

# Wireshark Developer's Guide

***Version 3.7.0***

Ulf Lamping, Graham Bloice

# Preface

## Foreword

This book tries to give you a guide to start your own experiments into the wonderful world of Wireshark development.

Developers who are new to Wireshark often have a hard time getting their development environment up and running. This is especially true for Win32 developers, as a lot of the tools and methods used when building Wireshark are much more common in the UNIX world than on Win32.

The first part of this book will describe how to set up the environment needed to develop Wireshark.

The second part of this book will describe how to change the Wireshark source code.

We hope that you find this book useful, and look forward to your comments.

## Who should read this document?

The intended audience of this book is anyone going into the development of Wireshark.

This book is not intended to explain the usage of Wireshark in general. Please refer the [Wireshark User's Guide](#) about Wireshark usage.

By reading this book, you will learn how to develop Wireshark. It will hopefully guide you around some common problems that frequently appear for new (and sometimes even advanced) developers of Wireshark.

## Acknowledgements

The authors would like to thank the whole Wireshark team for their assistance. In particular, the authors would like to thank:

- Gerald Combs, for initiating the Wireshark project.
- Guy Harris, for many helpful hints and his effort in maintaining the various contributions on the mailing lists.
- Frank Singleton from whose [README.idl2wrs idl2wrs: Creating dissectors from CORBA IDL files](#) is derived.

The authors would also like to thank the following people for their helpful feedback on this document:

- XXX - Please give feedback :-)

And of course a big thank you to the many, many contributors of the Wireshark development community!

## About this document

This book was developed by [Ulf Lamping](#), updated for VS2013 by [Graham Bloice](#), and updated for later versions of Visual Studio by various contributors.

It is written in AsciiDoc.

## Where to get the latest copy of this document?

The latest copy of this documentation can always be found at [https://www.wireshark.org/docs/wsdg\\_html\\_chunked/](https://www.wireshark.org/docs/wsdg_html_chunked/).

## Providing feedback about this document

Should you have any feedback about this document, please send it to the authors through [wireshark-dev\[AT\]wireshark.org](mailto:wireshark-dev[AT]wireshark.org).

## Typographic Conventions

The following table shows the typographic conventions that are used in this guide.

Table 1. *Typographic Conventions*

Style	Description	Example
<i>Italic</i>	File names, folder names, and extensions	<i>C:\Development\wireshark.</i>
<b>Monospace</b>	Commands, flags, and environment variables	CMake's <b>-G</b> option.
<b>Bold Monospace</b>	Commands that should be run by the user	Run <b>cmake -G Ninja ...</b>
<b>[ Button ]</b>	Dialog and window buttons	Press <b>[ Launch ]</b> to go to the Moon.
<b>Key</b>	Keyboard shortcut	Press <b>Ctrl+Down</b> to move to the next packet.
<b>Menu</b>	Menu item	Select <b>Go &gt; Next Packet</b> to move to the next packet.

## Admonitions

Important and notable items are marked as follows:

### WARNING

*This is a warning*

You should pay attention to a warning, otherwise data loss might occur.

### NOTE

*This is a note*

A note will point you to common mistakes and things that might not be obvious.

### TIP

*This is a tip*

Tips are helpful for your everyday work using Wireshark.

## Shell Prompt and Source Code Examples

*Bourne shell, normal user*

```
$ # This is a comment  
$ git config --global log.abbrevcommit true
```

*Bourne shell, root user*

```
# # This is a comment  
# ninja install
```

*Command Prompt (cmd.exe)*

```
>rem This is a comment  
>cd C:\Development
```

*PowerShell*

```
PS$># This is a comment  
PS$> choco list -l
```

## C Source Code

```
#include "config.h"

/* This method dissects foos */
static int
dissect_foo_message(tvbuff_t *tvb, packet_info *pinfo _U_, proto_tree *tree _U_, void
*data _U_)
{
    /* TODO: implement your dissecting code */
    return tvb_captured_length(tvb);
}
```

# Wireshark Build Environment

## *Wireshark Build Environment*

The first part describes how to set up the tools, libraries and source needed to generate Wireshark and how to do some typical development tasks.

# Introduction

## Introduction

This chapter will provide a general overview of Wireshark development.

## What Is Wireshark?

Well, if you want to start Wireshark development, you might already know what Wireshark is doing. If not, please have a look at the [Wireshark User's Guide](#), which will provide a lot of general information about it.

## Supported Platforms

Wireshark currently runs on most UNIX-like platforms and various Windows platforms. It requires Qt, GLib, libpcap and some other libraries in order to run.

As Wireshark is developed in a platform independent way and uses libraries (such as the Qt GUI library) which are available for many different platforms, it's thus available on a wide variety of platforms.

If a binary package is not available for your platform, you should download the source and try to build it. Please report your experiences to [wireshark-dev@wireshark.org](mailto:wireshark-dev@wireshark.org).

Binary packages are available for the following platforms along with many others:

### Unix And Unix-like Platforms

- Apple macOS
- FreeBSD
- HP-UX
- IBM AIX
- NetBSD
- OpenBSD
- Oracle Solaris

### Linux

- Arch Linux
- Debian GNU/Linux
- Ubuntu

- Fedora
- Gentoo Linux
- IBM S/390 Linux (Red Hat)
- Mandriva Linux
- PLD Linux
- Red Hat Linux
- Slackware Linux
- Suse Linux

## Microsoft Windows

Wireshark supports Windows natively via the [Windows API](#). Note that in this documentation and elsewhere we tend to use the terms “Win32”, “Win”, and “Windows” interchangeably to refer to the Windows API. “Win64” refers to the Windows API on 64-bit platforms. Wireshark runs on and can be compiled on the following Windows versions:

- Windows 10 / Windows Server 2016 / Windows Server 2019
- Windows 8.1 / Windows Server 2012 R2
- Windows 8 / Windows Server 2012

Development on Windows 7, Server 2008 R2, Vista, Server 2008, and older versions may be possible but is not supported.

Some versions of Windows support [case sensitive directories](#). We don't officially support building or running Wireshark in this environment, but we will accept patches to fix any issues that might arise.

## Development And Maintenance Of Wireshark

Wireshark was initially developed by Gerald Combs. Ongoing development and maintenance of Wireshark is handled by the Wireshark core developers, a loose group of individuals who fix bugs and provide new functionality.

There have also been a large number of people who have contributed protocol dissectors and other improvements to Wireshark, and it is expected that this will continue. You can find a list of the people who have contributed code to Wireshark by checking the About dialog box of Wireshark, or have a look at the <https://www.wireshark.org/about.html#authors> page on the Wireshark web site.

The communication between the developers is usually done through the developer mailing list, which can be joined by anyone interested in the development activities. At the time this document was written, more than 500 persons were subscribed to this mailing list!



It is strongly recommended to join the developer mailing list, if you are going to do any Wireshark development. See [Mailing Lists](#) about the different Wireshark mailing lists available.

## Programming Languages Used

Most of Wireshark is implemented in C99. A notable exception is the code in *ui/qt*, which is written in C++.

The typical task for a new Wireshark developer is to extend an existing dissector, or write a new dissector for a specific network protocol. Most dissectors are written in C99, so a good knowledge of C will be sufficient for Wireshark development in almost any case. Dissectors can also be written in Lua, which might be more suitable for your specific needs. As noted above, if you're going to modify Wireshark's user interface you will need a knowledge of C++.

Modifying the build system and support tooling might requires knowledge of CMake, Python, PowerShell, Bash, or Perl. Note that these are required to build Wireshark, but not to run it. If Wireshark is installed from a binary package, none of these helper tools are needed on the target system.

## Open Source Software

Wireshark is an [open source](#) software (OSS) project, and is released under the [GNU General Public License](#) (GPL). You can freely use Wireshark on any number of computers you like, without worrying about license keys or fees or such. In addition, all source code is freely available under the GPL. Because of that, it is very easy for people to add new protocols to Wireshark, either as plugins, or built into the source, and they often do!

You are welcome to modify Wireshark to suit your own needs, and it would be appreciated if you contribute your improvements back to the Wireshark community.

You gain three benefits by contributing your improvements back to the community:

- Other people who find your contributions useful will appreciate them, and you will know that you have helped people in the same way that the developers of Wireshark have helped you and other people.
- The developers of Wireshark might improve your changes even more, as there's always room for improvement. Or they may implement some advanced things on top of your code, which can be useful for yourself too.
- The maintainers and developers of Wireshark will maintain your code as well, fixing it when API changes or other changes are made, and generally keeping it in tune with what is happening with Wireshark. So if Wireshark is updated (which is done often), you can get a new Wireshark version from the website and your changes will already be included without any effort for you.

The Wireshark source code and binary packages for some platforms are all available on the

download page of the Wireshark website: <https://www.wireshark.org/download.html>.

## Releases And Distributions

Official Wireshark releases can be found at <https://www.wireshark.org/download.html>. Minor releases typically happen every six weeks and typically include bug fixes and security updates. Major releases happen about once a year and include new features and new protocol support. Official releases include binary packages for Windows and macOS along with source code.

### Binary Distributions

The Wireshark development team would like to make it as easy as possible for people to obtain and use Wireshark. This means that we need to support the software installation systems that different operating systems provide. We currently offer the following types of precompiled packages as part of each official release:

- Windows .exe installer. This is an executable file that installs Wireshark, and optionally Npcap and USBPcap, created using [NSIS](#). It is the most popular installation method on Windows.
- Windows [PortableApps](#) .paf.exe file. This is a self-contained package that can be run from anywhere, either standalone or under the PortableApps.com Platform.
- Windows .msi installer. This installs Wireshark using Microsoft's [Installer Database](#), created using the [WiX toolset](#). It does not yet include Npcap or USBPcap and is somewhat [experimental](#).
- macOS .dmg. This is a disk image which includes a drag-installable Wireshark application bundle along with utility packages for installing ChmodBPF and adding Wireshark to your PATH environment variable.

Most Linux and UNIX distributions have their own packaging systems which usually include Wireshark. The Wireshark sources include support for creating the following types of packages:

- Debian .deb files. Packaging assets can be found in the *debian* directory in the Wireshark sources.
- Red Hat .rpm files. Packaging assets can be found in the *packaging/rpm* directory in the Wireshark sources.

You can also create your own binary packages. See [Binary Packaging](#) for details.

### The Source Code Distribution

Wireshark is and will always be [open source](#). You're welcome to download a source tarball, build it, and modify it under the terms of the [GPLv2](#). However, it's usually much easier to use a binary package if you want to get up and running quickly in a production environment.

Source tarballs are commonly used for building the binary packages for UNIX and UNIX-like platforms. However, if you are going to modify the Wireshark sources, e.g. to contribute changes

back or to develop an in-house version of Wireshark we recommend that you use the latest Git sources. For details about the different ways to get the Wireshark source code see [Obtaining The Wireshark Sources](#).

Before building Wireshark from a source distribution, make sure you have all the tools and libraries required to build. Later chapters describe the required tools and libraries in detail.

## Automated Builds (GitLab CI And Buildbot)

The Wireshark development team uses GitLab’s continuous integration (CI) system and Buildbot to automatically build Wireshark for each Git merge request and commit. Automated builds provide several useful services:

- Cross-platform testing. Inbound merge requests and commits can be tested on each of our supported platforms, which ensures that a developer on one platform doesn’t break the build on other platforms.
- A health indicator for the source code. The CI badges at <https://gitlab.com/wireshark/wireshark/> and the waterfall status at <https://buildbot.wireshark.org/wireshark-master/> can quickly tell you how healthy the latest code is. Green is good, red is bad.
- Fast code delivery. After a change is committed to the repository, an installer is usually available within an hour at <https://www.wireshark.org/download/automated/>. This can be quite helpful for resolving issues, e.g. a bug reporter can easily verify a bugfix by installing a recent build.
- Automated regression tests. We run a comprehensive test suite as part of each build and continuously run fuzz tests that try to crash the dissection engine.

### What Do The Automated Builds Do?

GitLab’s CI and Buildbot operate by running a series of steps and reporting success or failure. A typical CI job might do the following:

1. Check out Wireshark from the source repository.
2. Build Wireshark.
3. Create a source tarball, binary package, or installer.
4. Run regression tests.

GitLab’s CI marks successful jobs with a green checkmark and failed jobs with a red “X”. Buildbot similarly colors successful jobs and steps green and failed ones red. Jobs and steps provide a link to the corresponding console logfile which provides additional information.

Release packages are built on the following platforms:

- Windows Server 2019 x86-64 (Win32, little endian, Visual Studio 2019)
- Windows Server 2019 x86-64 (Win64, little endian, Visual Studio 2019)

- Ubuntu 18.04 x86-64 (Linux, little endian, gcc, Clang)
- macOS 10.14 x86-64 (BSD, little endian, Clang)

Static code analysis and fuzz tests are run on the following platforms:

- Visual Studio Code Analysis (Win64, little endian, VS 2019)
- Clang Code Analysis, Coverity Scan, and fuzz tests (Linux, little endian, Clang)

Each platform is represented at the status page by a single column, the most recent entries are at the top.

## Reporting problems and getting help

If you have problems, or need help with Wireshark, there are several places that may be of interest to you (well, beside this guide of course).

### Website

You will find lots of useful information on the Wireshark homepage at <https://www.wireshark.org/>.

### Wiki

The Wireshark Wiki at <https://gitlab.com/wireshark/wireshark/wikis/> provides a wide range of information related to Wireshark and packet capturing in general. You will find a lot of information not part of this developer's guide. For example, there is an explanation how to capture on a switched network, an ongoing effort to build a protocol reference and a lot more.

And best of all, if you would like to contribute your knowledge on a specific topic (maybe a network protocol you know well), you can edit the Wiki pages by simply using your webbrowser.

### FAQ

The "Frequently Asked Questions" will list often asked questions and the corresponding answers.

Before sending any mail to the mailing lists below, be sure to read the FAQ, as it will often answer any questions you might have. This will save yourself and others a lot of time. Keep in mind that a lot of people are subscribed to the mailing lists.

You will find the FAQ inside Wireshark by clicking the menu item Help/Contents and selecting the FAQ page in the upcoming dialog.

An online version is available at the Wireshark website: <https://www.wireshark.org/faq.html>. You might prefer this online version as it's typically more up to date and the HTML format is easier to use.

## Other sources

If you don't find the information you need inside this book, there are various other sources of information:

- The file *doc/README.developer* and all the other *README.xxx* files in the source code. These are various documentation files on different topics

*Read the README*

### NOTE

*README.developer* is packed full with all kinds of details relevant to the developer of Wireshark source code. Its companion file *README.dissector* advises you around common pitfalls, shows you basic layout of dissector code, shows details of the APIs available to the dissector developer, etc.

- The Wireshark source code
- Tool documentation of the various tools used (e.g. manpages of sed, gcc, etc.)
- The different mailing lists. See [Mailing Lists](#)

## Q&A Site

The Wireshark Q&A site at <https://ask.wireshark.org/> offers a resource where questions and answers come together. You have the option to search what questions were asked before and what answers were given by people who knew about the issue. Answers are graded, so you can pick out the best ones easily. If your issue isn't discussed before you can post one yourself.

## Mailing Lists

There are several mailing lists available on specific Wireshark topics:

### **wireshark-announce**

This mailing list will inform you about new program releases, which usually appear about every 4-8 weeks.

### **wireshark-users**

This list is for users of Wireshark. People post questions about building and using Wireshark, others (hopefully) provide answers.

### **wireshark-dev**

This list is for Wireshark developers. People post questions about the development of Wireshark, others (hopefully) provide answers. If you want to start developing a protocol dissector, join this list.

### **wireshark-bugs**

This list is for Wireshark developers. Every time a change to the bug database occurs, a mail to

this mailing list is generated. If you want to be notified about all the changes to the bug database, join this list. Details about the bug database can be found in [Bug database \(Gitlab Issues\)](#).

### **wireshark-commits**

This list is for Wireshark developers. Every time a change to the Git repository is checked in, a mail to this mailing list is generated. If you want to be notified about all the changes to the Git repository, join this list. Details about the Git repository can be found in [The Wireshark Git repository](#).

You can subscribe to each of these lists from the Wireshark web site: <https://www.wireshark.org/lists/>. From there, you can choose which mailing list you want to subscribe to by clicking on the Subscribe/Unsubscribe/Options button under the title of the relevant list. The links to the archives are included on that page as well.

*The archives are searchable*

#### **TIP**

You can search in the list archives to see if someone previously asked the same question and maybe already got an answer. That way you don't have to wait until someone answers your question.

### **Bug database (Gitlab Issues)**

The Wireshark community collects bug reports in an issues database at <https://gitlab.com/wireshark/wireshark/issues>. This database is filled with manually filed bug reports, usually after some discussion on wireshark-dev, and automatic bug reports from the Buildbot tools.

### **Reporting Problems**

*Test with the latest version*

#### **NOTE**

Before reporting any problems, please make sure you have installed the latest version of Wireshark. Reports on older maintenance releases are usually met with an upgrade request.

If you report problems, provide as much information as possible. In general, just think about what you would need to find that problem, if someone else sends you such a problem report. Also keep in mind that people compile/run Wireshark on a lot of different platforms.

When reporting problems with Wireshark, it is helpful if you supply the following information:

1. The version number of Wireshark and the dependent libraries linked with it, e.g. Qt, GLib, etc. You can obtain this with the command `wireshark -v`.
2. Information about the platform you run Wireshark on.
3. A detailed description of your problem.
4. If you get an error/warning message, copy the text of that message (and also a few lines before and after it, if there are some), so others may find the build step where things go wrong. Please

don't give something like: "I get a warning when compiling x" as this won't give any direction to look at.

*Don't send large files*

**NOTE**

Do not send large files (>100KB) to the mailing lists, just place a note that further data is available on request. Large files will only annoy a lot of people on the list who are not interested in your specific problem. If required, you will be asked for further data by the persons who really can help you.

*Don't send confidential information*

**WARNING**

If you send captured data to the mailing lists, or add it to your bug report, be sure it doesn't contain any sensitive or confidential information, such as passwords. Visibility of such files can be limited to certain groups in the Gitlab Issues database by marking the issue confidential.

## Reporting Crashes on UNIX-like platforms

When reporting crashes with Wireshark, it is helpful if you supply the traceback information (besides the information mentioned in [Reporting Problems](#)).

You can obtain this traceback information with the following commands:

```
$ gdb `whereis wireshark | cut -f2 -d: | cut -d' ' -f2` core >& bt.txt
backtrace
^D
$
```

*Using GDB*

Type the characters in the first line verbatim. Those are back-tics there.

**NOTE**

`backtrace` is a `gdb` command. You should enter it verbatim after the first line shown above, but it will not be echoed. The `^D` (Control-D, that is, press the Control key and the D key together) will cause `gdb` to exit. This will leave you with a file called `bt.txt` in the current directory. Include the file with your bug report.

If you do not have `gdb` available, you will have to check out your operating system's debugger.

You should mail the traceback to [wireshark-dev@wireshark.org](mailto:wireshark-dev@wireshark.org) or attach it to your bug report.

## Reporting Crashes on Windows platforms

You can download Windows debugging symbol files (.pdb) from the following locations:

- 32-bit Windows: <https://www.wireshark.org/download/win32/all-versions/>
- 64-bit Windows: <https://www.wireshark.org/download/win64/all-versions/>

Files are named "Wireshark-pdb-win*bits*-x.y.z.zip" to match their corresponding "Wireshark-win*bits*-x.y.z.exe" installer packages.



# Quick Setup

## UNIX: Installation and Build Instructions

### Build environment setup

The following must be installed in order to build Wireshark:

- a C compiler and a C++ compiler;
- the Flex lexical analyzer;
- either Bison or Berkeley YACC;
- Perl;
- Python 3;
- CMake;
- several required libraries.

Either make or Ninja can be used to build Wireshark; at least one of those must be installed.

To build the manual pages, Developer's Guide and User's Guide, AsciiDoctor, Xsltproc, and DocBook must be installed.

Some features of Wireshark require additional libraries to be installed.

For Debian, and for Linux distributions based on Debian, such as Ubuntu, the script `tools/debian-setup.sh` will install the packages and libraries required to build Wireshark. It supports the command-line options:

- `--install-optional` to install additional tools and to install libraries required for all Wireshark features;
- `--install-deb-deps` to install packages required to build a .deb file for Wireshark;
- `--install-test-deps` to install packages required to run all tests.

For RPM-based Linux distributions such as Red Hat, Centos, Fedora, and openSUSE, the script `tools/rpm-setup.sh` will install the packages and libraries required to build Wireshark. It supports the command-line options:

- `--install-optional` to install additional tools and to install libraries required for all Wireshark features;
- `--install-rpm-deps` to install packages required to build a .rpm file for Wireshark.

For Alpine Linux, the script `tools/alpine-setup.sh` will install the packages and libraries required to build Wireshark. It supports the `--install-optional` command-line option to install additional tools

and to install libraries required for all Wireshark features.

For FreeBSD, NetBSD, OpenBSD, and DragonFly BSD, the script `tools/bsd-setup.sh` will install the packages and libraries required to build Wireshark. It supports the `--install-optional` command-line option to install additional tools and to install libraries required for all Wireshark features.

For macOS, you must first install Xcode. After installing Xcode, the script `tools/macos-setup.sh` will install the rest of the tools and libraries required to build Wireshark, as well as the additional tools required to build the documentation and the libraries required for all Wireshark features. If you're using Homebrew, the script `tools/macos-setup-brew.sh` will install the same tools and libraries from Homebrew.

If an install package is not available or you have a reason not to use it (maybe because it's simply too old), you can install that tool from source code. The following sections will provide you with the webpage addresses where you can get these sources.

## Building

The recommended (and fastest) way to build Wireshark is with CMake and Ninja. Building with make took nearly 2x time as Ninja in one experiment.

CMake builds are best done in a separate build directory, such as a `build` subdirectory of the top-level source directory. If that directory is a subdirectory of the top-level source directory, to generate the build files, change to the build directory and enter the following command:

```
$ cmake ..
```

to use make as the build tool or

```
$ cmake -G Ninja ..
```

to use Ninja as the build tool. If you create the build tool in the same directory that contains the top-level Wireshark source directory, to generate the build files, change to the build directory and enter the following command:

```
$ cmake ../{source directory}
```

to use make as the build tool or

```
$ cmake -G Ninja ../{source directory}
```

to use Ninja as the build tool. `{source directory}` is the name of the top-level Wireshark source

directory.

If you need to build with a non-standard configuration, you can run

```
$ cmake -LH ../{source directory}
```

to see what options you have.

You can then run Ninja or make to build Wireshark.

```
$ ninja  
$ # or  
$ make
```

Once you have build Wireshark with `ninja` or `make` above, you should be able to test it by entering `run/wireshark`.

## Optional: Install

Install Wireshark in its final destination:

```
make install
```

Once you have installed Wireshark with `make install` above, you should be able to run it by entering `wireshark`.

## Optional: Create User's and Developer's Guide

To build the Wireshark User's Guide and the Wireshark Developer's Guide, build the `all_guides` target, e.g. `make all_guides` or `ninja all_guides`. Detailed information to build these guides can be found in the file `docbook/README.adoc` in the Wireshark sources.

## Optional: Create an installable or source code package

To create a source code tarball, build the `dist` target.

To create an installable package after successfully building Wireshark:

- to build a Debian package, build the `deb-package` target;
- to build an RPM package, build the `rpm-package` target;
- to build an [AppImage](#) package, build the `appimage` target;
- to build a macOS dmg package containing an application bundle, build the `dmg-package` target.

## Troubleshooting during the build and install on Unix

A number of errors can occur during the build and installation process. Some hints on solving these are provided here.

If the `cmake` stage fails you will need to find out why. You can check the file `CMakeOutput.log` and `CMakeError.log` in the build directory to find out what failed. The last few lines of this file should help in determining the problem.

The standard problems are that you do not have a required development package on your system or that the development package isn't new enough. Note that installing a library package isn't enough. You need to install its development package as well.

If you cannot determine what the problems are, send an email to the *wireshark-dev* mailing list explaining your problem. Include the output from `cmake` and anything else you think is relevant such as a trace of the `make` stage.

## Win32/64: Step-by-Step Guide

A quick setup guide for Win32 and Win64 with recommended configuration.

### WARNING

Unless you know exactly what you are doing, you should strictly follow the recommendations below. They are known to work and if the build breaks, please re-read this guide carefully.

Known traps are:

1. Not using the correct (x86 or x64) version of the Visual Studio command prompt.
2. Not using a supported version of Windows. Please check [here](#) that your installed version is supported and updated.

## Recommended: Install Chocolatey

[Chocolatey](#) is a native package manager for Windows. There are [packages](#) for most of the software listed below. Along with traditional Windows packages it supports the Python Package Index.

Chocolatey tends to install packages into its own path (`%ChocolateyInstall%`), although packages are free to use their own preferences (Python for example is installed to `C:\Python37`). You can install Chocolatey packages using the command `choco install` (or its shorthand, `cinst`), e.g.

```
> rem Flex is required.
> choco install -y winflexbison3
> rem Git, CMake, Perl, Python, etc are also required, but can be installed
> rem via their respective installation packages.
> choco install -y git cmake strawberryperl python3
```

## Install Microsoft Visual Studio

[Download](#) and install “Microsoft Visual Studio 2019 Community Edition”. This is a small utility that downloads all the other required parts (which are quite large).

Check the checkbox for “Desktop development with C++” and then uncheck all the optional components other than the “VC++ 2019” item with the “latest ... tools”, the “Windows 10 SDK”, and the “Visual C++ tools for CMake” (unless you want to use them for purposes other than Wireshark).

You can use Chocolatey to install Visual Studio, using the Visual Studio Community and Native Desktop workload packages.

```
PS$> choco install -y visualstudio2019community visualstudio2019-workload-
nativedesktop
```

You can use other Microsoft C compiler variants, but VS2019 is used to build the development releases and is the preferred option. It’s possible to compile Wireshark with a wide range of Microsoft C compiler variants. For details see [Microsoft compiler toolchain \(Windows native\)](#).

You may have to do this as Administrator.

Compiling with gcc or Clang is not recommended and will certainly not work (at least not without a lot of advanced tweaking). For further details on this topic, see [GNU Compiler Toolchain \(UNIX And UNIX-like Platforms\)](#). This may change in future as releases of Visual Studio add more cross-platform support.

Why is this recommended? While this is a huge download, the Community Editions of Visual Studio are free (as in beer) and include the Visual Studio integrated debugger. Visual Studio 2019 is also used to create official Wireshark builds, so it will likely have fewer development-related problems.

## Install Qt

The main Wireshark application uses the Qt windowing toolkit. To install Qt, go to the [“Download Qt” page](#), select “Go open source”, download the **Qt Online Installer for Windows** from the Qt Project and select, for the desired Qt version, a component that matches your target system and compiler. For example, at the time of this writing the Qt 5.15.2 “msvc2019 64-bit” component is used to build the official 64-bit packages. The “Qt Debug Information Files” component contains PDB files which can be used for debugging. You can deselect all of the other the components such as “Qt

Charts” or “Android xxxx” as they aren’t required.

Note that installation of separate Qt components are required for 32 bit and 64 bit builds, e.g. “msvc2019 32-bit” and “msvc2019 64-bit”. The environment variable `QT5_BASE_DIR` should be set as appropriate for your environment and should point to the Qt directory that contains the bin directory, e.g. `C:\Qt\5.15.2\msvc2019_64`

The Qt maintenance tool (`C:\Qt\MaintenanceTool.exe`) can be used to upgrade Qt to newer versions.

## Install Python

Get a Python 3.x installer from <https://python.org/download/> and install Python into the default location (`C:\Python37`).

Alternatively you can install Python using Chocolatey:

```
PS$> choco install -y python3
```

Chocolatey installs Python in `C:\Python37` by default.

## Install Perl

Get a Perl installer from <http://strawberryperl.com/> or <https://www.activestate.com/> and install Perl into the default location.

Alternatively you can install Perl using Chocolatey:

```
PS$> choco install -y strawberryperl
# ...or...
PS$> choco install -y activeperl
```

## Install Git

Please note that the following is not required to build Wireshark but can be quite helpful when working with the sources.

Working with the Git source repositories is highly recommended, as described in [Obtaining The Wireshark Sources](#). It is much easier to update a personal source tree (local repository) with Git rather than downloading a zip file and merging new sources into a personal source tree by hand. It also makes first-time setup easy and enables the Wireshark build process to determine your current source code revision.

There are several ways in which Git can be installed. Most packages are available at the URLs below or via [Chocolatey](#). Note that many of the GUI interfaces depend on the command line version.

If installing the Windows version of git select the *Use Git from the Windows Command Prompt* (in chocolatey the */GitOnlyOnPath* option). Do **not** select the *Use Git and optional Unix tools from the Windows Command Prompt* option (in chocolatey the */GitAndUnixToolsOnPath* option).

## The Official Windows Installer

The official command-line installer is available at <https://git-scm.com/download/win>.

## Git Extensions

Git Extensions is a native Windows graphical Git client for Windows. You can download the installer from <https://github.com/gitextensions/gitextensions/releases/latest>.

## TortoiseGit

TortoiseGit is a native Windows graphical Git similar to TortoiseSVN. You can download the installer from <https://tortoisegit.org/download/>.

## Command Line client via Chocolatey

The command line client can be installed (and updated) using Chocolatey:

```
PS$> choco install -y git
```

## Others

A list of other GUI interfaces for Git can be found at <https://git-scm.com/downloads/guis>

## Install CMake

Get the CMake installer from <https://cmake.org/download/> and install CMake into the default location. Ensure the directory containing cmake.exe is added to your path.

Alternatively you can install CMake using Chocolatey:

```
PS$> choco install -y cmake
```

Chocolatey ensures cmake.exe is on your path.

## Install AsciiDoctor, Xsltproc, And DocBook

[AsciiDoctor](#) can be run directly as a Ruby script or via a Java wrapper (AsciiDoctorJ). The JavaScript flavor (AsciiDoctor.js) isn't yet supported. It is used in conjunction with Xsltproc and DocBook to generate the documentation you're reading and the User's Guide.

You can install AsciiDoctorJ, Xsltproc, and DocBook using Chocolatey. AsciiDoctorJ requires a Java runtime and there are [many to choose from](#). Chocolatey doesn't support alternative package dependencies at the present time, including dependencies on Java. As a result, installing the asciidoctorj package won't automatically install a Java runtime — you must install one separately.

```
PS$> choco install -y <your favorite Java runtime>
PS$> choco install -y asciidoctorj xsltproc docbook-bundle
```

Chocolatey ensures that asciidoctorj.exe and xsltproc.exe is on your path and that xsltproc uses the DocBook catalog.

## Install winflexbison

Get the winFlexBison installer from <https://sourceforge.net/projects/winflexbison/> and install into the default location. Ensure the directory containing win\_flex.exe and win\_bison.exe is on your path.

Alternatively you can install Winflexbison using Chocolatey:

```
PS$> choco install -y winflexbison3
```

Chocolatey ensures win\_flex.exe is on your path.

## Install and Prepare Sources

*Make sure everything works*

### TIP

It's a good idea to make sure Wireshark compiles and runs at least once before you start hacking the Wireshark sources for your own project. This example uses Git Extensions but any other Git client should work as well.

**Download sources** Download Wireshark sources into *C:\Development\wireshark* using either the command line or Git Extensions:

Using the command line:

```
>cd C:\Development
>git clone https://gitlab.com/wireshark/wireshark.git
```

Using Git extensions:

1. Open the Git Extensions application. By default Git Extensions will show a validation checklist at startup. If anything needs to be fixed do so now. You can bring up the checklist at any time via



## Tools › Settings.

2. In the main screen select *Clone repository*. Fill in the following:

Repository to clone: <https://gitlab.com/wireshark/wireshark.git>

Destination: Your top-level development directory, e.g. *C:\Development*.

Subdirectory to create: Anything you'd like. Usually *wireshark*.

### TIP

*Check your paths*

Make sure your repository path doesn't contain spaces.

3. Click the [ **Clone** ] button. Git Extensions should start cloning the Wireshark repository.

## Open a Visual Studio Command Prompt

From the Start Menu (or Start Screen), navigate to the “Visual Studio 2019” folder and choose the [Command Prompt](#) appropriate for the build you wish to make, e.g. “x64 Native Tools Command Prompt for VS 2019” for a 64-bit version or “x86 Native Tools Command Prompt for VS 2019” for a 32-bit version. Depending on your version of Windows the Command Prompt list might be directly under “Visual Studio 2019” or you might have to dig for it under multiple folders, e.g. **Visual Studio 2019 › Visual Studio Tools › Windows Desktop Command Prompts**.

You can set up a build environment in your own command prompt by running the appropriate `vcvarsARCHITECTURE.bat` command. See [Use the Microsoft C++ toolset from the command line](#) for details.

### TIP

*Pin the items to the Task Bar*

Pin the Command Prompt you use to the Task Bar for easy access.

All subsequent operations take place in this Command Prompt window.

1. Set environment variables to control the build.

Set the following environment variables, using paths and values suitable for your installation:

```
> rem Let CMake determine the library download directory name under
> rem WIRESHARK_BASE_DIR or set it explicitly by using WIRESHARK_LIB_DIR.
> rem Set *one* of these.
> set WIRESHARK_BASE_DIR=C:\Development
> rem set WIRESHARK_LIB_DIR=c:\wireshark-win64-libs
> rem Set the Qt installation directory
> set QT5_BASE_DIR=C:\Qt\5.15.2\msvc2019_64
> rem Append a custom string to the package version. Optional.
> set WIRESHARK_VERSION_EXTRA=-YourExtraVersionInfo
```

Setting these variables could be added to a batch file to be run after you open the Visual Studio Tools Command Prompt.

*Use Qt's LTS branch*

**TIP**

We recommend using the most recent “long term support” branch of Qt5 to compile Wireshark on Windows. At the time of writing this is Qt 5.15.

2. Create and change to the correct build directory. CMake is best used in an out-of-tree build configuration where the build is done in a separate directory to the source tree, leaving the source tree in a pristine state. 32 and 64 bit builds require a separate build directory. Create (if required) and change to the appropriate build directory.

```
> mkdir C:\Development\wsbuild64
> cd C:\Development\wsbuild64
```

to create and jump into the build directory.

The build directory can be deleted at any time and the build files regenerated as detailed in [Generate the build files](#).

## Generate the build files

CMake is used to process the CMakeLists.txt files in the source tree and produce build files appropriate for your system.

You can generate Visual Studio solution files to build either from within Visual Studio, or from the command line with MSBuild. CMake can also generate other build types but they aren't supported.

The initial generation step is only required the first time a build directory is created. Subsequent builds will regenerate the build files as required.

If you've closed the Visual Studio Command Prompt [prepare](#) it again.

To generate the build files enter the following at the Visual Studio command prompt:

```
> cmake -G "Visual Studio 16 2019" -A Win32 ..\wireshark
```

Adjusting the paths as required to Python and the Wireshark source tree. To use a different generator modify the `-G` parameter. `cmake -G` lists all the CMake supported generators, but only Visual Studio is supported for Wireshark builds.

To build an x64 version, specify it as the architecture, e.g. `-G "Visual Studio 16 2019" -A x64`:

```
> cmake -G "Visual Studio 16 2019" -A x64 ..\wireshark
```

The CMake generation process will download the required 3rd party libraries (apart from Qt) as required, then test each library for usability before generating the build files.

At the end of the CMake generation process the following should be displayed:

```
-- Configuring done
-- Generating done
-- Build files have been written to: C:/Development/wsbuild64
```

If you get any other output, there is an issue in your environment that must be rectified before building. Check the parameters passed to CMake, especially the `-G` option and the path to the Wireshark sources and the environment variables `WIRESHARK_BASE_DIR` and `QT5_BASE_DIR`.

## Build Wireshark

Now it's time to build Wireshark!

1. If you've closed the Visual Studio Command Prompt [prepare](#) it again.
2. Run

```
> msbuild /m /p:Configuration=RelWithDebInfo Wireshark.sln
```

to build Wireshark.

3. Wait for Wireshark to compile. This will take a while, and there will be a lot of text output in the command prompt window
4. Run `C:\Development\wsbuild64\run\RelWithDebInfo\Wireshark.exe` and make sure it starts.
5. Open **Help** > **About**. If it shows your "private" program version, e.g.: Version 3.7.0-myprotocol123 congratulations! You have compiled your own version of Wireshark!

You may also open the Wireshark solution file (*Wireshark.sln*) in the Visual Studio IDE and build

there.

**TIP**

If compilation fails for suspicious reasons after you changed some source files try to clean the build files by running `msbuild /m /p:Configuration=RelWithDebInfo Wireshark.sln /t:Clean` and then building the solution again.

The build files produced by CMake will regenerate themselves if required by changes in the source tree.

## Debug Environment Setup

You can debug using the Visual Studio Debugger or WinDbg. See the section on using the [Debugger Tools](#).

## Optional: Create User's and Developer's Guide

To build the Wireshark User's Guide and the Wireshark Developer's Guide, build the `all_guides` target, e.g. `msbuild all_guides.vcxproj`. Detailed information to build these guides can be found in the file `docbook\README.adoc` in the Wireshark sources.

## Optional: Create a Wireshark Installer

Note: You should have successfully built Wireshark before doing the following.

If you want to build your own *Wireshark-win32-3.7.0-myprotocol123.exe*, you'll need NSIS. You can download it from <http://nsis.sourceforge.net>.

Note that the 32-bit version of NSIS will work for both 32-bit and 64-bit versions of Wireshark. NSIS v3 is required.

If you've closed the Visual Studio Command Prompt [prepare](#) it again.

Run

```
> msbuild /m /p:Configuration=RelWithDebInfo nsis_package_prep.vcxproj
> msbuild /m /p:Configuration=RelWithDebInfo nsis_package.vcxproj
```

to build a Wireshark installer. If you sign your executables you should do so between the "nsis\_package\_prep" and "nsis\_package" steps.

Run

```
> packaging\nsis\wireshark-win64-{wireshark-version}-myprotocol123.exe
```

to test your new installer. It's a good idea to test on a different machine than the developer machine. Note that if you've built an x86 version, the installer name will contain "win32".

# Work with the Wireshark sources

## Introduction

This chapter will explain how to work with the Wireshark source code. It will show you how to:

- Get the source
- Compile it on your machine
- Submit changes for inclusion in the official release

This chapter will not explain the source file contents in detail, such as where to find specific functionality. This is done in [Source overview](#).

## The Wireshark Git repository

[Git](#) is used to keep track of the changes made to the Wireshark source code. The official repository is hosted at [GitLab](#), and incoming changes are evaluated and reviewed there. For more information on GitLab see [their documentation](#).

### *Why Git?*

Git is a fast, flexible way of managing source code. It allows large scale distributed development and ensures data integrity.

### *Why GitLab?*

GitLab makes it easy to contribute. You can make changes locally and push them to your own work area at [gitlab.com](#), or if your change is minor you can make changes entirely within your web browser.

*Historical trivia: GitLab is the **fourth** iteration of our source code repository and code review system.*

Wireshark originally used [Concurrent Versions System](#) (CVS) and migrated to [Subversion](#) in July 2004. We migrated from Subversion to Git and [Gerrit](#) in January 2014, and from Gerrit to GitLab in August 2020.

Using Wireshark's GitLab project you can:

- Keep your private sources up to date with very little effort.
- Receive notifications about code reviews and issues.
- Get the source files from any previous release (or any other point in time).
- Browse and search the source code using a web interface.
- See which person changed a specific piece of code.

## Git Naming Conventions

Like most revision control systems, Git uses [branching](#) to manage different copies of the source code and allow parallel development. Wireshark uses the following branch naming conventions:

*master.*

Main feature development and odd-numbered development releases.

*release-x.y, master-x.y.*

Stable release maintenance. For example, release-3.4 is used to manage the 3.4.x official releases.

Tags for major releases and release candidates consist of a “v” followed by a version number such as “v3.2.1” or “v3.2.3rc0”. Major releases additionally have a tag prefixed with “wireshark-” followed by a version number, such as “wireshark-3.2.0”.

## Browsing And Searching The Source Code

If you need a quick look at the Wireshark source code you can browse the repository files in GitLab at

<https://gitlab.com/wireshark/wireshark/tree/master>

You can view commit logs, branches, and tags, find files and search the repository contents. You can also download individual files.

## Obtaining The Wireshark Sources

There are two primary ways to obtain Wireshark’s source code: Git and compressed .tar archives. Each is described in more detail below. We recommend using Git for day to day development, particularly if you wish to contribute changes back to the project. The age mentioned in the following sections indicates the age of the most recent change in that set of the sources.

### Git Over SSH Or HTTPS

This method is strongly recommended for day to day development.

You can use a Git client to download the source code from Wireshark’s code review system. Anyone can clone from the anonymous HTTP git URL:

<https://gitlab.com/wireshark/wireshark.git>

If you have a GitLab account you can also clone using SSH:

`git@gitlab.com:wireshark/wireshark.git`

If wish to make changes to Wireshark you must create a GitLab account, create a fork of the official

Wireshark repository, update your fork, and create a merge request. See [Contribute Your Changes](#) for details.

The following example shows how to get up and running on the command line. See [Git client](#) for information on installing and configuring graphical Git clients.

1. Now on to the command line. First, make sure `git` works:

```
$ git --version
```

2. If this is your first time using Git, make sure your username and email address are configured. This is particularly important if you plan on uploading changes:

```
$ git config --global user.name "Henry Perry"  
$ git config --global user.email henry.perry@example.com
```

3. Next, clone the Wireshark repository:

```
# If you have a GitLab account, you can use the SSH URL:  
$ git clone -o upstream git@gitlab.com:wireshark/wireshark.git  
# If you don't you can use the HTTPS URL:  
$ git clone -o upstream https://gitlab.com/wireshark/wireshark.git  
# You can speed up cloning in either case by adding --shallow-since=1year or  
--depth=5000.
```

The clone only has to be done once. This will copy all the sources (including directories) from the server to your machine and check out the latest version.

The `-o upstream` flag uses the origin name “upstream” for the repository instead of the default “origin” as described in the [GitLab documentation](#).

Cloning may take some time depending on the speed of your internet connection.

The `--shallow-since=1year` option limits cloned commits to the last 1 year.

The `--depth=5000` option limits cloned commits to the last 5000.

## Development Snapshots

This method is useful for one-off builds or if Git is inaccessible (e.g. because of a restrictive firewall).

The Buildbot server automatically generates development packages, including source packages. They can be found at <https://www.wireshark.org/download/automated/src/>. Packages are available



for recent commits in the master branch and each release branch.

## Official Source Releases

This method is recommended for building downstream release packages.

The official source releases can be found at <https://www.wireshark.org/download.html>. You should use these sources if you want to build Wireshark on your platform based on an official release with minimal or no changes, such as Linux distribution packages.

## Update Your Wireshark Sources

After you've obtained the Wireshark sources for the first time, you might want to keep them in sync with the sources at the upstream Git repository.

*Take a look at the Buildbot first*

**TIP**

As development evolves, the Wireshark sources are compilable most of the time — but not always. You should take a look at <https://buildbot.wireshark.org/wireshark-master/waterfall> before fetching or pulling to make sure the builds are in good shape.

## Update Using Git

From time to time you will likely want to synchronize your master branch with the upstream repository. You can do so by running:

```
$ git pull --rebase upstream master
```

## Build Wireshark

The sources contain several documentation files. It's a good idea to read these files first. After obtaining the sources, tools and libraries, the first place to look at is *doc/README.developer*. Inside you will find the latest information for Wireshark development for all supported platforms.

*Build Wireshark before changing anything*

**TIP**

It is a very good idea to first test your complete build environment (including running and debugging Wireshark) before making any changes to the source code (unless otherwise noted).

Building Wireshark for the first time depends on your platform.

## Building on Unix

Follow the build procedure in [UNIX: Installation and Build Instructions](#) to build Wireshark.

## Windows Native

Follow the build procedure in [Win32/64: Step-by-Step Guide](#) to build Wireshark.

After the build process has successfully finished, you should find a `Wireshark.exe` and some other files in the `run\RelWithDebInfo` directory.

## Run Your Version Of Wireshark

### TIP

*Beware of multiple Wiresharks*

An already installed Wireshark may interfere with your newly generated version in various ways. If you have any problems getting your Wireshark running the first time, it might be a good idea to remove the previously installed version first.

## Unix-Like Platforms

After a successful build you can run Wireshark right from the `run` directory. There's no need to install it first.

```
$ ./run/wireshark
```

There's no need to run Wireshark as root user, but depending on your platform you might not be able to capture. Running Wireshark this way can be helpful since debugging output will be displayed in your terminal. You can also change Wireshark's behavior by setting various environment variables. See the [ENVIRONMENT VARIABLES](#) section of the Wireshark man page for more details.

## Windows Native

By default the CMake-generated Visual C++ project places all of the files necessary to run Wireshark in the subdirectory `run\RelWithDebInfo`. As with the Unix-like build described above, you can run Wireshark from the build directory without installing it first.

```
> .\run\RelWithDebInfo\Wireshark
```

## Debug Your Version Of Wireshark

### Unix-Like Platforms

You can debug using command-line debuggers such as `gdb`, `dbx`, or `lldb`. If you prefer a graphic debugger, you can use an IDE or debugging frontend such as Qt Creator, CLion, or Eclipse.

Additional traps can be set on Wireshark by setting the `WIRESHARK_LOG_FATAL` environment variable:

```
$ WIRESHARK_LOG_FATAL=critical gdb wireshark
```

If you're encountering memory safety bugs, you might want to build with [Address Sanitizer](#) so that Wireshark will immediately alert you to any detected issues.

```
$ cmake .. -G Ninja -DENABLE_ASAN=1
```

See <https://developer.gnome.org/glib/stable/glib-running.html>

## Windows Native

You can debug using the Visual Studio Debugger or WinDbg. See the section on using the [Debugger Tools](#).

# Make Changes To The Wireshark Sources

There are several reasons why you might want to change Wireshark's sources:

- Add support for a new protocol (i.e., add a new dissector)
- Change or extend an existing dissector
- Fix a bug
- Implement a glorious new feature

Wireshark's developers work on a variety of different platforms and use a variety of different development environments. Although we we don't enforce or recommend a particular environment, your editor should support [EditorConfig](#) in order to make sure you pick up the correct indentation style for any files that you might edit.

The internal structure of the Wireshark sources are described in [Wireshark Development](#).

*Ask the [wireshark-dev@wireshark.org](mailto:wreshark-dev@wireshark.org) mailing list before you start a new development task.*

### TIP

If you have an idea what you want to add or change it's a good idea to contact the developer mailing list (see [Mailing Lists](#)) and explain your idea. Someone else might already be working on the same topic, so a duplicated effort can be reduced. Someone might also give you tips that should be thought about (like side effects that are sometimes very hard to see).

# Contribute Your Changes

If you have finished changing the Wireshark sources to suit your needs, you might want to contribute your changes back to the Wireshark community. You gain the following benefits by contributing your improvements:

*It's the right thing to do.*

Other people who find your contributions useful will appreciate them, and you will know that you have helped people in the same way that the developers of Wireshark have helped you.

*You get free enhancements.*

By making your code public, other developers have a chance to make improvements, as there's always room for improvements. In addition someone may implement advanced features on top of your code, which can be useful for yourself too.

You save time and effort. The maintainers and developers of Wireshark will maintain your code as well, updating it when API changes or other changes are made, and generally keeping it in tune with what is happening with Wireshark. So if Wireshark is updated (which is done often), you can get a new Wireshark version from the website and your changes will already be included without any effort for you.

