5G in Transportation – pioneering the digital transformation in the transportation industry

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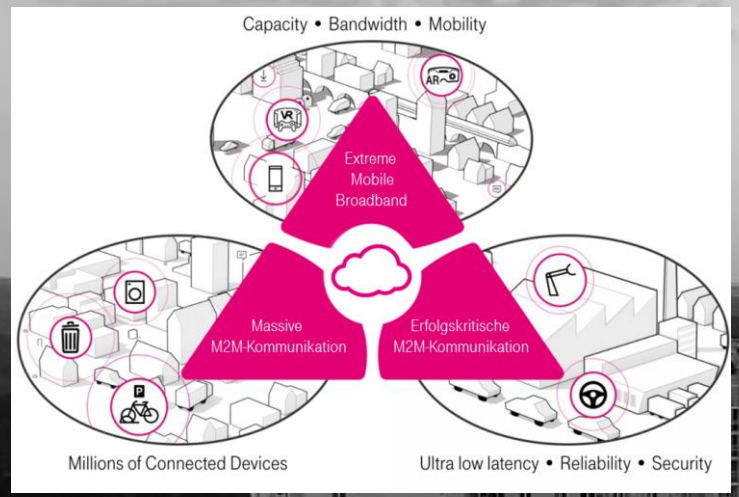
Deutsche Telekom AG / T-Systems International
Munich, November, 2019

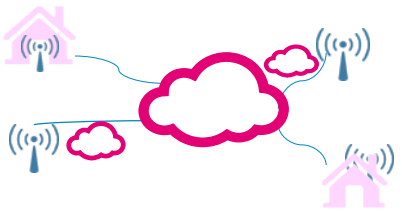
T··Systems· Let's power higher performance

