

ENGINEERING PHARMACEUTICAL INNOVATION



DCS Development Systems in a Virtualized Environment



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Presenter

- Scott Thompson – Systems Consultant



Introduction

- Challenges in supporting multiple DCS revisions
- Our Solution
- Benefits
- Your Benefits



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Challenges in Supporting Multiple Systems

- Flexibility
 - Support many different customer systems
 - Currently have ~80 Customer DCS databases loaded
 - ~10 Envoy NT/Control Desktop databases
 - Support many different DCS revisions
 - 16 different DCS versions
 - 5 different Windows versions (including service packs)
 - 2+ new systems in development (two more Windows Versions, Windows 7 & Server 2008 SP2)

Challenges in Supporting Multiple Systems

- Faster Turnaround
 - Reset back to base-line after testing
- Robustness
 - How fast can the system be recovered if something breaks

Challenges in Supporting Multiple Systems – Physical Hardware

- Flexibility
 - Support many different customer systems
 - Currently have ~80 Customer DCS databases loaded
 - ~10 Envoy NT/Control Desktop databases

Large number of computers



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Challenges in Supporting Multiple Systems – Physical Hardware

- Flexibility
 - Support many different DCS revisions
 - 16 different DCS versions
 - 5 different Windows versions (including service packs)
 - 2+ new systems in development (two more Windows Versions, Windows 7 & Server 2008 SP2)

At least 18 computers



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Challenges in Supporting Multiple Systems – Physical Hardware

- **Faster Turnaround**
 - Reset back to base-line after testing

Restore from image (1-3 hours)
- **Robustness**
 - How fast can the system be recovered if something breaks

Restore from image (1-3 hours)

Challenges in Going Virtual

- Will the development software work on a virtual computer?
- How stable will it be?
- ESX and ESXi don't support USB devices, how do I get the USB hardlock connected?
- How do I best save the system already running on the hardware I'm re-using?



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Challenges in Going Virtual

- Will the development software work on a virtual computer?
- How stable will it be?
- ~~ESX and ESXi don't support USB devices, how do I get the USB hardlock connected?~~ ESX(i) 4.1
- How do I best save the system already running on the hardware I'm re-using?



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Challenges in Going Virtual

- Will the development software work on a virtual computer?
 - In our case - Yes
- How stable will it be?
 - Similar to physical machine installation
- ~~ESX and ESXi don't support USB devices, how do I get the USB hardlock connected?~~
 - ~~USB Over Network~~ ESX(i) 4.1
- How do I best save the system already running on the hardware I'm re-using?
 - VMWare Converter



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Challenges in Going Virtual

- Still need a Windows computer to manage the ESX(i) computers
- ~~The USB Over Network server needs to be installed on a Windows or Linux computer~~



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Challenges in Supporting Multiple Systems – Virtualized

- Flexibility
 - Support many different customer systems
 - Currently have ~80 Customer DCS databases loaded
 - ~10 Envoy NT/Control Desktop databases

5 physical computers, many virtual



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Challenges in Supporting Multiple Systems – Virtualized

- Flexibility
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5 physical computers, many virtual



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Challenges in Supporting Multiple Systems - Virtualized

- **Faster Turnaround**
 - Reset back to base-line after testing

Restore to snapshot (5 minutes)
- **Robustness**
 - How fast can the system be recovered if something breaks

Restore to snapshot (5 minutes)

REM Development Network

- 73 Servers (real and virtual)
 - 16 physical stand-alone servers (application dedicated)
 - 5 VMWare Servers (running on Server 2003)
 - 17 virtual machines
 - 4 ESXi v4.x machines
 - 31 virtual machines
 - 21 Pro+ (600 DST – 12,000 DST)
 - 2 Batch Executives (for ~12,000 DST systems each)
 - 2 Batch Historians
 - Iconics Server
 - Mimic Server
 - Thin Manager Server
 - Syncade Server
 - Control Desktop Server (Windows NT 4)
 - Virtual CIOC



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REM Development Network

- Used existing hardware
- Upgraded RAM for three ESXi servers
- Additional hardware cost to add 19 virtual machines was ~\$340.

REM Development Network

- 19 licenses for Server 2003/Server 2008
 - \$14,440
 - If buying physical machine, cost is buried in hardware cost
- VMWare ESXi
 - \$0
- Windows TS CALS
 - \$0 (pre-existing)
- USB Over Network
 - \$600 for 8 USB devices



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REM Development Network

- 19 licenses for Server 2003/Server 2008
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 - If buying physical machine, cost is buried in hardware cost
- VMWare ESXi
 - \$0
- Windows TS CALS
 - \$0 (pre-existing)
- ~~• USB Over Network~~
 - ~~— \$600 for 8 USB devices~~



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REM Benefits

- Reduced hardware footprint
 - 3 vs. 19
- Reduced power usage
 - 750W vs. 4750W
- Reduced A/C load
 - 8,091 BTU/hr vs. 51,243 BTU/hr
 - < 1 ton vs. 5 ton
- Increased flexibility
 - Computers that support NT hard to find
- Decreased setup time for new system
 - Can have a new virtual computer on-line < 1hr.



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REM Benefits

- Lower testing risk
 - Take snapshots before installing something untested or installing updates
 - Easily revert to the snapshot if something doesn't work correctly



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Large Plant DCS Development System Example

– Physical Hardware

- Configuration Server, Batch/Continuous Historian, Batch Executive, Operator Station RT Server, Virtual Controllers Application Station (3)
 - Configuration Server - 1 R710 - \$7200
 - Historian, Batch Executive - 2 R710 - \$14400
 - Operator Station RT Server – 1 R710 - \$7200
 - Virtual Controllers – 3 R710 - \$21600
 - \$50,400

Large Plant DCS Development System Example – Virtualized

- Configuration Server, Batch/Continuous Historian, Batch Executive, Operator Station RT Server, Virtual Controllers Application Station (3)
 - Host Server - \$7200
 - 16 GB RAM upgrade - \$1400
 - Configuration Server – 1 OS License - \$750
 - Historian, Batch Executive - 2 OS Licenses - \$1500
 - Operator Station RT Server – 1 OS License - \$750
 - Terminal Server License (4 users) - \$320
 - Virtual Controllers – 3 OS Licenses - \$2350
 - \$14,270



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Large Plant DCS Development System Example

	Without Virtualization	With Virtualization	Savings
Cost	\$50,400		
Power Consumption	4,788 W		
Heat Dissipation	16,000 BTU/hr (1.36 tons)		

Large Plant DCS Development System Example

	Without Virtualization	With Virtualization	Savings
Cost	\$50,400	\$14,270	
Power Consumption	4,788 W	700 W	
Heat Dissipation	16,000 BTU/hr (1.36 tons)	2,334 BTU/hr (.19 tons)	

Large Plant DCS Development System Example

	Without Virtualization	With Virtualization	Savings
Cost	\$50,400	\$14,270	\$36,130 one-time
Power Consumption	4,788 W	700 W	\$2,100 per year (at \$0.06 per kWh)
Heat Dissipation	16,000 BTU/hr (1.36 tons)	2,334 BTU/hr (.19 tons)	\$697 per year (assumes very efficient A/C system, 0.33 K-factor)

Large Plant DCS Development System Example

	Without Virtualization	With Virtualization	Savings
Cost	\$50,400	\$14,270	\$36,130 one-time
Power Consumption	4,788 W	700 W	Reduce Carbon Footprint
Heat Dissipation	16,000 BTU/hr (1.36 tons)	2,334 BTU/hr (.19 tons)	Reduce Carbon Footprint

Questions?



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