

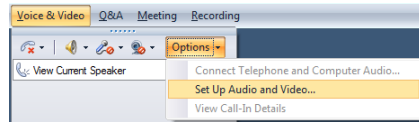


Empowering 24-7/365 Operations

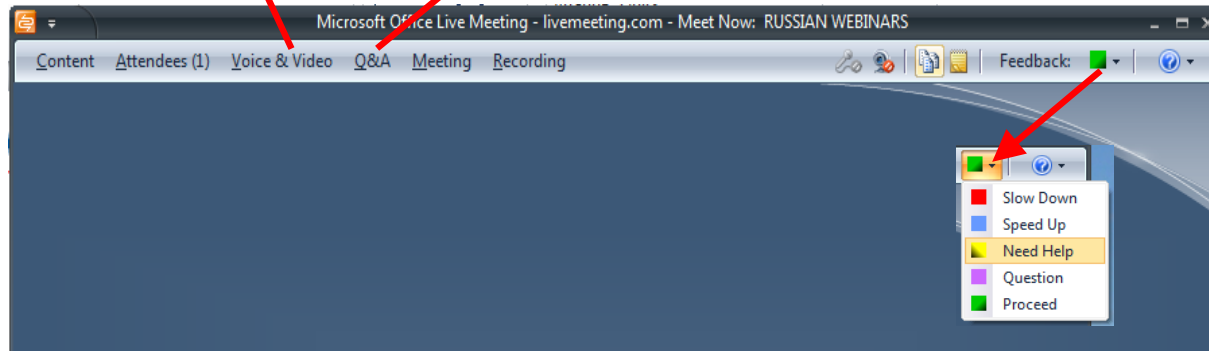
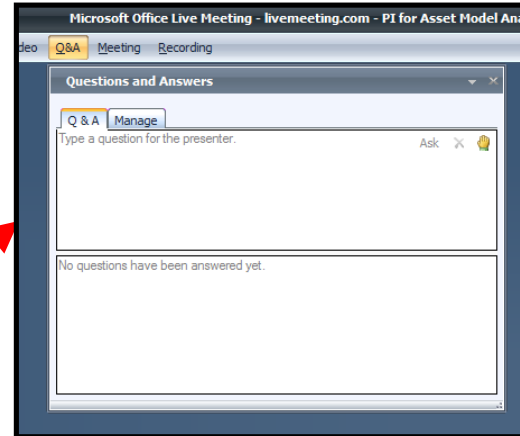
Presented by **John Daniels, Sr Systems Engineer**
Bilgehan Kayalar, Inside Account Representative

LiveMeeting Notes

Set Up Audio and Video



Ask a question



Agenda

1. Uptime and High Availability Intro
 - What is High Availability?
 - Why is High Availability important?
 - Common Myths
2. Designing for optimal uptime
 - Criticality of PI System data
 - Goals of a Highly Available System
 - 3-tier approach
3. Improving Uptime for the PI System
 - Understanding the phases of a highly available system
 - Customer Use Cases
4. Conclusions & Key Takeaways

1.

Uptime and High Availability

What does High Availability mean?

Definition: a system design and associated implementation that ensures a certain degree of operational continuity through maintenance activities, as well as unexpected events and faults

- Design for **availability** given planned & unplanned downtime
- Major approach is replication & redundancy
- Mission critical systems and maximum uptime
- Historical approaches:
 - Clusters & load balancing
 - Redundant/failover hardware (e.g., Tandem, Stratus, RAID)

Downtime can have severe repercussions and costs

72%

of public safety answering point systems experience **downtime**...57% for 15 minutes, 26% over an hour. 1 hour of downtime = **six 9-1-1 calls**¹

\$366,363

average system downtime **cost**²

53%

of IT decision-makers admitted that their companies had experienced **data loss** within the last 12 months³

670+

American Airlines flights were cancelled and **over 100,000** customers were impacted when their computer systems went down for 5 hours⁴

Footnotes:

1 <http://www.cm.com/slide-shows/storage/240148599/6-surprising-surveys-about-causes-and-effects-of-system-downtime.htm#pno/0/5>

2 <http://www.cm.com/slide-shows/storage/240148599/6-surprising-surveys-about-causes-and-effects-of-system-downtime.htm#pno/0/6>

3 <http://www.cm.com/slide-shows/storage/240148599/6-surprising-surveys-about-causes-and-effects-of-system-downtime.htm#pno/0/2>

4 <http://aviatorblog.dallasnews.com/2013/04/american-airlines-is-having-computer-problems-today.html>

Virtualizing my servers will give me full-time High Availability... Right?

