



OSIsoft®

REGIONAL SEMINAR 2012

E M E A

The Power of Data



Architecture and Best Practices

(Recommendation for P1 Systems)

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Customer Support Engineer

Agenda

- PI System High Availability
 - PI Server level (such as PI Server HA, AF HA, PI Notification HA, PI ACE HA)
 - Interface level (Unint Failover)
- Virtualization in PI
- Disaster Recovery (Recommendations)
- PI System Access (PSA)



PI System High Availability (HA)

OSIsoft HA Technology



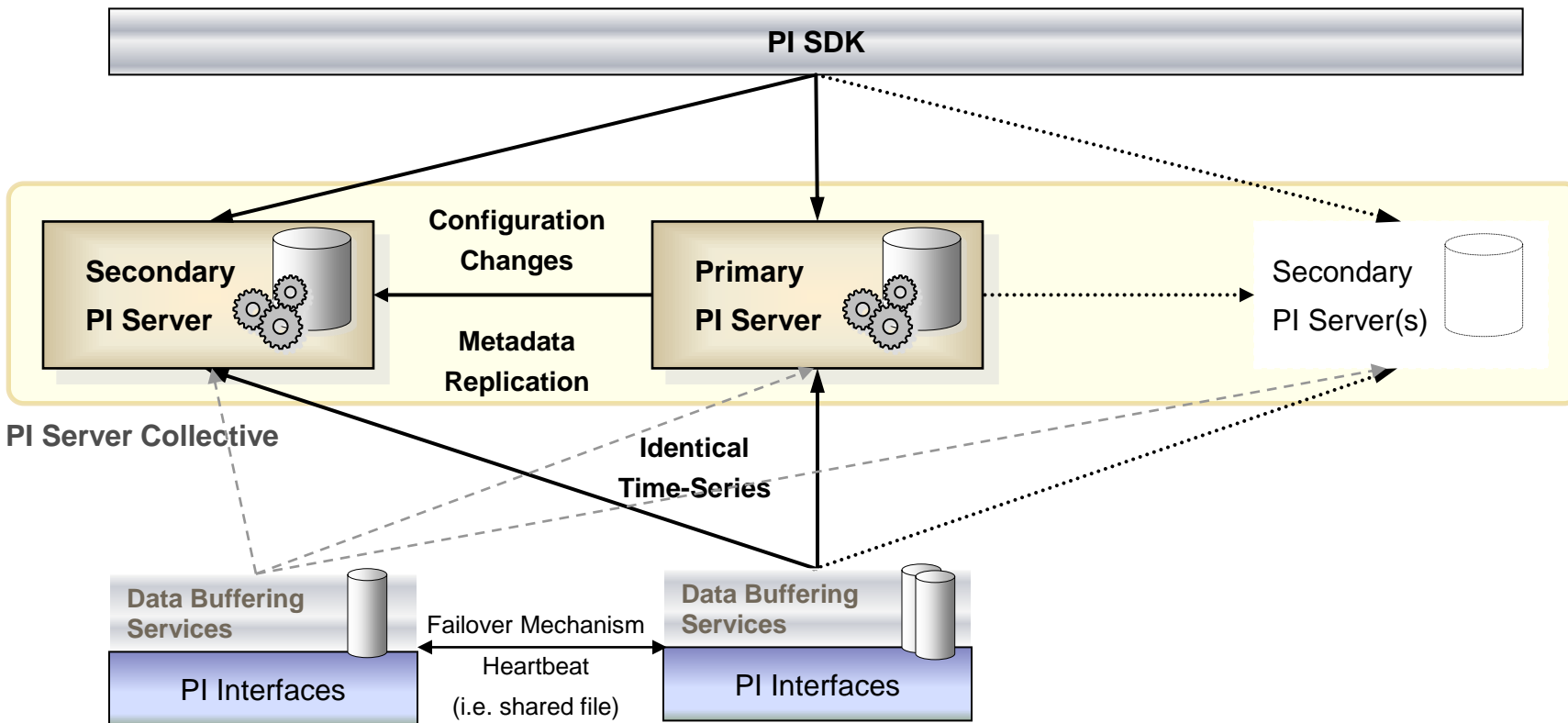
System Management Tools



PI ProcessBook, PI DataLink, PI WebParts, PI Notifications, PI ACE, PI Coresight



3rd party through PI System Access



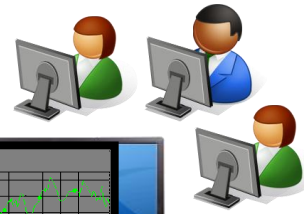
Built-in Benefits of PI HA

- 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)

