GE Digital

Greater Operator Efficiency in Water and Wastewater

MODERNIZING HMI/SCADA WITH IOT SOLUTIONS FOR MOBILITY & REMOTE MONITORING

TABLE OF CONTENTS

INTRODUCTION

Enter the world of water utilities:

- Aging infrastructure
- Declining revenues
- Retiring experienced workers
- Increasing service level expectations
- Regulations

What's more, resources for water and wastewater capital programs are limited, making it difficult to carry out infrastructure modernization, expansion, and technology upgrades.

How can you address these critical challenges while delivering the best return on investment to ratepayers or private sector investors? Chances are, you cannot easily raise water and sewer rates or purchase new equipment.

So you're left to become as efficient as possible with the assets you have. This means you've got to look at your operations holistically to understand and predict what's happening to make the best decisions for modernizing and optimizing.

GREATER EFFICIENCY WITH THE MODERN HMI/SCADA

The good news is the technology and solutions are here. They revolutionize what's possible for water and wastewater utilities.

By modernizing your existing HMI/SCADA system, you can have High Performance visualization, real-time information when and where you need it, and the ability to connect the dots between your data, leveraging the Internet of Things (IoT).

The modern HMI/SCADA lets you guide newer operators through the right steps to take. And, you can enable mobility and remote monitoring for greater efficiency.

Welcome to the modern HMI/SCADA system—where machines, data, insights, and people are connected.

The U.S. alone loses about

7 billion gallons

of treated water per year due to aging infrastructure.

TODAY'S CHALLENGES

In general, challenges at a utility are related to three main areas:

- Availability and reliability: Examples include aging infrastructure, stability of the system, and reliability of the data coming in from the field.
- Risk: Examples include compliance concerns, cybersecurity and physical security, reporting, and errors due to high workforce turnover and experienced operators retiring.
- Cost: Examples include chemicals, training newer operators, energy costs, maintenance.

Water and wastewater professionals are constantly facing the challenge of finding the right balance between availability and reliability, risk, and cost.

How to reduce cost without compromising availability? How to mitigate risks while keeping costs under control?

VALUE OF MODERN HMI/SCADA

The modern HMI/SCADA helps to reduce operating cost, maintain a high level of service, ease compliance with evolving regulatory standards, and increase the efficiency of the field operators.

Additionally, utilities can use this control layer as a foundation for digital transformation to be better prepared for the future.

By modernizing HMI/SCADA, utilities can directly address challenges in the three key areas in several ways:

High availability and reliability

- Secure-by-design SCADA
- Disaster recovery architecture
- Information anytime, anywhere

Risk Management

- Reliable data management
- Effective alarm management
- Consistent operating processes
- Improved communication and collaboration across teams

Cost Management

- More efficient operators
- Enhanced operations visibility
- Effective data analysis

VIEW HMI/SCADA DEMO

10 TIPS FOR MODERNIZING YOUR HMI/SCADA

DESIGNING AND STRUCTURING FOR BETTER OPERATIONAL PERFORMANCE

1. Get up to date with SCADA and OS versions and patches.

Many utilities are still on old – sometimes very old – versions of their SCADA software. However, regular updates and alignment to the latest features improve system availability. A lapse in updates increases security concerns. Additionally, you probably have higher, hidden costs by continuing to use an obsolete system.

This is a foundational step. Before you take any other steps to modernize including analytics or web-based interfaces, make sure your SCADA and OS is up to date with versions and patches. This will enable you to start with the right platform to enhance your capabilities.

Reminder! With Windows 7 end of life, upgrade to Windows 10.

2. Standardize your SCADA implementation.

Improve efficiency by defining standards for the overall SCADA system including application, configuration, security, architecture, and remote access – even the devices that people use.

Standardization will help you reduce errors, lower costs, and boost operations efficiency.

For example, consistent representation and procedures reduce errors across multiple stakeholders. Teams benefit from a shorter learning curve, faster roll-outs, and easier maintenance. Standardization also helps ensure compliance. Lastly, with tag name conventions, you can leverage OPC UA: browse OPC UA sources and automatically create your SCADA process database.

3. Develop a Disaster Recovery Plan.

A Disaster Recovery Plan can start simple, such as a versioning plan related to backup and restore. Next, lay out a long-term roadmap and think about moving to a redundant and failover system with configurations for minimal disruption.

You can build redundancy at all levels: SCADA server failover, LAN redundancy, client redundancy. Target having no data lost, looking at your databases, real-time data, and alarm synchronization. Make the system seamless for remote users.

A Disaster Recovery Plan is more than peace of mind; it is an essential part of improving availability and reliability.

10 TIPS FOR MODERNIZING YOUR HMI/SCADA

DESIGNING AND STRUCTURING FOR BETTER OPERATIONAL PERFORMANCE

4. Implement best-in-class data management.

Put together a plan to collect, store and distribute your data securely. You can't operate a plant effectively unless you have all the correct data in a timely fashion.

Consider a plant-wide historian for more reliable and consistent information – collecting from different data sources, providing the ability to extend and scale as your systems grow; and integrating your data management layer with your CMMS or GIS systems. Modern technologies make information available to stakeholders who aren't directly connected with the SCADA but need data to make decisions, such as demand and planning.

5. Build effective alarm procedures.

Many resources for effective alarm management are available, such as through ISA. A good alarm strategy means less noise, faster reactions, increased productivity and efficiency, and safer operations. You can move from an alarm to notification and guiding the right action.

6. Digitize work processes.

Every water facility has standard operating procedures in some form, mostly printed manuals. Now, you can move from manuals to integrating work processes into your SCADA system.

Using SCADA data, you can trigger a work process, guide operators through steps, and increase operational consistency. Electronic Standard Operating Procedures also capture best practices and accelerate new operator training.

Digitize your procedures to ensure:

- Consistency
- Repeatability
- Adherence to standards
- Accountability on tasks

You can drive the right actions and help prevent mistakes from happening. Additionally, you can record and track work processes for compliance.

7. Drive organization-wide connectivity.

Organization-wide SCADA connectivity – across the entire water system – provides a holistic view of performance, fills data gaps, and increases collaboration. Centralized Information Management drives consistency across plants and sites. You can leverage highly secure-by-design thin clients on inexpensive hardware to make information readily available to all levels of the organization.

10 TIPS FOR MODERNIZING YOUR HMI/SCADA

DESIGNING AND STRUCTURING FOR BETTER OPERATIONAL PERFORMANCE

8. Leverage persona-based visualization.

Give each person the information and capabilities that they need, rather than the same SCADA screen for every person.

Modern HMI/SCADA allows you to equip your workforce with tailored information, remote monitoring and control capabilities, and devices – whether a smartphone, iPad, or legacy device that supports HTML5.

You'll get the right operational information to the people who need it, saving tremendous staff time while speeding response and compliance.

9. Enable model-based HMI navigation.

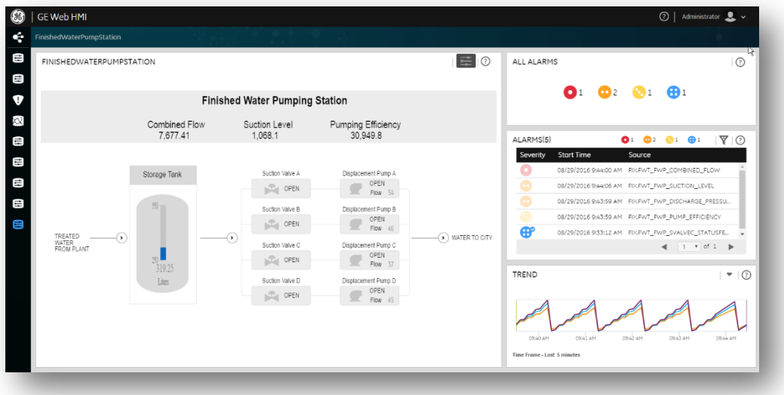
With modern HMI/SCADA, you can leverage industry standards to map your data model to an equipment model – structuring your data and providing standard context across locations and data sources.

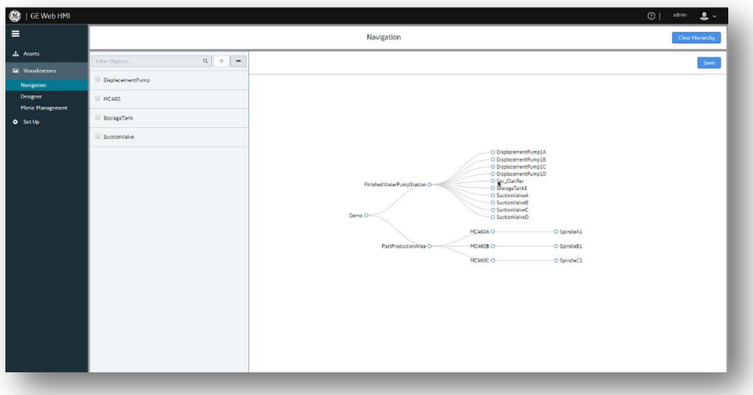
Users can quickly navigate in context, derived from the model. Model-based HMI navigation enables a common User Experience regardless of the screen, device, equipment, role, or process.

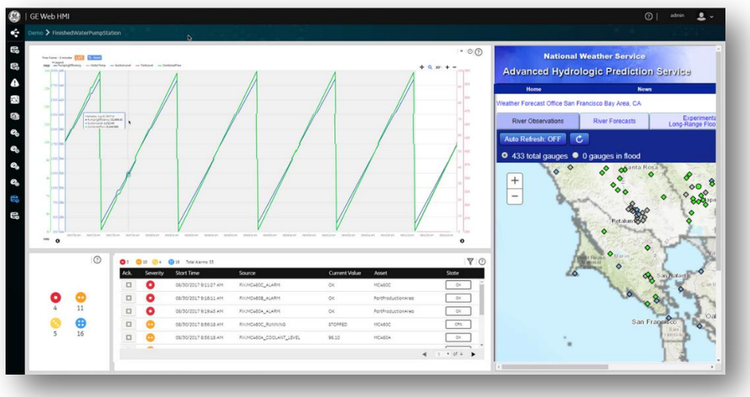
10. Implement High Performance HMI.

High Performance HMI, based on the ISA 101 standards, increases operator efficiency through better screens.

With a simple and consistent design, High Performance screens boost situational awareness, alarm detection, and productivity, while decreasing the risk of errors. Operators and technicians recognize and understand information with greater ease and speed.







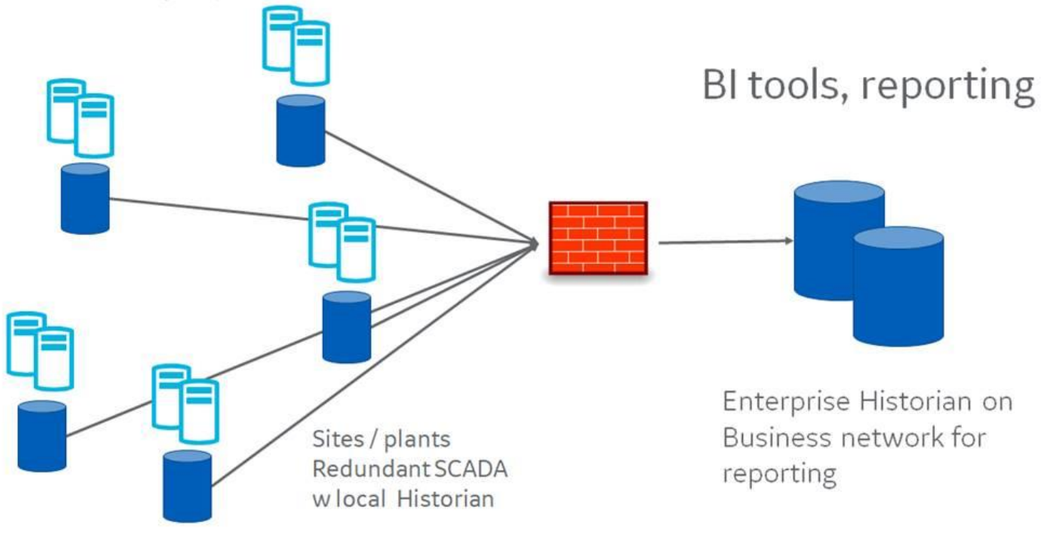
MODERNIZING WITH WATER AND WASTEWATER SOLUTIONS FROM GE DIGITAL

HAVE YOU SEEN OUR SOFTWARE LATELY?

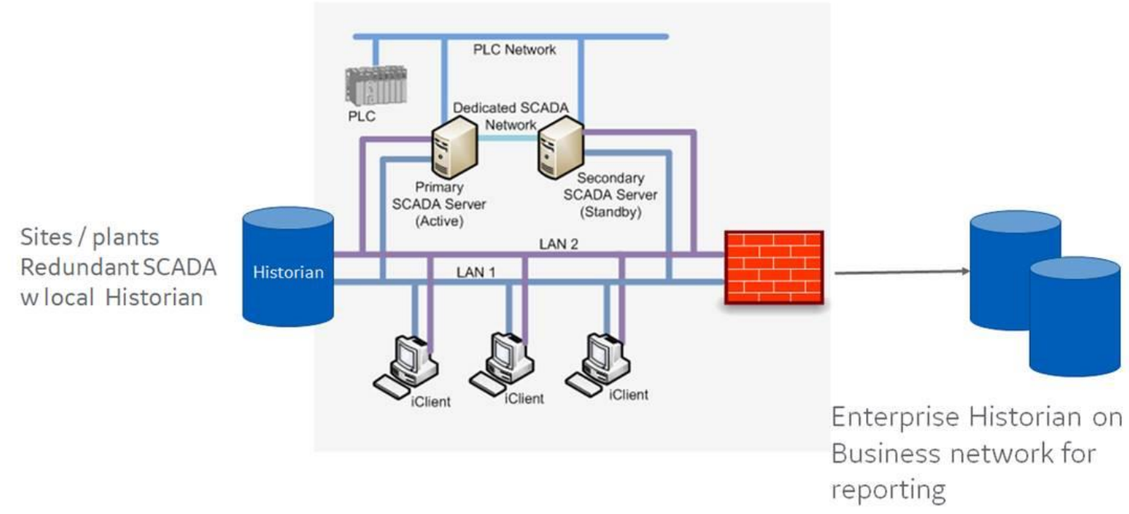
- iFIX HMI/SCADA
- CIMPLICITY HMI/SCADA
- Historian
- IGS – Industrial Gateway Server
- Webspace
- Operations Hub
- Dream Report
- WIN-911
- Workflow

ARCHITECTURE EXAMPLES

Common deployment scenario



High Availability iFIX with SCADA Synchronization



iFIX 6.0 from GE Digital

Improve operational productivity by driving decision support with High Performance visualization

High Performance HMI/SCADA increases efficiency and reduces costs

With just a glance, operators should be able to recognize which information requires their attention and what action needs to be taken. They need to know quickly what problems have arisen and how they can be addressed efficiently.

You can enable smart operators with new fourth-generation HMI/SCADA. The new iFIX 6.0 from GE Digital leverages the latest technologies that help deliver faster time to insight and greater efficiency for your operations while speeding time-to-insight for system integrators.

iFIX 6.0 offers several core enhancements to decrease deployment time, while increasing operational efficiency in a highly secure-by-design method to improve equipment uptime and reduce cost and risk. These enhancements include alarm shelving, an OPC UA server, support for long tag names and descriptions, and more.

Outcomes

- Speed response with modern screens and ISA 18.2 alarm management
- Reduce troubleshooting time with higher situational awareness, using High Performance HMI layouts and context-driven navigation based on a model structure
- Enable action anywhere, anytime with native responsive web design
- Speed up deployment through long tag names and descriptions that capture any hierarchy from your PLC
- Minimize maintenance time and costs with zero deployment clients
- Provide real-time data feeds to your supply chain through secure-by-design OPC UA communications
- Enable superior design flexibility for consumption of third-party HTML5 content

01 Increase situational awareness with modern screens and advanced alarm management

iFIX 6.0 provides new support for the ISA 18.2 alarm shelving standard, increasing efficiency by allowing operators to avoid responding to unnecessary alarms. Operators can shelve alarms directly at run-time and create up to 20 shelving policies with different shelving times for different areas of your plant. Alarms automatically unshelve when the shelve duration time expires for true plant safety.

