

Streaming Ahead

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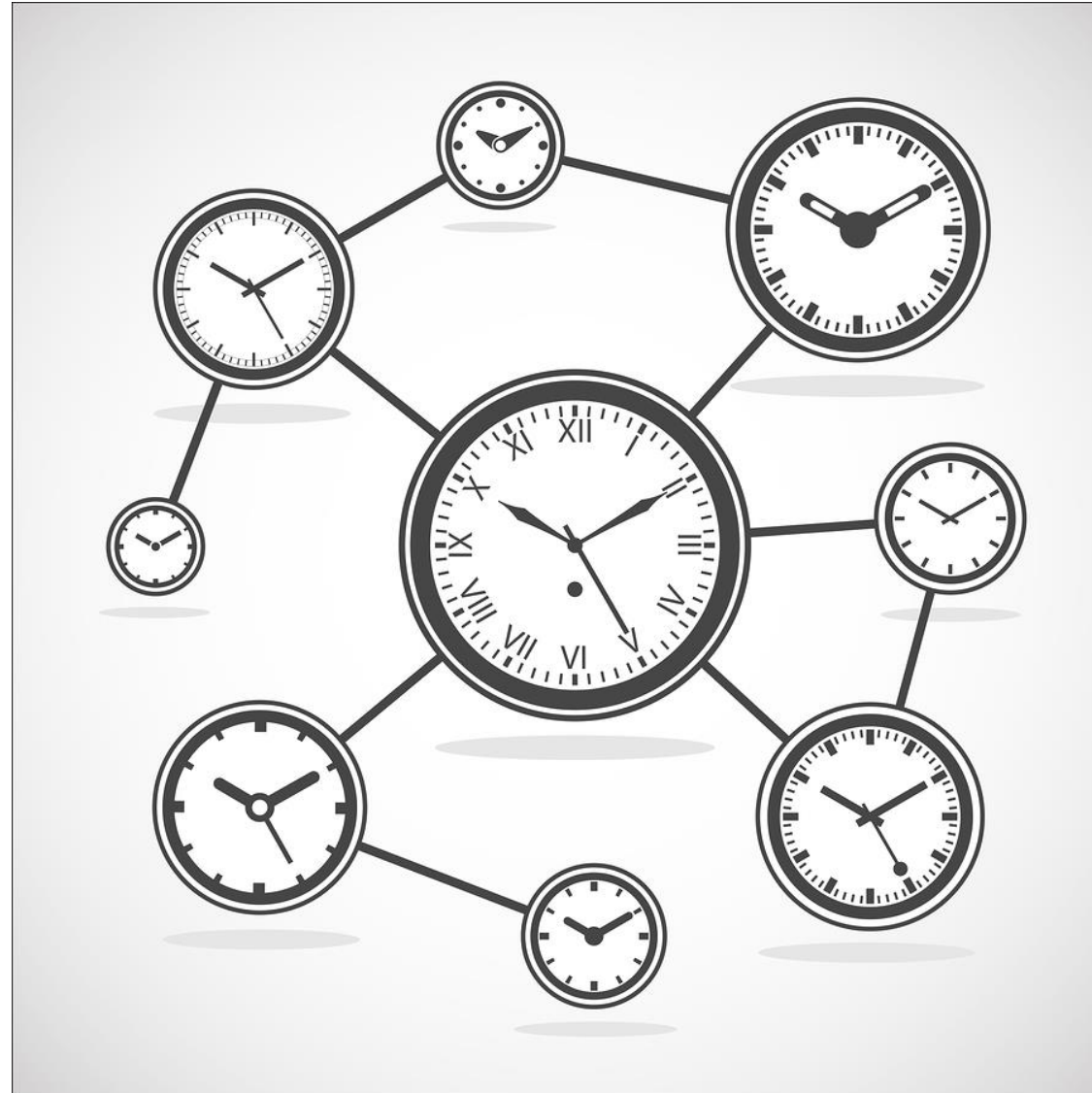
ST 2110 – IP Transport “Done”

