



EtherBurst[®]

Traffic Aware Transport



Headquarters: Mountain View, CA
Employees: 90
Status: Initial revenue stage
Investment: \$80M
Market Focus: Metro Optical Networks



<http://www.matissenetworks.com/>

September 2003

\$21M initial funding

June 2006

First beta test with Lawrence Livermore Labs

September 2006

EtherBurst® introduced

January 2007

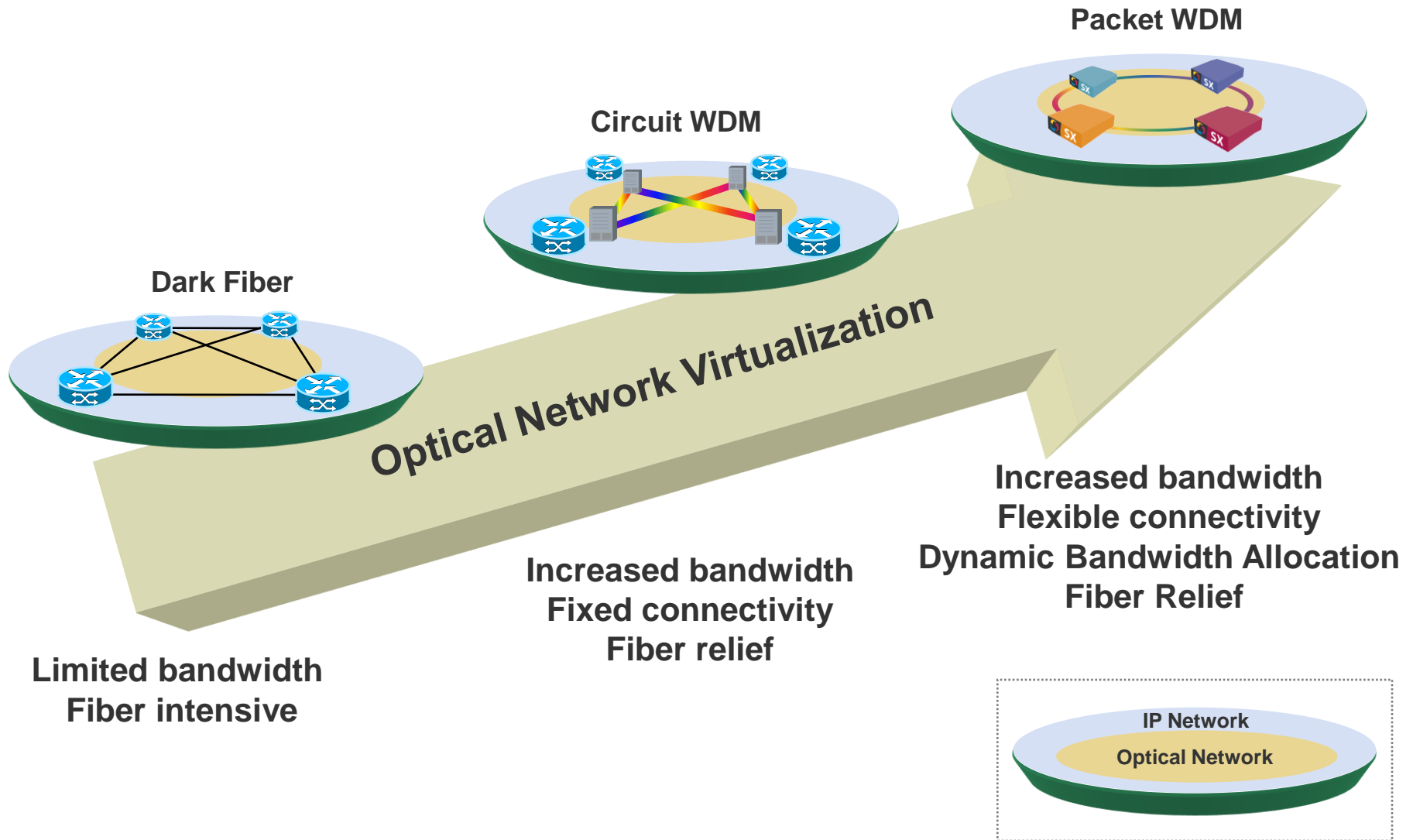
Lab trials with WW service providers

August 2007




Raised \$45M for market expansion

October 2008

Revenue shipments to US, EMEA and APAC

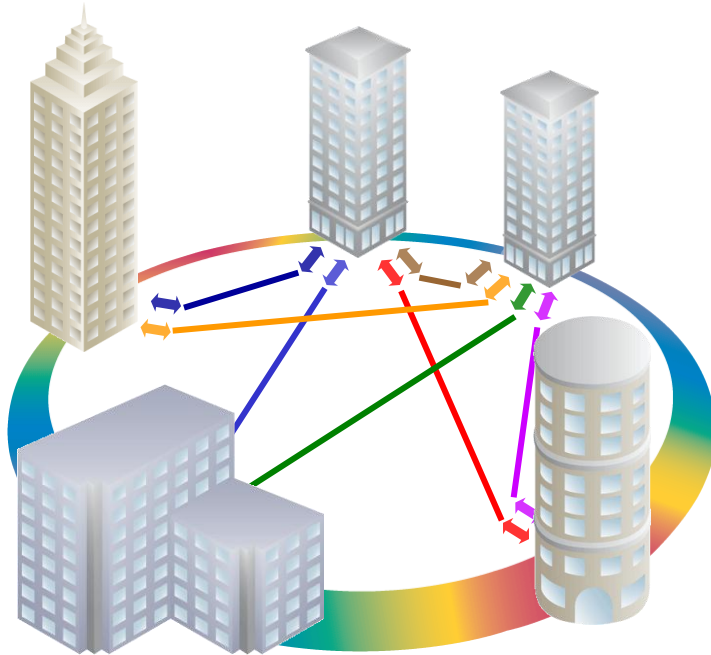


▪ As the Shift from SONET/SDH to Ethernet Continues:

-  – Bandwidth required to deliver Packetized Voice, Video & Data access exceeds that of legacy services
-  – Revenue per bit for new services such as IPTV, Business Ethernet and Internet Access is continuing to decrease
-  – Service Providers must efficiently share transport bandwidth in the optical network between all services to any location

Service Providers must maximize the use of available transport capacity

Circuit Optics



- All Traffic Transits Through 'Hub' Site
- 14 Transponders (expensive)
- High Latency
- Fixed Bandwidth

Packetized Optics



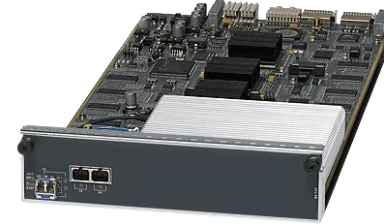
- Any-to-Any Traffic
- 5 Transponders
- Low Latency
- Dynamic Bandwidth



EtherBurst Optical Switch

- **eBURST – 10 Gbps Optical Burst Transponder**

- Tunable laser re-tunes to any ITU wavelength in nanoseconds to burst packets to destination
- Packet processor intelligently maps Ethernet frames to the optical burst domain



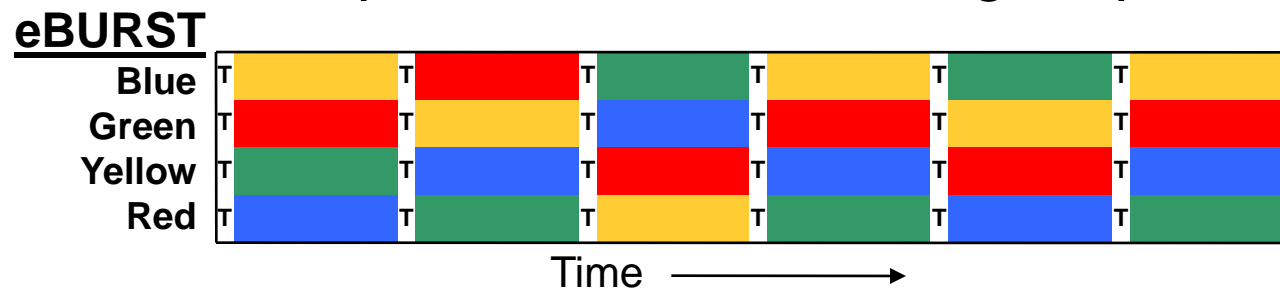
- **eWAVE – Optical Burst Amplifier**

- EDFA with transient power suppression
- ~18dB span reach

- **Packet processor controls when eBURST can Transmit**
 - Optical burst map ensures no collisions

