APSIS Value Proposition for Service Providers

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APSIS

- Historical Overview
- Use Cases
- Business Utility
- Technology
  - APSIS Specification
  - APSIS Reference Implementation

APSIS Historical Overview

- SCTE initiated an energy initiative in 2011
  - Goal: Ensure that access to energy not become a constraint in delivering ever greater volumes of data to customers
- Current activity is organized under Energy 2020
  - Goal: Increase energy efficiency by %20, from 2015 levels, by year 2020
    - Overall energy consumption may very well increase, but at a lesser rate than volume of services
- Adaptive Power Systems Interface Specification (APSIS)
  - Part of the original energy initiative, with contributions from a number of Service Providers and vendors, including Cisco, Arris, Juniper, Intel, and others
  - Defines a software framework to measure and control energy usage on devices within access network
  - Core definitions adopted from IETF Energy Management framework
  - Initial Specification published 2015. http://www.scte.org/SCTEDocs/Standards/ANSI_SCTE%20216%202015.pdf

APSIS Use Cases Summary

- Baseline Measurement. “If you can’t measure it, you can’t improve it”.
- Adaptation. E.g Adapt energy consumption to demand peaks and valleys
- Demand Response. Capture favorable pricing
- Manage energy supply. Respond to brown, blackouts, etc
- Provide energy management services to customers
- Details available on Working Group site

APSIS Business Utility

- Access Network consumes ~%75 of energy for a telecommunications provider.
- Management of energy can lead to multiple benefits:
  - cost avoidance of energy purchases
  - prolonged equipment lifespan
  - early detection of potential equipment failure
- Economic benefits can be quantified via additional research and trials. Early indicators include:
  - Diurnal adaptation by ARRIS on CCAP device demonstrated a %40 power consumption reduction during times of off-peak load. +%15 efficiency gain during daily cycle.
  - Technetix has estimated a ~%15 efficiency gain by attenuating bias current feeding RF amplifiers during off-peak
  - Demand response applications have yielded up to %30 cost avoidance. https://energy.gov/oe/services/technology-development/smart-grid/demand-response

