

Delay variation in Cut-through and Store & Forward Models

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Simulation Goals

- Compare Delay variation behavior between Store and Forward (SF) and Cut Through (CT) methods under different network load conditions
- Verify value of CT lower delay advantage over SF

CT

- If node is idle, transit packet is transmitted with 0 delay
- No segmentation. If node is transmitting a local packet the transit packet is delayed until the local packet ends.
- If N bytes ($N < \text{transit packet MTU}$) of the local packet are still to be transmitted, then the transit packet is delayed by N bytes only
- No transit packet buffer “memory”, for each transit packet the transit buffer is assumed to be empty

SF

- Transit packet is completely stored before being transmitted, adding a full MTU of constant delay per node.
- Transit packet has higher priority than local packets

Ring

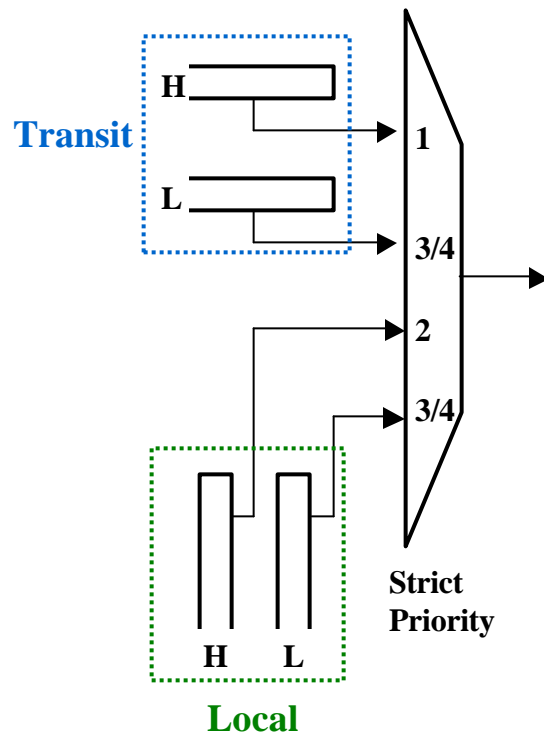
- 1 Gbps ring
- 63 nodes passed by transit packet
- 783 + 16 bytes fixed transit packet
- Delay variation measured on transit packet arrival time
- No fix delays

Statistical parameters

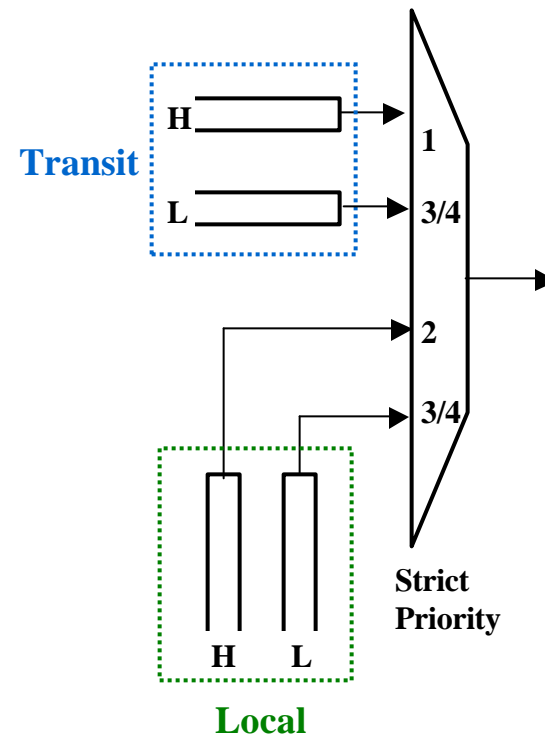
- Probability of a node transmitting a local packet when transit packet arrives:
 - ✍ 10%
 - ✍ 40%
 - ✍ 70%
 - ✍ 100%
- All nodes have the same probability of transmitting a local packet for each run
- Tri-modal and Quad-modal local packet distribution (+16 bytes of overhead)
- Transit packet arrival time during local packet transmission: uniform probability for the whole local packet transmit time