5G: A NEW RADIO
.... AND 4G/LTE (*) AS INTEGRAL PART

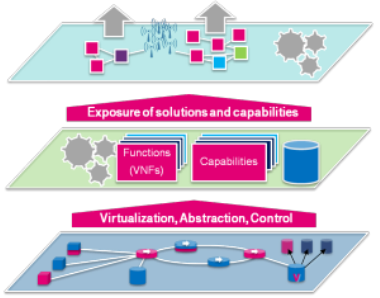
(*) LTE: LONG TERM EVOLUTION



5G: NEW CORE FEATURES



Networks in the Clouds

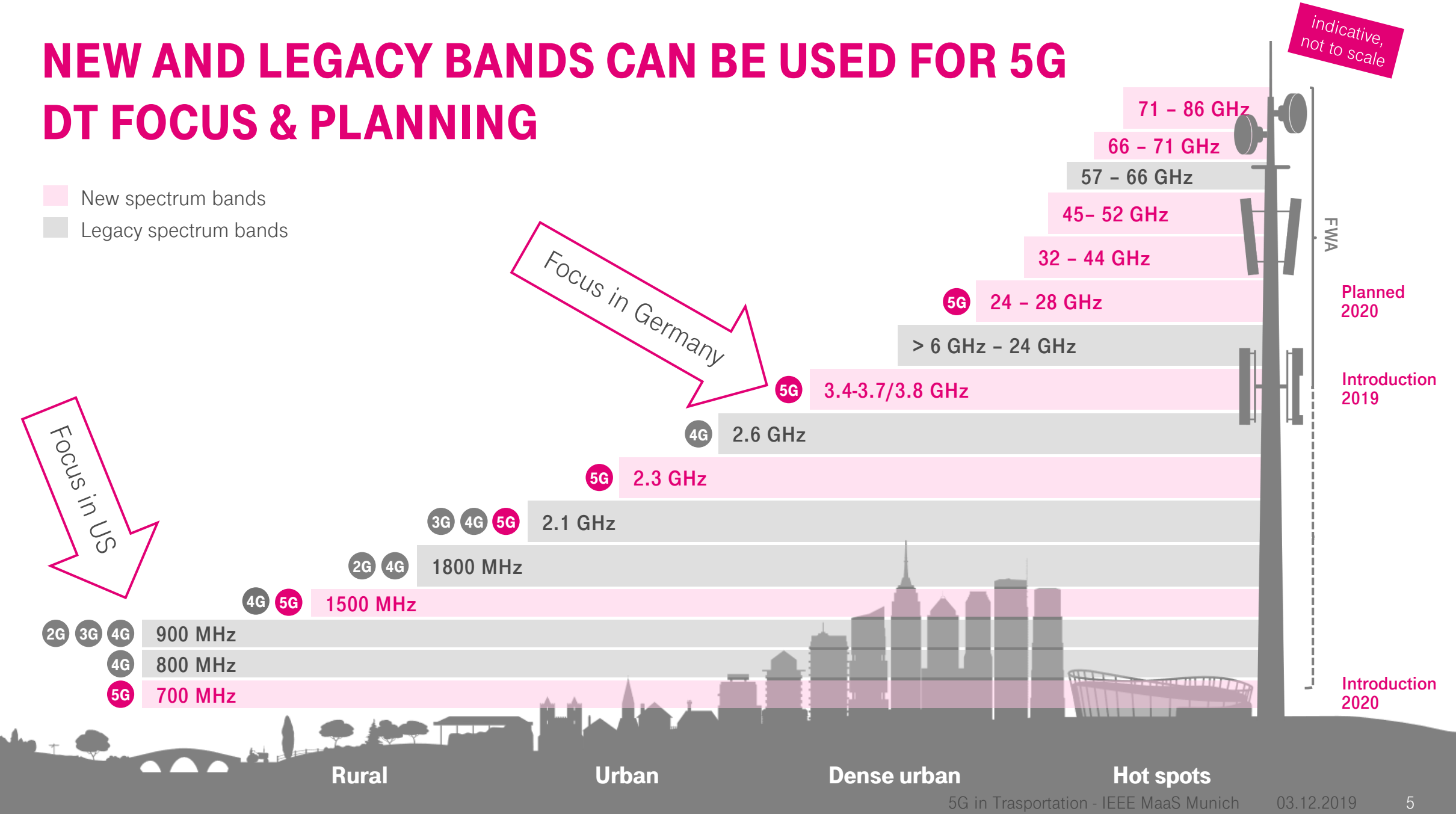


Network Slicing

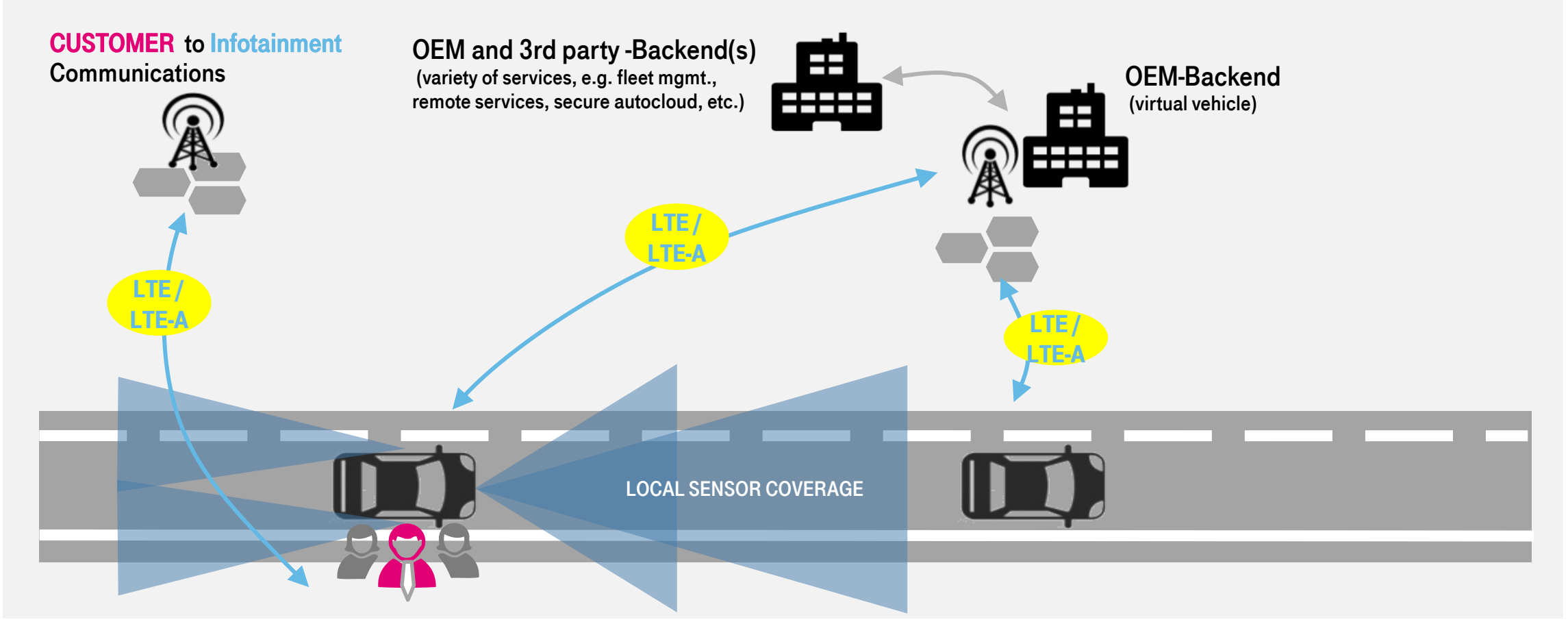
Ultra dense Networks

