



# Computer Virtualization in Process Control and Industrial Applications

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Achieving Hardware Independence for  
Critical Applications Through Virtualization

# Dynamic – Robust - Secure

**We have for so long, done  
so much with so little.**

**We can now do anything  
with nothing.**

(Engineering Maxim #1)

# How do you do more with less

*By understanding the full capabilities  
of the resources I already have.*

# Hipskind Core Philosophies

Bigger is not Better – Better is Better

The Customer's Perception is Reality

Surprises are Only for Birthdays



# Agenda

1. How Computer Operating Systems have Changed
2. Current Factory Automation deployments on Physical Infrastructure
3. Computer Virtualization 101 – What is it and How does it work
4. Factory Automation on Virtualized Infrastructure
5. Disaster Recovery – How a Virtualized control system eliminates costly downtime
6. Considerations when sizing a system

# How Computer Operating Systems have Changed

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# Operating System Lifecycle

<b>Product</b>	<b>LifeCycle Start Date</b>	<b>Main Steam Support</b>	<b>Extended Support</b>
Server 2000	March-2000	June-2005	July-2010
Server 2003	May-2003	July-2010	July-2015
Server 2008	June-2008	January-2015	January-2020
Server 2008R2	October-2009	January-2015	January-2020
Windows Xp	December-2001	April-2009	April-2014
Windows Vista	January-2007	April-2012	April-2017
Windows 7 Pro	October-2009	January-2015	January-2020
Exchange 2000	November-2000	December-2005	January-2011
Exchange 2003	September-2003	April-2009	April-2014
Exchange 2007	March-2007	April-2012	April-2017
Exchange 2010	November-2009	January-2015	January-2020
Office 2003	November-2003	April-2009	April-2014
Office 2007	January-2007	October-2012	April-2017
Office 2010	July-2010	October-2015	October-2020



Windows	Linux	Novelle NetWare	Sun Solaris	Other
Windows 3.1	Asianux 4 - 64 bit	Netware 5 and 6	Sun Solaris 8	Apple Mac OS X 10.6 (64 and 32 bit)
Windows 95	Asianux 4		Sun Solaris 9	eComStation 2
Windows 98	Asianux Server 3 - 64 bit		Sun Solaris 10 - 64 bit	eComStation
Windows Me	Asianux Server 3		Sun Solaris 10	Free BSD - 64 bit
Windows 2000 Server	CentOS - 64 bit		Sun Solaris 11 - 64 bit	Free BSD
Windows 2000 Advanced Server	CentOS			IBM OS/2
Windows Server 2003 Wed Edition	Debian 6 - 64 bit			MS-DOS
Windows Server 2003 Small Business	Debian 6			SCO OpenServer 5 and 6
Windows Server 2003 Enterprise x64	Debian 5 - 64 bit			SCO Unixware 7
Windows Server 2003 Enterprise	Debian 5			
Windows Server 2003 Standard x64	Fedora - 64 bit			
Windows Server 2003 Standard	Fedora			
Windows Server 2008 x64	Mandrake Linux			
Windows Server 2008 x64	Mandriva Linux - 64 bit			
Windows Server 2012	Mandriva Linux			
Windows NT	Novell Linux Desktop 9			
Windows 2000 Professional	OpenSUSE - 64 bit			
Windows XP Professional x64	OpenSUSE			
Windows XP Professional	Oracle Enterprise Linux - 64 bit			
Windows XP home	Oracle Enterprise Linux			
Windows Vista x64	Red Hat Enterprise Linux 6 - 64 bit			
Windows Vista	Red Hat Enterprise Linux 6			
Windows 7 x64	Red Hat Enterprise Linux 5 - 64 bit			
Windows 7	Red Hat Enterprise Linux 5			
Windows 8 x64	Red Hat Enterprise Linux 4 - 64 bit			
Windows 8	Red Hat Enterprise Linux 4			
	Red Hat Enterprise Linux 3 - 64 bit			
	Red Hat Enterprise Linux 3			
	Red Hat Enterprise Linux 2			
	Redhat Linux			
	SUSE Linux Enterprise 11 - 64 bit			
	SUSE Linux Enterprise 11			
	SUSE Linux Enterprise 10 - 64 bit			
	SUSE Linux Enterprise 10 - 64 bit			
	SUSE Linux Enterprise 7/8/9 - 64 bit			
	SUSE Linux Enterprise 7/8/9			
	SUSE Linux - 64 bit			
	SUSE Linux			
	TurboLinux - 64 bit			
	TurboLinux			
	Ubuntu - 64 bit			
	Ubuntu			

