

minikube from cli to gui



Summary of years of maintaining minikube

Medya Ghazizadeh
Twitter :@medya_dev

\$ whoami

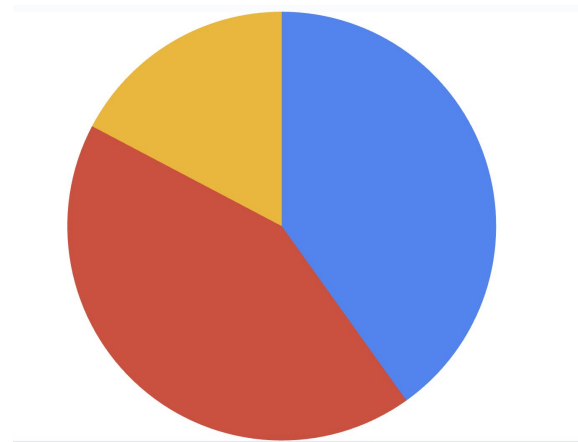
- Medya Ghazizadeh
- Maintaining minikube since 2019
- Released 86 versions of minikube (out of 140 total)
- Sr. Software Engineer/Manager at Google

What is minikube?

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 !





```
[ $ 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,, Predrag Rogic,
Honorable mention of previous maintainers: Dan Lorenc, Thomas Stromberg and more
than 800+ Individual Contributors ! (Thank you)

It all started with a GitHub issue in 2016

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



Special Needs ! Special Testing






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

 **Tweet**

**Dan Lorenc**
@lorenc_dan

Me today: TREAT YOUR BUILD SYSTEMS LIKE PRODUCTION SYSTEMS

Me 7 years ago:

github.com/kubernetes/kub...

[h/t @medya_dev](#)


minikube First Test Lab


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




First Release May 2016 by Dan Lorenc

May 30, 2016



 dlorenc

 v0.1.0

 599cf8a

Compare ▾

v0.1.0 Pre-release

Minikube v0.1.0

This is the initial release of Minikube. Minikube is still under active development, and features may change at any time.

Distribution

Minikube is only distributed in binary form for Linux and OSX systems for the v0.1.0 release. Binaries are available through Github or on Google Cloud Storage. The direct GCS links are:

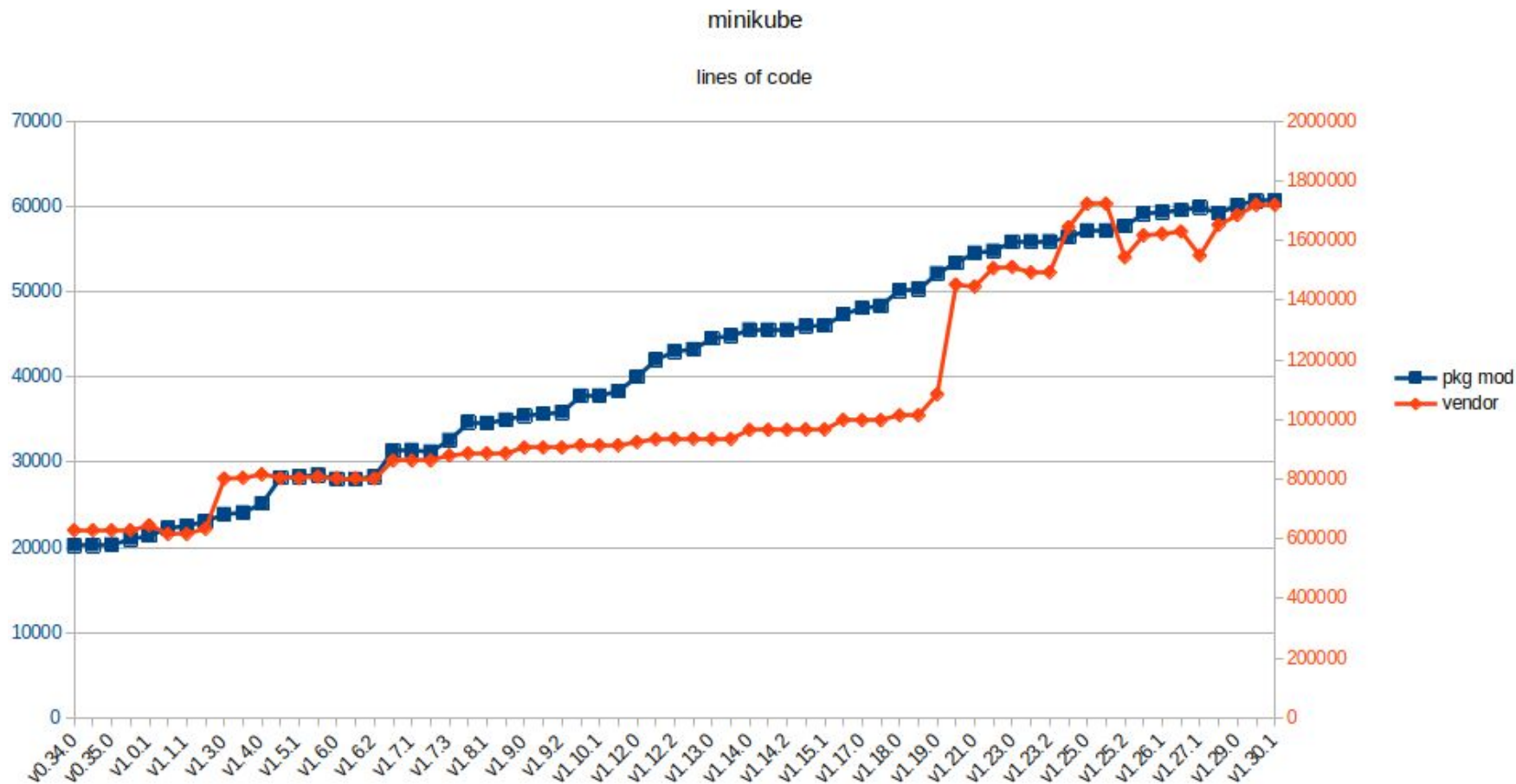
[Darwin/amd64](#)

