# Introduction to Streaming Telemetry

## IX Forum 9

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December 2015

# What has changed?

## New Capabilities

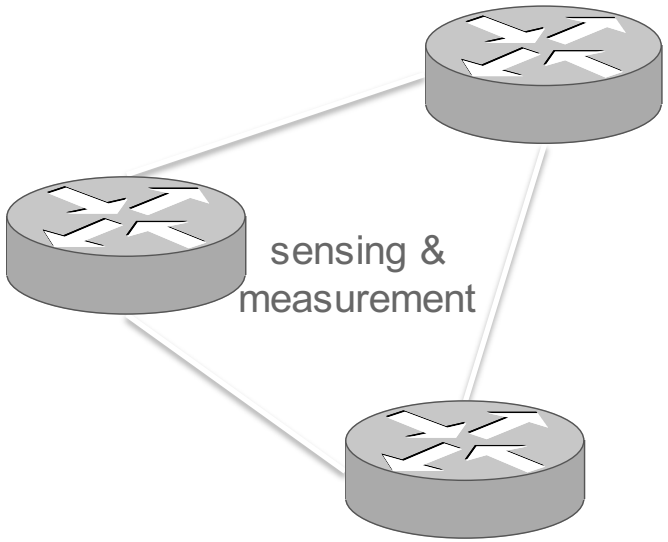

## New Requirements

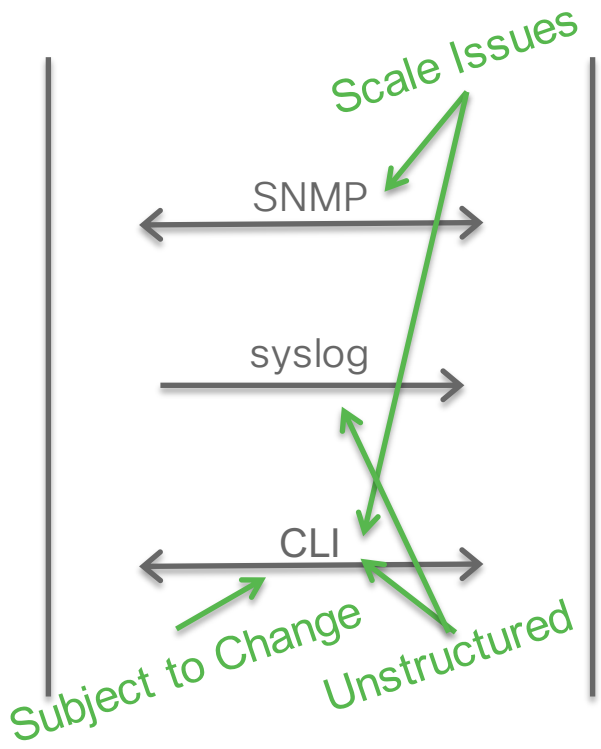
- Speed and scale
- SDN and centralized control
- Faster traffic engineering
- Gray failures
- Fault prediction
- Automated remediation

Network Monitoring is a Big Data Problem

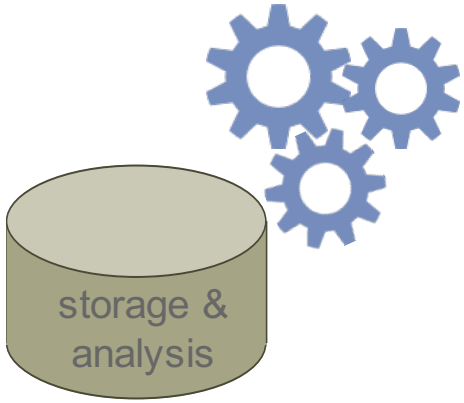
# Network Telemetry

## Where Data Is Created




## Where Data Is Useful



# We need something different

Vs

Pooling

Streaming

# Streaming Telemetry
## Design Vision

| | |
|---|---|
| Performance | • Get as much data off the box as quickly as possible |
| Coverage | • Grant full access to all operational data on the box |
| Automation | • Serialize the data in a flexible, efficient way that fits customers automated tools |

