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Multi-Domain Infrastructure-as-Code using Orchestration and CICD as a Service

Tony Dubiel Technical Solutions Architect @tdubiel

BRKDEV-2320

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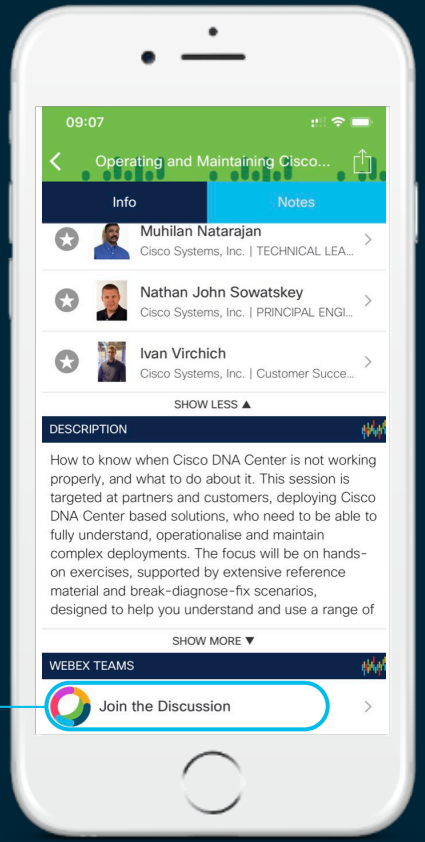


Agenda

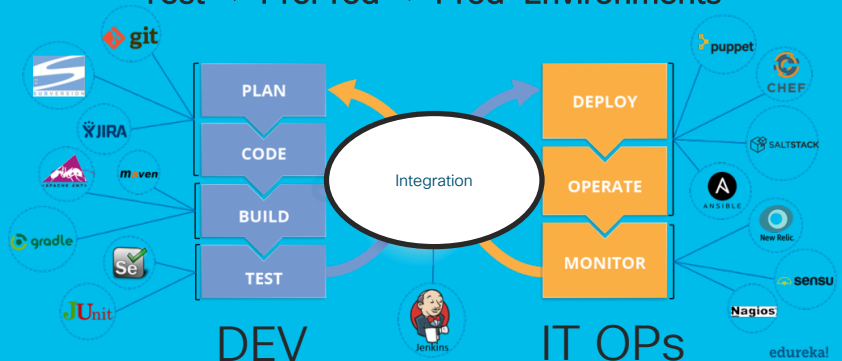
- Introduction to DevOps and NetDevOps
- Infrastructure-as-Code and CICD Pipelines
- Programmability and Orchestration
- Continuous Validation and Visibility
- Introduction to Multi-Domain Infrastructure-as-Code
- Demo for Multi-Domain Infrastructure-as-Code with CICD
- Conclusion

Introduction to DevOps and NetDevOps

What is DevOps?

Use case: Software Delivery Lifecycle Management

Test -> PreProd -> Prod Environments



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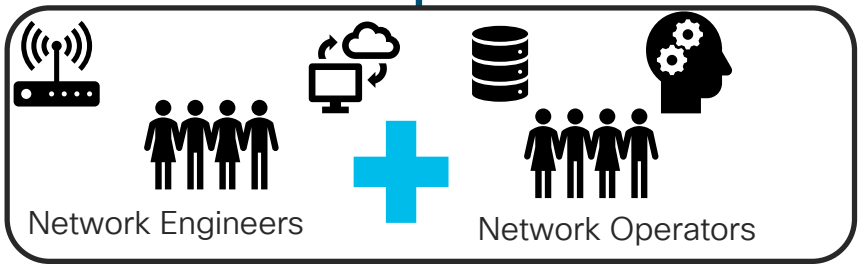
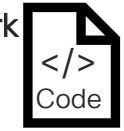
What is NetDevOps?

