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The bridge to possible

Datacentre Cisco Networking Automation

Camillo Rossi - Technical Leader Marketing Engineer

DEVNET-1687

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Cisco Networking Spotlight
Sweepstake

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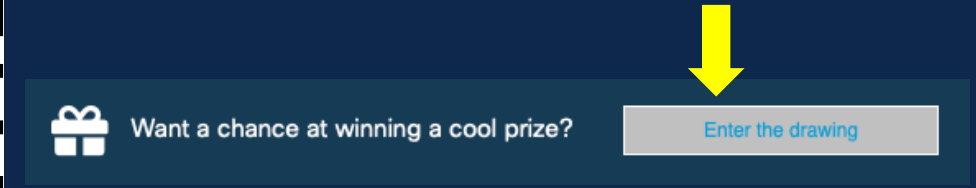
Step 1



Step 2

Step 3

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Agenda

Introduction

Cisco Strategy on Automation

Demo

Conclusion

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“Automation is to modern infrastructure what blood is to the body. It is core, you cannot have modern infrastructure without it.”

Gartner

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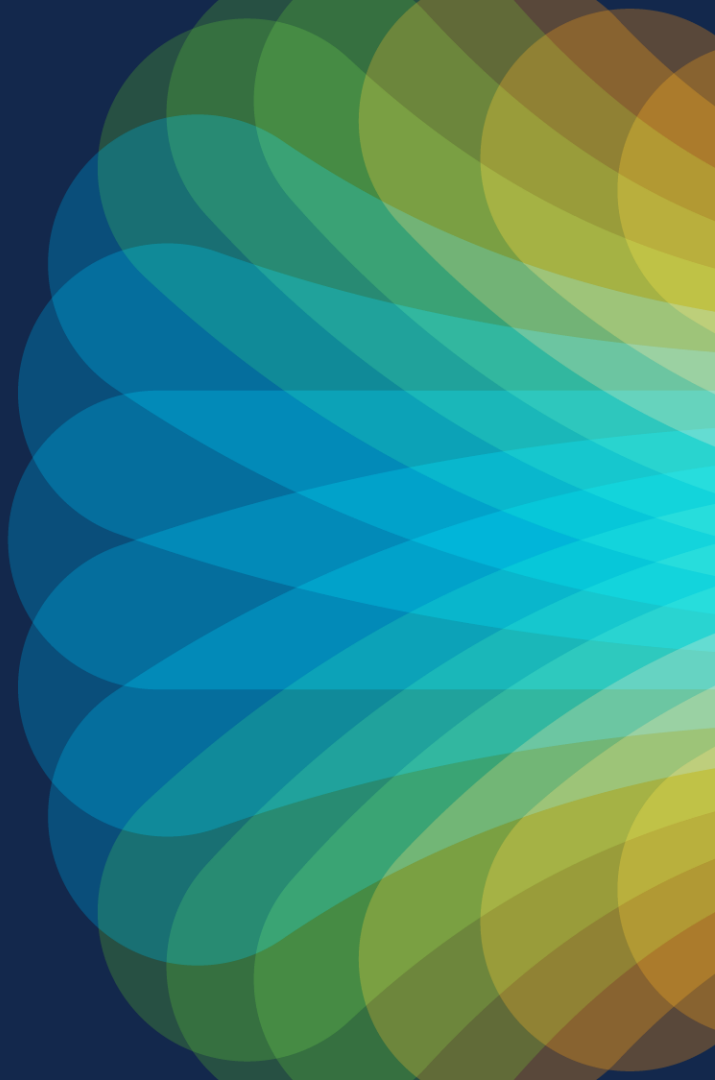
Foundations



Infrastructure as Code

- Infrastructure as Code (IaC) involves treating the IT infrastructure in a descriptive model, like software source code is treated.
- The infrastructure design and deployment can be handled in an automated, repeatable way using scripts and code, instead of through manual processes.
- This approach allows to automate the provisioning and management of IT infrastructure, reducing errors and inconsistencies due to manual configuration.
- IaC ~~can~~ should be used in conjunction with version control systems, allowing for versioning, testing, and continuous integration of infrastructure changes.

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Infrastructure as Code

typically, a multi-year journey

Infrastructure as Code is trending topic in the industry, but…

- Make sure there is a business reason behind this move
- Clarify business challenge or goal to achieve with it
- Have a solid plan before starting
- Think about the operational implications
  - Make smaller changes often (CI/CD) is a major deviation to what we are used to as Networking Admins
  - Engage with the other teams to make sure everyone is onboard
  - Ask yourself: What is the preferred way for you/your Engineers to make changes?
  - Do you need to retrain your staff?

