# Navigating Automata

Without a map

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# What starts as frustration, will either kill you or turn into something

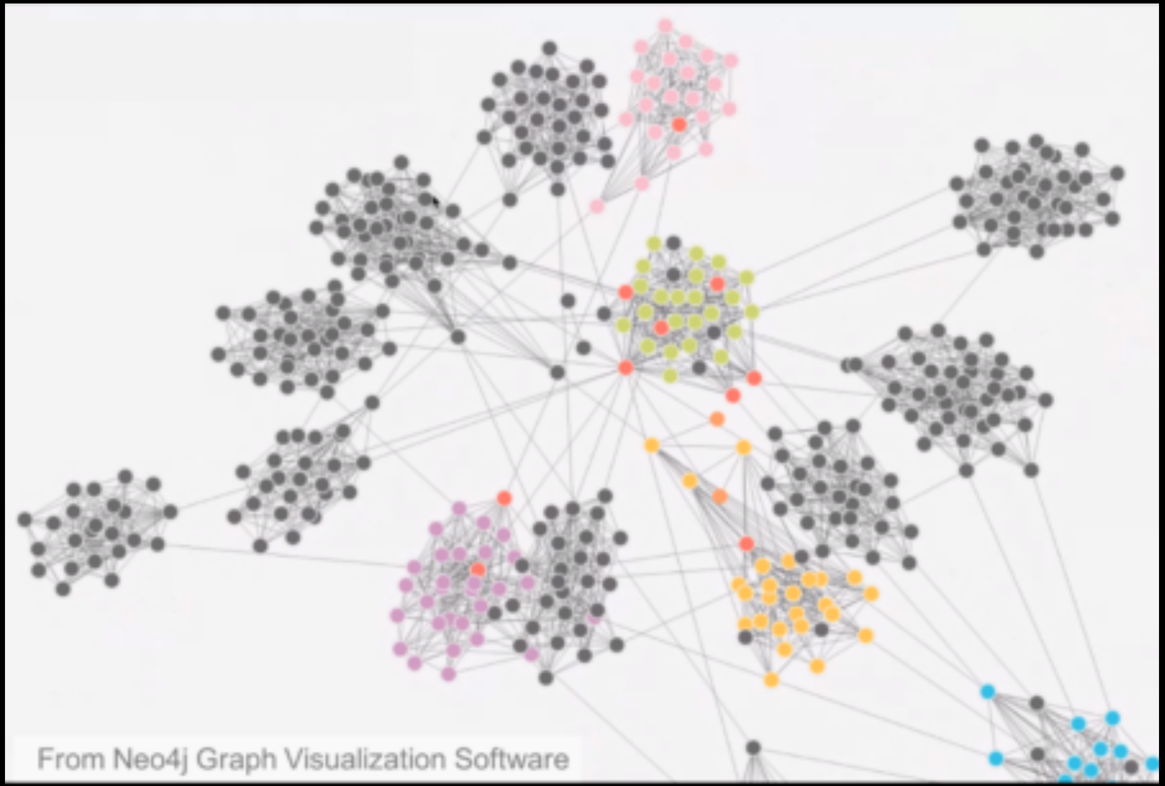
**Networking – is a graph**

Everything in networking is a graph

Graphs are everywhere in networking.

Everywhere, there are graphs in networking…I'll stop now…

Automation is ultimately a labelled transition system (graph) that allows us to model things like finite state machines. We call these things stateful **workflows** :s



From Neo4j Graph Visualization Software

# What starts as frustration, will either kill you or turn into something (right?)

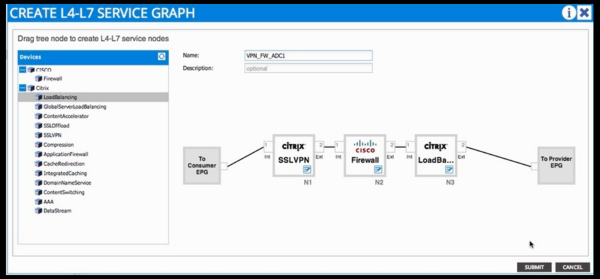
## Workflows: Directed Acyclic Graphs (sorry)

Workflows are your **map** to your intended moment in time desired state.

