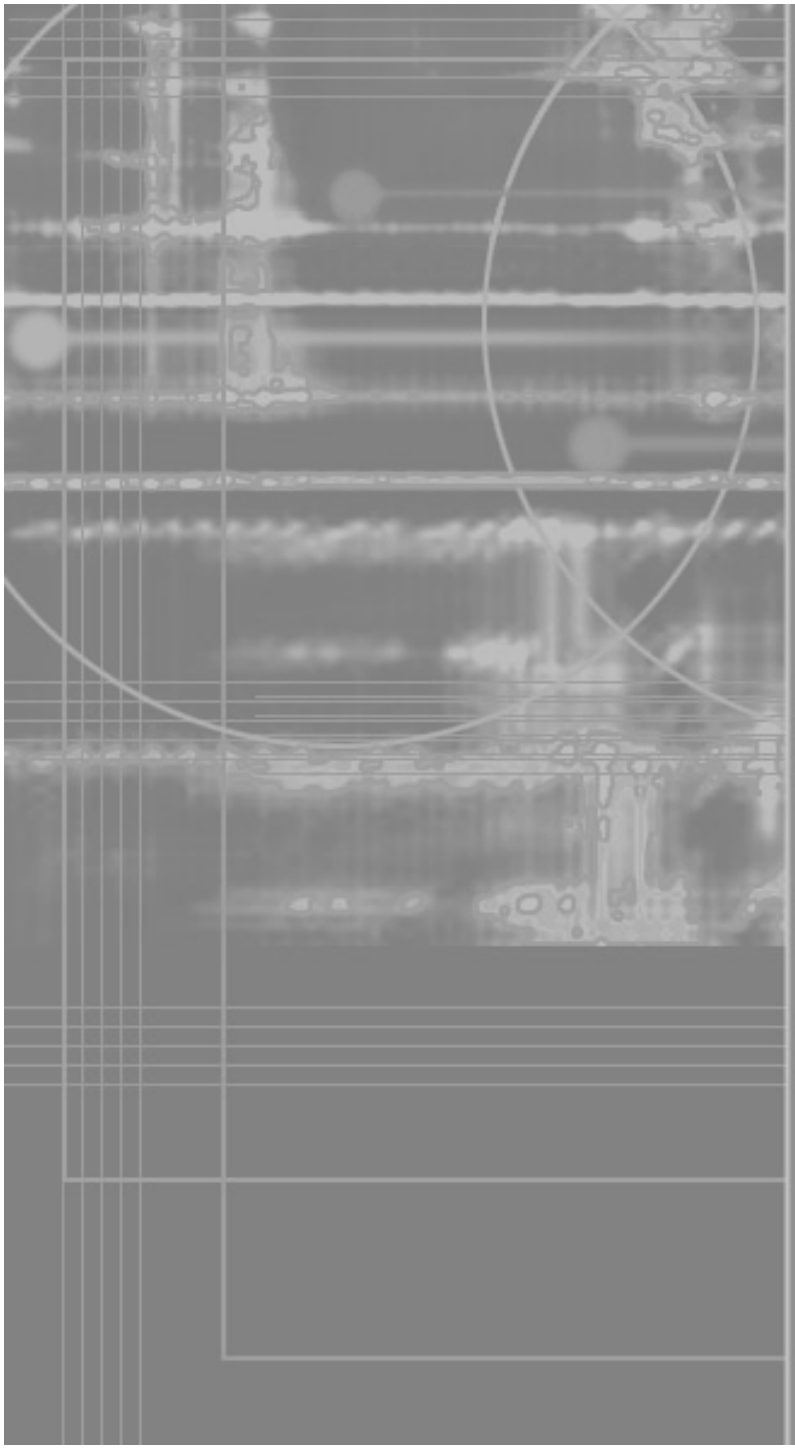

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RPR Rings vs RPR over SONET Rings

