Local Development to CI/CD

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Agenda

Section 1: Introduction to Automation

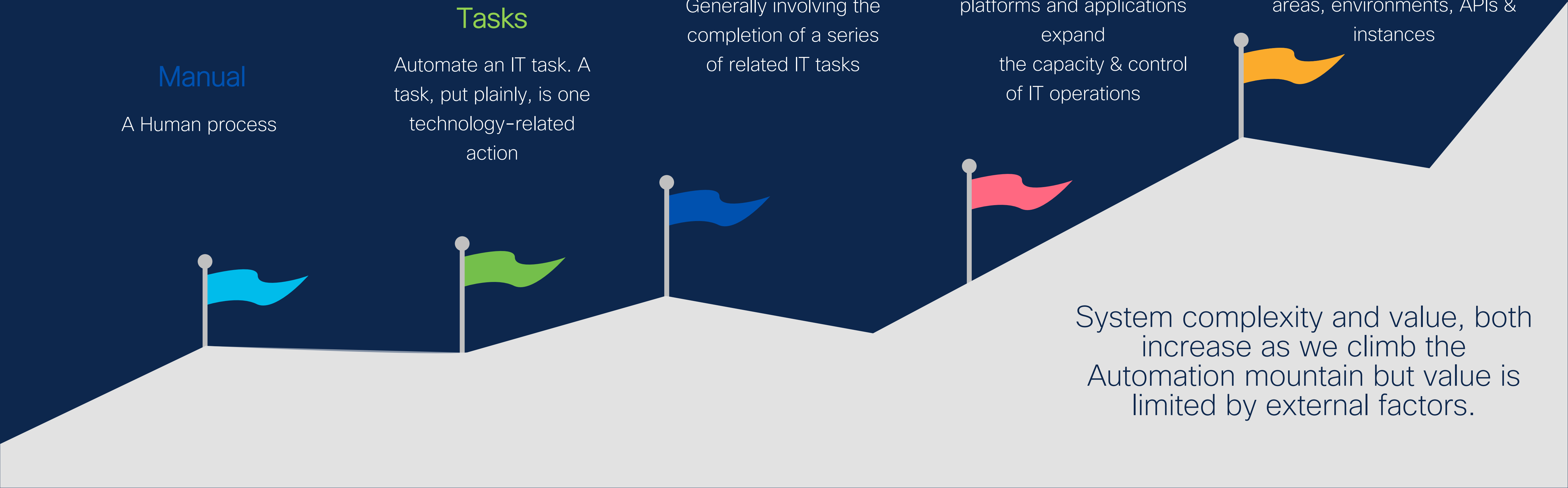
- Automation Concepts – 5 mins
- CI/CD (Continuous Integration & Continuous Delivery) – 5 mins
- IaC (Infrastructure as Code) – 10 mins
- Demo: Manual vs Automated – 30 mins

Section 2: More on Pipelines

- Pipelines Topics – 10 minutes
  - Validation – Linting
  - Testing - PyATS
  - Deployment – Stages, Conditional steps
  - Docs as Code
- Demo: Manual vs Automated – 30 mins

Back to Basics

Let's talk IT & Cloud Automation



Manual

A Human process

Automating Tasks

Automate an IT task. A task, put plainly, is one technology-related action

Automating Workflows

Generally involving the completion of a series of related IT tasks

Automating Workloads

IT process automation across platforms and applications expand the capacity & control of IT operations

Automating Business Processes

IT automation functions at the business level. Orchestrate processes across various business areas, environments, APIs & instances

System complexity and value, both increase as we climb the Automation mountain but value is limited by external factors.

Automation Strategy

Organisations have similar themes but often unique priorities and challenges. Generally, the approach is dependent on whether we're adopting a tactical technical solution or strategic organisational transformation.

