PI Event Frames: Find Your Data by Events

Presented by

Chris Nelson, Software Development Lead, OSIsoft

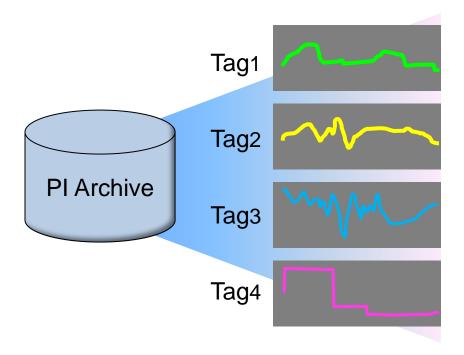Andreas Mueller, TechSupport Escalation Engineer, OSIsoft

Goals

- New capability of the PI System
- Roadmap with multi-phase rollout across platform
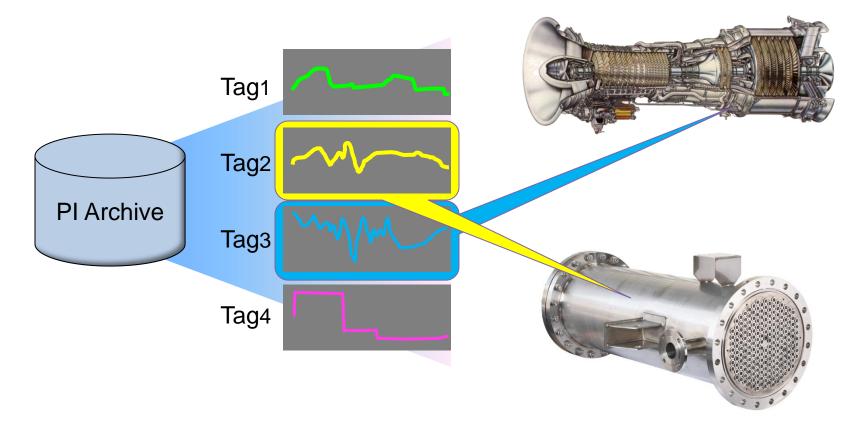- The way forward for PI Batch
- Demos and testimonials

PI Event Frames Vision

Imagine all that data you have been collecting 24/7…

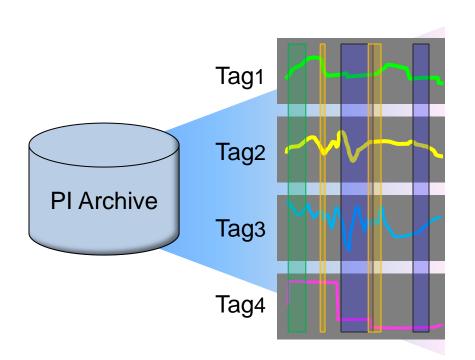# PI Server – Time series data and Tags
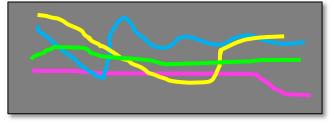
Assets help you find the right Tags
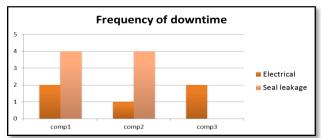
Event Frames help you find the right time periods

PI Archive

Tag1

Tag2

Tag3

Tag4

Frequency of downtime

- Electrical
- Seal leakage

comp1 comp2 comp3

What can PI Event Frames help you understand?

- Downtime and Overall Equipment Effectiveness (OEE)
- Excursions
- Startups, shutdowns
- Products (batch, mining, paper, etc.)
- Shifts, days

Downtime

- Down equipment is not producing
- How often is it down?
- What are causes of downtime?
- Which causes should I address first?

Intro to PI Event Frames

PI Event Frames

- What are these Event Frames?

- Where are these Event Frames?

- They are also a lot like PI AF Elements
  - Templates and indexing and show performance
  - References to assets
  - Attributes

- Demo with the downtime scenario

Event Frames are time periods plus more

Event Frame

Name = DT23032011-2

Start time = 23-Mar-2011 09:32
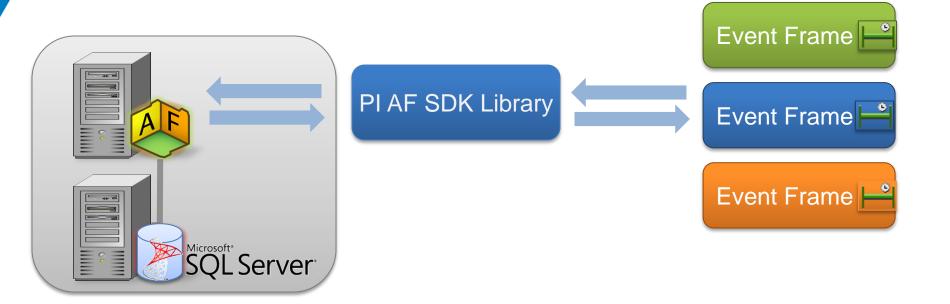
End time = 23-Mar-2011 09:50

Asset = Boiler 3

Attribute = Mechanical

Attribute = Fuel line clogged

An Event Frame records important process or business events and helps you find the related real-time data.

Event Frames are part of PI Asset Framework

Different events have different attributes

Downtime	Startup	Batch
DT23032011-2	ST23032011-2	BPS77-23032011-2
23-Mar-2011 09:3	23-Mar-2011 09:32	23-Mar-2011 09:32
23-Mar-2011 09:50	23-Mar-2011 09:50	23-Mar-2011 09:50
Boiler 3	Turbine 2	Mixer 1
Mechanical	Standard procedure	BPS77
Fuel line clogged		Prepolymer 16
		Feed stock 78-YNW

Name

Start Time

End Time

Related Assets

Event-Specific Attributes

Different events have different attributes

Downtime

DT23032011-2
23-Mar-2011 09:32
23-Mar-2011 09:50
Boiler 3
Mechanical — *Reason code*
Fuel line clog — *Comment*

Startup

ST23032011-2
23-Mar-2011 09:32
23-Mar-2011 09:50
Turbine 2
Standard procedure — *Startup procedure*

