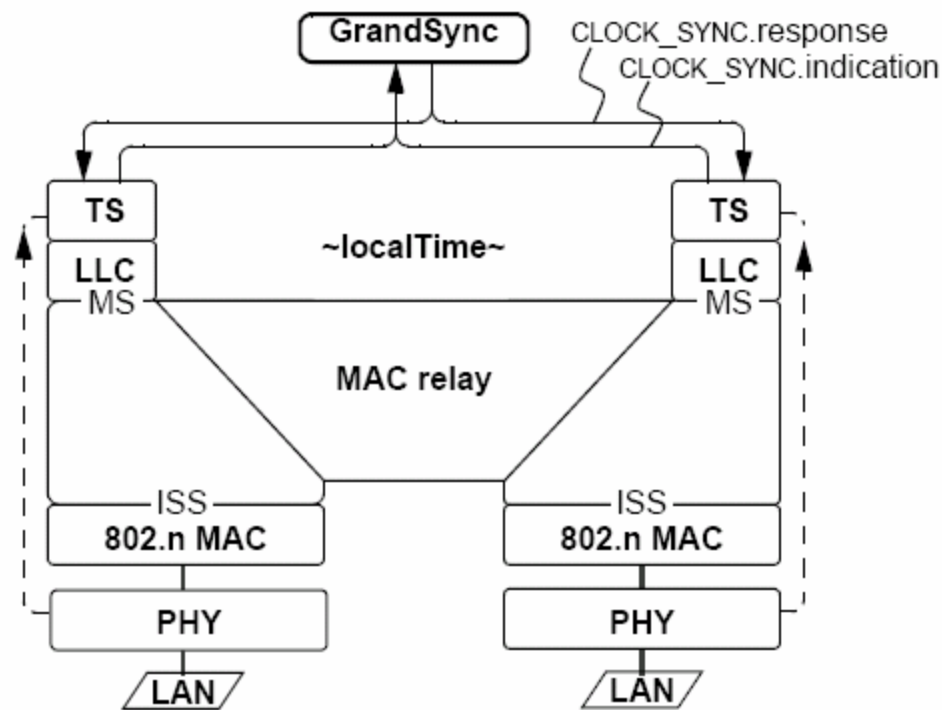

AV bridging:
Time-synchronization interfaces

David V James

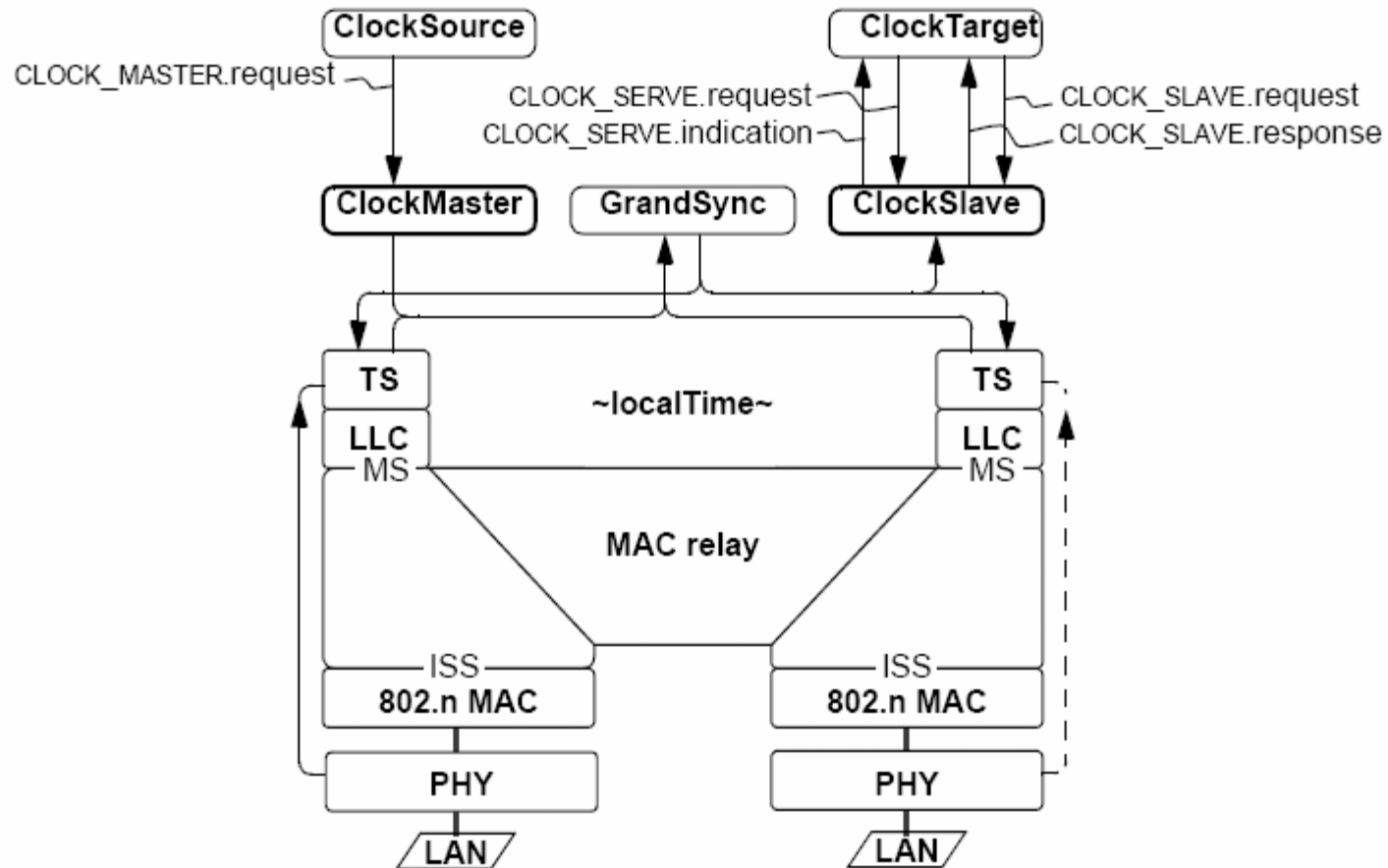
Higher-level themes

- Media-independent service interfaces
 - Define what should be “done”
 - And thus understand “how” it can be done
- Reduced options
 - Non-uniform media must be supported (BC)
 - Uniform media is simply a special case
- Eliminate excessive packets
 - Single packet,
 - not split components with distinct formats/timing/dependencies
 - Consistent with 64-byte minimum frame size
(??why send “reserved” bytes??)

