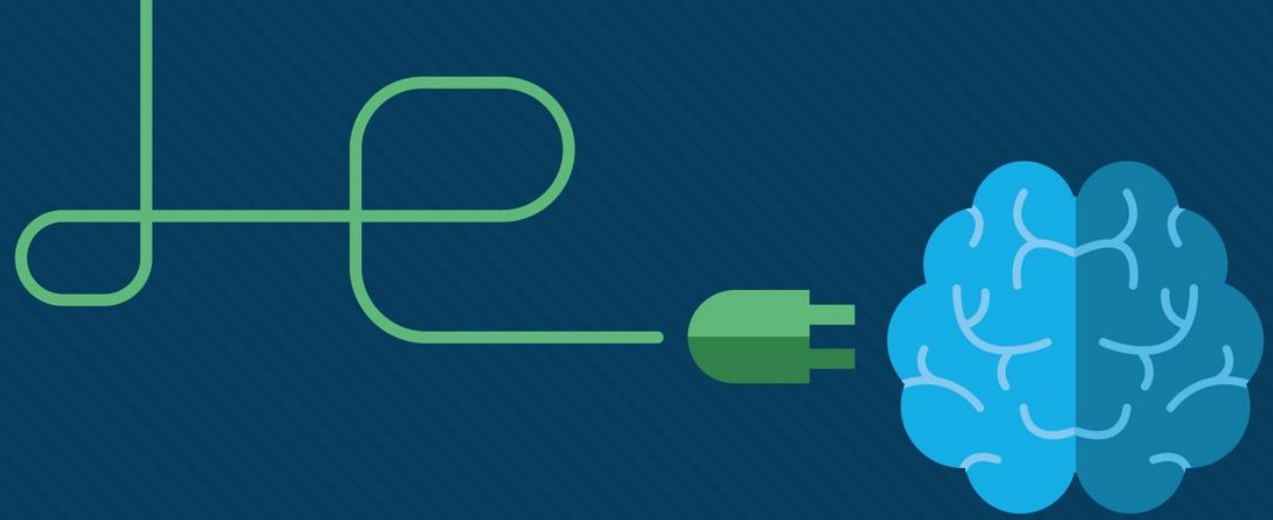

How to be a Network Engineer in a Programmable Age

Go beyond Infrastructure as Code and Automation

Hank Preston, ccie 38336
Principal Network Automation Engineer

June 2020

Twitter: hfpreston
Email: hapresto@cisco.com

Topics to Cover

- The Network Engineer of Old
- The Four Ages of Networking
- Applying DevOps to Networking
- Today's Network Engineer
  - Certifications!

The Network Engineer Evolves

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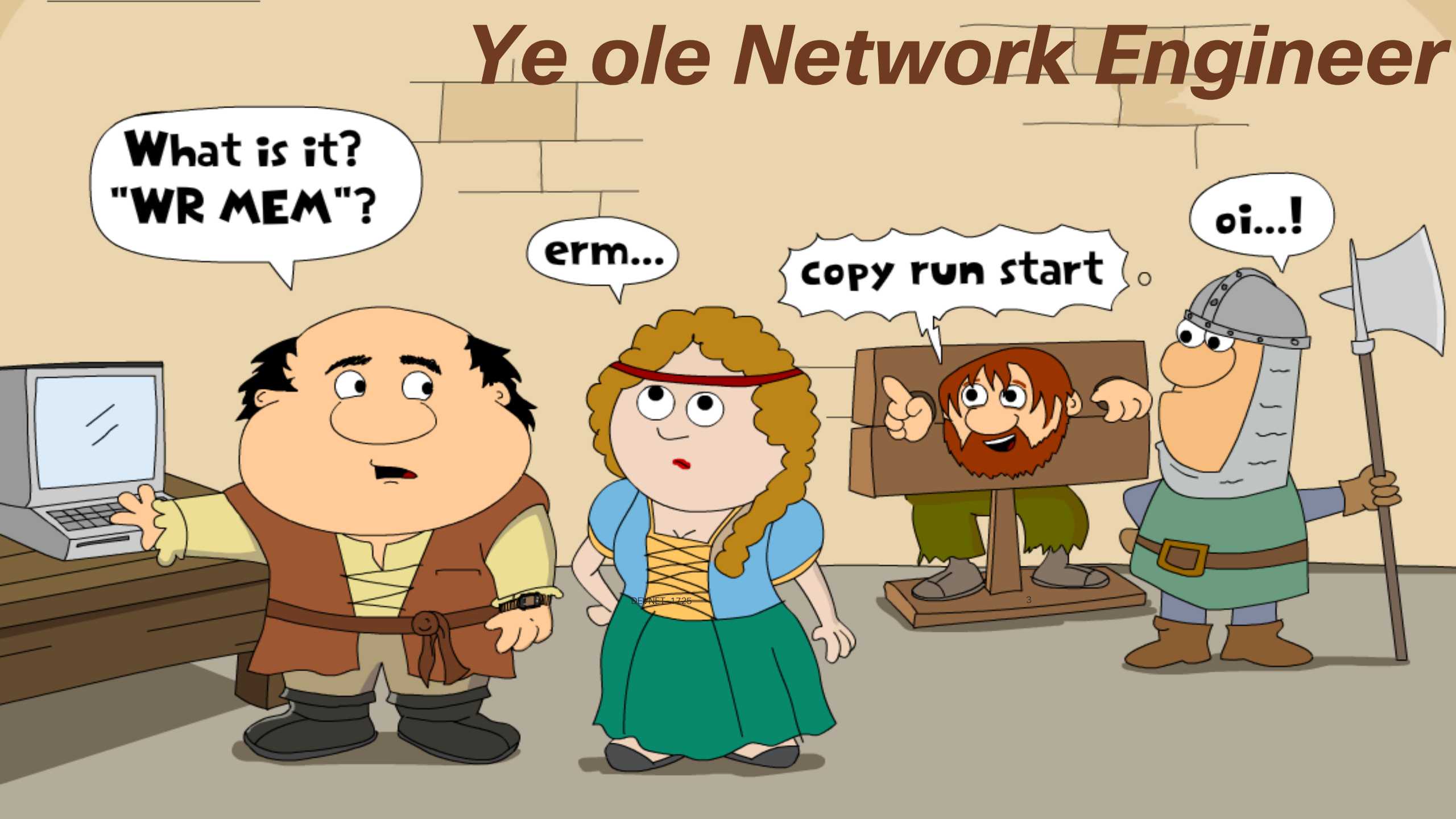
Ye ole Network Engineer



Meet Carl the Network Engineer

Programming Skills

- TCL
- EEM
- Expect Scripts

Networking Skills

- Spanning-Tree
- Routing Protocols
- QoS
- VPN Design
- Spanning-Tree
- VOIP
- Fibre Channel
- Security Policy
- MPLS
- Spanning-Tree
- Did I mention Spanning-Tree?

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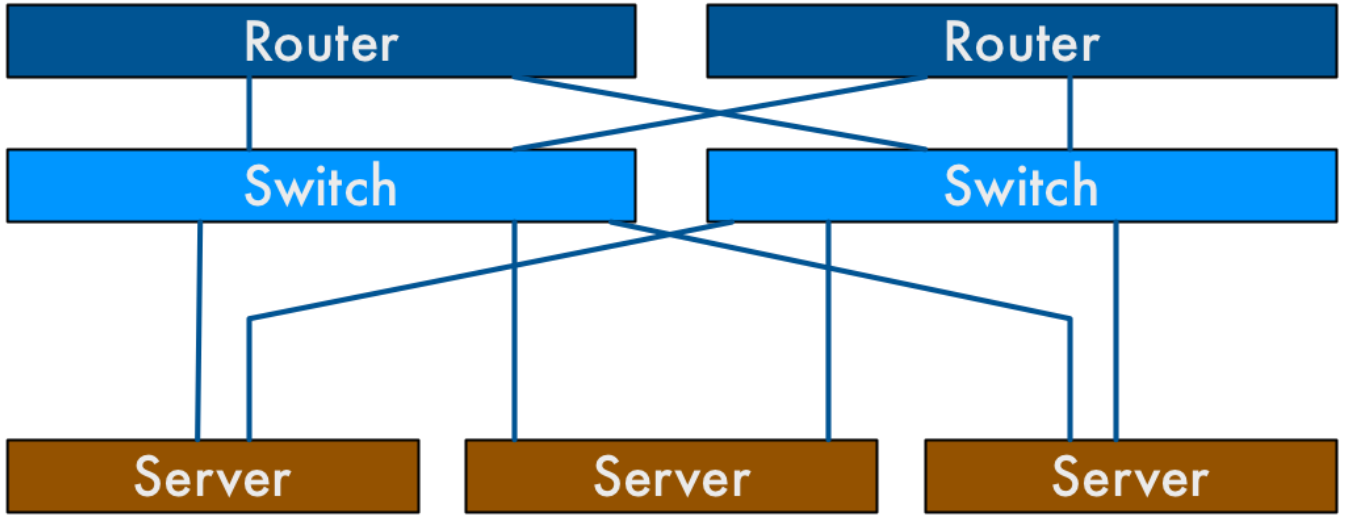
The Network...



