

>>> network .toCode()



The role of the Network Engineer in the DevOps era

devops.barcelona 2022

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Network Automation Architect

@chadell0

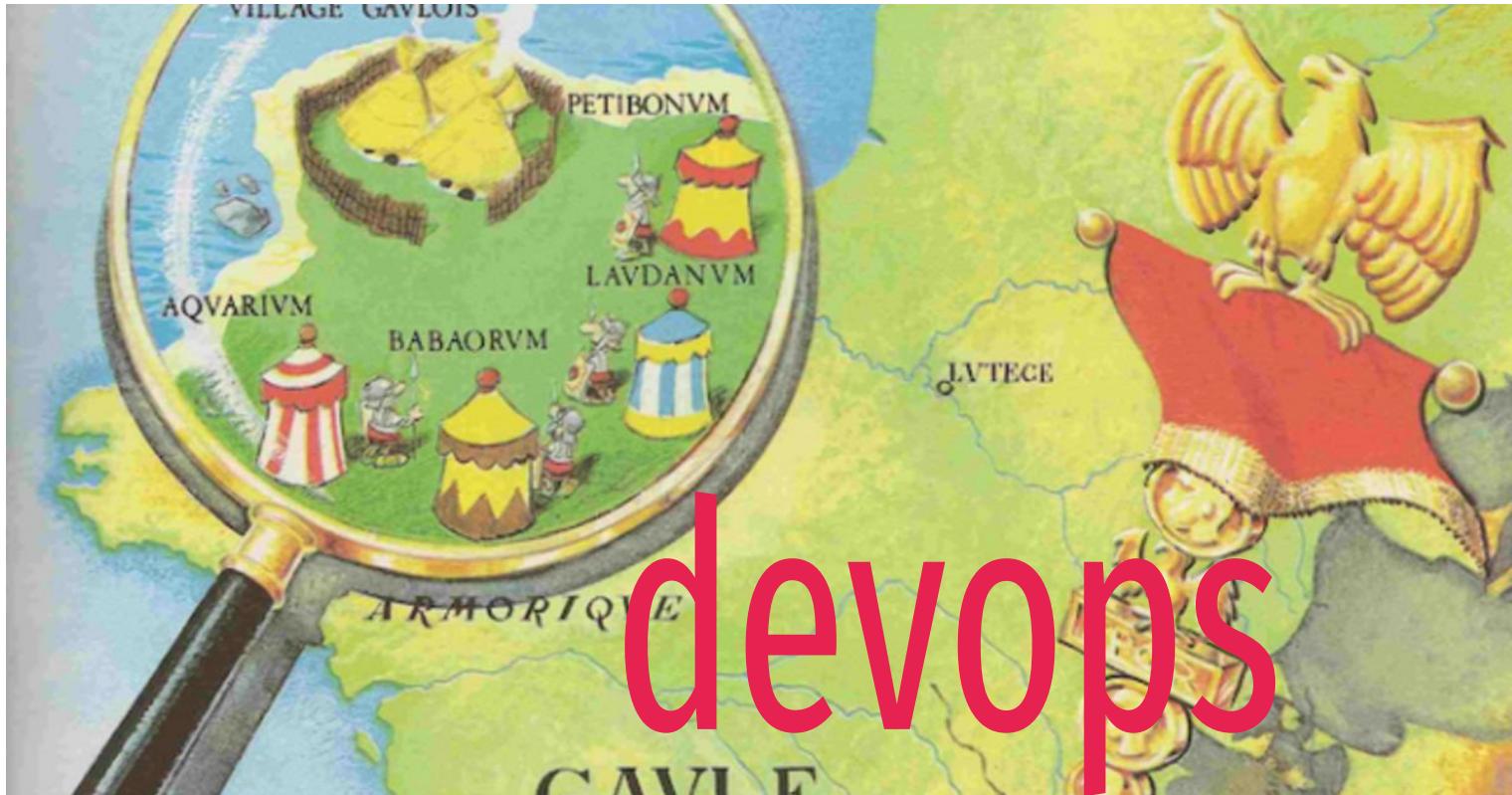


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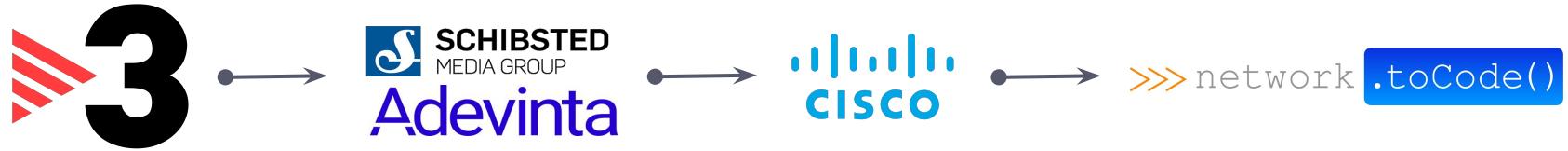


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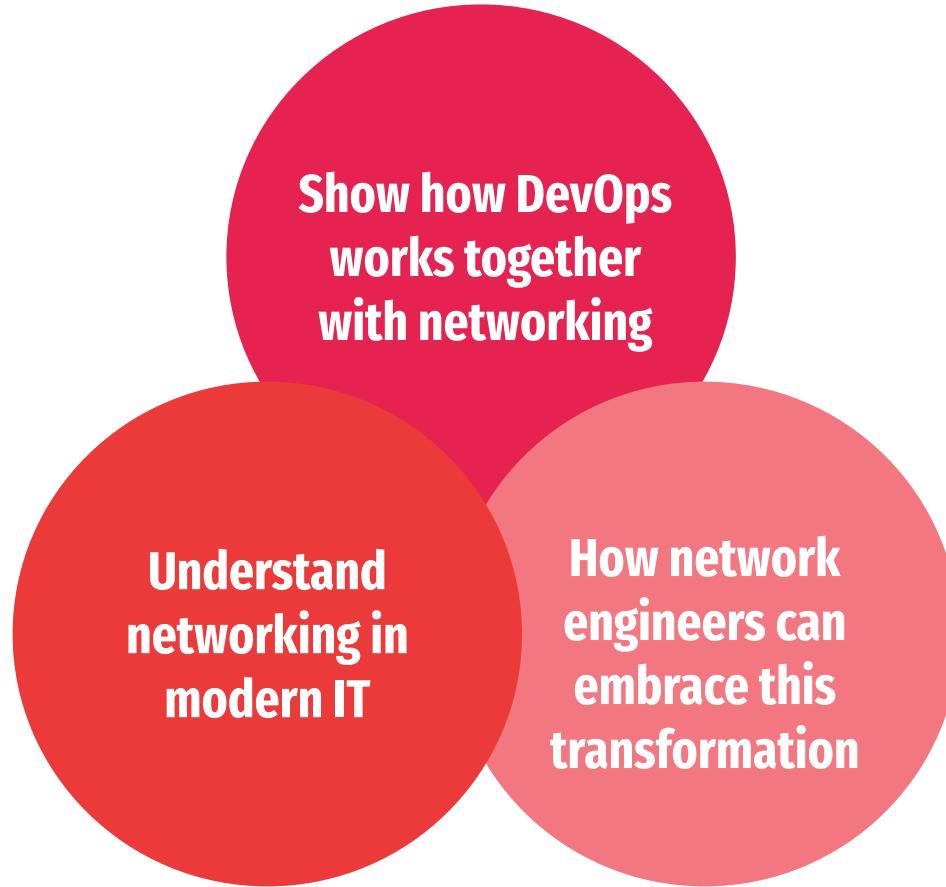
network team



