

## **PTTI 2010 OPENING ADDRESS**

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### **GREETING**

Ladies and Gentlemen:

It's a pleasure to have the chance to make a few remarks at this, the 42<sup>nd</sup> Annual Precise Time and Time Interval Meeting. It's time again to gather and exchange perspectives that challenge our current timing capabilities and shed light on research that has potential to contribute to the global infrastructure. These PTTI Meetings provide a valuable forum for time and time interval providers to make system developers aware of the latest improvements and trends.

### **PURPOSE**

The PTTI Systems and Applications Meeting is sponsored by the U.S. Naval Research Laboratory, the U.S. Naval Observatory, the NASA Jet Propulsion Laboratory, the Defense Information Systems Agency, and the U.S. Coast Guard Navigation Center. This forum has been designed to pursue four stated objectives, including:

- 1) To disseminate and coordinate PTTI information at the user level,
- 2) To review present and future PTTI requirements.
- 3) To inform Government engineers, technicians, and managers of precise time and frequency technology, and
- 4) To provide all stakeholders with an opportunity for an active exchange of new technology.

To address these objectives, this year's sessions will include highlights on recent work at the national laboratories, developments in time and frequency transfer using Global Navigational Satellite Systems, computer networks, and optical fibers, as well as advances in atomic standards, time scale algorithms, calibration, and analyses of clock performance.

### **FOCUS**

A quick look through the program shows that the distribution of accurate time and frequency is the major emphasis of this year's conference. While there has been significant progress made on devices over the past year, this year's forum will highlight the importance of accurate time and frequency dissemination to users along with developmental activity in this field. You will see this reflected clearly in the number of papers related to time and frequency distribution.

Members of the PTTI community frequently compare the distribution of time and frequency to the provision of water, gas, and electric utilities. Most people today recognize the essential roles of these utilities in our everyday life. Few, however, have recognized the pervasive use of time and frequency in today's infrastructure and even fewer have understood the nature of the need for accurate time and frequency. Many presentations in this conference will show that significant efforts are being made to ensure that tomorrow's infrastructure, both military and civil, will be able to take advantage of the unprecedented accuracy of the time and frequency standards anticipated in the future.

## **HISTORICAL PERSPECTIVE**

By way of some historical perspective, I'd like to rewind to the year 1865 when time service for the Naval Observatory was still limited to the dropping of a time ball from its flagstaff at noon. With the advent of the fire alarm telegraph a year earlier, William Harkness proposed to the Superintendent, and the Mayor of Washington, DC that the Observatory be connected by wire to the telegraph that would sound fire bells on the hour at 0700, noon, and 1800. It just so happened that the State Department had a direct wire to the fire alarm office, and likewise, the Western Union telegraph company had wires in the State Department building. By 1869, the Observatory fed time to all railroads across the southern states, followed by another wave of expansion in distribution across the continental United States as the need for accurate time hacks for meteorological observations became known.

Fast forwarding to today, global navigational satellite systems now serve an increasingly important role in providing accurate time and frequency distribution. PTTI information obtained from GPS is now a critical element in meeting today's communication, transportation, and power needs.

*Throughout recent history, improvements in time and time distribution have and will continue to underpin economic growth and development, and keeping an eye on the trends is critical.*

Along these lines, the growing development and fielding of other global systems highlights the need for close coordination of all of the elements required to provide the time and frequency information with the required accuracy. I want to stress the use of the word "accuracy." GNSS operators can provide the navigational services internal to their particular system with *precise* time. However, if we expect a future that relies on the compatibility of a set of navigational signals, we need to be able to provide time and frequency with the *accuracy* necessary to meet user needs. That means that we will need increased attention on the operational aspects of time and frequency distribution. Understanding systematic differences between these systems will be critical, and accurate calibration techniques at the sub-nanosecond level will be essential. It's not just a matter of *calibration*, however. Developers will need to adhere to the international convention standards for reference frames and physical models within their operational software in order to minimize the potential systematic differences among future systems, and while maximizing compatibility.

We also realize that GNSS cannot do it all. Just try to get a GPS signal inside your typical office building today. Tomorrow's building codes might even provide for the capability for internal distribution of time and frequency information within the structure. In the mean time, computer network time protocol remains a reliable way to distribute the necessary PTTI information. Further, the growing use of optical fiber also provides this community with the opportunity to disseminate time and frequency widely with high accuracy, and I'm looking forward to future developments in this field. I understand that a number of papers at this conference will address these challenges.

*42<sup>nd</sup> Annual Precise Time and Time Interval (PTTI) Meeting*

In the year since our last meeting, there have been significant developments in the area of PTTI in addition to the technical work that will be described in the sessions to follow. The issue regarding leap seconds and the future definition of Coordinated Universal Time is now moving toward potential resolution, and it appears to be on the schedule for discussion at the Radio Assembly in 2011.

The DoD is also coordinating an instruction on Precise Time and Time Interval Management. It updates and more clearly defines policy regarding DoD PTTI management spelled out in past DoD directives. It also provides procedures for coordination of PTTI requirements and maintenance of reference standards for use by all DoD Components, other agencies of the Federal Government, DoD contractors, and related scientific laboratories. USNO will continue to play a key role as DOD's PTTI manager under this new guidance.

On a broader scale, I'm encouraged to see that national and international laboratories are working together to make sure that global PTTI needs are met today, while keeping society apprised of future developments. I am confident that PTTI has a key role to play here. As I alluded to before, improvements in time distribution have always been a two way street: Time providers showing the art of the possible, and users, like the railroad industry and weather forecasters providing the demand signal for their commodity.

Today is no different. I believe that we should continue to challenge users of time and frequency to think creatively about new possibilities that take advantage of our ability to provide time and time interval with improved accuracy. Finally, I would offer that improved interaction among PTTI stakeholders in this forum may allow us to take advantage of new developments and research with potential cost savings through efficiency of effort – this is even more important in today's resource constrained environment.

I'm looking forward to working with you in making this happen and to the presentations and discussions of this 42<sup>nd</sup> Annual Precise Time and Time Interval Meeting. Thank you.