Use cases:
- Software Upgrades
- POC Lab Automation
- Deploy/Configuration

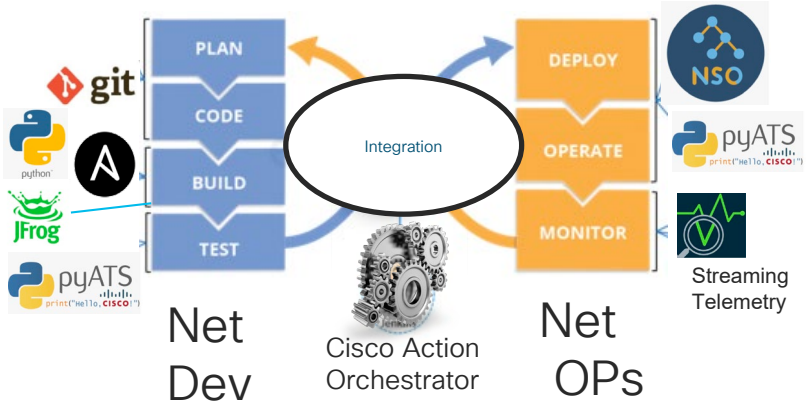


Network as code



- Config Templates
- Variables
- Config Data

Test -> PreProd -> Prod Environments

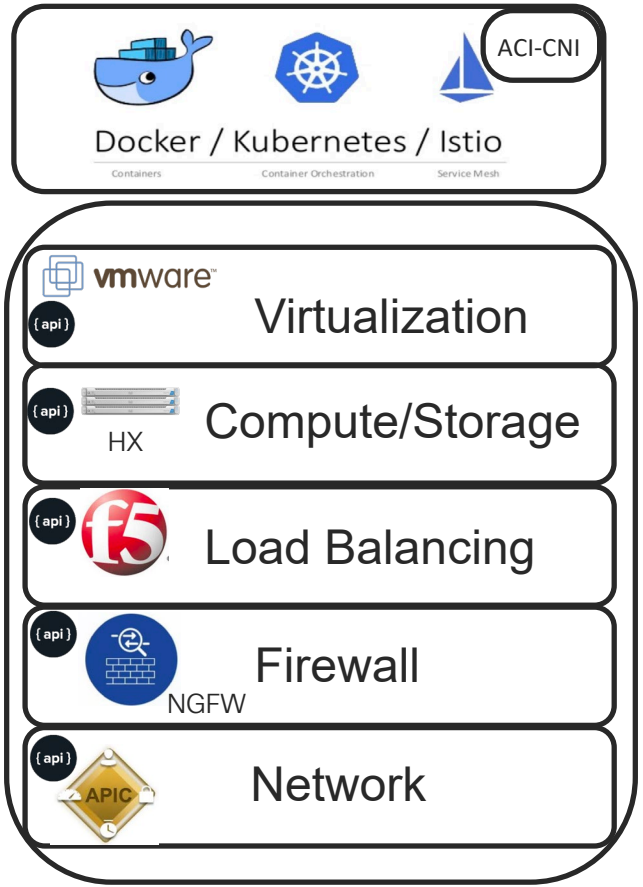


Infrastructure-as-Code and CICD Pipelines

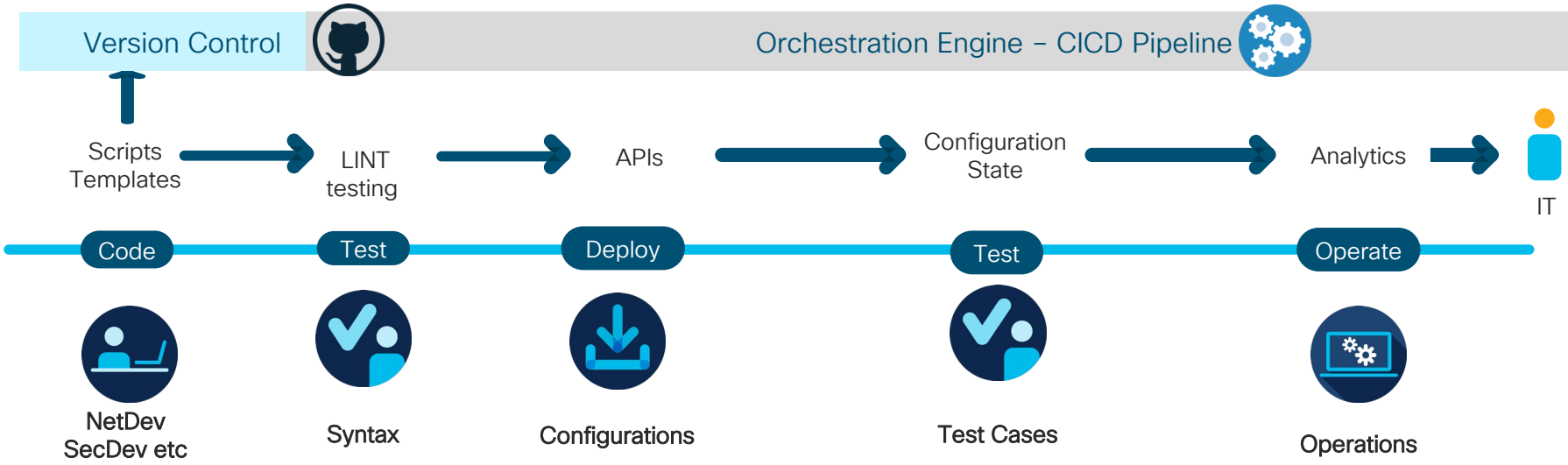
Infrastructure-as-Code

Full Stack: Cloud Native Application Example

- AppDev platforms require automated infrastructures
- APIs enable programmable Infrastructures
- Domain Controllers provide a single touchpoint for APIs, operational state and rollbacks within their domain.
- Orchestration Engines provide automated workflows across domain controllers



Continuous Integration/Continuous Delivery (CICD) for Infrastructure-as-Code