Batch

BPS77-23032011-2
23-Mar-2011 09:32
23-Mar-2011 09:50
Mixer 1
BPS77 — *Recipe*
Prepo — *Product*
Feed stock 78-YN — *Source*
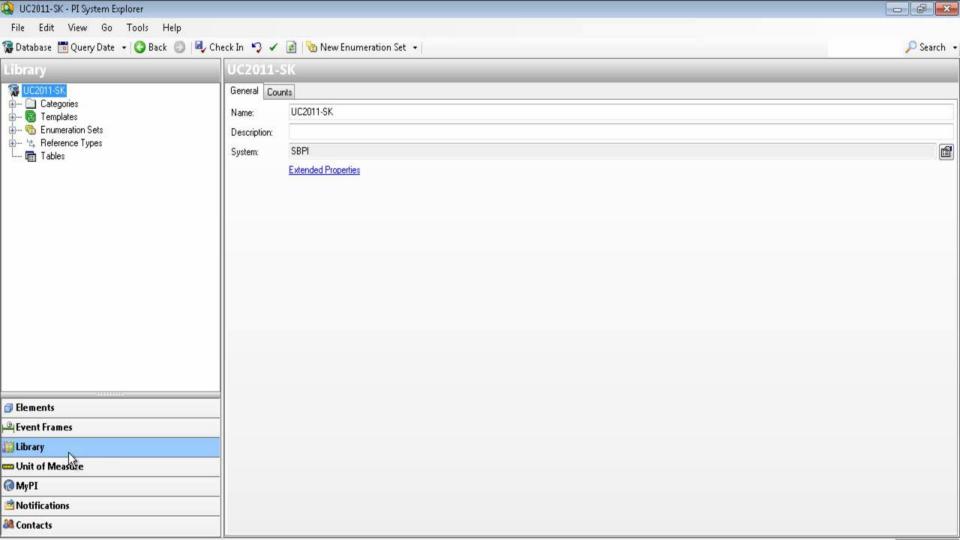
More Event Frames features

- Attributes with units of measure
  - Static numbers and strings
  - PI Point references (value at start or end, or summary value)
  - External data references
- References to other Event Frames

PI Event Frames

File   Edit   View   Go   Tools   Help

Database   Query Date   Back   Check In   New Enumeration Set   Search

Library

- UC2011-SK
  - Categories
  - Templates
  - Enumeration Sets
  - Reference Types
  - Tables

UC2011-SK

General | Counts

Name: UC2011-SK

Description:

System: SBPI

Extended Properties

Elements

Event Frames

Library

Unit of Measure

MyPI

Notifications

Contacts

Summary of Features

- Event Frames are a new time-period datatype
- Event Frames are stored in the PI AF database
- They are a lot like Elements
    - Templates and indexing
    - References to assets
    - Attributes
- References to other Event Frames

The Roadmap

Future State

Event Frames will be supported throughout the PI System

Store in the PI System

Generate Event Frames and use them in calculations

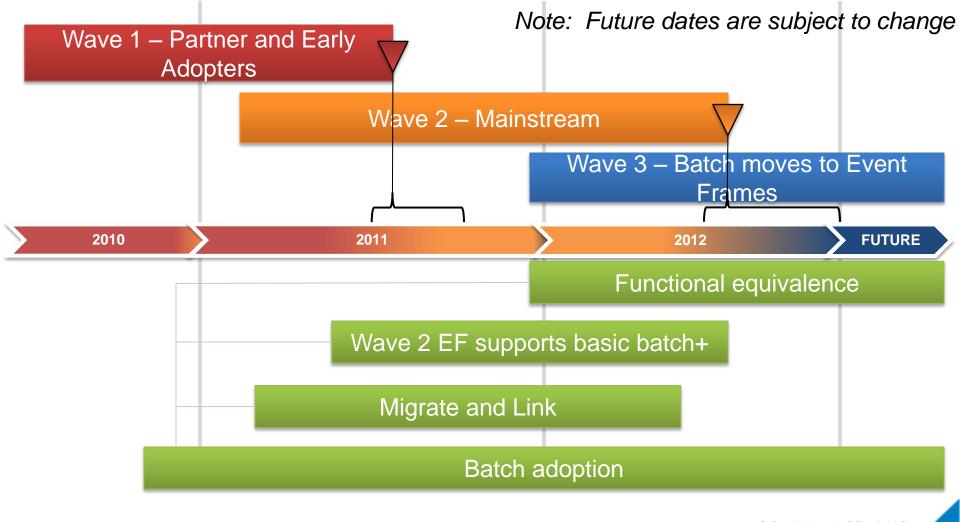View in all PI Clients and relate to time series data

COLLECT · HISTORIZE · FIND · ANALYZE · DELIVER · VISUALIZE

Collect from source systems

Find Event Frames and related data

Access Event Frames and Notify on changes

Note: Future dates are subject to change

Wave 1 – Partner and Early Adopters

Wave 2 – Mainstream

Wave 3 – Batch moves to Event Frames

| 2010 | 2011 | 2012 | FUTURE |

Functional equivalence

Wave 2 EF supports basic batch+

Migrate and Link

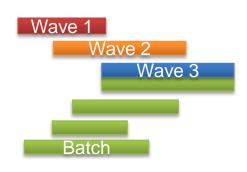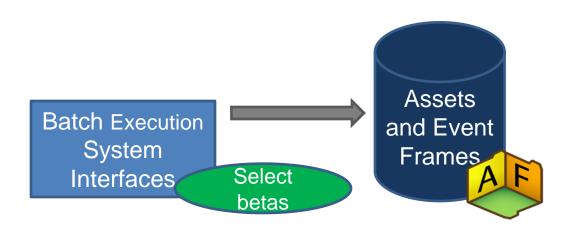Batch adoption

Wave 1 – Partner and Early Adopters

Goal

Infrastructure is able and ready. Partner and custom applications are needed for Event Frame generation and visualization.

Wave 1

Wave 2

Wave 3

Batch

Batch Execution System Interfaces

Select betas

Assets and Event Frames

A F

Scalability

Templates, Reference Types

Microsoft SQL Technology

Usability

Search

Extensible Attributes

Reliability

HA Solutions

Windows Security

PI Event Frames "abilities"

Partners leveraging PI Event Frames

- Keith Flynn of ADM presents:

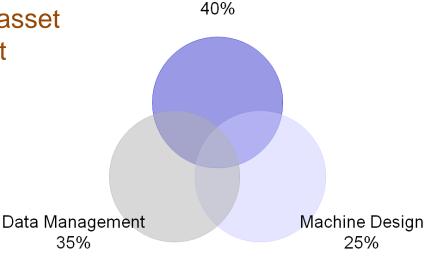- Yannick Galipeau of iTi presents:

About "ADM Systems Engineering Ltd."

