97-0616: UBR Buffer Requirements for TCP/IP over Satellite Networks

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- Goals
- Simulation Model
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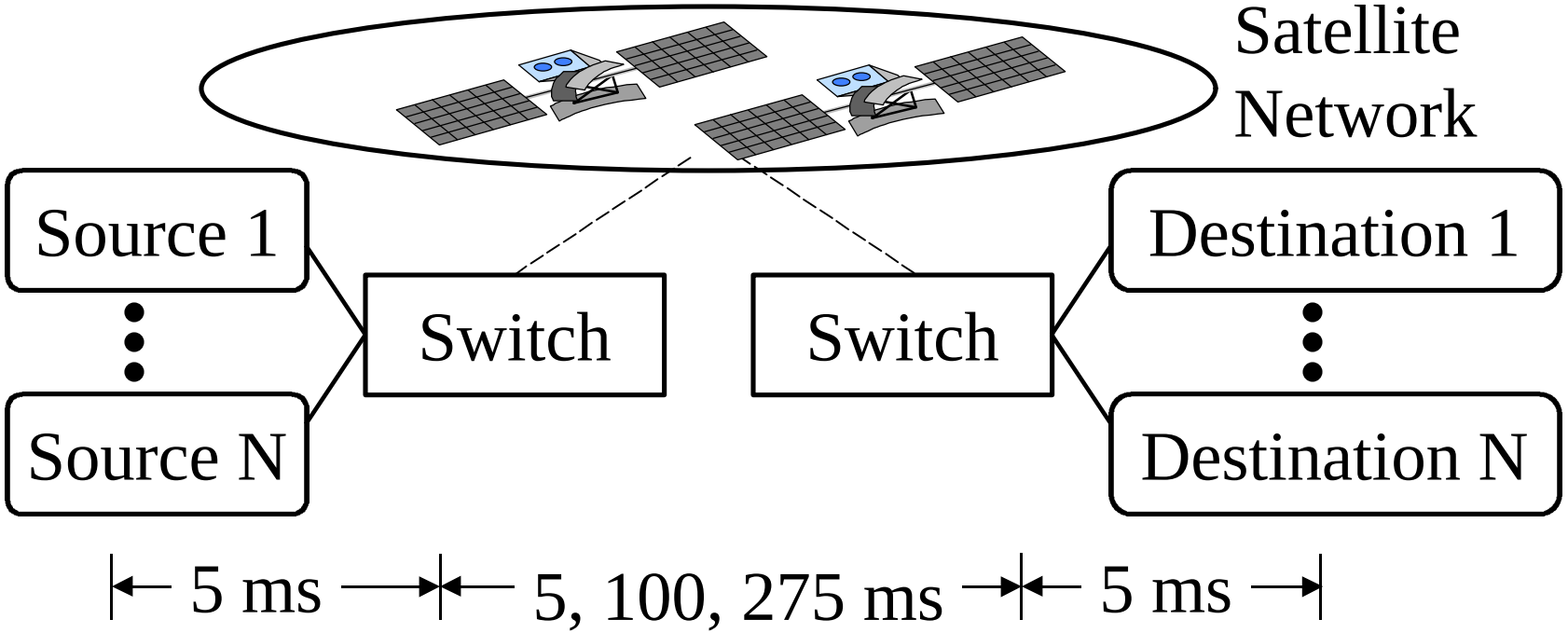
- Summary

Goals

- Assess buffer requirements for TCP over UBR for satellite latencies
- How does TCP throughput increase with increasing network buffers?
- How well can we do with less than 1 RTT buffers?

