

How Intelligent Connectivity Solutions Help to Simplify and Enhance SAN Management

Mike Smith

**Executive Vice President, Worldwide Marketing
Emulex Corporation**

Agenda

- **Overview of Storage Area Networks (SANs)**
- **Management: the Key to Unlocking the SAN's Value**
- **Emulex HBAnyware™: Centralized HBA Management**

Emulex Corporation

- **The world's largest supplier of Fibre Channel host bus adapters (IDC and Gartner Dataquest)**
 - ⇒ Largest supplier of Fibre Channel HBAs to HP with 300,000 unit installed-base
- **Major investments in emerging technologies:**
 - ⇒ 10Gb/s storage networking
 - ⇒ iSCSI
 - ⇒ Driver-based management technology
- **22 years experience in storage and networking technologies**
- **Listed on NYSE (ELX)**
- **Headquartered in Costa Mesa, California**



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Providing World-Class Storage Network Connectivity



**StorageWorks RAID
Array Series**



**StorageWorks Modular
Array series**



StorageWorks XP series



**StorageWorks Virtual
Array series**



**StorageWorks Enterprise
Virtual Array Series**



Certified HBAs across HP's broad line of storage systems

- Windows NT/2000, NetWare, Solaris and Linux
- Multiple HBA generations



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Providing World-Class Storage Network Connectivity



AlphaServer Series



ProLiant Server Series



HP 9000 Server Series



StorageWorks NAS 8000

Certified HBAs across HP's broad line of server systems

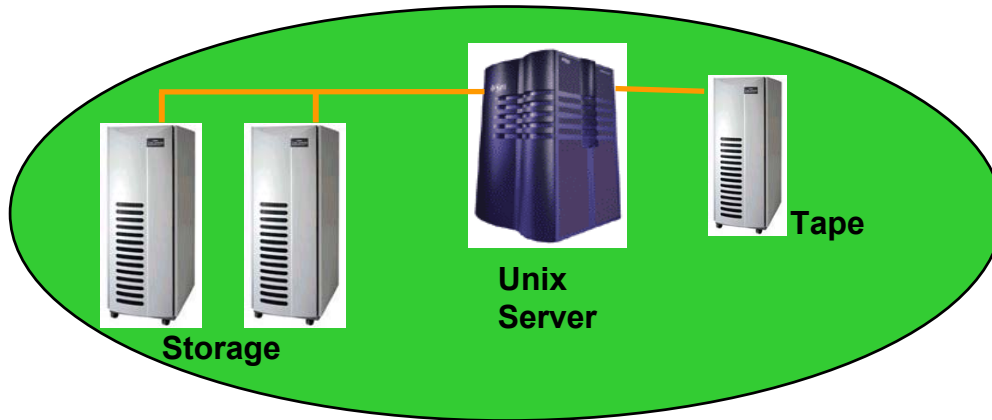
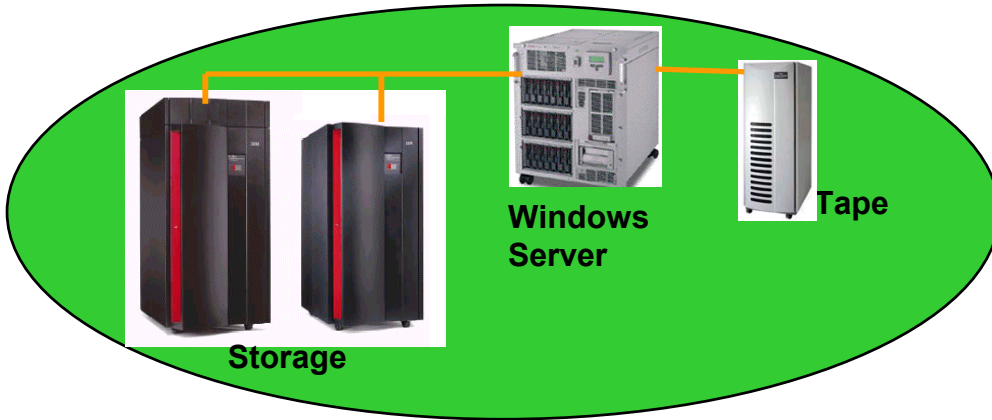
- Windows NT/2000, Linux and 'Certified by HP-UX' program
- Multiple HBA generations

What is a Storage Area Network?

