

REAL-TIME PERFORMANCE MANAGEMENT FOR THE ENTERPRISE

**RtPM**



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أرامكو السعودية  
Saudi Aramco



# Migrating Operations Applications to PI: How Much Do You Gain?

By  
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**OSIsoft User Conferences**  
**Frankfurt, 18 May 2005**

# Outline



- Introduction about Saudi Aramco “SA”
- Extend of PI use in SA
- Data flow to Operations Coordination Center “OCC”
- Business case to migrate applications from SCADA to PI
- Mapping SA Solution to OSIsoft technology offering
- Examples of applications migrated to PI
  - Tank Monitoring Application “TMA”
  - LinePack of sales gas system Application
- Technical challenges & solutions
- Benefits
- Future enhancements

# Saudi Arabian Oil Company



- Leads the world in crude oil production and export
- Major natural gas producer
- Top explorer of Natural Gas Liquids (NGL)
- Responsible for about 1/4 of the world's proven oil reserves
- Five Refineries, seven gas and NGL plants, and four joint ventures with two main refiners and lubricants companies
- Number of joint ventures around the world in oil & gas refining business
- Headquarters in Dhahran – Saudi Arabia
- +50,000 employees

# Extend of PI Use in Saudi Aramco

- SA is one of the major users of PI-UDS & applications in the Middle East
- Over 100 PI installations.
- Number of tags is close to 0.9 million tags.
- Hundreds of PI clients/applications licenses (ACE, ProcessBook, DataLink, DAP, etc.)
- Central PI server for Operations Coordination Center “OCC” that monitors -on real time basis- the critical operations of oil, gas and refined products for:
  - Production
  - Distribution
  - Storage
  - Exportation





