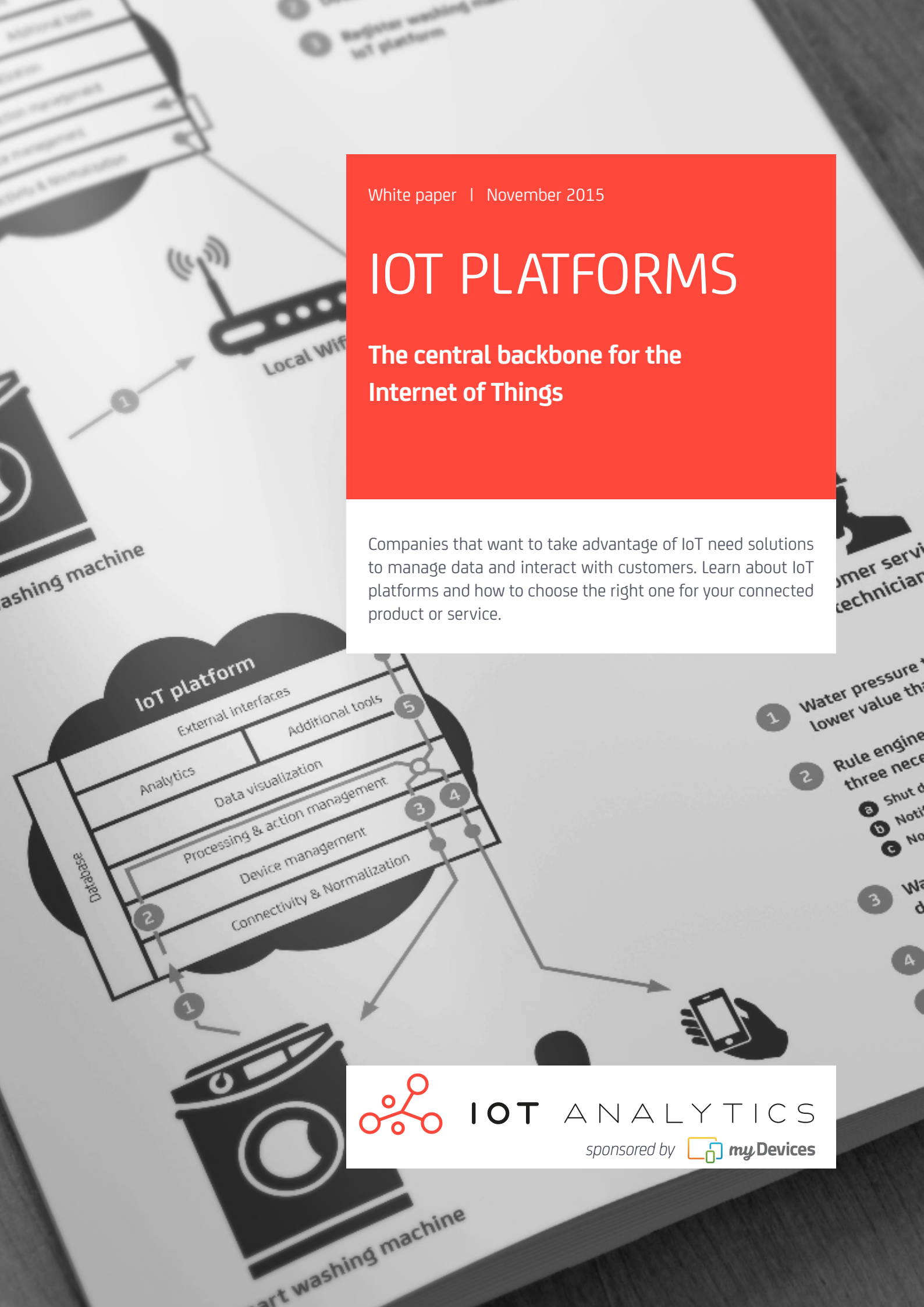
White paper | November 2015

IOT PLATFORMS

The central backbone for the Internet of Things

Companies that want to take advantage of IoT need solutions to manage data and interact with customers. Learn about IoT platforms and how to choose the right one for your connected product or service.



IOT ANALYTICS

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AT A GLANCE

As the Internet of Things (IoT) begins transforming businesses, economies and society, IoT platforms are emerging as the central backbone in the overall IoT infrastructure.

In this study we examine the current landscape of IoT platforms, how they work and the main aspects to consider when choosing a platform provider.

INSIGHTS

- In the next five years, IoT platforms will manage the interoperability of around 25 billion newly connected devices and their ~44 zettabytes of generated data.
- Besides basic device connectivity and data storage, advanced platforms encompass (among other things): device management, action management, analytics, and integration with external interfaces.
- The IoT platform market is expected to grow 35% per annum and attain a size of $1.16B by 2020.
- More than three hundred IoT platforms are available today, most of them are relatively new and often still under development. They differ by technological depth, segment-focus, and technology implementation offering.
- By outsourcing the IoT platform development, companies can benefit from a ~50% shorter implementation cycle and the assurance of working with IoT experts.

IN THIS STUDY YOU WILL LEARN

- Why IoT will create a $11 trillion business opportunity
- How IoT platforms work and the modules they incorporate
- How an IoT platform operates smart washing machines for an electronics retailer (use case)
- Whether to make or buy an IoT platform

1 IoT: An $11 trillion business opportunity

The idea of connecting the physical world to the Internet has been around since the 90s. But the idea didn't accelerate twenty – or even ten – years ago. It is accelerating now. The phenomenon of an interconnected world is called "Internet of Things" and it will dramatically change our lives in the coming years.

1.1 Understanding the Internet of Things and its impact

25 billion things will be connected to the Internet by 2020

The Internet of Things (IoT) in its essence describes how the physical world is being connected to the Internet. Gartner estimates that besides smartphones, tablets, and PCs more than 25B "things" will be connected to the Internet by 2020 (See EXHIBIT 1)[1].

Everything is becoming connected: the lightbulbs in your home, the shelf space in your grocery store, and the machines in many factories. With these new connections, business cases are popping up everywhere: smart parking, autonomous production, automatic home security alerts, and many, many more. Much like the Internet did roughly twenty years ago, IoT is bringing convenience, efficiency and safety to a totally new level – changing industries and society itself.

The Internet of Things will influence our lives like never before

Some industry experts go as far as saying that IoT will be the most influential and most disruptive technology in the history of mankind. McKinsey estimates at the top end that IoT will be an aggregated $11 trillion business opportunity over the next ten to fifteen years – equaling about 11% of the world economy[2].

