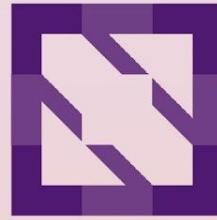




KubeCon



CloudNativeCon

North America 2023



KubeCon



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Minikube project update

Medya Ghazizadeh - Google



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\$ whoami

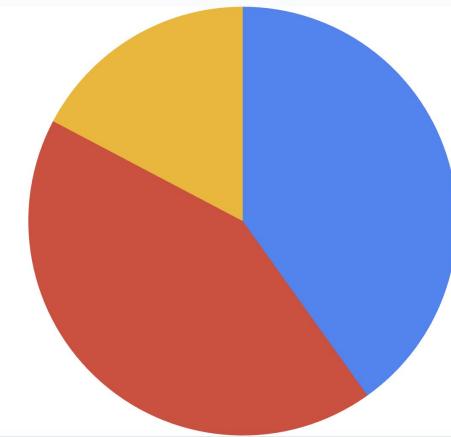
- Medya Ghazizadeh
- Sr. Software Engineer/Manager at Google
- Kubernetes Kernel Team
- Maintaining minikube since 2019
- Released 90 versions of minikube (out of 140 total)
- @medya_dev on twitter

Who uses minikube?

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
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 @dlorenz @ethernetdan @Runseb @mfburnett @bgrant0607 @pwitrock



Testing under the desk ...?



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A screenshot of a GitHub comment card. The profile picture of the user 'dlorenc' shows a man with short brown hair and a blue shirt. The comment was posted on April 12, 2016, and the user is identified as a 'Member'. The comment text is:

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.

At the bottom of the card are two interaction icons: a smiley face and a heart with the number '1'.

minikube First Test Lab

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



Fast Forward 2023... 1.8M LOC



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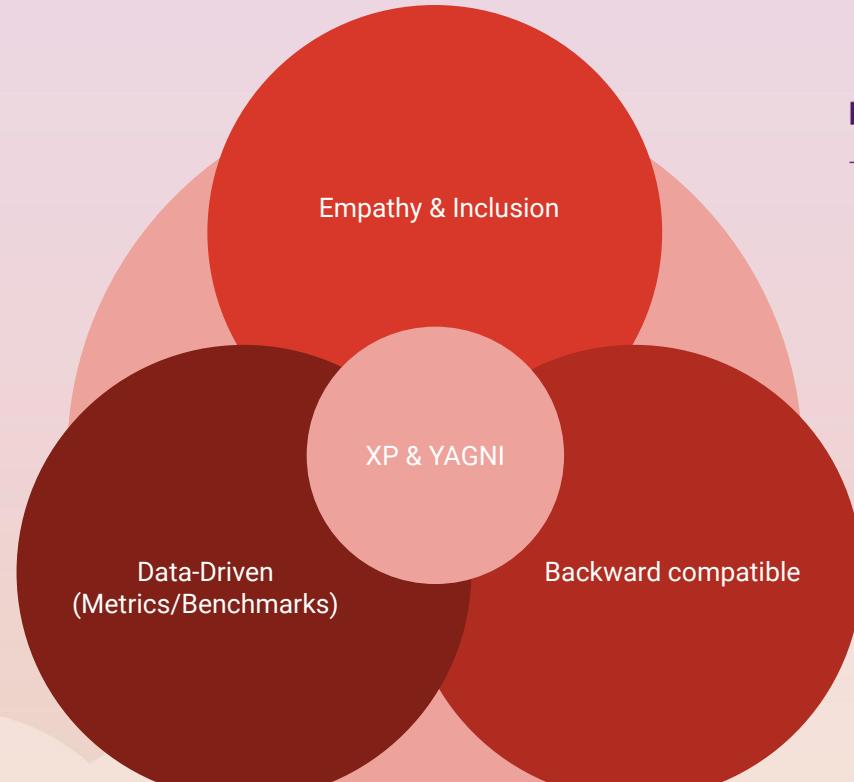


