

PAC RADAR

Digital CX & IoT | Europe | 2019

# Platforms for IoT & AR in Europe 2019

SITSI | Vendor Analysis | PAC RADAR

## IoT platforms for industrial applications

– Positioning of FORCAM –

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PAC Germany, July 2019

**teknowlogy** | PAC

**RA****AR**  
IT SUPPLIER ASSESSMENT FROM PAC

**TABLE OF CONTENTS**

**Objective of this report** ..... 4

**Report license**..... 5

**Introduction**..... 6

    The broader context of IoT platforms ..... 6

    General definition of IoT platforms ..... 6

    Basic differentiation of IoT platforms ..... 7

**Trends: The world of IoT platforms is consolidating and expanding simultaneously** ..... 8

    Consolidation of existing market segments ..... 8

    Newly emerging segments in the context of IoT platforms..... 9

**Impact on the existing vendor landscape**..... 11

    Intensifying competition leads to a new level of shakeout..... 11

    Increasing relevance of partnerships with hyperscalers..... 12

    Vendors are repositioning and enhancing their differentiation with new capabilities ..... 12

**Market situation – IoT platforms for industrial applications**..... 13

**Scope & definition**..... 15

    Definitions ..... 15

    Segmentation of IoT & AR platforms ..... 16

    Focus areas of different types of IoT & AR platform ..... 17

**PAC RADAR evaluation method** ..... 18

    Provider selection & participation ..... 18

    Considered providers by segment ..... 19

    The concept ..... 20

    Evaluation criteria ..... 21

    General PAC research method..... 22

    Positioning within the PAC RADAR ..... 22

**PAC RADAR “Platforms for IoT & AR in Europe 2019” – IoT platforms for industrial applications**..... 23

**Review of top-seeded provider FORCAM** ..... 24

    FORCAM..... 24

**About teknowlogy Group** ..... 25

**About the PAC RADAR** ..... 26

## TABLE OF FIGURES

Fig. 1:	Basic IoT stack .....	6
Fig. 2:	Basic functional capabilities of IoT platforms .....	7
Fig. 3:	Basic target audiences of IoT platforms .....	7
Fig. 4:	Segmentation of the current IoT platform market .....	8
Fig. 5:	Future segmentation of the consolidated IoT platform market .....	9
Fig. 6:	Newly emerging segments in the context of IoT platforms .....	11
Fig. 7:	Description of the PAC methodology .....	22
Fig. 8:	PAC RADAR IoT platforms for industrial applications in Europe 2019 .....	23

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## **OBJECTIVE OF THIS REPORT**

The purpose of the PAC RADAR from the market research and strategic consultancy PAC (teknowlogy Group) is to provide a holistic evaluation and visual positioning of leading IT providers within a defined IT segment on a local market. Using predefined criteria, the providers' revenue volumes and development and market share are assessed and compared alongside their performance and specific competences in the relevant market segment.



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## INTRODUCTION

### The broader context of IoT platforms

The basic IoT stack generally has three layers – IoT infrastructure, IoT platforms, and IoT applications.

- **IoT infrastructure** contains all required components to connect devices and machines to the Internet. This includes, for example, sensors and actors within these devices, but also network components such as gateways and embedded software on devices.
- **IoT platforms** form the layer connecting the IoT infrastructure layer and the IoT application layer.
- **IoT applications** are built to provide a solution for specific IoT use cases. This can, for example, be a predictive maintenance solution for a specific machine.

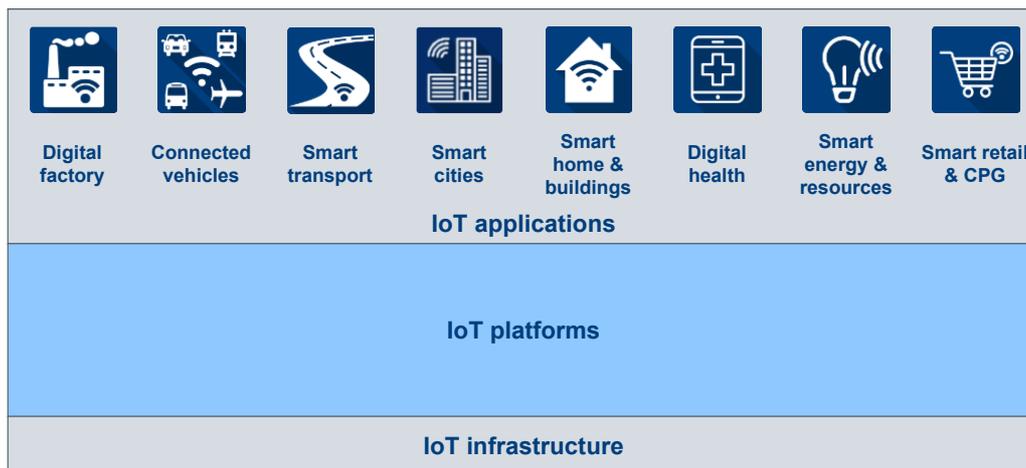


Fig. 1: Basic IoT stack

### General definition of IoT platforms

The purpose of an IoT platform is to manage the underlying IoT infrastructure, create and manage IoT applications, and orchestrate the IoT dataflow between IoT infrastructure and IoT applications. To fulfill this purpose, IoT platforms have to provide two kinds of functionality to clients: IoT device management and IoT application management. Both functions can be deployed at the edge, in the cloud, or in a hybrid model.

- **IoT device management** covers device provisioning, device connectivity, remote SW updates, and remote control.
- **IoT application management** includes application development & integration, data management, analytics & artificial intelligence (AI), data visualization, and event processing.