- A software company that delivers innovative software solutions to increase plant asset availability, performance and product quality.
- Total staff of 42+
  - Professional Engineers
  - Engineering Technologists
  - Software Development
  - Employee Owned
- Steady, uninterrupted growth since 2002

Automation
40%

Data Management
35%

Machine Design
25%
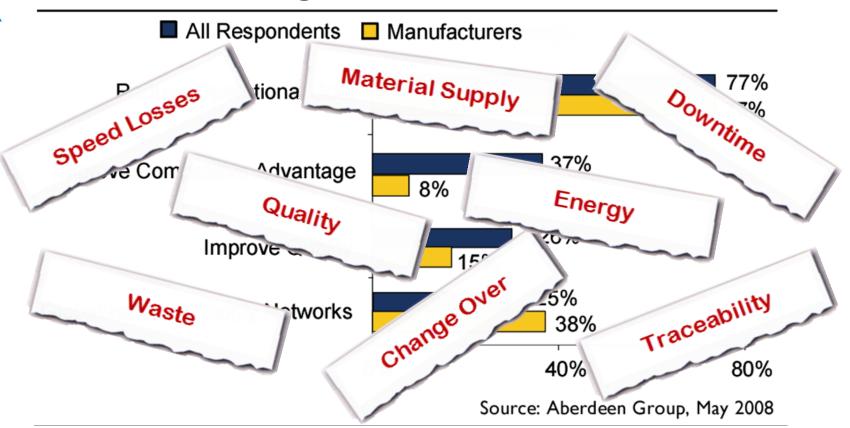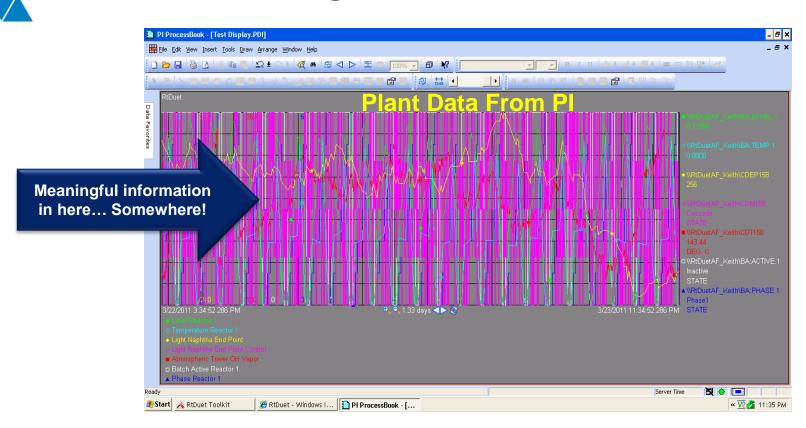
About "ADM Systems Engineering Ltd."

Pressures Facing Manufacturers

All Respondents · Manufacturers

Speed Losses

Material Supply

Downtime

Advantage 37%
8%

Quality

Energy

Improve 15%

Waste

Change Over

Networks 38%

Traceability

40%   80%

77%

Source: Aberdeen Group, May 2008

Pressures Facing Manufacturers

Meaningful information in here… Somewhere!

Plant Data From PI

Our Solution - RtDuet

RtDuet generates event frame records
Users add reason codes and comments

RtDuet provides insightful reports
Users can take corrective action

Optimize Performance - Reduce Downtime - Increase Profitability

Our Solution – RtDuet under the hood.

- RtDuet, the leading Manufacturing Execution System (MES) only available for the PI System
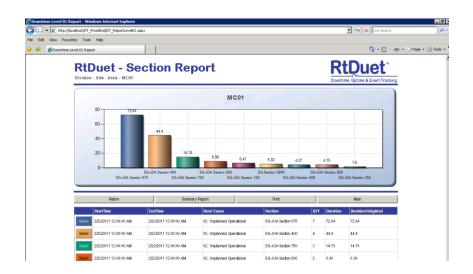- Event Tracking and Reporting for time based and condition based triggers:
  - Downtime
  - Energy
  - Production
  - Quality
  - Raw Material
  - Environmental
  - Events (PID Auto to Manual)
  - Reporting

What does RtDuet do?

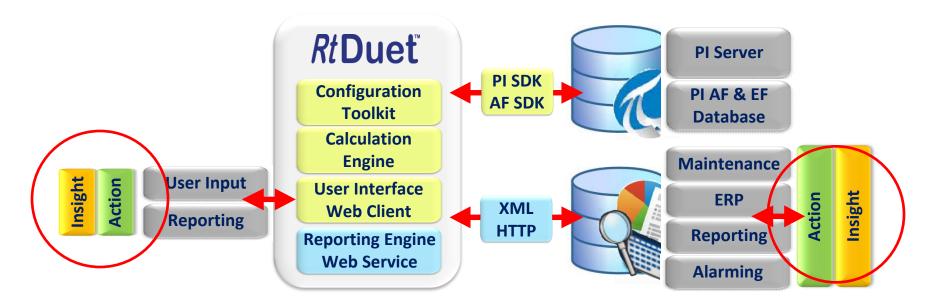- Automatically generates operational performance information.

- Exposes business logic using a configuration environment driven by templates.

- Calculates real-time Key Performance Indicators (KPI).

- Delivers information
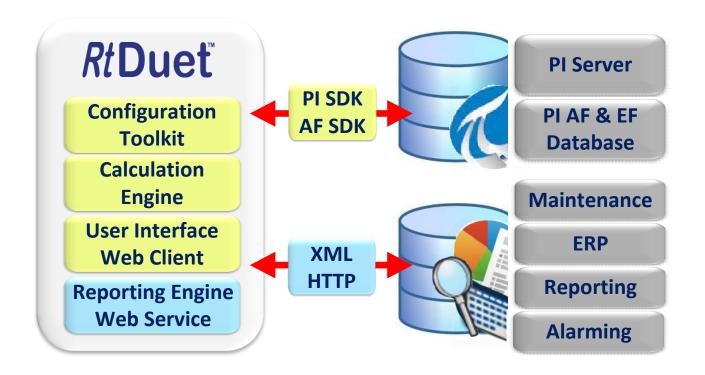
What is RtDuet?
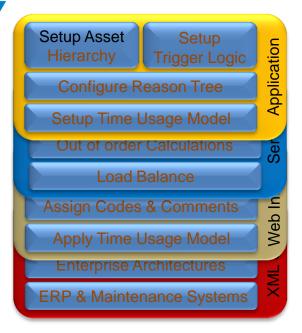
RtDuet is a bolt on application for OSIsoft's PI System that systematically records and analyses the occurrence and cause of equipment events.
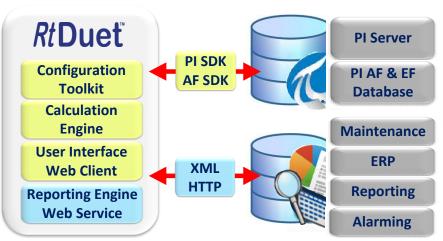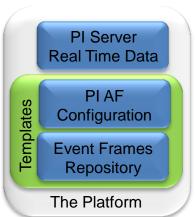
What is RtDuet?

