LABS.NETWORKRELIABILITY.ENGINEERING

Antidote: virtualized learning labs running over kubernetes

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Paris Open Source Summit - 2019/12/11

Plan

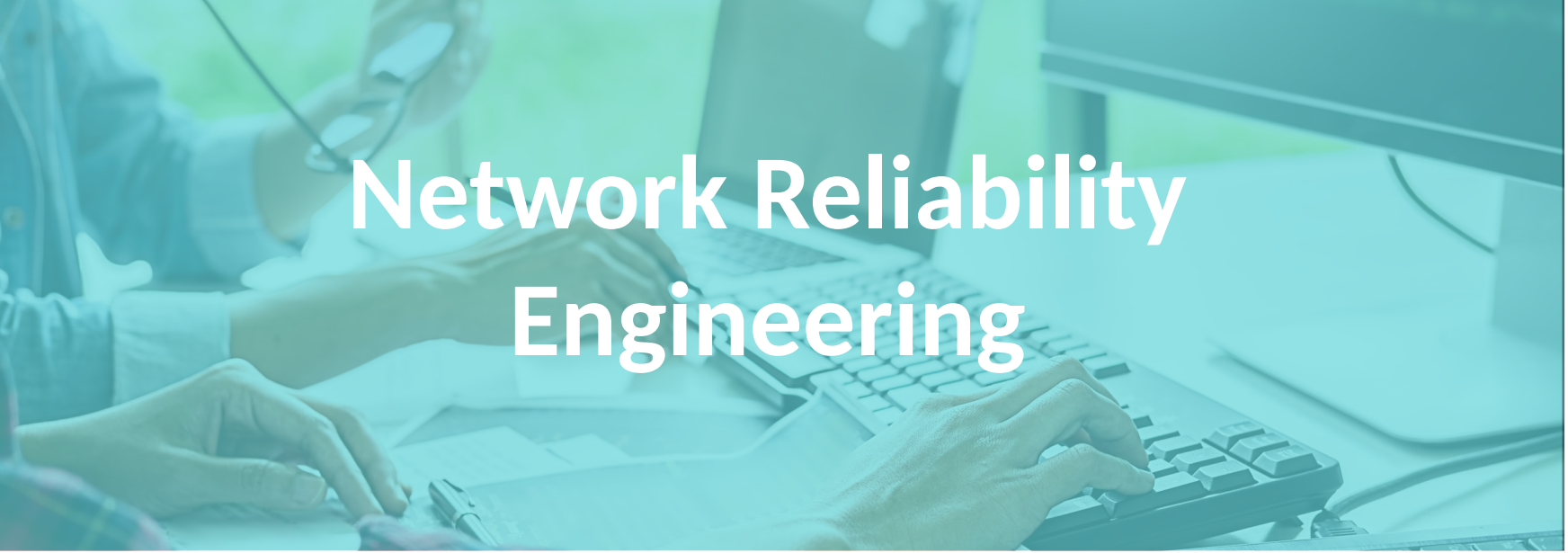
- Network Reliability Engineering
  (the community)
- NRE Labs
  (the labs platform)
- Antidote
  (the software making it possible)

About Me

Olivier Berger
@olberger
https://frama.link/obergix

- ✔ Research engineer @ Telecom SudParis
- ✔ Paris area (France)
- ✔ Teaching Computer Science
- ✔ Free & Open source software
- ✔ Software Developer
- ✔ Virtual labs tinkerer
- ✔ Recent Antidote contributor

Not in network automation



Network Reliability Engineering

NRE LABS

Network Reliability Engineering

Nre

Core networking fundamentals still matter. It's right in the name.

n**R**e

Represents a better way of doing things. Emphasizes the true goal of automation

nr**E**

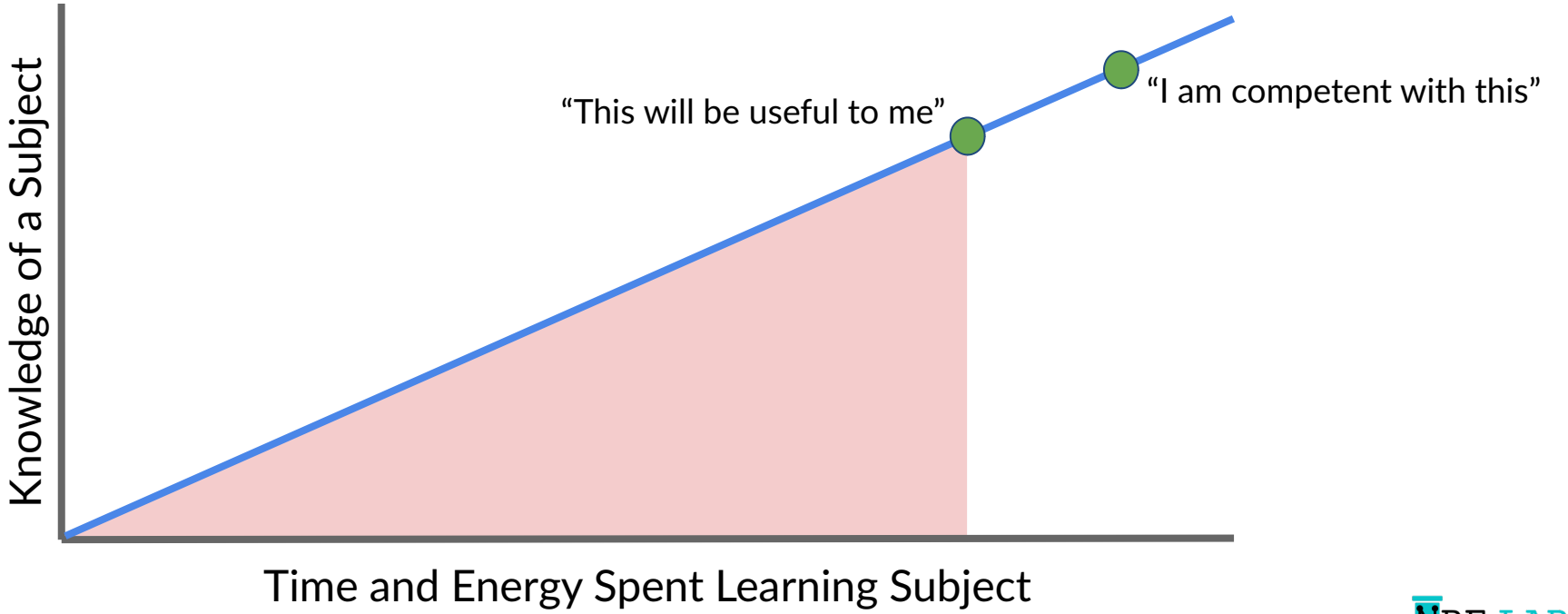
You can't buy engineering - you DO it. Sidesteps the "productization" of automation

