LABS.NETWORKRELIABILITY.ENGINEERING

Antidote: virtualized learning labs running over kubernetes

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About Me

Olivier Berger
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https://frama.link/obergix

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

- ✘ *Not in network automation*

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**

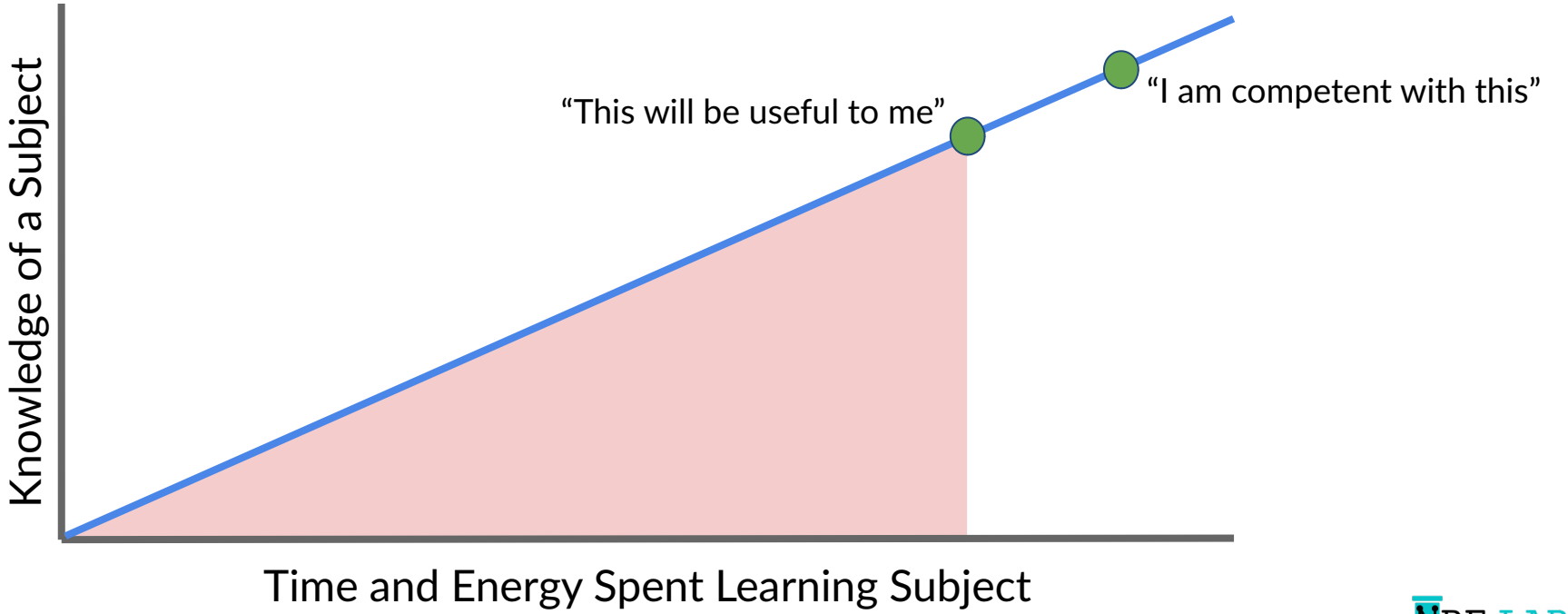
You can't buy engineering - you DO it. Sidesteps the "productization" of automation

