RPR Scope and Requirements

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50000 Foot View

- Goal of all members at 802.17 should be to rapidly develop standard to insure:
  - Resilient Packet Rings become the leading technology for the Metro market
    - everyone sells more equipment
  - enable vendor product differentiation & application space differentiation
    - companies compete on application space and value added features and not the base technology

What does this require?

- Pragmatic engineering
  - keep it simple
- Avoid feature creep
  - what features MUST be in the MAC
  - what features CAN be done outside the MAC
    - Allow box level differentiation for vendor value add
  - what features will make the standard too complex to be completed in a timely manner
- Limiting scope to a single ring for now
  - rings of rings or meshes of rings can wait

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- Dual counter rotating rings
  - scalable in terms of:
    - number of nodes
    - span speed and distance
  - data (and control) packets carried on both rings
  - resiliency to node or facility faults
  - fat pipe model
    - statistical multiplexing of packets
    - no channelization of RPR ring

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- Layer 1 agnostic
  - SONET, DWDM, CDWM, dark fiber
  - multiple speeds over SONET/SDH physical layers
  - 10 GE physical layer
  - all spans on the ring use the same physical layer
  - should adopt existing MAC / PHY interfaces where appropriate
    - SPI-3/4 for SONET/SDH

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- Plug and Play
  - no single points of failure
  - avoid past experiences with central point of failure/scaling issues
  - no central control servers required to join ring at MAC layer
  - automatic ring topology discovery required
  - 48-bit 802 MAC addressing
- Simplify network management
  - define standard MIB

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- Packet processing requirements
  - packet content agnostic
    - MAC doesn't care what payload a data packet contains
    - allows box / service differentiation and interoperability
  - minimize protocol overhead
  - destination stripping for uni-cast packets
  - support for broadcast (multi-cast) packets
  - no packet loss on ring except during protection event
    - minimize packet loss during protection event
  - bridging and routing supported
  - store and forward operation
    - simplifies clocking design of network

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- Distributed Bandwidth Management
  - master-less, token-less, fairness algorithm
    - avoid complexity under failure conditions
    - use local signaling between local node and neighbors
  - Traffic priority differentiation on ring
    - high priority for low latency / jitter – not subject to BWM algorithm
    - low priority for all other traffic that is managed by BWM algorithm
  - One BW domain

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- Intelligent Protection Switching
  - wrap traffic around fault
  - local node protection switching
    - fastest reaction time on local and neighbor information
      - giving lowest packet loss
    - local nodes can act autonomously
  - steering of traffic can occur later based on L2 or L3 information

Homogeneous Spans

- Simplify MAC and system design
  - homogeneous design allows for greater scalability
    - can design a dual MAC device
    - each ½ MAC does not have to run at a different rates
    - forward compatibility very difficult due to a higher speed MATE design that must be backwards compatible to the original design
    - easier to engineer high priority traffic
      - as compared to non homogeneous case

Simplify Network Clocking

- Nodes are independently (locally) timed
  - allow line timing at user request
    - Allows for interoperation with ADMs and WDM
  - no requirement for global clock distribution
- simple Layer 2 synchronization
  - avoids packet loss at MAC layer
    - insert a small amount of idle time on faster nodes

Queuing

- MAC should support a small number of queues and simple scheduling:
  - add path: control, high and low priority
  - drop path: single queue
  - through path: high and low priority
- Box can support more queues + complex scheduling
  - differentiation / value add
- Congestion control is a system / box level issue
  - once launched into the ring, packet should be delivered from ring
  - higher layer can determine if packets should be dropped

Achieving 802.17 Goals

- Rapid standardization has occurred when standards committees have adopted leading industry technology as basis for standard
  - Xerox Ethernet
  - IBM Token Ring
- Spatial Reuse Protocol provides the features to
  - create RPR products that meet customer requirements
  - provide vendor differentiation to foster competition