

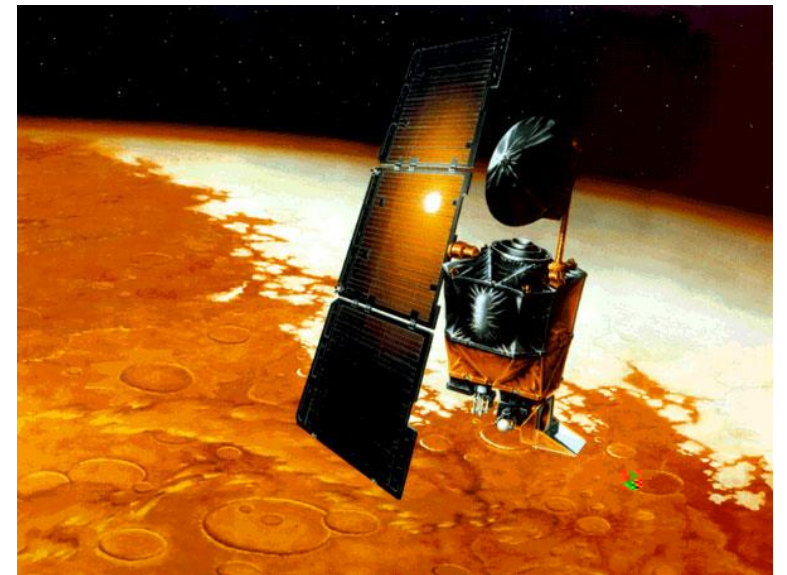
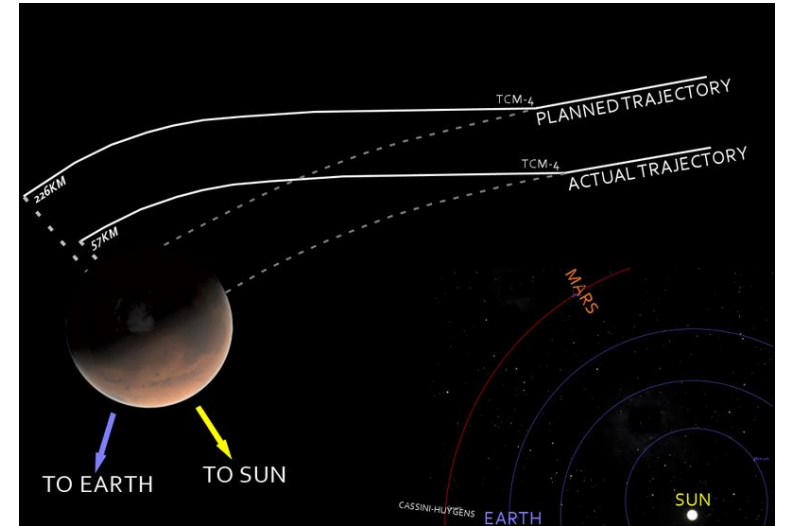
QUDT Introduction

