

Optical Technologies & Services in SBC's Metro Transport Network

Mehran Esfandiari
SBC Communications



BroadNets 2004

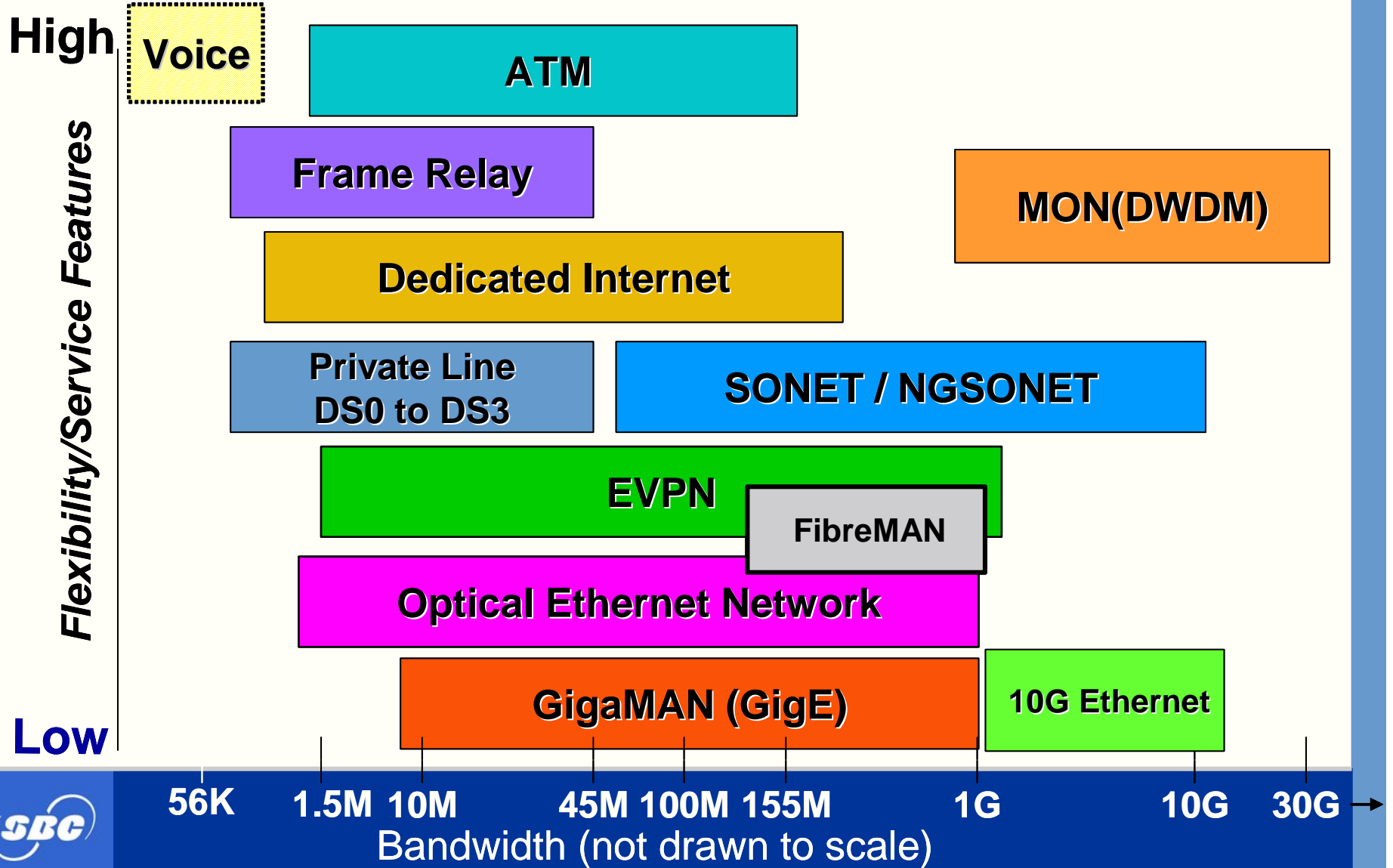
San Jose, California

October 26, 2004

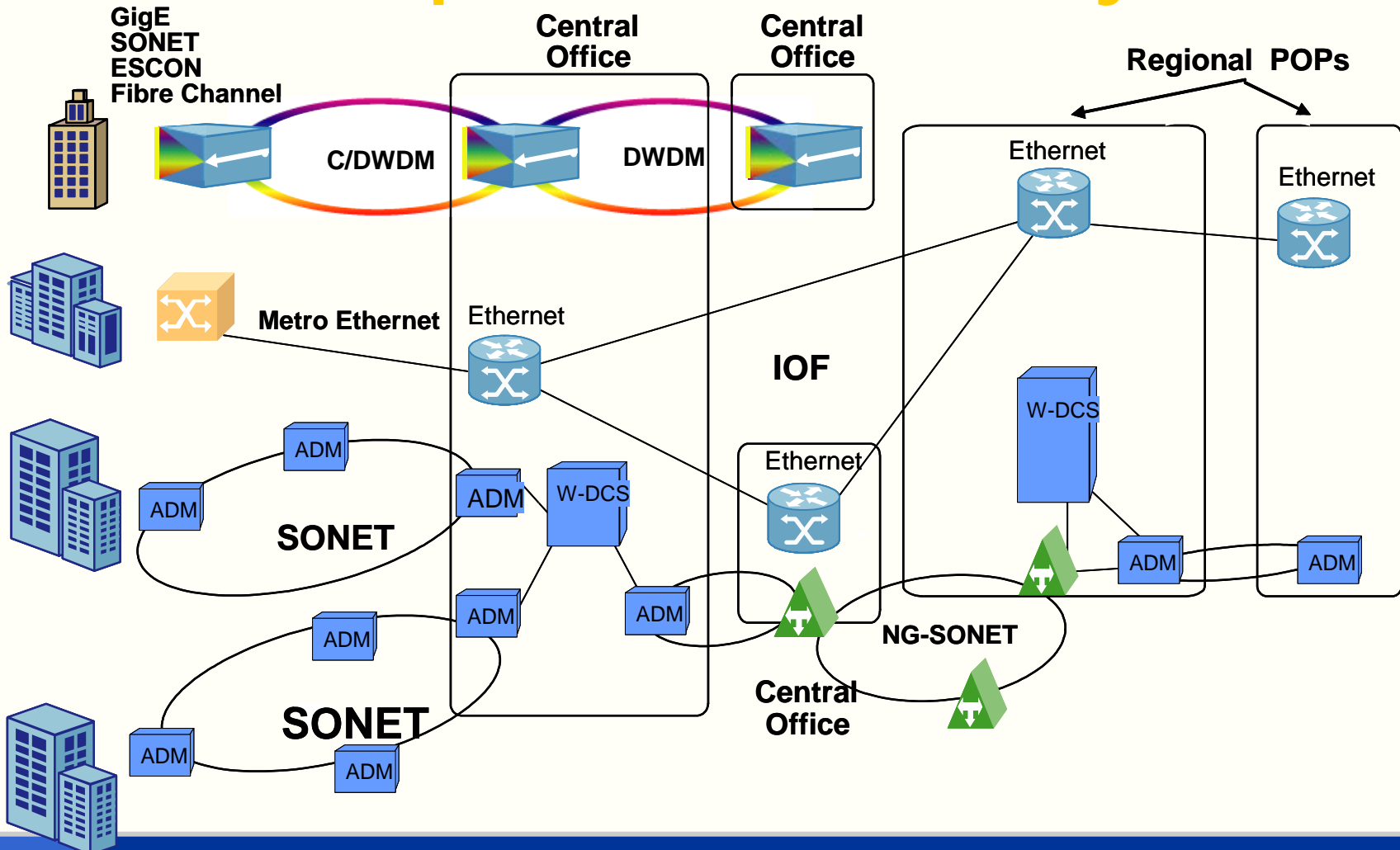
Architecture Drivers

- **Infrastructure Drivers**
 - Metro Fiber Capacity
 - Scale, Cost & Density Improvements
 - Network Element Consolidation
 - Common Network Management / Control Plane
- **Product Drivers**
 - Support for Legacy Services
 - Maintain Carrier Class Reliability – SLA
 - Customer Network Management Capabilities
 - Build towards Optical Ethernet Ubiquity
 - Ramp-up of Wavelength based Products

