
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

PRT265

SPONSORED BY DATADOG

What to know before adopting Arm: Lessons learned at Datadog

Jason Yee (he/him)

Staff Technical Evangelist
Datadog

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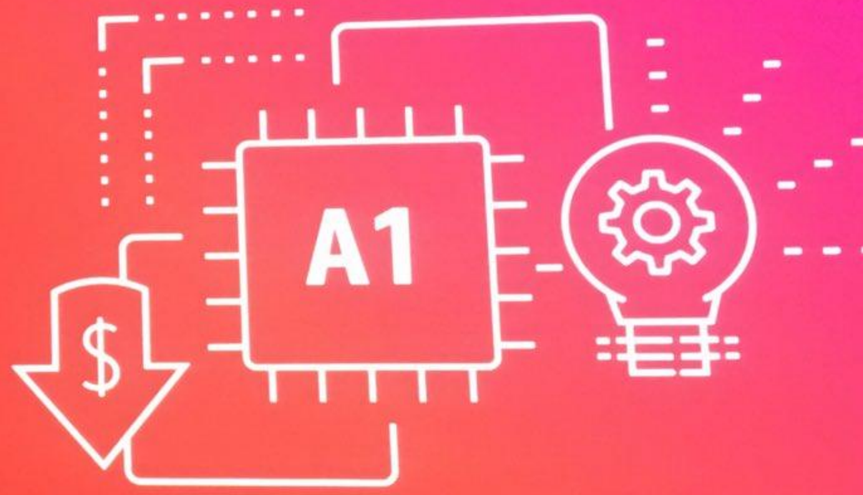
2018

NEW!

Amazon EC2 A1 Instances
Powered by the AWS Graviton Processor

Up to 45% lower cost for scale-out workloads

AVAILABLE IN US EAST (N. VIRGINIA), US EAST (OHIO), US WEST (OREGON), AND EUROPE (IRELAND) REGIONS



2019


POWERED BY AWS GRAVITON2 PROCESSORS
M6g, R6g, C6g instances for EC2
New generation of Arm-based instances powered by AWS Graviton2 processors offer 40% better price/performance than current x86-based instances
M6g
PREVIEW TODAY
R6g
COMING SOON
C6g
COMING SOON
NEW!
Graviton2

AWS News Blog

New EC2 T4g Instances – Burstable Performance Powered by AWS Graviton2 – Try Them for Free

by Danilo Poccia | on 14 SEP 2020 | in Amazon EC2, Announcements, Compute, Graviton, Launch, News | Permalink | Share

0:00 / 0:00

Voiced by Amazon Polly

December 10, 2020 *– Post updated for the extension of the T4g free-trial until March 31, 2021. During the free-trial period, customers who run a t4g.micro instance will automatically get 750 free hours per month deducted from their bill during each month. T4g free-trial will be available in addition to the existing AWS Free-Tier on t2.micro/t3.micro. Customers who have exhausted their t2.micro (or t3.micro, depending on the region) free-tier usage can still benefit from T4g free-trial. More info in the Amazon EC2 FAQs.*

Two years ago Amazon Elastic Compute Cloud (Amazon EC2) T3 instances were first made available, offering a very cost effective way to run general purpose workloads. While current T3 instances offer sufficient compute performance for many use cases, many customers have told us that they have additional workloads that would benefit from increased peak performance and lower cost.

Today, we are launching T4g instances, a new generation of low cost burstable instance type powered by AWS Graviton2, a processor custom built by AWS using 64-bit Arm Neoverse cores. Using T4g instances you can enjoy a performance

Resources

Getting Started
What's New
Top Posts
Official AWS Podcast
Case Studies

Follow

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Email Updates

2022



Graviton: “45% lower cost”

Graviton2: “40% better price/performance”

Graviton3: “25% better performance than Graviton2”

Jason Yee

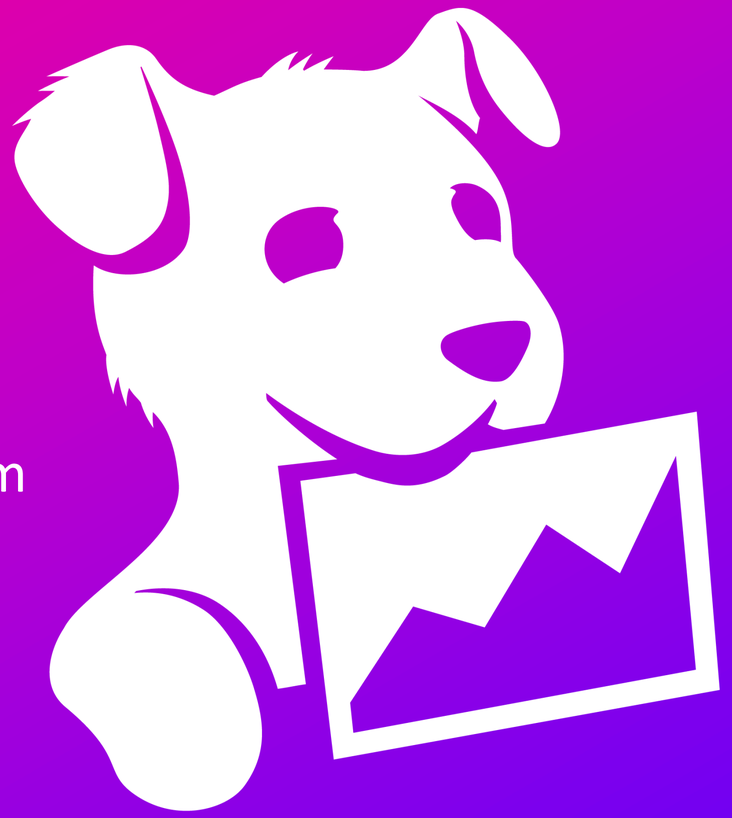
Staff Technical Evangelist,
Datadog

LinkedIn: gitbisect
Email: jason.yee@datadoghq.com



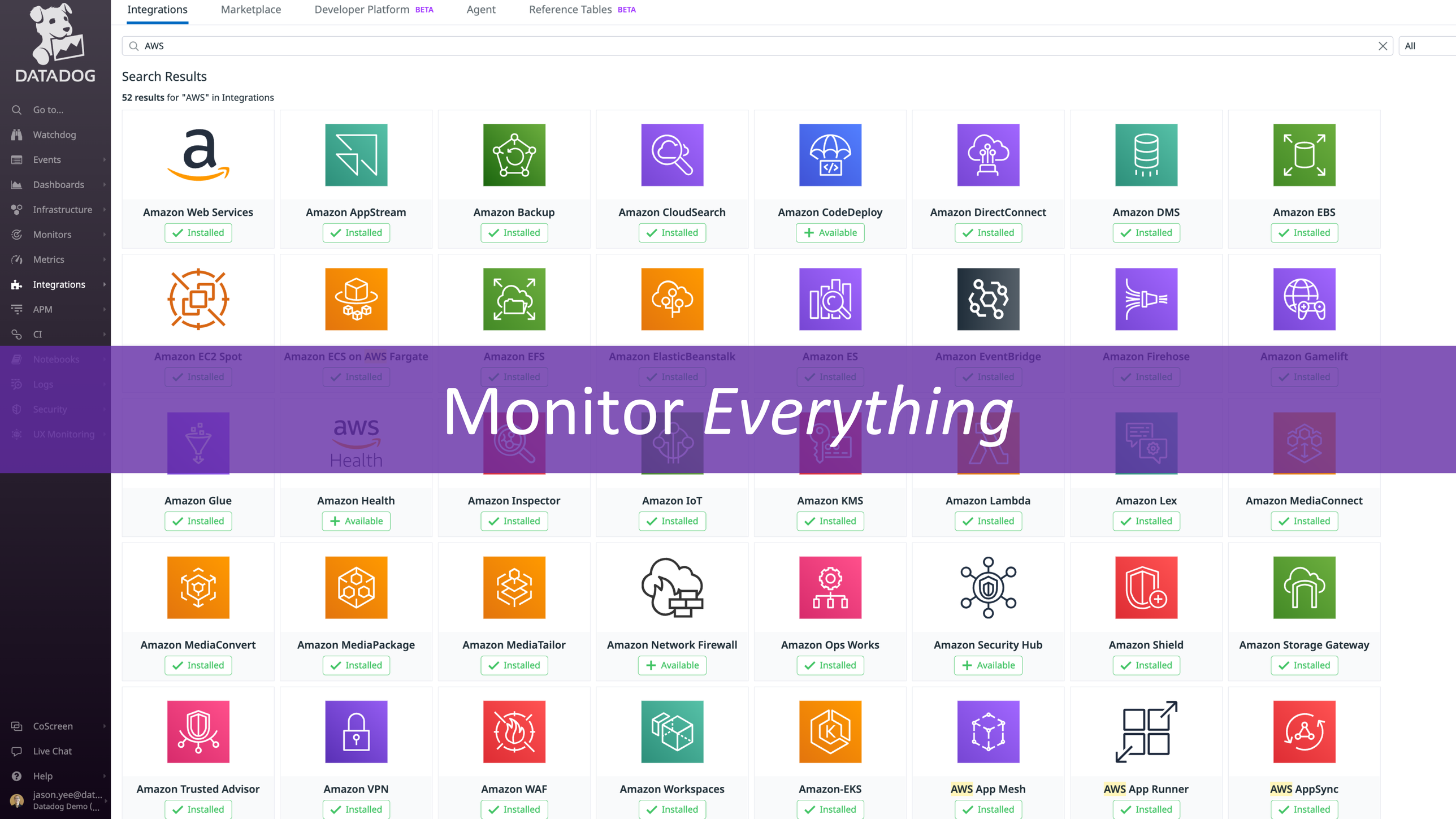
Datadog

Modern monitoring & security platform



@gitbisect
@datadoghq

DATADOG



Monitor *Everything*

DataDog / datadog-agent Public

Edit Pins | Unwatch 317 | Fork 932 | Star

Code | Issues 491 | Pull requests 210 | Discussions | Actions | Wiki | Security | Insights

