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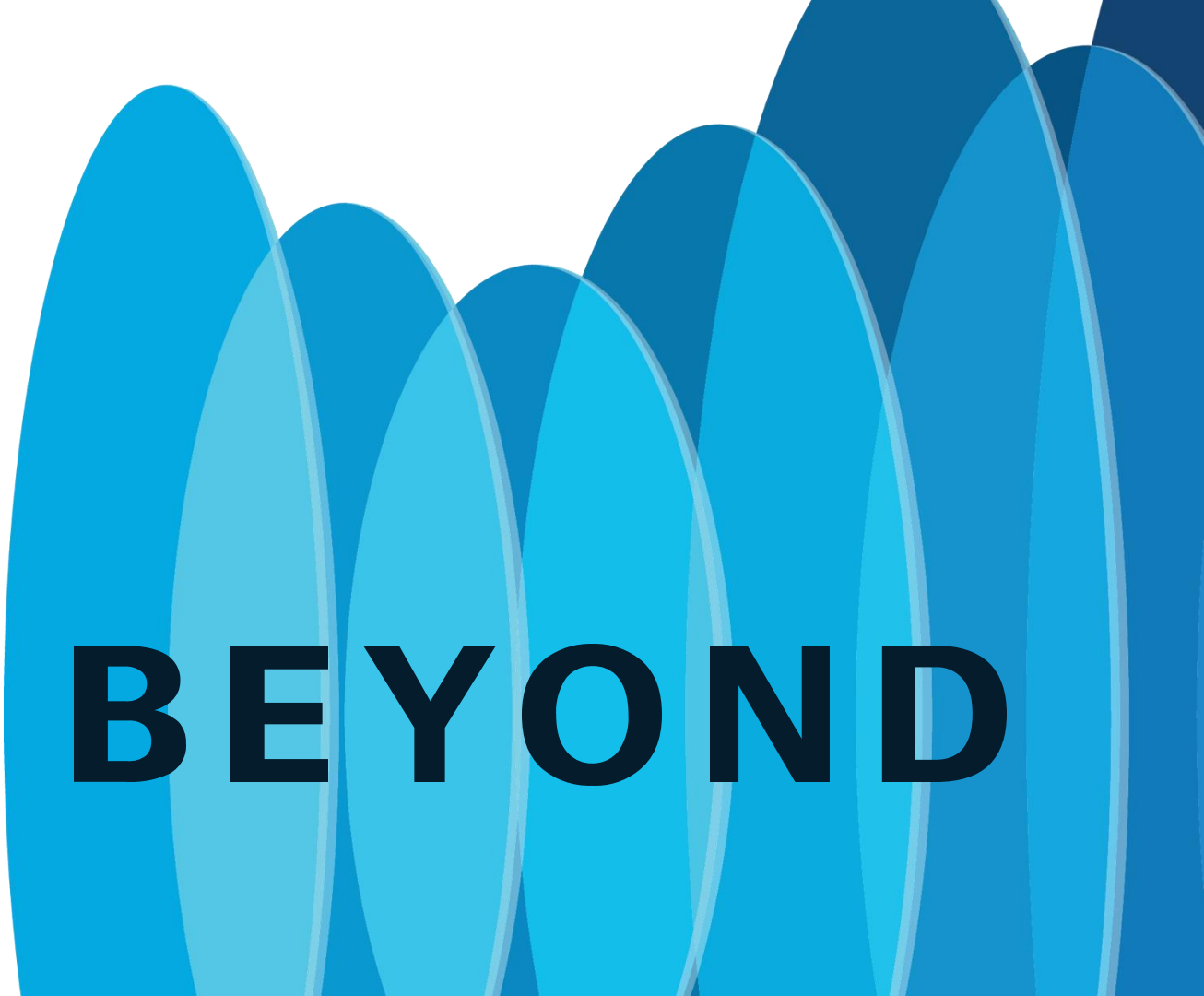

GO BEYOND

Closed-Loop Automation using CI/CD Pipelines with the Power of AI

Flo Pachinger, Developer Advocate Data & AI - Distinguished Speaker
Christopher Beye, Systems Architect - Distinguished Speaker
Joerg Schultz, Partner Systems Architect - Distinguished Speaker

LTRATO-2600

Flo Pachinger

Developer Advocate Data & AI

•

AI engineer & enthusiast

•

Cisco Live Distinguished Speaker

Chris Beye

Customer Success Specialist
Datacenter

•

Network Automation enthusiast

•

Cisco Live Distinguished Speaker

Jörg Schultz

Systems Architect
Partner Organization Germany

•

Automation & Programmability Lead
Cisco Germany

•

Cisco Live Distinguished Speaker

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Agenda

- Introduction
- Lab scenarios
- Lab tasks

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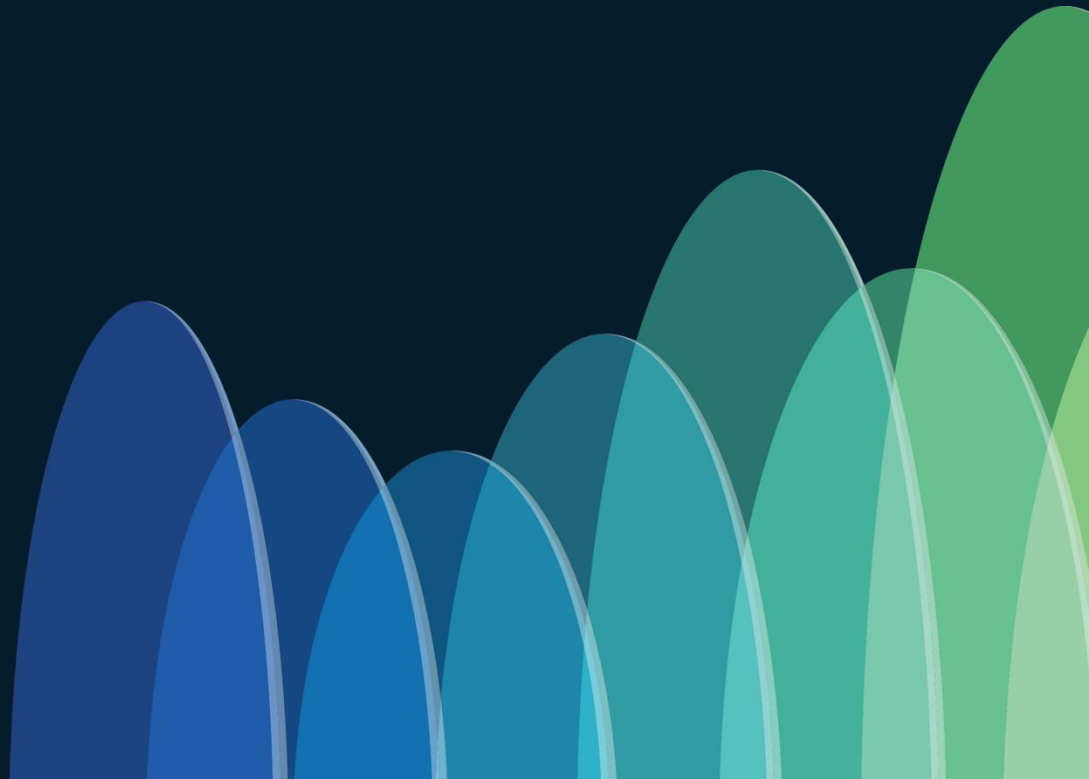
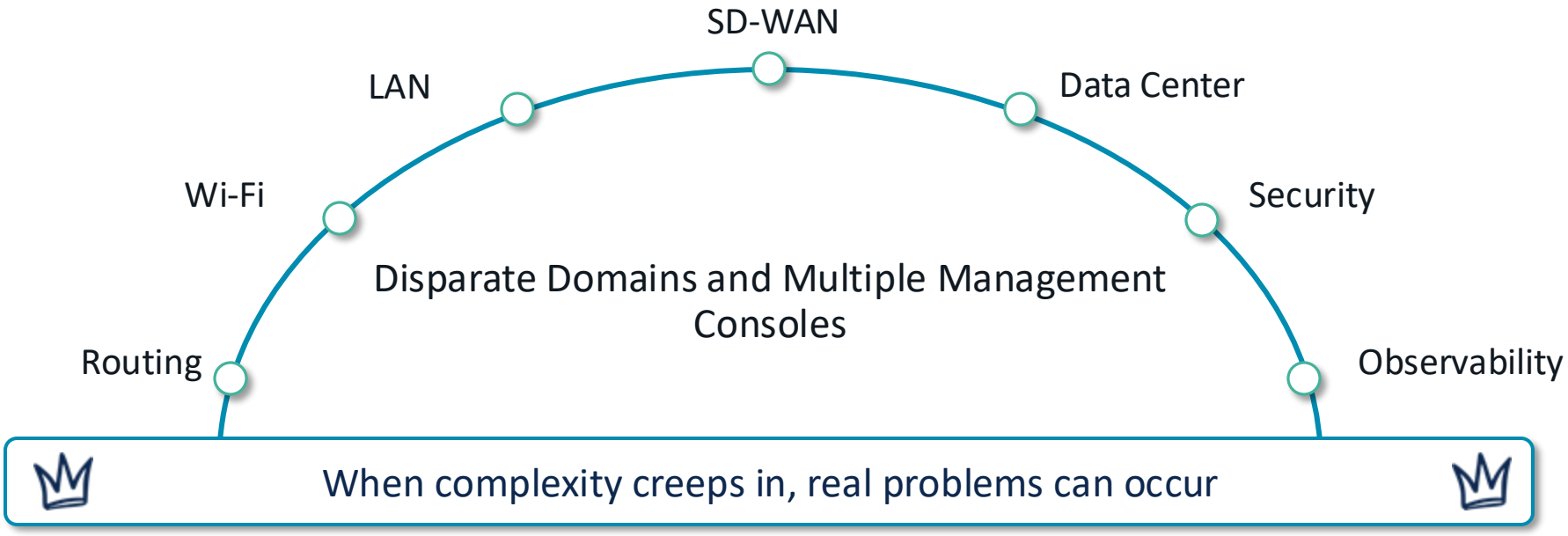
Introduction



