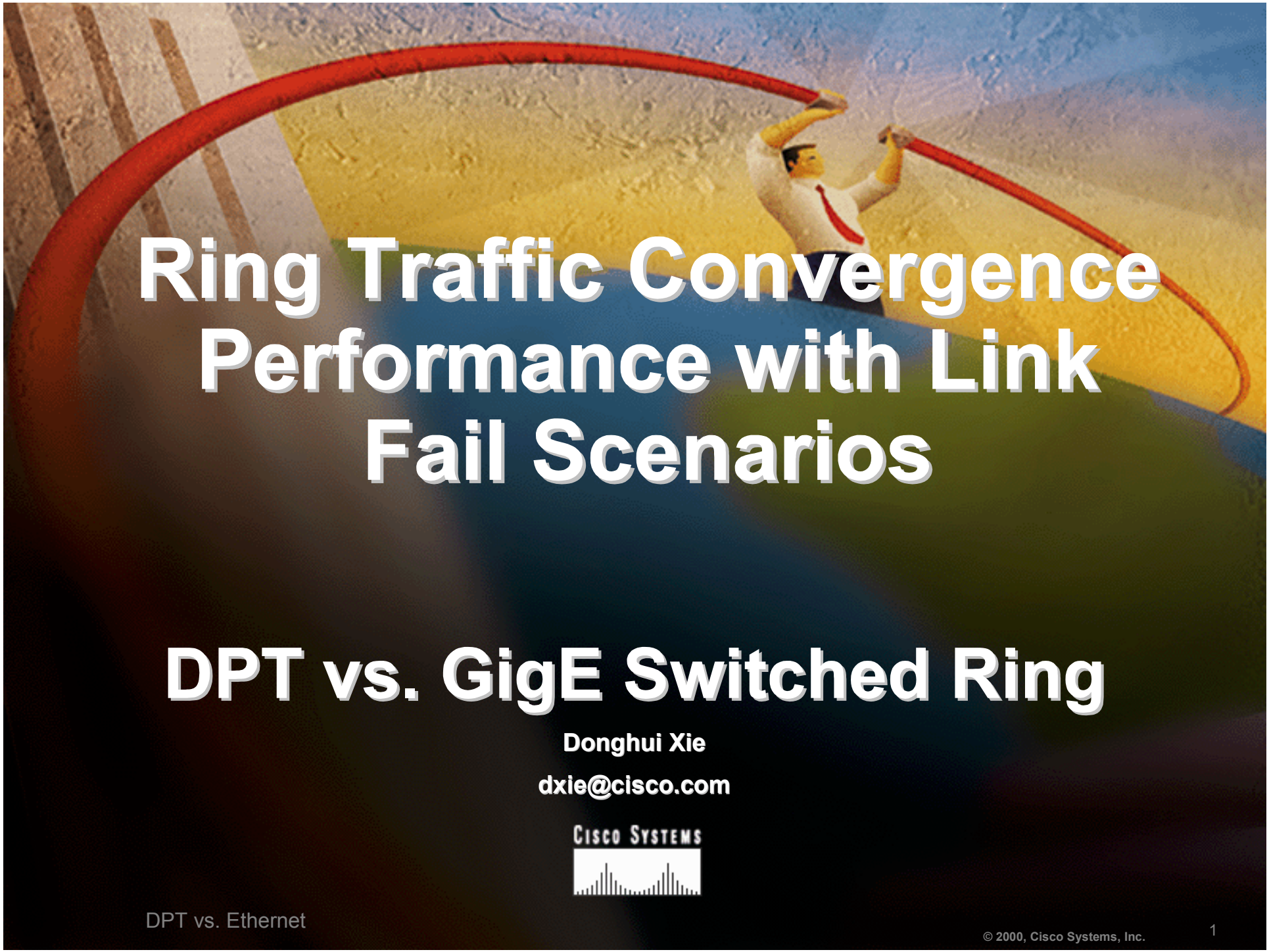

Ring Traffic Convergence Performance with Link Fail Scenarios

DPT vs. GigE Switched Ring

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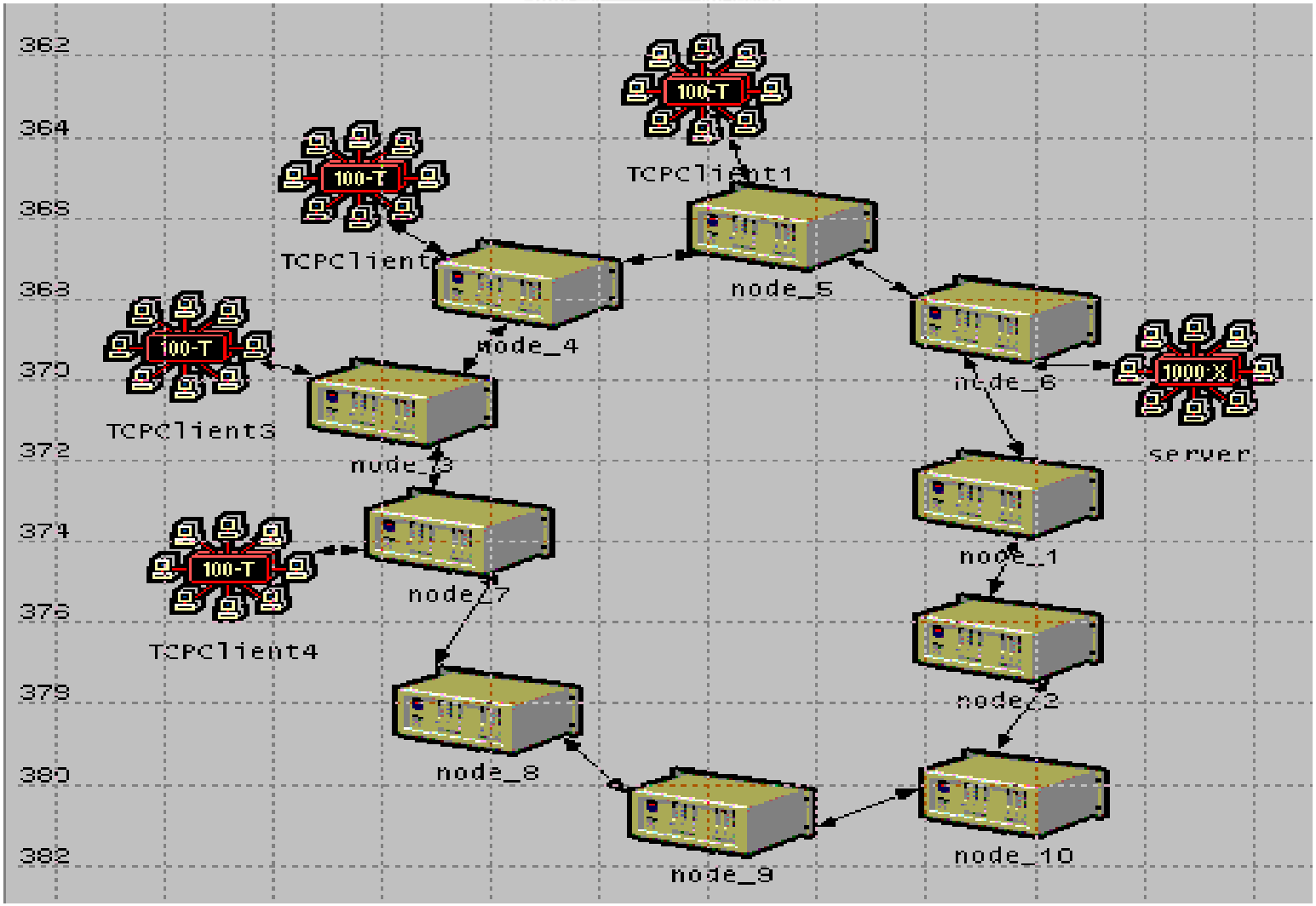
Cisco Systems

Contents

- Gigabit Ethernet Switched Ring with 10 Nodes Running STP
- Slow GigE Ring Traffic Convergence and Link Fail Adaptation
- DPT-OC12 Ring with 10 Nodes Running SRP
- Fast DPT Ring Traffic Convergence and Link Fail Adaptation
- Simulation Result Summary

