

Wikidata, behind the curtain

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WIKIMEDIA
DEUTSCHLAND

TOC

- Concepts
- Code structure
- Representations/API
- Secondary data storages
- Entity Usage
- Front-end stack
- Miscellaneous parts
- Future changes

Concepts



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Concepts

- **Wikibase:**
 - Wikibase Repo: Wikidata, Wikimedia Commons
 - Wikibase Client: English Wikipedia, German Wikisource, Wikidata
 - Federation
- **Entities:**
 - Item
 - Property
- **Data model:**
 - Terms: labels, descriptions, aliases
 - Statements
 - Sitelinks
- **Other Entities:**
 - Lexeme
 - i. Basically dictionary entries
 - ii. Has a different data model
 - MediaInfo
 - i. One per file in commons, making Structured Data on Commons possible
 - ii. Has a different data model

Alan Turing (Q7251)

British mathematician, logician, cryptanalyst, and computer scientist
Alan M. Turing | Alan Mathieson Turing | Turing | Alan Mathison Turing

Terms

aliases

▼ In more languages Configure

Language	Label	Description	Also known as
English	Alan Turing	British mathematician, logician, cryptanalyst, and computer scientist	Alan M. Turing Alan Mathieson Turing Turing Alan Mathison Turing
Persian		دانشمند کامپیوتر، رمزشکن، منطق‌دان و ریاضی‌دان آلن تورینگ بریتانیایی	
Polish	Alan Turing	angielski matematyk	
German	Alan Turing	britischer Logiker, Mathematiker und Kryptoanalytiker	Alan Mathison Turing Alan M. Turing

All entered languages

Statements

instance of	human
	› 3 references

- Wikipedia (141 entries) ^
- ady Тьюринг Алан
 - af Alan Turing
 - als Alan Turing
 - an Alan Turing
 - ar آلان تورینگ
 - arz الان تورینگ
 - ast Alan Turing
 - as এলাত টুরিং
 - azb آلن تورینگ
 - az Alan Turing
 - bat_smg Alans Tiorèngs
 - ba Алан Тьюринг
 - bcl Alan Turing
 - be_x_old Элан Т'юрын
 - be Алан Мэтысан Ц'юрын
 - bg Алън Тюринг
 - bh एलन ट्यूरिंग
 - bn আলান টুরিং
 - br Alan Turing
 - bs Alan Turing

Statements

Sitelinks

Code structure



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Example: Wikimedia Commons

(A repo wiki)

Wikibase				
Extension	Version	License	Description	Authors
WikibaseCirrusSearch	0.1.0 (788d536) 21:28, 4 September 2019	GPL-2.0-or-later	Wikibase extension for using CirrusSearch functionality	The Wikidata team and Stas Malyshev
WikibaseClient	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	Client for the Wikibase extension	The Wikidata team and others
WikibaseLexeme	- (47a8eb7) 11:08, 1 October 2019	GPL-2.0-or-later	Handle Lexeme entity type	The Wikidata team
WikibaseLib	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	Holds common functionality for the Wikibase and Wikibase Client extensions	The Wikidata team and others
WikibaseMediaInfo	0.1.0 (6555e13) 07:27, 1 October 2019	GPL-2.0-or-later	Wikibase extension to manage structured metadata of media files	The Wikidata team
WikibaseRepository	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	Structured data repository	The Wikidata team and others
WikibaseView	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	View component for the Wikibase Repository	The Wikidata team and others
WikimediaBadges	1.0.0 (a306315) 11:35, 23 August 2019	GPL-2.0-or-later	Default themes to display badges on Wikimedia projects	Bene* and Marius Hoch

Example: English Wikipedia

(A client wiki)

Wikibase				
Extension	Version	License	Description	Authors
WikibaseClient	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	Client for the Wikibase extension	The Wikidata team and others
WikibaseLexeme	- (47a8eb7) 11:08, 1 October 2019	GPL-2.0-or-later	Handle Lexeme entity type	The Wikidata team
WikibaseLib	- (2c7bfb6) 16:04, 1 October 2019	GPL-2.0-or-later	Holds common functionality for the Wikibase and Wikibase Client extensions	The Wikidata team and others
WikimediaBadges	1.0.0 (a306315) 11:35, 23 August 2019	GPL-2.0-or-later	Default themes to display badges on Wikimedia projects	Bene* and Marius Hoch

Directories

└─ .phan

└─ build

└─ client ←

└─ data-access ←

└─ docs

└─ jmeter

└─ lib ←

└─ repo ←

└─ tests/browser

└─ view ←

“data-access” is part of “lib”
“view” is part of “repo”



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Representations/APIs



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One source of truth

(Internal)

```
ladsgroup@mwmaint1002:~$ mwscrip getText.php wikidatawiki 'Q7251'
{"type":"item","id":"Q7251","labels":{"fr":{"language":"fr","value":"Alan Turing"},
"en":{"language":"en","value":"Alan Turing"},
"pl":{"language":"pl","value":"Alan Turing"},
"it":{"language":"it","value":"Alan Turing"},
"ilo":{"language":"ilo","value":"Alan Turing"},
"jbo":{"language":"jbo","value":".alan turin"},
"be-tarask":{"language":"be-tarask","value":"\u042d\u043b\u0430\u043d \u0422\u2019\u044e\u0440\u0438\u043d"},
"en-ca":{"language":"en-ca","value":"Alan Turing"},
"en-gb":{"language":"en-gb","value":"Alan Turing"},
"af":{"language":"af","value":"Alan Turing"},
"an":{"language":"an","value":"Alan Turing"},
"ar":{"language":"ar","value":"\u0622\u0644\u0627 \u062a\u0648\u0631\u064a\u0646"},
"arz":{"language":"arz","value":"\u0627\u0644\u0627 \u062a\u0648\u0631\u064a\u0646"},
"as":{"language":"as","value":"\u091c\u094d\u0940 \u0940\u094d \u0940\u094d"},
"ast":{"language":"ast","value":"Alan Turing"},
"az":{"language":"az","value":"Alan Turing"},
"be":{"language":"be","value":"\u0410\u043b\u0430\u043d \u0422\u044e\u0440\u0438\u043d"},
"bg":{"language":"bg","value":"\u0410\u043b\u0430\u043d \u0422\u044e\u0440\u0438\u043d"},
"bn":{"language":"bn","value":"\u091c\u094d\u0940 \u0940\u094d \u0940\u094d"},
"br":{"lang
```