What is RtDuet?

34

RtDuet uses Templates

Templates

- PI AF Configuration
- Event Frames Repository
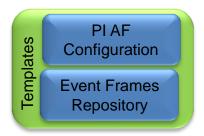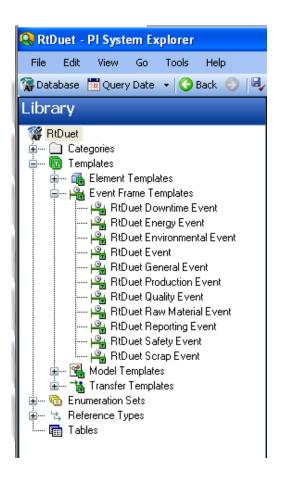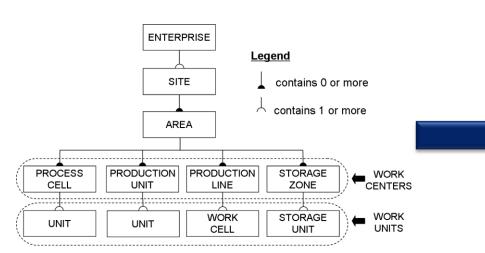
- Reduces implementation cost

- Provides flexibility

- Exposes business logic

- Allow changes to the model

- Large number of model instances

- Enforcement of model standards

- Allows us to match customer requirements.
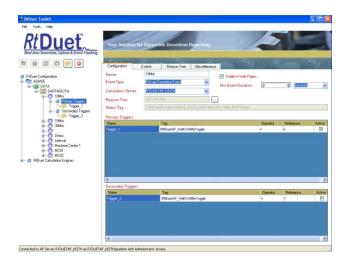
RtDuet – Configuration
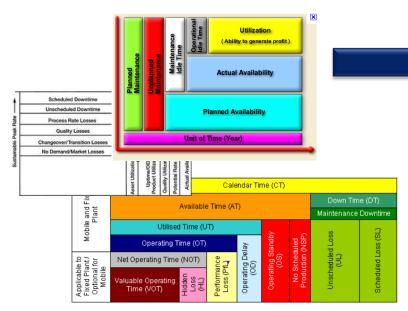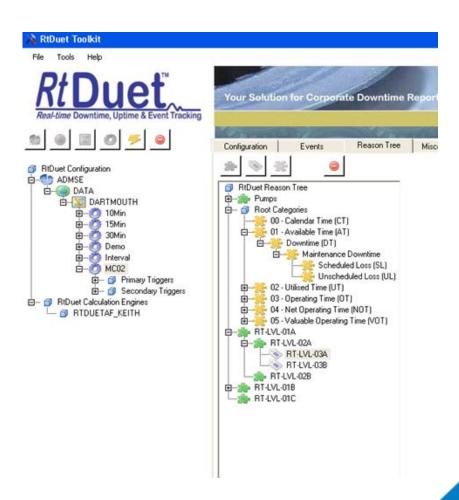
- Graphical Toolkit
- ISA95 Domain Hierarchy
- Setup triggers using PI Tags
- Setup Reason Tree
- Setup Time Usage Model

RtDuet – Configuration

- Setup Reason Tree
- Setup Time Usage Model
- Exposes Business Logic
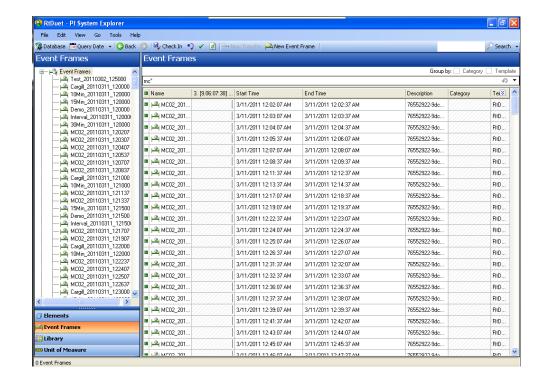
RtDuet – Calculation Engine
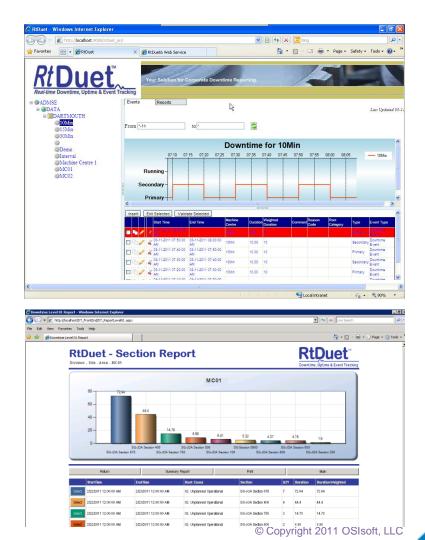
- **Event Frame Generator**
  - Triggers and Time
  - Based on Templates
- **Real-time Calculations**
- **Out of order**
- **Load Balancing**

