The Chicken or the Egg

*Or.. how we created a **Stable** Preprod Environment as a Public Cloud Provider*

$(whoami)
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- 8y at Linode, acquired by Akamai
- Philadelphia Native
- Held various roles and worked on almost every product
- US Lead of *In Reach* ERG
- Current Tech Lead of Virtualization and Host Platforms Team
- Engineer, runner, hiker, DIYer enthusiast, musician, birder, Auntie
- Cat Mom

Why am I here today?

Everyone has a story to tell, and sometimes it needs to be shared with the world...

Overview: The Problem

- Prior Test Datacenter Limitations
  - Reliability issues
  - Support “best effort” since there was no dedicated team
  - Not isolated completely from production
  - Only useful to a handful of Python application teams
  - SRE, Ops, Hardware had no safe place to test
- We needed a shared place to test real world changes
- Little precedent in the industry

The Journey

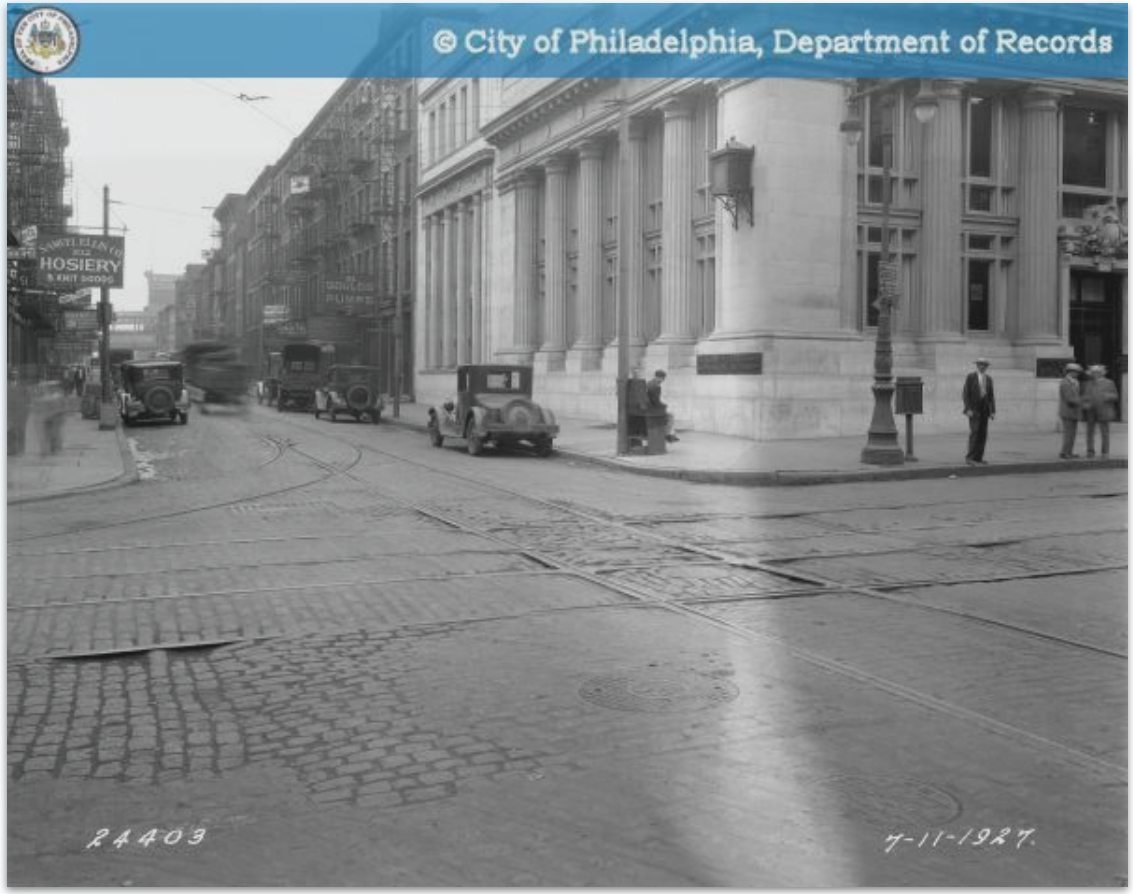
- **Overview**
- Building an Internal Testcloud
- First Customers
- Wins and Lessons Learned

First, Some History

- Cloud Company acquired by large public CDN company to be the branch into the compute business
- Had to scale very quickly!

Overview: History

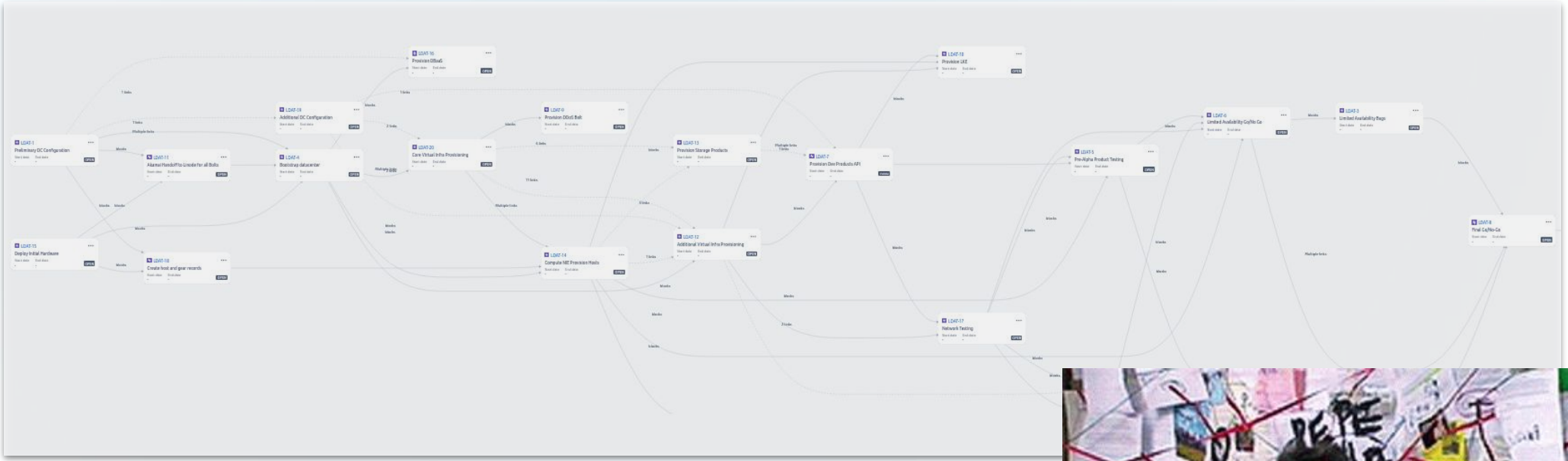
- 1.5y post-acquisition beginning of Testcloud project
- Year prior we deployed 13 datacenters
  - Doubled our compute footprint
- Many “chicken and egg” problems to solve
- Order of operations challenges