- **Packet processors communicate to form a common understanding of metro-wide bandwidth demands**
 - Optical burst map dynamically adjusted to handle changing traffic patterns

Optical Burst Scheduling Map



- **PX-1000 Photonic Node**

- eWAVE transient suppression EDFA
- Optical power management
- Optical add & drop for SX nodes

- **SX-1000 Ethernet Service Node**

- Gigabit & 10 Gigabit Ethernet modules
- eBURST modules
 - Optical burst transponder
 - Packet processor

- **MatisseView**

- Unified access, secure
- GUI, SNMP, CLI



Common Equipment

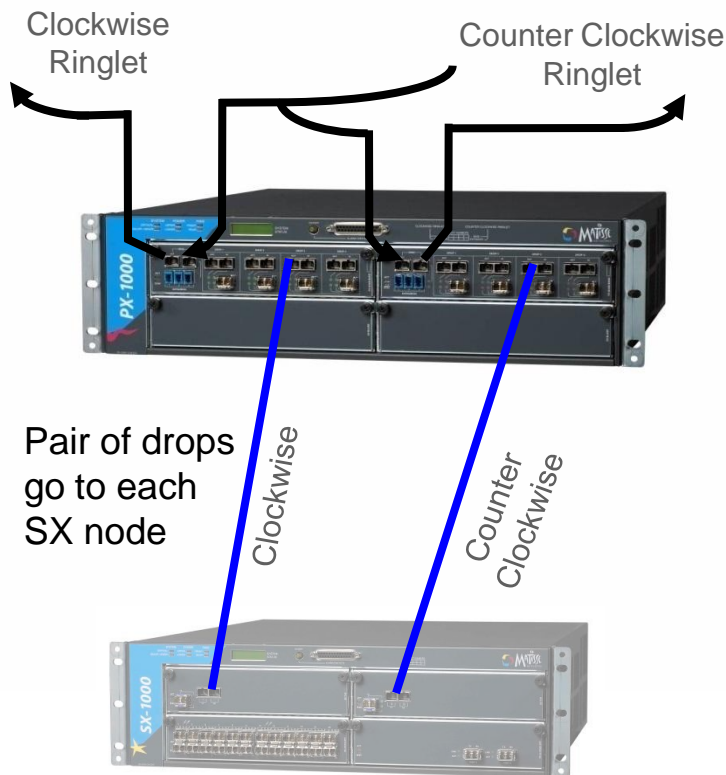
- AC and/or DC power (rear)
- 3RU: 5.25" x 17.5" x 21"
- NEBS compliant

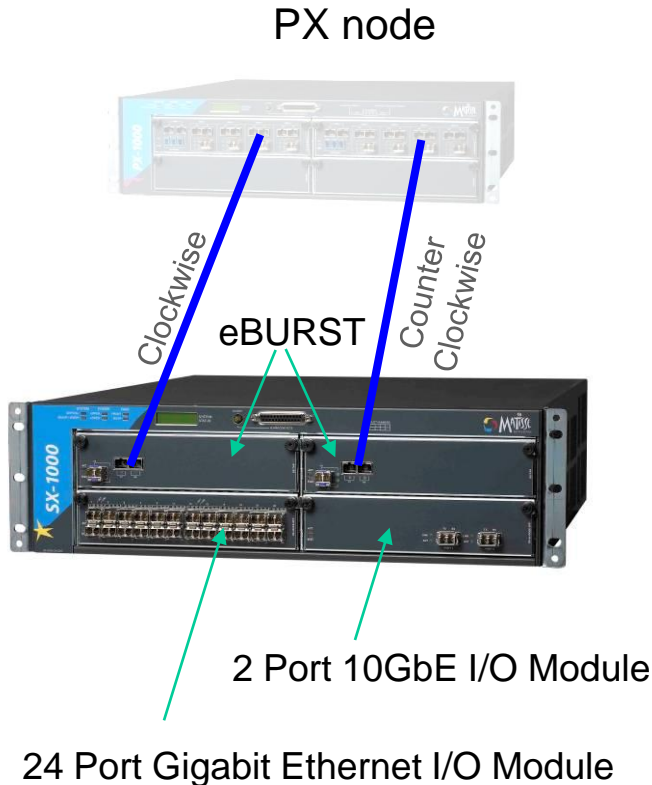
eWAVE

- Builds protected optical packet ring
- Transient suppression amplifier and filters

Benefits

- Plug and play optical management
- Reduces operational expenses





Common Equipment

- 160 Gig Switch Fabric (rear)
- AC and/or DC Power (rear)
- 3RU: 5.25" x 17.5" x 21"
- NEBS compliant

10Gig eBURST Modules

- Tango Burst Transponders
- MeshWave Packet Processor
- Connection to Photonic Layer