# Streaming Telemetry: The First Iteration

# Initial Goal: Validate the Big Data Proposition

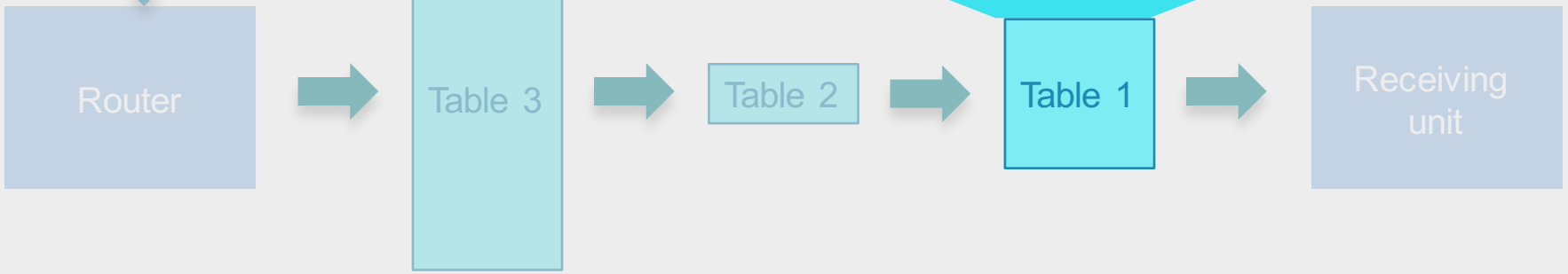
- “As much data as fast as possible”
- Enable a push model
- Make data simple to use
- Options for serialization/transport
- Focus on statistics
- Periodic delivery (~10 seconds)
- Give full access to operational data

# Ultra-high level picture

"I am the interface counters table"

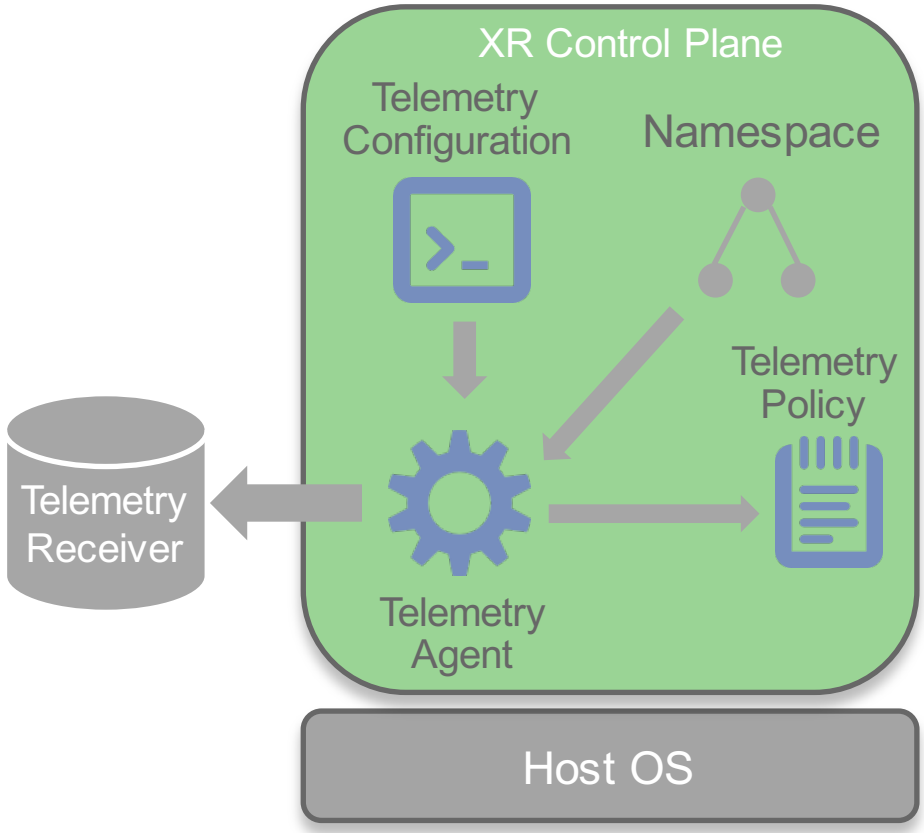
| Interface | ifInErrors | ifOutErrors | ifHCOutOctets | … |
|---|---|---|---|---|
| HundredGigabitEthernet 0/1/0/2 | 10 | 0 | 123456789 | … |
| Bundle-Ether42 | 3 | 0 | 234567890 | … |
| … | … | … | … | … |

Instruction on:
- What data to collect
- With what cadence
- And send to where



# Streaming Telemetry Model

- Telemetry Policy
  - Described in JSON.
  - Define one or multiple collection group(s).
  - Each group contains a rate and a pointer to one or multiple objects in the SysDB path
- Telemetry Configuration
  - Define the encoder, transport and the receiver(s) for each policy.
- Telemetry Agent
  - XR process that runs automatically and looks for registered policies to act on.



