The bridge to possible

DevOps and NetDevOps Some musings

What is it and how can I get started

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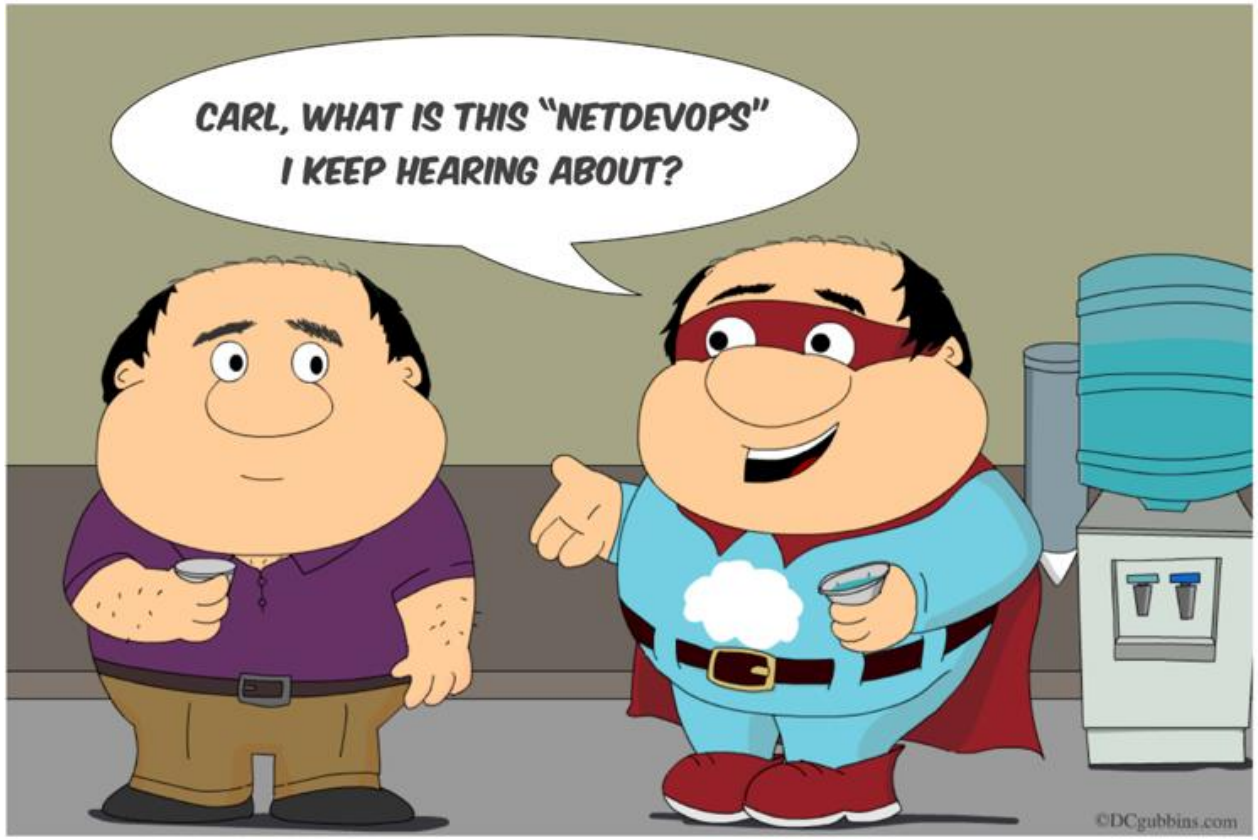
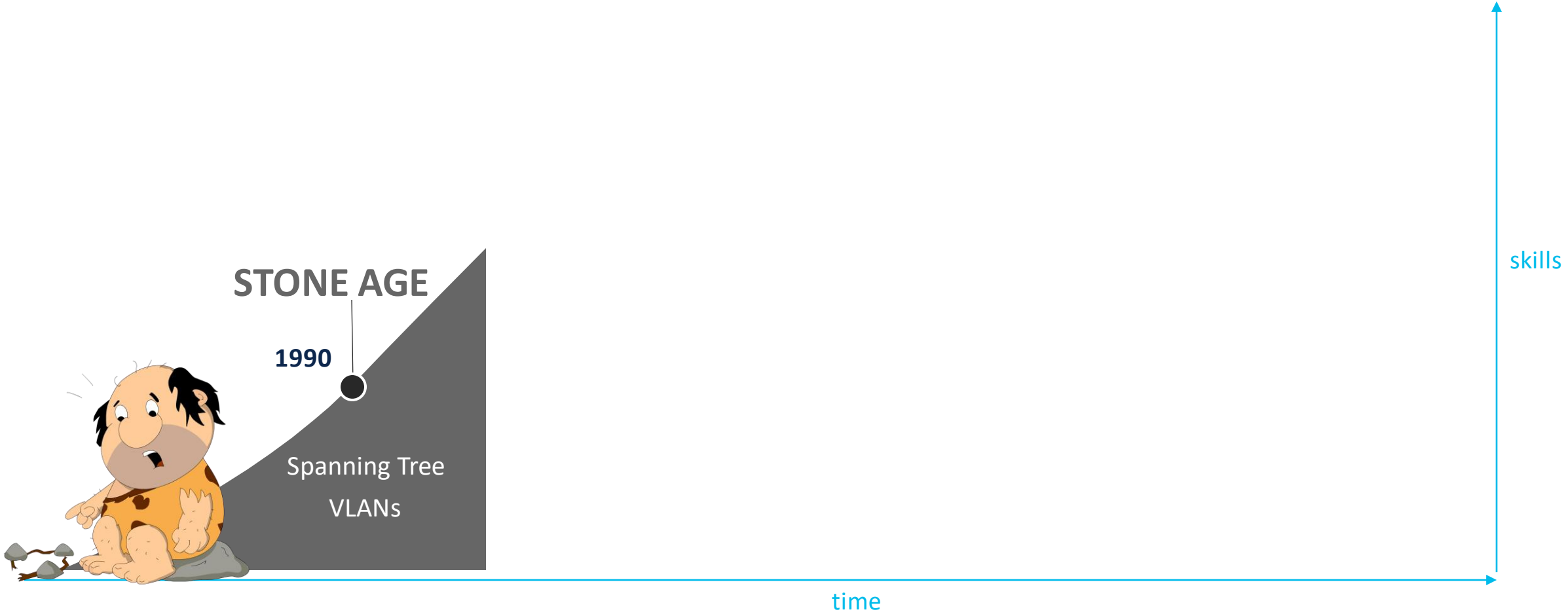
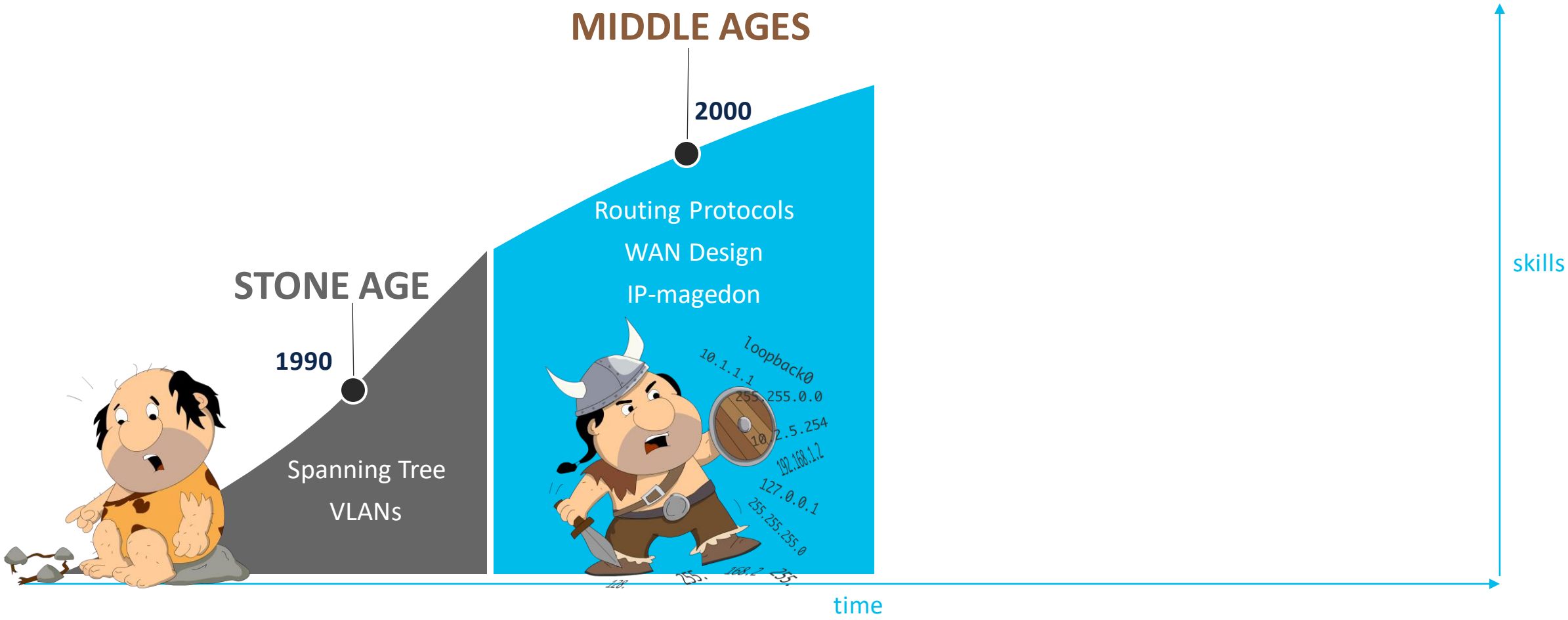
Topics to Cover

