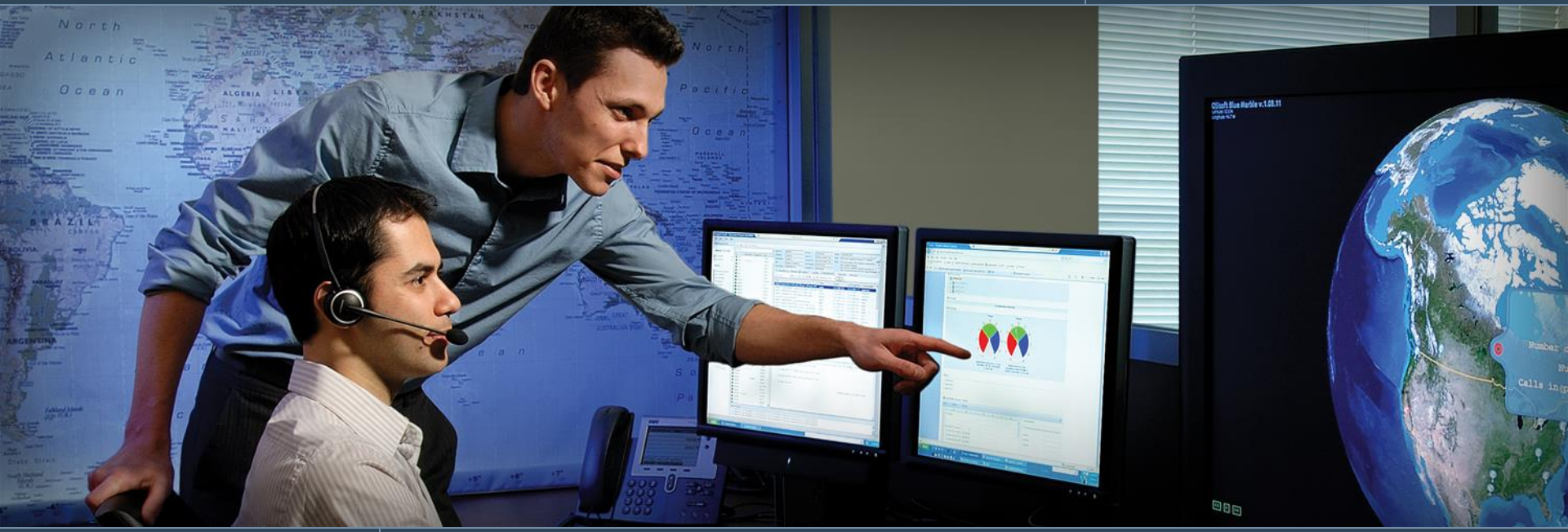


Virtualization and HA PI Systems: Strategies to Keep Your PI System Available, Scalable, and Portable

Empowering Business in Real Time.

Overview

- Virtualization
  - Storage (DAS, NAS, SAN)
  - Server
  - Application (Clients)
- How does PI High Availability play into virtualization?
  - Highly Available (HA) PI
  - HA PI in a virtual environment

Why Virtualization and PI?

You can realize substantial benefits using the combined strategies of virtualization (storage, server and application) and PI Collectives (HA).

These strategies provide you with:

- Increased reliability
- Reduced hardware and maintenance costs
- Improved scalability

Use them separately or together

Why Now?

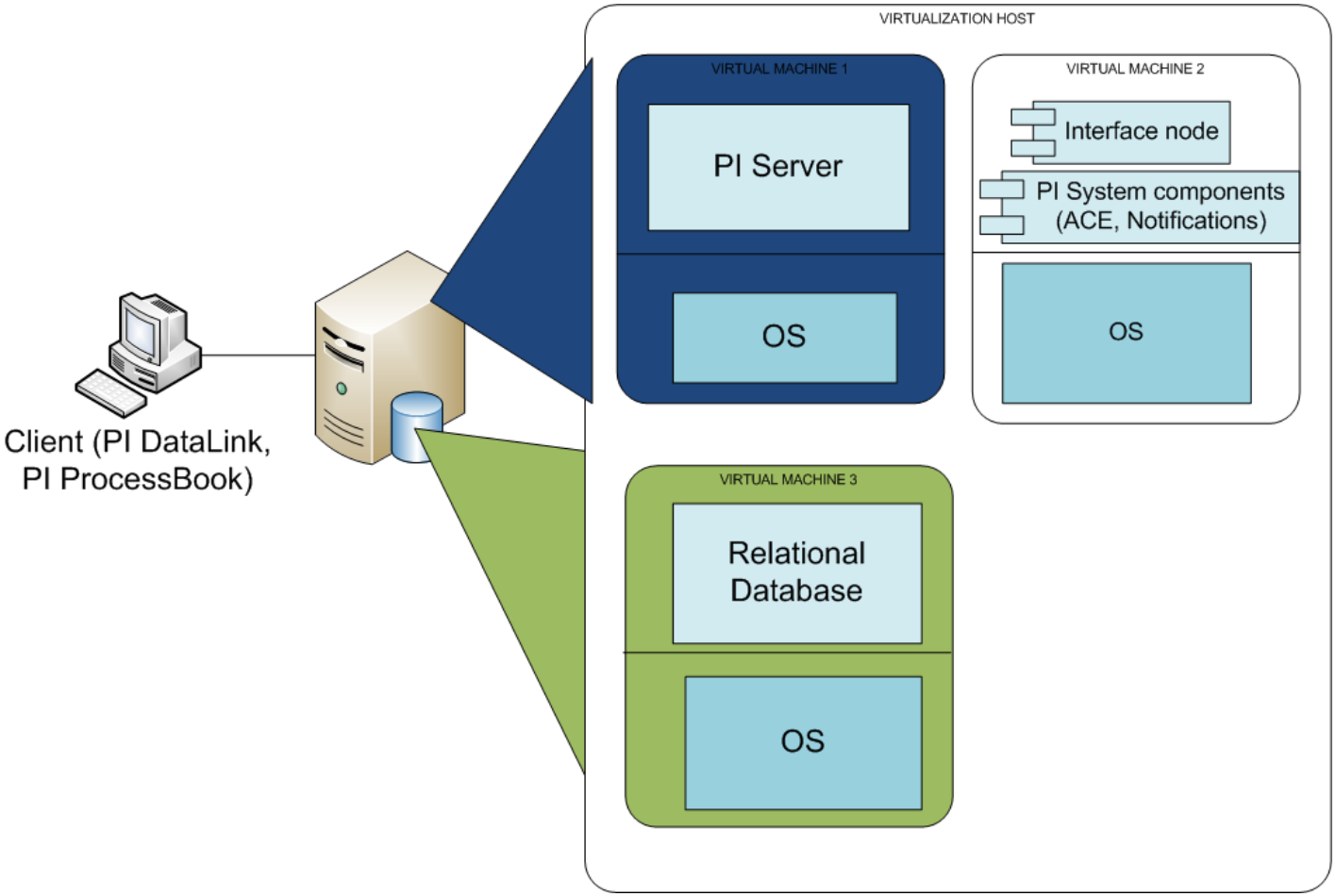
- You need to do more with less
- Your projects need to show immediate ROI
- IT is challenged to increase service levels with less staff
- Virtualization and HA are valuable separately, but better together

