EMAN as Background Info for GREEN

draft-eman-green-rfc6988bis-01

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EMAN (Energy MANagement) Concluded WG

- RFC 6933 May 2013 Entity MIB (Version 4)
- RFC 6988 Sep 2013 Requirements for Energy Management
- RFC 7326 Sep 2014 Energy Management Framework
- RFC 7460 Mar 2015 Monitoring and Control MIB for Power and Energy
- RFC 7461 Mar 2015 Energy Object Context MIB
- RFC 7577 Jul 2015 Definition of Managed Objects for Battery Monitoring
- RFC 7603 Aug 2015 Energy Management (EMAN) Applicability Statement

Concluded WG

Disclaimer: Helped the BoF proponents to compare with EMAN, by comparing requirements

https://author-tools.ietf.org/iddiff?url1=rfc6988&url2=draft-eman-green-rfc6988bis&difftype=--html

EMAN High Level Points

- From the charter:
  - “power and energy monitoring, power states, power state control, and potential power state transitions. The framework will focus on energy management for IP-based network equipment
    (routers, switches, PCs, IP cameras, phones and the like).”
- From the requirement doc
  - “accounting for the total power received and provided by an entity, a network, or a service”
- Focus
  - Host/PC/server
  - Switches, routers, and components within device
  - PoE and smart Power Distribution Unit (PDU),
  - No HVAC, except via an IP gateway
  - Battery management

EMAN High Level Points

- Read-write MIBs
  - Was actually foreseen for controling power states but …
  - Not YANG (too early) even if Writable MIB Module IESG Statement (2014)
- Actually an information model (Appendix A of RFC7326 – Framework)
  - For once, this is good news
- RFC 6933 Entity MIB: entPhysicalUUID/entPhysicalIndex
  - Same discussion today: we need « entity » IDs/UUIDs …
  - Hardware YANG (RFC 8348)
  - NetworkdId, NodeId, InterfaceId, Tpid (RFC8345, Network Topology)
- RFC 7461 Energy Object Context MIB
  - Each Energy Object can be attributed with identity, classification, and context
  - Ex: importance, keywords, role, domain

Three IANA-maintained Power State Set Registries

IEEE162

Value	Name	Reference
0	off	[IEEE1621]
1	sleep	[IEEE1621]
2	on	[IEEE1621]
3-255	Unassigned	

DMTF

Value	Name	ACPI	Reference
0	Reserved		[RFC7326]
1	Reserved		[RFC7326]
2	ON	G0-S0	[RFC7326]
3	Sleep-Light	G1-S1 G1-S2	[RFC7326]
4	Sleep-Deep	G1-S3	[RFC7326]
5	Power Cycle (Off-Soft)	G2-S5	[RFC7326]
6	Off-Hard	G3	[RFC7326]
7	Hibernate (Off-Soft)	G1-S4	[RFC7326]
8	Off-Soft	G2-S5	[RFC7326]
9	Power Cycle (Off-Hard)	G3	[RFC7326]
10	Master Bus Reset	G2-S5	[RFC7326]
11	Diagnostic Interrupt	G2-S5	[RFC7326]
12	Off-Soft Graceful	G2-S5	[RFC7326]
13	Off-Hard Graceful	G3	[RFC7326]
14	MasterBus Reset Graceful	G2-S5	[RFC7326]
15	Power Cycle Off-Soft Graceful	G2-S5	[RFC7326]
16	Power Cycle Off-Hard Graceful	G3	[RFC7326]
17-255	Unassigned		

