



Plant-Wide Monitoring with Clarity and Context

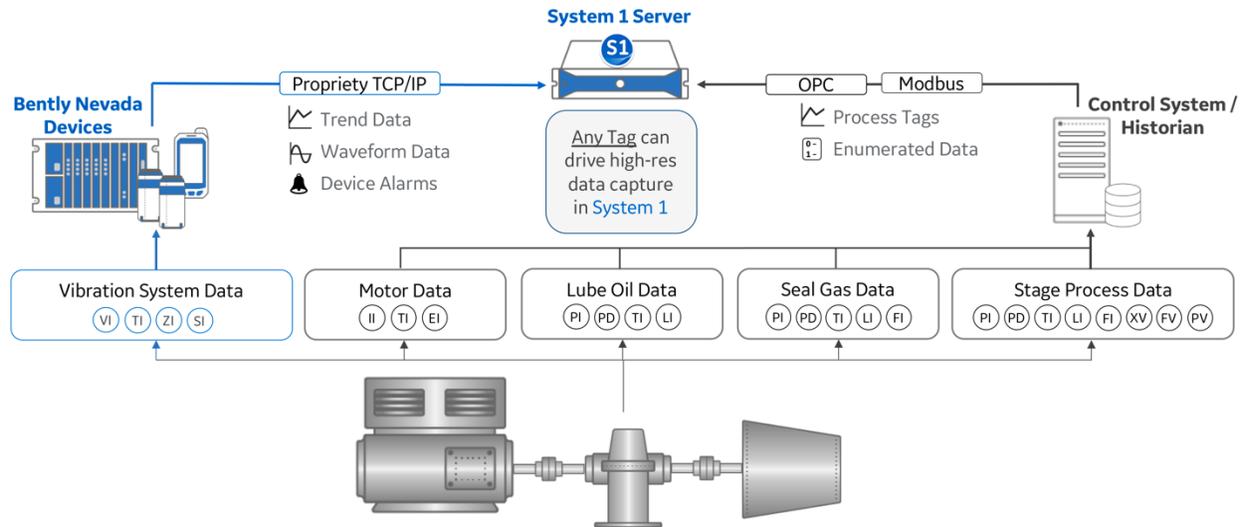
Process-intensive Industrial Operators are increasingly wading into the Digital Transformation revolution to streamline production in the face of globalization, a shifting workforce, and heightened cyber security threats. Delivering safe, reliable, and environmentally friendly operations while maintaining a competitive advantage over peers is virtually unachievable without intelligent adoption of technology and cultural acceptance of changes to long standing processes.

As long-time machinery experts retire, companies must adapt to the realities of integrating a new generation of technically savvy workers that lack extensive operational experience. Simply put, it is difficult to replace human expertise; however, technology can be leveraged to scale pockets of knowledge throughout global organizations, by collecting and transmitting contextual data from the edge to centrally managed locations for analytical development and remote support.

Bently Nevada has been partnering with customers to help solve these challenges by focusing on 3 key strategic pillars: **Connectivity**, **Analytics**, and **Visualization**. We are here to provide access to clear and contextualized data to support improving your businesses objectives.

Pillar 1: Connectivity

System 1 connects to data sources on the Edge and collects high resolution vibration, process, and control system data. This data can be collected from a Bently Nevada Device, such as 3500 or Ranger Pro, from a Programmable Logic Controller (PLC), or from another Historian. All data can be stored at up to once-per-second. In addition, an alarm on any tag mapped to a machine will trigger high-resolution data capture from all other tags, which includes 100ms static data from 3500.



Comprehensive Connectivity

Bently Nevada realizes many customers are using internal or external solutions (such as AI) to mine their data lakes and gain new insights. To support such initiatives, Bently Nevada has expanded System 1's export capabilities allowing Data Scientists to have access to System 1's simple and complex data sets. The OPC protocol is the primary interface, with DA export currently supported and UA export for Waveforms targeted for release in v19.2.

