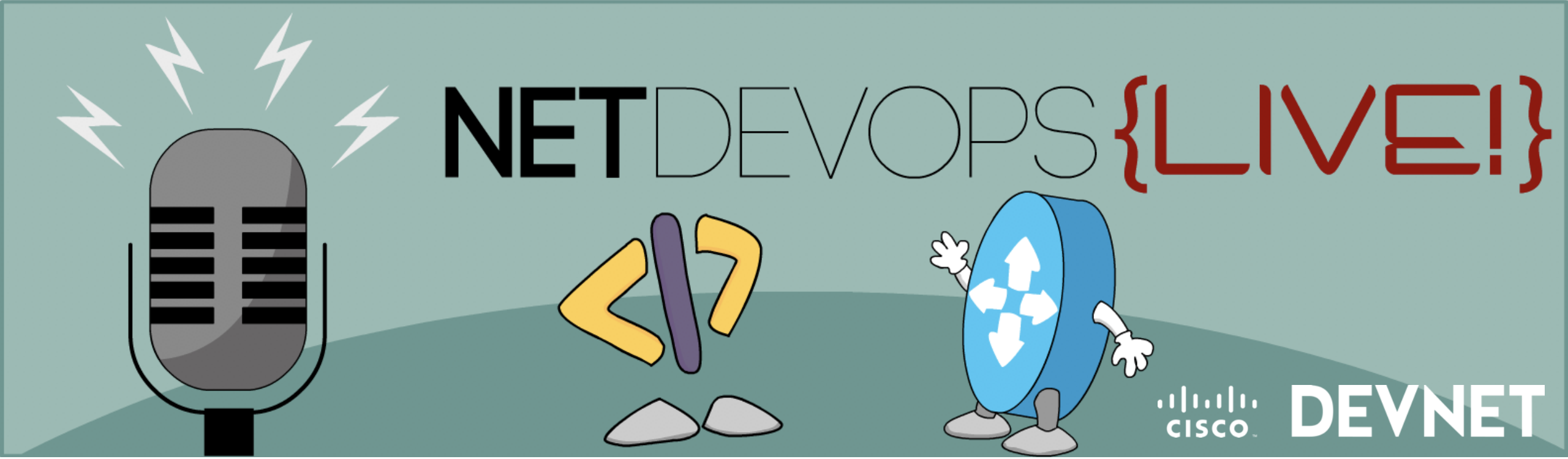


Streaming telemetry: The value of "realtime" analytics for the network

Stuart Clark

Network Automation Evangelist

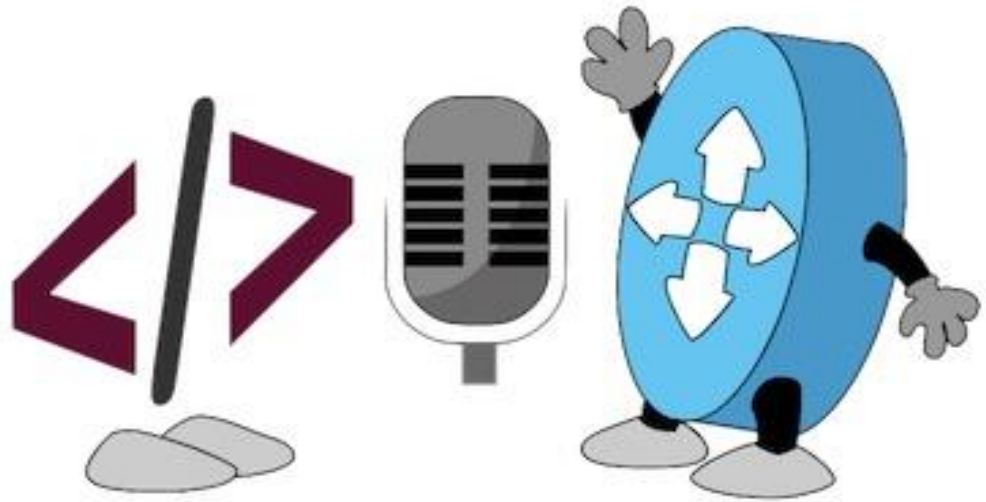
Twitter: bigevilbeard

Season 1, Talk 11

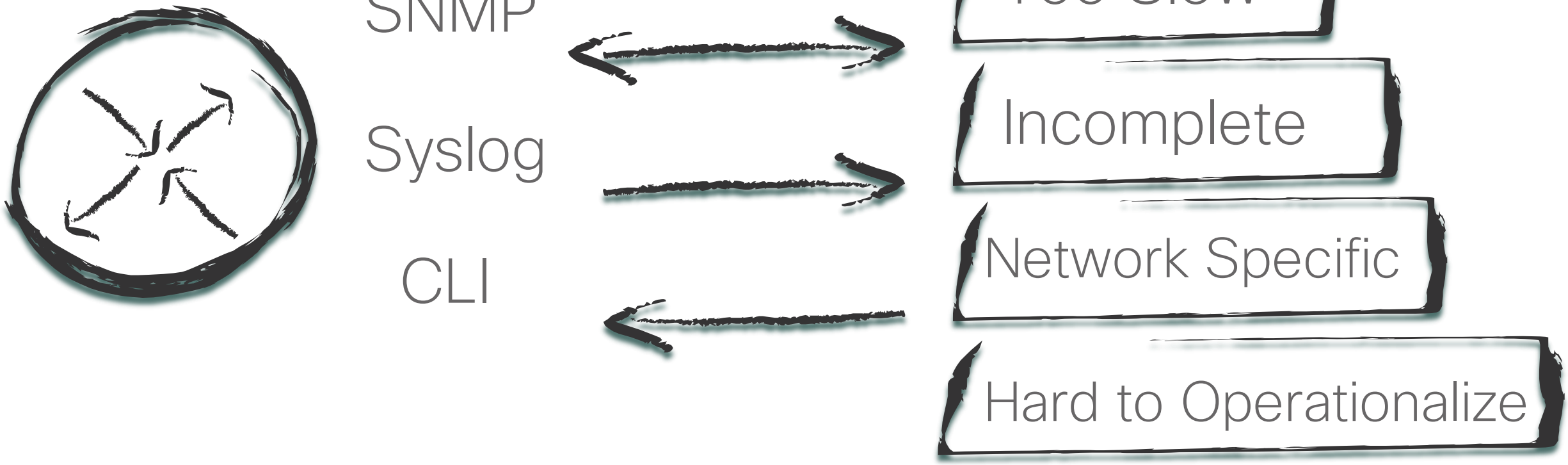
https://developer.cisco.com/netdevops/live

What are we going to talk about?

