Survival kit for CERN's organic webscape: Kubernetes and a community of Makers

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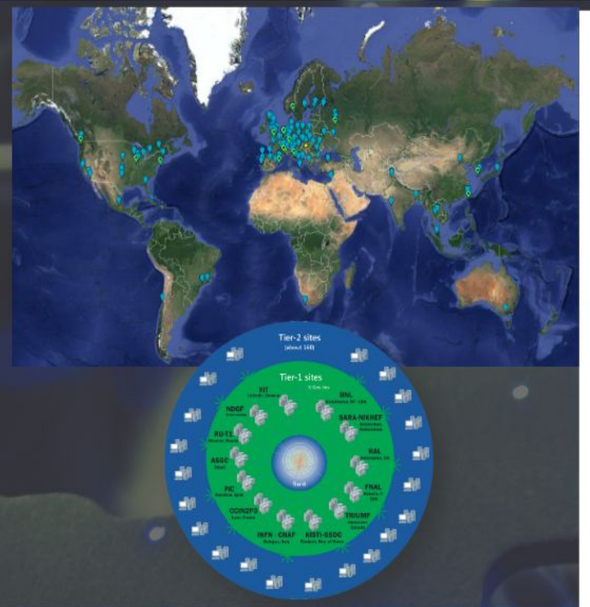
Catharine NOBLE, Francisco BARROS, Rajula VINEET

not anymore

Tier-0 (CERN and Hungary): data recording, reconstruction and distribution

Tier-1: permanent storage, re-processing, analysis

Tier-2: Simulation, end-user analysis



1 PB/s of data generated by the detectors

Up to **60 PB/year** of stored data

Large experiments have *managed* data sets of **>200 PB**

A distributed computing infrastructure of order of a **million cores** working 24/7

An average of 60M jobs/month

An continuous data transfer rate of 35-45 GB/s (**3 PB/day**) across the Worldwide LHC Grid (WLCG)

Public outreach

Home | CERN

https://home.cern

80%

ABOUT NEWS SCIENCE RESOURCES SEARCH | EN

Long-lived exotic particle discovered

News | 29 July, 2021

Welcome News Explore CERN Events Achievements

LATEST NEWS

Sparking the future of artificial intelligenc...

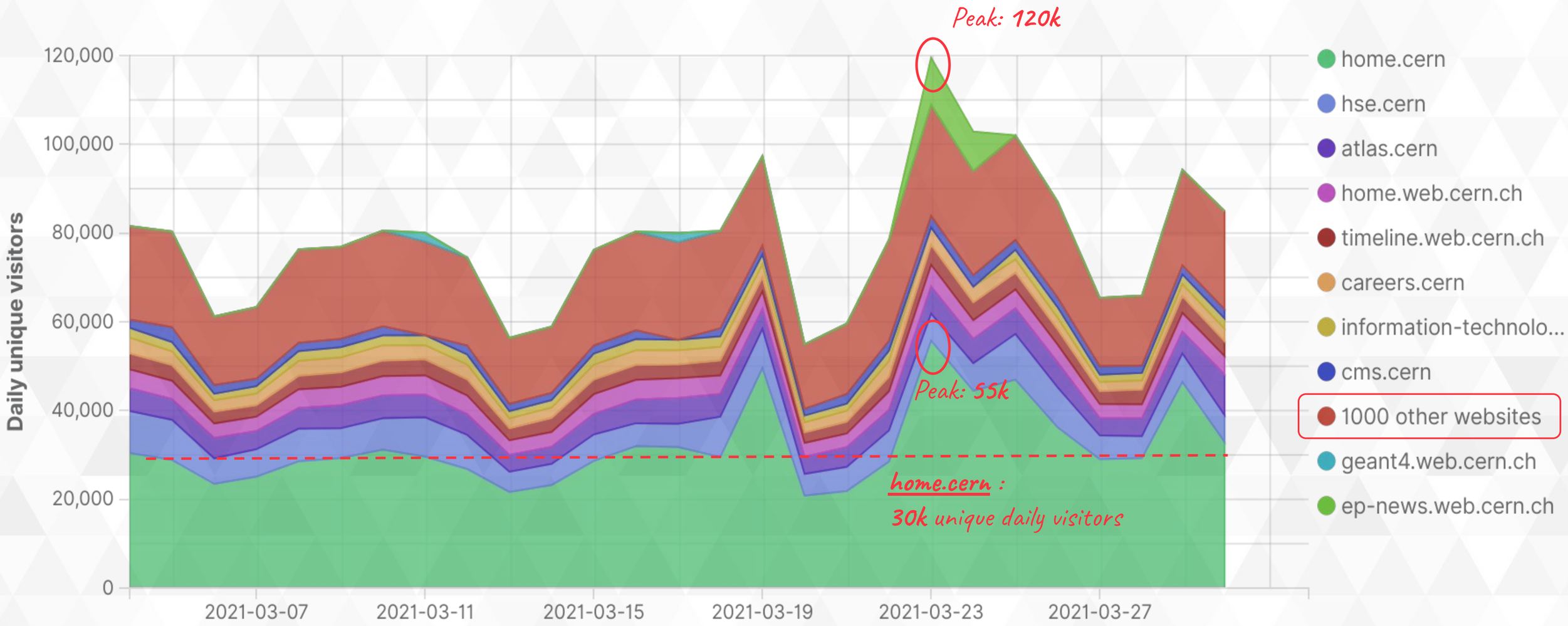
At CERN | News | 28 September, 2021

How to train your magnets

Accelerators | News | 28 September, 2021

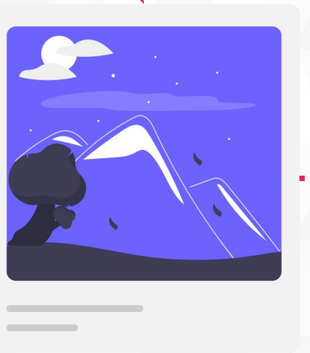
Professor Eliezer Rabinovici elected as next ...

At CERN | Press release | 24 September, 2021


Peak: 120k
Peak: 55k
home.cern :
30k unique daily visitors
Daily unique visitors
120,000
100,000
80,000
60,000
40,000
20,000
0
2021-03-07
2021-03-11
2021-03-15
2021-03-19
2021-03-23
2021-03-27
home.cern
hse.cern
atlas.cern
home.web.cern.ch
timeline.web.cern.ch
careers.cern
information-technolo...
cms.cern
1000 other websites
geant4.web.cern.ch
ep-news.web.cern.ch

Charting our journey

Web team, infra team & site builders



Tour of the Drupal service

Conflict! Shrinking web team... tech debt... **Drupal 8!**

Technical and Human solutions

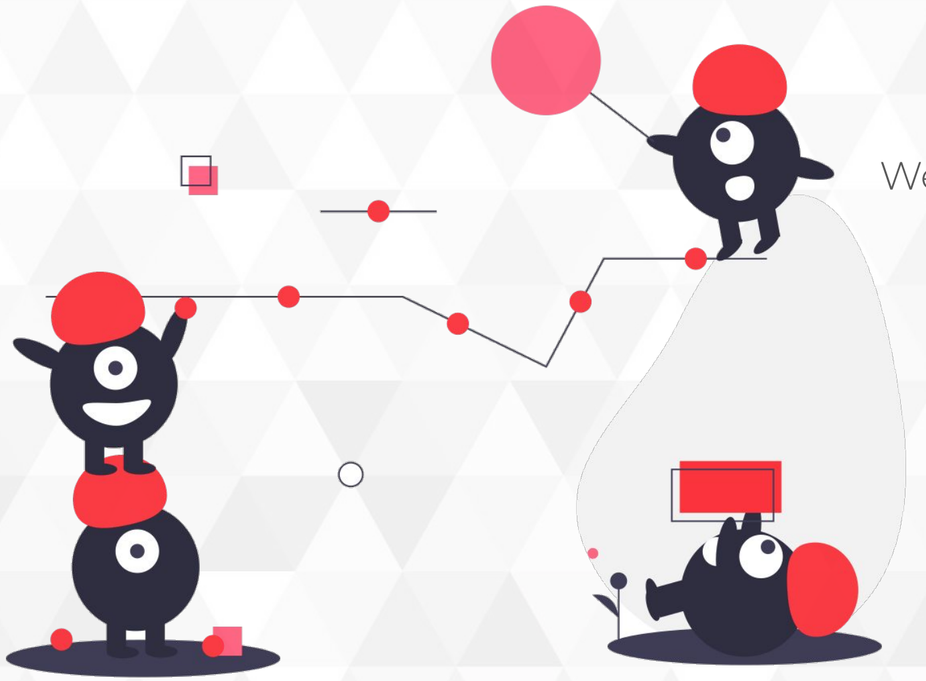
How well did we do?

