
# *Performance Adhoc Group*
# *IEEE 802.17*

---

**Khaled Amer**

**IEEE 802.17**
**Interim Meeting**

**January 2001**

# *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*

- **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**

# *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**

# *Agenda*


- **Performance Adhoc structure**
- **Status review:**
  - **Performance metrics overview**
    - **Scenarios**
    - **Traffic Types**
    - **Metrics**
  - **Initial Simulation scenarios**
    - **Suggestions for starting common simulations scenarios**
- **Next steps**

# *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**

# *Agenda*

- **Status review:**
  - **Performance metrics overview**
    - **Scenarios**
    - **Traffic Types**
    - **Metrics**
  - **Initial Simulation scenarios**
    - **Suggestions for starting common simulations scenarios**
- **Next steps**

# *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)**

# *Perf Adhoc Discussions …*


**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**