Resource Availability

Security Requirements

Time to Value

User Competency

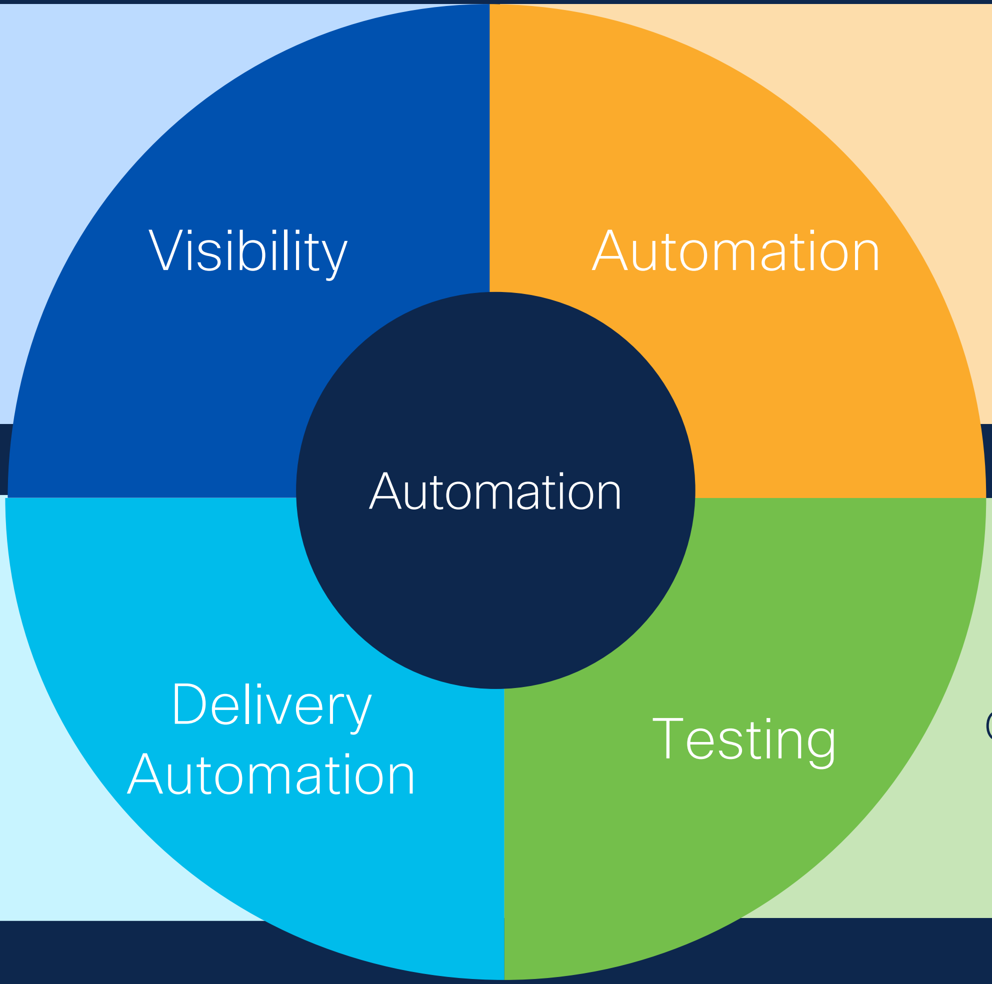
Technical Complexity

Technical Debt

Automation & Orchestration Use Cases

Data Aggregation
Network Visibility
*Event Correlation**

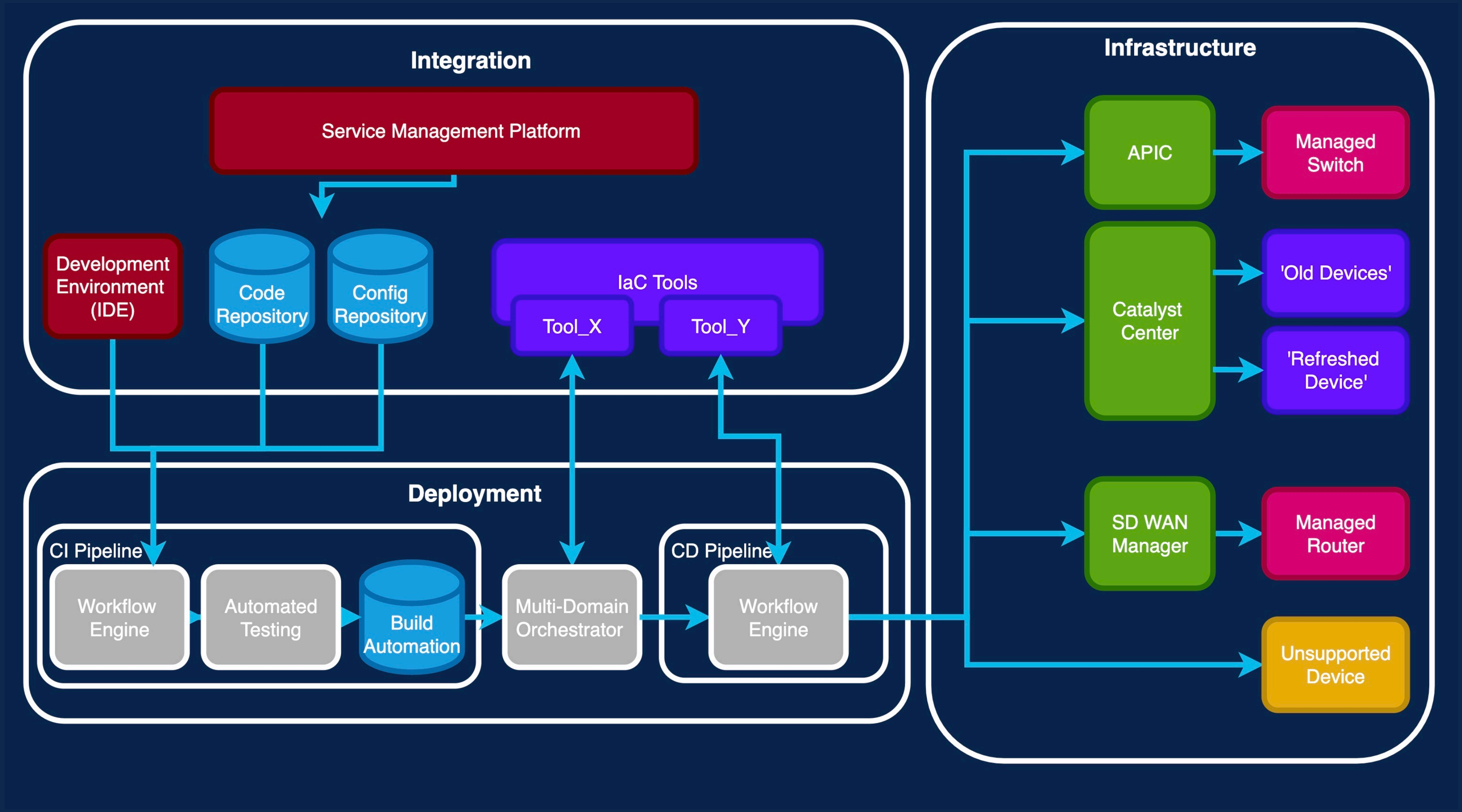
Configuration Management
Infrastructure as Code
Network Provisioning
Policy Management
Closed Loop Automation
Service Orchestration