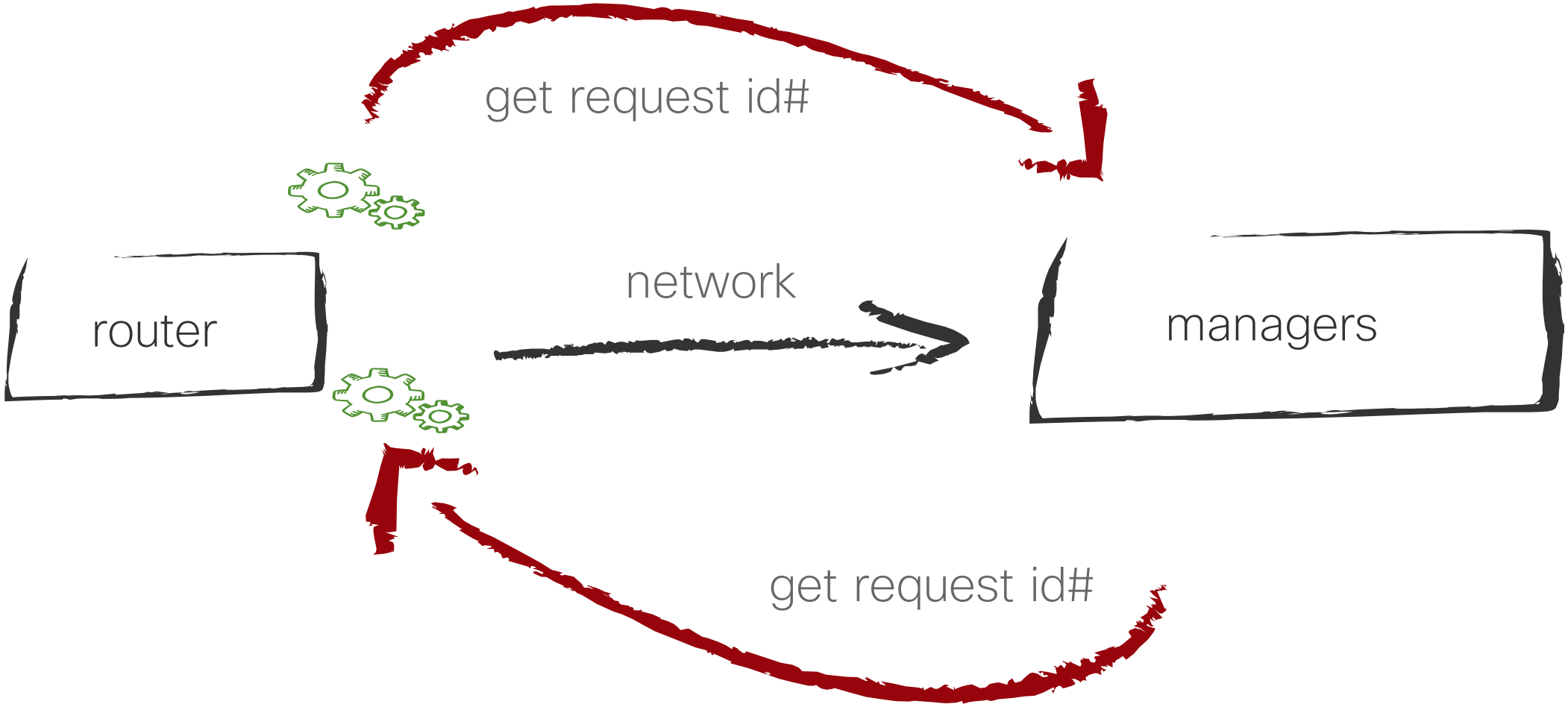
- The current state of play SNMP
- Streaming Telemetry gainzzz!
- Where do gRPC and NETCONF fit in here bro?
- Let's explore open source platforms ELK and Grafana
- Last stop, Streaming Telemetry Enabling



Current Network Visibility



SNMP Polling, all hand to pumps



Side effects of pushing SNMP hard

Streaming Telemetry gainzzz!