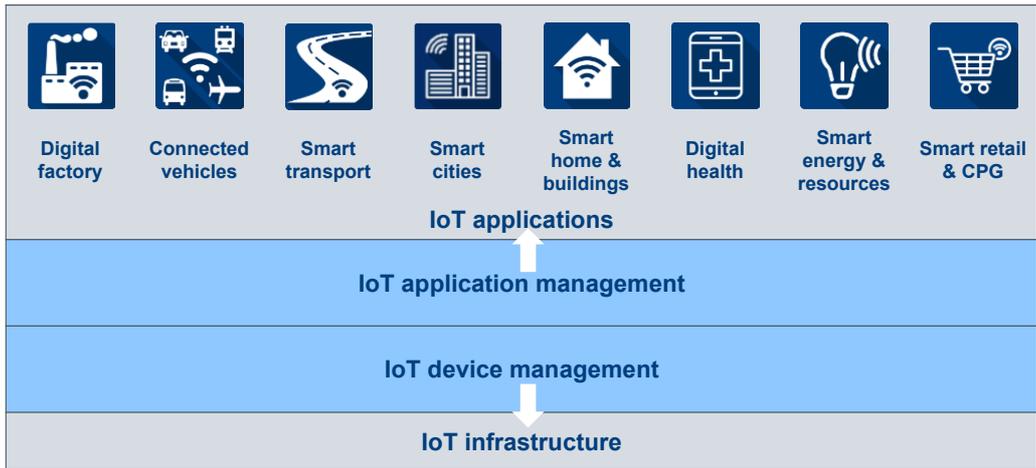


Fig. 2: Basic functional capabilities of IoT platforms

### Basic differentiation of IoT platforms

We can basically split IoT platforms into two groups that address two different target audiences – developers and non-developers:

- **IoT platforms for developers** have very broad capabilities and therefore allow the development of more complex IoT solutions. This includes, for example, IoT applications which require advanced analytics or machine-learning capabilities. But besides complex IoT applications, the aspect of device management can also be highly complex, such as in the case of software updates over the air for a large fleet of connected cars.
- **IoT platforms for non-developers** are specifically tailored to the needs of subject-matter experts without developer skills. This kind of platform allows the fast development of less complicated IoT applications. This includes, for example, data visualization and event processing in a simple drag-and-drop mode. Also, device management capabilities are often more basic.

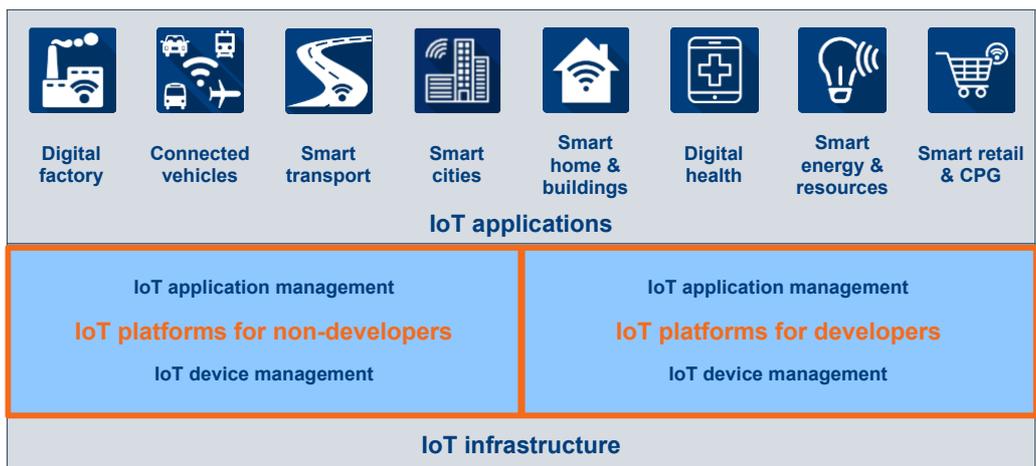


Fig. 3: Basic target audiences of IoT platforms

## TRENDS: THE WORLD OF IOT PLATFORMS IS CONSOLIDATING AND EXPANDING SIMULTANEOUSLY

### Consolidation of existing market segments

The world of IoT platforms today is more complicated than the above-mentioned basic differentiation indicates (figure 3). In reality, we observe that the market for IoT platforms for developers (around more complex solutions) is still more fragmented than the market for IoT platforms for non-developers. We identified four different market segments where we see providers offering different kinds of IoT platforms with different capabilities:

#### IoT platforms for developers

- **IoT platforms for analytics applications** focus on the enablement of developers to build more complex IoT applications such as predictive maintenance. For this purpose, an IoT platform has to provide deep capabilities around data analytics, artificial intelligence, application integration, and application development.
- **IoT platforms for device management** supports IT specialists with the critical management of complex device fleets on a large scale. From a functional perspective, besides device provisioning, these platforms mainly focus on centrally managed software updates at the device level (for security or functional reasons), but also remote configuration and control of devices.
- **IoT platforms for device development** are designed to manage IoT operating systems on embedded devices (embedded SW on constrained devices). This market will particularly be driven by the advent of a new range of lightweight IoT devices (based on microcontrollers with embedded SW) that communicate directly with an IoT platform via LPWAN technology (LoRA, Sigfox, NB-IoT), enabling security updates over the air on a large scale for many small devices out in the field.

#### IoT platforms for non-developers

- **IoT platforms for rapid application deployment** allow simple and fast device connectivity, data visualization via drag & drop dashboards, and event processing. This use case often serves as an easy starting point for clients in their journey towards IoT and is therefore frequently applied in the context of rapid prototyping.