Overview: History

- Eliminated manual tasks and built into Terraform
- Various scaling Platform challenges
- Created process *Linode Datacenter Automation Template* “LDAT” and controlled through a standardized set of tasks that mapped linear dependencies
  - Allowed us to see
    - what could be run in parallel
    - what needed to be automated
  - Hacking Jira to use as a “relational database” for a pure “waterfall” Hardware project

Overview: Dependencies have Dependencies



Overview: Constraints

- Very small core team (6)
- Mix of SRE and Dev with various backgrounds and degrees of understanding of the stack
- Nothing inherited from production (total isolation)
- No sharing of resources from production

Overview: Requirements

- Replace and deprecate existing Test Datacenter
- Adapt to new version of our network stack
- Deployed in a private RFC1918 IP space within Akamai’s lab network

Overview: Requirements

- Simulate a realistic “load” of an actual Datacenter
- Test various parts of the stack in shared environment from Hardware to Software
- Stack to be “stable” as well as the main point for “real” integration
- **Need to maintain parity**

… so just make a cloud from scratch

The Journey

- Overview
- **Building an Internal Testcloud**
- First Customers
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Building an Internal Testcloud

- Definitions
  - Hypervisor - runs groups of virtual machines
  - Host - Runs the Hypervisor
  - VM - virtual machine or guest machine
  - Linode - VM as a product (what we sell)
  - Network - Network topology
  - System Classes - collection of servers that make up a system
  - Terraform - tool to orchestrate deployment of VMs
  - Ansible - tool to configure VMs
  - Salt (saltstack) - tool to configure VMs

Building an Internal Testcloud: salt-pillar

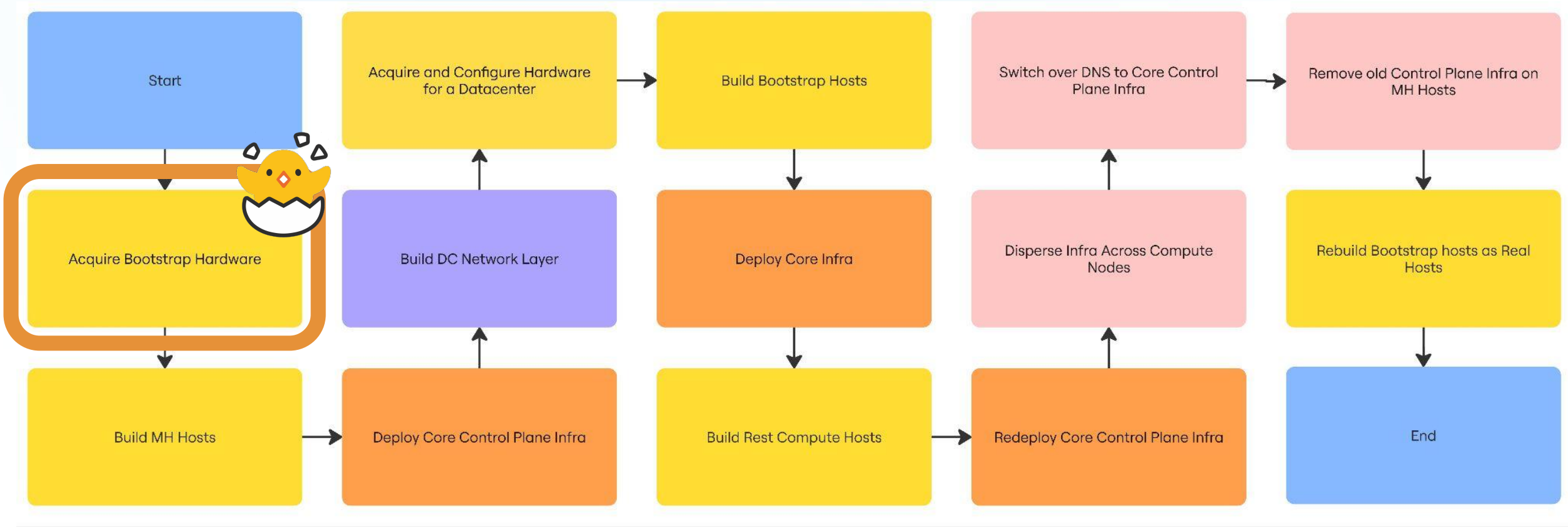
```
## packages.sls
bind:
    package-name: bind
    version: 9.16.1-0.1
    port: 53
    listen-on: any

## override.sls
bind:
    version: latest
```

```
$ salt-call pillar.get bind
local:
    ----------
    bind:
        ----------
        listen-on:
            any
        package-name:
            bind
        port:
            53
        version:
            latest
```

Building an Internal Testcloud: salt-states

```
bind_package:
  pkg.installed:
    - name: {{ salt['pillar.get']('bind:package-name', 'bind9') }}
    - version: {{ salt['pillar.get']('bind:version', 'latest') }}
```