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Minikube Principles



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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

```
[\$ 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 (コンテナー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](#)

Tech Support Matrix!

Green : Tested
Gray : Not Tested

OS	CPU Arch
Linux	X86
macOS	arm64
Windows	ppc64 s390x x86_64

Hypervisor technology	
	Driver
Container	Docker Podman
VM	HyperKit KVM Hyper-V VirtualBox Qemu VMware Parallels
MISC	Baremetal SSH



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CNI
bridge
calico
cilium
flannel
weave
kindnet



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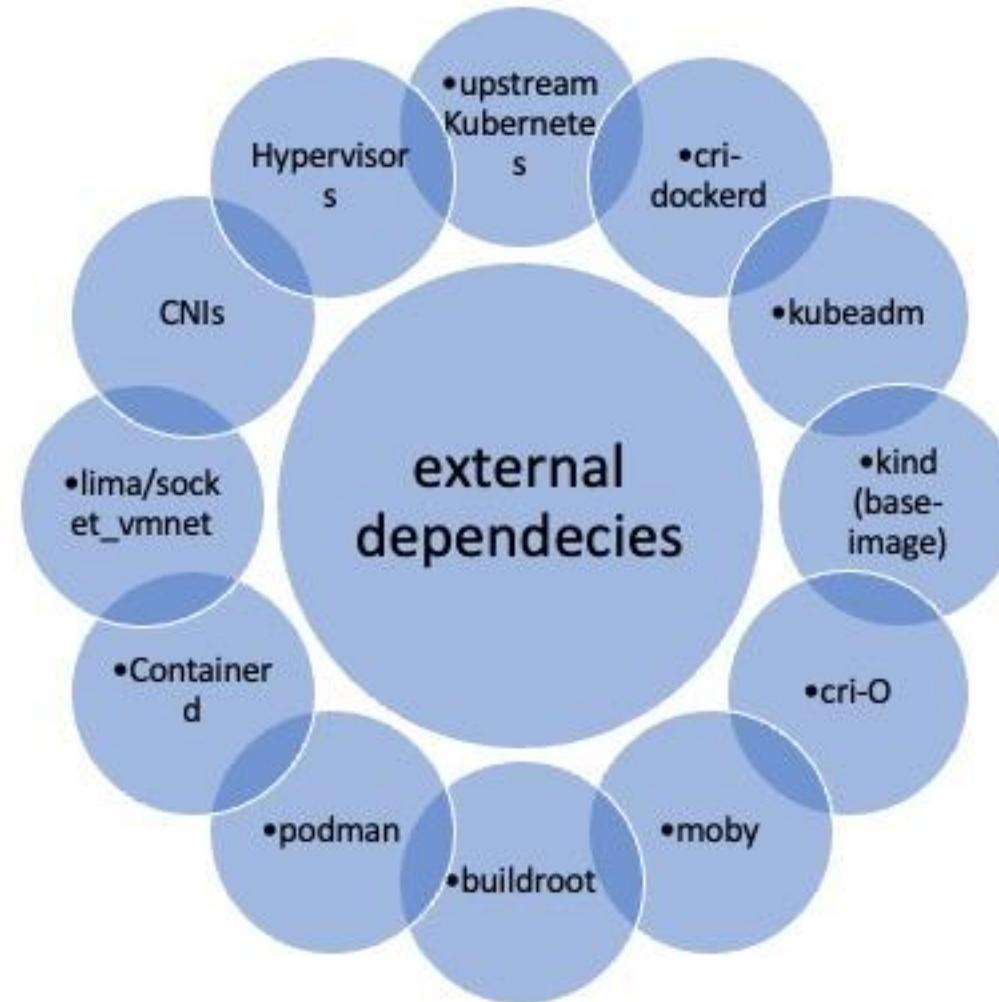
— North America 2023 —

minikube is more than one project

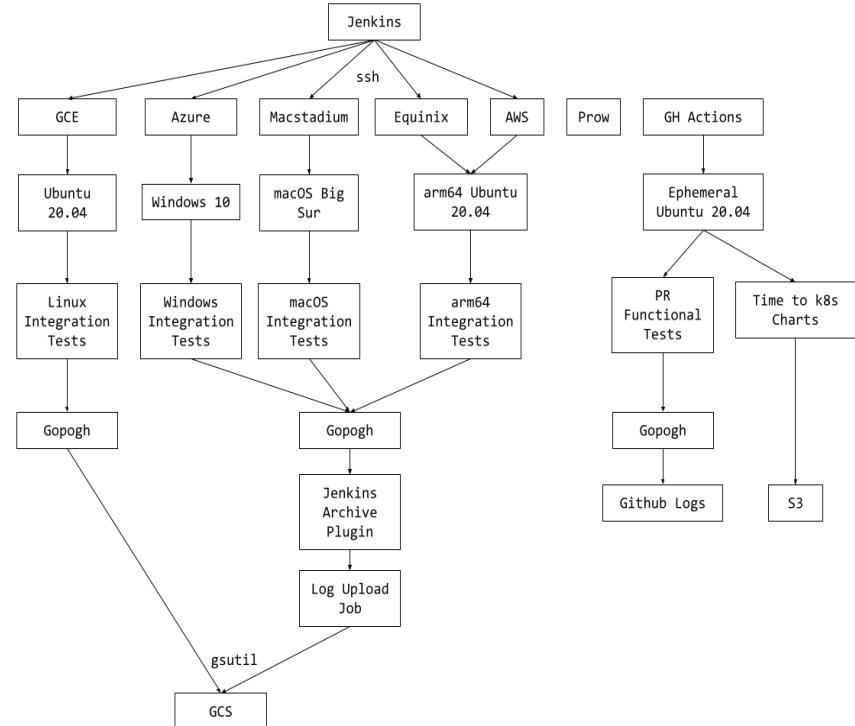




external dependencies



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"



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



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

50% resting CPU usage when idle #3207

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

nuela commented on Oct 2, 2018

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



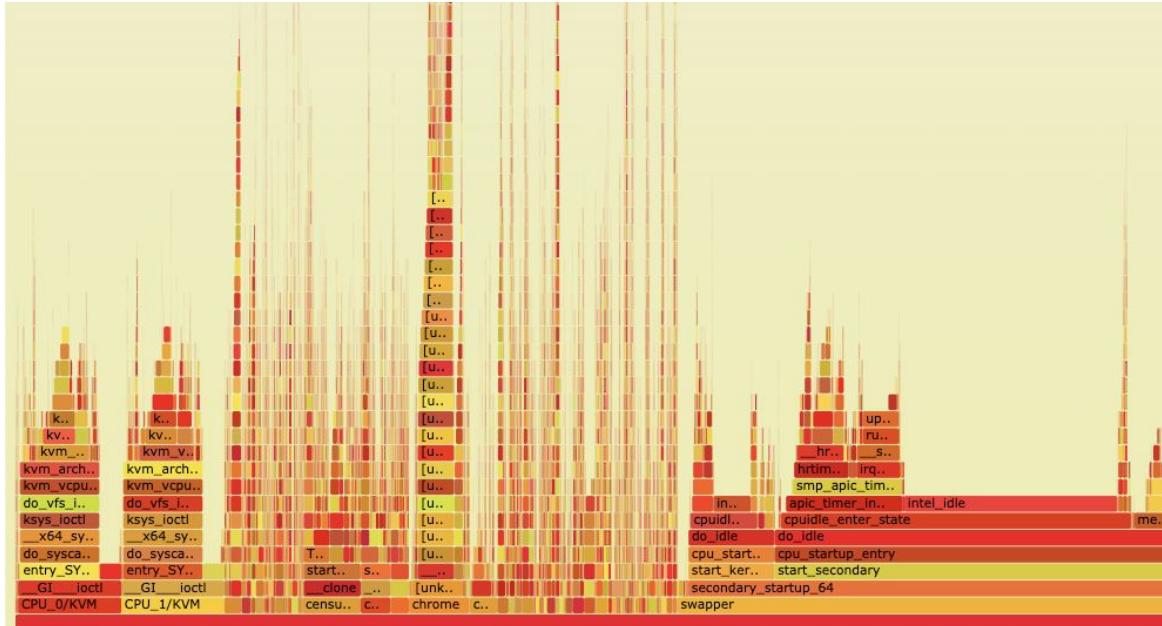
parasyte opened this issue on Nov 1, 2018 · 4 comments

Docker run stuck and consuming 100% CPU #5991



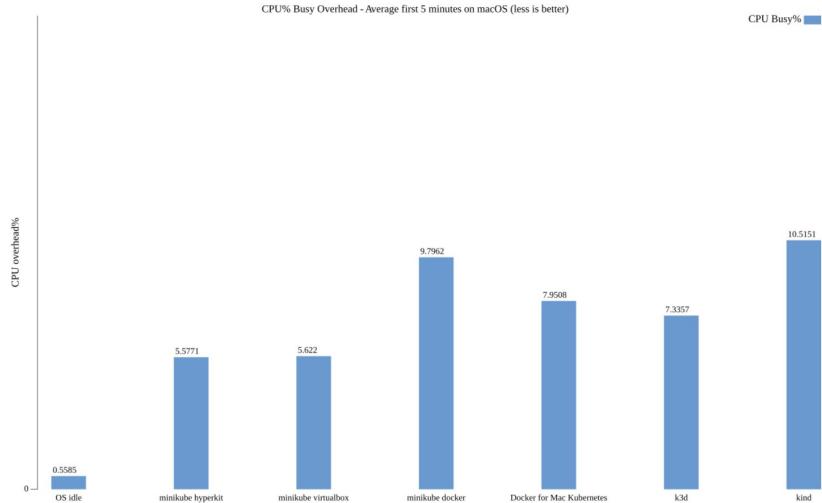
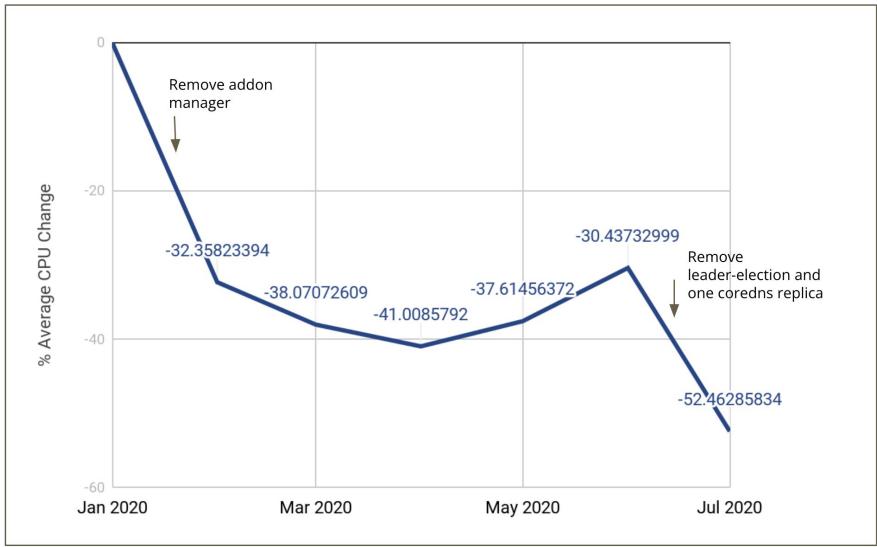
mvgiessel opened this issue on Nov 27, 2019 · 2 comments

CPU flame graph



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

CPU usage: before/after



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)

“minikube start” latency (2020)

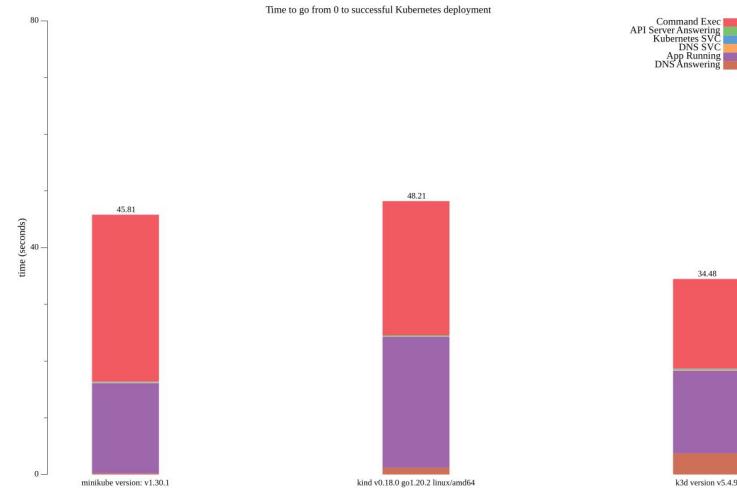