Who Needs This?

- PI users who cannot afford disruption in service (even for planned maintenance)
- IT organizations looking to consolidate management of computing resources (fewer servers to buy and maintain)
- IT organizations looking to streamline deployment of new tools for the user community (less IT time and resources)
- IT organizations investigating new ways to provide ever-increasing amounts of storage for mission critical systems
- A PI system administrator tasked with scaling PI to more users and other information systems
- Companies investigating virtualized test environments for validating new software purchases

A Simple System

A Simple Virtualized System

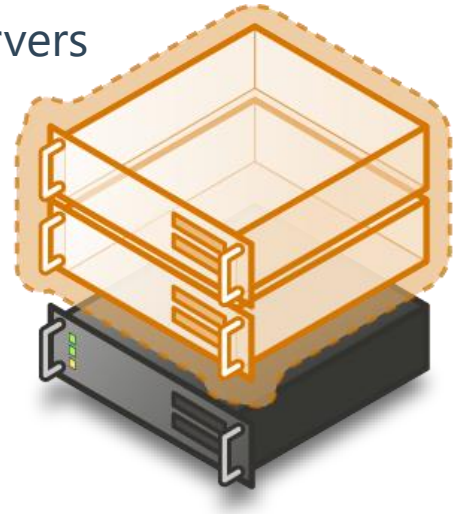


Virtualization

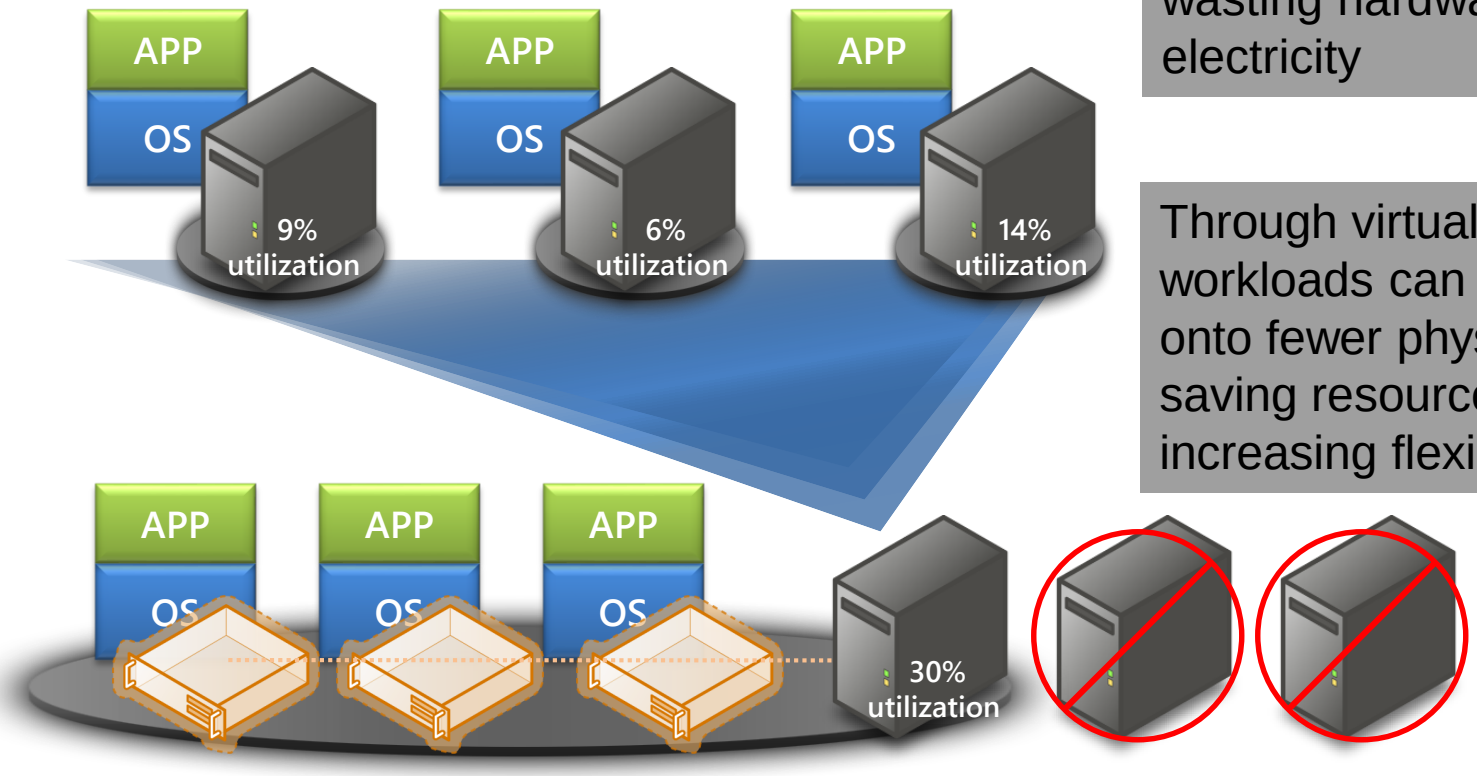
- Servers
- Storage
- Applications

Server Virtualization

- Instead of having physical machines, virtual servers run on a physical host
- Case Study: AtlantiCare
  - Eliminated need to expand or relocate data center
  - Microsoft® Virtual Server 2005 used to consolidate infrastructure and legacy application servers
  - Consolidation ratio achieved of 33:2



