

The Forrester Wave™: Industrial IoT Software Platforms, Q3 2018

The 15 Providers That Matter Most And How They Stack Up

by Paul Miller and Michele Pelino
August 9, 2018

Why Read This Report

In our 24-criteria evaluation of industrial internet-of-things (IIoT) software platform providers, we identified the 15 most significant — Amazon Web Services (AWS), Atos, Bosch, C3 IoT, Cisco, GE Digital, Hitachi, IBM, Microsoft, Oracle, PTC, SAP, Schneider Electric, Siemens, and Software AG — and researched, analyzed, and scored them. This report shows how each provider measures up and helps infrastructure and operations (I&O) professionals make the right choice.

Key Takeaways

IBM, C3 IoT, Microsoft, SAP, And PTC Lead The Pack

Forrester's research uncovered a market in which IBM, C3 IoT, Microsoft, SAP, and PTC are Leaders; Software AG, Hitachi, GE Digital, Atos, Oracle, Siemens, and Bosch are Strong Performers; AWS and Schneider Electric are Contenders; and Cisco is a Challenger.

IIoT Software Platforms Simplify Enabling Connected Products And Processes

To deliver differentiated connected products or transform business processes, I&O leaders face a fragmented set of network technologies, hardware, protocols, software, applications, and analytics solutions. Industrial IoT software platforms help simplify deploying, managing, operating, and capturing insights from internet-of-things (IoT)-enabled devices.

Analytics, Prepackaged Applications, Digital Twins, And Partners Are Key Differentiators

As IIoT solutions enter the mainstream, Leaders differentiate by doing far more than simply connecting industrial machinery to the internet. They turn insight into action with powerful analytics and use the digital twin to build bridges between physical and digital. These vendors offer a set of rich prepackaged applications on their platforms and actively partner to plug gaps in capability and deliver the comprehensive solutions their customers demand.

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Industrial Leaders See IoT As Central To Their Digital Future

In volatile market conditions, conservative industrial giants must move faster to survive. The digital transformation of traditional manufacturing firms cannot — and must not — simply be about making existing industrial processes more efficient. These organizations must recognize the opportunity to use digital as a way to create more sustainable and profitable customer relationships, continuously aligning product value to changing customer requirements.¹

But the physical products (and the hard-won industrial skills that created them) don't go away. A rich digital experience doesn't replace a well-built premium car or a dependable and resilient piece of industrial machinery. Rather, digital augments the product and enables designing, building, selling, using, and valuing it in new ways.² While the physical products certainly endure, the companies that built them must change to survive, investing in digital and baking it deeply into everything they do. IoT is core to industrial companies' efforts to bridge the divide between the physical and the virtual.³ IIoT platforms allow I&O pros to support the design of connected products, operate connected business processes, and consume connected insights.⁴

Industrial IoT Software Platforms Simplify IoT Solution Deployment

Forrester defines IIoT software platforms as:

Software solutions that connect to and manage smart devices and infrastructure in industrial and manufacturing environments to integrate operational data and control into business processes.

Industrial IoT software platform vendors incorporate a diverse array of functionality into their platforms, natively or via partnerships; we classify these in five core categories:

1. **Connect: Create the link between industrial machinery and digital systems.** Industrial IoT software platforms support a range of wide-area and short-range communications protocols. For example, Sigfox is a proprietary, ultra-narrow-band wireless technology and a network service provider; it deploys and maintains its own network.⁵ Other relevant connectivity options include Bluetooth LE, LTE Cat 0, and Wi-Fi.⁶ These platforms cater to the specific requirements associated with extracting data from complex industrial assets, supporting a broad set of industrial protocols that range from legacy SCADA to more modern OPC UA communication protocols.
2. **Secure: Protect IoT devices and data from attack.** IoT devices generate sensitive information about company operations and customers and transmit that data using specialized protocols to local gateways and then over the internet. In the industrial space, IoT brings connectivity to buildings, assets, and critical infrastructure that have traditionally not been connected. These connected devices are vulnerable to hacks that can leak information, damage equipment, or even cause personal injury. IIoT software platforms incorporate security components to ensure device attestation, network connectivity, software upgrades, authentication, identity and access management, and data loss prevention.