Telemetry Fundamentals

Definition

te·lem·e·try
tə'lemətrē/
noun
noun: **telemetry**

Telemetry *is an automated communications process by which measurements and other data are collected at remote or inaccessible points and transmitted to receiving equipment for monitoring.*

The word is derived from Greek roots: tele = remote, and metron = measure.

Fundamentals of Streaming Telemetry

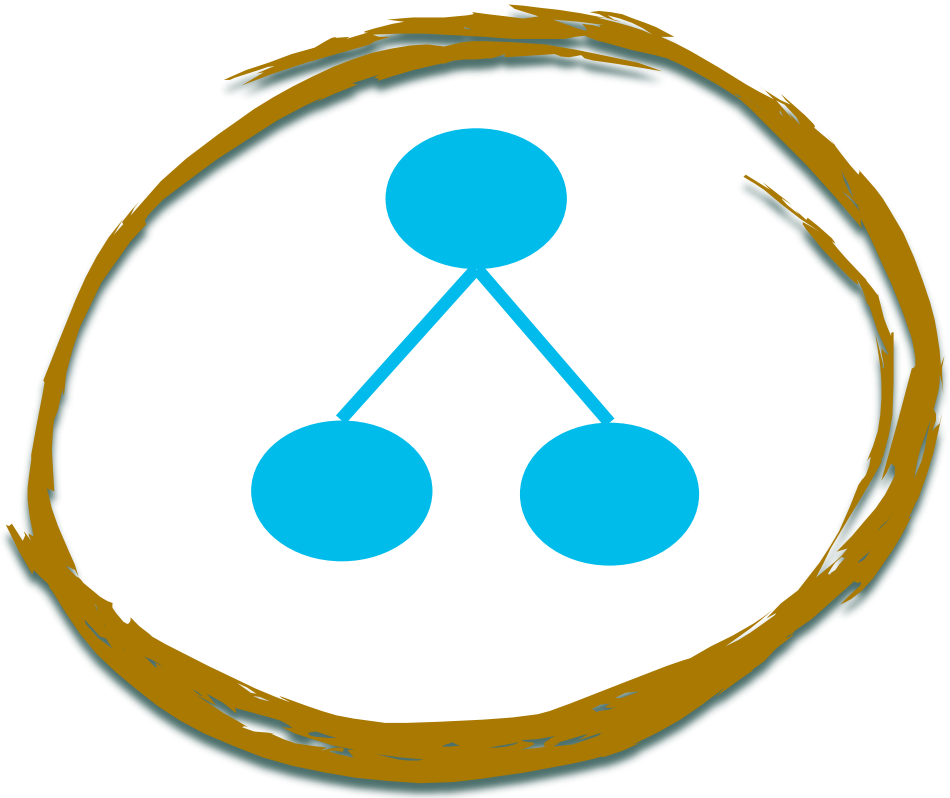
- Push not Pull
- Analytics-Ready Data
- Data-Model Driven