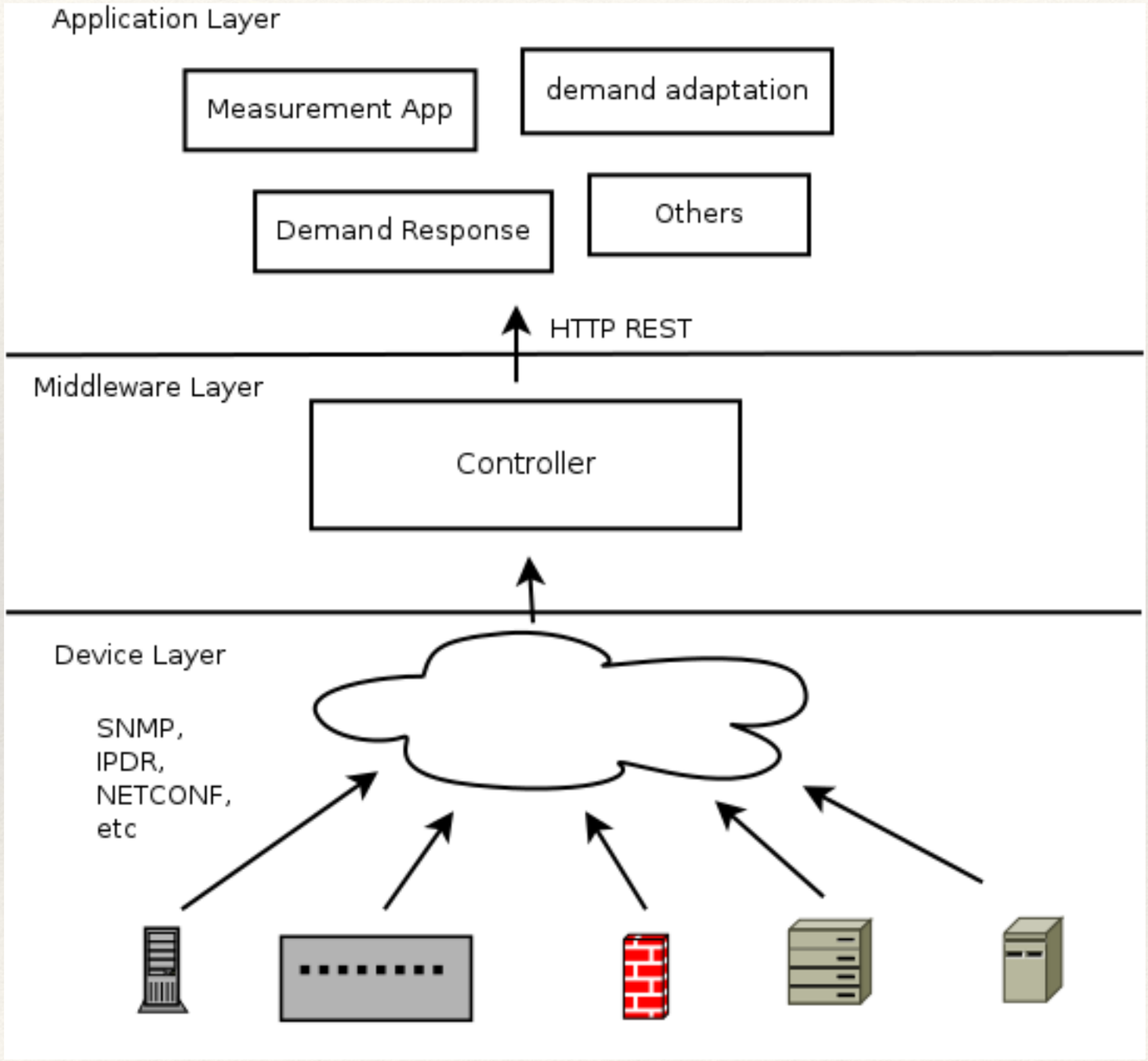
APSIS Specification

- APSIS Specification defines device-level energy management protocols
  - Currently references IETF EMAN SNMP MIBs
  - Includes abstract Information Model, allowing other protocols to support functional equivalence, e.g. NETCONF, IPDR, REST, others
- APSIS framework presupposes an application layer to collect measurements and issues controls
  - implies a middleware layer to handle device connections and expose device topology

APSIS Reference Implementation

- Comcast has sponsored the development of an APSIS Reference Implementation
- An eman (energy management plug-in) has been developed for the open source OpenDaylight Software Defined Networking (SDN) controller
- This places APSIS into the mainstream of other modern device management approaches
- Provides a means to further research APSIS technology and business applications
- https://wiki.opendaylight.org/view/EMAN:Main

APSIS RI stack



OpenDaylight Eman plug-n

- OpenDaylight (ODL) provides an open source SDN controller that is being leveraged throughout the telecommunications industry.
- It utilizes YANG to define a Model-Driven Service Abstraction Layer (MD-SAL), populate a data store, and expose a REST API
- The plug-in leverages the ODL framework for device discovery and protocol binding, and populates the MD-SAL to support the API
- Applications can read data from the REST API, invoke Remote Procedure Calls (RPCs) to poll for data, or receive notifications on device state change.

APSIS Operational Aspects

- APSIS defines a uniform mechanism to collect energy data and issue power state controls to devices in the network:
  - CMTS/CCAP (Arris, Cisco, Harmonic, Casa-Systems)
  - High density edge QAM devices (Arris, Harmonic, CommScope)
  - Switches/Routers (Cisco, Juniper, ALU, Nortel, Huawei)
  - Fiber transport platforms (Fujitsu/ALU)
  - Remote PHY-edge facilities (Arris, Cisco, others?)
  - Remote PHY-outside plant (OSP)/MDU (Arris, Cisco, others?)
  - More general fiber nodes (Arris, Cisco, Vector, Technetix, others?)
  - RF amplifiers (same as previous)
  - OSP power supplies (Alpha, others?)

APSIS Operational Aspects 2

- APSIS can support existing operational tools and new applications
  - In either case, applications can integrate directly with devices via APSIS (or functional equivalent using an ‘adapter’ layer), or
  - Integrate via a middleware controller, such as OpenDaylight or other platform, that exposes REST APIs

APSIS Operational Aspects 3

- Example 1: Extend existing applications
  - A major MSO has built a network management suite that provides operations with a real-time location based view of network entities. The application can be extended to incorporate power measures from OSP power supplies, providing a mechanism to ‘meter’ power usage internally and audit utility bills, thus avoiding suspected overcharges on bulk purchases.
- Example 2: New applications
  - depending on MSO priorities, any number of realtime or batch processes could be developed to detect and respond to energy related conditions, e.g. utilize battery backup systems in power supplies to implement utility signaled demand response, or (buzzword alert!) utilize Machine Learning algorithms to implement proactive maintenance policies.

APSIS Information Model