Time-sync entity overview



Time-sync clock interfaces



CLOCK_MASTER.request interface

```
ClockMaster.request {  
    interval,          // One-byte encoded  
    flags              // Control flags  
    {  
        disruption,   // Discontinuous time  
        traceable,    // A good timer reference  
    },  
    utcOffset,        // Leap seconds  
    grandTime         // Timer value  
};
```

CLOCK_SLAVE.response

```
CLOCK_SLAVE.response {
  interval,          // One-byte encoded
  flags              // Control flags
  {
    disruption,     // Discontinuous
    gmMaster,       // This clock is the GM
    traceable       // A good clock reference
  },
  utcOffset, // Leap seconds
  grandTime // Timer value
};
```

CLOCK_SLAVE.request

```
CLOCK_SLAVE.request {  
    // Trigger only; no data provided  
};
```

```
CLOCK_SERVE.request {  
    rate // Encoding is TBD  
};
```

rate > 0 seconds-per-cycle

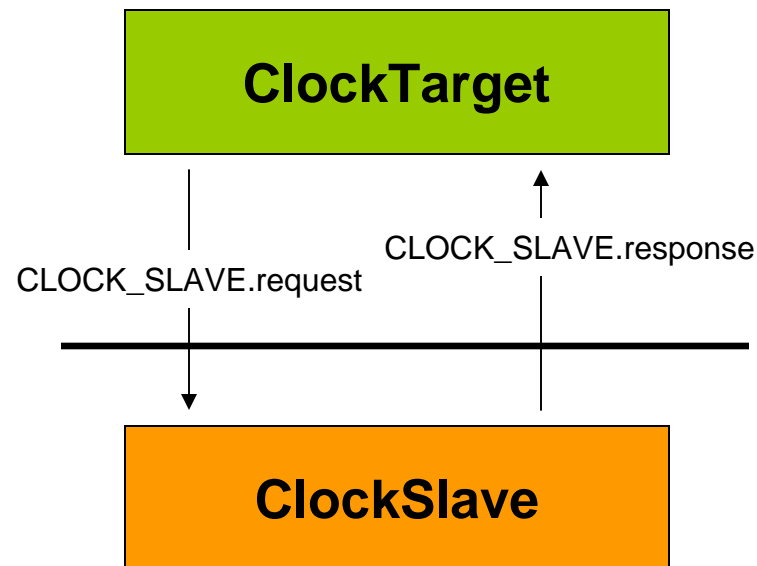
rate < 0 cycles-per-second

CLOCK_SERVE.indication

CLOCK_SERVE.indication
is the same as
CLOCK_SLAVE.response,
but is sent periodically

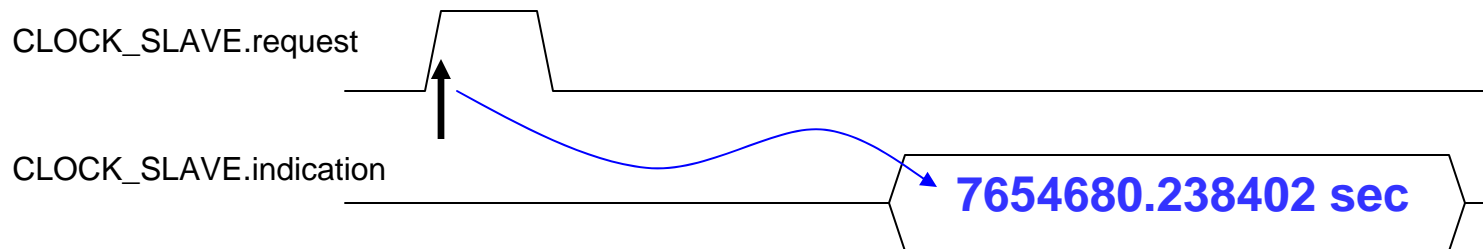
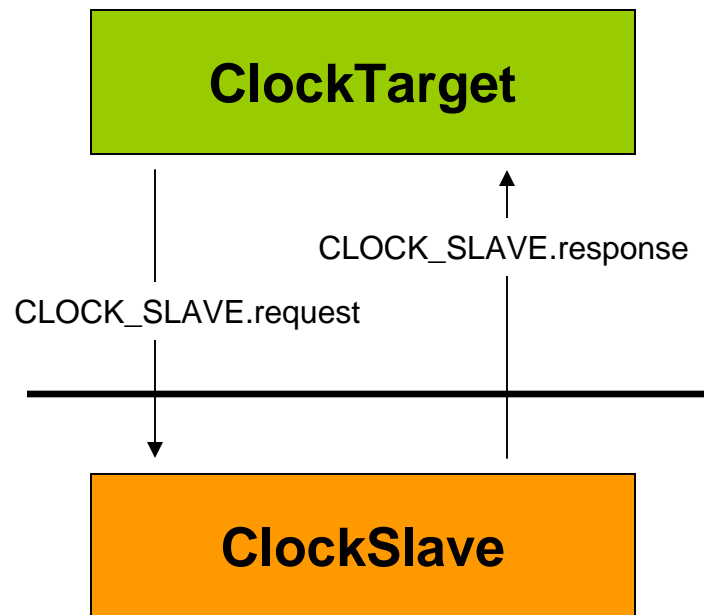
Clock-sink interfaces