Networks are more complex now than ever before



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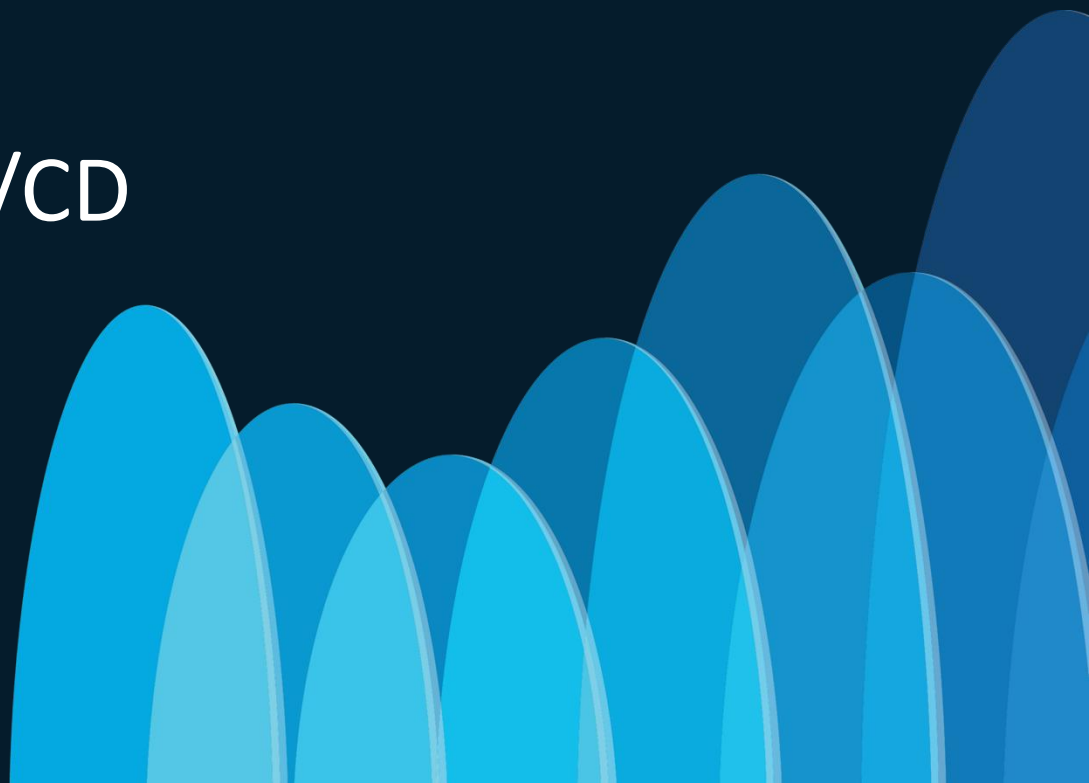
NetDevOps and CI/CD pipelines



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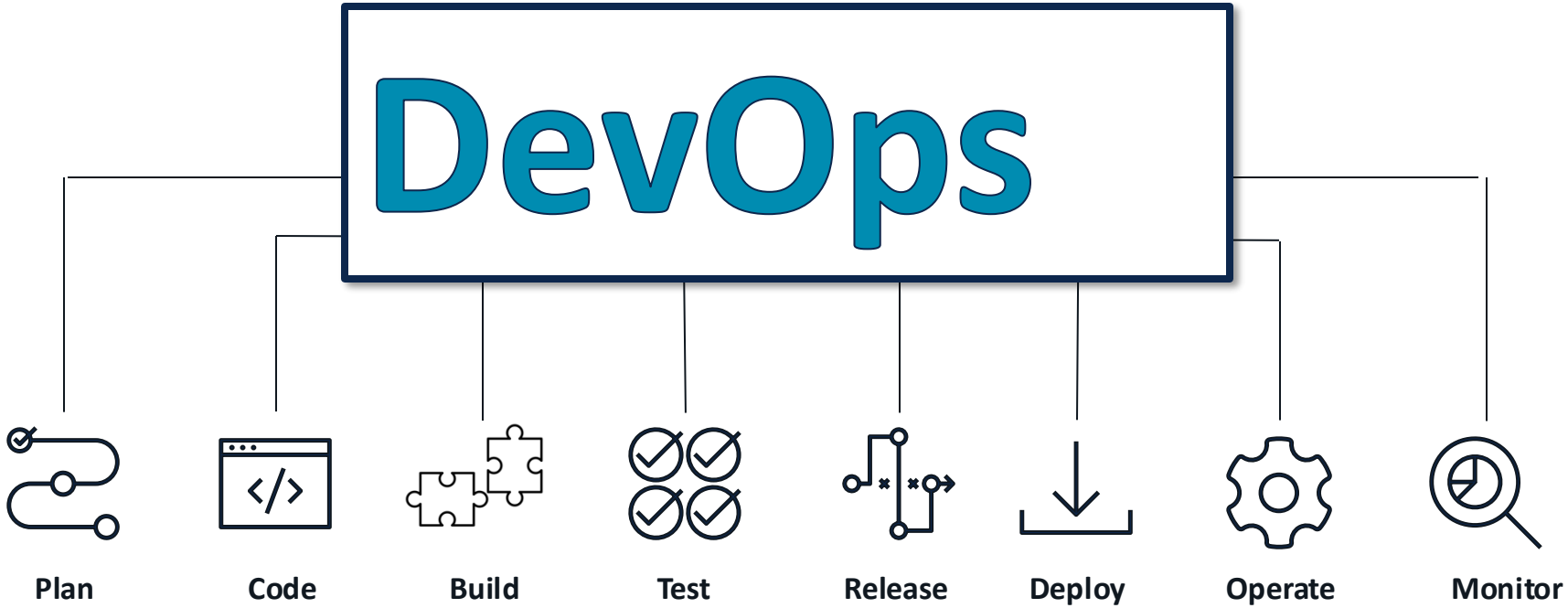
Practice what you preach …



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NetDevOps brings the DevOps practices

Develop

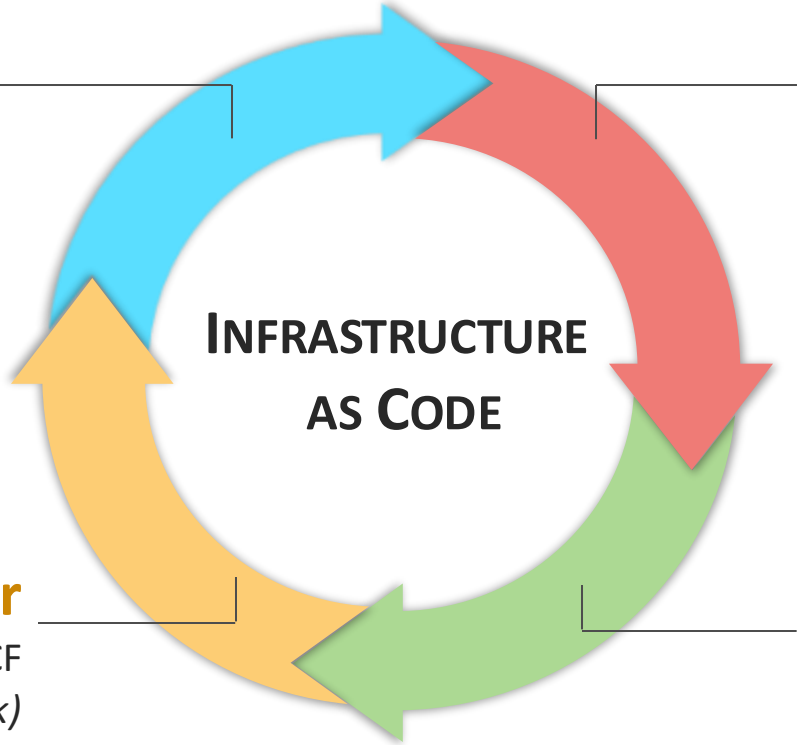
Code + Build = CI

*(**C**ontinuous **I**ntegration)*

Test

Test + Release = CD

*(**C**ontinuous **D**elivery)*



Monitor

Operate + Monitor = CF

*(**C**ontinuous **F**eedback)*

Deploy

*Continuous **D**eployment*

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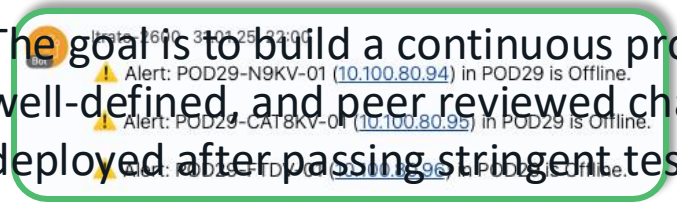
A typical pipeline



The goal is to build a continuous process in which small, well-defined, and peer reviewed changes are automatically deployed after passing stringent tests.

A typical pipeline could consist of four stages.

