INDUSTRIAL WSN
Executive Summary

Adoption of wireless sensor networking (WSN) is driving growth for the industrial Internet of Things. Today’s WSN technologies and associated cloud platforms are the key elements for the industrial IoT: multi-year battery-powered wireless nodes, IP addressability, fieldbus tunneling and cloud-based provisioning and management systems.

Two major industrial wireless IoT landscapes have emerged:
- Short range that typically operate in ranges of <300 meters
- Long range applications that communicate over multiple kilometers

By 2021, there will be 33 million installed wireless devices used for industrial sensing, actuating and asset tracking applications. Short range systems will make up the majority of connected devices by this time but long range systems using LPWAN technologies such as LTE-M1, NB-IoT, Sigfox, LoRa and RPMA will increase faster.

Wireless sensing, tracking and control equipment and associated services will reach $35 billion over the next five years for industrial automation, agriculture, construction and related markets.

Figure 1: Global Installed Industrial WSN Devices by Market Segment (2016-2021)

This report includes the results of ON World’s survey of 180+ industrial automation professionals that was completed over the past few months in collaboration with the International Society of Automation (ISA).
Wireless Mesh Standards

Short range wireless standards and technology innovations for industrial automation have focused on wireless mesh networking. Large-scale adoption of wireless mesh standards such as WirelessHART and ISA100.11a is largely due their use of channel hopping and time synchronization and enhanced data reliability. Tradeoffs include increased power consumption, complexity and more advanced network management requirements.

WirelessHART continues to have the largest market share for industrial wireless sensor mesh networking. However, ISA100.11a is increasing faster, largely due to its more flexible time scheduling, software tunneling and support for both star and mesh topologies. For process automation, adoption of ISA100.11a increased by 67% over the past two years.

ISA100.11a is gaining traction for several high demand applications. For example, GasSecure’s ISA100.11a certified all-wireless gas detectors can support all Safety Integrity Levels (SIL) in collaboration with infrastructure partners ABB, Honeywell, Siemens, Yokogawa and Phoenix Contact.

Our survey found that 2 in 3 of all respondents and 4 in 5 of those targeting process automation markets have deployed at least some wireless mesh nodes compared with 60% and 62% in 2014.

Figure 2: Industrial Wireless Mesh Adoption

Satisfaction with WSN solutions has increased overall but improvements are needed especially for battery life, costs, system integration and network range.
For end users, less than 1 in 3 are satisfied with these key areas today.

**Figure 3: End User WSN Satisfaction by Select Features**

![Graph showing satisfaction levels for Integration, Battery life, Cost, and Range.]

% satisfied/most satisfied

**LPWAN Disrupts the Industrial IoT**

Low Power Wide Area Network (LPWAN) technologies such as LTE-M, NB-IoT, LoRa, Sigfox and RPMA are disrupting industrial IoT markets with cloud connected, battery-powered wireless sensors and asset trackers that can communicate up to 30 kilometers.

Our survey found that industrial companies have a high level of awareness and interest in LPWAN technologies.

**Figure 4: Industrial LPWAN Awareness**

![Pie chart showing research and development.]

n=166  
Source: ON World

2 in 5 are researching, pilot testing or involved with commercial deployments of LPWAN solutions.
Over the past few years, there have been several initiatives and nation-wide rollouts to create and promote Low Power Wide Area Network (LPWAN) standards and vendor interoperability. The initial focus has been on unlicensed frequencies with technologies such as Sigfox, LoRa and Ingenu’s RPMA but interest is growing for 3GPP’s licensed IoT technologies such as LTE-M1 and NB1 (NB-IoT) that were completed last year as part of Release 13. Initial offerings are in testing by Altair, Sequans, Sierra Wireless, Telit, u-Blox, Ericsson and Huawei.

