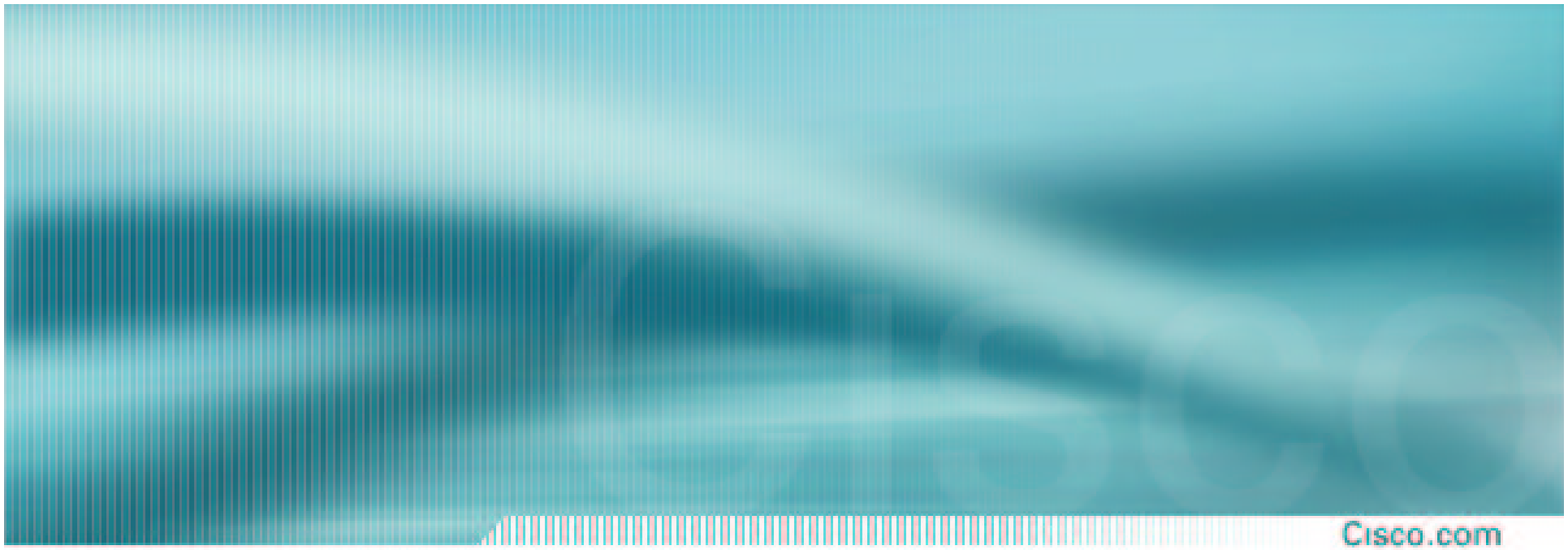

Storage Area and IP Networks Integration

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Agenda

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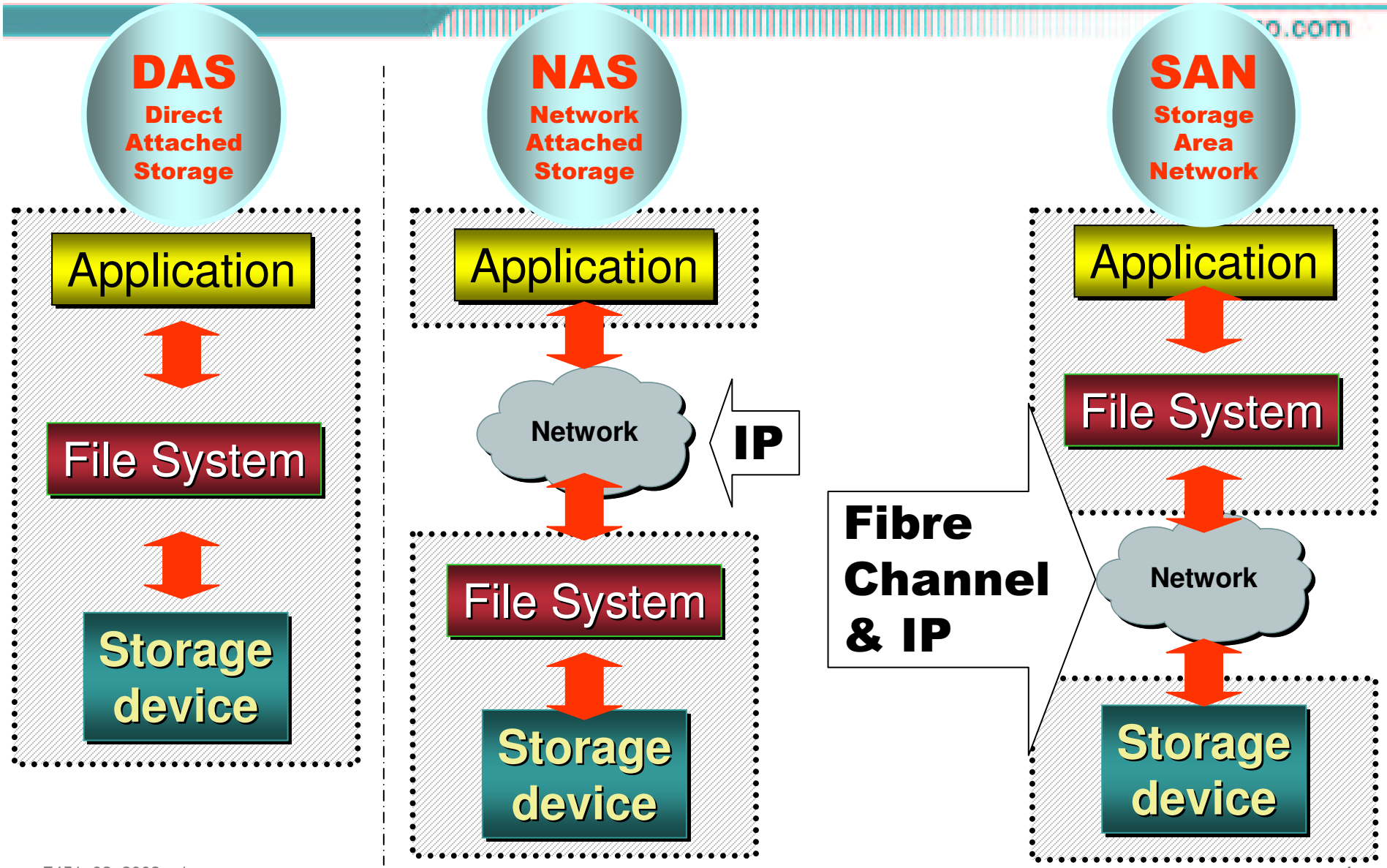
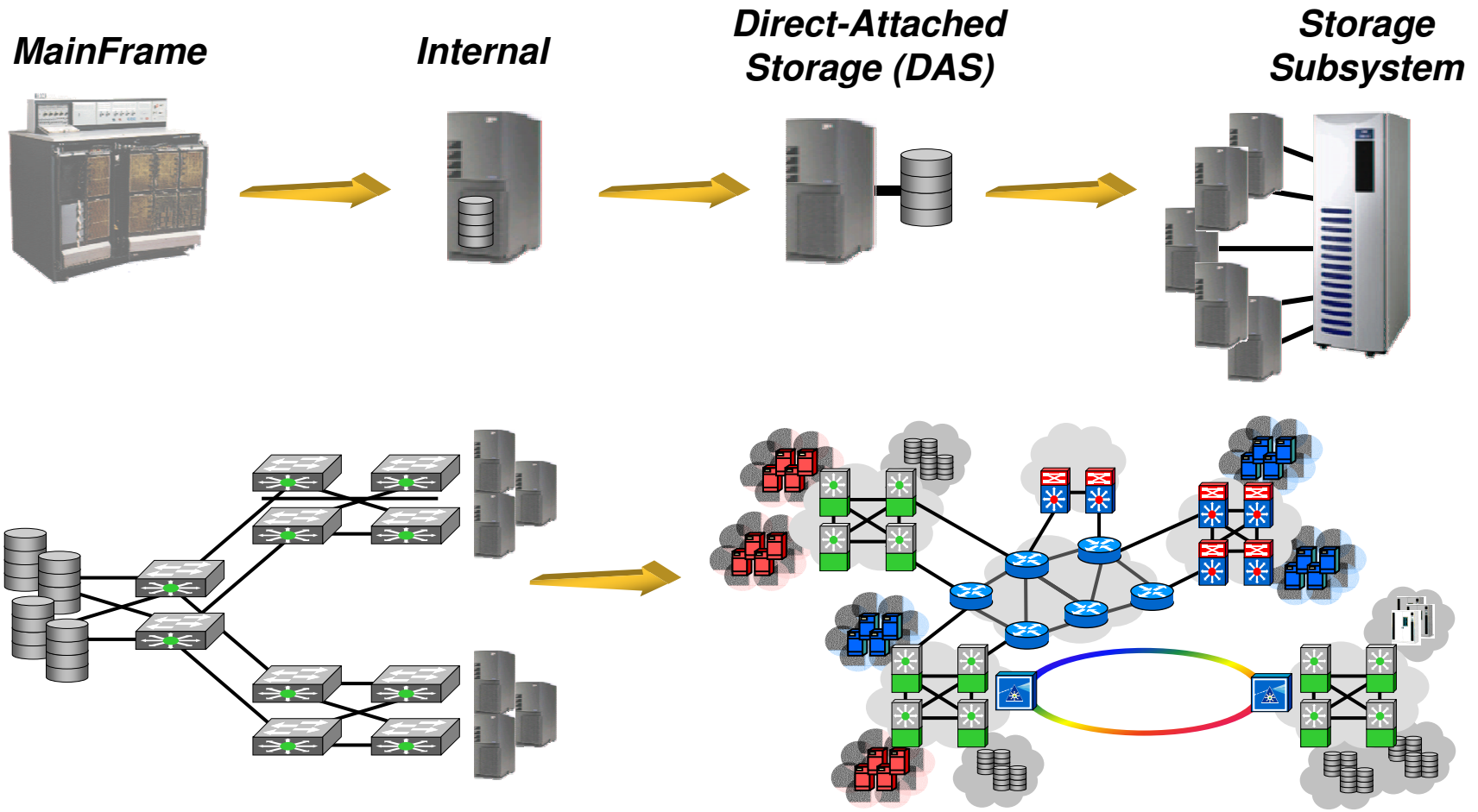
- **Brieft Introduction to Storage Networking**
- **Intelligent Storage services:**