Business leaders, innovators, and investment firms are taking note. In 2014 and 2015, Gartner[3] proclaimed IoT on top of its infamous hype cycle. A Forrester survey[4] of 1,055 business decision makers that came out in July

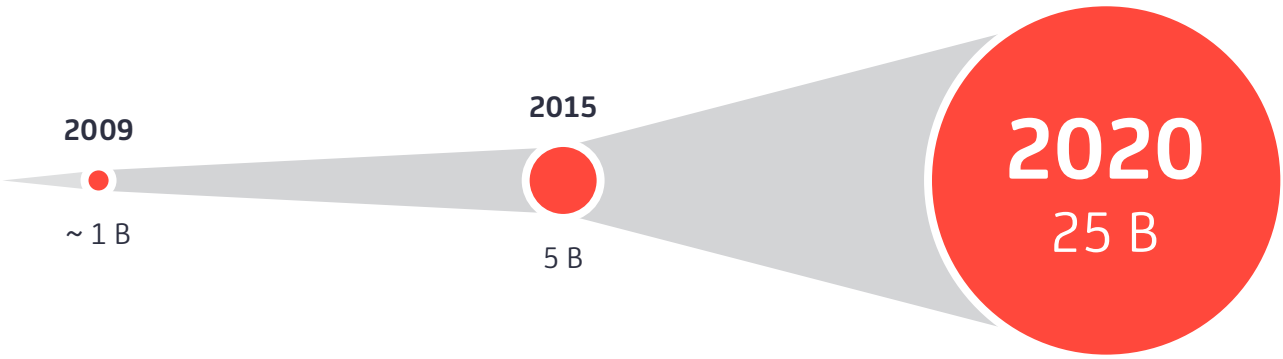


EXHIBIT 1: Explosion of connected "things" – IoT adoption will accelerate, 25B objects will be connected by 2020 (Source: Adapted from Gartner[1])

2015 revealed that 33% of businesses are planning or already conducting IoT projects while 25% are currently assessing the option of doing so.

1.2 Why is this happening now?

Running a somewhat smart factory ten years ago required expensive, custom-made automation systems that only large companies could afford. The situation was similar in your home. Automating a house with intelligent thermostats and security systems was far from being "smart" and you had to be a tech-heavy billionaire like Bill Gates to have your own custom-made system.

There are several reasons why the IoT opportunity is occurring now:

- **Affordable hardware.** Costs for actuators & sensors have been cut into half over the last ten years.
- **Smaller, but more powerful hardware.** Form factors of hardware (sensors, communication technology, etc.) have shrunk to millimeter or even nanometer levels. Now you can get a low-energy, state-of-the-art sensor with ubiquitous connectivity the size of your fingertip.
- **Ubiquitous & cheap mobility.** Cost for mobile devices, bandwidth and data processing have declined as much as 97% over the last ten years[5].
- **Availability of supporting tools**. Big data tools & cloud-based infrastructure have become widely available and fairly sophisticated.
- **Mass market awareness.** IoT has surpassed a critical tipping point. The vision of a connected world has reached such a followership that companies have initiated IoT development & marketing budgets. The commitment is irreversible.

1.3 Changing business paradigms: IoT data is the new gold

Gathering and connecting data points from physical objects is the key to letting new IoT business cases come to life. As Robert Metcalfe postulated in the 1980s: "The value of a telecommunications network is proportional to the square of the number of connected users of the system[6]. Insightful data is the key to unlocking this value.

This trend will be seen in many industries: selling the main product becomes a byproduct, while the business model around the data becomes the main product. On top of that, we will see the creation of entirely new industries that build business models solely on IoT data and use hardware partners to get access to the necessary data sources (e.g., the insurance industry of the future).

It is the Internet of Things with its 25 billion connections that will accelerate the data explosion. In that sense IoT data is the "new gold"

IDC estimates that the amount of data in the world will more than quadruple in the next five years to reach 44 zettabytes in 2020[7] (See Exhibit 2).

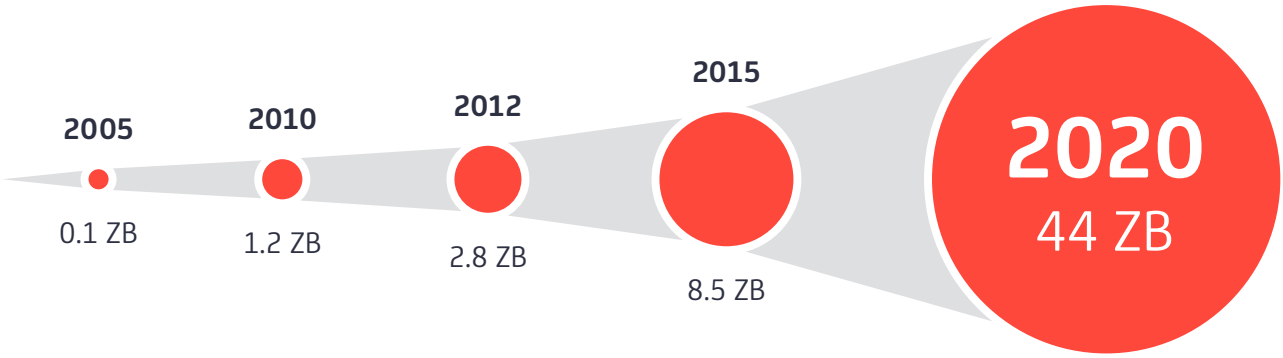


EXHIBIT 2: Explosion of data in the world – Data created by people, enterprises, and things will attain 44 zettabytes by 2020 (Source: Adapted from IDC[7])

2 IoT platforms: The backbone to manage IoT business cases

2.1 The IoT technology infrastructure

Four major building blocks of IoT

The ~44 zettabytes of data generated by the Internet of Things need a solid infrastructure in order to bring the many business cases to life. From a bird's eye view, four major technological building blocks of IoT are emerging.

Security is an additional element that is so important it needs to be mentioned as a foundation for each at the same level (See Exhibit 3).

- **Hardware.** This is where data is produced. The hardware layer includes the physical devices with their in-built microprocessors, sensors, actuators and communication hardware.
- **Communication.** This is where data gets transported. This part of the technology infrastructure ensures the hardware is connected to the network, via proprietary or open-source communication protocols.
- **Software backend.** This is where data is managed. The software backend manages all connected devices and networks and provides the necessary data integration as well as the interface to other systems (e.g., ERP-system).
- **Applications.** This is where data is turned into value. In the application layer, IoT use cases get presented to the user (B2C or B2B). Most of the applications run on smartphones, tablets, PCs or other devices/things and "do something valuable" with the data.

