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Empowering Business in **Real Time.**

PI Infrastructure for the Enterprise.

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The Servers

Frank Batke
Hans Herbert Gimmler

concern and content

Wrap up an Overview

Gathers, Organizes, Distributes, and Stores Data

- Time series data – PI Archive
- Data Access
- Real Time Interfaces
- Non Time series data – AF
- MCN Health Monitor

Functional Groups of The PI SYSTEM

The PI System

The Server

- PI Archive
- PI AF
- Real-Time Interfaces
- Data Access
- MCN Health Monitor

The Analytics

- ACE
- PI Analytics
- RtReports
- PI Notifications
- Sigmafine

The Visuals

Smart Clients

- PI ProcessBook
- PI DataLink
- PI Activeview
- PI BatchView

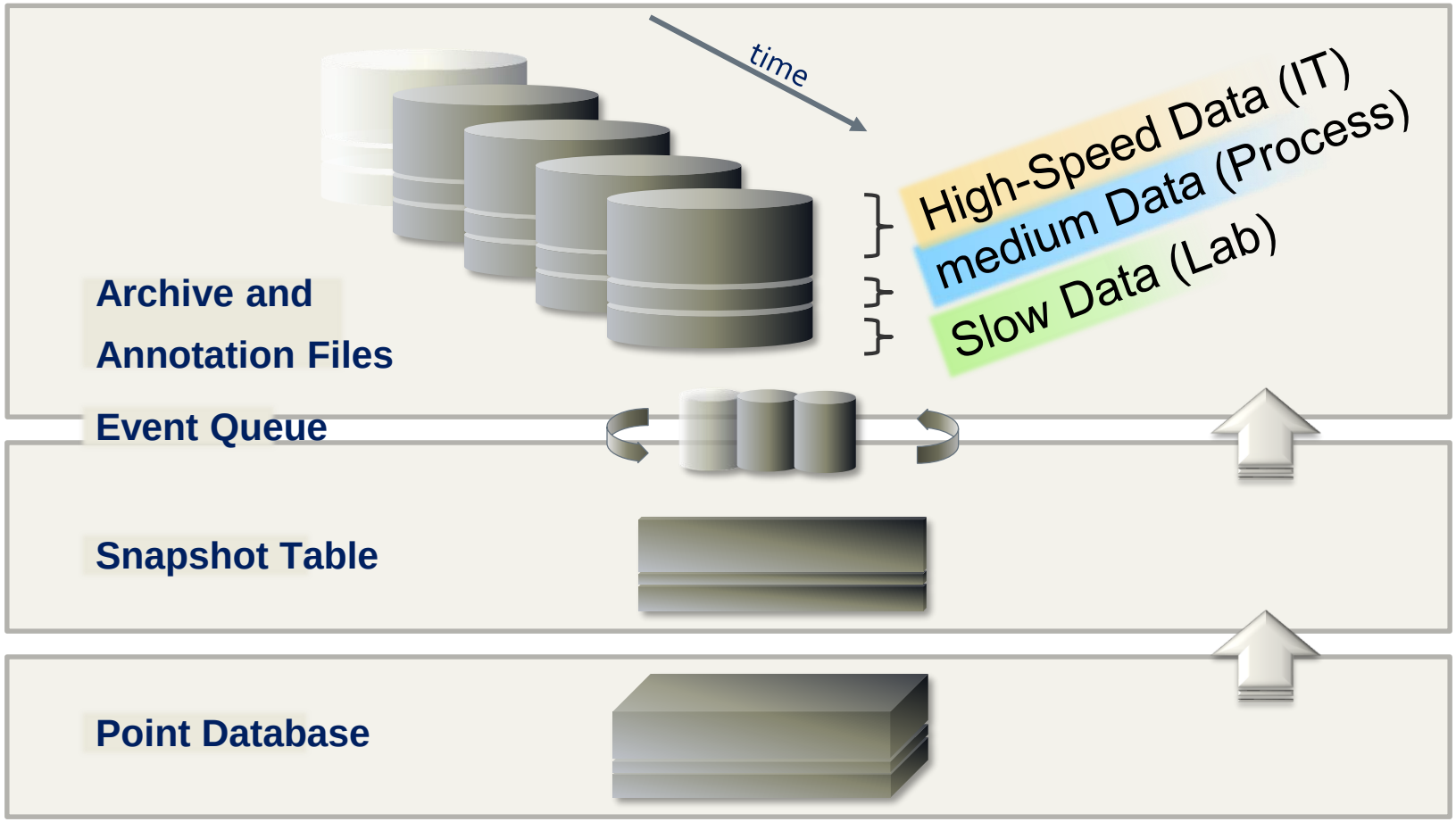
Thin Clients

- RtWebParts
- RtPortal iViews
- RtReports Clients

The Server

- PI Archive
- PI AF
- Real-Time Interfaces
- Data Access
- MCN Health Monitor

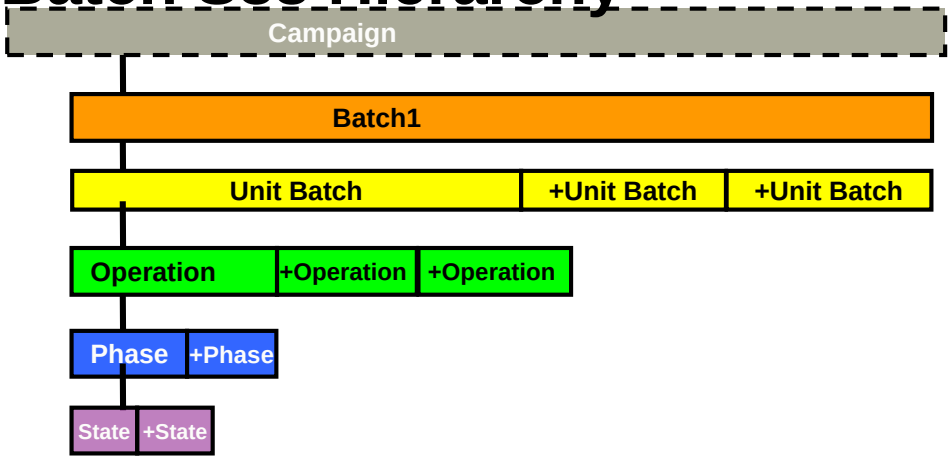
Event Storage – core today

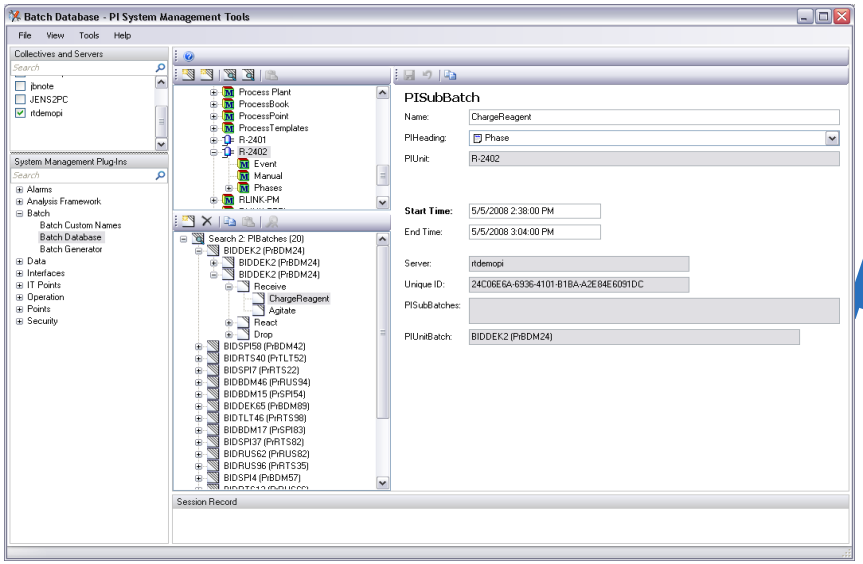


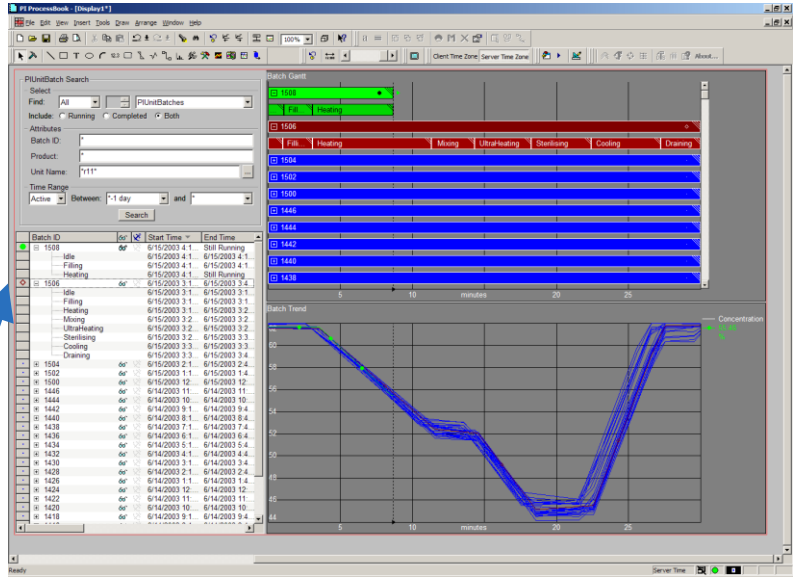
Event :=	Tag	Timestamp	Value	Questionable	Substituted	Annotation
	Where ?	When ?	What ?	Quality ?	Changed ?	Add. Bit stream