Node diagram

- CT

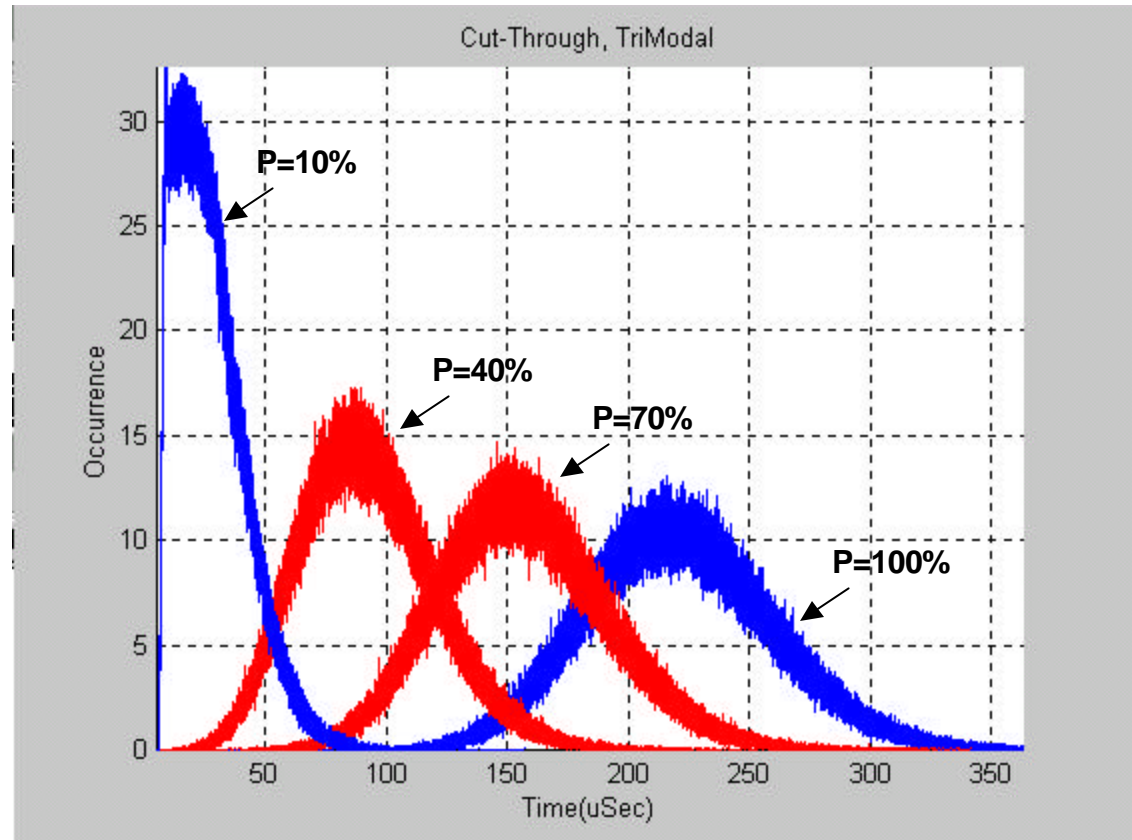


- SF



CT, Tri-Modal

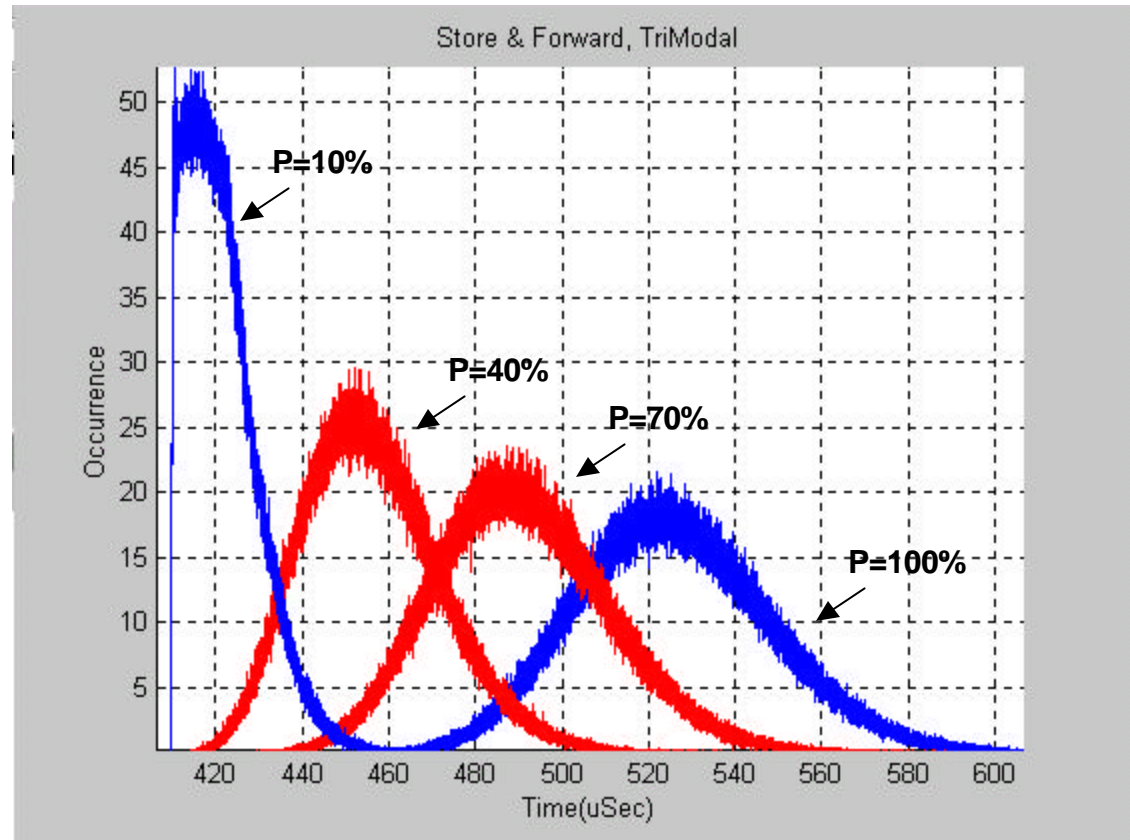
- P = Local transmit packet probability
- Total Delay variation measured between lowest possible delay (0) and 99% of curve for $P = 100\%$ (Maximum load)