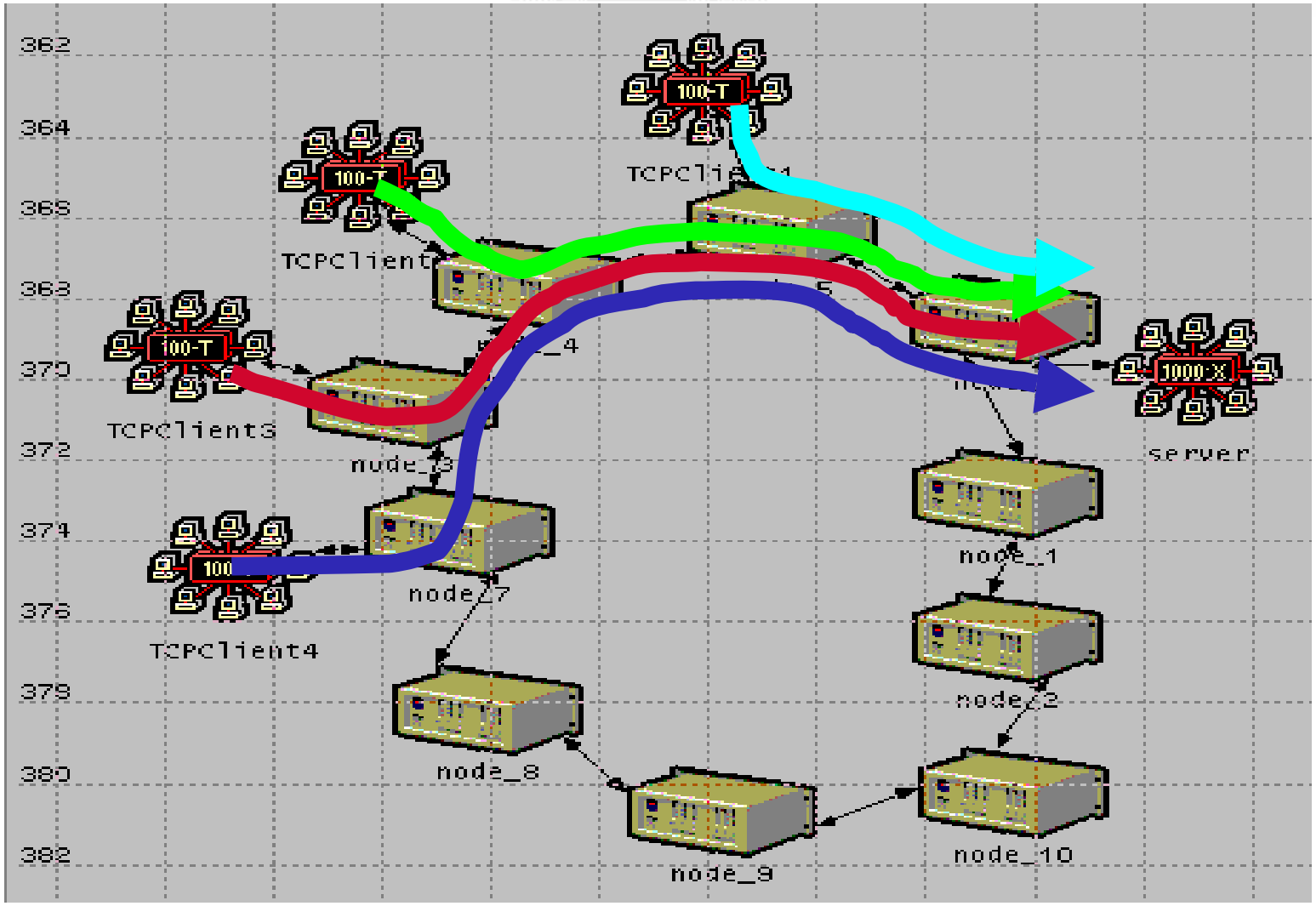
Switched Ethernet Ring with TCP Application



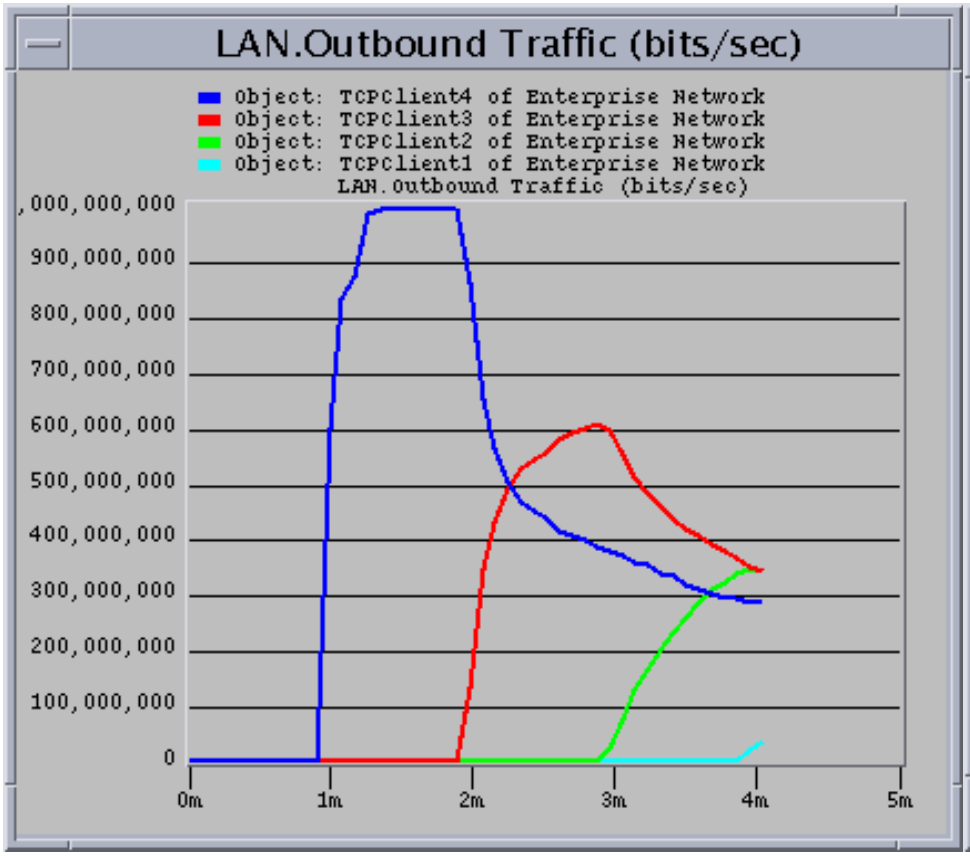
Gigabit Switched Ethernet Ring

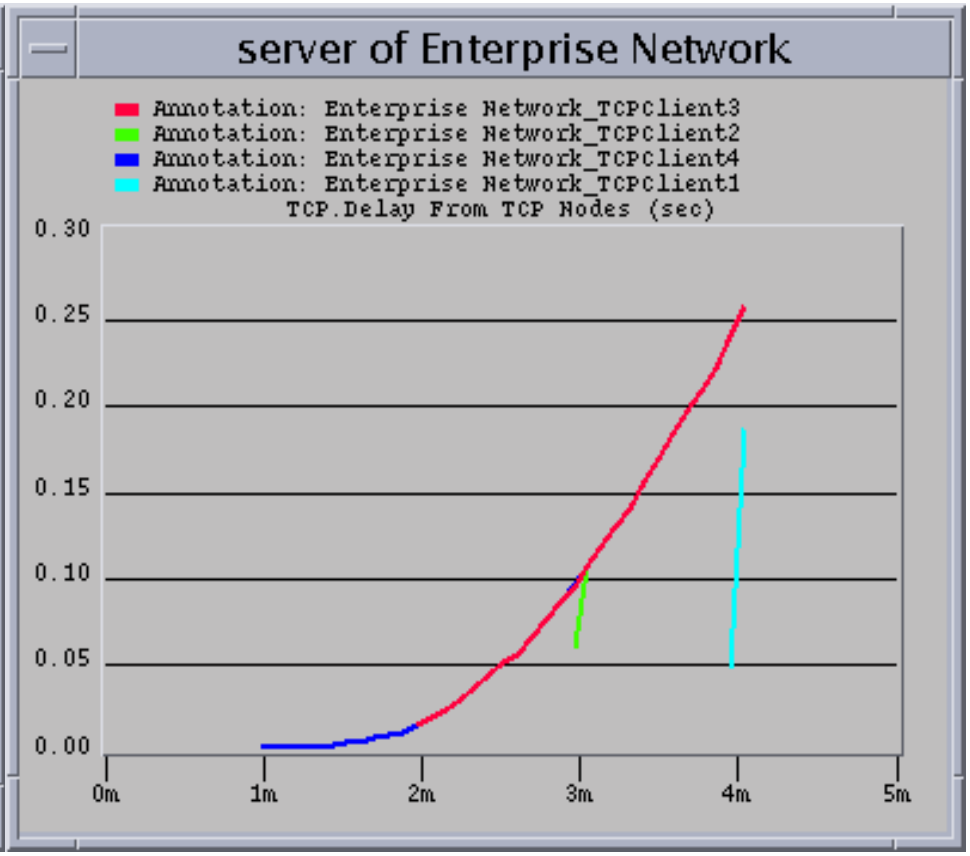
- Ten Node Ethernet Switched Ring Covering 20 Km
- 1 Gigabit Ring Bandwidth
- Four 1000BaseX LANs Running TCP Application
- One 1000BaseX LAN Running TCP Server Application
- TCP Client LAN Traffic 1Gbps To Server At One Minute Apart
- Ring Link Fail At 110 Seconds

