

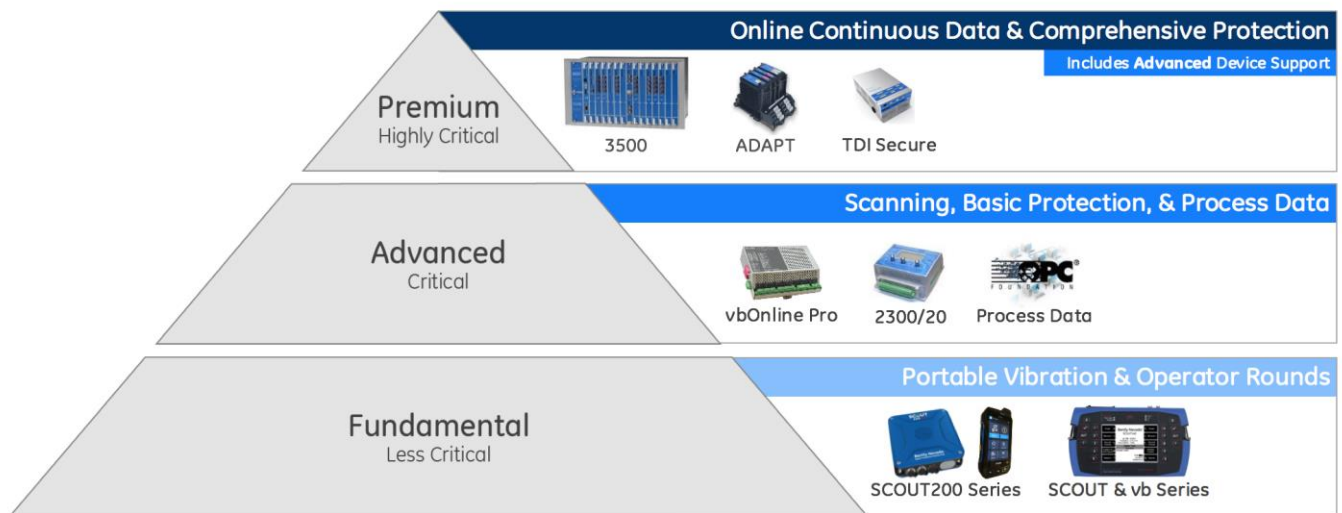


System 1*

Machinery Condition Monitoring

Overview

System 1* represents GE's Bently Nevada flagship condition monitoring (CM) solution with seamless integration to our industry leading line of online continuous, scanning, basic protection, & portable devices. The capabilities of System 1 scale based on the CM requirements at your facility, with flexible packages enabling portable-based CM all the way to comprehensive plant-wide CM by connecting to a range of field devices designed to cover diverse applications and equipment failure modes found in industrial facilities. Start by understanding your equipment and identifying which software package and field devices will enable you to achieve your operation and maintenance goals.



System 1 Packages

Keys to a Successful CM Program Bently Nevada Solution Scope



Establishing and maintaining a best-in-class CM program at your facility requires equipment knowledge with an understanding of failure modes and operational criticality combined with a cross functional team, process rigor, and enabling technology. Bently Nevada offers flexible solutions ranging from product delivery with deployment services to complete solution coverage through a supporting service agreement where we partner with your facility to manage the CM program.

S1 System 1 Package Ordering

Premium [Highly Critical]

3071/10 System 1 Software Premium Package
3071/10-AA-BB-CC

AA: Software Package

- 01 – **Premium** Package
- 02 – **Premium+** Package

BB: Quantity of Display Clients

- 01 – **Single** Client Package
- 05 – **Small** Package [6 Clients]
- 10 – **Medium** Package [11 Clients]
- 15 – **Unlimited** Clients

CC: Quantity of Server Licenses

– **Numeric Entry** [1→n]

Advanced [Critical]

3071/05 System 1 Software Advanced Package
3071/05-AA-BB-CC

AA: Software Package

- 01 – **Advanced** Package
- 02 – **Advanced+** Package

BB: Quantity of Display Clients

- 01 – **Single** Client Package
- 05 – **Small** Package [6 Clients]
- 10 – **Medium** Package [11 Clients]
- 15 – **Unlimited** Clients

CC: Quantity of Server Licenses

– **Numeric Entry** [1→n]

Fundamental [Less Critical]

3071/01 System 1 Software Fundamental Package
3071/01-AA-BB

AA: Quantity of Display Clients

- 01 – **Single** Client Package
- 05 – **Small** Package [6 Clients]
- 10 – **Medium** Package [11 Clients]
- 15 – **Unlimited** Clients

BB: Quantity of Server Licenses

– **Numeric Entry** [1→n]

Language Packs

3071/91 System 1 Non-English Languages
3071/91-AA

AA: S1 Evolution Language Options¹

- 01 – **German** v17.1
- 02 – **Simplified Chinese** v16.1
- 03 – **Russian** v17.1
- 04 – **Spanish** v17.1
- 05 – **Brazilian Portuguese** v17.1
- 06 – **Japanese** v16.2
- 07 – **French** v16.2

(AA) What is a language option?

