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# Differences between 802.1 AVB and 1588 Synchronization Protocols

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# Grandmaster Selection Algorithm

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## □ 1588 GM selection done by running BMC algorithm at each clock and port

- Hierarchy of clock qualities through stratum number, clock identifier, and PTP variance (related to Allan variance), in that order
- Can designate clock to be preferred for GM selection; can designate clock as slave only
- Preference hierarchy for selection
  - If one of the clocks is preferred, that clock is chosen
  - Next, if one clock has lower stratum number, that clock is chosen
  - Next, if one clock has better identifier, that clock is chosen
  - Next, if one clock has smaller variance, that clock is chosen
  - Next, if one clock is closer to GM or has heard from GM more recently, that clock is chosen
  - Next, if one clock has smaller UUID, that clock is chosen
  - Next, if one dataset indicates smaller port number, that dataset is chosen

## □ AVB GM selection

- Every AVB station is capable of becoming GM, but only 1 is selected
- Selection is based on preference value, using the following hierarchy
  - System tag, which indicates up to 16 preference levels (set by user)
  - Unique ID, e.g., MAC address (analogous to uuid\_field in IEEE 1588)
  - Hops count, i.e., distance from current GM)
  - Port tag, i.e., port id

# Different Frame Formats and Data Types

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- ❑ Message formats and data types in IEEE 1588 and current 802.1 AVB proposal differ
- ❑ Some of the differences are in data representation
- ❑ In addition, the AVB frequency and phase compensation algorithm uses additional information not transported in IEEE 1588
- ❑ 1588 sync and delay\_req messages contain an originTimestamp field, which is the measured time that the time stamp leaves, relative to the local clock after any corrections or compensation algorithms have been applied
  - E.g, if PLLs or servos are used, the time is measured relative to the clock phase time after any smoothing
- ❑ In contrast, the 802.1 AVB phase and frequency compensation algorithm requires
  - Time relative to the free running local oscillator (baseTime)
  - Time relative to the corrected frequency (flexTime; note that the corrected frequency can be calculated with software or firmware)
  - Cumulative time difference from the GM
  - Cumulative frequency difference from the GM

# Message Semantics

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## □ IEEE 1588 uses a one-way with less frequent two-way messaging scheme

- Master sends sync to slave with its current time
- If configured for followup, master will send followup at later time with better estimate of time sync was sent
- Less frequently, slave sends delay\_req to master with its current time
- Master sends delay\_resp back to slave, with time it received the delay\_req

## □ 802.1 AVB uses a two-way messaging scheme

- Slave sends messages to master at nominal rate; time in each message refers to the message two messages ago
- Master notes when it receives each successive message
- Master responds to slave with time it sent previous response, and times of sending and receipt of message from slave two messages ago

## □ IEEE 1588 uses separate followup message if it is desired for message to carry time of previous time stamp

## □ 802.1 AVB messages always refer to previous time stamps