>>> About me



>>> Goals



The background of the slide features a nighttime photograph of a major city's skyline, likely New York City, with numerous skyscrapers and illuminated windows. The foreground is dominated by a large, semi-transparent blue rectangular area.

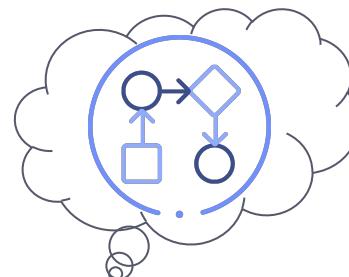
>>> Networking in 2022

>>> The Network Engineer role

Before

```
 eos-spine2#  
eos-spine2#conf t  
eos-spine2(config)#interface ethernet 2  
eos-spine2(config-if-Et2)#vlan 123  
eos-spine2(config-vlan-123)#state active  
eos-spine2(config-vlan-123)#exit  
eos-spine2(config)#sh interfaces ethernet 2  
Ethernet2 is up, line protocol is up (connected)  
Hardware is Ethernet, address is 5254.009d.1809 (bia 5254.009d.1809)  
Description: Connects to interface Ethernet3 on neighbor eos-leaf1.ntc.com  
Ethernet MTU 9214 bytes  
Full-duplex, Unconfigured, auto negotiation: off, uni-link: n/a  
Up 148 days, 19 hours, 37 minutes, 47 seconds  
Loopback Mode : None  
2 link status changes since last clear  
Last clearing of "show interface" counters never  
5 minutes input rate 0 bps (< with framing overhead), 0 packets/sec  
5 minutes output rate 0 bps (< with framing overhead), 0 packets/sec  
6849120 packets input, 837298680 bytes  
Received 0 broadcasts, 6849120 multicast
```

Network Design



Nowadays

Step 2: VPC with a Single Public Subnet

IP CIDR block*: 10.0.0.0/16 (65531 IP addresses available)

VPC name:

Public subnet*: 10.0.0.0/24 (251 IP addresses available)

Availability Zone*: No Preference

Subnet name: Public subnet

You can add more subnets after AWS creates the VPC.

Add endpoints for S3 to your subnets

Subnet: None

Enable DNS hostnames*: Yes No

Hardware tenancy*: Default

[Cancel and Exit](#) [Back](#) [Create VPC](#)



DigitalOcean



Google Cloud



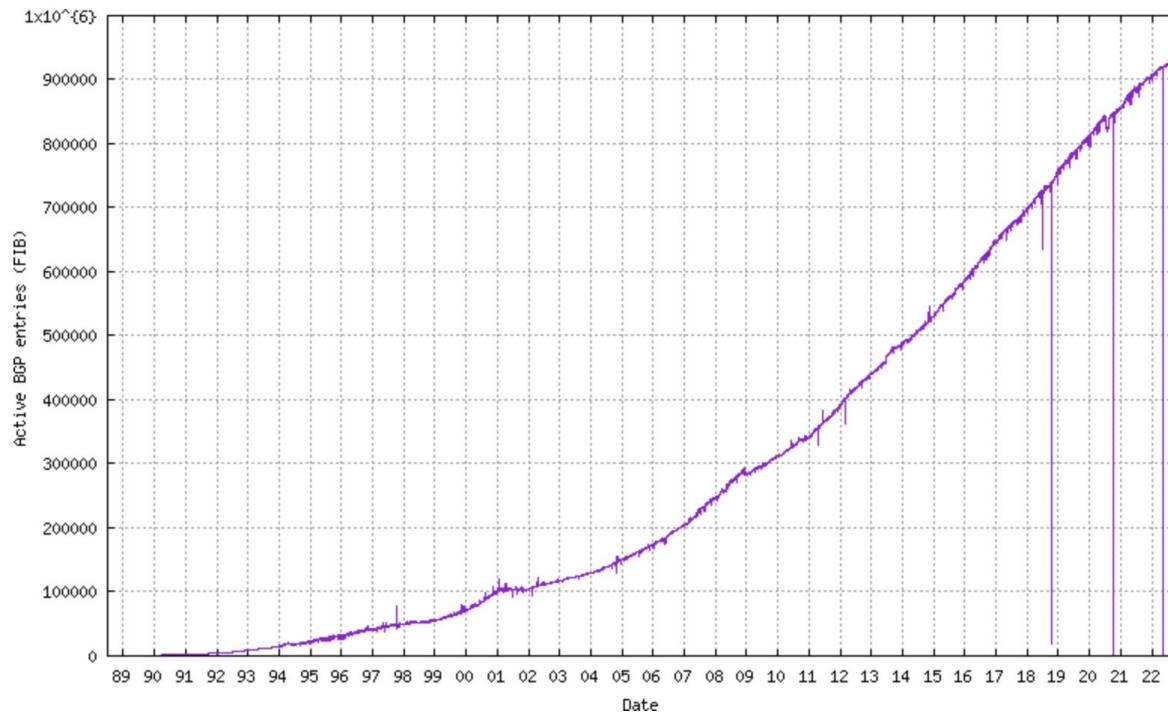
aws



Azure

>>> Is it getting simpler?