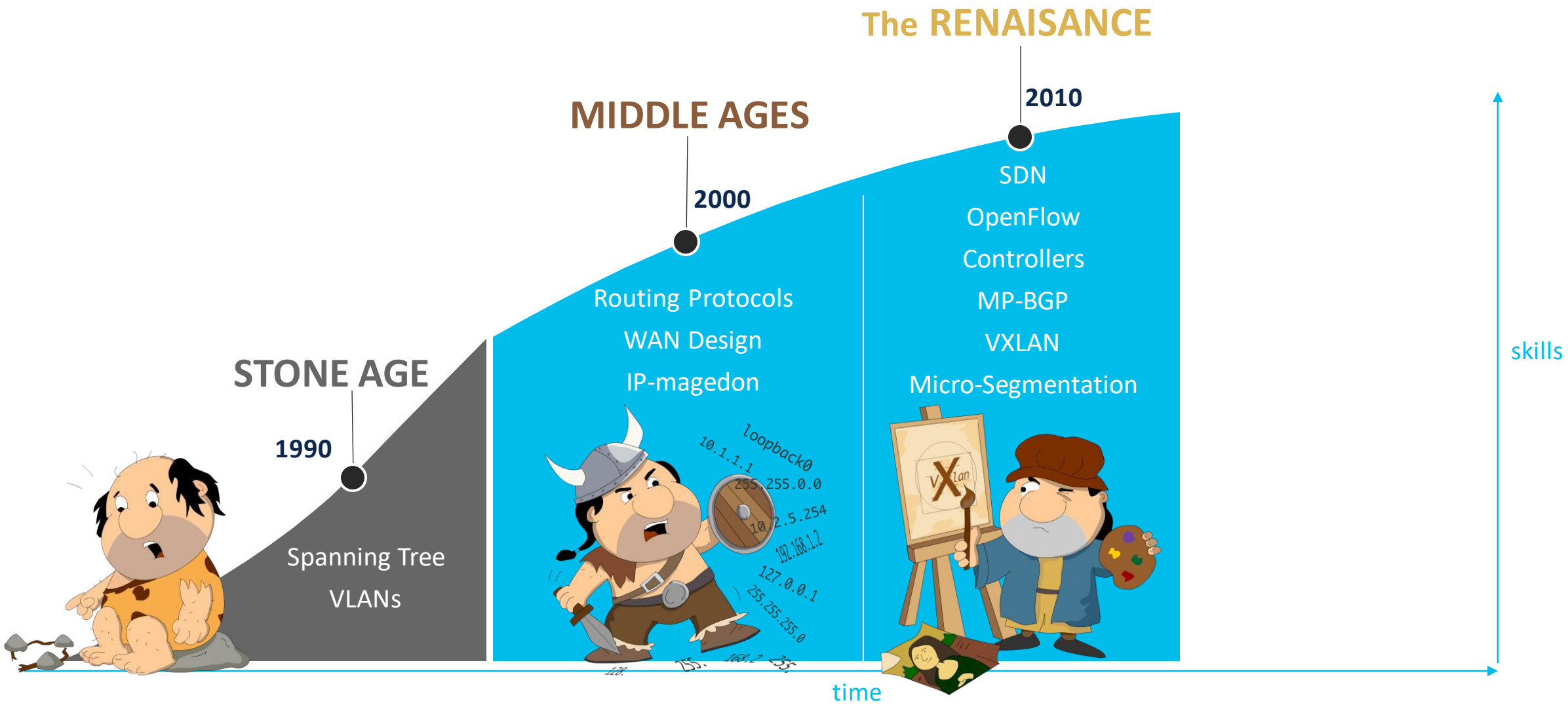
- NetDevOps Fundamentals
  - Define NetDevOps in relation to traditional network engineering
  - What makes a NetDevOps “Team”?
  - Applying NetDevOps
  - Effective NetDevOps Tooling
- Question / Answer / Discussion



The Network Engineer Evolves







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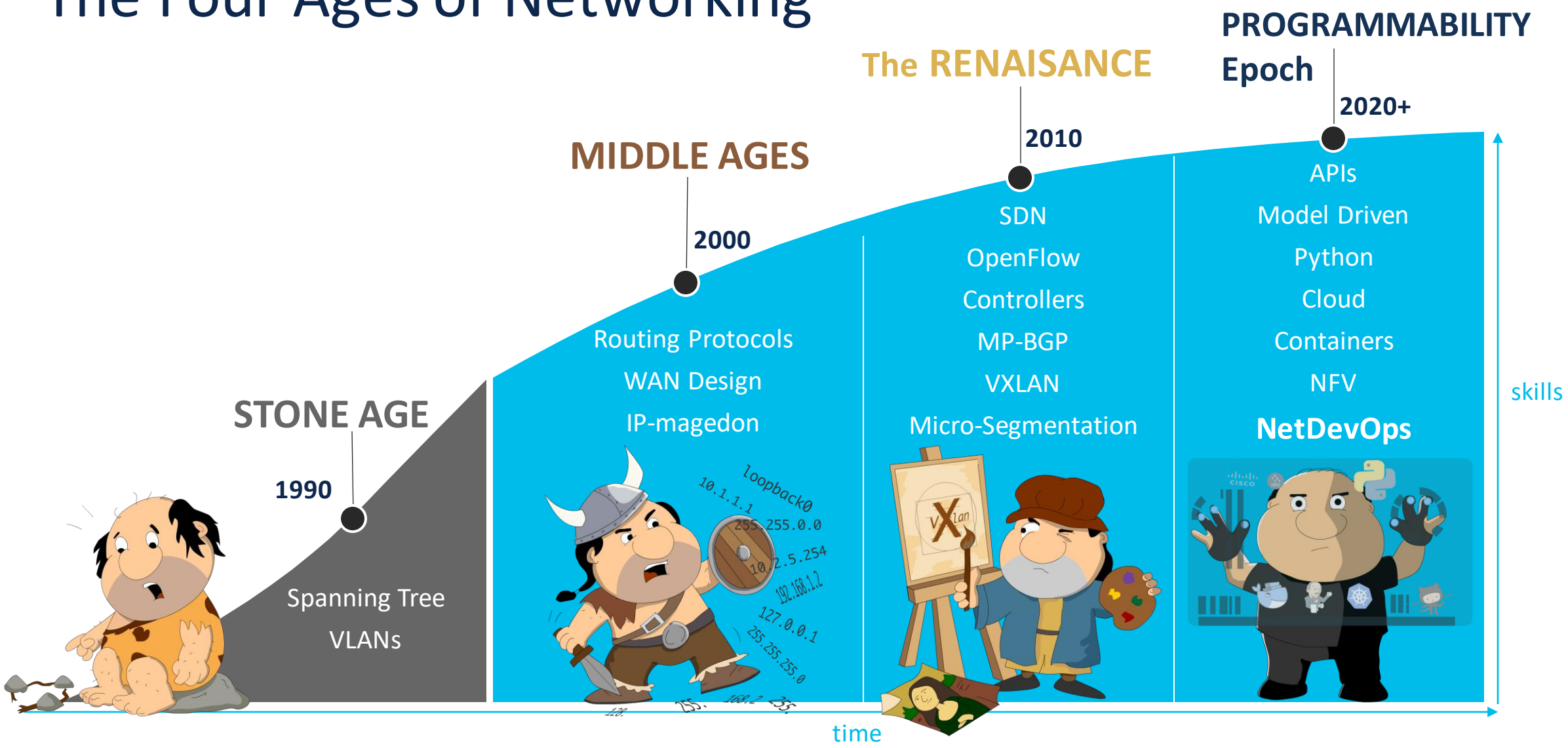
The Four Ages of Networking



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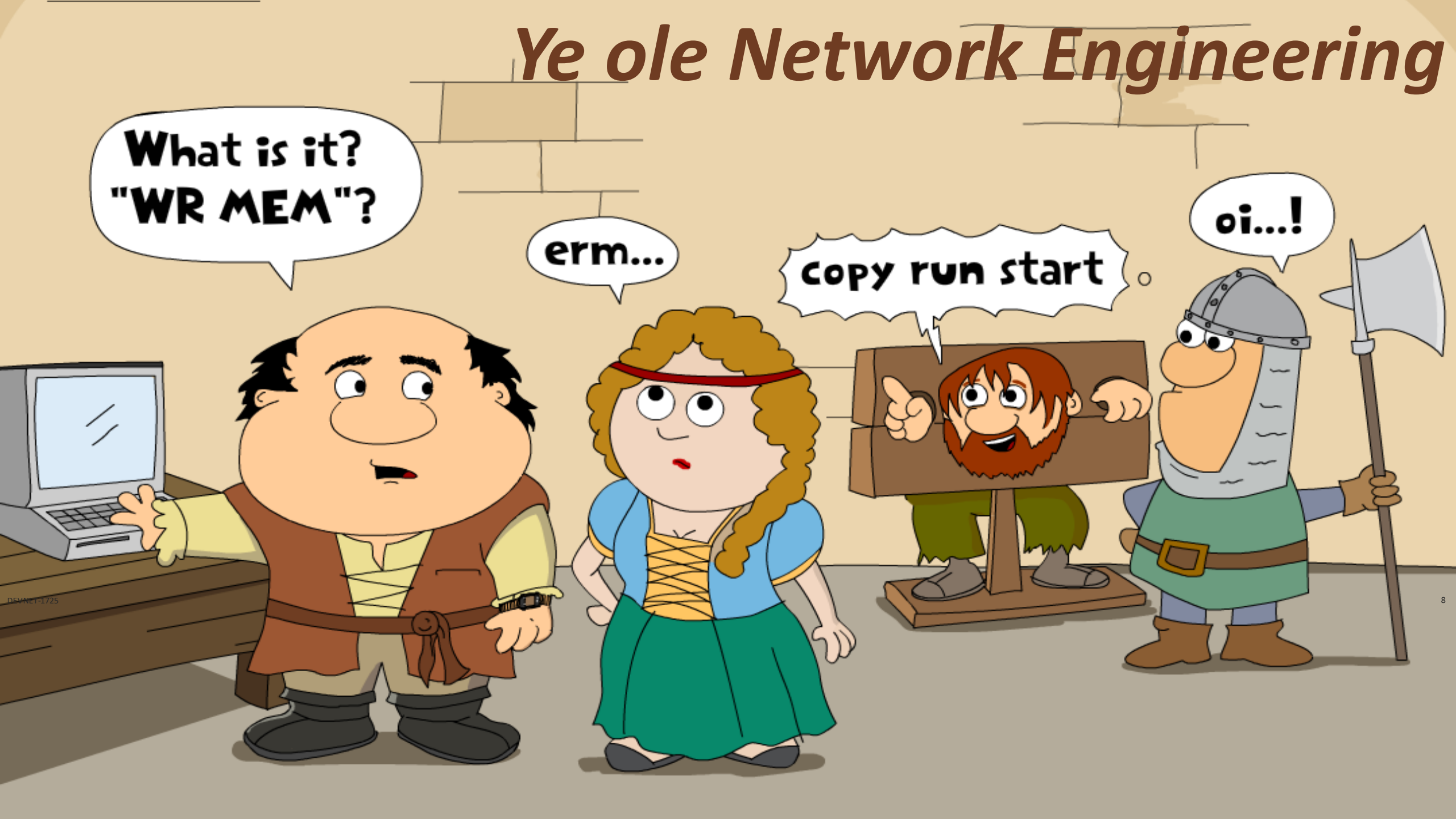
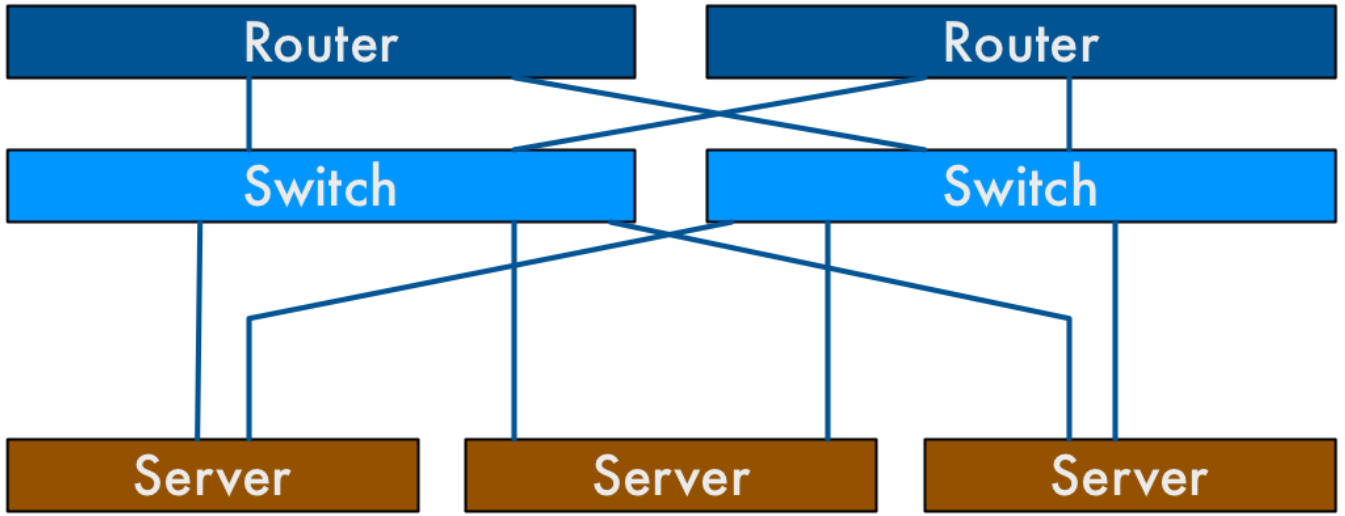
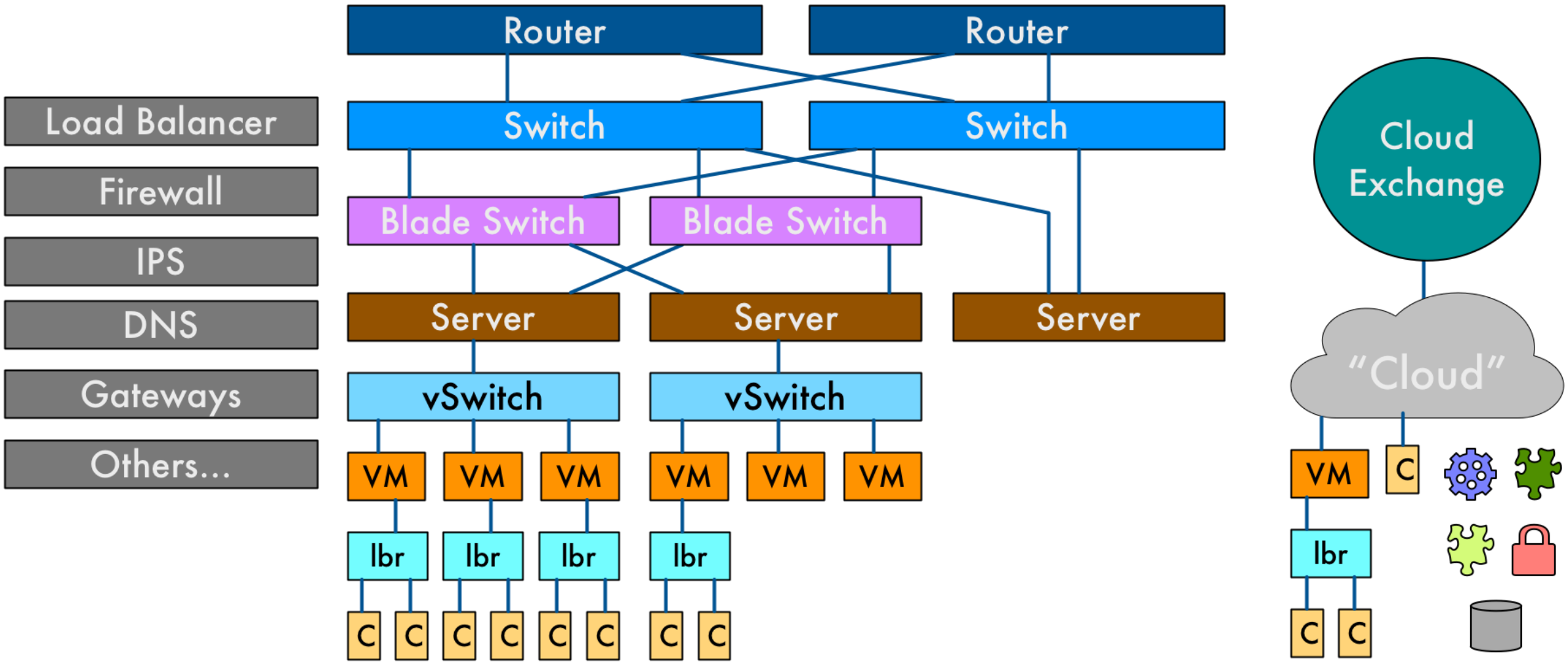
Ye ole Network Engineering



