



International Telecom Synchronisation Forum

The 2nd International Telecom Synchronisation Forum meeting was held in London hosted by the Institute of Electrical Engineers (IEE) from 1st-3rd November 2004 and was attended by more than 90 delegates from 15 Countries.

Networks are changing rapidly with the increasing dominance of packet networks but the need for Synchronisation remains. Synchronisation requirements, Synchronisation implementations and Synchronisation Network design are all changing in the new packet environment.

Many topics were raised during the presentations, question and discussions, some of the key issues were:

- GPS and Galileo Developments
- 3G Mobile Synchronisation Requirements and Design
- Metro/Access Sync in a Packet Environment
- Sync Testing, Measurement, Monitoring, Sync Service Level Agreements
- Robust Operator Network Synchronisation Designs

Although many of these issues are being discussed and analysed in the specialist synchronisation community it was agreed that there was a need for education of senior managers and budget holders of the strategic importance of synchronisation now and going forward.

GPS and Galileo Developments

Marc Weiss (US) from the National Institute of Standards and Technology (NIST) gave detailed presentations on the current and future status of GPS and its applicability to Telecom Network Synchronisation. New Satellites, new and

improved monitoring and control will improve the resilience of GPS system. However he highlighted that good receiver design as essential to reject erroneous information from satellites. Peter Whibberly (UK) of the National Physical Laboratory (NPL) showed how the European Galileo Satellite based Navigation system, planned to start full deployment in 2006, would augment the information from the current GPS system; providing additional sources and frequencies that could be used for telecom Synchronisation. Rob Rae (US) of Conner Winfield highlighted the advancements in GPS receiver design and held out the possibility of indoor GPS systems providing adequate Synchronisation and Timing capabilities for many applications in many indoor environments.

3G Mobile Requirements and Design

A whole session was devoted to Synchronisation of Mobile Networks. Andy Sutton (UK) and Martin Kingston (UK) both of Orange explained how their network migrated to meet the needs of 3rd generation UMTS and how the sync network was designed to meet these needs. Their design uses ATM in the access network with GPS derived synchronisation applied at Transmission Nodes close to the Node B base stations. Orange also highlighted the need for a new Synchronisation design in the future when the access to UMTS Base Stations (Node Bs) migrates to use IP access rather than the ATM access they use today.

Stefano Ruffini (Italy) of Ericsson gave an overview of 3G UMTS networks highlighting their synchronisation requirements, whilst Charles Curry (UK) proposed an MTIE mask suitable for UMTS Node Bs, highlighting measurement results for access networks which met the Node B requirement and some which had inadequate performance.

Sync in a Packet Environment

When networks migrate to using packets the traditional circuit orientated techniques for transporting synchronisation are lost and a number of new methods for transporting synchronisation are being investigated. Silvia Rodrigues (Canada) of Zarlink give an overview of what techniques are used in packet networks including Network Timing Protocol, IEEE 1588 and Adaptive Clock recovery. John Eidson (US) of Agilent gave a detailed presentation on IEEE 1588 explaining how a technique originally targeted for localised networks primarily at measurement and control systems is being considered for telecommunications metro networks. Motti Goran (Israel) of Lycium Networks proposed adaptive techniques for clock recovery and indicated their performance in test and trial conditions.

Kishan Sheno (US) Symmetricom analysed the needs for synchronisation in VOIP networks. He analysed the quality issues in VOIP networks and the impact if synchronisation is not considered. If the circuit is a voice call, much can be done using signal processing, to mitigate against packet loss and poor synchronisation performance however to maintain "toll quality" and to provide usability when the phone line is for a MODEM or FAX connection synchronisation is crucial.

Charles Curry (UK) Chronos provided examples of sync measurements in a packet environment in the access layer showing how this can generate significant wander if not managed correctly.

