TECHNOLOGY DEPT
Foundational & Sustaining Programs

February 2018 quarterly check-in
for work done in Q2 FY2017/18

WIKIMEDIA
FOUNDATION

Program Structure

Sustaining	TP1 Availability, Performance & Maintenance	TP3 Addressing Technical Debt TP8 Multi-datacenter Support
Foundational	TP2 Mediawiki Refresh TP6 Streamlined Service Delivery PP1 Discoverability	X-SPDM Security, Privacy, & Data mgmt X-SDC Structured Data on Commons
Community Support	TP5 Scoring Platform (ORES) TP9 Growing Wikipedia Across Languages [...] TP7 Smart Tools for Better Data	TP11 Citations/Verifiability TP12 Growing Contributor Diversity X-CH Community Health/Anti-harassment
Tech Community Support	TP4 Technical Community Building	TP10 Public Cloud Services & Support

Program Priorities

	If we don't do this...	Actual FTE (approximate)
Sustaining	The sites go down.	30
Foundational	Performance and data quality decays.	10
Community Support	Become technologically obsolete.	10
Tech Community Support	Lose bots and code contributions.	4

How we prioritize

Fundamentals
What is our part in fulfilling the mission?

Service
What are other people asking from us?

Improvement
What could we do to improve our offering?

Maintenance
What will sustain and improve our delivery?

Agenda:

Technology
Program 1: Availability, performance and maintenance
Program 2: MediaWiki
Program 3: Addressing technical debt
Program 6: Streamlined service delivery
Program 8: Multi-datacenter support

Product / Audiences & Cross-Departmental (tech portions only)
Program 1: Make knowledge more easily discoverable

Programs covered in other presentations:
Program 7: Payment processor investigation and long-term strategy
Program 8: Donor retention
Fundraising Tech / Advancement
Privacy, Security and Data Management
Structured Data on Commons (Database & Search integration)

Technology Program 1

Availability, Performance and Maintenance

Program Structure

Sustaining	TP1 Availability, Performance & Maintenance

We will **maintain** the *availability* of Wikimedia's sites and services for our global audiences, and ensure they're running ***reliably***, ***securely*** and ***performant*** while *modernizing* our infrastructure and improving current levels of service when it comes to testing, deployments and maintenance of software and hardware

Lewis Hine Power house mechanic working on steam pump, Public Domain

Feb 2018

TechOps / Traffic

New cache edge site *EQSIN*, to better serve Asia:

- **Completed purchasing of space and hardware**
- **Acquired IP address space from APNIC**
- **Installed all server & network hardware**
- **Network links and user service on track for Q3**

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TEAM/DEPT
TechOps / Core Ops

PROGRAM
1.1.1

Punch cards, Public Domain

Wikidata now has its own dedicated *database section* with dedicated resources: *s8*

After extensive preparation work throughout Q2, the migration was performed seamlessly on January 9th.

Keeping up…

All Puppet agents in production and Cloud Services have been upgraded to Puppet 4, *enabling new syntax and features*
- The upgrade of PuppetDB (backend) was postponed to Q3

The "*misc*" caching cluster was upgraded to Varnish 5
- all other clusters will follow in Q3

WIKIMEDIA
F O U N D A T I O N

Varnish being applied, CC0 Public Domain

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TEAM/DEPT

Release Engineering

PROGRAM

1.5

Migrate majority of developers to Node.js framework:

We are changing our canonical browser testing framework to being Node.js based (from Ruby).

This past quarter we officially deprecated the Ruby framework and only 46% of our repositories ("projects") depend on it at this point (with 7% in progress).

Technology Program 2

MediaWiki

Program Structure

Foundational

TP2 Mediawiki Refresh
TP6 Streamlined Service Delivery
PP1 Discoverability

We will strive for a refreshed and highly performant core platform by bringing renewed focus on MediaWiki

MediaWiki

Because ideas want to be free.

Outcome 1: Stakeholders in MediaWiki development will **have a sense of progress and direction** in MediaWiki.

    Objective 1: **develop** a MediaWiki **roadmap**

    Milestone 1: Hire a product manager for MediaWiki by 2017-08-31 ✔

Outcome 2: MediaWiki **code quality** will be improved.

    Objective 1: Increase measured unit test coverage

    Objective 2: Break up large classes and source files

Outcome 3: MediaWiki **security and stability** will be improved.

    Objective 1: Address the backlog of action items that arise from security and downtime post-mortems

How can we reduce complexity?

2 parsers

2 HTML storage systems

3 UIs

2 APIs

Co-leading the cross-departmental Audiences Technology Working Group

Developing a cross-departmental program:

- annual plan goals
- 3-5 year plan

Status: Planning in progress

Namespacization

Namespaces:
- Aid in readability
- Reduce ambiguity
- Avoid naming collisions
- Promote structuring of code

Developing a tool to rename almost all of MediaWiki core's 1,700 classes.