The Network as it was…

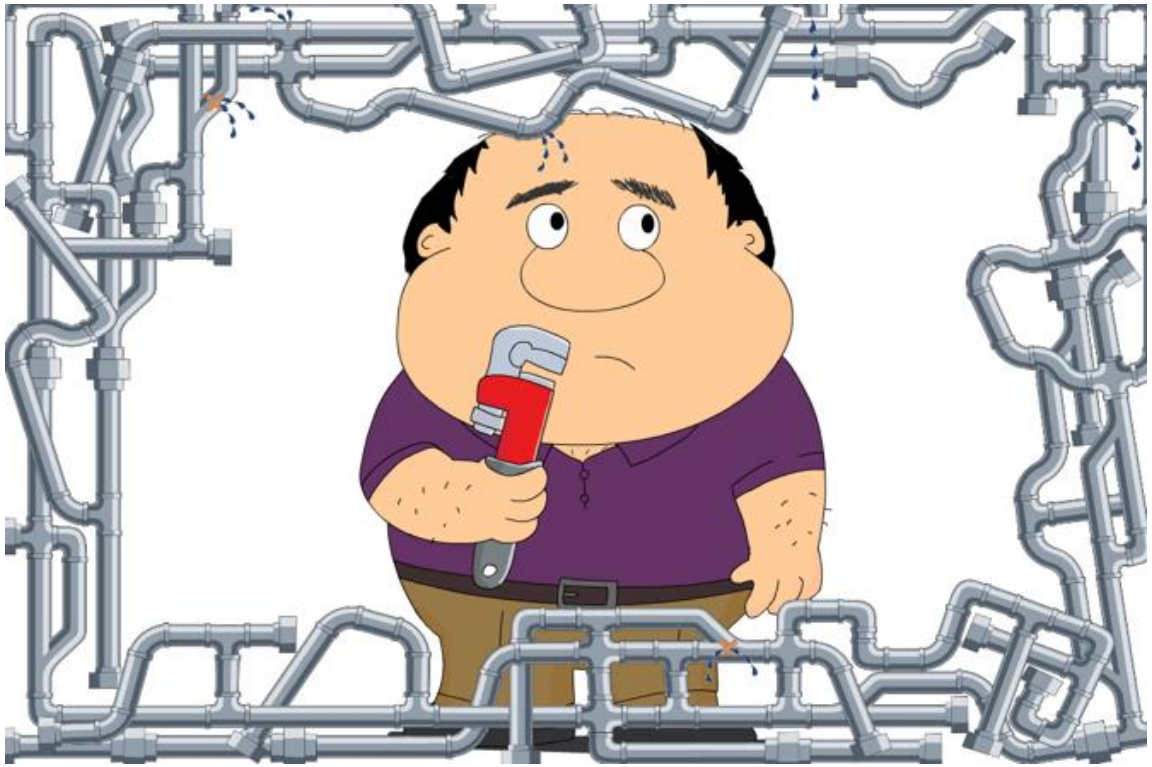


The Network as it is



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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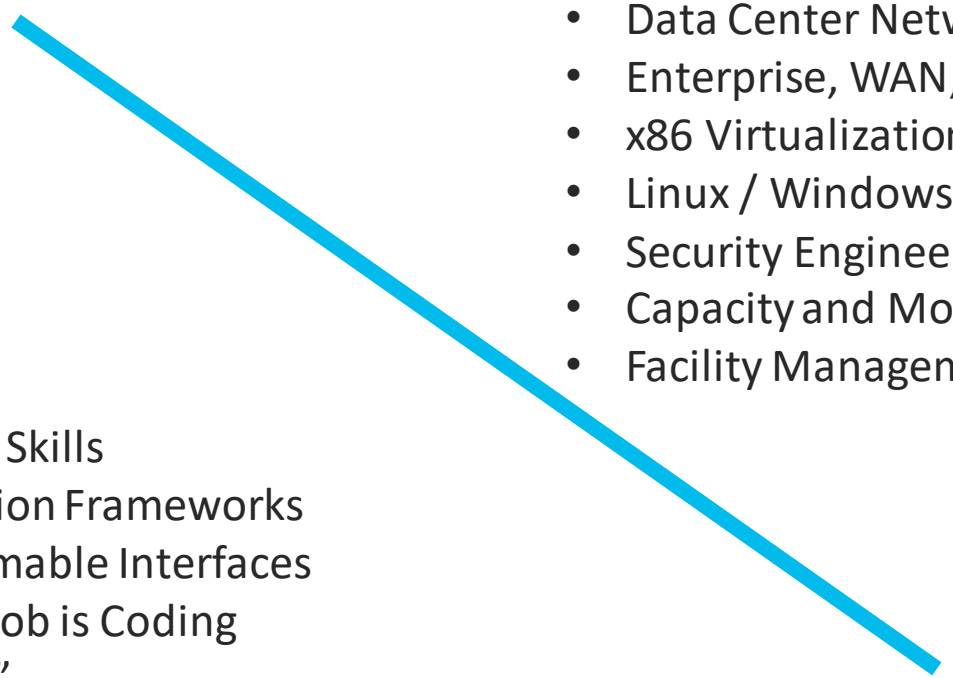
Engineering Teams of Today
Blending of Traditional Engineering and Automation

Infrastructure Engineering

- Data Center Network & Compute
- Enterprise, WAN, Wireless
- x86 Virtualization
- Linux / Windows Sysadmin
- Security Engineering
- Capacity and Monitoring
- Facility Management

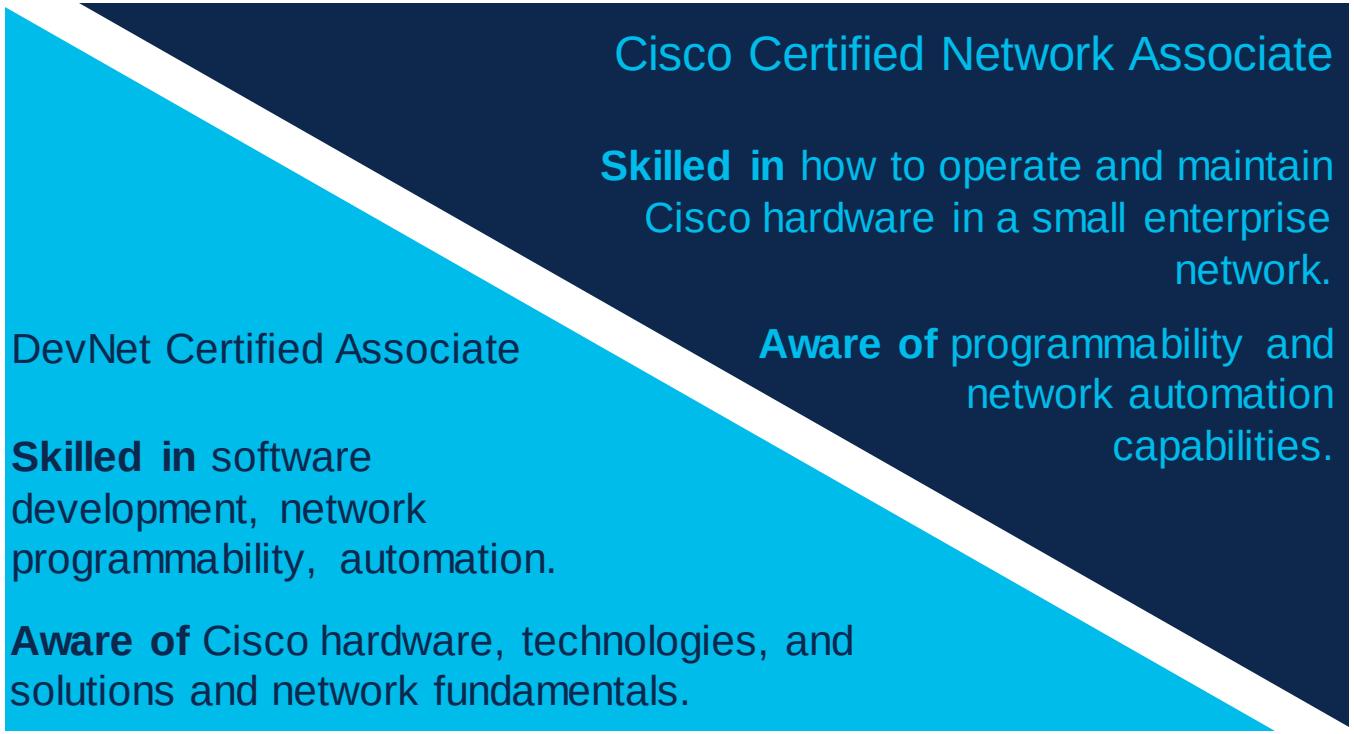


Infrastructure Automation

- Software Skills
- Automation Frameworks
- Programmable Interfaces
- Primary Job is Coding
- “DevOps”
- Docker & Kubernetes

Building teams with complementary skills

DevNet Certified Associate and the Cisco Certified Network Associate



Complementary balance and role alignment

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?