Building an Internal Testcloud: Double Bootstrap



Building an Internal Testcloud

Lab Network

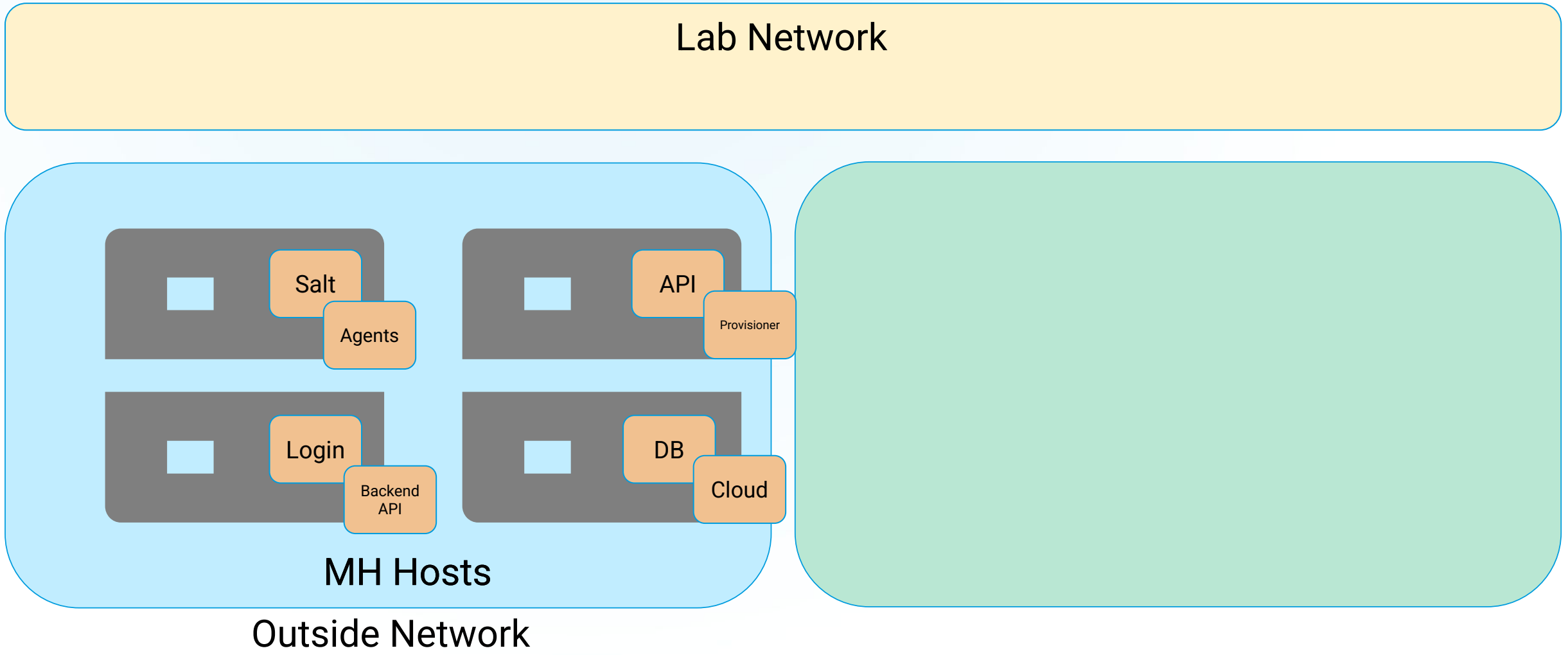
MH Hosts

Outside Network

Building an Internal Testcloud: testcloud-ansible

- Targeted a VM by regex and static IP address that was defined in our inventories
  - Libvirt VM or Vagrant VM
- Core system classes Salt and Vault
  - Vault: added environments where for each secret to create placeholders
  - Salt: not good at installing salt
  - DB was first
- Once we had these, all other systems we could “just highstate” (if the vault and db information were correct, which took time)

Building an Internal Testcloud



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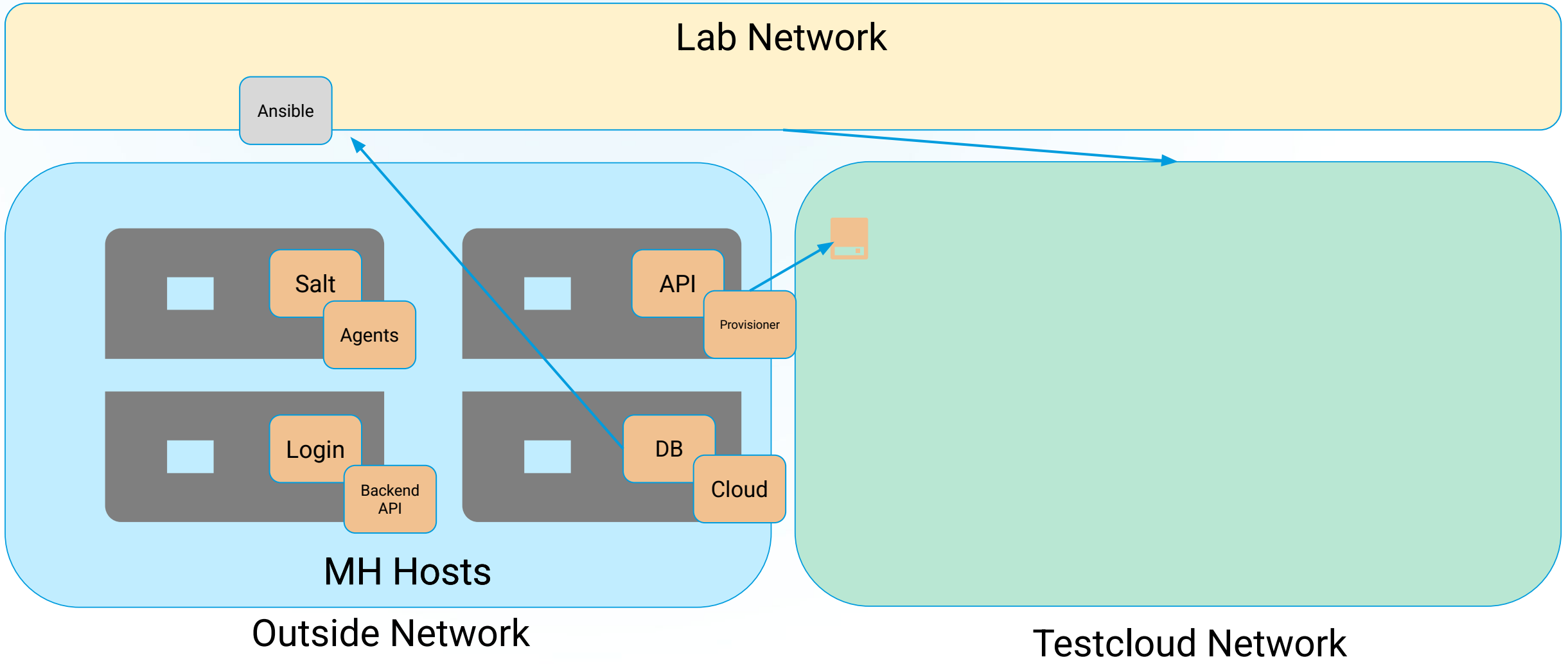