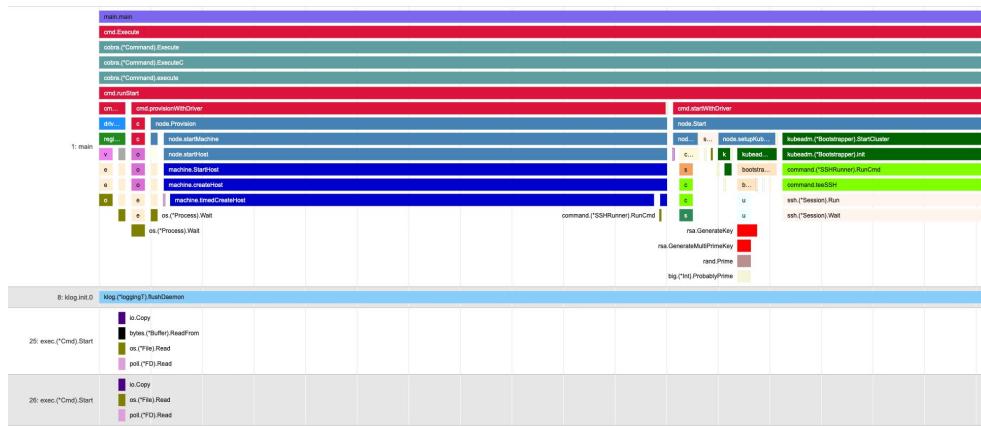
**2m35s
minute**



**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

Open-sourced SlowJam & Time-To-K8s



minikube team developed two tools inspect performance metrics

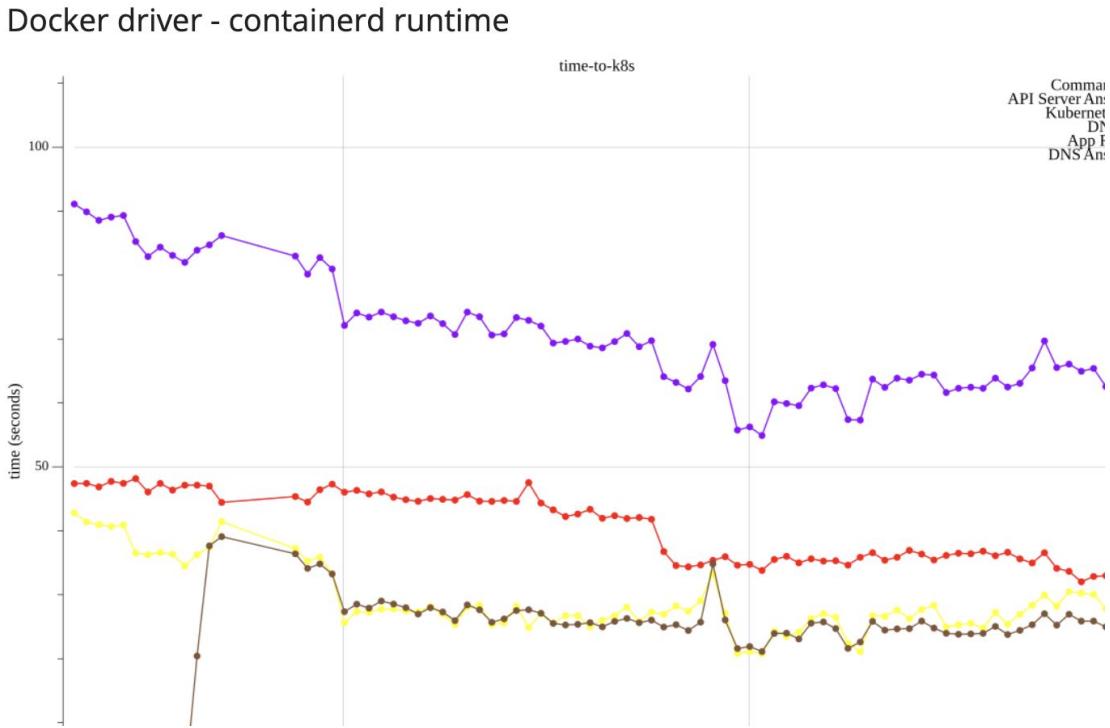
On the left: screenshot of SlowJam

On the right: screenshot of time-to-k8s

Automatic Benchmarks

Example of Time to
K8s daily
benchmarking

Checkout
benchmarking
section of
minikube website
for other
benchmarks





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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”, “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)

Platform	Known to Work?	Status
Prow	Yes ✓	
Google Cloud Build	Yes ✓	
Github	Yes ✓	
Azure Pipelines	Yes ✓	
Travis CI	Yes ✓	
CircleCI	Yes ✓	
Gitlab	Yes ✓	

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

Official Github Action



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

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

The screenshot shows the official minikube website at https://minikube.sigs.k8s.io/. The page has a clean, modern design with a header featuring the minikube logo and navigation links for Community and GitHub. The main content area includes a search bar, a "Documentation" sidebar with links like "Get Started!", "Handbook", and "Addons", and a central "Welcome!" section. The "Welcome!" section contains a brief introduction to minikube and a terminal window showing the command-line interface for starting a local Kubernetes cluster. At the bottom, there's a link to the latest release notes.

Documentation

Welcome!

minikube quickly sets up a local Kubernetes cluster on macOS, Linux, and Windows. We proudly focus on helping application developers and new Kubernetes users.

