

# A YANG Data Model for Energy Saving Management

draft-cwbgp-ivy-energy-saving-management-01

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

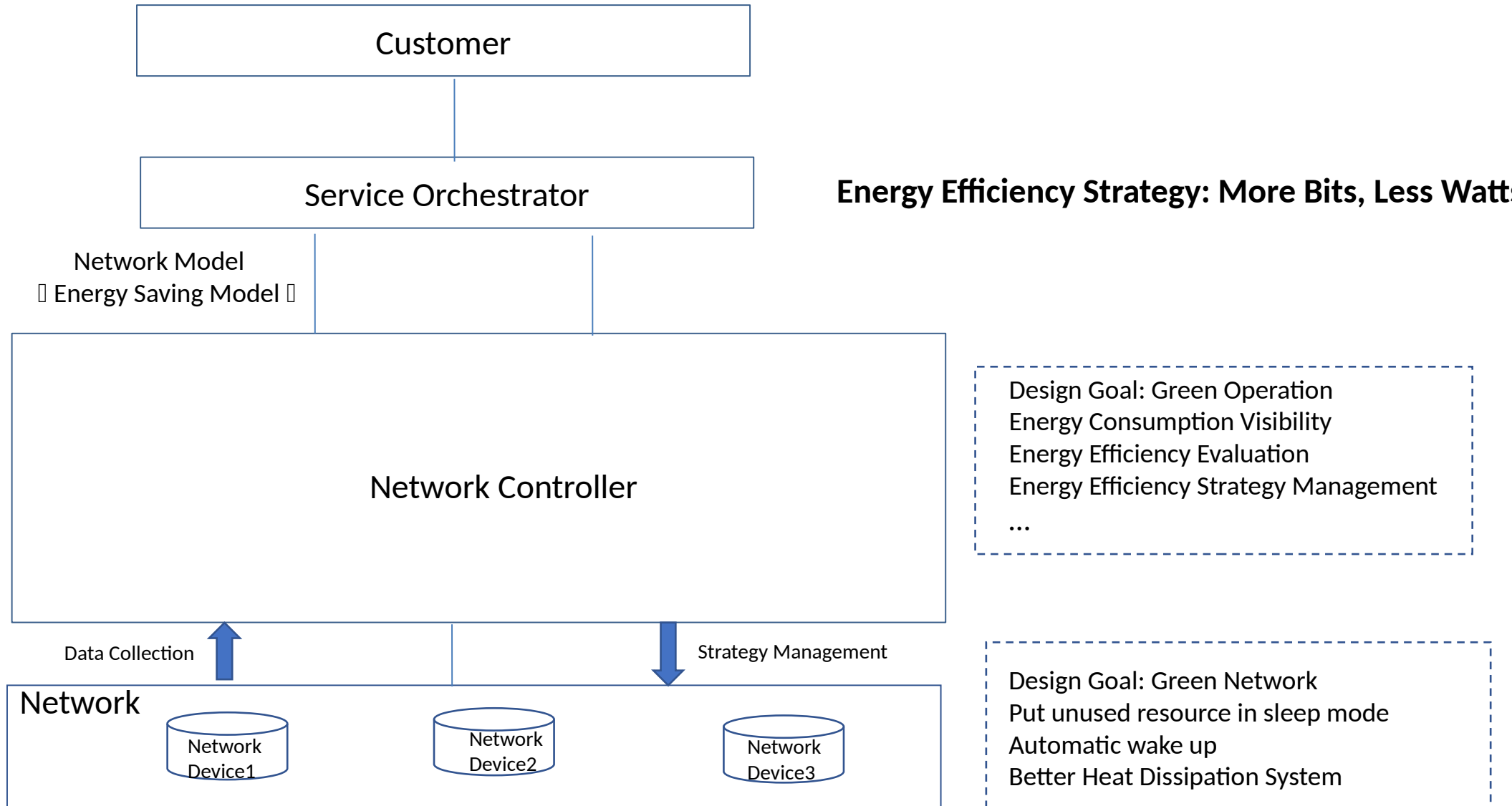
# Motivation and Goal

- Motivation:
  - Ensuring energy efficiency in the operation of network is a quite important as operators are seeking to minimize environment impact in telecommunication infrastructures.
    - Applicable to both device and network levels.
    - Examples: in 'tidal network', various methods to optimize the energy efficiency, etc.
  - No standard mechanism to report and control power usage or energy consumption
- Goal:
  - Define a YANG data model for power and energy management.
    - Investigate energy saving potential
    - Account for the total power received and provided by an entity, a network or a service
    - Predicting an entity's reliability based on power usage
    - etc

# Document Status

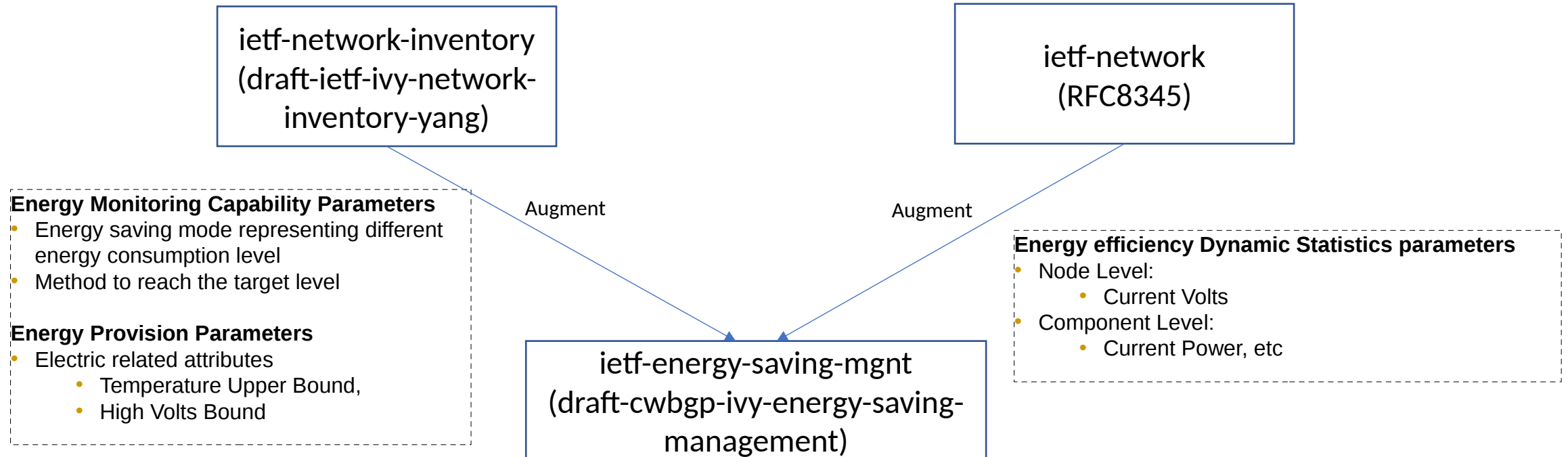
- First presented in IVY WG
- The latest version is v-01, change compared to the previous version:
  - Add reference to RFC6988, RFC7460
  - Add references for various parameters defined in the YANG model
  - Distinct energy saving capabilities from Dynamic power and energy consumption parameters
  - Add correlation with network topology
- Open issues tracked in the github
  - <https://github.com/boucadair/draft-cwbgp-energy-saving-management/issues>

# Sample Energy Saving Model Usage



# Energy Saving Model

## Design



# Data Model Overview

```
augment /nw:networks/nw:network/nw:node:
```

```

+--ro energy-power-consumption {energy-saving}?
|  +--ro total-energy-consumption?  yang:gauge64
|  +--ro saved-energy?              yang:gauge64
|  +--ro eer?                       decimal64
+--rw energy-saving-modes {energy-saving}?
    +--rw energy-saving-mode* [mode]
        +--rw mode                  identityref
        +--rw energy-saving-method* identityref