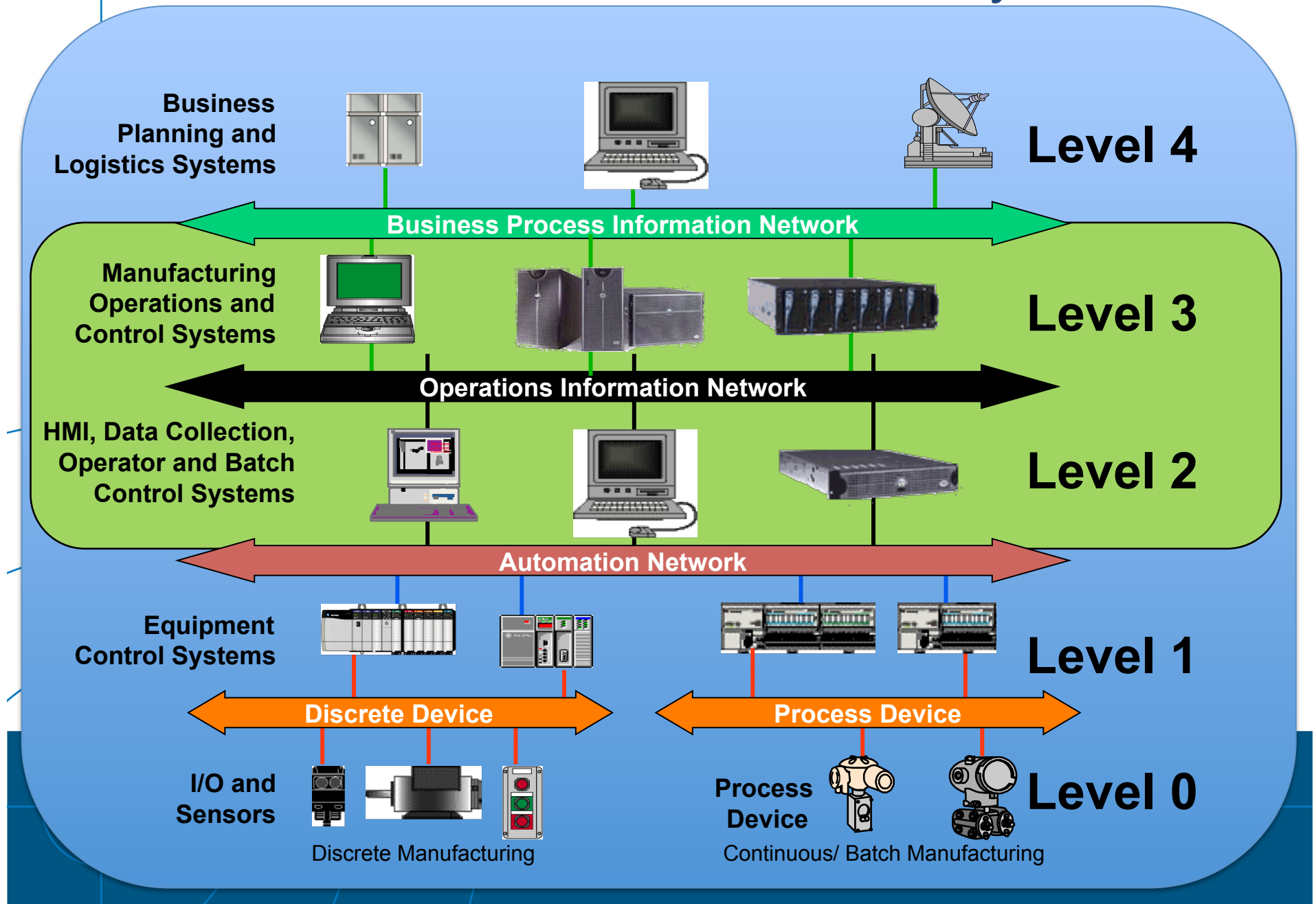
VMware Guest  
OS Support

Focused on IT

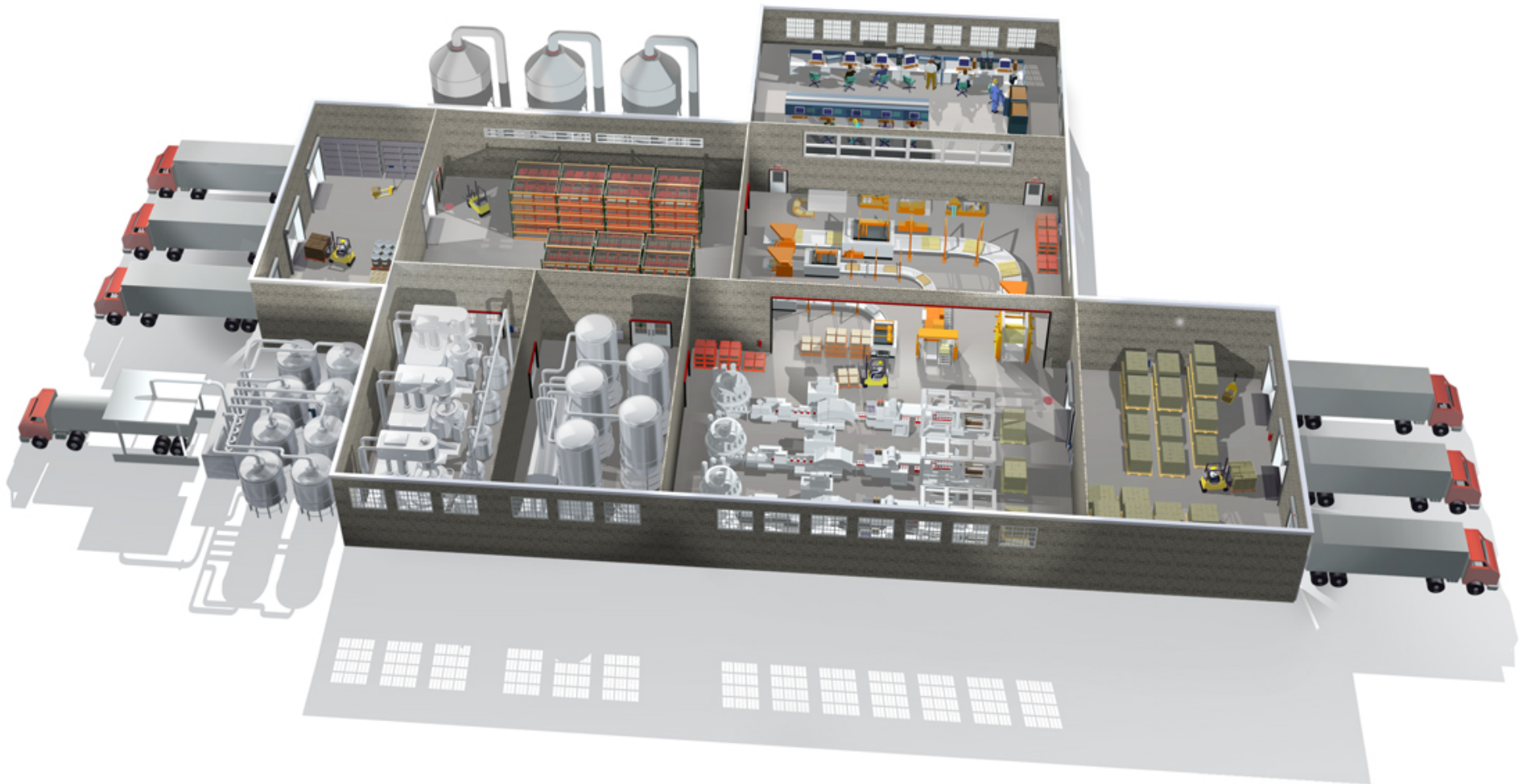
# Current Factory Automation Deployments on Physical Infrastructure

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# ANSI/ISA 95 Functional Hierarchy



# The Modern Factory!



# Process Automation System

## Engineering Work Station

Control System Eng. Tool  