Active BGP entries (FIB)



Total active BGP routes:
937246

Source: <https://bgp.potaroo.net/as2.0/bgp-active.html>

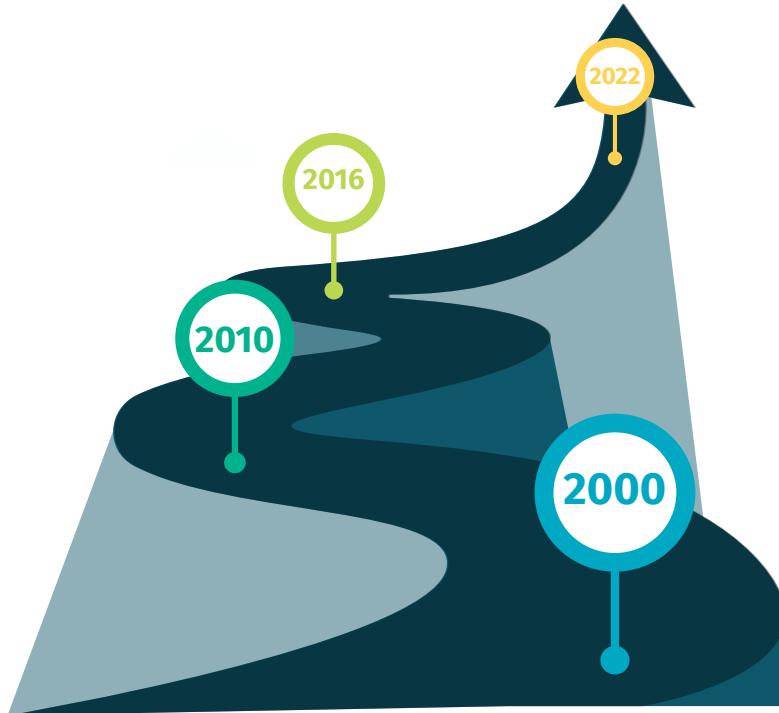
>>> Scope is constantly increasing

2022

Service Mesh, Hybrid cloud
and container networking

2010

Public and Private cloud
networking



2016

Network Disaggregation, Linux
NOS, controller-based network
services and IPv4 exhaustion

2000

Manage Campus and
Data Center networks,
core-distribution-access
architectures

>>> What makes networking “special”

Blast Radius Effect

Network down, business down

Distributed

Networking has the converge end-to-end, and rarely you own the full path



Heterogeneity

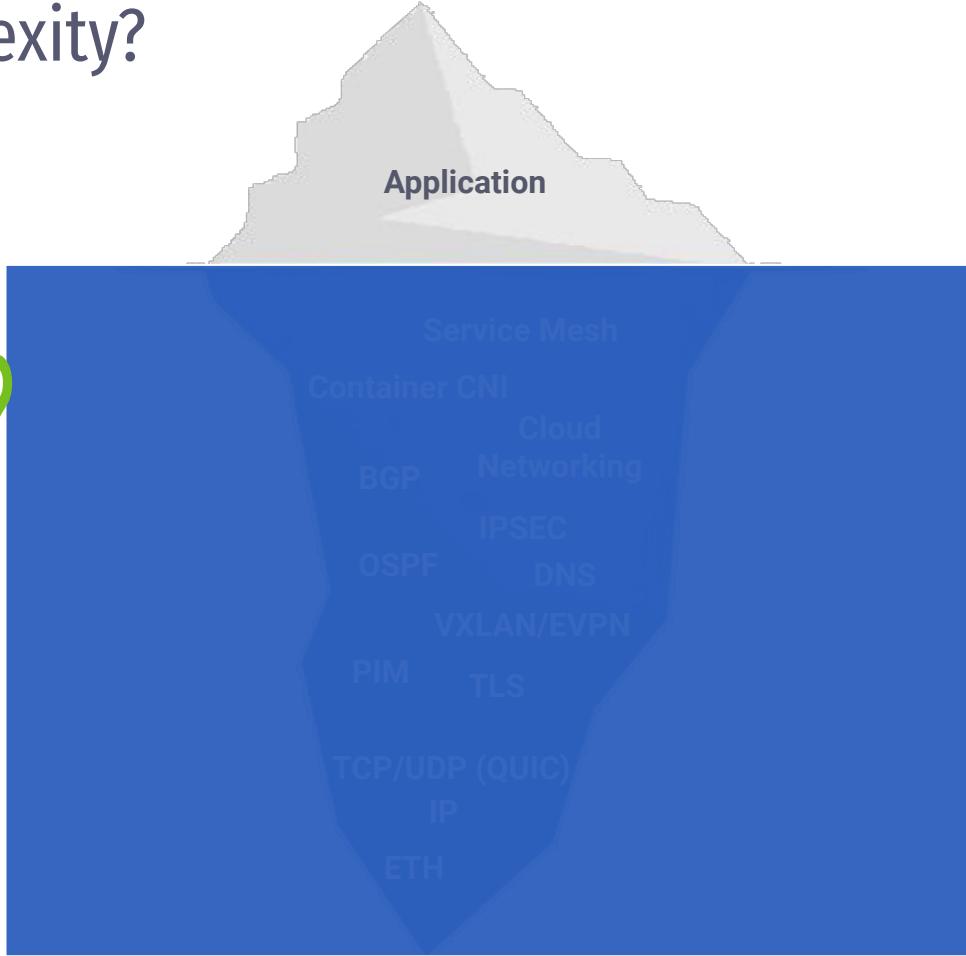
Depending on the problem to solve, there are different interfaces to interact with the network