RtDuet – User Interface

Visualize, Edit & Validate

Reports KPIs

Assign Codes & Comments

Apply Time Usage Model

Web Interface
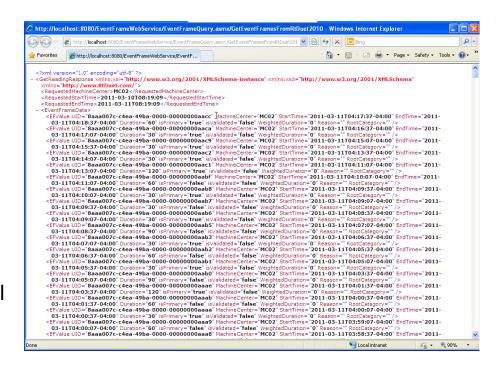
- Operators and Managers are presented with events automatically captured
- Manual data entry
- Role-based security
- Navigation using tree views
- Data trees for user content
  - Reason Trees
  - Time Usage Models
  - Product specific data
- Reports
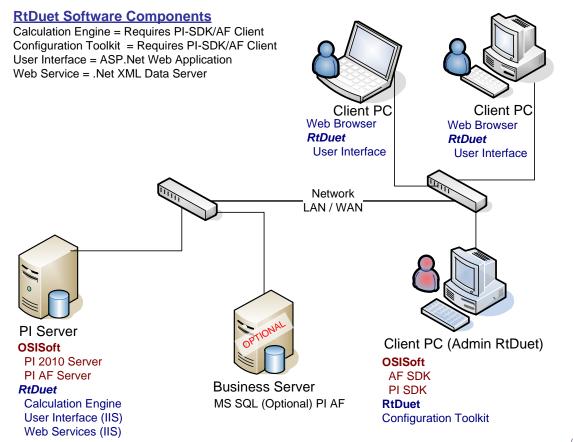
RtDuet – Integration
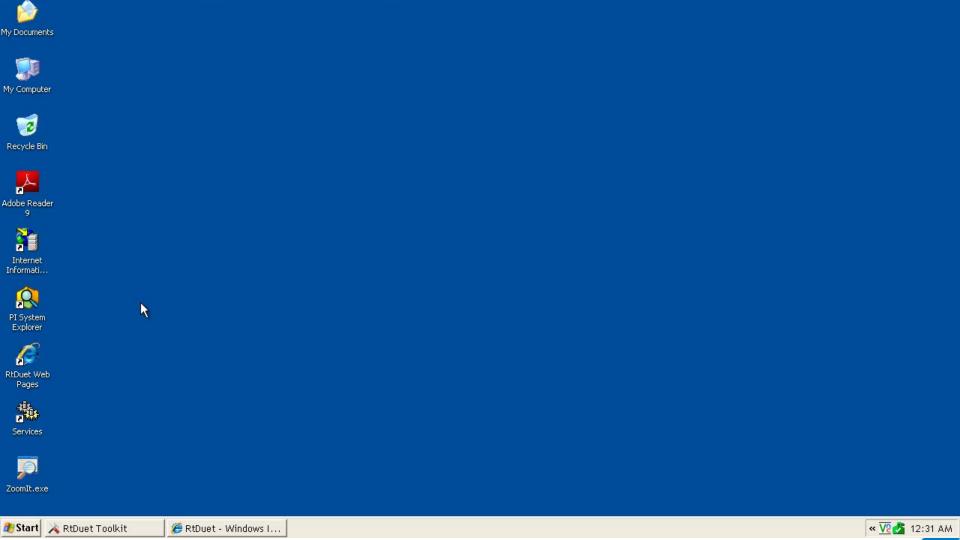
- **Web Services**
- Integrating enterprise architectures
  - ERP Systems
  - Maintenance applications
- Expose data and functionality for external systems
  - Reporting Services
  - Cognos
  - Excel
- Custom user interfaces and applications

Installation Architecture

RtDuet Software Components
Calculation Engine = Requires PI-SDK/AF Client
Configuration Toolkit = Requires PI-SDK/AF Client
User Interface = ASP.Net Web Application
Web Service = .Net XML Data Server

Client PC
Web Browser
RtDuet
  User Interface

Client PC
Web Browser
RtDuet
  User Interface

Network
LAN / WAN

PI Server
OSISoft
  PI 2010 Server
  PI AF Server
RtDuet
  Calculation Engine
  User Interface (IIS)
  Web Services (IIS)

OPTIONAL

Business Server
MS SQL (Optional) PI AF

Client PC (Admin RtDuet)
OSISoft
  AF SDK
  PI SDK
RtDuet
Configuration Toolkit

Demo

Questions

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    CIO - ADM Systems Engineering Ltd.
    Phone: +44 20 3239 8574
    Mobile: +1 902 476 8574
    Email: flynnk@admse.com

- Pablo Asirón, P.Eng.
    Manager - Data Management Group
    ADM Systems Engineering Ltd.
    Mobile: +1 506 229 5709
    Email: pablo@admse.com

    Web: www.admse.com

ITI History

- Founded in 2000

- Headquarters and R&D center located in Montreal, Canada

- Developer of the Ekho System

- Ekho is currently in use in Canada, United-States and Europe

- Working with OSIsoft since the beginning of ITI

- Early Adopter of OSIsoft technologies (PI AF, PI Event Frames)

What is Ekho?

Ekho is an Event Driven, EMI Software *(Enterprise Manufacturing Intelligence)*

- **Packaged Cases**
- **Chemical Reactor Batch**
- **Steel Coil**
- **Raw Material Lot #**
- **Reel of Paper**
- **Equipment Downtime**
- **Order**
- **Complaint**
- **Wind Turbine Fault**

- **Environmental Spill**
- **Process Centerline Event**
- **Quality upset**
- **KPI (OEE)**
- **Injury**
- **Recipe**
- **….**

Ekho System Features

- Production Tracking, Genealogy and Traceability

- Process Centerlining

- Quality and Specifications Management

- Automatic Downtime / Rate Loss Captures and Management

- Performance Management Calculations (OEE & KPI's)

- Accident and Injury Tracking

- Ad-Hoc Extractions and Data Analysis

- Web Reporting & Silverlight Web Dashboards

Market and Customers

System Architecture

Ekho Users

Ekho

PI Event Frame

PI AF

PI Server

For Connectivity:

- **PI AF SDK**
- **PI OLEDB Enterprise**
- **PI OLEDB Provider**
- **PI SDK**
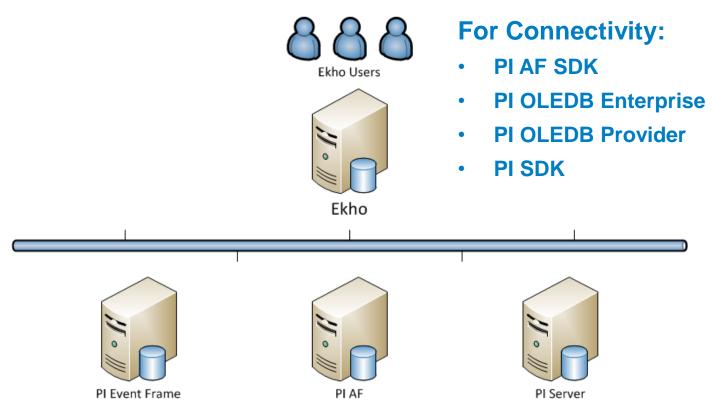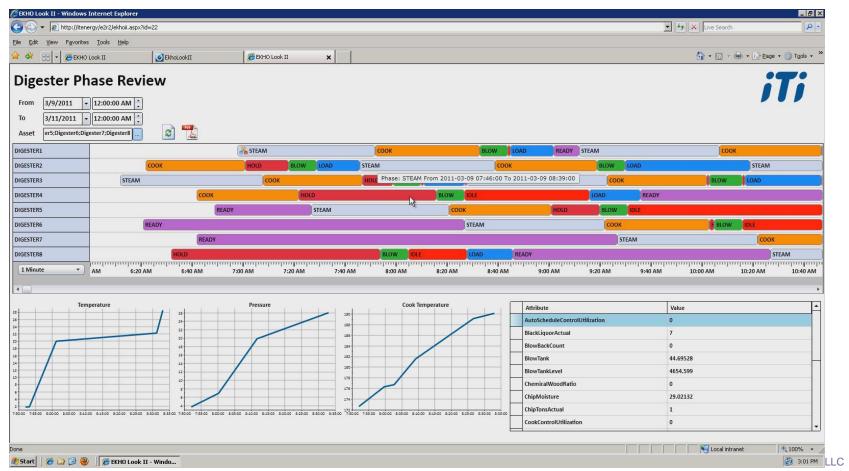
Why ITI is using to PI Event Frames and PI AF?