Pillar 2: Analytics

Within System 1, threshold alarms can be configured per machine operating state, with adjustable settings for time delay, latching, and suppression. While the S1 alarming engine is powerful, it can be augmented by supporting modules.

Decision Support allows users to easily create rules to gain new insights into the behavior of their machines and/or process conditions. For over a decade, customers have been using Decision Support to expedite processing of vibration analysis, process conditions, and machine performance conditions. Decision Support consumes live data from System 1, performs mathematical and logical operations on the data, and returns derived values to System 1 for alarming, visualization, and notification. The next generation Decision Support package, with enhanced features, will be available in August 2020.

Bently Performance further extends the analytic capabilities of the System 1 Platform with online thermodynamic performance monitoring. It is fully integrated with System 1 and provides access to comprehensive mechanical and thermodynamic machine-condition information.

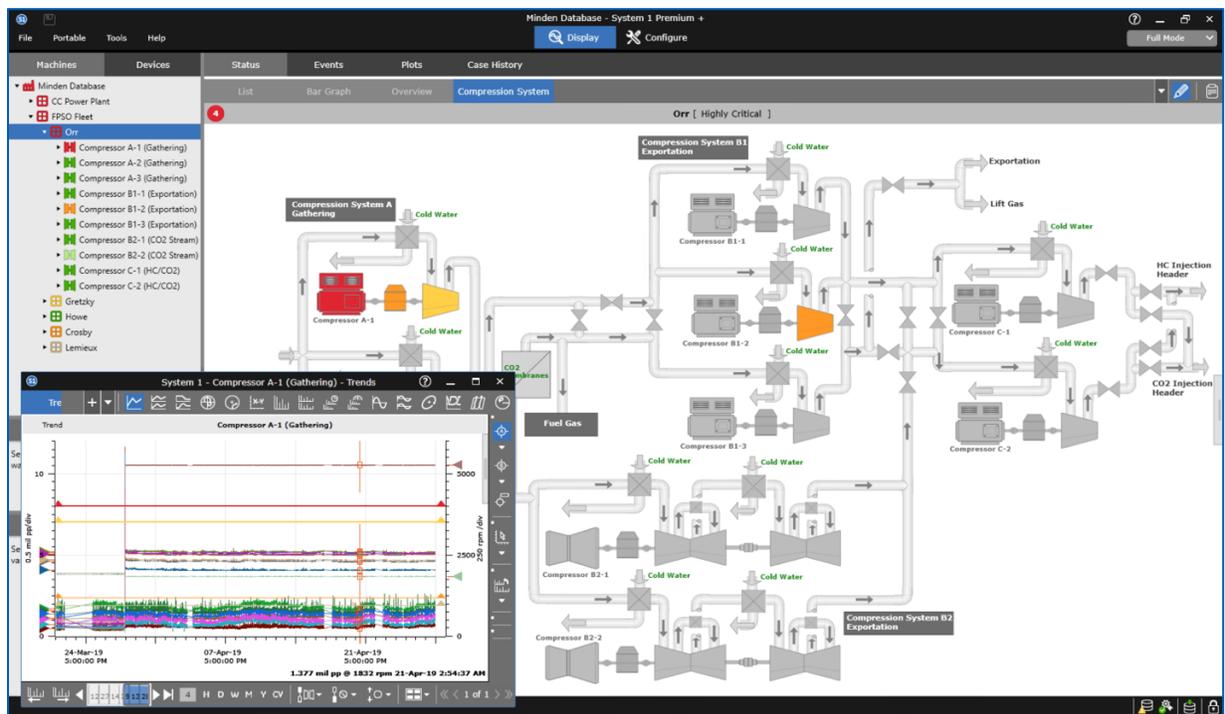


Pillar 3: Visualization

Post collection and analysis, System 1 provides best-in-class visualization tools. The HMI Builder allows customers to graphically represent their entire Plant System using the built-in symbol library. Measurement status can be associated with components within the HMI view and navigational links can be added to any Machine or Device View within the Enterprise.

