



The bridge to possible

# Taking Baby Steps to Adopt IOSXR Telemetry in Your Network

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# Agenda

- Introduction
- Step One - What Operational Data Is Inside a Device
- Step Two - How To Make a Device Stream Data
- Step Three - How To Collect Data
- Step Four - How To Present Data
- Demo - Putting Everything Together

# Introduction

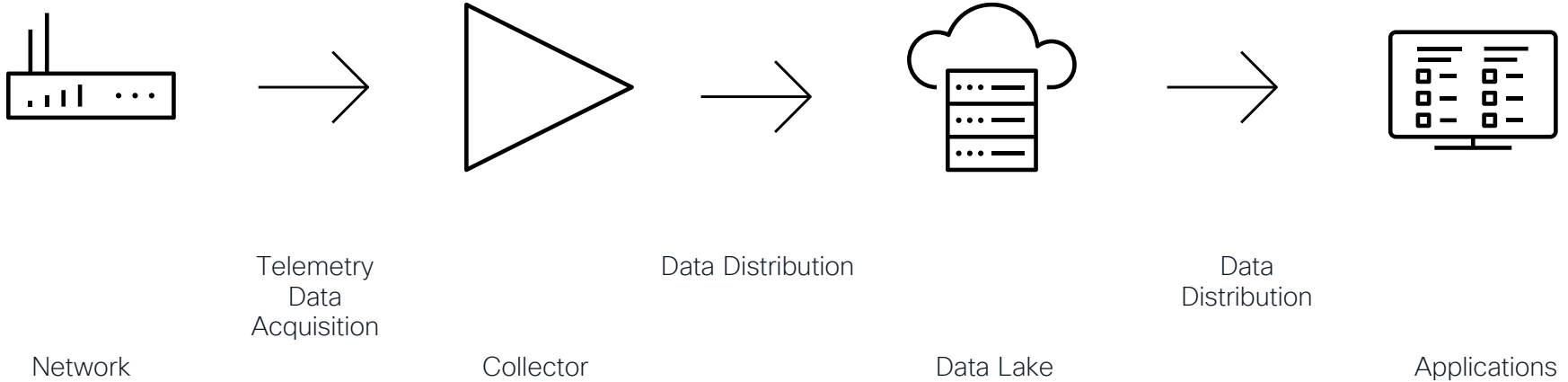


# Why Telemetry?

- Designed for web-scale architecture
- Real-time data collection
- Push model of streaming data
- Enhanced security
- Yang models integration
- Structured data format
- Well adopted across different vendors



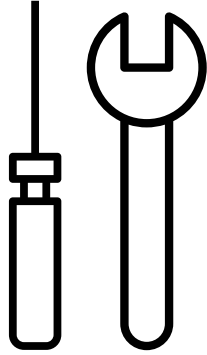
# Telemetry Pipeline



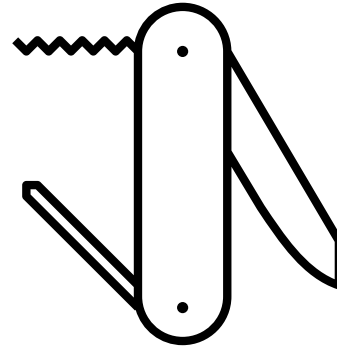
# Step One – What Operational Data Is Inside a Device



# Yang Data Models – This Is Where It All Begins



Cisco Native (Unified) Models



OpenConfig Models

IOSXR (7.6) comes with ~1300 native and ~110 OpenConfig models

<https://github.com/YangModels/yang/tree/main/vendor/cisco/xr>

# Tool For Checking Yang Models In Cisco Devices

## IOS XR YANG Data Models

1 Select a Product and Cisco IOS XR release, to explore the data models (Native, Unified, and OpenConfig).  
[Send us your feedback](#)

Product \*

Cisco 8000 Series Routers

Cisco IOS XR Release \*

7.7.1

Submit

Search for Data Model Name

### Cisco XR-Native models (XR-N) (555)

Config (152)

Act (56)

Oper (213)

Grouping/Augment/Types (134)

ModelName	Version	Revision	#node	#leaf
Cisco-IOS-XR-8000-fib-platform-cfg	1.0.0	2019-04-05	5	1
Cisco-IOS-XR-Ethernet-SPAN-cfg	5.0.0	2021-12-30	58	50
Cisco-IOS-XR-aaa-lib-cfg	1.1.0	2020-10-22	450	289
Cisco-IOS-XR-aaa-nacm-cfg	1.2.0	2021-09-20	36	23
Cisco-IOS-XR-accounting-cfg	1.0.1	2019-04-05	12	7
Cisco-IOS-XR-adt-config-cfg	1.0.0	2020-10-05	8	1
Cisco-IOS-XR-appmgr-cfg	2.0.0	2022-03-01	20	12
Cisco-IOS-XR-attestation-agent-cfg	1.0.0	2019-04-05	7	2
Cisco-IOS-XR-bundlemgr-cfg	2.0.0	2021-03-11	6	3
Cisco-IOS-XR-call-home-cfg	1.0.0	2019-04-05	94	60
Cisco-IOS-XR-cdp-cfg	1.0.1	2019-04-05	7	5
Cisco-IOS-XR-cli-cfg	2.0.0	2019-10-01	2	1
Cisco-IOS-XR-clns-isis-cfg	4.2.0	2022-03-01	939	611
Cisco-IOS-XR-config-cfgmgr-cfg	1.0.1	2020-06-26	3	1

### Cisco XR-Unified models (XR-UM) (245)

Config (147)

Act (0)

Oper (0)

Grouping/Augment/Types (98)