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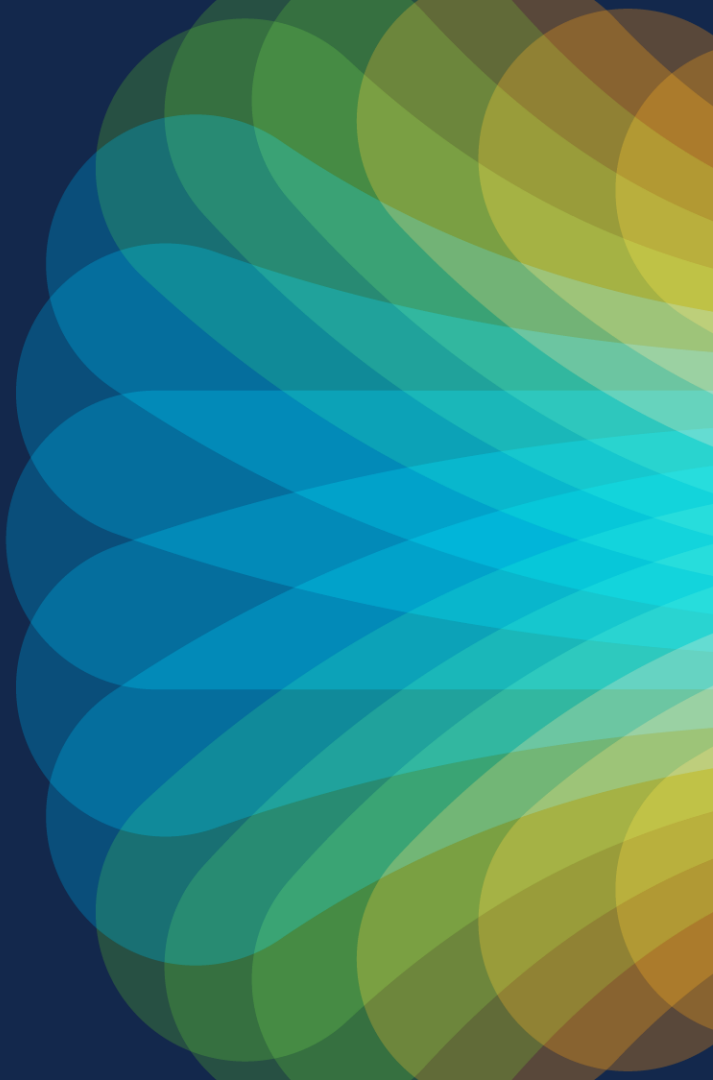
Infrastructure as Code Journey



Infrastructure as Code Journey

Considerations for a successful automation practice

Workflows

What do we automate? Do we have suitable workflows? Can we stardardize them?

Culture and Skillset

How is our organization structure? What are the skills in the team? How is collaboration?

Governance

How do we ensure compliance and collaboration? Which tools to use? Do we need CI/CD?

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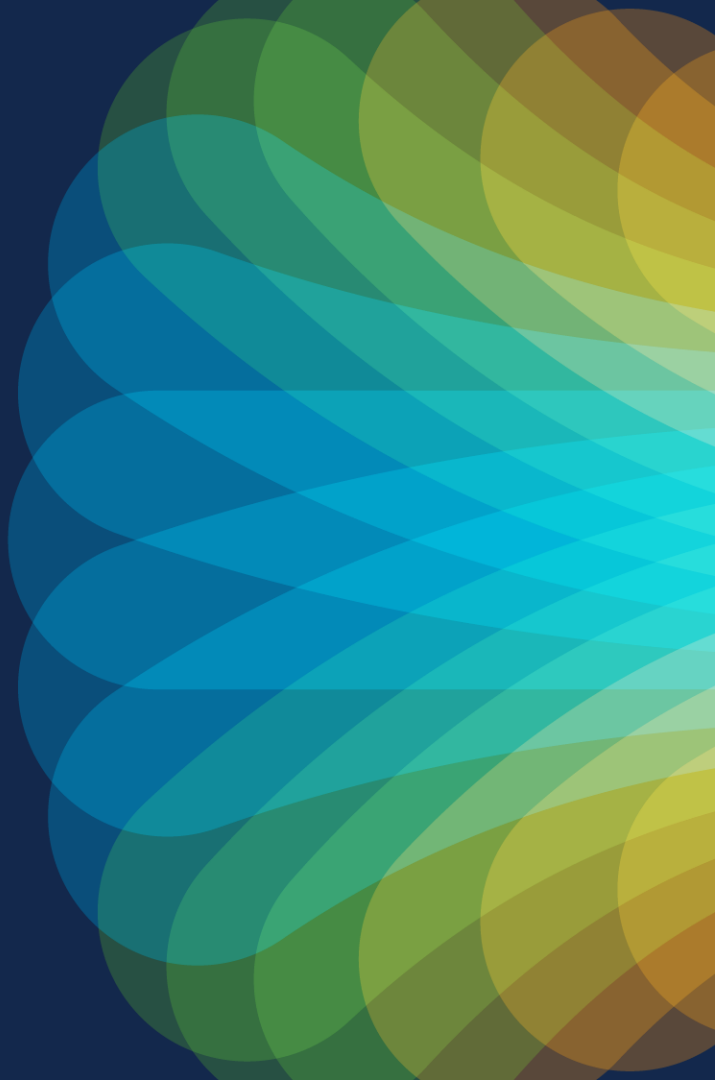
CI/CD Pipelines



