A YANG Data Model for Energy Saving Management

draft-cwbgp-green-energy-saving-management-01

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on behalf of Authors Team (Qin Wu, Gen Chen, Mohamed Boucadair, Oscar Gonzalez de Dios, Carlos Pignataro)

Why This Document in GREEN WG?

The Working Group will concentrate on the following:

- ..
- **Developing YANG models to enable measuring and reporting of energy usage through metrics and attributes at component, device, and network levels.**
- **Providing YANG models to allow operators to optimize energy usage in network components, devices, and across the network, via configurable energy efficiency capabilities.**
- ...

Work Items

The GREEN Working Group will initially focus on the following deliverables:

…

- Standard Track definitions of ***YANG data models at the component level, device level, and network level for energy-efficient network management*** including energy usage monitoring and energy consumption management.

Excerpt from the GREEN WG Charter

Background and Recap

- Network operator Requirements**:** Seeking for automation tools and solutions to better assess and control the energy consumption of networks, devices, and devices/components across their networks.
  - Power Consumption monitoring on devices is not sufficient since
    - Monitoring only tell you how much power are consumed at specific device.
    - But doesn’t tell you when where to consume such power, why consume so much power and how to save the power.

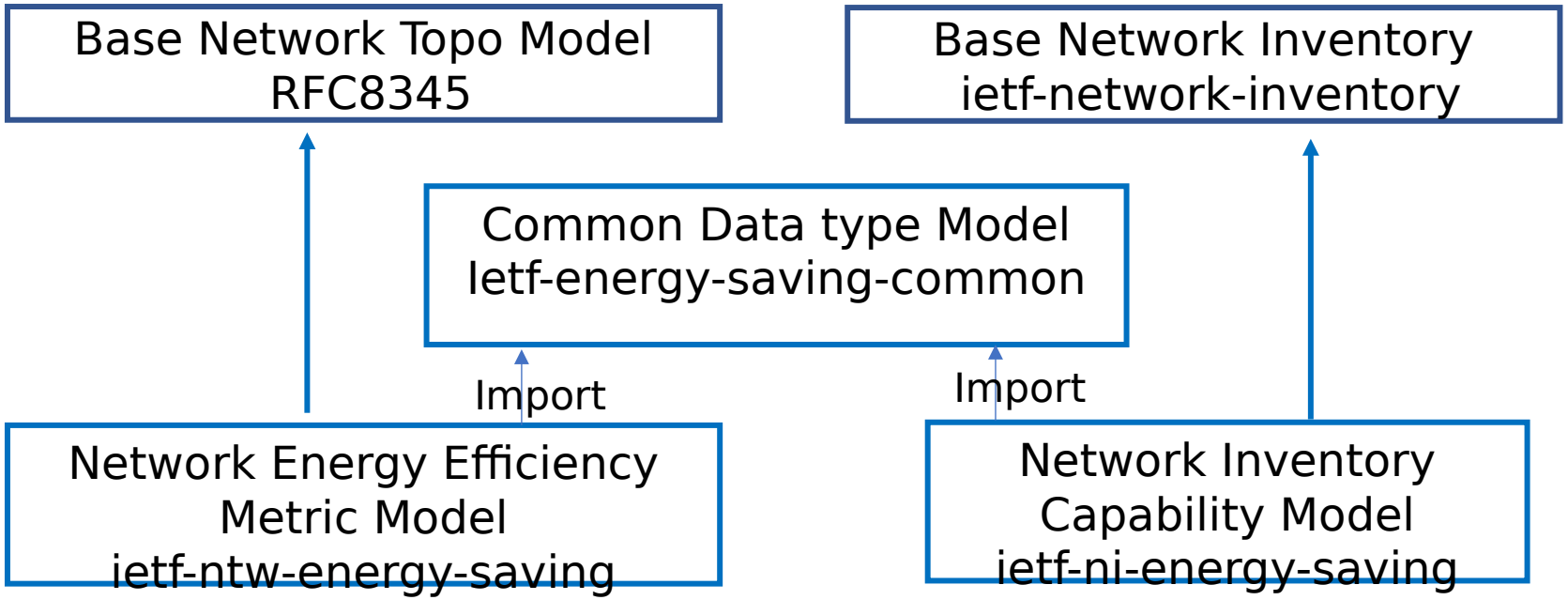
- Technology trend**:** Moving from power consumption monitoring toward energy efficiency observability and management