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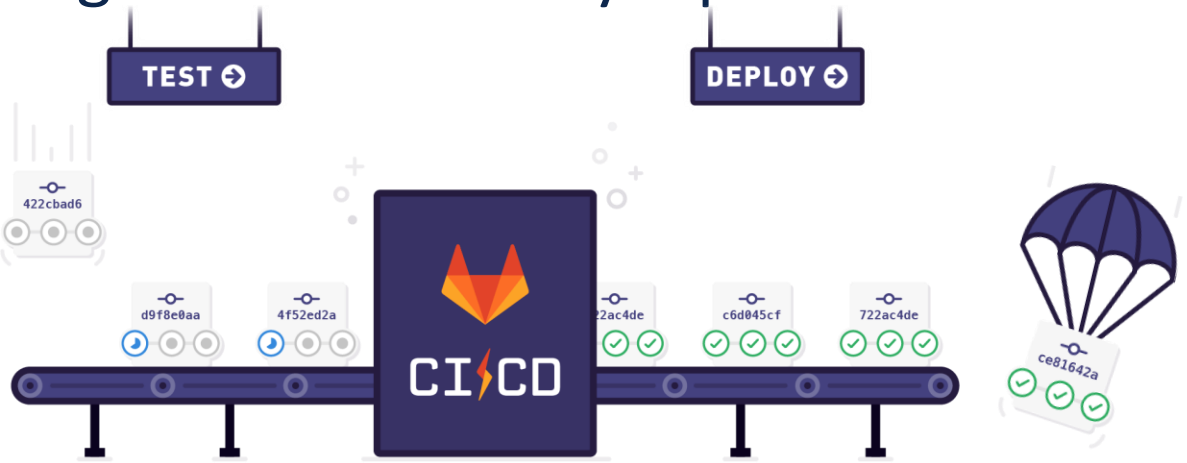
Continuous Integration & Delivery Pipeline



Continuous Integration: Keeping our code (= network configs/templates) in a shared repository, so we can test, collaborate and address conflicts early.

Continuous Delivery / Deployment: We can release new code (= services) often and in an incrementation fashion automatically.

Pipelines are our vehicle to do this in an automated fashion.

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Gitlab-CI pipeline

Code pushed to GitLab

GitLab triggers GitLab Runner

Install dependencies run tests jobs

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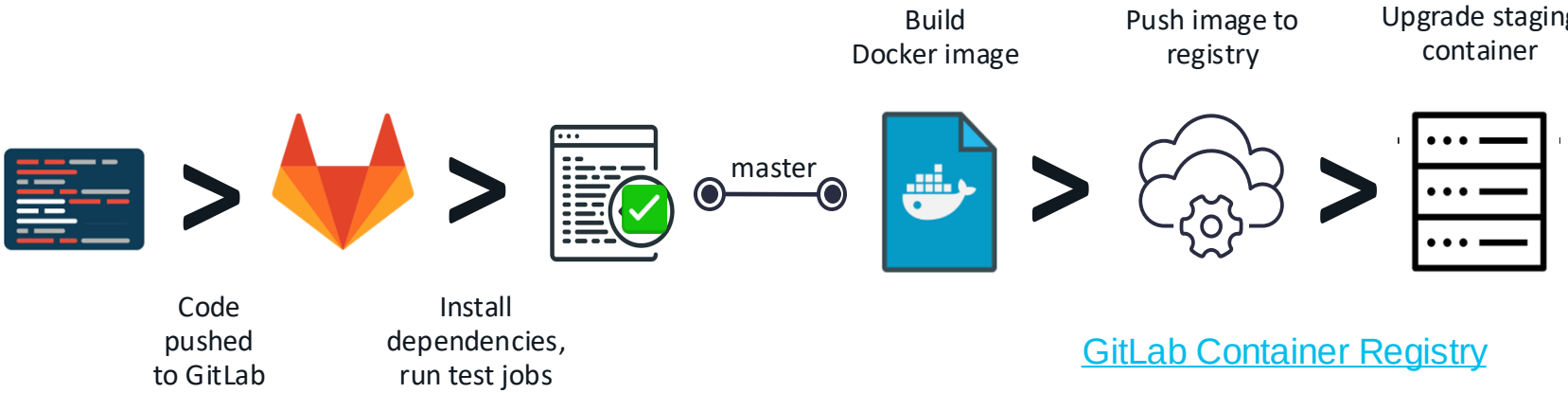
Docker

Docker Container allows developers to package their applications and dependencies into a single unit that can run consistently on any infrastructure.

With GitLab's Docker registry, it is possible build and store Docker images directly within GitLab, using GitLab CI/CD pipelines to automate the build and deployment processes.



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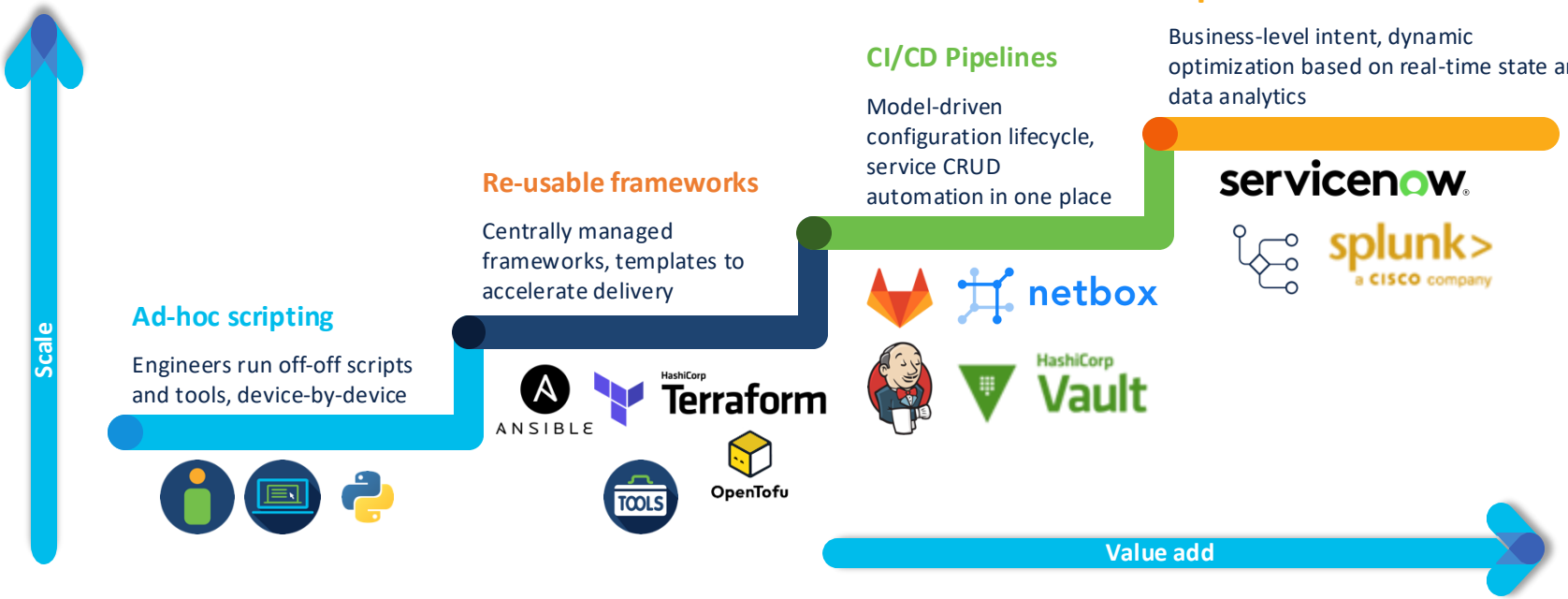
Automation approach in steps



BRKOPS-2814: Transforming network operations with Closed-Loop Automation using AI Insights *Jörg Schultz & Christopher Beye*
LTRATO-2600: Closed-Loop Automation using CI/CD Pipelines with the power of AI *Jörg Schultz & Christopher Beye & Flo Pachinger*
LTROPS-3773: Three Domains in One Pipeline: Cross-Domain Automation with Catalyst Center, FTD, and NDFC using NetDevOps Approaches *Jörg Schultz & Christopher Beye*
LTROPS-2977: Cross-Domain Automation with Cisco DNA Center and ACI using CI/CD Pipelines *Jörg Schultz & Christopher Beye*
BRKEMT-2007: NetDevOps - CI/CD with Cisco DNA Center Templates as Code *Jörg Schultz & Oliver Böhmer*