- An interconnect that allows storage to be de-coupled from systems
 - ⇒ Most storage today is direct attached
 - ⇒ In a SAN (typically) storage is shared, *NOT* files

- Fibre Channel has been *THE* enabling technology for SAN interconnects
 - ⇒ Key elements include:
 - ⇒ Host Bus Adapters
 - ⇒ Switches
 - ⇒ Storage devices (typically arrays)
 - ⇒ **Software....in the Host, Array and Switch**
 - ⇒ iSCSI offers an additional SAN interconnect

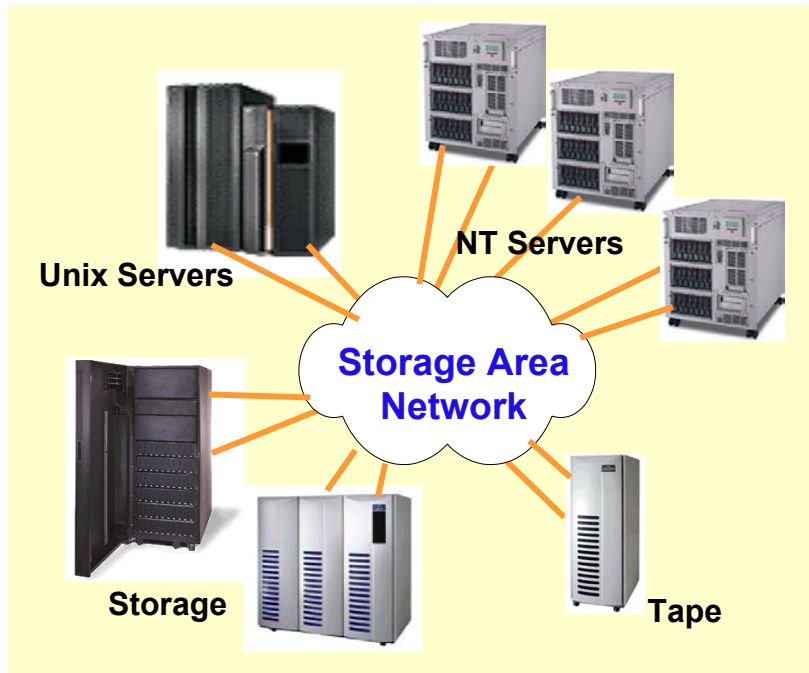
Direct Attach Storage (*DAS*) Model



■ Islands of Storage

- ⇒ Predominant technology has been parallel SCSI
- ⇒ Difficult and costly to scale
- ⇒ Excess capacity cannot easily be shared
- ⇒ High availability is costly
- ⇒ Costly to manage

