

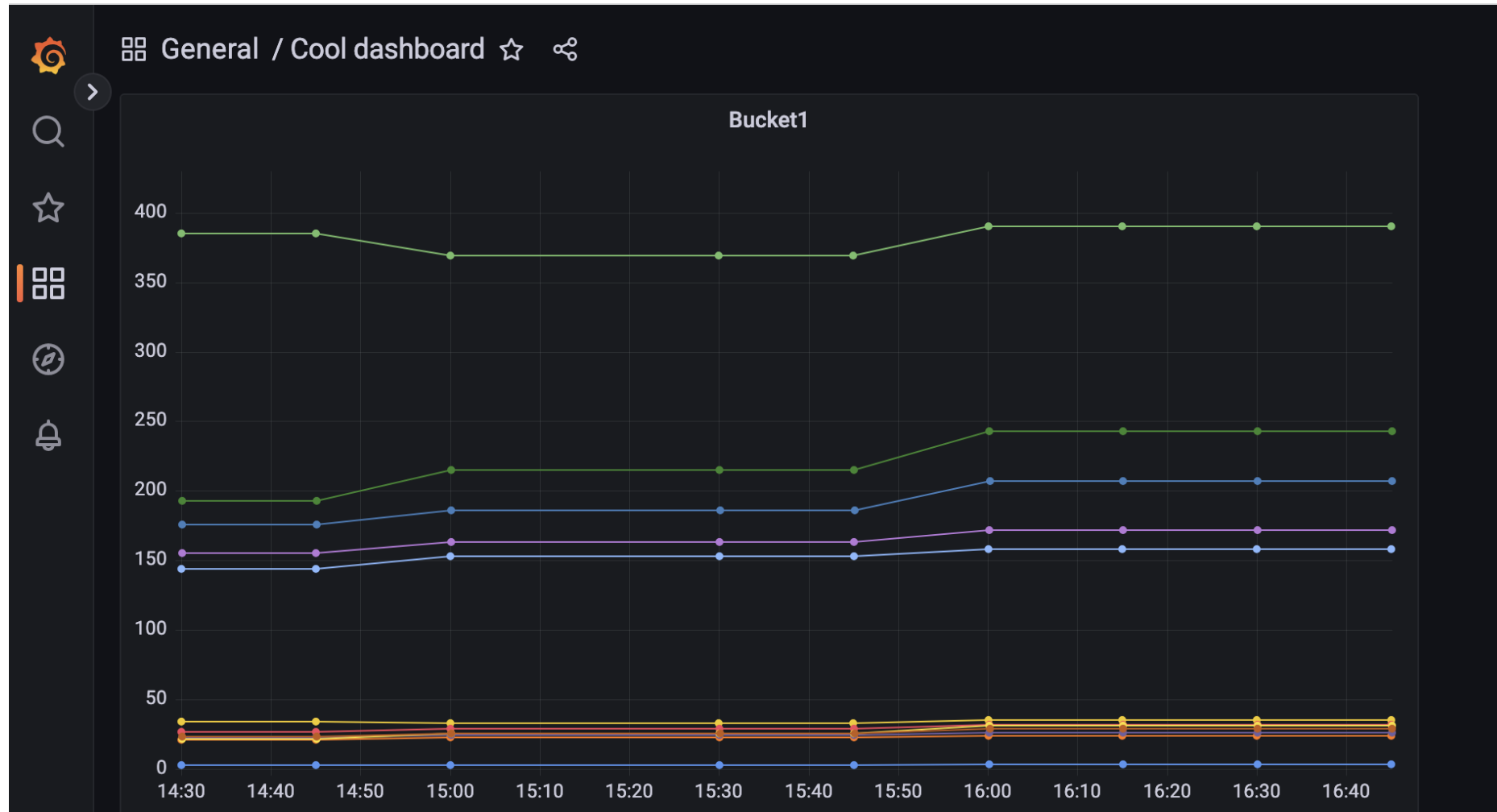
YANG-based Time Series Telemetry

March 2024, IETF 119

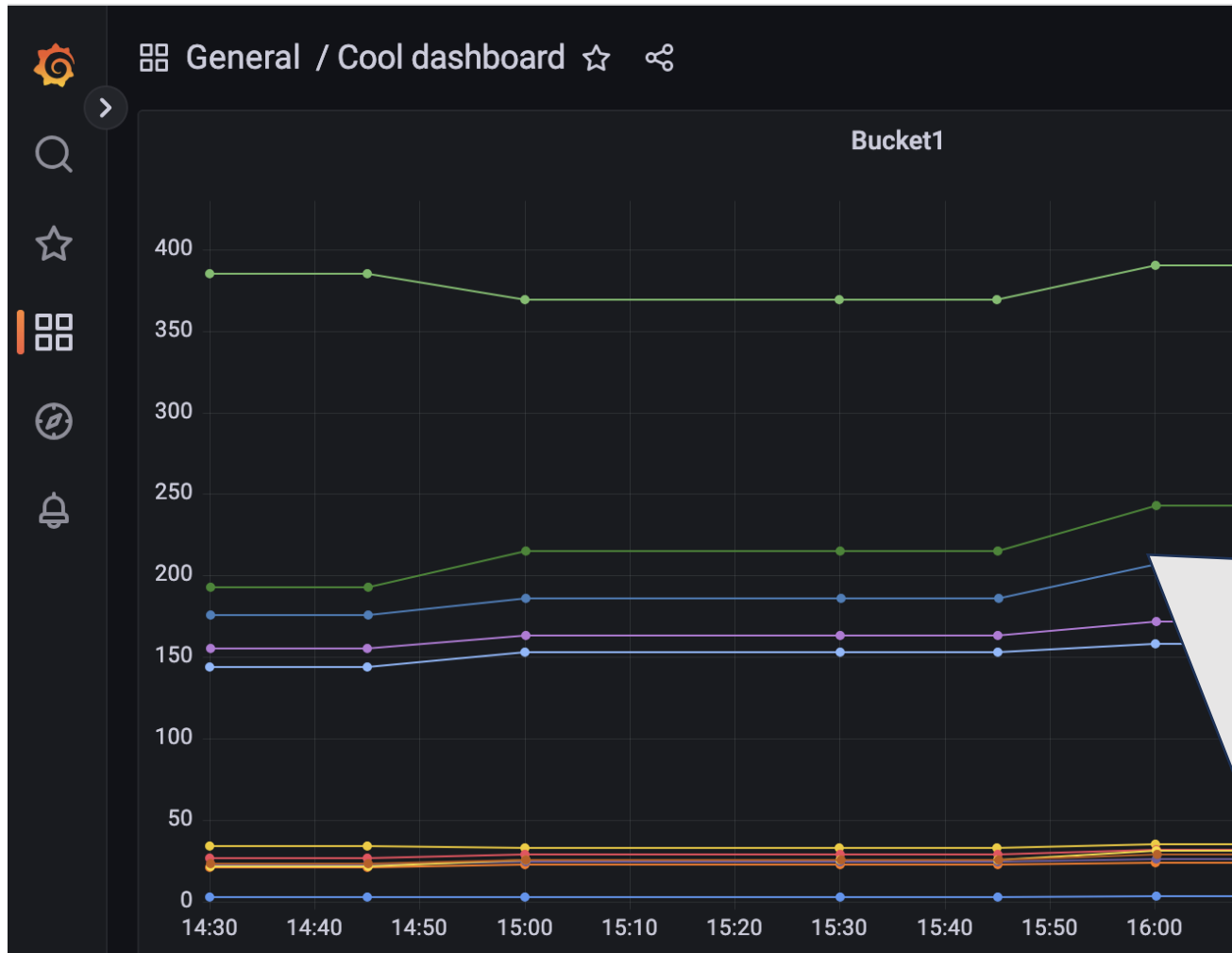
POWEFF-team

Jan Lindblad <jlindbla@cisco.com>

YANG-based Time Series Telem



YANG-based Time Series Telem



? Really Nice Graphs

- What is included?
- Traceability?
