Magic Quadrant for Industrial IoT Platforms

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CIOs in industrial enterprises serve larger roles in the selection of IIoT platforms. Complex IT/OT integration is accelerating as first-generation solutions evolve and trust develops in operations. CIOs must focus on the long-term potential of IIoT platforms in addition to near-term impact.

Strategic Planning Assumptions

By 2025, 50% of industrial enterprises will use industrial Internet of Things (IIoT) platforms to improve factory operations, up from 10% in 2020.

Through 2025, 25% of large global industrial enterprises will acquire or invest in an IIoT platform company; up from 5% in 2020.

Market Definition/Description

Gartner defines the IIoT platform market as a set of integrated software capabilities to improve asset management decision making within asset-intensive industries. IIoT platforms also provide operational visibility and control for plants, infrastructure and equipment.

IIoT Platforms

The IIoT platform is differentiated from legacy operational technology (OT; see Note 1) for its ability to cost-effectively collect higher volumes of high-velocity, complex machine data from networked IoT endpoints. The IIoT platform also orchestrates historically siloed data sources to enable better accessibility, and improve insights and actions across a heterogeneous asset group through specialized analysis of the data.

The IIoT platform:

- Monitors IoT endpoints and event streams
- Supports and translates a variety of manufacturer and industry proprietary protocols
- Analyzes data at the edge and in the cloud

- Integrates and engages IT and OT systems in data sharing and consumption
- Enables application development and deployment
- Can enrich and supplement OT functions for improved asset management life cycle strategies and processes

In some emerging use cases, the IIoT platform may obviate some OT functions.

The IIoT platform, in concert with the IoT edge and through enterprise IT/OT integration, prepares asset-intensive industries to become digital businesses. Digital capabilities are achieved by enhancing and connecting their core business with customers, suppliers and business partners.

The IIoT platform may be consumed as a technology suite, or as an open and general-purpose application platform, or both in combination. The IIoT platform is engineered to include the requirements of security, safety and mission criticality associated with industrial assets and their operating environments. The IIoT platform software that resides on and near devices — such as controllers, routers, access points, gateways and edge compute systems — is considered part of the "distributed IIoT platform."

Horizontal and vertical business applications are out-of-scope for this Magic Quadrant. However, the platform provider must exhibit demonstrable value in terms of integration and interoperability with such applications, which include:

- Enterprise asset management (EAM)
- Computerized maintenance management systems (CMMSs)
- Fleet management
- Condition-based maintenance (CBM)
- Manufacturing execution systems (MES)
- Maintenance, repair and operations (MRO)
- Product life cycle management (PLM)
- Application portfolio management (APM)
- Field service management (FSM)
- Building management systems (BMSs)

IIoT Platform Capabilities

The IIoT platform (see Note 2) is composed of the following technology functions:

Device management — This function includes software that enables manual and automated tasks to create, provision, configure, troubleshoot and manage fleets of IoT devices and gateways remotely, in bulk or individually, and securely.

Integration — This function includes software, tools and technologies, such as communications protocols, APIs and application adapters, which minimally address the data, process, enterprise application and IIoT ecosystem integration requirements across cloud and on-premises implementations for end-to-end IIoT solutions. These IIoT solutions include IIoT devices (for example, communications modules and controllers), IIoT gateways, IIoT edge and IIoT platforms.

Data management — This function includes capabilities that support:

- Ingesting IoT endpoint and edge device data
- Storing data from edge to enterprise platforms
- Providing data accessibility (by devices, IT and OT systems, and external parties, when required)
- Tracking lineage and flow of data
- Enforcing data and analytics governance policies to ensure the quality, security, privacy and currency of data

Analytics — This function includes processing of data streams, such as device, enterprise and contextual data, to provide insights into asset state by monitoring use, providing indicators, tracking patterns and optimizing asset use. A variety of techniques, such as rule engines, event stream processing, data visualization and machine learning, may be applied.

Application enablement and management — This function includes software that enables business applications in any deployment model to analyze data and accomplish IoT-related business functions. Core software components manage the OS, standard input and output or file systems to enable other software components of the platform. The application platform (for example, application platform as a service [aPaaS]) includes application-enabling infrastructure components, application development, runtime management and digital twins. The platform allows users to achieve “cloud scale” scalability and reliability and deploy and deliver IoT solutions quickly and seamlessly.

Security — This function includes the software, tools and practices facilitated to audit and ensure compliance. This function also establishes preventive, detective and corrective controls and actions to ensure privacy and the security of data across the IIoT solution.

Targeted Industrial Enterprises

For this market evaluation, Gartner focuses on three asset-intensive industries:

- Manufacturing and natural resources, which include the subsectors of automotive, consumer nondurable products, energy resources and processing, heavy industry, IT hardware, life sciences and healthcare products, and natural resources and materials
- Transportation, which includes the subsectors of air transport, motor freight, pipelines, rail and water, warehousing, couriers, and support services
- Utilities, which include the subsectors of electrical, gas and water

Magic Quadrant

Figure 1. Magic Quadrant for Industrial IoT Platforms

Source: Gartner (October 2020)

Vendor Strengths and Cautions

Altizon

Altizon is a Niche Player in this Magic Quadrant. Altizon's IIoT platform Datonis is built upon both in-house development and open-source modules. Datonis integrates with Microsoft Azure and Amazon Web Services (AWS). Altizon's target markets for the platform are primarily in manufacturing and natural resources, and utilities. Altizon maintains headquarters in the U.S. and serves Asia/Pacific

and Europe. International expansion is continuing and growing. Observed and verifiable industrial use cases include real-time anomaly detection to improve machine performance and increase throughput; quality and defect monitoring; uptime performance monitoring; operating parameters (overall equipment effectiveness [OEE]); identifying manufacturing deviations; and manufacturing traceability.

Strengths

- Altizon has strong domain expertise in industrial markets, particularly in the monitoring and analysis of manufacturing and industrial assets, including real-time machine data.
- Altizon differentiates itself by emphasizing real-time analytics and associated machine learning with a prebuilt library of statistical and machine learning models and algorithms.
- Datonis provides a range of prebuilt application adapters and a fully documented system API allowing the platform to be open to integration with existing legacy applications and new applications on-premises or on the cloud.
- Customers cite ease of integration, data fidelity, data analytics and visually appealing reports as technical strengths.

Cautions

- Altizon is primarily an India-centric company with direct operations in Asia/Pacific and the U.S. Company operations in Europe are presently 100% partner-driven. Further global expansion is dependent on third parties, which may restrict availability for global companies.
- Altizon is a small company with less than $1 million in revenue for the Datonis platform. Customers and prospects must examine future viability concerns with Altizon.
- Altizon addresses only part of an overall end-to-end IIoT solution and is dependent on markets where dominant application and cloud players do not have equivalent strengths. As the market matures and more significant players continue to complete their portfolios, the company's position will not be differentiated.
- The Datonis platform does not support a full range of safety, security and privacy standards for all of the vertical markets in which the company operates.

AWS

Amazon Web Services (AWS) is a Niche Player in this Magic Quadrant. AWS bases its IIoT platform on the AWS IoT services, which address all major functional components expected in this market. AWS's first approach to the market is from a general IoT perspective rather than a primary focus on industrial sectors. The services can include various types of AWS data persistence, integration,

artificial intelligence (AI), analytical models and management. AWS offers emerging capabilities for edge computing, such as the private cloud capabilities that AWS Outposts enable for some degree of edge and on-premises support. Organizations seeking to deploy asset monitoring and connected industrial asset solutions should consider the AWS IoT offering.

Strengths

- Customers cite ease of implementation as a strength of AWS IoT, noting great flexibility in combining IoT capabilities with various other AWS services outside of AWS IoT.
- AWS's broad range of capabilities enables industrial customers to create very diverse and verticalized solutions.
- Customers identify their partnership with AWS, specifically the vendor's willingness and ability to quickly innovate enhancements to existing services, as a significant reason for their successful deployments.
- As a market share leader in cloud infrastructure and platform as a service (PaaS) capabilities, as well as being part of one of the largest and best-resourced companies in the world, AWS can accelerate its impact in this market.

