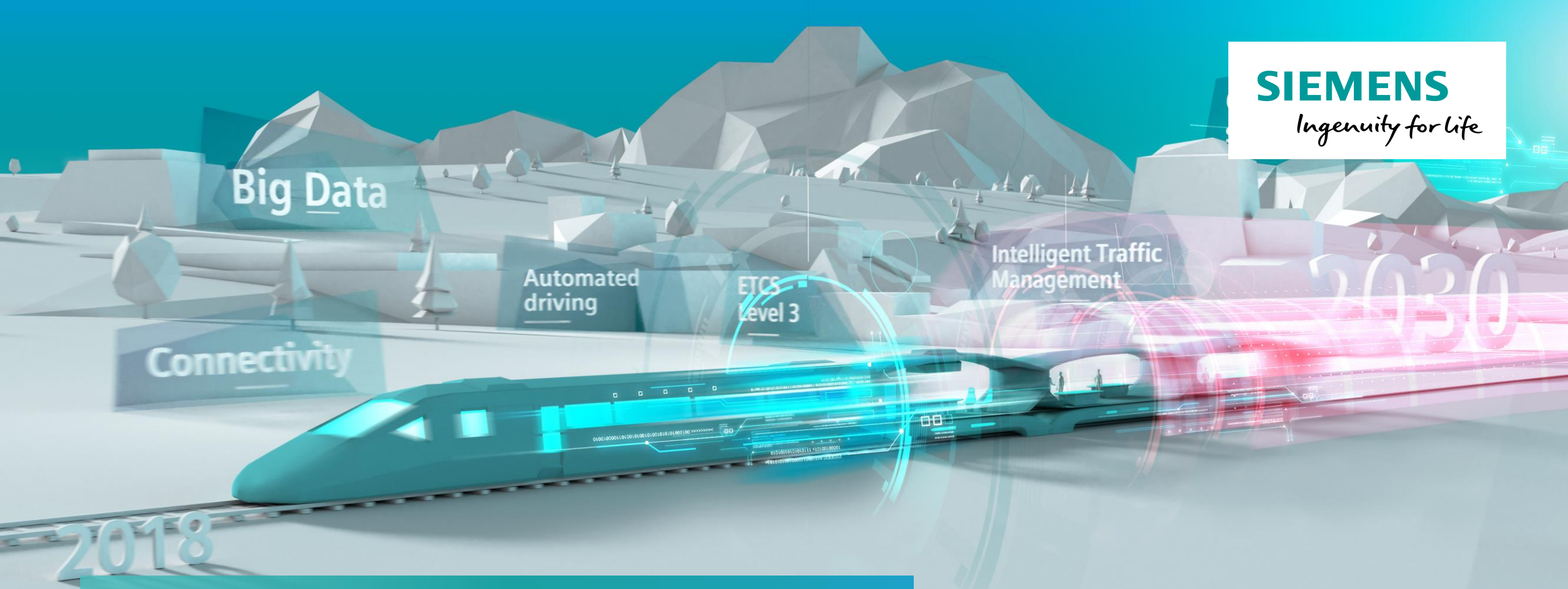

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ATO/UTO Use Cases

Voices on automatic train operation

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"As soon as 2020, around 40 percent of train journeys could be running automatically. We also expect 20 to 30 percent of long-distance travel to be partially automated by then."

Dr. Jochen Eickholt, CEO of Siemens Mobility Division, 2016

"The extension of ETCS is the basis for autonomous driving on railways and prepares the next technology push in railway traffic."

„Zukunft Bahn" quality program, German Railways, 2015

"Automated driving is, in the medium and long term, one of the major innovation levers to improve the competitiveness of rail freight transport."

Technology and innovation strategy @ DB Cargo, 2017

"ATO is an important component of SmartRail 4.0 and contributes to the aims of safety and increased capacity."