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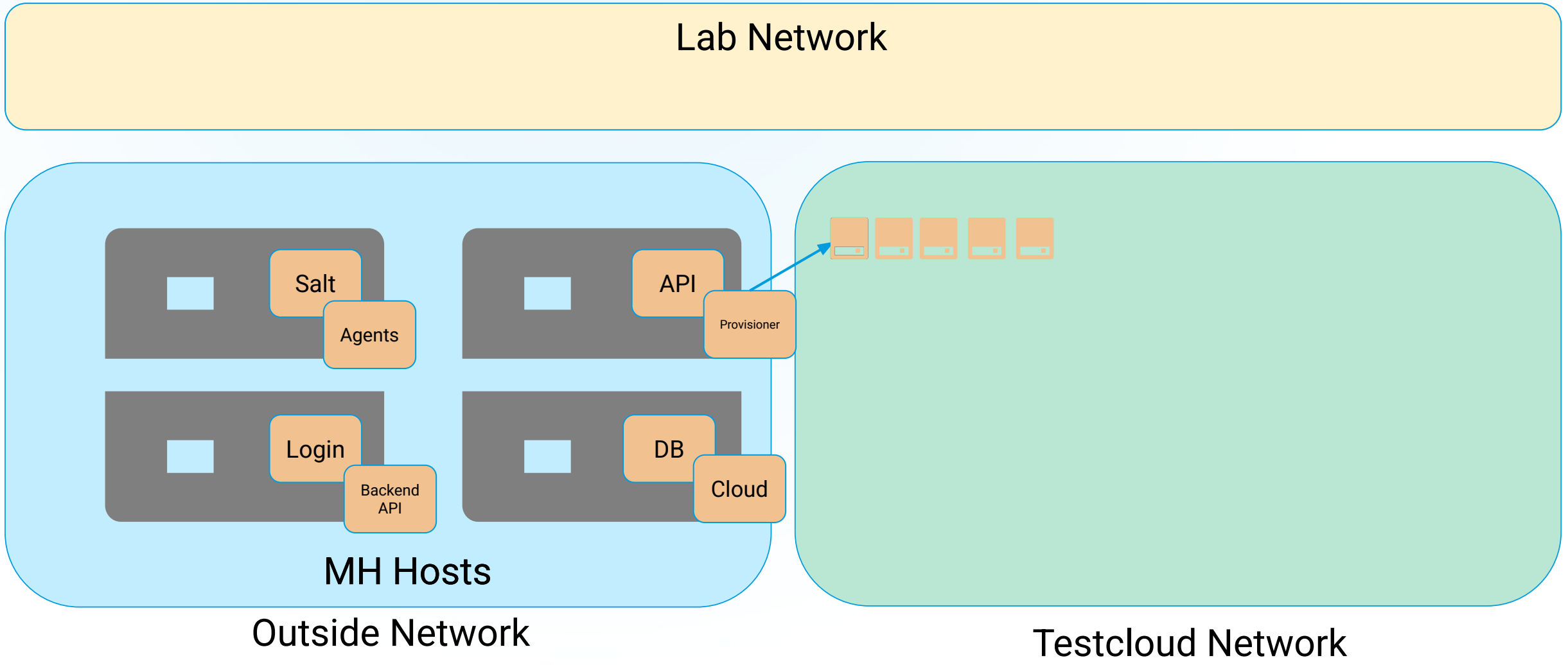
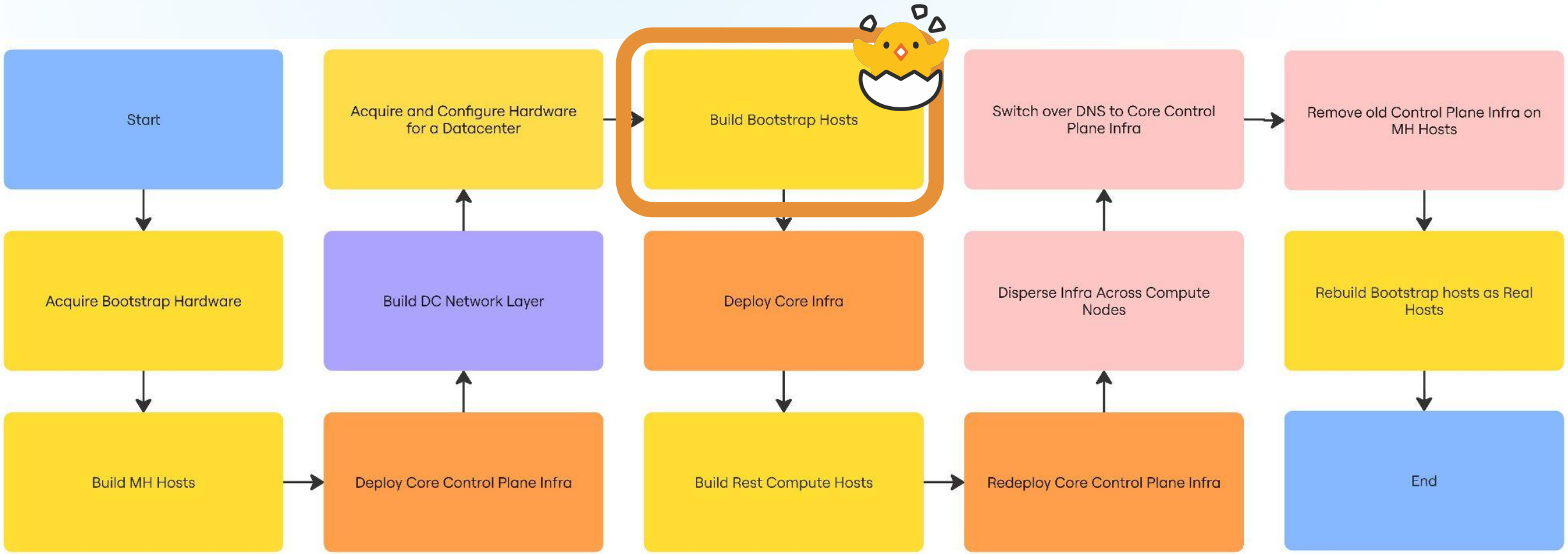
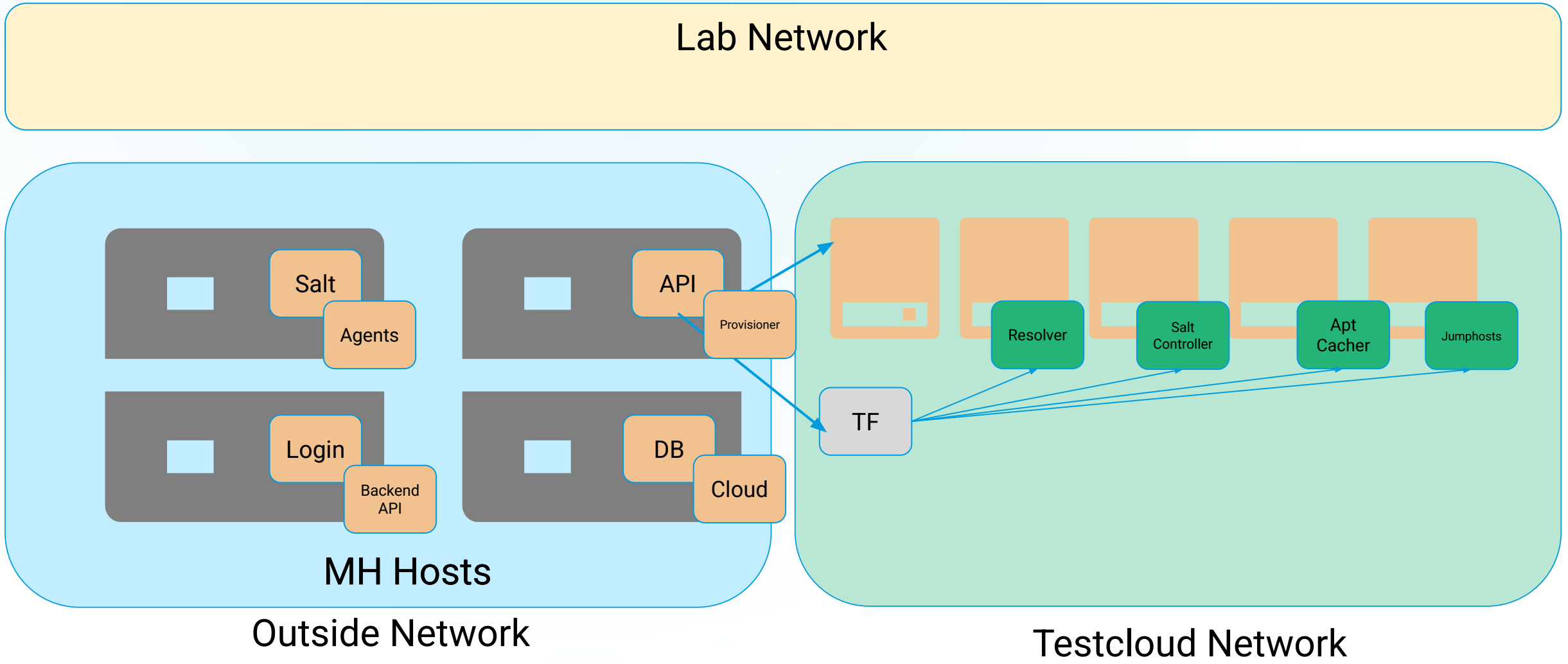


