Improved Situational Awareness with OSIsoft PI System for the U.S. Nuclear Regulatory Commission (NRC)

Presented by   Matt McDonald, Vice President &

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Agenda

- About PPC
- Story of the project
- OSIsoft PI System Solution for Situational Awareness
- Results & Benefits

FOCUS AREAS

INFORMATION SYSTEMS DEVELOPMENT	**KNOWLEDGE & INFORMATION MANAGEMENT**
CYBER SECURITY & INFORMATION ASSURANCE	**ENERGY MANAGEMRNT & ENVIRONMENTAL CONSULTING**

PPC is a recognized and responsible leader in innovative and cost-effective Technology and Management Solutions.

PPC is ever mindful to be at the forefront of Green Thinking and Sustainability in our key customer markets of: Energy, Environment, Public Safety, National Security, Financial, and Regulatory Compliance. We provide superior quality and always deliver on our promises.

CONTRACT VEHICLES

General Services Administration Schedules
Information Technology Professional Services (IT 70)
Management, Organization, and Business Improvement Services (MOBIS)

Government-wide Acquisition Contract (GWACs) & Multiagency Contracts (MACs)
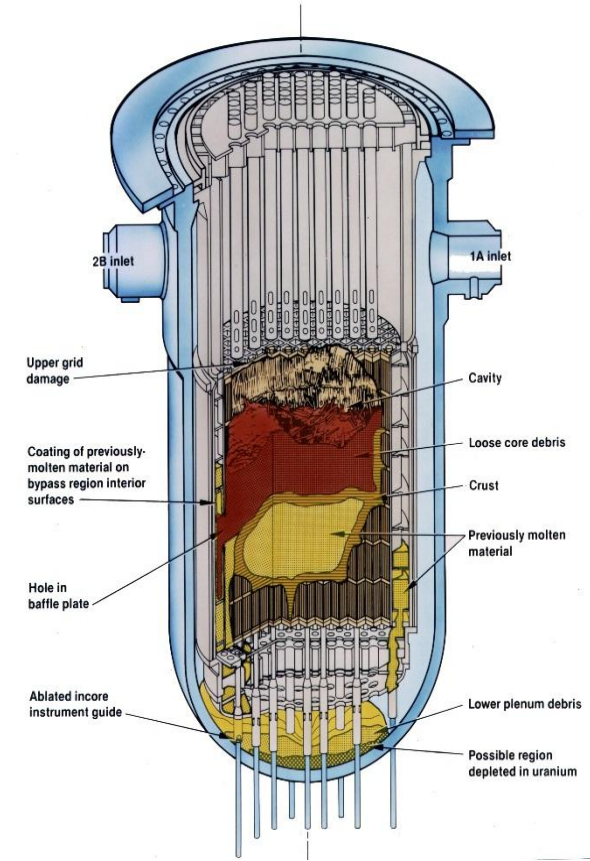*Chief Information Officers – Solutions and Partners 3 (CIO-SP3)*

NRC ERDS Example

Story of the PPC ERDS project

- On March 28, 1979, Three Mile Island Unit 2 (TMI-2) reactor, near Middletown, Pa., had a partial melt down

- This was the most serious accident in U.S. commercial nuclear power plant operating history

- The NRC tightened and heightened its regulatory oversight

- In 1985 the NRC deployed the first Emergency Response Data System (ERDS)

- In 2006 the NRC decides to replace an antiquated system with a new modern ERDS

TMI-2 Core End-State Configuration

- 2B inlet
- 1A inlet
- Upper grid damage
- Cavity
- Coating of previously-molten material on bypass region interior surfaces
- Loose core debris
- Crust
- Previously molten material
- Hole in baffle plate
- Ablated incore instrument guide
- Lower plenum debris
- Possible region depleted in uranium

Solution

- In 2006, PPC deploys an integrated architecture based on the PI System that is designed to collect nuclear power plant performance and environmental data for analysis by NRC and State emergency response personnel.

- It includes :

  – Secure connectivity to all plants and State Regulators

  – Redundant and high availability capabilities

  – A common interface for situational awareness

  – Stores and present data from nuclear power plants for the purpose of review and analysis – All 103 NRC licensed commercial nuclear power plants can be displayed

  – Leverage PPC expertise in OSIsoft, nuclear expertise, and best practices to design solution
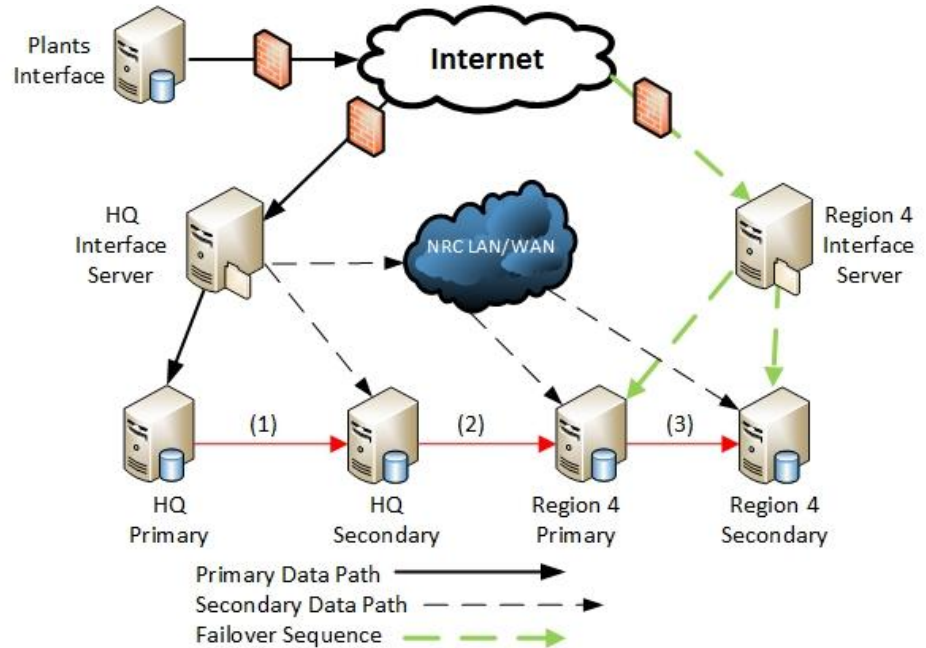
US NRC ERDS PI System Fact Sheet