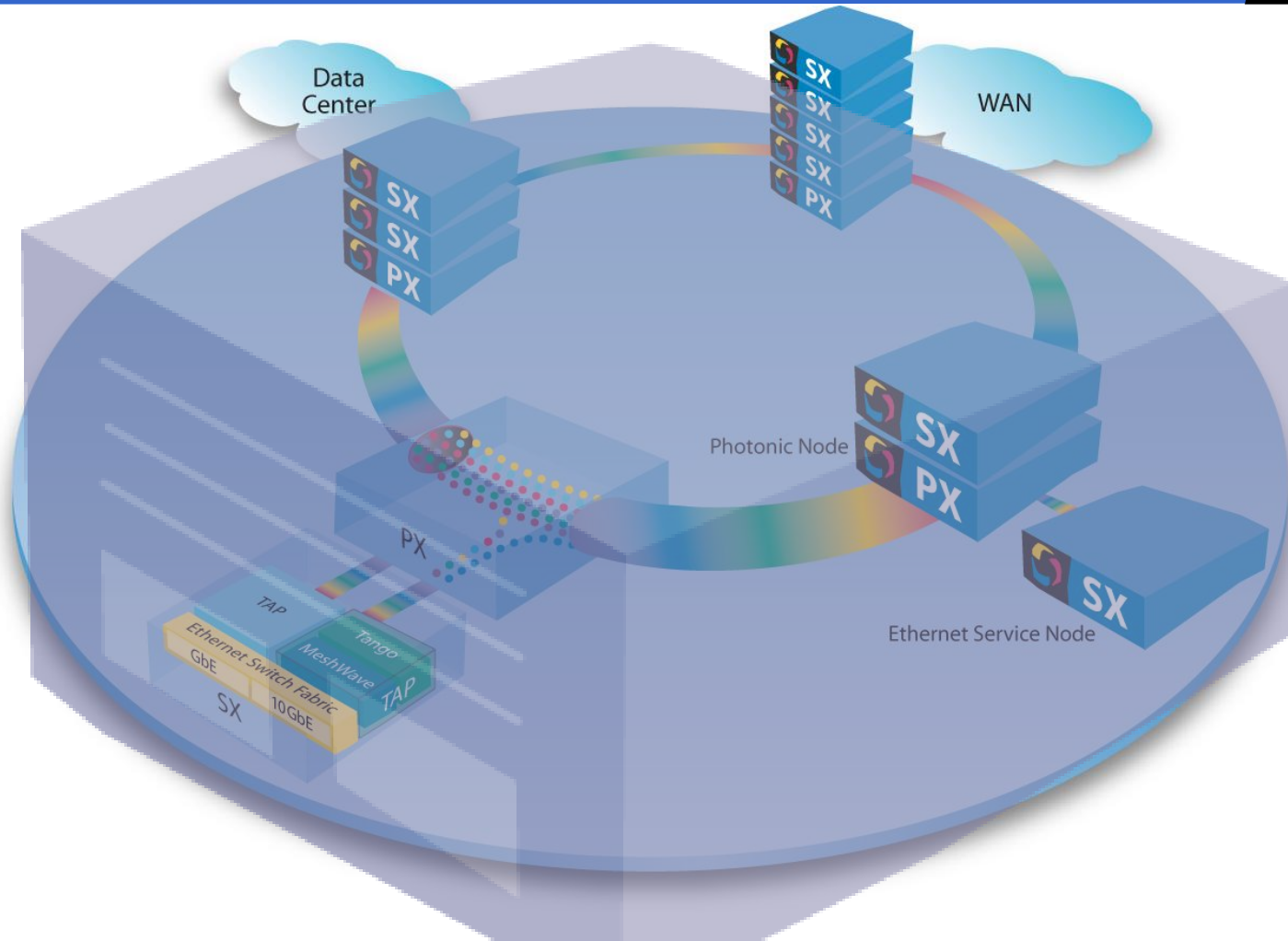
I/O Modules

- 2-port 10 Gigabit Ethernet (XFP)
- 24-port Gigabit Ethernet (SFP)

Benefits

- Seamless integration with packet networks
- Add bandwidth when and where needed

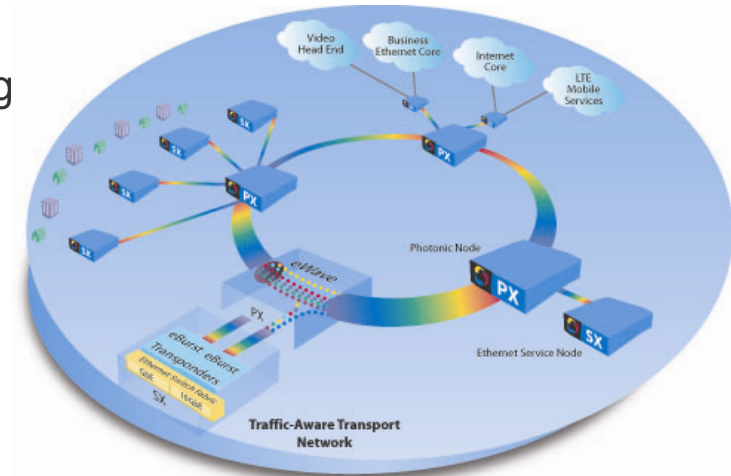
EtherBurst Operates as a Distributed Layer 2 Switch



All nodes on ring managed as a single switch, simplifying configuration and maintenance

- **Standards-based Ethernet interoperability**

- Unicast, broadcast and multicast support
- 802.1d Layer 2 bridging & dynamic MAC learning
- 802.1q VLANs connect ports on any node
- 802.1p Class of service prioritization
- 802.3ad Link aggregation
- 802.1ad QinQ provider bridging
- 802.1w Rapid spanning tree
- 802.1s Multiple spanning tree
- IGMP Snooping

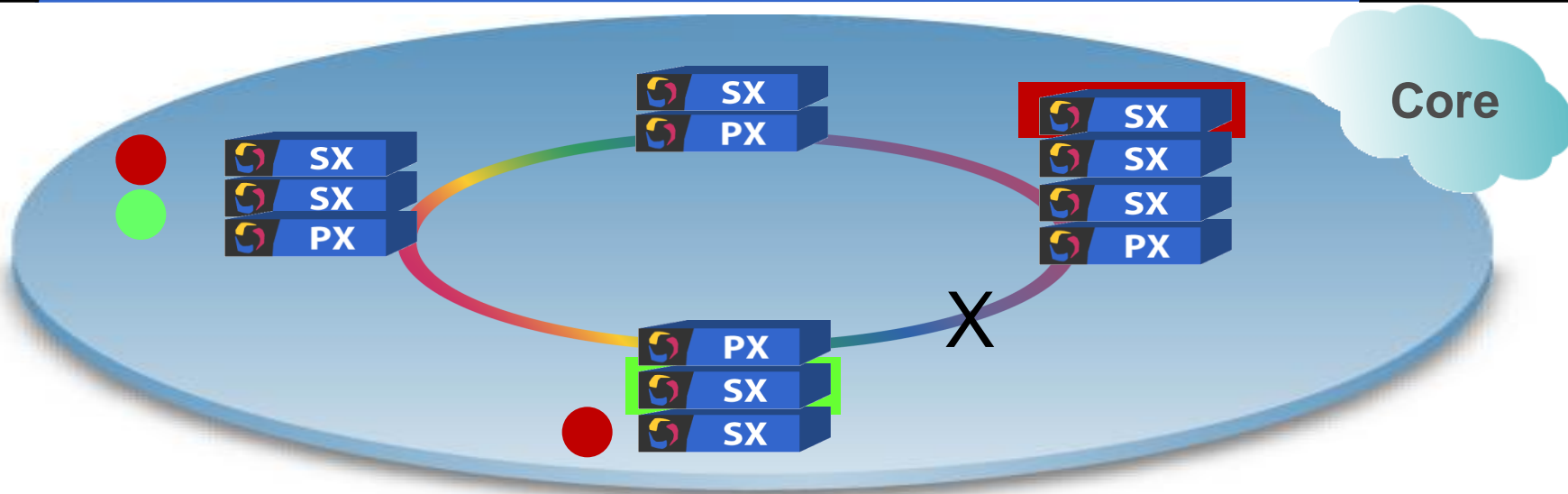


- **Metro Ethernet Forum (MEF) Certified**

- Assured interoperability with third-party switches and routers



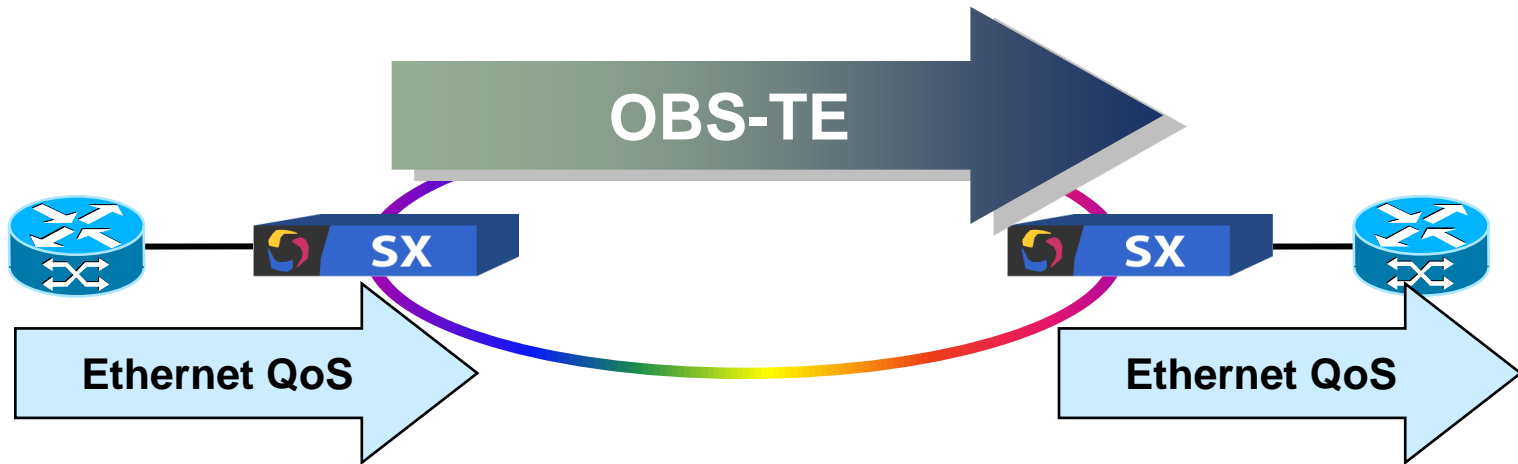
EtherBurst fully interoperable with 3rd party switches & routers