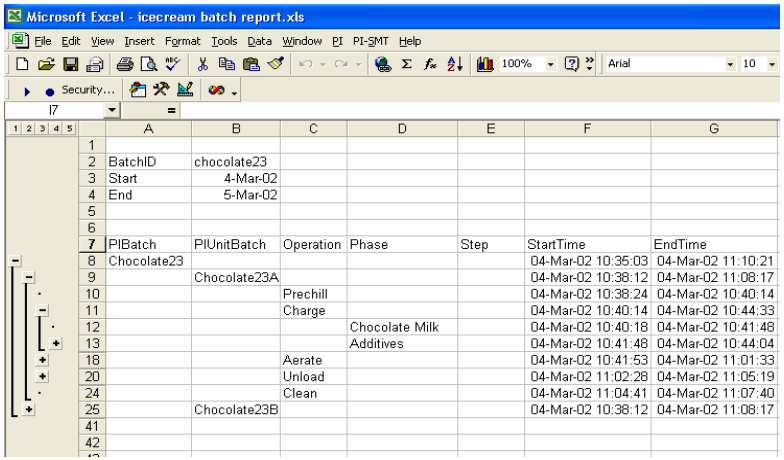
PI Batch Database: ANSI/ISA-88

Batch S88 Hierarchy









	A	B	C	D	E	F	G
1							
2	BatchID	chocolate23					
3	Start	4-Mar-02					
4	End	5-Mar-02					
5							
6							
7	PIBatch	PIUnitBatch	Operation	Phase	Step	StartTime	EndTime
8	Chocolate23					04-Mar-02 10:35:03	04-Mar-02 11:10:21
9		Chocolate23A				04-Mar-02 10:38:12	04-Mar-02 11:08:17
10			Prechill			04-Mar-02 10:38:24	04-Mar-02 10:40:14
11			Charge			04-Mar-02 10:40:14	04-Mar-02 10:44:33
12				Chocolate Milk		04-Mar-02 10:40:18	04-Mar-02 10:41:48
13				Additives		04-Mar-02 10:41:48	04-Mar-02 10:44:04
18			Aerate			04-Mar-02 10:41:53	04-Mar-02 11:01:33
20			Unload			04-Mar-02 11:02:28	04-Mar-02 11:05:19
24			Clean			04-Mar-02 11:04:41	04-Mar-02 11:07:40
25		Chocolate23B				04-Mar-02 10:38:12	04-Mar-02 11:08:17
41							
42							

PI Archive

All in one - Administration by PI-SMT

Example PI System Management Tool:

PI Server Collective

Large PI Server on 64 bit Platform

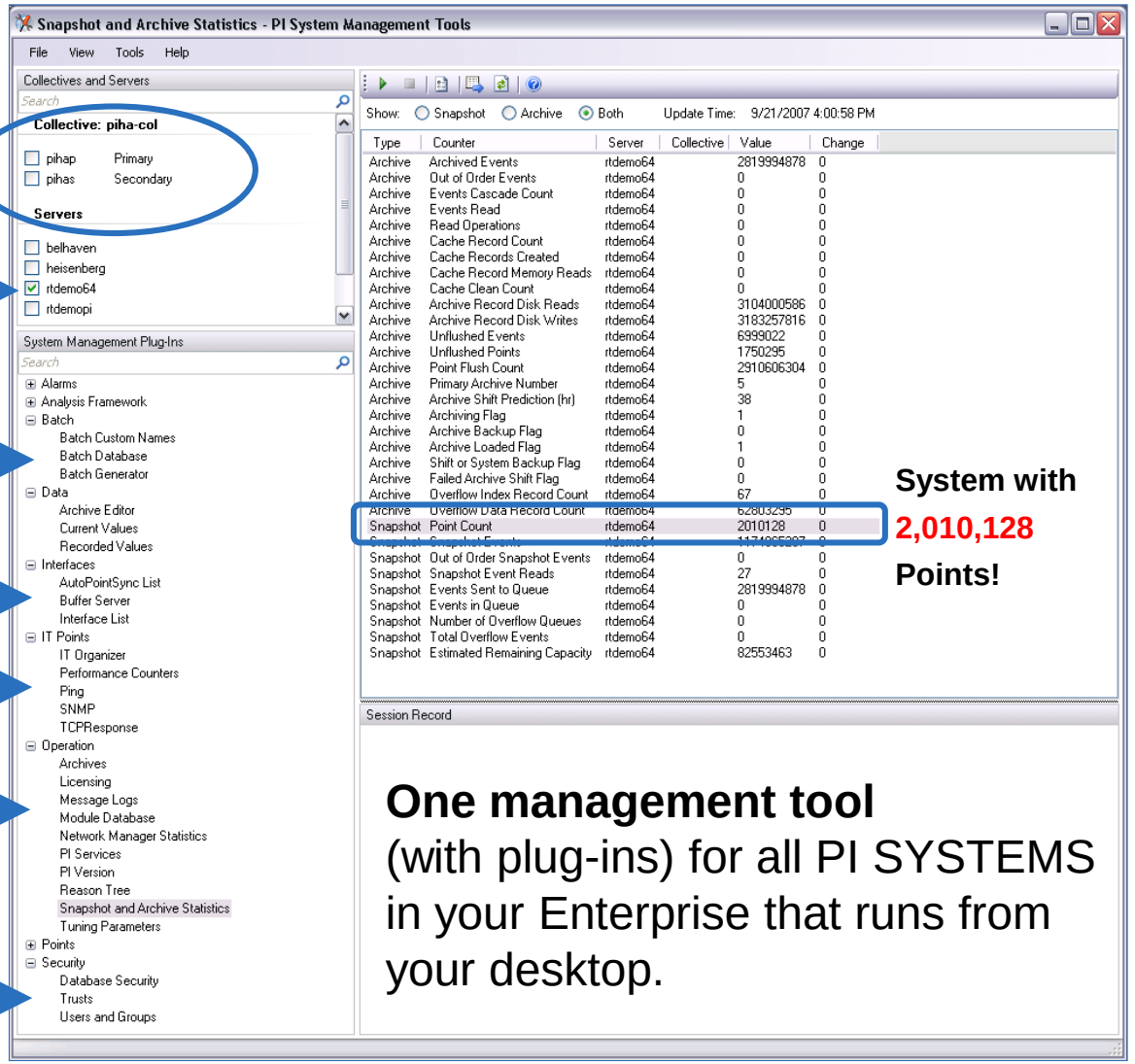
Batch Database Editor

Interface Configuration

IT Monitor Configuration

PI Server Configuration

PI Security Configuration



System with 2,010,128 Points!

