

# 5G for Industry-Specific Services

Monday 26 February 13:30 – 15:30



Creating a  
**Better  
Future**



**#MWC18**

# Anil Rao

Principal Analyst

**Analysys Mason**

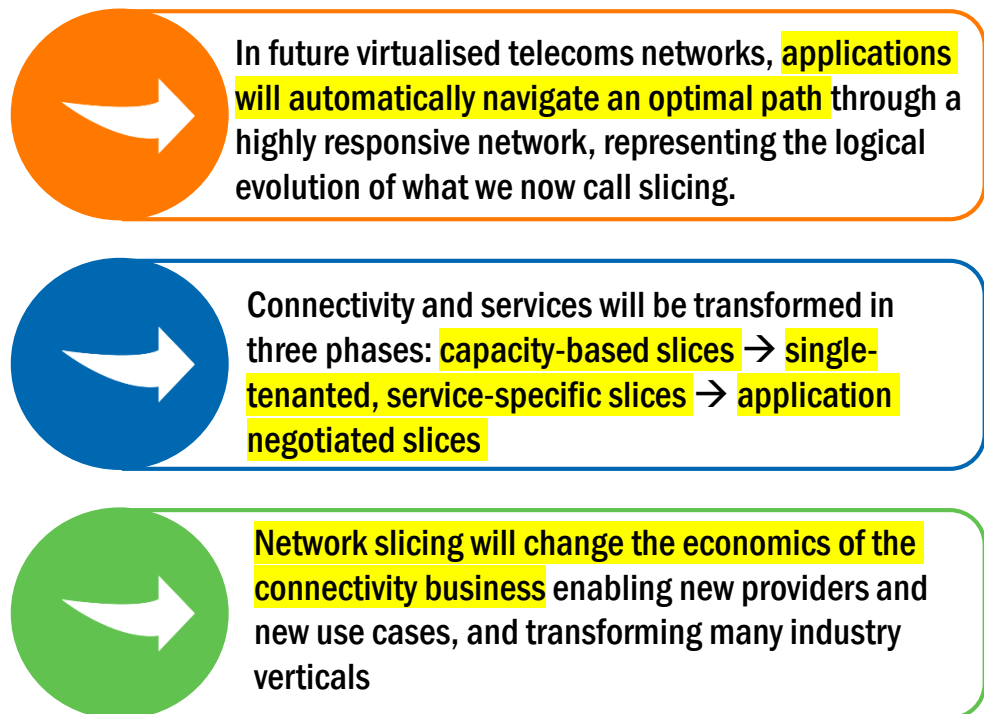


MWC 2018

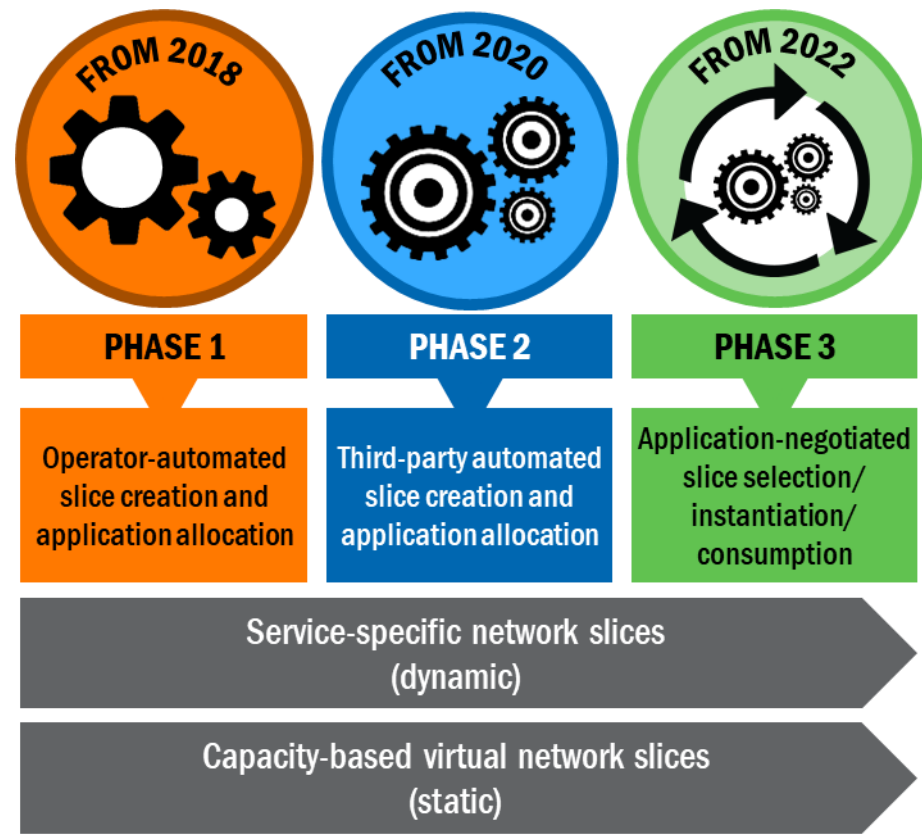
## NETWORK SLICING: THE FUTURE OF CONNECTIVITY IN A 5G AND FIBRE ERA

ANIL RAO - PRINCIPAL ANALYST

## Key takeaways

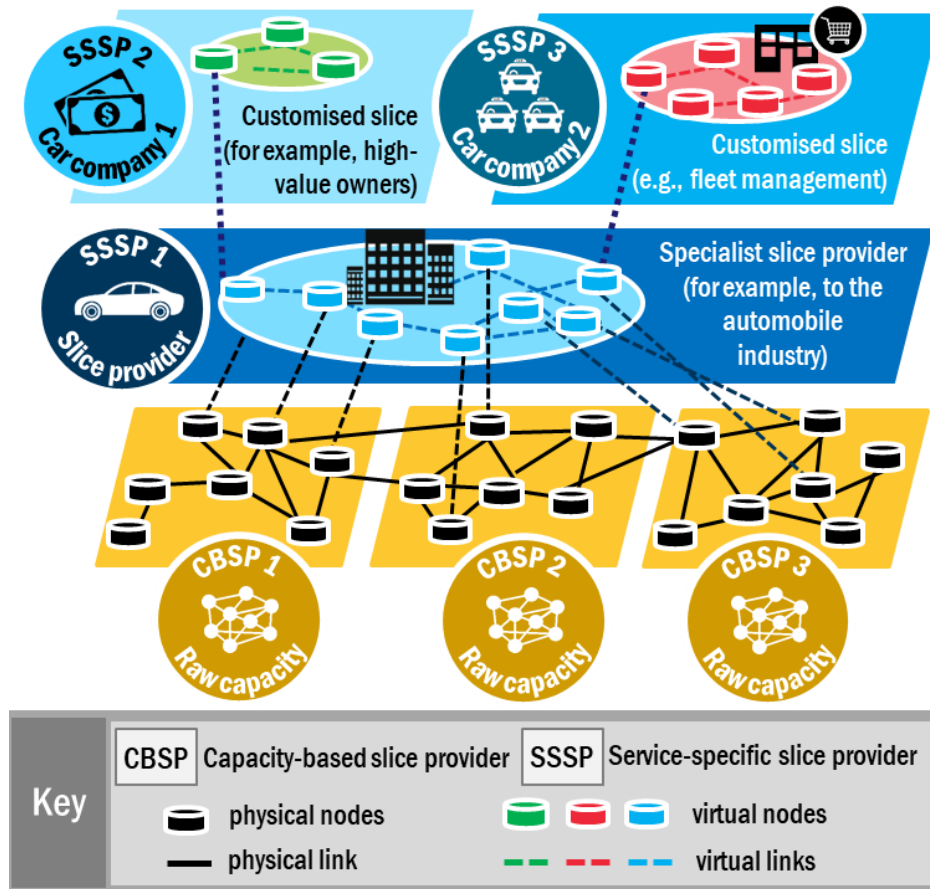


The network of the future will be sliced on different levels to support a wide range of service models and highly flexible resource usage



# Network slicing provides an end-to-end logical (virtual) network with dedicated capacity and/or other service-specific characteristics

Hierarchy of physical/logical network slicing, shown using an example from the automobile industry



Virtualisation will enable 'slicing' of the physical network into separate virtual networks, providing differentiated latency, performance, reliability, availability tuned for each use case/service

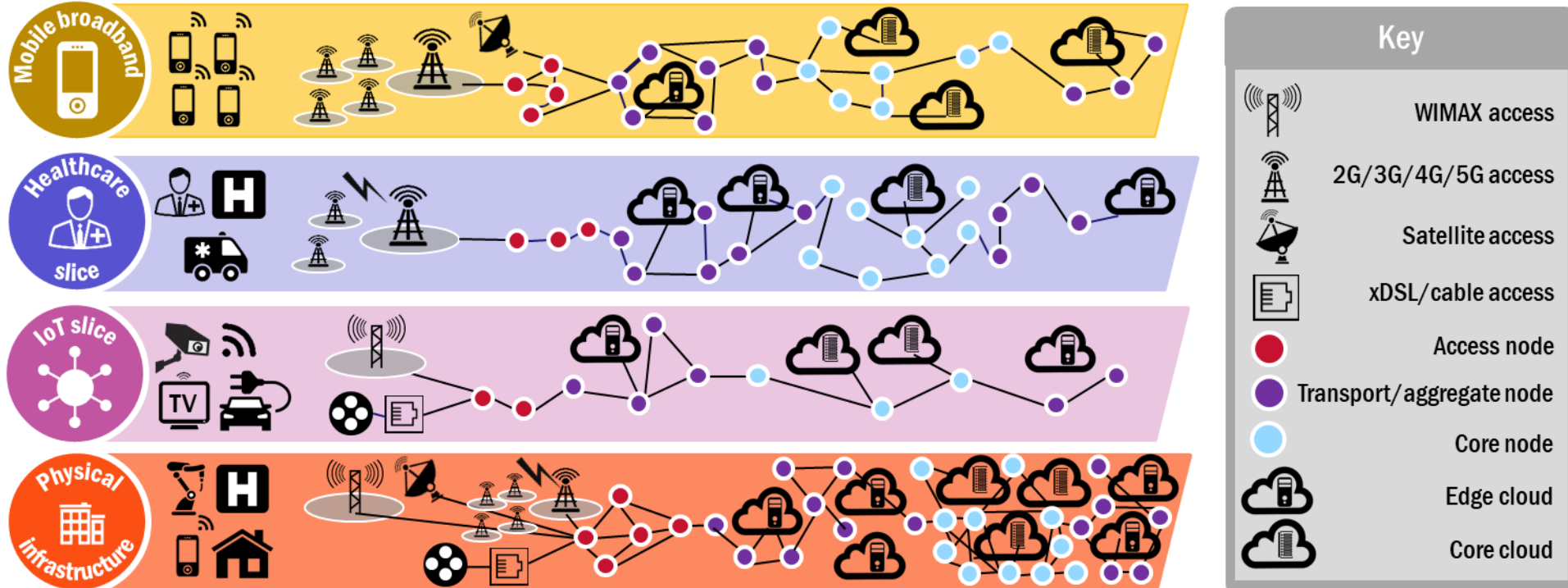
Network slices are end-to-end, virtualised connections across multiple network domains, including fixed/mobile access, transport and data centres

Network slices are created on-demand and independently controlled, managed and customised, with a degree of isolation previously achievable only with dedicated physical networks.

Source: Analysys Mason

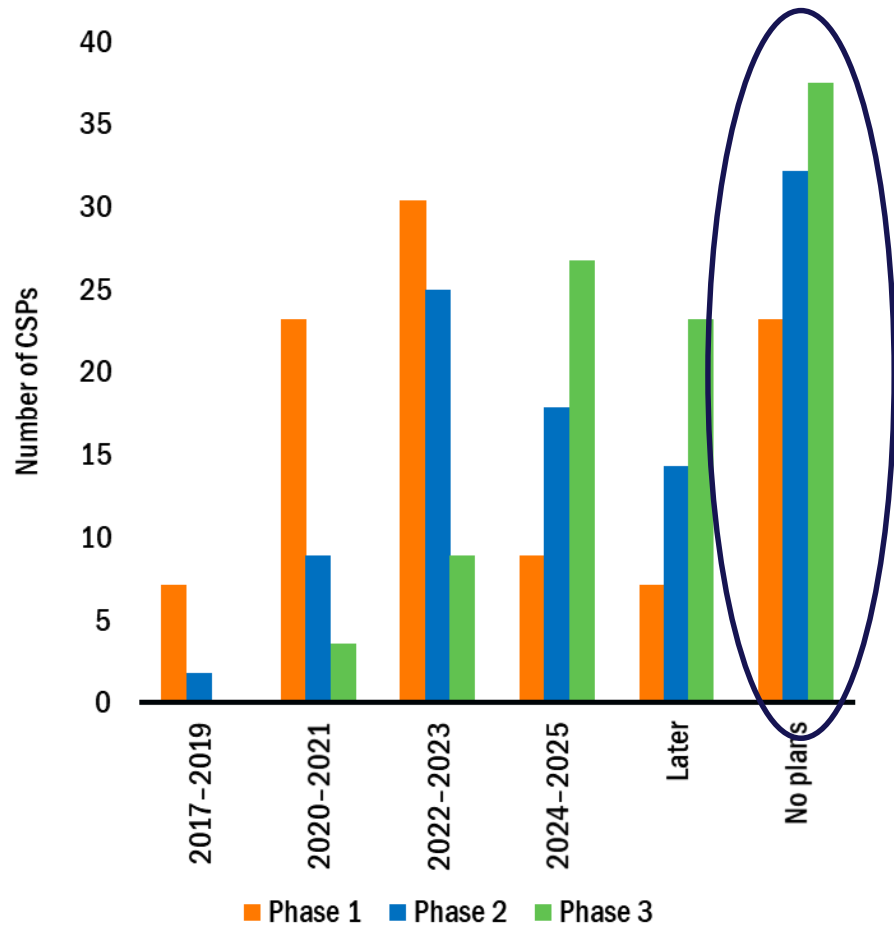
# There is little consensus on how many slices will be created, but the industry should plan for a large number, crossing many CSPs' networks

Conventional view of network slicing (Source: Analysys Mason and IEEE Communications Magazine)



# It is essential that established operators start to build their strategy now

When, if at all, would you anticipate deploying each of the network slicing stages?<sup>1</sup>



According to the results of a survey conducted by Analysys Mason, 23% have no plans to do slicing at all, while a further 9% will stay at Phase 1, and a further 6% at Phase 2

Operators staying at Phase 0 or 1 will find their revenues harder to defend and their share of the value chain diminished, unless they can invest in physical infrastructure at sufficient scale

For NFV/SDN, 52% of operators say they have not identified concrete business gains beyond cost reduction. Slicing is a key way to derive more value from their virtualisation investments.