  - **Virtual SAN (VSAN)**
  - **Multiprotocol: iSCSI and FCIP**
- **The benefits of IP storage**

Storage Networking : Where is the Network ?



The Storage Evolution



Storage Networking Evolution

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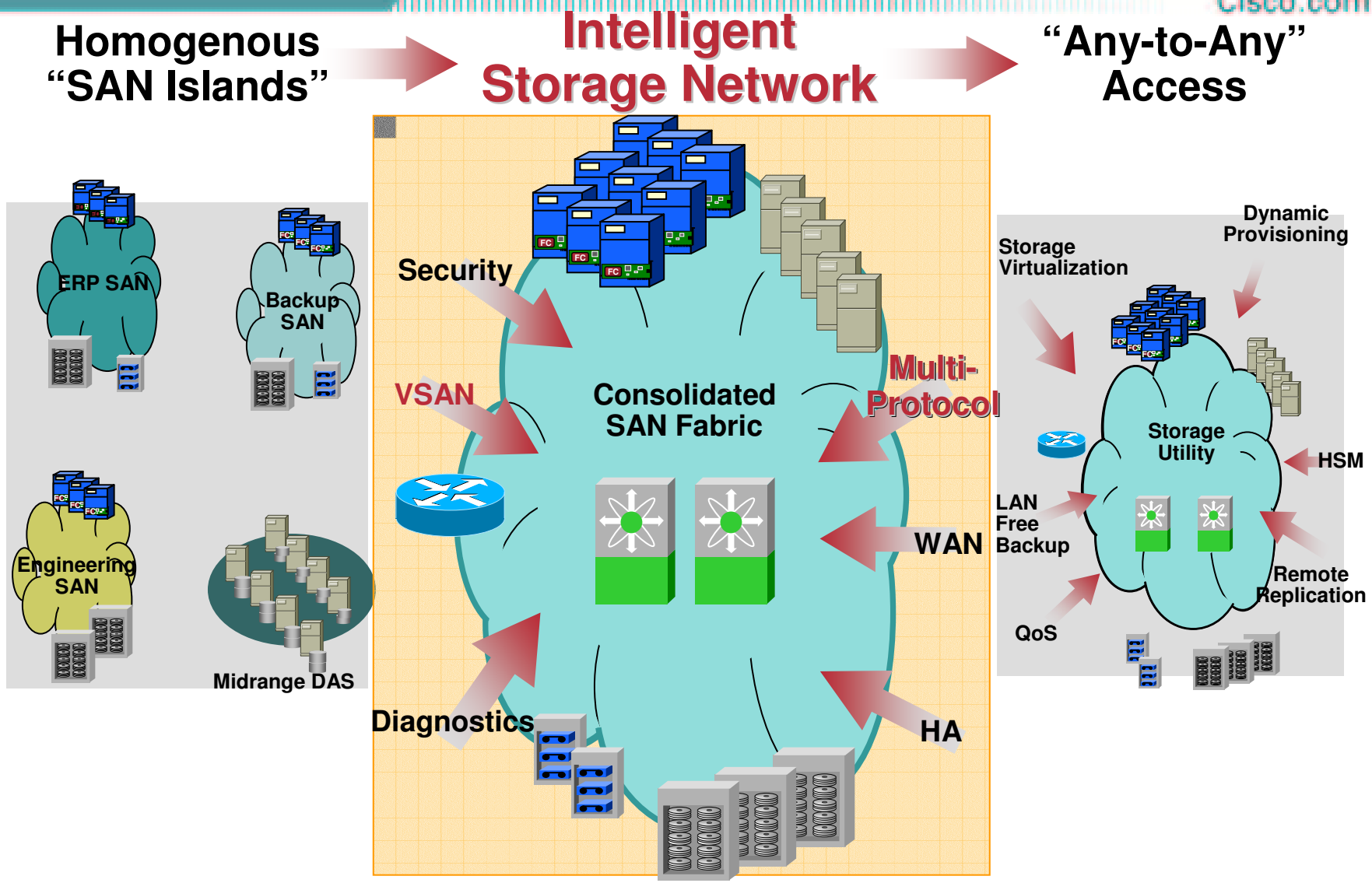
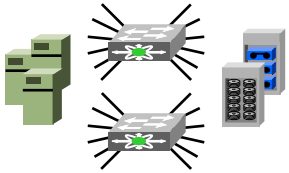