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3. **Manage: Control the provisioning, maintenance, and operation of IoT devices.** Industrial IoT scenarios often involve using thousands or tens of thousands of connected devices to measure state information like pressure, temperature, or vibration. IIoT software platforms enable technology stakeholders to simplify the process of configuring, provisioning, and initiating operation of connected assets and products. Once in production, IIoT software platforms offer a broad range of capabilities to support monitoring, testing, updating, and troubleshooting connected devices and software. Some IIoT platform solutions also include operational logs and reports documenting the status of updates.
4. **Analyze: Transform data into timely, relevant insight and action.** Many sensors capture and generate time-series data in a per-minute or real-time manner, while audio and video sensors deliver rich media insight. Most business analysts lack the tools to evaluate the varied types of captured sensor data to identify actionable insights. Rich analytics are an increasingly important category of IIoT software platform functionality, including data filtering and streaming analytics to monitor data in real time and advanced analytics to extract hidden patterns and insights from captured information.⁷
5. **Build: Create applications and integrate with enterprise systems.** The diverse array of industrial IoT use cases requires software integration and APIs to support relevant business processes and applications. Industrial IoT software platforms enable developers to easily create code, business rules, and data management capabilities integrated with those for specific IoT connectivity, security, and manageability. Development tools, scripting tools, API links, and API management tools interface with enterprise applications. Industrial IoT platforms also help transform industry- or technology-specific data elements and data models into a usable format by providing developers with a range of APIs, software development kits (SDKs), and development tools.

The Industrial IoT Software Platforms Category Is Maturing Rapidly

Forrester first evaluated the IoT software platforms market in 2016.⁸ Since then, much has changed in how industrial companies are transforming their businesses and how technology vendors have shaped their solutions to help (see Figure 1). In comparing our 2016 evaluation with today's, we see that:

- › **Industrial IoT is big, significant, and compelling enough to study alone.** In 2016, IoT software platforms were nascent and emerging. The potential use cases spanned everything from manufacturing and healthcare to consumer goods and the smart home. In 2018, IoT software platforms are more mature, with vendors offering more clear specialization. Forrester Analytics Business Technographics® data shows that 70% of enterprise telecommunications decision makers are implementing, have implemented, are expanding, are upgrading, or are planning to deploy IoT solutions or applications, and there's significant momentum within industrial firms that are doing so.⁹ Industrial IoT software platforms — and their users — now merit their own Forrester Wave™ evaluation.