High Availability for AF

- Compatible with SQL Replication, Clustering, and Mirroring
- Support for Microsoft Network Load Balancing
- Very similar to PI Server HA
- Automatic Failover for PI SDK-based clients

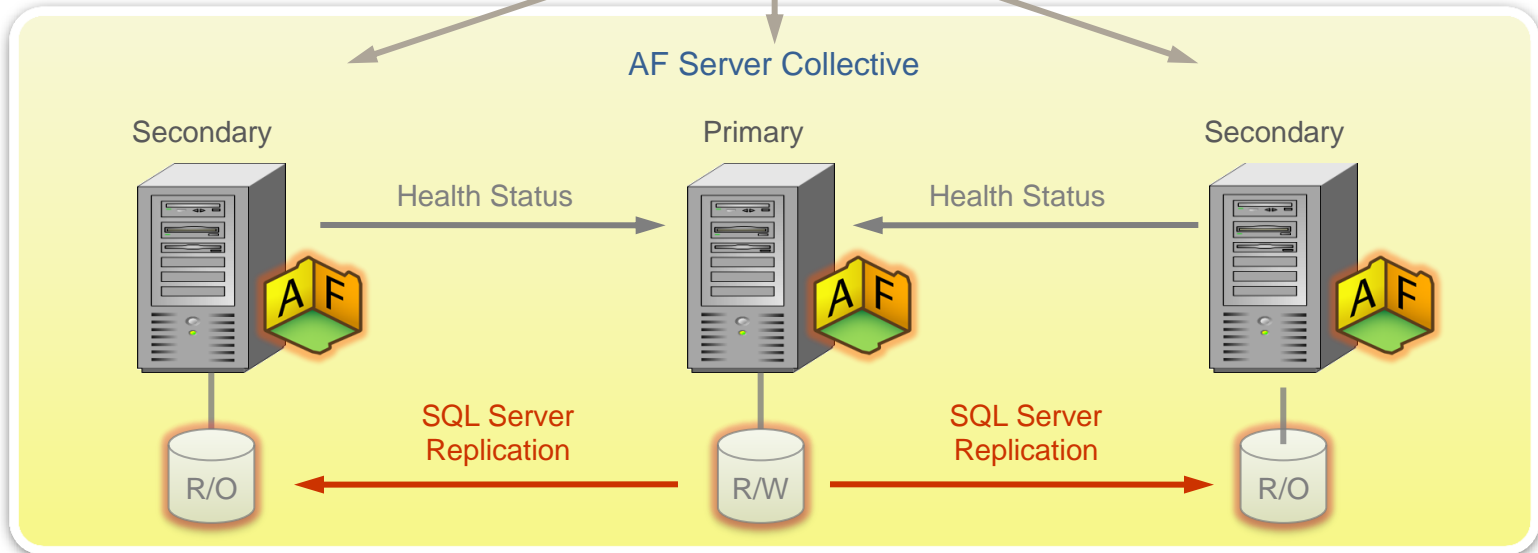
AF 2.x HA Collective



PI Server

AF SDK Library

PI Notifications, AF-based PI Client (PSE)
(PI WebParts, ProcessBook, DataLink, etc.)



