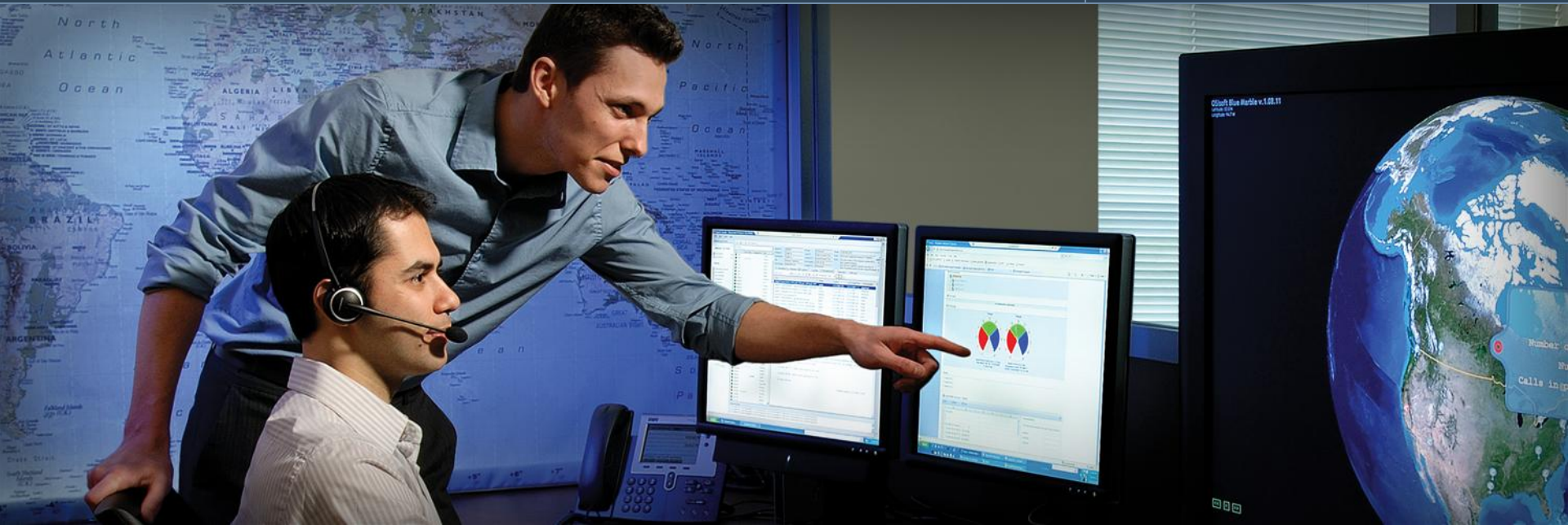




Regional Seminar Series Detroit, Michigan, USA

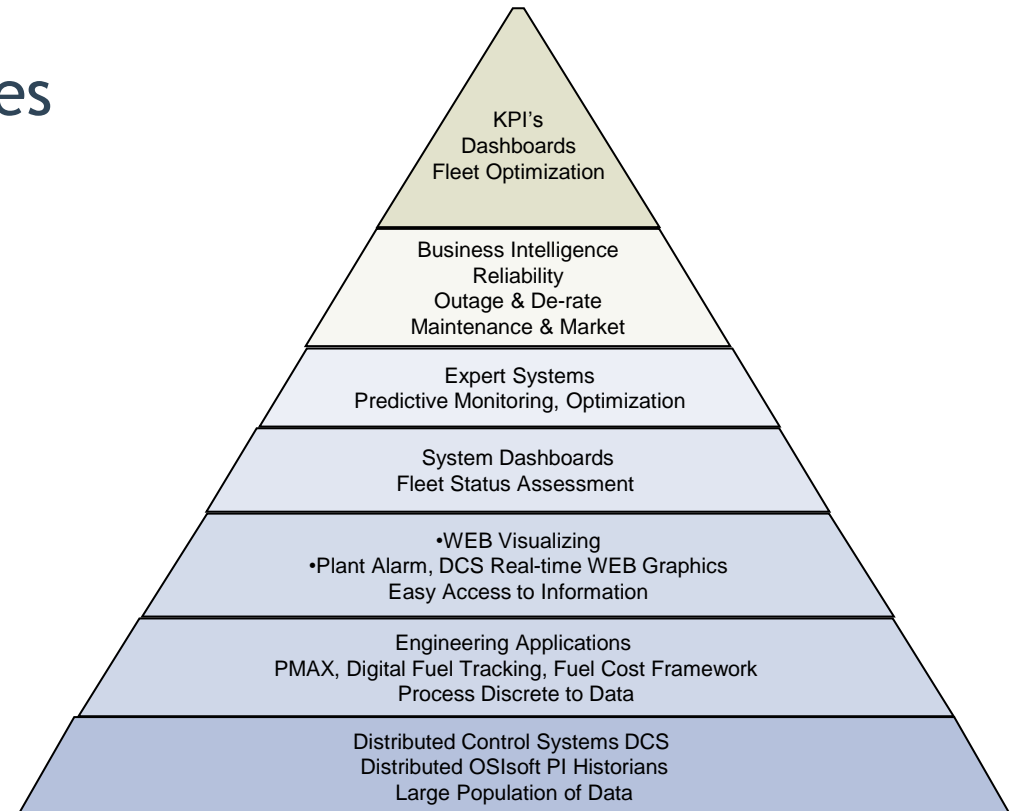


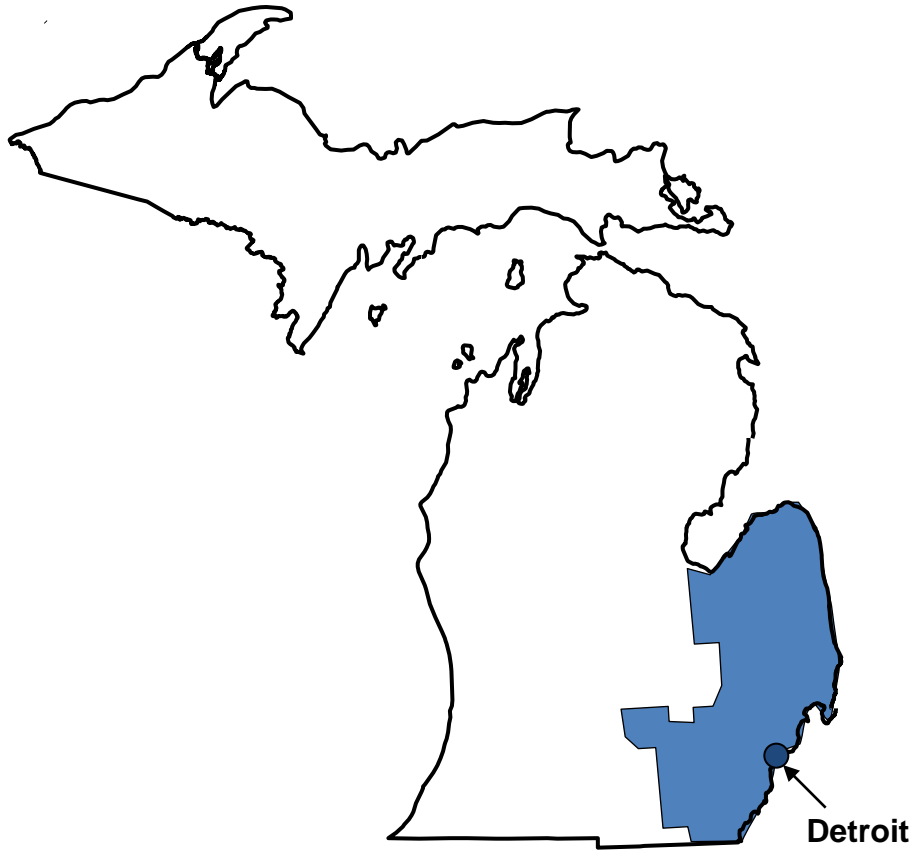
Managing Infrastructure using the PI System

Sumanth K. Makunur / Priyanka Gupta
DTE Energy

10/14/2010

- About DTE Energy
- Technology Framework
- Infrastructure challenges
- Solutions
- NERC-CIP
- Benefits
- Questions?





Detroit Edison

- Michigan's largest electric utility with 2.1 million customers
- Over 11,080 MW of power generation, primarily coal fired
- 54,000 GWh in electric sales
- \$4.7 billion in revenue

 DTE Energy - Detroit Edison

Plants & Performance Center



Monroe – 3,135 mw



Belle River – 1,260 mw