Datadog Puppy™, the bitesize™ Agent. #346

Code

Merged truthbk merged 16 commits into `master` from `hackathon/puppy` on Jul 20, 2017

Conversation 15 | Commits 16 | Checks 0 | Files changed 63 | +737 −140

masci commented on Jun 23, 2017 • edited — Contributor

June 2017 Hackathon project

Team

- @truthbk
- @gmmeyer
- @masci

The project

Pitch

Reviewers
- truthbk
- olivielpeau

Assignees
No one assigned

Labels
dev/tooling kind/enhancement

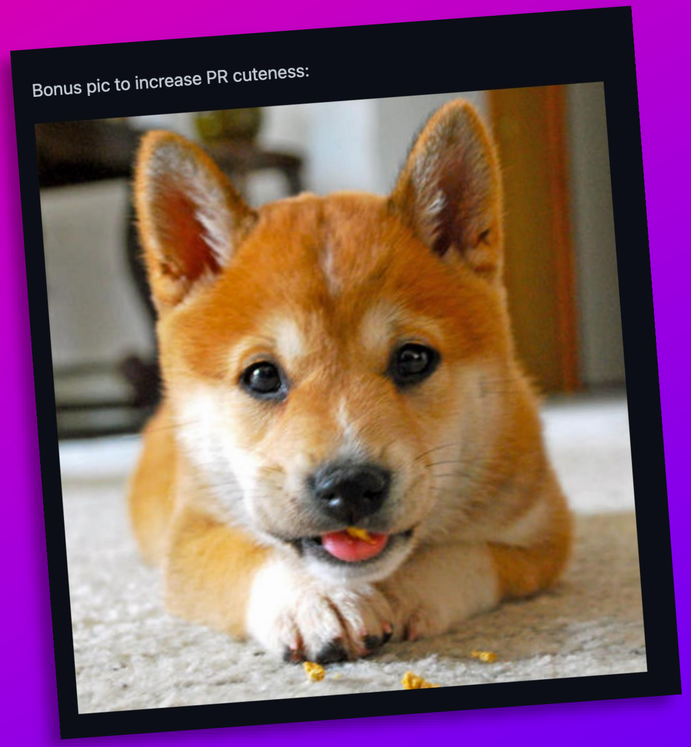
Projects
None yet

“I'd like to strip down as many components as I can from the Go Agent and see how far we can go shrinking binary size and memory footprint while keeping a decent amount of system metrics collected.”

Massimiliano Pippi

“I'd like to strip down as many components as I can from the Go Agent and see how far we can go shrinking binary size and memory footprint while keeping a decent amount of system metrics collected.”

Massimiliano Pippi



DataDog / datadog-agent Public

Edit Pins | Unwatch 317 | Fork 932

Code | Issues 491 | Pull requests 210 | Discussions | Actions | Wiki | Security | Insights

Add 4 arm targets to build pipeline #4443

Merged derekwbrown merged 4 commits into `master` from `db/arm` on Nov 18, 2019

Conversation 3 | Commits 4 | Checks 0 | Files changed 2

derekwbrown commented on Nov 13, 2019 — Member

What does this PR do?

Adds 4 package targets for ARM builds
debian-arm-a6
debian-arm-a7
rpm-arm-a6
rpm-arm-a7