- SMPTE ST 2110 suite of standards
- Codifies all transport and timing protocols required for the JT-NM (AIMS) roadmap.
- *ST2110-10: Rules for the use of RTP, system timing using ST2059 and the use of SDP.*
- *ST2110-20: Transport of Uncompressed Video (TR03) using RFC4175*
- *ST2110-21: Traffic Shaping Uncompressed Video.*
- *ST2110-30: PCM Audio. This is nearly AES67, with minor restrictions.*
- *ST2110-31: AES3 Transparent Transport (An adaptation of AES67).*
- *ST2110-40: Ancillary Data (what used to be in SDI VANC and HANC space – ID, timecode, range of metadata).*
- *ST2110-50: Integration with ST 2022-6 (TR04).*

Today's Session

- **Synchronisation and PTP Clocks**
 - A Look at different PTP clock types
- **Working with Streams**
 - Discovery/Registration
 - Connection Management

Synchronisation and PTP Clocks

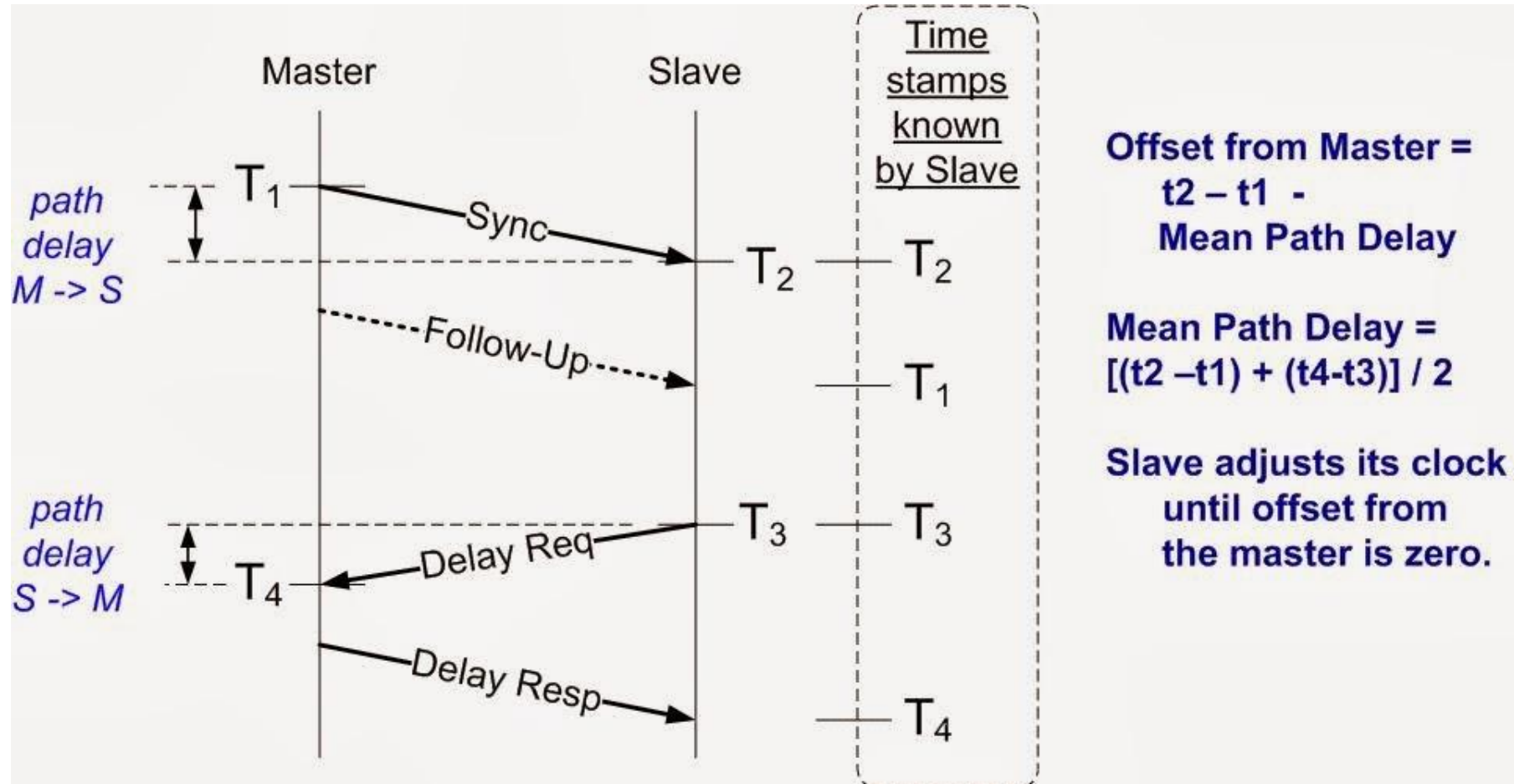


PTP (IEEE 1588-2008)