02 Find information easily with a context-rich HMI based on the model structure

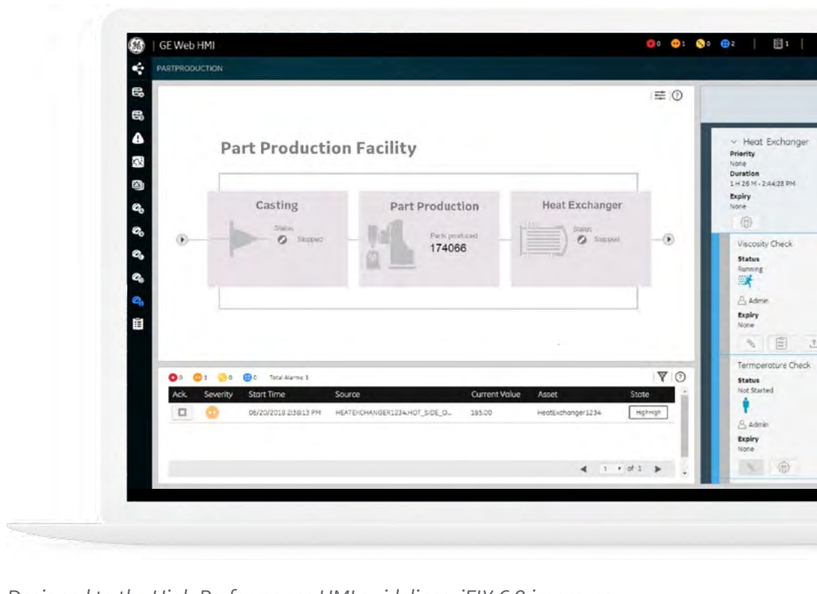
This context-rich HMI changes as the user moves through the system. Navigation is derived from the model structure built by the engineer. The context follows the asset definition and is defined only once for a class of assets. This prescribed experience provides the operator with the most relevant information—in context—and minimizes the effort to find it.

03 Reduce time to solution with High Performance HMI out of the box

To help engineers create the right user experience, iFIX 6.0 contains pre-defined objects and templates designed using High Performance HMI concepts. Effective layouts are also available out of the box. Designing your HMI has never been so easy, speeding time to solution and maintenance. iFIX 6.0 also allows assembly of graphic content using external HTML5 editors as well as automatic picture publishing for Web HMI.

04 Achieve visualization where you need it with native responsive web design

The HTML5 user interface produced using iFIX 6.0 offers native Web out of the box and supports responsive design concepts. The displays support multi-touch and can scale to adapt to various form factors.



Designed to the High Performance HMI guidelines, iFIX 6.0 improves operator decision making and speeds response.

05 Reduce risk with secure-by-design technology

iFIX leverages open and secure standards such as OPC UA, digital certificates, and Web tokens, which means you can deploy with confidence. Take advantage of GE Digital's iFIX Secure Deployment Guide for best practice recommendations.

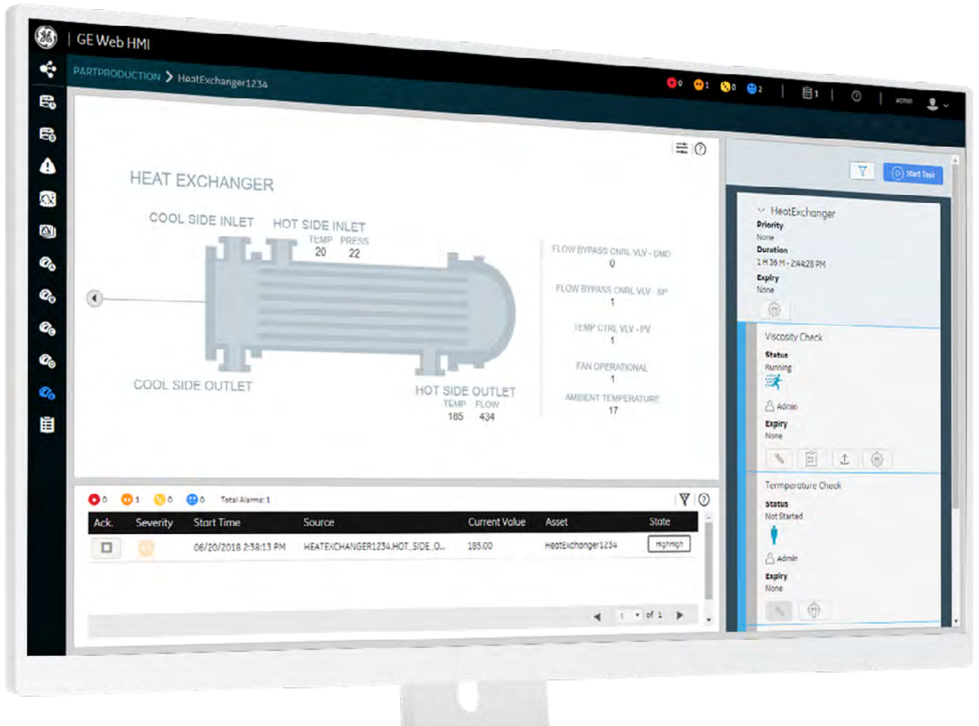
> *"iFIX is the easiest way to hook to a variety of things ... We haven't found anything that iFIX couldn't overcome."*
>
> **John Franklin, Logic Systems Administrator, Arizona Electric Power Cooperative**

iFIX 6.0 from GE Digital

Improve operational productivity by driving decision support with High Performance visualization

Features

- New in Version 6.0: ISA 18.2 alarm shelving, OPC UA server for secure-by-design client connections, long tag names and descriptions, domain caching, support for the latest Microsoft OS, and more
- Time lapse playback
- High performance Dynamos and other features at your fingertips for Efficient HMI
- Available options for high availability, alarm notification, and CFR 21 Part 11 support (eSig)
- Native Web HMI
- Structured asset model mapped to the SCADA database
- HTML5 object library for a more efficient HMI and HTML5 content generation from the workspace
- Base API to consume external HTML5 content
- Standard layouts and cards on topics such as trends, alarms, KPIs, and more
- Multi-touch alarm and trend viewer
- Local, remote over LAN, WAN, or Internet connections, including VPN
- Encrypted communication from your Web client using SSL / digital certificate, IT security friendly, and cloud ready



Hardware requirements

- A 2.0 GHz Intel Core2 Duo Processor or better computer. For better performance, GE Digital recommends a minimum 3 GHz computer with 4 GB memory or better is needed. Be aware that the computer must be at least dual core; a single core is not supported (with or without hyper-threading).
- A minimum of 2 GB RAM. For better performance, please consider using more.
- A minimum of 10 GB of free hard drive space for iFIX pictures, databases, alarm files, and other data files.

Software requirements

- Qualified HTML5 browsers
- One of the following operating systems:
  - Microsoft Windows 10
  - Microsoft Windows 8.1 (32-bit or 64-bit)
  - Microsoft Windows 7 Embedded Standard, Service Pack 1, for iFIX 6.0 Embedded licenses only. iFIX Embedded licenses will not run on Windows 10 IoT or other operating systems.
  - Microsoft Windows 7 (32-bit or 64-bit)
  - Microsoft Windows Server 2016
  - Microsoft Windows Server 2012 R2
- Network interface software for TCP/IP network communication and certain I/O drivers.
- An I/O driver for SCADA servers. GE Digital supplies I/O drivers for many programmable controllers.

Hardware and software requirements are representative and may vary by customer deployment. Please consult the product documentation for more details.

Today's SCADA is not just monitoring and visualization with alarms rolling in. iFIX 6.0 can optimize your operations for active decision support—enabling your team to achieve critical business outcomes.

LEARN MORE

Each window of the layout provides a different, interchangeable perspective, or view, on the displayed asset to deliver a personalized experience.

CIMPLICITY 10 from GE Digital

Precisely monitor and control every aspect of your industrial operations with efficient HMI/SCADA

Enable smarter operators with Efficient HMI for the right actions and outcomes

As a proven automation platform, CIMPLICITY from GE Digital provides true client-server visualization and control—from single machines to plant locations spanning the world—helping you manage your operations and improve decision-making.

Based on decades of GE Digital's research and development, CIMPLICITY is the HMI and SCADA of choice for the world's largest manufacturers. For applications of all sizes, CIMPLICITY can help deliver faster response, reduced costs, and increased profitability.

Our latest version enables Efficient HMI with Web HMI from GE Digital to speed operator actions, offers secure-by-design connectivity and certification management, enhances modeling for repeatability and time savings, and provides the latest operating system and database updates.

Outcomes

- Speed problem detection and response with ISA and GE research-based design concepts for Efficient HMI
- Reduce time-to-value with object-oriented design for repeatability
- Improve decision-making with richer information in context, supported by modeled data
- Reduce threat of cyber attacks with overall certificate-based communications
- Minimize maintenance time and costs with zero deployment clients
- Enable superior design flexibility for consumption of third-party HTML5 content
- Boost security and reliability with the latest operating system and database updates, including Microsoft Windows Server 2016 and Windows 10 support

01 Decrease operator response time and errors with Efficient HMI and SCADA

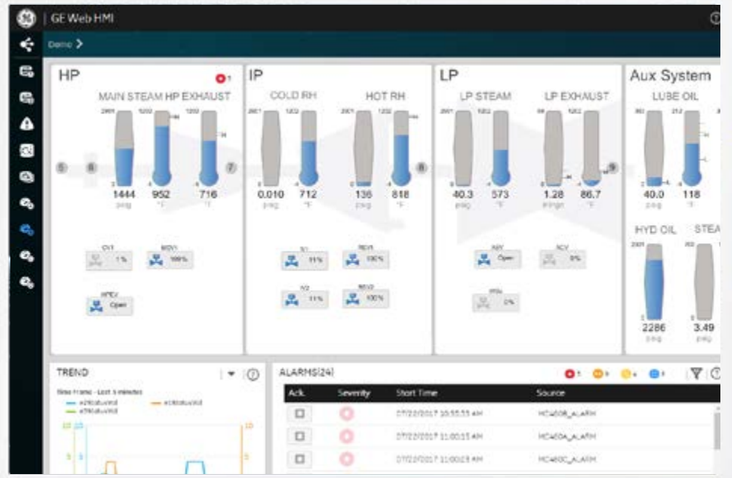
CIMPLICITY changes the HMI experience to enable decision support for the user. The overall HMI layout is designed to provide users with the most informed, personalized view of the problem or task at hand - for faster response and fewer errors.

02 Drive faster time-to-value with enhanced repeatability and modeling

Deploy solutions faster with CIMPLICITY's enhanced database with class containment. Employ object-oriented design for easy repeatability and faster time-to-value through modeled context. You can use classes and objects for building a structured database quickly. Modeling capabilities in CIMPLICITY allow you to create templated applications for repeatable assets, which can be leveraged in both the existing clients as well as the new Web HMI client.

03 Achieve visualization where you need it with native responsive web design

The CIMPLICITY screens created for the Web HMI are full HTML5 compliant and support responsive design concepts. The displays support multi-touch and can scale to adapt to various form factors and orientations where the HMI will be viewed, from small to large high-resolution screens.



With thousands of installations, CIMPLICITY with Web HMI offers trusted performance, reliability, one of the richest HMI/SCADA feature sets, and edge-to-cloud innovation from GE Digital.

04 Improve connectivity, security, and reliability across your entire operations

With OPC UA Server support for modeled data, CIMPLICITY helps you aggregate systems for a single connection to your SCADA and consolidated views. Additionally, CIMPLICITY's Global Discovery Server reduces threats from cyber attacks with overall certificate-based communication. Robust coding practices and Achilles Practices Certification make CIMPLICITY the SCADA of choice to help meet the most demanding security requirements.

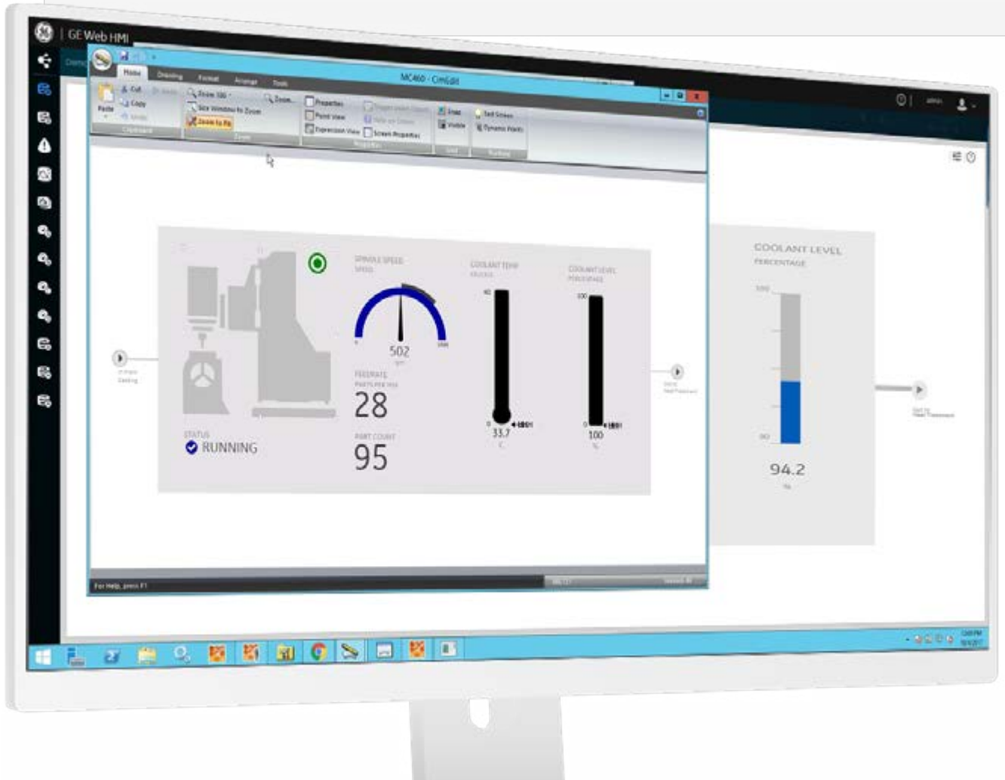
> *"Using GE Digital's software has enabled us to demonstrably increase productivity and significantly improve the process quality. The software facilitates the daily work of our staff."*
>
> **Martin Siegenthaler, Process Automation and System Support, Blaser Swisslube AG**

CIMPLICITY 10 from GE Digital

Precisely monitor and control every aspect of your industrial operations with efficient HMI/SCADA

Features

- OPC UA Alarm Server
- High performance HMI for efficiency
- Native Web HMI structured asset model mapped to CIMPLICITY's objects and classes
- Enhanced library for a more efficient HMI and HTML5 content generation from the workbench
- Never start with a blank sheet of paper, improve efficiency by starting with a model
- Standard layouts and cards on topics such as trends, alarms, KPIs, and more
- Multi-touch alarm and trend viewer
- Local, remote over LAN, WAN, or Internet connections, including VPN
- Encrypted communication from your Web client using SSL / digital certificate, IT security friendly, and cloud ready
- OPC UA for structured data and secure-by-design interoperability, including the OPC UA server for consolidated data in context to the model with certificate management
- Updated for new IT standards, including Microsoft Windows Server 2016 and Windows 10 support and Historian from GE Digital support



Hardware requirements

- Intel Core 2 Duo 3.0 GHz or better computer.
- A minimum of 4 GB RAM.
- A minimum of 40 GB of free hard drive space.

Software requirements

- One of the following operating systems:
  - Microsoft Windows 10
  - Microsoft Windows Server 2016
  - Microsoft Windows Server 2012 R2
  - Microsoft Windows 8.1
  - Microsoft Windows 7 SP1
- Supported: Microsoft SQL Server 2016, 2014, 2012 (11.x), 2008 R2; SQL Express 2014 and 2012; Microsoft Visual Studio 2012.4; Oracle 12C

Hardware and software requirements are representative and may vary by customer deployment. Please consult the product documentation for more details.

Improve your efficiency with the high performance HMI and SCADA capabilities in CIMPLICITY 10. With the latest innovation in HMI designs for efficiency, your operators can quickly identify problems and causes for a fast resolution.

LEARN MORE

With CIMPLICITY 10, you have a context-rich HMI that changes as the user moves through the system, based on an engineer-defined model structure. This prescribed experience provides the operator with the most relevant information—in context—and minimizes the effort to find it.

Historian 7.2 from GE Digital

Powerful industrial time-series data collection for on-premise and cloud-based storage & analysis

Best-in-class Historian solution from the edge to the cloud

Historian from GE Digital is a best-in-class historian software solution that collects your industrial time-series data needed to analyze asset and process performance so you can drive greater business value.

The emergence of cloud-based Industrial Internet of Things (IIoT) and big data solutions has spurred continued investment in our Historian. With decades of experience and thousands of successful customer installations around the world, Historian changes the way companies perform and compete by making data useful.

The new Historian 7.2 offers core enhancements to improve security, increase ease of use, and boost performance. You can take advantage of the solution's simple yet powerful features to unlock new value from your equipment and process data, and business models.