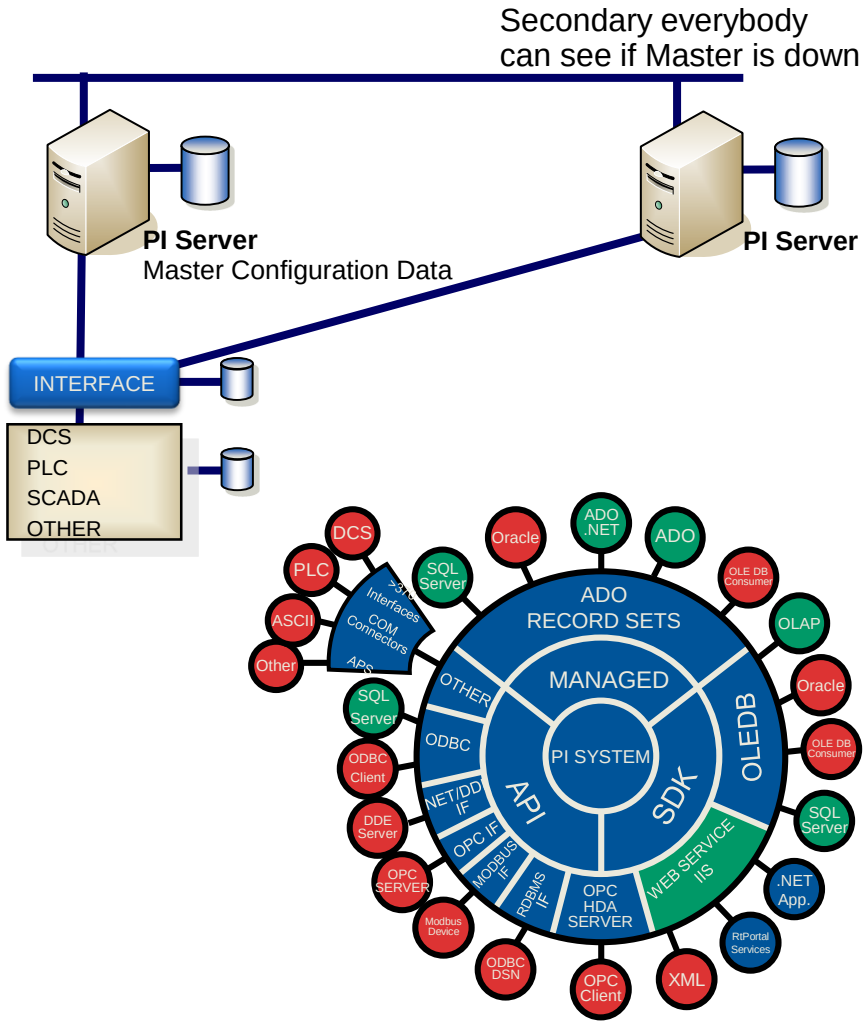
One management tool (with plug-ins) for all PI SYSTEMS in your Enterprise that runs from your desktop.

The Server

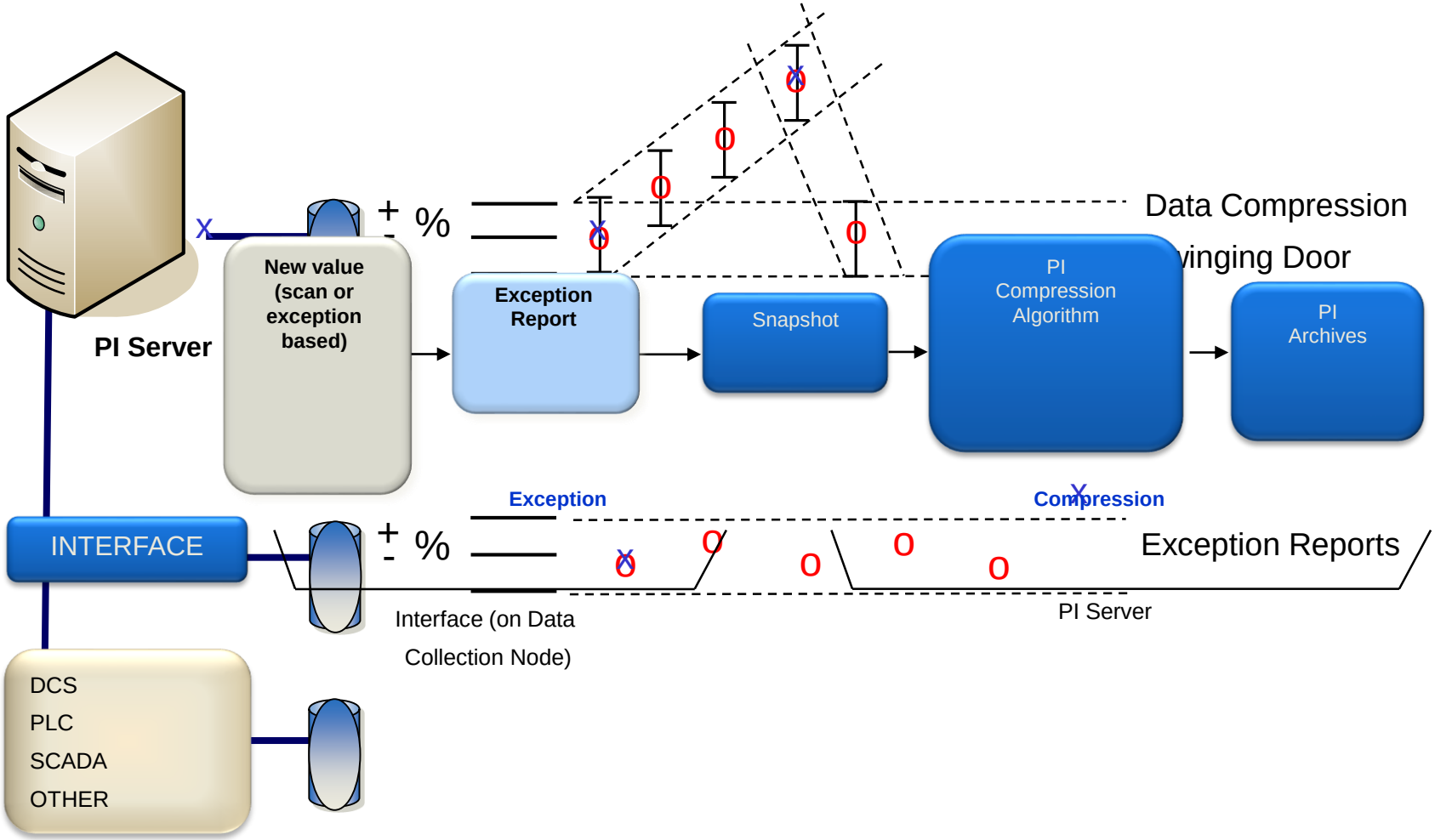
- PI Archive
- PI AF
- Real-Time Interfaces
- Data Access
- MCN Health Monitor

Advanced Real time Interfaces

- Can write to multiple Servers and Collectives
- Ease of Deployment and Maintenance
- Remote Configuration and Monitoring
- Auto Point Synchronization (APS)
  (between DCS / PLC / SCADA)
- Disconnected Startup
  (Node is able to restart without connection to the PI Server)
- Buffering and History Recovery
  (no Data loss)
- Exception Reporting
  (unload the bus)
- Automatic Failover, High Availability (HA)
- Data Security
- Standardized Logging and Debugging



