Energy Monitoring MIB

draft-claise-energy-monitoring-mib-02

Mouli Chandramouli, Brad Schoening, John Parello,
Benoit Claise

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Problem Description

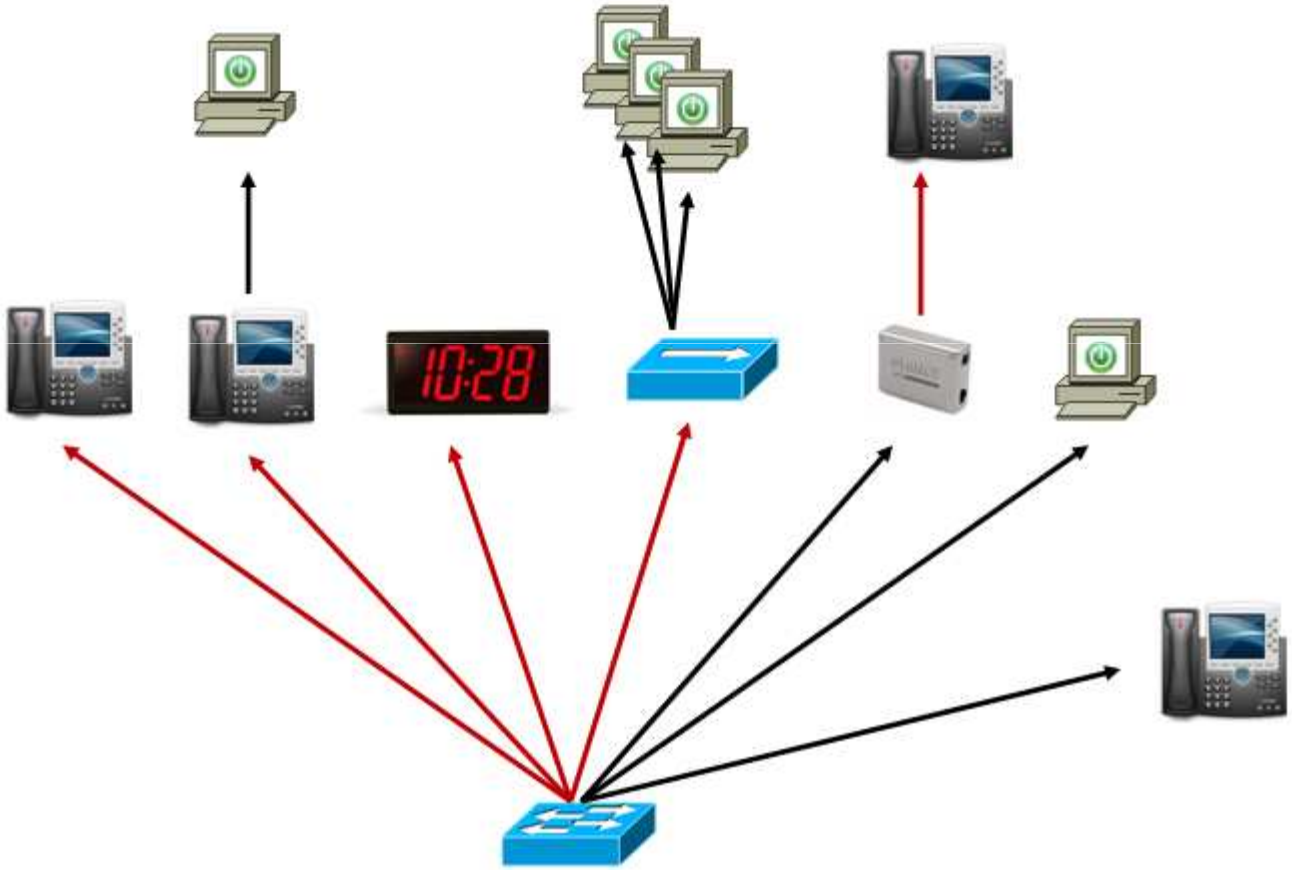
- Management Information Base (MIB) for use with network management protocols for monitoring the power state and the energy consumption of network elements