Beyond the horizon

The actors

Web team, infra team & site builders

Once upon a time at CERN...



Web team

→ CERN theme
→ Integration with CERN services

Site builders:

- low-code
- composable
- consistent

Infrastructure team

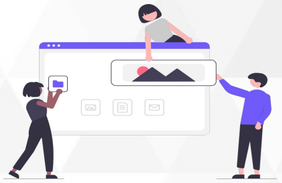
→ home-grown, Linux infrastructure
→ provision and maintain >1k Drupal sites

Site builders

Physicist

Administration

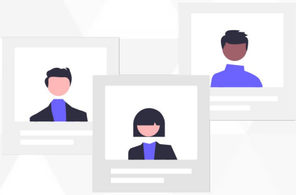
Drupal expert



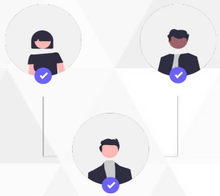
Comms expert

CERN
Drupal Distribution

Visitors



CERN Community



Authorities

General Public

home.cern
home.web.cern.ch
oldcc60facility.web.cern.ch
against-covid-19.web.cern.ch
apprentissage-technique.web.cern.ch
test-drupal8-65.web.cern.ch
test-ags-admin-guide.web.cern.ch
test-ombud-reference.web.cern.ch
cern-rugby-club.web.cern.ch
test-website-sparks.web.cern.ch
fcc-global-collaboration-working-group.web.cern.ch
test-hanan2.web.cern.ch
mishino.web.cern.ch
machine-protection-panel.web.cern.ch
test-en-dpo.web.cern.ch
be-safety.web.cern.ch
test-alice-figures-d8.web.cern.ch
cms-tbps-db.web.cern.ch
new-alpha.web.cern.ch
userspetition.web.cern.ch
en.web.cern.ch
passeport-big-bang.web.cern.ch
diversity-and-inclusion.web.cern.ch
alice-notes.web.cern.ch
test-anperezf.web.cern.ch
hilumilhc.web.cern.ch
project-ut.web.cern.ch
threedet.web.cern.ch
lcgdm.web.cern.ch
iefc-drupal.web.cern.ch
fap-dep.web.cern.ch
cms-secretariat.web.cern.ch
wlcg.web.cern.ch
council.web.cern.ch
csaio.web.cern.ch
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be-dep-gm.web.cern.ch
be-dep-abp.web.cern.ch
rilis-web.web.cern.ch
internship-portal.web.cern.ch
ifast.web.cern.ch
test-moritz.web.cern.ch
usersoffice.web.cern.ch
scientific-info.cern
test-echabert.web.cern.ch
cernandsocietyfoundation.cern
test-kt-d8.web.cern.ch
muoncollider.web.cern.ch
chis.web.cern.ch
cerf.web.cern.ch
test-be-dep-bi-ml.web.cern.ch
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procurement.web.cern.ch
hep-service-cerf.web.cern.ch
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astroclub.web.cern.ch
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international-relations.web.cern.ch
ipt-dep.web.cern.ch
sparks.cern
test-panos.web.cern.ch
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ifast-project.eu
scoollab.web.cern.ch
cnpdfs.web.cern.ch
beams.cern
visit.cern
timeline.web.cern.ch
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cerneu.web.cern.ch
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ams02.web.cern.ch
test-council2.web.cern.ch
na64.web.cern.ch
cas.web.cern.ch
careers.cern
dgamba.web.cern.ch
hr.web.cern.ch
visits.web.cern.ch
charm.web.cern.ch
be-dep-op.web.cern.ch
eam-opensource.web.cern.ch
admin-eguide.web.cern.ch
snd-lhc.web.cern.ch
test-linearcollider8.web.cern.ch
quantum.cern
beamlineforschools.cern
atlas-collaboration.web.cern.ch
geant4.web.cern.ch
hev.web.cern.ch
test-cnpdfs.web.cern.ch
fluka.cern
ippog.web.cern.ch
test-alegall2.web.cern.ch
ep-news.web.cern.ch
codex-b.web.cern.ch
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clicdp.web.cern.ch
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test-recuperation-sales-d8-v2.web.cern.ch
project-training-zgarai.web.cern.ch
quantum.web.cern.ch
cenf.web.cern.ch
d8-infrastructure.web.cern.ch
lhcathome.web.cern.ch
uointernal.web.cern.ch
quantumfutures.web.cern.ch
sce-dep.web.cern.ch
en-dpo.web.cern.ch
theory.cern
ep-dep.web.cern.ch
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test-alumnifeeds.web.cern.ch
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financeclub.web.cern.ch
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about.cern
test-ikrautsz.web.cern.ch
test-vauthier-2.web.cern.ch
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backup-openlab.web.cern.ch
norway.cern
enlight.web.cern.ch
staff-association.web.cern.ch
test-ombud-sandbox.web.cern.ch
test-jguliyev.web.cern.ch
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careers-at-cern.web.cern.ch
be-ics-group-surveys.web.cern.ch
test-katebrad2.web.cern.ch
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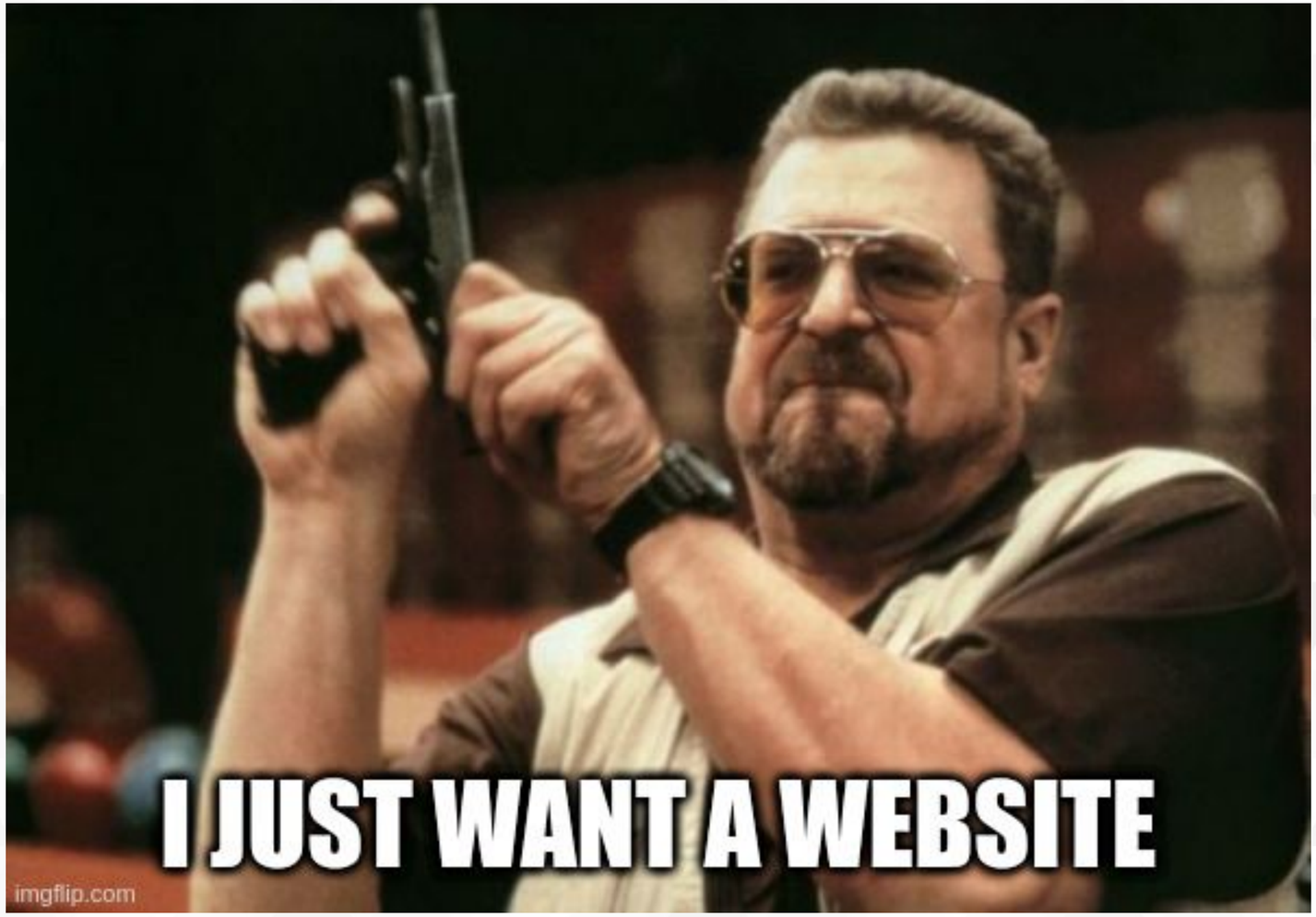
cern-flyfishing.web.cern.ch
europeanstrategyupdate.web.cern.ch
test-lpommepu-sndatlhc.web.cern.ch
info-portugal.web.cern.ch
test-sboutas-home.web.cern.ch
test-online-webfest.web.cern.ch
test-poulsens.web.cern.ch

