5G. For the mobility of tomorrow

SIEMENS

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5G is going to change the mobility industry
– it's fast, secure and reliable.

We at Siemens Mobility are ready for 5G wherever cellular is already the choice for communication, infrastructure and rolling stock. 5G opens up new prospects for passengers and operators alike and is a big step towards the mobility of tomorrow.

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5G – Changing industries

There is now no doubt: 5G is coming and will change entire industries. The commercial rollout is in full swing. Maybe you are lucky enough to be among those who already have a 5G-compatible smartphone? If so, you are already using the superfast network. However, the possibilities of 5G go far beyond this one use case.

It is the most powerful generation of mobile networks ever. 5G is faster, more reliable and consumes less energy. This makes the new technology incredibly valuable for use in industrial applications. Wherever applications require remote access to machines or plants, a public 5G network is the future.

Imagine a train traveling through landscapes and cities. The entire time it can be connected via 5G.

In addition to what public mobile network providers deliver, private standalone 5G networks can be created. With hybrid approaches to public and private networks, the industry can offer more secure and reliable communications than ever before.

5G opens up
new prospects

Data rate

Enhanced Mobile Broadband (eMBB)

- High data rates for data-driven applications
- Wide spectrum range
- Wide area of application

Number of devices

Massive Machine-Type Communications (mMTC)

- Scalable connectivity
- Wide area coverage
- Deep indoor penetration

5G

Reliability

Ultra-Reliable Low-Latency Communications (URLLC)

- Ultra-reliable for mission-critical applications
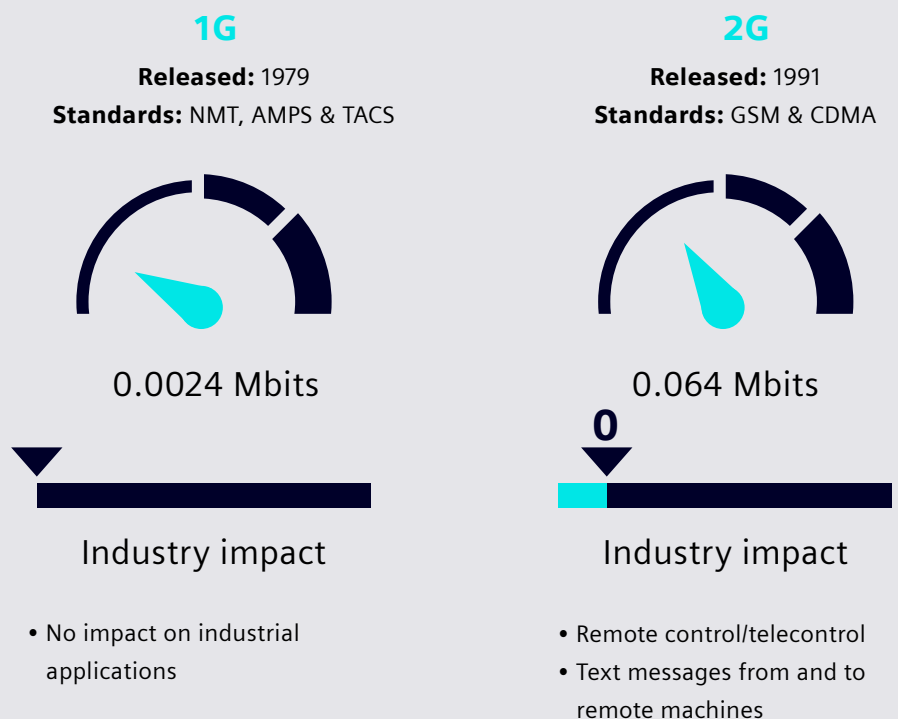- Low latency for real-time applications
- Suitable for industrial control

Security aspects
of 5G

5G security as an integral part of secure industrial operations.

5G is an enabler of both telecommunication and industrial use cases. But with many new devices connected to 5G networks, we need to understand potential security risks. The security requirements of telecommunications networks are well defined and have been widely published. The security requirements of OT networks (operational tech- nology) are different. For this reason, such networks are usually isolated from public networks.