- Faster Development for our applications

- Generic re-usable routines development

- Allows us to focus on added values features on top of OSIsoft Infrastructures (multi language, specifications, markers)

- Complete the Integration of Ekho with OSIsoft platforms (PI Server, PI AF, PI Event Frames)

- Allows OSIsoft Clients Applications to use Ekho Data
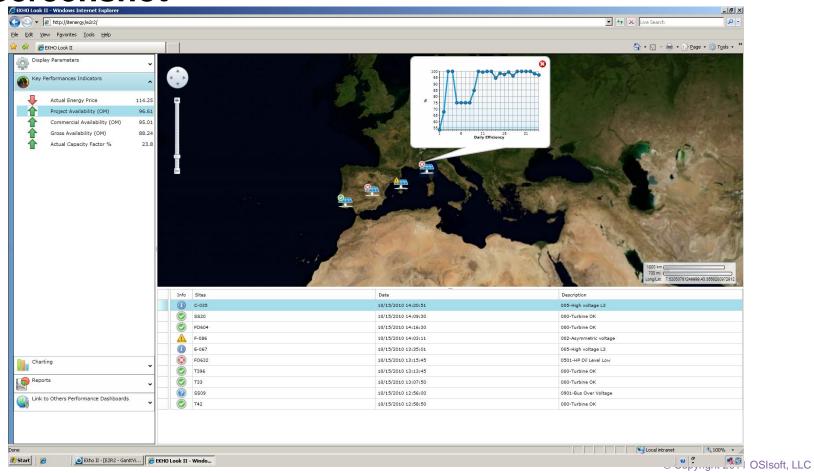
Screenshot
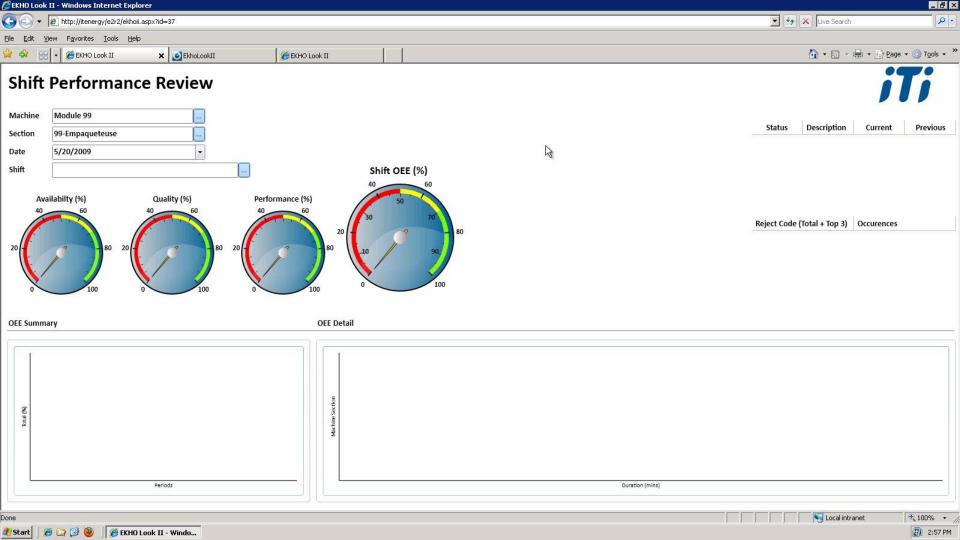
Screenshot

Screenshot
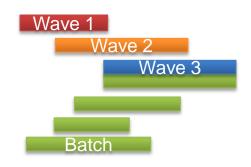
File   Edit   View   Favorites   Tools   Help

EKHO Look II   EkhoLookII   EKHO Look II

Page   Tools

Shift Performance Review

iTi

Machine	Module 99	...
Section	99-Empaqueteuse	...
Date	5/20/2009	
Shift		...

Status	Description	Current	Previous

Availabilty (%)   **Quality (%)**   **Performance (%)**   **Shift OEE (%)**

Reject Code (Total + Top 3)	Occurences

OEE Summary   OEE Detail

Total (%)   Periods

Machine Section   Duration (mins)

Done   Local intranet   100%

Start   EKHO Look II - Windo...   2:57 PM

Wave 1 – Partner and Early Adopters

Goal: *Infrastructure is able and ready. Partner and custom applications are needed for Event Frame generation and visualization.*
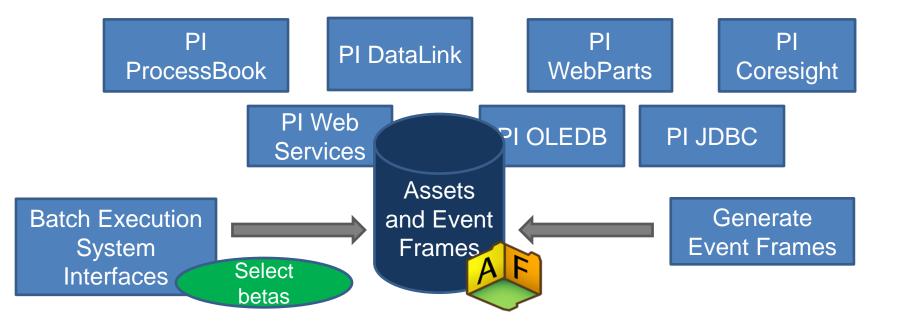
- CTP
  - OSIsoft vCampus
- Release
  - 3rd Quarter 2011 as part of the next release of the PI Asset Framework

Wave 2 – Mainstream

Goal: *First end-to-end Event Frames experience. Ability to generate Event Frames automatically. Several visualization options.*