# The Policy Plane

Policy Config

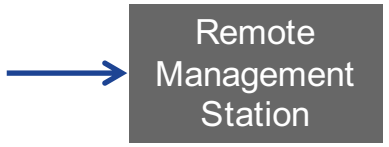
```
{
"Name": "ptt1",
  "Metadata": {
        "Version": 25,
        "Description": "This is a sample policy to demonstrate the syntax",
        "Comment": "This is the first draft",
        "Identifier": "ptt1-id"
   },
   "CollectionGroups": {
         "FirstGroup": {
              "Period": 30,
              "Paths": [
                "RootOper.InfraStatistics.Interface([*]).Latest.GenericCounters"
               ]
         },
         "SecondGroup": {
              "Period": 60,
              "Paths": [
                "RootOper.MemorySummary.Node({'NodeName': '0/RP0/CPU0'}).Summary",
                "RootOper.BGP.Instance({'InstanceName':'default'}).InstanceActive.DefaultVRF.Neighbor([*])"
              ]
         }
   }
}
$ scp ptt1.policy cisco@172.16.1.150:/telemetry/policies/ptt1.policy
```

# Control Plane

JSON Encoder

```
RP/0/RP0/CPU0:r1#show  run telemetry
Telemetry
     encoder json
policy group ptt-policies-group1
     policy ptt1
     destination ipv4 172.16.1.1 port 5555
     destination ipv6 fd01:23:6::1 port 5556
```

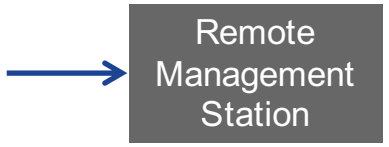
# Data Plane: Encoder Output





```
"RootOper": {
     "InfraStatistics": {
        "GigabitEthernet0/0/0/0": {
           "Latest": {
              "GenericCounters": {
                 "OutputQueueDrops": 0,
                 "LastDiscontinuityTime": 1449091544,
                 "InputIgnoredPackets": 0,
                 "PacketsReceived": 40881,
                 "OutputDrops": 0,
                 "UnknownProtocolPacketsReceived": 0,
                 "RuntPacketsReceived": 0,
                 "CRCErrors": 0,
                 "SecondsSinceLastClearCounters": 0,
                 "CarrierTransitions": 0,
                 "MulticastPacketsSent": 26784,
                 "BytesSent": 43668872,
                 "ThrottledPacketsReceived": 0,
                 "Applique": 0,
                 "FramingErrorsReceived": 0,
                 "GiantPacketsReceived": 0,
                 "OutputUnderruns": 0,
                 "OutputErrors": 0,
                 "BroadcastPacketsReceived": 0,
                 "OutputBuffersSwappedOut": 0,
                 "Resets": 0,
                 "SecondsSincePacketSent": 0,
                 "InputAborts": 0,
                 "InputOverruns": 0,
                 "InputQueueDrops": 0,
                 "InputDrops": 0,
                 "AvailabilityFlag": 0,
                 "MulticastPacketsReceived": 26775,
                 "SecondsSincePacketReceived": 0,
                 "OutputBufferFailures": 0,
                 "BytesReceived": 43635706,
                 "ParityPacketsReceived": 0,
                 "BroadcastPacketsSent": 2,
                 "LastDataTime": 1449320856,
                 "InputErrors": 0,
                 "PacketsSent": 40904
              }...
```

