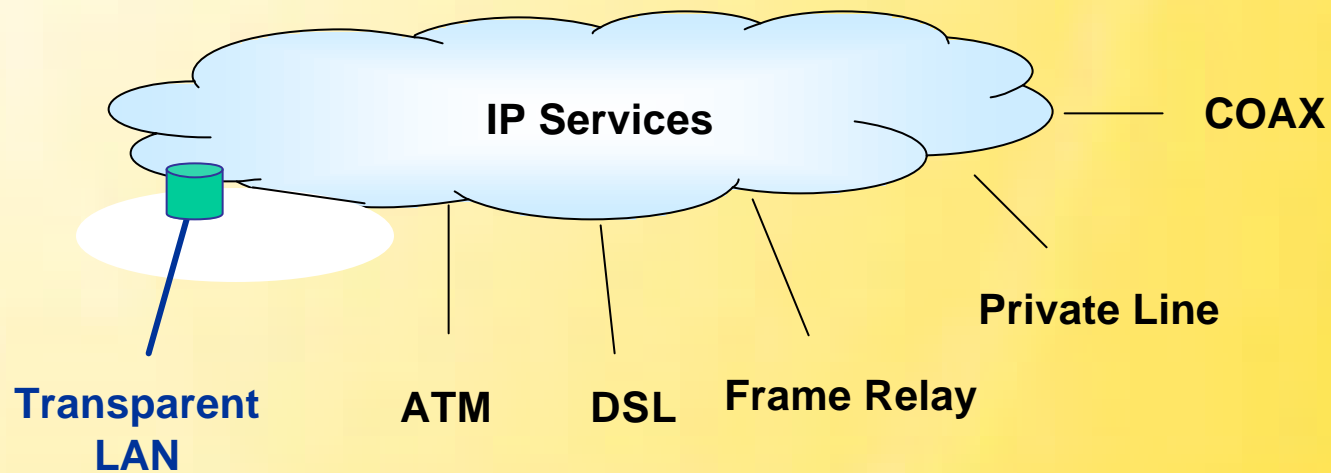# Last Mile Ethernet

Darrell Furlong

11/07/00

Today's MAN's

- *Typically Based on SONET*
- *Relies on TDM*
  - *nails up bandwidth*
- *MAN's slow compared to LAN;s*
  - *Typical speeds...DS-0 up to OC-3 max.*
- *SONET-based MANs expensive:*
  - *equipment*
  - *specialized staff (Too Many Ph.D's per mile)*
  - *months to provision new links.*
- *Media:*
  - *Copper, Fiber, Air*

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WAN Service Model

IP Services

COAX

Private Line

Transparent
LAN

ATM

DSL

Frame Relay

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Standards Activities

- ## *IEEE 802*
    - *802.3ae; 10Gigabit Ethernet Working Group*
    - *RPR; Resilient Pack Ring Study Group*
    - Ethernet in the Last Mile "Call for Interest"

- ## *IETF*
    - *IPoPTR; IP over Packet Transport Rings*

- ## *T1X1.5 Optical Hierarchical Interfaces*
    - *T1X1.5/99-038 IEEE 802.3 MAC frames to SONET payload*
    - *T1X1.5/99-268 Generic format...carrying Ethernet MAC frames over SONET*

- ## *Optical Internetworking Forum*
    - *OIF99.138 Generic format...carrying Ethernet MAC frames over SONET.*

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Media Options

- *It's not just Fiber! Maybe it should be?*

- *Investigate other options?*
  - *MMF and SMF*
  - *Copper (DSL based)*
  - *Air (Fixed Wireless)*
  - *Cable (COAX)*