5G: RADIO (LTE + 5GNR) + CORE FEATURES

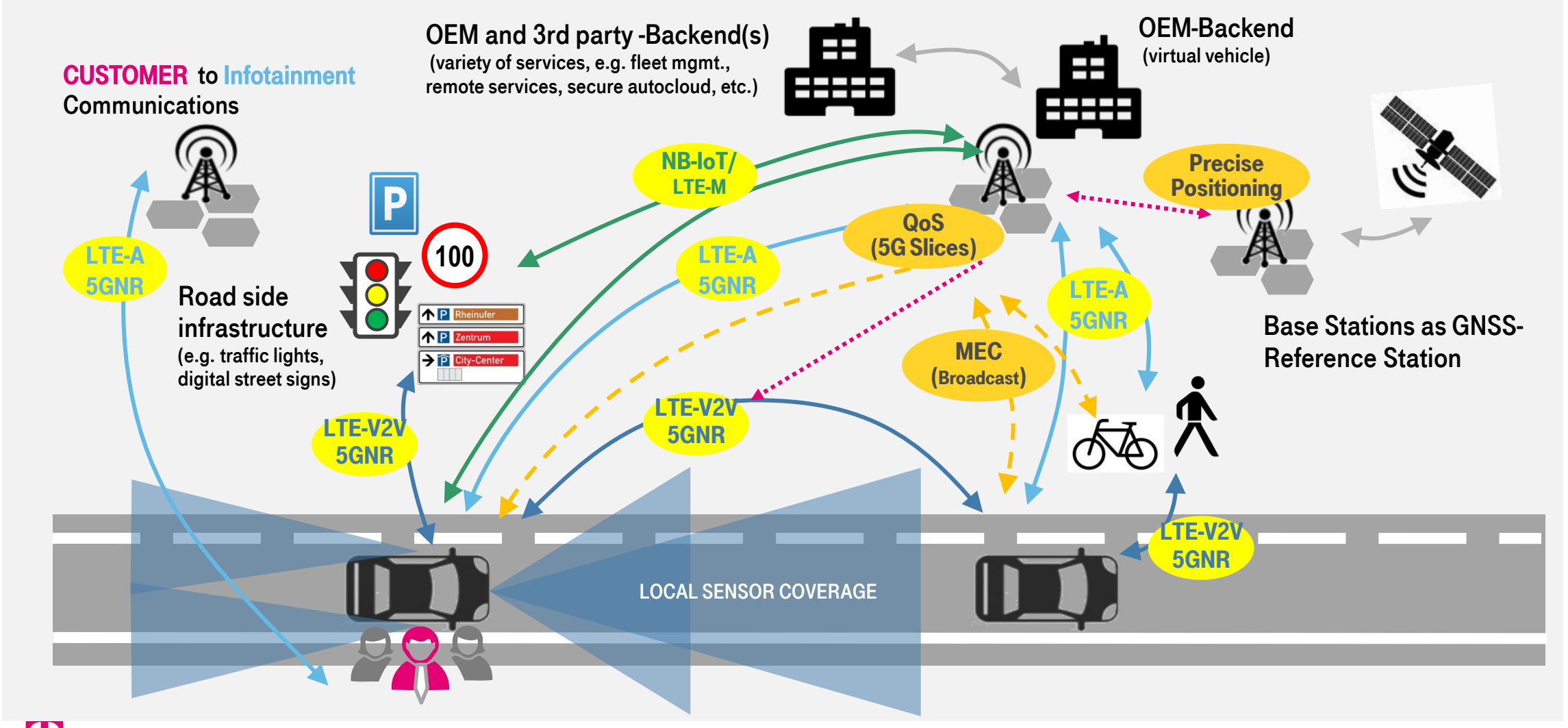
NEW AND LEGACY BANDS CAN BE USED FOR 5G
DT FOCUS & PLANNING



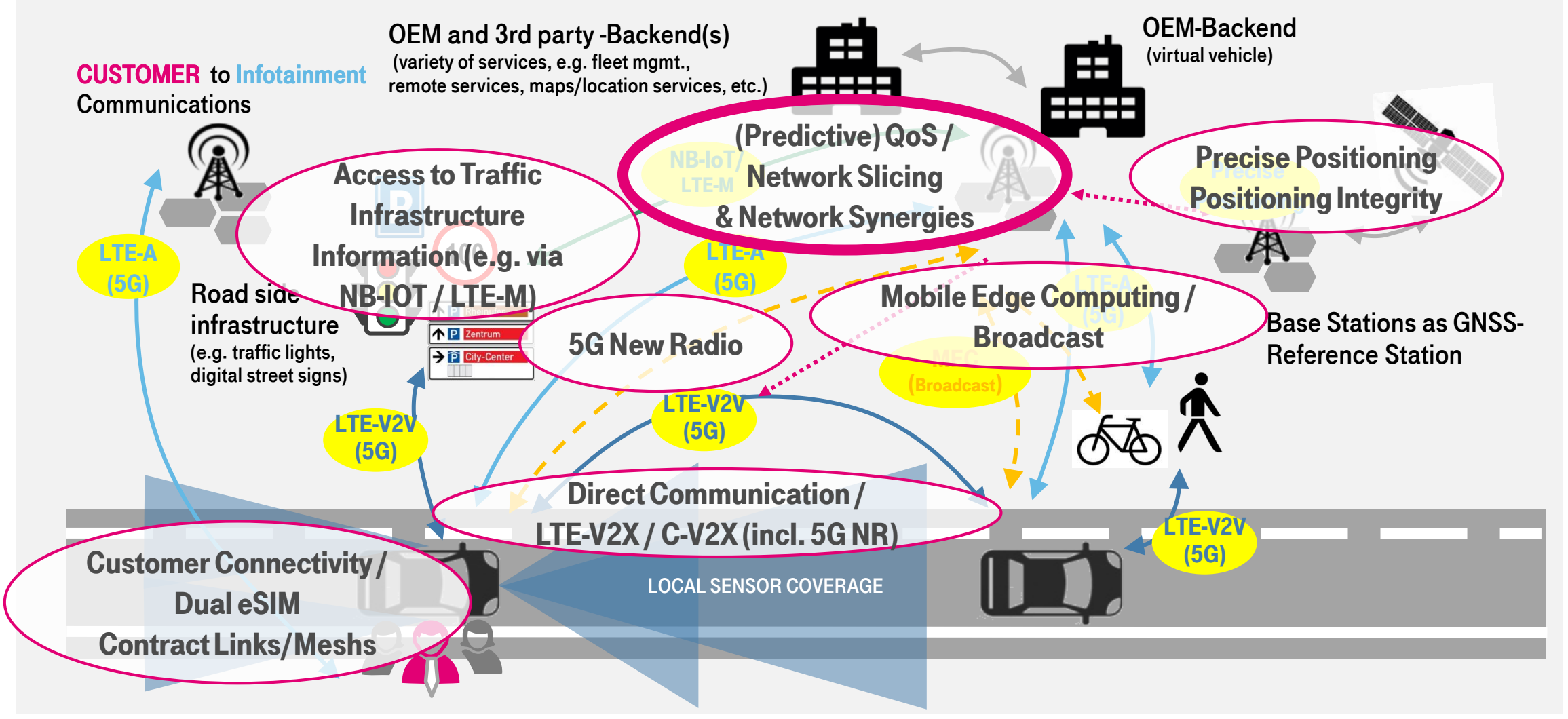
AUTOMOTIVE PICTURE TODAY
CELLULAR CONNECTIVITY AS A MATTER FACT



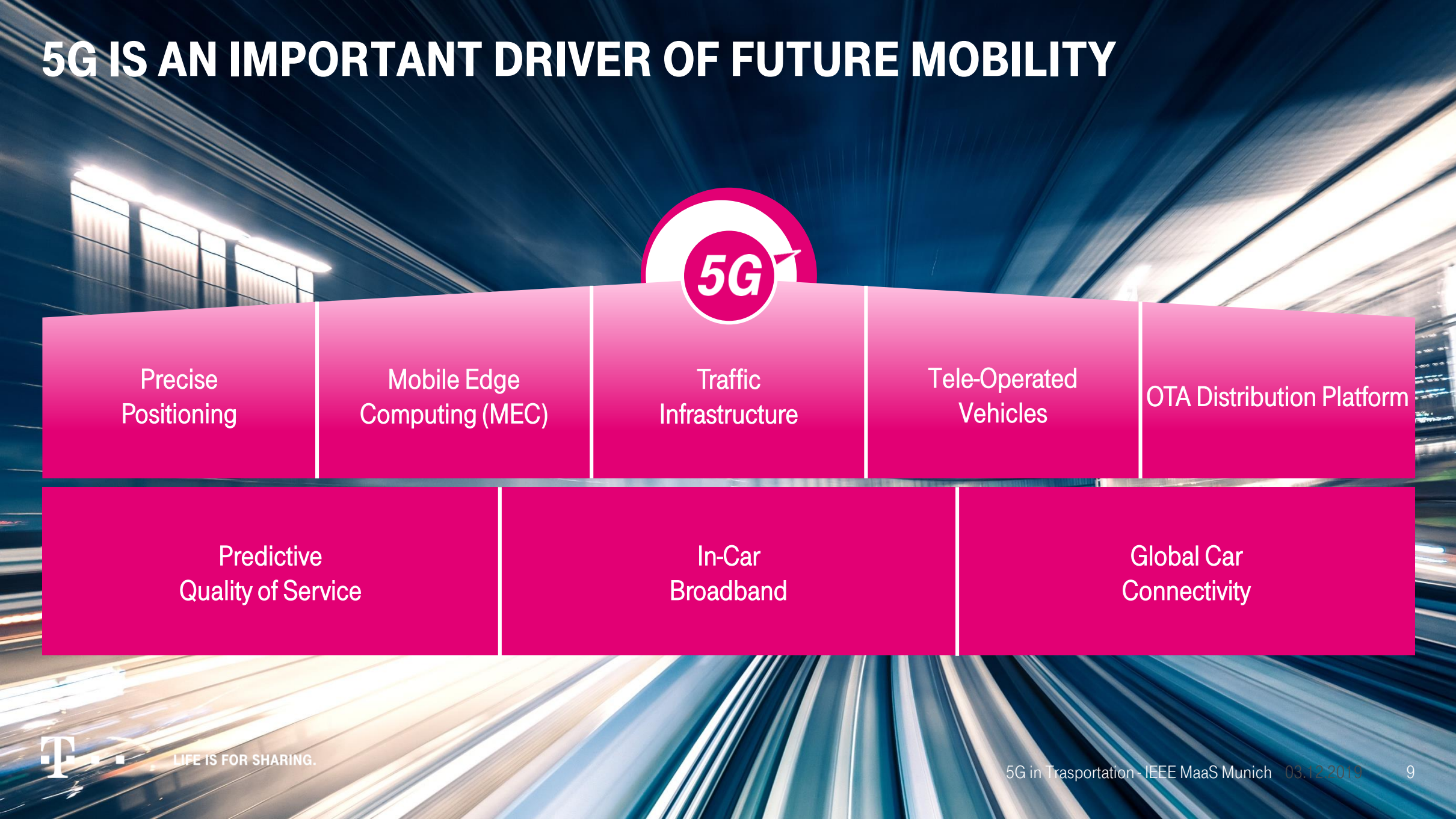
EXTENDED AUTOMOTIVE CELLULAR CONNECTIVITY



