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Minikube project update

Medya Ghazizadeh - Google

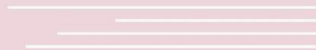


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\$ whoami

- Medya Ghazizadeh
- Sr. Software Engineer/Manager at Google
- Kubernetes Kernel Team
- Maintaining minikube since 2019
- Released 90 versions of minikube (out of 140 total)
- @medya_dev on twitter

Who uses minikube?



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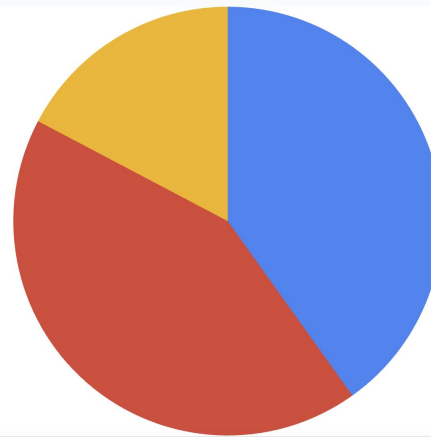
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Quickly sets up a local Kubernetes cluster on macOS, Linux, and Windows.
With a special focus on application developers and new Kubernetes users.

Survey Data:

- Application Developers 42%
- Learning Kubernetes 40%
- Testing 17.3%



Behind the minikube emojis !



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```
[ $ minikube start
🤗 minikube v1.30.1 on Darwin 13.3.1 (arm64)
✨ Using the docker driver based on existing profile
👍 Starting control plane node minikube in cluster minikube
🚚 Pulling base image ...
🏃 Updating the running docker "minikube" container ...
🐳 Preparing Kubernetes v1.26.3 on Docker 23.0.2 ...
🔗 Configuring bridge CNI (Container Networking Interface) ...
🔍 Verifying Kubernetes components...
  ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌟 Enabled addons: storage-provisioner, default-storageclass
🏖 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
```

Other Maintainers Steven Powell, Anders Bjorklund
more than 800+ Individual Contributors ! (Thank you)

It all started in 2016 ...



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Proposal for improving local cluster experience. #24106

Merged

k8s-github-robot merged 1 commit into `kubernetes:master` from `vishh:local-cluster-setup` on Apr 20, 2016



Conversation 101



Commits 1



Checks 0



Files changed 1



vishh commented on Apr 11, 2016

Member



This proposal attempts to improve the existing single node, local cluster experience in Kubernetes.

It is not a proposal that helps with setting up a multi-node, production cluster.

cc @dlorenc @ethernetdan @Runseb @mfburnett @bgrant0607 @pwittrock



Testing under the desk ...?



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dlorenc commented on Apr 12, 2016

Member



SGTM. Will we be CI testing on Mac and Windows? Will this be done on some boxes we run under our desks, or is there a better way to do this? Where will the results be available?

I have physical Windows and Mac machines under my desk that we can hook up as slaves to the existing Jenkins system or a new Jenkins system.

We could run Windows tests on GCE, but ideally we'd test the virtualization layer here as well and GCE doesn't support nested virtualization.



1

minikube First Test Lab

**R.I.P
2016-2020
San Francisco**



Fast Forward 2023... 1.8M LOC

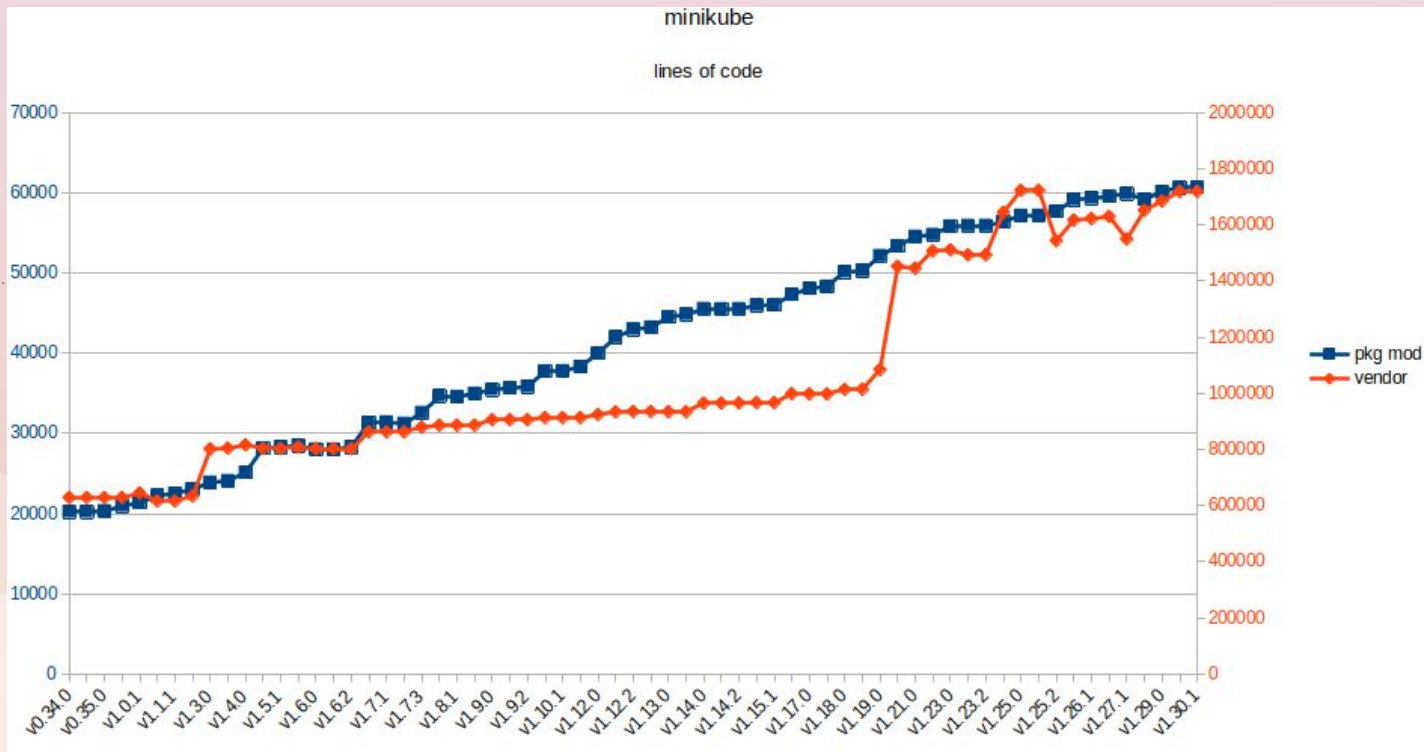


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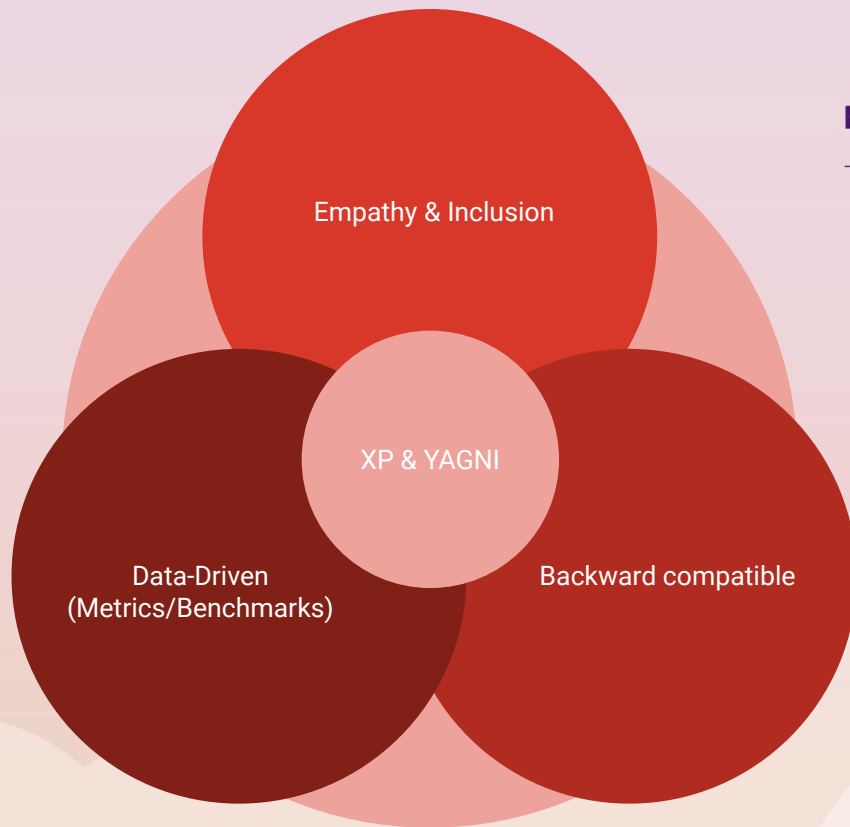


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Minikube Principles

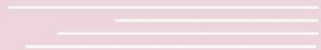


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KubeCon 2019 shanghai:

“Bring k8s for the next billion users”

- Link to the [KubeCon talk](#)
- Talks are available on minikube website (under [presentations](#))

Minikube for non-english languages



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```
[ $ minikube start
🐻 Darwin 13.3.1 (arm64) 上の minikube v1.30.1
🌟 既存のプロファイルを元に、docker ドライバーを使用します
👍 minikube クラスター中のコントロールプレーンの minikube ノードを起動しています
🚚 ベースイメージを取得しています...
🏃 実行中の docker 「minikube」 container を更新しています...
🐳 Docker 23.0.2 で Kubernetes v1.26.3 を準備しています...
🔗 bridge CNI (コンテナネットワークインターフェース) を設定中です...
🔍 Kubernetes コンポーネントを検証しています...
  ■ gcr.io/k8s-minikube/storage-provisioner:v5 イメージを使用しています
🌟 有効なアドオン: storage-provisioner, default-storageclass
🏃 終了しました! kubectl がデフォルトで「minikube」クラスターと「default」ネームスペースを使用する
よう設定されました
```