There's no direct way to push changes to the [main repository](#). Only a few people are authorised to actually make changes to the source code (check-in changed files). If you want to submit your changes, you should upload them to the code review system at [https://gitlab.com/wireshark/wireshark/-/merge\\_requests](https://gitlab.com/wireshark/wireshark/-/merge_requests). This requires you to set up git as described at [Git Over SSH Or HTTPS](#).

## Creating Merge Requests

GitLab uses a [forking workflow](#), which looks like this:

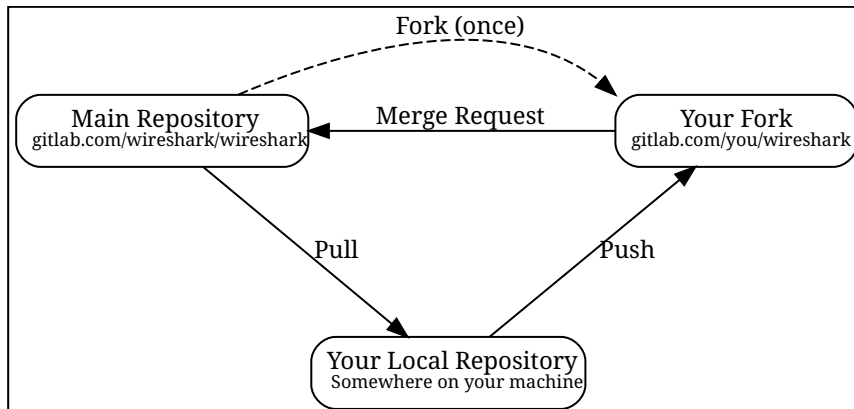


Figure 1. GitLab Workflow

In the diagram above, your fork can be created by pressing the “Fork” button at <https://gitlab.com/wireshark/wireshark>. Your local repository can be created as described in [Git Over SSH Or HTTPS](#). You only need to do this once. You should pull from the main repository on a regular basis in order

to ensure that your sources are current. You should push any time you want to make a merge request or otherwise make your code public. The “Pull”, “Push”, and “Merge Request” parts of the workflow are important, so let’s look at them in more detail.

First, you need to set up your environment. For the steps below we’ll pretend that your username is “henry.perry”.

1. Sign in to <https://gitlab.com/wireshark/wireshark> by clicking “Sign in / Register” in the upper right corner of the web page and following the login instructions.
2. [Add an SSH key to your account](#) as described in the GitLab documentation.
3. Make sure you have a clone of the main repository as described in [Git Over SSH Or HTTPS](#).
4. Create your own personal fork of the Wireshark project by [pressing the “Fork” button](#) at <https://gitlab.com/wireshark/wireshark>.
5. Add a remote for your personal repository. The main repository remote is named “upstream”, so we’ll name this one “downstream”.

```
$ git remote add downstream git@gitlab.com:henry.perry/wireshark.git
```

6. Double-check your remotes:

```
$ git remote -v
$ downstream git@gitlab.com:henry.perry/wireshark.git (fetch)
$ downstream git@gitlab.com:henry.perry/wireshark.git (push)
$ upstream git@gitlab.com:wireshark/wireshark.git (fetch)
$ upstream git@gitlab.com:wireshark/wireshark.git (push)
```

Before you begin it’s a good idea to synchronize your local repository with the main repository. This is the **Pull** part of the workflow. You should do this periodically in order to stay up to date and avoid merge conflicts later on.

1. Fetch and optionally apply the latest changes.

```
# Fetch changes from upstream and apply them to the current branch...
$ git pull --rebase upstream master
# ...or fetch changes and leave the current branch alone
$ git fetch upstream
```

Now you’re ready to create a merge request (the **Push** and **Merge Request** parts of the workflow above).

1. First, create a branch for your change:

```
$ git checkout -b my-glorious-new-feature upstream/master
```

2. Write some code! See [Some Tips For A Good Patch](#) and [Code Requirements](#) for details.
3. Commit your changes. See [Writing a Good Commit Message](#) for details.

```
$ git commit -a
```

4. Push your changes to your personal repository.

```
$ git push downstream HEAD
```

5. Go to [https://gitlab.com/wireshark/wireshark/merge\\_requests](https://gitlab.com/wireshark/wireshark/merge_requests). You should see a “Create merge request” button. Press it.
6. In the merge request page, make sure “Allow commits from members who can merge to the target branch” is selected so that core developers can rebase your change. You might want to select “Delete source branch when merge request is accepted” as well. Click the “Submit merge request” button.

## Updating Merge Requests

At this point various automated tests will be run and someone will review your change. If you need to make changes you can do so by force-pushing it to the same branch in your personal repository.

1. Push your changes to your personal repository.

```
# First, make sure you're on the right branch.  
$ git status  
On branch my-glorious-new-feature
```

2. Update your code.
3. Push your changes to your personal repository.

```
# Modify the current commit and force-push...  
$ git commit --amend ...  
$ git push downstream +HEAD  
# ...or keep the current commit as-is add another commit on top of it  
$ git commit ...  
$ git push downstream HEAD
```

The + sign is shorthand for forcing the push (-f).

## Some Tips For A Good Patch

Some tips that will make the merging of your changes into Git much more likely (and you want exactly that, don't you?):

*Use the latest Git sources.*

It's a good idea to work with the same sources that are used by the other developers. This usually makes it much easier to apply your patch. For information about the different ways to get the sources, see [Obtaining The Wireshark Sources](#).

*Update your sources just before making a patch.*

For the same reasons as the previous point.

*Inspect your patch carefully.*

Run `git diff` or `git show` as appropriate and make sure you aren't adding, removing, or omitting anything you shouldn't.

*Give your branch a brief but descriptive name.*

Short, specific names such as *snowcone-machine-protocol* are preferred.

*Don't put unrelated things into one large change.*

Merge requests should be limited in scope. For example, updates to the Snowcone Machine Protocol dissector and the Coloring Rules dialog box should be in separate merge requests.

In general, making it easier to understand and apply your patch by one of the maintainers will make it much more likely (and faster) that it will actually be applied.

*Thank you in advance for your patience.*

Wireshark is a volunteer effort. As a result, we can't guarantee a quick turnaround time.

*Preview the final product.*

Wireshark's GitLab CI jobs are disabled by default for forks, but if you need to test any CI jobs you can do so under the "Pipelines" section in your repository. For example, if your change might affect Debian (apt) packaging you can run the "build:debian-stable" job.

## Writing a Good Commit Message

When running `git commit`, you will be prompted to describe your change. Here are some guidelines on how to make that message more useful to other people (and to scripts that may try to parse it):

*Provide a brief description (under 60 characters or so) of the change in the first line.*

If the change is specific to a single protocol, start this line with the abbreviated name of the protocol and a colon. If the change is not yet complete prefix the line with "WIP:" to inform this change not to be submitted yet. This be removed when the change is ready to be merged.

*Insert a single blank line after the first line.*

This is required by various formatting tools and helpful to humans.

*Provide a detailed description of the change in the lines that follow.*

Break paragraphs where needed. Limit each line to 80 characters.

You can also reference and close issues in a commit message by prefixing the issue number with a [number sign](#). For example, “closes #5” will close issue number 5.

Putting all that together, we get the following example:

```
MIPv6: Fix dissection of Service Selection Identifier
```

```
APN field is not encoded as a dotted string so the first character is not a  
length. Closes #10323.
```

## Code Requirements

To ensure Wireshark’s code quality and to reduce friction in the code review process, there are some things you should consider before submitting a patch:

*Follow the Wireshark source code style guide.*

Wireshark runs on many platforms, and can be compiled with a number of different compilers. It’s easy to write code that compiles on your machine, but doesn’t compile elsewhere. The guidelines at [Coding Style](#) describe the techniques and APIs that you can use to write high-quality, portable, and maintainable code in our environment.

*Submit dissectors as built-in whenever possible.*

Developing a new dissector as a plugin can make compiling and testing quicker, but it’s usually best to convert it to built-in before submitting for review. This reduces the number of files that must be installed with Wireshark and ensures your dissector will be available on all platforms.

Dissectors vary, so this is not a hard-and-fast rule. Most dissectors are single C modules that can easily be put into “the big pile.” Some (most notably ASN.1 dissectors) are generated using templates and configuration files. Others are split across multiple source files and are often more suitable to be placed in a separate plugin directory.

*Ensure that the Wireshark Git Pre-Commit Hook is in the repository.*

In your local repository directory, there will be a `.git/hooks/` directory, with sample git hooks for running automatic actions before and after git commands. You can also optionally install other hooks that you find useful.

In particular, the `pre-commit` hook will run every time you commit a change and can be used to automatically check for various errors in your code. The sample git pre-commit hook simply detects whitespace errors such as mixed tabs and spaces. To install it just remove the `.sample` suffix from the existing `pre-commit.sample` file.



Wireshark provides a custom pre-commit hook which does additional Wireshark-specific API and formatting checks, but it might return false positives. If you want to install it, copy the pre-commit file from the tools directory (`cp ./tools/pre-commit .git/hooks/`) and make sure it is executable or it will not be run.

If the pre-commit hook is preventing you from committing what you believe is a valid change, you can run `git commit --no-verify` to skip running the hooks. Warning: using `--no-verify` avoids the commit-msg hook, and thus if you have setup this hook it will not run.

Additionally, if your system supports symbolic links, as all UNIX-like platforms do, you can use them instead of copying files. Running `ln -s ../../tools/pre-commit .git/hooks` creates a symbolic link that will make the hook to be up-to-date with the current master.

*Choose a compatible license.*

Wireshark is released under the [GPL version 2 or later](#), and it is strongly recommended that incoming code use that license. If that is not possible, it **must** use a compatible license. The following licenses are currently allowed:

- [BSD 1, 2, 3 clause](#)
- [GPL version 3 or later](#) **with** the [Bison parser exception](#)
- [ISC](#)
- [LGPL v2 or later](#), including [v2.1](#)
- [MIT / X11](#)
- [Public domain](#)
- [zlib/libpng](#)

Notable incompatible licenses include [Apache 2.0](#), [GPL 3.0](#), and [LGPL 3.0](#).

*Fuzz test your changes.*

Fuzz testing is a very effective way of finding dissector related bugs. In our case fuzzing involves making random changes to capture files and feeding them to TShark in order to try to make it crash or hang. There are tools available to automatically do this on any number of input files. See <https://gitlab.com/wireshark/wireshark/wikis/FuzzTesting> for details.

## Backporting A Change

When a bug is fixed in the master branch it's sometimes desirable or necessary to backport the fix to a release branch. You can do this in Git by cherry-picking the change from one branch to another. Suppose you want to backport change 1ab2c3d4 from the master branch to master-3.2. You can do so as follows:

```
# Create a new topic branch for the backport.
$ git checkout -b backport-g1ab2c3d4 upstream/master-3.2

# Cherry-pick the change. Include a "cherry picked from..." line.
$ git cherry-pick -x 1ab2c3d4

# If there are conflicts, fix them.

# Compile and test the change.
$ ninja
$ ...

# OPTIONAL: Add entries to docbook/release-notes.adoc.
$EDITOR docbook/release-notes.adoc

# If you made any changes, update your commit.
git commit --amend -a

# Push the change to your working repository.
git push downstream HEAD
```

You can also cherry-pick changes in the [GitLab web UI](#).

## Binary Packaging

Delivering binary packages makes it much easier for the end-users to install Wireshark on their target system. This section will explain how the binary packages are made.

### Packaging Guidelines

The following guidelines should be followed by anyone creating and distributing third-party Wireshark packages or redistributing official Wireshark packages.

#### Spelling And Capitalization

Wireshark is spelled with a capital “W”, and with everything else lower case. “WireShark” in particular is incorrect.

#### Main URL

The official Wireshark project URL is <https://www.wireshark.org/>.

#### Download URLs

Official packages are distributed on the main web server ([www.wireshark.org](http://www.wireshark.org)) and a [number of download mirrors](#). The canonical locations for packages are in the *all\_versions* subdirectories on

each server.

For example, if your packaging system links to or downloads the source tarball and you want to download from [1.na.dl.wireshark.org](http://1.na.dl.wireshark.org), use

<https://1.na.dl.wireshark.org/download/src/all-versions/wireshark-3.7.0.tar.xz>

instead of

<https://1.na.dl.wireshark.org/download/src/wireshark-3.7.0.tar.xz>

## Artwork

Logo and icon artwork can be found in the *image* directory in the distribution. This is available online at

<https://gitlab.com/wireshark/wireshark/tree/master/image>

## Licensing

Wireshark is released under the GNU General Public License version 2 or later. Make sure you and your package comply with this license.

## Trademarks

Wireshark and the “fin” logo are registered trademarks of the Wireshark Foundation. Make sure you and your package comply with trademark law.

## Privileges

All function calls that require elevated privileges are in `dumpcap`.

WIRESHARK CONTAINS OVER THREE MILLION LINES OF SOURCE CODE. DO NOT RUN THEM AS ROOT.

Warnings are displayed when Wireshark and TShark are run as root.

There are two [configure-time options](#) on non-Windows systems that affect the privileges a normal user needs to capture traffic and list interfaces:

### **-DDUMPCAP\_INSTALL\_OPTION=capabilities**

Install `dumpcap` with `cap_net_admin` and `cap_net_raw` capabilities. Linux only.

### **-DDUMPCAP\_INSTALL\_OPTION=suid**

Install `dumpcap` setuid root.

These are necessary for non-root users to be able to capture on most systems, e.g. on Linux or FreeBSD if the user doesn't have permissions to access `/dev/bpf*`. Setcap installation is preferred

over `setuid` on Linux. If `-DDUMPCAP_INSTALL_OPTION=capabilities` is used it will override any `setuid` settings.

The `-DENABLE_CAP` option is only useful when `dumpcap` is installed `setuid`. If it is enabled `dumpcap` will try to drop any `setuid` privileges it may have while retaining the `CAP_NET_ADMIN` and `CAP_NET_RAW` capabilities. It is enabled by default, if the Linux capabilities library (on which it depends) is found.

Note that enabling `setcap` or `setuid` installation allows packet capture for ALL users on your system. If this is not desired, you can restrict `dumpcap` execution to a specific group or user. The following two examples show how to restrict access using `setcap` and `setuid` respectively:

```
# groupadd -g packetcapture
# chmod 750 /usr/bin/dumpcap
# chgrp packetcapture /usr/bin/dumpcap
# setcap cap_net_raw,cap_net_admin+ep /usr/bin/dumpcap

# groupadd -g packetcapture
# chgrp packetcapture /usr/bin/dumpcap
# chmod 4750 /usr/bin/dumpcap
```

## Customization

Custom version information can be added by running `tools/make-version.pl`. If your package contains significant changes we recommend that you use this to differentiate it from official Wireshark releases.

```
tools/make-version.pl --set-release --untagged-version-extra=-{vcsinfo}-FooCorp
--tagged-version-extra=-FooCorp
```

See `tools/make-version.pl` for details.

The Git version corresponding to each release is in `version.h`. It's defined as a string. If you need a numeric definition, let us know.

If you have a question not addressed here, please contact `wireshark-dev[AT]wireshark.org`.

## Debian: .deb Packages

The Debian Package is built using `dpkg-buildpackage`, based on information found in the source tree under `debian`. See <https://www.debian.org/doc/manuals/maint-guide/build.en.html> for a more in-depth discussion of the build process.

In the `wireshark` directory, type:

```
dpkg-buildpackage -b -us -uc -jauto
```

to build the Debian Package.

## Red Hat: .rpm Packages

You can build an RPM package using the `rpm-package` target. The package version is derived from the current git HEAD, so you must build from a git checkout.

The package is built using `rpmbuild`, which comes as standard on many flavours of Linux, including Red Hat, Fedora, and openSUSE. The process creates a clean build environment in `${CMAKE_BINARY_DIR}/packaging/rpm/BUILD` each time the RPM is built. The settings that control the build are in `${CMAKE_SOURCE_DIR}/packaging/rpm/wireshark.spec.in`. The generated SPEC file contains CMake flags and other settings for the RPM build environment. Many of these come from the parent CMake environment. Notable ones are:

- `prefix` is set to `CMAKE_INSTALL_PREFIX`. By default this is `/usr/local`. Pass `-DCMAKE_INSTALL_PREFIX=/usr` to create a package that installs into `/usr`.
- Whether or not to create the “wireshark-qt” package (`-DBUILD_wireshark`).
- Lua, c-ares, nghttp2, and other library support (`-DENABLE_...`).
- Building with Ninja (`-G Ninja`).

In your build directory, type:

```
ninja rpm-package
# ...or, if you're using GNU make...
make rpm-package
```

to build the binary and source RPMs. When it is finished there will be a message stating where the built RPM can be found.

*This might take a while*

This creates a tarball, extracts it, compiles Wireshark, and constructs a package. This can take quite a long time. You can speed up the process by using Ninja. If you're using GNU make you can add the following to your `~/.rpmmacros` file to enable parallel builds:

**TIP**

```
_%_smp_mflags -j $(grep -c processor /proc/cpuinfo)
```

Building the RPM package requires quite a few packages and libraries including GLib, `gcc`, `flex`, AsciiDoctor, and Qt development tools such as `uic` and `moc`. The required Qt packages can usually be

obtained by installing the *qt5-devel* package. For a complete list of build requirements, look for the “BuildRequires” lines in *packaging/rpm/wireshark.spec.in*.

## macOS: .dmg Packages

The macOS Package is built using macOS packaging tools, based on information found in the source tree under *packaging/macosx*. It requires [Asciidoctor](#) and [dmgbuild](#).

In your build directory, type:

```
ninja dmg_package
# ...or, if you're using GNU make...
make dmg_package
```

to build the macOS Package.

## Windows: NSIS .exe Installer

The *Nullsoft Install System* is a free installer generator for Windows systems. Instructions on installing it can be found in [Windows: NSIS \(Optional\)](#). NSIS is script based. You can find the main Wireshark installer generation script at *packaging/nsis/wireshark.nsi*.

When building with CMake you must first build the *nsis\_package\_prep* target, followed by the *nsis\_package* target, e.g.

```
> msbuild /m /p:Configuration=RelWithDebInfo nsis_package_prep.vcxproj
> msbuild /m /p:Configuration=RelWithDebInfo nsis_package.vcxproj
```

Splitting the packaging projects in this way allows for code signing.

*This might take a while*

### TIP

Please be patient while the package is compressed. It might take some time, even on fast machines.

If everything went well, you will now find something like: *wireshark-setup-3.7.0.exe* in the *packaging/nsis* directory in your build directory.

## Windows: PortableApps .paf.exe Package

*PortableApps.com* is an environment that lets users run popular applications from portable media such as flash drives and cloud drive services.

Install the *PortableApps.com Platform*. Install for “all users”, which will place it in **C:\PortableApps**. Add the following apps:

- NSIS Portable (Unicode)
- PortableApps.com Installer
- PortableApps.com Launcher
- PortableApps.com AppCompactor

When building with CMake you must first build the *nsis\_package\_prep* target (which takes care of general packaging dependencies), followed by the *portableapps\_package* target, e.g.

```
> msbuild /m /p:Configuration=RelWithDebInfo nsis_package_prep.vcxproj
> msbuild /m /p:Configuration=RelWithDebInfo portableapps_package.vcxproj
```

*This might take a while*

#### TIP

Please be patient while the package is compressed. It might take some time, even on fast machines.

If everything went well, you will now find something like: *WiresharkPortable643.7.0.paf.exe\_* in the *packaging/portableapps* directory.

## Mime Types

Wireshark uses various mime-types for dragging dropping as well as file formats. This chapter gives an overview over all the mimetypes being used, as well as the data format in which data has to be provided for each individual mimetype.

If not otherwise stated, the data is encoded as a Json Object.

### Display Filter

**MimeType:** application/vnd.wireshark.displayfilter

Display filters are being dragged and dropped by utilizing this mime type.

```
{
  "filter": "udp.port == 8080",
  "field": "udp.port",
  "description": "UDP Port"
}
```

### Coloring Rules

**MimeType:** application/vnd.wireshark.coloringrules

Coloring Rules are being used for dragging and dropping color rules inside the coloring rules dialog.

```
{
  "coloringrules" :
  [
    {
      "disabled": false,
      "name": "UDP Ports for 8080",
      "filter": "udp.port == 8080",
      "foreground": "[0x0000, 0x0000, 0x0000]",
      "background": "[0xFFFF, 0xFFFF, 0xFFFF]"
    }
  ]
}
```

## Filter List

**MimeType:** application/vnd.wireshark.filterlist

*Internal Use only* - used on the filter list for moving entries within the list

## Column List

**MimeType:** application/vnd.wireshark.columnlist

*Internal Use only* - used on the column list for moving entries within the list



# Tool Reference

## Introduction

This chapter will provide you with information about the various tools needed for Wireshark development. None of the tools mentioned in this chapter are needed to run Wireshark. They are only needed to build it.

Most of these tools have their roots on UNIX or UNIX-like platforms such as Linux, but Windows ports are also available. Therefore the tools are available in different "flavours":

- UNIX and UNIX-like platforms: The tools should be commonly available on the supported UNIX and UNIX-like platforms. Cygwin is unsupported.
- Windows native: Some tools are available as native Windows tools, no special emulation is required. Many of these tools can be installed (and updated) using [Chocolatey](#), a Windows package manager similar to the Linux package managers apt-get or yum.

*Follow the directions*

### WARNING

Unless you know exactly what you are doing, you should strictly follow the recommendations given in [Quick Setup](#).

The following sections give a very brief description of what a particular tool is doing, how it is used in the Wireshark project and how it can be installed and tested.

Documentation for these tools is outside the scope of this document. If you need further information on using a specific tool you should find lots of useful information on the web, as these tools are commonly used. You can also get help for the UNIX based tools with `toolname --help` or the man page via `man toolname`.

You will find explanations of the tool usage for some of the specific development tasks in [Work with the Wireshark sources](#).

## Chocolatey

Chocolatey is a Windows package manager that can be used to install (and update) many of the packages required for Wireshark development. Chocolatey can be obtained from the [website](#) or from a Command Prompt:

```
C:\>@powershell -NoProfile -ExecutionPolicy unrestricted -Command "iex ((new-object net.webclient).DownloadString(_https://chocolatey.org/install.ps1_))" && SET PATH=%PATH%;%ALLUSERSPROFILE%\chocolatey\bin
```

or a Powershell prompt:

```
PS:\>iex ((new-object
net.webclient).DownloadString(_https://chocolatey.org/install.ps1_))
```

Chocolatey sometimes installs packages in unexpected locations. Python is a notable example. While it's typically installed in a top-level directory, e.g. `C:\Python37` or in `%PROGRAMFILES%`, e.g. `C:\Program Files\Python37`, Chocolatey tends to install it under `C:\ProgramData\chocolatey` or `C:\Tools`. If you want to avoid this behavior you'll probably want to install Python using the packages from [python.org](http://python.org).

Other package managers for Windows include the [Windows Package Manager \(winget\)](#) and [Scoop](#). As of May 2020 neither option provides all of the packages we require, but that might change in the future.

## CMake

Wireshark's build environment can be configured using CMake on various UNIX-like platforms, including Linux, macOS, and \*BSD, and on Windows. CMake is designed to support out-of-tree builds - so much so that in-tree builds do not work properly in all cases. Along with being cross-platform, CMake supports many build tools and environments including traditional make, Ninja, and MSBuild. Our Buildbot runs CMake steps on Ubuntu, Win32, Win64, and macOS. In particular, the macOS and Windows packages are built using CMake.

Building with CMake typically includes creating a build directory and specifying a **generator**, aka a build tool. For example, to build Wireshark using Ninja in the directory `wireshark-ninja` you might run the following commands:

```
# Starting from your Wireshark source directory, create a build directory
# alongside it.
$ cd ..
$ mkdir wireshark-ninja
$ cd wireshark-ninja
# Assumes your source directory is named "wireshark".
$ cmake -G Ninja ../wireshark
$ ninja (or cmake --build .)
```

Using CMake on Windows is described further in [Generate the build files](#).

Along with specifying a generator with the `-G` flag you can set variables using the `-D` flag. Useful variables and generators include the following:

### **-DBUILD\_wireshark=OFF**

Don't build the Wireshark GUI application. Each command line utility has its own `BUILD_XXX` flag as well. For example, you can use `-DBUILD_mmbdbresolve=OFF` to disable `mmbdbresolve`.

### **-DENABLE\_CAP=OFF**

Disable the POSIX capabilities check

### **-DCMAKE\_BUILD\_TYPE=Debug**

Enable debugging symbols

### **-DCARES\_INCLUDE\_DIR=/your/custom/cares/include,**

### **-DCARES\_LIBRARY=/your/custom/cares/lib/libcares.so**

Let you set the path to a locally-compiled version of c-ares. Most optional libraries have `xxx_INCLUDE_DIR` and `xxx_LIB` flags that let you control their discovery.

### **-DCMAKE\_OSX\_DEPLOYMENT\_TARGET=10.12**

Specify the minimum macOS version for Wireshark and each command line utility. Note that this doesn't affect the minimum target for third-party libraries. For example, if you're building for macOS 10.12 you'll need to install [Qt 5.14 or earlier](#) and ensure that other libraries support macOS 10.12, for example by running `tools/macos-setup.sh -t 10.12`.

### **-DENABLE\_APPLICATION\_BUNDLE=OFF**

Disable building an application bundle (Wireshark.app) on macOS

You can list all build variables (with help) by running `cmake -LH [options] ../<Name_of_WS_source_dir>`. This lists the cache of build variables after the cmake run. To only view the current cache, add option `-N`.

After running cmake, you can always run `make help` to see a list of all possible make targets.

Note that CMake honors user umask for creating directories as of now. You should set the umask explicitly before running the `install` target.

CMake links:

The home page of the CMake project: <https://cmake.org/>

Official documentation: <https://cmake.org/documentation/>

About CMake in general and why KDE4 uses it: <https://lwn.net/Articles/188693/>

Useful variables: <https://gitlab.kitware.com/cmake/community/wikis/doc/cmake/Useful-Variables>

Frequently Asked Questions: <https://gitlab.kitware.com/cmake/community/wikis/FAQ>

## **GNU Compiler Toolchain (UNIX And UNIX-like Platforms)**

## gcc (GNU Compiler Collection)

The GCC C compiler is available for most UNIX and UNIX-like operating systems.

If GCC isn't already installed or available as a package for your platform, you can get it at: <https://gcc.gnu.org/>.

After correct installation, typing at the bash command line prompt:

```
$ gcc --version
```

should result in something like

```
gcc (Ubuntu 4.9.1-16ubuntu6) 4.9.1
Copyright (C) 2014 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

Your version string may vary, of course.

## gdb (GNU Project Debugger)

GDB is the debugger for the GCC compiler. It is available for many (if not all) UNIX-like platforms.

If you don't like debugging using the command line, many [GUI frontends for it available](#), including Qt Creator, CLion, and Eclipse.

If gdb isn't already installed or available as a package for your platform, you can get it at: <https://www.gnu.org/software/gdb/gdb.html>.

After correct installation:

```
$ gdb --version
```

should result in something like:

```
GNU gdb (GDB) 8.3
Copyright (C) 2019 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
```

Your version string may vary, of course.

## make (GNU Make)

### NOTE

*GNU make isn't supported either for Windows*

GNU Make is available for most of the UNIX-like platforms.

If GNU Make isn't already installed or available as a package for your platform, you can get it at: <https://www.gnu.org/software/make/>.

After correct installation:

```
$ make --version
```

should result in something like:

```
GNU Make 4.0
Built for x86_64-pc-linux-gnu
Copyright (C) 1988-2013 Free Software Foundation, Inc.
Licence GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
```

Your version string may vary, of course.

## Ninja

Ninja is an alternative to make, and is available for many of the UNIX-like platforms. It runs builds faster than make does.

It is designed to have its build files generated by tools such as CMake; to generate build files for Ninja, run CMake with the `-G Ninja` flag.

If Ninja isn't already installed, see the list of suggestions for Ninja packages at: <https://github.com/ninja-build/ninja/wiki/Pre-built-Ninja-packages>.

If Ninja isn't already installed and isn't available as a package for your platform, you can get it from: <https://ninja-build.org>. You can download the source code or binaries for Linux, macOS, and Windows (we have not tested Ninja on Windows).

## Microsoft compiler toolchain (Windows native)

To compile Wireshark on Windows using the Microsoft C/C++ compiler (MSVC), you'll need:

1. C compiler (*cl.exe*)
2. Assembler (*ml.exe* for 32-bit targets and *ml64.exe* for 64-bit targets)

3. Linker (*link.exe*)
4. Resource Compiler (*rc.exe*)
5. C runtime headers and libraries (e.g. *stdio.h*, *vcruntime140.lib*)
6. Windows platform headers and libraries (e.g. *windows.h*, *WS2\_32.lib*)

## Official Toolchain Packages And Alternatives

Official releases are or were built with the following Visual C++ versions:

- Wireshark 3.4.x: Microsoft Visual C++ 2019.
- Wireshark 3.2.x: Microsoft Visual C++ 2019.
- Wireshark 3.0.x: Microsoft Visual C++ 2017.
- Wireshark 2.6.x: Microsoft Visual C++ 2017.
- Wireshark 2.4.x: Microsoft Visual C++ 2015.
- Wireshark 2.2.x: Microsoft Visual C++ 2013.
- Wireshark 2.0.x: Microsoft Visual C++ 2013.
- Wireshark 1.12.x: Microsoft Visual C++ 2010 SP1.
- Wireshark 1.10.x: Microsoft Visual C++ 2010 SP1.
- Wireshark 1.8.x: Microsoft Visual C++ 2010 SP1.
- Wireshark 1.6.x: Microsoft Visual C++ 2008 SP1.
- Wireshark 1.4.x: Microsoft Visual C++ 2008 SP1.
- Wireshark 1.2.x: Microsoft Visual C++ 2008 SP1.
- Wireshark 1.0.x and earlier: Microsoft Visual C++ 6.0.

Using the release compilers is recommended for Wireshark development work.

“Community” editions of Visual Studio such as “Visual Studio Community 2019” can be used to compile Wireshark but any PortableApps packages you create with them might require the installation of a separate Visual C++ Redistributable package on any machine on which the PortableApps package is to be used. See [Visual C++ Runtime “Redistributable” Files](#) below for more details.

However, you might already have a different Microsoft C++ compiler installed. It should be possible to use any of the following with the considerations listed. You will need to sign up for a [Visual Studio Dev Essentials](#) account if you don’t have a Visual Studio (MSDN) subscription. The older versions can be downloaded from <https://visualstudio.microsoft.com/vs/older-downloads/>.

*Visual C++ 2019 Community Edition*

### IDE + Debugger?

Yes

### SDK required for 64-bit builds?

No

CMake Generator: **Visual Studio 16**

You can use Chocolatey to install Visual Studio, e.g:

```
PS:\> choco install visualstudiocommunity2019 visualstudio2019-workload-nativedesktop
```

## cl.exe (C Compiler)

The following table gives an overview of the possible Microsoft toolchain variants and their specific C compiler versions ordered by release date.

Compiler Package	cl.exe	_MSC_VER
Visual Studio 2019	16.0.0	1920
Visual Studio 2019	16.1.2	1921
Visual Studio 2019	16.2.3	1922
Visual Studio 2019	16.3.2	1923

After correct installation of the toolchain, typing at the Visual Studio Command line prompt (cmd.exe):

```
> cl
```

should result in something like:

```
Microsoft (R) C/C++ Optimizing Compiler Version 19.23.28106.4 for x64  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
usage: cl [ option... ] filename... [ /link linkoption... ]
```

However, the version string may vary.

Documentation on the compiler can be found at [Microsoft Docs](#)

## link.exe (Linker)

After correct installation, typing at the Visual Studio Command line prompt (cmd.exe):

```
> link
```

should result in something like:

```
Microsoft (R) Incremental Linker Version 14.23.28106.4  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
usage: LINK [options] [files] [@commandfile]  
...
```

However, the version string may vary.

Documentation on the linker can be found at [Microsoft Docs](#)

## Visual C++ Runtime “Redistributable” Files

Please note: The following is not legal advice. Ask your preferred lawyer instead. It’s the authors view and this view might be wrong.

Wireshark and its libraries depend on POSIX functions such as `fopen()` and `malloc()`. On Windows, these functions are provided by the Microsoft Visual C++ C Runtime (CRT). There are many different versions of the CRT and Visual C++ 2015 and later use the *Universal CRT* (UCRT).

The Universal CRT comes standard with Windows 10 and is installed as part of Windows Update on earlier versions of Windows. The Wireshark .exe installers include redistributables (*vc redistrib\_x86.exe* or *vc redistrib\_x64.exe*) which ensure that the Universal CRT is installed and up to date.

*Make sure you’re allowed to distribute this file*

### NOTE

The files to redistribute must be mentioned in the `redist.txt` file of the compiler package. Otherwise it can’t be legally redistributed by third parties like us.

The following Microsoft Docs link is recommended for the interested reader:

### [Redistributing Visual C++ Files](#)

In all cases where *vc redistrib\_x86.exe* or *vc redistrib\_x64.exe* is downloaded it should be downloaded to the directory into which the support libraries for Wireshark have been downloaded and installed. This directory is specified by the `WIRESHARK_BASE_DIR` or `WIRESHARK_LIB_DIR` environment variables. It need not, and should not, be run after being downloaded.

## Windows Platform SDK

The Windows Platform SDK (PSDK) or Windows SDK is a free (as in beer) download and contains



platform specific headers and libraries (e.g. *windows.h*, *WSock32.lib*, etc.). As new Windows features evolve in time, updated SDKs become available that include new and updated APIs.

When you purchase a commercial Visual Studio or use the Community Edition, it will include an SDK.

## Documentation Toolchain

Wireshark's documentation is split across two directories. The `doc` directory contains man pages written in AsciiDoctor markup. The `docbook` directory contains the User's Guide, Developer's Guide, and the release notes, which are also written in AsciiDoctor markup. The split is for historical reasons (described below), and the documentation will likely be consolidated into one directory in the future.

Our various output formats are generated using the following tools. Intermediate formats are in *italics*.

### Man page roff

AsciiDoctor

### Man page HTML

AsciiDoctor

### Guide HTML

AsciiDoctor → *DocBook XML* → xsltproc + DocBook XSL

### Guide PDF

AsciiDoctor

### Release notes HTML

AsciiDoctor

### Release notes text

AsciiDoctor → *HTML* → html2text.py

## AsciiDoctor

[AsciiDoctor](#) comes in several flavors: a Ruby gem (AsciiDoctor), a Java bundle (AsciiDoctorJ), and transpiled JavaScript (AsciiDoctor.js). The Ruby and Java flavors can be used to build Wireshark's documentation, but the JavaScript flavor doesn't support all of the features that we require.

The guides and release notes were originally written in DocBook (hence the directory name). They were later converted to AsciiDoc and then migrated to AsciiDoctor. The man pages were originally in Perl's POD (Plain Old Documentation) format and were later converted to AsciiDoctor. We currently use AsciiDoctor's modern (>= 1.5.0) syntax.

PDF output requires AsciiDoctor's PDF backend. It is included with AsciiDoctorJ but *not* with AsciiDoctor.

## DocBook XML and XSL

Converting from DocBook to HTML requires the DocBook DTD (<http://www.sagehill.net/docbookxsl/ToolsSetup.html>) and DocBook stylesheets (<http://www.sagehill.net/docbookxsl/InstallStylesheets.html>). These are available via installable packages on most Linux distributions, Chocolatey, and Homebrew.

## xsltproc

`xsltproc` converts DocBook XML to various formats based on XSL stylesheets. It either ships as part of the operating system or is available via an installable package on most Linux distributions, Chocolatey, and Homebrew.

## Debugger

Using a good debugger can save you a lot of development time.

The debugger you use must match the C compiler Wireshark was compiled with, otherwise the debugger will simply fail or you will only see a lot of garbage.

### Visual Studio Integrated Debugger

You can use the integrated debugger of Visual Studio if your toolchain includes it. Open the solution in your build directory and build and debug as normal with a Visual Studio solution.

To set the correct paths for Visual Studio when running Wireshark under the debugger, add the build output directory to the path before opening Visual Studio from the same command prompt, e.g.

```
C:\Development\wsbuild64>set PATH="%PATH%;C:\Development\wsbuild64\run\RelwithDebInfo"  
C:\Development\wsbuild64>wireshark.sln
```

for PowerShell use

```
PS C:\Development\wsbuild64>$env:PATH += ";$(Convert-Path run\RelWithDebInfo)"  
PS C:\Development\wsbuild64>wireshark.sln
```

When Visual Studio has finished loading the solution, set the executable to be run in the debugger, e.g. Executables\Wireshark, by right clicking it in the Solution Explorer window and selecting "Set as StartUp Project". Also set the Solution Configuration (usually RelWithDebInfo) from the droplist on the toolbar.

**NOTE**

Currently Visual Studio regards a command line build as incomplete, so will report that some items need to be built when starting the debugger. These can either be rebuilt or ignored as you wish.

The normal build is an optimised release version so debugging can be a bit difficult as variables are optimised out into registers and the execution order of statements can jump around.

If you require a non-optimised version, then build using a debug configuration.

## Debugging Tools For Windows

You can also use the Microsoft Debugging Tools for Windows toolkit, which is a standalone GUI debugger. Although it's not that comfortable compared to debugging with the Visual Studio integrated debugger it can be helpful if you have to debug on a machine where an integrated debugger is not available.

You can get it free of charge from Microsoft in several ways, see the [Debugging tools for Windows](#) page.

You can also use Chocolatey to install WinDbg:

```
PS:\> choco install windbg
```

To debug Wireshark using WinDbg, open the built copy of Wireshark using the File → Open Executable... menu, i.e. C:\Development\wsbuild64\run\RelWithDebInfo\Wireshark.exe. To set a breakpoint open the required source file using the File → Open Source File... menu and then click on the required line and press F9. To run the program, press F5.

If you require a non-optimised version, then build using a debug configuration, e.g. `msbuild /m /p:Configuration=Debug Wireshark.sln`. The build products will be found in C:\Development\wsbuild64\run\Debug\.

## bash

The bash shell is needed to run several shell scripts.

### Unix

Bash (the GNU Bourne-Again SHell) is available for most UNIX and UNIX-like platforms. If it isn't already installed or available as a package for your platform, you can get it at <https://www.gnu.org/software/bash/bash.html>.

After correct installation, typing at the bash command line prompt:

```
$ bash --version
```

should result in something like:

```
GNU bash, version 4.4.12(1)-release (x86_64-pc-linux-gnu)  
Copyright (C) 2016 Free Software Foundation, Inc.
```

Your version string will likely vary.

## Python

[Python](#) is an interpreted programming language. It is used to generate some source files, documentation, testing and other tasks. Python 3.4 and later is required. Python 2.7 is no longer supported.

Python is either included or available as a package on most UNIX-like platforms. Windows packages and source are available at <https://python.org/download/>.

You can also use Chocolatey to install Python:

```
PS:\> choco install python3
```

Chocolatey installs Python into `C:\Python37` by default. You can verify your Python version by running

```
$ python3 --version
```

on UNIX-like platforms and

```
rem Official package  
C:> cd python35  
C:Python35> python --version  
  
rem Chocolatey  
C:> cd \tools\python3  
C:\tools\python3> python --version
```

on Windows. You should see something like

```
Python 3.5.1
```

Your version string may vary of course.

## Perl

Perl is an interpreted programming language. The homepage of the Perl project is <https://www.perl.org>. Perl is used to convert various text files into usable source code. Perl version 5.6 and above should work fine.

## Unix

Perl is available for most UNIX and UNIX-like platforms. If perl isn't already installed or available as a package for your platform, you can get it at <https://www.perl.org/>.

After correct installation, typing at the bash command line prompt:

```
$ perl --version
```

should result in something like:

```
This is perl 5, version 26, subversion 0 (v5.26.0) built for x86_64-linux-gnu-thread-multi  
(with 62 registered patches, see perl -V for more detail)
```

```
Copyright 1987-2017, Larry Wall
```

```
Perl may be copied only under the terms of either the Artistic License or the  
GNU General Public License, which may be found in the Perl 5 source kit.
```

```
Complete documentation for Perl, including FAQ lists, should be found on  
this system using "man perl" or "perldoc perl". If you have access to the  
Internet, point your browser at http://www.perl.org/, the Perl Home Page.
```

However, the version string may vary.

## Windows

A native Windows Perl package can be obtained from [Strawberry Perl](#) or [Active State](#). The installation should be straightforward.

You may also use Chocolatey to install either package:

```
PS:\> choco install strawberryperl
```

or

```
PS:\> choco install activeperl
```

After correct installation, typing at the command line prompt (cmd.exe):

```
> perl -v
```

should result in something like:

```
This is perl, v5.8.0 built for MSWin32-x86-multi-thread  
(with 1 registered patch, see perl -V for more detail)  
  
Copyright 1987-2002, Larry Wall  
  
Binary build 805 provided by ActiveState Corp. http://www.ActiveState.com  
Built 18:08:02 Feb 4 2003  
...
```

However, the version string may vary.

## Flex

Flex is a lexical analyzer generator used for Wireshark's display filters, some file formats, and other features.

## Unix

Flex is available for most UNIX and UNIX-like platforms. See the next section for native Windows options.

If GNU flex isn't already installed or available as a package for your platform you can get it at <https://www.gnu.org/software/flex/>.

After correct installation running the following

```
$ flex --version
```

should result in something like:

```
flex version 2.5.4
```

Your version string may vary.

## Windows

A native Windows version of flex is available in the *winflexbison3* [Chocolatey](#) package. Note that the executable is named *win\_flex*.

```
PS:\> choco install winflexbison3
```

Native packages are available from other sources such as [GnuWin](#). They aren't officially supported but *should* work.

## Git client

The Wireshark project uses its own Git repository to keep track of all the changes done to the source code. Details about the usage of Git in the Wireshark project can be found in [The Wireshark Git repository](#).

If you want to work with the source code and are planning to commit your changes back to the Wireshark community, it is recommended to use a Git client to get the latest source files. For detailed information about the different ways to obtain the Wireshark sources, see [Obtaining The Wireshark Sources](#).

You will find more instructions in [Git Over SSH Or HTTPS](#) on how to use the Git client.

## Unix

Git is available for most UNIX and UNIX-like platforms. If Git isn't already installed or available as a package for your platform, you can get it at: <https://git-scm.com/>.

After correct installation, typing at the bash command line prompt:

```
$ git --version
```

should result in something like:

```
git version 2.14.1
```

Your version will likely be different.

## Windows

The Git command line tools for Windows can be found at <https://git-scm.com/download/win> and

can also be installed using Chocolatey:

```
PS:\> choco install git
```

After correct installation, typing at the command line prompt (cmd.exe):

```
> git --version
```

should result in something like:

```
git version 2.16.1.windows.1
```

However, the version string may vary.

## Git Powershell Extensions (Optional)

A useful tool for command line git on Windows is [PoshGit](#). Poshgit provides git command completion and alters the prompt to indicate the local working copy status. You can install it using Chocolatey:

```
PS:\> choco install poshgit
```

## Git GUI Client (Optional)

Along with the traditional command-line client, several GUI clients are available for a number of platforms. See <https://git-scm.com/downloads/guis> for details.

## patch (Optional)

The patch utility is used to merge a diff file into your own source tree. This tool is only needed, if you want to apply a patch (diff file) from someone else (probably from the developer mailing list) to try out in your own private source tree.

In most cases you may not need the patch tool installed. Git should handle patches for you.

## Unix

Patch is available for most UNIX and UNIX-like platforms. If GNU patch isn't already installed or available as a package for your platform, you can get it at <https://www.gnu.org/software/patch/patch.html>.



After correct installation, typing at the bash command line prompt:

```
$ patch --version
```

should result in something like:

```
patch 2.5.8
Copyright (C) 1988 Larry Wall
Copyright (C) 2002 Free Software Foundation, Inc.