SRE / DevOps Model
CI/CD
Business and IT Alignment
In-house expertise
Tool Consolidation

Automated Testing
Issue Resolution
Compliance/Assurance Testing
Pre/Post Change Validation
*Event Correlation**

Example Architecture



Simplicity

Focus on standardization of platforms, tools and processes

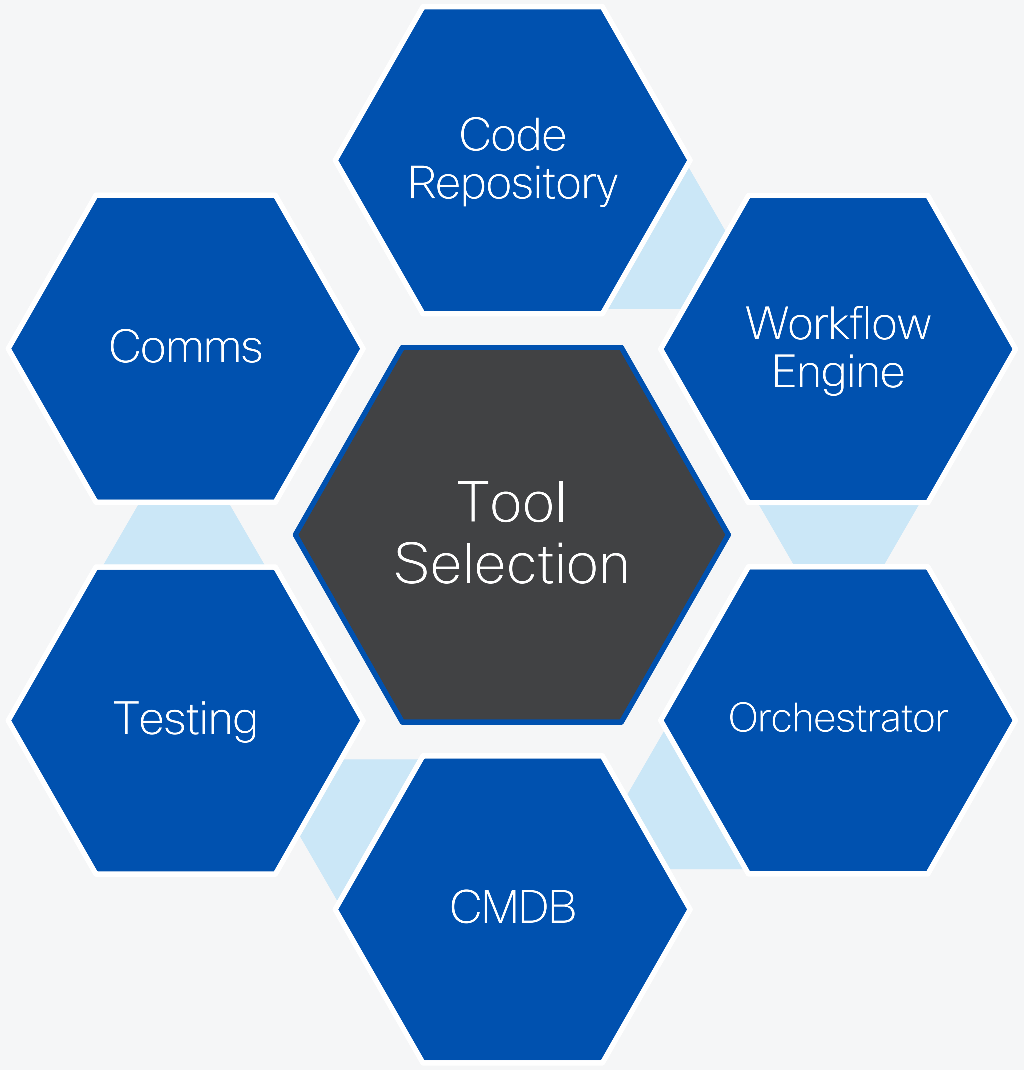
Acceleration

Focus is how to drive value as quickly as possible, strategic decisions focus on whether to consume or create logic with native vs open source.