A Profile of a NetDevOps Team!

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

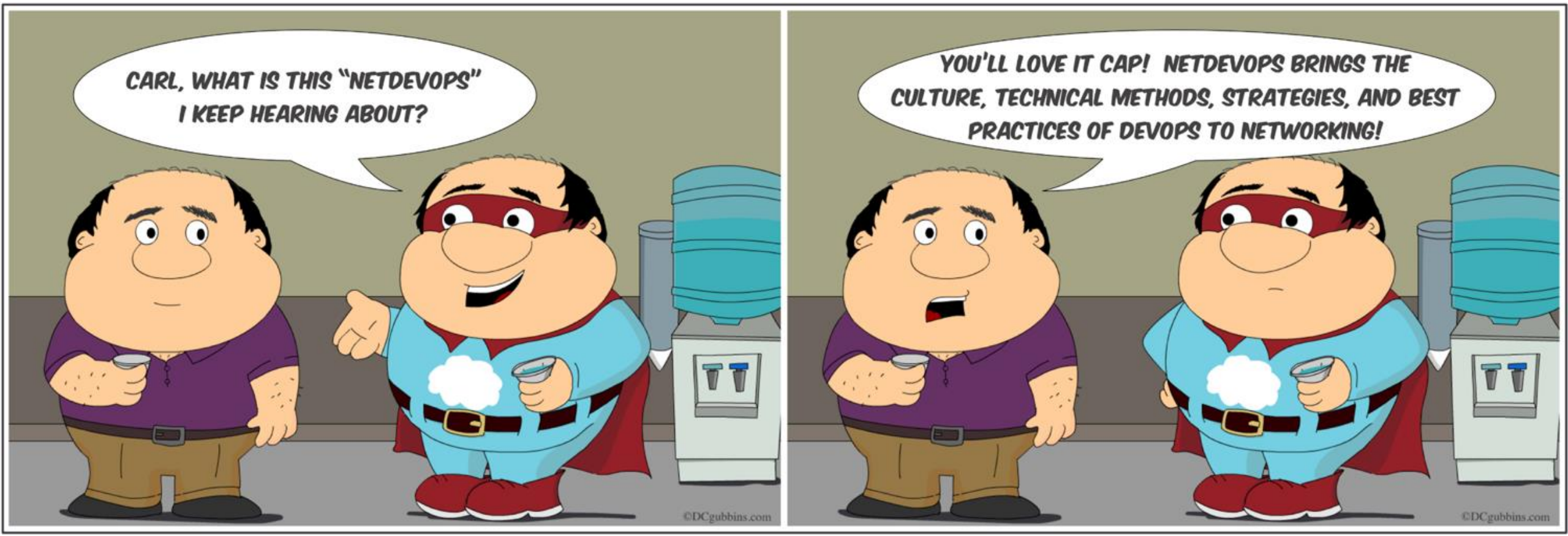
Platform Skills

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

Programming Skills

- Data Formats
- Python and APIs
- Source Control
- Configuration Management

Applying DevOps to Networking



DevOps

Desired Speed

Pipelines

Automation

Shared point in time, if at all

NetOps

Acceptable Risk

Sequential

CLI / UI

DevOps

Desired Speed

Pipelines

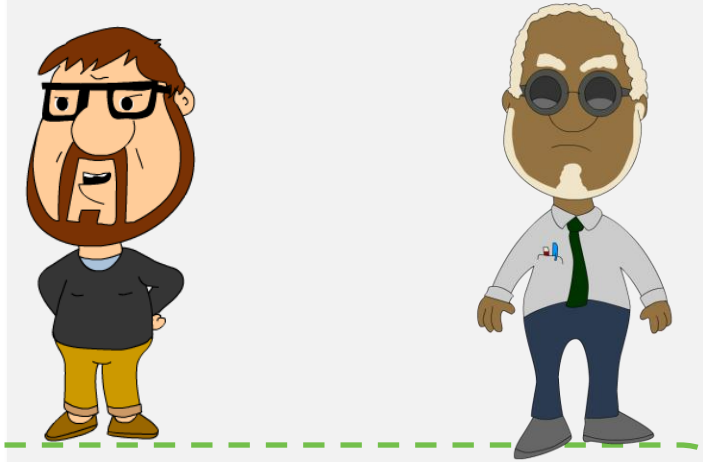
Automation

Speed & acceptable risk

Shared context

Common tools and workflows

NetOps



Acceptable Risk

Pipelines

Automation

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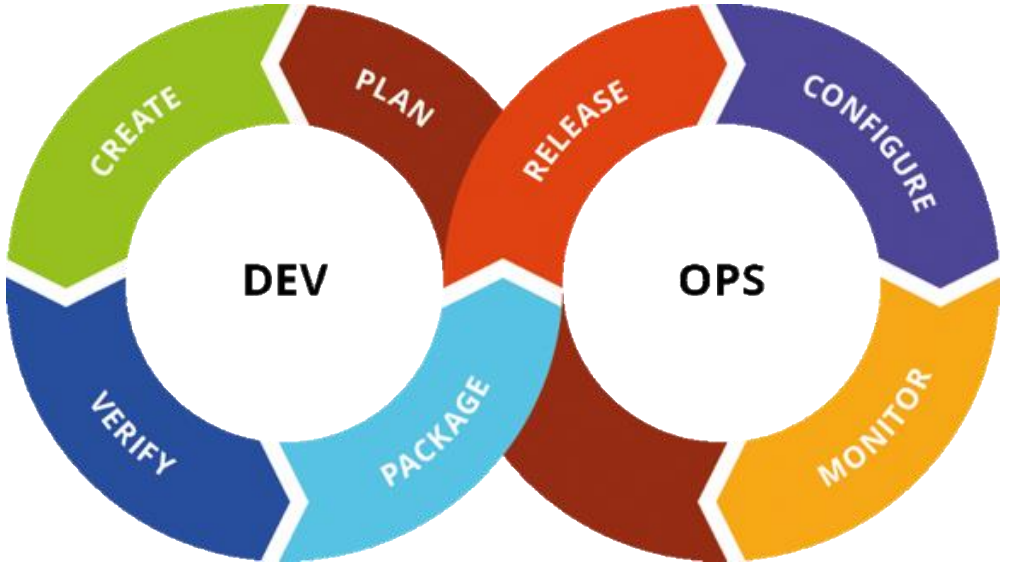
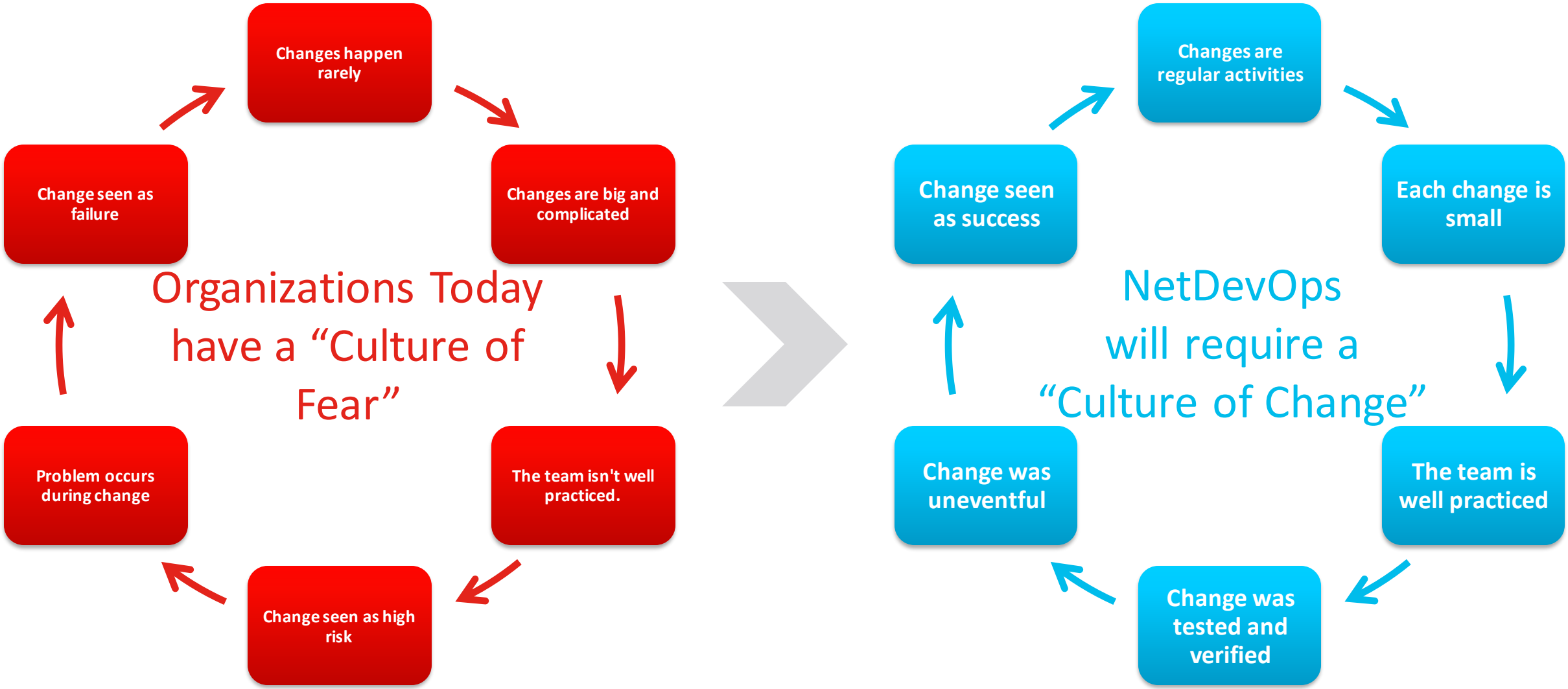
What is the “DevOps Culture”?

