

GE Energy

# Essential Insight .mesh\* Bently Nevada\* Wireless Condition Monitoring System for Essential Assets



imagination at work

The line separating online, permanent monitoring from hand-held, periodic data collection has been steadily shifting over the last two decades. A significant barrier to the adoption of conventional permanent monitoring has always been the complexity and installation costs associated with permanently mounting transducers and running the necessary hardwiring for signal and power. This is especially true for remote locations or areas of your plant where access is difficult.

Today, wireless technology from GE is available to meet the demanding criteria of such applications. We are proud to be at the leading edge of these technologies with the introduction of our new Bently Nevada\* Essential Insight .mesh\* wireless solution.

Our wireless solution consists of the following:

- **wSIM\*** – a wireless mesh network node that supports up to four sensor inputs. Initially supporting vibration (dynamic waveform and static data) and temperature.
- **wSIM Repeater** – a mesh-only node without I/O ports. This node extends the mesh network coverage for broader communications but does not directly support physically connected I/O.
- **Manager Gateway** – a gateway node that enables communication with other networks and protocols; it also serves as the network manager.
- **Transducers** – rugged and reliable vibration (accelerometer) and thermocouple probes (additional measurements to follow).

Tested in the extreme environments of the oil & gas and power generation industries, our wireless solution has been developed in conjunction with some of our most meticulous customers. The system is designed to address essential assets (non-critical machinery) by augmenting your conventional hardwired permanent monitoring and hand-held portable monitoring strategies—allowing reliable and affordable condition monitoring where conventional technology had reached its limits.

## The Business Problem

**Data quality.** Variations in readings introduced by manual measurement methods create data quality problems. A recent industry study of portable data collection systems showed that variations of 20% or more were routinely introduced by factors such as the amount of pressure applied to the transducer when collecting data, the angle at which the transducer was held against the machine, and whether the reading was taken at exactly the same measurement point. All of these factors combine to make it difficult to assess changes in condition versus simply changes in measurement.

**Data correlation.** Due to the asynchronous nature of manual data collection, operators have been unable to easily correlate process conditions and machine speed with condition measurements. Process conditions (and of course, machine speed) have enormous effects on

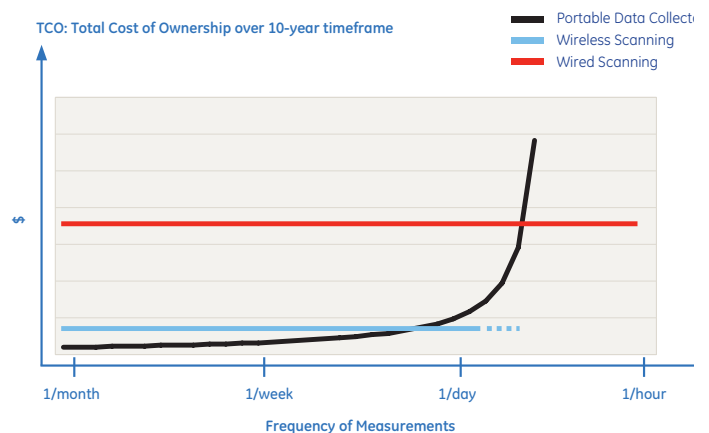
vibration, temperature, and other condition measurements. Thus, the ability to correlate this data and draw cause/effect conclusions may be problematic, even when customers are satisfied that data are being collected at suitable intervals.

**Data inaccessibility.** In remote or inaccessible locations, or in areas that represent safety concerns, manual data collection requires increased efforts and logistics, yet a permanently wired solution is often cost-prohibitive. As such, the operator simply has had to accept this constraint and live without adequate machinery condition information. These constraints have impacted overall plant reliability.

## The Solution

GE's Bently Nevada helps to solve these challenges by providing on-line, higher sampling frequency readings that can be correlated with measured process changes. GE uses proven condition monitoring technology and methodology for both static and dynamic spectrum information in a way that is easily deployable. Simplified deployment and reduced complexity allows you to more easily expand condition monitoring across essential, yet less-critical assets and improve overall plant reliability.

### Total Cost of Ownership for Wired, Wireless, and Manual Data Collection Over 10-Year Timeframe



## The Essential Insight .mesh System

**Components.** Each wireless node in the overall system is comprised of the following:

- One wSIM (a combination wireless Sensor Interface Module and mesh node), which supports four inputs
- Customized inputs can be any combination of the following:
  - Vibration transducers
    - 200150 general-purpose accelerometer
    - 200155 low-frequency accelerometer
    - 200157 enveloping accelerometer
  - Temperature transducers
    - Thermocouples (K, J, T, and R types)

wSIM nodes communicate through the Network Manager, a wireless gateway, to GE's System 1\* diagnostic software platform. Each wSIM supports up to four of any mix of vibration and/or temperature transducers. These transducers can be mounted separately from the wSIM node, allowing maximum flexibility to place the wSIM in the optimal position for access and signal transmission and each transducer in its optimal position for measurement accuracy.

**Software.** GE's Essential Insight .mesh system and System 1 software platform provide an integrated solution for your plant-wide condition monitoring program and enable connectivity to process control and automation systems for process data correlation as well. The result is a unified environment for all your condition monitoring needs, whether wired or wireless, online or portable, essential or critical.

**Signal Conditioning.** Vibration is configured as one of the following three channel types:

1. Acceleration (g)
2. Integrated acceleration (velocity) (in/sec or mm/sec)
3. Enveloped acceleration (Env g)

Vibration data is returned as both a proportional value based on the overall amplitude of the selected channel type and as a full dynamic waveform, which enables time-based and spectrum plots in System 1.