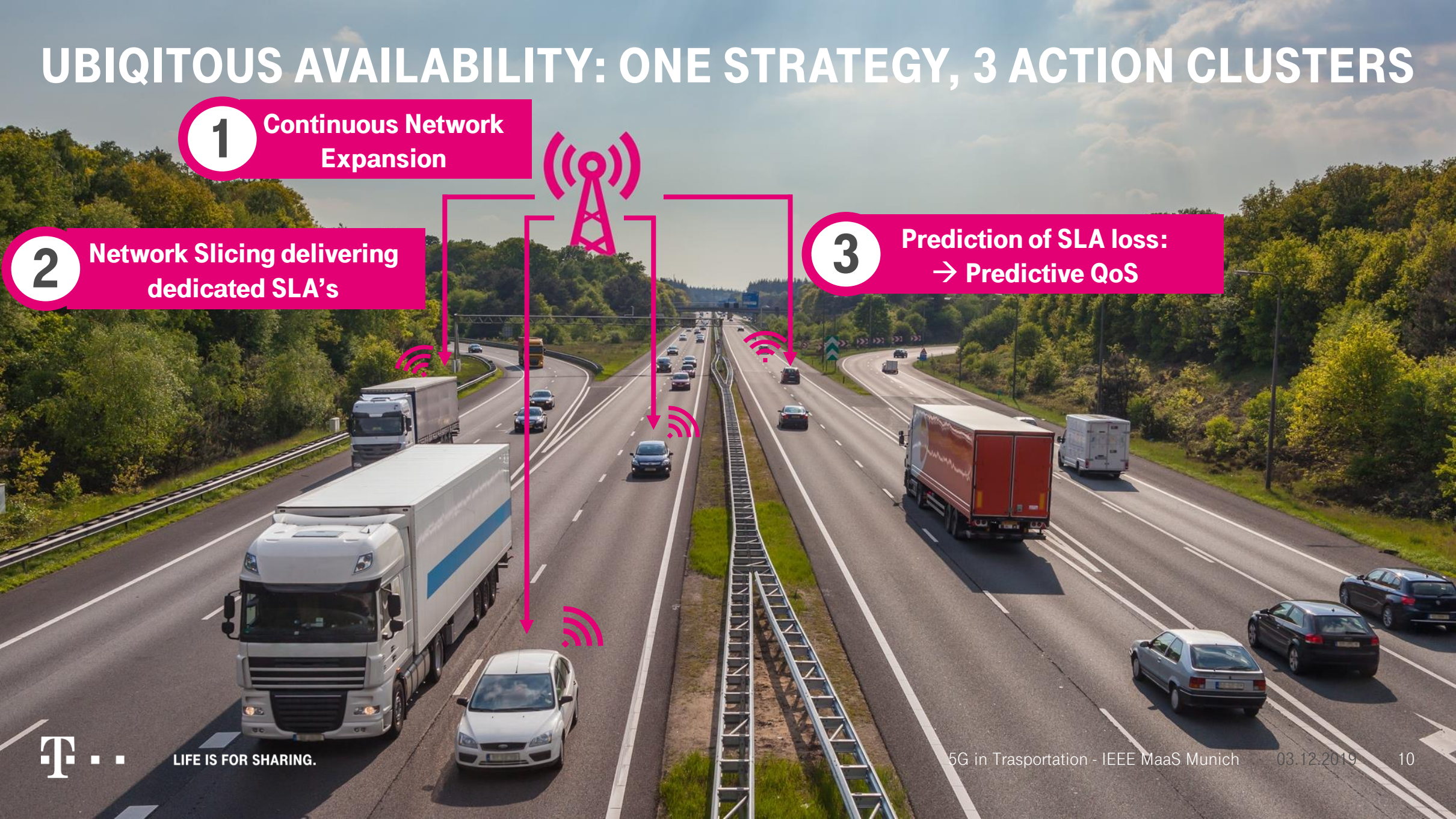
AUTOMOTIVE CELLULAR CONNECTIVITY / TOPICS



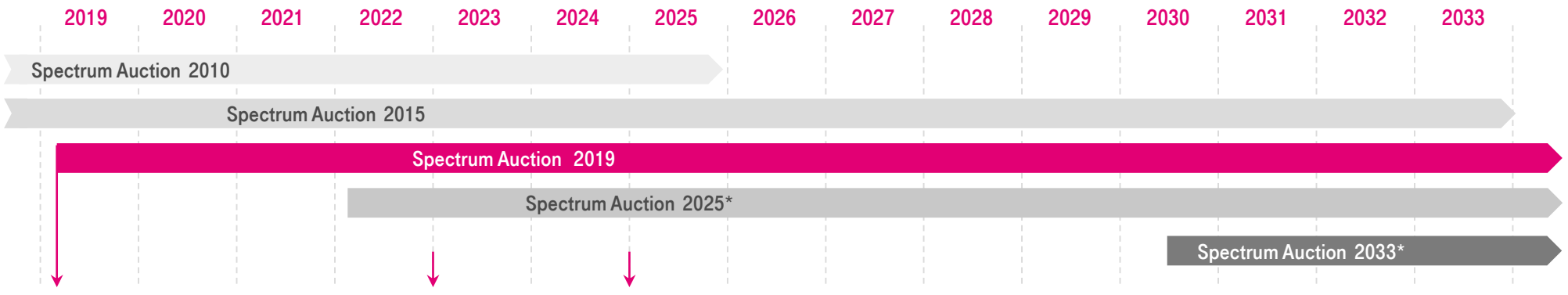
5G IS AN IMPORTANT DRIVER OF FUTURE MOBILITY



UBIQITOUS AVAILABILITY: ONE STRATEGY, 3 ACTION CLUSTERS



SPECTRUM AUCTIONS: → COVERAGE (EXAMPLE GERMANY)



Auction
2 GHz und 3,6 GHz

Coverage Obligations 2019
Step 1 (12/2022):

- 98% of households in every federal state
- All motorways
- Main primary roads
- Primary rail tracks
- 5G base stations 1.000
- Base Stations white spots 500

Coverage Obligations 2019
Step 2 (12/2024)

- Remaining primary roads
- Secondary and rural roads
- All rail tracks
- Harbors and important inner-country waterways