- Supporting French, Spanish, Japanese, Chinese, Korean, Polish, German and russian.
- You can easily contribute your language to minikube (no coding required)
Search for “translations” in [minikube website](https://minikube.sigs.k8s.io/docs/contributing/translations/)

Tech Support Matrix!



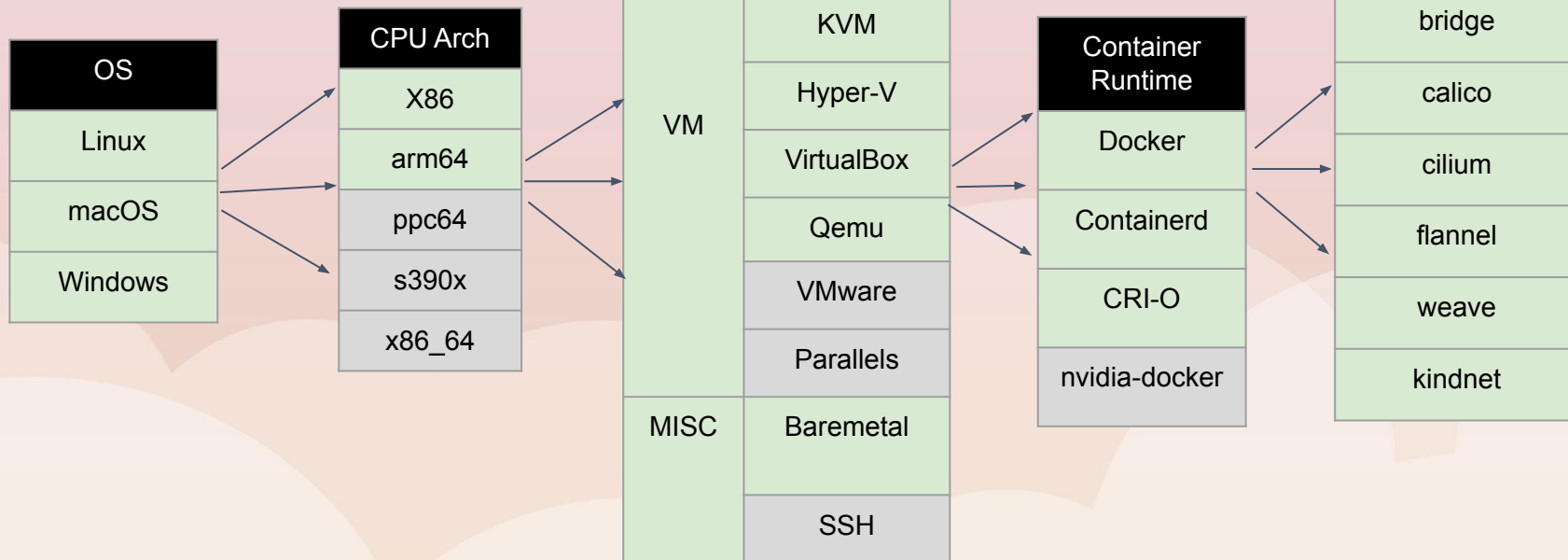
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Green : Tested
Gray : Not Tested





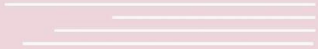
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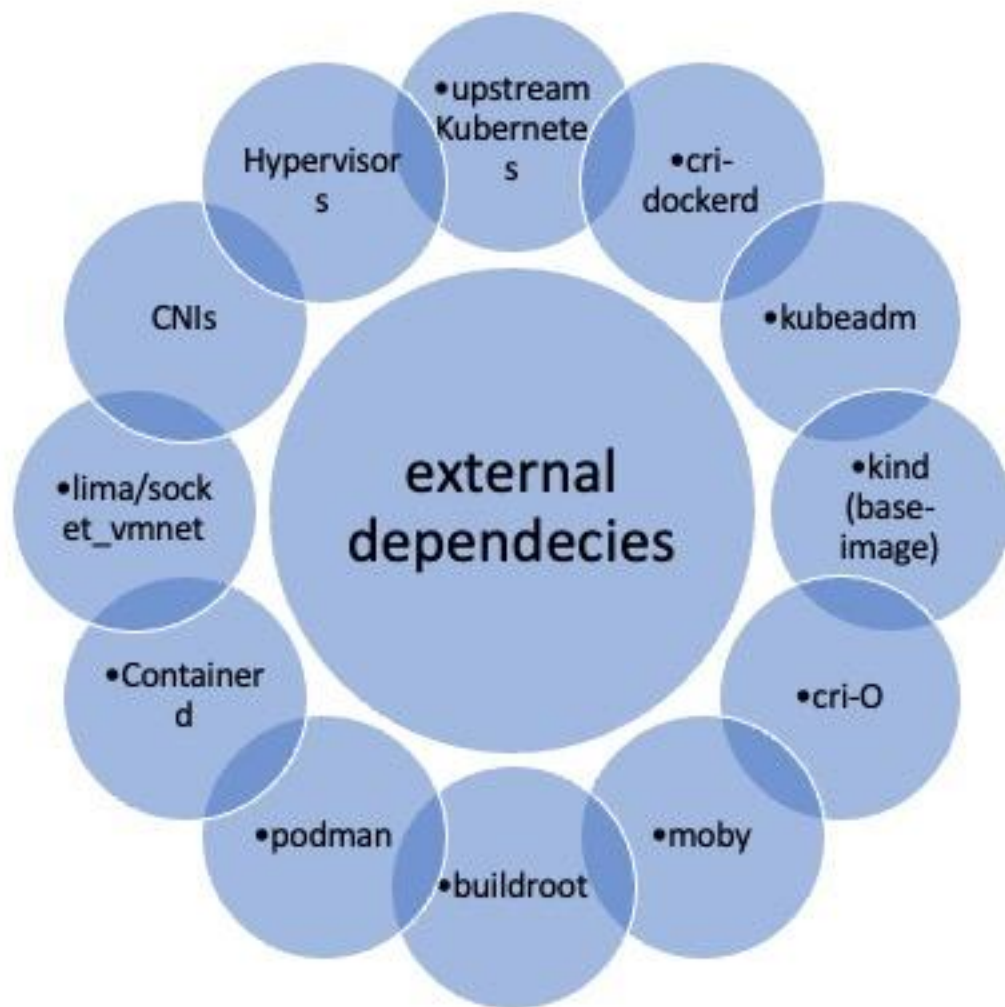
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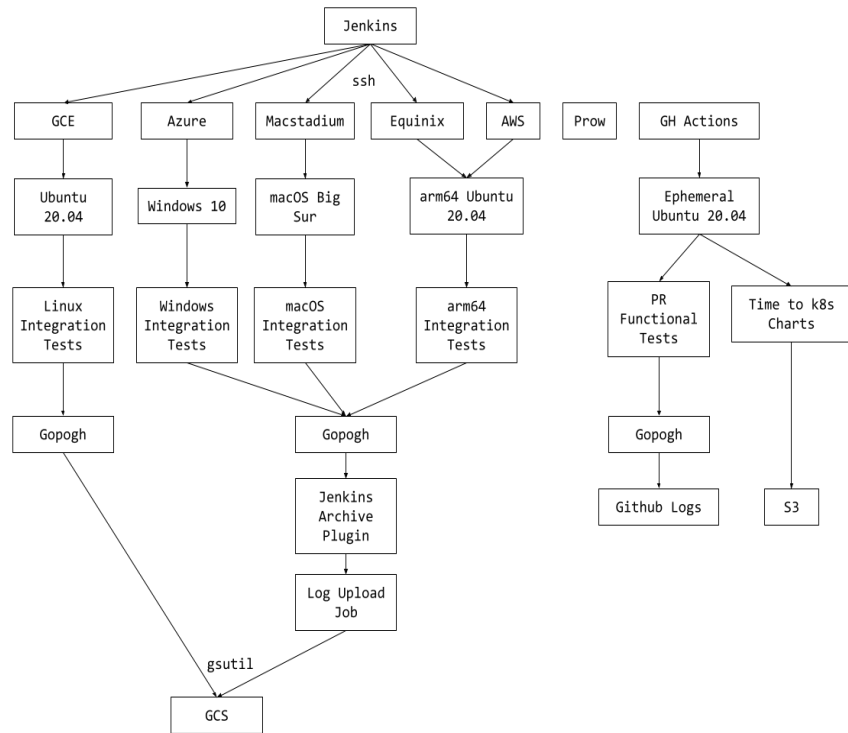
minikube is more than one project