Motivation

Support the ARM platform

Reviewers
albertvaka
agent-core-deprecated

Assignees
No one assigned

Labels
changelog/no-changelog
team/agent-platform

Adopting Arm64

Seeing Trends

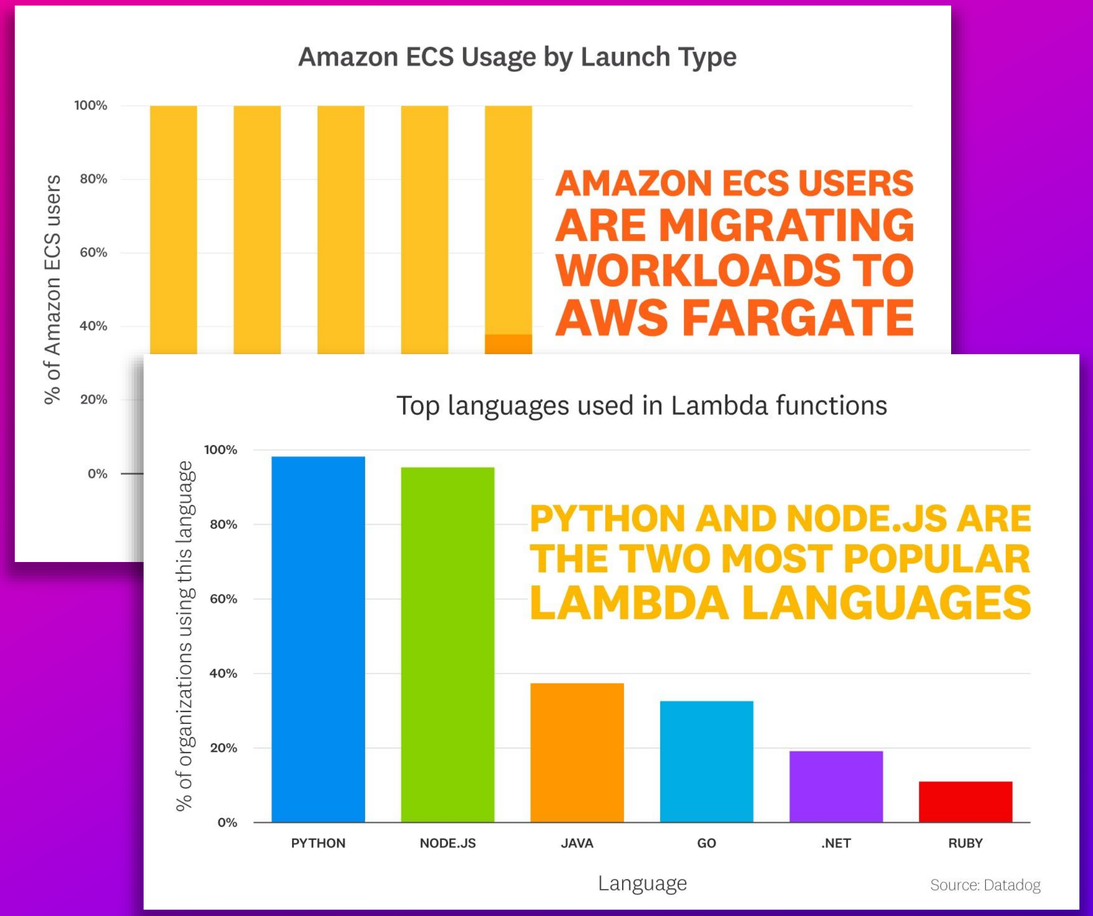
datadoghq.com/container-report/



Seeing Trends

datadoghq.com/container-report/

datadoghq.com/state-of-serverless/

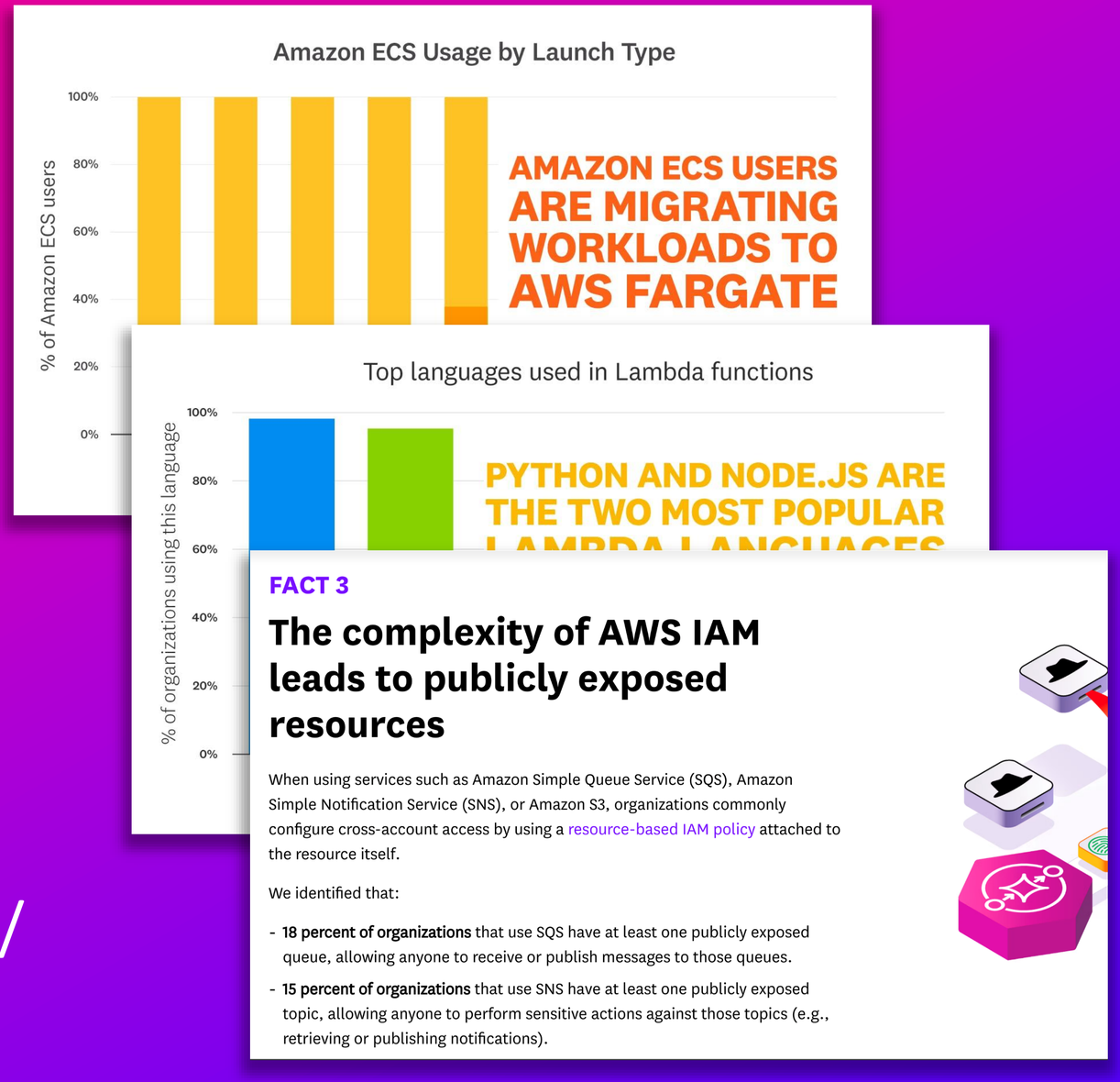


Seeing Trends

datadoghq.com/container-report/

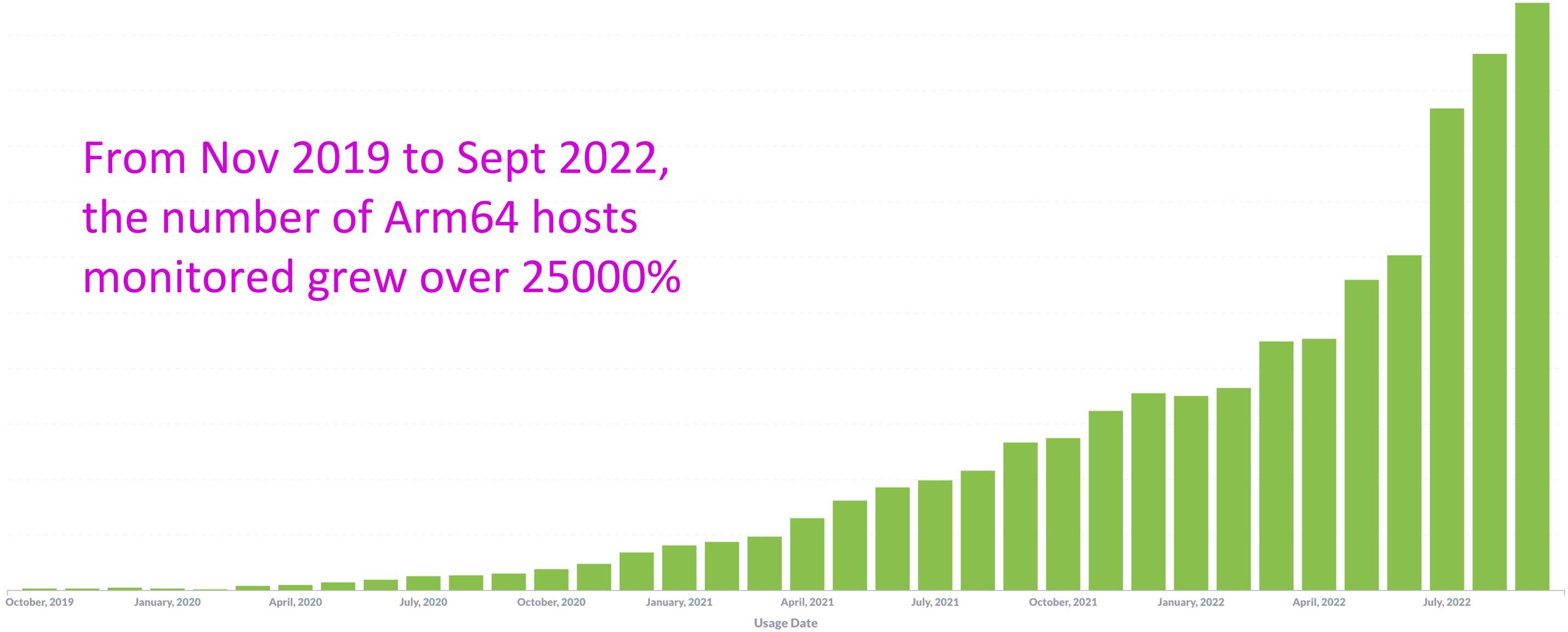
datadoghq.com/state-of-serverless/

datadoghq.com/state-of-aws-security/



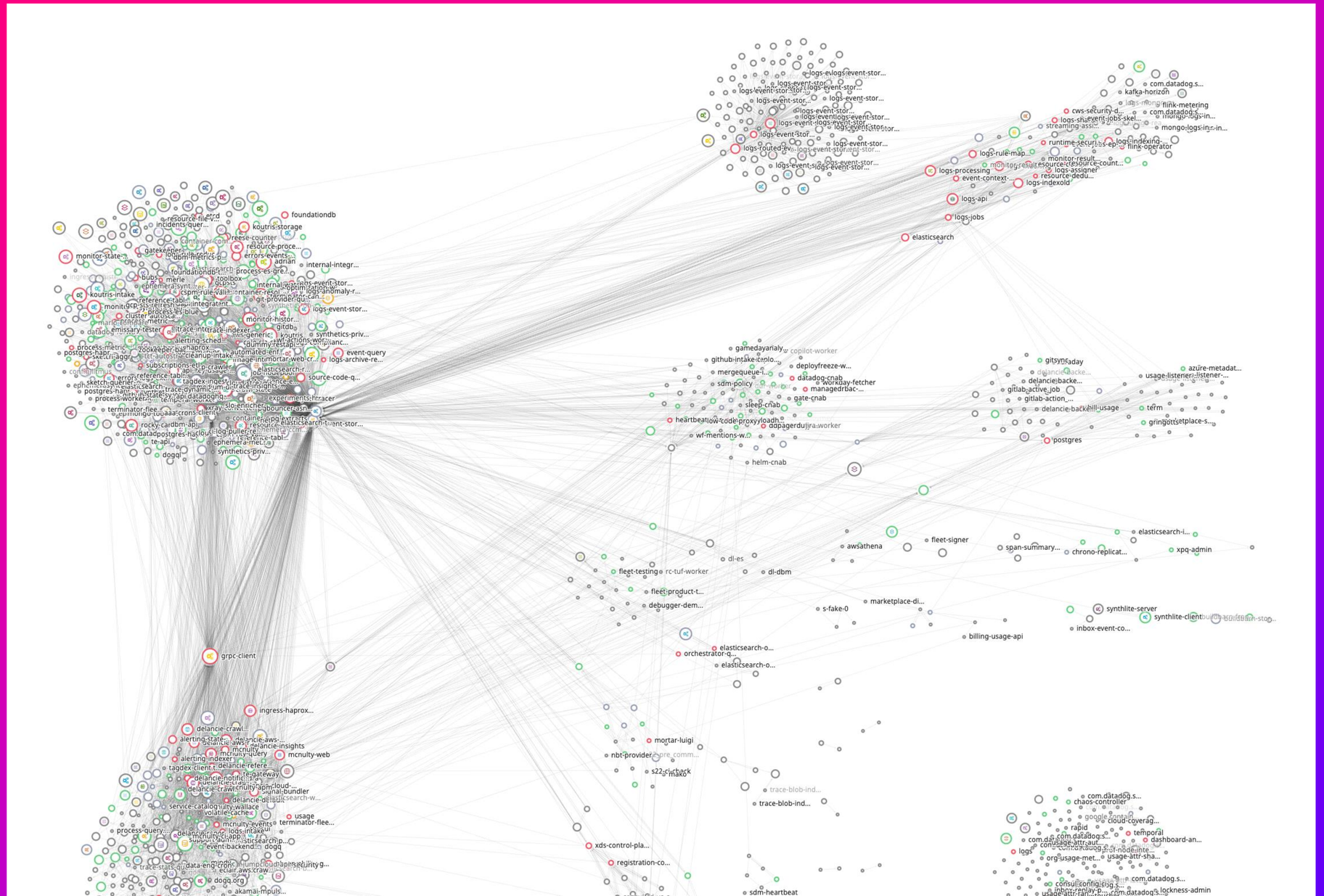
Arm64 Adoption

From Nov 2019 to Sept 2022,
the number of Arm64 hosts
monitored grew over 25000%



A peek under the hood

Microservices



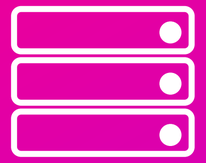
@gitbisect
@datadoghq

DATADOG

Start with a plan

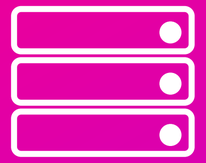
Three pieces

Infrastructure

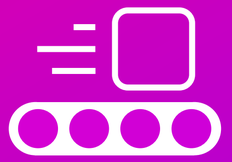


Three pieces

Infrastructure

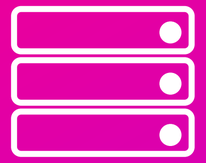


Build & Deploy (CI/CD)

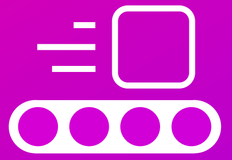


Three pieces

Infrastructure



Build & Deploy (CI/CD)



Applications & Services



The plan

1. **Chat with AWS**

The plan

1. Chat with AWS
2. **Identify services**

The plan

1. Chat with AWS
2. Identify services
3. **Check metrics (i.e., baseline)**

The plan

1. Chat with AWS
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4. **Do minimal work (sandbox or staging)**

The plan

1. Chat with AWS
2. Identify services
3. Check metrics (i.e., baseline)
4. Do minimal work (sandbox or staging)
5. **Check metrics & iterate**