Building an Internal Testcloud



Building an Internal Testcloud

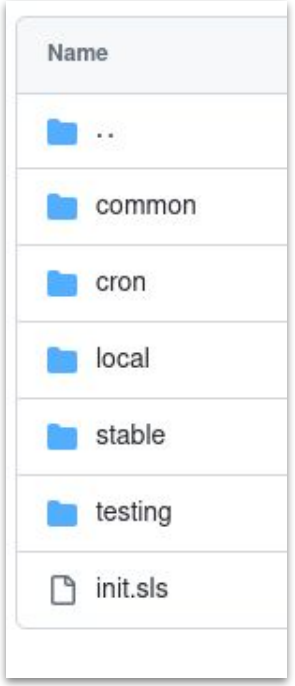


Building an Internal Testcloud: terraform-module-infra

- Internal client of our Linode Terraform Provider (TMI)
- Custom Modules that enforces standards
  - Creates DNS via Edge DNS API / Provider
  - Static networking where needed
  - Custom human-friendly DNS
  - Installation of Salt and grains for DC information
  - Baseline SSH configs and other sec hardening
  - Leverage Linode Tags for things like monitoring, etc
  - Consistent naming convention

Building an Internal Testcloud: salt-pillar

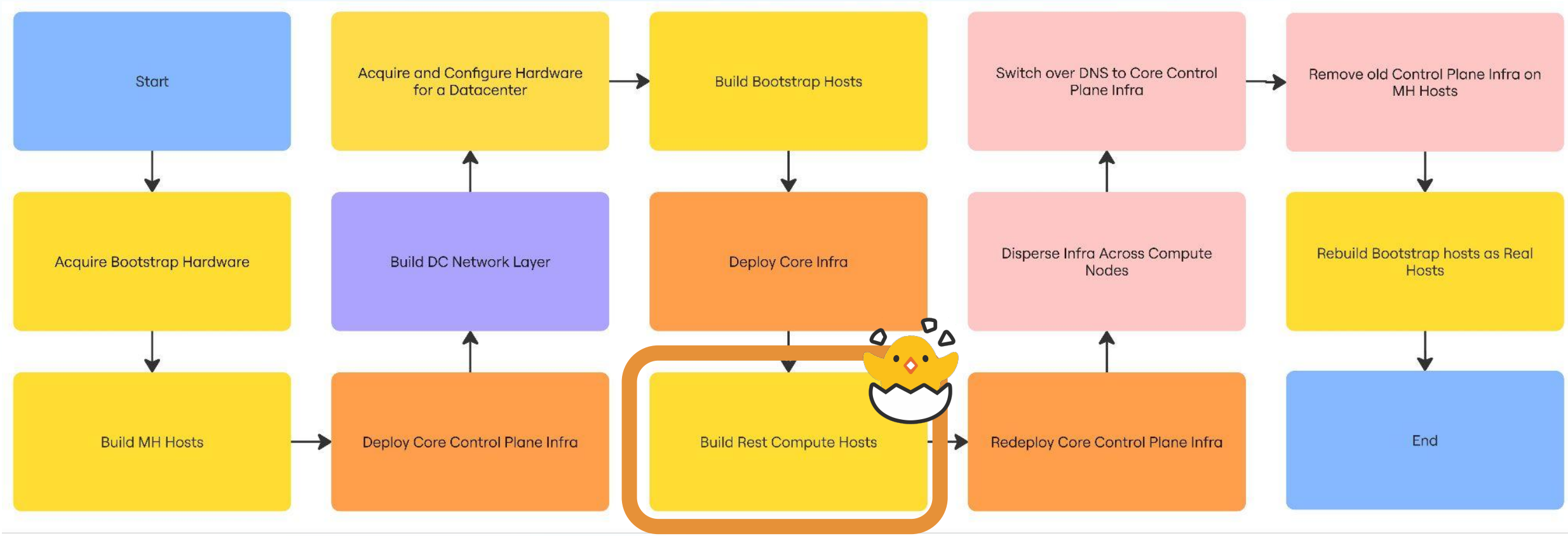
- How to make our configs DRY but keep things isolated?
  - Driven by grains set by an internal module that sets DC specific information
  - Layered pillar (prod as the base + layered lower env on top)
    - separate Vault but same paths or pillar rendering issues
  - Unexpected pillar merging issues
  - Issues like if the key is present but empty, salt will fail or other
  - Lists vs. dictionaries merging
  - Confusing order of operations for deploying net-new systems to Testcloud




```
{% set environment = grains.get('linode', {}).get('environment', 'stable') %}

include:
  - override.login.common
  - override.login.{{ environment }}
```

Building an Internal Testcloud



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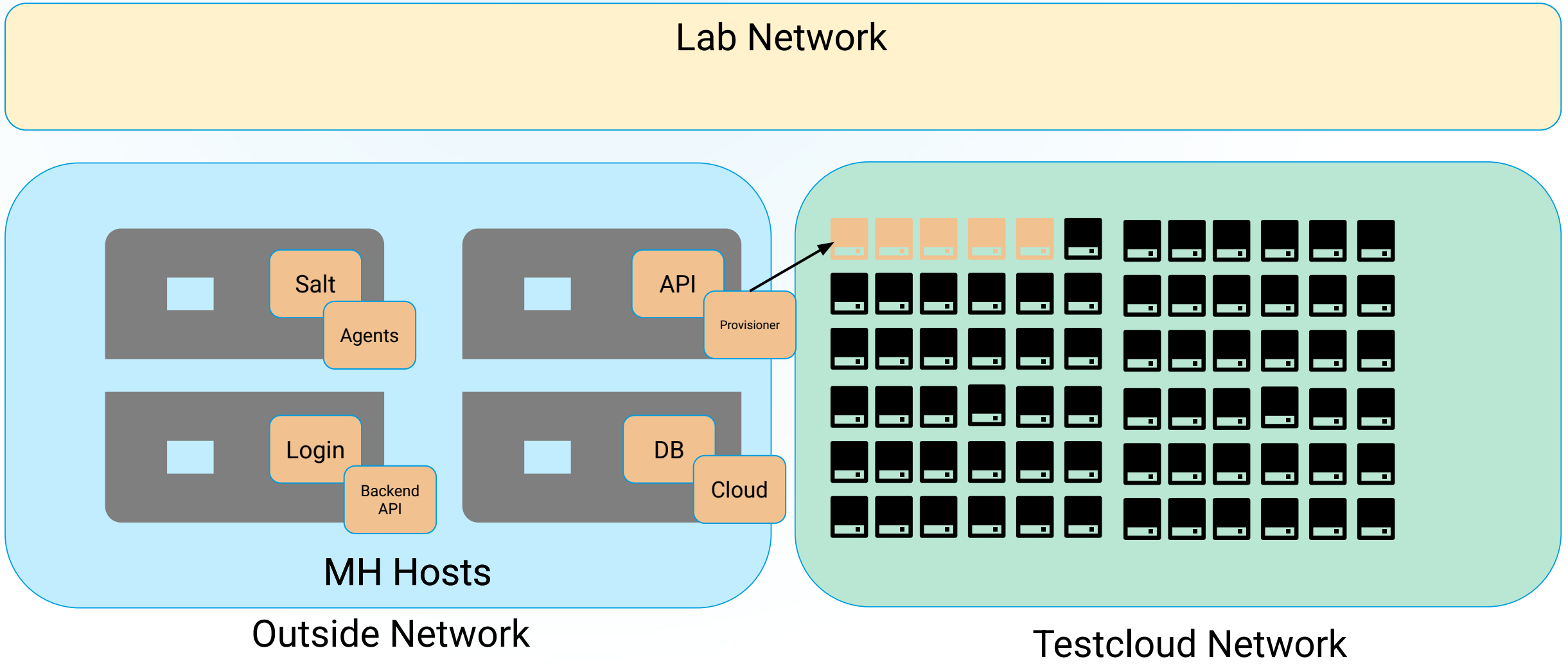