Programmability and Orchestration

Programmability Maturity Model

Ad-hoc/ Scripting

Getting Started

Engineer run one-off scripts and tools

- Postman,
- Python Script
- Ansible Playbook

Re-useable Frameworks

Adopting DevOps

Centrally managed frameworks & templates

- Ansible Roles,
- Python SDKs
- YANG: NETCONF, RESTCONF, gRPC
- PyATS

Controllers ?

Domain Orchestration

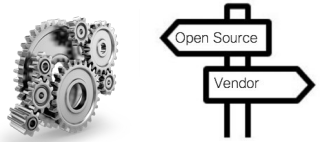
Optimizing

Automated configuration lifecycle. Creation, Modification and Removal automated in one place

Domain Work Flows

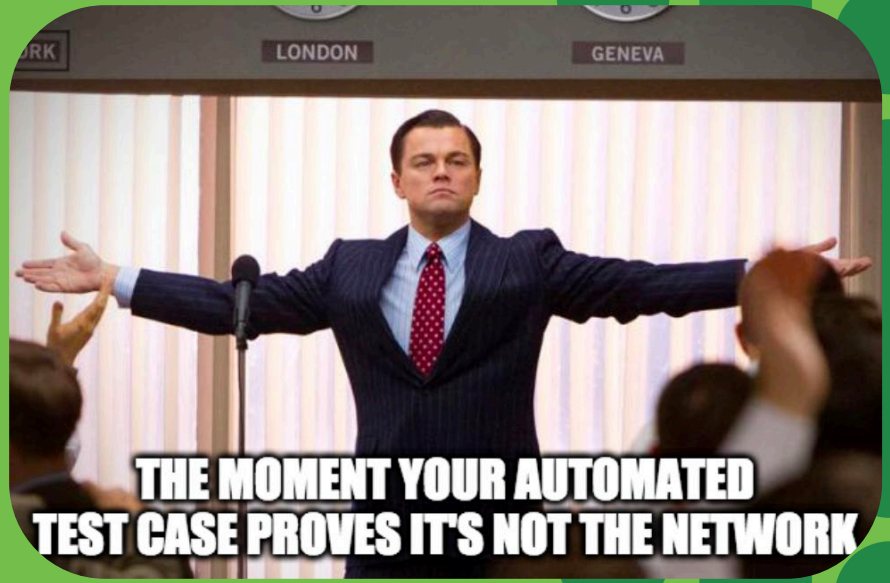
- Ansible Tower [OS, platforms, network]
- UCS Director (Intersight) [servers - BM, virtualization]
- Network Services Orchestrator (NSO) [network, multi-domain, multi-vendor]
- Cloud Center Suite [Multi-Cloud]

