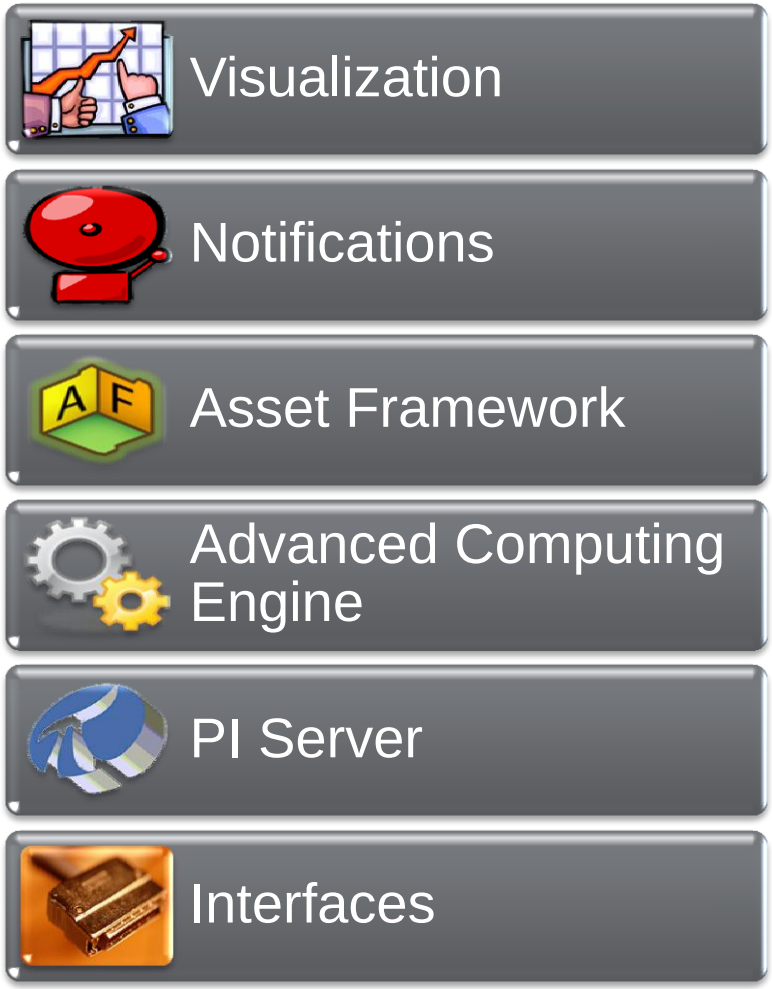
# Architecture and Best Practices Recommendations for PI Systems

