Residential Ethernet
(access control considerations)

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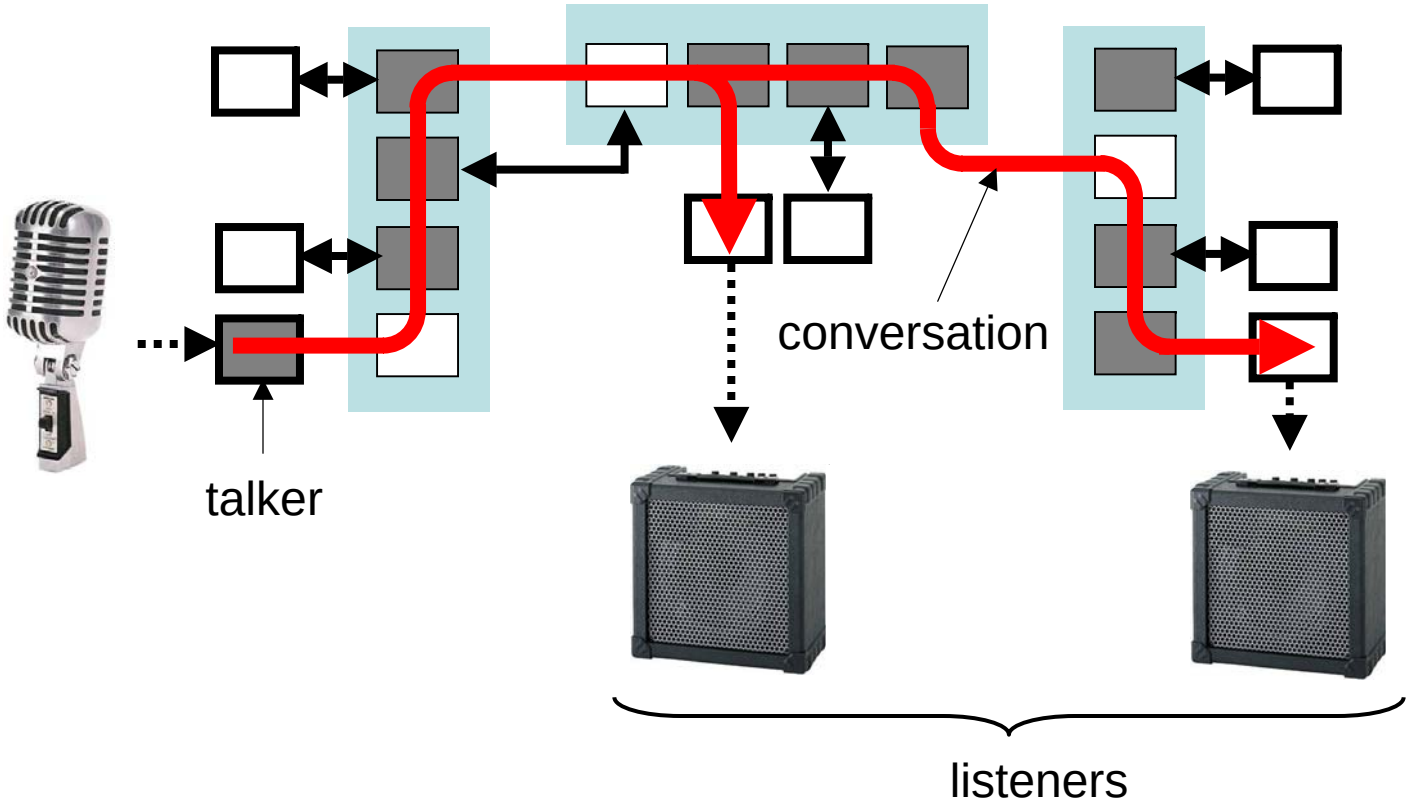
Vocabulary possibilities

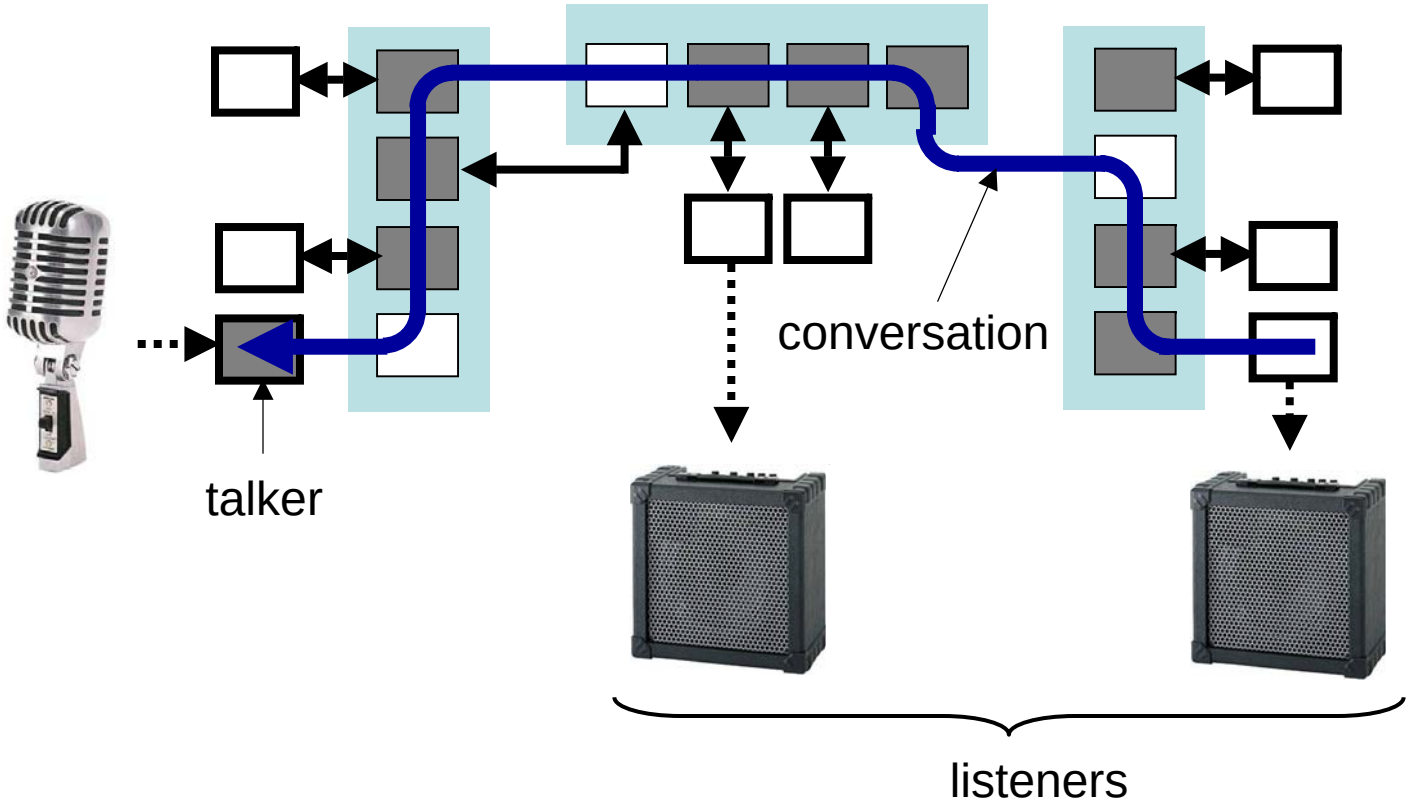


Categories of work

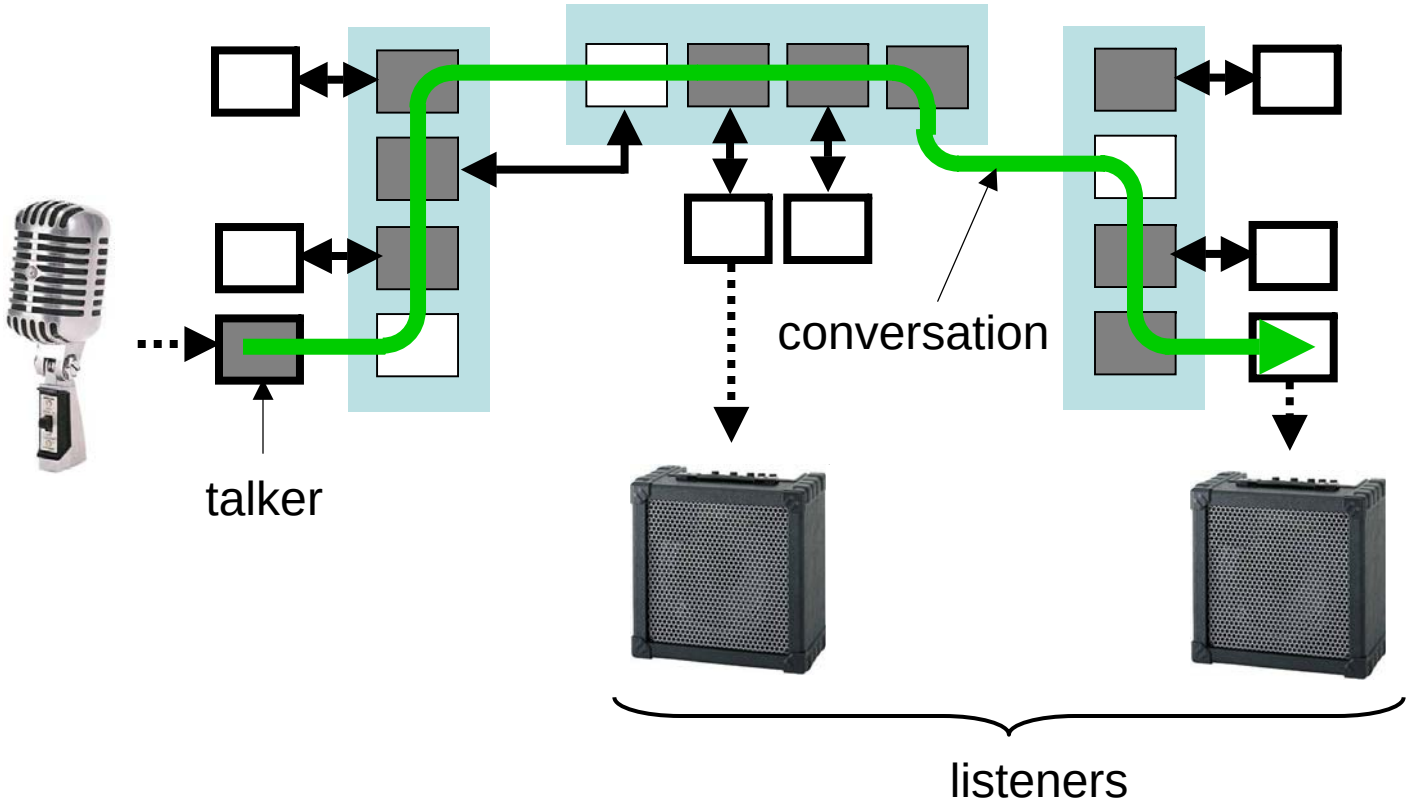
- Device discovery (out of scope)
  - Identify/control “talkers” and their available “plugs”
- Admission control (802.1 oriented)
  - Establish conversation between talker and listener(s)
  - Reject unless: linkBandwidth < linkCapacity
- Clock synchronization
  - Synchronous reception, forwarding, and presentation
- Transmission gating
  - Talkers and 100Mb bridge ports must be gated
- Formats
  - Frame formats and content (channel number, time stamps)
  - Time aware service interfaces