# Data Plane: Encoder Output



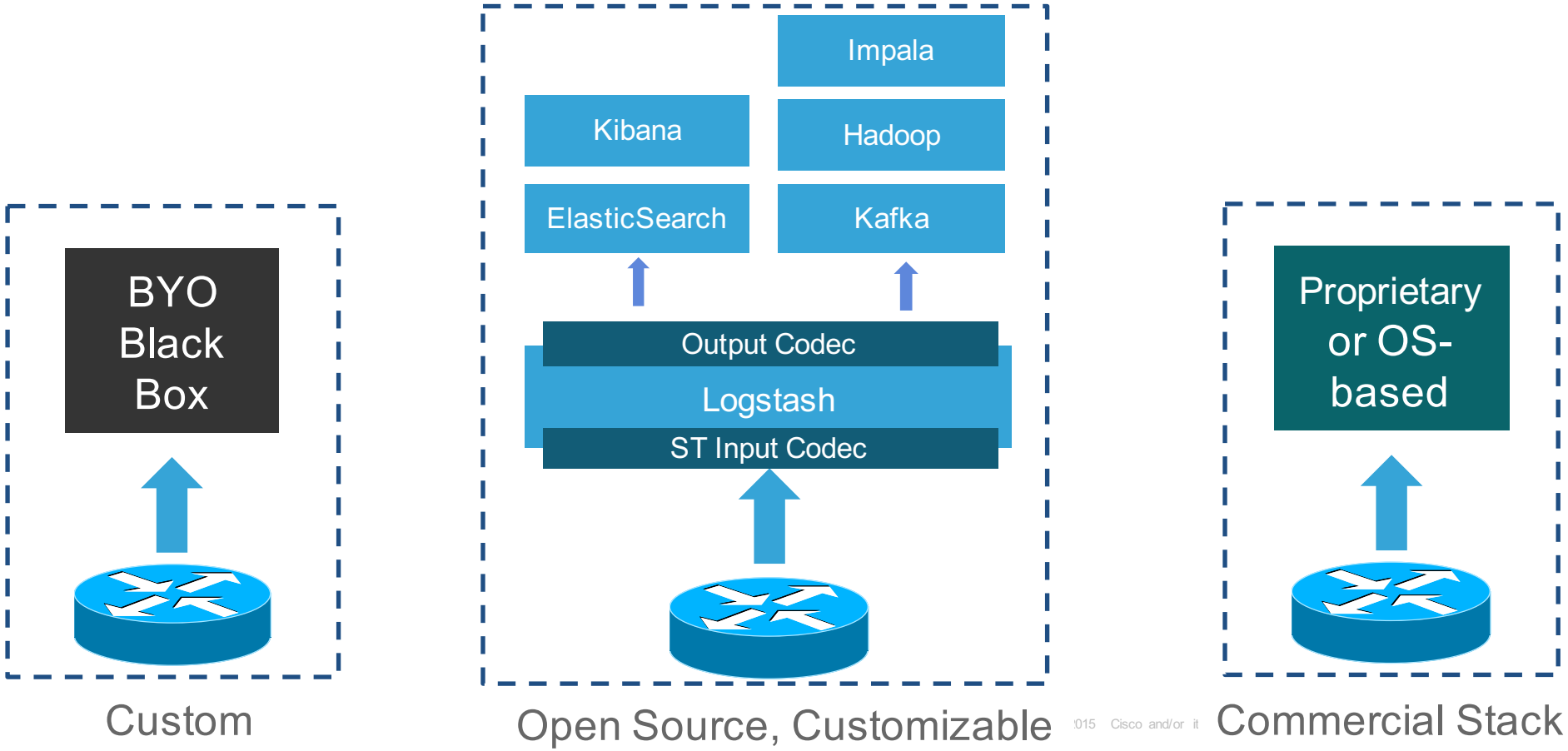

```
Identifier:Telemetry Source: 172.16.128.2
Start Time:Sun Jan 25 00:24:17 1970
End Time:Mon Dec  7 09:03:55 2015

# Tables:1
    Schema
    Path:
      RootOper.InfraStatistics.Interface.Latest.GenericCounters
    # Rows:5
…
      Row 4:
        applique:0
        availability_flag:0
        broadcast_packets_received:2
        broadcast_packets_sent:0
        bytes_received:864025
        …
        input_errors:0
        input_ignored_packets:0
        input_overruns:0
        input_queue_drops:0
        interface_name:GigabitEthernet0/0/0/1
        last_data_time:1449507828
```

```
last_discontinuity_time:1449503558
multicast_packets_received:521
multicast_packets_sent:1438
output_buffer_failures:0
output_buffers_swapped_out:0
output_drops:0
output_errors:0
output_queue_drops:0
output_underruns:0
packets_received:1918
packets_sent:1606
parity_packets_received:0
resets:0
runt_packets_received:0
seconds_since_last_clear_counters:0
seconds_since_packet_received:0
seconds_since_packet_sent:0
throttled_packets_received:0
unknown_protocol_packets_received:0
```