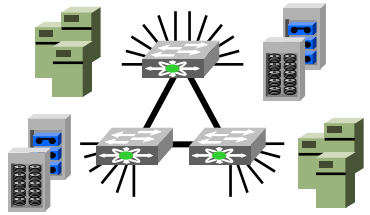
SAN Islands

- Today many SAN environments consist of numerous islands of connectivity
- Islands are physically isolated environments consisting of one or more interconnected switches
- Each island is typically dedicated to a single or multiple related applications
- Each island may be independently managed by a separate admin team
- Strict isolation from faults achieved through physical isolation

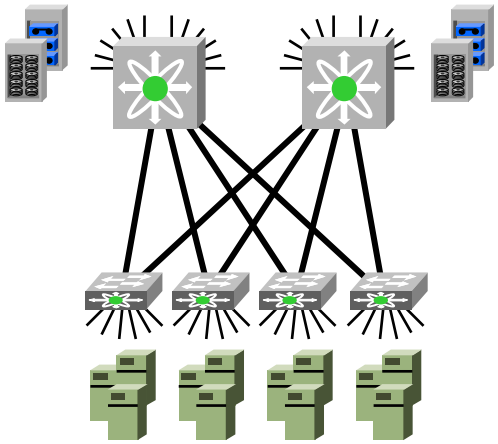
'Fan-out' SAN Islands



'Departmental' SAN Islands



'Larger Core-Edge' SAN Island



Intelligent Network Services—Virtual SANs (VSANs)

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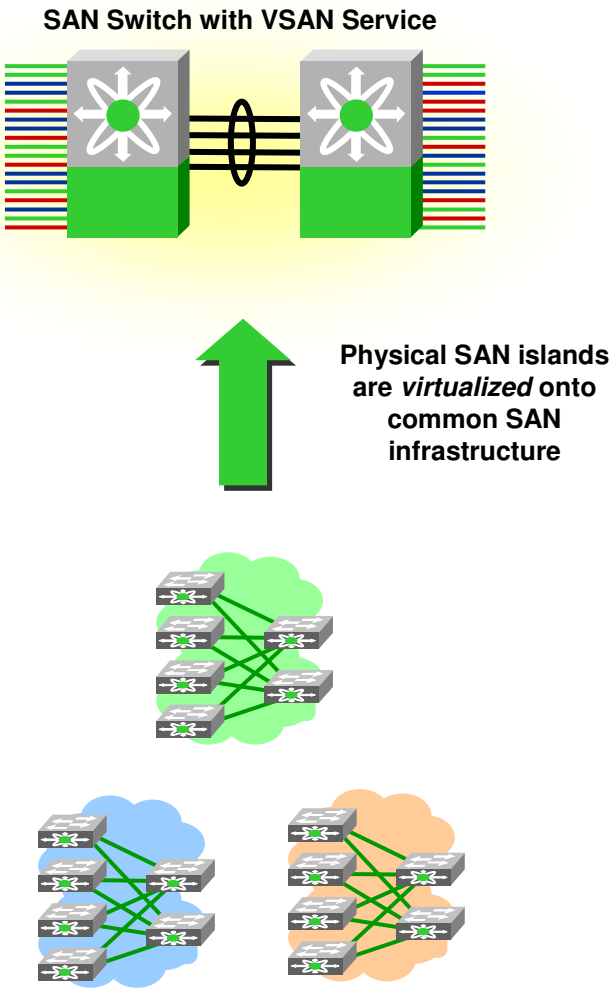
A Virtual SAN (VSAN) provides a method to allocate ports within a physical fabric to create virtual fabrics

- **Analogous to VLANs in Ethernet**
- **Virtual fabrics created from larger cost-effective redundant physical fabric**
- **Reduces wasted ports of island approach**
- **Fabric events are isolated per VSAN – maintains isolation for HA**
- **Hardware-based isolation - traffic is explicitly tagged across inter-switch links with VSAN membership info**
- **Statistics can be gathered per VSAN**