This program comes with NO WARRANTY, to the extent permitted by law.
You may redistribute copies of this program
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING.

written by Larry Wall and Paul Eggert
```

However, the version string may vary.

## Windows

The Windows native Git tools provide patch. A native Windows patch package can be obtained from <http://gnuwin32.sourceforge.net/>. The installation should be straightforward.

## Windows: NSIS (Optional)

The NSIS (Nullsoft Scriptable Install System) is used to generate *Wireshark-win32-3.7.0.exe* from all the files needed to be installed, including all required DLLs, plugins, and supporting files.

To install it, download the latest released version from <https://nsis.sourceforge.net>. NSIS v3 is required. You can also install it using Chocolatey:

```
PS$> choco install nsis
```

You can find more instructions on using NSIS in [Windows: NSIS .exe Installer](#).

## Windows: WiX Toolset (Optional)

The Wix Toolset can be used to generate Windows Installer (*.msi*) packages. You can download it from the [WiX web site](#) or install it using Chocolatey:

```
PS$> choco install wixtoolset
```

This also requires the Visual C++ redistributable merge modules, which can be installed by selecting “Individual Components → C++ 2019 Redistributable MSMs” in the Visual Studio installer.

Wireshark’s .msi packaging is currently experimental and the generated packages may be incomplete.

## Windows: PortableApps (Optional)

The PortableApps.com Installer is used to generate *WiresharkPortable64-3.7.0.paf.exe* and *WiresharkPortable32-3.7.0.paf.exe* from all the files needed to be installed, including all required DLLs, plugins, and supporting files.

To install it, do the following:

- Download the latest PortableApps.com Platform release from <https://portableapps.com/>.
- Install the following applications in the PortableApps.com environment:
  - PortableApps.com Installer
  - PortableApps.com Launcher

You can find more instructions on using the PortableApps.com Installer in [Windows: PortableApps .paf.exe Package](#).

# Library Reference

## Introduction

Several libraries are needed to build and run Wireshark. Most of them are split into three packages:

1. *Runtime*. System and third party libraries such as *vcruntime140.dll* and *libglib-2.0-0.dll*.
2. *Developer*. Documentation, header files, import libraries, and other files needed for compilation.
3. *Source*. Library sources, which are usually not required to build Wireshark.

*Our libraries are freely available*

### TIP

All libraries required to build Wireshark on Windows are available for download at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>. See [Windows Automated Library Download](#) for an easier way to install them.

## Binary Library Formats

Binary libraries are available in different formats, depending on the C compiler used to build it and of course the platform they were built for.

### Unix

If you have installed unix binary libraries on your system, they will match the C compiler. If not already installed, the libraries should be available as a package from the platform installer, or you can download and compile the source and then install the binaries.

### Windows

Most of the Win32 binary libraries you will find on the web are in this format. You will recognize MSVC libraries by the `.lib/.dll` file extension.

## Windows Automated Library Download

The required libraries (apart from Qt) are automatically downloaded as part of the CMake generation step, and subsequently as required when libraries are updated.

The libraries are downloaded into the directory indicated by the environment variable `WIRESHARK_BASE_DIR`, this must be set appropriately for your environment. The libraries are downloaded and extracted into `WIRESHARK_BASE_DIR\wireshark-win32-libs` and `WIRESHARK_BASE_DIR\wireshark-win64-libs` for 32 and 64 bit builds respectively.

You may also directly set the library directory with the environment variable

WIRESHARK\_LIB\_DIR, but if you switch between 32 bit and 64 bit builds, the value of this must be set appropriately.

## Qt

The Qt library is used to build the UI for Wireshark and is used to provide a platform independent UI. Wireshark can be built with Qt 5.3 or later.

For more information on the Qt libraries, see [The Qt Application Framework](#).

## Unix

Most Linux distributions provide Qt and its development libraries as standard packages. The required libraries and tools will likely be split across several packages. For example, building on Ubuntu requires *qttools5-dev*, *qttools5-dev-tools*, *libqt5svg5-dev*, *qtmultimedia5-dev*, and possibly others.

The Qt Project provides an installation tool for macOS, similar to Windows. It is available at <https://www.qt.io/download-open-source/#section-2>.

## Windows

Qt5 must be installed manually from the Qt installers page <https://www.qt.io/download-open-source/#section-2> using the version of Qt appropriate for your compiler. Note that separate installations (into different directories) of Qt are required for 32 bit and 64 bit builds. The environment variable QT5\_BASE\_DIR should be set as appropriate for your environment and should point to the Qt directory that contains the bin directory, e.g. `C:\Qt\5.15.2\msvc2019_64`.

## GLib And Supporting Libraries

The GLib library is used as a basic platform abstraction library and can be used in both CLI and GUI applications. For a detailed description about GLib see [The GLib library](#).

GLib depends on GNU libiconv, GNU gettext, and other libraries. You will typically not come into contact with these while doing Wireshark development. Wireshark's build system check for and require both GLib and its dependencies.

## Unix

The GLib library is available for most Linux distributions and UNIX flavors. If it isn't already installed and isn't available as a package for your platform, you can get it at <https://wiki.gnome.org/Projects/GLib>.

## Windows

GLib is part of our vcpkg-export bundles and is available at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## c-ares

C-Ares is used for asynchronous DNS resolution and lets us resolve names with a minimal performance impact.

### Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://c-ares.haxx.se/>.

### Windows

C-Ares is built using `vcpkg` and is available at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## SMI (Optional)

LibSMI is used for MIB and PIB parsing and for OID resolution.

### Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://www.ibr.cs.tu-bs.de/projects/libsmi/>.

### Windows

Wireshark uses the source libSMI distribution at <https://www.ibr.cs.tu-bs.de/projects/libsmi/>. LibSMI is cross-compiled using MinGW32. It's stored in the libsmi zip archives at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## zlib (Optional)

zlib is designed to be a **free**, general-purpose, legally unencumbered — that is, not covered by any patents — lossless data-compression library for use on virtually any computer hardware and operating system.

— The zlib web site, <https://www.zlib.net/>

## Unix

This library is almost certain to be installed on your system. If it isn't or you don't want to use the default library you can download it from <https://www.zlib.net/>.

## Windows

zlib is part of our vcpkg-export bundles and is available at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## libpcap or Npcap (Optional, But Strongly Recommended)

Libpcap and Npcap provide that packet capture capabilities that are central to Wireshark's core functionality.

### Unix: libpcap

If this library isn't already installed or available as a package for your platform, you can get it at <https://www.tcpdump.org/>.

### Windows: Npcap

The Windows build environment compiles and links against a libpcap SDK built using [vcpkg](#) and includes the [Npcap packet capture driver](#) with the .exe installer. Both are [automatically downloaded by CMake](#).

You can download the Npcap Windows packet capture library manually from <https://nmap.org/npcap/>.

*Npcap has its own license with its own restrictions*

#### WARNING

Insecure.Com LLC, aka "The Nmap Project" has granted the Wireshark Foundation the right to include Npcap with the installers that we distribute from wireshark.org. If you wish to distribute your own Wireshark installer or any other package that includes Npcap you must comply with the [Npcap license](#) and may be required to purchase a redistribution license. Please see <https://nmap.org/npcap/> for more details.

## GnuTLS (Optional)

The GNU Transport Layer Security Library is used to enable TLS decryption using an RSA private key.

## Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://gnutls.org/>.

## Windows

We provide packages cross-compiled using MinGW32 at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## Gcrypt

The Gcrypt Library is a low-level cryptographic library that provides support for many ciphers and message authentication codes, such as DES, 3DES, AES, Blowfish, SHA-1, SHA-256, and others.

## Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://directory.fsf.org/wiki/Libgcrypt>.

## Windows

Part of our GnuTLS package.

## Kerberos (Optional)

The Kerberos library is used to dissect Kerberos, sealed DCERPC and secureLDAP protocols.

## Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://web.mit.edu/Kerberos/dist/>.

## Windows

We provide packages for Windows at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## LUA (Optional)

The LUA library is used to add scripting support to Wireshark.

## Unix

If this library isn't already installed or available as a package for your platform, you can get it at <https://www.lua.org/download.html>.

## Windows

We provide copies of the official packages at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## MaxMindDB (Optional)

MaxMind Inc. publishes a set of IP geolocation databases and related open source libraries. They can be used to map IP addresses to geographical locations and other information.

If libmaxminddb library isn't already installed or available as a package for your platform, you can get it at <https://github.com/maxmind/libmaxminddb>.

We provide packages for Windows at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.

## WinSparkle (Optional)

WinSparkle is an easy-to-use software update library for Windows developers.

## Windows

We provide copies of the WinSparkle package at <https://anonsvn.wireshark.org/wireshark-win64-libs/trunk/packages/> and <https://anonsvn.wireshark.org/wireshark-win32-libs/trunk/packages/>.



# Wireshark Development

## *Wireshark Development*

The second part describes how the Wireshark sources are structured and how to change the sources such as adding a new dissector.

# How Wireshark Works

## Introduction

This chapter will give you a short overview of how Wireshark works.

## Overview

The following will give you a simplified overview of Wireshark's function blocks:

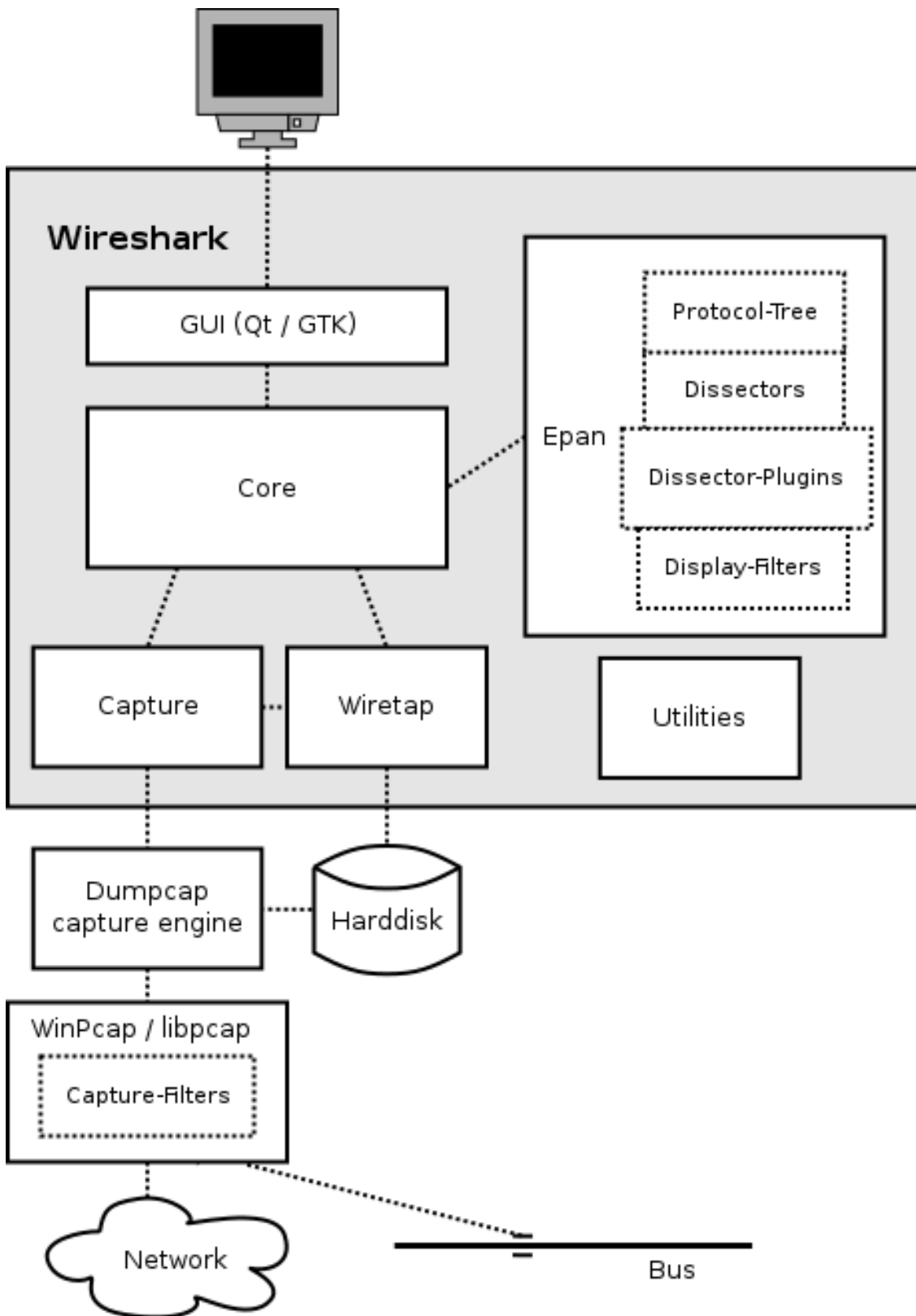


Figure 2. Wireshark function blocks

The function blocks in more detail:

### GUI

Handling of all user input/output (all windows, dialogs and such). Source code can be found in

the *ui/qt* directory.

## Core

Main "glue code" that holds the other blocks together. Source code can be found in the root directory.

## Epan

Enhanced Packet ANalyzer — the packet analyzing engine. Source code can be found in the *epan* directory. Epan provides the following APIs:

- Protocol Tree. Dissection information for an individual packet.
- Dissectors. The various protocol dissectors in *epan/dissectors*.
- Dissector Plugins - Support for implementing dissectors as separate modules. Source code can be found in *plugins*.
- Display Filters - The display filter engine at *epan/dfilter*.

## Wiretap

The wiretap library is used to read and write capture files in libpcap, pcapng, and many other file formats. Source code is in the *wiretap* directory.

## Capture

The interface to the capture engine. Source code is in the root directory.

## Dumpcap

The capture engine itself. This is the only part that executes with elevated privileges. Source code is in the root directory.

## Npcap and libpcap

These are external libraries that provide packet capture and filtering support on different platforms. The filtering in Npcap and libpcap works at a much lower level than Wireshark's display filters and uses a significantly different mechanism. That's why there are different display and capture filter syntaxes.

# Capturing packets

Capturing takes packets from a network adapter and saves them to a file on your hard disk.

Since raw network adapter access requires elevated privileges, these functions are isolated to the **dumpcap** program. Placing the capture functionality into **dumpcap** allows the rest of the code (dissectors, user interface, etc.) to run with normal user privileges.

To hide all the low-level machine dependent details from Wireshark, the libpcap and Npcap (see [libpcap or Npcap \(Optional, But Strongly Recommended\)](#)) libraries are used. These libraries provide a general purpose interface to capture packets and are used by a wide variety of applications.

# Capture Files

Wireshark can read and write capture files in its natural file formats, pcapng and pcap, which are used by many other network capturing tools, such as tcpdump. Additionally, Wireshark supports reading and writing packet capture files in formats used by other network capture tools. This support is implemented in Wireshark's wiretap library, which provides a general purpose interface for reading and writing packet capture formats and supports more than twenty packet capture formats.

## Dissect packets

Wireshark dissects packets in what it calls 'two-pass' dissection.

Wireshark performs a first pass of dissecting all packets as they are loaded from the file. All packets are dissected sequentially and this information is used to populate Wireshark's packet list pane and to build state and other information needed when displaying the packet.

Wireshark later performs 'second pass' ad-hoc dissections on the packets that it needs data from. This enables Wireshark to fill in fields that require future knowledge, like the 'response in frame #' fields, and correctly calculate reassembly frame dependencies.

For example, Wireshark will perform an ad-hoc dissection when a user selects a packet (to display the packet details), calculates a statistic (so all values are computed), or performs another action that requires packet data. However, because Wireshark may only dissect the packets that are needed, there is no guarantee that Wireshark will dissect all packets again, nor is there any guarantee as to the order that the packets will be dissected after the first pass.

# Introduction

## Source overview

Wireshark consists of the following major parts:

- Packet dissection - in the */epan/dissectors* and */plugins/epan/\** directories
- Capture file I/O - using Wireshark's own wiretap library
- Capture - using the libpcap and Npcap libraries, in *dumpcap.c* and the */capture* directory
- User interface - using Qt and associated libraries
- Utilities - miscellaneous helper code
- Help - using an external web browser and text output

## Coding Style

The coding style guides for Wireshark can be found in the “Portability” section of the file *doc/README.developer*.

## The GLib library

GLib is used as a basic platform abstraction library. It doesn't provide any direct GUI functionality.

To quote the GLib Reference Manual:

GLib provides the core application building blocks for libraries and applications written in C. It provides the core object system used in GNOME, the main loop implementation, and a large set of utility functions for strings and common data structures.

GLib contains lots of useful things for platform independent development. See <https://developer.gnome.org/glib/> for details about GLib.

# Packet Capture

This chapter needs to be reviewed and extended.

## How To Add A New Capture Type To Libpcap

For this discussion, I'll assume you're working with libpcap 1.0 or later. You probably don't want to work with a version older than 1.0, even if whatever OS you're using happens to include libpcap - older versions are not as friendly towards adding support for devices other than standard network interfaces.

First, read [the libpcap documentation on writing a new libpcap module](#)

(It's currently incomplete, but I'll be finishing it up over time. If you have contributions, feel free to submit pull requests for it.)

If you had to introduce one or more new `DLT_*` values, you will also have to add support in Wireshark for those `DLT_*` values to `wiretap/pcap-common.c`, which might mean adding one or more `WTAP_ENCAP` types to `wtap.h` and to the `encap_table[]` table in `wiretap/wtap.c`. You'd then have to write a dissector or dissectors for the link-layer protocols or protocols and have them register themselves with the `wtap_encap` dissector table, with the appropriate `WTAP_ENCAP` values by calling `dissector_add_uint()`.

## Extcap: Developer Guide

The extcap interface is a versatile plugin interface that allows external binaries to act as capture interfaces directly in Wireshark. It is used in scenarios, where the source of the capture is not a traditional capture model (live capture from an interface, from a pipe, from a file, etc). The typical example is connecting esoteric hardware of some kind to the main Wireshark app.

Without extcap, a capture can always be achieved by directly writing to a capture file:

*Bash example for traditional capture with a capture file.*

```
$ the-esoteric-binary --the-strange-flag --interface=stream1 --file dumpfile.pcap &  
$ wireshark dumpfile.pcap
```

but the extcap interface allows for such a connection to be easily established and configured using the Wireshark GUI.

The extcap subsystem is made of multiple extcap binaries that are automatically called by the GUI in a row. In the following chapters we will refer to them as "the extcaps".

Extcaps may be any binary or script within the extcap directory. Please note, that scripts need to be executable without prefacing a script interpreter before the call.

### IMPORTANT

**Windows Users** Because of restrictions directly calling the script may not always work. In such a case, a batch file may be provided, which then in turn executes the script. Please refer to [Execute a script-based extcap on Windows](#) for more information.

When Wireshark launches an extcap, it automatically adds its installation path (c:\Program Files\Wireshark\)) to the DLL search path so that the extcap library dependencies can be found (it is not designed to be launched by hand). This is done on purpose. There should only be extcap programs (executable, python scripts, ...) in the extcap folder to reduce the startup time and not have Wireshark trying to execute other file types.

## Extcap command line interface

The actual capture is run after a setup process that can be made manually by the user or automatically by the GUI. All the steps performed are done for every extcap.

Let's go through those steps.

### Query for available interfaces

In the first step the extcap is queried for its interfaces.

```
$ extcapbin --extcap-interfaces
```

This call must print the existing interfaces for this extcap and must return 0. The output must conform to the grammar specified for extcap, and it is specified in the doc/extcap.4 generated man page (in the build dir).

Since Wireshark 2.9 this call is extended with `--extcap-version=x.x`, which will always represent the calling Wireshark's version information. This can be used to change behavior depending on the Wireshark version in question.

*Example call for interface query*

```
$ extcap_example.py --extcap-interfaces --extcap-version=3.0
extcap {version=1.0}{help=Some help url}
interface {value=example1}{display=Example interface 1 for extcap}
interface {value=example2}{display=Example interface 2 for extcap}
```

The **version** for the extcap sentence (which may exist as many times as is needed, but only the last one will be used) will be used for displaying the version information of the extcap interface in the about dialog of Wireshark.



The value for each interface will be used in subsequent calls as the interface name `IFACE`.

Using the `help` argument, an interface may provide a generic help URL for the `extcap` utility.

### Ask for DLT's to each interface

The `extcap` binary is queried for all valid DLTs for all the interfaces returned by step 1.

```
$ extcap_example.py --extcap-dlts --extcap-interface IFACE
```

This call must print the valid DLTs for the interface specified. This call is made for all the interfaces and must return 0.

*Example for the DLT query*

```
$ extcap_example.py --extcap-interface IFACE --extcap-dlts  
dlt {number=147}{name=USER1}{display=Demo Implementation for Extcap}
```

A binary or script, which neither provides an interface list or a DLT list will not show up in the `extcap` interfaces list.

### The `extcap` configuration interface

The `extcap` binary is asked for the configuration of a specific interface

```
$ extcap_example.py --extcap-interface IFACE --extcap-config
```

Each interface can have custom options that are valid for this interface only. Those config options are specified on the command line when running the actual capture. To allow an end-user to specify certain options, such options may be provided using the `extcap config` argument.

To share which options are available for an interface, the `extcap` responds to the command `--extcap -config`, that shows all the available options (aka additional command line options).

Those options are automatically presented via a dialog to the user for the individual interface.

### Example for interface options

```
$ extcap_example.py --extcap-interface IFACE --extcap-config
arg {number=0}{call=--delay}{display=Time delay}{tooltip=Time delay between
packages}{type=integer}{range=1,15}{required=true}
arg {number=1}{call=--message}{display=Message}{tooltip=Package message
content}{placeholder=Please enter a message here ...}{type=string}
arg {number=2}{call=--verify}{display=Verify}{tooltip=Verify package
content}{type=boolflag}
arg {number=3}{call=--remote}{display=Remote Channel}{tooltip=Remote Channel
Selector}{type=selector}
arg {number=4}{call=--server}{display=IP address for log
server}{type=string}{validation=\\b(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-
9])\\.){3}(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-9])?\\b}
value {arg=3}{value=if1}{display=Remote1}{default=true}
value {arg=3}{value=if2}{display=Remote2}{default=false}
```

Now the user can click on the options and change them. They are sent to the extcap when the capture is launched.

There are three kind of options available:

#### Flag

boolflag for instance expects the option to be present resulting in the corresponding entry set to true, false otherwise

#### Value

are value based options and each expect a single value via the command-line call

#### Selection

are selections and can be presented multiple times in the command line. Both expect subsequent "value" items in the config list, with the corresponding argument selected via arg

### The capture process

Once the interfaces are listed and configuration is customized by the user the capture is started.

```
$ extcap_example.py --extcap-interface IFACE [params] --capture [--extcap-capture-
filter CFILTER]
--fifo FIFO
```

To run the capture, the extcap must implement the `--capture`, `--extcap-capture-filter` and `--fifo` option.

They are automatically added by Wireshark that opens the fifo for reading. All the other options

are automatically added to run the capture. The extcap interface is used like all other interfaces (meaning that capture on multiple interfaces, as well as stopping and restarting the capture is supported).

### Execute a script-based extcap on Windows

To use scripts on Windows, please generate an <scriptname>.bat inside the extcap folder, with the following content (in this case for a Python-based extcap utility):

```
@echo off
<Path to python interpreter> <Path to script file> %*
```

Windows is not able to execute most scripts directly (Powershell being an exception), which also goes for all other script-based formats besides VBScript and PowerShell

## Extcap Arguments

The extcap interface provides the possibility for generating a GUI dialog to set and adapt settings for the extcap binary.

All options must provide a number, by which they are identified. No **NUMBER** may be provided twice. Also all options must present the elements **CALL** and **DISPLAY**, where call provides the arguments name on the command-line and display the name in the GUI.

Additionally **TOOLTIP** and **PLACEHOLDER** may be provided, which will give the user an explanation within the GUI, about what to enter into this field.

These options do have types, for which the following types are being supported:

### INTEGER, UNSIGNED, LONG, DOUBLE

This provides a field for entering a numeric value of the given data type. A **DEFAULT** value may be provided, as well as a **RANGE**

```
arg {number=0}{call=--delay}{display=Time delay}{tooltip=Time delay between packages}{type=integer}{range=1,15}{default=0}
```

### STRING

Let the user provide a string to the capture

```
arg {number=1}{call=--server}{display=IP Address}{tooltip=IP Address for log server}{type=string}{validation=\\b(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-9]?\\.)}{3}(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-9]?\\b}
```

**validation** allows to provide a regular expression string, which is used to check the user input for validity beyond normal data type or range checks. Back-slashes must be escaped (as in `\\b` for `\b`)

## PASSWORD

Let the user provide a masked string to the capture. Password strings are not saved, when the extcap configuration is being saved

```
arg {number=0}{call=--password}{display=The user password}{tooltip=The password for the connection}{type=password}
```

## BOOLEAN, BOOLFLAG

This provides the possibility to set a true/false value. BOOLFLAG values will only appear in the command-line if set to true, otherwise they will not be added to the command-line call for the extcap interface

```
arg {number=2}{call=--verify}{display=Verify}{tooltip=Verify package content}{type=boolflag}
```

## FILESELECT

Let the user provide a filepath. If `MUSTEXIST=true` is being provided, the GUI gives the user a dialog for selecting a file. When `MUSTEXIST=false` is used, the GUI gives the user a file dialog for saving a file.

```
arg {number=3}{call=--logfile}{display=Logfile}{tooltip=A file for log messages}{type=fileselect}{mustexist=false}
```

## SELECTOR, RADIO, MULTICHECK

Optionfields, where the user may choose one or more options from. If `PARENT` is provided for the value items, the option fields for `MULTICHECK` and `SELECTOR` are being presented in a tree-like structure. `SELECTOR` and `RADIO` values must present a default value, which will be the value provided to the extcap binary for this argument

```
arg {number=3}{call=--remote}{display=Remote Channel}{tooltip=Remote Channel Selector}{type=selector}
value {arg=3}{value=if1}{display=Remote1}{default=true}
value {arg=3}{value=if2}{display=Remote2}{default=false}
```

## Reload a selector

A selector may be reloaded from the configuration dialog of the extcap application within

Wireshark. With the reload argument (defaults to false), the entry can be marked as reloadable.

```
arg {number=3}{call=--remote}{display=Remote Channel}{tooltip=Remote Channel Selector}
  {type=selector}{reload=true}{placeholder=Load interfaces...}
```

After this has been defined, the user will get a button displayed in the configuration dialog for this extcap application, with the text "Load interfaces..." in this case, and a generic "Reload" text if no text has been provided.

The extcap utility is then called again with all filled out arguments and the additional parameter `--extcap-reload-option <option_name>`. It is expected to return a value section for this option, as it would during normal configuration. The provided option list is then presented as the selection, a previous selected option will be reselected if applicable.

### Validation of arguments

Arguments may be set with `{required=true}` which enforces a value being provided, before a capture can be started using the extcap options dialog. This is not being checked, if the extcap is started via a simple double-click. The necessary fields are marked for the customer, to ensure a visibility for the end customer of the required argument.

Additionally text and number arguments may also be checked using a regular expression, which is provided using the validation attribute (see example above). The syntax for such a check is the same as for Qt RegExp classes. This feature is only active in the Qt version of Wireshark.

### Toolbar Controls

An extcap utility can provide configuration for controls to use in an interface toolbar. These controls are bidirectional and can be used to control the extcap utility while capturing.

This is useful in scenarios where configuration can be done based on findings in the capture process, setting temporary values or give other inputs without restarting the current capture.

### Example of interface definition with toolbar controls

```
$ extcap_example.py --extcap-interfaces
extcap {version=1.0}{display=Example extcap interface}
interface {value=example1}{display=Example interface 1 for extcap}
interface {value=example2}{display=Example interface 2 for extcap}
control {number=0}{type=string}{display=Message}{tooltip=Package message content. Must
start with a capital letter.}{validation=[A-Z]+}{required=true}
control {number=1}{type=selector}{display=Time delay}{tooltip=Time delay between
packages}
control {number=2}{type=boolean}{display=Verify}{default=true}{tooltip=Verify package
content}
control {number=3}{type=button}{display=Turn on}{tooltip=Turn on or off}
control {number=4}{type=button}{role=logger}{display=Log}{tooltip=Show capture log}
value {control=1}{value=1}{display=1 sec}
value {control=1}{value=2}{display=2 sec}{default=true}
```

All controls will be presented as GUI elements in a toolbar specific to the extcap utility. The extcap must not rely on using those controls (they are optional) because of other capturing tools not using GUI (e.g. tshark, tfshark).

### Controls

The controls are similar to the ARGUMENTS, but without the CALL element. All controls may be given a default value at startup and most can be changed during capture, both by the extcap and the user (depending on the type of control).

All controls must provide a NUMBER, by which they are identified. No NUMBER may be provided twice. Also all options must present the elements TYPE and DISPLAY, where TYPE provides the type of control to add to the toolbar and DISPLAY the name in the GUI.

Additionally TOOLTIP and PLACEHOLDER may be provided, which will give the user an explanation within the GUI.

All controls, except from the logger, help and restore buttons, may be disabled (and enabled) in GUI by the extcap during capture. This can be because of set-once operations, or operations which takes some time to complete.

All control values which are changed by the user (not equal to the default value) will be sent to the extcap utility when starting a capture. The extcap utility may choose to discard initial values and set new values, depending on implementation.

These TYPES are defined as controls:

#### BOOLEAN

This provides a checkbox with the possibility to set a true/false value.

The extcap utility can set a default value at startup, and can change (set) and receive value changes while capturing. When starting a capture the GUI will send the value if different from the default value.

The payload is one byte with binary value 0 or 1.

Valid Commands: Set value, Enable, Disable.

## **BUTTON**

This provides a button with different ROLES:

### **CONTROL**

This button will send a signal when pressed. This is the default if no role is configured. The button is only enabled when capturing.

The extcap utility can set the button text at startup, and can change (set) the button text and receive button press signals while capturing. The button is disabled and the button text is restored to the default text when not capturing.

The payload is either the button text or empty (signal).

Valid Commands: Set value, Enable, Disable.

### **LOGGER**

This provides a logger mechanism where the extcap utility can send log entries to be presented in a log window. This communication is unidirectional.

The payload is the log entry, and should be ended with a newline. Maximum length is 65535 bytes.

Valid Commands: Set log entry, Add log entry.

The Set command will clear the log before adding the entry.

### **HELP**

This button opens the help page, if configured. This role has no controls and will not be used in communication.

Valid Commands: NONE.

### **RESTORE**

This button will restore all control values to default. This role has no controls and will not be used in communication. The button is only enabled when not capturing.

Valid Commands: NONE.

## **SELECTOR**

This provides a combo box with fixed values which can be selected.

The extcap utility can set default values at startup, and add and remove values and receive change in value selection while capturing. When starting a capture the GUI will send the value if different from the default value.

The payload is a string with the value, and optionally a string with a display value if this is different from the value. This two string values are separated by a null character.

Valid Commands: Set selected value, Add value, Remove value, Enable, Disable.

If value is empty the Remove command will remove all entries.

## STRING

This provides a text edit line with the possibility to set a string or any value which can be represented in a string (integer, float, date, etc.).

The extcap utility can set a default string value at startup, and can change (set) and receive value changes while capturing. When starting a capture the GUI will send the value if different from the default value.

The payload is a string with the value. Maximum length is 32767 bytes.

Valid Commands for control: Set value, Enable, Disable.

The element VALIDATION allows to provide a regular expression string, which is used to check the user input for validity beyond normal data type or range checks. Back-slashes must be escaped (as in `\\b` for `\b`).

## Messages

In addition to the controls it's possible to send a single message from the extcap utility to the user. This message can be put in the status bar or displayed in a information, warning or error dialog which must be accepted by the user. This message does not use the NUMBER argument so this can have any value.

## Control Protocol

The protocol used to communicate over the control pipes has a fixed size header of 6 bytes and a payload with 0 - 65535 bytes.

Table 2. Control packet:

Sync Pipe Indication (1 byte)
Message Length (3 bytes network order)
Control Number (1 byte)
Command (1 byte)



Payload  
(0 - 65535 bytes)

*Sync Pipe Indication:*

The common sync pipe indication. This protocol uses the value "T".

*Message Length:*

Payload length + 2 bytes for control number and command.

*Control Number:*

Unique number to identify the control. This number also gives the order of the controls in the interface toolbar.

*Table 3. Commands and application for controls*

Command Byte	Command Name	Control type
0	Initialized	none
1	Set	boolean / button / logger / selector / string
2	Add	logger / selector
3	Remove	selector
4	Enable	boolean / button / selector / string
5	Disable	boolean / button / selector / string
6	Statusbar message	none
7	Information message	none
8	Warning message	none
9	Error message	none

The **Initialized** command will be sent from the GUI to the extcap utility when all user changed control values are sent after starting a capture. This is an indication that the GUI is ready to receive control values.

The GUI will only send **Initialized** and **Set** commands. The extcap utility shall not send the **Initialized** command.

Messages with unknown control number or command will be silently ignored.

# Packet Dissection

## How packet dissection works

Each dissector decodes its part of the protocol and then hands off decoding to subsequent dissectors for an encapsulated protocol.

Every dissection starts with the Frame dissector which dissects the details of the capture file itself (e.g. timestamps). From there it passes the data on to the lowest-level data dissector, e.g. the Ethernet dissector for the Ethernet header. The payload is then passed on to the next dissector (e.g. IP) and so on. At each stage, details of the packet are decoded and displayed.

Dissectors can either be built-in to Wireshark or written as a self-registering plugin (a shared library or DLL). There is little difference in having your dissector as either a plugin or built-in. You have limited function access through the ABI exposed by functions declared as `WS_DLL_PUBLIC`.

The big benefit of writing a dissector as a plugin is that rebuilding a plugin is much faster than rebuilding Wireshark after editing a built-in dissector. As such, starting with a plugin often makes initial development quicker, while the finished code may make more sense as a built-in dissector.

*Read `README.dissector`*

### NOTE

The file `doc/README.dissector` contains detailed information about writing a dissector. In many cases it is more up to date than this document.

## Adding a basic dissector

Let's step through adding a basic dissector. We'll start with the made up "foo" protocol. It consists of the following basic items.

- A packet type - 8 bits. Possible values: 1 - initialisation, 2 - terminate, 3 - data.
- A set of flags stored in 8 bits. 0x01 - start packet, 0x02 - end packet, 0x04 - priority packet.
- A sequence number - 16 bits.
- An IPv4 address.

## Setting up the dissector

The first decision you need to make is if this dissector will be a built-in dissector and included in the main program, or a plugin.

Plugins are easier to write initially, so let's start with that. With a little care, the plugin can be converted into a built-in dissector.

## Dissector Initialisation.

```
#include "config.h"
#include <epan/packet.h>

#define FOO_PORT 1234

static int proto_foo = -1;

void
proto_register_foo(void)
{
    proto_foo = proto_register_protocol (
        "FOO Protocol", /* name      */
        "FOO",          /* short name */
        "foo"           /* filter_name */
    );
}
```

Let's go through this a bit at a time. First we have some boilerplate include files. These will be pretty constant to start with.

Then a `#define` for the UDP port that carries *foo* traffic.

Next we have `proto_foo`, an int that stores our protocol handle and is initialised to `-1`. This handle will be set when the dissector is registered within the main program. It's good practice to make all variables and functions that aren't exported static to minimize name space pollution. This normally isn't a problem unless your dissector gets so big that it spans multiple files.

Now that we have the basics in place to interact with the main program, we'll start with two protocol dissector setup functions: `proto_register_XXX` and `proto_reg_handoff_XXX`.

Each protocol must have a register function with the form "proto\_register\_XXX". This function is used to register the protocol in Wireshark. The code to call the register routines is generated automatically and is called when Wireshark starts. In this example, the function is named `proto_register_foo`.

`proto_register_foo` calls `proto_register_protocol()`, which takes a `name`, `short name`, and `filter_name`. The name and short name are used in the "Preferences" and "Enabled protocols" dialogs and the documentation's generated field name list. The `filter_name` is used as the display filter name. `proto_register_protocol()` returns a protocol handle, which can be used to refer to the protocol and obtain a handle to the protocol's dissector.

Next we need a handoff routine.

## Dissector Handoff.

```
void
proto_reg_handoff_foo(void)
{
    static dissector_handle_t foo_handle;

    foo_handle = create_dissector_handle(dissect_foo, proto_foo);
    dissector_add_uint("udp.port", FOO_PORT, foo_handle);
}
```

A handoff routine associates a protocol handler with the protocol's traffic. It consists of two major steps: The first step is to create a dissector handle, which is a handle associated with the protocol and the function called to do the actual dissecting. The second step is to register the dissector handle so that traffic associated with the protocol calls the dissector.

In this example, `proto_reg_handoff_foo()` calls `create_dissector_handle()` to obtain a dissector handle for the foo protocol. It then uses `dissector_add_uint()` to associate traffic on UDP port FOO\_PORT (1234) with the foo protocol, so that Wireshark will call `dissect_foo()` when it receives UDP traffic on port 1234.

Wireshark's dissector convention is to put `proto_register_foo()` and `proto_reg_handoff_foo()` as the last two functions in the dissector source.

The next step is to write the dissecting function, `dissect_foo()`. We'll start with a basic placeholder.

## Dissection.

```
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree _U_, void *data _U_)
{
    col_set_str(pinfo->cinfo, COL_PROTOCOL, "FOO");
    /* Clear the info column */
    col_clear(pinfo->cinfo, COL_INFO);

    return tvb_captured_length(tvb);
}
```

`dissect_foo()` is called to dissect the packets presented to it. The packet data is held in a special buffer referenced here as `tvb`. The `packet_info` structure contains general data about the protocol and we can update information here. The tree parameter is where the detail dissection takes place. Note that the `_U_` following `tree` and `data` signals to the compiler that the parameters are unused, so that the compiler does not print a warning.

For now we'll do the minimum we can get away with. `col_set_str()` is used to set Wireshark's Protocol column to "FOO" so everyone can see it's being recognised. The only other thing we do is to

clear out any data in the INFO column if it's being displayed.

At this point we have a basic dissector ready to compile and install. The dissector doesn't do anything other than identify the protocol and label it. Here is the dissector's complete code:

*Complete packet-foo.c:*

```
#include "config.h"
#include <epan/packet.h>

#define FOO_PORT 1234

static int proto_foo = -1;

static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree _U_, void *data _U_)
{
    col_set_str(pinfo->cinfo, COL_PROTOCOL, "FOO");
    /* Clear the info column */
    col_clear(pinfo->cinfo, COL_INFO);

    return tvb_captured_length(tvb);
}

void
proto_register_foo(void)
{
    proto_foo = proto_register_protocol (
        "FOO Protocol", /* name */
        "FOO",          /* short_name */
        "foo"           /* filter_name */
    );
}

void
proto_reg_handoff_foo(void)
{
    static dissector_handle_t foo_handle;

    foo_handle = create_dissector_handle(dissect_foo, proto_foo);
    dissector_add_uint("udp.port", FOO_PORT, foo_handle);
}
```

To compile this dissector and create a plugin a few support files are required, besides the dissector source in *packet-foo.c*:

- *CMakeLists.txt* - Contains the CMake file and version info for this plugin.

- *packet-foo.c* - Your dissector source.
- *plugin.rc.in* - Contains the DLL resource template for Windows. (optional)

Samples of these files are available in the gryphon plugin directory (plugins/epan/gryphon). If you copy the files from the gryphon plugin, *CMakeLists.txt* will need to be updated with the correct plugin name, version info, and the relevant files to compile.

In the main top-level source directory, copy *CMakeListsCustom.txt.example* to *CMakeListsCustom.txt* and add the path of your plugin to the list in `CUSTOM_PLUGIN_SRC_DIR`.

Compile the dissector to a DLL or shared library and either run Wireshark from the build directory as detailed in [Run Your Version Of Wireshark](#) or copy the plugin binary into the plugin directory of your Wireshark installation and run that.

## Dissecting the protocol's details

Now that we have our basic dissector up and running, let's do something with it. The simplest thing to start with is labeling the payload. We can label the payload by building a subtree to decode our results into. This subtree will hold all the protocol's details and helps keep things looking nice in the detailed display.

We add the new subtree with `proto_tree_add_item()`, as is depicted below:

*Plugin Packet Dissection.*

```
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    col_set_str(pinfo->cinfo, COL_PROTOCOL, "FOO");
    /* Clear out stuff in the info column */
    col_clear(pinfo->cinfo, COL_INFO);

    proto_item *ti = proto_tree_add_item(tree, proto_foo, tvb, 0, -1, ENC_NA);

    return tvb_captured_length(tvb);
}
```

As the `FOO` protocol does not encapsulate another protocol, we consume all of the `tvb`'s data, from `0` to the end (`-1`).

The final parameter specifies the "encoding" and is set to `ENC_NA` ("not applicable"), as the protocol doesn't specifically use big endian (`ENC_BIG_ENDIAN`) or little endian (`ENC_LITTLE_ENDIAN`).

After adding the call to `proto_tree_add_item()`, there should be a label `FOO` in the protocol's detailed display. Selecting this label will highlight the remaining contents of the packet.

Now let's go to the next step and add some protocol dissection. To do this we'll need to construct

tables to define which fields will be present in the packet and to store the opened/closed state of the subtree. We'll add these statically allocated arrays to the beginning of the file and name them `hf_register_info` ('hf' is short for 'header field') and `ett`. The arrays will then be registered after the call to `proto_register_protocol()` by calling `proto_register_field_array()` and `proto_register_subtree_array()`:

*Registering data structures.*

```
static int hf_foo_pdu_type = -1;
static gint ett_foo = -1;

/* ... */

void
proto_register_foo(void)
{
    static hf_register_info hf[] = {
        { &hf_foo_pdu_type,
          { "FOO PDU Type", "foo.type",
            FT_UINT8, BASE_DEC,
            NULL, 0x0,
            NULL, HFILL }
        }
    };

    /* Setup protocol subtree array */
    static gint *ett[] = {
        &ett_foo
    };

    proto_foo = proto_register_protocol (
        "FOO Protocol", /* name */
        "FOO",          /* short_name */
        "foo"           /* filter_name*/
    );

    proto_register_field_array(proto_foo, hf, array_length(hf));
    proto_register_subtree_array(ett, array_length(ett));
}
```

As you can see, a field `foo.type` was defined inside the array of header fields.

Now we can dissect the `FOO PDU Type` (referenced as `foo.type`) field in `dissect_foo()` by adding the FOO Protocol's subtree with `proto_item_add_subtree()` and then calling `proto_tree_add_item()` to add the field:

Dissector starting to dissect the packets.

```
proto_item *ti = proto_tree_add_item(tree, proto_foo, tvb, 0, -1, ENC_NA);
proto_tree *foo_tree = proto_item_add_subtree(ti, ett_foo);
proto_tree_add_item(foo_tree, hf_foo_pdu_type, tvb, 0, 1, ENC_BIG_ENDIAN);
```

As mentioned earlier, the foo protocol begins with an 8-bit `packet type` which can have three possible values: 1 - initialisation, 2 - terminate, 3 - data. Here's how we can add the packet details:

The `proto_item_add_subtree()` call has added a child node to the protocol tree which is where we will do our detail dissection. The expansion of this node is controlled by the `ett_foo` variable. This remembers if the node should be expanded or not as you move between packets. All subsequent dissection will be added to this tree, as you can see from the next call. A call to `proto_tree_add_item()` in the `foo_tree`, this time using the `hf_foo_pdu_type` to control the formatting of the item. The pdu type is one byte of data, starting at 0. We assume it is in network order (also called big endian), so that is why we use `ENC_BIG_ENDIAN`. For a 1-byte quantity, there is no order issue, but it is good practice to make this the same as any multibyte fields that may be present, and as we will see in the next section, this particular protocol uses network order.

If we look in detail at the `hf_foo_pdu_type` declaration in the static array we can see the details of the definition.

```
static hf_register_info hf[] = {
    { &hf_foo_pdu_type,
      { "FOO PDU Type", "foo.type",
        FT_UINT8, BASE_DEC,
        NULL, 0x0,
        NULL, HFILL }
    }
};
```

- `hf_foo_pdu_type` - The node's index.
- `FOO PDU Type` - The item's label.
- `foo.type` - The item's abbreviated name, for use in the display filter (e.g., `foo.type=1`).
- `FT_UINT8` - The item's type: An 8bit unsigned integer. This tallies with our call above where we tell it to only look at one byte.
- `BASE_DEC` - For an integer type, this tells it to be printed as a decimal number. It could be hexadecimal (`BASE_HEX`) or octal (`BASE_OCT`) if that made more sense.

We'll ignore the rest of the structure for now.

If you install this plugin and try it out, you'll see something that begins to look useful.

Now let's finish off dissecting the simple protocol. We need to add a few more variables to the



hfarray, and a couple more procedure calls.

*Wrapping up the packet dissection.*

```
...
static int hf_foo_flags = -1;
static int hf_foo_sequenceno = -1;
static int hf_foo_initialip = -1;
...

static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    gint offset = 0;

    ...
    proto_item *ti = proto_tree_add_item(tree, proto_foo, tvb, 0, -1, ENC_NA);
    proto_tree *foo_tree = proto_item_add_subtree(ti, ett_foo);
    proto_tree_add_item(foo_tree, hf_foo_pdu_type, tvb, offset, 1, ENC_BIG_ENDIAN);
    offset += 1;
    proto_tree_add_item(foo_tree, hf_foo_flags, tvb, offset, 1, ENC_BIG_ENDIAN);
    offset += 1;
    proto_tree_add_item(foo_tree, hf_foo_sequenceno, tvb, offset, 2, ENC_BIG_ENDIAN);
    offset += 2;
    proto_tree_add_item(foo_tree, hf_foo_initialip, tvb, offset, 4, ENC_BIG_ENDIAN);
    offset += 4;
    ...

    return tvb_captured_length(tvb);
}

void
proto_register_foo(void) {
    ...
    ...
    { &hf_foo_flags,
      { "FOO PDU Flags", "foo.flags",
        FT_UINT8, BASE_HEX,
        NULL, 0x0,
        NULL, HFILL }
    },
    { &hf_foo_sequenceno,
      { "FOO PDU Sequence Number", "foo.seqn",
        FT_UINT16, BASE_DEC,
        NULL, 0x0,
        NULL, HFILL }
    },
    { &hf_foo_initialip,
```

```

        { "FOO PDU Initial IP", "foo.initialip",
          FT_IPv4, BASE_NONE,
          NULL, 0x0,
          NULL, HFILL }
    },
    ...
    ...
}
...

```

This dissects all the bits of this simple hypothetical protocol. We've introduced a new variable `offset` into the mix to help keep track of where we are in the packet dissection. With these extra bits in place, the whole protocol is now dissected.

## Improving the dissection information

We can certainly improve the display of the protocol with a bit of extra data. The first step is to add some text labels. Let's start by labeling the packet types. There is some useful support for this sort of thing by adding a couple of extra things. First we add a simple table of type to name.

*Naming the packet types.*

```

static const value_string packettypenames[] = {
    { 1, "Initialise" },
    { 2, "Terminate" },
    { 3, "Data" },
    { 0, NULL }
};

```

This is a handy data structure that can be used to look up a name for a value. There are routines to directly access this lookup table, but we don't need to do that, as the support code already has that added in. We just have to give these details to the appropriate part of the data, using the `VALS` macro.

*Adding Names to the protocol.*

```

{ &hf_foo_pdu_type,
  { "FOO PDU Type", "foo.type",
    FT_UINT8, BASE_DEC,
    VALS(packettypenames), 0x0,
    NULL, HFILL }
}

```

This helps in deciphering the packets, and we can do a similar thing for the flags structure. For this we need to add some more data to the table though.

## Adding Flags to the protocol.

```
#define FOO_START_FLAG      0x01
#define FOO_END_FLAG        0x02
#define FOO_PRIORITY_FLAG   0x04

static int hf_foo_startflag = -1;
static int hf_foo_endflag = -1;
static int hf_foo_priorityflag = -1;

static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    ...
    ...
    static int* const bits[] = {
        &hf_foo_startflag,
        &hf_foo_endflag,
        &hf_foo_priorityflag,
        NULL
    };

    proto_tree_add_bitmask(foo_tree, tvb, offset, hf_foo_flags, ett_foo, bits,
ENC_BIG_ENDIAN);
    offset += 1;
    ...
    ...
    return tvb_captured_length(tvb);
}

void
proto_register_foo(void) {
    ...
    ...
    { &hf_foo_startflag,
      { "FOO PDU Start Flags", "foo.flags.start",
        FT_BOOLEAN, 8,
        NULL, FOO_START_FLAG,
        NULL, HFILL }
    },
    { &hf_foo_endflag,
      { "FOO PDU End Flags", "foo.flags.end",
        FT_BOOLEAN, 8,
        NULL, FOO_END_FLAG,
        NULL, HFILL }
    },
    { &hf_foo_priorityflag,
      { "FOO PDU Priority Flags", "foo.flags.priority",
```

```

        FT_BOOLEAN, 8,
        NULL, FOO_PRIORITY_FLAG,
        NULL, HFILL }
    },
    ...
...
}
...

```

Some things to note here. For the flags, as each bit is a different flag, we use the type `FT_BOOLEAN`, as the flag is either on or off. Second, we include the flag mask in the 7th field of the data, which allows the system to mask the relevant bit. We've also changed the 5th field to 8, to indicate that we are looking at an 8 bit quantity when the flags are extracted. Then finally we add the extra constructs to the dissection routine.

This is starting to look fairly full featured now, but there are a couple of other things we can do to make things look even more pretty. At the moment our dissection shows the packets as "Foo Protocol" which whilst correct is a little uninformative. We can enhance this by adding a little more detail. First, let's get hold of the actual value of the protocol type. We can use the handy function `tvb_get_guint8()` to do this. With this value in hand, there are a couple of things we can do. First we can set the INFO column of the non-detailed view to show what sort of PDU it is - which is extremely helpful when looking at protocol traces. Second, we can also display this information in the dissection window.

```
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    gint offset = 0;
    guint8 packet_type = tvb_get_guint8(tvb, 0);

    col_set_str(pinfo->cinfo, COL_PROTOCOL, "F00");
    /* Clear out stuff in the info column */
    col_clear(pinfo->cinfo, COL_INFO);
    col_add_fstr(pinfo->cinfo, COL_INFO, "Type %s",
                val_to_str(packet_type, packettypenames, "Unknown (0x%02x)"));

    proto_item *ti = proto_tree_add_item(tree, proto_foo, tvb, 0, -1, ENC_NA);
    proto_item_append_text(ti, ", Type %s",
                           val_to_str(packet_type, packettypenames, "Unknown (0x%02x)"));
    proto_tree *foo_tree = proto_item_add_subtree(ti, ett_foo);
    proto_tree_add_item(foo_tree, hf_foo_pdu_type, tvb, offset, 1, ENC_BIG_ENDIAN);
    offset += 1;

    return tvb_captured_length(tvb);
}
```

So here, after grabbing the value of the first 8 bits, we use it with one of the built-in utility routines `val_to_str()`, to lookup the value. If the value isn't found we provide a fallback which just prints the value in hex. We use this twice, once in the INFO field of the columns—if it's displayed, and similarly we append this data to the base of our dissecting tree.

## How to add an expert item

A dissector showing the protocol fields and interpretation of their values is very informative. It can be even more helpful if the dissector can draw your attention to fields where something noteworthy can be seen. This can be something as simple as the start flag of a session, or something more severe as an invalid value.

Here we take our dissector for `F00` and add an expert item for the sequence number being zero (assuming that's a noteworthy thing for this protocol).

Expert item setup.

