ENGINEERING PHARMACEUTICAL INNOVATION

CITRIX®

Virtualized Development & Deployment

Driving Efficiencies and Cost

ISA Tarheel Capital Area Section

Setting the Standard for Automation™

North Carolina Biotechnology Center

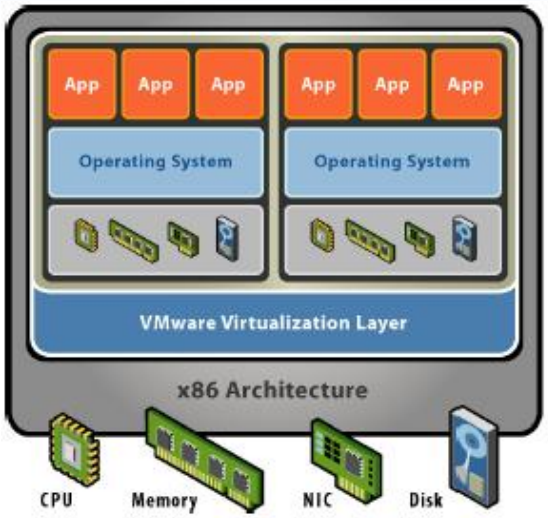
ISPE ENGINEERING PHARMACEUTICAL INNOVATION Carolina-South Atlantic Chapter

Agenda

- Virtualization Overview
- Benefits / Issues of Virtualization
- Future Trends
- Development Environment
- Deployment Experience

Virtual Categories

- Server virtualization (Common Reference)
  - Hypervisor Type 1 (Native / Bare metal)
  - Hypervisor Type 2 (Hosted)
- Desktop virtualization (Next Wave)
- Cloud (Future Wave)



BENEFITS

Why Virtual – Client Perspective

State of Infrastructure Today

Server Sprawl

- 36M physical x86 servers by 2011[1] – a ten-fold increase in 15 years[1]
- $140 bn in excess server capacity - a 3-year supply[2]

Power & Cooling

- 50c for every $1 spent on servers[2]
- $29 bn in power and cooling industry wide[2]

Space Crunch

- $1,000 / sqft[2]
- $2,400 / server[2]
- $40,000 / rack[2]

Operating Cost

- $8 in maintenance for every $1 spent on new infrastructure[2]
- 20-30 : 1 server-to-admin ratio[3]

1. IDC, U.S. and Worldwide Server Installed Base 2007–2011 Forecast, Doc #207044, May 2007
2. IDC, Virtualization And Multicore Innovations Disrupt The Worldwide Server Market, Doc #206035, March 2007
3. Source: VMware