HTML

/wiki/Special:EntityData/Q7251
/wiki/Q7251



- Main page
- Community portal
- Project chat
- Create a new item
- Create a new Lexeme
- Recent changes
- Random item
- Query Service
- Nearby
- Help
- Donate

Print/export

- Create a book
- Download as PDF
- Printable version

Tools

- What links here
- Related changes
- Special pages
- Permanent link
- Page information
- Concept URI
- Cite this page

Item [Discussion](#)

[Read](#) [View history](#)

Alan Turing (Q7251)

British mathematician, logician, cryptanalyst, and computer scientist

Alan M. Turing | Alan Mathieson Turing | Turing | Alan Mathison Turing

◄ In more languages

Configure

Language	Label	Description	Also known as
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Persian		دانشمند کامپیوتر، رمز‌شکن، منطق‌دان و ریاضی‌دان آلن تورینگ بریتانیایی	
Polish	Alan Turing	angielski matematyk	
German	Alan Turing	britischer Logiker, Mathematiker und Kryptoanalytiker	Alan Mathison Turing Alan M. Turing

All entered languages

Statements

instance of human
[3 references](#)

image



Wikipedia (141 entries)

- ady Тьюринг Алан
- af Alan Turing
- als Alan Turing
- an Alan Turing
- ar آلان تورینگ
- arz آلان تورینگ
- ast Alan Turing
- as এলান ট্যুরিং
- azb آلان تورینگ
- az Alan Turing
- bat-smg Alans Tiorėngs
- ba Алан Тьюринг
- bcl Alan Turing
- be_x-old Элан Т'юринг
- be Алан Мэтьюсан Ц'юрынг
- bg Алън Тюринг
- bh एलन ट्यूरिंग
- bn এলান ট্যুরিং
- br Alan Turing
- bs Alan Turing
- bxr Алан Тюринг
- ca Alan Turing
- ce Тьюринг, Алан
- ckb ئالان تۆرینگ
- co Alanu Turing
- cs Alan Turing
- cv Тьюринг Алан
- cy Alan Turing
- da Alan Turina

JSON API

/wiki/Special:EntityData/Q7251.json
/w/api.php?action=wbgetentities&id=Q7251

```
▼ entities:  
  ▼ Q7251:  
    pageid:      8455  
    ns:          0  
    title:       "Q7251"  
    lastrevid:   1023644940  
    modified:    "2019-10-01T04:00:08Z"  
    type:        "item"  
    id:          "Q7251"  
  ▼ labels:  
    ▼ fr:  
      language:  "fr"  
      value:     "Alan Turing"  
    ▼ en:  
      language:  "en"  
      value:     "Alan Turing"  
    ▼ pl:  
      language:  "pl"  
      value:     "Alan Turing"  
    ▼ it:  
      language:  "it"  
      value:     "Alan Turing"
```

RDF (ttl, jsonld)

/wiki/Special:EntityData/Q7251.ttl

```
@prefix pr: <http://www.wikidata.org/prop/reference/> .
@prefix prv: <http://www.wikidata.org/prop/reference/value/> .
@prefix prn: <http://www.wikidata.org/prop/reference/value-normalized/> .
@prefix wdno: <http://www.wikidata.org/prop/novalue/> .

data:Q7251 a schema:Dataset ;
  schema:about wd:Q7251 ;
  cc:license <http://creativecommons.org/publicdomain/zero/1.0/> ;
  schema:softwareVersion "1.0.0" ;
  schema:version "1023644940"^^xsd:integer ;
  schema:dateModified "2019-10-01T04:00:08Z"^^xsd:dateTime ;
  wikibase:statements "141"^^xsd:integer ;
  wikibase:identifiers "64"^^xsd:integer ;
  wikibase:sitelinks "159"^^xsd:integer .

wd:Q7251 a wikibase:Item .

<https://commons.wikimedia.org/wiki/Alan_Turing> a schema:Article ;
  schema:about wd:Q7251 ;
  schema:inLanguage "en" ;
  schema:isPartOf <https://commons.wikimedia.org/> ;
  schema:name "Alan Turing"@en .

<https://commons.wikimedia.org/> wikibase:wikiGroup "commons" .

<https://fr.wikiquote.org/wiki/Alan_Turing> a schema:Article ;
  schema:about wd:Q7251 .
```

/wiki/Special:EntityData/Q7251.jsonld

```
@graph:
  0:
    @id: "data:Q7251"
    @type: "schema:Dataset"
    about: "wd:Q7251"
    license: "http://creativecommons.org/publicdomain/zero/1.0/"
    softwareVersion: "1.0.0"
    version: 1023644940
    dateModified: "2019-10-01T04:00:08Z"
    statements: 141
    identifiers: 64
    sitelinks: 159
  1:
    @id: "wd:Q7251"
    @type: "wikibase:Item"
  2:
    @id: "https://commons.wikimedia.org/wiki/Alan_Turing"
    @type: "schema:Article"
    about: "wd:Q7251"
    inLanguage: "en"
    isPartOf: "https://commons.wikimedia.org/"
    name:
      @language: "en"
      @value: "Alan Turing"
  3:
    @id: "https://commons.wikimedia.org/"
    wikiGroup: "commons"
```

PHP API

```
ladsgroup@mwmaint1002:~$ mwscrip eval.php --wiki=wikidatawiki
> $entityLookup = \Wikibase\Repo\WikibaseRepo::getDefaultInstance()->getEntityLookup();

> $item = $entityLookup->getEntity( new \Wikibase\DataModel\Entity\ItemId( 'Q7251' ) );

> var_dump( $item->getLabels()->getByLanguage( 'en' ) );
object(Wikibase\DataModel\Term\Term)#811 (2) {
  ["languageCode":Wikibase\DataModel\Term\Term]:private=>
  string(2) "en"
  ["text":Wikibase\DataModel\Term\Term]:private=>
  string(11) "Alan Turing"
}

> █
```

