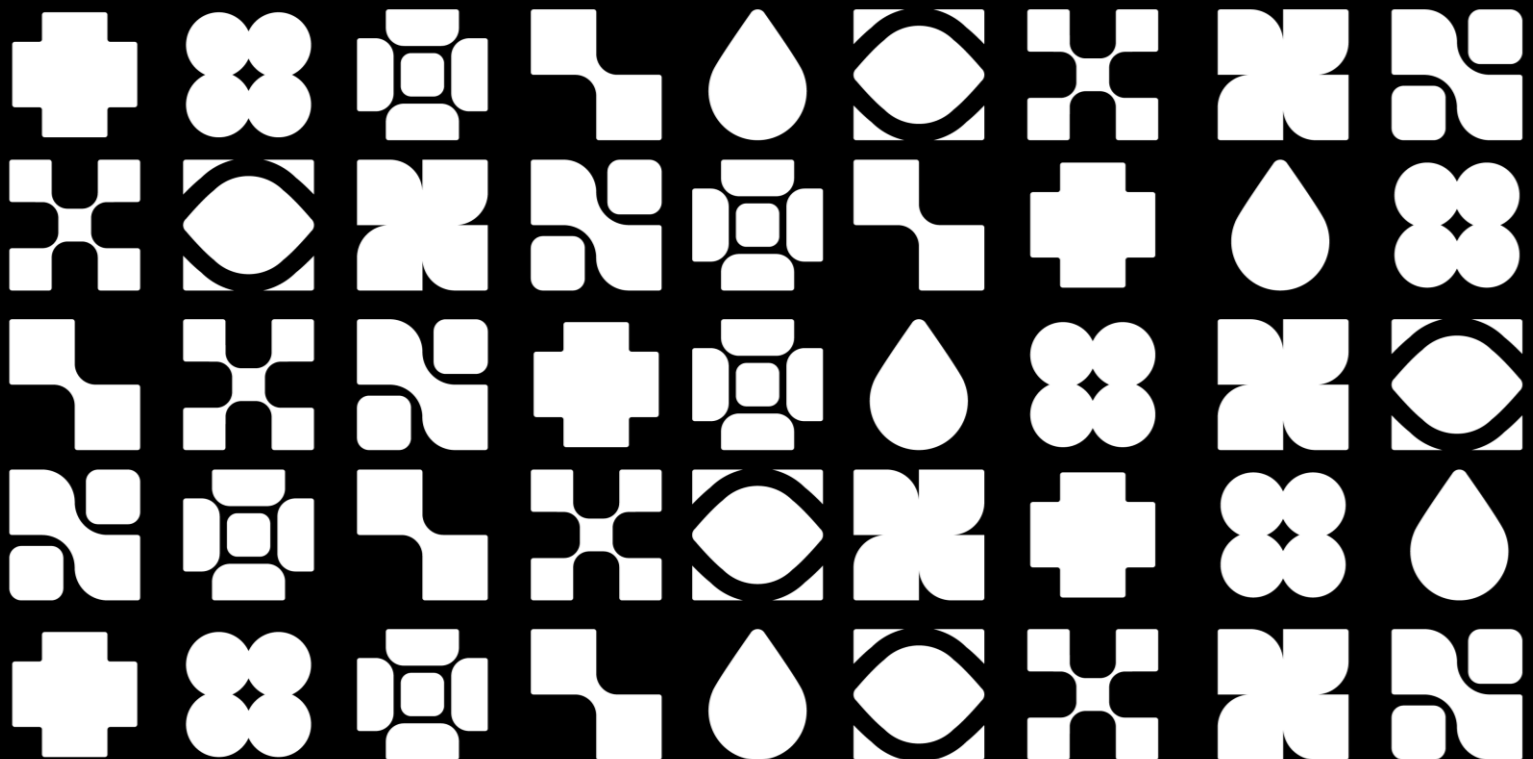




Endless ways to the future

Whitepaper

BEYOND THE SPEED: 5G'S PROMISES AND THE OVERLOOKED ASPECTS OF INNOVATION



BEYOND THE SPEED: 5G'S PROMISES AND THE OVERLOOKED ASPECTS OF INNOVATION

1. Faster data transfer than ever before

When it comes to IoT and AI, companies with production facilities or a fleet of devices cannot avoid 5G as a network technology. The benefits are straightforward: **up to ten times faster speeds and a significant increase in the reliability of data transmission.**