System 1 is supported in multiple languages. UI text is translated for the listed version; when using a newer version, some text may be shown in English.

Additional Details

Package	Online Continuous CM	Scanning & Process CM	Portable CM
Premium+	✓	✓	✓
Premium	✓	✓	
Advanced+		✓	✓
Advanced		✓	
Fundamental			✓

What is +?

The System 1 Premium & Advanced packages can be ordered with a "+". This adds the capability to utilize portable data collectors in addition to the online devices supported by each respective package.

What is a Display Client?

A System 1 Display Client connects to the System 1 Server locally (same computer) or remotely via network access. These clients can have full access to the CM database; however, remote clients can only connect to the CM database when direct or networked access to the server is available.

What is a Server?

A System 1 Server contains one or more CM databases, which can be accessed from one or more Display Clients. Historical data and configuration structure is contained on the server, so the CM databases are always available. Online data collection is restricted to a single database at a time.

Get Connected – Device Ordering

3500 Device Series

3071/11-AA-BB-CC-DD 3500 Series Device Import

- AA:** Qty of 3500 Devices - Turbomachinery (# - 1→n)
- BB:** Qty of 3500 Devices - General Machines (# - 1→n)
- CC:** Qty of 3500 Devices - Recip Machines (# - 1→n)
- DD:** Qty of TDI Secures (# - 1→n)



(AA-CC) 3500 "Full" and "Mini" Racks

	Supported Monitors																Data			
Dash Option	/22 - TDI	/25 - RPH	/32 - Relay 4ch	/33 - Relay 16ch	/40 - TSI	/42 - Extended TSI	/44 - Aeroderivative	/45 - Position	/50 - Tachometer	/60, /61 - Temperature	/62 - Process Variable	/64 - Dynamic Pressure	/65 - Temperature 16 ch	/70 - Recip Impulse/Velocity	/72 - Recip Rod Drop/Position	/77 - Recip Cylinder Pressure	SUSD (Transient) Data	Alarm Data	Waveform Data	Trend (Steady-State) Data
AA	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
BB	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x
CC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

(AA) Monitor turbomachinery. Also, useful for monitoring general purpose machines when slots available in device.

(BB) Monitor general purpose machines. Also, useful for monitoring turbomachinery, or reciprocating compressors when SUSD data not required.

(CC) Monitor reciprocating compressors. Also, useful for monitoring turbomachinery & general purpose machines when slots available in device.



(DD) TDI Secure /42E /45E /PV

(DD) Recommended for monitoring machines that cannot be natively connected to System 1 via standard devices (3rd party HW, Cyber, etc.)

- ✓ 24 simultaneous Vibration + 24 Process points + 4 Tachs

Distributed Device Series

3071/12-AA Distributed Device Import

- AA:** Quantity of ADAPT Monitoring Systems (# - 1→n)



(AA) ADAPT 3701 /40 /44 /46

- ✓ 12 simultaneous monitoring points + 2 Tachs
- ✓ 1 sec trend / 10 min waveform data capture
- ✓ High resolution alarm and transient data capture

Condition Monitoring & Basic Protection

3071/13-AA-BB CM & Basic Protection Device

- AA:** Quantity of vbOnline Pro Systems (# - 1→n)
- BB:** Quantity of 2300 Monitoring Systems (# - 1→n)



(AA) vbOnline Pro Monitoring Device

- ✓ 12 simultaneous monitoring points + 2 tachs
- ✓ 30 sec trend / 10 min waveform data capture
- ✓ Simultaneous Alarm Snapshot (1 per 30 sec)



(BB) 2300 Monitoring Device

- ✓ 2 simultaneous monitoring points + 1 tach
- ✓ 1 sec trend / 10 min waveform data capture

Process Data

3071/14-AA Process Data Import

- AA:** Quantity of OPC DA Server Import Licenses (# - 1→n)