Secondary data storages



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Term store (+ its caches)

```
wikiadmin@10.64.48.151(wikidatawiki)> select * from wb_terms where term_full_entity_id = 'Q7251' limit 5;
```

term_row_id	term_entity_id	term_full_entity_id	term_entity_type	term_language	term_type	term_text	term_search_key
1243775063	7251	Q7251	item	ilo	description	Britaniko a matematiko, lohiko, kriptanalista, ken sientista ti kompiuter	britaniko a matematiko, lohiko
1243775069	7251	Q7251	item	pl	description	angielski matematyk	angielski matematyk
1243775070	7251	Q7251	item	sk	description	britský matematik, logik, kryptograf a vojnový hrdina	britský matematik, logik, kryptograf a vojnový hrdina
1243775071	7251	Q7251	item	as	description	Computer scientist, mathematician, and cryptographer	computer scientist, mathematician, and cryptographer
1243775072	7251	Q7251	item	sv	description	brittisk datavetare, matematiker och ingenjör	brittisk datavetare, matematiker och ingenjör

5 rows in set (0.00 sec)

```
wikiadmin@10.64.48.151(wikidatawiki)>
```



Credit: Emoji one,
CC-BY-SA 4.0



ParserCache

- Stores the HTML representation
- Plugs into and the same as MediaWiki ParserCache
- Includes placeholders, cached values for information substituted per user preferences at read time
- Entry point for server-side rendering of VueJS micro front ends.
- Expires in a 30 days or gets invalidated by edit
- Fragmented by language (different than most WMF Wikis)

Blazegraph

- Stores an optimized version of RDF (turtle) representation
- That's what empowers Wikidata query service (WDQS, <https://query.wikidata.org>)
- A graph database made using RDF (turtle) representation of entities
- Completely out of appservers and wikidata itself.

Wikidata Query Service Examples

```
1 #defaultView:ImageGrid
2 SELECT ?pic
3 WHERE { wd:Q7251 wdt:P18 ?pic }
```

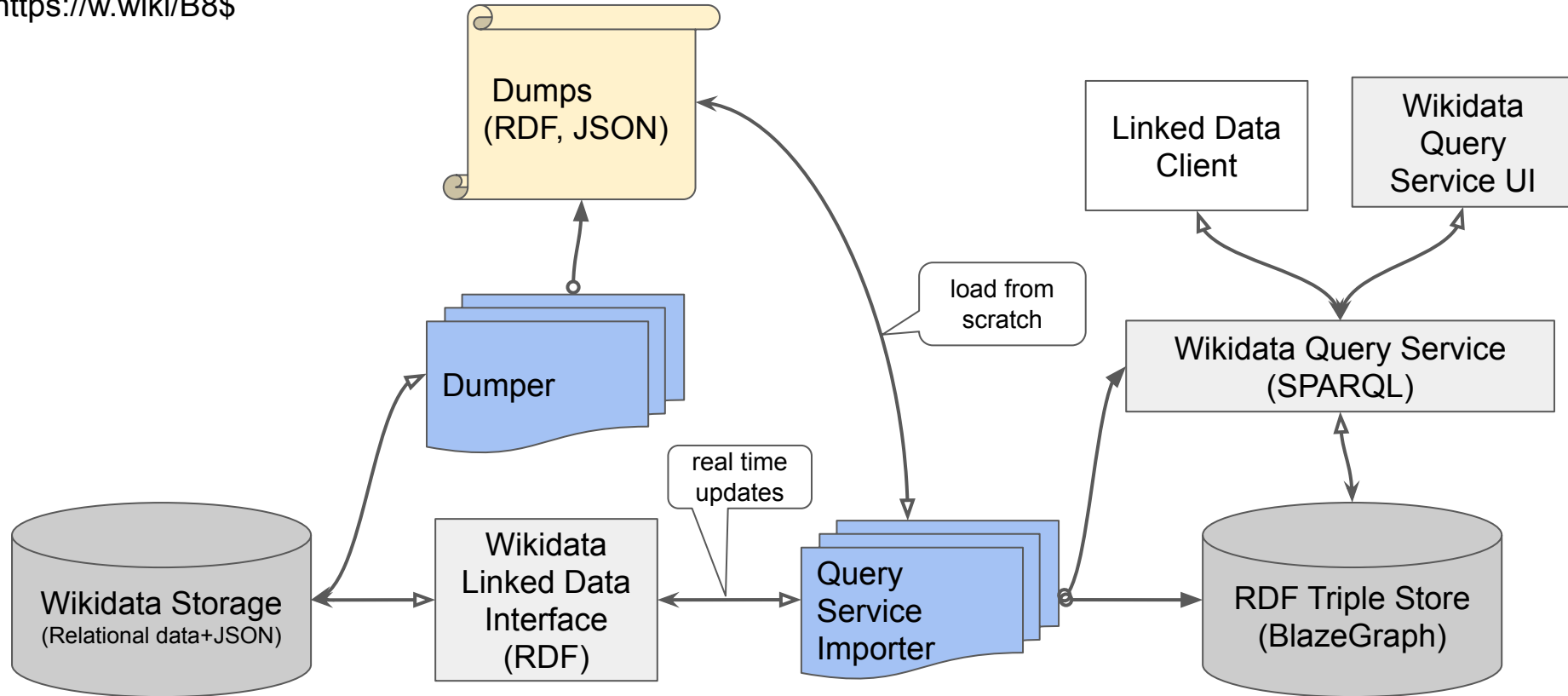
Image grid



[commons:Alan Turing Aged 16.jpg](#)

WDQS infrastructure

[https://w.wiki/B8\\$](https://w.wiki/B8$)



ElasticSearch

- Handled through WikibaseCirrusSearch extension
- It's optional, third parties can use the term store instead.
- Exposed via Special:Search (duh) and wbsearchentities API module

Search results

To search for Wikidata items by their title on a given site, use [Special:ItemByTitle](#).