Low latency in the networks will be even more interesting and crucial for IoT networks and AI applications. While 4G still has latencies of 60–98 ms, **5G already offers latencies of less than 1 ms.** This new standard allows data to be transmitted and analysed in near real-time, making 5G enterprise networks an extremely interesting - if not essential - technology. 5G networks also have other advantages over Wi-Fi. In industrial environments, seamless Wi-Fi connectivity is paramount, yet challenges arise during device handovers between access points, potentially impacting operations. However, advancements in IEEE 802.11 standards, particularly IEEE 802.11r, aim to facilitate smoother transitions, mitigating interruptions. Despite this, the real-world effectiveness of Wi-Fi handovers can vary, highlighting the importance of strategic network design and the potential integration of complementary technologies like 5G to ensure consistent, reliable connections across complex industrial landscapes. In addition, minimum bandwidth and latency cannot always be maintained. **This is why 5G networks are particularly useful for large production and logistics facilities with many moving parts.**

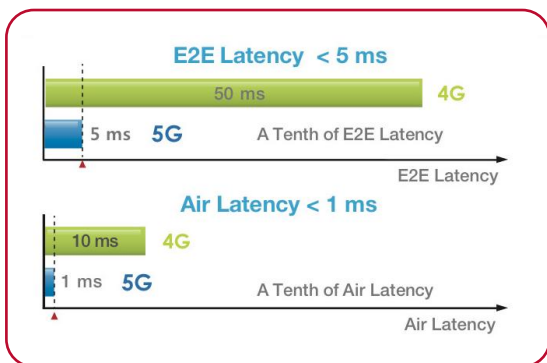


Figure 1: Comparison 4G vs. 5G

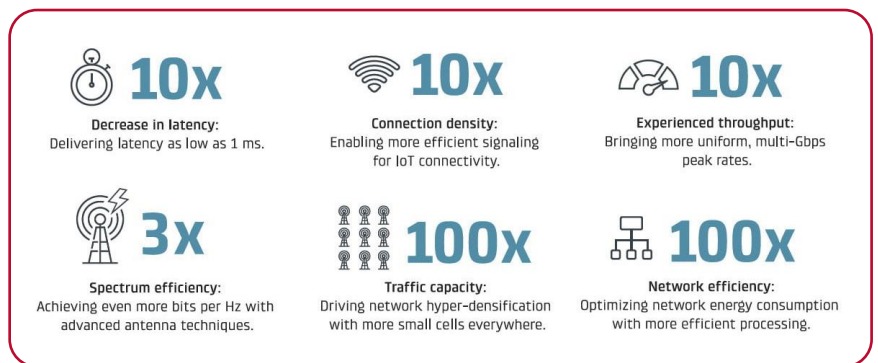


Figure 2: The landscape of 5G

Whitepaper: 5G and IoT

To build a 5G network, a demarcated frequency range will be defined and licensed. The new 5G network will be able to integrate many devices, and sensitive data will only be transported within the 5G network, providing an additional high level of security. The transmission speed and number of connected devices make 5G particularly useful for IoT networks, where countless sensors and cameras will be used. 5G will be particularly interesting in the combination of edge computing and fast data transmission to the cloud. Nothing stands in the way of near real-time processing.

The implementation of a company's own 5G network will accelerate the possibilities of IoT networks and enhance processes with real-time analytics and continuous data collection. It will also make working with the digital twin and collaborative working more feasible. 5G will also bring significant benefits to vending machine fleets and the transport sector. For example, 5G-enabled devices can make real-time route planning even more efficient, and adjustments based on day-to-day events (e.g. a major event in the immediate vicinity) can be implemented directly in the vending machines.