(AA) OPC DA Import

- ✓ License includes up to 6000 tags for a System 1 Server
- ✓ 1 sec trend data capture

3071/15-AA Process Data Export

- AA:** Quantity of OPC DA Server Export Licenses (# - 1→n)



(AA) OPC DA Export

- ✓ License includes up to 10000 tags for a System 1 Server
- ✓ 1 sec data export rate

Database Replication

3071/16-AA-BB-CC System 1 Replication

- AA:** License Value of Tx Server(s) (# - 1→n)
- BB:** Quantity of Rx Server Licenses (# - 1→n)
- CC:** Physical Installation Media

01 – No (Default)

02 – Yes

(AA) Tx Server?

- ✓ Conduit to move data to the business network
- ✓ Contains config info and connection to devices

(BB) Rx Server?

- ✓ Database that mirrors the S1 server on the Plant Network
- ✓ Supports 80-90% of daily CM tasks

General Capabilities

Distributed Client/Server Deployment

- ✓ TCP/IP Client to Server Communication (Ports 7550 & 7551)
- ✓ Clients can connect to 5 different CM databases simultaneously on a server (one "Online" Database per server + "Offline" Databases)
- ✓ System performance tested with 5 simultaneous client connections to one online database

Data Replication

- ✓ System 1 accessibility on the business network by replicating data across a data diode or firewall
- ✓ Enables customers to reduce Cyber Security risks to an acceptable level

User Security Profiling

- ✓ Leverages Windows Domain & Local Accounts
- ✓ **Administrator Profile** (Read, Write, Database Management)
- ✓ **Advanced Profile** (Read, Write)
- ✓ **Basic Profile** (Read Only)

Database & Server Capacity

- ✓ System 1 Server can run **one** "Online" (Premium or Advanced) CM database connected to supported online devices
- ✓ The System 1 Server can contain multiple "offline" (Fundamental) databases in addition to the "online" database
- ✓ Each CM database can contain a maximum of 2000 pieces of equipment (Motor + Pump = 2)
- ✓ **Embedded GE Historian** for data storage & management
- ✓ Edit Trend, Alarm, and Transient Data Store sizes and monitor health over time to avoid losing data

Display Unit Preferences

Effortlessly switch between "as configured", Imperial, and SI unit systems from Display

System Specifications

Standard Server

Intel Xeon™ E5-2620v4 8-Core™ (2.1 GHz Processor)
64 GB RAM or above
Operating System Hard Disk: RAID 1 & 300 GB – 10000 RPM
Historian Hard Disk: RAID 5 (see Table 3) – 10,000 RPM
DVD-RW

Light Server

Intel Xeon™ E5-2620v3 6-Core™ (1.90 GHz Processor)
16 GB RAM or above
Operating System Hard Disk: RAID 1 & 300 GB – 10,000 RPM
Historian Hard Disk: RAID 5 & 1.2 TB– 10,000 RPM
DVD-RW

Workstation

E5-1620v3 (3.5 GHz Processor)
16 GB RAM or above
1 GB Graphics Card
1 TB Hard Drive – 7200 RPM
DVD-RW

Laptop

i7 – 4700MQ1 (2.5 GHz Processor)
16 GB RAM or above
HD Graphics Card
1 TB Hard Drive – 7200 RPM
DVD-RW

Virtualized Systems

Refer to technical white paper²

Supported Operating Systems

Microsoft Windows 2016 Server Standard Edition 64 bit (**v17.2**)
Microsoft Windows 2012 Server Standard Edition 64 bit
Microsoft Windows 2012 Server R2 Standard Edition 64 bit
Microsoft Windows 2008 Server R2 Standard Edition 64 bit
Microsoft Windows 7 Professional 64 bit*
Microsoft Windows 8.1 Professional 64 bit*
Microsoft Windows 10 Professional 64 bit*

**Recommended for Client*

Network specification

Minimum 100 Mbps recommended

System Ordering

Servers and Accessories

3071/30 - Servers and Accessories

AA: Computers

00 – None

- Refer to table below

BB: Keyboards for Rack Servers

00 – None

01 – Compact KB with touchpad

03- Integrated keyboard drawer

CC: Monitors

00 – None

03 – 22" Flat Panel

04 – 24" Flat Panel

DD: Printers

00 – None

01 – HP Printer 110V B/W

02 – HP Printer 110V Color

03 – HP Printer 220V B/W

04 – HP Printer 220v Color

EE: Time Synch (see footnote)