```
#include <epan/expert.h>

static expert_field ei_foo_seqn_zero = EI_INIT;

/* ... */

void
proto_register_foo(void)
{
    /* ... */
    expert_module_t* expert_foo;

    /* ... */
    static ei_register_info ei[] = {
        {
            &ei_foo_seqn_zero,
            { "foo.seqn_zero", PI_SEQUENCE, PI_CHAT,
              "Sequence number is zero", EXPFILL }
        }
    };

    /* ... */
    expert_foo = expert_register_protocol(proto_foo);
    expert_register_field_array(expert_foo, ei, array_length(ei));
}
```

Let's go through this step by step. The data structures and functions needed for expert items are found in `epan/expert.h`, so we have to include that file.

Next we have to allocate an `expert_field` structure for every type of expert item we would like to add to the dissection. This structure is initialised with `EI_INIT`.

Now we have to register with the protocol we are providing expert info for. Since we already have a function to register our protocol, we add the expert info registration there too. This is done by calling `expert_register_protocol()` with the handle for the protocol we received earlier in this function.

Next we need to register an array of definitions of expert items that we would like to add to the dissection. This array, not unlike the array of header fields before, contains all the data the dissection engine needs to create and handle the expert items.

The expert item definition consists of a pointer to the `expert_field` structure we defined before and a structure with data elements of the expert item itself.

- `"foo.seqn_zero"` - The expert items display filter

- *PI\_SEQUENCE* - The group to which the expert item belongs
- *PI\_CHAT* - The severity of the expert item
- *"Sequence number is zero"* - The text string added to the dissection

We'll ignore the rest of the structure for now.

To keep an overview of lots of expert items it helps to categorize them into groups. Currently there are several types of groups defined, e.g. `checksum`, `sequence`, `protocol`, etc. All these are defined in the `epan/proto.h` header file.

Not every noteworthy field value is of equal severity. The start of a session is nice to know, while an invalid value may be significant error in the protocol. To differentiate between these severities the expert item is assigned one of them: `comment`, `chat`, `note`, `warn` or `error`. Try to choose the lowest one which is suitable. The topic you're currently working on seems probably more important than it will look like in a few weeks.

With the expert item array setup, we add this to the dissection engine with a call to `expert_register_field_array()`.

Now that all information of the expert item is defined and registered it's time to actually add the expert item to the dissection.

*Expert item use.*

```
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    guint32 sequenceno = 0xFFFF;

    /* ... */

    ti = proto_tree_add_item_ret_uint(foo_tree, hf_foo_sequenceno,
                                     tvb, offset, 2, ENC_BIG_ENDIAN, &sequenceno);
    if (sequenceno == 0) {
        expert_add_info(pinfo, ti, &ei_foo_seqn_zero);
    }

    /* ... */
}
```

There's been a slight alteration to the function used to add the sequence number dissection. First the `proto_item` created by the function is saved in previously defined variable `ti`, and the actual value of the field is stored in the variable `sequenceno`. We can now use the value of this field to determine whether to add the expert item.

Adding the expert item is simply done by calling `expert_add_info()` with reference to the

`packet_info` structure, the proto item `ti` to add the expert item to and the previously defined and registered expert item information.

## How to handle transformed data

Some protocols do clever things with data. They might possibly encrypt the data, or compress data, or part of it. If you know how these steps are taken it is possible to reverse them within the dissector.

As encryption can be tricky, let's consider the case of compression. These techniques can also work for other transformations of data, where some step is required before the data can be examined.

What basically needs to happen here, is to identify the data that needs conversion, take that data and transform it into a new stream, and then call a dissector on it. Often this needs to be done "on-the-fly" based on clues in the packet. Sometimes this needs to be used in conjunction with other techniques, such as packet reassembly. The following shows a technique to achieve this effect.

*Decompressing data packets for dissection.*

```
guint8 flags = tvb_get_guint8(tvb, offset);
offset ++;
if (flags & FLAG_COMPRESSED) { /* the remainder of the packet is compressed */
    guint16 orig_size = tvb_get_ntohs(tvb, offset);
    gchar *decompressed_buffer = (guchar*)wmem_alloc(pinfo->pool, orig_size);
    offset += 2;
    decompress_packet(tvb_get_ptr(tvb, offset, -1),
                     tvb_captured_length_remaining(tvb, offset),
                     decompressed_buffer, orig_size);
    /* Now re-setup the tvb buffer to have the new data */
    next_tvb = tvb_new_child_real_data(tvb, decompressed_buffer, orig_size,
    orig_size);
    add_new_data_source(pinfo, next_tvb, "Decompressed Data");
} else {
    next_tvb = tvb_new_subset_remaining(tvb, offset);
}
offset = 0;
/* process next_tvb from here on */
```

The first steps here are to recognise the compression. In this case a flag byte alerts us to the fact the remainder of the packet is compressed. Next we retrieve the original size of the packet, which in this case is conveniently within the protocol. If it's not, it may be part of the compression routine to work it out for you, in which case the logic would be different.

So armed with the size, a buffer is allocated to receive the uncompressed data using `wmem_alloc()` in `pinfo->pool` memory, and the packet is decompressed into it. The `tvb_get_ptr()` function is useful to get a pointer to the raw data of the packet from the offset onwards. In this case the decompression



routine also needs to know the length, which is given by the `tvb_captured_length_remaining()` function.

Next we build a new tvb buffer from this data, using the `tvb_new_child_real_data()` call. This data is a child of our original data, so calling this function also acknowledges that. No need to call `tvb_set_free_cb()` as the `pinfo` → `pool` was used (the memory block will be automatically freed when the `pinfo` pool lifetime expires). Finally we add this tvb as a new data source, so that the detailed display can show the decompressed bytes as well as the original.

After this has been set up the remainder of the dissector can dissect the buffer `next_tvb`, as it's a new buffer the offset needs to be 0 as we start again from the beginning of this buffer. To make the rest of the dissector work regardless of whether compression was involved or not, in the case that compression was not signaled, we use `tvb_new_subset_remaining()` to deliver us a new buffer based on the old one but starting at the current offset, and extending to the end. This makes dissecting the packet from this point on exactly the same regardless of compression.

## How to reassemble split packets

Some protocols have times when they have to split a large packet across multiple other packets. In this case the dissection can't be carried out correctly until you have all the data. The first packet doesn't have enough data, and the subsequent packets don't have the expected format. To dissect these packets you need to wait until all the parts have arrived and then start the dissection.

The following sections will guide you through two common cases. For a description of all possible functions, structures and parameters, see *epan/reassemble.h*.

### How to reassemble split UDP packets

As an example, let's examine a protocol that is layered on top of UDP that splits up its own data stream. If a packet is bigger than some given size, it will be split into chunks, and somehow signaled within its protocol.

To deal with such streams, we need several things to trigger from. We need to know that this packet is part of a multi-packet sequence. We need to know how many packets are in the sequence. We also need to know when we have all the packets.

For this example we'll assume there is a simple in-protocol signaling mechanism to give details. A flag byte that signals the presence of a multi-packet sequence and also the last packet, followed by an ID of the sequence and a packet sequence number.

```

msg_pkt ::= SEQUENCE {
    .....
    flags ::= SEQUENCE {
        fragment    BOOLEAN,
        last_fragment  BOOLEAN,
    .....
    }
    msg_id  INTEGER(0..65535),
    frag_id INTEGER(0..65535),
    .....
}

```

### Reassembling fragments - Part 1

```

#include <epan/reassemble.h>
...
save_fragmented = pinfo->fragmented;
flags = tvb_get_guint8(tvb, offset); offset++;
if (flags & FL_FRAGMENT) { /* fragmented */
    tvbuff_t* new_tvb = NULL;
    fragment_data *frag_msg = NULL;
    guint16 msg_seqid = tvb_get_ntohs(tvb, offset); offset += 2;
    guint16 msg_num = tvb_get_ntohs(tvb, offset); offset += 2;

    pinfo->fragmented = TRUE;
    frag_msg = fragment_add_seq_check(msg_reassembly_table,
        tvb, offset, pinfo,
        msg_seqid, NULL, /* ID for fragments belonging together */
        msg_num, /* fragment sequence number */
        tvb_captured_length_remaining(tvb, offset), /* fragment length - to the end */
        flags & FL_FRAG_LAST); /* More fragments? */
}

```

We start by saving the fragmented state of this packet, so we can restore it later. Next comes some protocol specific stuff, to dig the fragment data out of the stream if it's present. Having decided it is present, we let the function `fragment_add_seq_check()` do its work. We need to provide this with a certain amount of parameters:

- The `msg_reassembly_table` table is for bookkeeping and is described later.
- The tvb buffer we are dissecting.
- The offset where the partial packet starts.
- The provided packet info.
- The sequence number of the fragment stream. There may be several streams of fragments in flight, and this is used to key the relevant one to be used for reassembly.

- Optional additional data for identifying the fragment. Can be set to `NULL` (as is done in the example) for most dissectors.
- `msg_num` is the packet number within the sequence.
- The length here is specified as the rest of the `tvb` as we want the rest of the packet data.
- Finally a parameter that signals if this is the last fragment or not. This might be a flag as in this case, or there may be a counter in the protocol.

### Reassembling fragments part 2

```

new_tvb = process_reassembled_data(tvb, offset, pinfo,
    "Reassembled Message", frag_msg, &msg_frag_items,
    NULL, msg_tree);

if (frag_msg) { /* Reassembled */
    col_append_str(pinfo->cinfo, COL_INFO,
        " (Message Reassembled)");
} else { /* Not last packet of reassembled Short Message */
    col_append_fstr(pinfo->cinfo, COL_INFO,
        " (Message fragment %u)", msg_num);
}

if (new_tvb) { /* take it all */
    next_tvb = new_tvb;
} else { /* make a new subset */
    next_tvb = tvb_new_subset_remaining(tvb, offset);
}
}
else { /* Not fragmented */
    next_tvb = tvb_new_subset_remaining(tvb, offset);
}

.....
pinfo->fragmented = save_fragmented;

```

Having passed the fragment data to the reassembly handler, we can now check if we have the whole message. If there is enough information, this routine will return the newly reassembled data buffer.

After that, we add a couple of informative messages to the display to show that this is part of a sequence. Then a bit of manipulation of the buffers and the dissection can proceed. Normally you will probably not bother dissecting further unless the fragments have been reassembled as there won't be much to find. Sometimes the first packet in the sequence can be partially decoded though if you wish.

Now the mysterious data we passed into the `fragment_add_seq_check()`.

## Reassembling fragments - Initialisation

```
static reassembly_table reassembly_table;

static void
proto_register_msg(void)
{
    reassembly_table_register(&msg_reassemble_table,
                             &addresses_ports_reassembly_table_functions);
}
```

First a `reassembly_table` structure is declared and initialised in the protocol initialisation routine. The second parameter specifies the functions that should be used for identifying fragments. We will use `addresses_ports_reassembly_table_functions` in order to identify fragments by the given sequence number (`msg_seqid`), the source and destination addresses and ports from the packet.

Following that, a `fragment_items` structure is allocated and filled in with a series of ett items, hf data items, and a string tag. The ett and hf values should be included in the relevant tables like all the other variables your protocol may use. The hf variables need to be placed in the structure something like the following. Of course the names may need to be adjusted.

## Reassembling fragments - Data

```
...
static int hf_msg_fragments = -1;
static int hf_msg_fragment = -1;
static int hf_msg_fragment_overlap = -1;
static int hf_msg_fragment_overlap_conflicts = -1;
static int hf_msg_fragment_multiple_tails = -1;
static int hf_msg_fragment_too_long_fragment = -1;
static int hf_msg_fragment_error = -1;
static int hf_msg_fragment_count = -1;
static int hf_msg_reassembled_in = -1;
static int hf_msg_reassembled_length = -1;
...
static gint ett_msg_fragment = -1;
static gint ett_msg_fragments = -1;
...
static const fragment_items msg_frag_items = {
    /* Fragment subtrees */
    &ett_msg_fragment,
    &ett_msg_fragments,
    /* Fragment fields */
    &hf_msg_fragments,
    &hf_msg_fragment,
    &hf_msg_fragment_overlap,
    &hf_msg_fragment_overlap_conflicts,
```

```

&hf_msg_fragment_multiple_tails,
&hf_msg_fragment_too_long_fragment,
&hf_msg_fragment_error,
&hf_msg_fragment_count,
/* Reassembled in field */
&hf_msg_reassembled_in,
/* Reassembled length field */
&hf_msg_reassembled_length,
/* Tag */
    "Message fragments"
};
...
static hf_register_info hf[] =
{
    ...
    {&hf_msg_fragments,
        {"Message fragments", "msg.fragments",
        FT_NONE, BASE_NONE, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment,
        {"Message fragment", "msg.fragment",
        FT_FRAMENUM, BASE_NONE, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_overlap,
        {"Message fragment overlap", "msg.fragment.overlap",
        FT_BOOLEAN, 0, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_overlap_conflicts,
        {"Message fragment overlapping with conflicting data",
        "msg.fragment.overlap.conflicts",
        FT_BOOLEAN, 0, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_multiple_tails,
        {"Message has multiple tail fragments",
        "msg.fragment.multiple_tails",
        FT_BOOLEAN, 0, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_too_long_fragment,
        {"Message fragment too long", "msg.fragment.too_long_fragment",
        FT_BOOLEAN, 0, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_error,
        {"Message defragmentation error", "msg.fragment.error",
        FT_FRAMENUM, BASE_NONE, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_fragment_count,
        {"Message fragment count", "msg.fragment.count",
        FT_UINT32, BASE_DEC, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_reassembled_in,
        {"Reassembled in", "msg.reassembled.in",
        FT_FRAMENUM, BASE_NONE, NULL, 0x00, NULL, HFILL } },
    {&hf_msg_reassembled_length,
        {"Reassembled length", "msg.reassembled.length",
        FT_UINT32, BASE_DEC, NULL, 0x00, NULL, HFILL } },
    ...
}

```

```
static gint *ett[] =
{
...
&ett_msg_fragment,
&ett_msg_fragments
...
}
```

These hf variables are used internally within the reassembly routines to make useful links, and to add data to the dissection. It produces links from one packet to another, such as a partial packet having a link to the fully reassembled packet. Likewise there are back pointers to the individual packets from the reassembled one. The other variables are used for flagging up errors.

## How to reassemble split TCP Packets

A dissector gets a `tvbuff_t` pointer which holds the payload of a TCP packet. This payload contains the header and data of your application layer protocol.

When dissecting an application layer protocol you cannot assume that each TCP packet contains exactly one application layer message. One application layer message can be split into several TCP packets.

You also cannot assume that a TCP packet contains only one application layer message and that the message header is at the start of your TCP payload. More than one messages can be transmitted in one TCP packet, so that a message can start at an arbitrary position.

This sounds complicated, but there is a simple solution. `tcp_dissect_pdus()` does all this tcp packet reassembling for you. This function is implemented in *epan/dissectors/packet-tcp.h*.

```
#include "config.h"

#include <epan/packet.h>
#include <epan/prefs.h>
#include "packet-tcp.h"

...

#define FRAME_HEADER_LEN 8

/* This method dissects fully reassembled messages */
static int
dissect_foo_message(tvbuff_t *tvb, packet_info *pinfo _U_, proto_tree *tree _U_, void
*data _U_)
{
    /* TODO: implement your dissecting code */
    return tvb_captured_length(tvb);
}

/* determine PDU length of protocol foo */
static guint
get_foo_message_len(packet_info *pinfo _U_, tvbuff_t *tvb, int offset, void *data _U_)
{
    /* TODO: change this to your needs */
    return (guint)tvb_get_ntohl(tvb, offset+4); /* e.g. length is at offset 4 */
}

/* The main dissecting routine */
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data)
{
    tcp_dissect_pdus(tvb, pinfo, tree, TRUE, FRAME_HEADER_LEN,
                    get_foo_message_len, dissect_foo_message, data);
    return tvb_captured_length(tvb);
}

...
```

As you can see this is really simple. Just call `tcp_dissect_pdus()` in your main dissection routine and move your message parsing code into another function. This function gets called whenever a message has been reassembled.

The parameters `tvb`, `pinfo`, `tree` and `data` are just handed over to `tcp_dissect_pdus()`. The 4th parameter is a flag to indicate if the data should be reassembled or not. This could be set according to a dissector preference as well. Parameter 5 indicates how much data has at least to be available

to be able to determine the length of the foo message. Parameter 6 is a function pointer to a method that returns this length. It gets called when at least the number of bytes given in the previous parameter is available. Parameter 7 is a function pointer to your real message dissector. Parameter 8 is the data passed in from parent dissector.

Protocols which need more data before the message length can be determined can return zero. Other values smaller than the fixed length will result in an exception.

## How to tap protocols

Adding a Tap interface to a protocol allows it to do some useful things. In particular you can produce protocol statistics from the tap interface.

A tap is basically a way of allowing other items to see what's happening as a protocol is dissected. A tap is registered with the main program, and then called on each dissection. Some arbitrary protocol specific data is provided with the routine that can be used.

To create a tap, you first need to register a tap. A tap is registered with an integer handle, and registered with the routine `register_tap()`. This takes a string name with which to find it again.

### *Initialising a tap*

```
#include <epan/packet.h>
#include <epan/tap.h>

static int foo_tap = -1;

struct FooTap {
    gint packet_type;
    gint priority;
    ...
};

void proto_register_foo(void)
{
    ...
    foo_tap = register_tap("foo");
}
```

Whilst you can program a tap without protocol specific data, it is generally not very useful. Therefore it's a good idea to declare a structure that can be passed through the tap. This needs to be a static structure as it will be used after the dissection routine has returned. It's generally best to pick out some generic parts of the protocol you are dissecting into the tap data. A packet type, a priority or a status code maybe. The structure really needs to be included in a header file so that it can be included by other components that want to listen in to the tap.

Once you have these defined, it's simply a case of populating the protocol specific structure and



then calling `tap_queue_packet`, probably as the last part of the dissector.

#### *Calling a protocol tap*

```
static int
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree, void *data _U_)
{
    ...
    fooinfo = wmem_alloc(pinfo->pool, sizeof(struct FooTap));
    fooinfo->packet_type = tvb_get_guint8(tvb, 0);
    fooinfo->priority = tvb_get_ntohs(tvb, 8);
    ...
    tap_queue_packet(foo_tap, pinfo, fooinfo);

    return tvb_captured_length(tvb);
}
```

This now enables those interested parties to listen in on the details of this protocol conversation.

## How to produce protocol stats

Given that you have a tap interface for the protocol, you can use this to produce some interesting statistics (well presumably interesting!) from protocol traces.

This can be done in a separate plugin, or in the same plugin that is doing the dissection. The latter scheme is better, as the tap and stats module typically rely on sharing protocol specific data, which might get out of step between two different plugins.

Here is a mechanism to produce statistics from the above TAP interface.

#### *Initialising a stats interface*

```
#include <epan/stats_tree.h>

/* register all http trees */
static void register_foo_stat_trees(void) {
    stats_tree_register_plugin("foo", "foo", "Foo/Packet Types", 0,
        foo_stats_tree_packet, foo_stats_tree_init, NULL);
}

WS_DLL_PUBLIC_DEF void plugin_register_tap_listener(void)
{
    register_foo_stat_trees();
}
```

Working from the bottom up, first the plugin interface entry point is defined,

`plugin_register_tap_listener()`. This simply calls the initialisation function `register_foo_stat_trees()`.

This in turn calls the `stats_tree_register_plugin()` function, which takes three strings, an integer, and three callback functions.

1. This is the tap name that is registered.
2. An abbreviation of the stats name.
3. The name of the stats module. A “/” character can be used to make sub menus.
4. Flags for per-packet callback
5. The function that will called to generate the stats.
6. A function that can be called to initialise the stats data.
7. A function that will be called to clean up the stats data.

In this case we only need the first two functions, as there is nothing specific to clean up.

#### *Initialising a stats session*

```
static const quint8* st_str_packets = "Total Packets";
static const quint8* st_str_packet_types = "F00 Packet Types";
static int st_node_packets = -1;
static int st_node_packet_types = -1;

static void foo_stats_tree_init(stats_tree* st)
{
    st_node_packets = stats_tree_create_node(st, st_str_packets, 0, STAT_DT_INT,
TRUE);
    st_node_packet_types = stats_tree_create_pivot(st, st_str_packet_types,
st_node_packets);
}
```

In this case we create a new tree node, to handle the total packets, and as a child of that we create a pivot table to handle the stats about different packet types.

```
static tap_packet_status foo_stats_tree_packet(stats_tree* st, packet_info* pinfo,
epan_dissect_t* edt, const void* p)
{
    struct FooTap *pi = (struct FooTap *)p;
    tick_stat_node(st, st_str_packets, 0, FALSE);
    stats_tree_tick_pivot(st, st_node_packet_types,
        val_to_str(pi->packet_type, packettypenames, "Unknown packet type (%d)"));
    return TAP_PACKET_REDRAW;
}
```

In this case the processing of the stats is quite simple. First we call the `tick_stat_node` for the `st_str_packets` packet node, to count packets. Then a call to `stats_tree_tick_pivot()` on the `st_node_packet_types` subtree allows us to record statistics by packet type.

## How to use conversations

Some info about how to use conversations in a dissector can be found in the file `doc/README.dissector`, chapter 2.2.

## *idl2wrs*: Creating dissectors from CORBA IDL files

Many of Wireshark's dissectors are automatically generated. This section shows how to generate one from a CORBA IDL file.

### What is it?

As you have probably guessed from the name, `idl2wrs` takes a user specified IDL file and attempts to build a dissector that can decode the IDL traffic over GIOP. The resulting file is "C" code, that should compile okay as a Wireshark dissector.

`idl2wrs` parses the data struct given to it by the `omniidl` compiler, and using the GIOP API available in `packet-giop.[ch]`, generates `get_CDR_xxx` calls to decode the CORBA traffic on the wire.

It consists of 4 main files.

#### **README.idl2wrs**

This document

#### **wireshark\_be.py**

The main compiler backend

#### **wireshark\_gen.py**

A helper class, that generates the C code.

## idl2wrs

A simple shell script wrapper that the end user should use to generate the dissector from the IDL file(s).

## Why do this?

It is important to understand what CORBA traffic looks like over GIOP/IIOP, and to help build a tool that can assist in troubleshooting CORBA interworking. This was especially the case after seeing a lot of discussions about how particular IDL types are represented inside an octet stream.

I have also had comments/feedback that this tool would be good for say a CORBA class when teaching students what CORBA traffic looks like “on the wire”.

It is also COOL to work on a great Open Source project such as the case with “Wireshark” (<https://www.wireshark.org/>).

## How to use idl2wrs

To use the idl2wrs to generate Wireshark dissectors, you need the following:

- Python must be installed. See <https://python.org/>
- `omniidl` from the omniORB package must be available. See <http://omniorb.sourceforge.net/>
- Of course you need Wireshark installed to compile the code and tweak it if required. idl2wrs is part of the standard Wireshark distribution

To use idl2wrs to generate an Wireshark dissector from an idl file use the following procedure:

- To write the C code to stdout.

```
$ idl2wrs <your_file.idl>
```

e.g.:

```
$ idl2wrs echo.idl
```

- To write to a file, just redirect the output.

```
$ idl2wrs echo.idl > packet-test-idl.c
```

You may wish to comment out the `register_giop_user_module()` code and that will leave you with heuristic dissection.

If you don't want to use the shell script wrapper, then try steps 3 or 4 instead.

- To write the C code to stdout.

```
$ omniidl -p ./ -b wireshark_be <your file.idl>
```

e.g.:

```
$ omniidl -p ./ -b wireshark_be echo.idl
```

- To write to a file, just redirect the output.

```
$ omniidl -p ./ -b wireshark_be echo.idl > packet-test-idl.c
```

You may wish to comment out the `register_giop_user_module()` code and that will leave you with heuristic dissection.

- Copy the resulting C code to subdirectory `epan/dissectors/` inside your Wireshark source directory.

```
$ cp packet-test-idl.c /dir/where/wireshark/lives/epan/dissectors/
```

The new dissector has to be added to `CMakeLists.txt` in the same directory. Look for the declaration `DISSECTOR_SRC` and add the new dissector there. For example,

```
DISSECTOR_SRC = \  
    ${CMAKE_CURRENT_SOURCE_DIR}/packet-2dparityfec.c  
    ${CMAKE_CURRENT_SOURCE_DIR}/packet-3com-njack.c  
    ...
```

becomes

```
DISSECTOR_SRC = \  
    ${CMAKE_CURRENT_SOURCE_DIR}/packet-test-idl.c      \  
    ${CMAKE_CURRENT_SOURCE_DIR}/packet-2dparityfec.c  \  
    ${CMAKE_CURRENT_SOURCE_DIR}/packet-3com-njack.c   \  
    ...
```

For the next steps, go up to the top of your Wireshark source directory.

- Create a build dir

```
$ mkdir build && cd build
```

- Run cmake

```
$ cmake ..
```

- Build the code

```
$ make
```

- Good Luck !!

## TODO

- Exception code not generated (yet), but can be added manually.
- Enums not converted to symbolic values (yet), but can be added manually.
- Add command line options etc
- More I am sure :-)

## Limitations

See the TODO list inside *packet-giop.c*

## Notes

The `-p ./` option passed to `omniidl` indicates that the `wireshark_be.py` and `wireshark_gen.py` are residing in the current directory. This may need tweaking if you place these files somewhere else.

If it complains about being unable to find some modules (e.g. `tempfile.py`), you may want to check if `PYTHONPATH` is set correctly.

# Lua Support in Wireshark

## Introduction

Lua is a powerful light-weight programming language designed for extending applications. Wireshark contains an embedded Lua 5.2 interpreter which can be used to write dissectors, taps, and capture file readers and writers.

Wireshark's Lua interpreter starts by loading a file named `init.lua` from Wireshark's *global configuration directory*. The *global configuration directory's* `init.lua` controls whether or not Lua scripts are enabled via the `enable_lua` variable. Lua scripts are enabled by default. To disable Lua scripts, set the `enable_lua` variable to `false`. Wireshark 2.6 and earlier enabled or disabled Lua scripts using the variable `disable_lua` (deprecated). If both `enable_lua` and `disable_lua` are present, `disable_lua` is ignored.

If Lua is enabled, Wireshark will try to load a file named `init.lua` from the user's *personal configuration directory* and all files ending with `.lua` in the global and the personal *plugins directory*.

The command line option `-X lua_script:file.lua` can also be used to load specific Lua scripts.

The Lua code is executed after all protocol dissectors are initialized and before reading any file.

Wireshark for Windows uses a modified Lua runtime (`lua-unicode`) to support Unicode (UTF-8) filesystem paths. This brings consistency with other platforms (for example, Linux and macOS).

## Example: Creating a Menu with Lua

The code below adds a menu "Lua Dialog Test" under the Tools menu. When selected, it opens a dialog prompting the user for input and then opens a text window with the output.

```

-- Define the menu entry's callback
local function dialog_menu()
    local function dialog_func(person,eyes,hair)
        local window = TextWindow.new("Person Info");
        local message = string.format("Person %s with %s eyes and %s hair.", person,
eyes, hair);
        window:set(message);
    end

    new_dialog("Dialog Test",dialog_func,"A Person","Eyes","Hair")
end

-- Create the menu entry
register_menu("Lua Dialog Test",dialog_menu,MENU_TOOLS_UNSORTED)

-- Notify the user that the menu was created
if gui_enabled() then
    local splash = TextWindow.new("Hello!");
    splash:set("Wireshark has been enhanced with a useless feature.\n")
    splash:append("Go to 'Tools->Lua Dialog Test' and check it out!")
end

```

## Example: Dissector written in Lua

```

local p_multi = Proto("multi", "MultiProto");

local vs_protos = {
    [2] = "mtp2",
    [3] = "mtp3",
    [4] = "alcap",
    [5] = "h248",
    [6] = "ranap",
    [7] = "rnsap",
    [8] = "nbap"
}

local f_proto = ProtoField.uint8("multi.protocol", "Protocol", base.DEC, vs_protos)
local f_dir = ProtoField.uint8("multi.direction", "Direction", base.DEC, { [1] =
"incoming", [0] = "outgoing"})
local f_text = ProtoField.string("multi.text", "Text")

p_multi.fields = { f_proto, f_dir, f_text }

local data_dis = Dissector.get("data")

```



```

local protos = {
    [2] = Dissector.get("mtp2"),
    [3] = Dissector.get("mtp3"),
    [4] = Dissector.get("alcap"),
    [5] = Dissector.get("h248"),
    [6] = Dissector.get("ranap"),
    [7] = Dissector.get("rnsap"),
    [8] = Dissector.get("nbap"),
    [9] = Dissector.get("rrc"),
    [10] = DissectorTable.get("sctp.ppi"):get_dissector(3), -- m3ua
    [11] = DissectorTable.get("ip.proto"):get_dissector(132), -- sctp
}

function p_multi.dissector(buf, pkt, tree)

    local subtree = tree:add(p_multi, buf(0,2))
    subtree:add(f_proto, buf(0,1))
    subtree:add(f_dir, buf(1,1))

    local proto_id = buf(0,1):uint()

    local dissector = protos[proto_id]

    if dissector ~= nil then
        -- Dissector was found, invoke subdissector with a new Tvb,
        -- created from the current buffer (skipping first two bytes).
        dissector:call(buf(2):tvb(), pkt, tree)
    elseif proto_id < 2 then
        subtree:add(f_text, buf(2))
        -- pkt.cols.info:set(buf(2, buf:len() - 3):string())
    else
        -- fallback dissector that just shows the raw data.
        data_dis:call(buf(2):tvb(), pkt, tree)
    end

end

local wtap_encap_table = DissectorTable.get("wtap_encap")
local udp_encap_table = DissectorTable.get("udp.port")

wtap_encap_table:add(wtap.USER15, p_multi)
wtap_encap_table:add(wtap.USER12, p_multi)
udp_encap_table:add(7555, p_multi)

```

## Example: Listener written in Lua

```
-- This program will register a menu that will open a window with a count of
occurrences
-- of every address in the capture

local function menuable_tap()
    -- Declare the window we will use
    local tw = TextWindow.new("Address Counter")

    -- This will contain a hash of counters of appearances of a certain address
    local ips = {}

    -- this is our tap
    local tap = Listener.new();

    local function remove()
        -- this way we remove the listener that otherwise will remain running
indefinitely
        tap:remove();
    end

    -- we tell the window to call the remove() function when closed
    tw:set_atclose(remove)

    -- this function will be called once for each packet
    function tap.packet(pinfo,tvb)
        local src = ips[tostring(pinfo.src)] or 0
        local dst = ips[tostring(pinfo.dst)] or 0

        ips[tostring(pinfo.src)] = src + 1
        ips[tostring(pinfo.dst)] = dst + 1
    end

    -- this function will be called once every few seconds to update our window
    function tap.draw(t)
        tw:clear()
        for ip,num in pairs(ips) do
            tw:append(ip .. "\t" .. num .. "\n");
        end
    end
end

-- this function will be called whenever a reset is needed
-- e.g. when reloading the capture file
function tap.reset()
    tw:clear()
    ips = {}
end
```

```
end

-- Ensure that all existing packets are processed.
retap_packets()
end

-- using this function we register our function
-- to be called when the user selects the Tools->Test->Packets menu
register_menu("Test/Packets", menuable_tap, MENU_TOOLS_UNSORTED)
```

# Wireshark's Lua API Reference Manual

This Part of the User Guide describes the Wireshark specific functions in the embedded Lua.

Classes group certain functionality, the following notational conventions are used:

- *Class.function()* represents a class method (named *function*) on class *Class*, taking no arguments.
- *Class.function(a)* represents a class method taking one argument.
- *Class.function(...)* represents a class method taking a variable number of arguments.
- *class:method()* represents an instance method (named *method*) on an instance of class *Class*, taking no arguments. Note the lowercase notation in the documentation to clarify an instance.
- *class.prop* represents a property *prop* on the instance of class *Class*.

Trying to access a non-existing property, function or method currently gives an error, but do not rely on it as the behavior may change in the future.

## Saving Capture Files

The classes/functions defined in this module are for using a **Dumper** object to make Wireshark save a capture file to disk. **Dumper** represents Wireshark's built-in file format writers (see the `wtap_name_to_file_type_subtype` function).

(The `wtap_filetypes` table in `init.lua` is deprecated, and should only be used in code that must run on Wireshark 3.4.3 and earlier 3.4 releases or in Wireshark 3.2.11 and earlier 3.2.x releases.)

To have a Lua script create its own file format writer, see the chapter titled "Custom file format reading/writing".

## Dumper

### **Dumper.new(filename, [filetype], [encap])**

Creates a file to write packets. `Dumper:new_for_current()` will probably be a better choice.

### Arguments

#### **filename**

The name of the capture file to be created.

#### **filetype (optional)**

The type of the file to be created - a number returned by `wtap_name_to_file_type_subtype()`. (The `wtap_filetypes` table in `init.lua` is deprecated, and should only be used in code that must run on Wireshark 3.4.3 and earlier 3.4 releases or in Wireshark 3.2.11 and earlier 3.2.x releases.)

### **encap (optional)**

The encapsulation to be used in the file to be created - a number entry from the `wtap_encaps` table in `init.lua`.

### **Returns**

The newly created Dumper object

### **dumper:close()**

Closes a dumper.

### **Errors**

- Cannot operate on a closed dumper

### **dumper:flush()**

Writes all unsaved data of a dumper to the disk.

### **dumper:dump(timestamp, pseudoheader, bytearray)**

Dumps an arbitrary packet. Note: `Dumper:dump_current()` will fit best in most cases.

### **Arguments**

#### **timestamp**

The absolute timestamp the packet will have.

#### **pseudoheader**

The `PseudoHeader` to use.

#### **bytearray**

The data to be saved

### **dumper:new\_for\_current([filetype])**

Creates a capture file using the same encapsulation as the one of the current packet.

### **Arguments**

#### **filetype (optional)**

The file type. Defaults to `pcap`.

### **Returns**

The newly created Dumper Object

## Errors

- Cannot be used outside a tap or a dissector

## **dumper:dump\_current()**

Dumps the current packet as it is.

## Errors

- Cannot be used outside a tap or a dissector

## **PseudoHeader**

A pseudoheader to be used to save captured frames.

### **PseudoHeader.none()**

Creates a "no" pseudoheader.

### **Returns**

A null pseudoheader

### **PseudoHeader.eth([fcslen])**

Creates an ethernet pseudoheader.

### **Arguments**

#### **fcslen (optional)**

The fcs length

### **Returns**

The ethernet pseudoheader

### **PseudoHeader.atm([aal], [vpi], [vci], [channel], [cells], [aal5u2u], [aal5len])**

Creates an ATM pseudoheader.

### **Arguments**

#### **aal (optional)**

AAL number

#### **vpi (optional)**

VPI

**vci (optional)**

VCI

**channel (optional)**

Channel

**cells (optional)**

Number of cells in the PDU

**aal5u2u (optional)**

AAL5 User to User indicator

**aal5len (optional)**

AAL5 Len

**Returns**

The ATM pseudoheader

**PseudoHeader.mtp2([sent], [annexa], [linknum])**

Creates an MTP2 PseudoHeader.

**Arguments****sent (optional)**

True if the packet is sent, False if received.

**annexa (optional)**

True if annex A is used.

**linknum (optional)**

Link Number.

**Returns**

The MTP2 pseudoheader

## Obtaining Dissection Data

### Field

A Field extractor to obtain field values. A `Field` object can only be created **outside** of the callback functions of dissectors, post-dissectors, heuristic-dissectors, and taps.

Once created, it is used **inside** the callback functions, to generate a `FieldInfo` object.

## **Field.new(fieldname)**

Create a Field extractor.

### **Arguments**

#### **fieldname**

The filter name of the field (e.g. ip.addr)

### **Returns**

The field extractor

### **Errors**

- A Field extractor must be defined before Taps or Dissectors get called

## **Field.list()**

Gets a Lua array table of all registered field filter names.

**NOTE** | This is an expensive operation, and should only be used for troubleshooting.

Since: 1.11.3

### **Returns**

The array table of field filter names

## **field:\_\_call()**

Obtain all values (see [FieldInfo](#)) for this field.

### **Returns**

All the values of this field

### **Errors**

- Fields cannot be used outside dissectors or taps

## **field:\_\_tostring()**

Obtain a string with the field filter name.

## **field.name**

Mode: Retrieve only.



The filter name of this field, or nil.

Since: 1.99.8

### **field.display**

Mode: Retrieve only.

The full display name of this field, or nil.

Since: 1.99.8

### **field.type**

Mode: Retrieve only.

The `ftype` of this field, or nil.

Since: 1.99.8

## **FieldInfo**

An extracted Field from dissected packet data. A `FieldInfo` object can only be used within the callback functions of dissectors, post-dissectors, heuristic-dissectors, and taps.

A `FieldInfo` can be called on either existing Wireshark fields by using either `Field.new()` or `Field()` before-hand, or it can be called on new fields created by Lua from a `ProtoField`.

### **fieldinfo: \_\_len()**

Obtain the Length of the field

### **fieldinfo: \_\_unm()**

Obtain the Offset of the field

### **fieldinfo: \_\_call()**

Obtain the Value of the field.

Previous to 1.11.4, this function retrieved the value for most field types, but for `ftypes.UINT_BYTES` it retrieved the `ByteArray` of the field's entire `TvbRange`. In other words, it returned a `ByteArray` that included the leading length byte(s), instead of just the **value** bytes. That was a bug, and has been changed in 1.11.4. Furthermore, it retrieved an `ftypes.GUID` as a `ByteArray`, which is also incorrect.

If you wish to still get a `ByteArray` of the `TvbRange`, use `FieldInfo:get_range()` to get the `TvbRange`, and then use `Tvb:bytes()` to convert it to a `ByteArray`.

**fieldinfo.\_\_tostring()**

The string representation of the field.

**fieldinfo.\_\_eq()**

Checks whether lhs is within rhs.

**fieldinfo.\_\_le()**

Checks whether the end byte of lhs is before the end of rhs.

**Errors**

- Data source must be the same for both fields

**fieldinfo.\_\_lt()**

Checks whether the end byte of lhs is before the beginning of rhs.

**Errors**

- Data source must be the same for both fields

**fieldinfo.len**

Mode: Retrieve only.

The length of this field.

**fieldinfo.offset**

Mode: Retrieve only.

The offset of this field.

**fieldinfo.value**

Mode: Retrieve only.

The value of this field.

**fieldinfo.label**

Mode: Retrieve only.

The string representing this field.

### **fieldinfo.display**

Mode: Retrieve only.

The string display of this field as seen in GUI.

### **fieldinfo.type**

Mode: Retrieve only.

The internal field type, a number which matches one of the `ftype` values in `init.lua`.

Since: 1.99.8

### **fieldinfo.source**

Mode: Retrieve only.

The source `Tvb` object the `FieldInfo` is derived from, or nil if there is none.

Since: 1.99.8

### **fieldinfo.range**

Mode: Retrieve only.

The `TvbRange` covering the bytes of this field in a `Tvb` or nil if there is none.

### **fieldinfo.generated**

Mode: Retrieve only.

Whether this field was marked as generated (boolean).

### **fieldinfo.hidden**

Mode: Retrieve only.

Whether this field was marked as hidden (boolean).

Since: 1.99.8

### **fieldinfo.is\_url**

Mode: Retrieve only.

Whether this field was marked as being a URL (boolean).

Since: 1.99.8

### **fieldinfo.little\_endian**

Mode: Retrieve only.

Whether this field is little-endian encoded (boolean).

Since: 1.99.8

### **fieldinfo.big\_endian**

Mode: Retrieve only.

Whether this field is big-endian encoded (boolean).

Since: 1.99.8

### **fieldinfo.name**

Mode: Retrieve only.

The filter name of this field.

Since: 1.99.8

## **Global Functions**

### **all\_field\_infos()**

Obtain all fields from the current tree. Note this only gets whatever fields the underlying dissectors have filled in for this packet at this time - there may be fields applicable to the packet that simply aren't being filled in because at this time they're not needed for anything. This function only gets what the C-side code has currently populated, not the full list.

### **Errors**

- Cannot be called outside a listener or dissector

## **GUI Support**

### **ProgDlg**

Creates and manages a modal progress bar. This is intended to be used with [coroutines](#), where a main UI thread controls the progress bar dialog while a background coroutine (worker thread) yields to the main thread between steps. The main thread checks the status of the **[ Cancel ]** button and if it's not set, returns control to the coroutine.



Figure 3. A progress bar in action

The legacy (GTK+) user interface displayed this as a separate dialog, hence the “Dlg” suffix. The Qt user interface shows a progress bar inside the main status bar.

### ProgDlg.new([title], [task])

Creates and displays a new `ProgDlg` progress bar with a **[ Cancel ]** button and optional title. It is highly recommended that you wrap code that uses a `ProgDlg` instance because it does not automatically close itself upon encountering an error. Requires a GUI.

### Example

```
if not gui_enabled() then return end

local p = ProgDlg.new("Constructing", "tacos")

-- We have to wrap the ProgDlg code in a pcall in case some unexpected
-- error occurs.
local ok, errmsg = pcall(function()
    local co = coroutine.create(
        function()
            local limit = 100000
            for i=1,limit do
                print("co", i)
                coroutine.yield(i/limit, "step "..i.." of "..
limit)
            end
        end
    )
    )

    -- Whenever coroutine yields, check the status of the cancel button to
determine
    -- when to break. Wait up to 20 sec for coroutine to finish.
    local start_time = os.time()
    while coroutine.status(co) ~= 'dead' do
        local elapsed = os.time() - start_time

        -- Quit if cancel button pressed or 20 seconds elapsed
        if p:stopped() or elapsed > 20 then
            break
        end

        local res, val, val2 = coroutine.resume(co)
        if not res or res == false then
```

```

        if val then
            debug(val)
        end
        print('coroutine error')
        break
    end

    -- show progress in progress dialog
    p:update(val, val2)
end)

p:close()

if not ok and errmsg then
    report_failure(errmsg)
end

```

## Arguments

### title (optional)

Title of the progress bar. Defaults to "Progress".

### task (optional)

Optional task name, which will be appended to the title. Defaults to the empty string ("").

## Returns

The newly created `ProgDlg` object.

### progdg:update(progress, [task])

Sets the progress dialog's progress bar position based on percentage done.

## Arguments

### progress

Progress value, e.g. 0.75. Value must be between 0.0 and 1.0 inclusive.

### task (optional)

Task name. Currently ignored. Defaults to empty string ("").

## Errors

- GUI not available
- Cannot be called for something not a `ProgDlg`

- Progress value out of range (must be between 0.0 and 1.0)

### **progdlg:stopped()**

Checks whether the user has pressed the [ **Cancel** ] button.

#### **Returns**

Boolean **true** if the user has asked to stop the operation, **false** otherwise.

### **progdlg:close()**

Hides the progress bar.

#### **Returns**

A string specifying whether the Progress Dialog has stopped or not.

#### **Errors**

- GUI not available

## **TextWindow**

Creates and manages a text window. The text can be read-only or editable, and buttons can be added below the text.

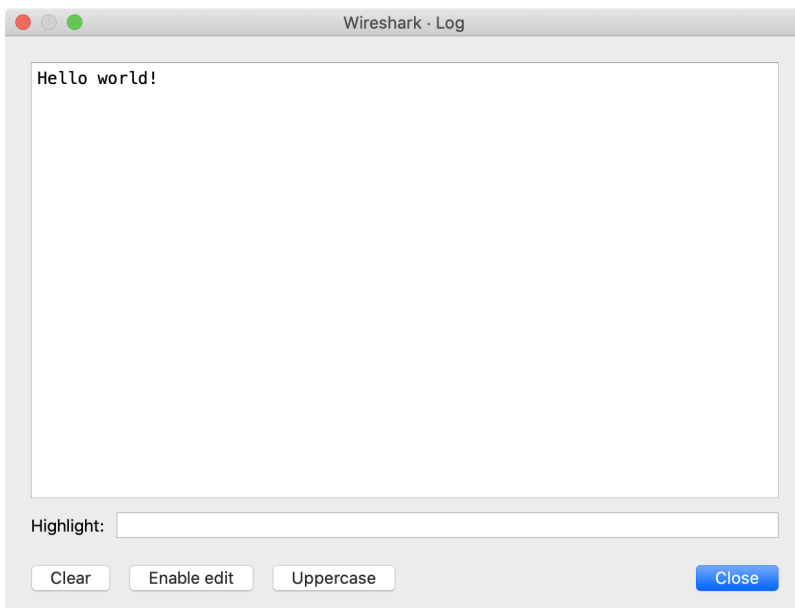


Figure 4. A text window in action

### **TextWindow.new([title])**

Creates a new **TextWindow** text window and displays it. Requires a GUI.

## Example

```
if not gui_enabled() then return end

-- create new text window and initialize its text
local win = TextWindow.new("Log")
win:set("Hello world!")

