Latest developments in Control & Safety Systems

Hidekazu Matsuura
Elbert van der Bijl

November, 2017

Industrial Automation Portfolio – Control Domain

Information Management
Advanced Control

Production Management
- Information Management System
- Multi-Variable Model Predictive Control
- Robust Quality Estimator

Operational Efficiency
Training Systems
Asset Management

- Operation Efficiency Improvement Package
- Terminal Automation System
- Training Simulator System
- Plant Resource Manager

Production Control and Safety Management

- Integrated Production Control System
- Network Based Control System
- Safety Shutdown Management System
Agenda

1. IA Trend and Customers’ Challenge
2. Latest Technology: DCS and SIS
3. Agile Project Execution
4. Cyber Security Approach

IA Trend and Customers’ Challenge
IA Treads – Global Mega Trend and Industry Trends

Global megatrends

**Technological**
- Internet of Things (IoT)
- Cloud computing
- Human augmentation

**Political**
- Geopolitical power balance
- Resource rationalization
- Electricity deregulation

**Environmental**
- Emissions reduction
- Energy rebalancing
- Natural disasters

**Economic**
- Growth of emerging economies
- Industrial reorganization
- Reinforcement of energy security

**Social**
- Globalization
- Demographic Changes
- Motivating younger generations

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Market Trends Hype vs. Reality

Gartner Hype Cycle for Emerging Technologies, 2017

- **1.** Introduction
- **2.** Peak of Inflated Expectations
- **3.** Trough of Disillusionment
- **4.** Rising of Productivity
- **5.** Hype of Productivity

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Digital Twin

Digital Replica of physical assets, Process & systems

Source: GE Digital

KBC & BAKER HUGHES(GE) 19th Sept
“For 1st time O&G customers can build Digital twin of a Plant, refinery or Rig with KBC’s Petro-SIM™”
Open Process Automation Forum

- Open Process Automation Forum is part of The Open Group
  - www.opengroup.org
- ExxonMobil selected The Open Group
- The Open Group is a non-profit, global consortium for IT standards

ExxonMobil Automation Vision

- Real-Time OT Services
  - Abnormal Event Detection
  - Procedural Automation
  - Advanced Control
  - Process Optimization

- Transactional IT Services
  - Planning & Scheduling
  - Enterprise Data Analytics

- Manufacturing OT Data Center (L1 → L3 Functions)

- Enterprise IT Data Centers (L4 Functions)

- Cloud Services
  - Predictive Maintenance
  - Global Data Analytics
  - Remote Operations
  - Fleet Services

- External Data Centers (L4 Functions)

- Legacy Device/Network Gateway

- Distributed Control Node (L1 → L3 Functions)

- Source: ExxonMobil
OT and IIoT

Process Automation and IIoT Integration
Enabling users in mission critical industrial plants to leverage IIoT derived benefits

Can you imagine cloud computing replacing our traditional controllers!

Customers’ Challenges and Concerns

Project execution
Managing uncertainty, project complexity, late changes, cost overruns, and deploys. The challenges are even greater when the lack of manpower and technical resources are factored in.
Customers’ Challenges and Concerns

Plant lifecycle

Sustainable operation

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Human Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce OPEX</td>
<td>Overcome shortage of skill, or skilled workforce</td>
</tr>
<tr>
<td>Enhance productivity and efficiency</td>
<td>Reduce human errors</td>
</tr>
<tr>
<td>Increase yield</td>
<td>Retain and transfer knowledge</td>
</tr>
<tr>
<td>Improve energy efficiency</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Availability</th>
<th>Safety &amp; Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce unplanned outages</td>
<td>Reduce abnormal situations</td>
</tr>
<tr>
<td>Manage aging assets</td>
<td>Improve cyber security</td>
</tr>
<tr>
<td>Ensure start-up/shut-down procedure</td>
<td>Adopt to environmental regulations</td>
</tr>
<tr>
<td></td>
<td>Enhance products</td>
</tr>
</tbody>
</table>

Lifecycle extension

- Shorter technology cycle results in multiple generation system compatibility issues and higher cost to maintain
- High OPEX to maintain obsolete system & components
- High CAPEX to upgrade systems
- Downtime due to system upgrades

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Customers' Challenges and Concerns

Results in higher OPEX & gaps between solutions and services throughout the plant lifecycle. Some problems cannot be solved without considering an integrated approach.

How do we help our customers achieve and sustain optimum performance throughout the entire plant lifecycle?
Customers’ Challenges and Concerns

Integrated approach

- Pursue Long-term partnership with customers based on a shared vision.
- Deliver sustainable plant lifecycle solutions, right from the beginning.