ModelName	Version	Revision	#node	#leaf
Cisco-IOS-XR-um-8000-controller-fabric-cfg	1.0.0	2021-08-19	9	1
Cisco-IOS-XR-um-8000-fpd-cfg	1.1.0	2022-02-17	7	0
Cisco-IOS-XR-um-8000-hw-module-power-profile-sfd-cfg	1.0.0	2022-01-24	9	3
Cisco-IOS-XR-um-8000-hw-module-power-profile-sff-cfg	1.0.0	2022-01-24	3	1
Cisco-IOS-XR-um-8000-hw-module-profile-cfg	2.0.0	2022-04-24	142	55
Cisco-IOS-XR-um-8000-udf-cfg	1.0.0	2020-12-07	9	5
Cisco-IOS-XR-um-aaa-cfg	2.0.0	2021-10-10	1267	306
Cisco-IOS-XR-um-adt-cfg	1.0.0	2021-07-07	8	1
Cisco-IOS-XR-um-appmgr-cfg	2.0.0	2021-11-19	18	11
Cisco-IOS-XR-um-arp-cfg	3.0.0	2019-10-10	35	17
Cisco-IOS-XR-um-attestation-cfg	1.0.0	2020-09-10	7	1

### OpenConfig Data Models (OC) (119)

Config/Act/Oper (17)

Grouping/Augment/Types (102)

ModelName	Version	Revision	#node	#leaf
openconfig-acl	1.2.1	2021-06-16	85	37
openconfig-bfd	0.2.3	2021-06-16	60	40
openconfig-bgp	6.1.0	2021-03-17	1617	1056
openconfig-interfaces	2.4.3	2019-11-19	371	211
openconfig-lacp	1.2.0	2021-07-20	44	32
openconfig-lldp	0.2.1	2018-11-21	82	58
openconfig-local-routing	1.2.0	2020-03-24	39	20
openconfig-macsec	0.2.0	2020-05-01	98	62
openconfig-messages	0.0.1	2018-08-13	21	12
openconfig-network-instance	0.15.0	2021-01-25	3841	2139
openconfig-optical-attenuator	0.1.0	2019-07-19	44	35
openconfig-platform	0.12.2	2019-04-16	216	141
openconfig-routing-policy	3.3.0	2022-05-24	236	105
openconfig-system	0.7.0	2019-01-29	331	189

<https://cfnnng.cisco.com/ios-xr/yang-explorer/view-data-model>



# Essential Router Commands

```
! Model list
# show netconf-yang capabilities

! Show corresponding Yang model to CLI command
# yang-describe operational <CLI_COMMAND>

! Get request (only native data models are supported)
# show yang operational <SENSOR_PATH> json | xml

! Subscribe and dump telemetry data to router console
# run mdt_exec -s <SENSOR_PATH> -c <CADENCE_IN_MILLISECONDS>
```

## SENSOR\_PATH

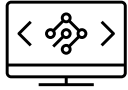
```
Cisco-IOS-XR-controller-optics-oper:optics-oper/optics-ports/optics-port[name=Optics0/0/2/2]/optics-info
openconfig-interfaces:interfaces/interface/state/counters
```

# Step Two – How To Make a Device Stream Data

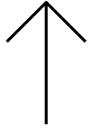


# Cisco Telemetry Taxonomy

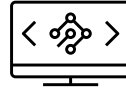
## Model Driven



time series data  
sent every N sec.



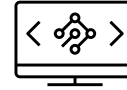
## Event Driven



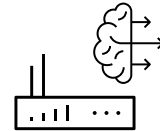
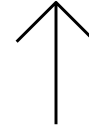
async event  
reporting



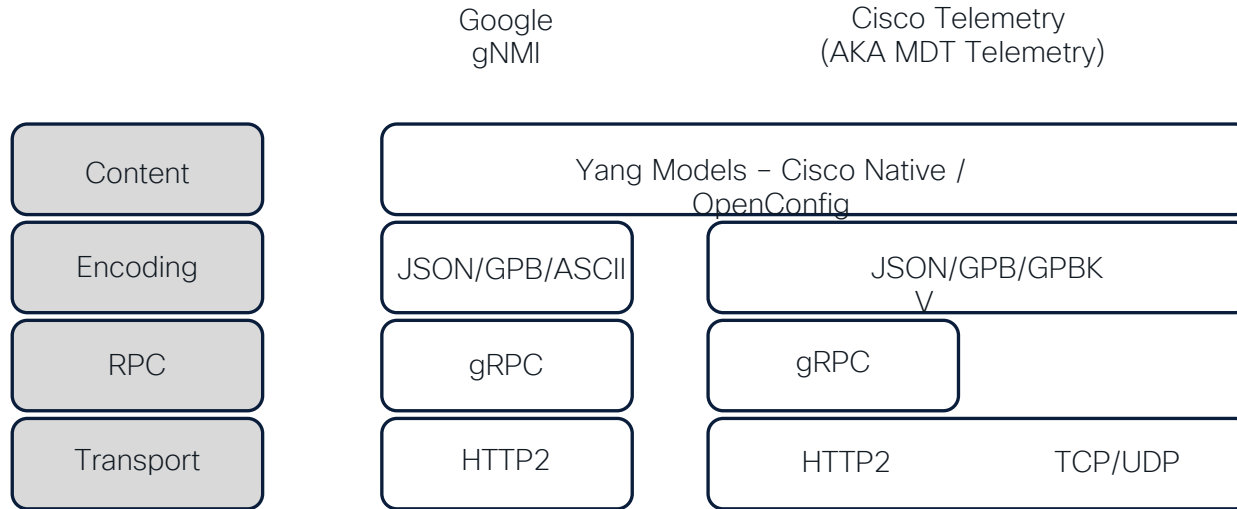
## AI Driven



data is selected by  
ML algorithm



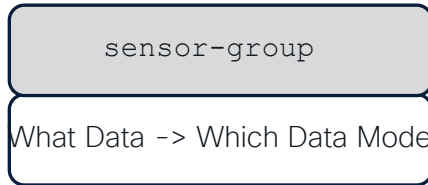
# Telemetry Transport In a Device



# Telemetry Interface Recap

	XR6 32bit	XR6 and XR7
MDT/EDT ADT	6.1.1 no	6.1.1 7.3.1
Yang Data Models	native/OC	native/OC
Encoding	GBP/GBP-KV/ JSON	GBP/GBP-KV/ JSON/ASCII
Cisco Telemetry	TCP/UDP  dial-out	gRPC/TCP/ UDP dial-in / dial-out
gNMI Telemetry	no	dial-in (7.0.12) dial-out (7.5.1)

