

RPR Requirements, A CLEC Perspective

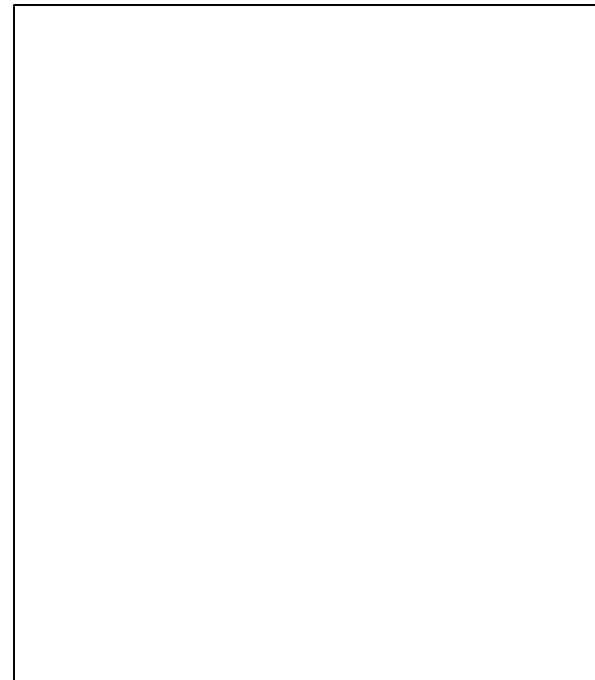
IEEE 802.17 RPR Working Group

Dave Milliron

dmilliron@evnetworks.com

A Greenfield CLEC

- Carrier's carrier
- Metropolitan networks in tier 1 cities
- 50-300 POPs per city
- Sub-1G to 8 wavelengths per ring
- Mixed transport media
- Services
 - TDM (backhaul)
 - VLAN, MAN, WAN
 - Internet & Data Center access



Network Map

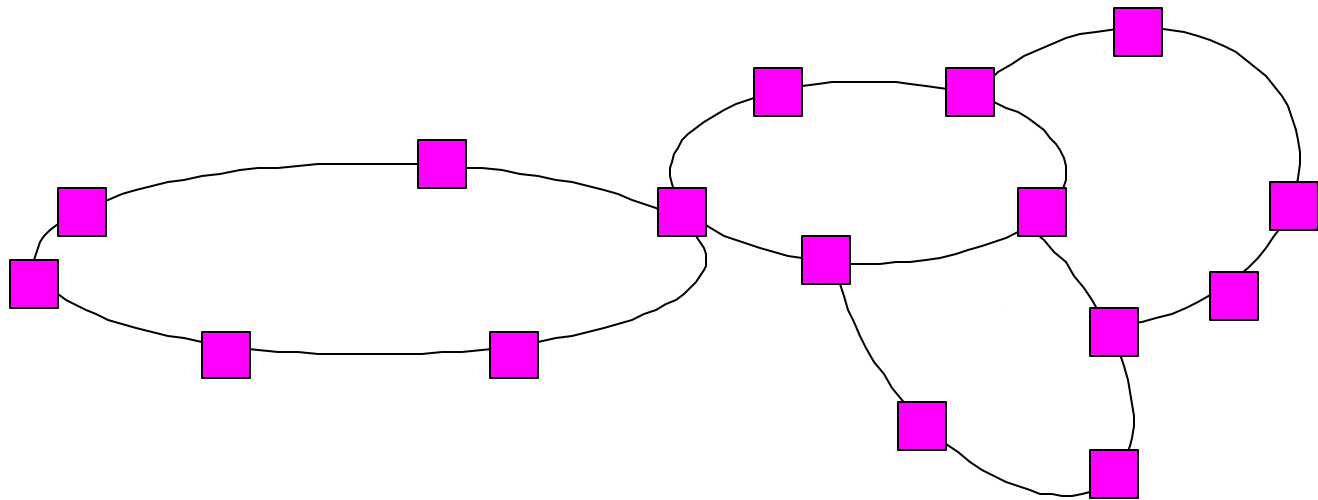
Ring Sizing

- **Metro**, Tier 1 city
 - POP spacing
 - Fiber 1 to 3.5 km
 - Wireless 3 to 10 km
 - POPs per ring
 - Fiber 15 to 30
 - Wireless 3 to 6
- **Regional**, Tier 2-4 cities in Eastern USA
 - POP spacing
 - Average 56.3 km
 - Maximum 116 km
 - POPs per ring
 - Average 22
 - Maximum 40

RPR Requirements

- Topology
- Ring speeds
- Transport media
- Mixed speeds
- Bandwidth
- Classes of service
- Legacy Transport
- Hooks
- Protection
- Interoperability

- Multiple subtending rings
 - Up to 4 layers
 - Dual attachment points on different rings