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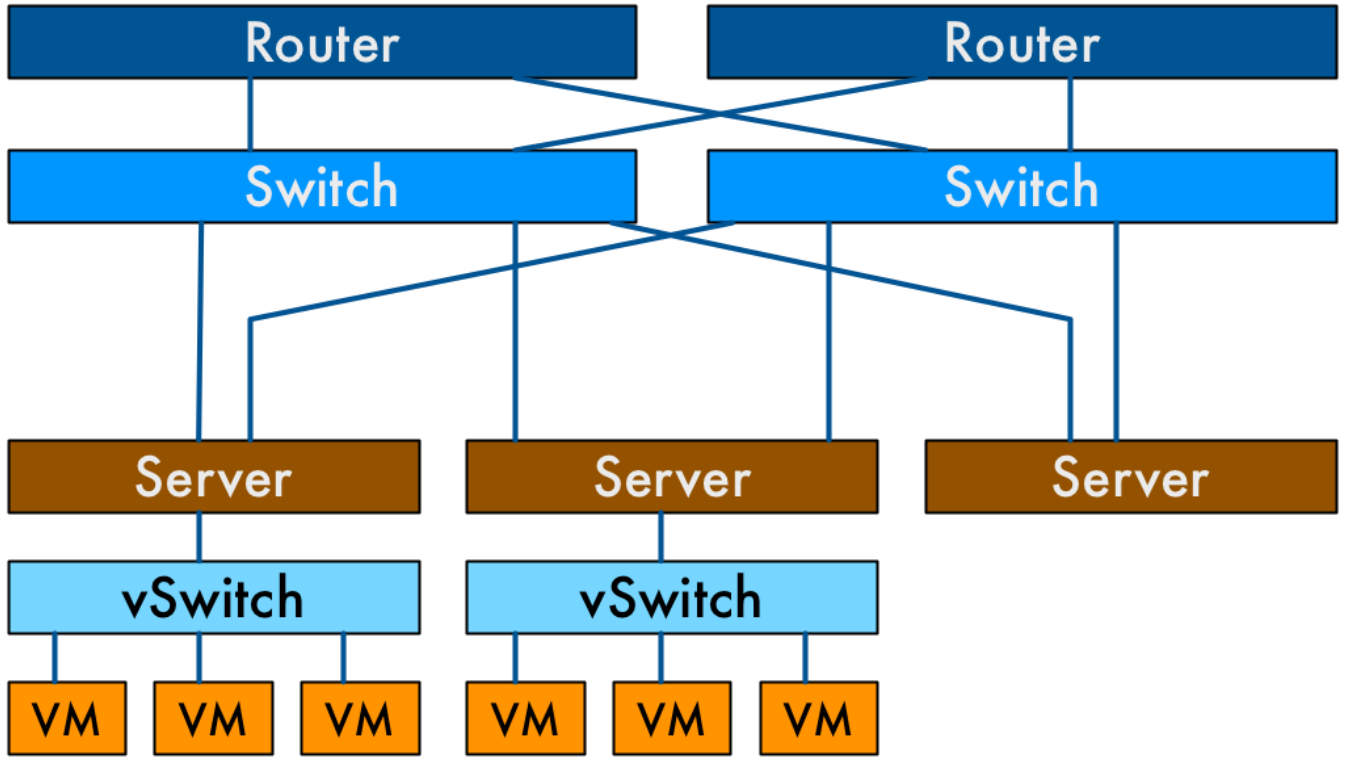

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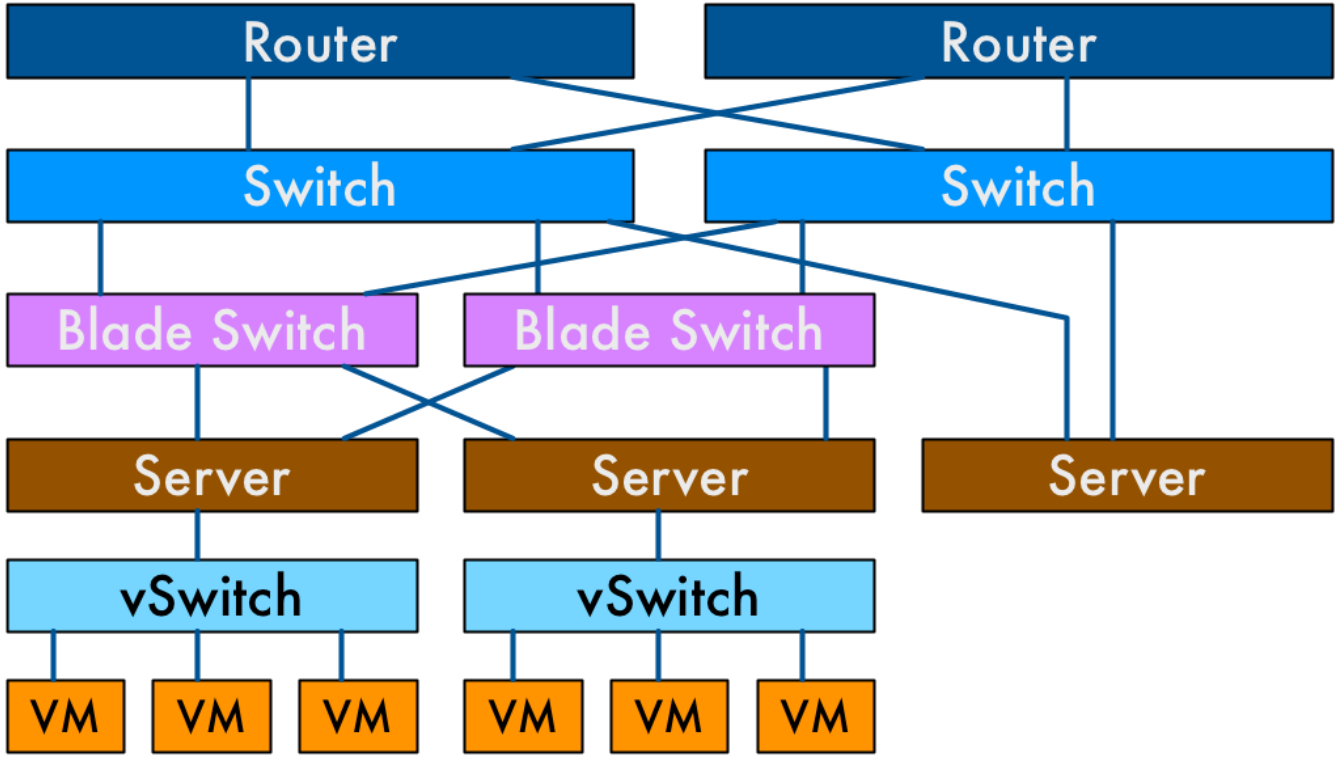

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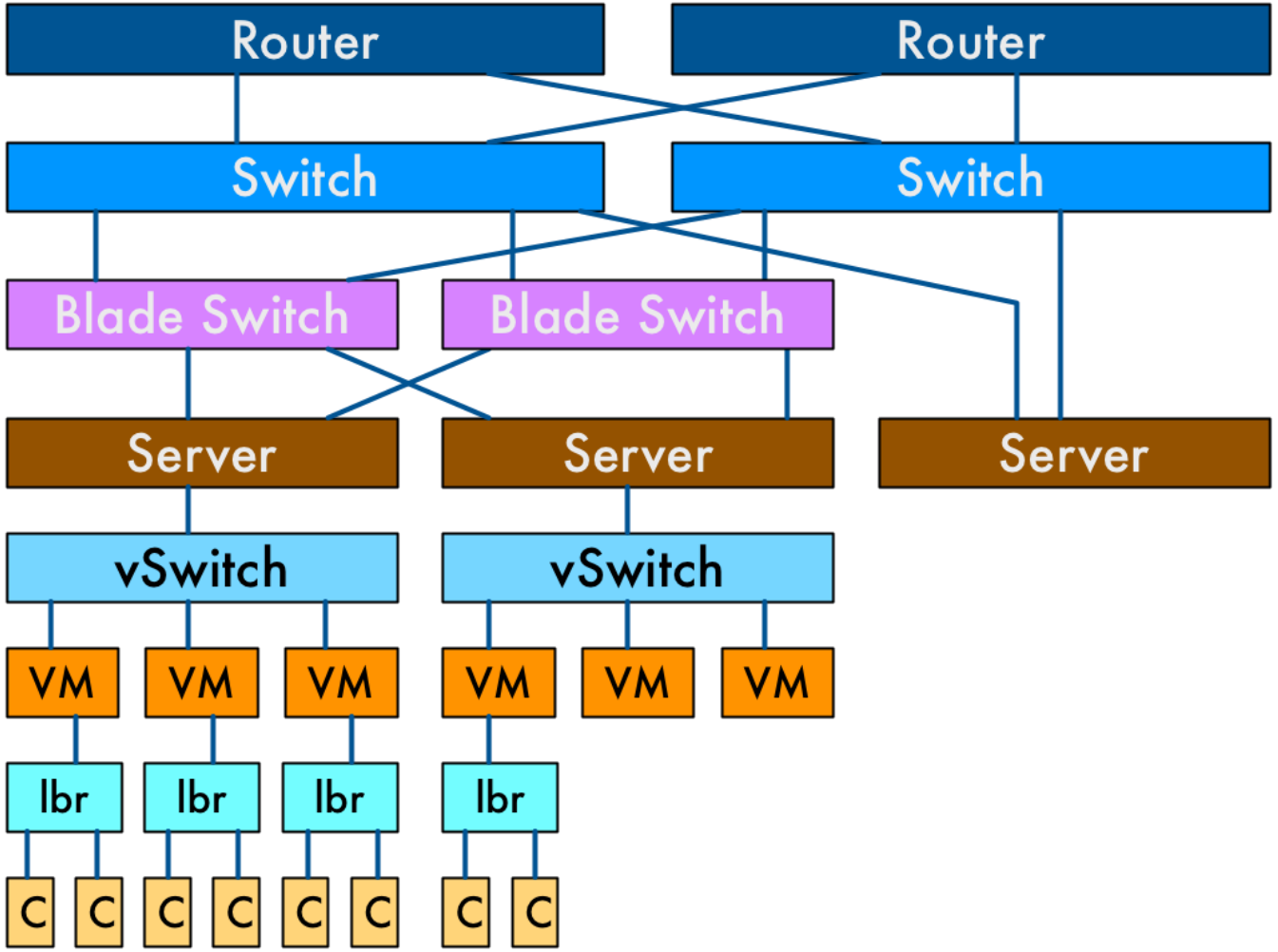