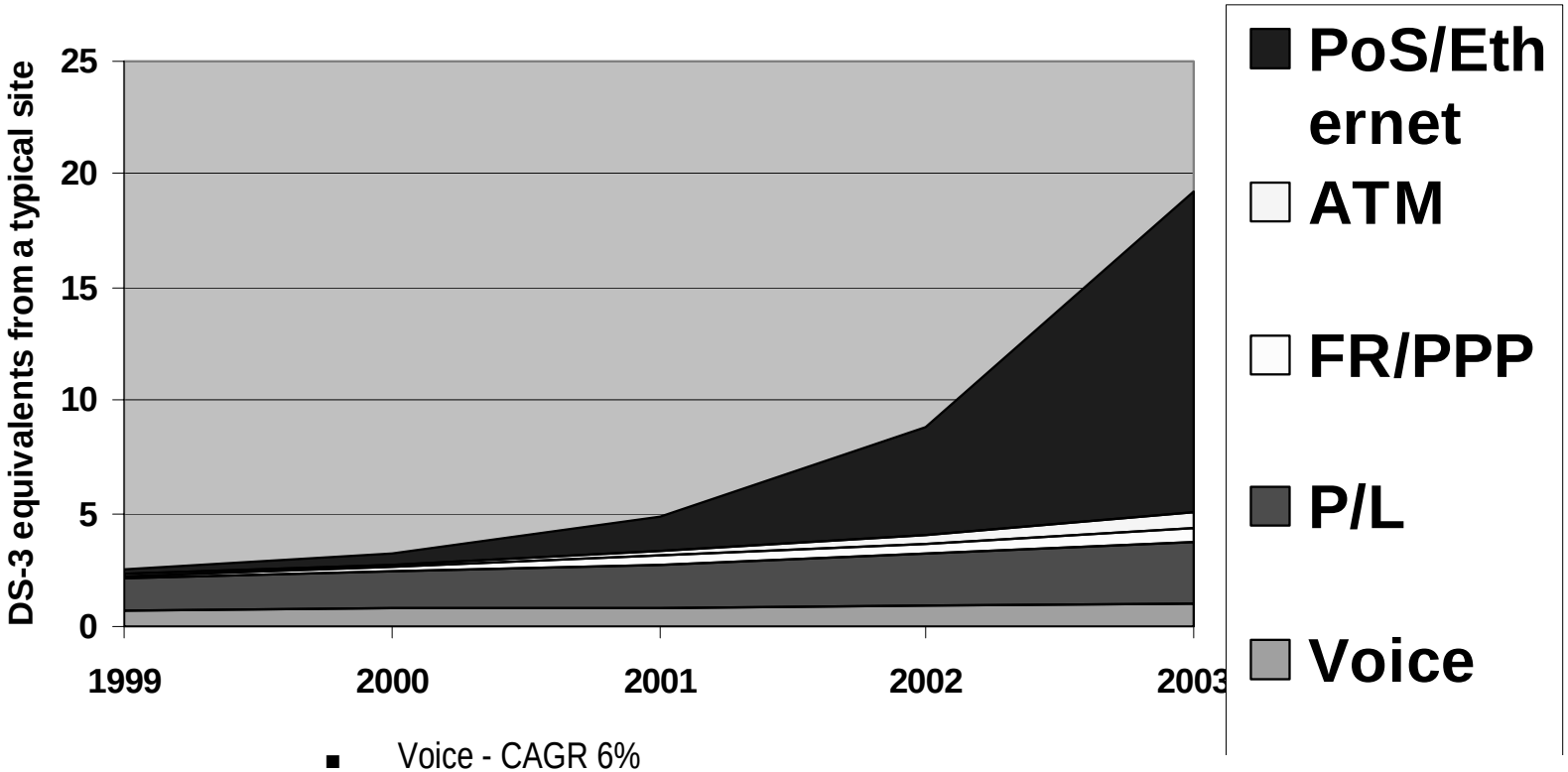
Outline

- Objectives
- Metro Traffic
- Metro Network Architectures
- Possible Network Solutions
- Study of one ring
- Assumptions
- Results
- Conclusions