Abstraction

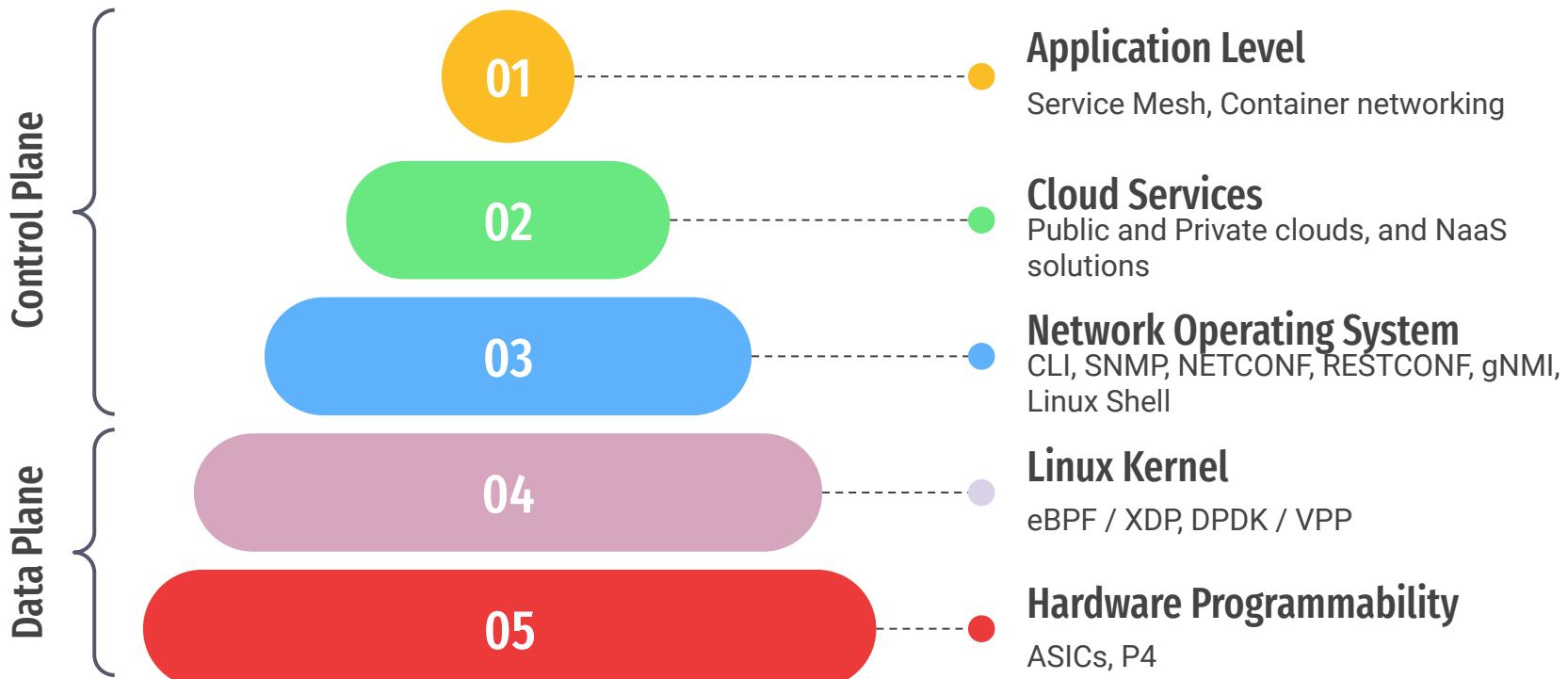
Providing several levels of abstraction increases the complexity understanding all the dependencies

>>> Where is the complexity?

Is it the network?
It's always DNS
It's always BGP



>>> How do you interact with the network?



>>> For me, the network is a ...



Commodity

Strategic Asset

Product



Application Level

Service Mesh, Container networking

Cloud Services

Public and Private clouds, and NaaS solutions

Network Operating System

CLI, SNMP, NETCONF, RESTCONF, gNMI, Linux Shell

Linux Kernel

eBPF / XDP, DPDK / VPP

Hardware Programmability

ASIC SDK, P4



The role of network engineering in DevOps teams

>>> T-Shape DevOps Teams



>>> Adopting DevOps in Networking

As a Service

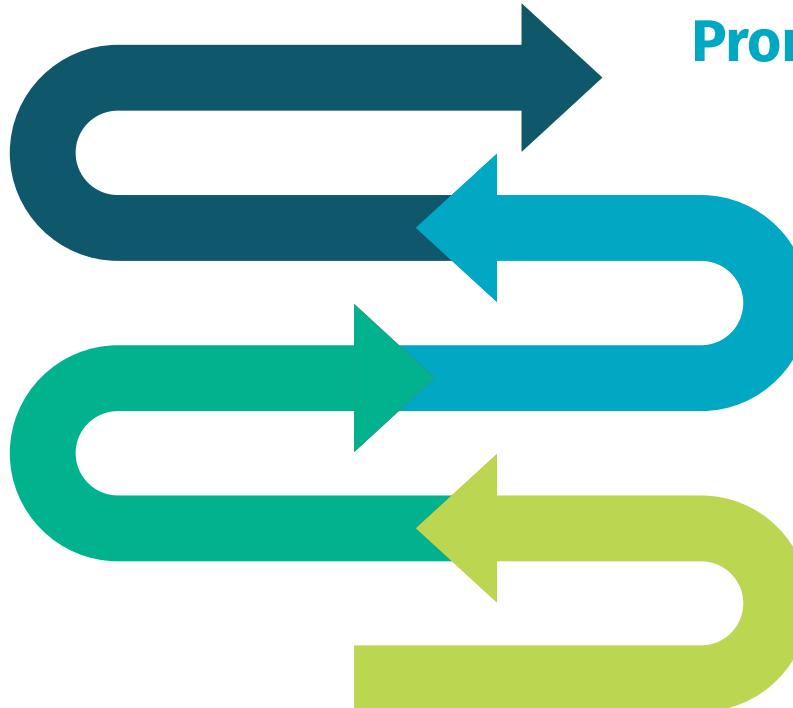
Ask for a Network as a Service experience. Make networking design be implicit in the whole IT architecture

Level-up Skills

Reinforce network team with extra profiles.
Spread the knowledge, build a path

Promote Cross-team

Give opportunity to participate as team members in other projects where networking is important.
Learn from others POVs



Culture First

Define why it's important to work together

>>> Let's call it Network Automation

Applying DevOps for Network Management

Global Network Automation Market Size, By Region, 2018 - 2028
(USD Million)