[Linux/amd64](#)

Installation

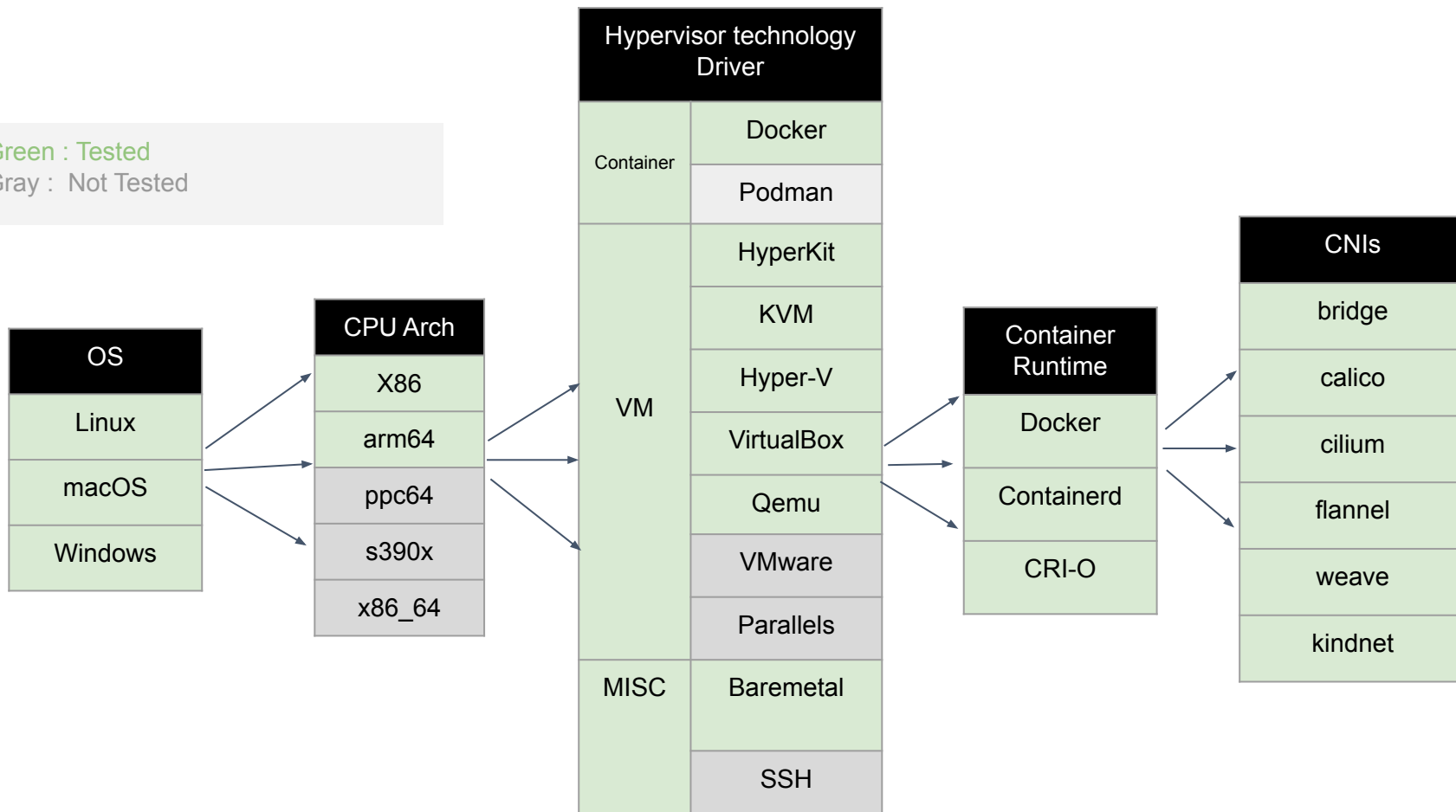
OSX

Fast Forward 2023... 1.8M LOC



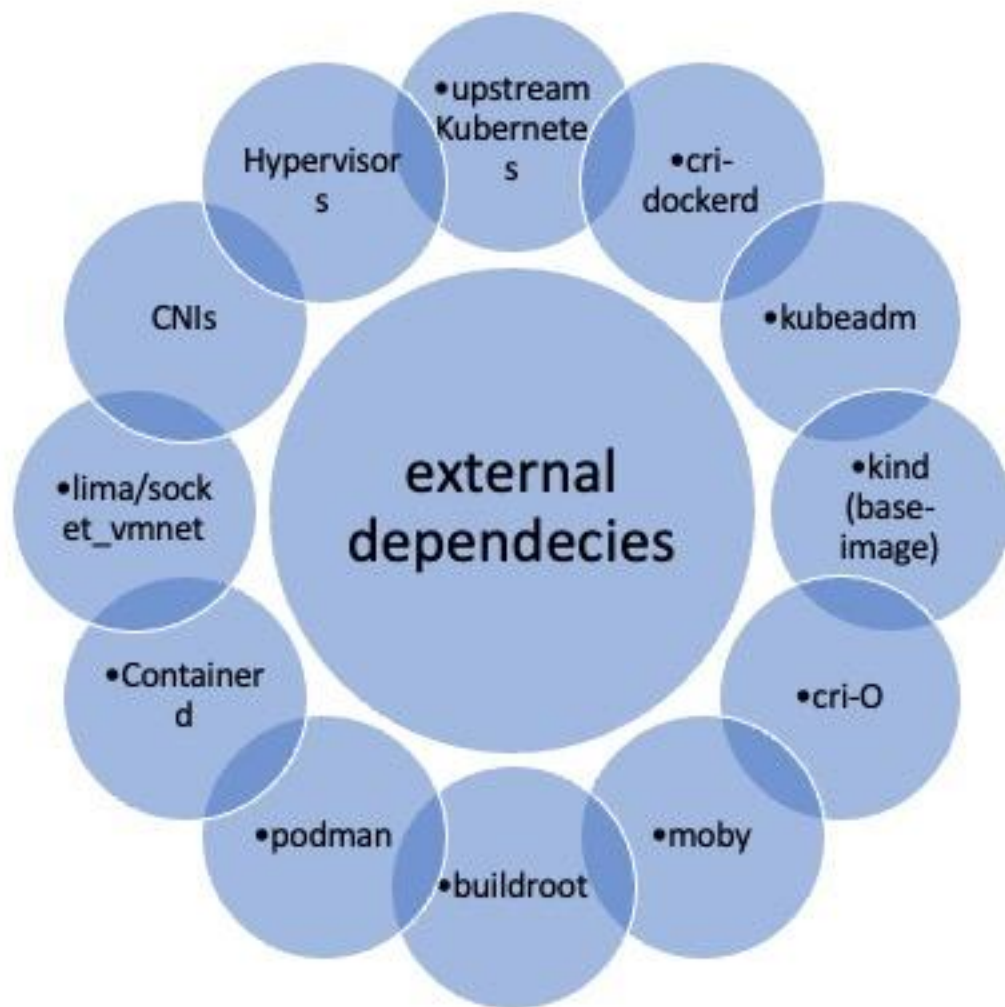
Tech Support Matrix!

Green : Tested
Gray : Not Tested

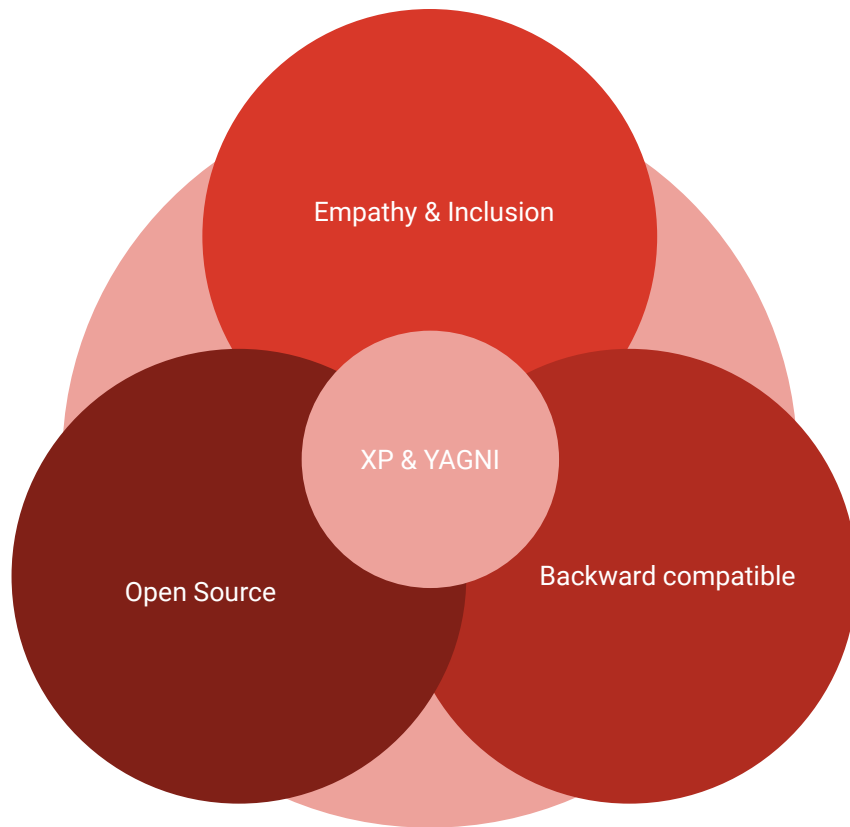


**“Minikube mai is not just one project”
It is like a sun with an orbit**

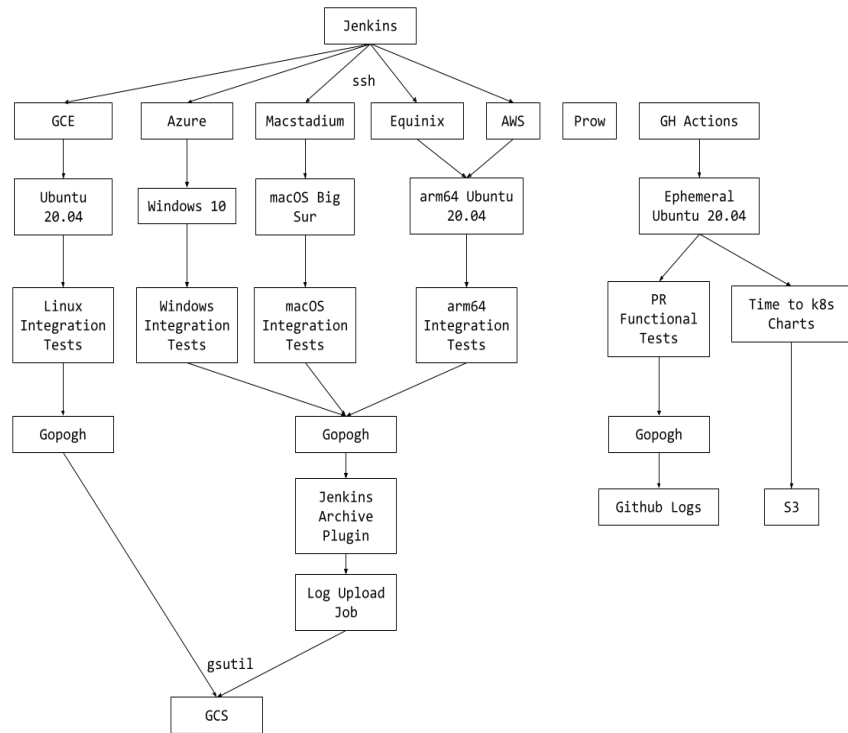
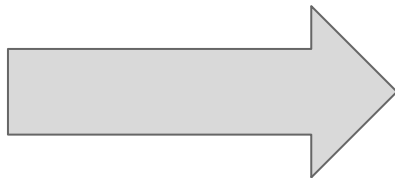




Minikube Principles



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
- 296 end to end tests in integration testing suite
- Checkout [detailed list of integration](#) tests cases on website

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

VM has 50% resting CPU usage when idle #3207

Open samuela opened this issue on Oct 2, 2018 · 46 comments

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

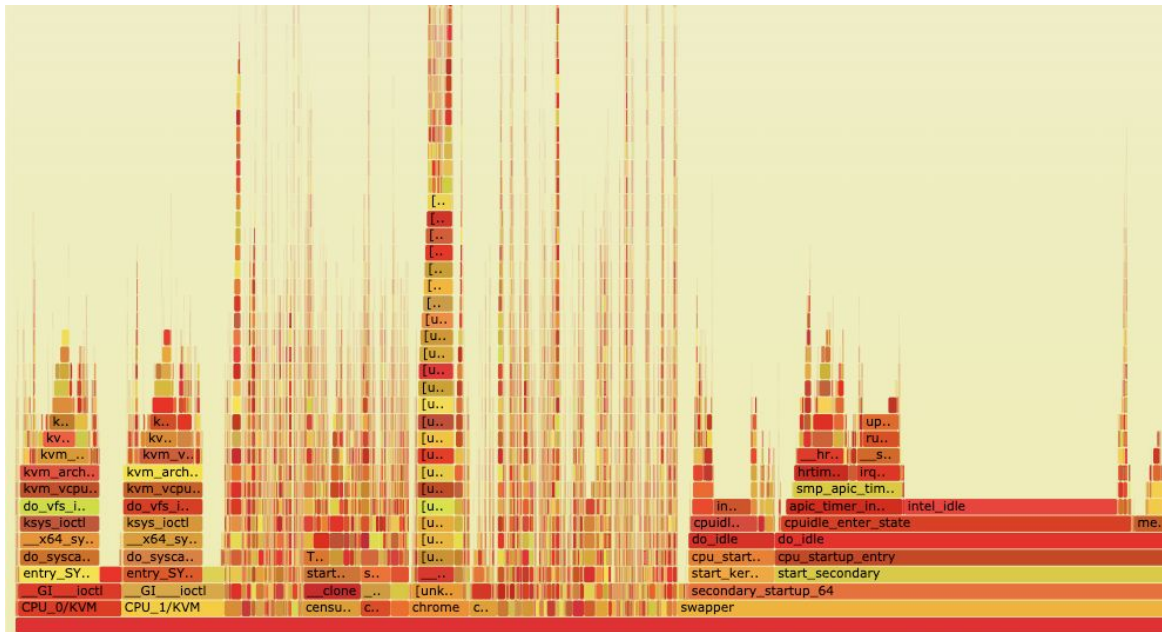
Closed parasite opened this issue on Nov 1, 2018 · 4 comments

Docker run stuck and consuming 100% CPU #5991

Closed mvgljssel opened this issue on Nov 27, 2019 · 2 comments



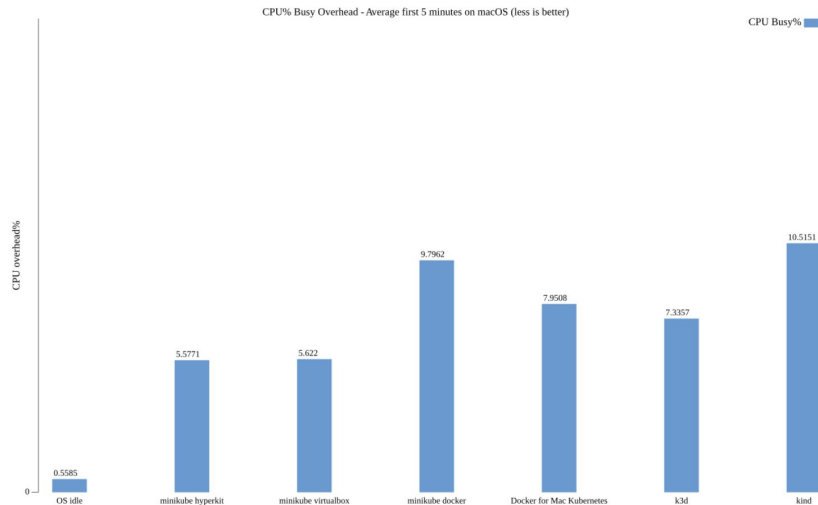
Developed tools to generate CPU flame graph



[cstat](#) (developed by minikube maintainer @tstromberg)

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

We transformed CPU Idle CPU usage



On the left CPU benchmarks after multiple optimization

On the right minikube cpu usage compared to similar tool.

Checkout more benchmarks on [minikube website](#)

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

Transform minikube start latency (2020)