Efficiency

1. Initial focus should be on reducing effort or risk i.e. ‘how you make a change.’
2. As capabilities grow the goal should be to maximize value with Cross-Domain workflows and monitoring.

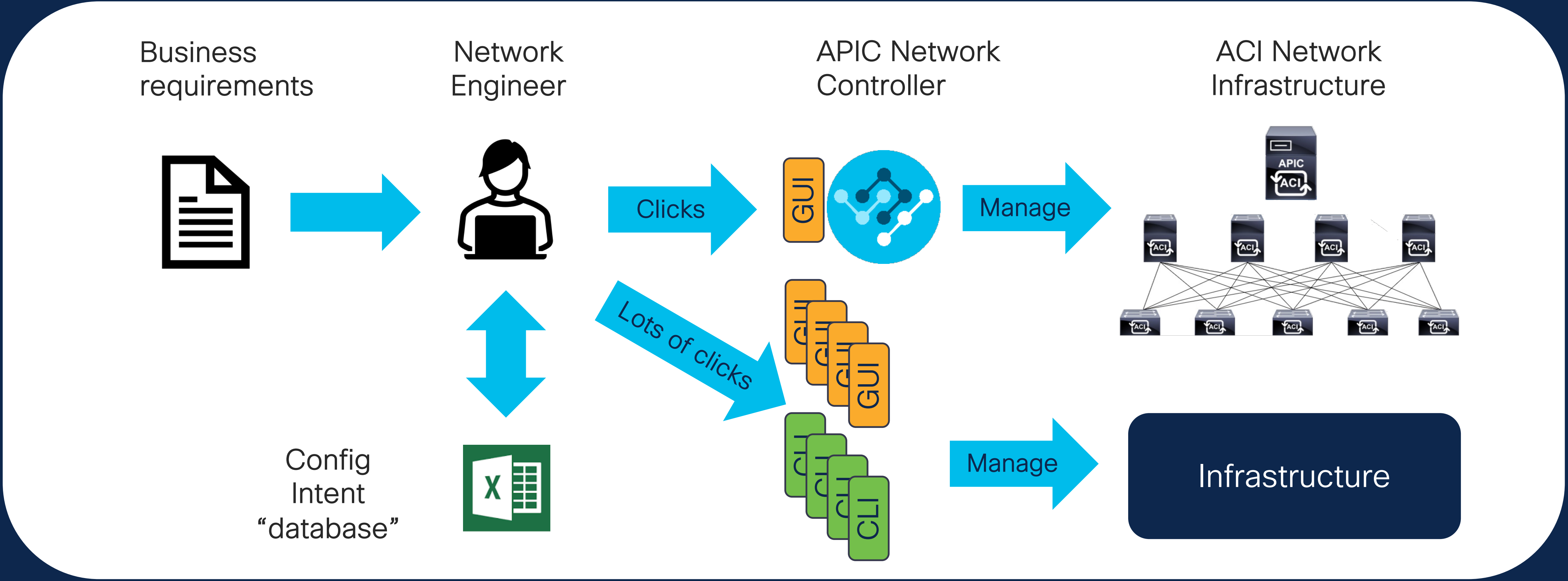
Component Selection



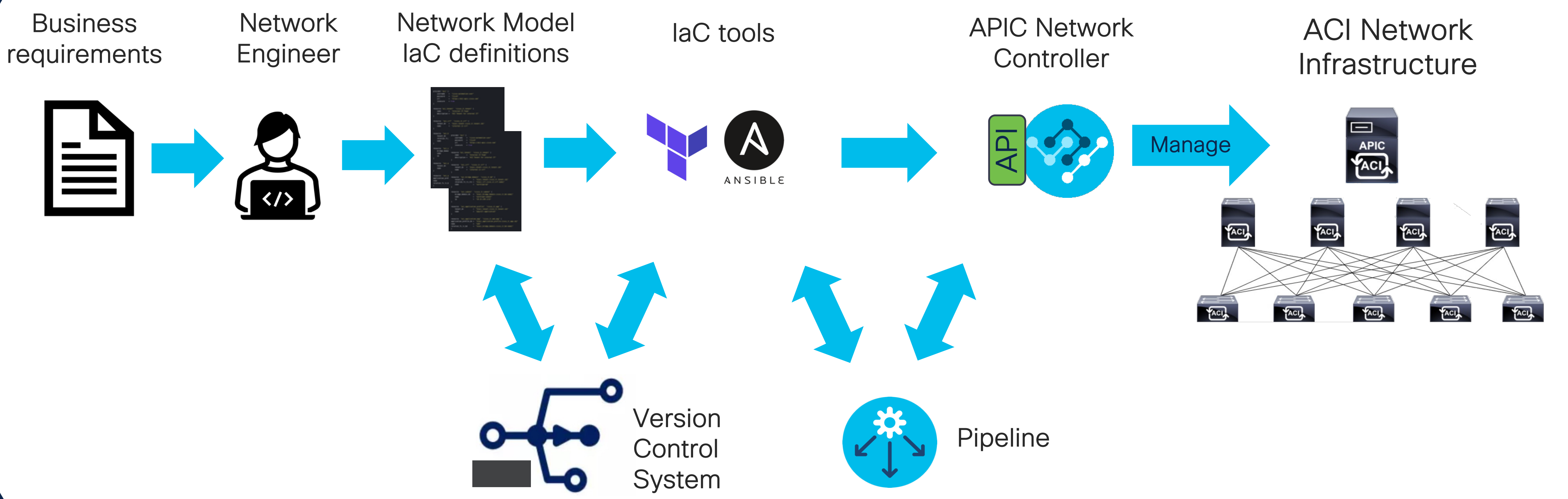
Non-Functional Requirements

- Support
- Skills
- Specific technical capabilities
- Cost
- Complexity
- Industry Adoption