Device Configuration  
Process Inst. Management  
Asset Management Tools

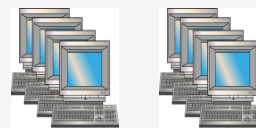


## PROCESS AUTOMATION SYSTEM SERVERS



## Operator Work Stations

Operator Consoles



## APPLICATION SERVERS



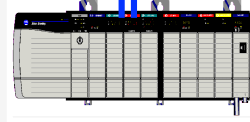
Ethernet/IP

## BRIDGE



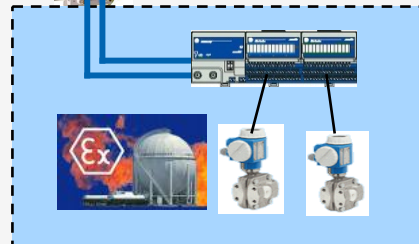
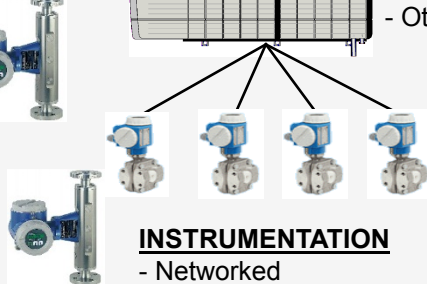
## REMOTE I/O