Outcomes

- Achieve fast time to value with simple installation and easy-to-use web clients with integrated tag searching and drag-and drop features
- Secure-by-design data collection and storage
- Small, powerful footprint, scaling to hundreds of users and millions of machine data points
- Support high availability with data redundancy
- Leverage continuous and highly scalable data read and write functionality
- Reduce storage costs
- Save time and costs with seamless ingestion to HDFS, adding time-series data to your big data analytics
- Take advantage of the time-saving dashboard, whereby critical data finds you

01 Improve data security

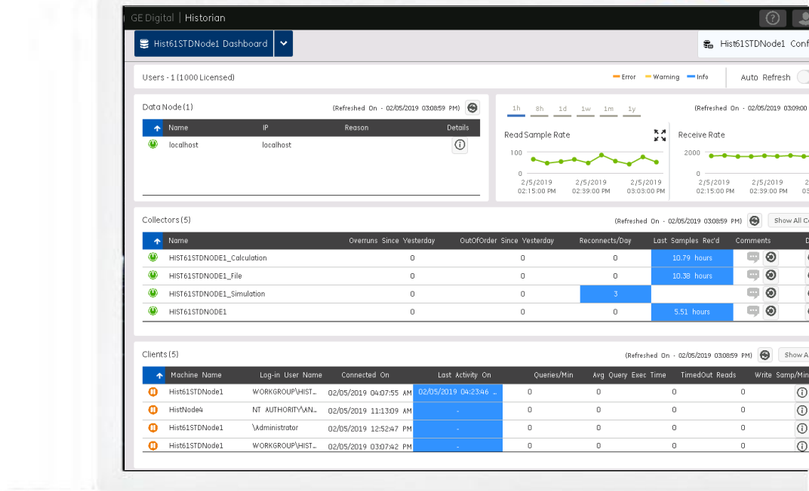
With data security as our highest priority, Historian 7.2 enhances the OPC UA collector to support user authentication. Historian also features integration with complex Active Directory to meet the needs of customers with complex nested domain arrangements. Users and administrators may belong to different organizations or domains. Additionally, domains may have sub-domains (multi-level) that need to inherit or refine on inherited permissions.

02 Simplification and ease of use

Historian installs in minutes and offers a small footprint yet scales to support hundreds of users and millions of individual machine data points. This new version replaces Oracle Java with AdoptOpenJDK, which uses infrastructure, build and test scripts to produce pre-built binaries from OpenJDK class libraries. Version 7.2 also enhances the OPC HDA Historian server to support aggregate functions, which are easily used to process raw data and visualize trends.

03 Better performance

Boosting read performance, Version 7.2 enhances the existing-archive files defragmentation tool. Users can defragment existing archive files using a command line based tool. This reorganizes the data nodes of a tag bringing the data nodes together so that bigger reads can be performed, improving read performance. Defragmentation can be done on all versions of archives, and the resulting archive will be the latest version.



The dashboard provides critical information from your data in a single view.

04 Faster configuration and easy connectivity for IIoT

Connect to your machine data with an existing collector or build your own using our SDK. Any collector can be configured to send data to your local Historian or to cloud-based Predix applications. Version 7.2 also introduces a bi-modal ODBC (SQL) collector.

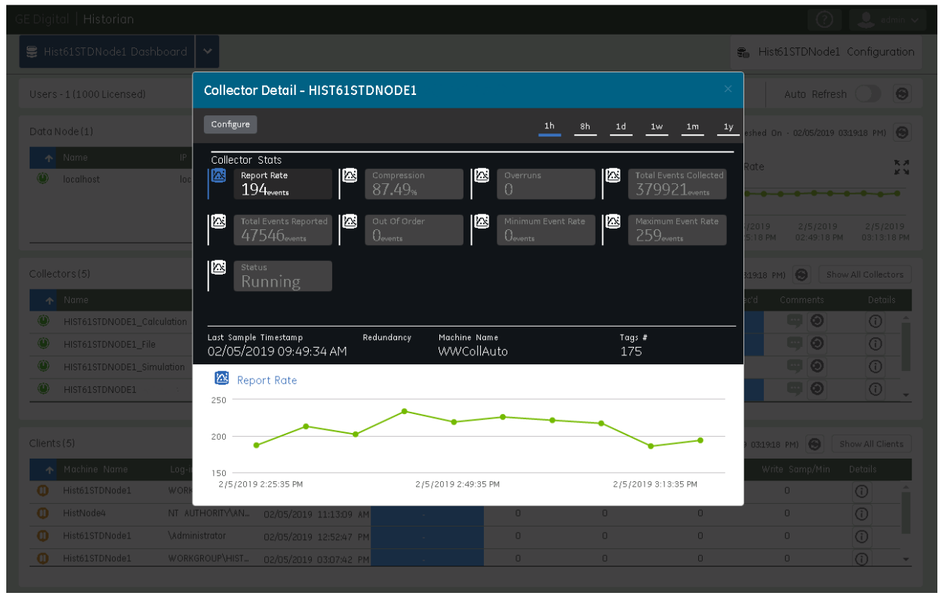
> *"GE's Historian is the heart of the [system]. This solution allows more accurate data to be implemented in real time for each machine and product."*
>
> **Hervé Husson, Automation and Industrial IT (A2i) Manager, Terreal**

Historian 7.2 from GE Digital

Powerful industrial time-series data collection for on-premise and cloud-based storage & analysis

Features

- Version 7.2: Replacement of Oracle Java with AdoptOpenJDK, enhanced OPC HDA Historian server to support aggregate functions, enhanced OPC-UA collector to support user authentication, new bi-modal ODBC (SQL) collector, enhanced PI Collector to support PI Snapshot
- Version 7.1: Integration with complex Active Directories (AD) arrangements, archive file defragmentation tool, new web-based online Help and standalone Help, data recovery in OPC HDA Collector, improved Search functionality, enhanced installation of OPC Collectors, and support for long-tag names and descriptions in iFIX.
- Easily deployable mirrored architecture based on GE's U.S.-patented highly efficient and secure storage format
- Alarms & Events database, allowing retrieval of A&E in correlation to time-series data
- Intelligent system diagnostic engine and dashboard
- Browser-based central administrative console and trend client
- UAA/OAuth2 Java Web Token security model
- Multi-threaded for high performance
- Scales to millions of tags
- Predix cloud and other client connectivity
- Cloudera certified method to move and query data in HDFS / Hadoop to Parquet
- Public REST API



Hardware Requirements

The following Hardware Requirements are not comprehensive. Please refer to the Getting Started Guide or Product Manager for complete requirements information related to your application.

- **Standard Historian Server – Minimum** 2.4 GHz clock-speed Intel Core i3 or i5 or i7 CPU or equivalent AMD Phenom CPU with 8 GB RAM for a 64-bit Historian Server; 80 GB free hard-drive space for the data archives, message files, buffer files, and log files used by the System; 100 Mbps TCP/IP compatible network interface adapter for network communication and certain I/O drivers.
- **Data Collector Node – Minimum** 2.0 GHz clock speed Intel Core i3 or i5 or i7 CPU or equivalent AMD Phenom CPU with 2 GB RAM; 40 GB of free hard-drive space to store buffered data; TCP/IP compatible network interface adapter for network communication and certain I/O drivers.
- **Microsoft Cluster Service – Minimum** 2.6 GHz clock-speed Intel Core i3 or i5 or i7 or Xeon or equivalent AMD Opteron CPU with minimum 8 GBRAM; 80 GB of local, free hard-drive space; 40 GB shared SCSI hard-drive (RAID preferred); Two 100Mbit TCP/IP-compatible network interface adapters for network communication and certain I/O drivers (One for public network, another for private network).

Note: The configuration of each server added to the cluster must be identical to the other servers in the cluster.

Software Requirements

- Operating Systems (64-bit systems only for your Historian Server): Windows Server 2019, Windows Server 2016, Windows Server 2012, Windows Server 2008 R2, Windows 7, 8.1, and 10
- Microsoft Excel 2016, 2013, 2010 (32 & 64 bit); 2007 (32 bit only)
- Browsers for Web Admin and Web Trend Tool Client Access: IE 11, Chrome 39+, Firefox 46+ . Browsers for Historian Help: IE 11, Chrome 39+, Firefox 46+, Microsoft Edge 40
- Web Server: Microsoft .NET Framework 4.5.2; Historian Client Tools 7.0 or greater; OLE DB, User API, and Historian Client Access Assembly

Other Information

- Collectors: Calculation, CygNet, File, iFIX, ODBC, OPC, OPC HDA, OPC UA Data Access, OSI PI (& OSI PI Distributor), Server-to-Server, Wonderware. Notes: To collect data from CIMPLICITY, you must use the Historian OPC collector with the CIMPLICITY OPC Server. See documentation for list of Bi-Modal Collectors. Majority of collectors can write to cloud.
- SQL Server 2008 R2 SP2 (S/E); SQL Server 2008 (E); SQL Server 2008 R2; SQL Server 2012 SP3; SQL Server 2014 SP1 (E/S/P); SQL Server 2016 (E/S/P); SQL Server 2017 (E/S/P)
- VMware ESXi: 5.0 and above

Hardware and software requirements are representative and may vary by customer deployment.
Please consult the product documentation for more details.

Both your IT department and end users will love the ease of deployment, scalability, simplicity, and speed of getting the data and value out of GE's Historian.

LEARN MORE

Industrial Gateway Server 7.66 from GE Digital

Enable reliable connections to your devices for control, data acquisition, and visualization

Robust, flexible connectivity

Industrial Gateway Server (IGS) from GE Digital is a powerful full- featured connectivity solution that's robust, reliable, and easy to use. IGS is packed with the latest and greatest industry standard protocols, which enable communication to thousands of mixed vendor devices and instruments.

With IGS 7.66, you have a comprehensive connectivity solution for GE Digital's HMI/SCADA, MES, and intelligence applications, as well as third-party solutions.

Outcomes

- Easily connect to GE Digital's software and third-party solutions
- Improve reliability with robust connectivity
- Save time with an enhanced interface that enables you to connect quickly
- Leverage control and security with powerful administration tools
- Enhance flexibility with basic drivers and premium options
- Achieve seamless communication with your installed base of equipment and systems

01 Options to drive connectivity further

IGS delivers a basic set of core drivers with an optional premium set that delivers additional specific niche drivers. IGS is available in two editions:

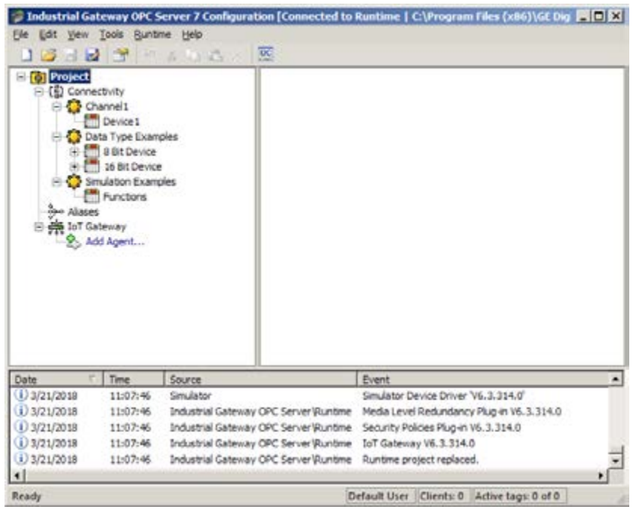
- **IGS Basic Protocol Drivers**
  This core offering delivers 100s of protocols for the most common devices in the automation industry. Key drivers in this package include Modbus, OPC, ODBC, Allen Bradley, GE, Honeywell, InTouch, Mitsubishi, Omron, Siemens, Yokogawa, and more.
- **IGS Premium Drivers**
  These premium drivers are an individual selection of industry-specific and IT protocols for advanced communications. These include protocols for power, water, oil and gas, and manufacturing.

02 Enhanced easy-to-use interface

The IGS configuration interface is designed to be easy and fast—enabling you to get your communications up quickly. In addition, IGS can be updated offline or online while clients are still connected to devices. This gives you the ability to update your system with minimal disruption—maximizing uptime and minimizing risk.

03 Control and security

IGS introduces a powerful set of administration tools to enhance control over the applicable IGS processes, configuration access, and runtime connection access. In addition to these options, when you're running multiple CPUs, you can specify which processor IGS uses—enabling full control of your system for the most demanding applications. The IGS OPC UA support includes tunneling which simplifies getting secure access to remote OPC DA servers on the same network or through firewalls, avoiding complicated DCOM configuration in Windows.



Industrial Gateway Server 7.66 from GE Digital

Enable reliable connections to your devices for control, data acquisition, and visualization

Features

- New in Version 7.66: support for the latest ControlLogix firmware (now up to version 31), security enhancements for configuration including password encryption for projects, keep alive option for configuration API, and various protocol specific bug fixes – refer to the release notes
- Connectivity for hundreds of different devices
- Built using the latest OPC standards (OPC DA 1.0, 2.05a, 3.0; OPC UA 1.01; OPC AE 1.0 and 1.1)
- Native driver for GE Digital's HMI/SCADA solutions and OPC connectivity across GE Digital's software portfolio
- Basic, Premium, and SNMP packaged sets of drivers
- Connectivity to thousands of devices from different vendors
- Ability to run many different protocols and devices simultaneously from a single instance
- Runs in service and interactive mode
- Certified OPC compliant
- Compatibility with GE Digital's iFIX, CIMPLICITY, Workflow, Plant Applications, and Historian software

If you're seeking reliable connectivity to your devices for control, data acquisition, and visualization, IGS is the right solution. It's flexible, robust, and easy to use with GE Digital's software and third-party solutions.

LEARN MORE

IGS brings more OPC server control and security to your implementations.

Industrial Gateway Server 7.66 from GE Digital

Enable reliable connections to your devices for control, data acquisition, and visualization

IGS Basic

IGS Basic includes access to all available IGS Basic protocols and use of up to 80 simultaneous protocols per server.

- Advanced Simulator
- Allen-Bradley 1609 UPS
  Allen-Bradley Bulletin 900
  Allen-Bradley ControlLogix Ethernet
  Allen-Bradley ControlLogix Unsolicited
  Allen-Bradley Data Highway Plus
  Allen-Bradley DF1
  Allen-Bradley Ethernet
  Allen-Bradley Micro800 Ethernet
  Allen-Bradley Micro800 Serial
  Allen-Bradley Unsolicited Ethernet
- Analog Devices
- Aromat Ethernet
  Aromat Serial
- AutomationDirect DirectNET
  AutomationDirect EBC
  AutomationDirect ECOM
  AutomationDirect K Sequence
  AutomationDirect Productivity Series Ethernet
- Beckhoff TwinCAT
- BUSWARE Ethernet
- CODESYS Ethernet
- Contrex M-Series
  Contrex Serial
- Custom Interface
- Cutler-Hammer D50/D300
  Cutler-Hammer ELC Ethernet
  Cutler-Hammer ELC Serial
- Dataforth isoLynx
- DDE Client
- Fanuc Focas Ethernet
  Fanuc Focas HSSB
- Fuji Flex
- GE CCM
  GE EGD
  GE Ethernet
  GE SNP
  GE SNPX
  GE SNP
  GE SNPX
- Hilscher Universal
- Honeywell HC900 Ethernet
  Honeywell UDC Ethernet
  Honeywell UDC Serial
- IDEC Serial
- Intelligent Actuator (IA) Super
- SEL
- InTouch Client
- IOtech PointScan 100
- Krauss Maffei MC4 Ethernet
- Memory Based
- Mettler Toledo
- Micro-DCI
- Mitsubishi CNC Ethernet
  Mitsubishi Ethernet
  Mitsubishi FX
  Mitsubishi FX Net
  Mitsubishi Serial
- Modbus ASCII
  Modbus Ethernet
  Modbus Plus
  Modbus Serial
  Modbus Unsolicited Serial
- MTConnect
- ODBC Client
- Omron FINS Ethernet
  Omron FINS Serial
  Omron Host Link
  Omron NJ Ethernet
  Omron Process Suite
  Omron Toolbus
- OPC DA Client
  OPC UA Client
  OPC XML-DA Client
- Optimation OptiLogic
- Opto 22 Ethernet
- Partlow ASCII
- Philips P8/PC20
- SattBus Ethernet
  SattBus Serial
- Scanivalve Ethernet
- Siemens S5
  Siemens S5 3964R
  Siemens S7 MPI
  Siemens S7-200
  Siemens TCP/IP Ethernet
  Siemens TCP/IP Unsolicited
- Ethernet
- Simatic/TI 505 Ethernet
  Simatic/TI 505 Serial
- SIXNET EtherTRAK
  SIXNET UDR
- Square D
- System Monitor
- Telemecanique Uni-Telway
- Thermo Westronics Ethernet
  Thermo Westronics Serial
- TIWAY Host Adapter
- Torque Tool Ethernet
- Toshiba Ethernet
  Toshiba Serial
- Toyopuc PC3/PC2 Ethernet
  Toyopuc Serial
- User Configurable (U-CON)
- WAGO Ethernet
- Yaskawa Memobus Plus
  Yaskawa MP Series Ethernet
  Yaskawa MP Series Serial
- Yokogawa Controller
  Yokogawa CX
  Yokogawa Darwin Ethernet
  Yokogawa Darwin Serial
  Yokogawa DX Ethernet
  Yokogawa DX Serial
  Yokogawa DXP
  Yokogawa HR
  Yokogawa MW
  Yokogawa MX
  Yokogawa YS100

IGS Premium – Optional Drivers

- ABB Totalflow
- Alstom Redundant Ethernet
- BACnet/IP
- Bristol/IP
- Enron Modbus
- Fisher ROC Suite
- Fisher ROC Suite (1-10 devices)
- Fisher ROC Suite (11-50 devices)
- Lufkin Modbus
- OMNI Flow Computer
- SNMP Suite (1-15 devices)
- SNMP Suite (51+)
- SNMP Suite (16-50)
- Triconex Ethernet
- Weatherford 8500
- WITS Suite

Option for Internet of Things (IoT) Gateway

- An optional plug-in that can be added to an IGS Server to connect Operations with IT to support IoT.
- Provides four agents to stream data over the MQTT, HTTP/REST, and the ThingWorx AlwaysOn protocols.
- Offers advanced message formatting for client agents to support multiple data modeling requirements, such as JSON, XML, CSV, and custom models.