ClockSlave interface overview

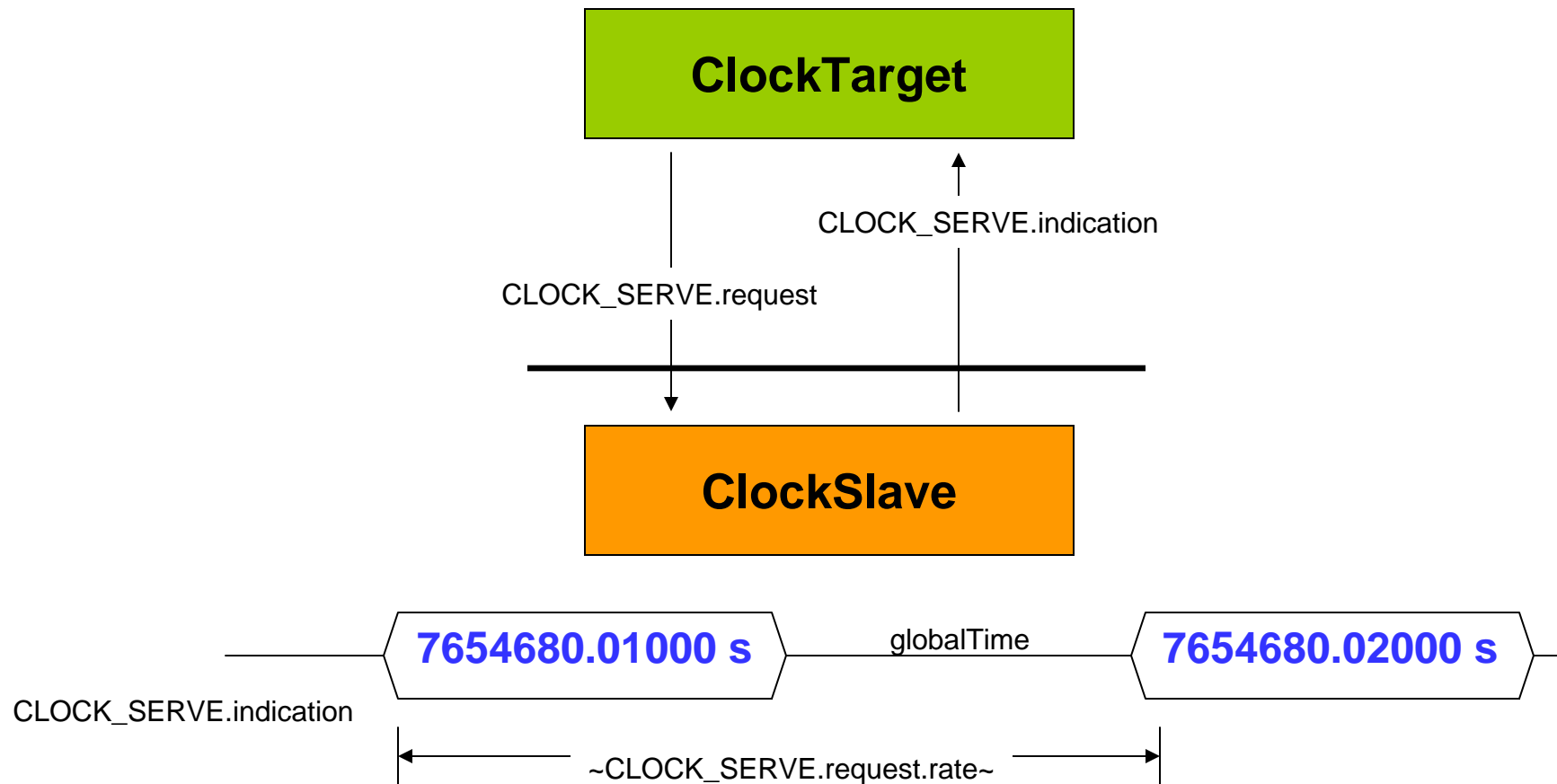


- `CLOCK_SLAVE.request` is a trigger
- `CLOCK_SLAVE.response` provides the time of the request arrival.