Today, most applications are complementary to existing technologies but LPWAN technologies are suited to a wide range of industrial solutions and markets that will increasingly compete and integrate with ISA100.11a and WirelessHART. Recent industrial LPWAN applications include oil and gas wellsite monitoring and pipeline surveillance using Ingenu’s RPMA technology with customers/partners such as Shell Nigeria, KONCAR and WellAware as well as vertical asset monitoring solutions using LoRa and Sigfox for agriculture, construction, facility management, mining and oil and gas. Asset tracking will be the fastest growing LPWAN application with the opportunity to track and locate low and mid-valued assets for all major industrial segments.

The Industrial IoT Challenge

In a growing challenge to the industrial automation incumbents, hundreds of industrial IoT platform providers have emerged over the past few years focused on data connectivity/management, integration and end-to-end solutions. Thirty percent (30%) of the surveyed end users have an IoT framework platform such as AWS, Microsoft Azure, IBM or Google. Two-thirds believe that investing in an IoT platform is “important” or “most important.” Industrial automation vendors are re-organizing their companies around the internet of things. GE Digital, a new division formed by GE in 2015 that focuses on IoT software solutions, generated $6 billion in revenues last year.

Independent network operators such as Sigfox, Ingenu, M2M Spectrum and SENET are providing the IoT infrastructure that has been lacking by established mobile carriers and other network operators. In addition, we found a growing number of industrial IoT service providers that are disrupting the competition with lower cost LPWAN based solutions that require minimal installation and maintenance such as Beep Networks, Quantified Ag, SENET, Senso Wave, SmartSensor Labs, Weenat, WellAware and Worldsensing.

For the past decade, ON World has conducted market research on industrial wireless sensing and IoT markets based on thousands of in-depth phone interviews across the whole industrial IoT value chain. In this report, we cover the global market for industrial wireless sensing and tracking in 12 market segments including 5-year market size forecasts, analysis of 100+ companies, an extensive technology review, the results of our recently completed survey on industrial wireless and IoT adoption trends, fastest growing applications, technologies, needed innovations and satisfaction with current systems.
Methodology/Scope

This report analyzes and quantifies the global market opportunity for industrial wireless sensing, tracking and control. Our research methodology is based on extensive phone interviews and surveys with 220+ individuals, an in-depth technology evaluation, weighted market drivers and a competitive analysis of 100+ companies with industrial WSN systems, platforms and components. The major components of our research include the following:

Data Collection/Investigation:
- Surveys/phone interviews with 220+ individuals representing industrial automation organizations worldwide.
- Secondary sources including third party reports, databases, financial reports, etc.

Segmentation:

| Geographies: | North America, Western Europe, Asia Pacific, and Rest of World |
| Markets/Segments: | Process (Oil & Gas; Refining/Petrochem/Chemicals; Electric Power; Primary Metals, Minerals and Mining; Water/wastewater; Paper); Hybrid & Discrete (Food & Beverage, Pharmaceuticals/Medical devices, Electronics/Semiconductor, Automotive/Transportation, Machinery and Electrical; Other discrete); Other (Agriculture, Construction and Others) |
| Solutions: | Process & Production; Asset management: Equipment health monitoring, Corrosion monitoring, Asset tracking/locating, tank monitoring and others; Health, safety and environmental monitoring |
| Product segments: | WSN equipment (End nodes, repeaters, gateways and associated software) and services (installation, maintenance and hosted/Web services); Chipsets/modules |

Competitive Forces & Technology Dynamics:
- Product segmentation, value chain and business model analysis
- Distribution channels, product availability and vendor strength
- Standards developments, technology adoption and emerging technologies
- Analysis of products’ performance, pricing, functionality and potential for disruption

Market Size Forecasts:
- **Primary Research**: Recent market data is collected from vendors and end users on unit sales, growth trends, applications, hardware/service pricing, distribution channels, etc.
- **Market drivers**: Analysis of the weighted driver impact for each solution/market.
- **Projections**: Using all of the above, we create data models from a conservative, moderate and aggressive viewpoint. Breakdowns are provided by target market, application, new vs displaced application, sensor type, geography, technology and product segment. Revenues are for equipment and associated software/services.
- **Verification**: Forecasts are benchmarked with secondary sources and verified/confirmed with vendors/industry experts whenever possible.
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