- *Topologies to consider*
  - *Point-to-Point (2 node ring)*
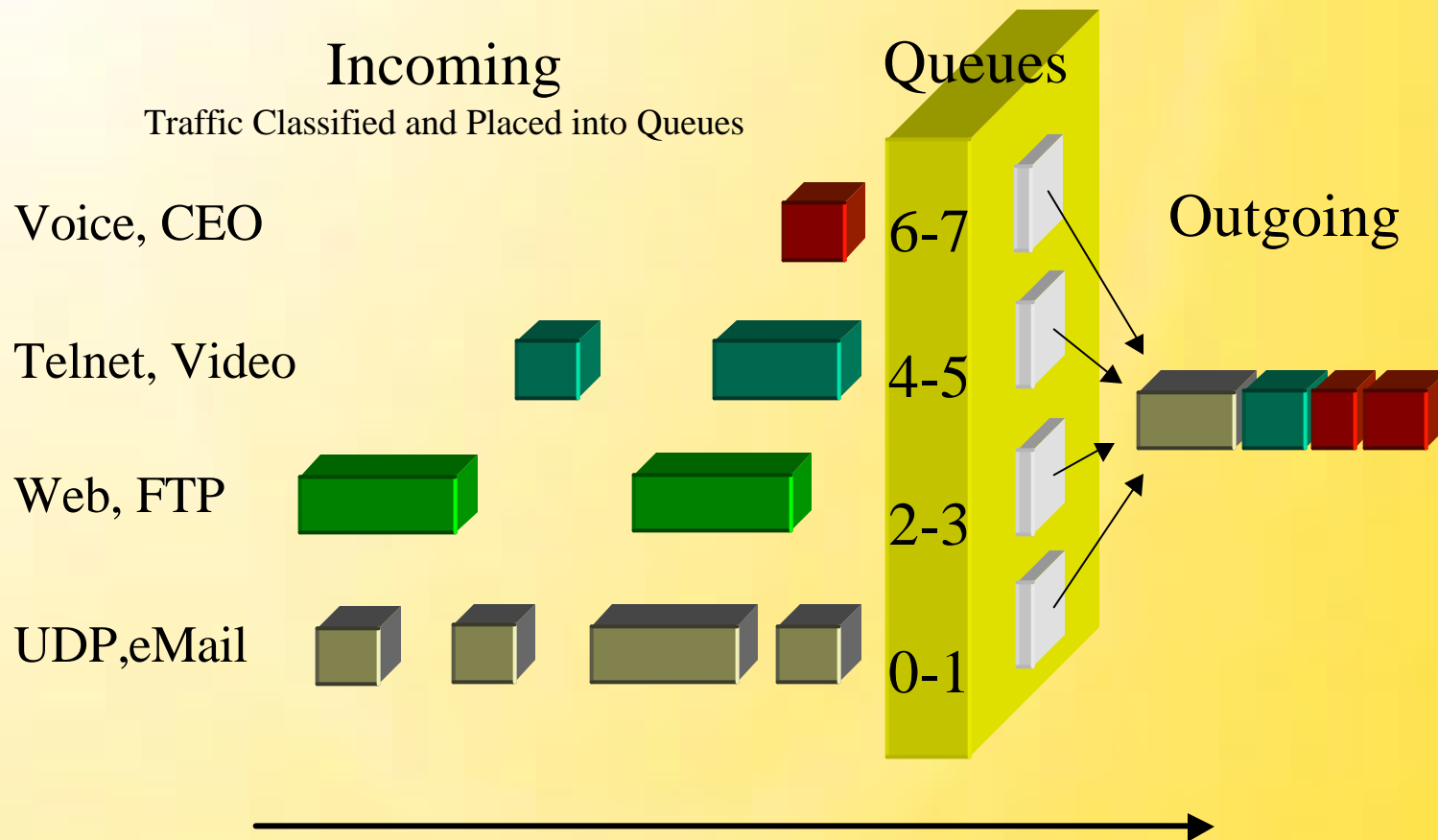 - *Ring with 3 or more nodes*
  - *DWDM*

Major End Point Functions

- *Central Office and "Point of Presence"*
  - *Provide WAN connectivity for Backbone Router*
  - *Concentration of Customer(s) Traffic*
  - *Offloads Routing Layer from WAN Cloud Physical changes*
  - *Management Interface for access loop*
- *Customer Premise Equipment*
  - *Provide Manageable Edge Access into the WAN Cloud*
  - *Identifies Service Providers Demarcation Point*
  - *Enables Traffic Grooming onto the WAN Transport*
  - *Provide Service Provisioning*

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Security

- *Use VLAN Tagging Technology.*

- *Service Provider offers Transparent LAN Service*

- *VLAN tag administered by SP*

- *Customer traffic is isolated by VLAN tag:*

    - *No need to administer IP addresses*

    - *No need to administer Ethernet MAC addresses*

    - *Broadcast domains limited to VLAN*

    - *VLAN to MPLS mapping used for Routed Backbone*

- *Source Destination MAC address filtering.*

Traffic Classification & Priority

Incoming

Traffic Classified and Placed into Queues

Queues

Outgoing

Voice, CEO

6-7

Telnet, Video

4-5

Web, FTP

2-3

UDP,eMail

0-1

Remember Theses?