Advanced search:

Search in:

[Alan Turing](#) (Q7251)

British mathematician, logician, cryptanalyst, and computer scientist

141 statements, 159 sitelinks - 2019-10-08T16:52:37

[Alan Turing](#) (Q28846012)

fictional analogon of Alan Turing (1912-1954)

8 statements, 0 sitelinks - 2019-10-08T16:52:37

[Alan Turing: The Enigma](#) (Q34308373)

biography by Andrew Hodges

15 statements, 2 sitelinks - 2019-10-08T16:52:37

[Alan Turing law](#) (Q27502852)

2017 British law pardoning formerly-illegal sex acts

6 statements, 8 sitelinks - 2019-10-08T16:52:37

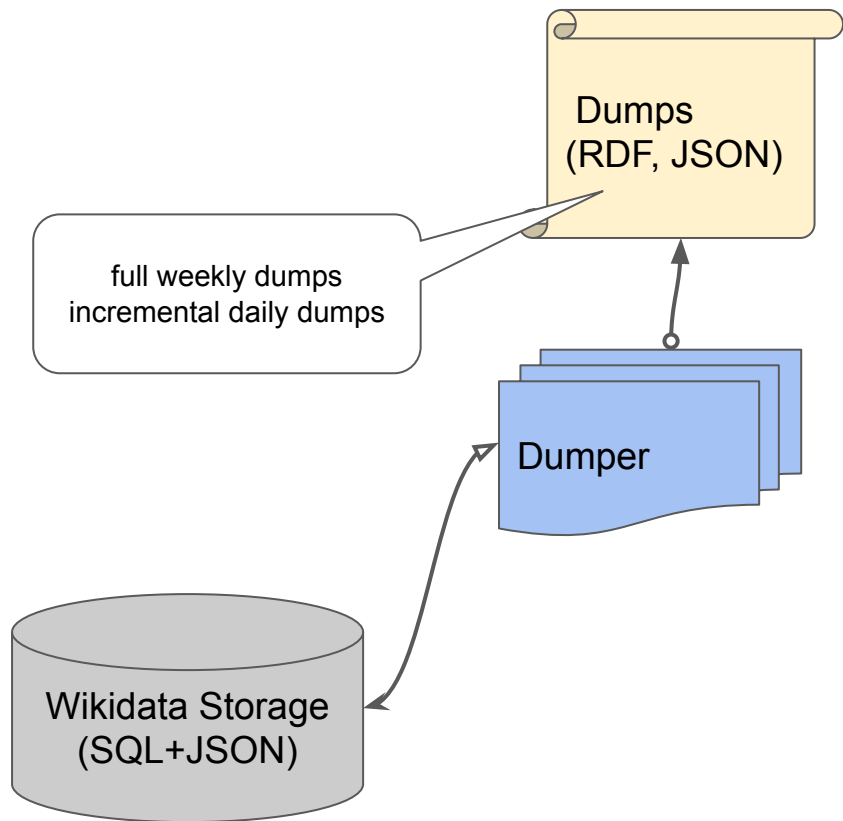
[Alan Turing Institute](#) (Q16826821)

research institute in Britain

14 statements, 1 sitelink - 2019-10-08T16:52:37



Dumps



Entity usage



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On Repo

- Rendering another item
- Special pages



The screenshot shows a Wikidata item snippet. On the left, the property **named after** is displayed in blue text, with a black arrow pointing upwards towards it. To the right of the property is the value **Alan Turing**, also in blue text, followed by three dots indicating a menu. A black arrow points from the right towards the 'Alan Turing' text. Below the value is the text **0 references** with a downward-pointing triangle. To the right of the value and references are three action buttons: **edit** (with a pencil icon), **+ add reference**, and **+ add value**.

On Client

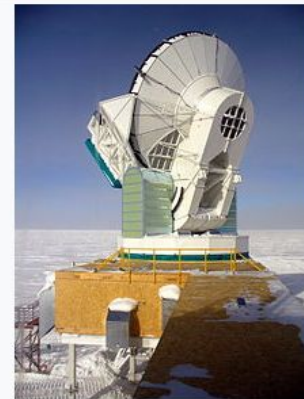
- Sitelink usage
- Data usage
 - Parser functions
 - Lua functions (<https://w.wiki/9Va>)

Languages 

العربية
Cymraeg
Deutsch
Español
Esperanto
فارسی
Français
Bahasa Indonesia
Italiano
Lëtzebuergesch
Lietuvių
Македонски
日本語
Norsk
Polski
Português
Українська
中文

 Edit links

South Pole Telescope



The South Pole Telescope in November 2009

Alternative names	SPT 
Part of	Amundsen–Scott South Pole Station  Event Horizon Telescope 
Location(s)	South Pole, Antarctic Treaty area, Antarctica 
Coordinates	 90°S 0°E 
Altitude	2.8 km (9,200 ft) ^[1] 
Built	November 2006  –February 2007  ^[2] 
First light	16 February 2007 