Status: In progress, target end of Q3

	A	B	C
815	RevDelRevisionItem	MediaWiki\RevisionDelete\RevDelRevisionItem	
816	RevDelRevisionList	MediaWiki\RevisionDelete\RevDelRevisionList	
817	RevisionDeleteUser	MediaWiki\RevisionDelete\RevisionDeleteUser	
818	RevisionDeleter	MediaWiki\RevisionDelete\RevisionDeleter	
819	RevisionItem	MediaWiki\RevisionItem	
820	RevisionItemBase	MediaWiki\RevisionItemBase	
821	RevisionListBase	MediaWiki\RevisionListBase	
822	RunningStat	MediaWiki\RunningStat	
823	ScopedCallback	MediaWiki\ScopedCallback	
824	AugmentPageProps	MediaWiki\Search\AugmentPageProps	
825	DummySearchIndexFieldDefinition	MediaWiki\Search\DummySearchIndexFieldDefinition	
826	NullIndexField	MediaWiki\Search\NullIndexField	
827	PerRowAugmentor	MediaWiki\Search\PerRowAugmentor	
828	ResultAugmentor	MediaWiki\Search\ResultAugmentor	
829	ResultSetAugmentor	MediaWiki\Search\ResultSetAugmentor	
830	SearchDatabase	MediaWiki\Search\SearchDatabase	
831	SearchEngine	MediaWiki\Search\SearchEngine	
832	SearchEngineConfig	MediaWiki\Search\SearchEngineConfig	
833	SearchEngineDummy	MediaWiki\Search\SearchEngineDummy	
834	SearchEngineFactory	MediaWiki\Search\SearchEngineFactory	
835	SearchExactMatchRescorer	MediaWiki\Search\SearchExactMatchRescorer	
836	SearchHighlighter	MediaWiki\Search\SearchHighlighter	
837	SearchIndexField	MediaWiki\Search\SearchIndexField	
838	SearchIndexFieldDefinition	MediaWiki\Search\SearchIndexFieldDefinition	
839	SearchMssql	MediaWiki\Search\SearchMssql	
840	SearchMySQL	MediaWiki\Search\SearchMySQL	
841	SearchNearMatchResultSet	MediaWiki\Search\SearchNearMatchResultSet	
842	SearchNearMatcher	MediaWiki\Search\SearchNearMatcher	
843	SearchOracle	MediaWiki\Search\SearchOracle	
844	SearchPostgres	MediaWiki\Search\SearchPostgres	
845	SearchResult	MediaWiki\Search\SearchResult	
846	SearchResultSet	MediaWiki\Search\SearchResultSet	
847	SearchSqlite	MediaWiki\Search\SearchSqlite	
848	SearchSuggestion	MediaWiki\Search\SearchSuggestion	
849	SearchSuggestionSet	MediaWiki\Search\SearchSuggestionSet	
850	SqlSearchResultSet	MediaWiki\Search\SqlSearchResultSet	
851	SiteConfiguration	MediaWiki\SiteConfiguration	
852	SiteStats	MediaWiki\SiteStats	
853	SiteStatsInit	MediaWiki\SiteStatsInit	
854	CachingSiteStore	MediaWiki\Site\CachingSiteStore	
855	DBSiteStore	MediaWiki\Site\DBSiteStore	
856	FileBasedSiteLookup	MediaWiki\Site\FileBasedSiteLookup	
857	HashSiteStore	MediaWiki\Site\HashSiteStore	
858	MediaWikiSite	MediaWiki\Site\MediaWikiSite	
859	Site	MediaWiki\Site\Site	

Code Quality

Mirror, mirror on the wall, how much testing to test it all?

✓ TEST 1
✓ TEST 2
✓ TEST 3

ILLUSTRATED BY SEGUE TECHNOLOGIES

Improvements to:
- continuous integration
- code coverage analysis
- extension management

Core and extension bug fixes

Code review

Status: On-going

Firejail

(a sandbox for external commands run by MediaWiki core)

Worked to:

- integrate Firejail into MediaWiki core
- contribute new features to Firejail upstream maintainers

Status: Development complete, deployment in Q3

Remove use of PHP serialization in revision storage

Addresses RFC *"Deprecate using php serialization inside MediaWiki"*

Status: Code written and in review, target completion end of Q3

Technology Program 3

Addressing technical debt

Program Structure

| Sustaining | TP3 Addressing Technical Debt |
| | TP8 Multi-datacenter Support |

We will lead an organization-wide effort to reduce technical debt

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TEAM/DEPT
Release Engineering
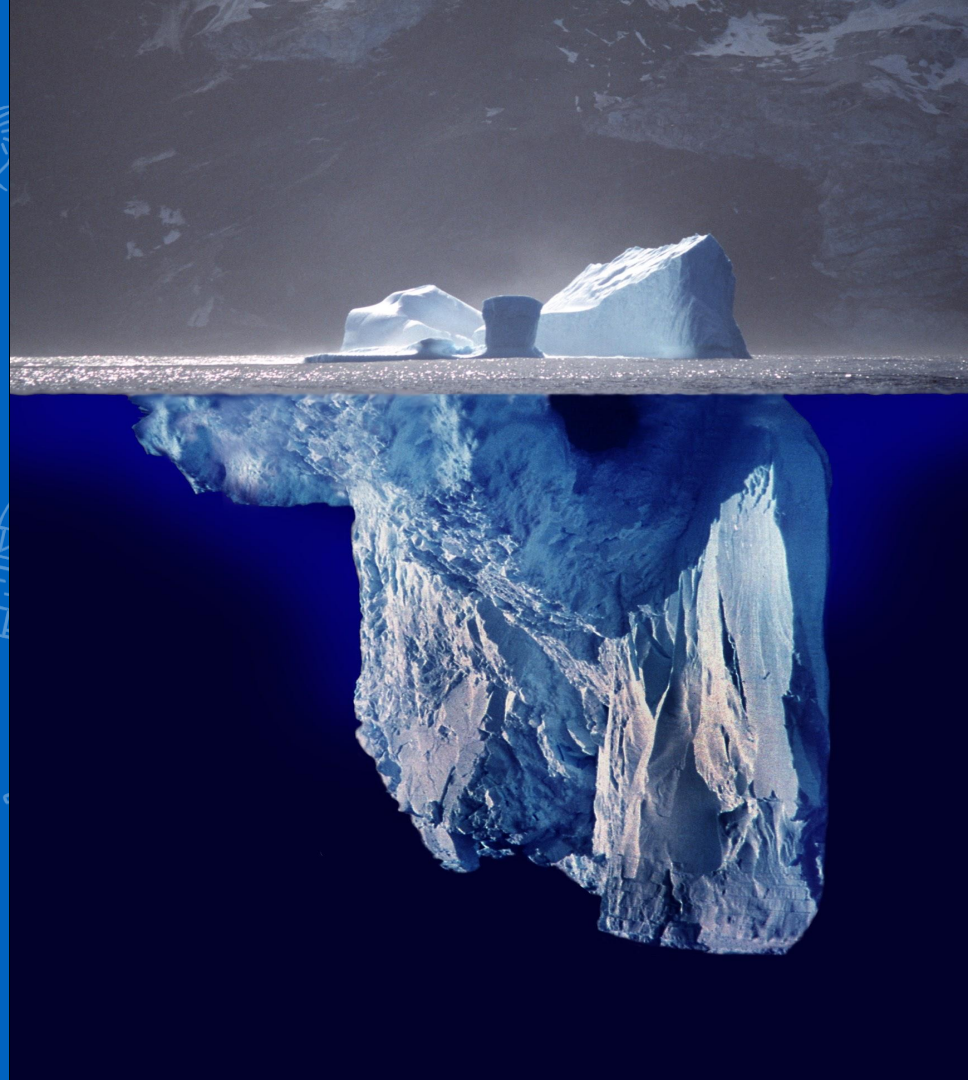
PROGRAM
3 - Tech Debt