- ***Constant Bit Rate***
    - *Voice, Video, Lease Line Emulation*
- ***Variable Bit Rate "Real Time"***
    - *Compressed Voice, process control*
- ***Variable Bit Rate "non-Real Time"***
    - *transaction processing*
- ***Available Bit Rate***
    - *email, WEB, and FTP*
- ***Unspecified Bit Rate***
    - *best effort, SNMP*

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Not Just for Service Providers

- **Enterprise Campus**
    - *Currently installing Fast Ethernet and Gig.*
    - *Leasing Dark Fiber*
    - *Want high availability*
    - *Replace FDDI Rings*

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Market Opportunity

Gig E Metro Opportunity
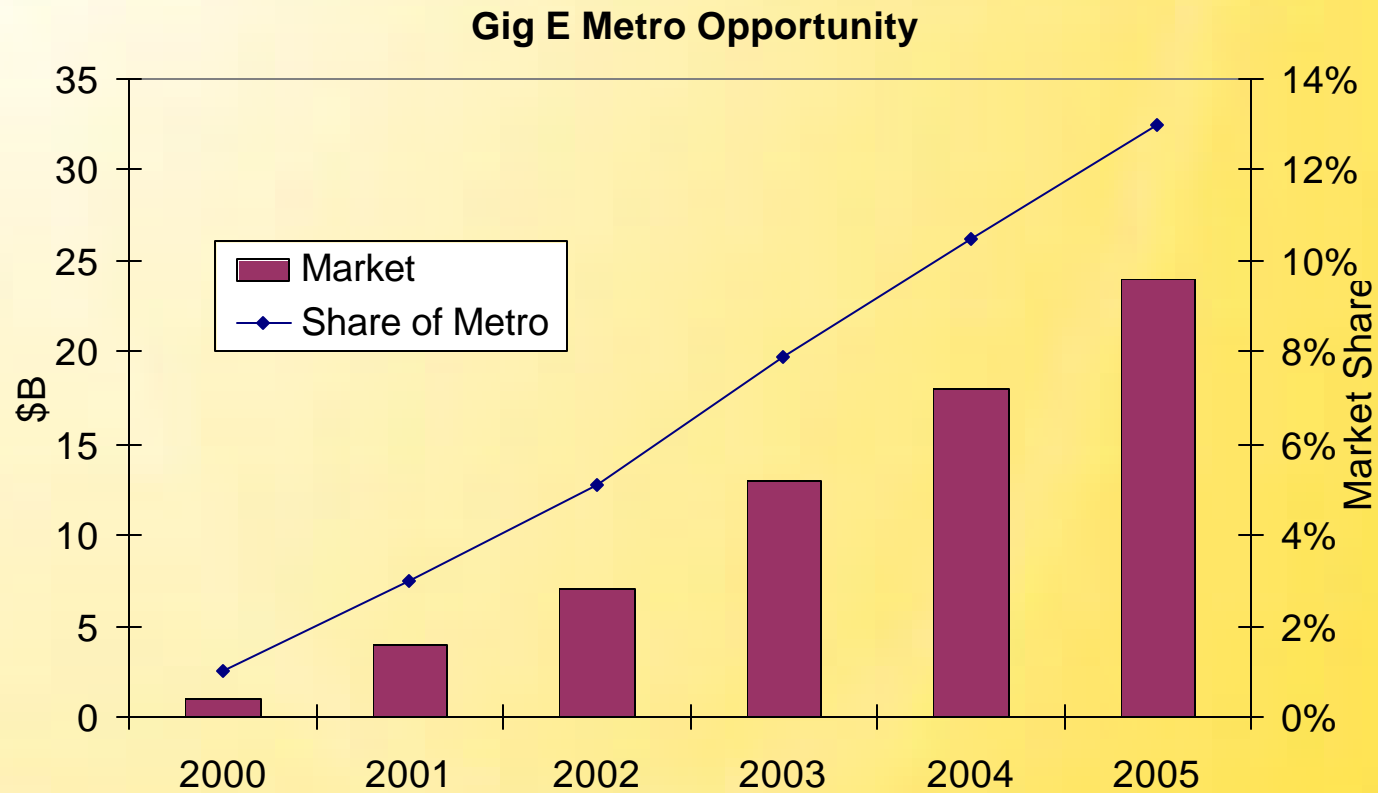
Source: CIBC World Markets, NGN2000 Telseon

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Some Nuts and Bolts

- **Ethernet WAN Standard Should Address**
  - *Inband Management (like SONET)*
  - *Remote Loopback (like DSU/CSU's)*
  - *Built in BER management objects*
  - *Restoration and Protection*
  - *Topology Agnostic*
  - *Nesting of VLAN Tags (SP Administered)*
  - *Granular bandwidth (Sub-rate provisioning)*
  - *Traffic Management and Classification*
  - *Discard eligible for over subscription*
  - *Full Duplex Only*
  - *SONET Friendly*

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