*- End-state is never a thing; networks are without an ‘end-state’*

**Workflows** mechanized, come in two distinct flavours:

- Productized automation like ACI and Contrail (do graph things)
- Generic workflow engine (graph engine)



CREATE L4-L7 SERVICE GRAPH

Drag tree node to create L4-L7 service nodes

Name: VPN_FW_ADC1

Description: optional

**The frustration**: Workflow (graphs) that react to external impulses (graph) to mutate network (graph) state (graph)…**can you guess what they need?**

# Where are we as an industry?

## Automate the keyboard

- First generate config
- Throw it at box
- Hope for the best

ANSIBLE

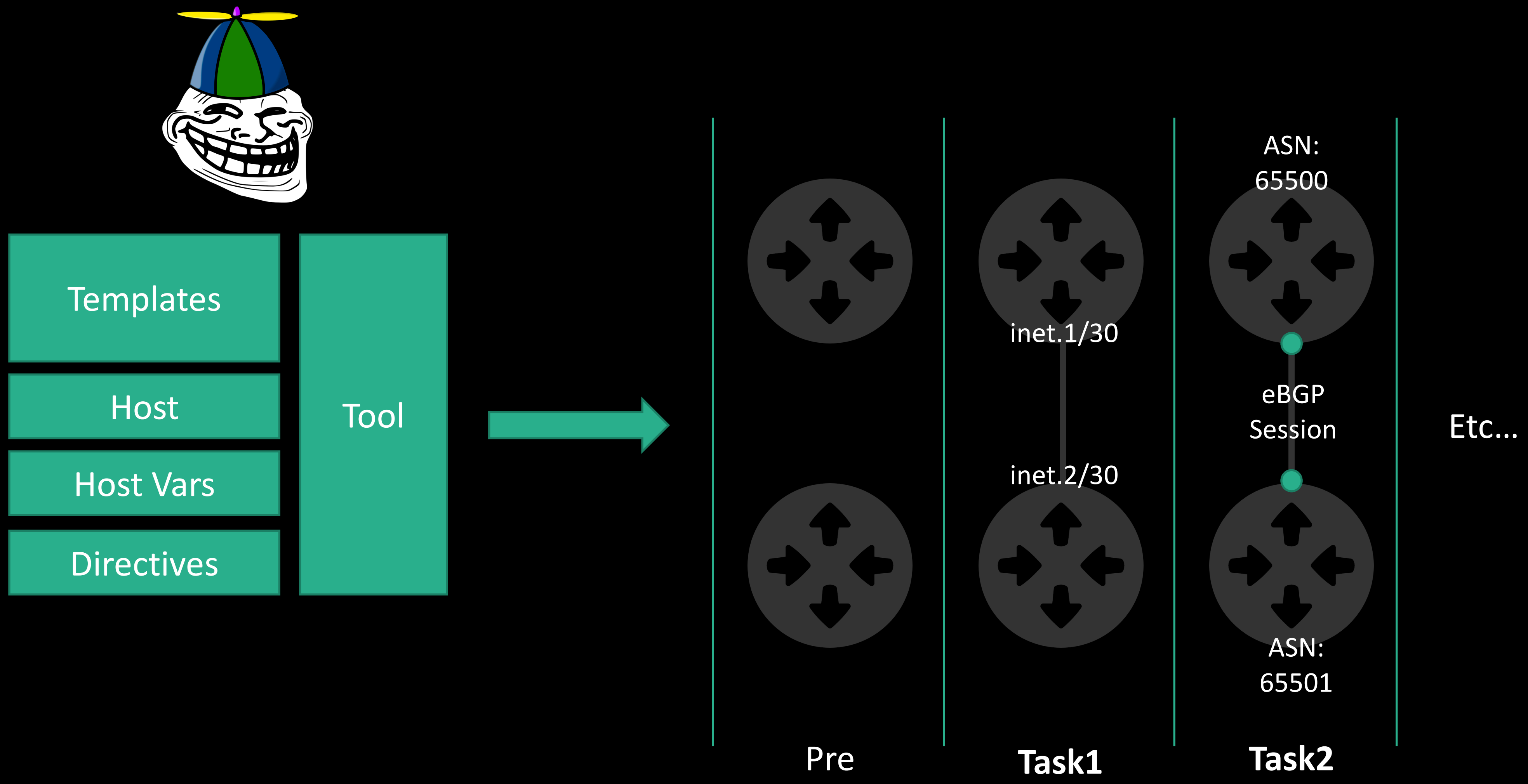
Separation of host variables from input, then render via actuation…

## Then came unit tests

- But what if we test first for pre-state and potential collisions…like a human does?
- Then what if we check for post state to make sure the management plane is in the state we want?

