

Fairness Requirements

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Agenda

- **Summary of carrier requirements presented**
- **Design Implications**
 - **Interrelationship Digraph**
- **Conclusions**

Previous Presentation from Carriers and Providers

- **Sprint**

- **Size**

- Entire network size 500 nodes
 - Ring 30+ nodes on OC-12 Ring

- **Servies**

- 2 priorities
 - Low delay and jitter, guaranteed BW
 - Bounded delay
 - At present only one class of traffic: BE
 - Scalable to higher speed interfaces

- **OA&M**

- Operational: Facilitate upgrade to increase customer BW requests
 - Troubleshooting requirement: like SONET OA&M
 - Carrier grade
 - Protection required:
 - High availability

Carrier Requirements (Cont'd)

- **MCI**
 - Size
 - 2 stations on access rings
 - Potential to add more stations on the ring
 - Services
 - Virtual Private Network
 - Virtual lease line model
 - Security
 - Future services
 - OA&M
 - Resiliency
 - Scalable services without fork lifting
 - <1% preemptable traffic

Carrier Requirements (Cont'd)

- **BellSouth**

- **Ring Size,**

- Metro Applications:
 - Access rings: OC-3-OC-48, IOF rings: OC-12-OC-192
 - <6 node 6-12 nodes, span 10-15km max
 - Ring size 50 km

- **Services**

- Multiple QoS support
 - Mixed with guaranteed BW&latency
 - Low priority burstable and weighted distributed
 - Best effort: Statistical multiplexing
 - Protection options

- **OA&M requirements**

- SONET like OA&M functions
 - Manual switch
 - Source routing

Carrier Requirements (Cont'd)

- **Global Crossing**

- Size:

- Metro ethernet services (ethernet distance extension to the WAN)
 - 150 km ring circumference, 40km span

- Services

- Ethernet services: Transparent LAN. Virtual private line.
 - Customer separation AND maintaining customer VLAN: Service label
 - weighted fairness with BW allocation due different aggregation point on a ring for different burstable customers
 - Flexible architecture for new revenue generating: BW, delay

- OA&M

- Symmetrical and asymmetrical contracts
 - Operation monitoring to meet SLA: unicast- Source and Destination
 - Fairness needed to have no impact by network loading
 - 50 ms protection
 - Statistics
 - SONET like OA&M functions

Carrier Requirements (Cont'd)

SBC

- Size:
 - metro, access and inter-office (WAN)
 - Multi-node ring
 - Reduce equipment: port consolidation
 - Shared media: fairness scheme
 - Scalable WAN ports: SONET, DWDM, GbE
 - GFP
 - Reduce equipment cost
- Services
 - Service for variable BW
 - Service for circuit emulation
- OA&M
 - Carrier grade
 - Protection
 - 99.999 availability SONET, DWDM, GbE
 - Reduces circuit administration
- Interoperability
 - Functional supplier interchangeability
 - Not just element interchangeability
 - Not just inter-working