Transform Test Infra



From few computers in the office to

- 46 Self-hosted CI VMs in 5 different clouds (GCP, AWS, Equinix Metal, Azure, Macstadium) + Prow and Github Action
- 300 end to end tests in integration testing suite
- Checkout [detailed list of integration](#) tests cases on website

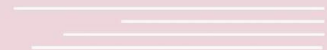


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State of minikube idle CPU in 2019

minikube roundtable



"Burning the legs off of developers since 2016"

Minikube v0.23.0 100% CPU usage from kubernetes-dashboard v1.7.0 #2130



Closed

bgehman opened this issue on Oct 28, 2017 · 4 comments

Minikube is 50% resting CPU usage when idle #3207

Samuela opened this issue on Oct 2, 2018 · 46 comments

Samuela commented on Oct 2, 2018

minikube-darwin-amd64 causing too many CPU wakeups #3291



Closed

parasyte opened this issue on Nov 1, 2018 · 4 comments

Docker run stuck and consuming 100% CPU #5991



Closed

mvrijssel opened this issue on Nov 27, 2019 · 2 comments



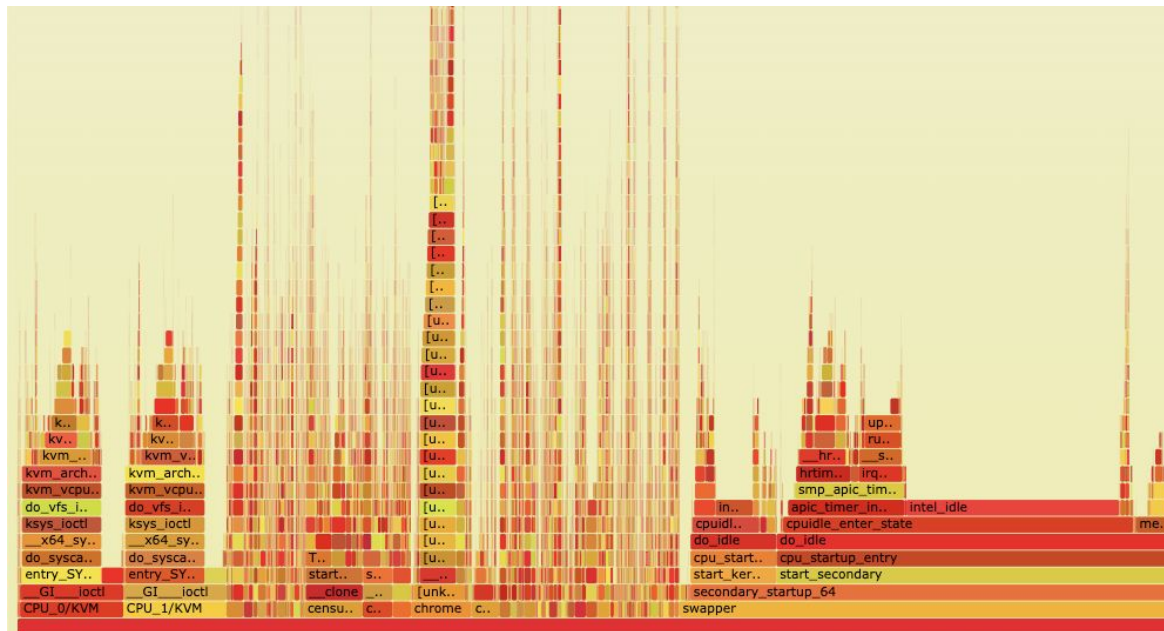
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CPU flame graph



Checkout KubeCon 2020 talk [Improving the Performance of Your Kubernetes Cluster - YouTube](#)

CPU usage: before/after

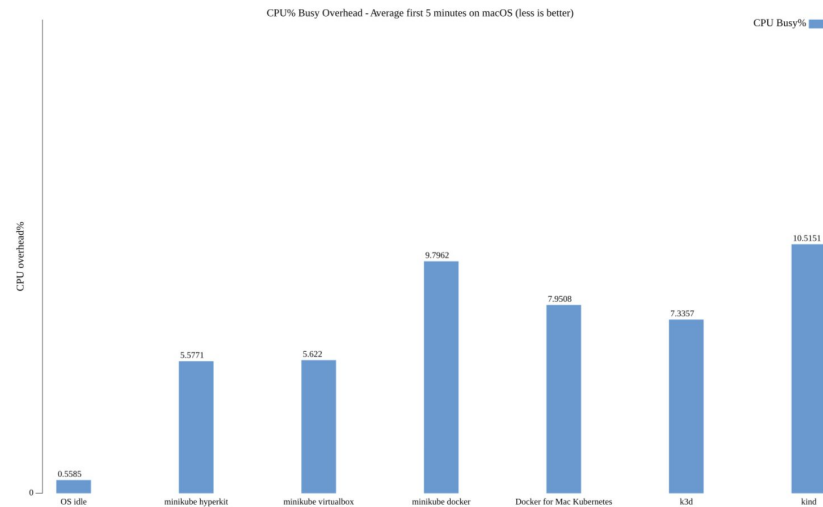
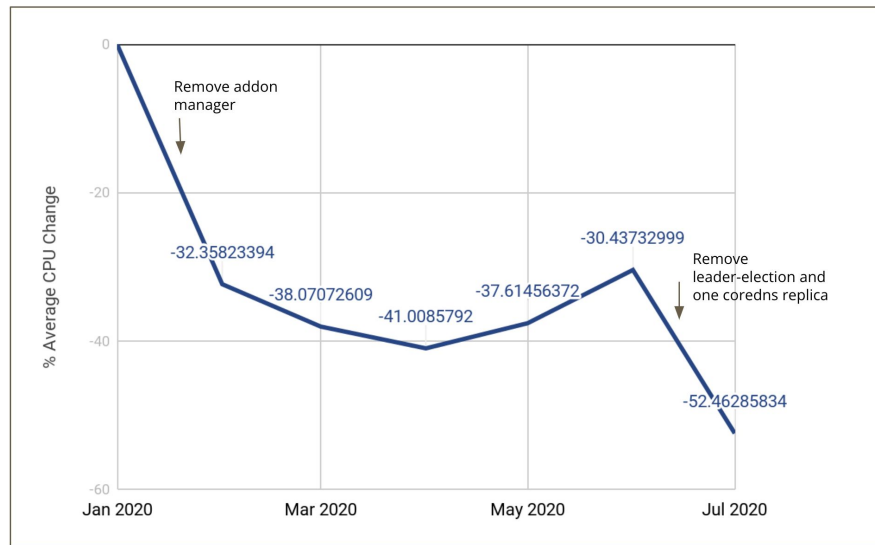


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On the left CPU benchmarks after multiple optimization

On the right minikube cpu usage compared to similar tool.

