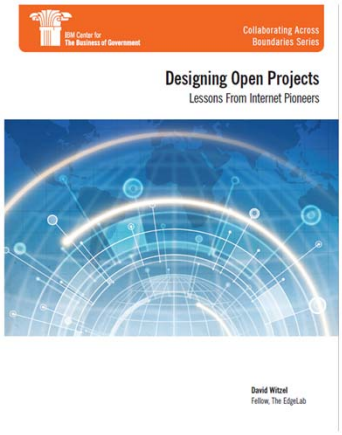
Designing Open Projects

Lessons from Internet Pioneers



David Witzel

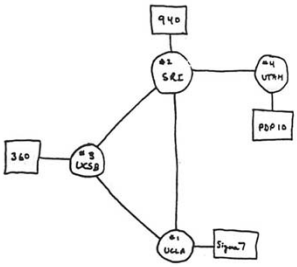
Fellow, The EdgeLab

More detail, citations, and funny cartoons in the full report – http://www.businessofgovernment.org/report/designing-open-projects-lessons-internet-pioneers

What can we learn
from how the Internet was built
about designing and managing
ambitious, collaborative, social initiatives?

2

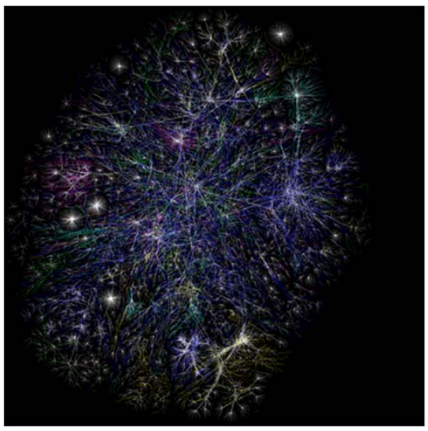
The Internet is so Cool!



THE ARPA NETWORK

DEC 1969

4 NODES

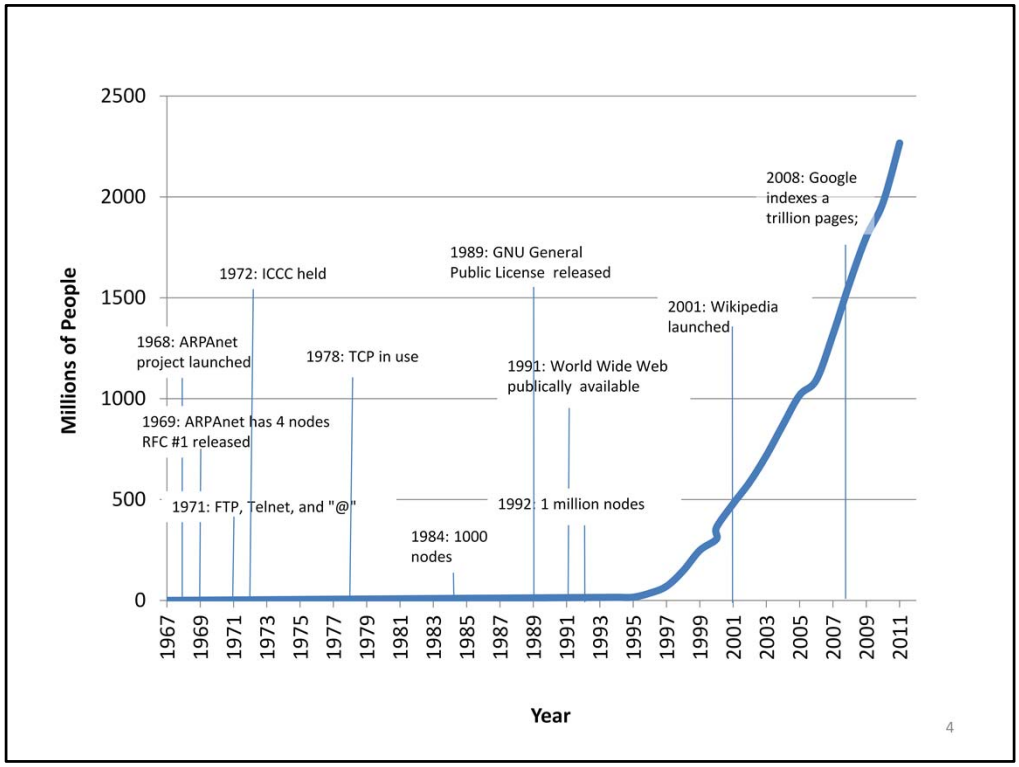


Then **Now**

3

Early sketch of ARPANET's first four nodes", Scientific American, December 4, 2009, http://www.scientificamerican.com/gallery_directory.cfm?photo_id=5B11E498-A639-3996-6D74347AFB957CAA

http://www.opte.org/maps/; http://blyon.com/blyon-cdn/opte/maps/static/1105496683.LGL.2D.400x400.png