Example: Server consolidation



Typically server workloads only consume a small fraction of total physical server capacity, wasting hardware, space, and electricity

Through virtualization, these workloads can be consolidated onto fewer physical servers, saving resources and increasing flexibility

Benefits of Server Virtualization*

- Less hardware required (HP went from 85 data centers to 6)
  - up to 35% reduction of annual server costs per user ($100-$200K per year per server)
- Better utilization of hardware (HP decreased servers by 40%)
- Reduce power consumption (HP reduced energy by 40%)
- Provide higher availability by supporting redundancy
- Rapidly deliver adaptive and reliable IT services
- Tie diverse components together into a single managed entity
- Storage efficiency can lead to higher storage utilization

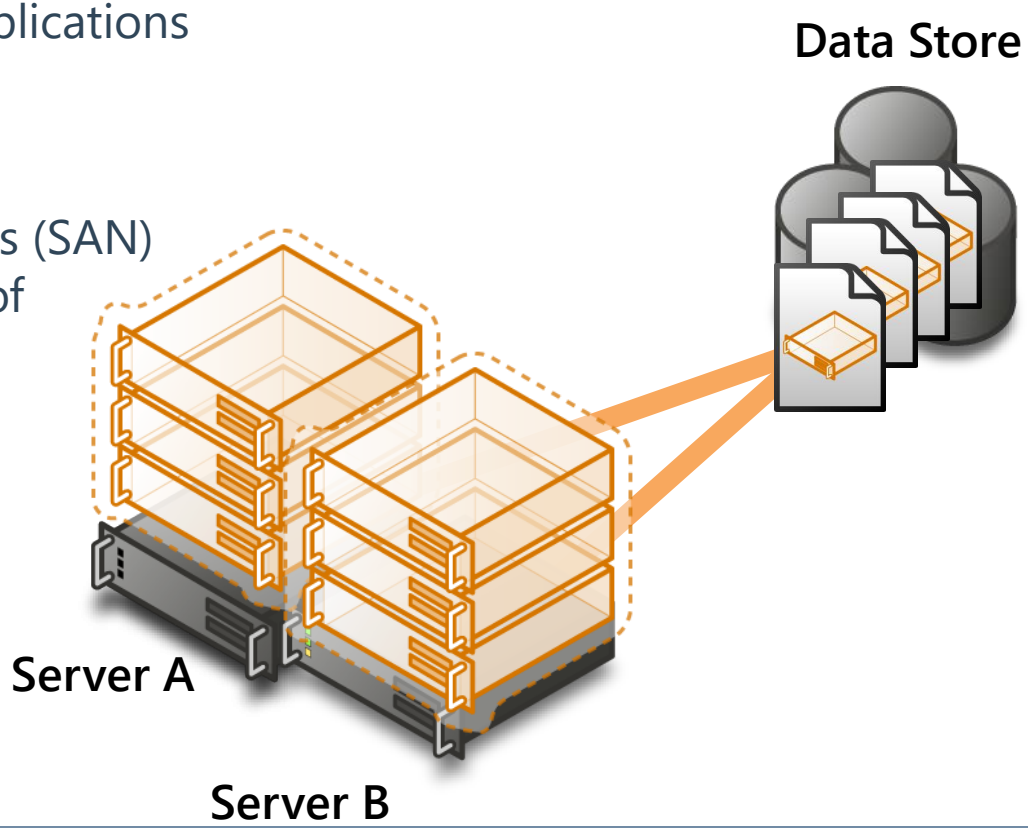
*Gillen, A., Grieser, T., Perry, R. 2008. Business Value of Virtualization: Realizing the Benefits of Integrated solutions. IDC.

PI and Server Virtualization

- Validated environments need a test bed (any pharmaceutical company; BMS; Shell)
- Environments that require portability of IT assets (Cargill Deicing Technology – Salt mining)
- Deploying new sites (Rio Tinto)

Storage virtualization

- **Challenge:**
  Grow available storage space without disrupting applications and servers
- **Solution:**
  Storage Area Networks (SAN) allow dynamic sizing of available storage



Storage Virtualization

- DAS: Direct Attached Storage (local hard drives)
- NAS: Network Attached Storage (e.g., mapped drives)
- SAN: Storage Area Network, essentially virtual storage