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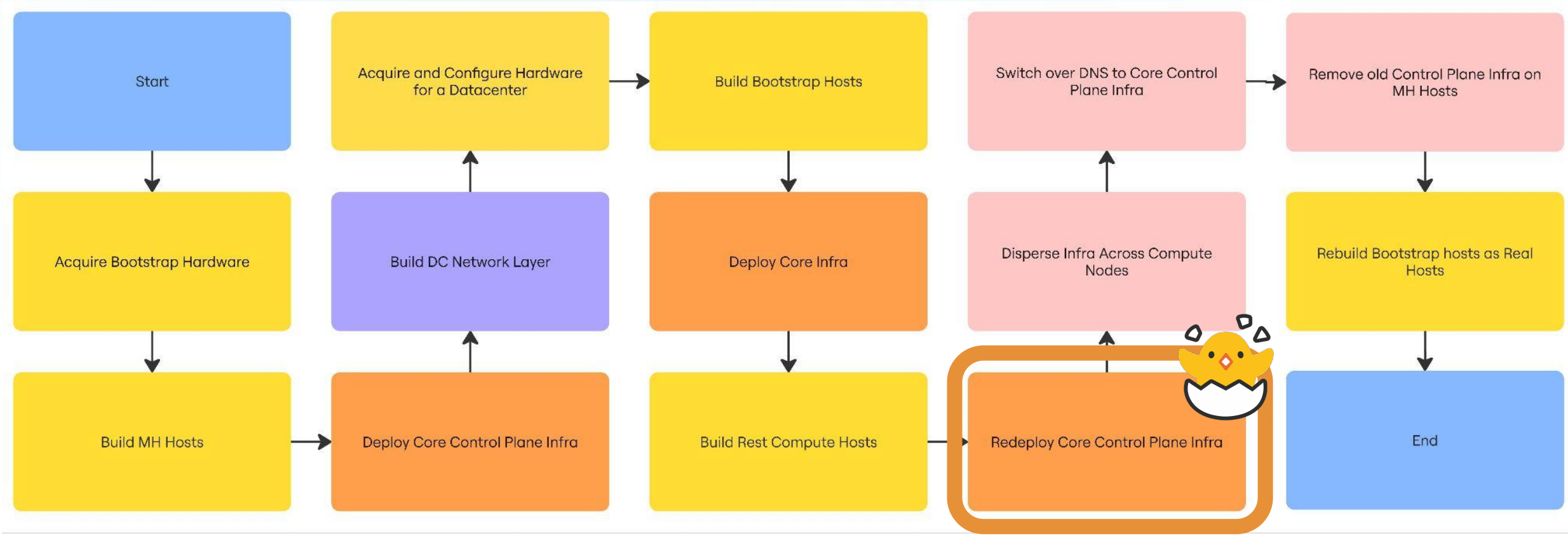

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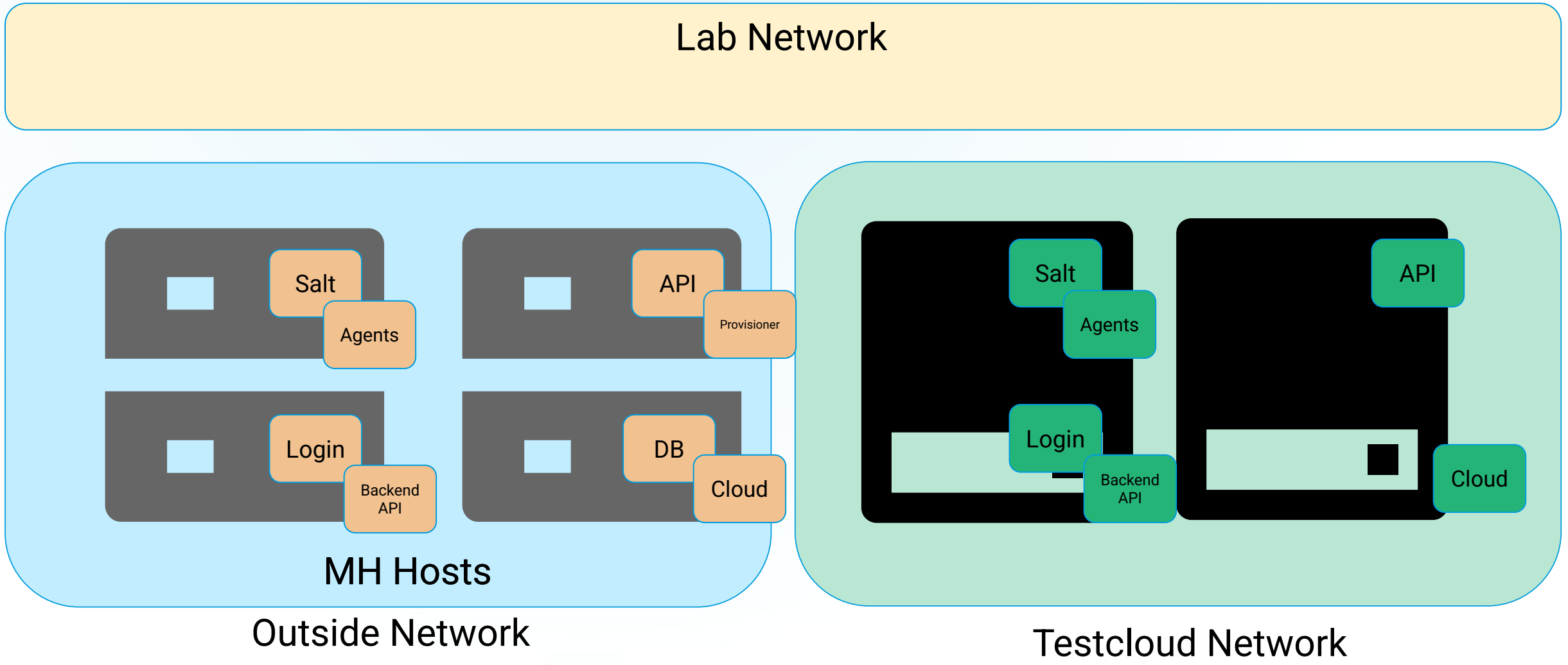

