Virtualization In Manufacturing Industries
What is Virtualization?

- Traditionally the OS and its applications were tightly coupled to the hardware they were installed on.
- Virtualization breaks the link between operating system and physical hardware.
- This allows the ability to change hardware without replacing the OS or applications.
- Additionally multiple instances of an OS with independent applications can now run on the same hardware.
Type 2 / Hosted Virtualization

Hypervisor runs as an application on another OS such as Linux or Windows.

Advantages:
- Low cost
- Self administered
- Independent of IT management and controls
Hypervisor replaces host operating system and manages host hardware and resources.

Advantages:

- Reduced host maintenance
- Improved host reliability
- Reduced security surface area
- Data center level vendor support
Server Consolidation

• Many physical servers
  - Under utilized
  - Requiring maintenance
  - Generating heat
  - Consuming energy

• Fewer physical servers
  – More efficiently utilized
  – Easier to maintenance
  – Generating less heat
  – Consuming less energy
VMware vSphere Overview

- Combines multiple servers and storage units into a pool of resources that can be divided between applications
- Provides central management for servers and their applications
- Advanced high availability and disaster recovery features

Intended to provide a highly available, always on back end for server applications and desktops.

Can segment hardware into multiple priority groups.
Centralized management (servers)

- Monitor all host servers and virtual machines
- Deploy new VM's from template
- Attached to the console session to manage installed applications
- Shutdown / reset problem VM's
- Backup and restore virtual machines with integrated addons (optional)
Manageability: vMotion

- Migrate a running VM from one physical server to another
Management server monitors host load and virtual machine placement vs. defined rules.
Either suggests or automatically executes vMotion operations.
Reliability: High Availability

- Hosts monitor each other and their virtual machines for failure.
- Failed virtual machines automatically restarted where resources are available.
Reliability: VMware Fault Tolerance

- Virtual machines execute simultaneously on two physical servers
- Bumpless failover in the event of a HARDWARE failure

No Reboot Seamless Cutover

DIAGRAM:
- VMware ESXi
- FAULT TOLERANCE
- Operating Server

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VMware View Overview

- Central management for both engineering and operations clients
- Rapid deployment of new desktops and updates
- Run virtual machines on production server cluster, or on engineering laptop
- Client can run on a range of devices from desktops to tablets
- End user focuses on using the applications rather than managing his virtual machine library

Aimed at systems that could benefit from centralized management
Extend server virtualization benefits to clients:

- Software independence from hardware
- Lower Administration and Support Costs
- Rapid Desktop Deployment
- Leverage VM Availability Features
- Centralized disaster recovery
- Integrated Secure Remote Access
Centralized management (clients)

- View status of current clients
- Reset problem clients
- Provision new systems
- Rapidly deploy tested patches or software updates
- Entitle or revoke user access

VMware View VDM can also be used to manage access to Microsoft Terminal Services.
Typical Hardware Architecture

In the data center
- Storage Array (iSCSI, FC, NFS)
- 2-5 Physical Servers
- Redundant Gigabit Switches

In the office and on the shop floor
- legacy desktops
- ruggedized laptops
- solid state thin clients
- Tablets (iPad / Android)
FactoryTalk System Example

- Active Directory
- FactoryTalk Directory
- Primary HMI
- Secondary HMI
- Asset Centre
- Historian
- VantagePoint
- Batch

- Engineering Workstations
- Operator Workstations
Process System Today

Plant Asset Management
Process Information

Plant Ethernet
Batch Management
Engineering Workstation
Operator Workstations
Process Automation System Servers

Process Control Ethernet
Cisco 3750 L3 Stack
Stratix 8000
CLX 01 to CLX 07
CLX 08 to CLX 13

Area 1
Area 2
Process System with Virtualization

**Hardware Consolidation**
- Process Automation System Server
- Operator Workstations x 16
- Engineering Workstation
- Batch Server

**Centralized Infrastructure**
- Servers (3)
- SAN Device

**Virtualization Management Console**

**Infrastructure Clients**

Cisco 3750 L3 Stack

Area 1
- CLX 01 to CLX 07

Area 2
- CLX 08 to CLX 13
What is the Industrial Data Center?

Industry-leading partners collaborating with Rockwell Automation to help your business realize the benefits of virtualization through a pre-engineered, scalable infrastructure offering.

- Complete turn key solution including:
  - Hardware
  - Software
  - Factory assembly
  - On-site configuration
  - Documentation
  - TechConnect℠ support

Standard pre-engineered industrial solution to simplify deployment making commissioning and maintenance easier, scalable, and more supportable.
Industrial Data Center – E1000

Resilient compute resources for small industrial data centers

- Supports up to 10 virtual machines
  - VMware ESXi pre-configured
  - Component Level Redundancy (HD, NIC, Power Supply)
  - Can be integrated into a full IDC at a later time
  - Rack and switch are not included, but can be purchased as options.

