A YANG Data Model for Host Power Monitoring

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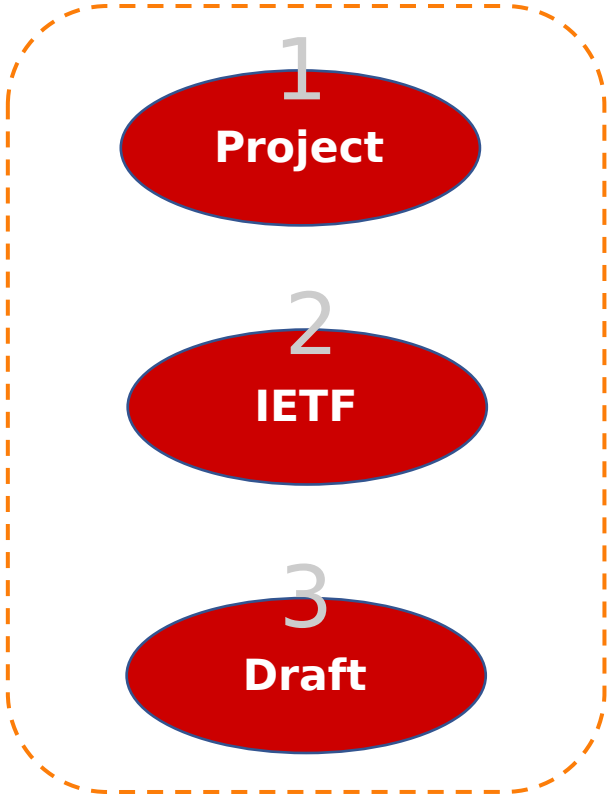
On behalf of Chang Liu and Yue Guo

Motivation



- Research of cost and effectiveness of computing infrastructure
- Construction and **operation**

- Contribute some work of the project to the IETF.
- Notice Operations & Management Area, and **WG green** fits us perfectly.

- Choose **energy consumption** as our topic.
- Existing RFCs barely consider **hosts**.
- Focus on **hierarchical model** among SDN controller/ management platform, router/switch and host.

Introduction

In the era of computing power, the energy consumption of data centers has increased exponentially, which is mainly reflected in IT equipment. **IT equipments account for 45%** of the overall **energy consumption** of data centers, of which hosts account for about 50%, storage systems account for about 35%, and network devices account for about 15%. Therefore, it is particularly important to focus on the energy consumption of network devices and hosts.

(Background)

This document will build **a hierarchical YANG data model** of SDN controller/management platform, router/switch and host to monitor the energy consumption of network devices and servers. SDN controller/management platform obtains data from routers/switches, and routers/switches obtain data from hosts. Therefore, in the overall hierarchical structure, the SDN controller/management platform directly obtains energy consumption data of all routers/switches, and indirectly obtains the specific energy consumption data of all hosts through routers/switches.

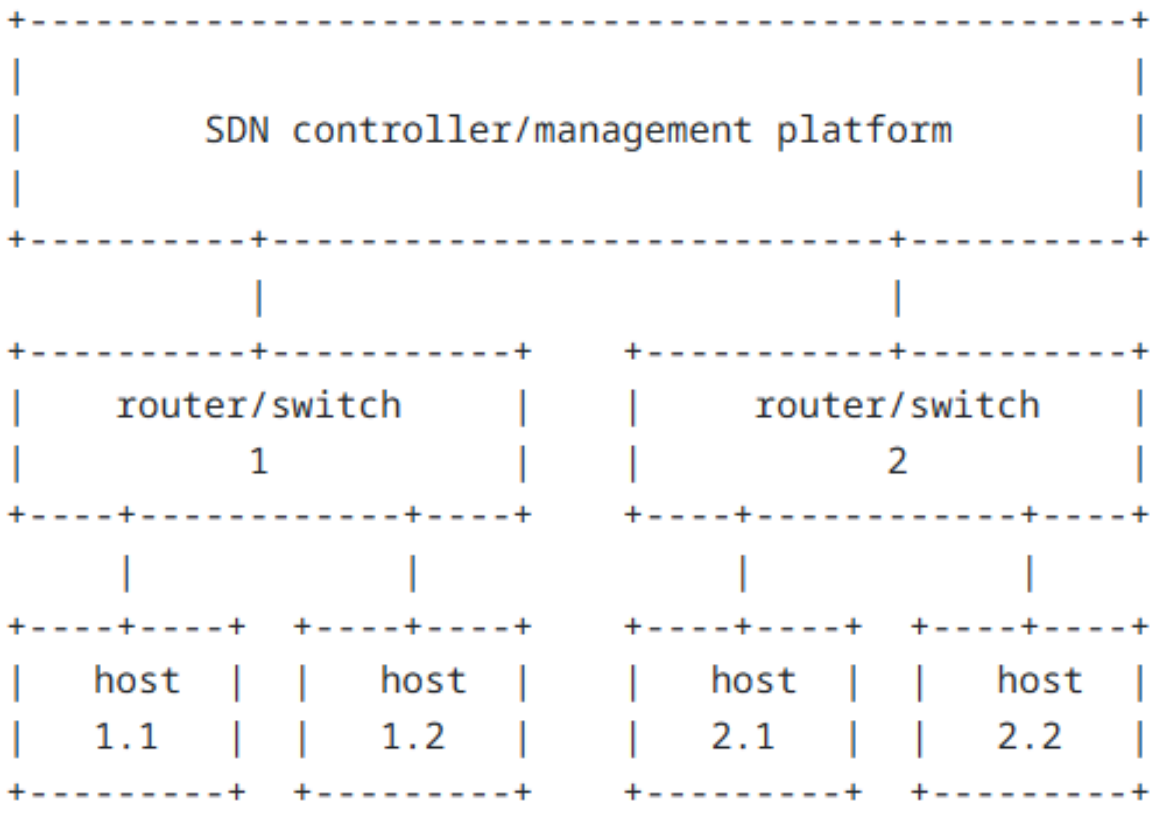
(Abstract)