Codify Automate Test

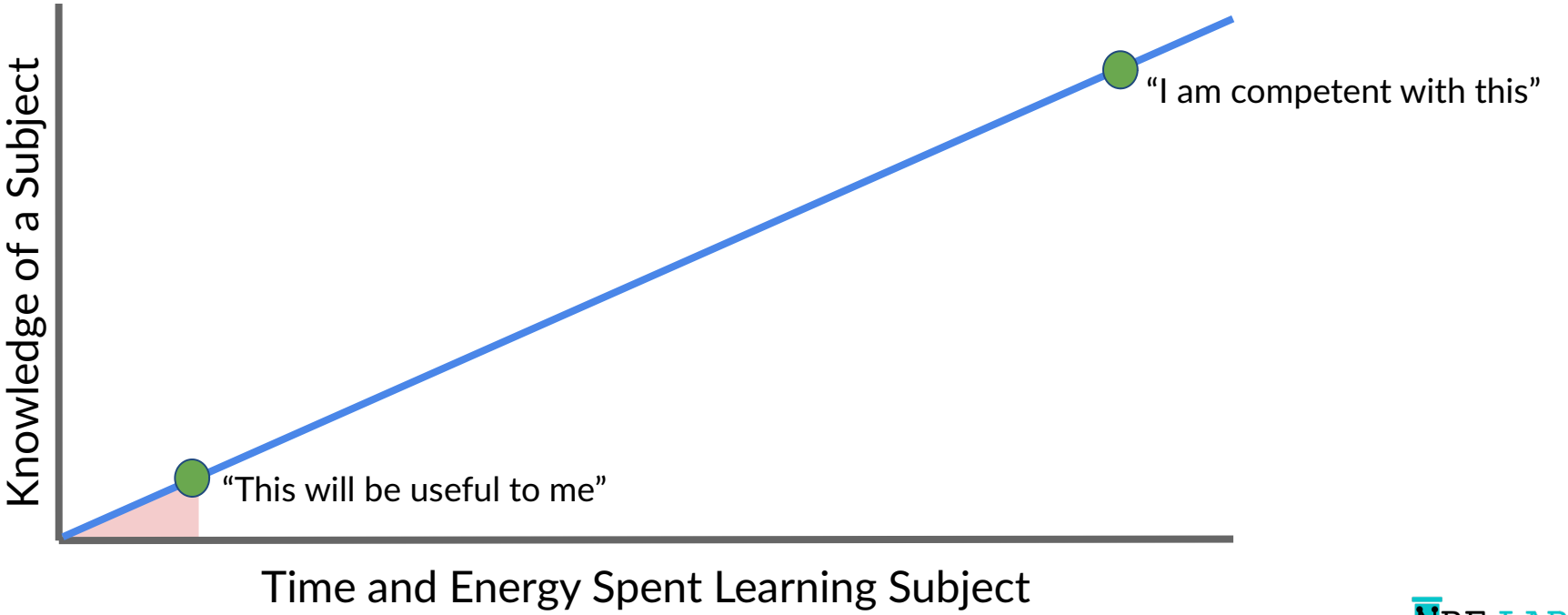
Monitor Measure

https://networkreliability.engineering/

Time Investment Minimum (TIM) - HIGH



Time Investment Minimum (TIM) - LOW

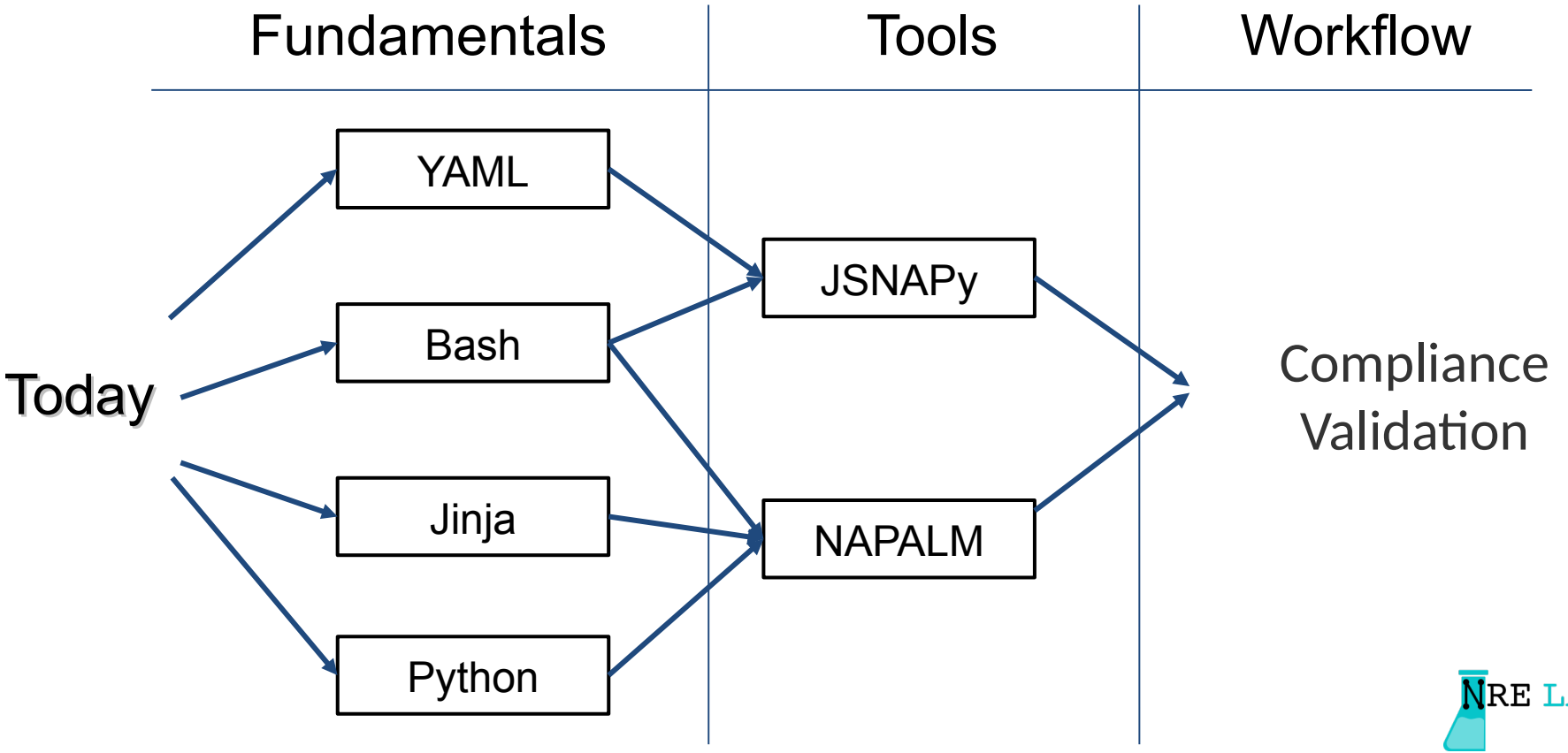


NRE Labs

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!)