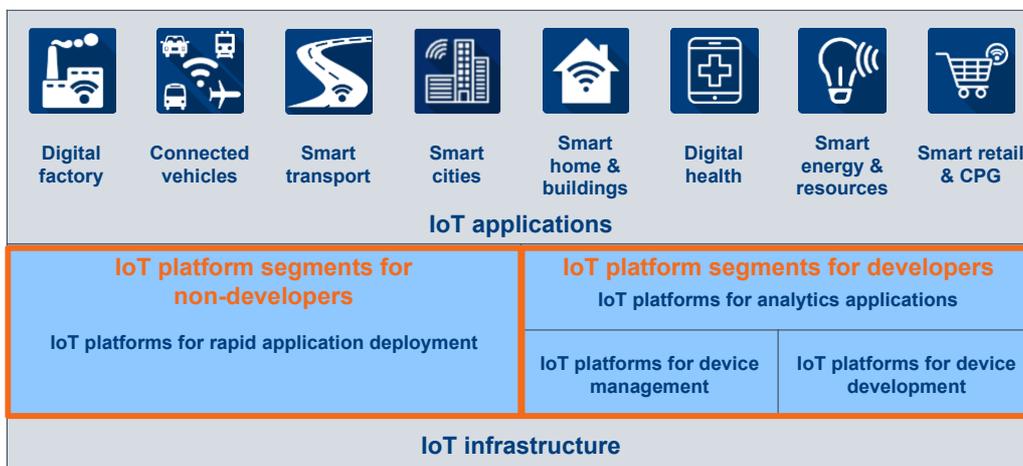


Fig. 4: Segmentation of the current IoT platform market

To evaluate the existing provider landscape in the above-mentioned market segments, teknowlogy published a user survey on IoT platforms in early 2019. The IoT Survey 2019 is the world's first biennial survey of IoT platform users, based on a sample of over 2,000 survey responses. The results offer detailed user feedback on 38 leading IoT platforms. You can download a summary of the key insights here: <https://www.iot-survey.com>

Going forward, we expect to see a consolidation of the current number of market segments. We mainly expect to see the integration of the three IoT platform segments for developers into one converged market segment. This will form a holistic offering, with many building blocks, for the individual needs of IoT developers. This trend will be driven especially by the two cloud hyperscalers Microsoft and AWS. Both players have the clear intention to offer a holistic portfolio for the needs of their developer community. To stay competitive, we expect other vendors to follow this trend – or exit the market. In addition, we expect to see an increasing overlap in the provider landscape between the two market segments for developers and non-developers. Nevertheless, we believe that these market segments will remain separate for the time being, as several players only offer an IoT platform for non-developers, without the intention to offer an additional IoT platform with broader capabilities for developers. Based on this perspective, we expect to see a simplified market segmentation in the future – IoT platforms for developers and IoT platforms for non-developers.

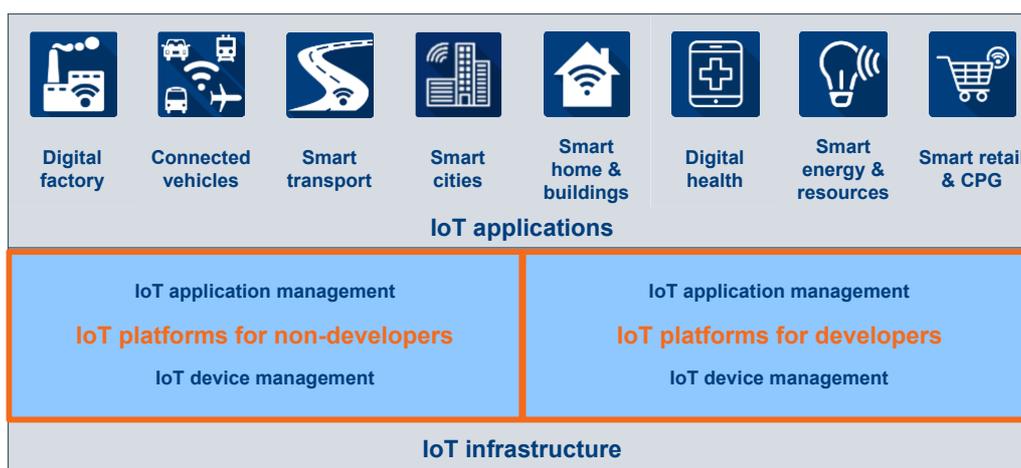


Fig. 5: Future segmentation of the consolidated IoT platform market

## Newly emerging segments in the context of IoT platforms

Besides the ongoing convergence of established market segments, we also see new market segments emerging that have the potential to further enlarge the overall market scope of IoT platforms to new levels. Two of them are emerging around IoT applications, two are related to technology, and one market segment provides additional services around IoT data:

- Emerging market segments where we see providers moving beyond IoT platforms with the intention to offer an open IoT application marketplace on top of their platform:
  - IoT platforms with application marketplaces
  - IoT platforms with industrial application marketplaces
- Emerging market segments around technology that are currently significantly increasing in relevance and user attention in the context of IoT:

- IoT platforms based on open source
- Augmented reality (AR) platforms for connected workers
- A newly emerging market segment that provides add-on services around IoT data:
  - IoT data exchange & monetization platforms

Not all of these solutions are tightly integrated or linked with IoT platforms today; however, we expect that the further evolution of the market will lead to these emerging market segments increasing in relevance. Plus, if they represent a separate market today (like AR), they will increasingly converge with the IoT platform market (see figure 4). Let's take a closer look at why we believe that this will happen.

In the context of IoT platforms in combination with IoT applications, we already discussed last year the emergence of more vertically-oriented IoT platforms that provide industry-specific applications to their clients for dedicated use cases. However, the evolution of vendors towards this new model has been slow over the past 12 months. We currently observe two developments: first, as an interim solution, some vendors provide a horizontal IoT application marketplace that addresses more generic use cases such as device tracking and monitoring across different industries. Second, from a vertical perspective, we see the most traction to adapt to this new concept in the industrial space.

In the context of open source, the answer is straightforward. Across the IT market, open source software is highly relevant and attractive to many users. Linux, one of the dominant operating systems for servers, is just one example in this context. Therefore, we see no reason why this should not also be the case for IoT platforms. We notice an increasing interest from user companies in taking open source into account in their vendor selection process for IoT platforms.

In the context of AR, we observe several things happening simultaneously. On the provider side, AR application development platforms are becoming simpler and also increasingly usable for non-developers. Also, the necessary hardware, smart glasses, is constantly improving in quality, and prices are falling. On the user side, there is increasing adoption of AR in the manufacturing space to provide support in many areas, such as field services, assembly, quality control, logistics, and training. The increasing integration of IoT data into AR applications is a logical next step. Therefore, we see the potential of IoT platforms, as the source of IoT data, and AR platforms, as a new means to visualize this IoT data, converging in the future.