Codify Automate Test

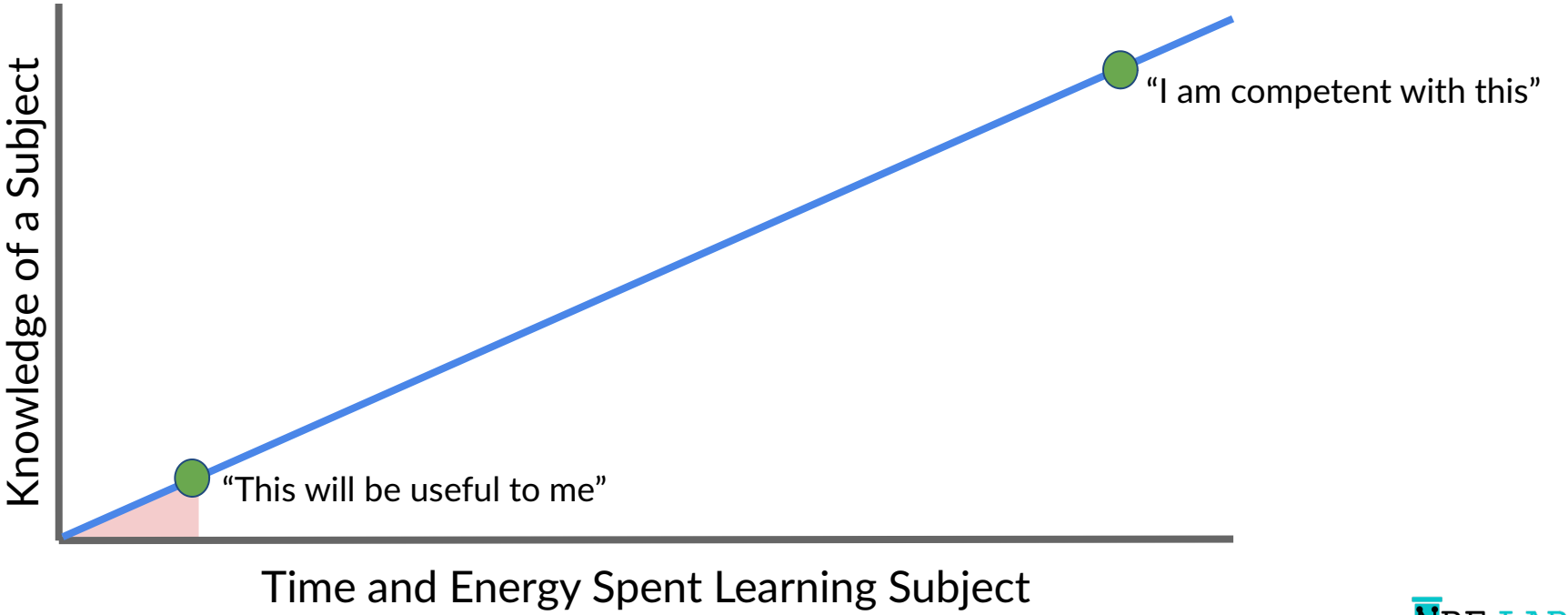
Monitor Measure

https://networkreliability.engineering/

Time Investment Minimum (TIM) - HIGH



Time Investment Minimum (TIM) - LOW



NRE Labs

NRE LABS

NRE Labs

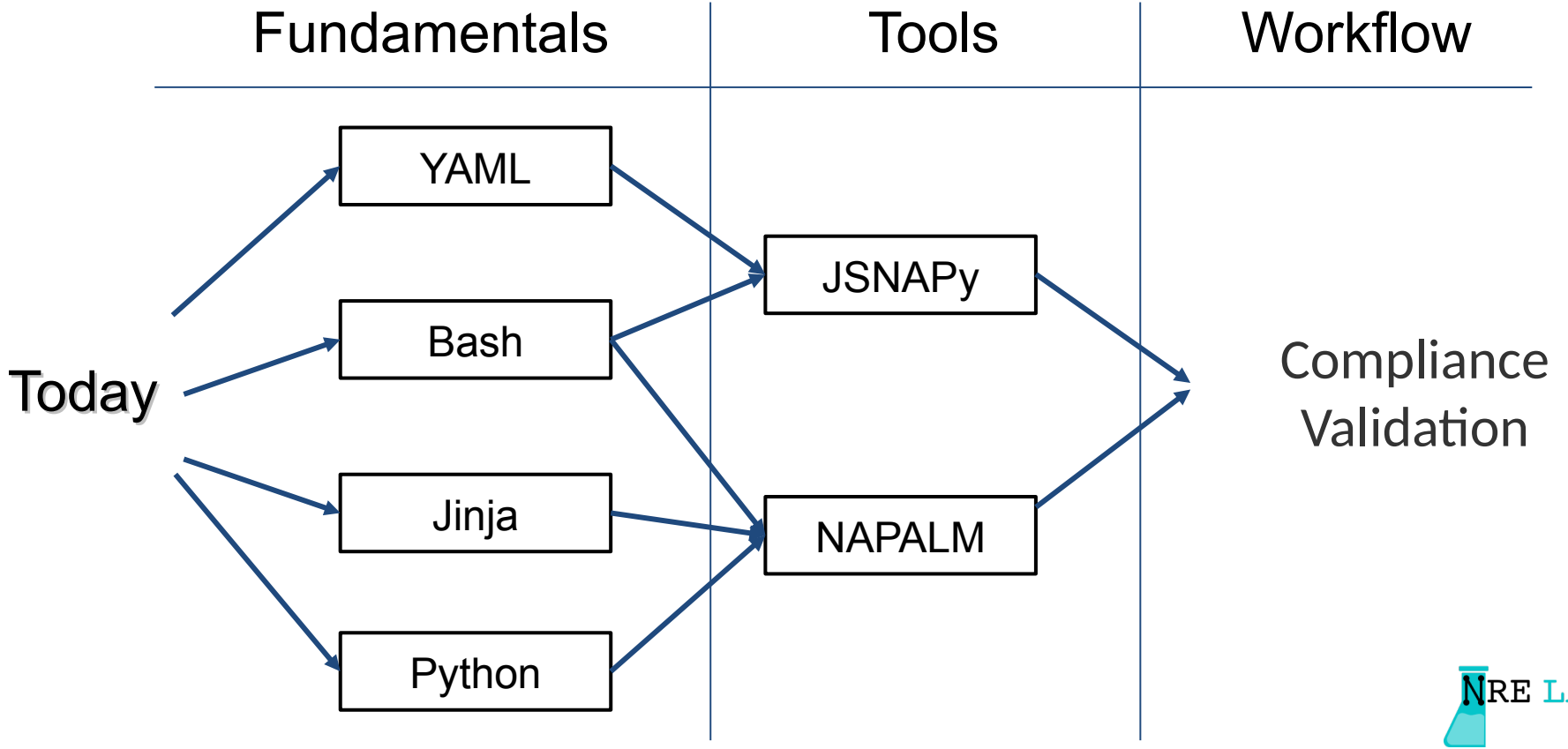
Community platform for learning and teaching automation and Network Reliability Engineering

- Totally browser-based
- Free - no login, paywall or creepy trackers
- Vendor-neutral
- Open Source (curriculum too!)

