
New concepts in science and technology

**Requirements from international
terminology standards**

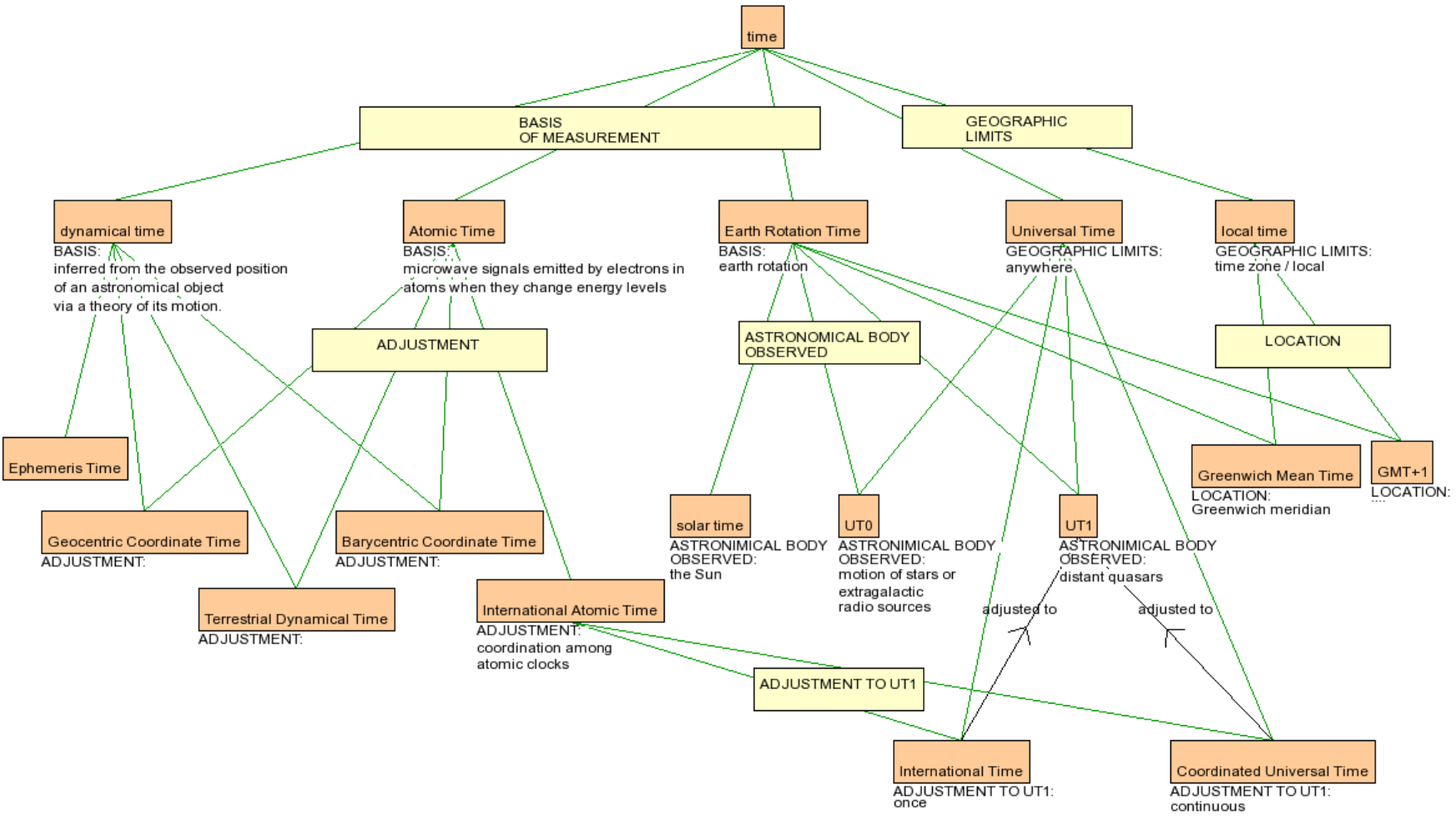
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Introductions and objective

- Over the years, different methods for measuring time have been developed for different user communities and purposes
- Each method is known by a specific name, or “term”
- The term for the method used for civil timekeeping is UTC
- A new method has been proposed, which would drop the leap-second adjustments in UTC
- This new method, if adopted, needs to be distinguishable by name from the other methods
- Terminology standards exist for precisely this situation