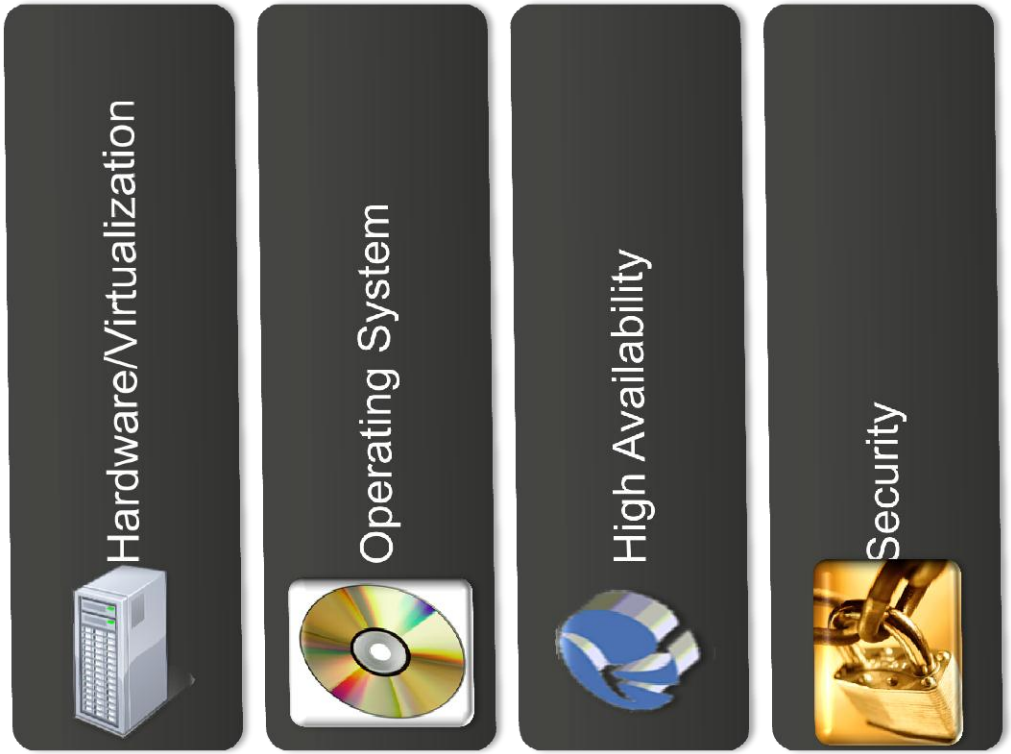
Presented by

Chris Lonsberry

Field Service Engineer

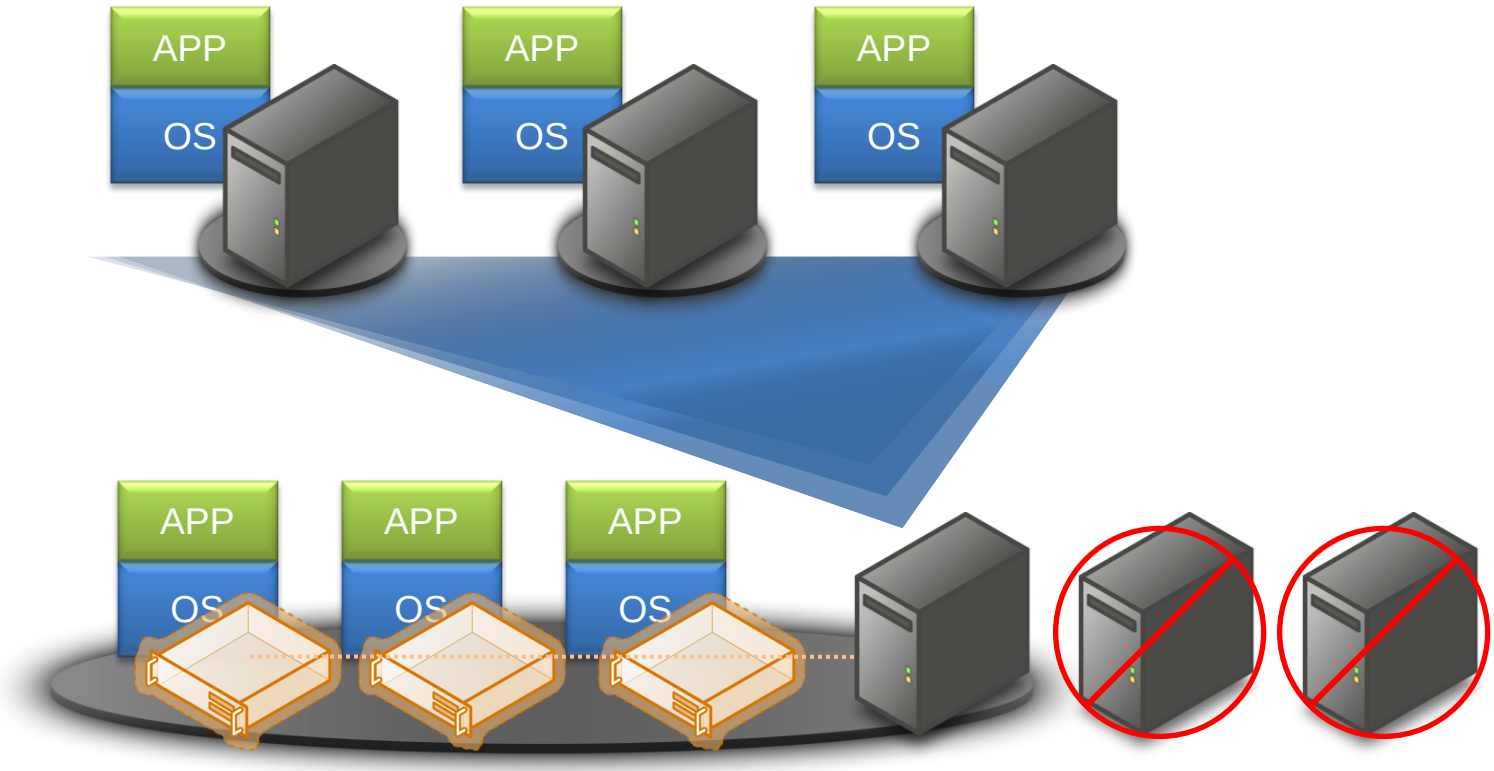
# Areas of discussion & Topics Outline



# Hardware and Virtualization

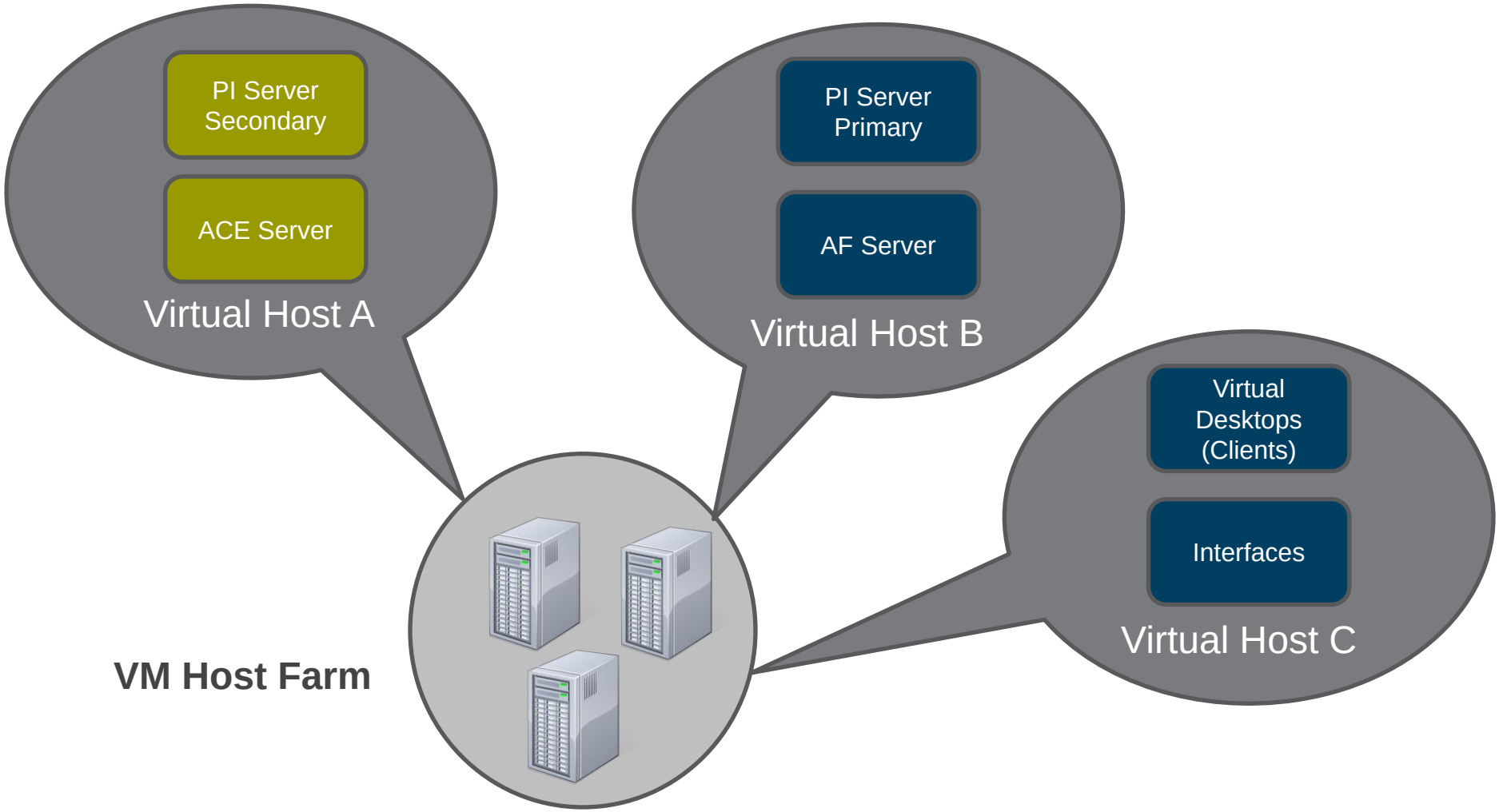
# Hardware Virtualization



# Operating System Virtualization

- Why are OSIsoft customers using Virtualization?
  - Server consolidation
  - Improved availability and provisioning
- OSIsoft supports virtualization
  - OSIsoft Knowledge Base article 3062OSI8
  - Consider shared resources implications

# Virtualized PI Systems



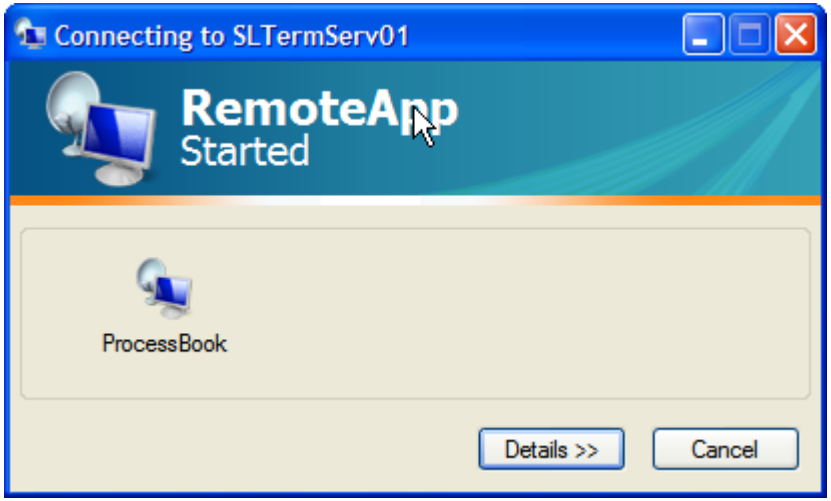
# Operating System Virtualization*

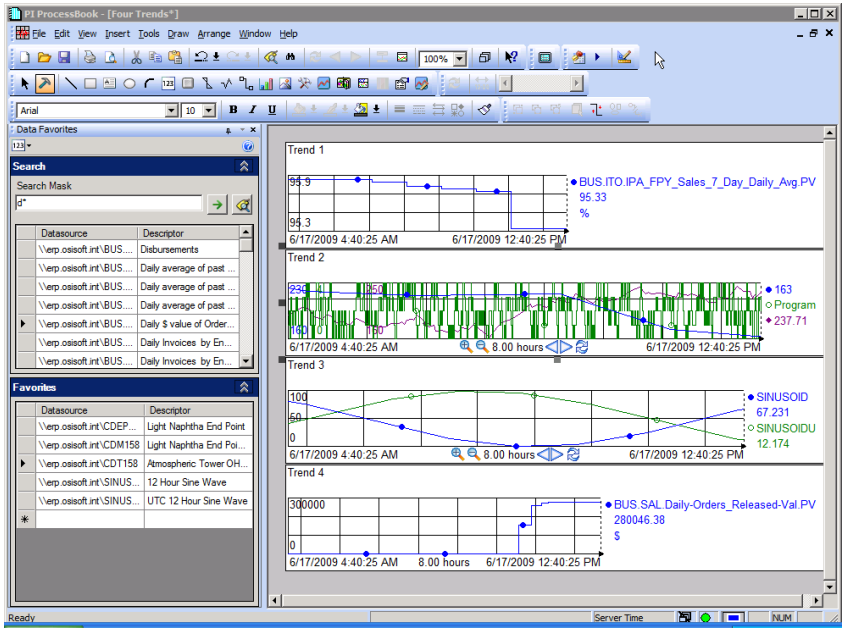
- Treat virtual machines as if they were physical machines
- Invest in Enterprise-level hardware and software
- Do not mix virtual and physical on the same host
- Use qualified Virtualization support personnel
- Test on the target platform

* OSIsoft Center of Excellence

# Application Virtualization

- Applications centrally installed and managed
- Users are remote
- OSIsoft customers are successfully using Microsoft and Citrix virtualization products



# 64-bit Operating Systems


- Why 64-bit?
  - Access to larger memory footprint
  - Reduce limitation to applications

# PI System 64-bit OS Support


- Several products support native 64-bit operation
  - Examples: PI Server, PI Web Parts, Asset Framework, PI ACE Scheduler
- Windows compatibility layer enables 32-bit programs to run on 64-bit
  - Example: Interfaces
- Future product releases will support native 64 bit
  - Example: PI Notifications

# 64-bit Application Support - Exceptions

- Certain components work only with 32-bit versions of applications
- PI Add-ins for Microsoft Excel
- DataLink for Excel
- RDBMS interface and 64-bit drivers
- PI ActiveView & PI Graphic (SVG)  require 32-bit Internet Explorer

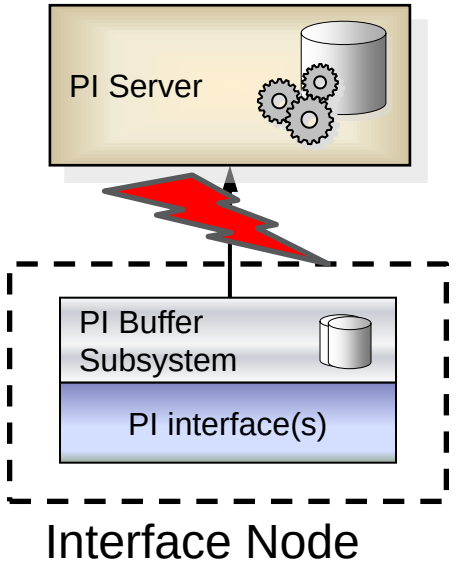
# PI System 64-bit Best Practices

- Verify support
  - Release Notes
  - Technical support
- Scenarios to watch out for
  - Applications that are plug-ins or run by another application
    - Microsoft Internet Information Server
    - Office 2010
  - Where 3rd party libraries (dlls) need to run with another application
    - RDBMS interface

# PI Interface Buffering and Failover

# Interface Buffering

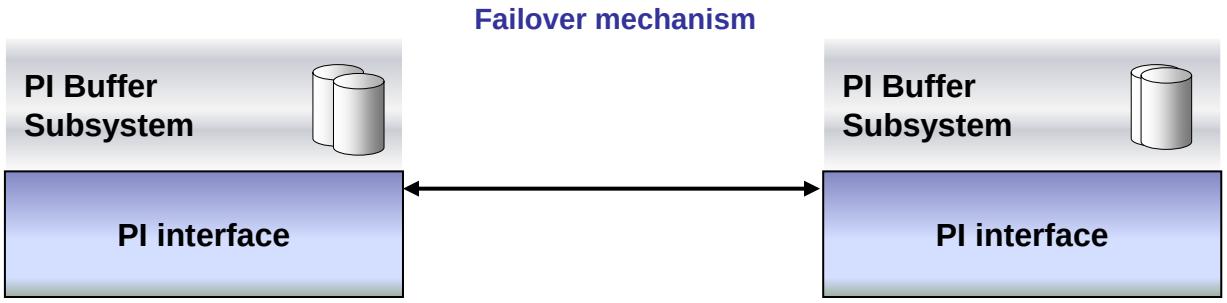
- Ability of interface node(s) to store data in the event of disconnection from PI Server(s)
- Goal: Minimize data loss
- Two flavors
  - **PI Buffer Subsystem**
  - PI Bufserv