Data extracted from “Internet World Stats”
http://www.internetworldstats.com/emarketing.htm

Internet development demonstrated characteristics we want

- Creativity and innovation
- Reach and scale
- Impact

5

Generations of Development

- ARPANET
- The Network of Networks
- The World Wide Web
- Web 2.0
- The Next Wave

6

Quick review of where we've come from
Using "internet" in the broad, common sense - the entire ecosystem of machines, connections, data, and software that people use to send email, surf the web, read news, shop, listen to music, watch movies, and more.

ARPANET

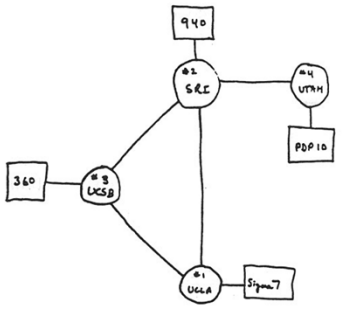
1969: 4 nodes connected

1969: RFC # 1 written

1971: FTP & Telnet released

1971: inter-computer email and "@" sign in use

1972: International Conference on Computer Communications



THE ARPA NETWORK

DEC 1969

4 NODES

7

Not really built to sustain nuclear attack though was a research interest for designer Paul Barand of RAND
Goal was to better share expensive computing equipment, reduce redundancy, simplify access.
Robert Taylor – didn't want 3 terminals connected to 3 different computers in his DARPA office

So DARPA gave a contract to BBN which designed the system and developed the software. BBN used Honeywell computers.

4 nodes were connected originally – UCLA to Stanford was 1st. Then UC Santa Barbara and Utah were added.
RFC #1 was issued in 1969 by Steve Crocker at UCLA

"Early sketch of ARPANET's first four nodes", Scientific American, December 4, 2009, http://www.scientificamerican.com/gallery_directory.cfm?photo_id=5B11E498-A639-3996-6D74347AFB957CAA

The Network of Networks

1974: TCP described

1977: TCP/IP released

1983: ARPANET runs on TCP/IP

Generations of software:

- Email
- NNTP
- IRC
- Gopher

Vint Cerf & Bob Kahn – writers of TCP/IP

8

Image: http://news.bbc.co.uk/2/hi/technology/6959034.stm

The World Wide Web

1991: Tim Berners-Lee offers HTTP & HTML

1991: Linus Torvald announces Linux project

1992: Internet opened up

1993: Mosaic released

9

http://www.time.com/time/covers/0,16641,19960219,00.html

Web 2.0

2001: Wikipedia launches

- RSS
- API's
- Open licenses
- Lots of user-contributor focus
- Lots of commerce

10

http://www.flickr.com/photos/30465871@N05/3434587927/sizes/m/in/photostream/

The Next Wave

- Mobile
- Cloud computing
- What else???

Open Projects

To a large extent, what we know as the Internet today is the result of many individual open projects, often run by groups of volunteers. These projects built new services or improved upon existing services and used existing interfaces in new ways.

12

Open vs. Closed

That a system is open means not simply that it engages in interchanges with the environment, but that this interchange is an essential factor underlying the system's viability.

Walter Buckley
Sociology and Modern Systems Theory

13

Walter Buckley, Sociology and Modern Systems Theory, 1967, as quoted in W. Richard Scott, Organizations: Rational, Natural, and Open Systems, 2003, p, 82

Characteristic	Closed	Open
Leadership	Clearly identified. Leadership and authority positions tightly tied.	Leadership actions can be made by a variety of actors. Leadership and authority loosely coupled.
Authority	Strong. Authority figures can firmly set and enforce direction and organize activities.	Weak. Authority figures suggest and cajole directions and activities.
Membership	Clearly defined by employment, contracts, or formal declarations. Fixed with members clearly identified.	May not be clearly defined. Dynamic with membership determined by participation and adoption of behaviors. Members may be anonymous.
Ownership	Tightly held. Intellectual and physical property is owned by the organization or project and controlled by its authorities.	Open and shared. Intellectual property is open licensed and shared. Use is determined by users.
Boundaries	Fixed and firm. Members are in or out.	Porous. Participants may join and leave, without giving notice.