- The goal of this document is to define a ***Network Level YANG model***:
  - Global visibility to network topology data, capability inventory data, power data, energy data
    - Capability Discovery
    - Energy Consumption/Energy Efficiency Metric Monitoring
  - Allow optimizing energy use on network devices based on capability while improving the overall network utilization

Focused Use Cases and Requirements

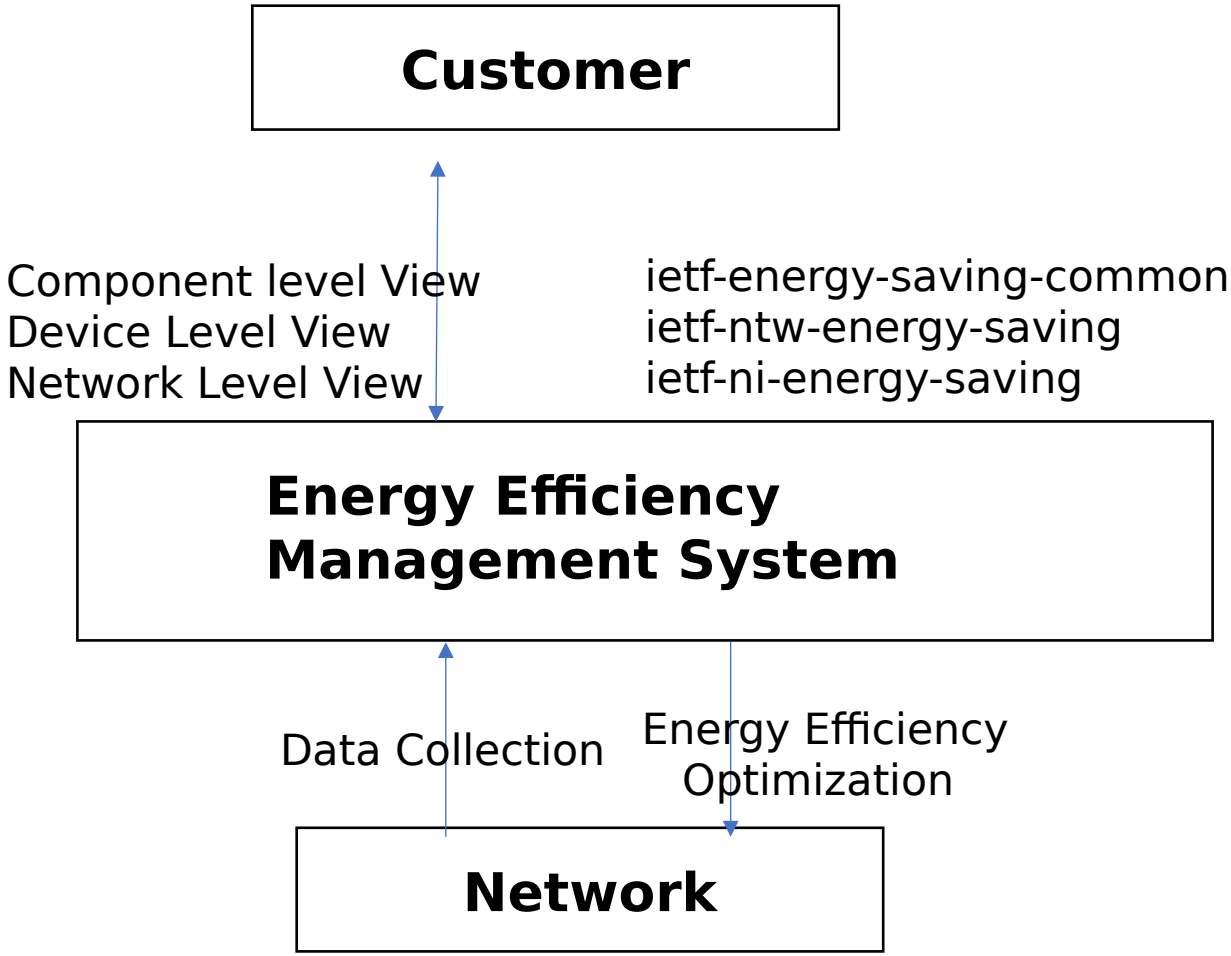
- **The focus** of targeted devices or device components are the ones consuming most of energy
  - E.g., pure network element in mobile network or fixed network
  - Hybrid scenario such as Power supply(e.g., PDU)+ network elements in data center Network
- Use cases such as
  - Energy consumption per device, per Network
  - Energy efficiency per device, per Network
  - Power usage effectiveness measurement on the whole data center network
- Requirements:
  - Capability Inventory Discovery
  - Power consumption monitoring
  - Energy Efficiency monitoring
  - Energy Efficiency Optimization and Control