Security is a must-have element for all of these building blocks. The IoT infrastructure has to be holistically designed so that the threat of attacks is minimized on all levels. This entails the protection and encryption of

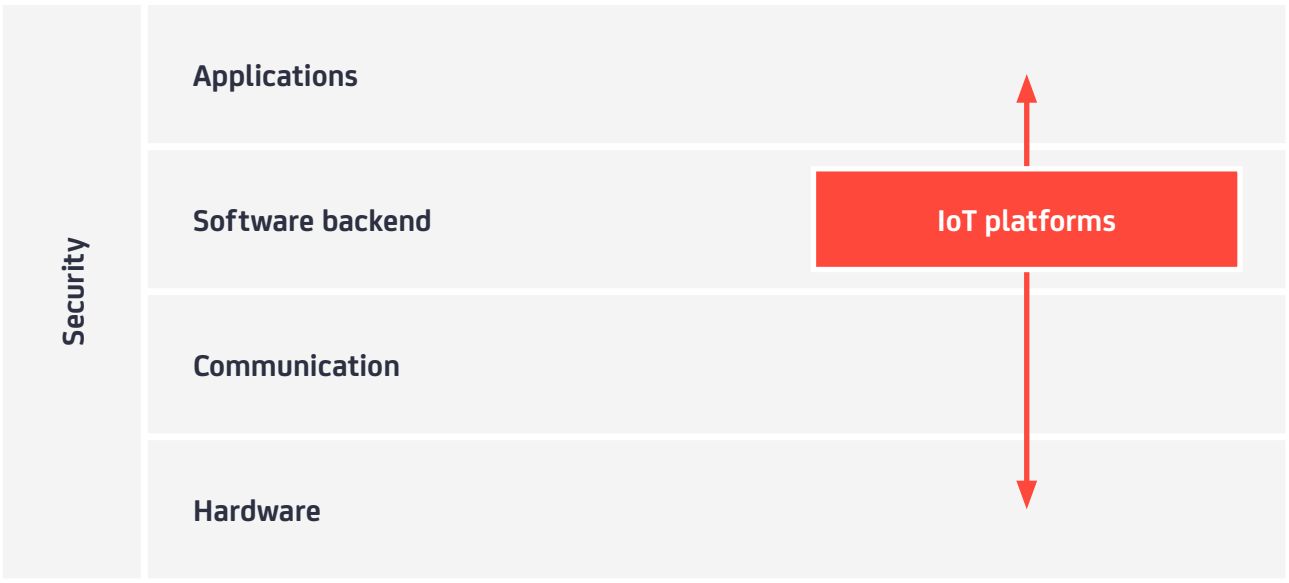


EXHIBIT 3: Central building blocks of IoT – IoT platforms are part of the central software backend in the IoT infrastructure (Source: IoT Analytics)

data and metadata, the management of device access, user authentication, and much more. While security must be scalable it is unfortunately often a trade-off with convenience, quick workflows, and project cost.

A quickly emerging landscape with few standards

The IoT technology architecture is currently far from being standardized or accurately defined and it is evolving very quickly. There are hundreds of different hardware units, connection protocols, low-level software languages, and an increasing number of IoT platforms. It is a relatively young infrastructure that hasn't come into itself yet.

IoT can be compared to the Internet of the early 90s where Microsoft and Netscape fought out the browser standardization battle, while Altavista and Yahoo were trying to develop the best search engine.

Companies are bundling their forces in consortia such as the AllSeen Alliance or the Industrial Internet Consortium in order to develop interoperable standards that would streamline the complex technology landscape. While some companies apply an open-source approach that fosters transparency and collaboration, others keep their APIs private. The latter are hoping to lock-in customers into a proprietary technology so they can cash-in on license fees and a monopoly-like position later on.

The IoT technology architecture is currently far from being standardized, but is evolving very quickly

As a result, one of the important functionalities of the software backend and especially the IoT platforms, is to integrate the different hard- and software standards one by one and enable interoperability.

2.2 What is an IoT platform and how does it work?

The eight main components of an IoT platform

IoT platforms are the central piece in the Internet of Things architecture that connect the real and the virtual worlds and enable communication between objects. McKinsey[2] estimates that "40 percent of the total value that can be unlocked with the Internet of Things requires different IoT systems to work together". In its most simple form, an IoT platform is just about enabling connectivity between objects. In a more sophisticated form, the platform consists of a variety of important building blocks:

Connectivity & normalization, device management, database, processing & action management, analytics, visualization, additional tools, and external interfaces. (See Exhibit 4)

1. CONNECTIVITY & NORMALIZATION

Every IoT platform starts with a connectivity layer. It has the function of bringing different protocols and different data formats into one "software" interface. This is necessary in order to ensure all devices can be interacted with and data is read correctly. Having all