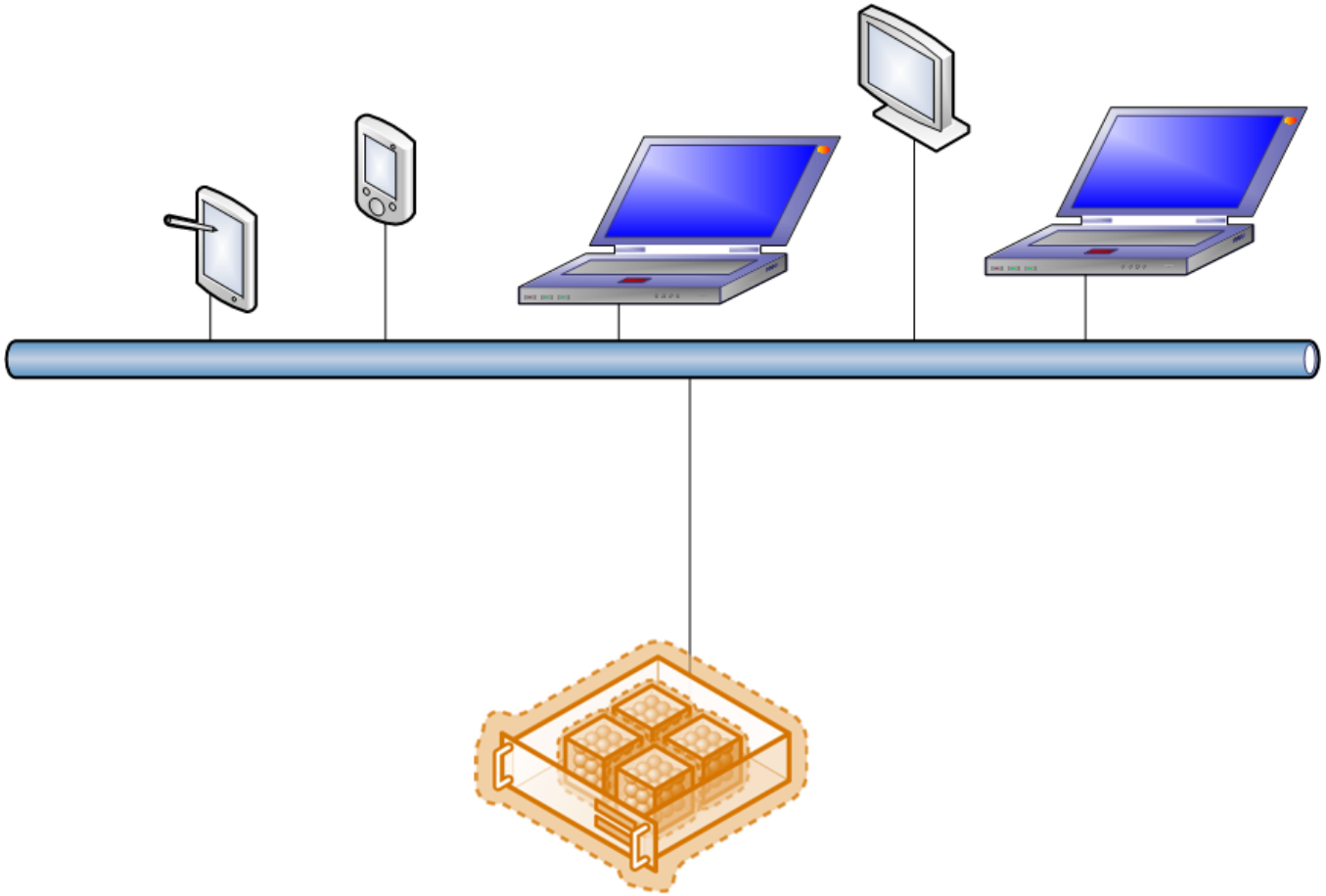
Benefits of SAN Technology

- Additional storage appears to be local to the host so users don't have to know where the files are stored
- Improve the ties between centralized storage and virtual infrastructure
- Provide virtual-machine consistent backups for data stores and the ability to restore virtual machines instantly in a few clicks
- Provide relief from disk subsystem access in virtualized environments (biggest performance hit on virtual host)
- Consolidate disk resources

PI and Storage Virtualization

- Keep more and higher fidelity data online; add or expand PI archive files
- Support aggregated PI Systems; VSS support enables backups
- Store PI Client files centrally
- Backup virtualized application and data servers
- Backup virtualized Terminal Server hosts
- Complete system backup storage

Application Virtualization



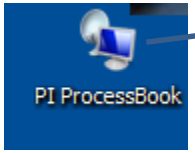
Application Virtualization

- Customers currently use Citrix or Terminal Server to reduce deployment costs and maintenance for client apps
- Windows 2008 Server offers a service that provides applications over an SSL connection (HTTPS) without client-side deployment (a thin deployment) – Terminal Services Gateway
- Terminal Services Gateway provides URL access to a host (like Remote Desktop connections, without the VPN requirement) or to specific applications on a host (even more secure for those outside the firewall)

Benefits of Application Virtualization

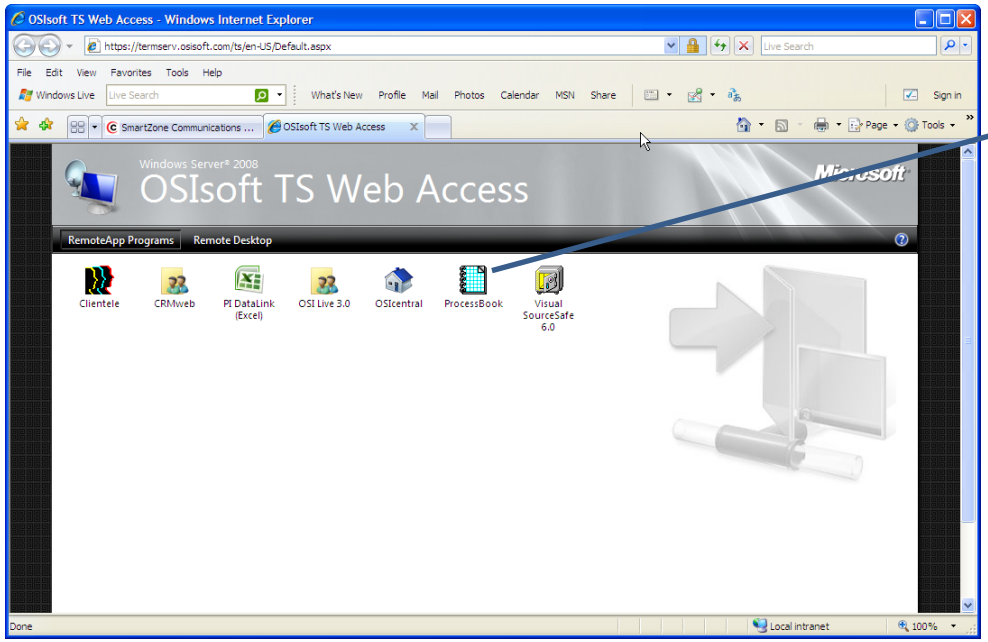
- One point of installation makes deployment simpler
- Access to applications secured
- All users have the same version of the software; no version or compatibility issues
- Casual users do not need to install anything to get started
- Save money on hardware investments by deploying client software in one place

PI and Application Virtualization (ProcessBook)