Cautions

- The cloud-centric nature of AWS's offering creates potential gaps for customers desiring all components of the platform to operate in a completely disconnected, on-premises model, particularly for device management.
- The abilities to integrate easily in brownfield industrial settings and deliver OT-like replacement functionality remain areas of emerging capabilities for AWS IoT as it looks to grow its IIoT catalog.
- Given the broad range of AWS services required to comprise a complete IIoT solution, customers are faced with development challenges, which few are capable of handling with organic resources.
- Unlike many of its competitors in this market, AWS does not offer a catalog of applications that leverage the capabilities of AWS IoT, creating a challenge for the vendor in presenting a "full solution" value proposition to the market.

Braincube

Braincube is a Niche Player in this Magic Quadrant. The company's differentiation and architectural center of gravity reside in its analytics and its application enablement capabilities. The company has a strong focus on user-friendly low- and no-code apps that enable IT and operational personnel to conduct manufacturing operational analyses with a critical emphasis on answering operational questions. With offices in France, the U.S., Brazil and Thailand, the company provides products and

services mostly to manufacturers. Key partners include ENGIE, Siemens and Microsoft. Braincube is most focused on continuous improvement, applying a variety of condition monitoring, asset tracking and predictive maintenance business solutions.

Strengths

- Braincube has extensive experience and expertise in process and discrete manufacturing.
- The Braincube visualization app enables manufacturing personnel to develop charts without having to code.
- Customers are very satisfied with the ease of use of Braincube's tools once integrated. Customers indicated both skilled developers and front-line workers used these capabilities.
- Braincube provides high quality of technical support.

Cautions

- The company needs to improve how it communicates enhancements and new releases and related documentation and training. Some customers also complained about slow releases of new features and improvements.
- Braincube's core expertise lies in manufacturing, and the company offers limited expertise, capabilities and partners for utilities, and transportation and logistics.
- Braincube has a limited set of service partners trained on the platform, requiring the enterprise to work with Braincube services as available or to have internal skilled developers or operations personnel for life cycle services.
- The Braincube platform rates below average for ease of integration and ease of deployment.

Davra

Davra is a Niche Player in this Magic Quadrant. Davra bases its platform on a range of open-source components. While the large number and wide range of open-source technologies add complexity to the overall architecture, Davra integrates these components into a cohesive and seamless platform. The ability to deploy the Davra IoT platform in a completely on-premises, disconnected manner, as well as in the cloud and as a hybrid, allows Davra to address a wide range of use cases and environments. The functionality available on-premises and in the cloud is identical. Organizations that seek an extensible platform that enables complex applications may see Davra's open-source roots as an advantage for deployment flexibility.

Strengths

- The Davra platform is deployable on-premises or in the cloud with identical functionality, and Davra has reference customers with production on-premises deployments.
- Customers provide positive feedback on the vendor's ability to provide timely and high-quality responses to support issues.
- Davra provides high-quality service and support.
- The platform's ease of integration and ease of use are critical factors in customers' selection and use of Davra.

Cautions

- The partner-centric go-to-market approach means Davra has a less direct focus on and interaction with end users, and it incurs the risk of reliance on partners to generate sales.
- Davra lacks the packaged applications that some resource-constrained enterprises require and that many of Davra's competitors provide.
- Davra has a limited set of service partners trained on the solution, which may impact the quality of deployment.
- Customers state some dissatisfaction with the lack of security features, including password management and out-of-the-box security models. Additionally, users report that some unexpected microservices development is required to recognize the value.

Eurotech

Eurotech is a Niche Player in this Magic Quadrant. The Eurotech IIoT platform is a microservices architecture without any dependencies for deployment. Positioned as a differentiator and as a way for customers to avoid vendor lock-in, Eurotech maintains an open-source approach to its IIoT platforms by driving the edge and cloud platforms based on Eclipse Kura and Eclipse Kapua projects, respectively. Edge computing is Eurotech's latest development in supporting analytics, AI inference, device management and security. Eurotech has demonstrated use cases within transportation, utilities and manufacturing.

Strengths

- Eurotech has a long and sustained presence in the IIoT market, beginning with gateways and extending into the full IoT device middleware and the cloud platform.
- Eurotech's edge and cloud technologies leverage Eclipse's open-source projects and provide consistent technologies across deployment models. Eurotech offers preintegration with Microsoft Azure, AWS, Software AG and SAP.

- Digital twins are a key offering to its edge and cloud platform. Eurotech's edge and cloud services provide third-party support to device shadow concepts of Microsoft and AWS.
- Eurotech offers a modular approach to selling and packaging its Everywhere platform. Customers do not need to acquire the entire end-to-end IIoT platform.

Cautions

- The analytics offered by Eurotech have reduced capabilities, lack ease of use, and generally do not meet user expectations.
- Eurotech is deficient in providing extended business value with its IIoT platform.
- Eurotech is still a small IIoT platform vendor that has been in the market for nearly 30 years. The company needs to show growth as compared to its competitors.
- Eurotech's customer base and focus are in the U.S. and Europe, with few examples of customers across the rest of the world.

Exosite

Exosite is a Niche Player in this Magic Quadrant. Exosite Murano and ExoSense are delivered as managed services and are deployable on public cloud infrastructure, including AWS and Microsoft Azure. Exosite has extensively API-enabled the Murano platform for expedited integration with various other technologies. Exosite's primary go-to-market approach targets OEMs to create connected products. Exosite's installed base includes several significant OEMs that have licensed Murano and ExoSense to develop predictive maintenance solutions that they offer to end customers. The Exosite Murano platform is best-suited for OEMs and other organizations seeking cloud-oriented capabilities to process and analyze data from connected products.

Strengths

- Flexible pricing and licensing contribute to strong customer perceptions of positive ROI and rapid time to value.
- Exosite's approach to RESTful APIs and the modern architecture of Murano contribute to positive customer experience with integration and ease of use.
- Application enablement, analytics and solution administration capabilities are critical factors in the selection of Exosite's platform.
- Customers view Exosite's services and support as timely and high-quality.

Cautions

- Customers report limited usage and satisfaction with capabilities such as device management and exhibit fewer examples of edge device control as compared with condition monitoring.
- The Murano platform leverages Lua, a scripting language for which skills are scarce, to provide serverless scripting functionality. Customers that use the ExoSense application are not required to work with Lua, but advanced customers wishing to customize the platform may find this an impediment.
- Exosite cannot point to a deep pool of on-premises deployments for industrial enterprises.
- Exosite's primary target is the connected product market. The company has less experience with the most common requirements in the physical plant and integration with OT and industrial control and automation systems.

Flutura

Flutura is a Niche Player in this Magic Quadrant. The strength of Flutura's Cerebra IoT platform centers on its analytics. Expertise in specific assets and processes reside in the Cerebra vertical-specific nano apps, a form of analytics-focused digital twin, that target specific IoT equipment analytics or process optimization analytics. Using Flutura's internally developed tools, analytical outputs can incorporate interactive queries, expert knowledge rule systems, physics-based models, hypothesis testing, and machine learning. Flutura targets specialty chemicals, oil and gas, and industrial machinery manufacturers. Flutura's partner ecosystem includes Intel, ABB, Accenture, Hitachi, TechnipFMC, Dell, Eurotech and Pricol. Flutura has observable outreach to IoT developers to create demand.

Strengths

- Flutura offers a track record of expertise and understanding related to the oil and gas companies as a sizable percentage of its installed base.
- Flutura's Cerebra provides a broad range of analytical styles leveraging physics, heuristics, and machine learning for industrial asset optimization and operations and management (O&M) with proven results.
- Customers cite the ease of integration of Flutura's Cerebra into IT and OT enterprise applications to enhance enterprisewide impact.
- Flutura's library of extensions to IoT analytics applications helps customers apply Flutura's technology to industrial asset maintenance challenges.

Cautions

- Flutura is yet to fully scale revenue-generating partnerships with IT and OT vendors to add value to IIoT.
- Flutura's device management lacks essential capabilities and is a lightweight solution option.
- Flutura does not offer general-purpose integration (for example, for translation) or a device integration software development kit (SDK).
- Flutura's Cerebra lacks natural language query processing and results generation.