SQL Server (primary)	<input checked="" type="checkbox"/> Express
	<input checked="" type="checkbox"/> Standard
	<input checked="" type="checkbox"/> Enterprise

SQL Server (secondary)	<input checked="" type="checkbox"/> Express
	<input checked="" type="checkbox"/> Standard
	<input checked="" type="checkbox"/> Enterprise

AF 2.x/SQL Server HA Deployments

	Non-HA	SQL Cluster	SQL Mirror	AF Collective (Replication)
HA Writes	No	Yes	Yes	No
HA Reads	No	Yes	Yes	Yes
Load Balanced Reads	No	No	No	Yes
Max Distance between SQL Servers	N/A	tens of meters	km	thousands of km
Read Access during Upgrade?	No	Yes	Yes	Yes
Read/Write Access during OS/SQL Upgrade?	No	Yes	Yes	No
Read/Write Access during AF upgrade?	No	No	No	Not while upgrading Primary
Special Hardware Required?	No	Yes	No	No
Minimum SQL Server Edition Required	Express	Standard	Standard	Primary: Standard Secondary: Express



Customer Experience: HA

- Transmission & Distribution customers cannot lose visibility or the grid can go down (e.g., Cal ISO)
- Dispersed sites can deploy collective members in each location for better client retrieval performance without losing synchronization (International Paper)
- Load balance the data retrieval by users (PJM, Cal ISO)
- 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