Ring Speeds

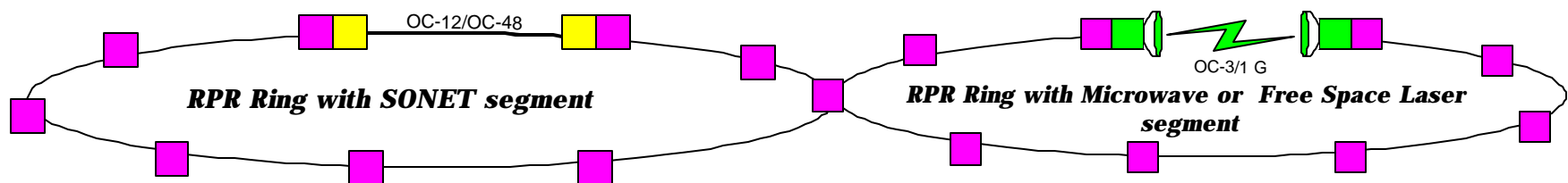
- Large rings
 - 1, 2.5 to 10G with WDM support
- Small rings
 - 100mbps to 155mbps
- Why? Fiber construction cost

Transport Media

- Lowest cost per km
 - New fiber construction \$25k-\$500k (1 km)
 - Dark fiber lease \$4.4k-10k (1 pair, 1 km)
 - Microwave \$55k (OC-3, 6.5km)
 - Free space lasers \$75k (1G, 1 km)
- Must have mixed media & capacity on same ring

Mixed Speeds

- Mix speeds on same ring
- Possible limit to min/max speed ratio
- Ring protection event
 - Affected by limited speeds
 - Can cause mixed ring speeds
- Affects flow control

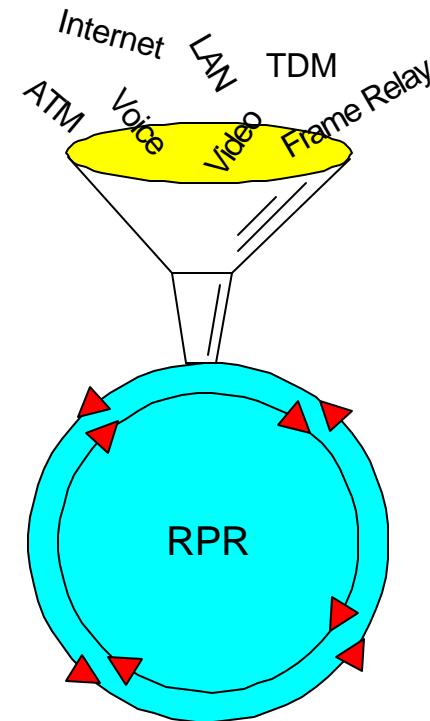


Ring Bandwidth

- Allocation resolution, 64Kbps
- Efficient utilization,
 - Spatial reuse
 - Low overhead
- Over subscription limit, 8:1
- Minimize
 - Packet overhead
 - Control messages

Classes of Service

- Need 4 to 6 classes
 - Dedicated bandwidth synchronous
 - Dedicated bandwidth asynchronous
 - Dedicated + burstable
 - Best effort
 - 1+1 Protected paths
- Optimized for all traffic types



Legacy Transport

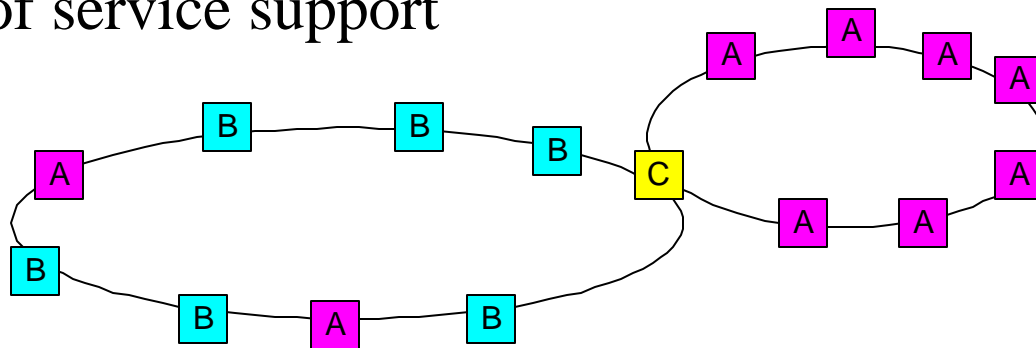
- T1, T3, OC-3 Circuit emulation
- Timing
 - CPE served by T1s are slaved timed
 - Timing insertion
- QOS
 - Equal or better than delivery over SONET network
 - BER, ES, BES
 - Jitter control mechanism

- Minimize packet loss
- 50 ms maximum path restoral
- Hitless return to original path
- Protection based on class of service
- Support 99.999% network availability

- Traffic flow monitoring
- Service creation
- Provisioning flexibility
- Performance monitoring

Interoperability

- Multiple vendors per ring
- Rings with differing equipment
 - Vendor A- high capacity box
 - Vendor B- low cost, low capacity box
 - Vendor C- very large hub
- Minimum feature set guarantees basic interoperability
- Common class of service support



Summary

- Minimize optional features that limit basic interoperability.
- Maximize flexibility so vendors can implement unique solutions and carriers can create new services.
- One standard for all.. Cannot cater to minority interests.