System 800xA
Virtualization

Customers specify it  Customers harmonize with IT

Training environments  Lower cost of ownership  Backup validation

Lower power and cooling costs  Server footprint reduction

Virtualization and 800xA.

Spare parts reduction  Flexibility  Lifecycle benefits

Performance benefits  Project upgrade benefits

Improved availability
What is a Virtual Machine?

- A virtual machine (VM) emulates a physical computer
- One or several VMs run on a regular computer
- Virtual hardware of each VM can differ, e.g. 2 NICs, amount of RAM, etc.
- Run different operating systems on the same physical computer - old as well as newer ones
- Reduced server footprint
- Simplified system maintenance
- Energy saving
System 800xA Virtualization
Virtualization – What is this???

Application: AS, CS, Batch, IM.....
OS: Windows 7 / Windows Server 2008
HW: Workstation / Server

ESX Server

VMware ESXi 5.1

Virtual Machine (VM)
Virtual Machine (VM)
Virtual Machine (VM)
Virtual Machine (VM)

A Virtual Machine (VM) emulates a physical PC

VMware ESXi is a OS running Virtual Machines

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System 800xA Virtualization

Virtualization – What is this???

800xA is now running in a virtual environment

A Virtual Machine (VM) emulates a physical PC

VMware ESXi 5.1

ESX Server

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System 800xA Virtualization
What is a Virtual Machine?

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A Virtual Machine (VM) emulates a physical PC

VMware ESXi 5.1

ESX Server
System 800xA Virtualization

What is VMware vSphere?

- VMware vSphere is a virtualization technology and market leader in virtualization
- VMware vSphere is used in 70%-90% of the world's virtualized computer systems
- VMware vSphere has a proprietary VMware kernel for running Virtual Machines
- vConverter converts physical computers to virtual machines
What is an ESX Server?

- The ESX Server is running the virtual environment and can be redundant (1oo2)
- ESX Server does not have a graphical interface
- vSphere client software running on Windows is used for interaction with the ESX Server
- The ESX server is based on multi CPUs and multi cores server hardware (e.g. Dell PowerEdge R720, which is based on 2 CPUs, each with 8 cores)

Primary ESX Server

Secondary ESX Server

vSphere client

The ESX Server is running the virtual environment

VMware ESXi 5.1
System 800xA Virtualization

What is vCenter?

- vCenter is used for the maintenance of the ESXi environment and runs on a Windows computer:
  - Backup and update
  - Performance diagnostics
  - Moving of virtual machines between servers
System 800xA Virtualization

System 800xA services running as virtual machines

- Primary and Secondary 800xA services are running on respective ESX Servers
- Virtual switches connect the 800xA nodes to the physical network via ESX Ethernet adapters
System 800xA Virtualization
Virtualized Clients – 5.1 FP 4

- Support for ESXi 5.1
- Virtualized Client capability in addition to 800xA Servers
- No 800xA SW on physical client machines
- Easier to install and maintain

The entire 800xA system can literally be virtualized!
System 800xA Virtualization
Client Virtualization based on Remote Desktop

Physical Client System
- 800xA OPW
- 3rd Party SW
- Drivers
- Windows 7

Rich Clients (1-4 screens)

Virtual Client System
- HP t610 Flexible Thin Client
- Embedded Windows 7
- Thin Clients (1-4 screens)

800xA Servers

800xA OPW

ESX Servers

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System 800xA Virtualization
Virtual Client Benefits

+ Reduced operator room space requirements
+ Reduced operator room power and heating requirements
  + Reduced operator room cooling requirements
  + Reduced operator room noise
+ Fast replacement of thin client
+ Ability to move virtual client to new hardware without reinstall
+ Standard installation. No messing with drivers.
+ Added security by setting up virtual client with no USB ability
+ Clients now in server room without costly remote solutions

…but…don’t install all client in the same server!
Client Virtualization Considerations

- Thin clients handle 1 to 4 screens
- Remote Desktop performance is impressive
- Graphics acceleration is not used, hence engineer and validate system graphical performance
- Avoid animated PG2 elements such as rolling drum
- Thin client with embedded Windows software, make sure the hardware supports 4 screens (graphic card performance) if that’s requested.
- Recommended Hardware for thin client as of March 2013, HP T610
- Currently working on a Dell solution, but not yet certified.
System 800xA Virtualization
SAN Cluster