CI/CD Pipelines

Introduction

- Why we use a CI/CD Pipeline?
  - Pipelines are used when multiple steps are required in the process
  - Pipelines implement the process in a consistent and automated way
    - Provides speed, consistency, efficiency and lower risk
- Networking CI/CD Pipelines helps automating steps in network provisioning process i.e.:
  - Config Build
  - Pre-change Validation
  - Automated Testing
  - Deploy changes

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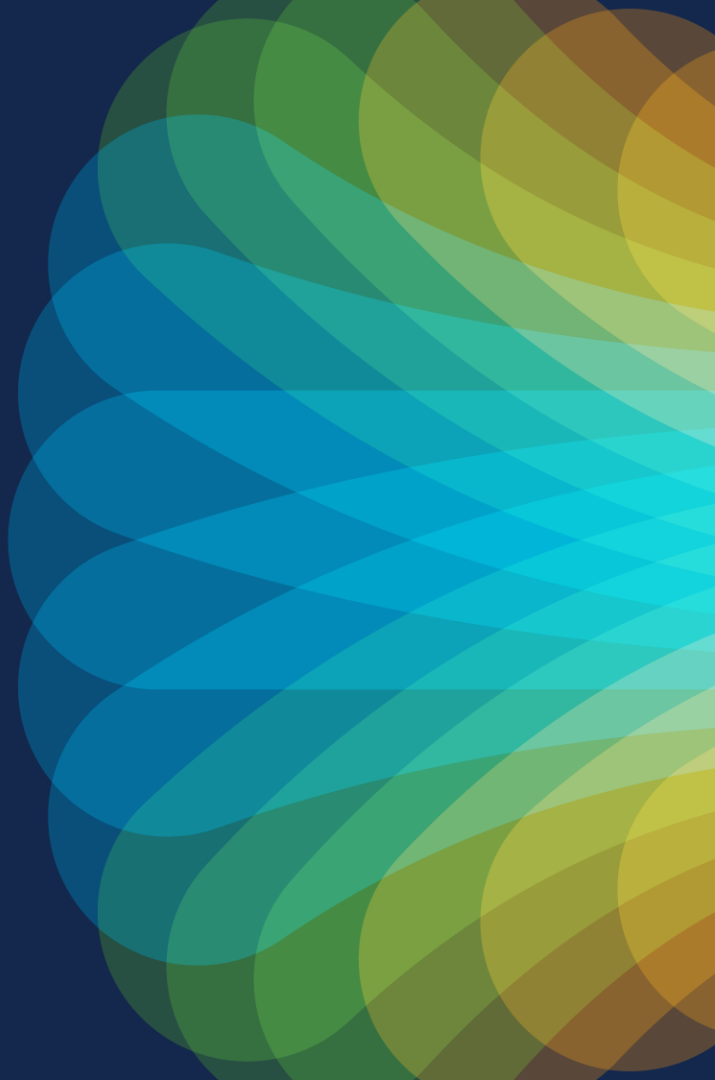
Choosing the right tools



Choosing the right tools

Ansible vs Terraform

- Both Ansible and Terraform can coexist
  - It's not an either/or story
  - Terraform can call Ansible for ad-hoc tasks after deploying a VM
- But what about network provisioning?
  - Both are very powerful tools for provisioning network infrastructure
  - Choosing the right tool requires a careful analysis, considering:
    - What is going to be automated
    - What is the desired process
    - Current skillsets in the organization
    - Organization's preference

It is critical to know the limits of each tool, and where they excel

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Choosing the right tools

Ansible vs Terraform

Both are...

Open Source

Commercial support available

Agentless

Declarative and Idempotent

Versatile

Strong presence in the market

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Choosing the right tools

Ansible vs Terraform

- Short learning curve
- Simple processing of nested variables
- Sequential processing of tasks
- Order of operations determined by user
- Destroy plan needs to be built manually
- Object replacement must be handled manually
- All tasks run every time even if no change

- Long learning curve
- Complex processing of nested variables
- Order of operations calculated based on dependencies
- Destroy plan calculated automatically
- Object replacement handled automatically
- Preview of plan (delta) with expected changes
- Only resources that have changed are executed