Manual Driven Configuration

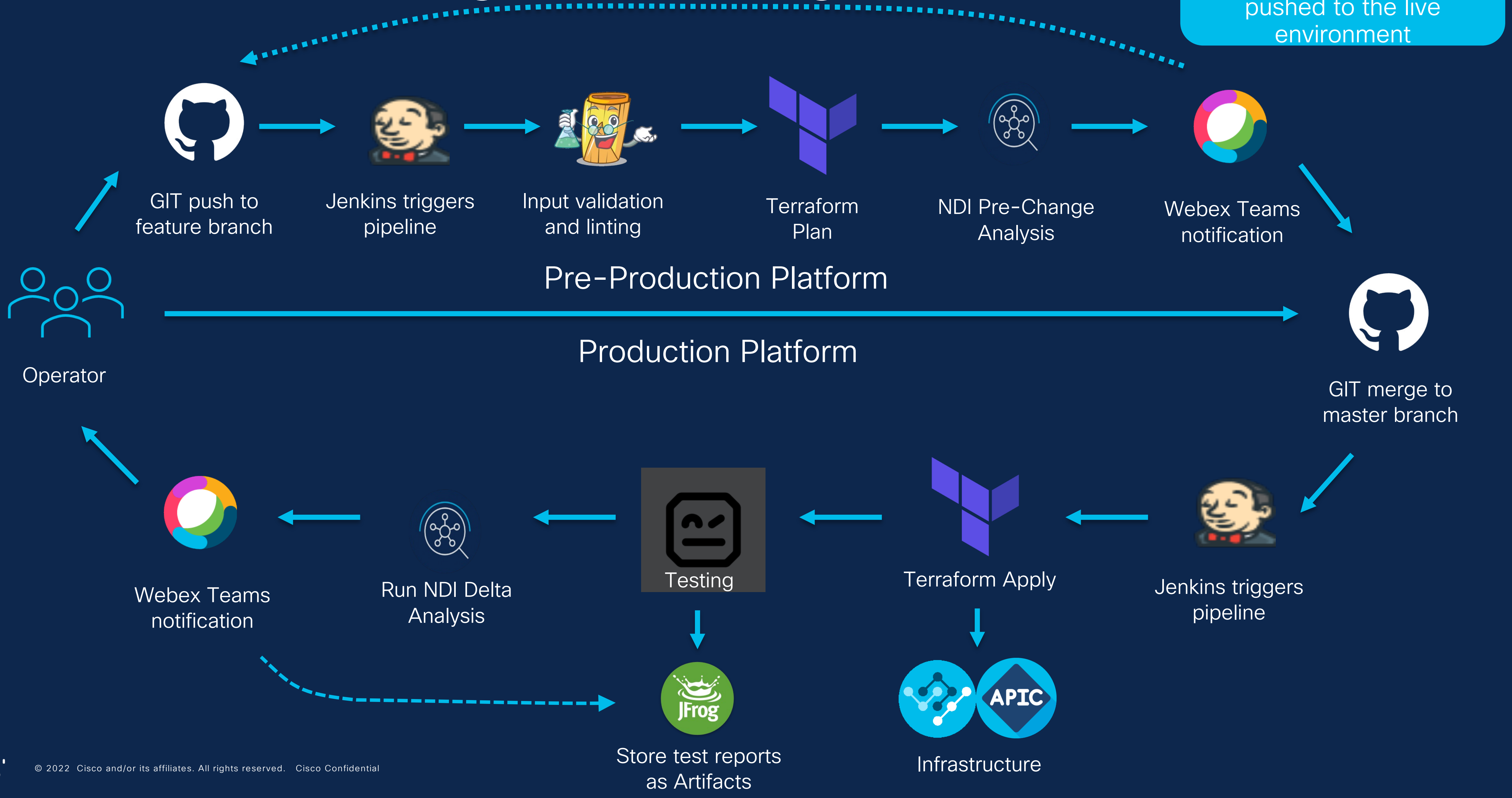


Model Driven – Infrastructure as Code



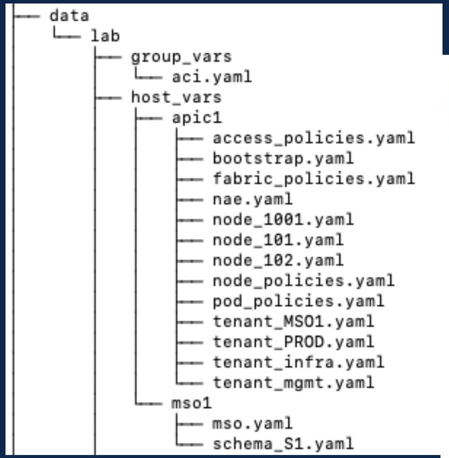
ACI with CI/CD Integration using Terraform

Key Take Away – Everything is tested and validated before it's pushed to the live environment

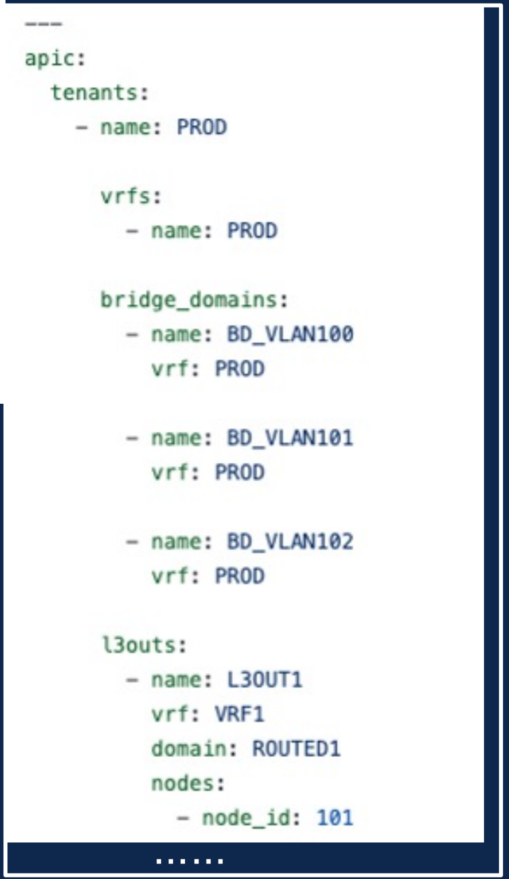


What does this look like?

Configuration (Deploy)



```
── data
   └── lab
       ├── group_vars
       │   └── aci.yaml
       ├── host_vars
       │   ├── apic1
       │   │   ├── access_policies.yaml
       │   │   ├── bootstrap.yaml
       │   │   ├── fabric_policies.yaml
       │   │   ├── nae.yaml
       │   │   ├── node_1001.yaml
       │   │   ├── node_101.yaml
       │   │   ├── node_102.yaml