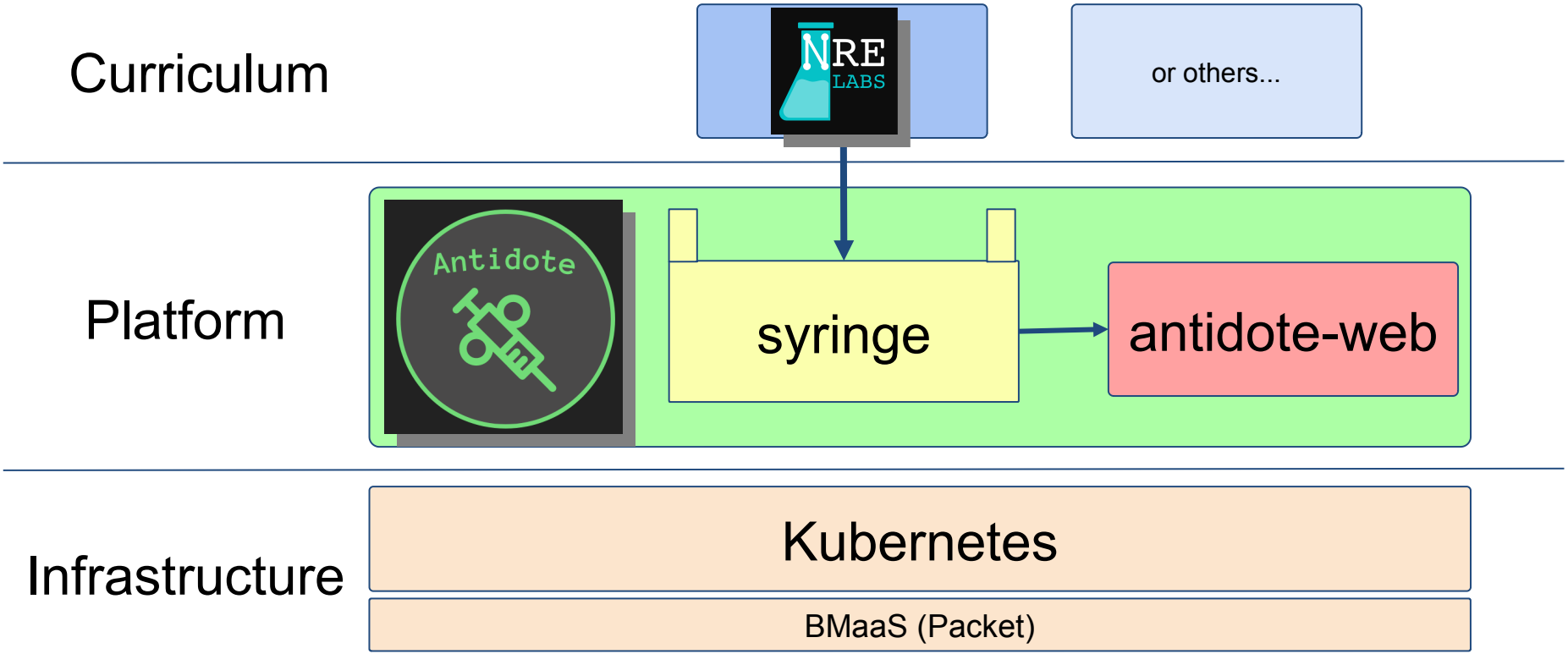
DEMO


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

Why should I care?

- Chance for the community to take back control of ops education
- Fairly new project - 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

Antidote 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
CHANGELOG.md	updated changelog	11 days ago

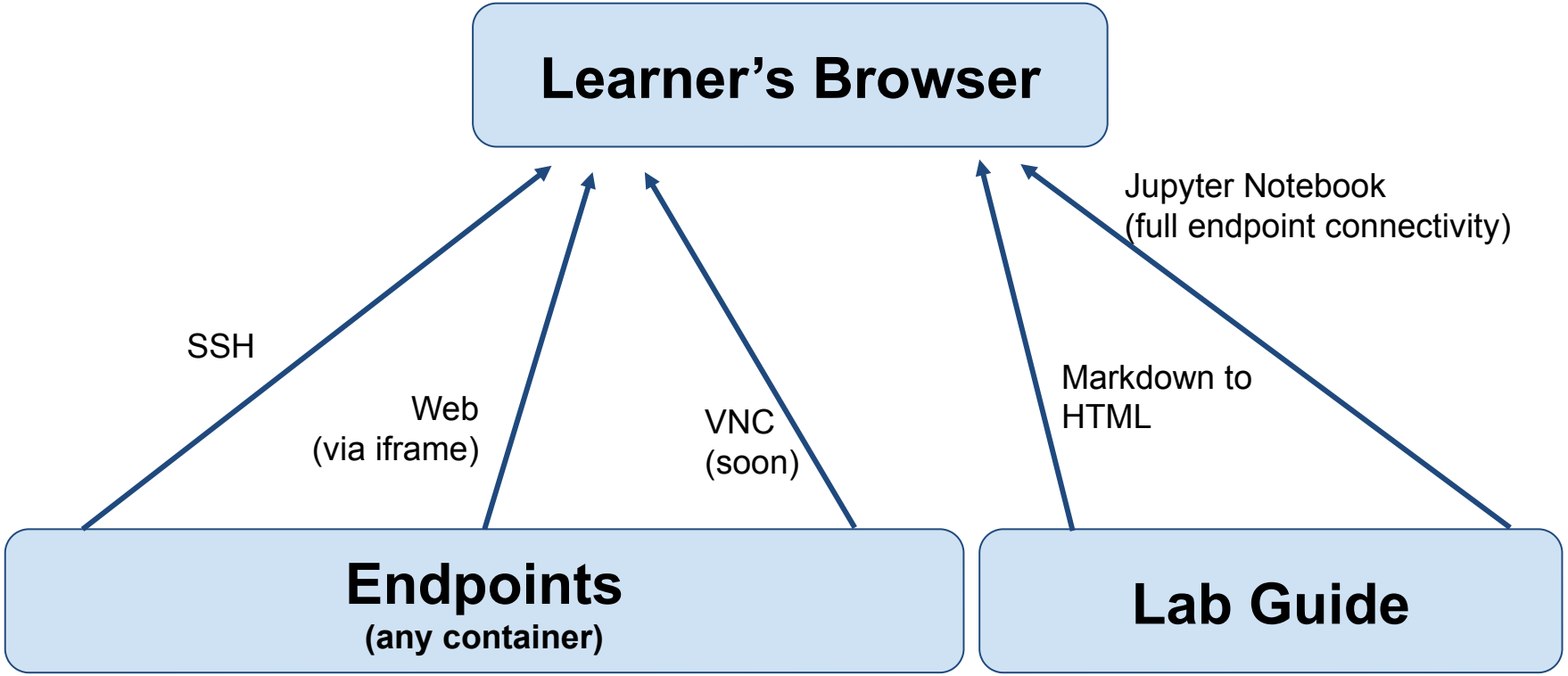
Selfmedicate

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

Diving Deeper...