Why so many websites ?
So many choices...
I have no idea

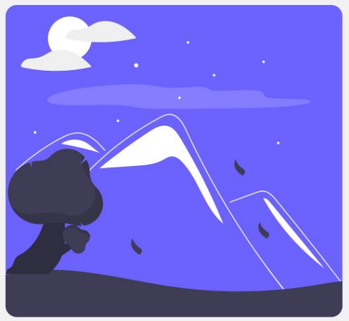
- Academic freedom
- Autonomous entities
- Plethora of tools

→ as many websites as people!

Most of them for coders

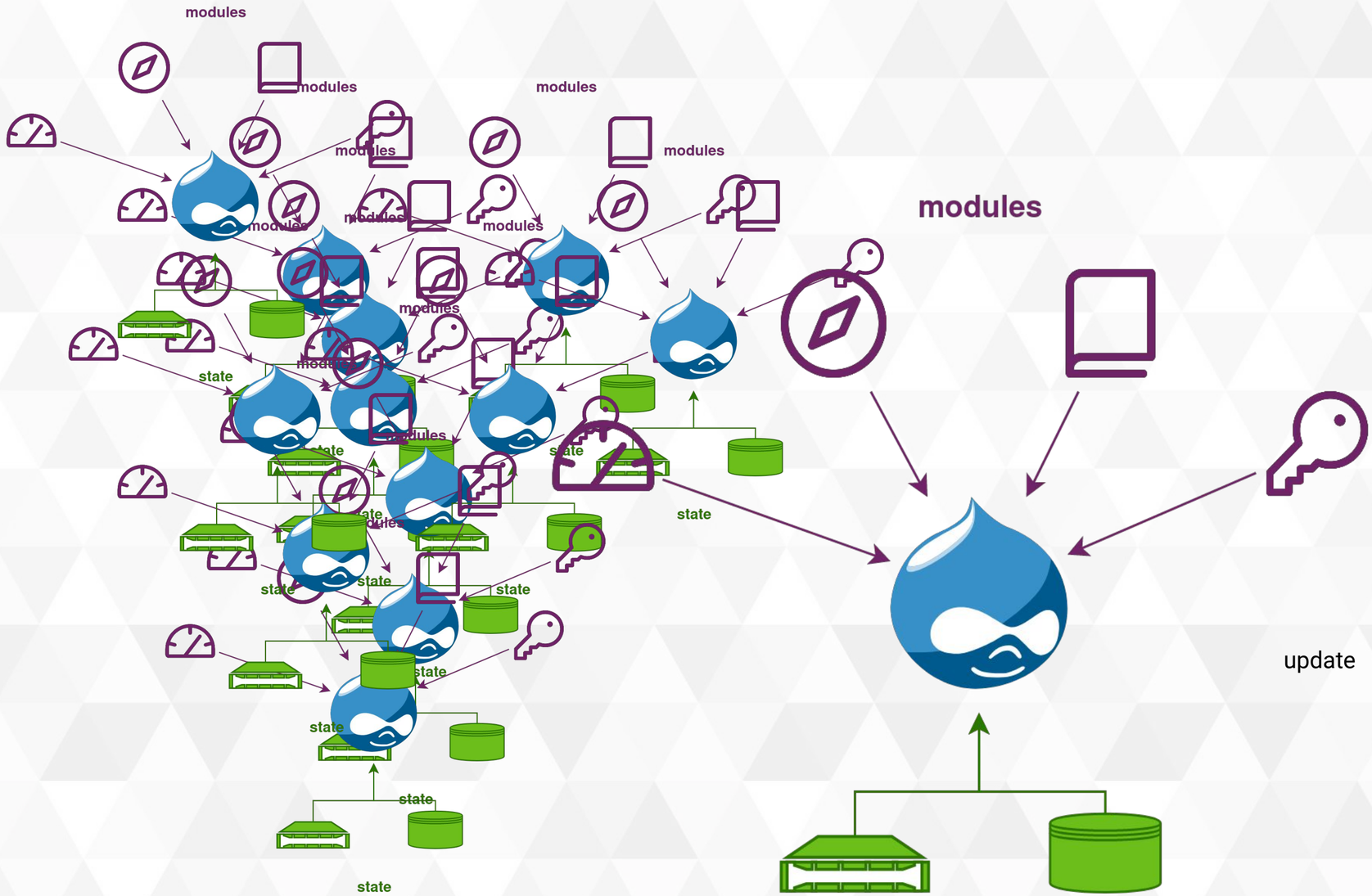


Can I get one?
Please?