Objectives

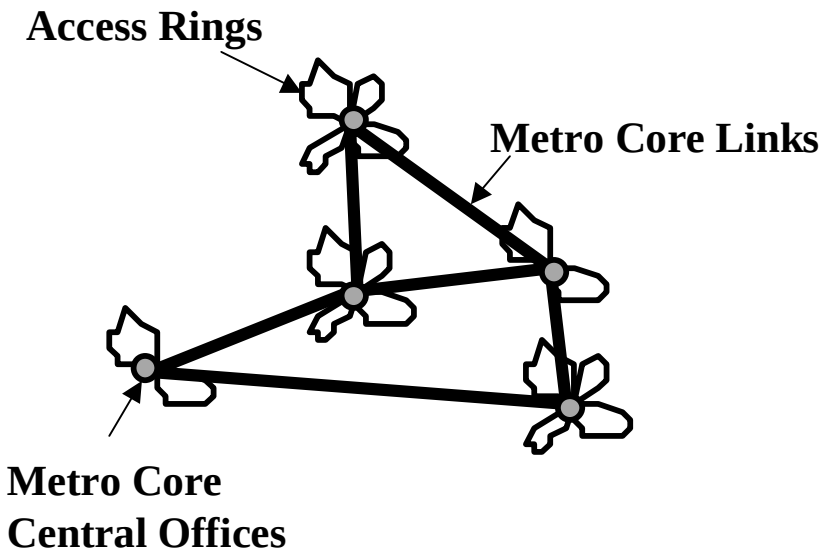
- Understand the value of RPR ring solutions with competing solutions
- What is the value of running RPR on its own versus over SONET
- Assume RPR Ring solutions will have similar price/performance as today's enterprise Ethernet switches
- Assume latest SONET price/performance in the market

Traffic Demand



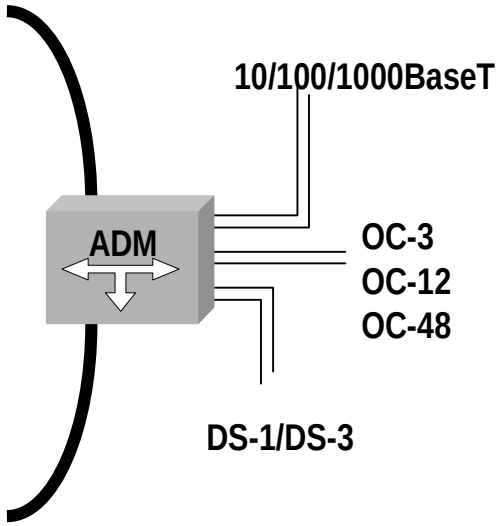
- Voice - CAGR 6%
- Private Line - majority of access traffic - CAGR 20%
- IP/Ethernet - CAGR - 200%, most access becomes via Ethernet
- ATM - small fraction but grows at 100%
- FR - CAGR 35%

Metro Network Architecture



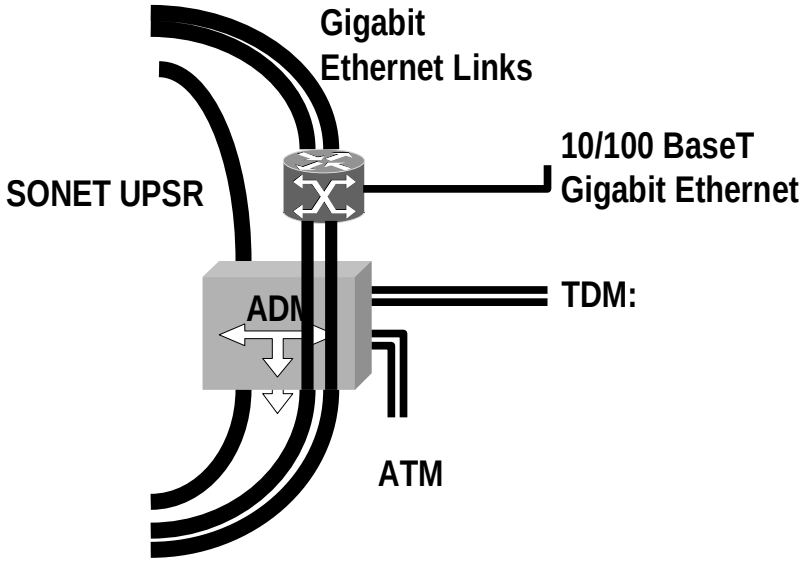
- Small diameter access rings with larger links for inter-CO
- Most/all traffic on access rings travels to CO
- Metro Core links may have access ADMs but less likely