Defined what it means to be a code steward
- pending a conversation with Toby and Victoria for wider dissemination

Defined the "Technical Debt Project Manager" role
- regularly communicates with all Foundation engineering teams regarding their technical debt

In collaboration with the Sunsetting Working Group
- developed a process ("Code Stewardship Reviews") for dealing with orphaned code; the first items are going through now

Continuing conversations
- with teams in support of finding stewards for orphaned code

Technology Program 6

Streamlined service delivery

Program Structure

| Foundational | TP2 Mediawiki Refresh
TP6 Streamlined Service Delivery
PP1 Discoverability |

We will *streamline* and *integrate* the delivery of services, by building a **new production platform** for integrated development, testing, deployment and hosting of applications

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TEAM/DEPT
TechOps / CoreOps

PROGRAM
6.1.2

TechOps (with Release Engineering) **extended the design of our new service delivery platform** with a design for *pod-level monitoring and service-level alerting* - monitoring standard metrics of CPU & memory usage, IO operations, etc...

Created *scaffolding* (of Helm charts) to setup services for either personal development or production deployment.

Operation Latencies

Kubelet operation latencies eqiad
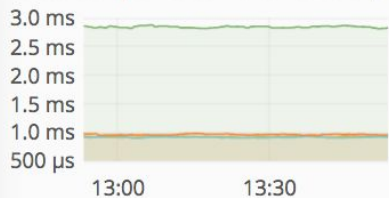
3.0 ms
2.5 ms
2.0 ms
1.5 ms
1.0 ms
500 µs

13:00 13:30

— kubernetes1001.eqiad.wmnet
— kubernetes1002.eqiad.wmnet
— kubernetes1003.eqiad.wmnet
— kubernetes1004.eqiad.wmnet

Kubelet operation latencies codfw

1.6 ms
1.4 ms
1.2 ms
1.0 ms
800 µs

13:00 13:30
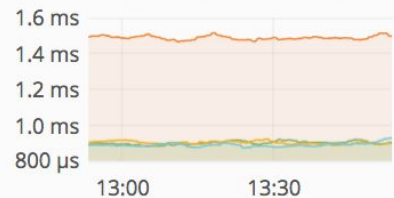
— kubernetes2001.codfw.wmnet
— kubernetes2002.codfw.wmnet
— kubernetes2003.codfw.wmnet
— kubernetes2004.codfw.wmnet

Kubelet operation latencies eqiad

4.0 ms
3.0 ms
2.0 ms
1.0 ms
0 µs

13:00 13:30
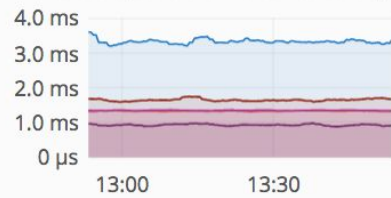
— container_status
— create_container
— exec
— image_status
— list_containers

Kubelet operation latencies codfw

2.0 ms
1.5 ms
1.0 ms
500 µs

13:00 13:30
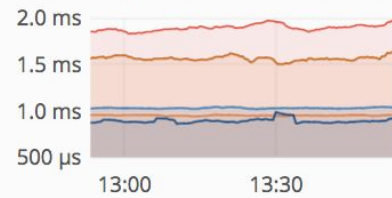
— run_podsandbox
— start_container
— status
— stop_podsandbox
— version

Response times

Kubelet response times eqiad
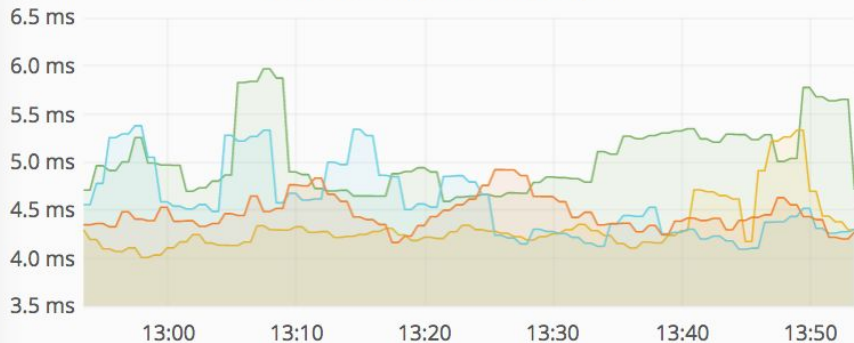
6.5 ms
6.0 ms
5.5 ms
5.0 ms
4.5 ms
4.0 ms
3.5 ms

13:00 13:10 13:20 13:30 13:40 13:50

— kubernetes1001.eqiad.wmnet — kubernetes1002.eqiad.wmnet
— kubernetes1003.eqiad.wmnet — kubernetes1004.eqiad.wmnet

Kubelet response times codfw
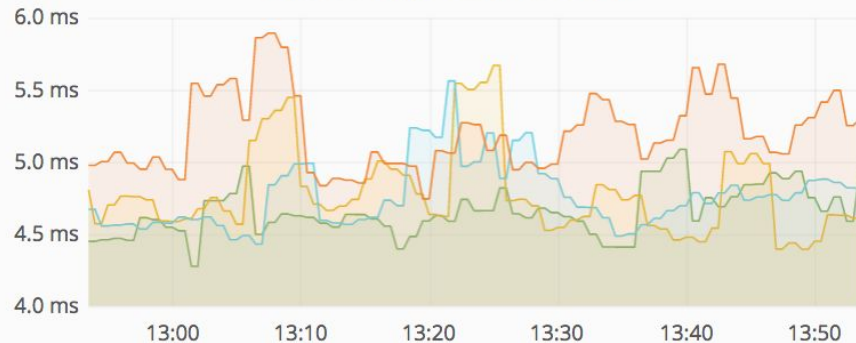
6.0 ms
5.5 ms
5.0 ms
4.5 ms
4.0 ms