ClockSlave interface details



ClockServe interface



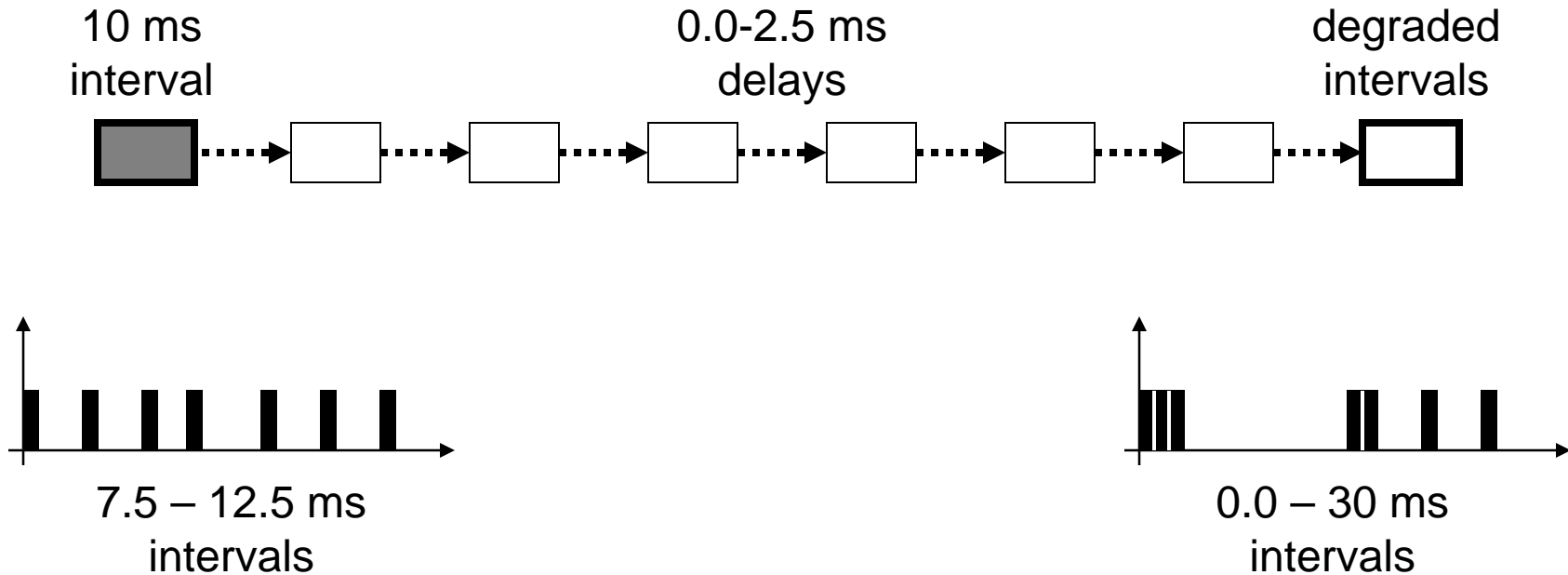
Boundary-clock only?

802.1as basic requirements

- Media friendly
 - Link-dependent time-sync intervals
 - Clock-master or clock-slave initiated
- Accurate
 - Errors limited by snapshot accuracies
 - Eliminate: gain peaking
 - Incorporate: per-stage low-pass filtering
- Responsive
 - RX: linkDelay—neighbor local-clock syntonization
 - TX: Minimal grandTime syntonization
- Simple
 - Minimal residence-time constraints

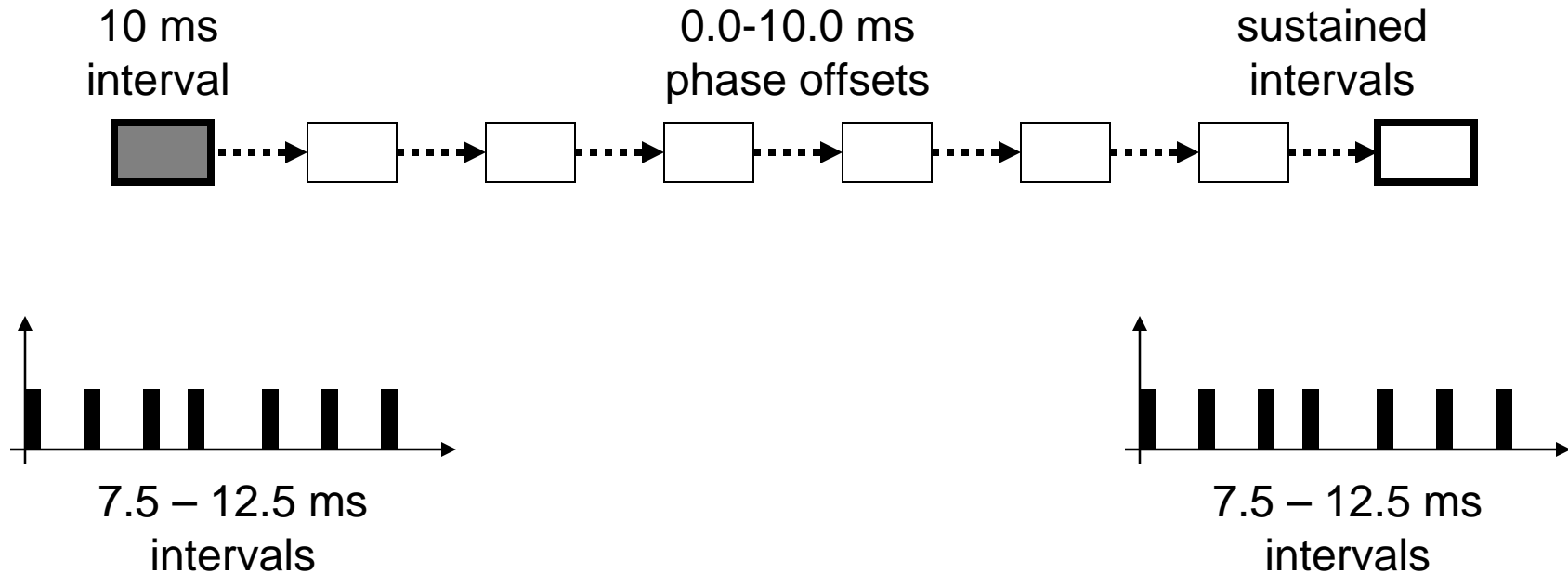
Cascaded TOD synchronization

(a nonscalable approach)