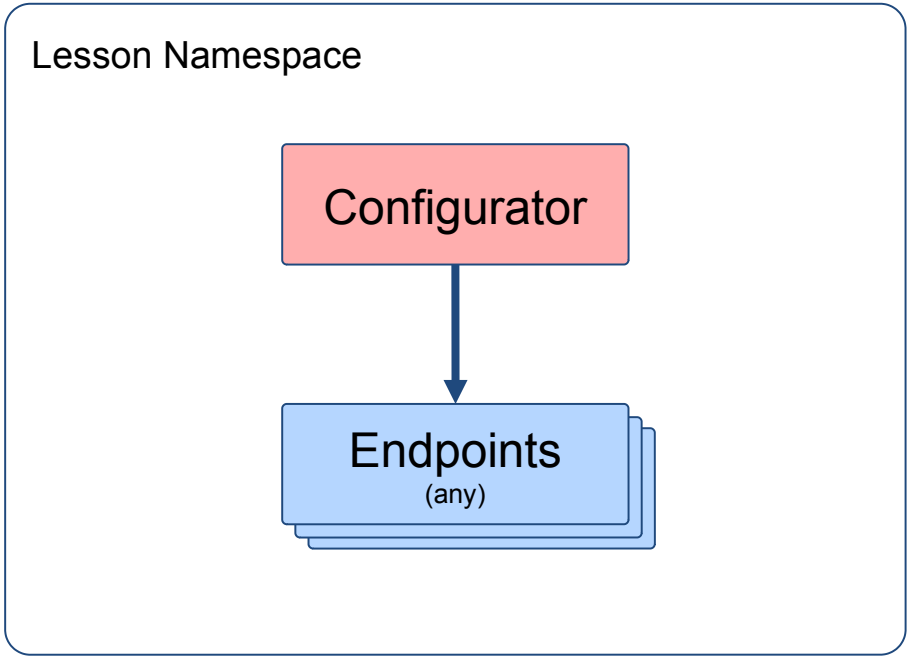
NRE LABS

Flexible Presentation Layer



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

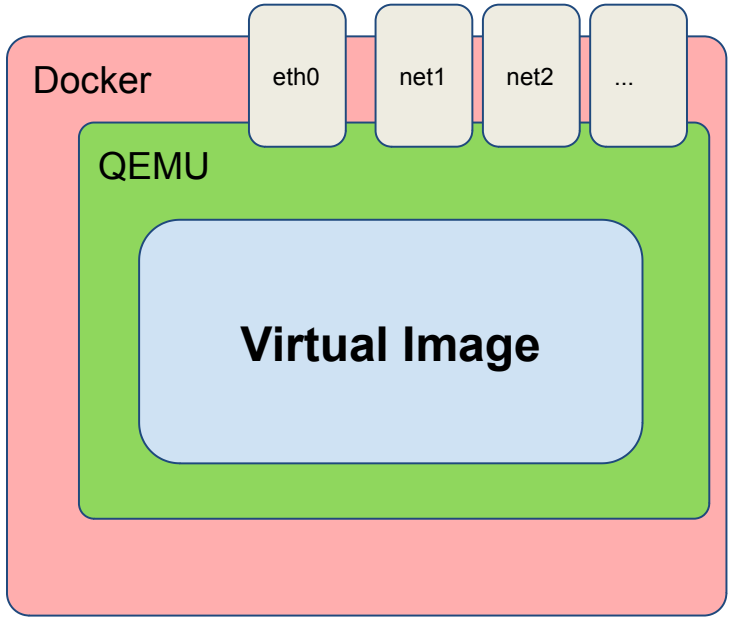
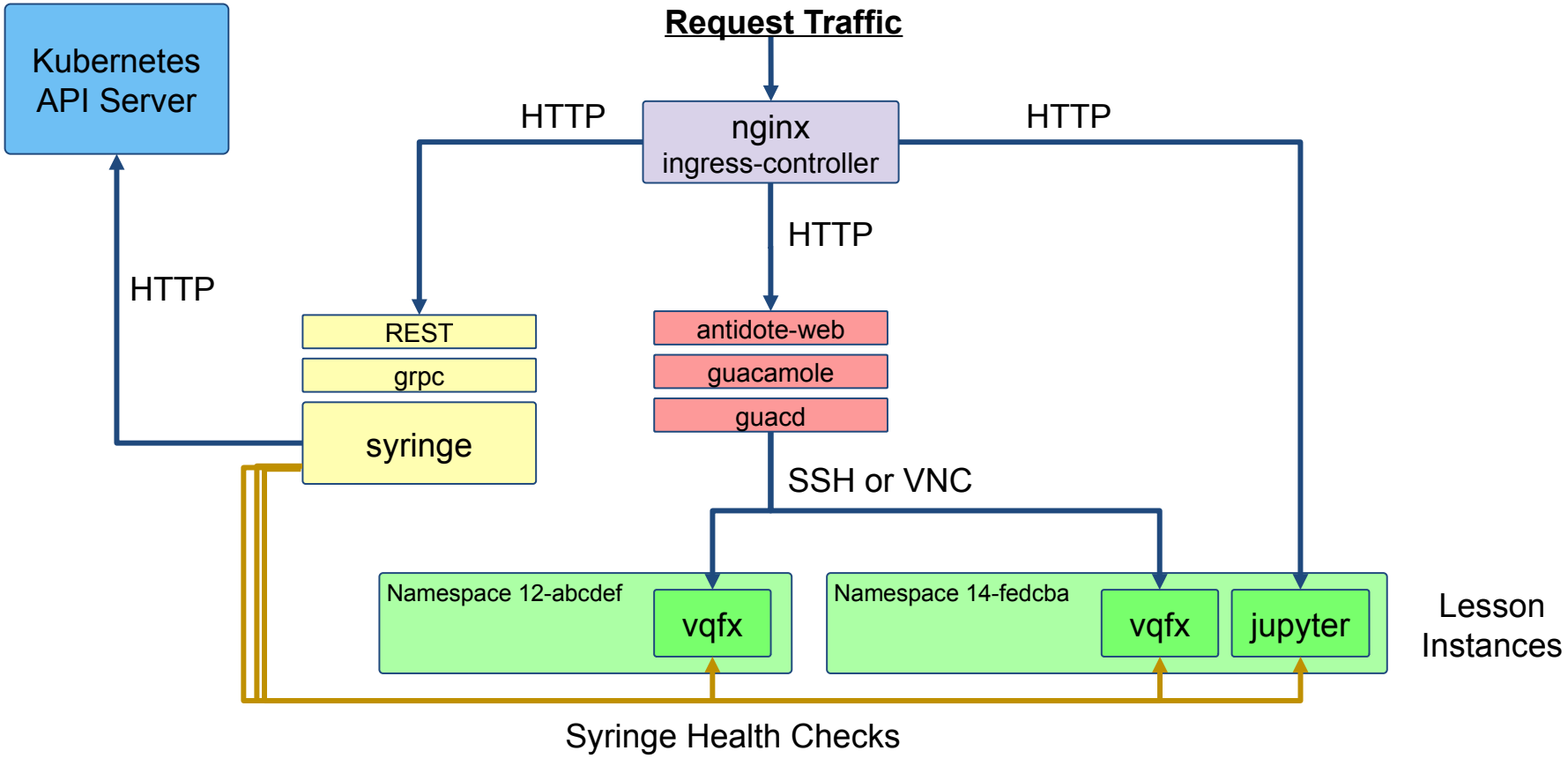