- ✓ **True:** Virtualizing your servers does give you significant reliability and security benefits
- ✗ **False:** System operators will see no down time and critical data will always available

Risks:

- Live migration of your VM to another host helps ensure your virtualized environment does not go down
- The time it takes to move could be seconds, minutes, or in many instances even longer
- More complicated are faults at the virtualization host or physical site, and live migration cannot be triggered in time, leading to much larger availability gaps and severe data consistency issues

2.

Designing for Maximum Uptime

The PI System is mission critical for many of our customers

Uncover problems / create insight ⇒ Core to operations strategy ⇒ Criticality of accessibility of information

Immediate Value
Out of the box

Value over time
Infrastructure for Business Initiatives



PI System as an Infrastructure dictates High Availability

- Strategic importance of the PI System has led to both powerful and more complex architectures, inherently introducing additional points of failure
- Safe guarding critical data
- Key users need maximum uptime and continuous access to PI System data for decision making
- Preparing for availability:
 - Planned maintenance:**
 - Gaps in data storage when PI Server is down
 - Data is still buffered while down, but not available to the clients
 - Although controlled can still impact day-to-day critical operations
 - Unplanned downtime represents the major risk:**
 - Failure that brings down data collection node (permanent loss of data)
 - Failure to PI Server storage (permanent loss of data if not already backed up)

High Availability – Concern and Goal

Software Fault-Tolerant System

- PI Interface Failover
- PI Buffering
- PI Server Replication
- PI Data Access services (discovery, failover, and load distribution)
- N-way buffering of non-interface data (e.g. AF and PI SDKs)
- Promotion of secondary nodes on primary failure (configurable)

Near-Independent, Physically Separated Servers

- No hardware/network restrictions, no limit on server node count

General Benefits

- Availability, end user sees one logical system
- Scalability, system load can be distributed
- Flexibility, accommodates your environment

For IT and Management

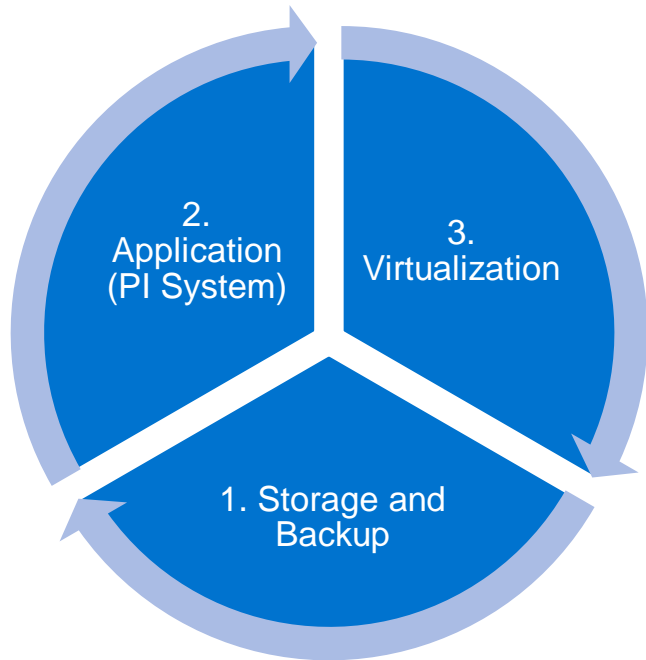
- Reduced Total Cost of Ownership (TCO)
- Allows Disaster Recovery Plans

