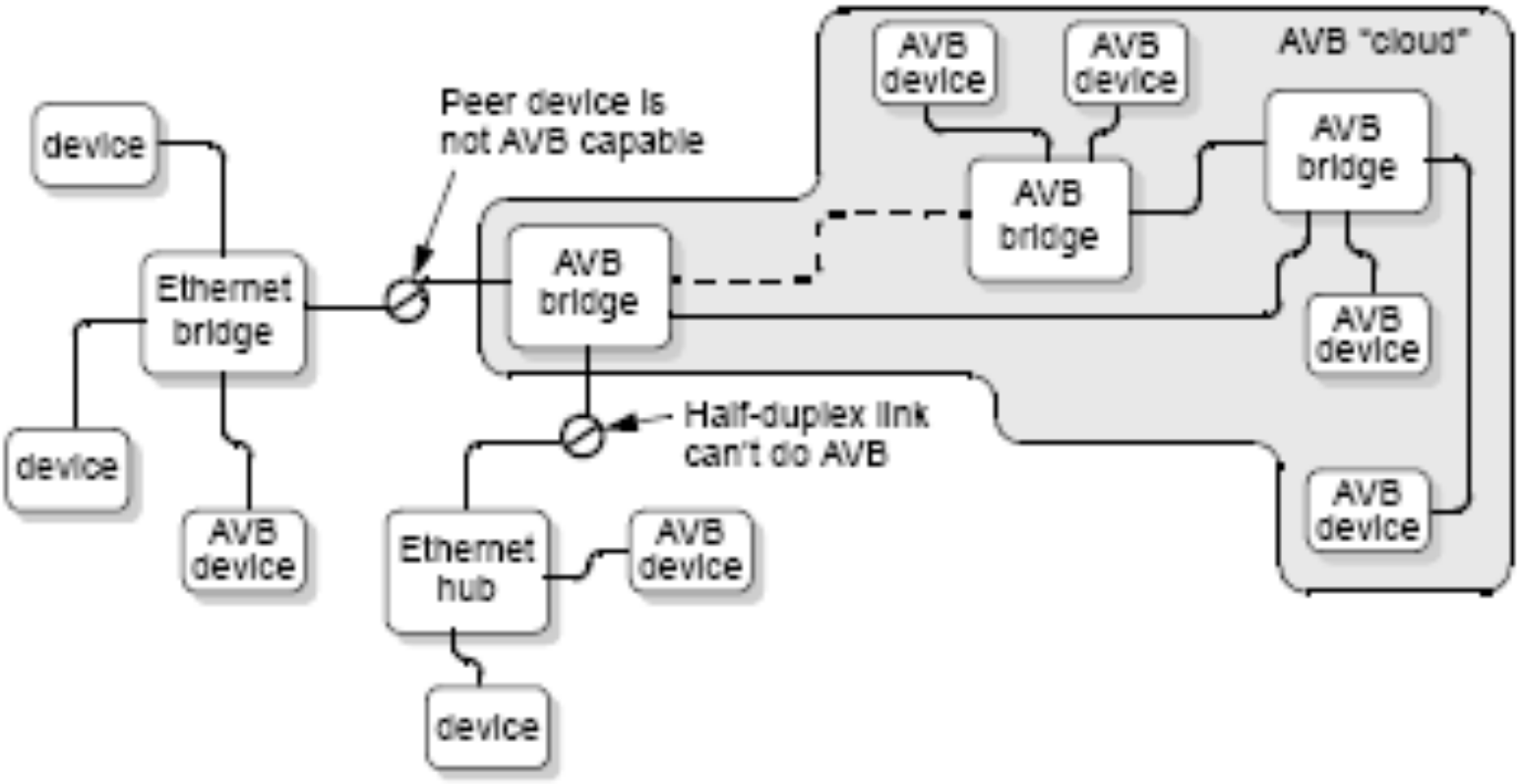
802.1as Time synchronization
(a simplistic approach)