- Measurement Units?
- Precision?

Compare numbers and graphs?
Between systems? Vendors?

Use as input for real decisions?

Philatelist Framework

AGGREGATOR

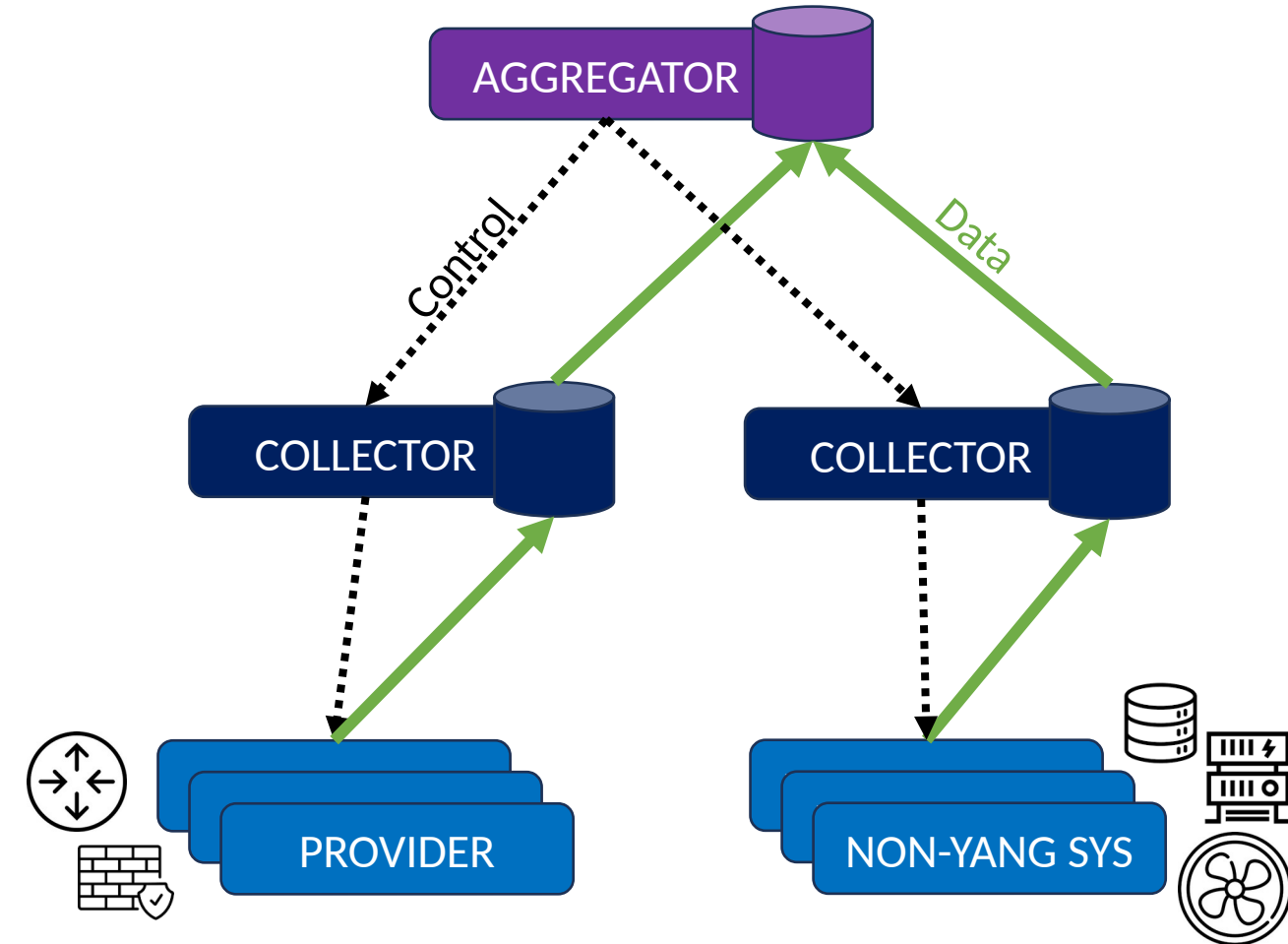
- Transform and aggregate data flows
- Deliver TSDB buckets with traceable, vendor agnostic, well defined data