Source: www.gminsights.com

>>> Benefits of Network Automation

Enhanced Reliability & Security

Using processes to enforce standardization, and increase network resiliency

Unattended Mitigation

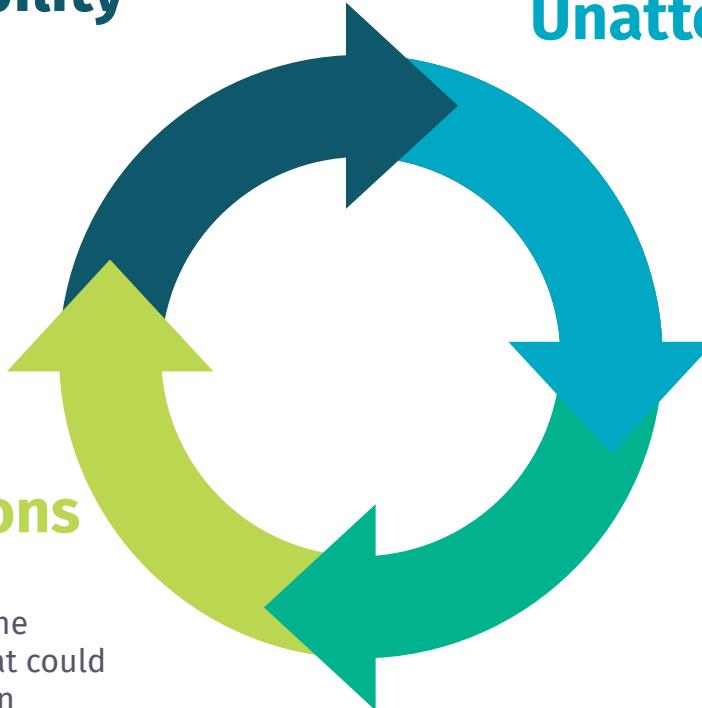
Automatically correcting state back to intent via closed-loop solutions

Assisted Operations

Assisting troubleshooting with the proper data, and suggesting what could be the root cause, or a mitigation workaround

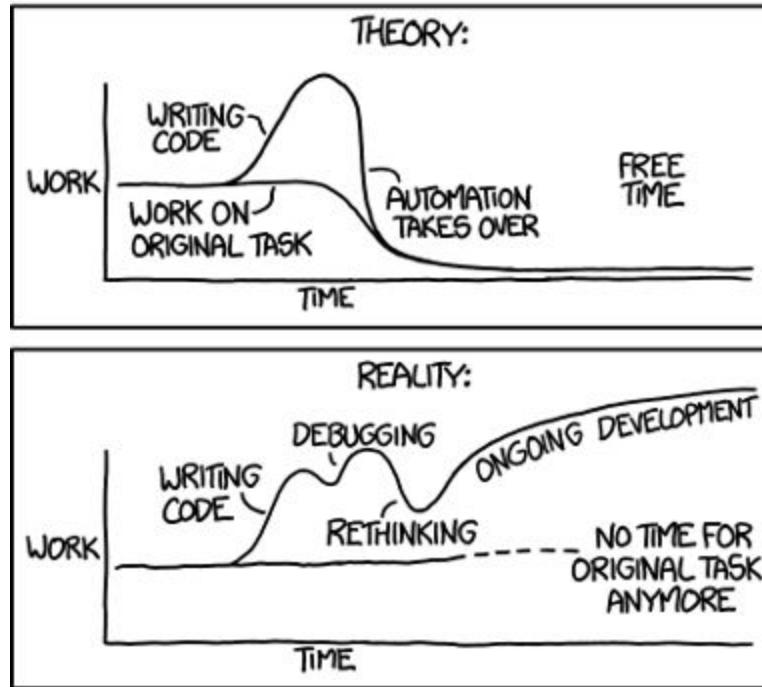
Business Agility

Accelerate service delivery, and increase business agility



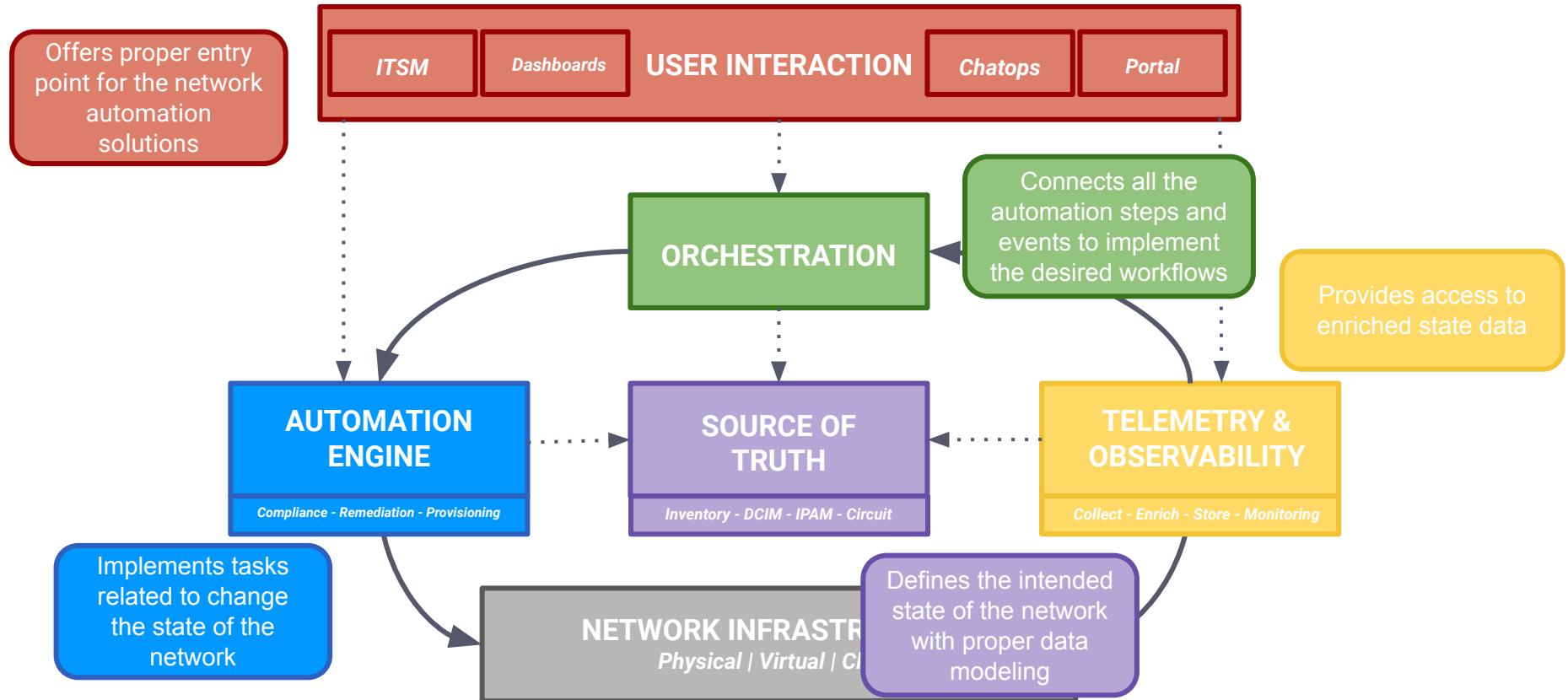
>>> but do not forget...