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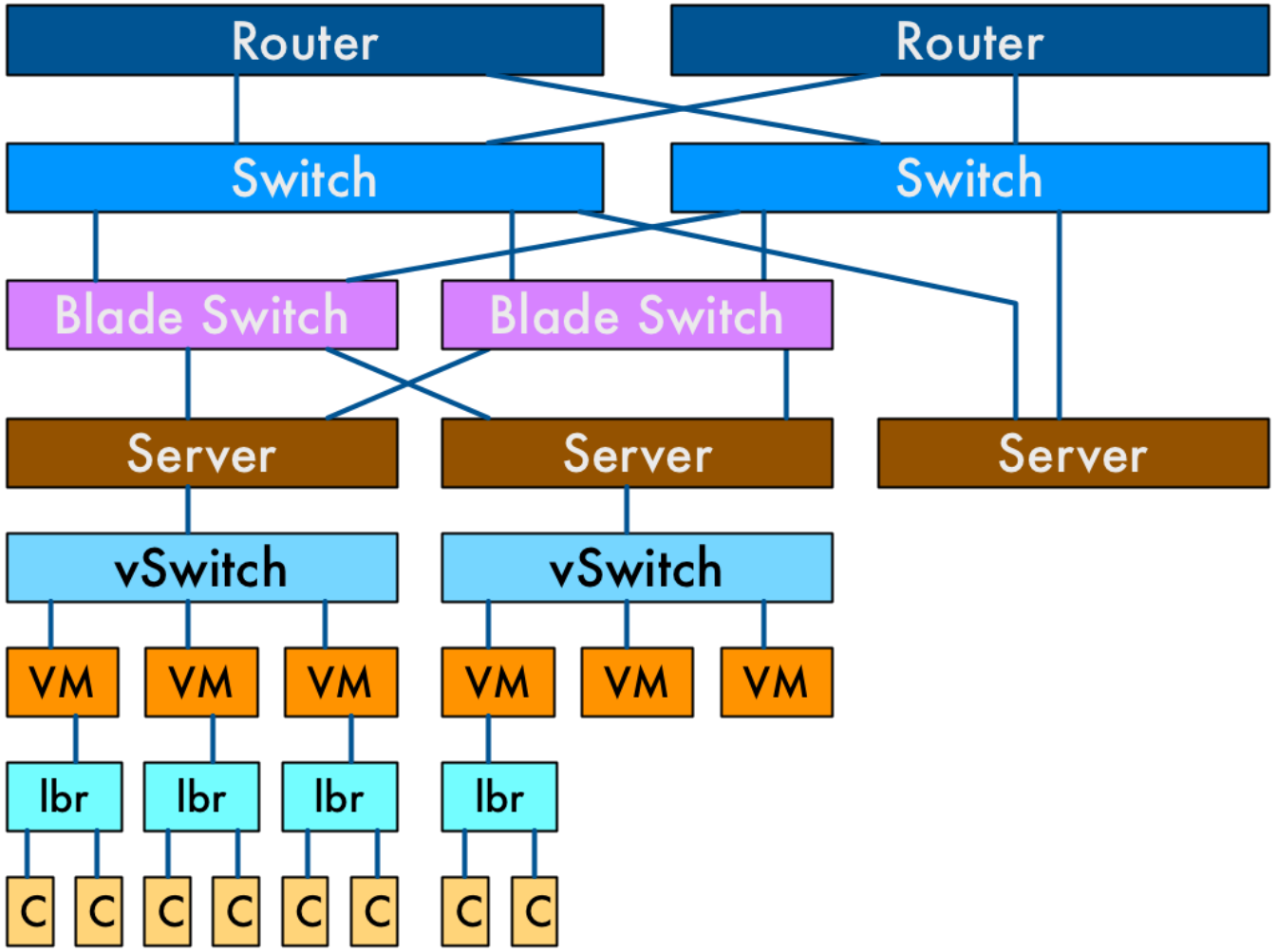

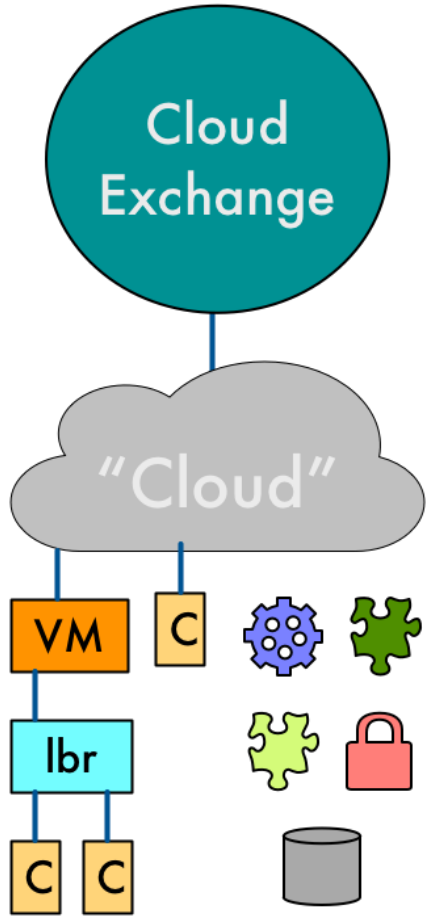

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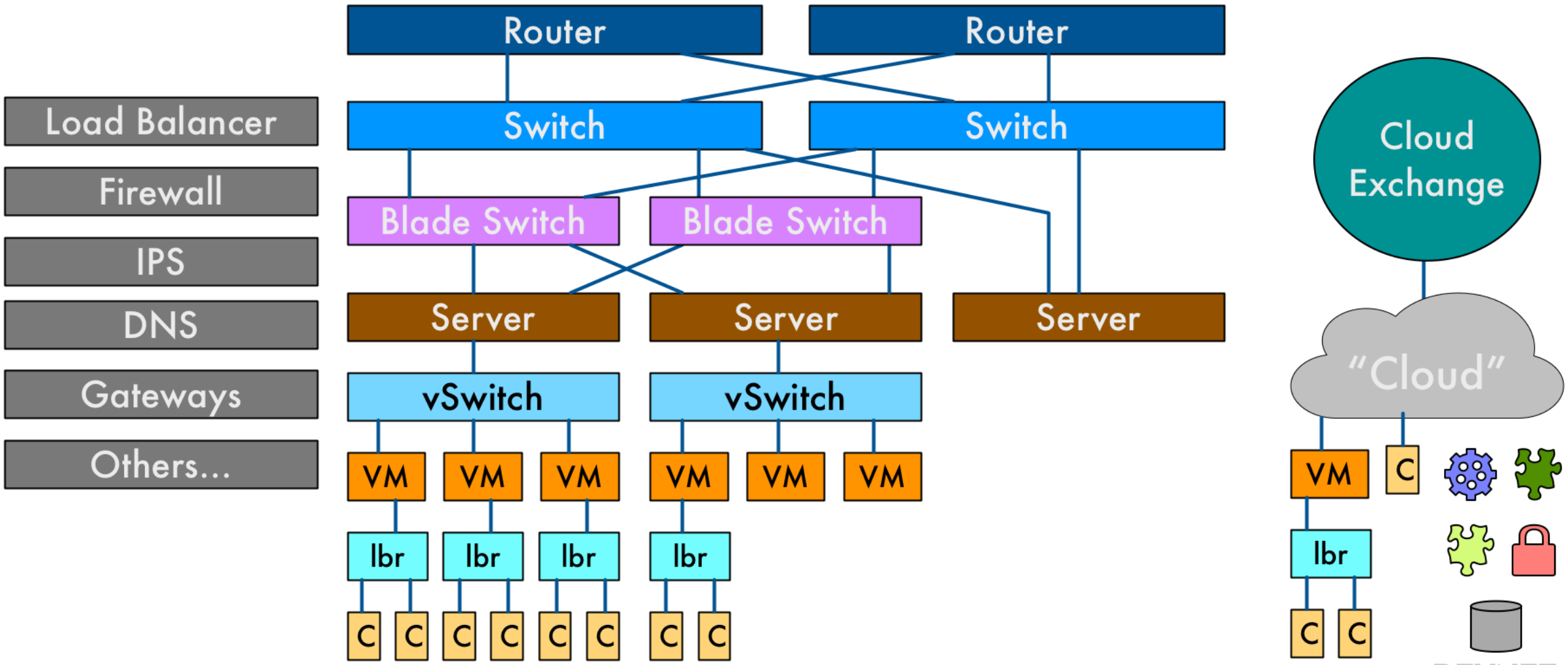

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The OSI Model of Networking…