by David V James

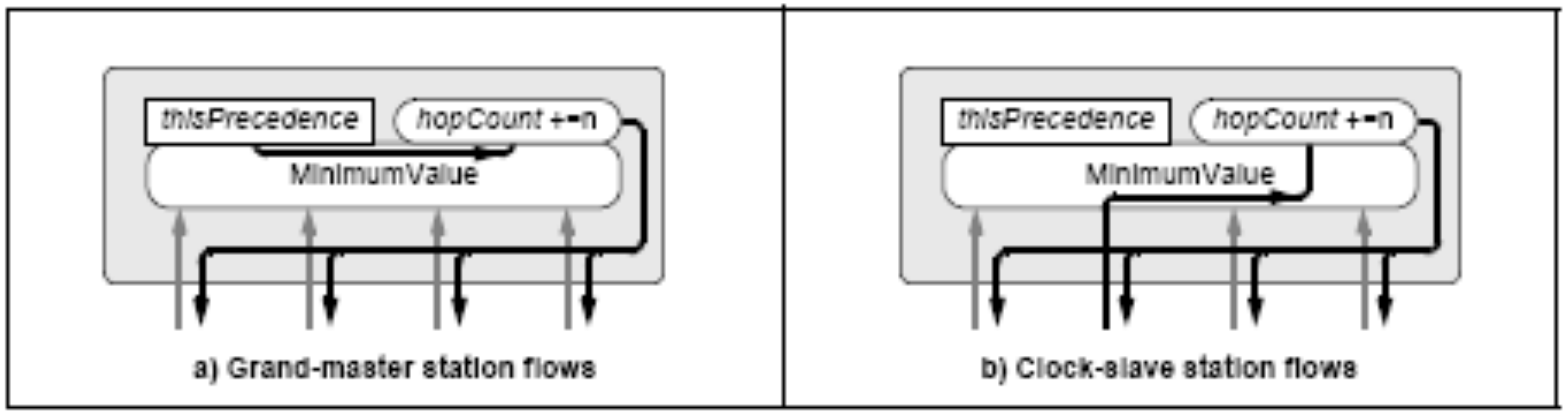
Features

- Simple
  - Single frame format
  - Single timeout (last of presence)
  - Single update rate (10 ms)
  - Single time format (scaled seconds)
- Accurate
  - Propagation-delay insensitive
  - Accurate cableDelay w/o grand-master syntonization
  - No gain peaking
- Familiar
  - Leverages 1588, changed only where simplifications needed
  - Common MAC-relay interface model

