VOUnits 1.0 → 1.1: a version bump to the standard

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IVOA Northern Fall Interop, 2022:
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kg m s$^{-2}$
$\text{kg m s}^{-2}$

$\text{kg m } /\text{s}^{2}$
kg \cdot m \cdot s^{-2}

kg \cdot m / s^{(2)}

kg \cdot m / s^2
Which syntax do you pick?
Which units are permitted?
How do you validate unit strings?
What do you *do* with a unit string?
Hence VOUunits 1.0!
And of course I'm going to cite https://xkcd.com/927/
VOUnits specification

www.ivoa.net/documents/VOUnits/
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- Contains a survey of current syntaxes (FITS, OGIP, CDS), adding deduced formal grammars for them (and discovering ambiguities in the process).
- Adds a new syntax, as much as possible in the intersection of existing ones, but with some extensions.
- If a string successfully parses in two distinct grammars, it means the same in both.
- Units: known, preferred, deprecated, and explicit support for ‘unknown’ units.
- Doesn't object to inch, for example, but would parse furlong as the femto-‘urlong’.
- Draws on QUDT v1 – qudt.org.
- v1.1 is in preparation/discussion in 2022, with only minor changes and clarifications.
Non-specification (ie, evading pain-points)

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- No support for ‘quantities’: units plus an amount, ‘2m/s’.
- No commitments about definitions of quantities (eg, atomic seconds vs astronomical).
- No definition of an algorithm for determining equivalence (is ‘m/s’ equivalent to ‘km/s’? or ‘km/ks’?).
- Unexpected units are not rejected, but labelled as such.
- All ASCII characters (ie, no ‘Å’).
Implementations

Any standard needs implementations, to debug and to support uptake
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• Reference implementation: Unity library – a parser library for both Java and C, which confirms validity, reports invalid or deprecated units, and reformats into other syntaxes (including LaTeX siunitx). See https://purl.org/nxg/dist/unity and doi:10.5281/zenodo.6949817

• DaCHS – docs.g-vo.org/DaCHS/ – a parallel implementation with a different grammar formalism, intended to investigate loose ends and muddy corners of the developing standard.

• Astropy units – docs.astropy.org/en/stable/units/
Validation exercise, Derriere and Landais

• CDS/Vizier in November 2021

• 26% of column metadata had one or other ‘invalid’ unit string

• ‘Obvious’ edits brought this down to 11% invalid, half of which are sexagesimal representations of angle, and half the rest are part of the prompt for discussion of v1.1

• Potentially errors below 0.1% (typos and exotic cases)
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wiki.ivoa.net/internal/IVOA/InterOpApr2022Ops/VizieR_VOUnits.pdf
VOUnits 1.1: next steps?

• The current standard is v1.0: [https://www.ivoa.net/documents/VOUnits/](https://www.ivoa.net/documents/VOUnits/)

• Current document: draft [https://ivoa.net/documents/VOUnits/20220525/index.html](https://ivoa.net/documents/VOUnits/20220525/index.html) and ‘issues’: [https://github.com/ivoa-std/VOUnits/issues/](https://github.com/ivoa-std/VOUnits/issues/) (and see also closed ones for a record of changes).

• Detailed/minor questions:
  • Is ‘%’ a unit? (YES, but strictly as an exception; ie, there is no open door to ‘ppm’).
  • Scalefactors: is ‘25.4mm’ a unit? (yuk, but this has been seen in the wild, so YES).
  • If we're allowing log(W) (and we do), should we allow log(1e3W)? (yuk, but if we allow the previous item, this should be allowed, too, on POLA grounds, so YES).

• The above changes are in the document at present. If thee have just cause to object, let thee now speak, or else hereafter forever hold thy peace.
Norman Gray – https://www.astro.gla.ac.uk/users/norman/
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