The Setting

Physical infrastructure


modules
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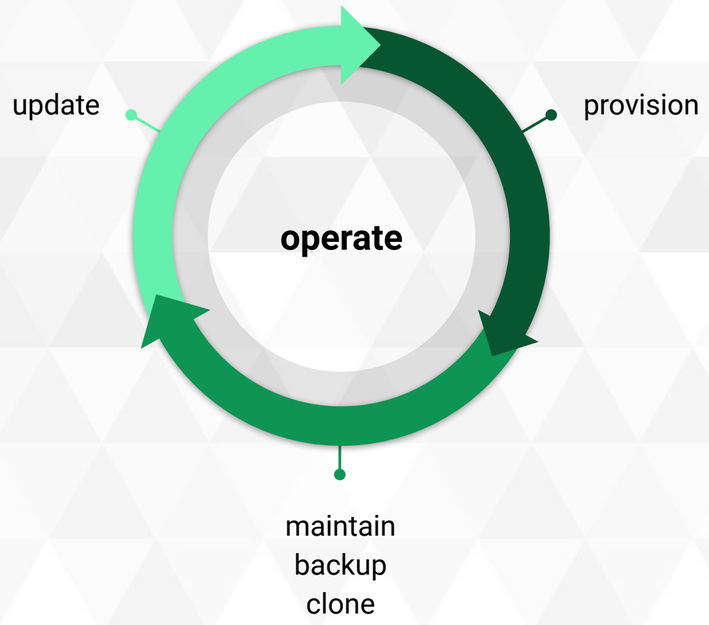
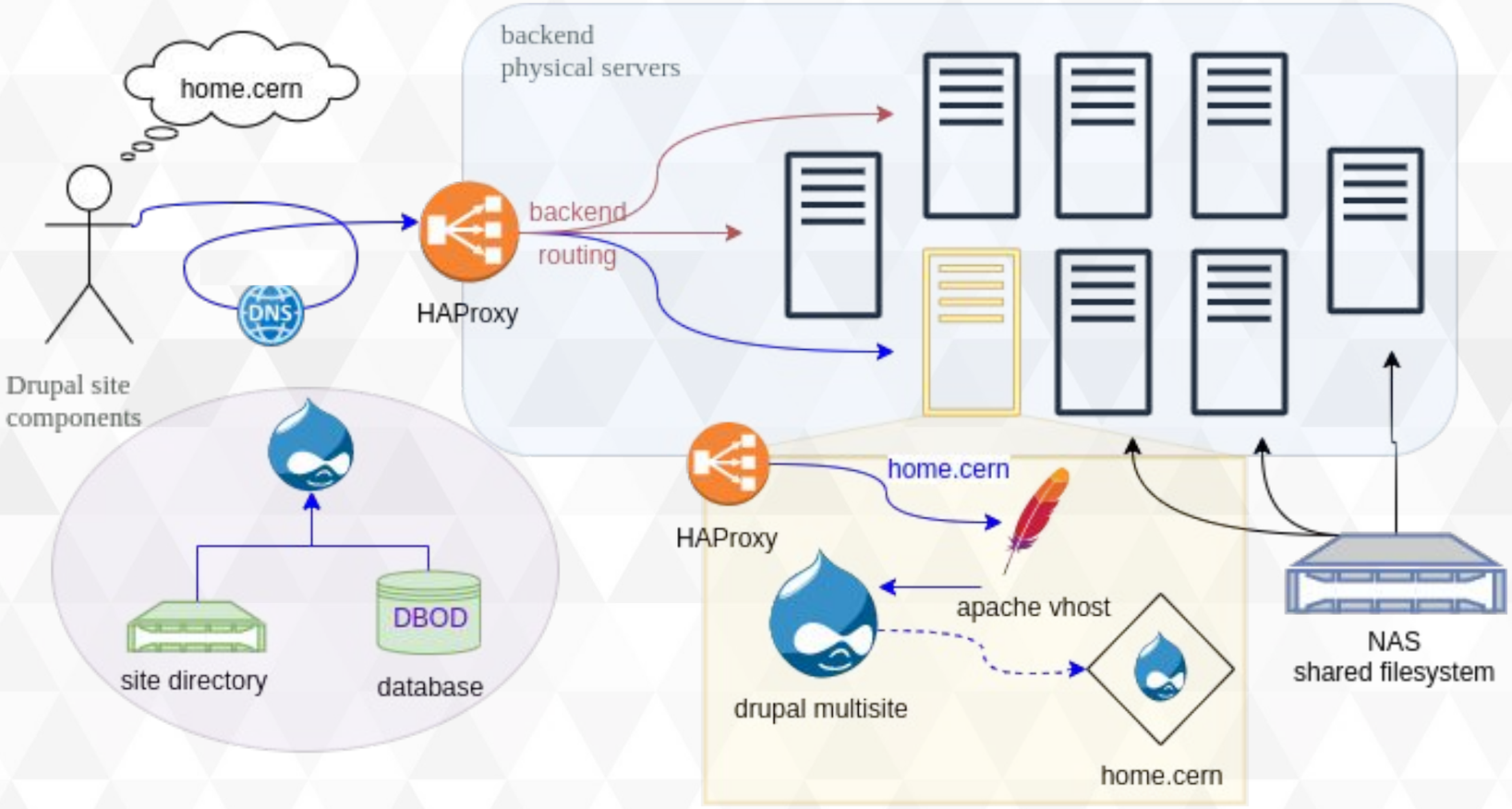

update
provision
operate
maintain
backup
clone

Journey of an HTTP request



Shortcomings

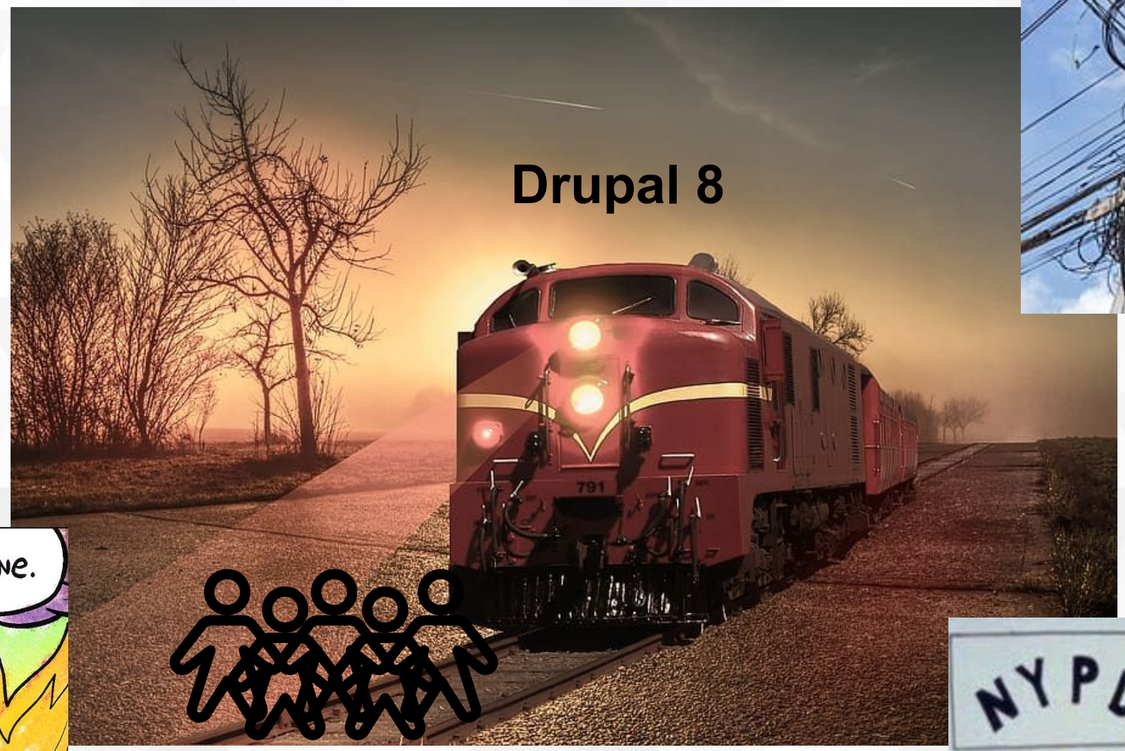
- Little isolation: sharing the same PHP-FPM process pool
- Multisite: sharing Drupal core between all websites, little customization
- ad-hoc, mutable, non-standard
- not scalable
- not very robust

Lacks all of the Cloud Native benefits

But for many years it was running

Crisis!

Smaller team, tech debt... Drupal 8 😱


Drupal 8

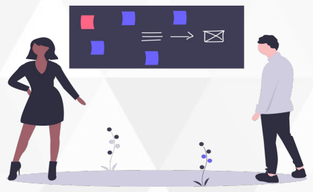
THIS IS FINE.

NYPD
SITE ADMIN
INFRA ADMIN
imgflip.com

Our actions

Kubernetes and a community of Makers

Our ideal infrastructure...