100 Mbit/s 50 Mbit/s 10 ms

* incl. 2 years preparation time

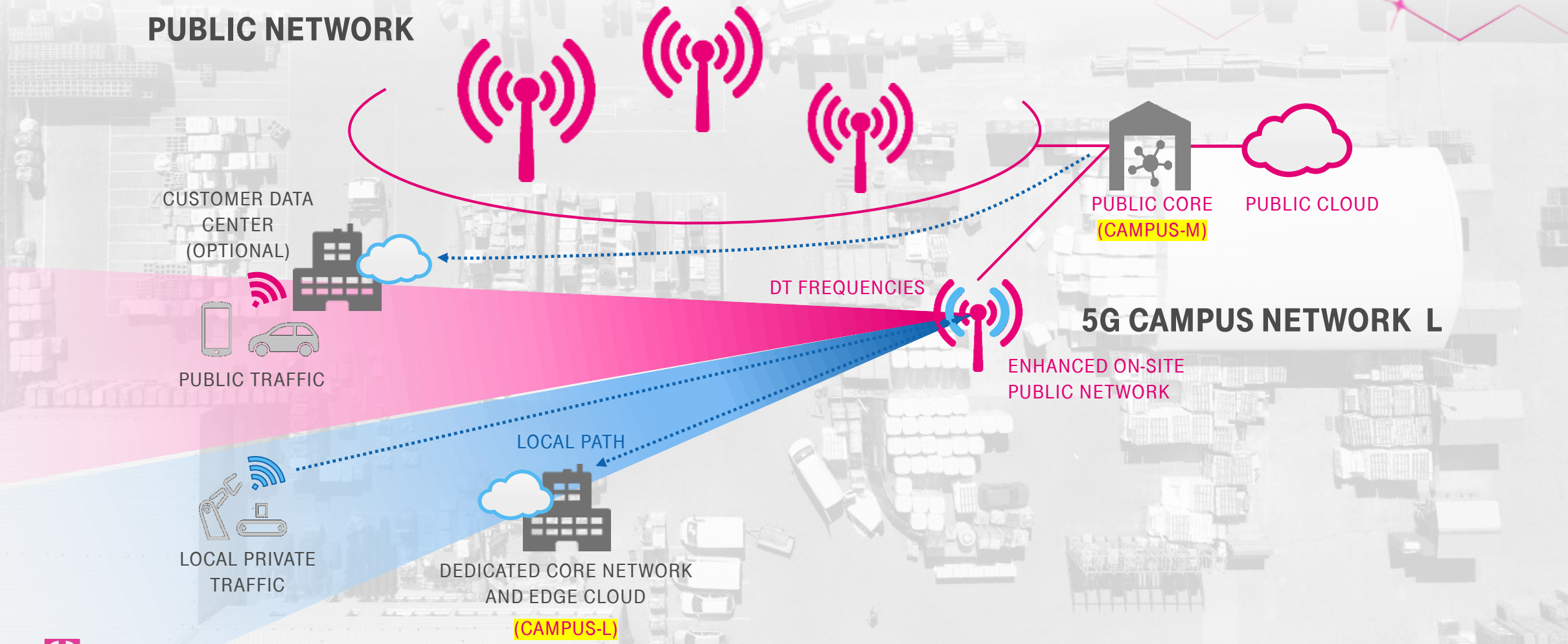
Quelle: Bundesnetzagentur

SLICING TODAY: 5G CAMPUS NETWORKS WITH A PUBLIC AND A PRIVATE NETWORK

RESERVED RESOURCES/ PRIVATE

LOCALLY ENHANCED/ PUBLIC

ARCHITECTURE OF A 5G CAMPUS NETWORK L

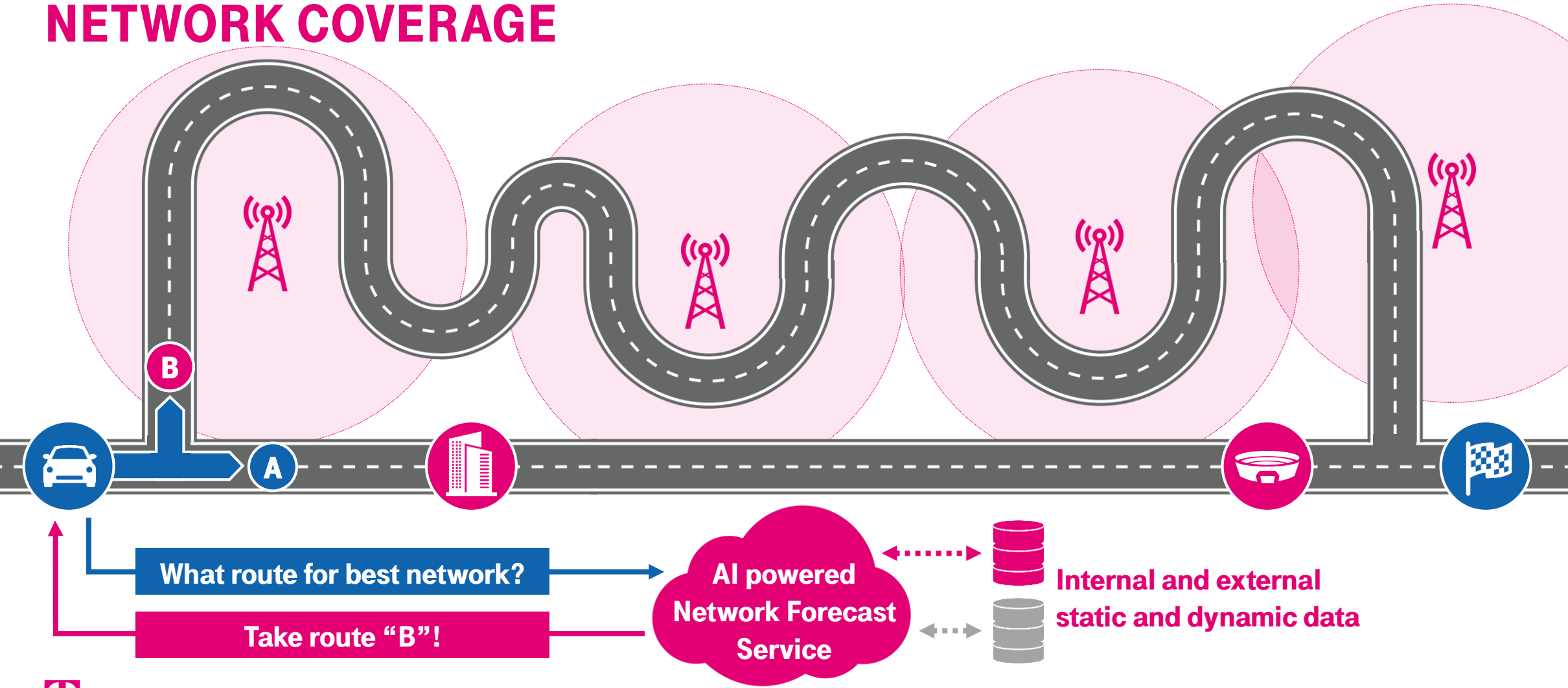


EXAMPLE FOR NETWORK SLICING: TELE-OPERATIONS AS PART OF AUTONOMOUS DRIVING

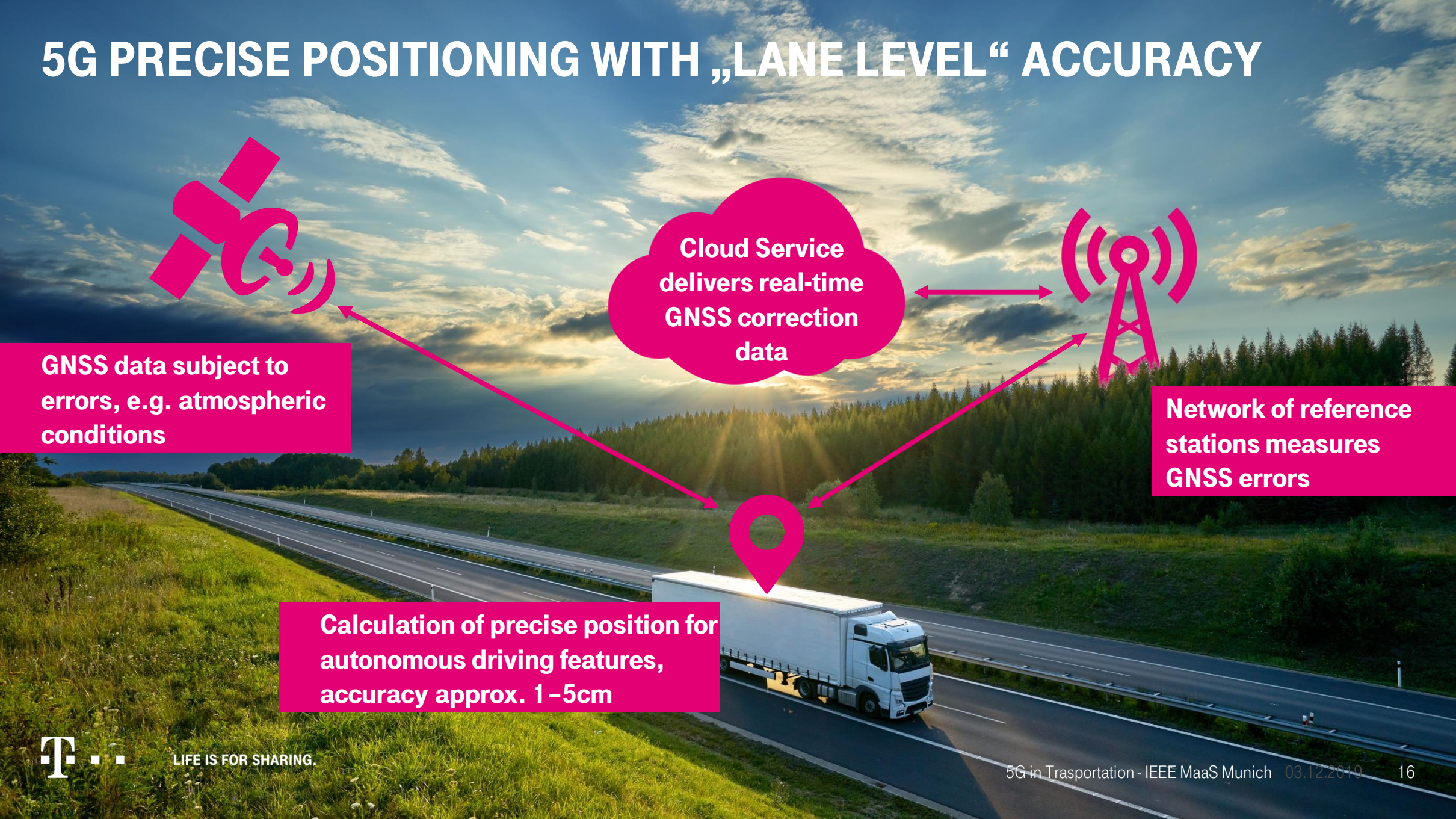
5G managed low latency and high bandwidth are key capabilities