- 4 ... 20 mA  
- HART  
- Other



## INSTRUMENTATION

- Networked  
- HART Based



- 1 **Process Controller**  
Real-time distributed tag database in controller
- 2 **System Servers**  
Data Server  
HMI Server  
Security Server  
Alarm Server
- 3 **Application Servers**  
Batch Server  
Additional HMI Server  
Historian Server  
Asset Management
- 4 **Application Servers**  
Production reports  
Gateway to ERP

Focused on IT



# What this can Mean for my Deployments



- Active Directory
- Factory Talk Directory
- Primary HMI
- Secondary HMI
- Asset Center
- Historian
- VantagePoint
- Batch

## Additional Requirements:

Engineering Workstations



Operator Workstations



This can lead to a significant footprint for servers and Workstations:



# How Virtualization Can Help

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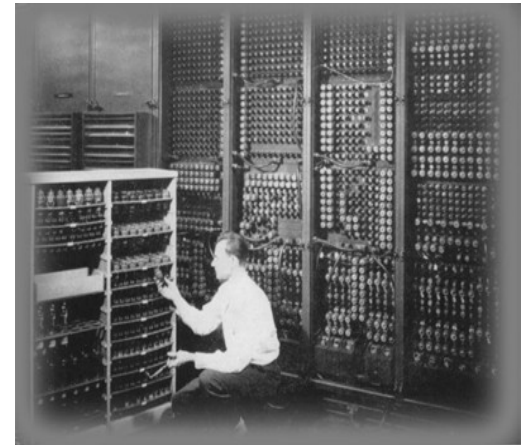
# The Cost of Automation Software

- Virtualization is widely adopted by IT and growing in manufacturing
- Manufacturing has some unique considerations and opportunities:

- Long system lifecycle needed (10-20 years)
- Obsolescent hardware infrastructure
- Legacy operating systems no longer available
- Remote geographical locations, Limited space
- Disperse Operator Workstations
- Reliability for 24 x 7 x 365

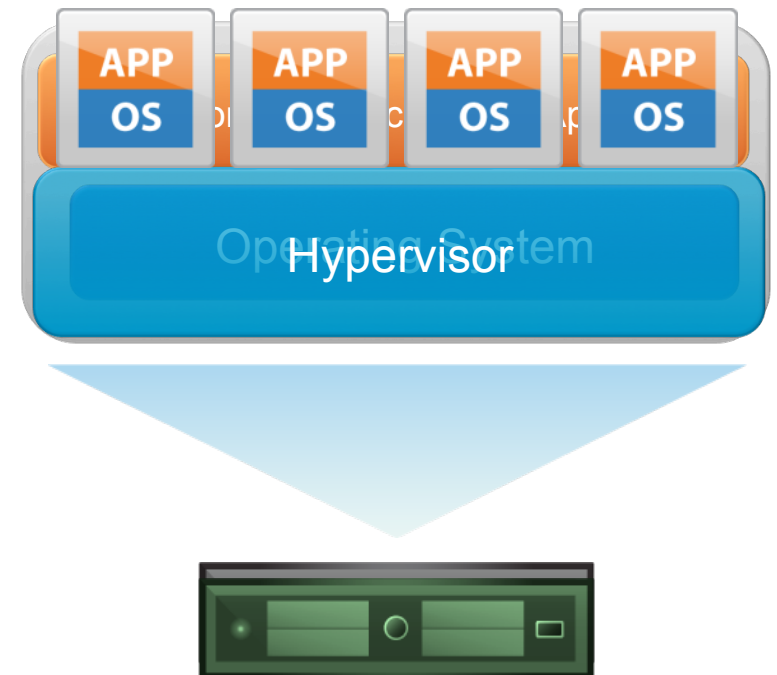
- **Address with Virtualization Value Propositions**

- System Longevity with HW/SW abstraction
- Server consolidation
- Deployment and administration from anywhere
- Centralized Desktop Support
- Availability (Reliability)