GE Digital

GE Digital is a Niche Player in this Magic Quadrant. GE Digital Predix is an application platform designed for building IIoT-enabled industrial-data-intense and analytics-intense solutions. Based on a distributed application and service architecture, and delivered as a platform as a service (PaaS) able to operate on the cloud and on-premises. GE Digital incorporates decades of domain expertise into Predix to address the requirements of the industrial market. As part of GE's evolution, GE Digital now has more of an industrial application focus. Observed and verifiable industrial use cases include asset-intensive monitoring and automation, predictive maintenance, operations optimization, digital twin and other critical industrial use cases.

Strengths

- GE Digital continues to exploit General Electric's in-depth domain expertise in industrial applications and services across a broad range of industrial markets and environments.
- Predix is available for sale as an IIoT platform, although with less emphasis, bolstered by the availability of Predix Private Cloud to deliver both cloud and on-premises solutions.
- GE Digital's modified strategy, including creating partnerships with AWS and Microsoft to host GE Digital and Predix applications, provides a broadened range of GE Digital solution implementation options.
- GE Digital has a significant number of industrial use cases across its four key identified markets: power generation; grid operations; oil and gas; and digital manufacturing.

Cautions

- Conversations with industrial enterprises and with GE Digital partners indicate that Predix suffers from a lack of market visibility and diminishing brand equity in the market for stand-alone IIoT platforms.
- GE Digital's moves from a platform approach to IIoT PaaS to an application approach (SaaS) relegates Predix to a supporting role as an underpinning software technology for GE Digital's

digital twins and applications. This status reduces Predix's ability to compete in the general-purpose IIoT platform market.

- GE's Predix Private Cloud lacks meaningful market adoption as a stand-alone IIoT platform.
- GE Digital has not provided existing Predix users a clear forward migration path from the past and existing implementations of Predix to the more application-centric approaches and strategy revolving around applications such as APM.

Hitachi

Hitachi is a Leader in this Magic Quadrant. Hitachi's Lumada platform satisfies requirements for asset-intensive industries like manufacturing, transportation, energy and utilities. Recent developments in Lumada include the repackaging of various applications that Hitachi had developed across implementations in its operating companies and non-Hitachi customers. The resulting application offerings are: Lumada Manufacturing Insights, Lumada Maintenance Insights and Lumada Video Insights (focused on applications that require analytics on video, lidar and other imagery). The vendors' repertoire of IIoT use cases, industries, data types and applications forms a foundation upon which customers can develop personalized solutions.

Strengths

- Hitachi Vantara can offer a complete Lumada platform and a curated solution from various OEM providers to different asset-intensive industries like manufacturing, transportation, oil and gas, utilities, and smart cities. Lumada can be fully deployed in on-premises, hybrid and cloud-centric patterns, giving customers a compelling range of options.
- Lumada exhibits strong capabilities, validated by numerous reference customers, in integration functionality and application development/composition. The platform's composable nature helps Hitachi Vantara in "co-creation" activities for the personalization of the platform for specific solution requirements.
- The vendor has a breadth of industrial use cases, reflected in numerous customers observed by Gartner that span many different industrial sectors.
- Hitachi Vantara has rearchitected a range of industrial application components into a focused application catalog, including Lumada Manufacturing Insights, Lumada Maintenance Insights and Lumada Video Insights.

Cautions

- Device management capabilities are weak compared to other competitors and are not considered competitive.

- Reference customers cite support for digital twins as among the weakest areas of Lumada functionality, rating this capability substantially below market average across all vendors.
- Hitachi's repositioning of Lumada as a more domain-agnostic (rather than IoT-specific) platform may lead to slower adoption of the platform, slow the growth of the developer community, and reduce the enrollment of partners into ecosystems explicitly focused on IIoT.
- Hitachi Vantara maintains a limited set of resellers for sales and services for Lumada, limiting the availability of resources in the market. Hitachi Vantara's recent reorganization to combine with Hitachi Consulting may cause this challenge to persist. Companies looking for third-party, independent services should address this issue with Hitachi.

IBM

IBM is a Niche Player in this Magic Quadrant. The IBM Watson IoT platform is primarily delivered as a managed collection of cloud services in the IBM Cloud, although it offers secure cloud portability. The industrial base for Watson IoT centers on manufacturing and transportation enterprises. However, IBM can present example deployments in buildings and utilities, as well. Common use cases are predictive maintenance and asset monitoring. The industrial deployments are cloud-centric, with minimal examples of completely on-premises implementations. The Watson IoT platform is best-suited for cloud-centric deployments across a range of use cases spanning asset monitoring and process improvement.

Strengths

- Customers regularly speak of the size and strength of IBM for account management and project management.
- Watson IoT provides customers with a wide and deep set of functionalities to build IIoT-enabled business solutions.
- Most Watson IoT customers report a positive experience from their interactions with IBM's Watson IoT technical teams and the support organization.
- Watson IoT analytics provides customers an easy-to-use graphical interface.

Cautions

- Watson IoT has a more limited set of capabilities for edge deployments in factories and plants.
- IBM's on-cloud, hybrid and on-premises IIoT platforms use different technologies across deployment types, which makes deployment and ongoing management much more challenging for users.

- Price is a concern with some customers. Gartner's conversations with customers and partners relating to pricing and contract negotiation confirm a difficult prolonged process that yield higher prices than some competitors.
- Some customers express dissatisfaction with Watson IoT's analytic styles and documentation, which required access to IBM experts or expensive consultants.

Litmus

Litmus is a Niche Player in this Magic Quadrant. The Litmus IIoT platform is an edge-deployed solution leveraging more than 250 preloaded device drivers. A significant portion of customers starts by deploying Litmus Edge on the factory floor for data acquisition and ingestion, later expanding the use case for advanced applications, such as machine learning or predictive analytics. Litmus Edge comes preloaded with connectors and integrates into any OT system. Observed and verifiable industrial use cases include asset monitoring and predictive maintenance of in-plant manufacturing operations, and monitoring of industrial products.

Strengths

- Customers and partners are strong advocates of Litmus' IoT device management and IoT data management capabilities and functions.
- Litmus has proven market success supporting large-scale manufacturing customers.
- Litmus has a strong proven ability to support customers for a full, on-premises deployment of an IIoT platform able to operate in a disconnected scenario.
- Customers cite price as a positive driver for adoption.

Cautions

- Litmus analytics capabilities are emergent, and customers should consider integrating with other vendors for advanced machine learning and AI capabilities.
- Litmus does not support a robust developer community and offers limited training and support desk capabilities for new developers.
- Litmus has limited expertise and engagement in utilities and transportation and logistics.
- The company lacks an ecosystem of IT and OT system integrators that can plan, build and run solutions for Litmus customers.

Microsoft

Microsoft is a Leader in this Magic Quadrant. Microsoft delivers IIoT platform capabilities via Azure IoT services. Microsoft benefits from its history working with industrial enterprises and their use of Microsoft operating systems and OPC within embedded systems. Industrials build and deploy IoT solutions composed of Azure IoT services and other Microsoft software services. Customers also have access to a marketplace for third-party software. Microsoft actively engages with industrial OT and OEM companies. These partnerships collaboratively develop IoT solutions and bring more IIoT workloads onto Azure IoT. Microsoft demonstrates consistent development and solution accelerators, specifically for industrial enterprises.

Strengths

- Microsoft has customers with production deployments that span core operations, supply chain and industrial field deployments for manufacturing, transportation and logistics, and utilities.
- Customers are very positive relating to Microsoft's approach to security for IIoT. Azure Sphere enhances device security to protect from cybersecurity and device encryption.
- Microsoft has a large, diverse partner ecosystem for both technology platforms and indirect sell-through partners.
- Microsoft has broad visibility in the market based on the frequency with which the company appears in buyers' evaluations for IIoT platforms.

Cautions

- Emerging Azure IoT Edge modules may be challenging to manage as both first party and third party mature through the development life cycle.
- While Microsoft's horizontal IoT technology can functionally support most customers' IoT requirements, most customers need or prefer to have Microsoft partners to act as intermediaries for solution planning and feature engineering. Customers feel this helps them leverage Microsoft technologies into end-to-end IoT solutions.
- To extract data from some OT systems, industrial equipment may need third-party protocol software or Edge modules to integrate into Azure IoT.
- The Azure portal has a highly customizable UI, but plug-ins or third-party modules may need to be leveraged to track service performance, utilization and health all in one page.