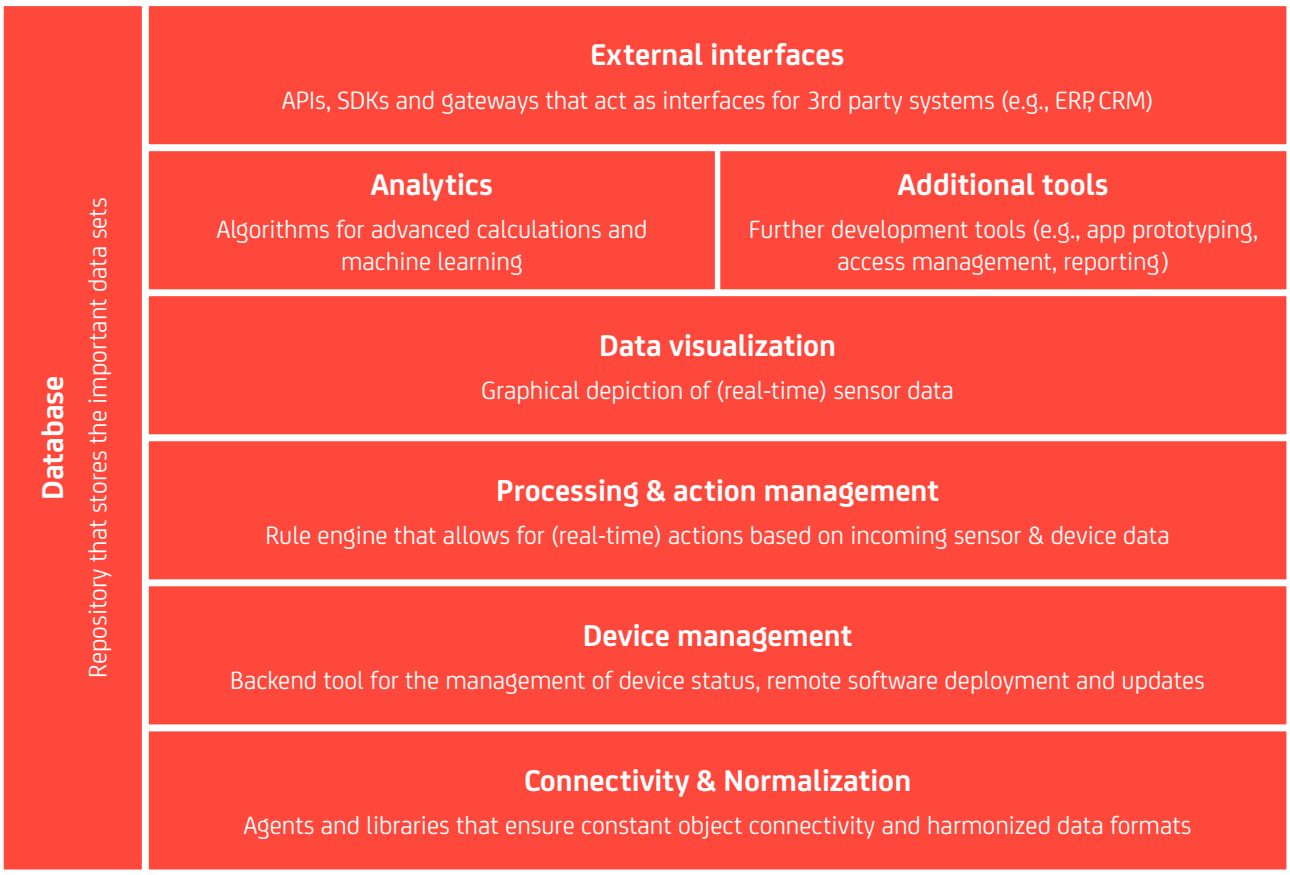


EXHIBIT 4: The eight major building blocks of an IoT platform (Source: IoT Analytics)

device data in one place and in one format is the basic necessity to monitor, manage, and analyze IoT devices.

What sounds fairly simple can be a nightmare from the point of view of a computer engineer. Libraries need to be set up for individual devices so that something as basic as an industrial pressure sensor that sends analogue signals can be integrated into the platform for one use case while a wearable device or the data from someone's smartphone can be integrated for another use case.

Advanced devices usually provide an API that allows for a standardized communication interface to the platform. However, very often so-called software agents have to be developed and installed on the hardware in order to enable the IoT platform to establish a stable connection.

2. DEVICE MANAGEMENT

The device management module of an IoT platform ensures the connected objects are working properly and its software and applications are updated and running.

Tasks performed in this module include device provisioning, remote configuration, management of firmware/ software updates, and troubleshooting. As thousands or even millions of different devices become part of an IoT enabled solution, bulk-actions, and automation are essential to control costs and reduce manual labor.

3. DATABASE

Data storage is a central piece in an IoT platform. The management of device data brings the requirements for databases to a new level:

- **Volume.** The amount of data that needs to be stored can be massive. In many IoT solutions only the minority of the generated data can be stored.
- **Variety.** Different devices and different sensor types produce very different forms of data.
- **Velocity.** Many IoT cases require the analysis of streaming data to make instant decisions.
- **Veracity.** In some instances, sensors produce ambiguous and inaccurate data.

An IoT platform therefore usually comes with a cloud-based database solution that is distributed across different sensor nodes. It should be scalable for big data and should be able to store both structured (SQL) and unstructured data (NoSQL).

4. PROCESSING & ACTION MANAGEMENT

The data that is captured in the connectivity & normalization module and that is stored in the database gets brought to life in this part of the IoT platform. A rule-based event-action-trigger allows performance of "smart" actions based on specific sensor data.

In a smart home, for instance, an event-action-trigger can be defined so that all lights get turned off when a person leaves the house. The technical realization often comes in the form of an If-this-then-that rule (IFTTT): If the GPS signal indicates Jason's smartphone is more than 5 yards away from his house, then turn off all the lights in his house.

5. ANALYTICS

Many IoT use cases go beyond action-management and require complex analytics to get the most out of the IoT data-stream.

In a smart home, for example, the analytics engine can provide the algorithms that allow the IoT platform to learn which combination of lights and heating are preferred by the user at what time of the day and in relation to the outside weather conditions.

The analytics engine encompasses all dynamic calculations of sensor data, from basic data clustering to deep machine learning.

6. DATA VISUALIZATION

Sometimes also referred to as "visual analytics," data visualization presents a much-underrated part of the IoT platform.

The combination of human eye and brain is still far superior to most analytic and rule-based engines. That is why data visualization is so important: it enables humans to see patterns and observe trends.

Visualization comes in the form of line-, stacked-, or pie charts, 2D- or even 3D-models. The visualization dashboard that is available to the manager of the IoT platform is often also included in the prototyping tools that an advanced IoT platform provides.

7. ADDITIONAL TOOLS

Advanced IoT platforms often offer an additional set of tools for the developer and the manager of the IoT solution.

Development tools allow the IoT developer to prototype and test the IoT case. Sometimes even in the form of what-you-see-is-what-you-get-editors (WYSIWYG) that lets you create simple smartphone apps for visualizing and controlling connected devices.

Management-focused tools support the daily operations of the IoT solution. An example is an „access management" tool that determines who has access to which device and to which data. Another tool is "reporting", that allows for data export (e.g., in a .csv or .json format) as well as data queries and other forms of structured output.

8. EXTERNAL INTERFACES

IoT enabled businesses are rarely built standalone and on a green field. In established companies it is crucial that the Internet of Things integrates with existing ERP systems, management tools, manufacturing execution systems and the rest of the wider IT-ecosystem.

Not every IoT platform is an IoT platform

Many companies offer an "IoT platform." For an outsider it is often hard to tell whether this term refers to a complete and mature IoT platform with the eight components described above or whether the term has been stretched to describe just an element of a platform – or even something completely different.

Companies active in providing just cloud storage, data security, CRM software, or simple connectivity management claim to offer a complete IoT platform. While it is certainly true that these software platforms offer a solution for the wider IoT ecosystem, a mature IoT platform requires all of the elements described above.

Built-in application programming interfaces (API), software development kits (SDK), and gateways are the key to the integration of 3rd-party systems and applications.

Well-defined external interfaces can cut specific integration efforts for enterprises from months to just a few days.

IoT platforms in action: Use case for an appliance retailer

A UK-based electronics retailer is bringing product experience and customer satisfaction to a new level, through the use of connected devices and an intelligent IoT platform.

One of its use cases is a sophisticated customer service program for smart washing machines.

