

Private Equity Practice

Growing opportunities in the Internet of Things

Maturing underlying technologies will make Internet of Things technologies easier to implement and help companies and investors seize new opportunities.

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After years of hype, anticipation, and steady uptake, the Internet of Things (IoT) seems poised to cross over into mainstream business use. The number of businesses that use the IoT technologies has increased from 13 percent in 2014 to about 25 percent today. And the worldwide number of IoT-connected devices is projected to increase to 43 billion by 2023, an almost threefold increase from 2018.¹

This level of uptake is both a result and an impetus of the developing technologies that underpin the IoT. For one, technological advancement means that IoT technology will become easier to implement, opening the door for a wider variety of companies to benefit from IoT applications. Indeed, although large enterprises began to invest their sizable resources in IoT technologies years ago, the beneficiaries of this latest wave of IoT maturity will be small and medium-size enterprises. While they may not have the means to execute bespoke implementations, they can still invest in easy-to-use IoT solutions.

As frequent investors in midsize companies, private equity (PE) funds should re-evaluate the IoT as a

sector that can help create significant value. To that end, this article will serve as an overview of the growing market for the IoT, the technology's major applications, and the elements within the IoT technology stack. These insights can then be translated into business benefits for PE funds interested in becoming involved with the IoT as investors, owners, and partners.

Consistent growth

Advanced principal technologies and a proliferation of devices have helped fuel the growth of IoT technologies. In fact, investments in IoT technology are projected to grow at 13.6 percent per year through 2022² (see sidebar "Varied growth within the IoT depending on underlying technology"). Further growth in the coming years will be possible thanks to new sensors, more computing power, and reliable mobile connectivity.

Sensor technology—embedded in IoT devices—will continue to become cheaper, more advanced, and more widely available. In turn, this availability and cost-effectiveness will make new sensor

Sidebar

Varied growth within the IoT

Because IoT technologies are at different levels of novelty, they are projected to grow at different rates.

Wide-area IoT networks extend over large geographic areas, in which connected objects typically communicate at a low data volume. The number of associated devices is projected to grow at 30 percent per year from 2016 to 2022. Wide-area IoT is expected to benefit from the rollout of 5G technology, which will rapidly increase bandwidth and improve

network performance. In addition, emerging low-cost alternatives to cellular technologies will facilitate the growth of new wide-area IoT networks.

Short-range IoT networks cover small areas. They are primarily found in applications for Industry 4.0 and smart homes and are projected to grow at 20 percent per year from 2016 to 2022.

Smartphones, a mature product category, are projected to grow at 3 percent per year. The advent of 5G

connectivity might elevate growth rates because of demand for new equipment.

Personal computers and tablets, another mature category, is stable at 0 percent annual growth. Although tablets still see some uptake in enterprise settings, personal computers are already in decline as a category.¹

¹ *Ericsson mobility report*, Ericsson, June 2019, ericsson.com.

¹ *Forecast: Internet of Things — Endpoints and Associated Services, Worldwide, 2017*, Gartner, December 2017, gartner.com.

² "IDC forecasts worldwide technology spending on the Internet of Things to reach \$1.2 trillion in 2022," IDC, June 18, 2018, idc.com.

IoT solutions at two private equity–owned companies

Two companies had recent successes improving their business operations with IoT tools.

One pest-control company deployed a fully automatic solution that uses cellular connectivity to continuously monitor and control pest activity. This solution's features made it more effective for customers than conventional pest-control services and was highly profitable for the provider. Ultimately, the IoT tool replaced the standard physical and manual pest-control tools, avoided the use of pesticides, and generated data and documents required for regulatory compliance.

Similarly, a specialty-chemical company used a suite of IoT solutions to improve its manufacturing and supply chain performance. The company was able to track overall equipment effectiveness online, eliminating bottlenecks in its operations, which led to significantly improved output.

