# Trends In Network Industry - Exploring Possibilities for IPAC Network

Steven Lo

# History

- Token Rings/Thick Ethernet
  - 5Mbs
- Shared Hubs
  - 10Mbs
  - 100Mbs
- ATM
  - 155Mbs
- Group Switching
  - 100Mbs
  - 1000Mbs

# Ethernet Switching and Virtual LAN

- Breakthrough / ground breaking technology
- Provide fault tolerance, traffic flow control and content filtering
- Non-sharing, concurrent multiple connections
- Solve congestion of the shared network
- ASIC hardware to improve performance over software
- Support virtual and private network
- Software configuration, easy management
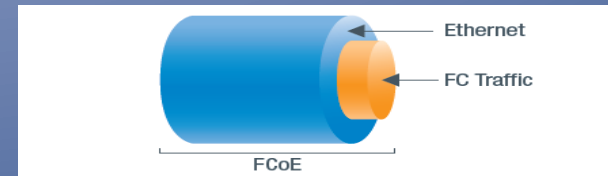  - Change system from subnet to subnet with one simple command

# 10 Gigabit/sec

- Enabling technology
- 10-fold bandwidth increase over Gigabit
- Gaining popular as cost reduced drastically
- Server consolidation and virtualization
  - Allow server to scale to larger number of processors (or VM)
- Address N -> 1 congestion issue
- LAN, SAN storage and cluster convergence
- Currently being used by backup and clustering applications at IPAC

# Network-based storage

- iSCSI (Internet Small Computer System Interface)
  - Encapsulate SCSI command over ethernet network (TCP)
  - Move from direct attach to network attach
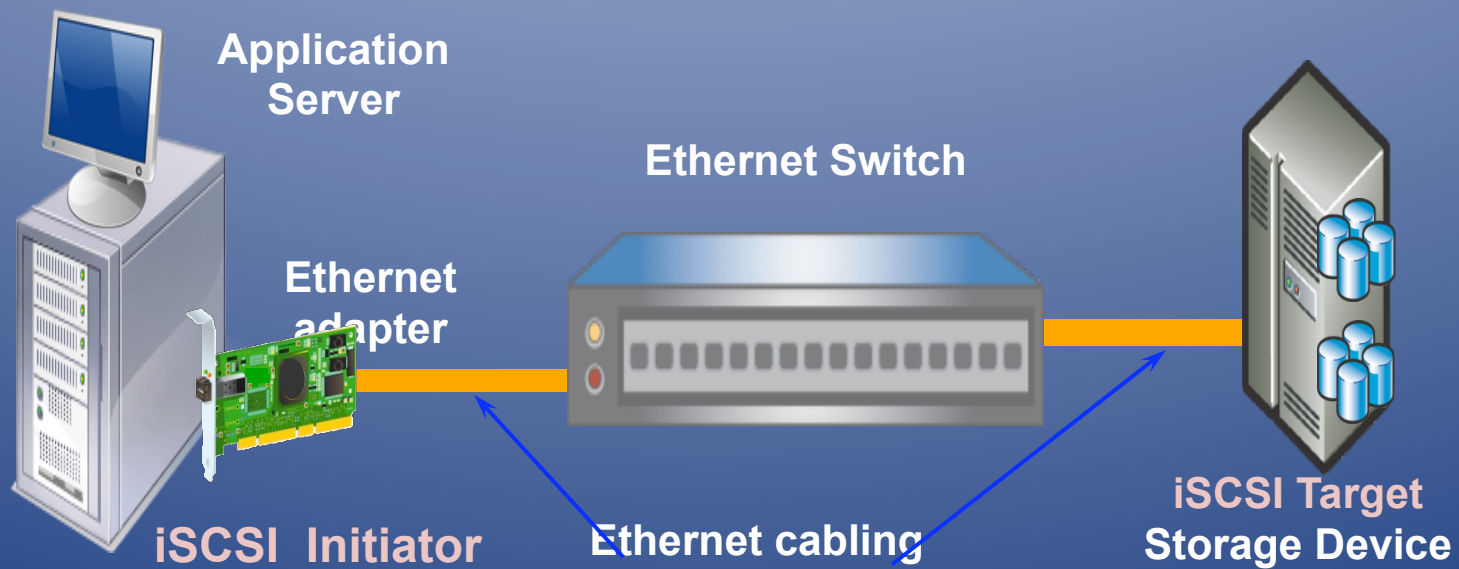  - Single IP protocol
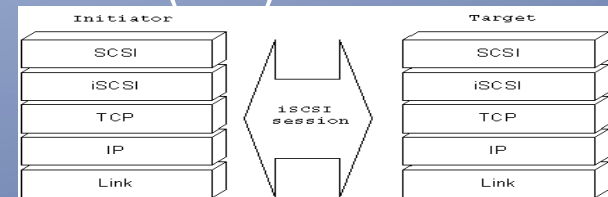


