HARMAN

Media Clock Negotiation (MCN)

IEEE 1722 6/20/2011

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AKG by HARMAN harman/kardon by HARMAN Infinity by HARMAN JBL by HARMAN Lexicon by HARMAN Mark Levinson by HARMAN

MCN

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- **Requirements**
  - Automatic election of a media clock
  - Support for multiple clock frequencies
  - Support for multiple clock domains
  - Support for AVB cloud boundaries
  - Quick failover in case of network break
  - Mechanism to avoid thrashing at startup
- **Options**
  - Base clock identifier
  - Human readable clock identifier

MCN Election

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- **Primary and Secondary streams are elected**
- **Match criteria**
  - gm_id
  - Domain_id
  - Frequency
  - Base_stream_id (optional)
- **Election criteria**
  - Priority1 (lowest value wins)
  - Priority2 (lowest value wins)
  - Source Mac Address (same comparison algorithm as MAAP)

MCN Election

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- **Single Packet Type**
  - Advertise Packet
- **Election losers go silent**
  - Only the Primary and Secondary continue to sent Advertise Packets
- **Primary and Secondary media streams must be active**
  - Streams will not actually flow until an SRP reservation is made
- **User can specify whether or not base_stream_id is required**
  - This decision needs to be made on a network wide basis
  - If base_stream_id is required then each base_stream_id becomes a separate domain
  - If base_stream_id is not required then base_stream_id is informational only and not used in the match phase

Media clock characteristics

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- **Media clocks may or may not include valid data**
  - Since media clock streams look just like data streams, they must contain data however it may not be valid. (since any properly formatted stream contains data, this is really irrelevant)
- **Secondary streams may be frequency locked to the primary**
  - It is possible for a device that cannot receive a media stream to advertise itself as a media clock stream.

MCN Failover

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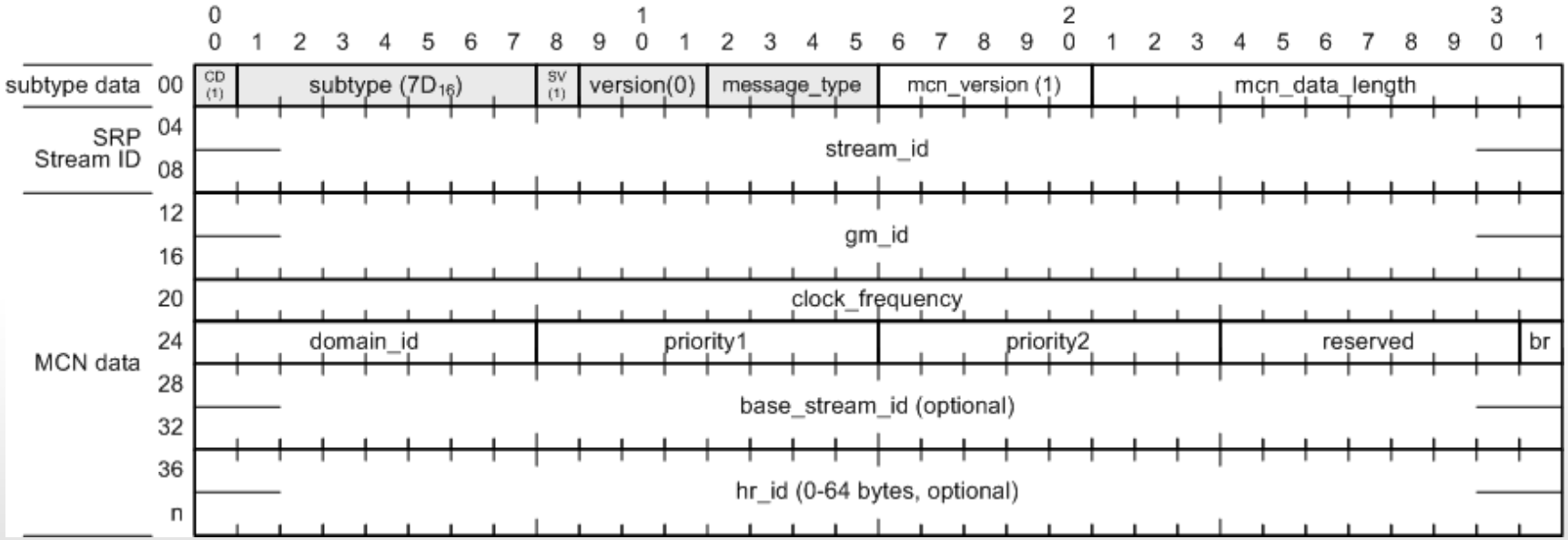
- Everyone keeps two winners, primary and secondary
- All listeners immediately switch to the secondary on primary timeout or loss of primary stream media stream
- New election for secondary takes place on fail over. Previous secondary becomes primary
- Talker is enabled and reservation is registered for primary and secondary
- If a node is unable to get a reservation to the media stream then it should accept the election results and not start a new election even though the primary stream is in a failed state.