QUDT

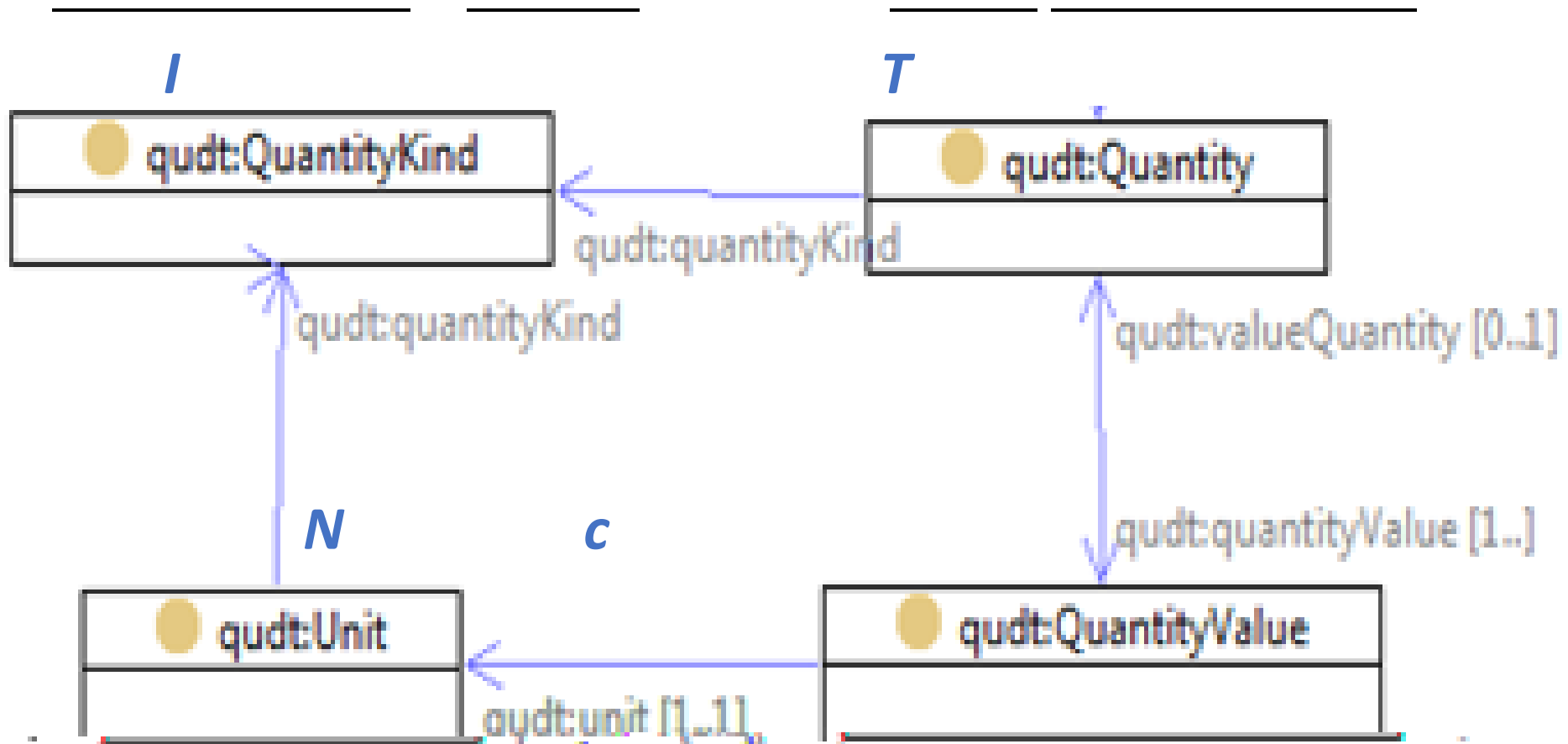


A key NASA Motivation

Web posted at: 1:46 p.m. EDT (1746 GMT)




Machine-readable Metadata



QUDT



NASA Motivations For the Constellation Program (Return to Moon and Mars)

 NASA TECHNICAL HANDBOOK National Aeronautics and Space Administration Washington, DC 20546-0001	HDBK-1003R Approved: MM-DD-YYYY Superseding NASA-HDBK-1003R
<p>NASA QUDT Handbook</p> <p>Quantities, Units, Dimensions and Types</p>	
<p>DRAFT v0.96 - April 30, 2013</p> <p>This official draft has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL.</p>	

The electronic version is the official approved document. Verify this is the correct version before use.

THIS HANDBOOK HAS NOT BEEN REVIEWED FOR EXPORT CONTROL RESTRICTIONS; CONSULT YOUR CENTER/FACILITY/HEADQUARTERS EXPORT CONTROL PROCEDURES/AUTHORITY PRIOR TO DISTRIBUTION OF THIS DOCUMENT.

QUDT



NASA QUDT started with ISO-80000 standards

The screenshot shows the QUDT.org website. The header includes the QUDT logo and a navigation menu with links: Home, QUDT Overview, QUDT Catalog, About, Contact, Join, and Donate. A search bar is located on the right.