```

```
augment /ni:network-elements/ni:network-element:
```

```

+--ro energy-management {energy-saving}?
    +--ro energy-monitoring-capability? boolean
    +--rw energy-saving-modes

```

```
module: ietf-energy-saving-mgt
```

```

+--rw component-energy-monitoring
    +--rw energy-consumption
        +--rw average-power?  yang:gauge64
        +--rw saved-power?    yang:gauge64
        +--rw real-power?     yang:gauge64
        +--rw actual-volts?   int32
        +--rw actual-amperes? int32
        +--rw actual-celsius? int32
    +--rw energy-saving
        +--rw enabled?        boolean
        +--rw power-state?   identityref

```

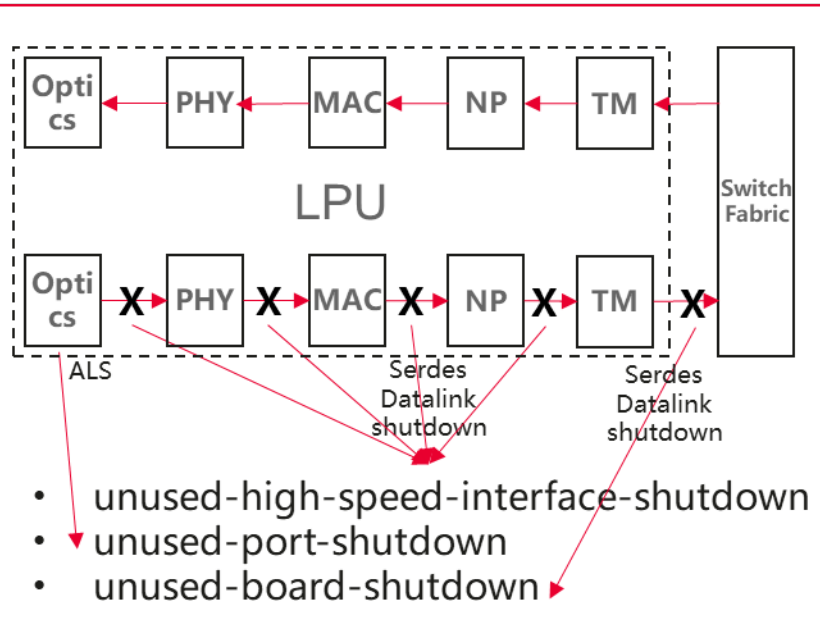
energy-saving-mode-name	
type	description
basic	In this mode, the system will shut down idle modules and put them in a sleep mode.
standard	In this mode, the system extends basic energy saving mode with more advanced Lossless energy saving features, e.g., power module schedule.
deep	In this mode, the system extends standard energy saving mode with more advanced system level energy saving features, e.g., board scheduling.

energy-saving-method	
type	energy-saving-mode
zone-based-fan-speed-adjustment	Basic
unused-high-speed-interface-shutdown	Basic
unused-port-shutdown	Basic
unused-board-shutdown	Basic
dynamic-frequency-adjustment	Standard
intelligent-power-module-scheduling	Standard
unused-channel-shutdown	Deep
intelligent-board-scheduling	Deep