Simulation Model

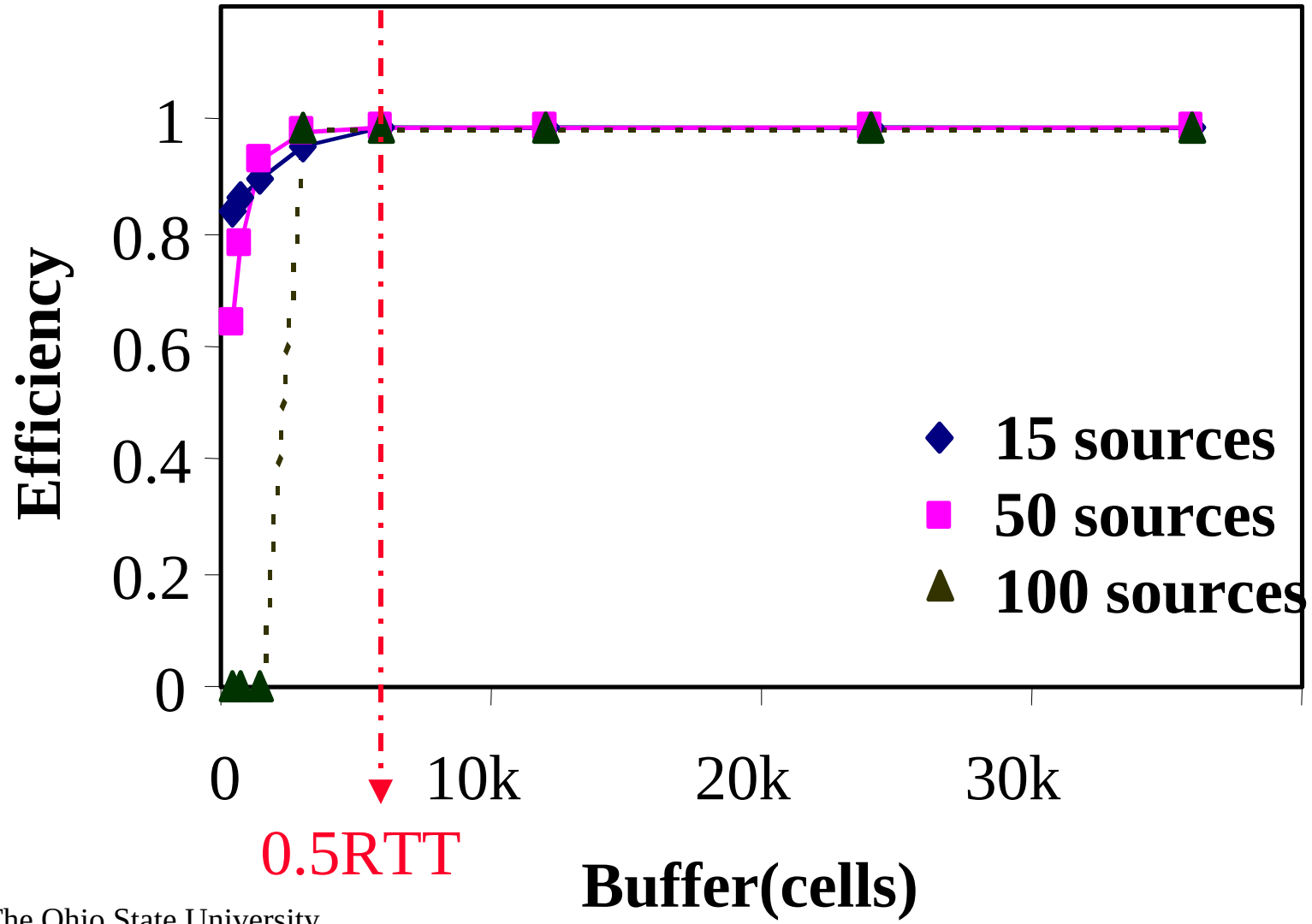


- N identical infinite TCP sources, SACK TCP
- Link Capacity = PCR = 155.52 Mbps
- Per-VC buffer management in switches (sel. drop)
- Simulation time = 100 s