Agenda

- Standards bodies
- Consensus on importance of standards
- Standardization of terminology – a prerequisite for all other standards
- ISO requirement - Univocity
- ISO TC37 – responsible for terminology
- ITU's terminology
- Recommendation: new concept = new term

International Standards

- The International Organization for Standardization (ISO) develops international standards in all scientific, technical, and economic sectors
- Each sector is governed by a Technical Committee
- Time measurement is one of the earliest activities subject to standardization

ISO TC37 – Standards for Terminology

- Standardization of principles, methods and applications relating to terminology
- One of only 7 “horizontal committees” among ISO’s 285 TCs
 - http://isostore.libnor.org/libnor/iso_committees_on_horizontal_subjects.pdf
 - ISO TC12 (quantities, units, symbols...) is also a horizontal committee
- “Horizontal” means that its standards are essential for developing other standards
- In ISO, ISO/TC 37’s rules are compulsory.

Complementary to ISO

- BIPM develops measurement standards
- ITU develops ICT standards
- IERS provides Earth orientation parameters

BIPM and ISO work together

- ISO participates in the Consultative Committee for Units (CCU), the Joint Committee for Guides in Metrology (JCGM), and the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS).
- The BIPM has Liaison A status with the following ISO Committees:
 - TC 12 (Quantities, units, symbols, conversion factors)
 - TC 146 (Air quality), TC 146/SC 3 (Ambient atmospheres)
 - TC 212 (Clinical laboratory testing and in vitro diagnostic test systems)
 - TC 229 (Nanotechnologies)
 - CASCO (Committee on conformity assessment)
 - REMCO (Committee on reference materials).
- ISO TC37 also has a Liaison A status with TC12 and with the ITU

Joint BIPM, OIML, ILAC and ISO Declaration on Metrological Traceability

- International consistency and comparability of measurements are required
- Measurement comparability is an essential characteristic of an international measurement system within which measurement results can be universally accepted
- This international consistency and comparability can only be guaranteed if measurement results are traceable to internationally recognized references

Prerequisites supporting the Joint Declaration

- Scientific and technical concepts need to be absolutely clear in order to serve their purpose
- This property of clarity is called “univocity”
- Terms that denote scientific and technical concepts therefore must be “univocal”
- A term is univocal if it has *one and only one meaning*

ISO/IEC Directives – Rules for international standards of all kinds

- Standards define clear provisions in order to facilitate international trade and communication
- To achieve this objective, “uniformity of terminology shall be maintained”
- “The standardization of terms and definitions is fundamental to all standardization activities.”
- ALL standards bodies share this objective
- Requirements are stipulated in ISO 10241-1 - *Terminological entries in standards*
- 10241-1 is a normative reference in the ISO Directives

ISO 10241-1

- A mandatory standard for all ISO committees
- Stipulates normative provisions for standardization of terms and definitions
- Key requirement : Univocity
 - One designation corresponds to one concept (a term shall have only one meaning)
 - One concept corresponds to one designation (a concept shall be named by only one term)
- The univocity principle is recognized by terminologists and lexicologists worldwide

ITU standardizes its terminology already

- ITU maintains a terminology database
- It contains 123,417 terms in six languages
- Its purpose is to standardize terms and concepts
- ITU has therefore already demonstrated an awareness about the importance of adopting clear and unambiguous terms for its scientific and technical concepts.

ITU-R	coordinated Universal Time Recommended	توقيت عالمي منسق Recommended	协调世界时 Recommended	tiempo universal coordinado Recommended	temps universel coordonné Recommended	всемирное координированное время Recommended
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Definition

English - [عربي](#) - [中文](#) - [Español](#) - [Français](#) - [Русский](#)

Sector : Radiocommunication (ITU-R) - Recommended

Abbreviation : UTC

Term : *coordinated Universal Time*

Definition : Rec. ITU-R V.573- 4 - The time scale, maintained by the BIPM and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals. UTC corresponds exactly in rate with TAI, but differs from it by an integral number of seconds. RR - The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap seconds) to ensure approximate agreement with UT1. Time scale, based on the second (SI), as defined in ITU-R Recommendation ITU-R TF.460-5. Rec. ITU-R TF. 460-5 - UTC is the time-scale maintained by the BIPM, with assistance from the IERS, which forms the basis of a coordinated dissemination of standard frequencies and time signals. It corresponds exactly in rate with TAI but differs from it by an integer number of seconds. The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap-seconds) to ensure approximate agreement with UT1.