COLLECTOR

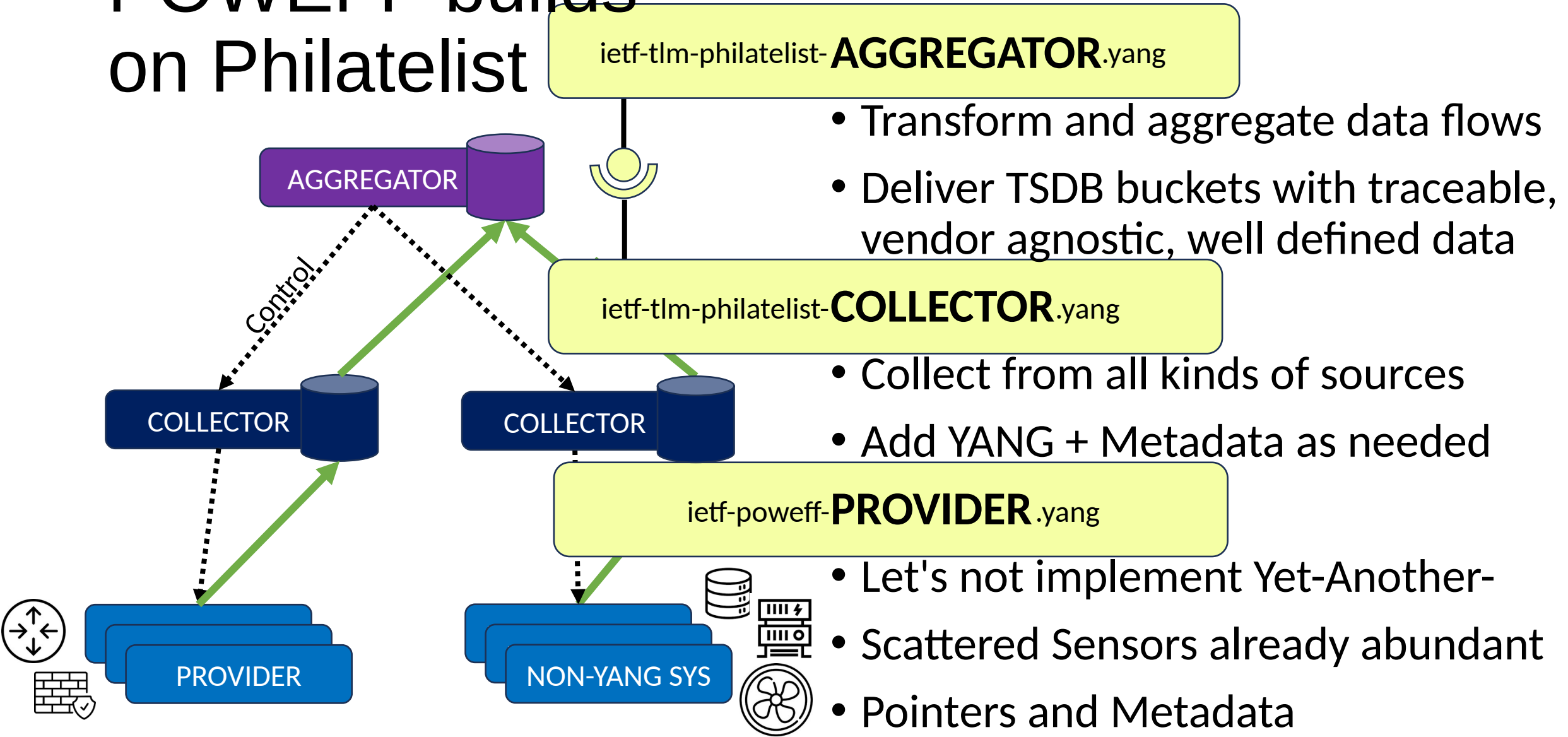
- Collect from all kinds of sources
- Add YANG + Metadata as needed

PROVIDER

- Let's not implement Yet-Another-
- Scattered Sensors already abundant
- Pointers and Metadata



