Cisco Storage + Optical Networking

Convergence of Networking and Storage

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Agenda

- Cisco Strategy for Storage + Optical Networking
  - Open, standards-based architecture
  - Cisco AVVID Partner Program
- Technology In Brief
- Business Continuance
- Products for Data Center and I-Storage

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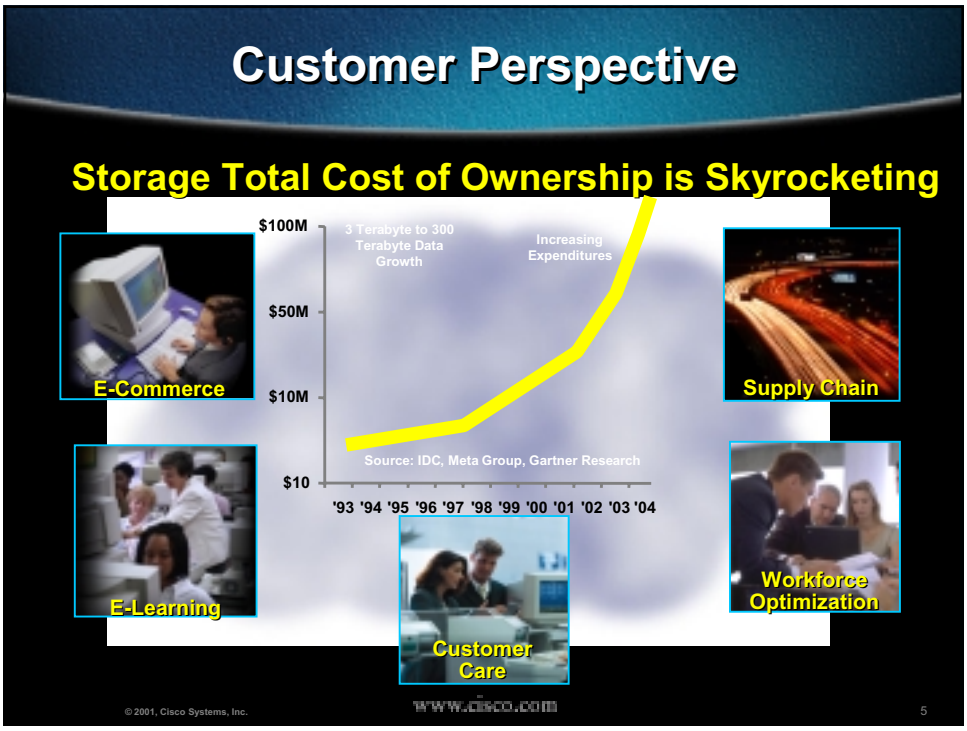

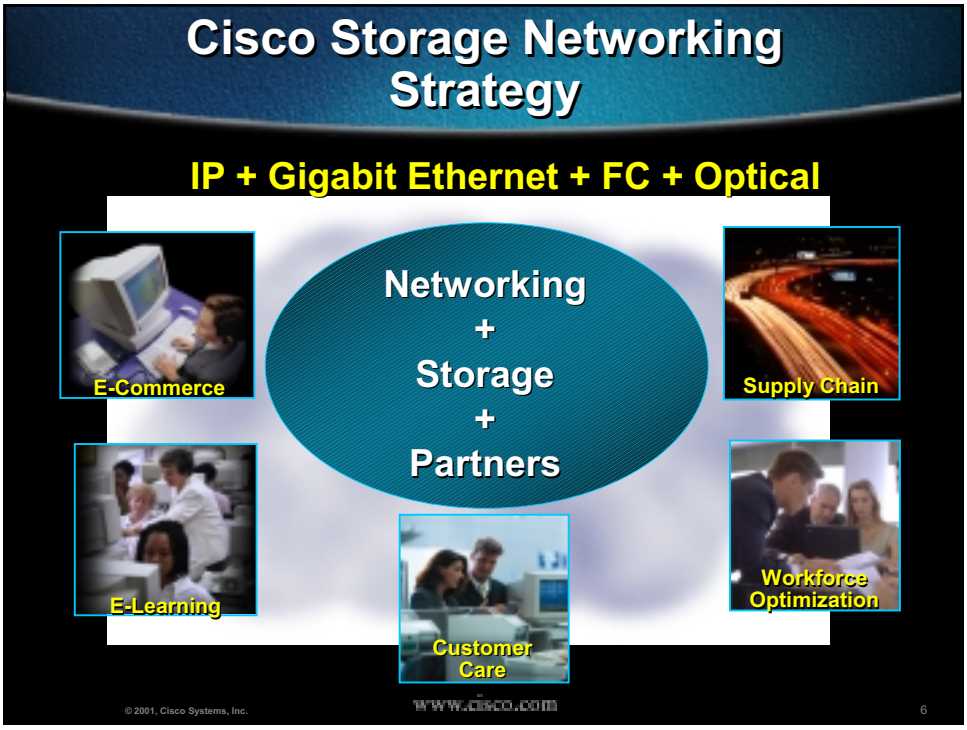

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Cisco Storage Networking Strategy

Cisco AVVID Partner Program

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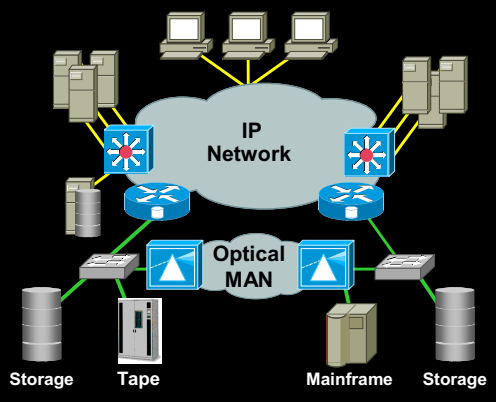
Networking + Storage + Partners



Network Storage Pool

Accelerate convergence of networking and storage technologies based on an open architecture

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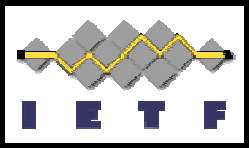
Based on Open Standards



Storage Networking Industry Association

- IETF IP Storage (IPS) Working Group
  - iSCSI
  - FCIP
- Storage Networking Industry Association (SNIA)
  - SNIA IP Storage Forum

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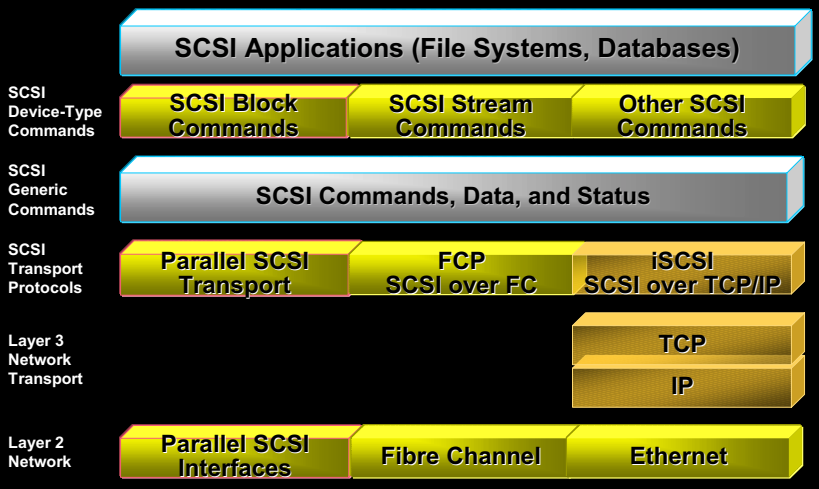
Based on Open Standards



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Cisco Storage Networking Life-cycle Services Strategy

- Planning & Design
- Implementation
- Industry leading operational support
- Advanced Services for optimizing high availability networks