- More than 38,500 PI Tags configured to receive data from nuclear facilities

- Connectivity with most plant systems that converts the hardware communication protocol used by a PLC into the OPC protocol

- Approximately 350 concurrent licenses of PI ProcessBook

- More than 150 concurrent web end users

- Customized PI to ERDS Interfaces with HA

- Custom code behind links to module database

- Calculated tags

    – + 500 PI Totalizer tags

    – + 250 PI Performance Equations
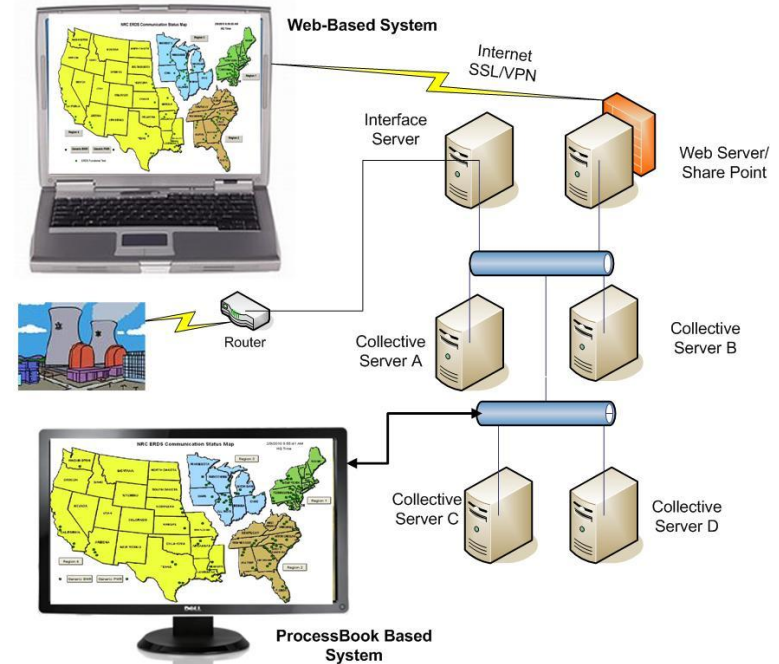
PI System Architecture at US NRC Today

- (4) node Collective - 64 Bit PI Servers (Higher performance, high availability, and redundancy)

- PI Agent (mPI) and PI Diagnostics monitoring (Alarms and Notifications)

- Enhanced global support with Enterprise Agreement and OSIsoft NOC monitoring

- Remote centralized support via Citrix

- PI Batch and PI Manual Logger enables users to easily and securely collect and input data manually

- PI WebParts provides visibility, navigation, and presentation of PI System data