PI ProcessBook

PI DataLink

PI WebParts

PI Coresight

PI Web Services

PI OLEDB

PI JDBC

Batch Execution System Interfaces

Select betas

Assets and Event Frames

Generate Event Frames

	A	B	C	D	E
1	Name	Start Time	End Time	Duration (Days)	Asset(s)
2	AC Failure 1	7/4/2010 15:15	7/5/2010 15:15	1.000	East AC
3	AC Failure 2	7/6/2010 13:17	7/6/2010 15:45	0.103	West AC
4	AC Failure 3	7/6/2010 19:15	7/7/2010 20:15	1.042	East AC
5	AC Failure 4	7/24/2010 15:15	7/25/2010 15:15	1.000	East AC
6	AC Failure 5	7/26/2010 12:05	7/26/2010 15:01	0.122	West AC
7	AC Failure 6	8/12/2010 16:38	8/12/2010 19:15	0.109	East AC
8	AC Failure 7	9/1/2010 11:05	9/1/2010 14:55	0.160	East AC
9	AC Failure 8	9/23/2010 15:15	9/24/2010 15:15	1.000	East AC
10	AC Failure 9	9/25/2010 15:15	10/1/2010 10:05	5.785	Backup AC
11	AC Failure 10	10/4/2010 18:18	10/5/2010 11:19	0.709	East AC

Event

Single Value — Multiple Value — Calculation — Update — Resources — Notifications

AC Failure Search

Display
- ☑ Name
- ☑ Start Time
- ☑ End Time
- ☑ Duration
- ☑ Asset(s)
- -- Value(s)
  - ☐ Min
  - ☐ Max
  - ☐ Start
  - ☐ End
  - ☐ Avg

PI DataLink Scenario 1: Pareto

Current Value | Archive Value ▾ | Compressed Data ▾ | Sampled Data ▾ | Timed Data | Calculated Data ▾ | Time Filtered ▾ | EVENTS | Update | Settings | About | Help | Notification Search

Single Value | Multiple Value | Calculation | Event Frames | Update | Resources | Notifications

Start Time	End Time	Asset(s)	Attribute	Min	Max	Start	End	Avg
7/4/2010 15:15	7/5/2010 15:15	East AC	Inlet Temp	65	102	92	85	88
			Outlet Temp	65	76	65	65	68
			Outside Temp	65	98	85	82	82
7/6/2010 13:17	7/6/2010 15:45	West AC	Inlet Temp	55	98	74	80	65
			Outlet Temp	65	77	75	65	72
			Outside Temp	55	93	84	81	76
7/6/2010 19:15	7/7/2010 20:15	East AC	Inlet Temp	57	97	72	96	68
			Outlet Temp	65	78	76	66	75
			Outside Temp	57	94	89	77	76
7/24/2010 15:15	7/25/2010 15:15	East AC	Inlet Temp	56	101	76	95	72
			Outlet Temp	65	79	78	72	75
			Outside Temp	55	98	85	92	77
7/26/2010 12:05	7/26/2010 15:01	West AC	Inlet Temp	51	97	75	93	69
			Outlet Temp	65	78	77	71	72
			Outside Temp	51	95	86	80	78
8/12/2010 16:38	8/12/2010 19:15	East AC	Inlet Temp	53	98	72	80	68
			Outlet Temp	65	79	77	72	73
			Outside Temp	52	96	89	72	81

AC Failure   🔍 Search ▾

Display
☐ Name
☑ Start Time
☑ End Time
☐ Duration
☑ Asset(s)
-- Value(s)
☑ Min
☑ Max
☑ Start
☑ End
☑ Avg

