



# ICT Frontline Technologies - Opportunities for Research and Development in Europe

**Euro CASE annual conference 2016**  
**Lyngby, November 14**

**Walter Haas**  
**CTO Huawei Germany**



# Agenda

Overview Huawei

ICT Frontline Technologies

Research & Innovation in Europe

A graphic showing a blue-tinted Earth globe with a complex network of glowing blue lines and nodes representing global connectivity. The text "A BETTER CONNECTED WORLD" is written in a white, hand-drawn style font across the top of the globe.

A BETTER CONNECTED WORLD



# Overview Huawei

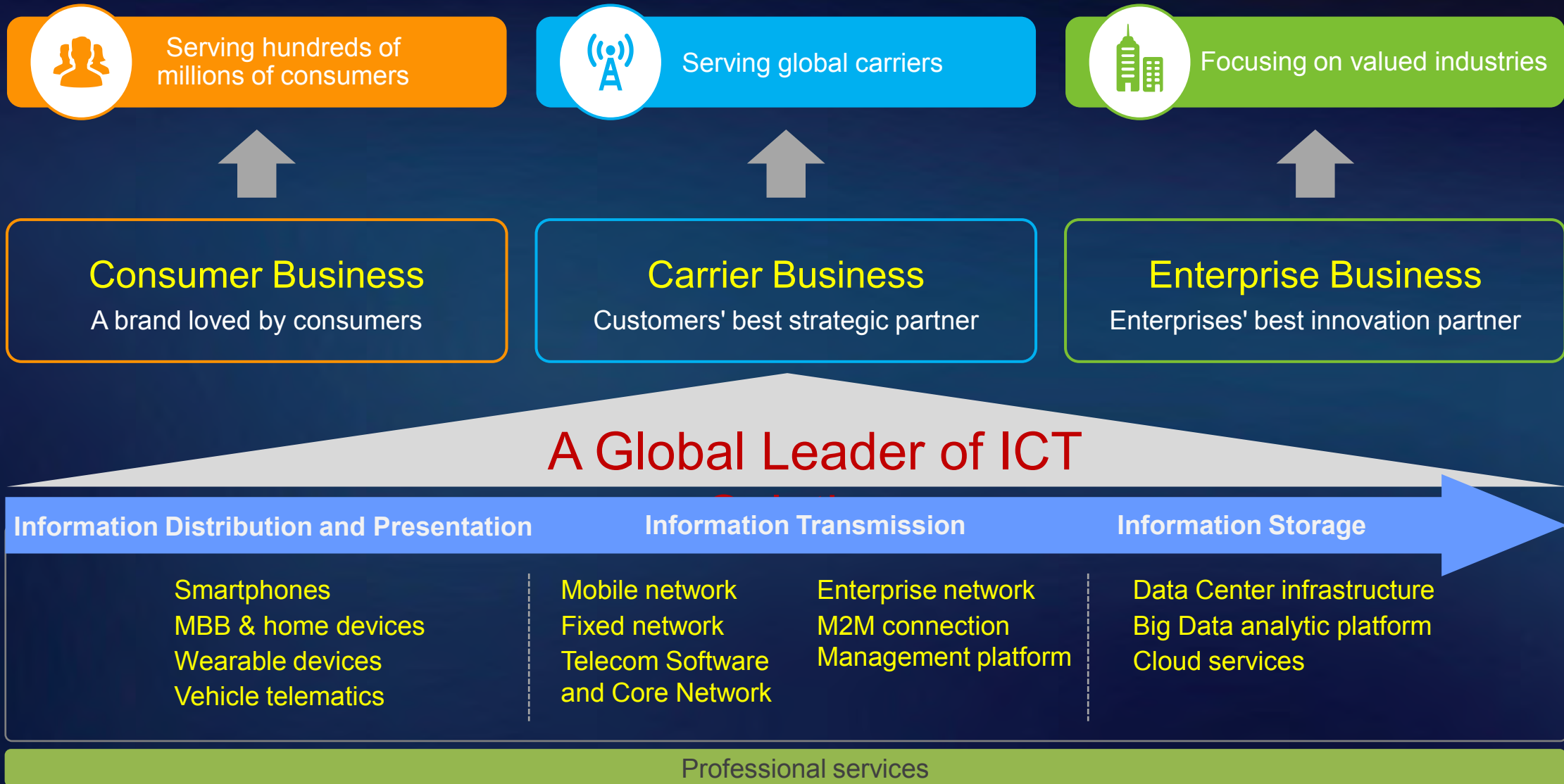


# Huawei at a Glance – A Global ICT Leader

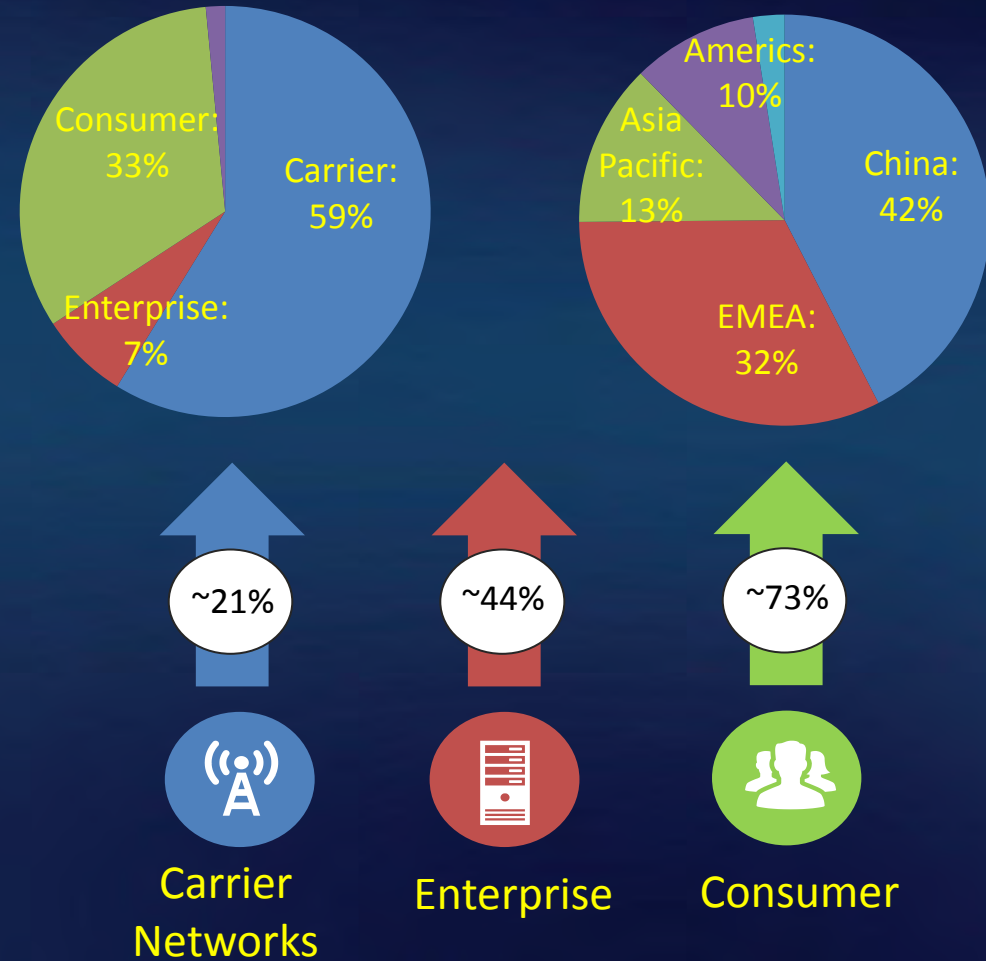
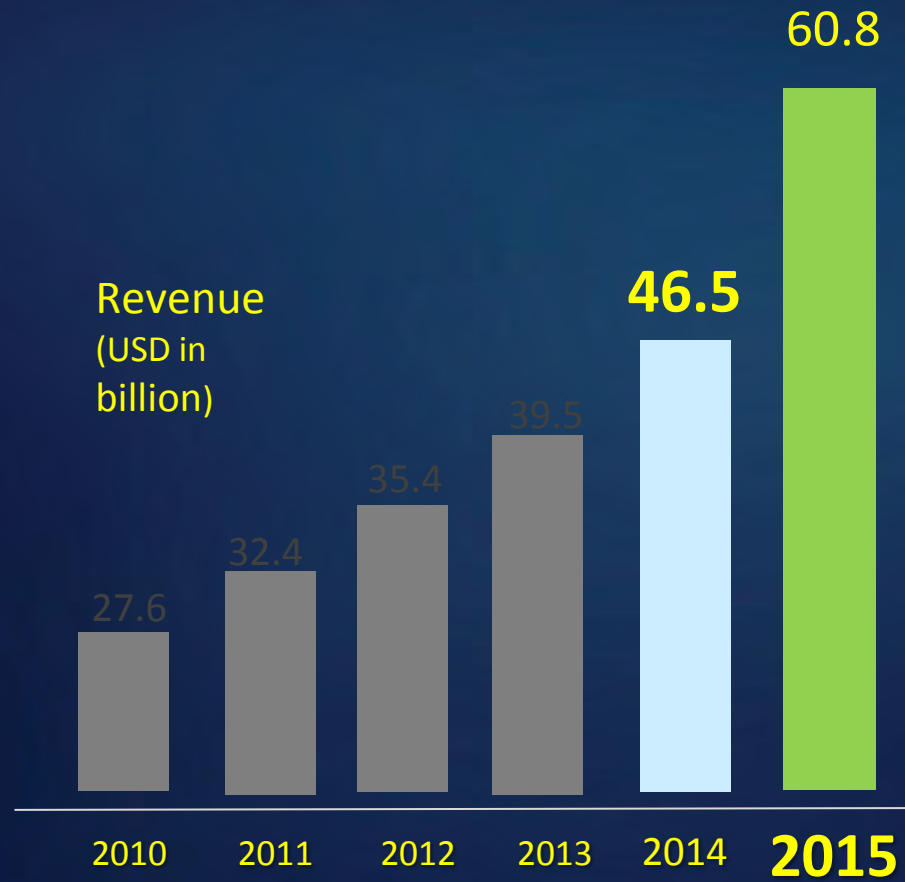


- \$60.8bn revenues in 2015 (+37%)
- Deployed 162 LTE industry networks, ranking No.1 globally
- Smartphone shipments exceeded 108 million units in 2015

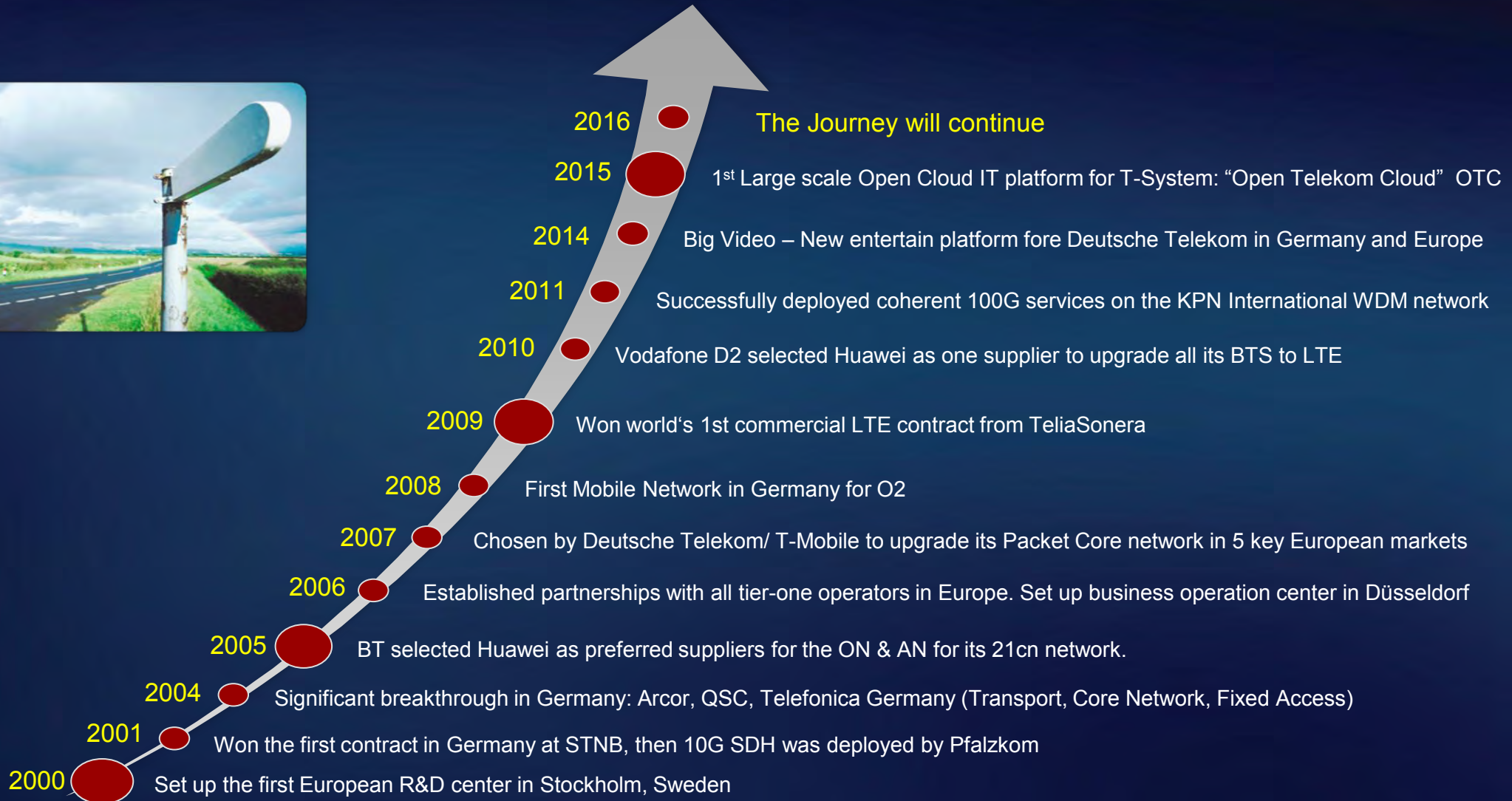
# ICT Solutions and Services for Three Customer Groups