Keyword tests for cfg & ops (if you’re skilled enough to use Robot)

# Where are we as an industry?



Templates

Host

Host Vars

Directives

Tool

Pre

Task1

inet.1/30

inet.2/30

Task2

ASN: 65500

eBGP Session

ASN: 65501

Etc…

# Where are we as an industry?

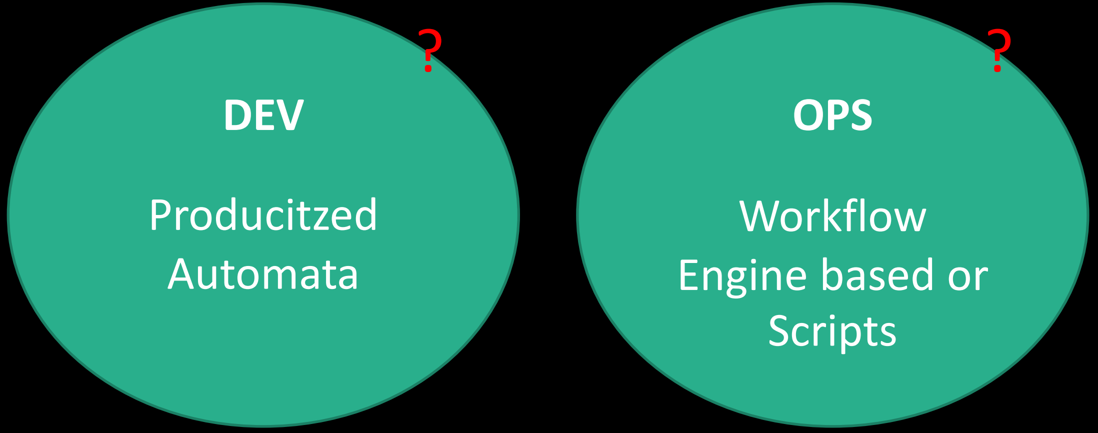
**Explosion of automation**

Ansible, RunDeck, Salt, Puppet, Chef, StackStorm, StableNet, Apstra, Tungsten Fabric – all human based ☹

**If we use these for networking, do you KNOW WHAT'S MISSING?**

You guessed it…a b***dy graph

# Where are we as an industry?



**DEV**

Producitzed Automata

?

**OPS**

Workflow Engine based or Scripts

?

Every tool is “heroic”, in its own special snowflake way

The industry is still trying to make DevOps fit bottom-up  (blast radius 1)

# Where are we as an industry?

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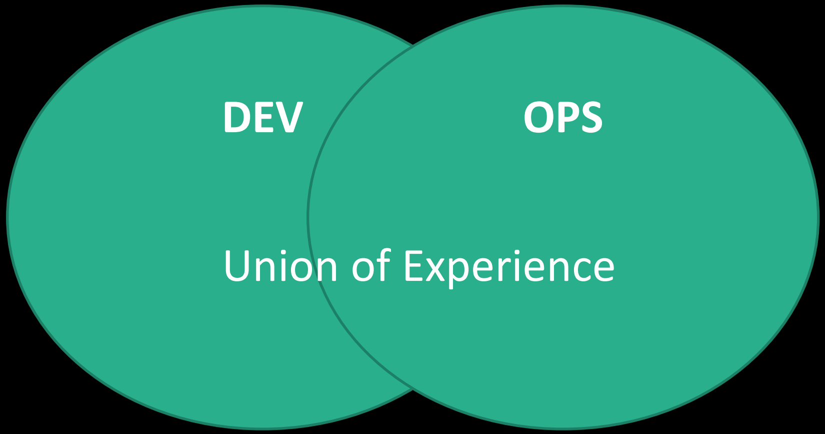
The Panacea

