NETWORK REQUIREMENTS FOR RPR

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NETWORK REQUIREMENTS

- SERVICES TO BE SUPPORTED BY RPR.
- MAINTENANCE, FAULT LOCATION, PREVENTIVE MAINTENANCE.
- MINIMUM TRANSIT DELAY PROTECTION.
- CARRIER CLASS AND BEST EFFORT PERFORMANCE
- NETWORK AVAILABILITY
- SUPPORTING PHYSICAL TOPOLOGIES
- LINE RATES AND SYMMETRY

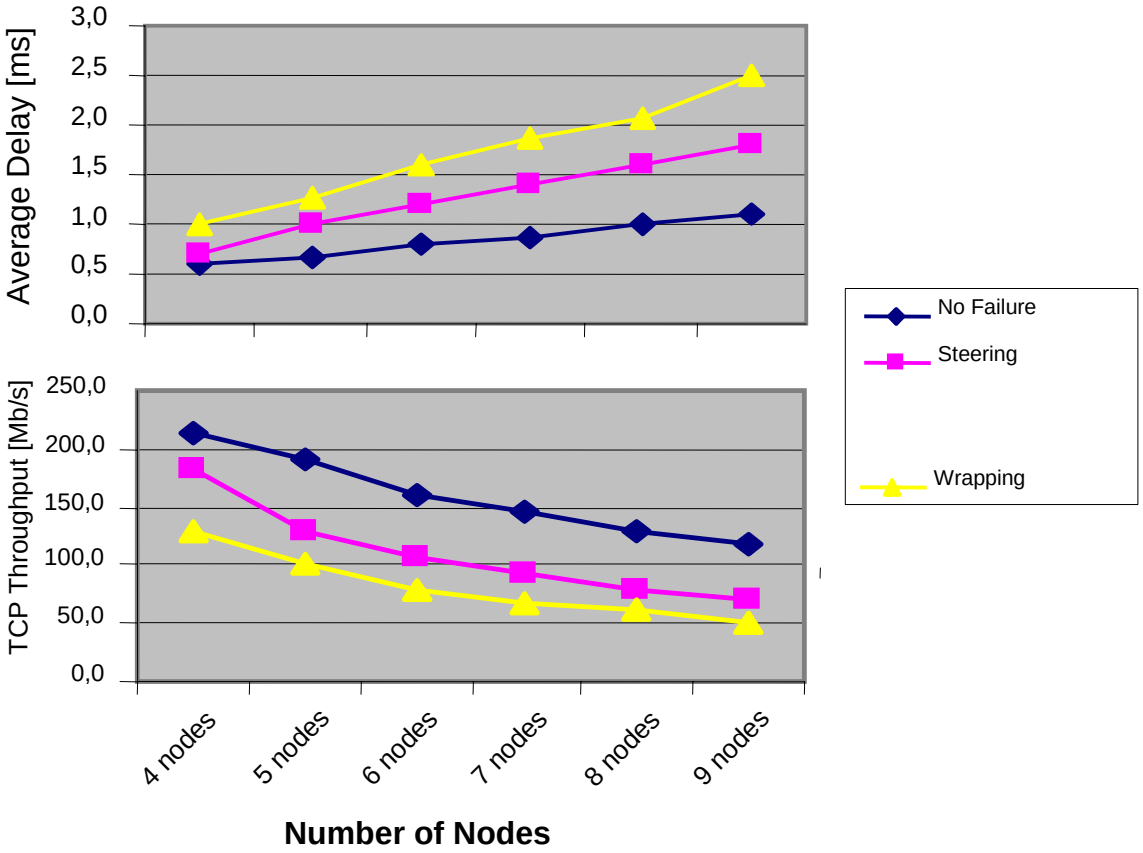
SERVICES TO BE SUPPORTED BY RPR

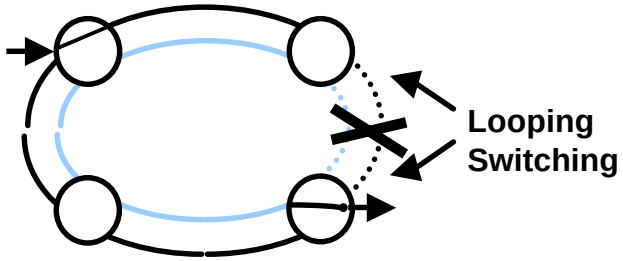
- **Extended LAN CAGR 74% in the US, with revenues of $1B in 2001. [The Yankee Group]**
- **Residential WEB Access in Sweden**
  - **$200 installation, $20 a month fees**
- **Business Access TLS in the US**
  - **Metro LAN services at $1000 F for a 3-4Mb/s throughput per month.**

MAINTENANCE, FAULT LOCATION, PREVENTIVE MAINTENANCE

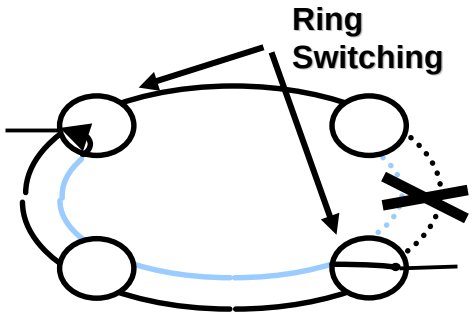
- The RPR should process BER to track hard and soft failures.
  - Soft failures include dirty connectors, fiber humidity, and lasers degradations. Performance monitoring processing allows to perform quality assessments on the service and preventive maintenance.
  - Hard Failures include fiber and interfaces failures.
- This facilitates also protection based on BER.
- → SDH interfaces already support maintenance in its broadest scope. No additional definitions are required in the RPR layer.
- → With Ethernet PHY interfaces (except WIS on 10GbE), some new mechanism is required in the RPR layer.