The Events List enables customers to view all alarms throughout the enterprise and quickly navigate to supporting data. Notifications can also be tied to Events for managing assets by exception.

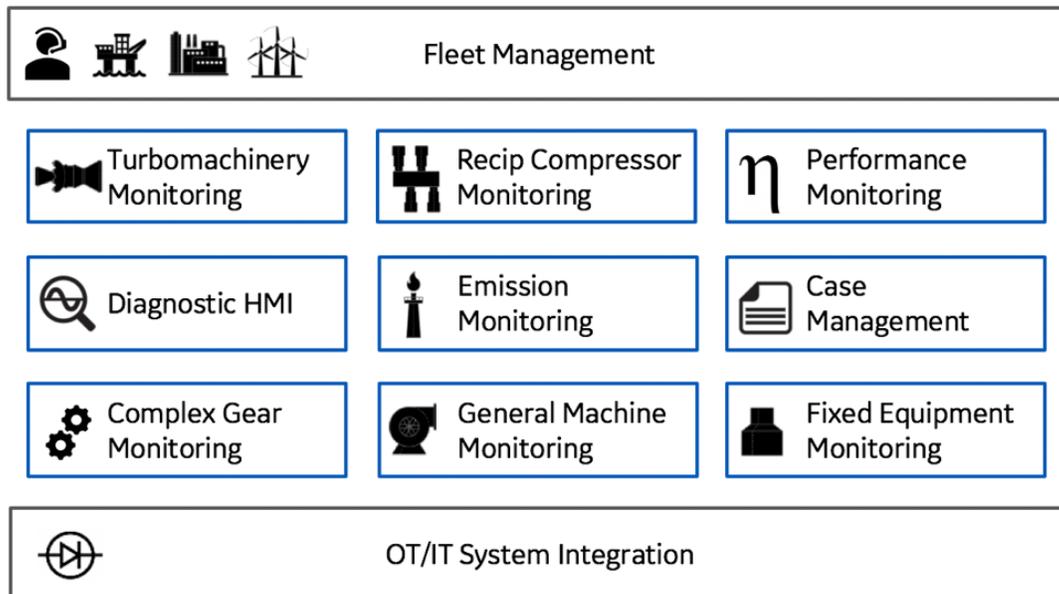
With all of that said, the true star of the application is the Plotting workspace, where collected data can be viewed and manipulated to diagnose machinery health issues. With a multitude of plot types and tools, users can quickly hone in on abnormalities to support smooth operation of their machinery.



FPSO Compression System HMI Viewed Alongside High-Res Trend Data

Designed for Key Customer Use Cases Across All Industrials

Expectations of usability have grown substantially over the last decade and as a result, users of consumer and industrial technology now demand products that seamlessly support their life and work. Through user research in 20 countries with more than 400 end users, we have studied our customers' team dynamics, site processes, and technology suites to determine how System 1 can best support Plant-Wide asset monitoring. As a result, we have designed System 1 around **11** key customer use cases, rather than to individual features and functionality. Every new feature is integrated in a manner that enhances these use cases, while maintaining consistency in interactions and visual patterns.



System 1 Key Use Cases

Notable features that have been driven into System 1 based on user research around our key use cases include:

- **Replication** – A key capability that enables *OT/IT System Integration*, Replication can transfer all System 1 data from the Edge to seamlessly integrate with Digital Transformation platforms. This includes 1-second trend data, startup/shutdown captures, and high-resolution alarm captures.