       │   │   ├── node_policies.yaml
       │   │   ├── pod_policies.yaml
       │   │   ├── tenant_MSO1.yaml
       │   │   ├── tenant_PROD.yaml
       │   │   ├── tenant_infra.yaml
       │   │   └── tenant_mgmt.yaml
       │   └── mso1
       │       ├── mso.yaml
       │       └── schema_S1.yaml
```

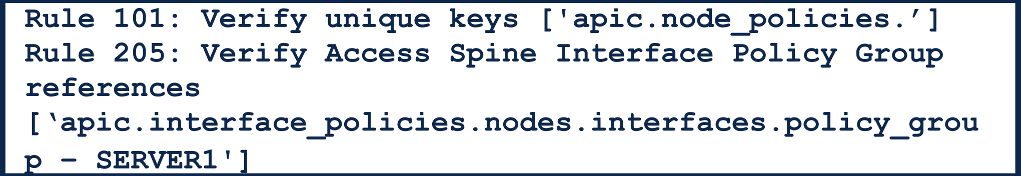


```yaml
---
apic:
  tenants:
    - name: PROD

      vrfs:
        - name: PROD

      bridge_domains:
        - name: BD_VLAN100
          vrf: PROD

        - name: BD_VLAN101
          vrf: PROD

        - name: BD_VLAN102
          vrf: PROD

      l3outs:
        - name: L3OUT1
          vrf: VRF1
          domain: ROUTED1
          nodes:
            - node_id: 101
```