- Embrace failure
- Change is good
- Active collaboration
- Empowered accountability
- Feedback systems
- Automation



Moving to a NetDevOps Culture and Mindset

Moving to a NetDevOps Culture and Mindset



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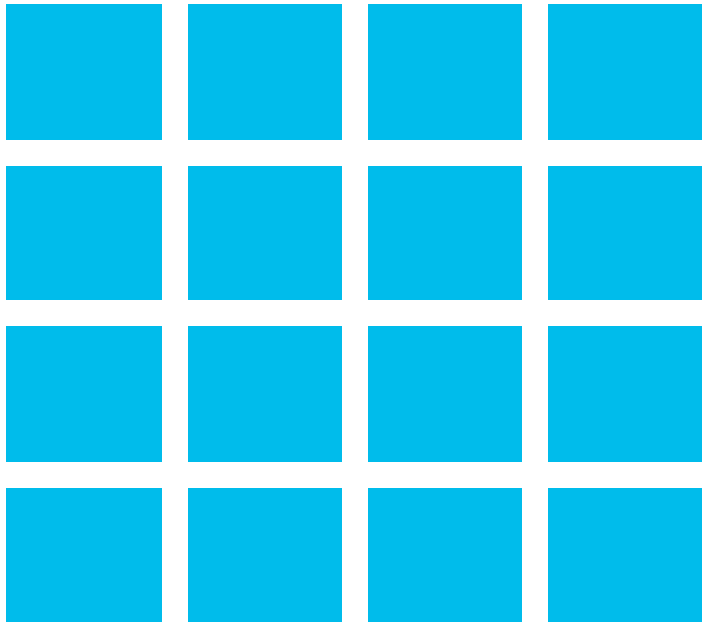
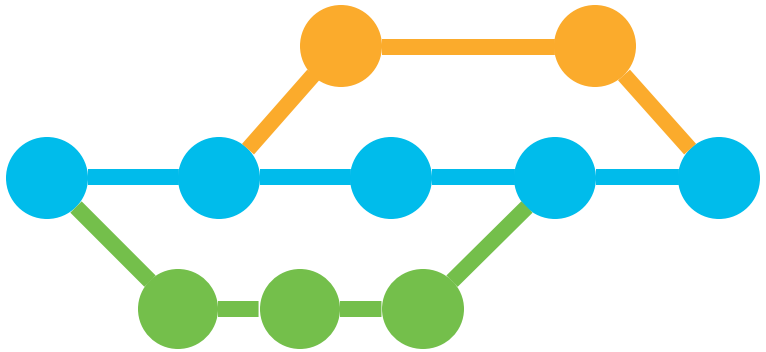
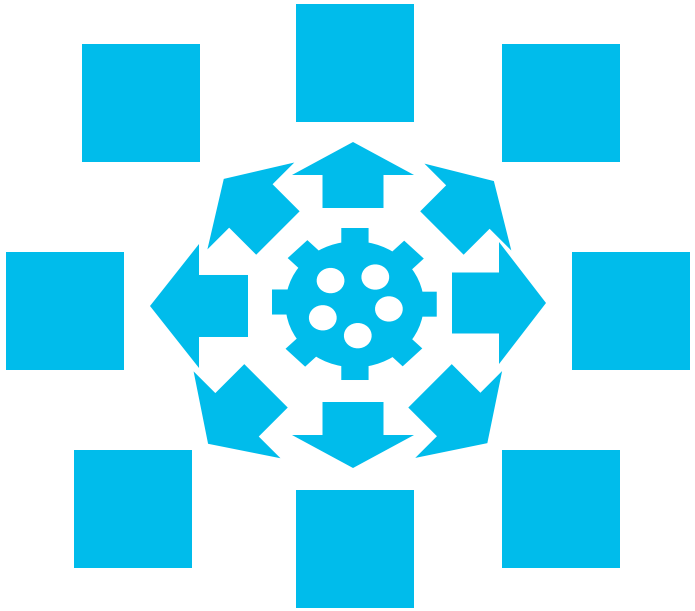
NetDevOps Will Deliver







Consistent Version Controlled Infrastructure deployed with Parallel & Automated Provisioning

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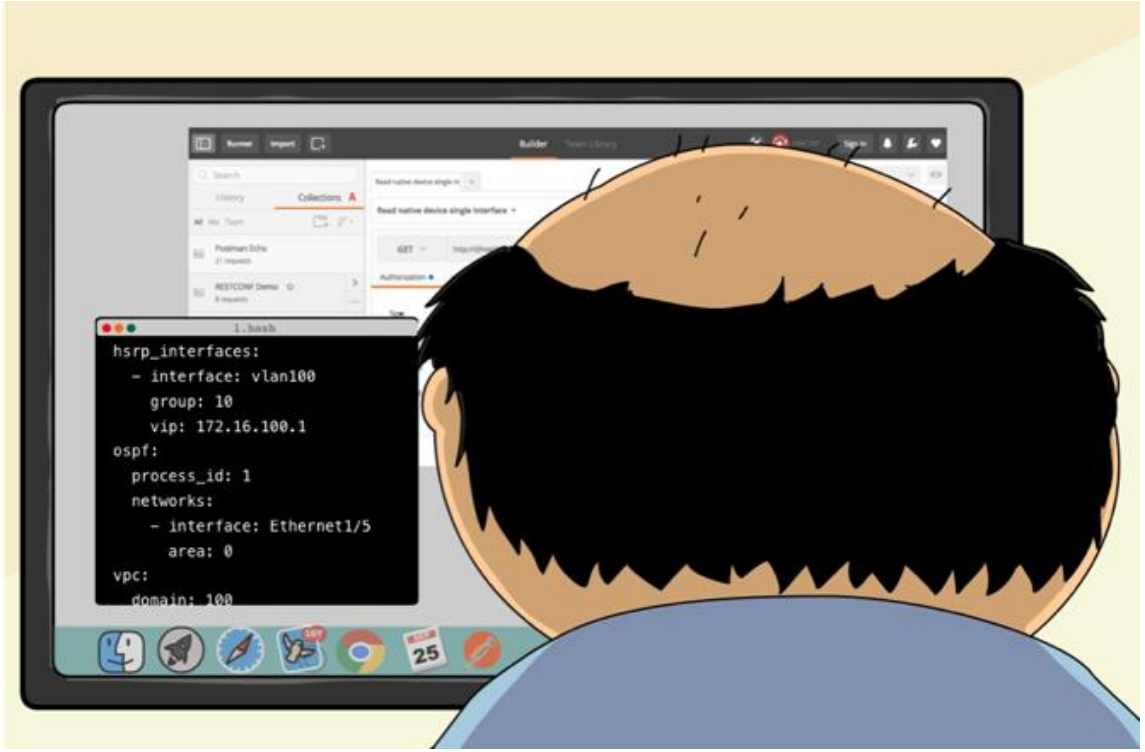
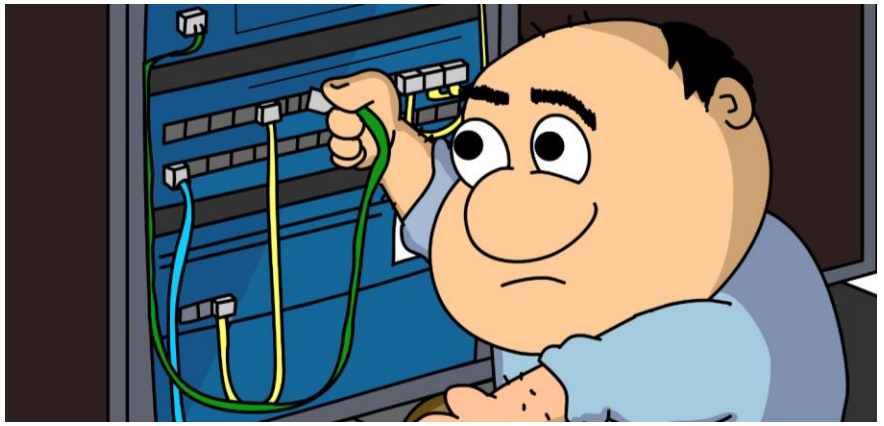
”When” do you NetDevOps?

- **Day 0 – Initial Bootstrap and Upgrades**
  - Onboard new hardware, deploy new virtual appliances
  - Upgrade in-service gear
- **Day 1 – Putting Gear into Service**
  - Render and deploy intended configuration to systems
  - Verify configuration operating as expected
- **Day N – Ongoing Operations**
  - Fulfill add/move/change requests
  - Monitor operational health of network
  - Identify and troubleshoot problems
  - Decommissioning infrastructure



”What” do you NetDevOps?

- **Deployment Activities**
  - Zero Touch Provisioning for new hardware
  - ISO/OVA/AMI deployment for virtualized systems
  - Automate software upgrade runbooks
  - Update Source of Truth(s), monitoring, etc
- **Configuration Management**
  - Initial configuration creation and deployment
  - Implement configuration changes overtime
  - Integrate with Source of Truth(s)
  - Leverage Network as Code, GitOps, CI/CD principals



- **Health and Performance Monitoring**
  - Configuration and operational verification/compliance
  - Identify unexpected changes and their causes
  - Gather and process system logs
  - Gather network telemetry and determine KPIs
  - Generate useful reports and dashboards for users
  - Determine normal baselines and find deviations
  - Provide intelligent alerting
  - Troubleshoot network problems and outages

Example Zero Touch Provisioning Automation

Add Gear to Source of Truth (SoT)

Install, Cable, Power on Gear

DHCP Provides IP and "Next Server" Info

Contact Deployment Server (DS)