These companies' results are typical. Implementing IoT solutions often generates efficiency gains of 20–30 percent by improving performance in areas such as delivery time and pricing for tailored opportunities. In addition, these solutions can help position private equity owned companies for their next phase of growth and new investors.

applications possible, including large-scale monitoring and detection. Meanwhile, computing power has increased about 100 times in the past 15 years.³ Applications such as real-time analytics and artificial intelligence can thus shift activity from local devices toward cloud and edge computing solutions.⁴ In addition, improved mobile connectivity with the advent of 5G will allow new applications for experiences such as augmented and virtual reality.

Finally, the IoT market will grow because existing IT devices will need to be linked to the IoT. Growth in traditional connected IT devices is admittedly moderate—about 2 percent per year. However, the installed base of more than five billion smartphones, two billion personal computers, and one billion tablets indicates a massive market for device integration.⁵

Wide applications

The IoT already numbers more than 200 known applications in enterprise settings, but IoT adoption isn't limited to large companies.⁶ And early adopters have moved beyond pilots to scale IoT solutions across their businesses. Indeed, IoT technologies have already given rise to a number of landmark applications in sectors as diverse as Industry 4.0, smart cities, smart homes, connected cars, and e-health. Furthermore, advances in the technologies that contribute to the IoT mean that all affected sectors can now access functionality that did not exist five years earlier. For instance, B2B companies have started using Industry 4.0 technologies to maintain direct connections to their products in the field. This constant monitoring makes predictive maintenance possible and improves efficiency and equipment uptime (see case study "IoT solutions at two private equity–owned companies").

Significant market opportunities

The IoT technology stack has advanced over the past five years—in the meantime, each layer holds significant market growth opportunities. Device-enablement platforms have an especially strategic advantage of enabling related IoT growth while still in their own growth phase.

Smart devices—the foundational layer of the IoT technology stack and the most mature product category—are dominated by large manufacturers and specialist suppliers and enjoy healthy market growth (Exhibit 1).

The connectivity layer of the IoT technology stack is most tightly bound to mobile-network operators that offer standard cellular connectivity. A small number of well-financed start-ups have targeted this layer of the stack and have made progress in subsegments such as low-power wide-area connectivity. Connectivity technology occupies a still-growing market that's strongly influenced by international standardization in this technology layer.

³ According to Moore's Law, the number of transistors on an integrated circuit chip doubles approximately every two years.

⁴ Edge computing activity is performed in distributed nodes and can take place independent of centralized clouds.

⁵ "Gartner says worldwide device shipments will increase 2 percent in 2018, reaching highest year-over-year growth since 2015," Gartner, October 17, 2017, gartner.com.

⁶ For more information, see "Unlocking the potential of the Internet of Things," McKinsey Global Institute, June 2015.

Exhibit 1

Markets for the IoT technology layers hold significant opportunities.

■ Focus
 ● Low
 ● High
 ⬆ Very high growth
 ⬆ High growth

IoT technology stack	Description	Market size	Market growth outlook	Technology maturity
Business applications	Customer- or device-facing functionality that uses insights for added value (eg, dynamic dashboard, mobile app and embedded software)	●	⬆	●
Enablement platforms and cloud computing	Enablement platforms Device enablement platforms (including endpoint protection and access management) for obtaining, importing, and processing data Analytics and visualization applications (including artificial intelligence) for insight generation, reporting and complex event handling	●	⬆	●
	Cloud computing Data processing (usually in real time) within a central cloud server farm or with edge computing Data storage and integration using standard protocols	●	⬆	●
Connectivity	Data transmission and basic device connectivity features with cellular networks, low power wide area networks, local wireless networks	●	⬆	●
Devices	Connected devices (eg, cars, buildings, equipment, wearables) Sensors providing environmental information (eg, temperature, pressure, motion, filling level, pollution) and actuators	●	⬆	●

In the third layer of the stack is cloud computing (which facilitates central processing and storage of data) and enablement platforms (which facilitate access to devices, data across devices, and connectivity standards). Complementary analytics and computational tools have emerged to interpret, visualize, and produce insights from device data. Together, these platforms have proliferated and developed over the past five years and now simplify device integration and application implementation—a favorable growth outlook for key players.