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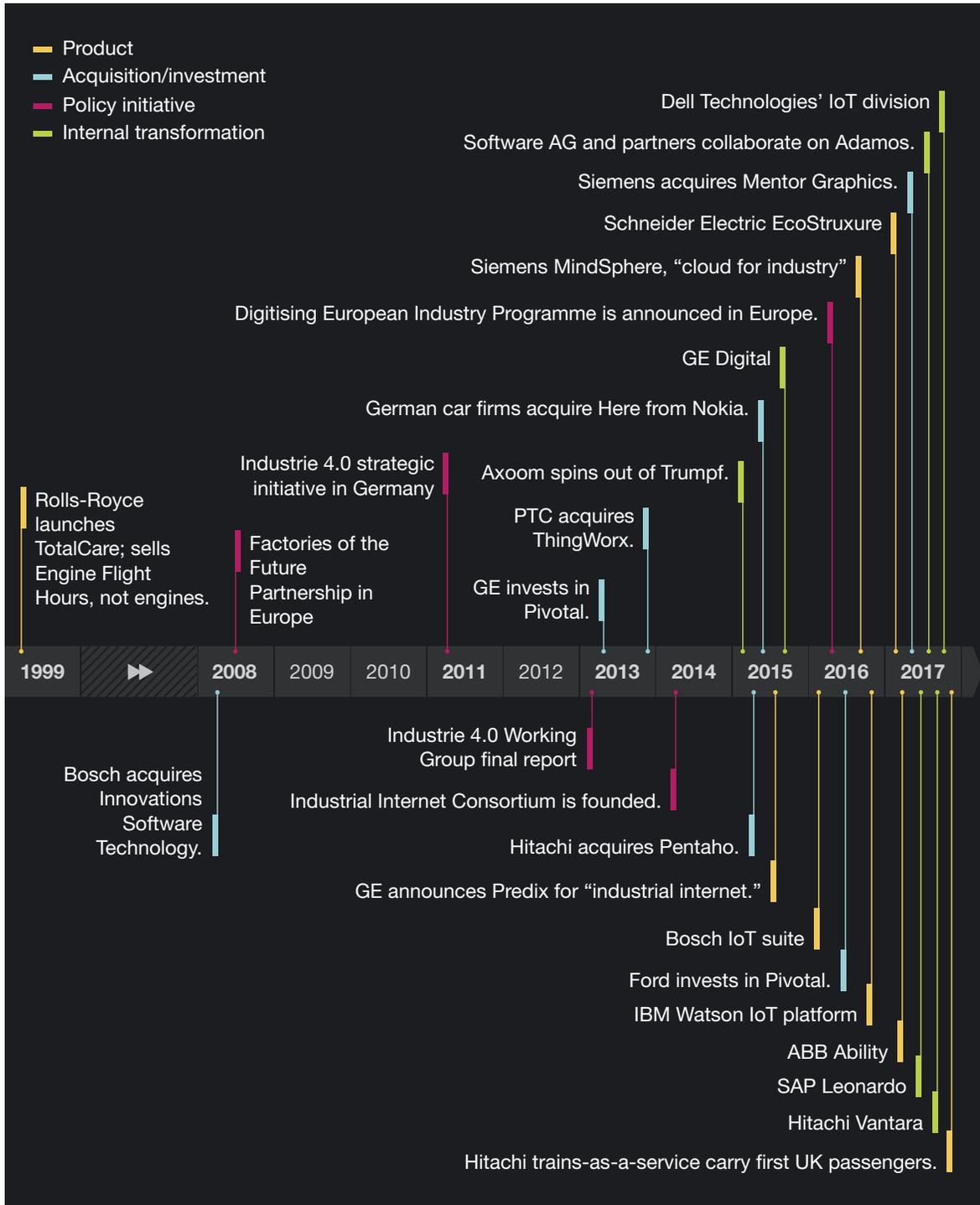
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- › **The public cloud is the place to be.** Practical considerations about providing connectivity to remote locations, plus a general suspicion about the security, capability, and trustworthiness of startup-obsessed public cloud providers, led the early entrants in the industrial IoT space to invest in building their own networks of data centers. Those days are behind us. All of the evaluated vendors retain some ability to deploy in private data centers, but the direction of travel is clear: They, and their customers, are headed to the cloud.
- › **User interfaces are modern, seamless, and API-backed.** Most vendors that we evaluated in 2016 have made dramatic improvements to their platform solution user interfaces, which one customer reference remarked used to “make [his] eyes bleed.” Across the vendors considered in this evaluation, interfaces are — mostly — modern, accessible, relatively intuitive, and similar in look and feel to other enterprise-grade web applications. And behind the web front end, the vast majority of capabilities are also fully accessible to developers via a set of rich, capable, and well-documented APIs.
- › **Analytics are a core component of the platform solution.** In 2016, IoT analytics was an emerging category of functionality. Today, analytics, machine learning, and even some nascent use of artificial intelligence are more common and allow industrial firms to move on from simply monitoring the state of their connected machinery.¹⁰ Vendors must bake analytics, insight, and action deeply into their platform offerings to support predictive maintenance, machine learning-powered workload optimization and scheduling, and more.
- › **The IoT silo is going away.** IoT data from the factory floor, the construction site, or the nuclear reactor has value in its own right. But that value is magnified when IoT systems and processes really get connected to processes and operations across the rest of the organization. We see growing interest in and capability around two-way flows of data between the IIoT software platform and other enterprise systems, including CRM, enterprise resource planning (ERP), and the service desk.
- › **The digital twin has arrived, and augmented reality is on the way.** Done right, the digital twin will lie at the heart of digitized industrial processes.¹¹ On the less mature end, this might only be a graphical representation of the real world. But more-mature solutions offer a data-driven bridge between the physical and the digital, reflecting real-world operating conditions and simulating possible future states. Augmented (and virtual) reality capabilities are further behind, with plenty of excitement but few tangible examples of delivering sustained value on the factory floor.
- › **Platform vendors are shifting from building blocks to finished results.** Early IoT software platforms were collections of technical capabilities with the potential for assembly into custom applications. In 2018, industrial IoT software platforms are rushing to reposition their offerings, delivering broadly applicable solutions that address outcomes. Predictive maintenance is the most common use case.

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FIGURE 1 Industrial Firms Accelerate Investment In Digital To Survive And Grow



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Industrial IoT Software Platforms Evaluation Overview

To assess the state of the industrial IoT software platforms market and identify how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of 15 key industrial IoT software platform vendors. After examining existing relevant research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated each vendor against 24 criteria, which we grouped into three high-level categories:

- › **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the strength of its current offering. Key criteria for these solutions include connectivity, device and application management, security, and analytics.
- › **Strategy.** Placement on the horizontal axis indicates the strength of the vendors' strategic initiatives. We evaluated professional services, partner strategies, and strategic differentiation.
- › **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's customer base and geographic reach.