The SBC Data Product Continuum



Metro Transport Network Today

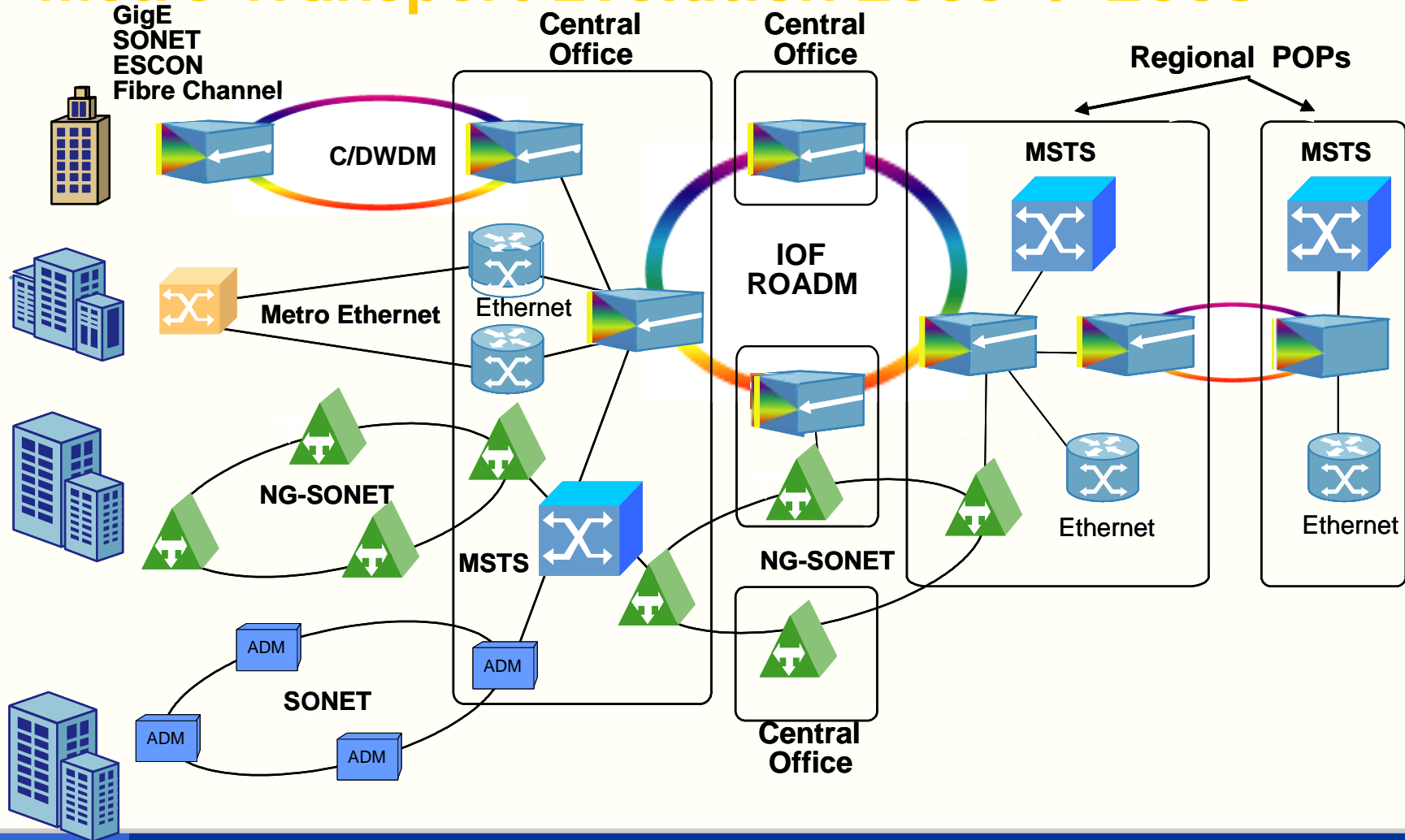


Access

Metro

Long Haul

Metro Transport Evolution 2005 → 2008



Access

Metro

Long Haul

Service [Capacity]	Protocols	Applications	Performance /SLA's	Cost per MB
<u>GigaMAN</u> [1 Gbps]	Gigabit Ethernet	<ul style="list-style-type: none"> • Pt to Pt connections only • Server farm/data center connectivity 	<ul style="list-style-type: none"> • Moderate • High (with APS & diversity options) 	Low
		<ul style="list-style-type: none"> • LAN extensions – HQ to branch • VoIP • SAN and remote data backup 		Lowest
<u>FibreMAN</u> [up to 2 Gbps]	Fibre Channel 1 Gbps/ 2 Gbps	<ul style="list-style-type: none"> • Pt to Pt connections • SAN and remote storage connectivity • Main frame computer connectivity 	Moderate	Low
<u>OPT-E-MAN</u> [10 Mbps to 1 Gbps]	Gigabit Ethernet 10/100 BaseT	<ul style="list-style-type: none"> • Connections to multiple sites in MAN with any to any & multipoint connectivity • Connect to Dedicated Internet Access (DIA)/NVPN • Simplify network with more scalable connections • Simpler version is customized for government/educ. markets 	<ul style="list-style-type: none"> • Moderate • Class of Service tiers 	Moderate



SBC Optical Portfolio

Service [Capacity]	Protocols	Applications	Performance /SLA's	Cost per MB