The final and top layer, business applications, will continue to be highly fragmented, with many

disparate solutions and established companies coexisting with significant start-up activity. Because of its relatively early life, the largest IoT financial opportunities will likely come from this layer of the stack. However, cloud computing and device-enablement platforms will also be technologically and financially important.

Progress in cloud computing

Cloud platforms, the hardware and operating environments of web-based data centers, developed quickly over the past half-decade and now grow at a CAGR of 18 percent.⁷ During that time, large technology providers contributed their data-storage

⁷ Research and Markets, "Worldwide cloud computing market outlook to 2023: Anticipated to grow at a CAGR of 18% - rise in the number of SME to create new revenue opportunities for cloud vendors," *Globe Newswire*, March 14, 2019, globenewswire.com.

capacity and computing power as crucial fuel for the growth of IoT applications, which helped create numerous sophisticated functionalities for security and analytics. These functionalities were aided by strategic, technical partnerships between providers of specialized services that further augmented the value of cloud computing. For instance, a provider of cloud infrastructure might partner with a supplier of analytics solutions. In that vein, advances such as mobile edge computing (which reduces network congestion and improves application performance) can make IoT solutions easier to implement and use.

Importance of device-enablement platforms

Device-enablement platforms—connecting devices, cloud providers, and applications for optimal processing in IoT settings—are a notable source of

growth and value.⁸ In a nutshell, device-enablement platforms improve financial performance across cost, revenue, and operating efficiency, especially for midmarket companies (see sidebar “Applications of device-enablement platforms”). These platforms’ ease of implementation helps midmarket companies take advantage of IoT opportunities, even as these companies have fewer resources for bespoke solutions compared with major enterprises.

Our research indicates that as device-enablement platforms become more important, in part due to uptake among small-to-medium-sized enterprises and small- and home-office users, their corresponding revenue pools will continue to grow at an average CAGR of 24 percent, 48 percent for the IoT use cases (Exhibit 2).

Sidebar

Applications of device-enablement platforms

Device-enablement platforms make many uses of the IoT technologies possible. This role has made them a lynchpin of the technology stack. Some of the most important IoT applications of device-enablement platforms, which are now worth €2.1 billion in revenues,¹ include the following:

- 1. Device connectivity**, or basic data connections through a platform, plus troubleshooting for all IoT devices
- 2. Remote monitoring** for real-time status monitoring
- 3. Remote control** for IoT devices
- 4. Incident management** allowing for automatic reset and repair procedures for malfunctioning equipment

However, device-enablement platforms are also still heavily used for traditional IT equipment, even though the offerings for the IT market and IoT market tend to come from different companies. The most significant capabilities of device-enablement platforms for IT, a €8.3 billion revenue market, include the following:

- 1. Unified support** plays a role in troubleshooting IT equipment, access management, and file transfers.
- 2. Remote access** allows users to access and directly control IT equipment, including local data and software tools. In small- or home-office and small and medium-size enterprise settings, users generally use standard platforms; meanwhile large enterprise customers might use

proprietary solutions and customized versions of standard platforms.

- 3. IT management** involves monitoring and error detection, patch management, over-the-air updates, and data backup.
- 4. Expert interaction** includes remote expert consultations using integrated software tools.
- 5. Augmented reality field support** is training, instruction, and direct online support for field professionals (such as repair technicians and machine operators).