Evaluated Vendors And Inclusion Criteria

Forrester included 15 vendors in the assessment: Amazon Web Services, Atos, Bosch, C3 IoT, Cisco, GE Digital, Hitachi, IBM, Microsoft, Oracle, PTC, SAP, Schneider Electric, Siemens, and Software AG. Each of these vendors has (see Figure 2):

- › **A generally available industrial IoT software platform.** Each vendor offers a standardized IoT software platform that connects to and manages smart devices and infrastructure in industrial and manufacturing environments to integrate operational data and control into business processes. This platform functionality was generally available to paying customers as of May 21, 2018.
- › **A significant focus on the industrial domain and its use cases.** Each vendor demonstrates understanding of and investment in supporting industrial use cases in areas including oil and gas, manufacturing, construction, and utilities.
- › **Native support for key industrial protocols.** Each vendor's platform provides native support for key protocols of relevance to the industrial domain, such as OPC Unified Architecture.
- › **A strong international presence.** Each vendor demonstrates international reach, with significant numbers of paying customers for its platform in key geographies.
- › **Strong Forrester client interest.** Forrester clients consistently inquire about each of these vendors in the context of industrial IoT software platform provisioning.

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FIGURE 2 Evaluated Vendors: Product Information And Inclusion Criteria

Vendor	Product evaluated
Atos	Atos Codex IoT
Amazon Web Services	AWS IoT
Bosch	Bosch IoT Suite
C3 IoT	C3 IoT Platform and Applications
Cisco	Cisco Kinetic and Cisco Jasper
GE Digital	Predix
Hitachi	Lumada
IBM	Watson IoT Platform
Microsoft	Azure IoT
Oracle	Oracle IoT Cloud Oracle IoT Applications
PTC	ThingWorx
SAP	SAP Leonardo IoT
Schneider Electric	EcoStruxure
Siemens	MindSphere
Software AG	Cumulocity IoT

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FIGURE 2 Evaluated Vendors: Product Information And Inclusion Criteria (Cont.)**Vendor inclusion criteria**

A generally available industrial IoT software platform. Each vendor offers a standardized IoT software platform that connects to and manages smart devices and infrastructure in industrial and manufacturing environments to integrate operational data and control into business processes. This platform functionality was generally available to paying customers as of May 21, 2018.

A significant focus on the industrial domain and its use cases. Each vendor demonstrates understanding of and investment in supporting industrial use cases in areas including oil and gas, manufacturing, construction, and utilities.

Native support for key industrial protocols. Each vendor's platform provides native support for key protocols of relevance to the industrial domain, such as OPC Unified Architecture.

A robust international presence. Each vendor demonstrates international reach, with significant numbers of paying customers for its platform in key geographies.

Strong Forrester client interest. Forrester clients consistently inquire about each of these vendors in the context of industrial IoT software platform provisioning.

Vendor Profiles

We intend this evaluation of industrial IoT software platforms to be a starting point only and encourage clients to conduct detailed product evaluations and adapt criteria weightings to align with their individual needs by using the Forrester Wave Excel-based vendor comparison tool (see Figure 3 and see Figure 4). Click the link at the beginning of this report on Forrester.com to download this tool.

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FIGURE 3 Forrester Wave™: Industrial IoT Software Platforms, Q3 2018

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FIGURE 4 Forrester Wave™: Industrial IoT Software Platforms Scorecard, Q3 2018

	Forrester's weighting	Amazon Web Services	Atos	Bosch	C3 IoT	Cisco	GE Digital	Hitachi	IBM
Current Offering	50%	2.50	2.58	2.39	4.13	2.31	3.09	3.07	3.88
Connect functions	20%	1.70	2.60	3.00	4.30	3.30	3.30	2.60	3.10
Management console	20%	1.90	2.80	3.20	4.10	2.10	3.00	3.50	3.80
Security/identity and access management	10%	4.00	2.00	2.00	5.00	5.00	4.00	3.00	4.00
Application enablement functions	25%	2.50	2.20	2.80	2.80	1.90	2.70	2.40	4.20
Analytics and data	25%	3.00	3.00	1.00	5.00	1.00	3.00	3.80	4.20
Strategy	50%	2.60	3.40	3.00	3.40	1.00	3.00	3.20	4.60
Professional services	20%	1.00	5.00	3.00	5.00	1.00	3.00	3.00	3.00
Strategic differentiation	45%	3.00	3.00	3.00	3.00	1.00	3.00	5.00	5.00
Partner strategy	35%	3.00	3.00	3.00	3.00	1.00	3.00	1.00	5.00
Market Presence	0%	3.00	2.00	1.50	2.00	4.50	3.50	2.00	4.50
Installed base	25%	3.00	1.00	1.00	1.00	5.00	3.00	3.00	5.00
Geographic customer distribution	50%	3.00	1.00	1.00	3.00	5.00	5.00	1.00	5.00
Dedicated employee resources	25%	3.00	5.00	3.00	1.00	3.00	1.00	3.00	3.00