- ST2059 – IEEE 1588-2008 profile
 - Defines a set of PTP options focused for broadcast environment
- OC “Ordinary Clock” – endpoints run local clocks that are slaved to a master clock and used to provide ‘time of day’ and media sampling clocks
- GM ‘Grand Master’ node provides corrective *sync* messages to all slaves.
- BMCA “Best Master Clock Algorithm”
 - Manages which clock is Master
 - Multiple clocks may be capable of becoming a master
 - Only one master chosen
 - All use same algorithm - uses defined set of clock properties to elect Master

PTP (IEEE 1588-2008)

- PTP Sync Correction

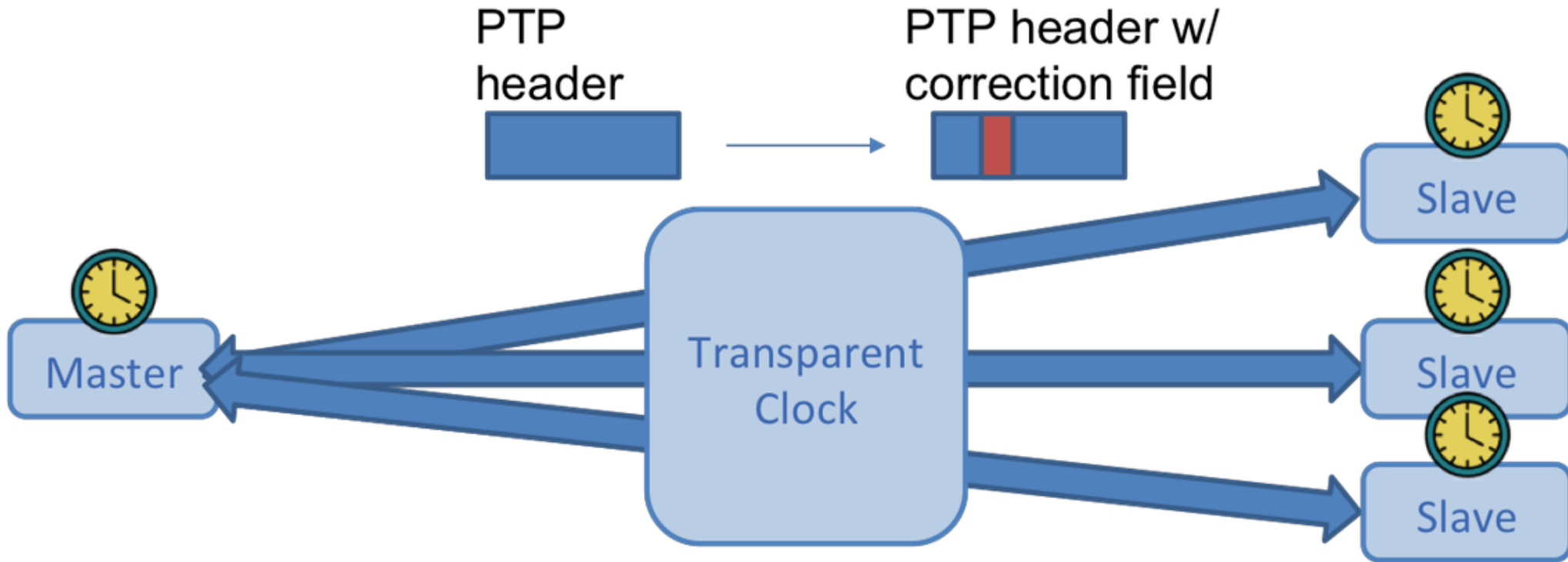


PTP (IEEE 1588-2008)

- Assumes Path Delay MS and SM is same
- Great if point to point
- Switches introduce PDV Packet Delay Variation due to queuing in buffers