Please don't ask about this…

L7: Application

L6: Presentation

L5: Session

L4: Transport

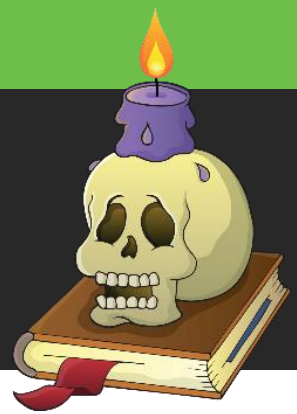
L3: Network

L2: Data Link

L1: Physical

Black Magic

Oh Yeah… We Got this



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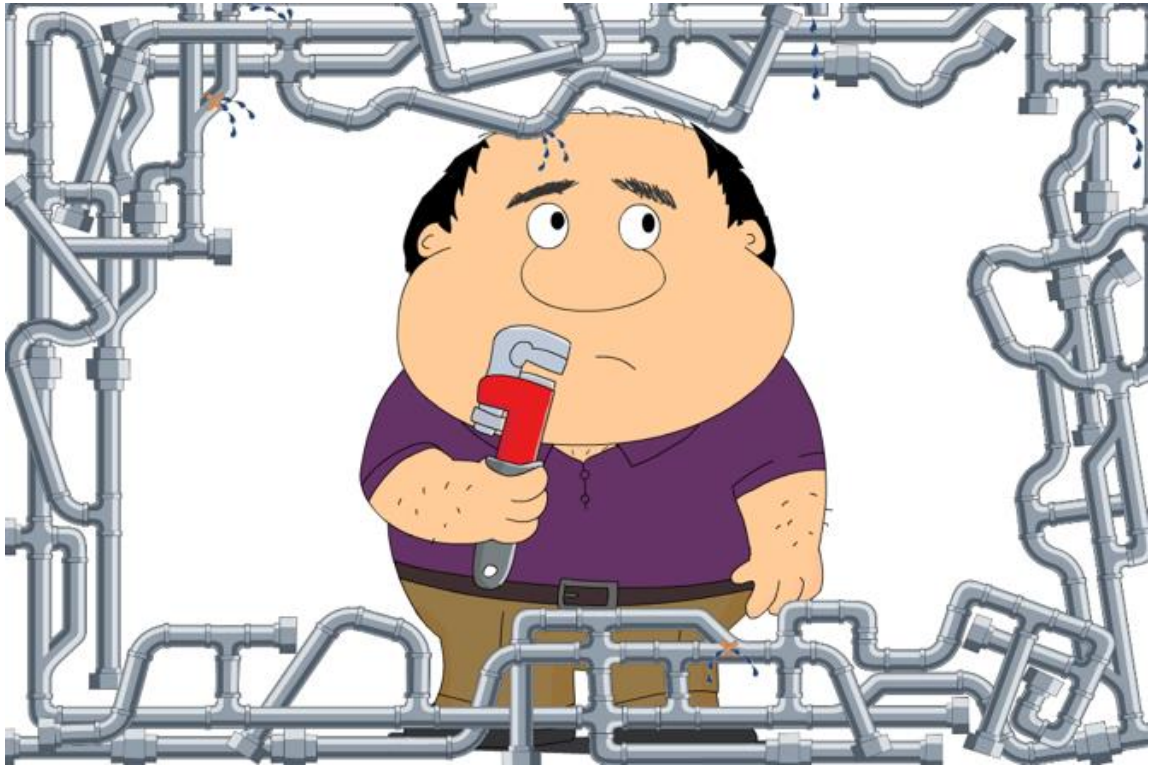
Today's reality…

- Functional but considered fragile
- Network configuration more "art than science"
- Tribal knowledge of key engineers



“Every time we implement a network change something goes wrong…”

“Isn’t it great, our switch hasn’t been rebooted in 6 years”

“We can’t update/change the network, our business won’t allow it”

* Paraphrased quotes from actual network operators

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From
Date
To:
Cc:
Subject: switch uptime

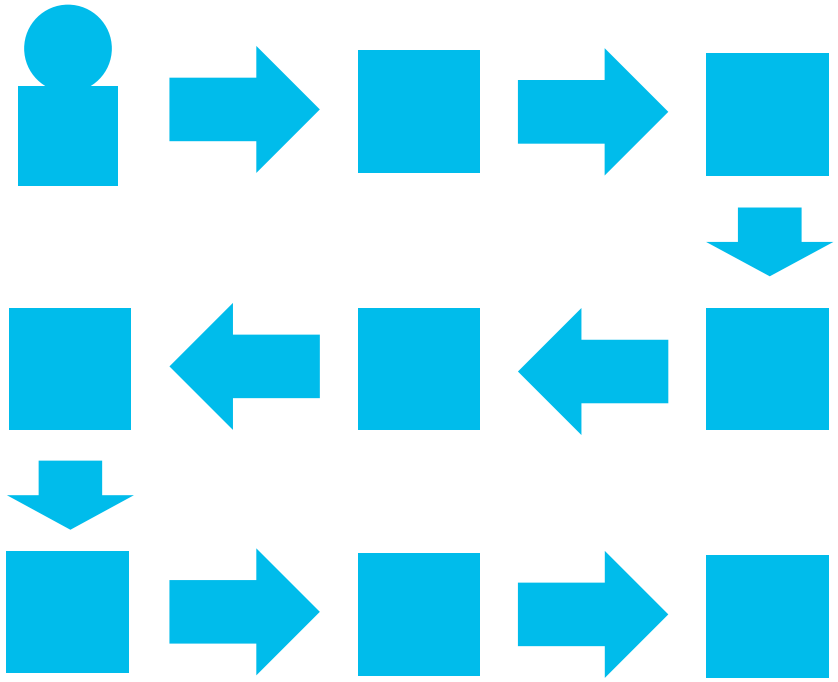
[redacted]1>sh ver
Cisco Internetwork Operating System Software
IOS (tm) s72033_rp Software (s72033_rp-ADVENTERPRISEK9_WAN-M), Version
12.2(18)SXF3, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by cisco Systems, Inc.
Compiled Tue 14-Feb-06 17:18 by kehsiao
Image text-base: 0x40101040, data-base: 0x42D90000

ROM: System Bootstrap, Version 12.2(17r)S2, RELEASE SOFTWARE (fc1)
BOOTLDR: s72033_rp Software (s72033_rp-ADVENTERPRISEK9_WAN-M), Version
12.2(18)SXF3, RELEASE SOFTWARE (fc1)

r[redacted] uptime is 11 years, 31 weeks, 1 day, 16 hours, 46 minutes
Time since r-secmgte1-1 switched to active is 11 years, 31 weeks, 1 day, 17
hours, 29 minutes
System returned to ROM by s/w reset (SP by power-on)
System restarted at 20:47:24 UTC Thu Mar 9 2006

Don't encourage this kind of behavior!!!!

Today's Network Realities



Sequential and Manual Infrastructure Provisioning

Snowflake and Time Capsules of Configuration

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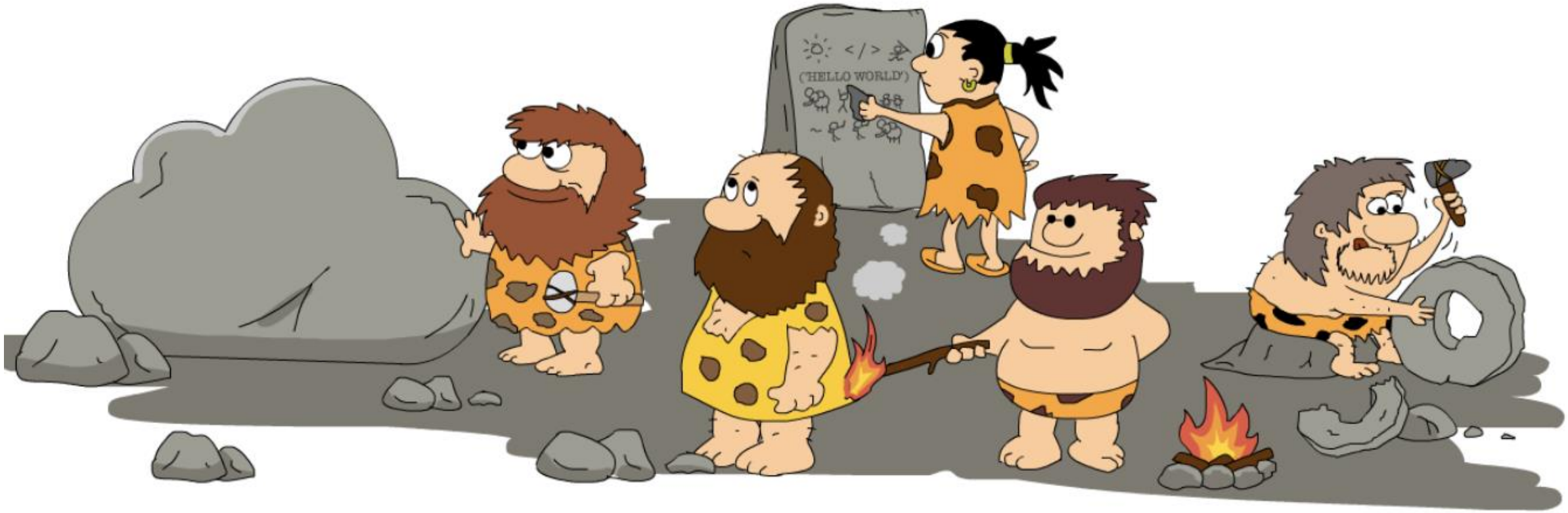
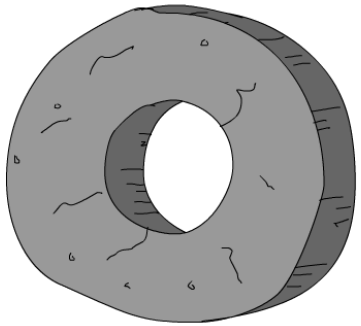


Networking through the ages...



Stone Age

Spanning Tree

VLANs

The Four Ages of Networking…..

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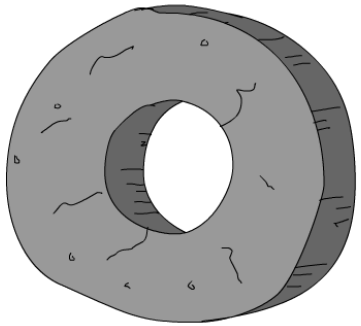
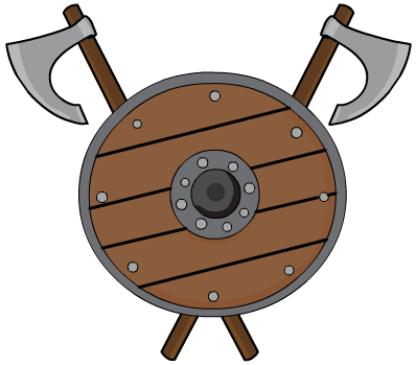


Stone Age

Spanning Tree

VLANs



Bronze Age

Routing Protocols

WAN Design

IP-magedon

The Four Ages of Networking.....