Total Delay variation = 315us

SF, Tri-Modal

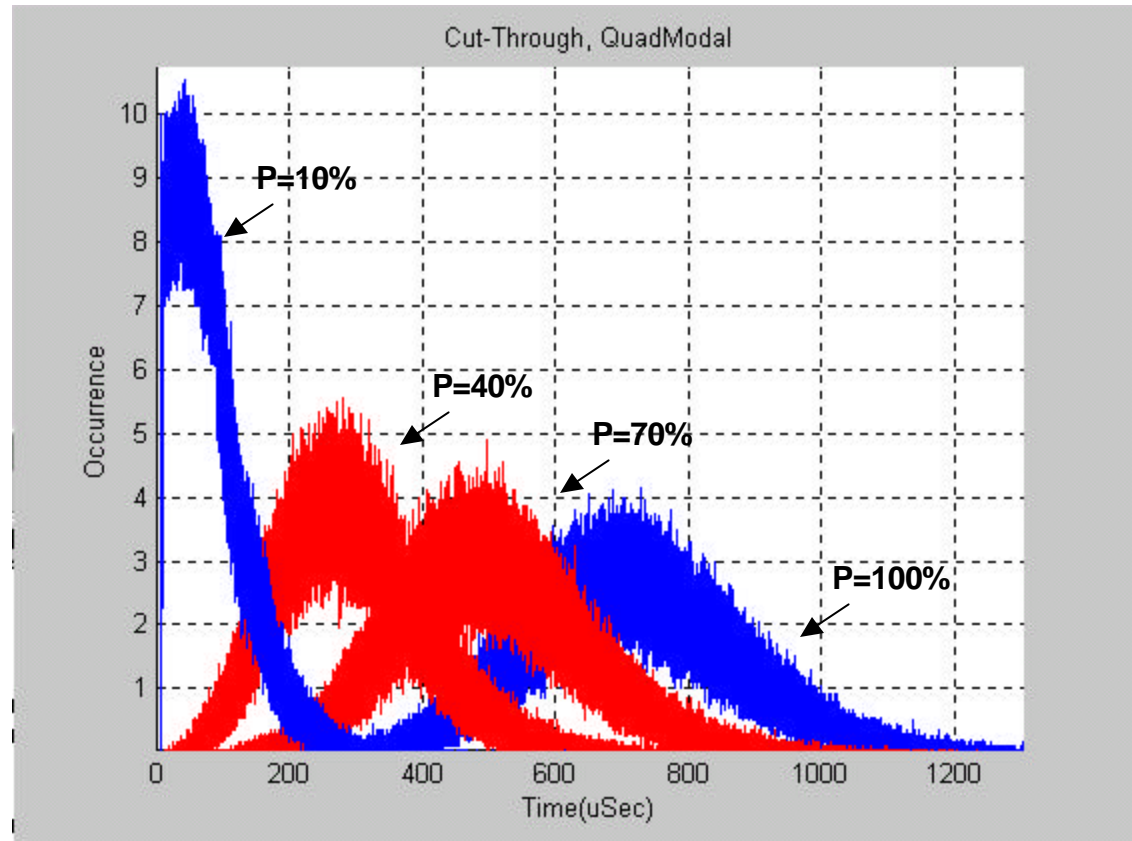
- P = Local transmit packet probability
- Total Delay variation measured between lowest possible delay (0) and 99% of curve for $P = 100\%$ (Maximum load)