- FCoE (Fiber Channel over Ethernet)
  - Encapsulate Fiber Channel frames over ethernet network
  - Unified Communication
  - Simplify data center cabling



  - Reduce heat and energy
  - Fiber Channel will be in a catch up situation in term of speed (8Gbs vs. 10Gbs)
  - 10Gbs cost goes down – FC cost goes up
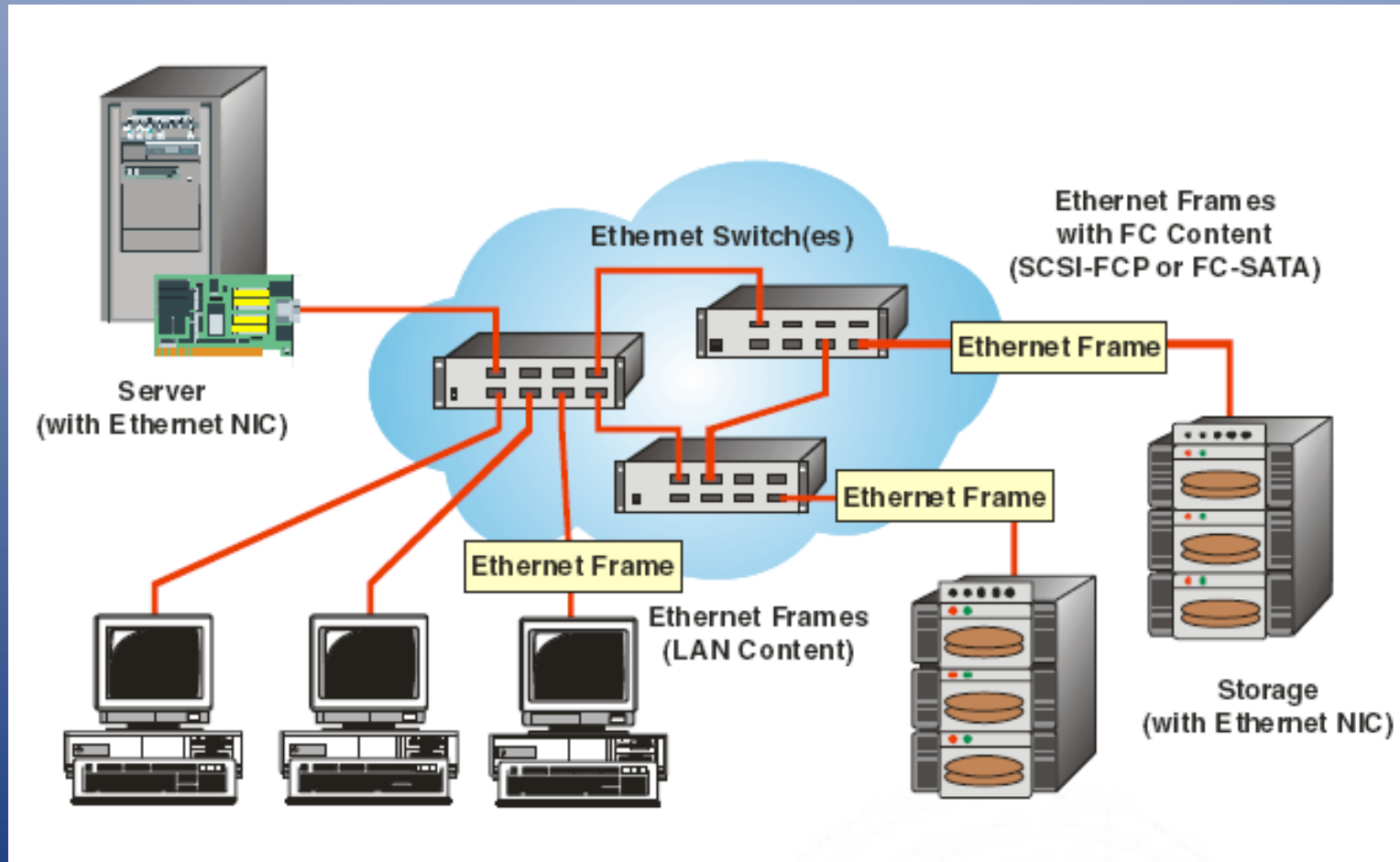- CEE (Converged Enhanced Ethernet) and DCB (Data Center Bridging)
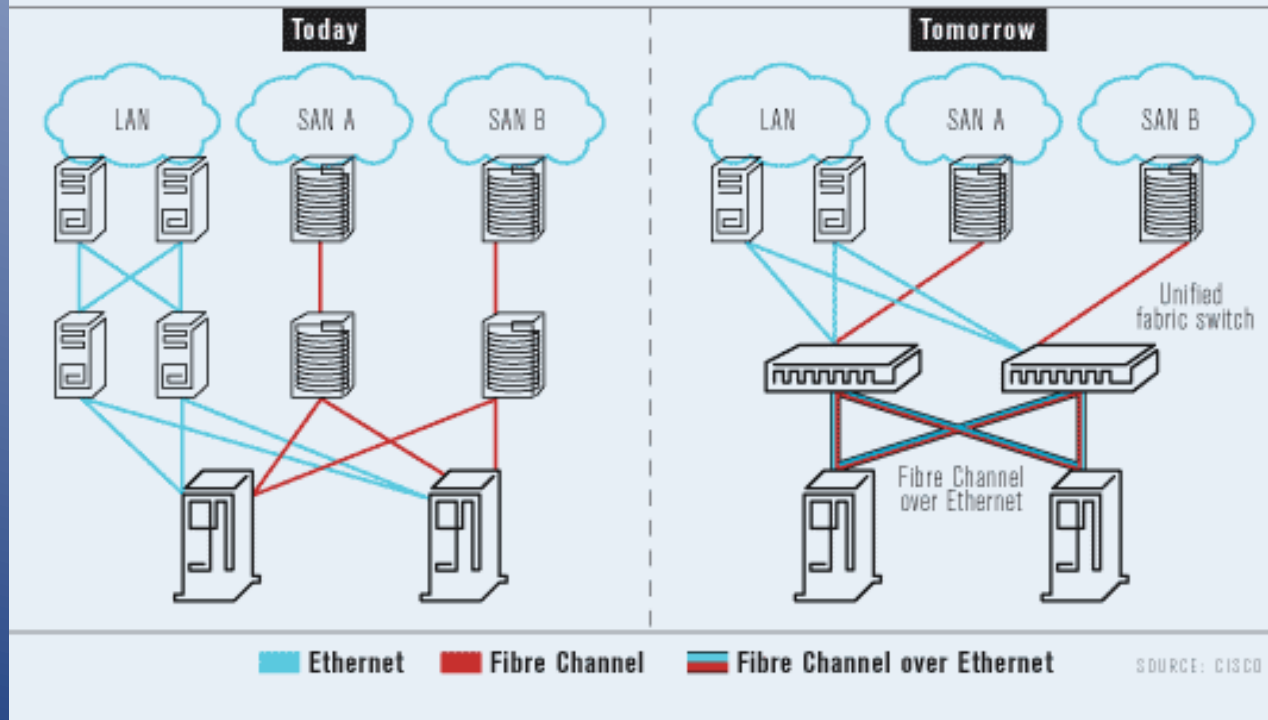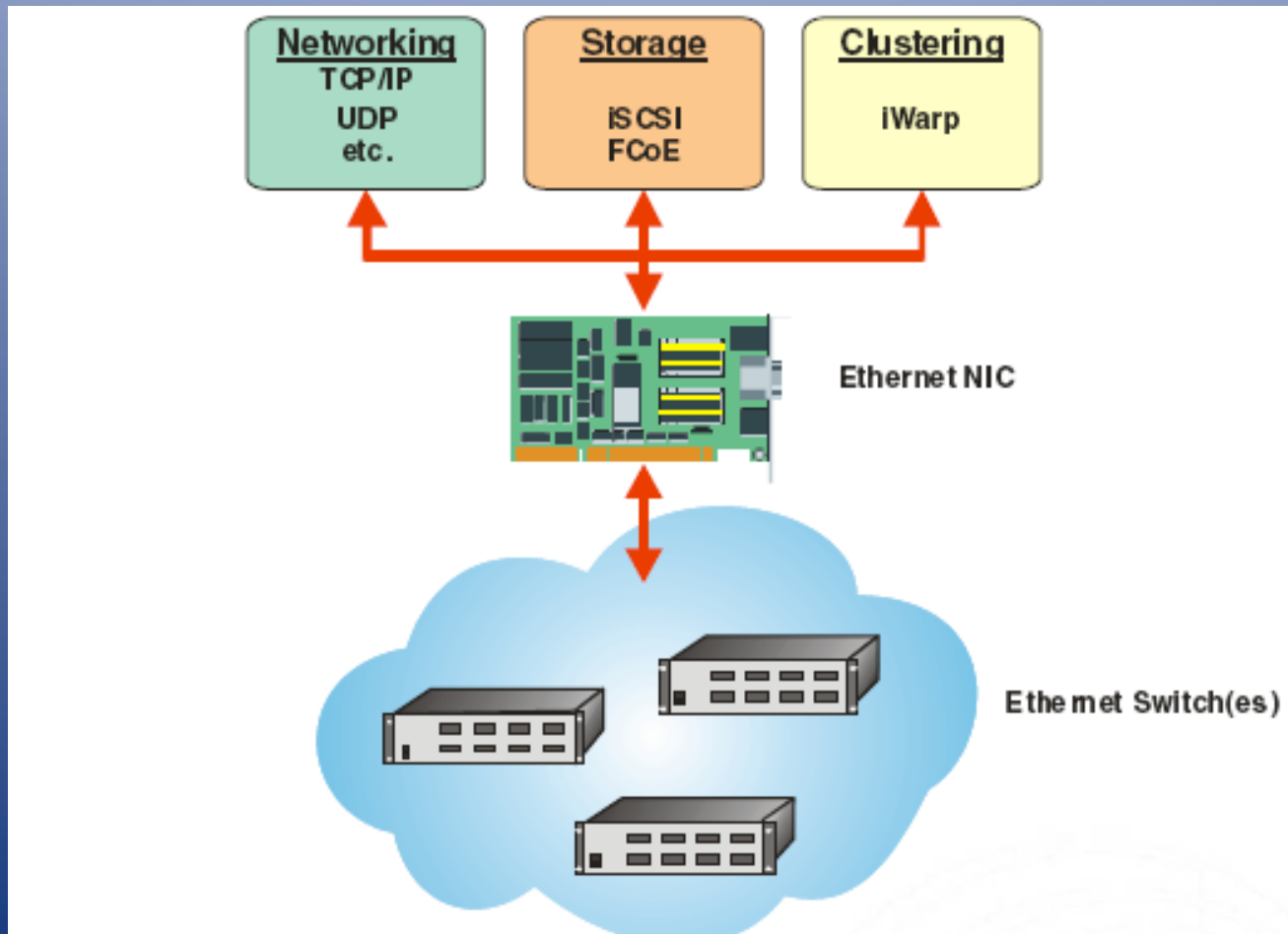
# iSCSI