- PI System Access - PI SDK, PI OLEDB, PI API, PI OPC

- Introduction of Simulator server to alleviate shutting down Production systems for licensee drills, exercises and training
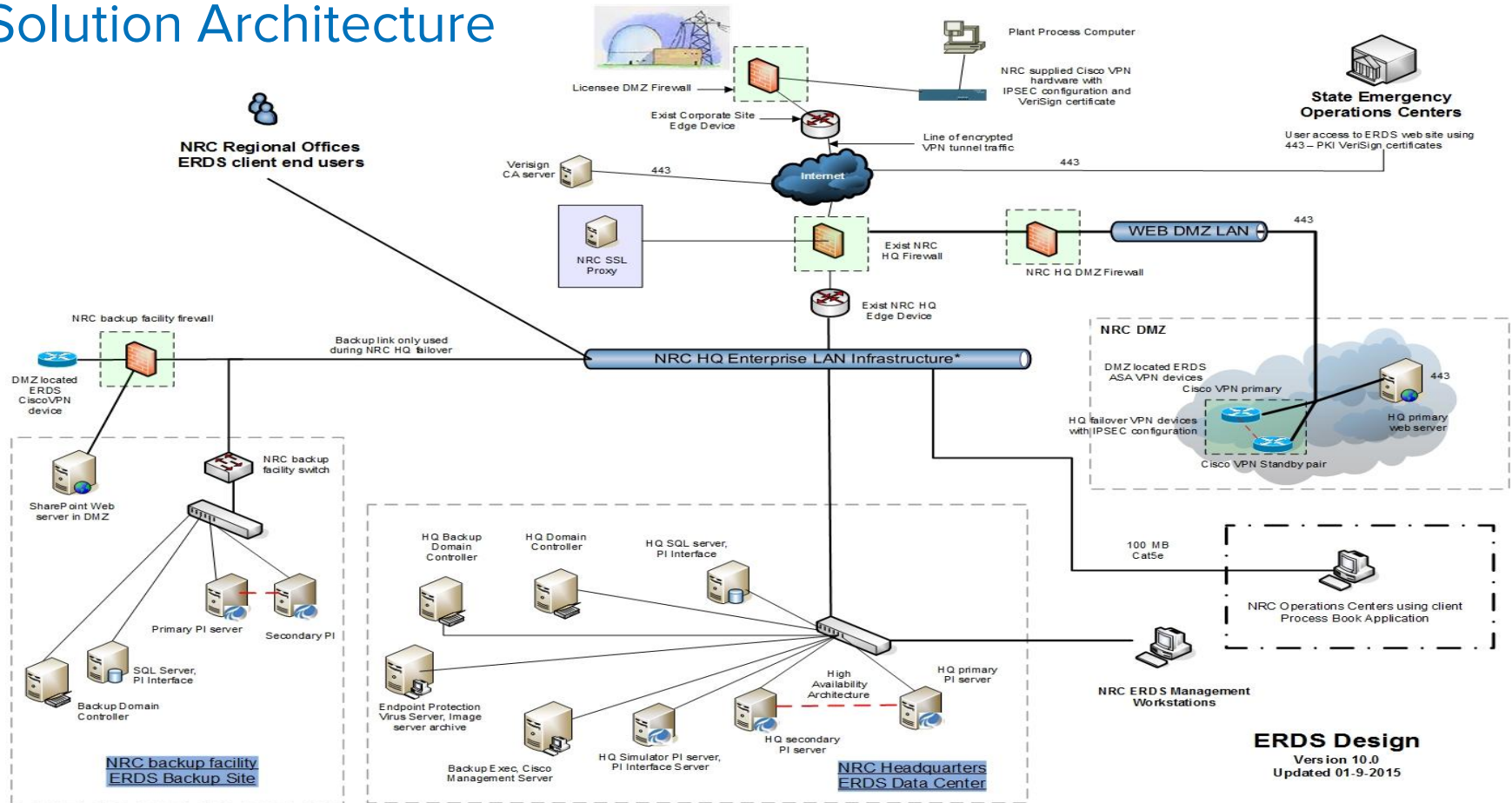
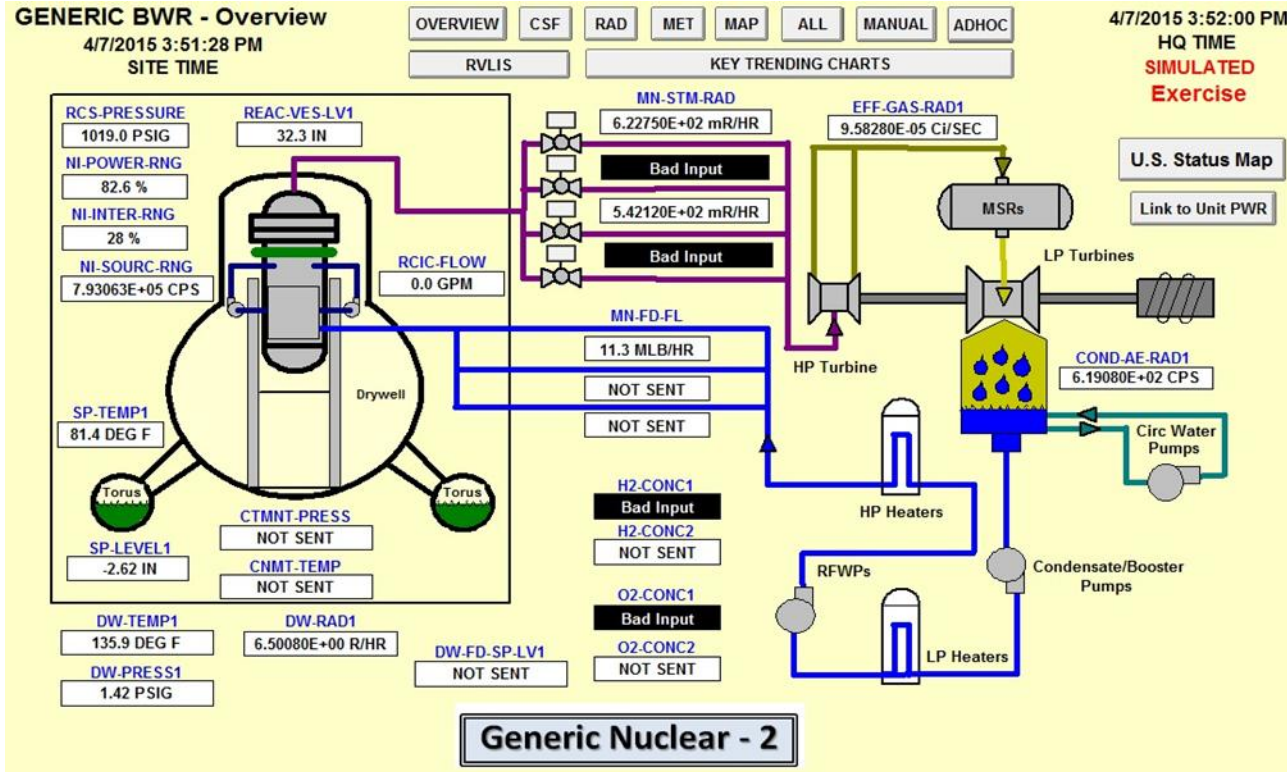# OSIsoft in the Nuclear Power Industry
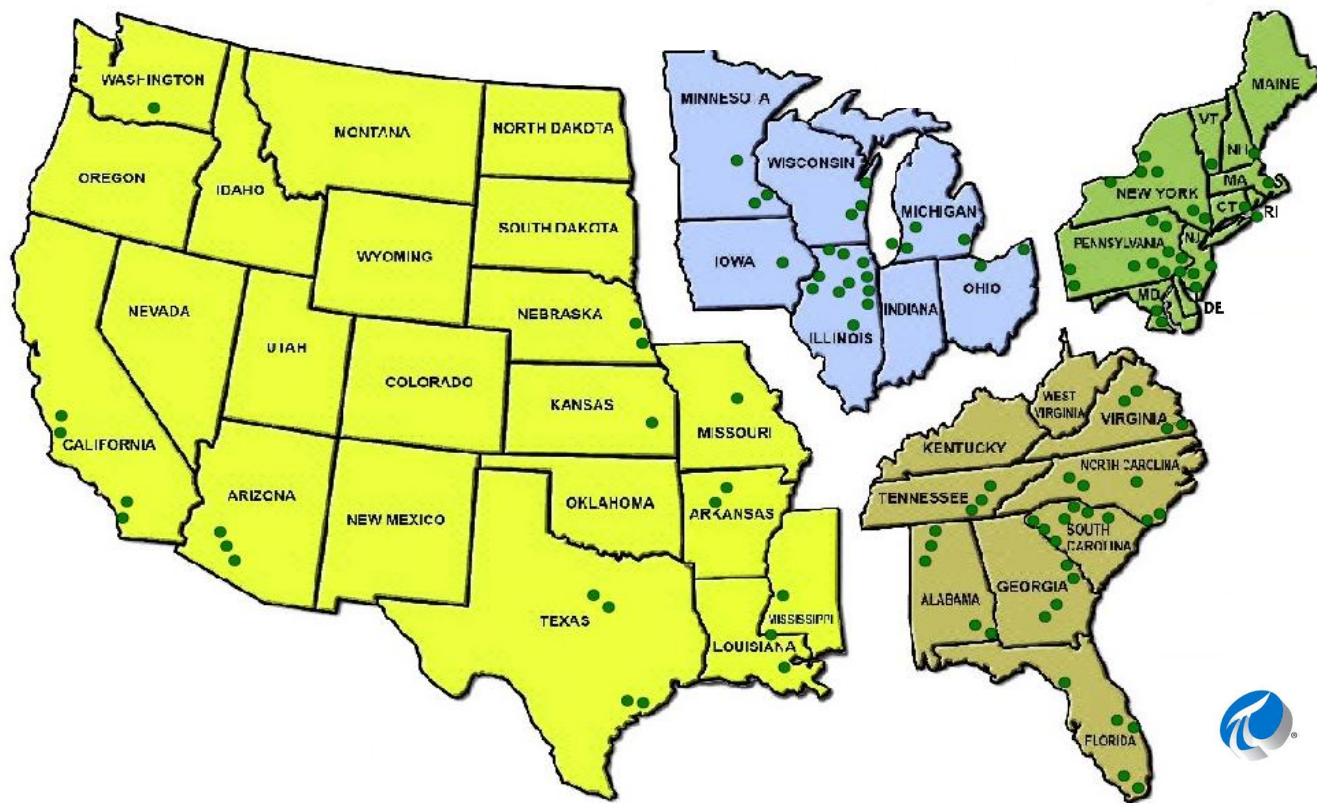
Operating in 78 NPP