The increasing capturing and storage of IoT data in IoT platforms enables a new kind of service – the exchange of IoT data plus its potential monetization. New platforms are emerging that are designed to orchestrate the data exchange and monetization between different providers and consumers. Today, this kind of service is mainly separate from IoT platforms, and we observe different vendor landscapes. However, as both kinds of platform focus on the best possible utilization of captured data, the increasing convergence of them is a potential scenario. We expect to see some vendors offer both in the future.

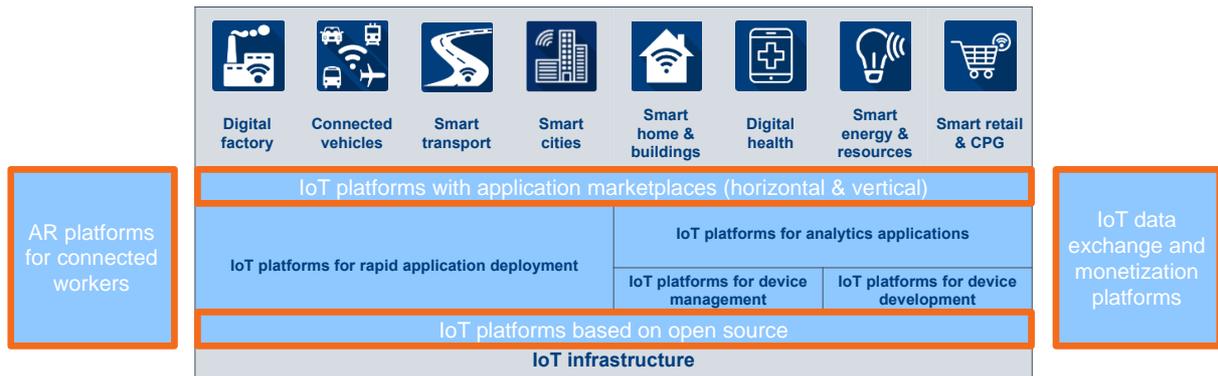


Fig. 6: Newly emerging segments in the context of IoT platforms

As a user survey on a broader basis is generally not possible for newly emerging markets such as the segments mentioned above (figure 5), we evaluate the provider landscape in our INNOVATION RADAR 2019 on IoT platforms. The INNOVATION RADARs provide our analyst perspective on the current provider landscape around newly emerging market segments.

## IMPACT ON THE EXISTING VENDOR LANDSCAPE

To summarize the previous chapter, we basically observe two main trends – the consolidation of existing market segments and, simultaneously, the emergence of new market segments in the context of IoT platforms. Both trends are already having an impact on the existing vendor landscape for IoT platforms, and this impact will continue in the future:

- Intensifying competition leads to a new level of shakeout.
- Increasing relevance of partnerships with hyperscalers.
- Vendor repositioning to enhance differentiation.

### Intensifying competition leads to a new level of shakeout

The consolidation of different market segments intensifies the competition between vendors. This is of course not new, but is now reaching a new level – from acquisitions to actual market exits. During 2014-2018, the vendor landscape constantly changed through acquisitions. This led to the market entry of big players such as AWS, Microsoft, SAP, Software AG, and Google. As a consequence, smaller players disappeared from the market and were replaced by large vendors. Over the past 12 months, besides further acquisitions by bigger vendors (ARM acquired Stream Technologies, Siemens acquired Mendix, and Munich RE acquired relayr), we also saw the first actual market exits of vendors. Windriver left the IoT platform market and transferred all assets to Telit. Samsung shut down its ARTIK cloud service. C3 IoT shifted its focus away from IoT use cases and even renamed the whole company to C3 AI to reflect this change in strategy.

## **Increasing relevance of partnerships with hyperscalers**

In the IoT space, collaboration with external partners has been highly relevant for years. However, the nature of partnerships has been changing over time. At the beginning, we saw strong competition between the IoT platform providers to collaborate intensively with the big C&SI providers such as Accenture, IBM, or Capgemini. In the next phase, many IoT platforms started to also collaborate with each other, which is still the case. The latest trend is for many IoT platforms to especially intensify collaboration with Microsoft and AWS. These partnerships are not only limited to their cloud infrastructure; they also include the integration of IoT platform capabilities. At the beginning of 2019, SAP announced the integration of SAP Leonardo IoT with Microsoft Azure IoT, and later on also with AWS IoT Core. SAP's intention is to utilize the connectivity and device management capabilities of AWS and Azure to give clients more flexibility in this space. PTC has been doing the same with AWS and Microsoft. PTC's relationship with Microsoft is even more strategic and holistic, and also includes AR/mixed reality, besides cloud infrastructure and IoT. In 2018, GE Digital also announced the integration of its Predix platform with Azure IoT. Microsoft and AWS are also further increasing their relevance in the industrial space through the announced strategic partnerships with big automotive vendors around connected cars and the digital factory (BMW and Microsoft in the factory space; VW and Microsoft around connected car services; VW and AWS in the factory space, BMW and AWS around connected car services).

## **Vendors are repositioning and enhancing their differentiation with new capabilities**

Vendors are turning towards repositioning and more differentiation to stay relevant in the tightening competitive landscape and to tap into new market opportunities.

SAP is shifting its focus to IoT applications and away from device management (they increasingly collaborate with Microsoft and AWS in this space, as mentioned above). In the application space they are focusing on application development and application management for developers and non-developers, plus application marketplaces.

Bosch Software Innovations is shifting its IoT positioning more and more towards open source, which is a good differentiator in the current market. The core of the Bosch IoT Suite is not only built on open source components, Bosch Software Innovations is also growing its consulting and system integration capabilities around open source-based IoT solutions in order to offer the whole stack of consulting, system integration, and managed services.

Siemens acquired Mendix, a low-code application development platform, with the intention to accelerate application development around MindSphere and build a growing industrial application marketplace. In addition, with the newly formed Business Unit for IoT Integration Services, Siemens is expanding its IoT platform offering to provide more support to customers in their digital transformation. Siemens plans to offer consulting, design, prototyping, and implementation services. The company plans to hire about 10,000 people in this area by 2025.