- **HMI Builder** – After engagements with major Oil & Gas Customers, the desire for an integrated HMI Builder within System 1 was identified. This capability, combined with external interfaces to import process and control system data, allows customers to graphically depict the health of their entire system. Layering on fundamental System 1 capabilities (e.g., high speed data storage, strong trending capabilities, performance curve overlays) rounds out the *Diagnostic HMI* use case.
- **OPC UA** – In pursuit of Digital Transformation, many customers have requested the ability to extract dynamic waveform data from the System 1 Historian for machine learning. The first phase of OPC UA capability will support this need with Waveform Export slated for v19.2. OPC UA will be extended in future releases to include A&E Export, Static Data Export, and Data Import.

Connectivity + Analytics + Visualization = A Complete Solution!

By combining its Connectivity, Analytics, and Visualization capabilities, System 1 is positioned to be the premier Edge Historian and Condition Monitoring platform of all Industrial Operators. To recap:

System 1 collects data from any asset within a facility. Collection rates of up to 1/second are achievable during steady-state operations, while sub-second data can be stored during alarm and startup/shutdown events (when available from the device).

The stored data can be analyzed to derive insights using a rich set of tools. The core System 1 application can configure threshold-based alarms, while Decision Support and Bently Performance layer on additional analytic capabilities for earlier detection of operational issues.

Replication frees data from the secure confines of the plant network, allowing users easy access to the System 1 Platform. Up to 8 Transmitter databases can be replicated to 1 Receiver database on the Business Network.

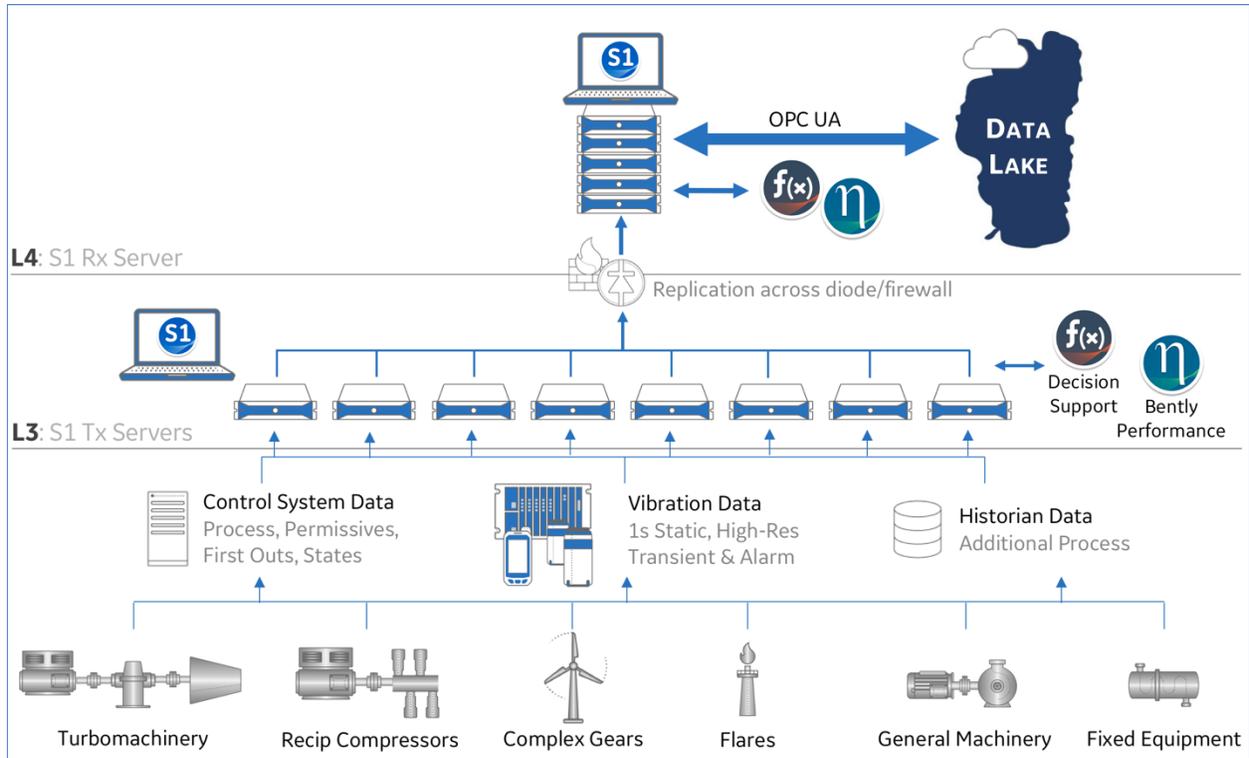
Once on the Business Network, users can access System 1's extensive visualization capabilities, allowing for efficient investigation of abnormal machine conditions.



