NetAcad goes DevNet

Ayca Ruppert

Programmability Lead Germany

Cisco

@cisco_ayruppert

DEVNET
Create

Ayca Ruppert

System Engineer – DevNet Germany

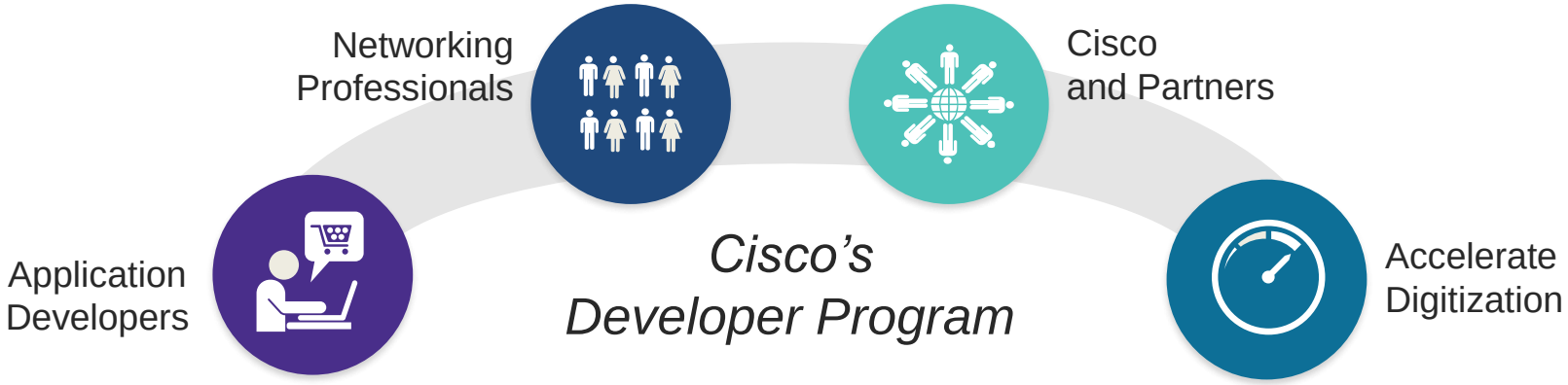
Ayca has been a System Engineer for over 15 years. Starting 2005 in Enterprise Networking, moving to a partner changed her core technology to Collaboration. After 12 years she's now moving on to software and starts her coding carrier. She is a passionate Geek and loves connecting the dots. Her strong analyzing skills support projects to find a path to possible!

Agenda

- Was ist DevNet?
- Vorstellung DevNet Associate
- DeepDive into Model Driven Programmability

Was ist DevNet?

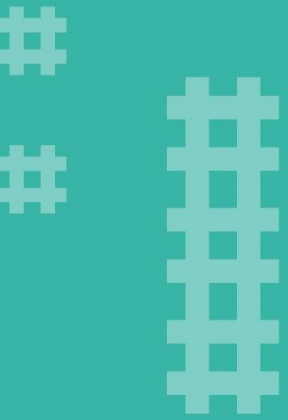
Cisco Developer Network – Cisco DevNet



Open APIs for Cisco Platforms

IoT | Cloud | Networking | Data Center | Security | Analytics & Automation | Open Source | Collaboration | Mobility

developer.cisco.com



Was gibt es für Module?

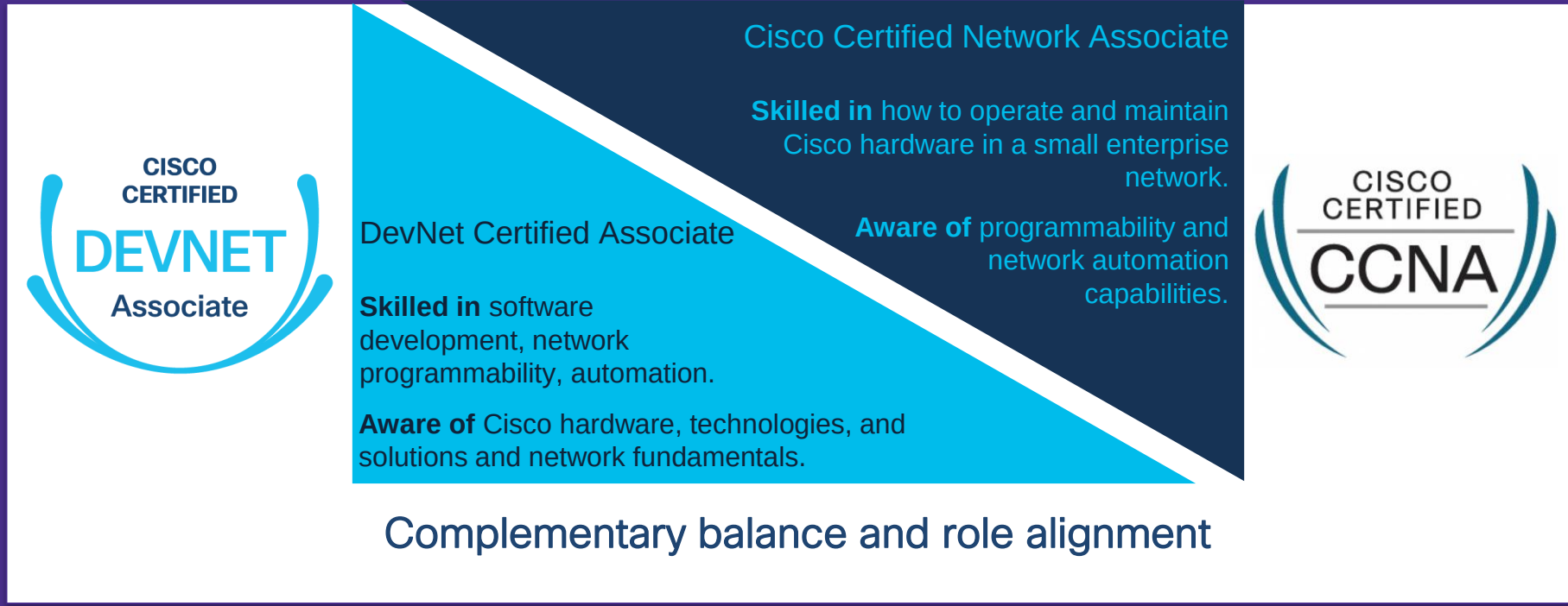
DevOps und Geek-Stuff

DevNet Associate Certification

Cisco's expanded certification suite

	Associate Level	Specialist Level	Professional Level	Expert Level
Engineering				
Software				