```
minikube
> time minikube start
minikube v1.13.0 on Darwin 10.15.6
Using the docker driver based on user configuration
Starting control plane node minikube in cluster minikube
Creating docker container (CPU=2, Memory=3852MB) ...
Preparing Kubernetes v1.19.0 on Docker 19.03.8 ...
Verifying Kubernetes components...
* Enabled addons: default-storageclass, storage-provisioner
💡 Kubectl not found. If you need it, try: "minikube kubectl -- get pods -A"
🎉 Done! Kubectl is now configured to use "minikube" by default

Executed in 23.96 secs  fish      external
  user time 1.66 secs 237.00 micros 1.66 secs
  system time 0.78 secs 943.00 micros 0.78 secs
> |
```

Latest Release: v1.30.1 - Apr 04, 2023 ([changelog](#))

Also Twitter-Bot and Slack Channel

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	Au	Desc	As	Rea	Cr	Up	Re	Cmntrs	Labels	Tags
16180		ISO: Bump Go from 1.19.6 to 1.19.8	18d	5d	12d				cncf-cla: yes size/XS approved	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	Au	Desc	As	Rea	Cr	Up	Re	Cmntrs	Labels	Tags
16329		Bump k8s.io/component-base from 0.27.0 to 0.27.1	1d	1d	1d				cncf-cla: yes size/S needs-ok-to-test dependencies go	collaborator-last recv unreviewed
16325		Bump k8s.io/kubectl from 0.27.0 to 0.27.1	1d	1d	1d				cncf-cla: yes size/M	collaborator-last



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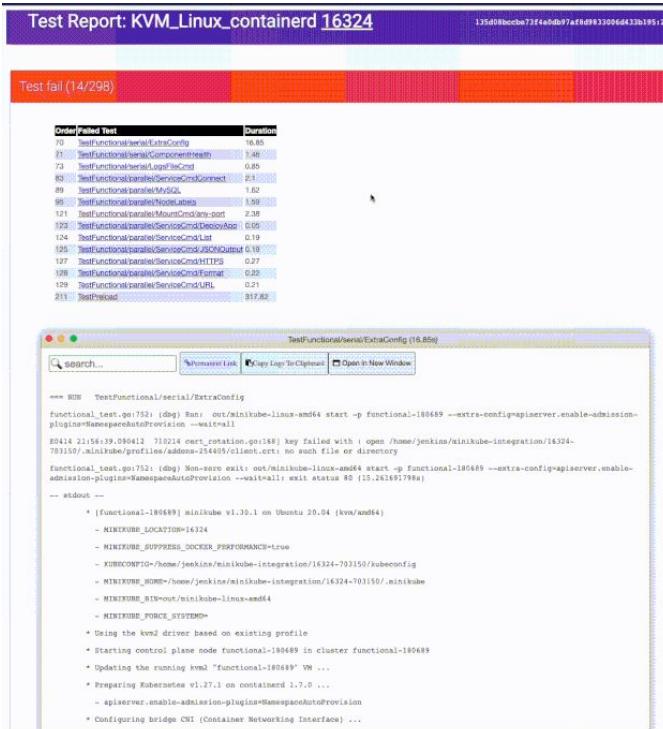
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Investments in Developer Velocity

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

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



Identify Test Flake on the PRs!