Collection & Storing

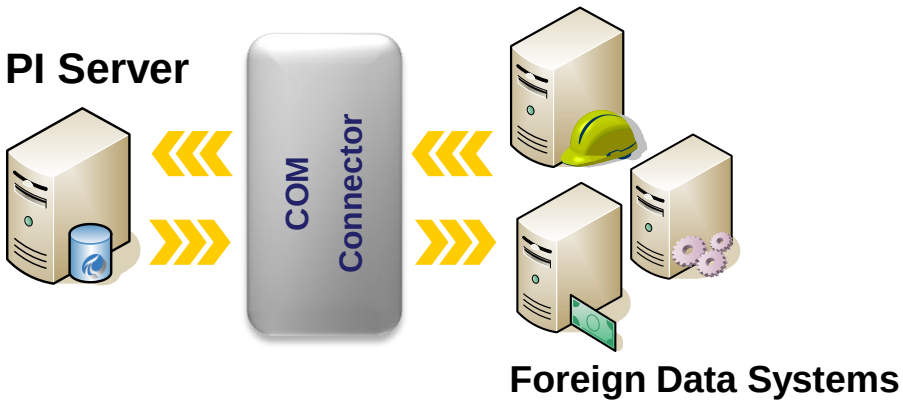


COM Connectors

- PI COM Connectors allow other enterprise systems to use PI architecture and clients, delivering data between the PI Server and foreign databases or data historians without storing them in PI Data Archive

- Each COM Connector obtains foreign system data using techniques provided by the foreign system vendor.

- A COM Connector can be implemented as either an in-process or an out-of-process COM object.



Name	Platform	Current Version	Shipping Version	Part#	APS Status
AspenTech IP21 COM Connector	NTI	2.0.0.0	2.0.0.0	PI-CTR-AT-IP21	
Honeywell PHD COM Connector	NTI	1.3.2.6	1.3.2.6	PI-CTR-HW-PHD	Released
OLEDB COM Connector	NTI	2.3.3.0	2.3.3.0	PI-CTR-OS-OLEDB	
OPC HDA Server COM Connector	NTI	1.0.1.45	1.0.1.45	PI-CTR-OS-OPCHDA	In development
OSI ECHO COM Connector	NTI	1.2.0.202	1.2.0.202	PI-CTR-OS-ECHO	
OSI PI COM Connector	NTI	1.0.3.5	1.0.3.5	PI-CTR-OS-PI	
OSI ProcessPoint COM Connector	NTI	1.0.0.10	1.0.0.10	PI-CTR-OSI-PLM	
WonderWare Industrial SQL COM Connector	NTI	1.0.0.103	1.0.0.103	PI-CTR-WW-ISQL	
Yokogawa Marex Exaquantum COM Connector	NTI	1.1.0.0	1.1.0.0	PI-CTR-YO-EXAQ	Released

High Availability – concern and goal

Software Fault-Tolerant System

- Interface Failover
- Buffering
- PI Server Replication
- *SDK Services (discovery, failover, and load distribution)*
- *N-way Buffering of Non-Interface Data (e.g. PI-SDK)*
- *Replication of Archive Edits among Server Nodes*
- *Promotion of Secondary Nodes on Primary Failure (configurable)*

Near-Independent, Physically Separated Servers

- No hardware/network restrictions, no limit on Server nodes

General Benefits

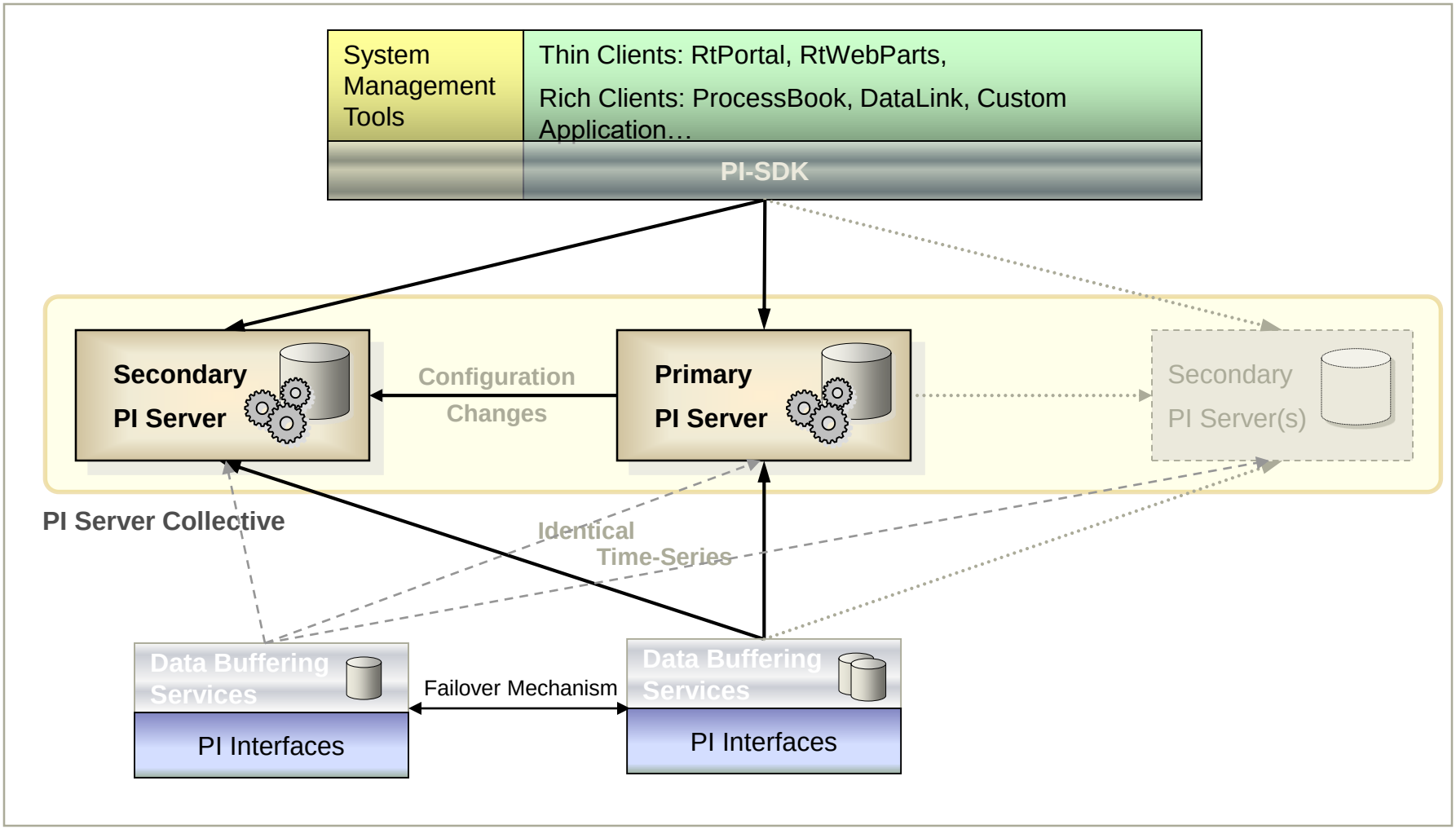
- Availability, end-USER sees one logical system
- Scalability, system load can be distributed
- Flexibility, accommodates your environment