TCP Traffic Flow over Ethernet Ring



Gigabit Ethernet Switched Ring Convergence and TCP Delay



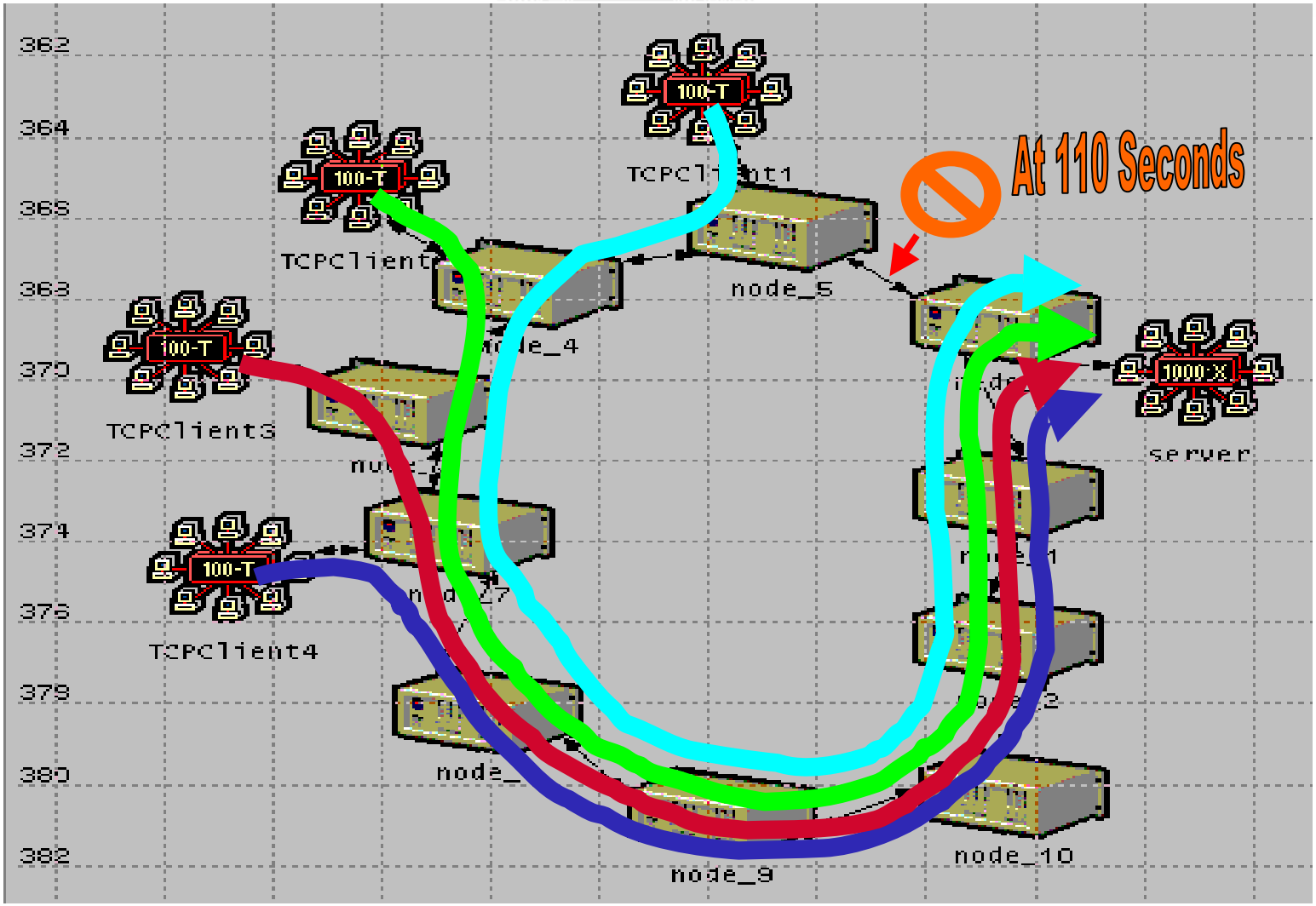


- When under stress, TCP applications experience large delay
- Slow convergence due to lack of layer 2 fairness control

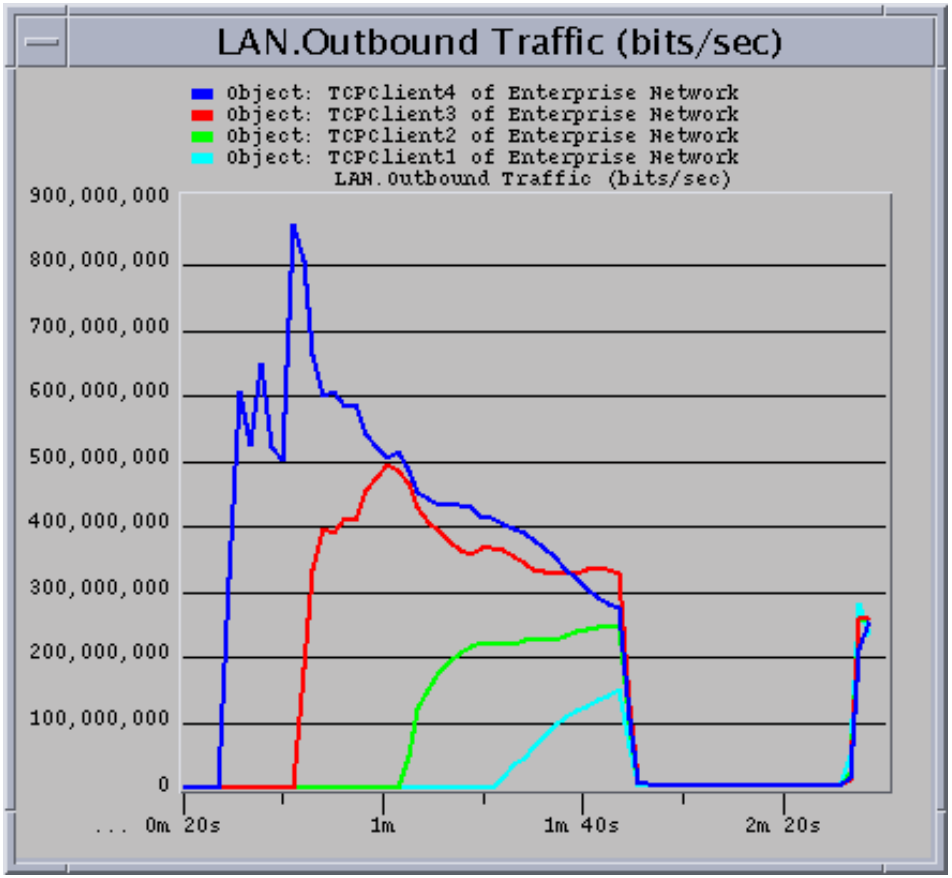
Gigabit Switched Ethernet Ring Under Link Fail - Case 1

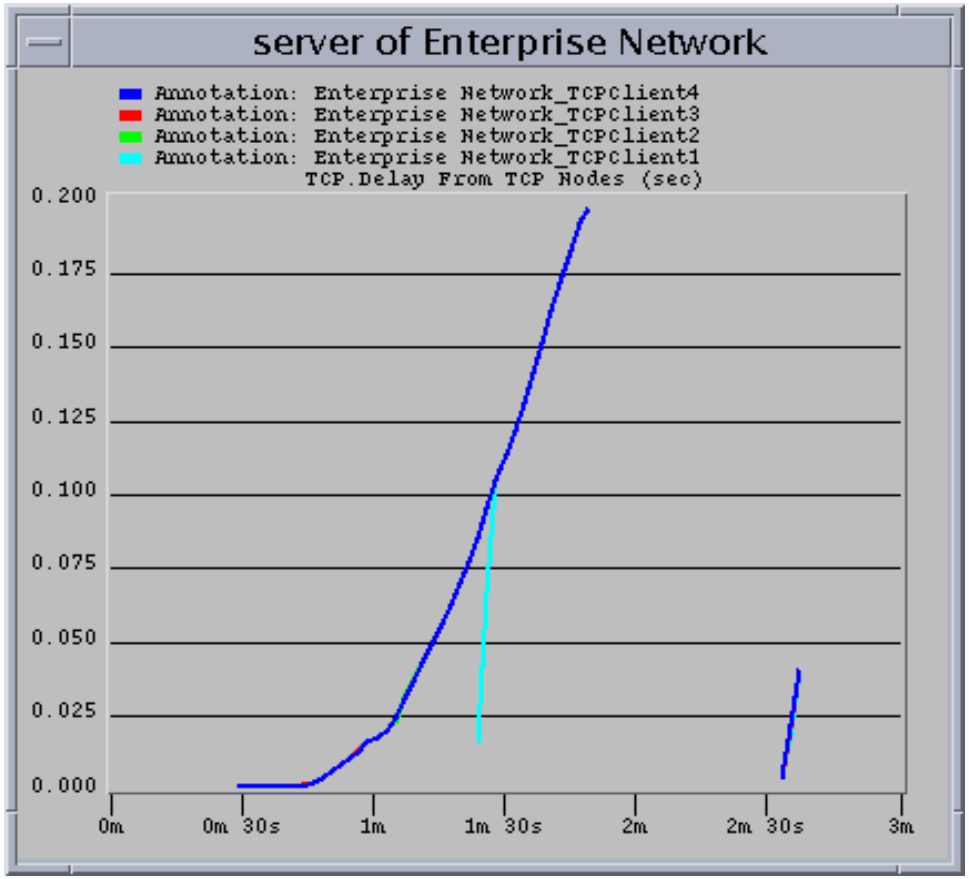
- Ten Node Ethernet Switched Ring Covering 20 Km
- 1 Gigabit Ring Bandwidth
- Four 1000BaseX LANs Running TCP Application
- One 1000BaseX LAN Running TCP Server Application
- TCP Client LAN Traffic 0.8Gbps To Server At 20 Seconds Apart
- Ring Link Fail At 110 Seconds

