Energy Management Framework

draft-claise-power-management-arch-02

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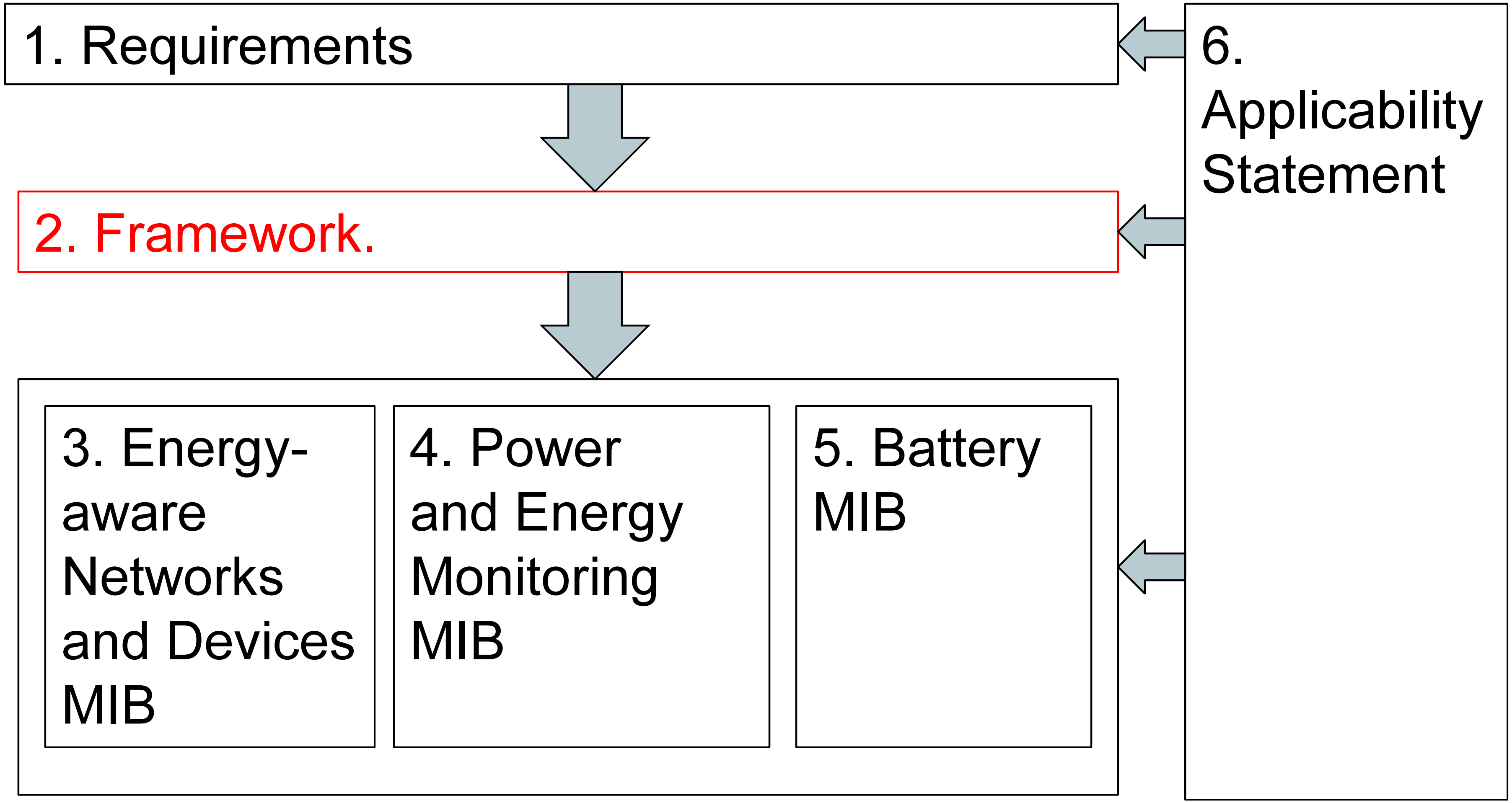
Charter: Documents