Temperature is returned as a proportional value in °C or °F.

**Sample Interval.** Sample intervals are configurable:

Channel Type	Minimum Sample Interval
Temperature	15 minutes
Static Vibration	15 minutes
Dynamic Vibration	24 hours

Appropriate sample intervals are chosen based on data resolution needs and battery life requirements or Energy Harvester power output.

**Security.** Our solution is based on standards in network communication and security. GE uses standards based security—the Advanced Encryption Standard (AES, NIST standard FIPS-197). To help ensure the safety of your process and information, we utilize 128-bit AES keys for both join keys and end-to-end message encryption.

**Power.** Power is available from a Lithium Thionyl Chloride cell or from optional Energy Harvester technology integrated with the wSIM node. Energy Harvester technology is an innovative new feature that allows the machine's vibration itself to serve as a power source via a miniature moving-coil generator. It is an environmentally friendly alternative to conventional power sources.

**Installation.** Installation is simplified with the option of both conventional stud-mount and magnetic-mount options for wSIM devices, and wSIM Repeaters. Magnetic-mount options are ideal for applications where you plan to move the wireless mesh system around periodically or simply need to experiment with the ideal measurement location before committing to a more permanent stud-mount approach.

**Mesh Network.** The Essential Insight .mesh system employs advanced mesh networking technology:

- Identical units – you have the flexibility to use a wSIM to support sensors or use it as a repeater, resulting in a simple, reliable network structure with simpler spare parts requirements
- Highly scalable in terms of numbers of sensors joining the network
- Self-joining and self-healing capabilities
- Dynamic network communication load balancing that provides less congestion, higher throughput, and enhanced reliability

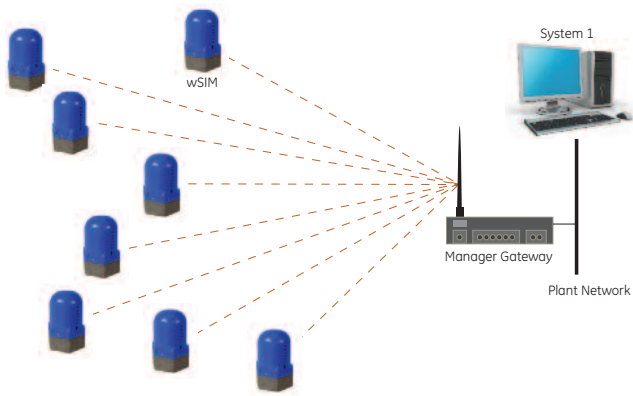
Unlike conventional networks in which each device must maintain direct contact with the host system, a mesh network allows each wSIM node to both receive and transmit messages from other wSIM nodes in their neighborhood. Because each device is an identical peer, if communication links are interrupted for any reason, numerous alternate signal transmission paths exist, enhancing data and communications integrity.

The network is also self-joining, meaning new wSIM nodes that you deploy are automatically detected and added to the network.

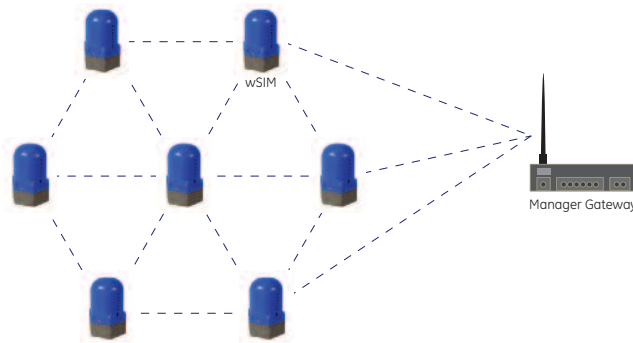
## Interoperability

GE is one of the original members on the task force developing the ISA-100.11a standards and we are fully committed to this standard. ISA-100 is an emerging family of standards for wireless automation and control devices, designed to not only address the rigors of industrial instrumentation and data reliability in such applications, but also to allow wireless devices among different vendors to interoperate.





In a conventional network, each field device can only communicate with the wireless gateway, not one another.



In a mesh network, each device is a peer that can talk to other peers, resulting in multiple signal transmission paths, higher reliability, and higher deployment flexibility.

## Proven Technology

GE's Essential Insight .mesh system was developed in conjunction with some of GE's most demanding customers in the oil and gas sector. The facilities in which this technology was prototyped, and later proven are some of the most difficult anywhere, combining extremely challenging environments for Radio Frequency (RF) communication interference and aggressive chemical and atmospheric conditions. You can choose the Essential Insight .mesh system with the confidence that it is robust, reliable, and field-proven.

## Phased Enhancements

The Essential Insight .mesh system is the first phase in a series of planned enhancements to our wireless offerings that you will see in the coming months. The systems you purchase today will be fully compatible in the coming years. Our 2008 release of our wireless system delivers a smaller wSIM with twice as many ports as our previous version as well as a full integration with System 1.

## Ease of Entry

Our innovative Advantage and Basic Packages provide everything you need to quickly and easily monitor your motor-driven assets — today. Both packages enable rapid deployment of 16 points of condition monitoring and allow scalable step-by-step plant-wide roll out.



Contact GE Energy at [bnsales@ge.com](mailto:bnsales@ge.com) today for complete product specifications and ordering information.

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