**iSCSI SAN Components**

**Application Server**

**Ethernet Switch**

**Ethernet adapter**

**iSCSI Initiator**

**Ethernet cabling**

**iSCSI Target Storage Device**

# FCoE Converged Network

# FCoE

# Converged Enhanced Ethernet (CEE)

# Virtualization Support

- System Virtualization
  - Industry predicted 50% applications will be virtualized in the next few years (by 2012)
- Manage network interface becomes difficult
- Each hypervisor has it's own management scheme – no standardization
- VEPA (Virtual Ethernet Port Aggregator)
  - Move networking from virtual servers to dedicated Ethernet switches
  - Centralize networking in dedicated equipments for better performance, security and management
  - Reduce the computing overhead on virtual servers as they scale to support more virtual machines
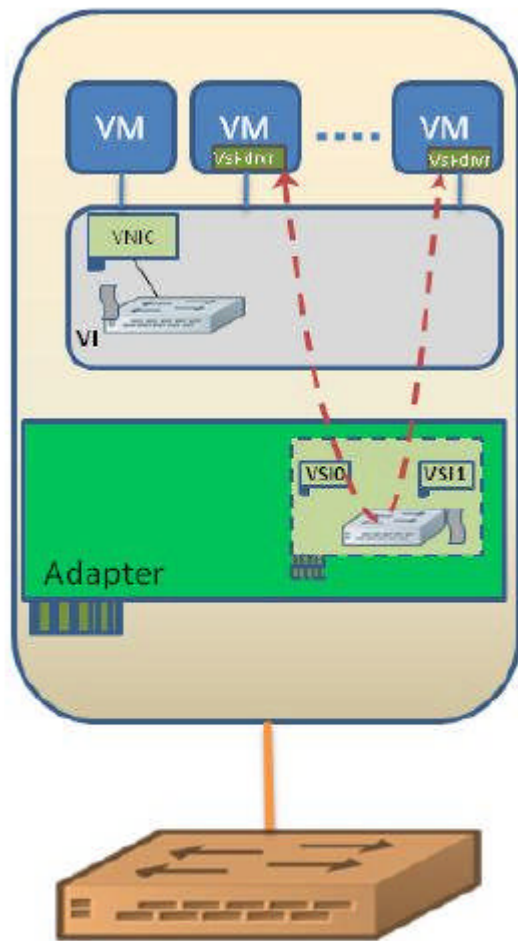
**Virtual Ethernet Bridging (VEB)**
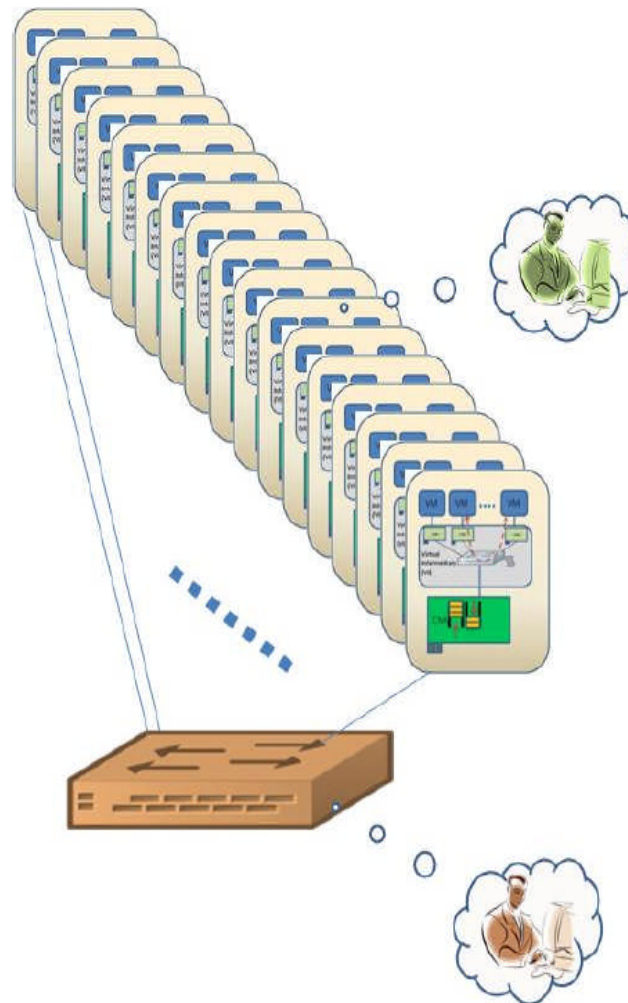
**Adjacent Bridge Assist (e.g. VEPA, PE)**

# Wireless

- Catching up with wired speed
- Mobility is the key
- 802.11n
  - Backward compatible with a/b/g wireless
  - MIMO (Multiple Input Multiple Output)
  - 2 to 3 simultaneous data streams
  - Standard for all modern laptops
  - Over 100Mbs and can reach 300Mbs
  - 600Mbs is coming
  - Switching controller with dumb AP (access point)
  - Concurrent multiple connections

# What Else to Explore

- 40 Gigabit/sec  and  100 Gigabit/sec
- Wireless 802.11ad
  - Gigabit Wireless (WiGig) - Wireless Gigabit Alliance
  - 60 GHz, short-range super-fast data transfers
- Video/Audio/Data on single large pipe
- InfiniBand / HPC / Clustering
- Converge wired and wireless data