Top Level Orchestration



Cisco Action Orchestrator

Continuous Validation and Visibility



pyATS | Genie | Robot: Test Automation Framework

- Originally intended for internal engineering use
- Used for automated troubleshooting and CI/CD across multiple product groups & platforms
  - IOS, IOSXE, IOSXR, NXOS

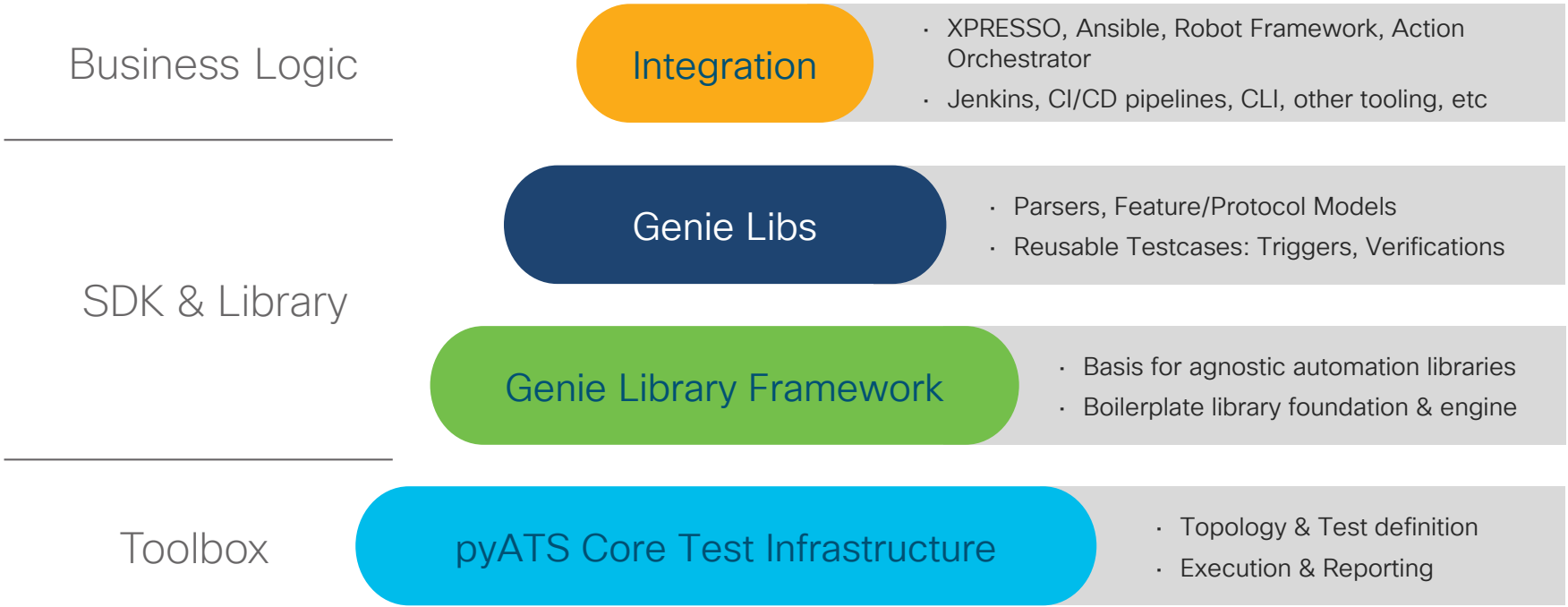
~3500 developers

15,000,000+ LoC

3,500,000+ runs

month

Solution Layout



Visibility

Application
- AppD

Infrastructure
- Streaming Telemetry (NIR)
- Syslogs
- Network Assurance

Security
- StealthWatch
- Tetration

Introduction to Multi-Domain Infrastructure-as-Code

Why Multi-Domain?
Infrastructure as Code

- Services
  - ITSM
  - IPAM
  - SaaS
  - PaaS
  - CaaS
  - IaaS (Pub/Private/Multicloud)
  - NaaS
    - (Multi-Domain-Policy MDP)
      - Ie, ACI + ISE + DNAC + SDWAN

What are the Domains?

Infrastructure as Code

- Technology Domains
  - Compute
  - Network
  - Storage
- Network Sub Domains
  - Campus Networks (SDA, Wifi)
  - Data Center Networks (SDN, EVPN, ACI)
  - WAN Networks (SDWAN, MPLS, Internet etc)
  - Cloud Edge (COLO, SDN + SDWAN)
  - L4-7 services (FWs, LBs, ACLs etc)
- Compute Sub Domains
  - Bare Metal