PTC, besides its IoT platform, ThingWorx, is increasingly investing into its AR platform, Vuforia. Their vision is to increasingly integrate IoT and AR, which will allow to use AR for the visualization of IoT data to connected workers. PTC also intends to build more and more standardized applications on top of ThingWorx and Vuforia to address dedicated use cases in a very easy-to-use way.



## MARKET SITUATION – IOT PLATFORMS FOR INDUSTRIAL APPLICATIONS

When it comes to platforms for sensor data and efforts to build an open application marketplace around it, we observe that manufacturing is more advanced than other sectors. Adoption of the concept is already strong in the process industry, and is gaining ground in discrete manufacturing. Adoption on the user side started with a clear focus on sensor data and application management, while device management was not at the top of the agenda. The concept of continuous software updates to enhance the functionalities and security of devices has of course reached the manufacturing industry, but many user companies are still reluctant to allow this kind of updates in an automated manner and with higher frequency. The reason is evident – they want to avoid unnecessary downtimes, therefore they often follow the rule to “never change a running system”. However, in a highly connected world, cyber attacks are becoming an increasingly realistic scenario, and manufacturing companies – whether they like it or not – have to change their rules to accommodate the fact that “a system without change (security updates) will not run for much longer”. This means that device management capabilities will become increasingly relevant in the future, but manufacturing companies are currently still more focused on the management of sensor data and related applications.

### **What makes an IoT platform with a marketplace for industrial applications attractive to users?**

One important aspect is technology-related: out-of-the-box connectivity to many different industrial devices, combined with real-time data management capabilities and a marketplace that is well-structured and allows direct buying and provisioning of applications (not just a catalogue). The second aspect is partnership-related: an open platform combined with a strong ecosystem of application development partners gives users fast and easy access to diverse and innovative applications, enabling them to boost the operational efficiency of their connected devices. The third aspect is related to success factors that provide a real advantage for vendors in further evolving their application development partner ecosystem around their own platform – a strong client base and/or an existing developer community. Vendors which have an established client base around industrial hardware (installed base of machinery and equipment) and/or industrial software (for example around industrial core applications such as MES) have a clear advantage in building a robust application partner ecosystem as their partners enjoy the benefit of selling to an existing user group. If vendors have already established an application developer community in other areas (outside the industrial space or IoT), this is also a big advantage, as it is much easier and faster to shift the focus of existing partners/developers to a new topic (such as IoT) than to establish entirely new partnerships/communities.

### **Who are the leading vendors in this field today?**

OSIsoft is leading in several of the above-mentioned aspects. It has a big installed base, especially in the process industry, which has evolved over many years. The company has well-proven capabilities around sensor-based, real-time data management and provides connectivity to many different industrial devices (including many interfaces to equipment from big industrial automation players such as ABB, Siemens, GE, Honeywell, and Rockwell). OSIsoft already has established a huge partner ecosystem, and a remarkable number of industrial applications are available on its marketplace.

The strength of Siemens MindSphere is linked to three aspects: the strong installed base in industrial hardware and software; the acquisition of the low-code application development platform Mendix, which gives Siemens access to a well-established developer community and enables much faster IoT application development around MindSphere; and the MindSphere store, which already is a real marketplace for many applications and not just a catalogue like many other so-called “marketplaces”.

FORCAM is the first MES provider that pursues the vision of building an open IoT platform with a linked industrial application marketplace around its existing MES solution. FORCAM FORCE already has a strong customer base in Europe, and we see a clear potential to build around this a strong partner ecosystem. FORCAM has been pushing this very hard, and we expect more MES vendors to follow this example. MPDV is going in the same direction with its Manufacturing Integration Platform (MIP).

PTC offers a very impressive number of applications around ThingWorx in its marketplace. The company has been making major efforts to further integrate its IoT platform with core applications such as PTC Windchill (PLM) and Rockwell Automation FactoryTalk (MES).

Microsoft and AWS have a strong developer community, and we expect these vendors to be moving very fast into the industrial space over the coming months. This is reflected by the announcements they made together with big automotive companies (AWS with VW, and Microsoft with BMW) to build industrial production platforms for them and their supplier networks.

ADAMOS and AXOOM currently do not have a strong client base, nor a developer community. These two facts harm their ability to further grow their ecosystems and increase the number of applications linked to their platforms and accessible via their marketplaces.



## SCOPE & DEFINITION

### Definitions

#### What is the PAC definition of IoT platforms?

- IoT platforms provide two basic types of functionality to clients: IoT device management and IoT application management.
  - **IoT device management** covers device provisioning, device connectivity, remote SW updates and remote control.
  - **IoT application management** includes application development & integration, data analytics, data visualization and event processing.

#### What is the PAC definition of AR platforms?

- Augmented reality (AR) platforms provide two basic types of functionality to clients: AR application development and AR data visualization.
  - **AR application development** contains a simple-to-use application development platform, which allows developers and/or non-developers to generate workflows and instructions for connected workers to improve their efficiency.
  - **AR data visualization** enables the visualization of data across many different devices, such as smartphones, tablets and smart glasses. This includes the worker's interaction with the device to perform steps and tasks within a process.

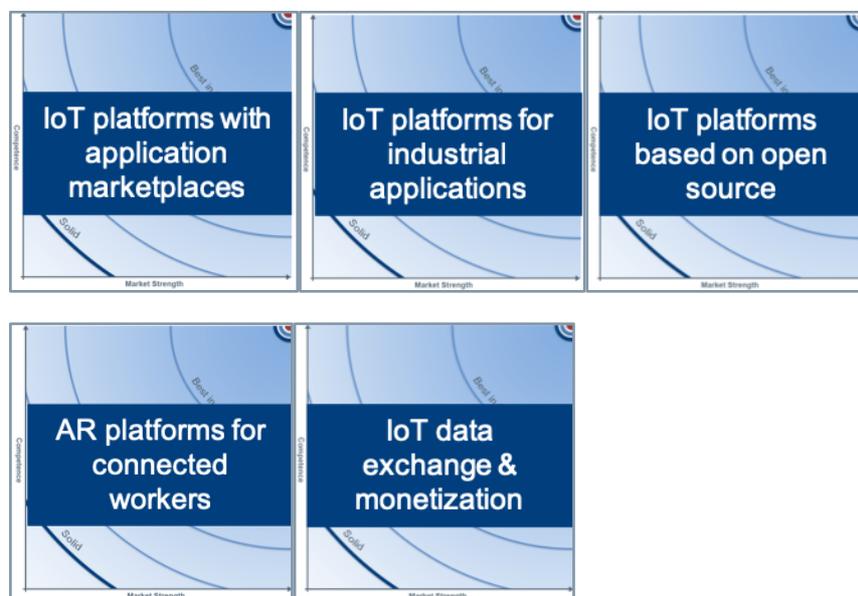
#### What is the PAC definition of IoT data exchange & monetization platforms?