PI and Virtualization

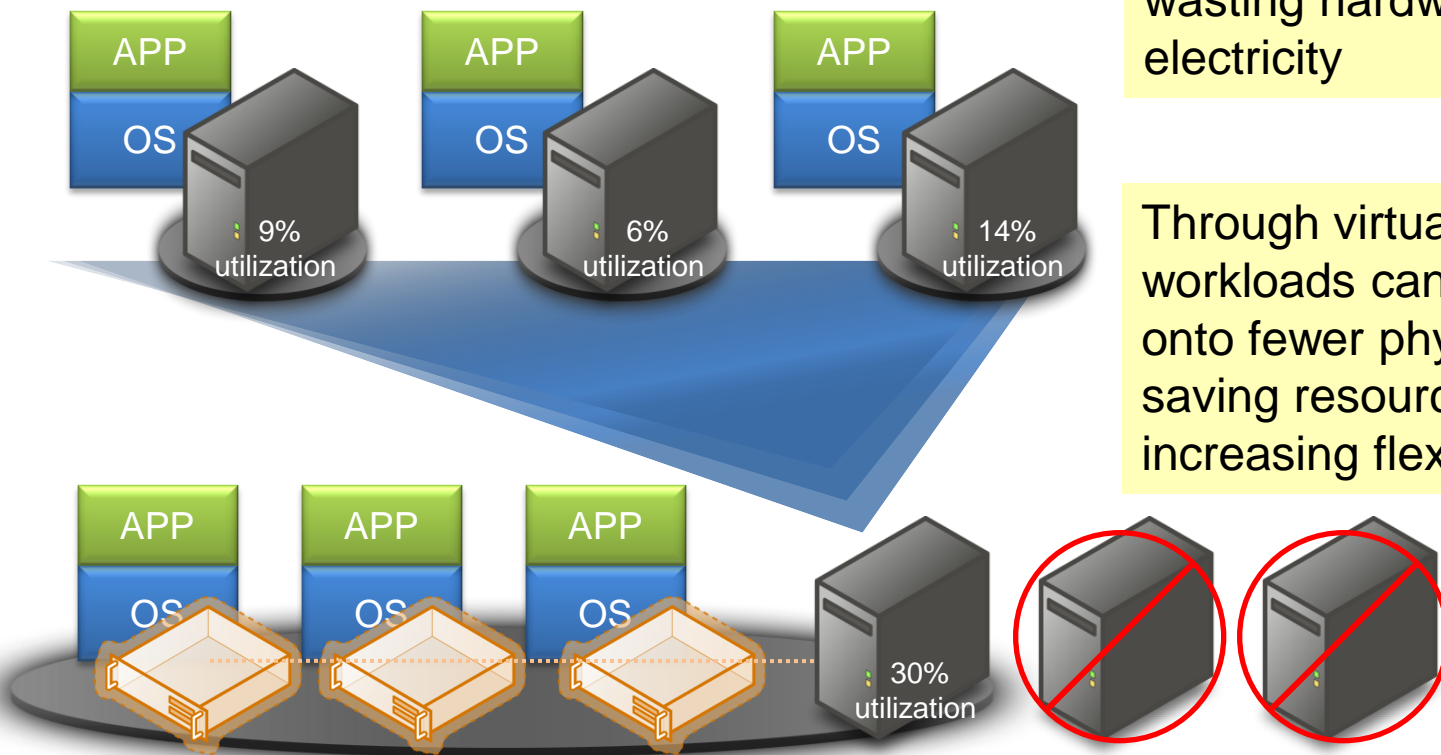
Virtualization

- Servers
- Storage
- Applications

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



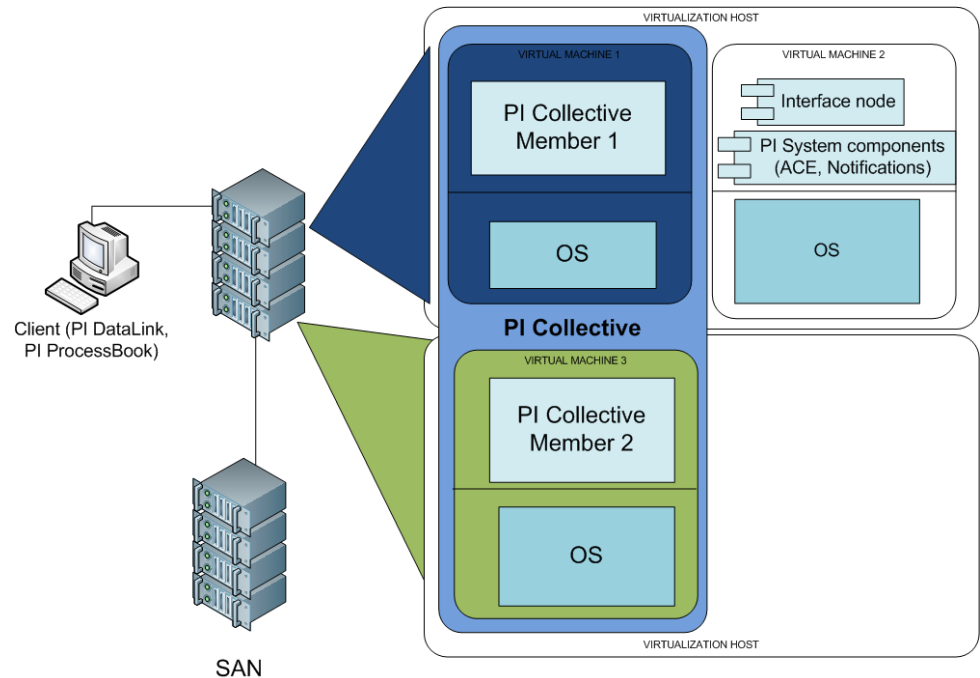
Benefits of Server Virtualization*

- 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.