  - Virtualization
  - Containers
  - Cloud

Infrastructure as Code – Domains

Reference Only

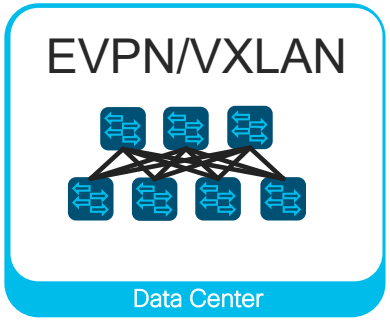
Domain	Technology	Cisco Solutions Controllers	Domain Orchestration	Use Cases	Top-level Orchestration
Network Campus	SDA/WIFI	DNAC Meraki	NSO	Campus End Users and Devices	CCS Action Orchestrator
Network WAN	SDWAN	Viptela/vManage	NSO	Remote Access	CCS Action Orchestrator
Network Data Center	SDN	ACI/APIC VXLAN/DCNM	NSO CCS/WLM UCSD	Private Cloud Services	CCS Action Orchestrator
Network Multi-Cloud	SDN	ACI/APIC	MSO NSO	Internetworking Private Cloud to Public Clouds	CCS Action Orchestrator
Compute Servers/HCI	Virtualized Bare-metal	UCSM CIMC	UCSD Intersight	Private Cloud IaaS	CCS Action Orchestrator
Storage	3rd Party	N/A	UCSD Intersight	Private Cloud NAS	CCS Action Orchestrator
Security	ASAv/FTD firewalls	N/A	CDO	Cloud management for security	CCS Action Orchestrator
Containers	Kubernetes	CCP	CCS/WLM	Priv or Pub - Cloud Native platform for microservices	CCS Action Orchestrator
Applications	CICD	N/A	CCS/WLM	App Development	CCS Action Orchestrator

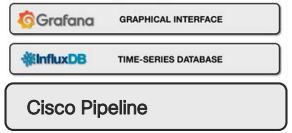
Demo for Multi-Domain Infrastructure-as-Code with CICD