Launch from Desktop icon

OR



Launch from web page

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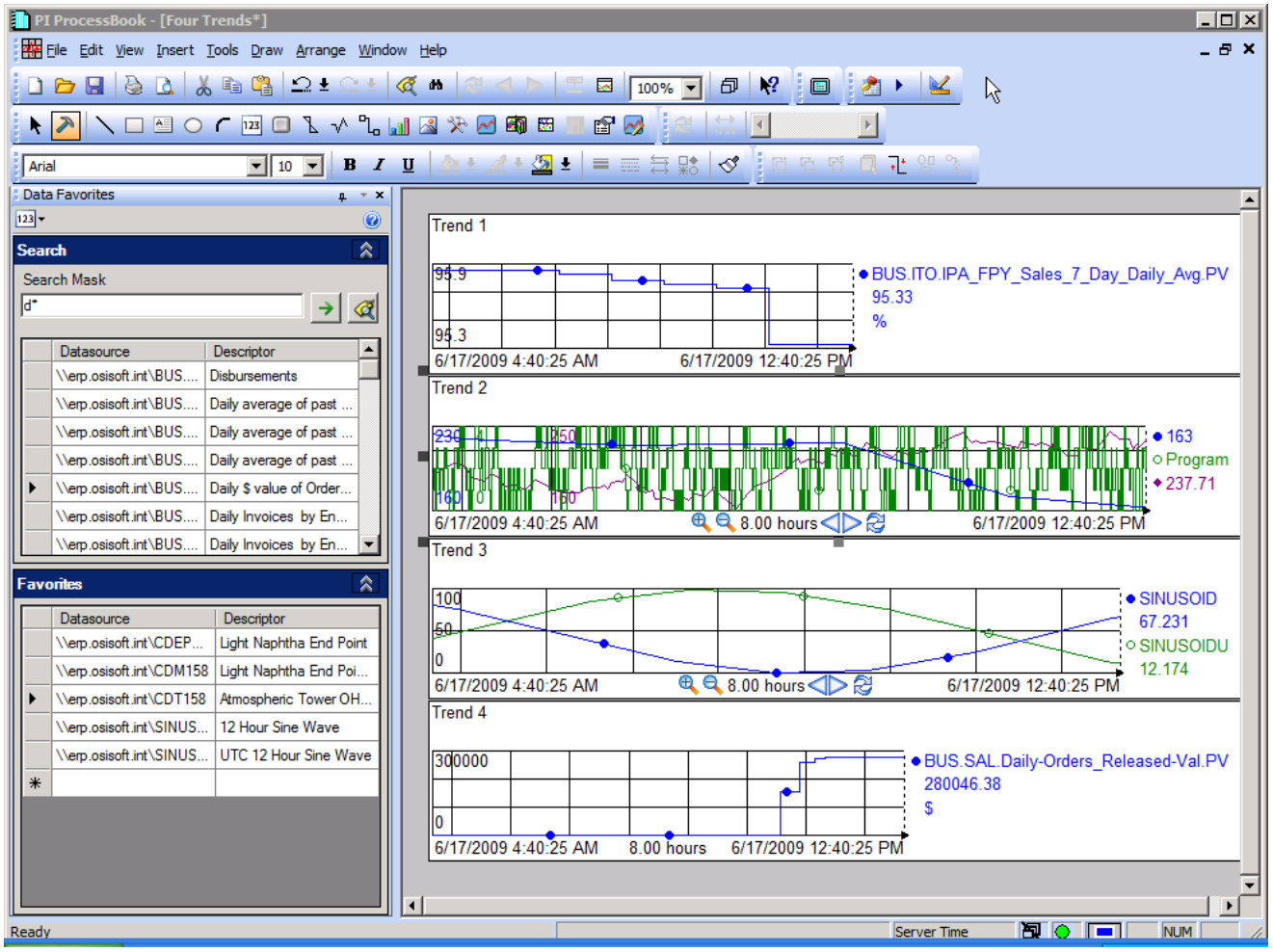
PI and Application Virtualization (ProcessBook)



Empowering Business in Real Time.

PI and Application Virtualization

- Environments with casual client users who need low barrier to entry for system access (Inco Limited)
- Terminal Server users (a partial list)
  - Georgia Pacific, Kellogg, SASO, SAPPI Fine Paper, Wacker Chemie, Alcoa, Eli Lilly, ExxonMobil Upstream, Iberdrola, Progress Energy Services
- Citrix users (a partial list)
  - SDG&E , Water Corporation, Amgen, Bayer Material Science, Genmab, PPG, Vaxgen, Katahdin Paper, Celanese Chemicals, Novo Nordisk, Queensland Alumina, Total
- Windows 2008 Terminal Services Gateway
  - OSIsoft

Five Principles for Virtualization Success*

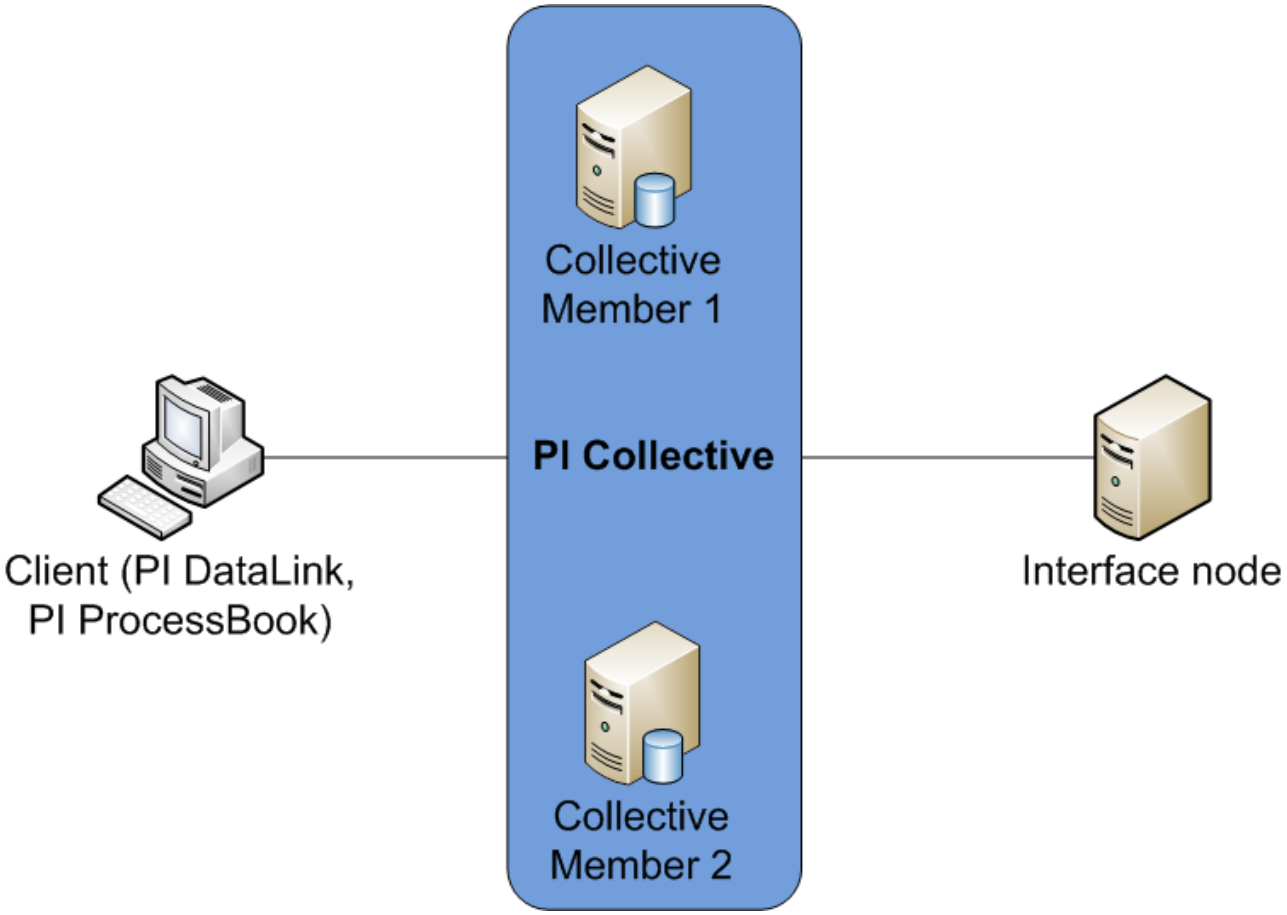
- Treat virtual machines as if they were physical machines
- Invest in Enterprise-level hardware and software
- Do not mix virtual and physical on the same host
- Use qualified Virtualization support personnel
- Test on the target platform