Trenton Channel - 730 mw



Performance Center – 11,588 mw



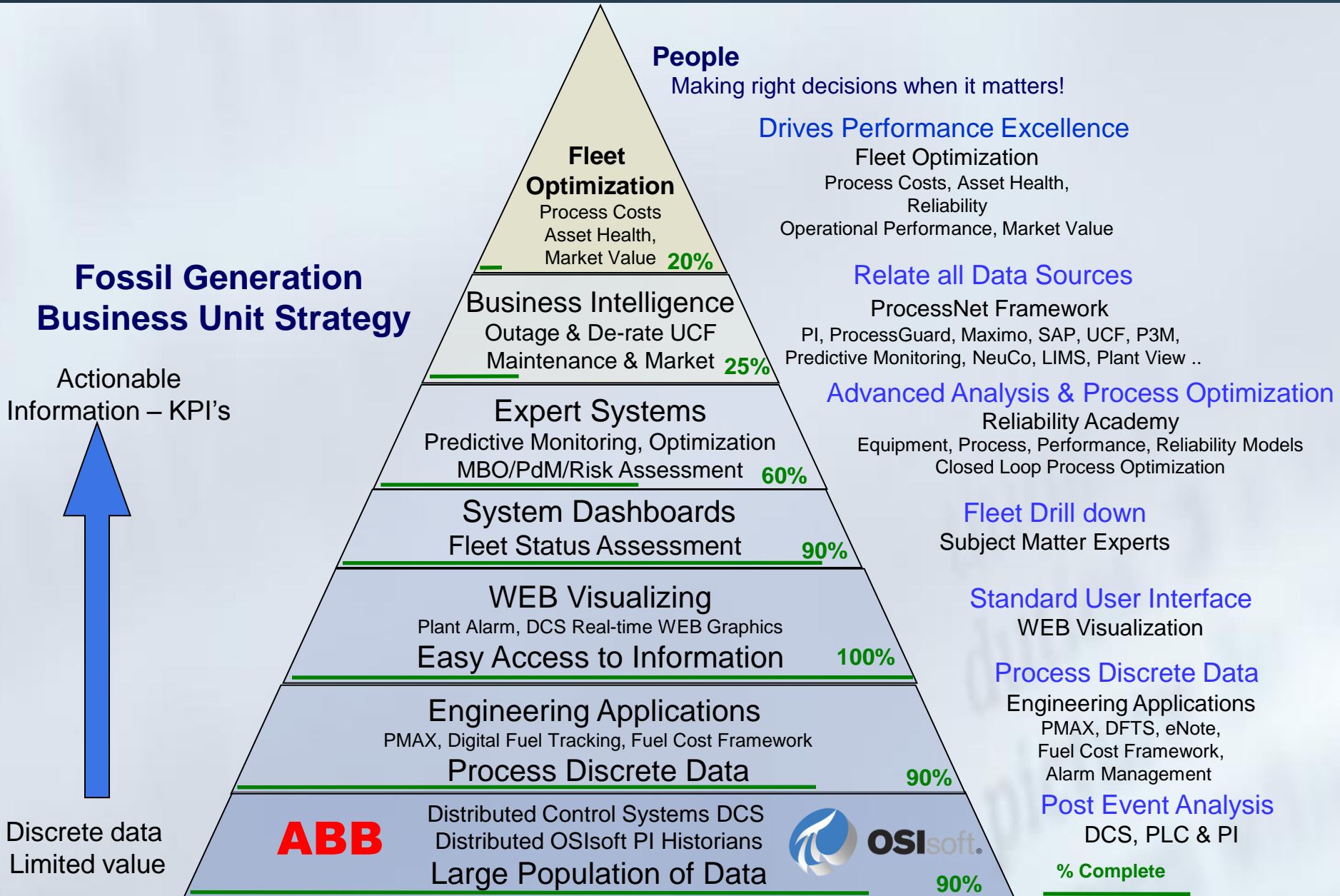
River Rouge - 527 mw



Greenwood – 785 mw

Generating Unit	Capacity Unit	Capacity Plant
Belle River 1	625	1260
Belle River 2	635	
Belle River		
Conners Creek 15	135	235
Conners Creek 16	100	
Conners Creek		
Fermi 2	1110	1110
Greenwood 1	785	785
Harbor Beach 1	103	103
Monroe 1	770	3135
Monroe 2	795	
Monroe 3	795	
Monroe 4	775	
Monroe		
River Rouge 2	247	527
River Rouge 3	280	
River Rouge		
St Clair 1	150	1409
St Clair 2	162	
St Clair 3	168	
St Clair 4	158	
St Clair 6	321	
St Clair 7	450	
St Clair		
Trenton Channel 7A	124	766
Trenton Channel 8	122	
Trenton Channel 9	520	
Trenton Channel		
Peakers	1224	1224
Totals:	10554	10554