<sup>1</sup> Source: Analysys Mason's survey of 56 Tier 1 CSPs worldwide, November 2017

## Contact details

**Anil Rao**

**Principal Analyst**

[Anil.Rao@analysismason.com](mailto:Anil.Rao@analysismason.com)

**Boston**

Tel: +1 202 331 3080  
boston@analysismason.com

**Cambridge**

Tel: +44 (0)1223 460600  
cambridge@analysismason.com

**Dubai**

Tel: +971 (0)4 446 7473  
dubai@analysismason.com

**Dublin**

Tel: +353 (0)1 602 4755  
dublin@analysismason.com

**Hong Kong**

Tel: +852 3669 7090  
hongkong@analysismason.com

**London**

Tel: +44 (0)20 7395 9000  
london@analysismason.com

**Madrid**

Tel: +34 91 399 5016  
madrid@analysismason.com

**Manchester**

Tel: +44 (0)161 877 7808  
manchester@analysismason.com

**Milan**

Tel: +39 02 76 31 88 34  
milan@analysismason.com

**New Delhi**

Tel: +91 124 4501860  
newdelhi@analysismason.com

**Oslo**

Tel: +47 920 49 000  
oslo@analysismason.com

**Paris**

Tel: +33 (0)1 72 71 96 96  
paris@analysismason.com

**Singapore**

Tel: +65 6493 6038  
singapore@analysismason.com

**Stockholm**

Tel: +46 709 211 719  
stockholm@analysismason.com



@AnalysysMason



linkedin.com/company/analysys-mason



youtube.com/AnalysysMason



analysismason.com/RSS



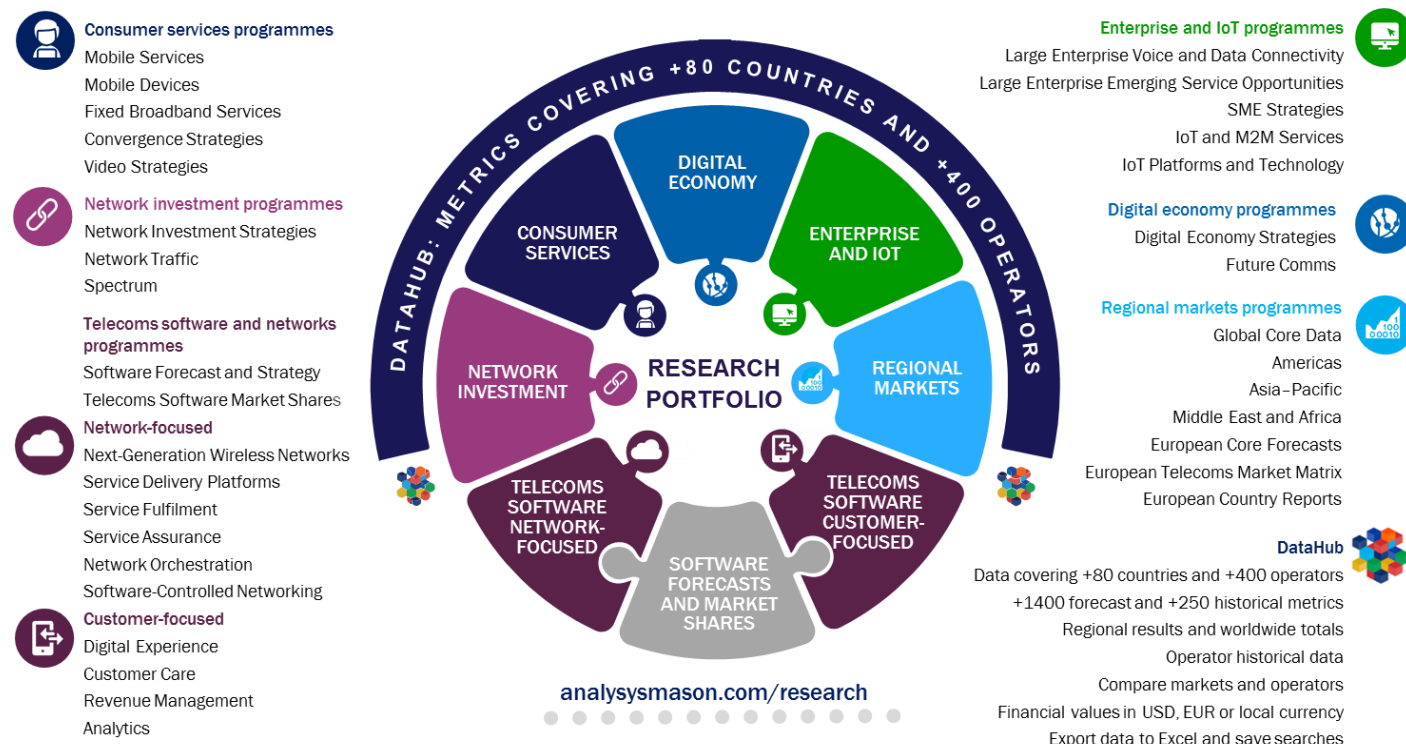
## Anil Rao – Principal Analyst, Telecom Software and Networks, Analysys Mason



Anil Rao, Principal Analyst, Telecoms Software and Networks, Analysys Mason: With over 15 years' experience in the telecommunications industry, Anil has broad ranging experience in designing and implementing telco network and operations solutions for both fixed and mobile operators. In his current stint as an industry analyst, Anil focuses on how network virtualisation, 5G and IoT will impact operations and enables telcos and industry players explore new business models and revenue opportunities.

# Research from Analysys Mason

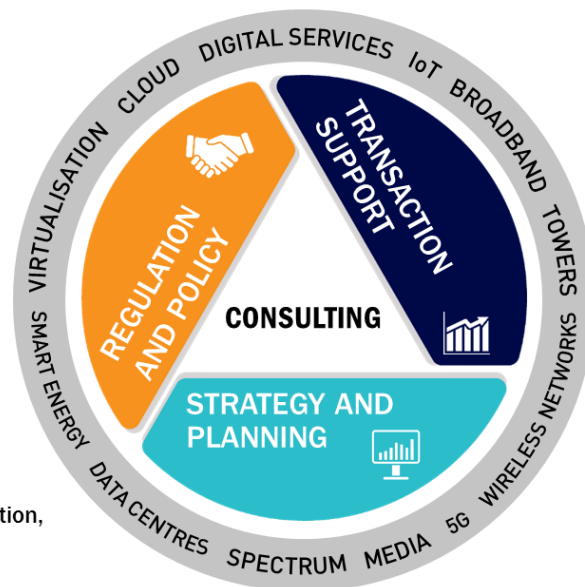
Clients across the breadth of telecoms, media and technology sectors rely on our research and analysis to inform business-critical decisions.



# Consulting from Analysys Mason

## REGULATION

- Quality of service
- Market review
- Margin squeeze tests
- Analysing regulatory accounts
- Regulatory economic costing
- Policy development and response
- Media regulation
- Expert legal support
- Radio spectrum management
- Net cost of universal service
- Radio spectrum auction support
- Postal sector policy: USO, liberalisation, costing, pricing and regulation



## TRANSACTION SUPPORT

- Commercial due diligence
- Technical due diligence
- Digital services
- Mid-market finance sponsors
- Data centres

## STRATEGY AND PLANNING

- Commercial expertise
- Technology optimisation
- New digital frontiers

[analysismason.com/consulting](http://analysismason.com/consulting)