Oracle

Oracle is a Niche Player in this Magic Quadrant. Oracle's IoT Cloud Service supports the IIoT market driven by Oracle's enterprise applications. Oracle moved to complete end-to-end IIoT-enabled application solutions and away from an emphasis on platform technologies. An application-centric

approach provides a faster time to market and a faster time to value. Oracle emphasizes use-case-based solutions with prebuilt content, such as Asset Monitoring, Product as a Service, Production Monitoring, Digital Field Service, Fleet and Shipment Tracking, and Connected Worker. Oracle maintains observed and verifiable industrial use cases across manufacturing and natural resources, transportation, and utilities.

Strengths

- The strength of Oracle's middleware and integration capabilities and solutions provides out-of-the-box connectivity with a range of Oracle and third-party enterprise applications and the ability to integrate with third-party cloud systems.
- Oracle provides advanced analytics capabilities, including automated machine learning (autoML), actionable insights utilizing deterministic, diagnostic, predictive and prescriptive capabilities, and AI that delivers the automation of data science model operations and autoconfigurable data science pipelines.
- Oracle develops advanced solutions that combine IIoT technologies with blockchain to address use cases such as track and trace, cold chain management, and warranty tracking, along with investments to enhance built-in AI and machine learning capabilities.
- Oracle's security story is end-to-end features that are baked into solutions using a single, unified infrastructure architecture. Oracle works with partners utilizing security management and a collaboration API that enables third-party vendors to securely execute functions such as device registration, activation and device life cycle events.

Cautions

- Oracle's IoT Cloud Service is available only on Oracle Cloud Infrastructure, and it is not available on any third-party cloud services. Customer references provided to Gartner have been cloud-only, which suggests that Oracle's on-premises solution is not a key strength of its offering.
- Customers looking to capitalize on a broad market of third-party IIoT products will find that Oracle's application-oriented and application-centric approach will artificially restrict the opportunity to choose from a wide variety of generally available IIoT market solutions. Oracle's investment in an IoT application-centric approach will likely inhibit Oracle's ability to remain competitive in the horizontal, general-purpose IoT platform market.
- Customers may need to rely on third-party device management solutions for specialized device management needs and certain types of industry-specific requirements.
- Oracle does not directly support a full range of IIoT protocols outside of OPC Unified Architecture and legacy protocols, such as Modbus and BACnet.

PTC

PTC is a Leader in this Magic Quadrant. ThingWorx's strength lies in its experience with assets across vertical markets. PTC has developed a global ecosystem of IIoT-focused technology partners, solution providers and global system integrators. PTC maintains a global sales force and an indirect channel of resellers worldwide. Observed and verifiable industrial use cases include asset monitoring and predictive maintenance of multiple in-field assets. As PTC focuses increasingly on IoT applications (mainly manufacturing-OEM-related applications), PTC increasingly leverages the Microsoft Azure IoT stack to support horizontal ThingWorx IoT-related middleware functionality for scale, device management and other capabilities.

Strengths

- PTC's go-to-market and R&D efforts with Rockwell Automation's FactoryTalk received positive user feedback and accelerated adoption since the strategic partnership was formed.
- PTC continues to invest more effectively in its market visibility and its community of users, partners and developers. Initiatives such as its LiveWorx event, its marketplace of software, and its developer portal make PTC a safer choice in many SI portfolios and on a majority of user shortlists reviewed by Gartner.
- PTC offers very high-quality service and support.
- ThingWorx has a strong proven ability to support customers for a full, on-premises deployment of an IIoT platform able to operate in a disconnected scenario.

Cautions

- Some customers using PTC's analytics expressed frustration relating to implementation and usability.
- PTC's digital twin offers limited support to industrial owner-operators of industrial assets.
- PTC still lacks a competitive installed base and related experience in the utilities, and transportation and logistics sectors.
- Based on customer feedback and customers in Gartner inquiries, PTC's pricing for its ThingWorx Enterprise Edition is often more expensive than competitors for both cloud-based and full on-premises deployments.

QiO

QiO Technologies is a Niche Player in this Magic Quadrant. QiO's Foresight Platform is a multicloud and edge-enabled IIoT platform. QiO's market focus is on high-energy-intensive industries such as steel, glass, cement, paper and pulp. QiO spent the past year developing an application approach to

IIoT. QiO has strategic partnerships with large partner companies, such as BT and World Wide Technology, to bundle QiO's prebuilt configuration-driven analytical application modules. QiO's partner ecosystem extends to traditional IT companies (Dell, HPE, VMware and Intel), OT companies (OSIsoft and Softing), and SIs (Globant and PA Consulting). Covered industries also include transportation and logistics (aviation) and energy (oil and gas).

Strengths

- Customers cite QiO's Foresight augmented analytics capabilities as the leading factor for selection of the IIoT platform.
- QiO has nearly doubled its connected IoT endpoints to a quarter-million asset base, which demonstrates growing appeal in the market.
- QiO provides strong technical expertise to customers, users and partners to plan, scale and build IIoT solutions.
- QiO has created IIoT application accelerators to enable customers and users to accelerate their digital journeys. These application accelerators have prebuilt templates to simplify deployments and data management.

Cautions

- Most installations of the QiO Foresight Platform are midsize deployments of less than 1,000 connected IIoT endpoints. Few are over 1,000 IIoT endpoints.
- QiO's IIoT platform developer program remains nascent with selected customers centered on on-site training, tutorials, and pairing with QiO developers for mentoring.
- QiO's invests limited resources in marketing.
- QiO lacks global OT partnerships, which constrains deployment of the Foresight Platform across various industrial subsectors.

ROOTCLOUD

ROOTCLOUD is a Niche Player in this Magic Quadrant. ROOTCLOUD is one of the first IIoT platform providers originating from China. ROOTCLOUD is a startup company incubated by Sany Heavy Industry, which specializes in heavy machinery. Until recently, the company marketed under the name Irootech. The ROOTCLOUD platform services about 500,000 high-value assets for real-time data collection, asset performance management, product life cycle management, intelligent services, analytics and AI. ROOTCLOUD Edge is an on-premises solution. The target market for ROOTCLOUD is the asset-intensive end users that specialize in heavy machinery and automotive. ROOTCLOUD has a limited presence in Asia/Pacific, Europe and the U.S.

Strengths

- ROOTCLOUD has excellent support for API and protocol data integration to manufacturing execution systems (MES), industrial control systems (ICSs) and computer numerical control (CNC) machinery. ROOTCLOUD also supports over 600 industrial protocols that connect to a series of programmable logic controllers, CNC tools, sensors and select devices from OEMs.
- The ROOTCLOUD platform is easy to use and provides effective and informative data visualization.
- The ROOTCLOUD platform has many use cases and reference customers in the heavy industry and automotive subsectors.
- ROOTCLOUD expanded its market presence in Europe with key partners like Putzmeister, Munich Re and Telenor Connexion.

Cautions

- ROOTCLOUD lacks a global direct sales force and has no plans to enter the Latin American market for IIoT.
- Customers cite weaknesses in the ease of implementation of digital twins.
- ROOTCLOUD has minimal experience or installed base within the utility sector outside of China.
- For service and support, ROOTCLOUD uses outsourced global technical support to providers for local language and capabilities. The company also lacks its own forward and reverse logistics capabilities and relies on its parent company, Sany.

Samsung SDS

Samsung SDS is a Niche Player in this Magic Quadrant. Samsung SDS's Brightics IoT is targeted at manufacturing, transportation, energy, construction and government. Samsung SDS develops all platform elements, including packaged support for standard and industrial communications protocols and interoperability with a variety of data persistence solutions. Open-source software components, such as Apache NiFi, Kylo and Spark software for data management, WS02 for integrations, Eclipse and Swagger for AE&M, and Nuclio for analytics, are combined to create IIoT platform functionality. The platform is deployable on various public and private cloud services, such as AWS, Microsoft Azure, Google, Alibaba, Samsung SDS Cloud and SAP HANA Enterprise Cloud.

Strengths

- Samsung SDS has flexible deployment options on various public and private cloud offerings, and the Brightics IoT platform includes an extensive range of in-house-developed and acquired security solutions.

- Samsung SDS excels at developing a business case for IoT investment and executive sponsorship on behalf of its customers.
- Brightics IoT device management provides strong capabilities for configuration, provisioning and authentication of IoT endpoints. The ease of deployment of the Brightics IoT platform is a point of strong customer and partner satisfaction.