## Saudi Aramco PI Sites

Kuwait

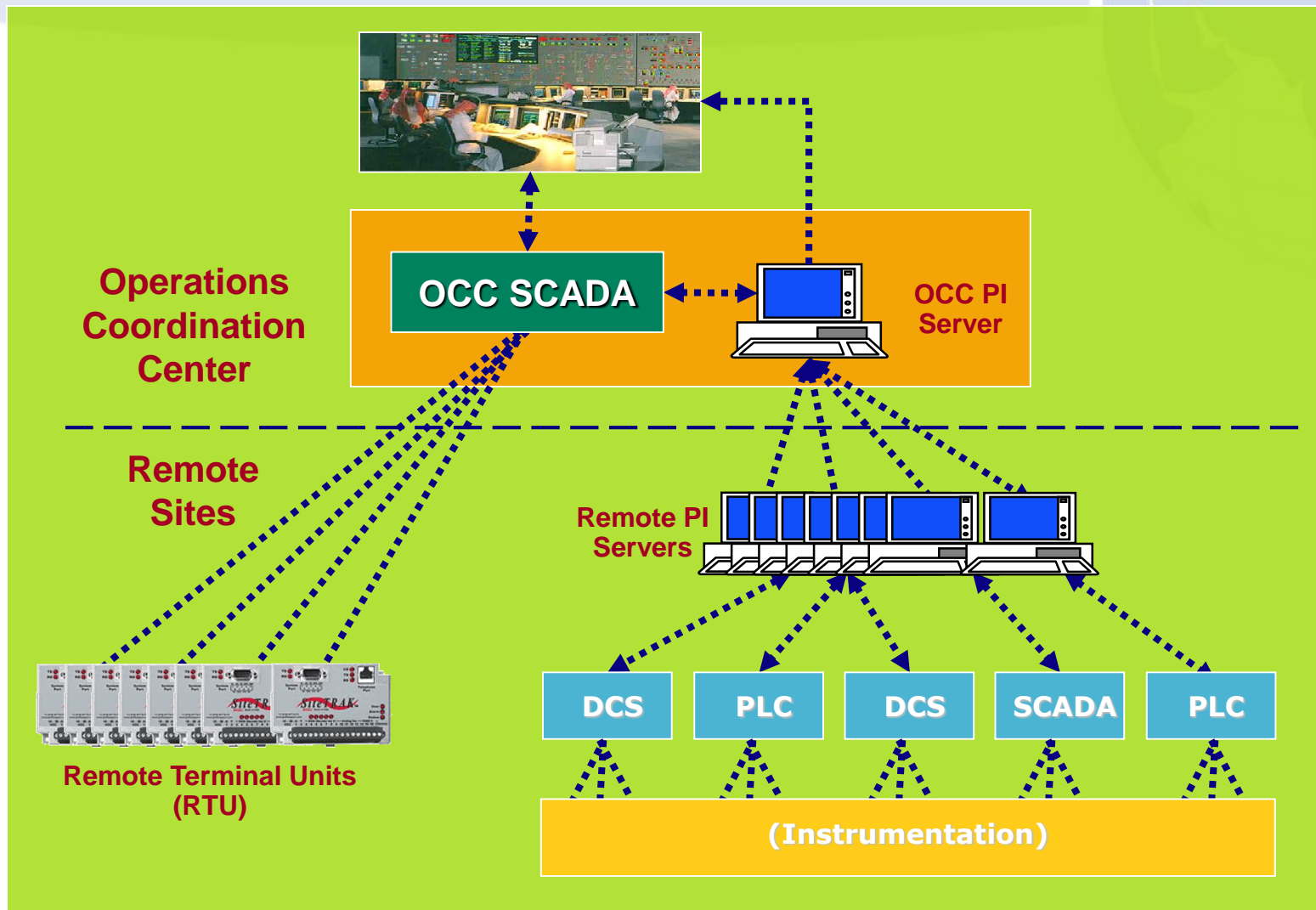
Doha

Riyadh

Jeddah

OCC

# Data Flow to OCC

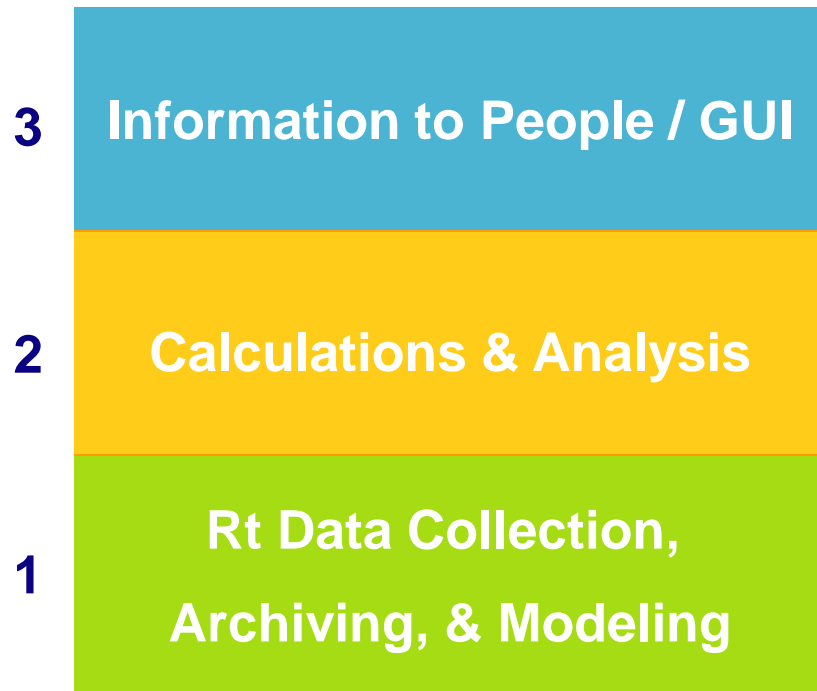


# Business Case

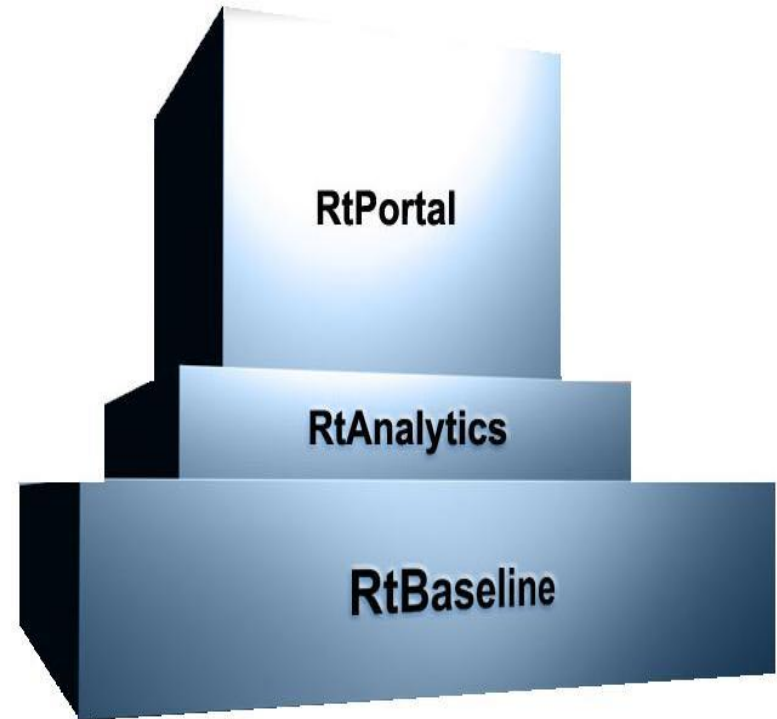
- Why do we need to migrate applications from SCADA?
  - High & additional costs on planned SCADA upgrades
  - Hard to maintain & modify
  - Difficult to manipulate data
- Why do we need to use PI software?
  - Off the shelf Systems don't meet operational requirements
  - High cost of the ready made systems with (not needed) addition functions
  - Need for real-time & historian data
  - Need to store static information (PI-ModuleDB)
  - Need to develop DB with hierarchical structure & store static information (PI-ModuleDB)
  - Need to develop on-line calculations (PI-ACE)



# Mapping SA Solution to OSIsoft Technology Offering



**SA Solution Architecture**



**OSIsoft RtPM**



# Tank Monitoring Application

- Customized application residing on the top of the central SCADA
- Used by OCC planners and engineers to monitor oil & gas storages and movements
- Contains essential information about major tanks of terminals, refineries, gas plants, gas & oil separation plants, & tankfarms

# Tank Monitoring Application

The screenshot displays the 'Tank Monitoring Application' interface. The main window, titled 'TANK SUMMARY', shows a list of tanks with columns for Tank ID, Tank Group, and Tank Name. A 'Select Tank to pop-up' button is visible. Below the list, the 'Current' tank is identified as '888'. The interface also includes a 'Tank Search' section with a 'Last Tank' button and a 'Done' button.

Overlaid on the main window is a 'PI Module Database Editor - Microsoft Internet Explorer' window. The address bar shows the URL: 'C:\Program Files\pip\SMT\MDBEditor\MDBEditor.html'. The main content area displays a tree view of the database structure under 'Context1'. The tree view shows a hierarchy of folders and sub-modules, including 'PI BatchDB', 'PI ModuleDB', '%OSI', 'ACEClassLibraries', 'ACEExecutables', 'PI\_TMA2', 'TMA\_TC1', and 'Tank\_calc'. The 'Tank\_calc' folder is expanded, showing a list of sub-modules: 'Context1', 'Context10', 'Context100', 'Context101', 'Context102', 'Context103', 'Context104', 'Context105', 'Context106', 'Context107', 'Context108', and 'Context109'.