In this use case, the Internet of Things enables the following benefits to the user of the washing machine:

- The machine is stopped automatically prior to a breakdown that could cause water damage (predictive maintenance).
- The user is informed about problems and has control over his/her washing machine via a smartphone app, independent of the user's whereabouts.
- A customer-service specialist or a craftsman can be dispatched. Based on important data such as washing machine type, performance data, history, and previous problems he/she can make an informed decision instantly.

Apart from an increase in customer satisfaction, the retailer has the following benefits:

- A commission for every local craftsman sent to a customer.
- The ability to actively recommend a new washing machine or additional products to the customer (e.g., if the washing machine is too expensive to repair).
- Further revenue opportunities by developing joint programs with partners (e.g., insurance companies that benefit from the reduced risk of water leakage when using a "smart" washing machine).

There are four major elements of the use case:

PART 1: CONNECTING THE WASHING MACHINE

Once the CPU of a washing machine has been WiFi-enabled and access to the API has been granted or a local IoT platform agent has been installed, the customer is ready to enter the new age of IoT-enabled washing machines.

All that is left to do for the customer is to connect the washing machine to his local WiFi and download the smartphone app that is either provided directly by the IoT platform or the retailer. The consumer then connects the washing machine to the IoT platform by registering the machine in the platform's device management system.

The washing machine is now sending continuous real-time data via the home's WiFi to the IoT platform.

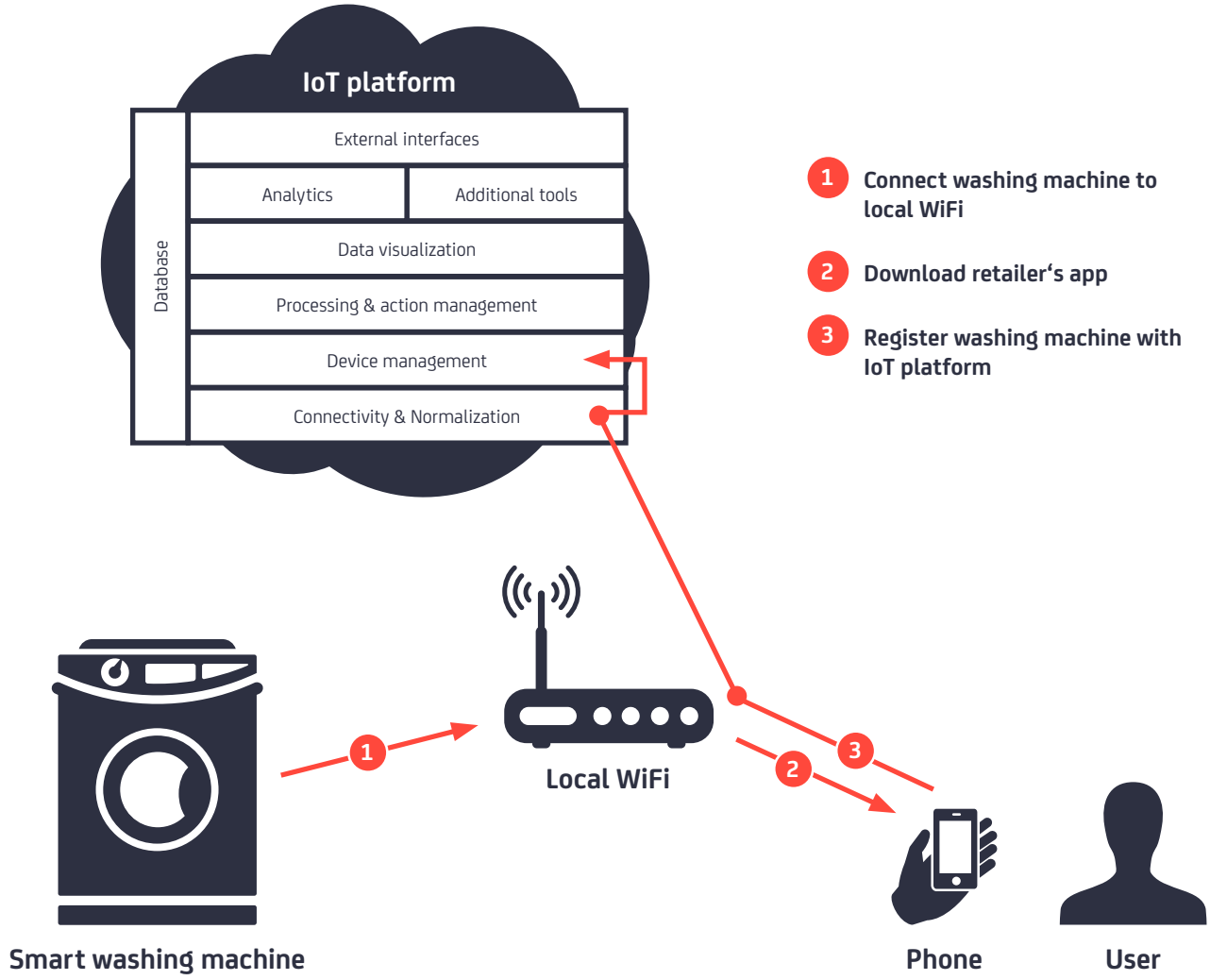


EXHIBIT 5: Connecting a "smart" washing machine to the IoT platform – After downloading an App, users can connect the washing machine to the retailer's IoT platform (Source: IoT Analytics)

PART 2: PREVENTING WATER LEAKAGE (AND OTHER USE CASES)

The washing machine is equipped with sensors that analyze the power consumption, water pressure, machine vibration and others.

Based on abnormalities in the real-time data stream of these sensors, the machine is stopped before causing damage.

A horrific scenario for every homeowner is a case of water leakage. Imagine the water pressure level in the washing machine suddenly drops when it shouldn't. Exhibit 6 shows how the IoT platform quickly stops the washing machine, thereby preventing potential water leakage. Both the user and a customer service technician get alerted so they can decide how to address this problem.