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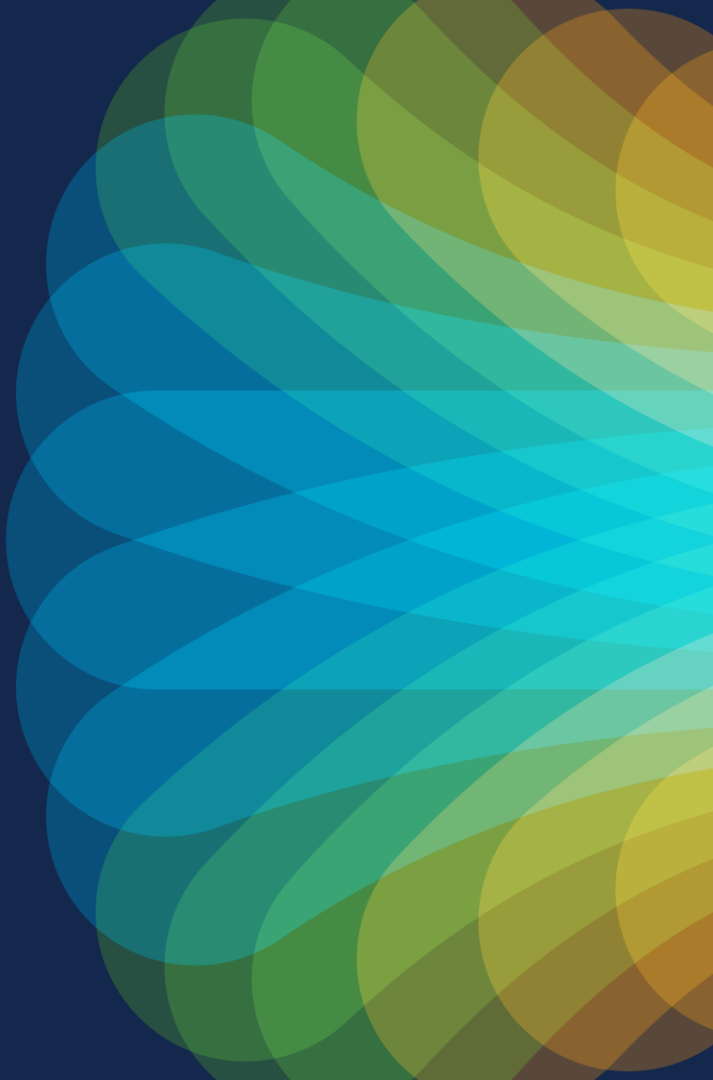
The “Code”



Ansible Collections
Cisco Data Centre Networking

Cisco NXOS	ACI Cloud / Onprem	Nexus Dashboard	Nexus Dashboard Fabric Controller
cisco.nxos	cisco.aci	cisco.nd cisco.mso	cisco.dcnm

All Cisco collections can be found here: https://galaxy.ansible.com/cisco/

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Terraform Providers
Cisco Data Centre Networking

Cisco NXOS	ACI Cloud / Onprem	Nexus Dashboard Orchestrator	Nexus Dashboard Fabric Controller
CiscoDevNet/nxos	CiscoDevNet/aci	CiscoDevNet/mso	CiscoDevNet/dcnm

All Cisco providers can be found here: https://registry.terraform.io/search/providers?namespace=CiscoDevNet

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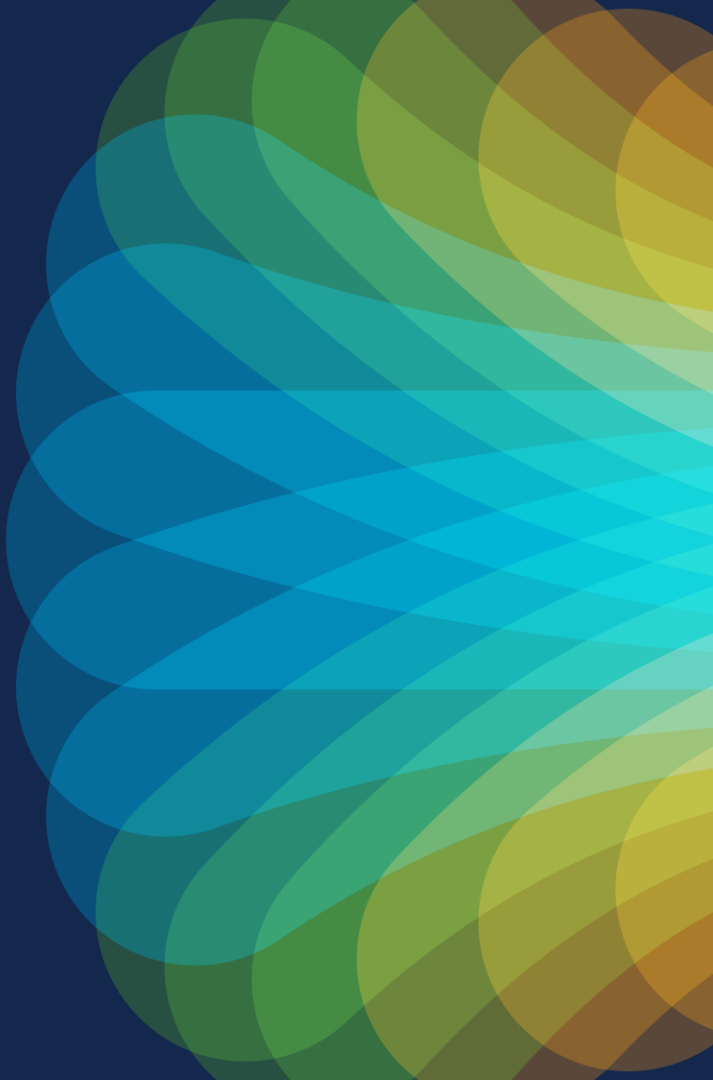
The “Inventory” Approach