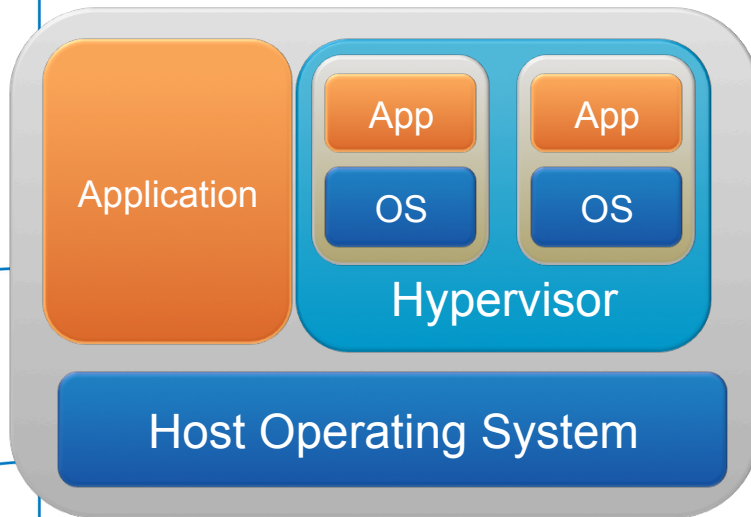
# What is Virtualization?

1. Traditionally the OS and its applications were tightly coupled to the hardware they were installed on
2. Virtualization breaks the link between operating system and physical hardware
3. This allows multiple instances of an OS with independent applications on the same hardware
4. As well as the ability to change hardware without replacing the OS or applications