# Huawei Business Global – Continuous Effective Growth



# Huawei Europe Milestones



A conceptual image featuring a human hand holding a globe of the Earth. The hand is positioned at the bottom, with fingers spread, supporting the globe. The globe is centered in the upper half of the frame. The entire scene is set against a dark blue gradient background. A horizontal teal band is overlaid across the middle of the image, containing the text.

# ICT Frontline Technologies



# World is changing toward ICT

Previous 100 Years  
Connected Communications



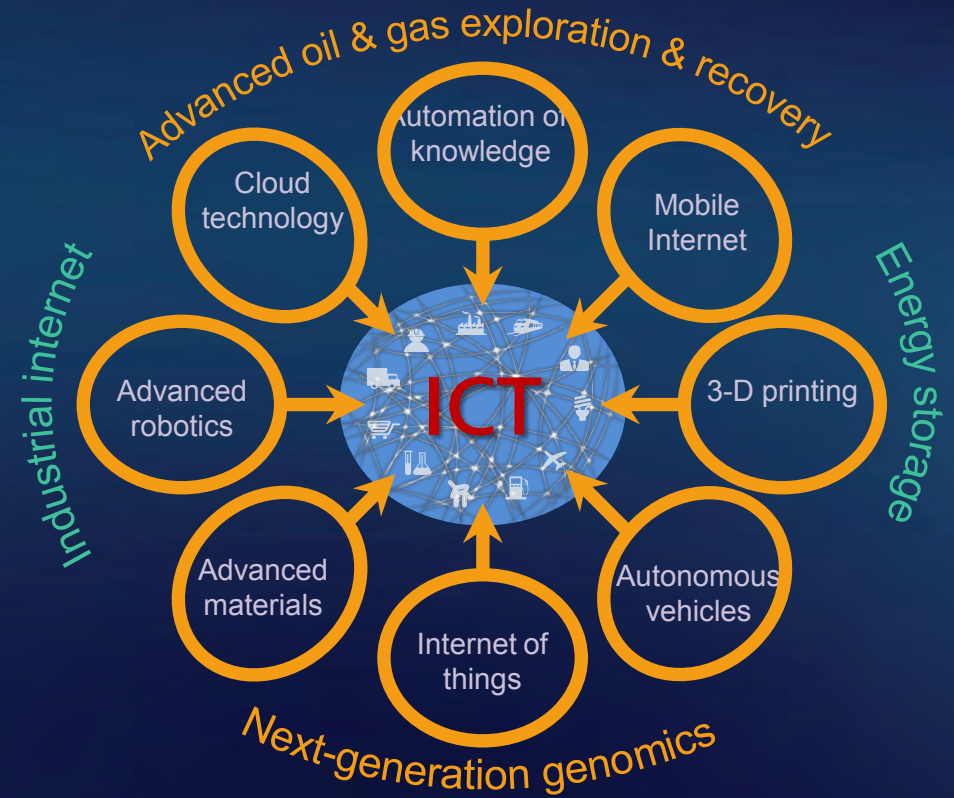
CT

Past 20 Years  
Social Internet



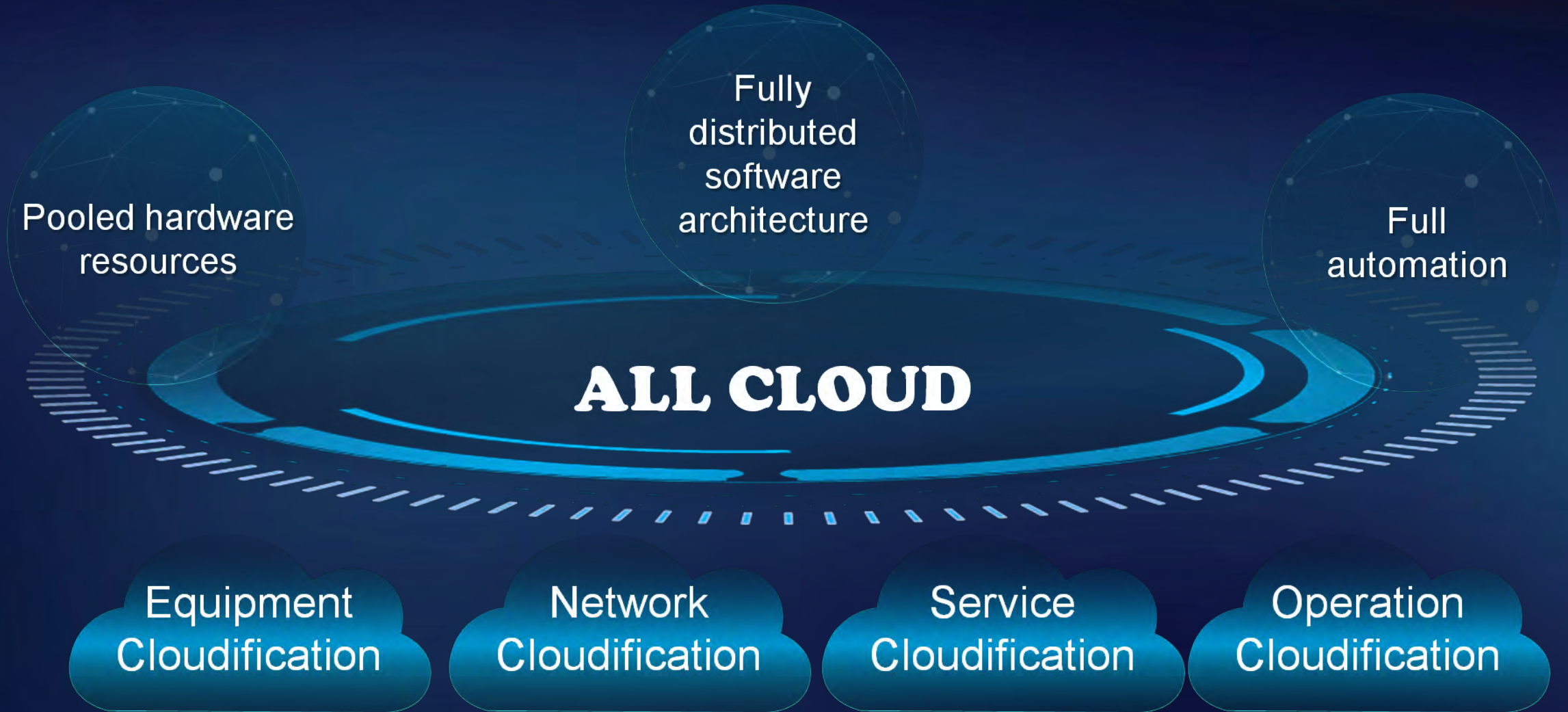
IT

Next 5-10+ Years  
Internet of Everything

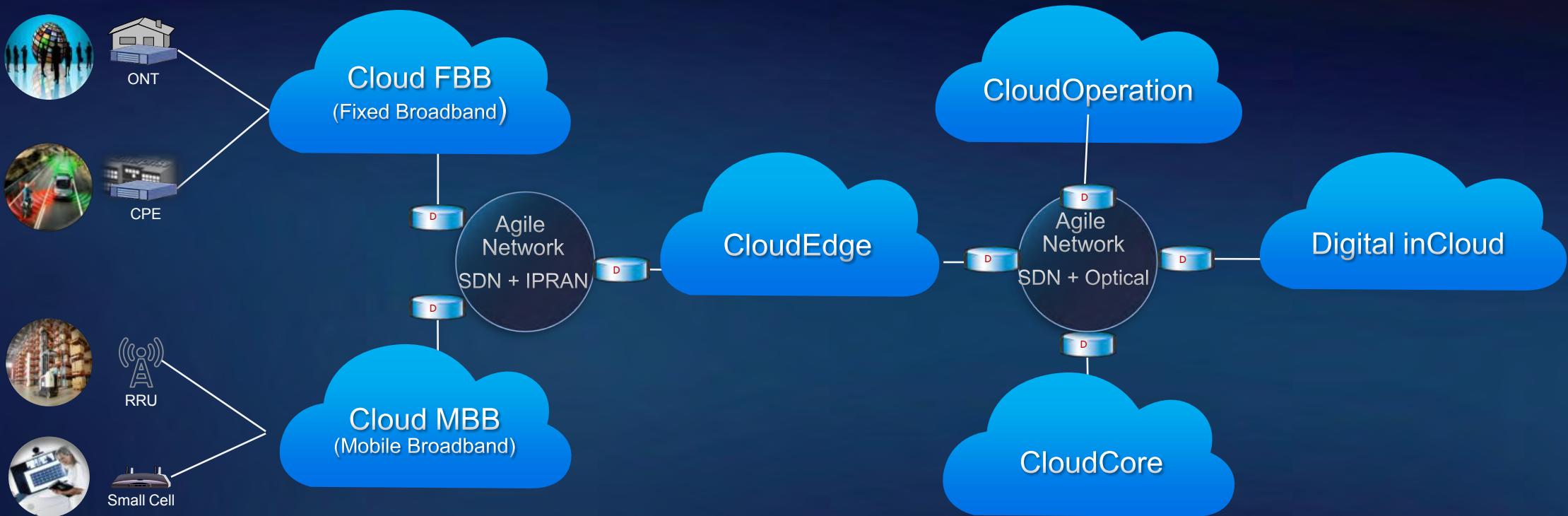


ICT

# Future Network based on “All Cloud” Strategy



# UBB (Ultra Broadband) 2025 : Meet the Future Network



DC-Centric	Central Office DC Time Delay Preferred	Edge DC Bandwidth Preferred	Core DC Cost Preferred