Multi-Domain Solution: VXLAN Tenant to/from SDWAN client

Json module

NX OS





Robot pyATS

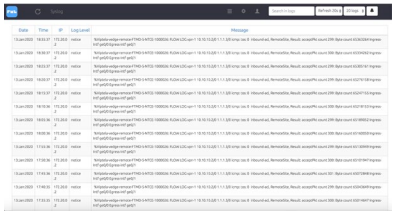
Verify

Visibility

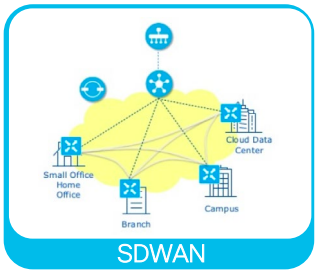
- Code
- Single Threaded (CRUD)
- SCM
- CICD

Yang/Model
CDB/State
Rollbacks

Server Tenant



Python
REST



Robot pyATS

Syslog Server

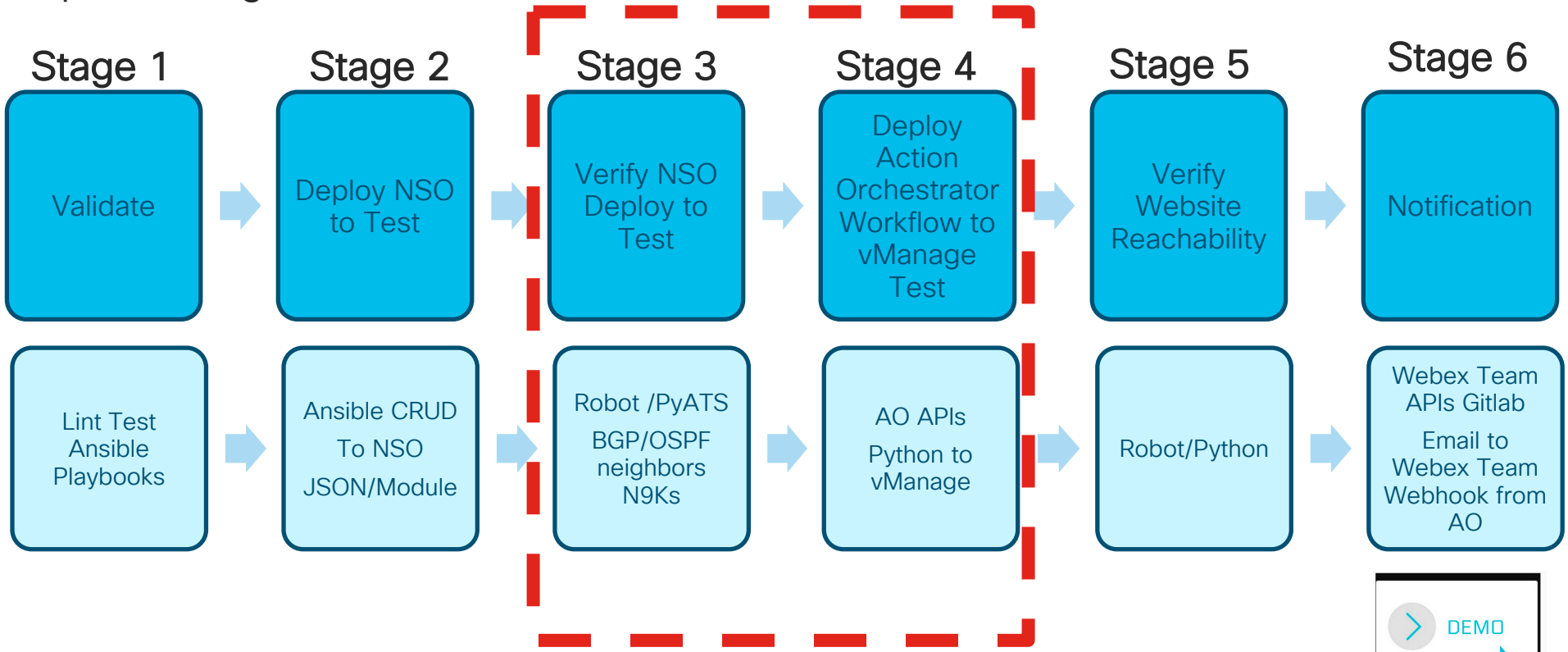
Cisco Action Orchestrator

Remote Client

Verify access to Web server

Multi-domain “Unified” Workflow