14

Be great to get more suggestions for distinctions between open & closed approaches.

Characteristic	Closed	Open
Objectives	Unitary and clear. Established by authorities.	Different in different parts of the system and determined by participants. Changeable dependent on environmental conditions.
Decisions	Made by those “above” in the hierarchy and passed down.	Made in many places throughout the system.
Organizational Structure	Formally planned, defined and fixed. Rigid and hierarchical one to many relationships and hub and spoke	Undefined and dynamic. Fluid networks with bi-directional and multi-directional communications and activities.
Incentives	Clearly defined with emphasis on financial rewards – salaries, fees, bonuses.	Mixed and reliant on financial as well as other personal rewards including acknowledgement, mastery, social good.
Location	Headquarters is clearly defined. Work is done in offices and factories.	No physical headquarters. Work is done in many venues.
Work time	During formal “work hours” with official vacations	Happens at any time, often during vacations.

Tip 1: Let Everyone Play

Collaborators welcome!

Tim Berners-Lee

I'm doing a (free) operating system (just a hobby, won't be big and professional…

Linus Torvalds

16

Internet has a "do it ourselves" culture

Open participation leads to:
Discovery of more smart people "most of the smartest people work for someone else"
Problem solving "with enough eyeballs all bugs are shallow"
New ideas – Zittrain's "Generativity"

Tip 2: Play Nice

When you read RFC 1, you walked away from it with a sense of, "Oh, this is a club that I can play in too"

Brian Reid

17

Procrastination principle – wait for problems to arise before solving them
Jimbo's "knives in a steak house" example
Allow diverse incentives to participate

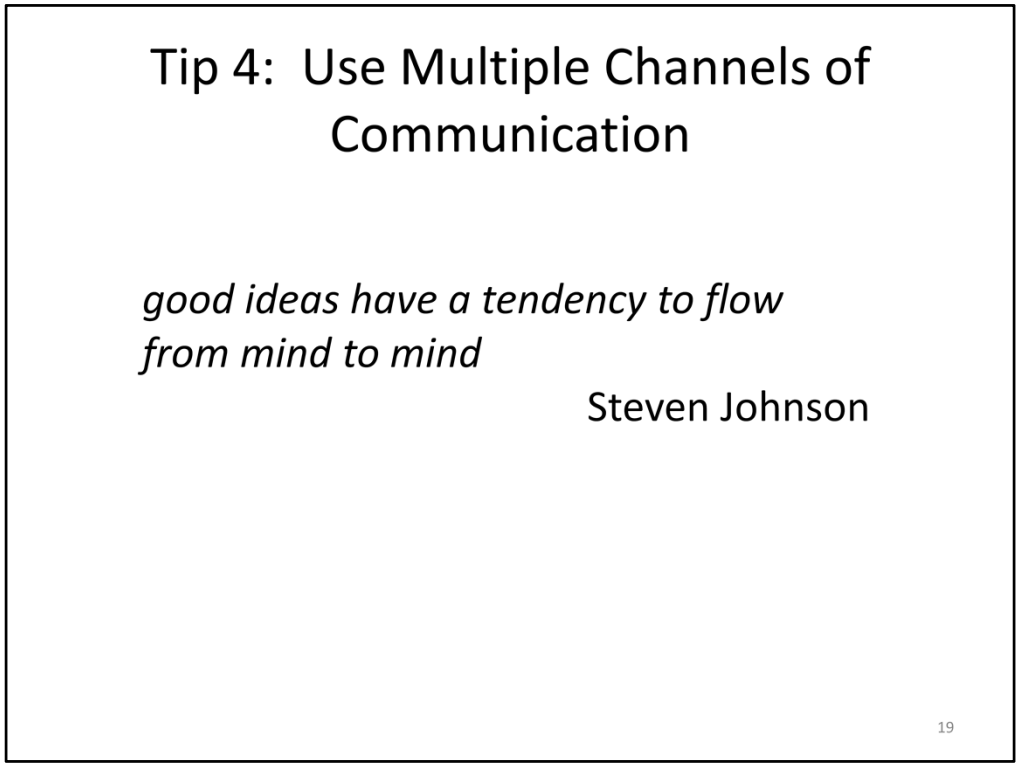
Tip 3: Talk About What You are Doing While You Do It

Narrate your work

David Winer

18

Improve communications
Accelerates learning
Helps potential participants figure out how and when to participate
Trust building



Many Internet products have been new communications approaches and improvements on those communications approaches
Repeated generations of News, email, chat.