- performance
- tool-chains
- automation

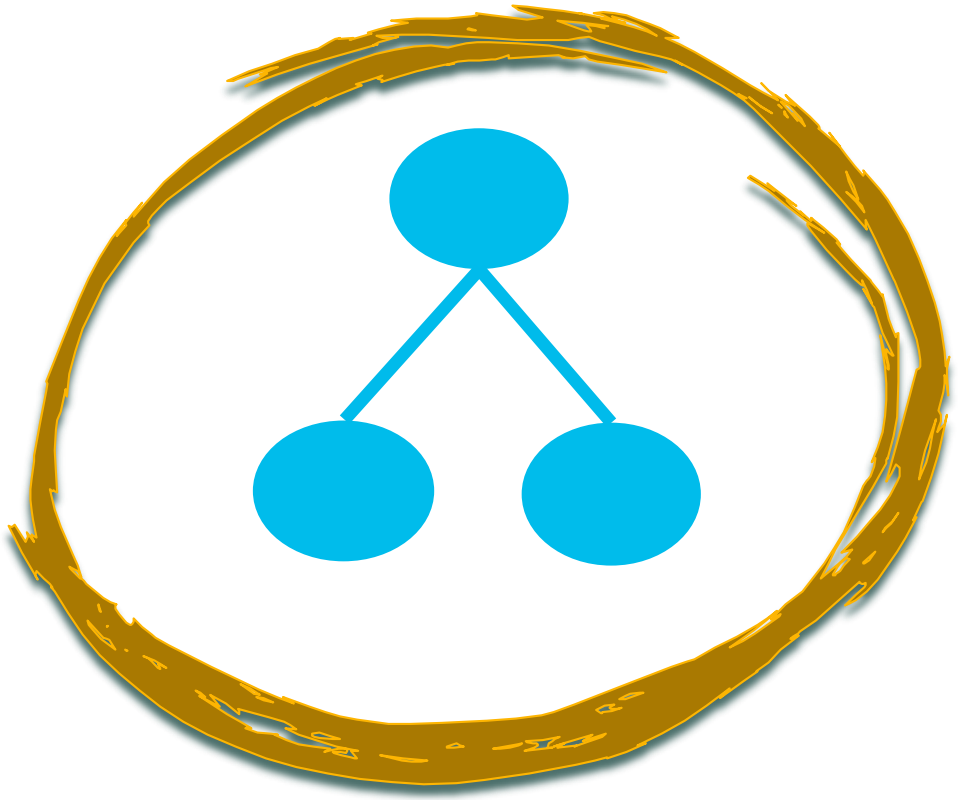
Streaming Telemetry data

- Telemetry data is described using YANG, a structured data modelling language, encoded in JSON, XML or using GPB (Google Protocol Buffers(and is then streamed over TCP, UDP or gRCP.

Data Models – What, when and where!