Cautions

- The Brightics IoT analytics capability requires improvement in the depth and breadth of sector-specific value for industrial enterprises.
- Samsung SDS must extend its partnerships with industry-specific solution providers to enhance the business outcomes of industrial clients.
- Samsung SDS does not demonstrate a robust installed base among asset-intensive industries such as oil and gas and chemicals.
- Some customers expressed dissatisfaction with the tools and resources required to create digital twins with Brightics IoT.

Software AG

Software AG is a Visionary in this Magic Quadrant. Software AG's Cumulocity IoT consists of Cumulocity IoT Cloud and Cumulocity IoT Edge. Software AG emphasizes the strength of its integration and device management and application enablement capabilities as key differentiators for Cumulocity IoT. Cumulocity IoT is strongly focused on manufacturing and transportation and logistics projects, applying a variety of condition monitoring, asset tracking and predictive maintenance business solutions. Cumulocity IoT addresses both the OEM maker of products and the owner-operator customers for IoT platforms. For example, flexible deployment options, the strength of IoT device connectivity, and the depth of integration serve owner-operators well.

Strengths

- Software AG supports over 150 third-party devices spanning more than 350 protocols to enable the connection of a broad range of industrial devices.
- Customers in manufacturing are typically satisfied with the overall experience with Cumulocity IoT.
- Cumulocity's device management software offers users a trusted and mature set of software capabilities.
- Software AG's strength in integration and use and management of APIs is a key differentiator.

Cautions

- Cumulocity IoT is not yet widely used by industrial enterprises to augment OT functions for improved asset management life cycle strategies and processes.
- There is a disconnect between the sales cycle and the implementation projects in Software AG's customer management organizations, which leads to customer dissatisfaction.
- Software AG's partners lack sufficient experience and knowledge to resell and implement Cumulocity IoT.
- The technical service and support at Software AG is sometimes a point of dissatisfaction for some channel partners and platform customers.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

- AWS
- Braincube
- Microsoft
- Samsung SDS

Dropped

- Accenture was dropped as the company is merging the capabilities from its Connected Platforms as a Service (CPaaS) IoT platform with its artificial intelligence for IT operations (AIOps) platform. The product fusion created a scenario where the stand-alone IIoT platform is not saleable and there are no customers for the newly merged IoT and AI platforms.
- Atos dropped out as the company spun off its Worldline business, which maintained some of the assets for the IIoT platform.

Notable Vendors to Consider for IIoT

The evaluation process for the IIoT platform Magic Quadrant identified more than 40 vendors that were excluded from the Magic Quadrant but that have forward-looking or specialized value for

industrial enterprises. CIOs have myriad choices for their IIoT platform beyond the cohort of vendors evaluated herein.

It is important to note that the exclusion of any vendor from this market evaluation is not a de facto assessment that the excluded vendor cannot provide value to industrial enterprises. Exclusion is a function of nonconformance with the inclusion criteria established based on Gartner's view of the evaluated market. Upon determining the criteria, Gartner seeks to evaluate vendors that are relevant and extensible to as many Gartner customers as possible. This evaluation of IIoT platforms focuses on a small number of providers that meet Gartner's inclusion criteria for this Magic Quadrant cycle. Other vendors merit consideration in any due diligence for IIoT solutions. The following vendors are presented based on platform capabilities, experience with industrial enterprises, and an ability to create related value.

Alibaba

Alibaba's IoT offering spans a range of required IIoT platform components for industrial enterprises. The company did not meet the Magic Quadrant criterion for offering the platform for an on-premises deployment in addition to cloud deployment.

AVEVA

AVEVA's IoT offering spans a range of required IIoT platform components for industrial enterprises. The company did not meet a Magic Quadrant criterion as the IIoT software platform is not separately saleable from its legacy OT software.

FORCAM

The FORCAM IIoT platform offers the range of required IIoT platform components for industrial enterprises. The company did not meet the Magic Quadrant criteria in Gartner's estimation, as FORCAM's offering is a composite OT and IoT system. The Magic Quadrant requires that the IIoT platform be sold independently of any other hardware or software outside of the defined IIoT platform definition.

Haier

Haier's IoT platform offering spans the range of required IIoT platform components for industrial enterprises. The company did not meet the Magic Quadrant criterion for maintaining a global installed base where industrial enterprises leverage the platform for industrial use cases.

Inclusion and Exclusion Criteria

The inclusion criteria represent the specific attributes that analysts believe are necessary for inclusion in this research. To qualify for inclusion, vendors must meet the following criteria:

1. The vendor must be a supplier of IoT software platform services focused on asset-intensive industries. The IoT software platform tendered for consideration must be generally available and

in production deployments in at least two defined industrial sectors. For this evaluation, Gartner has identified the following allowed sectors (and allowed subsectors) as representing asset-intensive industries:

- Sector: manufacturing and natural resources (subsectors: automotive, consumer nondurable products, energy resources and processing, heavy industry, IT hardware, life sciences and healthcare products, natural resources and materials)
- Sector: transportation (subsectors: air transport, motor freight, pipelines, rail and water, warehousing, couriers, support services)
- Sector: utilities (subsectors: electrical, gas, water)

2. The IIoT platform must be able to deliver and support the following capabilities in a single bundled offering, across a distributed architecture:
   - Analytics
   - Edge device management
   - Integration tools and management
   - Data management
   - Application enablement and management
   - Security

3. The provider may include, via a formal ongoing partnership(s) with other software vendors, portions of the IIoT platform capabilities. The vendor must demonstrate purpose-built integration, and support for scalability and interoperability relating to partnered IIoT platform capabilities. Partnered solution capabilities include IaaS and PaaS elements from third-party cloud service providers. If the predominance of the intellectual property that comprises the IIoT platform is derived from third parties, then the partnered software functionality or capabilities must only be accessible by the evaluated vendor's own APIs. Evaluated vendors cannot consider third-party software sold under a separate contract as an IIoT platform functionality or capability.

4. The general availability (GA) date for the IIoT platform must be 10 January 2020 or earlier. We also offer the following enhanced guidance relating to product releases:
   - Product releases must be in GA by 10 January 2020 in order to be assessed in the customer reference survey.

- Product releases occurring between 11 January 2020 and 28 February 2020 will be considered, but vendors will need to inform us of all impacts of the release(s). The information provided must be at the RFP level (vendor survey) occurring within this window, and rating for impacted functionality may be based solely on analyst opinion.
- Product releases after 1 March 2020 will not be factored into scoring and may not impact dot positioning on the Magic Quadrant.
- Major events, such as mergers and acquisitions, occurring after 1 March 2020 will be assessed for impact to influence Magic Quadrant positioning.

5. The IIoT platform must be saleable as a stand-alone offering and as an independent purchase without requirements for companion hardware or software purchases. Similarly, purchase of the IIoT platform should not be contingent on an existing asset base of vertical applications, software or hardware (for example, MRO, PLM, APM, EAM, MES, DCS, ICS, SCADA or historians). Please note that stand-alone IoT-enabled applications and SaaS do not contribute to conformance with the inclusion criteria. Stand-alone IoT-enabled applications and SaaS will be considered an element of vision, but not considered within "execution" (for example, product and service evaluation criteria). Manufacturers considered for inclusion within this Magic Quadrant must offer value to the equipment of other manufacturers. At least 30% of assets under management by a manufacturer's IIoT platform must be outside of its own product lines.
6. The vendor has 50 customers with GA deployments in production. These customers must demonstrate data acquisition, ingestion and analysis from industrial assets in industrial environments for industrial companies.
7. The vendor must have at a minimum 250,000 IIoT endpoints (see below) connected to its platforms across the installed base of customers. Note that an IoT endpoint enables equipment, assets or other objects to participate in one or more IoT solutions. There are three characteristics of an IoT endpoint when it is enabling an asset or object: (1) sense or activation capabilities; (2) compute (at a minimum data acquisition and control functions); and (3) communication. Gateways may have sense or actuation capabilities, but they must provide some compute (even if this is fundamental message filtering and formatting) and communication.
8. The vendor must have four unique customers operating the platform in production in each of three major geographies (in North America, the European Union, Latin America, the Middle East and Africa, and the Asia/Pacific region).
9. The product must be available in all of the designated deployment models: cloud-only, hybrid edge-cloud and on-premises. For on-premises deployments, Gartner will accept containerized solutions where all solution elements are available and the system is able to operate in a disconnected scenario for extended periods of time. When rating platforms, Gartner's evaluation

criteria will identify value, in terms of execution and vision, where vendors offer multiple deployment models to customers where functionality is consistent and equal across all deployment models.