Recommendation: Virtualized PI System

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



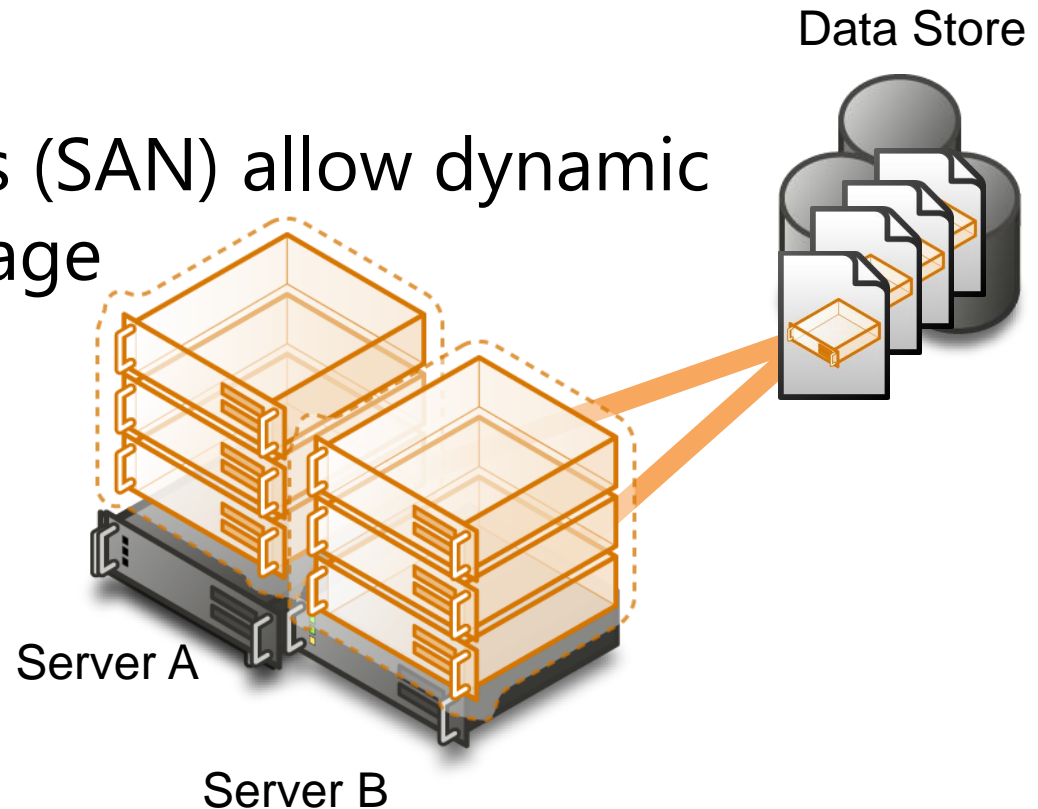
Storage Virtualization

- **Challenge:**

Grow available storage space without disrupting applications and servers

- **Solution:**

Storage Area Networks (SAN) allow dynamic sizing of available storage



PI and Storage Virtualization

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

Application Virtualization

- Citrix or Terminal Server can 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 upgrade investments by deploying client software in one place

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



Disaster Recovery

Disasters

- Complete loss of one or more of the PI System servers (PI, AF, ACE, Interface, etc.) as a result of catastrophe (fire, flood, earthquake, etc.) or structural failure.
- Require a server rebuild including hardware, operating system and application software.

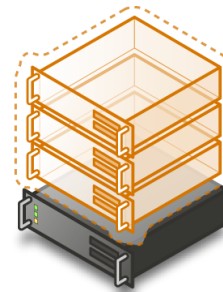
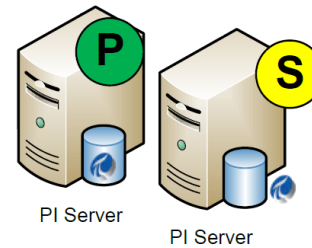


Disaster Recovery Principles

- Regular data Backups (or alternate copy of the data)
- Installation kits for the installed applications
- Governance
- Recovery organization structure
- Documented recovery procedures
- Periodic recovery rehearsals

Disaster Recovery

- Backups
- High Availability
- Virtualization



Backups

- Use the PI Backup Subsystem
- Build the health tags for the PI Backup Subsystem
- Take daily incremental backups
- Verify the backups
- Take weekly full backups
- Run ad hoc backups as needed (i.e. after major changes)
- Maintain an Excel file with current tag list and AF structure
- Include same version of PI Server, AF Server, PI Prerequisites, Windows, and SQL Server
- Test backup procedure annually

High Availability

- Pursue HA for mission critical PI Systems
 - Interfaces
 - PI Server
 - AF Server
 - ACE Server
 - SharePoint (PI WebParts)
 - Coresight (Uses Microsoft technology)
- Consider multiple nodes

Virtualization

Virtualization alone is not sufficient!