For IT and Management

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

Extra benefit: Hardware and Software just out of the box

PI HA Architecture - reality

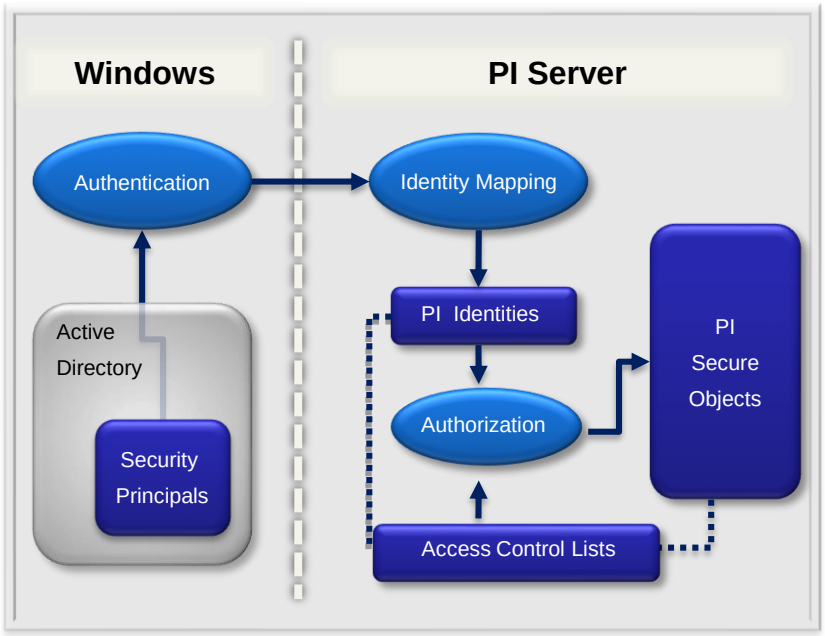


PI Server, Windows Security Integration 3.4.380.x

- Goals:
  1. More flexible access control

Security

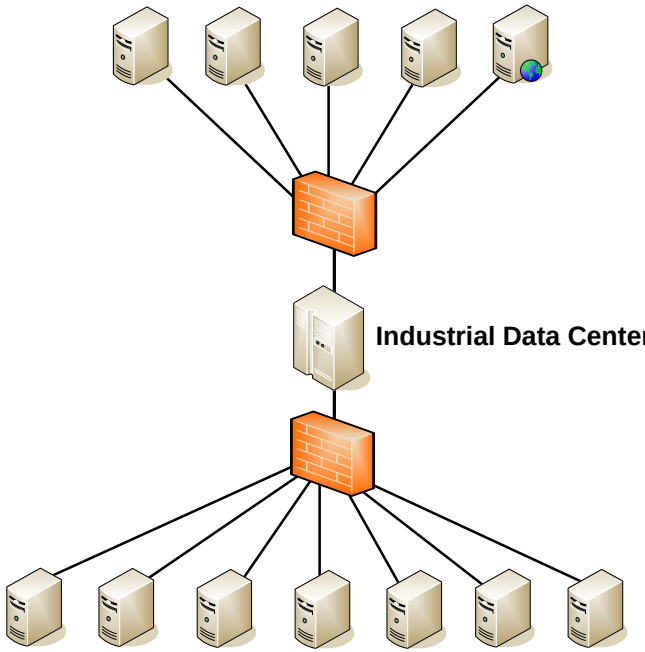
Windows Integrated Security



Single Sign ON

Security between IT Network & Process Control Network

Secure Real-time Communication



Application has its own logical Connection

- handeled through common PI Platform
- using Secure Connection
- Monitored

The Server

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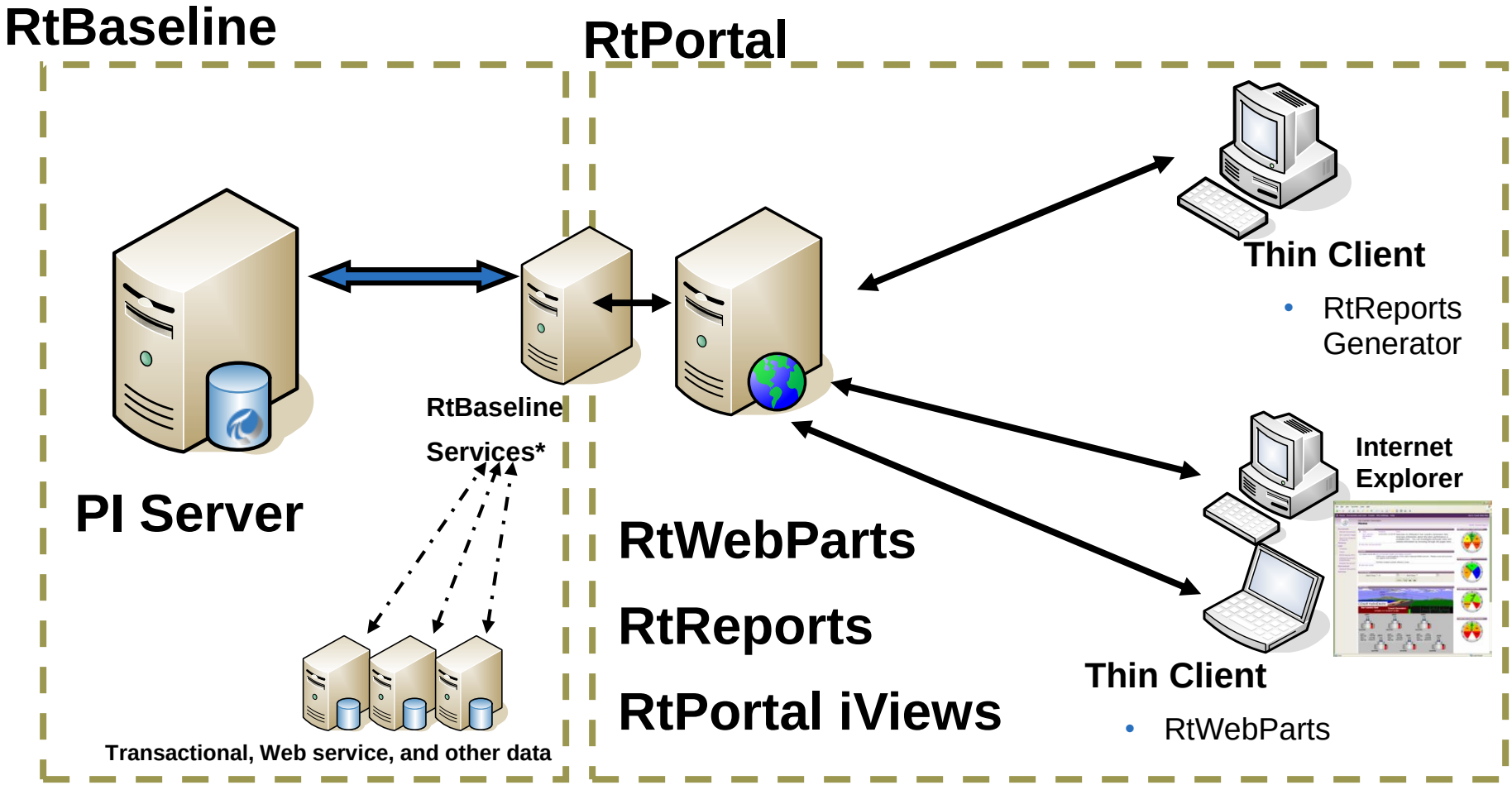
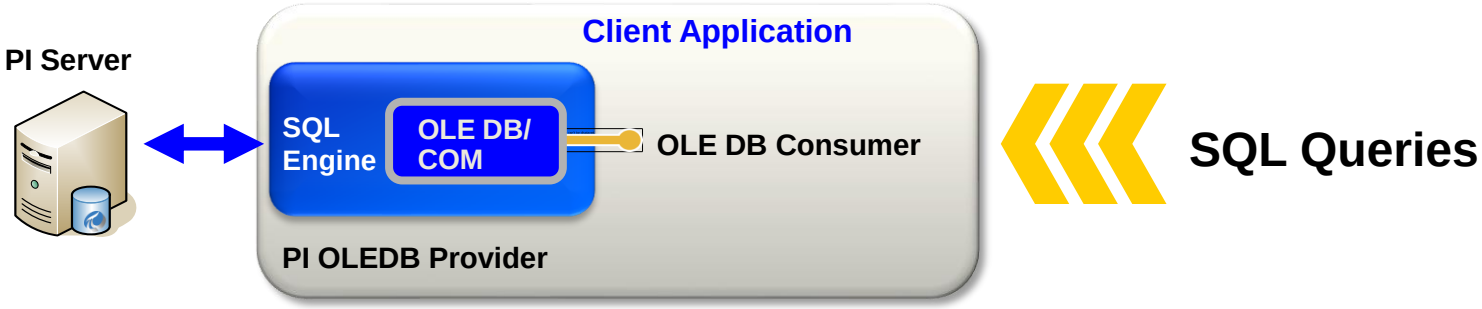
WebServices