Embed the discussion in the project e.g., Wikipedia talk pages and submission history in software repositories

Tip 5: Give it Away

After the music leaves us, it's on its own. If they want to collect it and show it around or re-live it, or whatever, that's okay with me.

Jerry Garcia

20

Much of the infrastructure of the Internet is freely available for reuse – TCP/IP, HTML, Wikipedia code & content, Linux, Apache, …

As Kevin Kelly says, “Cultivate increasing returns”

Opportunity for government work as it creates “self leveling playing fields”

Tip 6: Reach for the Edges

Out on the edge you see all kinds of things you can't see from center.

Kurt Vonnegut

innovative systems have a tendency to gravitate toward the 'edge of chaos': the fertile zone between too much order and too much anarchy.

Steven Johnson

21

Participants not in the "core" have different experiences and data

New ideas come from the "adjacent possible"

Tip 7: Make it Work, Then Make it Better

Done is better than perfect.

Mark Zuckerberg

The principle of constant change is perhaps the only principle of the Internet that should survive indefinitely.

RFC 1958

22

Keep it simple, make it work
Simplicity also makes it easier to include other people (tip 1)
Do it and learn from the doing.
Direct Project story – "doing" an implementation of transport protocols taught them that the protocols weren't the issue – it was trust between the transmitters

Tip 8: Make it Work, Then Standardize

We reject: kings, presidents and voting. We believe in: rough consensus and running code.

David D. Clark

There's no sense being precise about something when you don't even know what you're talking about.

John von Neumann

23

Standards are about persuasion - Demonstrating functioning implementation is an important criterion for getting agreement

Tip 9: Take Advantage of All Types of Organizations

- DARPA
- BBN
- Honeywell
- UCLA, UCSB, Stanford, Utah
- NSF
- Network Working Group
- CERN
- Students
- Commercial entities
- Foundations
  - Apache
  - Wikimedia
  - Linux

24

Mix of multiple kinds of organizations and interests – “ecosystems”
Linux has contributions from 500 separate companies but largest group is still individual contributors (20%)
“neutral” entities like the foundations have special roles for preserving assets

Tip 10: Design for Participation

Modularity is good. If you can keep things separate, do so.

RFC 1958

25

Break problems down into chunks
Balance between what Benkler calls “modularity” and “granularity” – don’t want to get pieces that are so small they are hard to put back together
Build “stacks” – like the LAMP stack or TCP/IP stack
Offer lots of different tasks suitable for different skills

Tip 11: Increase Network Impact

Mathematics says the sum value of a network increases as the square of the number of members.

Kevin Kelly

26

Broadcast – 1 to many
Community – many to many within one network (e.g., ARPANET)
Network of networks – e.g. the Internet. Ability to form own networks

Tip 12: Build Platforms

Tim Berners-Lee didn't develop hundreds of millions of websites.

Tim O'Reilly

27

Platforms are tools that help people and organizations coordinate their activities so they are jointly more productive

Infrastructure, plumbing
Don't solve the problem – give other people tools to solve it

Lessons Summary

Tip 1: Let Everyone Play
Tip 2: Play Nice
Tip 3: Talk About What You are Doing While You Do It
Tip 4: Use Multiple Channels of Communication
Tip 5: Give it Away
Tip 6: Reach for the Edges
Tip 7: Make it Work, Then Make it Better
Tip 8: Make it Work, Then Standardize
Tip 9: Take Advantage of All Types of Organizations
Tip 10: Design for Participation
Tip 11: Increase Network Impact
Tip 12: Build Platforms

28

Closed	Open
Tight control	Loose control
Clearly defined objectives	Fluid, emergent objectives
Enforceable deadlines	Flexible deadlines
Proprietary assets	Non-proprietary, shared assets
Allows secrecy	Secrecy discouraged
Resources are capped, tightly controlled, closely held	Resources are shared, without central control, distributed
Formal methods and processes are implementable and enforceable	Harder to enforce process
Superior in static settings	Superior in complex, dynamic settings
Implement “known” approaches	Discover “unknown” approaches
Responsibility clear	Responsibility hard to identify

When to use open vs. closed system – more suggestions?

David Witzel
dwitzel@policycommons.org
@dwitzel

http://www.businessofgovernment.org/report/designing-open-projects-lessons-internet-pioneers

30