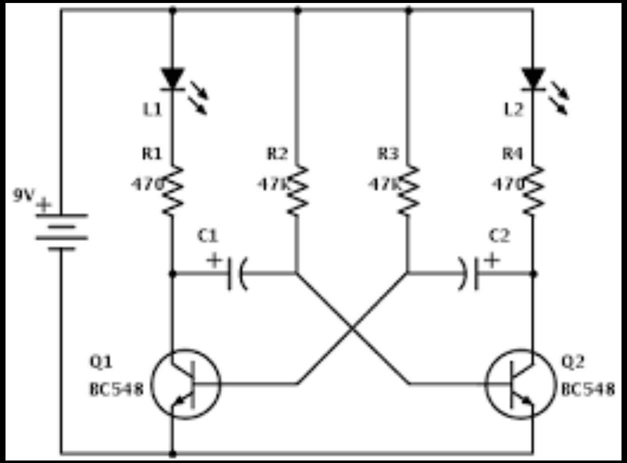


Every tool is “heroic”, in its own special snowflake way

The industry is still trying to make DevOps fit bottom-up (blast radius 1)

There is a blackhole in the middle of every automation system sucking the life out of possibility (and my soul)

# Where are we as an industry?



Network Control

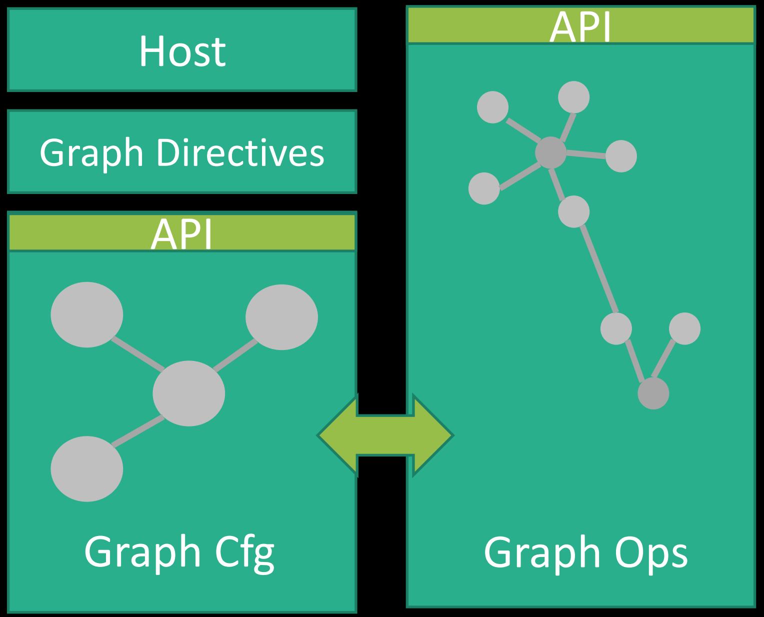
>>>

We shall use a tool.

The kingdom shall rejoice and pay many taxes.

- We don’t design, nor model and rarely verify
- We don’t have a formal language (even structured programming ~70yrs old now)
- Python/Ansible blinding the industry
- Automata is more complex than if-else statements