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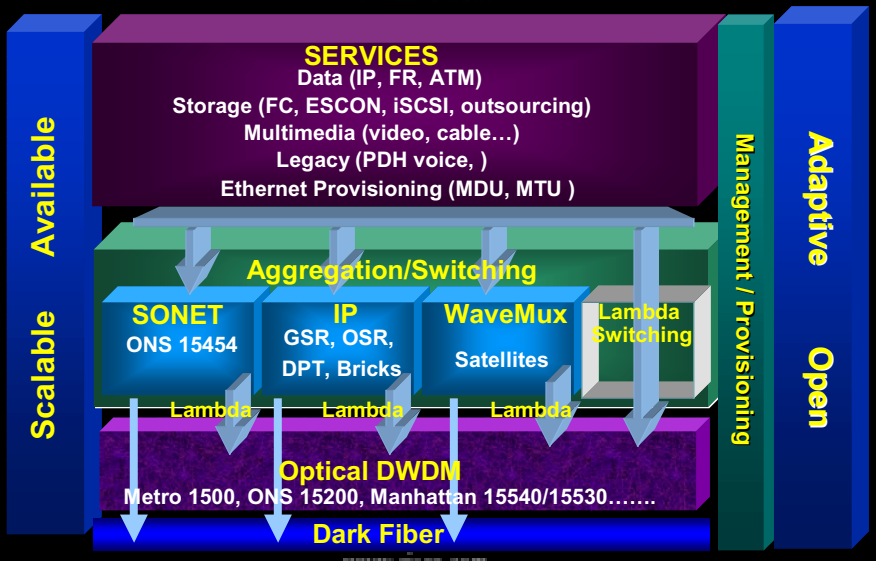
Cisco Metro Optical



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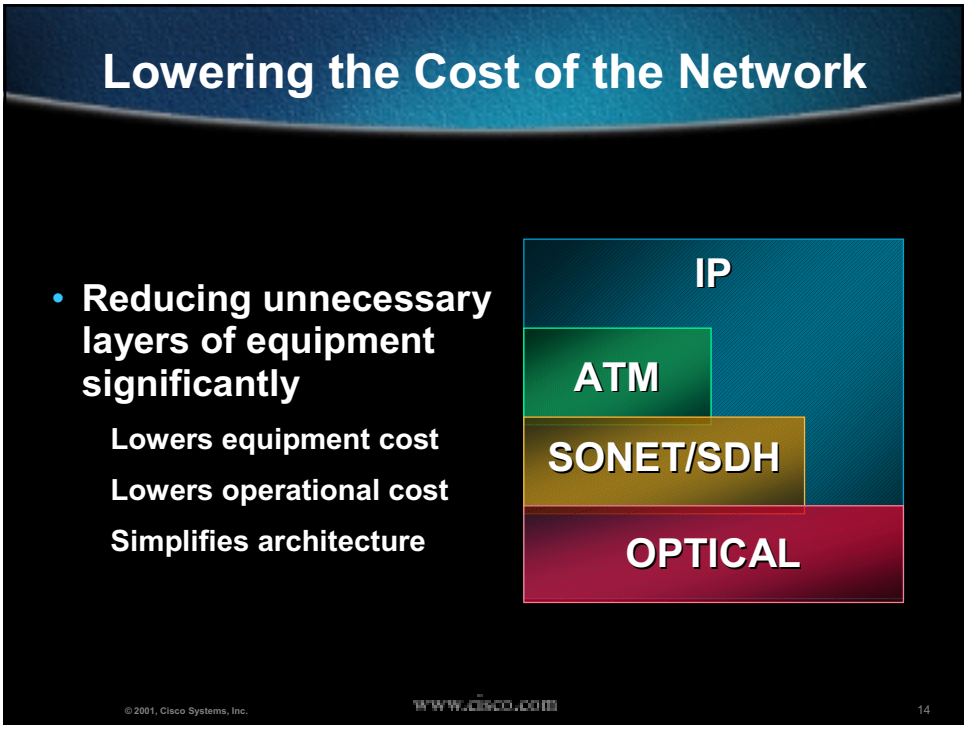

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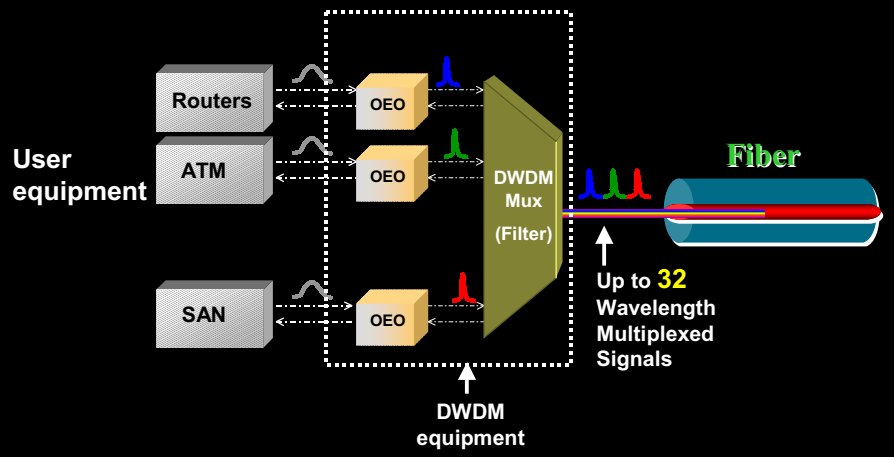
What is DWDM ?

Dense Wavelength Division Multiplexing



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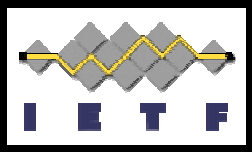
Driving towards Open Standards



Storage Networking Industry Association

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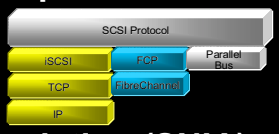
  - –iSCSI
  - –FCIP



- Storage Networking Industry Association (SNIA)
  - – SNIA IP Storage Forum
- iSCSI Drivers Freely Available to Industry

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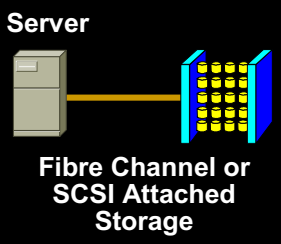
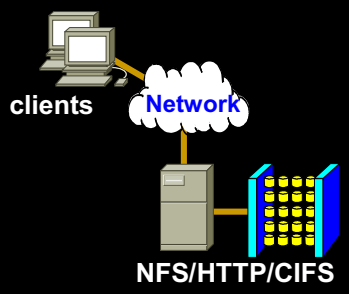
Traditional Storage Connections

Directly Attached



Network Attached Storage (NAS)



- Client/server
- File level access

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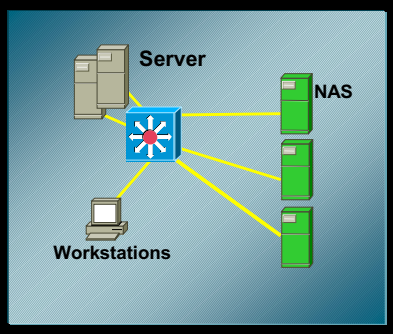
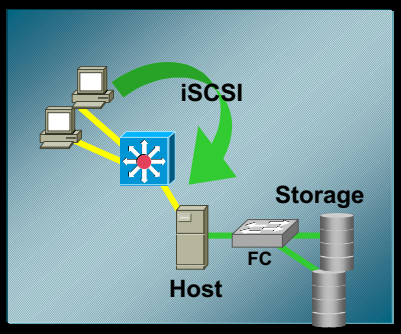
File vs Block Level Access

NAS File Access



- file level operations
- easy extension over data networks
- NFS, CIFS, HTTP

SAN Block Access



- large datablocks efficiently moved
- more difficult to extend over data networks due to strict timing & protocols (SCSI)

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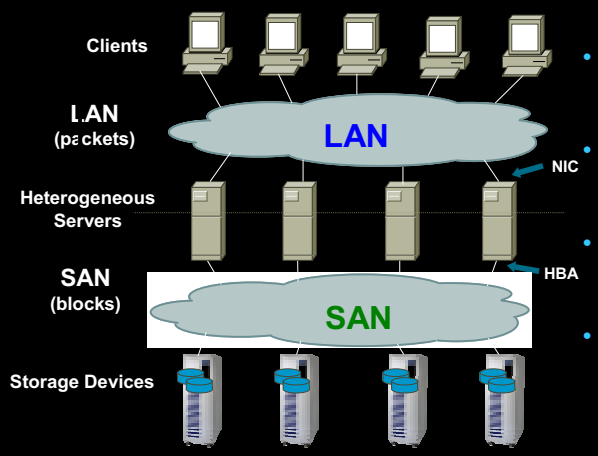
SAN: What Is It?