Control and Technology Framework



- DCS servers and workstations ~150
- PI-HA servers 22
- PI Interface servers - PI API, PI OPC DA, etc. 57

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ABB

Distributed Control Systems DCS
Distributed OSIsoft PI Historians
Large Population of Data



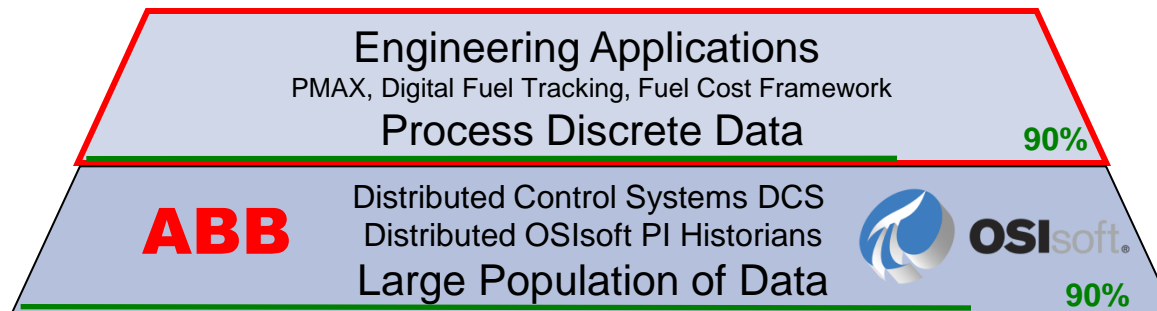
OSIsoft.

90%

Post Event Analysis
DCS, PLC & PI

- Thermal Performance Calculation Engine - PMAX 7
- Digital Fuel Tracking Systems 2
- Alarm Management - ProcessGuard 12
- Notification - PI notification/E-notification 2
- Mobile Operator rounds - IntelaTrac 3
- Continuous Emissions Monitoring Systems 18
- Electronic Protection Tagging system 7
- DCS Engineering Tool 16
- Backup 9

76



Process Discrete Data

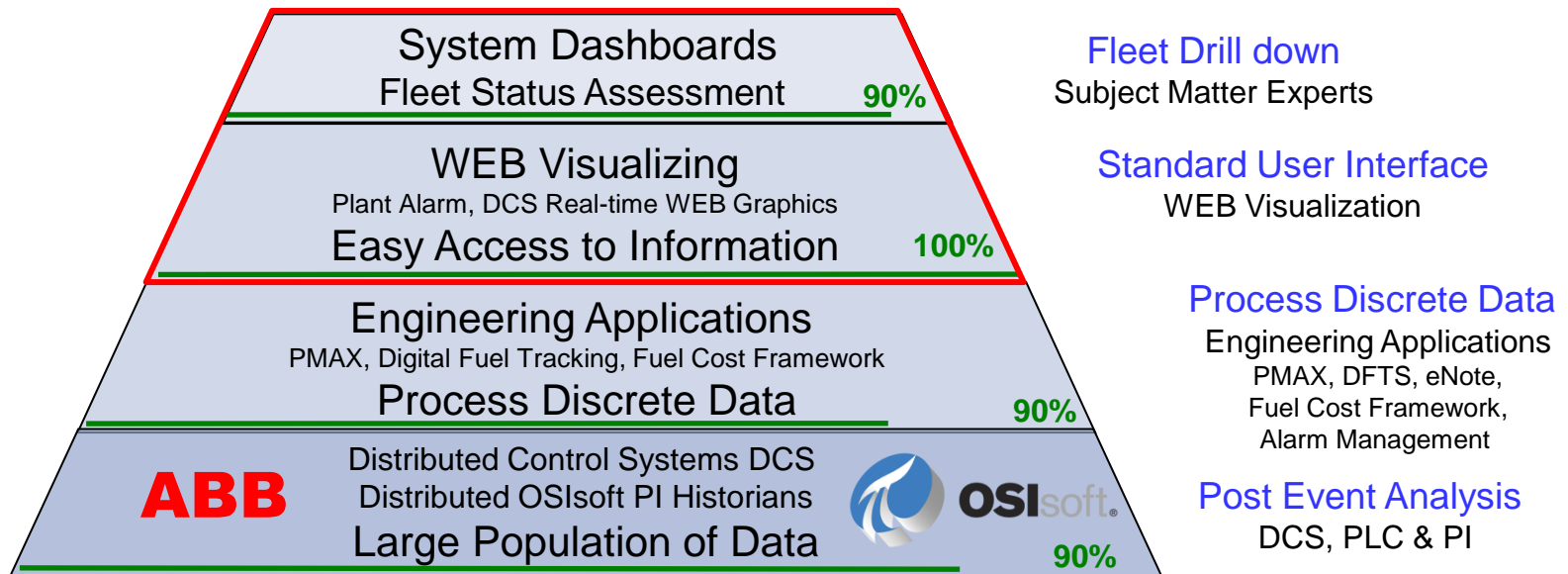
Engineering Applications
PMAX, DFTS, eNote,
Fuel Cost Framework,
Alarm Management