https://crossdomain-automation.tech/

Automate
Tomorrow
Today
Innovate

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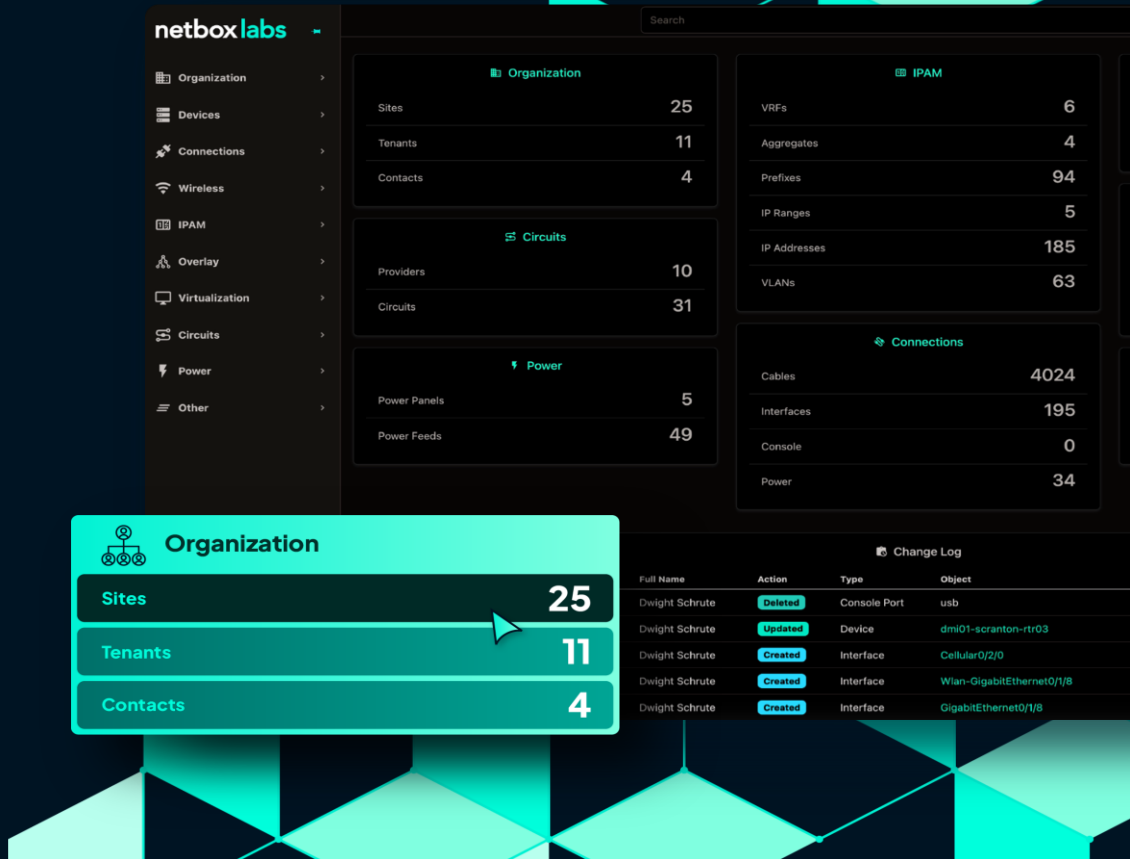
We Make It Easier to Build and Manage Complex Networks



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Commercial Stewards

Defining Community & Tech

netbox labs

- Founded in 2023 in NYC
- Commercial steward of NetBox OSS
- World class team built & lead NS1, founded the NetBox project
- World Class investors & customers

FLYBRIDGE · Grafana Labs · Notable. · salesforce ventures · TWO SIGMA VENTURES · FOUNDER COLLECTIVE · ENTRÉE CAPITAL · MANGO CAPITAL · IBM

Virtuous Circle

NetBox Labs leverages open source to generate commercial value and revenue, and reinvests in the community to create open source sustainability and scalability.

netbox

- 15K+ Github ☆- Widely loved by networking teams
- 11K+ Software commits - feature complete + rapid development
- 300+ Contributors - core, plugins + integrations
- 1000s of companies run NetBox in production

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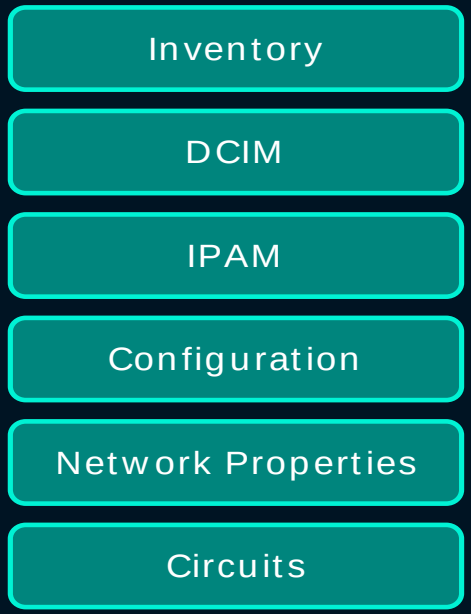
What is a Network Source of Truth (NSoT)?

- Defines the *intended* state of the network represented as *structured data*
- Should act as a single consistent data set
- Adopting an NSoT requires a significant mental shift for network engineers away from describing the network in design documents and diagrams
- NSoT becomes the authoritative reference for the network and its data *drives network automation*



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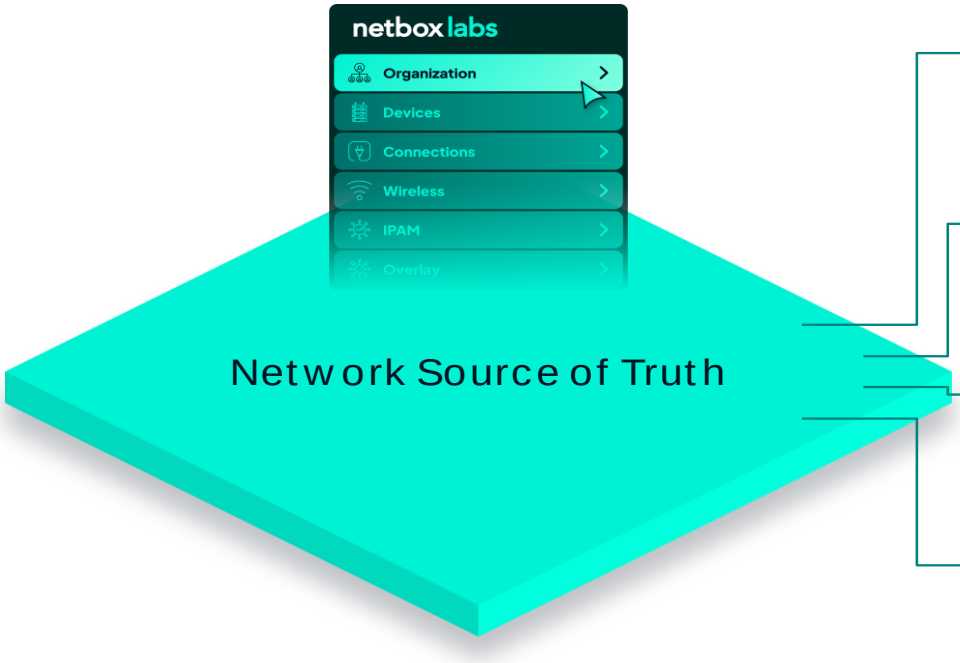
NetBox is the world's most popular Network Source of Truth (NSoT)



Comprehensive network data model

From ASNs to VPNs, and everything between

API & integration first

REST, GraphQL, Event Streams, Webhooks

Massive extensibility

Plugins, Device Types, Custom Scripts, Custom Fields, …

Enormous ecosystem

Everything works with NetBox

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The journey to network automation starts with implementing a NSoT

Document

- Converge legacy sources of truth
- Discovery or manual capture of additional network data
- Change operational processes to start with documentation

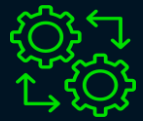
1

Model

- Connect network data through cohesive models
- Enforce consistency across models

2

72% of organizations are within these two phases.*



Automate

- Implement change management starting with NSoT/ intent
- Generate configs from model data
- Drive automations from dynamic inventory
- Assurance to identify/resolve operational drift

3

Only 28% of organizations have fully executed their network automation strategy.*

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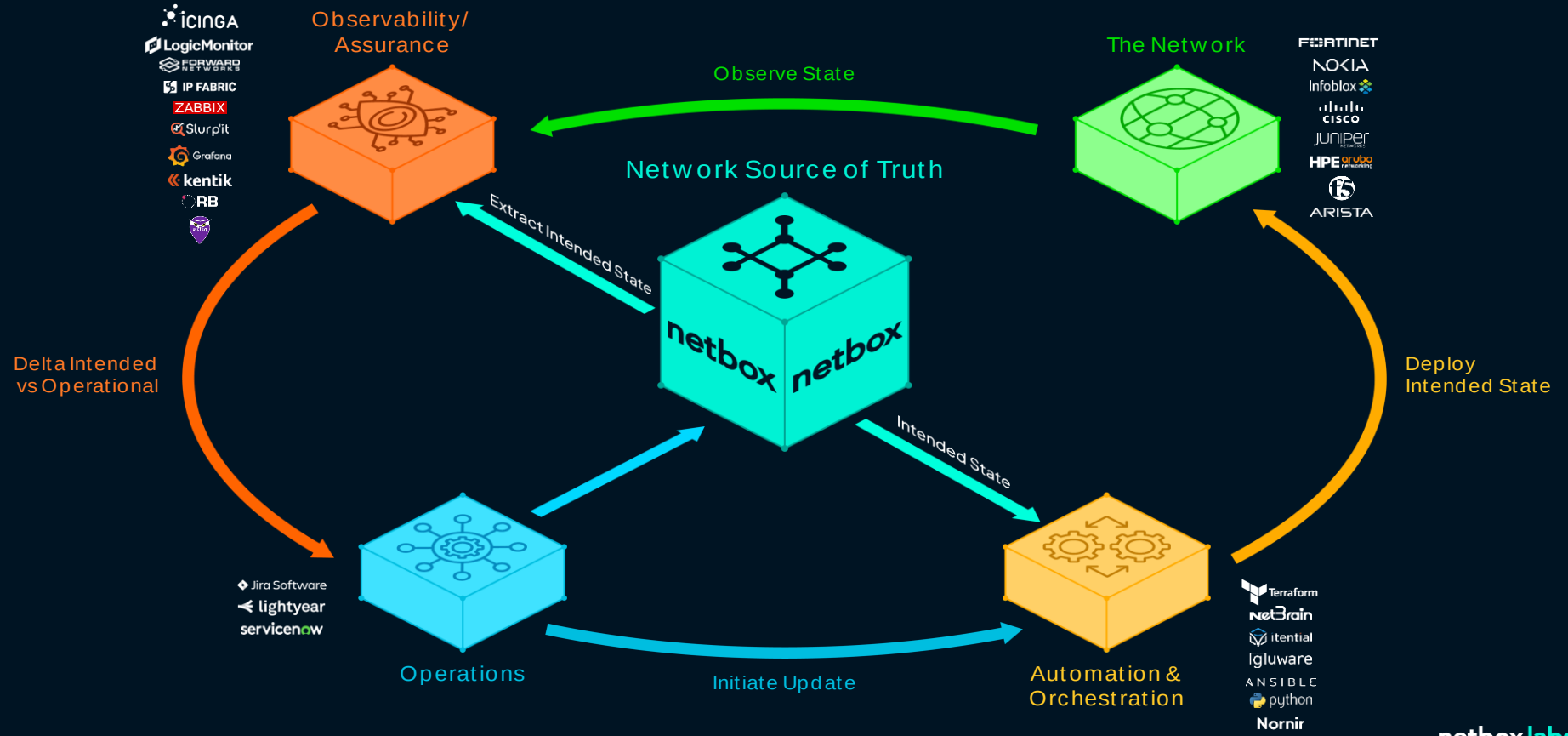
Modern Network Automation Architecture