Admission control
(some possibilities)

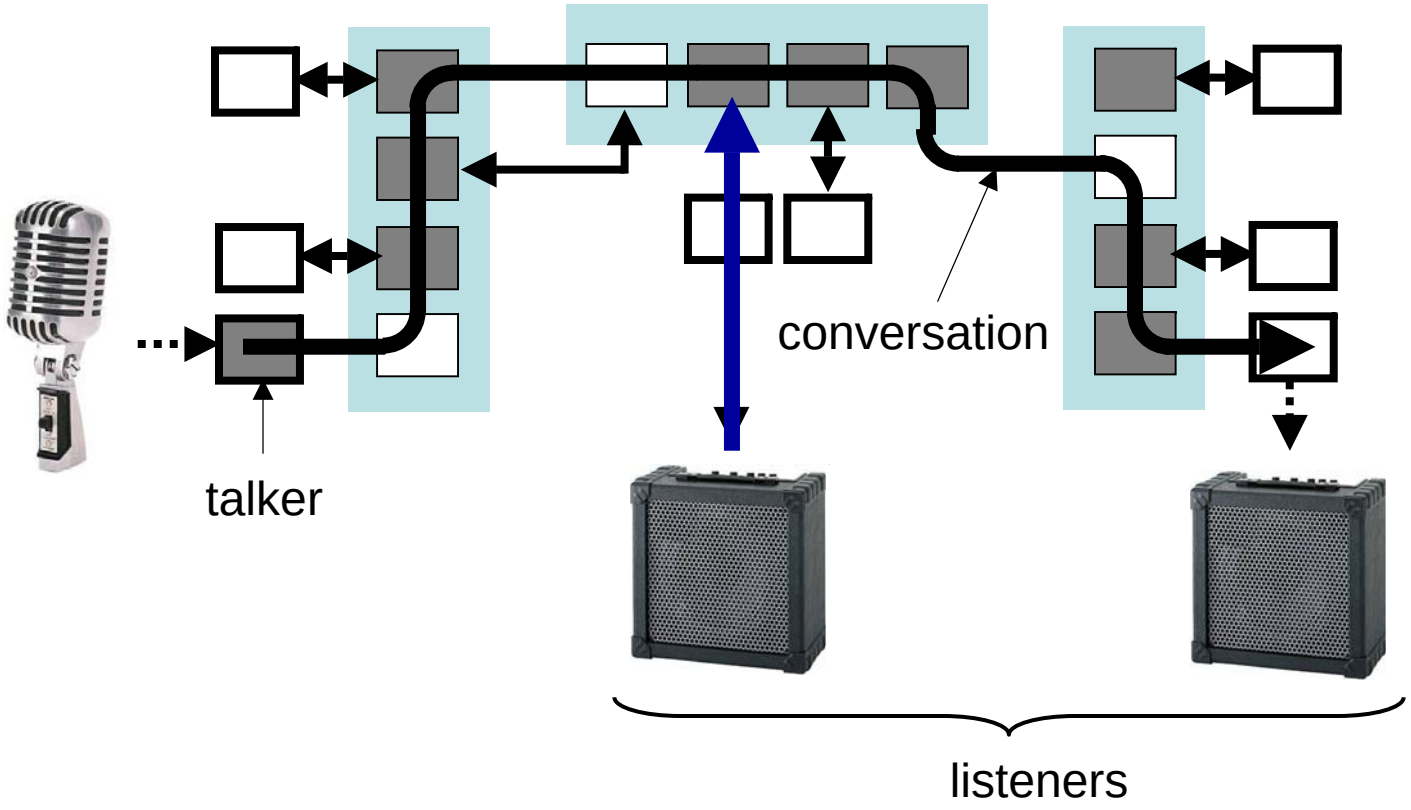
First access request



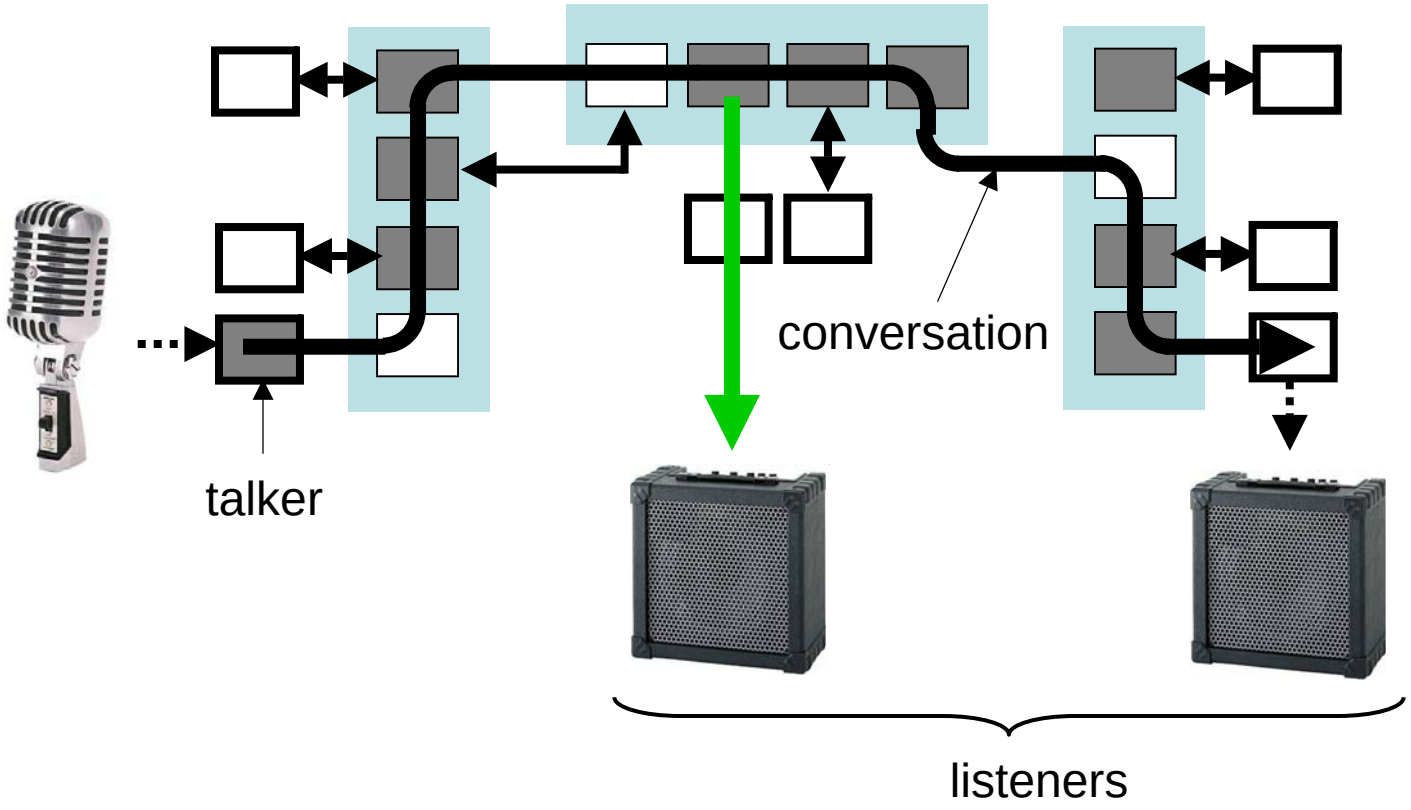
First access response



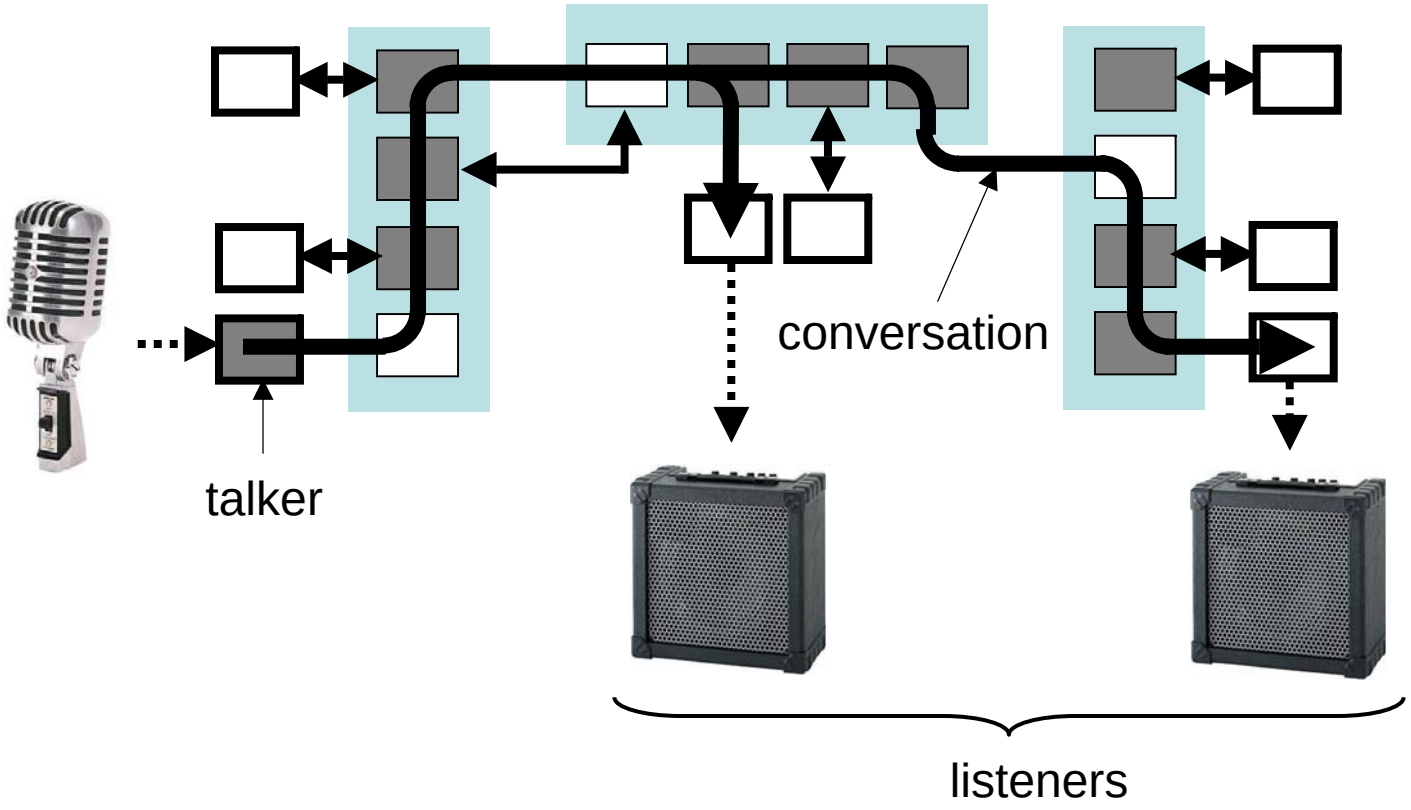
Second access request



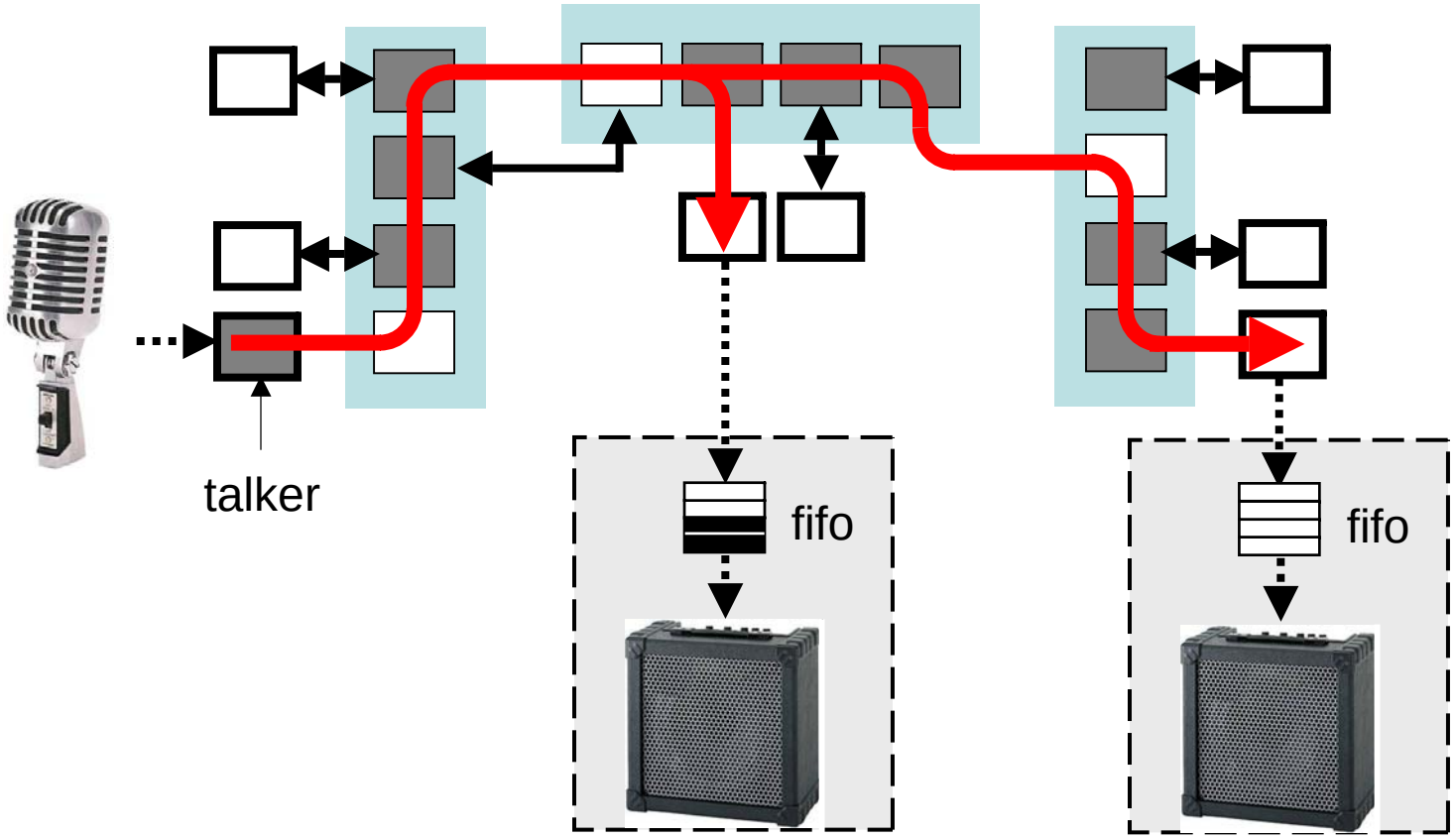
Second access response



Established conversations



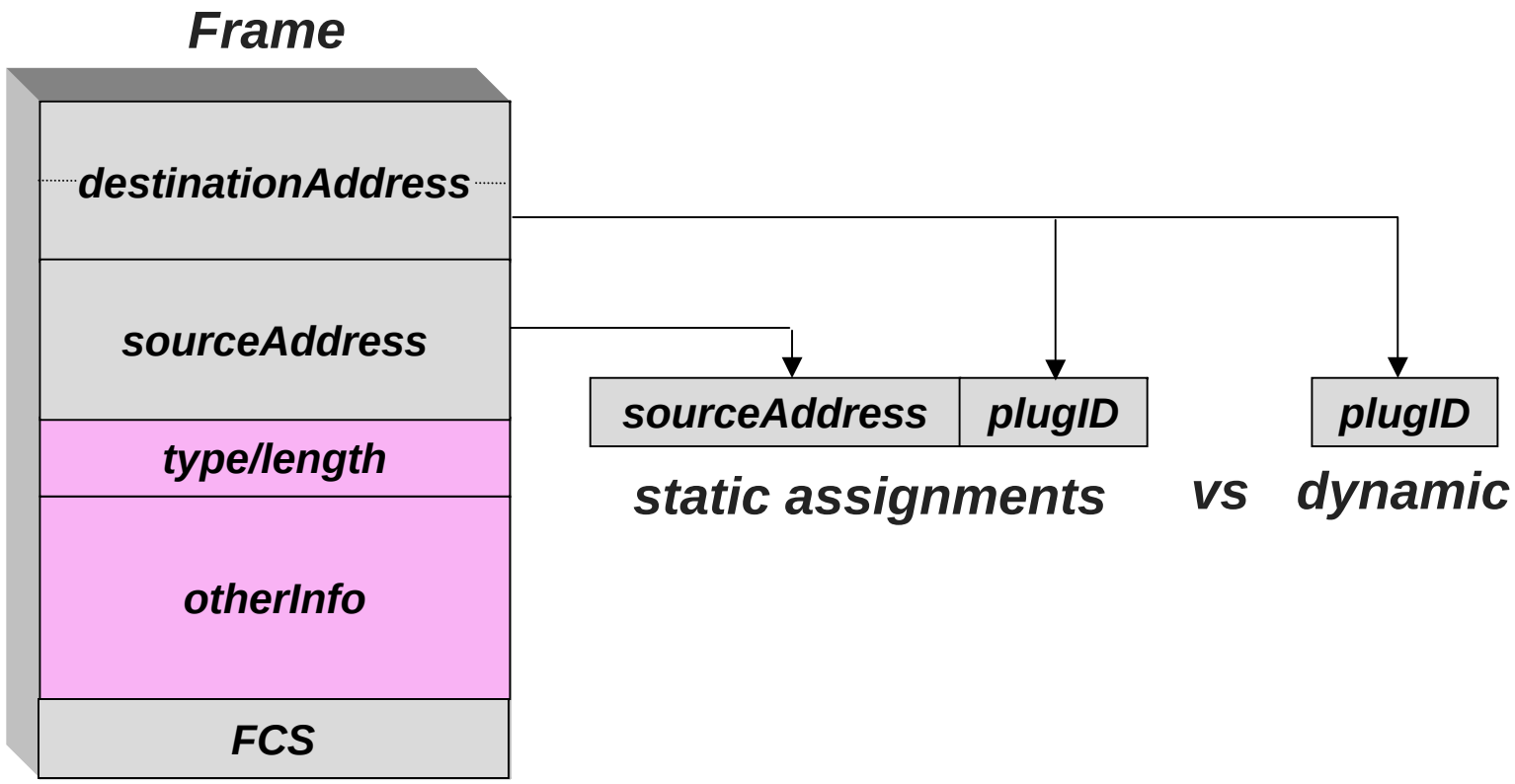
Delay-matching listener FIFOs



Heartbeat timeouts

- GARP defines timeout features
  - Tolerates single-frame losses
  - Multiple frame losses are not within its scope
- Timeouts use to:
  - Release of flooded (very rare) speculative resources
  - Removal of one or more listeners
  - Removal of the talker
  - Etc.