MINIMUM DELAY PROTECTION MECHANISM





Wrapping protection



Steering protection

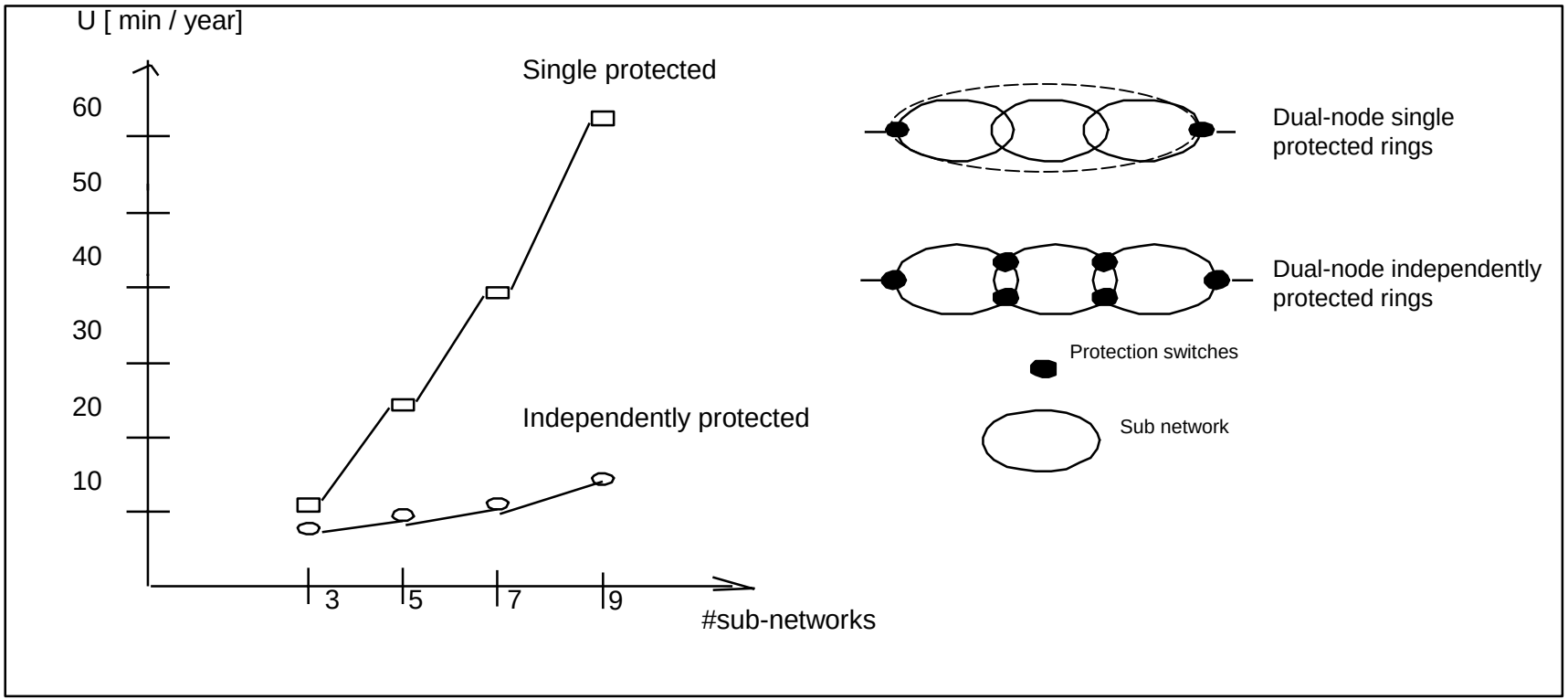
CARRIER CLASS AND BEST EFFORT PERFORMANCE SERVICES

- **Most of the telecom operators revenues come from carrier class services.**
- **Services with committed and guaranteed rate levels.**
- **Services as above with the possibility to exceed committed rate using best effort capacity, if network resources utilization allows.**
- **Best effort services, supporting CoS, will use low priority capacity and implementing overbooking.**

NETWORK AVAILABILITY

- **Metro fiber cables break very often:**
- **Fiber MTTR: 12-24 hours**
- **Fiber MTBF: 1 Failure every 10-20Km per year.**
- **So means to improve network availability like dual node interconnection (like Drop and Continue) are also recommended.**