SONET with RPR



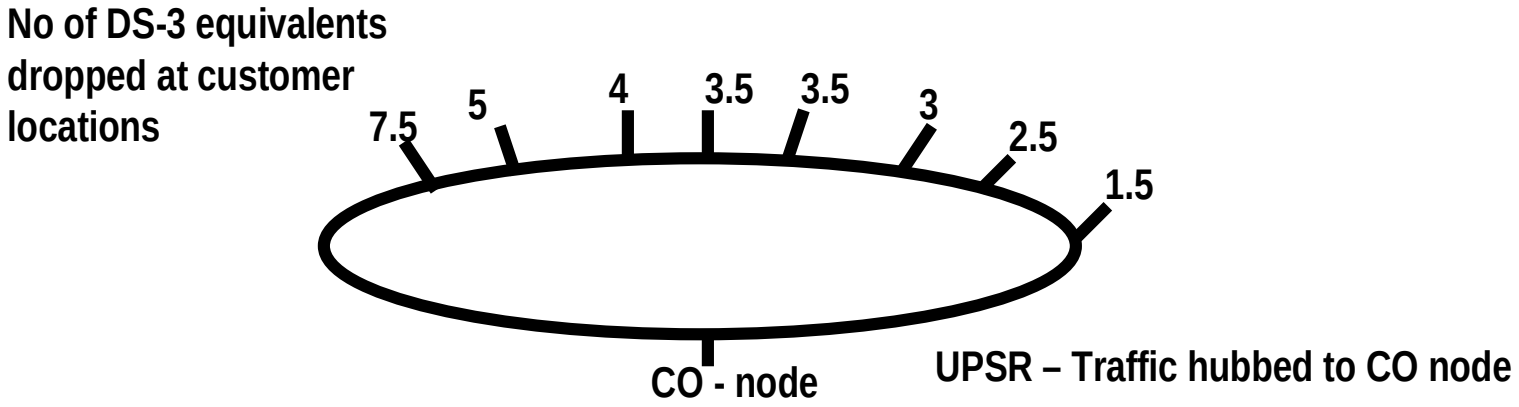
- Assume newer high density SONET with cross-connect capability
- RPR based rings run over SONET as un-protected traffic
- RPR traffic uses SONET framing and run as a concatenated signal
- SONET accesses traditional TDM traffic from DS-1 to OC-48
- In study assumed OC-48 SONET UPSR rings with an overlaid RPR ring with OC-n (n = multiple of 3)

RPR and SONET in Parallel



- New SONET and RPR rings are built as parallel networks on different fibers
- RPR rings are 1 Gb/s rings
- SONET rings are OC-48 rings
- Assume fiber is fairly cheap

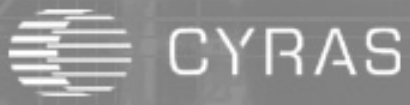
Modeling of a Single Ring



- Peaked Traffic reflecting some large buildings
- Average of 8-10 nodes per ring
- All Traffic hubbed to CO node