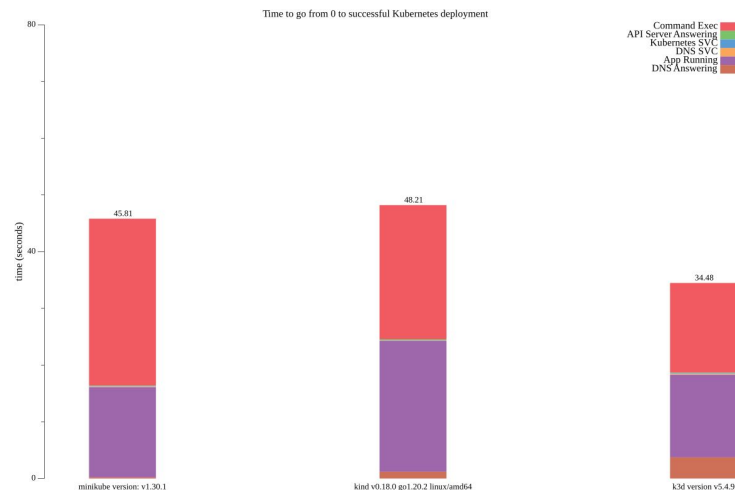
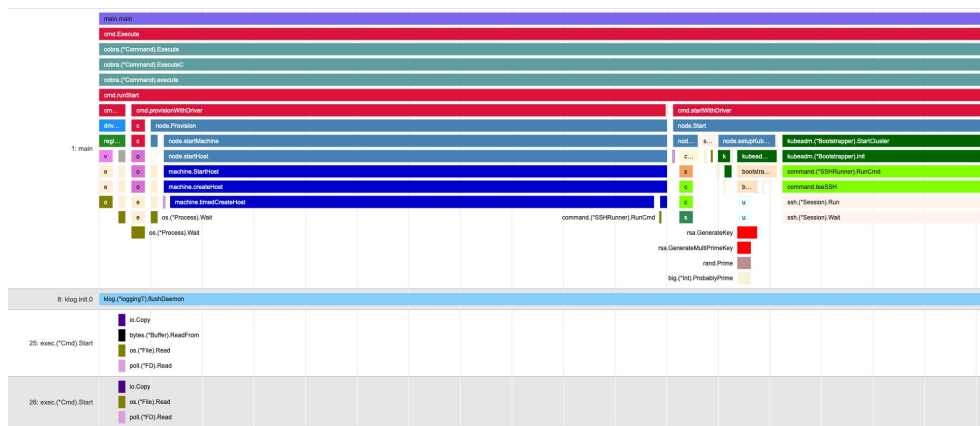
**2m35s
minute**



**21
seconds
(86%
faster)**

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

Open sourced SlowJam and Time-To-K8S



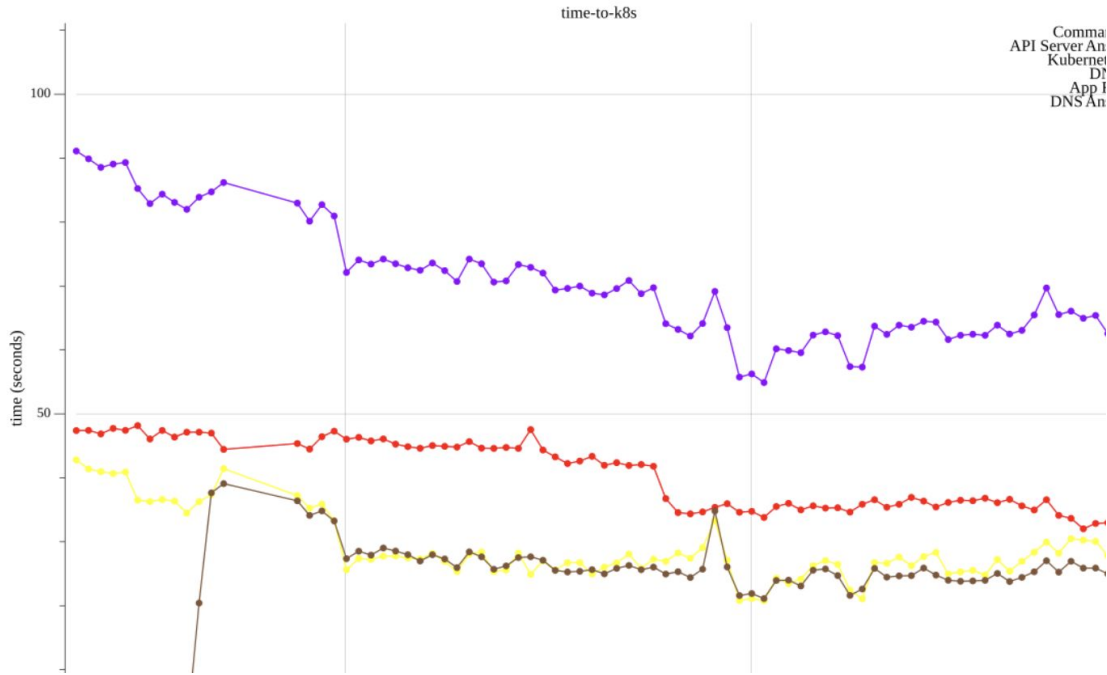
minikube team developed two tools inspect performance metrics

On the left: screenshot of SlowJam

On the right: screenshot of time-to-k8s

Automated Benchmarking

Docker driver - containerd runtime



Example of [daily benchmarking](#) charts showing minikube start up time in different categories identified by time-to-k8s over time.

**minikube for
embedded use
2021**

minikube for embedded use 2021

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





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

- 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

minikube to be used in CI (2021)

gitlab/prow/google cloud build/circleci,...

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

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

Official Github Action (setup-minikube)

- Setup-minikube Github Action maintained by minikube maintainers
- Simply test your PR/app against Kubernetes

Basic Usage

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

- See Examples: github.com/marketplace/actions/setup-minikube

Bring K8s for the next billion users


- Checkout talk 2019 [KubeCon talk](#) titled “Minikube: Bringing Kubernetes to the Next Billion Users “
- Talks are available on minikube website (under [presentations](#))

Minikube for non-english languages