TCP Traffic Flow over Ethernet Ring



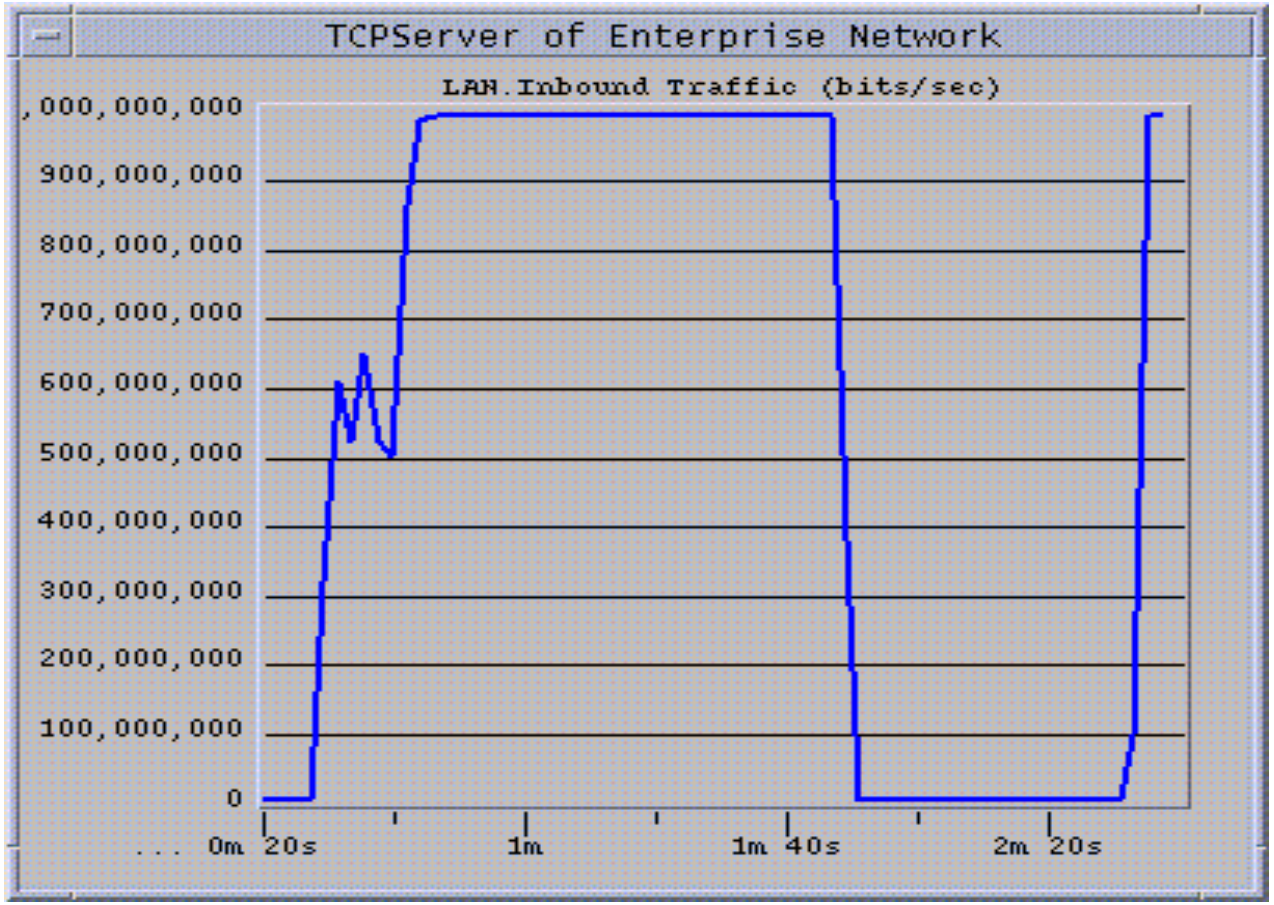
Gigabit Ethernet Switched Ring Convergence and TCP Delay





- When under stress, TCP applications experience large delay
- Complete service loss during link fail

Gigabit Ethernet Switched Ring Throughput

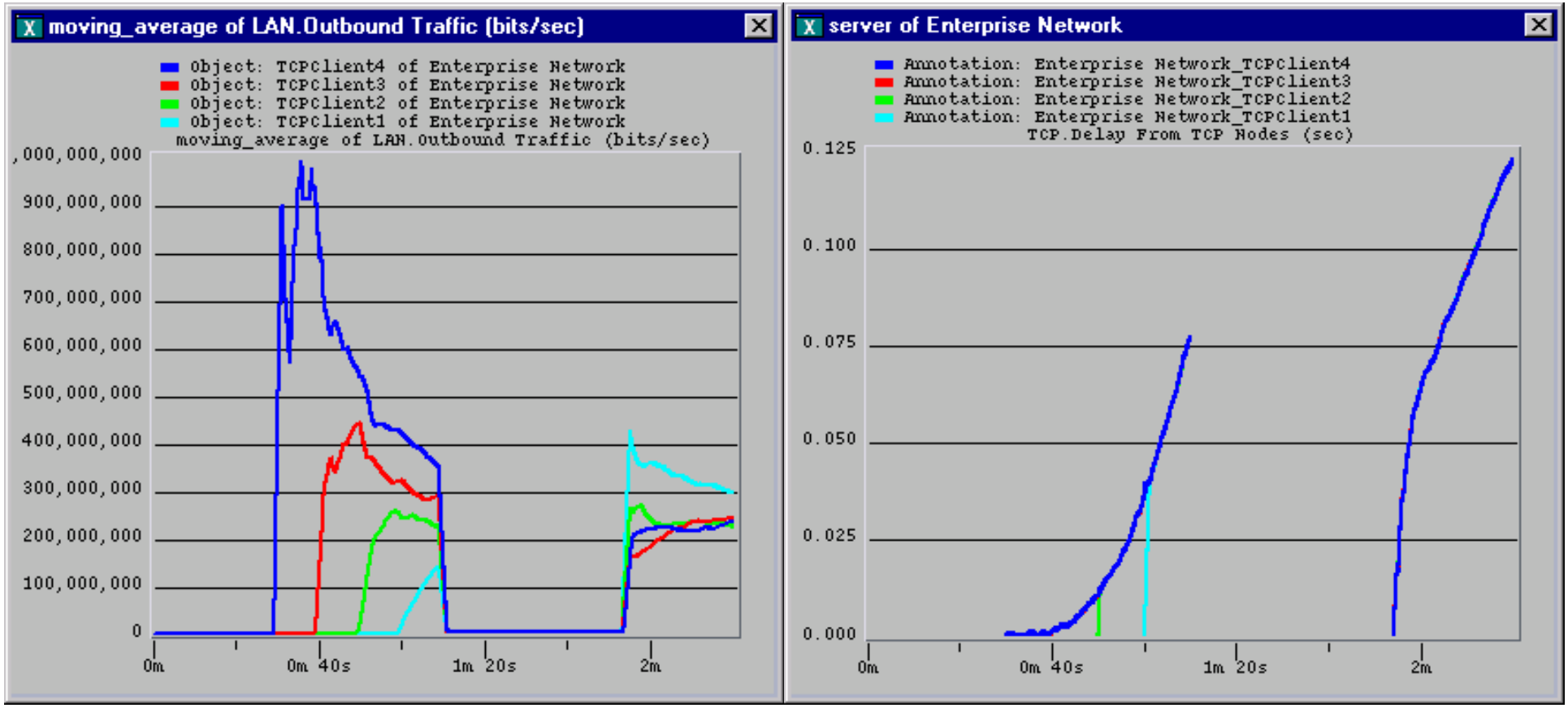


- Prolonged service outage during link fail

Gigabit Switched Ethernet Ring Under Link Fail - Case 2

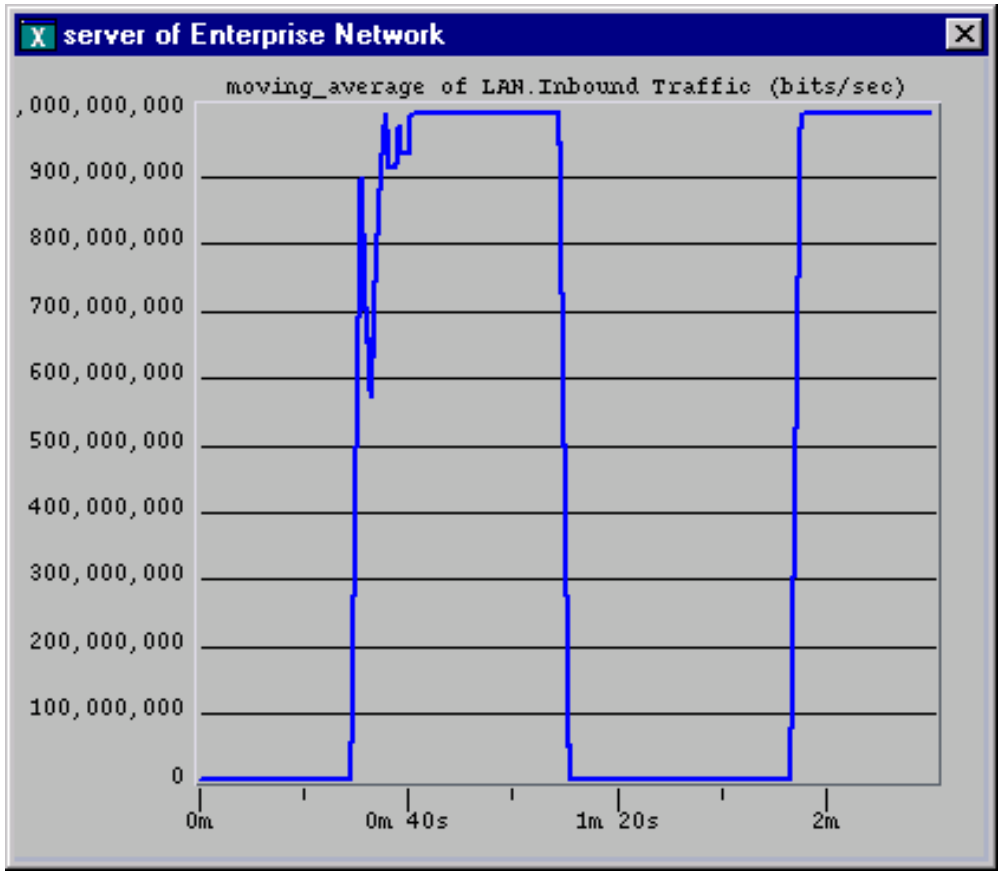
- Ten Node Ethernet Switched Ring Covering 20 Km
- 1 Gigabit Ring Bandwidth
- Four 1000BaseX LANs Running TCP Application
- One 1000BaseX LAN Running TCP Server Application
- TCP Client LAN Traffic 0.8Gbps To Server At 10 Seconds Apart
- Ring Link Fail At 70 Seconds