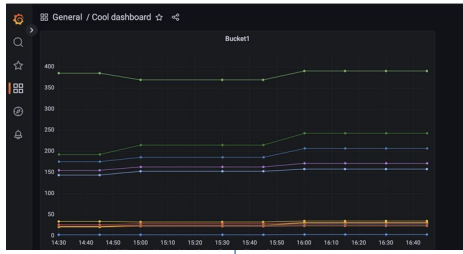
POWEFF builds on Philatelist



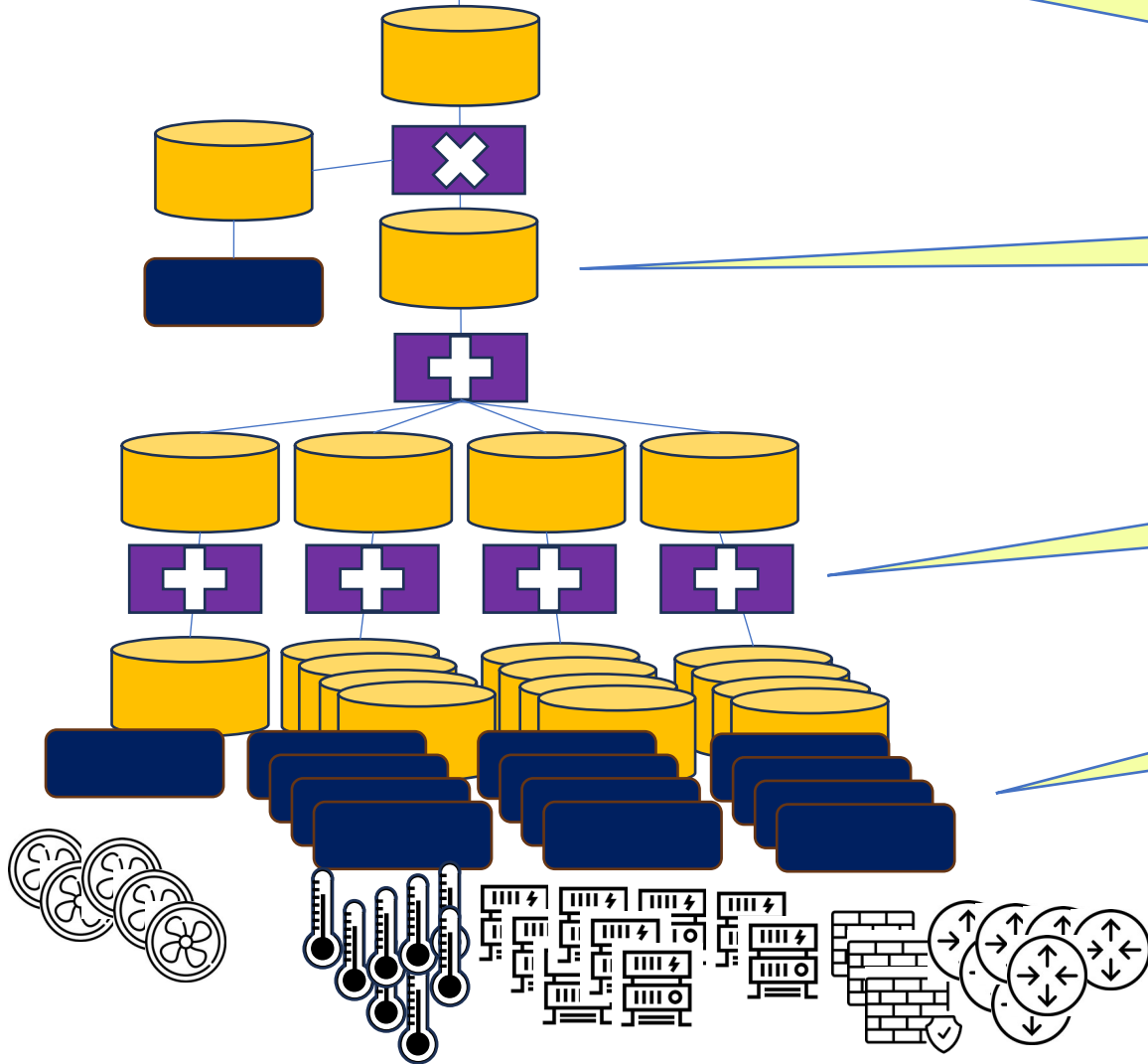
- Transform and aggregate data flows
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- Let's not implement Yet-Another-
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Collection (Xmas-)Tree