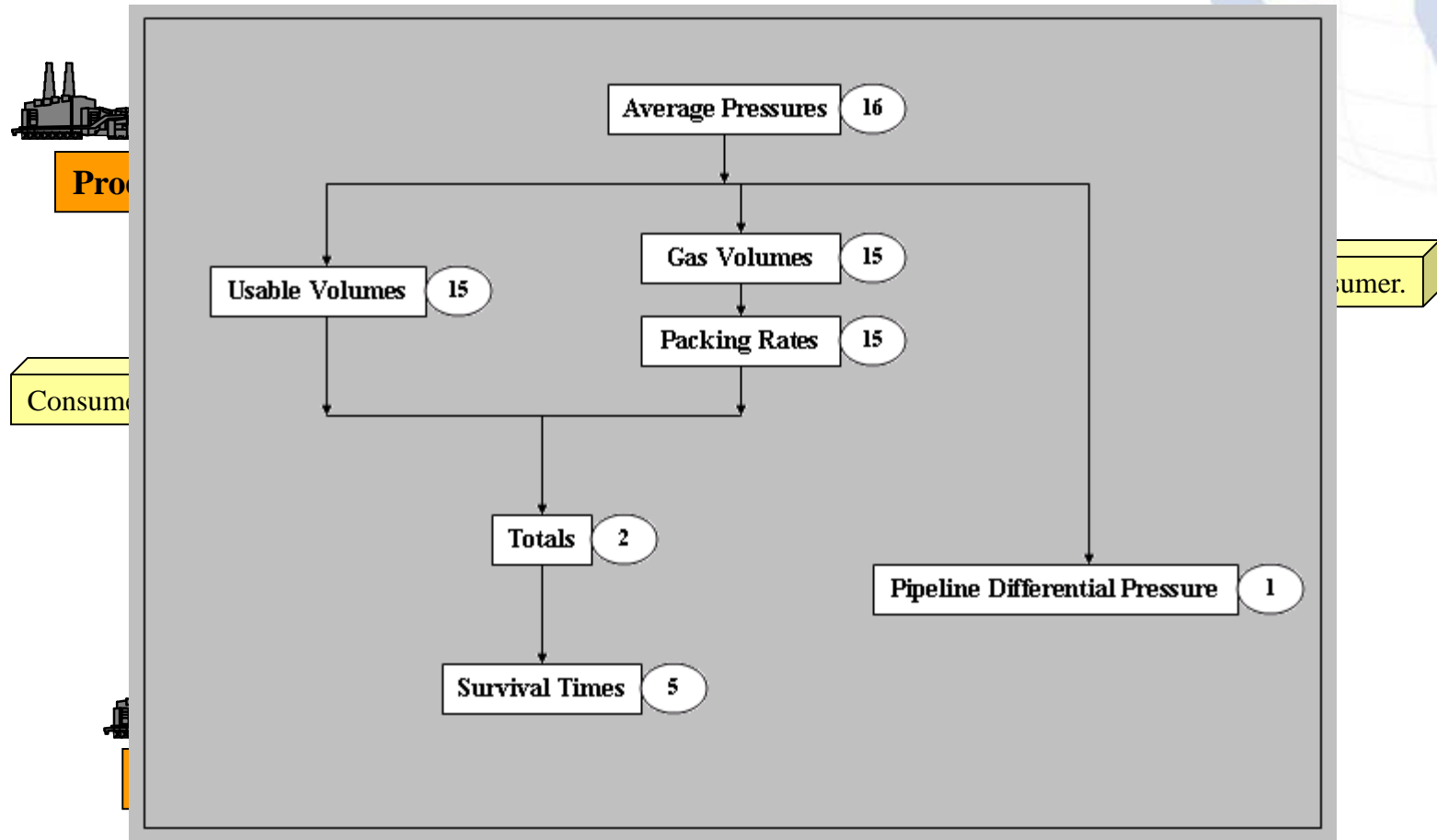
The 'Context1' sub-module is selected, and its properties are displayed in a table:

PIProperty Name	Value	Data...
CalculationLimit	600	Integer
ErrorMessage		String
IsModified	0	Long
MessageLevel	5	Long
Name	\\pisvr\TMA_T1\ABQAIQ-TF-1\814	String
Priority	3	Integer
RevHistory	0	Long
Rev1	0	Long
Date	1062312648	PITime
Priority	3	Integer
ScheduleInfo	0	Long
Offset	0	Long
Period	300	Double
UserID	piadmin	String
Status	1	Long
StatusSince	1063322261	PITime
ScheduleInfo	0	Long
Offset	0	Long
Period	300	Double

The status bar at the bottom of the database editor window shows: '0 Objects Type: PIModule Aliases: 0 Properties: 10 Effective Date: 1/1/1970 3:00:01 AM Query Date: 9/16/2003 12:44:46'. The status bar also includes buttons for 'Done', 'DATA', 'SNAPSHOT', and 'My Computer'.