Cisco's expanded certification suite



DevNet Associate Curriculum

1. Software Development & Design
   - JSON / XML / YAML, Git, Waterfall, Agile etc.
2. Understanding and Using APIs
   - HTTP Header / Body / Request / Response, REST APIs
3. Cisco Platforms & Development
   - DNA-Center / Webex Teams / Meraki, Cisco SDKs etc.
4. Application Deployment & Security
   - Virtual Machines / Containers, XSS / SQL injection etc.
5. Infrastructure & Automation
   - Ansible / NSO / Puppet, NETCONF + YANG, RESTCONF
6. Network Fundamentals
   - CCNA : VLANs, MAC / IP Addresses, Routers / Switches, Protocols etc.

Cisco's expanded certification suite

DevNet Associate Course from NetAcad

Features	• Online Curriculum with Formative and Summative Assessments • Hands-On Labs running Locally using Software tools • Introduction of a Project-Based Learning Framework
Target Audience	• Vocational Training Center • College • University
Prerequisites	• Writing code in any Object-Oriented Programming language (Python, C#, Java, etc.) • Fundamental skills of networking, equivalent of CCNA ITN
Course Delivery	Instructor-Led

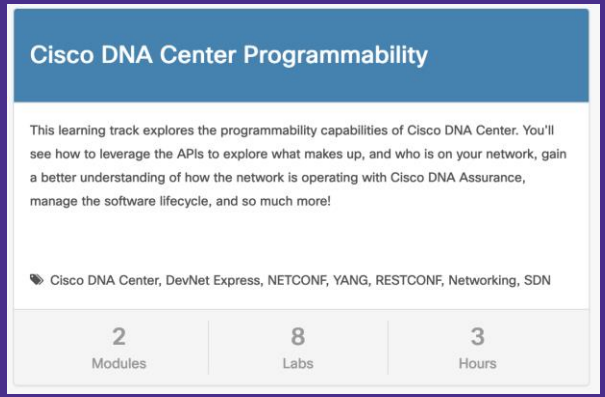
Equipment	• 2 Virtual Machines:
	  • Student's Lab VM bundled with all software tools
	  • Cisco CSR1000v
	• Packet Tracert for Network Automation

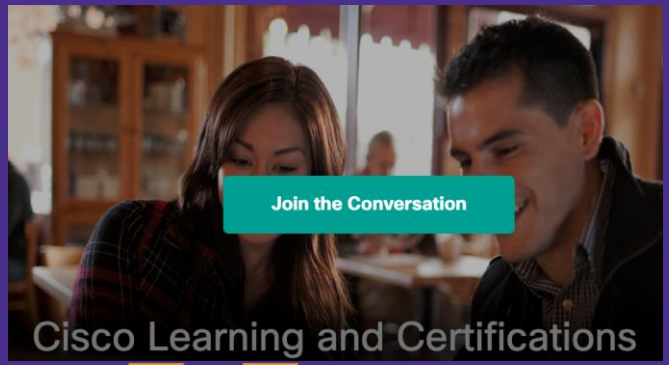
Estimated Time to Complete	70h
Learning Domains	1. Software Development and Design 2. Understanding and Using APIs 3. Cisco Platforms and Development 4. Application Deployment and Security 5. Infrastructure and Automation 6. Network Fundamentals