Dashboard (and YANG API) on top

Time-Series Database Bucket

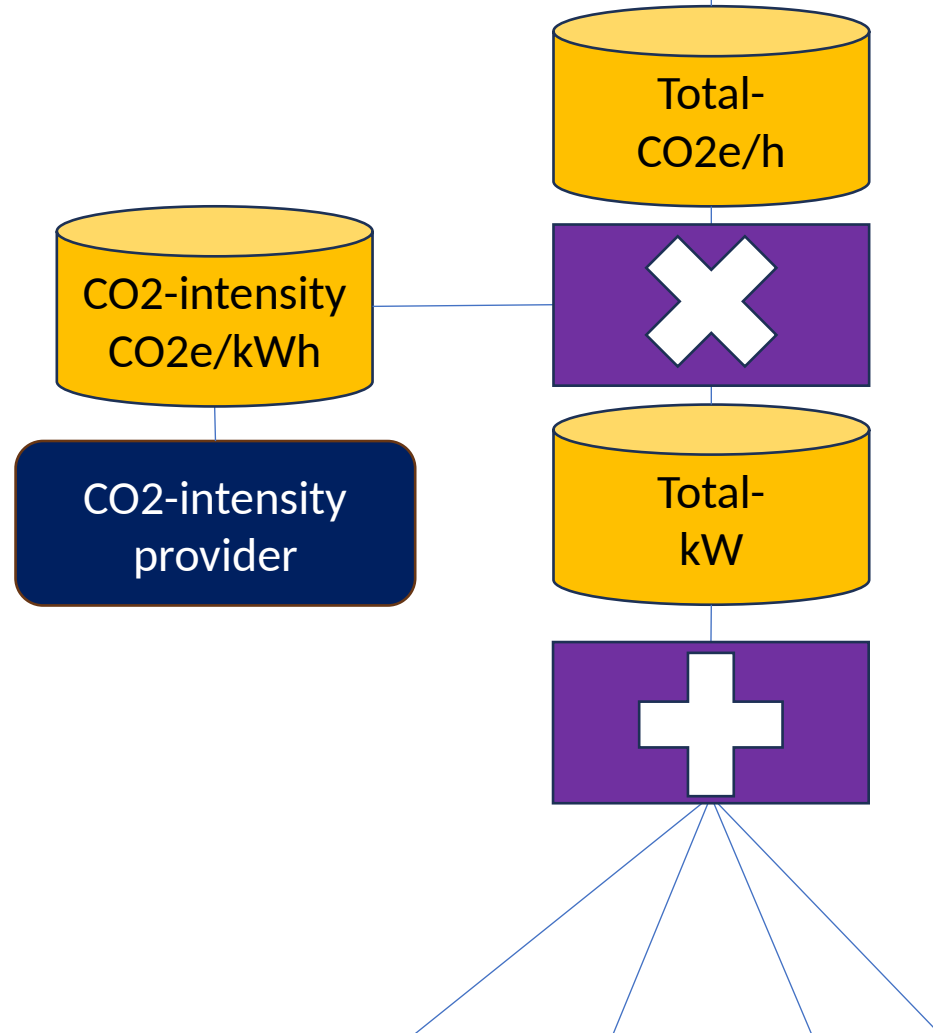
User visible-configuration,
tying it all together

User visible-configuration,
for collection processes

Existing devices of every kind,
with varying interfaces



Series: Total CO2e/h
 Scope: Network, Compute, Building, Cooling
 Only OPEX included (no embedded C)
 Precision: ±18%



```
tlm-flow Top-co2e/h {
  output destination Total-CO2e/h
  output units CO2e/h
  middle inputs [ Total-kW CO2-intensity ]
  middle operation linear-multiply
}
```

```
tlm-flow Network+Compute+Building+Cooling {
  output destination Total-kW
  output units kW
  middle inputs [ Network, Compute,
    Building, Cooling ]
  middle operation linear-sum
}
```



Series: Total CO2e/h
 Scope: Network, Compute, Building, Cooling
 Only OPEX included (no embedded C)
 Precision: ±18%

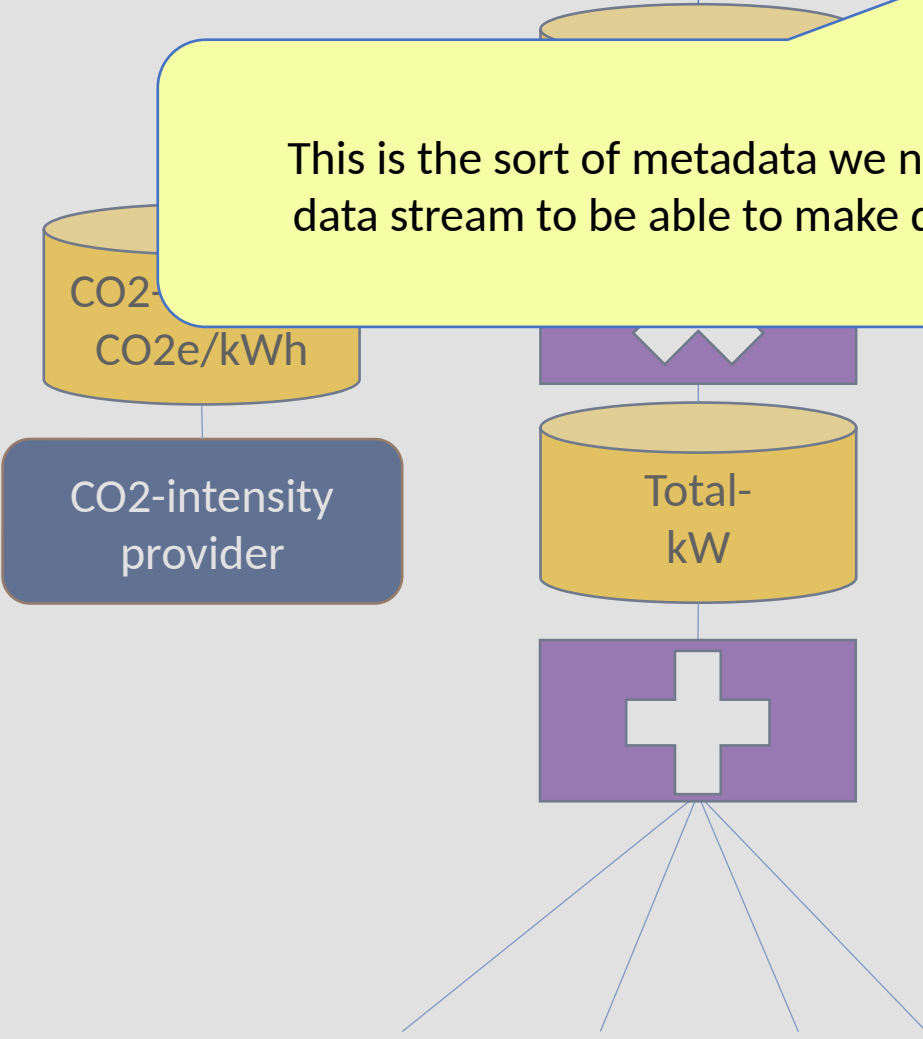
This is the sort of metadata we need for a data stream to be able to make decisions.