# Cisco Telemetry Configuration Summary



# Cisco Telemetry Configuration – MDT / EDT

```
sensor-group native-models
  sensor-path Cisco-IOS-XR-wdsysmon-fd-oper:system-monitoring/cpu-utilization
  sensor-path Cisco-IOS-XR-nto-misc-oper:memory-summary/nodes/node/summary
sensor-group openconfig-models
  sensor-path openconfig-interfaces:interfaces/interface/state/counters
  sensor-path openconfig-platform:components/component/power-supply/state
sensor-group interface-stats
  sensor-path Cisco-IOS-XR-ipv6-ma-oper:ipv6-network/nodes/node/interface-data/vrfs/vrf/global-briefs/global-brief
  sensor-path Cisco-IOS-XR-pfi-im-cmd-oper:interfaces/interface-xr/interface
```

sensor-group

```
destination-group new_tig_stack
  address-family ipv4 10.58.250.16 port 57000
  encoding self-describing-gpb
  protocol grpc no-tls
destination-group crosswork
  address-family ipv4 10.58.25.218 port 9010
  encoding json
  protocol tcp
```

destination-group

```
subscription mdt_subscription
  sensor-group-id native_models sample-interval 30000
  sensor-group-id openconfig_models sample-interval 600000
  destination-id new_tig_stack
  source-interface MgmtEth0/RP0/CPU0/0
subscription edt-subscription
  sensor-group-id interface-stats sample-interval 0
  destination-id crosswork
  source-interface MgmtEth0/RP0/CPU0/0
```

subscription

# Cisco Telemetry Configuration - ADT

```
adt enable
```

adt configuration

```
sensor-group adt-sensors  
  sensor-path Cisco-IOS-XR-adt-oper:adt/adt-output
```

sensor-group

```
destination-group new_tig_stack  
  address-family ipv4 10.58.250.16 port 57000  
  encoding self-describing-gpb  
  protocol grpc no-tls
```

destination-group

```
subscription adt-subscr  
  sensor-group-id adt-sensors sample-interval 0  
  destination-id new_tig_stack  
  source-interface MgmtEth0/RP0/CPU0/0
```

subscription



# gNMI Configuration – MDT / EDT

```
grpc
port 57400
no-tls
address-family ipv4
```

grpc configuration

```
! Additional configuration for some platforms such as ASR9k / NCS5xxx
tpa
vrf default
address-family ipv4
default-route mgmt
update-source dataports active-management
```

3<sup>rd</sup> party app traffic  
protection

Entire telemetry configuration resides on a collector

- Sensor paths
- Cadence
- Encoding

# Telemetry Configuration Verification

```
! Overall telemetry status on a device
```

```
# show telemetry model-driven summary
```

```
! Telemetry subscription on a device
```

```
# show telemetry model-driven subscription | <SUBSCRIPTION_ID>
```

```
! Destination information / statistics
```

```
# show telemetry model-driven destination | <DESTINATION_ID>
```

```
! gRPC protocol statistics
```

```
show grpc status
```

```
show grpc streams
```

# Step Three – How To Collect Data



# Collector

- Open-source collectors
  - Telegraf - <https://github.com/influxdata/telegraf>
  - Pipeline - <https://github.com/cisco-ie/pipeline-gr>

- Cisco Crosswork Data Gateway
  - <https://www.cisco.com/c/en/us/support/cloud-systems-management/crosswork-data-gateway/model.html>

```
#
#####
#                               #
#####
[[inputs.cisco_telemetry_gnmi]]
  addresses = ["$ROUTER1:$ROUTER_GRPC_PORT", "$ROUTER2:$ROUTER_GRPC_PORT"]

  username = "$ROUTER_USERNAME"
  password = "$ROUTER_PASSWORD"

  redial = "10s"

  [[inputs.cisco_telemetry_gnmi.tags]]
    host_name = ""

  [[inputs.cisco_telemetry_gnmi.subscription]]
    name = "gnmi-Cisco-IOS-XR-controller-optics-oper:/optics-oper/optics-ports/optics-port/optics-info"
    origin = "Cisco-IOS-XR-controller-optics-oper"
    path = "/optics-oper/optics-ports/optics-port/optics-info"
    subscription_mode = "sample"
    sample_interval = "60s"

  [[inputs.cisco_telemetry_gnmi.subscription]]
    name = "gnmi-Cisco-IOS-XR-controller-otu-oper:/otu/controllers/controller/info"
    origin = "Cisco-IOS-XR-controller-otu-oper"
    path = "/otu/controllers/controller/info"
    subscription_mode = "sample"
    sample_interval = "60s"

#####
#                               #
#####

[[processors.enum]]
  namepass = [{"gnmi-Cisco-IOS-XR-controller-optics-oper:/optics-oper/optics-ports/optics-port/optics-info",
               "gnmi-Cisco-IOS-XR-controller-otu-oper:/otu/controllers/controller/info"}]

[[processors.enum.mapping]]
  tag = "source"
  dest = "host_name"

  [[processors.enum.mapping.value_mappings]]
    "$ROUTER1" = "$ROUTER1_NAME"
    "$ROUTER2" = "$ROUTER2_NAME"
```