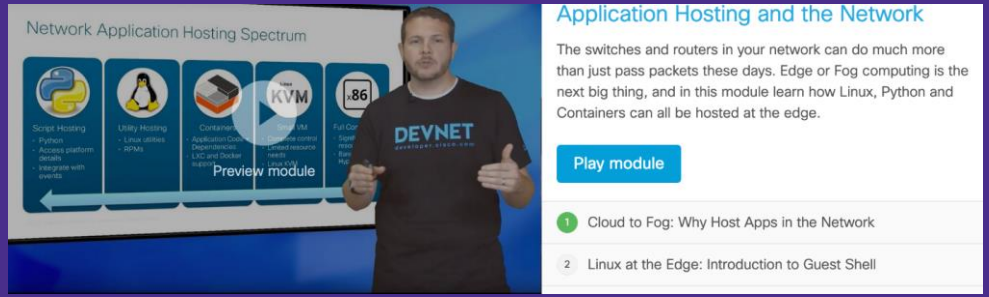
DevNet Tools & Resources

developer.cisco.com

1. Video Courses
2. Learning Paths
3. Sandboxes
4. Sample Code (Github)
5. Communities

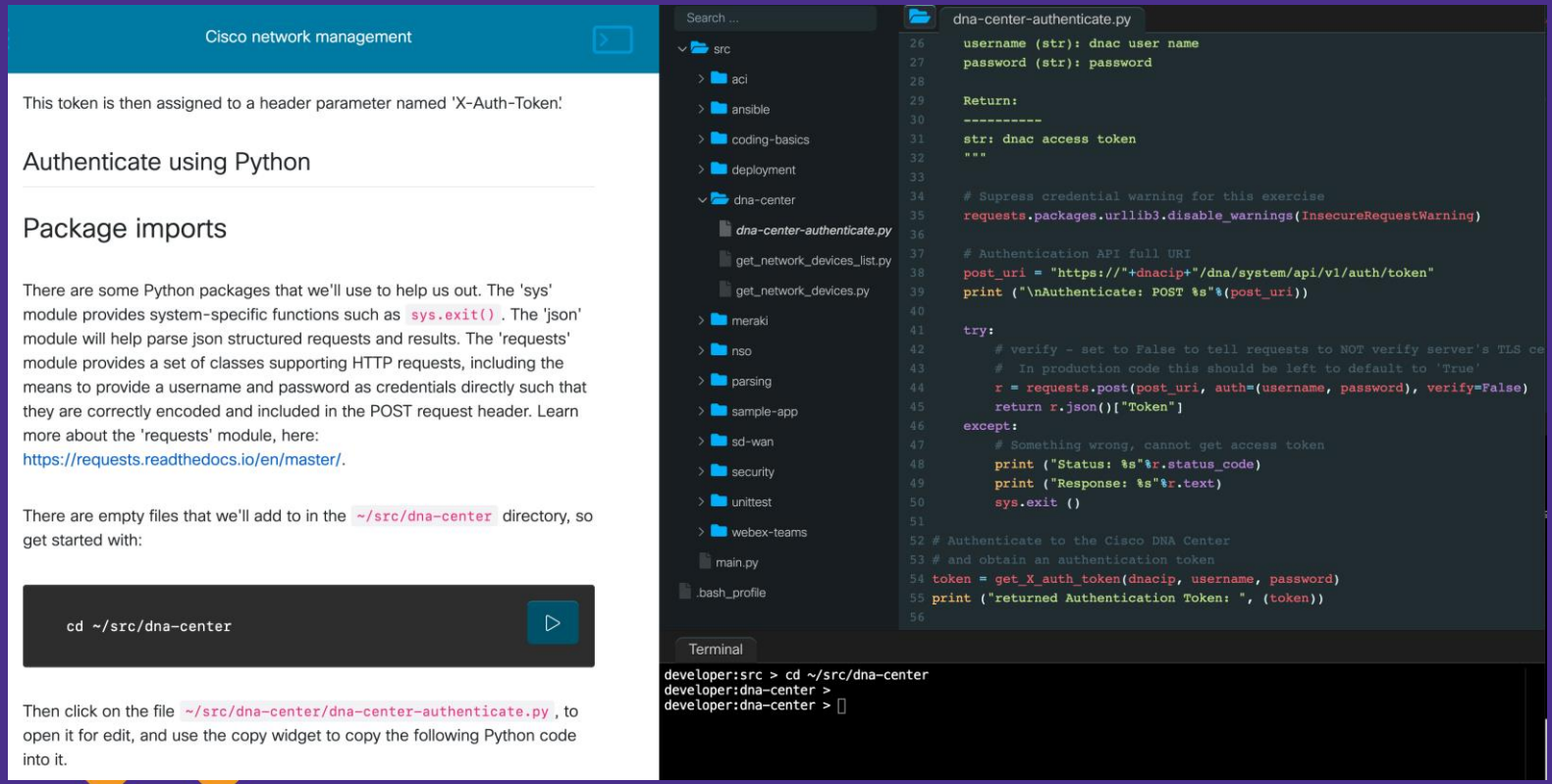






DevNet Tools & Resources

DevNet Associate Fundamentals Course



DevNet Tools & Resources

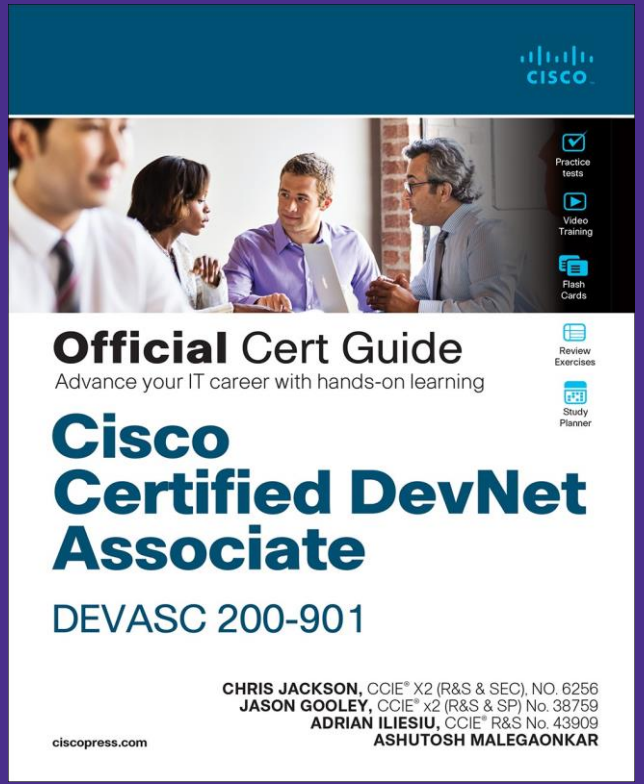
digital-learning.cisco.com

- Cisco Learning Platform
- Offers multiple DevNet courses
  - virtual labs to gain hands-on experience
- Courses about all other Cisco topics

DevNet Tools & Resources

Cisco Press “Official Cert Guide”

- Release: 20th July 2020
- Usually very detailed & In-depth



DevNet Tools & Resources

- Cisco Developer Website
  https://developer.cisco.com
- Cisco Press Official Cert Guide
  https://www.ciscopress.com/store/cisco-certified-devnet-associate-devasc-200-901-official-9780136677338
- Cisco Digital Learning Library
  https://digital-learning.cisco.com/
- Cisco Developer Website: DevNet ASC Fundamentals Training
  https://developer.cisco.com/certification/fundamentals/

By Susie Wee, SVP/GM Cisco DevNet & CX Ecosystem Success

Get Cisco certified and Cisco DevNet certified today with new online testing

Model Driven Programmability
Netconf
Restconf
gRPC

Configuration monitoring and compliance

NetOps

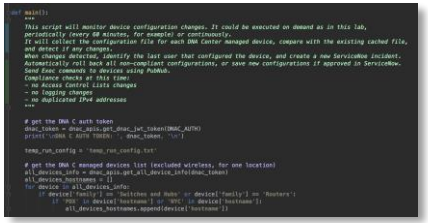
Gabi Zapodeanu
Technical Marketing Engineer

Business challenge

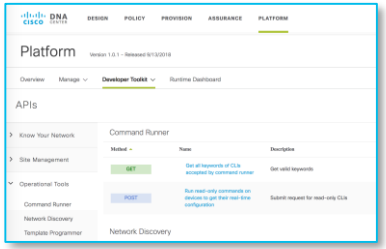
- The Challenge
  - 75% of network outages are due to user errors
  - Configuration drifting
- The Goal
  - Automated rollback of non-compliant changes
  - Alert on all network configuration changes
- The Solution
  - Integration between DNA Center, ServiceNow, Cisco IOS XE, and Webex Teams
- The Results
  - Non-compliant configuration changes are mitigated in minutes
  - Real Time view of any device configuration changes