Additional plug-ins (included)

- Thingworx – Enables IGS to be used for Thingworx-based projects
- Security – Security access based on permission. Enable/Disable access to objects, browsing, read/write on tags
- Media Level Redundancy – Communication path redundancy and device pair redundancy

Software requirements

Compatibility with the following:

- Microsoft Server 2016
- Windows 10 x64 (Pro and Enterprise Edition)
- Windows 10 x86 (Pro and Enterprise Edition)
- Windows 8.1 x64 (Windows 8, Pro, and Enterprise Edition)
- Windows 8.1 x86 (Windows 8, Pro, and Enterprise Edition)
- Windows 8 x64 (Windows 8, Pro, and Enterprise Edition)
- Windows 8 x86 (Windows 8, Pro, and Enterprise Edition)
- Windows 7 x64 (Professional, Ultimate, and Enterprise Edition)
- Windows 7 x86 (Professional, Ultimate, and Enterprise Edition)
- Windows Server 2012 x64 R2
- Windows Server 2012 x64
- Windows Server 2008 x64 R2

Note: The optional driver packages do not include the Basic Drivers. These must be purchased separately.
Hardware and software requirements are representative and may vary by customer deployment.
Please consult the product documentation for more details.

Webspace Version 6.0 from GE Digital

Deliver advanced control and visualization over iPad, Android, and a Web browser

Increase operator agility and effectiveness to improve business Performance

Webspace from GE Digital offers an easy-to-use, full-featured Web and mobile client that enables you to extend, expand, and enhance your new or existing iFIX or CIMPLICITY applications systems from GE Digital. It enables full control and visualization over your company Intranet or secure Internet without the need to change or alter your software application and can be set up within minutes.

With Webspace, you can reduce costs, improve time to action, and expand analytic capability—driving sustainable advantages across all levels of your business, including management, operators, engineering, and IT levels.

Outcomes

- Increase information sharing across teams with a full-featured, secure-by-design Web and mobile client for iFIX or CIMPLICITY
- Speed the right actions with efficient navigation and quick access to information over the Internet, anywhere
- Save time with zero client configuration and the ability to port screens instantly
- Decrease costs with one server that renders three applications on your choice of client, including iOS, Android, and browser access
- Boost flexibility by dynamically adjusting control points on the- fly and viewing multiple systems simultaneously
- Improve analytical and planning abilities with real-time data and information viewing

01 Extend your HMI/SCADA with the power of the Industrial Internet

Webspace extends 100% of your iFIX and CIMPLICITY system viewing and control abilities into a Web browser or tablet. A “zero-install” HTML5 client allows you to your applications from popular Web browsers on Windows, Mac, and Linux computers. For MAC OS X users, a dedicated app multi-monitor support, client sound, and Max OS X Gatekeeper support

Webspace doesn’t compromise your proven applications, graphics, or functionality— providing a full-featured client and delivering comprehensive functionality over a browser.

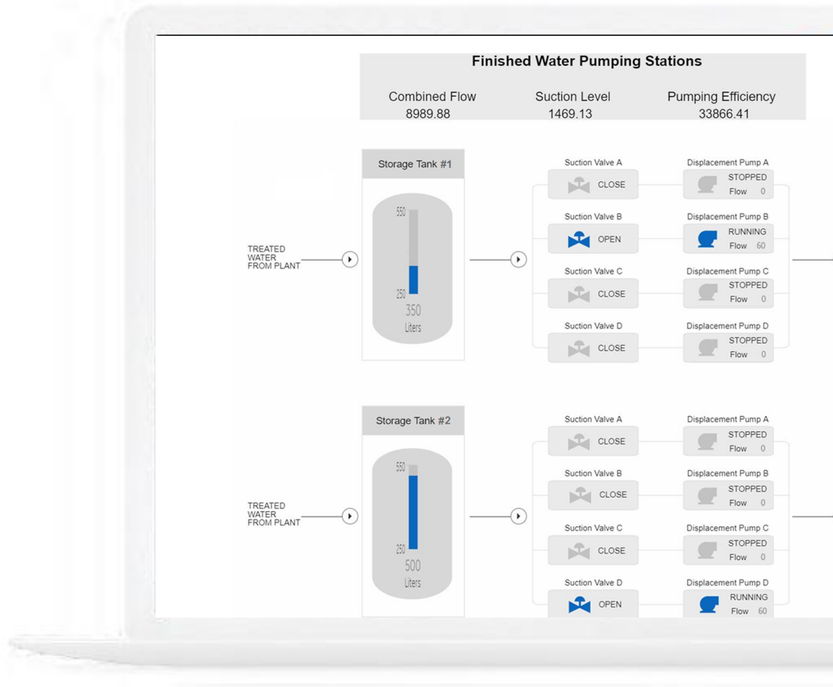
02 Increase information sharing with flexible, secure-by-design technology

With support for up to 70 simultaneous clients, Webspace enables new and existing systems to be dynamically expanded across the facility or globe. The solution enhances your user experience with the ability to run multiple Webspace clients and view many systems from one point. Additionally, Webspace allows you to manually configure a sandbox and white list entries for files and programs.

03 Gain full-featured mobility with the SCADA app

Easily and quickly harness the power of your HMI/SCADA on iPad or Android devices with minimal engineering effort. Download the free SCADA app and instantly connect to your runtime projects, and leverage the same full-featured capabilities of a standard client with full HMI/SCADA functionality, including third-party app support with no screen conversions required.

Thanks to the Mobile Sense technology, your application accessed from mobile devices, behave and respond more like mobile apps.



Webspace extends your application viewing and control abilities right into a Web browser—without compromising features, graphics, or functionality.

04 Increased security

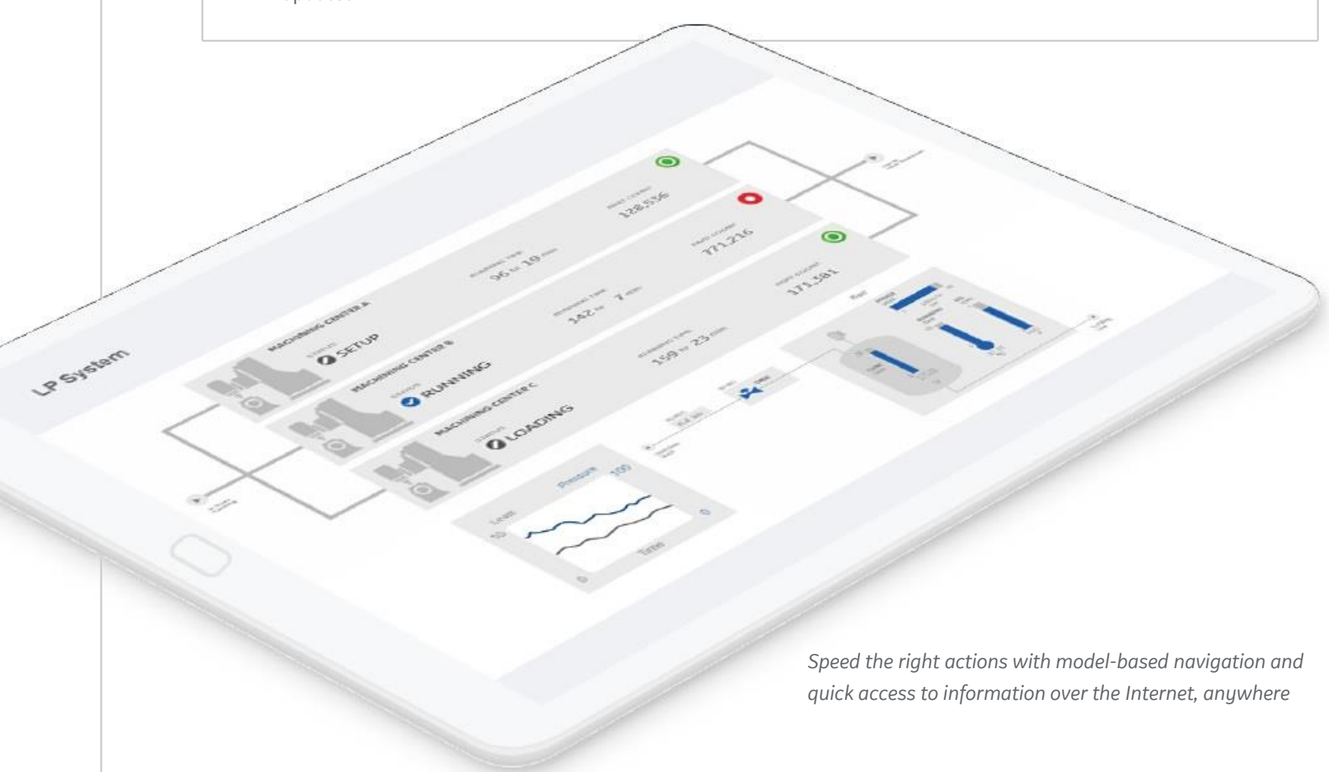
Your application deserves the best protection. For that matter, Webspace leverages SSL/TLS Encryption (up to 256-bit AES) to ensure the security of the data that is transmitted over the network.

Webspace Version 6.0 from GE Digital

Deliver advanced control and visualization over iPad, Android, and a Web browser

Features

- New Zero-install HTML5 client, no third-party software required
- New option for strong encryption
- New App for MAC OS X - simplified installation, multi-monitor support, client sound, and Max OS X Gatekeeper support
- Client-side scaling support for high-resolution devices
- Mobile Sense Technology Mobile for a better UX on mobile devices
- Load balancing and high availability
- Full-featured Web and mobile client for iFIX or CIMPLICITY—with one server and real-time data updates
- No restrictions on secure containment of third-party controls; launch third-party apps triggered in iFIX or CIMPLICITY, control elements operable within Webspace and inherit security setup
- External access over the Internet, multi-tab browser support, remote access for debug and support
- E-signature enhances security and audit trail
- Support displays with animations
- View, acknowledge, and silence alarms and warnings
- Administration: Client disconnect, client session shadowing, SSL 56 bit encryption, port selection, maximum client limit



Speed the right actions with model-based navigation and quick access to information over the Internet, anywhere

Software requirements

Webspace has many flexible configuration topologies and can be installed either on an independent dedicated server or your main application server.

- Server
  - Windows Server 2019 | Standard | Datacenter
  - Windows Server 2016 | Standard | Datacenter
  - Windows Server 2012 R2 | Standard | Datacenter
  - Windows Server 2008 R2 Service Pack 1 | Standard | Enterprise
  - Windows 10 | Professional | Enterprise
  - Windows 8.1 | Professional | Enterprise
  - Windows 7 Service Pack 1 | Professional | Ultimate | Enterprise
- Full VM Support including: VMware ESXi and Microsoft Hyper-V
- Web browsers
  - Microsoft Windows Internet Explorer 11
  - Mozilla Firefox 52 and later (standard and ESR, 32-bit and 64-bit) on Windows and Linux (32-bit)
  - Apple Safari 9.0 or later on Mac OS X
  - Google Chrome with Windows 7, Windows 8.1, Windows 10 and Chromebook
  - Microsoft Edge
- App for MAC OS X
- IOS and Android apps available free of charge

Hardware and software requirements are representative and may vary by customer deployment.
Please consult the product documentation for more details

Speed response to HMI/SCADA events and data by sharing information anywhere, anytime with Webspace for iPad, Android, and a browser.

LEARN MORE

Operations Hub Version 1.0 from GE Digital

Speed development of Web-based operations displays with code-free configuration

Operations Hub from GE Digital is a centralized environment for aggregating and visualizing contextual and situational information for industrial applications—supporting rapid application development and rich displays for faster operational response and better decision making.

With Operations Hub, systems integrators and in-house engineering teams can leverage powerful, code-free development tools to quickly assemble Web-based applications, enabling connectivity with GE Digital software and common IIoT sources, such as databases and control systems, and delivering high performance displays for operations. The code-free tools allow multiple, non-developer users to simultaneously contribute custom displays, which reduces costs and speeds development.

Operations Hub also provides the ability to connect to a variety of data sources and store the data for initial analysis and visualization. Organizations gain a foundation for insights into operations and productivity, a critical step in the journey to digital transformation.

01 Accelerate development of rich Web applications

Operations Hub allows non-developers to quickly assemble displays through a comprehensive library of widgets and arrange them to provide responsive operator visualization. You can easily define data sources and entities for connected devices and create queries to access the data to transform that data into actionable information for operations. Drag-and-drop design allows for simple placement and configuration of visualization components on the display, then dragging the query or data source onto the component quickly enables the data connections.

Outcomes

- Rapid development of Web-based displays for operations
- Faster response and better decision-making with centralized visualization
- Decreased costs and time-to-market for creating Web-based operations applications
- Lower maintenance costs with centralized Web applications
- Information anywhere, anytime with responsive design

With Operations Hub, you can leverage powerful, code-free development tools to quickly assemble high performance, web-based applications.

02 Deliver actionable information through displays and data collection

It's easy to create informative displays with graphs, tables, charts, images, video, maps, and more using the extensive widget library. Additionally, Operations Hub provides data input widgets for user input to collect data from operators, permitting interaction with the data and sending commands back to connected interfaces. Operators can bring up additional displays related to the data, change context, or enter data manually.

03 Information at your fingertips

Responsive design allows you build the application, so information is readily available on PC displays, tablets, and mobile phones, allowing access to information and insights into your operations from anywhere anytime.

04 Save time with zero deployment clients and centralized management

Leveraging Web technology, Operations Hub reduces deployment and maintenance time. The true native Web clients do not require any client installation. Deploying and maintaining has never been easier.

05 Fast, automatic response

Operations Hub allows you to trigger automatic actions based on human events or device data. You can configure actions to drive data queries, send emails, or send commands to devices.

Operations Hub Version 1.0 from GE Digital

Speed development of Web-based operations displays with code-free configuration

Features

- Develop, manage, and deliver applications that collect, display, and analyze data from equipment or servers—without needing programming skills
- User-friendly interface with a rich development library
- Trigger action based on values stored in a database table
- Events actions: Send an email (templates included), run a query, and send a command to a device
- Create entities and queries for a relational database
- HTML5 and CSS3 for platform independence
- Access applications using PC displays or mobile devices
- Controlled access to an application and data, based on user roles
- Query Types: Get, Update, Insert, Delete
- Widgets
  - Inputs: Check box, radio button, combo box, text slider, toggle, button, camera, text box
  - Display: Text, images, charts, graphs, grids, data tables, maps, lists, gauges, indicators
  - Layouts: Separators, containers, lines
- Connectivity
  - MQTT: A machine-to-machine protocol using a lightweight publish/subscribe messaging transport
  - REST API: A method of allowing communication between a Web-based client and server
- **Future Connectors include:** Historian, Time Series, Plant Applications, iFIX, CIMPLICITY, Workflow, Batch Execution, OPC UA, Relation Databases, REST API.
- **Future Visualization Content includes:** Historian Trend / Alarm Analysis, HMI Widgets, Workflow Widget, Plant Applications Widgets, Gauges, Charting Types (Pareto, Histogram, Event Trend, Heatmap, Radar, Spiderwell)

Hardware requirements

Single Server

- 4-core, 64-bit CPU, 8Gb RAM, 100G HDD

Dual Server: Recommended for production systems

- 1x 4-core, 64-bit CPU, 8Gb RAM, 25Gb HDD for the application server
- 1x 4-core, 64-bit CPU, 8Gb RAM, 100Gb HDD for the DB server
- Actual HDD Capacity depends on required data volumes

Software requirements

Latest version of Ubuntu Server 16.04 LTS for the platform server

- PostgreSQL v10.5 pre-installed on the DB Server of a dual server system
- PostgreSQL DB can be installed on any OS that supports it

Operations Hub allows non-developers to quickly assemble displays through a comprehensive library of widgets and arrange them to provide responsive operator visualization.