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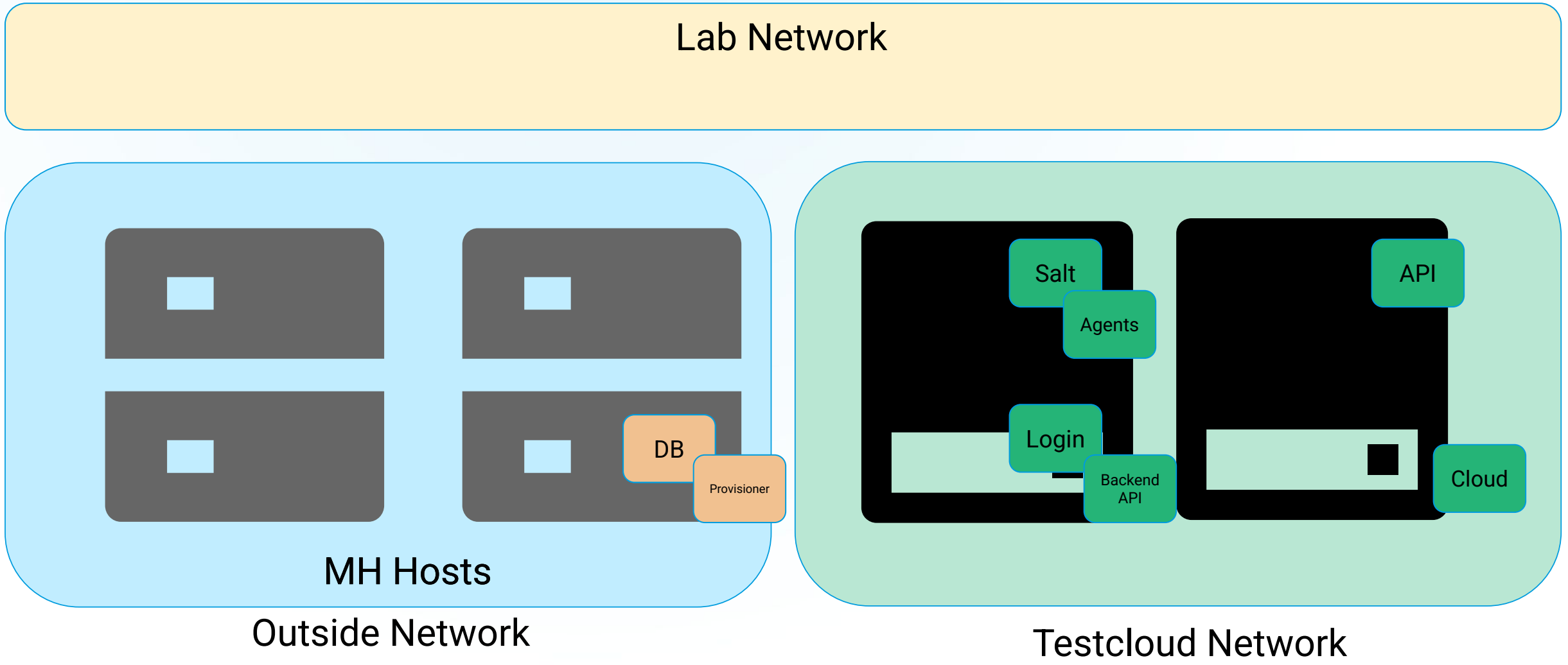
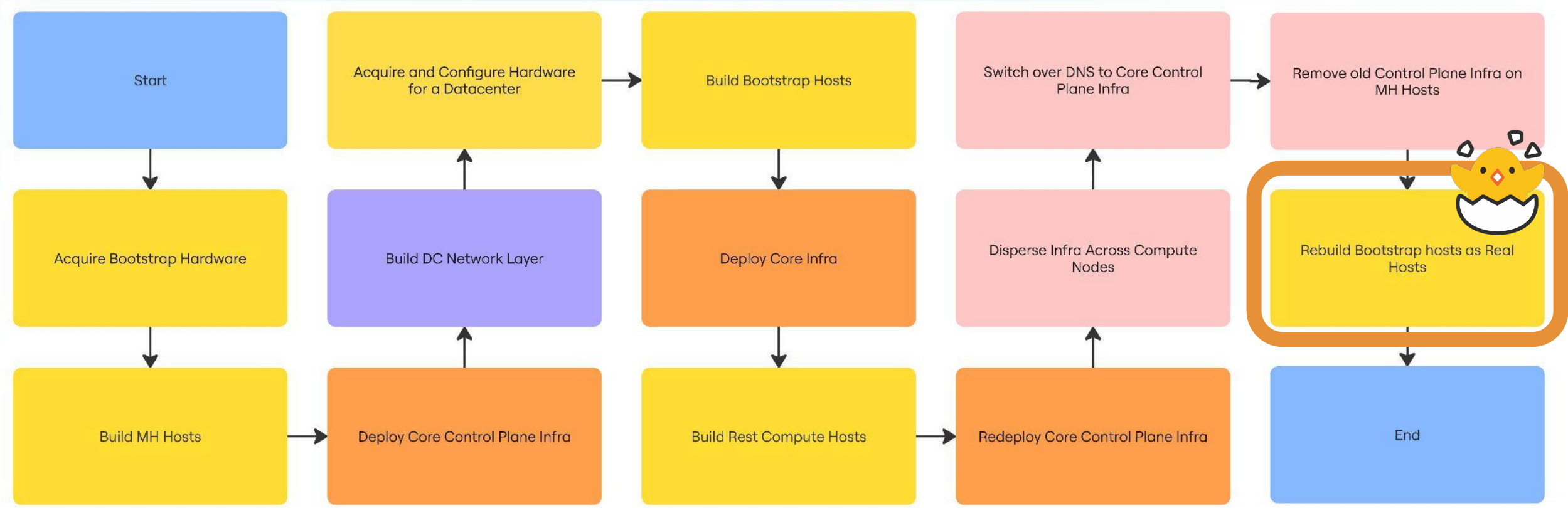
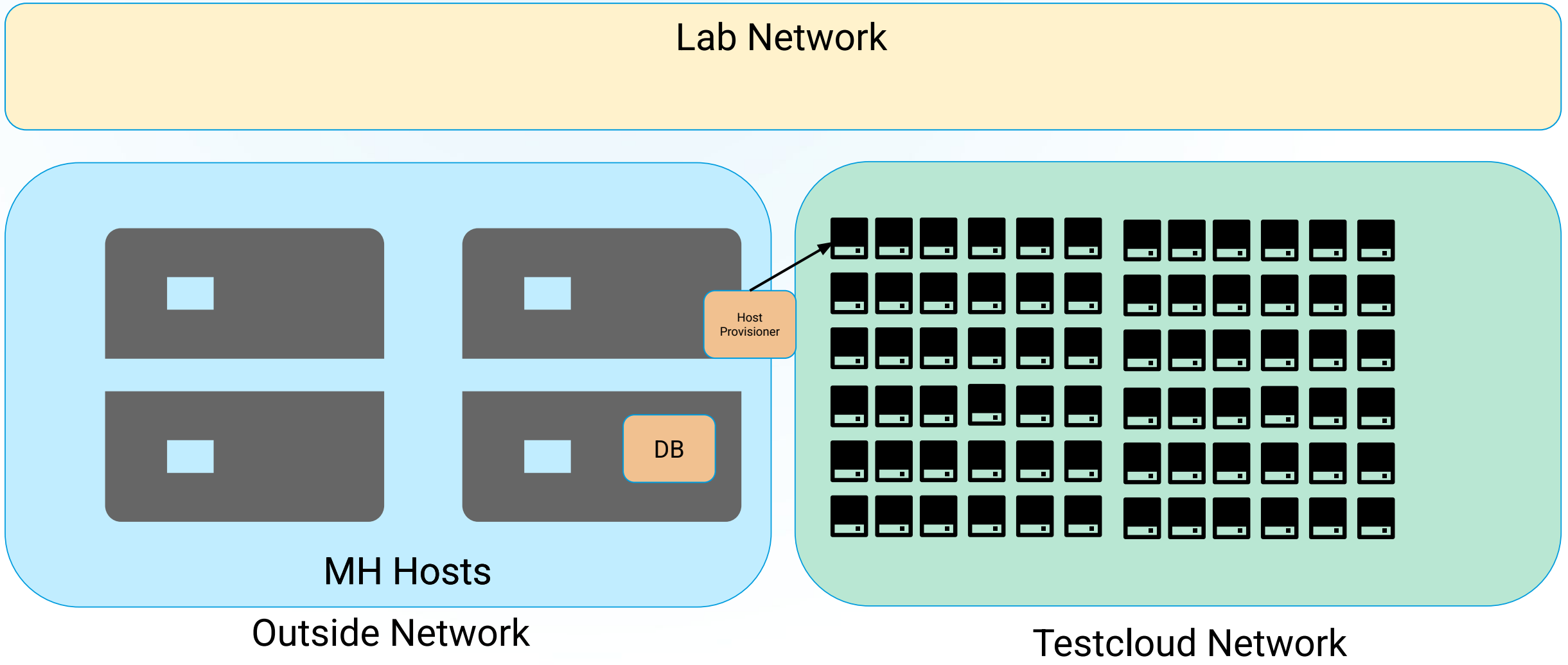