Nexus-as-Code open-source project

- Nexus-as-Code allows for complete separation of data (defining variables) from logic (infrastructure declaration). With little to no experience with automation, users can instantiate network fabrics in minutes.
- The model is structured in such a way that it logically represents the GUI of ACI

https://cisco.com/go/nexusascode

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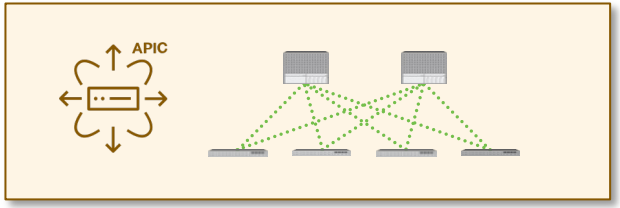
Nexus-as-Code

Outcomes and benefits

- Reduce time to value
- Create network fabrics in minutes
- Simplify configuration

```
apic:
  tenants:
    - name: CiscoLive
      vrfs:
        - name: VRF1
        - name: VRF2
```

HashiCorp Terraform



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Demo #1 –Terraform for ACI

- Process: Code Driven Automation
- What is being automated?
  - Tenant configuration (Tenant, EPG, BD)

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Demo #2 –Nexus As A Code for ACI

- Process: Inventory Driven Automation
  - The config resembles the ACI UI
- What is being automated?
  - Tenant configuration (Tenant, EPG, BD)

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Demo #3 – NDFC CICD with Ansible

- Process: Inventory Driven Automation
  - The config resembles the ACI UI
- What is being automated?
  - Network Deployment
  - Deployment in pre-prod for config testing
  - Deployment in prod

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Conclusion

Summary

- Both Ansible and Terraform are great tools you can use to automate your network
- Cisco has done extensive development in the Ansible and Terraform space and both solutions are being actively developed and improved
- Nexus As A Code provides a complete separation of data from logic. With little to no experience with automation, users can instantiate network fabrics in minutes.
- We just scratched the surface…

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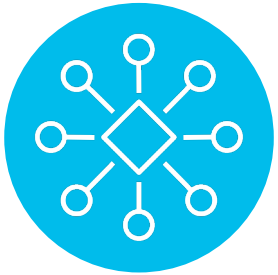
Use DevNet Learning Labs to start your journey!



ACI

ANSIBLE Intro Learning Lab

Intro Learning Lab

NDO

ANSIBLE Intro Learning Lab

Intro Learning Lab

NDFC

ANSIBLE Intro Learning Lab

Intro Learning Lab

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Cisco Webex App

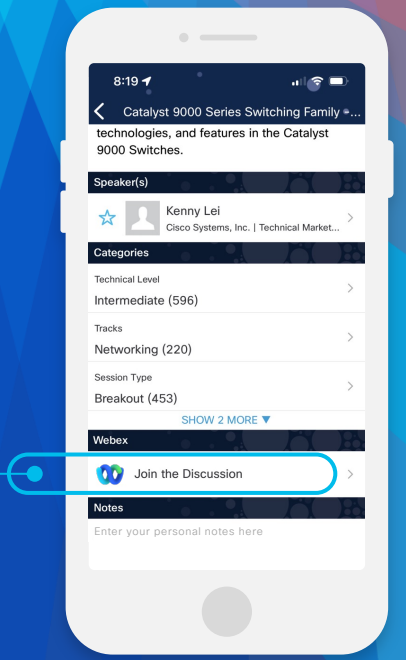
Questions?

Use Cisco Webex App to chat
with the speaker after the session

How

1. Find this session in the Cisco Live Mobile App
2. Click “Join the Discussion”
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until December 22, 2023.