13:00 13:10 13:20 13:30 13:40 13:50

— kubernetes2001.codfw.wmnet — kubernetes2002.codfw.wmnet
— kubernetes2003.codfw.wmnet — kubernetes2004.codfw.wmnet
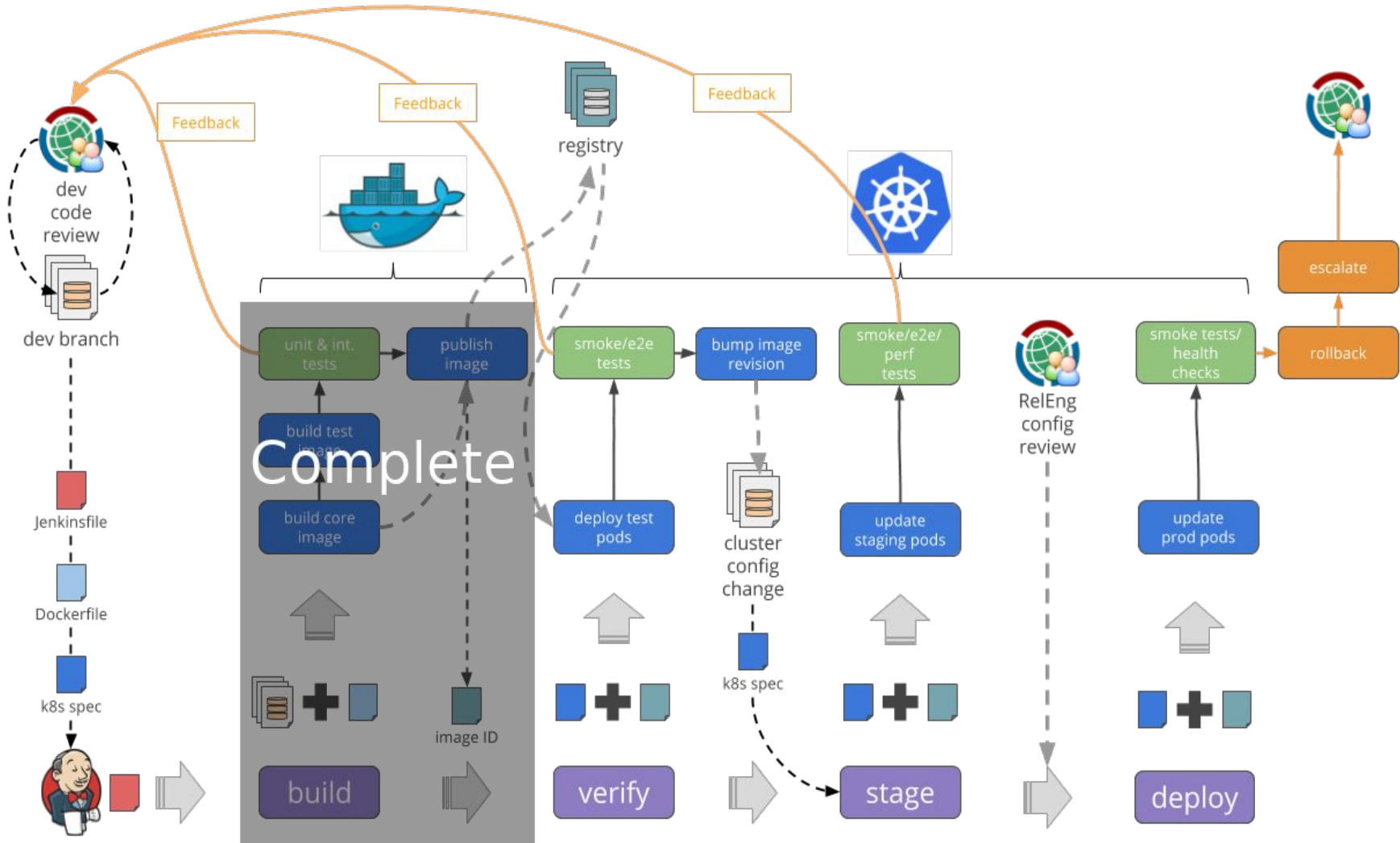
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TEAM/DEPT

Release Engineering

PROGRAM

6.1.2

End-to-end smoke tests are included to verify the functional integrity of production images before promotion to a staging environment.

Release Engineering also completed the push phase of the production variant of build and release pipeline.

Technology Program 8

Multi-datacenter support

Program Structure

Sustaining	TP3 Addressing Technical Debt
	TP8 Multi-datacenter Support

Program 8 Multi-datacenter support

1. **Faster primary datacenter switchover**

2. **Dual primary data centers**

Image by NASA

mcrouter deployment

- A Facebook product which provides memcached replication
- Goal: install and use in deployment-prep (Beta Cluster)
- Puppet module deployed, mostly complete
- Initial testing done
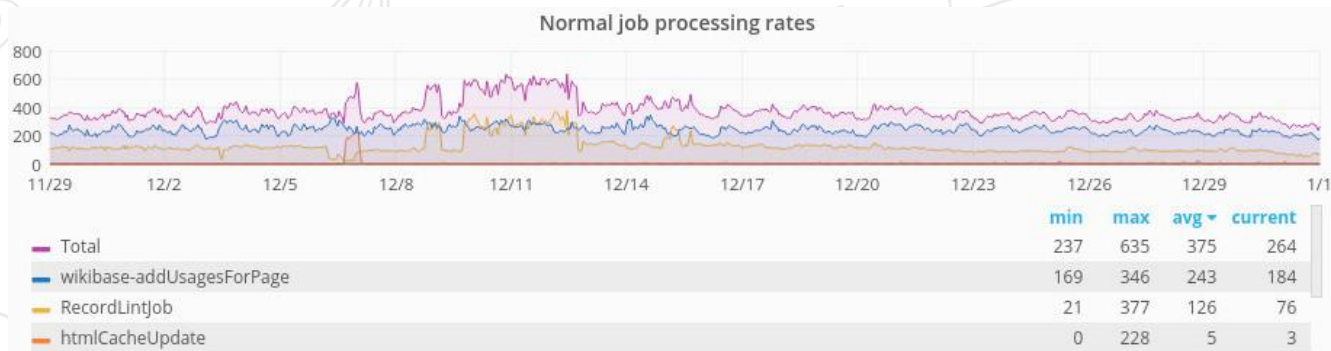- **Status: in progress**