Gigabit Ethernet Switched Ring Convergence



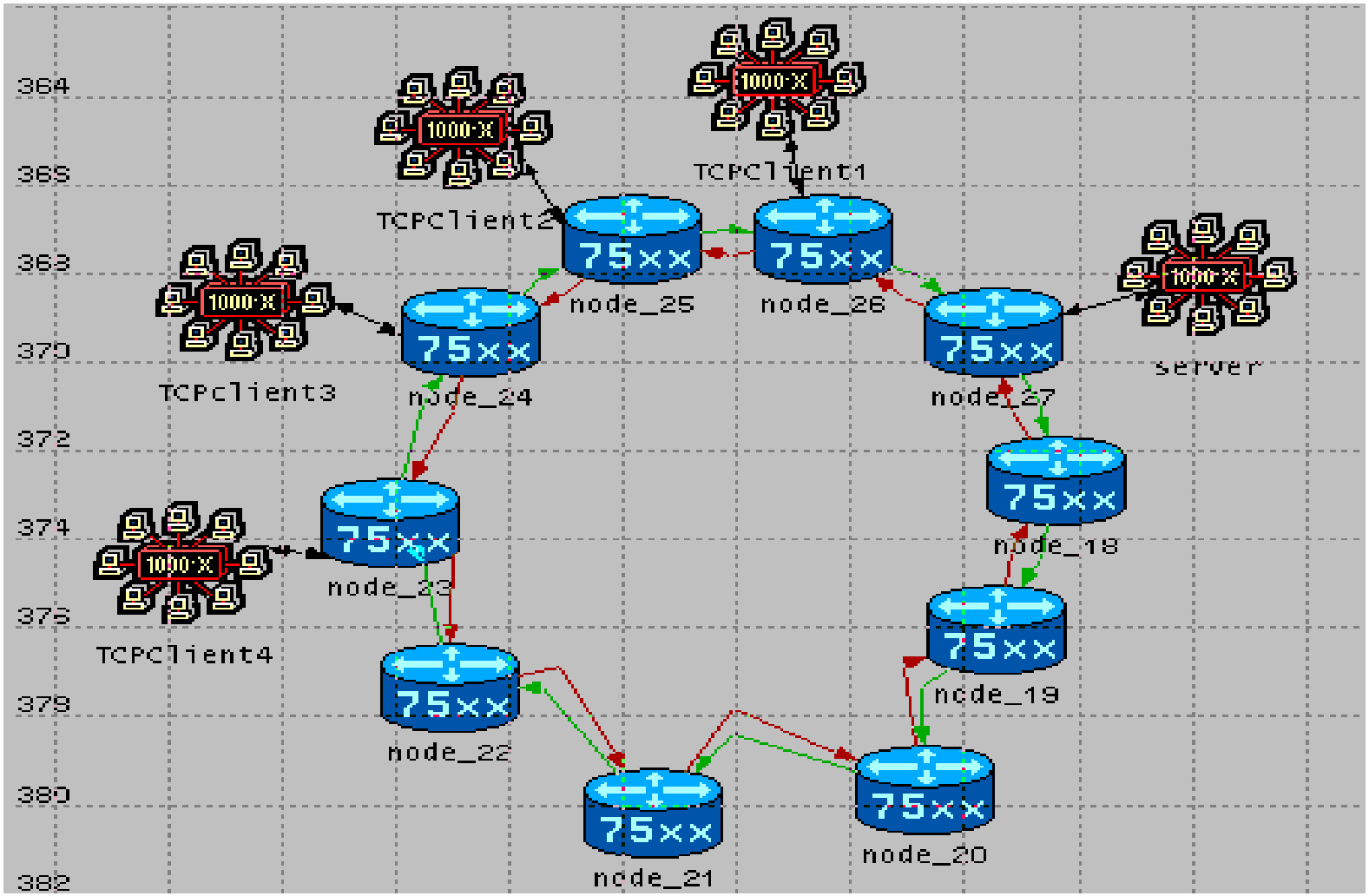
- When under stress, TCP applications experience large delay
- Slow convergence and no fairness

