LEAPSECONDS: PANEL DISCUSSION

Dennis D. McCarthy, Chairman
U.S. Naval Observatory

This session is designed to be a little different in what we have had in the last few days. So I will call on the panel members, if they're here, and that would be Steve Malys and Ron Beard.

What we are attempting to do here is to get out some discussion on the leap second. The session itself is meant to be a discussion session, so we invite your questions, opinions, the good points, and bad points about leap seconds. We'd like to bring out some of the considerations that we need to think about.

The format for this will be that Harold Chadsey is going to give a brief historical introduction as to how we got into the situation where we are today. I'm going to talk about some of the considerations for doing something about leap seconds that is different from what we are doing today. Steve Malys is going to talk about some of the reasons to keep the current situation, why we need to consider doing that. Ron Beard is going to talk about the reaction to the International Telecommunications Union to recent suggestions about changes in the process. And then we would like to invite some discussion on what we would like to see in the future about this. We will also talk about some of the other activities that are going on in this business right now. With that, we'll start off with Harold's presentation on the historical background of the current situation.

RELATING TIME TO THE EARTH'S VARIABLE ROTATION

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Abstract

With the beginning of the 21st Century, the timing community finds itself again facing a decades-old problem of how to synchronize a uniform time scale with time derived from the Earth's rotation. Atomic time is the basis for most everyday timing applications. However, time astronomically determined from the Earth's rotation is essential for other applications including navigation. The history of relating atomic time to the Earth's rotation is presented, including background information related to the current synchronization method of leap seconds.

INTRODUCTION

The technological advances of the 20th Century are causing the timing community to examine once again the decision to synchronize atomic time with the Earth's rotation using leap seconds. Historically, time scales in common use have been maintained to within at least 1 second of time derived from the Earth's rotation. The current practice is to insert 1-second adjustments, called leap seconds, into the atomic-based time scale to bring the two types of time to within 0.9 seconds of one another. These adjustments are made internationally, preferably at 23h 59m 59s on 30 June or 31 December depending on the varying rotation of the Earth. However, as technology advances, the time steps required to maintain that level of synchronization become more inconvenient for some users to implement. Before going into the details of leap second implementation, we should first look at the history of the second and leap seconds.

RECENT HISTORY OF THE DEFINITION OF THE SECOND

Two concepts for the definition of the second have been used in modern times. The first is the definition of a second based on the Earth's rotation with respect to the Sun. The second is based on the Earth's revolution about the Sun and is realized in practice by the frequency of an atomic transition in the cesium atom.

ROTATIONAL SECOND

Throughout history, the definition of time has traditionally been related to repetition of solar phenomena such as successive sunrises, sunsets or transits of the local meridian. In modern times, the astronomical second was defined conventionally as 1/86400 of the time required for