Take advantage of a centralized environment for aggregating and visualizing contextual and situational information for industrial applications—without needing IT or coding resources. Operations Hub supports rapid application development and rich displays for faster operational response and better decision making.

LEARN MORE

Dream Report from GE Digital

Powerful reporting to help improve performance and meet operational goals

The reports you need, anywhere, anytime

Built on modern technologies by Ocean Data Systems, Dream Report from GE Digital is a real-time report generator with an easy, configurable user interface. Dream Report offers direct connectivity to GE Digital's software, so you can leverage your automation data to generate the reports you need to make the best operational decisions.

This powerful reporting software accesses open and proprietary archives and databases to generate professional reports by schedule, on event, or manually—then publishes and distributes the reports. The solution delivers Web-based reports management over the Intranet or Internet via an integrated Web portal, enabling you to access generated reports, create new reports, and build Web-based interactive dynamic dashboards in minutes.

Outcomes

- Make better, faster decisions with automated reports and dashboards for real-time operational intelligence—anywhere, anytime
- Improve performance, efficiency, and maintenance reporting to support your business goals
- Generate reports on a schedule, by event, or manually
- Create richer reports more easily and cost effectively—without programming or IT skills
- Gain valuable insights with drill-down reporting functionality and data analysis
- Enable faster compliance reporting with flexible report generation and distribution

01 Easy, fast reporting

An intuitive and easy interface enables fast project development and project maintenance with low engineering costs. You can develop reports without a single line of code. A secure-by-design Web portal enables access to information for anyone at any place and any time.

02 Powerful report management tools

With built-in user management, you can define who has access to what by individual or by groups, and integrate with Windows user management. Dream Report also offers version management, audit trail, and electronic signature for demanding applications such as 21 CFR Part 11. It supports standardized report templates. Interactive and dynamic Web forms allow users to create Web-based, dynamic, and interactive reporting applications. Dream Report also delivers drill-down reporting functionality with user-managed navigation.

03 Data extraction & analysis, report design

Dream Report provides a user-friendly object library that can query data, perform statistics, and format results, delivering the information you need quickly and easily. It can display data in multiple formats, such as tables, bars, pies, and charts, so you can tailor the view. Dream Report also has an intuitive graphical editor, and you can create and save best-in-class reports as templates.

04 Report generation and distribution

With Dream Report, you can generate reports manually and automatically. In automatic mode, it can execute on event and on schedule, as needed. Furthermore, you can automatically print, email, store, and publish reports through an HTML5 browser-based user portal. Access your data from anywhere at any time.

Dream Report provides Web-based report management, enabling you to quickly and easily access reports, even on the go.

05 Reports at your fingertips

- Alarm reports
- Audit trail reports
- Batch reports
- Compliance reports
- Efficiency reports
- Energy audits
- Electronic flow measurement
- Federal regulatory reports
- Laboratory information systems
- Manufacturing Execution Systems (MES) reports
- Production reports
- Quality reports
- And more

"Dream Report makes reporting very easy. All capabilities are out of the box, and it gets the job done."

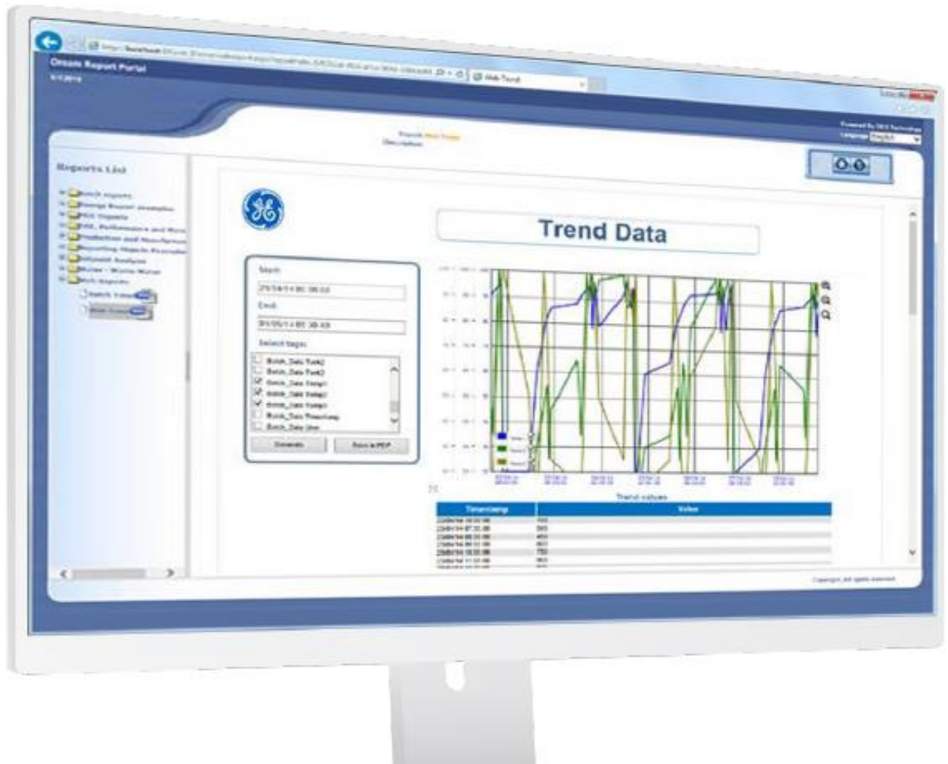
Mark Weston, Computer Engineer, Carollo

Dream Report from GE Digital

Powerful reporting to help improve performance and meet operational goals

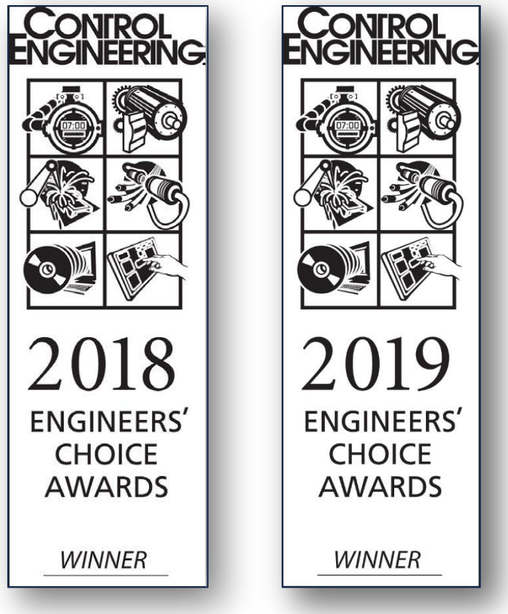
Features

- Version 4.83 is required for working with iFIX 6.0 Long Tag Names. 4.83 enhancements include: report prioritization, CSV exports and imports, difference statistical function, enhanced automatic statistical table (AST), ODBC driver enhancements, step table enhancements, and web portal raw data export with delimiter selection
- Leading, real-time report generator – designed for industrial applications
- Configurable, multi-language end user interface
- Directly connect to software: iFIX, CIMPLICITY, Historian, and SmartSignal from GE Digital. Additional drivers are available for other industry products – over 90 interfaces available
- Web portal for viewing and interacting with reports
- Secure-by-design technology, encrypted and protected
- Easily export data to Microsoft Excel
- Superior industry standards support: OPC DA, OPC AE, OPC HDA, ODBC, OLE-DB, Modbus, SNMP, BACnet, and more



Hardware Requirements V. 4.83

- CPU: Dual Core 2.4 GHz+
- RAM: 8 Gb+
- HDD: 1GB (for installation) minimum, 7,200 rpm or higher (or SSD)
- Video adapter: Minimum memory 128 Mb



Software Requirements V. 4.83

OS support includes:

- Windows 10, 8.1, 8, 7
- Windows Server 2016, 2012, 2008

Database support includes:

- MS SQL Server 2016
- MS SQL Server 2005 Express, 2008 Express, 2012 Express (using ODBC SQL Native Client 11), 2014 Express (using ODBC SQL Native Client 11), 2016 Express (using ODBC SQL Native Client 11)
- MS Access 2000, 2003, 2007, 2010, 2013, 2016
- MS SQL Server 2005, 2008
- MS SQL Server 2016, 2014, 2012 over ODBC SQL Native Client 11
- MySQL 4.x and 5.x versions over ODBC driver 3.51, 5.1
- Oracle 11, 12 over Oracle XE ODBC driver

Web browsers: Internet Explorer 10 and higher (IE 11 recommended), Edge, Chrome, Mozilla, Opera

Mobile operating systems: Android, iOS (both iPad and iPhone) and Windows Phone 8.1.

Hardware and software requirements are representative and may vary by customer deployment.
Please consult the product documentation for more details.

Find out how Dream Report can help you improve performance and meet your operational goals with powerful reporting capabilities.

LEARN MORE

WIN-911 Software from GE Digital

Improving operator efficiency with real-time alarm notifications

Notify the right person, at the right time, for faster alarm resolution

Make sure out-of-spec and critical events trigger a real-time alarm so your teams can take the right action, fast. WIN-911 Software from GE Digital provides easy integration with iFIX from GE Digital to help you improve the reliability of alarm notification for quick resolution and improved uptime.

As the most widely used alarm notification platform, WIN-911 works with iFIX to provide real-time notification to monitor operations and notify personnel of problem conditions. This proven software enables you to create a notification workflow tailored to your specific needs. You can filter, escalate, and direct alarms to any number of recipients using virtually any device – including mobile phones, desktop computers, and tablets.

Outcomes

- Increase operational efficiency, uptime, and reliability by improving alarm notification and speeding response with a proven, widely used software solution
- Improve asset, personnel, and public safety: greater alarm awareness and faster resolution lowers risk
- Reduce downtime with notification anywhere, anytime, to centralized and remote teams
- Optimize operations with alarm logging and reports for continuous improvement
- Drive insight into common errors or maintenance requirements with real-time notification
- Reduce time-to-value with quick configuration and easy integration to GE Digital's software

01 Increase resolution performance with timely alarm notification

Achieve complete freedom to create notification workflows the way you want them, escalating alarms and/or filtering information to any number of recipients. You can vary notifications depending on alarm severity, whether or not an alarm is acknowledged, what date or time the alarm is occurring, and many other user-configurable attributes of the alarm context.

02 Improve alarm response by sending notifications to the right person based on staff schedules

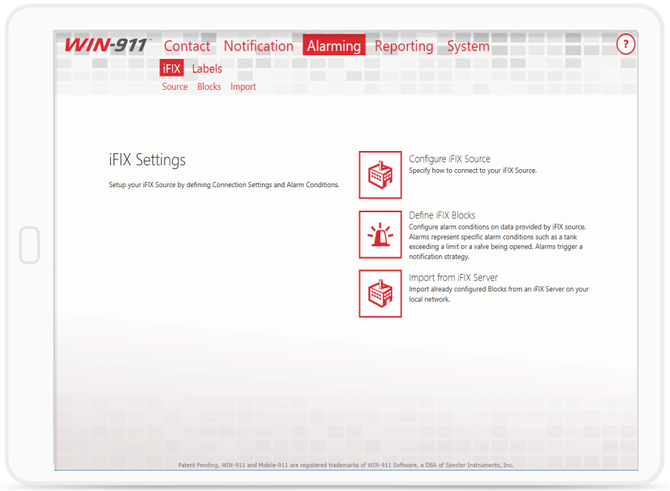
You can add staff schedules to the alarm notification system, ensuring that alarms reach the right person based on availability. WIN-911 knows who is "on shift" at the time of the alarm. Have a difficult schedule? No problem! WIN-911 supports complex shift scheduling to meet your needs.

03 Simplify initial set-up and on-going system maintenance

WIN-911 connects directly to GE Digital's HMI/SCADA software, allowing you to simplify configuration, optimize performance, and pass acknowledgements and other data back to the SCADA. You can determine which alarms to monitor by importing or setting up subscriptions based on filters. With the direct data integration with iFIX, you don't have to manage a second set of alarms within WIN-911, reducing set-up time and on-going system management.

04 Save time with WIN-911 managing the complexity of standards and protocols

Take advantage of one- or two-way email notifications for different security protocols to comply with control network security standards. SMS notifications support standards and modems used worldwide, and character sets for all major spoken languages. You can drive notifications via Voice over Internet Protocol (VoIP), fixed/analog lines, and plant announcement systems.



*As a value-added capability, WIN-911 Essential is available for free to licensed iFIX customers using iFIX Version 5.8 and later.**

Nestlé integrated HMI/SCADA from GE Digital with WIN-911 for mobile refrigeration alarm alerts, significantly reducing response time to less than 10 minutes and virtually eliminating production downtime.

WIN-911 Software from GE Digital

Improving operator efficiency with real-time alarm notifications

Features

- Flexible, convenient notification, delivered in preferred languages, on your choice of device: email, voice, mobile, and SMS
- Escalation engine with group-based alarm notification, retries, and acknowledgement
- Simple notification schedules with group start and repeat delays
- Unlimited personnel contacts, unlimited alarm groups (available with upgrade from Essential)
- Easy scheduling with common shifts provided
- Escalation of alarms for different scenarios (available with upgrade from Essential)
- View current and historical alarms/notifications with WIN-911 Log Viewer
- Control access with passwords and acknowledgement codes
- Ability to configure for redundancy and set up “watchdogs” to monitor SCADA and WIN-911 connection

Software requirements

- Win-911 is available for iFIX versions 5.8 and later.
- Existing iFIX customers are entitled to WIN-911 Essential; no additional license fees.*
- “Essential” version is included in every iFIX development license.*
- Upgrades from Essential to Premium or Ultimate are available.
- For software and hardware requirements, please visit www.win911.com.

*This offer is subject to change.

Used at more than 10,000 facilities around the world, WIN-911 provides a proven alarm notification platform.

Three Tiers of WIN-911 Software Available from GE Digital

Feature	Essential (free*)	Premium	Ultimate	HW Required
OPC DA	-	√	√	
Basic Tactics & Strategies	√	√	√	
Advanced Tactics & Strategies	-	-	√	
Reporting	√	√	√	
Remote Acknowledgement	√	√	√	
Alarm Count	50,000	50,000	50,000	
Voice (VoIP)	-	-	√	-
Voice (TAIP)	-	-	√	√ (additional cost)
E-mail	√ (2 Seats)	√ (255 Seats)	√ (255 Seats)	-
SMS (Cellular Modem)	√ (2 Seats)	√ (255 Seats)	√ (255 Seats)	√ (additional cost)
Mobile-911	√ (2 Seats)	√ (10 Seats)	√ (25 Seats)	-

Take advantage of proven alarm notification to improve operational efficiency, uptime, and reliability. With easy integration to HMI/SCADA, you can quickly improve asset, personnel, and public safety through greater alarm awareness.

LEARN MORE

Workflow 2.6 from GE Digital

Digitize work processes to achieve the right actions, at the right time, for the right results

Guide operators with interactive, step-by-step instructions

With Workflow from GE Digital, you can easily document processes, transfer knowledge, and drive consistency and predictability into your plant. Workflow provides step-by-step instructions to operators—from your choice of dedicated client—even when visualizing data from within your iFIX or CIMPLICITY HMI/SCADA application.

Digitize manual and automated processes with one tool across your entire facility— from plant operators and maintenance teams to field crews and leadership.

With documented processes and digitized procedures, every operator is an expert—with step-by-step instructions guiding the right actions.