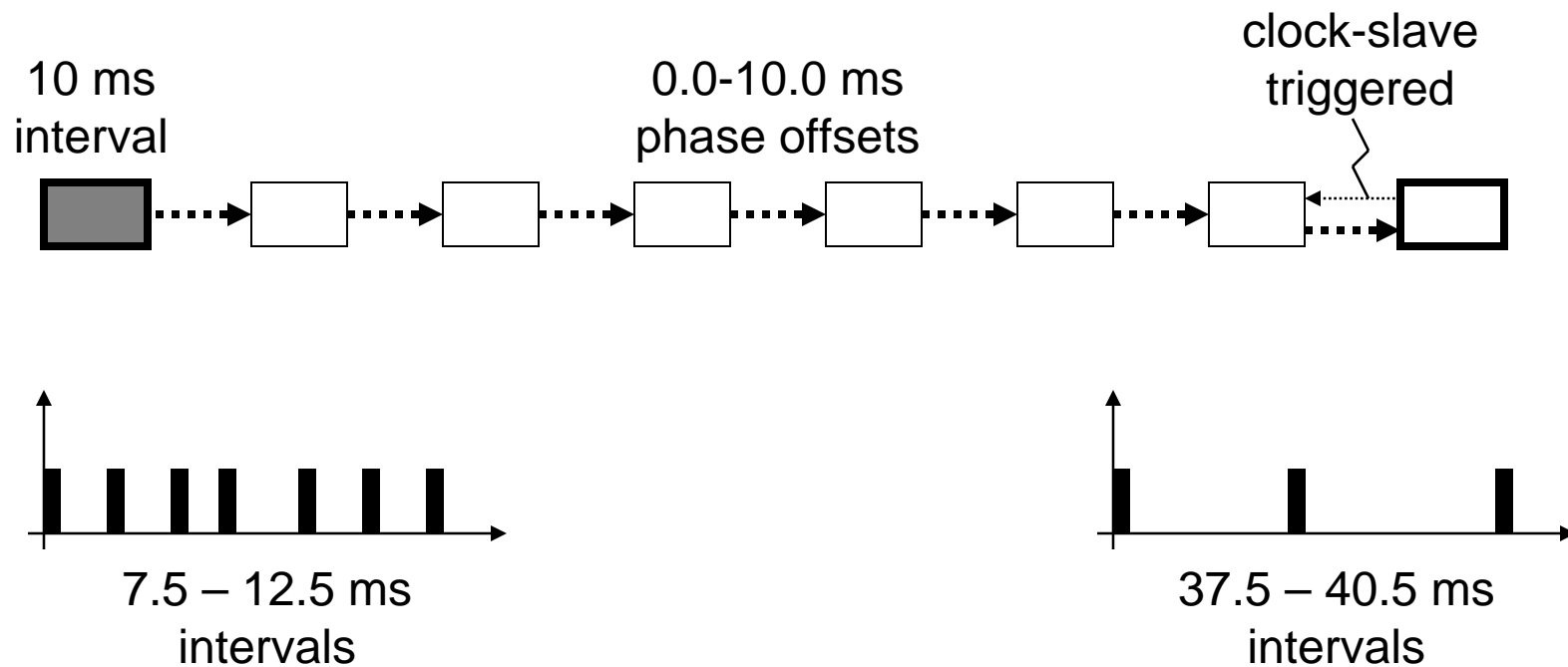
Reclocked TOD synchronization

(a scalable approach)



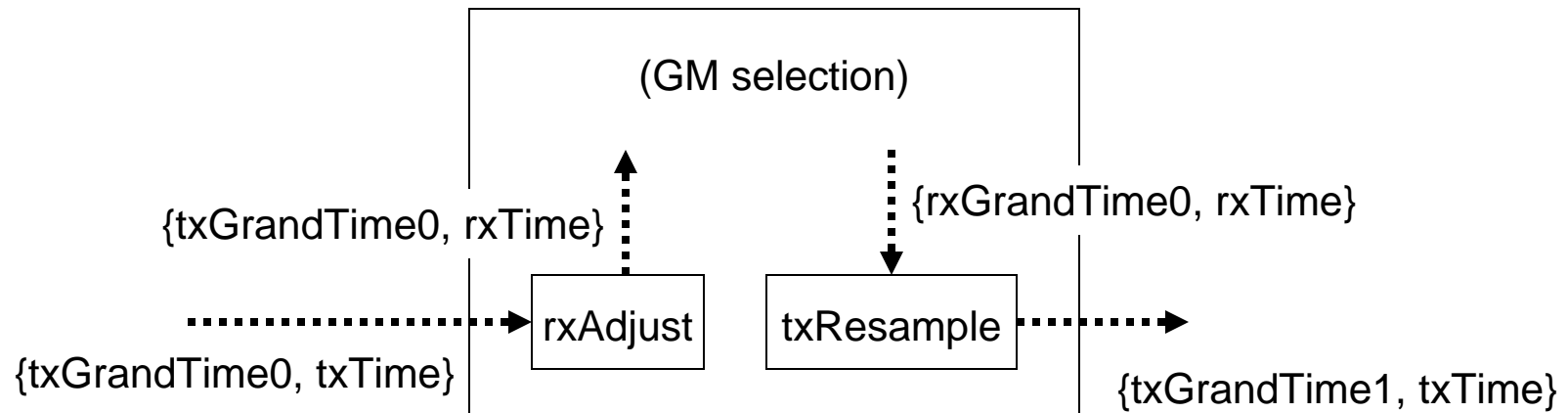
Slave-triggered synchronization

(a more heterogeneous cascade)



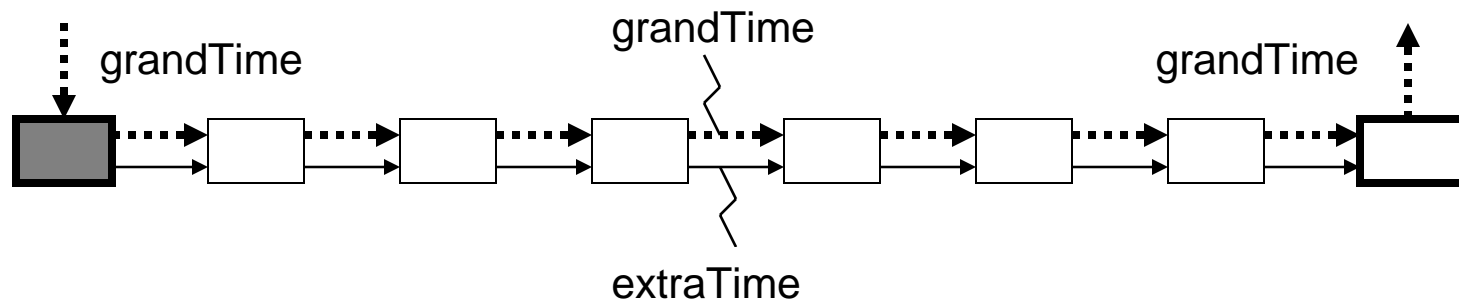
Rate conversion overview

(decoupled processes)

