TECHNIQUES FOR RESILIENT AND ROBUST TIMING IN PTP BASED BROADCAST/MEDIA NETWORKS

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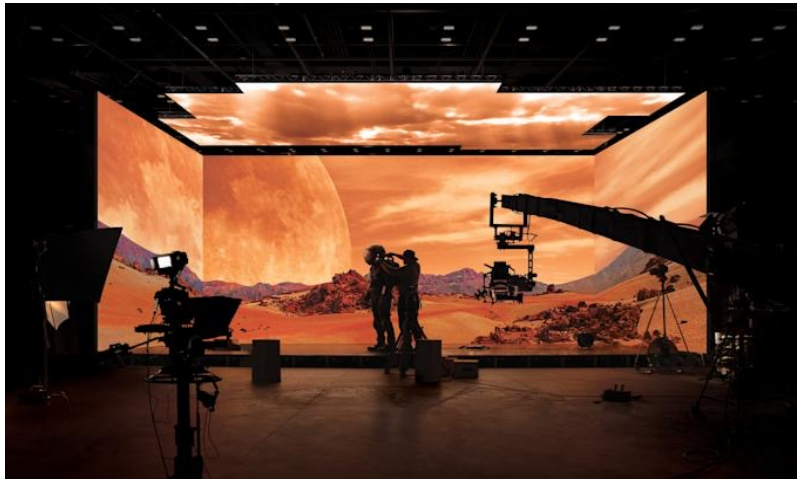
Why time is essential in Broadcast and Media

- Multiple audio and video files captured on separate equipment
  - Must be recombined for broadcast or steaming based on audio/visual file timestamps
  - Smooth transitions among cameras, playback devices and other audio-visual sources
- Color accuracy
- Prevents jitter and artifacts
- Frequency accuracy for broadcast signals
- Error budgeted to network time distribution is typically 1 μs.



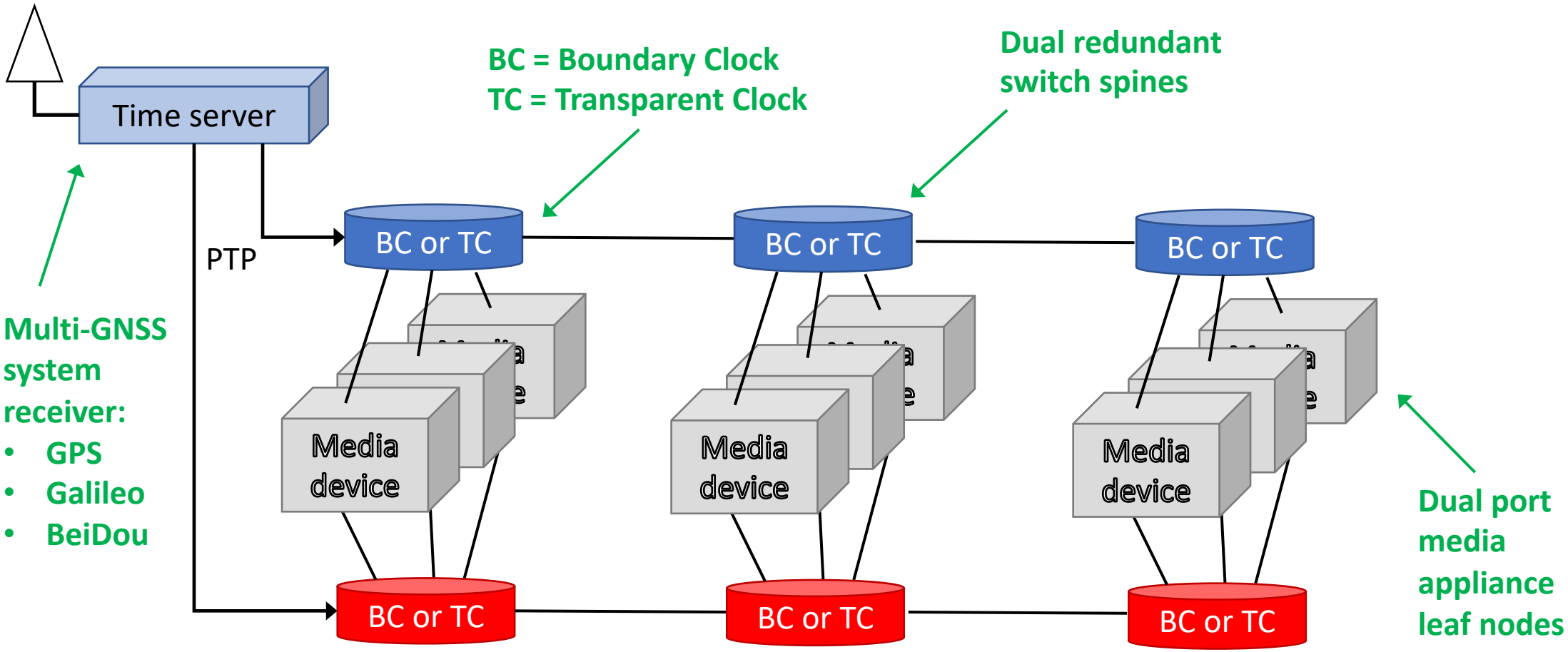
Techniques for resilient and robust timing