Gigabit Ethernet Switched Ring Throughput



- Persistent TCP service outage during link fail

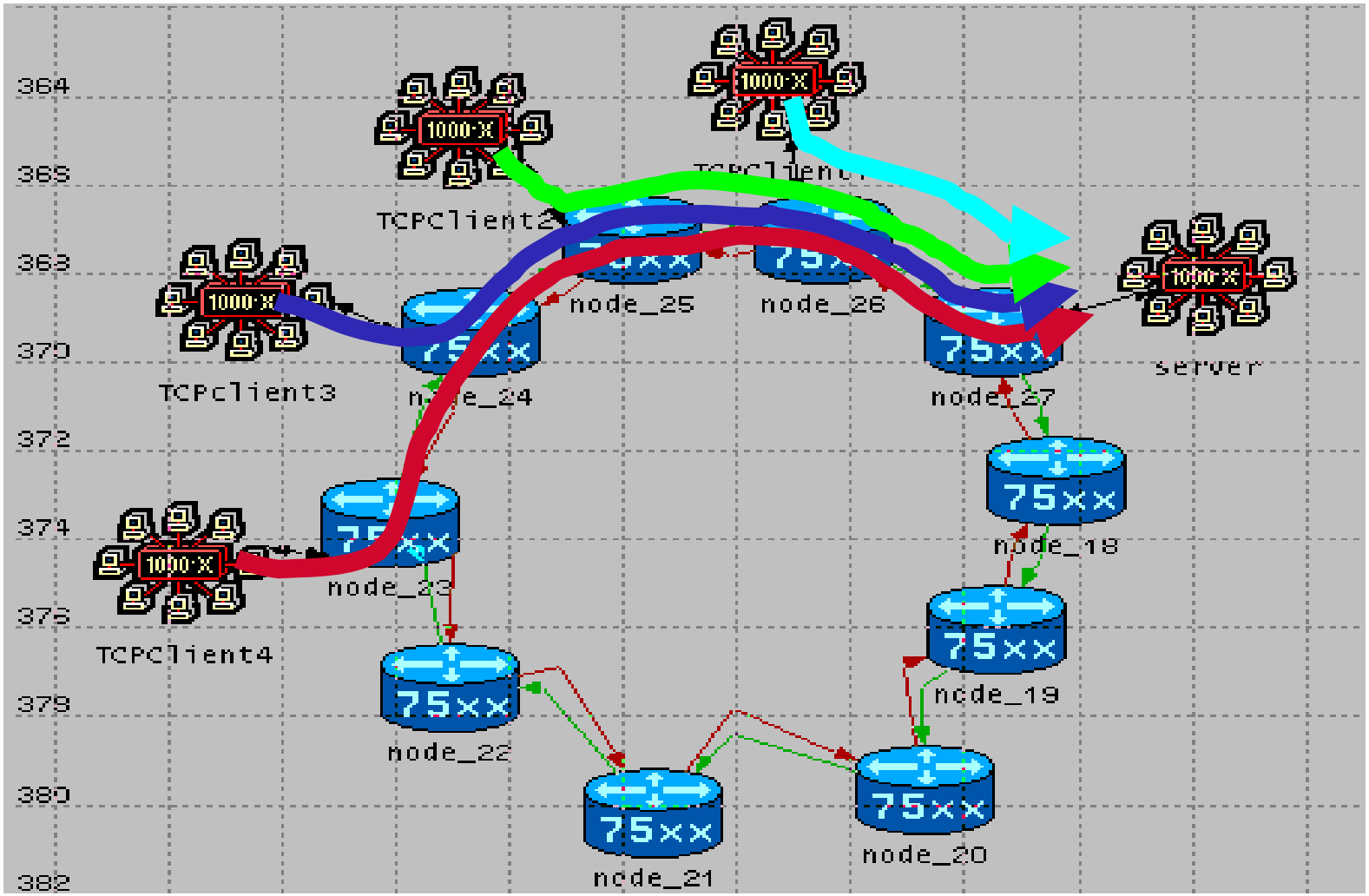
DPT-OC12 Ring with TCP Application



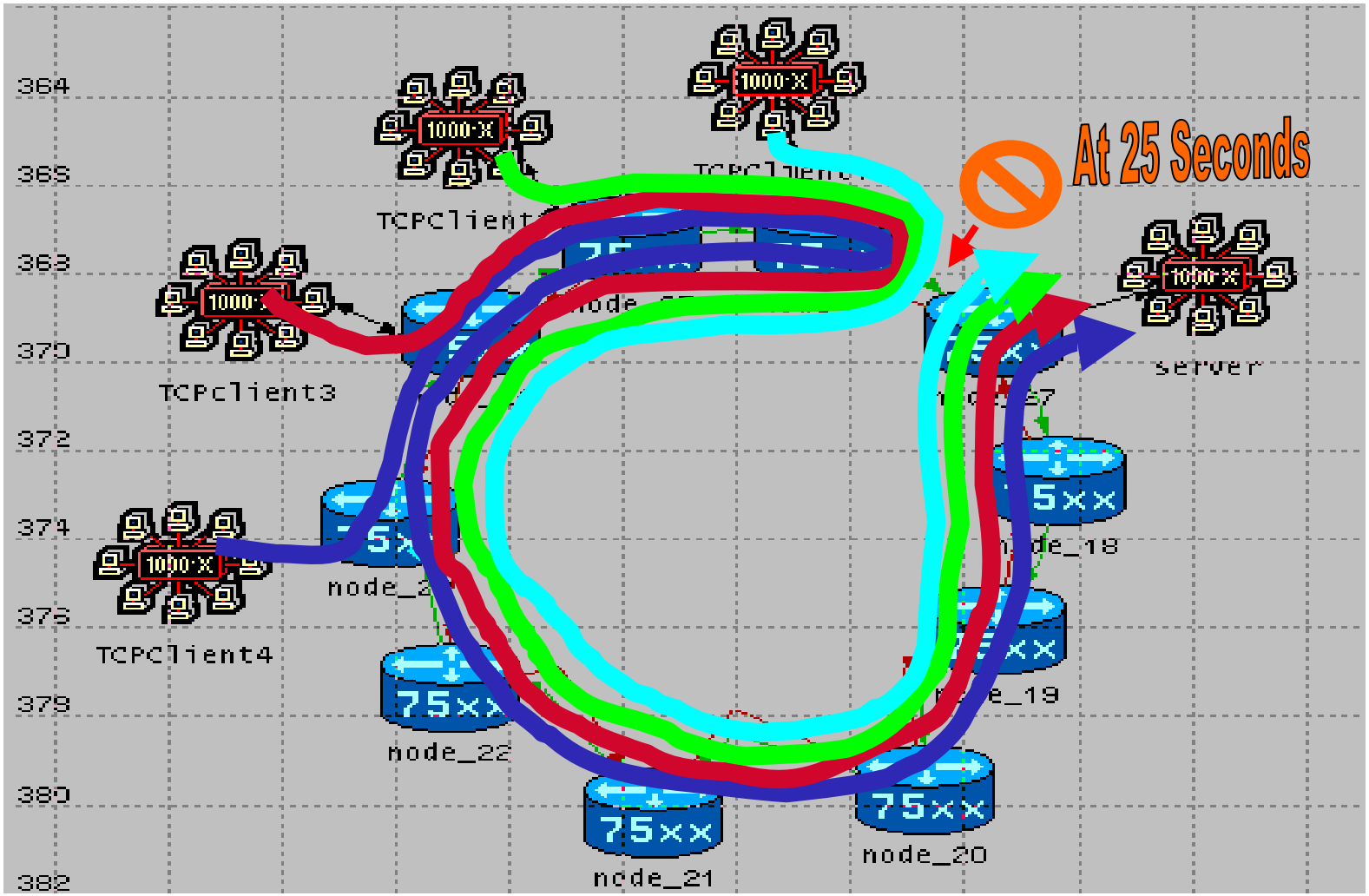
DPT-OC12 Ring with TCP Application

- Ten Node DPT-OC12 Ring Covering 200 Km
- Four 1000BaseX LANs Running TCP Application
- One 1000BaseX LAN Running TCP Server Application
- TCP Client LAN Traffic 622 Mbps To Server At 5 Seconds Interval
- Ring Link Fail At 25 Seconds and Restore At 30 Seconds