- **Configurable options for intelligent packet steering**
 - Balance traffic over both ringlets
 - Shortest path
 - Fixed ringlet (clockwise or counter-clockwise)
- **SDH-like 50ms protection**
 - If any path fails, packets are steered around the break
 - Only the bandwidth of the single span is lost during the outage
 - Failures are isolated to Matisse domain and are transparent to connected devices

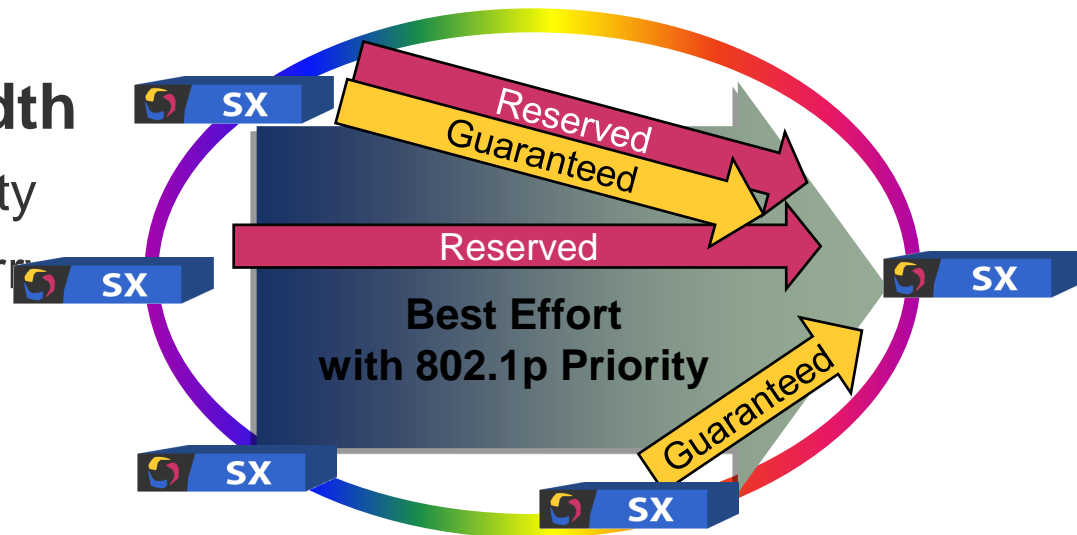
SDH-like protection for packet optical transport

Ethernet QoS - Layer 2 classification and prioritization
OBS-TE - Optical Burst Switch - Traffic Engineering



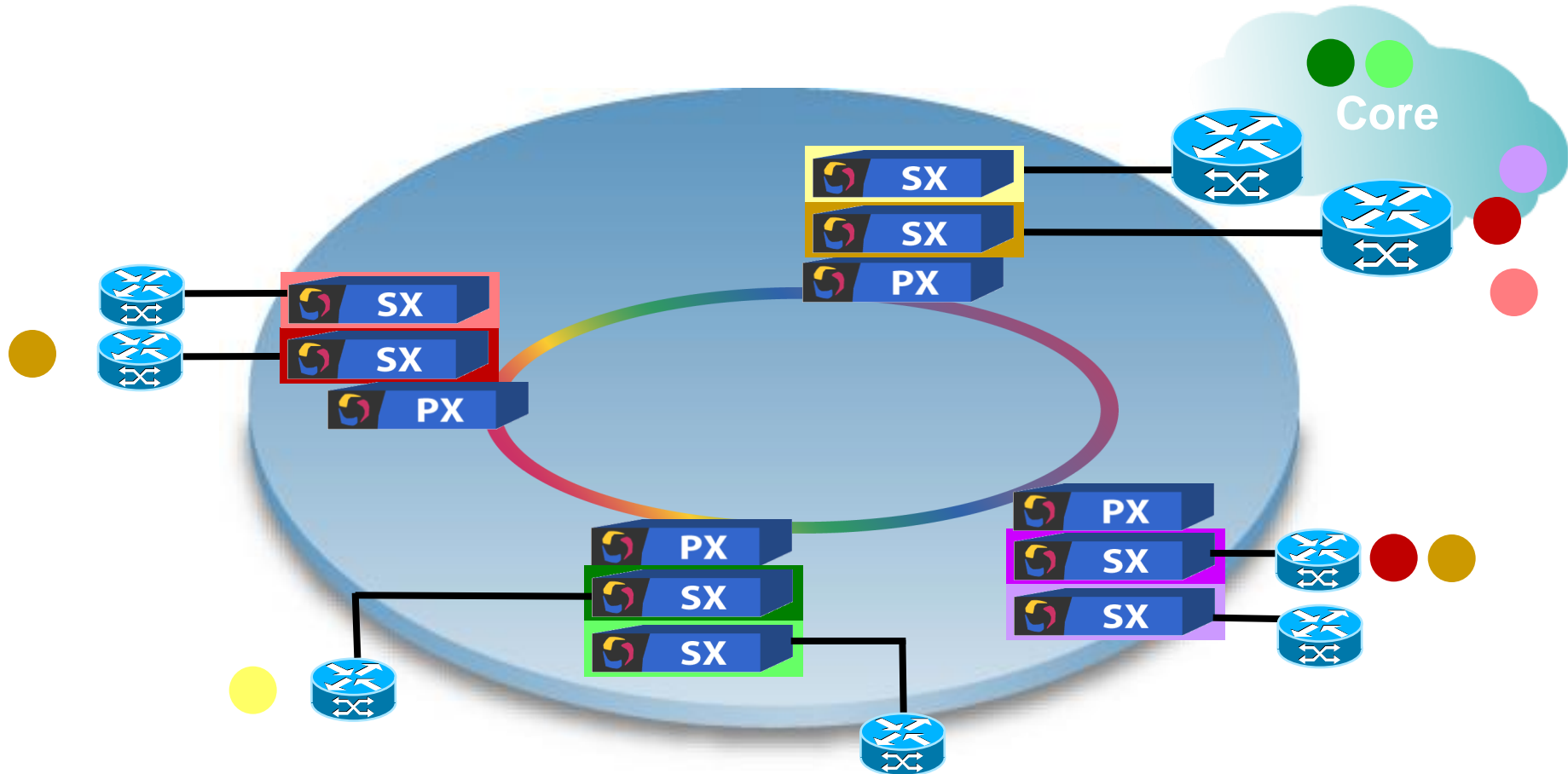
- **Optical Burst Switching - Traffic Engineering**
 - Provides control over node-to-node bandwidth allocation
 - Reserved Pre-allocated bandwidth
 - Guaranteed On-demand bandwidth allocation

- **No stranded bandwidth**
 - Unutilized optical capacity automatically used to carry lower priority services



OBS-TE
for Node-to-Node Traffic Engineering

EtherBurst Scales Efficiently with Bandwidth Demand



- *EtherBurst packetizes the optical layer – using color as destination address*
- *Plug and play network elements enable in-service upgrades*
- *Each SX adds up to 20Gbps of bandwidth enabling success based deployments*