Companies need access to data – today and even more so in the future. But not all data are easily accessible. On the other hand, companies have access to large parts of data which are also potentially relevant for other companies. Sharing data is the right solution for both parties and data marketplaces can bring buyers and users together on a large scale. A new kind of platform is emerging, which orchestrates data exchange and monetization. This becomes especially relevant in the context of IoT data. These new platforms allow for the secure management of data access, confidential sharing as well as monetization.

## Segmentation of IoT & AR platforms

### How does PAC segment the provider landscape for IoT platforms?

PAC is going to evaluate the providers of **IoT & AR platforms in Europe** by five new PAC INNOVATION RADAR segments, which are dedicated to specific user requirements:



### How will the providers be matched to the different types of IoT platform?

Depending on their specific focus area, the providers will be positioned in one or more of five PAC INNOVATION RADAR analyses.

### Why is PAC introducing and evaluating new types of platforms?

First, the boundaries between the segments of horizontal IoT platforms (for device management, rapid application deployment, analytics application, device development) introduced earlier are blurring, and existing vendors of IoT platforms are extending their capabilities more and more into other segments.

Second, as the established market segments of IoT platforms are growing more mature, we ask the users for their opinion. The IoT Survey 2019 is the world's first annual survey of IoT platform users, based on a sample of over 2,000 survey responses. For details on the survey, please visit <https://www.iot-survey.com>.

Third, the feedback from users is that they are increasingly looking for platforms which provide additional or very specific capabilities, besides the above-mentioned existing IoT platform categories. Therefore we will frequently enhance the perspective of the PAC INNOVATION RADAR with insights from newly emerging areas in the IoT context to address fast-evolving user needs. This year, we will focus on augmented reality (AR), open source and application marketplaces, but also IoT data exchange and monetization.

## Focus areas of different types of IoT & AR platform

### What are the focus areas of the different types of platform?

In principle, we can group the platforms analyzed into three different categories of platform:

- **IoT platforms**
  - IoT platforms with application marketplaces
  - IoT platforms for industrial applications
  - IoT platforms based on open source
- **AR platforms**
  - AR platforms for connected workers
- **Data exchange & monetization platforms**
  - IoT data exchange & monetization platforms

### The focus areas of these IoT platforms are the following:

**IoT platforms with application marketplaces** use a microservice structure and provide open APIs to their external ecosystem of developers. Based on this strength, we will see that powerful IoT platforms will establish and enhance an open marketplace of horizontal apps and add-ons, but also solutions for various verticals. This creates a continuous and entirely open system of innovation for the existing user base and their connected devices.

**IoT platforms for industrial applications** use a microservice structure and provide open APIs to their external ecosystem of developers. Based on this strength, we will see that powerful IoT platforms will establish and enhance an open marketplace of apps and add-ons dedicated to the complex industrial space. This creates a continuous and entirely open system of innovation for the existing user base and their connected devices.

**IoT platforms based on open source** are receiving more attention in the market, as they are becoming increasingly available. Also business users tend to consider them as a potential option in the IoT space. Since open source is relevant in general and very attractive to many users, we will take a first look at several of the most prominent open-source-based IoT platforms to understand their strengths and weaknesses by comparison.

**AR platforms for connected workers** provide worker-related application development and data visualization. AR application development contains a simple-to-use application development platform, which allows developers and/or non-developers to generate workflows and instructions for connected workers to improve their efficiency. AR data visualization enables the visualization of data across many different devices, such as smartphones, tablets and smart glasses. This includes the worker's interaction with the device to perform steps and tasks within the processes.

**IoT data exchange & monetization platforms** represent a new kind of platform, which orchestrates data exchange and monetization. This is becoming increasingly relevant in the context of IoT data, as more and more IoT data are being collected and made available via various IoT platforms. These new platforms for data exchange and monetization allow for the secure management of data access, confidential data sharing between data owners and buyers as well as data monetization.



## **PAC RADAR EVALUATION METHOD**

### **Provider selection & participation**

#### **Which providers are positioned in the PAC INNOVATION RADAR?**

Providers are selected and invited according to the following criteria:

- Size of revenues in the segment to be analyzed in the specified region;  
“Relevance”: Even providers that do not belong to the top-selling providers in the segment to be analyzed are considered, if PAC classifies them as relevant for potential customers, for instance due to an innovative offering, strong growth, or a compelling vision.

There is no differentiation as to whether the providers are customers of PAC – neither in the selection of the providers to be positioned, nor in the actual evaluation.

#### **What do providers have to do in order to be considered in a PAC INNOVATION RADAR analysis?**

The decision as to which providers are considered in the PAC INNOVATION RADAR analysis is entirely up to PAC. Providers do not have any direct influence on this decision.

However, in the run-up to a PAC INNOVATION RADAR analysis, providers can make sure in an indirect way that PAC can adequately evaluate their offerings and positioning – and thus their relevance – e.g. by means of regular analyst briefings etc.