The plan

1. Chat with AWS
2. Identify services
3. Check metrics (i.e., baseline)
4. Do minimal work (sandbox or staging)
5. Check metrics & iterate
6. **Canary deploy to production**

The plan

1. Chat with AWS
2. Identify services
3. Check metrics (i.e., baseline)
4. Do minimal work (sandbox or staging)
5. Check metrics & iterate
6. Canary deploy to production
7. **Check metrics**

Three lessons

Infrastructure

10,000,000,000,000+

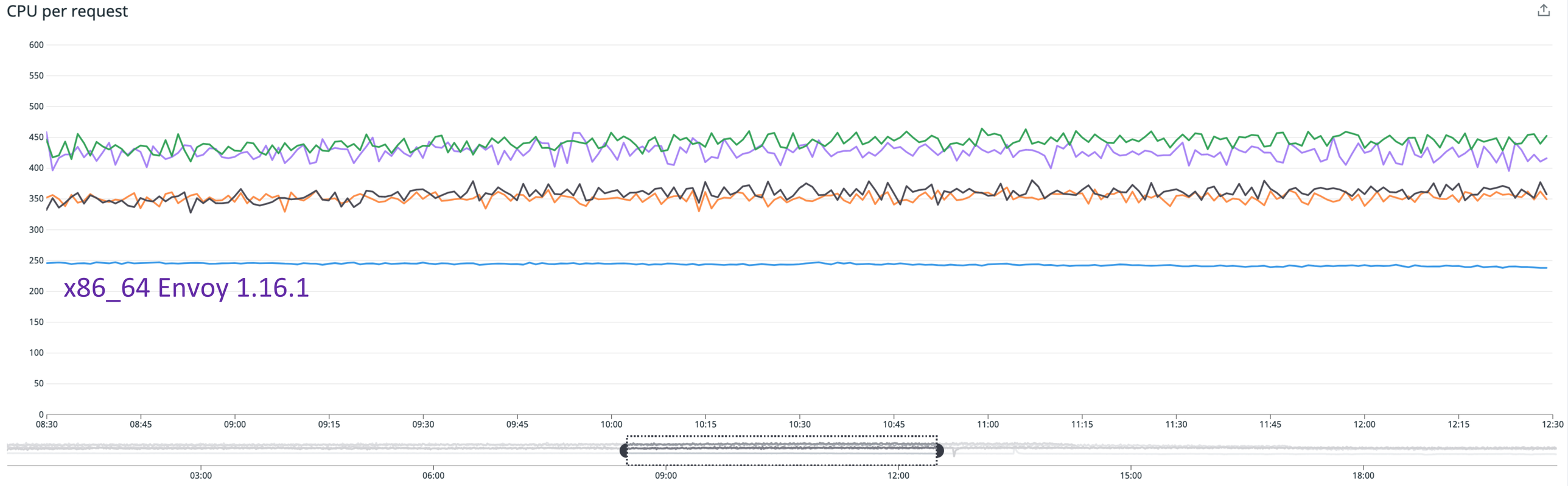
Infrastructure

"Redis is, mostly, a single-threaded server from the POV of commands execution. It is not designed to benefit from multiple CPU cores. People are supposed to launch several Redis instances to scale out on several cores if needed."

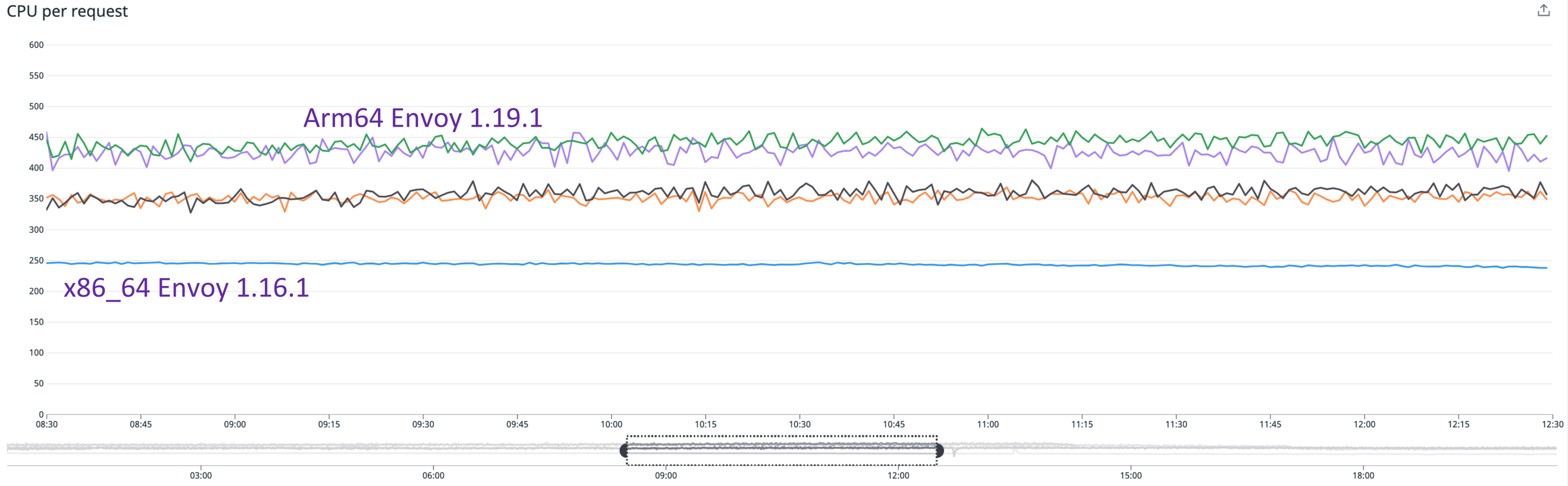
redis.io/docs/reference/optimization/benchmarks/


Great Value
Corned Beef
Hash
Just Heat & Serve
NET WT 14 OZ (396g)

Infrastructure



Infrastructure



Infrastructure



Lesson 1: Measure performance

What’s a container?

Build & Deploy



Manifest



Layer 1

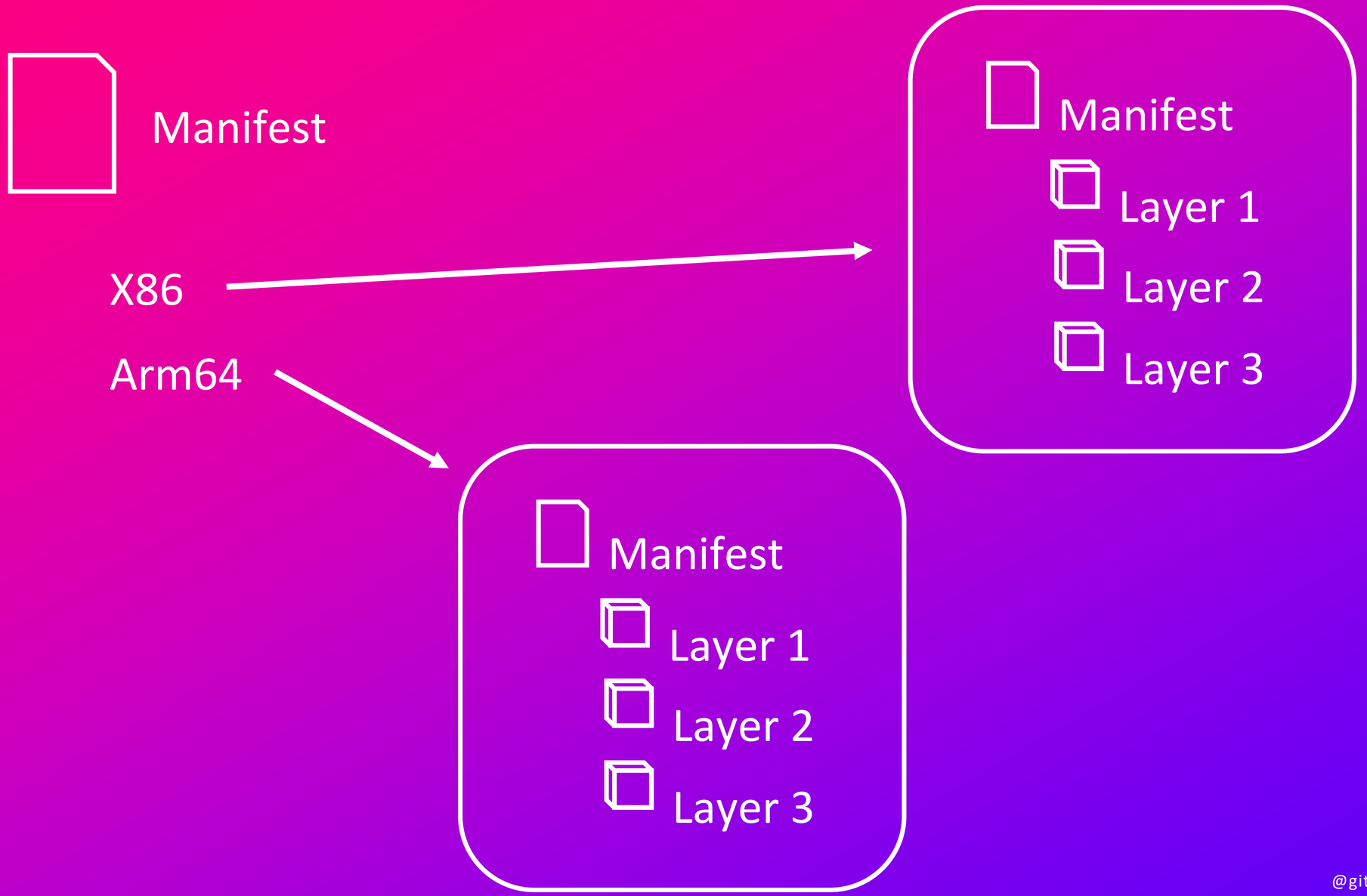


Layer 2



Layer 3

Build & Deploy



Build & Deploy



(QEMU 😆)