Modernize the JobQueue transport

- Migrated 3.5 high-traffic and 1 low-traffic job to EventBus
  - Q2 avg: 400 / 1100 jobs
- Identified the needs for the migration of the remaining jobs
  - refreshLinks (deduplication), CirrusSearch jobs (delayed execution)
- Documented metrics and common operational tasks
  - https://wikitech.wikimedia.org/wiki/Kafka_Job_Queue
  - https://grafana.wikimedia.org/dashboard/db/jobqueue-eventbus

Normal job processing rates

	min	max	avg ▾	current
━ Total	237	635	375	264
━ wikibase-addUsagesForPage	169	346	243	184
━ RecordLintJob	21	377	126	76
━ htmlCacheUpdate	0	228	5	3

Product Program 1

Make knowledge more easily discoverable
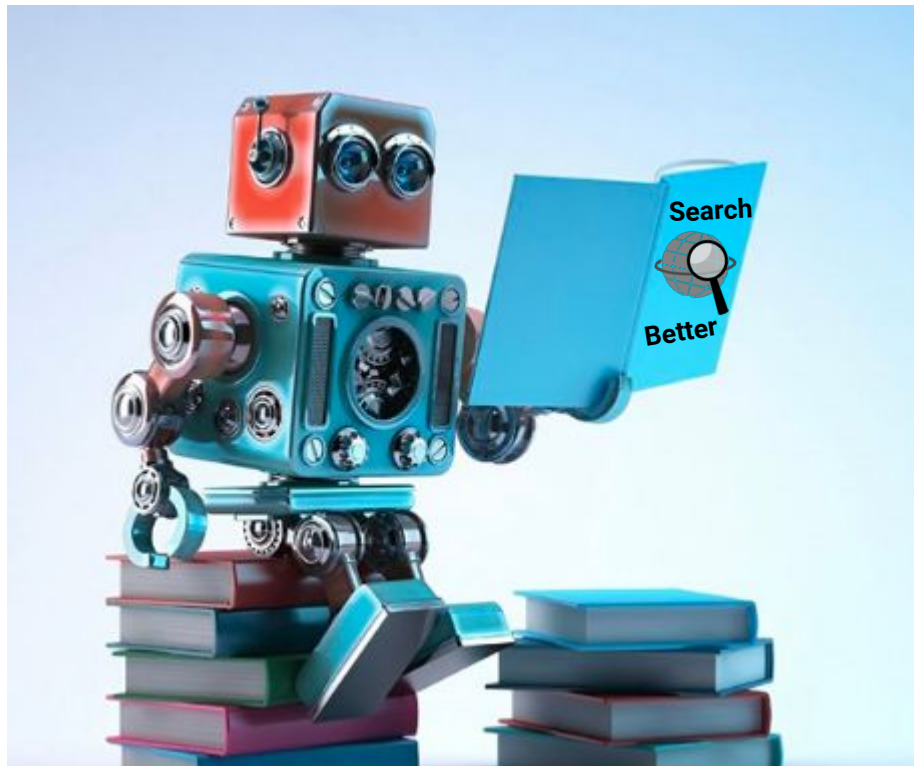
Program Structure

Foundational	TP2 Mediawiki Refresh
	TP6 Streamlined Service Delivery
	PP1 Discoverability

Through incremental search technology improvements, we will help readers more effectively discover and search for content.

Continued to improve
Machine Learning to Rank

- Implemented **more automation** of the training pipeline

- Added machine learning to rank for **8 additional languages**

- **Upgraded Elasticsearch** to v5.5

Follow the Epic: T161632

Improving
Search Across Languages

- Investigated seven open source language analysis software components for feasibility as Elasticsearch plugins (T171652)

- Investigated usage of fallback languages (T147959)
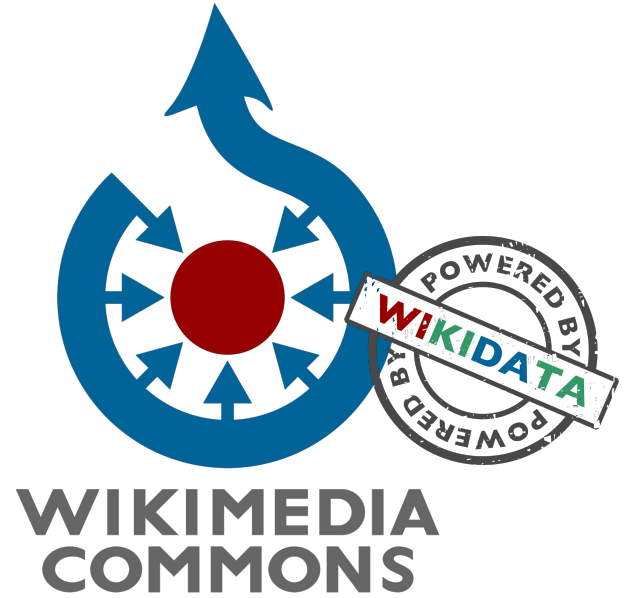
- Up Next for Q3: Phonetic Matching (T182708)