#### **Why should providers accept the invitation to participate actively?**

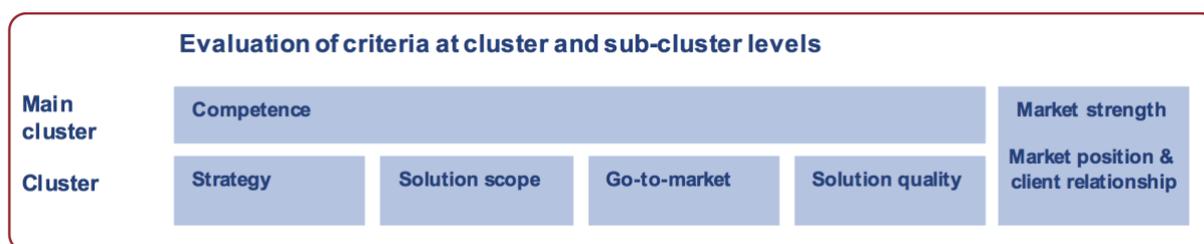
Whether or not a provider participates in the RADAR process does not actually affect their inclusion and positioning in the PAC INNOVATION RADAR, nor their assessment. However, there are a whole host of benefits associated with active participation:

- Participation ensures that PAC has access to the largest possible range of specific and up-to-date data as a basis for the assessment;
- Participating providers can set out their specific competences, strengths and weaknesses as well as their strategies and visions;
- The review process guarantees the accuracy of the assessed factors;
- The provider gets a neutral, comprehensive, and detailed view of its strengths and weaknesses as compared to the direct competition – related to a specific service in a local market;
- A positioning in the PAC INNOVATION RADAR gives the provider prominence amongst a broad readership as one of the leading operators in the segment under consideration.

**Considered providers by segment**

IoT platforms with application marketplaces	IoT platforms for industrial applications	IoT platforms based on open source	AR platforms for connected workers	IoT data exchange & monetization platforms
<ul style="list-style-type: none"> <li>• Advantech</li> <li>• Amazon Web Services (AWS)</li> <li>• FIWARE</li> <li>• Google</li> <li>• Libelium</li> <li>• Microsoft</li> <li>• PTC</li> <li>• SAP</li> </ul>	<ul style="list-style-type: none"> <li>• ADAMOS</li> <li>• Advantech</li> <li>• Amazon Web Services (AWS)</li> <li>• AXOOM</li> <li>• FORCAM</li> <li>• GE Digital</li> <li>• Microsoft</li> <li>• OSIssoft</li> <li>• PTC</li> <li>• SAP</li> <li>• Siemens</li> </ul>	<ul style="list-style-type: none"> <li>• Bosch Software Innovations</li> <li>• DeviceHive</li> <li>• DGLogik</li> <li>• Eurotech</li> <li>• Kaa</li> <li>• Mainflux</li> <li>• SiteWhere</li> <li>• Thinger.io</li> <li>• ThingsBoard</li> </ul>	<ul style="list-style-type: none"> <li>• Amazon Web Services (AWS)</li> <li>• Atheer</li> <li>• DAQRI</li> <li>• Diota</li> <li>• EON Reality</li> <li>• PTC (Vuforia)</li> <li>• RE'FLEKT</li> <li>• Scope AR</li> <li>• Ubimax</li> <li>• Upskill</li> </ul>	<ul style="list-style-type: none"> <li>• Caruso</li> <li>• DataBroker DAO</li> <li>• Deutsche Telekom/T-Systems</li> <li>• IOTA</li> <li>• Otonomo</li> <li>• Streamr</li> <li>• Terbine</li> </ul>

## The concept



### Evaluation method

PAC uses predefined criteria to assess and compare the providers within given service segments.

The assessment is based on the report-card score within the peer group of the positioned providers.

This is based on:

- The provider's detailed self-disclosure about resources, distribution, delivery, portfolio, contract drafting, pricing, customer structure, references, investments, partnerships, certifications, etc.;
- If applicable, a poll among customers by PAC;
- The analysis of existing PAC databases;
- Secondary research;
- Dedicated face-to-face interviews as relevant.

The provider data is verified by PAC and any omissions rectified based on estimates.

**If the provider does not participate**, the assessment is performed using the proven PAC methodology, in particular based on

- Information obtained from face-to-face interviews with the provider's representatives, analyst briefings, etc.;
- An assessment of company presentations, company reports, etc.;
- An assessment of PAC databases;
- An assessment of earlier PAC (INNOVATION) RADARs in which the provider participated;
- A poll among the provider's customers (as required) on their experiences and satisfaction.

### Reissue of published RADARs

The assessments in the PAC INNOVATION RADAR represent an assessment of the providers within the given peer group in the year in which the respective PAC INNOVATION RADAR was published.

The evaluations may not be directly comparable with those of any previous version due to subsequent content modifications. They particularly do not depict a development of individual providers over time.

Methodological and/or organizational modifications may be made due to changing market conditions and trends and can include:

- Different peer group in the focus of the analysis;
- Modification of individual criteria within clusters and sub-clusters;
- Increased or altered expectations by user companies;
- Adjustment of the weighting of individual criteria.

## Evaluation criteria

### Main cluster “Competence”

#### Sub-cluster “Strategy”

- Strategic focus on the topic
- Strategic activities over the last 12 months
- Unique selling proposition (USP)

#### Sub-cluster “Portfolio”

- Specific criteria for IoT platforms with application marketplaces:
  - Number of IoT applications
  - Number of IoT applications from third parties
  - Marketplace capabilities
  - Quality of IoT applications
- Specific criteria for industrial IoT platforms with application marketplaces:
  - Number of industrial IoT applications
  - Number of industrial IoT applications from third parties
  - Marketplace capabilities
  - Quality of industrial IoT applications
- Specific criteria for IoT platforms based on open source:
  - Open-source components of the IoT platform
  - Open-source components at the edge
  - Complementary service capabilities
  - Portfolio quality based on client references
- Specific criteria for IoT data exchange and monetization platforms:
  - Total number of data sources
  - Value of data sources
  - Addressed use cases
  - Complementary add-on services
- Specific criteria for AR platforms for connected workers:
  - Addressed use cases
  - Portfolio quality based on client references
  - Device flexibility and HW-related interoperability
  - Application and data integration

#### Sub-cluster “Go-to-market”

- Business model and pricing
- Sales approach and capabilities
- Marketing approach, partner strategy and training

### Main cluster “Market strength”

#### Sub-cluster “Market growth”

- Market perception in Europe
  - Awareness
  - Image
- Ability to grow
  - Capabilities
  - Momentum

#### Sub-cluster “Market position”

- Ecosystem of partners
  - Number of partners
  - Quality of partners
- Client base and relationship in Europe
  - Client base in Europe
  - Client relationship in Europe

## General PAC research method

The following overview describes PAC's research method for market analysis and key differentiation features.