- Storage Expansion
  - No impact on servers
- Server Expansion
  - No impact on storage
- Load Balancing
  - Active parallel paths
- Bandwidth on Demand
  - Robust topology

SAN is a dedicated network for attaching servers to storage devices

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SAN and NAS - Differences??

	SAN	NAS
Protocol:	FCP, Serial SCSI	NFS, CIFS
Network:	Fibre Channel	Ethernet
Source/ Target:	Server/Device	Client/Server, Server/Server
Device Connection:	Direct on Network	Indirect via NAS server
Embedded File System:	No	Yes

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What Is Fibre Channel ?

- Initial effort started in 1988
- Developed by ANSI
- Combines the benefits of both channel and network technologies
- SCSI and IP are the only upper layer protocols commercially available on Fibre Channel
- Benefits of mapping SCSI onto Fibre Channel include:
  - –Faster speed
  - –Ability to connect more devices together
  - –Greater distances allowed between devices
- Runs on copper (coax) or glass (fiber optic) cable

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Fibre Channel - Best of Both Worlds

I/O Channel	Network
Data block based	Packet based
Closed - structured	Open, unstructured
High performance	Error-free secondary
Error free	Peer to peer
Large data transfer	Data, voice, video
Hardware intensive	Software intensive

Fibre Channel - Best of Both Worlds!

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Fiber Channel - SCSI Comparison

	FibreChannel Fabric	FibreChannel Arbitrated Loop	SCSI Parallel
Connections:	16 Million	126	15
Distance:	10 Km	10Km	25 M
Bandwidth:	200 MB/sec *Per Connection*	100 MB/sec *Shared Bandwidth*	160 MB/sec * *Shared Bandwidth*
Hot Plug Capable:	Yes	Yes	No
Multiple Protocols:	Yes	Yes	No

* 160 MB/sec is maximum theoretical limit under specific conditions

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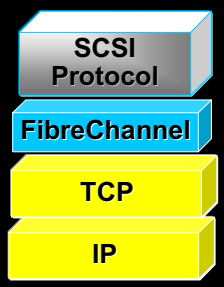
What Is FC/IP?

- Encapsulation of FC over TCP/IP
- Preserves entire Fibre Channel information
- For Storage-to-Storage over WAN



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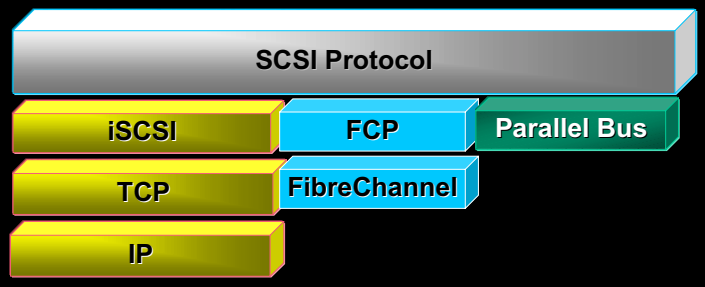
What Is iSCSI?

- Transport for SCSI command sets on TCP/IP
- Windows NT, Solaris 7, Linux



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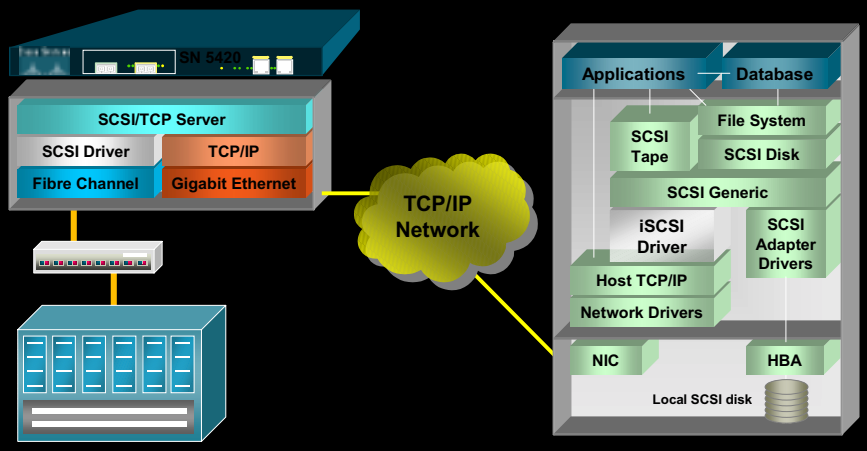
Cisco iSCSI Architecture



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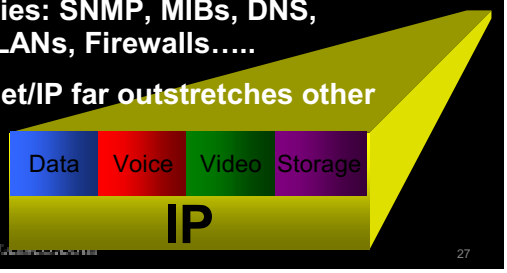
Why SCSI over IP?

- Make 'SCSI' distance-independent
- Ubiquitous & mature nature of IP
- Single technology for Enterprise and Storage Network
- Low support cost
- Scalability- Media, distance, node count, performance
- Manageable, secure and interoperable
  - Supporting technologies: SNMP, MIBs, DNS, LDAP, QoS, IPSEC, VLANs, Firewalls…..
- R&D investment on Ethernet/IP far outstretches other technologies



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- ***Business Continuance***

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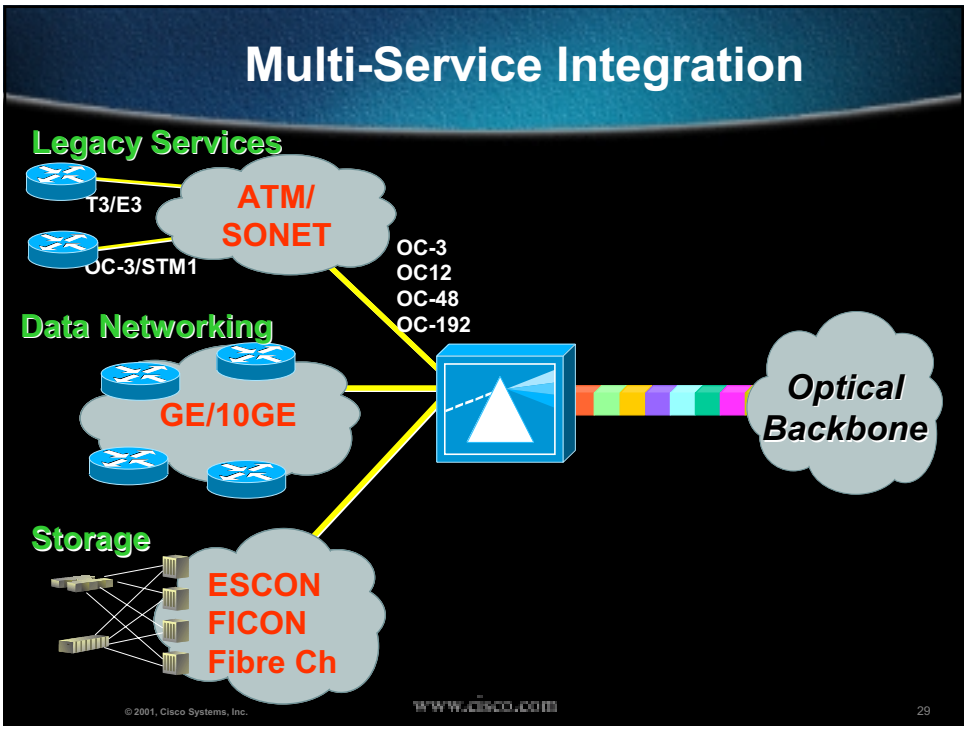