Solution Architecture

ERDS Design
Version 10.0
Updated 01-9-2015
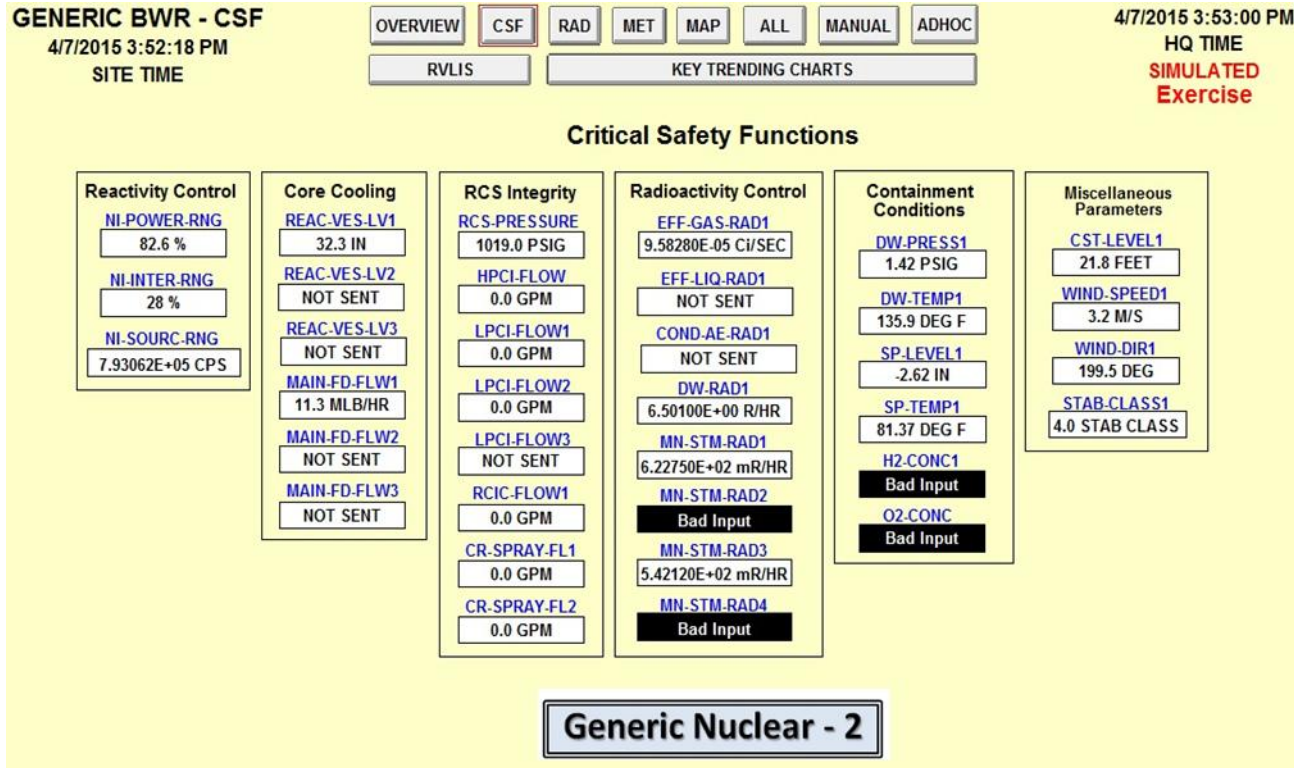
Single Pane of Glass

The integration of the PI System:

- PI Data Server,

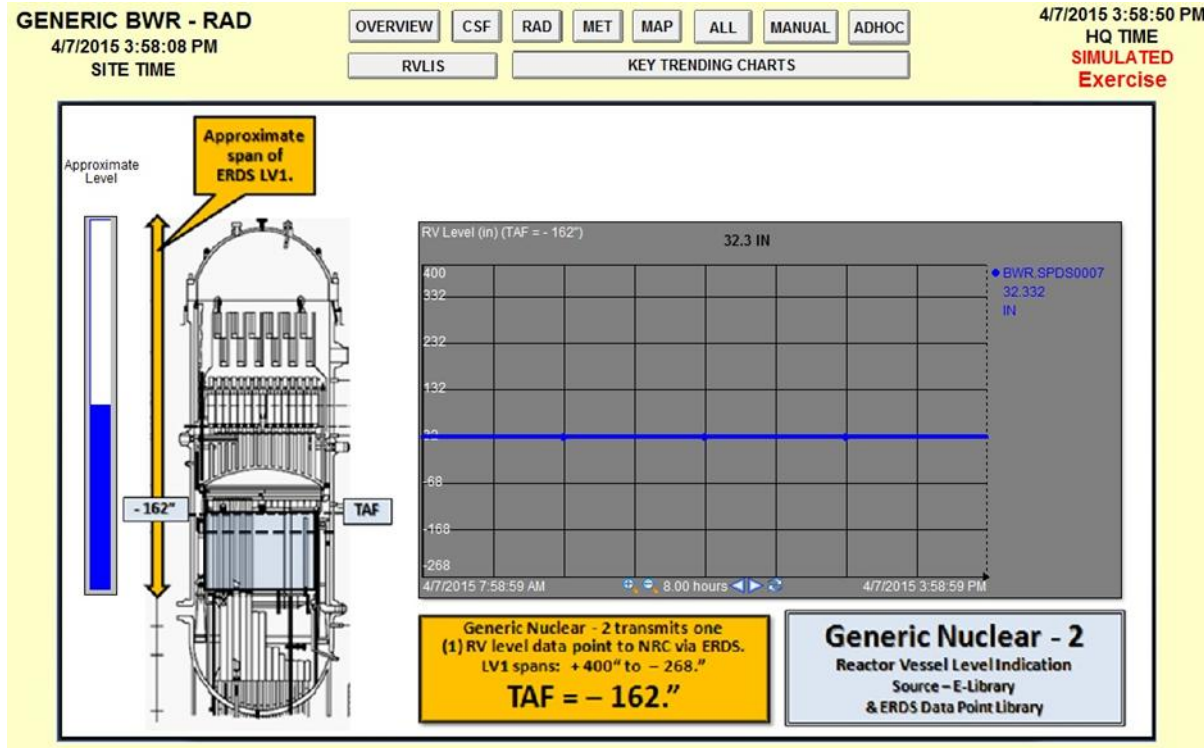- PI ProcessBook,

- PI WebParts

delivers to decision makers a single pane of glass dashboard of critical data to make informed decisions

Critical Safety Function Monitoring

- PI System has over 400 pre-built interfaces to Industrial Control Systems
- Provide flexibility to customize monitoring to your needs

Trending at Component Level

- Trending with the PI System will require integration with existing instrumentation and metering or installation of new equipment to deliver data.