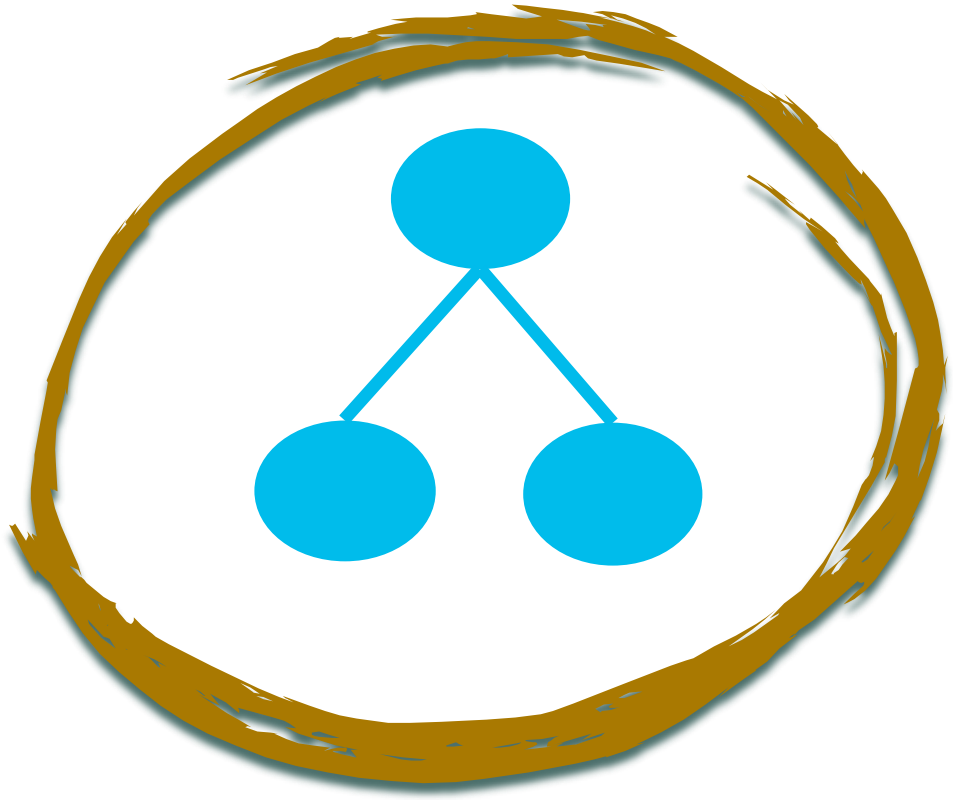


OpenConfig



Native

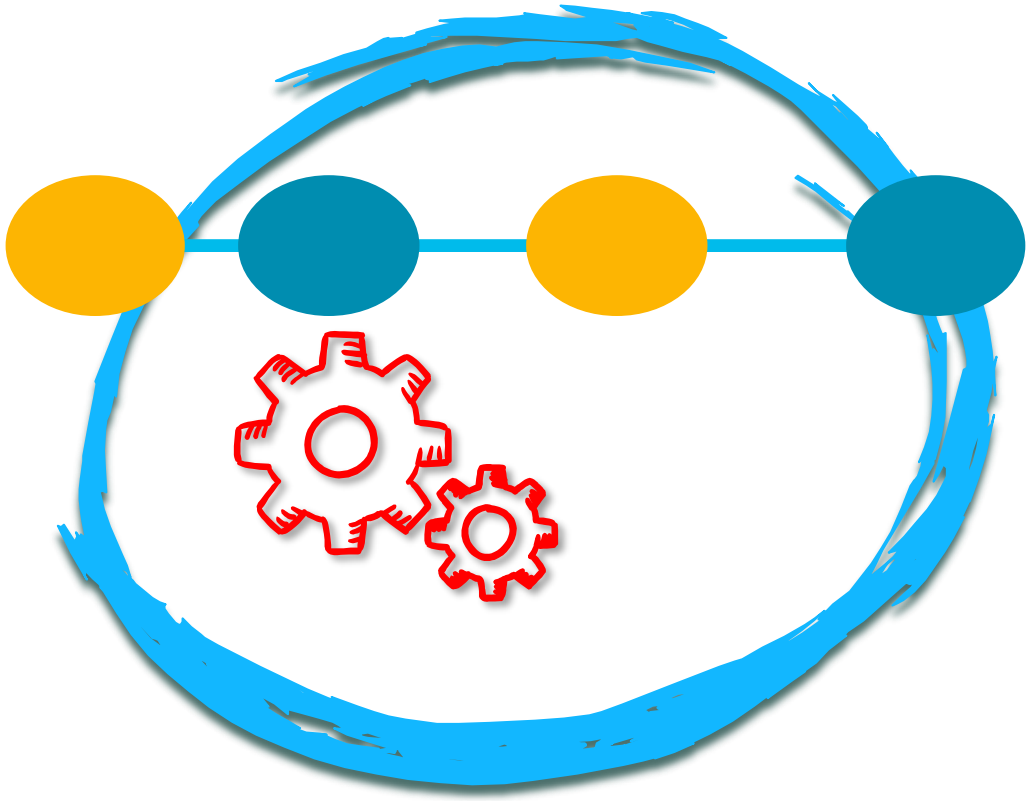
Subscribe to your data!



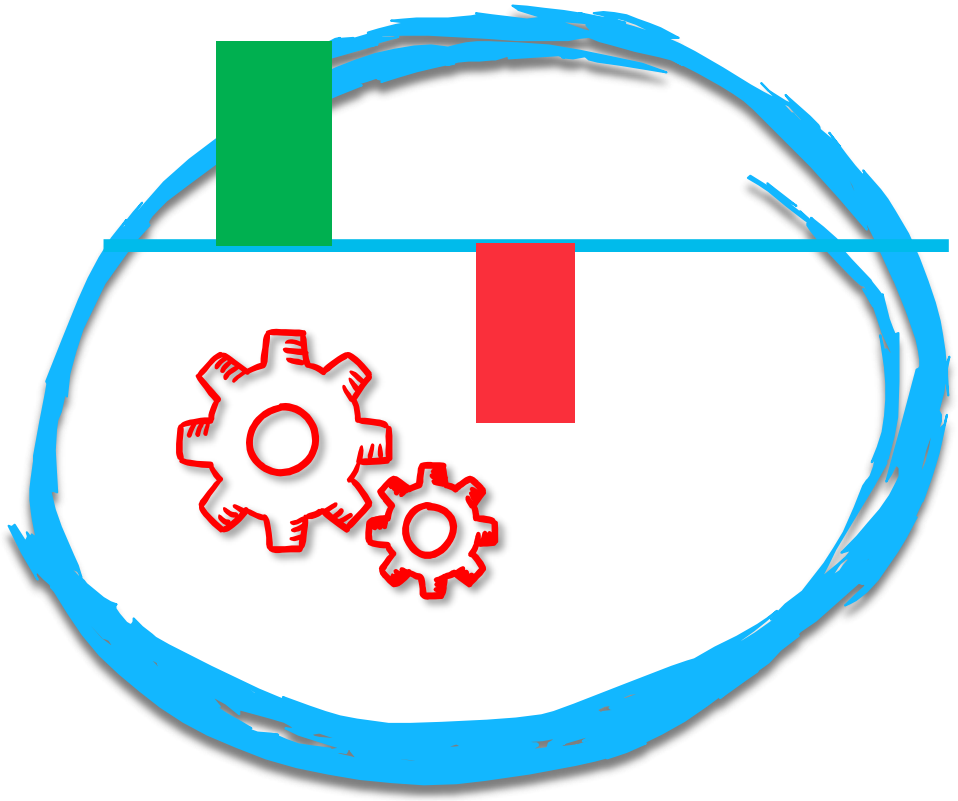
Stream your data at high frequency

- Control Plane
- Data Plane
- System Plane

Telemetry Streaming Methods



Cadence-driven



Event-driven

GPB Encoding

Google Protocol Buffers (GPB)

DESIGN GOALS

- Simplicity
- Performance
- Forward/Backward Compatibility

NON-GOALS

- Human-Readable
- Self-Describing
- Text-based

“Protocol buffers are Google's language-neutral, platform-neutral, extensible mechanism for serializing structured data – think XML, but smaller, faster, and simpler.”