A screenshot of a GitHub pull request comment. The comment is from the bot `minikube-pr-bot` and was posted 2 days ago. The message reads: "These are the flake rates of all failed tests." Below this is a table showing the flake rates for various test cases across different environments.

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



- 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

- 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...

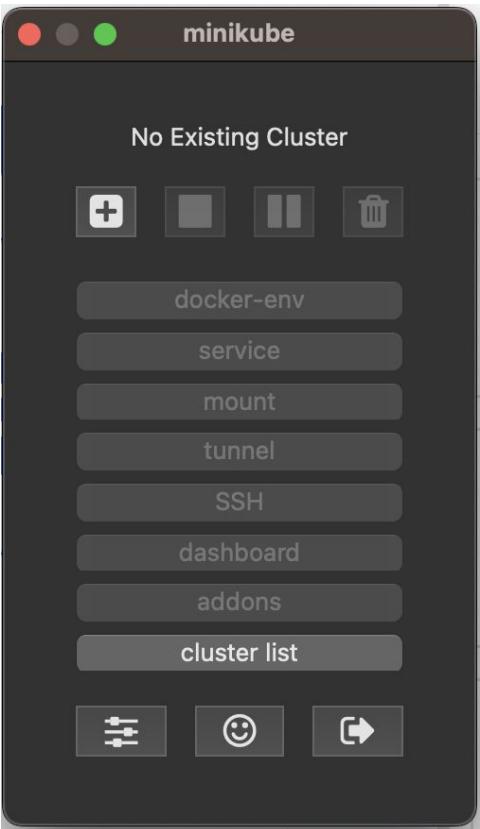
--no-kubernetes ?? (2022)

- 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)

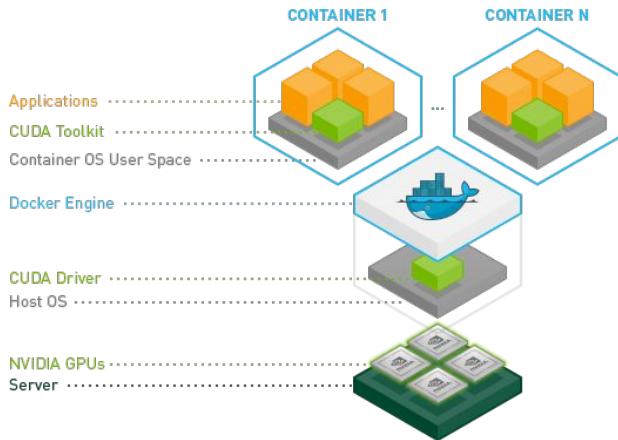
2022: The year arm64!

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

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



2023 Support Nvidia-Docker Runtime

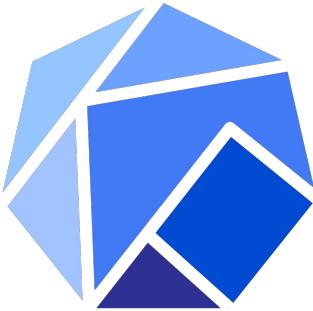