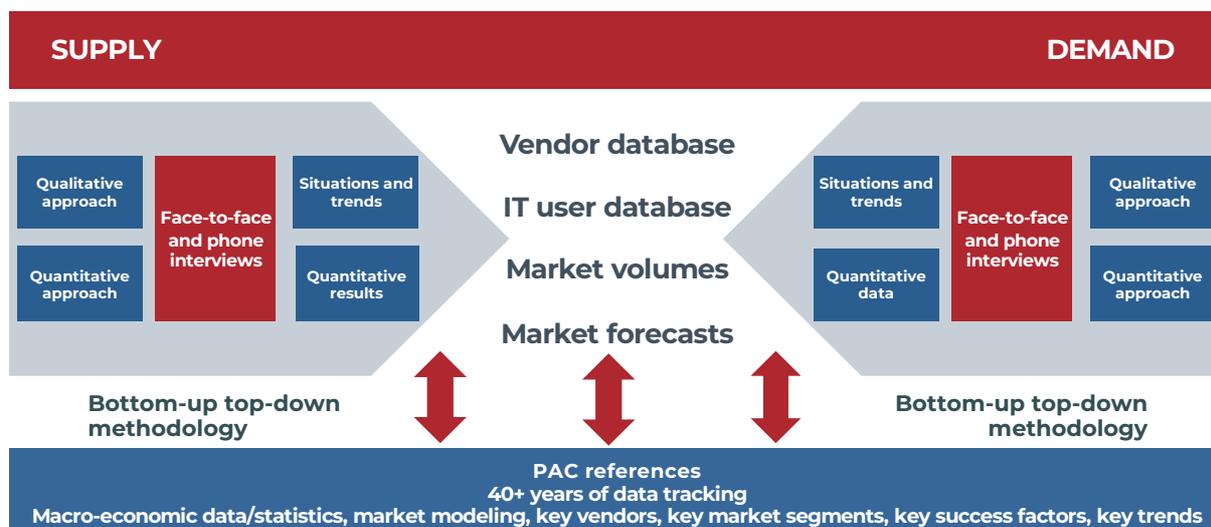


Fig. 7: Description of the PAC methodology

Local research and face-to-face communication are two core elements of PAC's methodology. In our market studies, we can draw on more than 40 years of experience in Europe.

## Positioning within the PAC RADAR

Based on the scores in competence and market strength, the overall score is calculated (calculation: competence score plus market strength score, divided by two). From the resulting overall score, each provider receives their characteristic positioning within a ring of the PAC RADAR. Here, the following applies: The closer a provider is to the center, the closer they are to meeting customers' requirements.

The "customer requirements" at the center represent a cross-section of the market; the position of the provider represents the completeness with which the provider's offerings and competence correspond with the requirements of all potential customers; i.e. purely local clients, international key accounts and SMEs alike.

The providers are positioned within ring 1 (innermost ring) to ring 4 (outermost ring), based on the total grade they achieved. The total grade is the average score of the two main clusters ("competence" & "market strength").

The rings of the PAC RADAR can be classified by the following attributes:

**Ring 1: "Best in Class" (total grade between 1 and 1.99)**

**Ring 2: "Excellent" (total grade between 2 and 2.99)**

**Ring 3: "Strong" (total grade between 3 and 3.99)**

**Ring 4: "Solid" (total grade between 4 and 4.99)**



**PAC RADAR “PLATFORMS FOR IOT & AR IN EUROPE 2019” – IOT PLATFORMS FOR INDUSTRIAL APPLICATIONS**

PAC RADAR IoT platforms for industrial applications in Europe 2019



Fig. 8: PAC RADAR IoT platforms for industrial applications in Europe 2019



**REVIEW OF TOP-SEEDED PROVIDER FORCAM**

**FORCAM**

**PAC RADAR IoT Platforms for Industrial Applications  
in Europe 2019** **Best in Class**

Cluster	Average	FORCAM
Competence	2.18	1.87
Market strength	2.29	2.03
<b>Total score</b>	<b>2.24</b>	<b>1.95</b>

Criteria rated as significantly ABOVE AVERAGE (more than 0.5)

- Quality of industrial IoT applications
- Sales approach and capabilities
- Marketing approach, partner strategy and training
- Market perception in Europe
- Ability to grow
- Client base and relationship in Europe

Criteria rated as significantly UNDER AVERAGE (more than 0.5)

- Number of industrial IoT applications
- Number of industrial IoT applications from 3rd parties
- Ecosystem of partners



## ABOUT TEKNOLOGY GROUP

teknology Group is the leading independent European research and consulting firm in the fields of digital transformation, software, and IT services. It brings together the expertise of three research and advisory firms, each with a strong history and local presence in the fragmented markets of Europe: [Ardour Consulting Group](#), [CXP](#) and [PAC \(Pierre Audoin Consultants\)](#).

We are a content-based company with strong consulting DNA. We are the preferred partner for European user companies to define IT strategy, govern teams and projects, and de-risk technology choices that drive successful business transformation.

We have a second-to-none understanding of market trends and IT users' expectations. We help software vendors and IT services companies better shape, execute and promote their own strategy in coherence with market needs and in anticipation of tomorrow's expectations.

Capitalizing on more than 40 years of experience, we operate out of seven countries with a network of 150 experts.

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The PAC RADAR is a graphical representation and written analysis of the positioning of various IT providers within a defined market segment at a specific point in time. The positioning and characterization of selected companies within the PAC RADAR is conducted on the basis of an analytical assessment of criteria which PAC previously defined for this analysis.

The selection, positioning, and characterization of companies within the PAC RADAR is not subject to any vested interests whatsoever. PAC does not support any providers that are represented in the PAC RADAR, and does not give any recommendations to technology users. The PAC RADAR represents a result from market research only and must not be taken as a recommendation for action.

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