# Interface Failover: Why?

- Support failure of data collection
- Goal: Minimize data loss
- Synchronization is with the data source

  or
- **Synchronization is between the interfaces**

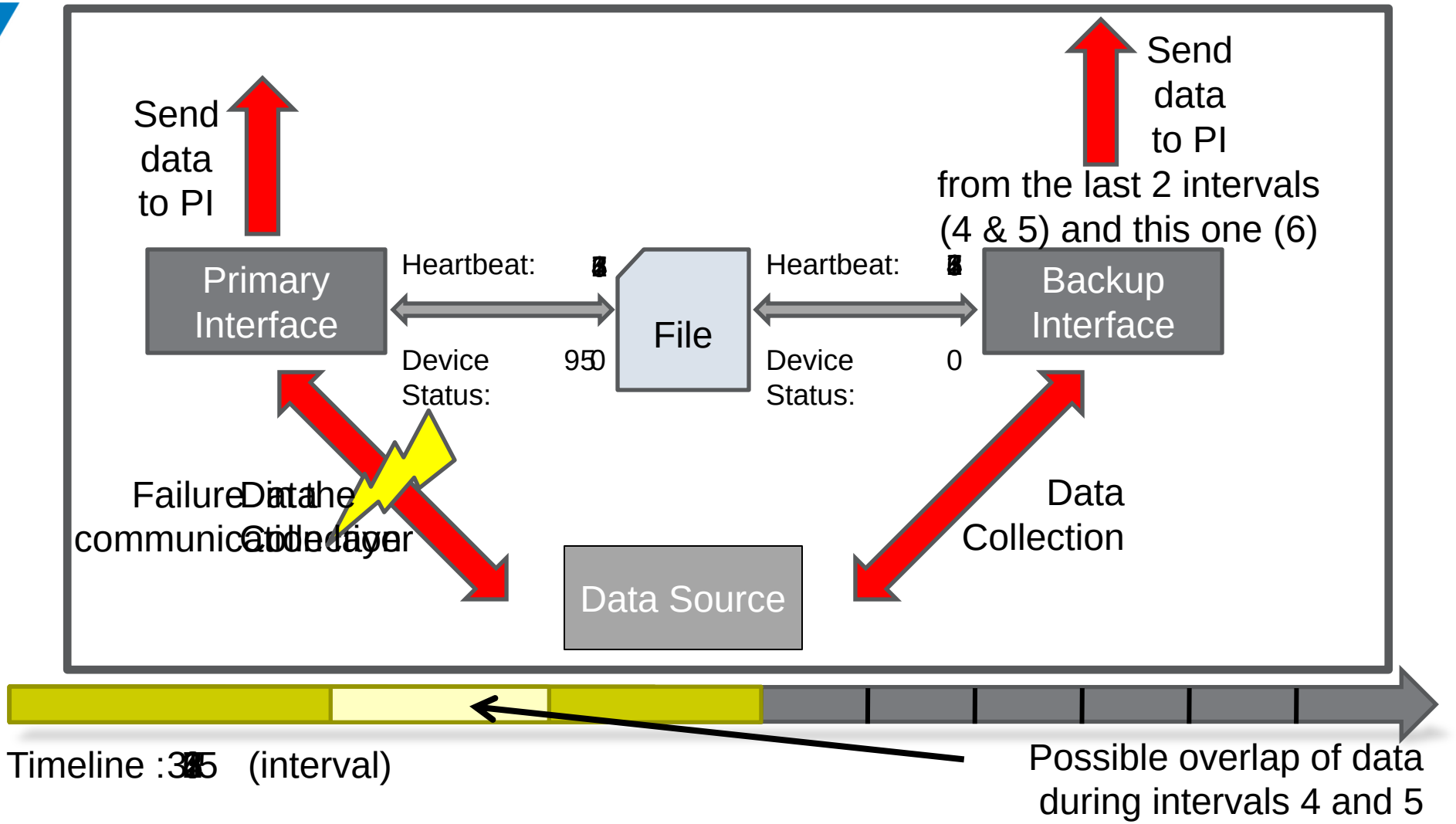


# Interface Failover: How?

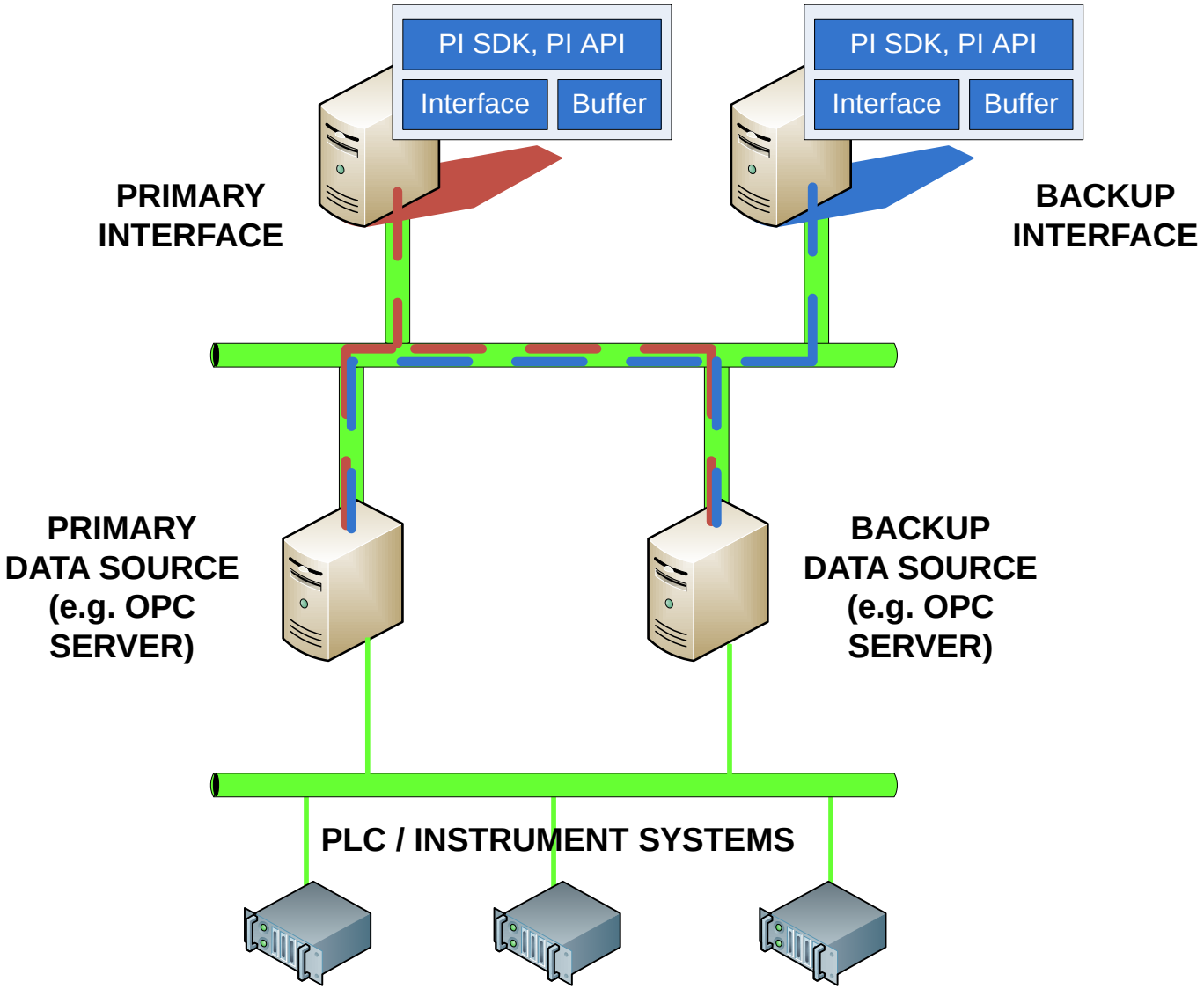
- Interfaces “watch” each other’s **Heartbeat** and **Status**
- Failover Types
  - **Hot** = No data loss
  - **Warm** = Maybe data loss
  - **Cold** = Some data lost

    (Hint: minimize data loss by using disconnected startup)

# Interface failover - Hot



# OPC Server Failover and Interface Failover



# Disconnected Startup

- Previously, if the PI Server was not available, it was not possible to start the interface
- Creates a local cache of all of the tags. Now the interface can start without connecting to the PI Server
- **Along with buffering, you know have an interface that can operate (almost) indefinitely without the PI Server!**
  - **Bonus**: We have seen impressive decreases in interface startup time when this feature is enabled
  - **Hint**: If you make a lot of changes to this interface's tags consider shutting down the interface and deleting the cache files.

# PI Interfaces Best Practices

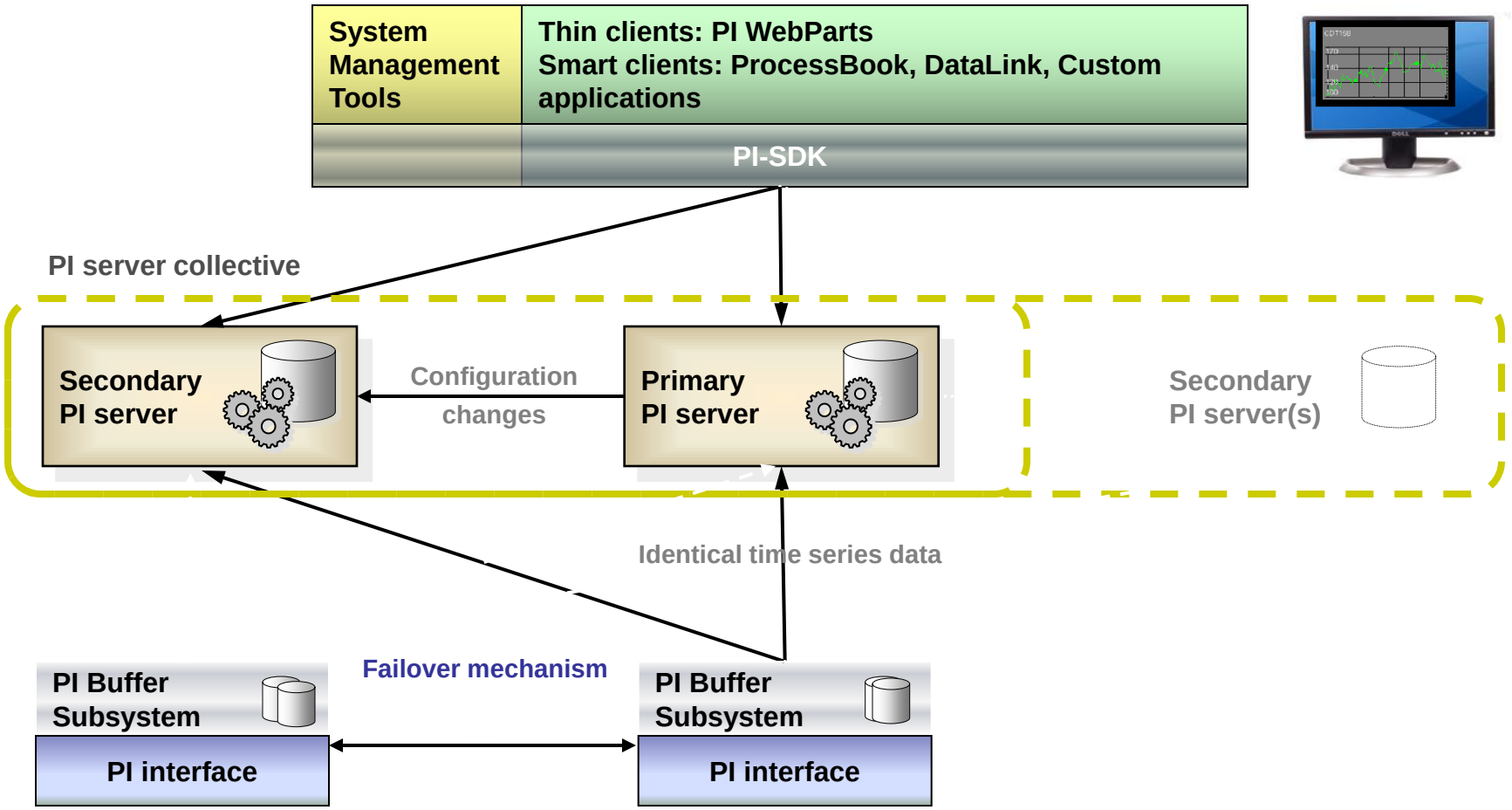
- Configure buffering with PI Buffer Subsystem
- Consider implementing failover support
- Disconnected start-up
- Create interface health points
- Configure 2+ trusts using a limited account (not piadmin)
- Don’t forget to test the new features after you implement them