vmware

Why Virtual – Client Perspective

State of Infrastructure with Virtualization

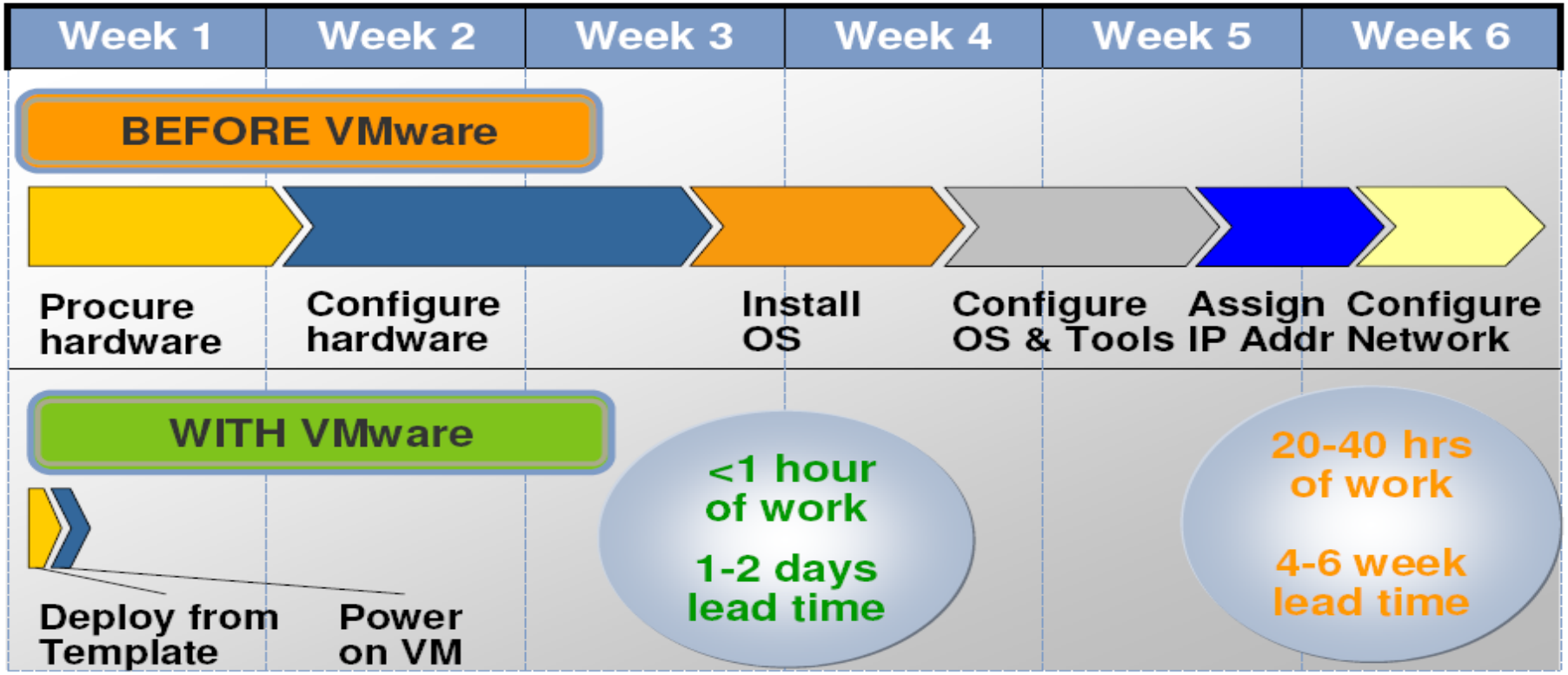
	BEFORE VMware	AFTER VMware	SAVINGS
Servers	1000	80	$5,816
Network Switches	84	10	$296
Power (kWh)	407	52	$759
Cooling (kWh)	509	64	$949
Real Estate (Sq ft)	2053	257	$431
Total Savings (Over 3 years)			$8,251*

* Note: Savings include estimated cost of VMware licenses, Support and Subscription

vmware

Why Virtual – Integrator Perspective

Instant Provisioning



vmware

Comparison

Virtual Server

- Supports Green objectives
- Enables Space Management
- Flexibility / Share Resources
- More Complex / Costly for Smaller Solutions?
- Difficulty in Monitoring / Management
- Vendor “Support”

Virtual Desktop

- Thin Client Support
- Quick Desktop Provisioning / Replacement
- Centralized App Mgmt.
- High Reliability / Quick Recovery
- Built-in Redundancy
- HMI Sharing

Comparison

Virtual Server

- Consolidation
- Self Hosted & Self Managed
- Highly Secure and Compliant

"Private" Cloud

- Elastic / Self-Service Platforms
- Self-hosted
- Catalog Based Services
- Chargeback Models
- More secure than Hybrid or Public / Shared Clouds
- ? Compliant ?

Vendor Support

Is accurate timing important?