Checkout more benchmarks on [minikube website](https://minikube.sigs.k8s.io/docs/faq/benchmarks/)

Also checkout minikube auto-pause addon (that pauses when not in use)

“minikube start” latency (2020)



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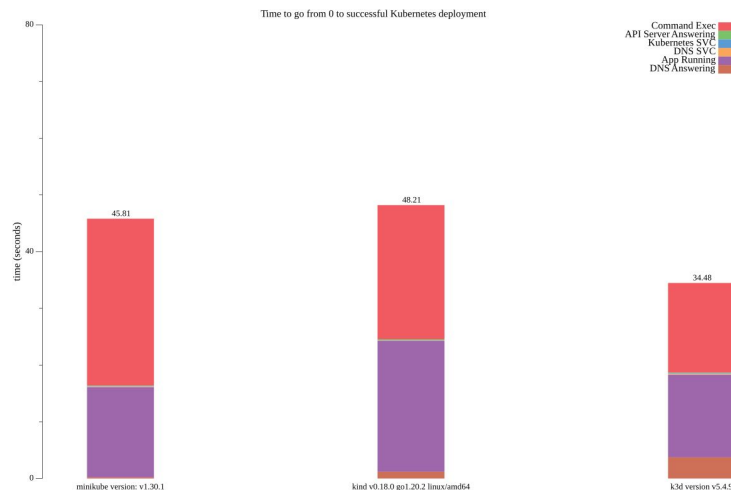
**2m35s
minute**



**21
seconds
(86%
faster)**

- VM-Free minikube (docker driver)
- Unified preload images for all drivers
- Massive refactor/overhaul of minikube code base
- Optimizations in Kubernetes config for local developers
- Parallelization

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On the right: screenshot of time-to-k8s

Automatic Benchmarkings



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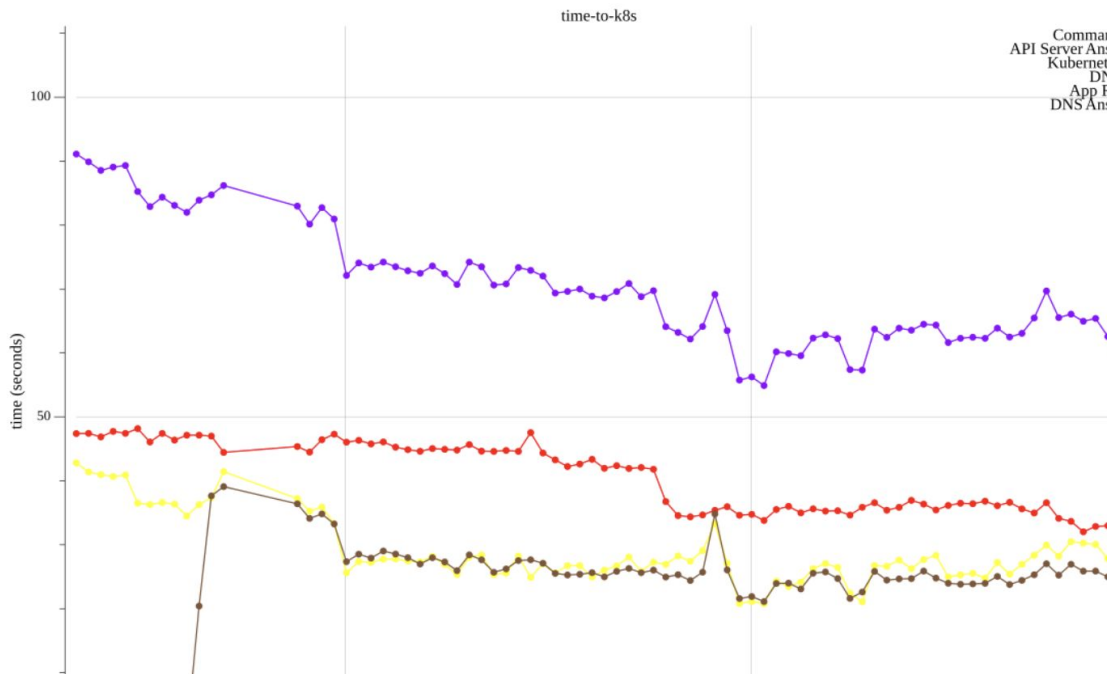
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Example of Time to
K8s [daily
benchmarking](#)

Checkout
benchmarking
section of
minikube website
for other
benchmarks

Docker driver - containerd runtime





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minikube for embedded use 2021

minikube for embedded use 2021



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Tons of features for minikube to be used as an embedded use

For example by Skaffold or IDE plugins (such as “cloud code”, “Skaffod”, ...)

- JSON output
- Schedule-stop
- Step Events
- Audit
- Advanced --wait logic
- --watch flag
- License command
- support CGroups
- Machine readable reason exit codes
- Auto generate docs on exit code

Run minikube in ci (2021)



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Platform	Known to Work?	Status
Prow	Yes ✓	build passing
Google Cloud Build	Yes ✓	cloud build success
Github	Yes ✓	Minikube passing
Azure Pipelines	Yes ✓	Azure Pipelines set up now
Travis CI	Yes ✓	build passing
CircleCI	Yes ✓	FAILED
Gitlab	Yes ✓	Gitlab

<https://github.com/minikube-ci/examples>

Simply test your PR/app against Kubernetes

Basic Usage

```
steps:
  - name: start minikube
    id: minikube
    uses: medyagh/setup-minikube@latest
```

github.com/marketplace/actions/setup-minikube

Minikube Communications



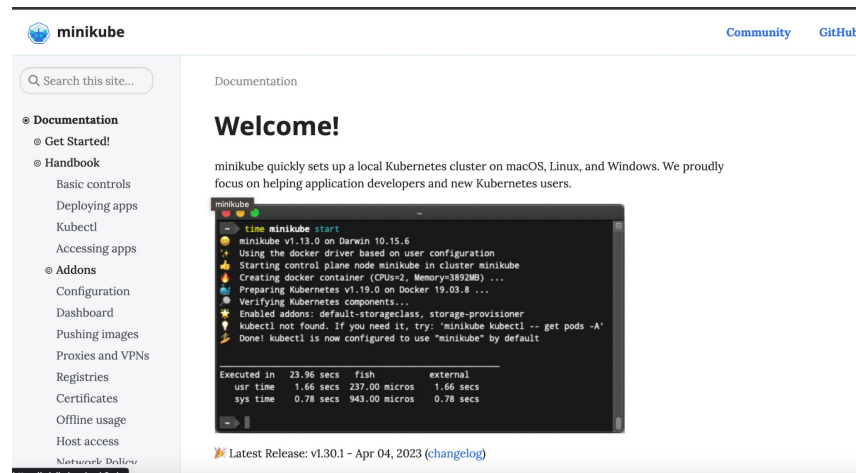
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- Office hours
- minikube website
 - <https://minikube.sigs.k8s.io/docs/>
 - Getting started
 - Tutorials
 - Handbooks
 - Addons
 - FAQ
 - Benchmarks
 - Contributors Guide



Also Twitter-Bot and Slack Channel

Triage Party! (Join every Wed)



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minikube 🇺🇸

Daily Triage

Weekly Triage

Bi-Monthly Scrub

In Milestone

Broken tests

Important

Similar

30 PRs

748 issues

31.5d avg wait

305 unique items, Avg age: 95.6d, Avg wait: 57.9d

Kanban

Solo

triage-on-duty zeroes out this queue once a day. Prioritize:

- * Keeping an open dialog with our users
- * Initial prioritization (does not have to be perfect)

Pull requests: Approved and getting old (1)

Resolution:

Average age: 18.2d, Avg wait: 0.0d

Search:

ID	As	Rea	Cr	Up	Re	Cmnts	Labels	Tags
16180			18d	5d	12d		cnf-cla: yes approved	size/XS collaborator-last commented unreviewed

Pull Requests: Review Ready (16)

Resolution: Review requests or mark them as do-not-merge/work-in-progress

Average age: 46.1d, Avg wait: 6.6d

Search:

ID	As	Rea	Cr	Up	Re	Cmnts	Labels	Tags
16329			1d	1d	1d		cnf-cla: yes needs-ok-to-test dependencies	size/S collaborator-last recv unreviewed
16325			1d	1d	1d		cnf-cla: yes size/M	collaborator-last

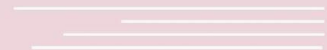


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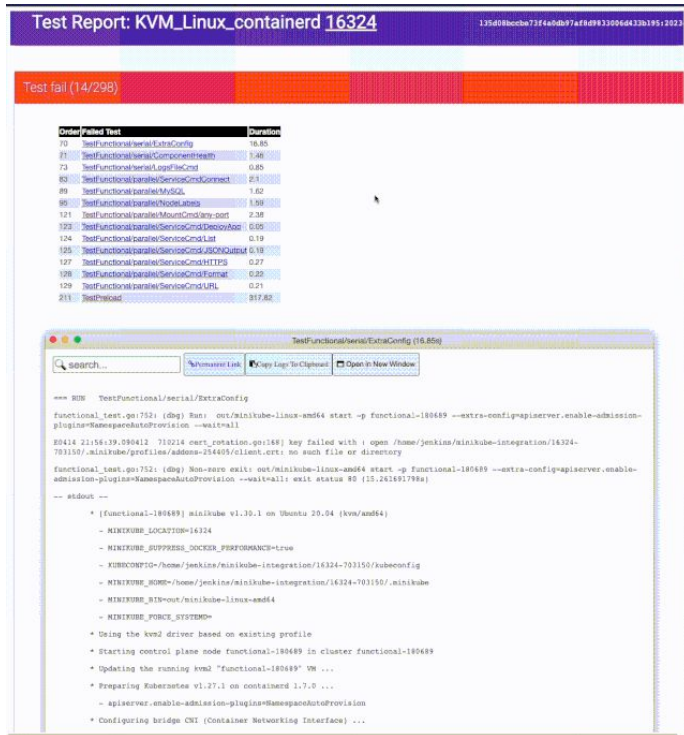
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Investments in Developer Velocity

GOPOGH: Reading dozen 10K lines logs is not fun !