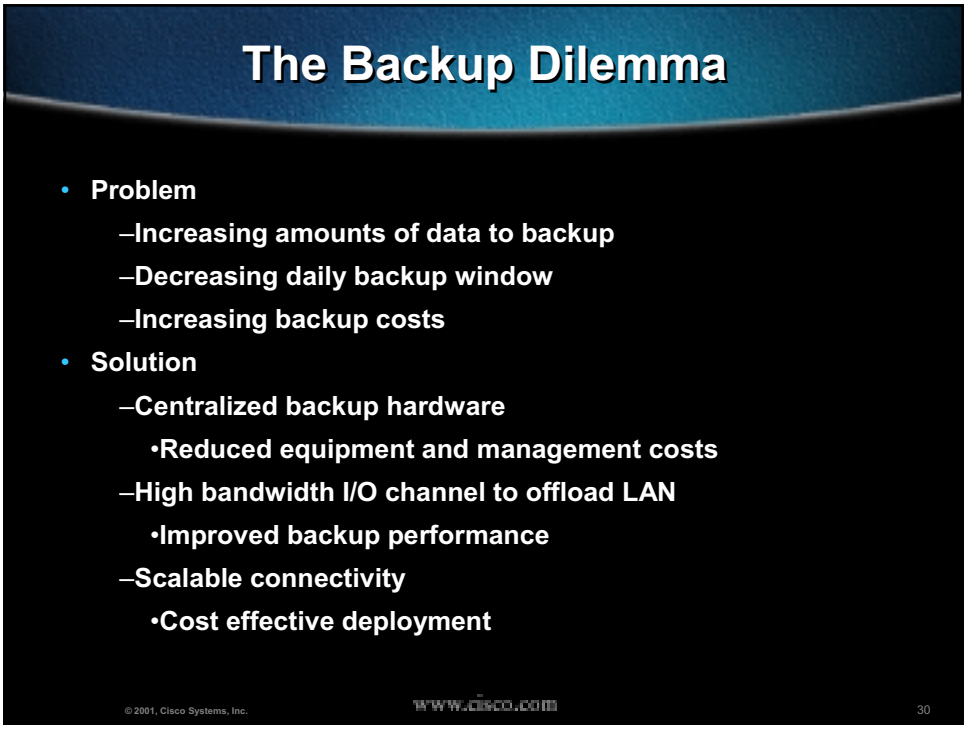

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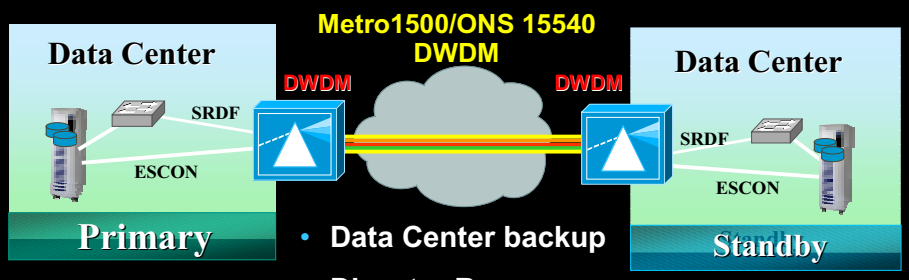
Disaster Recovery over Metro Optical

Business Continuance



- Data Center backup
- Disaster Recovery
- Remote mirroring
- Tape vaulting
- Remote printing
- Channel extension

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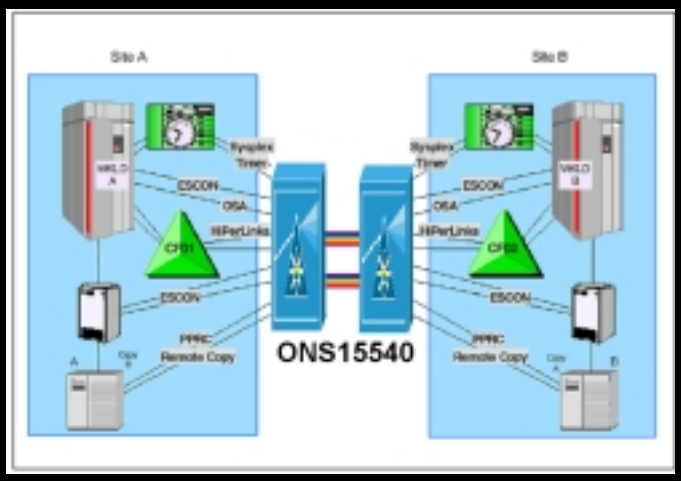
Business Continuance: Enterprise Data Centers

Parallel Sysplex configurations installed in two sites



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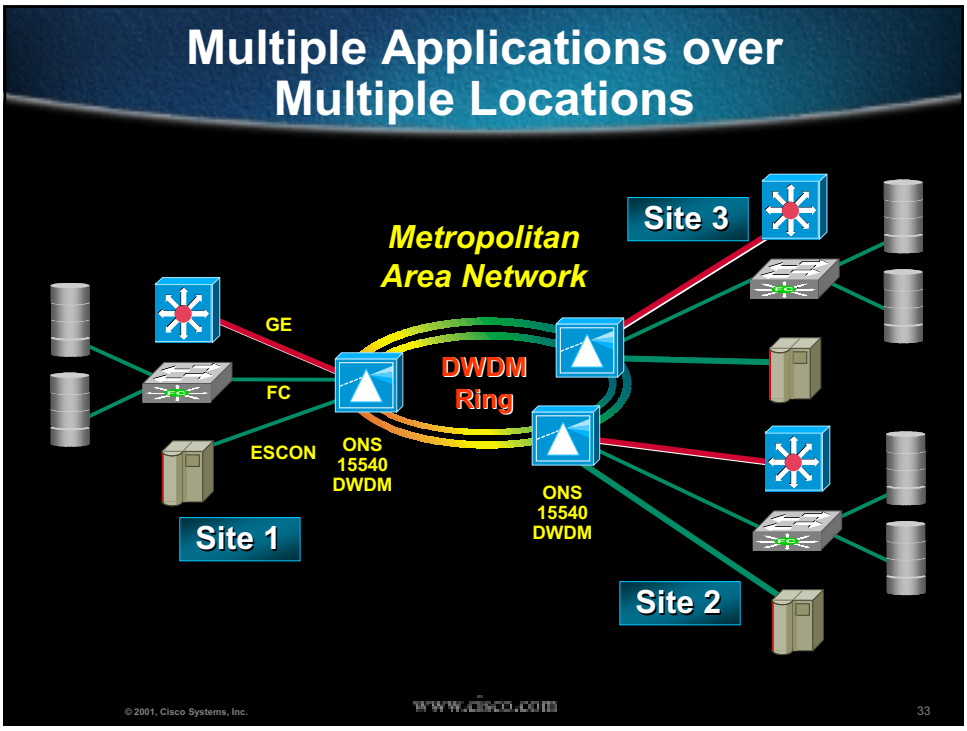