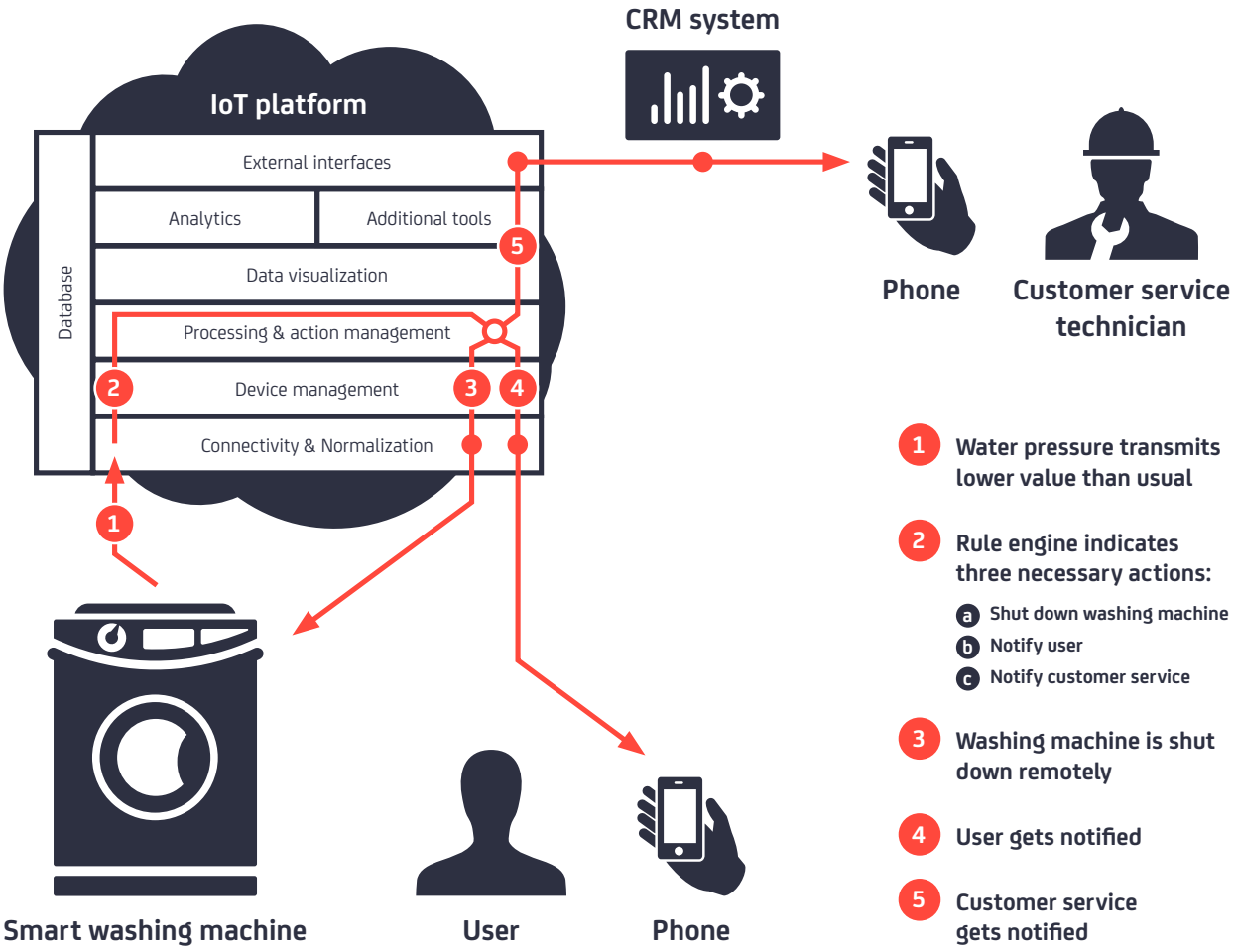


EXHIBIT 6: IoT platform triggering & performing actions – in case of dropping water pressure, the IoT platform shuts off the machine and informs the user and customer service (Source: IoT Analytics)

The processing & action module plays a vital part for these use cases. This is where real-time data that surpasses or falls below certain thresholds trigger specific actions.

In other use cases, the analytics module of the IoT platform also plays a vital part. Using the data from many other washing machines, one could, for example, calculate probabilities of water leakage based on specific sensor readings (e.g., a 30% higher power consumption and a 10% lower pipe pressure make a water-damage scenario 60% more likely).

PART 3: ENABLING CUSTOMER SERVICE

Whether it is a prevented water leakage or an electronic failure, the IoT-enabled washing machine helps the customer service representative to have a much deeper understanding of the real problem even though he/she is far away.

The customer service front-end of the IoT platform now allows the service team to visualize important information such as the history of critical events (e.g., power consumption, water pressure).

This leads to greater customer satisfaction. It also allows the retailer to be in touch with a repairman, thereby participating in his/her business and boosting new washing-machine sales.

PART 4: EXPLORING NEW BUSINESS WITH EXTERNAL PARTNERS (E.G., INSURANCE)

Even though a new washing machine is unlikely to break down, another revenue stream can be exploited from day one.

The IoT (platform) enabled predictive maintenance function substantially limits the risk of a pricy water-damage incident. Risk-pooling insurance companies that base their insurance rates on the probability of a breakdown (insured loss), can offer lower insurance rates for smart washing machine owners. They share the cost-reduction with the retailer who in return earns a commission on new contracts sold.

For the future, additional partners could be brought in to establish similar business models.

2.3 Understanding the different types of IoT platforms

We estimate that there are more than three hundred IoT platforms today and the number is growing almost every week However, not every platform is the same. There are three major lenses to differentiate IoT platforms: The technological depth, the segment-focus, and the implementation/customization approach.

IoT Platforms: A high-growth market

Preview of the "IoT Platforms 2015-2021 Market Report" – January 2016

The worldwide market size for IoT platforms is expected to be $300M in 2015 (see the IoT Analytics "IoT platforms market report 2015-2020" for more details[8]). IoT platforms are one of the fastest growing segments, even within the IoT market. The estimated annual growth rate for the next 6 years stands at 33%. In 2021, the market is expected to have grown to $1.6B.

While the market for many IoT hardware components (e.g., sensors) and IoT connectivity solutions (e.g., 3G) has existed for many years, the IoT platforms market was basically non-existent two years ago. Established enterprise platforms or software backend solutions are technically able to manage IoT data. However, these platforms were not designed with the sole purpose of running on network protocols such as MQTT or CoAP and operating systems such as Raspbian or Brillo.

There are further reasons for the strong growth of IoT platforms in the coming years:

- IoT platforms are a necessity for almost any IoT business case. If we are to see 25B IoT devices by 2020, the platform infrastructure has to be in place at the same time.
- Prices for the usage of IoT platforms are likely to increase as data streams get bigger and firms get locked into specific IoT solutions.
- IoT platforms will likely offer addtional modules (e.g., next-gen analytics, security)

Technological depth

Developing a deeply integrated IoT platform with all of the mentioned modules and integration into a number of IoT standards requires several years of focused work. Therefore different levels of technology depth for IoT platforms exist:

- LEVEL 1

  The connectivity platform. The simplest IoT platforms act as data collectors and provide a simple messaging bus.