Tracking entity usage

Client-side:

```
MariaDB [euwiki_p]> select * from wbc_entity_usage where eu_entity_id = 'Q7251';
+-----+-----+-----+-----+
| eu_row_id | eu_entity_id | eu_aspect | eu_page_id |
+-----+-----+-----+-----+
| 5792173 | Q7251        | C         | 24076       |
| 29936634 | Q7251        | L.eu      | 24076       |
| 2961057  | Q7251        | L.eu      | 284324      |
| 26509057 | Q7251        | L.eu      | 580923      |
| 18681943 | Q7251        | L.eu      | 807797      |
| 636108   | Q7251        | O         | 24076       |
| 636111   | Q7251        | S         | 24076       |
| 636109   | Q7251        | T         | 24076       |
| 2961059  | Q7251        | T         | 284324      |
| 26509058 | Q7251        | T         | 580923      |
+-----+-----+-----+-----+
10 rows in set (0.01 sec)

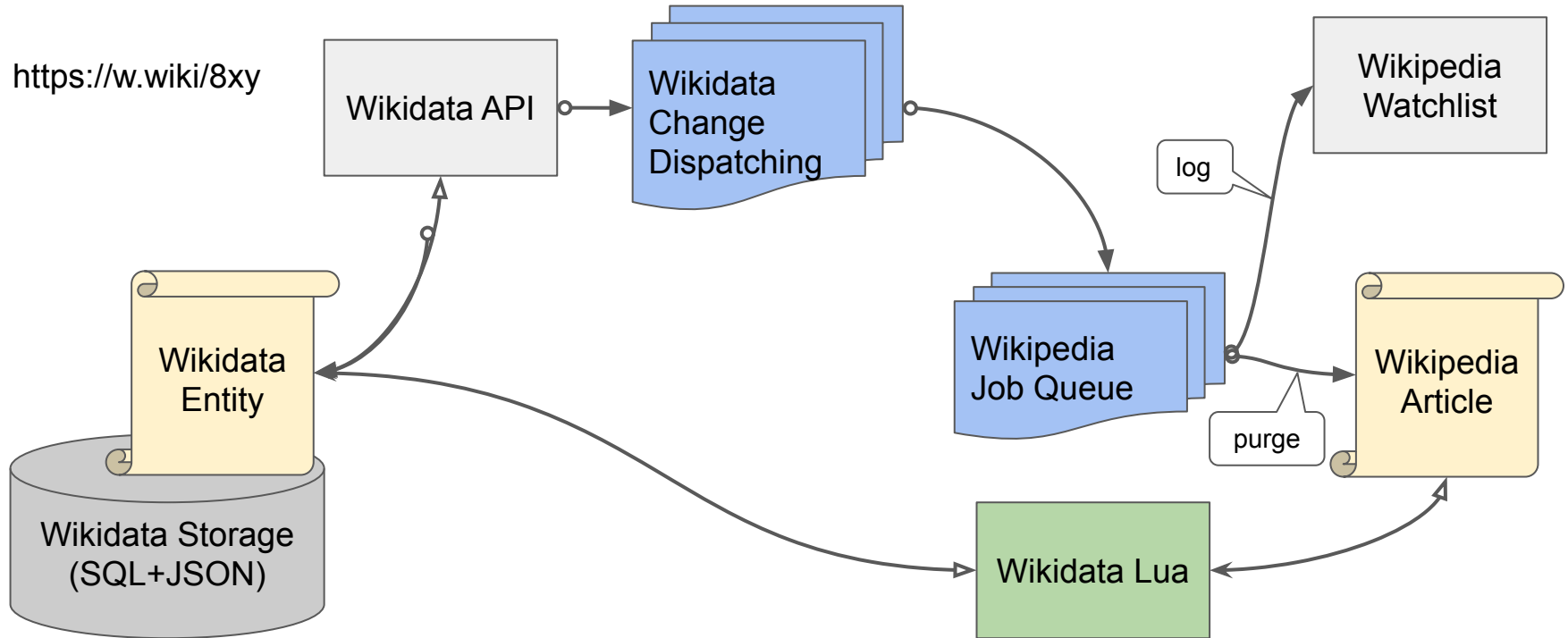
MariaDB [euwiki_p]> █
```

Repo-side:

```
MariaDB [wikidatawiki_p]> select * from wb_changes_subscription where cs_entity_id = 'Q7251';
+-----+-----+-----+
| cs_row_id | cs_entity_id | cs_subscriber_id |
+-----+-----+-----+
| 103425677 | Q7251        | adywiki           |
| 57014298  | Q7251        | afwiki           |
| 57041654  | Q7251        | alswiki          |
| 57095558  | Q7251        | anwiki           |
| 49287167  | Q7251        | arwiki           |
| 57122747  | Q7251        | arwiki           |
| 57145349  | Q7251        | astwiki          |
| 57154877  | Q7251        | aswiki           |
| 113578216 | Q7251        | azbwiki          |
| 76413512  | Q7251        | azwiki           |
| 57318864  | Q7251        | bat_smgwiki      |
| 57367856  | Q7251        | bawkt            |
| 117022292 | Q7251        | bclwiki          |
| 57455739  | Q7251        | be_x_oldwiki     |
| 106847561 | Q7251        | bewiki           |
| 106849366 | Q7251        | bewikiquote      |
| 72176889  | Q7251        | bgwiki           |
| 107711230 | Q7251        | bhwiki           |
| 57669624  | Q7251        | bnwiki           |
| 57771676  | Q7251        | brwiki           |
| 57863678  | Q7251        | bswiki           |
| 102052821 | Q7251        | bxrwiki          |
```



Change dispatching



On another repo

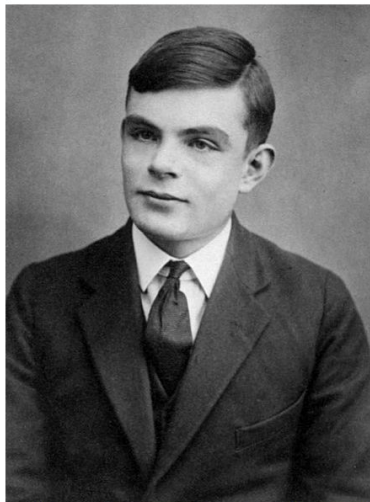
```
▼ entities:  
  ▼ M22828488:  
    pageid: 22828488  
    ns: 6  
    title: "File:Alan Turing Aged 16.jpg"  
    lastrevid: 357356024  
    modified: "2019-07-07T12:00:20Z"  
    type: "mediainfo"  
    id: "M22828488"  
    labels: {}  
    descriptions: {}  
  ▼ statements:  
    ▼ P180:  
      ▼ 0:  
        ▼ mainsnak:  
          snaktype: "value"  
          property: "P180"  
          ▼ datavalue:  
            ▼ value:  
              entity-type: "item"  
              numeric-id: 7251  
              id: "Q7251"  
              type: "wikibase-entityid"  
              type: "statement"  
              id: "M22828488$1c87d708-4dca-385a-d80e-7bbbff7f2615"  
              rank: "normal"
```



File:Alan Turing Aged 16.jpg

From Wikimedia Commons, the free media repository

[Download](#) [Use this file](#) [Use this file](#)



Size of this preview: 440 × 599 pixels. Other resolutions: 176 × 240 pixels | 352 × 480 pixels | 675 × 919 pixels.