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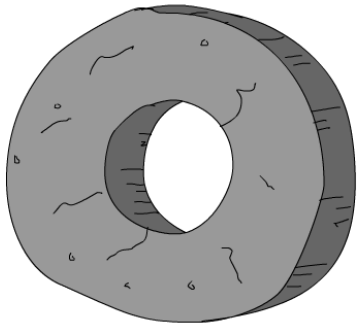

Stone Age

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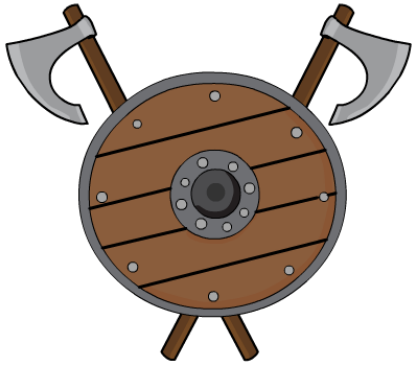
VLANs



Bronze Age

Routing Protocols

WAN Design

IP-magedon

The Renaissance

SDN

OpenFlow

Controllers

Overlays

MP-BGP

VXLAN

Micro-Segmentation

White Box

The Four Ages of Networking.....

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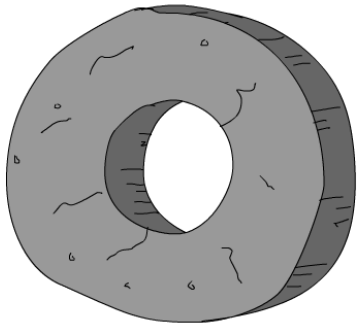
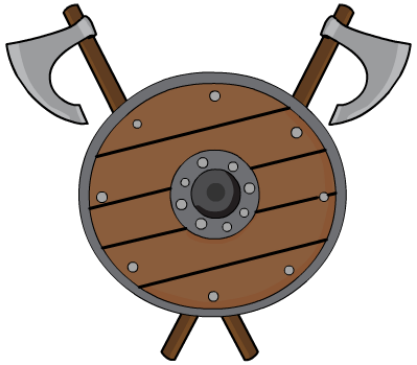


Stone Age

Spanning Tree

VLANs



Bronze Age

Routing Protocols

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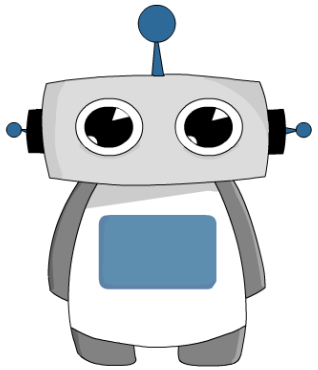

Programmable Age

Cloud

Python

REST / APIs

NETCONF / YANG

“Fabrics”

Network Function Virtualization (NFV)

Containers

DevOps

NetDevOps!

The Four Ages of Networking.....

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Applying DevOps to Networking

Moving to a NetDevOps Culture and Mindset

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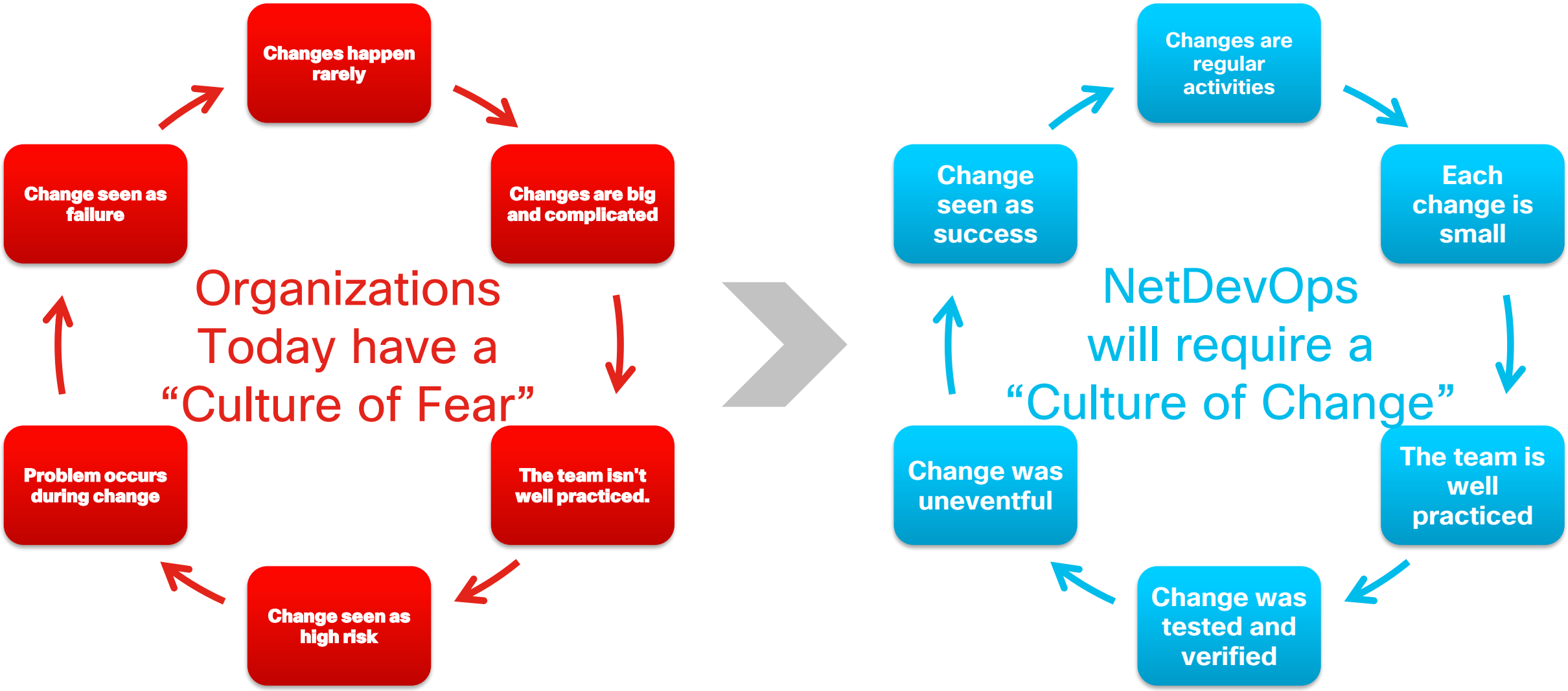
Moving to a NetDevOps Culture and Mindset



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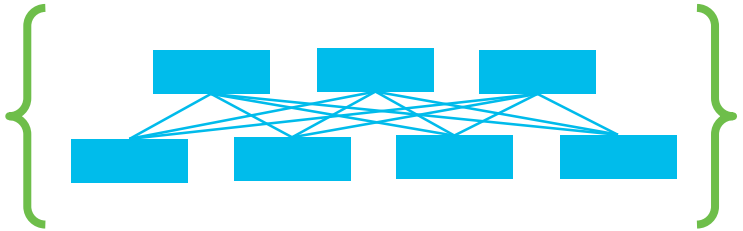
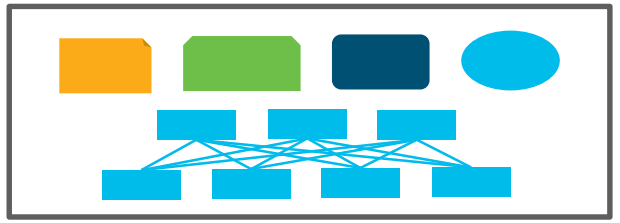
NetDevOps Operational Models

Network as Code



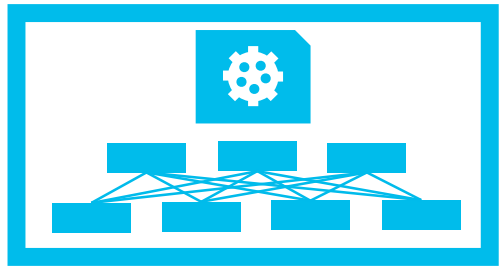
- Git based workflows
- Close alignment to software DevOps approaches
- Leverage abstractions, such as controllers, when possible

IT as a Service



- Service Catalog based workflows
- Deliver End User Self Service experience in “eStores”

Controller Driven



- Network Controller based workflows
- Evolving traditional network operation model