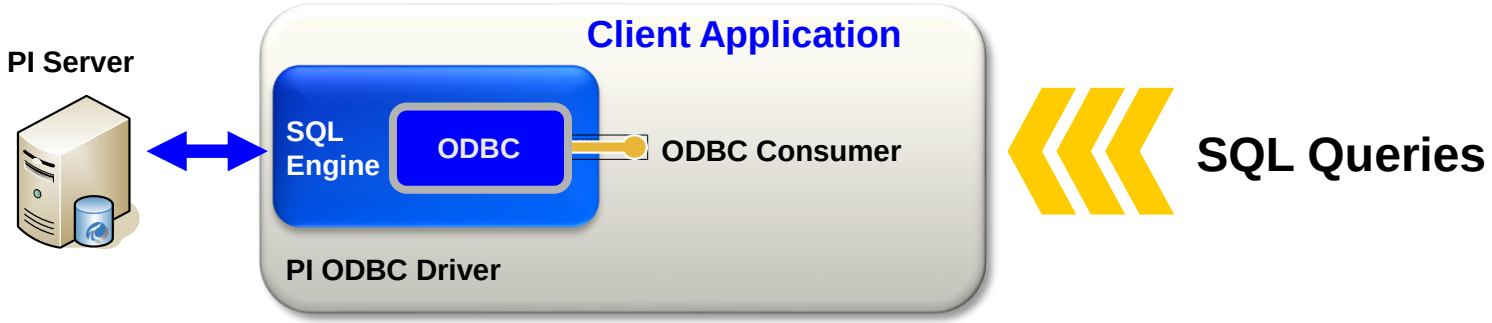


PI OLEDB and PI ODBC

PI OLEDB provider allows applications (OLE DB consumers) working with PI data and configuration through SQL queries:



PI ODBC driver allows applications working with PI data through SQL queries



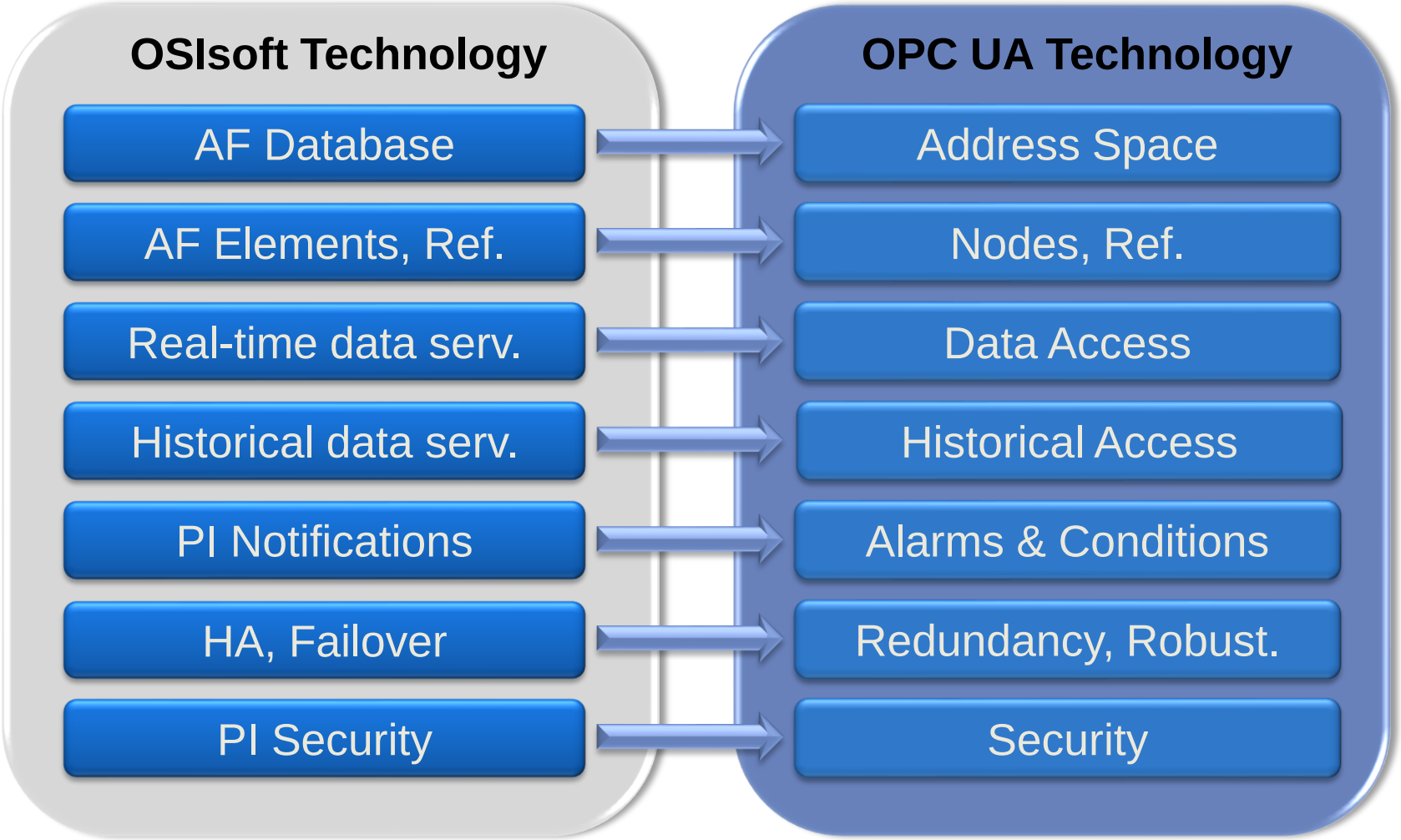
OPC DA / HDA

- PI OPC[1] DA/HDA[2] Server is an OPC server for OSI Software's PI data archives.
- This server interoperates with any OPC client that is compliant with OPC standards.
- This server can be installed on the same system as a PI archive, or it can be installed on a separate system.
- It can serve data from multiple PI SYSTEMS simultaneously.