GPB over UDP

# Consuming the Data

# Some Consumption Models

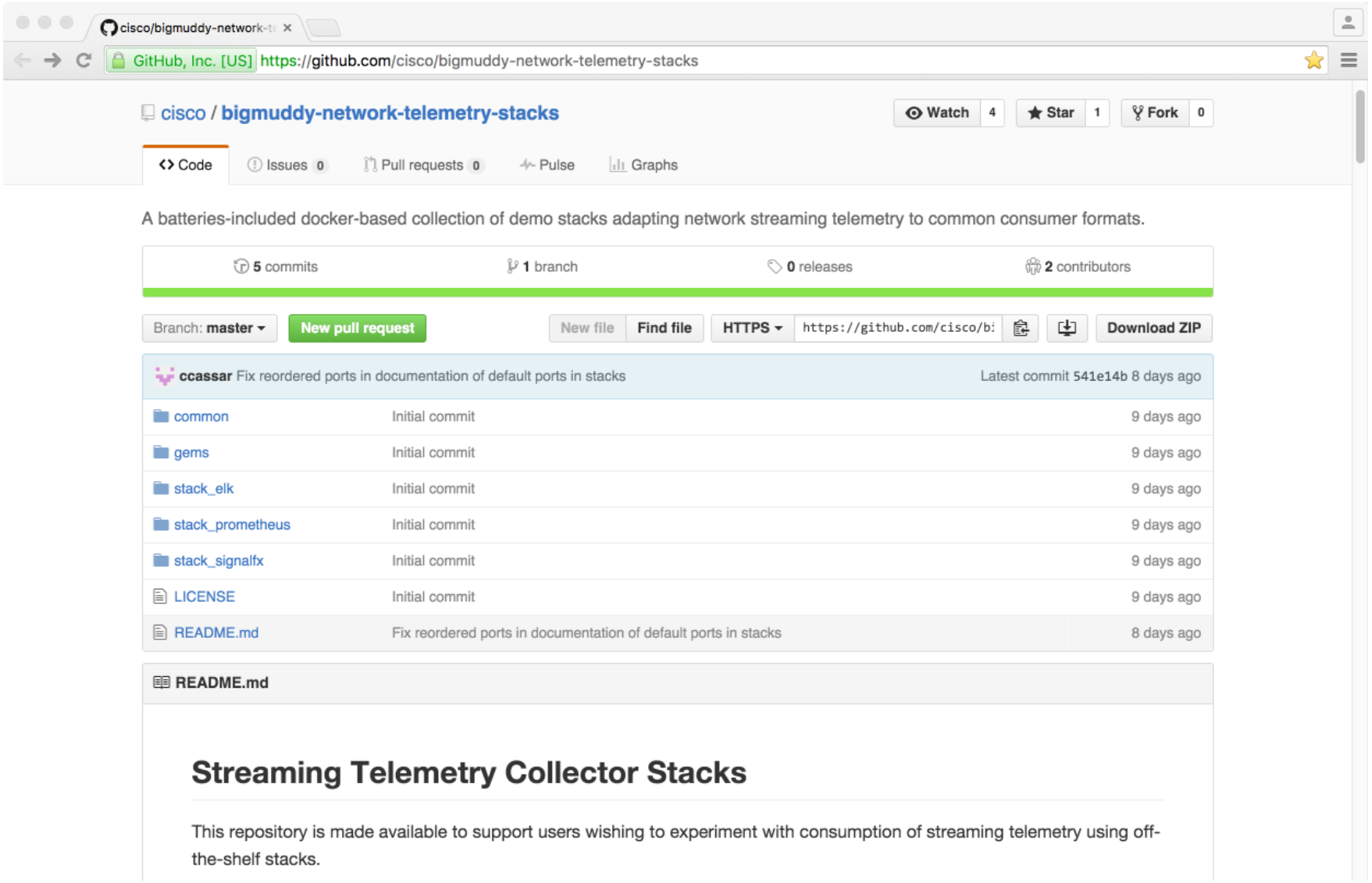



Custom

Open Source, Customizable

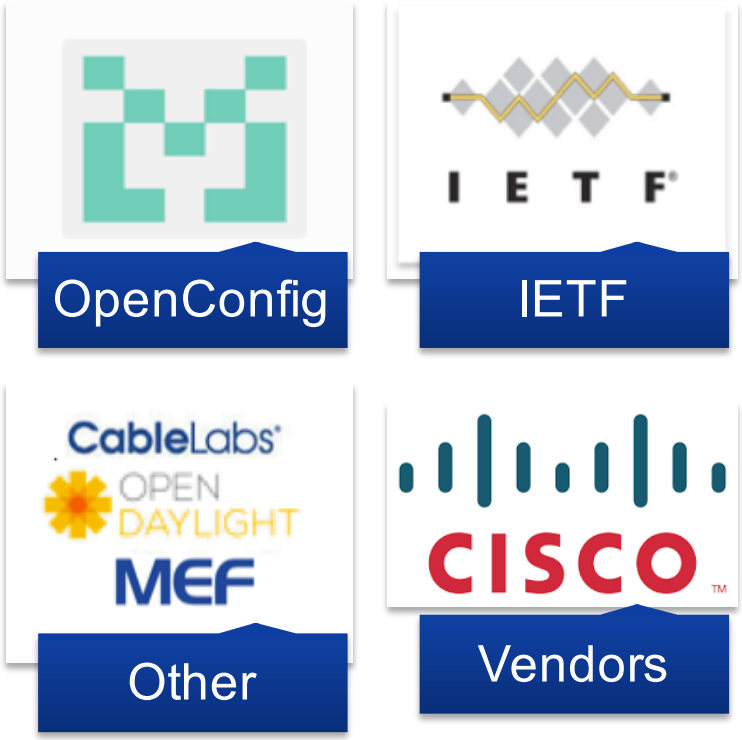


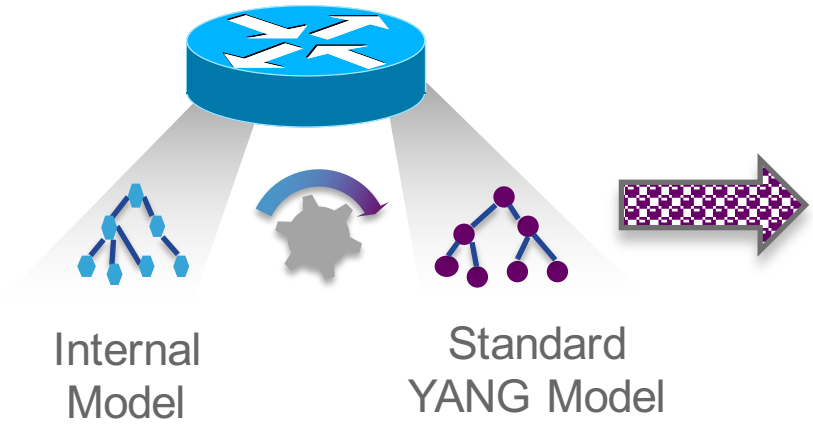
Commercial Stack


cisco/bigmuddy-network-t
GitHub, Inc. [US] https://github.com/cisco/bigmuddy-network-telemetry-stacks
cisco / bigmuddy-network-telemetry-stacks
Watch 4
Star 1
Fork 0
Code
Issues 0
Pull requests 0
Pulse
Graphs
A batteries-included docker-based collection of demo stacks adapting network streaming telemetry to common consumer formats.
5 commits
1 branch
0 releases
2 contributors
Branch: master
New pull request
New file
Find file
HTTPS
https://github.com/cisco/bi
Download ZIP
ccassar Fix reordered ports in documentation of default ports in stacks
Latest commit 541e14b 8 days ago
common Initial commit 9 days ago
gems Initial commit 9 days ago
stack_elk Initial commit 9 days ago
stack_prometheus Initial commit 9 days ago
stack_signalfx Initial commit 9 days ago
LICENSE Initial commit 9 days ago
README.md Fix reordered ports in documentation of default ports in stacks 8 days ago
README.md
Streaming Telemetry Collector Stacks
This repository is made available to support users wishing to experiment with consumption of streaming telemetry using off-the-shelf stacks.