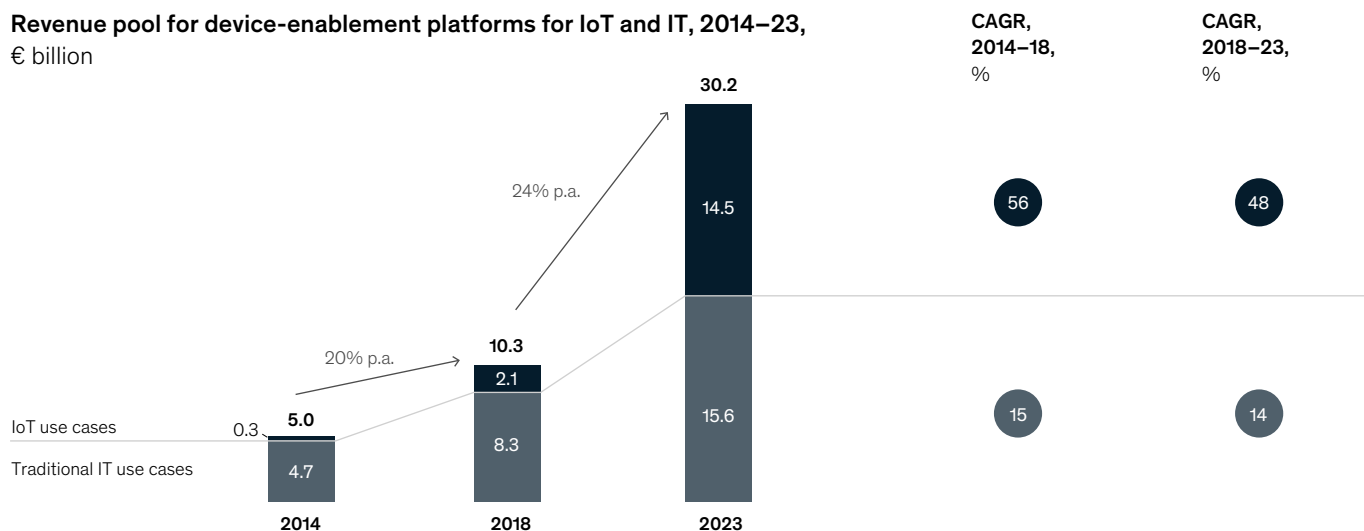
¹ Research was conducted with a focus on the EMEA market and used country-specific data; thus all monetary value is denoted in euros.

⁸ Device-enablement platforms enable the standardized use of disparate IT and IoT devices through a centralized cloud computing and data platform. These platforms also connect devices and generally support all major types of devices (such as sensors), network technologies, operating systems, and security standards. Crucially, device-enablement platforms also support standard software-development kits and application interfaces, which link devices to business applications such as analytics tools.

Exhibit 2

Revenue pools for connectivity platforms will continue to grow across use cases, regions, and enterprise sizes.

Revenue pool for device-enablement platforms for IoT and IT, 2014–23,
€ billion



By region	2014	2018	2023	CAGR, 2014–18, %	CAGR, 2018–23, %
APAC	0.8	1.6	5.3	21	26
Americas	2.7	5.5	15.8	20	24
EMEA	1.6	3.2	9.1	19	23

By company size	2014	2018	2023	CAGR, 2014–18, %	CAGR, 2018–23, %
Small or home office ¹	0.4	0.8	2.7	19	28
Small- and medium-size enterprises ¹	1.9	3.7	9.6	18	21
Large enterprises ¹	2.7	5.8	17.8	21	25

Note: Figures may not sum because of rounding.

¹Small or home office: 1–9 employees; Small- and medium-size enterprises: 10–999 employees; Large enterprises: ≥ 1,000 employees.

The majority of the device-enablement value pool is based in the Americas, where it was worth €5.5 billion in 2018. Device enablement’s importance to the IoT and its global revenue growth also means that both technological and business opportunities will be almost geography-agnostic and grow at similar rates. And although enterprise customers will remain the largest customer segment, device-enablement platforms will see fast uptake among small and mid-sized customers.

The growing market for IoT technology reflects some of the ways in which maturing technologies have begun to fulfill the promises of the IoT. PE funds should evaluate opportunities to leverage IoT in their portfolio companies and look for emerging investment opportunities in both the IoT market and in sectors that can reap outsized benefits from these technologies.

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