- Stable oscillators for holdover
- Multiple time reference sources

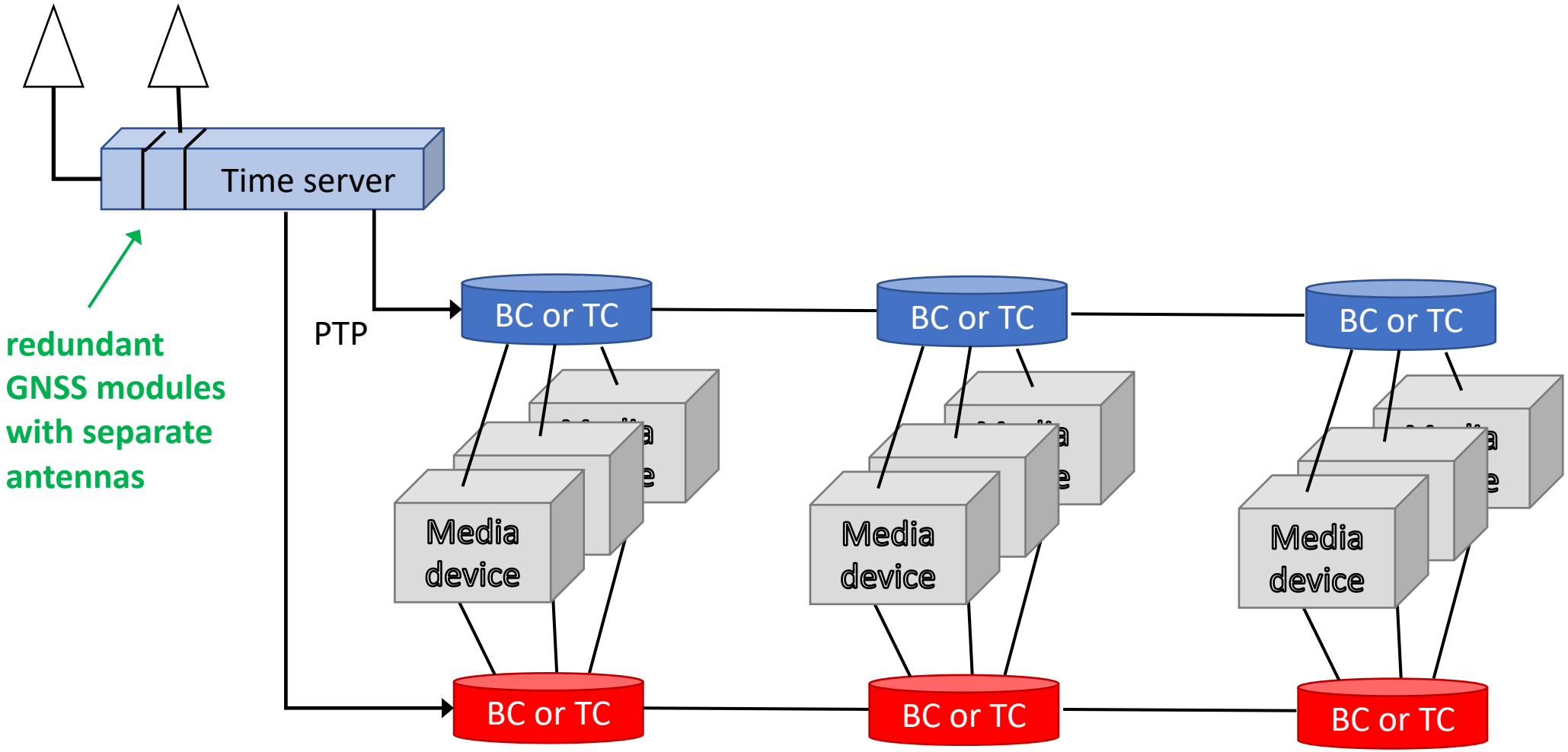
} Covered by my co-presenters

- Redundancy
  - Networks
  - GNSS receivers
  - Time servers
- Monitoring
  - Early warning of timing problems
  - Verify time transfer accuracy