Build & Deploy

Image Name	Native Build Time	Emulated Build Time
hello-world	23 seconds	

Build & Deploy

Image Name	Native Build Time	Emulated Build Time
hello-world	23 seconds	64 seconds

Build & Deploy

Image Name	Native Build Time	Emulated Build Time
hello-world	23 seconds	64 seconds
toolbox	16 minutes	

Build & Deploy

Image Name	Native Build Time	Emulated Build Time
hello-world	23 seconds	64 seconds
toolbox	16 minutes	92 minutes

Build & Deploy

```
FROM golang:1.13.1 as base
<...>
RUN git clone https://github.com/kubernetes-sigs/sig-storage-
local-static-provisioner.git
RUN git -C sig-storage-local-static-provisioner checkout $TAG
<...>
RUN go build -o /usr/local/bin/local-volume-provisioner cmd/local-
volume-provisioner/main.go
```

Build & Deploy

```
#11 [builder 5/5] RUN go build -o /usr/local/bin/local-volume-provisioner cmd/local-volume-
provisioner/main.go
#11 2.529 # sigs.k8s.io/sig-storage-local-static-provisioner/vendor/k8s.io/utils/io
#11 2.529 vendor/k8s.io/utils/io/read.go:36:6: ConsistentRead redeclared in this block
#11 2.529       previous declaration at vendor/k8s.io/utils/io/consistentread.go:28:61
#11 2.529 vendor/k8s.io/utils/io/read.go:43:6: consistentReadSync redeclared in this block
#11 2.529       previous declaration at vendor/k8s.io/utils/io/consistentread.go:35:81
#11 ERROR: process “/bin/sh -c go build -o /usr/local/bin/local-volume-provisioner cmd/local-
volume-provisioner/main.go” did not complete successfully: exit code: 2
```

```
#6 [3/5] RUN git clone https://github.com/kubernetes-sigs/sig-storage-local-static-
provisioner.git .  && ls -l vendor/k8s.io/utils/io/
#6 0.073 Cloning into '.'...
#6 3.166 -rw-r--r-- 1 root root  134 Sep 25 09:58 README.md
#6 3.166 -rw-r--r-- 1 root root 2982 Sep 25 09:58 read.go
```

```
#6 [3/5] RUN git clone https://github.com/kubernetes-sigs/sig-storage-local-static-
provisioner.git .  && ls -l vendor/k8s.io/utils/io/
#6 0.073 Cloning into '.'...
#6 3.166 -rw-r--r-- 1 root root  134 Sep 25 09:58 README.md
#6 3.166 -rw-r--r-- 1 root root 2982 Sep 25 09:58 read.go

#7 [4/5] RUN git checkout 93915e330be4291f209b13dc6df063729bd4d9c4 && ls -l
vendor/k8s.io/utils/io/
#7 1.068 Note: switching to '93915e330be4291f209b13dc6df063729bd4d9c4'.
#7 1.072 -rw-r--r-- 1 root root 1748 Sep 25 09:58 consistentread.go
```

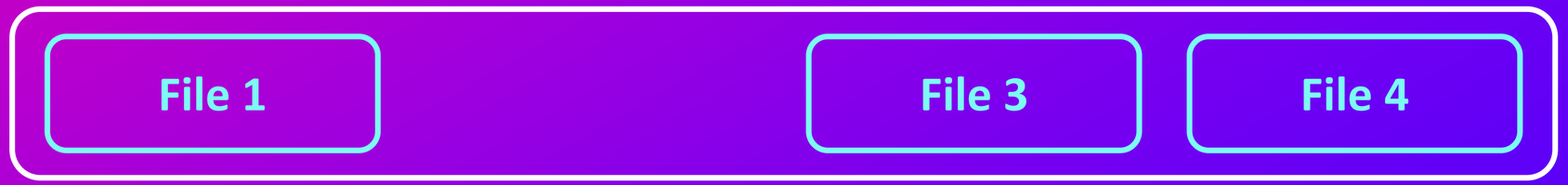
```
#6 [3/5] RUN git clone https://github.com/kubernetes-sigs/sig-storage-local-static-
provisioner.git .  && ls -l vendor/k8s.io/utils/io/
#6 0.073 Cloning into '.'...
#6 3.166 -rw-r--r-- 1 root root  134 Sep 25 09:58 README.md
#6 3.166 -rw-r--r-- 1 root root 2982 Sep 25 09:58 read.go

#7 [4/5] RUN git checkout 93915e330be4291f209b13dc6df063729bd4d9c4 && ls -l
vendor/k8s.io/utils/io/
#7 1.068 Note: switching to '93915e330be4291f209b13dc6df063729bd4d9c4'.
#7 1.072 -rw-r--r-- 1 root root 1748 Sep 25 09:58 consistentread.go

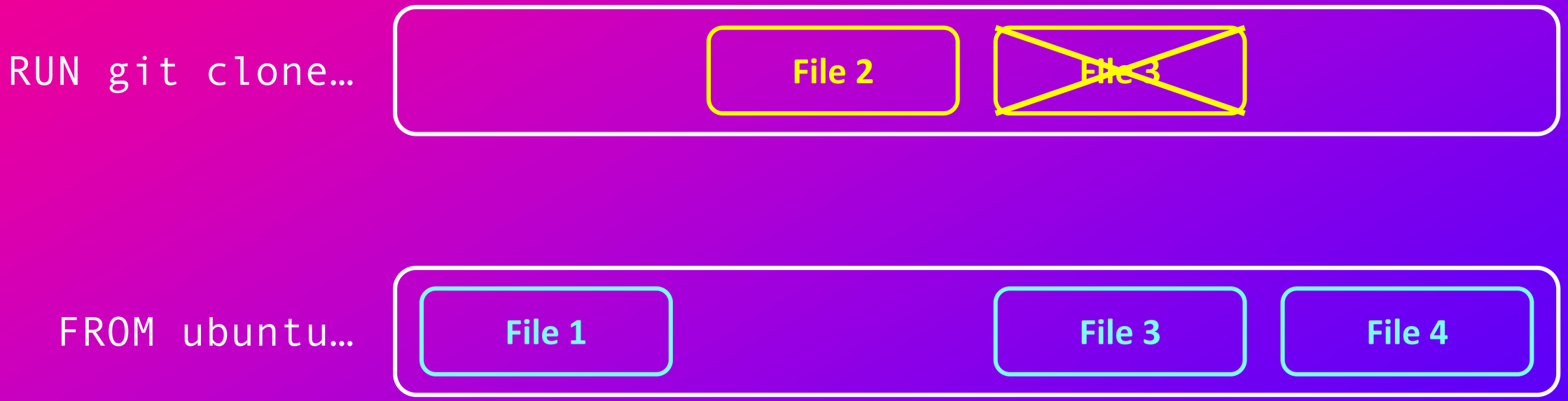
#8 [5/5] RUN echo "Checking content" && ls -l vendor/k8s.io/utils/io/
#8 0.120 Checking content
#8 0.121 -rw-r--r-- 1 root root  134 Sep 25 09:58 README.md
#8 0.121 -rw-r--r-- 1 root root 1748 Sep 25 09:58 consistentread.go
#8 0.121 -rw-r--r-- 1 root root 2982 Sep 25 09:58 read.go
```