Assumed topologies

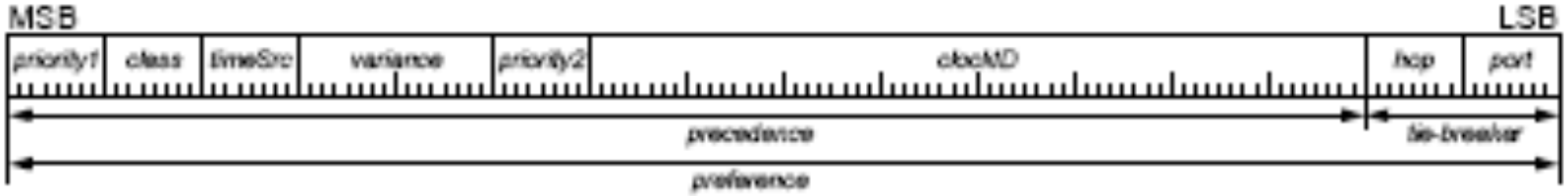


Rogue-frame aging

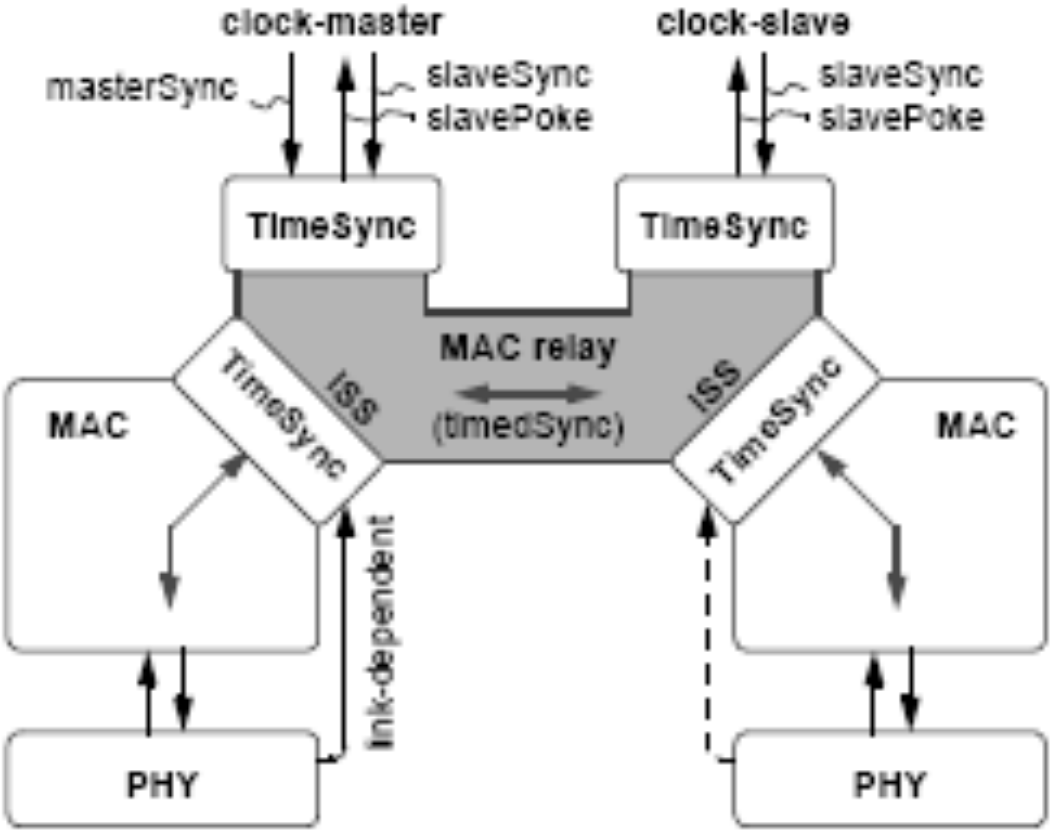



```
#define HOPS 255
n = (frame.hopCount > hopCount) ? (HOPS - frame.hopCount) / 2 : 1;
```

