Performance Adhoc Group
IEEE 802.17

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Interim Meeting

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Agenda

• Performance Adhoc structure
• Status review
  – Performance metrics overview
    • Scenarios
    • Traffic Types
    • Metrics
    – Initial Simulation scenarios
      • Suggestions for first steps in starting common simulations scenarios
• Next steps
Formation of the Perf Adhoc Group

- Requests to have a separate Adhoc group with the right experts to look into performance issues
- Not all 802.17 participants are interested in these issues
Perf Adhoc Objectives

• Agree on common/consistent perf simulation scenarios and metrics:
  – Traffic Models
  – Performance Metrics
  – Test Scenarios
  – Other?
Perf Adhoc Objectives ...

- These would be used to:
  - Compare the performance characteristics of various proposals
  - Compare performance characteristics of RPR solutions vs. using Ethernet switches
Expected Time for Perf Adhoc Group Work

• Expected to work in parallel with the efforts of 802.17 work to assist with development of the RPR standard

• Best estimate would be 8 - 12 months
Participation in Perf Adhoc Group

- Anyone welcome to participate
- People who can contribute to the perf analysis and perf modeling efforts
- People just interested in these topics
- People concerned about performance related issues and comparison process
- And then … anyone is welcome!
Perf Adhoc Plan

• Plan on having parallel sessions to allow more time for discussions
• Will be reporting progress
• Separate mailing list for perf discussions?
**Agenda**

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Progress and Status Report

• Presentations and discussions held in July plenary and August Interim meetings

• Closed on general performance metrics and scenarios (for now)

• Arrived to agreement on initial simulation scenarios
Progress and Status ...

- These would apply to:
  - Comparing various proposals
  - Comparing RPR mechanisms to using Ethernet switches
Goals of the Performance Modeling Efforts

- Test various aspects affecting ring performance for various proposals
- Investigate fairness, congestion control, admission control, QoS
- Investigate various access methods for the ring
- Investigate Ring restoration performance
- Analyze performance stability
Scenarios

- Configuration Variables:
  - Node count
  - Span distance
  - Data rate
  - On the ring and ingress/egress ports
- Mesh configurations for:
  - Campus, Metro, WAN
Scenarios ...

- Aggregation / Traffic Patterns
  - Tier1 ISP
  - Tier2 ISP
  - MSO (multi-service operator)
  - Metro Customer
  - Pop
    (with corresponding ingress/egress data rates)
Modeling parameters

- Number of flows
- Burstiness (traffic profiles)
- Packetization delay
- MTU
- PHY modeling characteristics
Traffic Types

- Data (normally using TCP)
  - ftp, http
- Multimedia (normally using UDP)
  - Time-sensitive / time insensitive
- Multicast
- Traffic characteristics:
  - Rates, packet size, destination and priority distributions
Metrics

• Global Ring Metrics:
  • Link utilization
  • Global throughput / Goodput
  • Fairness, congestion control, admission control
  • Fault recovery (link, span, node)
    • Stabilization time
    • Switching time
Metrics...

• Per class and per conversation metrics:
  – Packet Loss (ingress/egress/other?)
  – End-to-End Packet Delay
    • Including jitter for time sensitive traffic
    • Access Delay
  – Throughput
  – Fairness
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Objectives

- Establish starting point for simulation scenarios (subset of metrics presented before)
- Simulations to compare performance characteristics of RPR vs. Ethernet
Suggestions for Starting Simulation Scenarios

• Testing Basic Ring Parameters
  – Ring Performance
  – Congestion Control
  – Fairness
Suggestions for Later Simulation Scenarios

• Comparison of RPR vs. Ethernet Switches
  – Performance characteristics
  – Switch-over characteristics
  (I believe that this is needed now?)