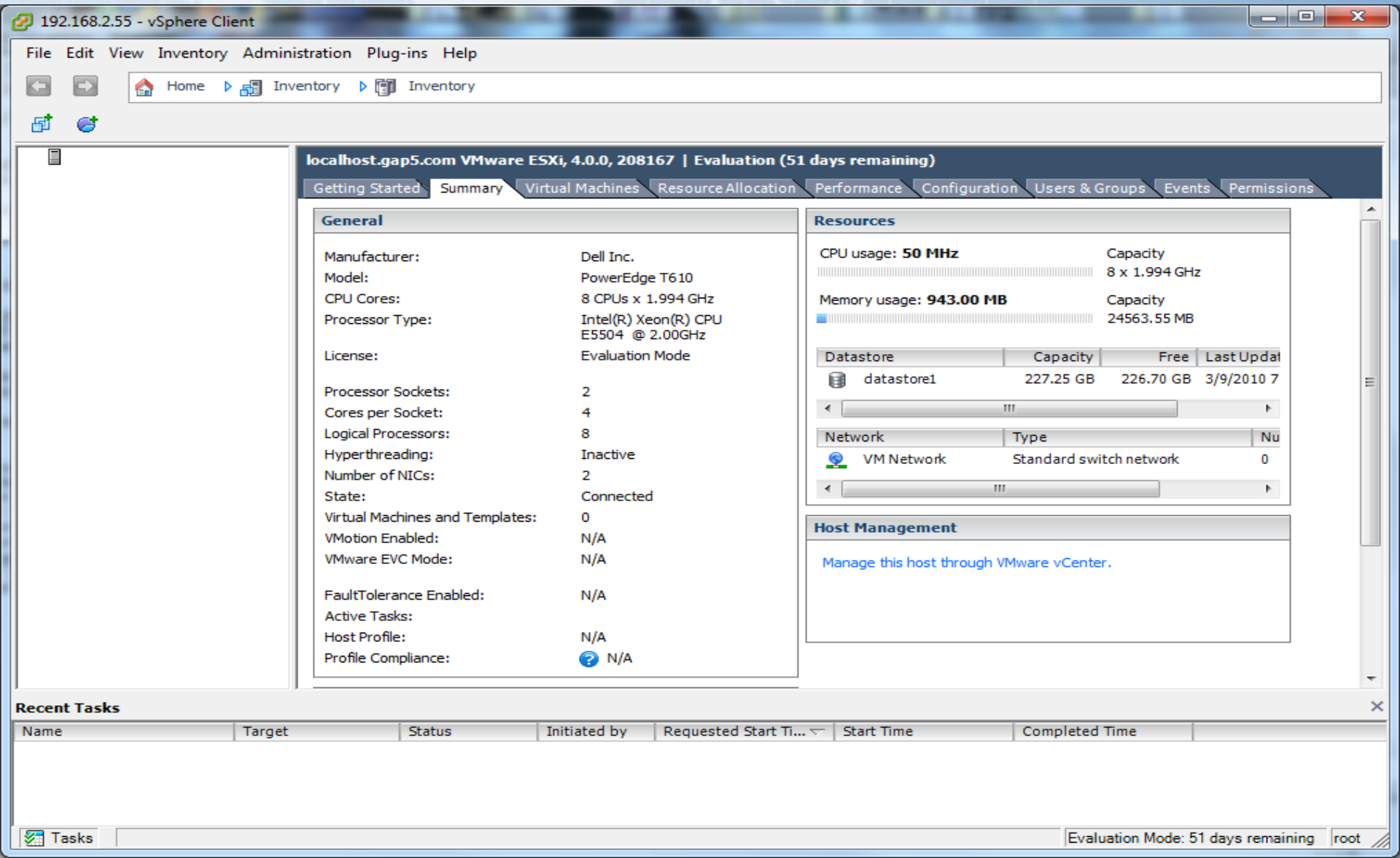
The virtualized system clock is directly affected by resource utilization on the physical host system. The more heavily-utilized the physical system is, the less reliable the virtualized system clock becomes. The result is a virtual system clock that slows and accelerates relative to real-time.