```
[ $ 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/)

Triage Party! (Join every Wed)

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	Aut	Desc	As	Rea	Cr	Up	Re	Cmnts	Labels	Tags
16180		ISO: Bump Go from 1.19.6 to 1.19.8			18d	5d	12d	 	cnf-cla: yes approved	size/XS collaborator-last commented unreviewed

Pull Requests: Review Ready (16) [🔗](#)

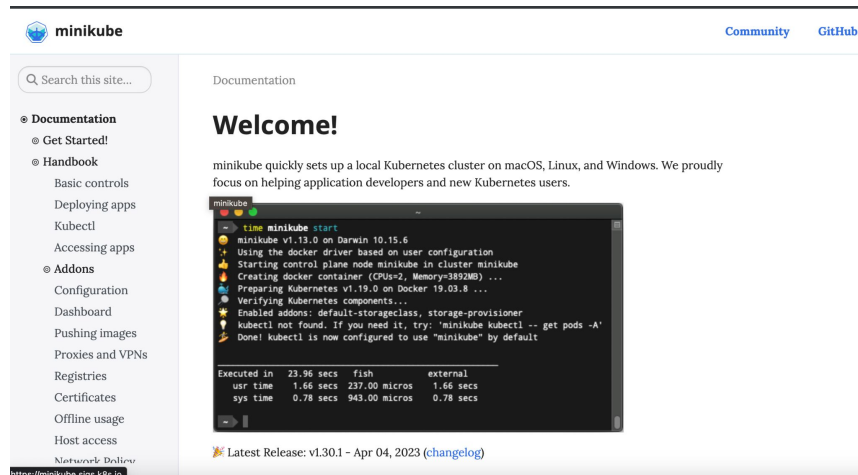
Resolution: Review requests or mark them as do-not-merge/work-in-progress
Average age: 46.1d, Avg wait: 6.6d

Search:

ID	Aut	Desc	As	Rea	Cr	Up	Re	Cmnts	Labels	Tags
16329		Bump k8s.io/component-base from 0.27.0 to 0.27.1			1d	1d	1d		cnf-cla: yes needs-ok-to-test dependencies go	size/S collaborator-last recv unreviewed
16325		Bump k8s.io/kubectl from 0.27.0 to 0.27.1			1d	1d	1d		cnf-cla: yes size/M	collaborator-last

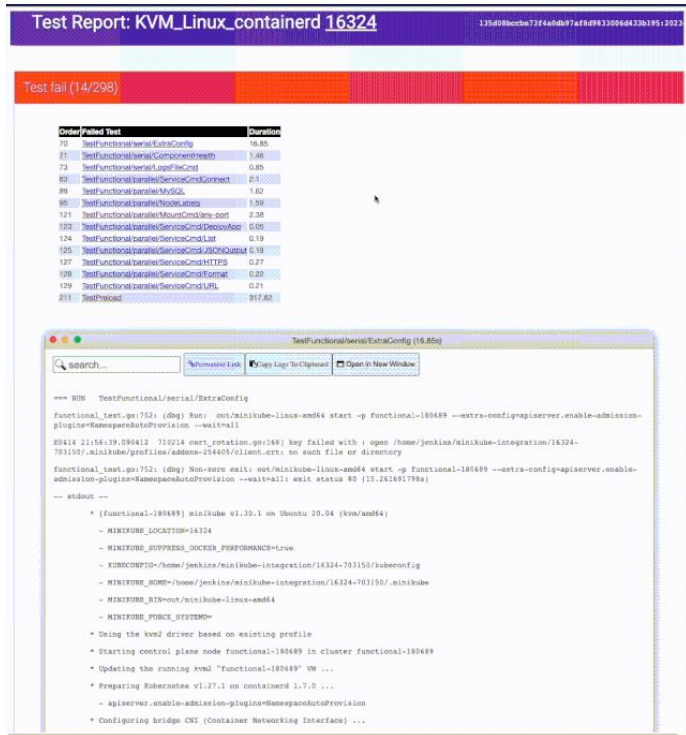
Overhaul of minikube Website (2019-2021)

- minikube website (Since 2019-06-15)
 - <https://minikube.sigs.k8s.io/docs/>
 - Getting started
 - Tutorials
 - Handbooks
 - Addons
 - FAQ
 - Contributors Guide
- Twitter (Since july 2021)
 - [@minikube_dev](https://twitter.com/minikube_dev)
- Slack Channel (6K members since 2016)



Investments in Developer Velocity

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

[illegible]

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

**Chart all
the things!**

Transform Developer Velocity: Identify Flakes!

