

Power and Energy YANG Module

draft-bcmj-green-power-and-energy-yang04

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Document History and Recap

- IETF 124 KEY Decisions
 - Establish GREEN design team; organize bi-weekly GREEN design team meetings to accelerate work on device monitoring firstly, followed by the biweekly GREEN WG meetings, for decision validation.
 - Referring to EMAN energy and power MIB as a starting point (RFC7460).
 - Parallel work with GREEN framework.
- Draft objectives
 - Define YANG module for power and energy monitoring.
 - Align with GREEN Framework & Terminology & Use Cases.
 - Support device & component-level energy management.

All the questions

- Questions addressed on the green-design-team meetings:
 - How should source identifications (unique IDs for energy objects) be handled, are they the same one on the device side and controller side, can we reuse existing uuid in RFC8348?
 - Do we need to introduce power-factor in the YANG model in replacement of power-current-type (AC/DC)?
 - What hierarchy should the accuracy classification follow to facilitate accurate statistics and what extensibility are needed?
 - Should the YANG model adopt unit-multiplier to represent 10-based exponents for scaling power/energy units?
 - How to address the double-counting risk when measuring power and energy, how to formalize the various relationships?
 - Should we integrate industry-standard energy efficiency certifications into the YANG model?

YANG tree overview

source-component-id is associated with the component name in the ietf-hardware model to realize the mapping of hardware and energy data (on the same box)

both monitoring attributes of power and energy, meeting the needs of instantaneous power monitoring and energy consumption statistics

Accuracy Levels:
- accuracy-like-parent
- accuracy-unknown
- accuracy-estimated
- accuracy-measured (bronze/silver/gold/red/ones)

The relationship uses type as the index key, which can define multiple sets of peers association relationships

```
module: ietf-power-and-energy
  +--ro energy-objects
    +--ro energy-entry* [object-id]
      +--ro object-id          string
      +--ro source-component-id? -> /hw:hardware/component/name
      +--ro power
        | +--ro instantaneous-power    int32
        | +--ro nameplate-power?      uint32
        | +--ro unit-multiplier        identityref
        | +--ro data-source-accuracy?  identityref
        | +--ro power-factor?          power-factor
        | +--ro measurement-local?     boolean
      +--ro energy
        | +--ro total-energy-consumed?  uint64
        | +--ro total-energy-delivered? uint64
        | +--ro unit-multiplier?       identityref
        | +--ro data-source-accuracy?  identityref
        | +--ro measurement-local?     boolean
        | +--ro certifications*        identityref
      +--ro relationship* [type]
        +--ro type          identityref
        +--ro peer* [id]
          +--ro id          string
          +--ro details?    string
```