# Where could we be?



Host

Graph Directives

API

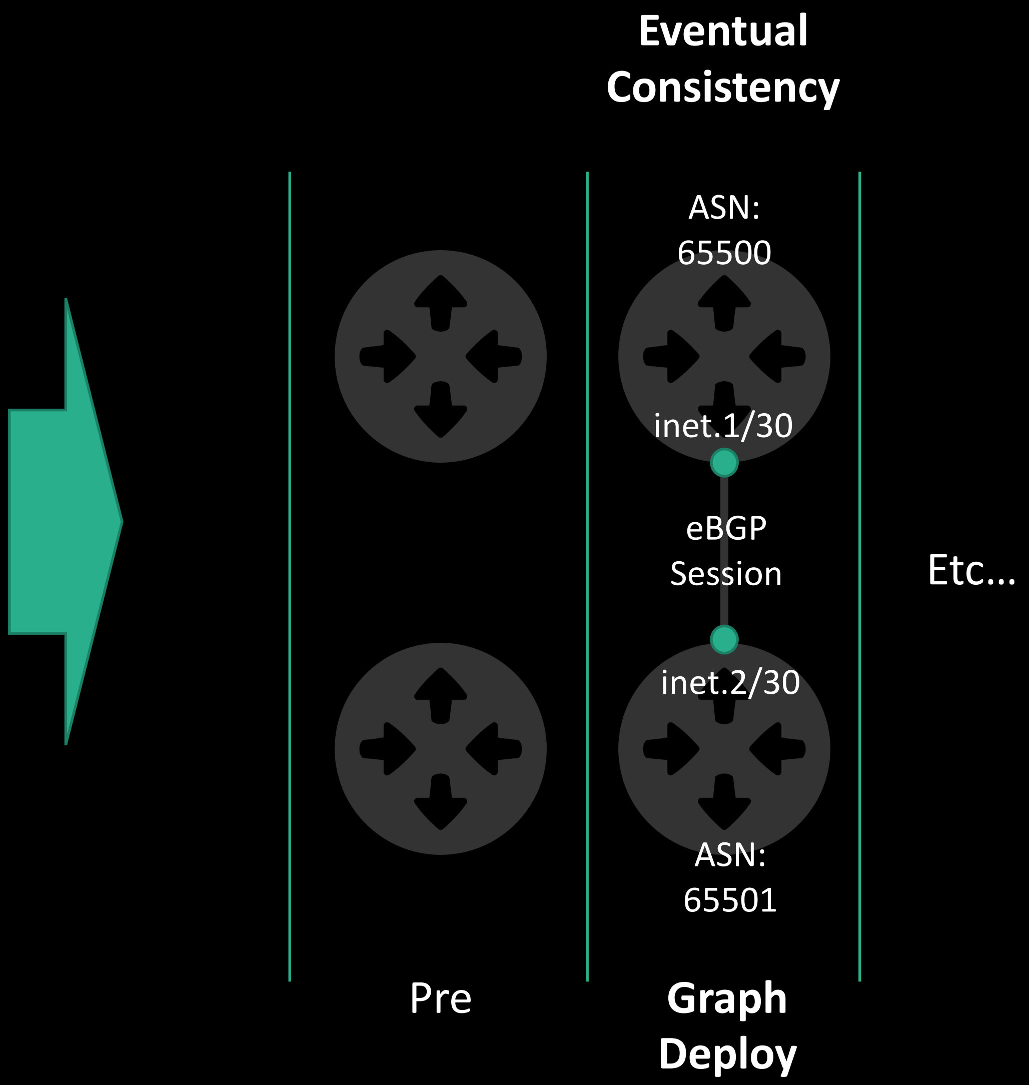
Graph Cfg

API

Graph Ops

Declarative
Ordered
Atomic

Physical / Cabling / Logical
Constant Discovery
Absolute Knowledge
Handles Dynamism
**DNA System**