[illegible]

<https://github.com/medyagh/gopogh>

Identify Test Flake on the PRs!



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minikube-pr-bot commented 2 days ago

These are the flake rates of all failed tests.

Environment	Failed Tests	Flake Rate (%)
Hyper-V_Windows	TestMountStart/serial/VerifyMountPostStop (gopogh)	0.00 (chart)
KVM_Linux	TestStartStop/group/default-k8s-diff-port/serial/AddonExistsAfterStop (gopogh)	1.25 (chart)
KVM_Linux	TestStartStop/group/default-k8s-diff-port/serial/Pause (gopogh)	1.25 (chart)
KVM_Linux	TestStartStop/group/default-k8s-diff-port/serial/SecondStart (gopogh)	1.25 (chart)
KVM_Linux	TestStartStop/group/default-k8s-diff-port/serial/UserAppExistsAfterStop (gopogh)	1.25 (chart)
KVM_Linux	TestStartStop/group/default-k8s-diff-port/serial/VerifyKubernetesImages (gopogh)	1.25 (chart)

Picture of a comment on a PR in minikube project that warns the reviewer the following integration test do NOT fail on a high rate on HEAD

Gopogh Flake Chart Examples



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- flake tests charts per environment and per test case are updated in minikube website daily and available for public
 - https://minikube.sigs.k8s.io/docs/contrib/test_flakes/

Automations



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- minikube-bot created more than 500 PRs!
- Pushing code after hours reducing traffic on test infrastructure for human developers
- Build Docker Image and ISO images on PRs (that took 5+ hours)
- Sync Images to Alibaba...

--no-kubernetes ?? (2022)



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- In 2022 minikube surveys showed significant interest of users using minikube as a free docker desktop replacement. (see site tutorial)
- Users asked for starting minikube without kubernetes!!!
 - And we delivered minikube start --no-kubernetes
- More info see [website](#) (search for docker desktop)

2022: The year arm64!



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- Delivering Docker arm64 was done earlier in 2021
- 2022 we delivered QEMU driver for macOS M1 (arm64)

2023: github.com/kubernetes-sigs/minikube-gui

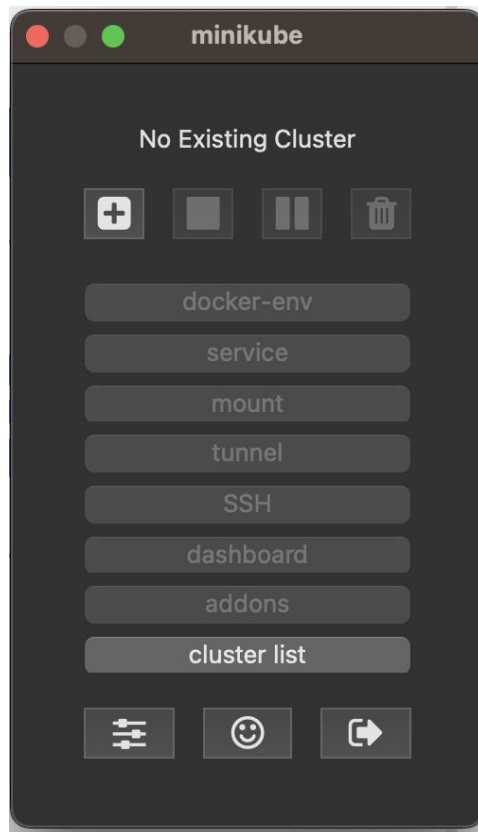


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2023 Support Nvidia-Docker Runtime

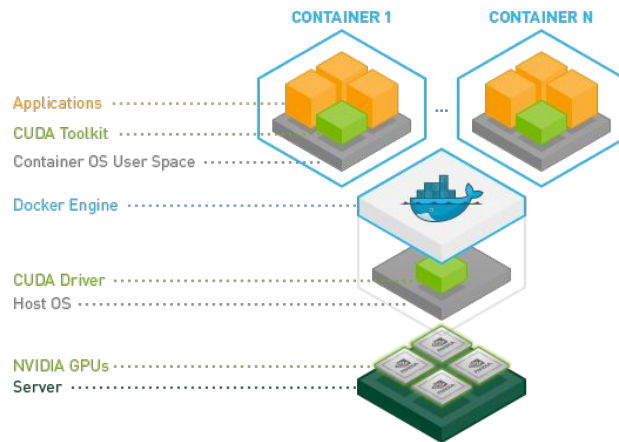


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Support for `gpus` with `nvidia-docker container-runtime`

- `minikube start --gpus=nvidia`

Docs: <https://minikube.sigs.k8s.io/docs/tutorials/nvidia/>

2023 AI: Try Kubeflow addon



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Kubeflow

minikube addons enable kubeflow

Link to all the minikube github repos

- Minikube GUI
 - github.com/kubernetes-sigs/minikube-gui
- Machine Drivers
 - github.com/machine-drivers/machine
- Setup-Minikube Github Action
 - github.com/marketplace/actions/setup-minikube
- Slowjam
 - github.com/google/slowjam
- Triage Party
 - github.com/google/triage-party
- Gopogh
 - github.com/medyagh/gopogh
- Time To K8s
 - github.com/tstromberg/time-to-k8s
- Minikube-CI
 - github.com/minikube-ci/examples
- Pull Sheet
 - github.com/google/pullsheet
- CSTAT
 - github.com/tstromberg/cstat
- GCP AUTH Addon
 - <https://github.com/GoogleContainerTools/gcp-auth-webhook>



