ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

SEP 03 2008

NETWORKS AND INFORMATION
INTEGRATION

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
COMMANDER, UNITED STATES STRATEGIC COMMAND
DIRECTOR, NATIONAL SECURITY AGENCY
DIRECTOR, DEFENSE INFORMATION SYSTEMS AGENCY
DIRECTOR, NATIONAL RECONNAISSANCE OFFICE
DIRECTOR, DEFENSE INTELLIGENCE AGENCY
DIRECTOR, NATIONAL GEOSPATIAL INTELLIGENCE AGENCY
DIRECTOR, MISSILE DEFENSE AGENCY

SUBJECT: Discontinuance of Leap Second Adjustments

The International Telecommunications Union Radiocommunications Sector will soon be considering a proposal to discontinue the periodic addition of leap seconds to Coordinated Universal Time. As outlined in the attached White Paper, any change regarding time definition could have significant impact on DoD systems that rely on this established time scale for stable or synchronized operation.

To ensure DoD captures the impact of such a change, please complete and submit one electronic polling form for each system which may be affected at http://tycho.usno.navy.mil/ ("Leap Second Poll" link) before September 19, 2008. For classified systems, please submit the requested poll information via email to bb@usno.navy.smil.mil. The staff point of contact for this action is Mr. Bill Bollwerk, U.S. Naval Observatory, (719) 567-6740, bill.bollwerk@usno.navy.mil.

John G. Grimes

Attachment:
As stated

CHANGES IN THE DEFINITION OF COORDINATED UNIVERSAL TIME

Recommendation

★ The U.S. Naval Observatory (USNO) as Precise Time and Time Interval Manager for DoD, recommends the following position for the Secretary of Defense regarding the establishment of a continuous international time scale that does not include "leap second" adjustments:

"The DoD supports the establishment and maintenance of a single continuous time scale for the U.S. and within the international community to ensure optimal synchronization, stability, and interoperability among defense, national, international, and commercial Positioning, Navigation, and Timing (PNT) systems. The establishment of a continuous time scale will require the discontinuation of the insertion of occasional leap seconds that adjust for the long term decrease in the earth's rotation. To allow sufficient time for necessary system modifications to be accomplished, the effective date for discontinuation must be no earlier than 1 January 2018."

Background

★ Coordinated Universal Time (UTC) is the internationally accepted standard time-scale maintained by the International Bureau of Weights and Measures in accordance with a standard definition of UTC established by the International Telecommunications Union Radiocommunication Sector, ITU-R. The time and frequency standard for all DoD is UTC(USNO), which is UTC as realized in real time by an ensemble of atomic clocks at the U.S. Naval Observatory (USNO).

★ UT1 is commonly used as a time determined from astronomical observations of the rotation of the Earth with respect to the International Celestial Reference System. UT1 is provided in near real time on a daily basis by the International Earth Rotation and Reference System Service (IERS), in the form of UT1-UTC.

★ Leap seconds are inserted so that UTC will not differ from UT1 by more than 0.9 seconds. A leap second steps UTC by one second in time resulting in a non-uniform time scale, and affects communications, timing, and navigation systems. The frequency of insertion depends on the variable rotational speed of the Earth. Observations show that the insertion of leap seconds will occur with greater frequency in the years to come.

★ UT1-UTC is one component of the set of Earth orientation parameters (EOP) provided solely in the U.S. by USNO. They relate the celestial reference frame to the inertial reference frame, used by space platforms, and the terrestrial reference frame used for military operations. Without frequently updated accurate EOP, the accuracy of geo-location systems, including ISR and GPS, degrade significantly.

Discussion

★ Per DODD 4650.5, USNO is designated the DoD Precise Time and Time Interval (PTTI) Manager and is responsible for providing coordination and recommendations on topics affecting UTC and DoD.

★ Proposals have been discussed by The International Telecommunications Union Radiocommunications Sector (ITU-R) to change the definition of UTC by eliminating the leap second. No formal action has been taken by the ITU-R to date. Should the ITU-R Working Party 7A adopt a formal proposal, it would be passed to ITU-R Study Group 7 for further discussion.and

possible approval in October 2008. At that point it is likely that the U.S. Government through the State Department would be asked for a formal opinion. To be internationally accepted, the final version of a proposal would have to be approved by the World Radio Conference as early as 2010.

★ Previously, USNO has informally polled elements of the DoD community to determine the effects of such proposals on operations. Some DoD users have taken advantage of the leap second in order to use UTC as a low accuracy surrogate for UT1. Should leap seconds be effectively eliminated, users of the leap second would have to change existing software in order to input more accurate values of UT1-UTC. Formal cost and schedule estimates for executing these changes have not yet been accomplished, but, based on an initial survey, they are expected to be significant. In order to ensure the decision to proceed is based on complete information, USNO will formally poll, via ASD(NII), known DoD users of precise time to determine (by September 2008):

1) A comprehensive list of systems owned or used by the DoD that will need to be modified to accept UT1 in lieu of UTC only (to include commercial remote sensing, etc)
2) Cost and schedule to modify each system
3) Operational risks associated with modification
4) Corresponding operational considerations and cost of retaining capability to continue using UTC with leap second adjustments.

★ Some other users have no requirement to maintain time close to a time scale related to the Earth's rotation. They cite the requirement for a continuous smooth time scale and express concern that they cannot operate effectively when a leap second occurs. The insertion of a leap second requires the expenditure of significant resources with each occurrence in order to pre-test equipment and procedures to ensure that no outages will occur during the actual insertion process. These users are typically involved in communications and target location.

★ Elimination of the leap second requires continued accessibility to EOP information. EOP are necessary to align the Earth and the celestial reference frames to maintain operational capability. Earth orientation data, provided by USNO to the DoD user community, will ensure that DoD and national systems requiring accurate alignment between UTC and UT1 will be able to maintain operational capability to perform their missions.

★ In order to prepare for the change in Coordinated Universal Time, DoD components would need to begin near-term program planning to fund software upgrades. All future systems should also take this into account.