Post Event Analysis

DCS, PLC & PI

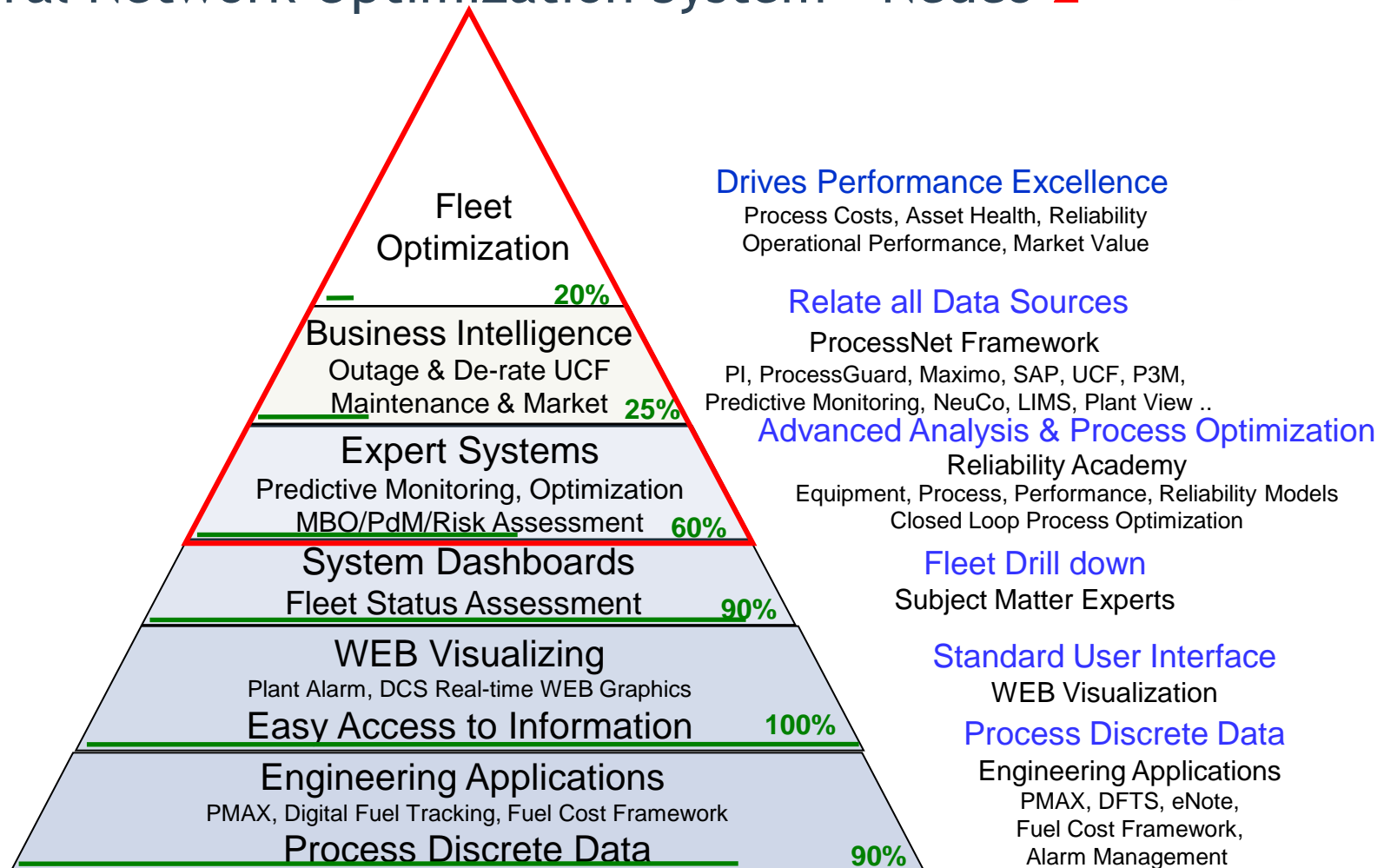
- Primary web server for Fossil Generation Business Unit **1**
- Web Visualizing Portal servers **9**
- PI WebParts **1**

11



- Predictive Monitoring System - SmartSignal 4
- Neural Network Optimization System - Neuco 2

6

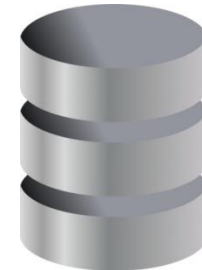


Site Name	Hardware	Applications
Monroe	60	82
Belle River	56	65
Harbor Beach	21	25
Trenton Channel	27	36
River Rouge	51	67
St. Clair	57	72
Greenwood	19	26
Engineering Support	27	38
Performance Center	11	15

329

426

- Multiple aspects of Engineering Applications need to be monitored
- Applications:
 - Web Applications
 - Databases
 - Thick-clients
 - Backups



- Need
 - Hardware Status
 - Operating System Health
 - Application related issues
- Visually display warnings and failures
- Notify System Experts
- Complement Managed PI
- OSIsoft's NOC monitors our PI architecture
- Our effort monitors our entire architecture

