Synchronization of SMPTE ST 2110 Signals:
SMPTE ST 2059

After establishing a two-way time transfer to its Master every Slave is able to calculate the offset of its local clock with respect to the Grandmaster.

PTP Message Flow
IEEE 1588-2008 defines profiles allowing PTP to be tailored to the a profile for use of PTP in professional broadcast applications.

PTP Clock: Dynamic Range 248 seconds, Resolution 1ns
Network Device
PTP Domain Number = 127 PTP Domain = 127
Reference
PTP Profiles
NTP VS. PTP
SMPTE ST 2059-1 defines the epoch as 1st of January 1970 at 0 hours, 0 minutes and 0 seconds TAI.

Clock = Continuously Increasing Counter
PTP
Resolution
Time Relationship
In PTP, multiple PTP devices communicate with each other using a common PTP Domain.

A bidirectional messaging pattern, delivered by PTP, allows time to be the broadcast accuracy time to dether to other network devices for synchronization of their local clocks.

The Grandmaster is the source of the time or common reference clock for all Slaves in the PTP network. This is called "Sync" messages, which contain a Grandmaster timestamp for clocks involved in timestamp generation. In this case, the PTP Grandmaster ID "39-A7 -94-FF-0E-07 -CB-D0" and PTP Domain "127" are specified.

In the absence of a master based on an external time, a common reference clock is not available. Different devices are considered asynchronously or streams from the same device will be synchronized with each other if a direct-referenced media clock is used.

Grandmaster
PTP Slave
PTP Slave
PTP Slave

Delay_Request Message
Delay_Response Message
Sync Message
Follow_Up Message

Device Internal Clock

In SMPTE ST 2110, inter-stream synchronization (such as audio/video synchronization, or proper presentation time for Closed Captions) relies on timestamp values in the RTP packet headers from senders based on a common reference clock. The common reference clock can be distributed to all participating senders and receivers over an IP network by use of the IEEE 1588-2008 Precision Time Protocol (PTP), and specifically for ST 2110, the PTP system must obey the SMPTE ST 2059-2 PTP Profile developed for use in professional broadcast applications. Details on the ST 2110 System Timing Model are specified in ST 2110-10.