All scores are based on a scale of 0 (weak) to 5 (strong).

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FIGURE 4 Forrester Wave™: Industrial IoT Software Platforms Scorecard, Q3 2018 (Cont.)

	Forrester's weighting	Microsoft	Oracle	PTC	SAP	Schneider Electric	Siemens	Software AG
Current Offering	50%	3.78	2.93	3.61	3.58	2.73	3.09	3.73
Connect functions	20%	2.80	2.40	4.40	5.00	3.00	3.00	5.00
Management console	20%	3.60	3.00	3.50	3.50	3.00	3.20	3.90
Security/identity and access management	10%	5.00	4.00	4.00	2.00	2.50	2.00	3.00
Application enablement functions	25%	3.00	2.80	3.50	3.70	3.30	3.60	2.80
Analytics and data	25%	5.00	3.00	3.00	3.00	1.80	3.00	3.80
Strategy	50%	3.70	3.00	3.70	3.90	2.10	2.60	3.00
Professional services	20%	3.00	3.00	3.00	3.00	3.00	1.00	3.00
Strategic differentiation	45%	3.00	3.00	3.00	5.00	1.00	3.00	3.00
Partner strategy	35%	5.00	3.00	5.00	3.00	3.00	3.00	3.00
Market Presence	0%	5.00	3.50	4.50	3.00	3.50	3.50	2.50
Installed base	25%	5.00	1.00	5.00	3.00	5.00	5.00	1.00
Geographic customer distribution	50%	5.00	5.00	5.00	3.00	3.00	3.00	3.00
Dedicated employee resources	25%	5.00	3.00	3.00	3.00	3.00	3.00	3.00

All scores are based on a scale of 0 (weak) to 5 (strong).

Leaders

- › **IBM builds on extensive analytics with industry-specific and services expertise.** IBM's multiyear investment in IoT encompasses building expertise in key IIoT markets, including manufacturing, energy, and oil and gas. It offers a comprehensive array of capabilities, including augmented reality, cognitive data processing, blockchain, edge analytics, and natural language processing. In addition, it integrates data sources such as weather, maps, and social media data into the IoT Connection Service and the Watson IoT Platform.

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IBM favors its own cloud, offering a more limited set of public, private, and on-premises delivery options than others in this evaluation. IBM has created a set of out-of-the-box solutions, such as prescriptive maintenance, that incorporate common equipment types and specialized manufacturing analytics. It should continue to expand these prebuilt application offerings to alleviate the need for more resource-intensive professional services projects.

- › **C3 IoT leaves management of things to partners and differentiates with analytics.** C3 IoT is a relatively young vendor and has shifted focus to prioritize its analytics capabilities, using data from connected devices to drive tangible business outcomes. The vendor maintains strong relationships with public cloud platforms, device makers, and others. C3 IoT has relatively few customers, but each deployment tends to be very large, with customers extremely positive about the nature and depth of the relationship.

As C3 IoT continues to grow rapidly, existing customers question whether the company can maintain the high-touch and high-value customer engagements they enjoy. The model-driven Type System underpinning the platform is powerful but carries a steep learning curve. C3 IoT does a good job of training early adopters at customer sites but would benefit from a simpler UI when scaling to larger cohorts of infrequent users. Emerging areas of interest to the platform's customers, such as augmented and virtual reality, aren't available today.

- › **Microsoft offers enabling cloud infrastructure and more.** Like its hyperscale public cloud peers, Microsoft's Azure public cloud infrastructure underpins many of the industrial IoT software platforms we considered in this evaluation. But Microsoft has ambitions to play a bigger role in the industrial IoT space in its own right. It offers a comprehensive set of development tools as well as a rich set of advanced analytics capabilities. Microsoft continues to invest in end-to-end security and in releasing an increasingly broad set of open source tools.