But public and private networks grow together, which is why Siemens decided to contribute to 5G standardization. Our many years of experience with both IT and OT networks enables us to manage security risks via connected devices – today and in the future.

The history of cellular networks in industry

1G

Released: 1979
Standards: NMT, AMPS & TACS

0.0024 Mbits

Industry impact

- No impact on industrial applications

2G

Released: 1991
Standards: GSM & CDMA

0.064 Mbits

0

Industry impact

- Remote control/telecontrol
- Text messages from and to remote machines

Secure and reliable communication

Predictions are that in the future, half of the world's data volume will no longer be generated by or between people, but by vehicles, sensors, and various types of networked devices.
In the field of mobility and especially rail infrastructure 5G opens up even more possibilities for radio-based communication.

Fully-automated train operations in main line and optimized train-to-track communication as well as real-time data collection in mass transit are already on the move. Secure and reliable communication is the pillar of digital economy.

3G

Released: 2002
Standards: UMTS & EV-DO

42 Mbits

+

Industry impact

- Video monitoring
- Remote access to machines (e.g. for teleservice)
- Remote condition monitoring

4G

Released: 2009
Standards: LTE

1,000 Mbits

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Industry impact

- Mobile service technicians
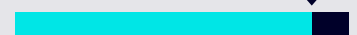- Service via smart phone
- Wireless backhaul

5G

Released: 2019
Standards: 5G

10,000 Mbits
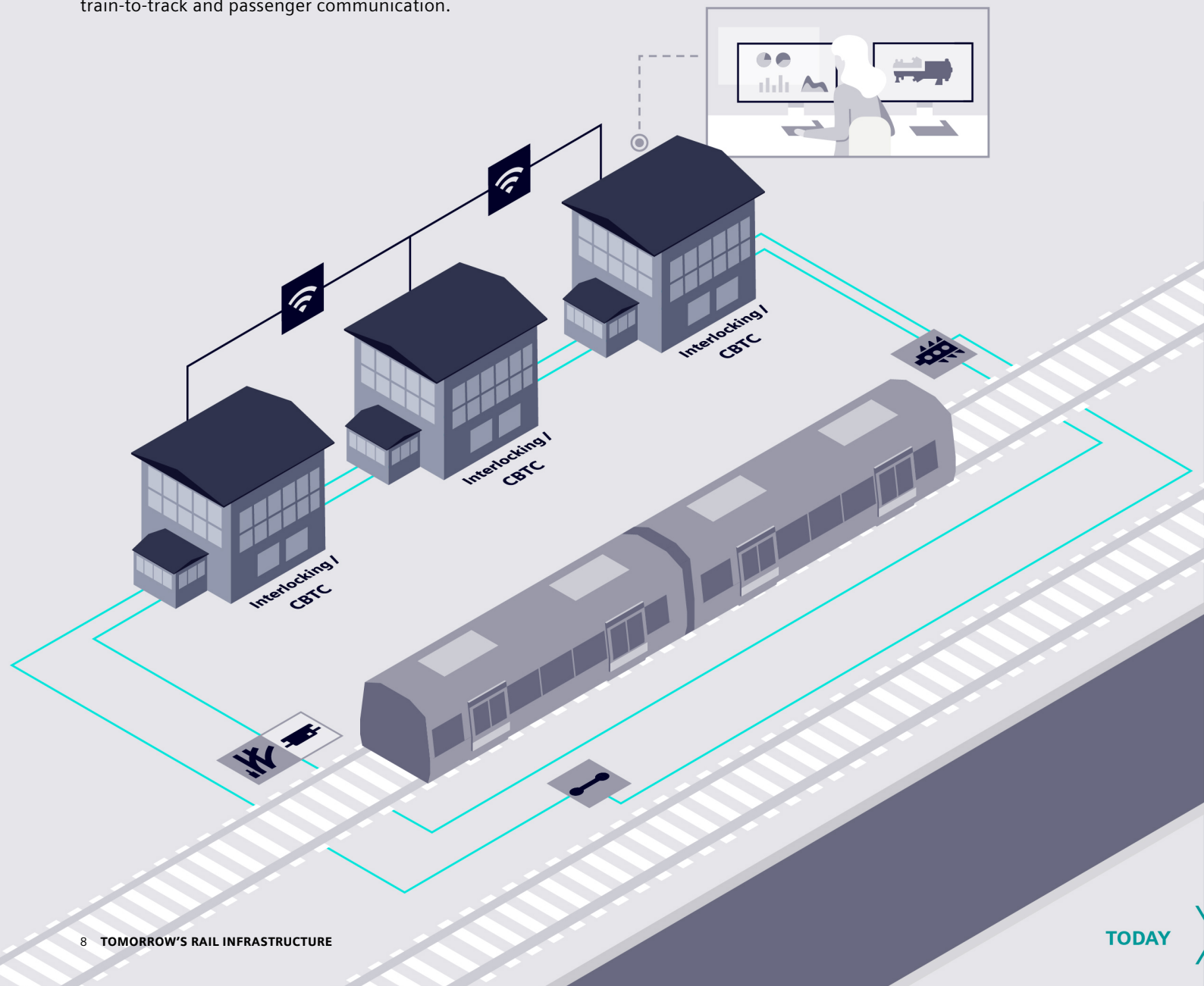
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Industry impact