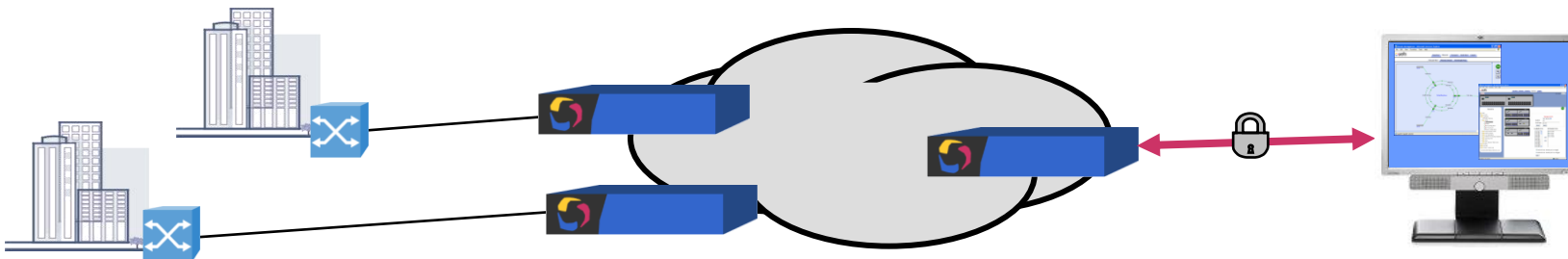
- **Complete Domain Management**
 - Unified management of entire domain
 - Integrated optical & packet management
 - Full OAM&P
- **Integrate with current management practices**



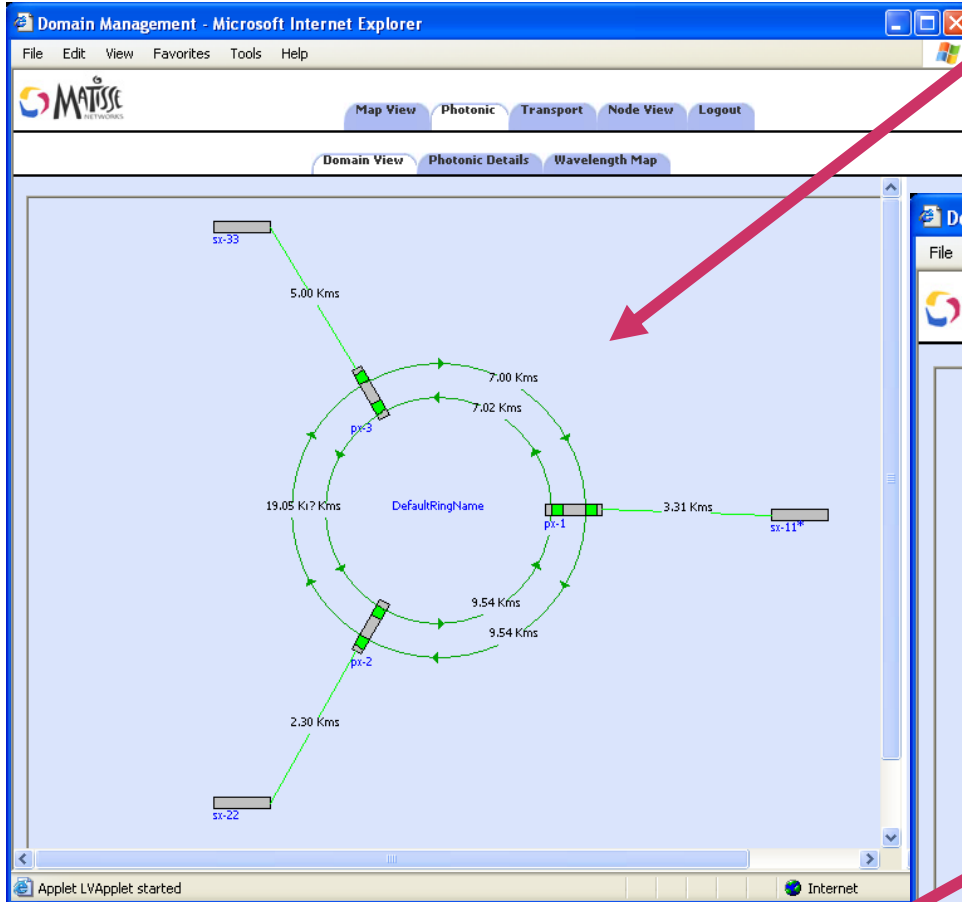
Subscribers

Metro

NOC

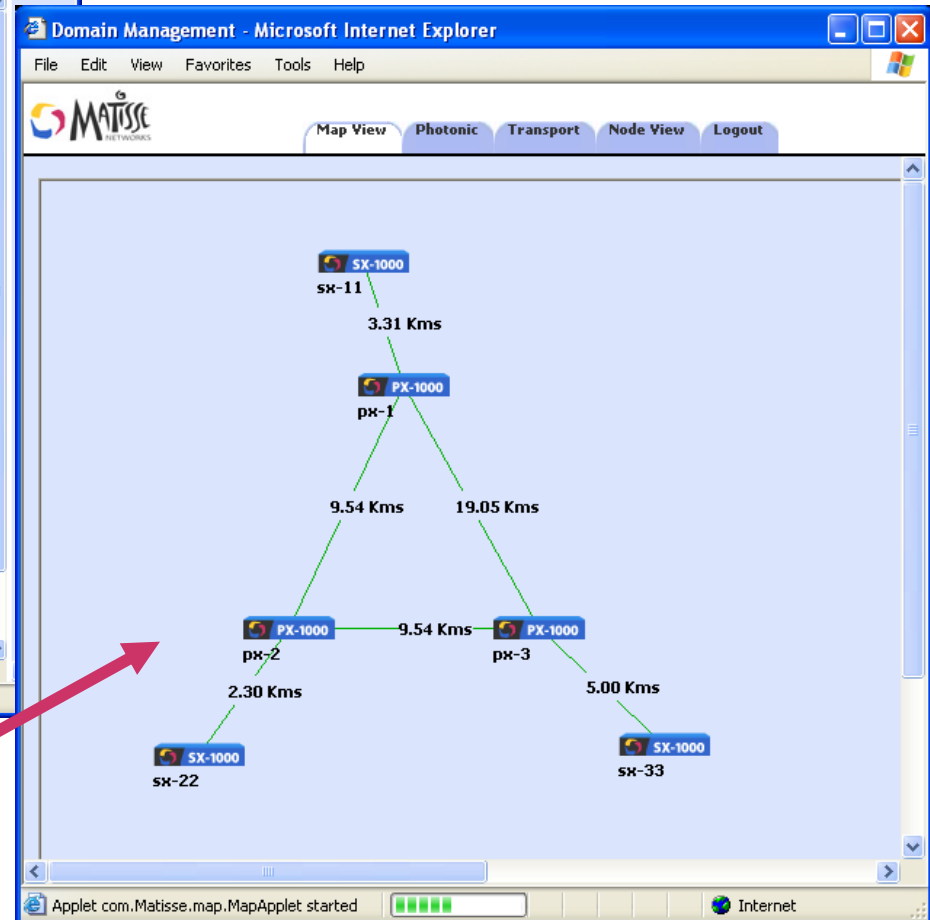


MatisseView Photonic and Map Windows



Photonic Layer Status
Rapid Fault Isolation

Map View of all Nodes
with Auto-Discovery
Simple Navigation



Graphic Status for Rapid Fault Isolation

Folder Navigation for Ease of Use

Ethernet Service Point-and-Click Provisioning

Input Editor Minimizes Operator Error

The screenshot displays the Matisse Networks Domain Management interface in a Microsoft Internet Explorer browser window. The interface includes a navigation tree on the left, a central configuration area, and a right-hand panel for VLAN management.