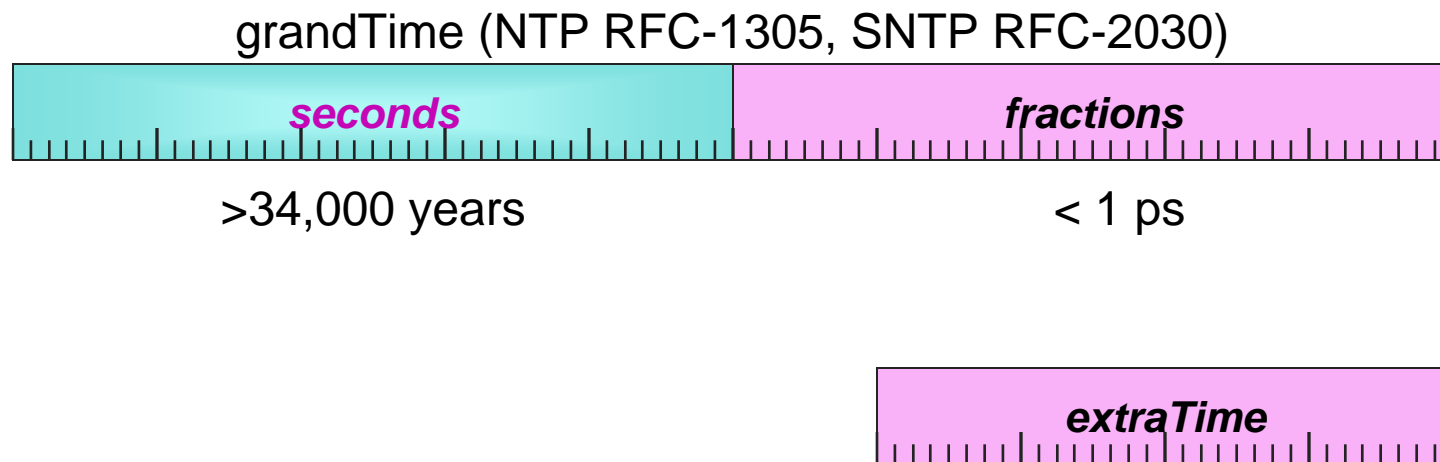


Gain-peaking suppression

(distinct calibration & deviation indications)