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**Super-Fast**  
@Access  
GigaRadio: 4.5G/5G  
GigaHome: Giga@Any Media

**Super-Flat & Broadband**  
@metro & backbone  
Flattened Network: 5 to 3 Layers  
Ultra Broadband: IP+Optical, Tera to Peta

**Super-Agile**  
@ E2E  
Network Re-architecture: DC centric  
Service Agility: SDN / NFV

# 5G will change the Paradigm



5G

Latency

1 ms  
E2E  
Latency

Throughput

10Gbps  
Per  
Connection

Connections

1,000K  
Connections  
Per Km2

Mobility

500km/h  
High-speed  
Railway

Network  
Architecture

Slicing  
Ability  
Required

GAP

30~50x

16x

100x

1.5x

NFV/SDN

LTE

30~50ms

600Mbps

10K

350Km/h

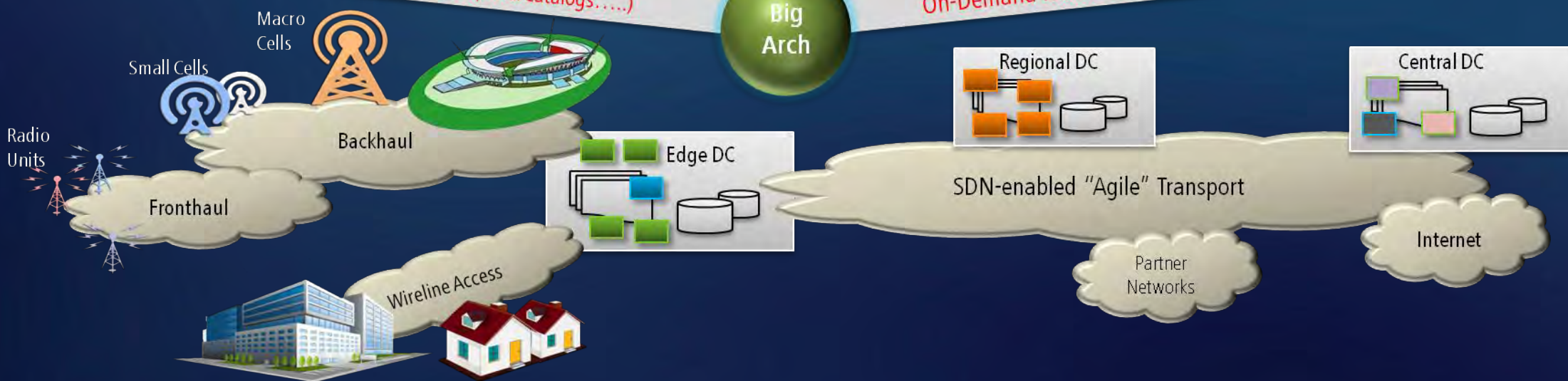
Inflexible

# Service Oriented New Architecture & New Operation



(Micro Services, Descriptors/Catalogs.....)