# PI Server High Availability (PI HA)

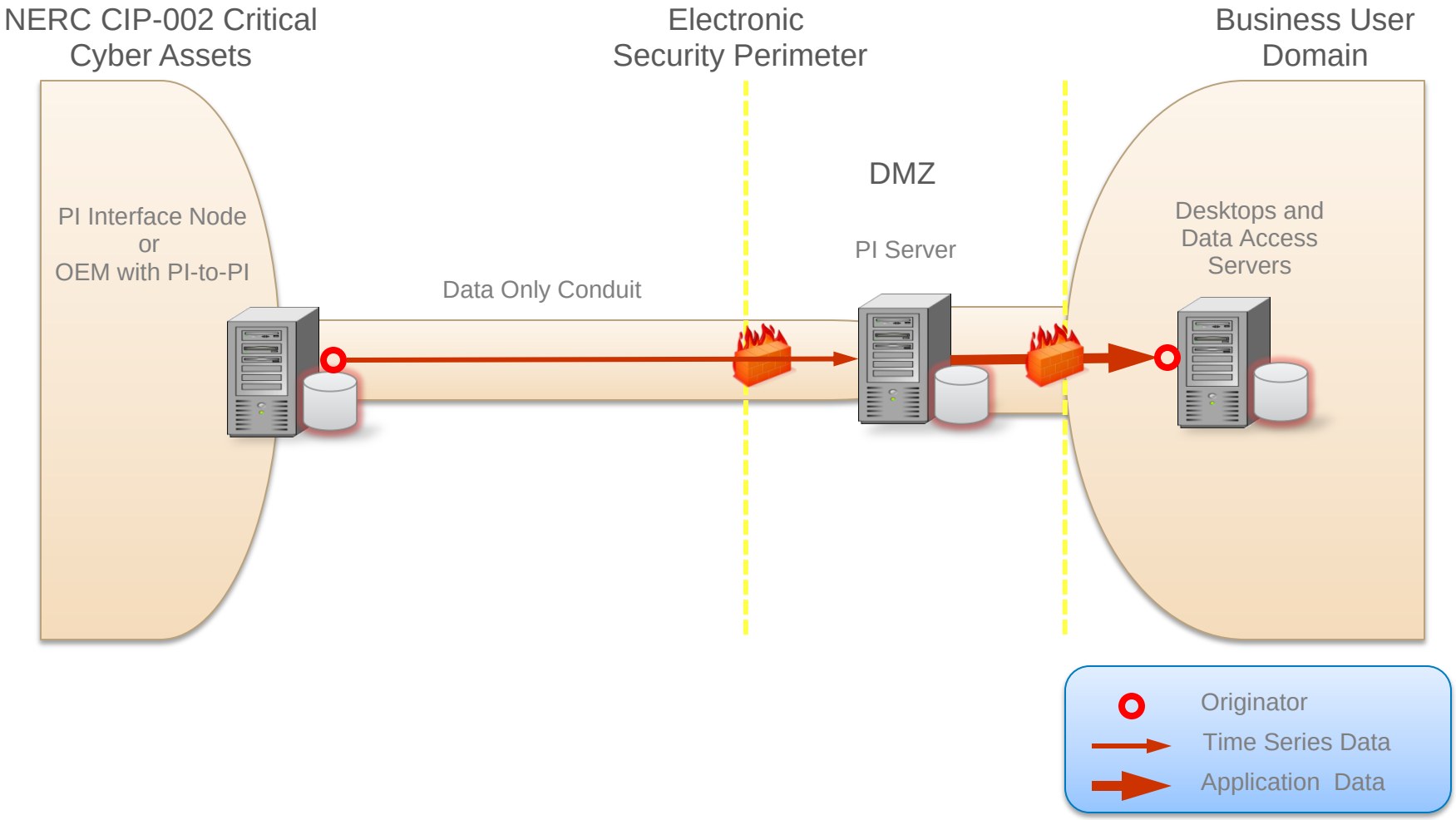
# PI Server High Availability (PI HA)

- Redundancy with multiple PI Servers as one collective
- Goal: Maximize data access for clients

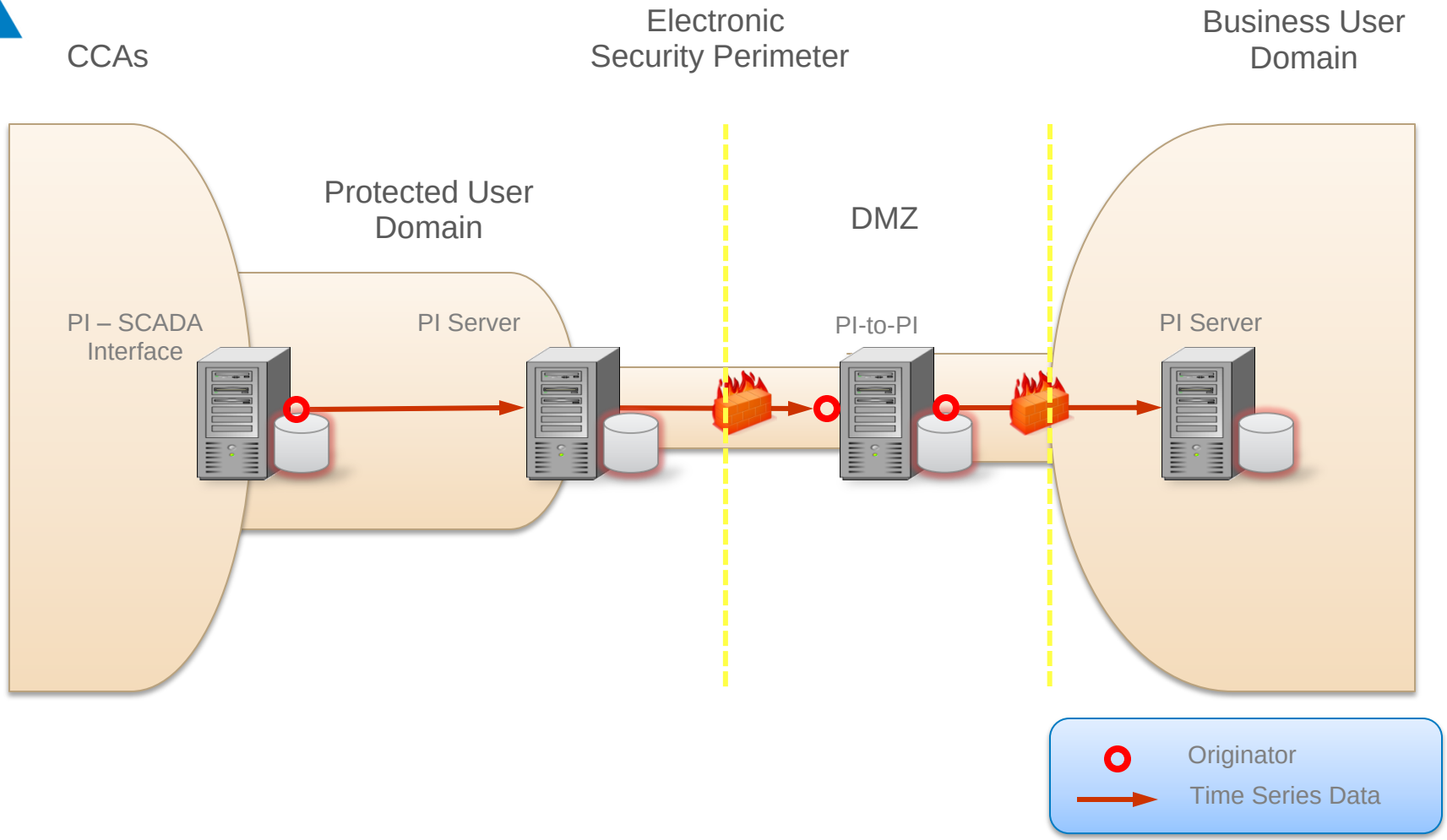
# PI Server – High Availability Architecture