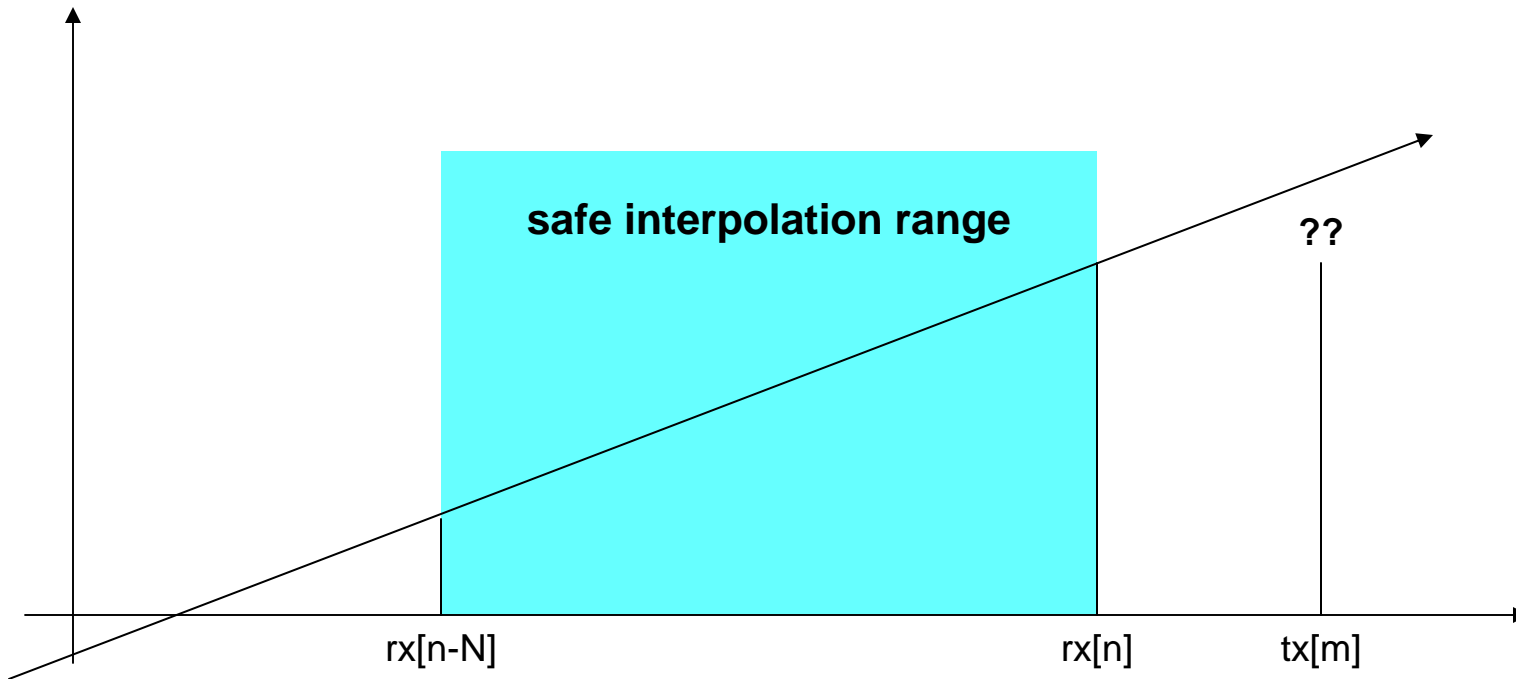


Time formats

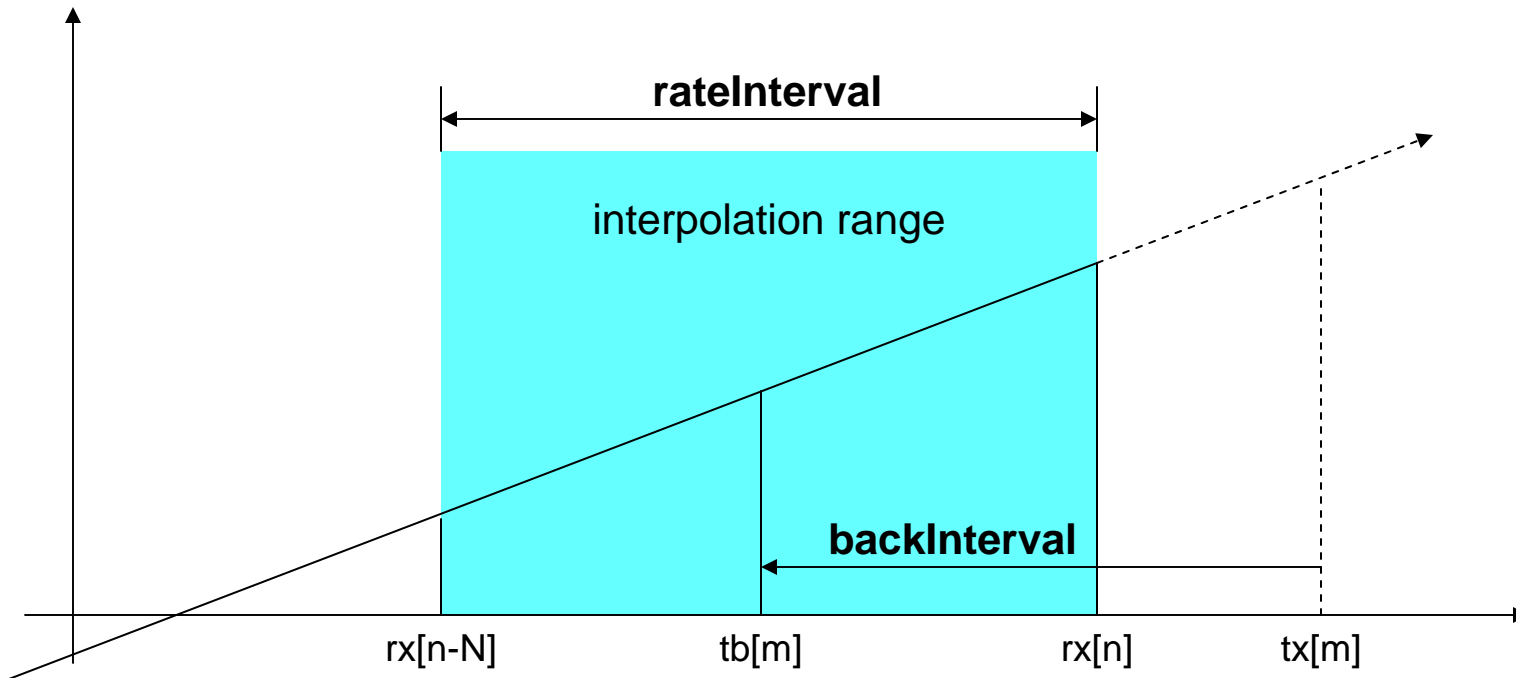


Interpolation concepts

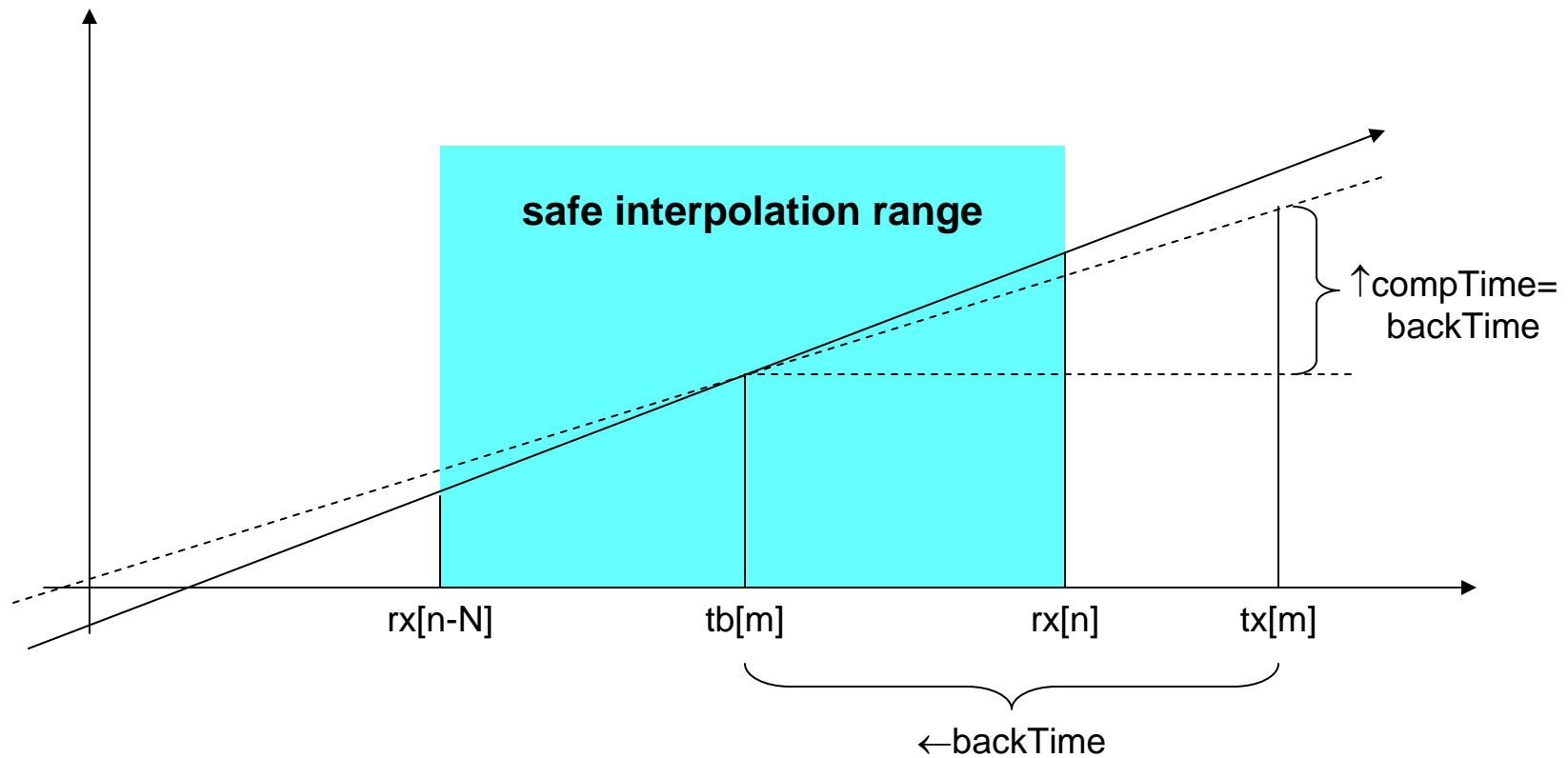
(interpolation range)