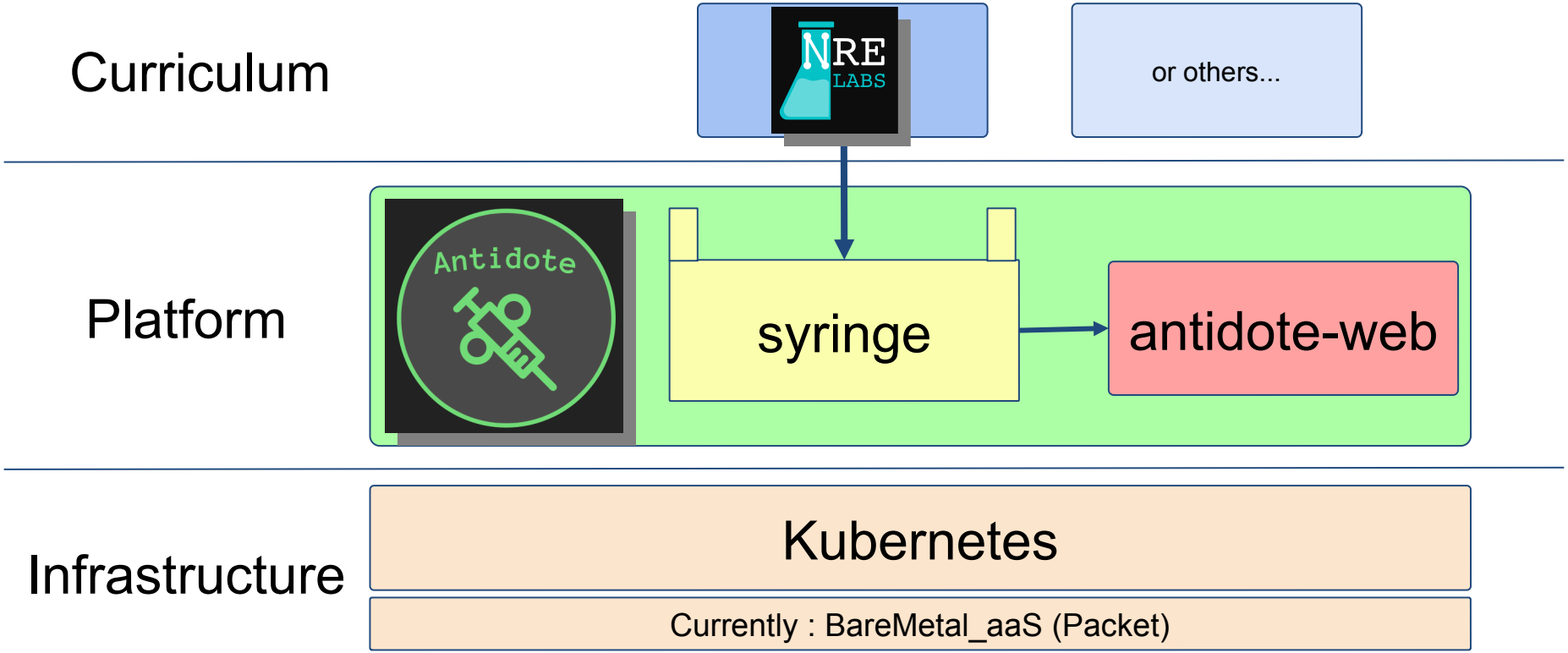
labs.networkreliability.engineering

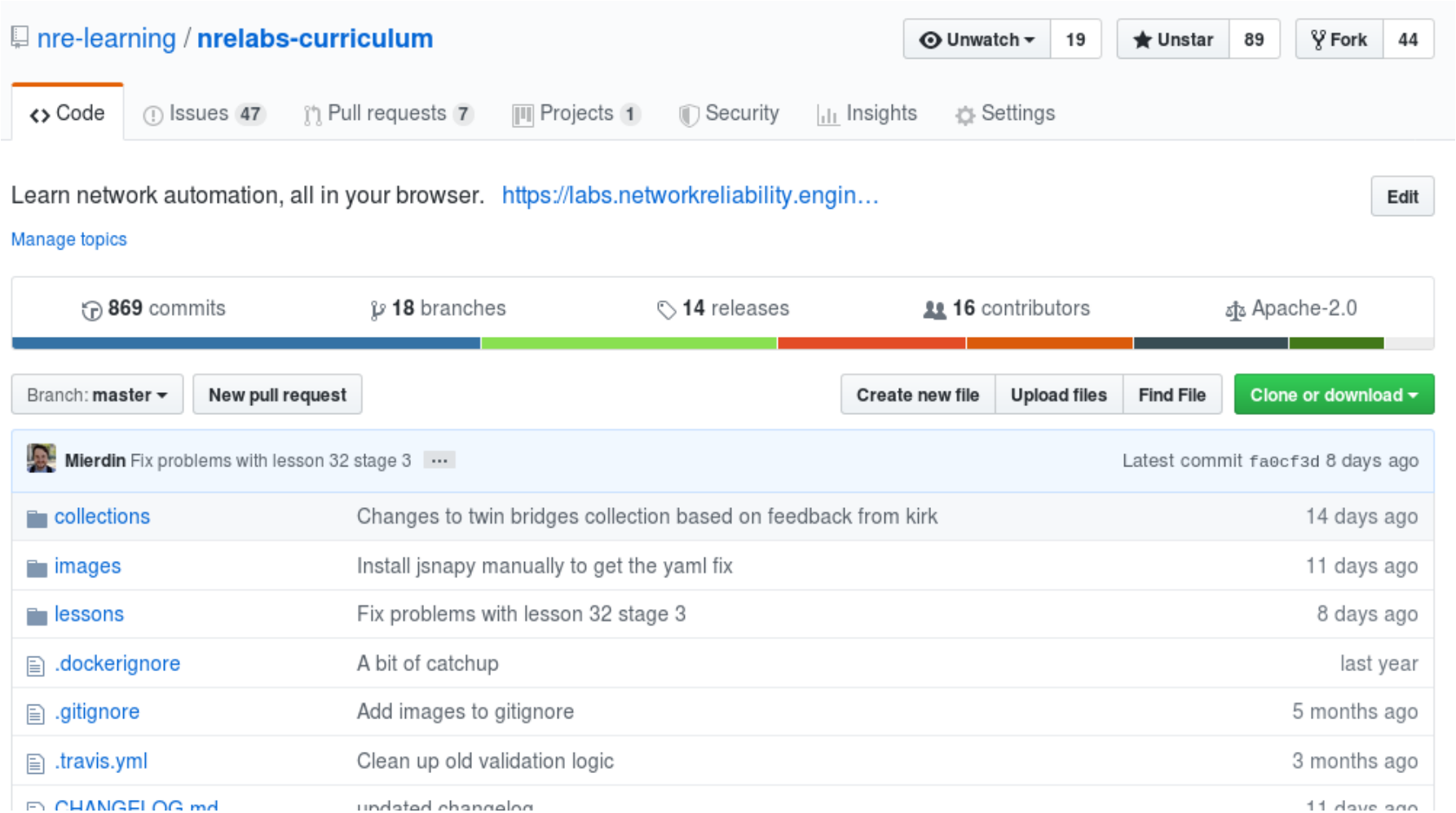
DEMO

Curriculum


Fundamentals
Tools
Workflow
YAML
Bash
Jinja
Python
JSNAPy
NAPALM
Today
Compliance
Validation