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Get Started for Free

NetBox Cloud Free Plan:

https://netboxlabs.com/free-netbox-cloud/

Includes:

- Up to 100 devices,
- 500 IP addresses,
- 10k API requests/month
- 2 operational branches

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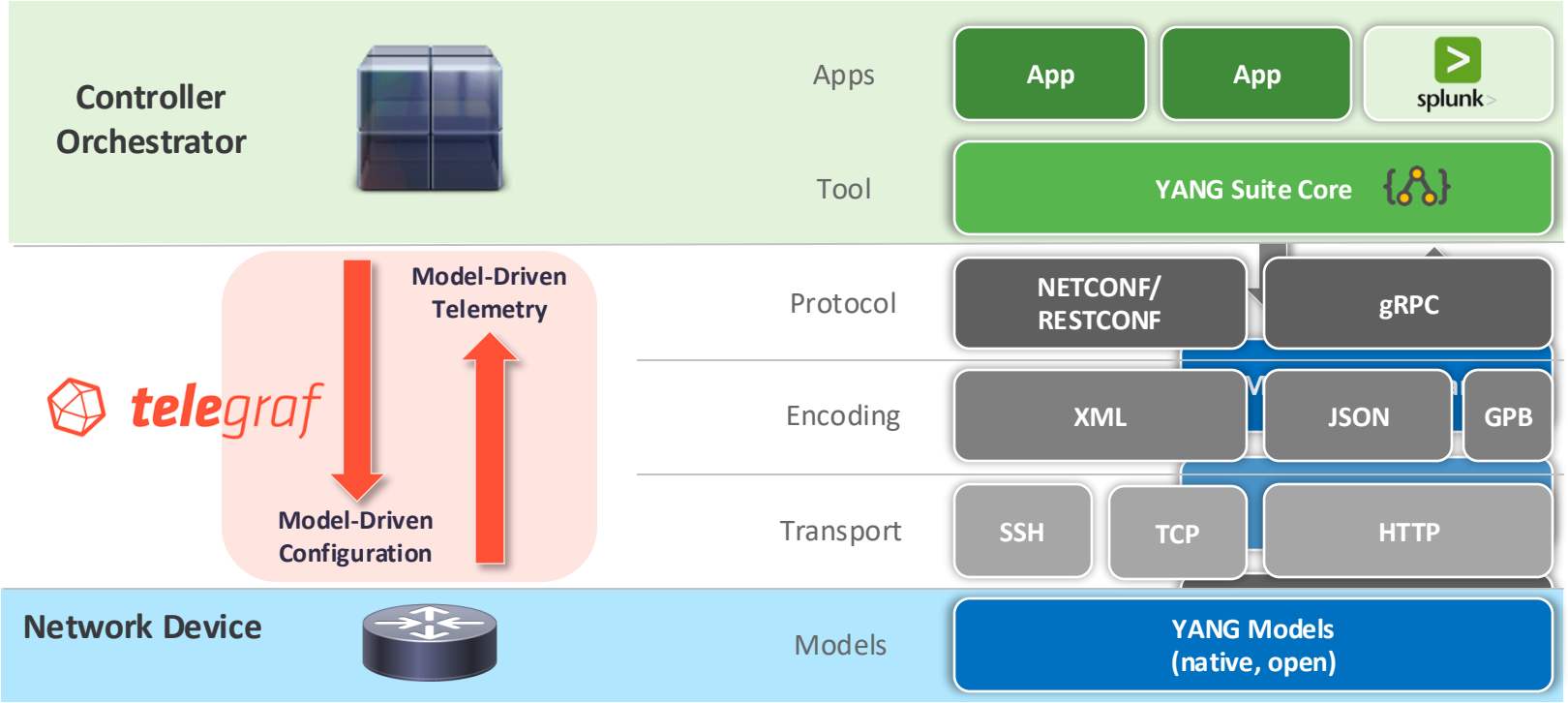
Model-Driven Manageability



https://developer.cisco.com/yangsuite

https://github.com/influxdata/telegraf/tree/master/plugins/inputs/cisco_telemetry_mdt

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Model-Driven Manageability

Inputs MDT

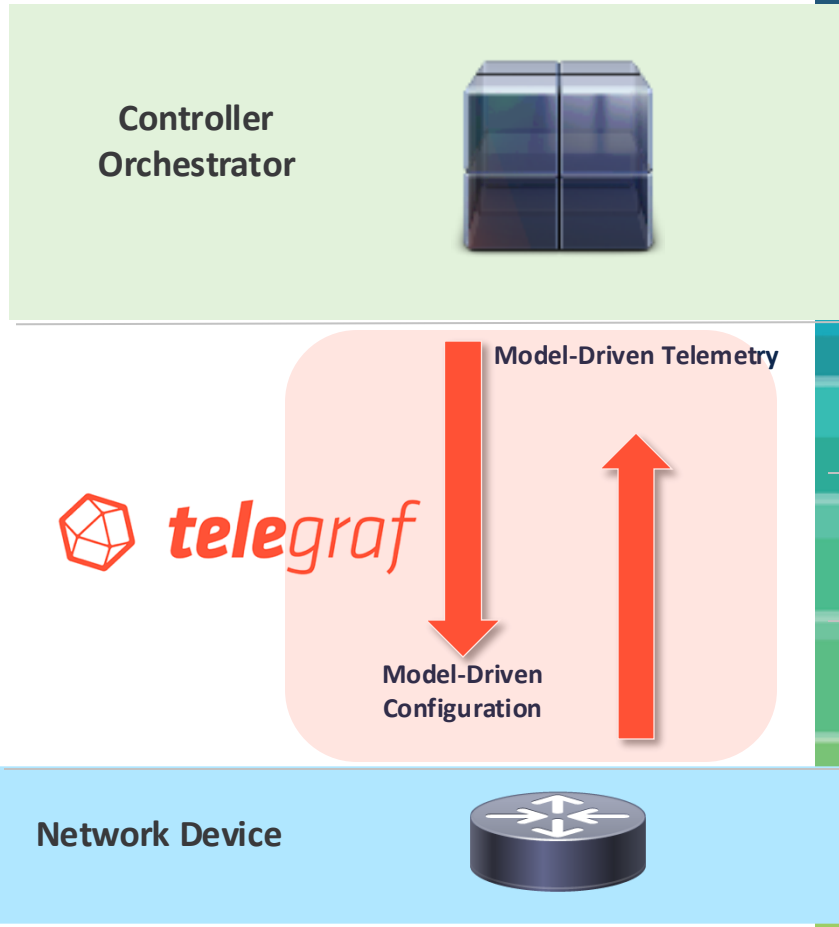
```
[[inputs.cisco_telemetry_mdt]]
 ## Telemetry transport can be "tcp" or "grpc".
 ## TLS is only supported when
 ## using the grpc transport.
 transport = "grpc"

 ## Address and port to host telemetry listener
 service_address = ":57400"

 ## Grpc Maximum Message Size, default is 4MB, increase the size.
 ## This is stored as a uint32, and limited to 4294967295.
 max_msg_size = 4000000
```

NX-OS

```
telemetry
  destination-group 10
    ip address 10.x.x.x port 57400 protocol gRPC encoding GPB
  sensor-group 10
    data-source YANG
    path openconfig-interfaces:interfaces/interface/state/counters
  subscription 10
    dst-grp 10
    snsr-grp 10 sample-interval 5000
```

IOS XE

```
telemetry ietf subscription 102
 encoding encode-kvgpb
 filter xpath /interfaces-ios-xe-oper:interfaces/interface/statistics
 stream yang-push
 source-address 10.x.x.x
 update-policy periodic 5000
 receiver ip address 10.x.x.x 57400 protocol grpc-tcp
```



