

SONET in the Telecommunications Network: No More Flashing 12:00 on the Old VCR?

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Although timing is critical to the operation of SONET, going beyond the minimal requirements for system operation could be of great value to the industry. Two significant benefits that can be derived from precise timing are: (1) the system can be made more resilient to disturbances and (2) marketable timing can be delivered outside the system to homes and industries.

Let's look first at the latter issue, the sale of timing. There is a growing

demand in the home for convenient access to the correct time. The blinking 12:00 on most VCR clocks is a common national joke. The elimination of this joke represents a potentially large market. The telecommunications industry has a pipeline into every residence, creating tremendous possibilities. Telephones with built-in clocks that are always right and houses wired with multiple outlets for delivering time to various appliances are the immediately obvious suggestions, but possibilities for the mode of

delivery of this product are surely myriad.

There is also a commercial market for synchronization which might be considered by the telecommunications industry. At the lower accuracy end, all sorts of securities and commodities trading activities rely on accurate time stamping of transactions for ordering of their business. At the higher performance end, the generation and distribution of electrical power require accurate timing. Should such timing be available within the telecommunications network, the possibilities are obvious.

Optical fiber is one of the best media for transferring accurate timing signals. The fiber's tremendous bandwidth which supports high data rates is accompanied by low dispersion which minimizes error (or distortion). These characteristics are exactly those needed to propagate synchronization signals. Somewhat like I-beams that provide the rigid structure for a building, optical fibers are already in the telecommunications system available for providing the rigid synchronization needed to support SONET communications. Unfortunately, the use of these optical fibers for synchronization in the current approach is like linking steel I-beams with rubber bands. Making use of this valuable resource by "welding" the I-beams together has the potential to decrease maintenance and increase service.

Currently, synchronization in telecommunications systems is accomplished by making signals available to which other devices (oscillators/clocks) can lock. There is no feedback or checking. The design is to "send and pray." The receiving device chooses to trust the incoming signal or not, based solely on local measurements. The receiving device cannot even identify the source of the signal, nor can it compare measurements with any of its neighbors in the network. Each device operates in a network with a tremendous number of oscillators linked through one of the best time-transfer media. Yet each device is isolated. Each device is "in the dark" for its knowledge of the synchronization it receives or the avail-

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Standards Puts The Show On the Road

By Bob Staffels

Editor, America's Network
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Hundreds of new products and leading-edge technology fill the exhibit area, but not one of them says, "Standards Developed Here."

But standards are the invisible platform on which almost every product displayed is based—and more than 1500 technical experts work to develop them.

"Standards define the telecommunications network of the future," said Arthur K. Reilly, chairman of committee T1-Telecommunications, which creates U.S. network interconnection and interoperability standards. "Never has the need for timely, robust telecommunications standards been more urgent. Standards are the first step on the ladder of competitive production of products or services both in this country and internationally."

Committee T1-Telecommunications is sponsored by the Alliance for Telecommunications Industry Solutions (formerly the Exchange Carriers Standards Association) and is accredited by the American National

Standards Institute to develop interconnection standards.

The people working on T1's six technical subcommittees churn out an average of one standard or technical report a week. These deal with one or more of seven principal "focus areas" for standards and technical reports work: Broadband ISDN (Integrated Services Digital Network), SONET (Synchronous Optical Network), SS7 (Signaling System 7) Interconnection, Personal Communications Services, Intelligent Network, Telecommunications Management Network, Switch to Computer Application Interface, and Network Survivability.

Committee T1 works closely with TIA and PCIA (Personal Communications Industry Association), two of the sponsors of SUPERCORE, primarily in the field of wireless access.

This organization also promotes global standards. ▲



Setting the Record Straight

The Director's Foreword in the annual report of the Computer Systems Laboratory of the National Institute of Standards and Technology included comments critical of the pace of standards development.

"Studies such as Global Standards: Building Blocks for the Future carried out by the Office of Technology Assessment, and Crossroads of Information Technology carried out by the National Research Council have pointed out that the standards process is slow and has not kept up with the rapid changes in information technology," wrote James H. Burrows, the laboratory director.