Outcomes

- Ensure the right actions fast – anywhere, anytime
- Increase consistency – less errors, rework and waste
- Capture best practices before experts retire
- Move from acknowledging alarms to driving the right corrective actions
- Minimize training time and costs
- Compare staff performance and processes to optimize
- Ease compliance by enforcing procedures
- Provide task steps within your familiar HMI/SCADA
- Escalate events, including sending text messages and emails
- Bridge the gap between your SCADA and CMMS, triggering work orders based on SCADA events

01 Drive the right actions based on real-time SCADA data

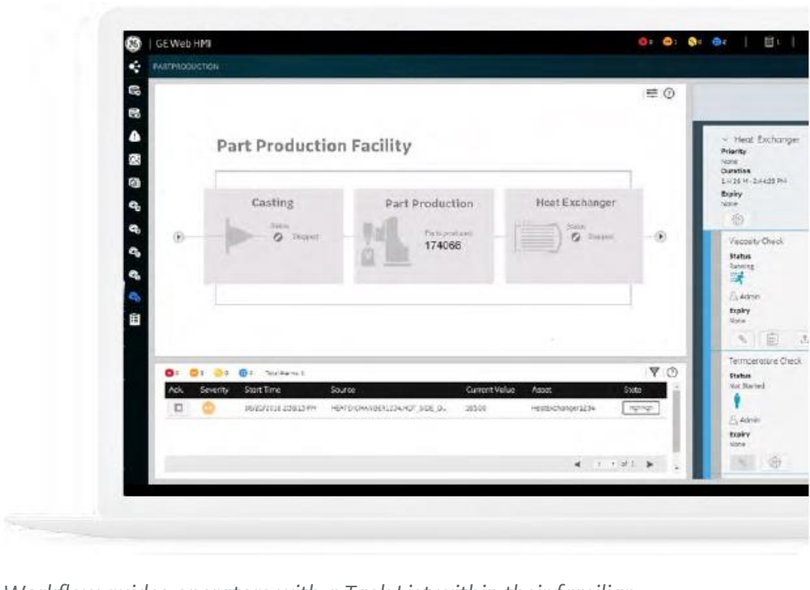
With Workflow, you can go beyond SCADA alarm acknowledgement and drive the right corrective action. With a guided and consistent event response, you can reduce troubleshooting time and those midnight emergency phone calls. Use alarm corrective action to fix production faster and gain greater visibility by automatically sending tasks to people or other systems, enabling the right response.

02 Capture best practices before experienced operators retire

With an easy-to-use interface and template strategy, you can speed documentation and easily digitize best practices. Templates can allow the creation of hundreds of workflows in a short amount of time, minimizing the effort to document even the most complex work processes. The easy interface allows clerical support to enter and modify workflows, without technical assistance. When you need even more capabilities, Workflow's authoring environment gives power to your engineers to graphically digitize any process.

03 Optimize processes and performance with reports

Workflow gives you an unprecedented way to analyze and optimize both staff performance and work processes. You can automatically store task-related information into an audit trail, then use this data to generate reports and lean processes. Workflow includes report templates, and you can easily build custom reports. Analysis can include: time to complete tasks, completed vs incomplete steps or tasks, reasons behind exceptions, staff performance variation, difficult steps, common alarms/events, and more.



Workflow guides operators with a Task List within their familiar HMI/SCADA environment.

04 Enable operators anywhere with mobile task instructions

With GE Digital's Web HMI and embedded Task List, you can leverage the power of Workflow on the go to receive expert guidance while performing field jobs. In addition to digitized instructions, SOPs, and alarm response procedures, you can collaborate with experts and peers on tasks in real time.

> *"Hundreds of Department of Public Works hours are saved (annually), and effective and consistent operations are ensured."*
>
> **Bill Fritz, P.E., Director of Public Works, Waterford Township, Michigan**

Workflow 2.6 from GE Digital

Digitize work processes to achieve the right actions, at the right time, for the right results

Features

- Version 2.6: Web HMI embedded Task List: single authentication; existing HTML5 forms can be reused, no migration necessary; utilities to export equipment model, no need to redesign. Historian 7.X support. OPC UA connectivity: read and write to tags, server discovery, automatic security certificate setup. SQL Server 2017 support: Workflow server, Workflow reporting database. Email service provider enhancements: more granularity to configure parameter used to send email, allows the user to add an attachment to an email. Improved server startup time: startup time reduced by up to 68%.
- Guide operators with clear, step-by-step, interactive work instructions
- Document when, by whom, and how long work is performed
- eSignature and audit trails at your fingertips
- Trigger action based on time or events
- Embed videos, live feeds, pictures, manuals, and MSDS
- Automatic escalation and notification
- Bring context to your data using ISA-95 models
- Easy process configuration using graphical environment and templates
- Mobility: iOS, Android, Microsoft Surface tablets
- Service providers for Maximo, SAP PM, Infor, Cityworks, and more

Real-Time Instructions

Workflow can help you:

- Document audit trails, including eSignature
- Deliver information and functionality based on business processes and workforce roles
- Drive process visibility – know where orders are at in the plant, right now
- Eliminate scripting languages
- Synchronize sequences and processes
- Escalate expired work requirements
- Condition data for reporting

Popular Use Cases

- Electronic Standard Operating Procedures (eSOPs) / paperless operations
- Automate engineering spec changes
- Exception management/corrective action
- Event-triggered QA sampling request
- Quality check
- Quarantine
- Rework product/scrap product
- Production order dispatch
- Package finished goods
- Machine setup
- Delivery – Truck reception/receive materials
- Metal detector check
- Data conditioning/middleware

Guide the right operator response to SCADA and MES real-time events, reducing errors, risk, and costs with Workflow.

LEARN MORE

CASE STUDIES IN WATER AND WASTEWATER

Does this describe your job?

- Population 100K – 3MM+
- Hundreds or thousands of miles of pipes
- Dozens to hundreds of remote locations over a dispersed geographical area
- Responsible for providing fresh drinking water from different sources
- Responsible for stormwater capture
- Responsible for wastewater management
- Responsible for environmental compliance reporting
- Being asked to do more with the same or less
- Concerned about security
- Needing to update/replace HMI/SCADA system

Learn how 7 utilities are tackling these challenges.

SUCCESS SPOTLIGHT

MODERN HMI/SCADA SOLUTION FOR WATER/WASTEWATER

Increased operator efficiency and improved operations reliability

City of San Luis Obispo, California

Challenge

Provide a modern and efficient UX for their operations personnel by seamlessly upgrading and consolidating five different control systems.

Action

Upgraded their existing iFIX installations and deployed Web HMI on top with CB Pacific to remotely monitor, supervise, manage their five facilities.

Result

- New HMI design increases operator performance, enables faster problem identification, and reduces reaction time
- Increased visibility and control using mobile devices – information delivered anywhere, any time
- Ability to create their own views without asking IT
- Increased compliance to local standards

SUCCESS SPOTLIGHT

MODERN HMI/SCADA SOLUTION FOR WATER/WASTEWATER

Decreased time and labor with faster, easier reporting

City of Chandler, Arizona, and Carollo

Challenge

Time- and labor-intensive reporting – requiring a specialized skillset, not always available. Detailed documentation and reports for EPA compliance and internal reviews. Long-term document management. Needed out-of-the box solution that would interface with existing automation.

Action

Implemented Dream Report with GE's CIMPLICITY HMI/SCADA for easy setup of report templates for EPA compliance and internal reviews. One-button web portal setup.

Result

- Faster, easier reporting – saving time and labor
- New reports created in minutes versus days
- Short learning curve with fast technical support
- Anywhere, anytime access – even from smart phones – for improved collaboration and decision making

SUCCESS SPOTLIGHT

MODERN HMI/SCADA SOLUTION FOR WATER/WASTEWATER

Optimized IT processes management and power consumption

VANDMILJØ RANDERS

Challenge

Replace aging HMI/SCADA system. Improve their way of working. Optimize IT processes management and power consumption.

Action

Novotek (GE Digital partner) proposed iFIX HMI/SCADA, enabling Vandmiljø Randers to generate all reports (without manual data entry), achieve the right tool to generate KPIs , improve decision making by being closer to the processes, optimize processes, and manage alarms including send the right information to the right person at the right time.

Result

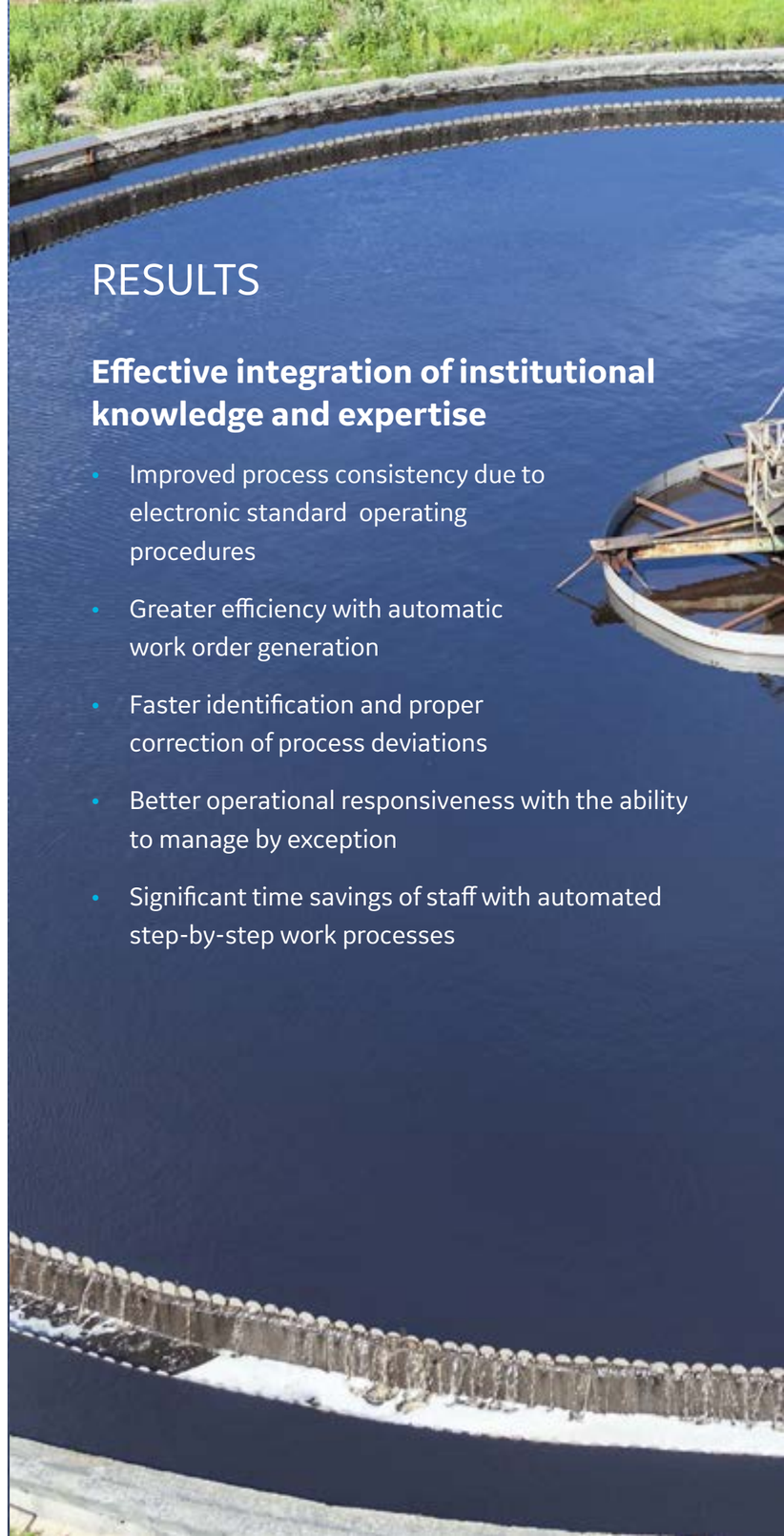
- Increased efficiency of working methods and managing processes more effectively
- Optimizing processes continuously and reducing power consumption

Waterford Township Department of Public Works

Standardized Workflows Improve Process Consistency and Efficiency

To link its SCADA, Computer Maintenance Management Systems (CMMS) and Document Management Systems (DMS) and to standardize workflow procedures to mitigate the loss of institutional knowledge due to workforce retirements, the Waterford Township Department of Public Works (DPW) implemented Workflow from GE Digital.

Located in the center of Oakland County, Michigan, Waterford Township is known as a Lakeland Paradise for its 34 lakes that surround the area, which covers 35.3 square miles. Over 71,700 Waterford residents rely on the DPW for service on a daily basis. DPW assets include 360 miles of water main and appurtenances and an overall water/sewer infrastructure that exceeds 80,000 features that require maintenance and work orders.



RESULTS

Effective integration of institutional knowledge and expertise

- Improved process consistency due to electronic standard operating procedures
- Greater efficiency with automatic work order generation
- Faster identification and proper correction of process deviations
- Better operational responsiveness with the ability to manage by exception
- Significant time savings of staff with automated step-by-step work processes

Waterford's Challenges

Like many of its counterparts across the country, Waterford Township has been faced with losing a significant number of DPW staff, some with more than three decades of water and wastewater knowledge, to retirement.

"We were looking for a solution that would link real-time operational data in our SCADA system to our CMMS and DMS to create Standard Operating Procedures and work orders automatically when conditions were met in defined workflow procedures," said Bill Fritz, P.E., Director of Public Works, Waterford Township.

"With SCADA continually sending real-time operational data through defined workflow procedures, the system automatically identifies abnormalities in operations and creates an Electronic Standard Operating Procedure (eSOP) and work order to ensure proper and timely correction."

Bill Fritz, P.E., Director of Public Works, Waterford Township

Fritz added that eSOPs also provide added benefits of "capturing the best institutional and professional methods for resolving the problem, which aids significantly as our workforce retires and becomes less experienced," he said.

"One key aspect of the project was to get operating procedures standardized and in a format where DPW staff in the field, who might not be familiar with the system, could go in and follow the steps necessary to correct the issue," Fritz said.

Now, any time an event occurs, assigned DPW staff is presented with a step-by-step list of instructions on how to resolve the issue. Because the process is electronic, it also captures and logs the process for future reference and evaluation.

To Fritz, Workflow provides a "middleware" solution that works in conjunction with iFIX from GE Digital – Waterford's SCADA system and Azteca Cityworks- Waterford's CMMS. Waterford also uses Historian from GE Digital. Integrating these systems together was an important operational improvement providing a crucial bridge between the SCADA and CMMS platforms, Fritz said.

Proactive Approach with Defined Processes

Linking these platforms together also provided the benefit of automatic work order generation based on SCADA data that flowed automatically into Workflow. Prior to the Workflow install, DPW staff had to manually look through operational data for conditions that may have presented a problem, which alarming didn't address. Once identified, work orders would be generated with very little, if any, eSOP to correct the problem. With Workflow, the SCADA data is continuously monitored and when deviations occur, appropriate workflows and work orders are automatically created saving valuable staff hours.

By utilizing real-time SCADA data and Workflow, Fritz said DPW staff are directed in a focused manner to resolve obscure operational problems and their root cause instead of never identifying the problem and/or root cause because that is the way it has always operated.

"Defined events are flagged automatically and consistently, forcing DPW staff to resolve them in a timely manner consistently," Fritz said. "If you have a sewer pumping station with multiple pumps and one is starting a lot more than another, you have to first be aware that it is happening and then ask yourself 'Why?' Workflow does this and creates an eSOP and work order automatically to correct the problem. The same is true for pump runtimes and required maintenance on pumps when they reach runtime maintenance thresholds. This system ensures that we are proactive instead of reactive in nature."