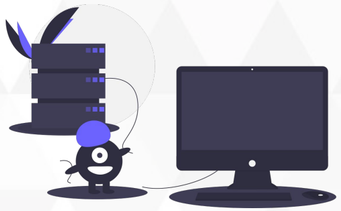


Tunable resources

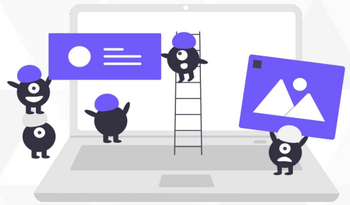
Isolation

More flexibility to users

CERN
Drupal Distribution



Reuse infrastructure components

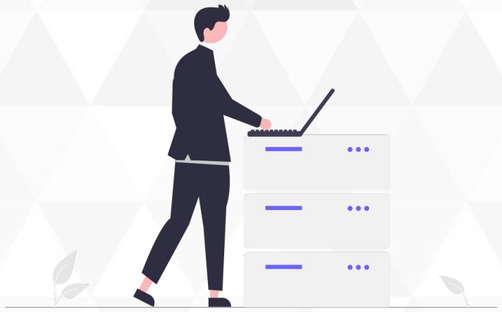


Reliable hosting

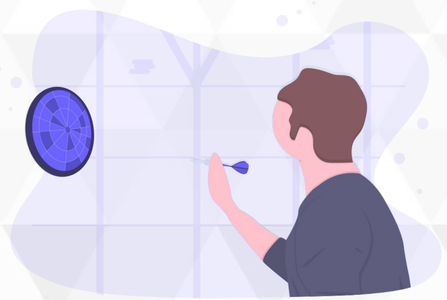
Automatic upgrades & Failure recovery

Custom modules & themes

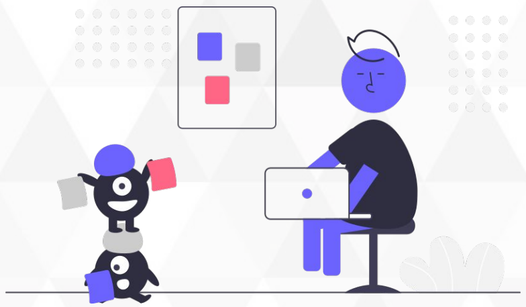
Modernization campaign



Shared PaaS components



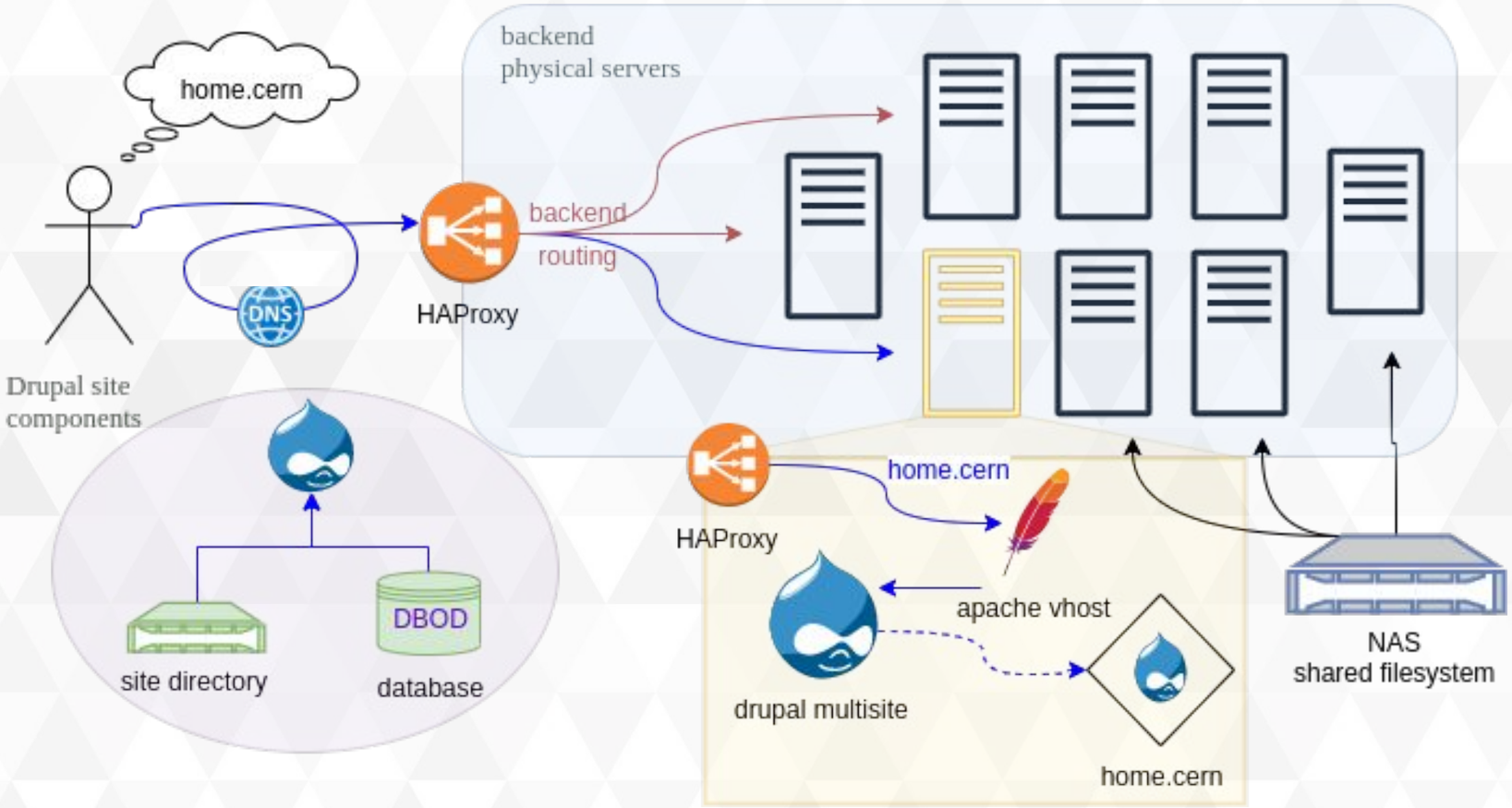