Image Catalog

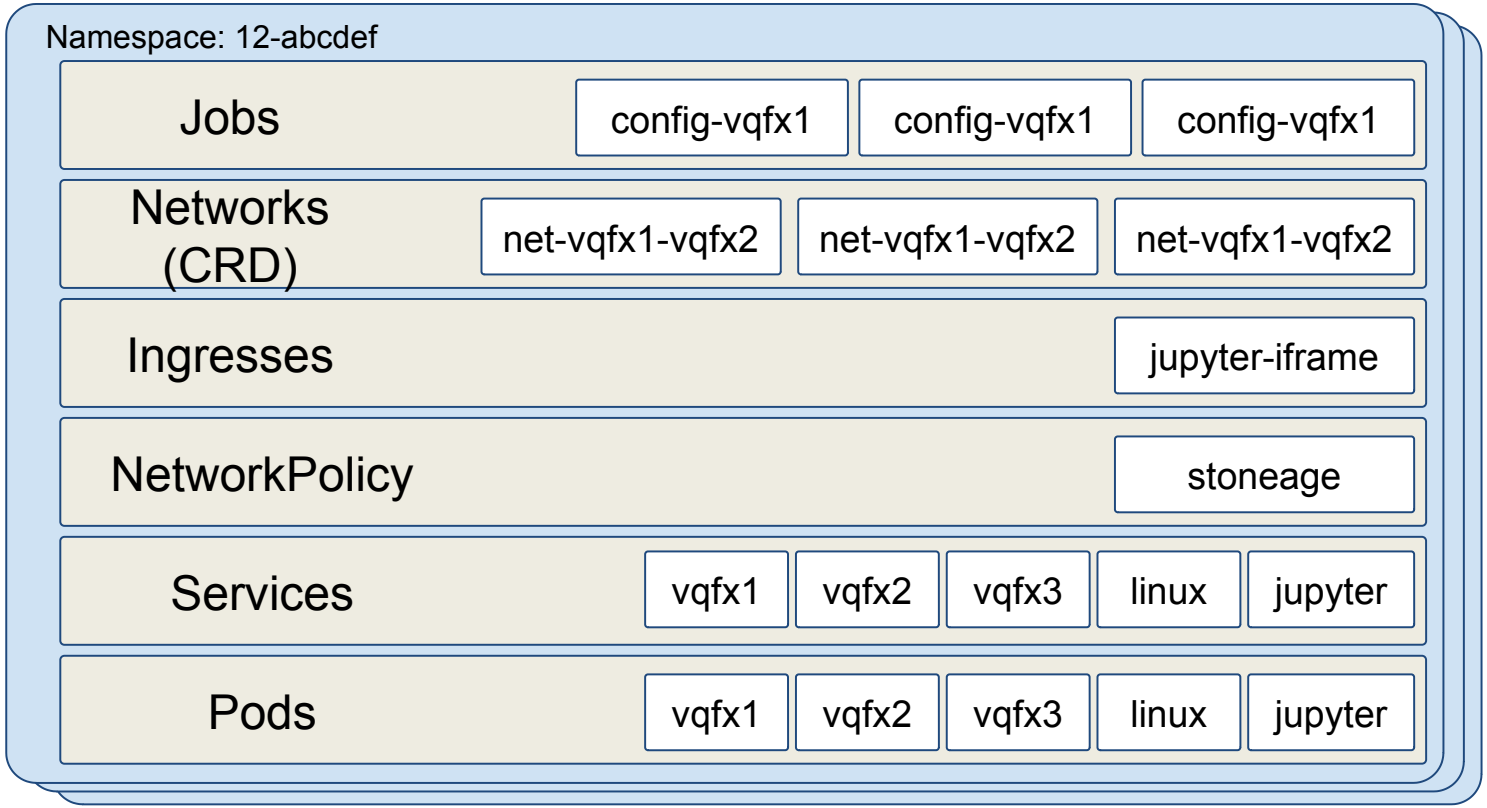
Current
- vQFX
- vMX
- Cumulus VX

Soon
- VyOS
- ExtremeXOS

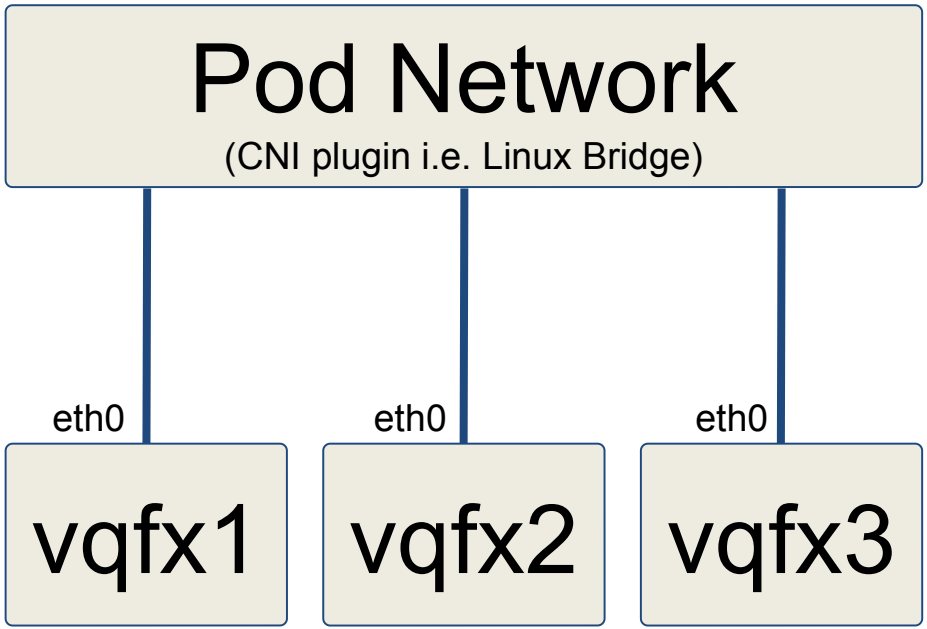
Antidote as Deployed in Kubernetes