Support for gpus with nvidia-docker container-runtime

- minikube start --gpus=nvidia

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

2023 AI: Try Kubeflow addon



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-Cl
 - github.com/minikube-ci/examples
- Pull Sheet
 - github.com/google/pullsheets
- CSTAT
 - github.com/tstromberg/cstat
- GCP AUTH Addon
 - <https://github.com/GoogleContainerTools/gcp-auth-webhook>



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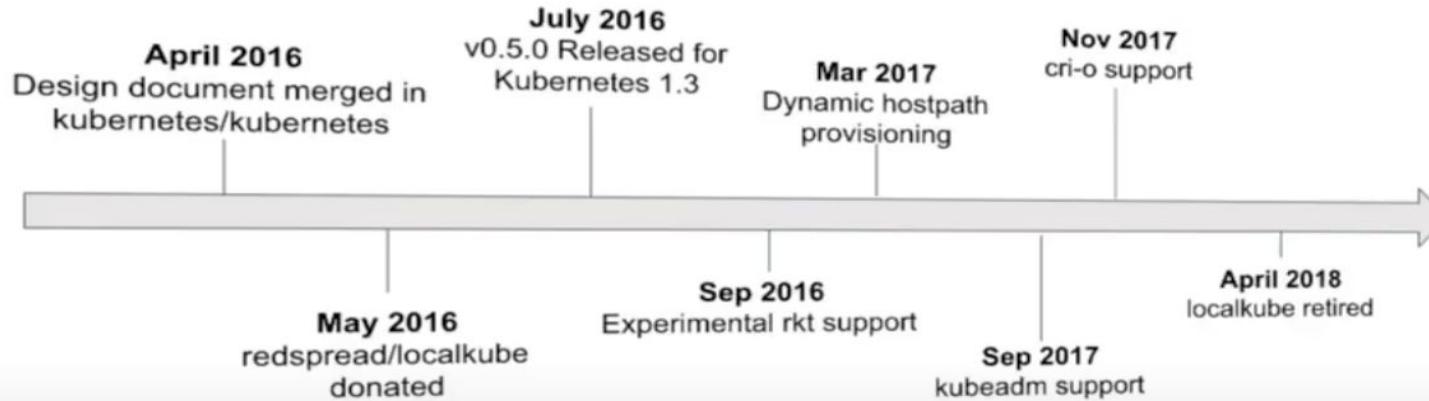


**Please scan the QR Code above
to leave feedback on this session**

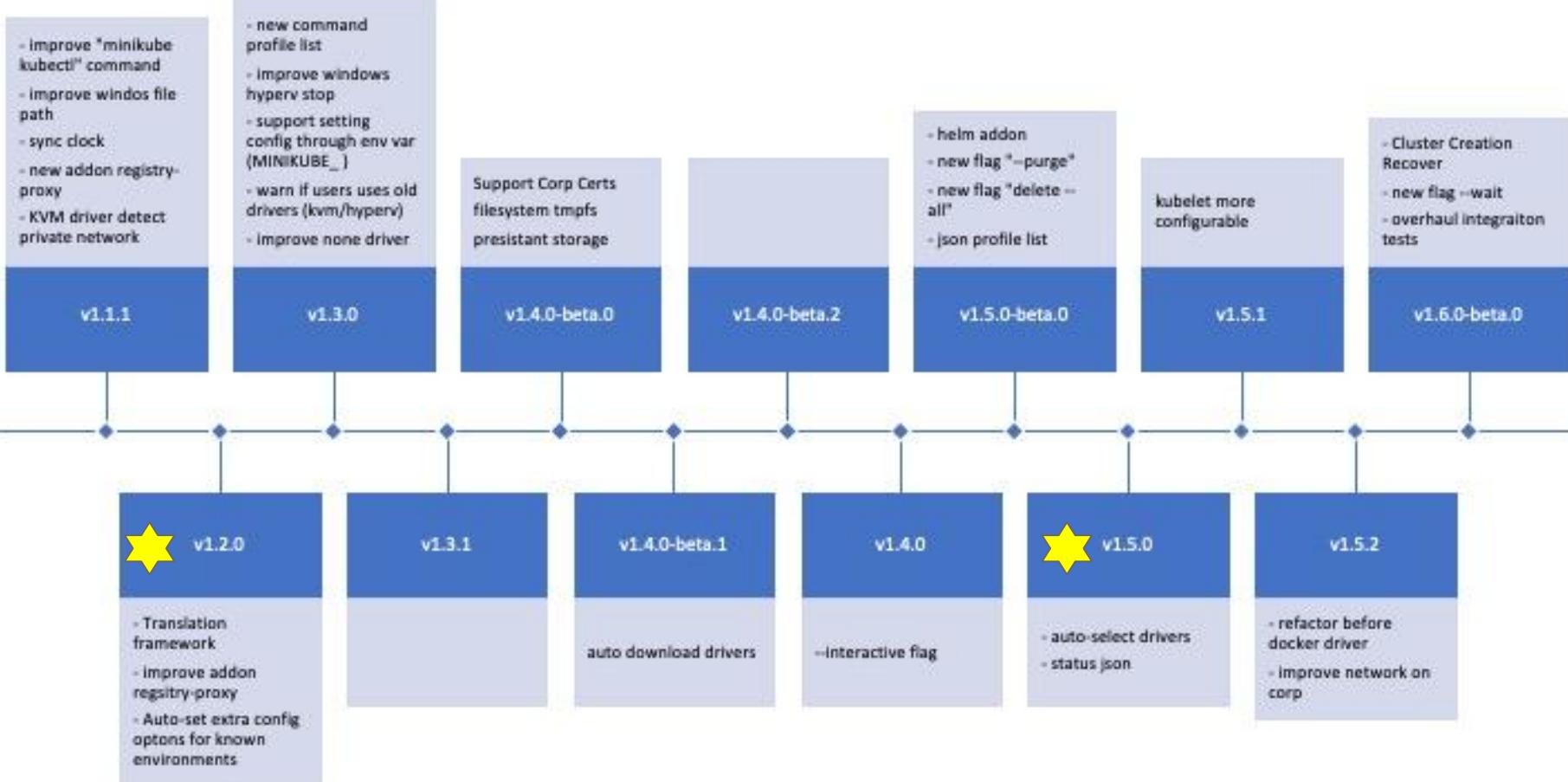
Appendix

Release Timeline

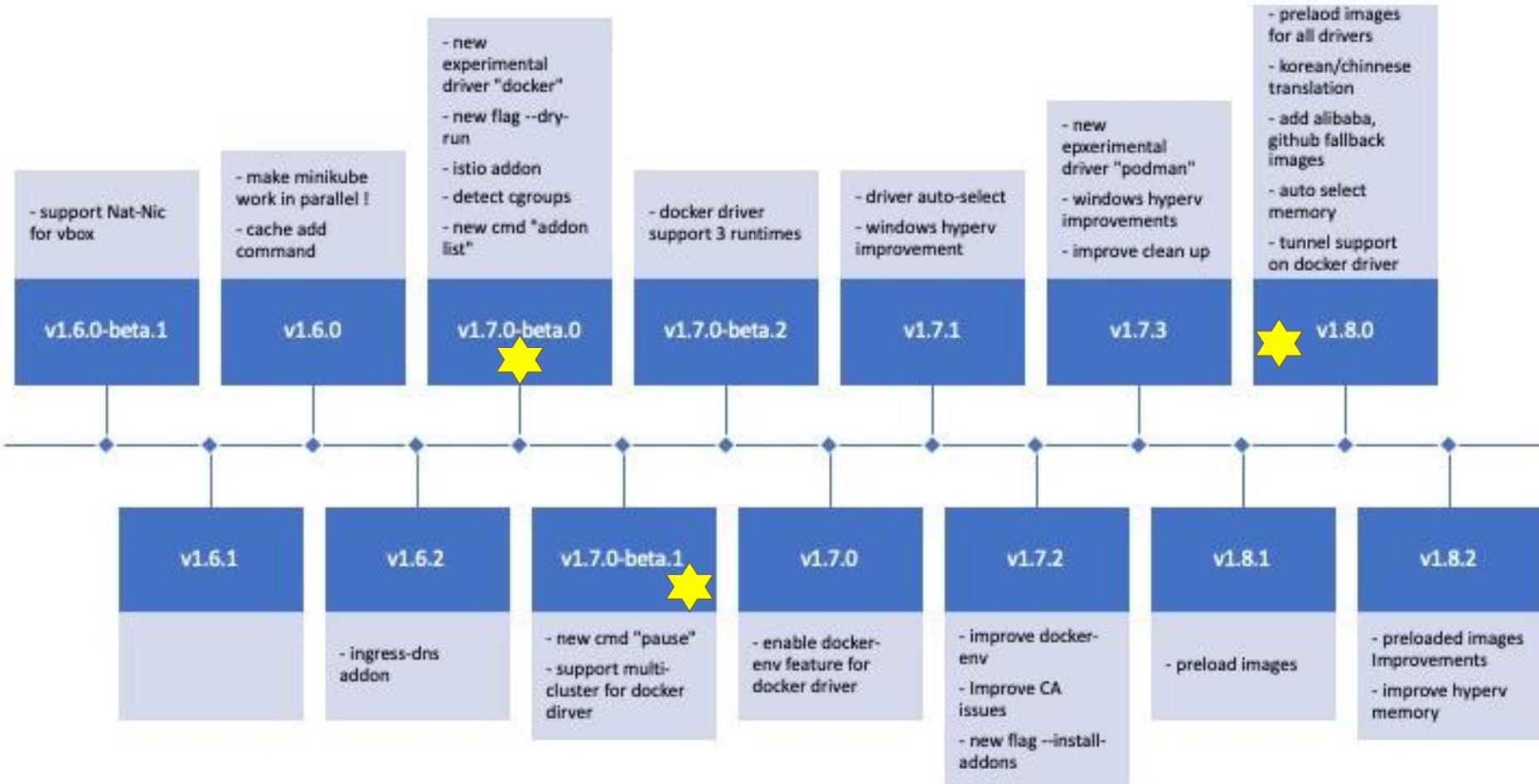
Minikube



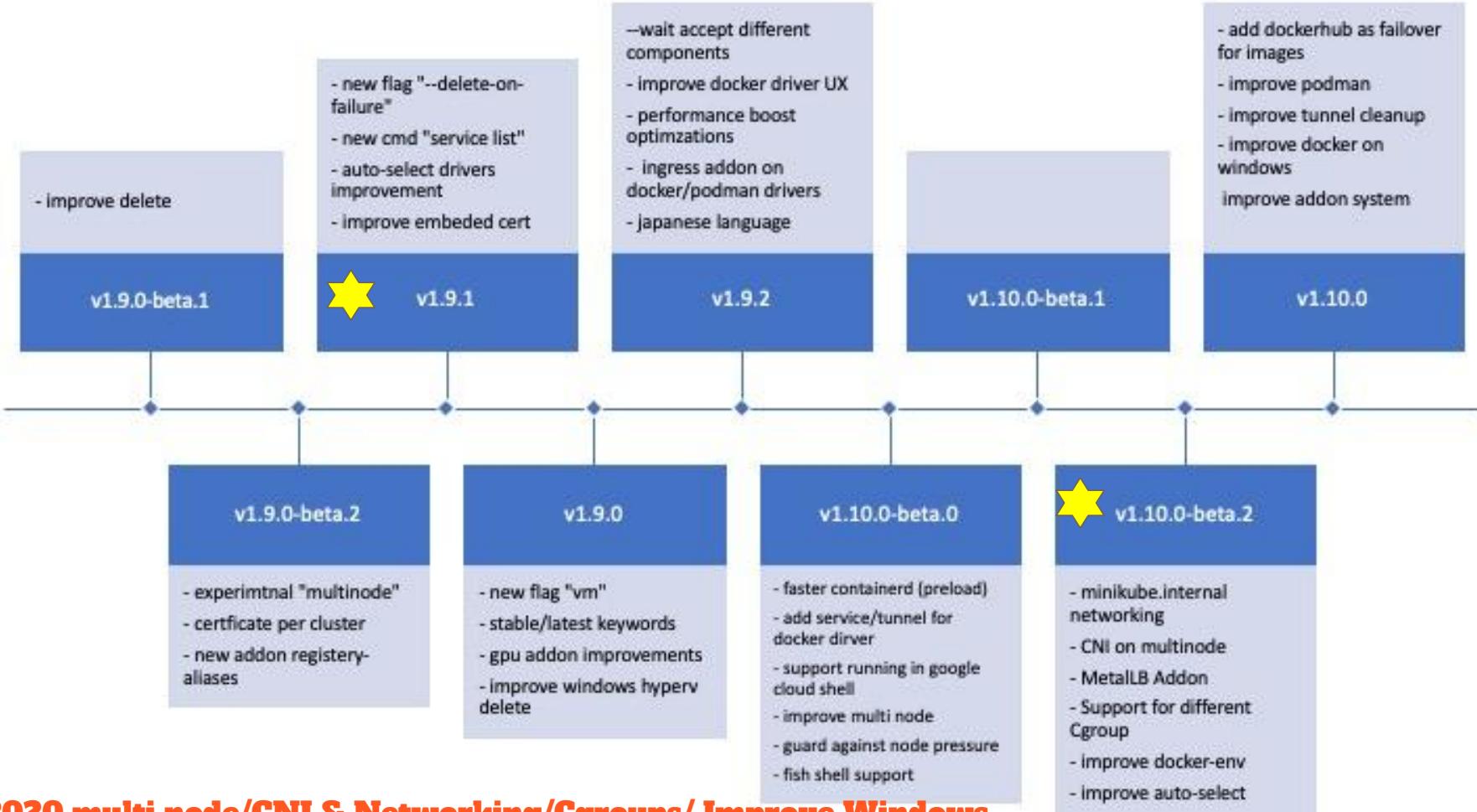
2016-2018 Dan Lorenc Time