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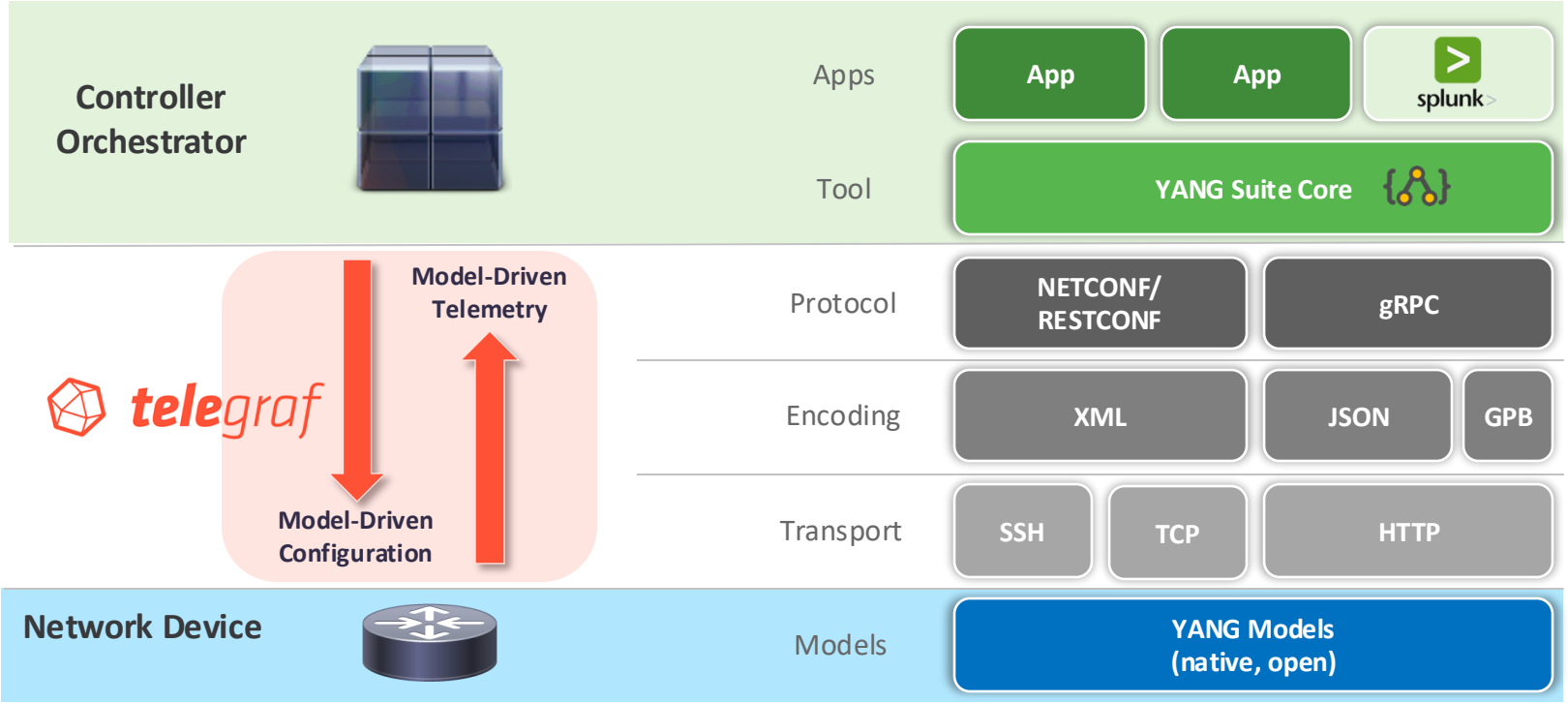
Model-Driven Manageability



https://developer.cisco.com/yangsuite

https://github.com/influxdata/telegraf/tree/master/plugins/inputs/cisco_telemetry_mdt

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Model-Driven Manageability

pp

splunk>

ite Core

gRPC

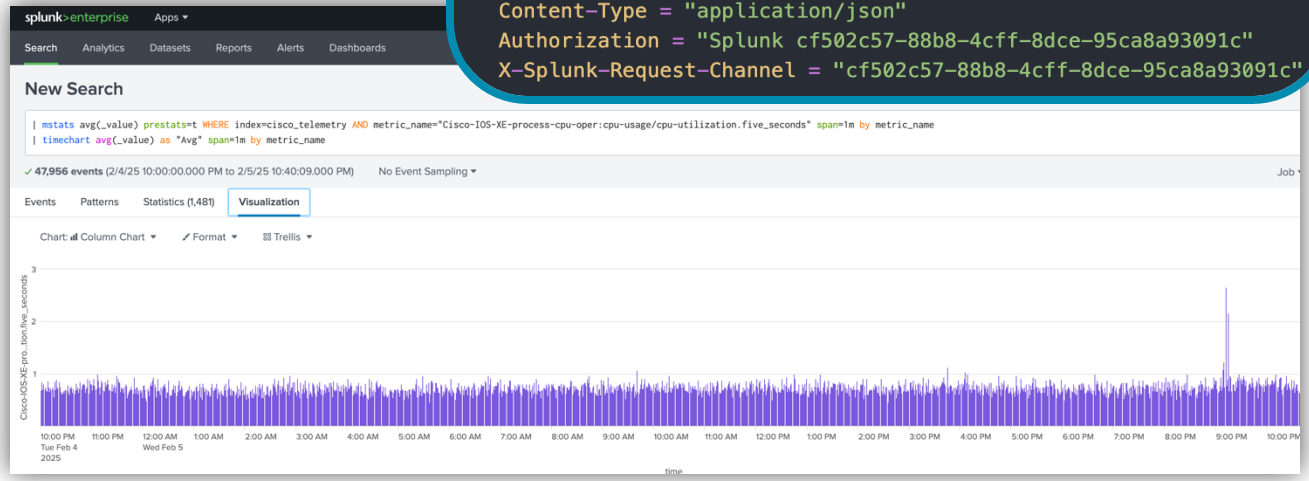
JSON

GPB

Outputs Splunk

```
# Splunk HTTP Event Collector (HEC) Output Plugin
[[outputs.http]]
  url = "https://10.x.x.x:8088/services/collector"
  data_format = "splunkmetric"
  insecure_skip_verify = true
  splunkmetric_hec_routing = true
  splunkmetric_multimetric = false
  splunkmetric_omit_event_tag = true

# Splunk HEC Token
[outputs.http.headers]
  Content-Type = "application/json"
  Authorization = "Splunk cf502c57-88b8-4cff-8dce-95ca8a93091c"
  X-Splunk-Request-Channel = "cf502c57-88b8-4cff-8dce-95ca8a93091c"
```



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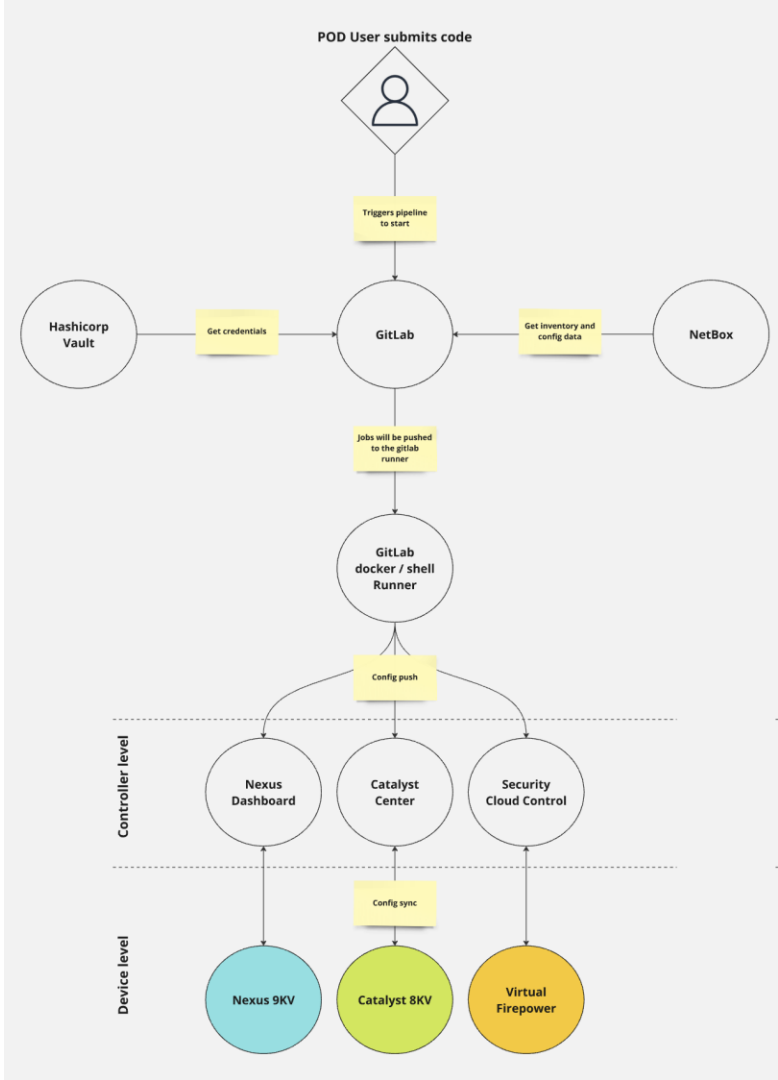
Lab scenarios