[ImageMapEdit](#) >

[Add a note](#) ?

Original file (675 × 919 pixels, file size: 212 KB, MIME type: image/jpeg); [request rotation](#)

[Open in Media Viewer](#) ⚙

File information **Structured data**

ⓘ Structured data labels link to their respective Wikidata pages and will open in a new window. ✕

Items portrayed in this file Edit

depicts

from Wikidata

[Alan Turing](#) ←

[Mark as prominent](#)

[+ Add statement](#)

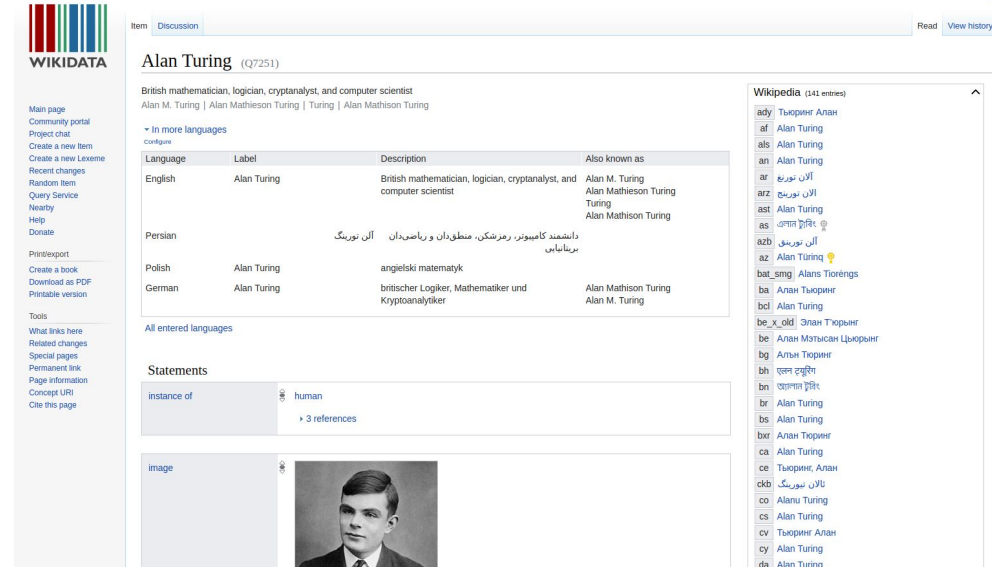
Front-end stack



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Entity pageview frontend

- jquery ui widgets
- Hooked into mediawiki ResourceLoader:
 - Start point: “wikibase.ui.entityViewInit” module



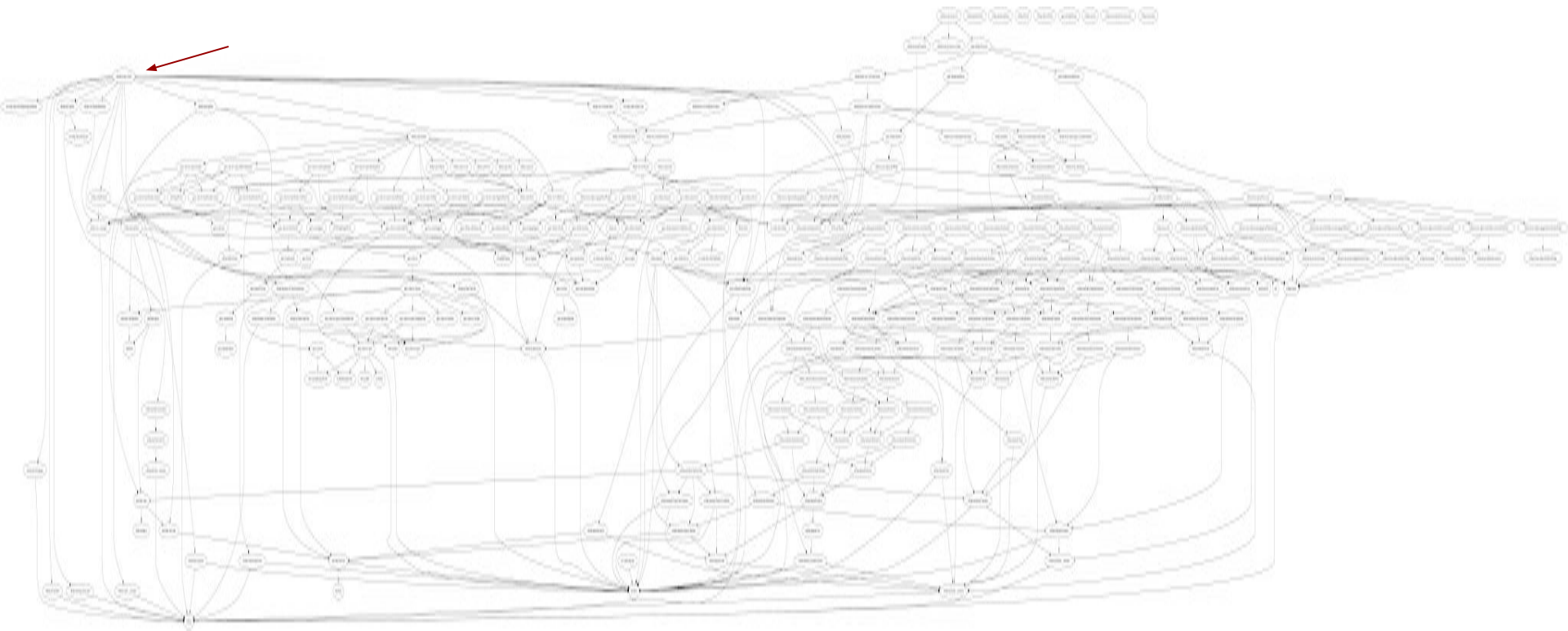
The screenshot displays the Wikidata entity page for Alan Turing (Q7251). The page is structured as follows:

- Header:** Wikidata logo and navigation links (Main page, Community portal, Project chat, etc.).
- Item:** "Alan Turing" (Q7251) with a "Discussion" tab.
- Description:** "British mathematician, logician, cryptanalyst, and computer scientist".
- Language Table:** A table showing labels and descriptions in various languages. The table has four columns: Language, Label, Description, and Also known as.
- Statements:** A section for "Instance of" showing "human" with 3 references.
- Image:** A portrait of Alan Turing.
- Wikipedia:** A list of 141 external Wikipedia links in various languages.