The main content area features a paragraph about QUDT.org as a 501(c)(3) public charity nonprofit organization. Below this, there are sections for "Why QUDT.org" and "Use Cases Benefitting From QUDT".

On the right side, there are two resource boxes: "QUDT Resources" and "Community Resources".

At the bottom, there is a "QUDT In The News" section and a large diagram illustrating the QUDT ontology structure.

QUDT Resources:

- QUDT Catalog Latest Release
- QUDT Catalog Release 2.1
- GitHub Public Repository
- Introduction to QUDT slide presentation
- Introductory User Guide (QUDT Wiki)
- Unit Vocabulary Submission Guide (QUDT Wiki)
- QUDT EDG environment
- QUDT SPARQL Endpoint

Community Resources:

- QUDTLib: Java Unit Conversion Library based on QUDT
- QUDT (Another Java QUDT Unit Conversion Library)
- occam-qudt (A Java library for math operations using QUDT)
- QUDTLib: Javascript Unit Conversion Library based on QUDT
- Loop3d Profile and Vocabulary of Units
- Searchable QUDT Units browser

QUDT In The News:

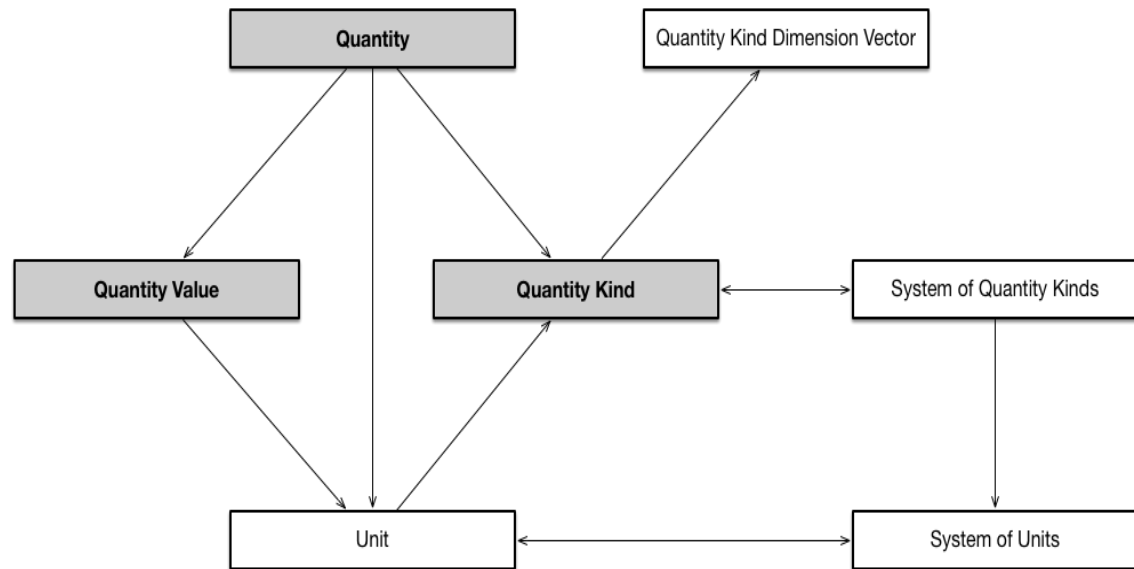
- The ABCs of QUDT - Blackwood
- The QUDT System for Dimensional Analysis and Unit Conversions - Winston
- Semantic Web for the Working Ontologist - Allemang, Hendler, Gandon

QUDT Ontology Diagram:

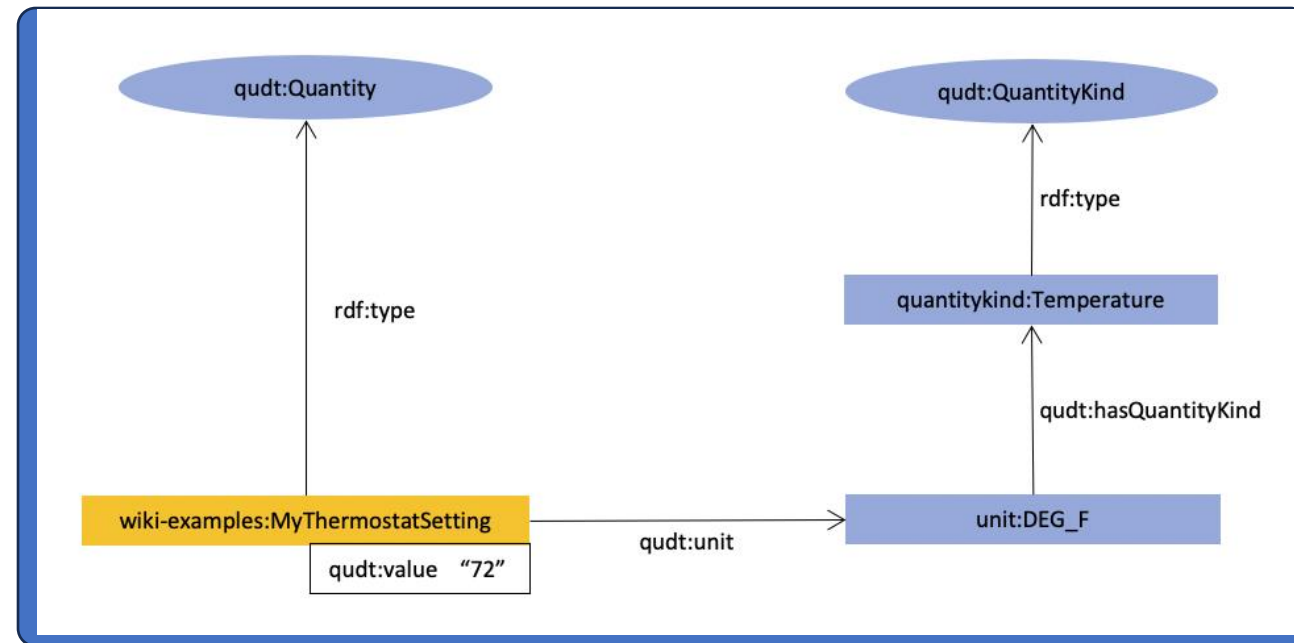
```

graph TD
    QV[Quantity Value] --> U[Unit]
    QK[Quantity Kind] --> U
    QK --> SQK[System of Quantity Kind]
    SQK --> SU[System of Units]
    U --> SU
  
```

What is QUDT?



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- Exists as a set of FAIR-compliant modular graphs for
 - Schema (both OWL and SHACL)
 - Vocabularies of
 - 2807 Units
 - 1169 Quantity Kinds
 - 224 Dimension Vectors (for the 7 SI base dimensions)
 - 328 Physical Constants
 - 11 Systems of Units
 - 10 Systems of Quantity Kinds
- Fully resolvable URIs for all vocabulary instances, (with content negotiation), and for the entire graphs
- Defined grammar for unit URI names
- Encoded as Turtle RDF files
- Web-based browsing and SPARQL querying
- QUDT is licensed under a Creative Commons Attribution 4.0 International License

The image shows a computer monitor and a tablet displaying the QUDT web interface. The monitor displays the 'unit:A' page, which includes the QUDT logo, the unit name 'unit:A', its URI, type, description, and a list of properties. The tablet displays a SPARQL query and its results, showing the same unit information as the monitor.

QUDT

unit:A

URI: <http://qudt.org/vocab/unit/A>

Type

qudt:Unit

Description

Ampere, often shortened to amp, is the SI unit of electric current and is one of the seven SI base units defined as:

$$A \equiv \frac{C}{s} \equiv \frac{\text{coulomb}}{\text{second}} \equiv \frac{\text{joule}}{\text{weber}}$$

Note that SI supports only the use of symbols and deprecates the use of any abbreviations for units.