Model Design Overview

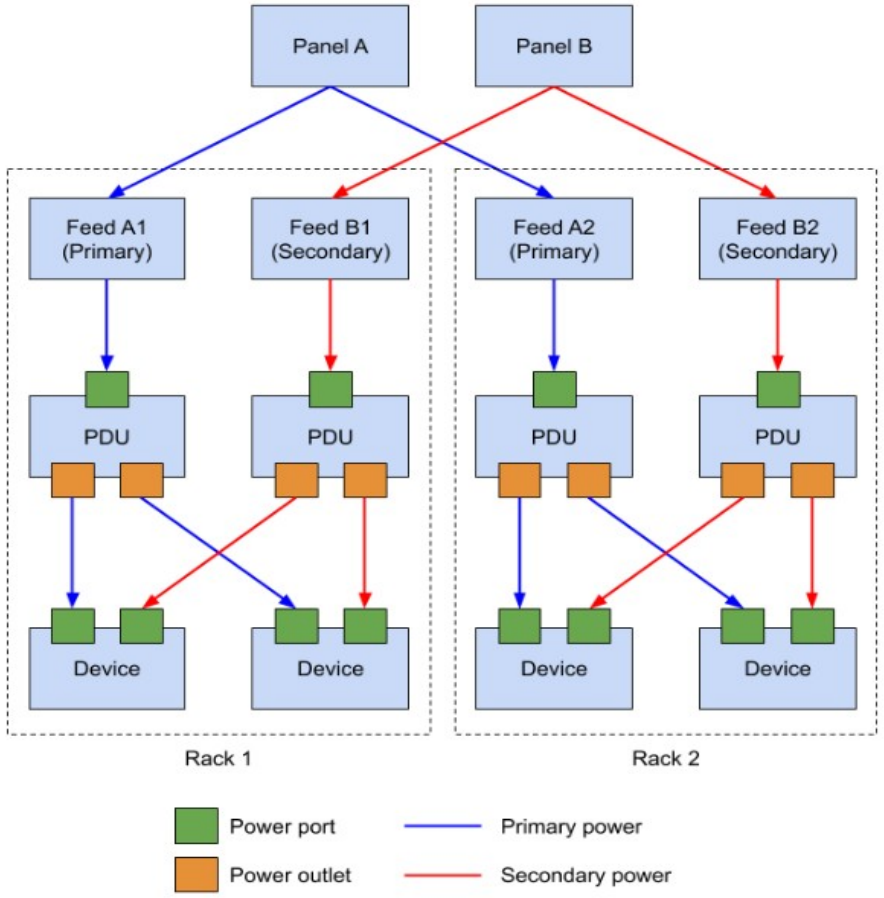


- Network Energy Efficiency Metric Model
  - Energy Consumption Monitoring at the component level, Device Level , Network Level
  - Energy Efficiency Metric Monitoring
  - Optionally support Energy Efficiency Optimization and Control
- Network Inventory Capability Model
  - Capability Inventory Discovery

Solution Overview



Open Issue 1: Power Distribution Units Use Case



- RFC7603 define PDU as:

“

Power Distribution Units (PDUs) can have built-in meters for each socket and can measure the power supplied to each device in an equipment rack. PDUs typically have remote management capabilities that can report and possibly control the power supply of each outlet.

”

The question is that how do we model PDU and Connection between PDU and Network Device?

Proposal:

- Model PDU as device and Model connection between PDU and Network Device as a link in the network topology

Open Issue2: **Distributed control and energy saving optimization**

- Energy Efficiency Optimization and Control allows both local management and network wide management
  - The local management will be used mostly
- Network Wide management is Turn on or off of energy saving capability globally per component based on discovered capabilities
- Local management is referred to dynamic energy saving
  - e.g., shutdown unused linecard and port
  - Or adjust the number of SerDes bus or working network processor cores based on network traffic load change, network condition change
  - Allow resource to be allocated or released when the number of component changes

Next Steps

- Continue to align with terminology draft
- Address issues tickets raised in the github
  - https://github.com/boucadair/draft-cwbgp-energy-saving-management/issues
- Your comments and input are welcome!