- More flexible than traffic monitors
  - Monitors place restriction on synchronous flows
  - Support of prioritized asynchronous may be desired

Isochronous addressing?



Are bridge changes necessary?

- End-station throttling (assuming highest priority)
  - With 1Gb/s switches, this may be sufficient
- Source device spreads transmissions evenly
  - Bunching may be tolerable within the home (needs study)
  - Must ensure that nothing else uses the highest priority
- But, some access control changes needed anyway
  - Bridges are naturally encountered along the path
  - Central topology database is thus unnecessary

Summary

- We need a GARP-like lower level protocol
  - Restrict N-to-N multicast, for 1-to-N traffic
  - Simultaneous bandwidth allocation required
  - Should track/influence in-progress revision (MRP/p802.1ak)
- The IP admission control alternative
  - Out of scope
  - Layering violations (non-IP synchronous traffic?)
  - Not generally supported by residential bridges
  - Multiple components (and synchronized use) required:
    - A multicast address server?
    - IGMP/snooping for multicast setup?
    - RSVP/snooping for bandwidth negotiation?

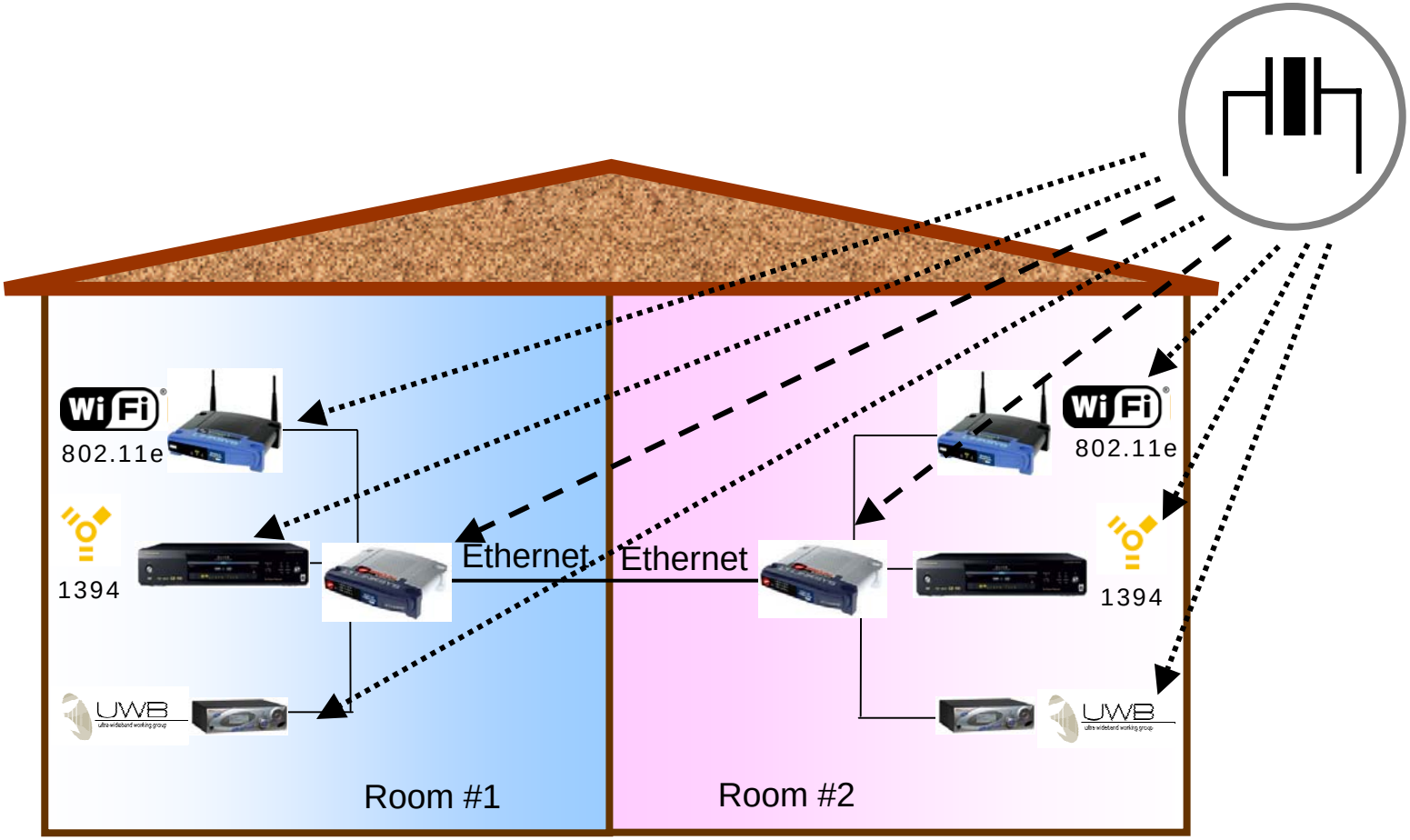
Backup slides
(from previous presentations)

Synchronized time-of-day clocks
(a Residential Ethernet SG presentation)

Synchronized time-of-day clocks

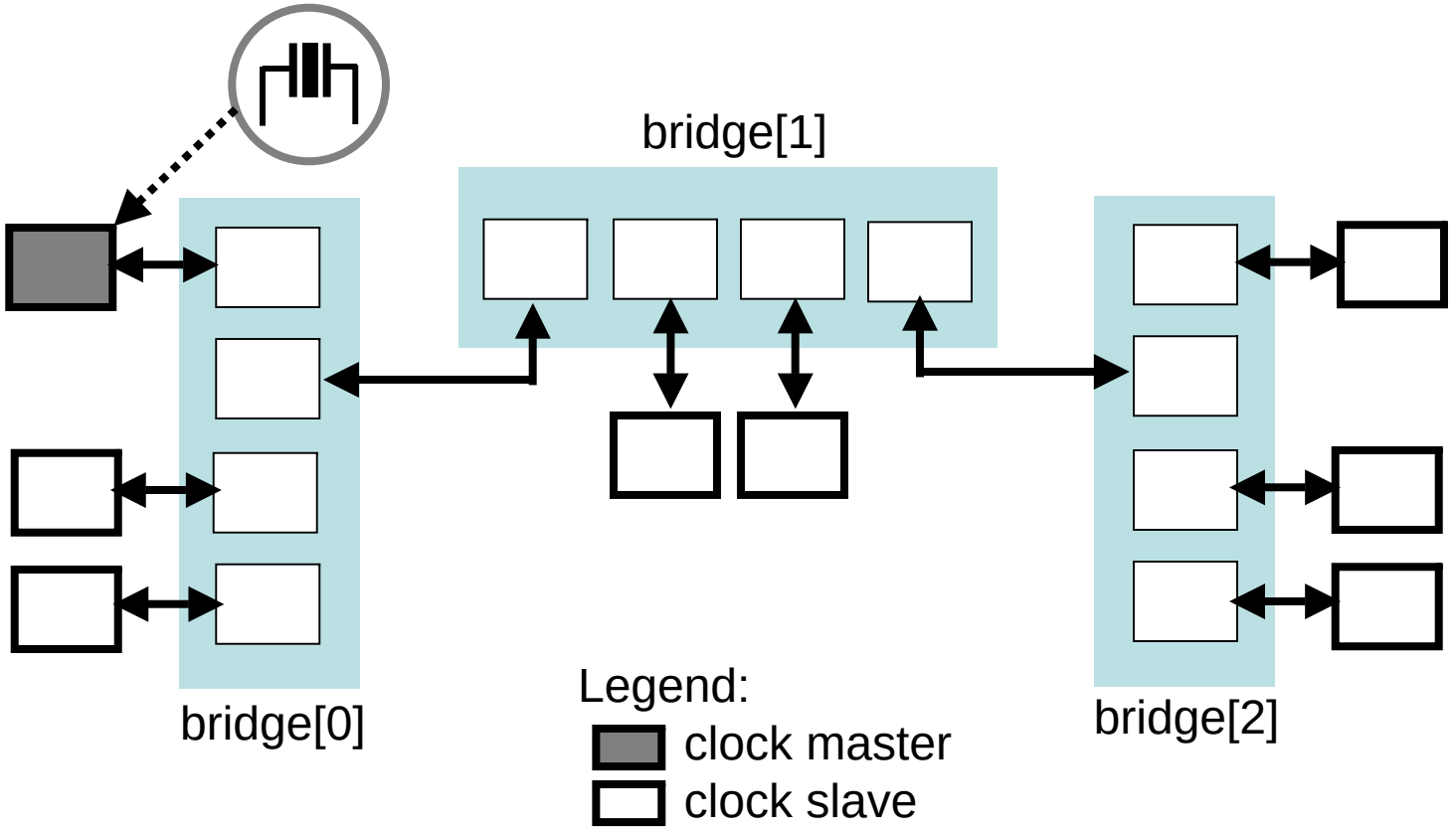
What?