Issues & challenges

Products . Solutions . Services

2. Latest Technology to Distributed Control System (DCS) and Safety Instrumented System (SIS)
Long Term Support & Migration

Full Lifecycle Support for Customers’ Legacy Systems
The migration path for each legacy system is always taken into consideration before a new system is released.

Enablers to Solve Customers’ Challenges

Smart Engineering
A new engineering ecosystem that delivers certainty and confidence.

System Agility
System agility that provides flexibility, adaptability and extensibility to cater for plant upgrading or extension needs, in tandem with changes in plant operations and business exigency.

Advanced Operation
An advanced operation that empowers operators to make smarter decisions.

Sustainable Plant
Optimum system performance throughout the entire lifecycle of the plant.
CENTUM VP R6 – New Release Components

<table>
<thead>
<tr>
<th>Next Generation</th>
<th>Integrated Engineering</th>
<th>Field Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart I/O</td>
<td>Environment</td>
<td>Tool</td>
</tr>
</tbody>
</table>

Smart I/O | Centralized Engineering | Field Device Adjustment Tool

Decoupling

Application development

Smart engineering

Flexible binding

Design

Parallel implementation

SAT

Yokogawa’s agile project execution model

Yokogawa’s ICSS System Architecture

Integrated Control and Safety System (ICSS)

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Traditional I/O System
Smart I/O System

Distributed Control System (DCS)

Real Time Control Network (Vnet/IP)

Unified Gateway Station

3rd party system Subsystems

Integrated Information Management

Human Interface Station

Engineering Station

Plant Asset Management

Traditional I/O System
Smart I/O System

Safety Instrumented System (SIS)
Yokogawa’s Smart I/O Solution

- Yokogawa Smart I/O is designed with fewer components. A single module can be configured to support AI/AO/DI/DO.
- An optional signal conditioner can be plugged in to support a wide range of I/O signal types (to DCS Only).
- The backplane allows I/O redundancy by design, resulting in a smaller footprint.

Smart I/O module
- 16 I/O channels
- Signal: AI/AO/DI/DO
- Software configurable
- HART 7 support
- Full redundancy

Signal conditioner (optional)
- Wide range of I/O
- Pulse, relay, DO, etc.

Comparison between Traditional and Smart I/O System

Marshalling – Traditional I/O System
- Field Cables (Multicore)
- Terminals
- Duct

Marshalling – Smart I/O System
- Field Cables (Multicore)
- Smart I/O

Termination block

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Field Validation Tool – FieldMate Validator

- Facilitate early completion of field work without requiring the entire system to be ready at site.
- Enable flexible binding with DCS at any stage of SAT.

3. Agile Project Execution

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Yokogawa’s Proposed New Project Execution

Conventional Execution

- Design
- Configuration
- Application & Hardware FAT
- Ship & Install
- Field wiring
- Site Activity (incl. Loop check)

Agile Project Execution

- Design
- Configuration
- Application & Hardware FAT
- Ship & Install
- Field wiring
- Site Activity

Late Start

Increasing quality and Reduce waste

Reducing risks of handover slippage

The class module effect
Smart I/O Solution effects
Field Device Adjustment Tool effects

Yokogawa’s agile project execution model

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Smart Engineering
4. Cyber Security Approach

Yokogawa provides the solutions to implement a comprehensive security lifecycle based on the “defense in depth” strategy.
## Plant Security Lifecycle Service Portfolio

<table>
<thead>
<tr>
<th>Assessment and Analysis</th>
<th>Design and Implementation</th>
<th>Operation Support</th>
<th>Validation Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Based Security</td>
<td>Security Update</td>
<td>Antivirus Update</td>
<td>Audit</td>
</tr>
<tr>
<td>Network Security</td>
<td>Secure Network Design</td>
<td>Virus Check Service</td>
<td></td>
</tr>
<tr>
<td>Security Assessment</td>
<td>Secure Network Design</td>
<td>Network Integrity Check</td>
<td></td>
</tr>
<tr>
<td>Antivirus Implementation</td>
<td>Firewall</td>
<td>Security Incident Response</td>
<td></td>
</tr>
<tr>
<td>OS Patch Management</td>
<td>Application Whitelisting Update</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malware Inactivated Service</td>
<td>Network Monitoring System</td>
<td>SOC (Managed Service)</td>
<td></td>
</tr>
<tr>
<td>OS Hardening/USB Port lock</td>
<td>Next Gen Firewall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User/PC Setting Management</td>
<td>IPS / IDS</td>
<td>Security Awareness Training</td>
<td></td>
</tr>
<tr>
<td>Backup Recovery System</td>
<td>Unidirectional Gateway</td>
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<td></td>
</tr>
</tbody>
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Thank you for your attention!