Storage Area Network (SAN) Model

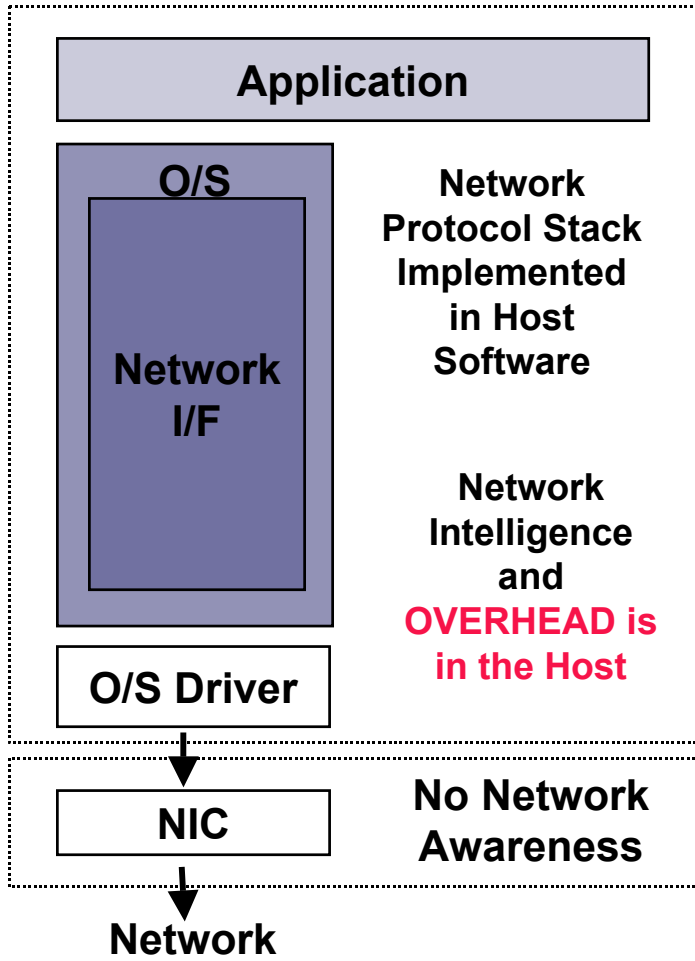


- **Benefits of Networked Storage**
 - ⇒ Improved system performance
 - ⇒ Improved utilization of disk storage capacity
 - ⇒ High-availability architecture
 - ⇒ Highly scalable
 - ⇒ Centralized management

SAN Management Software is Needed to Exploit SAN benefits

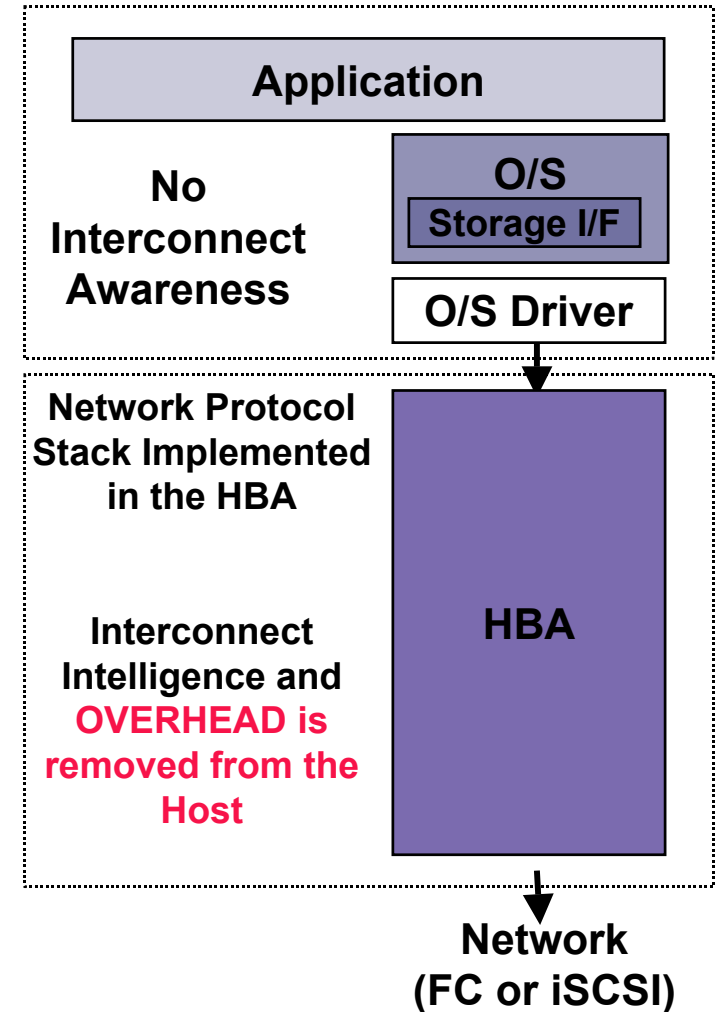
- **Configuring Servers, Fabrics and Arrays**
 - ⇒ “Zoning” or “fencing” of storage
 - ⇒ LUN mapping
 - ⇒ LUN masking
- **Providing visibility of “networked” objects**
- **Providing device management**
- **Typical management software is Host-based**
 - ⇒ **Runs on a Server connected to the SAN**
- **HBAs provide visibility and access to the SAN for effective management**

Traditional Network vs. Storage Interface



HBA's Provide Visibility to the Storage Network, Enabling Integrated SAN Management

VS.