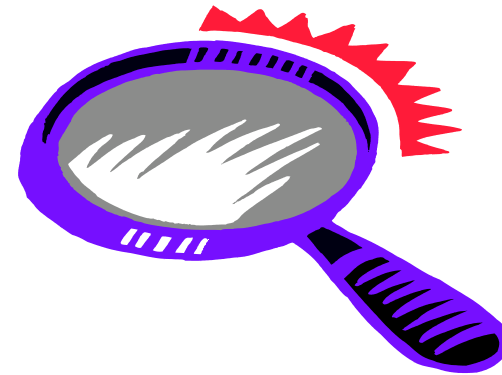


- Small group - 20 people
- Group divided into Engineering and Reliability

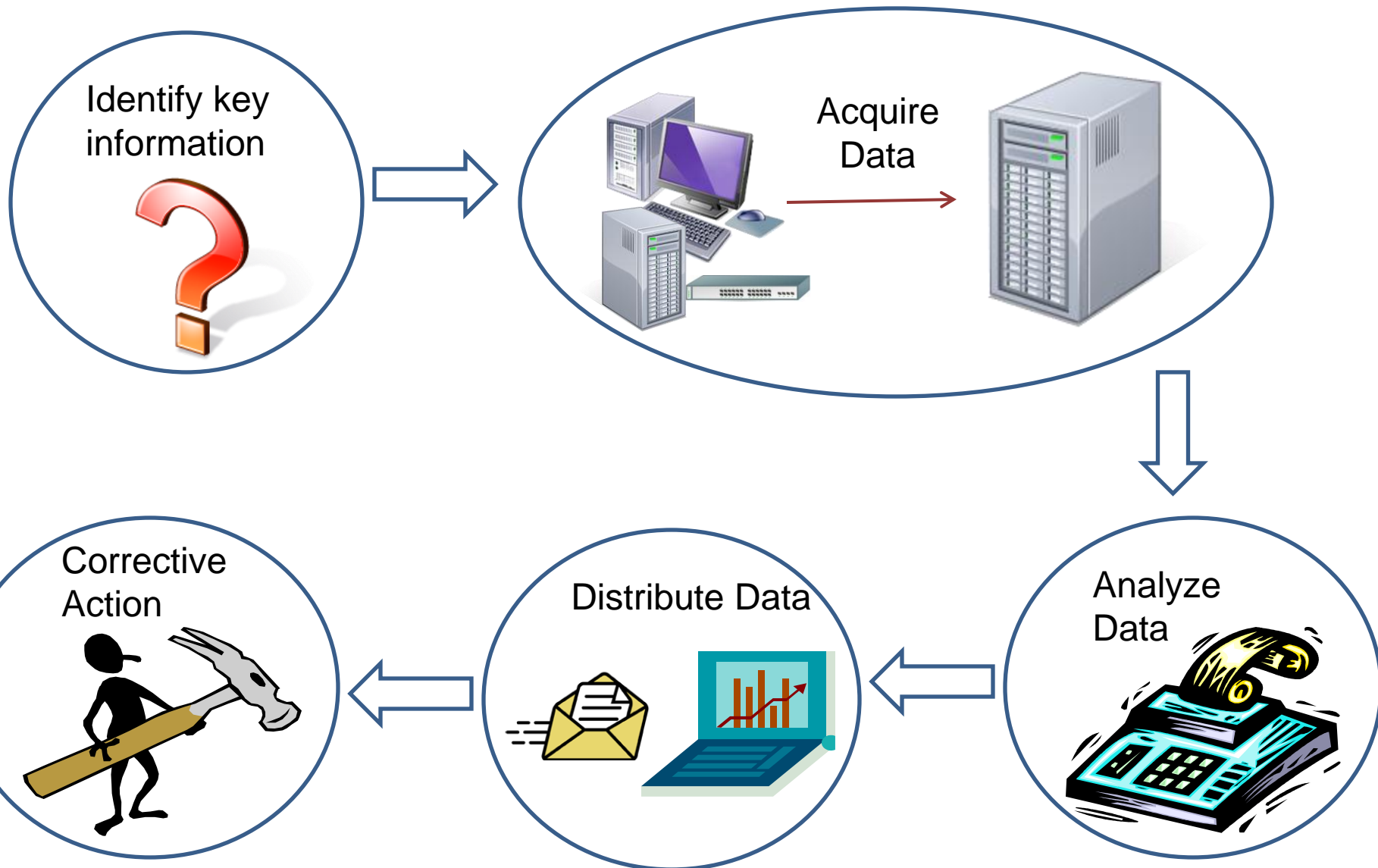


- Each site has an assigned Engineer/Technician who is the first-line of support
- Every Engineer is Subject Matter Expert SME for one or more systems in the Technology Framework who is the second line of support
- Vendors are the third line of support

- Large Number of servers/ workstations
- Variety of applications
- Equipment spread across various sites
- Few Engineers maintaining several systems
- Need advance warning of failure
- Need to facilitate prompt action for system repair
- Next Step - Detailed Process



Process Overview



Identifying Valuable information

- Inventory
- Business function of system
- Modes of system failure
- Advance warning factors



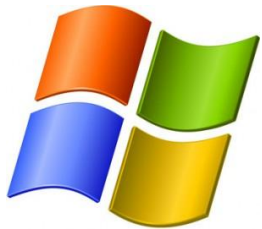
Step 1 - Data Acquisition

- PI IT Monitor Tool available to monitor health of systems
- It includes several interfaces to capture information to PI