- Autonomous logistics
- Autonomous machines
- Assisted work
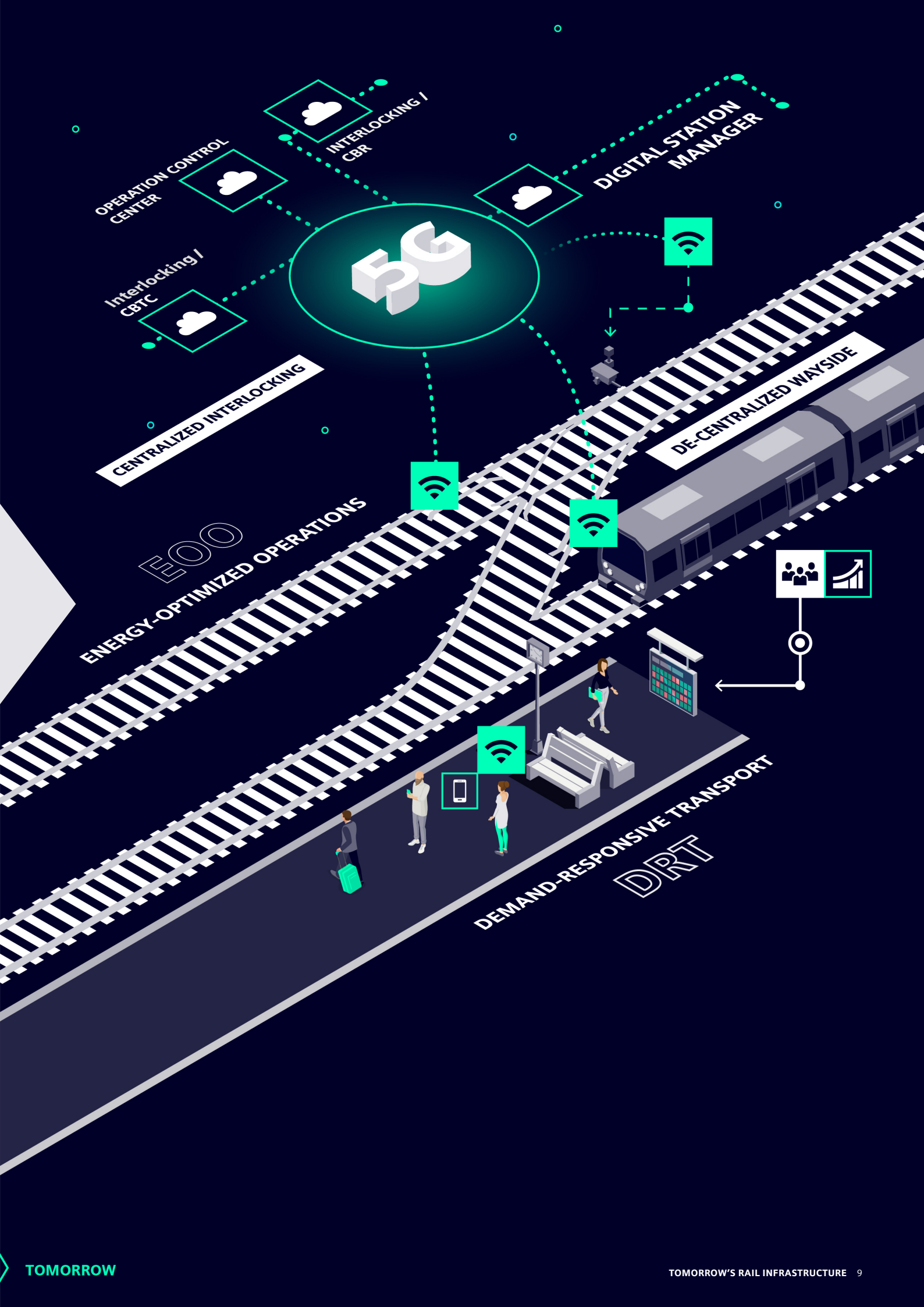- Wireless backhaul
- Edge computing
- Mobile equipment