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Sweepstake

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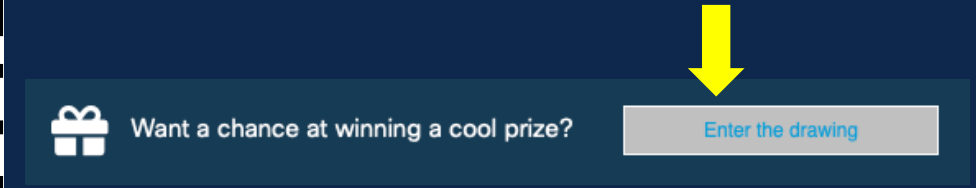

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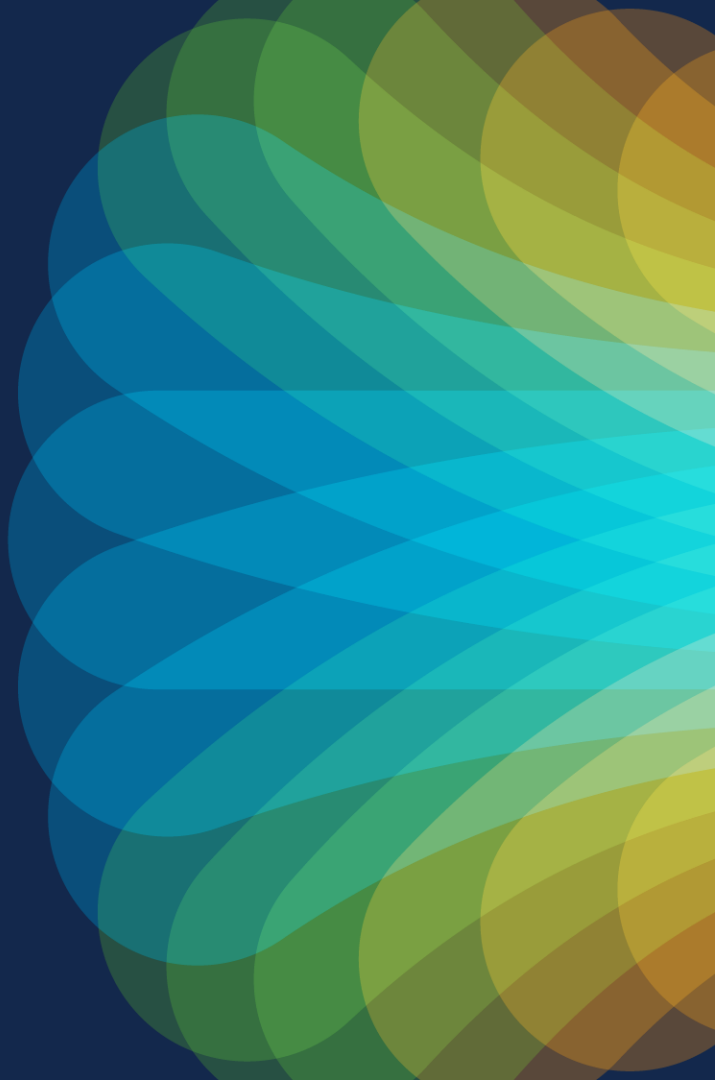
The bridge to possible

Thank you



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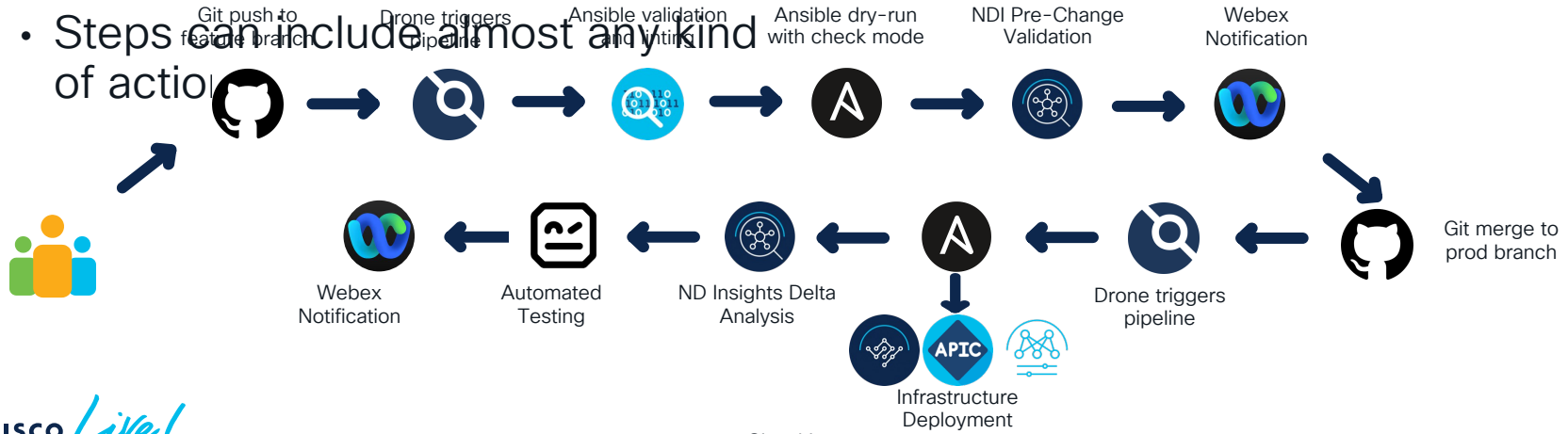
CI/CD Pipelines