Photo by Man vyi
https://commons.wikimedia.org/wiki/File:Welcome_multilingual_Guernsey_tourism.jpg
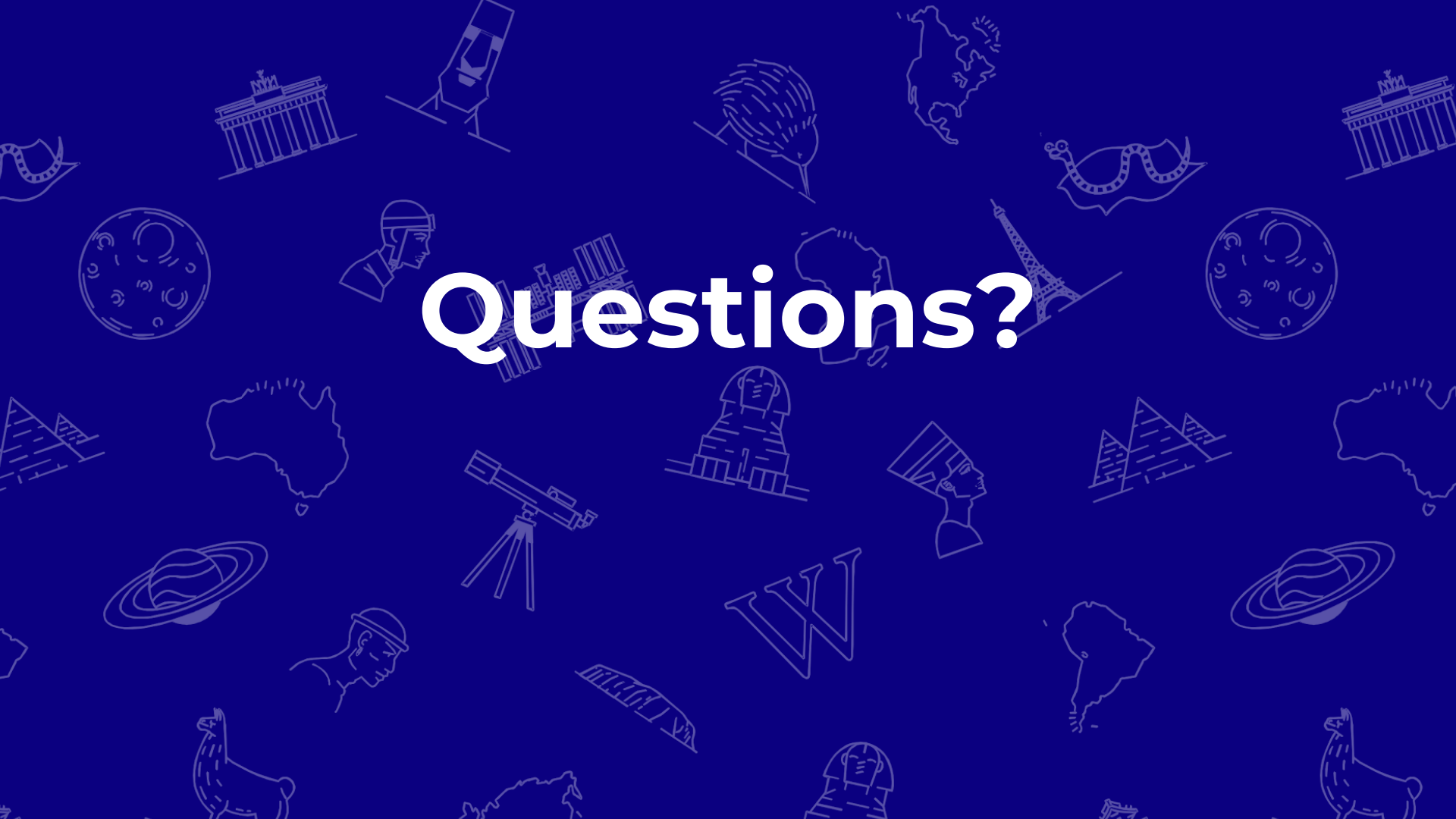
Preparing for
Structured Data on Commons

- **Category Search** via dumps for select wikis using SPARQL on WDQS

- Wikidata Query Service **Full-Text Search**

- Ready for next steps SDoC...
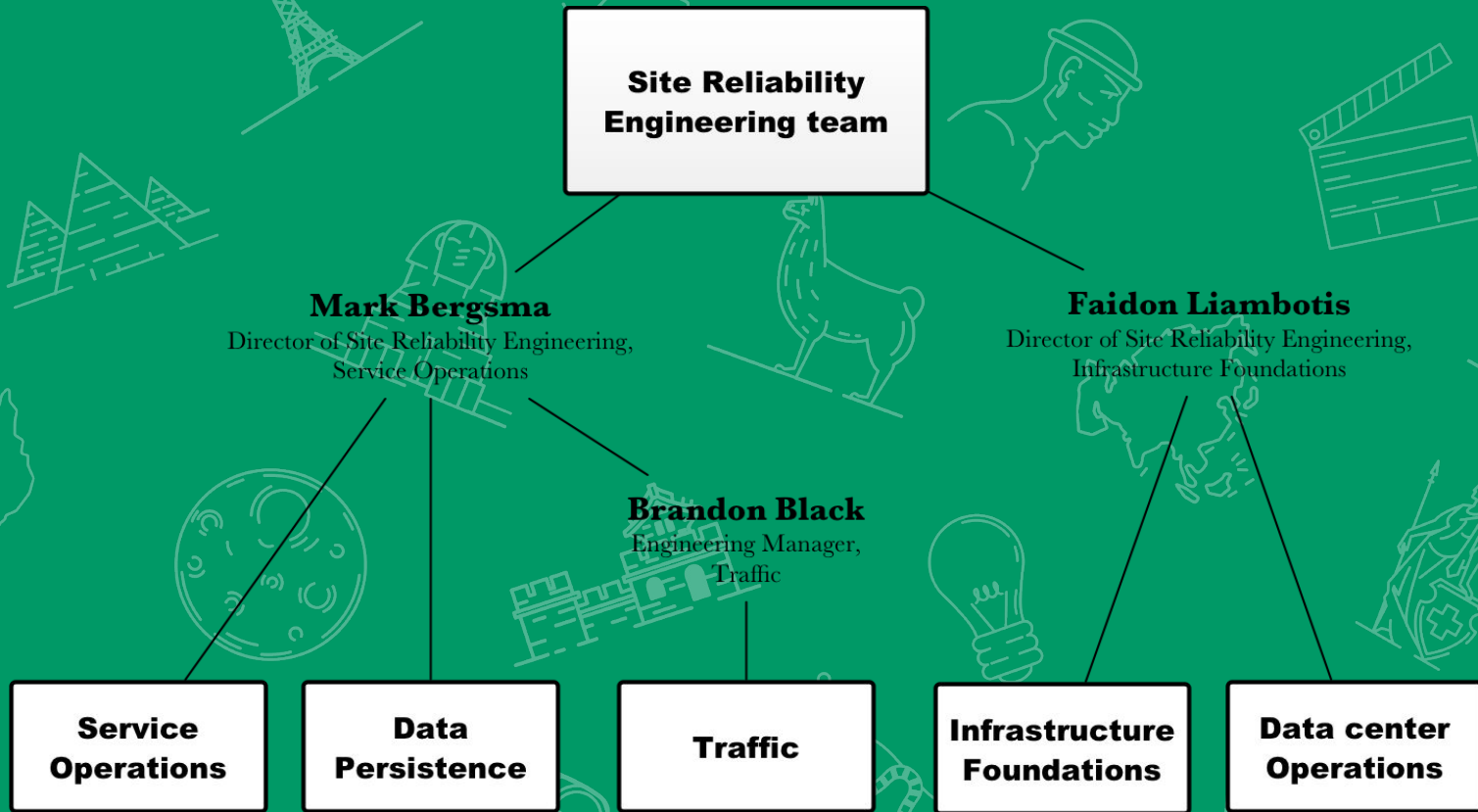
Questions?