Source : RR 1.14; RR 2004

Publications :

[Recommendation ITU-R M.493-12](#) (2007) - An. 1, § 8.1.3;

[Recommendation ITU-R TF.460-6](#) (2002) - cons. g);

[Recommendation ITU-R TF.686-2](#) (2002) - An. 1;

[Recommendation ITU-R V.573-4](#) (2000) - An. 1 (J06);

What to call the proposed measurement protocol has already been discussed

- 2003. ITU-R international colloquium in Torino, Italy
 - <http://www.ucolick.org/~sla/leapsecs/torino/index.html>
- 2011. Colloquium Exploring Implications of Redefining UTC in Astrodynamics, Astronomy, Geodesy, Navigation, Remote Sensing and Related Fields, Exton, PA
 - <http://futureofutc.org>
- 2012. Statement from ISO to ITU-R
- 2013. Colloquium - Requirements for UTC and Civil Timekeeping on Earth, Charlottesville, VA
 - <http://www.cacr.caltech.edu/futureofutc/index.html>
- 2013. ITU-R Assembly, Geneva

ITU-R Colloquium in Torino, 2003

There was broad agreement that:

- If a broadcast time scale without leap seconds is to be adopted
 - The change should not take place until 2022
 - The new concept be given a new name
- “Temps International (TI)” was put forward as a possible new name

A time measurement protocol without leap seconds = new concept

- “It should be a continuous atomic time scale, without leap seconds, that *is synchronized with UTC* at the time of transition.”
- If adopted, the protocol would co-exist with UTC as is universally understood today
- Calling it “UTC” would therefore be very confusing, and would result in *polysemy* – one term with two meanings.

“UTC” must avoid polysemy

- Polysemy undermines comprehension and causes problems when precision of meaning is important
- These problems are more serious in highly-restricted and specialized domains *such as time measurement*.
- If UTC is the term adopted to name the new protocol, the term is no longer univocal, but becomes **polysemic**
 1. “old UTC” = atomic time adjusted to UT1 to align with solar (earth rotation) time
 2. “new UTC” = ...

Time measurement without leap seconds should not be called UTC

- The name no longer reflects the concept because the concept is no longer connected to “universal time”, which is a measure of earth rotation
- Unless explicitly stated, the precise meaning in a given context will be un-determinable
- All existing time measurement terms containing “UT” are based on astronomical time, (UT0, UT1, etc.), i.e. rotation of the Earth
- A civil standard not tied to Earth rotation would be different from existing and historical practice, and shall therefore omit any reference to "Universal Time" by title

UTC is directly associated with the notion of “universal time”

By various resolutions of the ITU, CGPM, ISO, and IAU:

- The "Universal Day" is a mean solar day
- "Universal Time" as a subdivision of the Universal Day
- "Universal Time" is time based on rotation of the earth
- UTC without leap seconds would not be Universal Time
- The designation Universal Time (Coordinated), UTC, may be abbreviated to Universal Time, UT, thus indicating the expectation that UTC closely matches UT
- UTC provides Universal Time, or mean solar time
- UTC is a form of Universal Time (UT)

Source: <http://www.ucolick.org/~sla/leapsecs/epochtime.html>

Legal, geopolitical considerations

- UTC is the basis for legal time in many jurisdictions
- Legal terms *cannot* have more than one meaning
- International agreements require leap seconds in UTC
- International agreements do not require leap seconds in the broadcast time scale recommended by the ITU-R, if that is given a different name

Applying the standard

The ITU and ISO apply the univocity principle when adopting terms for scientific and technical concepts

The term UTC is associated with Earth rotation

Therefore, a time scale not synchronized with Earth rotation must invoke a term other than UTC

Concluding remarks

- Univocity: a new concept requires a new name
- This requirement has been applied by standards bodies world-wide for decades
- ISO advises all scientific and technical communities to apply the univocity principle when naming new concepts

References

- ISO 704 – Principles and methods of terminology work
- ISO 860 – Harmonization of concepts and terms
- ISO 10241-1 – Terminological entries in standards
- ISO/IEC Directives, Part 2