Scenario 1

Configure the environment

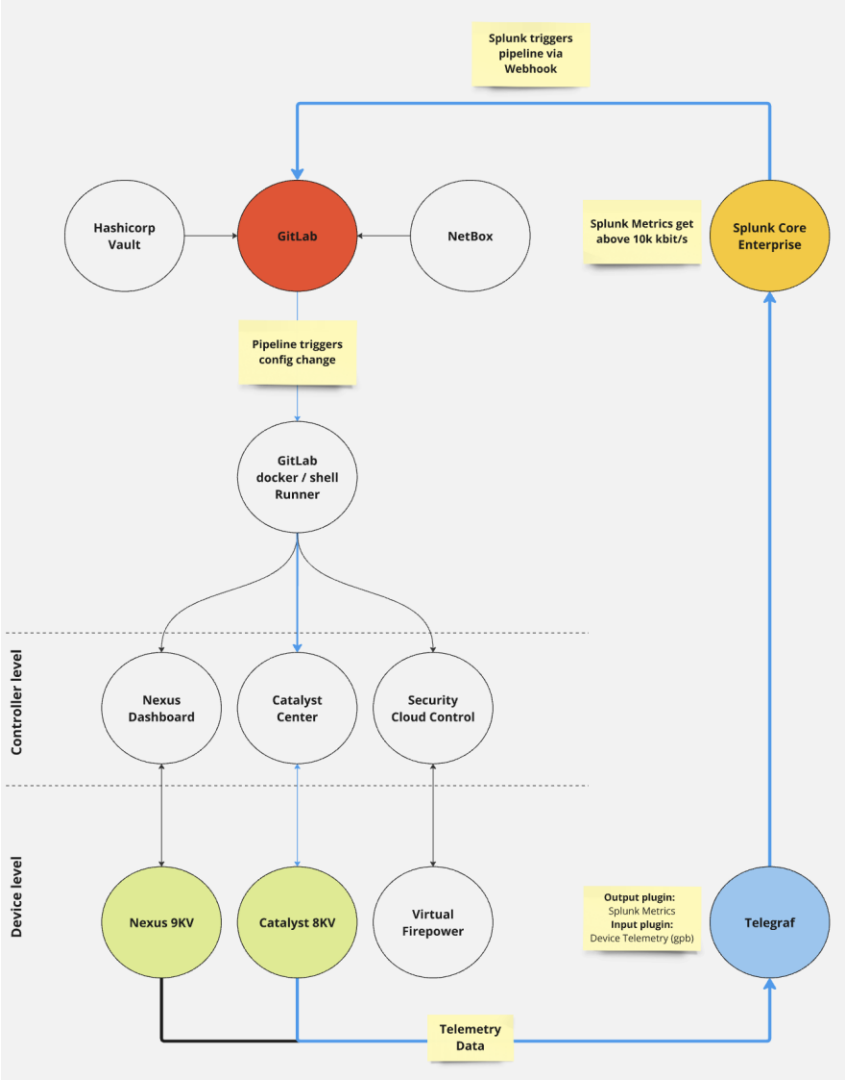
- **End-to-End Automation:** GitLab pipeline automates config changes across branch, data center, and security domains.
- **Secure Access:** Credentials are securely managed via HashiCorp Vault.
- **Accurate Configs:** NetBox ensures correct device and interface updates.
- **Automated Execution:** GitLab runner deploys configs to network controllers.
- **Verification:** Automated tests confirm connectivity and rule enforcement.



Scenario 2

Closed loop automation

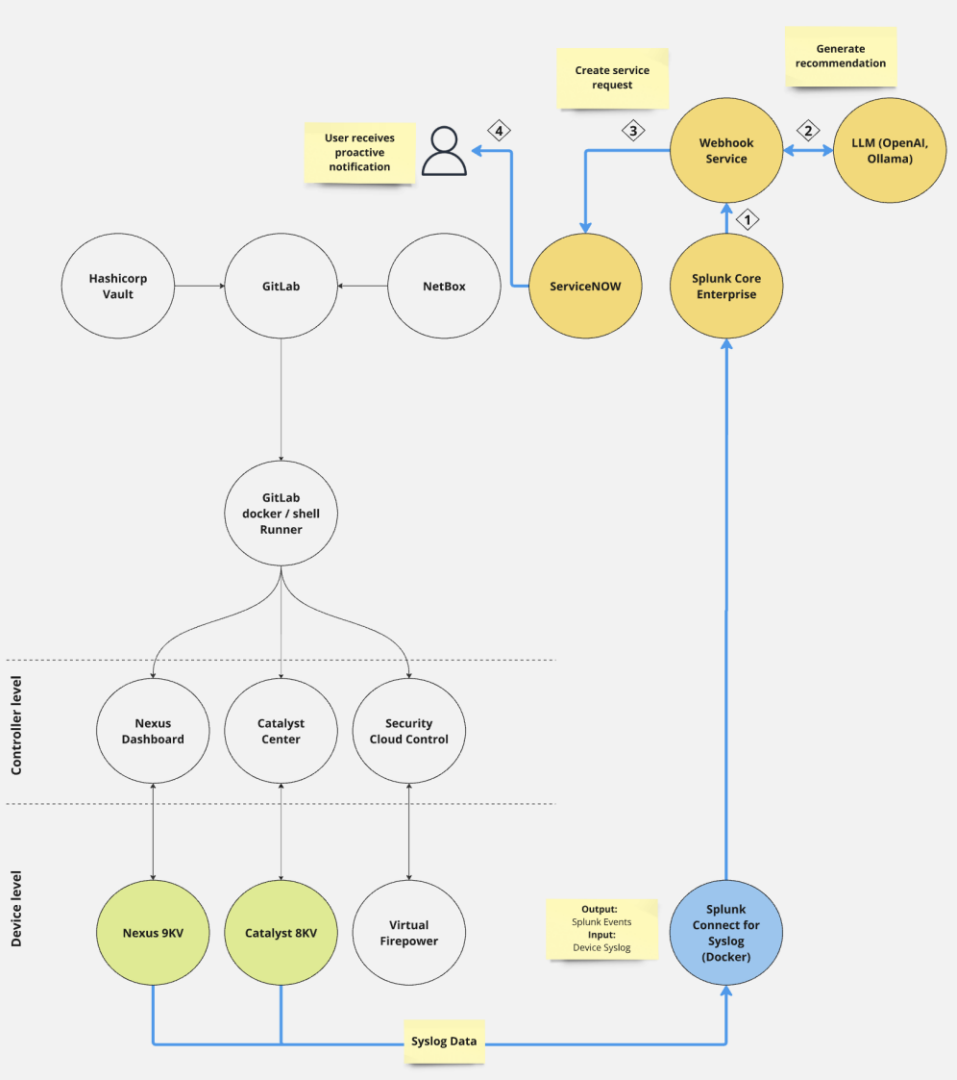
- **Telemetry Collection:** Nexus 9KV and Catalyst 8KV send telemetry data to Telegraf.
- **Trigger Response:** Telegraf forwards data to Splunk for rule-based actions.
- **Automated Response:** Splunk triggers GitLab pipeline via Webhook for config changes.
- **Config Deployment:** GitLab runner applies fixes to controllers, e.g. Catalyst Center.
- **Continuous Feedback:** Ensures stability by automating corrective actions.



Scenario 3

Enhancing IT-Support Tickets with AI

- **Syslog Collection:** Nexus 9KV and Catalyst 8KV send logs to Telegraf.
- **Log Processing:** Telegraf forwards logs to Splunk Connect for Syslog.
- **Data Analysis:** Splunk detects issues and sends alerts to Webhook Service.
- **Automated Actions:** ServiceNow tickets are created with AI-recommended solutions.
- **Proactive Alerts:** Users receive notifications to maintain network health.



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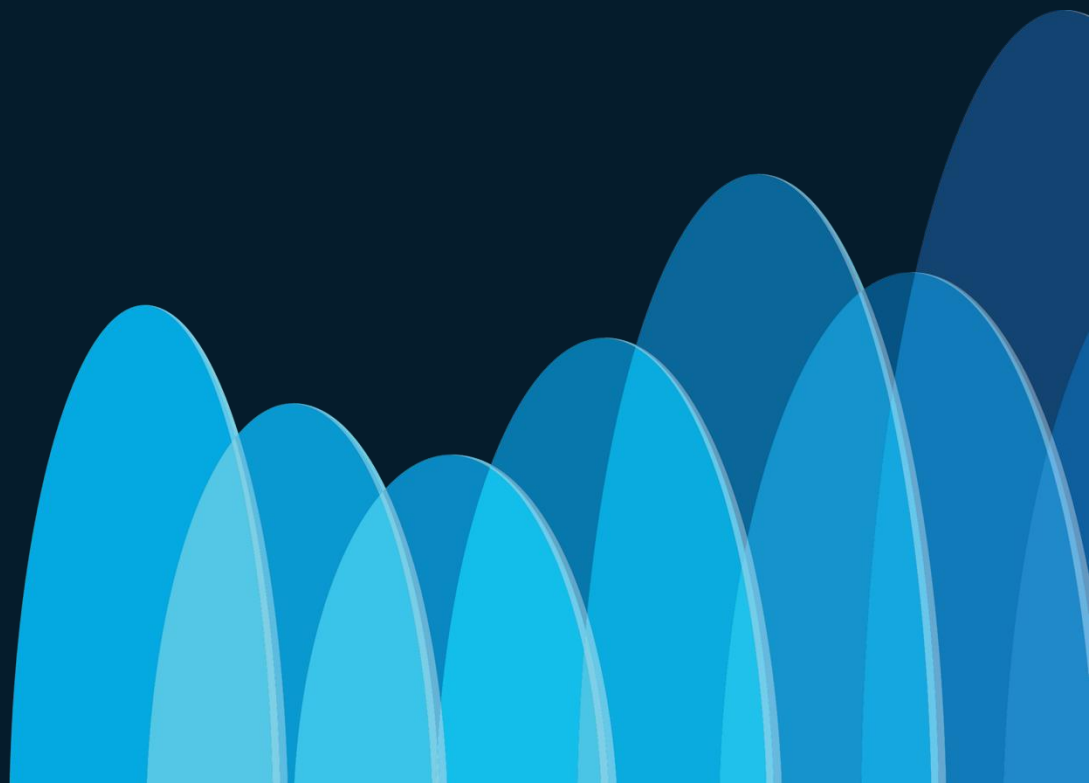
Lab tasks



Task overview

Task #1 - Verify the Lab environment

Task #2 - Secret management with Vault

Task #3 – Inventory management with NetBox

Task #4 – Build the first pipeline

Task #5 – Scenario 1 (Configure the environment)

Task #6 – Scenario 2 (Closed loop automation)

Task #7 – Scenario 3 (Enhancing IT-Support Tickets with AI)