Proposed Solution

NetOps App

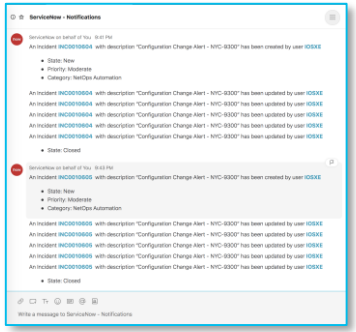


DNA Center



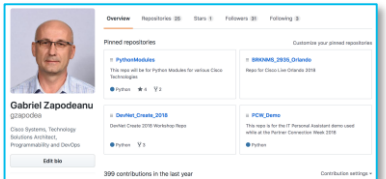
ServiceNow

Webex Teams



Open IOS XE, Guest Shell

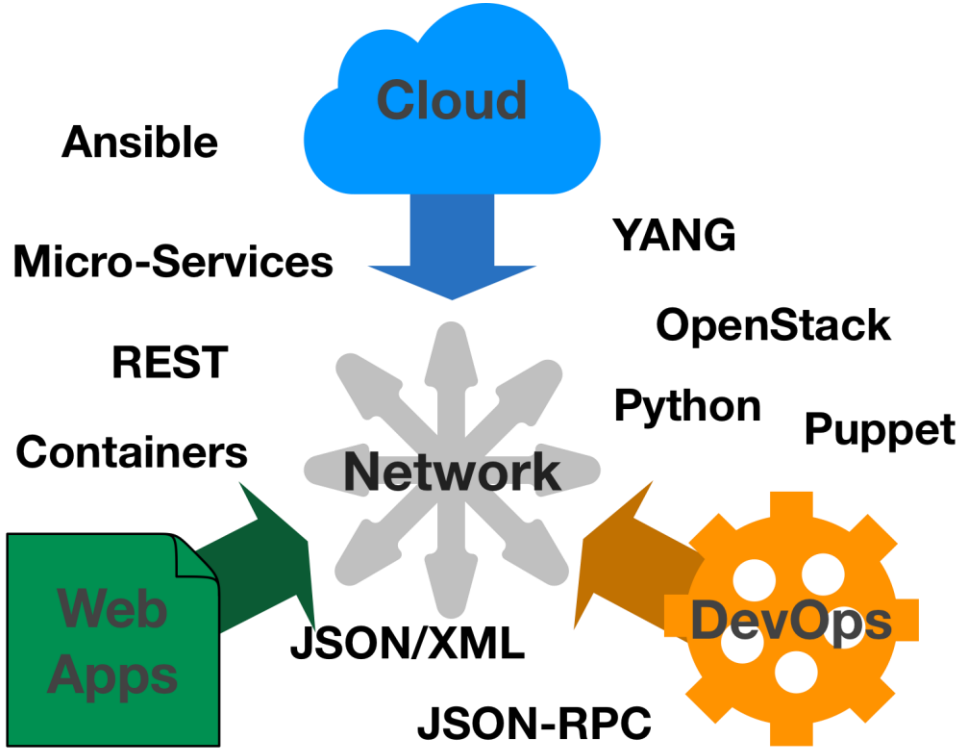
GitHub



Further details

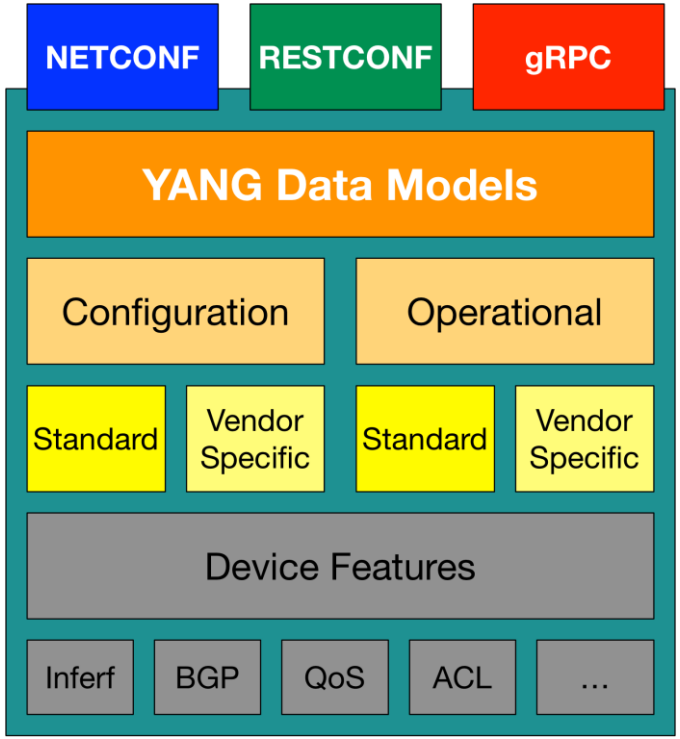
Here

The Network is No Longer Isolated

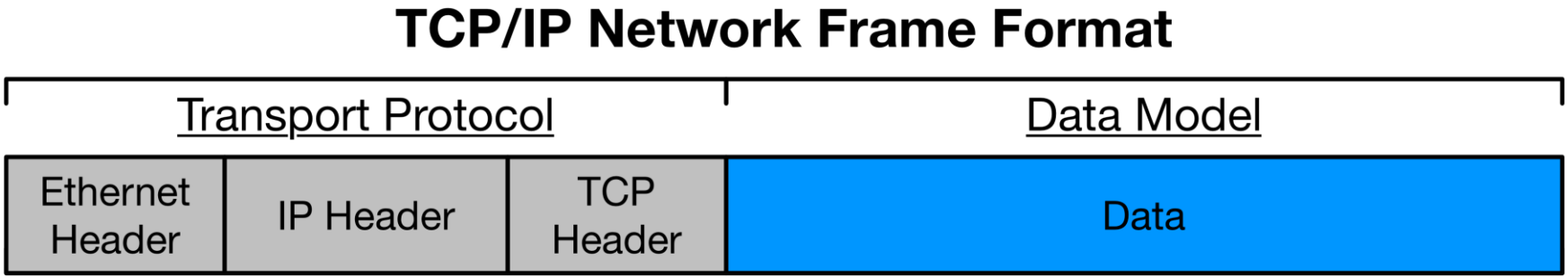


Model Driven Programmability

- NETCONF – 2006 – RFC 4741
  (RFC 6241 in 2011)
- YANG – 2010 – RFC 6020
- RESTCONF – 2017 – RFC 8040
- gRPC – 2015 – OpenSource project by Google



Transport (Protocol) vs Data (Model)



- NETCONF
- RESTCONF
- gRPC

- YANG

Transport mechanisms

NETCONF

- SSH
- RPC
  - <get-config>
  - <edit-config>
  - <commit>
  - <lock>
  - ...