Properties

qudt:siExactMatch <https://si-digital-framework.org/SI/units/ampere>

qudt:applicableSystem

CGS-EMU
CGS-GAUSS
SI
PLANCK

qudt:conversionMultiplier 1.0

qudt:conversionMultiplierSN 1.0E0

qudt:dbpediaMatch <http://dbpedia.org/resource/Ampere>

qudt:hasDimensionVector

dimension:A0E1L0I0M0H0T0D0

qudt:hasQuantityKind

quantitykind:CurrentLinkage
quantitykind:DisplacementCurrent
quantitykind:ElectricCurrentPhasor
quantitykind:MagneticTension
quantitykind:MagnetomotiveForce
quantitykind:TotalCurrent
quantitykind:ElectricCurrent

qudt:ieo61360Code

0112/2///62720#UAA101
0112/2///62720#UAD717

qudt:omUnit

<http://www.ontology-of-units-of-measure.org/>

qudt:symbol A

rdfs:type qudt:Unit

qudt:ucumCode A

qudt:udunitsCode A

qudt:uneceCommonCode AMP

SPARQL query results:

```

#prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
#prefix owl: <http://www.w3.org/2002/07/owl#> .
#prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
#prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .

<http://qudt.org/vocab/unit/A>
  a
    qudt:Unit ;
  rdfs:isDefinedBy <http://qudt.org/2.1/vocab/unit> ;
  rdfs:label "Ampere" ;
  rdfs:comment "The SI unit of electric current and is one of the seven SI base units defined as: A ≡ C/s ≡ coulomb/second ≡ joule/weber." ;
  qudt:siExactMatch <https://si-digital-framework.org/SI/units/ampere> ;
  qudt:applicableSystem
    CGS-EMU ,
    CGS-GAUSS ,
    SI ,
    PLANCK ;
  qudt:conversionMultiplier 1.0 ;
  qudt:conversionMultiplierSN 1.0E0 ;
  qudt:dbpediaMatch <http://dbpedia.org/resource/Ampere> ;
  qudt:hasDimensionVector
    dimension:A0E1L0I0M0H0T0D0 ;
  qudt:hasQuantityKind
    quantitykind:CurrentLinkage ,
    quantitykind:DisplacementCurrent ,
    quantitykind:ElectricCurrentPhasor ,
    quantitykind:MagneticTension ,
    quantitykind:MagnetomotiveForce ,
    quantitykind:TotalCurrent ,
    quantitykind:ElectricCurrent ;
  qudt:ieo61360Code
    0112/2///62720#UAA101 ,
    0112/2///62720#UAD717 ;
  qudt:omUnit <http://www.ontology-of-units-of-measure.org/> ;
  qudt:symbol A ;
  rdfs:type qudt:Unit ;
  qudt:ucumCode A ;
  qudt:udunitsCode A ;
  qudt:uneceCommonCode AMP ;