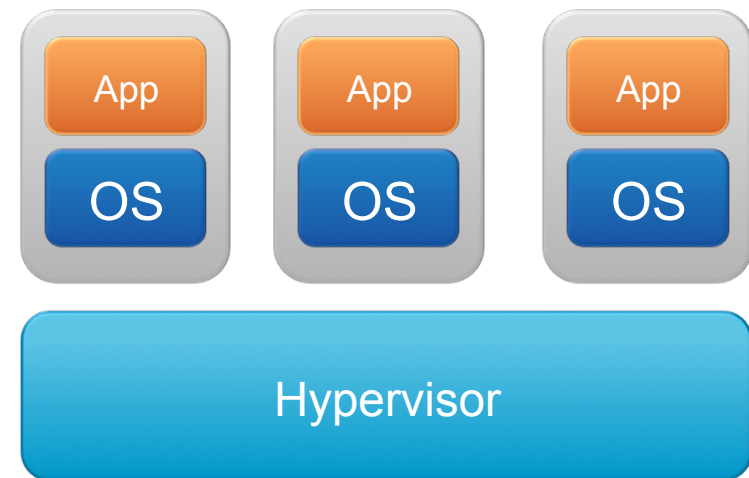


# Types of Virtualization

Hosted or “Desktop”  
Development Environment

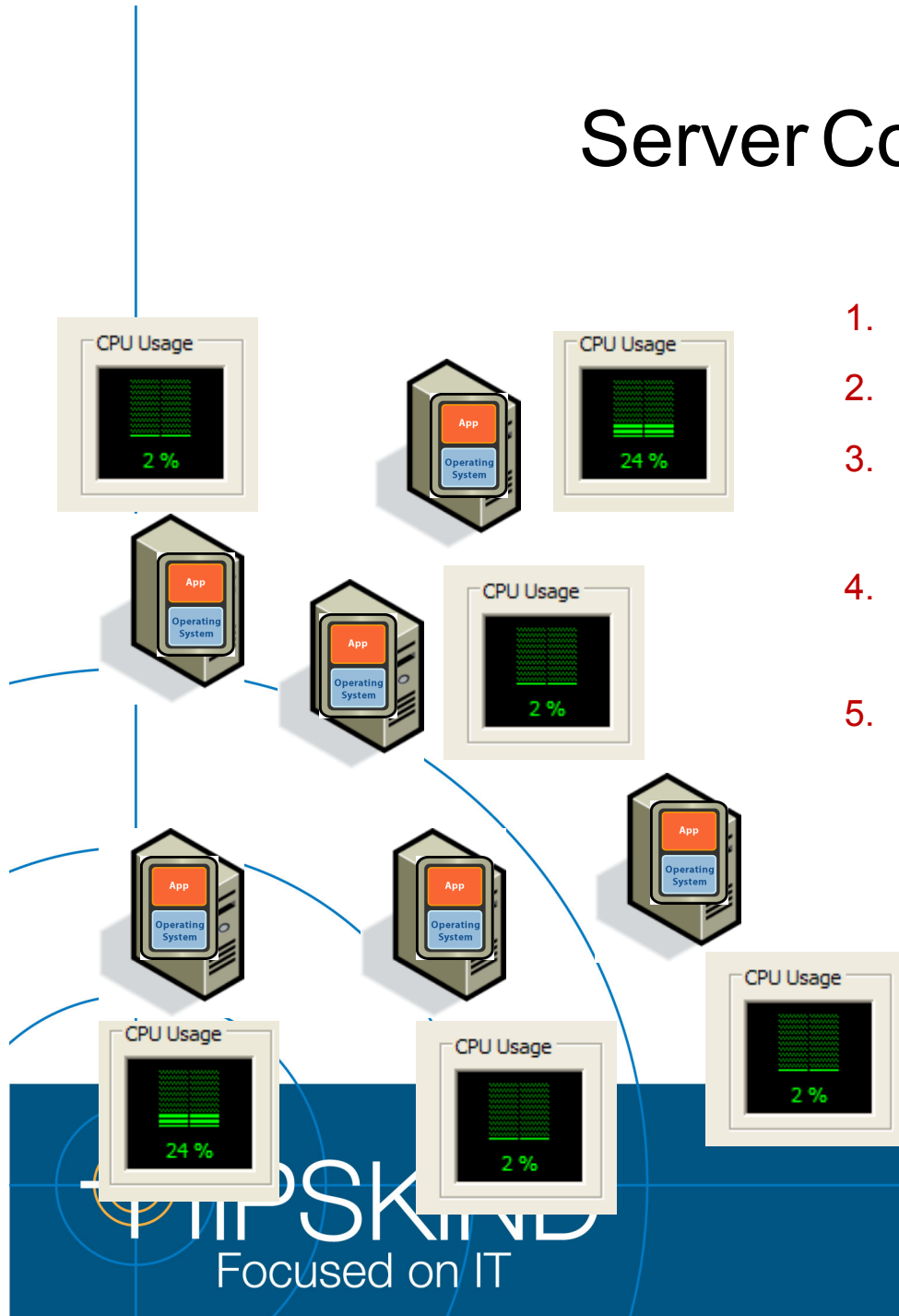


Bare Metal or “Server”  
Production Environment



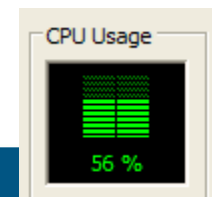
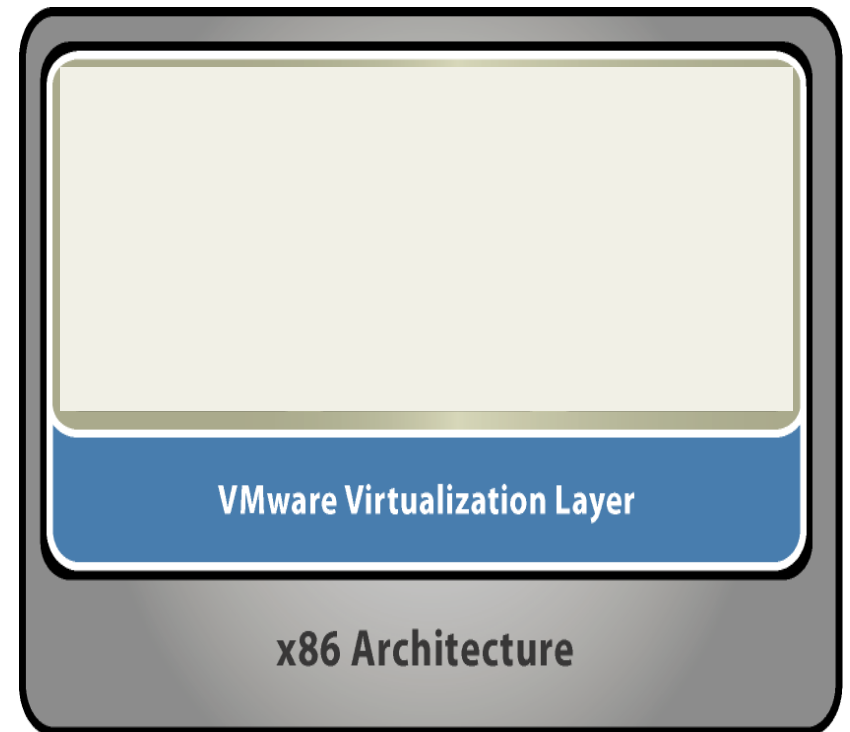
# Server Consolidation