Vendor Support

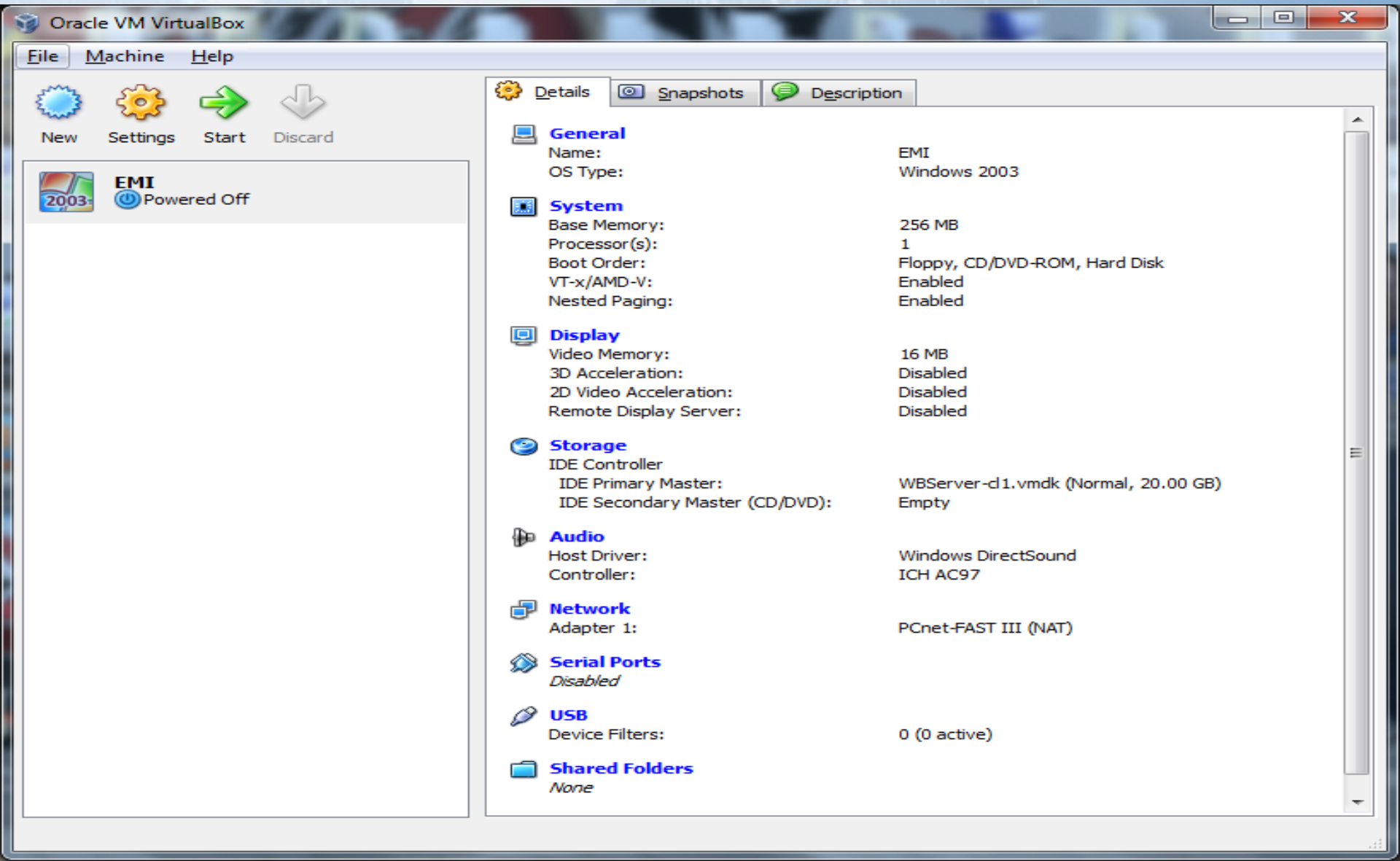
<vendor>Technical Support will not require clients running on VMWare ESX to recreate and troubleshoot every issue in a non-virtualized environment; however, <vendor> does reserve the right to request customers to diagnose certain issues in a native operating system environment, operating without the virtual environment. <vendor> will only make this request when there is reason to believe that the virtual environment is a contributing factor to the issue.