```


Adoption – Standards Activities

Adoption – Sample of Organisations

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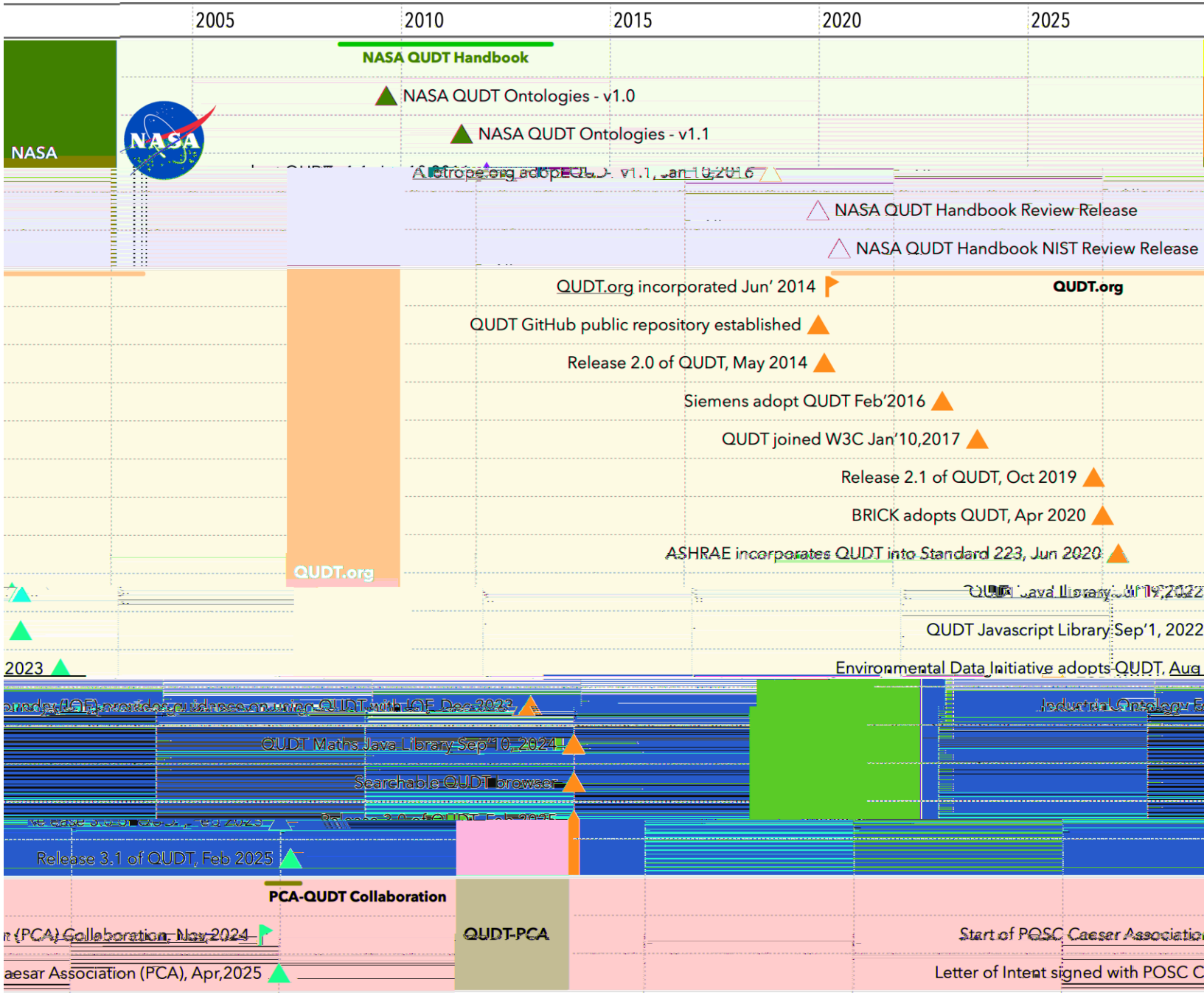