Extra benefit: Hardware and Software just out of the box

Data Integrity vs. Data Availability

	Data Integrity	Data Availability
Who cares?	What <u>everyone</u> is concerned about!	What <u>many</u> are concerned about!
Drivers for Concern	No one ever wants to LOSE data!	Availability concerns are driven by the customer's use of the data and how much it's integrated into their business processes.
What Question to Ask	If the PI Interface or PI Server goes down, will I lose data?	If the PI Server goes down, can my end users wait [4 hours] to see their data? What is the business impact of this?
Risk Mitigation Technologies	<ul style="list-style-type: none">• Interface Buffering• Interface Failover (Redundancy)• Interface History Recovery	<ul style="list-style-type: none">• Interface Failover (Redundancy)• Application Redundancy / High Availability (PI, AF, Analytics, Notifications , ...)

True data integrity and resiliency: 3-tier HA approach

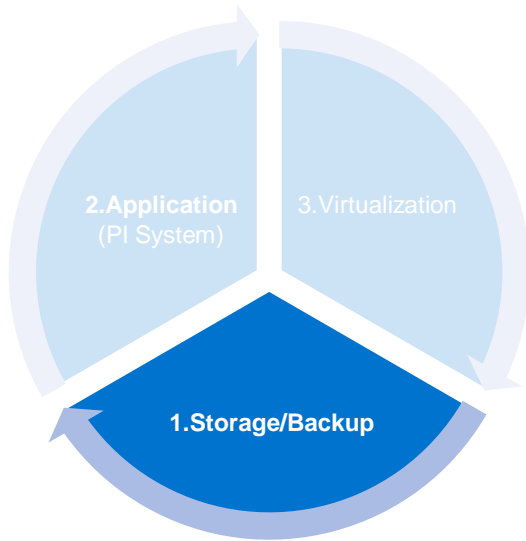


True **High Availability** requires that you **design** and **architect** your system to be able to withstand failure and provide your users the level of availability they require to make critical decisions

3.

Improving Uptime for the PI System

Phase 1: Storage/Backup



Approach:

- A must-have requirement to ensure maximum data availability
- Leverage PI to PI interface for alternative back up strategy
- Last resort back up

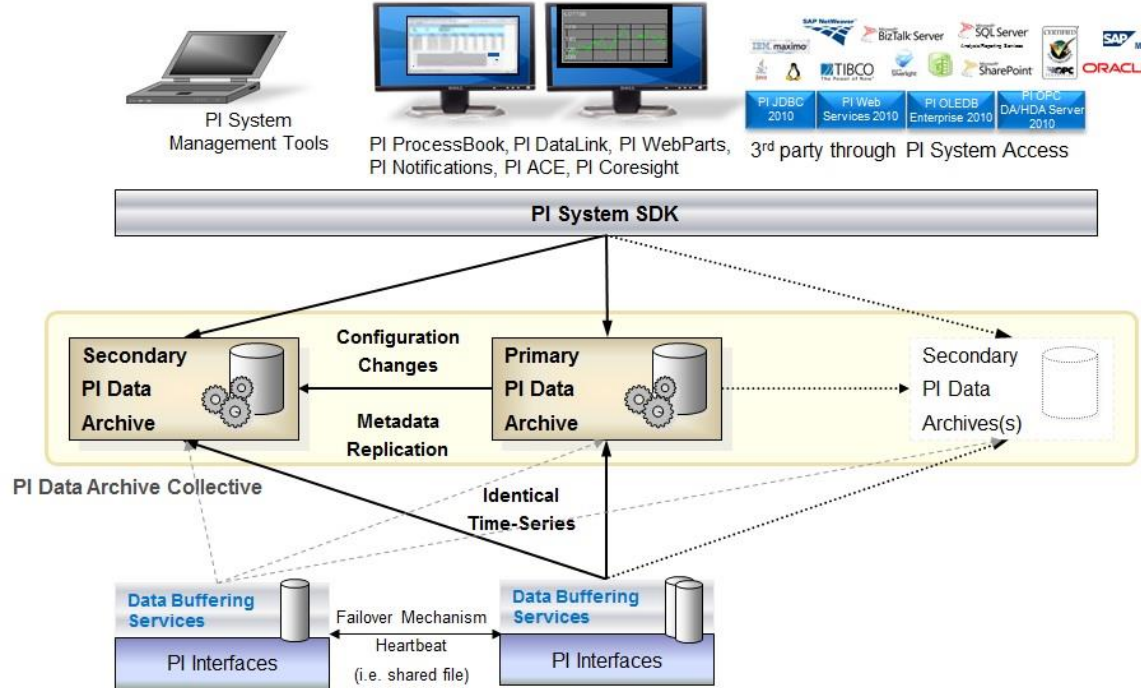
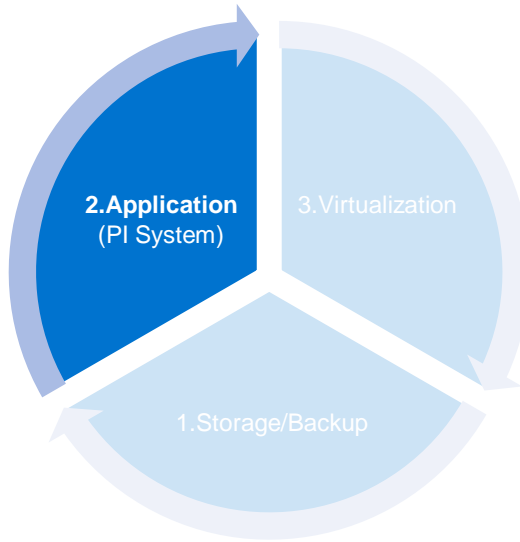
Benefits:

- Helps ensure human errors do not compromise data integrity – deleting a data stream will be a complete loss for the primary and secondary servers (not a backup)
- Recover and restore the PI Server from a low probability catastrophic failure
- Ensures you can restore both PI Server configuration and archives

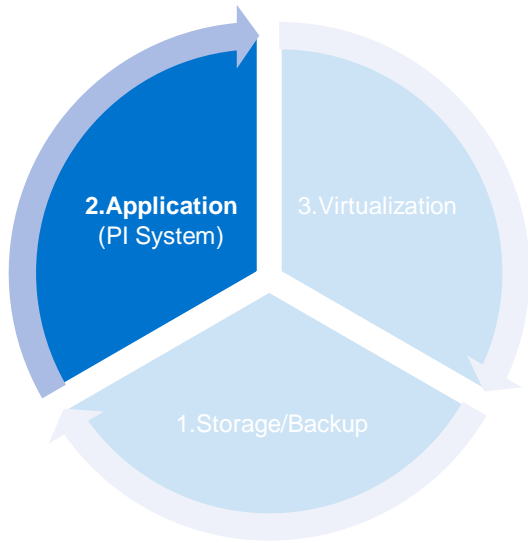
Challenges:

- Recovery is only as up to date as the frequency of your back up

Phase 2: Application Level (PI System)



Phase 2: Application Level (PI System)



Approach:

- HA solution is primarily focused on application resiliency and availability
- Designing for a “PI Collective” - The PI Server point database, module database, user database, trust table and most of the configuration tables will be replicated across the collective
- PI Server Interface failover and startup without connection to the PI Server
- PI AF database and PI Notifications are replicated across the PI AF Collective

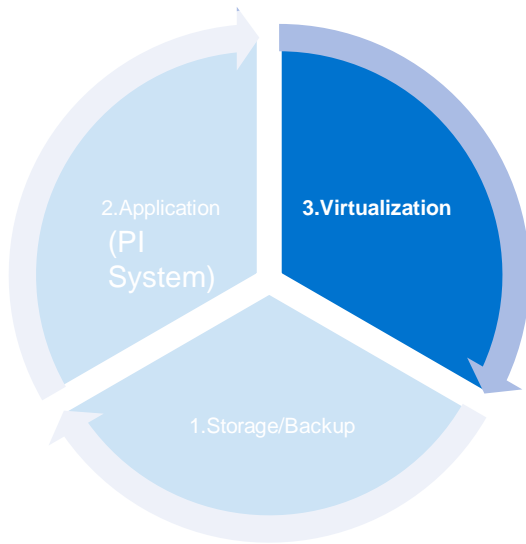
Benefits:

- Provides scalability and flexibility around QoS, application redundancy, interface failover, and ensures data availability
- Automatic ClientFailover
- Offline Startup
- N-Way Redundancy

Challenges:

- Higher complexity and cost

Phase 3: Virtualization



Approach:

- Multiple virtualization hosts
- Load PI System components across the hosts
- Avoid loading additional resource consuming applications on VM host

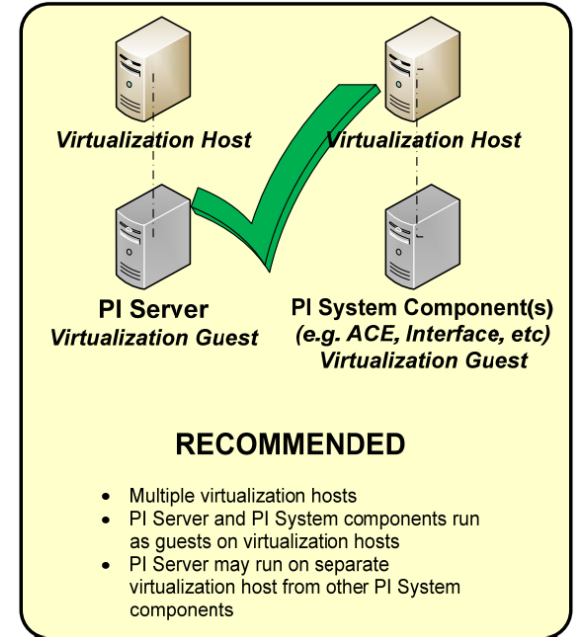
Benefits:

- Improved availability & operational flexibility (provisioning)
- Isolated from any virtualization guests; ensures performance of PI Server
- Increased fault tolerance through multiple virtualization hosts

Challenges:

- Additional hardware required for additional virtualization hosts
- You cannot stop or spin another app instance without downtime (because the PI Server is a stateful, memory-resident database)

Designing for Maximum Uptime



RasGas DualDiode OSIsoft PI HA Architecture

The Facts:

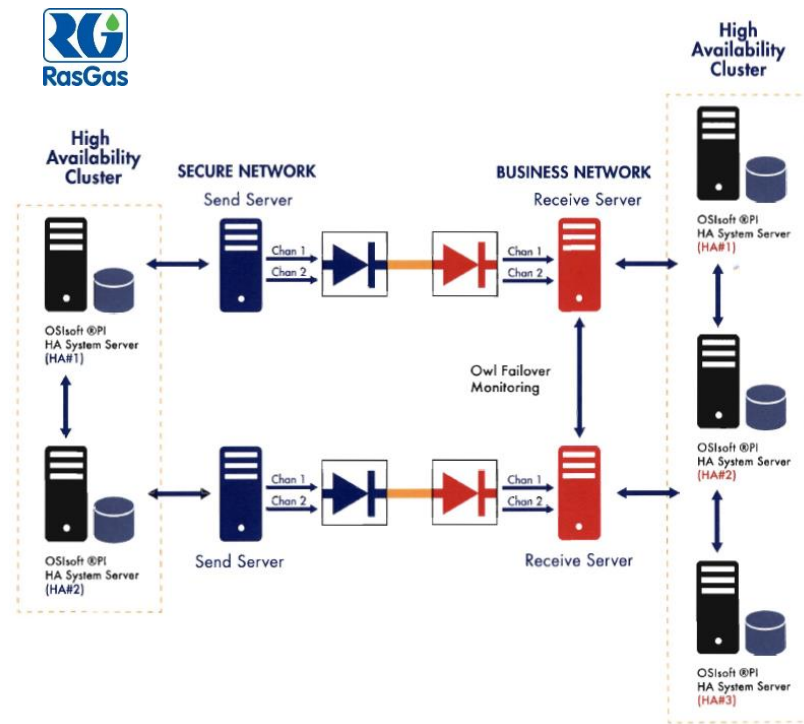
- Supplies LNG from Qatar to countries across Asia, Europe and the Americas
- Capacity of 27.1 million tonnes of LNG per year
- 75,000 tag PI System

Why High Availability?