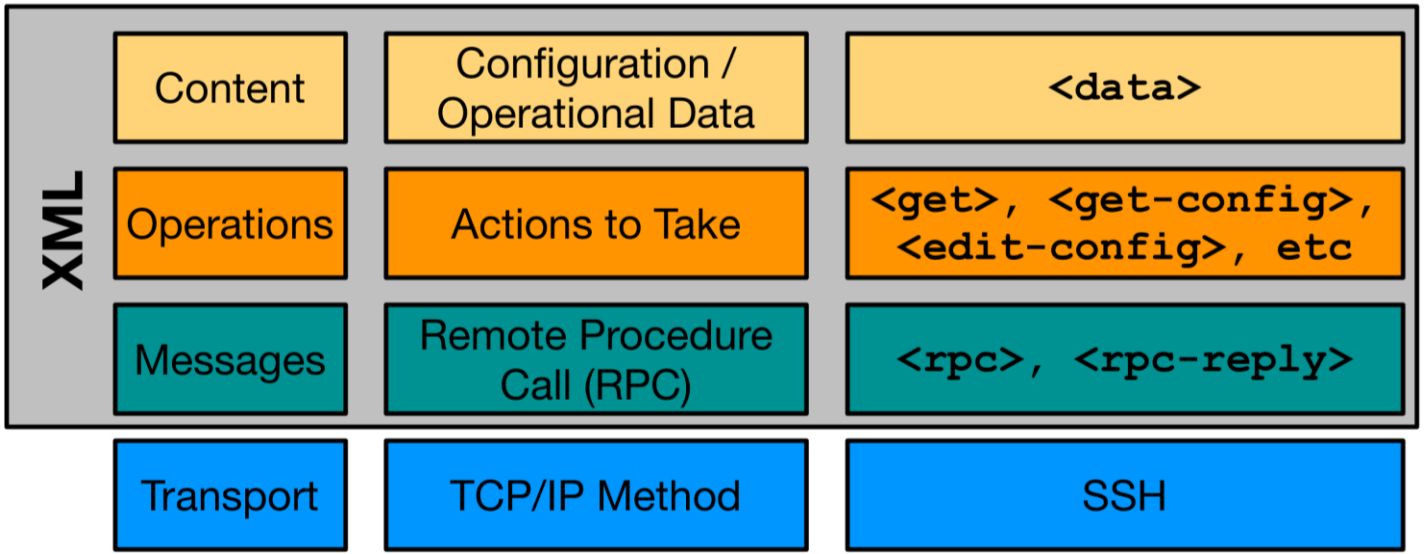
RESTCONF

- HTTP
- Methods
  - GET
  - POST
  - DELETE
  - PUT
  - ...