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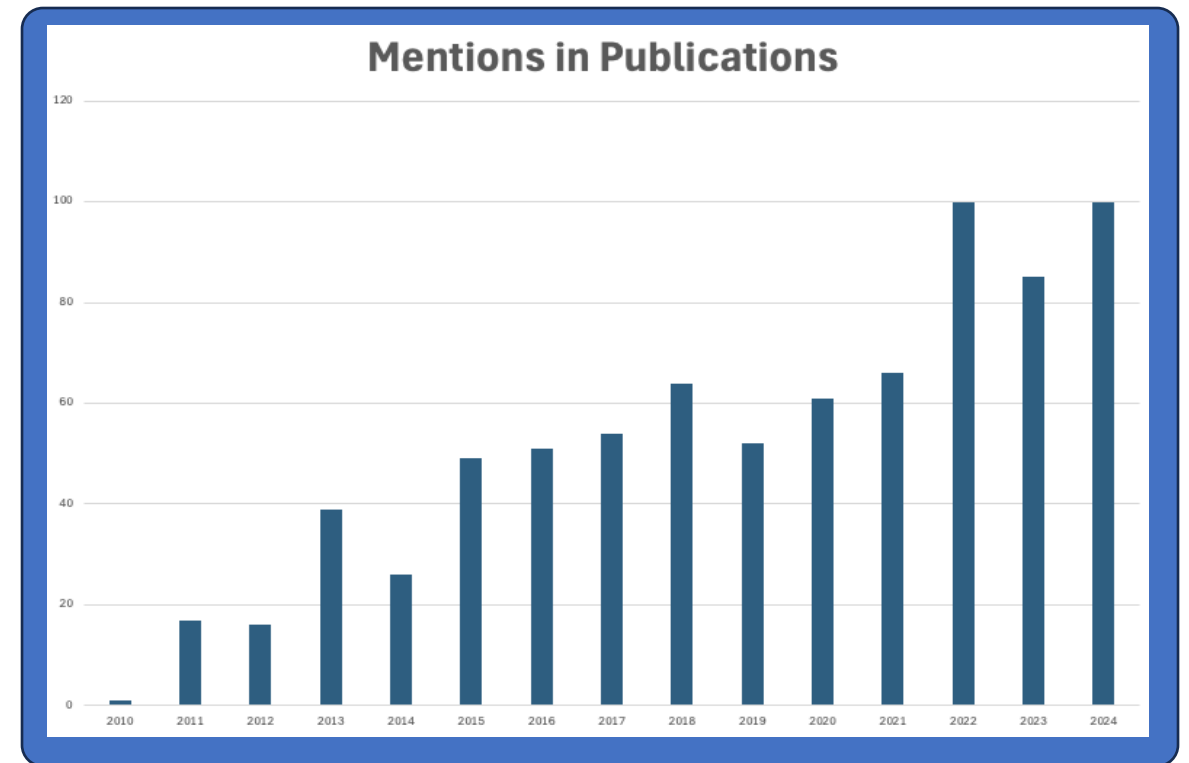
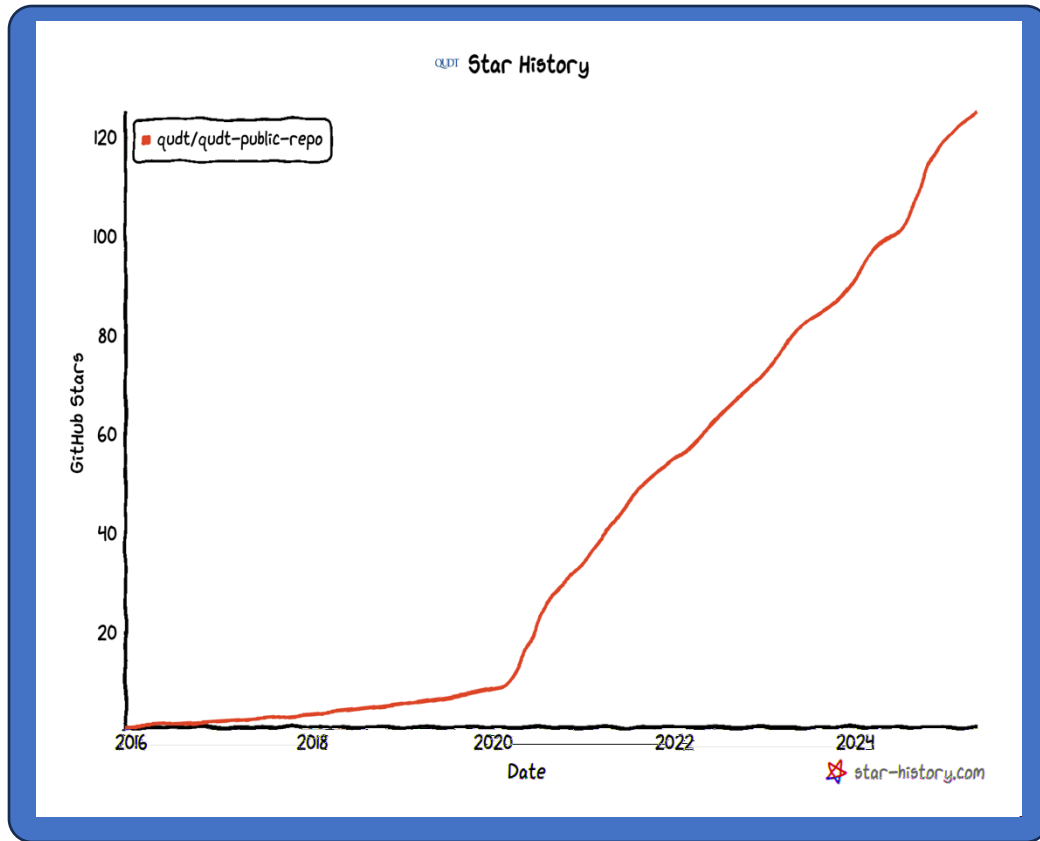
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Interest Trends