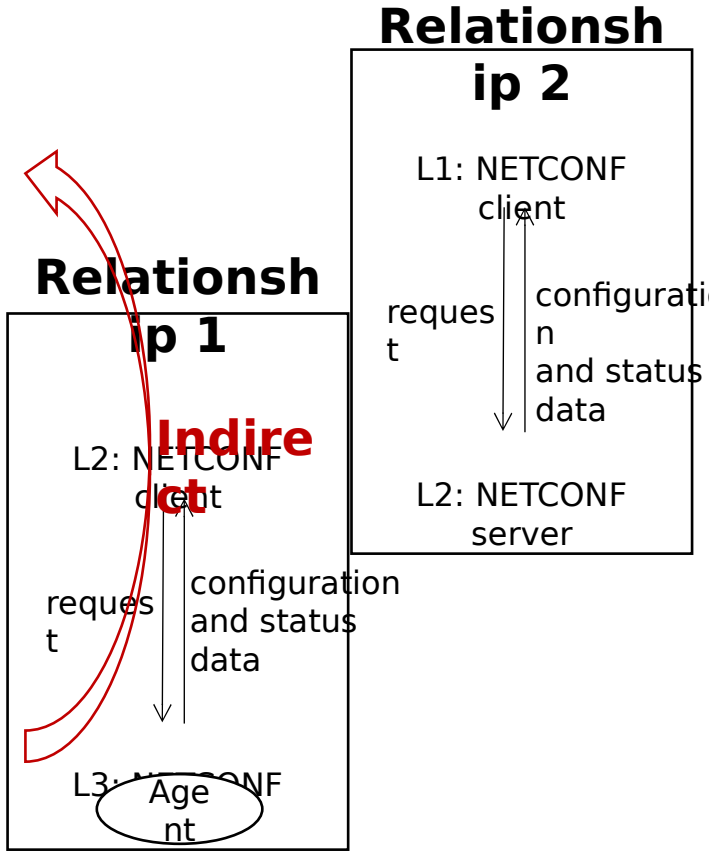
Model Stucture

Layer 1

Layer 2

Layer 3





Basic Elements and Layers

- Layer 1: SDN controller/management platform

  SDN controller/management platform send requests to routers/switches to obtain configuration and status data, including power information of routers/switches themselves and what they have obtained from hosts.

- Layer 2: Routers/switches

  Routers/switches provide configuration and status data, including power information of routers/switches themselves and what they have obtained from hosts, and respond to requests from the SDN controller management platform. In addition, routers/switches send requests to hosts to obtain configuration and status data, including power information.

- Layer 3: Hosts

  Agent needs to be installed to interact with routers/switches for NETCONF information. Hosts collect their energy consumption, and provide configuration and status data to routers/switches.