*OSIsoft Center of Excellence

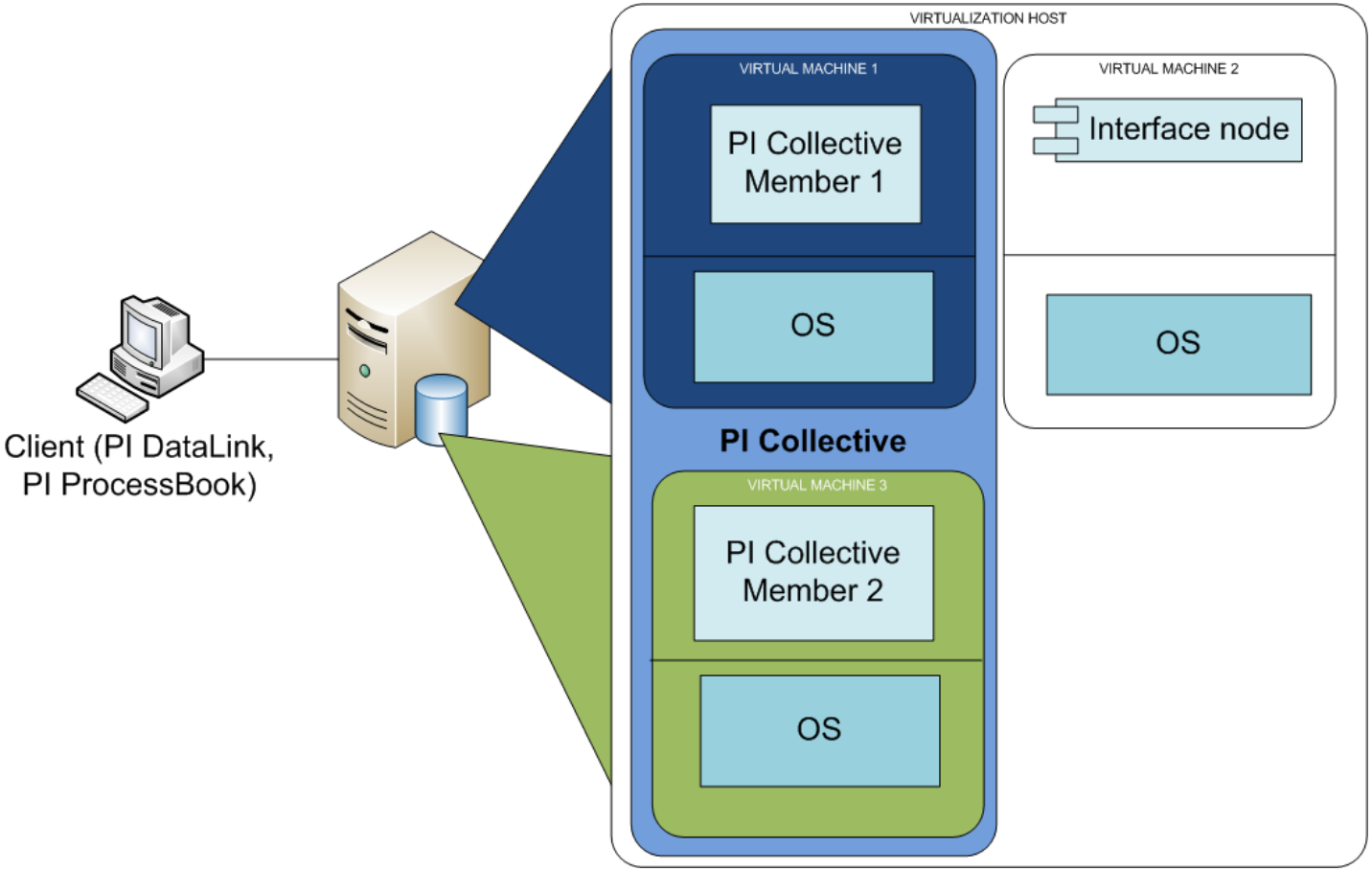
How does HA PI play into virtualization?