- Pipelines can be as complete (and complex) or as simple as needed
  - Continuous Integrations Tools enables to include as many steps as needed
  - Steps can include almost any kind of actio
- From operator experience, difference is minimal
  - Make changes on a branch, push, merge, open a pull request, ...
  - Rest of actions are triggered based on user's actions on the repository



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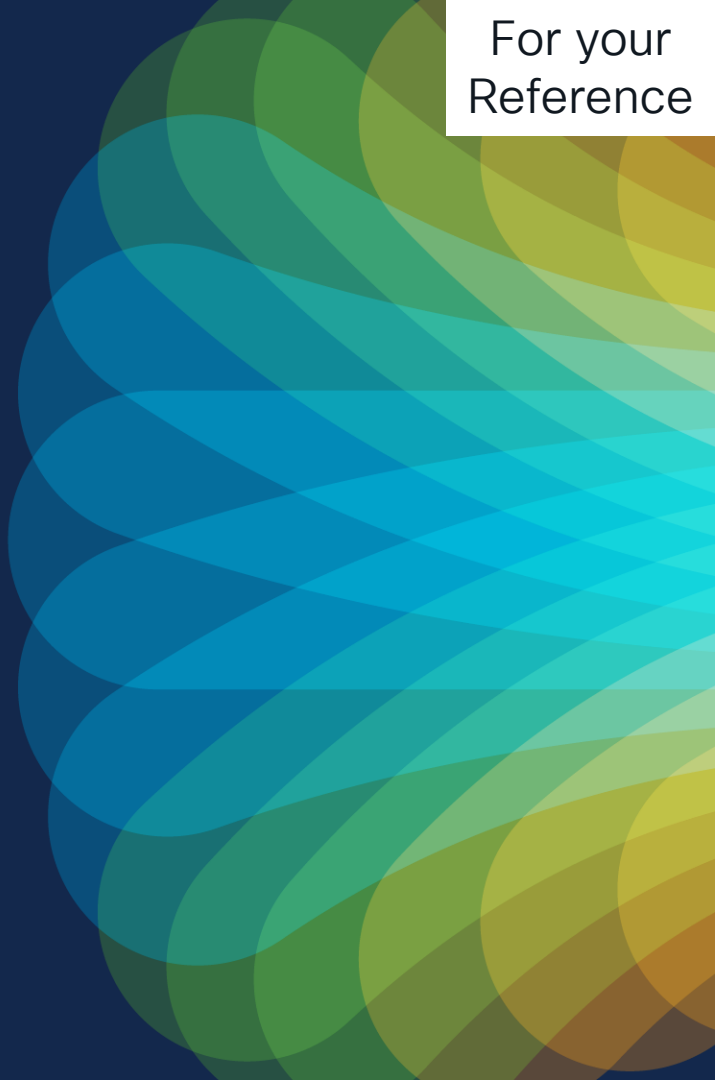
For your Reference

Workflow



Building a Workflow

Considerations

- Let's build a CI CD workflow
  - Aspects we need to consider:
    - Who is allowed to push to repository, and where
    - Branching strategy
    - How the repository (SSoT) is organized
    - How many repositories?
    - What is the structure per repository?
    - Pull Request
    - Are we using Pull Requests?
    - How is the review process?

The focus here is the process itself, not the tools being used.

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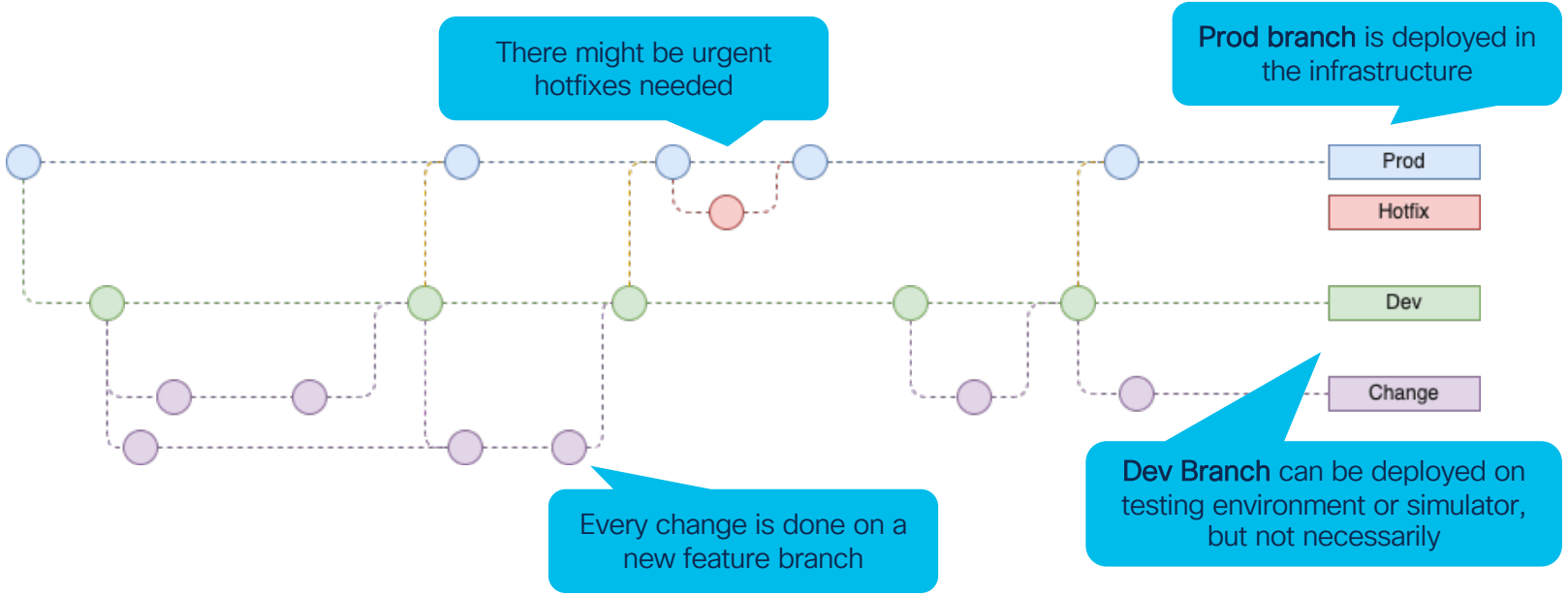
Building a Workflow