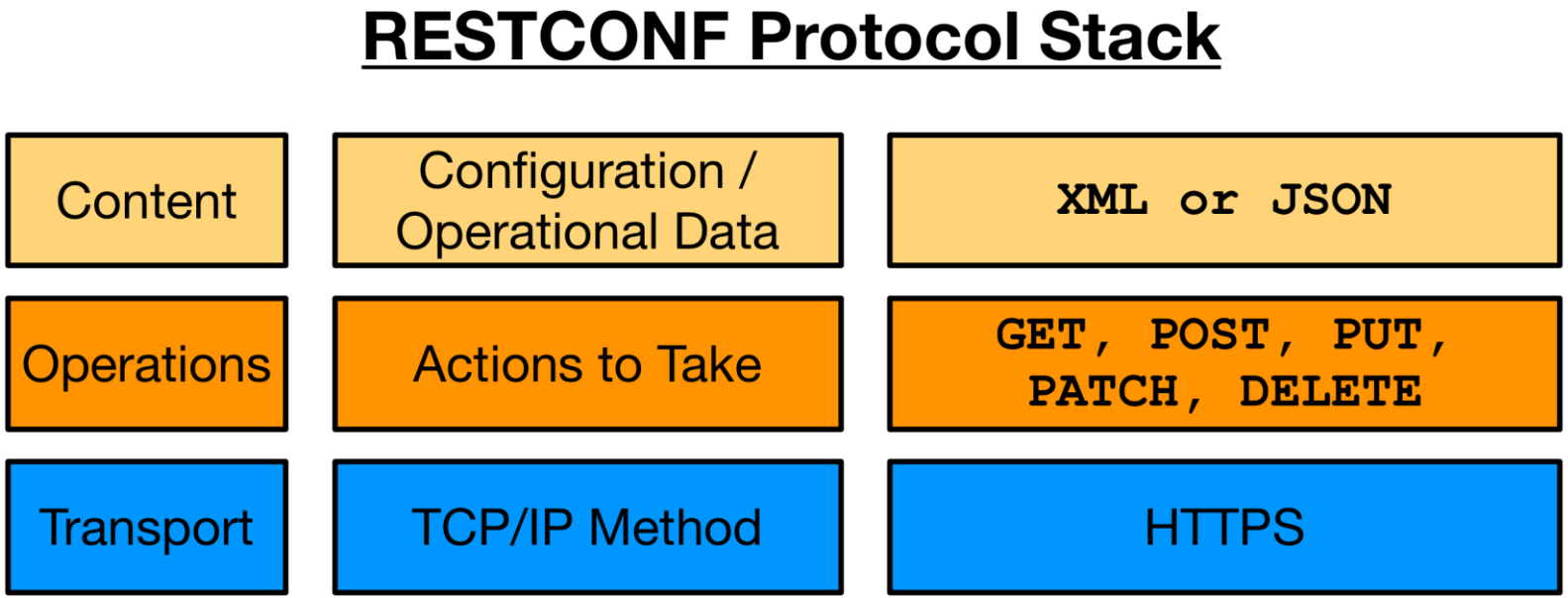
gRPC/gNMI

- HTTP/2
- RPC (user defined)
  - Capabilities
  - Get
  - Set
  - Subscribe

NETCONF Protocol Stack



RESTCONF Protocol Stack & Transport



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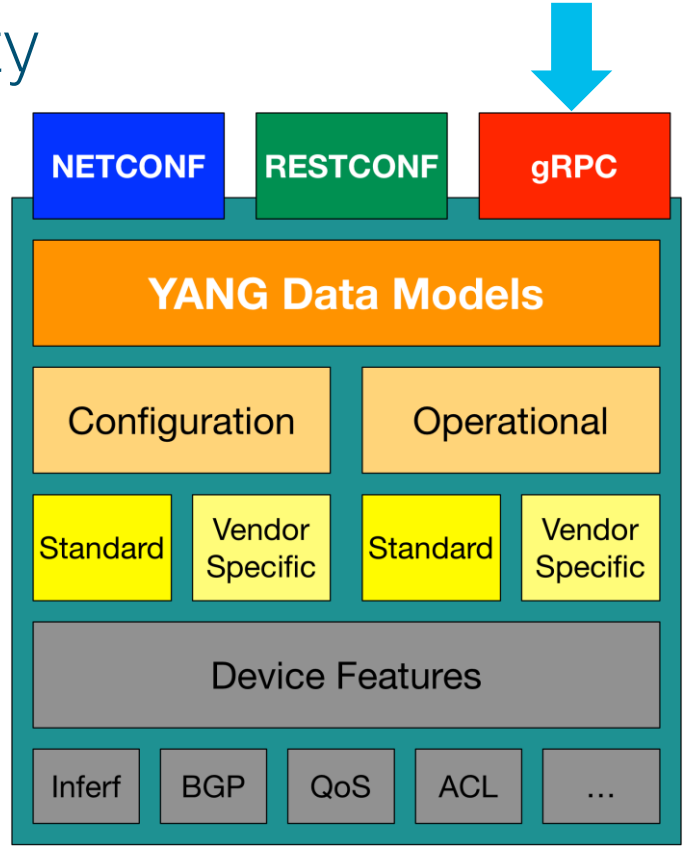

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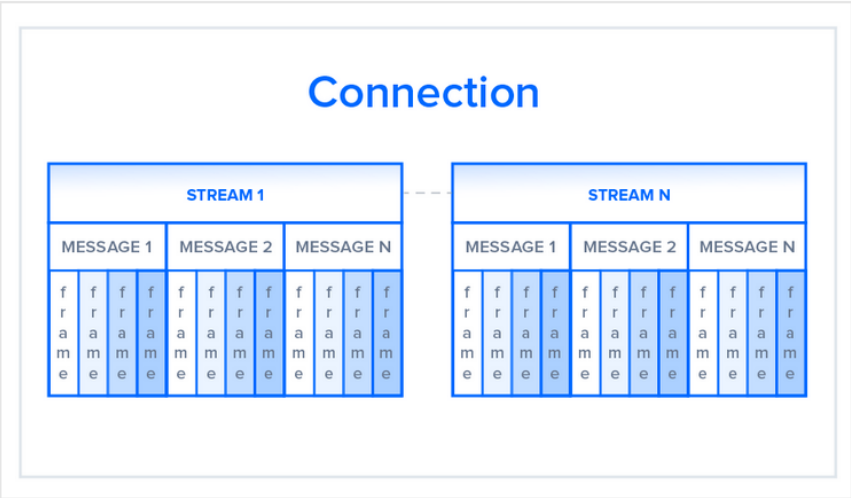
HTTP2: Someting like Multiplexing and QOS...



Within this connection there are multiple *streams* of data. Each stream consists of multiple messages in the familiar request/response format. Finally, each of these messages split into smaller units called *frames.*
The binary framing layer organizes messages into parallel streams of data.

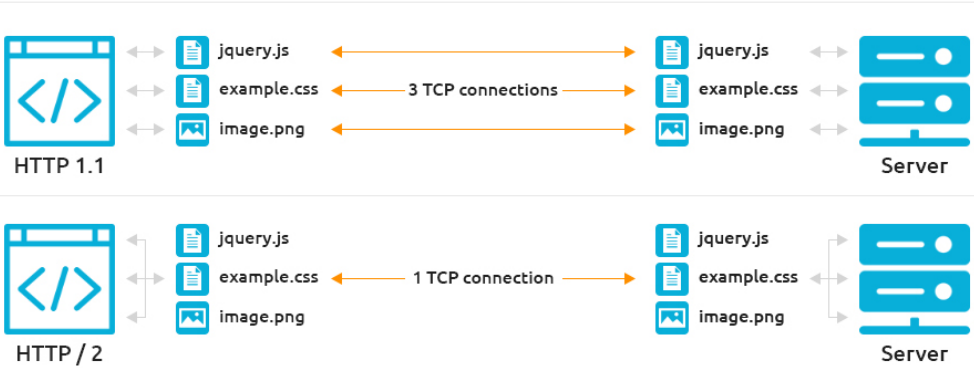
When a client sends concurrent requests to a server, it can prioritize the responses it is requesting by assigning a weight between 1 and 256 to each stream. The higher number indicates higher priority. In addition to this, the client also states each stream's dependency on another stream by specifying the ID of the stream on which it depends.

https://www.digitalocean.com/community/tutorials/http-1-1-vs-http-2-what-s-the-difference

So, what I unerstood

Since multiplexing allows the client to construct multiple streams in parallel, these streams only need to make use of a single TCP connection. Having a single persistent connection per origin improves upon HTTP/1.1 by reducing the memory and processing footprint throughout the network.
→ This results in better network and bandwidth utilization and thus decreases the overall operational cost.