00 – None

01 – Client Software (one license)

10 - Client SW & NTP Time Server³

20 - IRIG-B Time Card³

FF: Uninterruptable Power Supply

00 – None

01 – 110V Rack Mount

02 – 110V Tower

03 – 220V Tower

GG: Backup Devices

00 – None

01 – HP LTO Tape Drive

02 – DELL LTO Tape Drive

HH: Remote Access

00 – None

02 – 2X Remote App Server, 15 users + support

II: RDS 5 CAL Packs (needed with 2X)

– Numeric Entry [1→n]

Type	Bently Part Number	OE M	Model	Processor	RAID 1 Disk Space [GB]	RAID 5 Disk Space [TB]	RAM [GB]
Standard Server [Rack]	3071/30-A-01	HP	DL380p G9	E5-2620v4 2.1 GHz	300	2.4	64
	3071/30-A-02	Dell	R530	E5-2620v4 2.1 GHz	300	2.4	64
	3071/30-A-03	HP	DL380p G9	E5-2620v4 2.1 GHz	300	3.2	64
	3071/30-A-04	HP	DL380p G9	E5-2620v4 2.1 GHz	300	6.0	64
	3071/30-A-05	HP	DL380p G9	E5-2620v4 2.1 GHz	300	10.8	64
Standard Server [Tower]	3071/30-A-10	HP	ML350p G9	E5-2620v4 2.1 GHz	300	2.4	64
	3071/30-A-11	HP	ML350p G9	E5-2620v4 2.1 GHz	300	3.6	64
	3071/30-A-12	HP	ML350p G9	E5-2620v4 2.1 GHz	300	6.0	64
	3071/30-A-13	HP	ML350p G9	E5-2620v4 2.1 GHz	300	10.8	64
Light Server [Rack]	3071/30-A-20	HP	DL80 G9	E5-2609v3 1.9 GHz	300	1.2	16
Light Server [Tower]	3071/30-A-21	HP	ML110 G9	E5-2603v3 1.6 GHz	300	1.2	16
Workstation	02200478	HP	HP Z440	E5-1620v3 3.5 GHz	1000	-	16
Laptop	169849	HP	ZBOOK 15	i7-6700HQ 2.6 GHz	1000	-	16

Recommendations:

- **Standard Server** Medium, Large, or X-Large Premium/Advanced Databases
- **Light Server** Fundamental installation or Small Premium/Advanced Database
- **Workstation** Fundamental installation OR Premium/Advanced Client machine
- **Laptop** Fundamental installation



System 1 Software Capability Comparison

General Connectivity	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Device Support							
3500	✓ Complete	✓	✓				✓
3701	✓ Complete	✓	✓				✓
TDI Secure	✓ Complete	✓	✓				✓
vbOnline Pro	✓ Complete	✓	✓	✓	✓		
2300	✓ Complete	✓	✓	✓	✓		
OPC DA Import/Export	✓ Complete	✓	✓	✓	✓		
OPC UA Import/Export	📖 18.2						
SCOUT 100 Series	✓ Complete	✓		✓		✓	
SCOUT 200 Series	✓ Complete	✓		✓		✓	
Enterprise Impact	✓ Complete	✓	✓	✓	✓	✓	
S1 6.x Connector P1	📖 18.1						
.csv Import	📖 Future						
Modbus Import	📖 Future						
Bently Machine Library							
Compressors (Axial, Centrifugal)	✓ Complete	✓	✓	✓	✓	✓	
Compressors (Reciprocating)	● Executing 17.2	✓	✓	✓	✓	✓	
Fans	✓ Complete	✓	✓	✓	✓	✓	
Gas Turbines (Aero, Industrial)	✓ Complete	✓	✓	✓	✓	✓	
Gearbox (Wind Turbine, Configurable)	✓ Complete	✓	✓	✓	✓	✓	
Generators	✓ Complete	✓	✓	✓	✓	✓	
Generic Machine	✓ Complete	✓	✓	✓	✓	✓	
Motors	✓ Complete	✓	✓	✓	✓	✓	
Pumps (Between Bearings, Overhung)	✓ Complete	✓	✓	✓	✓	✓	
Steam Turbines	✓ Complete	✓	✓	✓	✓	✓	
User Machine Templates							
Machine Templates	✓ Complete	✓	✓	✓	✓	✓	
Machine + Device Templates	📖 18.1						
Template Import/Export	📖 18.2						
General Configuration							
Device Point to Equipment Mapping	✓ Complete	✓	✓	✓	✓		
Copy/Cut/Paste	✓ Complete	✓	✓	✓	✓		
Config Import/Export	✓ Complete	✓	✓	✓	✓		
Display Based Configuration	📖 18.2						
Linear Speed Support	📖 Future						
User Defined (Bearings, Sensors, FF)	📖 Future						
Undo/Redo In Configuration	📖 Future						
File Based Configuration	📖 Future						