NRE Labs Architectural Overview




nre-learning / nrelabs-curriculum
Unwatch 19
Unstar 89
Fork 44
Code
Issues 47
Pull requests 7
Projects 1
Security
Insights
Settings
Learn network automation, all in your browser. https://labs.networkreliability.engin…
Edit
Manage topics
869 commits
18 branches
14 releases
16 contributors
Apache-2.0
Branch: master
New pull request
Create new file
Upload files
Find File
Clone or download
Mierdin Fix problems with lesson 32 stage 3
Latest commit fa0cf3d 8 days ago
collections Changes to twin bridges collection based on feedback from kirk 14 days ago
images Install jsnapy manually to get the yaml fix 11 days ago
lessons Fix problems with lesson 32 stage 3 8 days ago
.dockerignore A bit of catchup last year
.gitignore Add images to gitignore 5 months ago
.travis.yml Clean up old validation logic 3 months ago

Antidote

NRE LABS

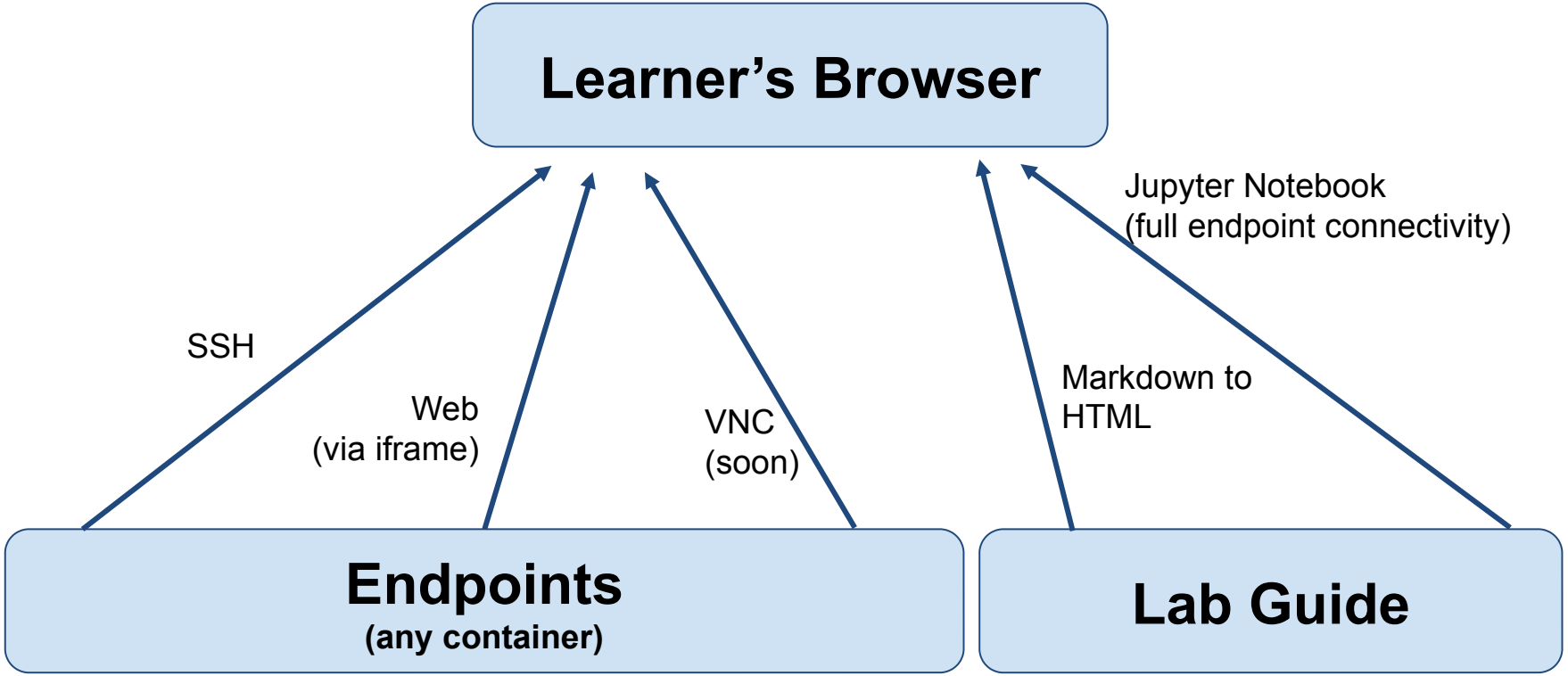
The Antidote software

- Started 1 year ago (initiated by Juniper)
- Currently 0.4.1
- Open Source (Apache license, soon under the umbrella of a non-profit fundation)
- Many repos under : github.com/nre-learning
- Antidote Docs - antidoteproject.rtfd.io
- Go, JS, k8s, ...
- Key people : Matt (`@mierdin`) Oswalt, Derick (`@cloudtoad`) Winkworth, Lisa Caywood, ...