Branching Strategy Example



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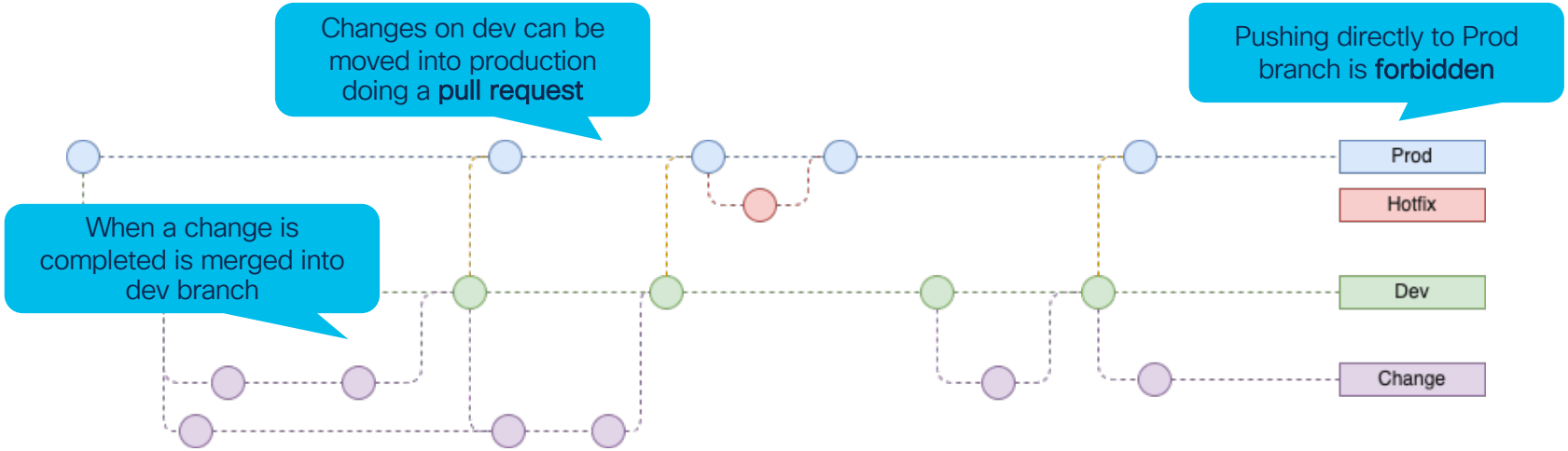
Building a Workflow

Branching Strategy Example



This is just an example, there are multiple possible workflows, with pros and cons

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Building a Workflow

Repository Structure Example

fabric-infra

- system-settings
- fabric-discovery
- infra-tenant
- ...

access-policies

- policies
- switch-profiles
- interface-profiles
- ...

common

- networking
- contracts
- app-services
- ...

prod-tenant

- networking
- contracts
- app-profile-x
- ...

Split the problem! Multiple repositories makes things simpler

Permissions in GitHub are per repo, consider this when planning the structure

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How are infrastructure changes driven?

- Code:
  - The user write ansible/terraform/python etc… code directly
  - The data (defining variables) and the logic (infrastructure declaration) are coupled
- Inventory:
  - Allows for complete separation of data (defininig variables) from logic (infrastructure declaration)
  - Requires little to no experience with automation
  - The code is hidden to the user and the ansible/terraform code is automatically generated

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