Anatomy of a Lesson



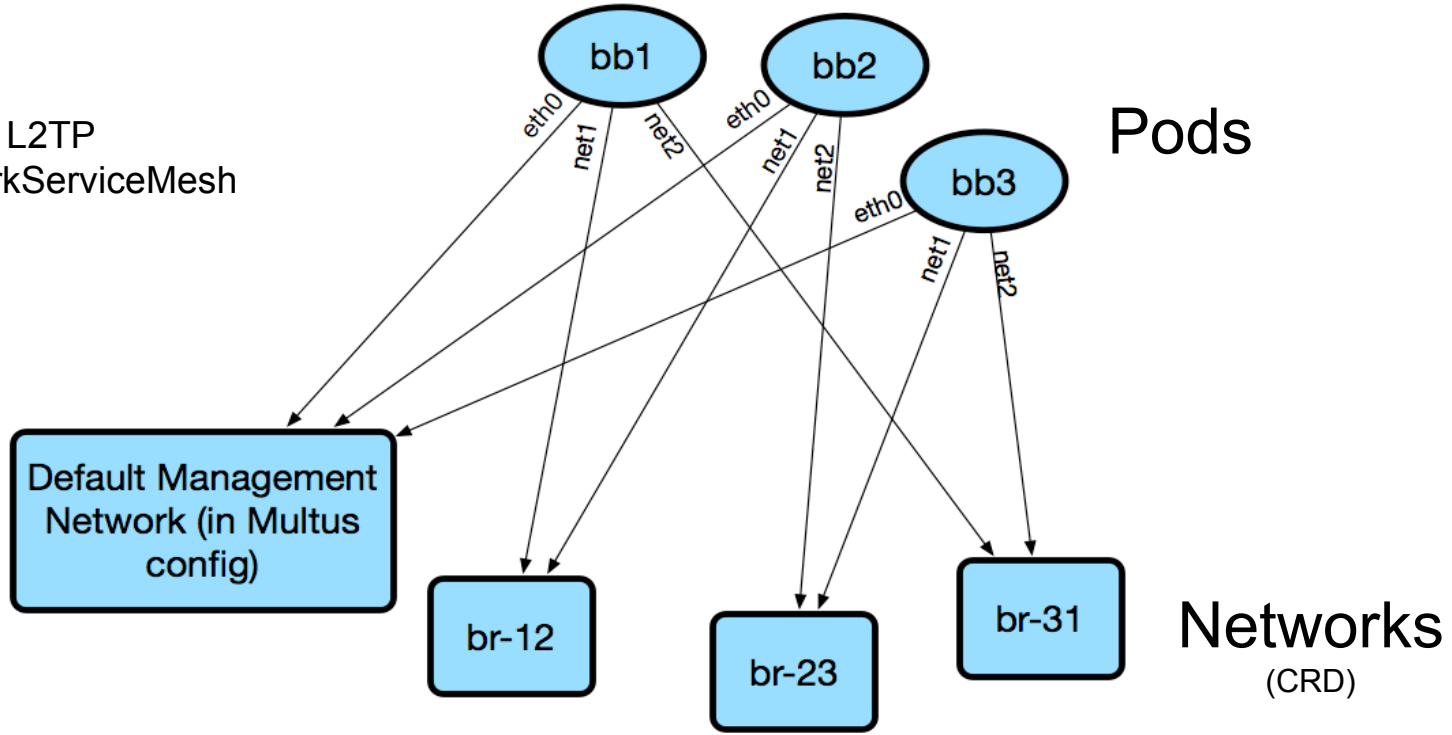
Normal Kubernetes Pod Networking



Using Multus for Advanced Network Topologies

Alternatives:

- QEMU L2TP
- NetworkServiceMesh



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

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?

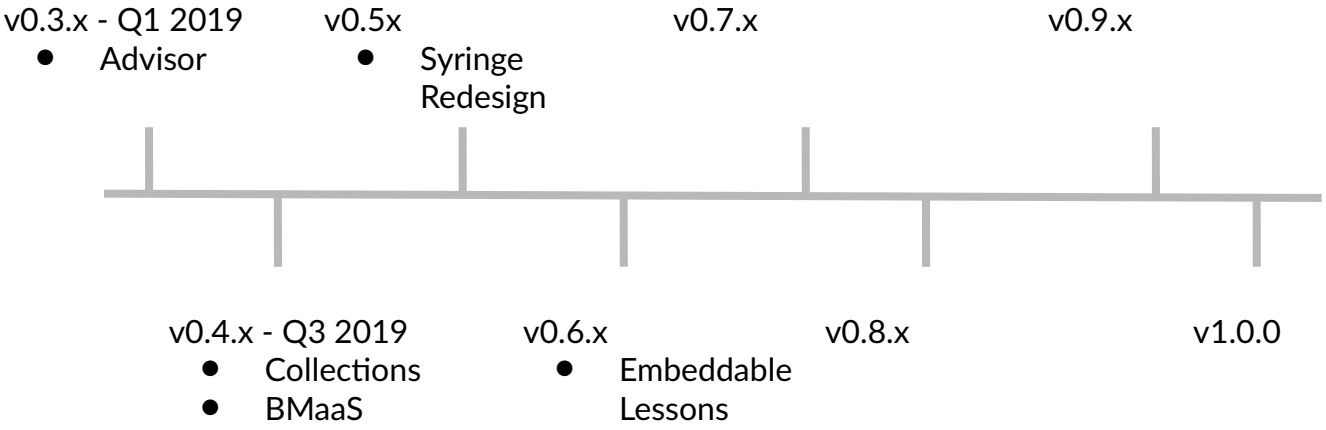
NRE LABS

Annex...