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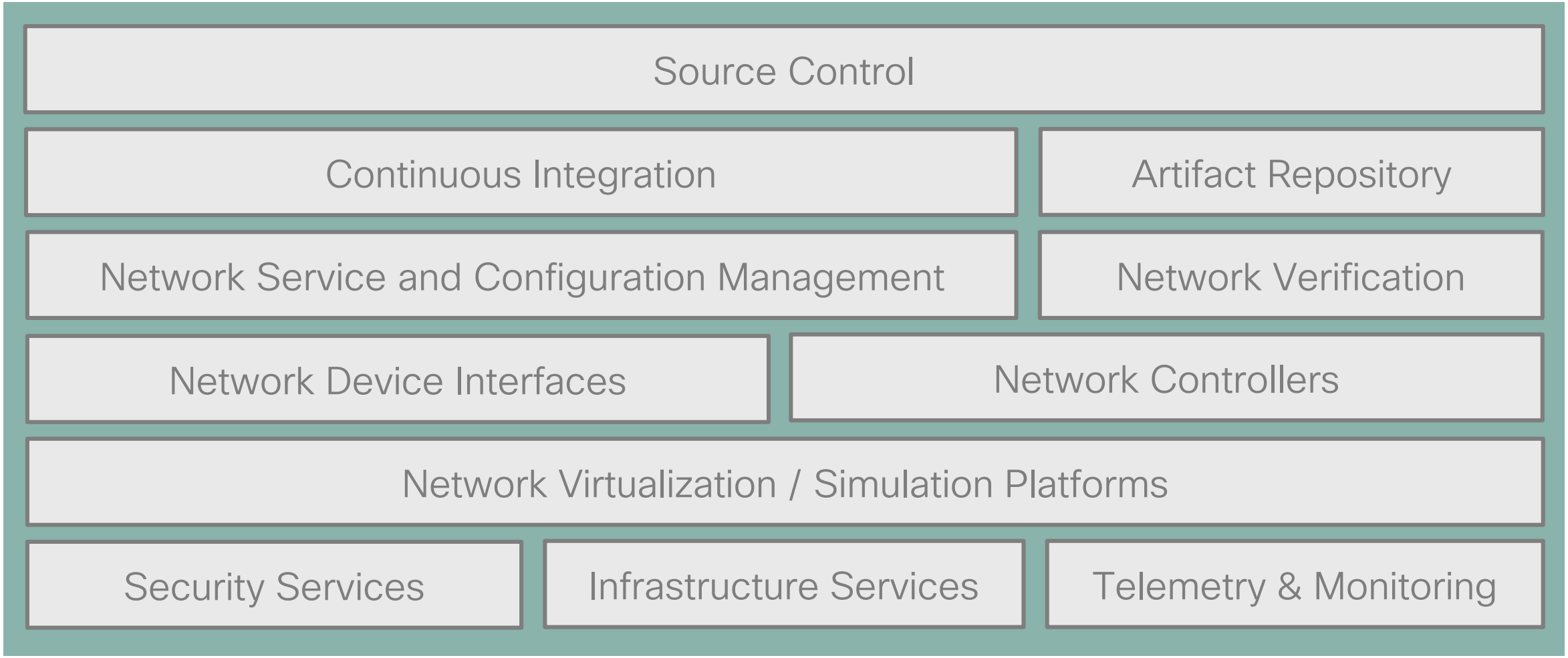
The NetDevOps Engineers Tool Chest



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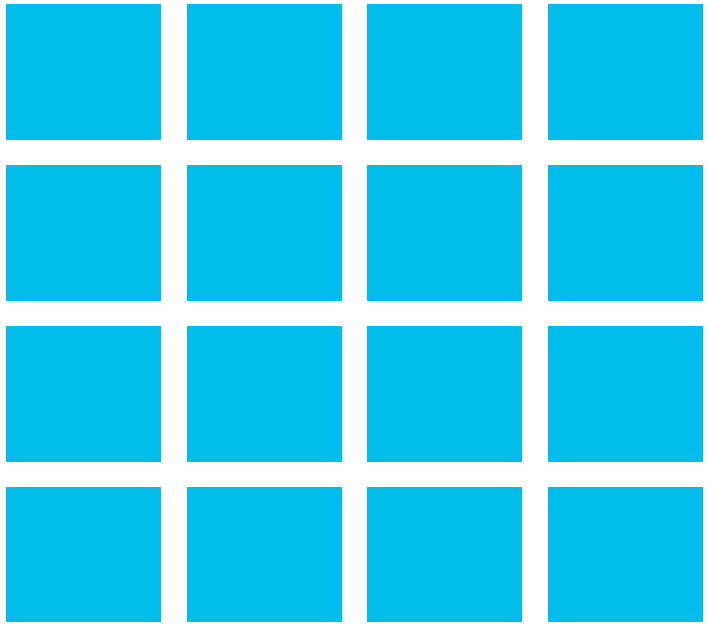
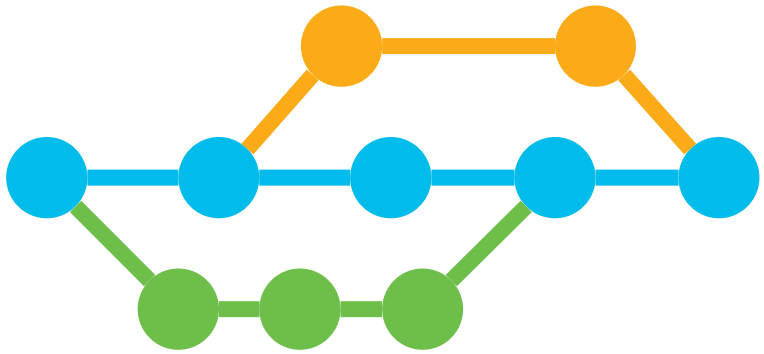
How to pick a tool? (Not in priority order)

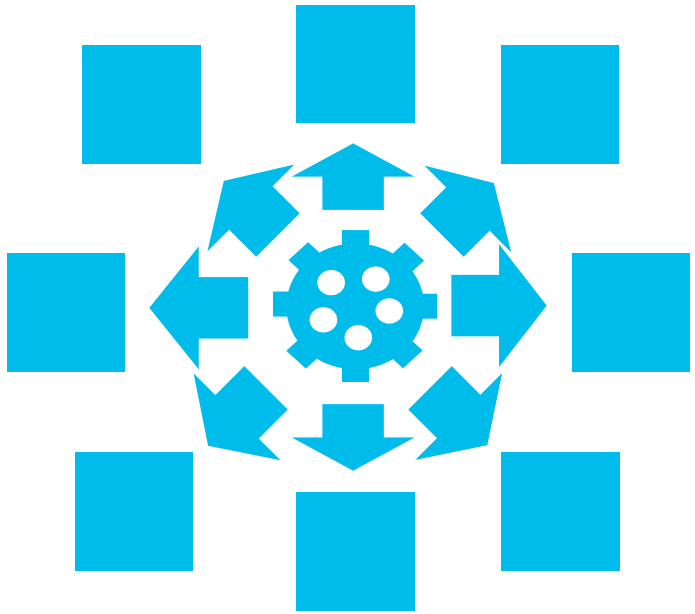
- Commercial vs Open Source
- Programming language
- Supported integrations
- Popularity in community
- Relevant examples
- Tool Capabilities
- Used elsewhere in organization

Often no one tool will fit,
using multiple is okay too!

NetDevOps Will Deliver







Consistent Version Controlled Infrastructure deployed with Parallel & Automated Provisioning

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IT'S ALIVE!!!
Today's Network Engineer

A ”Traditional” Network Engineer Profile

Network Skills

- Spanning-Tree
- Routing Protocols
- QoS
- VPN Design
- Spanning-Tree
- VOIP
- Fibre Channel
- Security Policy
- MPLS
- Did we mention Spanning-Tree?

Programming Skills

- TCL
- EEM
- Expect Scripts

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A Profile of a NetDevOps Engineer!

Network Skills

- Layer 2 & 3 Fundamentals
- Quality of Service
- Security and Segmentation
- Linux Networking
- Container Networking
- Cloud Networking
- IOT Networking
- Model Driven Programmability
- Network Function Virtualization

Platform Skills

- Linux Administration
- Container Fundamentals
- Micro Service Platforms
- Cloud Fundamentals

Programming Skills

- Data Formats (ex: JSON, YAML, etc)
- Python and APIs
  (ex: REST, NETCONF, etc)
- Source Control (ex: git, GitLab, etc)
- Configuration Management
  (ex: NSO, Ansible, Puppet, etc)

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Carl's 3 Step Approach to Network Programmability

Phase 1

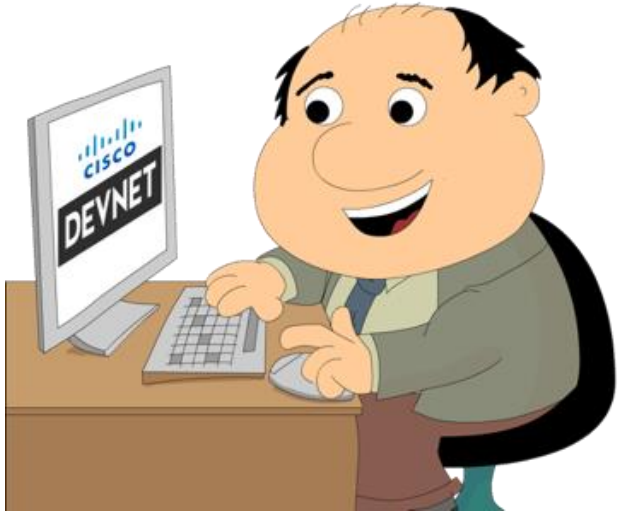
- Python
- REST APIs
- JSON/XML/YAML
- git/GitHub

Phase 2

- Linux Skills
- Config Management
- Docker
- NETCONF/YANG

Phase 3

- Linux Networking
- Container Networking
- Network Function Virtualization



As Needed

- Network Controllers
- IOT Networking
- Cloud Networking
- "DevOps"