Additional work:

Reactive, one-offs and notable achievements not mentioned previously

s/Tech Ops/SRE/

Site Reliability Engineering

Other achievements

- Deployed new MediaWiki appservers in eqiad
- Implemented BGP RPKI
- Setup server PSU redundancy monitoring/alerting
- Ramped up encryption of syslog traffic
- Upgraded Grafana to 4.6
- Upgraded HHVM to 3.18.5 across the fleet, fixing crash
- Removed duplicate db indexes on pagelinks and templatelinks
- Assisted with MCR schema design and testing
- Released 2 Pybal releases
- Finished 3DES TLS cipher removal process [w/Community Liaisons]

- Implemented Pybal multiple BGP sessions, per-svc MED support
- Ported Puppet cache manifests to role/profile
- Implemented nginx prometheus monitoring
- Migrated European ASN 43821 to ASN 14907
- Kept Jenkins updated to latest LTS releases [w/RelEng]
- Upgraded PDU firmware and hardened configuration
- Renewed network support contracts
- Upgraded OTRS to 5.0.23, then .24, .25 and .26
- Decommissioned Ganglia
- Migrated mail servers (MXes) certificates to Let's Encrypt

Other achievements

- Addressed various HTTP caching invalidation issues (incl. Commons)
- Increased MTU on all transit links to support Jumbo frames
- Puppetized and deployed Netbox experimental instance
- Decommissioned OCG
- Reduced paging false positives
- Fought seemingly unbounded growth of the JobQueue
- Implemented monitoring of SMART (HD/SSD health) metrics
- Performed MediaWiki schema changes for "refactored comments" [w/MediaWiki]

- Optimized Varnish timeouts, reducing HTTP errors
- Upgraded LibreNMS to latest release
- Redesigned apt.wikimedia.org repository structure
- Released new version of Cumin with additional features
- Sending "slow Varnish requests" to Logstash
- Implemented anycast for recursive DNS
- Implemented Icinga dashboard URLs to Grafana
- Migrating XML dumps to new (NFS) cluster [w/WMCS]
- Assisted with migration to Cassandra 3 [w/Services]

Other achievements

- Introduced database multi-instance hosts in core shards
- Standardized declaration and generation of certificates and keys for TLS/SSL
- Assisted Scoring platform team with ORES outages
- Assisted Scoring platform with ORES stress tests
- Assisted with scap upgrade to 3.7.4 and then 3.7.5
- Provided Performance with dedicate infra for web performance
- Moved package builder infrastructure to stretch and added support for buster
- Implemented monitoring for PuppetDB

- Restricted Varnish execution environment capabilities
- Improved script that automatically reimage servers
- Rollout of new wikidiff 1.5.1 [w/WMDE] (supports moved paragraphs)
- Revised repository structure for apt.wikimedia.org
- Video scalers migrated to stretch
- Hired a Traffic Security Engineer
- Assisted Services in the ongoing migration of the Jobqueue
- Began renewal of our network services, saving $45k/yr so far

Release Engineering

Other Highlights

- **Released MediaWiki 1.30, with help from Cindy/MW Platform Team**
- **Released MediaWiki 1.28.1/1.27.2/1.23.16 security releases**
- **Conducted 10 MediaWiki weekly train rollouts**
- **Reduced production logspam issues by closing a net of 19 tasks (50 created, 69 closed), see graphs on next slide.**
- **Conducted 2 incident post-mortems**
- **Gave a Tech Talk on Selenium tests in Node.js**
- **Enabled real-time pop-up notifications in Phabricator**

Logspam fighting
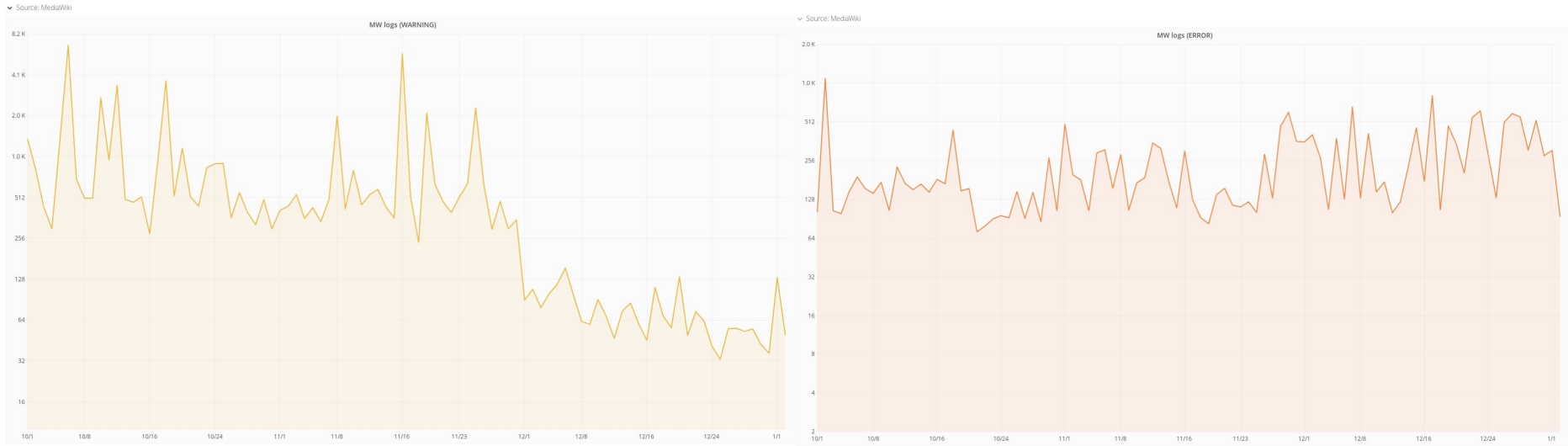
In essence: We reduced the rate of logging in the WARNING level, while ERROR (more severe) level stayed consistent.