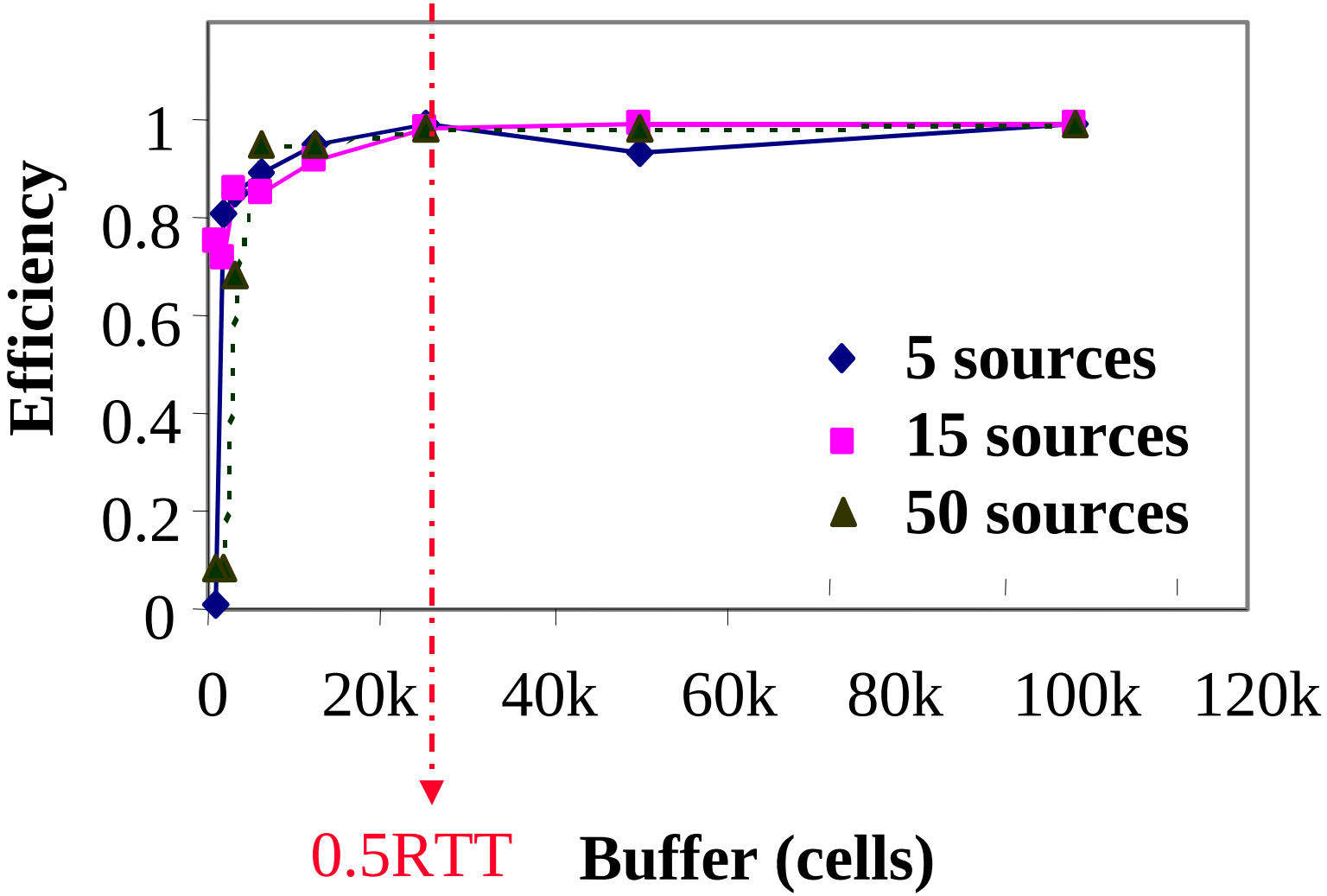
Parameters

- Latency between earth stations via satellite (1 way)
  - Single hop LEO: 5ms
  - Multiple hop LEO: 50 ms
  - Single hop GEO: 275 ms
- Number of Sources
  - Single hop LEO: 15, 50, 100
  - Multiple hop LEO, single hop GEO: 5, 15, 50
- Buffer Size
  - RTT × 2^{-k}, k = -1, 0, 1…6