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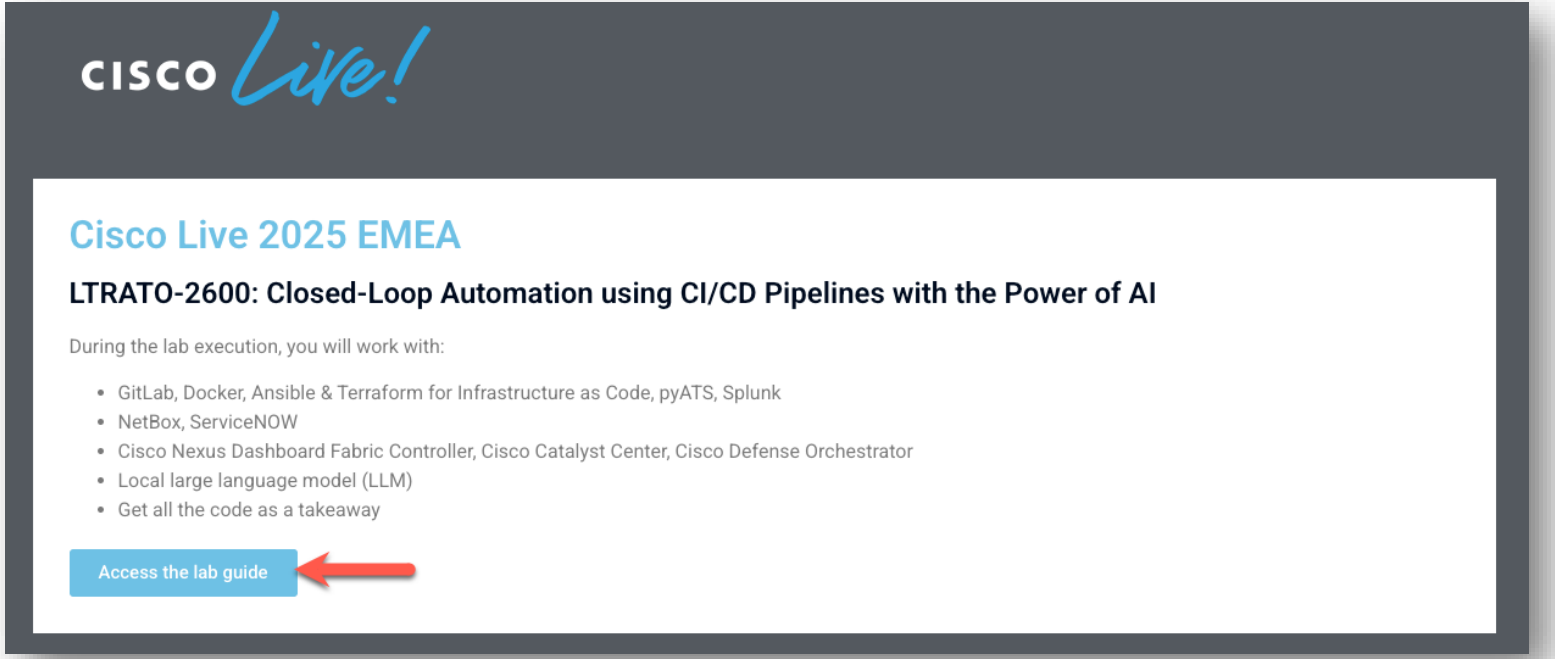
Online lab guide available here

- https://crossdomain-automation.tech/



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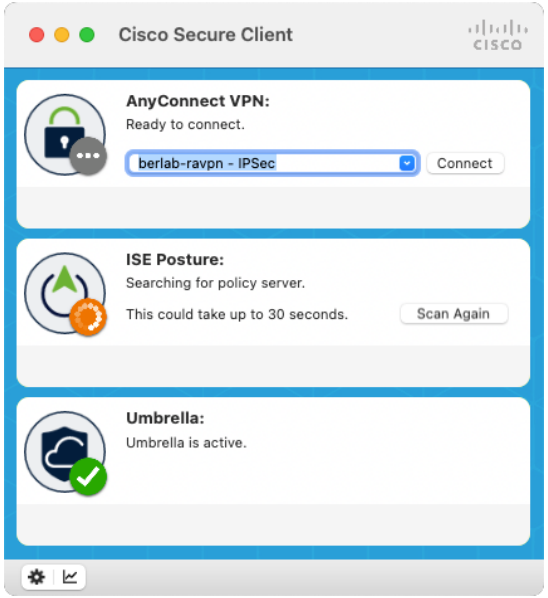
Connect to your lab

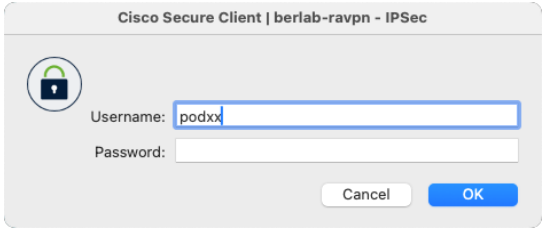
Step 1: Open Cisco Secure Client

- Type Remote server address

  64.103.36.161:10000



Step 2: Provide Username / Password



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How

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3. Install the Webex app or go directly to the Webex space
4. Enter messages/questions in the Webex space

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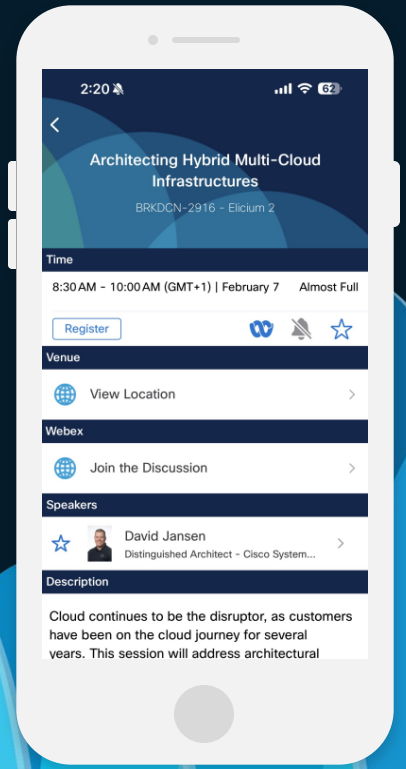

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Contact us at: cbeye@cisco.com
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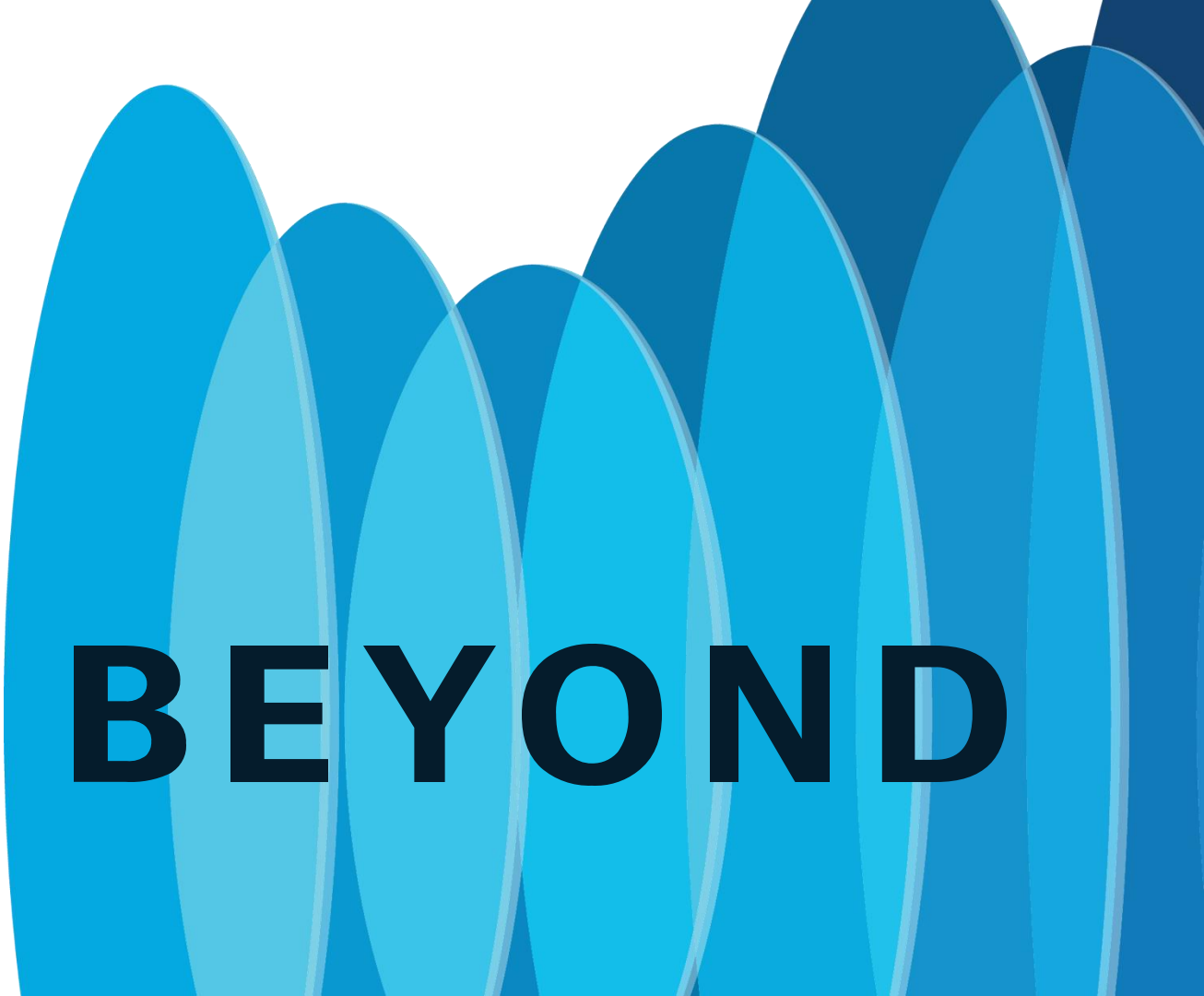

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