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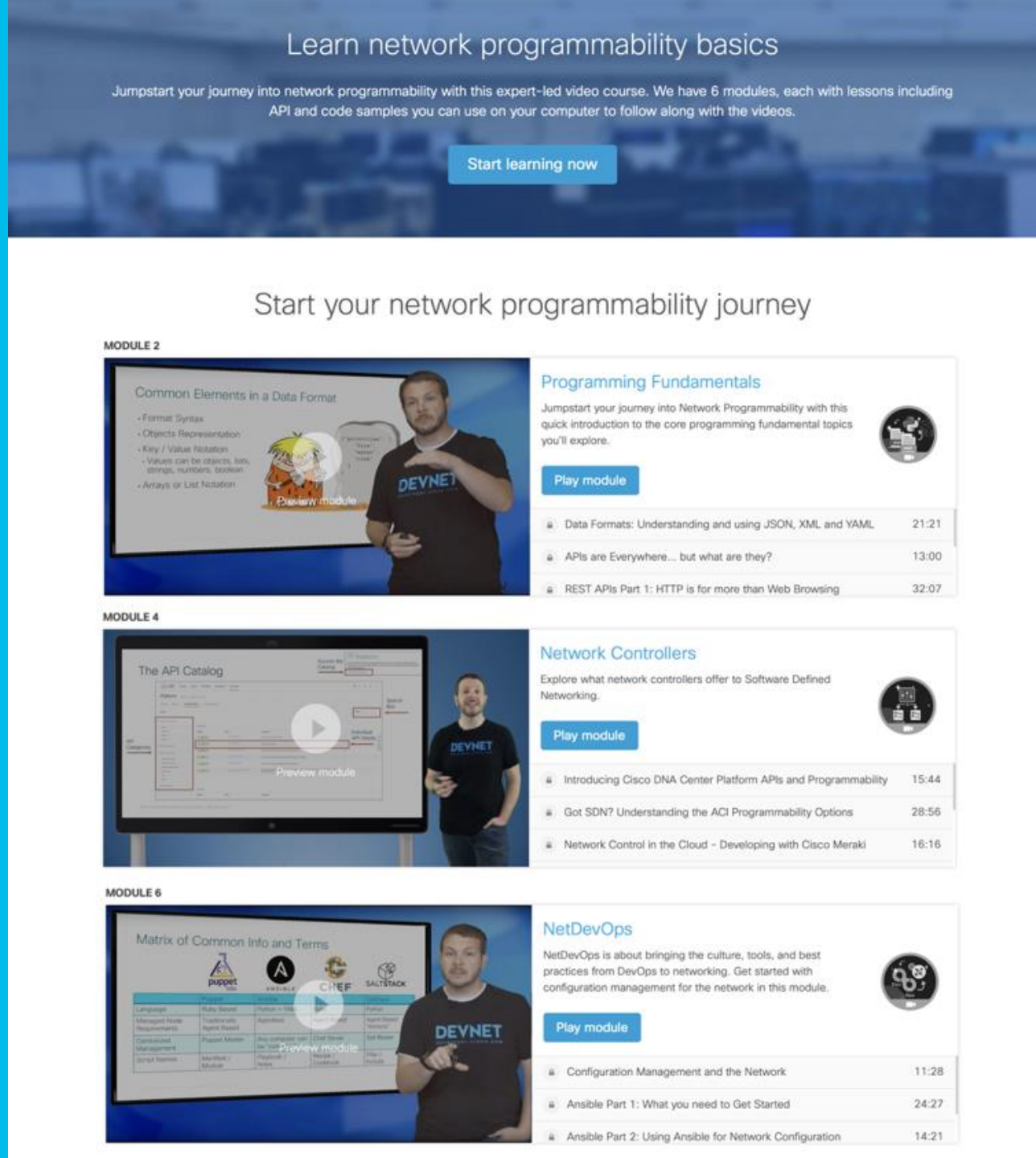
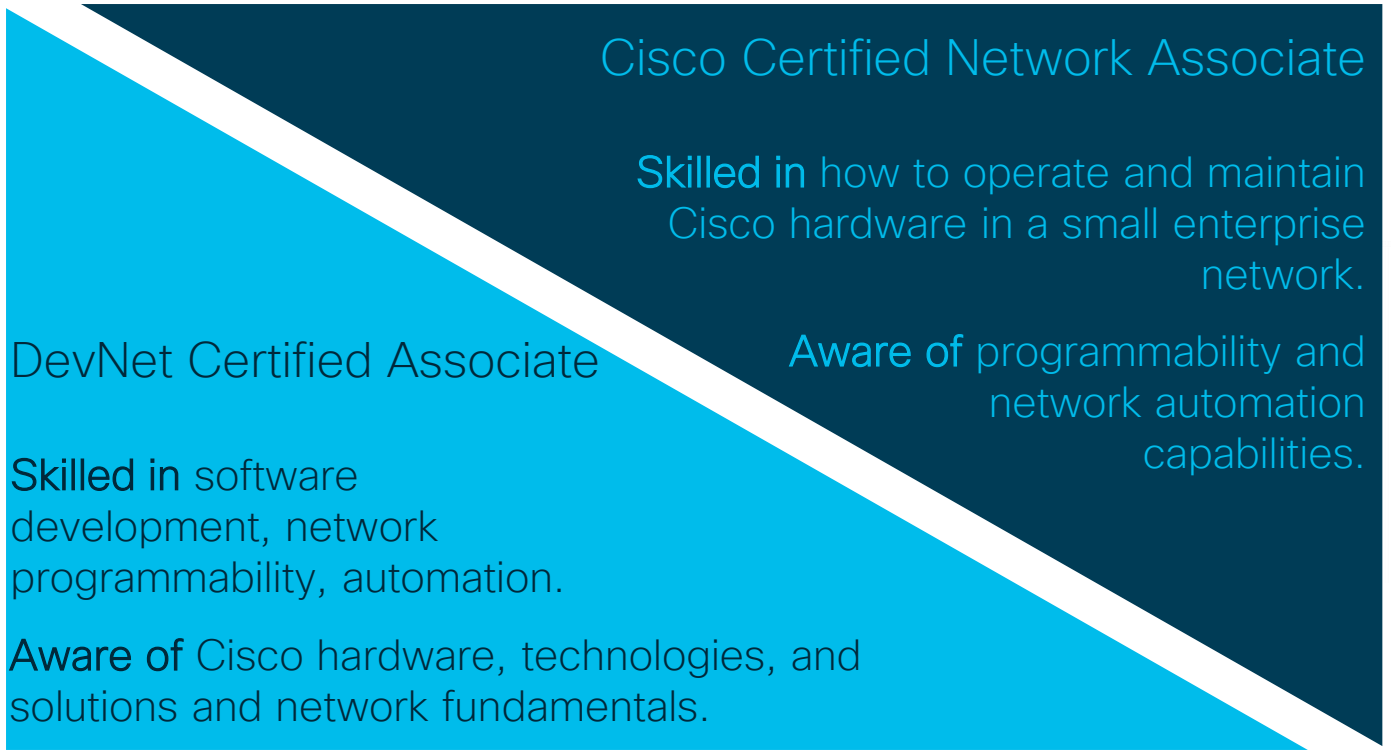
Jumpstart your Journey! Network Programmability Basics

10+ hours of FREE training on DevNet

http://developer.cisco.com/video/net-prog-basics/



Cisco Certifications for the Programmable Age!



Complementary balance and role alignment

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DevNet Certifications Available Today

DevNet Associate

DevNet Professional

DevNet Specialist
Enterprise Automation

DevNet Specialist
Data Center Automation

DevNet Specialist
Service Provider Automation

DevNet Specialist
Security Automation

DevNet Specialist
Collaboration Automation

DevNet Specialist
IoT

DevNet Specialist
WebEx

DevNet Specialist
DevOps

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Training for new job roles
NetDevOps Engineer

** One possible example of combining skills and training*

Professional certification	Technology concentrations
CCNP Enterprise	**Cisco Specialist: Data Center** Automate data center operations
	Cisco DevNet Associate Understand software development and programmability
	Cisco DevNet Specialist: Webex Build chat bots for alerting and monitoring

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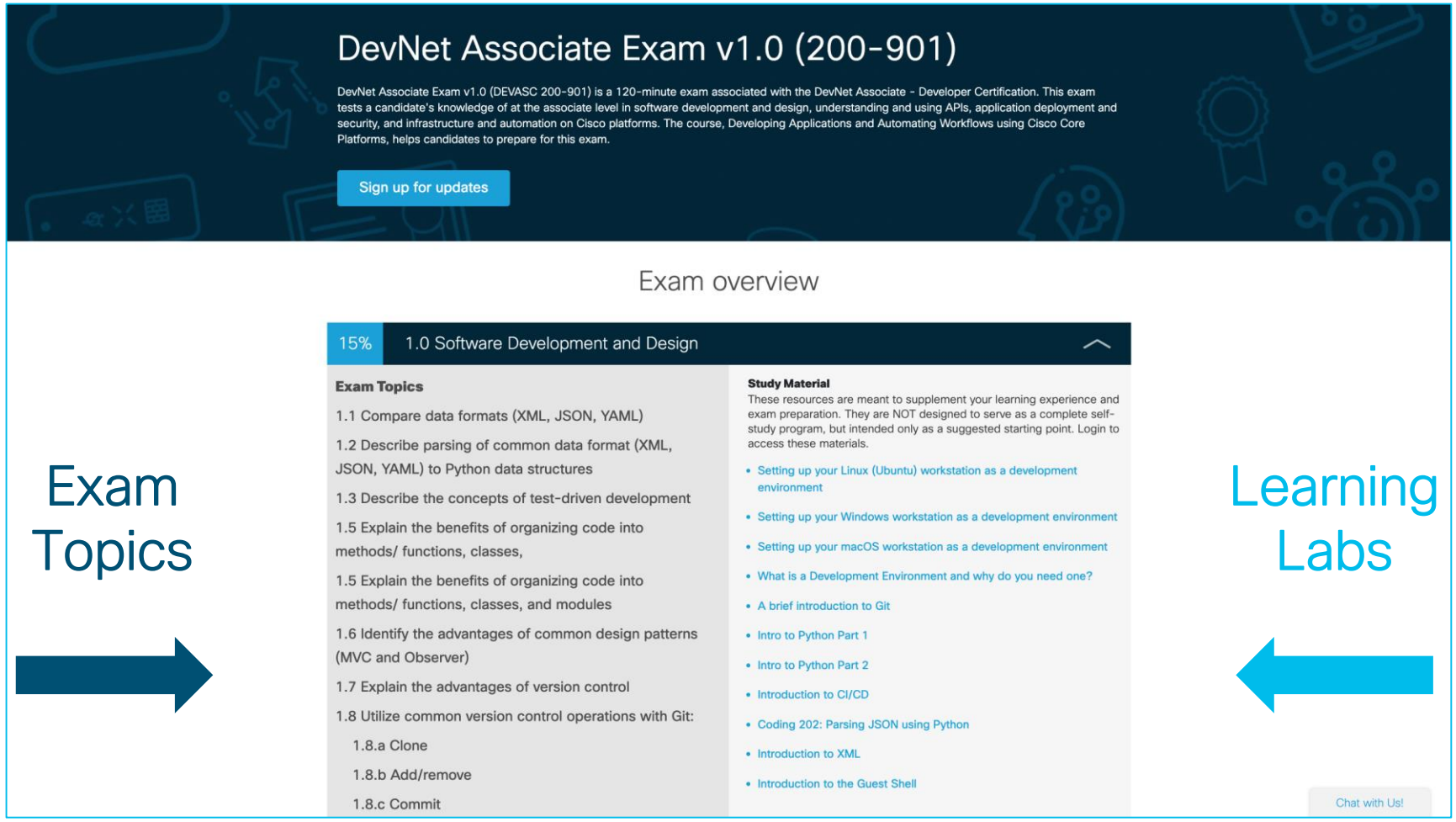
Find more information on DevNet, CLN, Cisco.com