- Does not provide redundancy
- Does not automatically backup
- Does minimize time to restoration
- Can provide additional backups via System Snapshots
- Can be used in conjunction with PI Backups and High Availability



PI System Access (PSA) Licensing

Exploring and Exposing Data



Gain **visibility** into the right data,
at the right place, at the right time.



How?
Need an easy way
to **disseminate** information.

Products Covered by PSA Today

- OSIssoft SDKs
 - PI SDK
 - AF SDK (includes AN/EF SDK)
- SQL Family
 - PI OLEDB Enterprise
 - PI JDBC
 - PI ODBC
- PI OPC DA/HDA Server
- PI Web Services

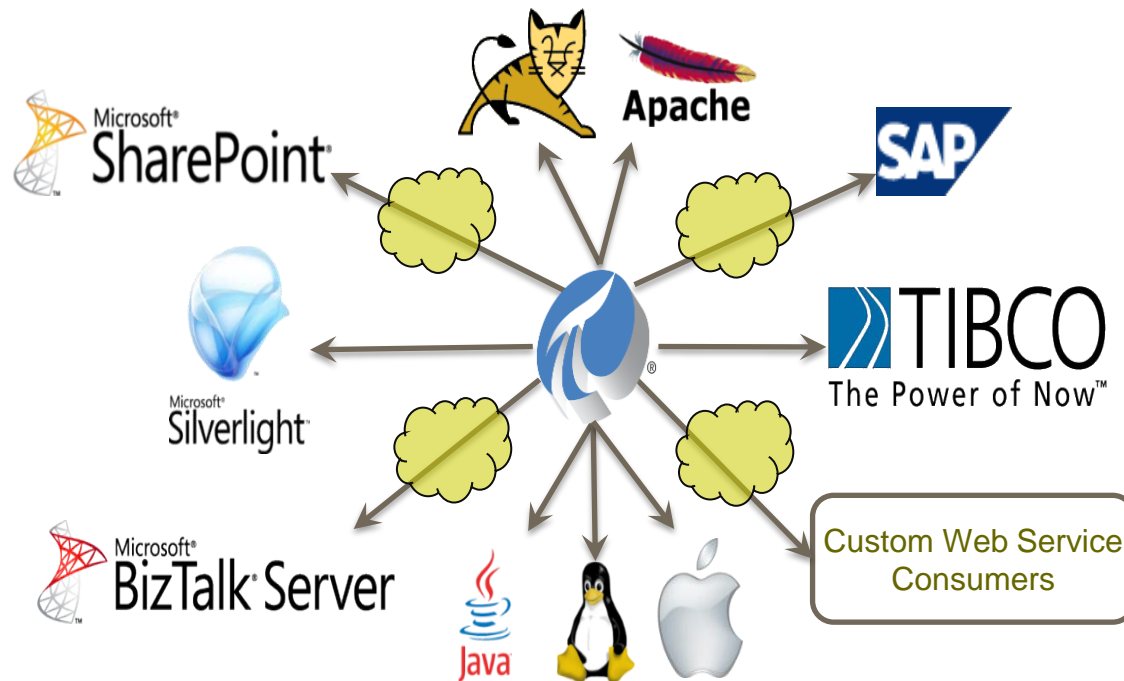


Use Cases

Web-based
visualization

Integration with
business systems

Non-Windows
environments

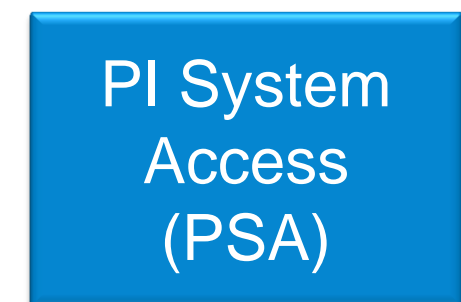
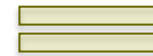