……

Pre-Deployment Validation (Validate)

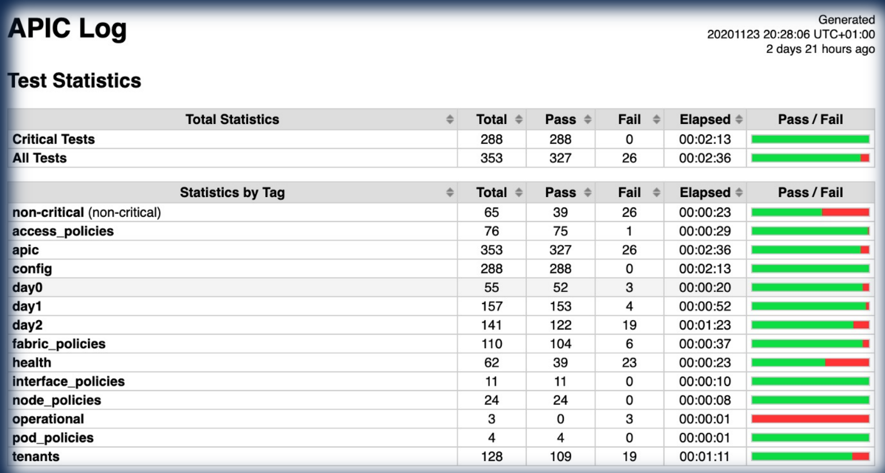
```
iac-validate
```



```
Rule 101: Verify unique keys ['apic.node_policies.’]
Rule 205: Verify Access Spine Interface Policy Group
references
[‘apic.interface_policies.nodes.interfaces.policy_grou
p – SERVER1']
```

Automated Testing (Test)

```
iac-test
```



APIC Log

Generated
20201123 20:28:06 UTC+01:00
2 days 21 hours ago

Test Statistics

Total Statistics	Total	Pass	Fail	Elapsed	Pass / Fail
Critical Tests	288	288	0	00:02:13	🟩
All Tests	353	327	26	00:02:36	🟩🟥

Statistics by Tag	Total	Pass	Fail	Elapsed	Pass / Fail
non-critical (non-critical)	65	39	26	00:00:23	🟩🟥
access_policies	76	75	1	00:00:29	🟩🟥
apic	353	327	26	00:02:36	🟩🟥
config	288	288	0	00:02:13	🟩
day0	55	52	3	00:00:20	🟩🟥
day1	157	153	4	00:00:52	🟩🟥
day2	141	122	19	00:01:23	🟩🟥
fabric_policies	110	104	6	00:00:37	🟩🟥
health	62	39	23	00:00:23	🟩🟥
interface_policies	11	11	0	00:00:10	🟩
node_policies	24	24	0	00:00:08	🟩
operational	3	0	3	00:00:01	🟥
pod_policies	4	4	0	00:00:01	🟩
tenants	128	109	19	00:01:11	🟩🟥

Demo 1 : Agenda & Outcomes

Tasks: Hands on 1

- Establish connectivity
- Basic manual device change
- Basic tool-based device change

Tasks: Hands on 2

- Execute change via pipeline
- Understand importance of standardisation
- Understand components in classical CI/CD