PI DataLink Scenario 1: Pareto with Expanded Data

PI DataLink Scenario 2: Event Frames in existing functions

Wave 2 – Mainstream

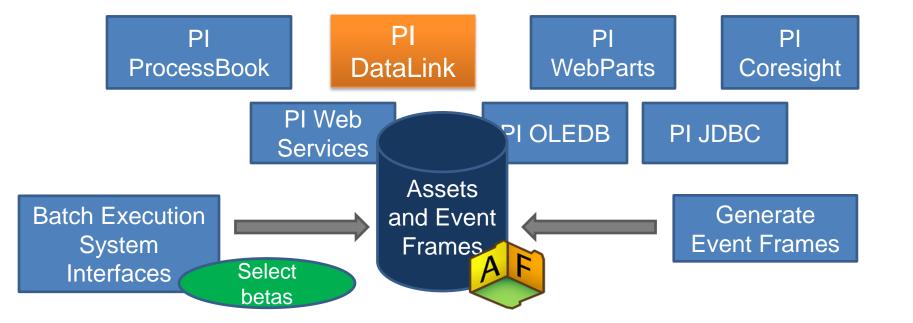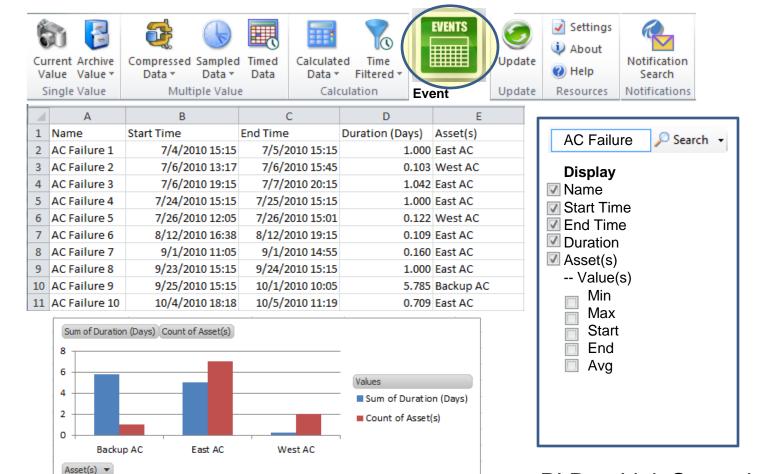**Goal:** *First end-to-end Event Frames experience. Ability to generate Event Frames automatically. Several visualization options.*
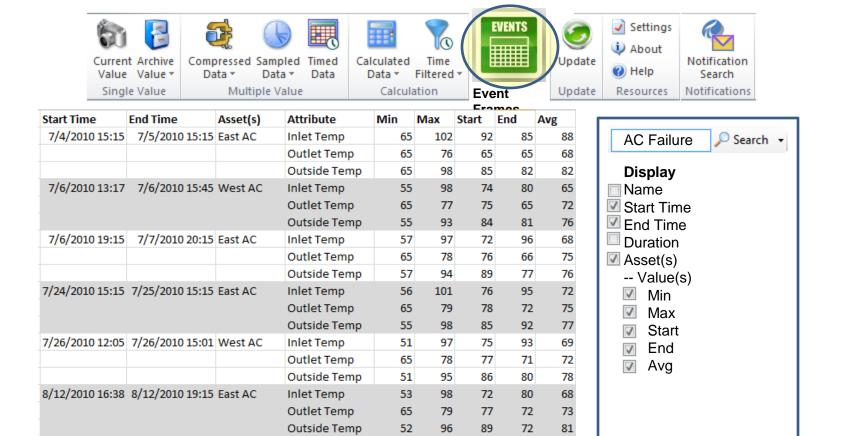
Wave 1
Wave 2
Wave 3
Batch
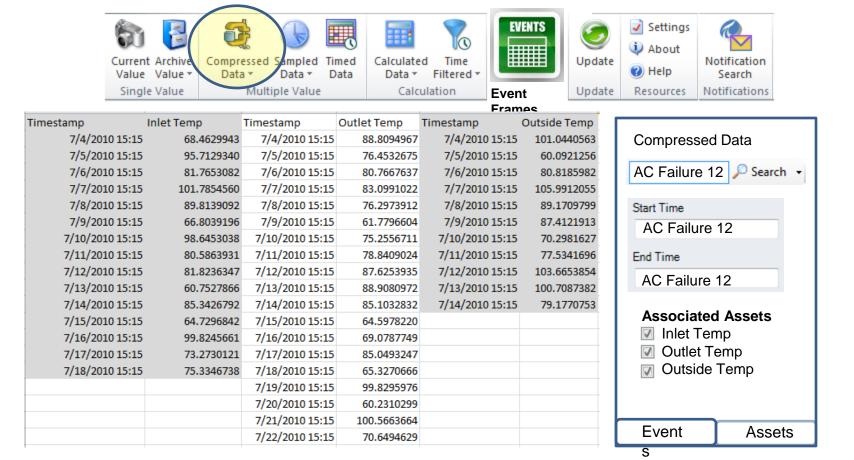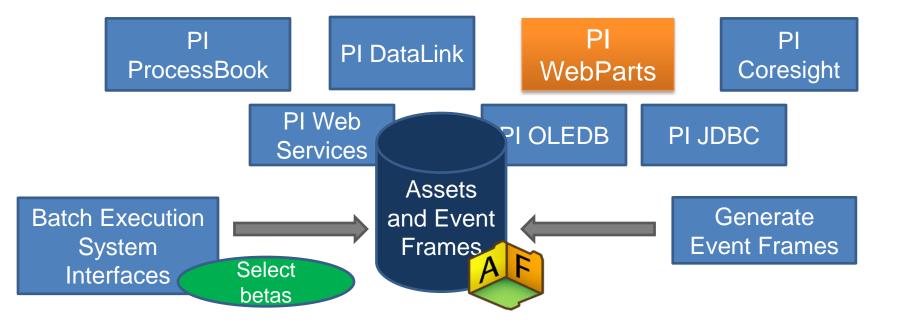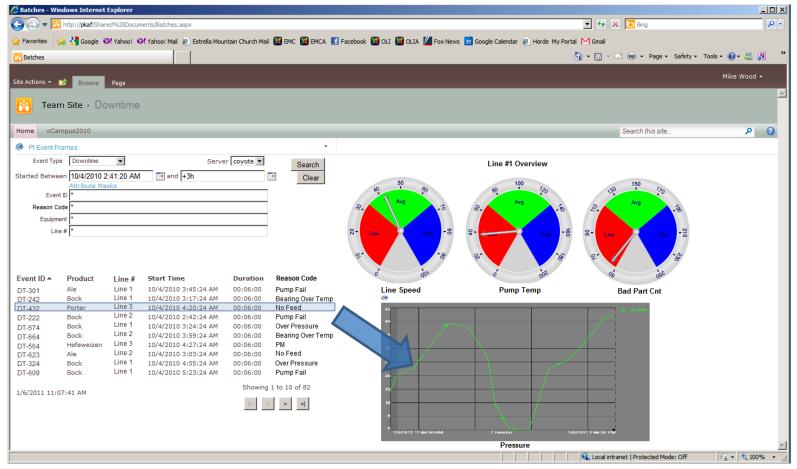
PI ProcessBook

PI DataLink

PI WebParts

PI Coresight

PI Web Services

PI OLEDB

PI JDBC

Assets and Event Frames

Batch Execution System Interfaces

Select betas

Generate Event Frames

PI WebParts: Event Frames Table

Wave 2 – Mainstream

Goal: *First end-to-end Event Frames experience. Ability to generate Event Frames automatically. Several visualization options.*

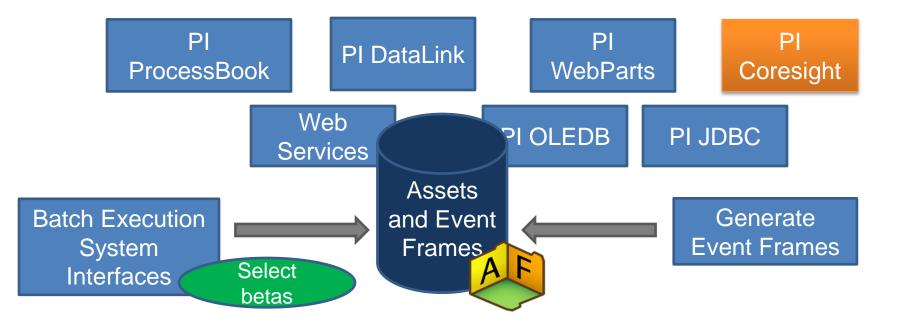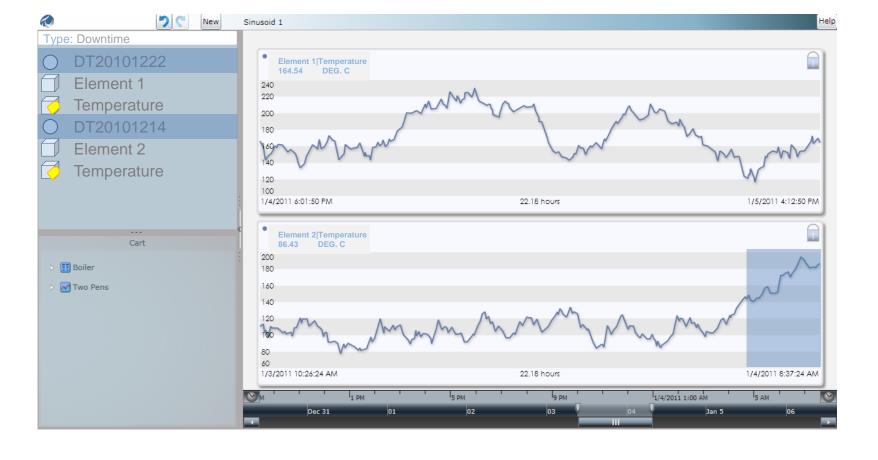| PI ProcessBook	PI DataLink	PI WebParts	PI Coresight

Web Services	PI OLEDB	PI JDBC

Assets and Event Frames

AF

Batch Execution System Interfaces → Assets and Event Frames ← Generate Event Frames

Select betas

PI Coresight: Event Frames Search and Trends