Detection	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Machine State Configuration							
Machine States	✓ Complete	✓	✓	✓	✓		
Turbo Quick Configuration	✓ Complete	✓	✓	✓	✓		
Machine States for Offline (Portables)	📄 Future						
Measurement Configurations							
TA Proven Method 4th Edition	✓ Complete	✓		✓		✓	
Measurement Quick Configuration	✓ Complete	✓		✓		✓	
Data Extractions							
Spectral Bands	✓ Complete	✓	✓	✓	✓	✓	
Waveform pk-pk	✓ Complete	✓	✓	✓	✓	✓	
Sideband Energy Ratio	● Executing 17.2	✓	✓	✓	✓	✓	
Fault Specific Bands	● Executing 17.2	✓	✓	✓	✓	✓	
Dynamic Energy Index	📄 Future						
Software Generated Speed	📄 Future						
Simple Math (+,-,/,*) P1	📄 Future						
Complex Transformation	📄 Future						
Alarm Generation							
State-Based Alarming	✓ Complete	✓	✓	✓	✓		
Alarm Quick Configuration from Statistics	✓ Complete	✓	✓	✓	✓	✓	
Designed Suppression	● Executing 17.2	✓	✓	✓	✓		
Time Delay	📄 18.1						
Alarm Latching	📄 18.1						
Change Detection Alarming	📄 Future						
Spectral Envelope Alarming	📄 Future						
SUSD Anomaly Alarm	📄 Future						

Notification	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
External Notification							
Email Notification	📄 18.1						
S1 Mobile	📄 Future						
Status							
List View	✓ Complete	✓	✓	✓	✓	✓	✓
Bar Graphs	✓ Complete	✓	✓	✓	✓	✓	✓
Configurable Machine Diagrams	📄 18.2						
Events							
Alarm List	✓ Complete	✓	✓	✓	✓	✓	✓
System Health List	✓ Complete	✓	✓	✓	✓	✓	✓
Alarm Acknowledgment	✓ Complete	✓	✓	✓	✓	✓	✓
Event Count	📄 18.2						
User Enabled Shelving	📄 18.2						
State Event List	📄 Future						
Export to .csv	📄 Future						

Machinery Diagnostics	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Turbomachinery							
Bode Plot	✓ Complete	✓	✓	✓	✓		
Polar Plot	✓ Complete	✓	✓	✓	✓		
Shaft Centerline Plot	✓ Complete	✓	✓	✓	✓		
Cascade Plot (3D)	✓ Complete	✓	✓	✓	✓		
Full Cascade	● Executing 17.2	✓	✓	✓	✓		
Startup/Shutdown Navigation	✓ Complete	✓	✓	✓	✓		
Compensation	● Executing 17.2	✓	✓	✓	✓		
Acceptance Region Visualization	📄 Future						
Performance Maps	📄 Future						
Recip Compressors							
Reciprocating (Crank Angle) Plot	● Executing 17.2	✓	✓				
Adiabatic Curve Overlay	● Executing 17.2	✓	✓				
Recip Waterfall Plot	📄 18.1						
Rod Drop "SCL" Plot	📄 18.2						
Less Critical (Fans, pumps...)							
Delete Data	✓ Complete	✓		✓		✓	
Move Data	✓ Complete	✓		✓		✓	
Circular Plot	📄 Future						
General Diagnostics							
Multi-Variable Trend	✓ Complete	✓	✓	✓	✓	✓	✓
Waveform Plot	✓ Complete	✓	✓	✓	✓	✓	✓
Orbit Plot	✓ Complete	✓	✓	✓	✓	✓	
Waterfall Plot (3D)	✓ Complete	✓	✓	✓	✓	✓	
State Setpoint Visualization	✓ Complete	✓	✓	✓	✓		
Full Waterfall	● Executing 17.2	✓	✓	✓	✓	✓	
Bently Machine Plot Sets	● Executing 17.2	✓	✓	✓	✓	✓	
Plot Invalid Data Filter	○ Planning						
Multi-Window Client	📄 18.1						
Colour Plot Data by State	📄 18.1						
Filtering Plot Data by State	📄 Future						
Plot Tools							
Synchronized Cursors/Scales	✓ Complete	✓	✓	✓	✓	✓	
Link Cursors to Samples	✓ Complete	✓	✓	✓	✓	✓	
Cursors (Harmonics, Sidebands, Micro)	✓ Complete	✓	✓	✓	✓	✓	
Spectral Band Bar Graphs	✓ Complete	✓	✓	✓	✓	✓	
Fault Frequency Overlays	✓ Complete	✓	✓	✓	✓	✓	
Time Range Control	✓ Complete	✓	✓	✓	✓	✓	
Plot Play	📄 Future						
Plot Annotation	📄 Future						
Plot Scaling (Manual, Integration)	📄 Future						
Data Export	📄 Future						