# Dr. Ryokichi Onishi & Kiichi Iwasaki

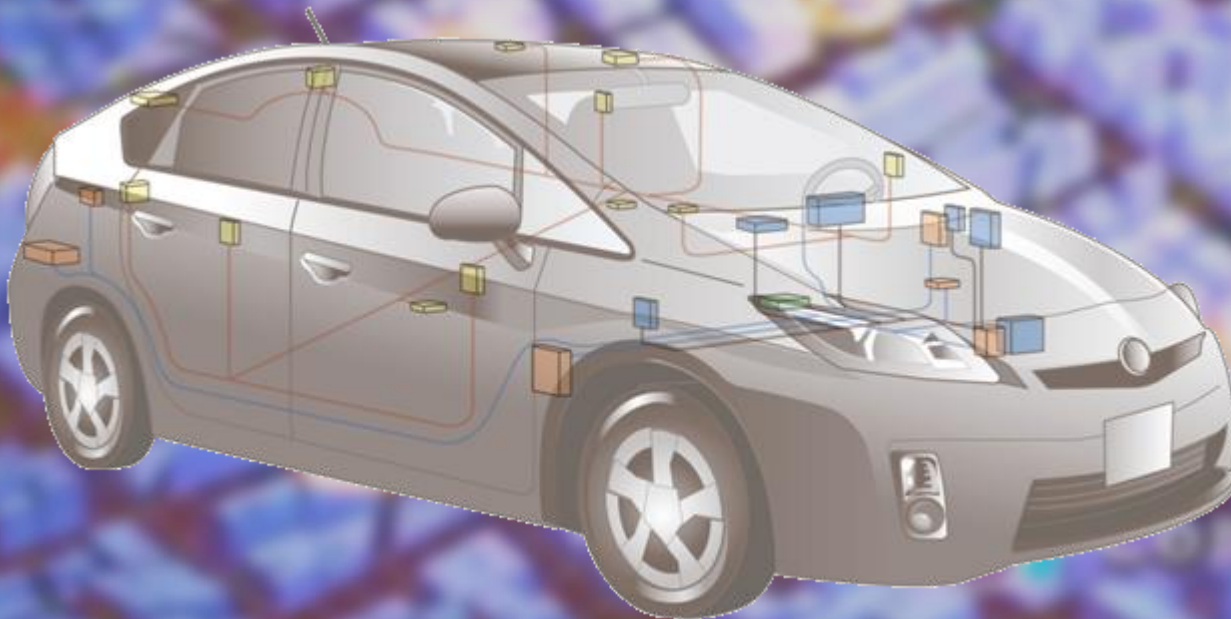
Group Leader / Project Manager

**Toyota**

**TOYOTA**

# **Automotive Edge Computing**

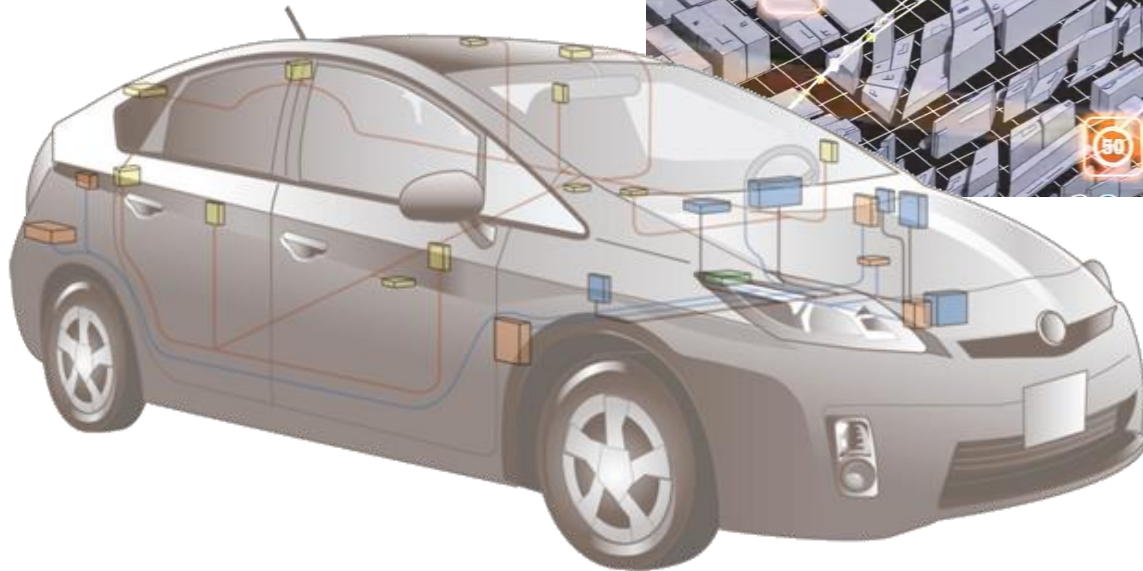
## **Use Case and Requirement**



**Kiichi Iwasaki**  
**Ryokichi Onishi**

# Global Impact around 2025

1EB  
~10EB/mo.  
Communication



100M units  
Connected car

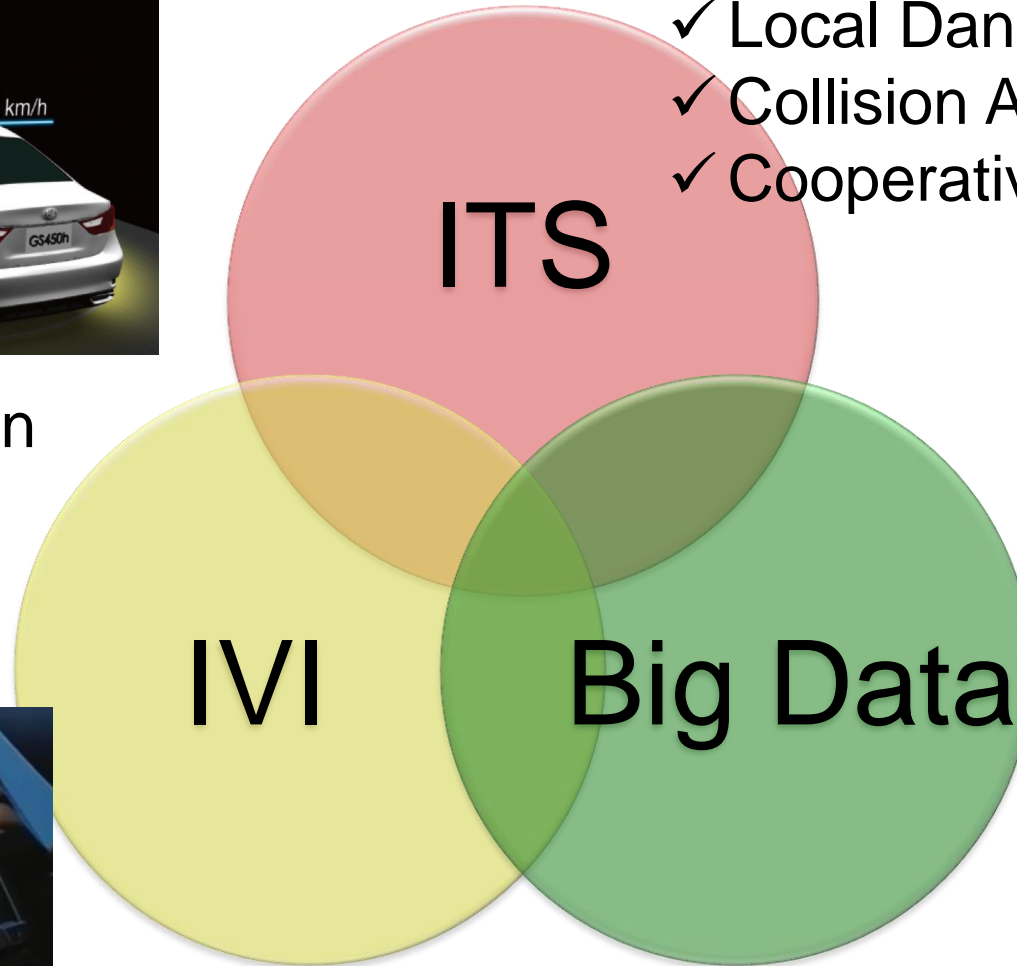
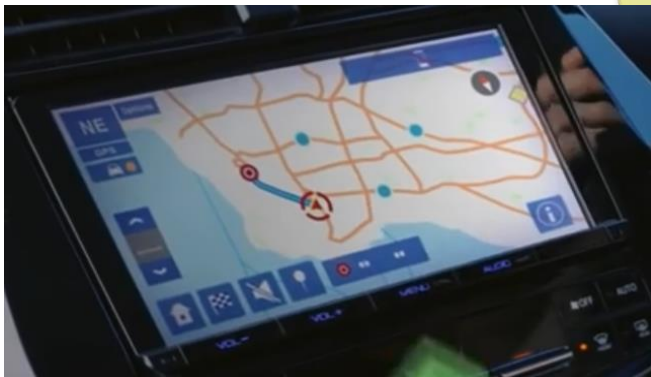
- Vision                      Connected Intelligence
- Issue                        Capacity and Scalability
- Solution                    Edge Computing
- Approach                  Community Basis

- Vision                      Connected Intelligence
- Issue                              Capacity and Scalability
- Solution                            Edge Computing
- Approach                           Community Basis





- ✓ Navigation
- ✓ Audio/TV
- ✓ Phone
- ✓ Internet

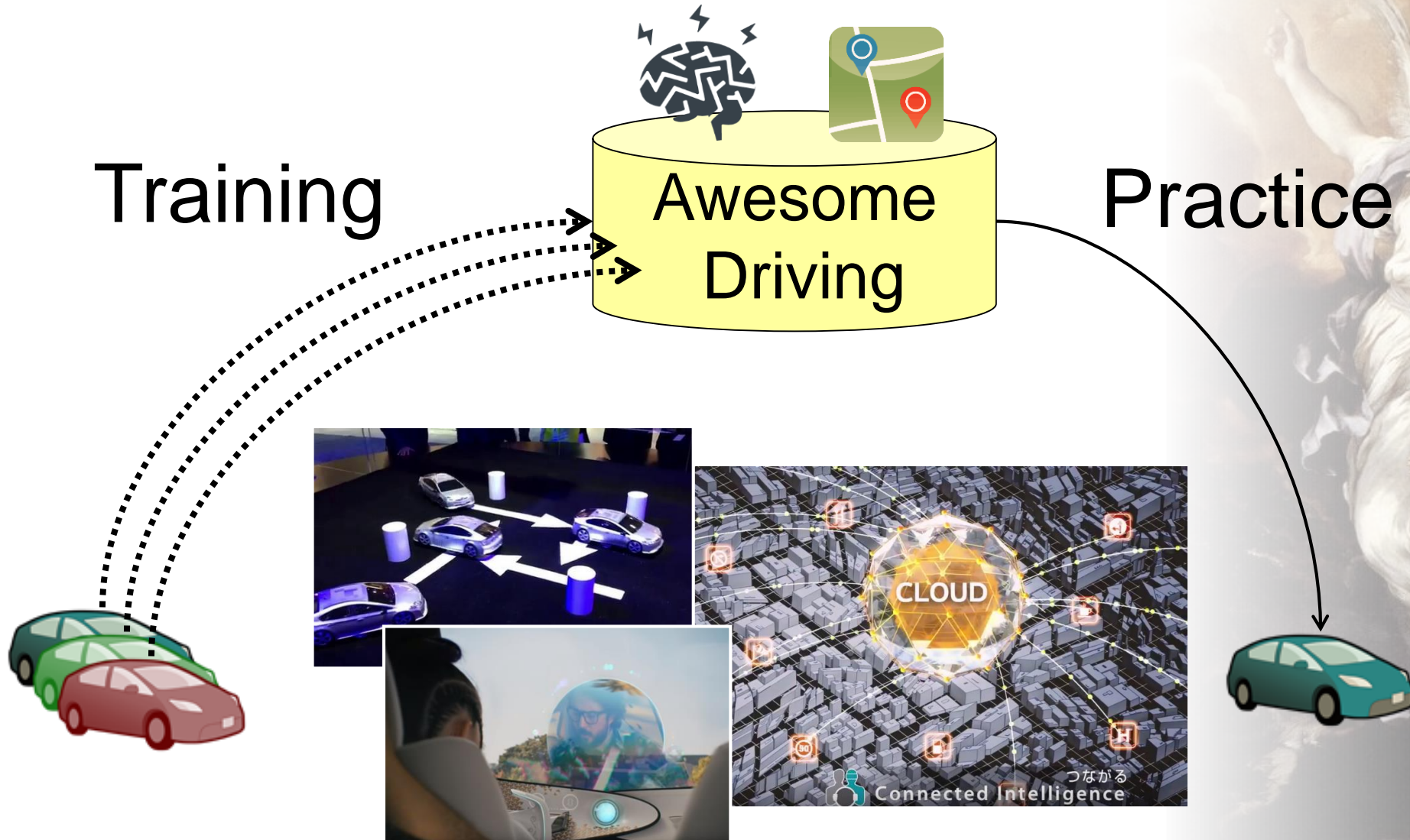


- ✓ Local Danger Warning
- ✓ Collision Avoidance
- ✓ Cooperative Adaptive Cruise Control



- ✓ Location Based Service
- ✓ Vehicle Quality Control
- ✓ High Definition Map
- ✓ Machine Learning

# Machine Learning (Intelligent Driving)



- Vision                      Connected Intelligence
- Issue                      Capacity and Scalability
- Solution                      Edge Computing
- Approach                      Community Basis



Safety

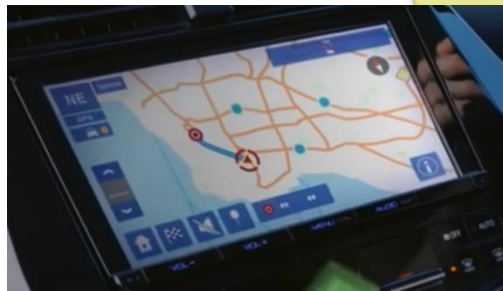
ITS

- P2P (sidelink)
  - Low latency
  - High reachability
- ☞ DSRC / Cellular V2X

Scope

User Experience

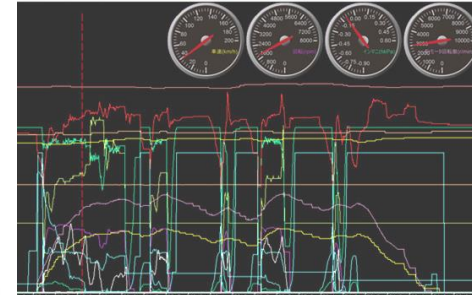
- Cloud (downlink)
  - High interactivity
- ☞ Cellular



IVI

Capacity

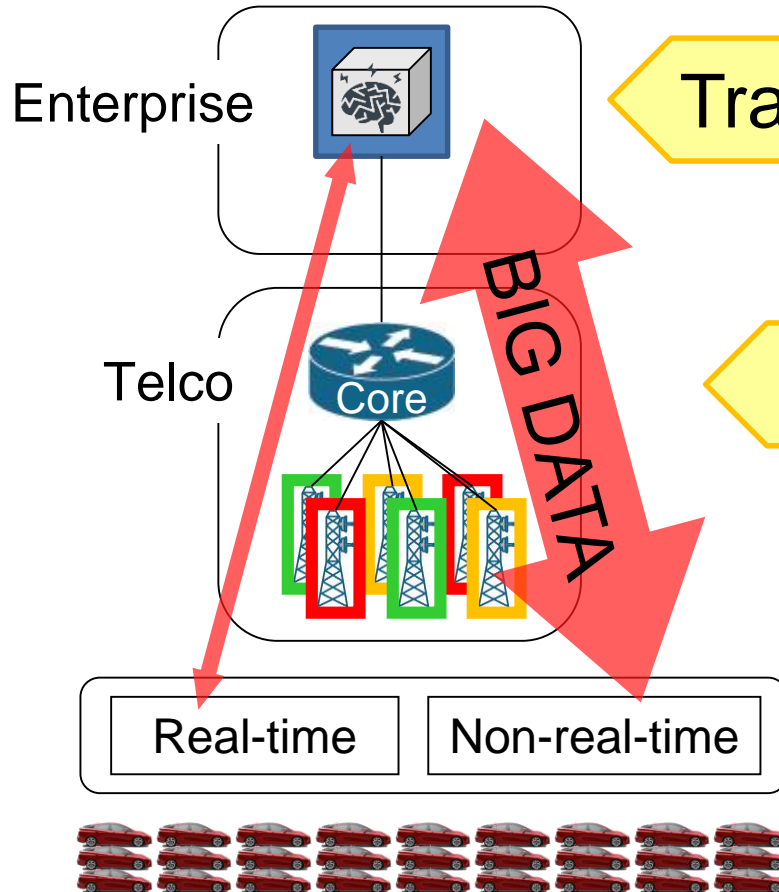
Big Data



- Cloud (uplink)
- Big data capacity
- Leverage of latency allowance

☞ WLAN and Cellular

## Regional business forecast around 2025



Transaction: 30~300PB/month

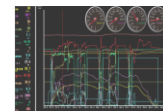
1 month  
~ 1 year

Just for storing data  
Assumption: 10GB/sec

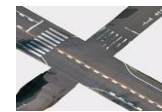
Traffic: 10~100GB / (month\*unit)