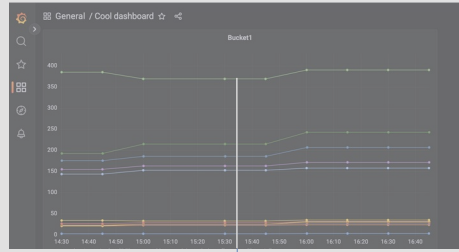
```

tlm-flow Top-co2e/h {
  output destination Total-CO2e/h
  output units CO2e/h
  middle inputs [ Total-kW CO2-intensity ]
  middle operation linear-multiply
}
  
```

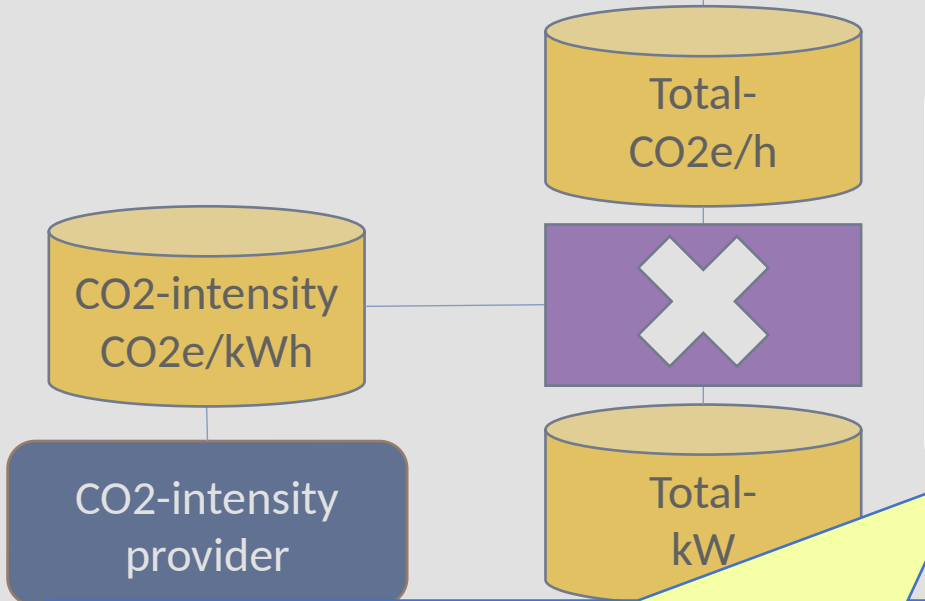
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tlm-flow Network+Compute+Building+Cooling {
  output destination Total-kW
  output units kW
  middle inputs [ Network, Compute,