Because Microsoft offers a broad set of solutions, its preference is to support its own portfolio of products. Azure dominates the platform deployment options and, though impressive, its augmented reality capabilities favor HoloLens. Updates to Azure IoT Edge, which weren't generally available during this evaluation, will bolster Microsoft's edge capabilities. Microsoft continues to focus on extending the platform's core capabilities but doesn't yet offer as comprehensive a set of prebuilt applications as others in this evaluation.

- › **SAP Leonardo encompasses IoT as well as other digital innovation technologies.** SAP Leonardo is a set of software solutions and microservices that enable customers to leverage innovative technologies such as IoT, machine learning, blockchain, analytics, and big data as part of their digital transformation initiatives. SAP Leonardo IoT enhances SAP Cloud Platform Internet of Things, which includes a comprehensive array of industrial protocols, by adding a wide range of preintegrated applications and solution accelerators spanning a broad variety of industrial use cases.

SAP's product portfolio terminology is confusing, and some customers may find it hard to decipher. In addition, SAP's IoT device management functionality, a result of the PLAT.ONE acquisition, is limited when compared with the device management capabilities of some others in this evaluation.

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- › **PTC fuses device connectivity strength with augmented reality vision.** PTC comes from the world of industrial design but was quick to seize the IIoT opportunity by acquiring ThingWorx in 2013. The company offers rich capabilities spanning design, manufacture, service, and operations, combining these in accessible end user applications. Kepware (acquired early in 2016) supports a plethora of industrial connectivity protocols, and with Vuforia (acquired in 2015), PTC supports several industrial use cases for augmented reality.

PTC has grown its IIoT business through acquisition and organic development, and although the company has made progress in integrating these disparate offerings, there's more to do. Kepware, for example, delivers powerful device connectivity capabilities but has a user interface that bears no relation to other pieces of the platform. Tool choices for developers are relatively limited compared with those of other vendors we evaluated.

Strong Performers

- › **Software AG strengthens device management functionality through Cumulocity IoT.** Software AG acquired Cumulocity to extend IoT connectivity and device management functionality for its Digital Business Platform. The Cumulocity platform powers IoT device connectivity functions for a joint venture of industrial firms in Germany called Adamos, a range of telco IoT offerings, and Siemens' MindSphere platform. It offers some of the richest wireless connectivity, industry-specific interface support, and edge connectivity of the solutions we evaluated.

Software AG is most successful in Europe and has an opportunity to extend penetration into other geographies. It primarily offers augmented reality solutions through partners but, compared with other vendors we evaluated, doesn't tightly integrate them into the platform. In addition, the platform provides relatively limited out-of-the-box support for business key performance indicators (KPIs).

- › **Hitachi doubles down on the digital twin to reach new markets.** Hitachi is an industrial powerhouse in its home market of Japan but less visible elsewhere. With Lumada, the company hopes to harness its deep domain knowledge in an IoT offering for global customers. The platform's management console is rich and intuitive, and the company's focus on the digital twin, which it refers to as an "asset avatar," underpins a variety of industrial use cases, from asset tracking to video analytics.

The biggest task for Hitachi's new Vantara division is demonstrating to prospects outside Japan that it offers a capable solution. The vendor takes a more conservative approach to building a strategic partner program than other evaluated offerings; Hitachi doesn't have a broad set of partners and resellers to support and amplify its solution. Wireless connectivity options are relatively limited, with no support for options such as Sigfox. Lumada currently lacks a comprehensive set of prepackaged applications aimed at end users.

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- › **GE Digital moves Predix beyond hype, navigating past recent corporate wobbles.** General Electric (GE) did such a good job of marketing Predix early on that many saw it as the industrial IoT software platform to beat. The vendor made an important change in shifting its strategy from building data centers for hosting Predix to leveraging public cloud for most deployments. It has also put more emphasis on building Predix-powered applications, solutions, and services and less on customers assembling the sometimes-daunting bundle of underlying functions to meet their own needs.

GE Digital's largest challenge is to shift market perception; customer and prospect conversations often cited uneasiness around structural challenges facing the broader corporation. GE Digital must persuade the market that it's in this for the long haul, with continued, repeated, and public commitment from the very top. GE Digital's support and training, as well as its monitoring and alerting functions, weren't as strong as some others in this evaluation.