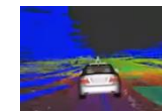
LBS



FOT



HD MAP



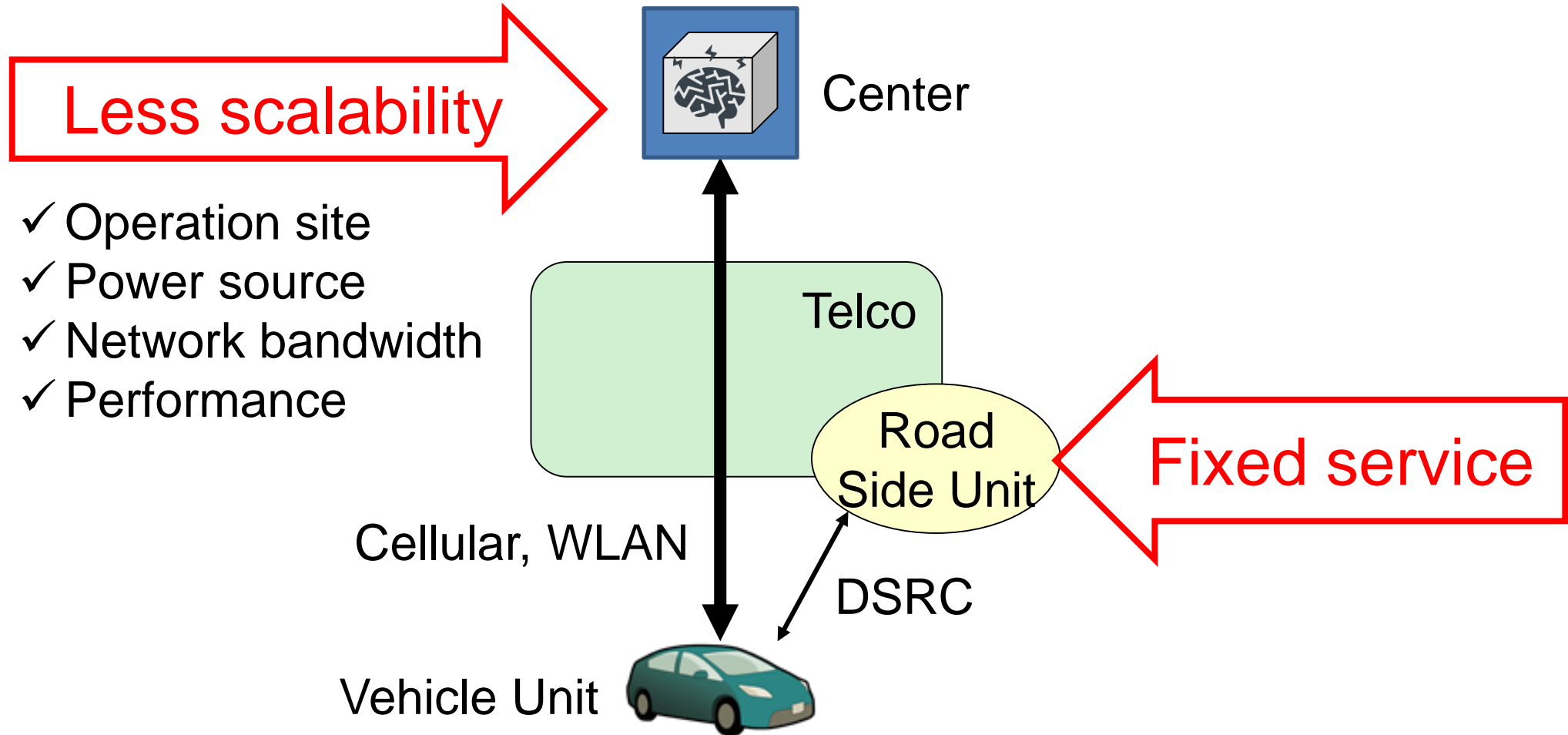
Situation



Emotion

Connected car: 3M units\*

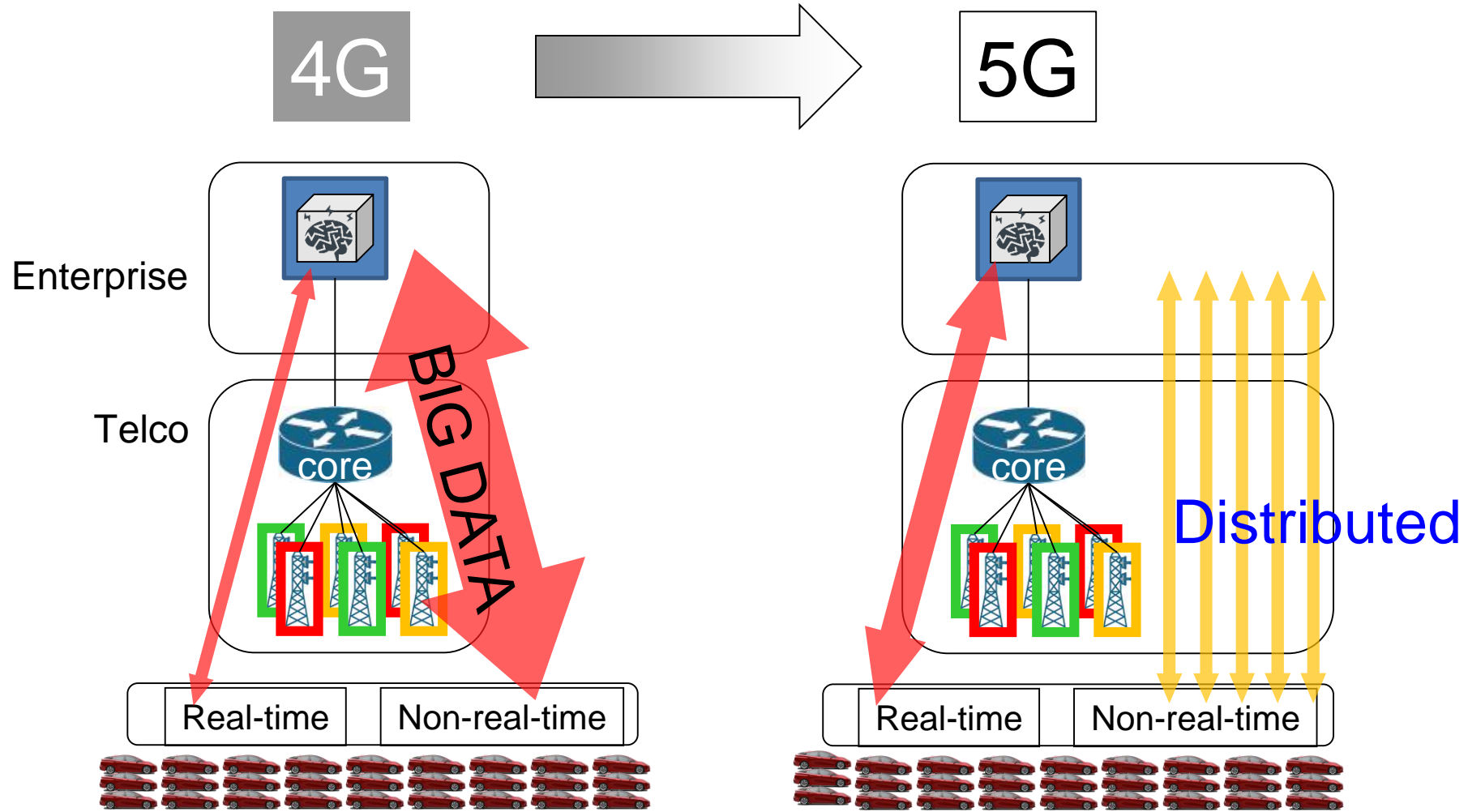
\* Assuming 12% global share and 25% regional ratio



Difficult to introduce emerging services

- Vision            Connected Intelligence
- Issue            Capacity and Scalability
- Solution        Edge Computing
- Approach        Community Basis

# Potential Solution

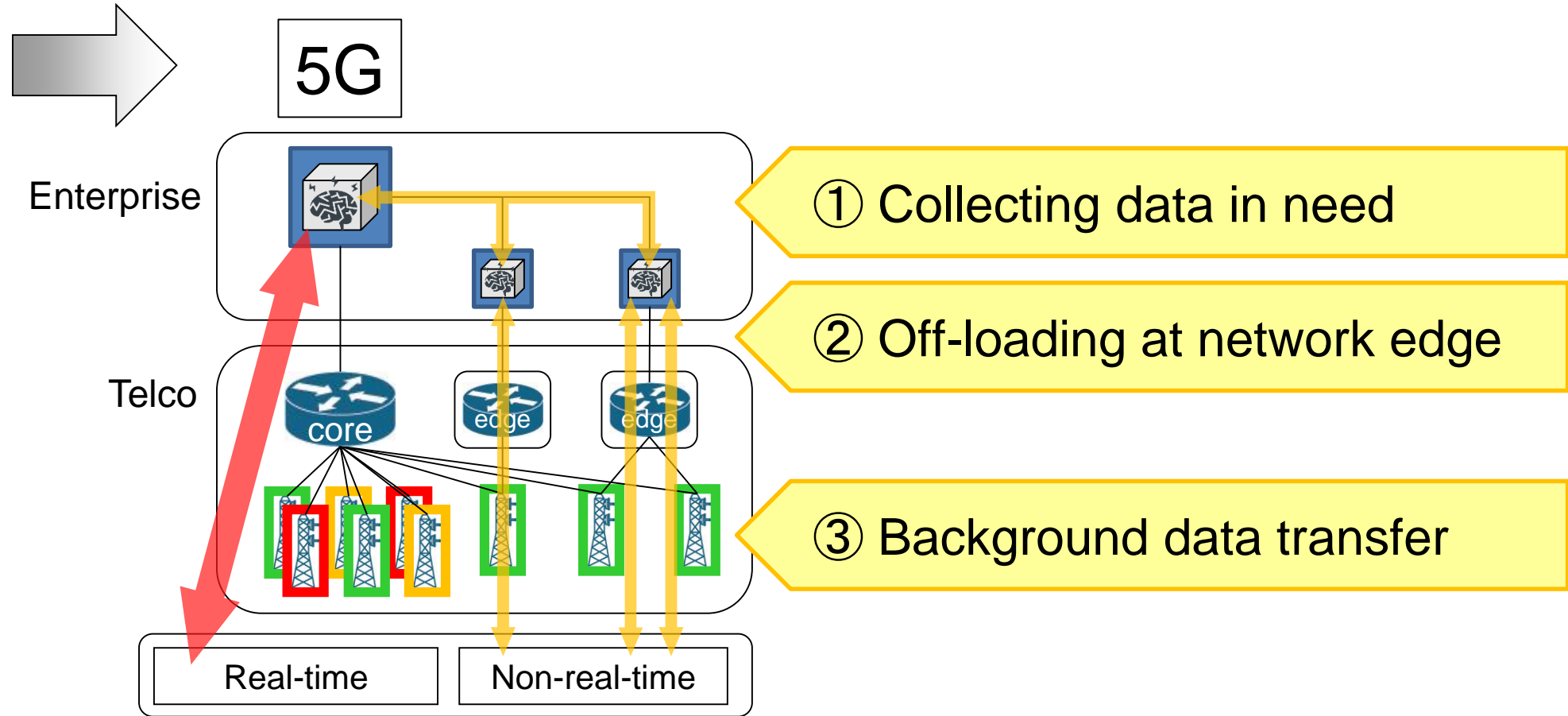


Issue: Big data

Solution: Distribution



# Potential Solution

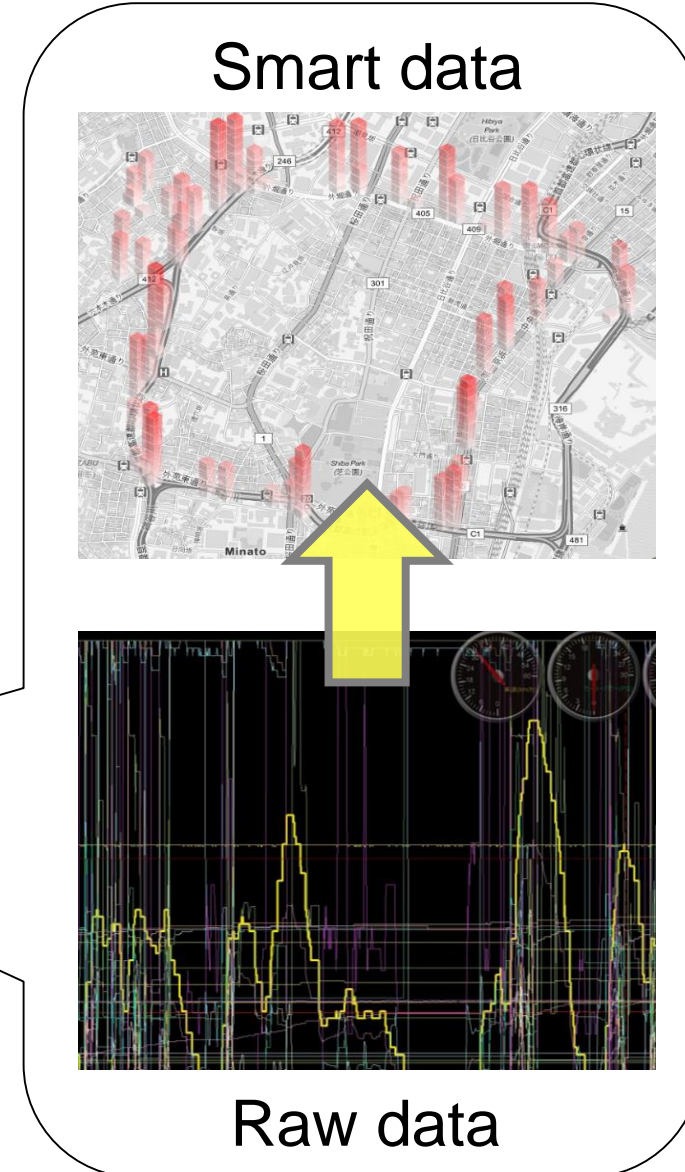
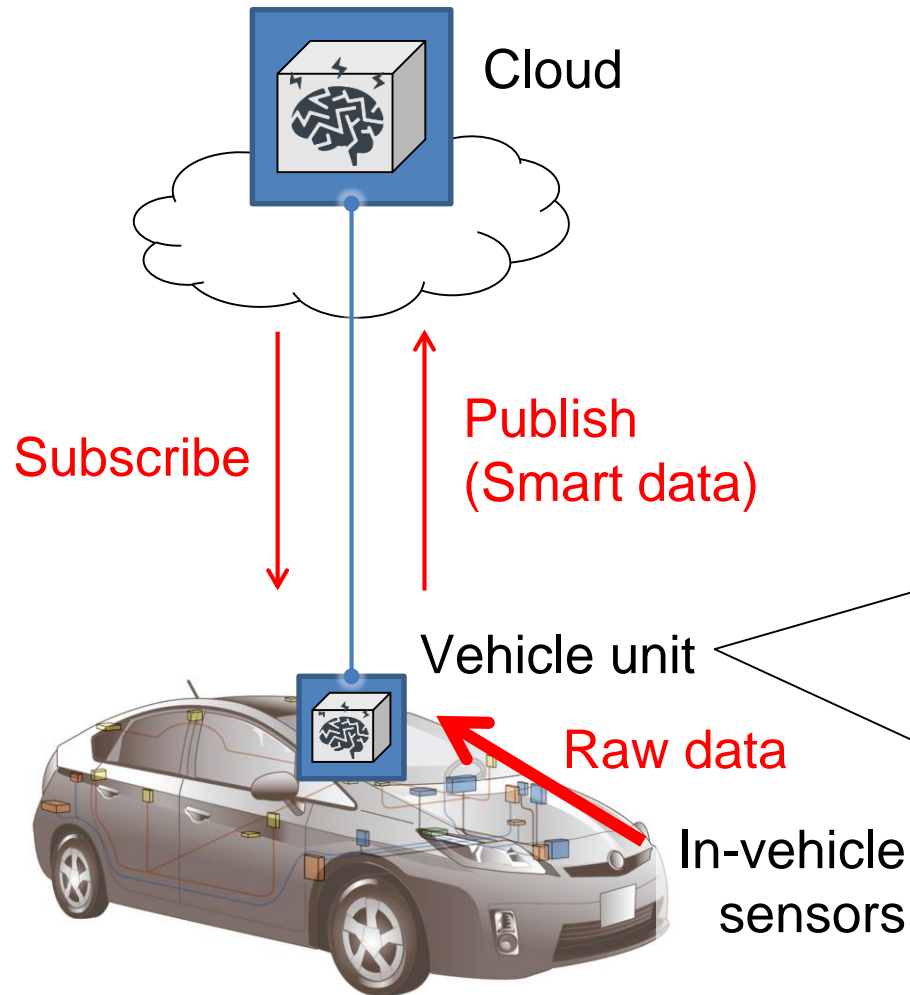