Language	Label	Description	Also known as
English	Alan Turing	British mathematician, logician, cryptanalyst, and computer scientist	Alan M. Turing Alan Mathison Turing Turing Alan Mathison Turing
Persian		دانشمند کامپیوتر، رمزشکن، منطق‌دان و ریاضیدان آئن تورینگ	
Polish	Alan Turing	angielski matematyk	
German	Alan Turing	britischer Logiker, Mathematiker und Kryptoanalytiker	Alan Mathison Turing Alan M. Turing

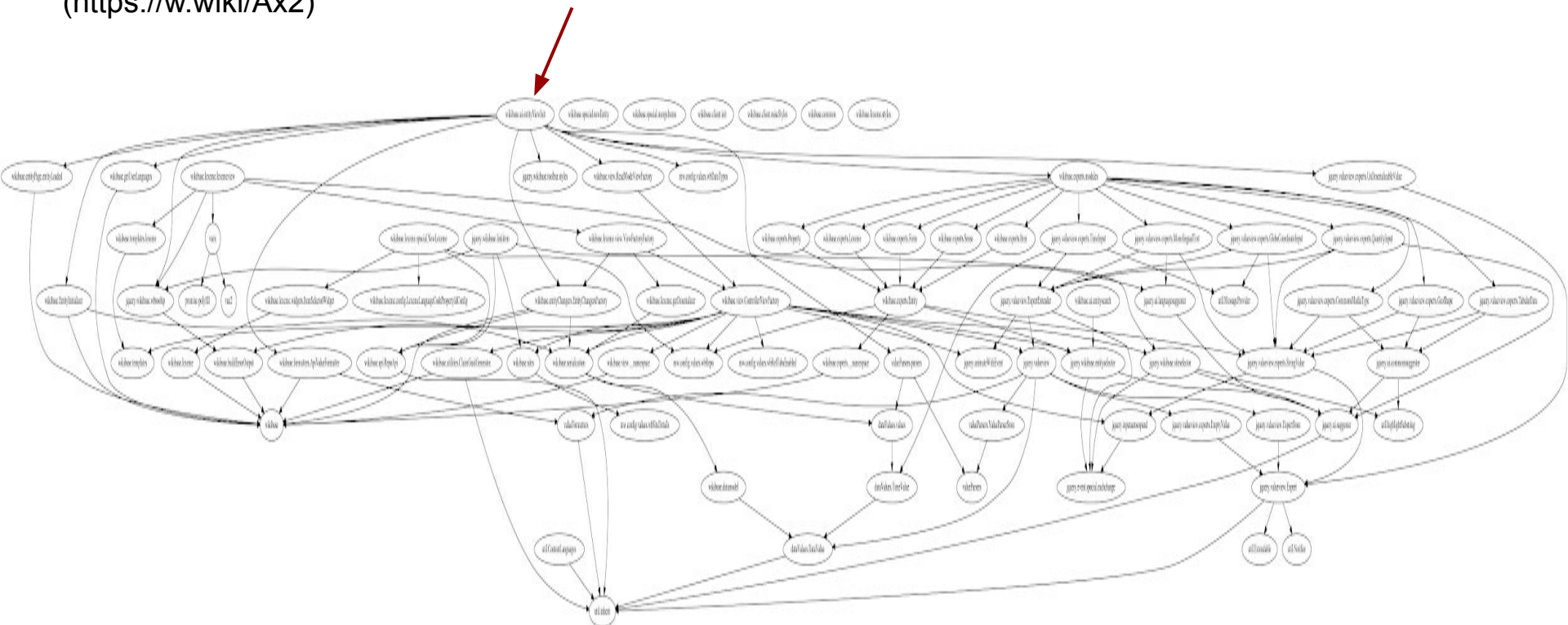
Legacy

(<https://w.wiki/9VN>)



Refactoring RL modules

(<https://w.wiki/Ax2>)



Modernizing frontend

- Server Side Rendering
- VueJS + TypeScript



Wikidata

(Q7251)