Netconf Encoding

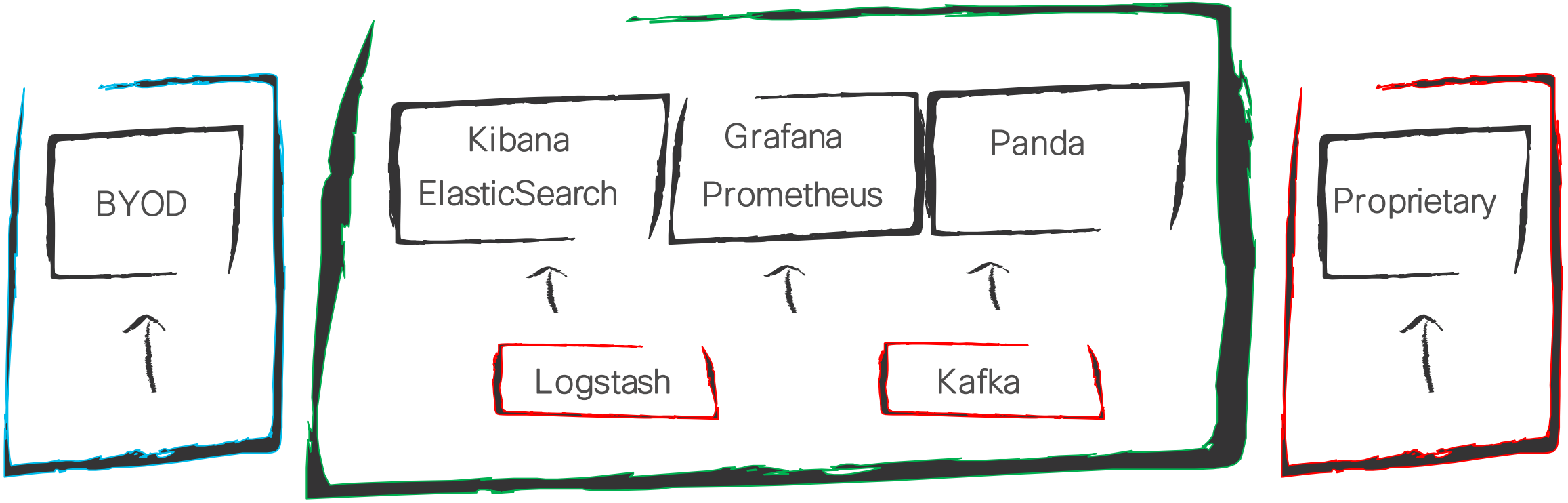
DESIGN GOALS

- Distinction between configuration and state data
- Multiple configuration data stores (candidate, running, startup)
- Configuration change transactions
- Configuration testing and validation support
- Selective data retrieval with filtering
- Streaming and playback of event notifications
- Extensible procedure call mechanism

Open Source Tools

Instead of polling data from the network devices, the **telemetry collector** subscribes the **streaming** data pushed from the data source in network

Different Collection Models



Custom Stack

Open Source, Customizable

Commercial Stack

The Elastic Stack: A Popular OpenSource Stack

- Kibana is the 'K' in the ELK Stack, very popular open source log analysis platform, and provides users with a tool for exploring, visualizing, and building dashboards on top of the log data stored in Elasticsearch clusters.
- Using various methods, users can search the data indexed in Elasticsearch for specific events or strings within their data for root cause analysis and diagnostics.
- Commercial/Cloud via elastic.co
- https://github.com/elastic

Grafana

- Grafana is an open source visualization tool that can be used on top of a variety of different data stores but is most commonly used together with Graphite, InfluxDB, and also Elasticsearch and Logz.io.
- Enterprise and Cloud versions
- Commonly used together with Graphite, InfluxDB, and also Elasticsearch and Logz.io
- Data stored as documents
- Full text search and log management
- https://github.com/grafana/grafana

Last stop, Streaming Telemetry Enabling

Configuring Model-Driven Telemetry (MDT)

Before we begin...

1.3.6.1.4.1.9.2.1.58.0

Cisco-IOS-XR-infra-statsd-oper:infra
statistics/interfaces/interface/latest/generic-counters

The Background (tl;dr)

Transport: The router can deliver telemetry data either across using TCP or gRPC over HTTP/2

Session Initiation: There are two options for initiating a telemetry session. The router can “dial-out” to the collector or the collector can “dial-in” to the router

Encoding: The router can deliver telemetry data in two different flavors of Google Protocol Buffers: Compact and Self-Describing GPB. Compact GPB is the most efficient encoding but requires a unique .proto for each YANG model that is streamed

Dial-Out Versus Dial-In

With the TCP Dial-Out method, the router initiates a TCP session to the collector and sends whatever data is specified by the sensor-group in the subscription.

With the gRPC Dial-In method, the collector initiates a gRPC session to the router and specifies a subscription. The router sends whatever data is specified by the sensor-group in the subscription requested by the collector.

