Scalability in Automation
for enterprise-wide visibility & increased efficiency

Amy Wooten
Senior Product Manager Digital Plant
GE Digital
GE Digital

At GE Digital, we are putting our industrial software to work to accelerate global transitions that will impact every industry on the planet.

Grid Software
40% of electricity created on the planet is touched by our industrial software.

Grid Software

For 30+ years, our software has helped more than 18,000 global manufacturing customers achieve operational agility with software that delivers enterprise-wide visibility and scalability – in CPG/F&B, Automotive, Pharma & LS, Water Utilities, etc.

Power Generation / Oil & Gas Software
Our industrial software manages more than 3000 gas and steam turbines, roughly 1/6th of the world's installed power base.

Aviation Software
Our software helps 450+ customers, 6000 pilots, and 57,000 crew improve customers' safety and efficiency, and improve the passenger experience.

GE Power
Equipping 90% of transmission utilities worldwide.

GE Renewable Energy
Installed 400+ GW capacity globally.

GE Aviation
Powering two-thirds of commercial aircraft departures.*

GE Healthcare
17,000+ babies born every day with the help of our equipment.

Scalability in automation
The importance of scalability in automation

Areas to consider

• Development & roll-out
• Maintenance – total life cycle of applications
• Performance
• Vulnerability
• Accessibility
Development & Roll out
From sensor to cloud
Can your automation start small & grow big?

- Common development tools across applications
- Consistent user experience
- Object-oriented & templatized apps
- Reduce infrastructure cost - cloud

Scalability in automation
Automation that scales

Expand the system as required:
• Add more clients incl. mobile
• Include more PLCs / control devices in the application
• A more servers for expansion/redundancy
• Add data storage capabilities

Selection criteria:
• I can seamlessly integrate new components
• Consistent UX
• “System of system”
• Maintain performance
• Fast upgradability with minimal downtime
Scalability & flexibility

Choosing the right client for the job

A Client Server Architecture

- Scale from a single station point solution ... to Enterprise applications.
- Supports hundreds of clients simultaneously

What type of client:

- Personas
- Thin or thick clients?
- On the plant floor & remote
- Use standard technologies:
  - Terminal Services
  - HTML 5 for interoperability
  - OPC UA for interoperability
Rapid Application Development (RAD)

**Faster time to value and adaption to change**

**Configuration vs. programming**
An open ecosystem provides the most flexibility
Data modelling & tag management are key - define your data structure/model once
Key capabilities out-of-the-box reduce development time – configure once & re-use

**REDUCE BUILD/DEPLOY TIME & REDUCE OVERALL TCO**
Rollout Challenges – Company-wide

Site 1
- First implementation
- Plant Expansion

Site 2
- Roll out
- Best practices

Site 3
- Roll out
- Central Management

Digital plant

Rollout Challenges

Scalability in automation

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Cost of deployment & maintenance

5 points to consider

**Installation**: Anyone can do it – system shall be installed and running in just hours

**Configuration**: Intuitive, WYSIWYG interface, configuration – not programming

**Data availability**: Make required data available in a fast and easy way – connectivity & interoperability

**Data & System accessibility**: Remote access thru web tools for modifications & enhancements

**Maintenance**: Solution shall require minimum on-line maintenance – easy to scale & upgrade

Reduce costs of deployment & maintenance
Performance
Different applications require different execution speed

- **Cloud**
  - 1 second to a few seconds
  - Few seconds to a minute
  - Minutes to hours

Company-wide analytics & reporting

- Automation / SCADA
  - Millisecond
  - Millisecond to < 1 second

Scalability in automation

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Asset</th>
<th>Plant</th>
<th>Area/District</th>
<th>Global Infrastructure</th>
<th>Cloud</th>
</tr>
</thead>
</table>

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What it means for industrial data

Operational data requires “near real time” speed to ensures optimal analysis & decision making – no data gap allowed!

RDBs\(^{(1)}\) cannot meet high performance data collection

An industrial data historian provides efficient data storage and compression:

- Reduce storage size
- Improve performance
- Decrease IT costs

(1) RDB: Relational Database
Optimizing data access for performance

- Polling vs. report by exception/event
- Optimizing request to control system to reduce load
- Hybrid cloud deployment based on data categorization
Cost of vulnerability
Production data needs to be highly reliable and available to ensure accuracy and quality for improvements
Security Goals - The “CIA” model

Maintain the **Confidentiality**, **Integrity** and **Availability** of systems and data

**Confidentiality**
- Only the people you want to see information can see it

**Integrity**
- The data is what it is supposed to be

**Availability**
- The system or data is available for use

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**General IT**

**Industrial Control Systems**

<table>
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<tr>
<th>Highest Priority</th>
<th>Lowest Priority</th>
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Ref.: Cyber Security Assessments of Industrial Control Systems, CNPI / US Homeland Security
Data vulnerability – points to remember

- Address the 3 security pillars: Availability, Integrity, Confidentiality
- Improve system availability with regular upgrades & alignment to latest features - You may have higher, hidden costs by continuing to use an obsolete system
- Use redundant & failover configurations for minimal disruption - Avoid downtime and information gaps
- Pick a solution which integrates with your IT security such as Active Directory & multiple domains support (MFA*, biometric login, ...)

* MFA: Multi-Factor Authentication
Accessibility
The right information anywhere, any time
Visualization a control that scales

- A single source of truth, from operators to managers
- Persona-based visualization - Get operational information in the hands of the people who need it
- Equip your workforce with mobile devices – for increased efficiency
- A holistic view of the performance to increase collaboration
Example
Remote monitoring and control of a large critical plant at GE Power
Remote monitoring & control at GE Power

Control room
(supervisor)

Full Control

Plant floor
(operator)

Monitoring only
(screen greyed out)
Remote monitoring & control at GE Power

Control room
(supervisor)

- Full Control
- Permits
- Grant access
  - Operator #1
  - Asset G11

Plant floor
(operator)

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Remote monitoring & control at GE Power

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- First pop up
- Confirm action
Remote monitoring & control at GE Power

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Supervisor can take over if needed

Control back to Supervisor

Back to normal

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First pop up

Confirm action

Release control

Operator #1

Asset G11
Remote monitoring & control at GE Power

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Company-wide visibility for central operations

**Key to success**

- Designing the optimal interfaces
- Enabling better collaboration between:
  - Remote operators,
  - SMEs,
  - plant personnel,
  - Etc.
Summary:
The requirements for truly scalable automation

1. Use a modern, integrated architecture
2. Ensure interoperability between components – use standards
3. Assess scalability of all components & plan for space capacity
4. Develop a strong data management strategy – information flow across the facilities, storage & retrieval
5. Develop once and reuse
6. Gain control tower visibility to provide process, data, and key metric transparency.
7. Secure data and applications access – built-in security
8. Optimize your legacy technology investment
Centralized, remote & mobile operations

**Key outcomes**

- See all OT/IT information in context
- Make better informed decision
- Democratization of digital tools give greater accessibility
- Ability to leverage analytics for assistance, advanced warnings & intelligent decision making

*Faster response time & increased operational agility*

**Realized outcomes & ROI***

- **Chemicals**: 37% increase in abnormal situation handling, ROI less than a year
- **Water utility company**: 40% faster troubleshooting, ROI less than a year
- **Power**: 70% increase of UX usability score
- **Building management**: 25% reduction of energy bill, ROI ~18 months

* Customer interviews
Thanks!

Q&A

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