- › **Atos capitalizes on professional services expertise and strong partnerships.** IT services company Atos offers platform solutions through Codex IoT. Solutions include those built on Atos' own infrastructure as well as public cloud partnerships with AWS and Microsoft Azure. Atos' strong professional services expertise and rich partner ecosystem enable the firm to develop and deliver solutions for industrial customers. Atos also provides development, hosting, and integration services to Siemens MindSphere customers.

Atos' customized approach may not appeal to industrial firms looking for out-of-the-box IIoT solutions. Atos offers some blueprints, use cases, and incubation services to help jump-start customers' IIoT initiatives but needs to develop a wider array of industry-focused frameworks.

- › **Oracle's IIoT strategy centers on offering customers preintegrated applications.** At the core of Oracle's IoT strategic positioning is a focus on preintegrated IIoT applications. These address use cases such as asset monitoring, production monitoring, fleet management, and connected workers. Oracle IoT Cloud deploys on Oracle Java Cloud Suite, enabling customers to take advantage of Oracle's scalable platform-as-a-service (PaaS) resources, including Elasticsearch, Oracle Big Data Cloud, Oracle Database Cloud, Oracle NoSQL, and Oracle Storage Cloud.

Though Oracle sales executives can leverage strong relationships with key IIoT decision makers and stakeholders in ERP and supply chain management, its value proposition isn't as strong for firms not currently part of Oracle's ecosystem. Oracle's industry-specific interfaces and partner strategy are limited compared with those of others in this evaluation, as are its augmented reality solutions. However, expanding these capabilities is on the firm's strategic road map.

- › **Siemens builds on industrial strength to deliver an increasingly open platform.** Siemens' MindSphere moved to the public cloud in 2018 as part of a broader strategic evolution to ensure that the platform addresses a range of IIoT use cases. The company takes a broad view of the digital twin's role and delivers compelling capabilities with the digital twin at their heart. Its prebuilt applications for end users are strong, and Siemens is actively encouraging a growing community of third-party developers and partners onto the platform.

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Siemens offers a range of hardware devices for deployment at the edge, including the MindConnect Nano and Simatic IoT family. These are capable devices, but Siemens' edge connectivity strategy can look more dependent on the vendor's own hardware than we see with others in this evaluation. MindSphere offers a relatively weak set of KPIs, and device management capabilities are also less robust than those of others, with a new user interface coming later this year.

- › **Bosch embraces the cloud and doubles down on industrial roots.** Bosch IoT Suite now runs as a fully managed service in AWS and Bosch IoT Cloud. One component, the device management and monitoring solution, is also available as a standalone service on other public clouds. Bosch employs open source to underpin the platform, and the vendor is a strategic member of the Eclipse Foundation and a founding member of the OSGi Alliance. Key platform components are themselves open source projects, seeded by Bosch.

The IoT Suite is good at controlling industrial devices, but compared with others in this evaluation, it has weak analytics. Bosch is working to introduce richer data management capabilities this year. Bosch Software Innovations does a good job persuading other companies in the Bosch family to build applications (like the Production Performance Manager solution from Bosch Connected Industry) on top of its platform. However, it must devote more effort to growing the set of compelling third-party applications and services that depend on Bosch for their IoT capabilities.

Contenders

- › **Schneider Electric bakes IoT deeply into its own products and services.** Schneider Electric's EcoStruxure IoT-enabled architecture and platform focuses on supporting six domains of expertise: power, IT, building, machine, plant, and grid. Its own business units use the platform's horizontal capabilities to develop, deliver, and support vertical applications for their machines, most of which are already able to connect to the platform. Customers have some ability to extend those applications to meet local requirements, and the company is growing a network of partners and developers.

Even more than other industrial vendors evaluated here, Schneider Electric most often uses EcoStruxure as an enabler for the digitization of its own products and services. This approach results in a richer and more integrated stable of industrial equipment from the vendor, but customers with a mixed estate of machines will have to validate the platform's ability to fully support their particular multivendor requirements. Schneider Electric hasn't yet secured the ISO 27001 security certification but expects to do so in 2018.

- › **AWS platform solutions span analytics, device management, and edge services.** Customers use AWS IoT services on the AWS Cloud to access a range of cloud-based capabilities, including data storage, processing, and analytics. AWS released Greengrass in June 2017; it provides edge devices with compute, messaging, and machine learning capabilities that work alongside equivalent services in the cloud. In addition, AWS's public cloud infrastructure plays a role in hosting many of the industrial IoT software platforms in this evaluation.