DEVELOPMENT ENVIRONMENT

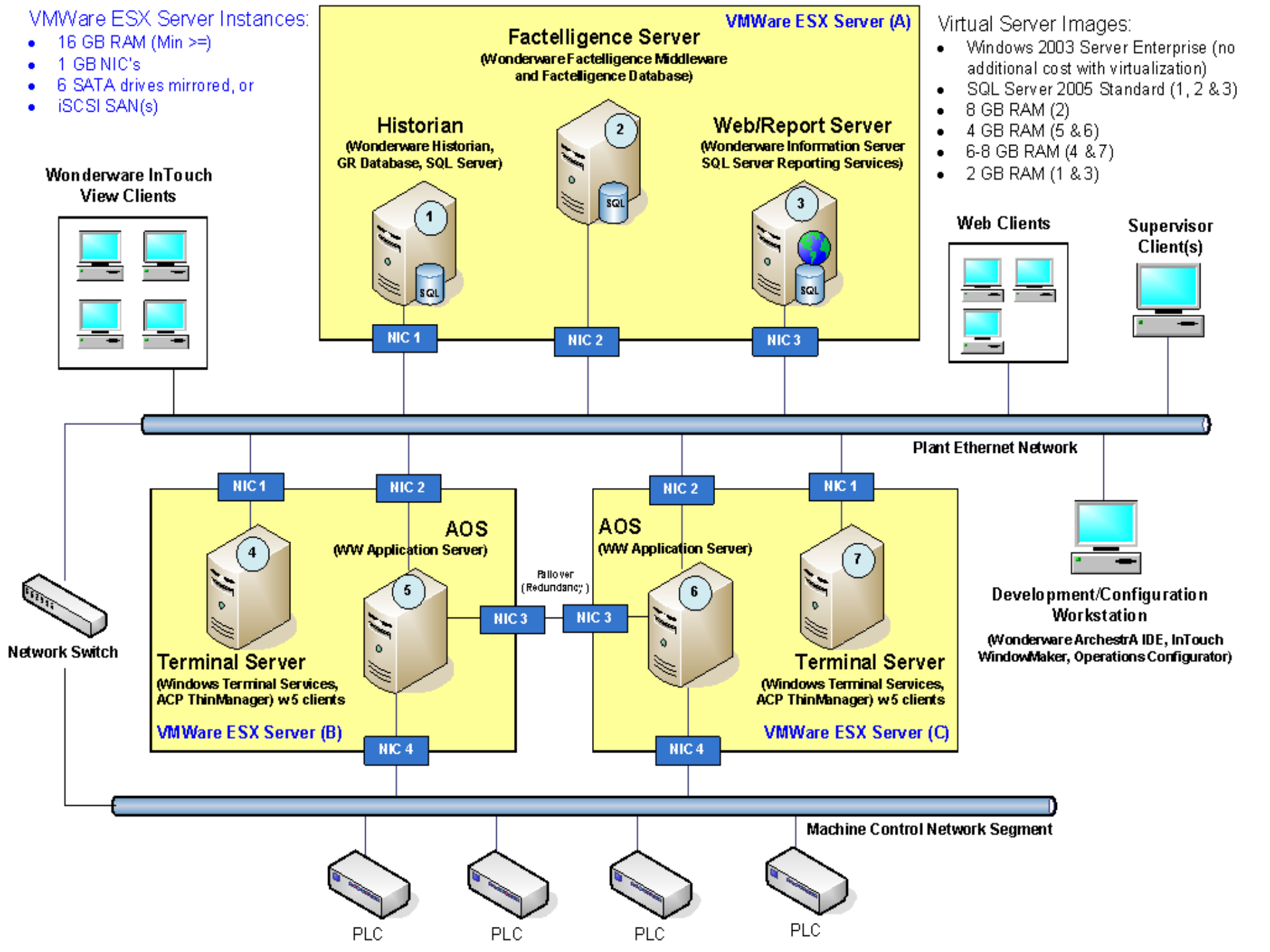
Collaborative Development

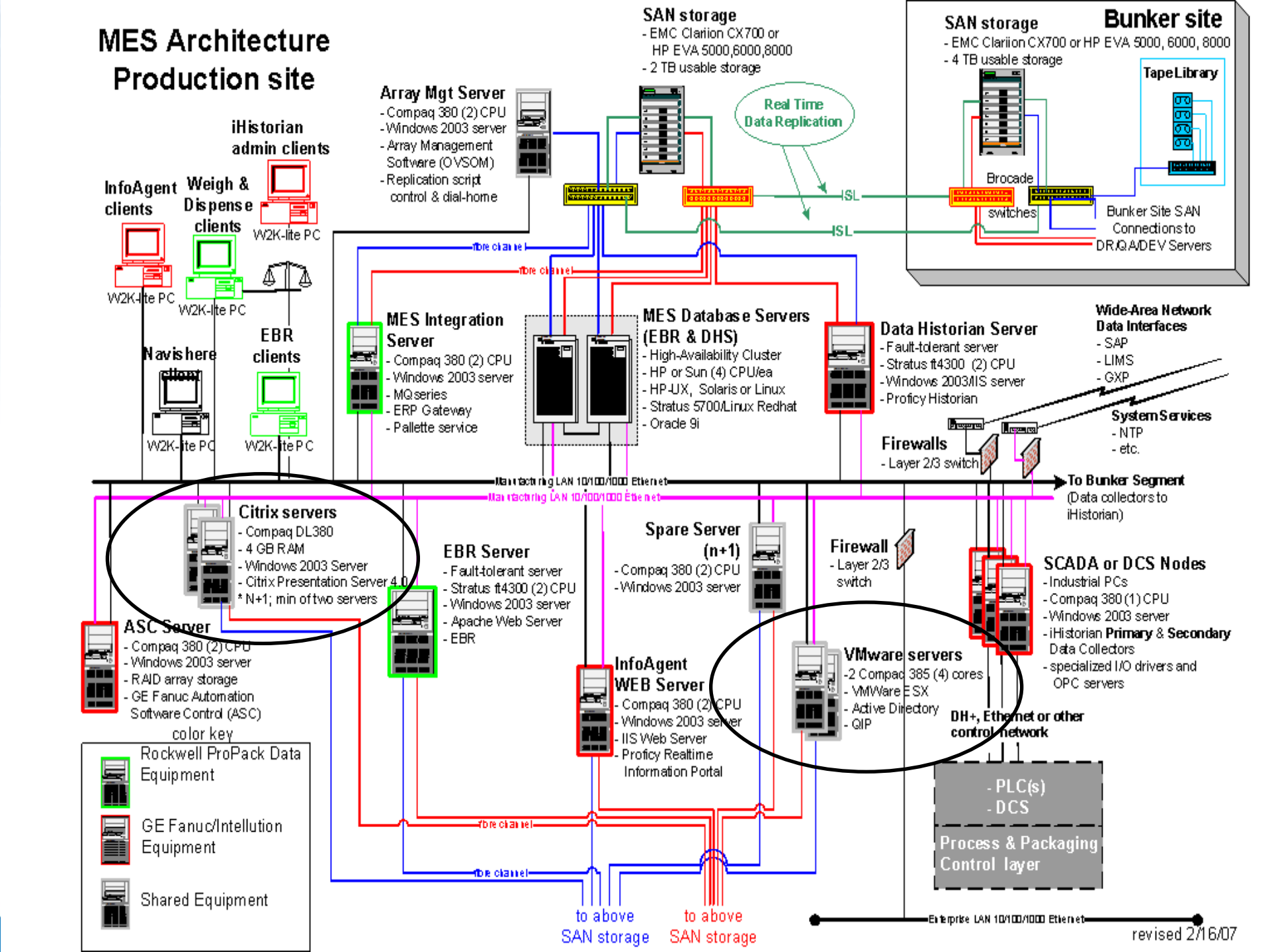


Small Projects



DEPLOYMENT EXAMPLES


VMWare ESX Server Instances:
16 GB RAM (Min >=)
1 GB NIC's
6 SATA drives mirrored, or
iSCSI SAN(s)
VMWare ESX Server (A)
Factelligence Server
(Wonderware Factelligence Middleware and Factelligence Database)
Historian
(Wonderware Historian, GR Database, SQL Server)
Web/Report Server
(Wonderware Information Server SQL Server Reporting Services)
Virtual Server Images:
Windows 2003 Server Enterprise (no additional cost with virtualization)
SQL Server 2005 Standard (1, 2 & 3)
8 GB RAM (2)
4 GB RAM (5 & 6)
6-8 GB RAM (4 & 7)
2 GB RAM (1 & 3)
Wonderware InTouch View Clients
Web Clients
Supervisor Client(s)
NIC 1
NIC 2
NIC 3
Plant Ethernet Network
AOS
(WW Application Server)
Failover (Redundancy)
Terminal Server
(Windows Terminal Services, ACP ThinManager) w5 clients
VMWare ESX Server (B)
VMWare ESX Server (C)
NIC 4
Network Switch
Development/Configuration Workstation
(Wonderware ArchestrA IDE, InTouch WindowMaker, Operations Configurator)
Machine Control Network Segment
PLC
PLC
PLC
PLC


MES Architecture
Production site
SAN storage
- EMC Clariion CX700 or
HP EVA 5000,6000,8000
