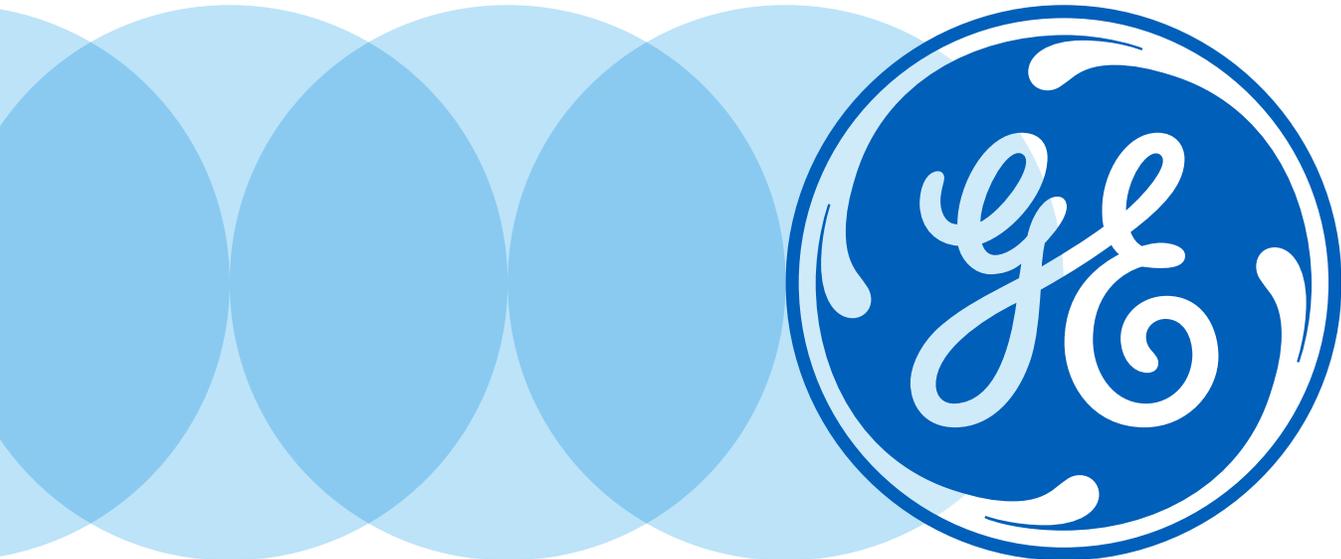


Making Machinery Health Information from the Process Control Network Available Anywhere on the Business Network

Technical White Paper

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Introduction

GE's Bently Nevada™ System 1® Fleet Management is a web-based dashboard providing a single, secure access point for monitoring equipment and instrument health from the machine to fleet levels across industrial users. System 1 Fleet Management offers a simple and intuitive interface while supporting workflow in a secure and reliable manner. With a straightforward implementation, the dashboard is affordable and requires little training for use and maintenance.

System 1 Fleet Management adds new capabilities to the System 1 suite, GE's patented condition monitoring software platform for real-time condition monitoring, and event diagnostics that enable increased equipment availability and reliability while reducing maintenance costs. System 1 Fleet Management applies Analytics to instrument and software alarms to help users quickly identify their equipment and instrument health issues. It securely connects to all your System 1 Enterprises to allow for summaries at the Fleet, Site, Train and Machine levels, allowing you to efficiently and effectively manage all your assets.

The purpose of this whitepaper is to describe a secure IT solution for implementing access to System 1 machinery health information from within a process control domain environment to a business domain environment.

System 1 Fleet Management

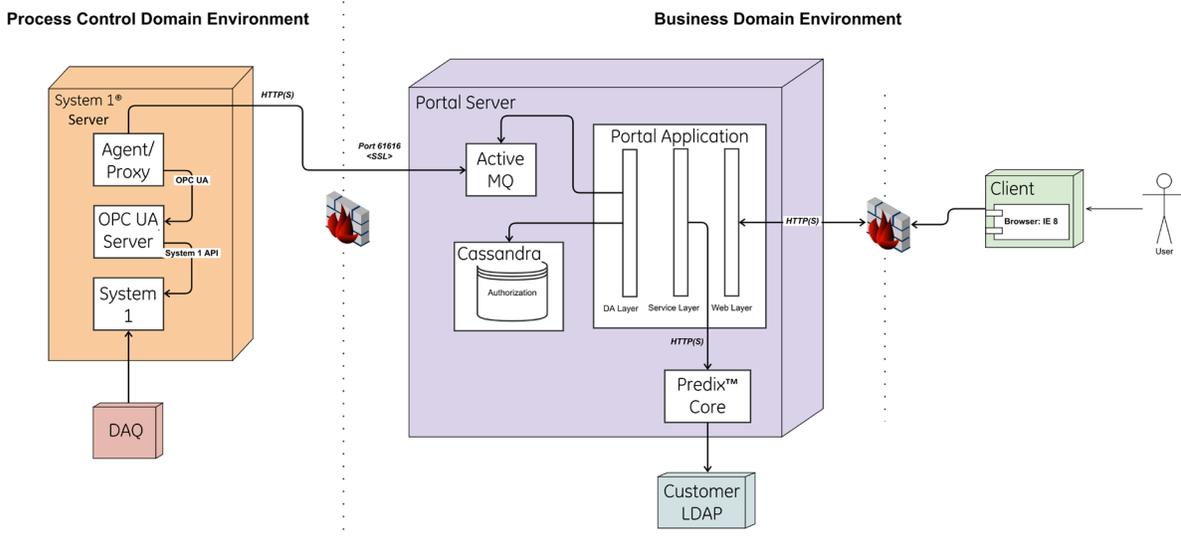
The System 1 Fleet Management solution comprises of a secure Fleet Dashboard Application (Web Portal) that communicates with remote clients across a business network. The Fleet Dashboard Application exchanges information and commands between machinery data in the System 1 Condition Monitoring software and the Web Portal. The machinery data and Web Portal Server must be able to interface with a condition monitoring system via secure protocols.