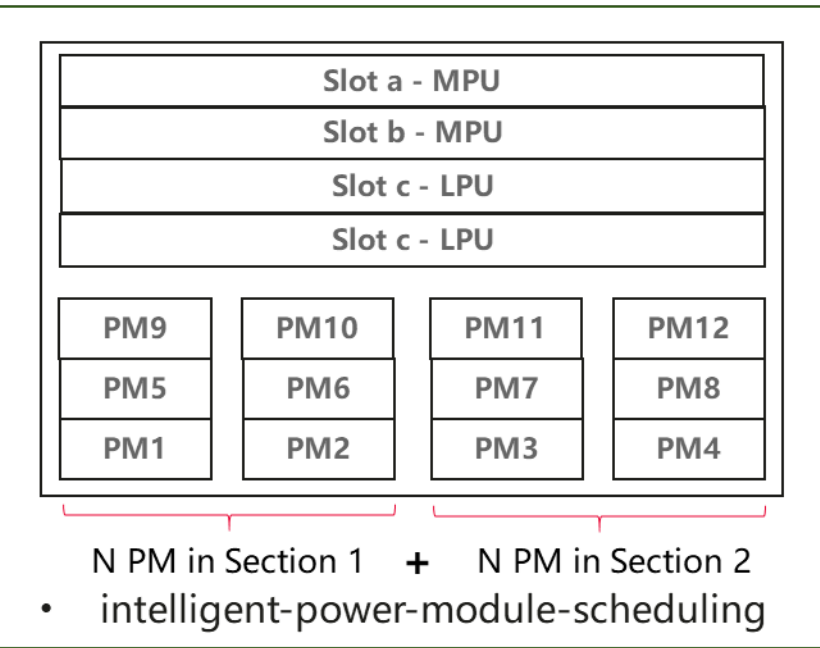
power-state	
enumeration	Description (RFC7326)
off-state	Indicates that the component typically requires a complete boot when awakened.
sleep-state	Indicates that a component with energy management support is not functional but immediately available such as wake up mechanism.
low-power-state	Indicates that some components with energy management support are available and these components can take measures to use less energy.
energy-saving-enable	Indicates that all components with energy management support are available and may use maximum power.