- **Criticality:** growing number of users, interfaces and critical data into RTIS, uninterrupted data
- **Reliability:** address obsolescence due to aging hardware and PI System version
- **Integrity:** take advantage of latest PI System surveillance tools
- **Security:** utilizing PI System features for data security

Value:

- Dedicated PI System platform for critical app support
- Integrated platform functionality minimizes changes to legacy networks
- Minimal admin & maintenance costs reduces TCO



Corning Life Sciences (CLS) OSIsoft PI HA Architecture

The Facts:

- Founded in 1851, Corning is the world leader in specialty glass and ceramics
- Over \$5B in rev, and 23,000 employees
- Focus on overall equipment & labor effectiveness (OEE) as well as scrap & downtime pareto analysis

Why High Availability?

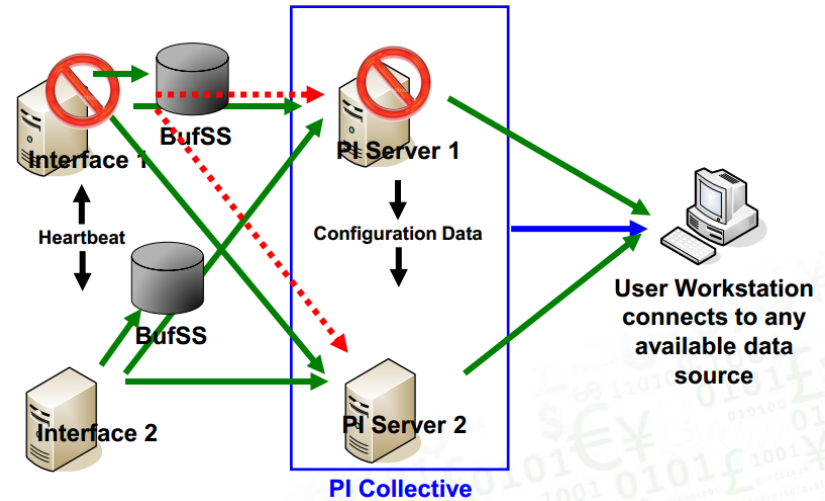
- Use of existing PI server as SCADA (and historian) to act as IO interface to MES
- MES generates product labeling & interacts with inventory systems – availability is paramount

Value

- Reliability (semi-transparent failover)
- Disaster Recovery support (Multiple Servers in diverse locations)
- Application availability during maintenance (rolling upgrades & security patching)

CORNING

Corning Life Sciences HA Topology



4.

Conclusions

Attributes of an HA PI System

Availability – A seamless connection and failover capability to redundant servers without experiencing changes to your displays, spreadsheets, and portal pages.

Scalability – Bigger and/or more servers can satisfy growing storage, retrieval, and computing loads.

Reliability – A set of redundant PI Server, called a PI collective, will leverage and extend the reliability of the underlying storage, virtualization, and operating system platform. Online backups offer added guarantees that human errors are fully mitigated.

Cost Savings – High Availability facilitates maintenance of your system. Offline troubleshooting also gives you (and OSIsoft) time to analyze and diagnose root cause issues without adversely affecting users.

Disaster Recovery – Having PI Server nodes in different locations ensures your data is protected in the event of a catastrophe, with options to locate your data as close to the users who need it.

Quality of Service – Demands on individual servers can be controlled by distributing user connections to dedicated server nodes.

Key Takeaways

The “PI System” is architected to minimize data loss and maximize data availability

- No single point of failure
- Tolerate multiple simultaneous failures (N-1)

An HA PI System offers redundancy for all functional areas, such as:

- Data Collection (PI Interfaces)
- Data and Asset Storage (PI, AF Servers)
- Data Analytics (ACE, & PI Notifications)
- Data Presentation (PI Visualization Servers)

Take into account data use and business risks to determine the right amount of HA

- If not implementing full PI System HA, you should still architect for it in the future by segregating the system components outlined above

Next Steps

- Further information regarding PI High Availability is available from your OSIsoft Account Manager or Inside Sales Representative.
- Please email sales@osisoft.com to request further information or to have an OSIsoft representative contact you.



Thank you

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