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  middle operation linear-sum
}
  
```





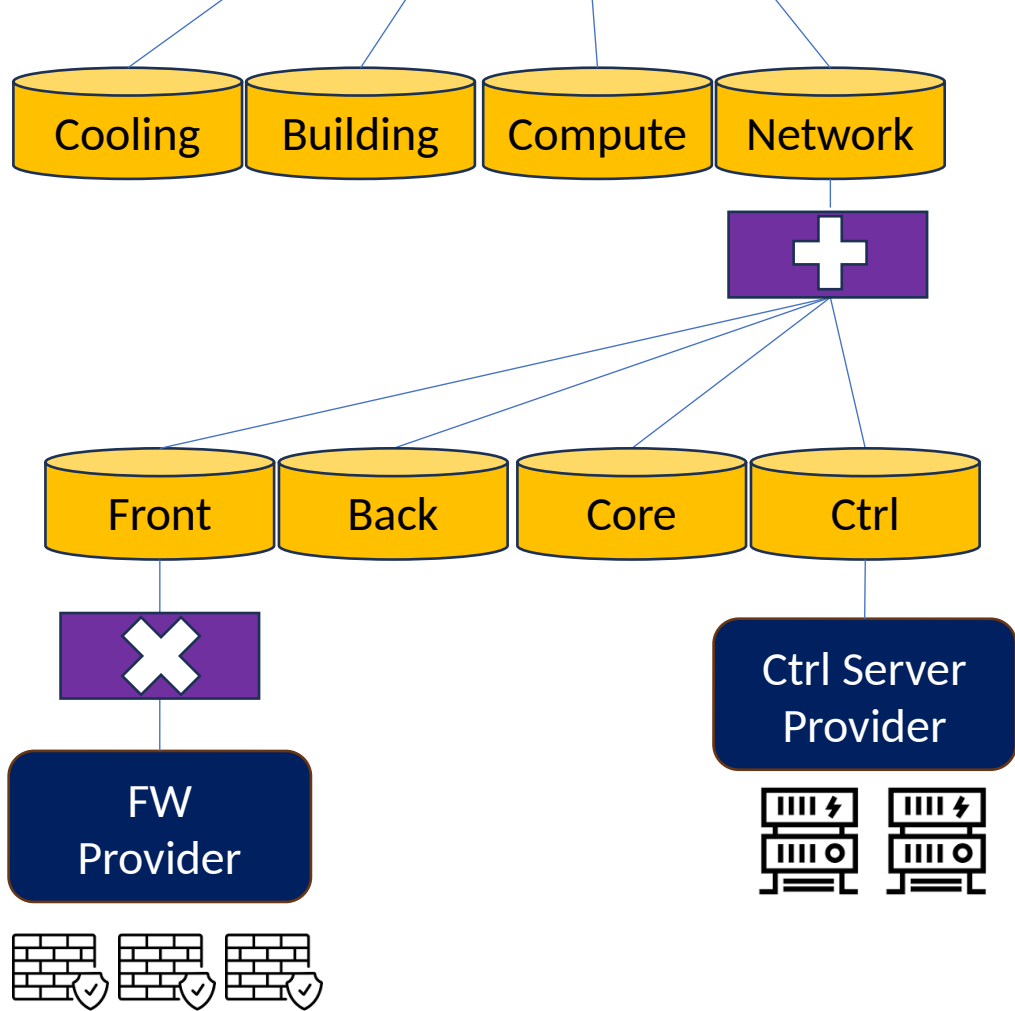
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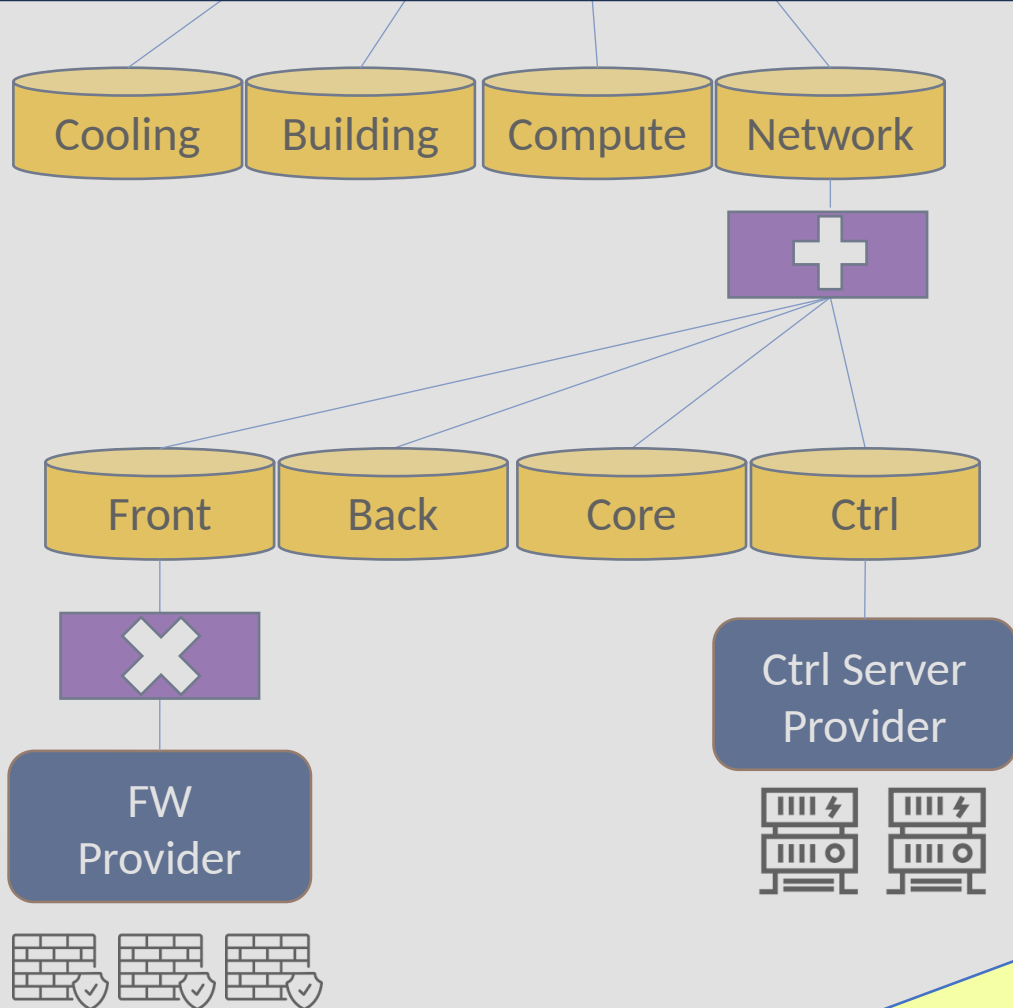
```
tlm-flow Top-co2e/h {
  output destination Total-CO2e/h
  output units CO2e/h
  middle inputs [ Total-kW CO2-intensity ]
  middle operation Linear-multiply
}
```

The aggregation & collection tree is built by user visible configuration on the controller level.