East Shore of Lake Tahoe, a short drive from Bently Nevada's Headquarters in Minden NV

Bently Nevada's Headquarters are located next to the Sierra Nevada mountains and Lake Tahoe, the largest alpine lake in North America and world-renowned for its clarity. Given the objective of the Digital Transformation to collect large amounts of data to achieve clarity in Plant Operations, we at Bently have chosen to utilize the shape of Tahoe when graphically depicting data lakes.

Finally, interfaces (i.e., OPC UA) serve up the rich System 1 data to external systems, populating data lakes and feeding machine learning algorithms.



The System 1 Solution: From the Edge to the Lake

What's New for v19.2

System 1 v19.2 will be released on 8-November-2019. The new version will include heavily requested features within all three platform pillars. Upon release, an overview of all new features will be provided as part of the *Welcome to System 1 v19.2* newsletter, accessible within the Bently Nevada FlexNet download portal. In addition, feature videos will be posted on BN Tech Support for all customers with an active M&S agreement.

System 1 v19.2 Capabilities

Connectivity	Analytics	Visualization
Bently Nevada Data <i>Trendmaster Phase 1</i> Interfaces <i>OPC UA Wfm Export</i> <i>OPC External Alarm Sync</i> <i>CSV Export/Import</i> Data Management <i>PostgreSQL Historian</i> <i>Bulk Device Config Sync</i> <i>Bulk IP Address Import</i> <i>Application Performance</i>	Core Alarming <i>Software Alarm Latching</i> Decision Support Beta <i>Custom Rules</i> <i>Integration with S1</i> Bently Performance <i>Bently Manual Input</i>	HMI Builder <i>Device Hierarchy Views</i> <i>Navigation</i> <i>Point Swapping</i> <i>New HMI Symbols</i> Plots <i>State Data Filtering</i> <i>Plot Set Delete</i> <i>Plot Set Save As</i>

Upcoming System 1 Orbit Articles

The deep capabilities of the System 1 Platform will be explored in upcoming releases of Orbit magazine. Planned articles include:

Q4 2019	System 1 - Diagnostic HMI
Q1 2020	The Evolution of System 1 – From Classic to Evo
Q2 2020	From the Edge to Lake - OT/IT System Integration with System 1
Q3 2020	(Re)Introducing System 1 Decision Support
Q4 2020	System 1 - Turbomachinery Monitoring

With many more to come...

About Bently Nevada

Bently Nevada has been synonymous with machinery protection and condition monitoring for more than 60 years. Our network of global experts is dedicated to helping customers solve some of their toughest challenges. From refineries and petrochemical plants to hydroelectric facilities and wind farms, Bently Nevada Asset Condition Monitoring offers trusted and proven vibration monitoring equipment and a comprehensive services portfolio to help improve the reliability and performance of production assets like turbines, compressors, motors, generators, and everything in between.

Behind every suite of great products is a team of great people, and the Bently Nevada team is one of the most experienced in the industry. That experience translates into high-quality, flexible and scalable solutions coupled with a dedicated services team focused on providing proactive, consistent support throughout the lifecycle of your operations. Our domain experts can help you operate safely while maximizing plant uptime and efficiency.

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