10. Offer, directly or through partnerships, professional services (installation, implementation and integration) and support services (help desk, product support and sustaining engineering) in at least three major geographies.

11. The vendor product must provide the features and capabilities to secure the IIoT platform. The IIoT platform must also offer (organic or partnered) secure functions and capabilities at critical integration points: edge to platform, and platform to applications.

Evaluation Criteria

Ability to Execute

Gartner evaluates vendors on the quality and efficacy of the processes, systems, methods or procedures that enable IT provider performance to be competitive, efficient and effective. Vendors are also rated on the ability to positively impact revenue, retention and reputation within Gartner's view of the market.

Providers are judged on their ability and success in translating market requirements — and their vision for the market — into products that match market needs and enable clients to achieve a successful outcome with minimal risk.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Product or Service	High
Overall Viability	High
Sales Execution/Pricing	High
Market Responsiveness/Record	Medium
Marketing Execution	Low

Evaluation Criteria	Weighting
Customer Experience	High
Operations	High

Source: Gartner (October 2020)

Product/Service

This criterion includes the core products and services that compete in and/or serve the defined market for IIoT platforms. This includes current product and service capabilities, quality, feature sets, skills and so forth. This can be offered natively or through some OEM agreements or partnerships, as defined in the Market Definition/Description section and detailed in the subcriteria. The subcriteria for this evaluation criterion are analytics, IoT edge device management, integration, data management, application enablement and management, and security.

Overall Viability (Business Unit, Financial, Strategy and Organization)

Viability includes an assessment of the organization's overall financial health, as well as the financial and practical success of the business unit. This evaluation criterion views the likelihood of the organization to continue to offer and invest in the product. Additionally, this criterion works to understand the product position in the current portfolio and within the company's strategic view of IIoT. Ultimately, IIoT must relate to digital business strategy and the digital optimization and transformation of its customers.

Sales Execution/Pricing

This criterion includes the organization's capabilities for presales activities and the structures and tools that support them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of sales channels. Gartner is especially interested in the sophistication and efficacy of the company's indirect channel to enable resellers, integrators and outsourcers of IT and OT to extend the company's platform to asset-intensive companies.

Market Responsiveness and Track Record

This criterion includes the vendor's ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve, and IIoT market dynamics change. This criterion also considers the vendor's history of responsiveness to changing market demands.

Marketing Execution

This criterion involves the clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to:

- Influence the IIoT market
- Promote the brand
- Increase awareness of products
- Establish a positive identification in the minds of customers

This "mind share" can be driven by a combination of publicity, promotional, thought leadership, social media, referrals and sales activities. Gartner views successful engagement of developers, standards bodies, industry consortia and related organizations as key capabilities.

Customer Experience

This criterion includes IIoT products and services and/or programs that enable customers to achieve anticipated results with the products evaluated. Specifically, this includes quality supplier/buyer interactions, technical support or account support. This may also include ancillary tools, customer support programs, availability of user groups, service-level agreements, and so forth. Considered within this criterion are efforts to educate and transfer knowledge and insight to the market, including users, partners and the growing community of industrial-specific IoT developers.

Operations

This criterion involves the ability of the organization to meet goals and commitments of industrial enterprise customers. Factors include the perceived quality of the organizational structure, skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently. Investments in tools, support structures and marketplaces are considered essential elements in this criterion.

Completeness of Vision

Gartner analysts evaluate vendors on their ability to convincingly articulate logical statements that appeal to, and support, industrial enterprises. This includes current and future market direction, innovation, customer needs, and competitive forces and how well they map to Gartner's view of the market.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓

Evaluation Criteria	Weighting
Market Understanding	High
Marketing Strategy	High
Sales Strategy	Medium
Offering (Product) Strategy	High
Business Model	Low
Vertical/Industry Strategy	Medium
Innovation	High
Geographic Strategy	Low

Source: Gartner (October 2020)

Market Understanding

This criterion involves the vendor's ability to understand customer needs in asset-intensive industries and translate them into products, services, and market awareness and trust. Vendors show a clear vision of their market — listen and understand customer demands — and they can shape or enhance market changes with their added vision through the following:

- Product and service development
- Effective market conditioning and awareness
- Innovation spanning platform functionalities
- Business practices creating greater overall demand

Marketing Strategy

This criterion looks for clear, differentiated messaging consistently communicated internally and externalized through social media, advertising, customer-facing programs, partner programs and positioning statements to generate platform recognition and positive brand regard in the IIoT platform market.

It also includes the vendor's ability to either identify opportunities to expand adoption through geographic expansion or identify the underserved or poorly served market subsectors and unique business requirements through microsegmentation analysis and outreach.

Sales Strategy

This criterion involves a focused and structured strategy for selling IIoT platforms. The strategy identifies the appropriate channel mix, including:

- Direct and indirect sales
- Marketing and business development
- Direct and partnered service delivery (partner-led, co-delivery and private label)
- Supportive communication

Developing sales and value-added service partners and market alliances, all of which extend the scope and depth of market reach, expertise, technologies, services and their customer base, is a key consideration.

Offering (Product) Strategy

This criterion includes an approach to IIoT platform development and delivery that emphasizes market differentiation, functionality, methodology and features as they map to current and future requirements for asset-intensive businesses.

Business Model

This criterion includes the design, logic and execution of the organization's business proposition to achieve continued success in selling IIoT platforms to asset-intensive industries.

Vertical/Industry Strategy

This criterion involves the vendor's strategy and approaches to direct resources, skills and products to meet the needs of industrial market segments and industry subsectors within manufacturing and natural resources, utilities, and transportation and logistics.

Innovation

This criterion involves the direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or preemptive purposes to:

- Secure the trust and business of asset-intensive industries
- Apply IoT to internal operations
- Extend product capabilities and services into adjacent and new industrial use cases

Geographic Strategy

This criterion involves the vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography. This may be achieved either directly or through partners, channels and subsidiaries, as appropriate for that geography and market.

Quadrant Descriptions

Leaders

Leaders invest in, and shape, the future of IIoT. Leaders perform skillfully and often exceed expectations regarding outcomes achieved with their technologies and services. The companies within the Leaders quadrant bring to market a stable IoT business unit and a cohort of lead executives with relevant IIoT experience aligned with the overall corporate strategy and vision.

Leaders have a clear vision of the market's direction. Leaders develop and bundle targeted competencies and capabilities expressed in sector-specific platform/suite functionalities to establish and maintain market leadership. Leaders consistently market and sell a complete IIoT platform as a single provider to any asset-intensive subsector for industrial use cases. Leaders offer services, capabilities and functions essential to those markets they serve (for example, protocol and regulatory support and conformance). The vision and execution of Leaders are evident in the platform's ability to integrate and interoperate with a broad and diverse installed base of industrial assets, endpoints and OT systems across different asset manufacturers and IT/OT independent software vendors (ISVs). Any differentiated functionality results from internal development and external relationships. These relationships include formal technology alliances and service delivery partnerships to facilitate broad, deep, and frictionless integration and interoperability with third-party IT and OT hardware and software.

Through internal development and acquisition and investment, Leaders provide products and services that meet and expand the market needs of asset-intensive industries through innovation.

Leaders transfer knowledge to customers, partners, and prospects through a library of sector-specific use-case frameworks and methodologies predicated on past performance. Leaders also

engender trust by presenting numerous compelling and complex industrial reference customers and case studies in industrial environments to the market and prospects.

Leaders can leverage IIoT platforms to augment and replace functions of legacy closed-loop control and automation systems. Leaders develop and market IIoT platforms that augment and replace industrial enterprise applications, such as MES, EAM and APM. The development occurs through custom development or via marketplaces for connectors, extensions, microservices, and apps. Leaders focus on providing a consistent set of technologies across cloud-based and on-premises deployments.