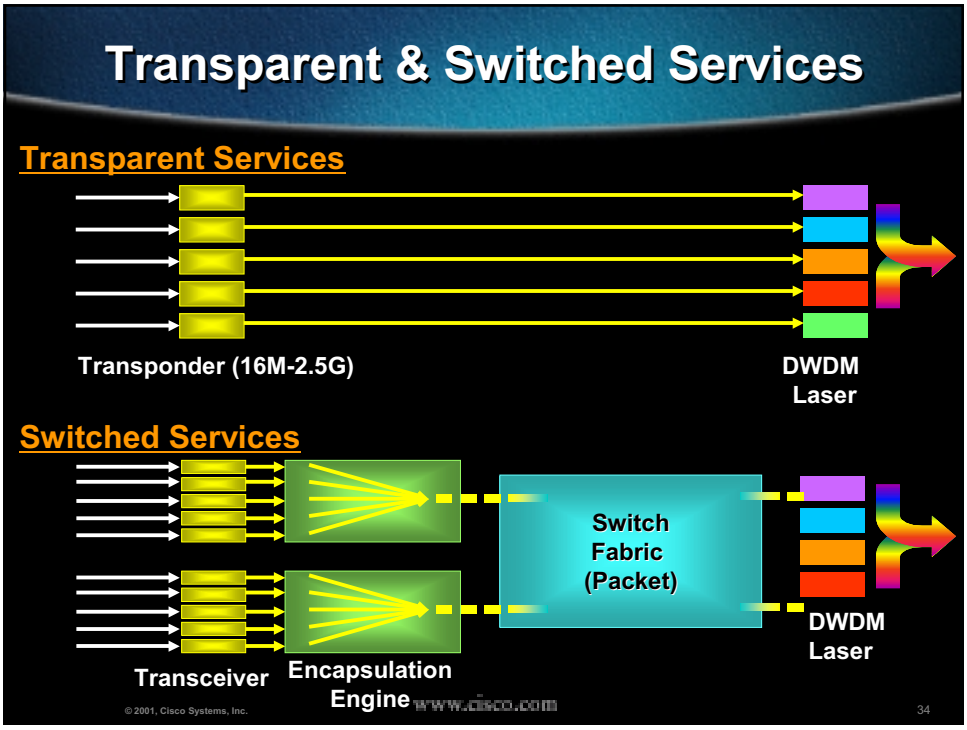

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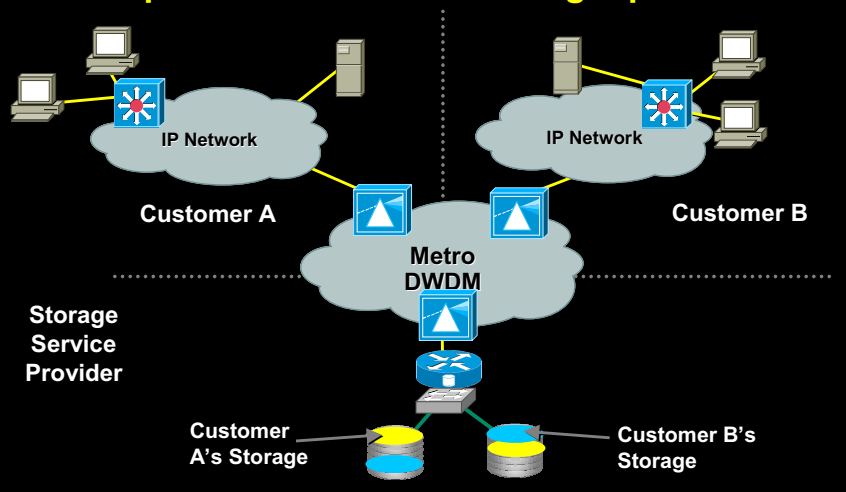
Storage Outsourcing

IP and Optical to Provide Wavelength per Customer



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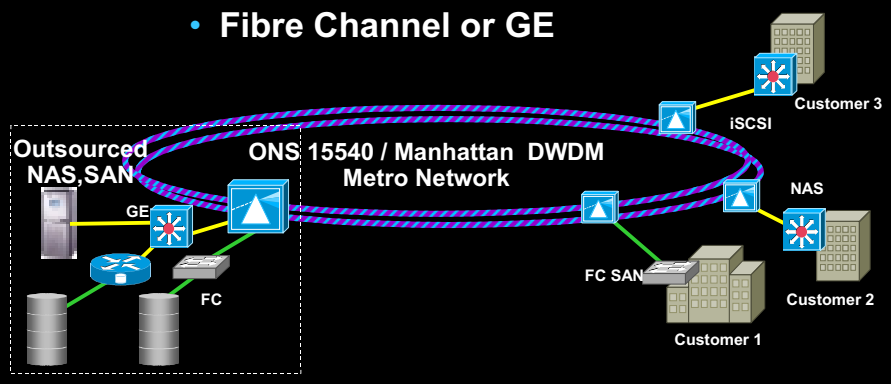
Hosted Storage over Service Provider DWDM

- DWDM service
- Provide Wavelength per customer
- Fibre Channel or GE



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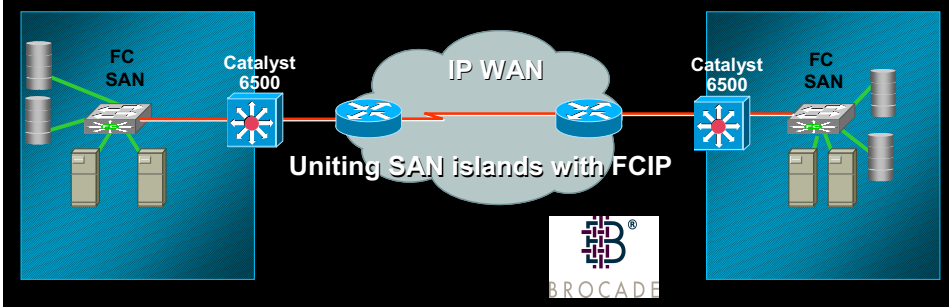
Storage-to-Storage over WAN using FCIP

Isolated SAN Islands



Corporate HQ

Remote Site

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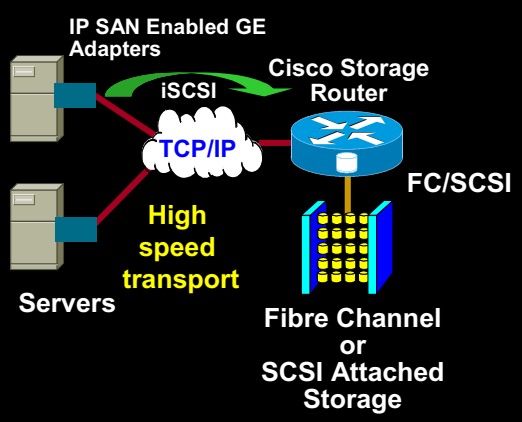
Cisco Storage Area Network (SAN)

- Virtualization of Storage (distance independence)
- Reduced cost of ownership
- Consolidated storage management
- Improved storage scalability
- Open Standard based



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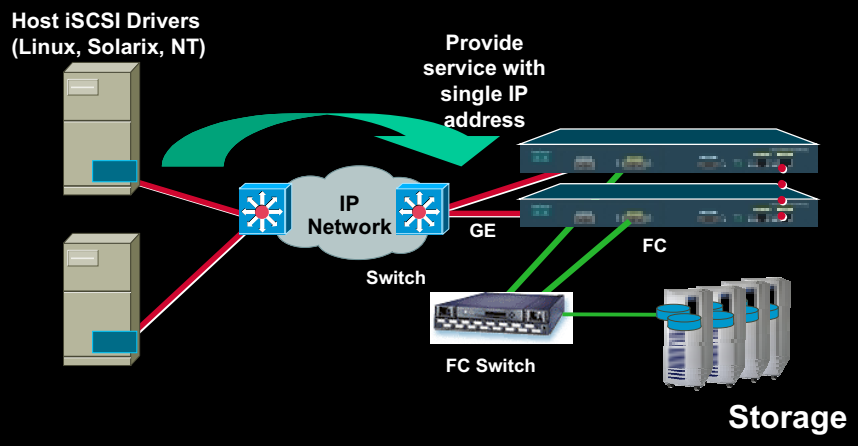
SN5420 Storage Router High Availability

SN5420 high availability cluster



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Products for Data Centers and I-Storage