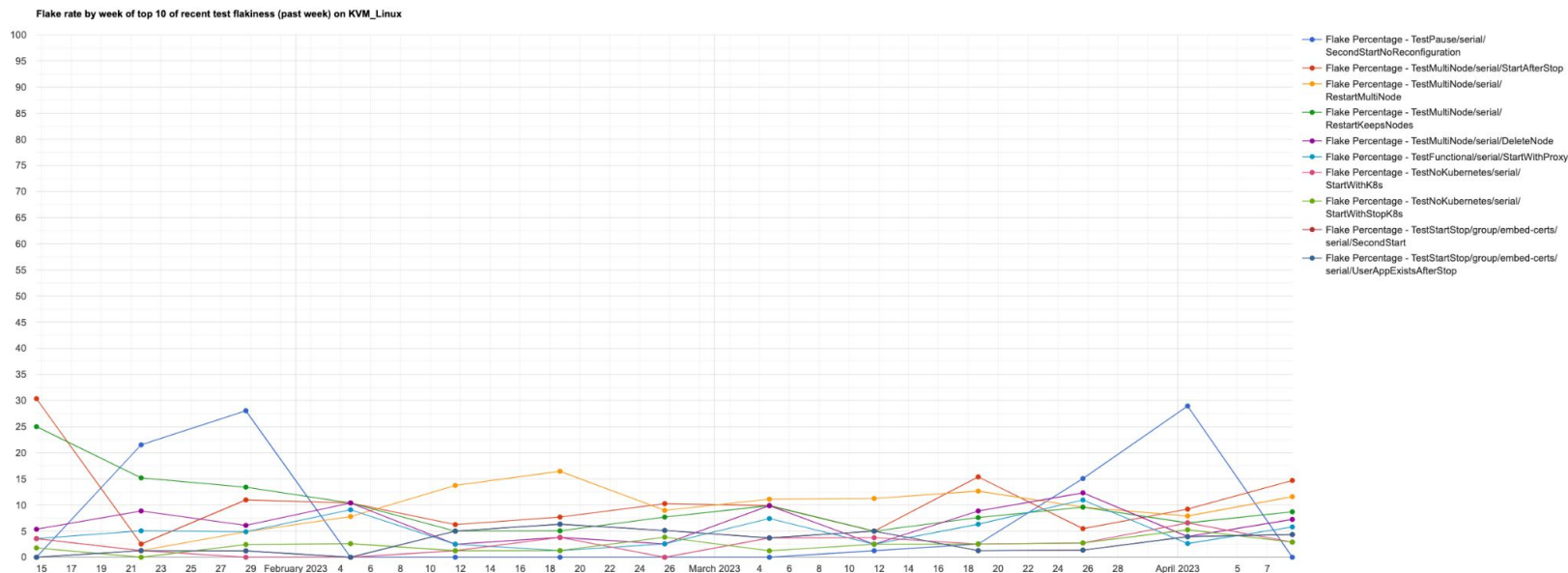
minikube bot warns the reviewer the following integration test do NOT fail on a high rate on HEAD

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)

Maintainer Velocity: Flake Charts Example



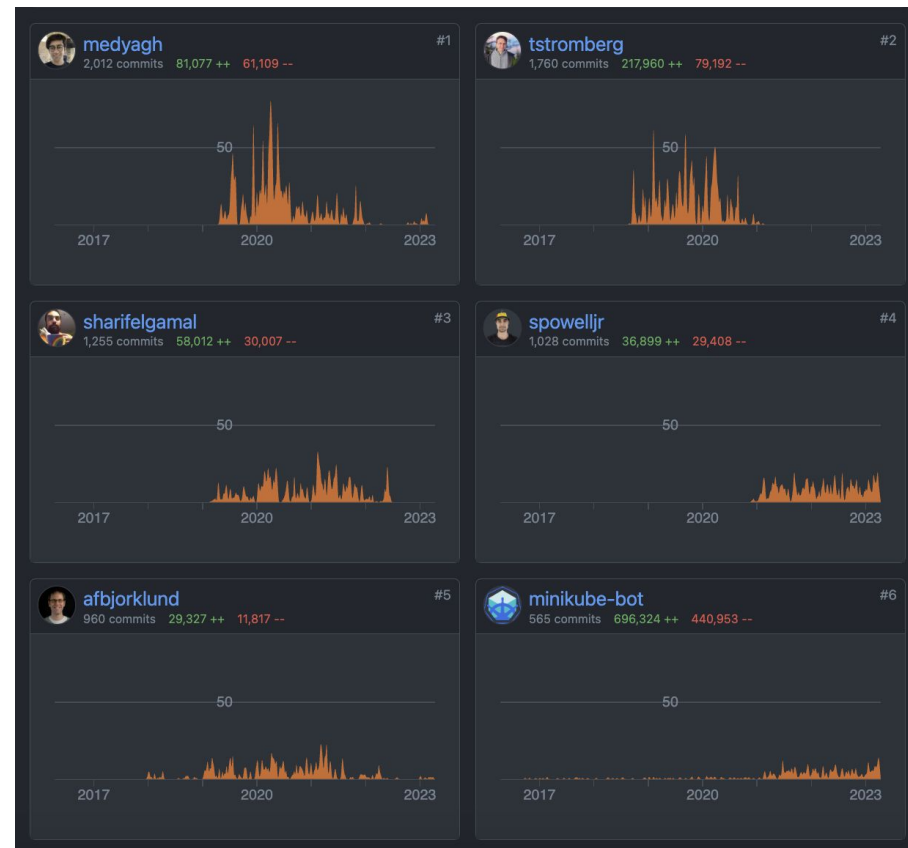
- flake tests charts per environment and per test case are updated in minikube website daily and available for public
 - https://minikube.sigs.k8s.io/docs/contrib/test_flakes/

Developer Velocity: Automated PRs at Midnight

- 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



Robot in Top 6 contributors!



docker desktop alternative?

--no-kubernetes (2022)

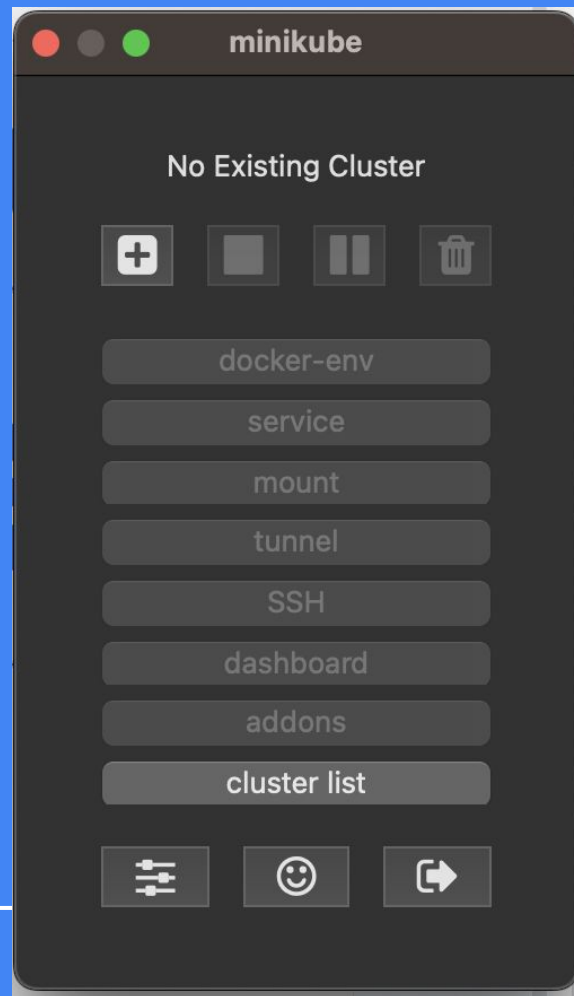
- In 2022 minikube surveys showed significant interest of users using minikube as a free docker desktop replacement. (see site tutorial)
- Users asked for starting minikube without kubernetes!!!
 - And we delivered minikube start --no-kubernetes
- More info see [website](#) (search for docker desktop)

2022: The year arm64!