Following is a letter written to Mr. Burrows by George L. Edwards, president of the Alliance for Telecommunications Industry Solutions, which sponsors Committee T1.

Dear Mr. Burrows:

I read with interest the Annual Report of the Computer Systems Laboratory, particularly the Director's Forward. First, let me say that the Computer Systems Laboratory has undertaken an impressive amount of work. Second, I endorse your commitment to support national and international voluntary industry standards development activities. I am aware of NIST's significant past cooperation with Committee T1 in the area of synchronization.

The Alliance for Telecommunications Industry Solutions (ATIS) sponsors Committee T1—Telecommunications, which as you know, is accredited by the American National Standards Institute (ANSI) to develop technical network interconnection and interoperability standards for the United States. Committee T1 also is a recognized leader in promoting regional and global harmonization of telecommunications standards. I represent ATIS on the Board of Directors of ANSI.

I must tell you I was dismayed by your broad brush statement about the pace of standards development citing as a reference the out-dated Office of Technology study, Global Standards: Building Blocks for the Future. That report was published in March 1992; the research done in 1991. A great many knowledgeable people did not agree at that time with many of the OTA's sweeping conclusions. And, a recent symposium on international standards and global trade sponsored by the Network Research Council evidenced no criticism of the timeliness of standards development. Let there be no confusion here: as it pertains to Committee T1, the standards process is not slow. Open, deliberate, fair to all regardless of size, consensus-based, user-oriented, yes. Slow, no.

More than 1,200 engineers and scientists work in the six technical subcommittees of T1. They're producing broad-based, implementable standards and technical reports at the rate of one per week. We're near the end of a trial using parallel balloting of standards developed in the technical subcommittees which will shave several weeks if not months off the approval process. Just in the past year, ANSI has cut nearly in half the time it takes to publish a standard after T1 approval. And, T1 has identified and is focusing its main efforts on leading edge technologies such as intelligent network, telecommunications management network, broadband ISDN, personal communications, etc. Overarching all their deliberations and planning is the goal of being a major contributor to the development of the National Information Infrastructure.

You're well acquainted with Arthur Reilly, Chairman of Committee T1, and he and I would be happy to meet with you to elaborate on T1's accomplishments and objectives and to discuss any specific issues you have about T1 and the timeliness of its work. T1 recognizes that timely production of standards is critically important in addressing technical barriers to interoperability and encouraging the adoption of new technologies. ▲

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ability of other options for timing.

It is possible to use the optical fibers to "turn on the lights" in the system. A given device (oscillator/clock) at some node in the system could monitor the timing signals from a variety of neighbors and send back both information and its own timing to these neighbors. Now we have a two-way synchronization system, a "send and verify" upgrade from the "send and pray" system. Such a system has a real backbone. Though failures are still possible, any given device will know what is happening. Each device could now have intelligence to make judgements about the quality of its primary synchronization signal as well as other potential sources of synchronization. Such an intelligent system could take care of itself in many ways, responding quickly and automatically to anomalies and requiring little external maintenance.

My institution, the Time and Frequency Division of the National Institute of Standards and Technology (NIST) has been working closely on synchronization issues with T1 Technical Subcommittees for the last several years. Our first contribution involved tools for characterizing the noise which can corrupt distribution of synchronization within SONET. Measures for such noise previously used by the industry were simply insufficient for use with SONET. We are able to bring a completely different viewpoint, based on our experience with international time-keeping and time coordination, to the industry to resolve the problem. From this modest success and from further work, both communities in this interaction have come to appreciate that our different approaches to synchronization are highly complementary. We have thus committed ourselves to a longer-term interaction with the telecommunications industry. We are now planning to collaborate with T1 committees, T1X1 and T1M1 as appropriate, on experiments such as two-way synchronization in SONET and the use of time-of-day synchronization in SONET and the use of time-of-day synchronization. This seems to me a good marriage of talents. We look for a synerism between our experience in high level synchronization and the telecommunications expertise in the industry to bear fruit. The goal is to make synchronization so available and reliable that it is not an issue. ▲