Requirements



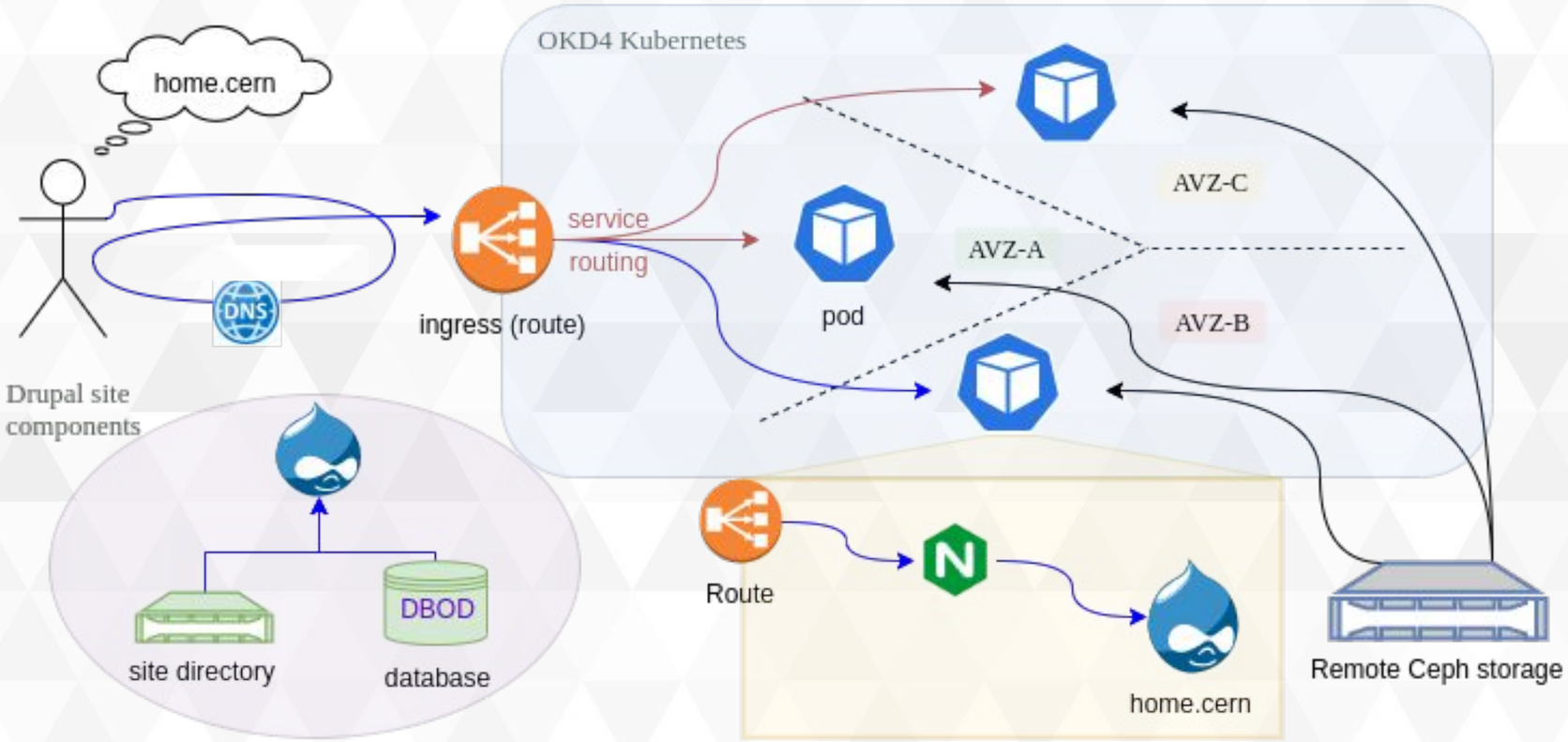
Crew

Cloud Native Drupal Infrastructure

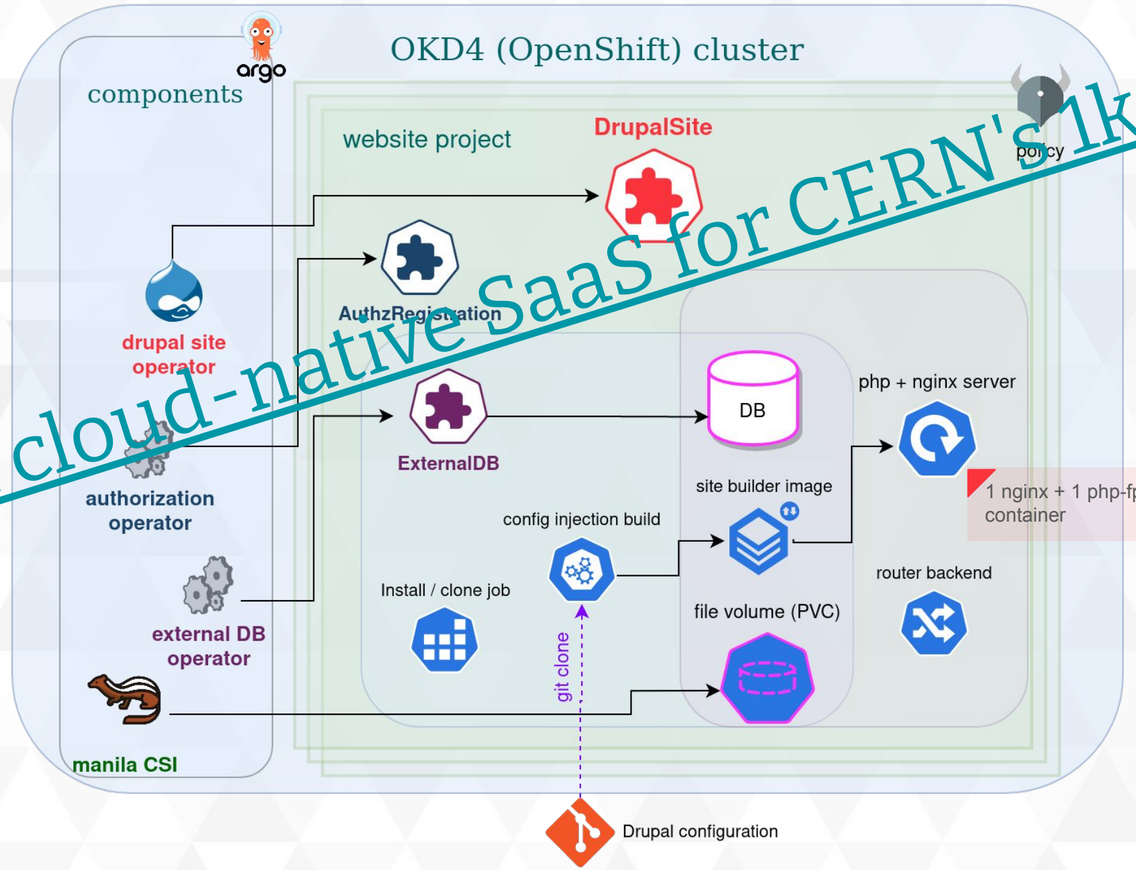
A Cloud Native facelift



A Cloud Native facelift

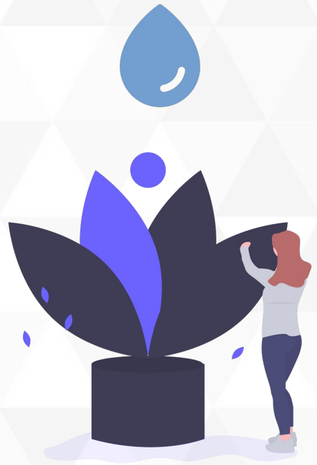


A Cloud Native facelift



Building a cloud-native SaaS for CERN's 1k Drupal sites

Check out our Kubecon presentation for more details:
https://youtu.be/4O-pcSQR8Vw



Community from a chore

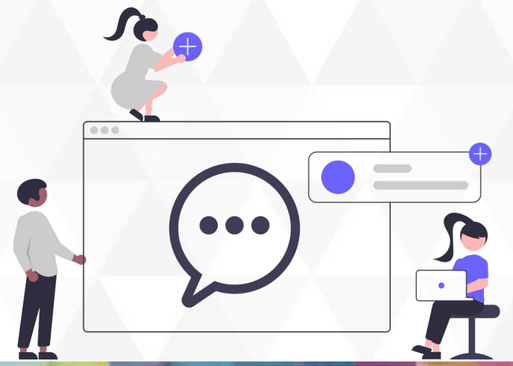
We can only do so much!