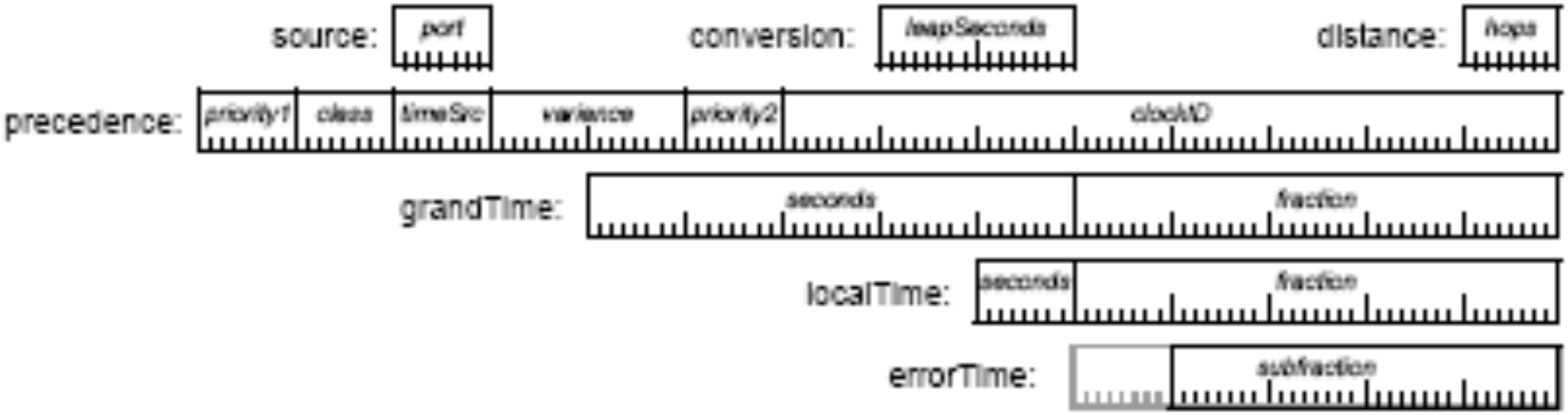
Grand-master precedence



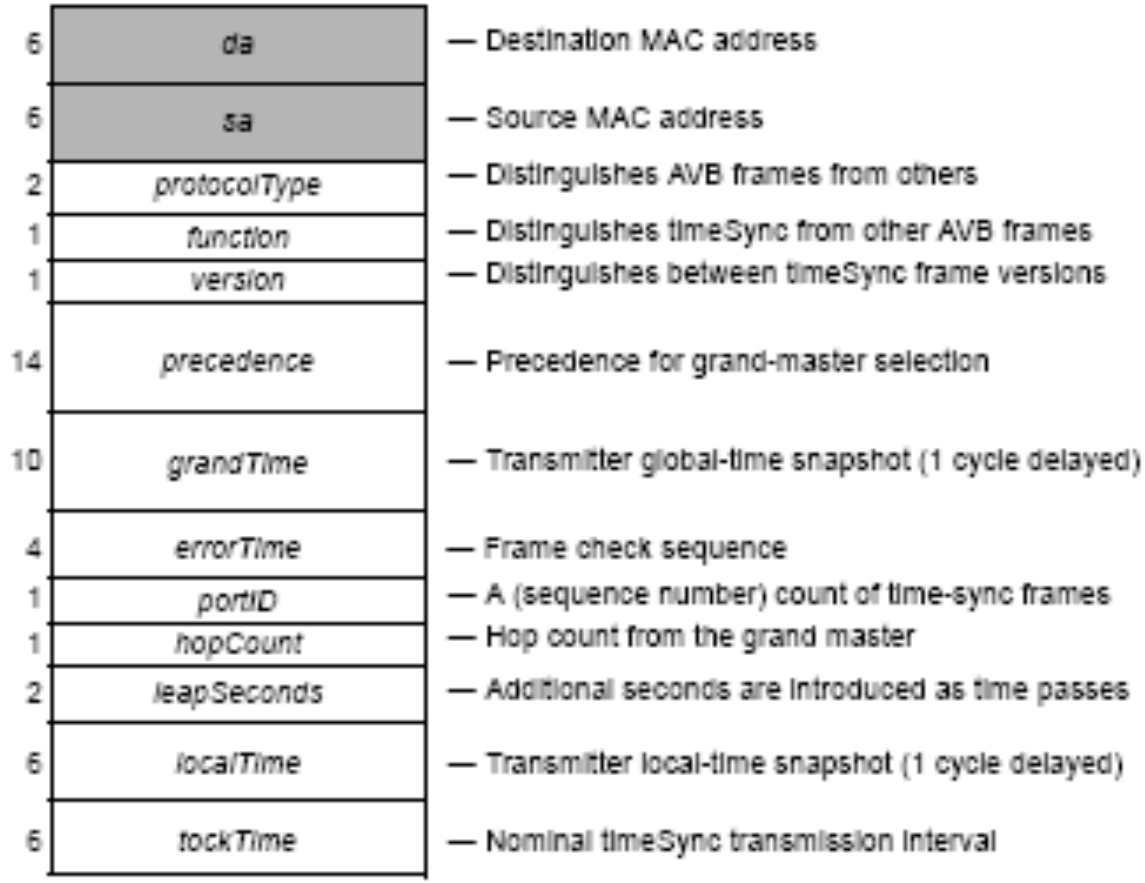
Standardized interface



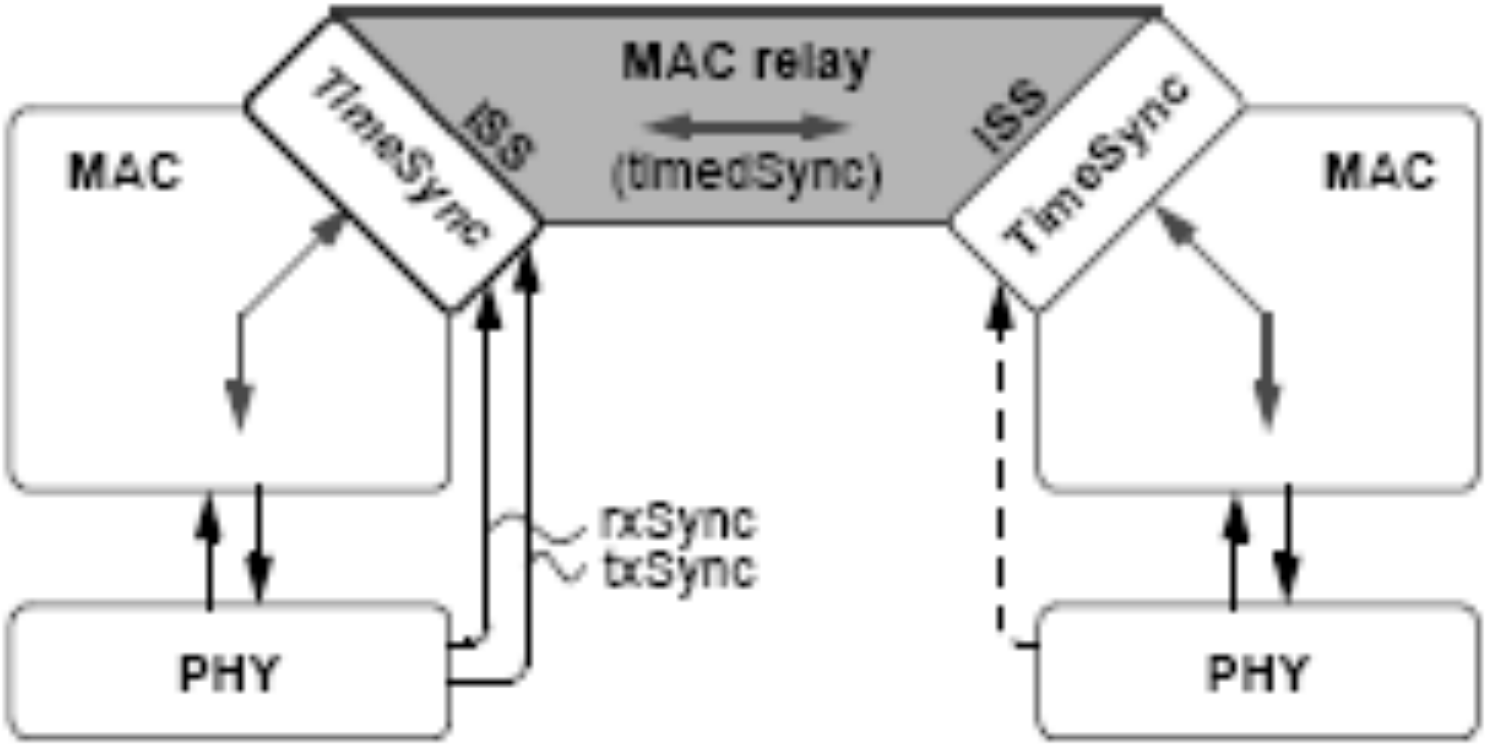
MAC-relay information



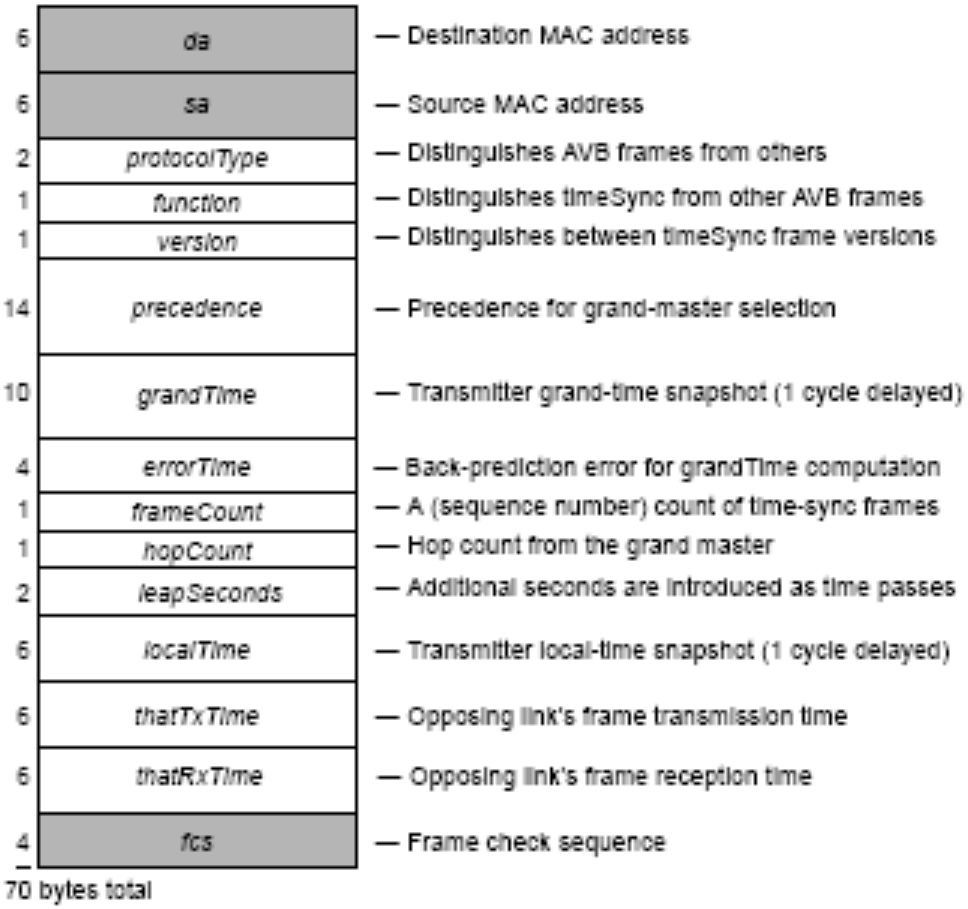
MAC-relay frame



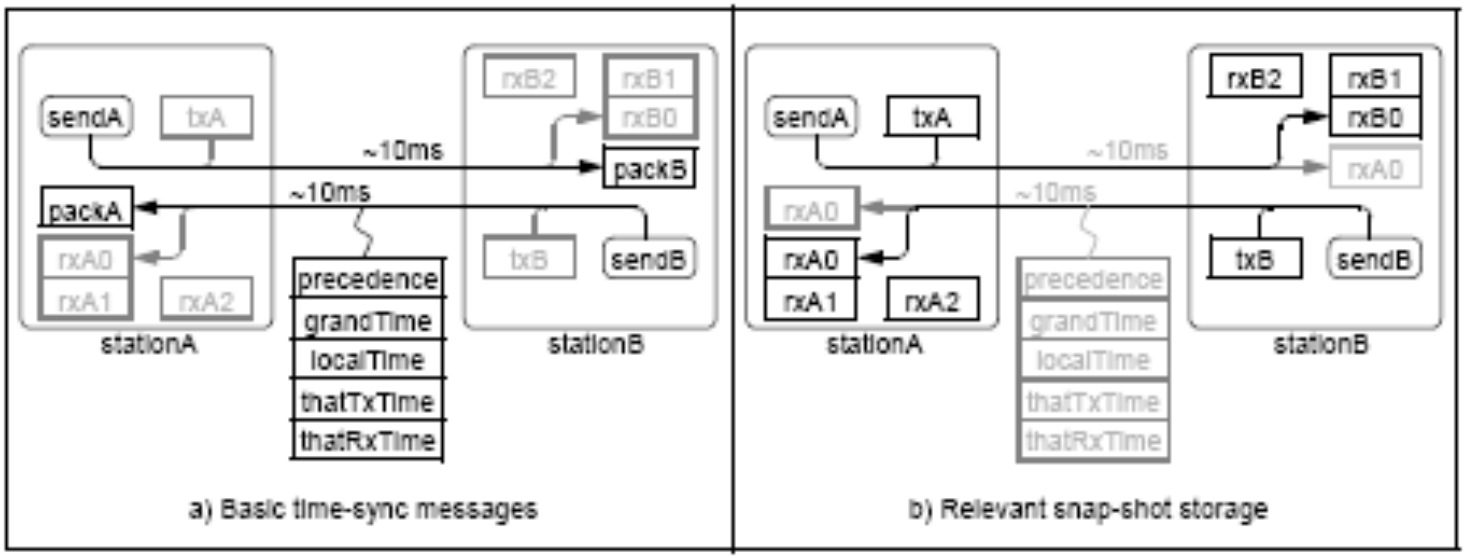
Duplex-link MACs



