OSCILLOQUARTZ
An ADVA Company

Time for better broadcast and production networks

Driving towards IP

In recent decades, networks in many industries have undergone a fundamental transformation. With IP as the convergence technology, monolithically integrated, proprietary applications have been steadily replaced by common multi-purpose hardware featuring open software and standardized interfaces. Today's PABXs, for example, are soft-switches on standard servers. This transition to IP is now happening in broadcast networks. One of the key challenges here is synchronization, which is instrumental for flexible and efficient processing of video and audio streams.

Packet networks aren't great at keeping applications in sync

Cameras, recorders and video processing devices are today predominantly equipped with SDI interfaces for creating uncompressed, highest quality video streams. The synchronous format of this signal in combination with embedded timing ensures a tight synchronization of content streams. But the move to IP replaces synchronous transport networks with asynchronous technology. This leads to the SDI signal being broken down into multiple independent video and audio streams, each of which must be accurately aligned. As shown below, there are three main requirements for the synchronization of IP-based broadcast streams and their respective transport networks.

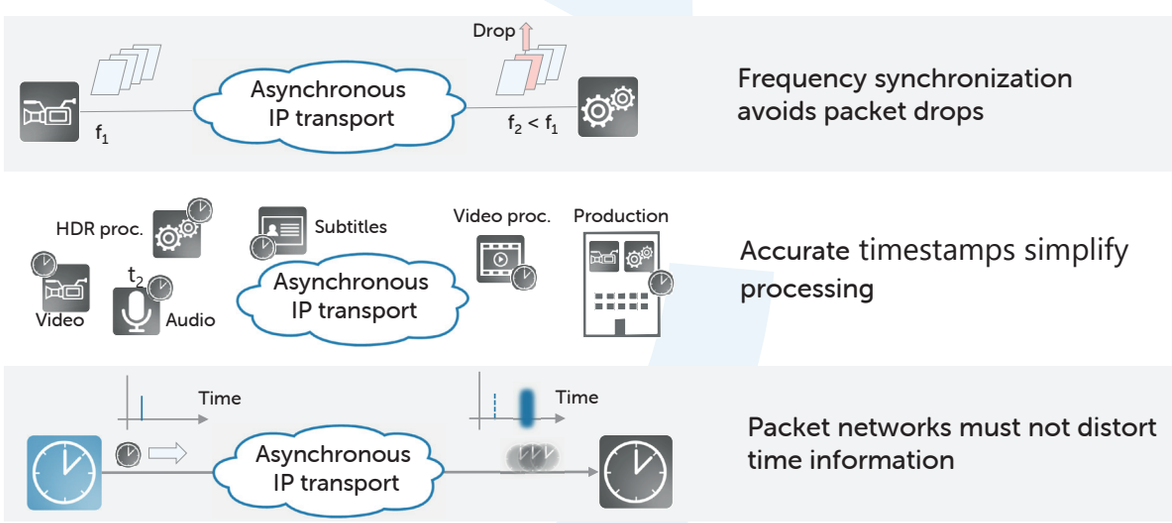
Broadcasters and production companies are turning to PTP

A seamless transition from SDI to IP-based technology requires the SDI-frame to be packetized and data to be mapped onto individual, timestamped video and audio streams. Respective encoders and decoders need accurate time information, which is supplied by standards-based Precision Time Protocol (PTP) as defined by IEEE 1588.

PTP delivers accurate timing over packet networks

- **High accuracy**
  due to network-support and hardware implementation
- **Resilience**
  with redundant grandmasters and standardized selection algorithm
- **Delay compensation**
  by measuring round trip delay
- **Standard compliance**
  for interoperability and ease of operation
- **Flexibility**
  in combining central and distributed grandmasters with boundary clocks

Timestamped packets deliver accurate sync over IP networks with IP routers featuring boundary or transparent clock capabilities, enabling time information to be processed for scale and accuracy. A central grandmaster provides a source of precise time information, frequently synchronized by a GNSS receiver.



What synchronization problems need to be solved?

Stable standards as the foundation for a successful migration

SDI is a proven and well-established technology. But even though it has served the industry for more than 30 years, it now doesn't meet the flexibility and agility requirements of IP-centric networking. The Society of Motion Picture and Television Engineers (SMPTE) has helped to enable the transition to IP by developing technical specifications such as ST 2110 for converting SDI formats into independent, timestamped content streams and ST 2059 for introducing IEEE 1588 for the delivery of accurate time and frequency information.

The path to IP broadcast and production networks

Building on those specifications, broadcasting networks can seamlessly migrate from established SDI architectures to future-proof IP networking. Best practices for precise synchronization recommend initially installing compact GNSS-based grandmasters at each production and broadcast site. With this approach, precise time can be available at any site with very moderate cost. In a second step, the time delivery capability of the IP network is improved by introducing centralized high-performance grandmasters and by improving the PTP delivery capability of the network by implementing boundary and transparent clock functionality.

Perfect solutions

The most immediate need for precise time comes from remote studios and mobile sites, which connect to production and broadcast sites over public/private networks.

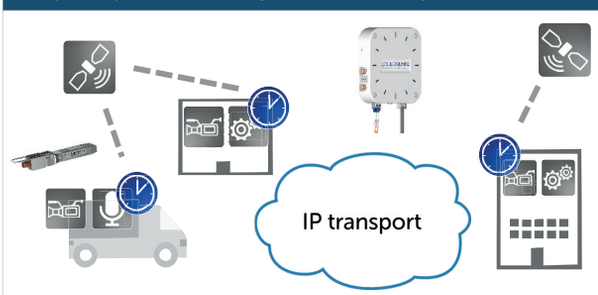
Synchronization solutions for broadcast and production networks

- Industry smallest, zero-footprint SFP-based grandmaster provides timing capability to legacy switches
- Integrated grandmaster with GNSS receiver and antenna simplifies installation and integration
- Compact low-cost, low-power grandmaster clocks at the edge of the network are a practical first step for providing accurate timing
- Core grandmaster clocks in combination with a PTP-enabled network efficiently complement GNSS-based timing at the edge
- Built-in jamming and spoofing detection is complemented by AI-based analytics in central management

Fortunately, compact and versatile grandmasters are easy to deploy and the Oscilloquartz product portfolio has been specifically optimized for this application. Due to very low power consumption, our zero-footprint grandmaster, the OSA 5401, can easily be plugged into the interface port of a local switch. What's more, our OSA 5405 offers an integrated grandmaster with a GNSS receiver and antenna, providing a very simple solution for satellite-based, highly accurate time and frequency reference.

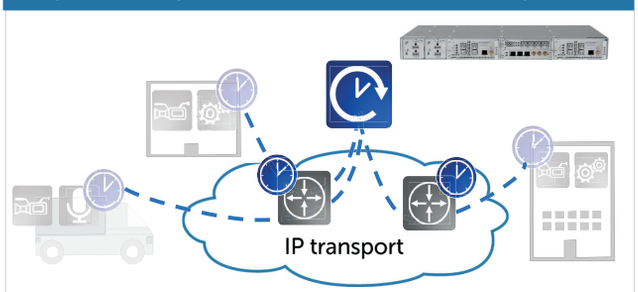
For ultimate availability and reliability, complementing GNSS-based timing with network-based timing is key.

Step 1: Synchronizing broadcasting devices



- Installing very compact grandmasters
- Satellite-based timing at any site
- Backed up by network-based PTP

Step 2: Backup with network-based delivery



- Central, redundant high-performance grandmasters
- Sync-aware network devices (TC, BC)

Seamlessly introducing PTP in broadcasting networks

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