Formal support channels overloaded

Knowledge attrition
- As teams grow smaller, expert knowledge gets lost

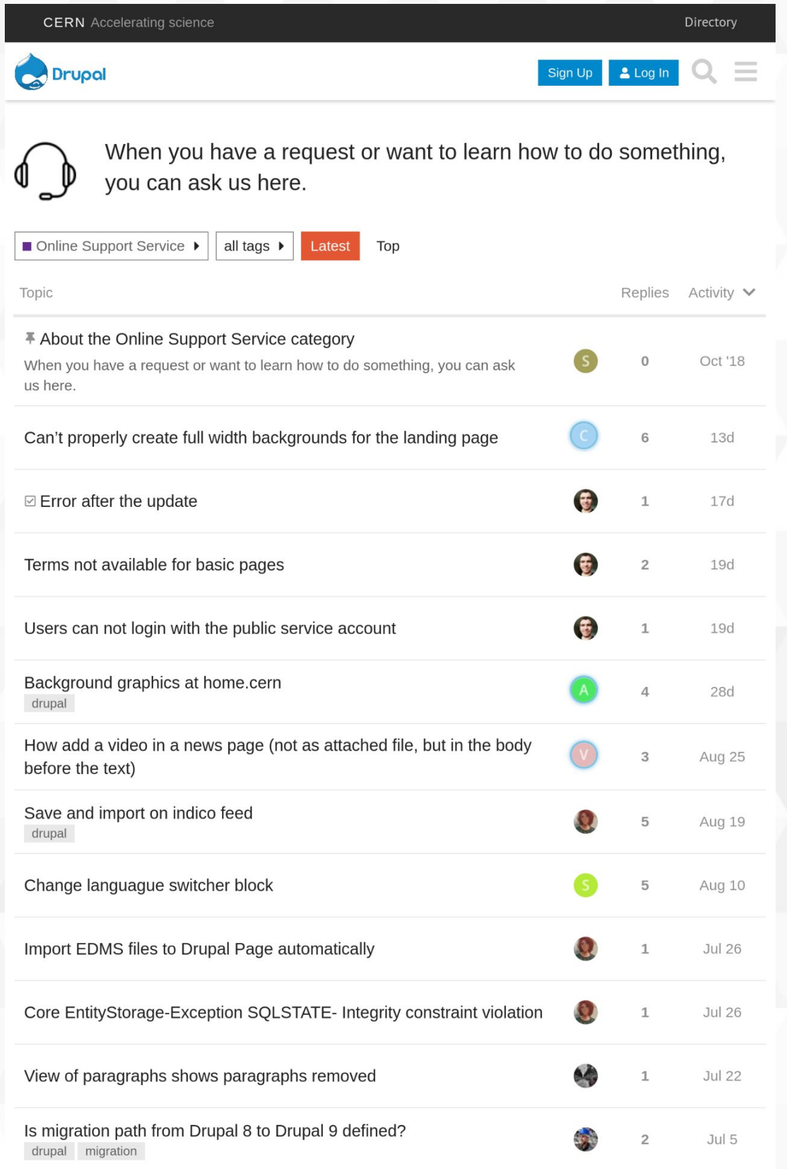
The stack overflow model works
- few dedicated experts, lots of disseminated know-how

People reach out to each other
- CERN values collaboration



50 instances → more than 40k users

Did I Make Something Wrong Or Should I Add Any Modules?
I Created A Basic Page
It Possible To Export Webform Results? If Yes, How?
I Don't Fancy Creating A New Node Just To Hold A Redirect (especially As I've Been Working On Cleani
I Have An Existing Faq Page To Which I Would Like To Add A Pdf Document At The Top Of The Page.
And Now Would Like To Give Another Person Permission To Edit It.
I See This Error When Users Try To Sign In With An "external" Account. What To Do?
It Seems That The Simplesamlphp Module Isn't Synchronising With The E-groups
I Would Lilke To Delete A Website, But I Need To Keep The Webform Results.
Hello @here, I'm Having Synchronisation Issues With The Atlas Collaboration Page
How Can I Give Editing Permission To A Specific Node To Another Person?
Anyone Know How To Set Up Redirects From A Drupal Node That No Longer Exists?
I Have Set Up Following The Outage. Nothing Was Changed In Terms Of Configuration.
I Would Like To Use The Same Background Graphics For The Cern Qti Website Like The One Used On Home.
There Has To Be A Better Way...
Could You Please Tell Me Where I Could Find It:
I Received This Error Message When I Tried To Change The Website Logo.



Progress ?

Development timeline

start date	end date	event
2020/10/09		*Manual deployment (template) of Drupal server resources*
2020/10/15		*Scaffold the DrupalSite operator with operator-sdk*
2020/11/18	2020/12/03	Site provisioning with operator
2020/12/02	2021/02/10	Implement basic features (site install, environments, custom builds)
2021/02/12	2021/02/20	Pilot migrations
2021/03/15	2021/07/05	Start Database integration
2021/03/20	2021/05/29	Automate Drupal updates
2021/03/25	2021/03/30	Scale tests, Ceph integration issues. Kubecon presentation.
2021/04/28	2021/06/01	Define release model of CERN Drupal Distribution
2021/05/04	2021/06/26	Integrate OIDC flow in Drupal sites
2021/07/05	2021/07/15	Implement backup & restore
2021/07/09		Migration process reaches maturity

Fun with integrations

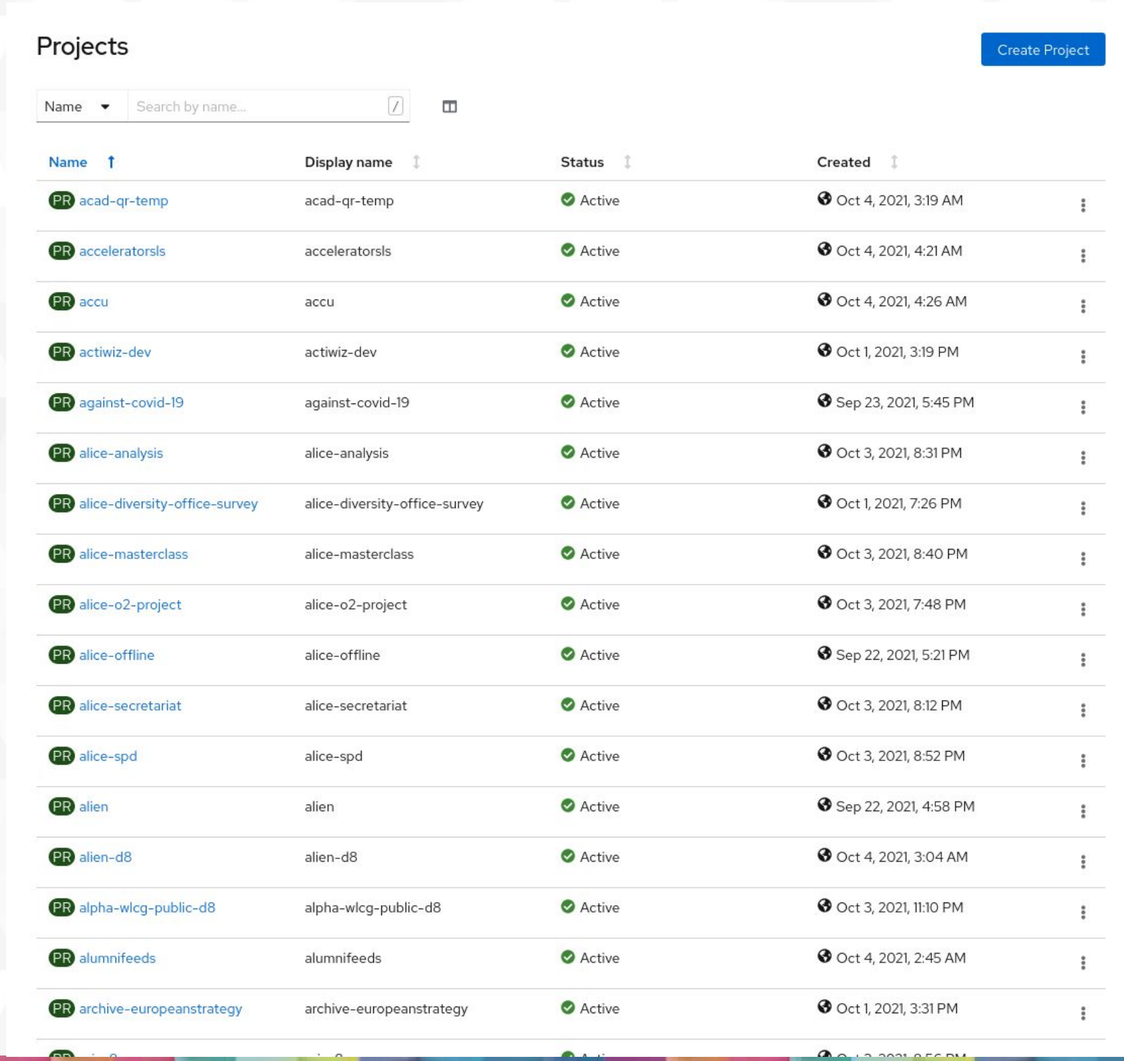
How will this look like in the future?