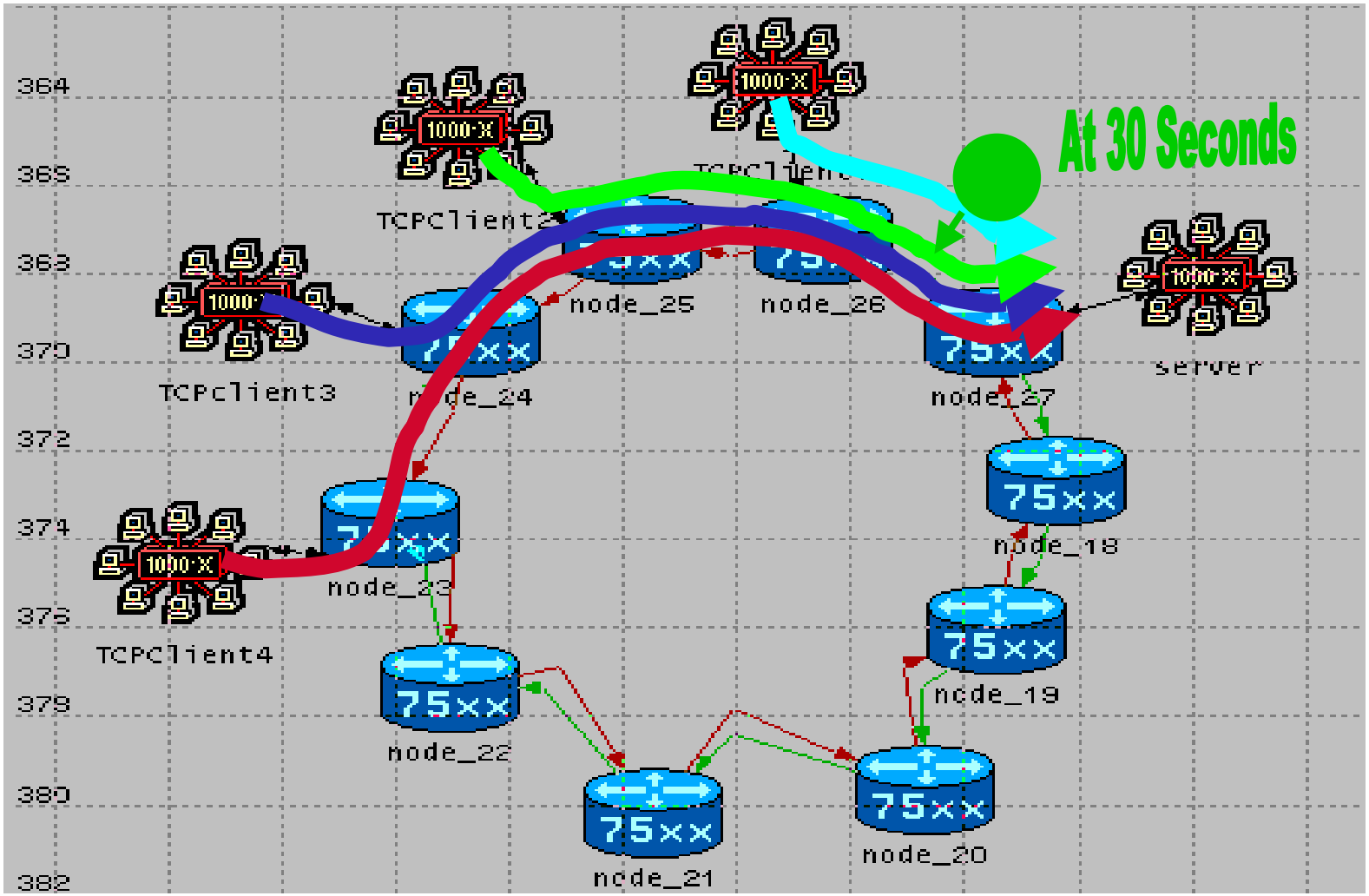
DPT-OC12 Ring TCP Traffic Flow



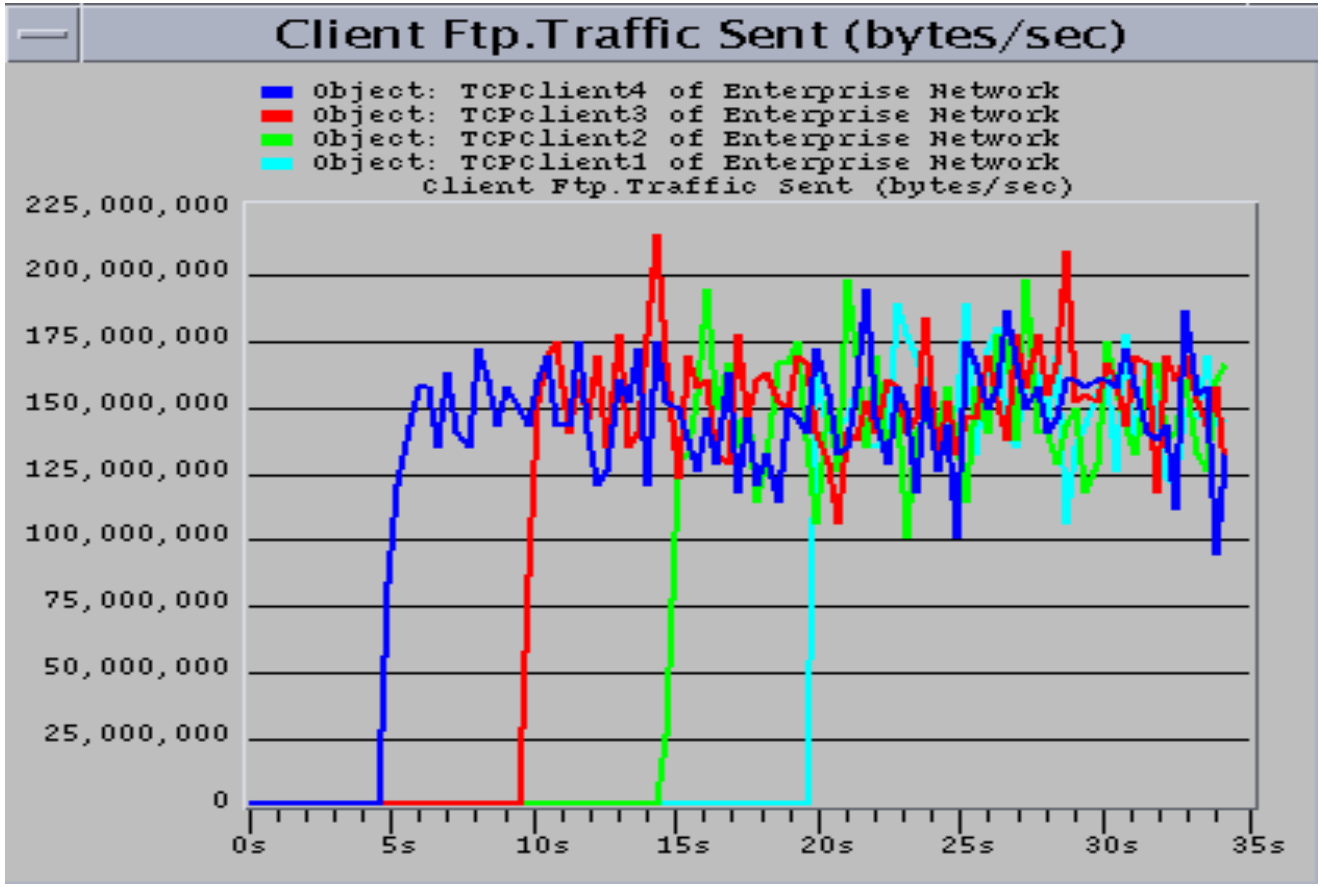
DPT-OC12 Ring TCP Traffic Flow



DPT-OC12 Ring TCP Traffic Flow

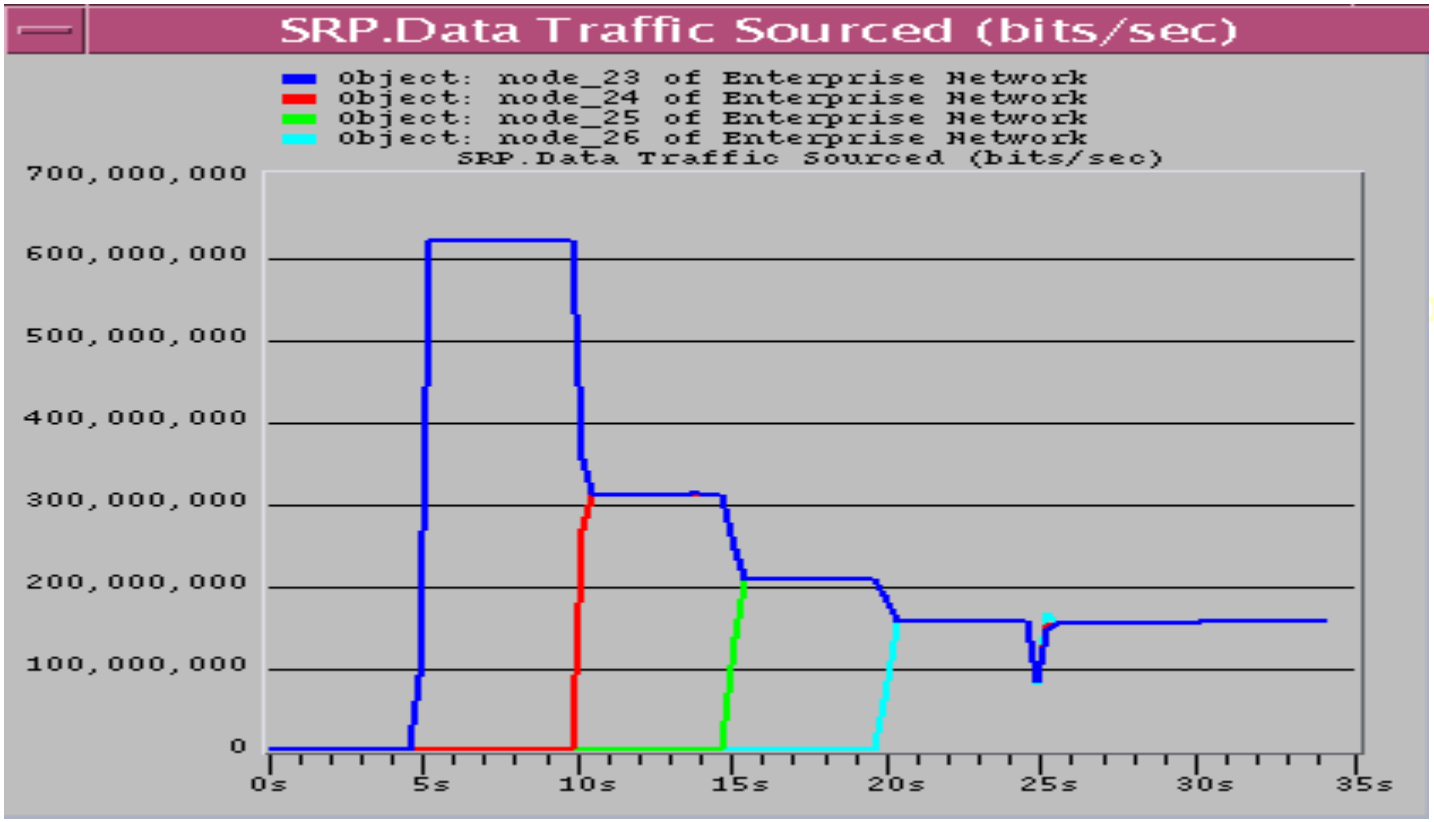


TCP/FTP Traffic Source



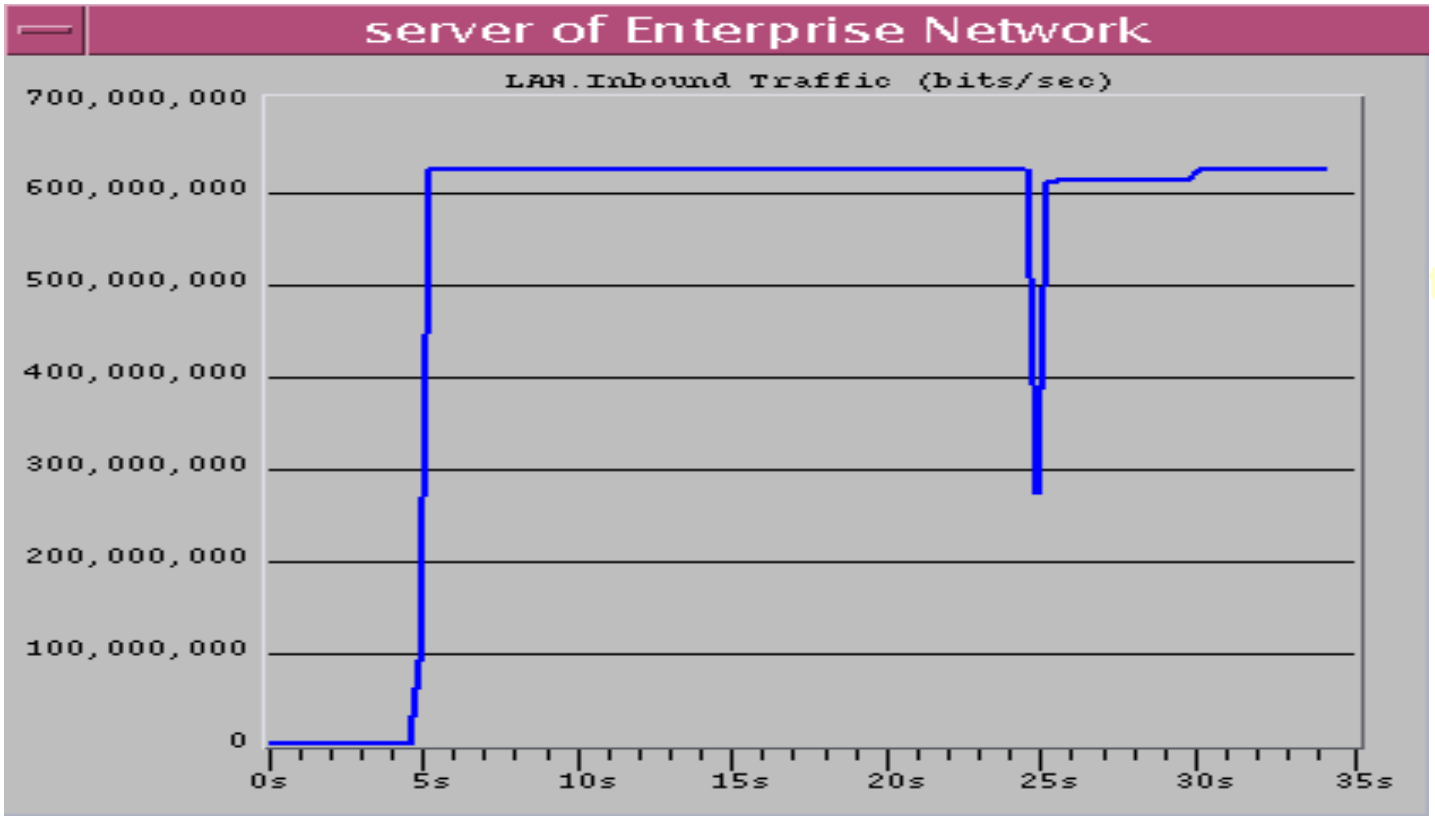
Stockholm

Fast DPT Fairness, Convergence and Link Fail Adaptation



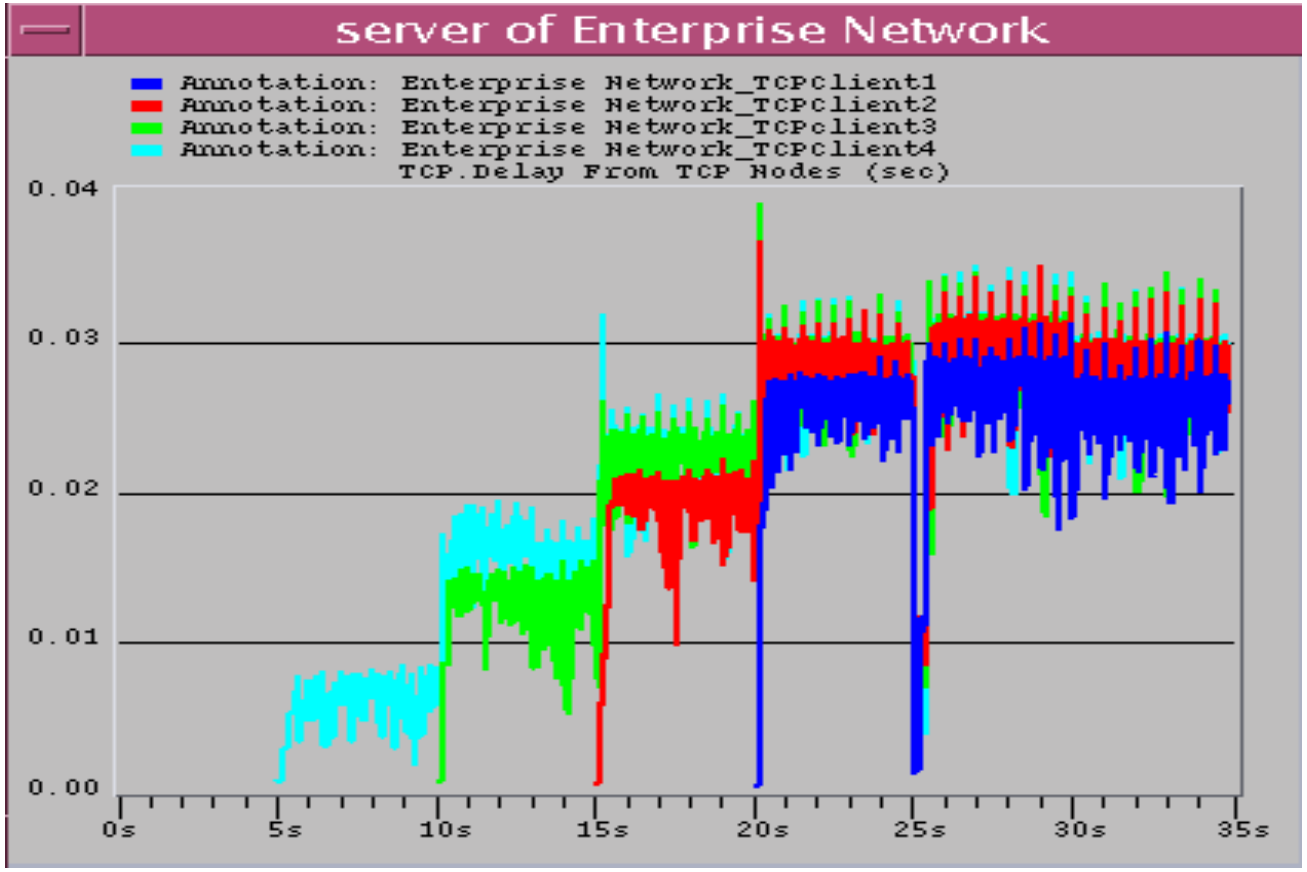
- **DPT/SRP Usage Fairness and Fast Convergence Through Link Fail, Ring Wrap, Link Restore and Ring Unwrap**

Full TCP Server Utilization and Blink-of-Eye Service Restoration



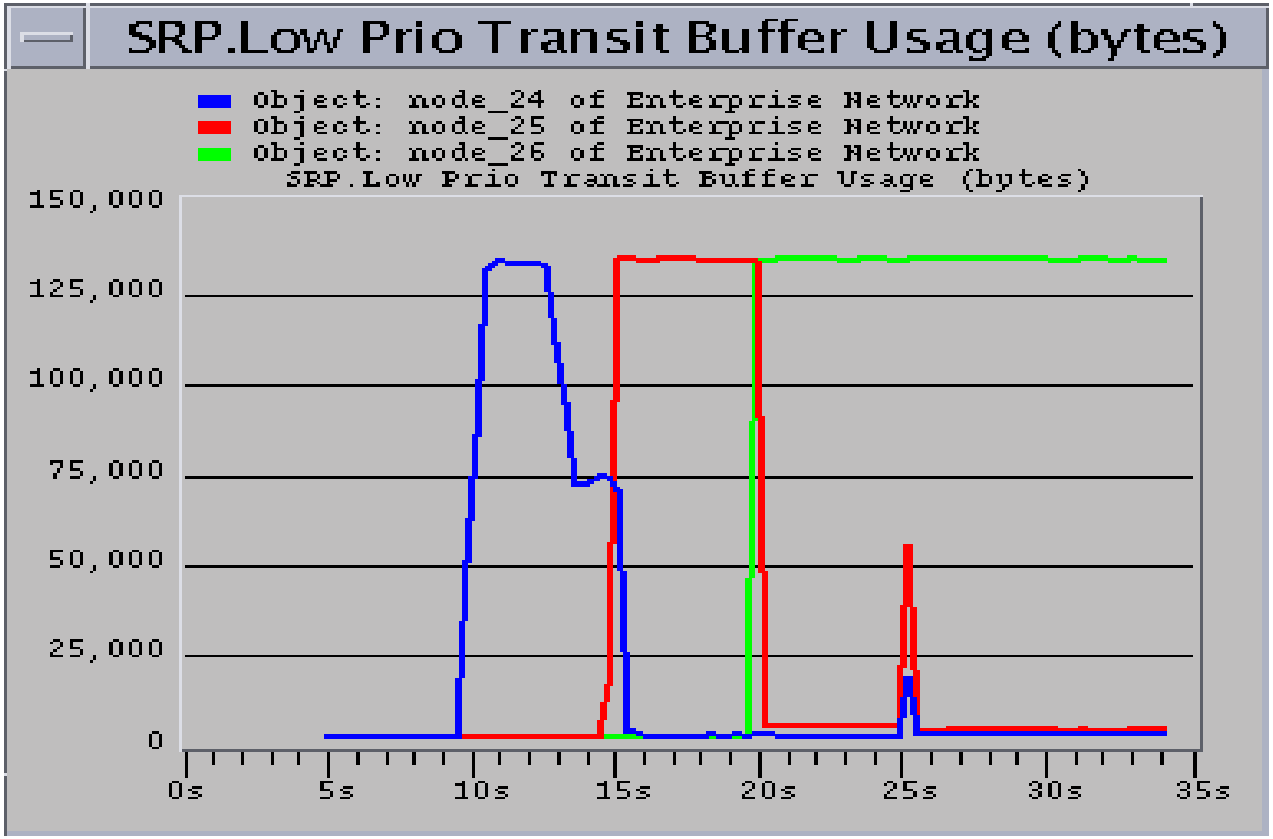
- **Minimal TCP Service Interruption During Link Failure and Restoration**

TCP Packet Delay over DPT/SRP



- Consistent TCP packet delay throughout link fail/ring wrap
- Extra delay is due to upper layer queuing access delay

Consistent Ring Transit Delay



- Consistent transit buffer delay, hence the extra delay is incurred at access instead of in transit

Simulation Summary

DPT/SRP

- **Superior Ring Fairness and Fast Traffic Convergence**
- **Fast Link Fail Adaptation and Minimal Service Interruption Throughout Ring Link Fail/Wrap/Restoration/Unwrap**

vs. Switched Ethernet Ring

- **Poor Fairness and Slow Traffic Convergence**
- **Prolonged Service Outage and Interruption Through Link Fail/STP Re-configuration**