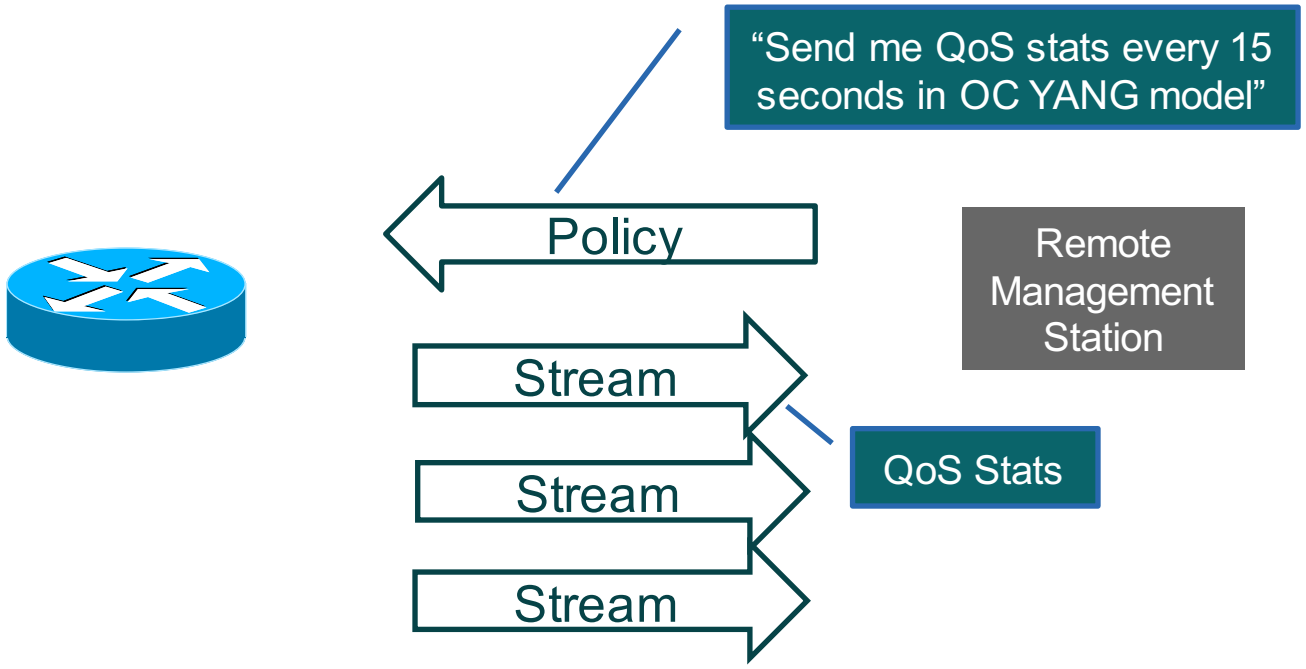
# Future Iterations

# Data Plane: YANG-Driven Telemetry



# Management Plane: Dynamic Policy Config



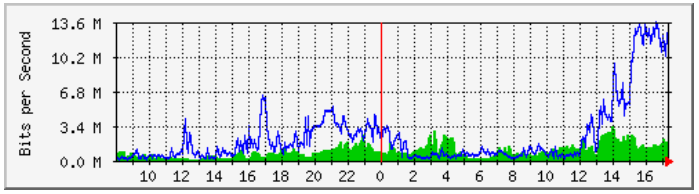
# What Kinds of Data Are Interesting

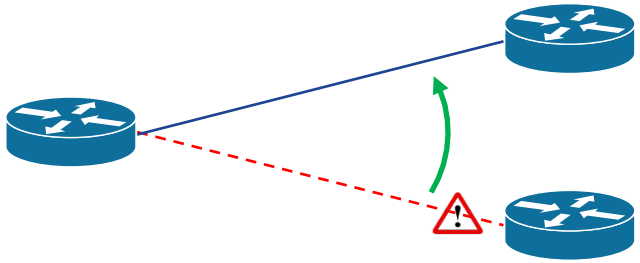
## Statistics

- Interface
- QoS
- LSP
- ACL stats
- Environmental
- …

## Operational State

Interface Up/Down
BGP Neighbor
LSP Changes
Topology
…




CISCO
TOMORROW starts here.