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

**And now
present to you!
minikube-gui !**

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



Appendix

**Release
Timeline**

Minikube

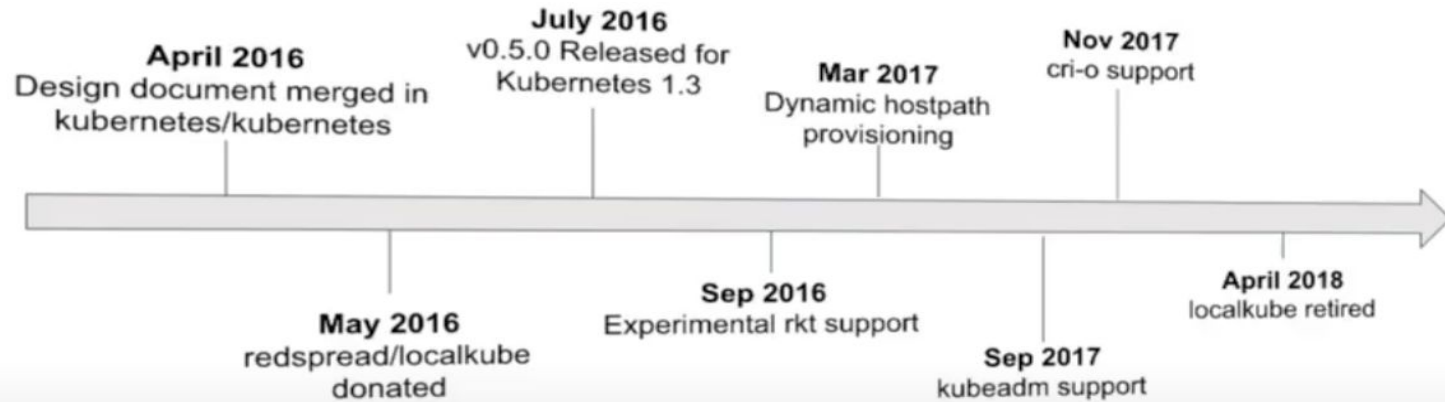


KubeCon

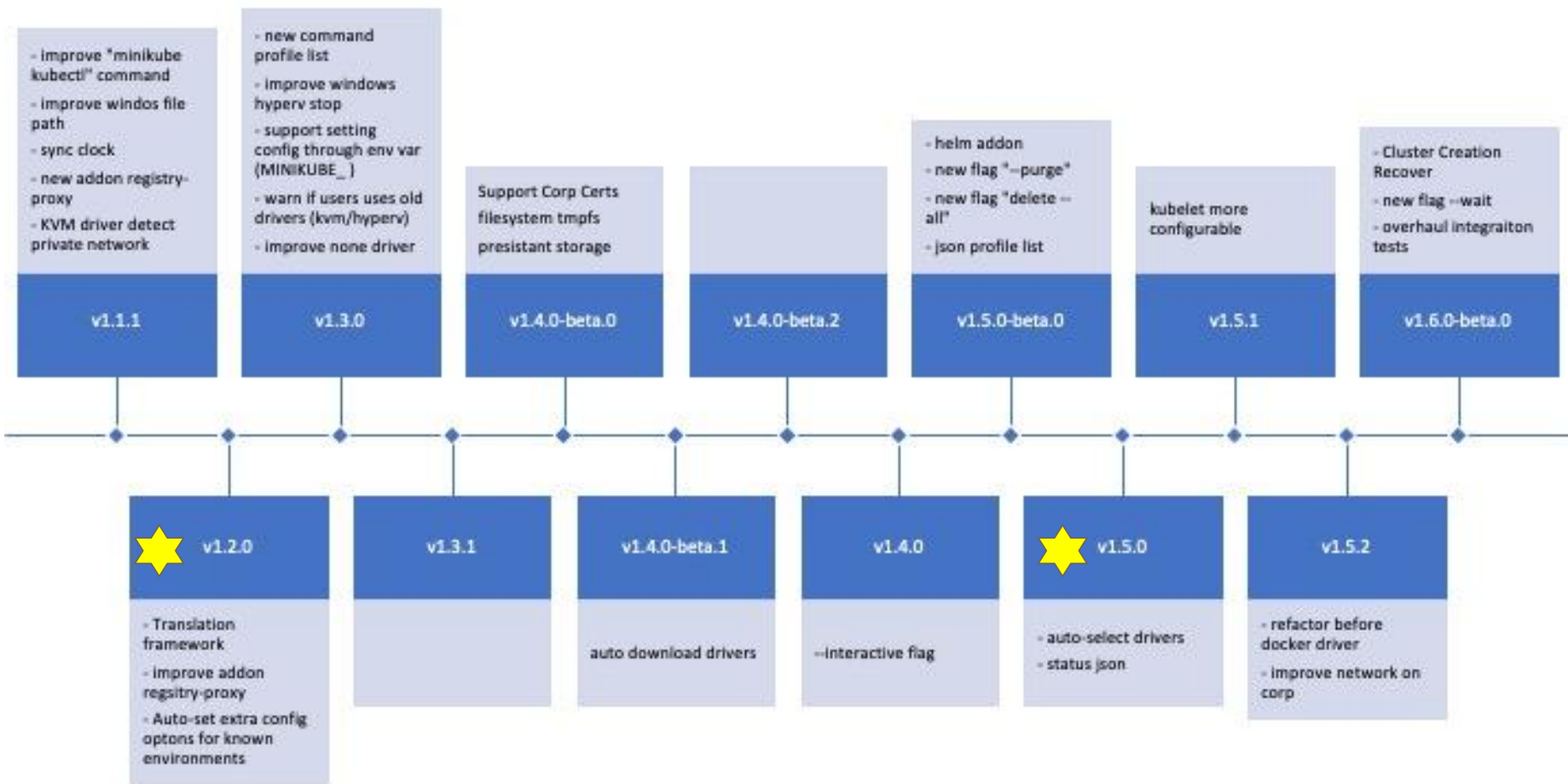