Tomorrow's rail **infrastructure**

The future of rail infrastructure is shaped by Future Railway Mobile Communication System (FRMCS), 5G, Demand Responsive Transport (DRT), Cloud Solutions, Energy-Optimized Operation (EOO) and many more.

5G is key to sustainable mobility solutions. It will change the way mobility infrastructure is designed and installed, potentially replacing many legacy radio technologies. It will act as the standard radio technology for wireless-based activities, such as train-to-track and passenger communication.

Quite a challenge for rail operators – however, this means a big step for control centers. Operators will have an enhanced overview of the whole rail infrastructure. The changes allow for lower invest-ment, less hardware and minimized lifecycle costs.

Interlocking / CBTC

Interlocking / CBTC

Interlocking / CBTC

OPERATION CONTROL CENTER

INTERLOCKING / CBR

DIGITAL STATION MANAGER

Interlocking / CBTC

5G

CENTRALIZED INTERLOCKING

DE-CENTRALIZED WAYSIDE

EOO
ENERGY-OPTIMIZED OPERATIONS

DEMAND-RESPONSIVE TRANSPORT

DRT

Smart signaling powered by 5G **– our use cases**

Discover the feasibility of seamless 5G, cloud environment integration for data exchange and real-time communication with our use cases from several fields of the mobility industry.

Collecting and using real-time data in Mainline

The dual mode Vectron equipped with 5G onboard hardware collects useful key data on every trip, so we have information about: latency, 5G network coverage, data transmission, GPS data. Plus, we achieve 5G readiness for future Automatic Train Operation (ATO).

Communications-Based Train Control (CBTC) in the Oslo Metro system

Thanks to 4G where public networks are used, the radio-based CBTC signaling system and its related services allow for real-time data on vehicle position and speed profiles. The digitized Oslo Metro system can thus safely increase the number of vehicles on a rail line, and the tighter timing of train arrivals will enable it to handle higher passenger volumes.

Additionally, ongoing system status updates will improve operational efficiency with the grade of automation 2 (GoA 2), resulting in fewer delays and up-to-date travel information.

S-Bahn Hamburg: Highly automated train operation in Mainline

For the densely populated city of Hamburg, the challenge was to increase capacity on existing lines, while also ensuring timetable stability, improving punctuality, and shortening stopping times.

With implementing an ATO according to the latest European Train Control System (ETCS) a higher degree of automation for passenger operation in mainline has been reached. 5G data transmissions are fully realized for communication from train-to-track and security transmission for track-to-track – to improve throughput and reduce energy consumption.