Navigation Tree:

- Node
 - System
 - Switching
 - Traffic Steering
 - VLAN
 - Configuration
 - Status
 - Port Configuration
 - Port Summary
 - Reset Configuration
 - Protocol-based VLAN
 - IGMP Snooping
 - Link Aggregation
 - Multicast Forwarding Database
 - Spanning Tree
 - QinQ
 - MAC Address Table Limits
 - Routing
 - Security
 - Access Control Lists

Central Configuration Area:

Shows a graphical representation of a switch (SX-11) with a port configuration table. A red circle highlights the configuration for three switches (sx-11, sx-22, sx-33). The table for sx-11 is as follows:

1	3	5	7	9	11	13	15	17	19	21	23
2	4	6	8	10	12	14	16	18	20	22	24

Manage VLAN Panel:

Manage VLAN

VLAN ID: 100 - Vlan 100

VLAN Name: Vlan 100

Buttons: Submit, Delete

Available Ports:

- sx-11/3/1
- sx-11/3/2
- sx-11/3/3
- sx-11/3/4
- sx-11/3/5
- sx-11/3/6
- sx-11/3/7
- sx-11/3/8
- sx-11/3/9
- sx-11/3/10
- sx-11/3/12
- sx-11/3/13
- sx-11/3/14
- sx-11/3/15
- sx-11/3/16

[T] Member Ports:

- sx-11/3/11
- sx-22/4/2
- sx-33/4/5
- sx-33/4/16

Options:

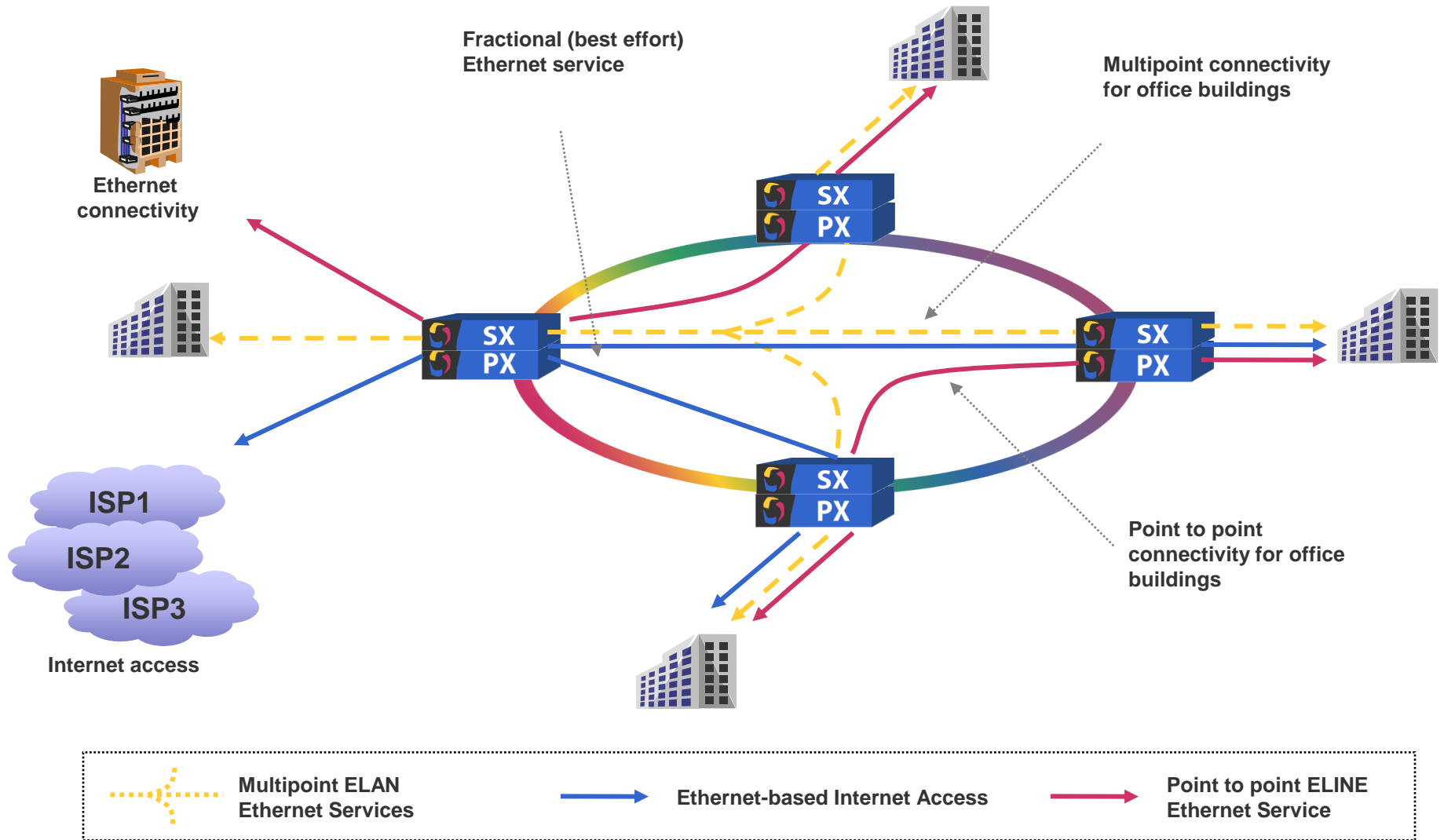
- Default all new member ports as tagged
- Default all new member ports as untagged

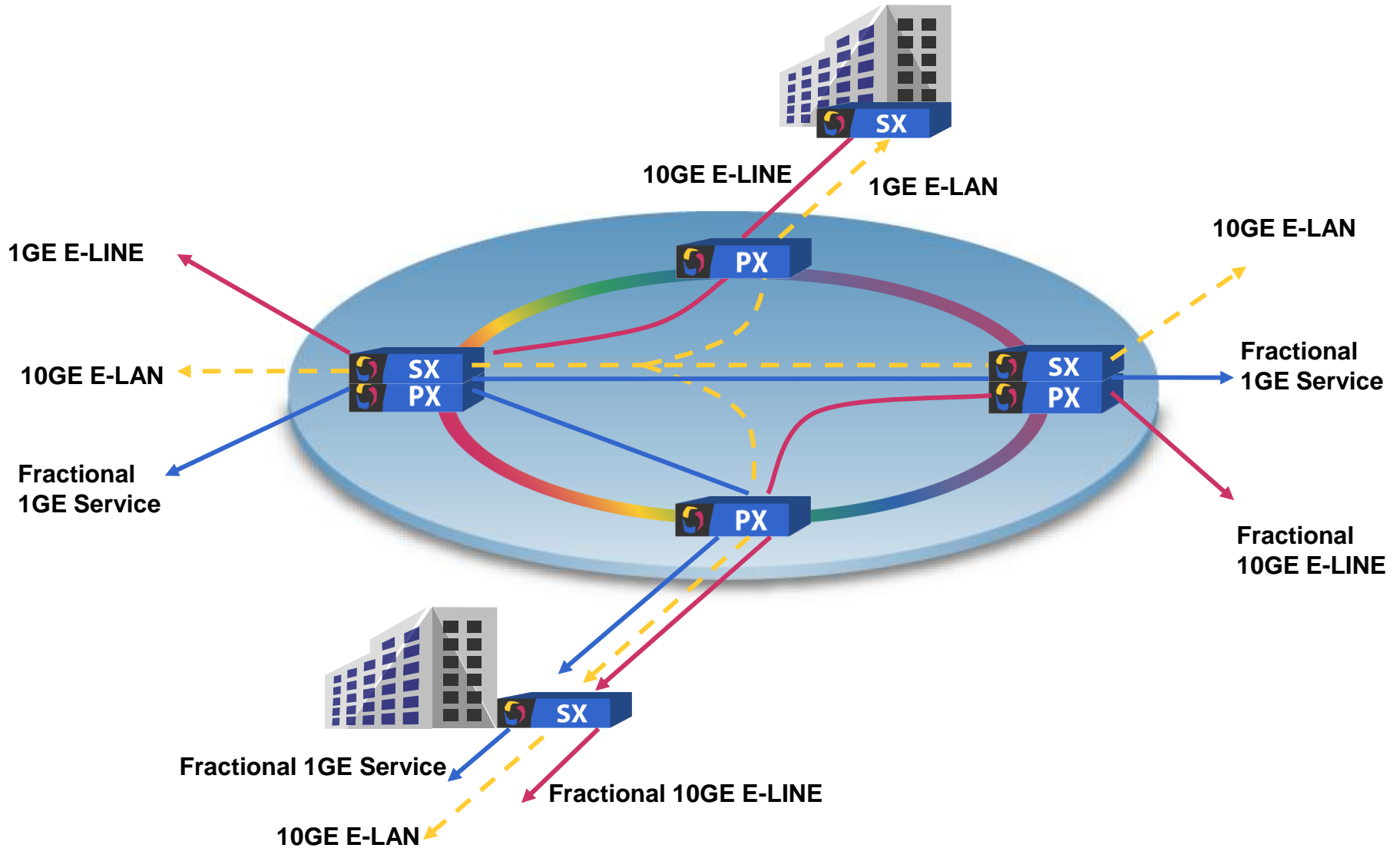
 Button: Apply



Some Applications!