Interpolation intervals

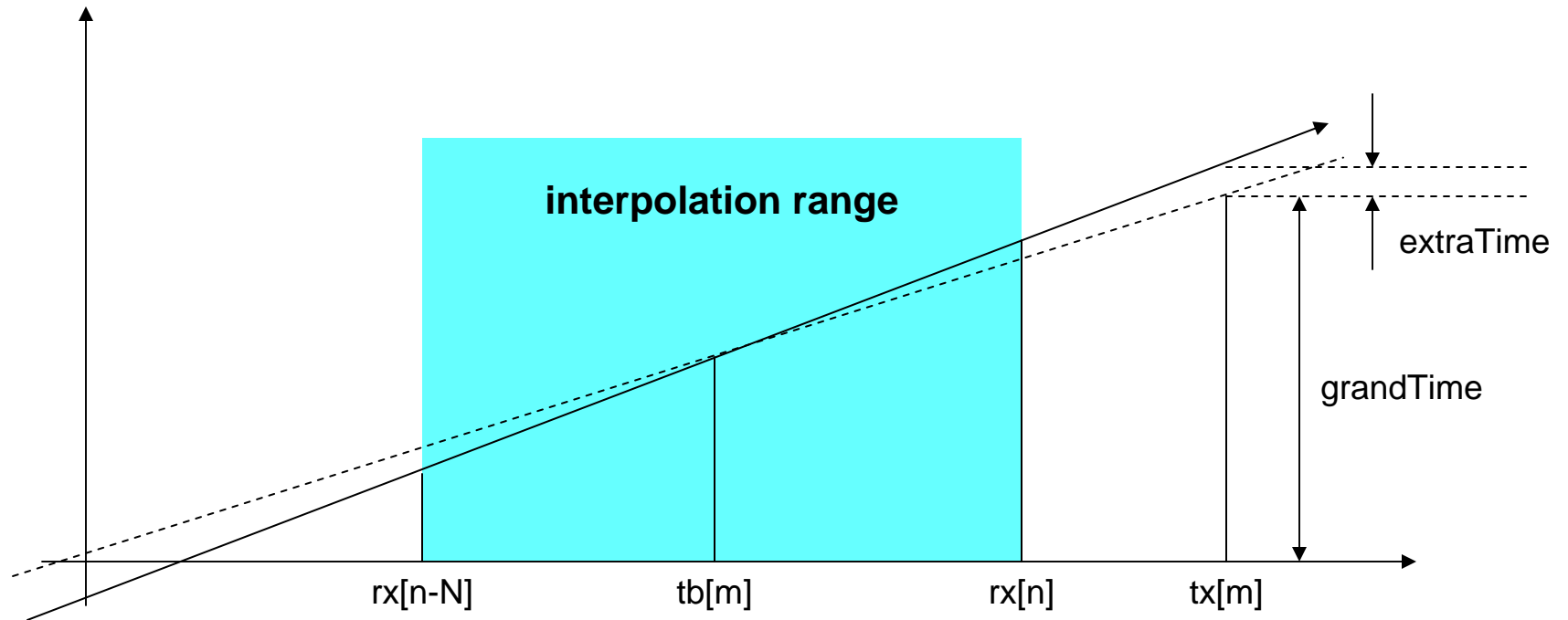


Interpolation adjustments



Interpolation errors

(extraTime supplement)



Simplify.
Two step (not 2x2x2 step)!

Excess packet transmissions