- The target devices include:
  - Router & switches
  - Attached devices such as Power over Ethernet (PoE) devices
  - But not limited to PoE devices. Example: PC
  - Intelligent meters
  - Proxy for building energy management
  - Home energy gateway
  - Etc…

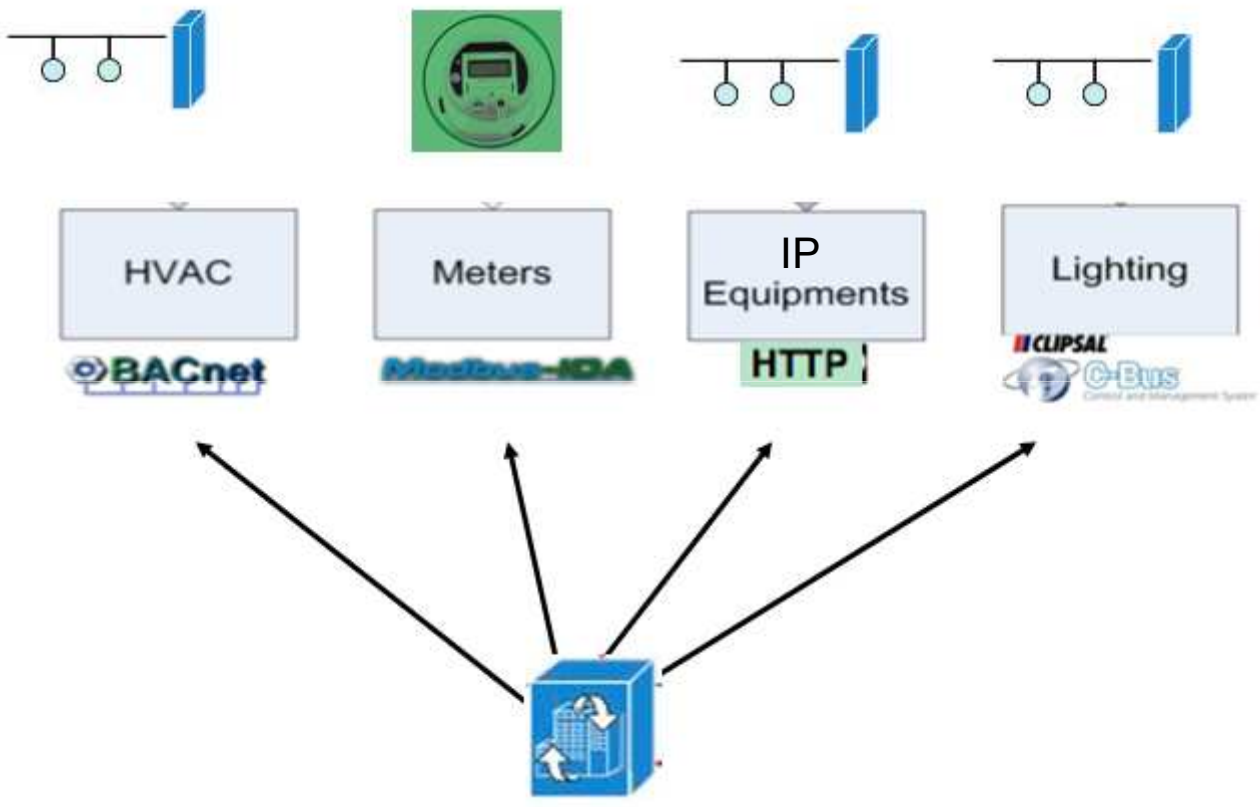
Existing Implementation

- draft-quittek-power-monitoring-requirements-00
  - Section 2.3 “Remote and Aggregated Monitoring”
- Note: the energy gain is in controlling the attached devices