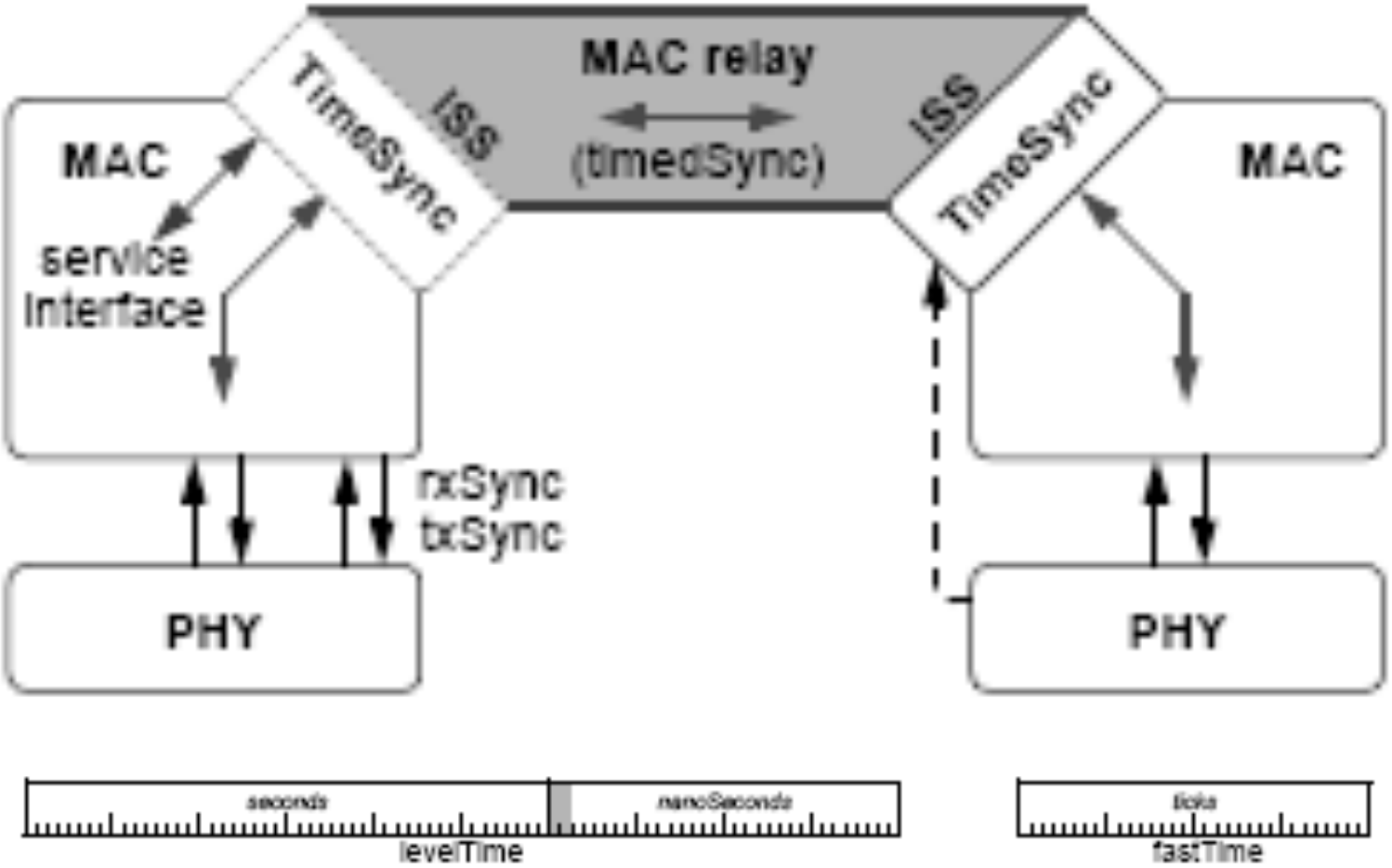
Duplex-link packet format



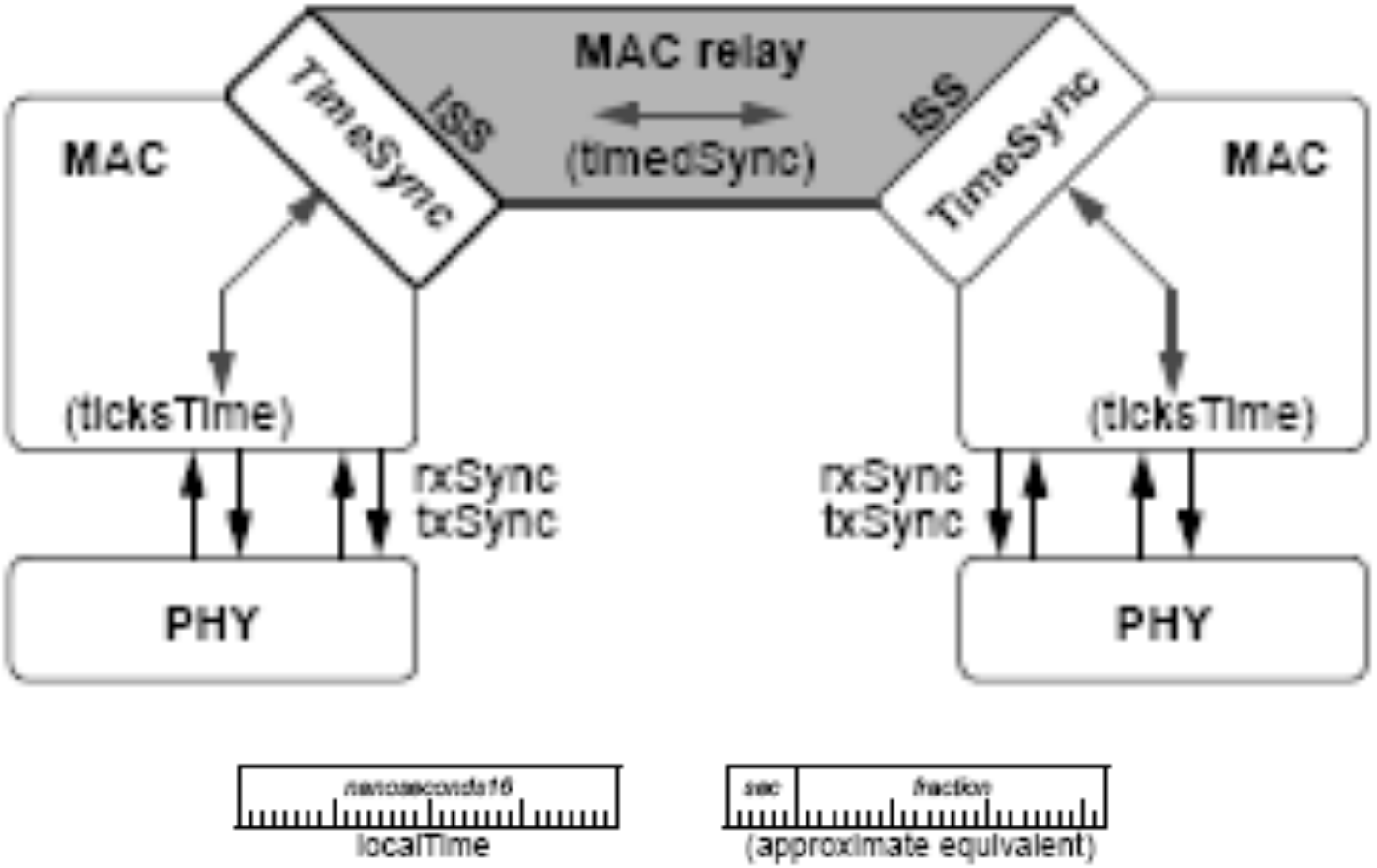
Duplex-link timing



Radio times


MAC relay
(timedSync)
ISS
TimeSync
ISS
TimeSync
MAC
MAC
service
interface
rxSync
txSync
PHY
PHY
seconds
nanoSeconds
levelTime
ticks
fastTime

Ethernet PON



State of the proposal

- First-pass completion