Sync Testing, Measurement, Monitoring, Sync Service Level Agreements

The need to test and validate the performance of networks was a strong theme in the conference and came up in a number of papers. Ian Wright (UK) Chronos raised the issue of Synchronisation Service level agreements when synchronisation is taken from third parties and the need to understand the susceptibility of equipment to wander. Helmut Imlau (Germany) of T-COM also raised the issue of supplying synchronisation as a service and the need to have agreed limits which were not network limits allowing third parties to add additional equipment on the end of a third party synchronisation feed.

Robust Operator Network Synchronisation Designs

There were presentations from three leading Network operators. Chuck Norman (US) of Sprint gave a very interesting presentation on their network design which focuses on reliability and simplicity. In the US major failures effecting more than 30,000 customers for 30 minutes need to be reported and about 10% of such failures in the US are attributable to Synchronisation problems. However using their robust network design technique combining distributed PRCs based on GPS and Loran C with Rubidium in each office Sprint have never had such a major network failure attributed to Synchronisation.

Helmut Imlau (Germany) of T-COM explained their new synchronisation network design based on distributing two Caesium references to all key sites with distributed GPS sources available as third priority back up source.

Greg Mason (UK) of BT explained their network and raised the challenge of maintaining conformant predictable and resilient operation when converging on packet/cell networks. He highlighted issues with some access delivery techniques (HDSL) and showed if configured correctly that SHDSL could supply acceptable quality.

Louis Lamarche (Canada) of Hydro Quebec gave a very interesting paper that investigated the wander on fibre optic lines. Theoretical and measurement results of the analysis of the temperature effect on fibre were presented showing 93.9ps/km/°C and 91ps/km/°C respectively. Given Hydro Quebec has a large network and the Fibre is strung between Pylons in the Earth cable, the fibre is liable to ambient temperature changes. In order to ensure that induced wander does not cause the clock received over the fibre to exceed $\pm 2 \times 10^{-10}$, thus ensuring upstream Stratum 2 clocks will lock to it, the maximum distance that a Stratum 1 clock can be transported is limited to 625km. After that distance a new Stratum 1 clock needs to be deployed.

George Zampetti (US) Symmetricom gave a very interesting talk on synchronisation in Next generation networks and advocated the benefits of using a two-way transfer technique between synchronisation supply units and the network equipment they connect to. The two-way transfer scheme would allow the synchronisation equipment to move away from the current “send and hope” technique used today enabling them to detect if the equipment they were connected to were functioning correctly. This technique would also allow time and frequency to be distributed

It is not only access networks that are changing Dominic Schneuwly (Switzerland) of Oscilloquartz explained the effect the Optical Transport Network (OTN) (the ITUs standardised WDM based network) will have on synchronisation. OTN allows Mapping and Multiplexing of SDH rate signals but the quality of the synchronisation on the SDH connections over the OTN lines must be controlled to allow its use for synchronisation transport.

Eugene Lambert (Canada) Hydro Quebec explained their Telecom network and its synchronisation but also introduced the need for synchronisation of their electricity distribution network and their use of NTP. He presented measurement results of transfer the timing in their network and introduced a new architecture with distributed GPS receivers which can be monitored centrally for fault detection.

Conclusion

Overall the conference was well received by all delegates. Following unanimous delegate approval for another event in 2005, the Steering Group agreed to a provisional booking at the IEE, London for 17-19th October 2005.

The Steering Group also received the resignation of John Laverty (UK) NPL as Chairman due to his change in role at NPL and unanimously elected Charles Curry (UK) Chronos as Steering Group Chairman to take the ITSF forward to ITSF05. Two further members were elected to the Steering Group being David O'Connor of Horsebridge and Peter Whibberley of NPL.

Key messages from ITSF04 were the need to reinforce sync awareness and the importance that good quality sync plays in a network to senior management in the telecom operators. Also going forward – Quality of Service (QoS) at the edge of a network with regard to the way sync is delivered to legacy applications or users is considered vitally important and the need for an international standard defining synchronisation availability was acknowledged.