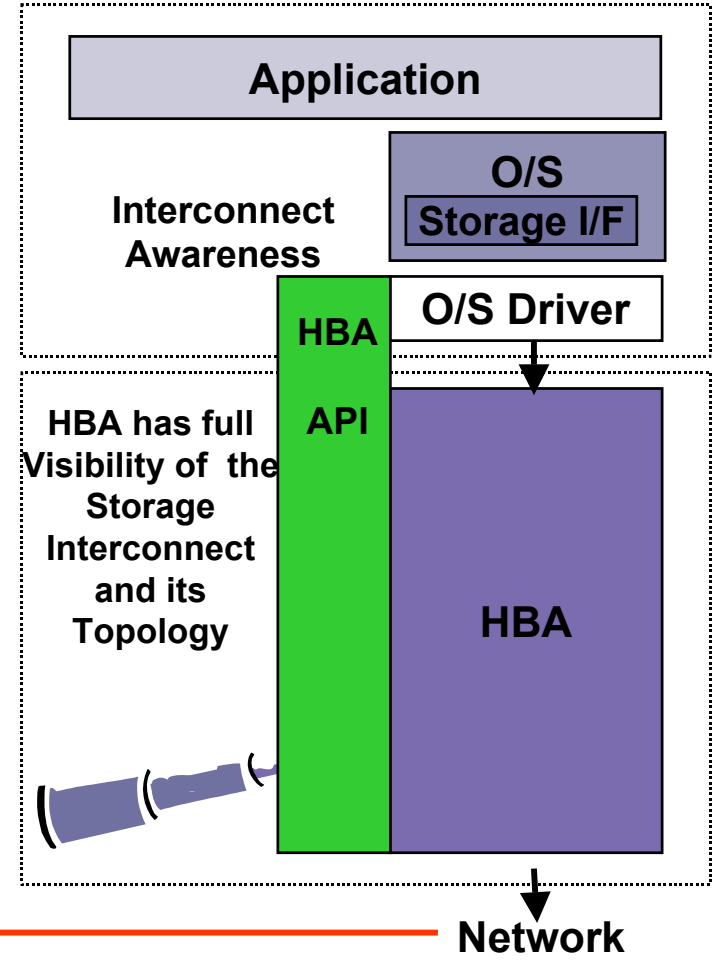
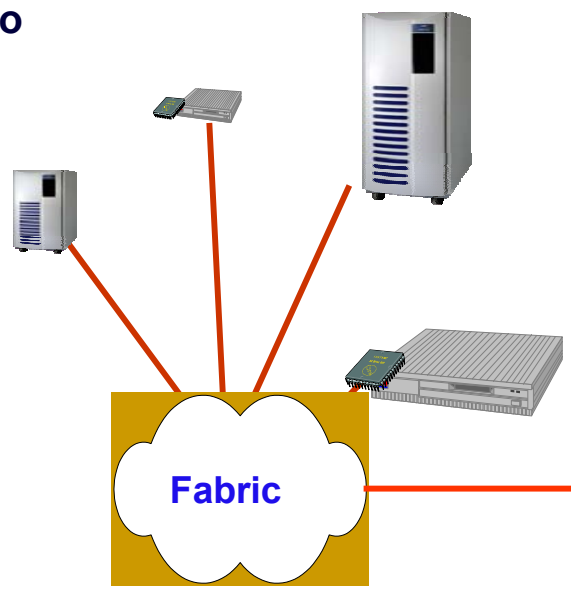
HBAs: Bridging the Visibility Gap

- The issue:

Protocol Offload Obscures Host Visibility of the Interconnect

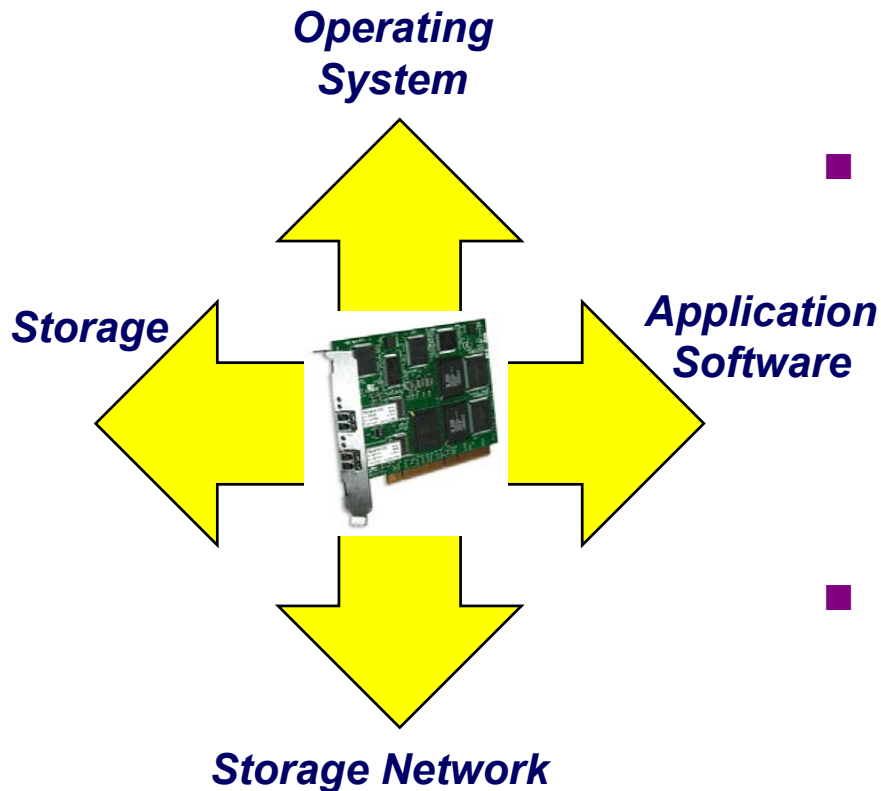
- The Solution:

Export Full Network Visibility to the Host thru cHBA API (and emerging equivalents)



HBAs:

Key Intersection between Storage and Systems



- Provides the basic interface to Operating System's "storage stack"
- Adapter has extensive knowledge of the Transport layer
 - ⇒ Configuration/stats. (transport management)
 - ⇒ Mapping, status (storage policy management)
 - ⇒ Storage devices (storage device management)
- Wide range of applications utilize HBA-provided information
 - ⇒ Industry standard cHBA API used for both in-band and out-of-band management

Current State of SAN Management

Generations of SAN management

- **First generation – already deployed:**
 - ⇒ Objective: basic reliable operation
 - ⇒ Many “point” solutions glued together
 - ⇒ Focus on major-impact devices: arrays, switches
 - ⇒ Infrastructure: SNMP, proprietary GUIs

- **Second generation – in progress now:**
 - ⇒ Objectives: cost-effectiveness, application-aware management
 - ⇒ Focus on servers, HBAs and better integration of vendor tool-sets
 - ⇒ Infrastructure: industry-based implementations: FDMI, cHBA API, Authenticated CT

- **Third generation – future:**
 - ⇒ Objective: global policy-based management, QOS
 - ⇒ Pervasive management semantics across all objects
 - ⇒ CIM model (SMI implementations)

Host tool kits used to build SAN management applications

cHBA API Library

- **Standards-based cHBA API (common HBA API)**
 - ⇒ **ANSI T11.3 FC-MI version 1.92 Annex A (Dec 4, 2001) 1.0**
 - ⇒ **Future revisions in progress (HBA API 2.0)**
- **Consistent HBA standard interface for accessing Fibre Channel SAN information including:**
 - ⇒ **Ability to query local HBA properties and port information**
 - ⇒ **Ability to correlate a WWN of a device to the local SCSI address**
 - ⇒ **Ability to discover WWNs of discovered end nodes**
 - ⇒ **Ability to query properties of discovered end nodes**
 - ⇒ **Ability to retrieve LUN mappings of an HBA**

Emulex cHBA API Libraries

- **cHBA API libraries are packaged with each supporting driver in the driver kit**
- **Currently available libraries:**
 - ⇒ Windows NT/2000 SCSI Miniport and full Port driver
 - ⇒ Solaris
 - ⇒ Linux
- **User transparent installation**
 - ⇒ Management application links to library for capture of available information
- **Implementation is left to each vendor**
 - ⇒ Emulex HBA API Developer's Notes available to partners
 - ⇒ Provides details of the Emulex implementation of drivers and libraries that conform to FC-MI Annex A