Solution: Distribution

Load  
L M H

# ① Collecting Data in Need

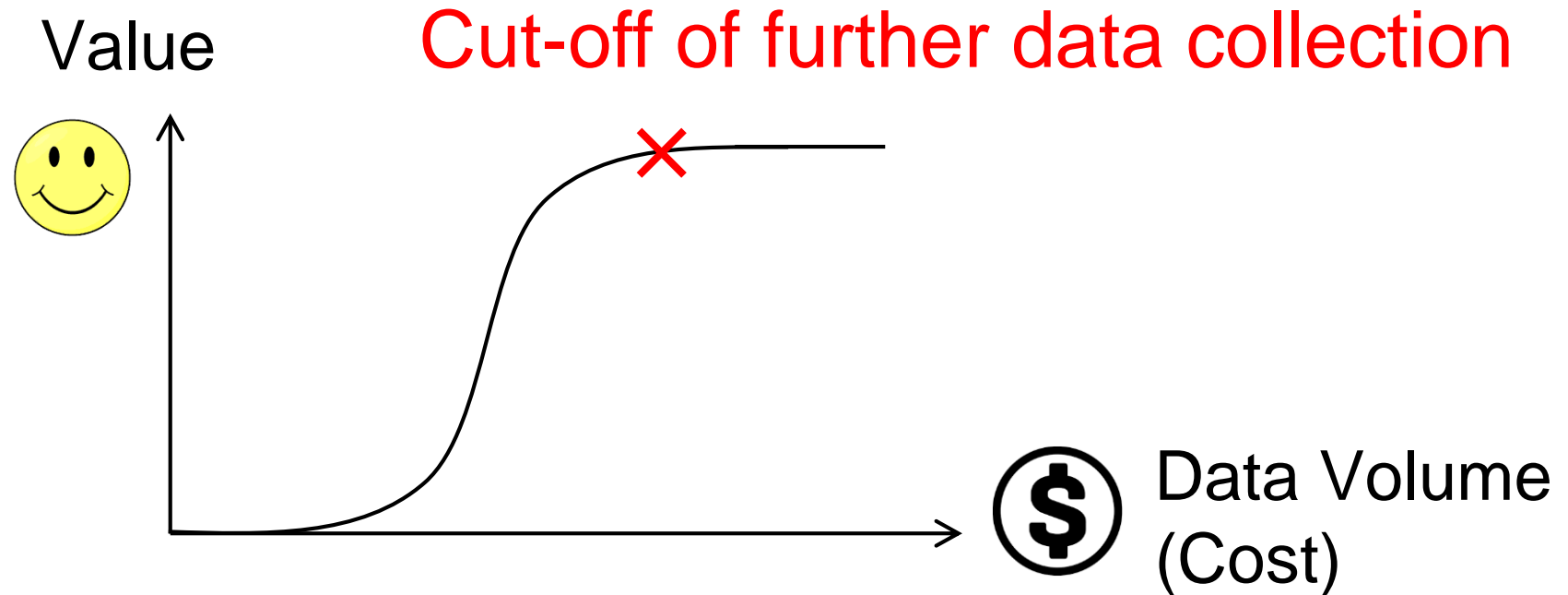
## ■ Data centric network



# ① Collecting Data in Need

## ■ Decline data unwanted

- ▣ Collected/Sufficient data
- ▣ Obsolete data



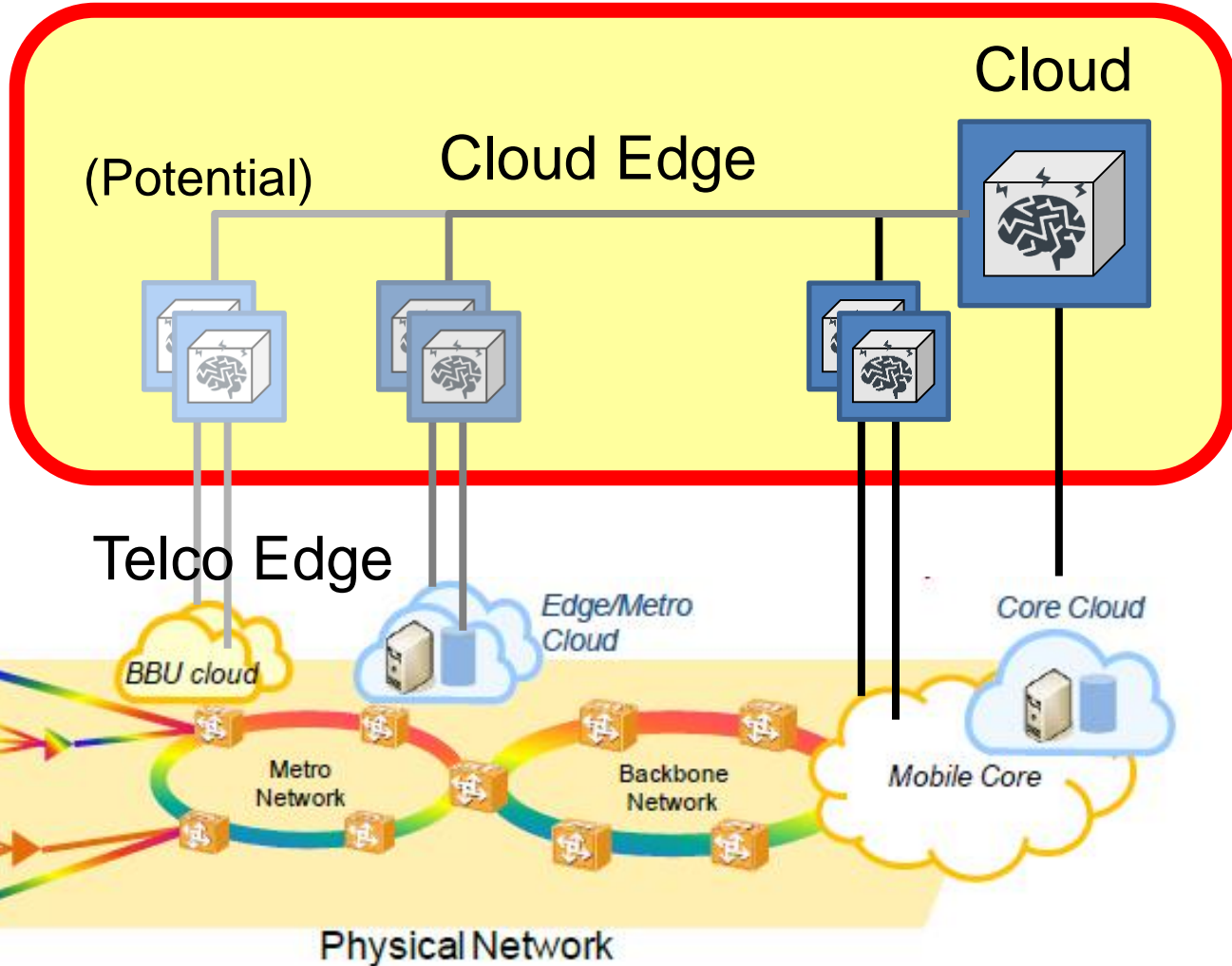
# ② Off-loading at Network Edge

- Scale-out following service growth

Primary Interest

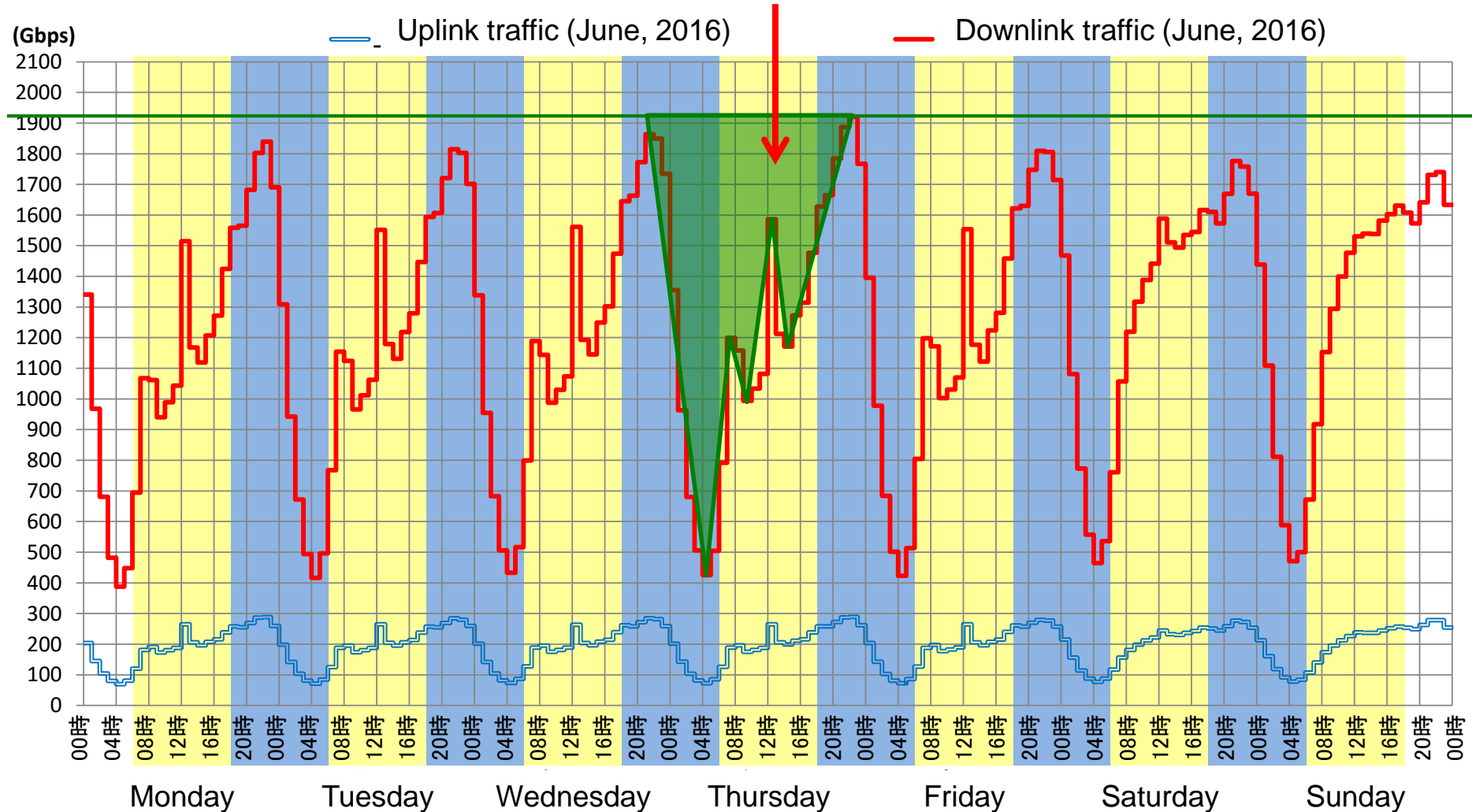


Device Edge



# ③ Background Data Transfer

Some network resource even in daytime





MEDIA COMPLEX  
QFRONT

12日の東京円相場は午後5時現在

STARBUCKS COFFEE

Hisamitsu  
サロンパス

Mighty Vision SHIBUYA

三千里薬品

BEST FICTION  
HANE ARUSA

大盛堂書店

歩きタバコ禁止

SEIBU

TSUTAYA

100-

Ameba  
http://ameba.jp

epius.jp



200  
m先

# ③ Background Data Transfer

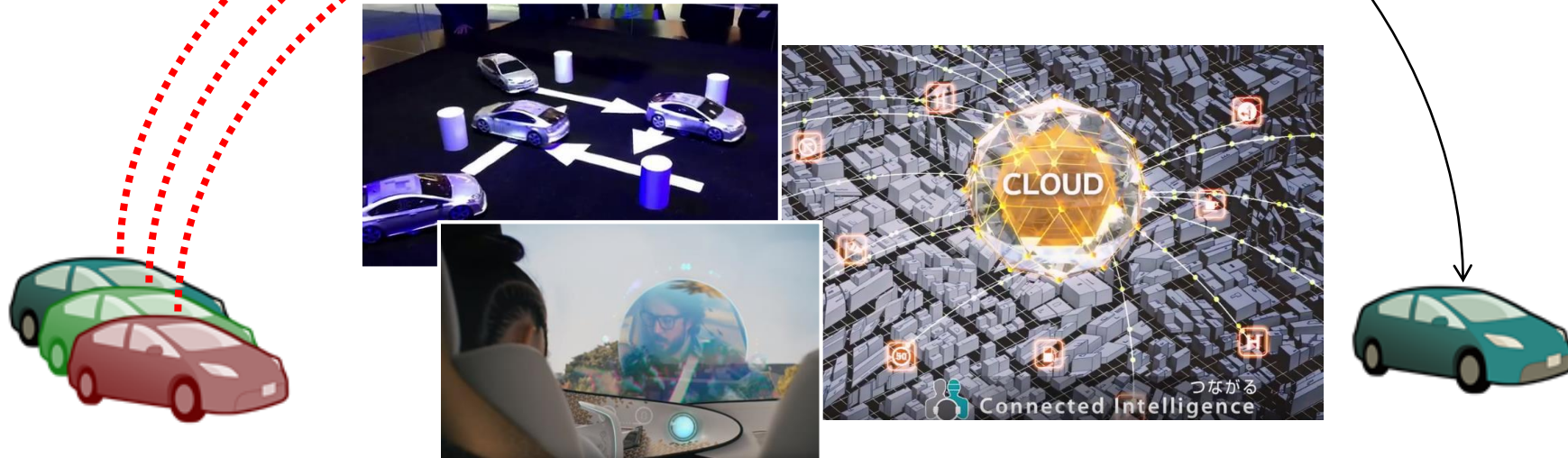
## Training

- ✓ Non-real-time
- ✓ Big data



## Practice

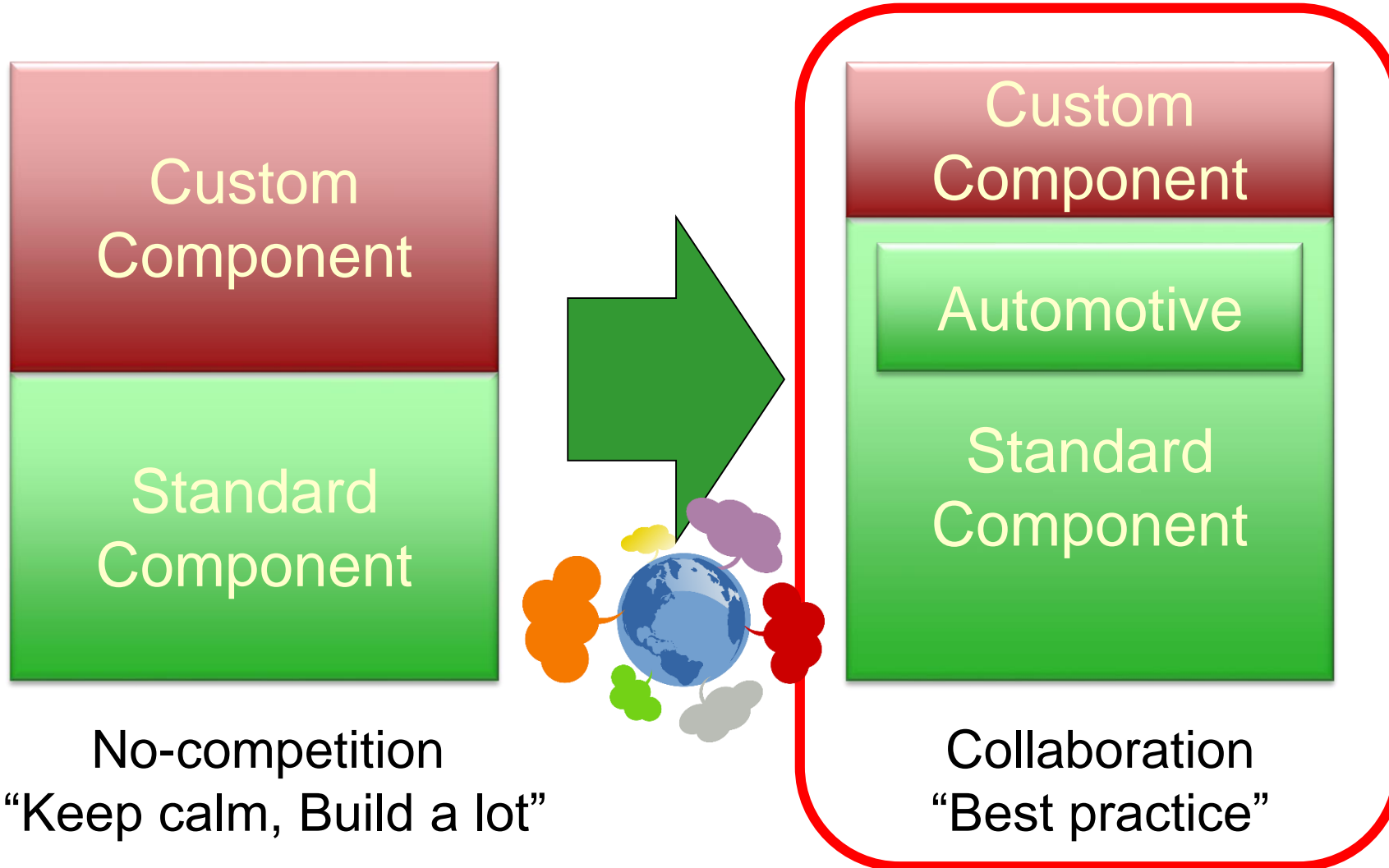
- ✓ Real-time
- ✓ Small data