"I SPEND A LOT OF TIME ON THIS TASK.
I SHOULD WRITE A PROGRAM AUTOMATING IT!"



Credits: xkcd

>>> Network Automation Architecture



>>> Source of Truth for networking

Inventory
- Device List - Software Version - Hardware - License

DCIM
- Location - Racks - Cables - Power

IPAM
- IP Addresses - IP Prefixes - VLANs - VRFs



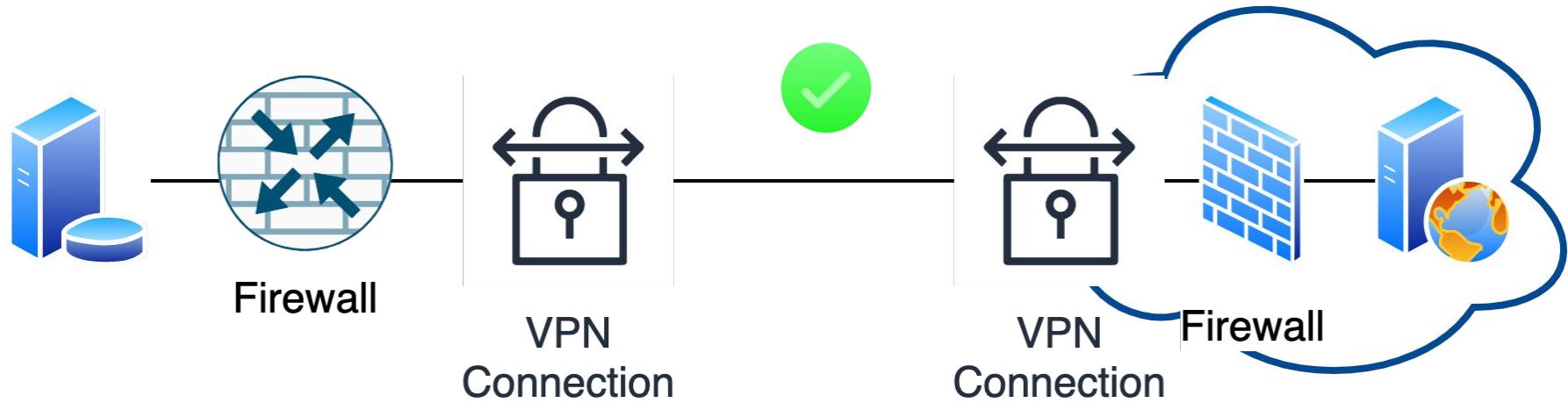
Templates
- CLI - YANG

Circuits
- Circuits - Providers - Maintenances

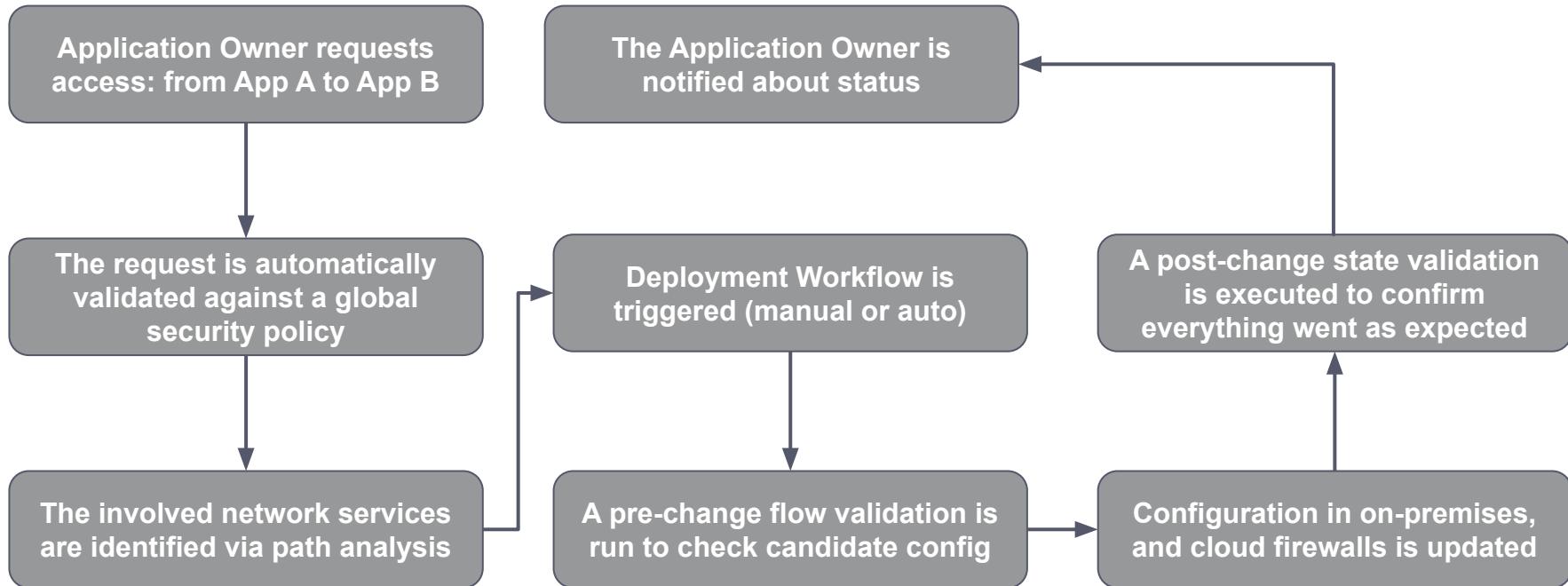
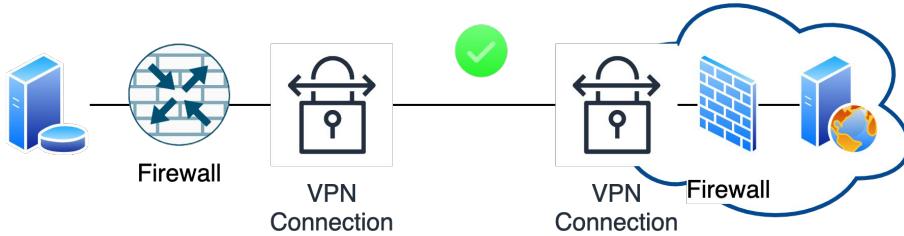
Cloud Infrastructure
- Network Services