House reference clock



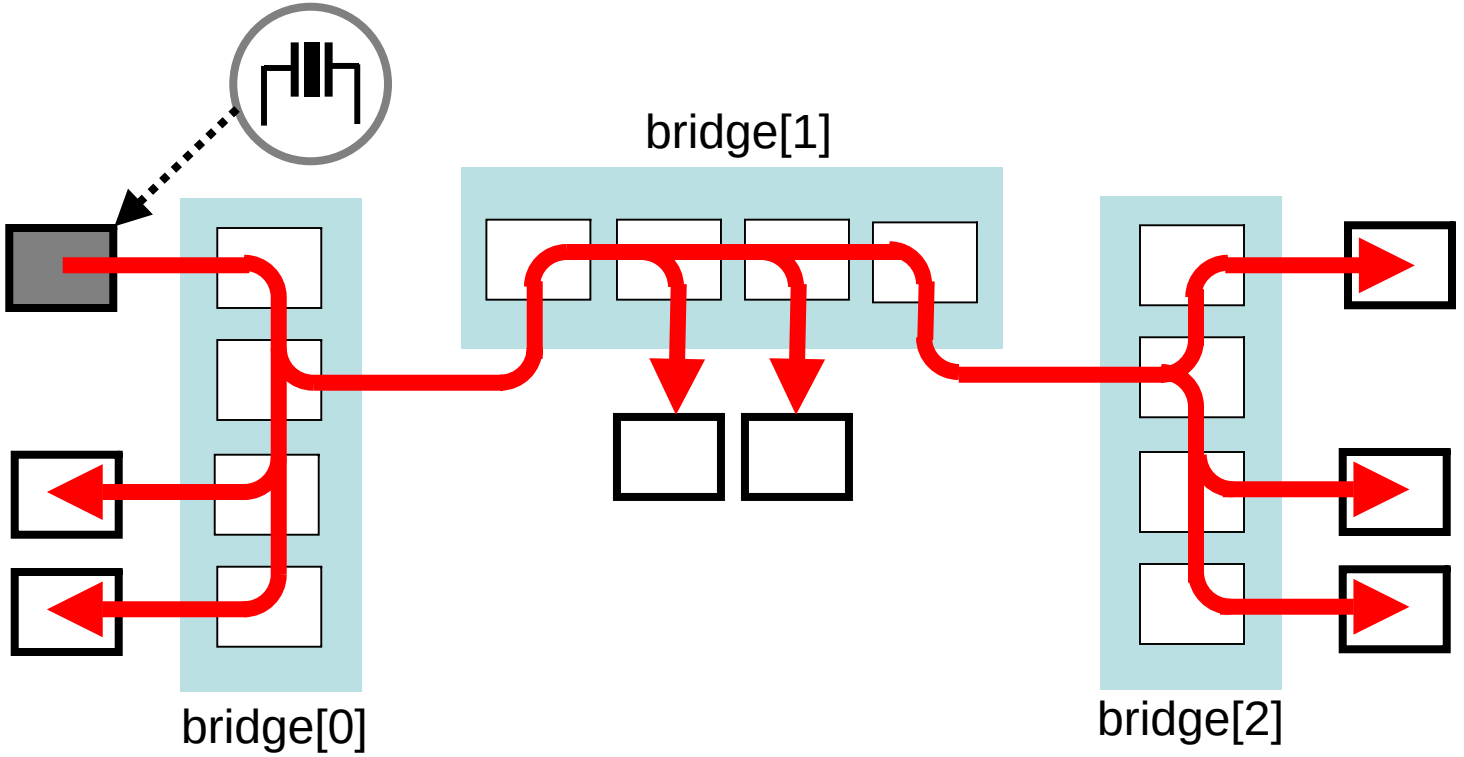
Cascaded TOD synchronization

Physical topology constraints



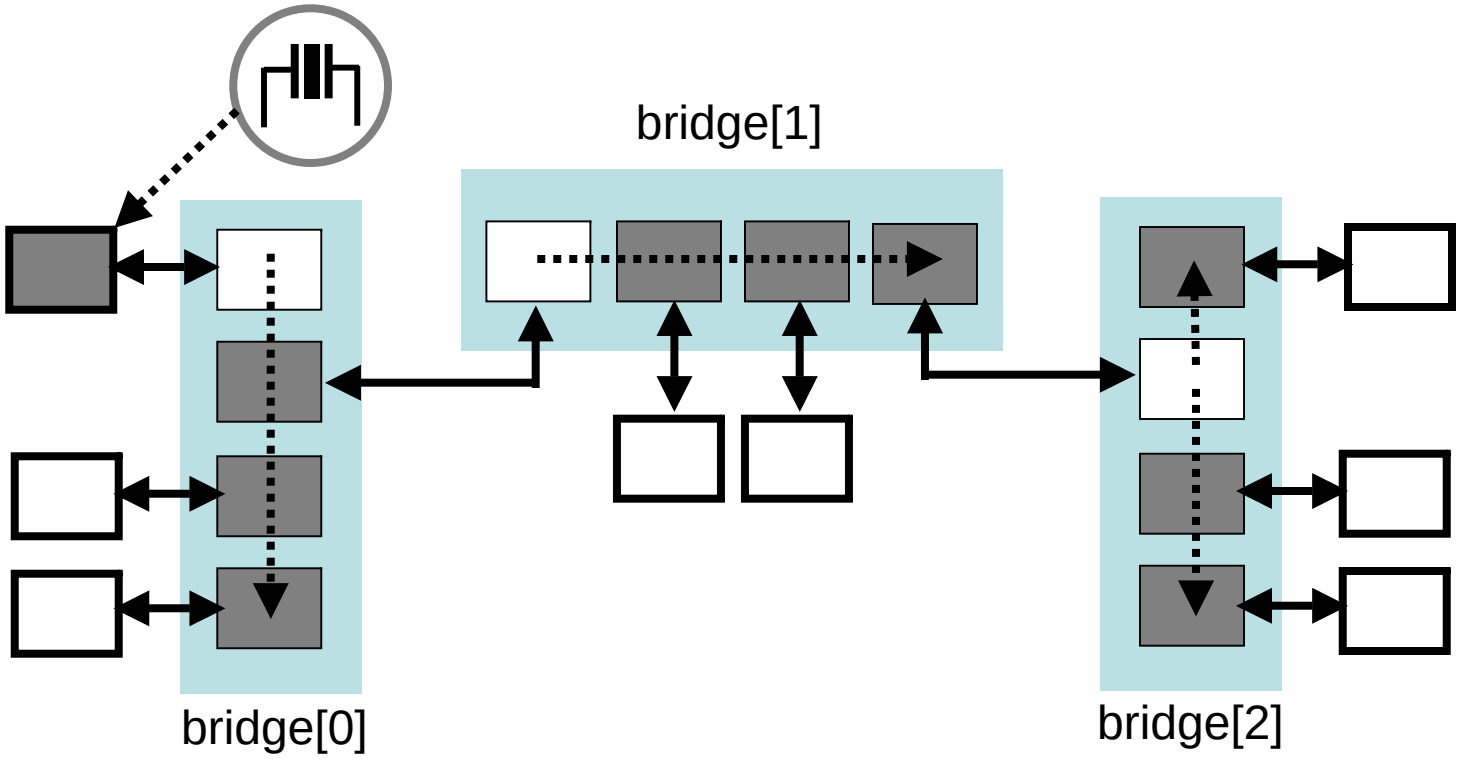
Cascaded TOD synchronization

Wall-clock distribution model

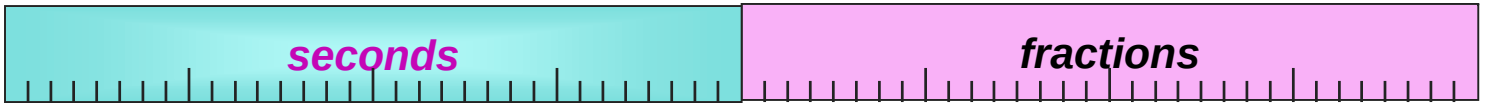


Cascaded TOD synchronization

Cascaded adjacent-synchronization hierarchy

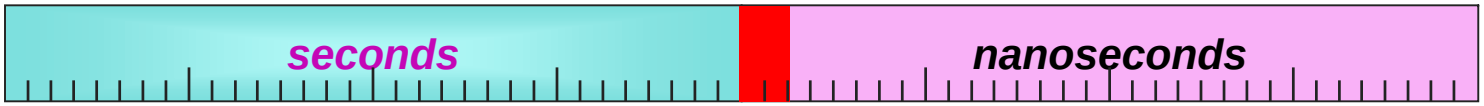


Time-of-day format options