Note 1: OPC is a synonym for *OLE (=Object Linking and Embedding) for Process Control*. wikipedia: "(OPC) Foundation is an industry consortium that creates and maintains standards for open connectivity of industrial automation devices and systems." More details on www.OPCfoundation.org.org)

Note 2: Data Access / Historical Data Access

Mapping into OPC UA



The Server

- PI Archive
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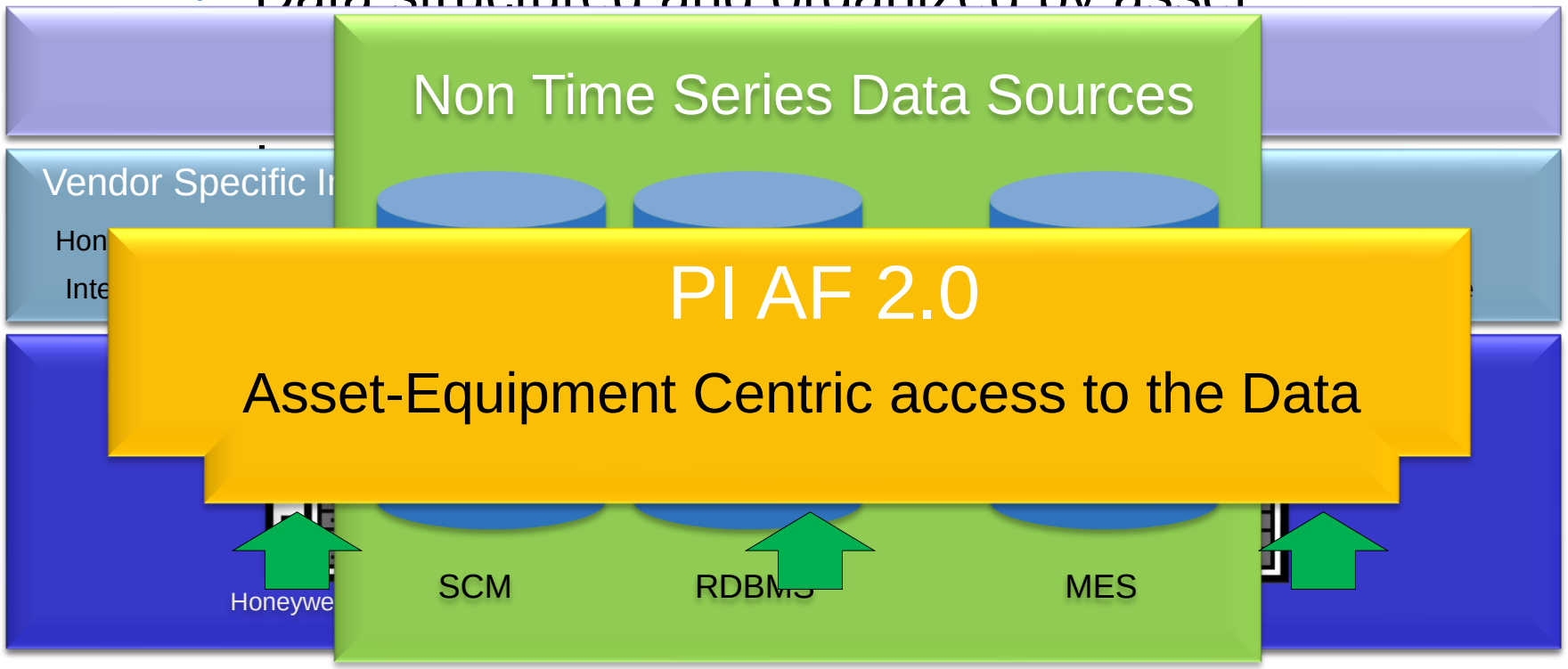
PI AF 2.0 in the PI System

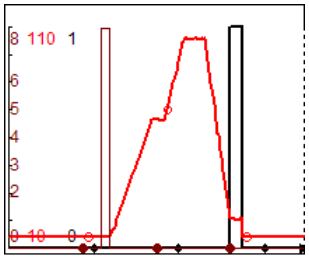
- Data structured and organized by asset



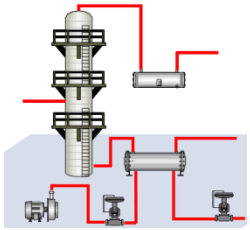
Evolution

Processbook
Datalink
Batch
Performance
Equations

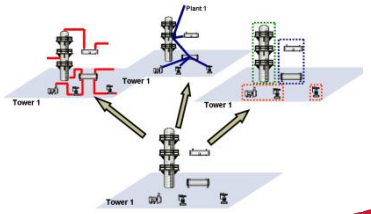
Control Monitor



ACE
Module relative
Displays



Notifications



Tag

Module

Element

Asset

History

Connectivity

PI – Archive

Context

Aliasing

Versions
Hierarchies

Module database

Connections

Templating

Flow sheeting

“foreign” data

Model analyses

Analysis
Framework

1.x

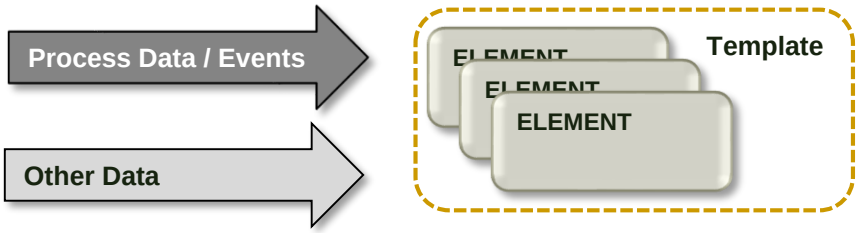
Unification

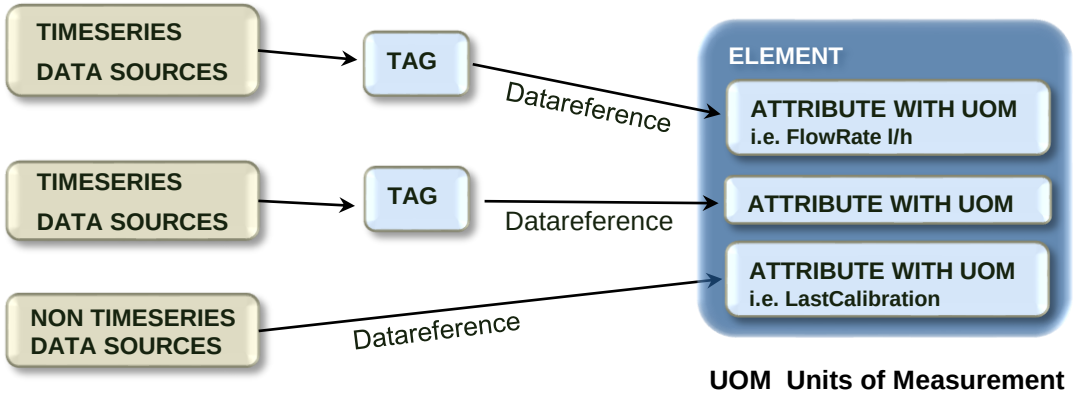
“foreign”
structures

Analysis
Framework

2.x

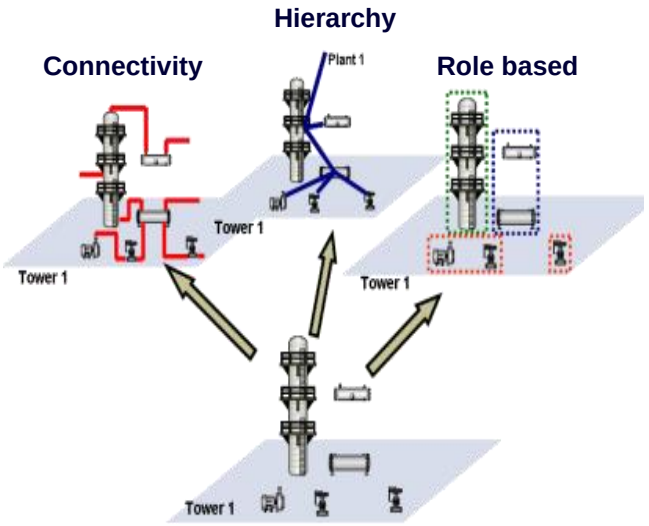
AF – Developed Once – Deployed Everywhere