Human driver at vehicle control center takes over in case of accident, technical problems, identification or decision issues

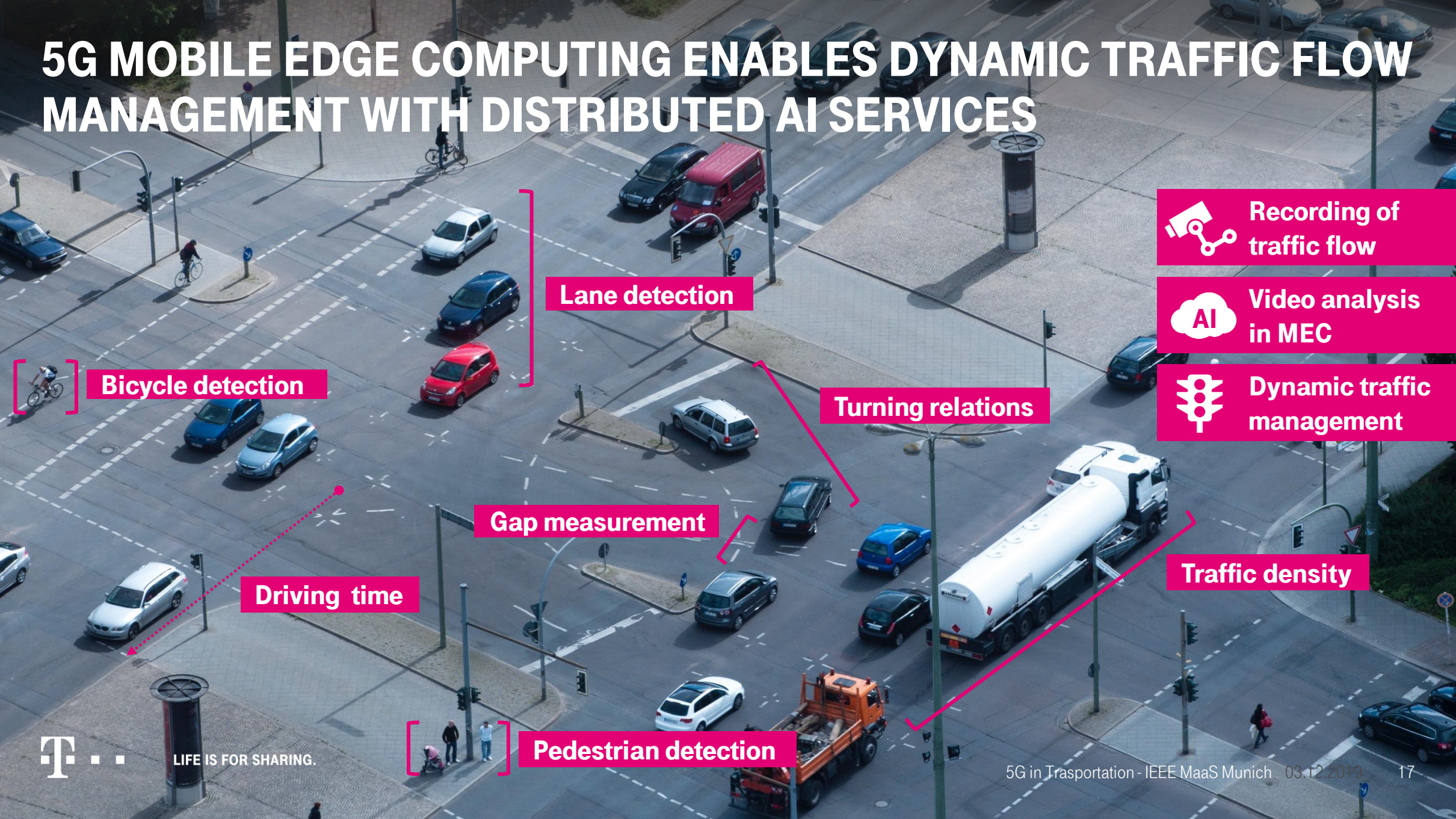
PREDICTIVE QUALITY OF SERVICE HELPS TO ANTICIPATE NETWORK COVERAGE



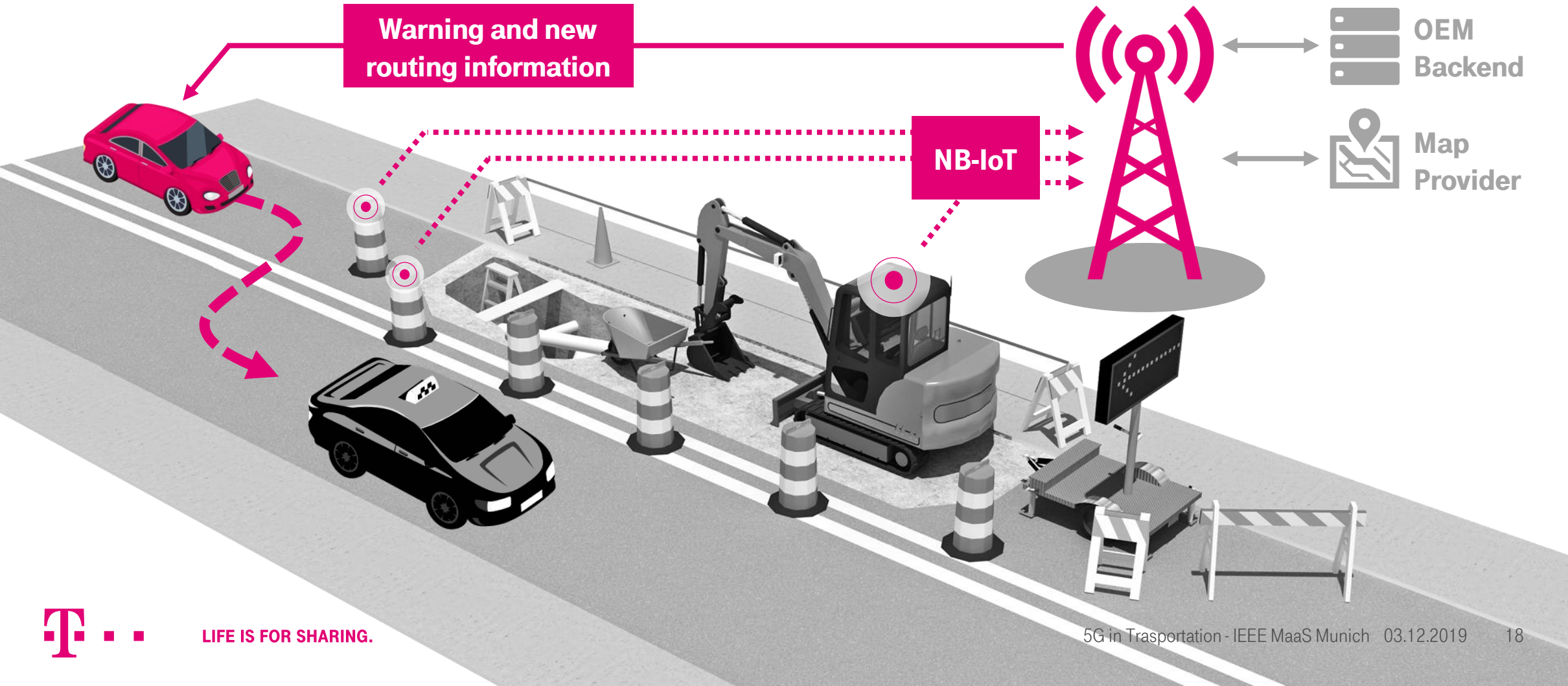
5G PRECISE POSITIONING WITH „LANE LEVEL“ ACCURACY



5G MOBILE EDGE COMPUTING ENABLES DYNAMIC TRAFFIC FLOW MANAGEMENT WITH DISTRIBUTED AI SERVICES



TRAFFIC INFRASTRUCTURE: LOCATION TRACKING OF CONSTRUCTION EQUIPMENT VIA NB-IOT