DS retrieves details from SoT

DS sends OS deployment instructions

Gear performs OS upgrade

Gear contacts DS for next step

DS renders bootstrap config from SoT

DS sends bootstrap config

Gear applies bootstrap config

DS/Gear updates SoT with status

Example Configuration Management Pipeline

Create Proposed Branch

Update
Automation or Config

Test Configuration

Push Proposed Changes

DEV

TEST / PROD

Build Automation Starts

Build Test Network

Deploy Changes and Test

Send
Notification

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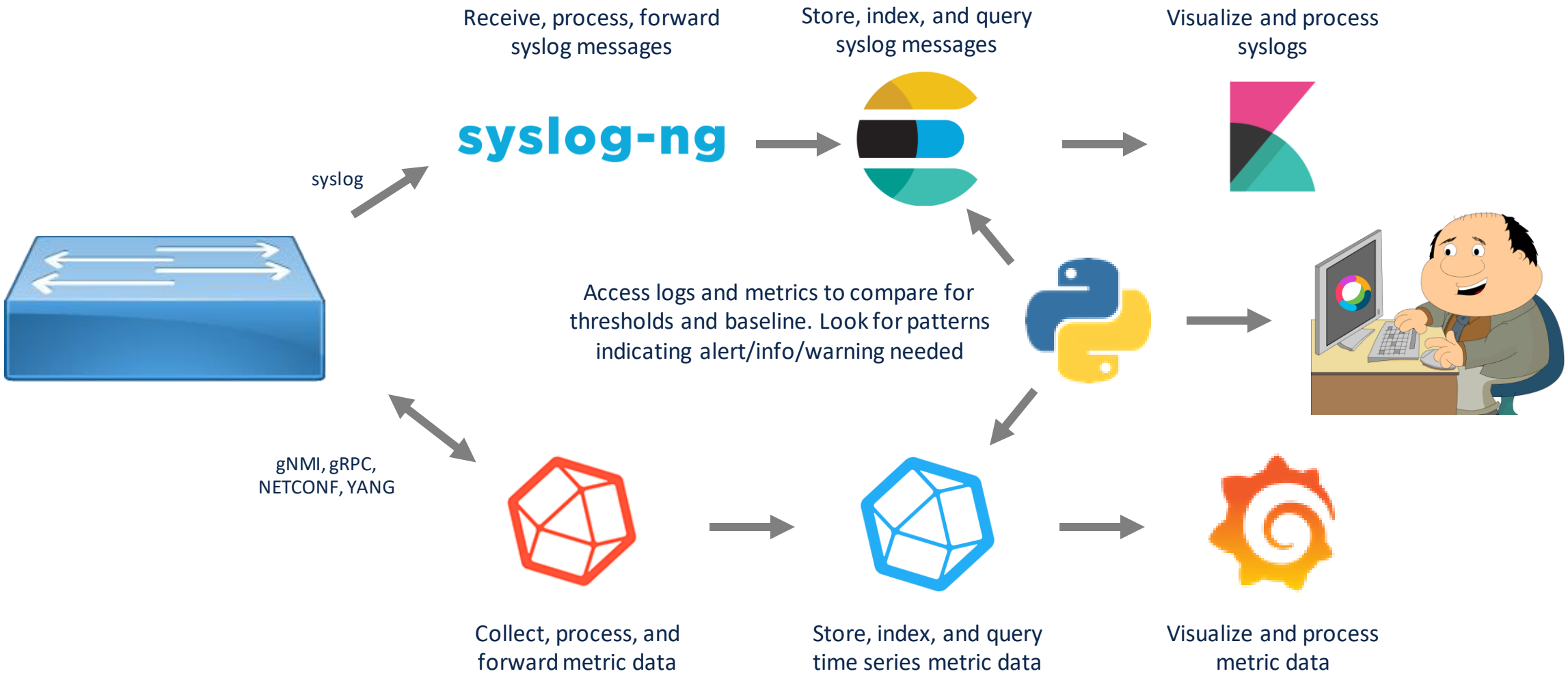
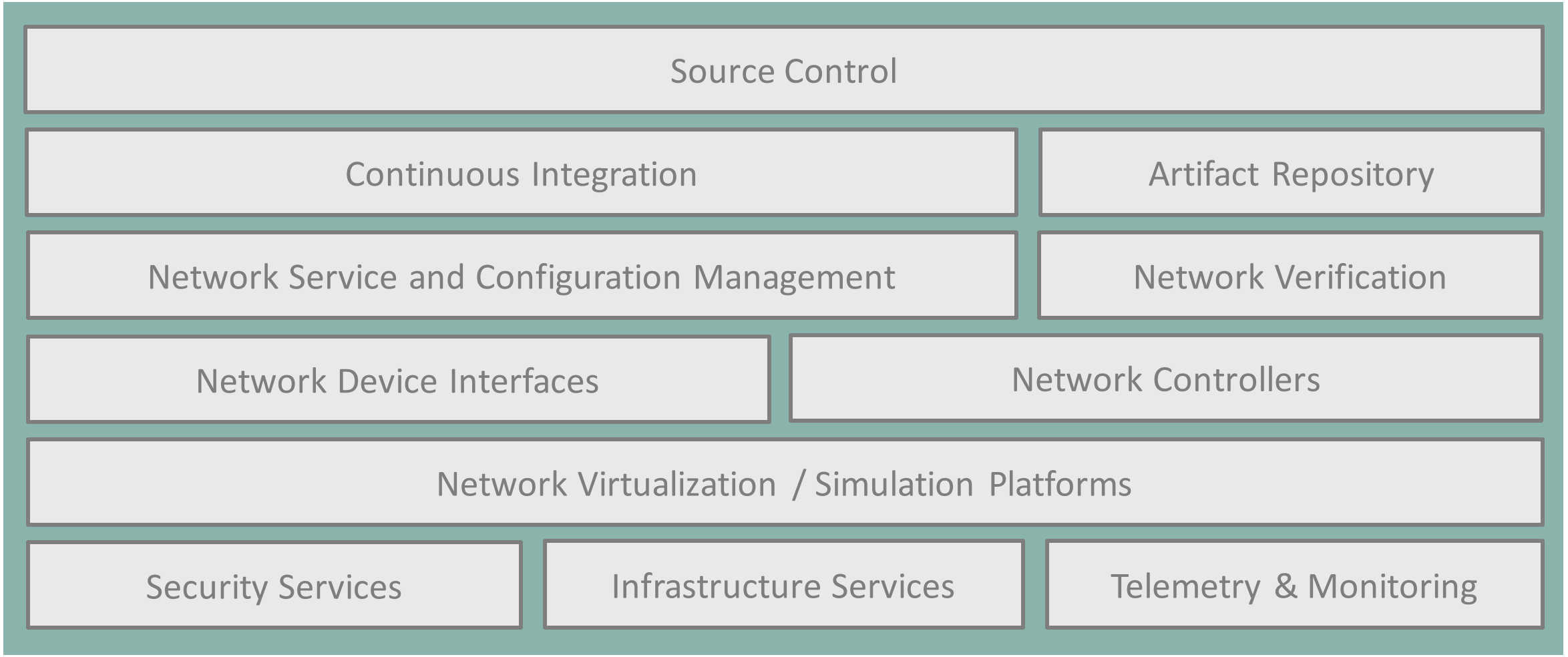
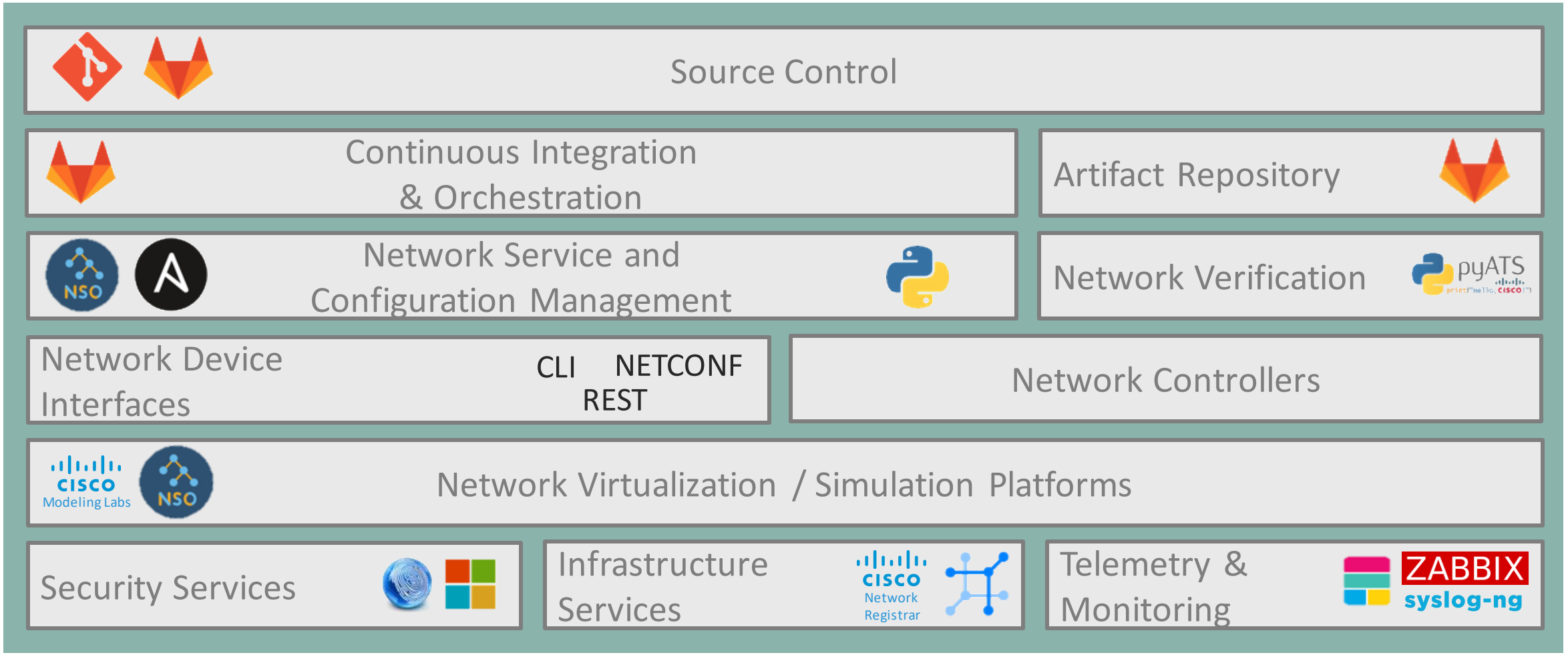
Example Monitoring Setup



The NetDevOps Engineers Tool Chest



Example NetDevOps Tool Chest



More Details on the Toolchest in Resources

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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!

Questions / Discussion

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

Got more questions? Stay in touch!

Hank Preston

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Supporting Info


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

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
- Python and APIs
- Source Control
- Configuration Management

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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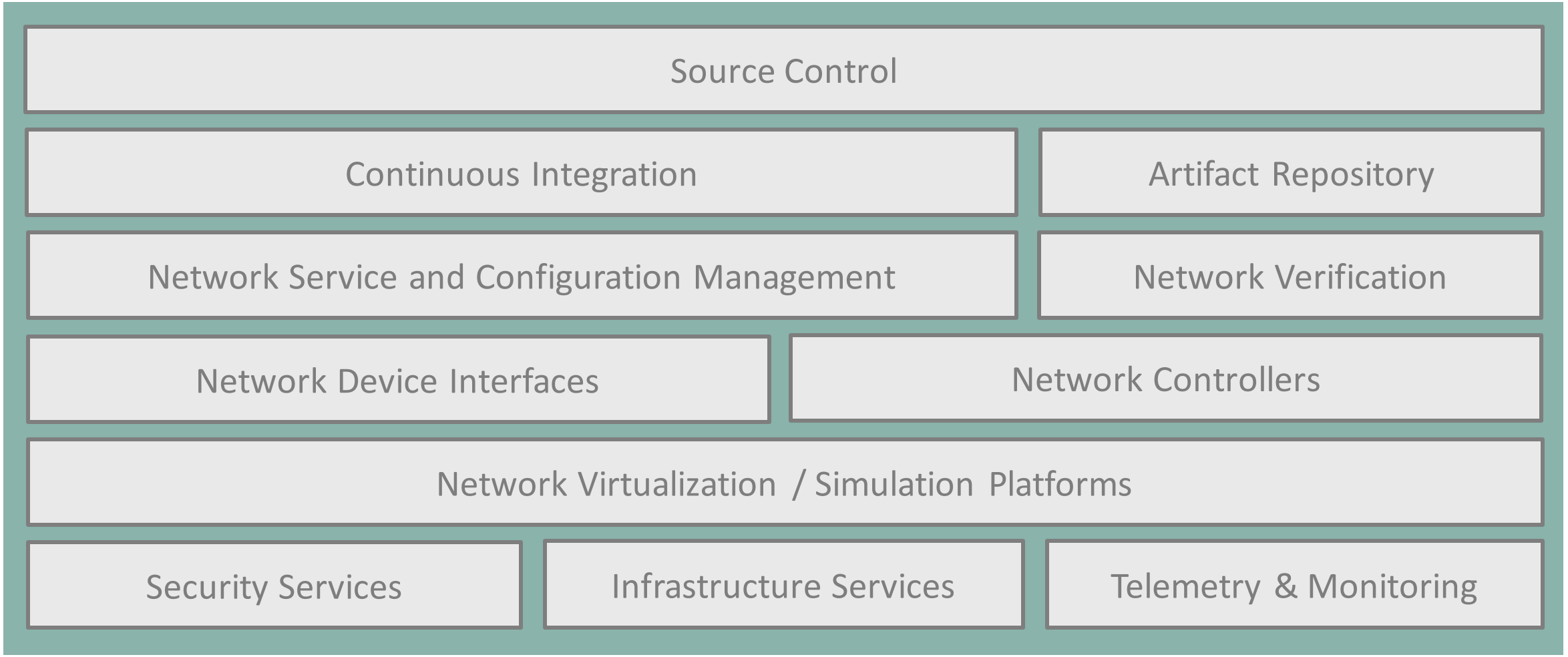
NetDevOps Tool Chest

The NetDevOps Engineers Tool Chest



The NetDevOps Engineers Tool Chest

Source Control systems enable easy management of documents, code, and other pieces of information with tooling to support collaboration, revision management, and easy distribution.