Efficiency of electrified railroads paired with flexibility of trucks

Imagine a huge number of moving vehicles, infrastructure and operation devices being connected as reliably and powerfully as by cable. 5G promises a lot for transportation via roads. Our eHighway test bed in Munich Perlach serves as a very encouraging example of an efficiently running system based on a private 5G network. With the core innovation of the active pantograph and usage of large amounts of sensor data, the eHighway system enables trucks to use renewable energy and therefore help reduce CO_2 emissions.

What's next?

Our commitment to sustainable and innovative solutions is shaping our future.

For even smarter and more comprehensive "Artificial Intelligence" in the rail sector, new concepts and technologies are needed for the communication between trains and infrastructure – from passengers to operators.

Applications via 5G for data and video transmission, for "prudent" AI solutions are already no longer hurdles for us. This takes effect in areas such as autonomous train control, augmented reality applications for safe and effective driving, and virtual reality applications for users.

The unprecedented reliability and low latencies, as well as the comprehensive connectivity of 5G, are paving the way for trend-setting applications in the rail sector.

In the search for long-term sustainable communications solutions, we are already focusing on new cellular technologies. Even though we are just at the beginning of 5G, the sixth generation mobile network is surely on the horizon. We are actively involved in the development and technical realization of the new standard for the industry.

Smart signaling with 5G

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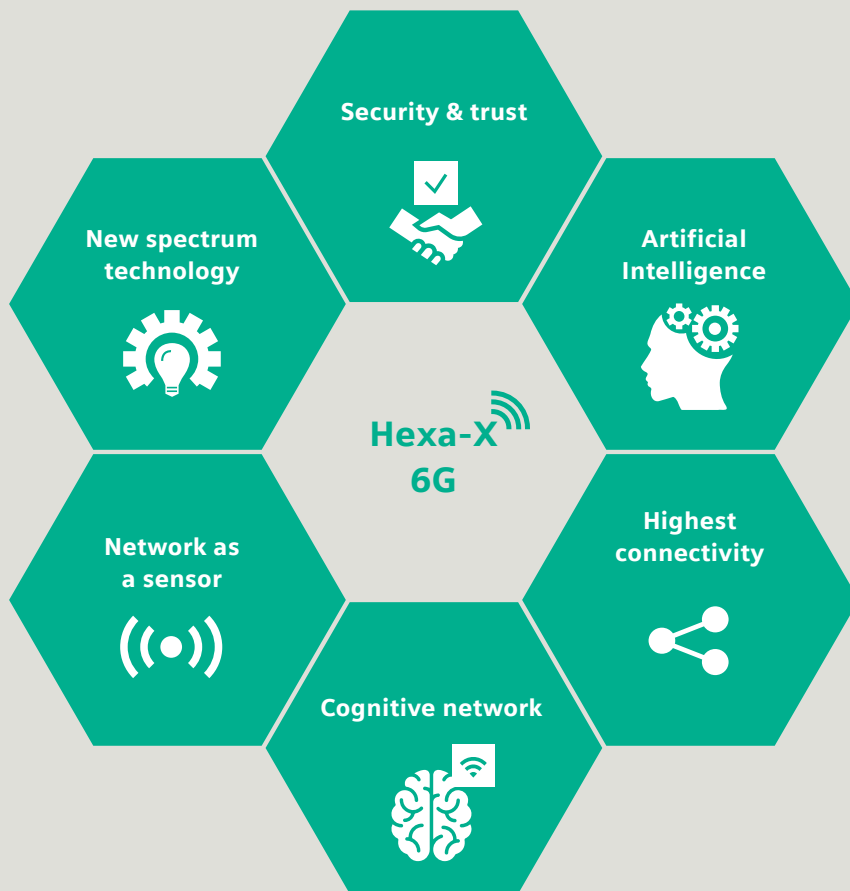
The Hexa-X vision is the necessary next step to combine the digital, human and physical world. We bring it to life.