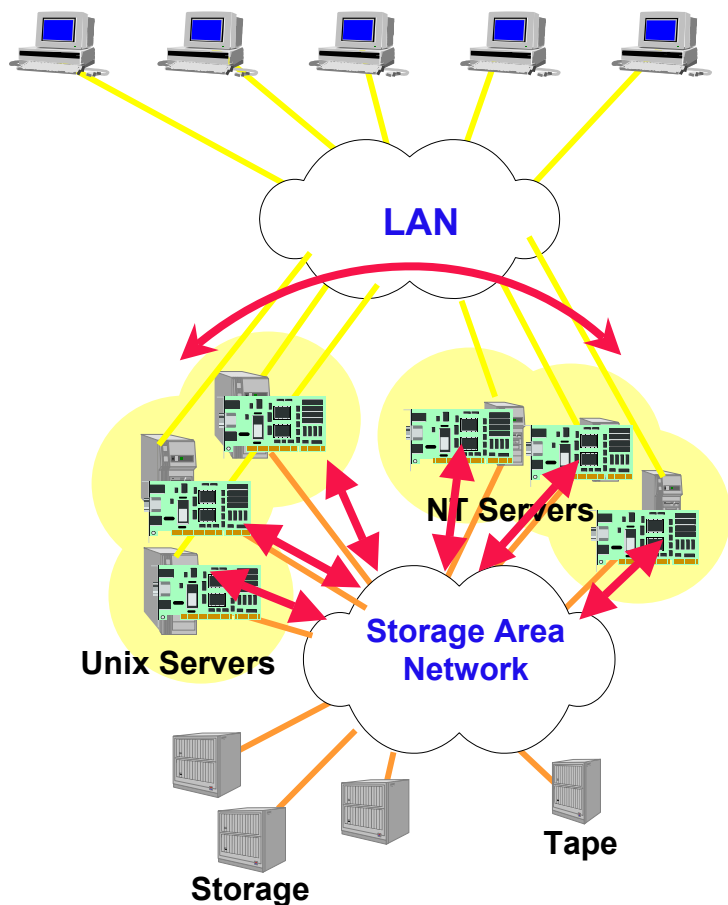
HBAnyware™, a Centralized HBA Management Suite

HBAnyware

Centralized HBA Management Suite

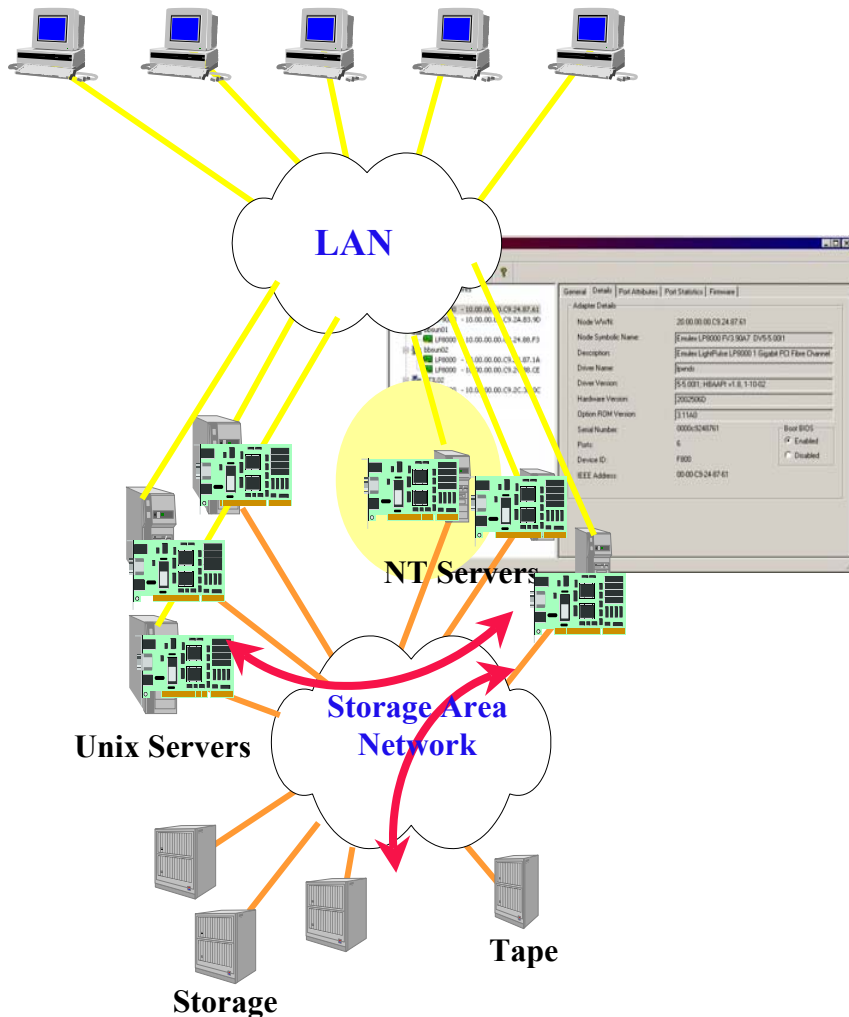
- **Designed to simplify and improve SAN management, and lower total cost of ownership for SAN-based storage**
 - ⇒ Enables complete HBA management across heterogeneous SANs from a single console
- **Driver-based technology**
 - ⇒ No separate agents required
- **Complements third party management applications**
- **Introduced October 2002**
 - ⇒ APIs submitted to INCITS T11.5 standards body (December '02)