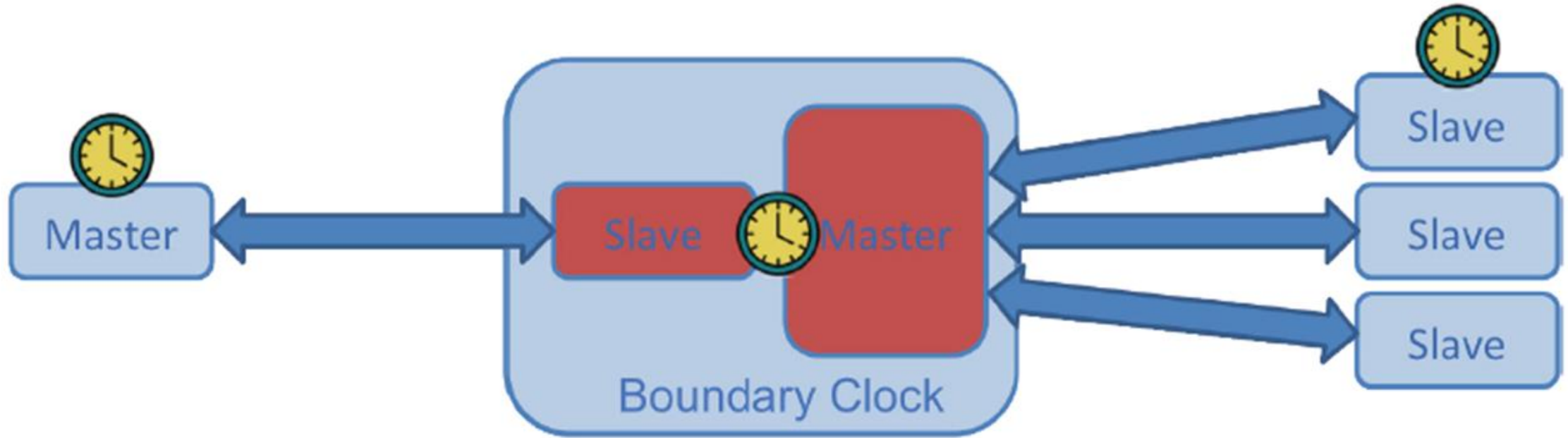


TC “Transparent Clock”



- No requirement to sync with GM
- Measures Packet Delay through switch
- Modifies Follow-Up packet time correction field

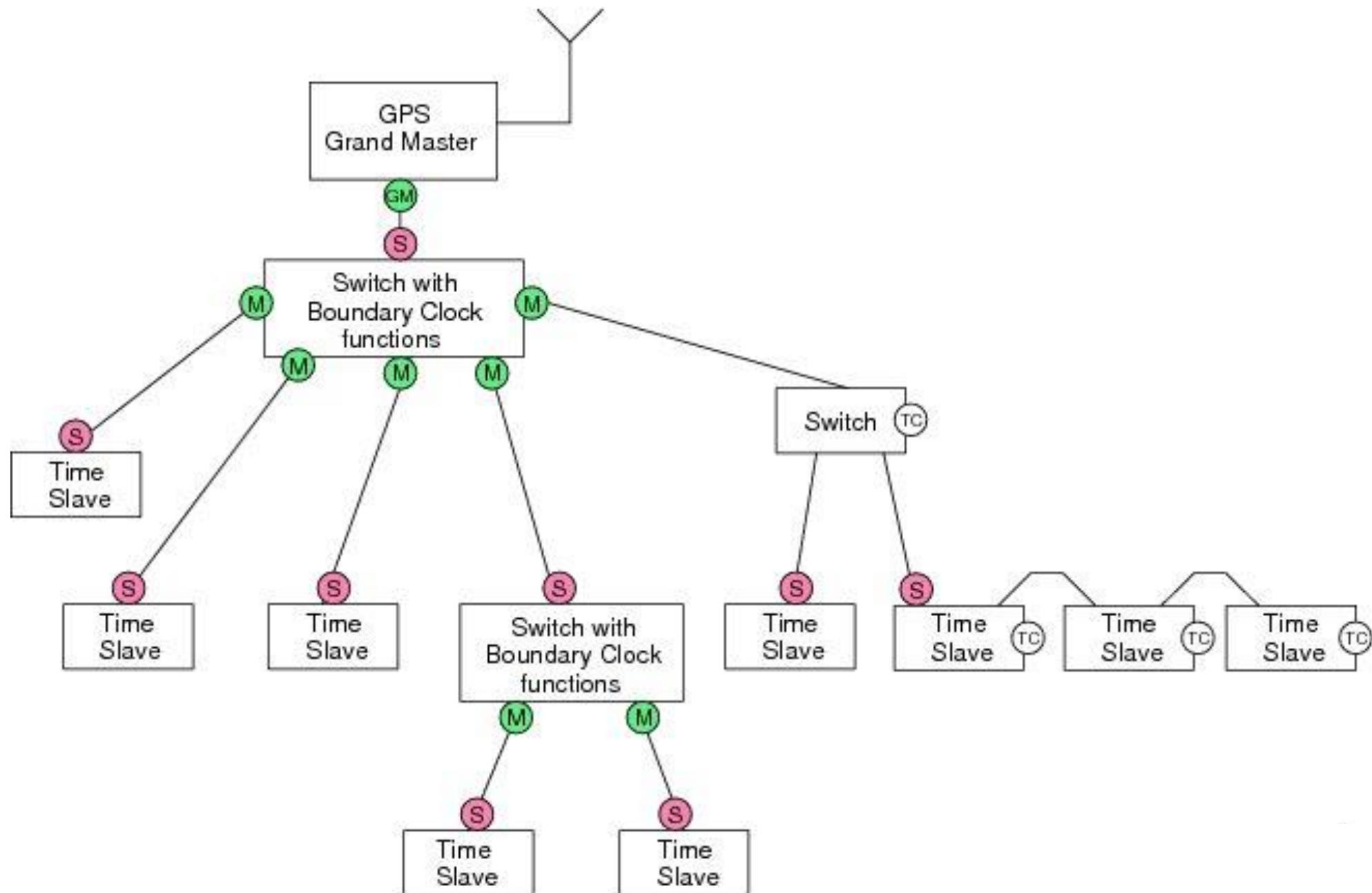
BC “Boundary Clock”