**USE CASE: OEM/Single Line**
- 2 PASS/HMI servers
- 1 Historian
- 1 Asset Centre
- Domain controllers and other management services
Resilient compute resources for small industrial data centers

Supports up to 60 virtual machines
- VMware HA and FT
- Maximum 3 physical servers
- Maximum 75 disks

USE CASE: Multiple Line/Small Plant
- 4 PASS/HMI servers
- FactoryTalk Batch
- FactoryTalk Historian
- FactoryTalk Asset Centre
- 15 Operator stations
- 5 Engineering Stations
- Domain controllers and other management services

Industrial Data Center – E2000 (Essentials)
Industrial Data Center – E3000 (Essentials+)

Fully redundant, fully scalable information infrastructure for the plant floor

Supports up to 150 virtual machines
- VMware HA, FT and DRS
- Max 6 servers
- Max 100 disks

USE CASE: Small/Large Plate Wide Control
- 6-8 PASS/HMI Servers
- FactoryTalk Batch
- FactoryTalk Metrics
- FactoryTalk Historian
- FactoryTalk Asset Centre
- Anti-Virus
- Secure Remote Access
- 50 Operator stations
- 20 Engineering Stations
- Domain Controllers and other management services
Scalable Remote Support Solutions
Industrial Data Center

One Number to Dial for support of all of Your Industrial Assets

- 8x5 Support Included (24x7 Support Optional)
- Remote Monitoring Optional
- Data Center Administration Optional

Value
## Industrial Data Center At-a-Glance

<table>
<thead>
<tr>
<th></th>
<th>E1000</th>
<th>E2000 (Essentials)</th>
<th>E3000 (Essentials+)</th>
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</thead>
<tbody>
<tr>
<td><strong>Cabinet RU</strong></td>
<td>24 (optional)</td>
<td>24</td>
<td>42</td>
</tr>
<tr>
<td><strong>Compute</strong></td>
<td>Cisco C240 Rack Mount Servers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min/Max Servers</td>
<td>1</td>
<td>2/3</td>
<td>3/6</td>
</tr>
<tr>
<td>Core</td>
<td>12</td>
<td>24 - 36 (12 per server)</td>
<td>36 - 72 (12 per server)</td>
</tr>
<tr>
<td>RAM (GB)</td>
<td>64</td>
<td>256 - 384 (128 per server)</td>
<td>384 - 768 (128 per server)</td>
</tr>
<tr>
<td><strong>Network Switch</strong></td>
<td>—</td>
<td>2 – Cisco Catalyst 3750X 24 Port</td>
<td>2 – Cisco Catalyst 3750X 48 Port</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>—</td>
<td>EMC VNXe 3150</td>
<td></td>
</tr>
<tr>
<td>Usable TB Storage</td>
<td>2 TB</td>
<td>5 TB</td>
<td>9 TB</td>
</tr>
<tr>
<td>Hypervisor</td>
<td>VMware vSphere Standard</td>
<td>VMware vSphere Enterprise</td>
<td></td>
</tr>
<tr>
<td>Desktop Virtualization</td>
<td>—</td>
<td>VMware Horizon View (10 seats)</td>
<td>VMware Horizon View (20 seats)</td>
</tr>
<tr>
<td><strong>Operating System</strong></td>
<td>MS 2012 2 processors / 10 cals</td>
<td>MS 2012 4 processors / 20 cals</td>
<td>MS 2012 6 processors / 30 cals</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>8x5 TechConnect SM (upgrade available to 24x7 or remote monitoring)</td>
<td>One year HWSW warranty</td>
<td></td>
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</tbody>
</table>
Virtual Machine Image Templates

- When the templates are ordered the customer receives
  - The 3 core PlantPAx system elements as Images on a USB Hard-Drive (HDD) with all required Rockwell Software preinstalled, but NOT activated.
  - 3 Microsoft Operating System Full Packaged Product (FPP) Licenses
    - The end-user must convert the FPP to a Microsoft Volume License within 90 days
  - Templates require a Microsoft Volume License to run
    - Customers should contact their Microsoft Rep. to convert the licenses

- Activating the Templates
  - EWS – Order → 9528-EWSLICENE – US List $12,900.00
  - OWS – Order → 9528-OWSLICENE – US List $2,660.00
  - PASS – Order → 9528-PASS100ENE – US List $6,990.00
    - 9528-PASS250ENE – US List $9,810.00
    - 9528-PASSUNLENE – US List $16,000.00

*PASS Activation based on HMI display count of 100, 250, or Unlimited
*Activations are in increments of 1 per image. Order 1 for each image required
Questions?