SmartRail 4.0 – an innovation program of the Swiss railway industry , 2018

Major constraints in introduction of automated driving in mainline rail services

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MASS TRANSIT

Single operator
for infrastructure and vehicles

Purely passenger transport

Identical vehicles
with similar characteristics

Simple infrastructure
closed and access-protected

Integrated system
as closed solution of a single vendor

MAINLINE

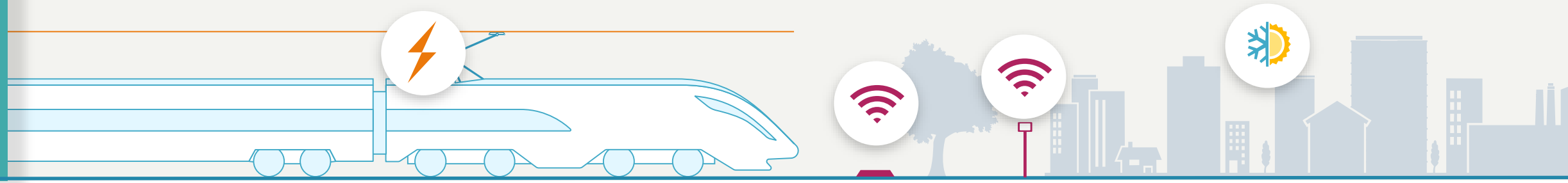
Various operators
for infrastructure and vehicles

Mixed traffic
comprising high speed, regional and freight transport

Multiple vehicles
with different characteristics

Highly complex infrastructure
open and publicly accessible

Network-wide interoperability
with a wide range of signaling solutions of multiple vendors



Towards fully automatic train operation in line with GoA 3/4 via organizational and technical expansions

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MindSphere for extended data analysis…

MindSphere

…and to provide additional services

- Adjustment of normative and legal conditions
- Definition of operational fallback scenarios in case of disturbance
- Adjustment of operating rules
- Technical support in case of vehicle disturbances and emergency situations
- Automatic obstacle detection and platform protection (obstruction detection)
- Utilization of state-of-the-art communications (e.g. 5G)

Various operators
for infrastructure and vehicles

Mixed traffic
comprising high speed, regional and freight transport

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with different characteristics

Highly complex infrastructure
open and publicly accessible

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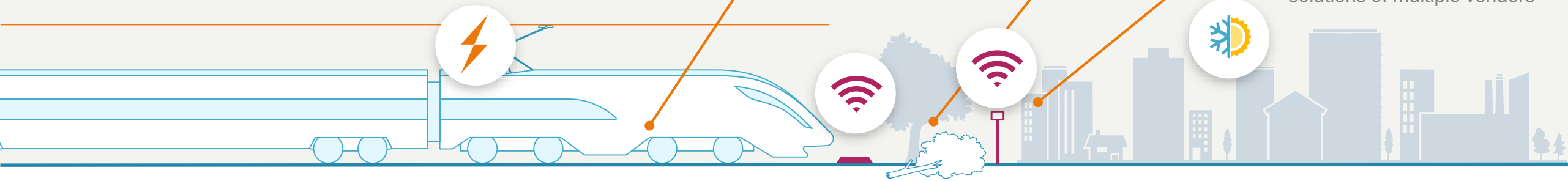

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Use Cases

Siemens is pioneer for highly and fully automatic train operations

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Siemens has already equipped more than 300 route km for metro systems with technology for driverless train operations worldwide and is therefore market leader in this field.

Shift2Rail „ATO over ETCS“ (X2Rail-1)
Specification and development of interoperable ATO (09/2016 - 08/2019)

ATO for freight transport
Demonstrator for automated driving in rail freight transport

Thameslink (2018)
First commercial ATO application in mainline rail services with ETCS

ATO demonstrator for SBB (2018)
ATO over ETCS L2 with ETCS Baseline 2.3.0d

Autonomous tram (2018)
Demonstrator for automatic obstacle detection in real-life operation

„Digital S-Bahn Hamburg“ (2021)
Reference project for „Digitale Schiene Deutschland

Luzhskaya Hump Yard
First ATO/UTO application for shunting locos

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Joint Project of RZD, NIIAS and SIEMENS

- ATO/UTO shunting operation powered by MALS (RZD/NIIAS)
- ATO/UTO humping operation powered by MSR32 (SIEMENS)
- Joint RZD/SIEMENS application for IP rights (invention for Method and System of managing of train in the humping and sorting out process)
- Start of operation in 2017

Thameslink
First commercial ATO application in mainline rail services with ETCS

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World's first commercial ATO application in mainline rail services in combination with ETCS

- Delivery of rolling stock, ETCS and ATO
- Increased capacity on existing infrastructure (24 trains per hour, track and direction on the north-south inner-city link of London)
- Capacity objectives only achievable with ATO
- ATO over ETCS in the core area (communication via Packet 44) with ETCS Level 2 Baseline 3
- Start of passenger services with ATO in May 2018

“Digital S-Bahn Hamburg”
Reference project for „Digitale Schiene Deutschland“

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First-time implementation of highly and fully automatic train operation in regional and mainline rail services in Germany