-- add buttons to clear text window and to enable editing
win:add_button("Clear", function() win:clear() end)
win:add_button("Enable edit", function() win:set_editable(true) end)

-- add button to change text to uppercase
win:add_button("Uppercase", function()
    local text = win:get_text()
    if text ~= "" then
        win:set(string.upper(text))
    end
end)

-- print "closing" to stdout when the user closes the text window
win:set_atclose(function() print("closing") end)
```

## Arguments

### title (optional)

Title of the new window. Optional. Defaults to "Untitled Window".

## Returns

The newly created `TextWindow` object.

## Errors

- GUI not available

### textwindow:set\_atclose(action)

Set the function that will be called when the text window closes.

## Arguments

### action

A Lua function to be executed when the user closes the text window.

## Returns



The `TextWindow` object.

### Errors

- GUI not available

### `textwindow:set(text)`

Sets the text to be displayed.

### Arguments

#### `text`

The text to be displayed.

### Returns

The `TextWindow` object.

### Errors

- GUI not available

### `textwindow:append(text)`

Appends text to the current window contents.

### Arguments

#### `text`

The text to be appended.

### Returns

The `TextWindow` object.

### Errors

- GUI not available

### `textwindow:prepend(text)`

Prepends text to the current window contents.

### Arguments

#### `text`

The text to be prepended.

## Returns

The `TextWindow` object.

## Errors

- GUI not available

## `textwindow:clear()`

Erases all of the text in the window.

## Returns

The `TextWindow` object.

## Errors

- GUI not available

## `textwindow:get_text()`

Get the text of the window.

## Returns

The `TextWindow`'s text.

## Errors

- GUI not available

## `textwindow:close()`

Close the window.

## Errors

- GUI not available

## `textwindow:set_editable([editable])`

Make this text window editable.

## Arguments

### `editable (optional)`

`true` to make the text editable, `false` otherwise. Defaults to `true`.

## Returns

The `TextWindow` object.

## Errors

- GUI not available

### `textwindow:add_button(label, function)`

Adds a button with an action handler to the text window.

## Arguments

### **label**

The button label.

### **function**

The Lua function to be called when the button is pressed.

## Returns

The `TextWindow` object.

## Errors

- GUI not available

## Global Functions

### `gui_enabled()`

Checks if we're running inside a GUI (i.e. Wireshark) or not.

## Returns

Boolean `true` if a GUI is available, `false` if it isn't.

### `register_menu(name, action, [group])`

Register a menu item in one of the main menus. Requires a GUI.

## Arguments

### **name**

The name of the menu item. Use slashes to separate submenus. (e.g. **Lua Scripts > My Fancy Statistics**). (string)

## action

The function to be called when the menu item is invoked. The function must take no arguments and return nothing.

## group (optional)

Where to place the item in the menu hierarchy. If omitted, defaults to MENU\_STAT\_GENERIC. One of:

- MENU\_STAT\_UNSORTED: **Statistics**
- MENU\_STAT\_GENERIC: **Statistics**, first section
- MENU\_STAT\_CONVERSATION: **Statistics** › **Conversation List**
- MENU\_STAT\_ENDPOINT: **Statistics** › **Endpoint List**
- MENU\_STAT\_RESPONSE: **Statistics** › **Service Response Time**
- MENU\_STAT\_TELEPHONY: **Telephony**
- MENU\_STAT\_TELEPHONY\_ANSI: **Telephony** › **ANSI**
- MENU\_STAT\_TELEPHONY\_GSM: **Telephony** › **GSM**
- MENU\_STAT\_TELEPHONY\_LTE: **Telephony** › **LTE**
- MENU\_STAT\_TELEPHONY\_MTP3: **Telephony** › **MTP3**
- MENU\_STAT\_TELEPHONY\_SCTP: **Telephony** › **SCTP**
- MENU\_ANALYZE: **Analyze**
- MENU\_ANALYZE\_CONVERSATION: **Analyze** › **Conversation Filter**
- MENU\_TOOLS\_UNSORTED: **Tools**

## new\_dialog(title, action, ...)

Displays a dialog, prompting for input. The dialog includes an [ **OK** ] button and [ **Cancel** ] button. Requires a GUI.

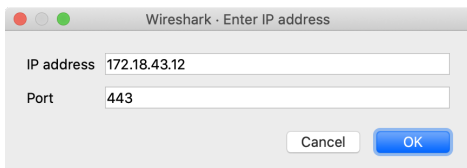


Figure 5. An input dialog in action

## Example

```

if not gui_enabled() then return end

-- Prompt for IP and port and then print them to stdout
local label_ip = "IP address"
local label_port = "Port"
local function print_ip(ip, port)
    print(label_ip, ip)
    print(label_port, port)
end
new_dialog("Enter IP address", print_ip, label_ip, label_port)

-- Prompt for 4 numbers and then print their product to stdout
new_dialog(
    "Enter 4 numbers",
    function (a, b, c, d) print(a * b * c * d) end,
    "a", "b", "c", "d"
)

```

## Arguments

### title

The title of the dialog.

### action

Action to be performed when the user presses [ OK ].

...

Strings to be used as labels of the dialog's fields. Each string creates a new labeled field. The first field is required. Instead of a string it is possible to provide tables with fields 'name' and 'value' of type string. Then the created dialog's field will be labeled with the content of name and prefilled with the content of value.

## Errors

- GUI not available
- At least one field required

### retap\_packets()

Rescans all packets and runs each [tap listener](#) without reconstructing the display.

### copy\_to\_clipboard(text)

Copy a string into the clipboard. Requires a GUI.

## Arguments

### text

The string to be copied into the clipboard.

### open\_capture\_file(filename, filter)

Open and display a capture file. Requires a GUI.

## Arguments

### filename

The name of the file to be opened.

### filter

The [display filter](#) to be applied once the file is opened.

### get\_filter()

Get the main filter text.

### set\_filter(text)

Set the main filter text.

## Arguments

### text

The filter's text.

### get\_color\_filter\_slot(row)

Gets the current [packet coloring rule](#) (by index) for the current session. Wireshark reserves 10 slots for these coloring rules. Requires a GUI.

## Arguments

### row

The index (1-10) of the desired color filter value in the temporary coloring rules list.

Table 4. Default background colors

Index	RGB (hex)	Color
1	ffc0c0	pink 1
2	ffc0ff	pink 2
3	e0c0e0	purple 1

Index	RGB (hex)	Color
4	c0c0ff	purple 2
5	c0e0e0	green 1
6	c0ffff	green 2
7	c0ffc0	green 3
8	ffffc0	yellow 1
9	e0e0c0	yellow 2
10	e0e0e0	gray

### **set\_color\_filter\_slot(row, text)**

Sets a [packet coloring rule](#) (by index) for the current session. Wireshark reserves 10 slots for these coloring rules. Requires a GUI.

### **Arguments**

#### **row**

The index (1-10) of the desired color in the temporary coloring rules list. The default foreground is black and the default backgrounds are listed below.

*Table 5. Default background colors*

Index	RGB (hex)	Color
1	ffc0c0	pink 1
2	ffc0ff	pink 2
3	e0c0e0	purple 1
4	c0c0ff	purple 2
5	c0e0e0	green 1
6	c0ffff	green 2
7	c0ffc0	green 3
8	ffffc0	yellow 1
9	e0e0c0	yellow 2
10	e0e0e0	gray

The color list can be set from the command line using two unofficial preferences: `gui.colorized_frame.bg` and `gui.colorized_frame.fg`, which require 10 hex RGB codes (6 hex digits each), e.g.

```
wireshark -o
gui.colorized_frame.bg:${RGB0},${RGB1},${RGB2},${RGB3},${RGB4},${RGB5},${RGB6},${RGB7}
,${RGB8},${RGB9}
```

For example, this command yields the same results as the table above (and with all foregrounds set to black):

```
wireshark -o
gui.colorized_frame.bg:ffc0c0,ffc0ff,e0c0e0,c0c0ff,c0e0e0,c0ffff,c0ffc0,ffffc0,e0e0c0,
e0e0e0 -o
gui.colorized_frame.fg:000000,000000,000000,000000,000000,000000,000000,000000,000000
```

## text

The [display filter](#) for selecting packets to be colorized .

## apply\_filter()

Apply the filter in the main filter box. Requires a GUI.

### WARNING

Avoid calling this from within a dissector function or else an infinite loop can occur if it causes the dissector to be called again. This function is best used in a button callback (from a dialog or text window) or menu callback.

## reload()

Reload the current capture file. Deprecated. Use `reload_packets()` instead.

## reload\_packets()

Reload the current capture file. Requires a GUI.

### WARNING

Avoid calling this from within a dissector function or else an infinite loop can occur if it causes the dissector to be called again. This function is best used in a button callback (from a dialog or text window) or menu callback.

## redissect\_packets()

Redissect all packets in the current capture file. Requires a GUI.

### WARNING

Avoid calling this from within a dissector function or else an infinite loop can occur if it causes the dissector to be called again. This function is best used in a button callback (from a dialog or text window) or menu callback.



## **reload\_lua\_plugins()**

Reload all Lua plugins.

## **browser\_open\_url(url)**

Opens an URL in a web browser. Requires a GUI.

### **WARNING**

Do not pass an untrusted URL to this function.

It will be passed to the system's URL handler, which might execute malicious code, switch on your Bluetooth-connected foghorn, or any of a number of unexpected or harmful things.

## **Arguments**

### **url**

The url.

## **browser\_open\_data\_file(filename)**

Open a file located in the data directory (specified in the Wireshark preferences) in the web browser. If the file does not exist, the function silently ignores the request. Requires a GUI.

### **WARNING**

Do not pass an untrusted URL to this function.

It will be passed to the system's URL handler, which might execute malicious code, switch on your Bluetooth-connected foghorn, or any of a number of unexpected or harmful things.

## **Arguments**

### **filename**

The file name.

# **Post-Dissection Packet Analysis**

## **Listener**

A **Listener** is called once for every packet that matches a certain filter or has a certain tap. It can read the tree, the packet's **Tvb** buffer as well as the tapped data, but it cannot add elements to the tree.

## **Listener.new([tap], [filter], [allfields])**

Creates a new **Listener** tap object.

## Arguments

### tap (optional)

The name of this tap. See `Listener.list()` for a way to print valid listener names.

### filter (optional)

A display filter to apply to the tap. The `tap.packet` function will be called for each matching packet. The default is `nil`, which matches every packet. Example: "m2tp".

### allfields (optional)

Whether to generate all fields. The default is `false`. Note: This impacts performance.

## Returns

The newly created Listener listener object

## Errors

- tap registration error

## Listener.list()

Gets a Lua array table of all registered `Listener` tap names.

Note: This is an expensive operation, and should only be used for troubleshooting.

Since: 1.11.3

## Example

```
-- Print a list of tap listeners to stdout.  
for _,tap_name in pairs(Listener.list()) do  
    print(tap_name)  
end
```

## Returns

The array table of registered tap names

## listener:remove()

Removes a tap `Listener`.

## listener:\_\_tostring()

Generates a string of debug info for the tap `Listener`.

## listener.packet

Mode: Assign only.

A function that will be called once every packet matches the `Listener` listener filter.

When later called by Wireshark, the `packet` function will be given:

1. A `Pinfo` object
2. A `Tvb` object
3. A `tapinfo` table

```
function tap.packet(pinfo,tvb,tapinfo) ... end
```

**NOTE** | `tapinfo` is a table of info based on the `Listener`'s type, or nil.

## listener.draw

Mode: Assign only.

A function that will be called once every few seconds to redraw the GUI objects; in Tshark this function is called only at the very end of the capture file.

When later called by Wireshark, the `draw` function will not be given any arguments.

```
function tap.draw() ... end
```

## listener.reset

Mode: Assign only.

A function that will be called at the end of the capture run.

When later called by Wireshark, the `reset` function will not be given any arguments.

```
function tap.reset() ... end
```

# Obtaining Packet Information

## Address

Represents an address.

### **Address.ip(hostname)**

Creates an Address Object representing an IPv4 address.

#### **Arguments**

##### **hostname**

The address or name of the IP host.

#### **Returns**

The Address object.

### **Address.ipv6(hostname)**

Creates an Address Object representing an IPv6 address.

#### **Arguments**

##### **hostname**

The address or name of the IP host.

#### **Returns**

The Address object

### **Address.ether(eth)**

Creates an Address Object representing an Ethernet address.

#### **Arguments**

##### **eth**

The Ethernet address.

#### **Returns**

The Address object.

### **address.\_\_tostring()**

#### **Returns**

The string representing the address.

### **address.\_\_eq()**

Compares two Addresses.

**address:\_le()**

Compares two Addresses.

**address:\_lt()**

Compares two Addresses.

**Column**

A Column in the packet list.

**column:\_\_toString()****Returns**

The column's string text (in parenthesis if not available).

**column:clear()**

Clears a Column.

**column:set(text)**

Sets the text of a Column.

**Arguments****text**

The text to which to set the Column.

**column:append(text)**

Appends text to a Column.

**Arguments****text**

The text to append to the Column.

**column:prepend(text)**

Prepends text to a Column.

**Arguments****text**

The text to prepend to the Column.

### **column:fence()**

Sets Column text fence, to prevent overwriting.

Since: 1.10.6

### **column:clear\_fence()**

Clear Column text fence.

Since: 1.11.3

## **Columns**

The **Columns** of the packet list.

### **columns:\_\_tostring()**

#### **Returns**

The string "Columns". This has no real use aside from debugging.

### **columns:\_\_newindex(column, text)**

Sets the text of a specific column. Some columns cannot be modified, and no error is raised if attempted. The columns that are known to allow modification are "info" and "protocol".

#### **Arguments**

##### **column**

The name of the column to set. Valid values are:

<b>Name</b>	<b>Description</b>
number	Frame number
abs_time	Absolute timestamp
utc_time	UTC timestamp
cls_time	CLS timestamp
rel_time	Relative timestamp
date	Absolute date and time
date_doy	Absolute year, day of year, and time
utc_date	UTC date and time
utc_date_doy	UTC year, day of year, and time
delta_time	Delta time from previous packet

<b>Name</b>	<b>Description</b>
delta_time_displayed	Delta time from previous displayed packet
src	Source address
src_res	Resolved source address
src_unres	Numeric source address
dl_src	Source data link address
dl_src_res	Resolved source data link address
dl_src_unres	Numeric source data link address
net_src	Source network address
net_src_res	Resolved source network address
net_src_unres	Numeric source network address
dst	Destination address
dst_res	Resolve destination address
dst_unres	Numeric destination address
dl_dst	Destination data link address
dl_dst_res	Resolved destination data link address
dl_dst_unres	Numeric destination data link address
net_dst	Destination network address
net_dst_res	Resolved destination network address
net_dst_unres	Numeric destination network address
src_port	Source port
src_port_res	Resolved source port
src_port_unres	Numeric source port
dst_port	Destination port
dst_port_res	Resolved destination port
dst_port_unres	Numeric destination port
protocol	Protocol name
info	General packet information
packet_len	Packet length
cumulative_bytes	Cumulative bytes in the capture
direction	Packet direction
vsan	Virtual SAN

Name	Description
tx_rate	Transmit rate
rssi	RSSI value
dce_call	DCE call

### Example

```
pinfo.cols['info'] = 'foo bar'
```

— syntactic sugar (equivalent to above) `pinfo.cols.info = 'foo bar'`

### text

The text for the column.

### columns: \_\_index()

Get a specific `Column`.

## NSTime

NSTime represents a `nstime_t`. This is an object with seconds and nanoseconds.

### NSTime.new([seconds], [nseconds])

Creates a new NSTime object.

### Arguments

#### seconds (optional)

Seconds.

#### nseconds (optional)

Nano seconds.

### Returns

The new NSTime object.

### nstime: \_\_call([seconds], [nseconds])

Creates a NSTime object.

### Arguments

#### seconds (optional)



Seconds.

### **nseconds (optional)**

Nanoseconds.

### **Returns**

The new NSTime object.

### **nstime:tonumber()**

Returns a Lua number of the **NSTime** representing seconds from epoch

Since: 2.4.0

### **Returns**

The Lua number.

### **nstime:\_\_tostring()**

### **Returns**

The string representing the nstime.

### **nstime:\_\_add()**

Calculates the sum of two NSTimes.

### **nstime:\_\_sub()**

Calculates the diff of two NSTimes.

### **nstime:\_\_unm()**

Calculates the negative NSTime.

### **nstime:\_\_eq()**

Compares two NSTimes.

### **nstime:\_\_le()**

Compares two NSTimes.

### **nstime:\_\_lt()**

Compares two NSTimes.

**nstime.secs**

Mode: Retrieve or assign.

The NSTime seconds.

**nstime.nsecs**

Mode: Retrieve or assign.

The NSTime nano seconds.

**Pinfo**

Packet information.

**pinfo.visited**

Mode: Retrieve only.

Whether this packet has been already visited.

**pinfo.number**

Mode: Retrieve only.

The number of this packet in the current file.

**pinfo.len**

Mode: Retrieve only.

The length of the frame.

**pinfo.caplen**

Mode: Retrieve only.

The captured length of the frame.

**pinfo.abs\_ts**

Mode: Retrieve only.

When the packet was captured.

**pinfo.rel\_ts**

Mode: Retrieve only.

Number of seconds passed since beginning of capture.

**pinfo.delta\_ts**

Mode: Retrieve only.

Number of seconds passed since the last captured packet.

**pinfo.delta\_dis\_ts**

Mode: Retrieve only.

Number of seconds passed since the last displayed packet.

**pinfo.curr\_proto**

Mode: Retrieve only.

Which Protocol are we dissecting.

**pinfo.can\_desegment**

Mode: Retrieve or assign.

Set if this segment could be desegmented.

**pinfo.desegment\_len**

Mode: Retrieve or assign.

Estimated number of additional bytes required for completing the PDU.

**pinfo.desegment\_offset**

Mode: Retrieve or assign.

Offset in the tvbuff at which the dissector will continue processing when next called.

**pinfo.fragmented**

Mode: Retrieve only.

If the protocol is only a fragment.

**pinfo.in\_error\_pkt**

Mode: Retrieve only.

If we're inside an error packet.

**pinfo.match\_uint**

Mode: Retrieve only.

Matched uint for calling subdissector from table.

**pinfo.match\_string**

Mode: Retrieve only.

Matched string for calling subdissector from table.

**pinfo.port\_type**

Mode: Retrieve or assign.

Type of Port of .src\_port and .dst\_port.

**pinfo.src\_port**

Mode: Retrieve or assign.

Source Port of this Packet.

**pinfo.dst\_port**

Mode: Retrieve or assign.

Destination Port of this Packet.

**pinfo.dl\_src**

Mode: Retrieve or assign.

Data Link Source Address of this Packet.

**pinfo.dl\_dst**

Mode: Retrieve or assign.

Data Link Destination Address of this Packet.

**pinfo.net\_src**

Mode: Retrieve or assign.

Network Layer Source Address of this Packet.

**pinfo.net\_dst**

Mode: Retrieve or assign.

Network Layer Destination Address of this Packet.

**pinfo.src**

Mode: Retrieve or assign.

Source Address of this Packet.

**pinfo.dst**

Mode: Retrieve or assign.

Destination Address of this Packet.

**pinfo.p2p\_dir**

Mode: Retrieve or assign.

Direction of this Packet. (incoming / outgoing)

**pinfo.match**

Mode: Retrieve only.

Port/Data we are matching.

**pinfo.columns**

Mode: Retrieve only.

Access to the packet list columns.

**pinfo.cols**

Mode: Retrieve only.

Access to the packet list columns (equivalent to pinfo.columns).

**pinfo.private**

Mode: Retrieve only.

Access to the private table entries.

## **pinfo.hi**

Mode: Retrieve or assign.

Higher Address of this Packet.

## **pinfo.lo**

Mode: Retrieve only.

Lower Address of this Packet.

## **pinfo.conversation**

Mode: Assign only.

Sets the packet conversation to the given Proto object.

## **PrivateTable**

PrivateTable represents the pinfo → private\_table.

## **privatetable:\_\_tostring()**

Gets debugging type information about the private table.

## **Returns**

A string with all keys in the table, mostly for debugging.

# **Functions For New Protocols And Dissectors**

The classes and functions in this chapter allow Lua scripts to create new protocols for Wireshark. **Proto** protocol objects can have **Pref** preferences, **ProtoField** fields for filterable values that can be displayed in a details view tree, functions for dissecting the new protocol, and so on.

The dissection function can be hooked into existing protocol tables through **DissectorTable** so that the new protocol dissector function gets called by that protocol, and the new dissector can itself call on other, already existing protocol dissectors by retrieving and calling the **Dissector** object. A **Proto** dissector can also be used as a post-dissector, at the end of every frame's dissection, or as a heuristic dissector.

## **Dissector**

A reference to a dissector, used to call a dissector against a packet or a part of it.

### **Dissector.get(name)**

Obtains a dissector reference by name.

#### **Arguments**

##### **name**

The name of the dissector.

#### **Returns**

The `Dissector` reference if found, otherwise `nil`.

### **Dissector.list()**

Gets a Lua array table of all registered Dissector names.

Note: This is an expensive operation, and should only be used for troubleshooting.

Since: 1.11.3

#### **Returns**

The array table of registered dissector names.

### **dissector:call(tvb, pinfo, tree)**

Calls a dissector against a given packet (or part of it).

#### **Arguments**

##### **tvb**

The buffer to dissect.

##### **pinfo**

The packet info.

##### **tree**

The tree on which to add the protocol items.

#### **Returns**

Number of bytes dissected. Note that some dissectors always return number of bytes in incoming buffer, so be aware.

### **dissector:\_\_call(tvb, pinfo, tree)**

Calls a dissector against a given packet (or part of it).

## Arguments

### **tvb**

The buffer to dissect.

### **pinfo**

The packet info.

### **tree**

The tree on which to add the protocol items.

### **dissector: \_\_tostring()**

Gets the Dissector's protocol short name.

## Returns

A string of the protocol's short name.

## DissectorTable

A table of subdissectors of a particular protocol (e.g. TCP subdissectors like http, smtp, sip are added to table "tcp.port").

Useful to add more dissectors to a table so that they appear in the "Decode As..." dialog.

### **DissectorTable.new(tablename, [uname], [type], [base], [proto])**

Creates a new `DissectorTable` for your dissector's use.

## Arguments

### **tablename**

The short name of the table. Use lower-case alphanumeric, dot, and/or underscores (e.g., "ansi\_map.tele\_id" or "udp.port").

### **uname (optional)**

The name of the table in the user interface. Defaults to the name given in `tablename`, but can be any string.

### **type (optional)**

One of `ftypes.UINT8`, `ftypes.UINT16`, `ftypes.UINT24`, `ftypes.UINT32`, or `ftypes.STRING`. Defaults to `ftypes.UINT32`.

### **base (optional)**

One of `base.NONE`, `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX` or `base.HEX_DEC`. Defaults to `base.DEC`.



### **proto (optional)**

The **Proto** object that uses this dissector table.

### **Returns**

The newly created DissectorTable.

### **DissectorTable.list()**

Gets a Lua array table of all DissectorTable names - i.e., the string names you can use for the first argument to DissectorTable.get().

Note: This is an expensive operation, and should only be used for troubleshooting.

Since: 1.11.3

### **Returns**

The array table of registered DissectorTable names.

### **DissectorTable.heuristic\_list()**

Gets a Lua array table of all heuristic list names - i.e., the string names you can use for the first argument in Proto:register\_heuristic().

Note: This is an expensive operation, and should only be used for troubleshooting.

Since: 1.11.3

### **Returns**

The array table of registered heuristic list names

### **DissectorTable.try\_heuristics(listname, tvb, pinfo, tree)**

Try all the dissectors in a given heuristic dissector table.

### **Arguments**

#### **listname**

The name of the heuristic dissector.

#### **tvb**

The buffer to dissect.

#### **pinfo**

The packet info.

## **tree**

The tree on which to add the protocol items.

## **Returns**

True if the packet was recognized by the sub-dissector (stop dissection here).

## **DissectorTable.get(tablename)**

Obtain a reference to an existing dissector table.

## **Arguments**

### **tablename**

The short name of the table.

## **Returns**

The `DissectorTable` reference if found, otherwise `nil`.

## **dissectortable:add(pattern, dissector)**

Add a `Proto` with a dissector function or a `Dissector` object to the dissector table.

## **Arguments**

### **pattern**

The pattern to match (either an integer, a integer range or a string depending on the table's type).

### **dissector**

The dissector to add (either a `Proto` or a `Dissector`).

## **dissectortable:set(pattern, dissector)**

Clear all existing dissectors from a table and add a new dissector or a range of new dissectors.

Since: 1.11.3

## **Arguments**

### **pattern**

The pattern to match (either an integer, a integer range or a string depending on the table's type).

### **dissector**

The dissector to add (either a `Proto` or a `Dissector`).

## **dissectortable:remove(pattern, dissector)**

Remove a dissector or a range of dissectors from a table.

### **Arguments**

#### **pattern**

The pattern to match (either an integer, a integer range or a string depending on the table's type).

#### **dissector**

The dissector to remove (either a **Proto** or a **Dissector**).

## **dissectortable:remove\_all(dissector)**

Remove all dissectors from a table.

Since: 1.11.3

### **Arguments**

#### **dissector**

The dissector to remove (either a **Proto** or a **Dissector**).

## **dissectortable:try(pattern, tvb, pinfo, tree)**

Try to call a dissector from a table.

### **Arguments**

#### **pattern**

The pattern to be matched (either an integer or a string depending on the table's type).

#### **tvb**

The **Tvb** to dissect.

#### **pinfo**

The packet's **Pinfo**.

#### **tree**

The **TreeItem** on which to add the protocol items.

### **Returns**

Number of bytes dissected. Note that some dissectors always return number of bytes in incoming buffer, so be aware.

### **dissectortable:get\_dissector(pattern)**

Try to obtain a dissector from a table.

#### **Arguments**

##### **pattern**

The pattern to be matched (either an integer or a string depending on the table's type).

#### **Returns**

The `Dissector` handle if found, otherwise `nil`

### **dissectortable:add\_for\_decode\_as(proto)**

Add the given `Proto` to the “Decode as...” list for this `DissectorTable`. The passed-in `Proto` object's `dissector()` function is used for dissecting.

Since: 1.99.1

#### **Arguments**

##### **proto**

The `Proto` to add.

### **dissectortable:\_\_tostring()**

Gets some debug information about the `DissectorTable`.

#### **Returns**

A string of debug information about the `DissectorTable`.

## **Pref**

A preference of a `Proto`.

### **Pref.bool(label, default, descr)**

Creates a boolean preference to be added to a `Proto.prefs` Lua table.

#### **Example**

```
-- create a Boolean preference named "bar" for Foo Protocol
-- (assuming Foo doesn't already have a preference named "bar")
proto_foo.prefs.bar = Pref.bool( "Bar", true, "Baz and all the rest" )
```

## Arguments

### label

The Label (text in the right side of the preference input) for this preference.

### default

The default value for this preference.

### descr

A description of this preference.

### **Pref.uint(label, default, descr)**

Creates an (unsigned) integer preference to be added to a `Proto.prefs` Lua table.

## Arguments

### label

The Label (text in the right side of the preference input) for this preference.

### default

The default value for this preference.

### descr

A description of what this preference is.

### **Pref.string(label, default, descr)**

Creates a string preference to be added to a `Proto.prefs` Lua table.

## Arguments

### label

The Label (text in the right side of the preference input) for this preference.

### default

The default value for this preference.

### descr

A description of what this preference is.

### **Pref.enum(label, default, descr, enum, radio)**

Creates an enum preference to be added to a `Proto.prefs` Lua table.

## Example:

```
local OUTPUT_OFF      = 0
local OUTPUT_DEBUG    = 1
local OUTPUT_INFO     = 2
local OUTPUT_WARN     = 3
local OUTPUT_ERROR    = 4

local output_tab = {
    { 1, "Off"          , OUTPUT_OFF },
    { 2, "Debug"       , OUTPUT_DEBUG },
    { 3, "Information" , OUTPUT_INFO },
    { 4, "Warning"     , OUTPUT_WARN },
    { 5, "Error"       , OUTPUT_ERROR },
}

-- Create enum preference that shows as Combo Box under
-- Foo Protocol's preferences
proto_foo.prefs.outputlevel = Pref.enum(
    "Output Level",          -- label
    OUTPUT_INFO,            -- default value
    "Verbosity of log output", -- description
    output_tab,             -- enum table
    false                   -- show as combo box
)

-- Then, we can query the value of the selected preference.
-- This line prints "Output Level: 3" assuming the selected
-- output level is _INFO.
debug( "Output Level: " .. proto_foo.prefs.outputlevel )
```

## Arguments

### label

The Label (text in the right side of the preference input) for this preference.

### default

The default value for this preference.

### descr

A description of what this preference is.

### enum

An enum Lua table.

**radio**

Radio button (true) or Combobox (false).

**Pref.range(label, default, descr, max)**

Creates a range (numeric text entry) preference to be added to a `Proto.prefs` Lua table.

**Arguments****label**

The Label (text in the right side of the preference input) for this preference.

**default**

The default value for this preference, e.g., "53", "10-30", or "10-30,53,55,100-120".

**descr**

A description of what this preference is.

**max**

The maximum value.

**Pref.statictext(label, descr)**

Creates a static text string to be added to a `Proto.prefs` Lua table.

**Arguments****label**

The static text.

**descr**

The static text description.

**Prefs**

The table of preferences of a protocol.

**prefs:\_\_newindex(name, pref)**

Creates a new preference.

**Arguments****name**

The abbreviation of this preference.

## pref

A valid but still unassigned Pref object.

## Errors

- Unknown Pref type

## prefs: `_index(name)`

Get the value of a preference setting.

## Example

```
-- print the value of Foo's preference named "bar"  
debug( "bar = " .. proto_foo.prefs.bar )
```

## Arguments

### name

The abbreviation of this preference.

## Returns

The current value of the preference.

## Errors

- Unknown Pref type

## Proto

A new protocol in Wireshark. Protocols have several uses. The main one is to dissect a protocol, but they can also be dummies used to register preferences for other purposes.

## Proto.new(name, desc)

Creates a new `Proto` object.

## Arguments

### name

The name of the protocol.

### desc

A Long Text description of the protocol (usually lowercase).



## Returns

The newly created `Proto` object.

### **proto:\_\_call(name, desc)**

Creates a `Proto` object.

## Arguments

### **name**

The name of the protocol.

### **desc**

A Long Text description of the protocol (usually lowercase).

## Returns

The new `Proto` object.

### **proto:register\_heuristic(listname, func)**

Registers a heuristic dissector function for this `Proto` protocol, for the given heuristic list name.

When later called, the passed-in function will be given:

1. A `Tvb` object
2. A `Pinfo` object
3. A `TreeItem` object

The function must return `true` if the payload is for it, else `false`.

The function should perform as much verification as possible to ensure the payload is for it, and dissect the packet (including setting `TreeItem` info and such) only if the payload is for it, before returning true or false.

Since version 1.99.1, this function also accepts a Dissector object as the second argument, to allow re-using the same Lua code as the `function proto.dissector(...)`. In this case, the Dissector must return a Lua number of the number of bytes consumed/parsed: if 0 is returned, it will be treated the same as a `false` return for the heuristic; if a positive or negative number is returned, then the it will be treated the same as a `true` return for the heuristic, meaning the packet is for this protocol and no other heuristic will be tried.

Since: 1.11.3

## Arguments

**listname**

The heuristic list name this function is a heuristic for (e.g., "udp" or "infiniband.payload").

**func**

A Lua function that will be invoked for heuristic dissection.

**proto.dissector**

Mode: Retrieve or assign.

The protocol's dissector, a function you define.

When later called, the function will be given:

1. A `Tvb` object
2. A `Pinfo` object
3. A `TreeItem` object

**proto.prefs**

Mode: Retrieve only.

The preferences of this dissector.

**proto.prefs\_changed**

Mode: Assign only.

The preferences changed routine of this dissector, a Lua function you define.

**proto.init**

Mode: Assign only.

The init routine of this dissector, a function you define.

The called init function is passed no arguments.

**proto.name**

Mode: Retrieve only.

The name given to this dissector.

**proto.description**

Mode: Retrieve only.

The description given to this dissector.

### **proto.fields**

Mode: Retrieve or assign.

The `ProtoField`'s Lua table of this dissector.

### **proto.experts**

Mode: Retrieve or assign.

The expert info Lua table of this `Proto`.

Since: 1.11.3

## **ProtoExpert**

A Protocol expert info field, to be used when adding items to the dissection tree.

Since: 1.11.3

### **ProtoExpert.new(abbr, text, group, severity)**

Creates a new `ProtoExpert` object to be used for a protocol's expert information notices.

Since: 1.11.3

### **Arguments**

#### **abbr**

Filter name of the expert info field (the string that is used in filters).

#### **text**

The default text of the expert field.

#### **group**

Expert group type: one of: `expert.group.CHECKSUM`, `expert.group.SEQUENCE`,  
`expert.group.RESPONSE_CODE`, `expert.group.REQUEST_CODE`, `expert.group.UNDECODED`,  
`expert.group.REASSEMBLE`, `expert.group.MALFORMED`, `expert.group.DEBUG`, `expert.group.PROTOCOL`,  
`expert.group.SECURITY`, `expert.group.COMMENTS_GROUP`, `expert.group.DECRYPTION`,  
`expert.group.ASSUMPTION` or `expert.group.DEPRECATED`.

#### **severity**

Expert severity type: one of: `expert.severity.COMMENT`, `expert.severity.CHAT`,  
`expert.severity.NOTE`, `expert.severity.WARN`, or `expert.severity.ERROR`.

## Returns

The newly created `ProtoExpert` object.

## `protoexpert: __tostring()`

Returns a string with debugging information about a `ProtoExpert` object.

Since: 1.11.3

## ProtoField

A Protocol field (to be used when adding items to the dissection tree).

### `ProtoField.new(name, abbr, type, [valuestring], [base], [mask], [descr])`

Creates a new `ProtoField` object to be used for a protocol field.

## Arguments

### **name**

Actual name of the field (the string that appears in the tree).

### **abbr**

Filter name of the field (the string that is used in filters).

### **type**

Field Type: one of: `ftypes.BOOLEAN`, `ftypes.CHAR`, `ftypes.UINT8`, `ftypes.UINT16`, `ftypes.UINT24`, `ftypes.UINT32`, `ftypes.UINT64`, `ftypes.INT8`, `ftypes.INT16`, `ftypes.INT24`, `ftypes.INT32`, `ftypes.INT64`, `ftypes.FLOAT`, `ftypes.DOUBLE`, `ftypes.ABSOLUTE_TIME`, `ftypes.RELATIVE_TIME`, `ftypes.STRING`, `ftypes.STRINGZ`, `ftypes.UINT_STRING`, `ftypes.ETHER`, `ftypes.BYTES`, `ftypes.UINT_BYTES`, `ftypes.IPv4`, `ftypes.IPv6`, `ftypes.IPXNET`, `ftypes.FRAMENUM`, `ftypes.PCRE`, `ftypes.GUID`, `ftypes.OID`, `ftypes.PROTOCOL`, `ftypes.REL_OID`, `ftypes.SYSTEM_ID`, `ftypes.EUI64` or `ftypes.NONE`.

### **valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that corresponds to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`, or one of `frametype.NONE`, `frametype.REQUEST`, `frametype.RESPONSE`, `frametype.ACK` or `frametype.DUP_ACK` if field type is `ftypes.FRAMENUM`.

### **base (optional)**

The representation, one of: `base.NONE`, `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING` or `base.RANGE_STRING`.

### **mask (optional)**

The bitmask to be used.

**descr (optional)**

The description of the field.

**Returns**

The newly created `ProtoField` object.

**ProtoField.char(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an 8-bit ASCII character.

**Arguments**

**abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.NONE`, `base.HEX`, `base.OCT` or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`.

**mask (optional)**

Integer mask of this field.

**descr (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.uint8(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an unsigned 8-bit integer (i.e., a byte).

**Arguments**

**abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.HEX` or `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING` or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing the unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.uint16(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an unsigned 16-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING` or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.uint24(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an unsigned 24-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing the unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.uint32(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an unsigned 32-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing the unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.uint64(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of an unsigned 64-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.HEX`, `base.OCT`, `base.DEC_HEX`, `base.HEX_DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing the unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.



**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.int8(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of a signed 8-bit integer (i.e., a byte).

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.int16(abbr, [name], [base], [valuestring], [mask], [desc])**

Creates a `ProtoField` of a signed 16-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuelstring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.int24(abbr, [name], [base], [valuelstring], [mask], [desc])**

Creates a `ProtoField` of a signed 24-bit integer.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

**valuelstring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### `ProtoField.int32(abbr, [name], [base], [valuestring], [mask], [desc])`

Creates a `ProtoField` of a signed 32-bit integer.

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

### **base (optional)**

One of `base.DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING`.

### **valuestring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

### **mask (optional)**

Integer mask of this field.

### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### `ProtoField.int64(abbr, [name], [base], [valuestring], [mask], [desc])`

Creates a `ProtoField` of a signed 64-bit integer.

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

One of `base.DEC`, `base.UNIT_STRING`, or `base.RANGE_STRING``.

**valuelstring (optional)**

A table containing the text that corresponds to the values, or a table containing tables of range string values that correspond to the values (`{min, max, "string"}`) if the base is `base.RANGE_STRING`, or a table containing unit name for the values if base is `base.UNIT_STRING`.

**mask (optional)**

Integer mask of this field.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.framenum(abbr, [name], [base], [frametype], [mask], [desc])**

Creates a `ProtoField` for a frame number (for hyperlinks between frames).

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**base (optional)**

Only `base.NONE` is supported for framenum.

**frametype (optional)**

One of `frametype.NONE`, `frametype.REQUEST`, `frametype.RESPONSE`, `frametype.ACK` or `frametype.DUP_ACK`.

**mask (optional)**

Integer mask of this field, which must be 0 for framenum.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

## **ProtoField.bool(abbr, [name], [display], [valuestring], [mask], [desc])**

Creates a `ProtoField` for a boolean true/false value.

### **Arguments**

#### **abbr**

Abbreviated name of the field (the string used in filters).

#### **name (optional)**

Actual name of the field (the string that appears in the tree).

#### **display (optional)**

How wide the parent bitfield is (`base.NONE` is used for NULL-value).

#### **valuestring (optional)**

A table containing the text that corresponds to the values.

#### **mask (optional)**

Integer mask of this field.

#### **desc (optional)**

Description of the field.

### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

## **ProtoField.absolute\_time(abbr, [name], [base], [desc])**

Creates a `ProtoField` of a `time_t` structure value.

### **Arguments**

#### **abbr**

Abbreviated name of the field (the string used in filters).

#### **name (optional)**

Actual name of the field (the string that appears in the tree).

#### **base (optional)**

One of `base.LOCAL`, `base.UTC` or `base.DOY_UTC`.

#### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### `ProtoField.relative_time(abbr, [name], [desc])`

Creates a `ProtoField` of a `time_t` structure value.

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### `ProtoField.float(abbr, [name], [valuestring], [desc])`

Creates a `ProtoField` of a floating point number (4 bytes).

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

### **valuestring (optional)**

A table containing unit name for the values.

### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.double(abbr, [name], [valuestring], [desc])**

Creates a `ProtoField` of a double-precision floating point (8 bytes).

#### **Arguments**

##### **abbr**

Abbreviated name of the field (the string used in filters).

##### **name (optional)**

Actual name of the field (the string that appears in the tree).

##### **valuestring (optional)**

A table containing unit name for the values.

##### **desc (optional)**

Description of the field.

#### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.string(abbr, [name], [display], [desc])**

Creates a `ProtoField` of a string value.

#### **Arguments**

##### **abbr**

Abbreviated name of the field (the string used in filters).

##### **name (optional)**

Actual name of the field (the string that appears in the tree).

##### **display (optional)**

One of `base.ASCII` or `base.UNICODE`.

##### **desc (optional)**

Description of the field.

#### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.stringz(abbr, [name], [display], [desc])**

Creates a `ProtoField` of a zero-terminated string value.

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

### **display (optional)**

One of `base.ASCII` or `base.UNICODE`.

### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.bytes(abbr, [name], [display], [desc])**

Creates a `ProtoField` for an arbitrary number of bytes.

## Arguments

### **abbr**

Abbreviated name of the field (the string used in filters).

### **name (optional)**

Actual name of the field (the string that appears in the tree).

### **display (optional)**

One of `base.NONE`, `base.DOT`, `base.DASH`, `base.COLON` or `base.SPACE`.

### **desc (optional)**

Description of the field.

## Returns

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.ubytes(abbr, [name], [display], [desc])**

Creates a `ProtoField` for an arbitrary number of unsigned bytes.

## Arguments



**abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**display (optional)**

One of `base.NONE`, `base.DOT`, `base.DASH`, `base.COLON` or `base.SPACE`.

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.none(abbr, [name], [desc])**

Creates a `ProtoField` of an unstructured type.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.ipv4(abbr, [name], [desc])**

Creates a `ProtoField` of an IPv4 address (4 bytes).

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.ipv6(abbr, [name], [desc])**

Creates a `ProtoField` of an IPv6 address (16 bytes).

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.ether(abbr, [name], [desc])**

Creates a `ProtoField` of an Ethernet address (6 bytes).

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.guid(abbr, [name], [desc])**

Creates a `ProtoField` for a Globally Unique Identifier (GUID).

#### **Arguments**

##### **abbr**

Abbreviated name of the field (the string used in filters).

##### **name (optional)**

Actual name of the field (the string that appears in the tree).

##### **desc (optional)**

Description of the field.

#### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.oid(abbr, [name], [desc])**

Creates a `ProtoField` for an ASN.1 Organizational Identified (OID).

#### **Arguments**

##### **abbr**

Abbreviated name of the field (the string used in filters).

##### **name (optional)**

Actual name of the field (the string that appears in the tree).

##### **desc (optional)**

Description of the field.

#### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

### **ProtoField.protocol(abbr, [name], [desc])**

Creates a `ProtoField` for a sub-protocol. Since 1.99.9.

#### **Arguments**

##### **abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.rel\_oid(abbr, [name], [desc])**

Creates a `ProtoField` for an ASN.1 Relative-OID.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

**ProtoField.systemid(abbr, [name], [desc])**

Creates a `ProtoField` for an OSI System ID.

**Arguments****abbr**

Abbreviated name of the field (the string used in filters).

**name (optional)**

Actual name of the field (the string that appears in the tree).

**desc (optional)**

Description of the field.

**Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

## **ProtoField.eui64(abbr, [name], [desc])**

Creates a `ProtoField` for an EUI64.

### **Arguments**

#### **abbr**

Abbreviated name of the field (the string used in filters).

#### **name (optional)**

Actual name of the field (the string that appears in the tree).

#### **desc (optional)**

Description of the field.

### **Returns**

A `ProtoField` object to be added to a table set to the `Proto.fields` attribute.

#### **protofield:\_tostring()**

Returns a string with info about a protofield (for debugging purposes).

## **Global Functions**

### **register\_postdissector(proto, [allfields])**

Make a `Proto` protocol (with a dissector function) a post-dissector. It will be called for every frame after dissection.

### **Arguments**

#### **proto**

The protocol to be used as post-dissector.

#### **allfields (optional)**

Whether to generate all fields. Note: This impacts performance (default=false).

### **dissect\_tcp\_pdus(tvb, tree, min\_header\_size, get\_len\_func, dissect\_func, [desegment])**

Make the TCP-layer invoke the given Lua dissection function for each PDU in the TCP segment, of the length returned by the given `get_len_func` function.

This function is useful for protocols that run over TCP and that are either a fixed length always, or have a minimum size and have a length field encoded within that minimum portion that identifies their full length. For such protocols, their protocol dissector function can invoke this `dissect_tcp_pdus()` function to make it easier to handle dissecting their protocol's messages (i.e.,

their protocol data unit (PDU)). This function should not be used for protocols whose PDU length cannot be determined from a fixed minimum portion, such as HTTP or Telnet.

Since: 1.99.2

## Arguments

### **tvb**

The `Tvb` buffer to dissect PDUs from.

### **tree**

The `Tvb` buffer to dissect PDUs from.

### **min\_header\_size**

The number of bytes in the fixed-length part of the PDU.

### **get\_len\_func**

A Lua function that will be called for each PDU, to determine the full length of the PDU. The called function will be given (1) the `Tvb` object of the whole `Tvb` (possibly reassembled), (2) the `Pinfo` object, and (3) an offset number of the index of the first byte of the PDU (i.e., its first header byte). The Lua function must return a Lua number of the full length of the PDU.

### **dissect\_func**

A Lua function that will be called for each PDU, to dissect the PDU. The called function will be given (1) the `Tvb` object of the PDU's `Tvb` (possibly reassembled), (2) the `Pinfo` object, and (3) the `TreeItem` object. The Lua function must return a Lua number of the number of bytes read/handled, which would typically be the `Tvb:len()`.

### **desegment (optional)**

Whether to reassemble PDUs crossing TCP segment boundaries or not. (default=true)

## Adding Information To The Dissection Tree

### **TreeItem**

`<lua_class_TreeItem,TreeItem>>`s represent information in the [packet details](#) pane of Wireshark, and the packet details view of Tshark. A `TreeItem` represents a node in the tree, which might also be a subtree and have a list of children. The children of a subtree have zero or more siblings which are other children of the same `TreeItem` subtree.

During dissection, heuristic-dissection, and post-dissection, a root `<lua_class_TreeItem,TreeItem>>` is passed to dissectors as the third argument of the function callback (e.g., `myproto.dissector(tvbuf, pktinfo, root)`).

In some cases the tree is not truly added to, in order to improve performance. For example for

packets not currently displayed/selected in Wireshark's visible window pane, or if Tshark isn't invoked with the `-V` switch. However the "add" type `TreeItem` functions can still be called, and still return `TreeItem` objects - but the info isn't really added to the tree. Therefore you do not typically need to worry about whether there's a real tree or not. If, for some reason, you need to know it, you can use the `TreeItem.visible` attribute getter to retrieve the state.

### `treeitem:add_packet_field(protofield, [tvbrange], encoding, [label])`

Adds a new child tree for the given `ProtoField` object to this tree item, returning the new child `TreeItem`.

Unlike `TreeItem:add()` and `TreeItem:add_le()`, the `ProtoField` argument is not optional, and cannot be a `Proto` object. Instead, this function always uses the `ProtoField` to determine the type of field to extract from the passed-in `TvbRange`, highlighting the relevant bytes in the Packet Bytes pane of the GUI (if there is a GUI), etc. If no `TvbRange` is given, no bytes are highlighted and the field's value cannot be determined; the `ProtoField` must have been defined/created not to have a length in such a case, or an error will occur. For backwards-compatibility reasons the `encoding` argument, however, must still be given.

Unlike `TreeItem:add()` and `TreeItem:add_le()`, this function performs both big-endian and little-endian decoding, by setting the `encoding` argument to be `ENC_BIG_ENDIAN` or `ENC_LITTLE_ENDIAN`.

The signature of this function:

```
tree_item:add_packet_field(proto_field [,tvbrange], encoding, ...)
```

In Wireshark version 1.11.3, this function was changed to return more than just the new child `TreeItem`. The child is the first return value, so that function chaining will still work as before; but it now also returns the value of the extracted field (i.e., a number, `UInt64`, `Address`, etc.). If the value could not be extracted from the `TvbRange`, the child `TreeItem` is still returned, but the second returned value is `nil`.

Another new feature added to this function in Wireshark version 1.11.3 is the ability to extract native number `ProtoField`'s from string encoding in the `TvbRange`, for ASCII-based and similar string encodings. For example, a `ProtoField` of as `ftypes.UINT32` type can be extracted from a `TvbRange` containing the ASCII string "123", and it will correctly decode the ASCII to the number 123, both in the tree as well as for the second return value of this function. To do so, you must set the `encoding` argument of this function to the appropriate string `ENC_*` value, bitwise-or'd with the `ENC_STRING` value (see `init.lua`). `ENC_STRING` is guaranteed to be a unique bit flag, and thus it can be added instead of bitwise-or'ed as well. Only single-byte ASCII digit string encoding types can be used for this, such as `ENC_ASCII` and `ENC_UTF_8`.

For example, assuming the `Tvb` named "tvb" contains the string "123":

```
-- this is done earlier in the script
local myfield = ProtoField.new("Transaction ID", "myproto.trans_id", ftypes
.UINT16)

-- this is done inside a dissector, post-dissector, or heuristic function
-- child will be the created child tree, and value will be the number 123 or nil
on failure
local child, value = tree:add_packet_field(myfield, tvb:range(0,3), ENC_UTF_8 +
ENC_STRING)
```

## Arguments

### protofield

The ProtoField field object to add to the tree.

### tvbrange (optional)

The `TvbRange` of bytes in the packet this tree item covers/represents.

### encoding

The field's encoding in the `TvbRange`.

### label (optional)

One or more strings to append to the created `TreeItem`.

## Returns

The new child `TreeItem`, the field's extracted value or nil, and offset or nil.

### treeitem:add([protofield], [tvbrange], [value], [label])

Adds a child item to this tree item, returning the new child `TreeItem`.

If the `ProtoField` represents a numeric value (int, uint or float), then it's treated as a Big Endian (network order) value.

This function has a complicated form: 'treeitem:add([protofield,] [tvbrange,] value], label)', such that if the first argument is a `ProtoField` or a `Proto`, the second argument is a `TvbRange`, and a third argument is given, it's a value; but if the second argument is a non-`TvbRange`, then it's the value (as opposed to filling that argument with 'nil', which is invalid for this function). If the first argument is a non-`ProtoField` and a non-`Proto` then this argument can be either a `TvbRange` or a label, and the value is not in use.

## Example



```

local proto_foo = Proto("foo", "Foo Protocol")
proto_foo.fields.bytes = ProtoField.bytes("foo.bytes", "Byte array")
proto_foo.fields.u16 = ProtoField.uint16("foo.u16", "Unsigned short", base.HEX)

function proto_foo.dissector(buf, pinfo, tree)
  -- ignore packets less than 4 bytes long
  if buf:len() < 4 then return end

  -- #####
  -- # Assume buf(0,4) == {0x00, 0x01, 0x00, 0x02}
  -- #####

  local t = tree:add( proto_foo, buf() )

  -- Adds a byte array that shows as: "Byte array: 00010002"
  t:add( proto_foo.fields.bytes, buf(0,4) )