How to get PI Data Access

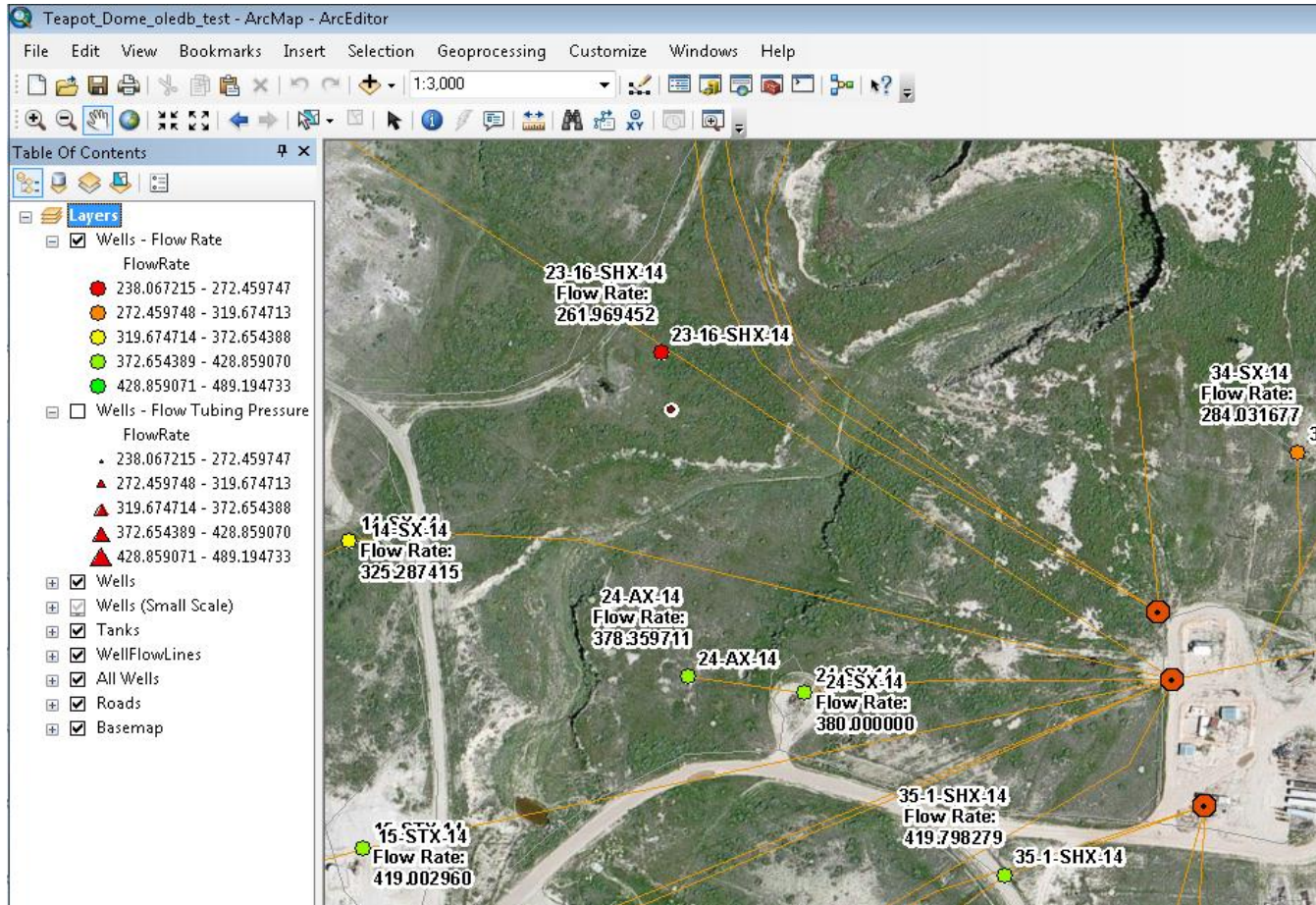
```
AFTimeRange tr = new AFTimeRange(new AFTime(tex  
AFValues vals = _afDB.Elements["Pump123"].Attri  
  
lstValues.Items.Clear();  
foreach(AFValue val in vals)  
{  
  
    lstValues.Items.Add(val.Value.ToString() +  
}  
}
```



(only pay for what you need)



Maps with Operational Data





THANK YOU

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