- Function, failure, and risk will need to be determined in order to optimize trending.

Situational Awareness: is the perception of environmental elements with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed, such as time, or some other variable, such as a predetermined event.

Source: Wikipedia

Solutions for Situational Awareness

PI Systems for US NRC Scheduled for 2015 / 2016

- Standardized architecture
  - VMWare implementation
  - Mobile connectivity
  - Alternative network paths and redundancy failover utilizing load balancers

- PI Server 2012
  - Notifications
  - Asset Framework (AF)
  - SQL server clusters and HA

- Data Access
  - PI OLEDB Enterprise
  - PI Web Services
  - PI OPC Server

- PI Visualization Suite
  - PI DataLink 2012
  - PI ProcessBook 2012
  - PI WebParts 2012
  - PI ActiveView
  - PI Coresight
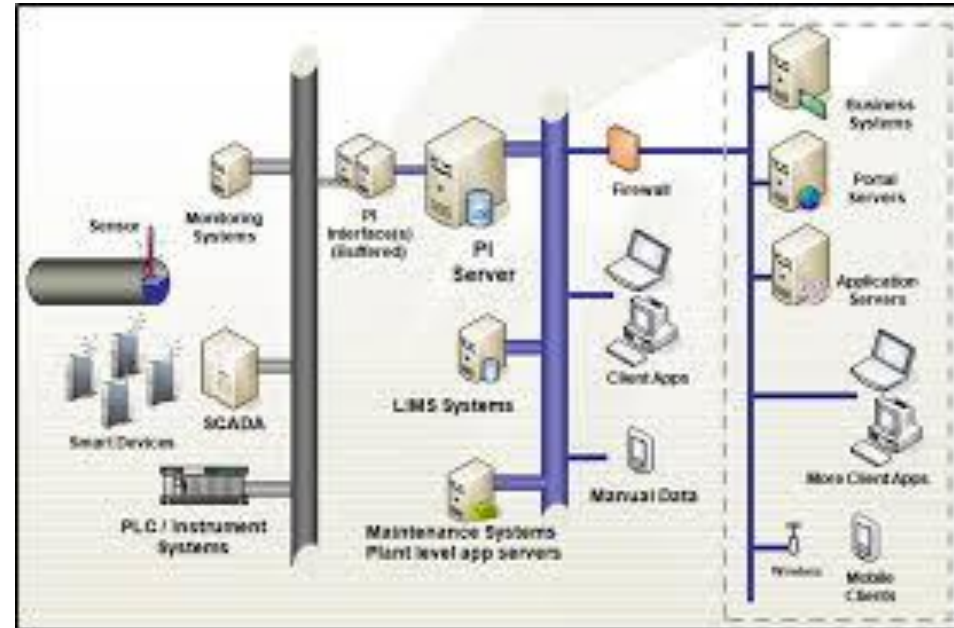
Opportunities for Enhancing User Experience

- Goal #1: Improve emergency response coordination

- Goal #2: Expand situational awareness out of the control room

- Goal #3: Improve trend analysis to support root cause analysis

- Expected Result

  - Leverage Internal and External Plant Sensor Data

  - Enhance coordination and communication

  - Improving situational awareness by expanding the community of users who can use the data to make informed decision.

Goal #1: Improving Emergency Response

- This radioactive plume measured via aerial surveillance on March 31, 1979 shows just how narrow the path of radiation travel can be. Releases passing between the stationary ground-based monitors went undetected in 1979. The narrow plume path also explains why health effects can be found in one neighborhood and not another.
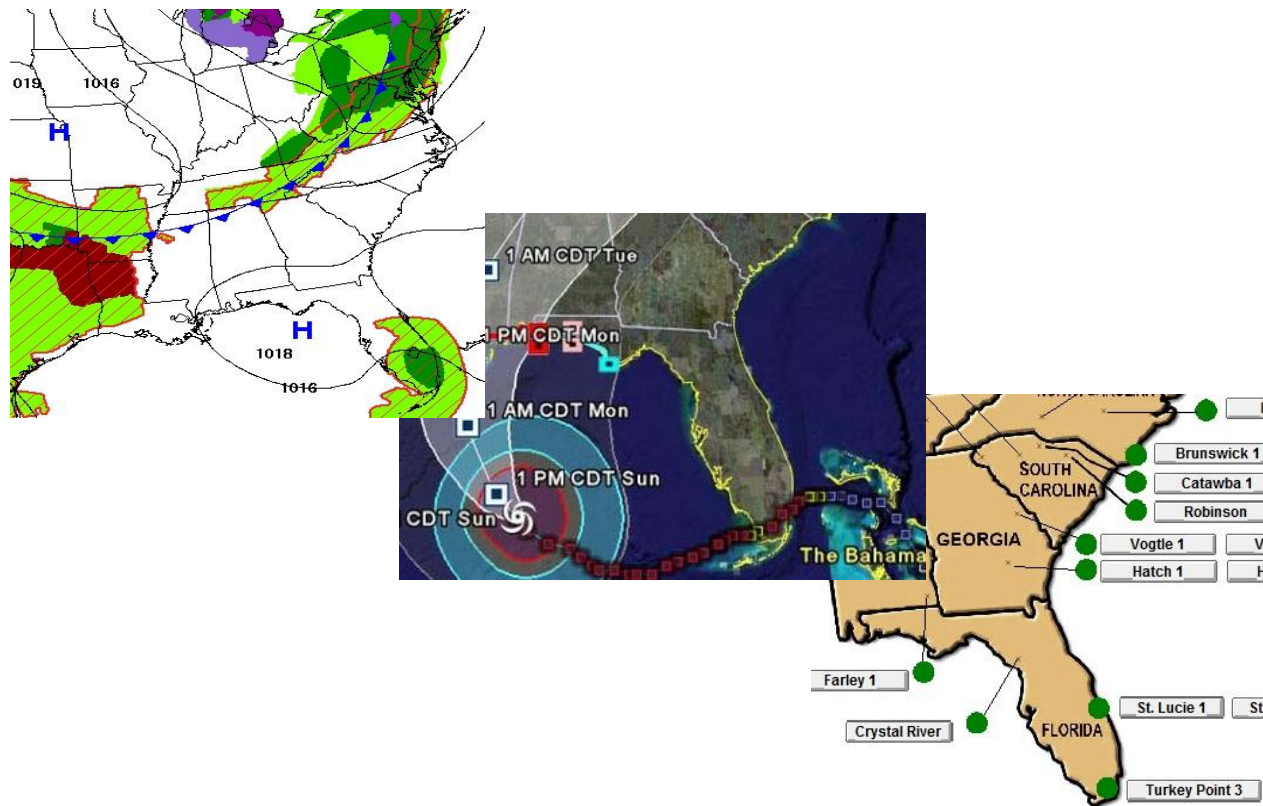
Improving ERDS through ArcGIS Integration