NETWORK AVAILABILITY

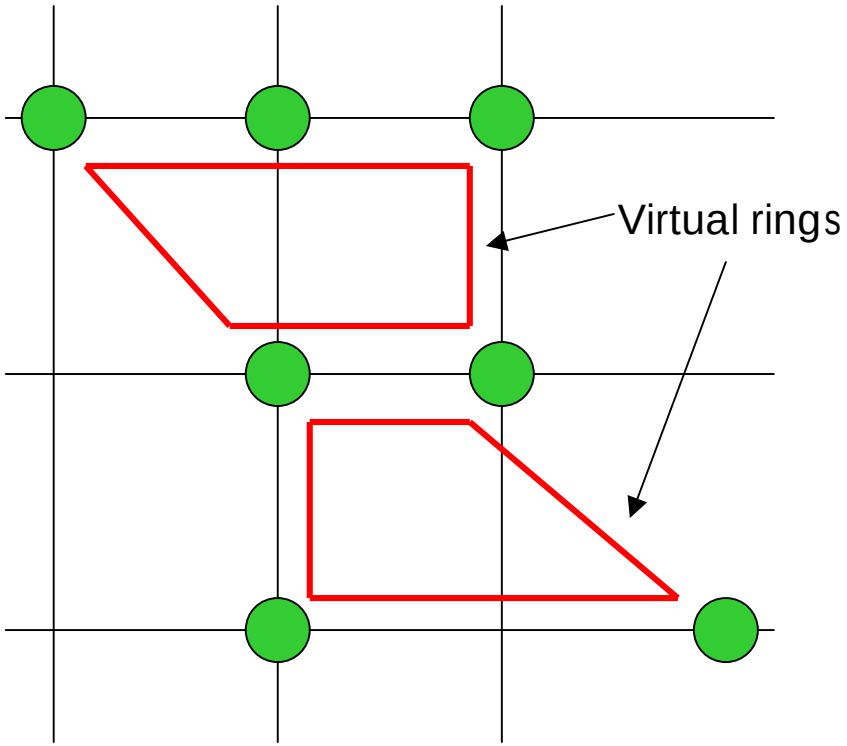


SUPPORTING PHYSICAL TOPOLOGIES

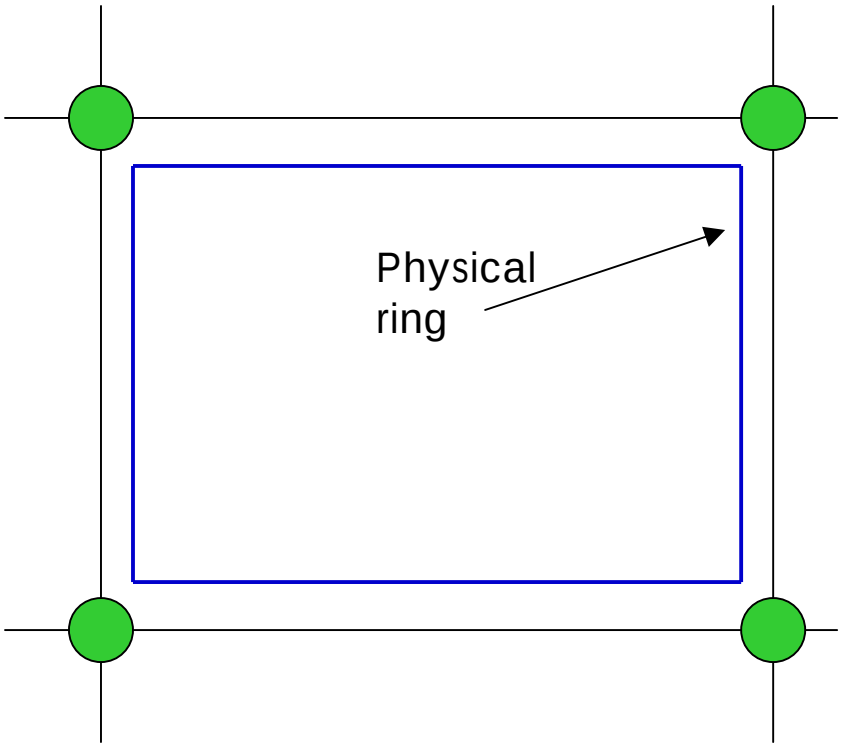
- **Established operators have a very well meshed cable infrastructure in the metro area and second operators have very little fiber availability to make their networks.**
- **The possibility to implement virtual rings irrespectively on the underlying physical topologies is a solution that satisfy meshed and ring requirements for both operators physical topologies.**

SUPPORTING PHYSICAL TOPOLOGIES I

Established operators



Second operators



LINE RATES

- Line rates from STM-1 to STM-64 and above:
  - 1 GbE and 10GbE interfaces
  - STM-1 and STM-4 rings for low density areas
  - STM-16 and STM-64 rings for high rise areas.
  - Above STM-64 for future applications

CONCLUSIONS

- **Maintenance is a fundamental network functionality:**
  - **This is already available in SDH interfaces and paths.**
  - **The implementation of BER detection and proactive maintenance in GbE interfaces could be left for future study.**
- **Transmission delay can be minimized using steering protection.**
- **For multi-ring physical topologies, dual node interconnection improves significantly network reliability .**
- **In well meshed physical topologies, virtual RPR applications improve fiber utilization and network availability.**