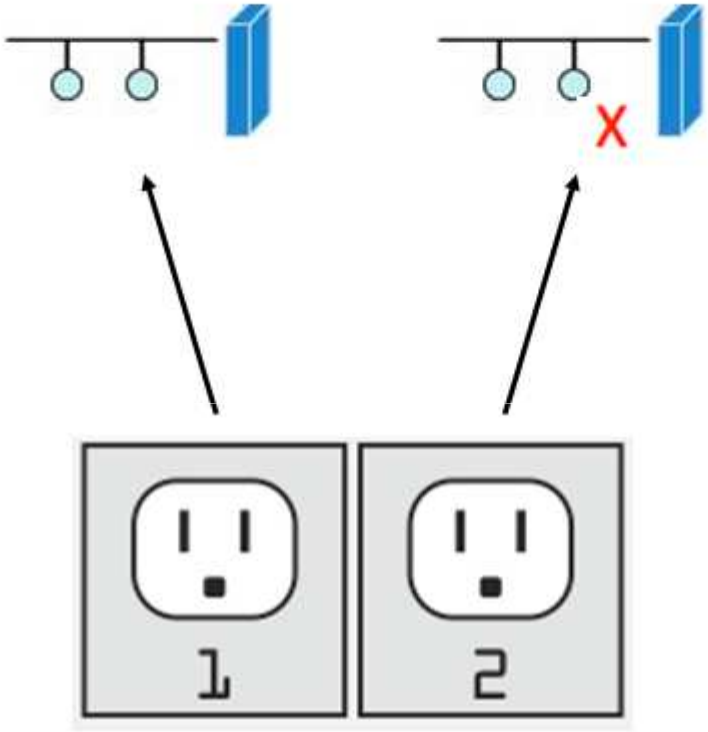
Target Devices: Router, PoE, and non PoE device



Target Devices – Building Management System



Target Devices: Smart PDU



Entity-MIB?

- Can we assume that the ENTITY-MIB is supported on all monitored devices?
  - No, so can't use the entPhysicalIndex as THE index in the table
  - New index: pmIndex, for each power monitor
- Extra advantage of pmIndex