1. Many Server Machines
2. Many Operating Systems
3. Many Applications with Different CPU Usage
4. High Maintenance of Server Infrastructure
5. High Utility Cost (Electricity, Cooling)



# Server Consolidation

- Different applications with OS requirements
- Different Operating Systems
- Removes dependency on hardware



# Factory Automation on Virtualized Infrastructure

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## Customer Benefits

- Increase Engineering Bandwidth
- Create an environment for change and growth
- Creates a flexible migration and implementation environment
- Ensure Solutions are installed into the appropriate hardware environment

# Physical Deployment



- Active Directory
- Primary HMI
- Secondary HMI
- Asset Center
- Historian
- Batch Servers

## Additional Requirements:

Engineering Workstations



Operator Workstations



This can lead to a significant footprint for servers and Workstations:

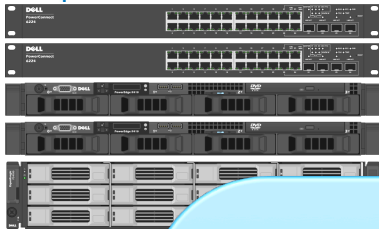


# Virtual Deployment

Engineering Workstations



Operator Workstations



Active Directory



FactoryTalk Directory



Primary HMI



Secondary HMI



Asset Centre



Historian



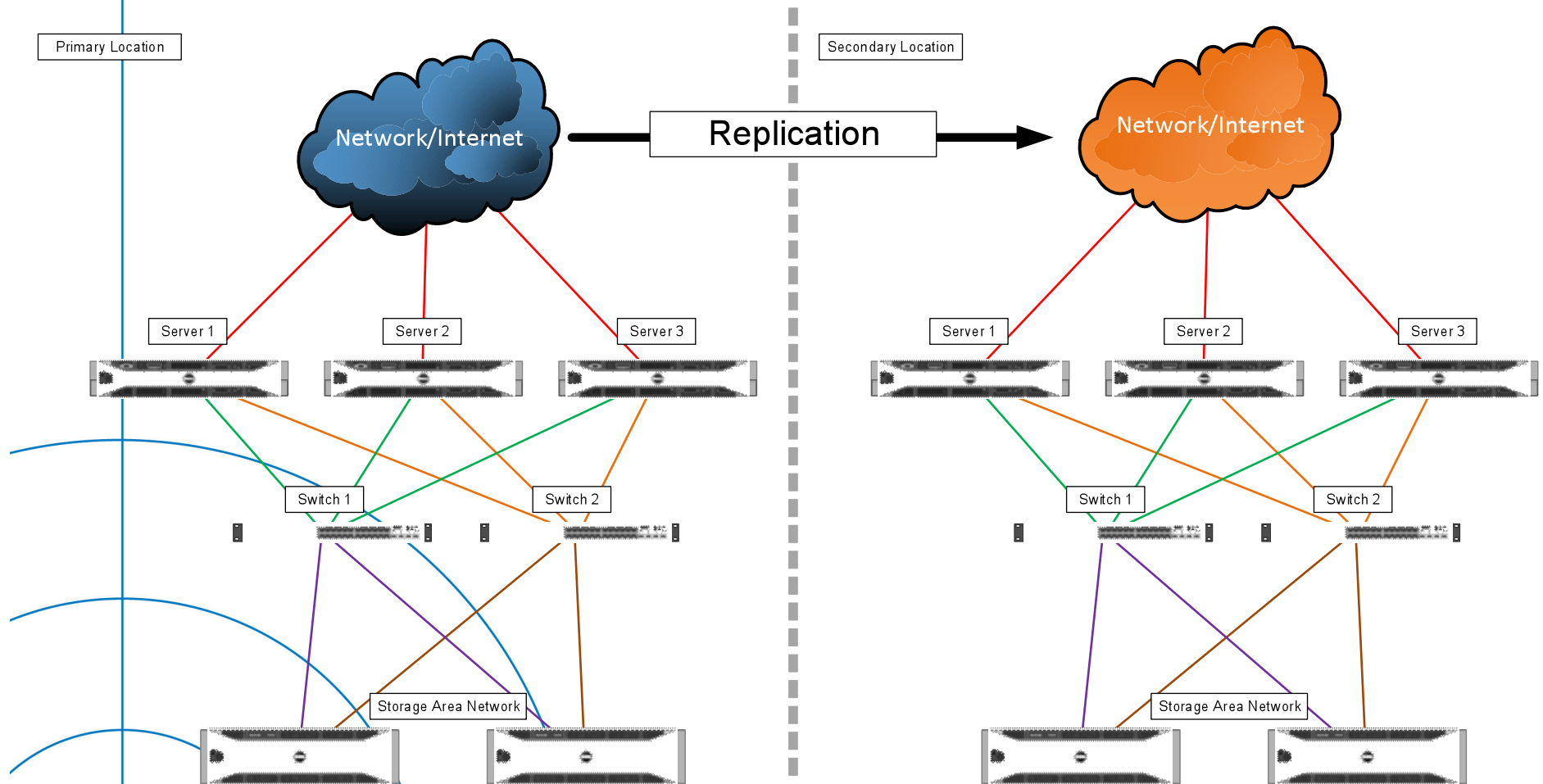
VantagePoint



Batch

# Disaster Recovery – How a Virtualized Control System Eliminates costly Downtime

# Backup, Restore and Disaster Recovery



# Considerations when Sizing a System

- Entry Level
- Basic
- Advanced