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AWS provides customers with a horizontal platform and a wide range of database, analytics, and storage services. This platform lets customers address these generic functions at scale, but it has few industrial-focused prebuilt applications compared with others in this analysis. In addition, AWS has a relatively small in-house professional services team that primarily focuses on helping customers with AWS' own services. Customers with more-complex industrial architecture and integration issues will turn to third-party partners for help with using AWS' Cloud and IoT-specific APIs to address their needs.

Challengers

- › **Cisco builds on the strength of its Jasper Control Center.** Cisco Jasper has a vast global telecom partnership network to connect, manage, and monitor SIM-based IIoT devices. The Cisco Jasper Control Center offers a user-friendly, rules-based billing and subscription engine that allows for real-time monitoring of SIM cards across carrier networks. A separate Kinetic platform includes modules that provide users with gateway management, edge processing, and data control functions.

Cisco has two separate products, Jasper and Kinetic, that are not yet tightly integrated. For example, end users must log into two separate platform consoles, creating a disjointed experience. In addition, Cisco provides limited support for digital twin functionality, which is increasingly important in addressing a broader set of industrial IoT use cases.

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Supplemental Material

Online Resource

The online version of Figure 3 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at the beginning of this report on Forrester.com to download the tool.

Data Sources Used In This Forrester Wave

Forrester used a combination of four data sources to assess the strengths and weaknesses of each solution. We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by July 27, 2018.

- › **Vendor surveys.** Forrester surveyed vendors on their capabilities as they relate to the evaluation criteria. Once we analyzed the completed vendor surveys, we conducted vendor calls, when necessary, to gather details of vendor qualifications.

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- › **Executive briefings.** We asked each vendor to make members of its executive team available to us to share its vision, road map, and strategy. We used findings from these conversations to better understand each vendor's approach to the particular needs of the industrial sector.
- › **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.
- › **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with up to three of each vendor's current customers.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria for evaluation in this market. From that initial pool of vendors, we narrow our final list. We choose these vendors based on 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of questionnaires, demos, executive briefings, and discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool. The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. For more information on the methodology that every Forrester Wave follows, please visit [The Forrester Wave™ Methodology Guide](#) on our website.

Integrity Policy

We conduct all our research, including Forrester Wave evaluations, in accordance with the [Integrity Policy](#) posted on our website.

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Endnotes

- ¹ For a more in-depth look into why industrial leaders must pursue digital transformation and how they're already embracing digital, see the Forrester report "[From Grease To Code: Industrial Giants Bet Their Future On Software.](#)"
- ² Your customers increasingly interact with your products and service directly through the software they touch: mobile apps, connected products, websites, and digital experiences. If the software fails — or fails to delight — the brand suffers. Even physical products, from automobiles to thermostats, are increasingly enhanced by software. But software doesn't stop with the applications that customers touch. It pervades your entire product and service experience, from call center reps to analytically derived custom offers from marketing. More than ever, software either enriches or degrades your brand. It's time for companies to acknowledge the central role of software and elevate it from an IT-led application development group to a business-led product-development function. See the Forrester report "[Software Must Enrich Your Brand.](#)"
- ³ To find out which IoT use cases could provide the most value for your company operations, see the Forrester report "[Internet-Of-Things Heat Map 2018.](#)"
- ⁴ For an understanding of the true value derived from IoT investments, see the Forrester report "[Untangle Your IoT Strategies.](#)"
- ⁵ For more insight into the range of new IoT device connectivity options, see the Forrester report "[Implementation Timelines Will Drive Your IoT Low-Power Wireless WAN Technology Decision.](#)"
- ⁶ LTE Cat 0 removed some of the LTE capabilities to lower the power consumption of IoT devices sending data. See the Forrester report "[Implementation Timelines Will Drive Your IoT Low-Power Wireless WAN Technology Decision.](#)"
- ⁷ To read more about the role that analytics plays in supporting IoT opportunities, see the Forrester report "[Put Data To Work In The Industrial Internet Of Things.](#)"
- ⁸ See the Forrester report "[The Forrester Wave™: IoT Software Platforms, Q4 2016.](#)"
- ⁹ Source: Forrester Analytics Global Business Technographics Networks And Telecommunications Survey, 2018.
- ¹⁰ To read more about how IoT and machine learning are transforming the industrial sector, see the Forrester report "[Put Data To Work In The Industrial Internet Of Things.](#)"
- ¹¹ For a comprehensive look at the concept of the digital twin, see the Forrester report "[Untangle Digital Twin As Part Of Your Digital Product Strategy.](#)"

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