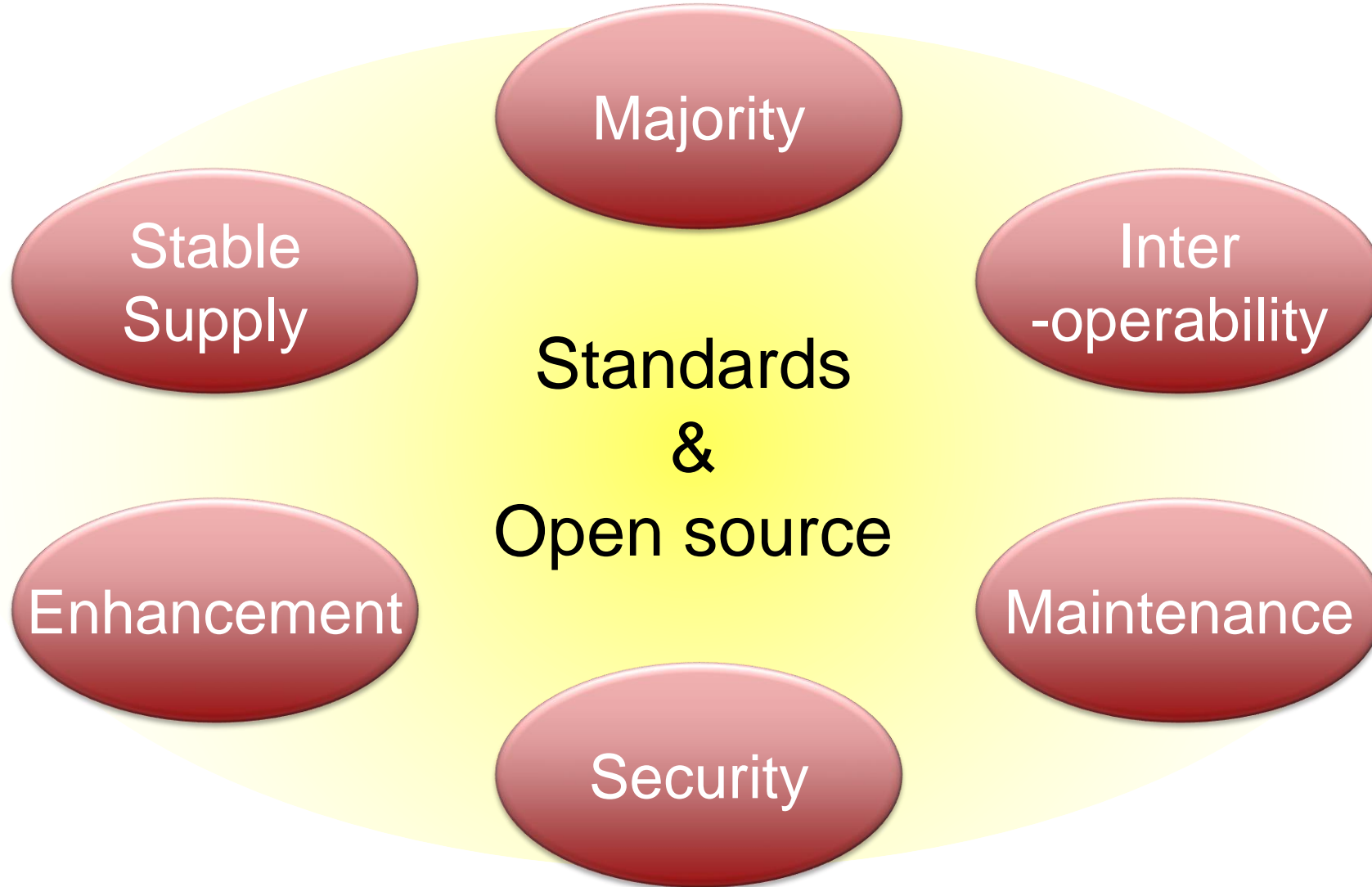




- Vision                      Connected Intelligence
- Issue                        Capacity and Scalability
- Solution                    Edge Computing
- Approach                Community Basis

# Community-based Development





- Network and Computing for Automotive Big Data
- Initial focus on Vehicle to Cloud
- Global and Sustainable Ecosystem
- Leading Market Actors Join Forces
  - AT&T, Denso, Ericsson, Intel, KDDI, NTT and Toyota more in the pipe to join
  - <https://aecc.org/>



AUTOMOTIVE EDGE  
COMPUTING CONSORTIUM



*DENSO*



**KDDI**



**NTT docomo**



- Marketing
  - Eco-system, Whitepaper
- Use case and requirement
- Specification
  - Functional Architecture
  - Protocol / APIs
  - Conformance Test
- Certification



AUTOMOTIVE EDGE  
COMPUTING CONSORTIUM

## Related Communities



Cellular



Wireless LAN



Internet



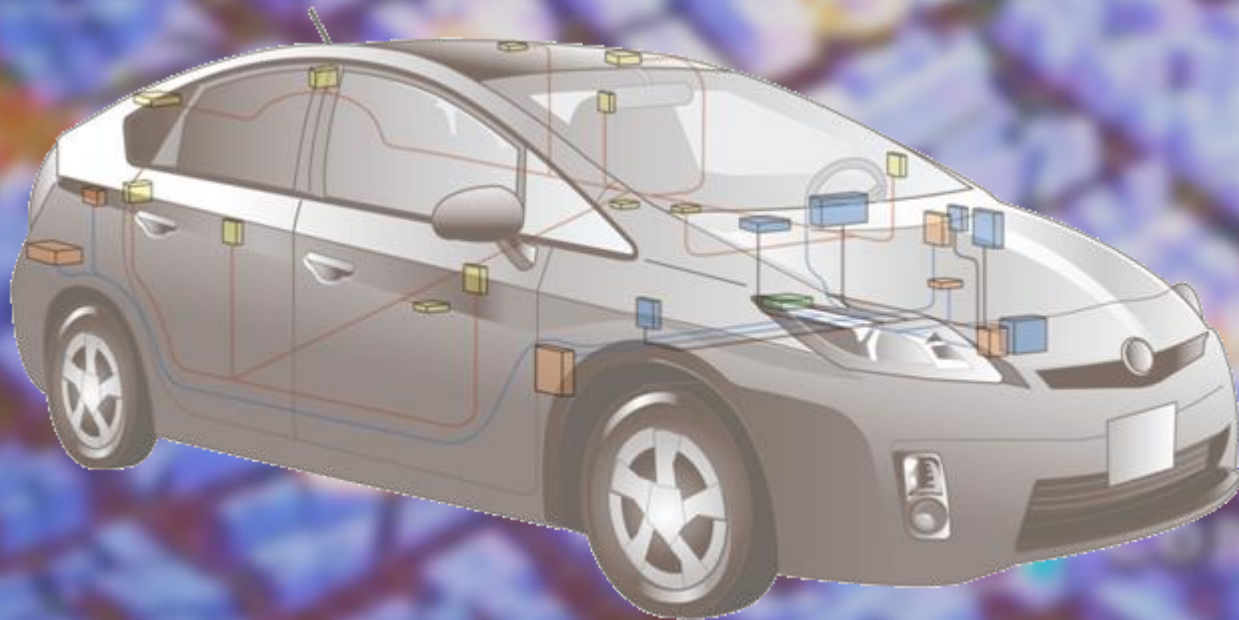
OS/Platform

...