Pipeline Stages Gitlab CICD



Conclusion

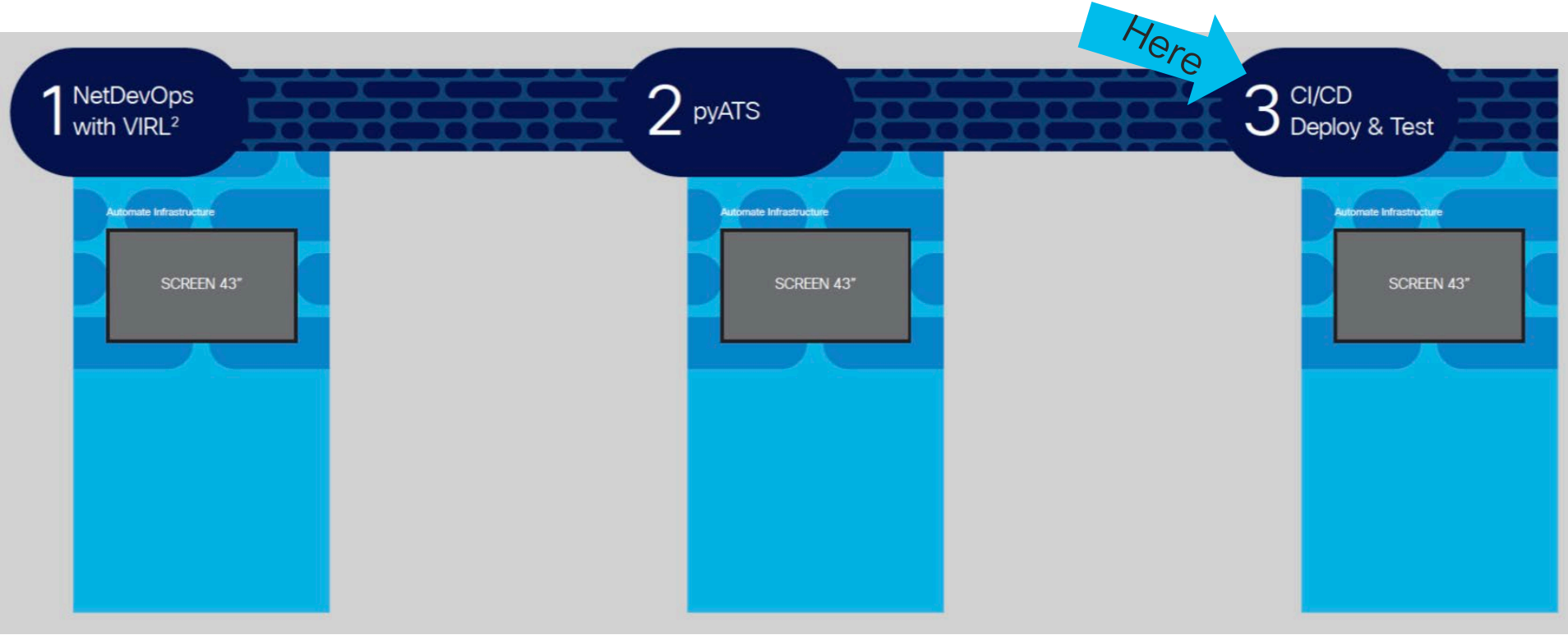
Key Take Away

Multi-Domain Infrastructure as Code

- Adopt DevOps Best practices where practical
- Treat Infrastructure as Code
- Decision Points (Vendor vs Open Source)
- Incorporate CICD with Test Validation and Feedback Loops
- Multi-Domain Orchestration is needed for the Future of IT Service Delivery

Continue the Conversation

DevNet Zone: Automation Journey



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