# Deployment Overview

Provide a Flexible approach to the deployment of Virtualization that enhances and builds upon the investment of existing infrastructure.



# Entry Level



***One Dell PowerEdge R210 Server*** (Intel Xeon E5620  
2.4 GHz CPU, 8GB RAM, 500GB Internal Storage)

***VMware Hypervisor***

***Multi-Vendor Process Automation Software***

*(Also available as a Tower System)*

Benefits: HMI

# Basic



***One Dell PowerEdge R510 Server*** (Intel Xeon E5640 2.53 GHz CPU, 32GB RAM, 2TB Internal Storage)

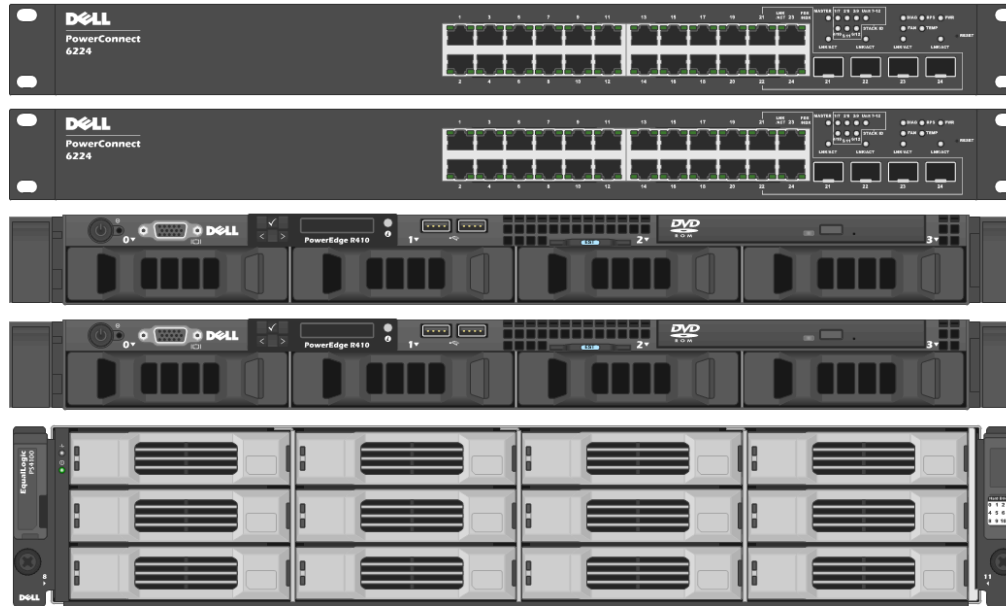
***VMware Hypervisor***

***Multi-Vendor Process Automation Software***

*(Also available as a Tower System)*

Benefits: HMI and Data Collection

# Advanced



*Two Dell PowerEdge R410 Servers* (Intel Xeon E5649 2.53 GHz CPU, 24GB RAM)

*One Dell EqualLogic PS4100E* Storage Array (12TB Raw Capacity)

*Two Dell PowerConnect 6224* Switches

*VMware vSphere 5.0*

*VMware* Virtual Center Server

*Multi-Vendor Process Automation Software*

Benefits: Plant wide Implementation



**And as Always:**

**All of these offerings can be  
customized to meet your  
unique needs**



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Questions?

The background is a solid dark blue. It features a design of concentric circles and a crosshair. There are three concentric circles centered on the left side of the image. A horizontal and a vertical line intersect at the center of these circles, forming a crosshair that spans the width and height of the image.

Thank You