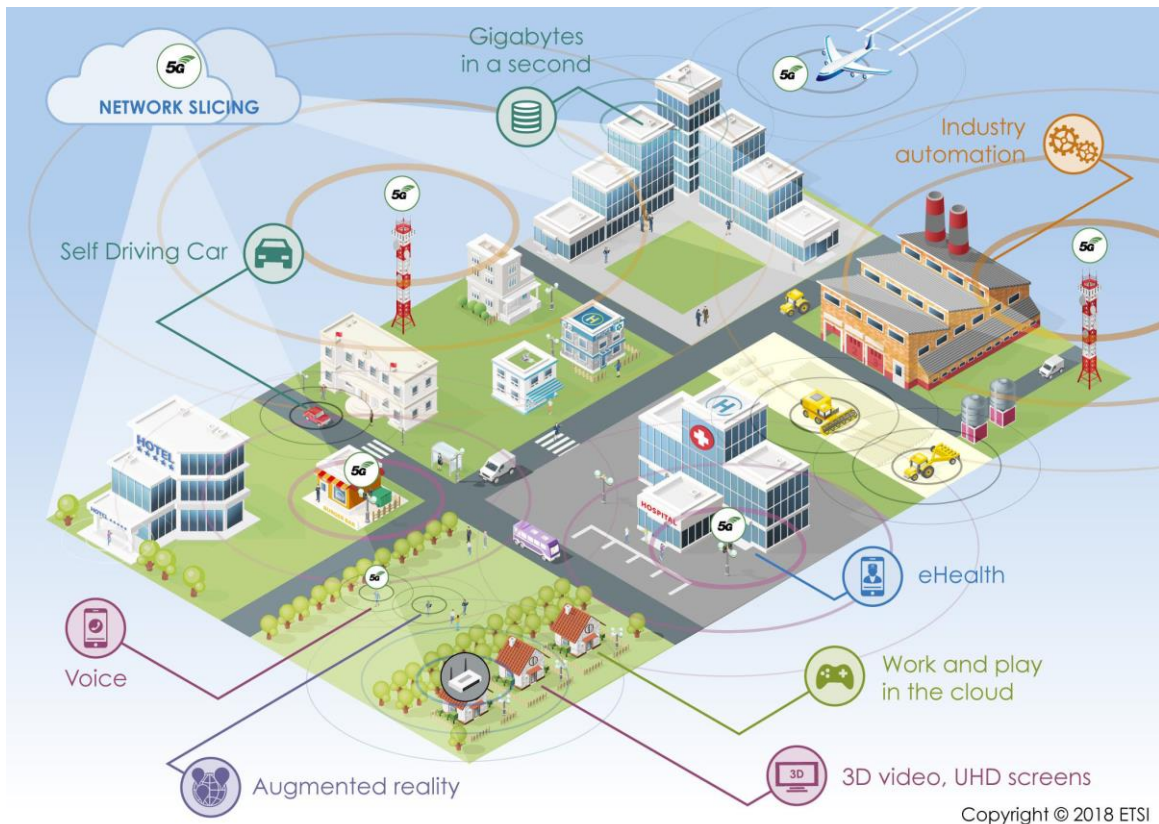


Figure 3: network slicing planned with 5G architecture (all rights reserved ETSI).

2. Critical component: the antenna

This means that 5G is a transmission technology that no one can really avoid if they don't want to be at a competitive disadvantage due to reduced transmission speeds. However, it is important to equip your devices with the right technology. Antenna positioning is critical to the success of a 5G endpoint solution. It requires in-depth expertise and specialised tools for testing and simulation. Therefore, a solution should come from an experienced provider.

SECO has decades of experience in PCB design, has built up an extensive database of stack-up layers and has analysed every aspect of the antenna position on a PCB. This enables accurate simulations. During the design phase, **SECO creates a digital twin that tests all aspects of the antenna, in particular as a critical component, even before a physical prototype is created.** Practical testing with the physical prototype then takes place in the in-house test laboratory. SECO has already recorded the antenna positions in every conceivable application scenario and can therefore offer the best possible solution to minimize interruptions or EMI interference.

Many terminals are mobile and therefore require energy-saving operation, which requires additional attention for a terminal solution. Energy saving solutions for mobile handheld devices have been part of SECO's core business for many years.