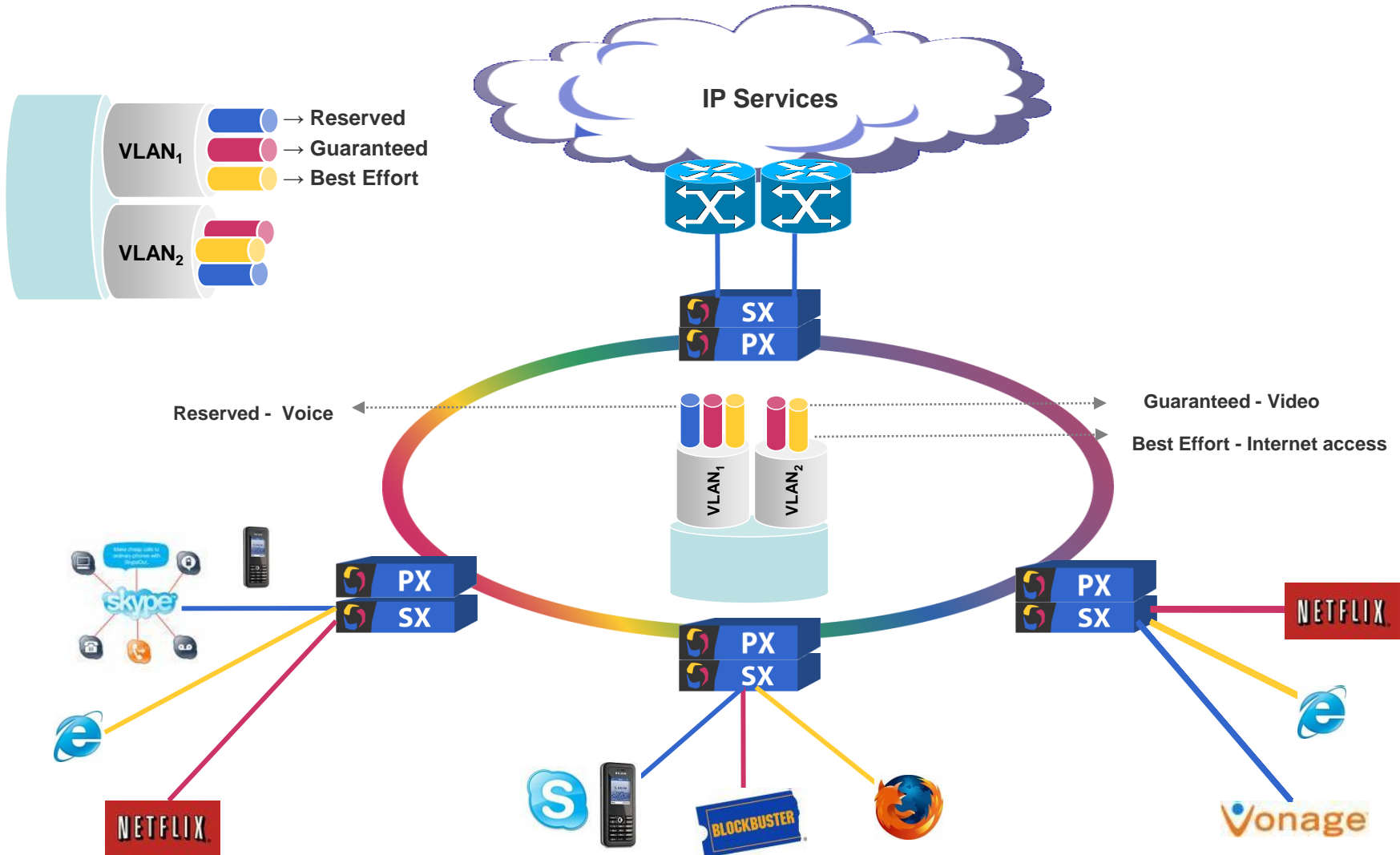
Point to Point and Multipoint Ethernet Services