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Appendix

**Release
Timeline**

Minikube

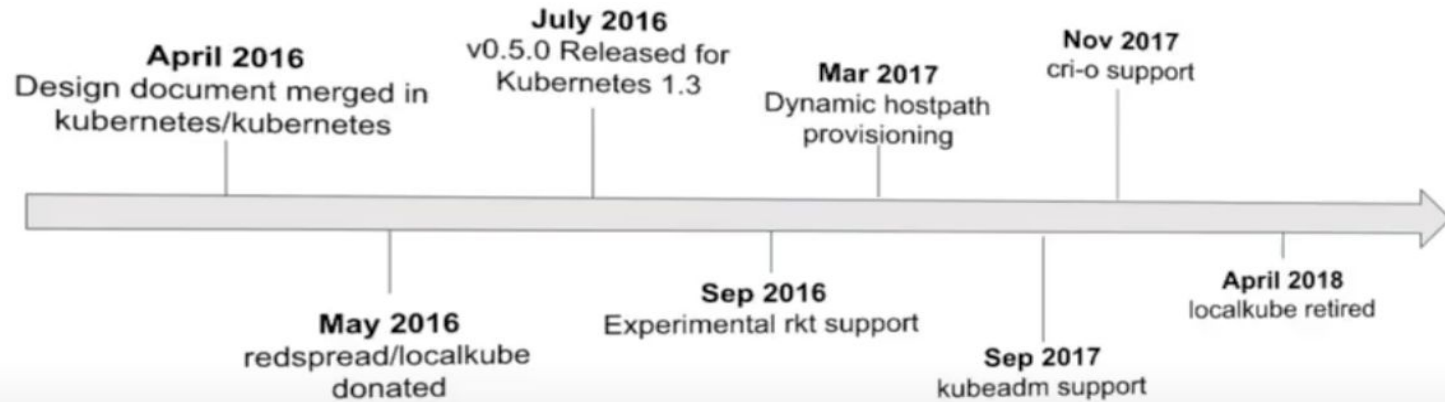


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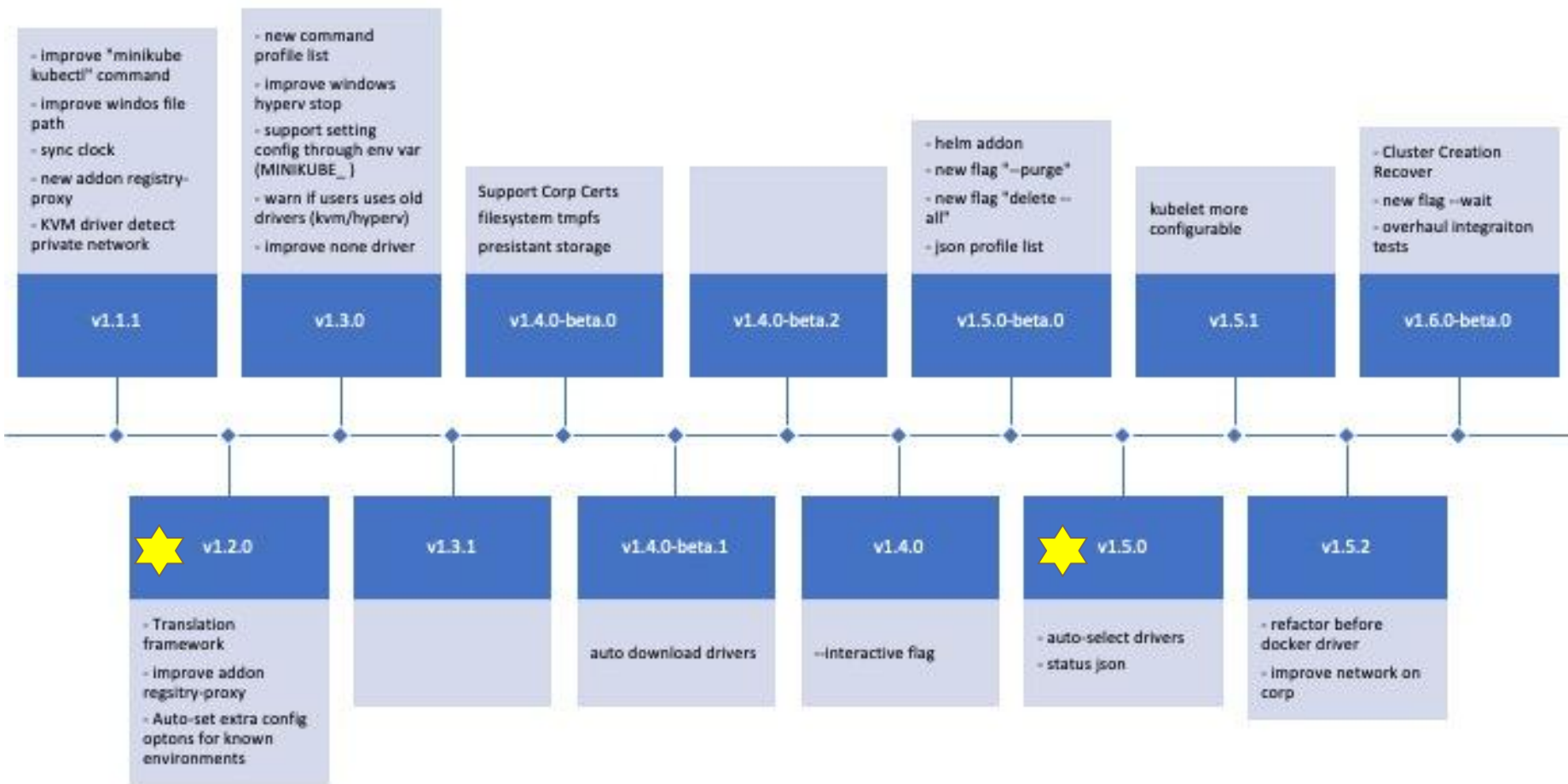


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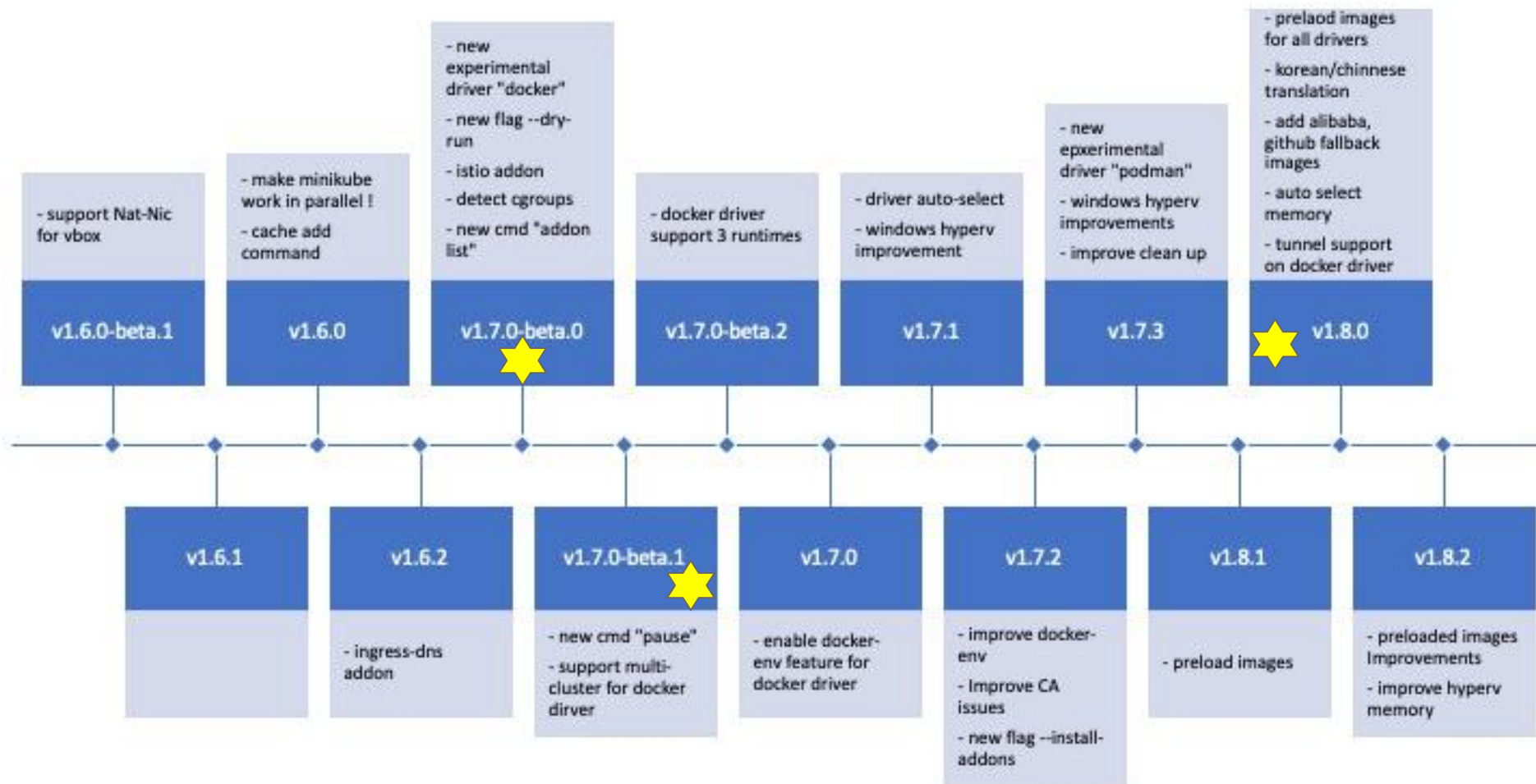
Europe 2018