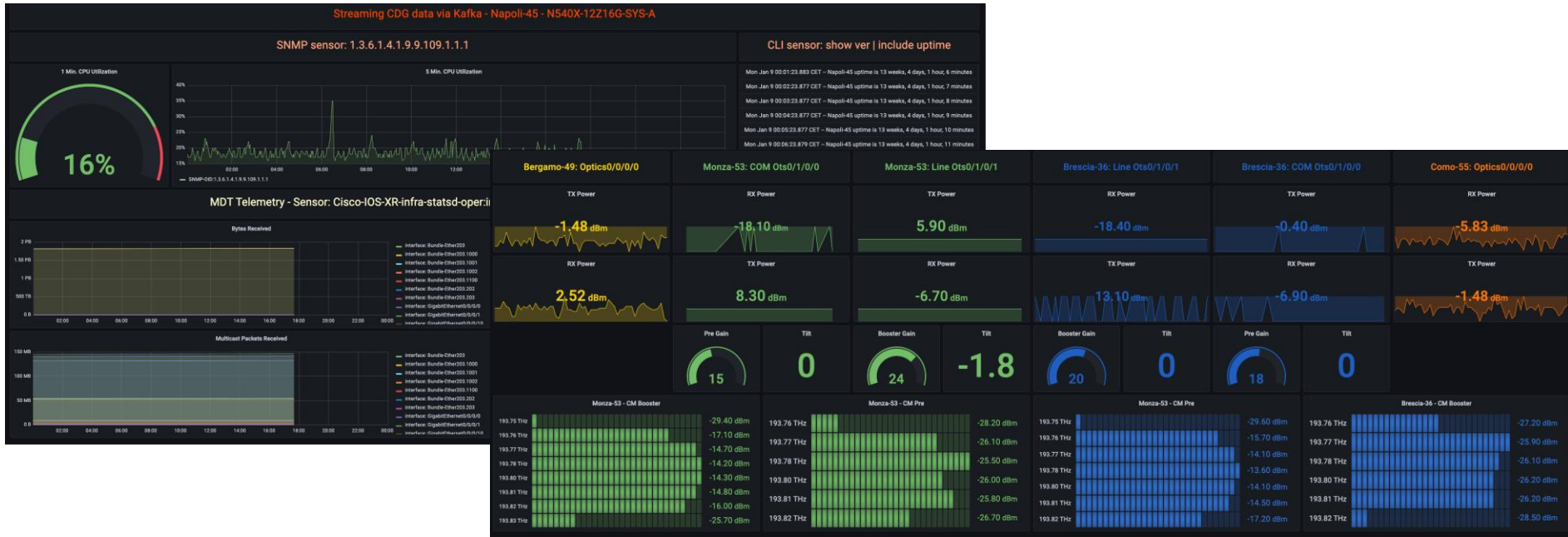
# Time Series Data(base)

- Time series data is a sequence of a data points mostly comprising successive measurements taken from the same device every a given time interval
- Time Series Database is design and optimized to store time series data
- InfluxDB - <https://www.influxdata.com/products/influxdb-overview>
- Graphite - <https://github.com/graphite-project/whisper>
- Prometheus - <https://prometheus.io>
- OpenTSDB - <http://opentsdb.net>

# Step Four – How To Present Data



# Data Visualization

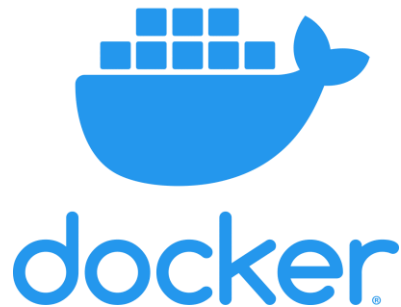


- Grafana – <https://grafana.com/oss/grafana>
- Graphite – <https://github.com/graphite-project/graphite-web>
- InfluxDB UI – <https://docs.influxdata.com/influxdb/v2.0/visualize-data>

# Demo – Putting Everything Together



# App Stack



# Clone Repo

The screenshot shows the GitHub repository page for 'premborek / RON-TIG-stack'. The repository is public and has 1 branch (main) and 0 tags. The commit history shows a recent commit by 'fcr9fc' 4 hours ago with 4 commits. The file list includes 'etc', '.env', '.gitignore', 'LICENSE', 'README.md', and 'docker-compose.yml'. The README.md file is open, showing the title 'TIG (Telegraf / InfluxDB / Grafana) Stack For Monitoring RON Link'. The README content describes the stack as a sample for collecting telemetry data from Cisco routers. It includes a screenshot of the Grafana dashboard showing various metrics like '400.0Gb/s', 'mod-16qam', and '191.363 ms'. The installation instructions are listed below the dashboard screenshot.

**Installation:**

1. Clone repo

<https://github.com/premborek/RON-TIG-stack>

# Deploying The Stack - 1

1. Update `.env` file to match your setup
  - Docker IP address to match your host IP
  - Grafana Admin password
  - Application ports if needed
  - Routers IP and credentials

2. Build the stack

```
# docker-compose up -d
```

3. Log in to Grafana dashboard - <http://<Docker IP>:3000/>
4. Update router hostnames in Grafana dashboard
5. See the dashboard

```
#####  
#  
# Change variables below accordingly  
#  
DOCKER_IP=10.58.250.12  
#  
#  
ROUTER1=10.58.244.51  
ROUTER2=10.58.244.54  
ROUTER_GRPC_PORT=57400  
ROUTER_USERNAME=demo  
ROUTER_PASSWORD=demo123  
#####
```