Network Properties
- NTP - AAA - DNS - Routing - ACLs

>>> Example: Firewall Rule Automation



>>> Example: The Workflow



>>> Example: Mapping to Functions

USER INTERACTION

Application Owner requests access: from App A to App B

The Application Owner is notified about status

SOURCE OF TRUTH

The request is automatically validated against a global security policy

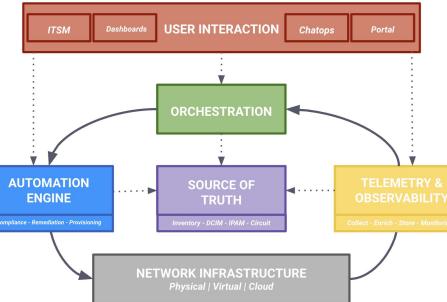
The involved network services are identified via path analysis

Deployment Workflow is triggered (manual or auto)

A pre-change flow validation is run to check candidate config

A post-change state validation is executed to confirm everything went as expected

Configuration in on-premises, and cloud firewalls is updated



>>> Example: Mapping to Tools

USER INTERACTION

 Mattermost



SOURCE OF TRUTH

 HashiCorp
Consul

 git

>>> nautobot

ORCHESTRATION



AUTOMATION ENGINE

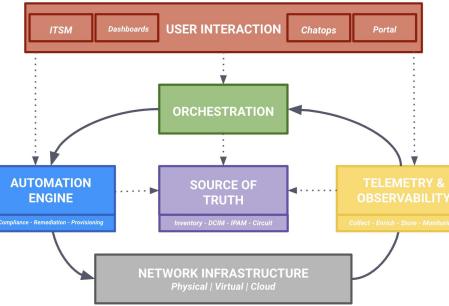


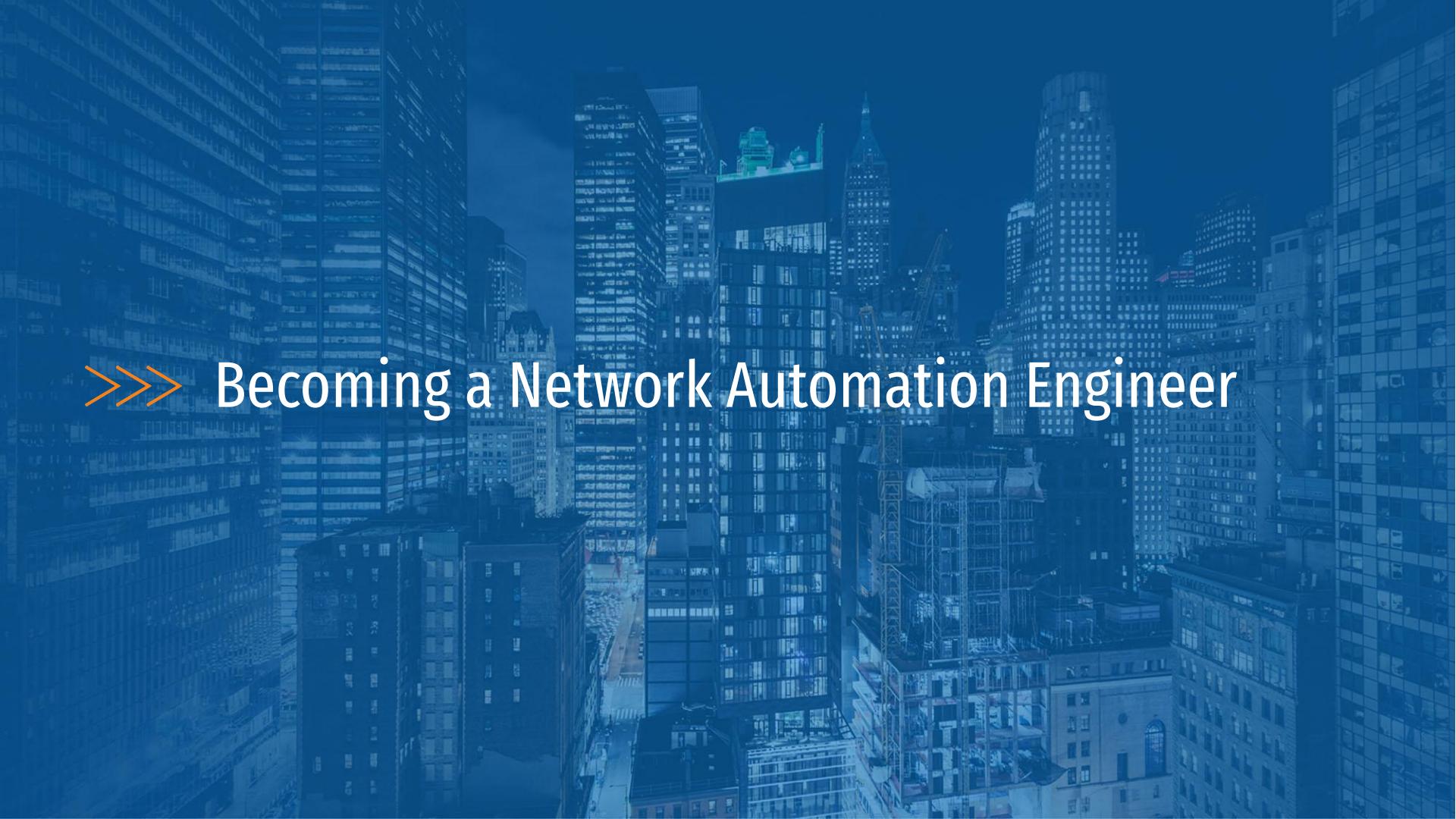
TELEMETRY & OBSERVABILITY

 telegraf

 Prometheus

>>> network .toCode()