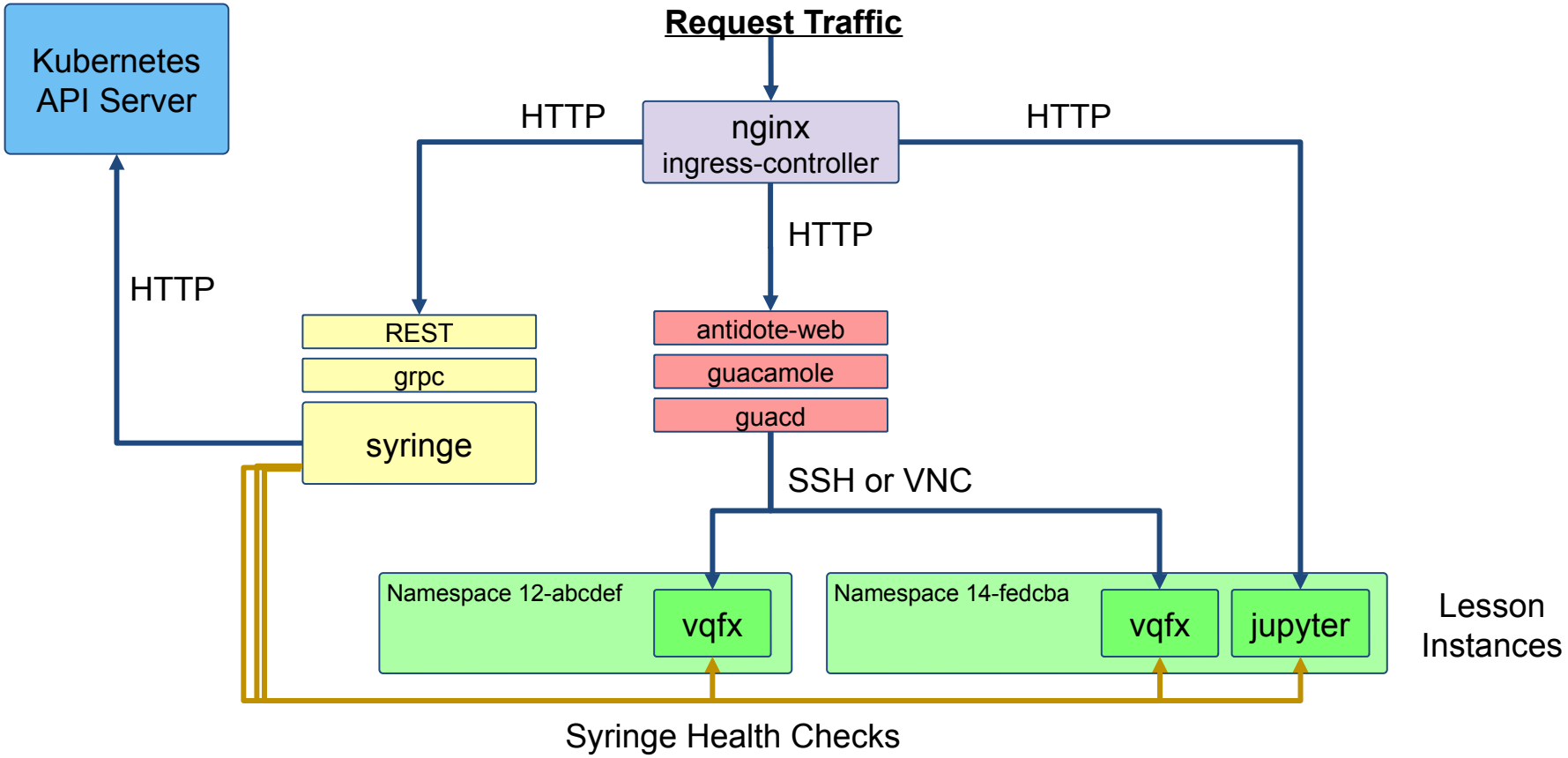
Self-medicate

- Scripts and Kubernetes Manifests for deploying Antidote on Vagrant with Minikube
- https://github.com/nre-learning/antidote-selfmedicate/
- Easily preview curriculum content locally before submitting a PR.