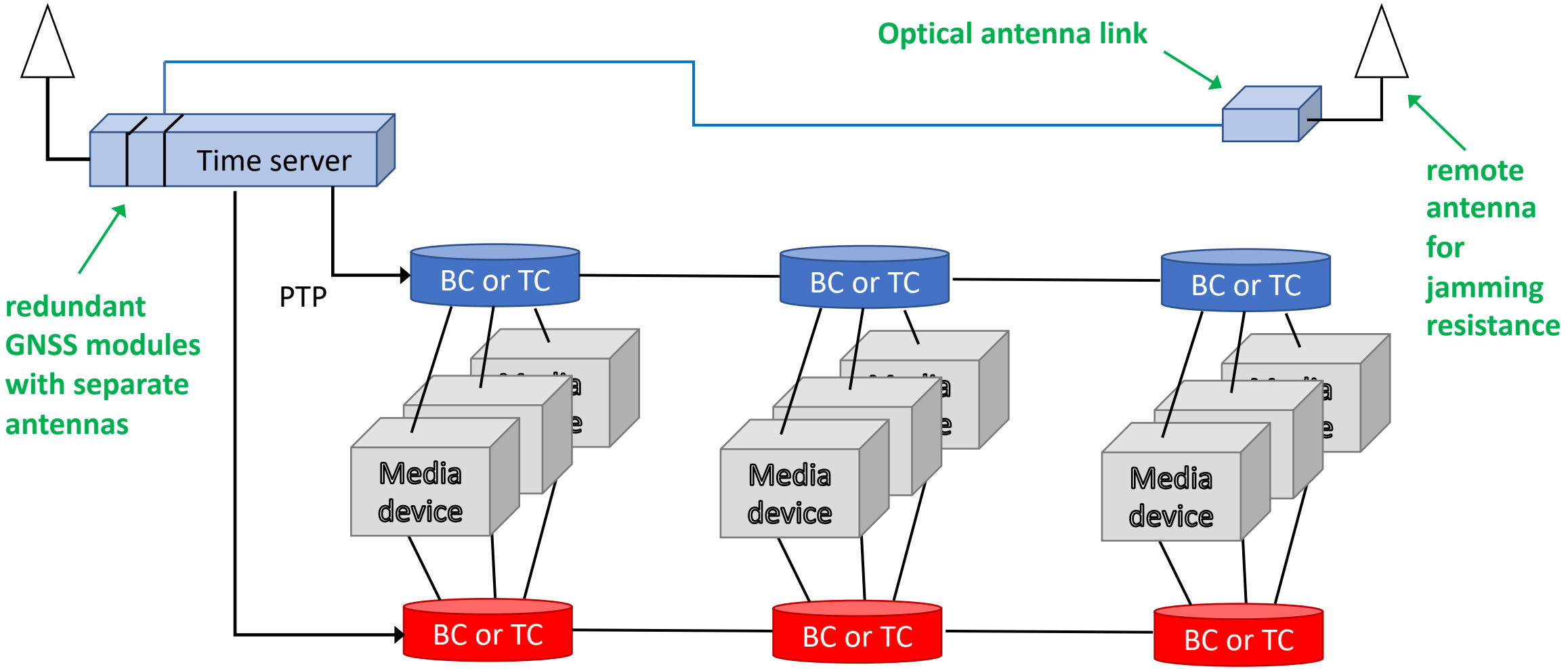
Redundant Spine and Leaf Networks



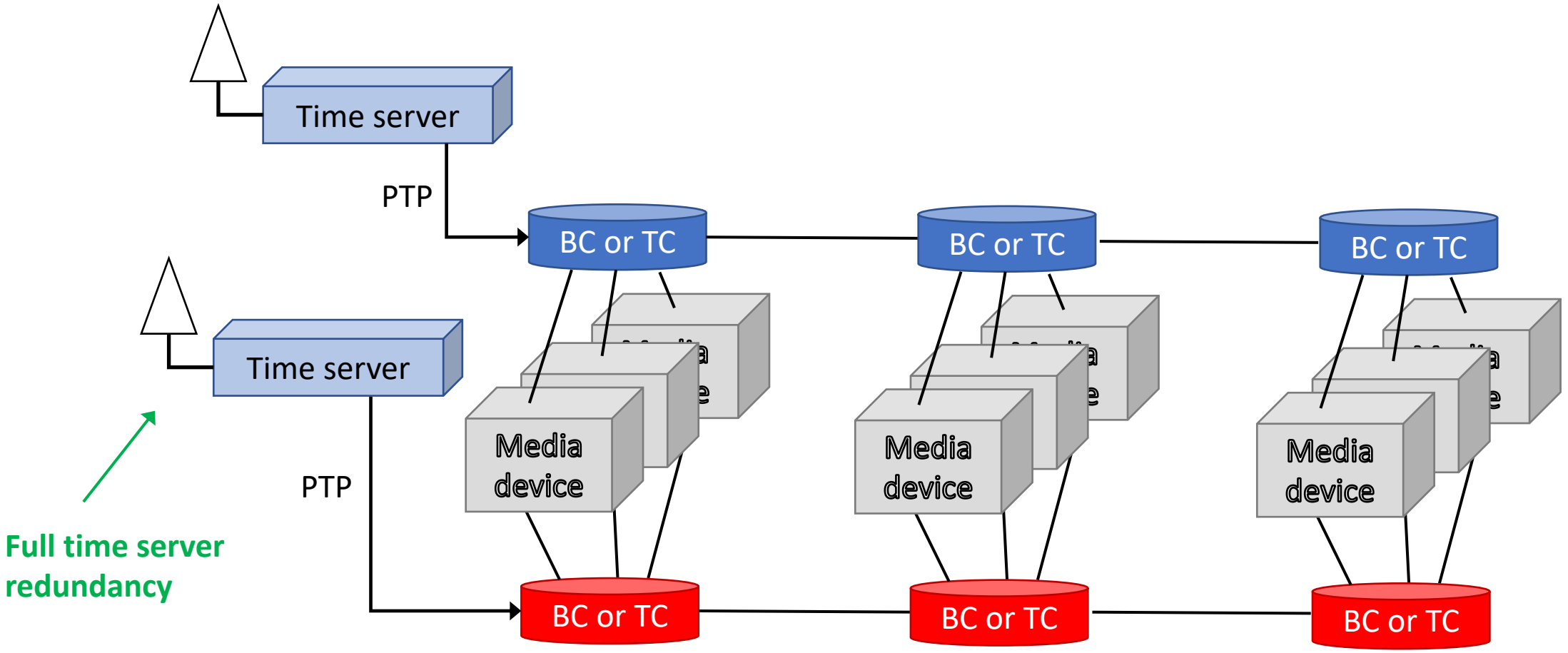
Redundant GNSS Receivers and Antennas



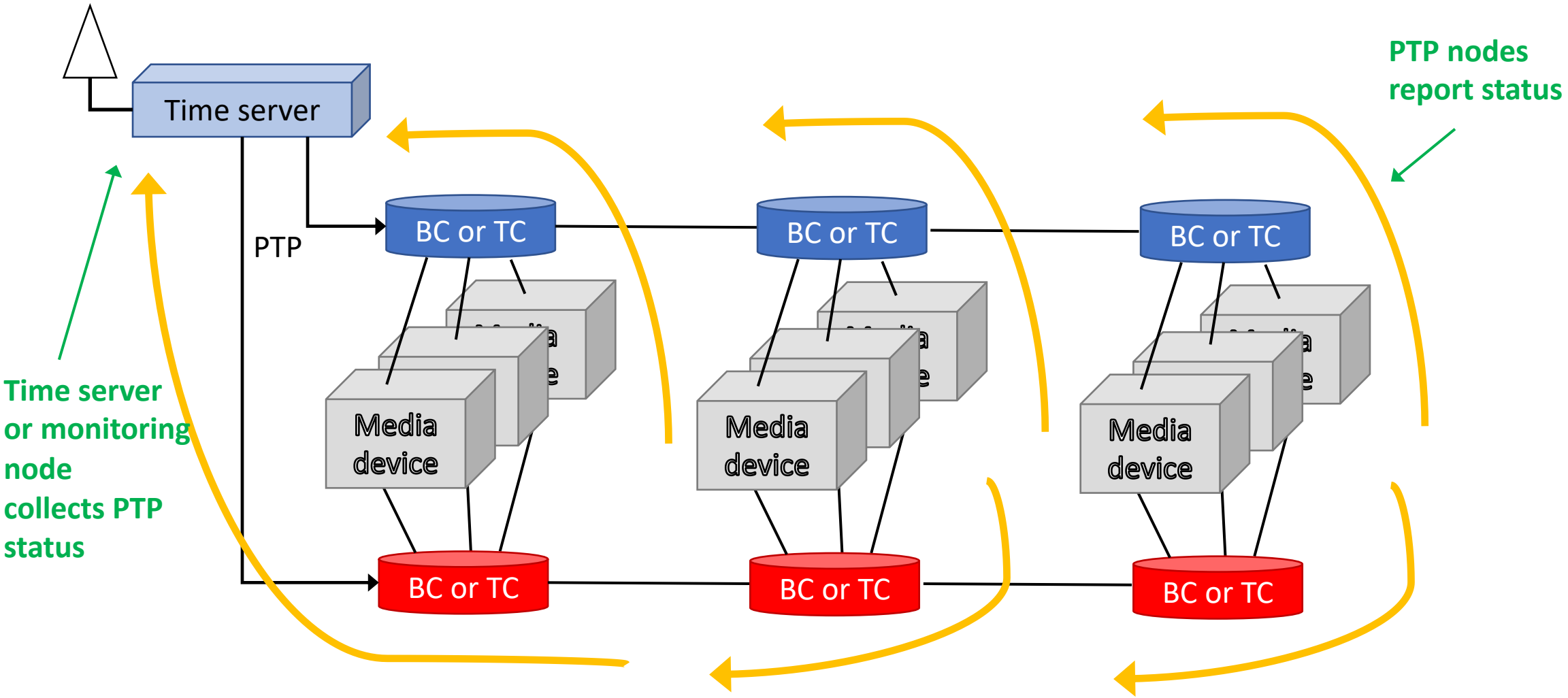
Physically Separated Antennas