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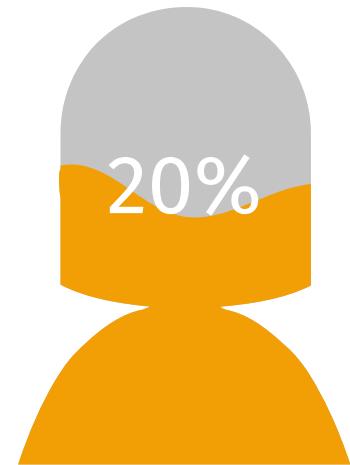
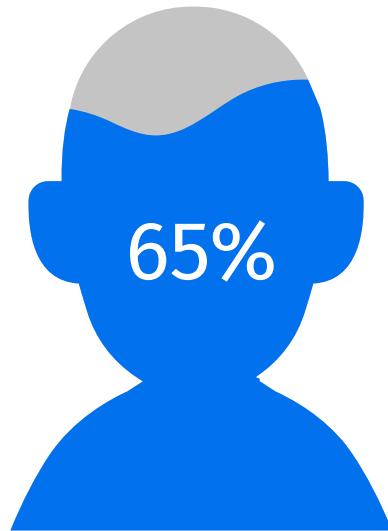
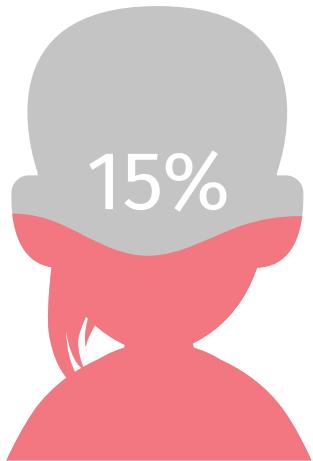
>>> Becoming a Network Automation Engineer

>>> T-Shape Network Engineer

Development

Networking

Systems
IaC



* these numbers are just an example

>>> What is the industry looking for?

Job Qualifications

- 5+ years of hands-on experience deploying and troubleshooting in large-scale networking environments. In-depth knowledge of advanced networking architectures and interconnectivity options
- 3+ years of experience architecting and designing Routing & Switching enterprise-level solutions (Cisco & Arista).
- Experience with infrastructure automation (e.g. automated provisioning of network devices)
- 2+ years experience of working in one or more multinational work environments (e.g. healthcare industry experience is a plus)

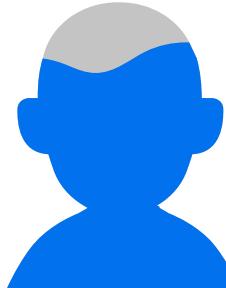
Desirable & Bonus skills:

- Professional level network certifications preferred
- Knowledge in any of the following technologies: Wireless, SLB, DDI.
- Experience with AWS Networking
- Programming experience with Python or similar high-level language
- Network automation experience with Ansible
- Experience and knowledge of CI/CD and orchestration tools
- Distributed version control and source code management tools using GIT protocol like GitHub, GitLab, or equivalent

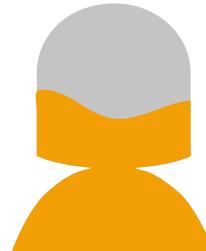
* this is a real job description, for Spain



Development



Networking



Systems
IaC

>>> A learning path for the Network Automation Engineer

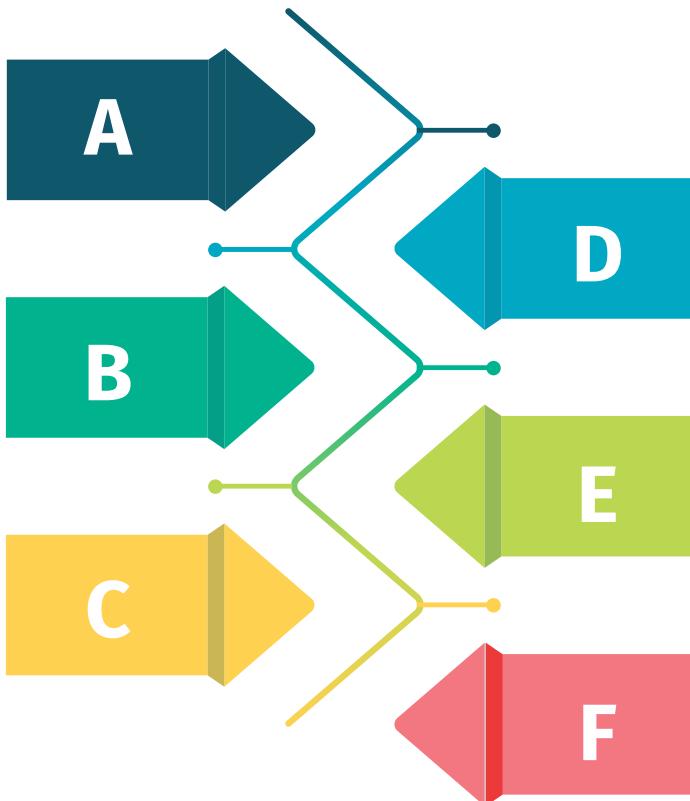
Networking Fundamentals

APIs

HTTP, gRPC, NETCONF, etc.
Data formats (JSON, YAML, etc.)

Tooling for IaC

Config Management and Provisioning



Coding Language

Python, Go

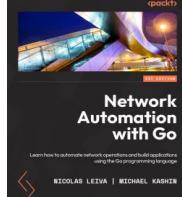
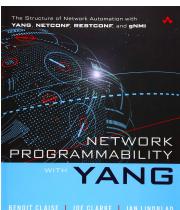
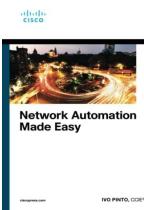
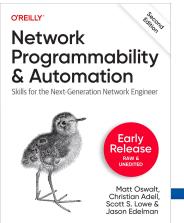
Software Development LifeCycle

Git, CI/CD, Testing

Linux OS, Containers

Linux Shell,
Containerization technologies

>>> Learning Resources



NetBCN



Books



Podcasts

 **Network to Code**
@networktocode

Network to Code's public Slack hit 20,000 members! Join fellow network automation peers from around the world to share ideas, ask questions, create your own project channels, and more! Join here: slack.networktocode.com

Tradueix el tuit

20,000 Members!

9:01 p. m. · 1 de des. de 2021 · Hootsuite Inc.



>>> Wrap-up

>>> Final Thoughts

Networking is a fundamental pillar

Every decision about networking will have consequences in the global delivery of IT services

Adopt DevOps culture for networking

Bring DevOps practices to network operations, and adopt network understanding into other teams

Evolve your skills to achieve higher impact

Understand the networking principles, and adopt automation mindset and skills to increase your impact

You are not alone!

There is a big shift from companies and individuals to embrace the DevOps culture in networking

>>> network .toCode()

Gràcies!

Thanks to [Slidesgo](#) and [Freepik](#) for the slide resources!

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