pmIndex 2

Known via LLDP-MED

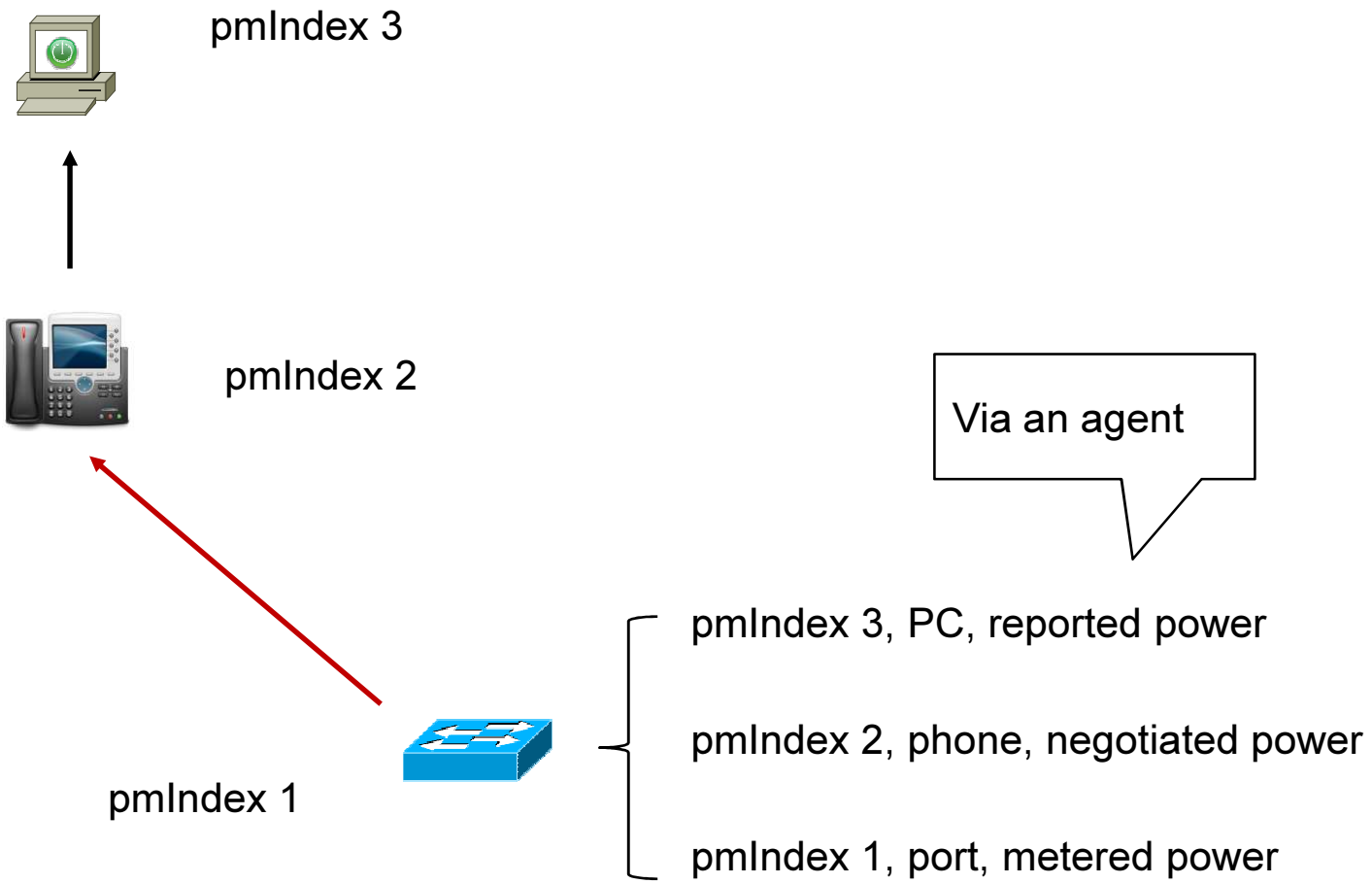
pmIndex 1

pmIndex 2, end point, negotiated power

pmIndex 1, port, metered power

- Same pattern (device / end point) applies all over

Target Devices



Parent/Child

- The parent/Child = the parent reporting the power for the end point (child)
  - And actually the parent controlling the child power states (not in scope)
  - For example, Wake-on-Lan
- Scaling issue if the NMS would control each child
- Building Managemenent System requires a proxy

pmIndex 3, phone, reported power,
parent = switch

pmIndex 2, phone, negotiated power,
parent = switch

pmIndex 1, port, metered power

Power States -> Mapping the ACPI Levels

Level	ACPI Global/System State	Name	
1	G3, S5	Mech Off	Non-operational states
2	G2, S5	Soft Off	
3	G1, S4	Hibernate	
4	G2, S3	Sleep, Save-to-RAM	
5	G2, S2	Standby	
6	G2, S1	Ready	
7	G0, S0, P5	Low	Operational states
8	G0, S0, P4	Frugal	
9	G0, S0, P3	Medium	
10	G0, S0, P2	Reduced	
11	G0, S0, P1	High	
12	G0, S0, P0	Full	

G = Global state, S = System state, P = Performance state

ACPI: Advanced Configuration and Power Interface

Power States

- How many operational states do we need?
  - Example1: an IP phone with an external dial pad and power savings (LCD off) having three power modes (i.e., 9w, 12w, 14w)
  - Example2: a Laptop PC with Windows 7 has 3 states: High Performance, Balanced, and Power Saver.
  - Example3: video camera, 4 levels (lower resolution, take samples)
  - Example4: PoE has 5 classes of power in IEEE 802.3at and pethPsePortPowerClassifications

IEEE 802.3at capable devices are also referred to as "type 2". An 802.3at PSE may also use layer2 communication to signal 802.3at capability.[8]