Leaders accommodate unique customer requirements with flexible engagement models and business development activities and provide value across multiple geographies. The company's customer successes and innovation result from providing market-leading resources and tools, marketplaces, and support to a large and active developer program focused on IIoT value-based outcomes. Gartner believes that active and participatory membership (code contributions and sponsorship) in multiple industry consortia and trade groups is required to expand IIoT and IoT and establish market leadership. This leadership is focused more on the development of market visibility and brand equity. It does not necessarily transfer to "de jure" platform leadership.

Leaders have the organizational size and scale to pursue and win substantial multinational opportunities for IIoT consistently. These opportunities are truly global in supporting a referenceable customer base of multinational corporations (MNCs) that build their digital futures on the IIoT platform of the provider in at least four regions.

Vendors: Hitachi, Microsoft, PTC

Challengers

Challengers are similarly influential in the future of IIoT. Challengers perform skillfully across multiple business-driven use cases and industrial subsectors, often meeting or exceeding expectations regarding planned outcomes achieved with their technologies and services. The companies within the Challengers quadrant bring to market a stable IoT business unit and a stable cohort of lead executives aligned with the overall corporate strategy and vision.

Challengers can leverage IIoT platforms to augment and replace functions of legacy closed-loop control and automation systems. Challengers develop and market IIoT platforms that augment and replace industrial enterprise applications, such as MES, EAM, and APM. Additionally, value is available through custom development or via marketplaces for connectors, extensions, microservices and apps.

Challengers focus on providing a consistent set of technologies across cloud-based and on-premises deployments.

Challengers have an emerging and coalescing vision of the market's direction. They develop competencies expressed more in adjacent, value-added application capabilities such as digital business, fleet management or use-case-specific analytics "applets," rather than end-to-end horizontal IIoT platforms/suites. Challengers choose a narrower path to sell their IIoT platforms to a targeted number of asset-intensive subsectors, rather than a broad cross-industrial focus. Challengers' vision and execution are evident in the platform's ability to integrate and interoperate with a diverse installed base of industrial assets, endpoints, and control systems across various manufacturers and IT/OT ISVs. The vision and execution can result from the creation of a limited set of formal technology and service delivery alliances. Such alliances enable integration and interoperability with third-party IT and OT hardware and software. However, these alliances are not considered best in class in terms of offering customers broad and deep value across asset manufacturers and IT/OT ISVs. Challengers provide products and services, through internal development and acquisition, that meet the generally competitive market needs of asset-intensive industries.

Challengers can transfer knowledge to customers, partners, and prospects through a deep and broad library of sector-specific use-case frameworks and methodologies. Challengers engender trust by presenting numerous compelling, complex industrial reference customers and case studies in industrial environments.

Challengers accommodate customer requirements with flexible engagement models and business development activities, as well as provide value across multiple geographies. Challengers invest in customer success and innovation by providing resources and tools, marketplaces, and support to a developer program. Gartner sees participatory memberships by Challengers in multiple industry consortia and trade groups for the expansion of IIoT and IoT.

Challengers have the organizational size and scale to pursue and win substantial multinational opportunities for IIoT consistently. These opportunities are truly global in terms of supporting a referenceable customer base of MNCs that build their digital futures on the IIoT platform of the provider in at least three regions.

Visionaries

Visionaries have a clear view of the market's requirements and direction. Visionaries focus on providing advanced (in comparison to the general market), and often differentiated, value in targeted platform elements to meet the current and future market needs. Business value can take the form of technologies or business and operational models for complex industrial customers and use cases.

Visionaries focus on providing a broad continuum of value to meet future market needs and to effectively upsell and cross-sell within their installed base through trust and the extension of recognizable, iterative value. Visionaries expand their capabilities through acquisition, internal development and, increasingly, robust partnering. Visionaries need to improve their ability to meet customer expectations that address core operational intelligence and integration with OT. Visionaries

must extend market adoption through service delivery partnerships and technology alliances (for example, resell and OEM agreements). Additionally, Visionaries must work to expand their market focus through marketplace and developer community expansion.

Visionaries can leverage IIoT platforms to augment functions of legacy closed-loop control and automation systems. Challengers can also develop and market IIoT platforms that augment and replace industrial enterprise applications, such as MES, EAM and APM, through custom development or via marketplaces for connectors, extensions, microservices, and apps. Visionaries focus on providing a consistent set of technologies across cloud-based and on-premises deployments.

Visionaries may have the size and scale to pursue and win large multinational opportunities for IIoT, but they tend to focus on one or two geographies for deep market engagement.

Vendors: Software AG

Niche Players

Niche Players focus successfully on a set of products and services and, often, focus on a narrow set of industry use cases. Niche Players focus on the IoT platform to support legacy or new applications and SaaS capabilities. Niche Players can show sales and marketing success in a limited number of industrial enterprises in regional markets or, often, dedicate only a portion of sales and marketing resources to newer, stand-alone IIoT platform opportunities.

Most often, Niche Players tend to sell their end-to-end IoT platform capabilities to their more significant, more loyal installed base — legacy “captured” customers — or as a bundled “vertical IoT” application platform or as a managed service. Niche Players are unable to exhibit much success in “greenfield” opportunities — without much of an existing relationship — for IT, OT and IoT integration. Niche Players’ key weakness is that they engage industrial enterprises, but they engage them in mostly “commercial” applications of IoT. Niche Players are unable to exhibit large-scale success and adoption of industrial use cases that span multiple plants, countries, or regions. The narrower focus and successes of Niche Players may affect their ability to outperform or innovate. Niche providers focus on providing cloud-first solutions and may have to offer separate catalogs of technologies for on-premises deployments.

Niche Players maintain a small installed base of complex industrial customers for industrial environments. They tend to focus more on in-field assets and use cases, where industrial enterprises interact with supply chain partners or commercial clients. Such use cases include connected commercial and industrial products by manufacturers, and meter and demand management by utility companies. Niche Players can be successful in a small selection of industrial use cases focused on a single market or subsector or single geography. Niche Players have difficulty expanding into alternative market industrial subsectors or upselling broader IIoT value to their installed base or new prospects. Even where Niche Players have off-the-shelf products aimed at industrial enterprises,

Niche Players have been unable to take command as a leading force for IT/OT integration as an IIoT platform.

Niche Players are still very much viable providers of IIoT platforms.

Vendors: Altizon, AWS, Braincube, Davra, Eurotech, Exosite, Flutura, GE Digital, IBM, Litmus, Oracle, QiO, ROOTCLOUD, Samsung SDS

Context

Gartner customers should not use this Magic Quadrant alone as a tool for vendor selection. This Magic Quadrant presents a view of an emerging market. Our analysis and opinion emerge from Gartner's unique ability to engage in user dialogue and to research the industrial enterprises across all subsectors and the vast landscape of competitive vendors. Gartner presents this modified and differentiated definition of the generalized IoT platform to reflect the segment of the IoT market where most of the high-impact, high-value investigation, and net new adoption is taking place.

Because of this definition, historical comparison with existing Market Guides from previous years (to assess vendor capabilities) is strongly discouraged for projecting capabilities for industrial-specific use cases and driving bid opportunities for vendors not evaluated.

Readers should pay careful attention to the previous Quadrant Descriptions section to understand the qualities of each quadrant provider type and to determine the gaps between player types when considering vendor engagement. It is essential to determine the most essential provider attributes laid out in the Quadrant Descriptions section and align those with the enumerated Strengths and Cautions.

Gartner advises that platform due diligence, bid solicitation and selection decisions move in parallel with analyst inquiry engagement. Additionally, readers must keep up to date with forthcoming reference model documents and other IIoT-centric research.

For insight into vendors considered outside of this Magic Quadrant evaluation, see the Notable Vendors to Consider for IIoT section. Otherwise, this Magic Quadrant is a summary of Gartner's current perspective and research on this market, with a focus on platforms for the IoT dedicated to asset-intensive industries.

Market Overview

Gartner has observed the following changes in the market and user behavior since the last Magic Quadrant for Industrial IoT Platforms.

The Future of the IIoT Edge Is Container-Based

The same hardware and software comprise many IT and OT systems. With increasing frequency, practitioners in OT-centric roles and business units have adopted IT patterns and methodologies

such as DevOps and microservices in embedded designs and solutions. Similarly, IT-centric vendors have taken the OT concepts of real-time systems built on distributed computing resources to create a market for IoT solutions.