- LEVEL 2

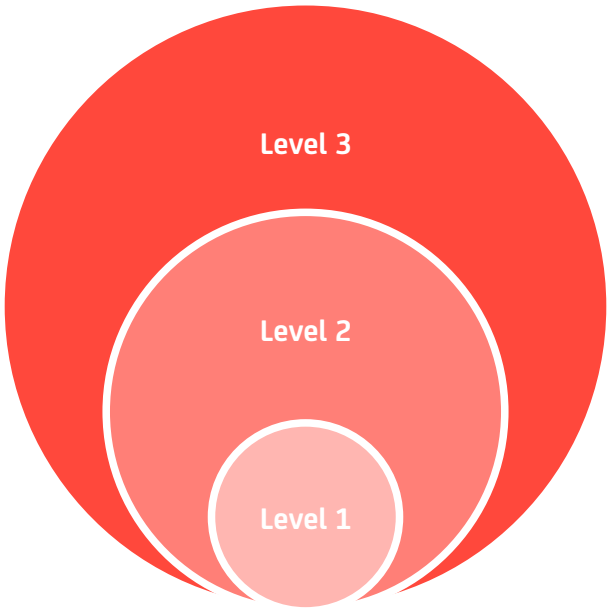
  The action platform. Platforms on this level not only manage the connection but also allow to trigger actions based on specific events. These platforms for example allow to turn on the light when the sensor indicates someone is home.

- LEVEL 3

  Full-scale platform. The most advanced platforms go beyond connectivity and action by separating different platform modules, enabling external interfaces seamlessly, and supporting a wide variety of protocols and standards. These platforms also come with advanced database solutions that allow for scalability to many devices and truly big data sets.

Roughly 75% of today's IoT platforms focus solely on providing connectivity

Roughly ~75% of the companies offering IoT platforms today are at level 1, providing not much more than a messaging bus. As a customer of an IoT platform, one needs to evaluate carefully which IoT platform has the right technological depth and fits with the specific use



1 Connectivity platform

- Data collection & normalization
- Messaging bus

2 Action platform

- Data processing
- Event-action management, e.g. rule-based

3 Full-scale platform

- Device, protocol, standards agnostic
- Multi-formfactor visual back-ends
- Sophisticated external interfaces (e.g., APIs, SDKs)
- Advanced database solutions, made for big data
- Extensibility of the platform: to manage large number of devices

EXHIBIT 7: IoT platform technology levels – From the IoT connectivity platform (level 1) to the full-scale platform (level 3) (Source: IoT Analytics)

case. (See also the checklist provided in chapter 3.2). One should note that it is not necessarily a bad thing to have a level 1 platform. Some of the largest IoT platforms focus only on basic connectivity but do this extremely well.

Besides the level of technological depth, one should note that there is also a battle of architecture philosophies going on. More conservative platforms are developed using Java or .NET, use a central SQL database, and build their components as jar files. In contrast, many modern platforms are developed using Python or Node.js, use distributed key/value databases and build components as services. The latter claim that their setup is more "native" to a state-of-the-art cloud architecture.

End-customer segment-focus

The retailer described above has fundamentally different requirements than, for example, a company seeking to manage sensor data from industrial machinery. Major differences include different device and protocol support, different kind of required analytics and visualization, integration into different external interfaces, as well as a different kind of security infrastructure. Therefore some IoT platform companies are focusing on specific end-user segments such as Smart Home or Smart City while only very few offer the full bandwidth from the B2C maker scene to industrial settings.

- B2C (MAKER SCENE)
  The so-called "maker movement" stands for a technology-based DIY culture using mini computers such as the Raspberry Pi or the Arduino. Platforms in this space are often open-source and free to use in their basic version.

- SMART HOME
  Smart Home platforms support home connectivity standards such as WiFi, Zigbee, Z-wave, and Bluetooth. They often come with pre-built visual apps and are optimized to monitor and control devices in the house.

- CONNECTED CAR
  Connected car platforms work with traditional automotive standards as well as the next-generation vehicle-to-vehicle (V2V) communications protocol. They offer infotainment integration and pay special attention to security as hacking this platform can quickly become deadly for a vehicle driver. The platforms also integrate with telematics services such as fleet management or usage-based insurance.

- SMART RETAIL
  Retail platforms that manage the product portfolio of a retailer typically need to support a very large variety of different devices and therefore consist of numerous agents and libraries. Integration with connected enterprise services (e.g., CRM software) is also rather advanced.

- SMART CITY
  Smart city use cases such as smart parking or connected waste management often rely on low-power networks such as mesh networks, or low-power wide area networks (LPWAN). The platforms are also optimized to work with mapping services (e.g., Google maps) and local street information displays.

- INDUSTRIAL
  Industrial IoT platforms provide special gateways to integrate into existing SCADA and automation systems. Enhanced security is also of major importance as companies fear to unintentionally reveal sensitive data to customers or competitors.

- OTHER
  Other specialty platforms can be found in segments such as smart farming, connected health, or smart grid.

Integration approach

The third major differentiator of IoT platforms is the integration approach of the IoT platform company. Some platforms come as they are while others offer extensive implementation support and the option to white-label the platform.

- ONE-STOP-SHOP PLATFORM
  These platforms come with a defined set of devices that can be integrated into the platform as well as specific developer tools. There is limited technical support and little to no own platform integration/ implementation offering. Since these platform types are the most simple to use and allow for cost-effectiveness, they are often used for early prototyping and in consumer segments, where most devices have standardized APIs.

- CUSTOMIZABLE WHITE-LABEL PLATFORMS
  Customizable white-label platforms. Often found in B2B-segments such as the industrial sectors, these platforms come with extensive implementation support from the side of the platform vendor. Some of the IoT platform providers have up to 75% of their workforce working in project-specific platform integration, rather than in core platform development or other tasks. Very often these customizable platforms allow the customer to white-label the solution. The electronics retailer mentioned earlier, for example, is using a customizable white-label platform that allows it to have the customer-applications branded under its name even though the platform was provided by another party. This allows the retailer to focus on the use cases development with his customers, while the IoT platform experts focus on providing a seamless technology experience.

3 Choosing the right platform to build an IoT solution

The IoT platform is a central element for anyone deciding to build an IoT enabled solution. As with every technological element in this IoT solution architecture one of the key questions is therefore: make or buy. Do we use an existing IoT platform or do we build our own? In many cases, the wisest decision is to use an existing IoT platform. But there are many IoT platforms out there. How to choose the right one?

3.1 Make or buy?

This is one of the early decisions in an IoT project. It should be made wisely because there are risks involved either way. Choosing an external platform leads to dependencies on the IoT platform provider. Is the platform mature enough and easy to operate? Does it integrate easily with our other systems (e.g., ERP system)? Can it support all necessary functions?