On-Demand Resource Allocation

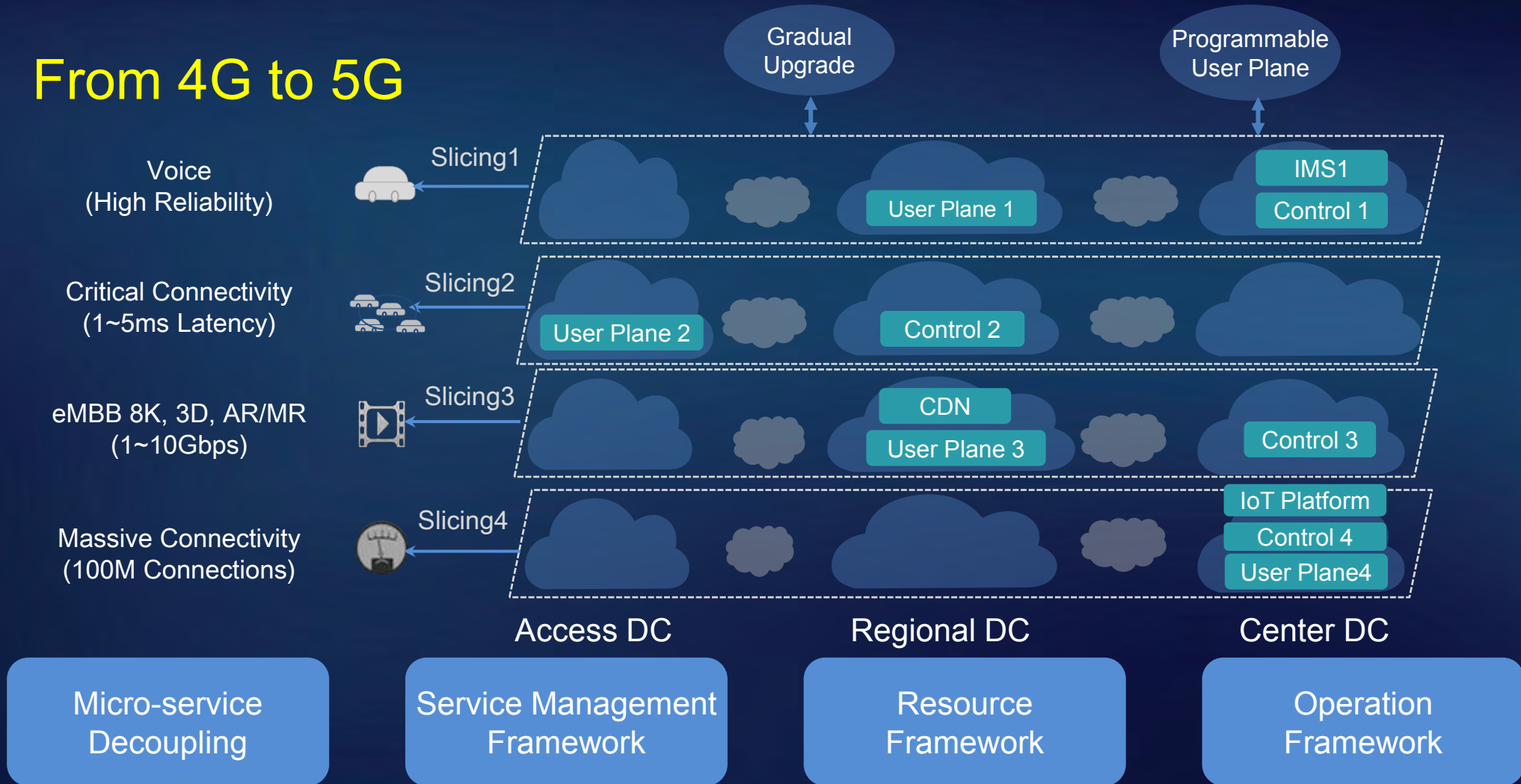


On-Demand Industrial Infrastructure

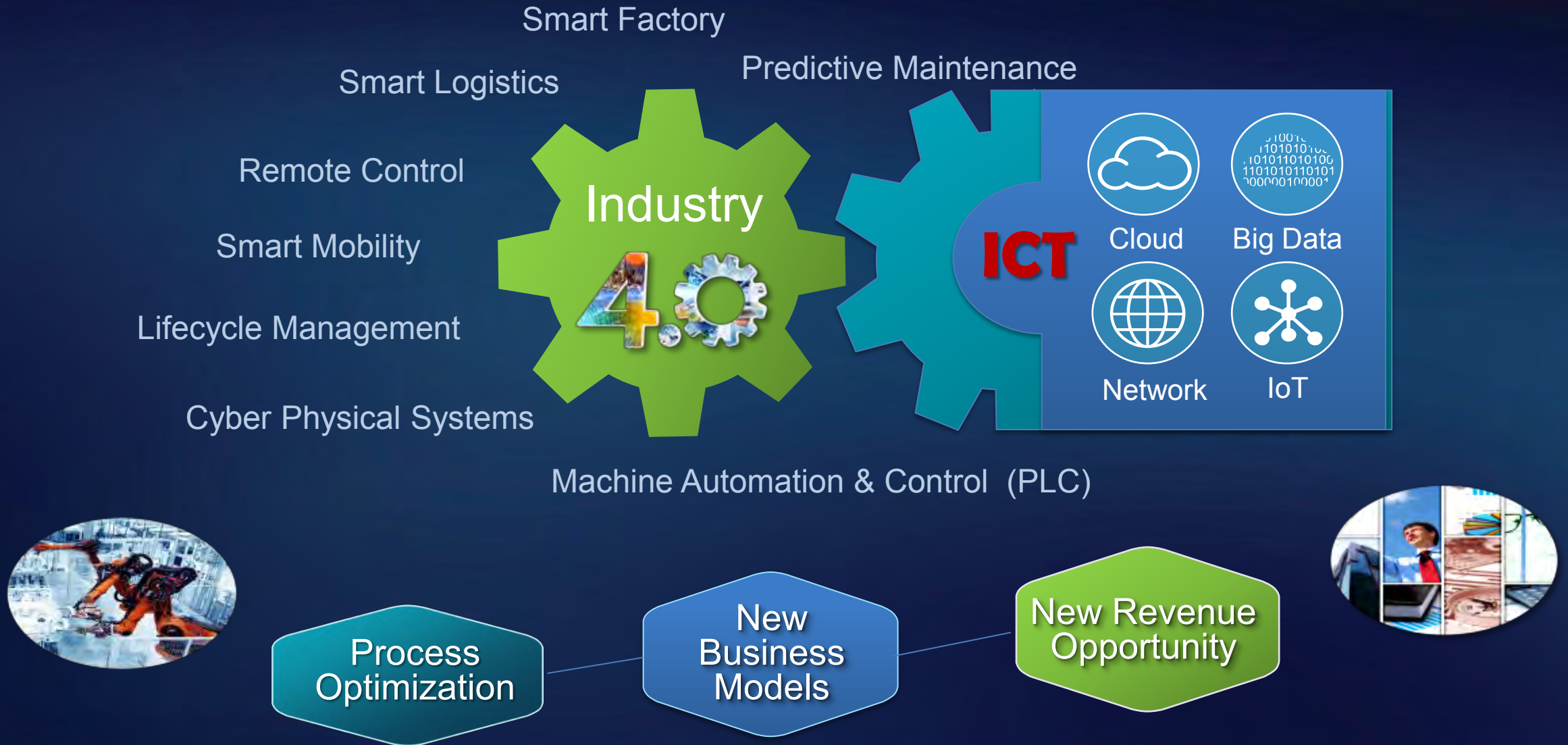
Shared Physical Infrastructure

# Cloud Native is best for Vertical Industry Slicing

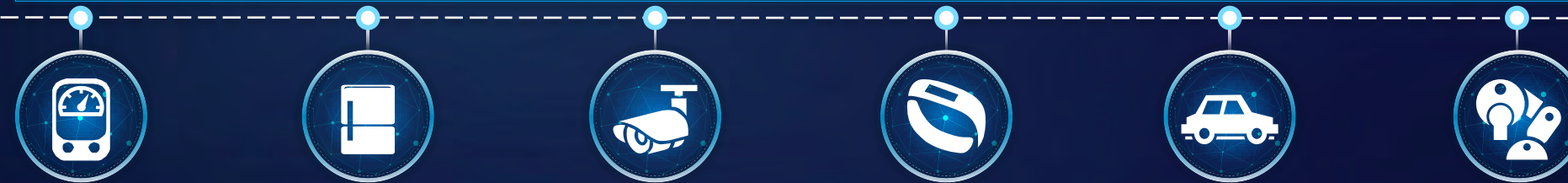
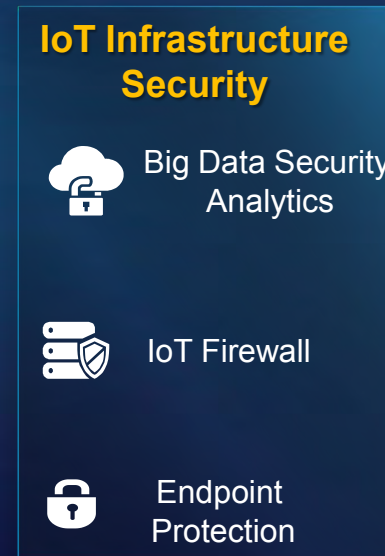
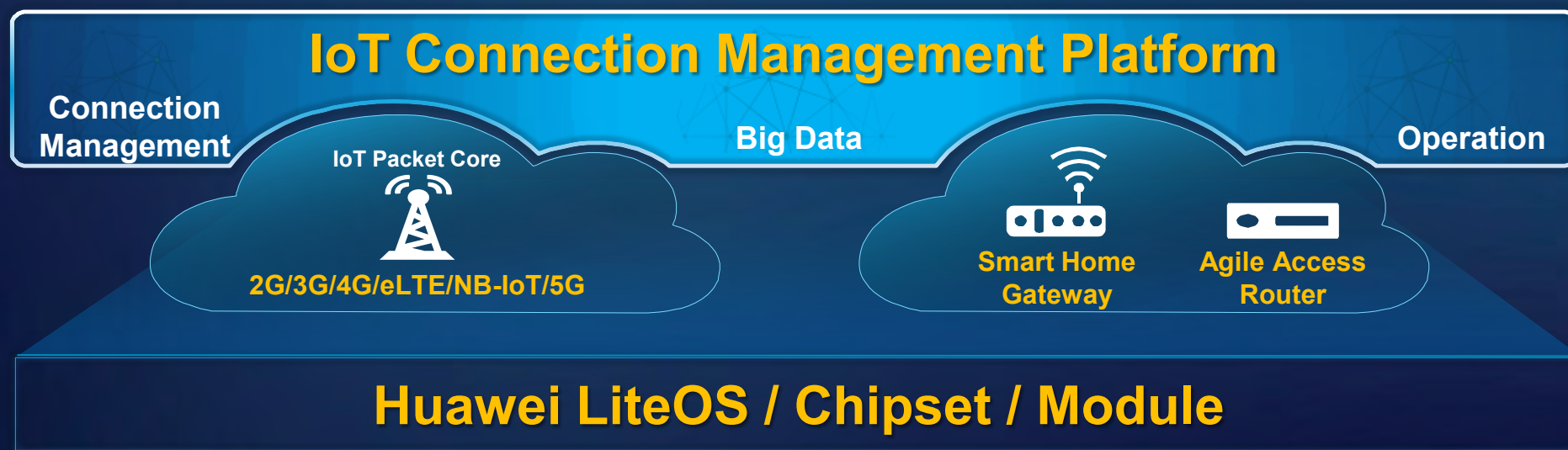
## From 4G to 5G



# Industry Mega Trend: Digitization



# ICT Technology Enabling Digitization





# New ICT in IoT and Cloud era



A conceptual image featuring a human hand holding a globe of the Earth. The hand is positioned at the bottom, with fingers spread, supporting the globe from below. The globe is centered in the upper half of the frame. The background is a dark, teal-to-blue gradient. A horizontal teal band is overlaid across the middle of the image, containing the text.