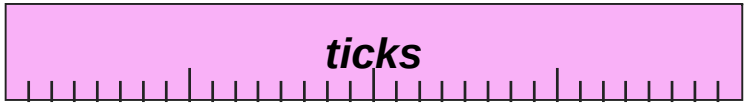


>150 years <250 ps

OR



OR

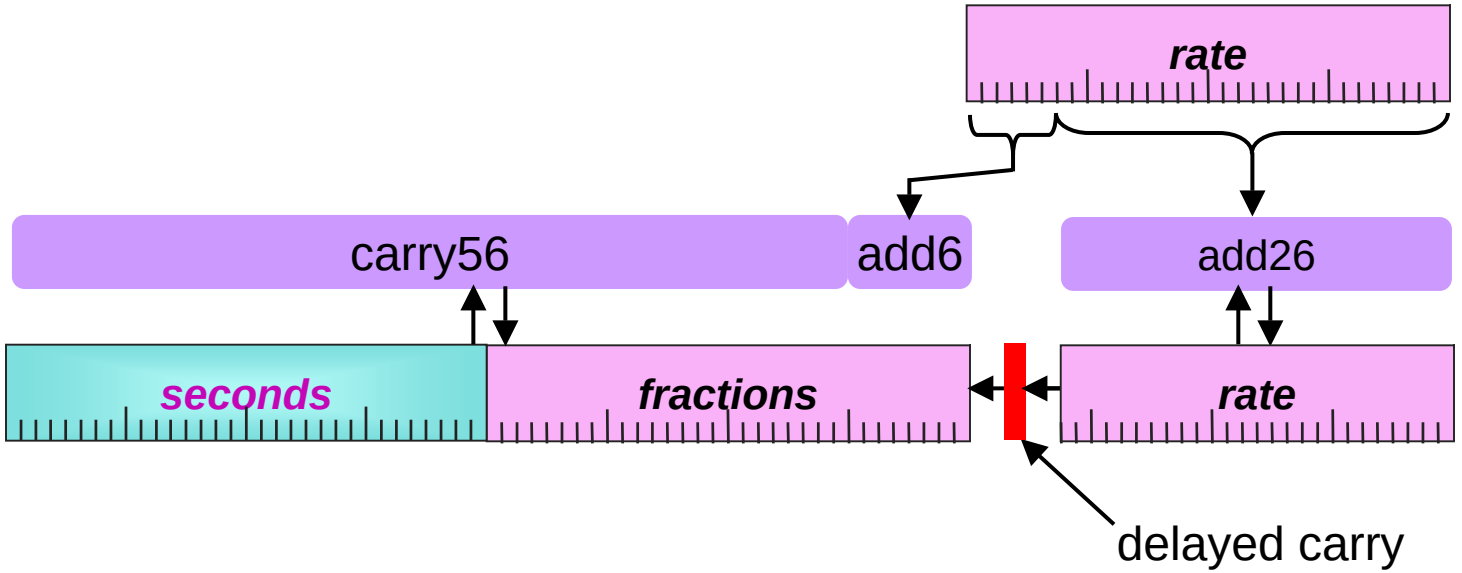


16 ns

OR

(…)

Time-of-day rate adjustments

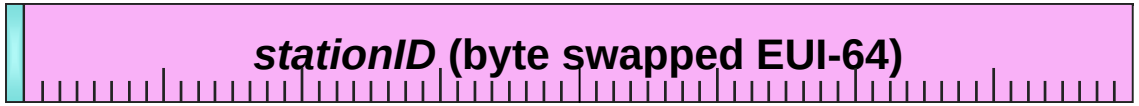


Time-of-day precedence

smaller

802.3 STP precedence
(IEEE Std 802.3D-1998)

preferred



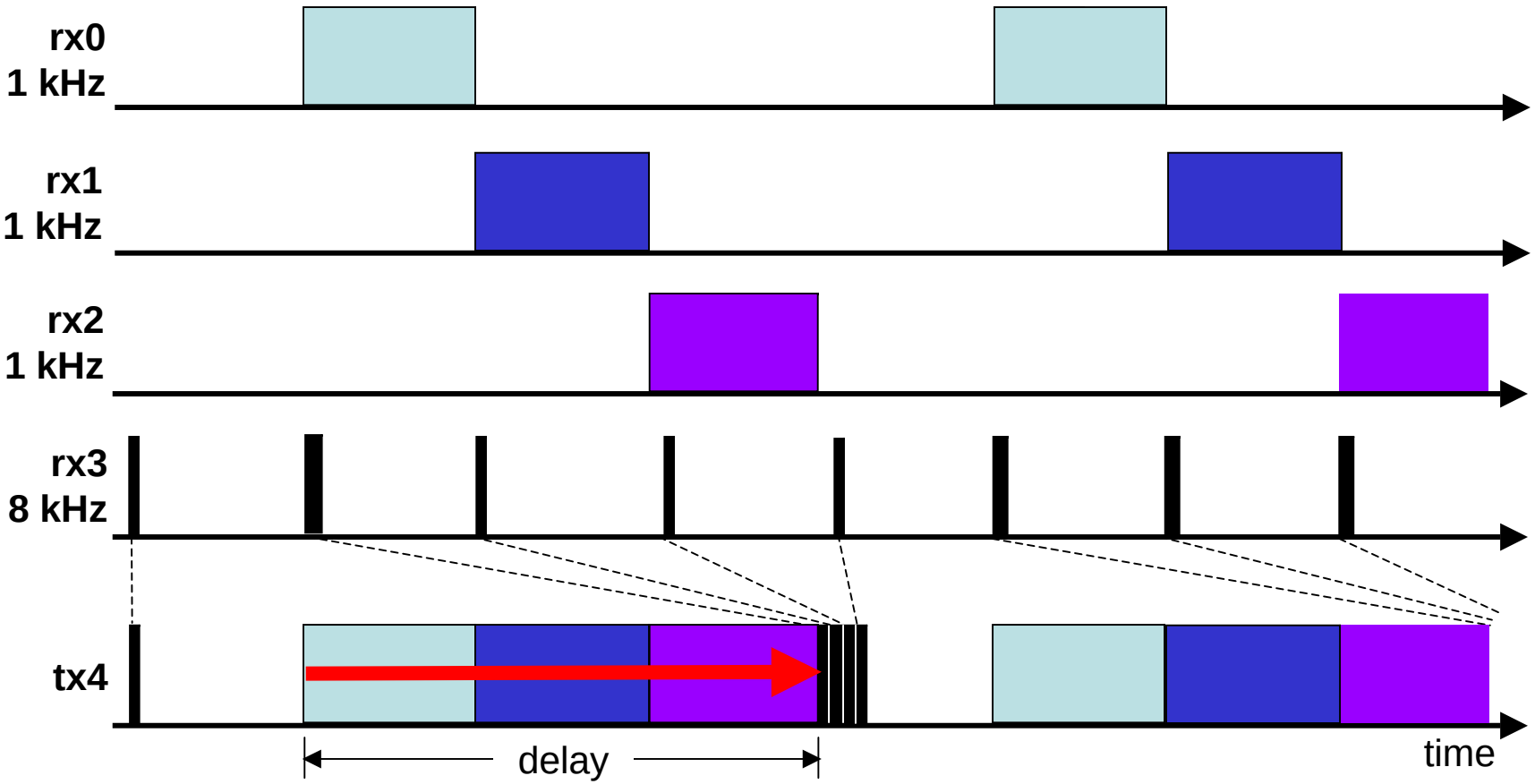
larger

1394 precedence

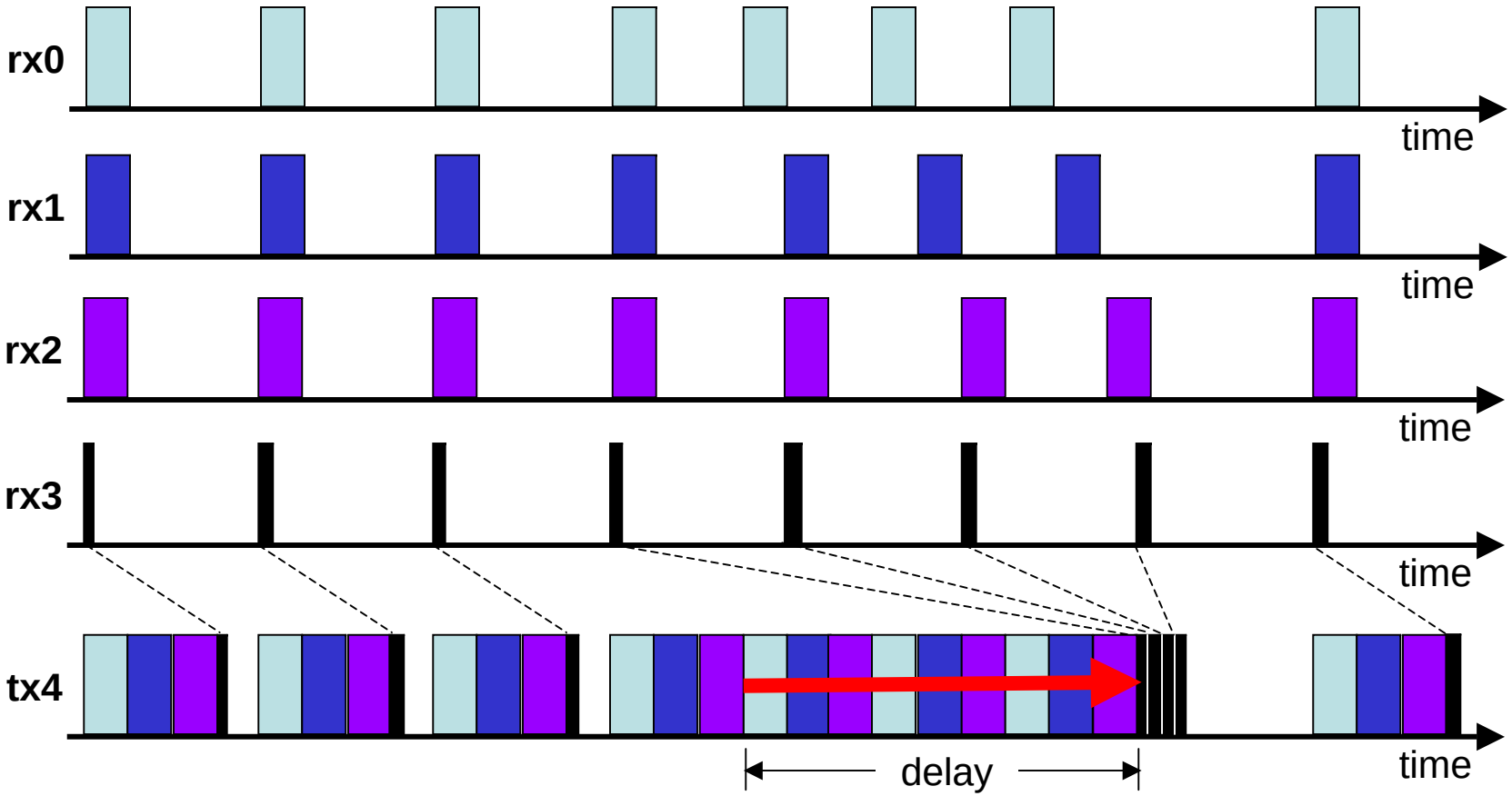
Synchronized time-of-day clocks

Why?