  -- Adds a byte array that shows as "Byte array: 313233"
  -- (the ASCII char code of each character in "123")
  t:add( proto_foo.fields.bytes, buf(0,4), "123" )

  -- Adds a tree item that shows as: "Unsigned short: 0x0001"
  t:add( proto_foo.fields.u16, buf(0,2) )

  -- Adds a tree item that shows as: "Unsigned short: 0x0064"
  t:add( proto_foo.fields.u16, buf(0,2), 100 )

  -- Adds a tree item that shows as: "Unsigned short: 0x0064 ( big endian )"
  t:add( proto_foo.fields.u16, buf(1,2), 100, nil, "(", nil, "big", 999,
nil, "endian", nil, ")" )

  -- LITTLE ENDIAN: Adds a tree item that shows as: "Unsigned short: 0x0100"
  t:add_le( proto_foo.fields.u16, buf(0,2) )

  -- LITTLE ENDIAN: Adds a tree item that shows as: "Unsigned short: 0x6400"
  t:add_le( proto_foo.fields.u16, buf(0,2), 100 )

  -- LITTLE ENDIAN: Adds a tree item that shows as: "Unsigned short: 0x6400
( little endian )"
  t:add_le( proto_foo.fields.u16, buf(1,2), 100, nil, "(", nil, "little",
999, nil, "endian", nil, ")" )
end

udp_table = DissectorTable.get("udp.port")
udp_table:add(7777, proto_foo)

```

## Arguments

### **protofield (optional)**

The `ProtoField` field or `Proto` protocol object to add to the tree.

### **tvbrange (optional)**

The `TvbRange` of bytes in the packet this tree item covers/represents.

### **value (optional)**

The field's value, instead of the `ProtoField/Proto` one.

### **label (optional)**

One or more strings to use for the tree item label, instead of the `ProtoField/Proto` one.

## Returns

The new child `TreeItem`.

### **treeitem:add\_le([protofield], [tvbrange], [value], [label])**

Adds a child item to this tree item, returning the new child `TreeItem`.

If the `ProtoField` represents a numeric value (int, uint or float), then it's treated as a Little Endian value.

This function has a complicated form: `'treeitem:add_le([protofield,] [tvbrange,] value], label)'`, such that if the first argument is a `ProtoField` or a `Proto`, the second argument is a `TvbRange`, and a third argument is given, it's a value; but if the second argument is a non-`TvbRange`, then it's the value (as opposed to filling that argument with 'nil', which is invalid for this function). If the first argument is a non-`ProtoField` and a non-`Proto` then this argument can be either a `TvbRange` or a label, and the value is not in use.

## Arguments

### **protofield (optional)**

The `ProtoField` field or `Proto` protocol object to add to the tree.

### **tvbrange (optional)**

The `TvbRange` of bytes in the packet this tree item covers/represents.

### **value (optional)**

The field's value, instead of the `ProtoField/Proto` one.

### **label (optional)**

One or more strings to use for the tree item label, instead of the `ProtoField/Proto` one.

## Returns

The new child `TreeItem`.

### **`treeitem:set_text(text)`**

Sets the text of the label.

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

## Arguments

### **text**

The text to be used.

## Returns

The same `TreeItem`.

### **`treeitem:append_text(text)`**

Appends text to the label.

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

## Arguments

### **text**

The text to be appended.

## Returns

The same `TreeItem`.

### **`treeitem:prepend_text(text)`**

Prepends text to the label.

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

## Arguments

### **text**

The text to be prepended.

## Returns

The same `TreeItem`.

### **treeitem:add\_expert\_info([group], [severity], [text])**

Sets the expert flags of the item and adds expert info to the packet.

This function does **not** create a truly filterable expert info for a protocol. Instead you should use `TreeItem.add_proto_expert_info()`.

Note: This function is provided for backwards compatibility only, and should not be used in new Lua code. It may be removed in the future. You should only use `TreeItem.add_proto_expert_info()`.

#### **Arguments**

##### **group (optional)**

One of `PI_CHECKSUM`, `PI_SEQUENCE`, `PI_RESPONSE_CODE`, `PI_REQUEST_CODE`, `PI_UNDECODED`, `PI_REASSEMBLE`, `PI_MALFORMED` or `PI_DEBUG`.

##### **severity (optional)**

One of `PI_CHAT`, `PI_NOTE`, `PI_WARN`, or `PI_ERROR`.

##### **text (optional)**

The text for the expert info display.

#### **Returns**

The same `TreeItem`.

### **treeitem:add\_proto\_expert\_info(expert, [text])**

Sets the expert flags of the tree item and adds expert info to the packet.

Since: 1.11.3

#### **Arguments**

##### **expert**

The `ProtoExpert` object to add to the tree.

##### **text (optional)**

Text for the expert info display (default is to use the registered text).

#### **Returns**

The same `TreeItem`.

### **treeitem:add\_tvb\_expert\_info(expert, tvb, [text])**

Sets the expert flags of the tree item and adds expert info to the packet associated with the `Tvb` or

`TvbRange` bytes in the packet.

Since: 1.11.3

## Arguments

### **expert**

The `ProtoExpert` object to add to the tree.

### **tvb**

The `Tvb` or `TvbRange` object bytes to associate the expert info with.

### **text (optional)**

Text for the expert info display (default is to use the registered text).

## Returns

The same `TreeItem`.

### **treeitem:set\_generated([bool])**

Marks the `TreeItem` as a generated field (with data inferred but not contained in the packet).

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

## Arguments

### **bool (optional)**

A Lua boolean, which if `true` sets the `TreeItem` generated flag, else clears it (default=true)

## Returns

The same `TreeItem`.

### **treeitem:set\_hidden([bool])**

Marks the `TreeItem` as a hidden field (neither displayed nor used in filters). Deprecated

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

## Arguments

### **bool (optional)**

A Lua boolean, which if `true` sets the `TreeItem` hidden flag, else clears it. Default is `true`.

## Returns

The same `TreeItem`.

## **treeitem:set\_len(len)**

Set `TreeItem`'s length inside tvb, after it has already been created.

This used to return nothing, but as of 1.11.3 it returns the same tree item to allow chained calls.

### **Arguments**

#### **len**

The length to be used.

### **Returns**

The same `TreeItem`.

## **treeitem:referenced(protofield)**

Checks if a `ProtoField` or `Dissector` is referenced by a filter/tap/UI.

If this function returns `false`, it means that the field (or dissector) does not need to be dissected and can be safely skipped. By skipping a field rather than dissecting it, the dissector will usually run faster since Wireshark will not do extra dissection work when it doesn't need the field.

You can use this in conjunction with the `TreeItem.visible` attribute. This function will always return `TRUE` when the `TreeItem` is visible. When it is not visible and the field is not referenced, you can speed up the dissection by not dissecting the field as it is not needed for display or filtering.

This function takes one parameter that can be a `ProtoField` or `Dissector`. The `Dissector` form is useful when you need to decide whether to call a sub-dissector.

Since: 2.4.0

### **Arguments**

#### **protofield**

The `ProtoField` or `Dissector` to check if referenced.

### **Returns**

A boolean indicating if the `ProtoField/Dissector` is referenced

## **treeitem: \_\_tostring()**

Returns string debug information about the `TreeItem`.

Since: 1.99.8

### **treeitem.text**

Mode: Retrieve or assign.

Set/get the `TreeItem`'s display string (string).

For the getter, if the `TreeItem` has no display string, then nil is returned.

Since: 1.99.3

### **treeitem.visible**

Mode: Retrieve only.

Get the `TreeItem`'s subtree visibility status (boolean).

Since: 1.99.8

### **treeitem.generated**

Mode: Retrieve or assign.

Set/get the `TreeItem`'s generated state (boolean).

Since: 1.99.8

### **treeitem.hidden**

Mode: Retrieve or assign.

Set/get `TreeItem`'s hidden state (boolean).

Since: 1.99.8

### **treeitem.len**

Mode: Retrieve or assign.

Set/get `TreeItem`'s length inside tvb, after it has already been created.

Since: 1.99.8

## **Functions For Handling Packet Data**

### **ByteArray**

## **ByteArray.new([hexbytes], [separator])**

Creates a new `ByteArray` object.

Starting in version 1.11.3, if the second argument is a boolean `true`, then the first argument is treated as a raw Lua string of bytes to use, instead of a hexadecimal string.

### **Example**

```
local empty = ByteArray.new()
local b1 = ByteArray.new("a1 b2 c3 d4")
local b2 = ByteArray.new("112233")
```

### **Arguments**

#### **hexbytes (optional)**

A string consisting of hexadecimal bytes like "00 B1 A2" or "1a2b3c4d".

#### **separator (optional)**

A string separator between hex bytes/words (default=" "), or if the boolean value `true` is used, then the first argument is treated as raw binary data

### **Returns**

The new `ByteArray` object.

#### **bytearray:\_\_concat(first, second)**

Concatenate two `ByteArrays`.

### **Arguments**

#### **first**

First array.

#### **second**

Second array.

### **Returns**

The new composite `ByteArray`.

#### **bytearray:\_\_eq(first, second)**

Compares two `ByteArray` values.



Since: 1.11.4

## Arguments

### first

First array.

### second

Second array.

## bytearray:prepend(prepended)

Prepend a `ByteArray` to this `ByteArray`.

## Arguments

### prepended

`ByteArray` to be prepended.

## bytearray:append(appended)

Append a `ByteArray` to this `ByteArray`.

## Arguments

### appended

`ByteArray` to be appended.

## bytearray:set\_size(size)

Sets the size of a `ByteArray`, either truncating it or filling it with zeros.

## Arguments

### size

New size of the array.

## Errors

- `ByteArray` size must be non-negative

## bytearray:set\_index(index, value)

Sets the value of an index of a `ByteArray`.

## Arguments

**index**

The position of the byte to be set.

**value**

The char value to set [0-255].

**bytearray:get\_index(index)**

Get the value of a byte in a `ByteArray`.

**Arguments****index**

The position of the byte to get.

**Returns**

The value [0-255] of the byte.

**bytearray:len()**

Obtain the length of a `ByteArray`.

**Returns**

The length of the `ByteArray`.

**bytearray:subset(offset, length)**

Obtain a segment of a `ByteArray`, as a new `ByteArray`.

**Arguments****offset**

The position of the first byte (0=first).

**length**

The length of the segment.

**Returns**

A `ByteArray` containing the requested segment.

**bytearray:base64\_decode()**

Obtain a Base64 decoded `ByteArray`.

Since: 1.11.3

### Returns

The created `ByteArray`.

### `bytearray:raw([offset], [length])`

Obtain a Lua string of the binary bytes in a `ByteArray`.

Since: 1.11.3

### Arguments

#### **offset (optional)**

The position of the first byte (default=0/first).

#### **length (optional)**

The length of the segment to get (default=all).

### Returns

A Lua string of the binary bytes in the `ByteArray`.

### `bytearray:tohex([lowercase], [separator])`

Obtain a Lua string of the bytes in a `ByteArray` as hex-ascii, with given separator

Since: 1.11.3

### Arguments

#### **lowercase (optional)**

True to use lower-case hex characters (default=false).

#### **separator (optional)**

A string separator to insert between hex bytes (default=nil).

### Returns

A hex-ascii string representation of the `ByteArray`.

### `bytearray:__tostring()`

Obtain a Lua string containing the bytes in a `ByteArray` so that it can be used in display filters (e.g. "01FE456789AB").

### Returns

A hex-ascii string representation of the `ByteArray`.

### `bytearray:tvb(name)`

Creates a new `Tvb` from a `ByteArray`. The `Tvb` will be added to the current frame.

### Example

```
function proto_foo.dissector(buf, pinfo, tree)
  -- Create a new tab named "My Tvb" and add some data to it
  local b = ByteArray.new("11223344")
  local tvb = ByteArray.tvb(b, "My Tvb")

  -- Create a tree item that, when clicked, automatically shows the tab we
  just created
  tree:add( tvb(1,2), "Foo" )
end
```

### Arguments

#### name

The name to be given to the new data source.

### Returns

The created `Tvb`.

### Tvb

A `Tvb` represents the packet's buffer. It is passed as an argument to listeners and dissectors, and can be used to extract information (via `TvbRange`) from the packet's data.

To create a `TvbRange` the `Tvb` must be called with offset and length as optional arguments; the offset defaults to 0 and the length to `tvb:captured_len()`.

#### WARNING

`Tvbs` are usable only by the current listener or dissector call and are destroyed as soon as the listener or dissector returns, so references to them are unusable once the function has returned.

### `tvb:__tostring()`

Convert the bytes of a `Tvb` into a string. This is primarily useful for debugging purposes since the string will be truncated if it is too long.

### Returns

The string.

### **tvb:reported\_len()**

Obtain the reported length (length on the network) of a `Tvb`.

#### **Returns**

The reported length of the `Tvb`.

### **tvb:captured\_len()**

Obtain the captured length (amount saved in the capture process) of a `Tvb`.

#### **Returns**

The captured length of the `Tvb`.

### **tvb:len()**

Obtain the captured length (amount saved in the capture process) of a `Tvb`. Same as `captured_len`; kept only for backwards compatibility

#### **Returns**

The captured length of the `Tvb`.

### **tvb:reported\_length\_remaining()**

Obtain the reported (not captured) length of packet data to end of a `Tvb` or 0 if the offset is beyond the end of the `Tvb`.

#### **Returns**

The captured length of the `Tvb`.

### **tvb:bytes([offset], [length])**

Obtain a `ByteArray` from a `Tvb`.

Since: 1.99.8

#### **Arguments**

##### **offset (optional)**

The offset (in octets) from the beginning of the `Tvb`. Defaults to 0.

##### **length (optional)**

The length (in octets) of the range. Defaults to until the end of the `Tvb`.

### Returns

The `ByteArray` object or nil.

### `tvb:offset()`

Returns the raw offset (from the beginning of the source `Tvb`) of a sub `Tvb`.

### Returns

The raw offset of the `Tvb`.

### `tvb:__call()`

Equivalent to `tvb:range(...)`

### `tvb:range([offset], [length])`

Creates a `TvbRange` from this `Tvb`.

### Arguments

#### **offset (optional)**

The offset (in octets) from the beginning of the `Tvb`. Defaults to 0.

#### **length (optional)**

The length (in octets) of the range. Defaults to -1, which specifies the remaining bytes in the `Tvb`.

### Returns

The `TvbRange`

### `tvb:raw([offset], [length])`

Obtain a Lua string of the binary bytes in a `Tvb`.

Since: 1.11.3

### Arguments

#### **offset (optional)**

The position of the first byte. Default is 0, or the first byte.

#### **length (optional)**

The length of the segment to get. Default is -1, or the remaining bytes in the `Tvb`.

## Returns

A Lua string of the binary bytes in the `Tvb`.

### `tvb:__eq()`

Checks whether contents of two `Tvbs` are equal.

Since: 1.99.8

## TvbRange

A `TvbRange` represents a usable range of a `Tvb` and is used to extract data from the `Tvb` that generated it.

`TvbRanges` are created by calling a `Tvb` (e.g. `'tvb(offset,length)'`). If the `TvbRange` span is outside the `Tvb`'s range the creation will cause a runtime error.

### `tvbrange:tvb()`

Creates a new `Tvb` from a `TvbRange`.

### `tvbrange:uint()`

Get a Big Endian (network order) unsigned integer from a `TvbRange`. The range must be 1-4 octets long.

## Returns

The unsigned integer value.

### `tvbrange:le_uint()`

Get a Little Endian unsigned integer from a `TvbRange`. The range must be 1-4 octets long.

## Returns

The unsigned integer value

### `tvbrange:uint64()`

Get a Big Endian (network order) unsigned 64 bit integer from a `TvbRange`, as a `UInt64` object. The range must be 1-8 octets long.

## Returns

The `UInt64` object.

### **tvbrange:le\_uint64()**

Get a Little Endian unsigned 64 bit integer from a `TvbRange`, as a `UInt64` object. The range must be 1-8 octets long.

#### **Returns**

The `UInt64` object.

### **tvbrange:int()**

Get a Big Endian (network order) signed integer from a `TvbRange`. The range must be 1-4 octets long.

#### **Returns**

The signed integer value.

### **tvbrange:le\_int()**

Get a Little Endian signed integer from a `TvbRange`. The range must be 1-4 octets long.

#### **Returns**

The signed integer value.

### **tvbrange:int64()**

Get a Big Endian (network order) signed 64 bit integer from a `TvbRange`, as an `Int64` object. The range must be 1-8 octets long.

#### **Returns**

The `Int64` object.

### **tvbrange:le\_int64()**

Get a Little Endian signed 64 bit integer from a `TvbRange`, as an `Int64` object. The range must be 1-8 octets long.

#### **Returns**

The `Int64` object.

### **tvbrange:float()**

Get a Big Endian (network order) floating point number from a `TvbRange`. The range must be 4 or 8 octets long.



## Returns

The floating point value.

### **tvbrange:le\_float()**

Get a Little Endian floating point number from a `TvbRange`. The range must be 4 or 8 octets long.

## Returns

The floating point value.

### **tvbrange:ipv4()**

Get an IPv4 Address from a `TvbRange`, as an `Address` object.

## Returns

The IPv4 `Address` object.

### **tvbrange:le\_ipv4()**

Get an Little Endian IPv4 Address from a `TvbRange`, as an `Address` object.

## Returns

The IPv4 `Address` object.

### **tvbrange:ipv6()**

Get an IPv6 Address from a `TvbRange`, as an `Address` object.

## Returns

The IPv6 `Address` object.

### **tvbrange:ether()**

Get an Ethernet Address from a `TvbRange`, as an `Address` object.

## Returns

The Ethernet `Address` object.

## Errors

- The range must be 6 bytes long

### **tvbrange:nstime([encoding])**

Obtain a `time_t` structure from a `TvbRange`, as an `NSTime` object.

#### **Arguments**

##### **encoding (optional)**

An optional `ENC_*` encoding value to use

#### **Returns**

The `NSTime` object and number of bytes used, or `nil` on failure.

#### **Errors**

- The range must be 4 or 8 bytes long

### **tvbrange:le\_nstime()**

Obtain a `nstime` from a `TvbRange`, as an `NSTime` object.

#### **Returns**

The `NSTime` object.

#### **Errors**

- The range must be 4 or 8 bytes long

### **tvbrange:string([encoding])**

Obtain a string from a `TvbRange`.

#### **Arguments**

##### **encoding (optional)**

The encoding to use. Defaults to `ENC_ASCII`.

#### **Returns**

A string containing all bytes in the `TvbRange` including all zeroes (e.g., `"a\000bc\000"`).

### **tvbrange:ustring()**

Obtain a Big Endian (network order) UTF-16 encoded string from a `TvbRange`.

#### **Returns**

A string containing all bytes in the `TvbRange` including all zeroes (e.g., "a\000bc\000").

### **tvbrange:le\_ustring()**

Obtain a Little Endian UTF-16 encoded string from a `TvbRange`.

### **Returns**

A string containing all bytes in the `TvbRange` including all zeroes (e.g., "a\000bc\000").

### **tvbrange:stringz([encoding])**

Obtain a zero terminated string from a `TvbRange`.

### **Arguments**

#### **encoding (optional)**

The encoding to use. Defaults to `ENC_ASCII`.

### **Returns**

The string containing all bytes in the `TvbRange` up to the first terminating zero.

### **tvbrange:strsize([encoding])**

Find the size of a zero terminated string from a `TvbRange`. The size of the string includes the terminating zero.

Since: 1.11.3

### **Arguments**

#### **encoding (optional)**

The encoding to use. Defaults to `ENC_ASCII`.

### **Returns**

Length of the zero terminated string.

### **tvbrange:ustringz()**

Obtain a Big Endian (network order) UTF-16 encoded zero terminated string from a `TvbRange`.

### **Returns**

Two return values: the zero terminated string, and the length.

## **tvbrange:le\_ustringz()**

Obtain a Little Endian UTF-16 encoded zero terminated string from a `TvbRange`

### **Returns**

Two return values: the zero terminated string, and the length.

## **tvbrange:bytes([encoding])**

Obtain a `ByteArray` from a `TvbRange`.

Starting in 1.11.4, this function also takes an optional `encoding` argument, which can be set to `ENC_STR_HEX` to decode a hex-string from the `TvbRange` into the returned `ByteArray`. The `encoding` can be bitwise-or'ed with one or more separator encodings, such as `ENC_SEP_COLON`, to allow separators to occur between each pair of hex characters.

The return value also now returns the number of bytes used as a second return value.

On failure or error, nil is returned for both return values.

### **NOTE**

The encoding type of the hex string should also be set, for example `ENC_ASCII` or `ENC_UTF_8`, along with `ENC_STR_HEX`.

### **Arguments**

#### **encoding (optional)**

An optional `ENC_*` encoding value to use

### **Returns**

The `ByteArray` object or nil, and number of bytes consumed or nil.

## **tvbrange:bitfield([position], [length])**

Get a bitfield from a `TvbRange`.

### **Arguments**

#### **position (optional)**

The bit offset ([MSB 0 bit numbering](#)) from the beginning of the `TvbRange`. Defaults to 0.

#### **length (optional)**

The length in bits of the field. Defaults to 1.

### **Returns**

The bitfield value

### **tvbrange:range([offset], [length])**

Creates a sub-[Tvbrange](#) from this [Tvbrange](#).

#### **Arguments**

##### **offset (optional)**

The offset (in octets) from the beginning of the [Tvbrange](#). Defaults to 0.

##### **length (optional)**

The length (in octets) of the range. Defaults to until the end of the [Tvbrange](#).

#### **Returns**

The [Tvbrange](#).

### **tvbrange:uncompress(name)**

Obtain an uncompressed [Tvbrange](#) from a [Tvbrange](#)

#### **Arguments**

##### **name**

The name to be given to the new data-source.

#### **Returns**

The [Tvbrange](#).

### **tvbrange:len()**

Obtain the length of a [Tvbrange](#).

### **tvbrange:offset()**

Obtain the offset in a [Tvbrange](#).

### **tvbrange:raw([offset], [length])**

Obtain a Lua string of the binary bytes in a [Tvbrange](#).

Since: 1.11.3

#### **Arguments**

**offset (optional)**

The position of the first byte within the range. Default is 0, or first byte.

**length (optional)**

The length of the segment to get. Default is -1, or the remaining bytes in the range.

**Returns**

A Lua string of the binary bytes in the `TvbRange`.

**tvbrange:\_\_eq()**

Checks whether the contents of two `TvbRanges` are equal.

Since: 1.99.8

**tvbrange:\_\_tostring()**

Converts the `TvbRange` into a string. The string can be truncated, so this is primarily useful for debugging or in cases where truncation is preferred, e.g. "67:89:AB:...".

**Returns**

A Lua hex string of the `TvbRange` truncated to 24 bytes.

## Custom File Format Reading And Writing

The classes/functions defined in this section allow you to create your own custom Lua-based "capture" file reader, or writer, or both.

Since: 1.11.3

### CaptureInfo

A `CaptureInfo` object, passed into Lua as an argument by `FileHandler` callback function `read_open()`, `read()`, `seek_read()`, `seq_read_close()`, and `read_close()`. This object represents capture file data and meta-data (data about the capture file) being read into Wireshark/Tshark.

This object's fields can be written-to by Lua during the read-based function callbacks. In other words, when the Lua plugin's `FileHandler.read_open()` function is invoked, a `CaptureInfo` object will be passed in as one of the arguments, and its fields should be written to by your Lua code to tell Wireshark about the capture.

Since: 1.11.3

### **captureinfo.\_tostring()**

Generates a string of debug info for the CaptureInfo

#### **Returns**

String of debug information.

### **captureinfo.encap**

Mode: Retrieve or assign.

The packet encapsulation type for the whole file.

See `wtap_encaps` in `init.lua` for available types. Set to `wtap_encaps.PER_PACKET` if packets can have different types, then later set `FrameInfo.encap` for each packet during `read()/seek_read()`.

### **captureinfo.time\_precision**

Mode: Retrieve or assign.

The precision of the packet timestamps in the file.

See `wtap_file_tsprec` in `init.lua` for available precisions.

### **captureinfo.snapshot\_length**

Mode: Retrieve or assign.

The maximum packet length that could be recorded.

Setting it to `0` means unknown.

### **captureinfo.comment**

Mode: Retrieve or assign.

A string comment for the whole capture file, or nil if there is no `comment`.

### **captureinfo.hardware**

Mode: Retrieve or assign.

A string containing the description of the hardware used to create the capture, or nil if there is no `hardware` string.

### **captureinfo.os**

Mode: Retrieve or assign.

A string containing the name of the operating system used to create the capture, or nil if there is no `os` string.

### **captureinfo.user\_app**

Mode: Retrieve or assign.

A string containing the name of the application used to create the capture, or nil if there is no `user_app` string.

### **captureinfo.hosts**

Mode: Assign only.

Sets resolved ip-to-hostname information.

The value set must be a Lua table of two key-ed names: `ipv4_addresses` and `ipv6_addresses`. The value of each of these names are themselves array tables, of key-ed tables, such that the inner table has a key `addr` set to the raw 4-byte or 16-byte IP address Lua string and a `name` set to the resolved name.

For example, if the capture file identifies one resolved IPv4 address of 1.2.3.4 to `foo.com`, then you must set `CaptureInfo.hosts` to a table of:

```
{ ipv4_addresses = { { addr = "\01\02\03\04", name = "foo.com" } } }
```

Note that either the `ipv4_addresses` or the `ipv6_addresses` table, or both, may be empty or nil.

### **captureinfo.private\_table**

Mode: Retrieve or assign.

A private Lua value unique to this file.

The `private_table` is a field you set/get with your own Lua table. This is provided so that a Lua script can save per-file reading/writing state, because multiple files can be opened and read at the same time.

For example, if the user issued a reload-file command, or Lua called the `reload()` function, then the current capture file is still open while a new one is being opened, and thus Wireshark will invoke `read_open()` while the previous capture file has not caused `read_close()` to be called; and if the `read_open()` succeeds then `read_close()` will be called right after that for the previous file, rather than the one just opened. Thus the Lua script can use this `private_table` to store a table of values specific to each file, by setting this `private_table` in the `read_open()` function, which it can then later get back inside its `read()`, `seek_read()`, and `read_close()` functions.



## CaptureInfoConst

A `CaptureInfoConst` object, passed into Lua as an argument to the `FileHandler` callback function `write_open()`.

This object represents capture file data and meta-data (data about the capture file) for the current capture in Wireshark/Tshark.

This object's fields are read-from when used by `write_open` function callback. In other words, when the Lua plugin's `FileHandler write_open` function is invoked, a `CaptureInfoConst` object will be passed in as one of the arguments, and its fields should be read from by your Lua code to get data about the capture that needs to be written.

Since: 1.11.3

### `captureinfoconst:_tostring()`

Generates a string of debug info for the `CaptureInfoConst`

### Returns

String of debug information.

### `captureinfoconst.type`

Mode: Retrieve only.

The file type.

### `captureinfoconst.snapshot_length`

Mode: Retrieve only.

The maximum packet length that is actually recorded (vs. the original length of any given packet on-the-wire). A value of `0` means the snapshot length is unknown or there is no one such length for the whole file.

### `captureinfoconst.encap`

Mode: Retrieve only.

The packet encapsulation type for the whole file.

See `wtap_encaps` in `init.lua` for available types. It is set to `wtap_encaps.PER_PACKET` if packets can have different types, in which case each Frame identifies its type, in `FrameInfo.packet_encap`.

### **captureinfoconst.comment**

Mode: Retrieve or assign.

A comment for the whole capture file, if the `wtap_presence_flags.COMMENTS` was set in the presence flags; nil if there is no comment.

### **captureinfoconst.hardware**

Mode: Retrieve only.

A string containing the description of the hardware used to create the capture, or nil if there is no hardware string.

### **captureinfoconst.os**

Mode: Retrieve only.

A string containing the name of the operating system used to create the capture, or nil if there is no os string.

### **captureinfoconst.user\_app**

Mode: Retrieve only.

A string containing the name of the application used to create the capture, or nil if there is no user\_app string.

### **captureinfoconst.hosts**

Mode: Retrieve only.

A ip-to-hostname Lua table of two key-ed names: `ipv4_addresses` and `ipv6_addresses`. The value of each of these names are themselves array tables, of key-ed tables, such that the inner table has a key `addr` set to the raw 4-byte or 16-byte IP address Lua string and a `name` set to the resolved name.

For example, if the current capture has one resolved IPv4 address of 1.2.3.4 to `foo.com`, then getting `CaptureInfoConst.hosts` will get a table of:

```
{ ipv4_addresses = { { addr = "\01\02\03\04", name = "foo.com" } }, ipv6_addresses = { } }
```

Note that either the `ipv4_addresses` or the `ipv6_addresses` table, or both, may be empty, however they will not be nil.

## captureinfoconst.private\_table

Mode: Retrieve or assign.

A private Lua value unique to this file.

The `private_table` is a field you set/get with your own Lua table. This is provided so that a Lua script can save per-file reading/writing state, because multiple files can be opened and read at the same time.

For example, if two Lua scripts issue a `Dumper:new_for_current()` call and the current file happens to use your script's writer, then the Wireshark will invoke `write_open()` while the previous capture file has not had `write_close()` called. Thus the Lua script can use this `private_table` to store a table of values specific to each file, by setting this `private_table` in the `write_open()` function, which it can then later get back inside its `write()`, and `write_close()` functions.

## File

A `File` object, passed into Lua as an argument by FileHandler callback functions (e.g., `read_open`, `read`, `write`, etc.). This behaves similarly to the Lua `io` library's `file` object, returned when calling `io.open()`, **except** in this case you cannot call `file:close()`, `file:open()`, nor `file:setvbuf()`, since Wireshark/tshark manages the opening and closing of files. You also cannot use the 'io' library itself on this object, i.e. you cannot do `io.read(file, 4)`. Instead, use this `File` with the object-oriented style calling its methods, i.e. `myfile:read(4)`. (see later example)

The purpose of this object is to hide the internal complexity of how Wireshark handles files, and instead provide a Lua interface that is familiar, by mimicking the `io` library. The reason true/raw `io` files cannot be used is because Wireshark does many things under the hood, such as compress the file, or write to `stdout`, or various other things based on configuration/commands.

When a `File` object is passed in through reading-based callback functions, such as `read_open()`, `read()`, and `read_close()`, then the File object's `write()` and `flush()` functions are not usable and will raise an error if used.

When a `File` object is passed in through writing-based callback functions, such as `write_open()`, `write()`, and `write_close()`, then the File object's `read()` and `lines()` functions are not usable and will raise an error if used.

Note: A `File` object should never be stored/saved beyond the scope of the callback function it is passed in to.

For example:

```
function myfilehandler.read_open(file, capture)
    local position = file:seek()

    -- read 24 bytes
    local line = file:read(24)

    -- do stuff

    -- it's not our file type, seek back (unnecessary but just to show it...)
    file:seek("set",position)

    -- return false because it's not our file type
    return false
end
```

Since: 1.11.3

### **file:read()**

Reads from the File, similar to Lua's `file:read()`. See Lua 5.x ref manual for `file:read()`.

### **file:seek()**

Seeks in the File, similar to Lua's `file:seek()`. See Lua 5.x ref manual for `file:seek()`.

### **Returns**

The current file cursor position as a number.

### **file:lines()**

Lua iterator function for retrieving ASCII File lines, similar to Lua's `file:lines()`. See Lua 5.x ref manual for `file:lines()`.

### **file:write()**

Writes to the File, similar to Lua's `file:write()`. See Lua 5.x ref manual for `file:write()`.

### **file:\_tostring()**

Generates a string of debug info for the File object

### **Returns**

String of debug information.

## **file.compressed**

Mode: Retrieve only.

Whether the File is compressed or not.

See `wtap_encaps` in `init.lua` for available types. Set to `wtap_encaps.PER_PACKET` if packets can have different types, then later set `FrameInfo.encap` for each packet during `read()/seek_read()`.

## **FileHandler**

A FileHandler object, created by a call to `FileHandler.new(arg1, arg2, ...)`. The FileHandler object lets you create a file-format reader, or writer, or both, by setting your own `read_open/read` or `write_open/write` functions.

Since: 1.11.3

### **FileHandler.new(description, name, internal\_description, type)**

Creates a new FileHandler

#### **Arguments**

##### **description**

A description of the file type, for display purposes only. E.g., "Wireshark - pcapng"

##### **name**

The file type name, used to look up the file type in various places. E.g., "pcapng". Note: The name cannot already be in use.

##### **internal\_description**

Descriptive text about this file format, for internal display purposes only

##### **type**

The type of FileHandler, "r"/"w"/"rw" for reader/writer/both, include "m" for magic, "s" for strong heuristic

#### **Returns**

The newly created FileHandler object

### **filehandler:\_\_tostring()**

Generates a string of debug info for the FileHandler

#### **Returns**

String of debug information.

### **filehandler.read\_open**

Mode: Assign only.

The Lua function to be called when Wireshark opens a file for reading.

When later called by Wireshark, the Lua function will be given:

1. A **File** object
2. A **CaptureInfo** object

The purpose of the Lua function set to this **read\_open** field is to check if the file Wireshark is opening is of its type, for example by checking for magic numbers or trying to parse records in the file, etc. The more can be verified the better, because Wireshark tries all file readers until it finds one that accepts the file, so accepting an incorrect file prevents other file readers from reading their files.

The called Lua function should return true if the file is its type (it accepts it), false if not. The Lua function must also set the File offset position (using **file:seek()**) to where it wants it to be for its first **read()** call.

### **filehandler.read**

Mode: Assign only.

The Lua function to be called when Wireshark wants to read a packet from the file.

When later called by Wireshark, the Lua function will be given:

1. A **File** object
2. A **CaptureInfo** object
3. A **FrameInfo** object

The purpose of the Lua function set to this **read** field is to read the next packet from the file, and setting the parsed/read packet into the frame buffer using **FrameInfo.data = foo** or **FrameInfo:read\_data(file, frame.captured\_length)**.

The called Lua function should return the file offset/position number where the packet begins, or false if it hit an error. The file offset will be saved by Wireshark and passed into the set **seek\_read()** Lua function later.

### **filehandler.seek\_read**

Mode: Assign only.

The Lua function to be called when Wireshark wants to read a packet from the file at the given

offset.

When later called by Wireshark, the Lua function will be given:

1. A `File` object
2. A `CaptureInfo` object
3. A `FrameInfo` object
4. The file offset number previously set by the `read()` function call

The called Lua function should return true if the read was successful, or false if it hit an error. Since 2.4.0, a number is also acceptable to signal success, this allows for reuse of `FileHandler:read`:

```
local function fh_read(file, capture, frame) ... end
myfilehandler.read = fh_read

function myfilehandler.seek_read(file, capture, frame, offset)
    if not file:seek("set", offset) then
        -- Seeking failed, return failure
        return false
    end

    -- Now try to read one frame
    return fh_read(file, capture, frame)
end
```

Since 3.6.0, it's possible to omit the `FileHandler:seek_read()` function to get a default `seek_read` implementation.

### **filehandler.read\_close**

Mode: Assign only.

The Lua function to be called when Wireshark wants to close the read file completely.

When later called by Wireshark, the Lua function will be given:

1. A `File` object
2. A `CaptureInfo` object

It is not necessary to set this field to a Lua function - `FileHandler` can be registered without doing so - it is available in case there is memory/state to clear in your script when the file is closed.

### **filehandler.seq\_read\_close**

Mode: Assign only.

The Lua function to be called when Wireshark wants to close the sequentially-read file.

When later called by Wireshark, the Lua function will be given:

1. A `File` object
2. A `CaptureInfo` object

It is not necessary to set this field to a Lua function - `FileHandler` can be registered without doing so - it is available in case there is memory/state to clear in your script when the file is closed for the sequential reading portion. After this point, there will be no more calls to `read()`, only `seek_read()`.

### **filehandler.can\_write\_encap**

Mode: Assign only.

The Lua function to be called when Wireshark wants to write a file, by checking if this file writer can handle the wtap packet encapsulation(s).

When later called by Wireshark, the Lua function will be given a Lua number, which matches one of the encapsulations in the Lua `wtap_encaps` table. This might be the `wtap_encap.PER_PACKET` number, meaning the capture contains multiple encapsulation types, and the file reader should only return true if it can handle multiple encap types in one file. The function will then be called again, once for each encap type in the file, to make sure it can write each one.

If the Lua file writer can write the given type of encapsulation into a file, then it returns the boolean true, else false.

### **filehandler.write\_open**

Mode: Assign only.

The Lua function to be called when Wireshark opens a file for writing.

When later called by Wireshark, the Lua function will be given:

1. A `File` object
2. A `CaptureInfoConst` object

The purpose of the Lua function set to this `write_open` field is similar to the `read_open` callback function: to initialize things necessary for writing the capture to a file. For example, if the output file format has a file header, then the file header should be written within this `write_open` function.

The called Lua function should return true on success, or false if it hit an error.

Also make sure to set the `FileHandler.write` (and potentially `FileHandler.write_finish`) functions before returning true from this function.



## **filehandler.write**

Mode: Assign only.

The Lua function to be called when Wireshark wants to write a packet to the file.

When later called by Wireshark, the Lua function will be given:

1. A **File** object
2. A **CaptureInfoConst** object
3. A **FrameInfoConst** object of the current frame/packet to be written

The purpose of the Lua function set to this **write** field is to write the next packet to the file.

The called Lua function should return true on success, or false if it hit an error.

## **filehandler.write\_finish**

Mode: Assign only.

The Lua function to be called when Wireshark wants to close the written file.

When later called by Wireshark, the Lua function will be given:

1. A **File** object
2. A **CaptureInfoConst** object

It is not necessary to set this field to a Lua function - **FileHandler** can be registered without doing so - it is available in case there is memory/state to clear in your script when the file is closed.

## **filehandler.type**

Mode: Retrieve only.

The internal file type. This is automatically set with a new number when the FileHandler is registered.

## **filehandler.extensions**

Mode: Retrieve or assign.

One or more semicolon-separated file extensions that this file type usually uses.

For readers using heuristics to determine file type, Wireshark will try the readers of the file's extension first, before trying other readers. But ultimately Wireshark tries all file readers for any file extension, until it finds one that accepts the file.

(Since 2.6) For writers, the first extension is used to suggest the default file extension.

### **filehandler.writing\_must\_seek**

Mode: Retrieve or assign.

True if the ability to seek is required when writing this file format, else false.

This will be checked by Wireshark when writing out to compressed file formats, because seeking is not possible with compressed files. Usually a file writer only needs to be able to seek if it needs to go back in the file to change something, such as a block or file length value earlier in the file.

### **filehandler.writes\_name\_resolution**

Mode: Retrieve or assign.

True if the file format supports name resolution records, else false.

### **filehandler.supported\_comment\_types**

Mode: Retrieve or assign.

Set to the bit-wise OR'ed number representing the type of comments the file writer supports writing, based on the numbers in the `wtap_comments` table.

## **FrameInfo**

A FrameInfo object, passed into Lua as an argument by FileHandler callback functions (e.g., `read`, `seek_read`, etc.).

This object represents frame data and meta-data (data about the frame/packet) for a given `read` / `seek_read` / `write`'s frame.

This object's fields are written-to/set when used by read function callbacks, and read-from/get when used by file write function callbacks. In other words, when the Lua plugin's FileHandler `read` / `seek_read` / etc. functions are invoked, a FrameInfo object will be passed in as one of the arguments, and its fields should be written-to/set based on the frame information read from the file; whereas when the Lua plugin's `FileHandler.write()` function is invoked, the `FrameInfo` object passed in should have its fields read-from/get, to write that frame information to the file.

Since: 1.11.3

### **frameinfo:\_\_tostring()**

Generates a string of debug info for the FrameInfo

### **Returns**

String of debug information.

## **frameinfo:read\_data(file, length)**

Tells Wireshark to read directly from given file into frame data buffer, for length bytes. Returns true if succeeded, else false.

### **Arguments**

#### **file**

The File object userdata, provided by Wireshark previously in a reading-based callback.

#### **length**

The number of bytes to read from the file at the current cursor position.

### **Returns**

True if succeeded, else returns false along with the error number and string error description.

A Lua string of the frame buffer's data.

### **frameinfo.comment**

Mode: Retrieve or assign.

Table of comments in this frame.

### **frameinfo.time**

Mode: Retrieve or assign.

The packet timestamp as an NSTime object.

Note: Set the `FileHandler.time_precision` to the appropriate `wtap_file_tsprec` value as well.

### **frameinfo.data**

Mode: Retrieve or assign.

The data buffer containing the packet.

**NOTE** | This cannot be cleared once set.

### **frameinfo.rec\_type**

Mode: Retrieve or assign.

The record type of the packet frame

See `wtap_rec_types` in `init.lua` for values.

## **frameinfo.flags**

Mode: Retrieve or assign.

The presence flags of the packet frame.

See `wtap_presence_flags` in `init.lua` for bit values.

## **frameinfo.captured\_length**

Mode: Retrieve or assign.

The captured packet length, and thus the length of the buffer passed to the `FrameInfo.data` field.

## **frameinfo.original\_length**

Mode: Retrieve or assign.

The on-the-wire packet length, which may be longer than the `captured_length`.

## **frameinfo.encap**

Mode: Retrieve or assign.

The packet encapsulation type for the frame/packet, if the file supports per-packet types. See `wtap_encaps` in `init.lua` for possible packet encapsulation types to use as the value for this field.

## **FrameInfoConst**

A constant `FrameInfo` object, passed into Lua as an argument by the `FileHandler` write callback function. This has similar attributes/properties as `FrameInfo`, but the fields can only be read from, not written to.

Since: 1.11.3

### **frameinfoconst:\_\_tostring()**

Generates a string of debug info for the `FrameInfo`

### **Returns**

String of debug information.

### **frameinfoconst:write\_data(file, [length])**

Tells Wireshark to write directly to given file from the frame data buffer, for length bytes. Returns true if succeeded, else false.

### **Arguments**

**file**

The File object userdata, provided by Wireshark previously in a writing-based callback.

**length (optional)**

The number of bytes to write to the file at the current cursor position, or all if not supplied.

**Returns**

True if succeeded, else returns false along with the error number and string error description.

**frameinfoconst.comment**

Mode: Retrieve only.

The first string comment for the packet, if any; nil if there is no comment.

**frameinfoconst.time**

Mode: Retrieve only.

The packet timestamp as an NSTime object.

**frameinfoconst.data**

Mode: Retrieve only.

The data buffer containing the packet.

**frameinfoconst.rec\_type**

Mode: Retrieve only.

The record type of the packet frame - see `wtap_presence_flags` in `init.lua` for values.

**frameinfoconst.flags**

Mode: Retrieve only.

The presence flags of the packet frame - see `wtap_presence_flags` in `init.lua` for bits.

**frameinfoconst.captured\_length**

Mode: Retrieve only.

The captured packet length, and thus the length of the buffer in the FrameInfoConst.data field.

### **frameinfoconst.original\_length**

Mode: Retrieve only.

The on-the-wire packet length, which may be longer than the `captured_length`.

### **frameinfoconst.encap**

Mode: Retrieve only.

The packet encapsulation type, if the file supports per-packet types.

See `wtap_encaps` in `init.lua` for possible packet encapsulation types to use as the value for this field.

## **Global Functions**

### **register\_filehandler(filehandler)**

Register the FileHandler into Wireshark/tshark, so they can read/write this new format. All functions and settings must be complete before calling this registration function. This function cannot be called inside the reading/writing callback functions.

#### **Arguments**

##### **filehandler**

The FileHandler object to be registered

#### **Returns**

the new type number for this file reader/write

### **deregister\_filehandler(filehandler)**

Deregister the FileHandler from Wireshark/tshark, so it no longer gets used for reading/writing/display. This function cannot be called inside the reading/writing callback functions.

#### **Arguments**

##### **filehandler**

The FileHandler object to be deregistered

## **Directory Handling Functions**

### **Dir**

A Directory object, as well as associated functions.

## **Dir.make(name)**

Creates a directory.

The created directory is set for permission mode 0755 (octal), meaning it is read+write+execute by owner, but only read+execute by group members and others.

If the directory was created successfully, a boolean `true` is returned. If the directory cannot be made because it already exists, `false` is returned. If the directory cannot be made because an error occurred, `nil` is returned.

Since: 1.11.3

### **Arguments**

#### **name**

The name of the directory, possibly including path.

### **Returns**

Boolean `true` on success, `false` if the directory already exists, `nil` on error.

## **Dir.exists(name)**

Returns true if the given directory name exists.

If the directory exists, a boolean `true` is returned. If the path is a file instead, `false` is returned. If the path does not exist or an error occurred, `nil` is returned.

Since: 1.11.3

### **Arguments**

#### **name**

The name of the directory, possibly including path.

### **Returns**

Boolean `true` if the directory exists, `false` if it's a file, `nil` on error or not-exist.

## **Dir.remove(name)**

Removes an empty directory.

If the directory was removed successfully, a boolean `true` is returned. If the directory cannot be removed because it does not exist, `false` is returned. If the directory cannot be removed because an error occurred, `nil` is returned.

This function only removes empty directories. To remove a directory regardless, use `Dir.remove_all()`.

Since: 1.11.3

## Arguments

### name

The name of the directory, possibly including path.

## Returns

Boolean `true` on success, `false` if does not exist, `nil` on error.

### `Dir.remove_all(name)`

Removes an empty or non-empty directory.

If the directory was removed successfully, a boolean `true` is returned. If the directory cannot be removed because it does not exist, `false` is returned. If the directory cannot be removed because an error occurred, `nil` is returned.

Since: 1.11.3

## Arguments

### name

The name of the directory, possibly including path.

## Returns

Boolean `true` on success, `false` if does not exist, `nil` on error.

### `Dir.open(pathname, [extension])`

Opens a directory and returns a `Dir` object representing the files in the directory.

## Example

```
-- Print the contents of a directory
for filename in Dir.open('/path/to/dir') do
  print(filename)
end
```

## Arguments



**pathname**

The pathname of the directory.

**extension (optional)**

If given, only files with this extension will be returned.

**Returns**

The `Dir` object.

**Dir.personal\_config\_path([filename])**

Gets the [personal configuration](#) directory path, with filename if supplied.

Since: 1.11.3

**Arguments****filename (optional)**

A filename.

**Returns**

The full pathname for a file in the personal configuration directory.

**Dir.global\_config\_path([filename])**

Gets the [global configuration](#) directory path, with filename if supplied.

Since: 1.11.3

**Arguments****filename (optional)**

A filename

**Returns**

The full pathname for a file in Wireshark's configuration directory.

**Dir.personal\_plugins\_path()**

Gets the personal plugins directory path.

Since: 1.11.3

**Returns**

The pathname of the [personal plugins](#) directory.

### **Dir.global\_plugins\_path()**

Gets the global plugins directory path.

Since: 1.11.3

### **Returns**

The pathname of the [global plugins](#) directory.

### **dir: \_call()**

Gets the next file or subdirectory within the directory, or `nil` when done.

## **Example**

```
-- Open a directory and print the name of the first file or subdirectory
local dir = Dir.open('/path/to/dir')
local first = dir()
print(tostring(file))
```

### **dir:close()**

Closes the directory. Called automatically during garbage collection of a `Dir` object.

# **Wtap Functions For Handling Capture File Types**

## **Global Functions**

### **wtap\_file\_type\_subtype\_description(filetype)**

Get a string describing a capture file type, given a filetype value for that file type.

Since: 3.2.12, 3.4.4

### **Arguments**

#### **filetype**

The type for which the description is to be fetched - a number returned by `wtap_name_to_file_type_subtype()`.

### **Returns**

The description of the file type with that filetype value, or `nil` if there is no such file type.

### **wtap\_file\_type\_subtype\_name(filetype)**

Get a string giving the name for a capture file type, given a filetype value for that file type.

Since: 3.2.12, 3.4.4

#### **Arguments**

##### **filetype**

The type for which the name is to be fetched - a number returned by `wtap_name_to_file_type_subtype()`.

#### **Returns**

The name of the file type with that filetype value, or nil if there is no such file type.

### **wtap\_name\_to\_file\_type\_subtype(name)**

Get a filetype value for a file type, given the name for that file type.

Since: 3.2.12, 3.4.4

#### **Arguments**

##### **name**

The name of a file type.

#### **Returns**

The filetype value for the file type with that name, or nil if there is no such file type.

### **wtap\_pcap\_file\_type\_subtype()**

Get the filetype value for pcap files.

Since: 3.2.12, 3.4.4

#### **Returns**

The filetype value for pcap files.

### **wtap\_pcap\_nsec\_file\_type\_subtype()**

Get the filetype value for nanosecond-resolution pcap files.

Since: 3.2.12, 3.4.4

#### **Returns**

The filetype value for nanosecond-resolution pcap files.

### **wtap\_pcapng\_file\_type\_subtype()**

Get the filetype value for pcapng files.

Since: 3.2.12, 3.4.4

#### **Returns**

The filetype value for pcapng files.

The table.

## **Utility Functions**

### **Global Functions**

#### **get\_version()**

Gets the Wireshark version as a string.

#### **Returns**

The version string, e.g. "3.2.5".

#### **set\_plugin\_info(table)**

Set a Lua table with meta-data about the plugin, such as version.

The passed-in Lua table entries need to be keyed/indexed by the following:

- "version" with a string value identifying the plugin version (required)
- "description" with a string value describing the plugin (optional)
- "author" with a string value of the author's name(s) (optional)
- "repository" with a string value of a URL to a repository (optional)

Not all of the above key entries need to be in the table. The 'version' entry is required, however. The others are not currently used for anything, but might be in the future and thus using them might be useful. Table entries keyed by other strings are ignored, and do not cause an error.

#### **Example**

```
local my_info = {  
    version = "1.0.1",  
    author = "Jane Doe",  
    repository = "https://github.com/octocat/Spoon-Knife"  
}  
  
set_plugin_info(my_info)
```

Since: 1.99.8

## Arguments

### table

The Lua table of information.

### format\_date(timestamp)

Formats an absolute timestamp into a human readable date.

## Arguments

### timestamp

A timestamp value to convert.

## Returns

A string with the formatted date

### format\_time(timestamp)

Formats a relative timestamp in a human readable time.

## Arguments

### timestamp

A timestamp value to convert.

## Returns

A string with the formatted time

### get\_preference(preference)

Get a preference value. @since 3.5.0

## Arguments

**preference**

The name of the preference.

**Returns**

The preference value, or nil if not found.

**set\_preference(preference, value)**

Set a preference value. @since 3.5.0

**Arguments****preference**

The name of the preference.

**value**

The preference value to set.

**Returns**

true if changed, false if unchanged or nil if not found.

**reset\_preference(preference)**

Reset a preference to default value. @since 3.5.0

**Arguments****preference**

The name of the preference.

**Returns**

true if valid preference

**apply\_preferences()**

Write preferences to file and apply changes. @since 3.5.0

**report\_failure(text)**

Reports a failure to the user.

**Arguments****text**

Message text to report.

### **loadfile(filename)**

Loads a Lua file and compiles it into a Lua chunk, similar to the standard [loadfile](#) but searches additional directories. The search order is the current directory, followed by the user's [personal configuration](#) directory, and finally the [global configuration](#) directory.

### **Example**

```
-- Assume foo.lua contains definition for foo(a,b). Load the chunk
-- from the file and execute it to add foo(a,b) to the global table.
-- These two lines are effectively the same as dofile('foo.lua').
local loaded_chunk = assert(loadfile('foo.lua'))
loaded_chunk()

-- ok to call foo at this point
foo(1,2)
```

### **Arguments**

#### **filename**

Name of the file to be loaded. If the file does not exist in the current directory, the user and system directories are searched.

### **dofile(filename)**

Loads a Lua file and executes it as a Lua chunk, similar to the standard [dofile](#) but searches additional directories. The search order is the current directory, followed by the user's [personal configuration](#) directory, and finally the [global configuration](#) directory.

### **Arguments**

#### **filename**

Name of the file to be run. If the file does not exist in the current directory, the user and system directories are searched.

### **register\_stat\_cmd\_arg(argument, [action])**

Register a function to handle a `-z` option

### **Arguments**

#### **argument**

The name of the option argument.

## action (optional)

The function to be called when the command is invoked.

# Handling 64-bit Integers

Lua uses one single number representation which can be chosen at compile time and since it is often set to IEEE 754 double precision floating point, one cannot store 64 bit integers with full precision.

Lua numbers are stored as floating point (doubles) internally, not integers; thus while they can represent incredibly large numbers, above  $2^{53}$  they lose integral precision — they can't represent every whole integer value. For example if you set a lua variable to the number 9007199254740992 and tried to increment it by 1, you'd get the same number because it can't represent 9007199254740993 (only the even number 9007199254740994).

Therefore, in order to count higher than  $2^{53}$  in integers, we need a true integer type. The way this is done is with an explicit 'Int64' or 'UInt64' object (i.e., Lua userdata). This object has metamethods for all of the math and comparison operators, so you can handle it like any number variable. For the math operators, it can even be mixed with plain Lua numbers.

For example 'my64num = my64num + 1' will work even if 'my64num' is a **Int64** or **UInt64** object. Note that comparison operators ('==','<=','>', etc.) will not work with plain numbers — only other Int64/UInt64 objects. This is a limitation of Lua itself, in terms of how it handles operator overloading.

### WARNING

Many of the UInt64/Int64 functions accept a Lua number as an argument. You should be very careful to never use Lua numbers bigger than 32 bits (i.e., the number value 4,294,967,295 or the literal 0xFFFFFFFF) for such arguments, because Lua itself does not handle bigger numbers consistently across platforms (32-bit vs. 64-bit systems), and because a Lua number is a C-code double which cannot have more than 53 bits of precision. Instead, use a Int64 or UInt64 for the argument.

For example, do this...