Traditional Method of SAN Management



- **SAN management applications reside on each host server**
 - ⇒ Applications must be available for each O/S, limiting choices and functionality
 - ⇒ Ported software or agent must run on each server, adding complexity
 - ⇒ Typically management information is collected using secondary out-of-band network
- **Each HBA managed independently by host server**
 - ⇒ Difficult to scale data center to 100's or 1,000's of servers
 - ⇒ Costly to maintain and update/upgrade
 - ⇒ “Native” OS management methodologies, security infrastructures and APIs are generally unique

HBAnyware Capabilities



- Real-time discovery of in-depth HBA data beyond scope of existing solutions
 - ⇒ Models, revisions, configuration, port statistics, status
 - ⇒ Supports server, appliance, and target-based HBAs
- Enables remote firmware upgrades
 - ⇒ Full access and control over each HBA in the SAN
- In-band communication provides a secure mechanism for client access
 - ⇒ Uses standards-based *Authenticated CT* (industry first)
 - ⇒ Operates seamlessly across heterogeneous SANs

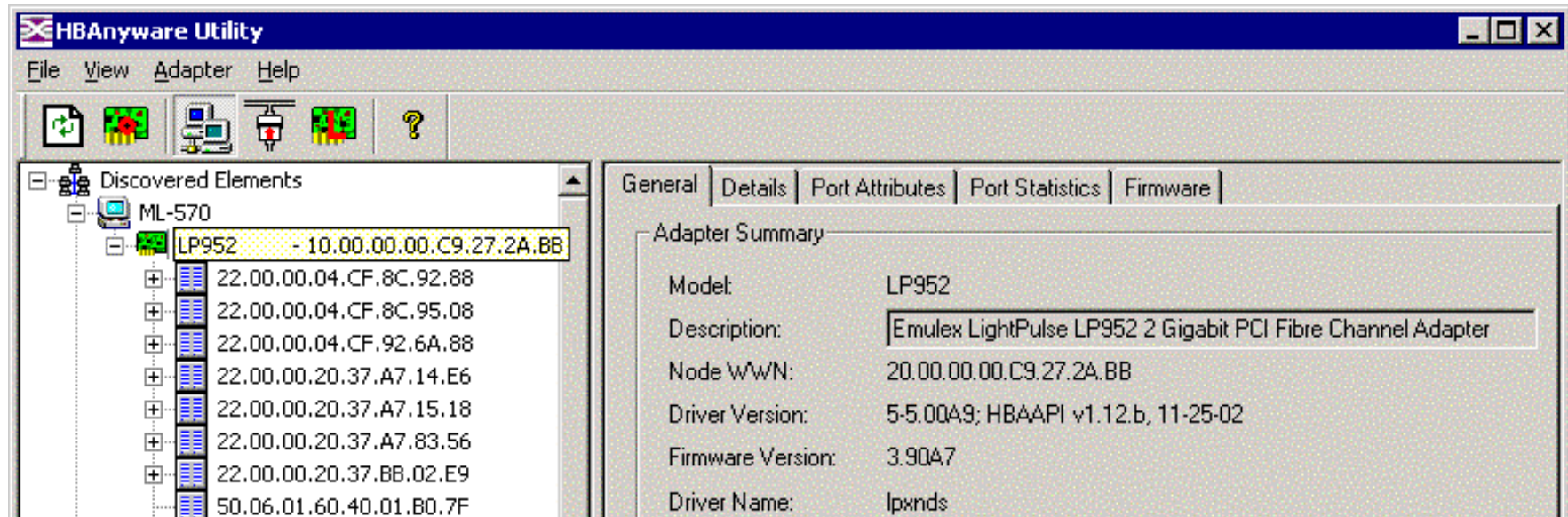
HBAnyware Capabilities

- **Hardware platform independent**
 - ⇒ Can run on host server, switch, or storage array
- **Fully compatible with installed base of HBAs for easy deployment**
 - ⇒ Fully leverage-able for Emulex iSCSI HBAs
- **Remote management API support for OEM and 3rd party applications**
 - ⇒ Provides real-time event notification to IT professionals
 - ⇒ Extends standards-based cHBA API for OEM and partner management software integration

HBAnyware Supported Environments

- **Emulex supported user interfaces:**