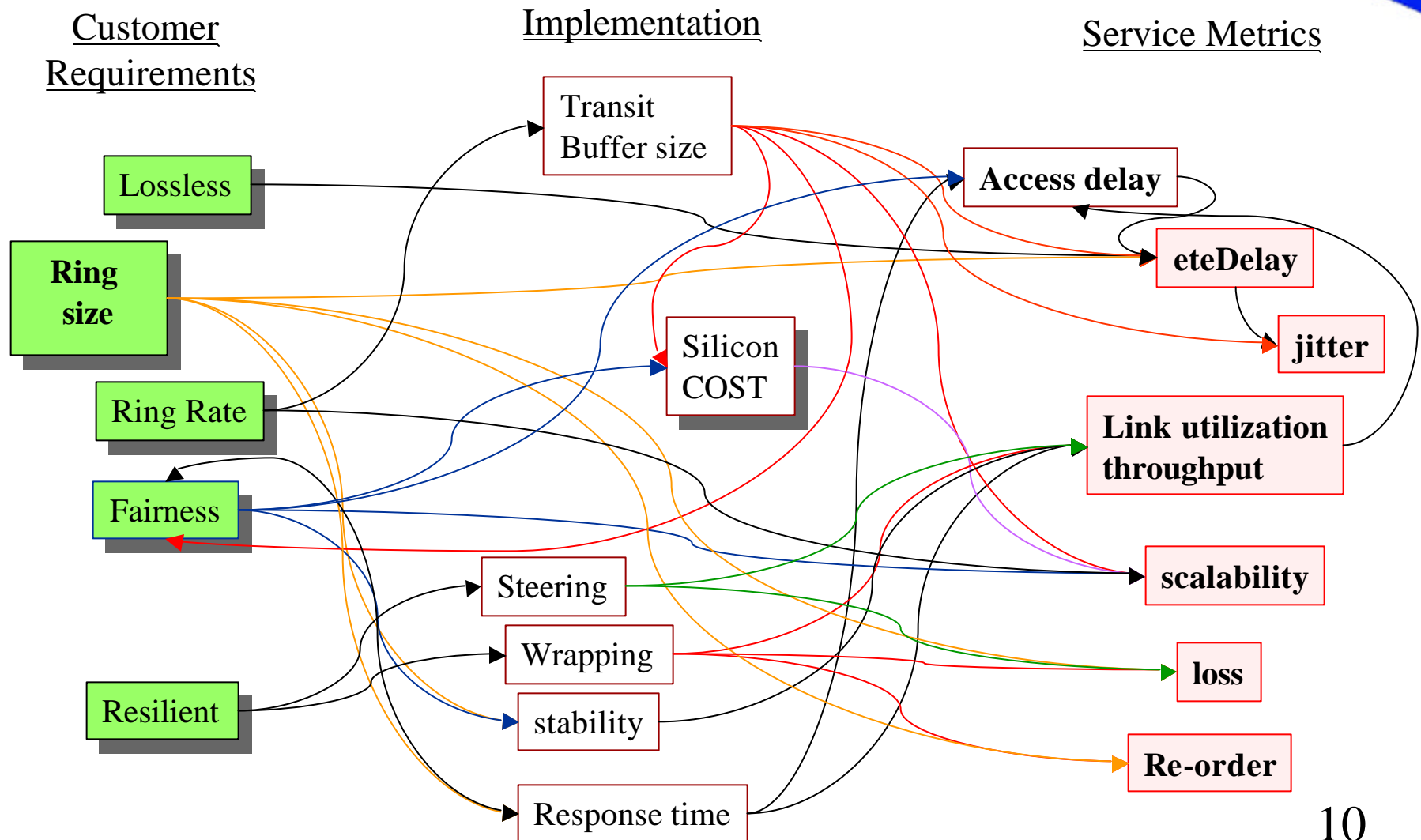
Bell Canada

- Size
 - MAN:
 - Metro Core ring: 8 nodes, 170 km, max span 15 km
 - Access ring: 2-6 nodes, 20-50 km
- Services
 - Carrier class transparent LAN service
 - Ethernet technology: reduce operation cost
 - VPN
 - Customer separation
 - Scalable to thousand to millions of VLAN
 - Lower cost higher BW
 - Higher BW demand: GE to customer
 - Support for multicast
- OA&M
 - Carrier Grade
 - Reliability
 - Resiliency
 - Scalable and flexible lowest cost per managed bit

Requirement Summary

- Size
 - Access
 - Metro
 - WAN
- Services Metrics
 - BW, Delay, and Loss
 - Impact RPR:
 - Oversubscribe, Congestion management/avoidance,
 - Buffering: Ingress and egress buffers, Tandem buffers
- SLA
 - BW
 - CIR: need traffic engineering
 - Weighted fairness for class
 - Differentiated service
 - Differentiate service: priority
 - delay and jitter
 - Five 9 availability
 - Protection
 - Non preemptable traffic
 - New Preemptable service: No protection on failure.
- Need tracability for all the services: simple OA&M framework

RPR Interrelationship Digraph



Implications

- Must limit the scope of application
 - Ring circumference
 - number of stations
 - E.g.
 - NHL all star play off, Cybercast cross USA but limited to 4 nodes.
 - Ring size 6000miles/9700km
- Have to ask “Does the implementation meet customer requirements?”
 - Link utilization
 - Customer requirements
 - Service support
 - Complexity
 - scalability
- Reduce Operation Cost
 - Operation complexity
 - Equipment cost

Conclusions: To get to the right Requirements

Use Carrier requirements to define a set metric for RPR specific Requirements (shall) and objective (should)

- Define the reference network
 - TTM is important, limit the scope
 - Understand competing technologies

- Metrics

- Fairness: must solve media contention
 - Support BW guaranteed service
 - Support weighted fairness for different ingress demand?
 - Support CoS performance parameters: BW, delay, jitter
- Protection
 - Support protected and un-protected services
 - Protection switch. (50ms)
- Operation Simplicity
 - Minimize operation cost: training, debugging
 - Facilitate network engineering
- Scalable
 - From 155 to 10G,
 - 40G and beyond
 - Feasibility, cost, complexity

Yes

No

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- Use the Metric to decide “is the requirement adequate?”
- Understand the interrelationship to make trade-off



Questions and Answers

References

- **Outages**

- <http://www.zdnet.com/intweek/stories/news/0%2C4164%2C406174%2C00.html>

- **NHL**

- <http://www.internetworld.com/040101/04.01.01internettech1.jsp>
 - <http://www.nortelnetworks.com/products/library/collateral/56010.43-03-01.pdf>