CloudNativeCon

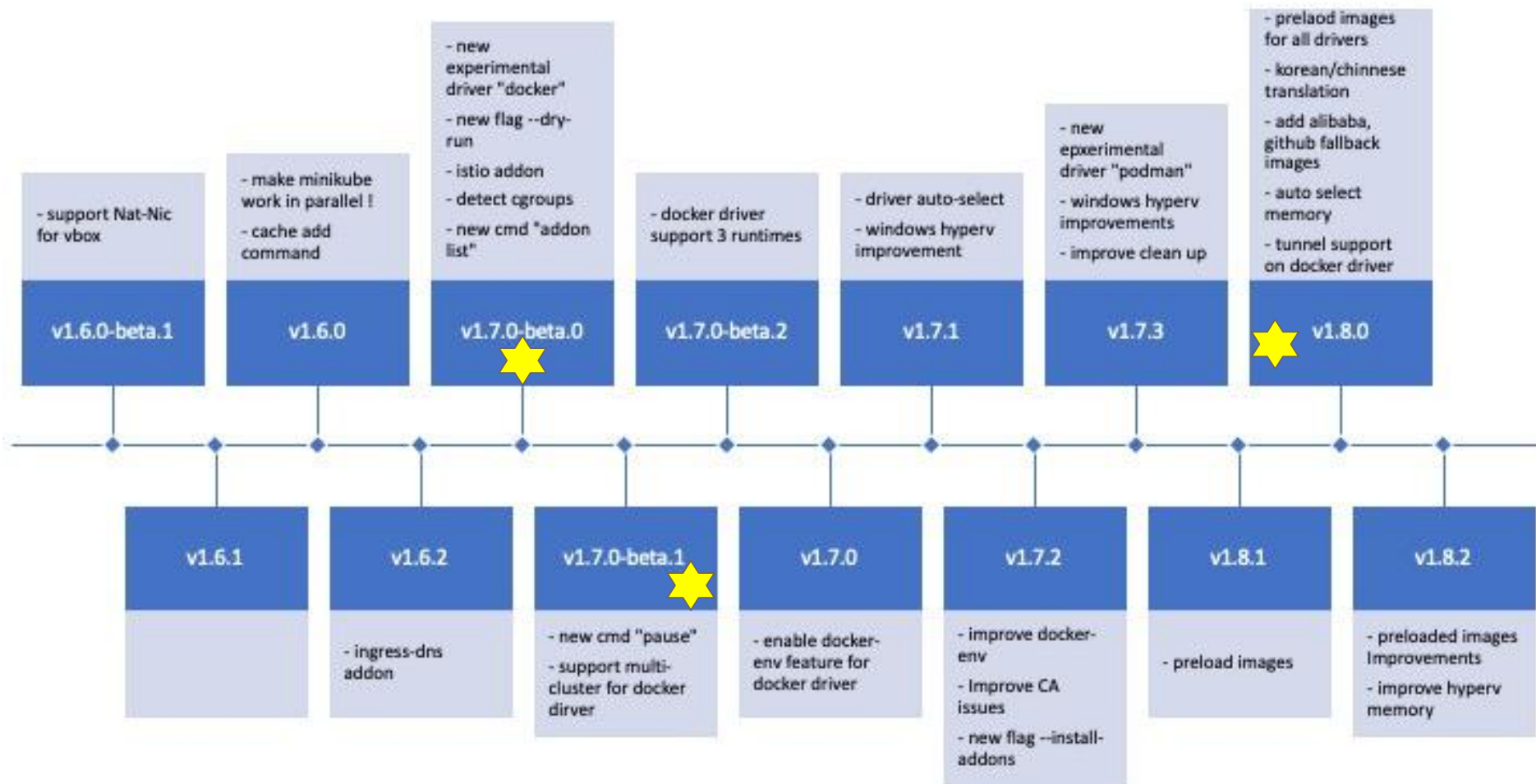
Europe 2018



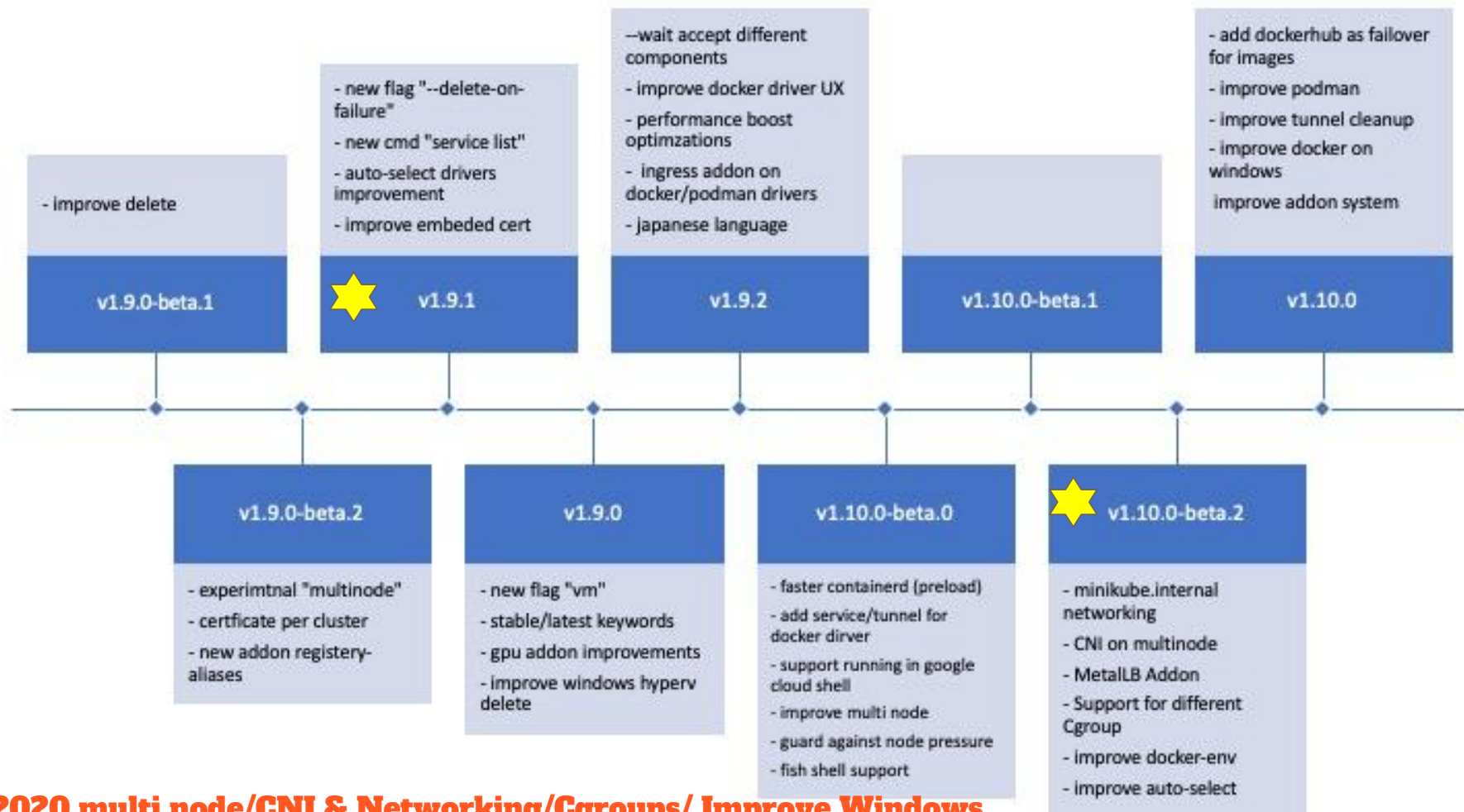
2016-2018 Dan Lorenc Time



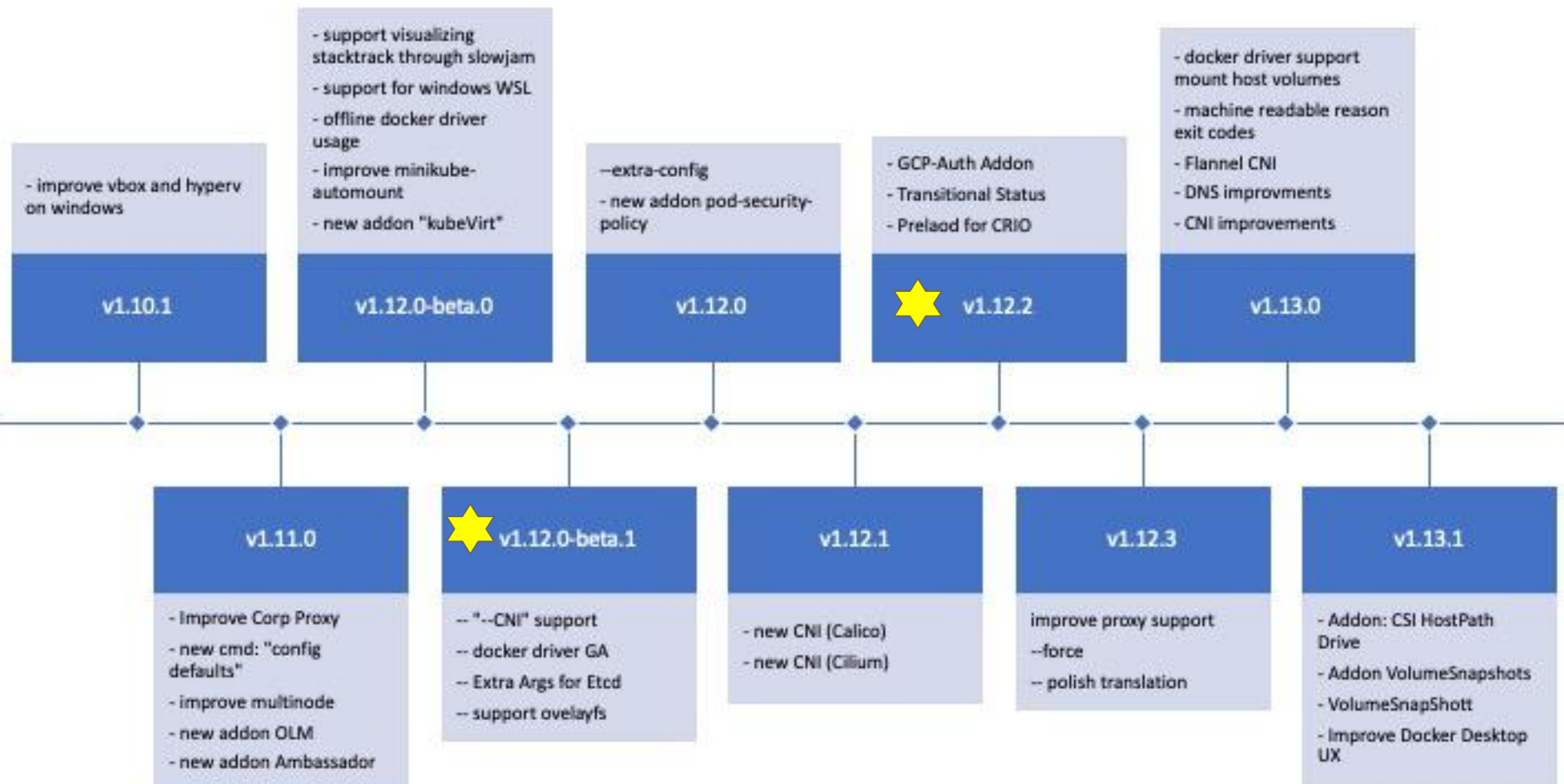
**2019-2020 Translations/Auto-select options/
Refactor technical debt**