Machinery Health Data

At the System 1 data acquisition level, time-varying signals such as vibration, pressure, temperature, and other process inputs are sampled and converted into a digital representation. The digital representation includes health status, values and plots such as trends, spectrums and timebases. Using System 1 UA OPC Server and Remote Proxy solutions, the digital data is presented to the Web Portal to the business network via HTTPS.

Network

The following illustration depicts the various environments combined to allow all instruments accessibility over the network:



Business Network

The business domain environment and process control domain environment represent the whole business network, including remote users. The Remote Proxy uses Java Message Service ActiveMQ protocol which initiates a connection to the Fleet Dashboard over HTTPS. The end user accesses the business domain environment to log in to the Fleet Dashboard Application.

Web and CM Servers

The Web Server accepts connections from one or more System 1® condition monitoring (CM) servers via the network. The Web Server communicates directly with Remote Proxies. The Remote Proxies each include the OPC UA Client which can exist on a CM Server or on a different server. Each Remote Proxy/OPC UA Client is associated with one CM Server. In some cases, the CM Server and the Data Acquisition (DAQ) computer can be the same server. A System 1 DAQ collects and stores machinery data, such as vibration, pressure, and temperature. The CM software retrieves data from a DAQ and communicates it to the Remote Proxy/OPC UA Client via the OPC UA Server.

Security Components

A fleet dashboard solution must implement security measures to address the communication across business and process control domain networks. The following components help secure this solution:

Access through the Business Network (Internal and Remote Users)

- Secure communication using HTTPS
- Read-only access
- LDAP and Local Authentication
- No machinery health data is stored by the Fleet Dashboard Application, except for configuration information

Access through the Process Control Network

- Secure communication using TLS
- Authentication of Remote Proxy by message broker
- Separate read/write access to request and response topics

The Fleet Dashboard Application uses an authentication service based on industry standards to authenticate requests and to perform authorization decisions. A message broker handles the communication between the Fleet Dashboard Application and the Remote Proxies by verifying TLS certificates and by enforcing encrypted passwords. Installation of System 1 Fleet Management requires the customer IT organization to provide TLS certificates for secure communication.

Fleet Dashboard Application

The System 1® Fleet Management Application is the graphical user interface that provides the end user with a portfolio of features that makes complex tasks manageable. Tasks can include the following:

- Overall Health of Fleet
- Fleet-level Dashboard of Actionable Items
- Monitor Alarms and Events Across the Fleet
- Access Real-time Performance Status of Assets
- Build Custom Trends of Data Points

Summary

By implementing this solution, your business can have access to production health conditions on your business network without compromising best in class security requirements.

Terminology

- **Asset Management:** A system that can manage anything of value in an organization, for example, rotating and reciprocating machinery.
- **Authentication (Service):** This authentication service is used to access a secure network.
- **Client:** The end-user's computer to access the user interface of the Fleet Dashboard Application.
- **Condition Monitoring Server:** The hardware and software that provide the interface to the CM software.
- **Condition Monitoring Software:** This condition monitoring software (e.g. System 1®) is used to configure and to monitor instruments and machines for proper operation.
- **Business Network:** The network that allows access to Fleet Dashboard Application and subsequently, customer fleet data.
- **DAQ:** Data acquisition computer that stores data from instruments and communicates with System 1.
- **Fleet Dashboard Application:** A centralized asset management (AM) system includes the software that enables a full range of asset management capabilities, from condition monitoring to performance monitoring and analysis, for multiple sites (plants).
- **Instrument:** An instrument (e.g. BN 3500) that receives raw data from machines (e.g., compressors).
- **Lightweight Directory Access Protocol (LDAP) Server:** This server contains the customer directory for creating users in a Fleet Dashboard Application. This server uses LDAP to communicate with the Web Server.
- **Message Broker:** This message broker handles communication between the Web Server and Condition Monitoring Servers.
- **OPC UA:** OPC is the abbreviation for Object Linking and Embedding (OLE) for Process Control. UA is the abbreviation for Unified Architecture. OPC UA is an interoperability standard for industrial automation. It is a series of open standard specifications for allowing connectivity across different device platforms. OPC UA includes an application programming interface (API) between the OPC UA Server and Remote Proxy/OPC UA Client.
- **Remote Proxy/OPC UA Client:** Data exchange proxy responds to requests from Web Server to route data, to and from System 1. Each Remote Proxy includes an OPC UA Client.
- **Web Server:** The hardware and software that provide the centralized interface to connected devices issuing commands and requesting data.

References

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