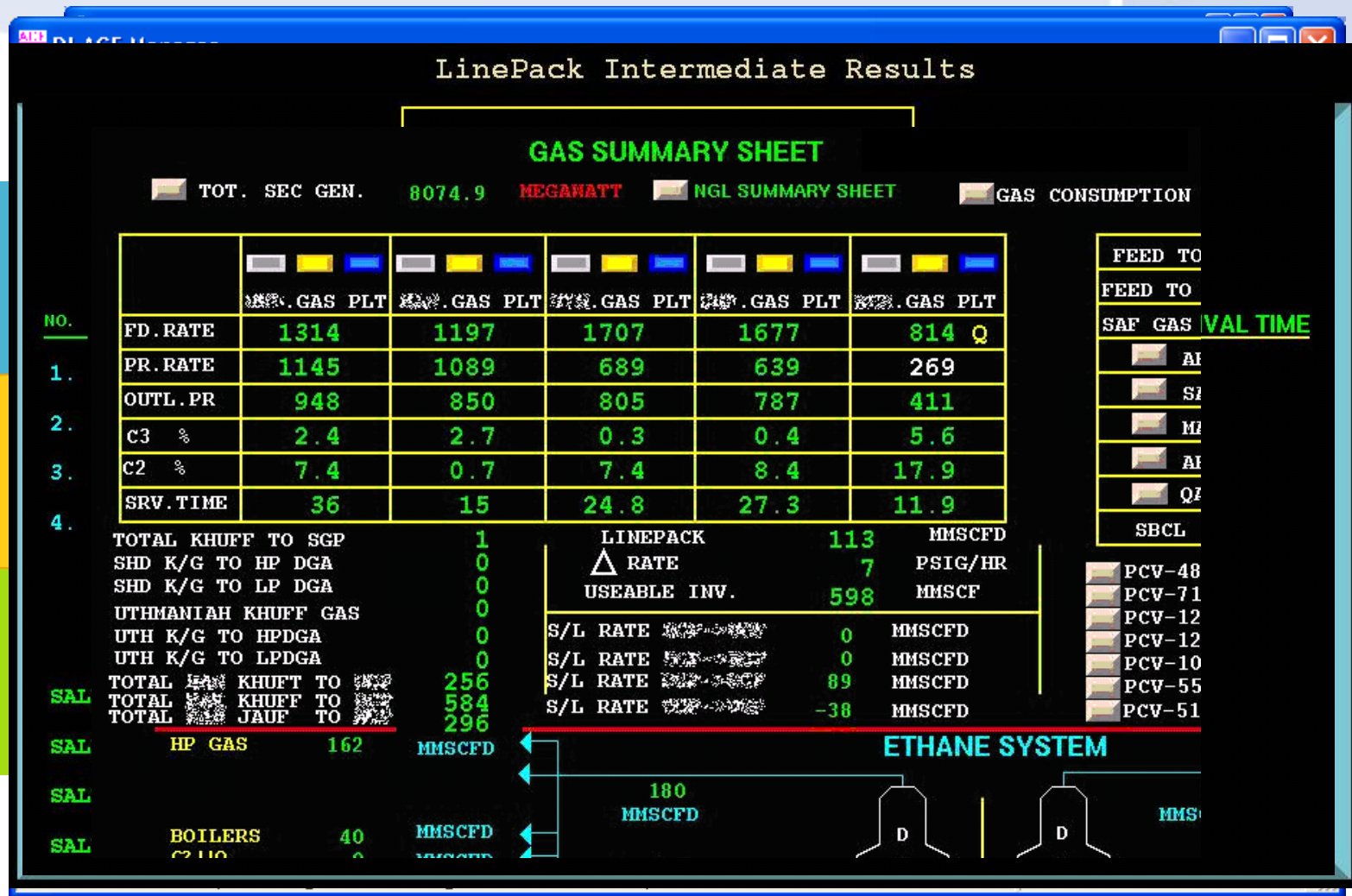


# LinePack Application





# LinePack Application



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# Technical Challenges & Solutions

## Problems

**Difficult to move node on Tank**

- Large number of calculations
- Continuous number of minutes

- Need to work with process
- Significant number of users

**Switching and process calculations**

**Security changes**

**Switch applications to Servers**

PIProperty Name	Value	Datatype
Full Name	Rayan H. Hafiz	String
RPD	True	Boolean
OIL	True	Boolean
NGL	True	Boolean
Division	CAST	String

0 Objects Type: PIModule Aliases: 0 Properties: 5 Effective Date: 1/1/1970 3:00:01 AM

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# Benefits

- General
  - Reduce the scope of future SCADA upgrades that will save cost and ensure ease of execution (up to \$0.5M)
  - Avoid high cost of other COTS Software (up to \$1M)
  - Ensure ease of software support by the in-house expertise within SA
- TMA
  - Provide ease of access through Web Based GUI on every PC.
  - Provide accurate results using field strapping tables instead of the minimized strapping table used in the SCADA-TMA
  - Provide less data interface layers
- LinePack Application
  - Provide on the fly Modifications & Additions of new Segments
  - Save the cost of purchasing not needed SW packages

# Future Enhancements

- Moving the GUI from PI-ProcessBook & PI-ActiveView to thin client web application
- Replacing the PI modules structure with new version of PI-ModuleDB that is SQL based (To be done by OSI)
- Re-implement all calculations on PI-ACE
- Implement successful applications at all sites as corporate solutions (i.e. TMA)



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