J. Parello, B. Claise, B. Schoening, J. Quittek
History: Draft Evolution

• IETF 77, 78 3/2010
  – OPSAG Monitor MIB
  – Introduction, MIB, Use Cases

• IETF 79 11/2010
  – EMAN WG Start
  – Introduction, UML become draft along with UML from MIB

• IETF 80 3/2011 –
  – UML and MIB Revised
  – feedback from PDU vendors
  – Requirements and use cases added

• IETF 81 7/2011
  – -Single Power State Series set detailed

• IETF 82 11/2011
  – Single Power State discussed
  – Definitions discussed in separate draft
  – Use Cases and Requirements modev to drafts

• IETF 83 3/2012
  – Multiple Power State Series Adopted
  – Power Interfaces Adopted

• IETF 84 7/2012
  – Definitions reviewed and incorporate
  – Relationships detailed and Topology examples put in

• IETF 85 11/2012
  – Editorial changes from tracker

• IETF 86 3/2013
  – Examples removed form Terminology
  – Editorial changes form tracker and reorganization

• IETF 87
  – Edited intro, Model format, Realtionship intro

• IETF 88
  – WGLC Feedback
## History: Stable

<table>
<thead>
<tr>
<th>IETF</th>
<th>REQ</th>
<th>USE CASES</th>
<th>Intro</th>
<th>Info Model</th>
<th>States</th>
<th>Relationships</th>
<th>Topologies</th>
<th>Interfaces</th>
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ADD: concept is new to the draft  
CHG: Concept is not new approach is changes  
= : Concept and text is the same, editorial or language edits may have been made  
EDIT: Concept and approach(class) is the same attributes may have been modified, added or deleted  
DEL : Concept was removed from the draft
Summary: Work Since 87

• Rev-11 based on feedback for WGLC of Rev-09
  – Feedback: 66 edits, 29 clarifications, 15 regrets
• Weekly Author meetings with chair to go over feedback
• ETSI GAL Liaison review
• Implementations
• Summary of edits were sent to the list
  – Major items highlights here
Summary: Highlighted Edits in this draft

- **EDIT:** Terminology capitalization / consistency
  - Modeling definitions out of terminology in model
  - Clarified physical / conceptual model notation
- **DEL:** Concerns section removed
- **CLARIFIED:** Metering clarified as pertaining to Meter devices not just measuring
- **EDIT:** Fixed IEEE1621 hibernate as off not sleep and quoted verbatim
- **EDIT:** Replaced power interface and component attribute in pseudo code that was lost from UML
**Edit: Clarify Physical v Model**

- **Common terms lower case**
- **Moved modeling definitions to modeling section out of terminology**
- **Summary of Notation for Modeling Physical Equipment**

<table>
<thead>
<tr>
<th>Physical</th>
<th>Modeling (Meta Data)</th>
<th>Model Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>equipment</td>
<td>Energy Object (Class)</td>
<td>Energy Object</td>
</tr>
<tr>
<td>device</td>
<td>Device (Class)</td>
<td>Device</td>
</tr>
<tr>
<td>component</td>
<td>Component (Class)</td>
<td>Component</td>
</tr>
<tr>
<td>inlet/outlet</td>
<td>Power Interface (Class)</td>
<td>Power Interface</td>
</tr>
</tbody>
</table>
Edit: Removed sections “Concerns”

– Scrubbed information and was covered in applicability and other parts of doc

– Promoted sections
  • Target Devices
  • Physical Reference Model
  • Nor Covered By Framework
Summary: Not Applied

• Kept Power State discussion in section on control even though it can be for monitoring only.
• Kept Context on the device and not only in EnMS
• Kept Scalar for role and category
• Kept Attributes and did not use name value pairs in keyword
• Kept caliber since we had consensus and also asked implementations and liaison
• See list where approach differences not applied.
Review: Topologies
(Since IETF 84)
class EnergyObject {

  // identification
  index : int
  identifier : uuid // RFC 4133
  alternatekey : string

  // context
  domainName : string
  role : string
  keywords [0..n] : string
  importance : int

  // relationship
  relationships [0..n] : Relationship

  // measurements
  nameplate : Nameplate

  // power and energy
  power : PowerMeasurement
  energy : EnergyMeasurement
  demand : DemandMeasurement

  // power states
  powerControl [0..n] : PowerStateSet
}

CLASS PowerInterface EXTENDS EnergyObject{
  eoIfType : enum { inlet, outlet, both}
}

class Device extends EnergyObject {
  eocategory : enum { producer, consumer, meter, distributor, store
  powerInterfaces[0..n]: PowerInterface
  components [0..n] Component
}

class Component extends EnergyObject
  eocategory : enum { producer, consumer, meter, distributor, store
  powerInterfaces[0..n]: PowerInterface
  components [0..n] Component
}

class Relationship {
  relationshipType : enum { meters, meteredby, powers, poweredby, aggregates, aggregatedby
  relationshipObject : uuid
}
Liaison: ETSI Green Abstraction Layer Liaison

- https://docs.google.com/file/d/0B31njMYqFndxNEZzdVlaQkw0N28/edit?usp=sharing

- Adopted from our discussion
  - Id’s should conform to new RFC4133
  - Power measurement as base plus exponent
  - Power measurement caliber added
  - Power States can be represented as single vector
    - GAL EnergyAwareState (P,S) intersection can be one vector
Ready for WGLC

Aside from what we discuss today we are ready for WGLC!

Discuss: Continue with pseudo code IM description or use a table?

Discuss: Should implementation section be added?
Discuss: Pseudo Code

Discuss: Continue with pseudo code or use a table?

Our pseudo code:

```c
CLASS Measurement {
  multiplier: enum { -24..24}
  caliber : enum { actual, estimated, static }
  accuracy : enum { 0..10000 } // hundreds of percent
}
```

Re-written in a tabular format:

<table>
<thead>
<tr>
<th>Properties</th>
<th>Description</th>
<th>Type</th>
<th>Get/Set</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplier</td>
<td>Base 10 exponent</td>
<td>Enum</td>
<td>G</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Caliber</td>
<td>Actual, estimate, or static</td>
<td>Enum</td>
<td>G</td>
<td>Optional</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Hundredths of percent</td>
<td>Enum</td>
<td>G</td>
<td>Optional</td>
</tr>
</tbody>
</table>

Inheritance can be specified as in IEC 68150
Discuss: Should implementation section be added?

- Reference implementations
  - SNMP.com prototypes
  - Stanford Python
- Compatible Implementations
  - EnMS’ (Joulex, Verdiem, CA Nimsoft, IBM Tivoli, Schneider)
  - ciscoEnergyWiseMib 1.3.6.1.4.1.9.9.683
  - Cisco EnergyWise Device Partners
    - IM is a subset of Model in this program
    - Java, TLV, C, Python implementations of model
  - Devices:
    - PDU (APC, Schneider, Raritan, WTI, Cyberswitching)
    - Light (NuLeds)
    - Facilities translators (Field Server, Schneider)
    - Facility controllers (Schneider, JCI)
    - 102 Partner Companies...
Summary:

• Reviewed with WG and Liaisons
• Lots of Editorial Revisions applied
• Approach is stable
• No open issues

• Given Stability and lots of review...
  – WG last call?
Thanks!