(SenML) Units for LwM2M/IPSO

IETF/IRTF joint meeting with OMA SpecWorks

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Units for SenML and OMA SpecWorks IPSO/LwM2M models

- All LwM2M/IPSO resources have (optional) unit attribute
  - Short string identifier for engineering units (e.g., "Cel" for temperature)
  - Some IPSO objects have Unit resource
  - Currently no OMA registry for unit identifiers
- SenML units registry seems like a good fit
  - LwM2M already using SenML JSON/CBOR for serialization of objects
  - Just needed to add a few new units: draft-bormann-senml-more-units does this
    - Byte (B), volt-ampere (VA), VA reactive (var), joule per meter (J/m)
    - Degrees (deg) for "compass direction"
- **We are not defining/registering new units, just the short IDs**

Challenge #1: scale

- SenML units shouldn't contain scale (k, M, m, etc.) prefixes
  - Use exponent in numeric value instead
  - JSON has exponent notation (e.g., 4e3)
  - CBOR exponent and decimal fraction types that make this simple
  - Note: there's no need for any floating point operations to make this work
- No scale in unit enables trivial comparisons
  - Units of different resources
  - Values from different sources (no need for application to check the unit prefix and multiply the values)
- Fixing scale in unit and using integer values fixes usable semantics
  - For example using "mA" for battery: unable to express values from 0 to 1 mA

Potential solutions for #1 in LwM2M/IPSO

- Scale only in the value (as suggested today)
  - For some resources "natural" scale is far from the base SI unit. For example micrometers for air particles or years for time.
- Scale attribute in schema for resources
  - For example "e-6" for "micro" prefix
  - Unit (string) comparison still trivial

Challenge #2: missing units

- SenML policy: one unit for one measure, (almost) only SI units
  - E.g., only "m/s", no "km/h" or "mph"
- Need efficient process to add units to the SenML registry
  - Already added Byte (B), volt-ampere (VA), VA reactive (var), joule per meter (J/m). PR exists for adding "deg" (compass direction).
- Do we need more relaxed rules than SenML?
  - For example Wh (not SenML units) is 3600 Joules (existing SenML unit)
  - Already exception for Byte (8 bits)

Potential solutions to #2

- Second SenML unit registry for "relaxed rules" units
  - Recommending to use the first for better interop
  - Providing possibly mapping to the units in first registry
- Register new units with "legacy" tag (*)
- Allow using non-SenML units with a prefix (e.g., "ucum:K")

- For the short IDs UCUM seems like good source
  - …but has many units we don't want to use (too rich set; harmful for interop)