5G OVER THE AIR DISTRIBUTION PLATFORM FOR MAPS AND SOFTWARE PUSH

SOTA: SOFTWARE UPDATES, E.G. NEW FUNCTIONALITIES

MAPS: FREQUENT INCREMENTAL UPDATES PLUS DYNAMIC UPDATES ON CRITICAL EVENTS

5G IMPROVES IN-CAR BROADBAND FOR PASSENGERS INCL. VOD, CLOUD-GAMING OR VIDEO CONFERENCING

5G Capabilities

- Peak data rates up to 10 Gbit/s
- Capacity up to 10 Tbit/s per km^2
- Up to 500 km/h user movement speed

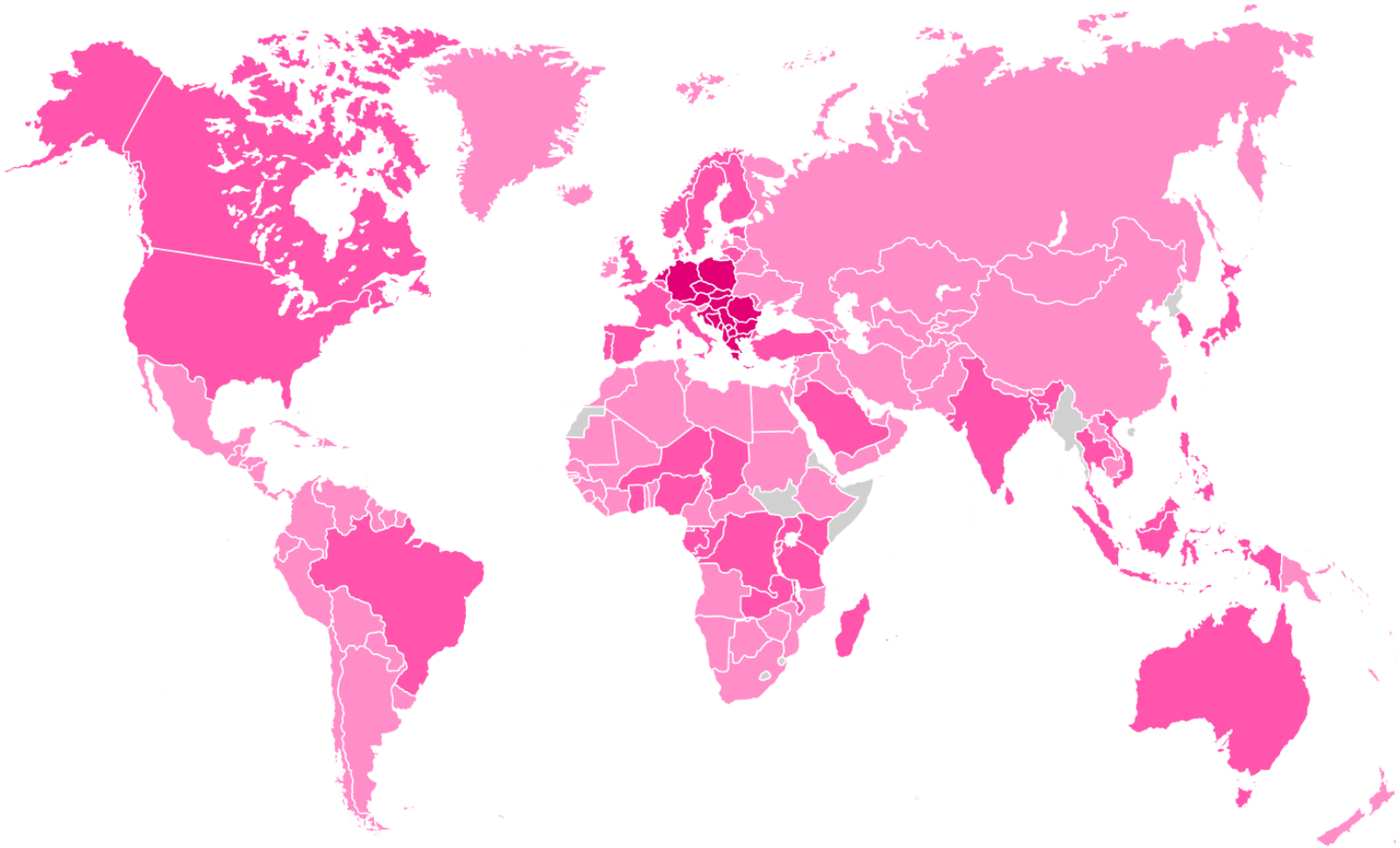
In-Car WiFi

- Cars line-fitted with WiFi and embedded eSIM
- Permanent roaming
- WPA encryption