- Limited functionality
- Emergency Response Mangers view multiple screens
- Expansion of "The Internet of Things" provides tremendous opportunity
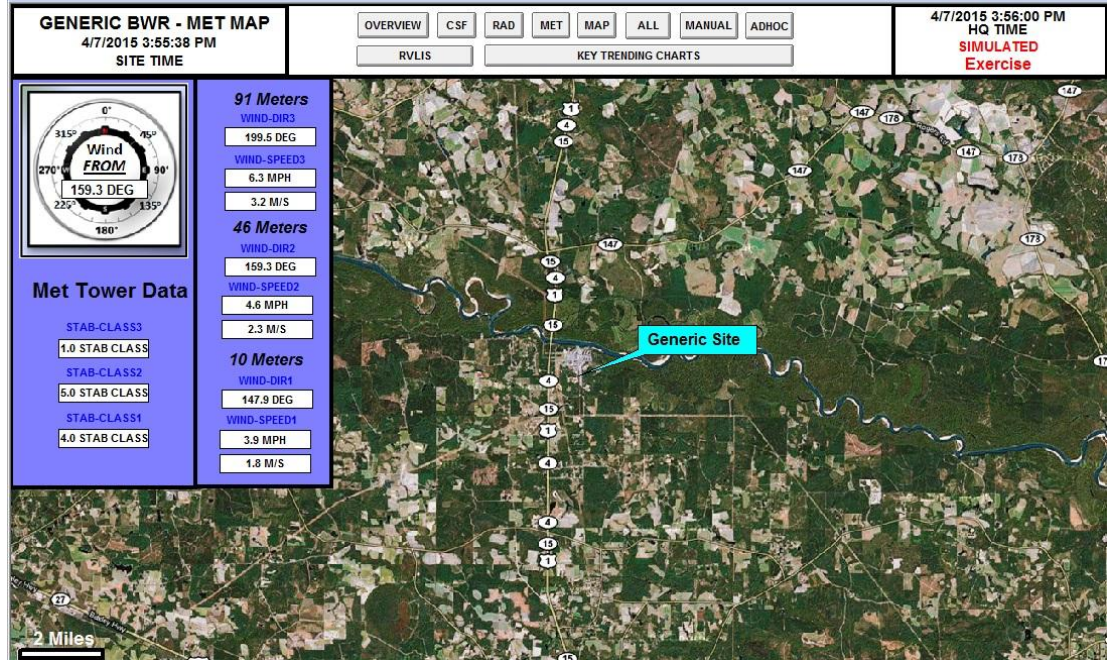
Action: PI Systems and ArcGIS Integration

- Incorporation of Google Earth, NOAA, HURREVAC and other existing tools to create a single view, will provide a better visualized concise analysis

- Integration with modeling products such as RASCAL

Results: Actionable Data through ArcGIS Integration

- Isolate the location

- Model the impact

- Monitor the event

- Leverage data

  – Plant Sensor Data

  – Emergency Responder Locations

  – Weather Patterns

  – Regional Monitors

  – Traffic Management

- Improve response and minimize impact
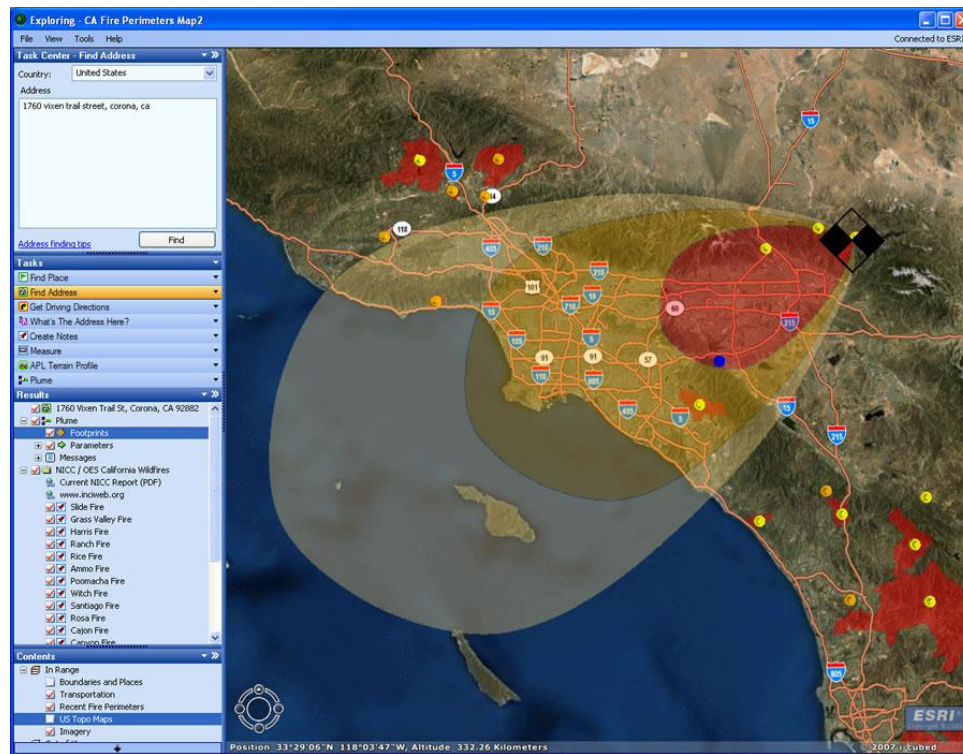
Improving Health, Safety, and the Environment

Goal #2: Expand Situational Awareness Community

- How do we better answer: Who? What? Where? When? How?