Build & Deploy

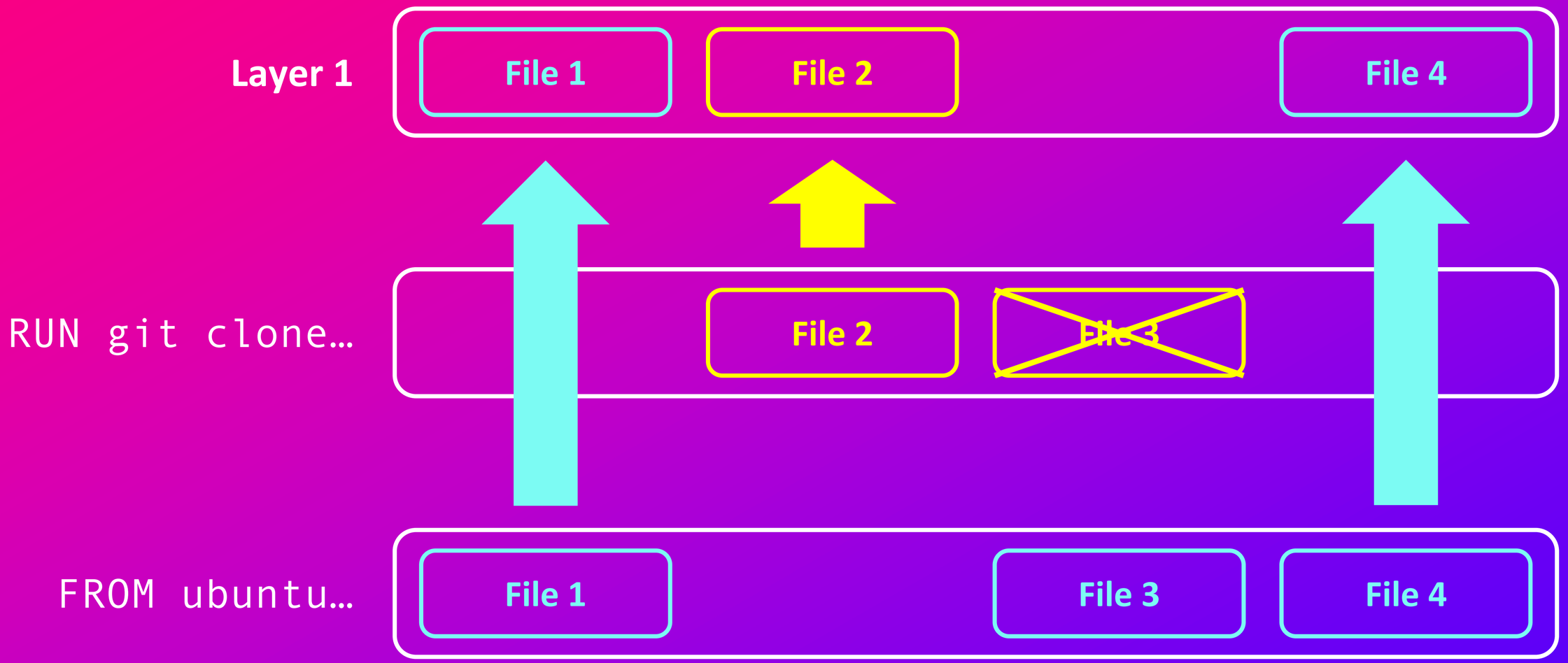
```
FROM ubuntu…
```



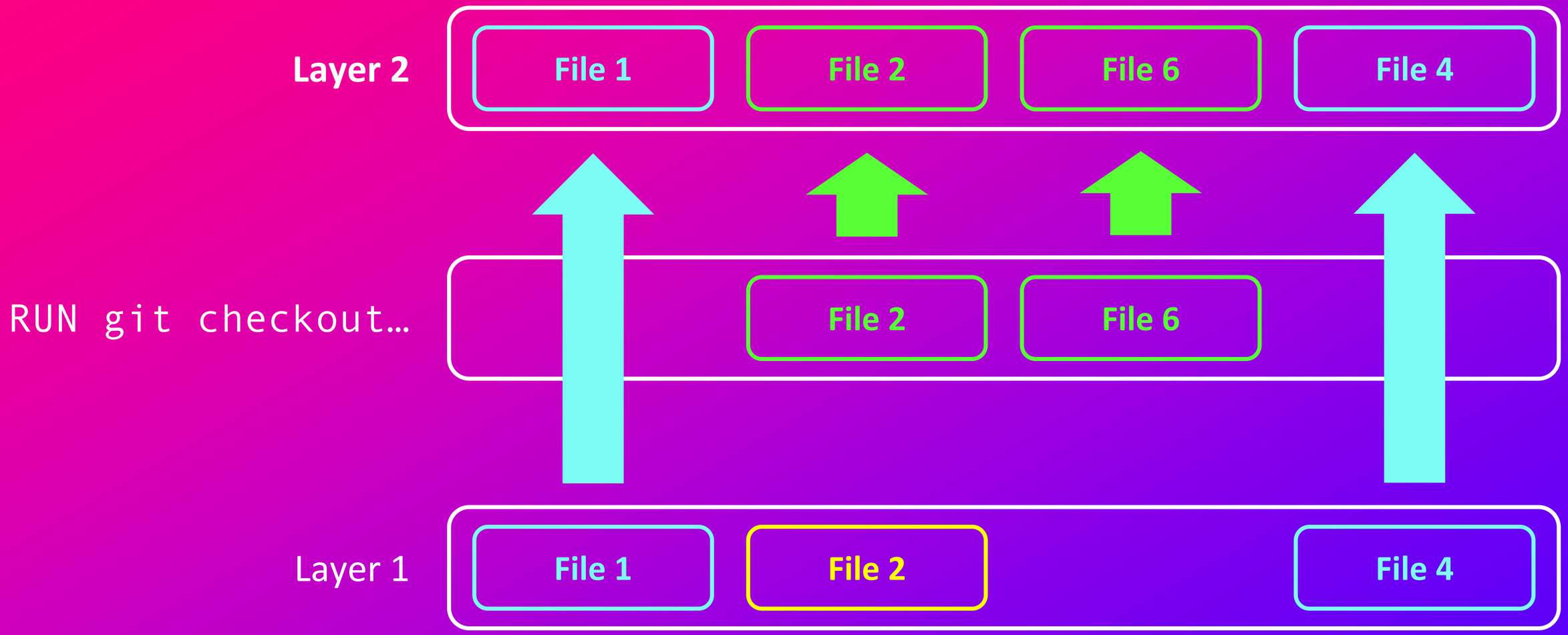
Build & Deploy



Build & Deploy



Build & Deploy

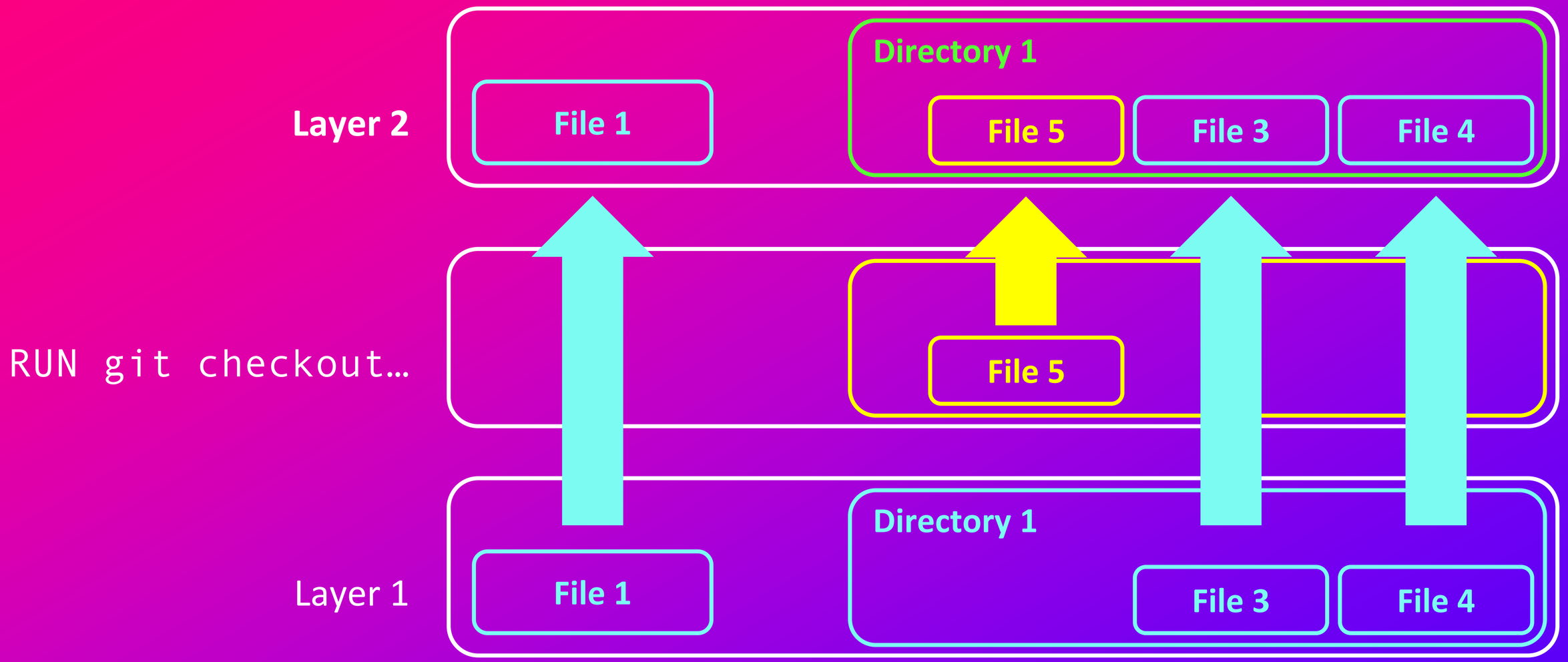


Build & Deploy

`RUN git checkout…`



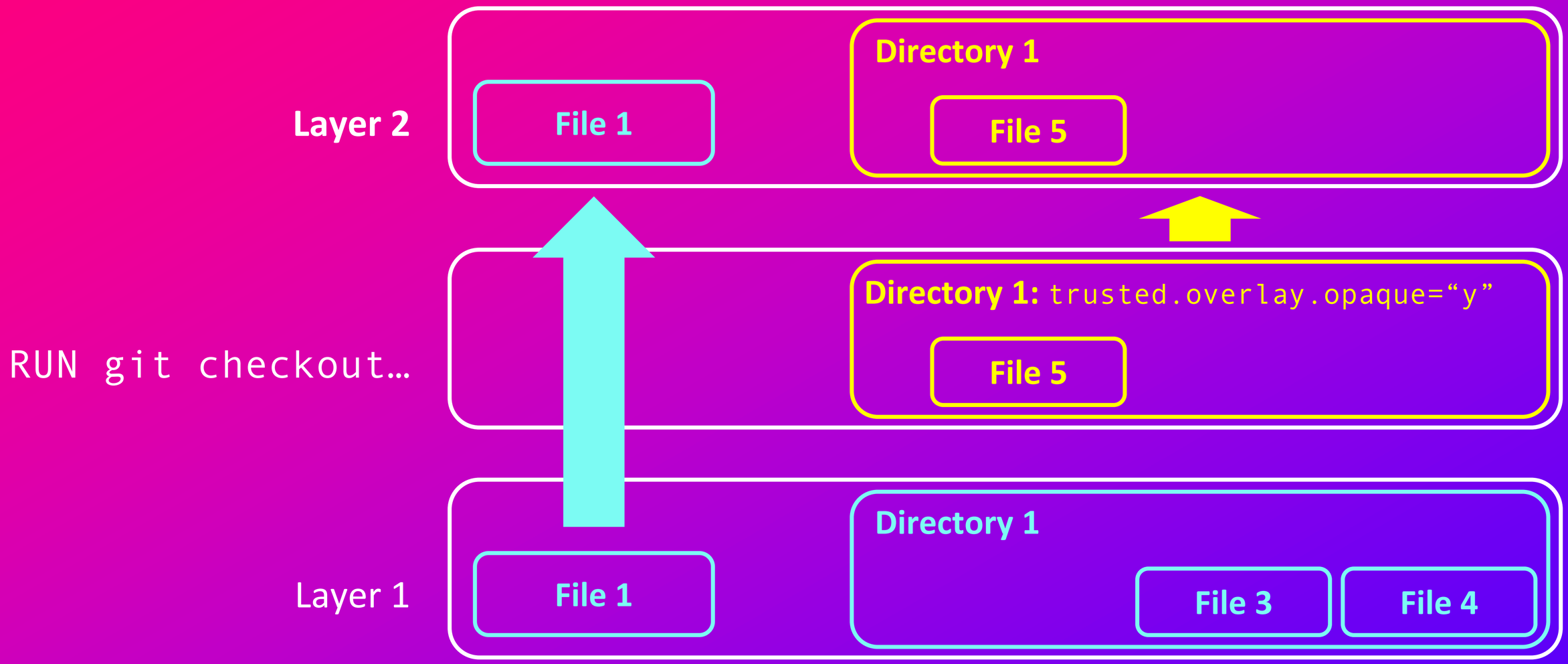
Build & Deploy



Build & Deploy

```
trusted.overlay.opaque="y"
```

Build & Deploy



```
getfattr -R -d -m "" upper/vendor/k8s.io/utils/io
<empty>
```

```
getfattr -R -d -m "" upper/vendor/k8s.io/utils/io
<empty>
```

trusted.overlay.opaque

torvalds / linux Public

Watch 8.1k | Fork 45.1k | Star 140k

Code | Pull requests 312 | Actions | Projects | Security | Insights

ovl: user xattr

Browse files

```
Optionally allow using "user.overlay." namespace instead of
"trusted.overlay."

This is necessary for overlayfs to be able to be mounted in an unprivileged