Total Delay variation = 172us

CT, Quad-Modal

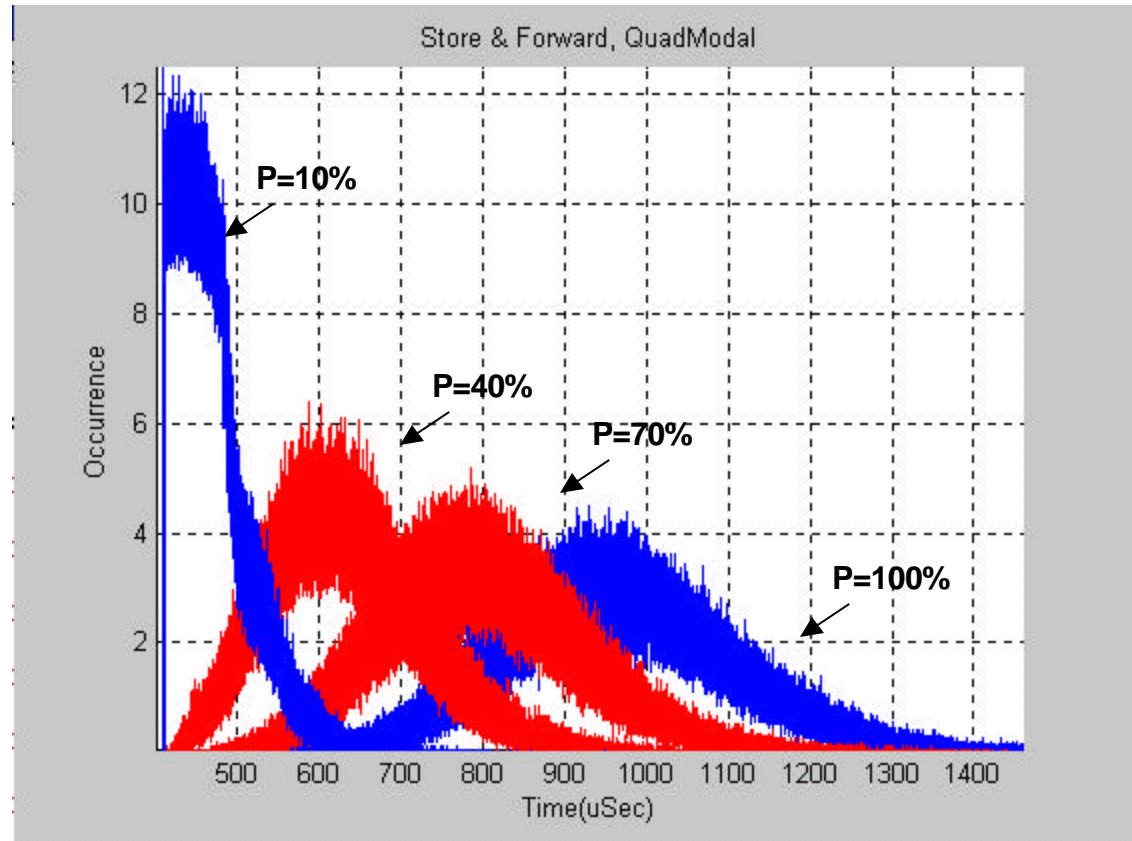
- P = Local transmit packet probability
- Total Delay variation measured between lowest possible delay (0) and 99% of curve for $P = 100\%$ (Maximum load)



Total Delay variation = 1092us

SF, Quad-Modal

- P = Local transmit packet probability
- Total Delay variation measured between lowest possible delay (0) and 99% of curve for $P = 100\%$ (Maximum load)



Total Delay variation = 898us

Results table – Tri-Modal

	CT		SF	
P	Mean [us]	Delay Variation [us]	Mean [us]	Delay Variation [us]
10%	29	70	421	36
40%	92	164	456	88
70%	157	243	491	132
100%	227	315	526	172

Results table – Quad-Modal

	CT		SF	
P	Mean [us]	Delay Variation [us]	Mean [us]	Delay Variation [us]
10%	77	241	465	200
40%	287	568	631	469
70%	500	842	797	693
100%	720	1092	963	898

Observations

- CT has higher delay variance than SF, under all load conditions
- CT delay variation is higher than SF, for load conditions changes
- In synchronous networks the delay variation compensation buffer for CT should be ~200us longer than for SF
- In pass-through timed networks CT will add more wander than SF

Conclusions

- CT delay gain is low
- CT needs a larger delay variation compensation buffer
- No real value to require CT in RPR