Migration underway

All our websites are now previewed

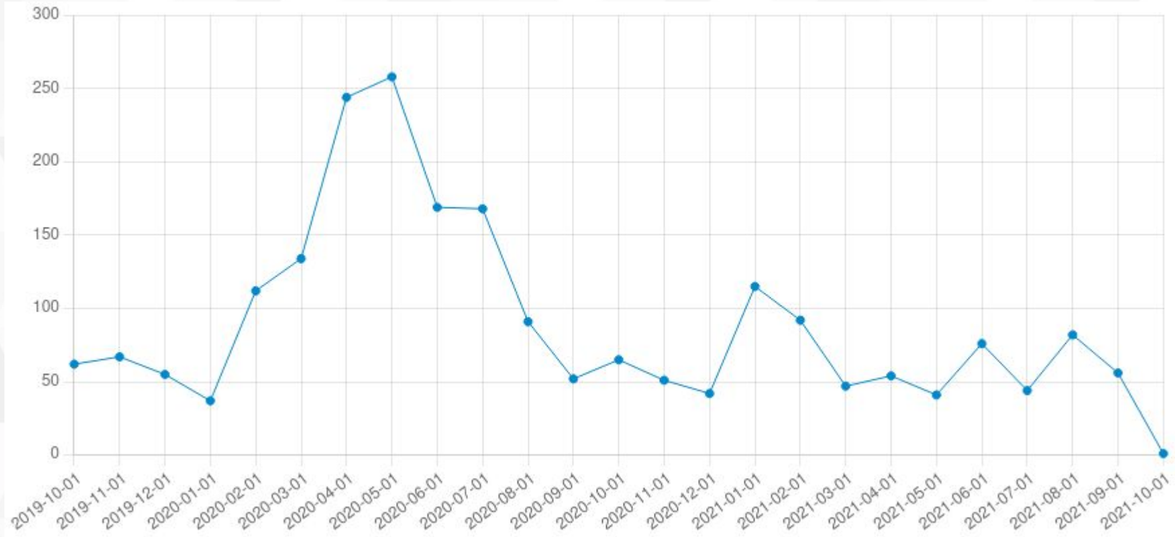
Users excited with the new features!

- custom composer projects
- Drupal 9 previews

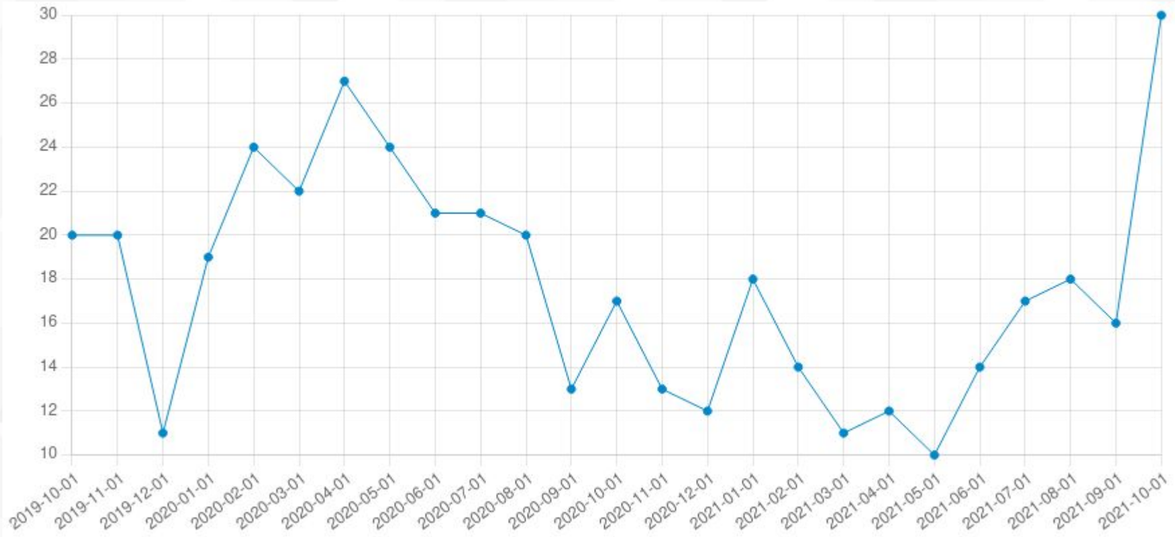


Drupal community is engaging

especially in pandemic times!



Monthly posts



User Engagement

Daily Active Users : Monthly Active Users

Beyond the horizon

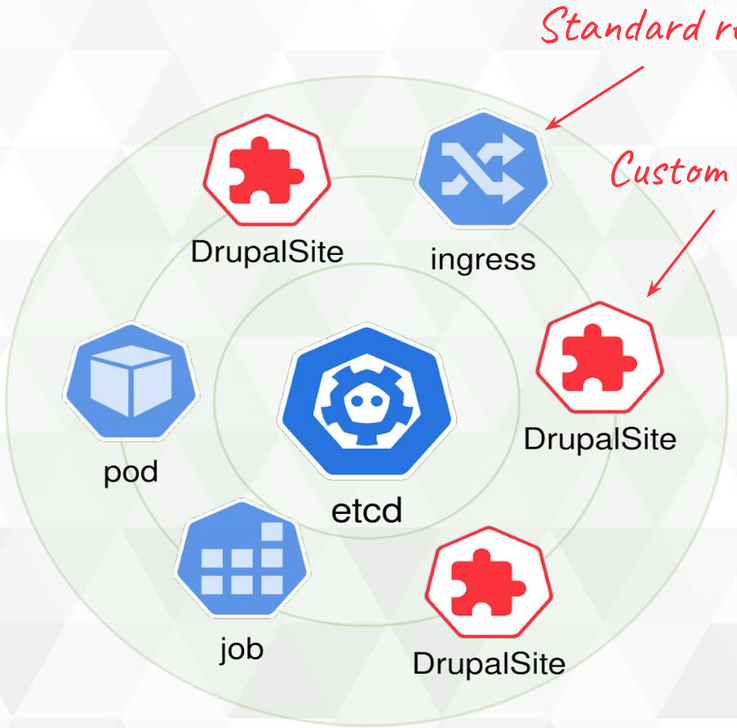
Technical goals

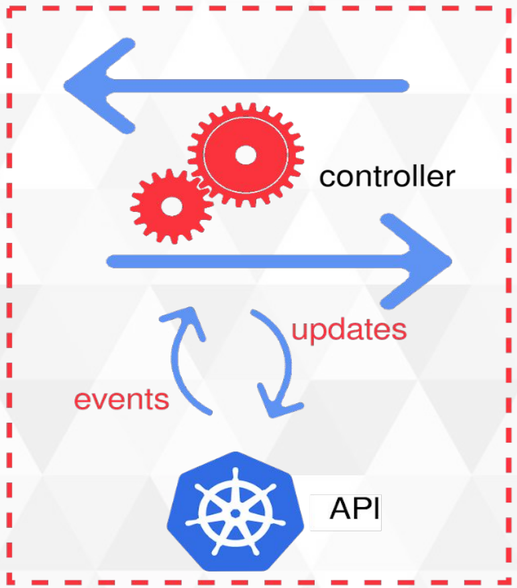
- new Drupal use cases (Drupal as a backend)
- deploy other low-code website solutions
- give back to community: operator that works outside of CERN

Is this infrastructure useful to You?

Poll

Thank you!





"the world":
what is running in the cluster

Operator a *custom resource and controller*, conceptually similar to an OOP class with data & methods