Performance

Other achievements

- Onboarded new Performance Team manager
- Established stable, repeatable synthetic testing infrastructure
- Wrote and published the first comprehensive guide to performance testing Mediawiki features
- Replaced thumbnail generation infrastructure with Thumbor for all public wikis, and published a detailed set of blog posts on the process and rationale for the migration
- Worked with Mozilla to identify performance impacts of Firefox 57 ("Quantum"), and filed a number of bugs related to performance regressions

Cloud Services

Other achievements

- Migrated all Wiki Replica traffic to new cluster and decommissioned old servers
- Onboarded Arturo Borrero González as Operations Engineer
- Worked with Administration and CTO to make Sarah Rodlund available for 20 hours of Technical Writing per week starting in Q3

- Team offsite in Austin in conjunction with KubeCon/CloudNativeCon
- Introduced Arturo to smoked brisket
- Hired Brooke Storm as Operations Engineer
- Filled Tech Support contract role
- Filled Product Manager contract role

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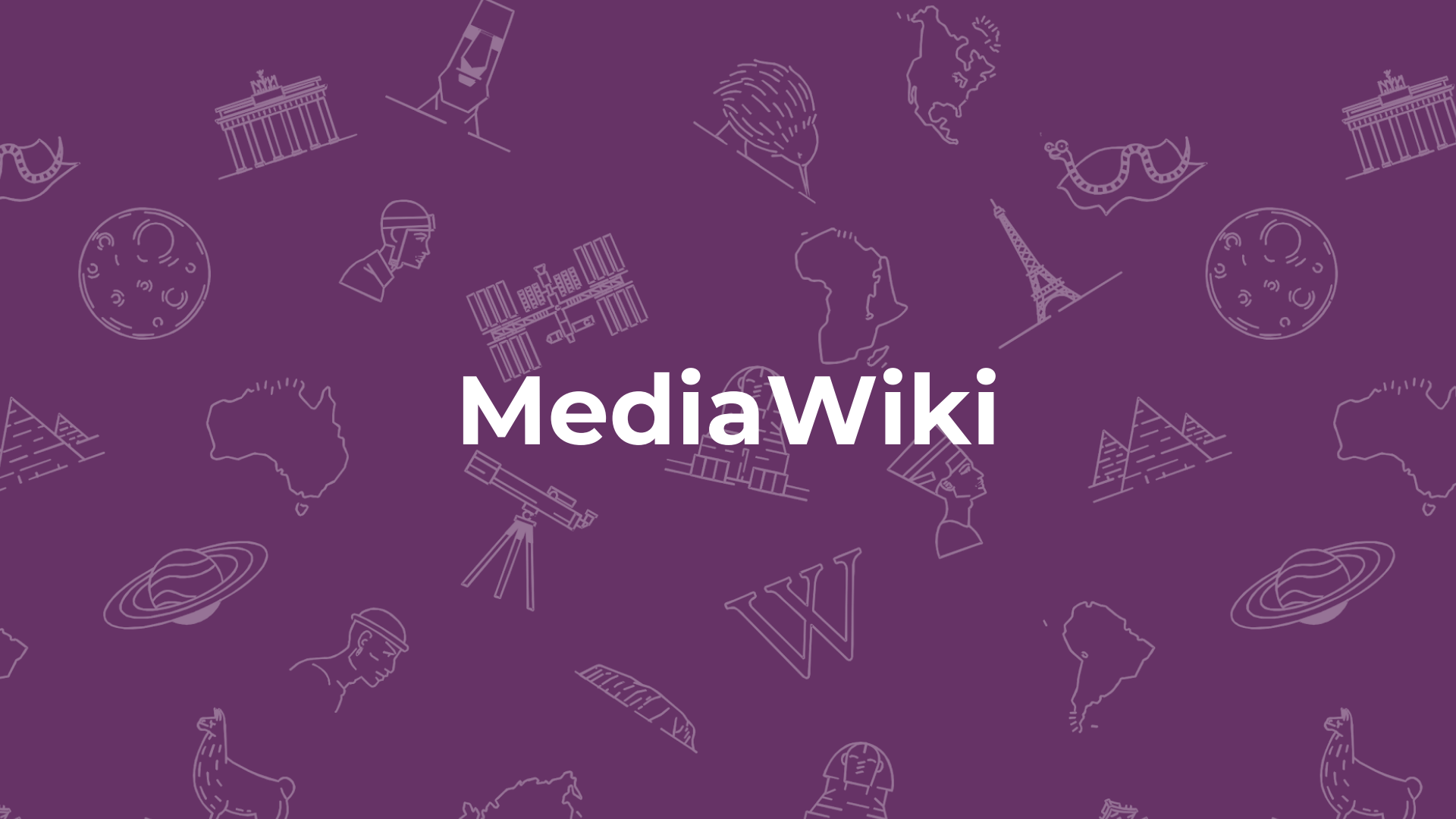
Other achievements

Major architectural work for Structured Data on Commons supporting Multi-Content Revisions:

- Comment table development complete, schema changes in progress
- Actor table development nearly complete, in code review

22%	mediawiki-core
90%	mediawiki-libs-Assert
100%	mediawiki-libs-Equivset
100%	mediawiki-libs-ObjectFactory

Other work to improve the MediaWiki platform:

- Helped Wikidata move to the normal deployment/branching system instead of a manual build
- Added a PSR-4 autoloader to MediaWiki core so developers aren't maintaining manual class and file listings
- Created "MinusX", a build tool to identify files with an executable bit set, that shouldn't
- Prettified test coverage listing on doc.wikimedia.org (see screenshot), in preparation for more work relating to test coverage
- Refactored edit conflict handling to support two column conflict (WMDE) Development