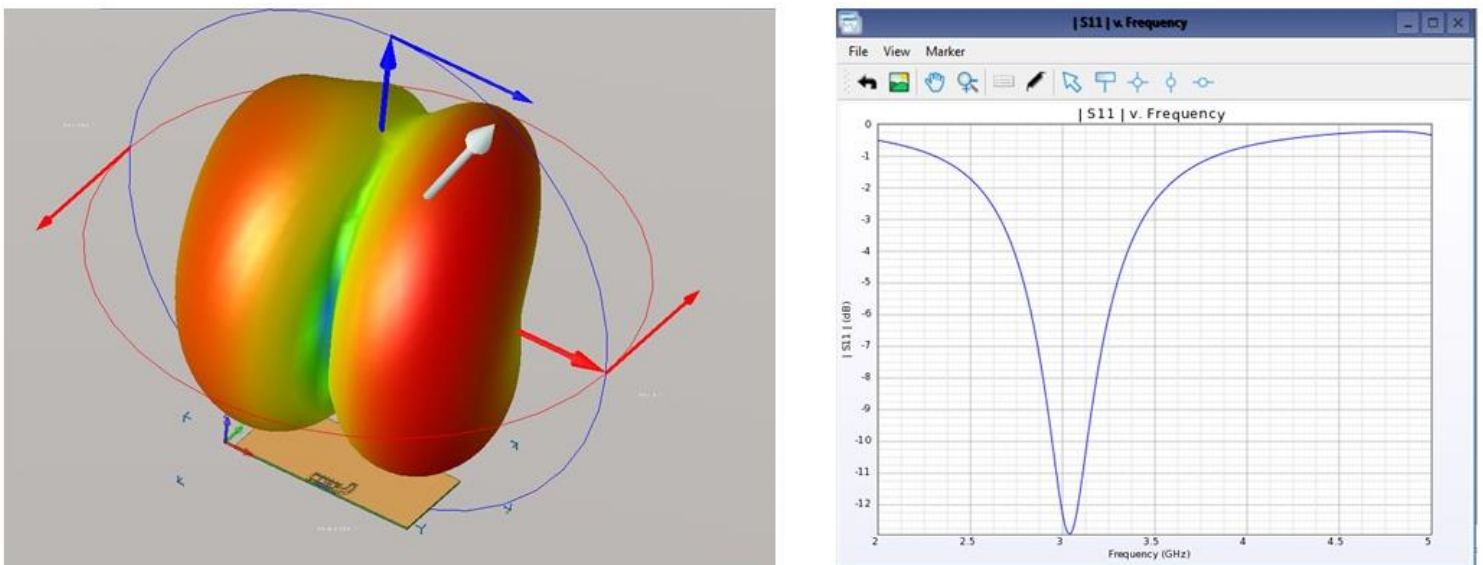


Figure 4: Simulation of the performance of the antenna position in EMPro – FEM analysis

3. Choosing an IoT platform



Figure 5: Connected devices

As businesses worldwide strive to realise the full potential of the Internet of Things (IoT), the rise of 5G technology is proving to be a pivotal development, offering unparalleled opportunities to redefine IoT infrastructure. This cutting-edge wireless technology promises to significantly enhance the capabilities of IoT systems through its superior speed, reduced latency and increased capacity for device connectivity. **Integrating 5G into existing IoT frameworks isn't just an upgrade; it's a transformative change that will enable real-time data analytics, support the deployment of complex autonomous systems, and facilitate the creation of smart environments in industries ranging from manufacturing to urban development.** By embracing 5G, businesses can achieve new levels of efficiency, innovation and connectivity, paving the way for the next generation of industrial and consumer applications.

To prepare for 5G integration, companies must ensure their IoT infrastructure is compatible with 5G technology and enhance security measures. This foundational work is vital for leveraging 5G's transformative potential in IoT applications, ensuring a smooth transition to a more interconnected and efficient operational framework.

It is important for IoT infrastructures to be able to quickly adapt both connected devices and sensors. This can be the case, for example, when production is rapidly reconfigured. In addition, the IoT solution needs to be flexible when new devices are added or when conditions change.

Today's IoT platforms need to meet requirements that will bring significant benefits in the future and that will pose a challenge to other platform solutions.