# Deploying The Stack - 2

```
[wae@docker RON-TIG-stack]$ docker-compose up -d
Creating network "ron-tig-stack_default" with driver "bridge"
Pulling influxdb1.0 (influxdb:1.8)...
1.8: Pulling from library/influxdb
32de3c850997: Pull complete
fa1d4c8d85a4: Pull complete
c796299bbbdd: Pull complete
d5d3e05d16cd: Pull complete
70b94764a22e: Pull complete
e81cd77cc6a8: Pull complete
935d1d4d70f6: Pull complete
424d0ece5b3d: Pull complete
Pulling telegraf (telegraf:1.22.3)...
1.22.3: Pulling from library/telegraf
67e8aa6c8bbc: Pull complete
627e6c1e1055: Pull complete
0670968926f6: Pull complete
d362a0af2235: Pull complete
a75e1b3581e0: Pull complete
4be3330127dc: Pull complete
59a4414d85bf: Pull complete
Pulling grafana (grafana/grafana:8.5.6)...
8.5.6: Pulling from grafana/grafana
df9b9388f04a: Pull complete
a47e13b86868: Pull complete
d312264f72bc: Pull complete
b36bad725349: Pull complete
065a9f3ec5d9: Pull complete
6c3311e22d19: Pull complete
ba32514f4c69: Pull complete
64ed03f7f2f5: Pull complete
e236b1e129a5: Pull complete
Creating grafana ...
Creating influxdb1.0 ...
Creating grafana ... done
Creating telegraf ... done
8.5.6: Pulling from grafana/grafana
[wae@docker RON-TIG-stack]$
```

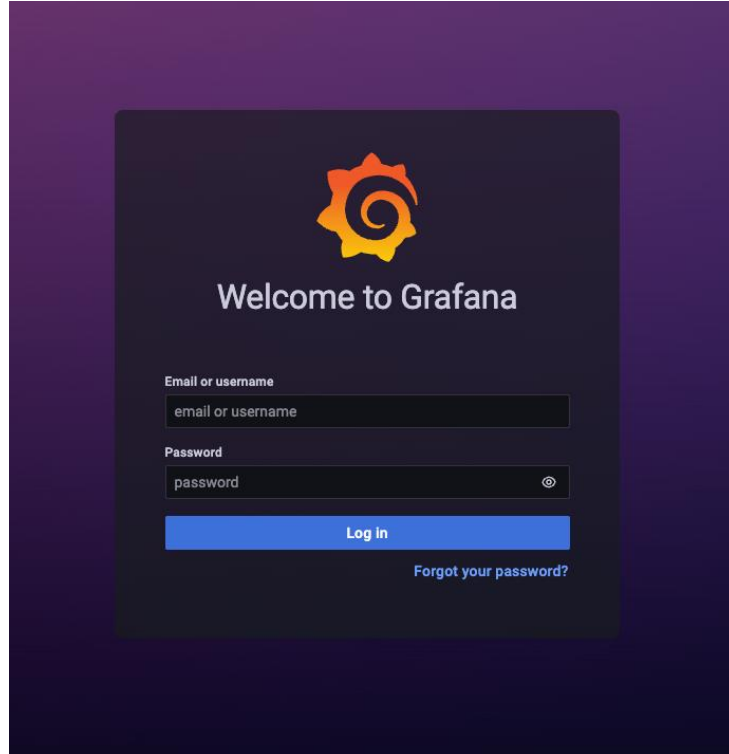
# Deploying The Stack - 2

```
[wae@docker RON-TIG-stack]$ docker-compose ps
```

Name	Command	State	Ports
grafana	/run.sh	Up	0.0.0.0:3000->3000/tcp
influxdb1.0	/entrypoint.sh influxd	Up	0.0.0.0:8086->8086/tcp
telegraf	/entrypoint.sh telegraf -- ...	Up	0.0.0.0:57000->57000/tcp, 8092/udp, 8094/tcp, 8125/udp, 0.0.0.0:9273->9273/tcp

```
[wae@docker RON-TIG-stack]$
```

# Deploying The Stack - 3



[http://<Docker\\_IP>:3000/](http://<Docker_IP>:3000/)

# Deploying The Stack - 4

General

Annotations

**Variables**

Links

Versions

Permissions

JSON Model

Save dashboard

Save As...

Variables > Edit

General

Name

host1

Type

Query

Label

optional display name

Hide

Variable

Description

descriptive text

Query Options

Data source

InfluxDB1.0

Refresh

On dashboard load

Query

show tag values from "gNM-Cisco-IOS-XR-controller-otu-oper:otu/controllers/controller/info" with key="host\_name"