- Joint project with City of Hamburg and DB AG
- Equipment of a 23 km section with ETCS Level 2
- Equipment of four trains and the trackside operation control with ATO over ETCS
- Unattended, fully automated train operation between depot and platform
- Putting into operation by the “Intelligent Transport Systems (ITS)” world congress in October 2021

Autonomous tram

Demonstrator for automatic obstacle detection in real-life operation

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World's first demonstration project for autonomous tram in real-life road traffic

- Joint project with Verkehrsbetriebe Potsdam GmbH (ViP)
- Rapid correct reaction to many challenges (pedestrians, crossing vehicles and priority situations)
- Lidar, radar and camera sensors as digital "eyes" to read the traffic environment
- Complex algorithms as "brain" to interpret, evaluate and predict driving situations

ATO for freight transport

Demonstrator for automated driving in rail freight transport

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Ingenuity for life

World's first demonstration project for automated driving in rail freight transport

- Joint project with DB Cargo
- Integration of ATO and additional sensor technology into an existing locomotive
- Automated driving at maximum speed as well as driving through a speed restriction section, automated braking and starting according to track specifications
- Automated sensor-supported approaching to car cuts for coupling
- Sensor-controlled obstacle detection
- Remote control via tablet

ATO for freight transport

Demonstrator for automated driving in rail freight transport

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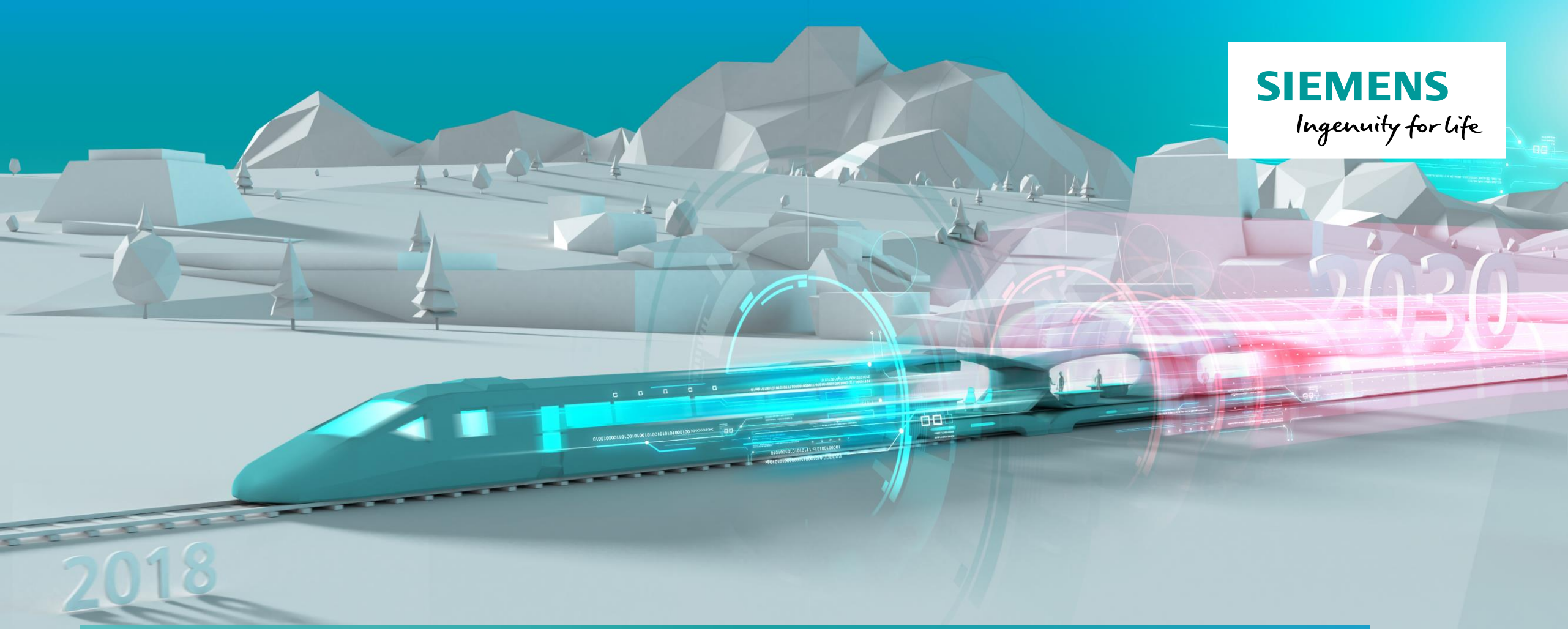

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We turn your vision into reality.