```
tlm-flow Network+Compute+Building+Cooling {
  output destination Total-kW
  output units kW
  middle inputs [ Network, Compute,
    Building, Cooling ]
  middle operation linear-sum
}
```



```
tlm-stream Network-Controller-Server {
  source [ 2001::0368, 2001::0369 ]
  sensor-group [ Ctrl-Power, Ctrl-Load,
                 Service-List ]
  destination Ctrl
}
sensor-group Ctrl-Power {
  redfish-polling 15min
  path [ /redfish/v1/Chassis/0/power ]
}
sensor-group Ctrl-Load {
  snmp-polling 5min
  path [ .1.3.6.1.4.1.2021.10.1.3.2 ]
}
sensor-group Service-List {
  restconf-yang-push-subscription
  path [ /l3vpn-svc/vpn-services/vpn-id ]
}
```



```

tlm-stream Network-Controller-Server {
  source [ 2001::0368, 2001::0369 ]
  sensor-group [ Ctrl-Power, Ctrl-Load,
                Service-List ]
  destination Ctrl
}

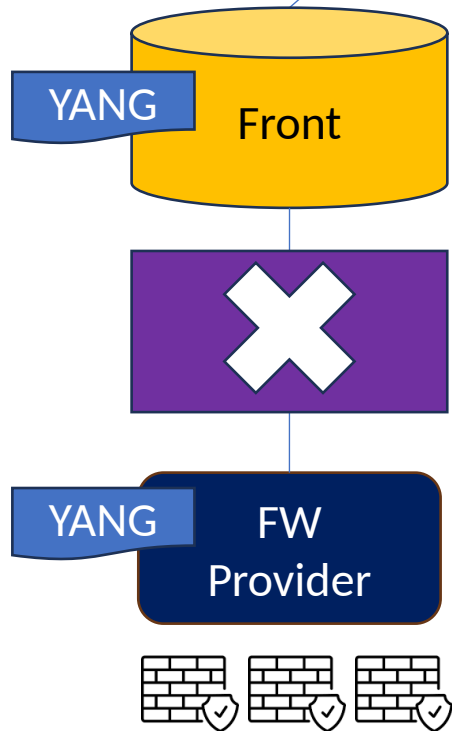
sensor-group Ctrl-Power {
  redfish-polling 15min
  path [ /redfish/v1/Chassis/0/power ]
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sensor-group Ctrl-Load {
  snmp-polling 5min
  path [ .1.3.6.1.4.1.2021.10.1.3.2 ]
}

sensor-group Service-List {
  restconf-yang-push-subscription
  path [ /l3vpn-svc/vpn-services/vpn-id ]
}

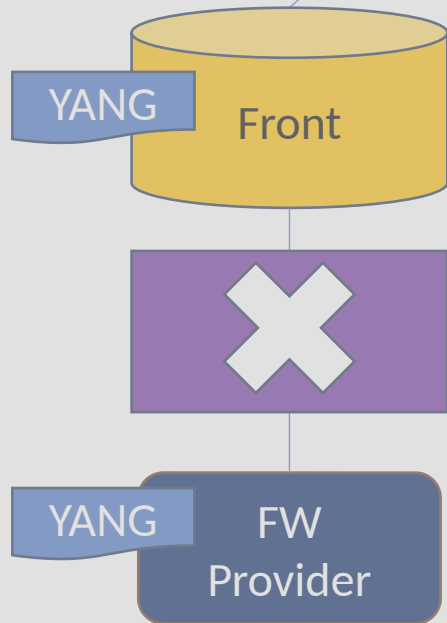
```

Providers use configuration to know what data to collect, and how, for a class of devices. Device experts need to supply this information.



```
tlm-flow FW-Correction {  
  output destination Front  
  output units kW  
  middle inputs [ FW-Power, FW-Load,  
                 FW-LoadFactor ]  
  middle operation Apply-LoadCorrectionFactor  
}
```

```
tlm-stream Network-FW {  
  source [ 2001::2000/120 ]  
  sensor-group [ FW-Power, FW-Load ]  
  destination Front  
}  
sensor-group FW-Power {  
  gnmi-polling 5min  
  path [ /vendor-x/psu/current  
         /vendor-x/psu/voltage ]  
}  
sensor-group FW-LoadFactor {  
  file vendor-x-load-to-power-correction.csv  
  path [ ApparentPower ActualPower ]  
}
```



```
tlm-flow FW-Correction {
  output destination Front
  output units kW
  middle inputs [ FW-Power, FW-Load,
                  FW-LoadFactor ]
  middle operation Apply-LoadCorrectionFactor
}
```

```
tlm-stream Network-FW {
  source [ 2001::2000/120 ]
  sensor-group [ FW-Power, FW-Load ]
  destination Front
}
sensor-group FW-Power {
  gnmi-polling 5min
  path [ /vendor-x/psu/current
         /vendor-x/psu/voltage ]
}
```

```
sensor-group FW-LoadFactor {
  file vendor-x-load-to-power-correction.csv
  path [ ApparentPower ActualPower ]
}
```

Some of the data is collected in (near) real-time, some may be fetched from files, or external sources. Varies by device type.

YANG to Time Series Database Mapping

Original YANG Instance-Identifier:

`/interfaces/interface[name='eth0']/statistics/in-unicast-pkts`

- Metric: `interfaces_interface_statistics_in_unicast_pkts`
- Value: 5432100
- Labels:
 - `host = router-01`
 - `interfaces_interface_name = eth0`

Handling Old and New Devices in Parallel

Controller strategy (existing devices)

- Work with existing devices
 - No time to wait for standards to develop, then deploy in field
- Add metadata
 - Device experts need to describe device data flows to controllers
- Reduce power draw on existing devices
 - Typically requires detailed knowledge about use case, device behavior

Device strategy (new devices)

- Develop standard ways to read power data from devices
 - Ways that include the metadata from day one
- Develop standard ways to control power draw in given use cases
 - Ways that describe the reduction in expectations, i.e. intent
- Implement, deploy

Thank you