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Products for Data Centers and I-Storage

- Metro1500 (DWDM Optical)
- ONS15540/15530 (DWDM Optical)
- SN 5420 Storage Router
- ONS15252 … (future …)

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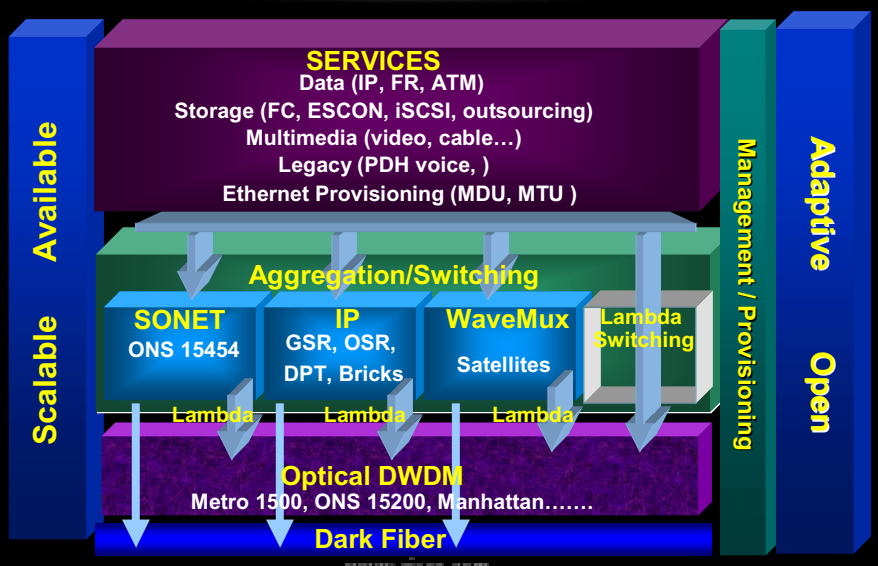
Cisco Metro Optical



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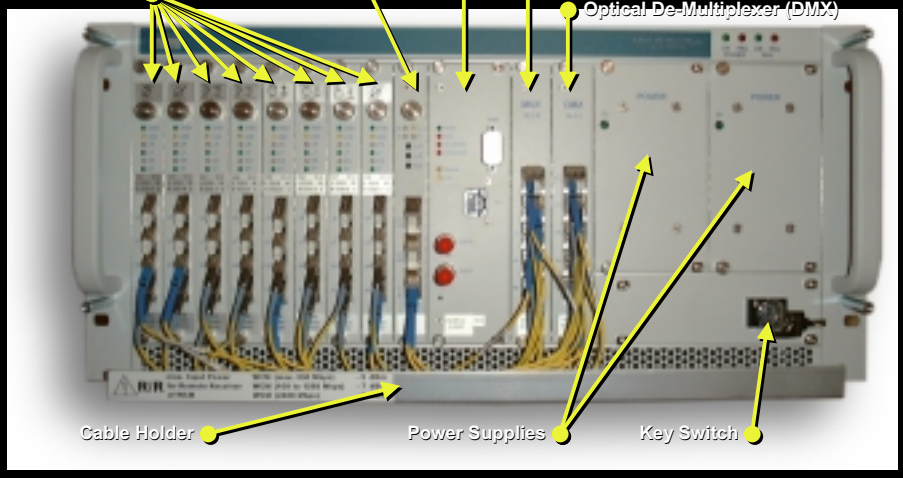
Eight Channel Chassis



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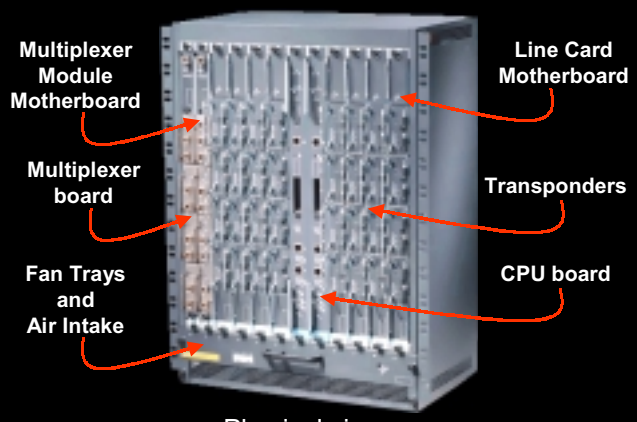
Cisco ONS 15540 Extended Services Platform



Physical view

- 32+1 wavelengths
- 100GHz grid (C_band) for the first 32 wavelengths(protected)
- plug in transponders (four per line card)
- optical supervisory chnl (33rd wavelength)
- NEBS compliant

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ONS 15540 ESP Features

- ITU DWDM Grid, 100 GHz separation
- Transparent Services
  - 16 Mb to 2.5Gb transmission rate per wavelength
  - Type 1 Transponders
  - Up to 32 channels per shelf
    - 8 Line Cards per shelf
      - 4 channels per Line card
- OC-3, -12, -48, -192, FE, GE, FC, FICON, ESCON, 10GE
- Point-to-point, Bus and Ring
- Optical MUX/ADM Options
  - 4 channel with and without OSC ADM
  - 8 channel with and without OSC ADM
  - 32 channel with and without OSC terminal mux/demux

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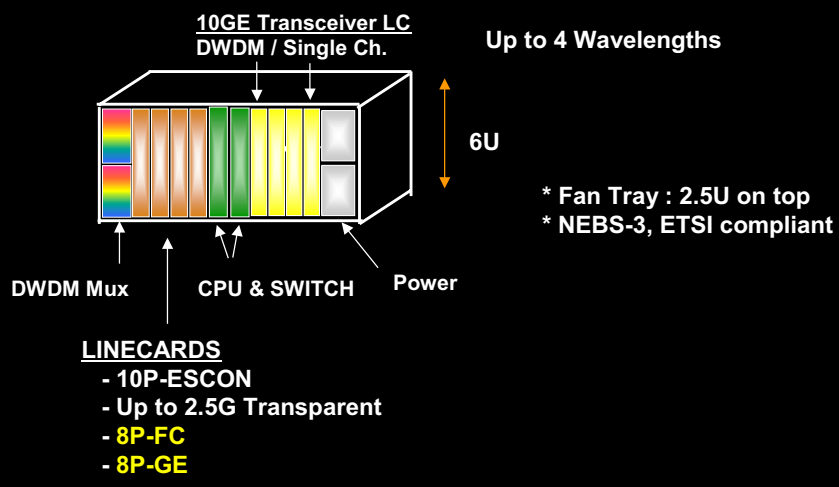
ONS 15530 (Phase 0.5)

40G Access Node with 10GE & Service Mux per Wave



* Fan Tray : 2.5U on top
* NEBS-3, ETSI compliant

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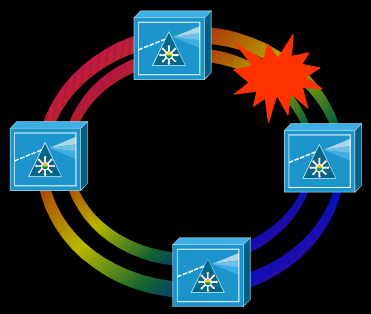
High Availability

Multi-level protections based on user needs :

- Optical splitter based protection
- Line card & Y cable based protection
- Application level protection