A single TCP connection also improves the performance of the HTTPS protocol, since the client and server can reuse the same secured session for multiple requests/responses.



https://coolicehost.com/http2-protocol.html

https://www.digitalocean.com/community/tutorials/http-1-1-vs-http-2-what-s-the-difference

gRPC benchmark

Procession time

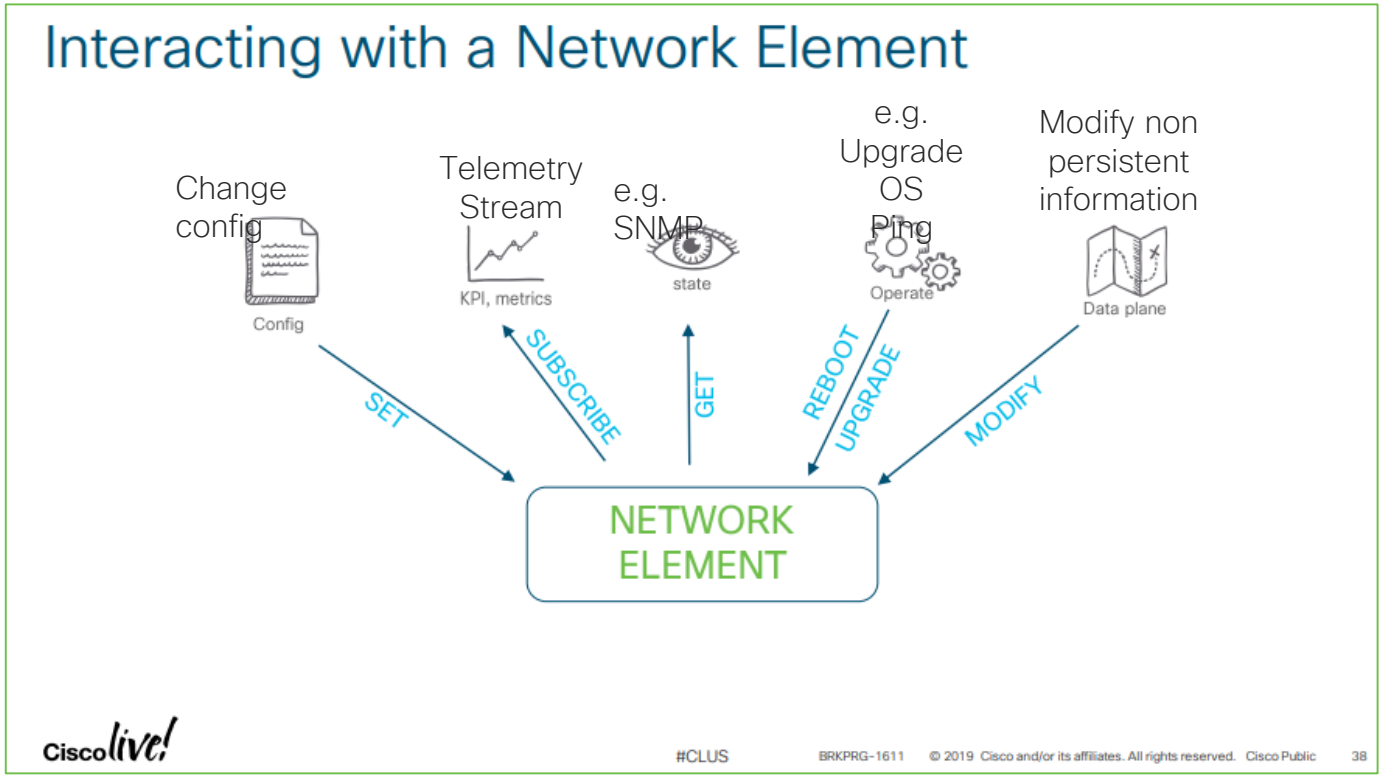
RPC	# of requests	# of clients	total time	per-request time
`jsonrpc`	300,000	1	8m7.270s	1.624ms
gRPC	300,000	1	36.715s	122.383µs
gRPC	300,000	100	7.167s	23.892µs

Memory allocation

RPC	`jsonrpc`	gRPC	delta
NsPerOp	487271046903	36716116701	-92.46%
AllocsPerOp	32747687	25221256	-22.98%
AllocedBytesPerOp	3182814152	1795122672	-43.60%

https://blog.gopheracademy.com/advent-2015/etcd-distributed-key-value-store-with-grpc-http2/

What can we use gRPC for?



All those Interactions are represented on OpenConfig gRPC interfaces

gNMI

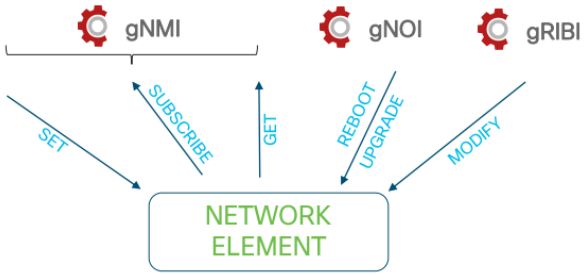
gRPC Network Management Interface

gNOI

gRPC Network Operations Interface

gRIBI

gRPC Routing Information Base Interface



gRPC service interface definitions

gNMI

```
service gNMI {
  rpc Capabilities(CapabilityRequest) returns (CapabilityResponse);
  rpc Get(GetRequest) returns (GetResponse);
  rpc Set(SetRequest) returns (SetResponse);
  rpc Subscribe(stream SubscribeRequest) returns (stream SubscribeResponse);
}
```

gNOI

```
service System {
  rpc Ping(PingRequest) returns (stream PingResponse) {}
  rpc Traceroute(TracerouteRequest) returns (stream TracerouteResponse) {}
  rpc Time(TimeRequest) returns (TimeResponse) {}
  rpc SetPackage(stream SetPackageRequest) returns (SetPackageResponse) {}
  …
}
```

Cisco

```
service gRPCConfigOper {
    rpc GetConfig(ConfigGetArgs) returns(stream
ConfigGetReply) {};
    rpc MergeConfig(ConfigArgs)
returns(ConfigReply) {};
...
    rpc CreateSubs(CreateSubsArgs) returns(stream
CreateSubsReply) {};
}

service gRPCExec {
...
    rpc ActionJSON(ActionJSONArgs) returns(stream
ActionJSONReply) {};
}
```

Goal is to make all services available across all platforms in one method over all vendors e.g. Cisco, HP etc.