Source Control

Network Device Interfaces

Network Controllers

Network Virtualization / Simulation Platforms

Security Services

Infrastructure Services

Telemetry & Monitoring

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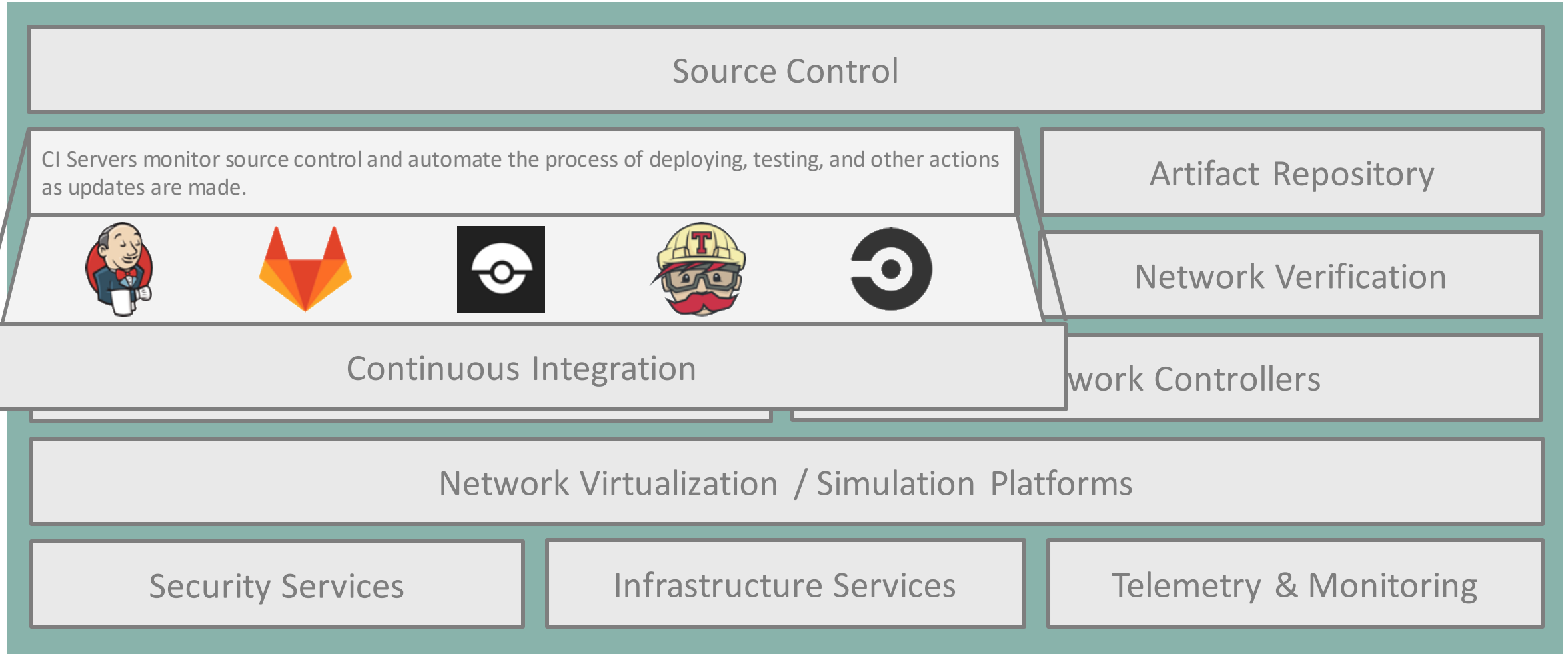

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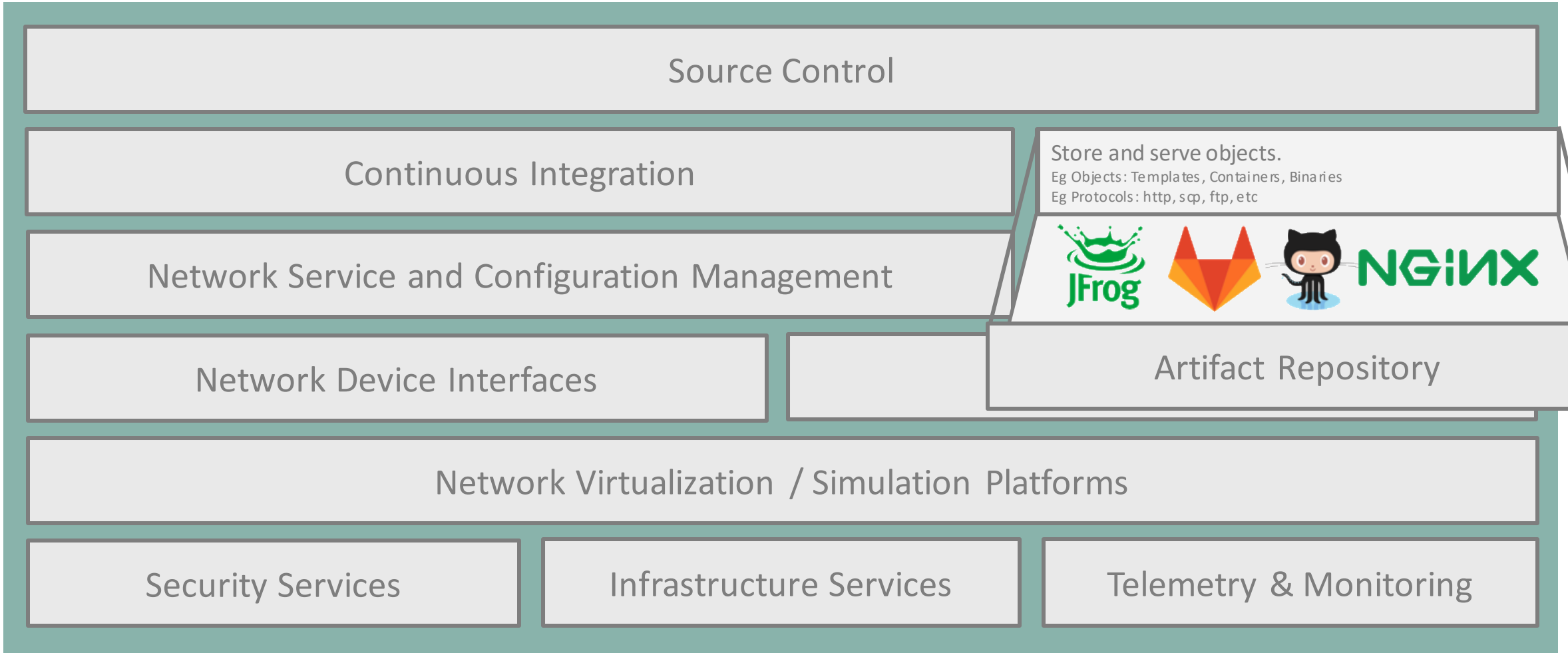

The NetDevOps Engineers Tool Chest

Source Control

Continuous Integration

Artifact Repository

Network Service and Configuration Management tools enable Network as Code and ensure the desired state of the network.

Network Verification

etwork Controllers

Network Service and Configuration Management

orms

Security Services

Infrastructure Services

Telemetry & Monitoring

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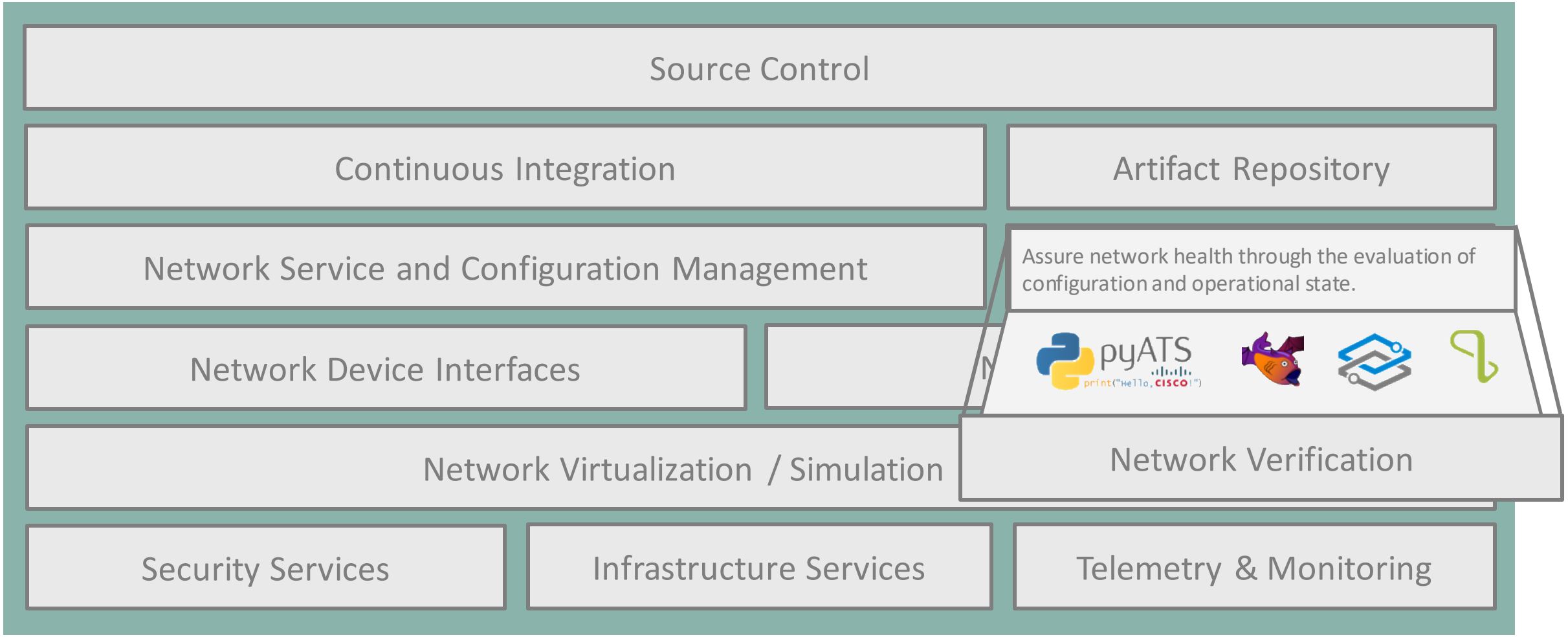