Double Bootstrap Method

Building an Internal Testcloud



Building an Internal Testcloud



Why so complicated?

Overview: Requirements

- …
- **Need to maintain parity**

The Journey

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- **First Customers**
- Wins and Lessons Learned

First Customers

- Our first customers were the compute team, they are responsible for building our main stack
- Each member of the team was assigned a team to help them onboard
- Setup Customer accounts by Department, using Terraform to manage with the Linode provider
  - Allows us to track usage per department
  - Allows us to allocate Infra to different teams
  - Connects to “reservation” service for tracking, using and cleaning of Compute Hosts

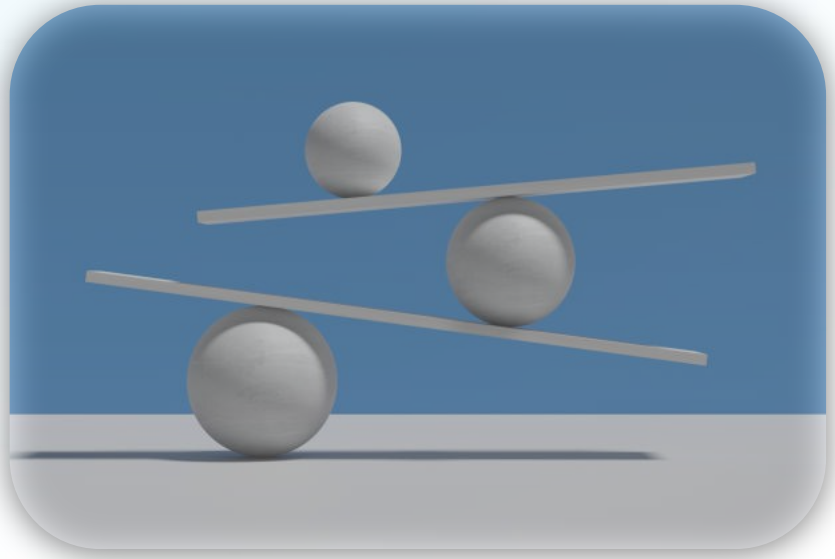
Dedicated Team

Team structure was set up across 3 geos: NA, EMEA, and APAC

- We have a “firechief” rotation to assist customers and help onboarding and other tickets and provide help during all geo timezones
- We try to make things as self service as possible, and encourage teams to assign code owners
- We automate toil but there is still a pretty heavy volume of requests.

Maintaining Stability

- Dedicated team
- Alerting same as Prod
- Have incidents when things are broken
- Culture and naming of “stable”



Value Add

- Testcloud is now in the release path of almost every product
- We caught many important bugs before they made their way into our production environment
- No need to worry about things being on the internet and tests becoming compromised – it’s a huge win!
- We can test things we weren’t able to before
- Chaos testing, performance testing and seeing the upper bounds of our applications

The Journey

- Overview
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- **Wins and Lessons Learned**

Wins and Lessons Learned

- Platform as an internal private cloud
- To date we have over 500+ customers
- Getting to 100% parity is nearly impossible, but we are very close

Wins and Lessons Learned

The biggest surprises were

- Difficulty of getting prioritized engagement from other teams
- The integration from our Previous Test Datacenter provided and folks expected to be part of stable not being present
- The tech debt we took on from hard forking production repos really was underestimated.
- What people built on the platform
  - We have seen a ton of innovation in terms of expanding our tooling, especially our local dev tooling

Takeaways

- When building an internal Pre-prod platform with circular dependencies, use the “double bootstrap” approach
  - Build Thing1, use Thing1 to build Thing2, replace Thing1 with Thing2, delete Thing1
- Don’t underestimate the power of interpretation
- Front-load scaling tasks as they come up (e.g. hard coded domain, ip range, etc)
- Resist the fork and push for changes upstream and manage override configs for your specific environments.

THANK YOU!

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