BY THE NUMBERS

Waterford Township Department of Public Work's Assets:

49,000 | Customer Leads (24,000 Water, 25,000 Sewer)

360 | Miles of Water Main and Appurtenances

19 | Production Wells

2 | Elevated and **1** Ground Storage Tanks

11 | Iron Filtration Plants

1 | High Service Pumping Station

355 | Miles of Sanitary Sewer

63 | Sewer Lift Stations

15 | Township Buildings

5 | Township Cemeteries

230 | Vehicle Fleet

3,500 | Gate Valves

3,400 | Fire Hydrants

7,000 | Water Main Segments

11 | Water Treatment Plants

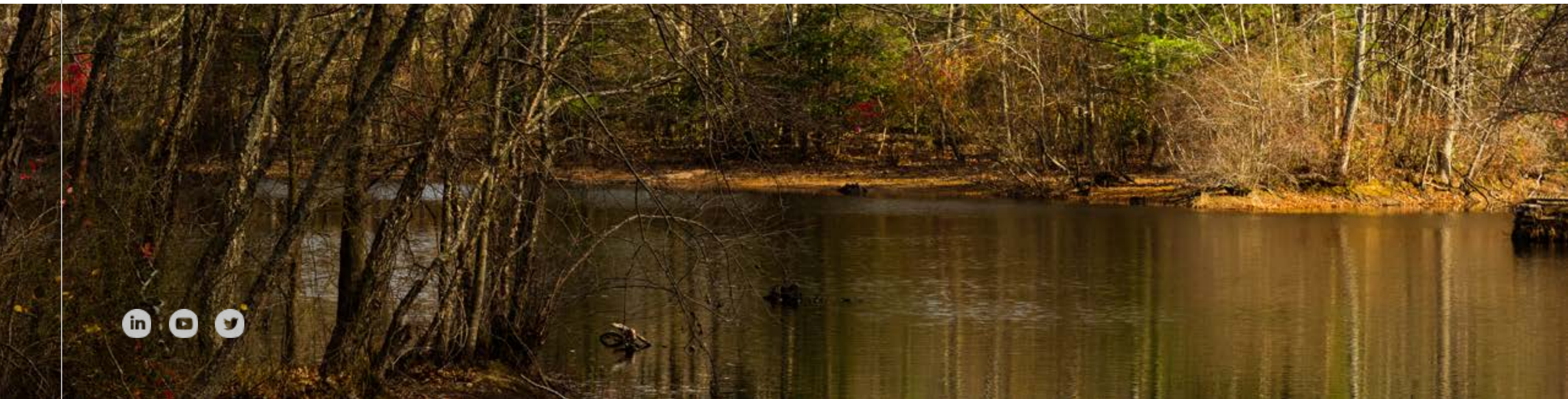
3 | Elevated and Ground Storage Tanks

24,000 | Customer Water Leads

8,300 | Sewer Manholes

8,500 | Sewer Main Segments

64 | Sewer Pumping Stations



The Project

The DPW implemented Workflow from GE Digital to provide the department with the ability to apply logic to SCADA values for work order generation, employ eSOPs and to create inspection forms for data collection.

The goal of the project was threefold:

01 Integrate SCADA workflows with Cityworks by utilizing Cityworks Work Order API

02 Employ eSOPs to provide a method for documenting proper process and transference of institutional knowledge

03 Provide auto task generation by creating a workflow component for SCADA

The project was split into two phases, the first of which centered around automating workflows triggered by two incidents – those based on data coming in from the SCADA system such as pump starts/starts/runtimes and others like sewer station inspections that dealt with specific activities or a regularly occurring schedule such as every week.

The first phase also included the integration of the Work Order API to fully automate work order generation.

Phase two of the project includes the integration of the DPW's DMS, which provides staff with seamless links to documents, drawings, agreements, manuals, etc., that are archived and used to develop additional workflows.

Manage by Exception

The Workflow integration included creation of four main components – the equipment model, events, Workflow templates, and schedules. Creation and utilization of these components create a process-driven workflow for managing by exception.

The DPW first modeled its system in Workflow by linking relevant database tags from the SCADA system. This allowed data to flow in real time from SCADA into defined workflows.

A trigger event was then created to initiate a defined workflow based on conditional expressions or time-based factors.

Condition-based events utilize transferred real-time iFIX tag values such as pump starts and stops, pump runtimes, water levels increasing or decreasing out of range, or changes in flow. These events use values stored in the equipment configuration to evaluate expressions to automatically determine whether or not action needs to be taken.

Managing by exception enables DPW to act quickly based on real-time data, using condition-based events to automatically determine whether action is needed.

With condition-based logic, events can be triggered based on multiple sets of criteria varying from sub-set to entire categories that must be met for a workflow to be triggered. Logical expressions can also be designed to evaluate criteria defined in the Workflow process such as is one already running for the same event.

Another type of event trigger is time. Time-based events use a data/time expression to determine when an event should be triggered, such as sewer station inspections at set time intervals such as every two weeks.

Automated processes

The next step was to create Workflow templates that contain the procedures and steps for DPW staff to follow when completing the workflow. The procedures and steps can be executed automatically such as having a pump turn on or off or manually through interaction by the user. These procedures and steps can be modified by the workflow authors, and services can be added by the administrator to refine the process.

Finally, schedules are created by defining time-based activities within the Workflow template, if necessary.

When a workflow is triggered, an email is sent to appropriate DPW staff to alert them of the workflow and to provide them with the work order, if defined to be automatically generated. DPW staff can then begin to process the workflow and view all of the details involved.

Real-time SCADA data related to the workflow can also be displayed to aid DPW staff in resolving the event as well as specific eSOPs and documents such as operational manuals.

The eSOPs outline steps to problem resolution in a numbered format and have a “comments” field for the operator to enter information.

The steps guide users through resolution of the issue and have expiration times in place. If a step is not completed in a certain amount of time, escalation processes such as supervisory notifications can occur.

At any time, DPW staff can get a list of completed workflows and check a workflow history to view its details. Managers can develop workflows based on functions of their group. They can also delegate work and see the status of operations by viewing pending workflows.

Additional Efficiencies Ahead

In the future, DPW staff will design workflows to assist in automation of preventative maintenance on equipment such as pumps.

Examples include pump-runtime-driven maintenance such as bearing lubrication and seal inspection. Instead of hoping DPW staff remembers to perform this critical maintenance at a manufacturer’s recommended runtimes, a workflow can automatically be created and a work order generated to ensure it will be done.

“Workflow is more about its potential than anything. If you have an operational process, it can most certainly benefit from a workflow designed to monitor abstract and varied functionality to ensure proper operation and efficiency. No doubt it takes work at the beginning to develop them, but when they are in place, hundreds of DPW staff hours are saved and effective and consistent operations are ensured,”

Bill Fritz, P.E., Director of Public Works, Waterford Township

The City of Haverhill Water and Wastewater Division

Meeting critical needs and maintaining high quality

The city of Haverhill, Massachusetts, keeps a close watch on its water infrastructure, operating both Water and Wastewater Divisions.

The city's Water Division provides drinking water to 58,000 Haverhill residents and businesses, and produces two billion gallons of water on average each year. The plant itself is manned 24 hours a day, seven days a week, to ensure the highest quality water is delivered each day to the city's residents. Water quality is constantly monitored to make sure that it meets both state and federal drinking water quality standards at all times. Water treatment processes include conventional surface water treatments such as coagulation, flocculation, sedimentation, filtration, disinfection, and pumping.

The city's Wastewater Division maintains the wastewater treatment plant, which provides both primary and secondary treatment for the city's wastewater. Within the Wastewater Division there are two groups—one monitoring wastewater collection, and the other overseeing wastewater treatment, which includes bringing water and routing wastewater into various facilities from multiple points across the city.

As part of its duty to safeguard the city's water supply, the Water Division is also responsible for monitoring, water maintenance, and water treatment, which includes protecting water resources. The city of Haverhill is currently supplied with water from Kenoza Lake, Millvale Reservoir, Round Pond, and Crystal Lake.

The facilities themselves are 32-years-old, however, the control strategies they have in place today have put them well ahead of other facilities of similar size and operation—thanks in large part to tools becoming more readily available, accessible, and connected.

Benefits of working with GE Digital

- GE Digital has put the city of Haverhill's Water and Wastewater Divisions well ahead of other facilities of similar size and operation
- They now have the ability to use advanced analytics to model high-flow scenarios—and better prepare the plant for potential weather-related issues
- Plant's knowledge base was captured, reducing training overhead

John D'Aoust, Plant Manager for the city of Haverhill's Water Division, has been with the city for 18 years, and has been leading the charge to harness the power of the Industrial Internet. He began many years ago by teaming with GE Digital to automate many of the processes that his team had manually documented in order to follow standard operating procedures (SOPs), including state-mandated emergency response plans (ERPs).

D'Aoust's first step was to implement GE Digital's iFIX. It quickly became a real asset in maintaining water quality. Next, the Haverhill team added GE Digital's Workflow, a software platform for measuring and managing the efficiency of plant operations. It was an immense performance improvement over their documented processes. Moving to a computerized process environment allowed D'Aoust and his team to have a cohesive system to follow procedures, and respond to events in a consistent and sequenced manner.

He took his connected environment even further, and purchased Dell Latitude laptops for his on-call operators. Allowing them to be untethered from the facility, but still access GE Digital's software to maintain control of operations from any location. The on-call people are the first responders for after-hour issues—maintaining pumps, monitoring chemical levels in the treatment plant, and even keeping a watchful eye on the plant itself as the post-911 era raised awareness for new safety concerns.

"With GE Digital's iFIX you can dial in the plant—get it set up and you don't have to watch it as closely. It was all manually controlled before—all hardware based, and it took a lot of attention by the team to maintain," he said.

The laptops were equipped with GE Digital's software and cellular dongles to access water facility operations. Each laptop had to be maintained and manually updated. The benefits of being remote and still being able to access iFIX were clearly visible. So much so that D'Aoust put GE Digital's mobile app to work and swapped out his pool of laptops for a single Apple iPad connected over wireless LTE. The plant's team is alerted to any issue through a series of alarms that have been established, and they can use related products, such as trouble-shooter programs to conduct flow chart decision-making for their wastewater operations.

"They have all the features of the control room in their hands."

"With GE Digital's iFIX you can dial in the plant—get it set up and you don't have to watch it as closely. It was all manually controlled before—all hardware based, and it took a lot of attention by the team to maintain."

John D'Aoust, Plant Manager for the city of Haverhill's Water Division

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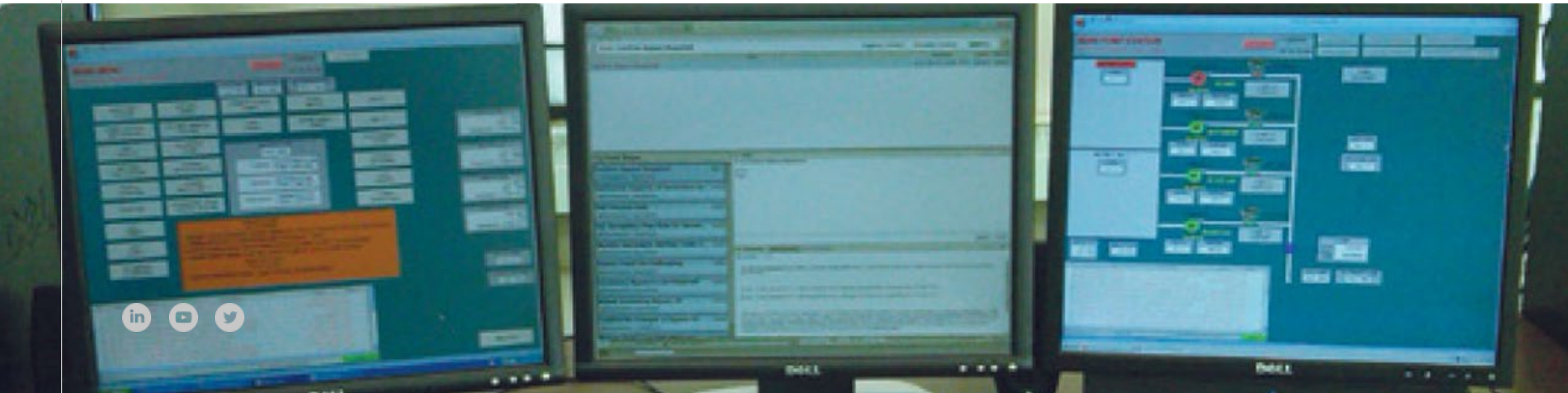


According to John D'Aoust, "The upside of moving from three laptops to an iPad is that there's only one machine to maintain, and the price per iPad is considerably less than having to purchase multiple laptops. There's a time savings, and it lowers the complexity of our system."

The one technical hurdle that he had to overcome in his move to become more mobile was to ensure the security of the network. In order to get the iPad onto their internal network, they had to reevaluate their VPN connection. Ultimately that involved a change of provider.

One of the unanticipated benefits of this newly-connected world was the ability to capture and transfer knowledge easily between senior members of this staff and new hires.

"One of the biggest project benefits of putting the data model together has been capturing our knowledge base," said Fred Haffty, Wastewater Facility Manager. "We have people who have been here since the plant started more than 30 years ago, and when they retire, they take that experience with them. So when new operators come in, they are able to know how the system works—to be able to adjust the treatment process for swings without impacting quality."

The move from a manually-intensive operation to a much more efficient software-based mobile operation has afforded the plant with much more flexibility, and resulted in cost savings. The team is able to see everything that's happening at the plant from a remote location, and be alerted to changes in the water operations without a strain on human capital.

Just recently, the team started using advanced analytics to model data for high flow situations—such as potential threats brought about by severe weather. Using GE Digital's Troubleshooter, a powerful analytical tool that utilizes leading-edge techniques to extract knowledge from historical processes and plant data, the team is able get a real sense of how the plant will perform under certain conditions.

For example, if the plant exceeded X-number of gallons a day, what is the likely result? Previously, the team had to refer back to historical data that was fixed and not fluid. Information was logged into an Excel spreadsheet—it was a very manual process with no modeling capability. Now they have five key performance indicators to monitor operational performance much more effectively. GE Digital's Troubleshooter can have a fundamental impact on present time.

It's been 12 years since John began working with GE Digital to transform the city of Haverhill's water operations from a fixed hardware-based manual operation to one that's leading-edge in his industry. His experience continues to be a positive one.

"We've been working with [GE Digital] for the past 12 years now, and it's been a great relationship," said John D'Aoust. "We've made those 2 a.m. calls to our reps, and they've been right there to answer—whatever we've needed. Our philosophy is that you pick a good company up front to meet your needs, and you stick with them. We haven't been disappointed."

Mekorot: High Availability, Connected Control Solution Virtually Eliminates Downtime

Challenge

Mekorot, Israel's National Water Company, provides 70% of all water, and 80% of the drinking water for the country. Mekorot sought to reduce production costs through improved energy efficiency and tighter process control.

By leveraging GE Digital's software and GE's hardware automation solutions, Mekorot is now using real-time data to automatically monitor and control devices from a single control room. This has created a connected environment in which minimal intervention by operational staff is required. Full redundancy was also employed to virtually eliminate downtime and to simplify controller backup.

Background

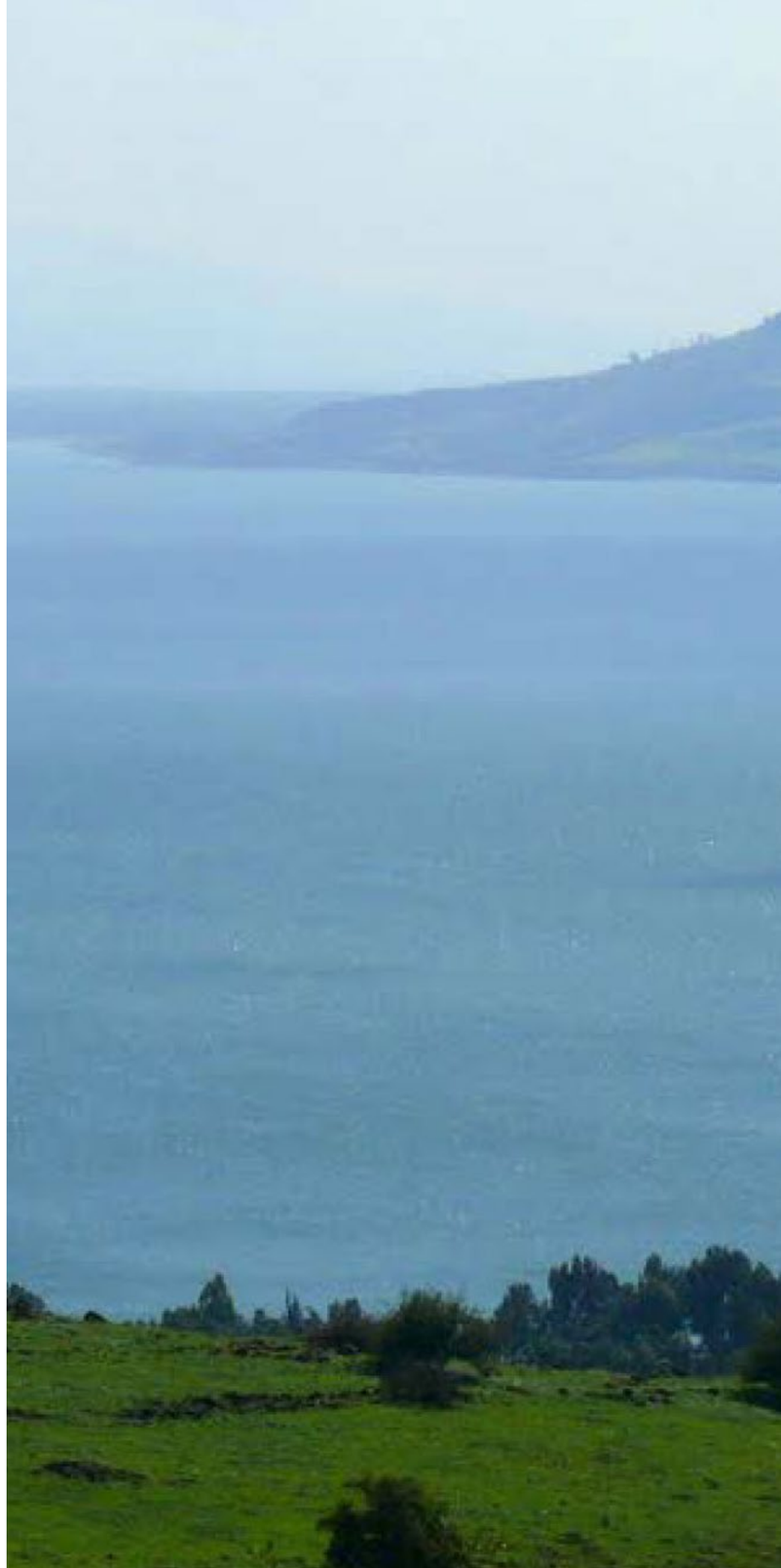
In an arid climate such as Israel, water is an especially valuable commodity. Frequent droughts and a dramatic increase in demand have made securing a reliable source of high-quality water a national priority.