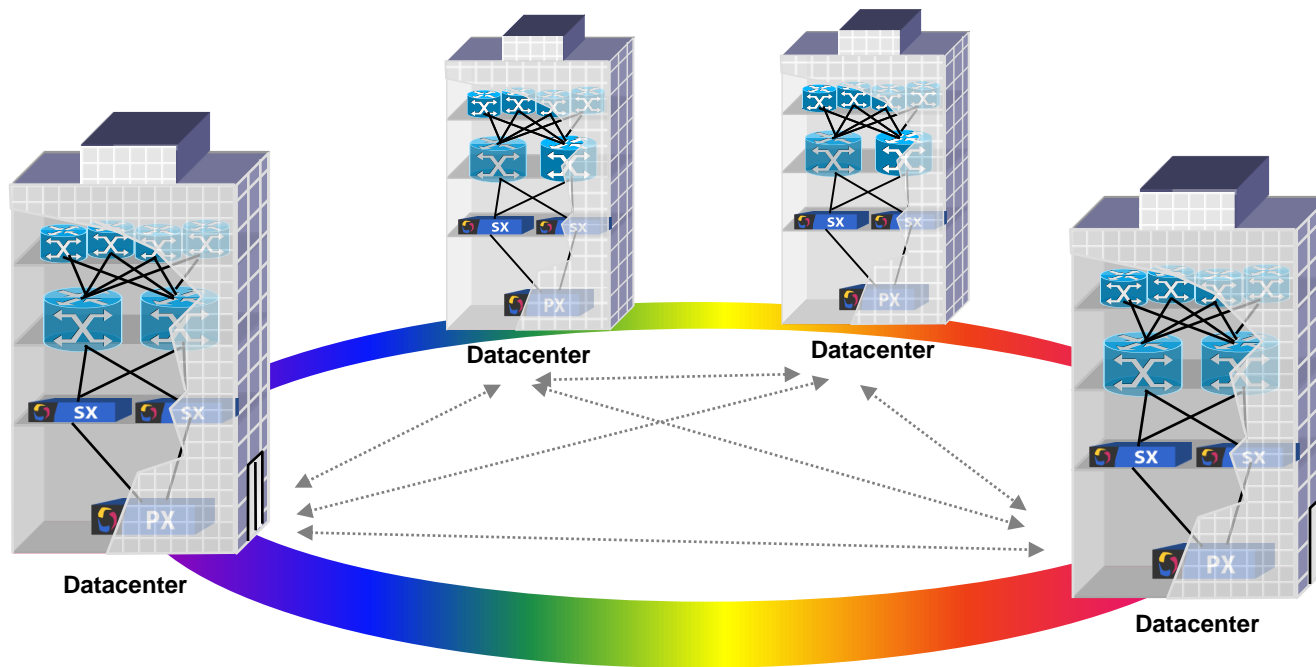




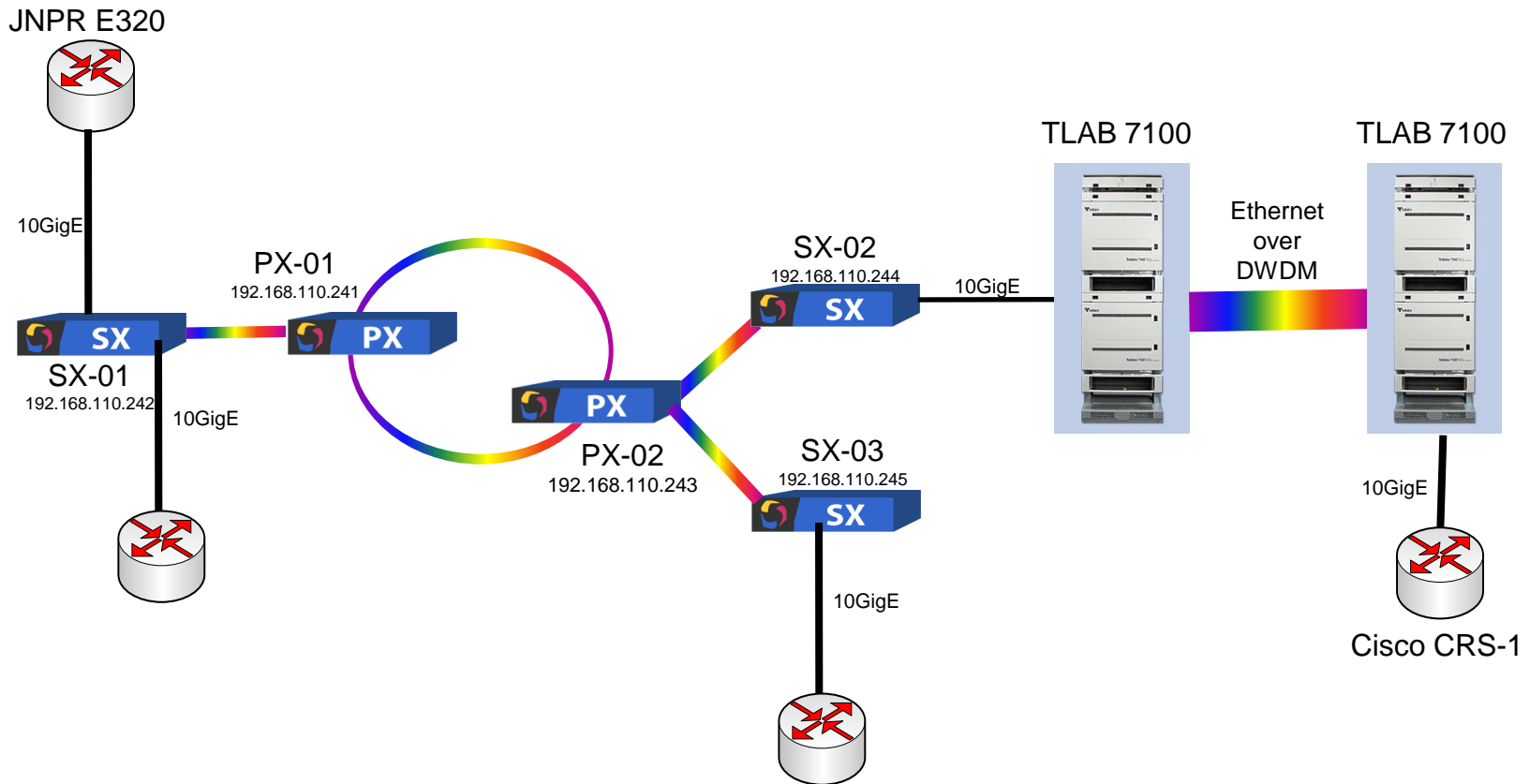
Triple-play Services

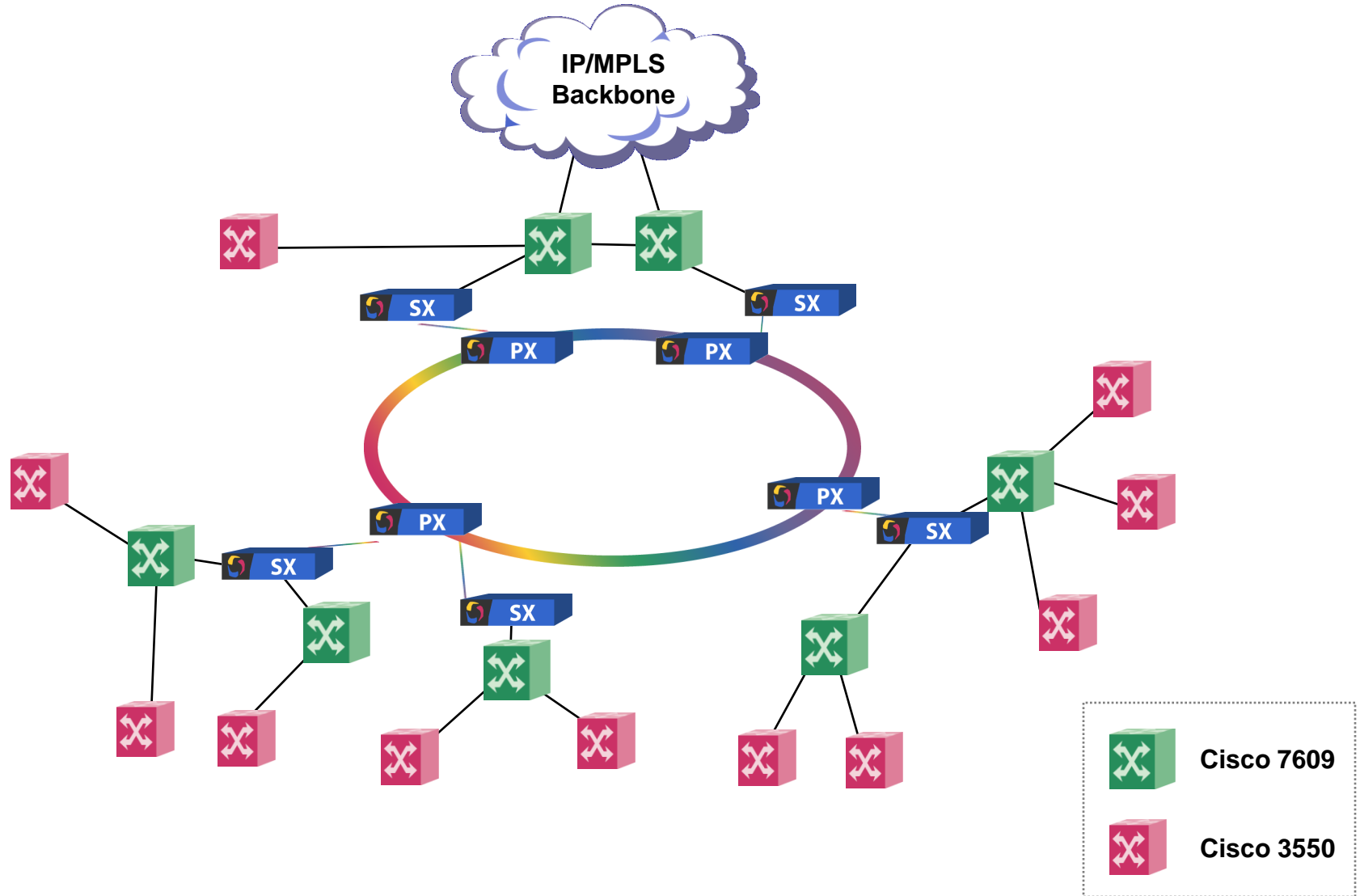
Matching QoS Requirements for Each Service





- Virtualization of the metro enables dynamic bandwidth allocation
- Fast provisioning and service agility for single hop, color-based delivery







Summary

- Matisse is very different to a traditional DWDM PTP architecture
- Because Matisse uses a single transponder (eBURST) for ALL communications from each SX, we're able to fully utilize the available 20Gbps of bandwidth to the ring
- Matisse employs an internal algorithm that was created to constantly review traffic demand across ALL points in the network
- Dynamic bandwidth allocation is the 'common denominator' of a Matisse solution as 'offered' demand in the access portion 'ebbs and flows'.
- Because an EtherBurst network has the ability to operate as a 'logical mesh' with no O-E-O transition, the system offers very low latency (~70uS ingress/egress)



Thank You!