- Clock synced to GM
- Slave on one port – Master on all other ports
- Becomes Master for downstream endpoints (scrubs any PDV)

Transparent versus Boundary Clocks

	PROS	CONS
TC "Transparent Clock"	<ul style="list-style-type: none">• Reduces PDV• End to End delay correction	<ul style="list-style-type: none">• Increases packet load on GM
BC "Boundary Clock"	<ul style="list-style-type: none">• Reduces packet load on GM• Scrubs PDV (acts like Master clock)	<ul style="list-style-type: none">• Cascaded BC's can accumulate greater errors



Working with Streams

- What Streams are available - [Discovery](#)
- Flexible Audio Stream characteristics
 - What is the audio format (L24, L16)?
 - How many channels are there?
 - What is the packet time?
 - What is the sample rate of the stream?
 - Where is it coming from?
- Receiver
 - Needs to be aware of Stream Characteristics to register for a stream - [SDP](#)

SDP (Session Description Protocol)

- Example multicast SDP
- 8 channel, 24-bit, 48kHz, 1ms packet time

```
v=0
o=- 1311738121 1311738121 IN IP4 192.168.1.1
s=Stage left I/O
c=IN IP4 239.0.0.1/32
t=0 0
m=audio 5004 RTP/AVP 96
i=Channels 1-8
a=rtpmap:96 L24/48000/8
a=recvonly
a=ptime:1
a=ts-refclk:ptp=IEEE1588-2008:39-A7-94-FF-FE-07-CB-D0:0
a=mediaclk:direct=0
```

Discovery

- Methods for Exchanging SDP data



- Sneakernet – Manual SDP exchange

- RTSP
 - Ravenna - automatic within own domain
 - Livewire - automatic within own domain

- SAP
 - Dante AES67 - automatic within own domain

- SIP
 - Unicast AES67

- AMWA IS-04 (NMOS) - framework for Devices/Streams to be Discovered and Registered as they are connected to the network

AMWA APIs

- AMWA IS-04 (NMOS) - ST2110 framework for Devices/Streams to be Discovered and Registered as they are connected to the network
- AMWA IS-05 (NMOS) - ST2110 framework for Connection Management - allows the configuration of connections between Senders and Receivers
- AMWA IS-06 (NMOS) - ST2110 framework NMOS IS-06 Network Control – “in progress” - viewable network topology, allows creation/retrieval/update/deletion of flows in the network between endpoints. Includes monitoring and diagnostics.

Stream Manager Applications

- APIs for Manufacturers
- Manufacturer agnostic management of Streams
- Centralised Stream Management server
- Practical system wide approach to Managing Streams across a broadcast infrastructure.