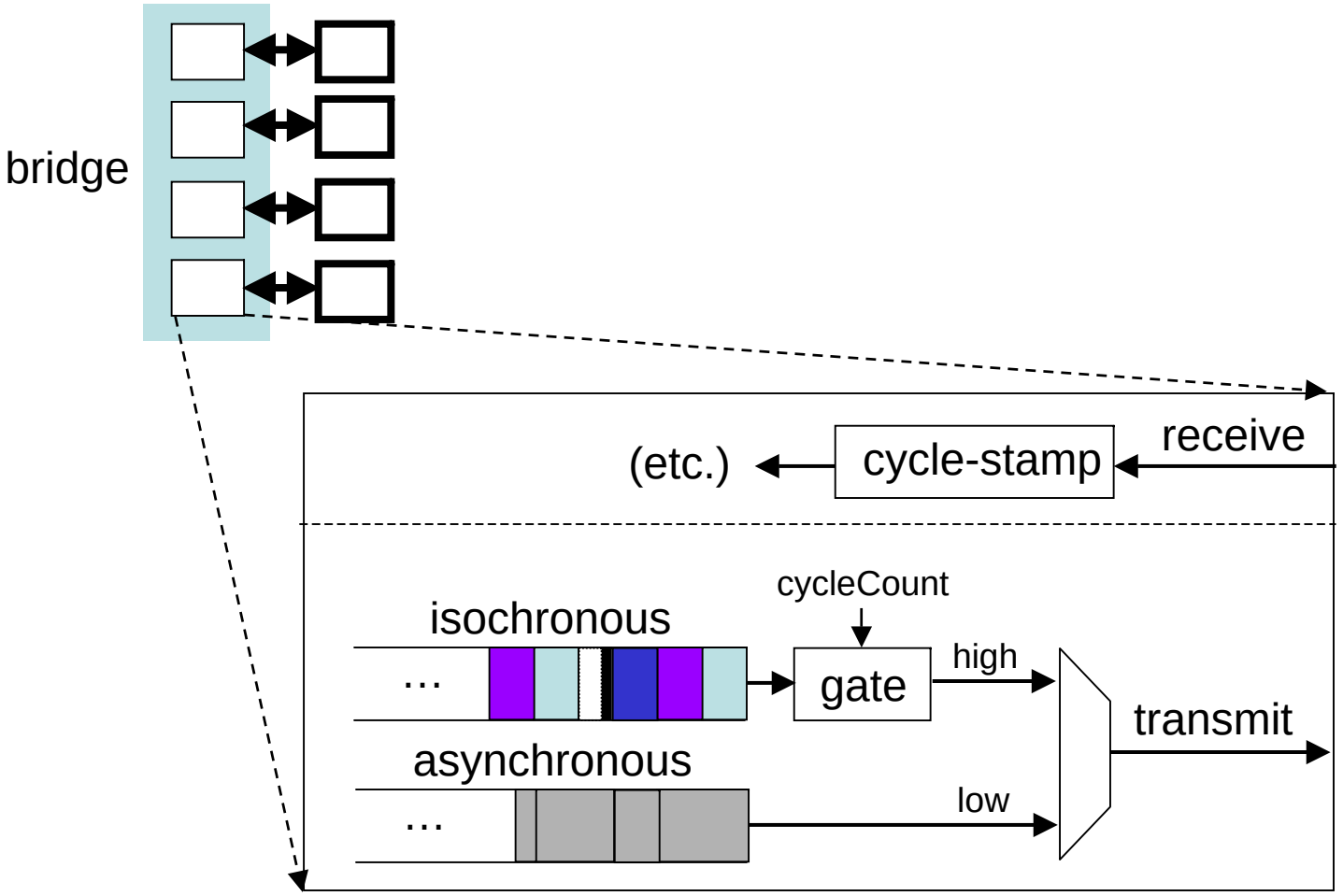
Bursting causes jitter



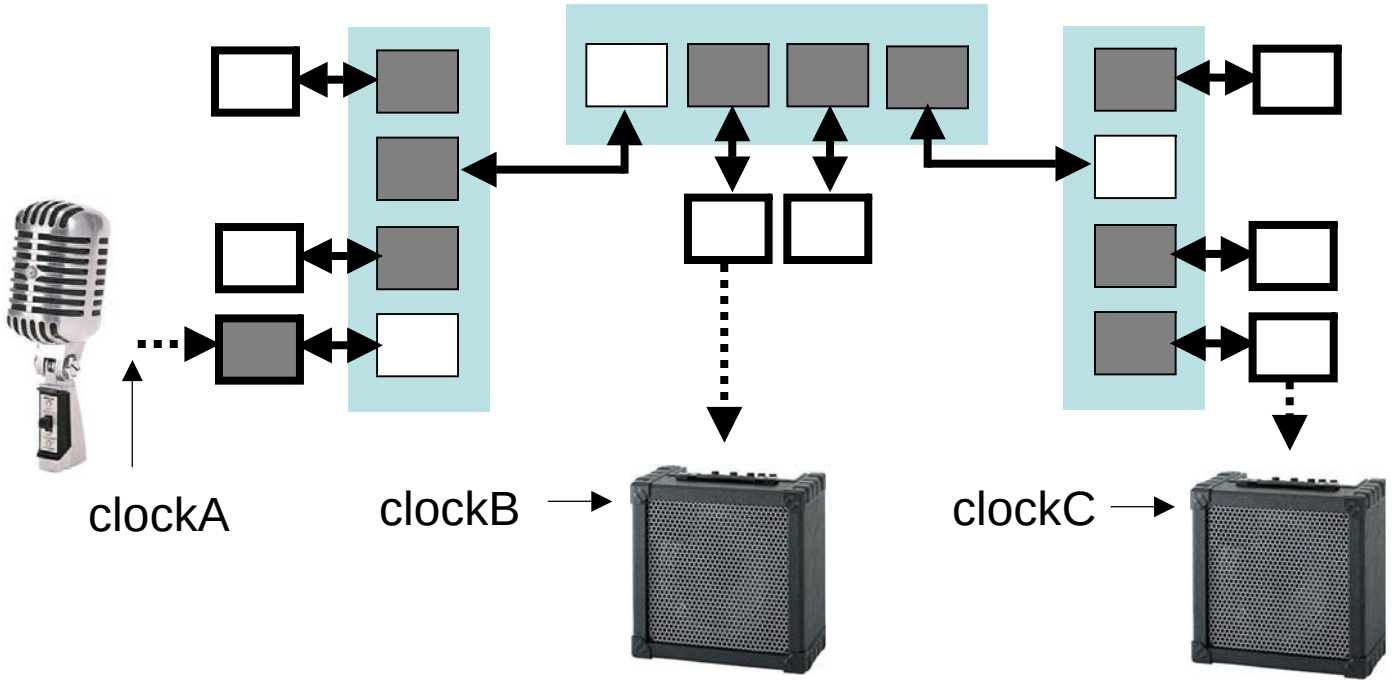
Bunching causes jitter



Bridge re-clocking contains jitter



Synchronized reception/presentation



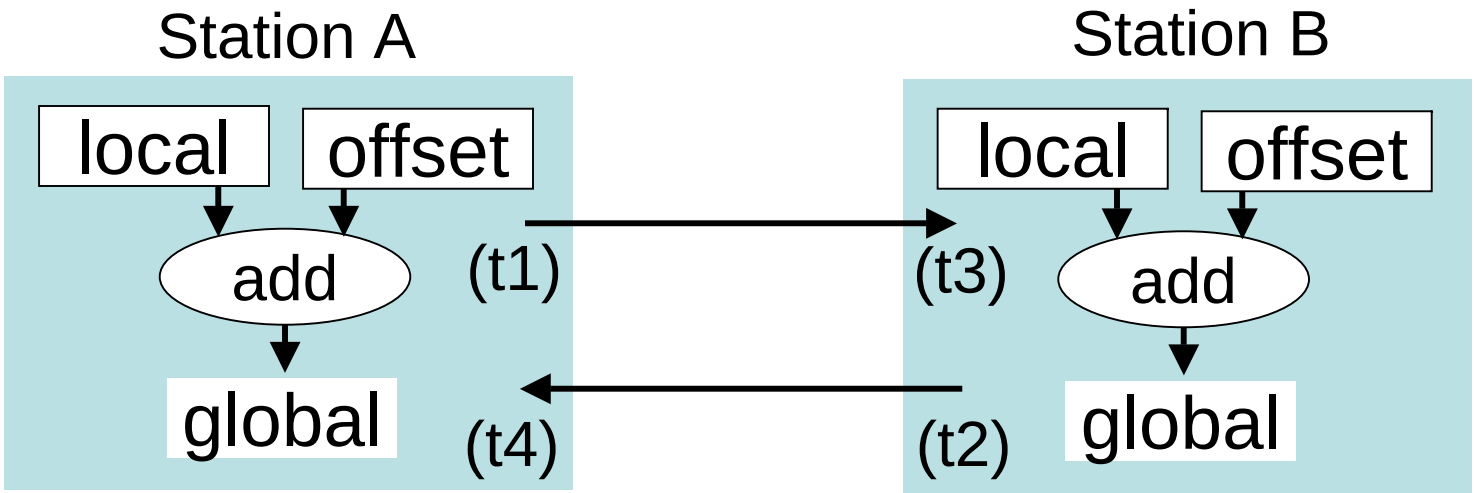
No long-term drift: clockA, clockB, clockC
Clock jitter: sub nanosecond (after PLL)

Synchronized time-of-day clocks

How?