  - Very few “we will” items
  - Compiled w/o errors C code
  - Wrap-around and unknown bugs
  - A few overlooked items
- MAC-relay
  - Ethernet-PON and Radio
  - Model to understand/justify complexities
- Details
  - State machines for all
  - A few details are missing

State of the proposal (A)

Table 8.1—TimeSyncRxRadio state machine table

Current		Row	Next	
state	condition		action	state
START	(req1 = Dequeue(Q_S1_IND)) != NULL	1	// Summary of TimeSyncRxRadio1Indicate() pPtr->rxTurnRound = req1.fastTime3 – req1.fastTime2;	WAIT
	—	2	localTimes = RadioLocalTimes(pPtr);	START

WAIT	(req2 = Dequeue(Q_S2_IND)) != NULL	3	// Summary of TimeSyncRxRadio2Indicate()
			rPtr = &(relayFrame);
			twice = req2.roundTrip – pPtr->rxTurnRound;
			moved = localTimes.ticksTime – req2.fastTime4;
			SetRelayFrame(pPtr, rPtr);
			rPtr->grandTime =
			RadioToGrand(req2.radioTime) +
			MultiplyHi((twice/2) + moved, RADIO_TIME);
			rPtr->localTime = localTimes.localTime;
			Enqueue(Q_MR_HOP, relayFrame);
				START

	—	4		—