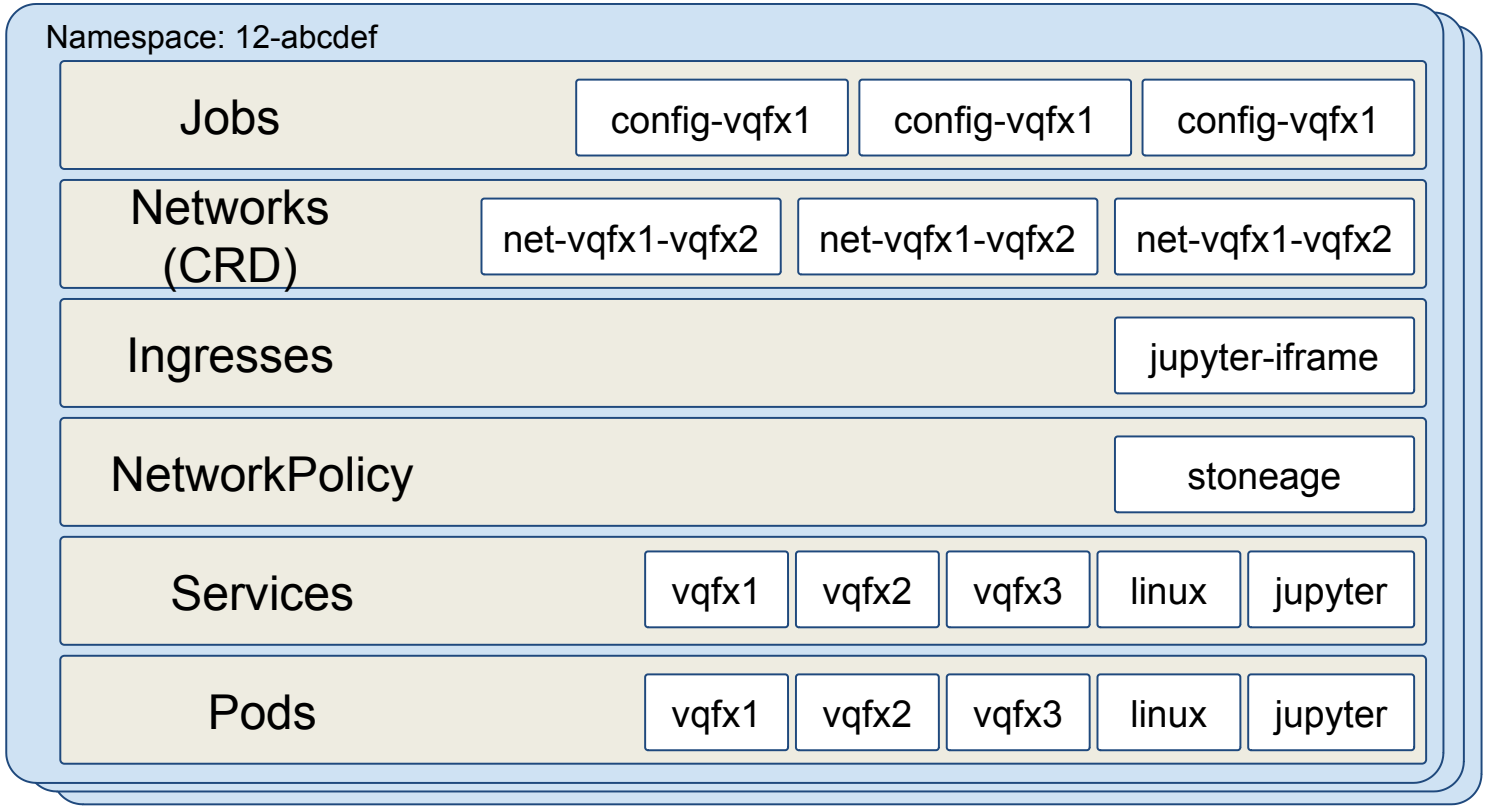
Flexible Presentation Layer



Antidote as Deployed in Kubernetes

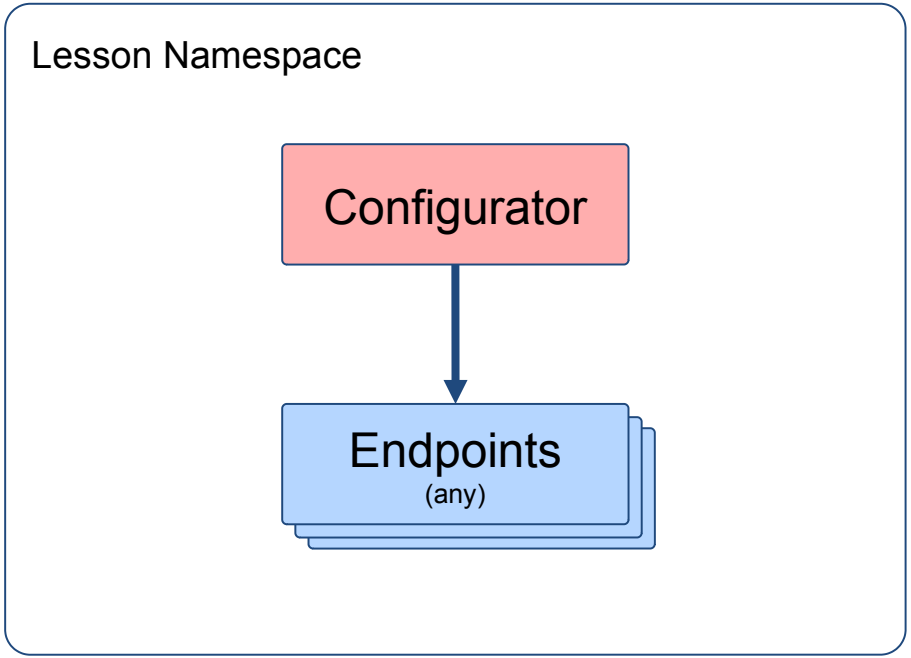


Anatomy of a Lesson



Inter-Stage Configuration

- Hands-Free environment prep while moving within a lesson
- Configurations present within lesson directory will be applied during stage transitions
- Currently supports NAPALM, Ansible, or Custom Python



Network Devices in Docker

- Originally inspired by vrnetlab but currently a bit more bespoke. Hoping to get more standardized soon.
- Images packaged straight into docker and executed by the kubelet on the scheduled host
- ANY vendor is feasible as long as it runs in a VM and talks on a port

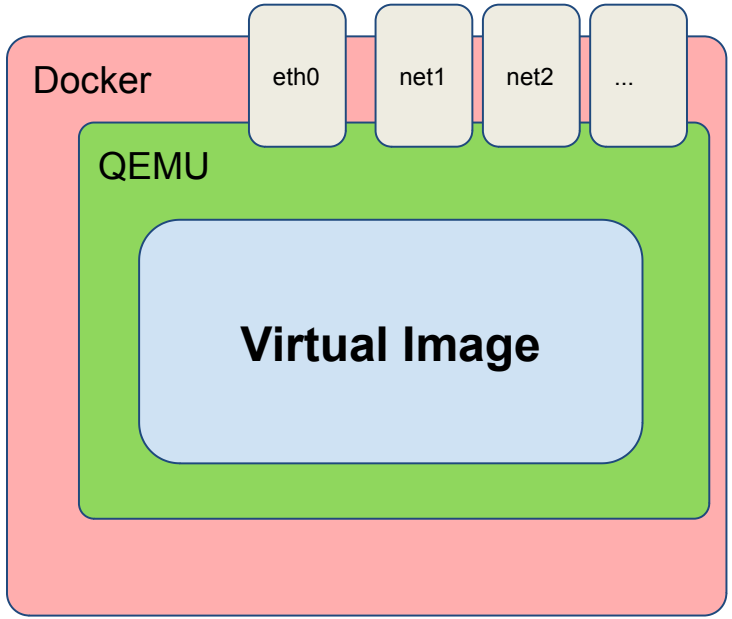
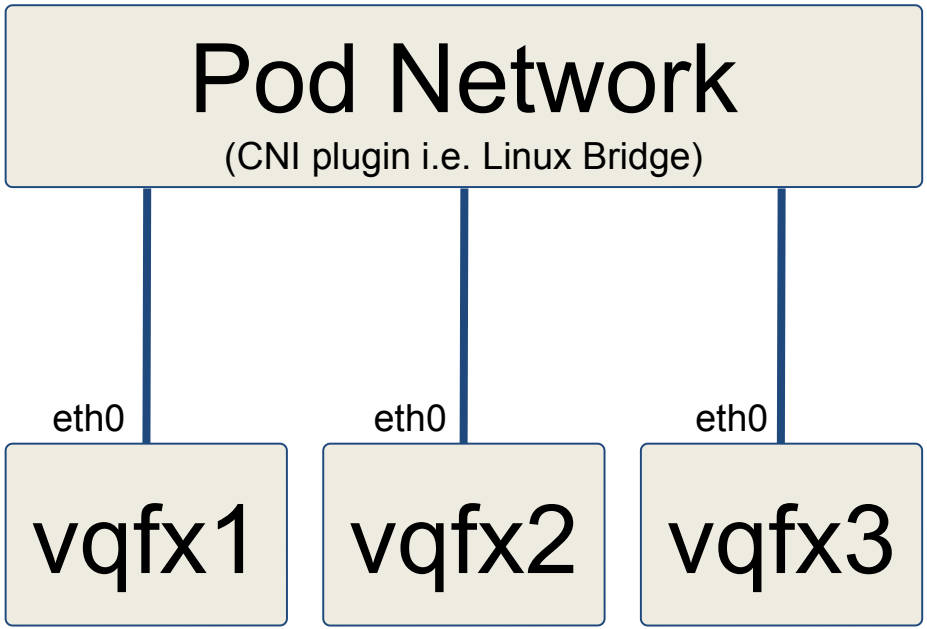