Two Primary Functions of VSANs

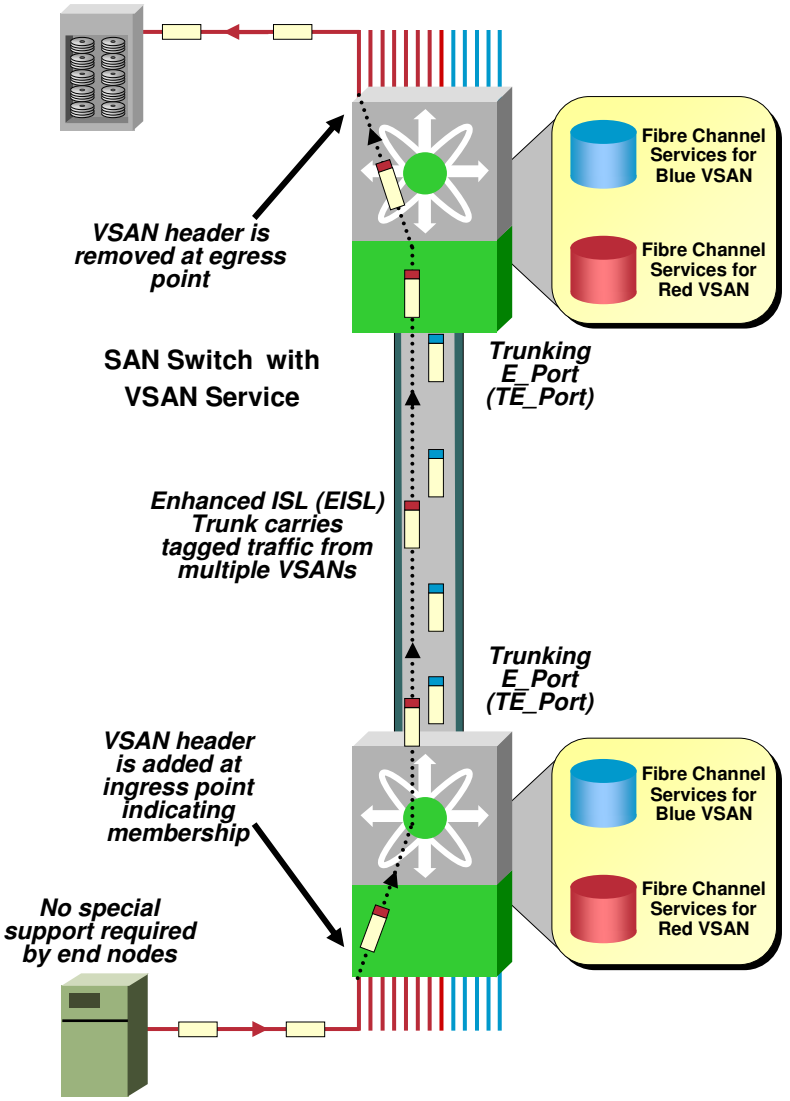
The Virtual SANs feature consists of two primary functions:

1. **Hardware-based isolation of tagged traffic belonging to different VSANs**

   - No special drivers or configuration required for end nodes (hosts, disks, etc)
   - Traffic tagged at Fx_Port ingress and carried across EISL (enhanced ISL) links between switches

2. **Create independent instance of Fibre Channel services for each newly created VSAN – services include:**

   - Zone server, name server, management server, principle switch election, etc.
   - Each service runs independently and is managed/configured independently

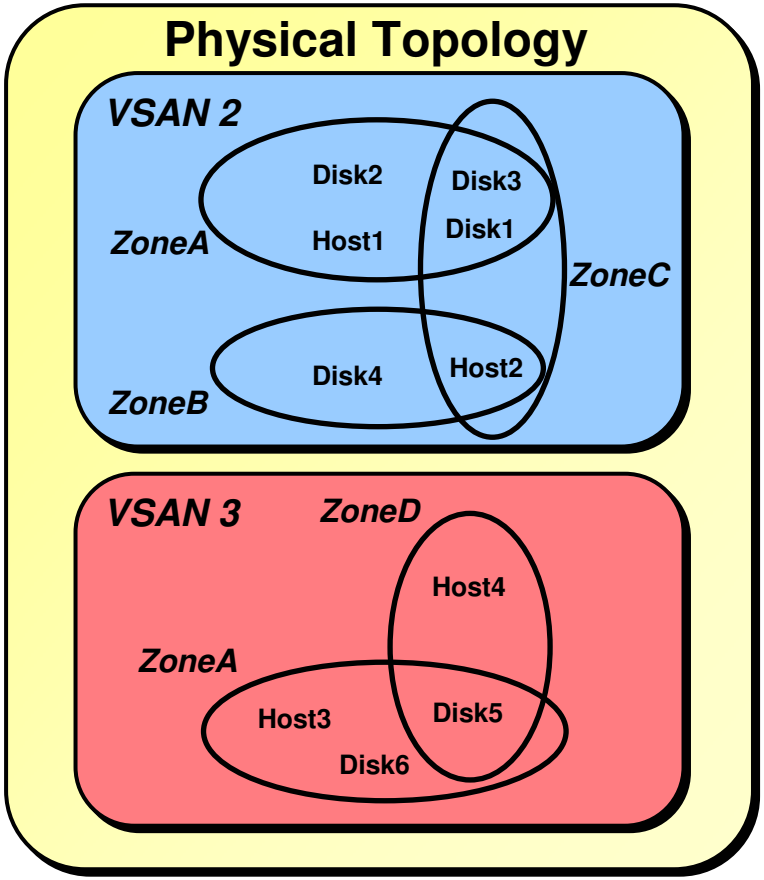


VSANs and Zones - Complimentary

Virtual SANs and fabric zoning are very complimentary

- **Hierarchical relationship –**
  - **First assign physical ports to VSANs**
  - **Then configure independent zones per VSAN**
- **VSANs divide the physical infrastructure**
- **Zones provide added security and allow sharing of device ports**
- **VSANs provide traffic statistics**
- **VSANs only changed when ports needed per virtual fabric**
- **Zones can change frequently (eg. backup)**
- **Ports are added/removed non-disruptively to VSANs**

Relationship of VSANs to Zones



IP Storage Networking

- IP storage networking provides solution to carry storage traffic within IP
- Uses TCP, a reliable transport for delivery
- Can be used for local data center and long haul applications
- Two primary protocols:

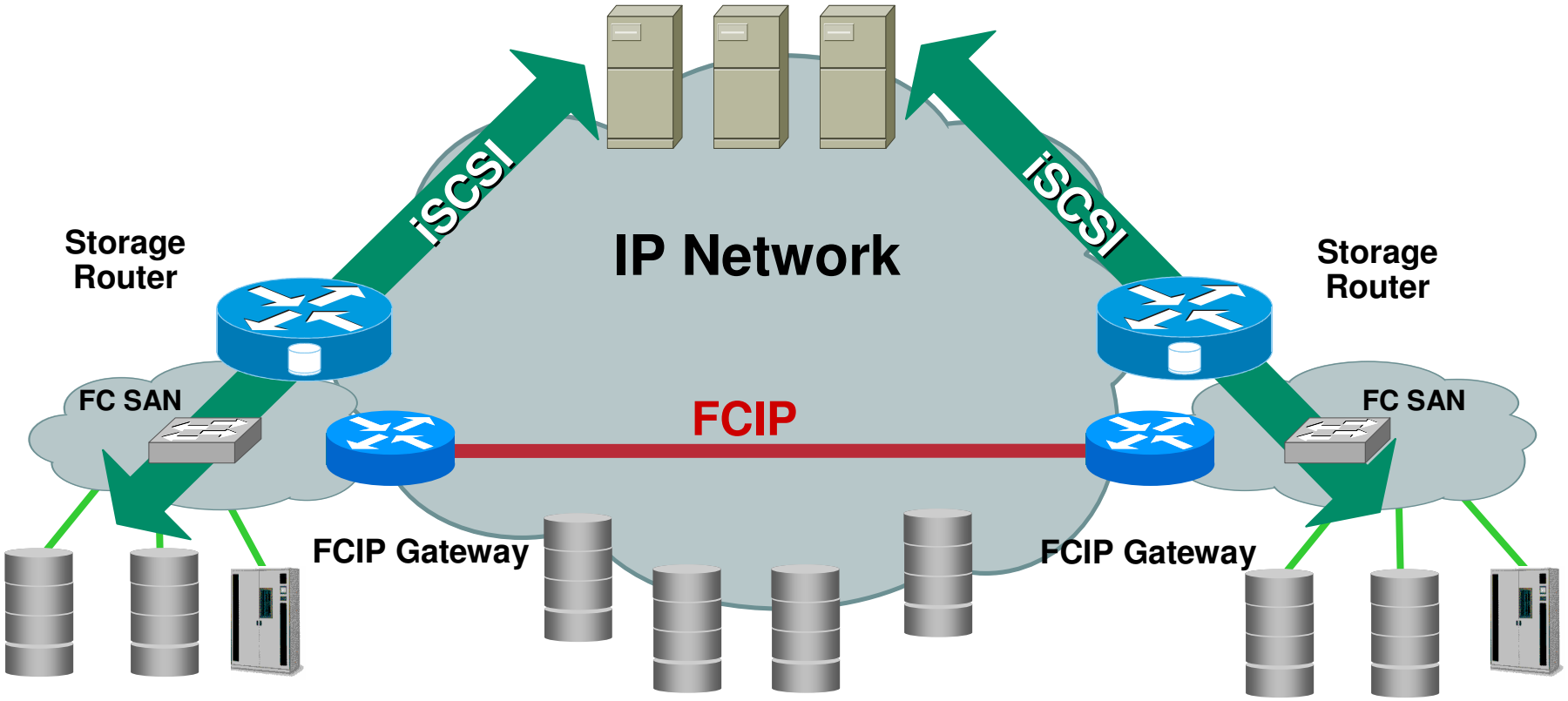
iSCSI[1] – IP-SCSI - used to transport SCSI CDBs and data within TCP/IP connections

FCIP – Fibre-Channel-over-IP – used to transport Fibre Channel frames within TCP/IP connections

[1]SCSI over IP (iSCSI) – RFC 3347

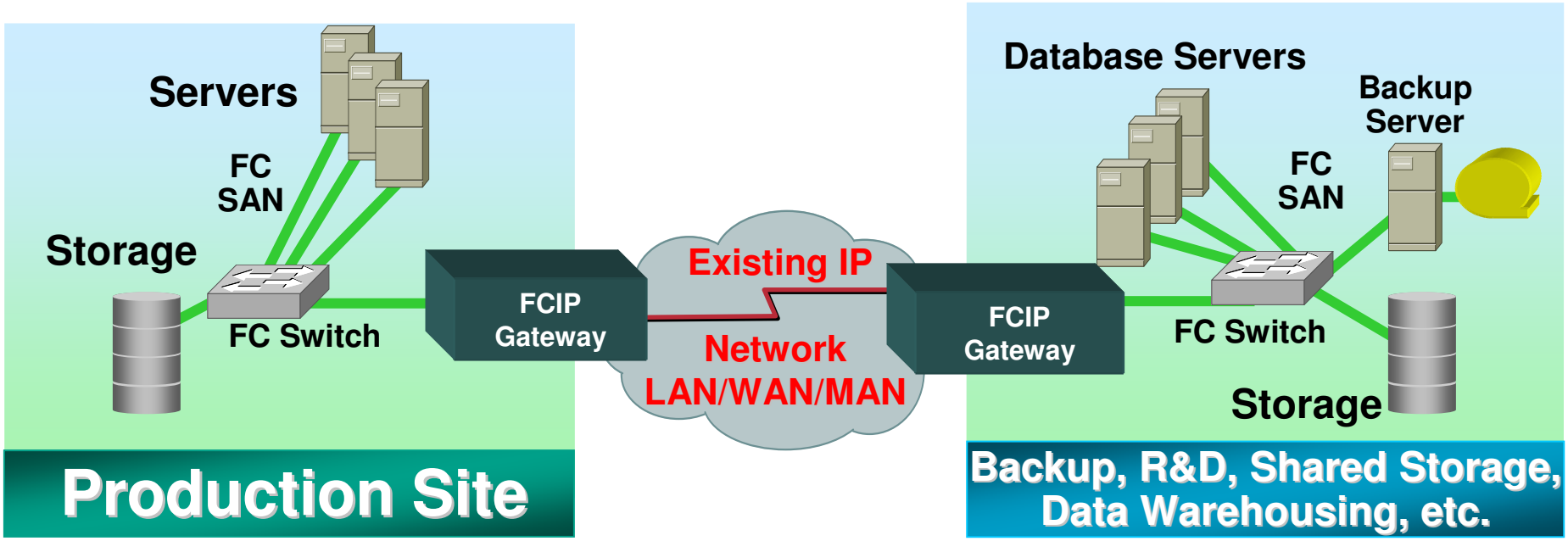
FCIP and iSCSI – Complementary Standards

- FCIP: SAN-to-SAN over IP
- iSCSI: Host to Storage over IP



FCIP

- FCIP Gateways perform Fibre Channel encapsulation process into IP Packets and reverse that process at the other end
- FC Switches connect to the FCIP gateways through an E_Port for SAN fabric extension to remote location
- A tunnel connection is set up through the existing IP network routers and switches across LAN/WAN/MAN