Assumptions

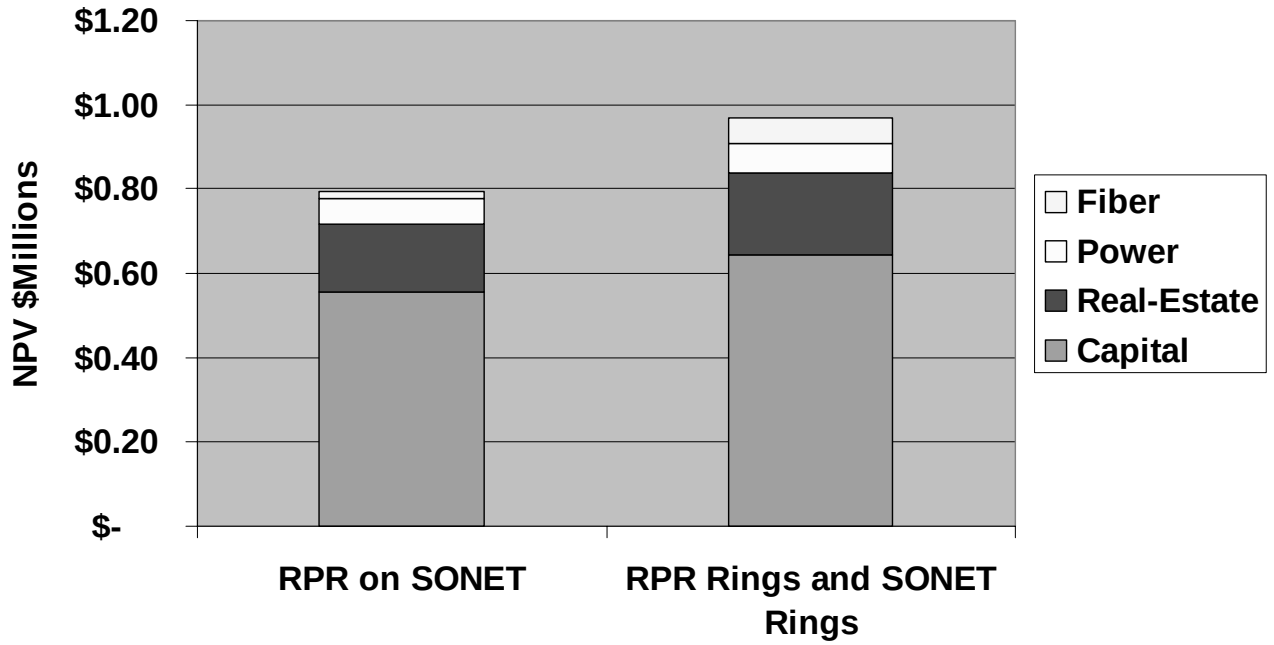
- Key Prices Used
  - SONET Equipment
    - Chassis - $12K (Can handle 2 OC-48 Rings) - takes 1/4 of rack
    - OC-48 - $6K
    - 10/100 Per Port Cost - $400
    - Gigabit Ethernet Per Port Cost - $2000
  - RPR Based Switch
    - Chassis - $6K (can handle 2 Gig E rings) - takes 1/8 of rack
    - 10/100 Per Port Cost - $200
    - Gigabit Ethernet Per Port Cost - $1500
  - **RPR based switches at most 60% of SONET switch costs**



Other Assumptions

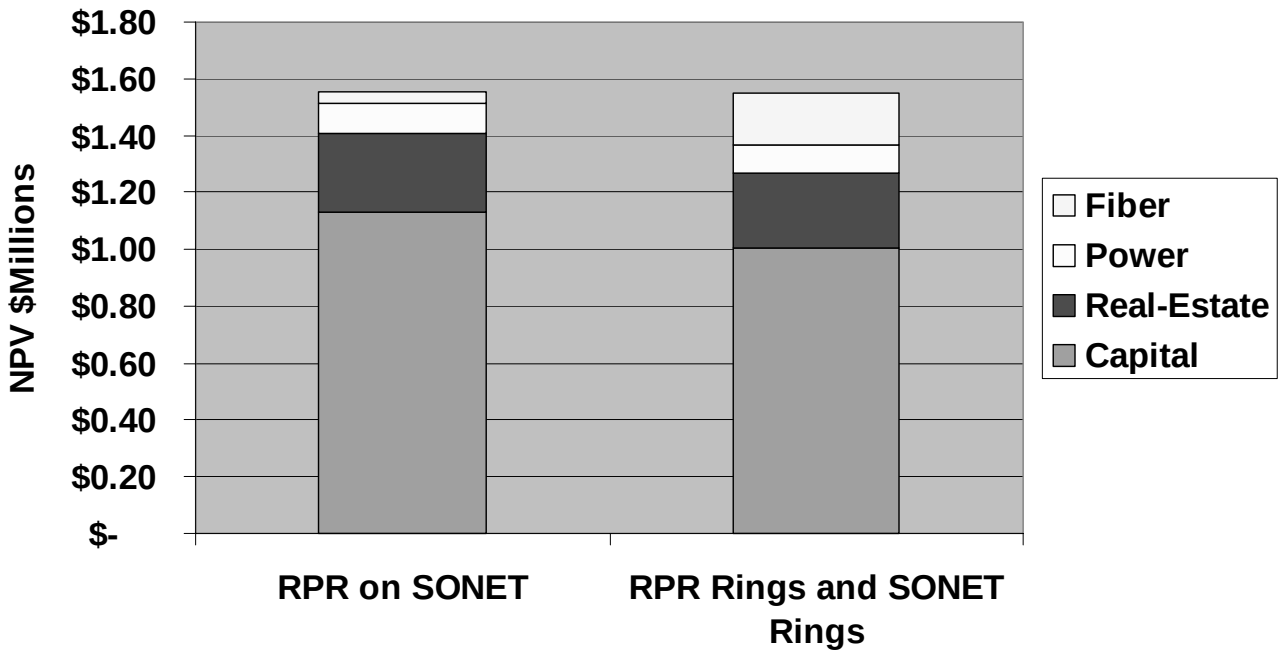
- Real-Estate Costs - $800/month/rack
- Power Costs - $300/month/rack
- Fiber Costs - $500/fiber/mile (one-time)
- Interest Rate - 9%