- Vision      Connected Intelligence  
for mobility evolution
- Issue      Capacity and Scalability  
for automotive big data
- Solution      Edge Computing  
“Cloud Edge”
- Approach      Community Basis  
“Automotive Edge Computing Consortium”

TOYOTA

**Thank you!**



Connected Intelligence

# Dr. Andreas Müller

Senior Expert and Project Manager

**Bosch**



# Network Slicing for Industry 4.0

## - Expectations and Opportunities



**Dr. Andreas Mueller**  
**Robert Bosch GmbH**



**BOSCH**

# Network Slicing for Industry 4.0 - Expectations and Opportunities

## The Role of 5G for Industry 4.0

### Industry 4.0



- Increase the flexibility, versatility, productivity, resource efficiency & usability of industrial production
- Connectivity as a key enabler for cyber-physical production systems

Future Industrial  
Connectivity  
Infrastructures

### 5G



- Strong focus on machine-type communication and the IoT
- URLLC<sup>1</sup> + mMTC<sup>2</sup> enable completely new applications, also in industry
- 5G is more than wireless

Enabler for new  
applications & use cases  
and for lifting Industry  
4.0 to the next level



(Mobile) Robots



Factory  
Automation



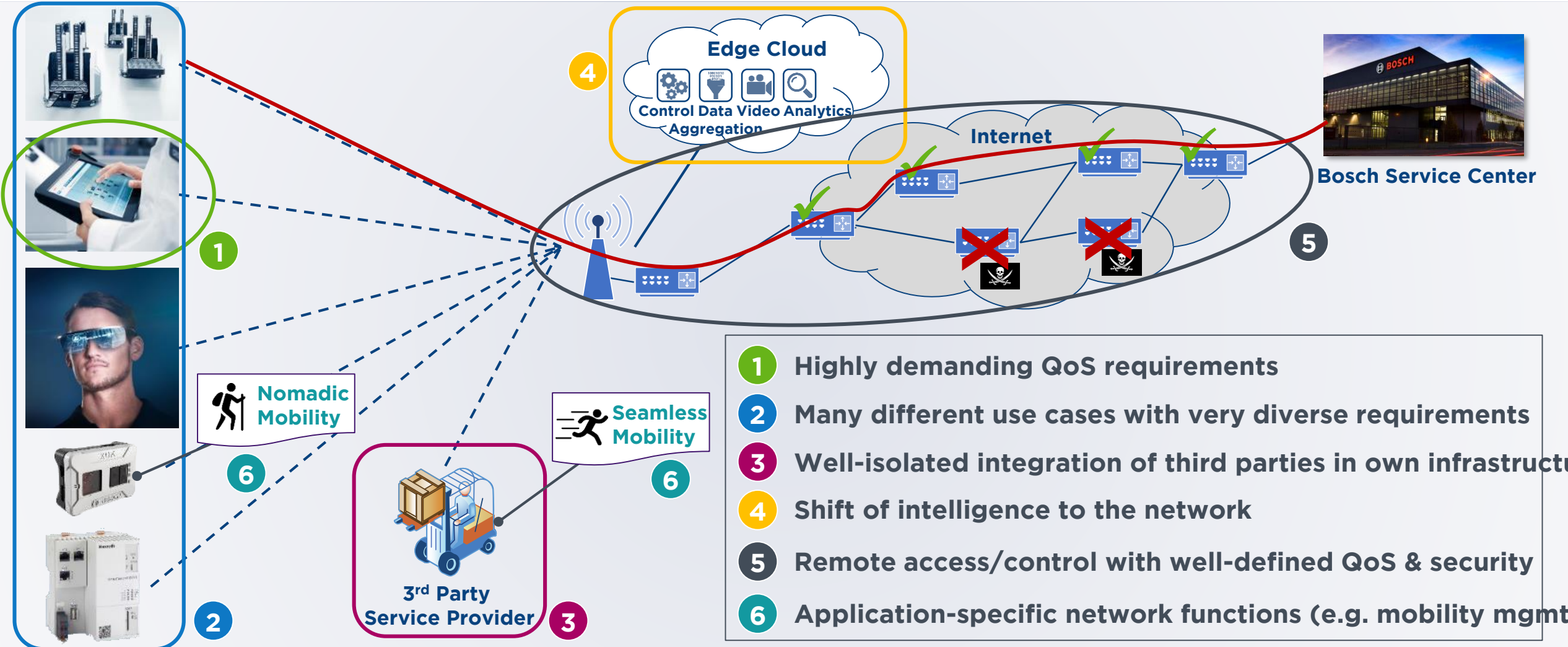
New HMIs<sup>3</sup>



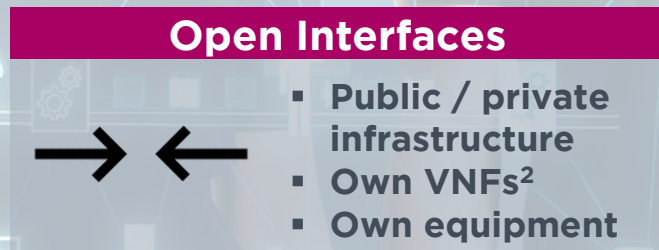
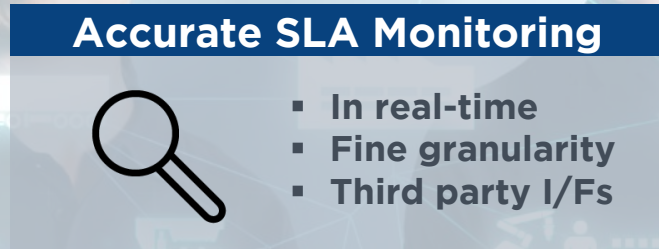
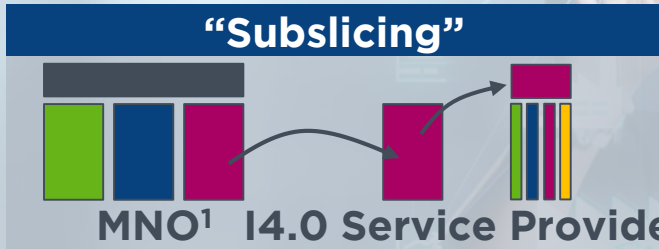
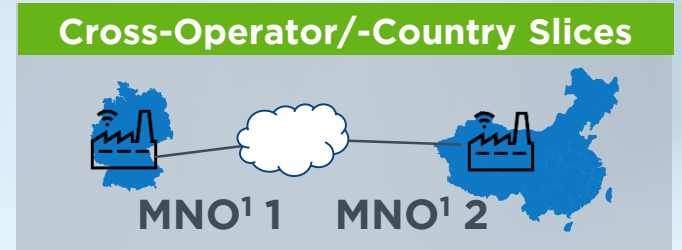
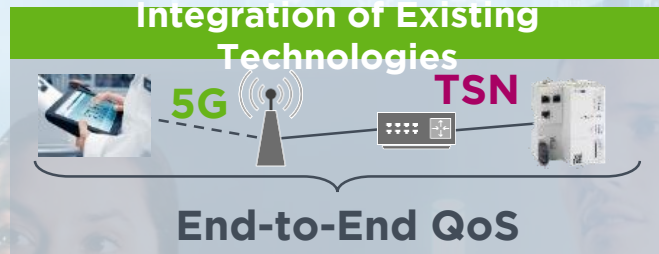
Logistics

# Network Slicing for Industry 4.0 - Expectations and Opportunities

## Why Network Slicing Is Needed (Selection)



# Network Slicing for Industry 4.0 - Expectations and Opportunities/ Requirements from the I4.0 Perspective



# Network Slicing for Industry 4.0 - Expectations and Opportunities

## Take-Away Messages

- 1 5G may be disruptive for the manufacturing industry
- 2 Many different use cases w/ highly diverse requirements
- 3 Network slicing as a key enabler to support Industry 4.0
- 4 Many industrial requirements not addressed yet
- 5 Close interaction of the whole ecosystem needed
- 6 Industry 4.0 may become THE killer application for 5G 😊

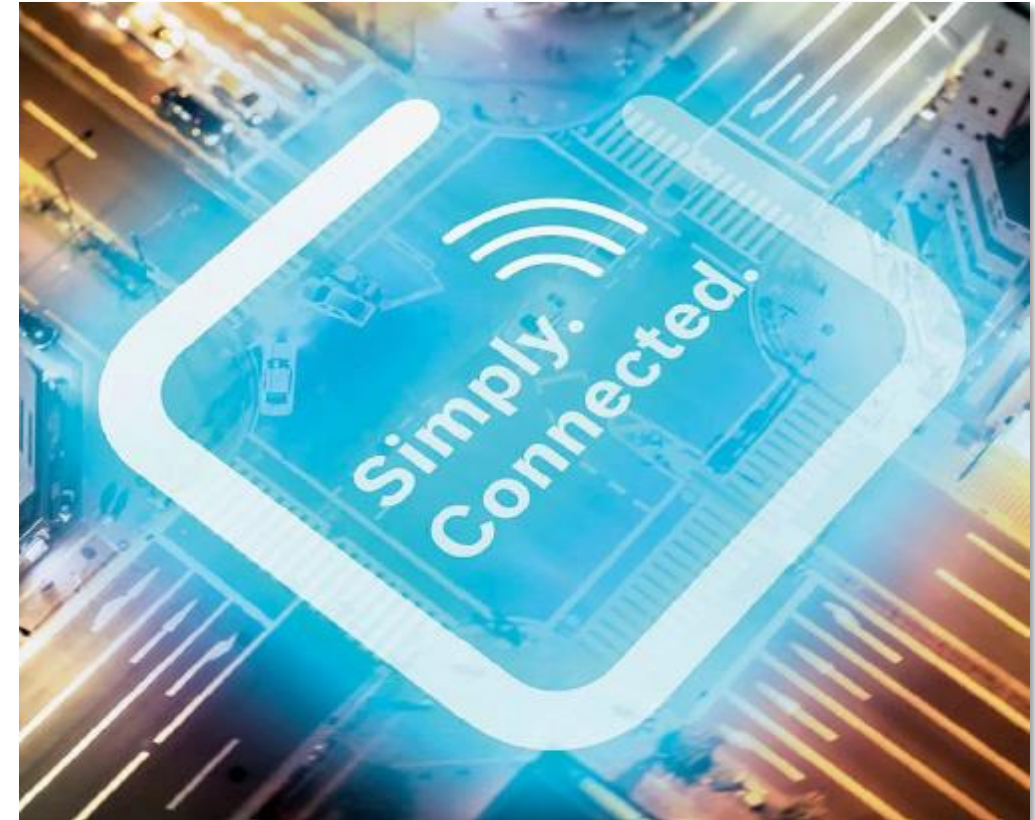


Image: BOSCH

# Thank you



Dipl.-Ing., M.Sc.  
Dr.-Ing. Andreas Müller

Corporate Sector Research and Advance Engineering  
Communication and Network Technology (CR/AEX1)

[andreas.mueller21@de.bosch.com](mailto:andreas.mueller21@de.bosch.com)  
Tel.: +49-711-811-20836

# Allan Cai

Senior Production Design Expert

**Alibaba**

# Alibaba :

# Try to Define the Future of Business

and its requirements for 5G network





让天下没有难做的生意  
*To make it easy to do business anywhere*



#MWC18



# The Alibaba Ecosystem

## DIGITAL MEDIA & ENTERTAINMENT



## CORE COMMERCE



## LOCAL SERVICES



## PAYMENT & FINANCIAL SERVICES



## LOGISTICS



## MARKETING SERVICES & DATA MANAGEMENT PLATFORM



## CLOUD COMPUTING

\* Ant Financial, Alibaba Pictures, Weibo, Paytm, Tao Piao Piao, Koubei and Ele.me are affiliated entities



Barter

Road  
Manpower/  
Animalpower  
Currency  
Metrology



Waterway  
Bank

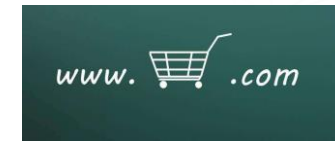
Coal & Oil  
Steamer  
Aviation



Electricity  
Communication



IT  
Network  
Mobile



Internet  
e-Wallet  
Cloud Computing

#MWC18  
What is the next?