# Research & Innovation in Europe

# 3 Pillars of Research & Innovation



ERI (European Research Institute)

/ERC (European Research Center):

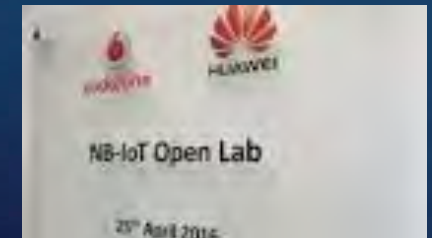
- Solution & product oriented research
- Academic partners
- Industry partners

## Joint Innovation Center:

- Joint innovation with key customers
- Examples for each Business Group:
  - Mobile Innovation Center with Deutsche Telekom
  - Innovation center with SAP
  - “Max Berek” Innovation Lab with Leica in Wetzlar/Germany

## Open Lab:

- Industry solution cooperation Lab for IoT
- Open Lab with key customers (e.g. NB-IoT lab with VDF)



# Joint Innovation & Research on 5G



Joint “Mobile Innovation Center” (MIC)

Deutsche Telekom & Huawei

MIC is connected to DT “5G:haus”



**Huawei and Deutsche Telekom  
Jointly Win 5G Global Cooperation Award**

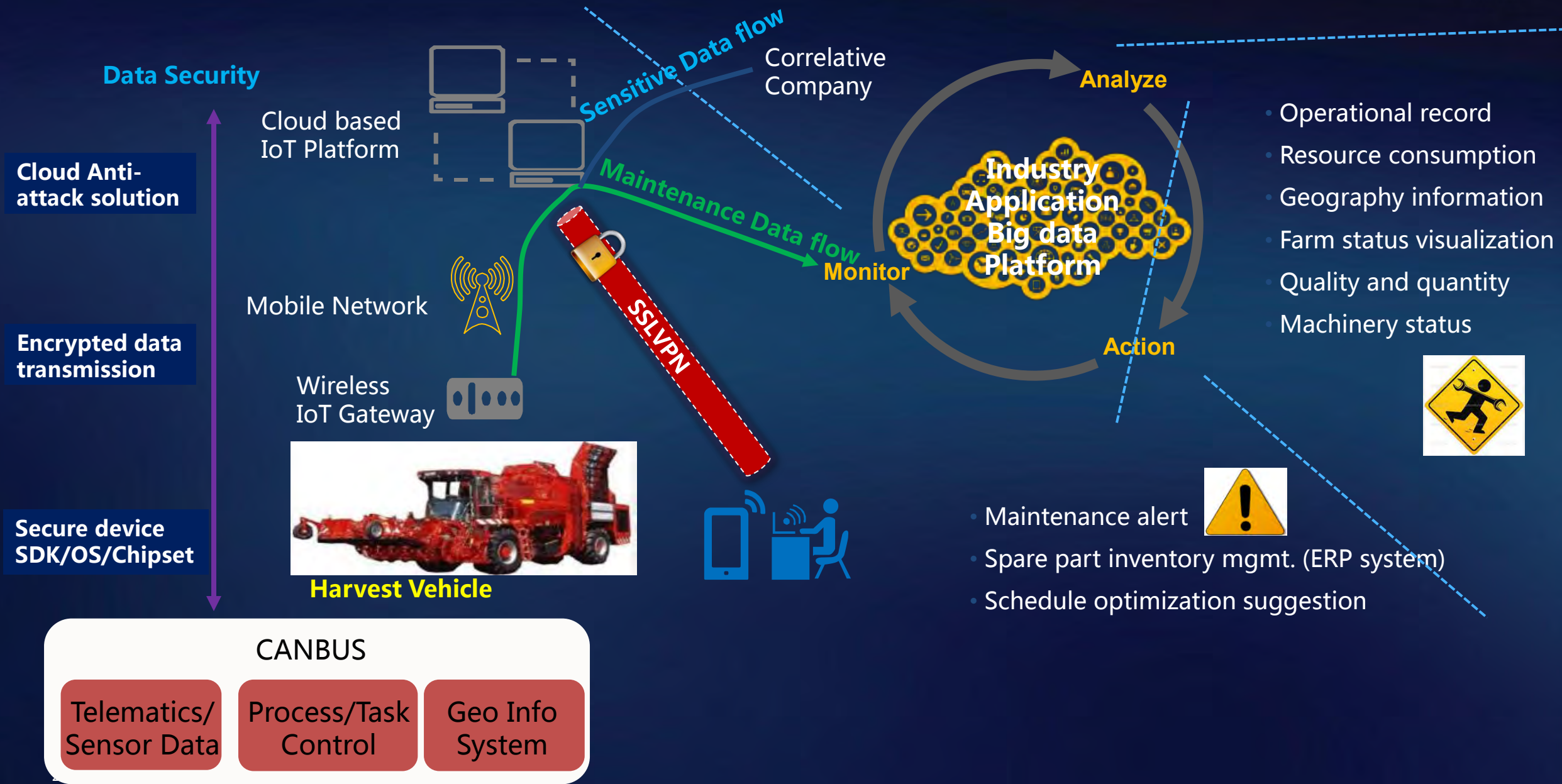


**World Record:  
70 Gbps on the 73 GHz millimeter wave band**



The world's first showcase of 5G E2E network slicing was created in the 5G:haus with strong contribution from the Huawei-Deutsche Telekom Innovation Center based in Bonn, Germany