Relationship Between Layers

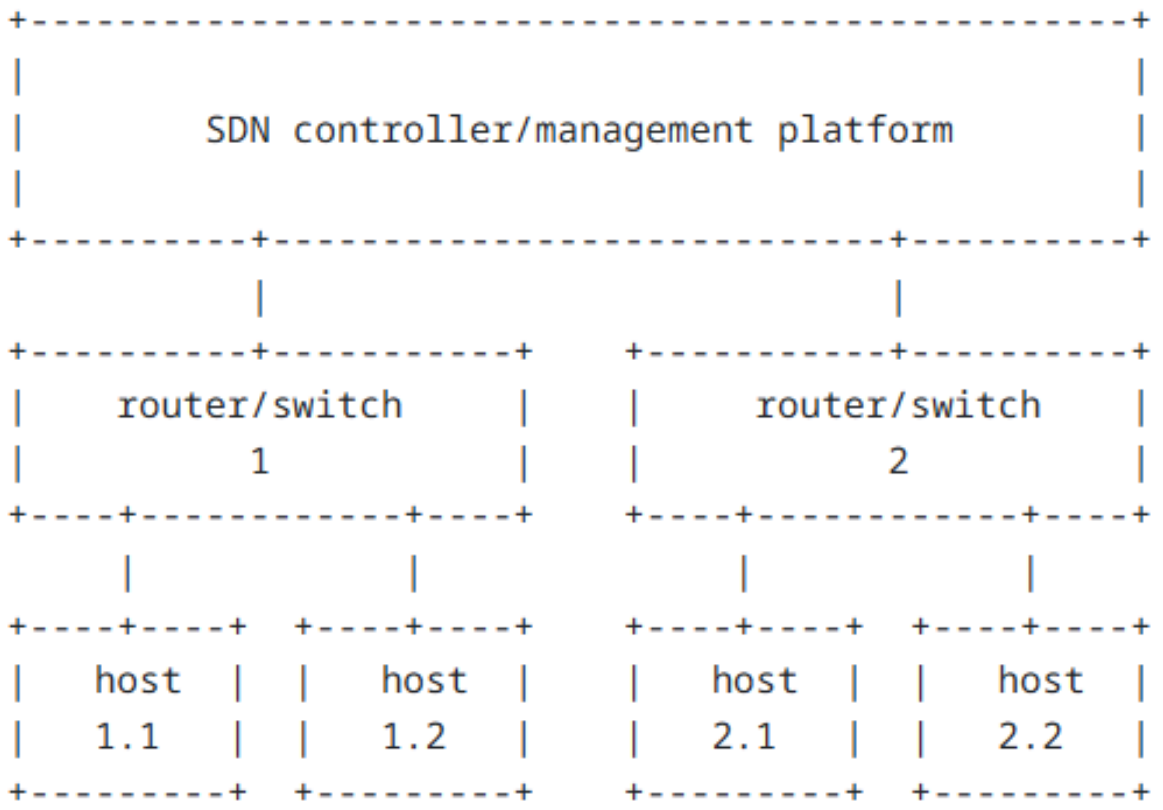
- Relationship 1: Between router/switch and host

  Router/switch acts as a NETCONF client and host acts as a NETCONF server. Host collects its energy consumption, and responds to the request of the upper-layer router/switch through the NETCONF agent to provide configuration and status data. Router/switch obtains energy consumption data of its lower-layer hosts.

- Relationship 2: Between SDN controller/management platform and router/switch

  SDN controller/management platform acts as a NETCONF client, and router/switch acts as a NETCONF server. The SDN controller/management platform obtains energy consumption data of routers/switches, and energy consumption data of hosts which has been already obtained.

Hierarchy Representation



Tree Diagram and YANG Model

```
module: power-statistics
  +--ro power-statistics
     +--ro network-device-statistics* [network-device-name]
        +--ro network-device-name     string
        +--ro network-device-power    uint32
        +--ro host-statistics*        [host-name]
           +--ro host-name            string
           +--ro host-power           uint32
```

```
module power-statistics {
  description
    "Module of power statistics.";
  list network-device-statistics {
    description
      "List of network devices statistics, i.e. routers/switches.";
    key "network-device-name";
    leaf network-device-name {
      type string;
      description
        "Names of network devices.";
    }
    leaf network-device-power {
      type uint32;
      units "watts";
      description
        "Power consumption of each network devices.";
    }
    list host-statistics {
      description
        "List of hosts.";
      key "host-name";
      leaf host-name {
        type string;
        description
          "Names of hosts.";
      }
      leaf host-power {
        type uint32;
        units "watts";
        description
          "Power consumption of each host.";
      }
    }
  }
}
```

Contact information

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