Image Catalog

Current
- vQFX
- vMX
- Cumulus VX

Soon
- VyOS
- ExtremeXOS

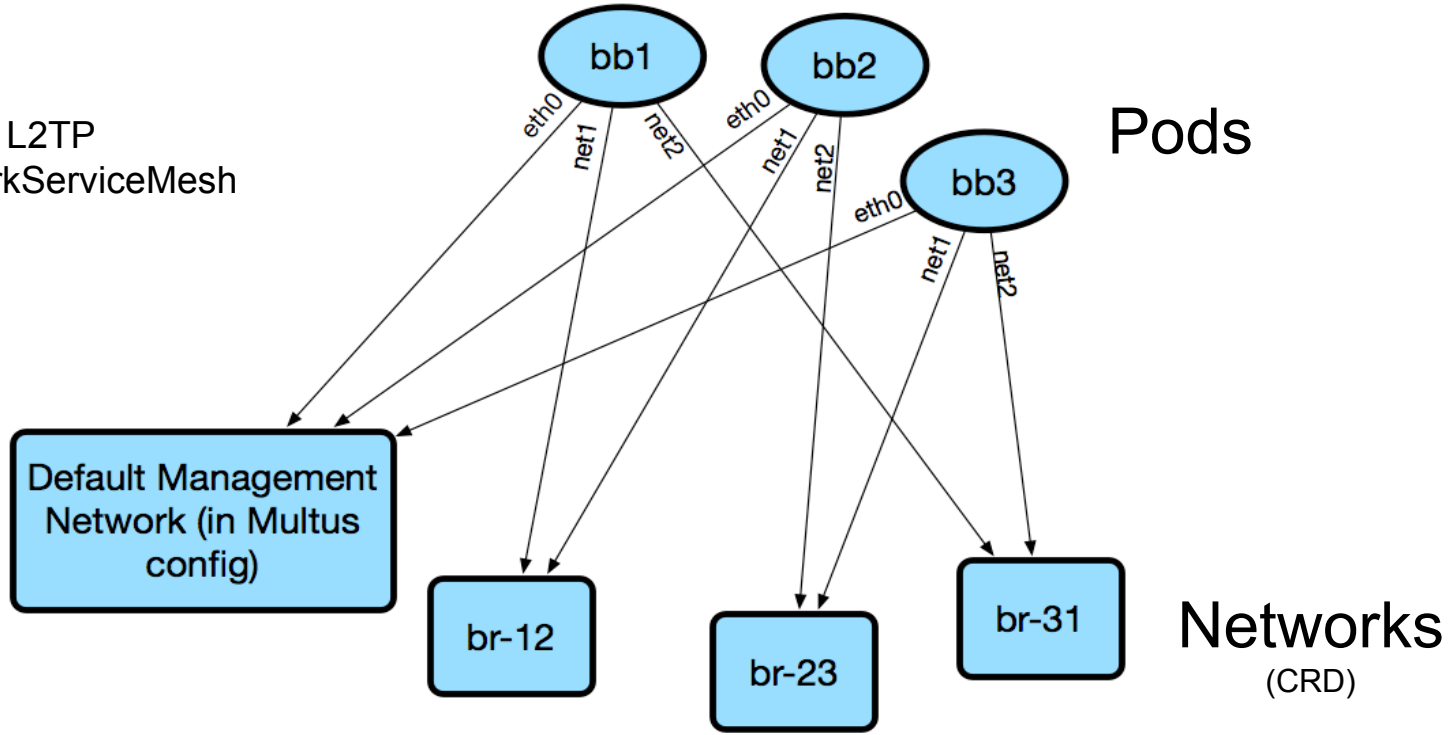
Normal Kubernetes Pod Networking



Using Multus for Advanced Network Topologies

Alternatives:

- QEMU L2TP
- NetworkServiceMesh



https://github.com/intel/multus-cni

Why should I care?

- Chance for the community to take back control of ops education
- Fairly new project (1 year old) - lots to do
- Covers a wide spectrum of disciplines
  - frontend, systems programming, ops, content
- Several cutting-edge technologies in use now or in the near future
- Deploying your own “virtual labs” platform, on your preferred k8s cluster : university, training center, etc. ?

Resources

Labs - labs.networkreliability.engineering

Community - community.networkreliability.engineering

Open Source - github.com/nre-learning

Antidote Docs - antidoteproject.rtfd.io

Standups - Every Tuesday 17:00 GMT+1

Twitter - @NRELabs

No Contribution Too Small!

- Use NRE Labs and open issues!
- Lesson Contributions - new or existing
- Platform enhancements/fixes

Questions?

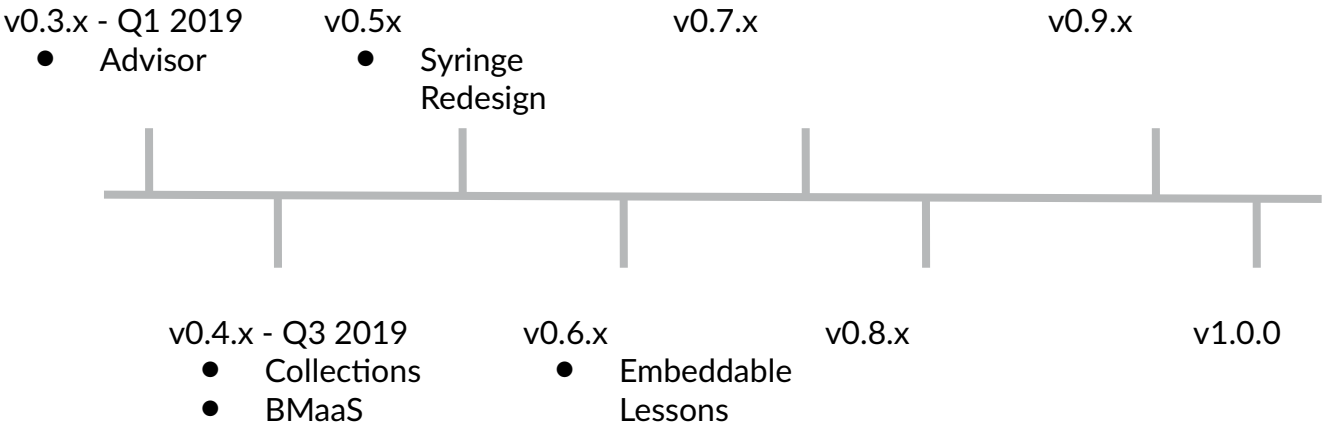
NRE LABS

Annex...