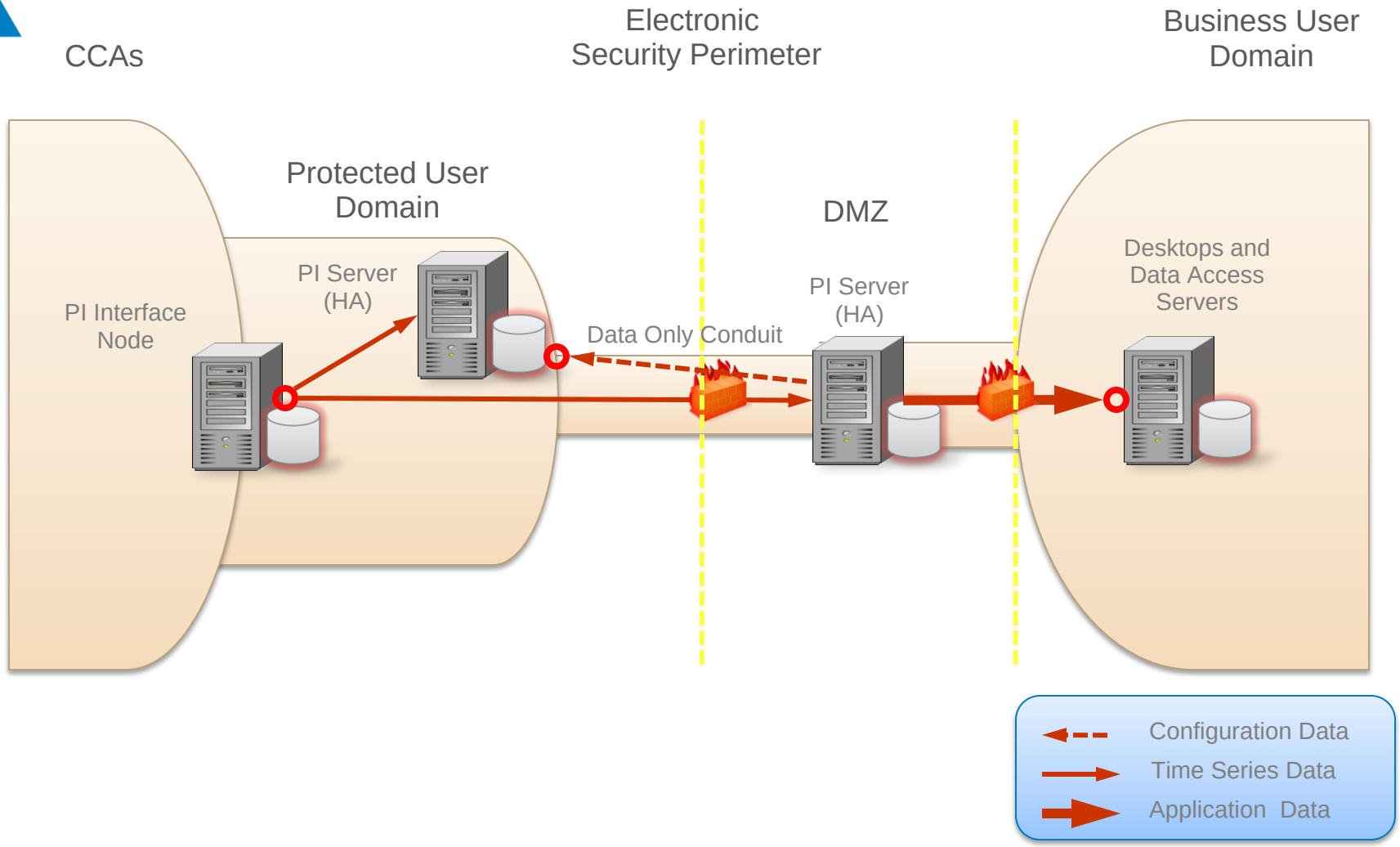
# DMZ PI Server



# Business Domain PI Server with PI to PI Interface



# HA Allows DMZ PI Server and Protected PI Server



# PI Server High Availability

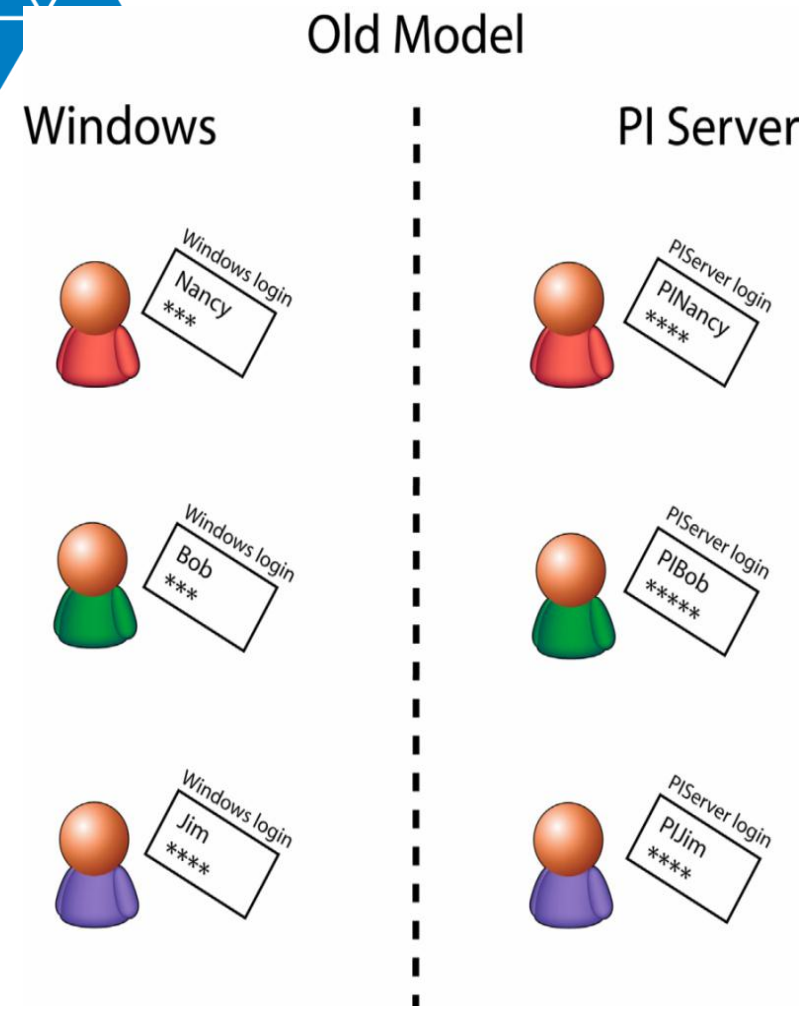
- Benefits
  - Maintain availability during scheduled maintenance
  - Redundancy of data
  - Locate PI Server member close to consumers of the data
- Best Practices
  - Implement PI Server High Availability

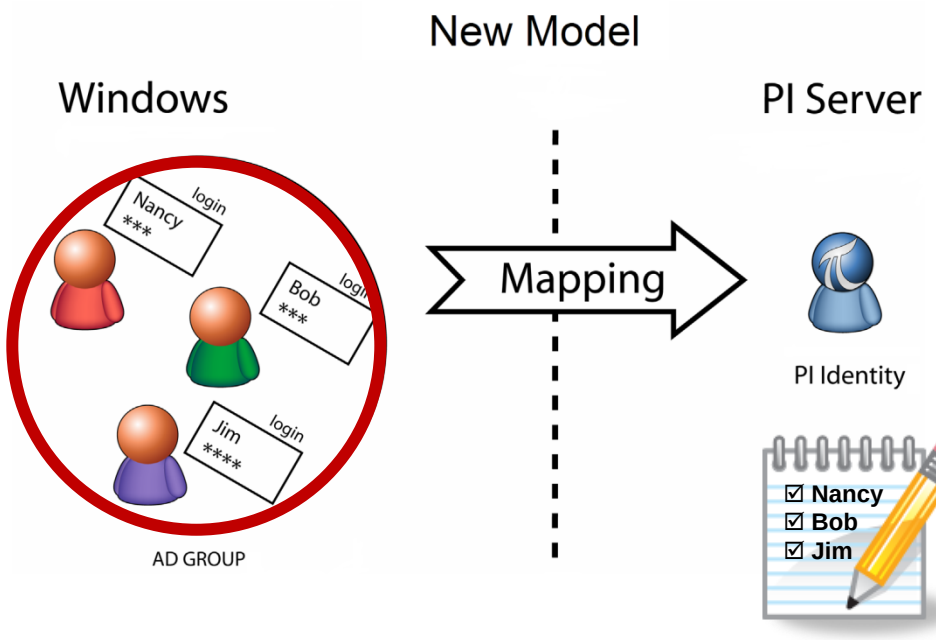
# PI Server Windows Integrated Security

# PI Server Security: Overview

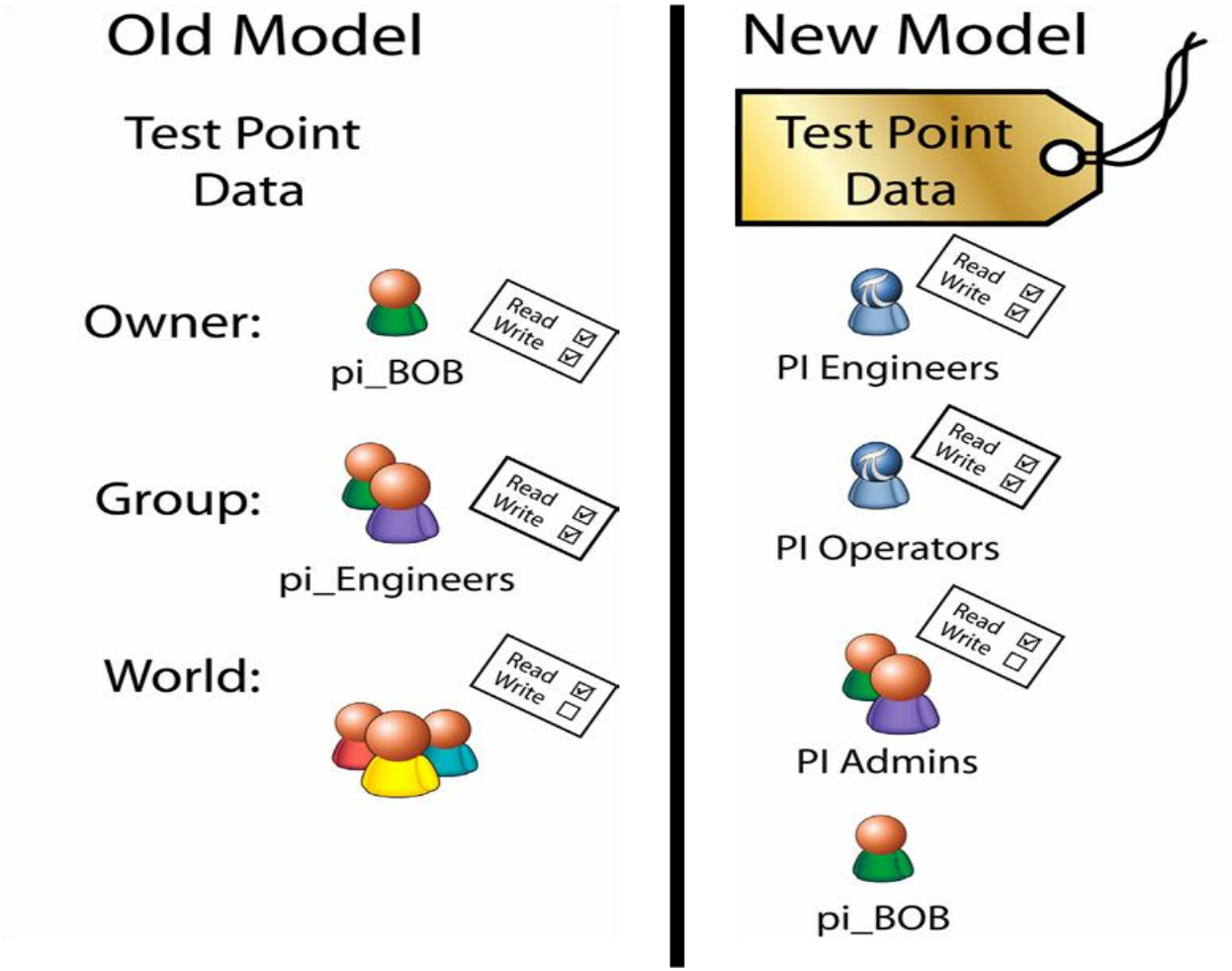
- PI Server 3.4.380.36 (2009) introduced support for Windows Integrated Security
- Microsoft Active Directory (AD) integration
- Map AD users to PI Identities
- PI Identities are roles on the PI Server
  - PIOperators, PIEngineers, PISupervisor