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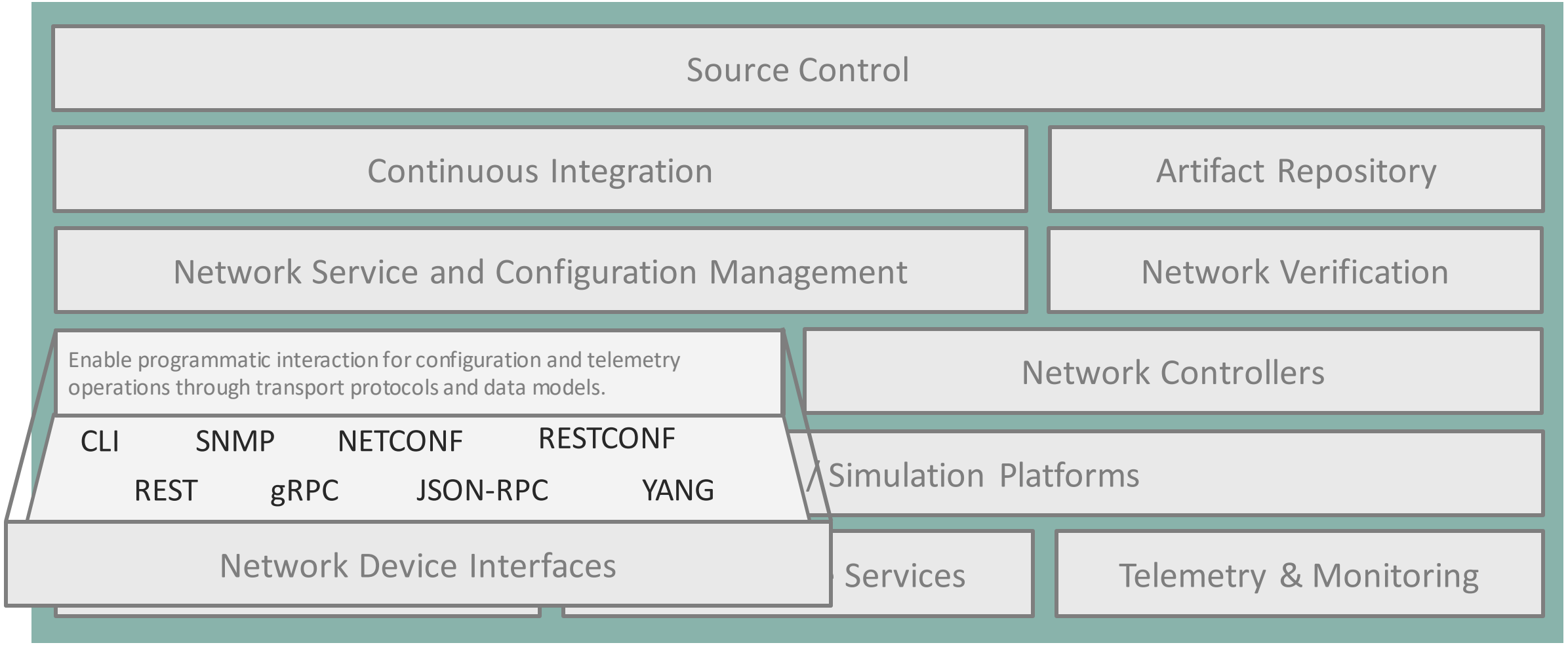

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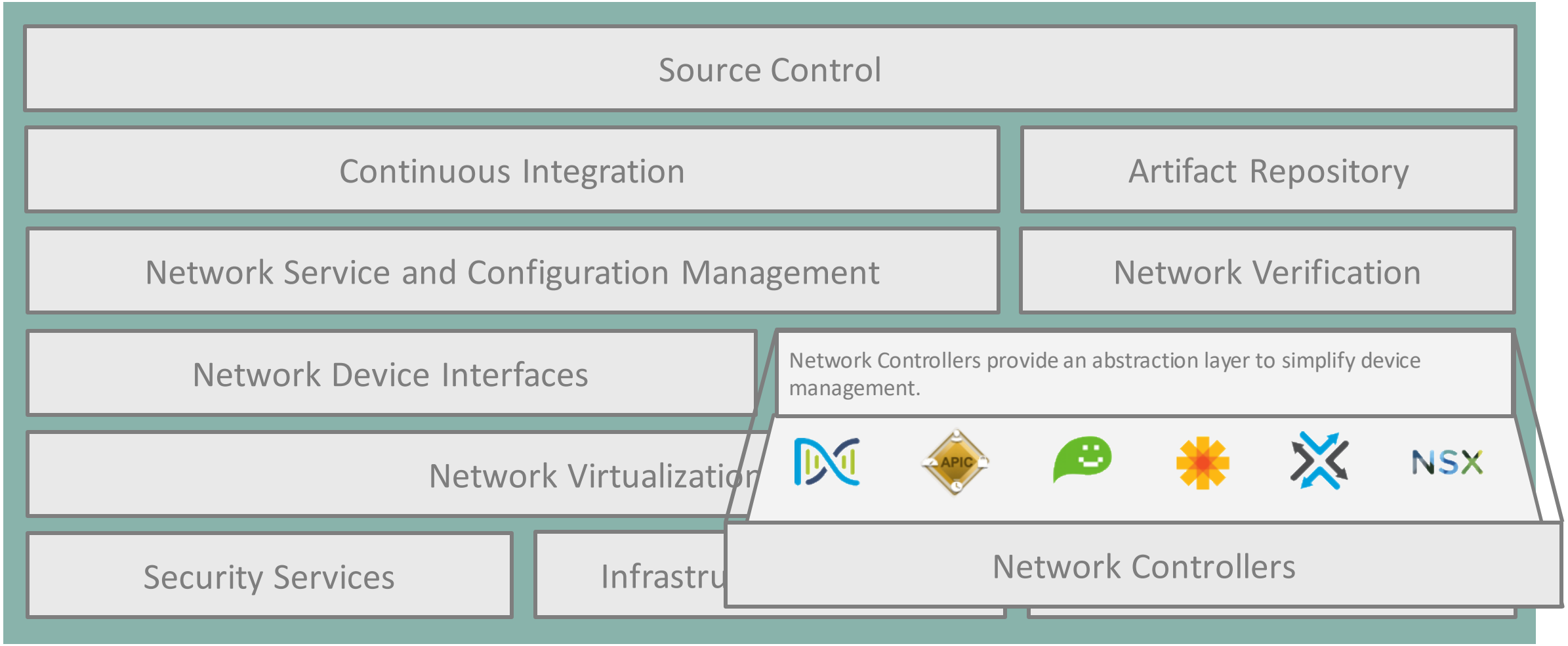

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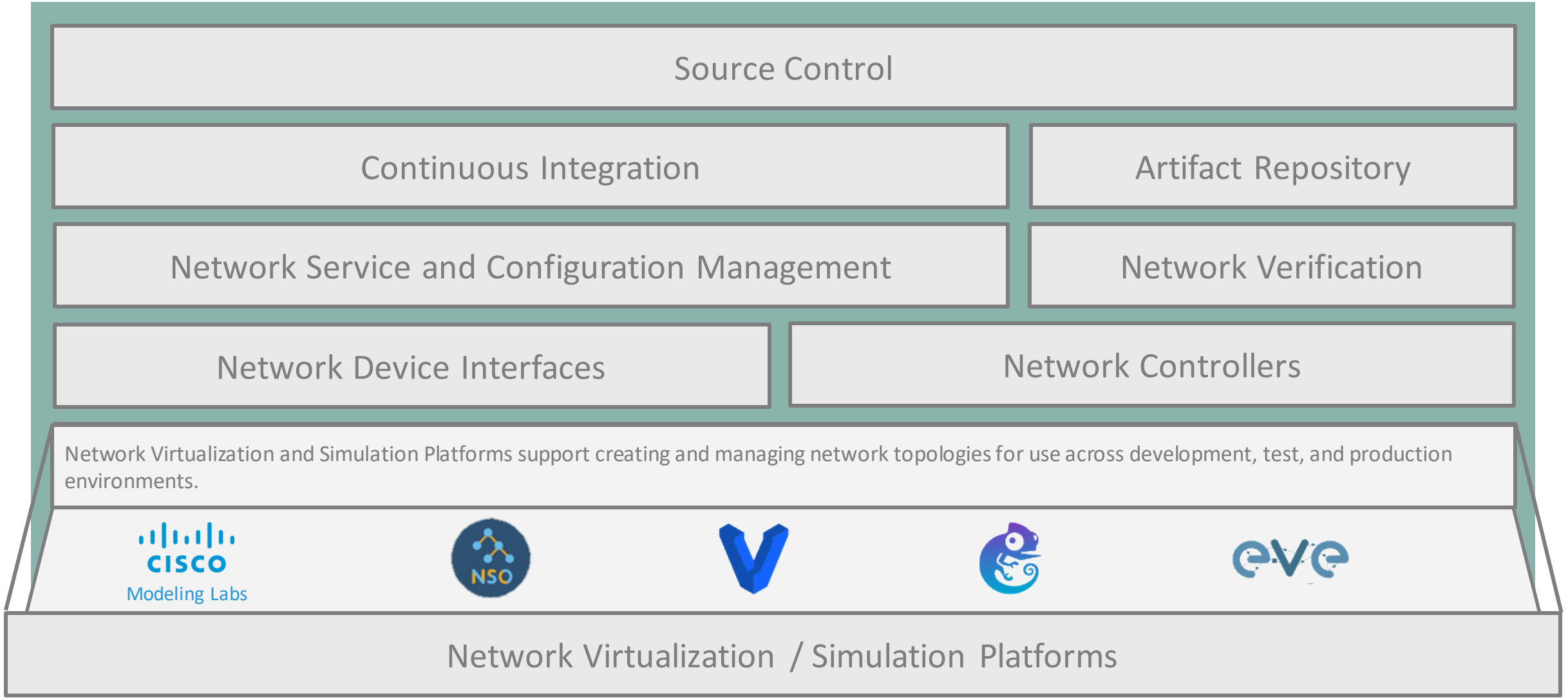

The NetDevOps Engineers Tool Chest

Source Control

Continuous Integration

Artifact Repository

Network Service and Configuration Management

Network Verification

Network Device Interfaces

Network Controllers

Network Virtualization / Simulation Platforms

Support RBAC, AAA, & Certificate Services across network.

Infrastructure Services

Telemetry & Monitoring

Security Services

The NetDevOps Engineers Tool Chest

Source Control

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Network Service and Configuration Management

Network Verification

Network Device Interfaces

Network Controllers

Network Virtualization / Simulation Platforms

Security Services

Deliver required services to the network.
Eg Services: IPAM, DHCP, DNS, NTP

Telemetry & Monitoring

Infrastructure Services

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Security Services

Infrastructure Services

Ingest, process, & make available telemetry data from the network.

Eg Sources: syslog, netflow, gRPC, SNMP

Telemetry & Monitoring