SECO has such a solution in its portfolio with the Clea IoT software stack. An often-overlooked factor in IoT networks is the scalability of the system. Nothing is more detrimental to operations than when the existing IoT solution reaches its limits. It could be that the maximum number of connected devices has been reached and stability is at risk, or that no new data packets can be processed. **Following an open-source approach, Clea uses a dynamic data model that allows it to easily adapt to changes in the network. This means there are virtually no limits to the IoT network in terms of connected devices or data volumes.** Clea users and operators are therefore not restricted in terms of scalability or the closed nature of the system. Clea and its middleware components Astarte and Edgehog can be easily implemented in any edge device.

The security of corporate data is more important than ever. Clea, as an IoT solution, offers extensive capabilities to continuously protect data and data flows. This is made possible by its open, cloud-agnostic design and the fact that Clea can be seamlessly integrated into any server infrastructure. Security software with real-time and anomaly checking is also optionally integrated to control data flow and anomalies.

What makes **Clea** special is that it **can be used for small, manageable devices and sensors, and can be easily scaled up to 6-digit devices without compromising the stability of the plastic mould.**

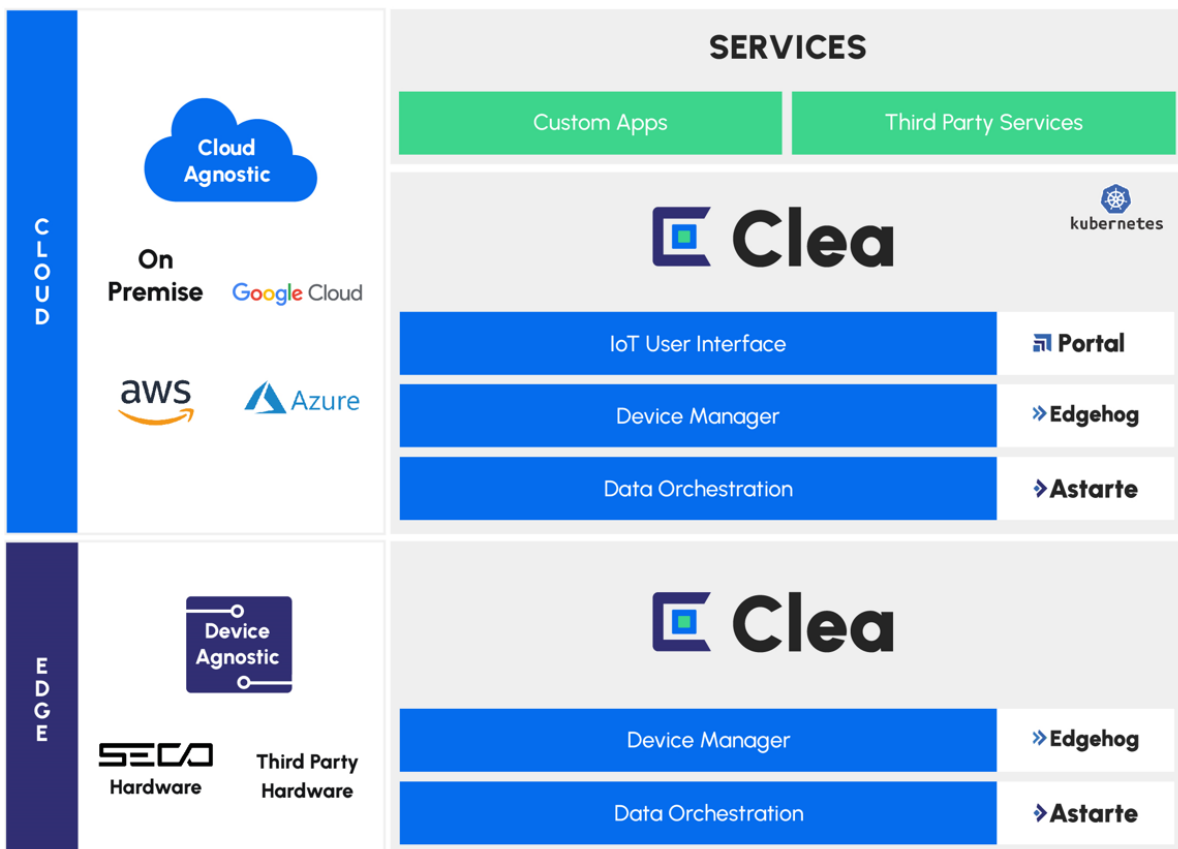


Figure 6: Clea IoT Software Stack architecture

4. The game changer in 5G networks: Slicing

Network slicing in 5G unlocks unparalleled efficiencies for IoT solutions by enabling a physical network to be divided into multiple virtual networks. Each is tailored to specific performance requirements such as bandwidth, latency and security. For operators of IoT device fleets, this means more effective use of network resources and the creation of tailored solutions that directly address their operational needs. A critical component of this ecosystem is a robust IoT platform that can not only manage large numbers of IoT devices, but also adapt to the unique QoS requirements of 5G network slicing. Such a platform ensures that each IoT application receives optimal network resources, improving real-time performance and network efficiency.

An IoT platform ready for the 5G era must offer advanced analytics, security and device management capabilities. It should facilitate the secure collection and analysis of data, provide actionable insights, and support automated decision making. It must also monitor the health and software integrity of a wide range of IoT devices. By integrating with 5G network slicing, an IoT platform enables organisations to refine their IoT deployments, deliver customised services, and explore new commercial opportunities in a hyper-connected landscape.