```
local mynum = UInt64(0x2b89dd1e, 0x3f91df0b)
```

...instead of this:

```
-- Bad. Leads to inconsistent results across platforms  
local mynum = UInt64(0x3f91df0b2b89dd1e)
```

And do this...



```
local masked = mynum:band(UInt64(0, 0xFFFFFFFF))
```

...instead of this:

```
-- Bad. Leads to inconsistent results across platforms
local masked = mynum:band(0xFFFFFFFF00000000)
```

## Int64

**Int64** represents a 64 bit signed integer.

Note the caveats [listed above](#).

### **Int64.decode(string, [endian])**

Decodes an 8-byte Lua string, using the given endianness, into a new **Int64** object.

Since: 1.11.3

### **Arguments**

#### **string**

The Lua string containing a binary 64-bit integer.

#### **endian (optional)**

If set to true then little-endian is used, if false then big-endian; if missing or **nil**, native host endian.

### **Returns**

The **Int64** object created, or nil on failure.

### **Int64.new([value], [highvalue])**

Creates a **Int64** Object.

Since: 1.11.3

### **Arguments**

#### **value (optional)**

A number, **UInt64**, **Int64**, or string of ASCII digits to assign the value of the new **Int64**. Default is 0.

#### **highvalue (optional)**

If this is a number and the first argument was a number, then the first will be treated as a lower

32 bits, and this is the high-order 32 bit number.

### Returns

The new `Int64` object.

### `Int64.max()`

Creates an `Int64` of the maximum possible positive value. In other words, this should return an `Int64` object of the number 9,223,372,036,854,775,807.

Since: 1.11.3

### Returns

The new `Int64` object of the maximum value.

### `Int64.min()`

Creates an `Int64` of the minimum possible negative value. In other words, this should return an `Int64` object of the number -9,223,372,036,854,775,808.

Since: 1.11.3

### Returns

The new `Int64` object of the minimum value.

### `Int64.fromhex(hex)`

Creates an `Int64` object from the given hexadecimal string.

Since: 1.11.3

### Arguments

#### `hex`

The hex-ASCII Lua string.

### Returns

The new `Int64` object.

### `int64:encode([endian])`

Encodes the `Int64` number into an 8-byte Lua string using the given endianness.

Since: 1.11.3

## Arguments

### **endian (optional)**

If set to true then little-endian is used, if false then big-endian; if missing or `nil`, native host endian.

## Returns

The Lua string.

### **int64:\_\_call()**

Creates a `Int64` object.

Since: 1.11.3

## Returns

The new `Int64` object.

### **int64:tonumber()**

Returns a Lua number of the `Int64` value. Note that this may lose precision.

Since: 1.11.3

## Returns

The Lua number.

### **int64:tohex([numbytes])**

Returns a hexadecimal string of the `Int64` value.

Since: 1.11.3

## Arguments

### **numbytes (optional)**

The number of hex chars/nibbles to generate. A negative value generates uppercase. Default is 16.

## Returns

The string hex.

### **int64:higher()**

Returns a Lua number of the higher 32 bits of the `Int64` value. A negative `Int64` will return a negative Lua number.

Since: 1.11.3

#### **Returns**

The Lua number.

### **int64:lower()**

Returns a Lua number of the lower 32 bits of the `Int64` value. This will always be positive.

Since: 1.11.3

#### **Returns**

The Lua number.

### **int64:\_\_tostring()**

Converts the `Int64` into a string of decimal digits.

#### **Returns**

The Lua string.

### **int64:\_\_unm()**

Returns the negative of the `Int64` as a new `Int64`.

Since: 1.11.3

#### **Returns**

The new `Int64`.

### **int64:\_\_add()**

Adds two `Int64` together and returns a new one. The value may wrapped.

Since: 1.11.3

### **int64:\_\_sub()**

Subtracts two `Int64` and returns a new one. The value may wrapped.

Since: 1.11.3

### **int64: \_\_mul()**

Multiplies two `Int64` and returns a new one. The value may truncated.

Since: 1.11.3

### **int64: \_\_div()**

Divides two `Int64` and returns a new one. Integer divide, no remainder. Trying to divide by zero results in a Lua error.

Since: 1.11.3

### **Returns**

The `Int64` object.

### **int64: \_\_mod()**

Divides two `Int64` and returns a new one of the remainder. Trying to modulo by zero results in a Lua error.

Since: 1.11.3

### **Returns**

The `Int64` object.

### **int64: \_\_pow()**

The first `Int64` is taken to the power of the second `Int64`, returning a new one. This may truncate the value.

Since: 1.11.3

### **Returns**

The `Int64` object.

### **int64: \_\_eq()**

Returns `true` if both `Int64` are equal.

Since: 1.11.3

### **int64:lt()**

Returns `true` if first `Int64` is less than the second.

Since: 1.11.3

### **int64:le()**

Returns `true` if the first `Int64` is less than or equal to the second.

Since: 1.11.3

### **int64:bnot()**

Returns a `Int64` of the bitwise 'not' operation.

Since: 1.11.3

### **Returns**

The `Int64` object.

### **int64:band()**

Returns a `Int64` of the bitwise 'and' operation with the given number/`Int64/UInt64`. Note that multiple arguments are allowed.

Since: 1.11.3

### **int64:bor()**

Returns a `Int64` of the bitwise 'or' operation, with the given number/`Int64/UInt64`. Note that multiple arguments are allowed.

Since: 1.11.3

### **int64:bxor()**

Returns a `Int64` of the bitwise 'xor' operation, with the given number/`Int64/UInt64`. Note that multiple arguments are allowed.

Since: 1.11.3

### **int64:lshift(numbits)**

Returns a `Int64` of the bitwise logical left-shift operation, by the given number of bits.

Since: 1.11.3

## Arguments

### numbits

The number of bits to left-shift by.

## Returns

The `Int64` object.

### `int64:rshift(numbits)`

Returns a `Int64` of the bitwise logical right-shift operation, by the given number of bits.

Since: 1.11.3

## Arguments

### numbits

The number of bits to right-shift by.

## Returns

The `Int64` object.

### `int64:arshift(numbits)`

Returns a `Int64` of the bitwise arithmetic right-shift operation, by the given number of bits.

Since: 1.11.3

## Arguments

### numbits

The number of bits to right-shift by.

## Returns

The `Int64` object.

### `int64:rol(numbits)`

Returns a `Int64` of the bitwise left rotation operation, by the given number of bits (up to 63).

Since: 1.11.3

## Arguments

### numbits

The number of bits to roll left by.

### Returns

The `Int64` object.

### `int64:ror(numbits)`

Returns a `Int64` of the bitwise right rotation operation, by the given number of bits (up to 63).

Since: 1.11.3

### Arguments

#### `numbits`

The number of bits to roll right by.

### Returns

The `Int64` object.

### `int64:bswap()`

Returns a `Int64` of the bytes swapped. This can be used to convert little-endian 64-bit numbers to big-endian 64 bit numbers or vice versa.

Since: 1.11.3

### Returns

The `Int64` object.

## `UInt64`

`UInt64` represents a 64 bit unsigned integer, similar to `Int64`.

Note the caveats [listed above](#).

### `UInt64.decode(string, [endian])`

Decodes an 8-byte Lua binary string, using given endianness, into a new `UInt64` object.

Since: 1.11.3

### Arguments

#### `string`

The Lua string containing a binary 64-bit integer.



### **endian (optional)**

If set to true then little-endian is used, if false then big-endian; if missing or `nil`, native host endian.

### **Returns**

The `UInt64` object created, or nil on failure.

### **UInt64.new([value], [highvalue])**

Creates a `UInt64` Object.

Since: 1.11.3

### **Arguments**

#### **value (optional)**

A number, `UInt64`, `Int64`, or string of digits to assign the value of the new `UInt64`. Default is 0.

#### **highvalue (optional)**

If this is a number and the first argument was a number, then the first will be treated as a lower 32 bits, and this is the high-order 32-bit number.

### **Returns**

The new `UInt64` object.

### **UInt64.max()**

Creates a `UInt64` of the maximum possible value. In other words, this should return an `UInt64` object of the number 18,446,744,073,709,551,615.

Since: 1.11.3

### **Returns**

The maximum value.

### **UInt64.min()**

Creates a `UInt64` of the minimum possible value. In other words, this should return an `UInt64` object of the number 0.

Since: 1.11.3

### **Returns**

The minimum value.

## **UInt64.fromhex(hex)**

Creates a **UInt64** object from the given hex string.

Since: 1.11.3

### **Arguments**

#### **hex**

The hex-ASCII Lua string.

### **Returns**

The new **UInt64** object.

## **uint64:encode([endian])**

Encodes the **UInt64** number into an 8-byte Lua binary string, using given endianness.

Since: 1.11.3

### **Arguments**

#### **endian (optional)**

If set to true then little-endian is used, if false then big-endian; if missing or **nil**, native host endian.

### **Returns**

The Lua binary string.

## **uint64:\_\_call()**

Creates a **UInt64** object.

Since: 1.11.3

### **Returns**

The new **UInt64** object.

## **uint64:tonumber()**

Returns a Lua number of the **UInt64** value. This may lose precision.

Since: 1.11.3

### **Returns**

The Lua number.

### **uint64:\_\_tostring()**

Converts the `UInt64` into a string.

#### **Returns**

The Lua string.

### **uint64:tohex([numbytes])**

Returns a hex string of the `UInt64` value.

Since: 1.11.3

#### **Arguments**

#### **numbytes (optional)**

The number of hex-chars/nibbles to generate. Negative means uppercase Default is 16.

#### **Returns**

The string hex.

### **uint64:higher()**

Returns a Lua number of the higher 32 bits of the `UInt64` value.

#### **Returns**

The Lua number.

### **uint64:lower()**

Returns a Lua number of the lower 32 bits of the `UInt64` value.

#### **Returns**

The Lua number.

### **uint64:\_\_unm()**

Returns the `UInt64` in a new `UInt64`, since unsigned integers can't be negated.

Since: 1.11.3

#### **Returns**

The `UInt64` object.

#### **`uint64: __add()`**

Adds two `UInt64` together and returns a new one. This may wrap the value.

Since: 1.11.3

#### **`uint64: __sub()`**

Subtracts two `UInt64` and returns a new one. This may wrap the value.

Since: 1.11.3

#### **`uint64: __mul()`**

Multiplies two `UInt64` and returns a new one. This may truncate the value.

Since: 1.11.3

#### **`uint64: __div()`**

Divides two `UInt64` and returns a new one. Integer divide, no remainder. Trying to divide by zero results in a Lua error.

Since: 1.11.3

#### **Returns**

The `UInt64` result.

#### **`uint64: __mod()`**

Divides two `UInt64` and returns a new one of the remainder. Trying to modulo by zero results in a Lua error.

Since: 1.11.3

#### **Returns**

The `UInt64` result.

#### **`uint64: __pow()`**

The first `UInt64` is taken to the power of the second `UInt64`/number, returning a new one. This may truncate the value.

Since: 1.11.3

## Returns

The `UInt64` object.

### `uint64: __eq()`

Returns true if both `UInt64` are equal.

Since: 1.11.3

### `uint64: __lt()`

Returns true if first `UInt64` is less than the second.

Since: 1.11.3

### `uint64: __le()`

Returns true if first `UInt64` is less than or equal to the second.

Since: 1.11.3

### `uint64:bnot()`

Returns a `UInt64` of the bitwise 'not' operation.

Since: 1.11.3

## Returns

The `UInt64` object.

### `uint64:band()`

Returns a `UInt64` of the bitwise 'and' operation, with the given number/`Int64/UInt64`. Note that multiple arguments are allowed.

Since: 1.11.3

### `uint64:bor()`

Returns a `UInt64` of the bitwise 'or' operation, with the given number/`Int64/UInt64`. Note that multiple arguments are allowed.

Since: 1.11.3

### `uint64:bxor()`

Returns a `UInt64` of the bitwise 'xor' operation, with the given number/`Int64/UInt64`. Note that

multiple arguments are allowed.

Since: 1.11.3

### **uint64:lshift(numbits)**

Returns a `UInt64` of the bitwise logical left-shift operation, by the given number of bits.

Since: 1.11.3

#### **Arguments**

##### **numbits**

The number of bits to left-shift by.

#### **Returns**

The `UInt64` object.

### **uint64:rshift(numbits)**

Returns a `UInt64` of the bitwise logical right-shift operation, by the given number of bits.

Since: 1.11.3

#### **Arguments**

##### **numbits**

The number of bits to right-shift by.

#### **Returns**

The `UInt64` object.

### **uint64:arshift(numbits)**

Returns a `UInt64` of the bitwise arithmetic right-shift operation, by the given number of bits.

Since: 1.11.3

#### **Arguments**

##### **numbits**

The number of bits to right-shift by.

#### **Returns**

The `UInt64` object.

### **uint64:rol(numbits)**

Returns a **UInt64** of the bitwise left rotation operation, by the given number of bits (up to 63).

Since: 1.11.3

#### **Arguments**

##### **numbits**

The number of bits to roll left by.

#### **Returns**

The **UInt64** object.

### **uint64:ror(numbits)**

Returns a **UInt64** of the bitwise right rotation operation, by the given number of bits (up to 63).

Since: 1.11.3

#### **Arguments**

##### **numbits**

The number of bits to roll right by.

#### **Returns**

The **UInt64** object.

### **uint64:bswap()**

Returns a **UInt64** of the bytes swapped. This can be used to convert little-endian 64-bit numbers to big-endian 64 bit numbers or vice versa.

Since: 1.11.3

#### **Returns**

The **UInt64** object.

## **Binary encode/decode support**

The Struct class offers basic facilities to convert Lua values to and from C-style structs in binary Lua strings. This is based on Roberto Ierusalimschy's Lua struct library found in <http://www.inf.puc-rio.br/~roberto/struct/>, with some minor modifications as follows:

- Added support for **Int64/UInt64** being packed/unpacked, using 'e'/'E'.

- Can handle 'long long' integers (i8 / I8); though they're converted to doubles.
- Can insert/specify padding anywhere in a struct. ('X' eg. when a string is following a union).
- Can report current offset in both `pack` and `unpack` ('=').
- Can mask out return values when you only want to calculate sizes or unmarshal pascal-style strings using '(' & ')'.

All but the first of those changes are based on an email from Flemming Madsen, on the lua-users mailing list, which can be found [here](#).

The main functions are `Struct.pack`, which packs multiple Lua values into a struct-like Lua binary string; and `Struct.unpack`, which unpacks multiple Lua values from a given struct-like Lua binary string. There are some additional helper functions available as well.

All functions in the Struct library are called as static member functions, not object methods, so they are invoked as "Struct.pack(...)" instead of "object:pack(...)".

The first argument to several of the `Struct` functions is a format string, which describes the layout of the structure. The format string is a sequence of conversion elements, which respect the current endianness and the current alignment requirements. Initially, the current endianness is the machine's native endianness and the current alignment requirement is 1 (meaning no alignment at all). You can change these settings with appropriate directives in the format string.

The supported elements in the format string are as follows:

- `` `` (empty space) ignored.
- ``!n'` flag to set the current alignment requirement to 'n' (necessarily a power of 2); an absent 'n' means the machine's native alignment.
- ``>'` flag to set mode to big endian (i.e., network-order).
- ``<'` flag to set mode to little endian.
- ``x'` a padding zero byte with no corresponding Lua value.
- ``b'` a signed char.
- ``B'` an unsigned char.
- ``h'` a signed short (native size).
- ``H'` an unsigned short (native size).
- ``l'` a signed long (native size).
- ``L'` an unsigned long (native size).
- ``T'` a `size_t` (native size).
- ``in'` a signed integer with 'n' bytes. An absent 'n' means the native size of an int.
- ``In'` like ``in'` but unsigned.



- ``e'` signed 8-byte Integer (64-bits, long long), to/from a Int64 object.
- ``E'` unsigned 8-byte Integer (64-bits, long long), to/from a UInt64 object.
- ``f'` a float (native size).
- ``d'` a double (native size).
- ``s'` a zero-terminated string.
- ``cn'` a sequence of exactly 'n' chars corresponding to a single Lua string. An absent 'n' means 1. When packing, the given string must have at least 'n' characters (extra characters are discarded).
- ``c0'` this is like ``cn'`, except that the 'n' is given by other means: When packing, 'n' is the length of the given string; when unpacking, 'n' is the value of the previous unpacked value (which must be a number). In that case, this previous value is not returned.
- ``xn'` pad to 'n' number of bytes, default 1.
- ``Xn'` pad to 'n' alignment, default MAXALIGN.
- ``('` to stop assigning items, and ``)'` start assigning (padding when packing).
- ``='` to return the current position / offset.

Using `i`, `I`, `h`, `H`, `l`, `L`, `f`, and `T` is strongly discouraged, as those sizes are system-dependent. Use the explicitly sized variants instead, such as `i4` or `E`.

#### NOTE

Unpacking of `i/I` is done to a Lua number, a double-precision floating point, so unpacking a 64-bit field (`i8/I8`) will lose precision. Use `e/E` to unpack into a Wireshark `Int64/UInt64` object instead.

Since: 1.11.3

## Struct

### **Struct.pack(format, value)**

Returns a string containing the values `arg1`, `arg2`, etc. packed/encoded according to the format string.

### Arguments

#### **format**

The format string

#### **value**

One or more Lua value(s) to encode, based on the given format.

### Returns

The packed binary Lua string, plus any positions due to '=' being used in format.

### **Struct.unpack(format, struct, [begin])**

Unpacks/decodes multiple Lua values from a given struct-like binary Lua string. The number of returned values depends on the format given, plus an additional value of the position where it stopped reading is returned.

#### **Arguments**

##### **format**

The format string

##### **struct**

The binary Lua string to unpack

##### **begin (optional)**

The position to begin reading from (default=1)

#### **Returns**

One or more values based on format, plus the position it stopped unpacking.

### **Struct.size(format)**

Returns the length of a binary string that would be consumed/handled by the given format string.

#### **Arguments**

##### **format**

The format string

#### **Returns**

The size number

### **Struct.values(format)**

Returns the number of Lua values contained in the given format string. This will be the number of returned values from a call to Struct.unpack() not including the extra return value of offset position. (i.e., Struct.values() does not count that extra return value) This will also be the number of arguments Struct.pack() expects, not including the format string argument.

#### **Arguments**

##### **format**

The format string

## Returns

The number of values

### **Struct.tohex**(bytestring, [lowercase], [separator])

Converts the passed-in binary string to a hex-ascii string.

## Arguments

### **bytestring**

A Lua string consisting of binary bytes

### **lowercase (optional)**

True to use lower-case hex characters (default=false).

### **separator (optional)**

A string separator to insert between hex bytes (default=nil).

## Returns

The Lua hex-ascii string

### **Struct.fromhex**(hexbytes, [separator])

Converts the passed-in hex-ascii string to a binary string.

## Arguments

### **hexbytes**

A string consisting of hexadecimal bytes like "00 B1 A2" or "1a2b3c4d"

### **separator (optional)**

A string separator between hex bytes/words (default none).

## Returns

The Lua binary string

## GLib Regular Expressions

Lua has its own native *pattern* syntax in the string library, but sometimes a real regex engine is more useful. Wireshark comes with GLib's Regex implementation, which itself is based on Perl Compatible Regular Expressions (PCRE). This engine is exposed into Wireshark's Lua engine through the well-known Lrexlib library, following the same syntax and semantics as the Lrexlib PCRE implementation, with a few differences as follows:

- There is no support for using custom locale/chartables
- `dfa_exec()` doesn't take `ovecsize` nor `wscount` arguments
- `dfa_exec()` returns boolean true for partial match, without subcapture info
- Named subgroups do not return name-keyed entries in the return table (i.e., in `match/tfind/exec`)
- The `flags()` function still works, returning all flags, but two new functions `compile_flags()` and `match_flags()` return just their respective flags, since GLib has a different and smaller set of such flags, for regex compile vs. match functions
- Using some assertions and POSIX character classes against strings with non-ASCII characters might match high-order characters, because glib always sets PCRE\_UCP even if G\_REGEX\_RAW is set. For example, `[:alpha;]` matches certain non-ASCII bytes. The following assertions have this issue: `|b`, `|B`, `|s`, `|S`, `|w`, `|W`. The following character classes have this issue: `[:alpha:]`, `[:alnum:]`, `[:lower:]`, `[:upper:]`, `[:space:]`, `[:word:]`, and `[:graph:]`.
- The compile flag G\_REGEX\_RAW is always set/used, even if you didn't specify it. This is because GLib runs PCRE in UTF-8 mode by default, whereas Lua strings are not UTF-aware.

Since: 1.11.3

This page is based on the full documentation for Lrexlib at <https://rrthomas.github.io/lrexlib/manual.html>

The GLib Regular expression syntax (which is essentially PCRE syntax) can be found at <https://developer.gnome.org/glib/2.38/glib-regex-syntax.html>

## GRegex

GLib Regular Expressions based on PCRE.

Since: 1.11.3

### Notes

All functions that take a regular expression pattern as an argument will generate an error if that pattern is found invalid by the regex library.

All functions that take a string-type regex argument accept a compiled regex too. In this case, the compile flags argument is ignored (should be either supplied as nils or omitted).

The capture flag argument `cf` may also be supplied as a string, whose characters stand for compilation flags. Combinations of the following characters (case sensitive) are supported:

- `i` = G\_REGEX\_CASELESS - Letters in the pattern match both upper- and lowercase letters. This option can be changed within a pattern by a "(?i)" option setting.
- `m` = G\_REGEX\_MULTILINE - By default, GRegex treats the strings as consisting of a single line of

characters (even if it actually contains newlines). The “start of line” metacharacter (“^”) matches only at the start of the string, while the “end of line” metacharacter (“\$”) matches only at the end of the string, or before a terminating newline (unless `G_REGEX_DOLLAR_ENDONLY` is set). When `G_REGEX_MULTILINE` is set, the “start of line” and “end of line” constructs match immediately following or immediately before any newline in the string, respectively, as well as at the very start and end. This can be changed within a pattern by a “(?m)” option setting.

- `s = G_REGEX_DOTALL` - A dot metacharacter (“.”) in the pattern matches all characters, including newlines. Without it, newlines are excluded. This option can be changed within a pattern by a “(?s)” option setting.
- `x = G_REGEX_EXTENDED` - Whitespace data characters in the pattern are totally ignored except when escaped or inside a character class. Whitespace does not include the VT character (code 11). In addition, characters between an unescaped “#” outside a character class and the next newline character, inclusive, are also ignored. This can be changed within a pattern by a “(?x)” option setting.
- `U = G_REGEX_UNGREEDY` - Inverts the “greediness” of the quantifiers so that they are not greedy by default, but become greedy if followed by “?”. It can also be set by a “(?U)” option setting within the pattern.

### **GRegex.new(pattern)**

Compiles regular expression pattern into a regular expression object whose internal representation is corresponding to the library used. The returned result then can be used by the methods, e.g. `match`, `exec`, etc. Regular expression objects are automatically garbage collected.

Since: 1.11.3

### **Arguments**

#### **pattern**

A Perl-compatible regular expression pattern string

### **Returns**

The compiled regular expression (a userdata object)

### **Errors**

- A malformed pattern generates a Lua error

### **GRegex.flags([table])**

Returns a table containing the numeric values of the constants defined by the regex library, with the keys being the (string) names of the constants. If the table argument is supplied then it is used as the output table, otherwise a new table is created. The constants contained in the returned table can then be used in most functions and methods where compilation flags or execution flags can be

specified. They can also be used for comparing with return codes of some functions and methods for determining the reason of failure.

Since: 1.11.3

### Arguments

#### **table (optional)**

A table for placing results into

### Returns

A table filled with the results.

#### **GRegex.compile\_flags([table])**

Returns a table containing the numeric values of the constants defined by the regex library for compile flags, with the keys being the (string) names of the constants. If the table argument is supplied then it is used as the output table, otherwise a new table is created.

Since: 1.11.3

### Arguments

#### **table (optional)**

A table for placing results into

### Returns

A table filled with the results.

#### **GRegex.match\_flags([table])**

Returns a table containing the numeric values of the constants defined by the regex library for match flags, with the keys being the (string) names of the constants. If the table argument is supplied then it is used as the output table, otherwise a new table is created.

Since: 1.11.3

### Arguments

#### **table (optional)**

A table for placing results into

### Returns

A table filled with the results.

## **GRegex.match(subject, pattern, [init], [cf], [ef])**

Searches for the first match of the regexp pattern in the string subject, starting from offset init, subject to flags cf and ef. The pattern is compiled each time this is called, unlike the class method *match* function.

Since: 1.11.3

### **Arguments**

#### **subject**

Subject string to search

#### **pattern**

A Perl-compatible regular expression pattern string or GRegex object

#### **init (optional)**

start offset in the subject (can be negative)

#### **cf (optional)**

compilation flags (bitwise OR)

#### **ef (optional)**

match execution flags (bitwise OR)

### **Returns**

On success, returns all substring matches ("captures"), in the order they appear in the pattern. *false* is returned for sub-patterns that did not participate in the match. If the pattern specified no captures then the whole matched substring is returned. On failure, returns *nil*.

## **GRegex.find(subject, pattern, [init], [cf], [ef])**

Searches for the first match of the regexp pattern in the string subject, starting from offset init, subject to flags ef. The pattern is compiled each time this is called, unlike the class method *find* function.

Since: 1.11.3

### **Arguments**

#### **subject**

Subject string to search

#### **pattern**

A Perl-compatible regular expression pattern string or GRegex object

**init (optional)**

start offset in the subject (can be negative)

**cf (optional)**

compilation flags (bitwise OR)

**ef (optional)**

match execution flags (bitwise OR)

**Returns**

On success, returns the start point of the match (a number), the end point of the match (a number), and all substring matches ("captures"), in the order they appear in the pattern. false is returned for sub-patterns that did not participate in the match. On failure, returns nil.

**GRegex.gmatch(subject, pattern, [init], [cf], [ef])**

Returns an iterator for repeated matching of the pattern patt in the string subj, subject to flags cf and ef. The function is intended for use in the generic for Lua construct. The pattern can be a string or a GRegex object previously compiled with GRegex.new().

Since: 1.11.3

**Arguments****subject**

Subject string to search

**pattern**

A Perl-compatible regular expression pattern string or GRegex object

**init (optional)**

start offset in the subject (can be negative)

**cf (optional)**

compilation flags (bitwise OR)

**ef (optional)**

match execution flags (bitwise OR)

**Returns**

The iterator function is called by Lua. On every iteration (that is, on every match), it returns all captures in the order they appear in the pattern (or the entire match if the pattern specified no captures). The iteration will continue till the subject fails to match.



## **GRegex.gsub(subject, pattern, [repl], [max], [cf], [ef])**

Searches for all matches of the pattern in the string subject and replaces them according to the parameters repl and max. The pattern can be a string or a GRegex object previously compiled with GRegex.new().

Since: 1.11.3

For details see: <https://rrthomas.github.io/lrexlib/manual.html#gsub>

### **Arguments**

#### **subject**

Subject string to search

#### **pattern**

A Perl-compatible regular expression pattern string or GRegex object

#### **repl (optional)**

Substitution source string, function, table, false or nil

#### **max (optional)**

Maximum number of matches to search for, or control function, or nil

#### **cf (optional)**

Compilation flags (bitwise OR)

#### **ef (optional)**

Match execution flags (bitwise OR)

### **Returns**

On success, returns the subject string with the substitutions made, the number of matches found, and the number of substitutions made.

## **GRegex.split(subject, sep, [cf], [ef])**

Splits a subject string subj into parts (sections). The sep parameter is a regular expression pattern representing separators between the sections. The function is intended for use in the generic for Lua construct. The function returns an iterator for repeated matching of the pattern sep in the string subj, subject to flags cf and ef. The sep pattern can be a string or a GRegex object previously compiled with GRegex.new(). Unlike gmatch, there will always be at least one iteration pass, even if there are no matches in the subject.

Since: 1.11.3

### **Arguments**

**subject**

Subject string to search

**sep**

A Perl-compatible regular expression pattern string or GRegex object

**cf (optional)**

compilation flags (bitwise OR)

**ef (optional)**

match execution flags (bitwise OR)

**Returns**

The iterator function is called by Lua. On every iteration, it returns a subject section (can be an empty string), followed by all captures in the order they appear in the sep pattern (or the entire match if the sep pattern specified no captures). If there is no match (this can occur only in the last iteration), then nothing is returned after the subject section. The iteration will continue till the end of the subject.

**GRegex.version()**

Returns a returns a string containing the version of the used library.

Since: 1.11.3

**Returns**

The version string

**regex:match(subject, [init], [ef])**

Searches for the first match of the regexp pattern in the string subject, starting from offset init, subject to flags ef.

Since: 1.11.3

**Arguments****subject**

Subject string to search

**init (optional)**

start offset in the subject (can be negative)

**ef (optional)**

match execution flags (bitwise OR)

## Returns

On success, returns all substring matches (“captures”), in the order they appear in the pattern. `false` is returned for sub-patterns that did not participate in the match. If the pattern specified no captures then the whole matched substring is returned. `nil` is returned if the pattern did not match.

### **gregex:find(subject, [init], [ef])**

Searches for the first match of the regexp pattern in the string `subject`, starting from offset `init`, subject to flags `ef`.

Since: 1.11.3

## Arguments

### **subject**

Subject string to search

### **init (optional)**

start offset in the subject (can be negative)

### **ef (optional)**

match execution flags (bitwise OR)

## Returns

On success, returns the start point of the match (a number), the end point of the match (a number), and all substring matches (“captures”), in the order they appear in the pattern. `false` is returned for sub-patterns that did not participate in the match. On failure, returns `nil`.

### **gregex:exec(subject, [init], [ef])**

Searches for the first match of the compiled GRegex object in the string `subject`, starting from offset `init`, subject to the execution match flags `ef`.

Since: 1.11.3

## Arguments

### **subject**

Subject string to search

### **init (optional)**

start offset in the subject (can be negative)

### **ef (optional)**

match execution flags (bitwise OR)

## Returns

On success, returns the start point of the first match (a number), the end point of the first match (a number), and the offsets of substring matches (“captures” in Lua terminology) are returned as a third result, in a table. This table contains false in the positions where the corresponding sub-pattern did not participate in the match. On failure, returns nil. Example: If the whole match is at offsets 10,20 and substring matches are at offsets 12,14 and 16,19 then the function returns the following: 10, 20, { 12,14,16,19 }.

### **gregex:dfa\_exec(subject, [init], [ef])**

Matches a compiled regular expression GRegex object against a given subject string subj, using a DFA matching algorithm.

Since: 1.11.3

## Arguments

### **subject**

Subject string to search

### **init (optional)**

start offset in the subject (can be negative)

### **ef (optional)**

match execution flags (bitwise OR)

## Returns

On success, returns the start point of the matches found (a number), a table containing the end points of the matches found, the longer matches first, and the number of matches found as the third return value. On failure, returns nil. Example: If there are 3 matches found starting at offset 10 and ending at offsets 15, 20 and 25 then the function returns the following: 10, { 25,20,15 }, 3

### **gregex:\_\_tostring()**

Returns a string containing debug information about the GRegex object.

Since: 1.11.3

## Returns

The debug string

# User Interface

## Introduction

Wireshark can be logically separated into the backend (dissecting protocols, file loading and saving, capturing, etc.) and the frontend (the user interface).

The following frontends are currently maintained by the Wireshark development team:

- Wireshark, Qt based
- TShark, console based

This chapter is focused on the Wireshark frontend, and especially on the Qt interface.

## The Qt Application Framework

Qt is a cross-platform application development framework. While we mainly use the core (QtCore) and user interface (QtWidgets) modules, it also supports a number of other modules for specialized application development, such as networking (QtNetwork) and web browsing (QtWebKit).

At the time of this writing (September 2016) most of the main Wireshark application has been ported to Qt. The sections below provide an overview of the application and tips for Qt development in our environment.

### User Experience Considerations

When creating or modifying Wireshark try to make sure that it will work well on Windows, macOS, and Linux. See [Human Interface Reference Documents](#) for details. Additionally, try to keep the following in mind:

**Workflow.** Excessive navigation and gratuitous dialogs should be avoided or reduced. For example, compared to the legacy UI many alert dialogs have been replaced with status bar messages. Statistics dialogs are displayed immediately instead of requiring that options be specified.

**Discoverability and feedback.** Most users don't like to read documentation and instead prefer to learn an application as they use it. Providing feedback increases your sense of control and awareness, and makes the application more enjoyable to use. Most of the Qt dialogs provide a "hint" area near the bottom which shows useful information. For example, the "Follow Stream" dialog shows the packet corresponding to the text under the mouse. The profile management dialog shows a clickable path to the current profile. The main welcome screen shows live interface traffic. Most dialogs have a context menu that shows keyboard shortcuts.

## Qt Creator

Qt Creator is a full-featured IDE and user interface editor. It makes adding new UI features much easier. It doesn't work well on Windows at the present time, so it's recommended that you use it on macOS or Linux.

To edit and build Wireshark using Qt Creator, open the top-level *CMakeLists.txt* within Qt Creator. It should ask you to choose a build location. Do so. It should then ask you to run CMake. Fill in any desired build arguments (e.g. `-D CMAKE_BUILD_TYPE=Debug` or `-D ENABLE_CCACHE=ON`) and click the **[ Run CMake ]** button. When that completes select **Build > Open Build and Run Kit Selector...** and make sure *wireshark* is selected.

Note that Qt Creator uses output created by CMake's "CodeBlocks" generator. If you run CMake outside of Qt Creator you should use the "CodeBlocks - Unix Makefiles" generator, otherwise Qt Creator will prompt you to re-run CMake.

## Source Code Overview

Wireshark's `main` entry point is in *ui/qt/main.cpp*. Command-line arguments are processed there and the main application class (*WiresharkApplication*) instance is created there along with the main window.

The main window along with the rest of the application resides in *ui/qt*. Due to its size the main window code is split into two modules, *main\_window.cpp* and *main\_window\_slots.cpp*.

Most of the modules in *ui/qt* are dialogs. Although we follow Qt naming conventions for class names, we follow our own conventions by separating file name components with underscores. For example, *ColoringRulesDialog* is defined in *coloring\_rules\_dialog.cpp*, *coloring\_rules\_dialog.h*, and *coloring\_rules\_dialog.ui*.

General-purpose dialogs are subclasses of *QDialog*. Dialogs that rely on the current capture file can subclass *WiresharkDialog*, which provides methods and members that make it easier to access the capture file and to keep the dialog open when the capture file closes.

## Coding Practices and Naming Conventions

### Names

The code in *ui/qt* directory uses three APIs: Qt (which uses upper camel case), GLib (which uses snake\_case), and the Wireshark API (which also uses snake\_case).

As a general rule, for names, Wireshark's Qt code:

- uses upper camel case, in which words in the name are not separated by underscores, and the first letter of each word is capitalized, for classes, for example, `PacketList`;
- uses lower camel case, in which words in the name are not separated by underscores, and the

first letter of each word other than the first word is capitalized, for methods, for example, `resetColumns`;

- uses snake case, in which words in the name are separated by underscores, and the first letter of the word is not capitalized, for variables, with a trailing underscore used for member variables, for example, `packet_list_model_`.

## Dialogs

Dialogs that work with capture file information shouldn't close just because the capture file closes. Subclassing `WiresharkDialog` as described above can make it easier to persist across capture files.

When you create a window with a row of standard “OK” and “Close” buttons at the bottom using Qt Creator you will end up with a subclass of `QDialog`. This is fine for traditional modal dialogs, but many times the “dialog” needs to behave like a `QWindow` instead.

Modal dialogs should be constructed with `QDialog(parent)`. Modeless dialogs (windows) should be constructed with `QDialog(NULL, Qt::Window)`. Other combinations (particularly `QDialog(parent, Qt::Window)`) can lead to odd and inconsistent behavior. Again, subclassing `WiresharkDialog` will take care of this for you.

Most of the dialogs in `ui/qt` share many similarities, including method names, widget names, and behavior. Most dialogs should have the following, although it's not strictly required:

- An `updateWidgets()` method, which enables and disables widgets depending on the current state and constraints of the dialog. For example, the Coloring Rules dialog disables the **Save** button if the user has entered an invalid display filter.
- A `hintLabel()` widget subclassed from `QLabel` or `ElidedLabel`, placed just above the dialog button box. The hint label provides guidance and feedback to the user.
- A context menu (`ctx_menu_`) for additional actions not present in the button box.
- If the dialog box contains a `QTreeWidget` you might want to add your own `QTreeWidgetItem` subclass with the following methods:

### `drawData()`

Draws column data with any needed formatting.

### `colData()`

Returns the data for each column as a `QVariant`. Used for copying as CSV, YAML, etc.

### `operator<()`

Allows sorting columns based on their raw data.

## Strings

Wireshark's C code and GLib use UTF-8 encoded character arrays. Qt (specifically `QString`) uses UTF-16. You can convert a `char *` to a `QString` using simple assignment. You can convert a `QString` to

a `const char *` using `QString::toUtf8`.

If you're using GLib string functions or plain old C character array idioms in Qt-only code you're probably doing something wrong, particularly if you're manually allocating and releasing memory. `QString`s are generally **much** safer and easier to use. They also make translations easier.

If you need to pass strings between Qt and GLib you can use a number of convenience routines which are defined in `ui/qt/utills/qt_ui_utills.h`.

If you're calling a function that returns wmem-allocated memory it might make more sense to add a wrapper function to `qt_ui_utills` than to call `wmem_free` in your code.

## Mixing C and C++

Sometimes we have to call C++ functions from one of Wireshark's C callbacks and pass C++ objects to or from C. Tap listeners are a common example. The C++ FAQ [describes how to do this safely](#).

Tapping usually involves declaring static methods for callbacks, passing `this` as the tap data.

## Internationalization and Translation

Qt provides a convenient method for translating text: `QObject::tr()`, usually available as `tr()`.

However, please avoid using `tr()` for static strings and define them in `*.ui` files instead. `tr()` on manually created objects like `QMenu` are not automatically retranslated and must instead be manually translated using `changeEvent()` and `retranslateUi()`. See `ui/qt/main_window.cpp` for an example of this.

### NOTE

If your object life is short and your components are (re)created dynamically then it is ok to use `tr()`.

In most cases you should handle the `changeEvent` in order to catch `QEvent::LanguageChange`.

Qt makes translating the Wireshark UI into different languages easy. To add a new translation, do the following:

- Add your translation (`ui/qt/wireshark_XX.ts`) to `ui/qt/CMakeLists.txt`
- (Recommended) Add a flag image for your language in `image/languages/XX.svg`. Update `image/languages/languages.qrc` accordingly.
- Run `lupdate ui/qt -ts ui/qt/wireshark_XX.ts` to generate/update your translation file.
- Add `ui/qt/wireshark_XX.ts` to `.tx/config`.
- Translate with Qt Linguist: `linguist ui/qt/wireshark_XX.ts`.
- Do a test build and make sure the generated `wireshark_XX.qm` binary file is included.
- Push your translation to GitLab for review. See [Contribute Your Changes](#) for details.



Alternatively you can put your QM and flag files in the *languages* directory in the Wireshark user configuration directory (`$XDG_CONFIG_HOME/wireshark/languages/` or `$HOME/.wireshark/languages/` on UNIX).

For more information about Qt Linguist see [its manual](#).

You can also manage translations online with [Transifex](#). Translation resources are organized by type of translation and development branch:

### **master**

Qt Linguist resources in the *ui/qt* in the master branch.

### **debian**

GNU gettext resources in the *debian* directory in the master branch.

### **qt-XY, master-XY**

Qt Linguist resources in the *ui/qt* in the *X.Y* release branch. For example, qt-34 matches the Wireshark 3.2 release branch.

### **po-XY, debian-XY**

GNU gettext (.po) resources in the *debian* directory in the *X.Y* release branch. For example, po-34 matches the Wireshark 3.4 release branch.

Each week translations are automatically synchronized with the source code through the following steps:

- Pull changes from Transifex by running `tx pull -f`.
- Run `lupdate` on the ts files.
- Push and commit on Gerrit.
- Push changes to Transifex by running `tx push`.

## **Colors And Themes**

Qt provides a number of colors via the `QPalette` class. Use this class when you need a standard color provided by the underlying operating system.

Wireshark uses an extended version of the [Tango Color Palette](#) for many interface elements that require custom colors. This includes the I/O graphs, sequence diagrams, and RTP streams. Please use this palette (defined in `tango_colors.h` and the `ColorUtils` class) if `QPalette` doesn't meet your needs.

Wireshark supports dark themes (aka “dark mode”) on some platforms. We leverage Qt's dark theme support when possible, but have implemented our own support and workarounds in some cases. You can ensure that your code includes proper dark theme support by doing the following:

- You can use a macOS-style template icon by creating a monochrome SVG document with

“.template” appended to the name, e.g. `image/stock_icons/24x24/edit-find.template.svg`.

- Qt draws unvisited links `Qt::blue` no matter what. You can work around this by using `ColorUtils::themeLinkBrush()` and `ColorUtils::themeLinkStyle()`.
- You can catch dark and light mode changes by handling `QEvent::ApplicationPaletteChange`.

## Other Issues and Information

The main window has many `QActions` which are shared with child widgets. See `ui/qt/proto_tree.cpp` for an example of this.

To demonstrate the functionality of the plugin interface options, a demonstration plugin exists (`pluginifdemo`). See `doc/README.plugins` and `plugins/epan/pluginifdemo`.

`GammaRay` lets you inspect the internals of a running Qt application similar to `Spy++` on Windows.

## Human Interface Reference Documents

Wireshark runs on a number of platforms, primarily Windows, macOS, and Linux. It should conform to the Windows, macOS, GNOME, and KDE human interface guidelines as much as possible. Unfortunately, creating a feature that works well across these platforms can sometimes be a juggling act since the human interface guidelines for each platform often contradict one another. If you run into trouble you can ask the `wireshark-dev` mailing list as well as the User Experience Stack Exchange listed below.

For further reference, see the following:

- Android Design: <https://developer.android.com/design/>. Wireshark doesn't have a mobile frontend (not yet, at least) but there is still useful information here.
- GNOME Human Interface Guidelines: <https://developer.gnome.org/hig/stable/>
- KDE Human Interface Guidelines: <https://hig.kde.org>
- macOS Human Interface Guidelines: <https://developer.apple.com/design/human-interface-guidelines/macos/overview/themes/>
- Design guidelines for the Windows desktop: <https://docs.microsoft.com/en-us/windows/desktop/uxguide/guidelines>
- User Experience Stack Exchange: <https://ux.stackexchange.com/>

# Wireshark Tests

The Wireshark sources include a collection of Python scripts that test the features of Wireshark, TShark, Dumpcap, and other programs that accompany Wireshark. These are located in the `test` directory of the Wireshark source tree.

The command line options of Wireshark and its companion command line tools are numerous. These tests help to ensure that we don't introduce bugs as Wireshark grows and evolves.

## Quick Start

The recommended steps to prepare for and to run tests:

- Install two Python packages, `pytest`: `pip install pytest pytest-xdist`
- Build programs (“wireshark”, “tshark”, etc.): `ninja`
- Build additional programs for the “unittests” suite: `ninja test-programs`
- Run tests in the build directory: `pytest`

Replace `ninja test-programs` by `make test-programs` as needed.

The test suite will attempt to test as much as possible and skip tests when its dependencies are not satisfied. For example, packet capture tests require a Loopback interface and capture privileges. To avoid capture tests, pass the `--disable-capture` option.

List available tests with `pytest --collectonly`. Enable verbose output with `pytest --verbose`. For more details, see [Listing And Running Tests \(pytest\)](#).

If for whatever reason `pytest` is too old or unavailable, you could use a more limited test runner, `test/test.py`. Use `test/test.py --help` to see all options. For more details, see [Listing And Running Tests](#).

CMake currently runs `test/test.py` when the “test” target is built.

## Test suite structure

The following sections describes how the test suite is organized.

### Test Coverage And Availability

The testing framework can run programs and check their stdout, stderr, and exit codes. It cannot interact with the Wireshark UI. Tests cover capture, command line options, decryption, file format support and conversion, Lua scripting, and other functionality.

Available tests depend on the libraries with which Wireshark was built. For example, some

decryption tests depend on a minimum version of Libgcrypt and Lua tests depend on Lua.

Capture tests depend on the permissions of the user running the test script. We assume that the test user has capture permissions on Windows and macOS and capture tests are enabled by default on those platforms.

If a feature is unavailable, the test will be skipped. For example, if an old version of Libgcrypt is in use, then some decryption tests will be skipped while other tests can still run to completion.

## Suites, Cases, and Tests

The `test/test.py` script uses Python’s “unittest” module. Our tests are patterned after it, and individual tests are organized according to suites, cases, and individual tests. Suites correspond to python modules that match the pattern “suite\_\*.py”. Cases correspond to one or more classes in each module, and case class methods matching the pattern “test\_\*” correspond to individual tests. For example, the invalid capture filter test in the TShark capture command line options test case in the `command_line_options_suite` has the ID “suite\_clopts.case\_tshark\_capture\_clopts.test\_tshark\_invalid\_capfilter”.

## pytest fixtures

A test has typically additional dependencies, like the path to an executable, the path to a capture file, a configuration directory, the availability of an optional library, and so on. The Python unittest library is quite limited in expressing test dependencies, these are typically specified on the class instance itself (`self`) or via globals.

`pytest` is a better test framework which has full parallelization support (test-level instead of just suite-level), provides nicer test reports, and allows [modular fixtures](#). Ideally the test suite should fully switch to `pytest`, but in meantime a compatibility layer is provided via the “fixtures” module.

A fixture is a function decorated with `@fixtures.fixture` and can either call `fixtures.skip("reason")` to skip tests that depend on the fixture, or return/yield a value. Test functions (and other fixture functions) can receive the fixture value by using the name of the fixture function as function parameters. Common fixtures are available in `fixtures_ws.py` and includes `cmd_tshark` for the path to the `tshark` executable and `capture_file` for a factory function that produces the path to a capture file.

Each unittest test case must be decorated with `@fixtures.uses_fixtures` to ensure that unittest test classes can actually request fixture dependencies.

## Listing And Running Tests

Tests can be run via the `test/test.py` Python script. To run all tests, either run `test/test.py` in the directory that contains the Wireshark executables (`wireshark`, `tshark`, etc.), or pass the executable path via the `-p` flag:

```
$ python3 test/test.py -p /path/to/wireshark-build/run
```

You can list tests by passing one or more complete or partial names to `tshark.py`. The `-l` flag lists tests. By default all tests are shown.