TCP Dial-Out Router Configuration

```
telemetry model-driven
  destination-group DGroup1
     address family ipv4 192.168.1.2 port 5432
     encoding self-describing-gpb
     protocol tcp
  !
!
sensor-group SGroup1
sensor-path Cisco-IOS-XR-infra-statsd-oper:infra
statistics/interfaces/interface/latest/generic-counters
!
  subscription Sub1
     sensor-group-id SGroup1 sample-interval 30000
     destination-id DGroup1
```

https://www.cisco.com/c/en/us/td/docs/iosxr/asr9000/telemetry/b-telemetry-cg-asr9000-61x/b-telemetry-cg-asr9000-61x_chapter_011.html

gRPC Dial-Out Router Configuration

```
telemetry model-driven
  destination-group DGroup1
     address family ipv4 192.168.2.1 port 57500
     encoding self-describing-gpb
     protocol grpc
  !
!
sensor-group SGroup2
sensor-path Cisco-IOS-XR-nto-misc-oper:memory-summary/nodes/node/summary
!
  subscription Sub2
     sensor-group-id SGroup2 sample-interval 30000
     destination-id DGroup2
```

https://www.cisco.com/c/en/us/td/docs/iosxr/asr9000/telemetry/b-telemetry-cg-asr9000-61x/b-telemetry-cg-asr9000-61x_chapter_011.html

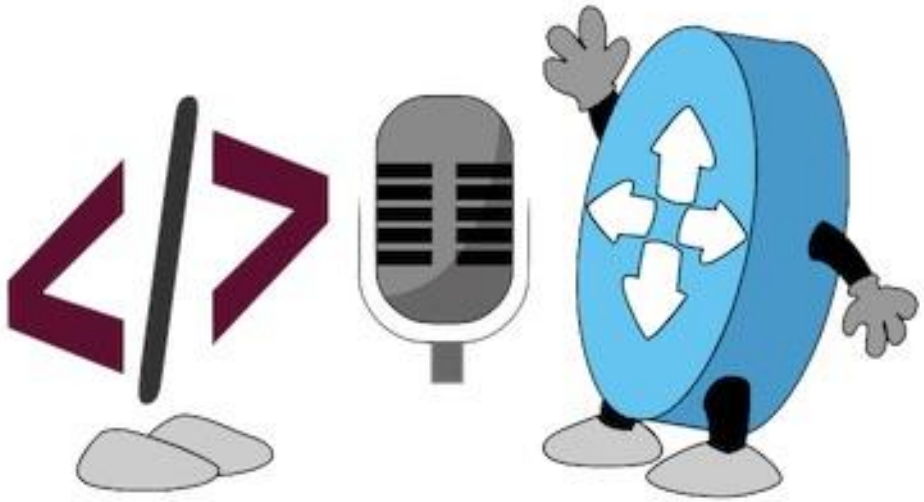
gRPC Dial-In Router Configuration

```
grpc
 port 57500
!
telemetry model-driven
sensor-group SGroup3
 sensor-path openconfig-interfaces:interfaces/interface
!
subscription Sub3
   sensor-group-id SGroup3 sample-interval 30000
```

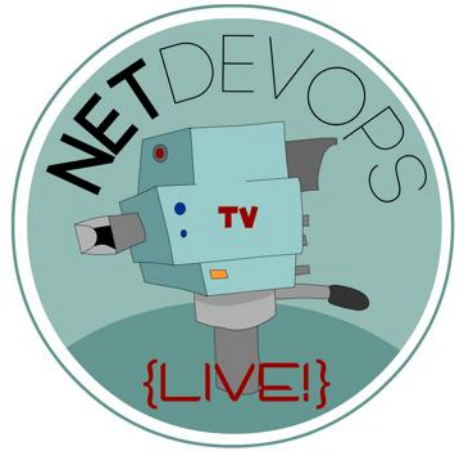
https://www.cisco.com/c/en/us/td/docs/iosxr/asr9000/telemetry/b-telemetry-cg-asr9000-61x/b-telemetry-cg-asr9000-61x_chapter_011.html

What did we Talk about?

- The current state of play SNMP
- Streaming Telemetry gainzzz!
- Where do gRPC and NETCONF fit in here bro?
- Let's explore open source platforms ELK and Grafana
- Last stop, Streaming Telemetry Enabling