UOM Units of Measurement

Assets



Collections of **reusable** Elements

The Server

- PI Archive
- PI AF
- Real-Time Interfaces
- Data Access
- MCN Health Monitor

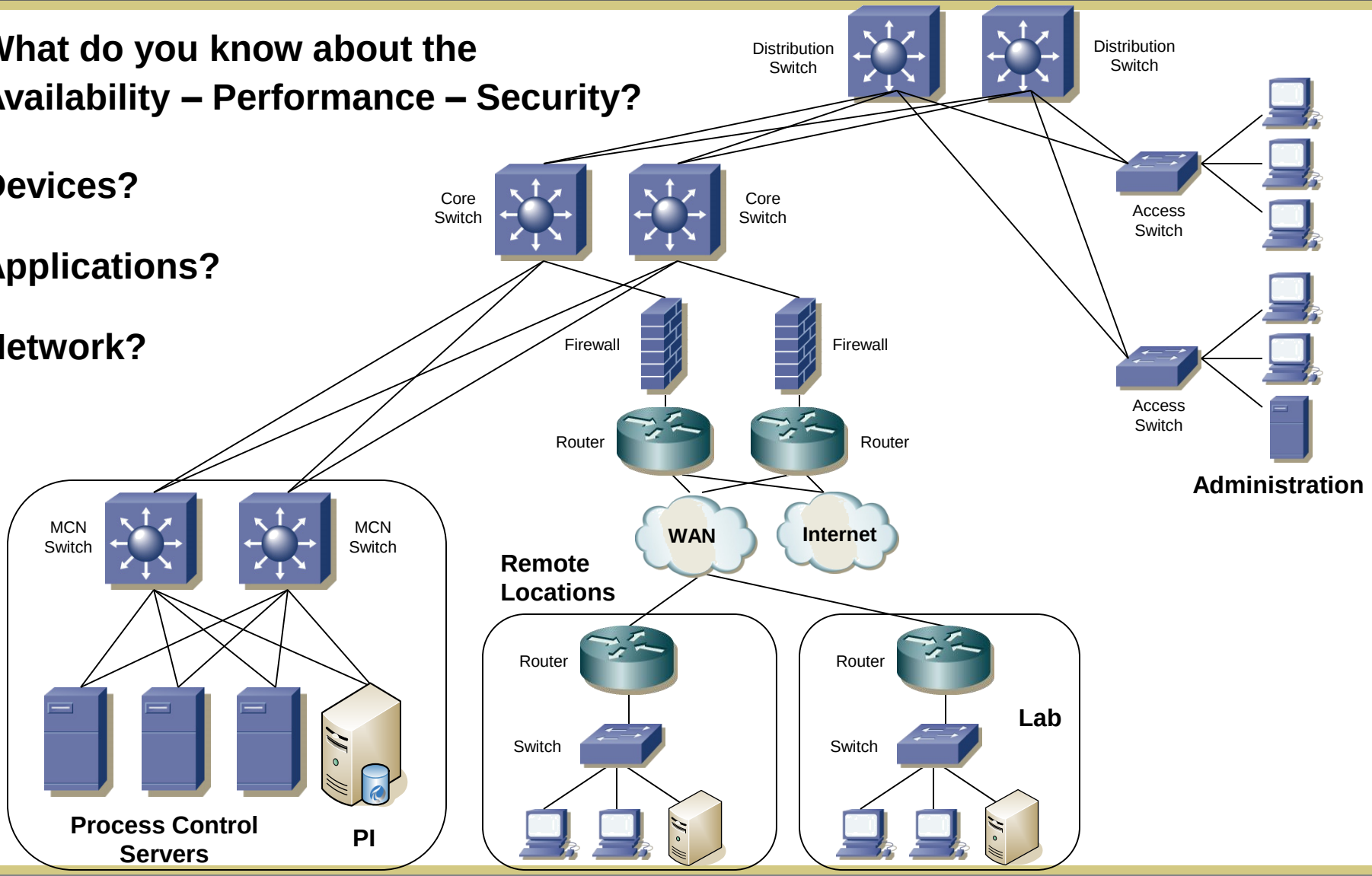
Overview

What do you know about the Availability – Performance – Security?

Devices?

Applications?

Network?



MCN HealthMonitor

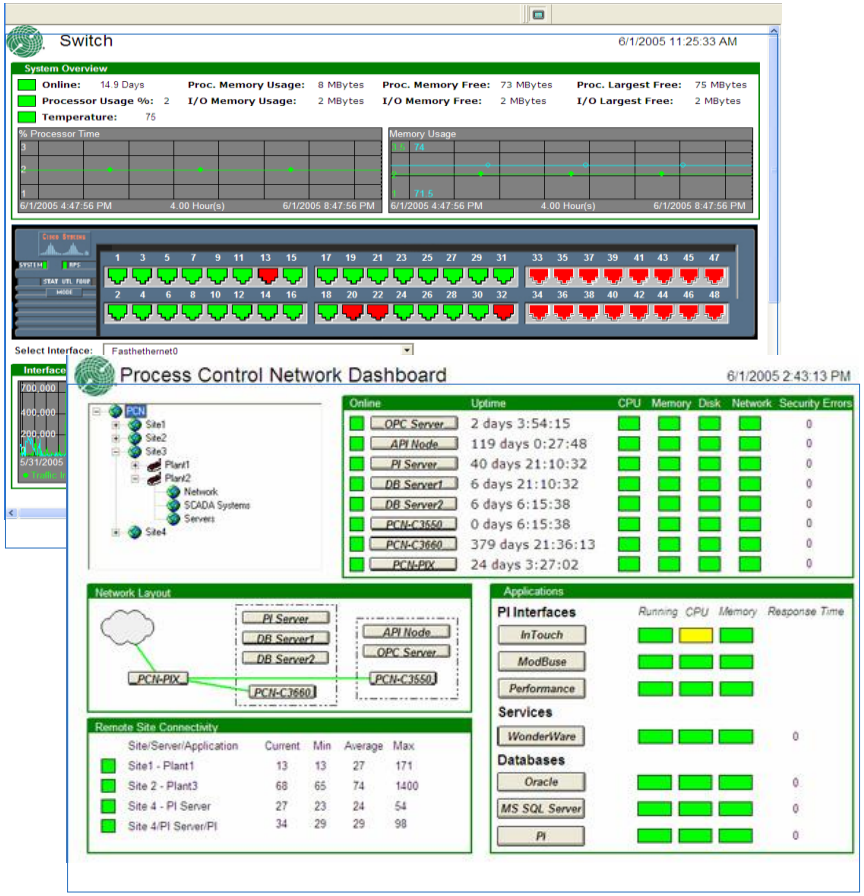
Proactive Communication Infrastructure Monitoring and Informed Decision-Making

Management Console

- IT Organizer
- IT Overview

Monitoring Interfaces

- Perfmon
- SNMP
- PING
- TCP response



Dont mix server and services

Services to run in a PI server environment

- Advanced Computing Engine to combine .NET programming power with PI event power with PI event power on PI reusable structures
- PI notification services to combine Microsoft messaging mechanisms with PI event power on PI reusable structures
- Rtbaseline services to combine portal visualization technology with PI event power on PI reusable structures
- Sigmafine analysis Methods to combine mathematical balance methods with PI event power on PI reusable structures

everything is changing over time

Designed for time series and non time series data:

- High Performance (storage AND retrieval)
  e.g. Timestamp Resolution ~ 15 µs; Sustained Read from Archive ~300.000 values/sec
  and write 100.000 values/sec depends on hardware + multiple users
- Scalability (no practical limits in growth)
  System Size 1.000 to 2.000.000 Data Streams (32 bit) # 1.000 to 10.000.000 Data Streams (64 bit);
  Number of Users limited only by hardware
- High Availability (backbone for business critical applications)
  High Availability for Server collectives and Client failover, actual Part of Platform Release 1
  in development load balancing, peer-to-peer replication
- Security (access to all data with no risk for operations)
  Configuration & Data Security by Tag, Element and User
- Extensibility (be prepared for unplanned integration)
  Supported Standards like OPC DA, OPC HDA, OPC A&E, OPC XML-DA, ODBC, OLE DB, COM, .NET, SNMP, Perf.Counter
- Crossing boundaries (technical, organizational, regional,...)
- Protection of investment: Integration of legacy systems
  e.g. Data from 20 year old DCS shown in Excel Services
- Unified data access to all operations

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