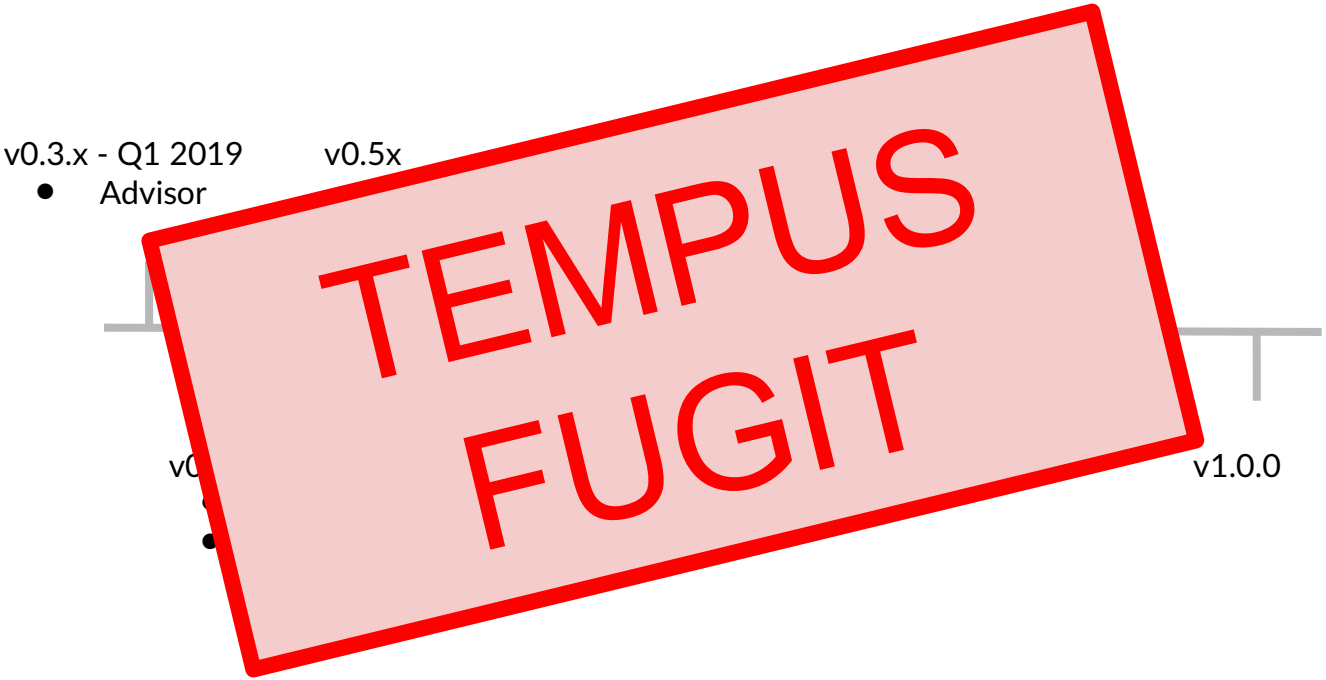
The Road to v1.0

NRE LABS

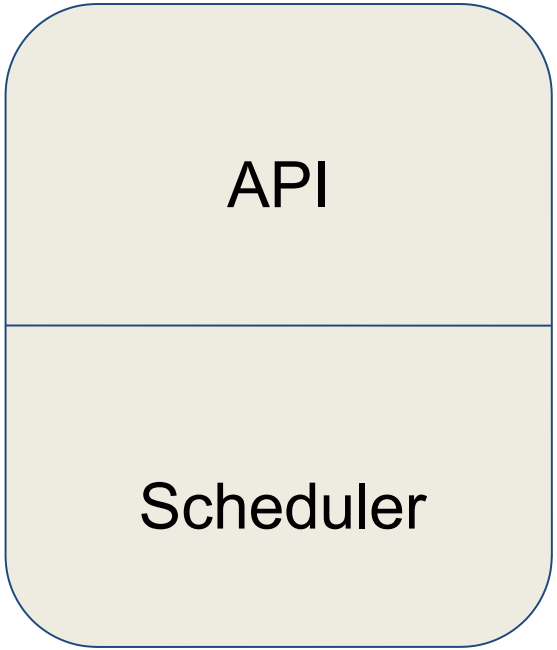
The Road to v1.0



The Road to v1.0



Current Syringe Architecture



Single Process - “syringed”

Advantages:

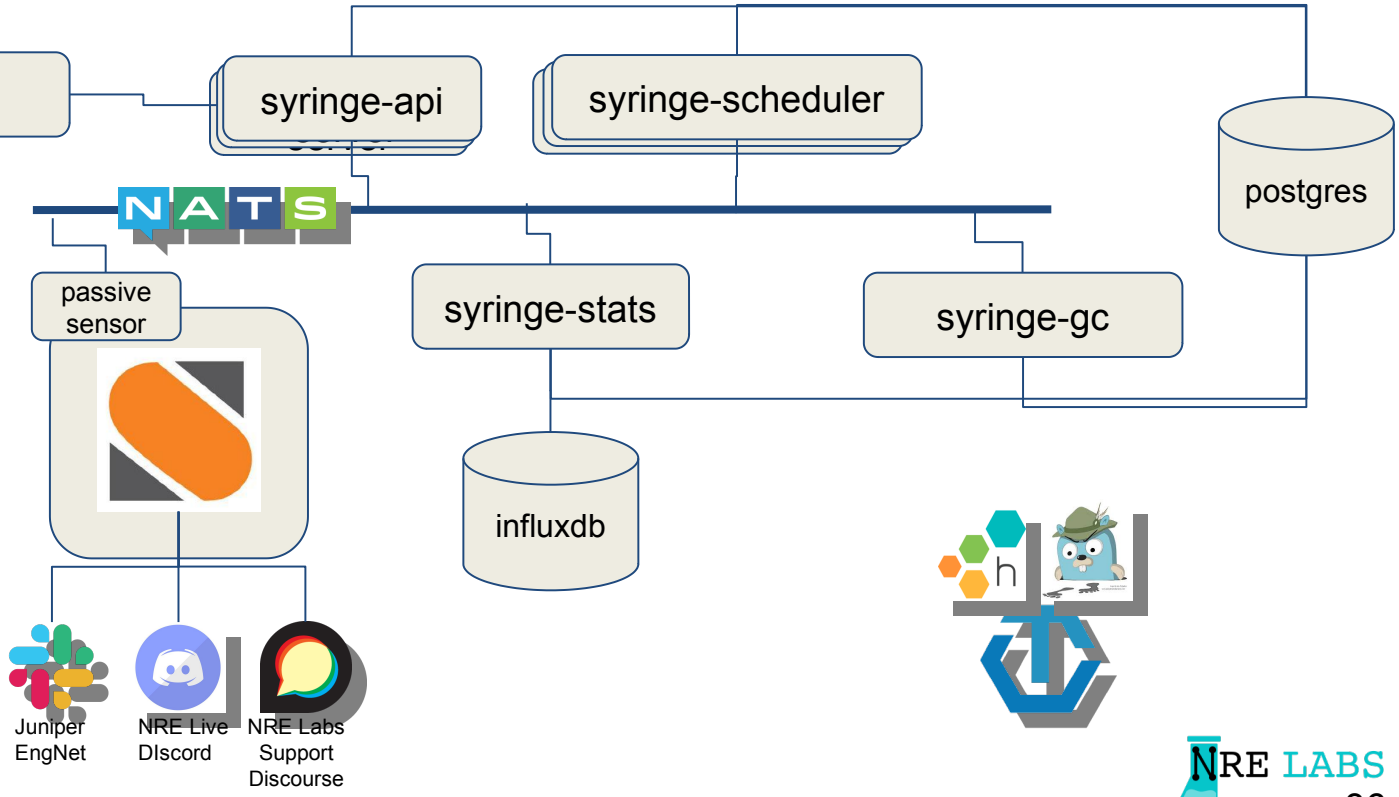
- Single binary
- No external database to worry about
- Allowed us to get NRE Labs public quick

Disadvantages

- Single point of failure
- Everything is tightly coupled, harder to extend
- State is kept in-memory, so restart means state is lost
  - This means we need to kill all existing lessons on start
- Fairly opaque

MP - Syringe Redesign

- Better resilience - no “one syringe”
- Easier to extend - just pop a new service on the message bus
- Easier to reason about, maintain, and contribute to individual services



User Experience

- Are users having problems?
  - Monitoring components is easy, monitoring the full thing is hard?
- If they are, what can we even do about it?
  - By definition, our users aren't experts in Github
  - In the 0.01% of cases where users find a way to get feedback to us, all of the context is lost.

MP - Observability Instrumentation

- ✔ **User feedback right in the UI**. Click this button or type in this box to tell us about a problem. Responses go to some kind of queue for filtering and triage. Includes session and request IDs
- ✔ **Better centralized and structured logging**
- ✔ **System observability** - Tracing from web front-end all the way through every syringe microservice. HIgh cardinality based from initial session and lesson ID allows us to get to a specific interaction easily.

MP - Standard and Secure Endpoint Images

- Target: security of VMs with developer experience of containers
- Candidates:
  - Weave Ignite
  - Kata Containers
  - Custom tooling
- KubeVirt
  - May help in future but this is mostly focused on ops-side stuff we don't need.

MP - Build Lessons in the Browser

- ✔ Come full-circle and enable lesson contributions in the browser
- ✔ Using Mozilla Janitor as inspiration (uses Amazon Cloud9)
- ✔ Have to figure out a cost-effective deployment model