MCN Packet Fields

- mcn_version
- mcn_data_length
- stream_id
- gm_id
- clock frequency
- domain_id
- priority1
- priority2

- br
- base_stream_id
- hr_id
- Add clock class between priority 1 and 2 and change priority 2 to 4 bits with 4 bit fields.



Packet Contents

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- Single packet type – MCN Advertise
- MCN subtype assigned from 1722 subtypes
- MCN multicast address assigned from 1722 reserved addresses

Packet Fields

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- **mcn_version**
  - Current MCN version (1)
- **mcn_data_length**
  - Length in bytes of the mcn data
- **stream_id**
  - Stream id of the media stream being advertised
- **gm_id**
  - Current gPTP grandmaster ID
- **clock_frequency**
  - clock frequency in hertz of the advertised media clock stream, unless the divide by 1.001 bit is set then it is in hertz/1.001

Packet Contents

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- **domain_id**
  - User configured domain ID (default = 0)
- **priority1**
  - User configured Priority (default = 248)
- **priority2**
  - Internal priority
  - Beginning value = 248
  - Decrements to 240 when first device subscribes to the advertised media stream
- **StreamID**

Packet Contents

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- **Clock Domain ID**
  - Default domain
  - User configurable
- **Clock Frequency**
  - 48k, 44.1k 192k

Packet Contents

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- **br**
  - Base stream ID required
- **base_stream_id (optional)**
  - The stream id that this media clock is frequency locked to
  - Stream may be a multiple of the base stream clock
  - Example: 96k stream may be locked to a 48k stream
  - If br is set to 1 then base_stream_id is used to match or discard Advertise packets
  - If br is set to 0 then base_stream_id is information only and has no effect on the MCN election
  - base_stream_id is set to all 0's if it is unused

Packet Contents

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- **hr_id (optional)**
  - Human readable clock identifier (0-64 utf-8 bytes)
  - If the hr_id is included in an MCN packet then a base_stream_id must also be included
  - base_stream_id must be set to all 0's if unused
  - The actual text should be designed to be useful to the user to easily identify the source. Text should include make, model and unique id.
  - Example
    - "dbx SC 00:01:23:45:67:89"
    - "dbx SC HiQnet node 34"

Packet Flow

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- Advertise packet 1 per advertise interval
- Advertise timeout is 3x advertise interval
- All Advertise packets that do not match gm_id, domain_id and frequency and optionally base_stream_id are ignored
- Once a higher priority packet is received, Advertises are no longer sent
- Devices without a user configured domain_id use the default domain_id

Priority2

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- 4 bit field
- Initial value on startup is 12
- Value is decremented to 8 upon being elected primary and an active SRP reservation is acquired
- On loss of an election the priority2 value reverts to 12
- On loss of a all valid SRP reservations value reverts to 12

Backup Material

Items currently not included

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- **Fractional Clock Frequencies**
  - All we need is a divide by 1.001 bit to support NTSC frequencies. But this in the reserved field with the br field
- **Clock Quality**

Fractional Clock Frequecies

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- **MCN currently represents frequency in hertz**
- **Current range 1 Hz – 2^{32} Hz (4294.96 MHz)**
- **Is there a need to represent clocks outside this range?**
- **Is there a need to represent clocks in fractional hertz?**
- **SMPTE 247M and 296M specify video sample rate as Fs/M**
  - 1080p59.94 used Fs=148.5 M=1.001
  - results in approximately 148351648.35Hz, commonly referred to as 148.35MHz

Clock Quality (obsolete)

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- **Surveyed dedicated word clocks**
  - Apogee Big Ben
  - ART SyncGen
  - Black Lion Audio MicroClock
- **Only common specification given is jitter**
- **Advertised jitter on dedicated word clocks is in pico seconds**
- **Jitter of the original source is likely to be overwhelmed by the additional jitter from AVB.**
- **802.1AS defines clockClass and clockAccuracy, these are not really applicable to our needs.**
- **What can we define that is meaningful?**

New Clock Quality (6/20/11)

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- PPM
- PPM drift
- Temperature range
- Frequency drift over temperature

WHERE SOUND MATTERS

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