Find learning lab and sandbox offerings to start learning journey



developer.cisco.com/certification cisco.com/nextlevel

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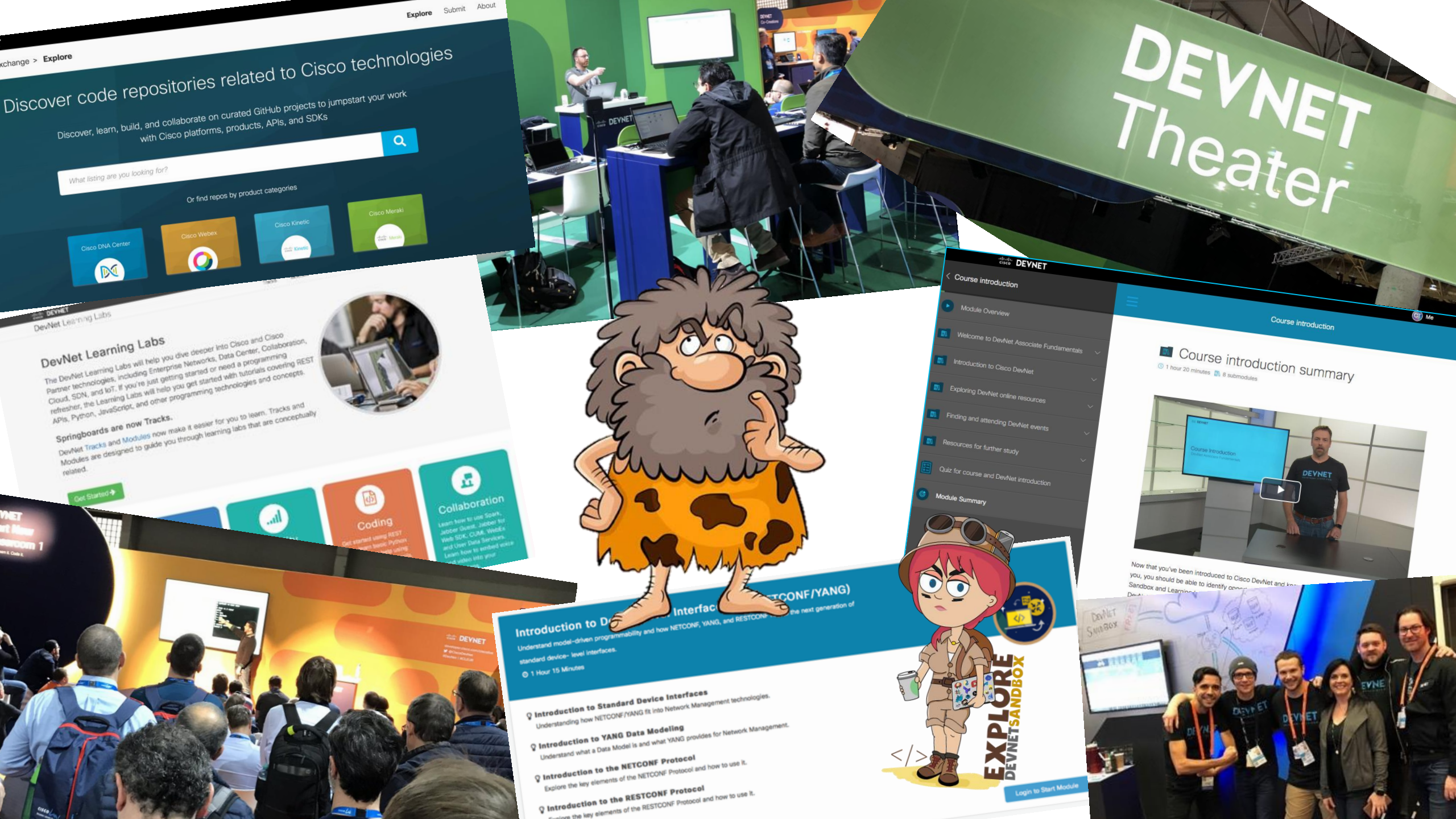
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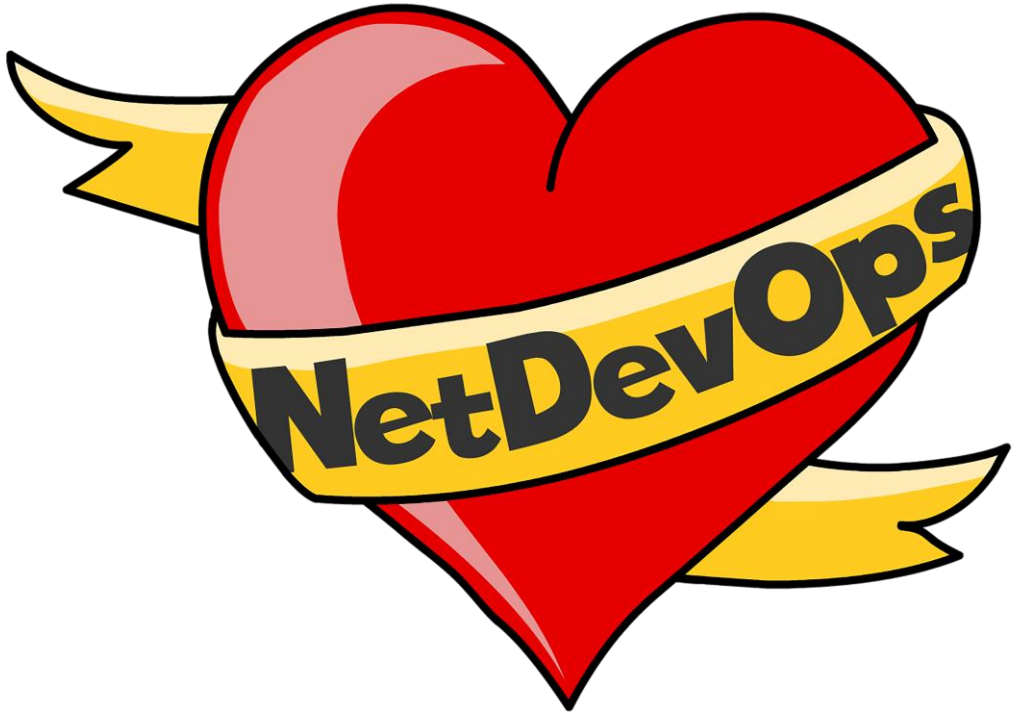
Submit
About
Discover code repositories related to Cisco technologies
Discover, learn, build, and collaborate on curated GitHub projects to jumpstart your work with Cisco platforms, products, APIs, and SDKs
What listing are you looking for?
Or find repos by product categories
Cisco DNA Center
Cisco Webex
Cisco Kinetic
Cisco Meraki
DEVNET
Theater
DevNet Learning Labs
DevNet Learning Labs will help you dive deeper into Cisco and Cisco Partner technologies, including Enterprise Networks, Data Center, Collaboration, Cloud, SDN, and IoT. If you're just getting started or need a programming refresher, the Learning Labs will help you get started with tutorials covering REST APIs, Python, JavaScript, and other programming technologies and concepts.
Springboards are now Tracks.
DevNet Tracks and Modules now make it easier for you to learn. Tracks and Modules are designed to guide you through learning labs that are conceptually related.
Get Started
Coding
Collaboration
Course introduction
Module Overview
Welcome to DevNet Associate Fundamentals
Introduction to Cisco DevNet
Exploring DevNet online resources
Finding and attending DevNet events
Resources for further study
Quiz for course and DevNet introduction
Module Summary
Course introduction summary
1 hour 20 minutes
8 submodules
Introduction to Standard Device Interfaces
Understanding how NETCONF/YANG fit into Network Management technologies.
Introduction to YANG Data Modeling
Understand what a Data Model is and what YANG provides for Network Management.
Introduction to the NETCONF Protocol
Explore the key elements of the NETCONF Protocol and how to use it.
Introduction to the RESTCONF Protocol
Explore the key elements of the RESTCONF Protocol and how to use it.
1 Hour 15 Minutes
Login to Start Module
EXPLORE
DEVNETSANDBOX

Summing up

Review

- We looked back on the history of the network and network engineering
- Traveled through the Four Ages of Networking
- Explored how NetDevOps will change Networking
- Considered the skills a network engineer needs today



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What do do next?

- Certification Information
- NetDevOps Readings
  - Embrace NetDevOps, Say Goodbye to a "Culture of Fear"
  - NetDevOps Goes Beyond Infrastructure as Code
  - What does "Network as Code" Mean?
  - A Network Engineers Journey in Programmability
  - NetDevOps and the Rise of the Programmable Network
- NetDevOps Learning Resources
  - Network Programmability Basics Video Course
  - NetDevOps Learning Labs
  - NetDevOps Live!
- NetDevOps Videos
  - How to be a Network Engineer in a Programmable Age
  - Network as Code in Action
  - Benefits of Configuration Management

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Got more questions? Stay in touch!

Hank Preston

hapresto@cisco.com

@hfpreston

http://github.com/hpreston

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