**Eventual Consistency**

ASN: 65500

inet.1/30

eBGP Session

inet.2/30

ASN: 65501

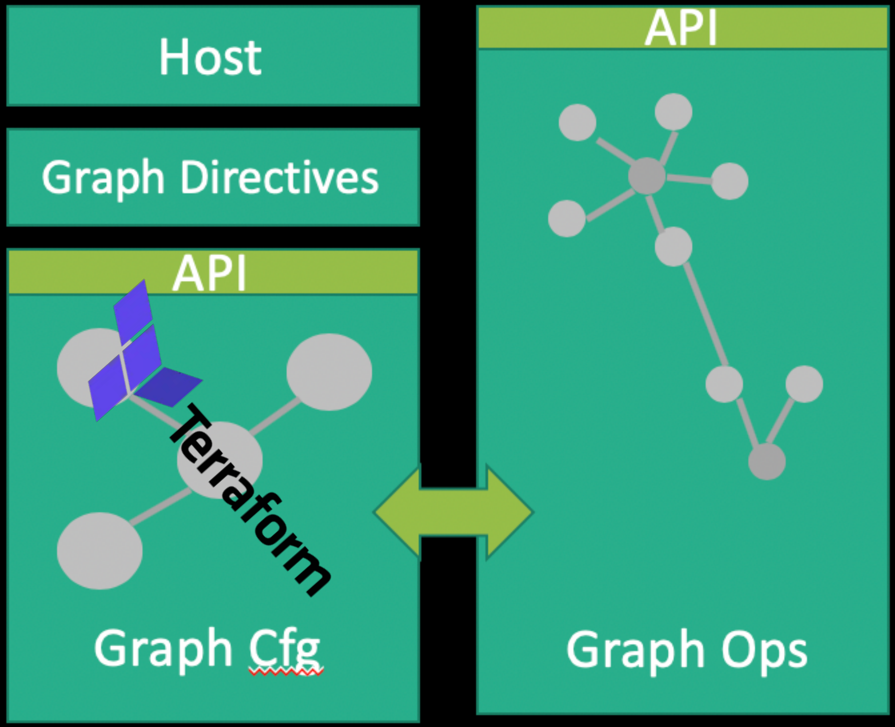
Etc…

Pre

**Graph Deploy**

# What I’m trying to do about it at Juniper

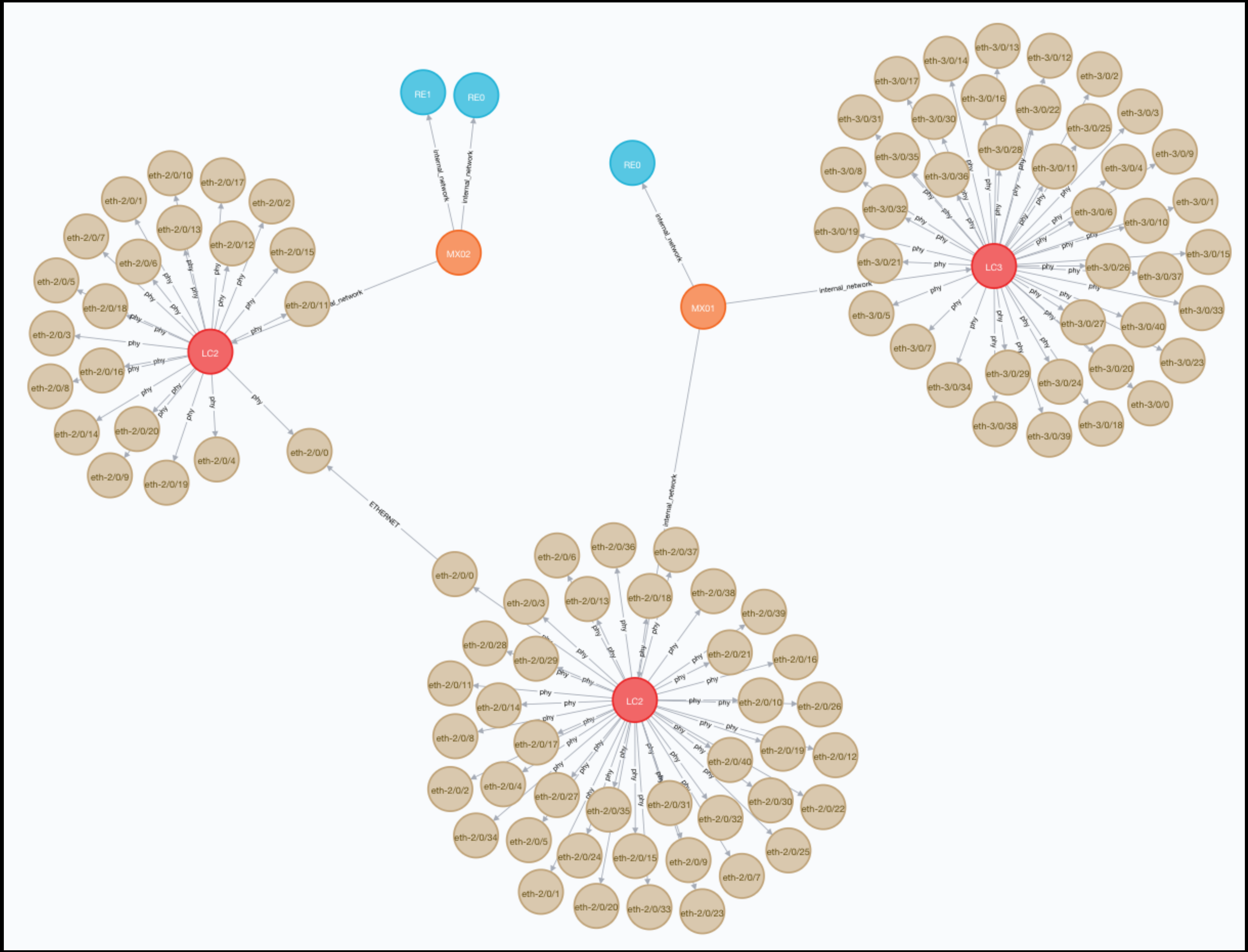
1. **Release Terraform Providers for Junos that are generated from YANG (graph) models**
2. **Terraform has a graph engine for configuration changes, that deals with CRUD (properly)**
3. **Build or open source a graph ops engine**



Super early experimental work, but showing promise.

Build on Neo4j, with Go, GPB and NATS to glue things together.

Will hopefully come back in the future with more info and a demo!



# Thank you!

(Hopefully not too ranty)