```
# List all tests
$ python3 test/test.py -l
$ python3 test/test.py -l all
$ python3 test/test.py --list
$ python3 test/test.py --list all

# List only tests containing "dumpcap"
$ python3 test/test.py -l dumpcap

# List all suites
$ python3 test/test.py --list-suites

# List all suites and cases
$ python3 test/test.py --list-cases
```

If one of the listing flags is not present, tests are run. If no names or `all` is supplied, all tests are run. Otherwise tests that match are run.

```
# Run all tests
$ python3 test/test.py
$ python3 test/test.py all

# Only run tests containing "dumpcap"
$ python3 test/test.py dumpcap

# Run the "clopts" suite
$ python3 test/test.py suite_clopts
```

Run `python3 test/test.py --help` for all available options.

## Listing And Running Tests (pytest)

Tests can also be run with `pytest`. Advantages include finer test selection, full parallelism, nicer test execution summaries, better output in case of failures (containing the contents of variables) and the ability to open the PDB debugger on failing tests.

To get started, install `pytest 3.0` or newer and `pytest-xdist`:

```
# Install required packages on Ubuntu 18.04 or Debian jessie-backports
$ sudo apt install python3-pytest python3-pytest-xdist

# Install required packages on other systems
$ pip install pytest pytest-xdist
```

Run `pytest` in the Wireshark build directory, Wireshark binaries are assumed to be present in the `run` subdirectory (or `run\Re1WithDebInfo` on Windows).

```
# Run all tests
$ cd /path/to/wireshark/build
$ pytest

# Run all except capture tests
$ pytest --disable-capture

# Run all tests with "decryption" in its name
$ pytest -k decryption

# Run all tests with an explicit path to the Wireshark executables
$ pytest --program-path /path/to/wireshark/build/run
```

To list tests without actually executing them, use the `--collect-only` option:

```
# List all tests
$ pytest --collect-only

# List only tests containing both "dfilter" and "tvb"
$ pytest --collect-only -k "dfilter and tvb"
```

The test suite will fail tests when programs are missing. When only a subset of programs are built or when some programs are disabled, then the test suite can be instructed to skip instead of fail tests:

```
# Run tests when libpcap support is disabled (-DENABLE_PCAP=OFF)
$ pytest --skip-missing-programs dumpcap,rawshark

# Run tests and ignore all tests with missing program dependencies
$ pytest --skip-missing-programs all
```

To open a Python debugger (PDB) on failing tests, use the `--pdb` option and disable parallelism with the `-n0` option:

```
# Run decryption tests sequentially and open a debugger on failing tests
$ pytest -n0 --pdb -k decryption
```

Note that with the option `--pdb`, stray processes are not killed on test failures since the `SubprocessTestCase.tearDown` method is not executed. This limitation might be addressed in the future.

## Adding Or Modifying Built-In Tests

Tests must be in a Python module whose name matches “suite\_\*.py”. The module must contain one or more subclasses of “SubprocessTestCase” or “unittest.TestCase”. “SubprocessTestCase” is recommended since it contains several convenience methods for running processes, normalizing and checking output, and displaying error information. Each test case method whose name starts with “test\_” constitutes an individual test.

Success or failure conditions can be signalled using the “unittest.assertXXX()” or “subprocesstest.assertXXX()” methods.

Test dependencies (such as programs, directories, or the environment variables) are injected through method parameters. Commonly used fixtures include `cmd_tshark` and `capture_file`. See also [pytest fixtures](#).

The “subprocesstest” class contains the following methods for running processes. Stdout and stderr is written to “<test id>.log”:

### **startProcess**

Start a process without waiting for it to finish.

### **runProcess**

Start a process and wait for it to finish.

### **assertRun**

Start a process, wait for it to finish, and check its exit code.

All of the current tests run one or more of Wireshark’s suite of executables and either check their return code or their output. A simple example is “suite\_clopts.case\_basic\_clopts.test\_existing\_file”, which reads a capture file using TShark and checks its exit code.

```

import subprocessesstest
import fixtures

@fixtures.mark_usefixtures('test_env')
@fixtures.uses_fixtures
class case_basic_clopts(subprocessesstest.SubprocessTestCase):
    def test_existing_file(self, cmd_tshark, capture_file):
        self.assertRun((cmd_tshark, '-r', capture_file('dhcp.pcap')))

```

Program output is decoded as UTF-8 and CRLF sequences (`\r\n`) are converted to LFs (`\n`). Output can be checked using `SubprocessTestCase.grepOutput`, `SubprocessTestCase.countOutput` or other `unittest.assert*` methods:

```

import subprocessesstest
import fixtures

@fixtures.mark_usefixtures('test_env')
@fixtures.uses_fixtures
class case_decrypt_80211(subprocessesstest.SubprocessTestCase):
    def test_80211_wpa_psk(self, cmd_tshark, capture_file):
        tshark_proc = self.assertRun((cmd_tshark,
            '-o', 'wlan.enable_decryption: TRUE',
            '-Tfields',
            '-e', 'http.request.uri',
            '-r', capture_file('wpa-Induction.pcap.gz'),
            '-Y', 'http',
        ))
        self.assertIn('favicon.ico', tshark_proc.stdout_str)

```

Tests can be run in parallel. This means that any files you create must be unique for each test. “`subprocessesstest.filename_from_id`” can be used to generate a filename based on the current test name. It also ensures that the file will be automatically removed after the test has run.

## Adding Or Modifying External Tests

You can test the dissection of files outside the Wireshark source code repository by using the external test generator, which creates tests using a JSON configuration file. The file must have the following format:



```

{
  "case_name": "<test case name>",
  "tests": [
    {
      "test_name": "<test name>",
      "tshark_args": [ <tshark argument array> ],
      "requirements": [ <one or more requirements> ]
    }
  ]
}

```

`tshark_args` elements can use `#{case_dir}` to specify the path to the JSON configuration file. `requirements` can be one or more of

[ "count", "<pattern>", <count> ]

Require `count` occurrences of `pattern` in the dissection output. Equivalent to the built-in Python `assertEqual(countOutput('<pattern>'), <count>)`

[ "grep", "<pattern>" ]

Dissection output must contain `pattern`. Equivalent to `assertTrue(grepOutput('<pattern>'))`.

[ "!grep", "<pattern>" ]

Dissection output must *not* contain `pattern`. Equivalent to `assertFalse(grepOutput('<pattern>'))`.

[ "in", "<string>", <line> ]

Zero-indexed line `line` of the dissection output must contain `string`. Equivalent to `assertIn('<pattern>', lines[<line>])`.

[ "!in", "<string>", <line> ]

Zero-indexed line `line` of the dissection output must *not* contain `string`. Equivalent to `assertNotIn('<pattern>', lines[<line>])`.

Patterns can be any valid Python regular expression.

The example below defines a single test case, named “external\_example”. The case has a single test named “dns”, which runs TShark on `tests/dns-1/dns.pcapng`, relative to the JSON configuration file.

```

{
  "case_name": "external_example",
  "tests": [
    {
      "test_name": "dns",
      "tshark_args": [ "-r", "${case_dir}/tests/dns-1/dns.pcapng",
        "-Y", "dns", "-T", "fields", "-e", "dns.qry.name"
      ],
      "requirements": [
        [ "count", "in.m.yahoo.com", 1 ],
        [ "grep", "in.m.yahoo.com" ],
        [ "!grep", "in.m.notyahoo.com" ],
        [ "in", "in.m.yahoo.com", 0 ],
        [ "!in", "in.m.notyahoo.com", 0 ]
      ]
    }
  ]
}

```

You can specify external tests using the `test.py --add-external-test`. For example, if the JSON file above is named `wireshark-tests.json` you can list its test by running the following:

```

$ ./test/test.py -p ./build/run --add-external-test /path/to/wireshark-tests.json
--list external
suite_external.case_external_example.test_dns

```

# Creating ASN.1 Dissectors

The `asn2wrs` compiler can be used to create a dissector from an ASN.1 specification of a protocol. It is a work in progress but has been used to create a number of dissectors.

It supports:

- ITU-T Recommendation [X.680](#) (07/2002), Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation
- ITU-T Recommendation [X.681](#) (07/2002), Information technology - Abstract Syntax Notation One (ASN.1): Information object specification
- ITU-T Recommendation [X.682](#) (07/2002), Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification
- ITU-T Recommendation [X.683](#) (07/2002), Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications

It has inbuilt support for:

- ITU-T Recommendation [X.880](#) (07/1994), Information technology - Remote Operations: Concepts, model and notation

## About ASN.1

The most useful first step in writing an ASN.1-based dissector is to learn about ASN.1. There are a number of free resources available to help with this. One collection of such resources is maintained on [the ASN.1 Consortium's web site](#).

## ASN.1 Dissector Requirements

The compiler needs 4 input files: an ASN.1 description of a protocol, a `.cnf` file, and two template files. The ASN.1 specification may have to be edited to work, however work is in progress to at least read all ASN.1 specifications. Changing the ASN.1 file is being deprecated as this creates problems when updating protocols. The H.248 Binary encoding dissector is a good example of a dissector with relatively small changes.

A complete [simple ASN.1 UDP-based dissector](#) is also available.

## Building An ASN.1-Based Plugin

The usual way to build an ASN.1-based dissector is to put it into the `epan/dissectors/asn1` subtree. This works well and is somewhat simpler than building as a plugin, but there are two reasons one might want to build as a plugin:

- To speed development, since only the plugin needs to be recompiled.

- To allow flexibility in deploying an updated plugin, since only the plugin needs to be distributed.

Reasons one might *not* want to build as a plugin:

- The code is somewhat more complex.
- The CMakeFile is quite a bit more complex.
- Building under the `asn1` subtree keeps all such dissectors together.

If you still think you'd like to build your module as a plugin, see [Building ASN1 Plugins](#).

## Understanding Error Messages

When running `asn2wrs`, you could get the following errors:

- A `LexToken` error (`main.ParseError: LexToken(DOT, '.',71)`) means that something is not understood in the ASN1 file, line 71, around the dot (`.`) - can be the dot itself.
- A `ParseError` (`main.ParseError: LexToken(SEMICOLON, ';',88)`) means that the `';` (`SEMICOLON`) is not understood. Maybe removing it will work?

## Hand-Massaging The ASN.1 File

If a portion of your ASN.1 file is unsupported you can modify it by hand as needed. However, the preferred way to resolve the issue is to report it on the [wireshark-dev](#) mailing list or in the issue tracker so that `asn2wrs` can be improved.

## Command Line Syntax

## ASN.1 to Wireshark dissector compiler

```
asn2wrs [-h|?] [-d dbg] [-b] [-p proto] [-c cnf_file] [-e] input_file(s) ...
-h|?      : Usage
-b        : BER (default is PER)
-u        : Unaligned (default is aligned)
-p proto  : Protocol name (implies -S). Default is module-name
           from input_file (renamed by #.MODULE if present)
-o name   : Output files name core (default is <proto>)
-O dir    : Output directory for dissector
-c cnf_file : Conformance file
-I path   : Path for conformance file includes
-e        : Create conformance file for exported types
-E        : Just create conformance file for exported types
-S        : Single output for multiple modules
-s template : Single file output (template is input file
           without .c/.h extension)
-k        : Keep intermediate files though single file output is used
-L        : Suppress #line directive from .cnf file
-D dir    : Directory for input_file(s) (default: '.')
-C        : Add check for SIZE constraints
-r prefix : Remove the prefix from type names

input_file(s) : Input ASN.1 file(s)

-d dbg      : Debug output, dbg = [l][y][p][s][a][t][c][m][o]
             l - lex
             y - yacc
             p - parsing
             s - internal ASN.1 structure
             a - list of assignments
             t - tables
             c - conformance values
             m - list of compiled modules with dependency
             o - list of output files
```

## Generated Files

Asn2wrs creates the following intermediate files:

- packet-prot0-ett.c
- packet-prot0-ettarr.c
- packet-prot0-fn.c
- packet-prot0-hf.c

- packet-proto-hfarr.c
- packet-proto-val.h
- packet-proto-exp.h
- packet-proto-table.c
- packet-proto-syn-reg.c

These files should be included in the template file as described in the [conformance file examples](#). Some are optional.

## Step By Step Instructions

1. Create a directory for your protocol in the *epan/dissectors/asn1* directory and put your ASN.1 file there.
2. Copy *CMakeLists.txt* from another ASN.1 dissector and edit it to suit your needs.
3. Create a .cnf file either by copying an existing one and editing it or using the empty example above.
4. Create template files either by copying suitable existing ones and editing them or use the examples above, putting your protocol name in the appropriate places.
5. Add your dissector to *epan/dissectors/asn1/CMakeLists.txt*
6. Test generating your dissector by building the *generate\_dissector-\*proto\** target.
7. Depending on the outcome you may have to edit your .cnf file, ASN.1 file etc...
8. Build Wireshark.

## Hints For Using Asn2wrs

Asn2wrs does not support all of ASN.1 yet. This means you might need to modify the ASN.1 definition before it will compile. This page lists some tips and tricks that might make your life easier.

### COMPONENTS OF

Asn2wrs does not support the COMPONENTS OF directive. This means that you will have to modify the asn definition to manually remove all COMPONENTS OF directives. Fortunately this is pretty easy. COMPONENTS OF is a directive in ASN.1 which include all specified fields in the referenced SEQUENCE by those fields as if they had been explicitly specified.

### Example

Assume you have some definition that looks like this:

```

Foo ::= SEQUENCE {
    field_1 INTEGER,
    field_2 INTEGER
}

Bar ::= SEQUENCE {
    COMPONENTS OF Foo,
    field_3 INTEGER
}

```

Since Asn2wrs can not handle COMPONENTS OF you will have to modify the ASN.1 file so that instead Bar will look like this :

```

Bar ::= SEQUENCE {
    field_1 INTEGER,
    field_2 INTEGER,
    field_3 INTEGER
}

```

That was pretty easy wasn't it?

## Semicolon Characters

In some ASN1 you may have semicolon characters like this:

```

PBAddressString ::= SEQUENCE {
    extension INTEGER(1), natureOfAddressIndicator INTEGER, numberingPlanInd INTEGER,
    digits OCTET STRING (SIZE(0..19))
};

```

You will have to remove the last semicolon character.

## Parameters

Parameters will have to be replaced too. Something like this:

```

AChBillingChargingCharacteristics
    {PARAMETERS-BOUND : bound} ::= OCTET STRING (SIZE (minAChBillingChargingLength ..
    maxAChBillingChargingLength))

```

Will have to be replaced with the real values of the parameters:

```
AChBillingChargingCharacteristics ::= OCTET STRING (SIZE (5 .. 177))
```

## ANY And Parameterized Types

Asn2wrs can handle the type ANY but not parameterized types. Fortunately this is easy to work around with small changes to the ASN file and some conformance file magic. Assuming you have a construct that looks something like this:

```
AlgorithmIdentifier ::= SEQUENCE {  
    algorithm ALGORITHM.&id({SupportedAlgorithms}),  
    parameters ALGORITHM.&Type({SupportedAlgorithms}{@algorithm}) OPTIONAL  
}
```

Which is essentially a structure that takes two fields, one field being an object identifier and the second field that can be just about anything, depending on what object identifier was used. Here we just have to rewrite this SEQUENCE slightly so that it looks like this:

```
AlgorithmIdentifier ::= SEQUENCE {  
    algorithm OBJECT IDENTIFIER,  
    parameters ANY OPTIONAL  
}
```

The only thing remaining now is to add the actual code to manage the dissection of this structure. We do this by using the [\#.FN\\_BODY conformance file directive](#), which will replace the function body of a dissector with the contents that you specify in the conformance file. For this one we need a string where we store the OID from AlgorithmIdentifier/algorithm so that we can pick it up and act on later from inside the dissector for AlgorithmIdentifier/parameters. So we have to add something like this:

```
static char algorithm_id[64]; /* 64 chars should be enough? */
```

to the template file. Then we add the following to the conformance file:



```
#.FN_BODY AlgorithmIdentifier/algorithmId

offset = dissect_ber_object_identifier(FALSE, pinfo, tree, tvb, offset,
    hf_x509af_algorithm_id, algorithm_id);

#.FN_BODY AlgorithmIdentifier/parameters

offset=call_ber_oid_callback(algorithm_id, tvb, offset, pinfo, tree);
```

This example comes from the X509AF dissector. Please see the code there for more examples on how to do this.

## Tagged Assignments

There is currently a bug in Asn2wrs that makes it generate incorrect code for the case when tagged assignments are used. The bug is two-fold, first the generated code "forgets" to strip of the actual tag and length, second it fails to specify 'implicit\_tag' properly.

A tagged assignment is something that looks like this example from the FTAM asn specification:

```
Degree-Of-Overlap ::=
[APPLICATION 30] IMPLICIT INTEGER {
    normal(0), consecutive(1), concurrent(2)
}
```

I.e. an assignment that also specifies a tag value.

Until Asn2wrs is enhanced to handle these constructs you **MUST** add a workaround for it to the conformance file:

```

#.FN_BODY Degree-Of-Overlap

gint8 class;
gboolean pc, ind_field;
gint32 tag;
gint32 len1;

/*
 * XXX asn2wrs can not yet handle tagged assignment yes so this
 * is some conformance file magic to work around that bug
 */

offset = get_ber_identifier(tvb, offset, &class, &pc, &tag);
offset = get_ber_length(tree, tvb, offset, &len1, &ind_field);
offset = dissect_ber_integer(TRUE, pinfo, tree, tvb, offset, hf_index, NULL);

```

This tells Asn2wrs to not autogenerate any code at all for the Degree-Of-Overlap object instead it should use the code specified here. Note that we do have to specify the `implicit_tag` value explicitly and we can NOT use the parameter passed to the function from the caller (also due to the bug in Asn2wrs) this is the `TRUE` parameter in the call to `dissect_ber_integer()`. We specify `TRUE` here since the definition of Degree-Of-Overlap was using `IMPLICIT` tags and would have specified `FALSE` if it was not.

The code above can be easily cut-n-pasted into the conformance file with the exception of the last line that actually calls the next dissector helper (...`dissect_ber_integer`... in this case). The easiest way to find out exactly what this final line should look like in the conformance file; just generate the dissector first without this workaround and look at what call was generated. Then put that line in the conformance directive and replace `implicit_tag` with either `TRUE` or `FALSE` depending on whether `IMPLICIT` is used or not.

## Untagged CHOICES

Asn2wrs cannot handle untagged CHOICES within either a SET or a SEQUENCE. For example:

```

MessageTransferEnvelope ::= SET {
    ...
    content-type    ContentType,
    ...
}

ContentType ::= CHOICE {
    built-in        BuiltInContentType,
    extended        ExtendedContentType
}

BuiltInContentType ::= [APPLICATION 6] INTEGER {
    unidentified(0), external(1), interpersonal-messaging-1984(2), interpersonal-
messaging-1988(22),
    edi-messaging(35), voice-messaging(40)}

ExtendedContentType ::= OBJECT IDENTIFIER

```

The Asn2wrs SET/SEQUENCE parsing only looks one level deep into the dissection tree and does not have access to class/tags of the elements in the CHOICE.

As with COMPONENTS OF, the solution is to expand the CHOICE in-line within the SET or SEQUENCE, but **make sure** that each element of the CHOICE is marked as OPTIONAL. For example,

```

MessageTransferEnvelope ::= SET {
    ...
    built-in    BuiltInContentType OPTIONAL,
    extended    ExtendedContentType OPTIONAL
    ...
}

```

This isn't an entirely correct ASN.1 definition, but should allow successful parsing.

## Imported Module Name Conflicts

When importing a module using `#INCLUDE` in the conformance file, this may introduce a definition from the module which contradicts the definition used in the current ASN.1 file. For example, the X.509 Authentication Framework defines Time as

```

Time ::= CHOICE {utcTime          UTCTime,
                  generalizedTime GeneralizedTime
}

```

whereas X.411 defines Time as

```
Time ::= UTCTime
```

This can lead to failure to decode the ASN.1 as, in the example, Asn2wrs will be passed the wrong attributes when trying to decode an X.411 time. In order to solve this problem, (if you don't want to globally change the conflicting name within the ASN.1 module), then you must add an appropriate `#.TYPE_ATTR` into the conformance file **before** the `#.INCLUDE` line. For example

```
#.TYPE_ATTR  
Time TYPE = FT_STRING  DISPLAY = BASE_NONE  STRING = NULL  BITMASK = 0
```

## Simple ASN.1-Based Dissector

The following snippets show the different files that make up a dissector for a “FOO” protocol dissector.

## F00 protocol dissector

-----

This trivial dissector is an example for the struggling dissector developer (me included)

of how to create a dissector for a protocol that is encapsulated in UDP packets for a specific port, and the packet data is ASN1 PER encoded.

The thing that took me a while to figure out was that in order to see my packet dissected on the detail pane, I had to:

1. Tell the compiler which block in the ASN1 definition is a PDU definition by adding FOO-MESSAGE under the #.PDU directive in the foo.cnf file
2. Add a call to dissect\_FOO\_MESSAGE\_PDU() function in the dissect\_foo() function in the packet-foo-template.c file.

To build and test it:

1. in foo directory, run make
2. run make copy\_files
3. add packet-foo.c and packet-foo.h to epan/dissectors/Makefile.common
4. run top level make

CAVEAT: Makefile.nmake was not tested .

You can take it from here :-)

--00--

*foo.asn*

```
-- FOO PROTOCOL
--

FOO-PROTOCOL DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

-- General definitions

MessageId      ::= INTEGER (0..65535)
FlowId         ::= INTEGER (0..65535)

MessageData    ::= SEQUENCE {
    name        OCTET STRING(SIZE(10)),
    value       OCTET STRING(SIZE(10))
}

FOO-MESSAGE ::= SEQUENCE {
    messageId   MessageId,
    flowId      FlowId,
    messageData MessageData
}

END
```

### *foo.cnf*

```
# foo.cnf
# FOO conformation file

# $Id$

#.MODULE_IMPORT

#.EXPORTS

#.PDU
FOO-MESSAGE

#.NO_EMIT

#.TYPE_RENAME

#.FIELD_RENAME

#.END
```

### *packet-foo-template.h*

```
/* packet-foo.h
 * Routines for foo packet dissection
 *
 * Wireshark - Network traffic analyzer
 * By Gerald Combs <gerald@wireshark.org>
 * Copyright 1998 Gerald Combs
 *
 * SPDX-License-Identifier: GPL-2.0-or-later
 */

#ifndef PACKET_FOO_H
#define PACKET_FOO_H

#endif /* PACKET_FOO_H */
```

### *packet-foo-template.c*

```
/* packet-foo.c
 * Routines for FOO packet dissection
 *
 * Wireshark - Network traffic analyzer
 * By Gerald Combs <gerald@wireshark.org>
 * Copyright 1998 Gerald Combs
```

```

*
* SPDX-License-Identifier: GPL-2.0-or-later
*/

#ifdef HAVE_CONFIG_H
# include "config.h"
#endif

#include <glib.h>
#include <epan/packet.h>
#include <epan/conversation.h>

#include <stdio.h>
#include <string.h>

#include "packet-per.h"
#include "packet-foo.h"

#define PNAME "FOO Protocol"
#define PSNAME "FOO"
#define PFNAME "foo"
#define FOO_PORT 5001 /* UDP port */
static dissector_handle_t foo_handle=NULL;

void proto_reg_handoff_foo(void);
void proto_register_foo(void);

/* Initialize the protocol and registered fields */
static int proto_foo = -1;
static int global_foo_port = FOO_PORT;

#include "packet-foo-hf.c"

/* Initialize the subtree pointers */
static int ett_foo = -1;

#include "packet-foo-ett.c"

#include "packet-foo-fn.c"

static void
dissect_foo(tvbuff_t *tvb, packet_info *pinfo, proto_tree *tree)
{
    proto_item      *foo_item = NULL;
    proto_tree      *foo_tree = NULL;
    int              offset = 0;

    /* make entry in the Protocol column on summary display */

```



```

        if (check_col(pinfo->cinfo, COL_PROTOCOL))
            col_set_str(pinfo->cinfo, COL_PROTOCOL, PNAME);

    /* create the foo protocol tree */
    if (tree) {
        foo_item = proto_tree_add_item(tree, proto_foo, tvb, 0, -1, FALSE);
        foo_tree = proto_item_add_subtree(foo_item, ett_foo);

        dissect_FOO_MESSAGE_PDU(tvb, pinfo, foo_tree);
    }
}

/*--- proto_register_foo -----*/
void proto_register_foo(void) {

    /* List of fields */
    static hf_register_info hf[] = {

#include "packet-foo-hfarr.c"
    };

    /* List of subtrees */
    static gint *ett[] = {
        &ett_foo,
#include "packet-foo-ettarr.c"
    };

    /* Register protocol */
    proto_foo = proto_register_protocol(PNAME, PSNAME, PFNAME);
    /* Register fields and subtrees */
    proto_register_field_array(proto_foo, hf, array_length(hf));
    proto_register_subtree_array(ett, array_length(ett));

}

/*--- proto_reg_handoff_foo -----*/
void
proto_reg_handoff_foo(void)
{
    static gboolean initd = FALSE;

    if( !initd ) {

        foo_handle = create_dissector_handle(dissect_foo,
                                            proto_foo);
        dissector_add("udp.port", global_foo_port, foo_handle);
    }
}

```

```
        initied = TRUE;
    }
}
```

### *CMakeLists.txt*

```
set( PROTOCOL_NAME foo )

set( PROTO_OPT )

set( EXT_ASN_FILE_LIST
)

set( ASN_FILE_LIST
    Foo.asn
)

set( EXTRA_DIST
    ${ASN_FILE_LIST}
    packet-${PROTOCOL_NAME}-template.c
    ${PROTOCOL_NAME}.cnf
)

set( SRC_FILES
    ${EXTRA_DIST}
    ${EXT_ASN_FILE_LIST}
)

set( A2W_FLAGS )

ASN2WRS()
```

## Conformance (.cnf) Files

The .cnf file tells the compiler what to do with certain things, such as skipping auto generation for some ASN.1 entries. They can contain the following directives:

### **#.OPT**

Compiler options.

### **#.MODULE and #.MODULE\_IMPORT**

Assign Wireshark protocol name to ASN.1 module name.

### **#.INCLUDE**

Include another conformance file.

### **#.EXPORTS**

Export type or information object class.

### **#.PDU, #.PDU\_NEW, #.REGISTER, #.REGISTER\_NEW, and #.SYNTAX**

Create PDU functions and register them optionally to dissector table.

### **#.CLASS**

Declare or define information object class.

### **#.ASSIGNED\_OBJECT\_IDENTIFIER**

Declare assigned object identifier.

### **#.TABLE\_HDR, #.TABLE\_BODY, and #.TABLE\_FTR**

User tables.

### **#.OMIT\_ASSIGNMENT, #.NO\_OMIT\_ASSGN, #.OMIT\_ALL\_ASSIGNMENTS, #.OMIT\_ASSIGNMENTS\_EXCEPT, #.OMIT\_ALL\_TYPE\_ASSIGNMENTS, #.OMIT\_TYPE\_ASSIGNMENTS\_EXCEPT, #.OMIT\_ALL\_VALUE\_ASSIGNMENTS, and #.OMIT\_VALUE\_ASSIGNMENTS\_EXCEPT**

Ignore assignments from ASN.1 source.

### **#.NO\_EMIT and #.USER\_DEFINED**

See linked text for info.

### **#.VIRTUAL\_ASSGN, #.SET\_TYPE, #.MAKE\_ENUM, #.MAKE\_DEFINES, and #.ASSIGN\_VALUE\_TO\_TYPE**

Unknown.

### **#.TYPE\_RENAME, #.FIELD\_RENAME, and #.TF\_RENAME**

Type/field renaming

### **#.IMPORT\_TAG, #.TYPE\_ATTR, #.FIELD\_ATTR**

Type attributes

### **#.FN\_HDR, #.FN\_BODY, #.FN\_FTR, and #.FN\_PARS**

Type function modification

### **#.END**

End of directive

### **#.END\_OF\_CNF**

End of conformance file

## Example .cnf File

```
#.MODULE IMPORT
InformationFramework x509if

#.INCLUDE ../x509if/x509if_exp.cnf

#.EXPORTS +
ObjectName

#.PDU
ObjectName

#.REGISTER
Certificate B "2.5.4.36" "id-at-userCertificate"

#.SYNTAX
ObjectName [FriendlyName]

#.NO_EMIT ONLY_VALS
# this can be used with: [WITH_VALS|WITHOUT_VALS|ONLY_VALS]
# using NO_EMIT NO_VALS means it won't generate value_string array for it
Type1

#.USER_DEFINED
Type1 [WITH_VALS|WITHOUT_VALS|ONLY_VALS]

#.TYPE_RENAME

#.FIELD_RENAME

#.TYPE_ATTR Ss-Code TYPE = FT_UINT16 DISPLAY = BASE_HEX STRINGS = VALS(ssCode_vals)

# This entry will change the hf definition from the auto-generated one for Ss-Code ::=
OCTET STRING(SIZE(1))

    { &hf_gsm_map_ss_Code,
      { "ss-Code", "gsm_map.ss_Code",
        FT_BYTES, BASE_HEX, NULL, 0, "", HFILL }},

# to:

    { &hf_gsm_map_ss_Code,
      { "ss-Code", "gsm_map.ss_Code",
        FT_UINT16, BASE_HEX, VALS(ssCode_vals), 0, "", HFILL }},
```

In the proto\_abbr-template.c file the corresponding value string must be inserted. As an example the following would be included in proto\_abbr-template.c to define ssCode\_vals:

```
static const value_string ssCode_vals[] = {
    { 0, "ssCodeString 1" },    /* The string for value 0 */
    { 1, "String 2" },         /* String for value 1 */
    { 5, "String for value 5" }, /* Value String 5 */
    { 0, NULL }                /* Null terminated array */
}
```

Note that the NULL value must be the final entry and that the index values need not be consecutive.

Foo is expressed in different ways depending on where you want to insert your code and the ASN.1 code in question.

- Foo
- Foo/foo
- Foo/\_item/foo

For Tagged type use:

```

Foo/_untag

#.FN_HDR Foo
/* This is code to be inserted into the dissector for Foo BEFORE the BER/PER helper is
called. */
tvbuff_t *out_tvb;
fragment_data *fd_head;
tvbuff_t *next_tvb = NULL;

#.FN_BODY Foo
/* This here is code to replace the actual call to the helper completely. */
offset = dissect_ber_octet_string(implicit_tag, pinfo, tree, tvb, offset, hf_index,
&out_tvb);

/* Putting %(DEFAULT_BODY)s inside #.FN_BODY will insert the original code there. */

#.FN_FTR Foo
/* This is code to be inserted into the dissector for Foo AFTER the ber/per helper has
returned called. */
if (foo_reassemble) {
...
}

#.FN_PARS

#.END

```

## Example packet-protocol-template.h File

Example template.h file. Replace all PROTOCOL/protocol references with the name of your protocol.

```

/* packet-protocol.h
 * Routines for Protocol packet dissection
 *
 * $Id$
 *
 * Wireshark - Network traffic analyzer
 * By Gerald Combs <gerald@wireshark.org>
 * Copyright 1998 Gerald Combs
 *
 * SPDX-License-Identifier: GPL-2.0-or-later
 */

#ifndef PACKET_PROTOCOL_H
#define PACKET_PROTOCOL_H

#include "packet-protocol-exp.h"

#endif /* PACKET_PROTOCOL_H */

```

## Example packet-protocol-template.c File

Example template.c file. Replace all PROTOCOL/protocol references with the name of your protocol.

```

/* packet-protocol.c
 * Routines for PROTOCOL packet dissection
 *
 * $Id$
 *
 * Wireshark - Network traffic analyzer
 * By Gerald Combs <gerald@wireshark.org>
 * Copyright 1998 Gerald Combs
 *
 * SPDX-License-Identifier: GPL-2.0-or-later
 */

#ifdef HAVE_CONFIG_H
# include "config.h"
#endif

#include <glib.h>
#include <epan/packet.h>
#include <epan/conversation.h>

#include <stdio.h>
#include <string.h>

```

```

#include "packet-ber.h"
#include "packet-protocol.h"

#define PNAME  "This Is The Protocol Name"
#define PSNAME "PROTOCOL"
#define PFNAME "protocol"

/* Initialize the protocol and registered fields */
int proto_protocol = -1;
#include "packet-protocol-hf.c"

/* Initialize the subtree pointers */
#include "packet-protocol-ett.c"

#include "packet-protocol-fn.c"

/*--- proto_register_protocol -----*/
void proto_register_protocol(void) {

    /* List of fields */
    static hf_register_info hf[] = {
#include "packet-protocol-hfarr.c"
    };

    /* List of subtrees */
    static gint *ett[] = {
#include "packet-protocol-ettarr.c"
    };

    /* Register protocol */
    proto_protocol = proto_register_protocol(PNAME, PSNAME, PFNAME);

    /* Register fields and subtrees */
    proto_register_field_array(proto_protocol, hf, array_length(hf));
    proto_register_subtree_array(ett, array_length(ett));

}

/*--- proto_reg_handoff_protocol -----*/
void proto_reg_handoff_protocol(void) {
#include "packet-protocol-dis-tab.c"
}

```

## Conformance File Directive Reference

The following directives can be used in conformance (.cnf) files:



## **#.END**

Some of the other directives in the Asn2wrs conformance file consists of multiple lines. The .END directive is used to terminate such a directive. All other “.” directives (except #.INCLUDE) automatically act as an implicit #.END directive which is why you will not see many #.END directives in the conformance files for the dissectors shipped with Wireshark.

## **#.EXPORTS**

This directive in the Asn2wrs conformation file is used to export functions for type decoding from the dissector.

### **Syntax**

```
#.EXPORTS

TypeName [WITH_VALS|WITHOUT_VALS|ONLY_VALS] [WS_VAR] [NO_PROT_PREFIX]
...
#.END
```

### **Options:**

- WITH\_VALS (default): Exports dissection function and value string table if present.
- WITHOUT\_VALS: Exports only the dissection function.
- ONLY\_VALS: Exports only the value string table.
- WS\_VAR and WS\_VAR\_IMPORT: Used for value string table so as it can be exported from libwireshark.dll.
- NO\_PROT\_PREFIX: - value string table name does not have protocol prefix

### **Example**

```
#.EXPORTS
NonStandardParameter
RasMessage           WITH_VALS WS_VAR
H323-UU-PDU/h323-message-body  ONLY_VALS WS_VAR
#.END
```

## **#.FN\_BODY**

Sometimes, like when we have ANY types, we might want to replace whatever function body that Asn2wrs generates with code of our own. This is what this directive allows us to do.

## Example: ANY

Asn2wrs can handle the type ANY but we have to help it by adding some small changes to the conformance file. Assuming you have a construct that looks something like this:

```
AlgorithmIdentifier ::= SEQUENCE {
    algorithm OBJECT IDENTIFIER,
    parameters ANY OPTIONAL
}
```

To handle this we need to specify our own function bodies to both the algorithm and the parameters fields, which we do using the `#.FN_BODY` directive.

This particular example also requires us to keep some state between the two field dissectors, namely the OBJECT IDENTIFIER from algorithm which specifies what the content of parameters is. For this one we need a string where we store the oid from AlgorithmIdentifier/algorithm so that we can pick it up and act on later from inside the dissector for AlgorithmIdentifier/parameters. So we have to add:

```
static char algorithm_id[64]; /* 64 chars should be enough? */
```

to the template file as a placeholder to remember which OID we picked up. Then we add to the conformance file:

```
#.FN_BODY AlgorithmIdentifier/algorithmId
    offset = dissect_ber_object_identifier(FALSE, pinfo, tree, tvb, offset,
        hf_x509af_algorithm_id, algorithm_id);

#.FN_BODY AlgorithmIdentifier/parameters
    offset=call_ber_oid_callback(algorithm_id, tvb, offset, pinfo, tree);
```

The dissector body we specified for AlgorithmIdentifier/algorithmId here stores the retrieved OID inside the variable `algorithm_id` we specified.

When we later come to the dissector for AlgorithmIdentifier/parameters we pick this OID up from the static variable and just pass it on to the ber/oid dissector helper.

This example comes from the X509AF dissector. Please see the code there for more examples on how to do this.

## **#.MODULE\_IMPORT And #.INCLUDE**

These directive in the Asn2wrs conformance file are used to manage references to external type definitions, i.e. IMPORTS. The examples below are all from the X.509 Authentication Framework

(x509af) dissector source code in Wireshark.

## Example ASN

This is an example from the X509AF dissector which amongst other things imports definitions from X.509 InformationFramework:

```
IMPORTS
    Name, ATTRIBUTE, AttributeType, MATCHING-RULE, Attribute
FROM InformationFramework informationFramework
```

Which tells the Asn2wrs compiler that the types 'Name', 'ATTRIBUTE', 'AttributeType', 'MATCHING-RULE' and 'Attribute' are declared inside the external InformationFramework ASN module and that they are referenced from this module. In order for Asn2wrs to generate correct code for the dissection it is necessary to give it some help by telling what kind of types these are, i.e. are they INTEGERS or SEQUENCES or something else.

In order to be able to access these functions from this module it is important that these types have been declared as #.EXPORTS in the X509 InformationFramework dissector so that they are exported and that we can link to them.

## #.MODULE\_IMPORT

First we need to tell Asn2wrs which protocol name Wireshark uses for the functions in this external import, so that Asn2wrs can generate suitable function call signatures to these external functions. We do this by adding a directive to the conformation file :

```
#.MODULE_IMPORT
InformationFramework x509if
```

Where InformationFramework is the ASN name for the module used in the asn IMPORTS declaration and that x509if is the name we use inside Wireshark for this protocol.

This tells Asn2wrs that the function name to call to dissect Name would be dissect\_x509if\_Name(...). Without this knowledge Asn2wrs would not know which function name to generate.

## #.INCLUDE

Second, in order for Asn2wrs to generate correct code it also needs to know the BER type and class of these types that are imported, since that would affect how they are to be encoded on the wire. This information about what kind of BER attributes these imported types have are done using the #.INCLUDE directive in the conformance file:

```
#.INCLUDE ../x509if/x509if_exp.cnf
```

See `#.EXPORTS` for a description and examples of these types of include files.

## **`#.NO_EMIT` And `#.USER_DEFINED`**

These two directives in the conformance file for Asn2wrs can be used to suppress generation of dissectors and/or value\_strings and similar for a protocol. This is useful when there are types in the asn definition that either Asn2wrs can not handle or if we want to handle the dissection ourself inside the template file to do additional state keeping or things that Asn2wrs does not know how to manage.

These two directives are very similar. The only difference between is that `#.NO_EMIT` will suppress emitting the dissector for that function and also any value\_strings while `#.USER_DEFINED` will emit declarations instead of definitions.

I.e. `#.USER_DEFINED` will emit declarations such as `extern const value_string Type_vals[];` and `[static] int dissect_Proto_Type(...);`

Use `#.NO_EMIT` if you dont need to call this function at all from anywhere (except from the template itself) and use `#.USER_DEFINED` is better if you implement the function inside the template but still want to allow it to be called from other places.

### **Syntax**

```
#.USER_DEFINED
TypeName [WITH_VALS|WITHOUT_VALS|ONLY_VALS]
...
#.END
```

```
#.NO_EMIT
TypeName [WITH_VALS|WITHOUT_VALS|ONLY_VALS]
...
#.END
```

Options:

- `WITH_VALS` (default): Both dissection function and value string table are user defined and not emitted.
- `WITHOUT_VALS`: Only dissection function is user defined and not emitted.
- `ONLY_VALS`: Only value string table is user defined and not emitted.

## **`#.PDU` and `#.PDU_NEW`**

This directive in the Asn2wrs conformation file will generate a wrapper function around an object dissector. This is useful if there is an object inside the ASN.1 definition that we really want to

register as a protocol dissector or if we want it to have a well known signature.

## Function Names

The wrapper functions that are created will all be named and have the following signature:

```
static void dissect_ProtocolName_ObjectName(tvbuff_t *tvb, packet_info *pinfo,
proto_tree *tree);
```

Notice that this is exactly the same signature as `dissector_t` which is used by all dissector entry points.

## Usage

To get Asn2wrs to generate such wrapper functions you just have to list all objects one by one on the lines following the `#.PDU` declaration.

## Example

```
#.PDU
SomeObject
```

This will result in Asn2wrs creating this wrapper function in the `packet-foo.c` dissector file:

```
static void dissect_SomeObject_PDU(tvbuff_t *tvb, packet_info *pinfo, proto_tree *
tree) {
    dissect_foo_SomeObject(FALSE, ...
}
```

This function can then later be called or referenced from the template file or even exported.

## **#.REGISTER and #.REGISTER\_NEW**

This directive in the Asn2wrs conformation file can be used to register a dissector for an object to an OID. This is very useful for X.509 and similar protocols where structures and objects are frequently associated with an OID. In particular, some of the structures here encode an OID in a field and then the content in a different field later, and how that field is to be dissected depends on the previously seen OID.

One such example can be seen in the ASN.1 description for X.509/AuthenticationFramework which has a structure defined such as

```
AlgorithmIdentifier ::= SEQUENCE {
    algorithm    ALGORITHM.&id({SupportedAlgorithms}),
    parameters  ALGORITHM.&Type({SupportedAlgorithms}{@algorithm}) OPTIONAL
}
```

Which means that the parameters field in this structure, what this field contains and how it is to be dissected depends entirely upon what OID is stored inside algorithm. A whole bunch of protocols use similar types of constructs. While dissection of this particular structure itself currently has to be hand implemented inside the template (see x509af for examples of how this very structure is handled there). The `#.REGISTER` option in the conformance file will at least make it easy and painless to attach the actual OID to dissector mappings.

## Usage

To get Asn2wrs to generate such automatic registration of OID to dissector mappings just use the `#.REGISTER` directive in the conformation file.

## Example

```
#.REGISTER
Certificate B "2.5.4.36" "id-at-userCertificate"
```

Which will generate the extra code to make sure that anytime Wireshark needs to dissect the blob associated to the OID "2.5.4.36" it now knows that that is done by calling the subroutine to dissect a Certificate in the current protocol file. The "id-at-userCertificate" is just a free form text string to make Wireshark print a nice name together with the OID when it presents it in the decode pane. While this can be just about anything you want I would STRONGLY use the name used to this object/oid in the actual ASN.1 definition file.

## Include File

During the compilation phase Asn2wrs will put all the extra registration code for this in the include file `packet-protocol-dis-tab.c`. Make sure that you include this file from the template file or the registration to an OID will never occur. `#include "packet-protocol-dis-tab.c"` should be included from the `proto_reg_handoff_protocol` function in the template file.

## See Also

The various dissectors we have for X.509 such as the X.509AF which contains several examples of how to use this option. That dissector can also serve as an example on how one would handle structures of the type AlgorithmIdentifier above. Asn2wrs can NOT handle these types of structures so we need to implement them by hand inside the template.

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