  - By improving information sharing

  - By improving data accuracy and reliability

  - By expanding the reach of situational awareness out of the operations center

  - By enabling resources on the ground

  - By integrating disparate data sources

- Access PI System data from any device and from anywhere.

- Combine PI Coresight displays with other web applications to gain even more insights and drive new innovations.

- PI Coresight allows users a quick and easy way to share displays and encourages collaboration across the enterprise.

- Give all your users secure access to the data they need with one simple installation and no special software on users machines.

Action: Implement PI Coresight

- Will complement existing PI System and SharePoint

- Leveraging Coresight to easily incorporate new data and displays by the Operations Center staff

- Will allow for better timestamp trending for exercises, drills and training to visualize what is happening

- Opens data to a larger audience to share displays while maintaining security

- Resolve existing limitations of available browser support
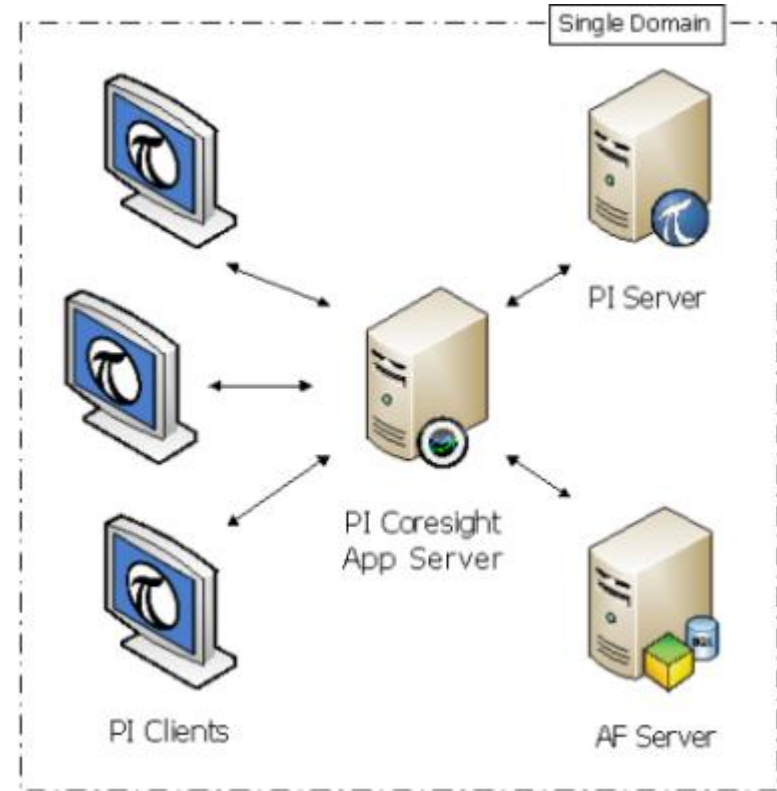
Result: Expand Situational Awareness Community

- Integration of data to provide resources in the field or at the plant with more insights and situational awareness.

- Allows ad-hoc customization to allow individual analysis which can then be shared dynamically.

- Provides emergency response teams to make informed decision in the midst of an emergency with real-time data on hand held or mobile devices.

Access PI System data from any device and from anywhere.

Goal #3: Improve Root Cause Analysis

- Currently, first glance of "ALL" points, team members don't know what is up-to-the-minute unless they recognize the values that are out of range and then launch a trend

- Implementation of a trending indicator will provide quicker analysis and lead to better trouble shooting to identify the origin of the issue

Action: Improve Root Cause Analysis

- Addition of indicators that show how points are trending on specific screens

- Quality tags identify problem areas
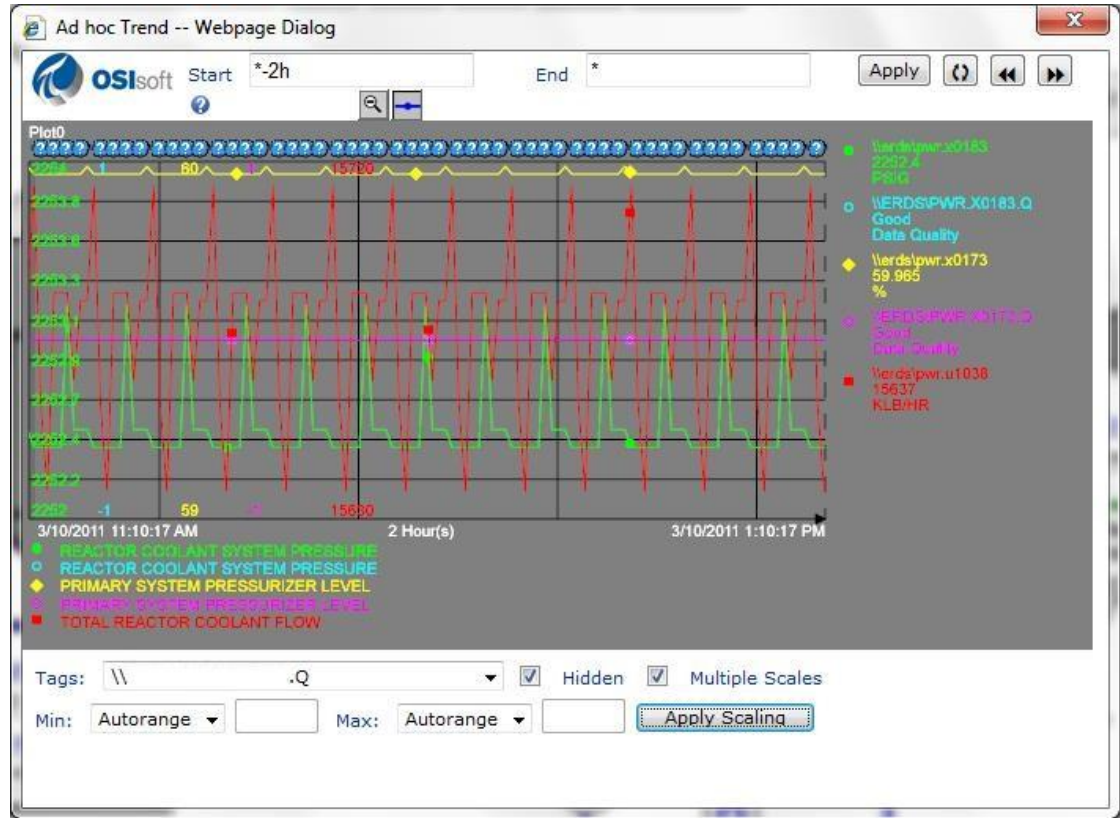
Result: Improve Root Cause Analysis