Regex

/Rave\*/

Sort

Disabled

Selection options

Multi-value

Include All option

Preview of values

Ravello-51

Update

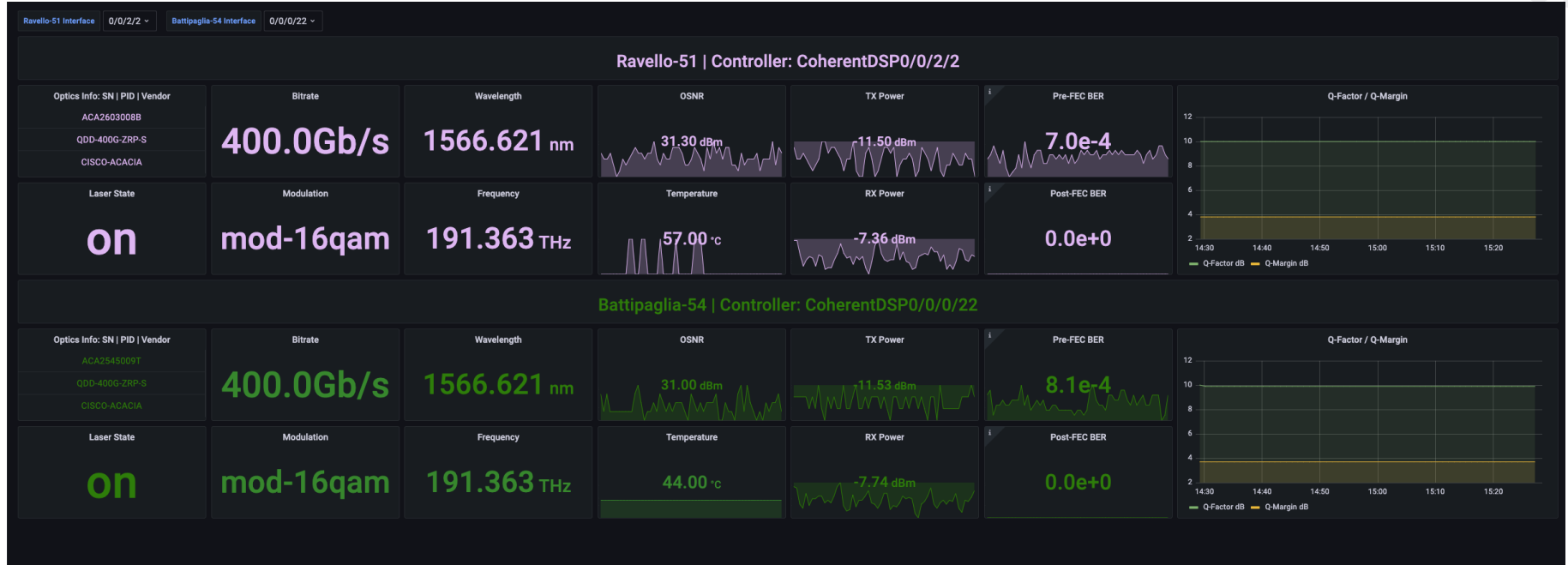
CISCO *Live!*

DEVNET-2758

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31

# Deploying The Stack - 5





# Call To Action

- Visit “Routed Optical Networking” demo in SP Area inside World of Solutions to see IOSXR telemetry in action
- Get your hands on TIG stack demo
  - <https://github.com/premborek/RON-TIG-stack>
- Discover more about telemetry on IOSXR
  - <https://xrdocs.io/telemetry/>
- Familiarize yourself with telemetry in IOSXR devices using DevNet Sandbox
  - <https://developer.cisco.com/learning/modules/iosxr-streaming-telemetry/>

# Cisco Webex App

## Questions?

Use Cisco Webex App to chat with the speaker after the session

## How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated until February 24, 2023.



# Complete your Session Survey

- Please complete your session survey after each session. Your feedback is important.
- All surveys can be taken in the Cisco Events Mobile App or by logging in to the Session Catalog and clicking the "Attendee Dashboard" at <https://www.ciscolive.com/emea/learn/sessions/session-catalog.html>



# Continue Your Education



Visit the Cisco Showcase for related demos.



Book your one-on-one Meet the Engineer meeting.



Attend the Instructor Led Lab “A Cisco Solution for Multivendor Telemetry Collection – LTRSPG-3918”.



Visit the On-Demand Library for more sessions at [ciscolive.com/on-demand](https://ciscolive.com/on-demand).



The bridge to possible

# Thank you

CISCO *Live!*

# Addendum

# Essential Router Commands - Output

```
RP/0/RP1/CPU0:Ravello-51#show netconf-yang capabilities
Thu Jan 26 15:11:10.720 CET
[Netconf capabilities]
```

D: Has deviations

Capability	Revision	ID
urn:ietf:params:netconf:base:1.1	-	
urn:ietf:params:netconf:capability:candidate:1.0	-	
urn:ietf:params:netconf:capability:confirmed-commit:1.1	-	
urn:ietf:params:netconf:capability:interleave:1.0	-	
urn:ietf:params:netconf:capability:notification:1.0	-	
urn:ietf:params:netconf:capability:rollback-on-error:1.0	-	
urn:ietf:params:netconf:capability:validate:1.1	-	
http://cisco.com/calvados/Cisco-IOS-XR-sysadmin-issu	2019-06-12	
http://cisco.com/calvados/Cisco-IOS-XR-sysadmin-time-of-day-timezone	2019-04-15	
http://cisco.com/ns/yang/Cisco-IOS-XR-Ethernet-SPAN-act	2021-03-22	
http://cisco.com/ns/yang/Cisco-IOS-XR-Ethernet-SPAN-cfg	2021-12-30	
http://cisco.com/ns/yang/Cisco-IOS-XR-Ethernet-SPAN-datatypes	2021-10-06	
http://cisco.com/ns/yang/Cisco-IOS-XR-aaa-diameter-oper	2021-10-08	
http://cisco.com/ns/yang/Cisco-IOS-XR-aaa-lib-cfg	2020-10-22	
...		
http://openconfig.net/yang/acl	2021-06-16	*
http://openconfig.net/yang/aft	2017-05-10	
http://openconfig.net/yang/aft/ni	2017-01-13	
http://openconfig.net/yang/alarms	2019-07-09	
http://openconfig.net/yang/alarms/types	2018-01-16	
http://openconfig.net/yang/bfd	2021-06-16	
http://openconfig.net/yang/bgp-policy	2022-05-24	*
http://openconfig.net/yang/bgp-types	2021-08-06	

# Essential Router Commands - Output

```
RP/0/RP1/CPU0:Ravello-51#yang-describe operational show interfaces fourHundredGigE 0/0/1/12
Thu Jan 26 15:21:21.411 CET
```

YANG Paths:

```
Cisco-IOS-XR-pfi-im-cmd-oper:interfaces/interface-xr/interface
```