namepsace.

Make the option explicit, since it makes the filesystem format be
incompatible.

Disable redirect_dir and metacopy options, because these would allow
privilege escalation through direct manipulation of the
"user.overlay.redirect" or "user.overlay.metacopy" xattrs.

Signed-off-by: Miklos Szeredi <mszeredi@redhat.com>
Reviewed-by: Amir Goldstein <amir73il@gmail.com>
```

master

v6.0 ... v5.11-rc1

Miklos Szeredi committed on Dec 14, 2020 — 1 parent 82a763e — commit 2d2f2d7322ff43e0fe92bf8cccdc0b09449bf2

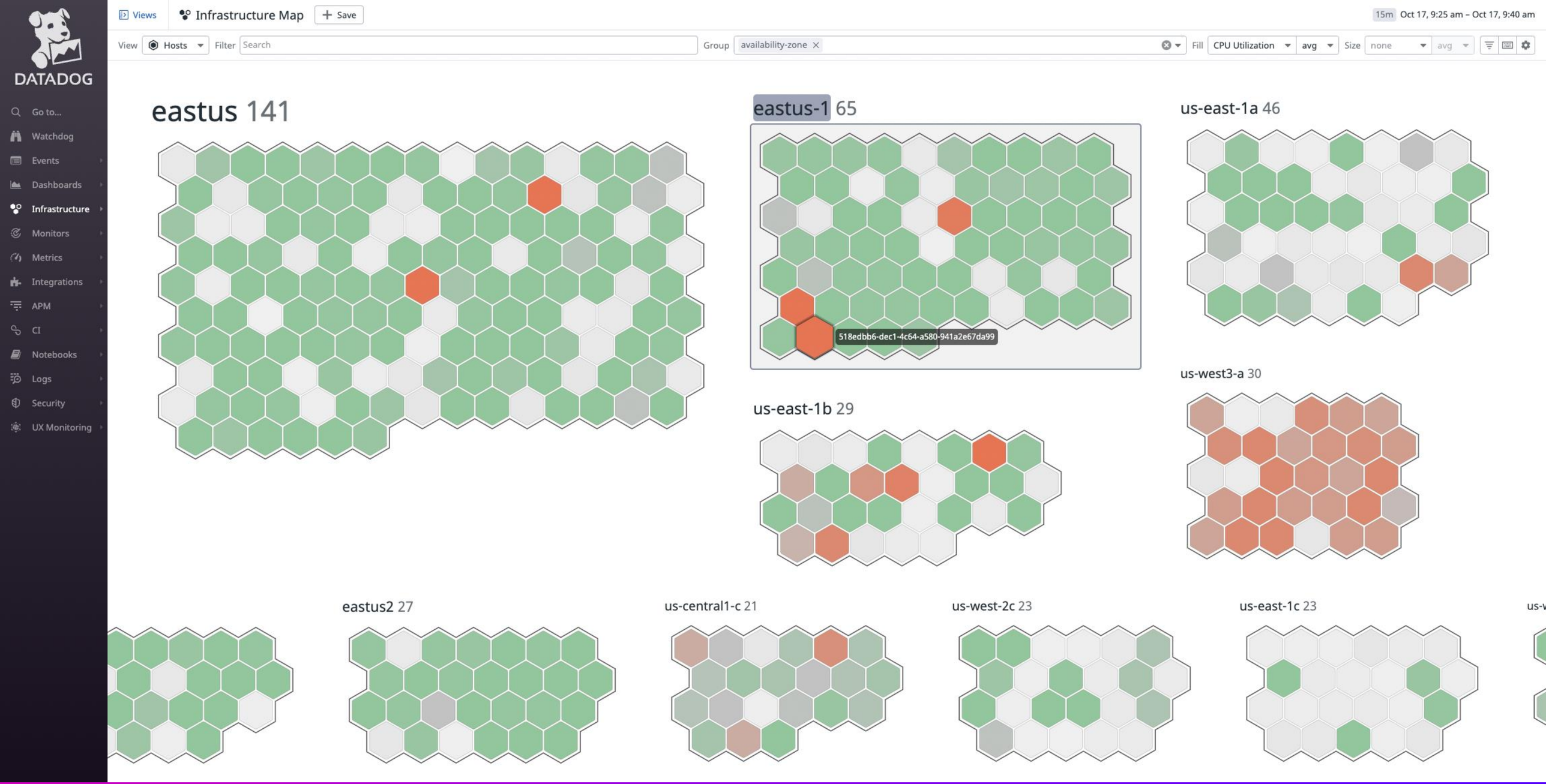
Showing **6 changed files** with **82 additions** and **18 deletions**.

Split | Unifie

Lesson 2: Stay up to date

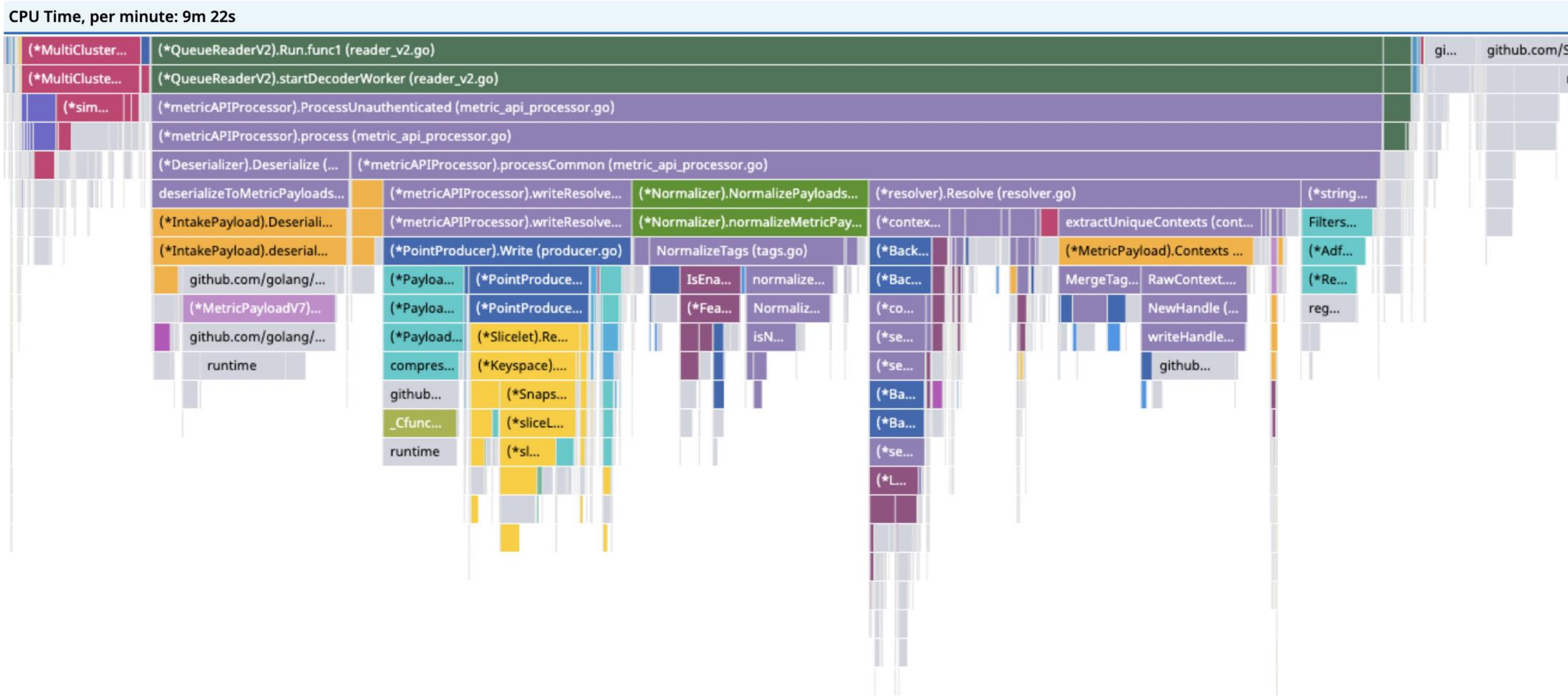
"DogStatsD implements the StatsD protocol and adds a few Datadog-specific extensions: histogram metric type, service checks, events, and ***tagging***."