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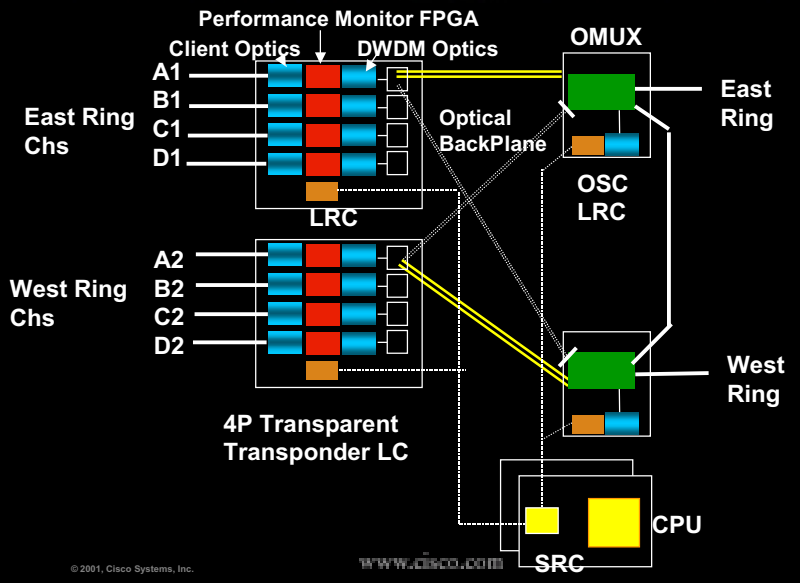
Application Level Protection Mode



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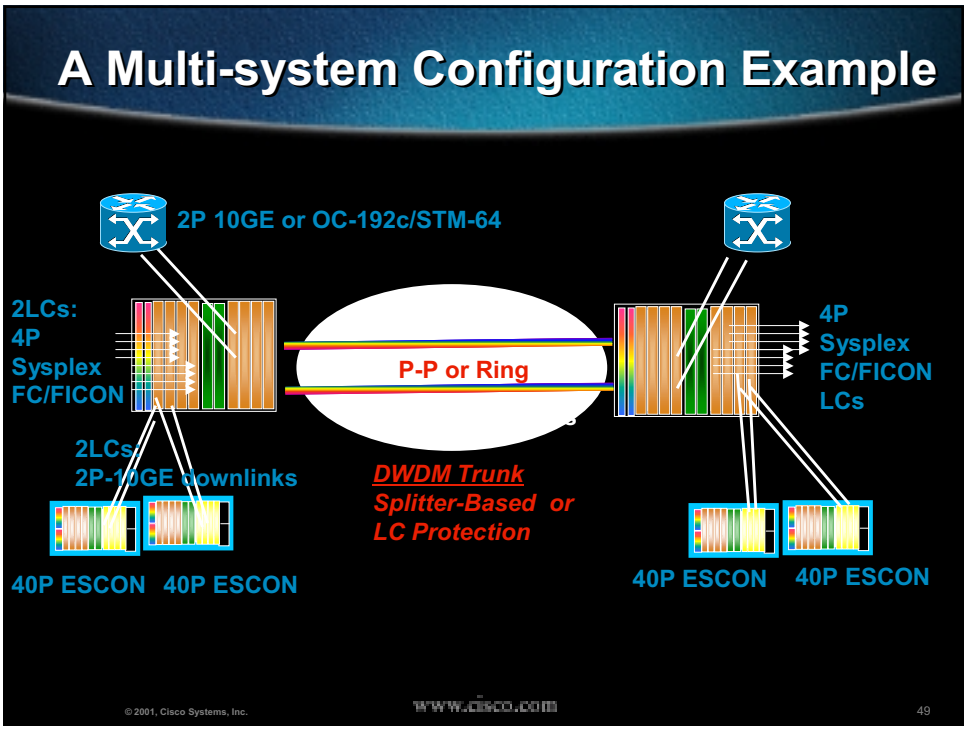

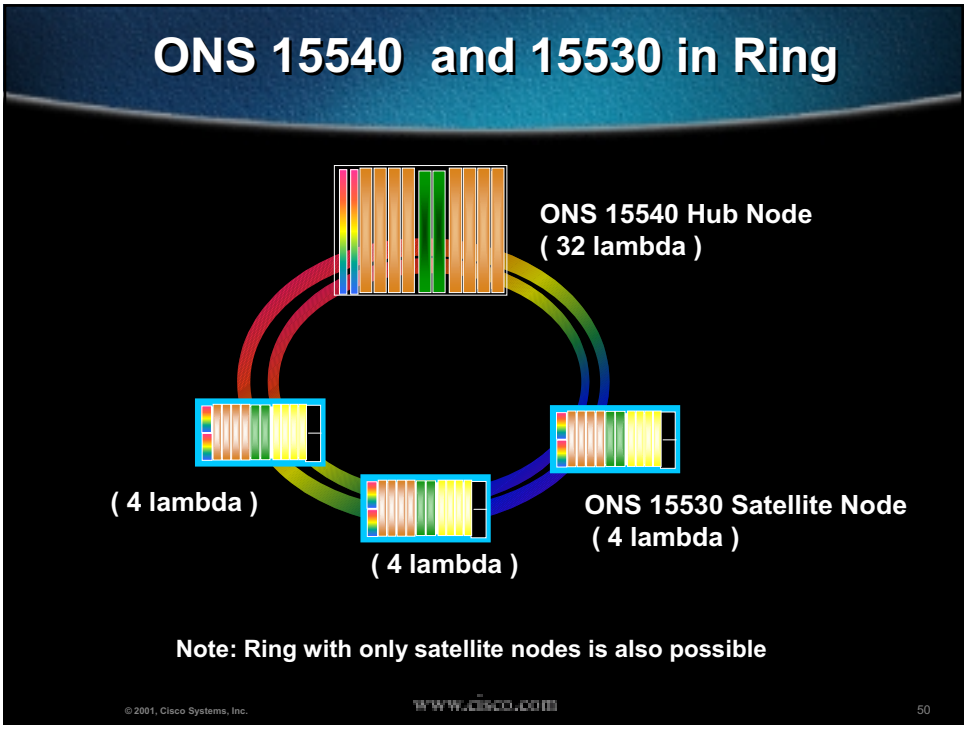

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Products for Data Centers and I-Storage

- SN 5420 Storage Router

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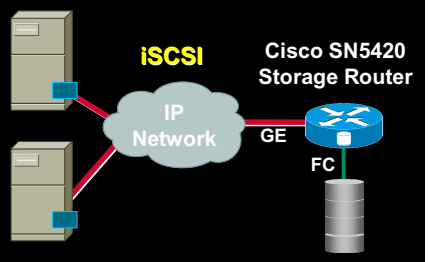
SN5420 Storage Router

Universal Access to Storage over IP networks

- Features and Benefits
  - Share storage resources
  - Extend storage over IP networks
  - Security ACLs/LUN Mapping
  - High availability
  - Heterogenous support for Windows NT, Solaris, and Linux
  - Standards-based
  - Web-based management



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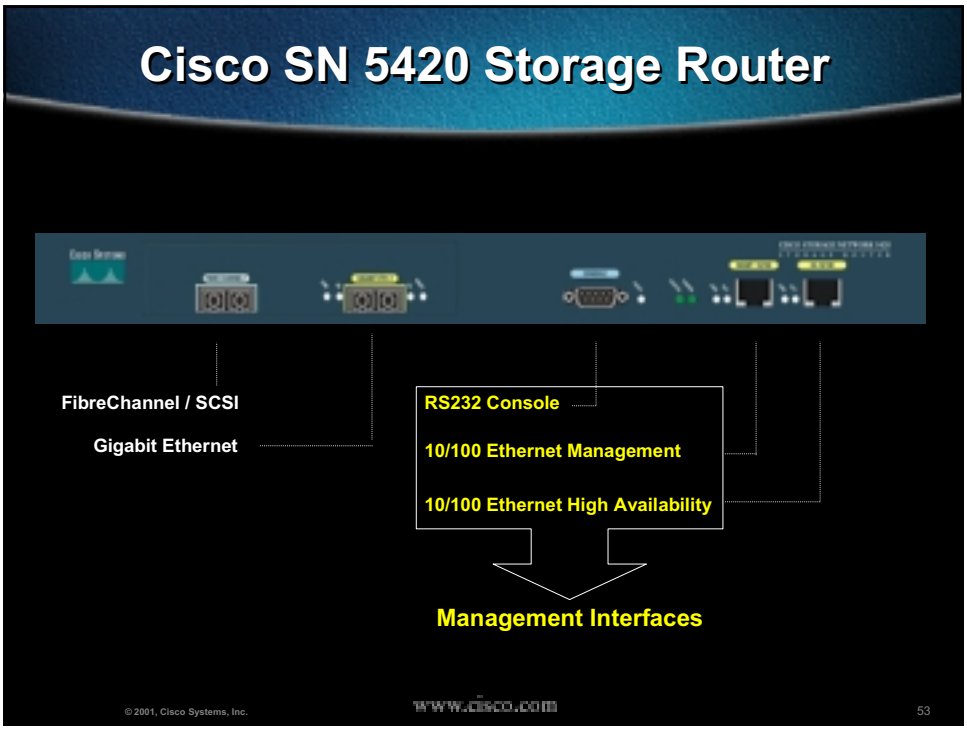