# Essential Router Commands - Output

```
RP/0/RP1/CPU0:Ravello-51#show yang operational controller-optics-oper:optics-oper optics-ports optics-port optics-info JSON
Thu Jan 26 15:19:17.184 CET
```

```
{
  "Cisco-IOS-XR-controller-optics-oper:optics-oper": {
    "optics-ports": {
      "optics-port": [
        {
          "name": "Optics0/0/0/0",
          "optics-info": {
            "transport-admin-state": "tas-ui-is",
            "optics-present": false,
            "optics-type": "optics-unknown",
            "derived-optics-type": "Unavailable",
            "dwdm-carrier-band": "c-band",
            "grey-wavelength": 0,
            "rx-low-threshold": 0,
            "rx-high-threshold": 0,
            "lbc-high-threshold": 0,
            "tx-low-threshold": 0,
            "tx-high-threshold": 0,
            "lbc-th-high-default": 0,
            "lbc-th-low-default": 0,
            "temp-low-threshold": 0,
            "temp-high-threshold": 0,
            "volt-low-threshold": 0,
            "volt-high-threshold": 0,
            "pm-enable": 0,
            "laser-state": "off",
            "controller-state": "optics-state-down",
            "phy-type": "invalid",
            "optics-alarm-info": {
              "high-rx-power": {
                "is-detected": false
              }
            },
            ...
          }
        }
      ]
    }
  }
}
```

# Essential Router Commands - Output

```
run mdt_exec -s Cisco-IOS-XR-controller-optics-oper:optics-oper/optics-ports/optics-port/optics-info -c 3000
Thu Jan 26 15:24:29.960 CET
Enter any key to exit...
  Sub_id 200000001, flag 0, len 0

{"node_id_str":"Ravello-51","subscription_id_str":"app_TEST_200000001","encoding_path":"Cisco-IOS-XR-controller-optics-oper:optics-oper/optics-ports/optics-port/optics-info","collection_id":"175548","collection_start_time":"1674743004225","msg_timestamp":"1674743012124","data_json":[{"timestamp":"1674743010645","keys":[{"name":"Optics0/0/0/30"}],"content":{"transport-admin-state":"tas-ui-is","optics-present":false,"optics-type":"optics-unknown","derived-optics-type":"Unavailable","dwdm-carrier-band":"c-band","grey-wavelength":0,"rx-low-threshold":0,"rx-high-threshold":0,"lbc-high-threshold":0,"tx-low-threshold":0,"tx-high-threshold":0,"lbc-th-high-default":0,"lbc-th-low-default":0,"temp-low-threshold":0,"temp-high-threshold":0,"volt-low-threshold":0,"volt-high-threshold":0,"pm-enable":0,"laser-state":"off","controller-state":"optics-state-down","phy-type":"invalid","optics-alarm-info":{"high-rx-power":{"is-detected":false},"low-rx-power":{"is-detected":false},"high-tx-power":{"is-detected":false},"low-tx-power":{"is-detected":false},"high-lbc":{"is-detected":false},"low-temperature":{"is-detected":false},"high-temperature":{"is-detected":false},"low-voltage":{"is-detected":false},"high-voltage":{"is-detected":false},"high-rx0-power":{"is-detected":false},"high-rx1-power":{"is-detected":false},"high-rx2-power":{"is-detected":false},"high-rx3-power":{"is-detected":false},"high-rx4-power":{"is-detected":false},"high-rx5-power":{"is-detected":false},"high-rx6-power":{"is-detected":false},"high-rx7-power":{"is-detected":false},"high-rx8-power":{"is-detected":false},"low-rx0-power":{"is-detected":false},"low-rx1-power":{"is-detected":false},"low-rx2-power":{"is-detected":false},"low-rx3-power":{"is-detected":false},"low-rx4-power":{"is-detected":false},"low-rx5-power":{"is-detected":false},"low-rx6-power":{"is-detected":false},"low-rx7-power":{"is-detected":false},"low-rx8-power":{"is-detected":false},"high-tx0-power":{"is-detected":false},"high-tx1-power":{"is-detected":false},"high-tx2-power":{"is-detected":false},"high-tx3-power":{"is-detected":false},"high-tx4-power":{"is-detected":false},"high-tx5-power":{"is-detected":false},"high-tx6-power":{"is-detected":false},"high-tx7-power":{"is-detected":false},"high-tx8-power":{"is-detected":false},"low-tx0-power":{"is-detected":false},"low-tx1-power":{"is-detected":false},"low-tx2-power":{"is-detected":false},"low-tx3-power":...
```

# Telemetry Configuration Verification - Output

```
RP/0/RP1/CPU0:Ravello-51#show telemetry model-driven summary
Thu Jan 26 15:33:21.969 CET
Subscriptions      Total:    6      Active:    6      Paused:    0
Destination Groups Total:    7
Destinations      grpc-tls:  0  grpc-nontls: 5      tcp:    4      udp:    0
                  dialin:  4      Active:  9      Sessions: 9      Connecting: 0
Sensor Groups      Total:    7
Num of Unique Sensor Paths :    7
Sensor Paths       Total:    7      Active:    7 Not Resolved: 0
Max Sensor Paths   : 1000
Max Containers per path :    16
Minimum target defined cadence : 30000
Target Defined cadence factor :    2
```

# Telemetry Configuration Verification - Output

```
RP/0/RP1/CPU0:Ravello-51#show telemetry model-driven subscription
```

```
Thu Jan 26 15:35:15.347 CET
```

```
Subscription: green State: ACTIVE
```

```
-----
```

```
Sensor groups:
```

Id	Interval(ms)	State
green-envmon	6000	Resolved

```
Destination Groups:
```

Id	Encoding	Transport	State	Port	Vrf	IP
green	self-describing-gpb	grpc	Active	57500		10.58.239.170
TLS : False						

```
Subscription: GNMI__9264461703627440687 State: ACTIVE
```

```
-----
```

```
Sensor groups:
```

Id	Interval(ms)	State
GNMI__9264461703627440687_0	120000	Resolved

```
Destination Groups:
```

Id	Encoding	Transport	State	Port	Vrf	IP
GNMI_1105	gnmi-proto	dialin	Active	57504		10.58.25.218
TLS : False						

