REPORT ON
CURRENT ACTIVITIES OF ITU-R WP7A

51th Meeting of the CGSI C
Timing Subcommittee
19 September 2011

Ron Beard, Chairman
ITU-R Working Party 7A
The International Telecommunication Union
Radio Communications Sector
ITU-R

Agency responsible for coordination of Radio Spectrum and utilization

Promotes international cooperation in assignment of geostationary satellite orbits

Focal point for governments and private sector in developing networks and services

Maintains Frequency Allocations in ITU Radio Regulations, an international treaty, through World Radiocommunication Conferences (WRC)

Held every 3 to 4 years

Process is implemented through seven Radiocommunication Study Groups

Study Groups establish formalized series of questions, recommendations, reports, handbooks and opinions relevant to technology and operation in radio spectrum and satellite transmission characteristics
Study Group 7-Science Services
Working Party 7A-Broadcast Time and Frequency Services

Responsible for Time and Frequency Signal (TFS) Services both terrestrial and satellite

Maintains questions, TF series of recommendations, reports, opinions and handbooks covering fundamentals of TFS generation, measurements and data processing

Topics include

- Terrestrial TFS transmissions, including HF, VHF and UHF
- Television broadcasting
- Microwave links
- Coaxial and optical cables
- Space based including navigation, communications and metrological satellites
- Frequency standards, clocks and TFS measurements systems
- TFS performance characterization
- Time scales and time codes
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Coordinated Universal Time (UTC)


Originated from the need to “coordinate” time at different timing centers and their time broadcasts

Defined as stepped atomic time scale to approximate UT1 from International Atomic Time (TAI)

UTC = TAI + n seconds, where n = integer seconds

Adjusted when the predicted difference will maintain

UT1 - UTC < 0.9 seconds

Rate determined by TAI so basic interval is SI second
The Future of The UTC Time Scale
Question ITU-R 236/7
(2000)

1. What are the requirements for globally-accepted time scales for use both in navigation and telecommunications systems, and for civil time-keeping?
   • Accuracy, Stability, Based on the SI Second
   • Uniformity, Accessibility
   • Reliability
   • Availability
   • Civil / National Timekeeping

2. What are the present and future requirements for the tolerance limit between UTC and UT1?
   • \(|\text{UT1} - \text{UTC}|\) Tolerance of 0.9 seconds
   • Could a Greater Tolerance be Accommodated?

3. Does the current leap second procedure satisfy user needs, or should an alternative procedure be developed?
   • Availability of Leap Second Information for Users
   • Alternatives Used (Establishing System Independent Time)
   • Relationship of Telecom & NAVSAT System Internal Time to Time Scales
Prior Working Party Activities on Future of UTC

A Special Rapporteur Group was formed to focus studies
   Efforts were generally ignored
   Associated surveys were inconclusive
   Data calls were less than fruitful

Credible impact to software for controlling telescopes and astrodynamic orbit
determination a serious concern
   Cost estimates provided spanned orders of magnitude

Assessment of developments in radio- and tele-communication are indicative of
needs
   Ad hoc time in systems are driven by need for “Real-time” accuracy and
   precision
   “Local Time” determined by statistical process of many standards/ clocks
   are being employed in new systems - UTC(k)
   Telecommunications capabilities needing distributed syntonized operation
   (CDMA Network) are increasing
Alternatives to Modifying UTC

Create a new time scale, to be known as International Time (TI)
   Eliminate UTC and replace with TI
   Could result in major confusion

Use TAI instead of UTC
   TAI is metrologic scale and not distributed
   Transition could result in major time step

Adopt GPS Time as the official international time scale
   GPS Time is a system real time internal time scale
   Derived from system clocks not global timing centers
   Rate and time steps can be changed in accord with system demands

Increase maximum tolerance of DUT1
   One hour would be similar to Daylight Savings Time (Summer Time)

Do Nothing
Results and Conclusions

Major scientific and GNSS organizations have not taken issue with the subject
There has been ample opportunity and encouragement to contribute

Major cost issues with systems have been raised
Little information on quantitative costs has been provided
The few estimates offered seem to be guesses at best
Few observers noted there are costs associated with maintaining the status quo - Example of impact of EOP re-definition

A variety of continuous internal system time scales have proliferated to provide a solution to discontinuities in UTC
Multiple time scales in global systems could create potential problems in operational use as well as conceptual confusion on the proper definition and roles of time references

The Consultative Committee on Time and Frequency has strongly recommended proceeding with a decision so enough time is available for any necessary software and systems modifications
CURRENT SITUATION

Working Party 7A exhausted technical considerations and studies

Consensus not reached due to other than technical grounds

Forwarded to Study Group 7 (SG7) for resolution

SG7 likewise unable to resolve the issue
SG7 submitted informal survey to Member States for Comment - Few responses

SG7 to submit issue to Radio Assembly for resolution

A second informal survey was circulated to raise awareness of issue