- Incident response teams can immediately see how points are trending without having to drill down on each point or create an ad-hoc trend
- Gives the ability to create trends on specific points that are trending similarly to highlight possible issues
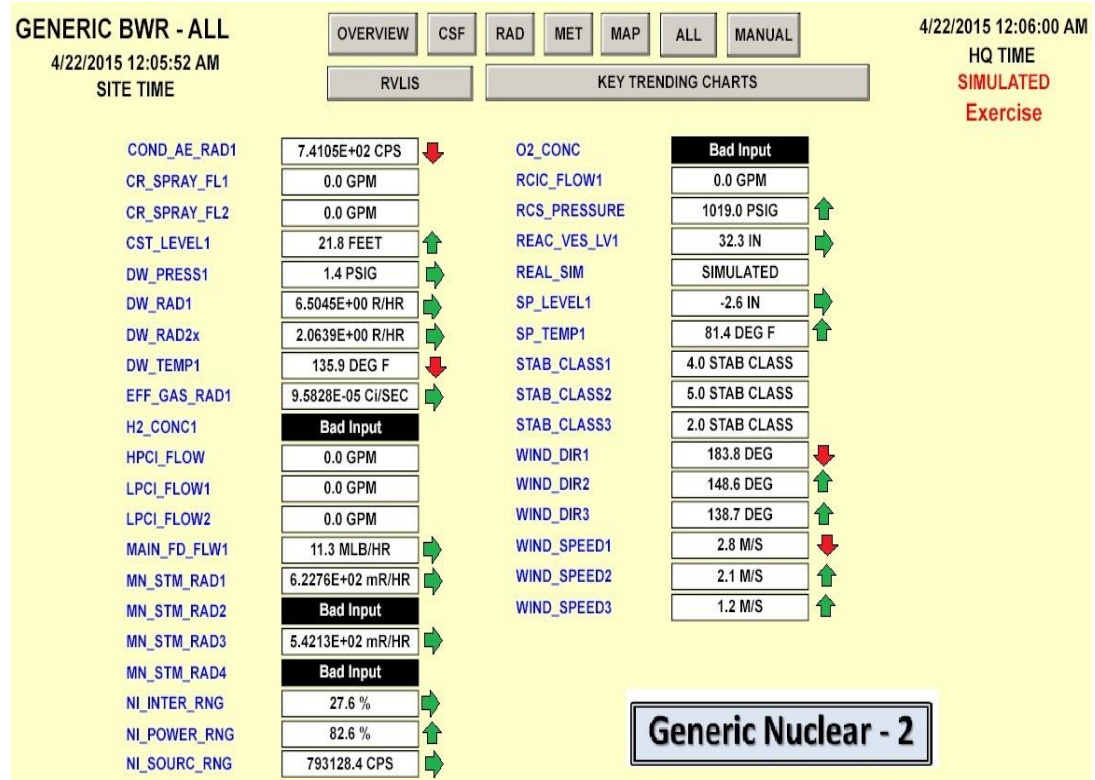
PPC PI System Solutions for Situational Awareness
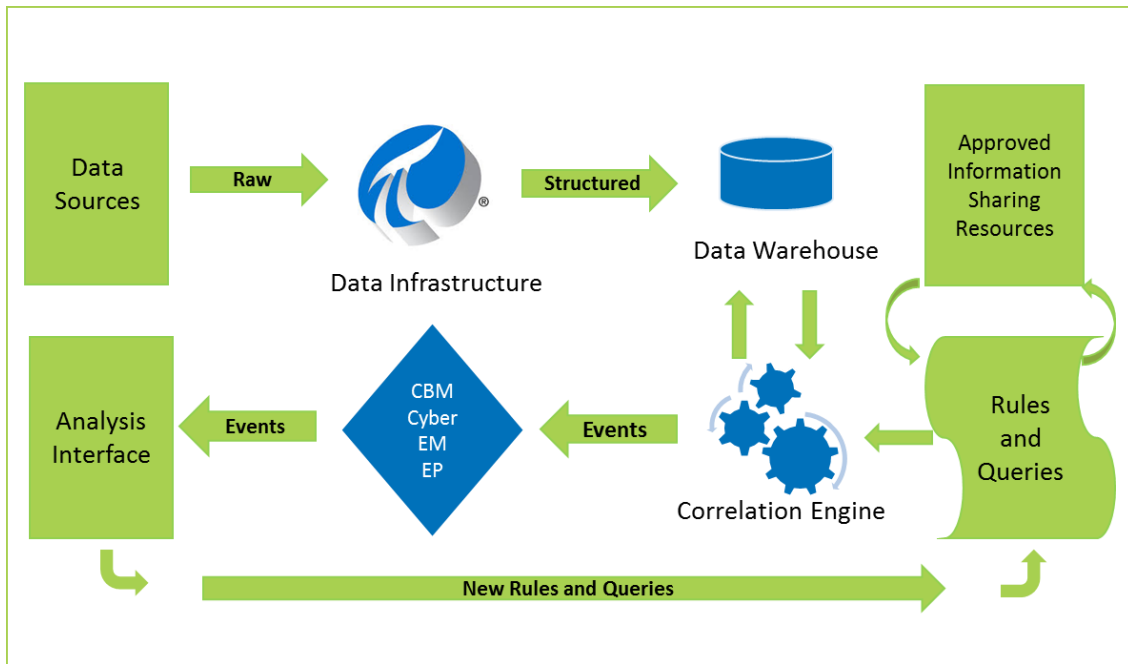
- Provides a comprehensive situational awareness tool to capture and maintain an accurate, shared common operating picture

- Applicable to:
  - Lifecycle Maintenance
  - Cyber Security
  - Energy Management
  - Emergency Preparedness

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Questions

Please wait for the **microphone** before asking your questions

State your
name & company

THANK YOU