- PI collectives (HA) and interfaces
- Virtualized HA PI

A Simple HA PI System



A Simple Virtual HA PI System



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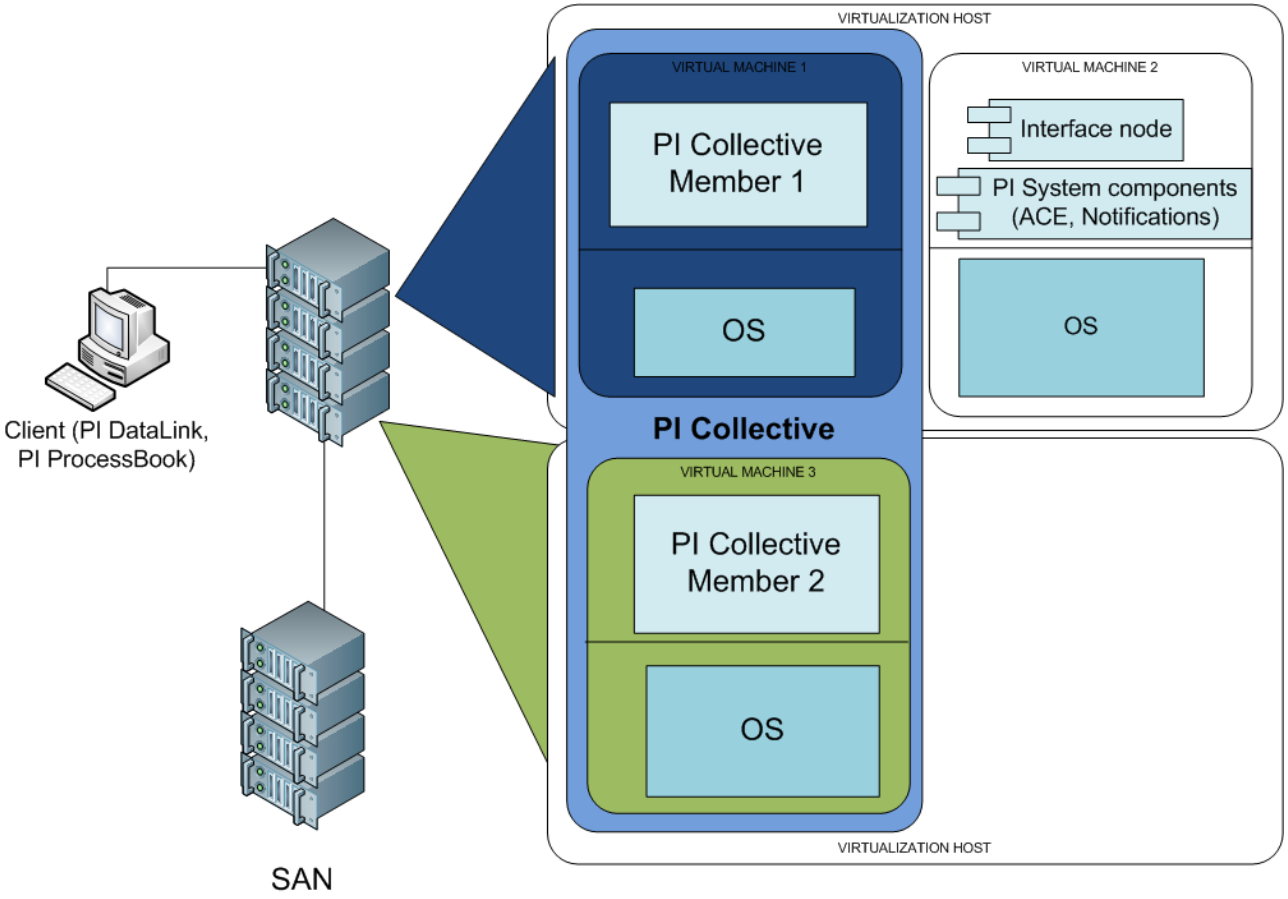
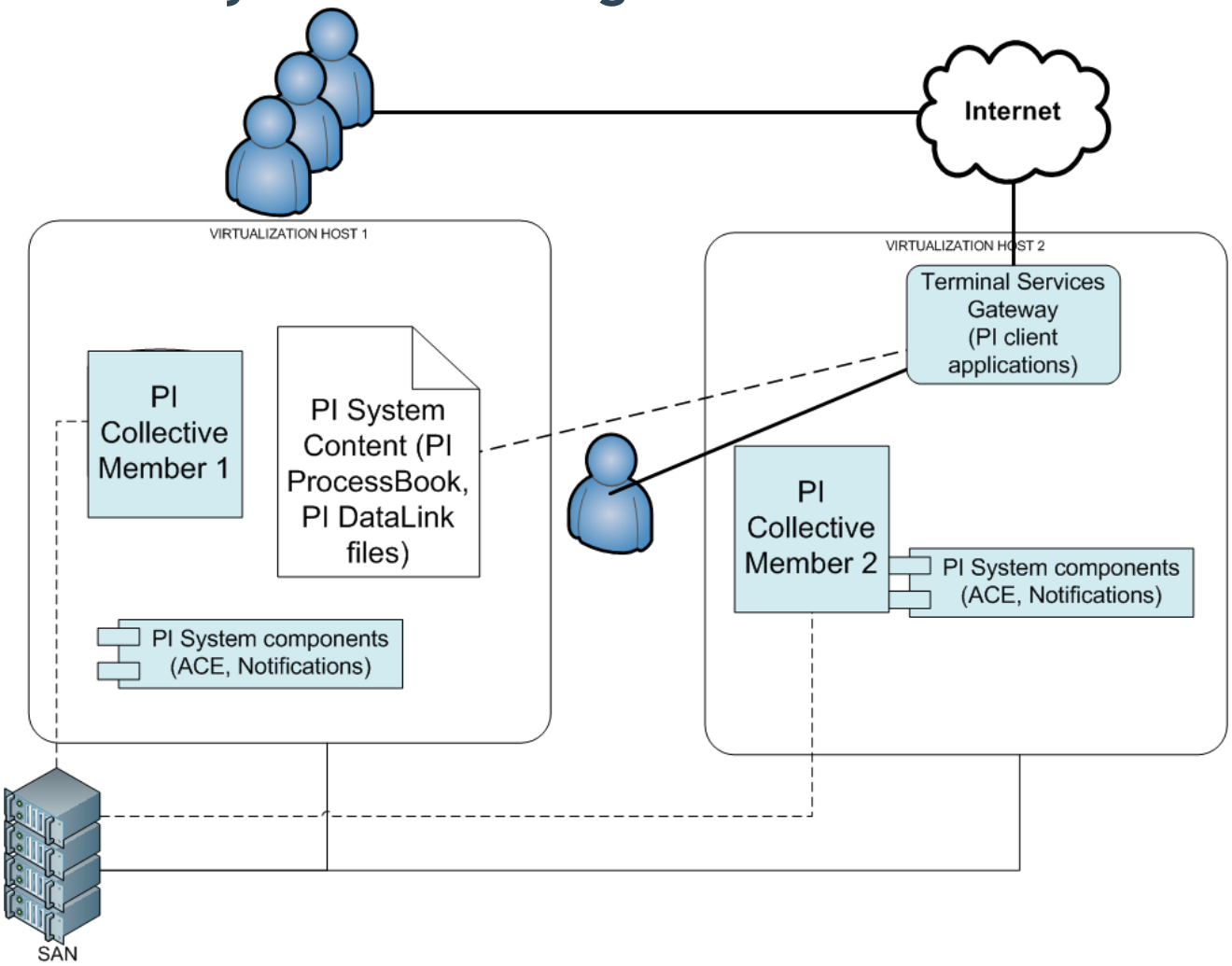
Virtual HA PI with SAN