Lake Kinneret, also known as the Sea of Galilee, is a key source of water for the Mekorot system. To improve the quality of the water pumped from Lake Kinneret and address Israel's decades-long water shortage, Mekorot built a state-of-the art filtration plant controlled by GE Digital's state-of-the-art high-performance automation solutions. The Central Filtration Center at Eshkol in Northern Israel is currently the only one of its kind in Israel, and one of the largest in the world.

Lake Kinneret is 212 meters (695 feet) below sea level, so most of the water filtered at the Eshkol plant is pumped 152 meters (498 feet) above sea level, and then flows through pipes and open canals to the Eshkol Site. At the plant, it is treated and filtered before being distributed to urban, industrial, and agricultural customers.

"We aim to achieve high energy efficiency and process efficiency, so that we can facilitate cost reduction in the production of water. To achieve this, we have to leverage operations support systems and programming tools, which enable real-time decision-making. The GE control system at the plant performs automatic monitoring and control of the devices from a single control center."

Nuriel Meraro, Command & Control Engineering Manager of Mekorot's Jordan Valley Division



Solution

During the filtration center's planning and construction, Mekorot worked with GE's channel partner General Engineers, which specified and provided GE solutions to control and monitor the plant.

Mekorot chose GE's process control products for their ability to meet three critical customer needs:

1. Efficient, connected operation with fewer shifts and personnel
2. High availability
3. High and proven reliability

Simplifying operations

GE Digital's automation solutions monitor and manage the Eshkol plant from a single control center. Dozens of monitors visualize and track the plant's systems with minimal intervention from operational staff, dramatically increasing operational efficiency and minimizing costs.

Securing water

As a critical system, the Eshkol filtration plant operates 24/7, except once a year, when water flow is stopped for maintenance and upgrades that can't be performed when water is flowing. Otherwise, GE's control system allows upgrades to the system while in process, allowing Mekorot to maintain a steady flow of water to its customers.

The control system installed at the Eshkol Filtration Center features the PACSystems High Availability solution, which provides true redundancy and enables full backup of the controller. The GE control and monitoring system has identical modules which work independently, and have full backup to help ensure the continuous and reliable operation that is of critical importance to Mekorot. Operations support system and programming tools enable real-time decision-making.

The system features 7 pairs of PACSystems RX3i controllers, controlling 6,000 I/O points with redundant architecture at all control layers—I/O to end devices, controllers, and HMI system. It is wired with fiber optic cables to ensure the fastest failover communication.

GE Digital's CIMPLICITY HMI/SCADA software monitors the control system. The software was customized to the requirements of Mekorot, enabling optimal control of all facets of the filtration processes.

> *"PACSystems controllers along with [GE Digital] CIMPLICITY HMI/SCADA system provide the highest flexibility in their implementation, as well as cost reduction for the end customers."*
>
> **Hertzel Perry, Technical Manager for Control and Communication Systems of General Engineers**

Benefits

With GE's hardware controls and GE Digital's software solutions, Israel National Water Company met its goals for the Central Filtration Center:

High availability

The plant runs 24/7, even during system upgrades

Increased efficiency

The connected plant can run with fewer shifts and personnel than similar-sized operations

Reduced cost

Less unplanned downtime and greater operational efficiency has reduced operational expenses

High reliability

True system redundancy enables continuous operation

Building on the success of the GE controls at the Eshkol Filtration Center, soon additional screens will control and monitor the plant's sludge treatment process. This process cycles sludge created by the filtration process back through the system, saving water, enhancing the overall efficiency of the water filtration process, and reducing costs.

> *"Mekorot faced challenging targets in the last seven decades of the Israeli water market. We feel proud to be part of turning these challenges into reality with our advanced solutions and our engineering expertise."*
>
> **Zachi Stromza, Automation and SW Solution Division Manager of General Engineers**

Formellino Wastewater Treatment Solutions for the Water Industry

"We used [GE Digital] products in this plant for the first time, and despite the complexity of the logics and the installations, we encountered no problems at all."

Alberto Tabanelli, Novanet Technical Manager

Results

- All plant data is collected and used for predictive calculations and for optimizing process efficiency
- Improved water purification process and 30% energy saving
- Improved water quality and better control of crucial river habitat parameters

The Formellino plant purifies 1000 m3/hour of water, diverting it from water flowing to the Lamone river.

Water is cleaner with GE Digital

The Formellino Wastewater Treatment plant at Faenza is managed by Hera Imola—Faenza S.r.l. It is a medium-sized installation, which purifies 1000 m3/hour of water and runs 24 hours a day, seven days a week. The plant must ensure that all of the water produced by the purification treatment process meets or exceeds the required quality regulations.

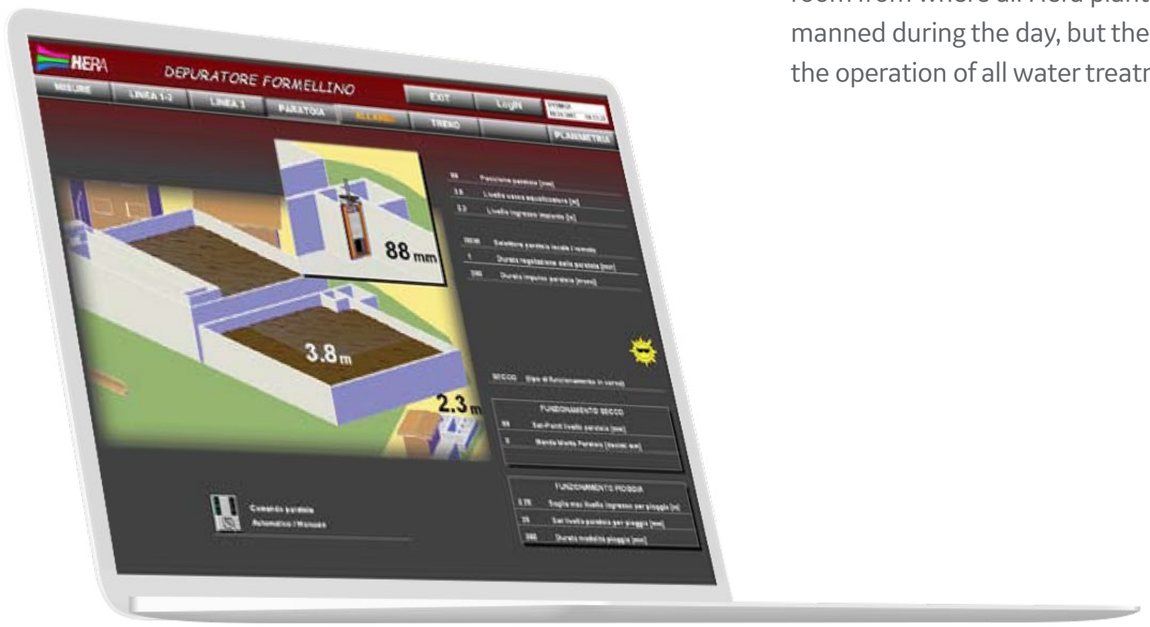
The purification treatment process

The Formellino Wastewater Treatment plant diverts the water flowing into the Lamone river, splits the flow onto two parallel lines, and directs the two flows to the treatment tanks. The water is pumped back downstream into the river after the purification treatment process. The activated sludge purification system is a biological type where organic substances and ammonia are oxidized in the presence of oxygen by the activated sludge. The nitrate products, typically eutrophying nutrients, are later removed in absence of oxygen. Consequently, the oxygen content, the active sludge concentration, the nitrates, and the ammonia are key data inputs of the plant process control system. The first steps upon entrance into the plant are grit removal and deoiling (not managed by the control system). The first active step of the plant follows: the equalization and primary decantation tanks form a vessel for controlling the sewage flow rate into the various tanks by means of sluices (a simple level gauge is used for this).

Then sewage reaches the oxidation and pre-denitrification tanks where the level of oxygen in the slurry is measured at the inlet and at the outlet. The nitrates and suspended solids are also measured in these tanks (by means of turbidimeters, which are designed specifically for measuring turbidity by implementing optical techniques), along with the phosphorous and ammonia contents, the level of decanted sludge, and the inlet and outlet water flow rate. Some of the output sludge is recirculated back to the inlet and reintroduced to improve the biological processes. After oxidation, the water flows to the secondary decantation tanks where the sludge deposited on the bottom is collected and conveyed to the thickener. Here, the sludge is prepared for drying and disposal. The clarified water is instead released into the river.

Plant criticalities

The water treatment plant is, due to its intrinsic nature, subject to seasonal variations determined by rainfall. Consequently, one of the process criticalities is that the quality of the water to be treated cannot be determined beforehand. Furthermore, the plant collection basin includes a number of industries, which introduce large amounts of waste, thus the water chemistry and flow varies greatly. Another criticality of a plant like this, with such an extensive coverage, is that it is always on. This is essential to prevent the risk of releasing polluted water into the river and to prevent being fined by the water quality monitoring authority.



Before and after

The old plant was run according to a fixed time logic. This consisted of making the sewage water stand in the various vessels for a predetermined length of time and controlling the operation of the process-related machines (aerators, blowers, pumps, etc.) according to dissolved oxygen measurements and laboratory test data only. The goal set by Giovanni Tedioli, Water Treatment Manager of Hera Imola—Faenza, was to use the data collected by various sensors to control the transit times of the sewage in the tanks and machine operation according to the values of oxygen, ammonia, suspended solids, and nitrates to improve plant processing and energy efficiency. Furthermore, the new control system had to allow an operator to work at the plant as well as relaying data to the control room from where all Hera plants are monitored. The plants are manned during the day, but the control room alone monitors the operation of all water treatment plants during the night.

Massimo Zanoni, Electrical Maintenance, Automation and Remote Control Manager of Hera Imola—Faenza S.r.l., recollects the project start-up: “When we decided to refurbish the plant, we asked ourselves how to make sure that the new automation system would guarantee our peace of mind. The water treatment plant releases water into our own rivers and this implies additional responsibilities towards society: we need to guarantee faultless operation, for ourselves and for our environment."

The “peace of mind” Zanoni mentions was then to be translated into high plant availability and reliability, data access by operators, and improved process management in terms of better results and more efficient use of energy resources. In order to reach these goals, Hera called Pastorelli’s Environmental Engineering firm to establish the project guidelines. The system was made by Novanet, a company based in Emilia-Romagna, Italy, with major expertise in the construction of large control and automation systems. Hera asked Novanet to use GE products for implementing the control system. These products are standard at Hera Imola—Faenza plants because they are reliable, competitively priced, the construction technology is good, and assistance in case of need is prompt and conclusive.

The water flow through the various stations of the water treatment plant is adjusted by controlling sluices.

The control system

The “brain” of the system is a GE PACSystems RX3i in redundant hot backup configuration, which interfaces with all the field instruments on a Profibus network (part optical fibres and part copper wires); there are several new and old sensors in total, amounting to approximately 600 controlled tags. The two redundant CPUs ensure the high plant availability required by the application criticality. The PAC Contoller establishes the standing times of the slurry in the various stages of the plant. By means of a direct Modbus/TCP link, the PAC communicates data to the Hera control room, where they are stored in a SQL database and concisely displayed so that the operator (present 24 hours a day) can be warned of faults and act accordingly.

At the Formellino plant, a local computer running CIMPLICITY from GE Digital, part of the HMI/SCADA suite, monitors and displays information and data in the form of trend or log, in addition to alarms, which may be silenced or not by the users according to their access levels. Ten profiles corresponding to ten different operative and data access levels have been created according to the privileges established for each user class.

The application allows for set up and program control parameters (the plant has been running only for a few months and the control logic is still being fine-tuned). Many fault detecting functions have been implemented in program running at the water treatment plant today to signal measurements deviating from expected values and to collect and use self-diagnostic data from the field sensors.

Novanet, the company who implemented the water treatment control process, was new to GE, despite having made control and automation systems for years.

“We used [GE Digital] products in this plant for the first time and, despite the complexity of the logics and the installations, we encountered no problems at all,” said Alberto Tabanelli, Novanet Technical Manager. “The PLC hot backup function provided default hardware redundancy, which avoided us further complications, and the system performance allowed us to introduce a predictive control, which has greatly improved plant performance.”

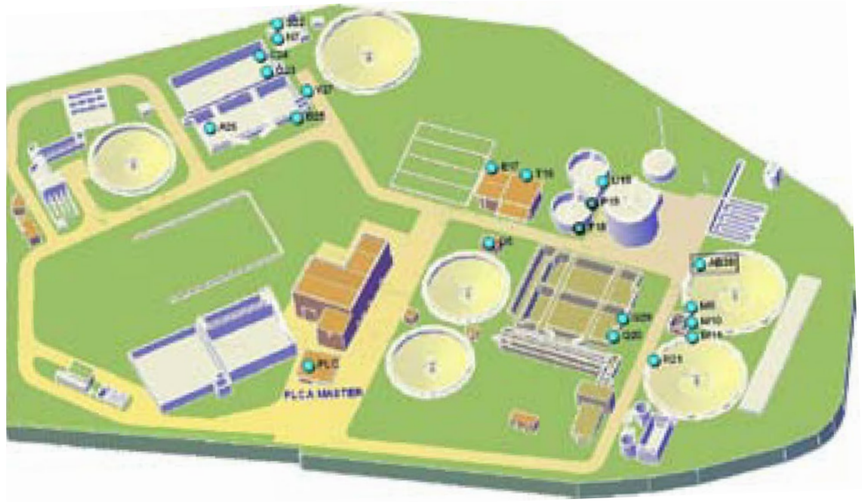
The “brain” of the system is a PACSystems Rx3i in redundant configuration, which interfaces with the field instruments.

Intuitive displays show the plant status to operators at any given time.

The data collected from the field is used to carry out a predictive control and therefore optimize machine use.

The results

The new system collects plant data for constantly monitoring everything in detail. Predictive control, sensor data collection, and use and control system response rapidity have been exploited to optimize machine running times and consequently decrease energy consumption while keeping the water quality high. Before installing the new system, for example, the water was over-oxygenated, and this was pointless from a microbiological point of view. The Formellino Water Treatment plant automation system has been running for only a few months and the implemented logics are still being optimized. After only 50 days, an energy consumption of 30% has already been observed. The plant was shut down for approximately half an hour to allow the new system to be installed. Personnel training was swift, thanks to intuitive, self-explanatory graphic displays, and was carried out over several shifts to account for staff turnover.



Future developments

New actuators, which will be controlled continuously instead of in steps, will be added in the future. They will be installed on the Profibus field network and controlled directly by the PACSystems Rx3i. These improvements will provide the best results where the processed matter is kept moving: i.e., in oxidation and sludge recirculation tanks.

About Hera

The Hera Group was established in 2002 following the merge of eleven public utility companies from Emilia-Romagna. Other companies were acquired during the merging process, including Agea, based in Ferrara in 2004, and Meta in 2005. This completed the first Italian merge of listed stock multiutility companies. The Hera Groups works in approximately 180 towns in the provinces of Bologna, Ferrara, Forlì-Cesena, Modena, Ravenna, Rimini, and in some towns in the provinces of Florence and Pesaro-Urbino. It is split into seven Local Operative Companies, one of which is Hera Imola Faenza, which is responsible for managing water, gas, electricity, remote heating systems, and environmental hygiene over an area of 23 towns.

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About Novanet

NOVANET is a system integration and engineering firm specialized in building automation, management, supervision, remote control, and home automation.

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ABOUT GE

GE (NYSE: GE) is the world's Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive and predictive. GE is organized around a global exchange of knowledge, the "GE Store," through which each business shares and accesses the same technology, markets, structure and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

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