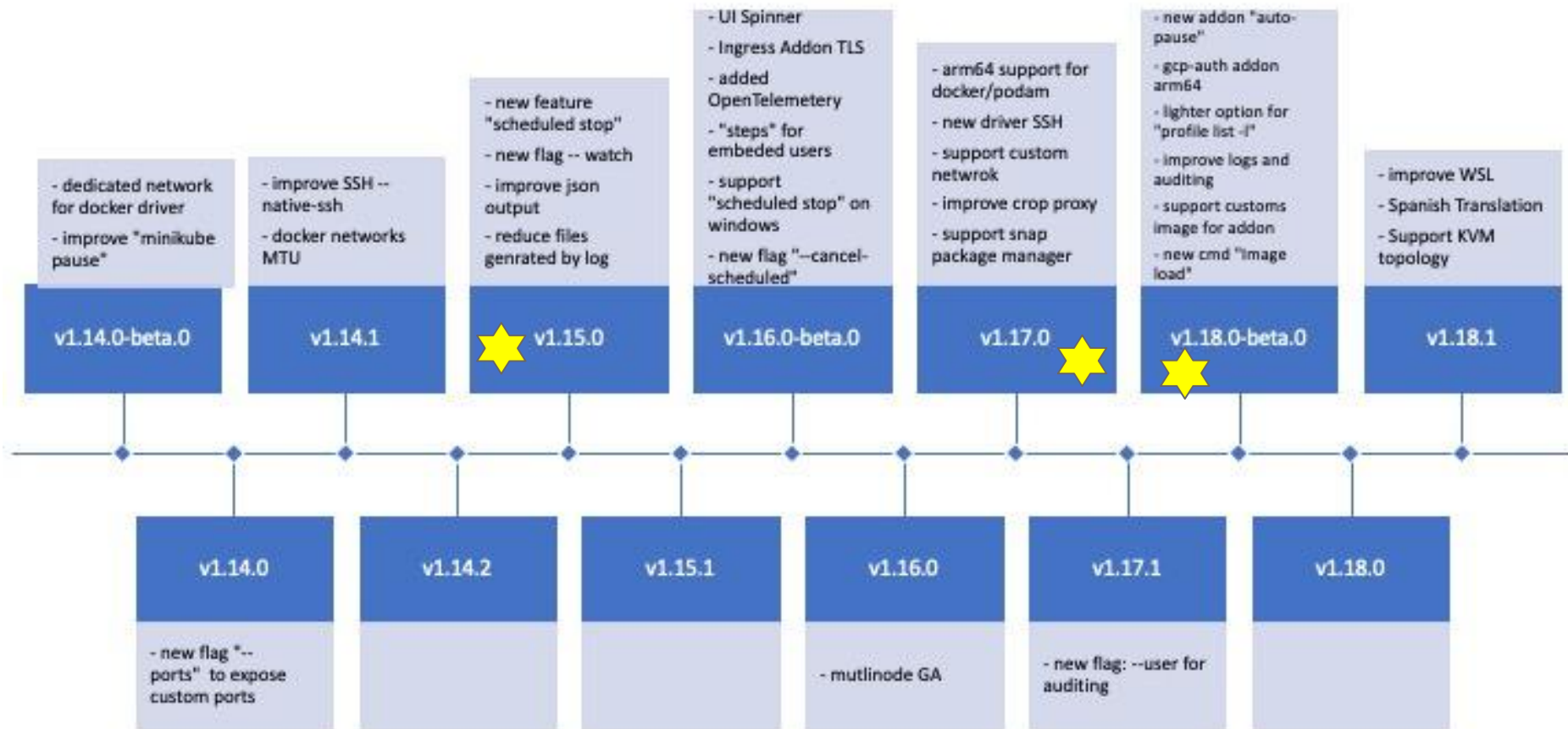
**2019-2020- docker driver/unified
preload/pause cmd**



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

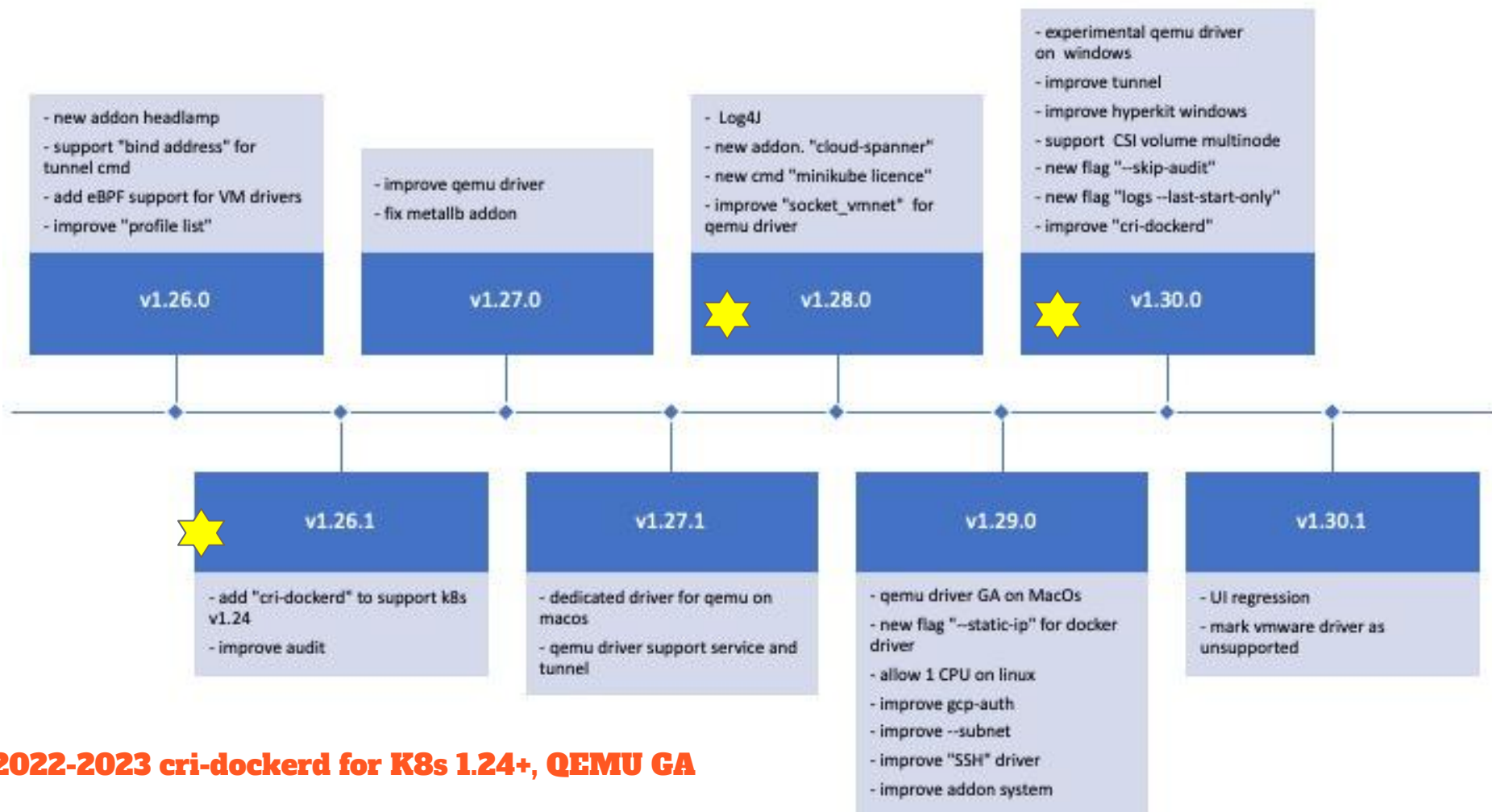
v1.25.2

- 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

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>