Webinar Resource List



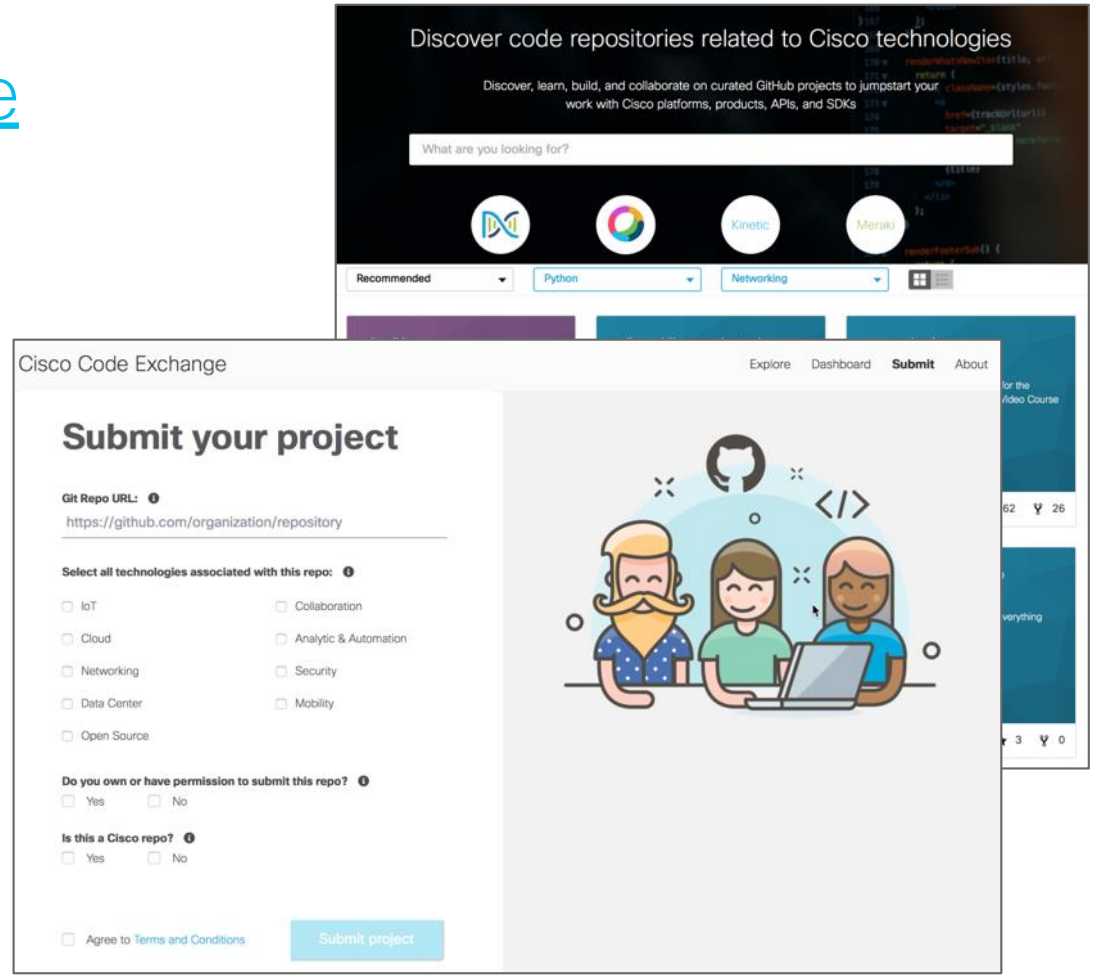
- Docs and Links
  - https://xrdocs.io/telemetry/
  - https://developer.cisco.com/docs/nx-os/#telemetry
  - https://developer.cisco.com/docs/ios-xe/#!streaming-telemetry-quick-start-guide
- Learning Labs
  - XR Streaming Telemetry http://cs.co/iosxr-streaming-telemetry
- DevNet Sandboxes
  - Streaming Telemetry http://cs.co/sbx-st
  - NX-OS Always On http://cs.co/sbx-nxos
  - IOS XR Programmability http://cs.co/sbx-iosxr

NetDevOps Live! Code Exchange Challenge

developer.cisco.com/codeexchange

Try the Streaming Telemetry Sandbox

Using the learning labs and other guides as reference. Create your own collectors for databases you use in your environment.



DEVNET
developer.cisco.com

Looking for more about NetDevOps?

- NetDevOps on DevNet
  developer.cisco.com/netdevops
- NetDevOps Live!
  developer.cisco.com/netdevops/live
- NetDevOps Blogs
  blogs.cisco.com/tag/netdevops
- Network Programmability Basics Video Course
  developer.cisco.com/video/net-prog-basics/

Got more questions? Stay in touch!

Stuart Clark

stuaclar@cisco.com

@bigevilbeard

http://github.com/bigevilbeard

CISCO DEVNET

LEARN CODE INSPIRE CONNECT

developer.cisco.com

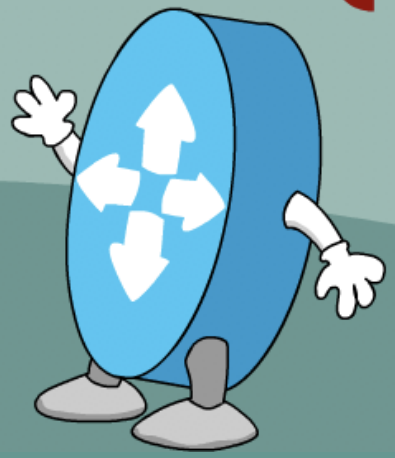
@CiscoDevNet

facebook.com/ciscodevnet/

http://github.com/CiscoDevNet

NETDEVOPS {LIVE!}

cisco DEVNET



https://developer.cisco.com/netdevops/live

@netdevopslive