# Methods to reach energy saving target levels

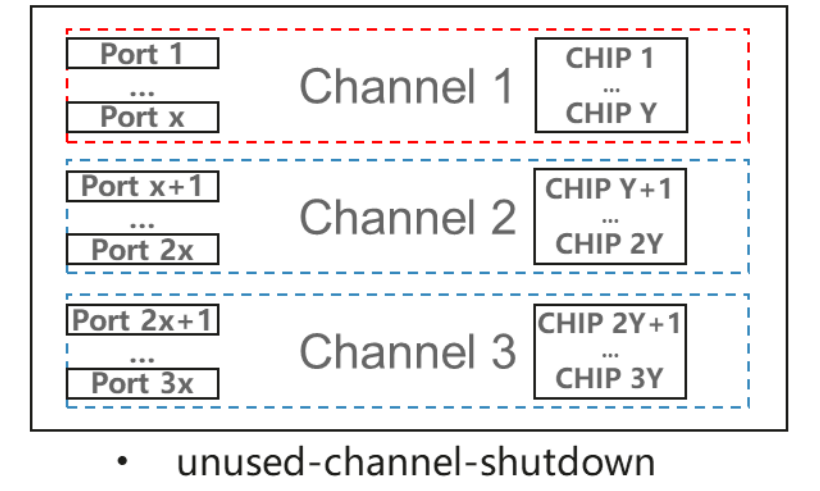
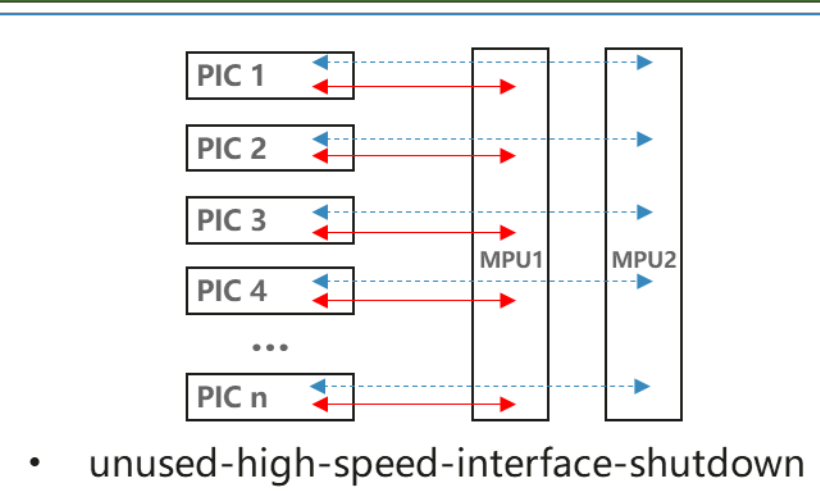
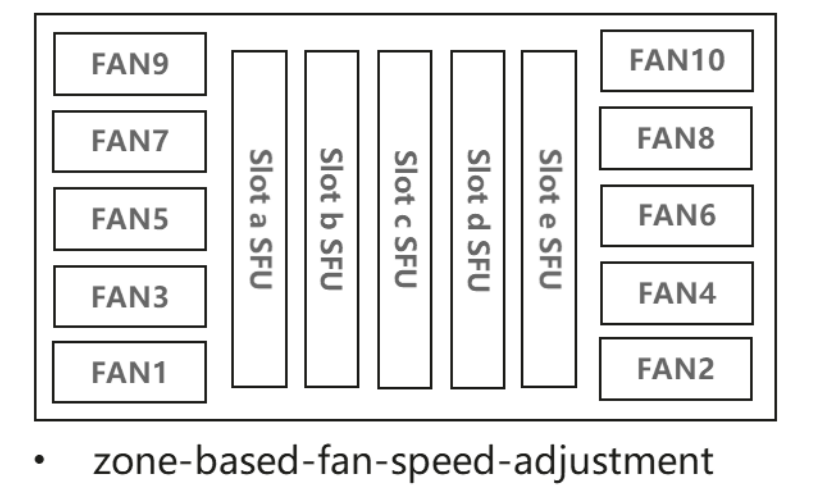
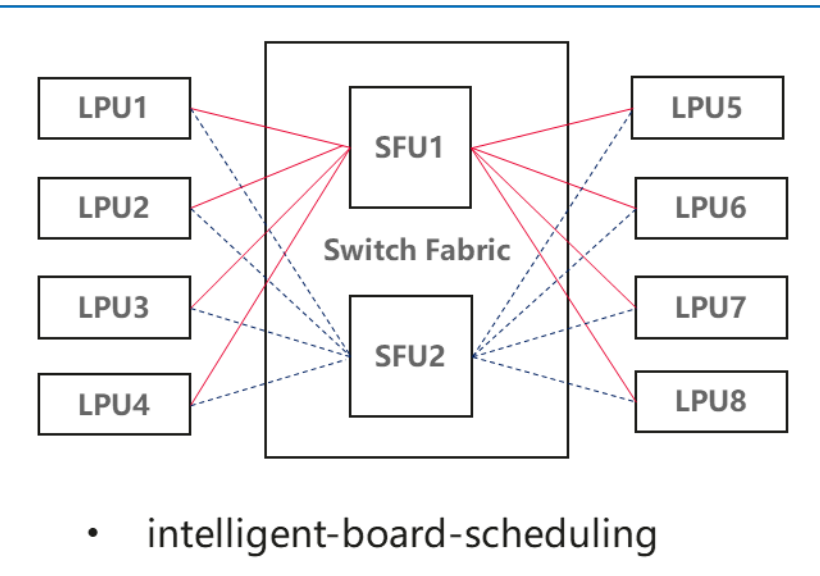
Basic