Potential FCIP Environments

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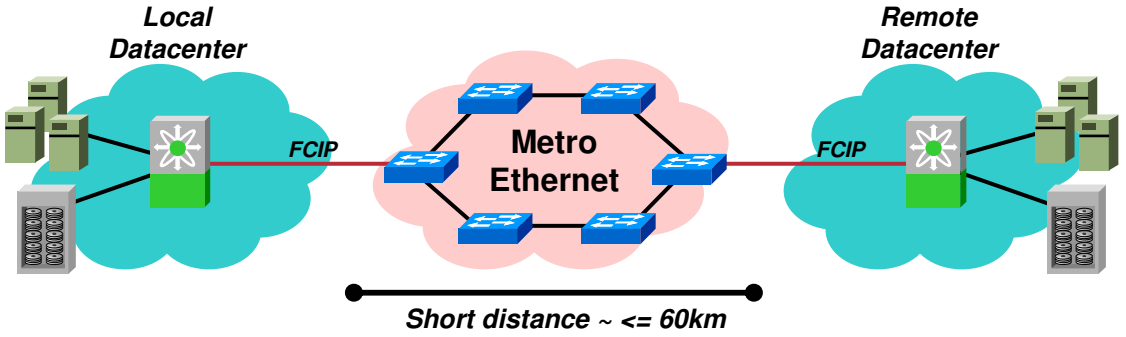
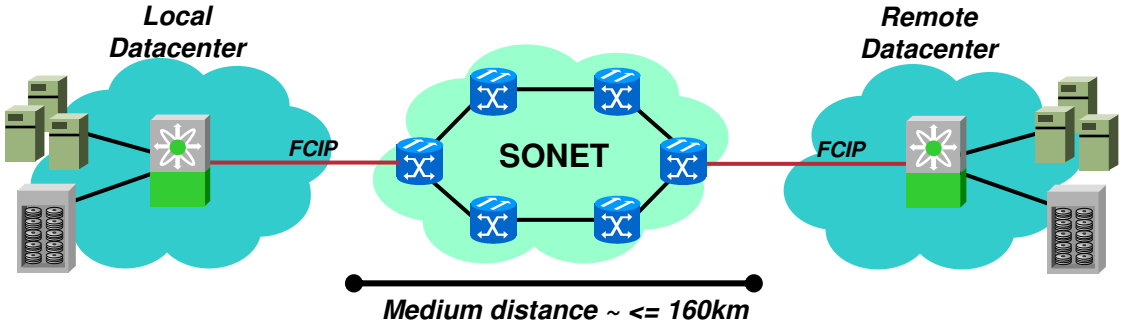
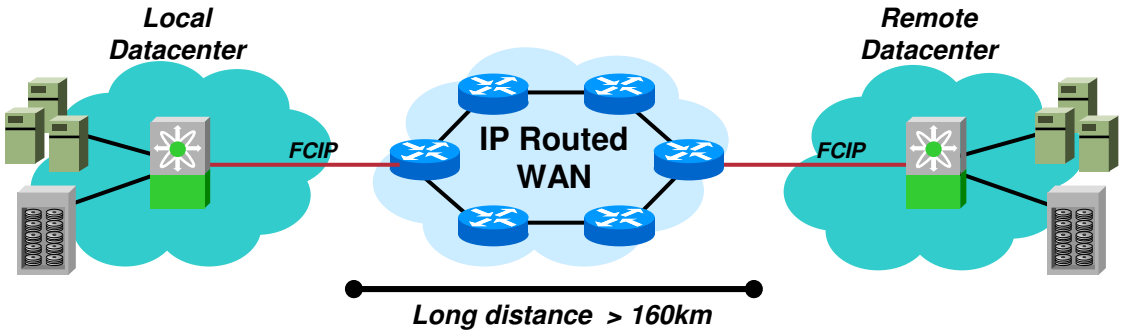
- Wire-rate (1Gbps)
- Relatively low latency
- Sync or Async replication
- Metro Ethernet offers cost effective solution



- Typical OC3 / OC12
- Relatively low latency
- Mainly asynchronous
- Suitable for some synchronous apps