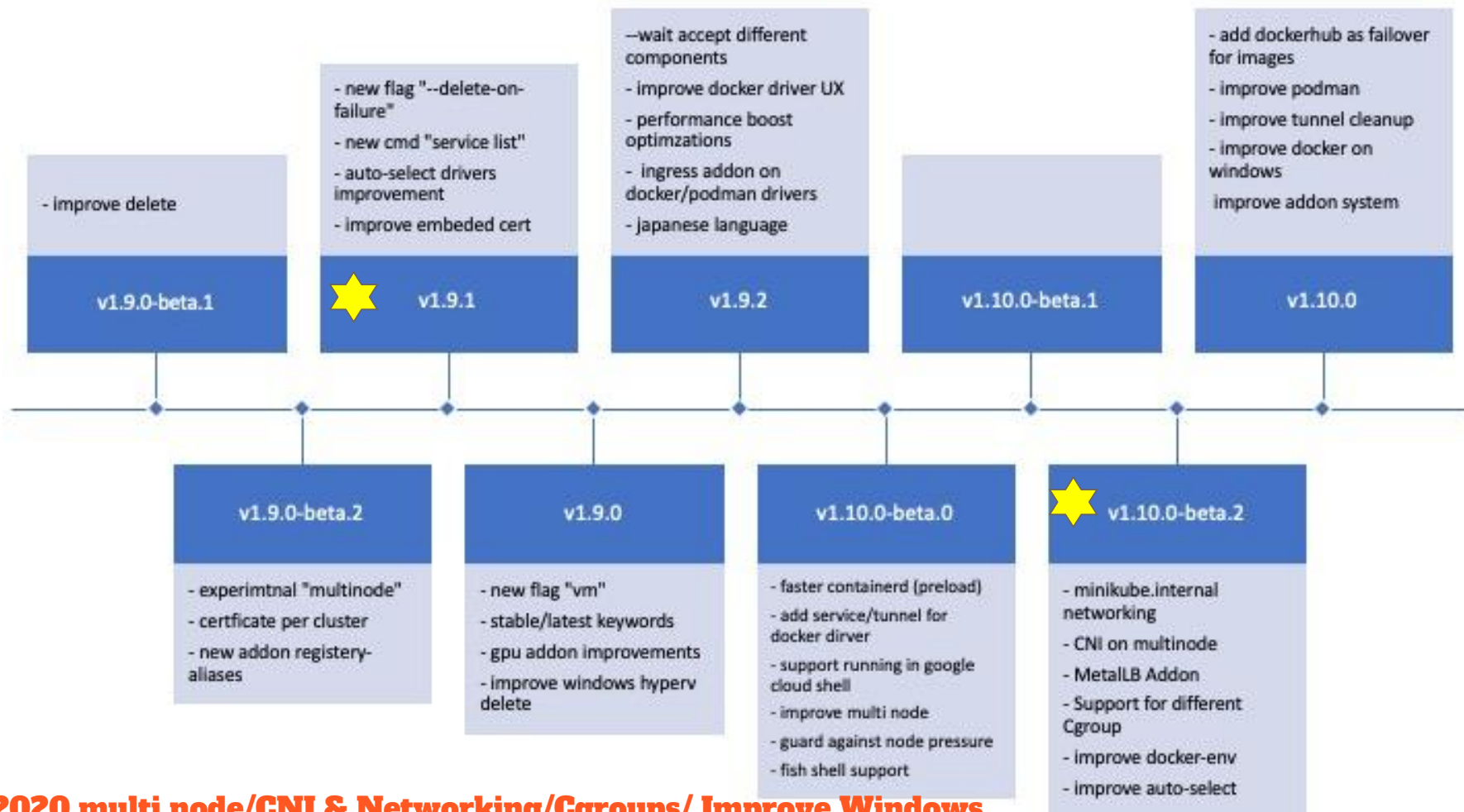
2016-2018 Dan Lorenc Time



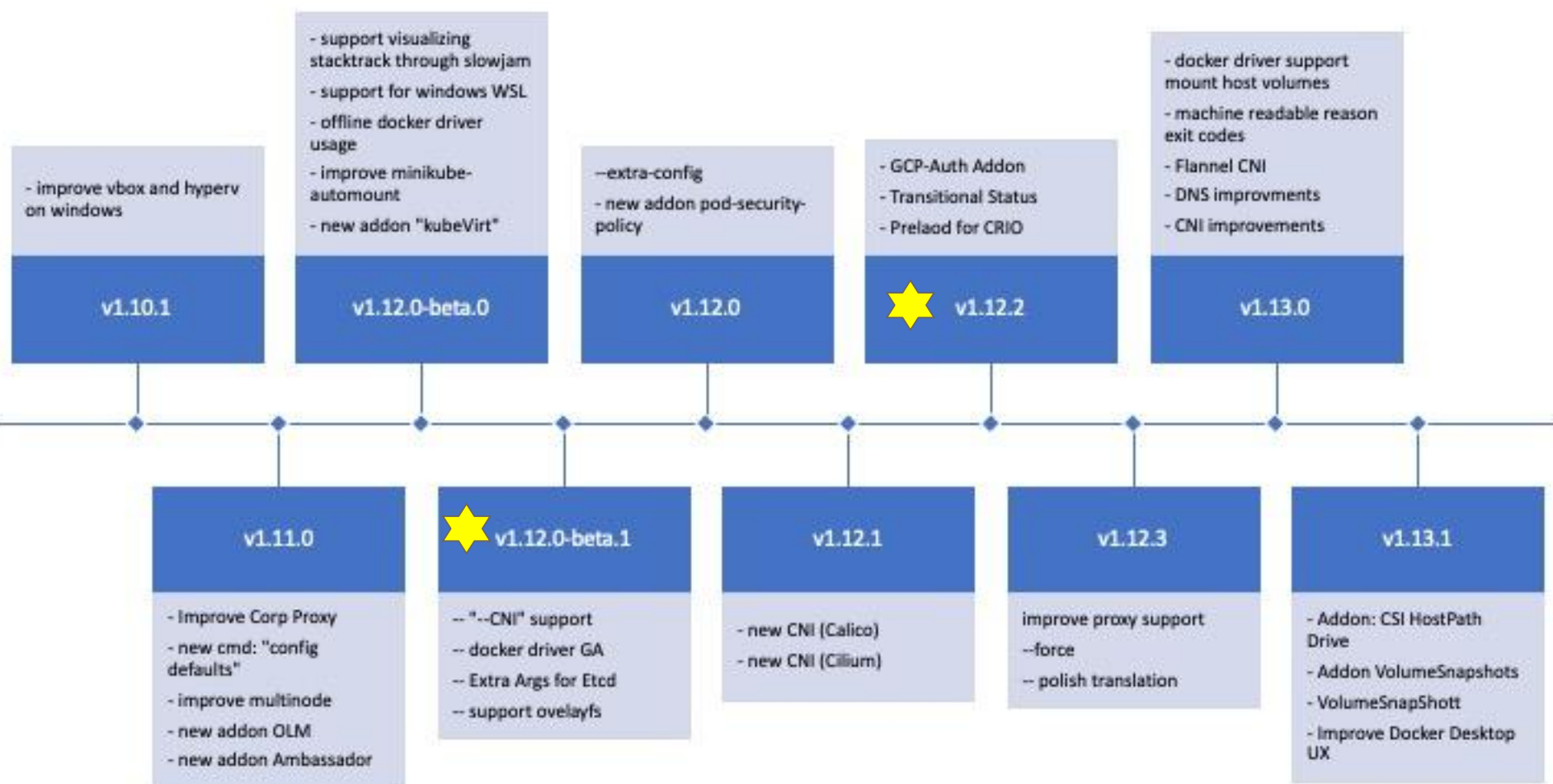
**2019-2020 Translations/Auto-select options/
Refactor technical debt**