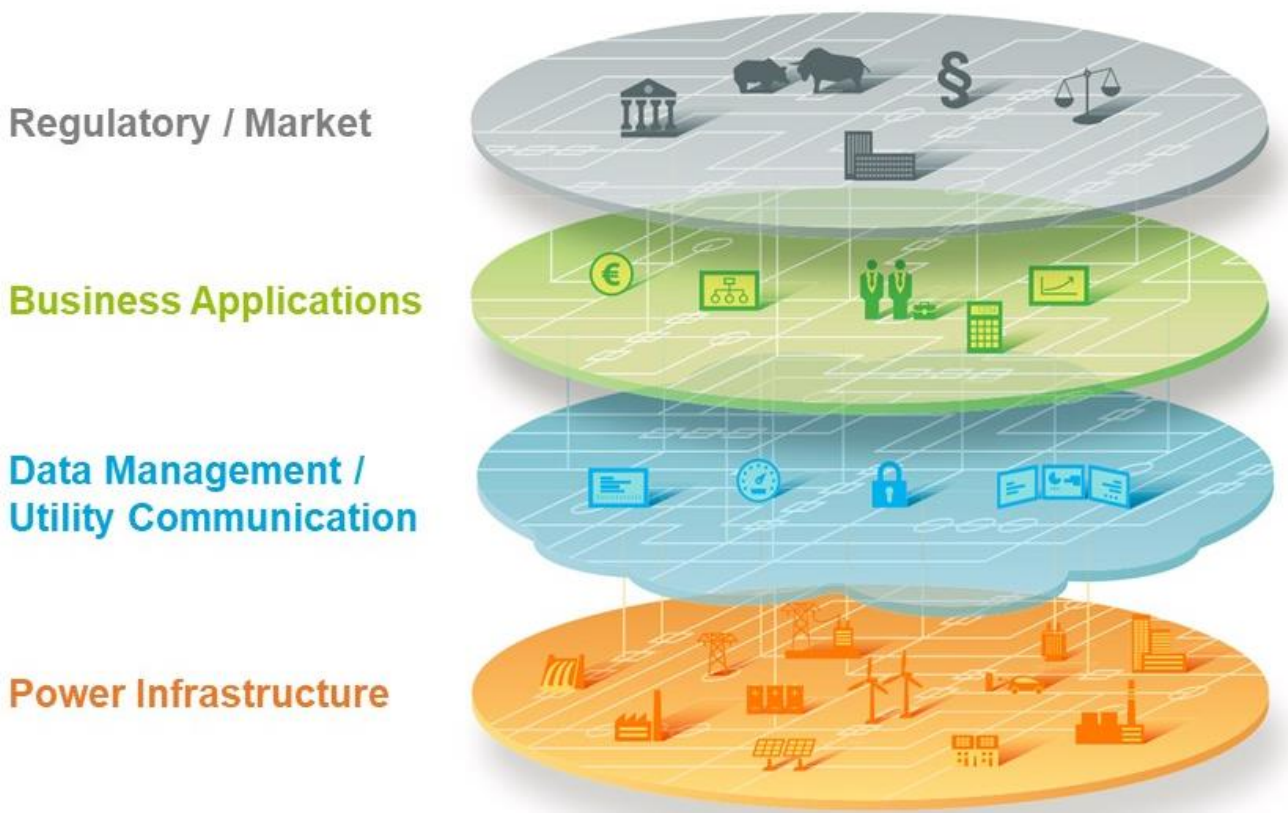


Figure 7: 5G Network slicing



Whitepaper: 5G and IoT

5. AI applications and the digital twin

Without a stable and flexible IoT platform, future developments such as the digital twin and AI applications will not be possible. Even if the added value for businesses is not yet fully apparent, certain benefits can already be derived.

The **digital twin**, for example, **is a virtual representation of a factory or building**. The digital copy can simulate and verify optimisation processes in advance and transfer them directly to the physical plant. **The predictive capability of the digital twin enables early planning and can ensure that efficiency does not suffer**. Bottlenecks can be identified and rectified or rescheduled in near real-time, or maintenance intervals can be planned intelligently.

In terms of data security, **the twin in 5G offers another advantage: making it possible to improve the security of IoT systems by providing a detailed understanding of the system architecture and identifying and eliminating potential vulnerabilities**. It can also be used to simulate security incidents in order to develop better strategies for risk management and emergency planning.

Thanks to 5G and low latency, synchronisation and data exchange will take place in near real-time. As middleware, the Clea IoT platform ensures that data can be reliably transferred between devices and the cloud, and that the digital twin can function optimally.

The digital twin is already being used in agriculture, for example, where drones are used to create a digital twin of the agricultural land. The drones measure and analyse the condition very regularly and transfer this to the digital twin. The 5G network guarantees the latest data and the twin can react quickly if action is required.