Customer Benefits

- Car antenna for stable internet
- All WiFi-devices, no SIM needed
- Independent of mobile contract and included data volume

5G CAPABILITIES NEEDS TO BE PROVIDED GLOBALLY



- High quality global access portfolio
- Connectivity services via own infrastructure or tier one partners:
  - Deutsche Telekom own network
  - GMA + GMA Bridge Alliance
  - Roaming Partners

5GAA created to connect telecom industry and vehicle manufacturers and work closely together to develop end-to-end connectivity solutions for future mobility and transportation services

AUTOMOTIVE INDUSTRY

Vehicle Platform, Hardware and Software Solutions

TELECOMMUNICATIONS

Connectivity and Networking Systems, Devices and Technologies

End-to-end solutions for intelligent transportation, mobility systems and smart cities


AIRBUS
Airgain
ALPINE
AMERICAN TOWER
ANALOG DEVICES
Anritsu
envision:ensure
applied
INFORMATION
ASKEY
AT&T
Audi
Autotalks
BAIC GROUP
Baidu 百度
宝能
BAONENG
Bell
BlackBerry
BMW GROUP
BOSCH
BUREAU VERITAS
CETECOM
中国移动
China Mobile
中国电信
CHINA TELECOM
千方科技
CHINA TRANSINFO
China unicom 中国联通
CISCO
Cohda Wireless
commsignia
Continental
The Future in Motion
CTAG
DAIMLER
DANLAW
AUTOMOTIVE MADE SMART
DEKRA
DENSO
Deutsche Messe
Dt&C
EBERLE DESIGN INC.
EDI
edgeconnex
EQUINIX
ERICSSON
Faraday Future
FET
FCA
FEV
flex.
Ford
Fraunhofer
GEELY
gemalto
security to be free
GM
GRL
GRANITE RIVER LABS
Gotell
果通科技
here
Hirschmann Car Communication
TE
HITACHI
Inspire the Next
HONDA
HUAWEI
HYUNDAI MOTOR GROUP
HYUNDAI MOBIS
iDIRECT
Infineon
intel
INTERDIGITAL
JAGUAR
LAND ROVER
JUNIPER NETWORKS
KDDI
KEYSIGHT TECHNOLOGIES
KPIT
kt
LEAR CORPORATION
LG
LINKS
lmt
MARELLI
MARBEN
MITSUBISHI ELECTRIC
Changes for the Better
molex
muRata
NAVINFO
Neusoft 东软
NIO
NISSAN MOTOR CORPORATION
NOKIA
noris network
docomo
OAKLAND UNIVERSITY
OKI
orange
P3
Panasonic
PFU
PIRELLI
proximus
PSA GROUPE
qorvo
QUALCOMM
QUECTEL
Build a Smarter World
GROUPE RENAULT
ROHDE&SCHWARZ
ROHM SEMICONDUCTOR
SAIC
上汽集团
SAIC MOTOR
SAMSUNG
SAVARI
SGS
上海国际汽车城
Anting • Shanghai International Automobile City
SK telecom
SKYWORKS
SMART MOBILE LABS
SoftBank
SPORTON LAB.
SUMITOMO ELECTRIC
swift
NAVIGATION
TATA
TIM
Telefónica
A1
TELUS
Tencent
腾讯
TERRANET
TÜVRheinland
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VENIAM
verizon
VIAVI
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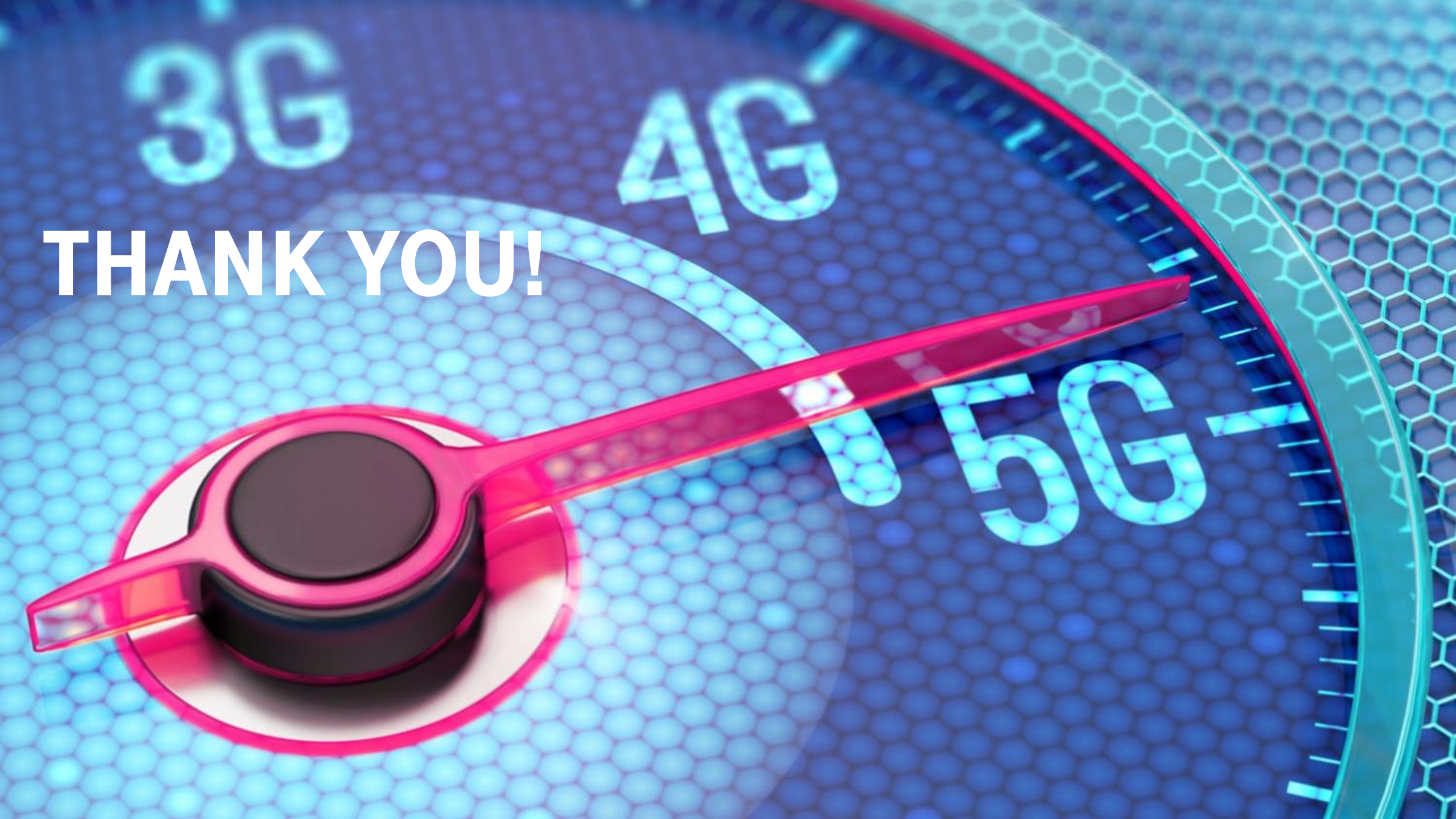
Volkswagen
VOLVO
WNC
Wistron NeWeb Corp.
ZF
ZTE


3G
4G
5G
THANK YOU!