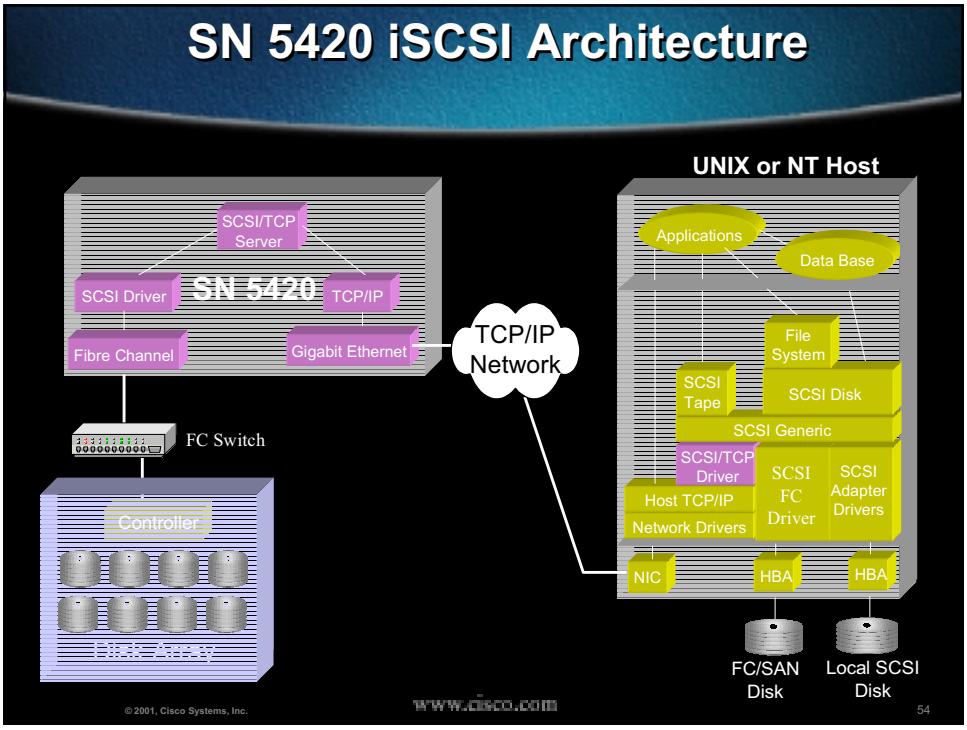

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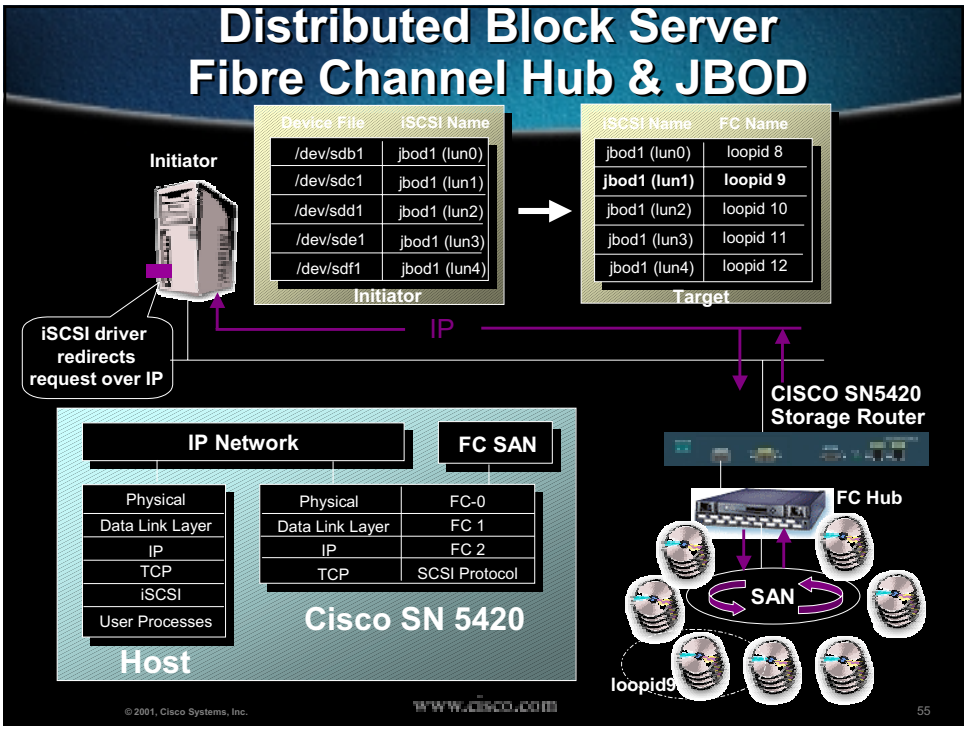

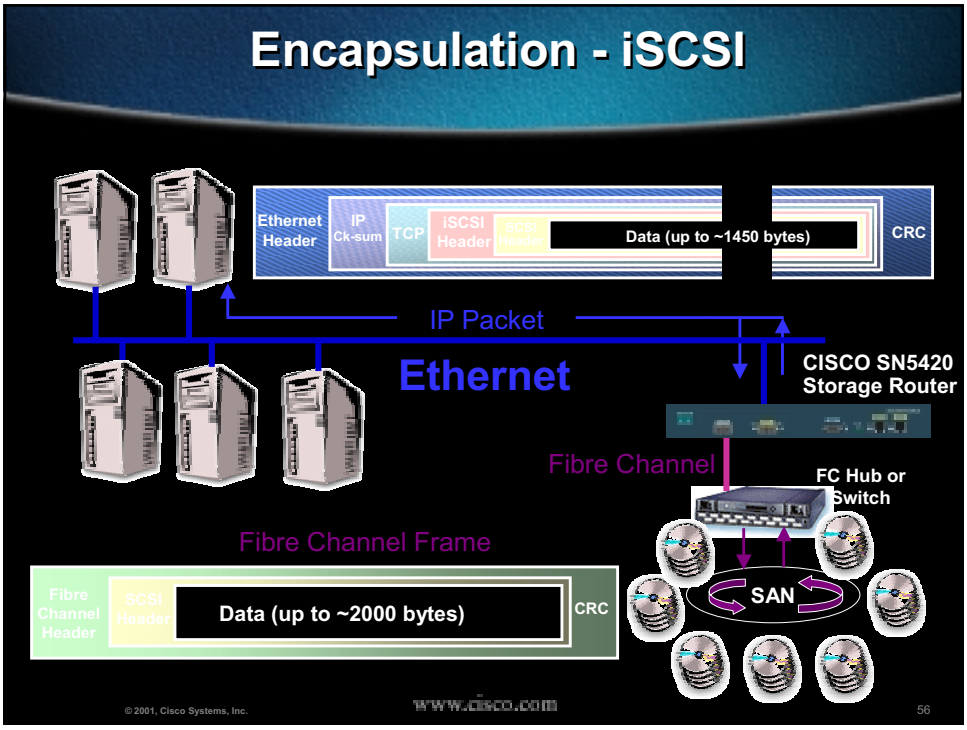

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