 - ⇒ Windows GUI, Java GUI for Unix and Command Line interface for all implementations
- **Operating system platforms and drivers**
 - ⇒ Windows NT/2000/2003 – SCSI Miniport and full Port drivers
 - ⇒ Windows Server 2003 - Storport Miniport
 - ⇒ Linux
- **Host bus adapters**
 - ⇒ All Emulex Fibre Channel HBAs are supported
 - ⇒ Pushing for remote API adoption into cHBA API v2.0 (thru ANSI T11.5)
- **Supplying HBAnyware Remote APIs to OEMs and software partners**
 - ⇒ VERITAS, CA, Brocade, Tivoli, CreekPath, Fujitsu Softek, InterSAN, ApplQ and many others

Emulex GUI Layout



Left Pane

Right Pane

■ Discovery tree

⇒ Icons and discovered SAN elements

⇒ Systems, HBAs, and targets/LUNs

■ Property tabs

⇒ Configuration, statistical and status information for SAN elements

Navigating

- Use Toolbar or Menu bar



⇒ Rediscover adapters



⇒ Reset adapter



⇒ Sort by host name (default setting)



⇒ Sort by fabric address

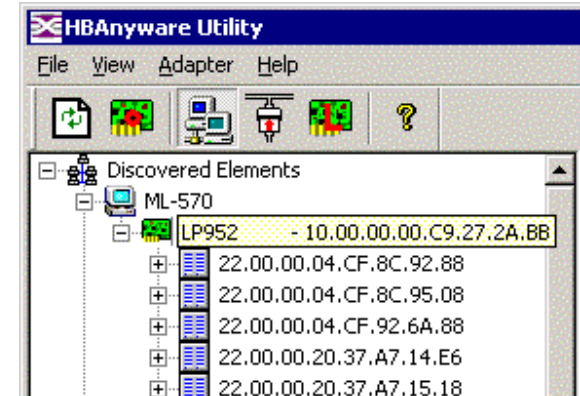


⇒ Local host only

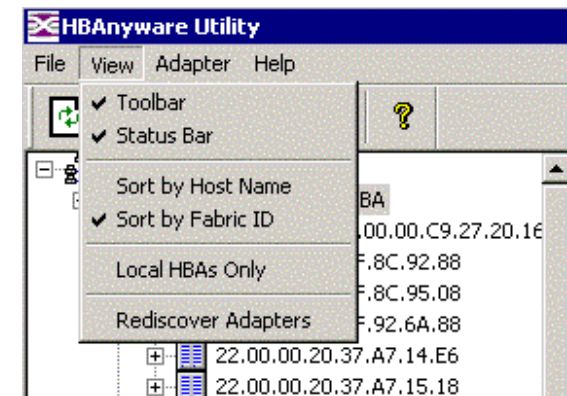
⇒ Displays HBAs in local host system

- Multiple HBAs are sorted by WWNN

- Targets sorted by WWPN



Toolbar



Menu bar

Better Integration Simplifies SAN Management

- As the integration and transparency of SAN management tools increase:
 - ⇒ SANs become easier to deploy
 - ⇒ SANs become easier to maintain
 - ⇒ SANs become easier to scale
 -
 -
 - ⇒ More value is extracted from “Networked Storage” !!
- We are working with leading OEMs and software providers to fully integrate HBA management

HBAnyware Simplifies Mundane Tasks

- I could update firmware on 100's of HBAs from each server, or.....
- I could check link statistics from 100's of HBAs on each server, or.....

Use
HBAnyware



Questions and Comments ?