One should keep the following aspects in mind:

- **Building your own IoT platform prolongs the IoT project duration significantly.** The most mature IoT platforms on the market have a cumulated twenty years of development under the hood. Even with a

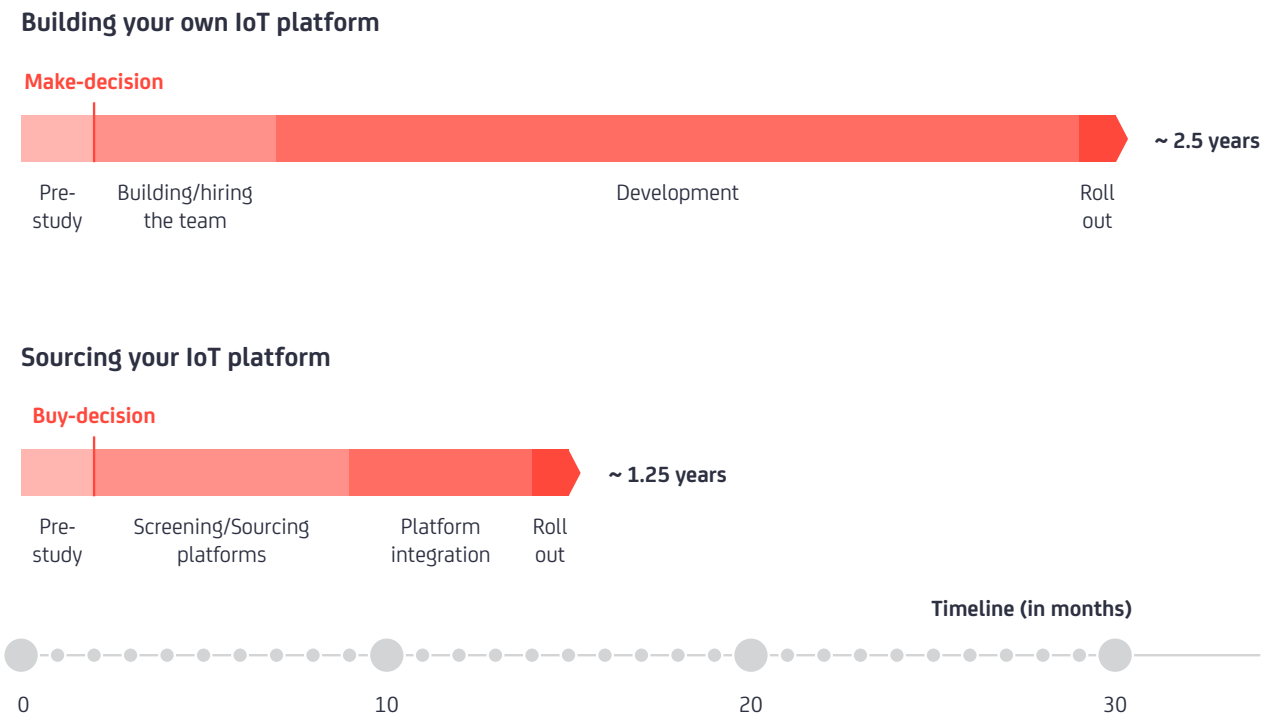


EXHIBIT 8: **Simplified IoT project timeline –** Developing your own (medium complex) IoT project could easily double time-to-market (Source: IoT Analytics)

bigger team, it can easily take years to mirror the basic functionalities these platforms have already built-in.

- **In-house expertise is rare and expensive.** Just because you have an IT department does not mean that these people understand advanced cloud computing, protocols such as MQTT, and building agents onto hardware devices. Quite in contrast, most IT departments lack expertise in these new areas of IoT. You might want to leave the development to the experts.

- **IoT projects are complex – even with an outsourced platform.** Even with an outsourced IoT platform, the overall project remains complex. The hardware needs to be integrated and there are plenty of external interfaces and additional modules such as specific analytics. You might as well focus on developing those well instead of redoing the basics.

3.2 How to select the right IoT platform. A checklist.

Once companies have decided to integrate an existing IoT platform, they will face the choice of which IoT platform.

In the evolving IoT platform market of 2015, where a lot of development is still in progress, many platforms are not fully mature and lack meaningful reviews from former customers. It is difficult to choose the right one.

Besides typical project considerations such as cost, time, strategic fit, there are some IoT platform specific requirements one should consider. With the help of several customer and expert interviews, we developed an IoT platforms selection checklist that can help in the assessment and selection of an IoT platform with the goal to make the IoT solution as successful as possible.

1. COMPREHENSIVE SECURITY

	What to look for:
a. Encryption	End-to-end encryption
b. Authentification	Multi-level-authentication, specific data-access-rules
c. Dominant programming philosophy	Code based on secure, state-of-the-art languages such as node.js
d. Defense in depth	Specific, sophisticated security mechanisms at every layer and touch-point (hardware, communication, software, applications)

2. OPEN & FLEXIBLE ARCHITECTURE

	What to look for:
a. Agnosticism	Plug & play device integration, comprehensive protocol support
b. Interfaces	Open APIs, libraries, SDKs & gateways
c. Modular Approach	Open, modularized platform

3. INTEGRABILITY & MANAGEABILITY

	What to look for:
a. 3rd-party integrations	Integrates quickly with existing IT-/ ERP-systems
b. Visual Backends	User-friendly, multi-formfactor visual backends
c. User Management	Multi-user/group/ division rights- & access management

4. ROBUST & SCALABLE IT INFRASTRUCTURE

	What to look for:
a. Servers & Network	Dedicated, hardened, and redundant servers that can handle peak-demand and have guaranteed uptime and performance levels
b. Databases	Distributed state-of-the-art IoT databases (key/value NoSQL, SQL) that handle real-time data and can be scaled to big data volumes

5. IOT CASE SPECIFIC HARDWARE AND / OR MODULES

	What to look for:
a. Hardware integration	Relevant hardware modules are already preconfigured matching the specific IoT case requirements
b. Backend applications	Relevant backend applications for the specific use case already built-in
c. End-consumer applications	Customizable white label smartphone app already built-in

6. IMPLEMENTATION / INTEGRATION / SUPPORT

	What to look for:
a. Developer documentation	Convincing manuals, wikis, blogs, potentially lively developer-community around the IoT platform
b. Technical customer service	Experienced technical expert team that is easy to reach
c. Solution development assistance	Dedicated solution team for consulting, concepting, prototyping (hardware and software), testing, roll-out, and training of employees

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Exhibits

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IoT Analytics is the leading provider of market insights and industry intelligence for the Internet of Things (IoT).

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You may get directly in touch with the authors:
Knud Lasse Lueth (knud.lueth@iot-analytics.com)
Jan Kotzorek (jan.kotzorek@iot-analytics.com)

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