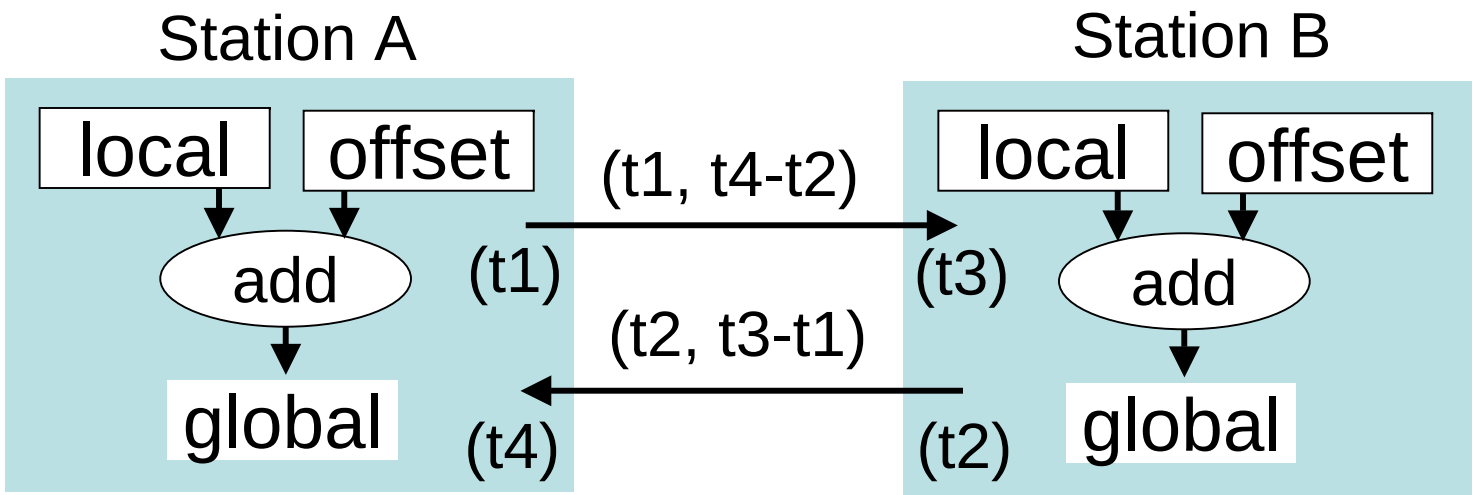
Adjacent-station synchronization

Timing snapshots



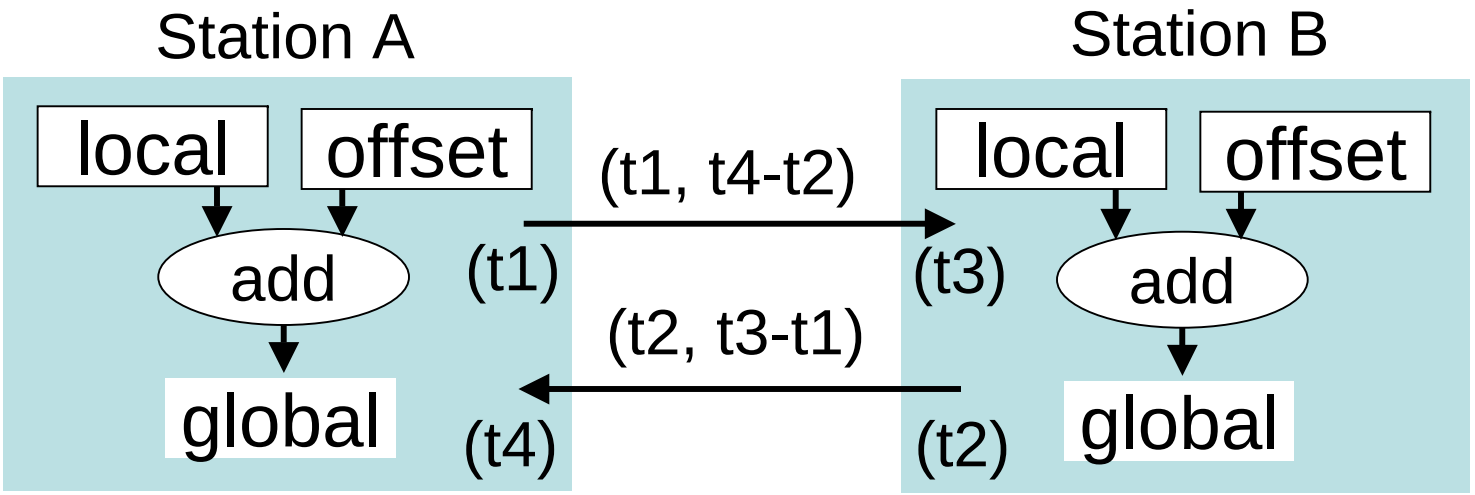
Adjacent-station synchronization

Snapshot value distribution



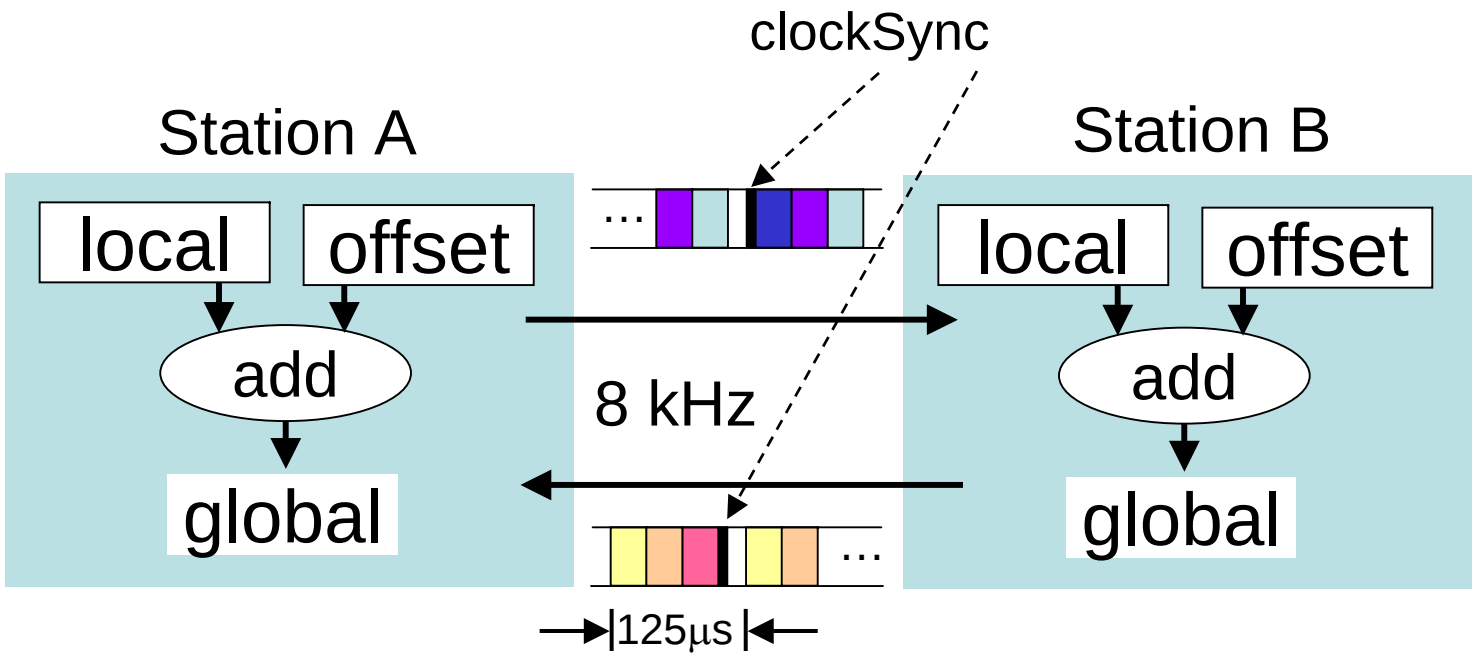
Adjacent-station synchronization

Offset value adjustments



- clockDelta = ((t3 – t1) – (t4 – t2)) / 2;
- cableDelay = ((t3 – t1) + (t4 – t2)) / 2;
- offsetB = offsetA – clockDelta;

Adjacent station synchronization



In summary

- Time-of-day synchronization (house clock)
  - Global synchronization is required
  - Implemented as cascaded adjacent synchronizations
- Time synchronization formats
  - Binary time is accurate with simple add/subtract
  - Clock-master voting: 48+ or 64+ selection priorities
- Time-of-day applications
  - Synchronous reception and presentation, within applications
  - Synchronous re-clocking within bridges
- Time-of-day distribution
  - Pipelined sampling for highest accuracies
  - Cable delays can be derived, based on the same information

Synchronized time-of-day clocks

Questions?