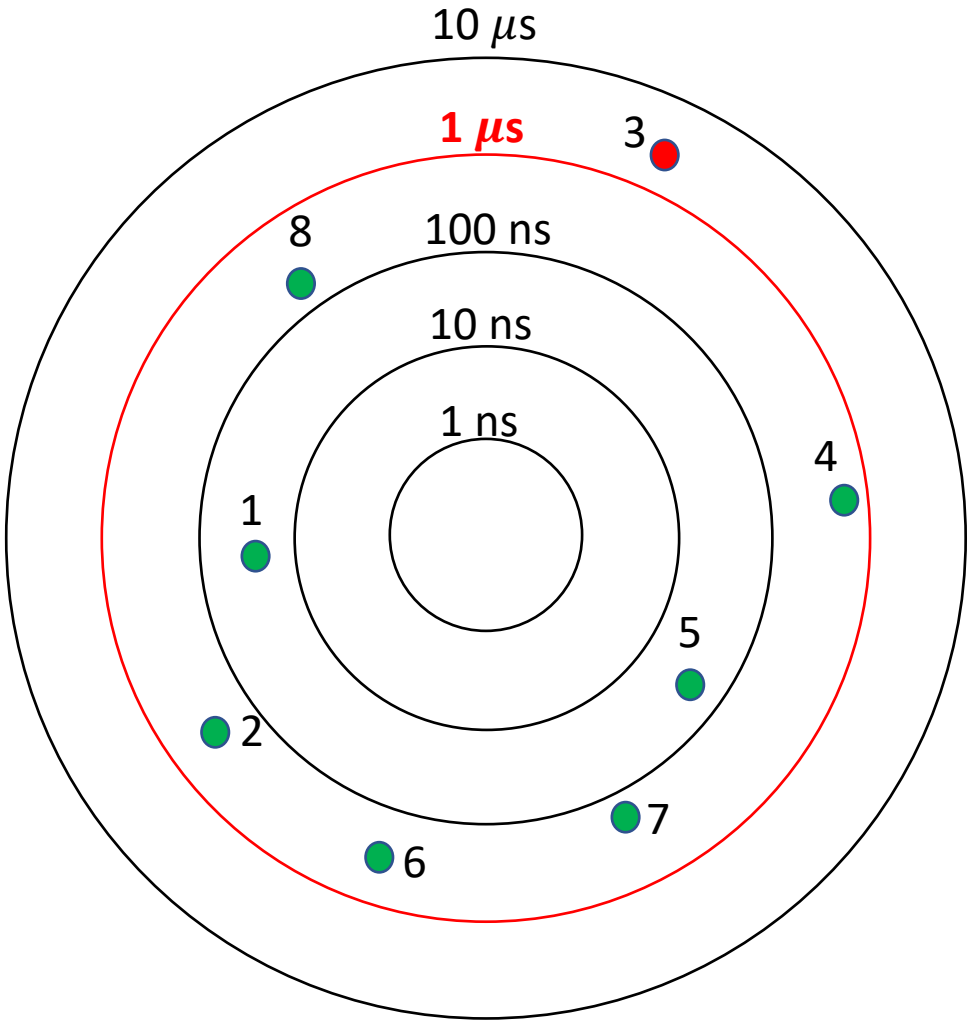
Redundant Timeservers



Monitoring using management interfaces

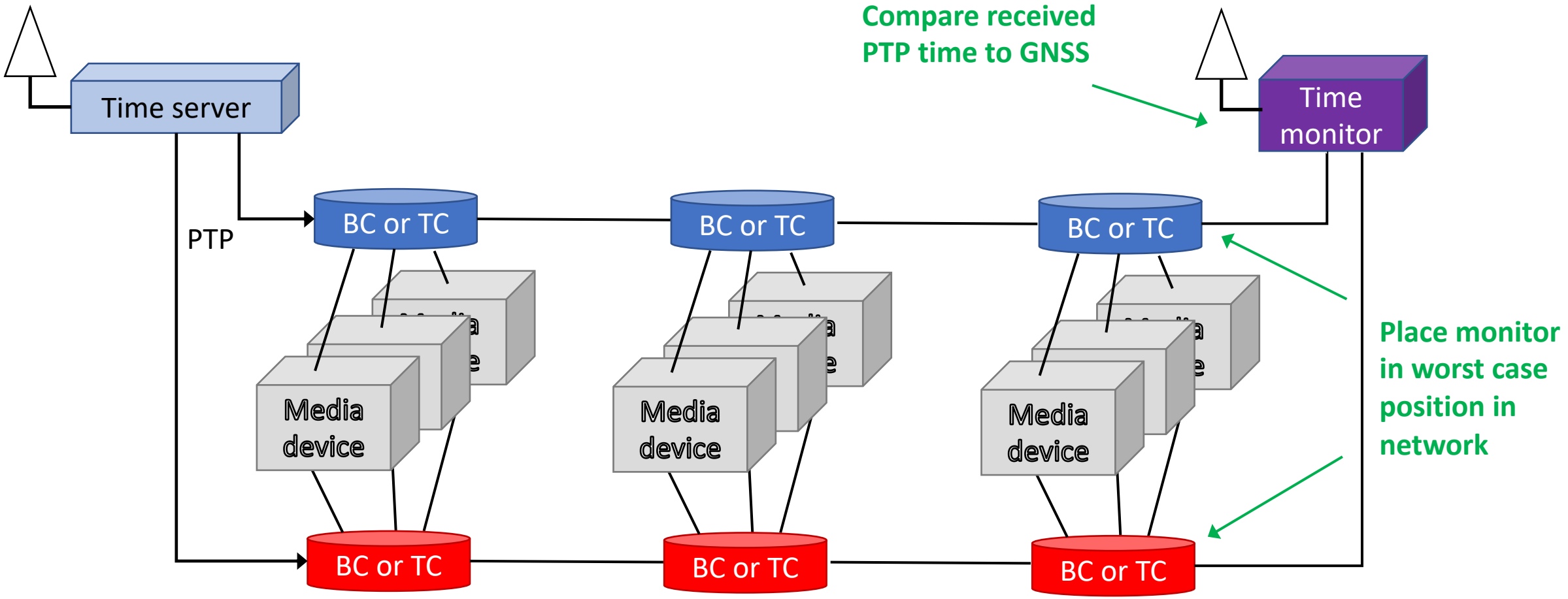


Monitoring data presentation



ID	Alias	Address	Offset
1	BC_1	172.27.19.01	37 ns
2	Media_1	172.27.19.02	541 ns
3	Media _2	172.27.19.03	**3.11 μs**
4	Media_3	172.27.19.04	792 ns
5	TC_1	172.27.19.05	68 ns
6	Media_4	172.27.19.06	199 ns
7	BC_2	172.27.19.07	206 ns
8	TC_2	172.27.19.08	317 ns

Time Transfer Accuracy Monitor



Key Points

- Precise timing is essential in Broadcast/Media networks
- Redundancy increases resilience and robustness
  - Redundant networks
  - Multi-GNSS receiver protects against GNSS system failures
  - Redundant GNSS antennas (maximum physical separation is best)
  - Redundant Time servers
- Monitoring
  - Identify timing issues in live network
  - Time server of monitoring node can collect status of PTP nodes
  - Monitor node with independent time source placed at ”worst Point” in network