- 2 TB usable storage
Array Mgt Server
- Compaq 380 (2) CPU
- Windows 2003 server
- Array Management
Software (OVSOM)
- Replication script
control & dial-home
Real Time
Data Replication
Bunker site
SAN storage
- EMC Clariion CX700 or HP EVA 5000, 6000, 8000
- 4 TB usable storage
Tape Library
Brocade
switches
ISL
ISL
Bunker Site SAN
Connections to
DR/QA/DEV Servers
fibre channel
fibre channel
iHistorian
admin clients
InfoAgent
clients
Weigh &
Dispense
clients
W2K-lite PC
W2K-lite PC
W2K-lite PC
W2K-lite PC
Navishere
client
EBR
clients
W2K-lite PC
W2K-lite PC
MES Integration
Server
- Compaq 380 (2) CPU
- Windows 2003 server
- MQseries
- ERP Gateway
- Pallette service
MES Database Servers
(EBR & DHS)
- High-Availability Cluster
- HP or Sun (4) CPU/ea
- HP-UX, Solaris or Linux
- Stratus 5700/Linux Redhat
- Oracle 9i
Data Historian Server
- Fault-tolerant server
- Stratus ft4300 (2) CPU
- Windows 2003/IIS server
- Proficy Historian
Wide-Area Network
Data Interfaces
- SAP
- LIMS
- GXP
System Services
- NTP
- etc.
Firewalls
- Layer 2/3 switch
Manufacturing LAN 10/100/1000 Ethernet
Manufacturing LAN 10/100/1000 Ethernet
To Bunker Segment
(Data collectors to
iHistorian)
Citrix servers
- Compaq DL380
- 4 GB RAM
- Windows 2003 Server