Primary ESX Server
Secondary ESX Server
Failover ESX Server

Primary 800xA
Secondary 800xA
Tertiary 800xA

vCenter Server
Switch
Switch

SAN is a redundant network disk cluster
System 800xA Virtualization
SAN Cluster

Primary ESX Server

Secondary ESX Server

Failover ESX Server

Automatic Restarting Of Nodes

vCenter Server

Switch

Secondary 800xA

Primary 800xA

Switch
System 800xA Virtualization
Improved MTTR (Mean Time To Recovery)

- At server failure the Virtual Machines are restarted on another server automatically
- Single mode operation only for a few minutes – MTTR improved
- Makes use of the VMware High Availability feature
  - Restarting virtual machines on another ESX server in case of hardware failure
  - Will not replace 800xA redundancy schemes – not real time from a DCS perspective
System 800xA Virtualization

Virtualization benefits

1. Increased performance
   - Utilize latest processor technology
   - Faster network through virtual machines on virtual switches

2. Increased Availability
   - Well proven installation and configuration of all software

3. Reduced Maintenance Cost
   - Less variants of software, hardware and related configurations
   - Migration to new hardware without reinstallation
   - More possibilities to add additional servers
System 800xA Virtualization

Virtualization benefits

4. **Reduced Upgrade Costs and risks**
   - The complete upgraded system can be set-up, tested, and started in parallel with the previous version

5. **Reduced physical equipment**
   - Reduced server count
   - Reduced installation and wiring

6. **Second order effects in**
   - Power saving, less cooling
   - Saving cabinets and space
   - Reduced spare parts requirements
   - etc.
System 800xA Virtualization
Energy saving potential

- Before

- After

- 800xA servers used for various product support tasks

- Before virtualization:
  - 9 st Dell PE1850 - 200W => 15.768 kWh/year

- After virtualization:
  - 1 Dell R610 - 200W => 1.765 kWh/year

- Annual saving – 14.000 kWh
System 800xA Virtualization

Virtual CPU – What is that???

- E.g. Dell PowerEdge R720, based on 2 CPUs, each with 8 cores => 16 cores
- Each core can handle 2 Virtual CPUs => 32 vCPUs
- One Virtual Machine (VM) requires two vCPUs => Max 16 Virtual Machines
Best practices for creating robust virtualized solutions

<table>
<thead>
<tr>
<th>Node</th>
<th>vCPU</th>
<th>RAM GB</th>
<th>Disk GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC1</td>
<td>2</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>AS1</td>
<td>2</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>CS1</td>
<td>2</td>
<td>4</td>
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<tr>
<td>IM</td>
<td>2</td>
<td>4</td>
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</tr>
<tr>
<td>BS1</td>
<td>2</td>
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<tr>
<td>VCL</td>
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</tr>
<tr>
<td>ECS</td>
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<tr>
<td>Total</td>
<td>26</td>
<td>50</td>
<td>970</td>
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2 vCPUs per 800xA service nodes are required

<table>
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<tr>
<th>Node</th>
<th>vCPU</th>
<th>RAM GB</th>
<th>Disk GB</th>
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</tr>
<tr>
<td>VCL</td>
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<tr>
<td>Total</td>
<td>30</td>
<td>54</td>
<td>780</td>
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</table>

30 vCPUs totally are required

<table>
<thead>
<tr>
<th>Node</th>
<th>Log CPU</th>
<th>RAM GB</th>
<th>Disk GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>32</td>
<td>64</td>
<td>1500</td>
</tr>
<tr>
<td>Server</td>
<td>32</td>
<td>64</td>
<td>1500</td>
</tr>
</tbody>
</table>

32 vCPUs are available => OK!

Note: Log CPU = Logical CPU, i.e. Hyperthreaded cores. e.g. 2 x 8 core CPU gives 2 x 8 x 2 Logical Processors

For each server, the total number of vCPU should be less than the number of Logical Processors
Summary

- Virtualization offers excellent cost-of-ownership advantages
- Fully supported for System 800xA
- ESX(i) 4.x and ESXi 5.x supported
- From a security standpoint a system running on virtual machines does not differ from a conventional one
- No performance drawbacks identified
- System 800xA
  Server Node Virtualization User Guide
Power and productivity for a better world™