➤ Data categorize into

Operating System



- Processor usage
- Hard-disk space
- Memory usage
- Network usage

Hardware



- Physical disk status
- Temperature
- Fan Status
- Power Supply

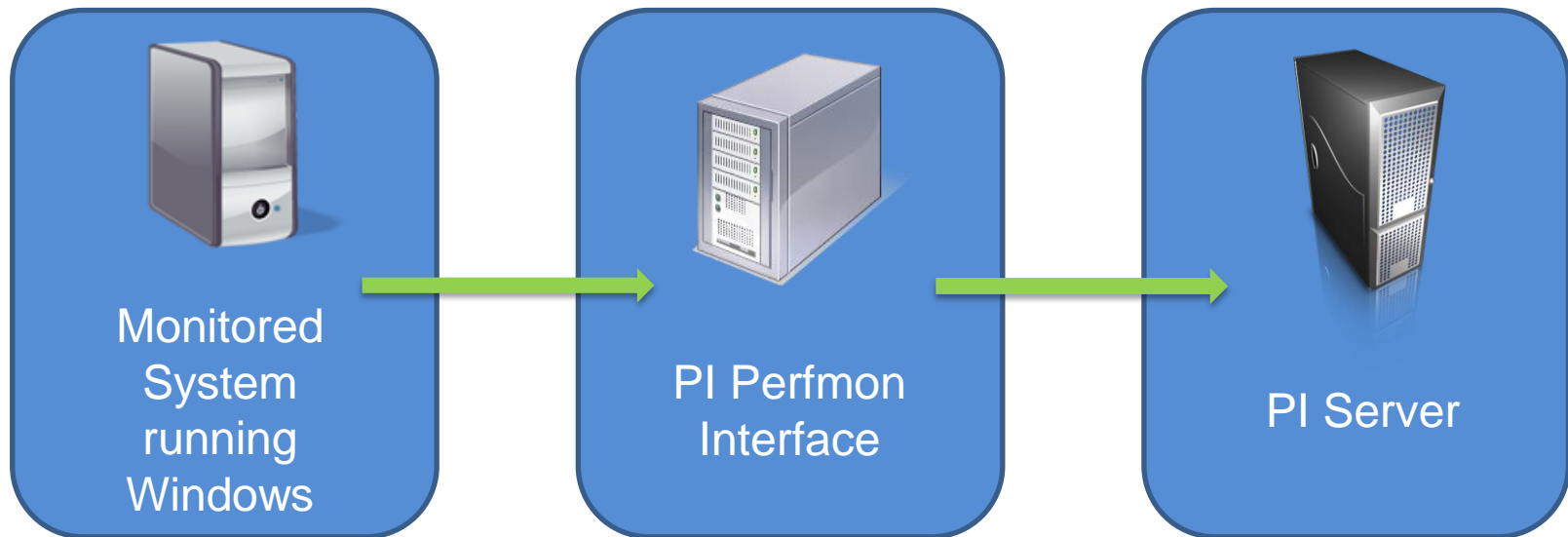
Application



- Application Service
- Web page
- Database
- Backup

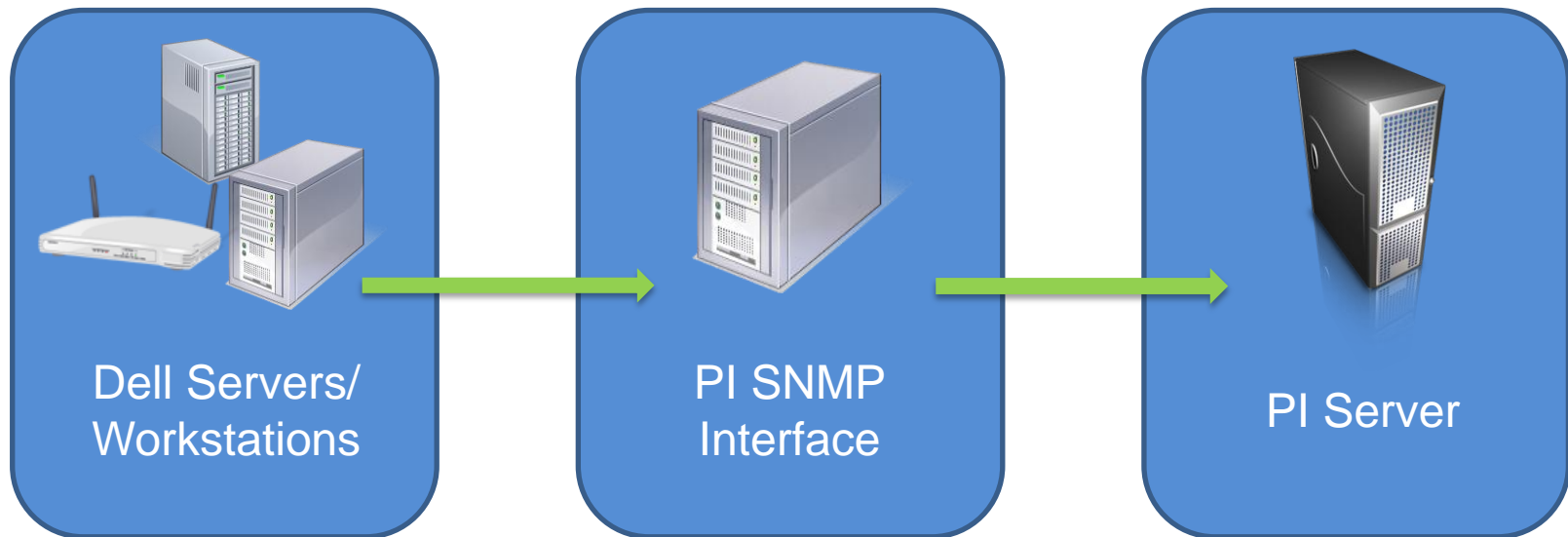
Step 1 - Data Acquisition Operating System

- Performance data transferred using *PI Perfmon* Interface which utilizes Windows Performance Management Tool
- Thousands of Data points Available
- Created PI tags for key health factors - Processor Usage, Hard-drive Space, Memory Usage, Network Card Traffic
- Template for selected data points



Step 1 - Data Acquisition Hardware

- Dell servers and computers
- Uninterrupted Power Supply UPS units
- *PI SNMP* interface to capture data in PI
- Identified Key Hardware Information - Hard disk status, memory status, power supply, fan status and temperature