# Comparing PI Users and PI Identities



# Authorization: Object Level Security Model



# Automatic Backward Compatibility

| Tag | dataaccess | datagroup | dataowner |
|---|---|---|---|
| sinusoid | o:rw g:rw<br>w:r | pi_users | bob |

| Tag | datasecurity |
|---|---|
| sinusoid | pi_users:A(r,w) \| bob:A(r,w) \| PIWorld:A(r) |

# Active Directory Integration

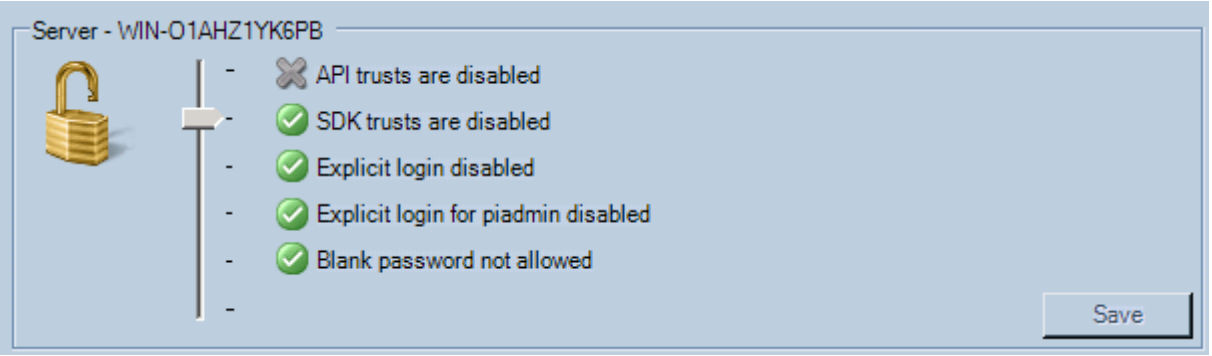
- PI Server must be a member of a domain to leverage Kerberos authentication
- Multiple AD domains must have trusts established or users and groups from other domain cannot be used
  - One-way trusts are supported: the server domain must trust the client domain
- For non-domain accounts, you can use Windows Local Groups from the PI Server machine
  - Passwords have to match for NTLM authentication

# PI Identity Planning

- Develop a PI Identity Scheme for your Organization
  - Protect your data
  - Ease of maintenance
  - Organizational separation
  - Standardize
- Consider Kerberos
  - Map AD principals directly
  - Map AD principals to local groups

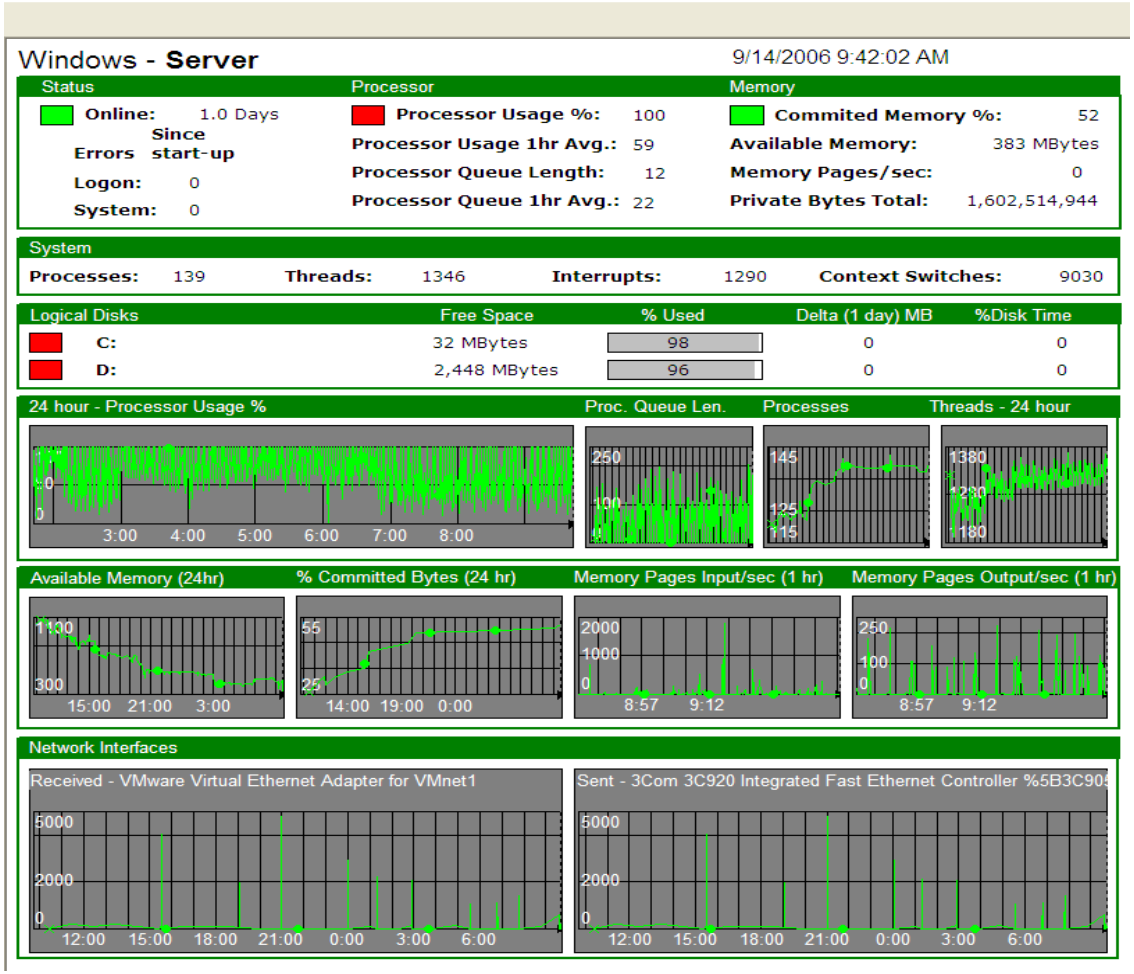
# How to Tighten Security: Best Practices

1. Physical and OS security are the first line of defense
2. Use the new Security Tool to help secure your PI Server
3. Do not use the PIADMIN account in trusts or mappings
4. Disable PI Password authentication (explicit logins) (see KB00304)
5. Retire PI SDK-based Trusts
6. Use Windows Integrated Security



# PI Server: Best Practices

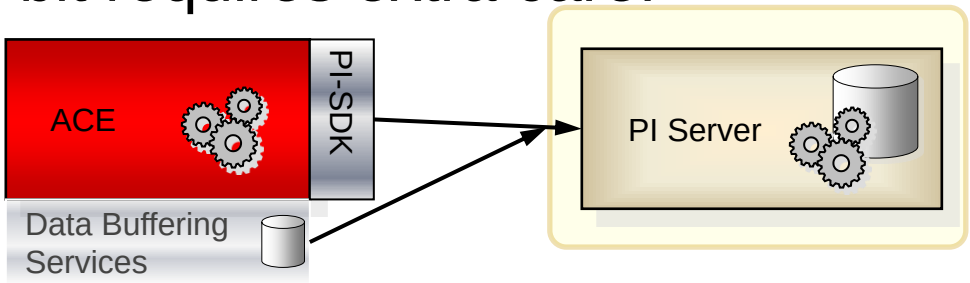
- Security
- MCN Health Monitor
- Archives
- Backups



# PI Advanced Computing Engine

# PI Advanced Computing Engine

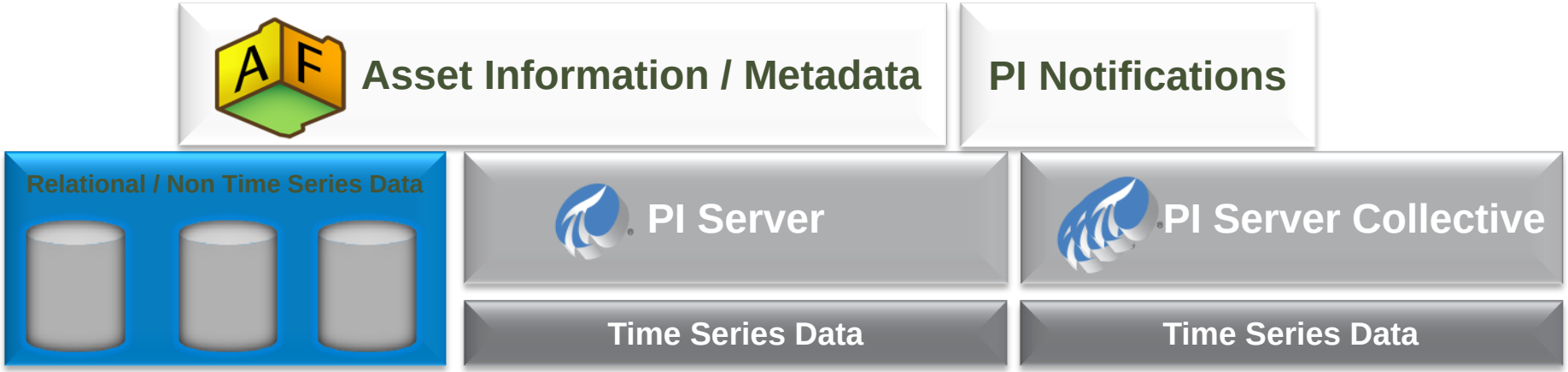
- Overview
  - Develop calculations in Microsoft Visual Studio
  - Wizards assist configuration
  - High availability
  - PI ACE 2010 adds support for 64-bit calculations (How To: KB00553)
- Best Practices
  - Configure buffering (64-bit requires extra care: KB00552)
  - Error handling
  - Performance Counters