# New Retailing: HEMA



HEMA APP



HEMA CLUB



#MWC18



# HEMA's vision

## Establish a new retailing format

Evolving the single channel retailing to integration business



HEMA

BETTER LIFE RIGHT HERE

# New Retailing: TAO CAFÉ

## —— no-checkout-line store



Entering with mobile APP

Track and trace

Voice Command

Self-shopping with RT processing

Auto-Pay gate

TAOCAFE  
淘|宝|会|员|店

# behind the TAO CAFÉ



- Autonomous sensory and learning
- Target tracking and analysis
- Prediction and identification

TAOCAFE  
淘宝会员店





# Insight into the future of business

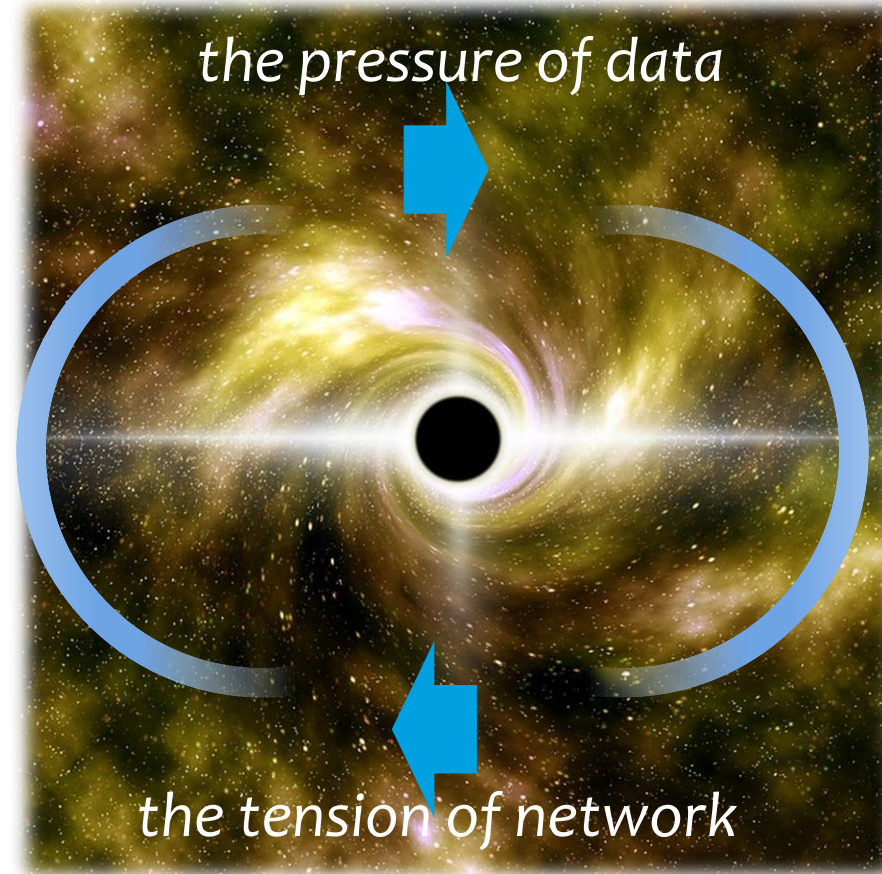
## Next Decade: Intelligent Business's nuclear fusion

1. Using the advantages of the Internet and algorithms, providing low-cost real-time services to a large amount of users.
2. To meet the individual needs of each user.
3. Fast iterations, auto-updating, auto-improvement.

#MWC18

# The black hole effect with Intelligent Business

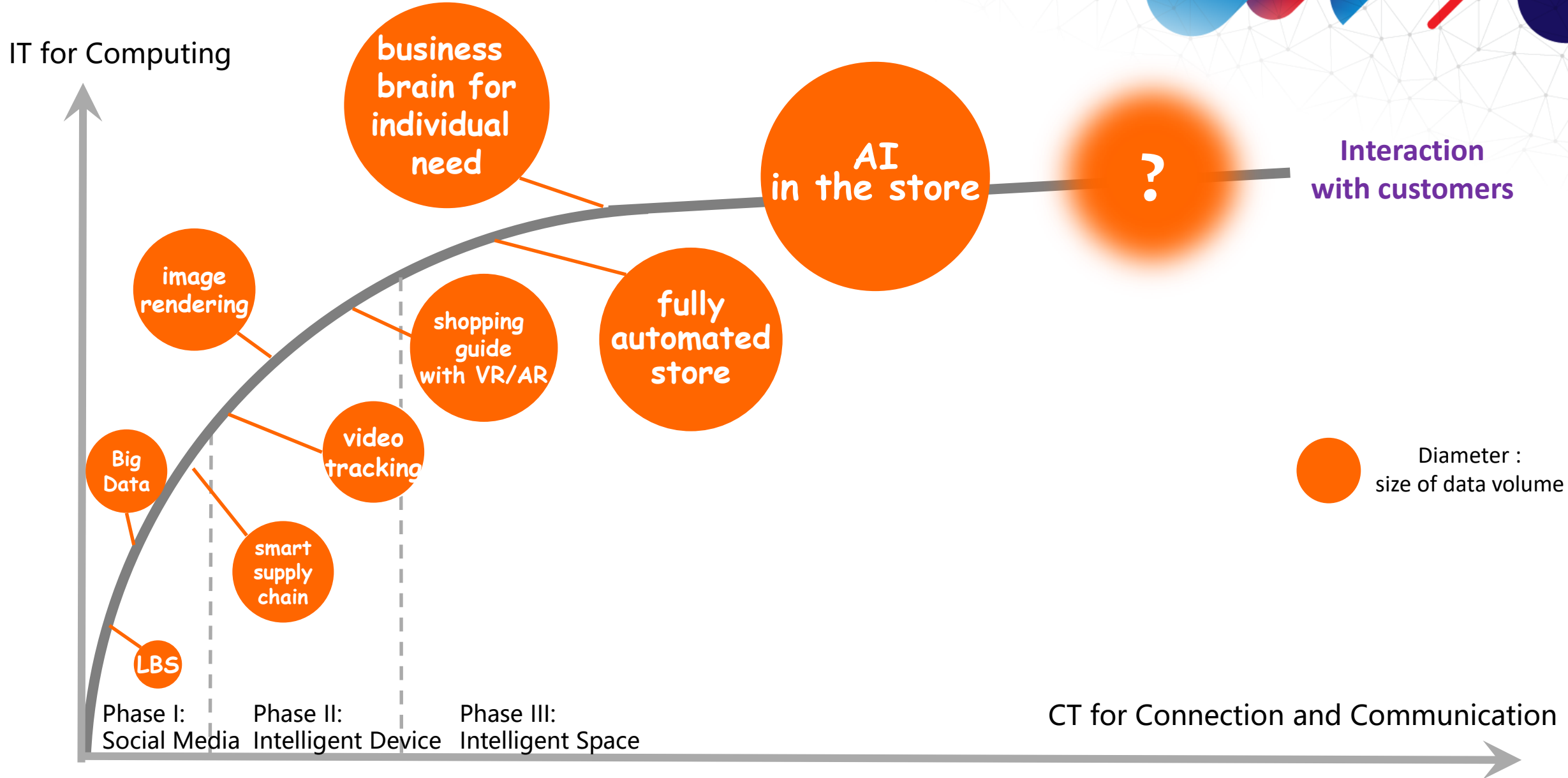
Network Synergy



Data intelligence

#MWC18

# IT & CT support the consumer with “no interaction”



# What does the scene need?

from

eMBB

mMTC

URLLC

to

5G-Native Innovation



- Mass data transmission and real time processing
- Diversified, Large-scale high-density computing
- Boundaryless with services implementation

#MWC18

# So : 5G, for the unpredictable future,

becomes



extensive



on-demand



elastic



open



secure

to enable business with

Ubiquitous  
connection and rich  
capabilities

Effective, reliable, secure  
and on-demand connection  
guarantee

Standardized MANO and  
business development  
enabling



**THANK YOU**  
and  
**Happy Chinese New Year !**



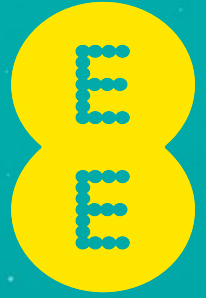
**#MWC18**

# Matt Stagg

Head of Media & Entertainment Technology

EE

# 5G FOR MEDIA & ENTERTAINMENT



**HOW THE NEXT GENERATION OF MOBILE  
TECHNOLOGY WILL REVOLUTIONISE THE MEDIA &  
ENTERTAINMENT SECTOR**

**Matt Stagg**

**Head of Media & Entertainment Technology**

**MWC 2018**



# THE UK'S MOST ADVANCED DIGITAL COMMUNICATIONS COMPANY



EE runs the UK's biggest and fastest mobile network, pioneering the UK's first superfast 4G mobile service in October 2012

4G coverage today reaches more than 90% of the UK geography

EE has approximately 553 retail stores, and services more than 31 million connections across its mobile, fixed and wholesale networks

# 5G Overview



Guaranteed  
user data rate

$\geq 50\text{Mb/s}$

Capable of human-  
oriented terminals

$\geq 20$  billion

Capable of IoT terminals

$\geq 1$  trillion

Aggregate service  
reliability

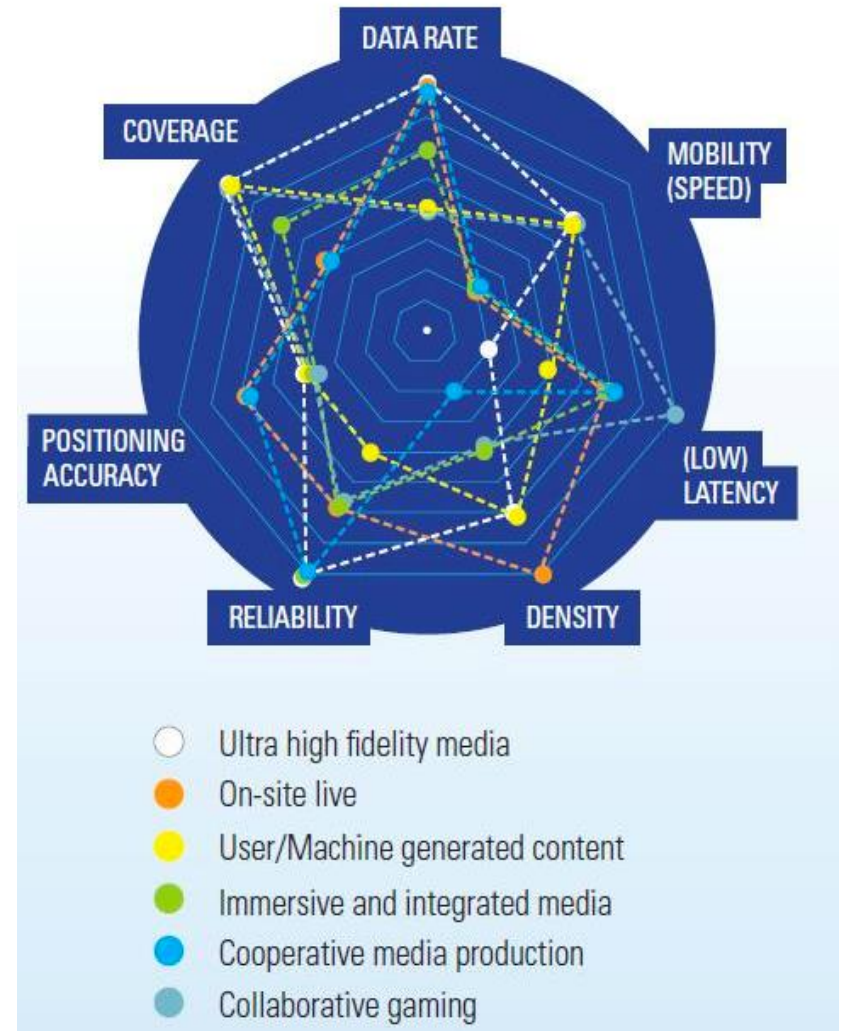
$\geq 99.999\%$

Mobility support at speed  
 $\geq 500\text{km/h}$   
for ground transportation

Accuracy of outdoor  
terminal location

$\leq 1$  meter


# 5G for Media and Entertainment




# Media & Entertainment

## Vertical

**A**  
**u**  
**t**  
**o**  
**m**  
**o**  
**t**  
**i**  
**v**  
**e**



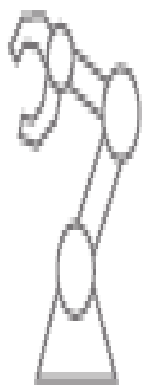
**H**  
**e**  
**a**  
**l**  
**t**  
**h**



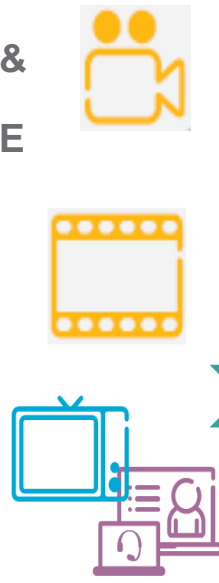
**B**  
**r**  
**a**  
**d**  
**b**  
**a**  
**n**  
**d**





**M**  
**a**  
**n**  
**u**  
**f**  
**a**  
**c**  
**t**  
**u**  
**r**  
**i**  
**n**  
**g**



**M**  
**&**  
**E**



- IPTV
- Mobile Video
- DTT
- 4K - 8K - xK
- Cameras
- Outside Broadcast
- Live & Linear Video
- VoD
- Caching
- CDN
- VR / AR

 Unicast – Multicast - Broadcast 

# 5G XCAST



69



# Glastonbury Use Case



4G is extensively used for OB in many UK locations

52TB of data was consumed on EE's Network

8.5TB was uplink an increase of >70% from 2016

OB needs a guaranteed bit rate for primary feed

5G slicing could allow a separate 'OB grade network'

Consumers and OB will not compete for bandwidth

# Aligning M&E Requirements for 5G

OB / Location  
Filming /  
Sport

Discovery CHANNEL  
BT Sport  
HBO AMC  
sky sports  
BBC  
ITN  
REUTERS

Contribution

AVIWEST  
LiveU BT  
BT Media & Broadcast  
TELSTRA  
ARQIVA

Distribution

ARQIVA  
E  
Virgin media  
BT  
vodafone

Consumer Devices

Netgem SAMSUNG  
technicolor G  
NOKIA

Industry Bodies

DTG  
EBU SMPTE  
streaming video alliance

5G M&E Forum?

Standards bodies

3GPP A GLOBAL INITIATIVE  
ETSI  
HbbTV  
DVB Digital Video Broadcasting





For the M&E Vertical to capitalise on 5G there needs to be more collaboration within the industry

We need to take a 'glass to glass' view engaging partners from each of the technology areas

Working in isolation will result in fragmentation of requirements

Without identifying, collating and developing requirements, the M&E industry cannot exploit the opportunities offered by 5G