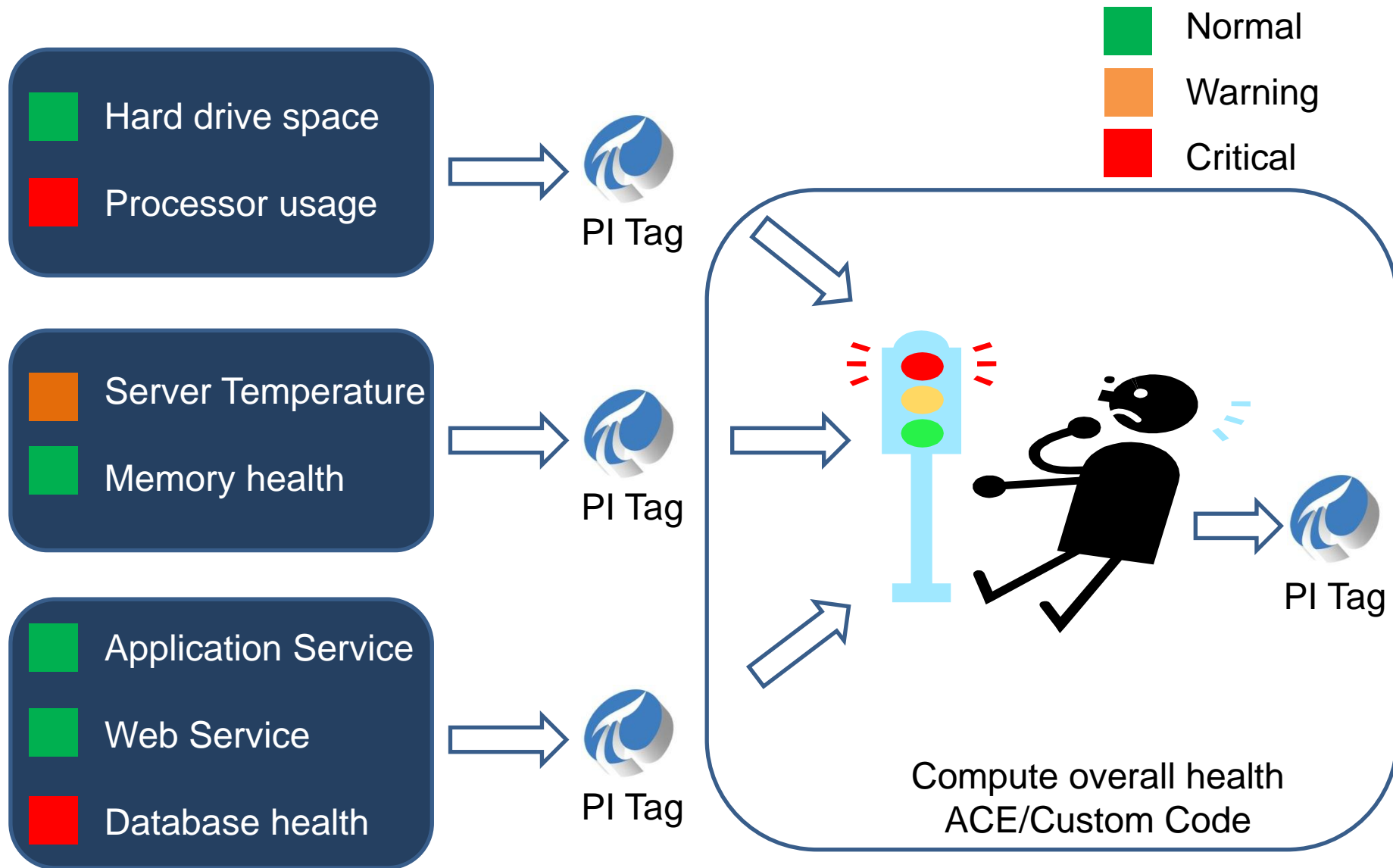
Step 1 - Data Acquisition Application



- Operating System and Hardware information is standard for most systems
- But application information varies from system to system Architecture, platform etc.
- Typical Architecture
 - Client/Server Applications - *PI Perfmon* Interface
 - Web applications - *PI TCPResponse* Interface
 - Databases - *RDBMSPI* Interface

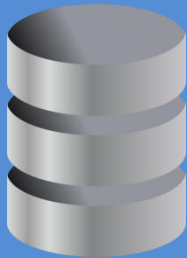
- Numerous data points available giving indicators of health status
- Need to calculate an overall health status of a server
- PI Advanced Calculation Engine (*PI ACE*) using PI Module Database
- Custom Code
- Performance Equations

Step 2 - Data Analysis



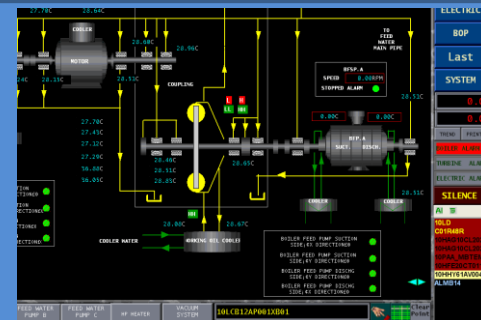
➤ Example - Application server hosting web portal, database connection and PI Interface

- Website TCP response < 5 seconds
- IIS windows service running

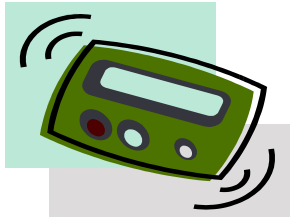


- Database Availability = "Online"
- Timestamp by Windows Service current

- Application Services Running
- PI Interface Health Status



Step 3 - Displays/Notifications



Distribute Data

Notification



Acknowledgement

Escalation



Facilitating corrective action

Step 3 - Data Distribution

PI Notification



Date: Monday, April 12, 2010 01:14PM

Subject: fpc-ec-mirro Status

History:  This message has been forwarded.

Attribute Value:

\\.\fpc-ec-mirro|ServerName: ps-fpc-ec-mirro

\\.\fpc-ec-mirro|OS: Warning

\\.\fpc-ec-mirro|OS_Source:

\\.\fpc-ec-mirro|HW: OK

\\.\fpc-ec-mirro|App: Normal

\\.\fpc-ec-mirro|App_Source:

Actions:

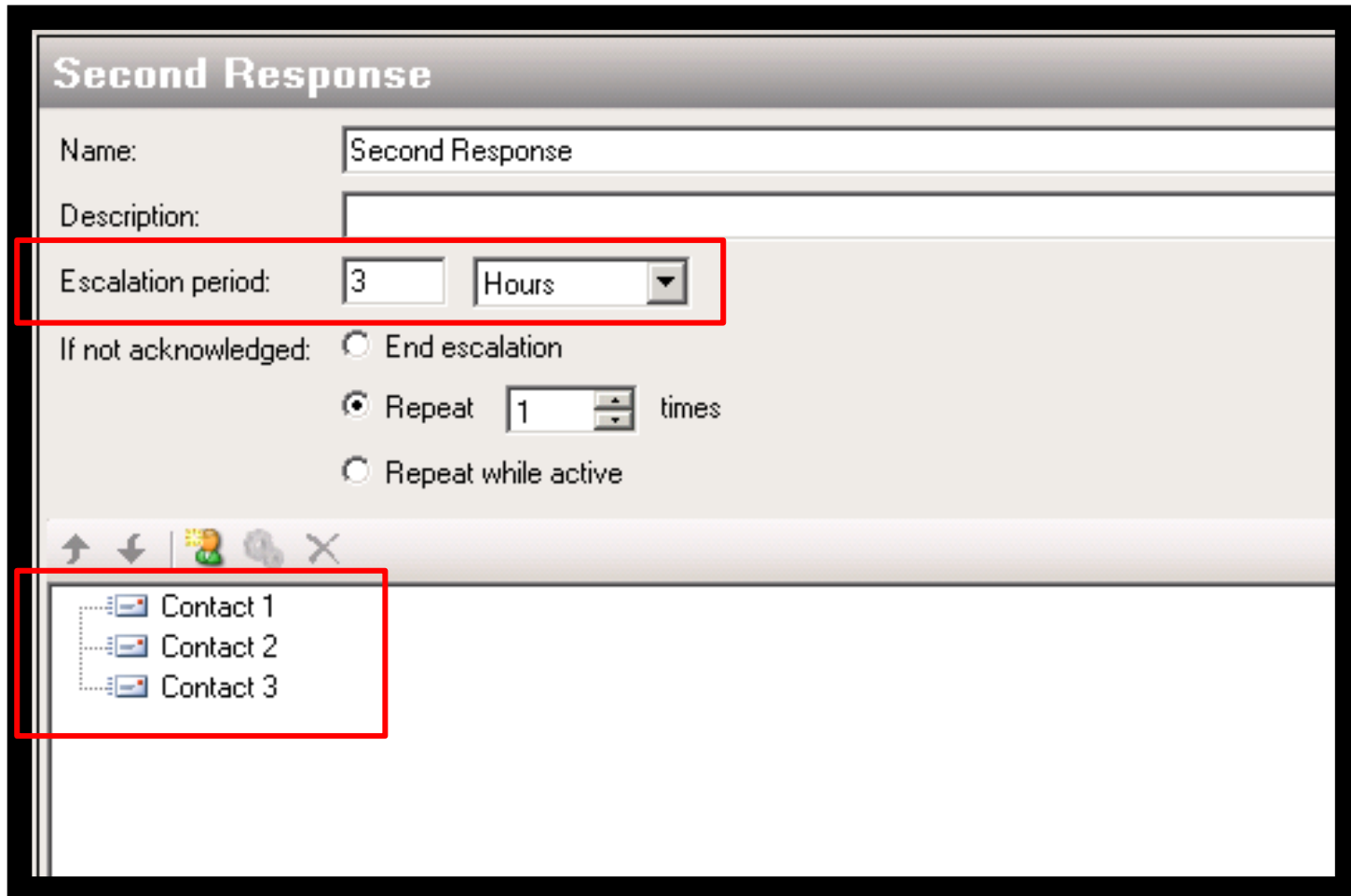
[Acknowledge](#)