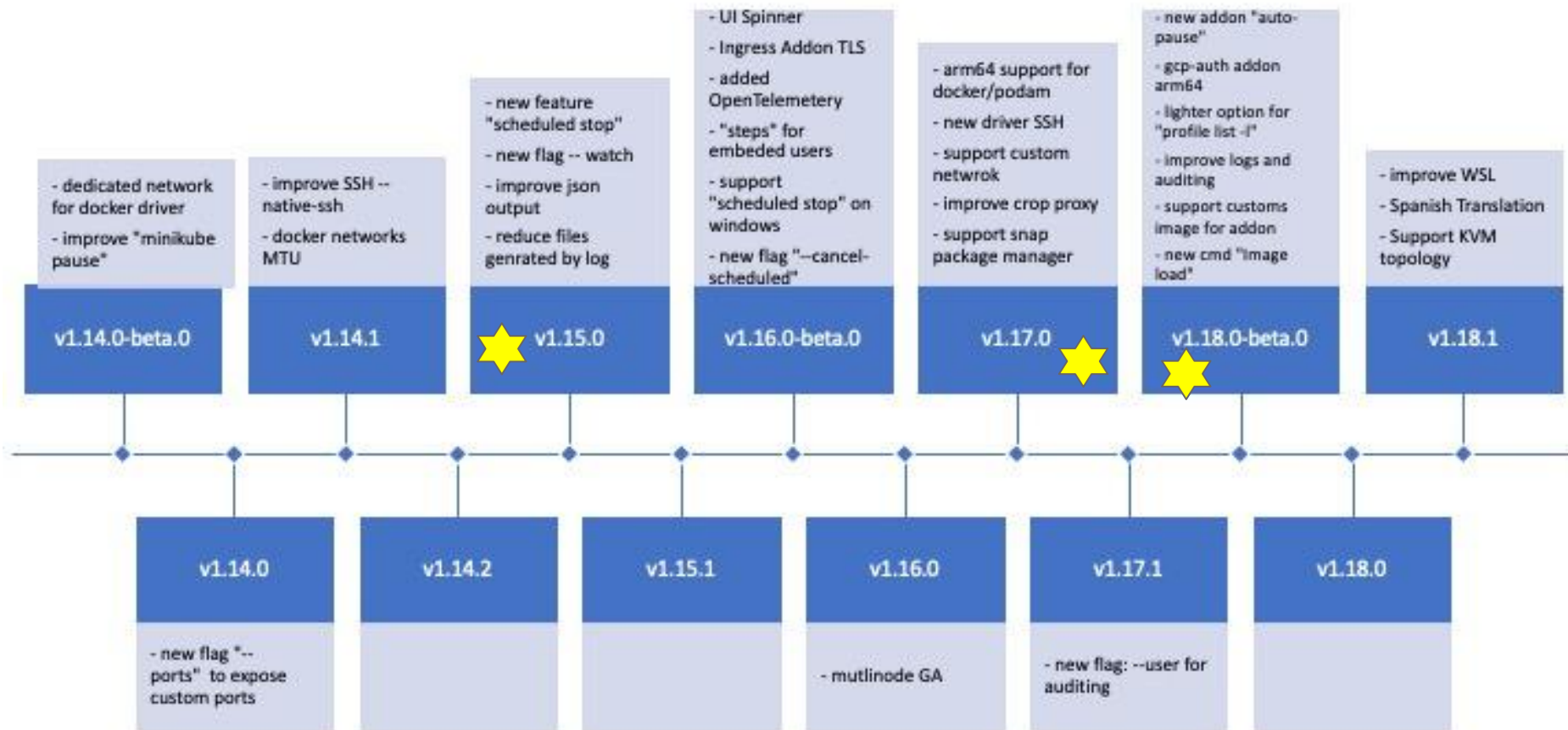
**2019-2020- docker driver/unified
preload/pause cmd**



2020 multi node/CNI & Networking/Cgroups/ Improve Windows



2020 Docker Driver GA/more CNIs/New Addons!



2020- 2021 Embedded use/Arm64 Docker Driver/ Auto Pause/ Multinode GA/Audit

- new cmd "minikube cp"
- new cmd "image rm"
- new flag "--listen-address"
- improve tmp log files
- cordns optimization
- improve "minikube kubectl"

v1.19.0-beta.0



- support building image using "minikube image build"
- new cmd: minikube image pull
- improve CNI with runtimes
- new flag --short for "minikube version"
- improve ingress addon

v1.20.0-beta.0

- new alias "resume"
- optimize downloading
- improve gcp-auth
- "minikube cp" command supports multinode
- improve container runtime cpu usage

v1.21.0-beta.0

- auto-pause on arm64
- support setting "max" for cpu and memory
- add maintainers to addons list
- improve french translations
- support running x86 binary on M1
- improve containerd

v1.22.0-beta.0

v1.19.0

- Auto Pause for VM drivers
- image list

v1.20.0

- new flag "--file" for minikube logs
- speed up "minikube logs"
- identify problematic K8S Versions
- update olm addon

v1.21.0

- update polish translations

v1.22.0

- new flag to list internal components version "version --components"
- Auto-pause for Containerd and CRIO

**2021 optimizations ,new cmds "image/cp",
Autopause**

- new cmd "minikube image"
- support rootless Docker
- "docker-env" support tcsh
- support ingress docker driver on Mac
- --image-repository support URLs with port
- improve tunnel
- improve windows WSL
- improve gcp-auth addon

v1.23.0

v1.23.2

-no-kubernetes !!!



v1.24.0

v1.25.1

- qemu driver
- arm64 ISO for VM drivers
- audit flag
- disable-metrics flag
- subnet for docker/podman drivers
- Fix nvidia-gpu addon with KVM



v1.26.0-beta.0

v1.23.1

- improve "minikube version --components"
- improve addons gcp-auth/metallb/ingress/ingress-dns/ambassador
- improve windows installer

v1.24.0-beta.0

- sync Alibaba
- podman on Windows/MacOs
- zshell completion
- improve windows mount
- improve "minikube image build"

v1.25.0

- new flag "binary-mirror"
- format flag "image ls"
- custom cert for ingress

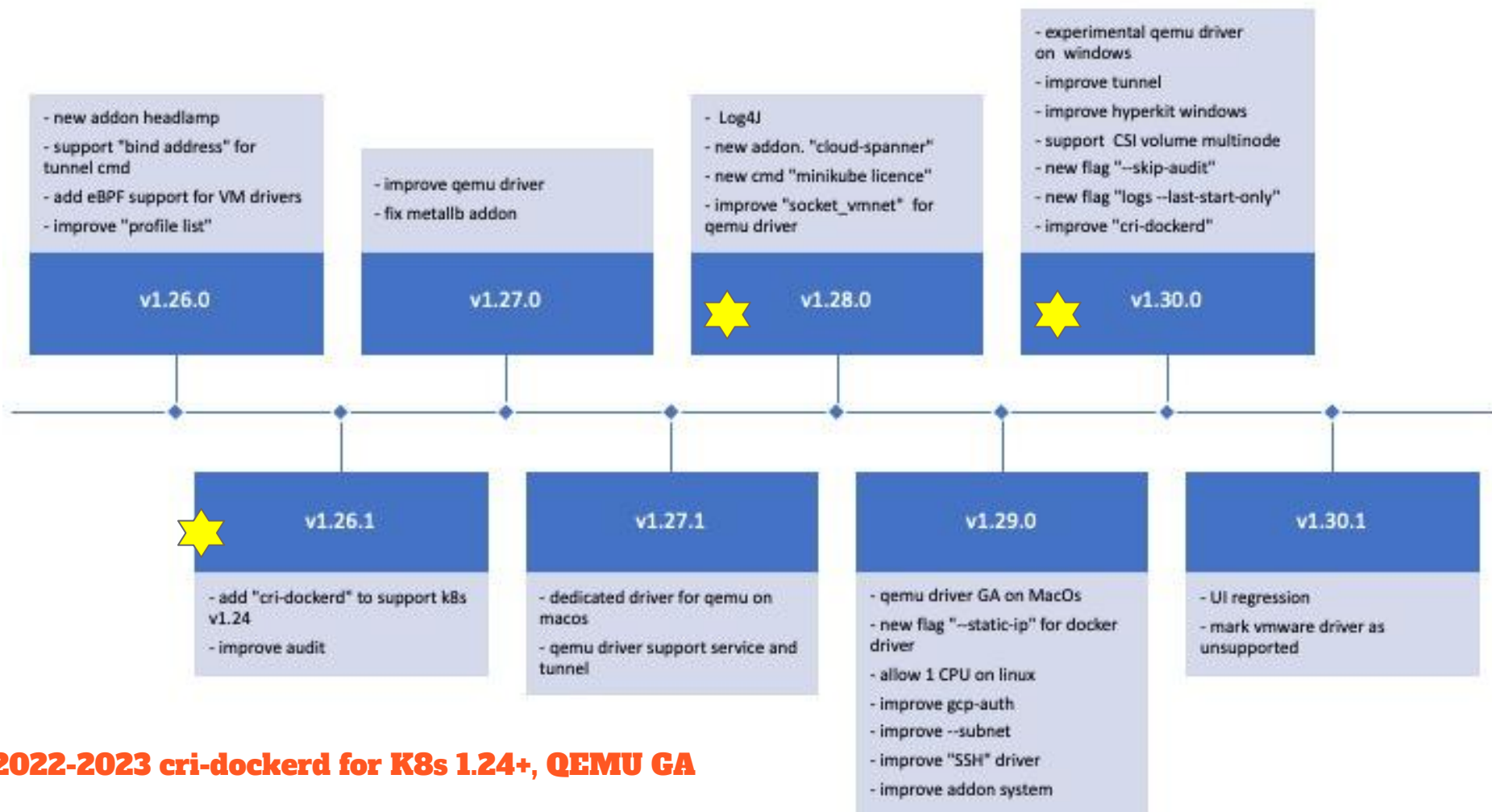
v1.25.2

- new addon "kong"
- new flag service --all
- new flag -disable-optimizations
- improve restart
- support ingress on multi-node

v1.26.0-beta.1

- improve qemu driver
- "registry-aliases" addon configurable

2021-2022 no-kubernetes/gemu driver, arm64 on VMS, improve behind firewall/rootless docker.



2022-2023 cri-dockerd for K8s 1.24+, QEMU GA



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