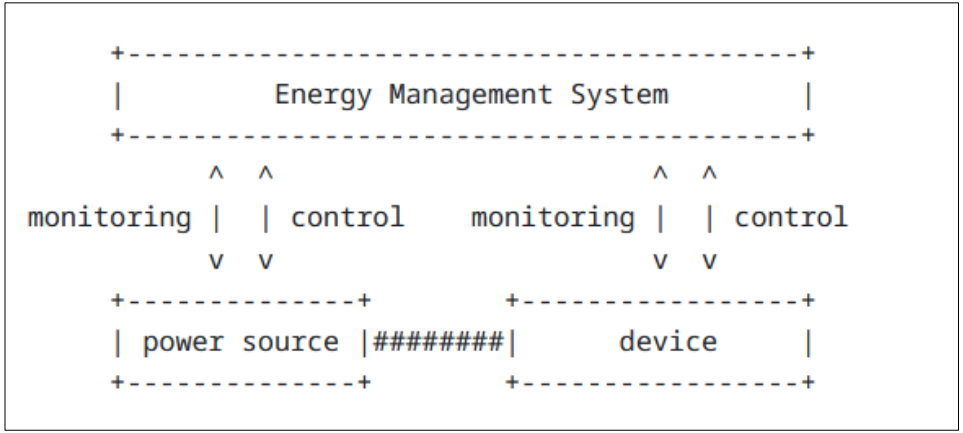
EMAN (RFC

Value	Name	Description
0	mechoff	An off state where no Energy Object features are av removed.
1	softoff	Similar to mechoff(0), but some components remai softoff(1), no context is saved, and the device typica
2	hibernate	No Energy Object features are available. The Energy sleep(3). An example for state hibernate(2) is a save zero.
3	sleep	No Energy Object features are available, except for standby(4). An example for state sleep(3) is a save-t
4	standby	No Energy Object features are available, except for time for availability is longer than ready(5). For exar
5	ready	No Energy Object features are available, except for Energy Object can be quickly transitioned into an o
6	lowMinus	Indicates that some Energy Object features may no low(7).
7	low	Indicates that some Energy Object features may no mediumMinus(8).
8	mediumMinus	Indicates that all Energy Object features are availab
9	medium	Indicates that all Energy Object features are availab
10	highMinus	Indicates that all Energy Object features are availab
11	high	Indicates that all Energy Object features are availab
12-255	Unassigned	

EMAN Power State 7 to 11: no specific energy-related mapping, per design

https://www.iana.org/assignments/power-state-sets/power-state-sets.xhtml

EMAN Framework: Relationship



- Some “entitie”s have control over Power States of other entities

  => The power distribution path is not the networking/traffic path

- RFC7461 Energy Object Context MIB):
  - poweredBy(1), -- power relationship
  - powering(2),
  - meteredBy(3), -- meter relationship
  - metering(4),
  - aggregatedBy(5), -- aggregation relationship
  - aggregating(6)
- Notion of Power Interface
- No sure we can’t really avoid this in GREEN. At least think about it/the use cases

Observations

- The definitions and some concepts are still applicable
- Implementations?
  - Energywise at Cisco
  - Maybe more (Smart PDU vendors were involved)
- EMAN success at that time?
  - The energy crisis did not last too long! Might be different this time
  - “Operators, which SLA degradation can you accept to minimize energy?” Answer: none
  - Campus: shutting down a few ports (<10 W/port) was not worth it
  - Local energy management/policy trend, without an external controller: battery, FAN, LC optimization, low-power mode per component/technology
  - Read-write MIBs

12. Open Issues to be Discussed at the BoF

o EMAN "eco system" includes many MIBs. Which one are largely deployed? Will they/How can they benefit of the GREEN works ?

o Battery use cases migh be different 10 years after. Should it be addressed in a future charter? So far the decision is no. Nevertheless it might be generalized to cover backup sources of energy capabilities and use.

o Do we need to keep a reference to the MIB object entPhysicalUUID (in section 4.4 from ENTITY-MIB v4) in case of legacy device (MIB)?

o The EMAN requirements and EMAN framework had a lot of emphasis on t he "Reporting on Other Entities", typically smart PDU or PoE. Is this important? Should this be removed? Should it be addressed in a future charter? This is text about "Sections 7 and 8 contain requirements specific to Energy Management. Due to the nature of power supply, some monitoring and control functions are not conducted by interacting with the entity of interest but rather with other entities, for example, entities upstream in a power distribution tree."

o It's not clear whether we need new Power State (Set)? Maybe not but we need to explain the mapping of existing energy efficient features to specific Power States.

More in the draft

What EMAN Did Not Cover?

- YANG
- Energy Efficient Management (for a definition of it)
- Network-wide energy efficiency metric, such as the Power Usage Effectiveness (PUE)
- Carbon footprint (Embedded Carbon, Embodied Energy)
- New use case eco design (the benefits of leveraging existing devices modularity to introduce eco-designed components in the networks while being able to assess the gains in sustainability, draft-stephan-legacy-path-eco-design-01)

- Final thought: « EMAN has done some things, not everything, and has some deployment but not a complete success either, and that we can learn from this”

APPENDIX

draft-eman-green-rfc6988bis

1.2. High-level Differences with RFC6988

The following section will delve into the specific details but from a high level point of view, the differences between this document and the RFC6988 are:

- New definition for "Energy Efficiency Management"

- A focus towards YANG, and not any longer on MIB modules

- As a consequence from the previous point, the ENTITY-MIB v4 (RFC6933) is replaced by the Hardware YANG module RFC8348

- No focus on the battery management (as batteries haves some self-optimization features these days)

- Less focus on the Power over Ethernet management

- A focus on reporting lifecycle management, considering energy and transformation towards carbon awareness

The semantics of a Power State are specified by:

- a) The functionality provided by an Energy Object in this state.
- b) A limitation of the power that an Energy Object uses in this state.
- c) A combination of a) and b).

RFC 7603: EMAN Applicability Statement