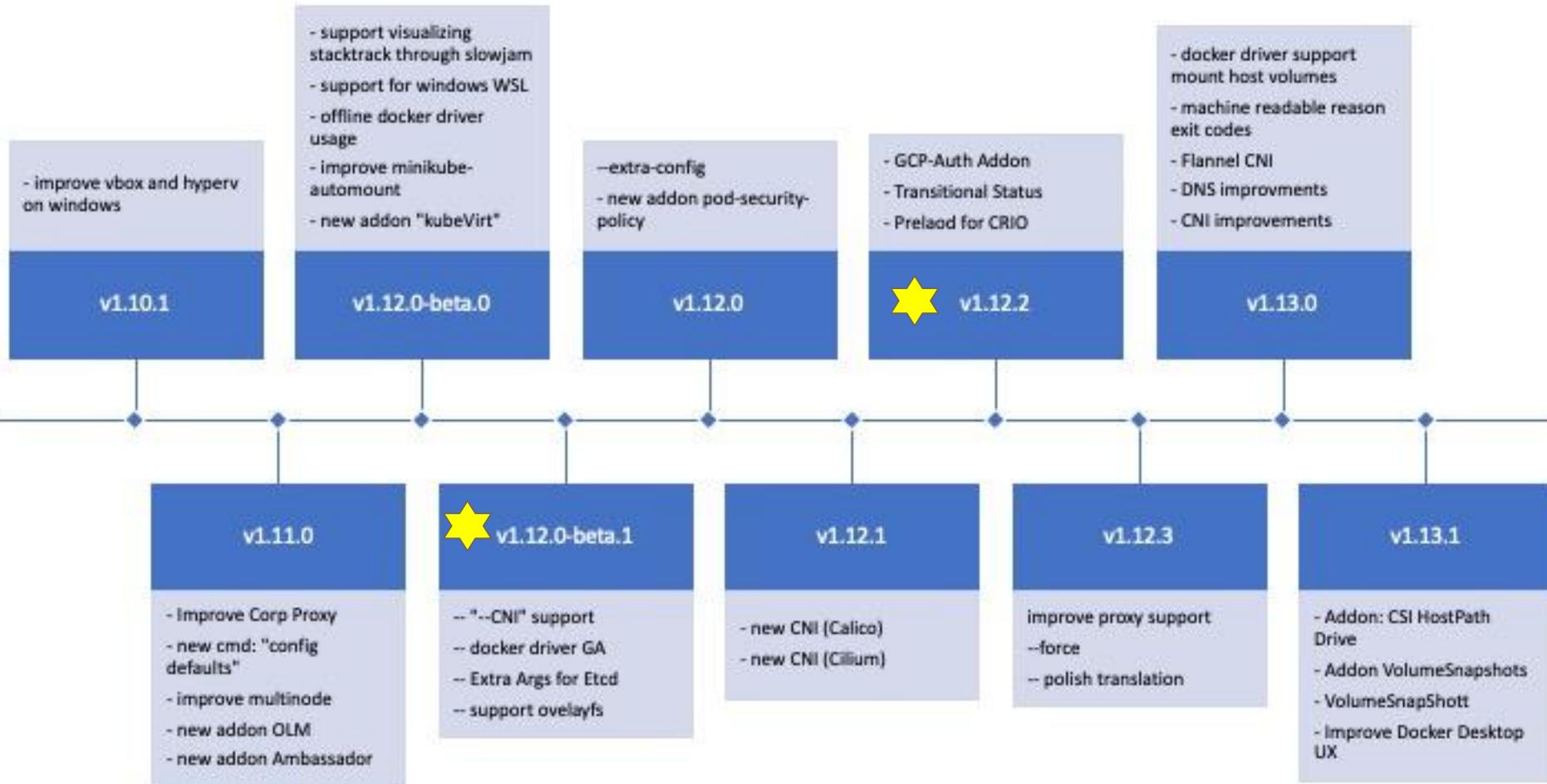


**2019-2020 Translations/Auto-select options/
Refactor technical debt**

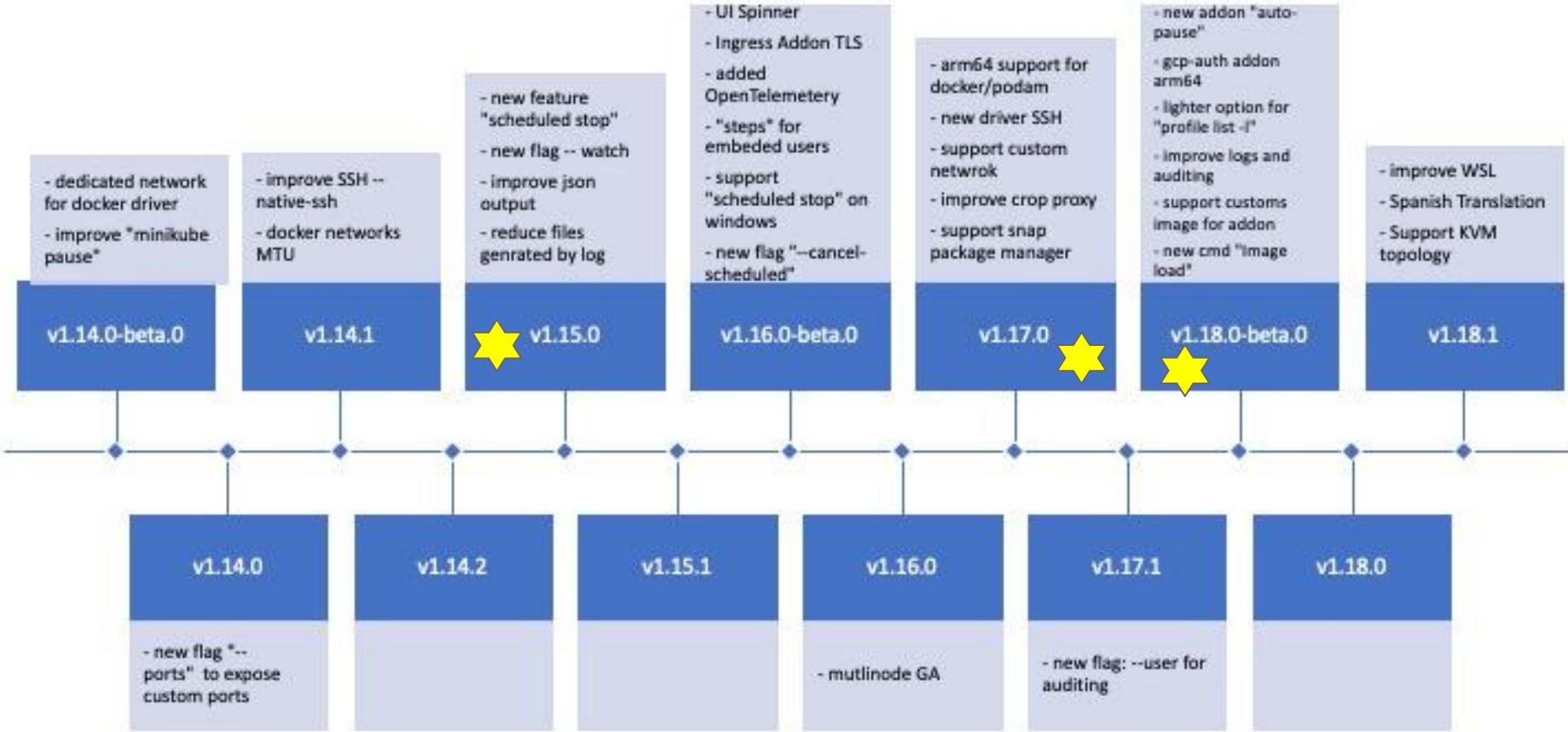


**2019-2020- docker driver/unified
preload/pause cmd**

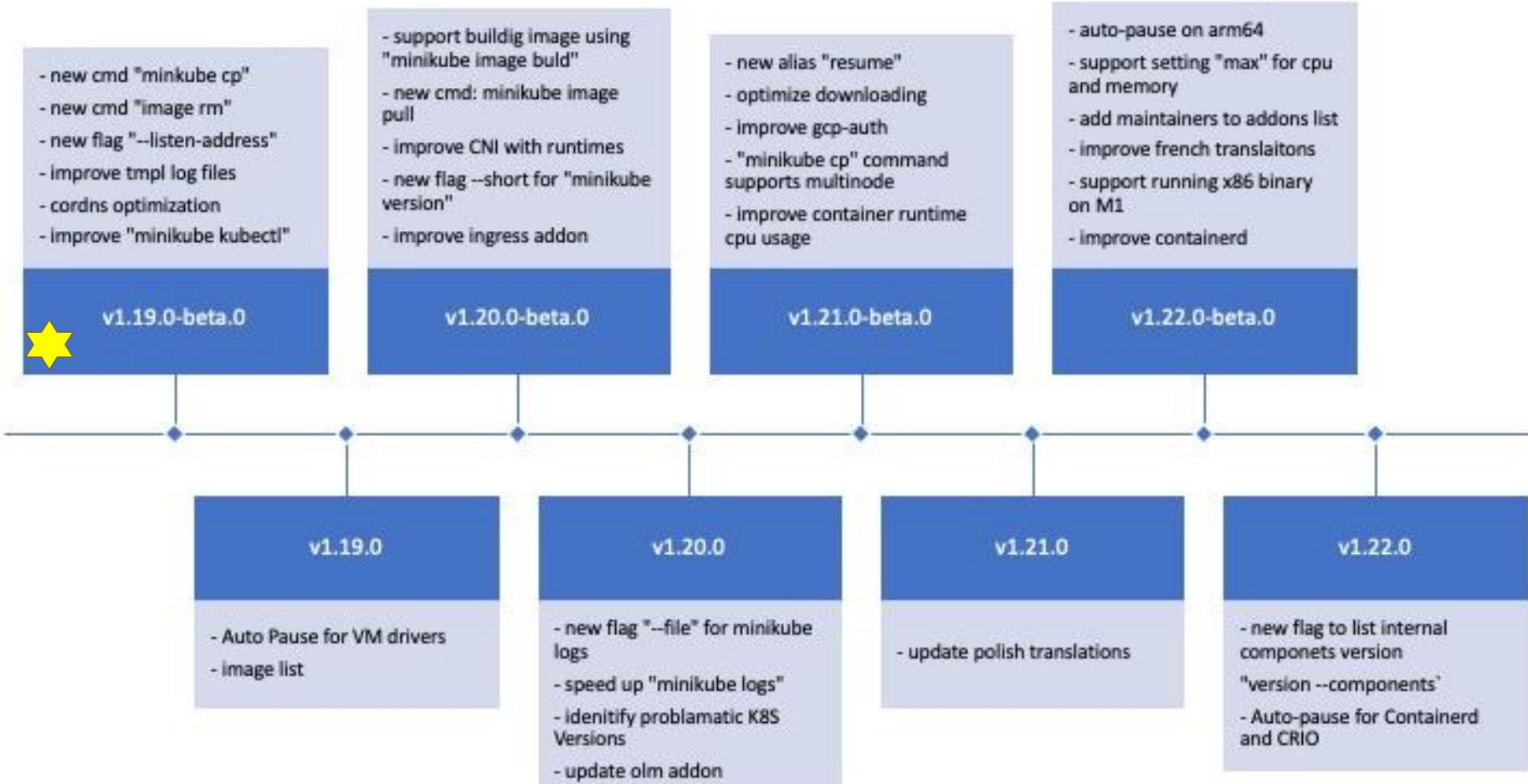




2020 Docker Driver GA/more CNIs/New Addons!



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



- 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

- 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

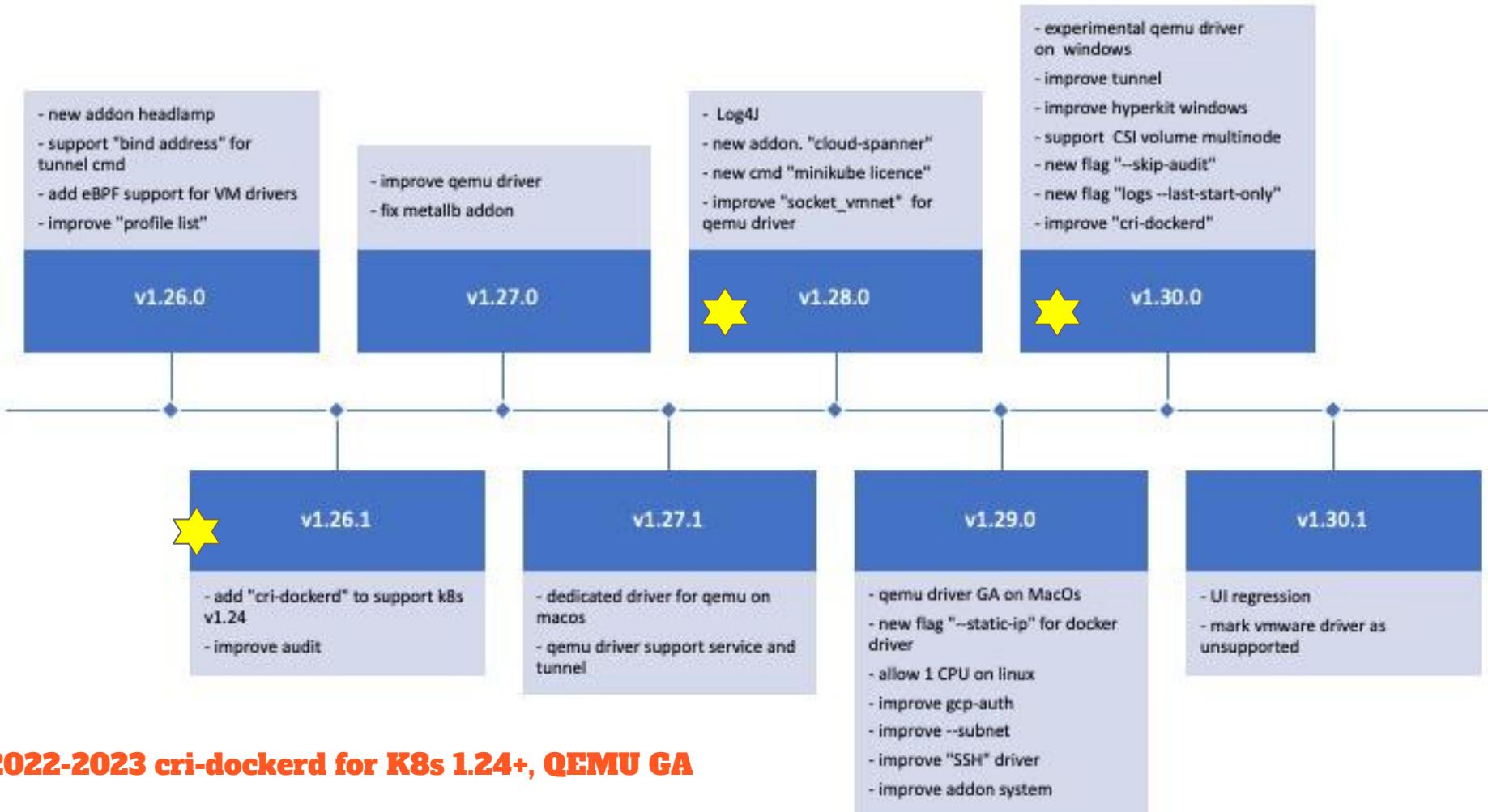
v1.25.2

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

v1.26.0-beta.1

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

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



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



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Content