Power levels available

Class	Usage	Classification current [mA]	Power range [Watt]	Class description
0	Default	0 - 4	0.44 - 12.94	Classification unimplemented
1	Optional	9 - 12	0.44 - 3.84	Very Low power
2	Optional	17 - 20	3.84 - 6.49	Low power
3	Optional	26 - 30	6.49 - 12.95	Mid power
4	Reserved	36 - 44	12.95 - 25.50	High power

Power States Conclusion

- 6 operational and 6 non operational states
- Power States are like policies
  - Full interoperability is difficult
  - Guidelines for interoperability
  - But depends on the feature using the power states

Power Monitoring MIB - pmTable

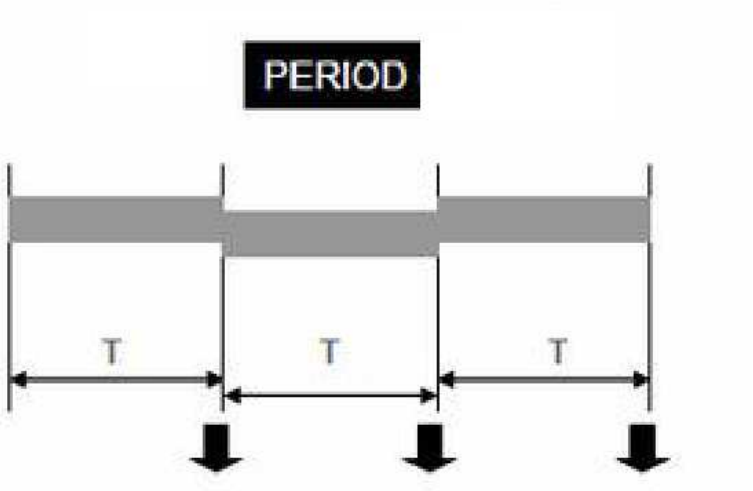
- pmIndex Integer32,
- pmPowerMonitorId PowerMonitorId (=UUID)
- pmPhysicalEntity PhysicalIndexOrZero,
  (= entPhysicalIndex if ENTITY-MIB supported)
- pmethPortIndex PethPsePortIndexOrZero,
  (making the link with the PoE MIB)
- pmethPortGrpIndex PethPsePortGroupIndexOrZero,
  (making the link with the PoE MIB)
- pmDomainName SnmpAdminString,
- pmName SnmpAdminString,
  (if entPhyName exists = pmName = entPhyName)
- pmRoleDescription SnmpAdminString,
- pmPowerUnits MonitorScale,
- pmPowerUsage Integer32,
- pmPowerUsageNameplate Integer32,
- pmPowerUsageAccuracy Integer32 (inline with IEC and ANSI X.12)
- pmPowerUsageCaliber INTEGER,
- pmPowerLevel PowerMonitorLevel,
- pmPowerUsageCategory BITS,
- pmParentId PowerMonit (consusmer, producer, meter)

Power Monitoring MIB - pmLevelTable

- "This table enumerates the maximum power usage in watts at each PowerState Level for each PowerMonitor Entity.

• pmLevelIndex	PowerMonitorLevel,
• pmLevelMaxUsage	Integer32,
• pmLevelPowerUnits	MonitorScale

Power Monitoring MIB - Demand Table



Two energy tables (control and data)

- emDemandIntervalStartTime TimeTicks,
  emDemandIntervalEnergyUsed Integer32,
  emDemandIntervalEnergyUnits MonitorScale,
  emDemandIntervalMax Integer32

- INDEX { pmIndex, emDemandIntervalStartTime }

Conclusion

- We need a MIB module for power, power state, (and energy) monitoring
- Which problem do we want to solve?
  - Not only router, switches and PoE devices

- What's next?
  - Justify some more the use cases in the draft, or improve draft-quittek-power-monitoring-requirements
  - Insert Juergen's feedback
  - Insert a power quality monitoring MIB module
    - Based on the expert feedback
    - Already defined in a different standard?
  - Look closely at the IEC (International Electrotechnical Commission) data model
    - Feedback received from Schneider Electric