# PI Asset Framework and PI Notifications

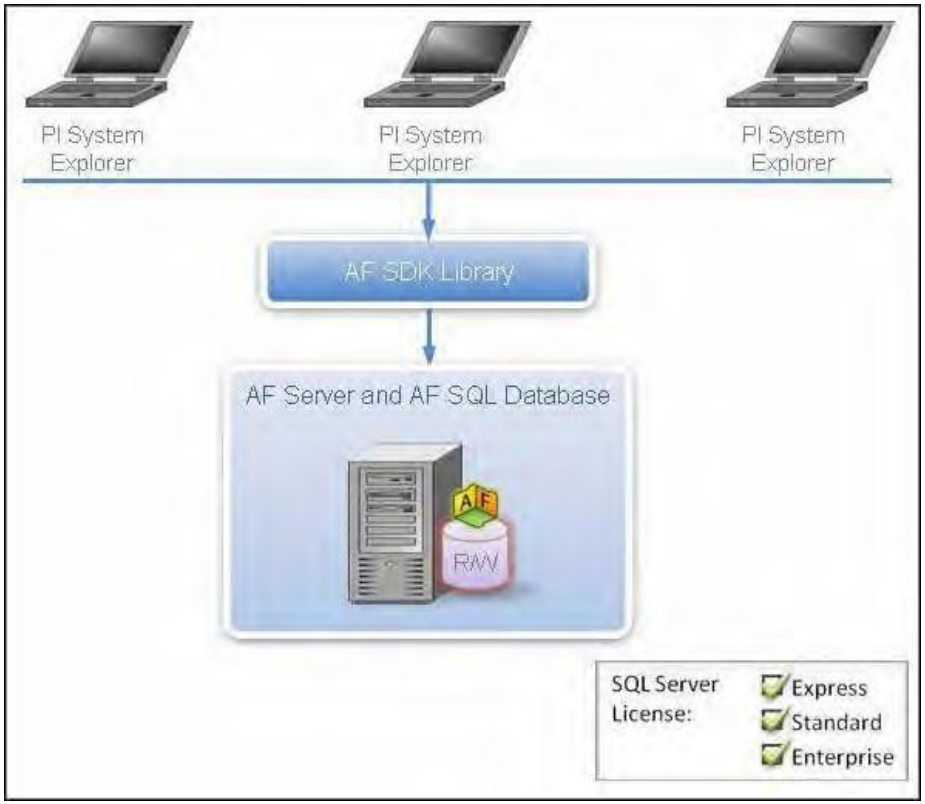
# PI Asset Framework: Overview

- An asset model to organize and structure all your data with context
- Build hierarchy, categories and connectivity models
- Data references to time series (PI Points) and other data
- Search across multiple PI Servers to find information
- Leverage PI Notifications

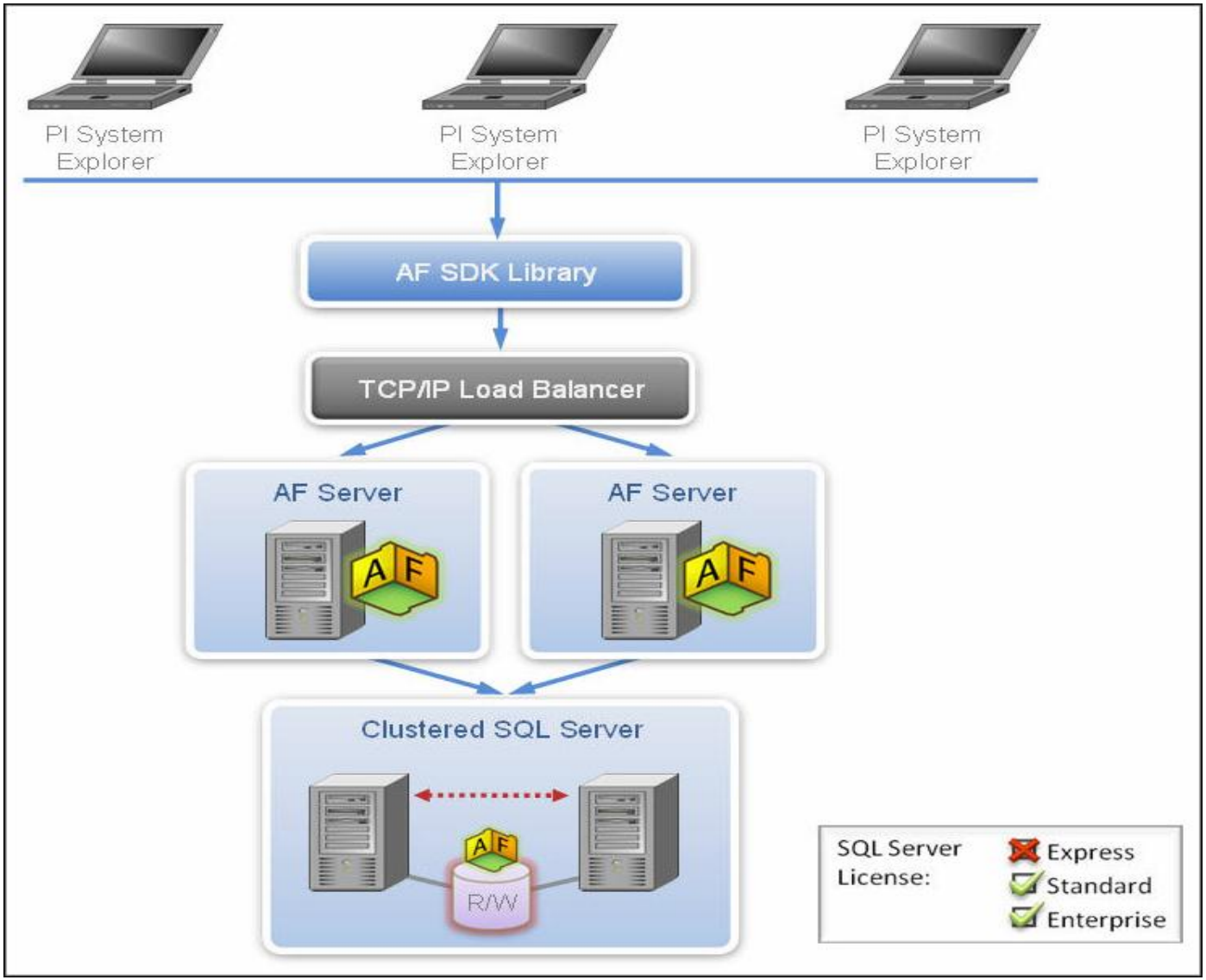


# PI Asset Framework – Components

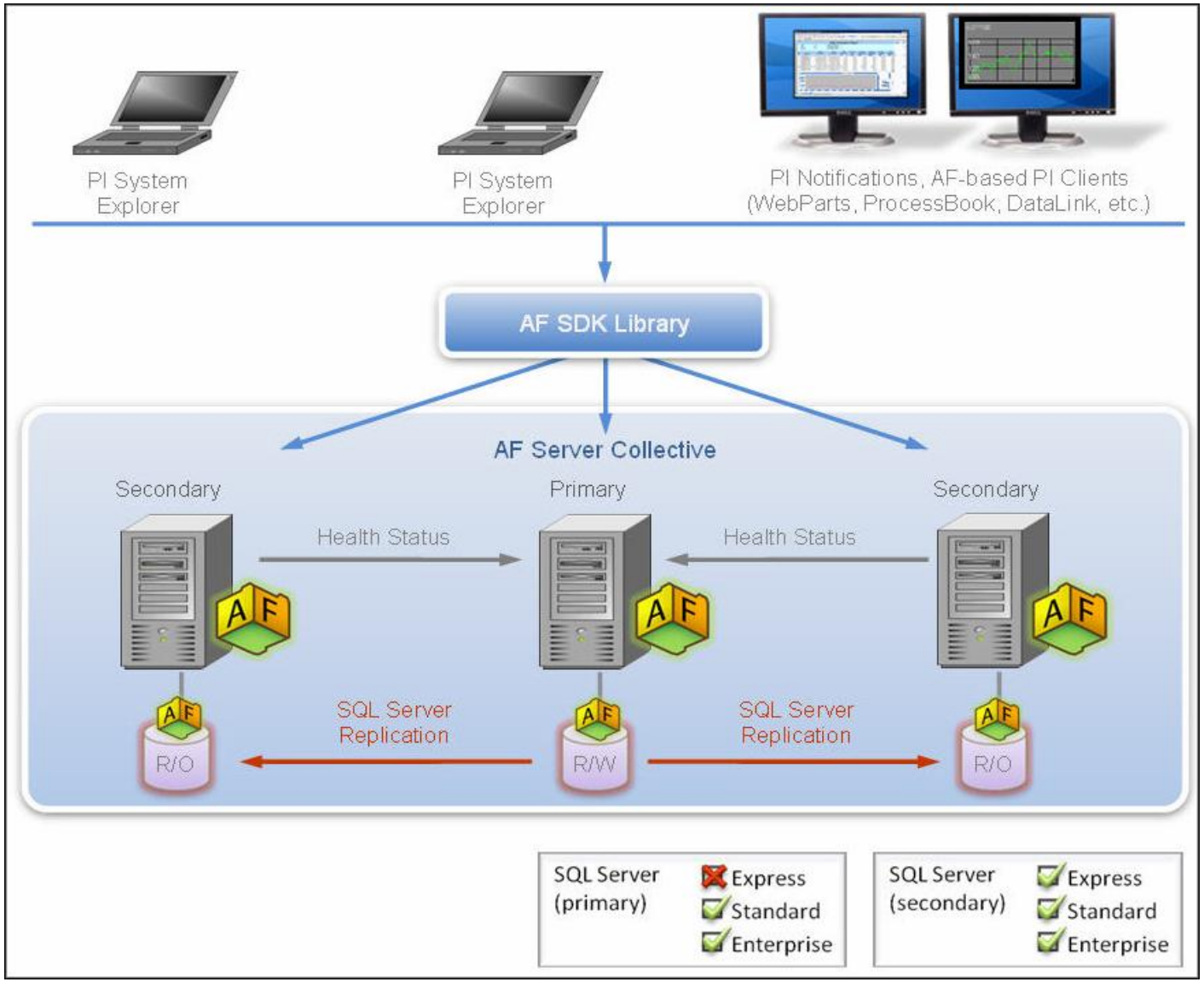
- Two key components
  - AF Server
  - SQL Server database
- SQL Server
  - Express, Standard
  - Cluster or Mirror
- AF Server
  - Behind a load balancer
  - AF SDK Collective