- Citrix Presentation Server 4.0
* N+1; min of two servers
EBR Server
- Fault-tolerant server
- Stratus ft4300 (2) CPU
- Windows 2003 server
- Apache Web Server
- EBR
Spare Server
(n+1)
- Compaq 380 (2) CPU
- Windows 2003 server
Firewall
- Layer 2/3
switch
SCADA or DCS Nodes
- Industrial PCs
- Compaq 380 (1) CPU
- Windows 2003 server
- iHistorian Primary & Secondary
Data Collectors
- specialized I/O drivers and
OPC servers
ASC Server
- Compaq 380 (2) CPU
- Windows 2003 server
- RAID array storage
- GE Fanuc Automation
Software Control (ASC)
InfoAgent
WEB Server
- Compaq 380 (2) CPU
- Windows 2003 server
- IIS Web Server
- Proficy Realtime
Information Portal
VMware servers
-2 Compaq 385 (4) cores
- VMWare ESX
- Active Directory
- QIP
DH+, Ethernet or other
control network
- PLC(s)
- DCS
Process & Packaging
Control layer
color key
Rockwell ProPack Data
Equipment
GE Fanuc/Intellution
Equipment
Shared Equipment
fibre channel
fibre channel
to above
SAN storage
to above
SAN storage
Enterprise LAN 10/100/1000 Ethernet
revised 2/16/07

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Tarheel Capital Area Section
Setting the Standard for Automation™

North Carolina Biotechnology Center

ISPE Engineering Pharmaceutical Innovation
Carolina-South Atlantic Chapter