- Low speed (T1 – DS3)
- Higher latency
- Longer distance
- Mainly asynchronous



iSCSI Architectural Model

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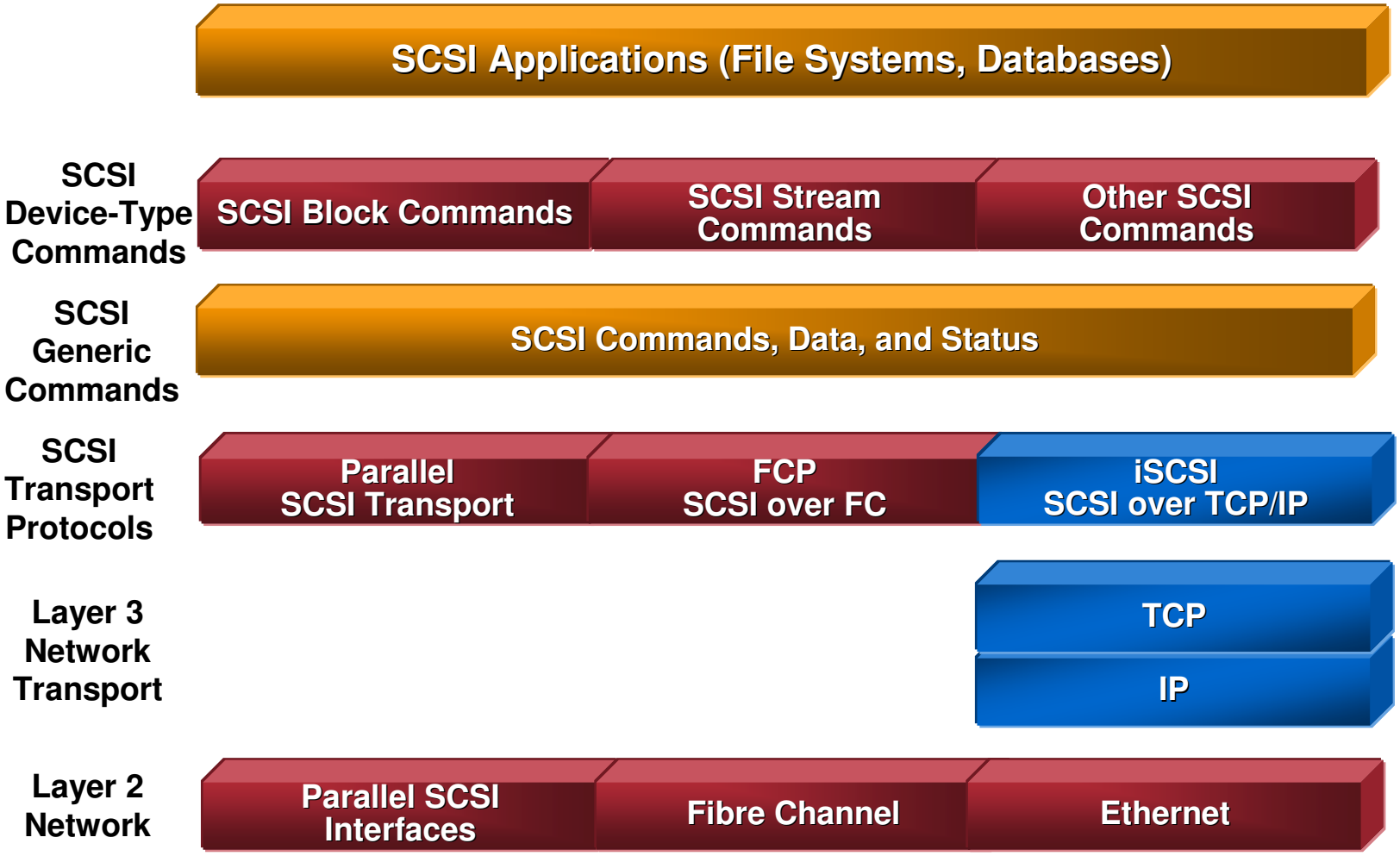
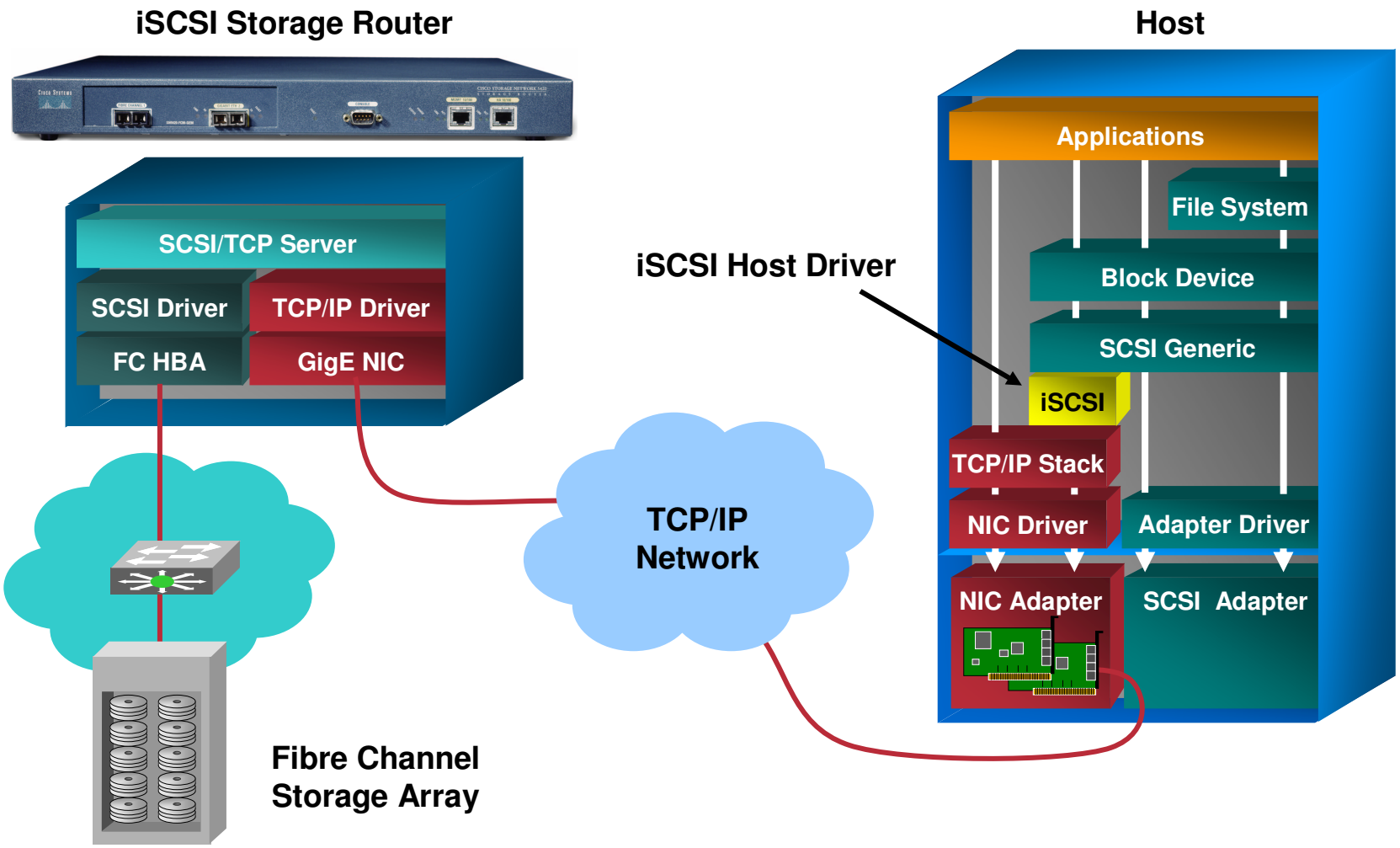
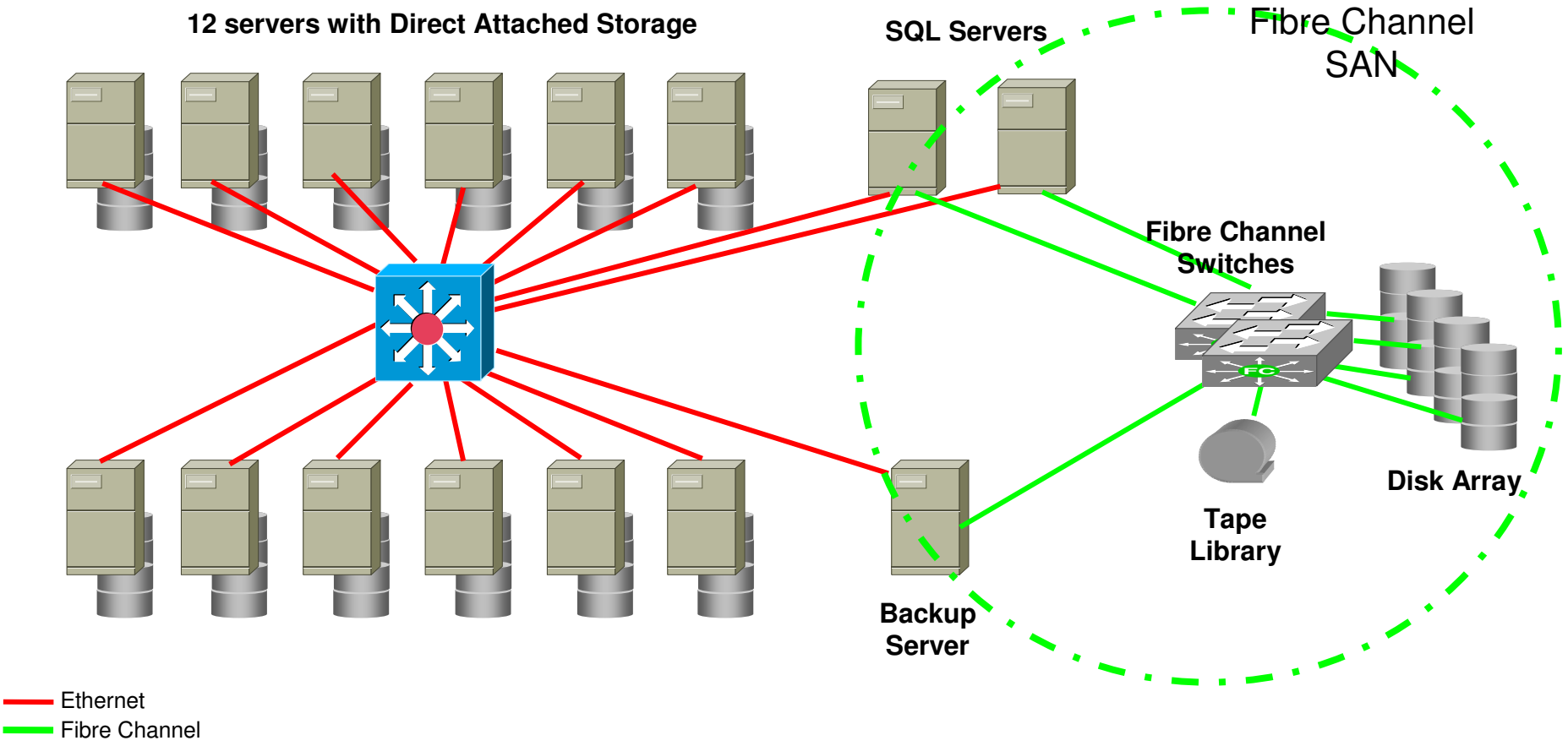