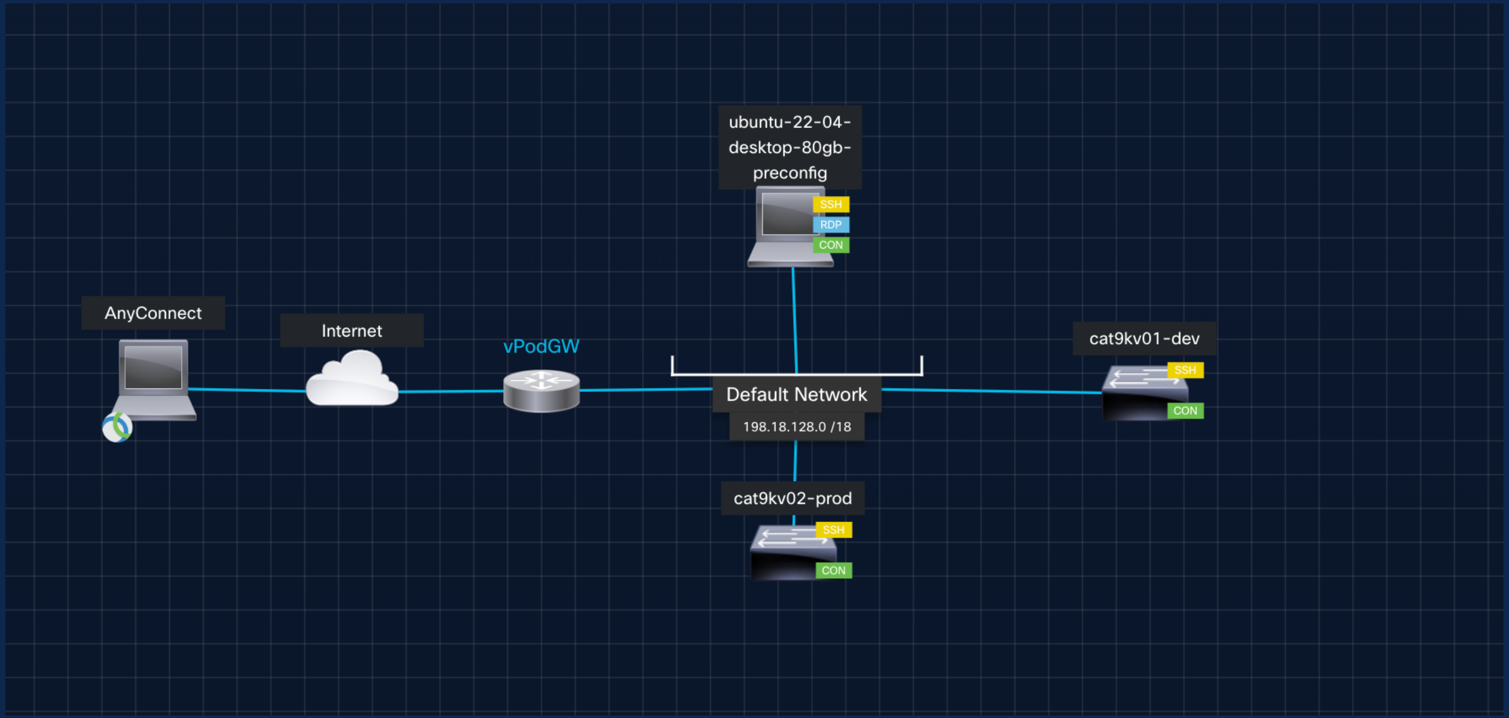
Outcomes

- Familiarity with Automation tools: Gitlab & Ansible
- Basic understanding of containerization: Docker
- Acceptance of potential value when compared with manual processes

Lab Guide

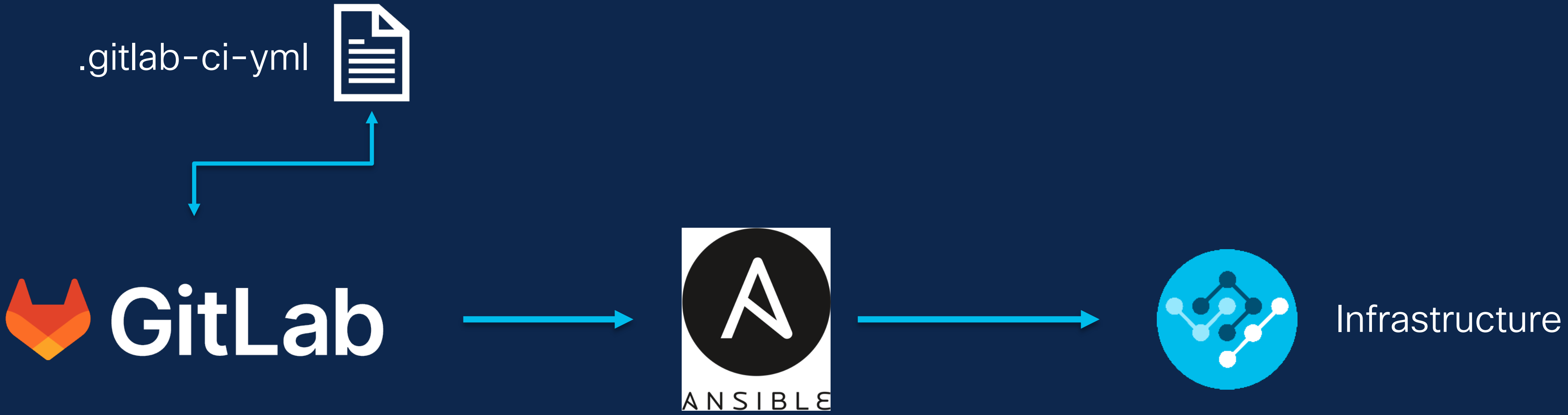
GitHub Repository

DevNet Learning Lab



My first Pipeline

My first Pipeline



Different Types of Testing

In the validation phase several tools are used to ensure that the provided input data is valid, but also that common best practices and formatting guidelines are followed.

- ✓ Format validation – limits typos
- Syntax validation –enforces standardization of variables
- ✓ Semantic validation – enforces policy adherence
- System **testing** - tests an entire system end-to-end

Demo – No slides (ask any questions you like)

CISCO

The bridge to possible