# PI Asset Framework – High Availability



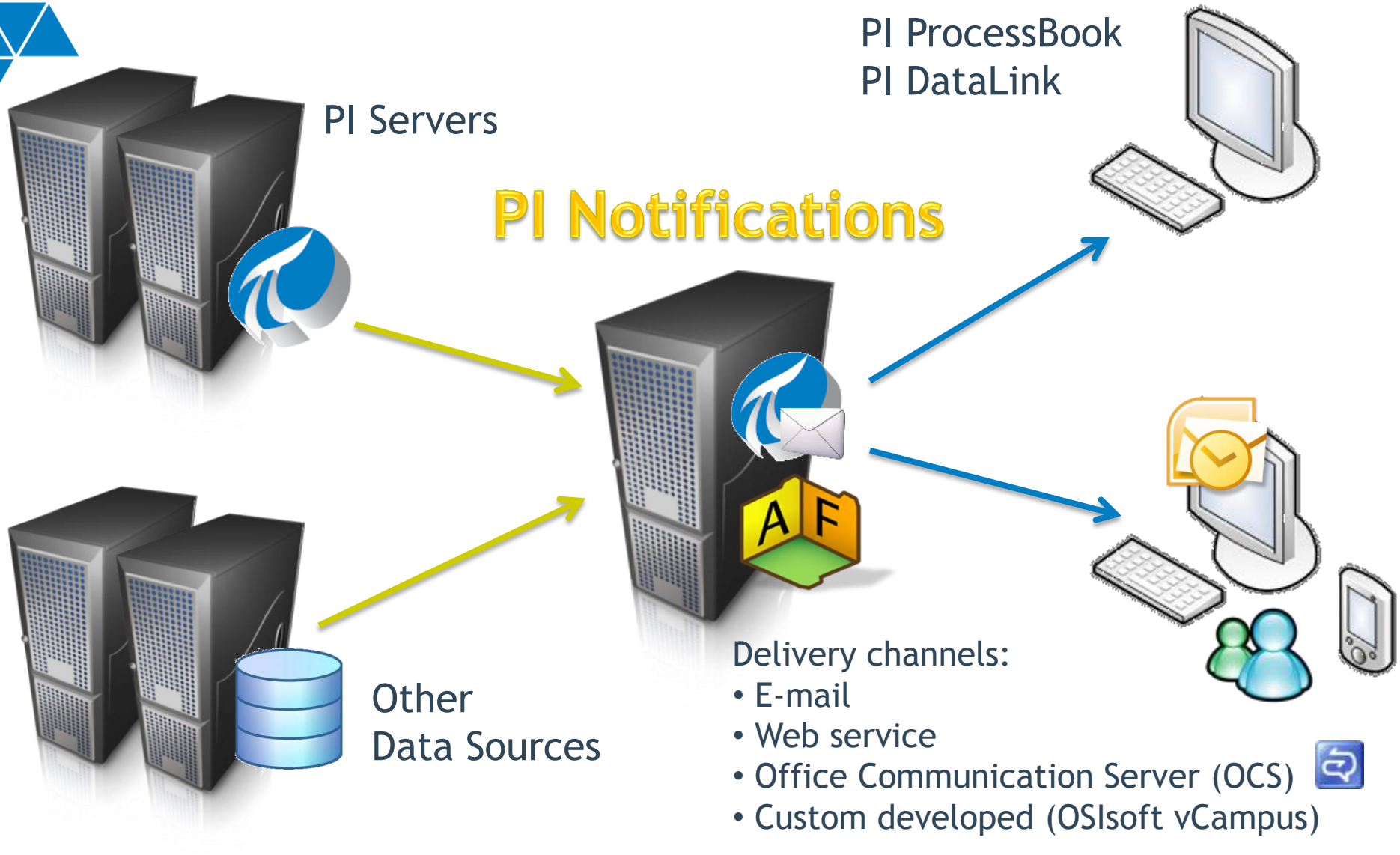
# PI AF – AF SDK High Availability



# PI Asset Framework: Best Practices

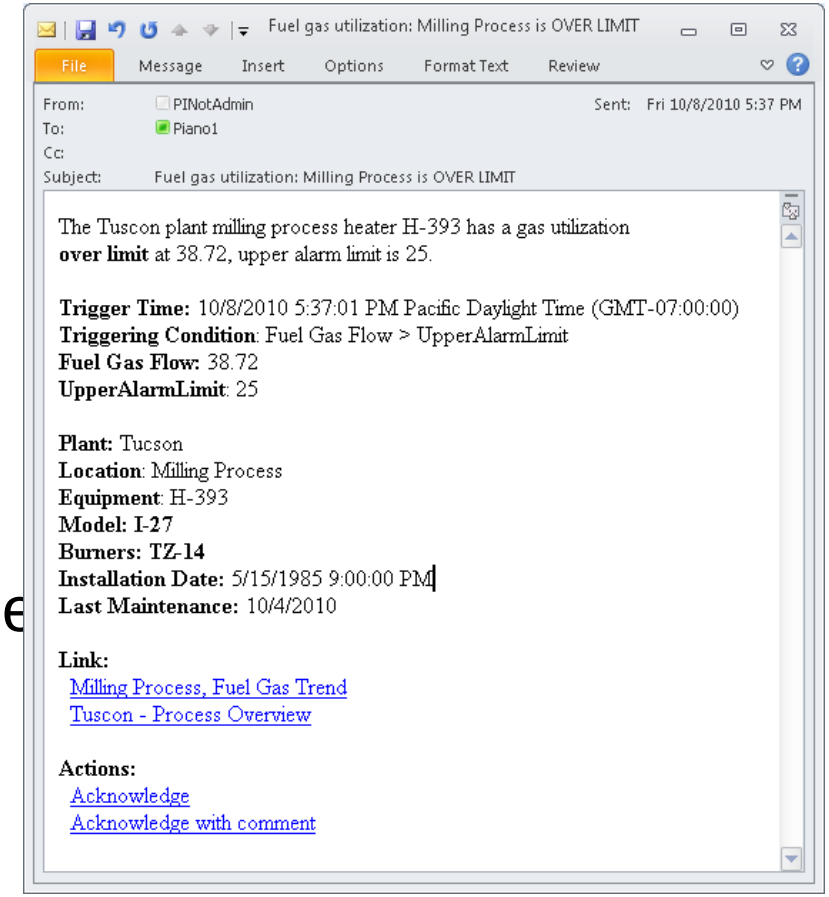
- Backups!
- Monitor SQL Server with PI MCN Health Monitor
- Do not run the SQL Server database engine as LOCALSYSTEM, admin, or domain admin.
- DO NOT RUN the AF Server with SysAdmin privilege (don't use SA account, LOCALSYSTEM, or admin)
- Minor: for AF Table, disable AF2.0 compatibility, enable impersonation

# PI Notifications Architecture: Overview



# PI Notifications: Best Practices

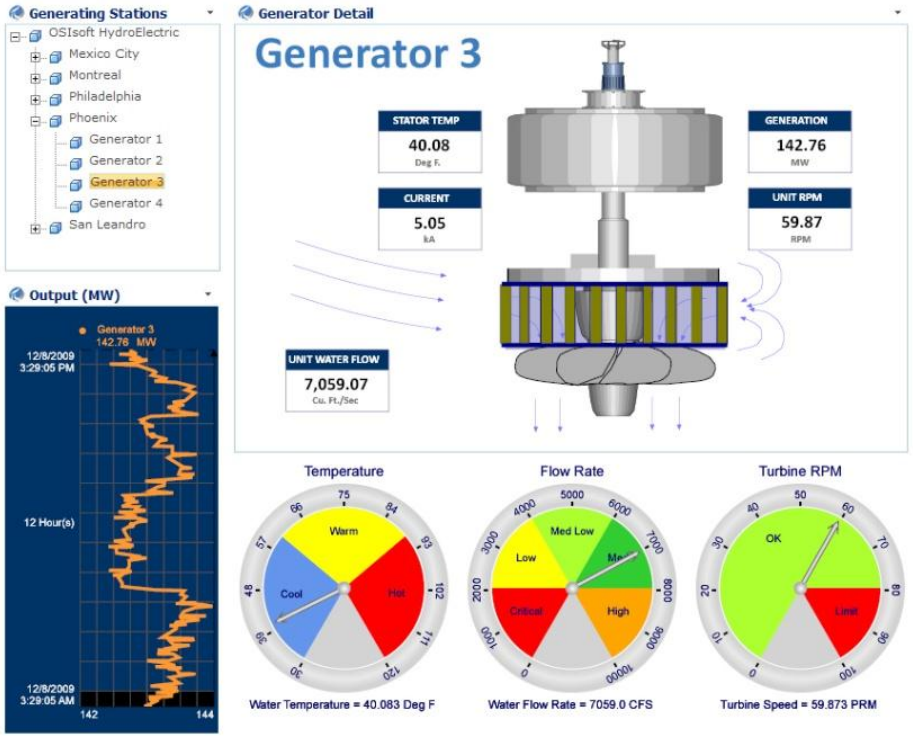
- Configure buffering
- Performance Counters
- Configure redundant schedule
- Utilize templates



# PI WebParts

# PI WebParts

- Overview
  - Visualization with Microsoft SharePoint
  - Versions PI MDB or PI AF
- Best Practices
  - Backup SharePoint
  - Explore querystrings



# More Information

- Whitepapers and Tech Support bulletins on OSIsoft website
- User Manuals
  - PI Server 2010 Configuring Security
  - PI Asset Framework 2010 User's Guide
- OSIsoft vCampus – Online community
  - Forums, Whitepapers, Webinars

# Thank you