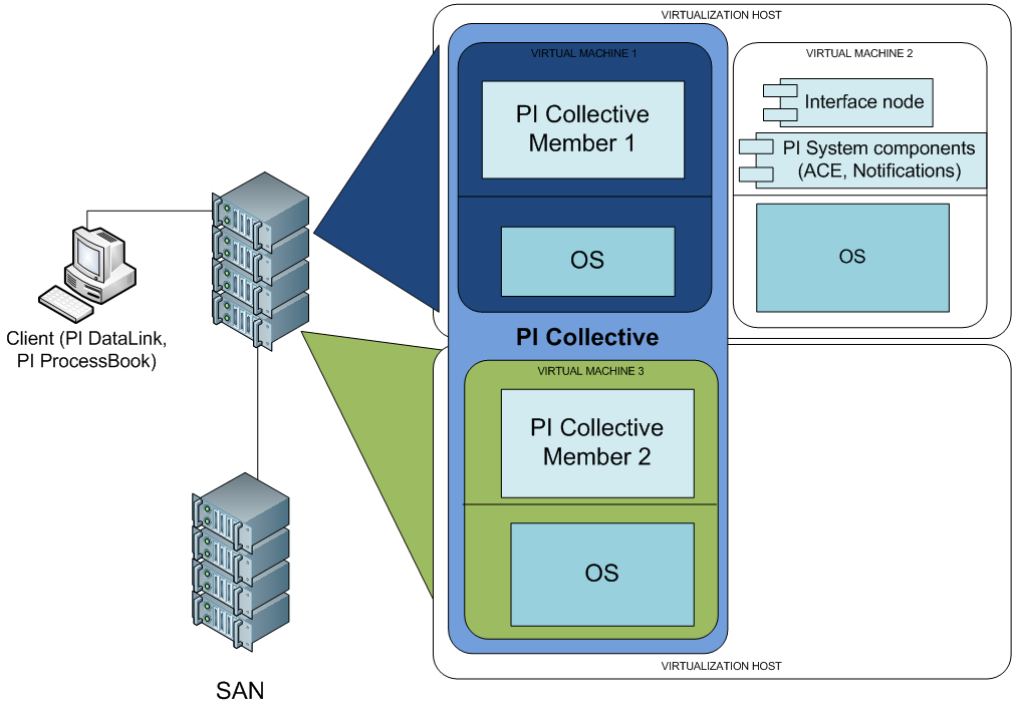


Virtual System including Clients



Recommendation: Virtualized PI System

- Multiple hosts (cluster)
- Collective can be split across hosts
- PI Server components can run as separate virtual machines for scalability and performance
- SAN can offload storage



Built-in Benefits of HA PI

- PI is there all the time – users trust it
- No late night heroics to restore a backup or perform routine maintenance
- Removes fear of a bad backup
- Simple design is robust, low bandwidth and supported by WANs
- Geographical independence (replace PI to PI)
- Support more or specialized users
- Facilitates capacity planning
- Complements virtualization strategies:
  - PI is perfect for monitoring a virtualized environment (HyperV performance counters; VMWare SNMP interface)

Customer Examples: HA

- Transmission & Distribution customers cannot lose visibility or the grid can go down (e.g., Cal ISO)
- Customers with dispersed sites can deploy collective members in each location for better client retrieval performance without losing synchronization (International Paper)
- Customers want to balance the load of data retrieval by many users (PJM, Cal ISO)
- Customers need to aggregate data into one large PI system (PSE&G)
- Load Balancing and Failover for virtual machines
- NERC CIP: dedicated PI server inside the security perimeter

Benefits of PI in a Virtualization Project

- Value of HA PI—
  - Availability, Quality of Service (QoS)
  - No data loss
  - Scaling
  - Improved IT management
- Value of virtual machines and SAN
  - Consolidation
  - Scaling and hardware utilization
  - Centralized IT management
- All adds up to higher quality of service for less cost

Details of Server Virtualization

- Available virtual technologies (partial list)
  - Microsoft (Hyper V, in particular)
  - VMWare (ESX server, in particular)

Virtual Vendors, Compared

	VMware ESX Server	Microsoft Hyper-V
Support for 32/64 bit hosts	Yes	Only 64 bit hosts
Support for 32/64 bit guests	Yes	Yes
Device Driver Support	Hypervisor	Guest OS
Maximum RAM	64GB	64GB
Maximum Virtual CPUs	4	4
Shared VM Memory	Yes	No
Boot VMs from SAN	Yes	Yes
Live Migration	Yes	Yes
Maximum Active VMs	128	Unlimited

Microsoft's Hyper-V R2

- Live Migration--increased reliability/availability
  - Clustered Shared Volumes
- Cluster Node Connectivity Fault Tolerance. Dynamic I/O redirection.
- Improved management of VMs. Including multiple servers.
- Improve Performance
  - VM Chimney/TCP Offload
  - Note--Intel now builds their chips with features to improve VM performance. (VM Chimney is an example).
- Green
  - Core Parking
- Simplified deployment.
  - .vhd files now the de facto standard.
  - Server 2008 R2 can boot from a vhd on local hard drive

More Information

- Whitepapers and Tech Support bulletins on OSIsoft web site
- Vendor web sites
- OSIsoft internal expertise
- Microsoft representatives for Hyper V and Terminal Server Gateway solutions

Next Steps

- Knowledge Base article #3062OSI8
- Learn whether there are plans for (or an existing) virtualization environment in your organization
- Estimate the hardware reduction to be gained by virtualizing your existing server applications
- Estimate the hardware reduction for server applications both with and without a SAN available (more hosted servers per host if data storage is offloaded, for example).
- Estimate the hardware, software and support reduction to be gained by moving your client applications to a hosted environment (e.g., Terminal Server)
- Consider the value of monitoring the virtualized environment with PI

Thank you for your time

- Email your questions to: ProductManagers@osisoft.com or Ldieffenbach@osisoft.com
- Contact your salesperson for more detailed information