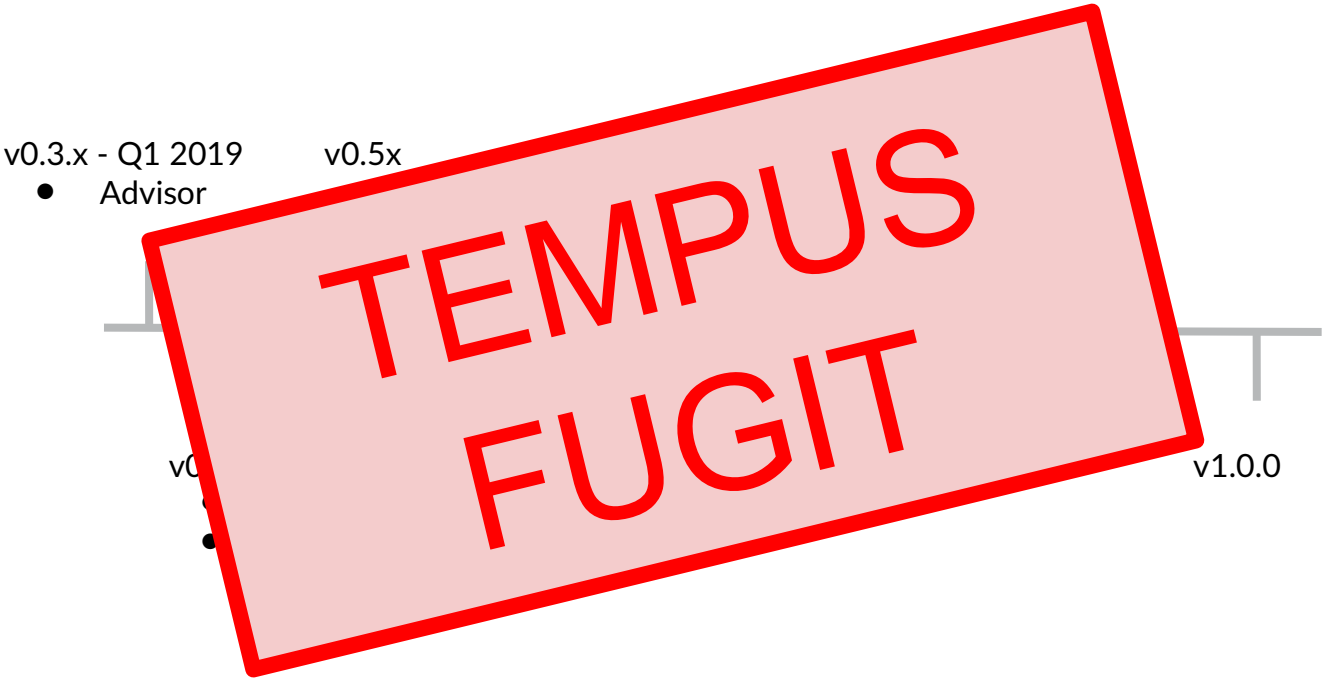
The Road to v1.0

NRE LABS

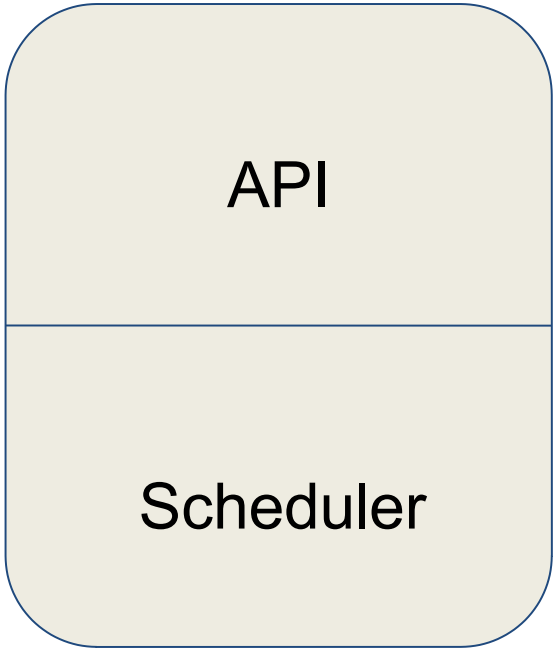
The Road to v1.0



The Road to v1.0



Current Syringe Architecture



Single Process - “syringed”

Advantages:

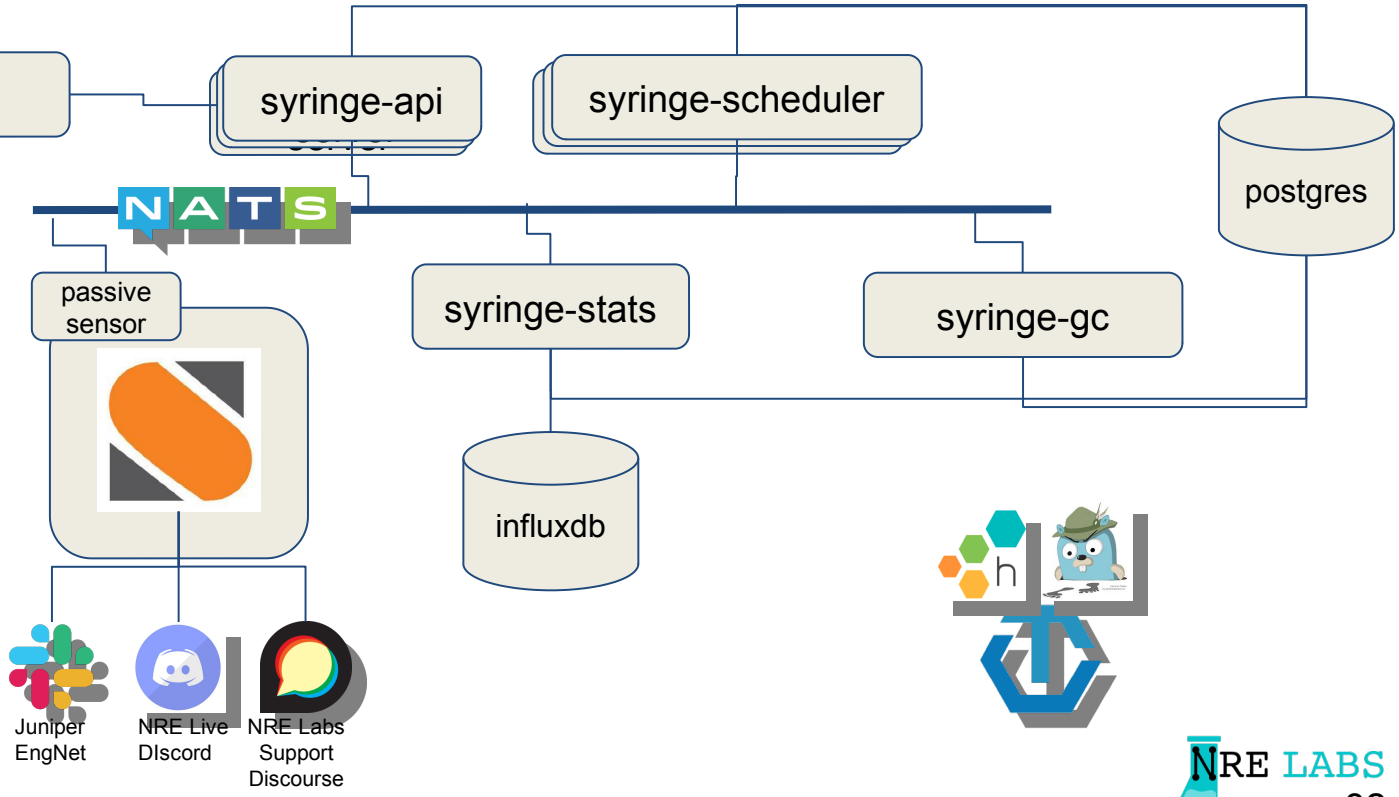
- Single binary
- No external database to worry about
- Allowed us to get NRE Labs public quick

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

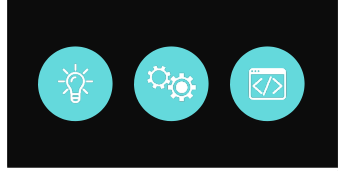
- Better resilience - no “one syringe”
- Easier to extend - just pop a new service on the message bus
- Easier to reason about, maintain, and contribute to individual services



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