Architecture: Overview of Scenarios

- Use Case Scenarios
  - Switch with PoE endpoints
  - Switch with PoE endpoints + device(s)
  - Switch with Wireless Access Points
  - Building Gateway Device
  - Data Center Network
  - Power Consumption of UPS
  - Power Consumption of Battery-based

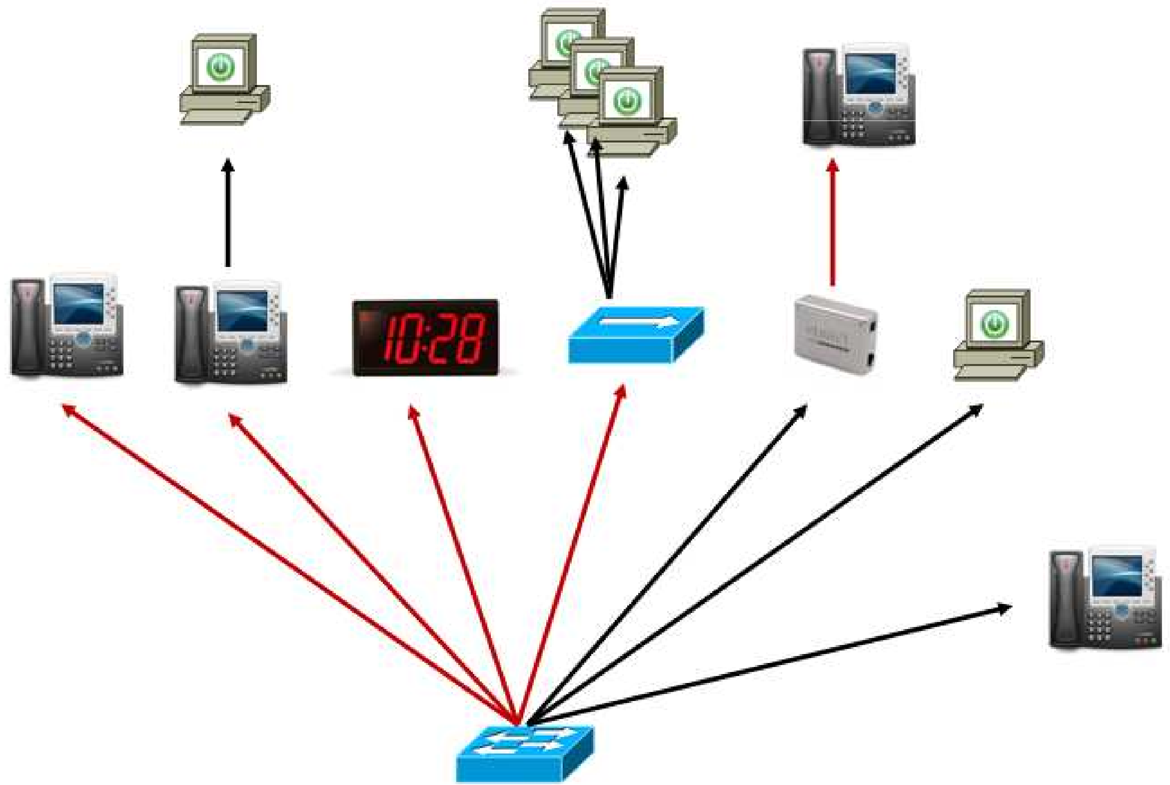
Architecture: Concept of Parent/Child

The Parent/Child:

1. the parent reporting/aggregating the power for the end points
2. the parent potentially controlling the child power states
   (“how” not in scope)

Justification:

1. Scaling issue if the NMS would control each child
2. Building Management System requires a proxy



Reference Model

```
                    +---------------+
                    |      NMS      |            -
                    +-----+---+-----+            |
                          |   |                  |
                          |   |                  |  S
                +---------+  +--------+          |  N
                |                     |          |  M
                |                     |          |  P
        +---------------+      +------+-------+  |
        | Power Monitor |      | Power Monitor | |
        | Parent 1      | ...  | Parent N      | -
        +---------------+      +---------------+
                |||
      (protocol |||
      out of    |||      +-------------+---------+
      the scope)|||------| Power Monitor Child 1 |
                ||       +-----------------------+
                ||
                ||       +-------------+---------+
                ||-------| Power Monitor Child 2 |
                |        +-----------------------+
                |
                |
                |--------          ...
                |
                |
                |        +-------------+---------+
                |--------| Power Monitor Child M |
                         +-----------------------+
```

Power source can be the parent (PoE) but no compulsory

Architecture: Concept of Power 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	LowMinus	Operational states
8	G0, S0, P4	Low	
9	G0, S0, P3	MediumMinus	
10	G0, S0, P2	Medium	
11	G0, S0, P1	HighMinus	
12	G0, S0, P0	High	

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

ACPI: Advanced Configuration and Power Interface

Architecture: Concept of Manufacturer Power Levels

Manufacturer Power Level	Manufacturer Power Name
0	none
1	short
2	tall
3	grande
4	venti

Implementation: Device Manufacturer's Capability

Power Level/Name	Manufacturer Power Level / Name
1 / Mech Off	0 / none
2 / Soft Off	0 / none
3 / Hibernate	0 / none
4 / Sleep, Save-to-RAM	0 / none
5 / Standby	0 / none
6 / Ready	1 / short
7 / LowMinus	1 / short
8 / Low	1 / short
9 / MediumMinus	2 / tall
10 / Medium	2 / tall
11 / HighMinus	3 / grande
12 / High	4 / venti

Interface: Mapped to the Standard Levels

Manufacturer must be set from the Power Level

Architecture: Terminology

- Power Monitor,
  Power Monitor Parent,
  Power Monitor Child,
  Power Monitor Meter Domain,
  Power Level,
  Manufacturer Power Level

- Note: Important to agree on these terms, as they will be re-used in all the other documents

Architecture: Overview of New Concepts

- Monitoring
  - Power Monitor Information
  - Power Monitor Meter Domain
  - Power Monitor Parent and Child
  - Power Monitor Levels
  - Power Monitor Context

- Discovery
  - PoE -> Obvious
  - LLDP, LLDP-MED, CDP
  - Proprietary for non-IP protocols

    "communication specifications between the Power Monitor Parent and Children is out of the scope of this document"

TO DO

- How to specify the notion of child capabilities, i.e. the capabilities that the Power Monitor Parents have with Power Monitor Children. Example:
  1. Monitoring (only reporting)
  2. Configuration power state
  3. Configuration: power Example: on a PC, we can set power level without knowing the power
- Explain the 3 domains in more details:
  - Meter domain
  - Control domain
  - Power source domain

Open Issues

- How should the WG consider IPFIX in this architecture?
- Should transition states be tracked when setting a level.
  - Example: The configured level is set to Off from High. The Actual level will take time to update as the device powers down. Should there be transitions shown or will the two variables suffice to track the device state.
- Question for working group: Should implementation scenarios be incorporated in the architecture draft?

Conclusion

- Still a couple of open issues
  - Which we have to solve soon
  - MIB dependencies
- However, we would like to have this document considered as working item
- Any feedback/question?

Backup slides

Architecture: Power Levels

- 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

Architecture: Power Levels

Table 3 – PowerState Values and ACPI States

PowerState enum Value	Description	Corresponding ACPI State
2 (On)	System is fully on.	G0 (S0)
3 (Sleep - Light)	System is in Standby or Sleep state.	G1 (S1 or S2)
4 (Sleep -Deep)	System is in Standby or Sleep state.	G1 (S3)
6 (Off - Hard)	System is powered off except for the real-time clock, power consumption is zero.	G3
7 (Hibernate (Off - Soft))	System is in hibernation. System context and OS image was written to non-volatile storage. System and devices are powered off.	G1 (S4)
8 (Off - Soft)	System is powered off where the system consumes a minimal amount of power..	G2 (S5)