<u>SONET</u> [up to 10 Gbps] •SONET •NGSONET •RPR •WaveMAN	<ul style="list-style-type: none"> • DS1, DS3 • OC-3 to OC-192 • GigE, Fast Ethernet • 10/100 BaseT • RPR • "Clear channel" SONET delivered via wavelengths 	<ul style="list-style-type: none"> • Pt-pt or Ring Same applications as GigaMAN plus: <ul style="list-style-type: none"> - Traditional TDM applications - Mission critical data networking - EoS enables customer to share Ethernet and TDM on same ring - RPR supports Layer 2 Ethernet applications for more bandwidth 	Highest	High
<u>MON (DWDM)</u> [up to 320 Gbps]	<ul style="list-style-type: none"> • OC-3 to OC-192 • GigE, 10 GigE, • D1 Video • ESCON, FICON, Fibre Channel 	<ul style="list-style-type: none"> • Pt to Pt or Ring • Multiple native protocols on single Network Element • Large data center connections • Main frame computer connectivity • Disaster recovery/Mission critical 	Moderate to Highest (depending upon level of protection selected)	Highest



SBC Optical Portfolio

Metro Optical Transport Evolution

- SBC offers many services using various technologies. Each have their unique market space with some overlap.
 - NGSONET (GFP, VCAT, LCAS, EoS); RPR; DWDM; Ethernet & ATM Switches.
 - As Technology and Operational Support Systems advance, more integrated optical services are provided.
- Packet switching is used for data that requires bandwidth efficiency, lower cost, & less stringent SLAs.
- Convergence among layers will progress:
 - First between similar layers (NG-SONET & DWDM; Ethernet & IP)
 - Later for multi-layers (IP & DWDM; IP & SONET)
 - Key is Network Elements with Multi layer/service capabilities, along with integrated Management (e.g. MPLS / GMPLS control plane),