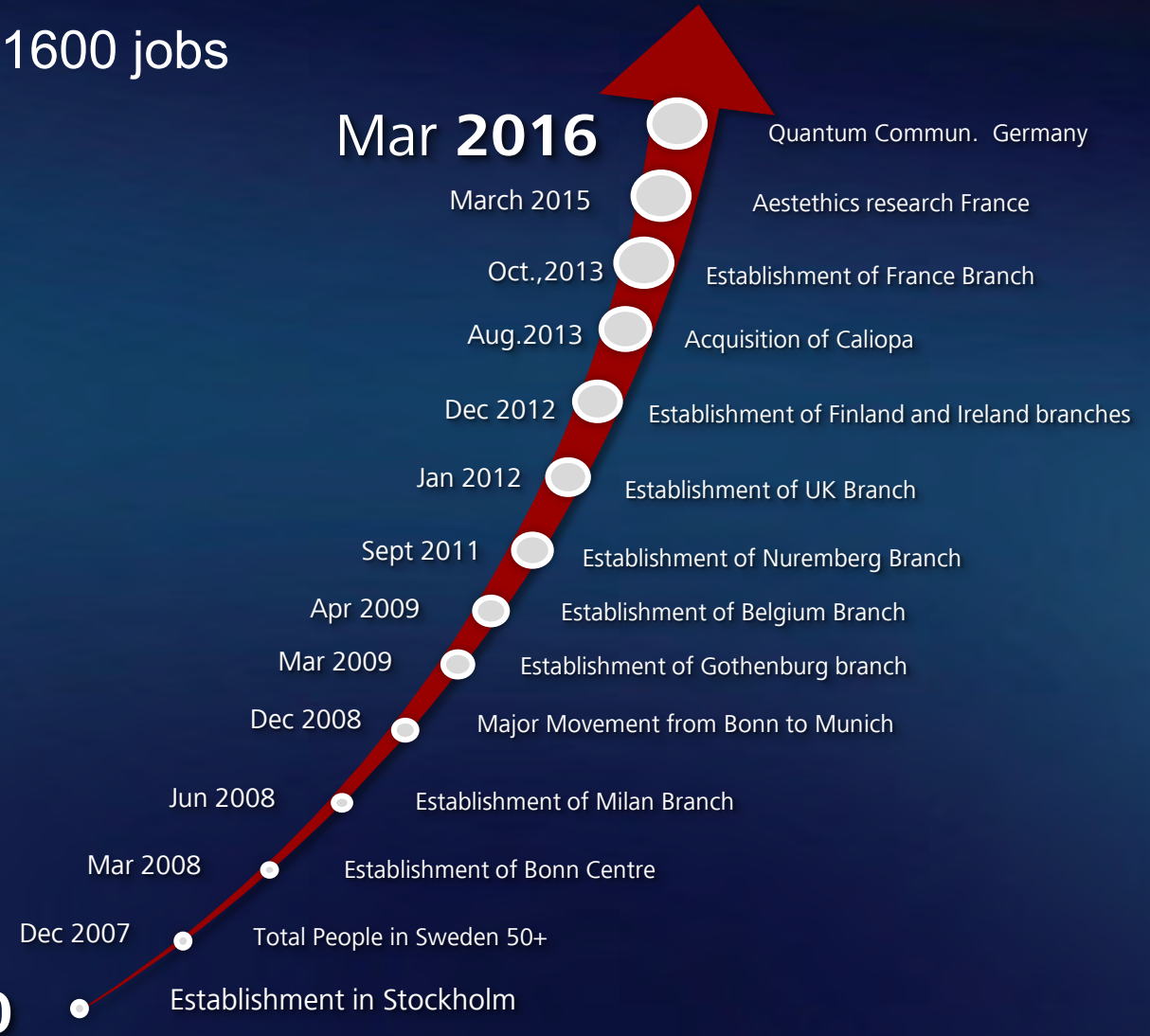
# IoT Eco-System co-operation: 4 party Open Lab innovation



# Huawei European Research Institute: Structure



18 local R&D-sites throughout 8 countries created 1600 jobs



# Huawei ERI strategy & responsibility

Being close to industrial and academic partners in order to accelerate ICT-based innovations of future life and future work.

Coordination of research activities of all European Research Centers of Huawei

Industrial Solutions

Telecom  
IT  
ITS / Mobility  
Industries 4.0  
IoT  
E-/M-Health



Key Technical Innovation

Cloud and Big Data

Wireless Networks

Optical System

Terminals and IoTings



Fundamental R&D

New Theories  
New Materials  
New Components  
New Devices

## Areas of research:

- 5G wireless
- IoT and embedded systems
- Networks and SW incl. NFV, SDN
- Optical transmission and quantum computing/communication
- Big data and cloud HW and SW
- IT-security
- Terminals and devices, wearables
- Silicon for above applications



# 5G Landscape



## Post Smartphone Era

400MHz

**Direct communication**

**D2D**

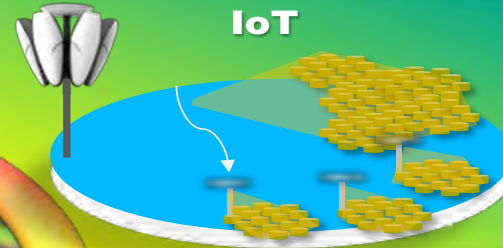


**Open OTT**



**Internet of Things**

**IoT**



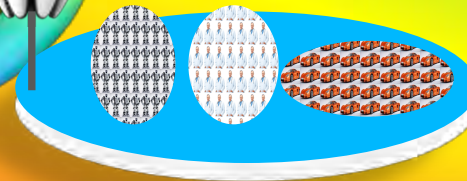
10GHz

**MBB**



**New Radio Access Network**

**Verticals**



100GHz

**Capacity**  
1000X

**Speed**  
100X

**Latency**  
Less than 1ms

**Links**  
100x

**Energy**  
1000X  
Reduce

Automatic Driving



Industry 4.0



Medicare – eHealth



Meters, Sensors



# Global Talents Focusing on 5G Research

**500+** 5G Experts



**9** 5G Research Centers

- Stockholm, Sweden**
  - System Architecture
  - Algorithms
- Paris, France**
  - Standardization
- Munich, Germany**
  - Verticals
- Moscow, Russia**
  - Fundamental Algorithms
- New Jersey, USA**
  - 5G Transmission
- Ottawa, Canada**
  - 5G Radio
  - Network Architecture
- 5G Research Centers in China**
  - Shenzhen
  - Shanghai
  - Chengdu

Huawei began 5G research in 2009 and will invest **\$600m** before 2018

# 5G Industry Contributions



## Europe

**METIS**



**Board Member**

**5GPPP**



**Board Member**

**5GIC**



**Key Founder**

**5GVIA**



**Key Founder**

**5GAA**



**Founding Member**

**New**

## Asia

**IMT-2020**



**Board Member**

**5GMF**



**Leading R&D Partner**

## NGMN



**Leading R&D Partner**

# Fostering 5G Momentum in Europe

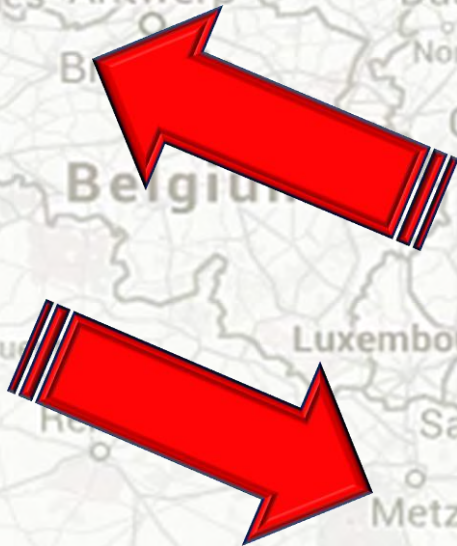


5G IC  
(Surrey University)

UK 5G IC

Logos: HUAWEI, UNIVERSITY OF SURREY

Logos: UNIVERSITY OF SURREY, HUAWEI, vodafone, Ofcom, BT



Vertical industry

EU 5GPPP

Logos: HUAWEI, European Union



5GVIA  
(Munich)

# Joint Innovation with the industry partners for the unified 5G standard



- 5G is not only high data rate,
- Even 5G high data rate, it is not only mmWave,
- Frequency below 6Ghz are required.

- 5GVIA was announced at 26<sup>th</sup>, Feb., 2015
- 5GAA was announced at 27<sup>th</sup>, Sept., 2016

# THANK YOU

## BUILDING A BETTER CONNECTED WORLD

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