These technological convection currents have accelerated the adoption of virtualized computing approaches to IoT deployment. Container-based IIoT solutions are emerging as a preferred approach for on-premises solutions where platforms are required to operate in a disconnected scenario for an extended period.

Based on Gartner's inquiry, a review of vendor solutions, and engagement with production customers, Gartner augmented the Inclusion Criteria for this Magic Quadrant to consider the container-based deployment model as on-premises deployments of an IIoT platform. Vendors are still required to provide (near) functionally equivalent offerings as available as full, on-premises deployments. User feedback points to containers as a less complicated approach to build, deploy and run embedded solutions. Users are positive about the isolation of less resource-intensive containers from other applications and containers.

Most importantly, container-based solutions are proving to be an improved approach to push intelligence to the edge. The increase of computing capabilities embedded within assets, physical infrastructure and operational systems expands the value generated from data closer to the event using trained machine learning models. By transitioning inferencing out of the cloud and onto edge resources, IIoT platforms are better able to provide real-time analytics.

IoT Remains the Primary Catalyst Driving Real IT/OT Convergence

For IIoT practitioners, the unrealized promise of the IIoT is the marriage of the strengths of software-defined architecture, enhanced data acquisition, condition monitoring and superior analytics. Together, these combined offers will augment and eventually replace legacy control systems. In 2018, Gartner witnessed many industrial enterprises investing in R&D for IoT solutions that extended the IIoT platform beyond the edge-gateway and onto the controller (or software-defined controller). These investments often include equity positions in startups. Additionally, increasing numbers of industrial enterprises seek to leverage the analytics from IIoT platforms as a feedback mechanism within closed-loop control systems.

Most encouraging was the vision expressed by this year's Magic Quadrant references. Reference customers for this Magic Quadrant were surveyed and asked to enumerate the reasons for adopting an IIoT platform. Among the 221 references, 93% believe that the adoption of IoT will augment or replace capabilities of OT systems. For example:

- Six percent of the references agreed that IoT adoption will not result in the replacement of any OT capabilities for automation and control.

- Fifty-five percent of the references agreed that IoT adoption is likely to replace some of our OT capabilities for automation and control.
- Thirty-two percent of the references agreed that IoT adoption is likely to replace most of our OT capabilities for automation and control.

Gartner believes that many industrial enterprises will be open to limited field trials for advanced IoT-OT convergence for distributed assets in the field, outside of core plant operations.

IIoT DataOps

As IIoT solutions, anchored by IIoT platforms, support more diverse, complex and mission-critical business processes, many organizations are challenged to get projects into production, adapting them as requirements change and generating value in a reasonable period. The pressure to deliver faster, with higher quality and with resiliency in the face of constant change, is causing IIoT teams to rethink resource and organizational structures and alignment. Traditional development methodologies aren't meeting the need — the distance between requirements definition and delivery of value is expanding, the time required is too long, and too many critical tasks get lost or degraded across role and team silos. The vendor references for this Magic Quadrant experienced 5.65 months on average for the deployment time for IIoT platforms. Forty percent of the references required longer than six months, and 15 percent required longer than nine months to deploy an IIoT platform. Those are exceedingly long deployment times, given the modest scope of most IIoT projects.

Gartner defines DataOps as a collaborative data management practice focused on improving the communication, integration and automation of data flows between data managers and data consumers. It is a different way of working when delivering data and analytics solutions. Applying techniques adapted from the DevOps concepts, which many organizations have leveraged in implementing applications, better communication, and tighter collaboration, results in faster deployments and greater effectiveness in reacting to change postdeployment. (See Innovation Insight for DataOps.) DataOps techniques can address the challenges inherent in deploying IIoT solutions through a more agile, collaborative and change-friendly approach to building and managing complex solutions with many components that contribute to deriving value from industrial asset data. We expect to see more IIoT platform providers introducing application enablement, data management and analytics functionality which leverages DataOps principles to improve the speed of deployment and value for their investments in terms of augmented analytics and augmented intelligence.

Evidence

Gartner's assessments and commentary in this Magic Quadrant draw on the following sources:

- Instruction manuals and documentation of selected vendors. We used these to verify platform functionality.

- An online survey of vendors' reference customers conducted from January through March 2020. This survey elicited nearly 200 responses relating to experience with the vendors' platforms. The references were provided by the rated vendors.
- Separate telephonic interviews conducted by Gartner analysts with at least 40 of the aforementioned customer references.
- Vendor briefings covering product capabilities and vendors' product development and go-to-market strategies, and vendor operations.
- An extensive RFP inquiring how each vendor delivers specific features that correspond to Gartner evaluation criteria.
- Interactions between Gartner analysts and Gartner clients deciding their evaluation criteria, and Gartner clients' opinions about how successfully vendors meet these criteria.
- Nearly 1,000 inquiries between Gartner analysts and industrial enterprises about IIoT from April 2019 through May 2020.
- Multiple primary research surveys conducted in 2019 and 2020. These surveys focused on IoT and adjacent digital markets where IoT is relevant. This Magic Quadrant evaluation was focused on gleaning responses from respondents identifying their market sector as manufacturing, utilities, and transportation and logistics, which were isolated and analyzed.
- Secondary research focused on collecting publicly available information relating to vendors, including: IoT-related information from earnings reports (where available), customer wins, announced go-to-market partnerships, announced technology alliances, investments and incubation of complementary vendor products.

Note 1
Operational Technology Definition

Gartner defines operational technology (OT) as the systems used to control and operate the physical, non-IT assets of enterprises. OT is involved in the event detection related to, and/or the control of, physical processes such as electricity, valves, machine tools, lighting or ambient environment.

Note 2
Differentiating the IIoT Platform From General IoT

The industrial Internet of Things is distinguished from general IoT in that IIoT technologies are focused and architected for use within asset-intensive industries and related environments (typically regulated). The integration, extensibility and impact of IIoT spans IT and OT systems. The IIoT solution collects, aggregates, orchestrates and analyzes data to:

- Accelerate asset management decision making
- Illuminate operational visibility, which reduces the costs to automate and control assets, infrastructure and equipment

Some of the qualities of IIoT platforms include the following:

- IIoT platforms must be extensible through integration with both OT and enterprise IT applications. Integration must be secure and robust.
- Reliability and resilience are fundamental in most IIoT solutions, mainly because there may also be regulated safety factors involved. Included in reliability and resilience are the monitoring and management of critical devices and services that require 100% availability. Therefore, IIoT solutions are usually designed for failure identification and the ability to recover from failure. These factors add to the architectural challenges.
- Deployment requirements in IIoT are complex and often regulated. This situation results in significant integration challenges to ensure the safety of life, mission criticality of systems, and data security and privacy. The primary enterprise applications — for example, MES, ERP, APM, CBM, EAM and CMMSs — drive the solutions, with IoT services running on the cloud or on-premises or as a hybrid implementation. Today, IIoT must be able to address on-premises deployment requirements to operate in disconnected scenarios, as well as cloud requirements.
- IIoT has edge computing requirements with delegated services from both the cloud and IoT end devices, which have multiple sensors throwing off large amounts of data — often at high velocity. Edge computing includes edge platforms and edge gateways running mostly on-premises. IoT and OT devices with a multitude of different protocols (standard and proprietary) connect through gateways and edge platforms with significant computing capabilities. IIoT is mostly a five-tier architectural model — device, gateway, edge computing, platform and enterprise application integration.

It is important to note that within enterprise applications is the use of, and increasing reliance on, third-party data services by industrial enterprises. These services may include data critical to operations and production planning, such as weather; prevailing prices for commodities and goods and services; customization demands; forward and reverse logistics; and other supply chain considerations.

IIoT solutions have a low number of endpoints (in the thousands or tens of thousands) compared with commercial and consumer-centric IoT solutions, which may reach into the hundreds of thousands or millions. The volume of data generated by the endpoints, along with the frequency and velocity of data, is generally very high. Sensors are often transmitting data at millisecond intervals. IIoT solutions are device-light but data-heavy.

The data generated by IIoT sensors is often critical to the operation of end devices and may also contribute to the safety of the environment. Hence, processing and analyzing at the edge are more significant in IIoT solutions to address safety, as is emphasizing uptime and minimizing data loss through sophisticated and segmented network design. Data also contributes greatly to efficiency and availability targets, which drive cost reductions and extend the functional lives of assets.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.