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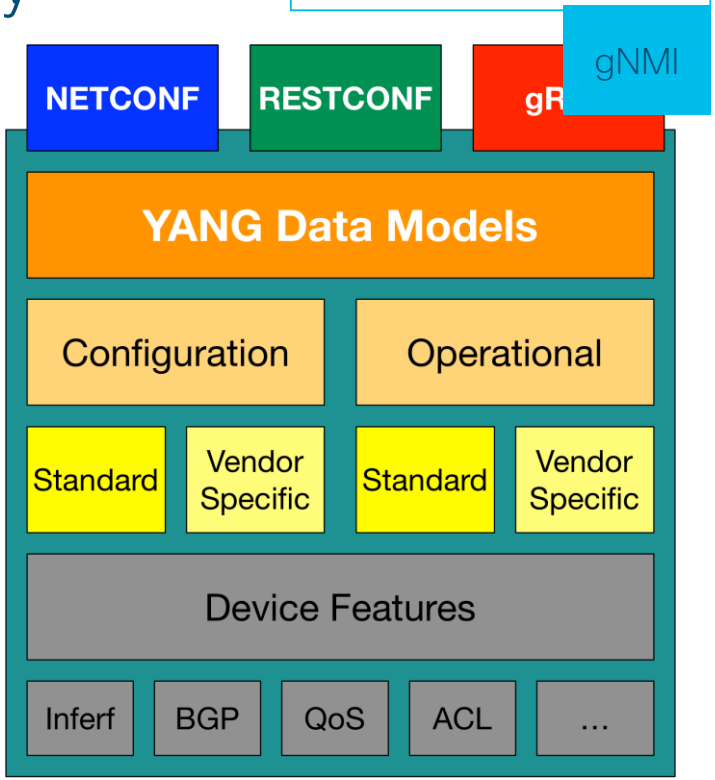
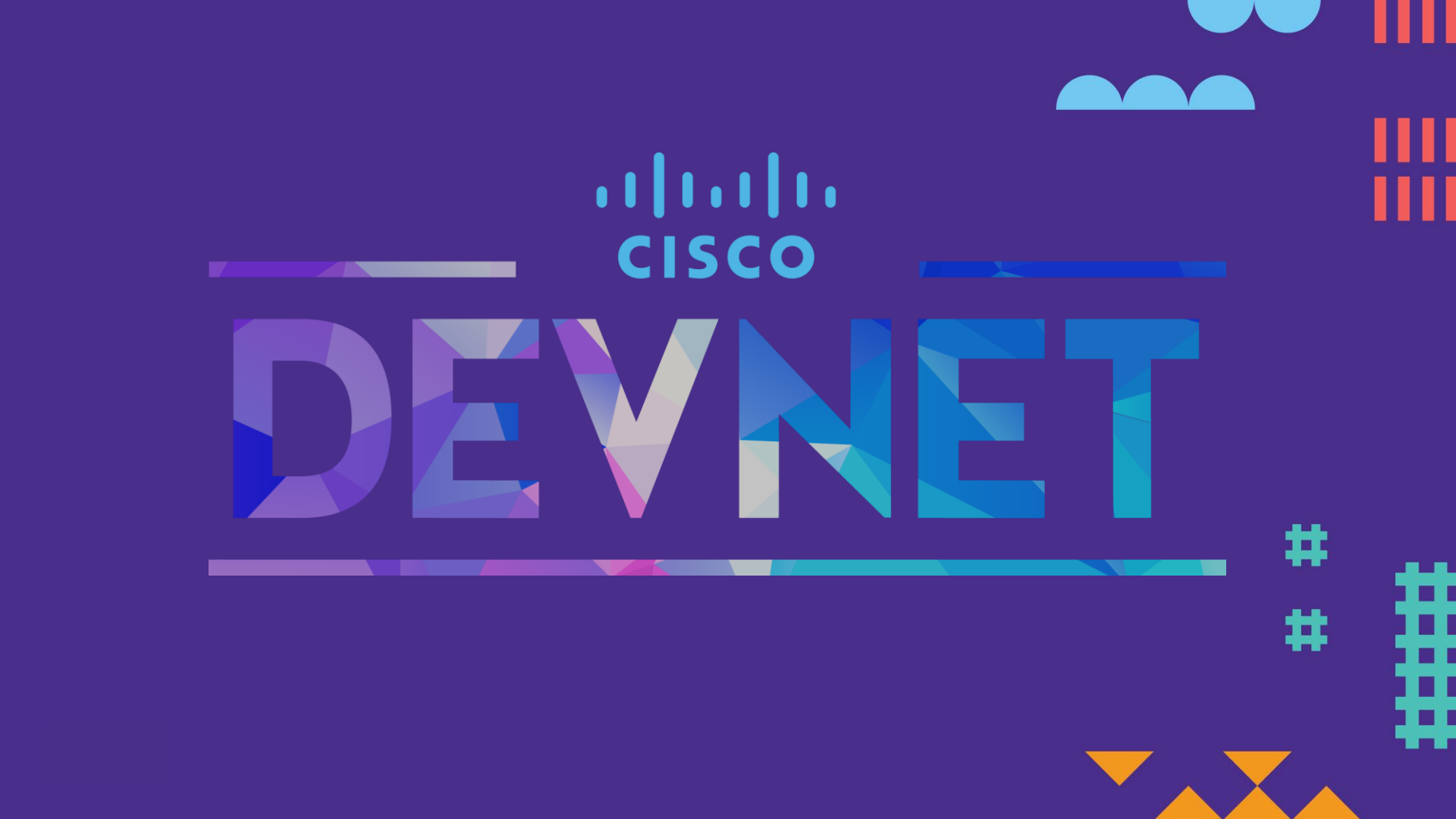
This would be more accurate. You agree? ;)



Q&A ☺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