# Telemetry Configuration Verification - Output

```
RP/0/RP1/CPU0:Ravello-51#show telemetry model-driven destination
```

```
Thu Jan 26 15:38:34.612 CET
```

Group Id	Sub	IP	Port	Encoding	Transport	State
green	green	10.58.239.170	57500	self-describing-gpb	grpc	Active

```
TLS: False
```

```
Collection statistics:
```

```
Maximum tokens           : 4000
Event tokens              : 750
Cadence tokens            : 633
Token processed at        : 2023-01-26 15:26:47.594969 +0100
Cadence token advertised at : 2023-01-26 15:26:47.596091 +0100
Event token advertised at  : 2023-01-26 15:26:47.595005 +0100
GNMI initial synchronization time:
Pending queue size        : 0
Pending queue memory size (bytes): 0
Processed events           : 0
Collection tokens          : 633
```

# Telemetry Configuration Verification - Output

```
RP/0/RP1/CPU0:Ravello-51#show grpc status
Thu Jan 26 15:57:41.915 CET
*****show gRPC status*****
-----
transport                :      grpc
access-family             :      tcp4
TLS                       :      disabled
trustpoint                :      NotSet
listening-port            :      57400
local-connection          :      disabled
max-request-per-user      :      32
max-request-total         :      256
max-streams               :      128
max-streams-per-user      :      128
vrf-socket-ns-path        :      global-vrf
min-client-keepalive-interval :    300
*****End of showing status*****
```

# Telemetry Configuration Verification - Output

```
RP/0/RP1/CPU0:Ravello-51#show grpc streams
Thu Jan 26 15:59:42.066 CET
```

```
Streaming gRPCs: 4
```

```
10.58.250.12:35510
```

```
User       : demo
Request-ID  : 6
Type       : gNMI
Created    : 2023-01-16T20:05:02.982087+01:00
Duration   : 849280s
```

```
10.58.25.218:57504
```

```
User       : crosswork
Request-ID  : 99
Type       : gNMI
Created    : 2023-01-25T15:36:43.443724+01:00
Duration   : 87779s
```

```
10.58.25.218:57504
```

```
User       : crosswork
Request-ID  : 100
Type       : gNMI
Created    : 2023-01-25T15:37:02.212714+01:00
Duration   : 87760s
```

```
10.58.250.16:58946
```

```
User       : crosswork
Request-ID  : 101
Type       : gNMI
Created    : 2023-01-25T20:22:36.596251+01:00
Duration   : 70626s
```

# gNMIc – gNMI CLI Client – Output

```
gnmic --address 10.58.244.51:57400 --insecure --username demo --password demol23 capabilities
```

```
gNMI version: 0.7.0
```

```
supported models:
```

- Cisco-IOS-XR-ncs5500-qos-oper, Cisco Systems, Inc., 2019-08-24
- Cisco-IOS-XR-ncs5500-qos-oper-sub2, Cisco Systems, Inc., 2019-08-24
- Cisco-IOS-XR-ncs5500-qos-oper-sub1, Cisco Systems, Inc., 2019-08-24
- Cisco-IOS-XR-um-nsr-cfg, Cisco Systems, Inc., 2020-03-23
- Cisco-IOS-XR-ipv4-bgp-act, Cisco Systems, Inc., 2020-06-15
- Cisco-IOS-XR-pim-oper, Cisco Systems, Inc., 2022-02-09
- Cisco-IOS-XR-pim-oper-sub2, Cisco Systems, Inc., 2022-02-09
- Cisco-IOS-XR-pim-oper-sub1, Cisco Systems, Inc., 2022-02-09
- Cisco-IOS-XR-qos-ma-oper, Cisco Systems, Inc., 2020-07-27
- Cisco-IOS-XR-ownership-act, Cisco Systems, Inc., 2021-11-25
- Cisco-IOS-XR-interface-cem-cfg, Cisco Systems, Inc., 2021-08-18
- Cisco-IOS-XR-um-cont-wanphy-cfg, Cisco Systems, Inc., 2022-06-01
- Cisco-IOS-XR-um-config-hostname-cfg, Cisco Systems, Inc., 2020-12-14
- Cisco-IOS-XR-attestation-agent-cfg, Cisco Systems, Inc., 2019-04-05
- Cisco-IOS-XR-um-ipv6-nd-cfg, Cisco Systems, Inc., 2022-03-11
- ...
- cisco-xr-openconfig-terminal-device-deviations, Cisco Systems, Inc., 2022-05-19
- Cisco-IOS-XR-sysadmin-tacacs-show-tacacs, Cisco Systems, Inc., 2019-04-15
- Cisco-IOS-XR-sysadmin-fpd-infra-cli-fpd-service, Cisco Systems, Inc., 2019-04-15

```
supported encodings:
```

- JSON\_IETF
- ASCII
- PROTO



# gNMlc – gNMI CLI Client – Output

```
gnmic -a 10.58.244.92:57400 -u demo -p demo123 --insecure --timeout 1m --encoding JSON_IETF get --path 'Cisco-IOS-XR-infra-xtc-agent-oper:xtc/policies/policy'
[
  {
    "source": "10.58.244.92:57400",
    "timestamp": 1674768678526258334,
    "time": "2023-01-26T22:31:18.526258334+01:00",
    "updates": [
      {
        "Path": "Cisco-IOS-XR-infra-xtc-agent-oper:xtc/policies/policy[id=1]",
        "values": {
          "xtc/policies/policy": {
            "administrative-up": 1,
            "binding-sid": {
              "is-fallback-dynamic": false,
              "is-within-pfp-range": true,
              "is-within-srlb-range": false,
              "value": {
                "label": 26115,
                "sid-type": "mpls"
              }
            }
          },
          ...
        }
      }
    ]
  }
]
```

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