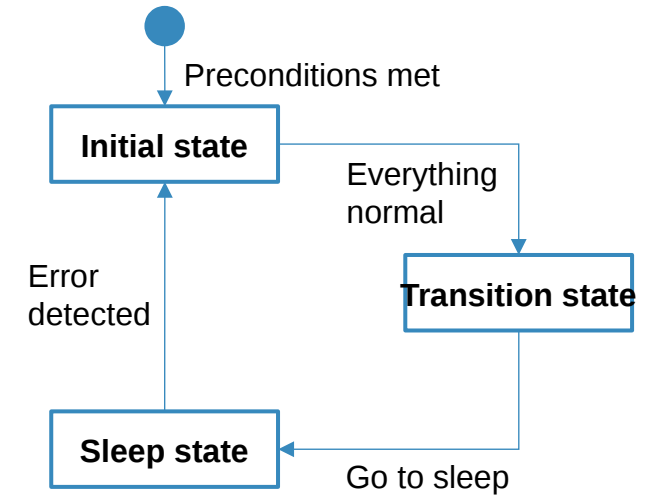
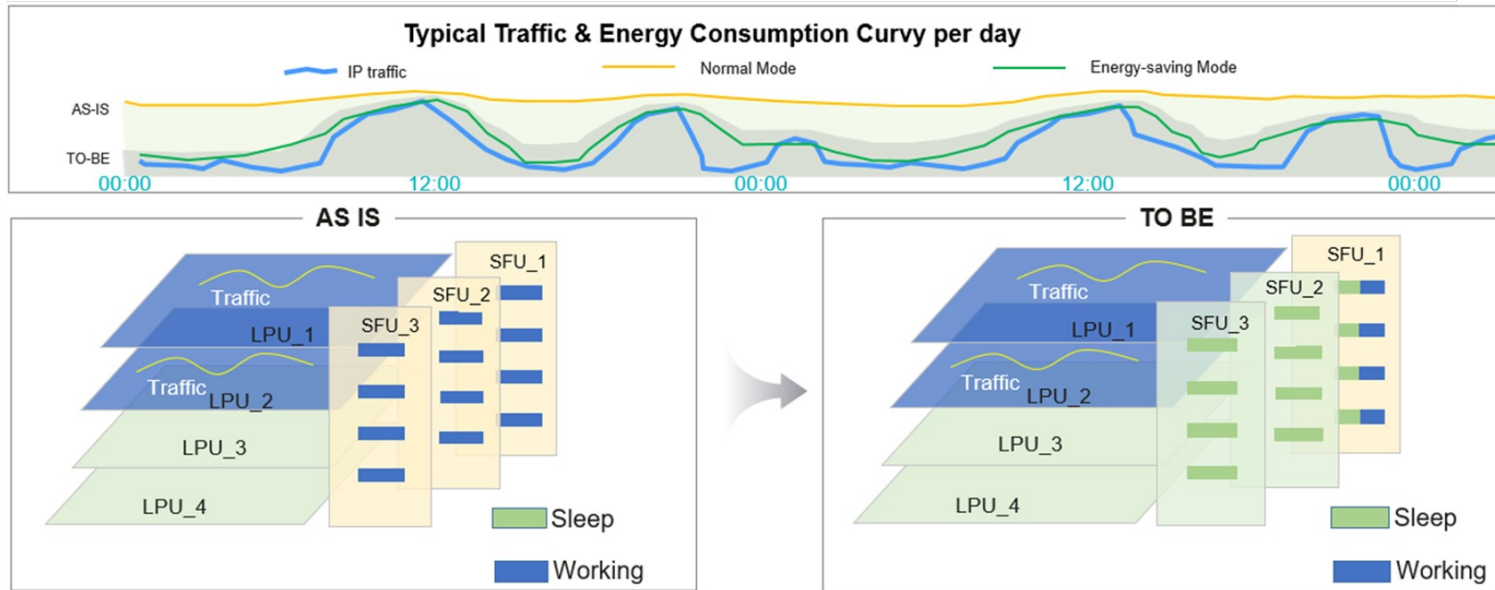
Standard (Basic+...)



Deep



# Tidal network Energy Monitoring Use Case



## Preconditions:

See section 3.4 of draft-ietf-tvr-use-cases

1. Device supports energy saving features;
2. Working normally with no alarms reported;
3. There is at least one extra SFU board which could be put in sleep mode when the traffic tide falls;

## Energy-saving mode enabled:

4. On the cut-off point of the traffic tide, the extra SFU board goes to sleep mode;
5. When certain abnormal event happen such as configuration update or alarm raised, the SFU board will be awake from the sleep mode and check if the events affect the energy saving status.
6. If the above mentioned event does not affect the energy saving status, the SFU board will go back to sleep mode again, if it does affect, then the board will go to initial state.
7. There will be some delay between the transition from the initial state to sleep mode as to avoid some kind of high frequency failures or unstable status flapping.



# Comments, Questions, Concerns?