English

Alan Turing

British mathematician, logician, cryptanalyst, and computer scientist

Alan M. Turing | Alan Mathison Turing | Turing | Alan Mathison Turing

In more languages

Polish

Alan Turing

angielski matematyk

German

Alan Turing

britischer Logiker, Mathematiker und Kryptoanalytiker

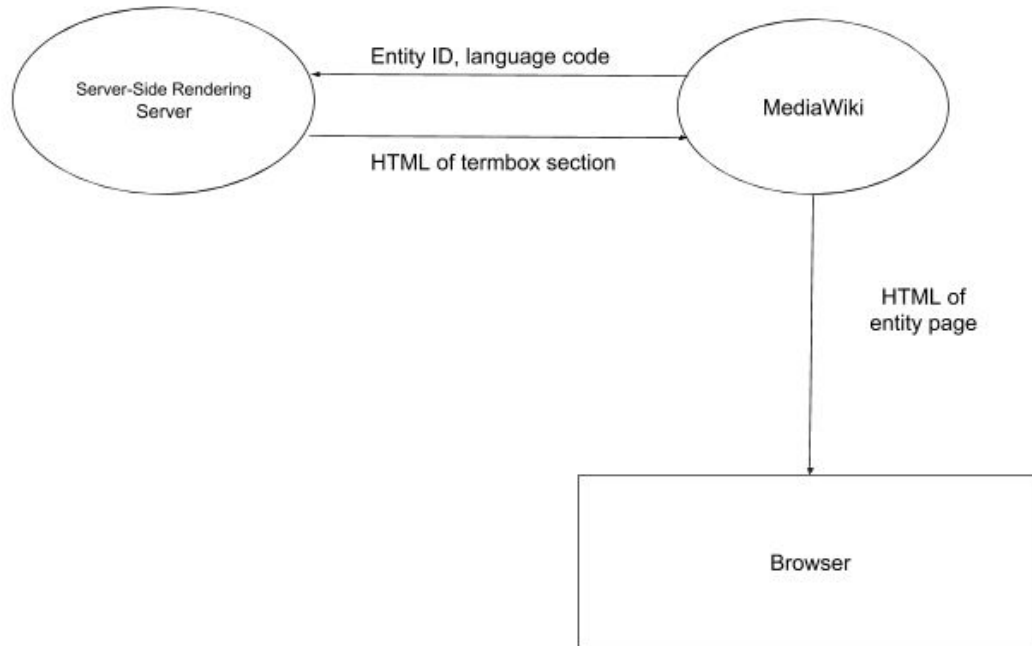
Alan Mathison Turing | Alan M. Turing

Russian

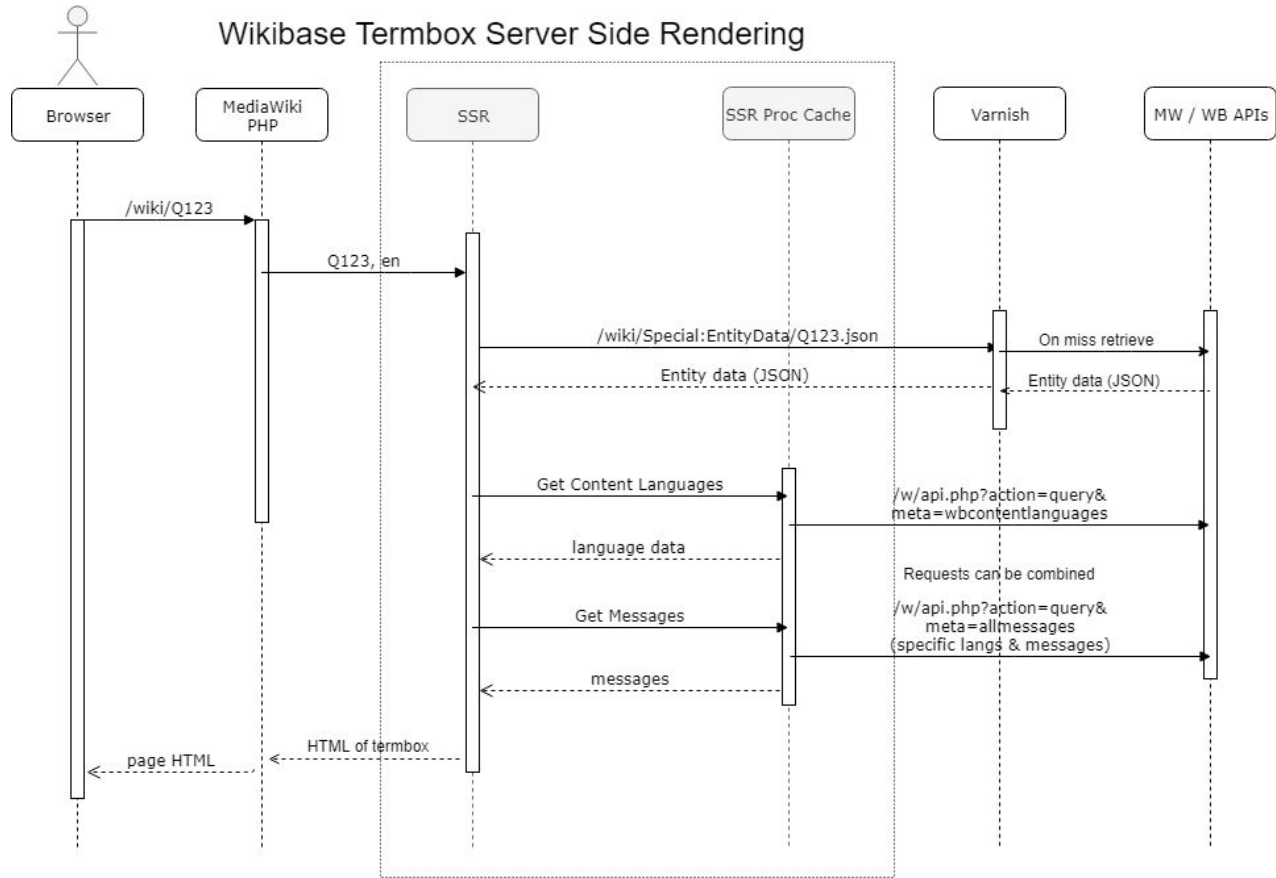
Алан Тьюринг

английский математик, логик, криптограф

SSR, overview



SSR, details



Miscellaneous parts



WIKIMEDIA
DEUTSCHLAND

Even more things to support Wikidata

- WikibaseQualityConstraints
- WMDE analytics refinery
- PropertySuggester
- ArticlePlaceholder (for client wikis)
- Bot frameworks:
 - QuickStatements
 - Pywikibot
 - WikidataIntegrator
 - ...

The screenshot shows a Wikidata interface with a 'Potential issues' dialog box open. The dialog box has a title bar with 'Potential issues' and a close button (X). Below the title bar, there is a section for 'distinct values constraint' with a 'Help Discuss' link. The text below reads: 'This property's value should not be present on any other item, but is also present on [Category:Alan Turing](#).' At the bottom of the dialog box, there is a section for 'Advanced issues' with an '[Expand]' link. The background shows a 'Commons gallery' and a 'Commons category' section.

Future changes



WIKIMEDIA
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Some changes

maintenance:

- Term store migration
- Wikidata query service backend scaling
- Frontend improvements

feature:

- Client editing (wikidata bridge)

Docs

- [Docs directory in the git repo](#)
- [Wikidata page in wikitech](#)
- [Wikibase page in mediawiki.org](#)



Thank you!

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