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Demo 1: Units of Force

```
SELECT DISTINCT ?qk ?qku (COALESCE(?labelEn, ?qkl) AS ?label)
WHERE {
  BIND (quantitykind:Force AS ?arg1) .
  ?qk rdf:type qudt:QuantityKind .
  FILTER (?qk = ?arg1) .
  ?qku qudt:hasQuantityKind ?qk .
  ?qku a qudt:Unit .
  ?qku rdfs:label ?qkl .
  OPTIONAL {
    ?qku rdfs:label ?labelEn .
    FILTER (lang(?labelEn) = "en")
  }
} ORDER BY ?qku
```

which results in 23 values for ?qku:

qk	qku	label
qudtqk:Force	unit:CentiN	CentiNewton
qudtqk:Force	unit:DYN	Dyne
qudtqk:Force	unit:DeciN	DeciNewton
qudtqk:Force	unit:GM_F	Gram Force
qudtqk:Force	unit:GigaN	GigaN
qudtqk:Force	unit:KIP_F	Kip
qudtqk:Force	unit:KilGM_M_BER_SEC2	Kilogram metre per second squared
qudtqk:Force	unit:KiloGM_F	Kilogram Force
qudtqk:Force	unit:KiloLB_F	KiloPound Force
qudtqk:Force	unit:KiloN	Kilonewton
qudtqk:Force	unit:KiloPOND	Kilopond
qudtqk:Force	unit:LB_F	Pound Force

Demo 2: Unit Conversion

```
SELECT DISTINCT ?toConvert ?label ?into (COALESCE(?labelEn, ?otherUnitLabel) AS ?otherlabel) ?multiplyBy
WHERE {
  BIND ("To convert" AS ?toConvert) .
  BIND ("into" AS ?into) .
  BIND ("multiply by" AS ?multiplyBy) .
  BIND (unit:MilliGRAY as ?unit) .
  ?unit rdfs:label ?label .
  ?unit qudt:conversionMultiplier ?cm1 .
  ?unit qudt:hasQuantityKind/qudt:hasDimensionVector ?qkdv .
  ?otherUnit qudt:hasQuantityKind/qudt:hasDimensionVector ?qkdv .
  ?otherUnit a qudt:Unit .
  FILTER (?otherUnit != ?unit) .
  ?otherUnit qudt:conversionMultiplier ?cm2 .
  ?otherUnit rdfs:label ?otherUnitLabel .
  OPTIONAL {
    ?otherUnit rdfs:label ?labelEn .
    FILTER (lang(?labelEn) = "en") .
  }
  BIND ((?cm1/?cm2) AS ?multiplier) .
}
ORDER BY ?otherlabel
```

Executing this query produces output that looks like this:

Milligray	into	BTU-IT-PER-lb	multiply by	0.000000429922
Milligray	into	British Thermal Unit (TH) per Pound	multiply by	0.00000043021043303
Milligray	into	Calorie (international Table) per Gram	multiply by	0.00000023884589662
Milligray	into	Calorie (thermochemical) per Gram	multiply by	0.00000023900573613
Milligray	into	Erg per Gram	multiply by	10.0

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QUDT Supports Multiple Communities

- Linked Data community
 - Resolvable URIs for graphs and individuals
 - Continuously updated
- Industrial User community
 - Versioning of Releases for embedding and managing within industrial applications
- Choice of OWL or SHACL representation for the schemas
- Explicit or dynamically inferred (SHACL) properties
 - E.g. “applicableUnits” for each QuantityKind
- Available for use with or without the need for reasoners

Future standards should keep these disparate needs in mind

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Governance

Policies, Principles, Processes, Issues, Measures

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