Results - NPV to 2001



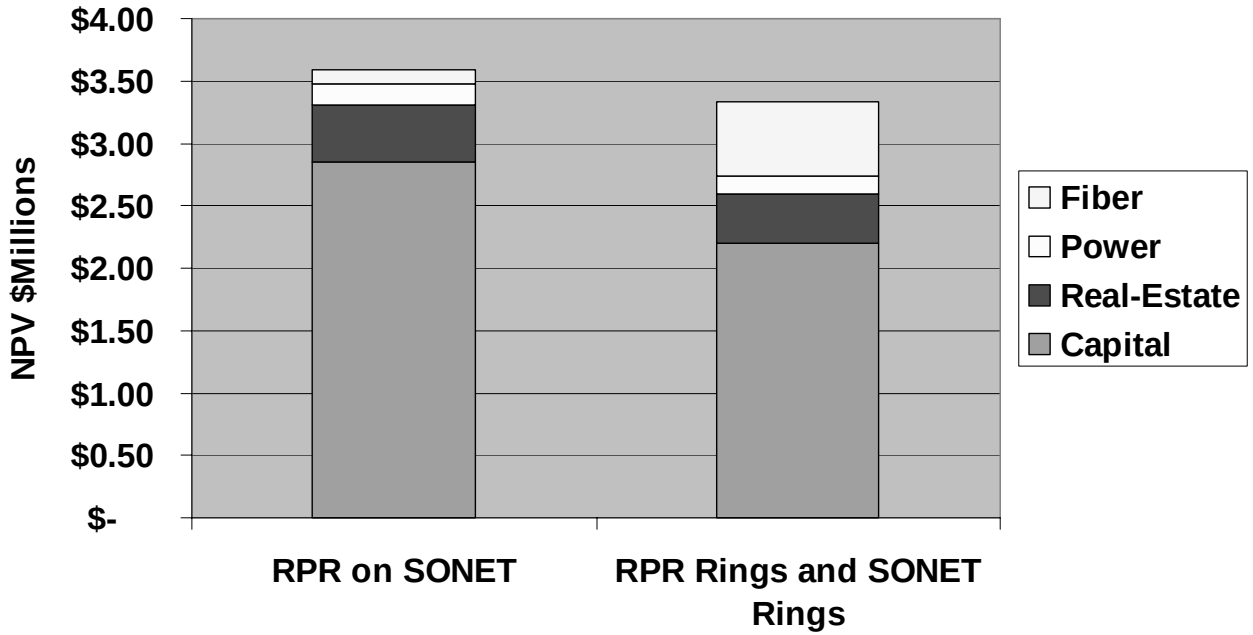
- Fairly even mix of Ethernet and non-Ethernet traffic (60:40)
- Integrated Solution is about 20% lower cost

Results - NPV to 2002



- Ethernet to non-Ethernet (60:40)
- Fairly even cost solutions

Results - NPV to 2003



- Ethernet to non-Ethernet (75:25)
- Parallel network solution better due to better cost/port and chassis costs

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Key Conclusions

- The results be even more tilted towards RPR on SONET when total network management costs are included as managing two separate networks would be more than one network
- When fiber costs are high, it would favor the single network solution of RPR on SONET even more as passive DWDM costs are about $800-$1000 per lambda on each end.
- With active DWDM the penalty of having more lambdas would be even higher
- The parallel networks solution does appear to be cheaper with 75% or more of Ethernet traffic
- RPR on SONET is likely a more efficient solution for a large majority of types of traffic cases