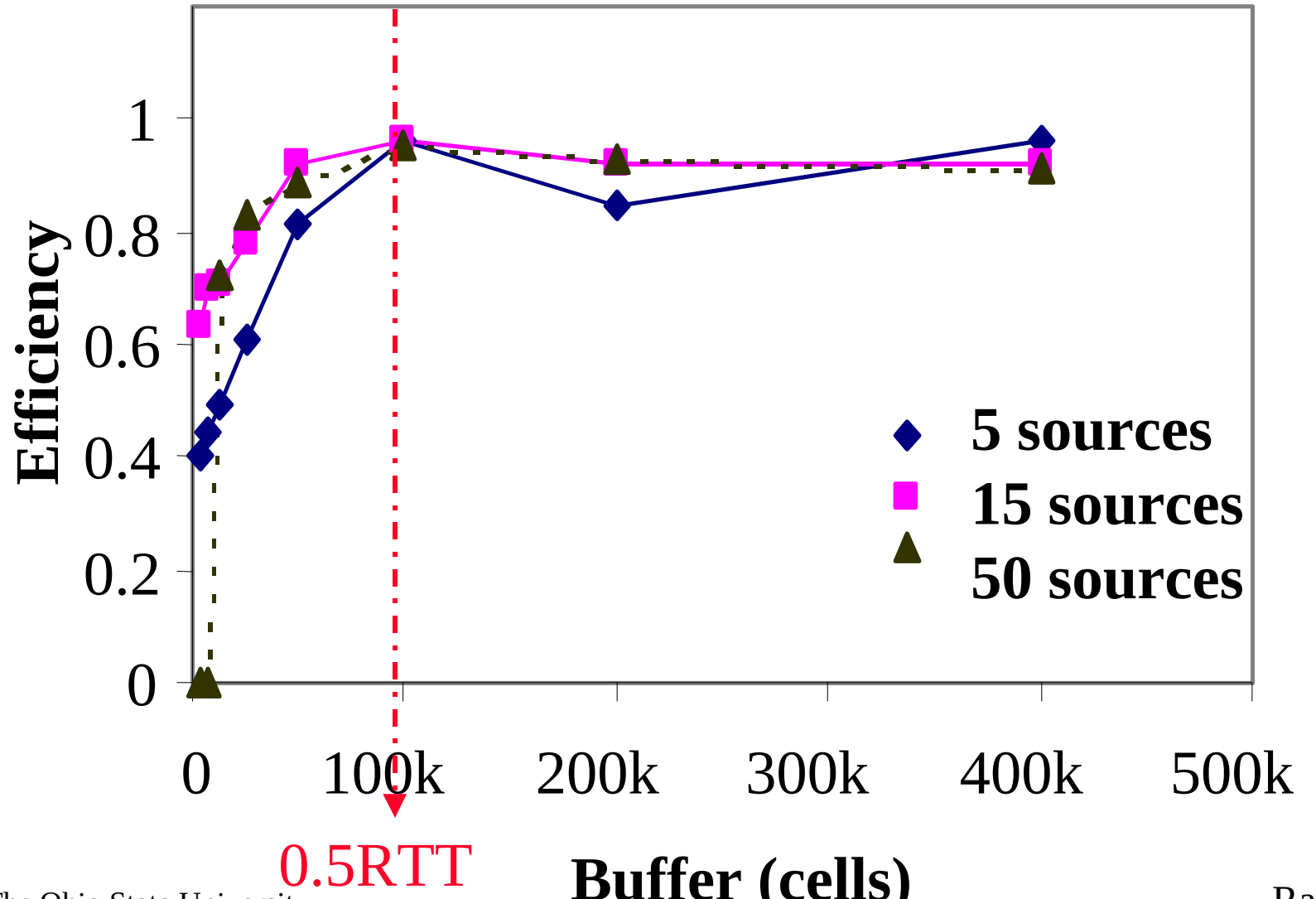
Single hop LEO



Multiple hop LEO



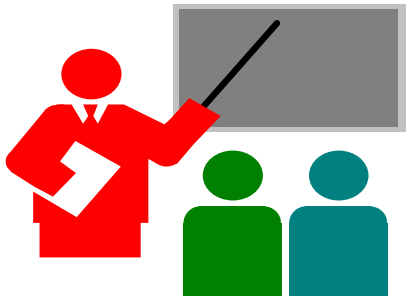
Single hop GEO



Results

- Very small buffer sizes result in low efficiency
- Moderate buffer sizes (less than 1 RTT)
  - Efficiency increases with increase in buffer size
  - Efficiency asymptotically approaches 100%
- Buffer size = 0.5*RTT results in very high efficiency (98% or higher) even for a large number of sources
- Fairness is high because of per-VC buffer management

Summary



- Assessed buffer requirements for SACK TCP over UBR with per-VC buffer management for satellite latencies
- Latencies included single hop LEO, multiple hop LEO, and GEO
- 0.5*RTT buffers provide sufficiently high efficiency for TCP over UBR even for a large number of TCP sources