iSCSI Solution Architecture



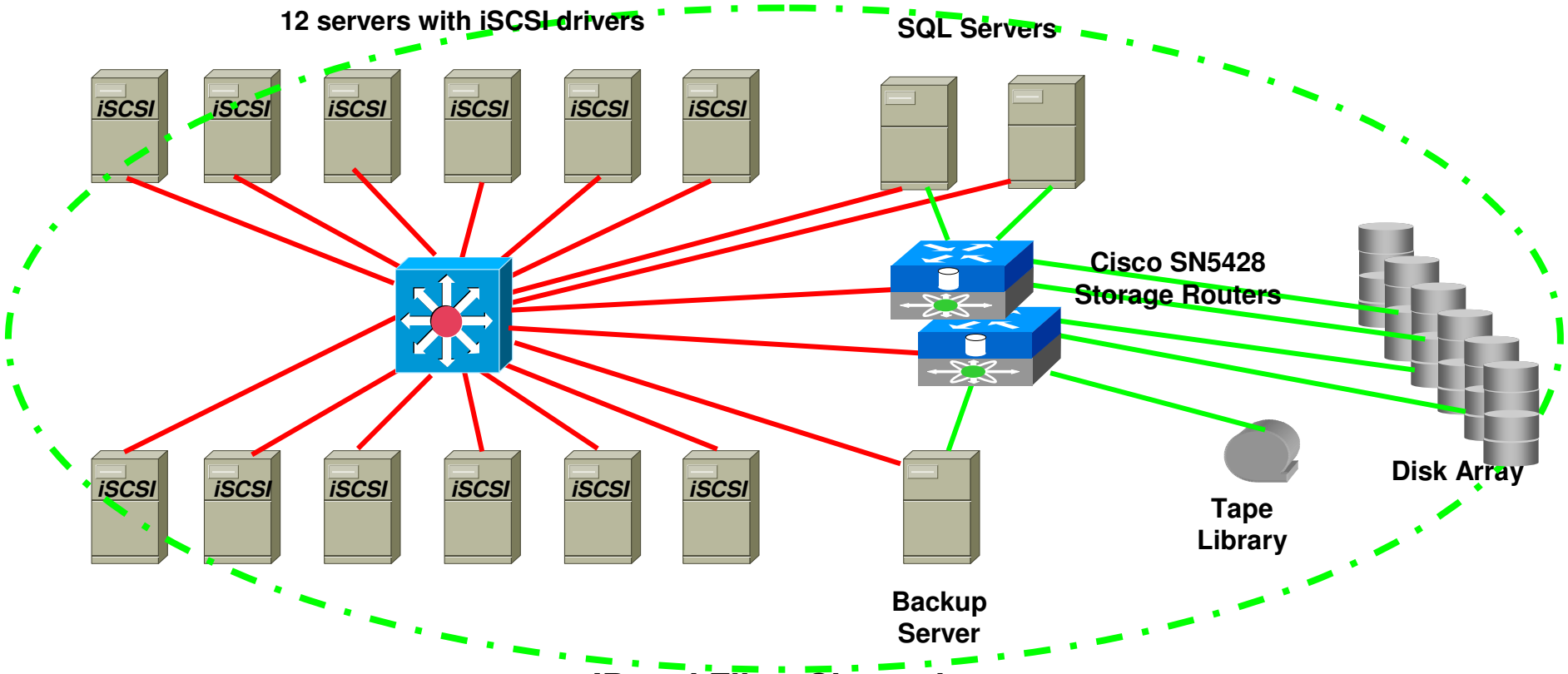
Case study- before iSCSI

Before iSCSI:
2 separate networks: IP and Fibre Channel



Case study- after iSCSI

After iSCSI: IP Storage
All servers participate in the SAN



Benefits of IP Storage

- **Simplifies Enterprise-Scale Business Continuance**
  - **Enables backup, remote replication, and disaster recovery over WAN distances using open-standard FCIP tunneling.**
- **Lowers Storage TCO for Midrange Servers**
  - **Enables consolidation of midrange server storage using industry standard iSCSI protocol**
  - **Provides midrange servers access to SAN-based backup and business continuance services**
- **Simplifies Management of Multi-Protocol SANs**
  - **Enables unified SAN services and management independent of the protocol being used**