SECO accompanies their customers every step of the way towards becoming an intelligent company. All hardware solutions are designed to be IoT and Edge AI ready and can be connected directly to the IoT platform after implementation. They also support 5G and all other known connectivity options. We develop the embedded solution with you and adapt it to the application scenario so that the antenna is optimally positioned for 5G. With Clea, we build a reliable IoT infrastructure.

6. Result

- **5G** will be a **building block for IoT infrastructures** and significantly **expand the range of real-time applications**.
 - To reap the full benefits, **connected devices** will also **need to be equipped with 5G-enabled technology**.
 - The position of the **antenna** is particularly important.
 - The **IoT platform must also meet the requirements**, which will pay off in the long run.
 - **5G and IoT platforms** pave the way for **AI applications** and **digital twin** scenarios
-

Explore



Do you have an IoT project?



Explore



References

- **Figure 1:** <https://www.linkedin.com/pulse/5g-air-latency-1ms-e2e-5ms-moulay-elmanouar/>
- **Figure 2:** <https://itnspotlight.com/a-brief-introduction-into-5g-mobile-network/>
- **Figure 3:** Copyright ©ETSI; <https://www.etsi.org/technologies/5g>
- **Figure 4:** Copyright ©SECO
- **Figure 5:** ©AdobeStock_617080218
- **Figure 6:** Copyright ©SECO
- **Figure 7:** <https://tractebel-engie.de/de/nachrichten/2018/smart-grid-studie-fuer-bangladesch>



Whitepaper: 5G and IoT

About SECO

SECO is a high-tech company that develops and manufactures cutting-edge solutions for the digitalization of industrial products and processes. SECO's hardware and software offering enables B2B companies to introduce edge computing, Internet of Things, data analytics and artificial intelligence in their businesses. SECO's technology spans across multiple fields of application: serving more than 450 customers, operating in sectors like Medical, Industrial Automation, Fitness, Vending, Transportation and many others. Enabling to accurately monitor the functioning of on-field devices, SECO solutions contribute to creating low environmental impact business models thanks to a more efficient use of resources.

For more information: <http://www.seco.com/>