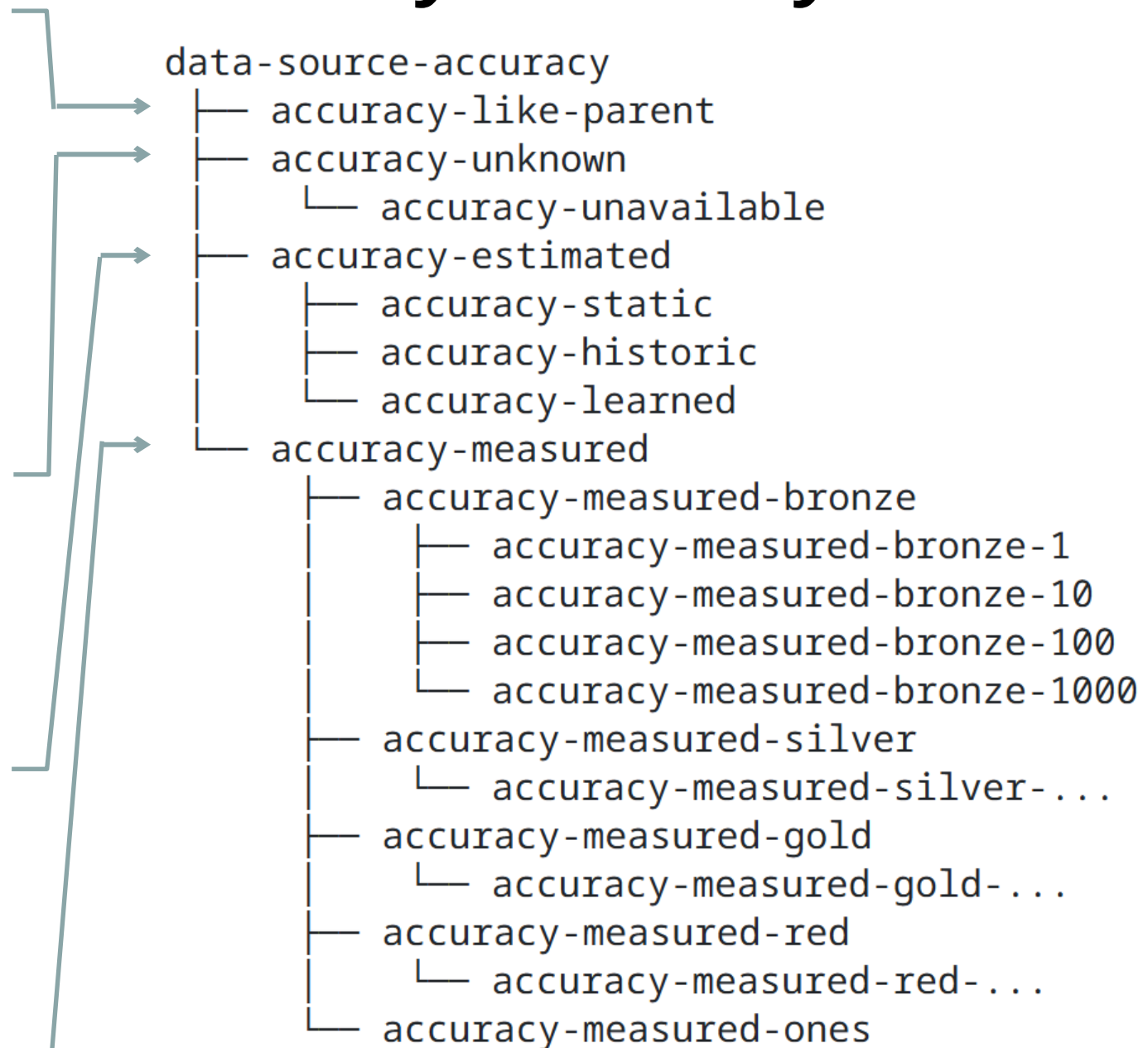
Accuracy Identity

streamline the calculation of green metrics and avoid the complexity of aggregating data components with disparate accuracy levels. It is the recommended default setting for child nodes.

a clear identity for power and energy data where accuracy cannot be validated or quantified, due to uncalibrated sensing devices, missing measurement metadata, etc.

power and energy data whose accuracy is derived from indirect methods rather than direct measurement, to distinguish inferential metrics from physically measured ones.

flexible and precise accuracy characterization for directly measured power and energy data by enabling both percentage-based and absolute value-based accuracy levels referring to IEC 62053.



Relationship

The relationship identities:

- powering/powered by;
- metering/metered by;
- aggregating/aggregated by

It is designed to establish clear and associative links between data nodes across the boxes while allowing the remote peer nodes to be described in multiple ways.

Enabling unambiguous traceability of data provenance, resource dependency, and aggregation logic, critical for reliable metric calculation and avoid report duplications.

```
identity energy-relationship-type {
  description "Base identity for energy object relationships";
  reference "RFC 7461: IANAEnergyRelationship";
}
identity powered-by {
  base energy-relationship-type;
  description "Energy Object A is powered by Energy Object B";
}
identity powering {
  base energy-relationship-type;
  description "Energy Object A is powering Energy Object B";
}
identity metered-by {
  base energy-relationship-type;
  description "Energy Object A is metered by Energy Object B";
}
identity metering {
  base energy-relationship-type;
  description "Energy Object A is metering Energy Object B";
}
identity aggregated-by {
  base energy-relationship-type;
  description "Energy Object A is aggregated by Energy Object B";
}
identity aggregating {
  base energy-relationship-type;
  description "Energy Object A is aggregating Energy Object B";
}
```

IANA Certification Types

- The IANA registration of power and energy certification identities ensures that energy efficiency indicators comply with international energy efficiency certifications, such as 80-plus for PSU.
- Additionally, the certification mechanism is extensible after expert review, which is mainly to ensure that relevant energy efficiency has a basis to follow rather than to impose restrictions.

```
identity certification-type {
  description
    "Base identity for certification types applicable to energy
    objects. This identity serves as the root for a hierarchy of
    certification types, allowing for extensibility.";

  reference
    "Industry sustainability and energy efficiency certifications";
}

identity energy-star {
  base certification-type;
  description
    "ENERGY STAR certification for energy efficiency.";
  reference
    "https://www.energystar.gov/";
}

identity c80-plus {
  base certification-type;
  description
    "80 PLUS Power Supply Certification";
  reference
    "https://www.cleareresult.com/80plus/";
}

identity epeat {
  base certification-type;
  description
    "Electronic Product Environmental Assessment Tool ratings (Bronze/Silver/Gold).";
  reference
    "https://www.epeat.net/";
}
```

Feedback from Amanda Baber:

- According to RFC 9907, Section 4.1, all IANA-maintained YANG modules MUST begin with the prefix “iana-“
- “All sub-registries” and “new sub-registry” should be replaced with “All registries” and “new registry”

Next Steps

- Collect feedback from the community.
- The design team believe the draft is ready for the operational information.
- Request WG adoption.
- Still some open issues, which might influence this draft => Next Presentation
 - Operational versus configuration (power states)
 - Device level versus network wide

```
+--ro relationship* [type]
  +--ro type      identityref
  +--ro peer* [id]
    +--ro id      string
    +--ro details? string
```

Thank You

- Datatracker :
<https://datatracker.ietf.org/doc/draft-bcmj-green-power-and-energy-yang/>
- Github :
<https://github.com/ietf-wg-green/green-design-work>
- Mailing List :
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