• Spatial reuse
Ring Performance

- **Metrics:**
  - Link utilization under heavy loads
    - Flow control overhead
  - Global throughput
Congestion Control

• Metrics:
  – Throughput in the presence of congestion
    • Per class
    • Per node
    • Per conversation (or flow)
Fairness

• Metrics:
  – Throughput and end-to-end packet delay and jitter:
    • Per class
    • Per node
    • Per conversation (or flow)
• Need scenarios that demonstrate fairness in overload conditions
Suggested Starting Configuration

• Dual Ring
• 16 nodes (0 - 15)?
• Ring running under capacity and well as over capacity (overload)
• Ring circumference (100Km, 1000Km)?
• Ring rate: 10G
Suggested Starting Applications

- Hub application
  - 50% of the traffic is generated by all nodes and flows to the hub node (let’s say node #15)
  - 50% of the traffic is generated by the hub node and flows to all the other nodes
Suggested Starting Applications ...

- Random source/destination pairs
  - Would demonstrate spatial reuse effect better than hub application
  - Need to come up with some common way of generating the random source/dest pairs
Suggested Traffic Scenarios

- Scenario #1:
  - Multimedia
    - Using UDP
    - No upper layer protocol
- Scenario #2 (later)
  - Data (using TCP)
Suggested Traffic Scenarios ...

• Scenario #3 (later):
  Mix of:
  – Data (using TCP)
  – Multimedia:
    • Using UDP
    • No upper layer protocol
Suggested Traffic Characteristics

• Packet size distributions (probabilistic):
  – Trimodal (40% 64B, 40% 512B, 20% 1518B)
  – Bimodal (50% 64B, 50% 9KB)
• Committed rate per node
  – 30% of ring capacity / # nodes
  – 60% of ring capacity / # nodes
Suggested Traffic Characteristics ...

- Offered load
  - Each node provides load of:
    - 200% of ring capacity / # nodes
  - Staggered traffic input for each port

- Traffic distribution
  - 10 conversations (flows) per node
  - On/Off with staggering period
    - Needs to be quantified in more detail
Suggested Simulation output results

- Throughput
- ETE delay
- Jitter (99.9th percentile of delays)
- For all output results:
  - Show curves and numbers
  - Per node, per class, per conversation
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Next Steps

• Separate breakout session for Performance Adhoc
• Presentations showing performance characteristics of proposals
• Presentations comparing performance characteristics of RPR rings vs. Ethernet rings
• Other suggestions?
Discussions
Perf Adhoc Discussions

- Lunch meeting (8 attended)
- Discuss objectives and work to be done
- Discuss some of the open issues raised during the performance presentation
- Discuss next steps
Perf Adhoc Discussions

Discussions on:

- Modeling tools
- Convergence of simulation results (length of simulations)
- Availability of models from various vendors
- Traffic input characterization
Perf Adhoc Discussions

- Architectural/behavioral abstractions needed for each RPR proposal
- Reference model (?)
- Understand the effect of various architectural aspects instead of various vendor implementations
Perf Adhoc Discussions ...

Objectives:

– Set parameters, metrics, scenarios to help provide a consistent way of comparing architectural ideas

– Not chartered to run simulations for the working group
Perf Adhoc Discussions …

Resolution of open issues:
Packet size distributions (probabilistic):

- Trimodal
  - (60% 64B, 20% 512B, 20% 1518B)

- Quadmodal (?)
  - (50% 64B, 15% 512B, 15% 1518B, 20% 9K)
Unresolved issues:

Starting scenarios options:

- Using UDP
- No upper layer protocol
- Data using TCP
- Combination?
Perf Adhoc Discussions …

Step #2

- Scenarios to include:
  - 2 node rings
  - 3 node rings
  - Multiple rings
Perf Adhoc Discussions …

Unaddressed issues:

• Input traffic arrival distribution
Perf Adhoc Conclusions

• Too many open issues to start simulations based on the recommendations of the perf adhoc group
• Request 2 sessions in March (4 hours each)
• Discussions on the RPR reflector between now and March