[Acknowledge with comment](#)

Step 3 - Data Distribution

PI Notification Escalation

- Allows notification to secondary response team when the notification goes unacknowledged by the first



Step 3 - Data Distribution Displays

Known Problems

Process Controls & Technology - Performance Overview

Network Overview

3/11/2010 2:52:35 PM

BRV

CCK

GRW

HBH

MON

RRG

STC

TCH

Temp
ESO

FPC

ESO/FPC

PI

PI2

PI-APPS

Enote

PMAX

CEMS

PEMS

DBDoc

PG

PNET

BACKUP

UPS

PTAG

eso-kbase

eso-powerpro

eso-db1

eso-db2

eso-db

fpc-sql

fpc-ecweb

fpc-ec

fpc-ec-mirro

fpc-ecdev

fpc-ssweb

fpc-ss

ptag-spare

Operating
System

Hardware

Application

OS HW App

Normal

Warning

Critical

Bad Data

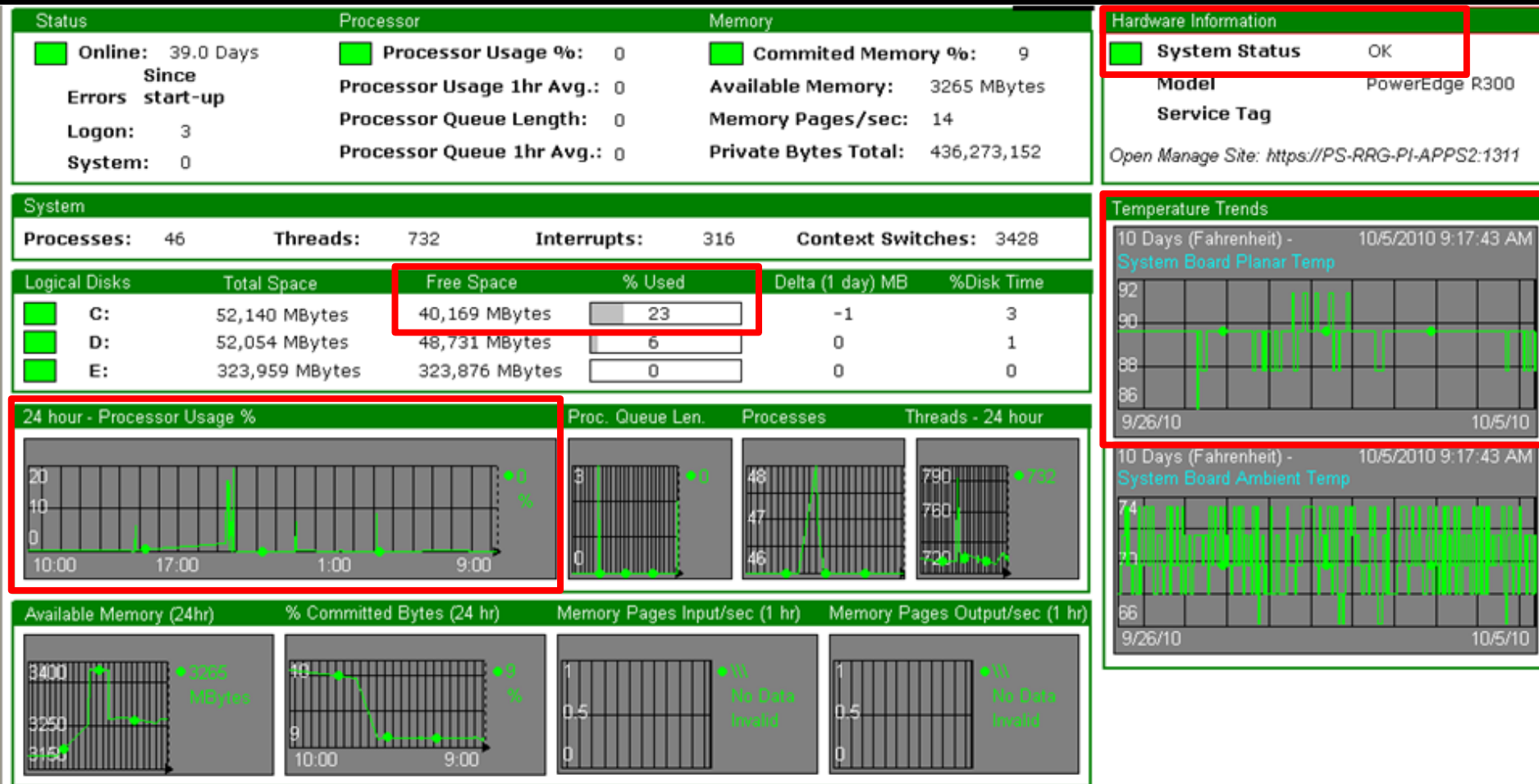
Equipment To Be Monitored

Equipment Does Not Exist/ Not Monitored

Recommended version of Processbook - 3.1.0

Step 3 - Data Distribution Displays

- Operating System and Hardware data



- Data Acquisition 
- Data Analysis 
- Notification 
- Corrective Action 

- NERC-CIP regulations require protection of critical infrastructure/assets
- Regulations require monitoring access of all critical systems



- To comply with the regulations the architecture at critical sites had to be altered
- Change in architecture required 27 additional servers and workstations

- *PI Ping* Interface
- *PI Syslog* Interface
- *PI WinEventLog* Interface
- *PI Notifications*
- Dashboards in *PI WebParts*

Benefits

- Increased Hardware Availability
- Advanced notification provides increase lead time
- YTD Infrastructure Reliability 99.8%
- Remote monitoring of system

Future Plans

- Expansion to monitor remaining systems, other BU's
- Monitor Network
- Use AF or Module Database for displays
- Improve Monitoring System

Questions?





Thank you

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