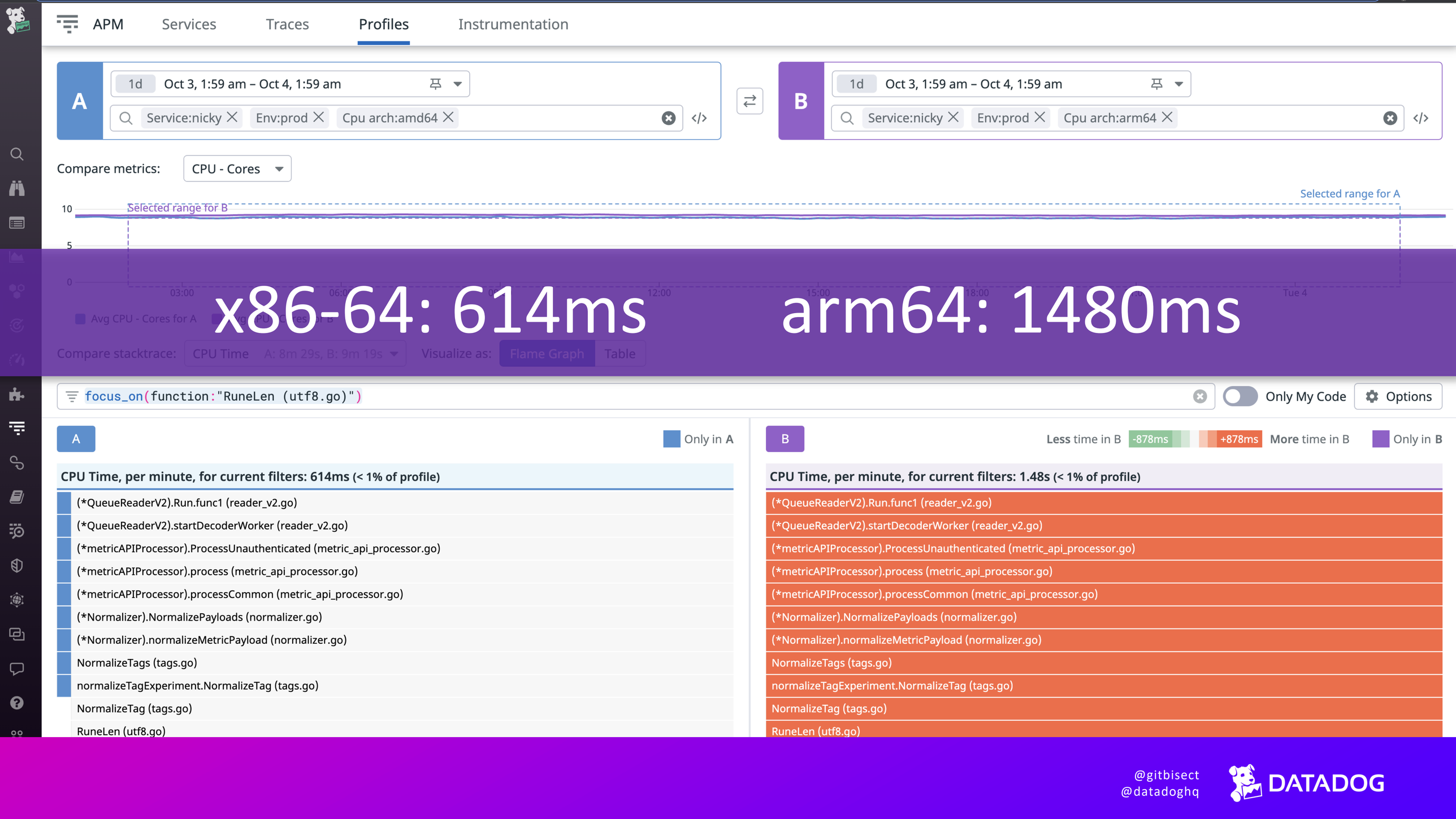
docs.datadoghq.com/developers/dogstatsd



@gitbisect
@datadoghq

DATADOG


CPU Time, per minute: 9m 22s
(*MultiCluster...
(*QueueReaderV2).Run.func1 (reader_v2.go)
gi...
github.com/S
(*MultiCluste...
(*QueueReaderV2).startDecoderWorker (reader_v2.go)
(*sim...
(*metricAPIProcessor).ProcessUnauthenticated (metric_api_processor.go)
(*metricAPIProcessor).process (metric_api_processor.go)
(*Deserializer).Deserialize (...
(*metricAPIProcessor).processCommon (metric_api_processor.go)
deserializeToMetricPayloads...
(*metricAPIProcessor).writeResolve...
(*Normalizer).NormalizePayloads...
(*resolver).Resolve (resolver.go)
(*string...
(*IntakePayload).Deseriali...
(*metricAPIProcessor).writeResolve...
(*Normalizer).normalizeMetricPay...
(*contex...
extractUniqueContexts (cont...
Filters...
(*IntakePayload).deserial...
(*PointProducer).Write (producer.go)
NormalizeTags (tags.go)
(*Back...
(*MetricPayload).Contexts ...
(*Adf...
github.com/golang/...
(*Payloa...
(*PointProduce...
IsEna...
normalize...
(*Bac...
MergeTag...
RawContext....
(*Re...
(*MetricPayloadV7)...
(*Payloa...
(*PointProduce...
(*Fea...
Normaliz...
(*co...
NewHandle (...
reg...
github.com/golang/...
(*Payload...
(*Slicelet).Re...
isN...
(*se...
writeHandle...
runtime
compres...
(*Keyspace)....
(*se...
github...
github...
(*Snaps...
(*Ba...
_Cfunc...
(*sliceL...
(*Ba...
runtime
(*sl...
(*se...
(*L...


APM
Services
Traces
Profiles
Instrumentation
A
1d
Oct 3, 1:59 am – Oct 4, 1:59 am
Service:nicky
Env:prod
Cpu arch:amd64
B
1d
Oct 3, 1:59 am – Oct 4, 1:59 am
Service:nicky
Env:prod
Cpu arch:arm64
Compare metrics:
CPU - Cores
Selected range for A
Selected range for B
10
5
0
03:00
12:00
15:00
18:00
Tue 4
x86-64: 614ms
arm64: 1480ms
Compare stacktrace:
CPU Time
A: 8m 29s, B: 9m 19s
Visualize as:
Flame Graph
Table
focus_on(function:"RuneLen (utf8.go)")
Only My Code
Options
A
Only in A
B
Less time in B
-878ms
+878ms
More time in B
Only in B
CPU Time, per minute, for current filters: 614ms (< 1% of profile)
(*QueueReaderV2).Run.func1 (reader_v2.go)
(*QueueReaderV2).startDecoderWorker (reader_v2.go)
(*metricAPIProcessor).ProcessUnauthenticated (metric_api_processor.go)
(*metricAPIProcessor).process (metric_api_processor.go)
(*metricAPIProcessor).processCommon (metric_api_processor.go)
(*Normalizer).NormalizePayloads (normalizer.go)
(*Normalizer).normalizeMetricPayload (normalizer.go)
NormalizeTags (tags.go)
normalizeTagExperiment.NormalizeTag (tags.go)
NormalizeTag (tags.go)
RuneLen (utf8.go)
CPU Time, per minute, for current filters: 1.48s (< 1% of profile)
(*QueueReaderV2).Run.func1 (reader_v2.go)
(*QueueReaderV2).startDecoderWorker (reader_v2.go)
(*metricAPIProcessor).ProcessUnauthenticated (metric_api_processor.go)
(*metricAPIProcessor).process (metric_api_processor.go)
(*metricAPIProcessor).processCommon (metric_api_processor.go)
(*Normalizer).NormalizePayloads (normalizer.go)
(*Normalizer).normalizeMetricPayload (normalizer.go)
NormalizeTags (tags.go)
normalizeTagExperiment.NormalizeTag (tags.go)
NormalizeTag (tags.go)
RuneLen (utf8.go)

```
func RuneLen(r rune) int {
	switch {
		case r < 0:
			return -1
		case r <= rune1Max:
			return 1
		case r <= rune2Max:
			return 2
		case surrogateMin <= r && r <= surrogateMax:
			return -1
		case r <= rune3Max:
			return 3
		case r <= MaxRune:
			return 4
		}
	return -1
}
```

```go
func NormalizeTag(tag string) string {
     // Fast path: Check if the tag is valid and only contains ASCII characters,
     // if yes return it as-is right away. This has reduced the CPU time of this
     // function by about 1.8x.

     if isNormalizedASCIITag(tag) {
          return tag
     }
```

Lesson 3: Rethink your code

- Measure performance

- Measure performance
- Stay up to date

- Measure performance
- Stay up to date
- Rethink your code

Thanks


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@gitbisect
@datadoghq

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Resources

Building Container Images (Kubecon): https://dtdg.co/building-containers-kubecon-2022
AWS Under the Hood – Graviton Migration Episode: https://dtdg.co/graviton-twitch-stream

Questions?

For more information about Datadog products and to see a demo, visit our booth in the sponsor hall.

Thank you!

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