Case History and Reporting	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Machine Health Reviews	✓ Complete	✓	✓	✓	✓	✓	
Condition Monitoring Notes	✓ Complete	✓	✓	✓	✓	✓	
Plot Records	○ Planning						
Comparison (Reference) Data	📄 18.1						
Multi-Media Notes	📄 18.2						
Diagnostic Report Customization	📄 Future						

Database Management	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Data Collection & Storage							
Trend Data	✓ Complete	✓	✓	✓	✓	✓	
Alarm Data	✓ Complete	✓	✓	✓	✓		
Transient Data	✓ Complete	✓	✓	✓	✓		
Online & Offline Database Support	✓ Complete	✓	✓	✓	✓		
Enhanced Data Store	📄 Future						
Database Manager							
Basic Management (Rename, Delete)	✓ Complete	✓	✓	✓	✓	✓	
Backup/Restore	✓ Complete	✓	✓	✓	✓	✓	
Data Store Configurability	✓ Complete	✓	✓	✓	✓		
Machine Audit File	● Executing 17.2	✓	✓	✓	✓	✓	
Complete Database Archive	● Executing 17.2	✓	✓	✓	✓	✓	
Data Migration							
S1 6.x DB Migration	● Executing 17.2	✓	✓				
Ascent DB Migration	● Executing 17.2	✓		✓		✓	
ADAPT.wind DB Migration	📄 Future						
Database Access							
Client/Server Deployment	✓ Complete	✓	✓	✓	✓	✓	
Simultaneous Database Access	✓ Complete	✓	✓	✓	✓	✓	
Open Multiple DBs in Single Client	📄 Future						

General Application	Status	Premium +	Premium	Advanced +	Advanced	Fundamental	Basic
Preferences							
Display Units	✓ Complete	✓	✓	✓	✓	✓	✓
Cursors (# of Harmonics, Sidebands)	✓ Complete	✓	✓	✓	✓	✓	✓
Waveform (Filter, # Revs)	✓ Complete	✓	✓	✓	✓	✓	✓
Machine Criticality Naming	📄 18.1						
Alarm Levels (Colours, Numbering)	📄 18.1						
Plot Curve Colors	📄 Future						
Adaptive Profiles	📄 Future						
Cyber Security							
User Security	✓ Complete	✓	✓	✓	✓	✓	
Code Obfuscation	✓ Complete	✓	✓	✓	✓	✓	✓
Licensing	● Executing 17.2	✓	✓	✓	✓	✓	✓

Footnotes:

1. Language translations for 17.1 are expected 1-2 months after release.
2. Virtualized Systems Technical White Paper coming soon
3. Some of the time synch options have different export control than the servers so must be ordered separately. For option 10, order 3071/30-EE-01 (Client SW) and part 165764 GPS Network Time Server separately. For option 20, order part 167114 – PCI IRIG Time Receiver separately.

© 2014-2017 Bentley Nevada, LLC. All rights reserved.

* Denotes a trademark of Bentley Nevada, LLC, a wholly owned subsidiary of General Electric Company.

Core™ and Xeon™ are trademarks of Intel Corporation.

Microsoft, Windows, and Windows Server are trademarks of Microsoft Corporation in the United States and other countries.

All product and company names are trademarks of their respective holders.

Use of the trademarks does not imply any affiliation with or endorsement by the respective owners.

The information contained in this document is subject to change without prior notice.

Printed in USA. Uncontrolled when transmitted electronically.

1631 Bentley Parkway South, Minden, Nevada USA 89423

Phone: 775.782.3611 www.GEmeasurement.com