ON THE ROAD TO 5G

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Network Products, Ericsson Maghreb

ITU Arab Forum on Future Networks: "Broadband Networks in the Era of App Economy", Tunis - Tunisia, 21-22 Feb. 2017

AGENDA

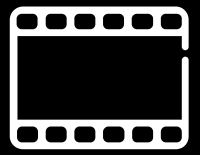
- Why 5G?
- What is 5G?
- The Road To 5G
  - End User Experience & Spectrum Efficiency
  - IOT as part of 5G
  - 5G Plug-INS
  - Deploying 5G

Why 5G?

FASTER TO 5G

5G

MORE USAGE

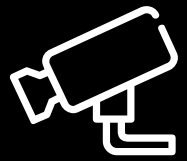


8x mobile data traffic between 2016 and 2022 driven by video

MORE PEOPLE

8 billion MBB subscriptions by 2022

MORE THINGS



1.5 billion cellular IoT devices by 2022

MORE BUSINESS

Fixed Wireless Access, Smart Cities, Health Care, etc.

Source: Ericsson Mobility Report Nov 2016

ACCESS COMPLEXITIES

Use Case Technical Requirements Vary Widely

Use Cases

Sensors Everywhere

Broadband and Media Everywhere

Smart Vehicles, Transport

Infrastructure, Monitor and Control

Critical Control of Remote Devices

Interaction Human-IoT

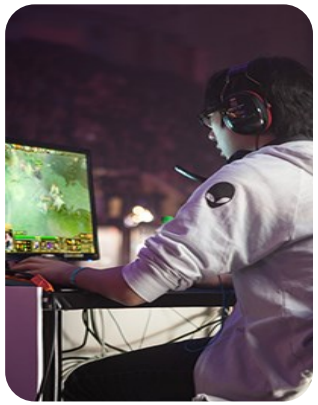
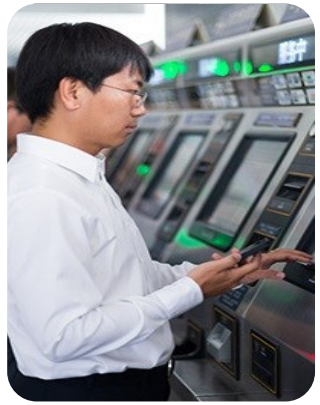
Technical Requirements

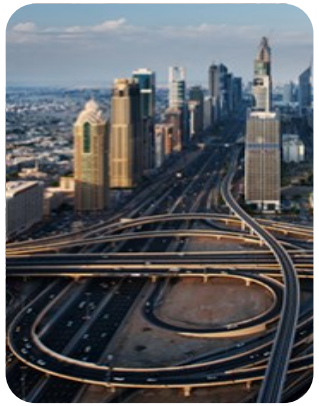
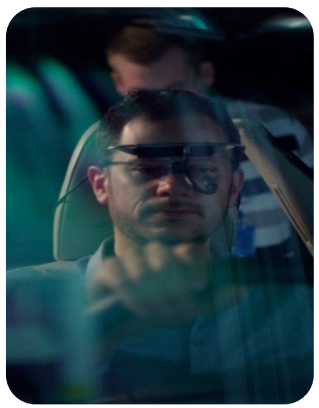
- High User Density
- High Capacity
- Low Device Energy Consumption
- Good Cell Edge Performance
- Reduced Signaling
- Low Latency
- Access to New Spectrum
- Faster Data Throughput
- High Availability
- Quality Uplink

What is 5G?

WHAT IS 5G – WHAT WILL IT BRING

A Network for the Networked Society

10-100x
END-USER DATA RATES

1000x
MOBILE DATA VOLUMES

5x
LOWER LATENCY

100x
MORE DEVICES

Cost
DEVICE COST REDUCTION

10+
YEARS BATTERY LIFE

+20dB
BETTER COVERAGE

ON THE ROAD TO 5G

2016 | 2017 | 2018 | 2019 | 2020

3GPP Rel-14 | Rel-15 | Rel-16 | Rel-17

Early deployments

5G new Carrier Type, NR

Low latency

Intelligent Connectivity

RAN Virtualization

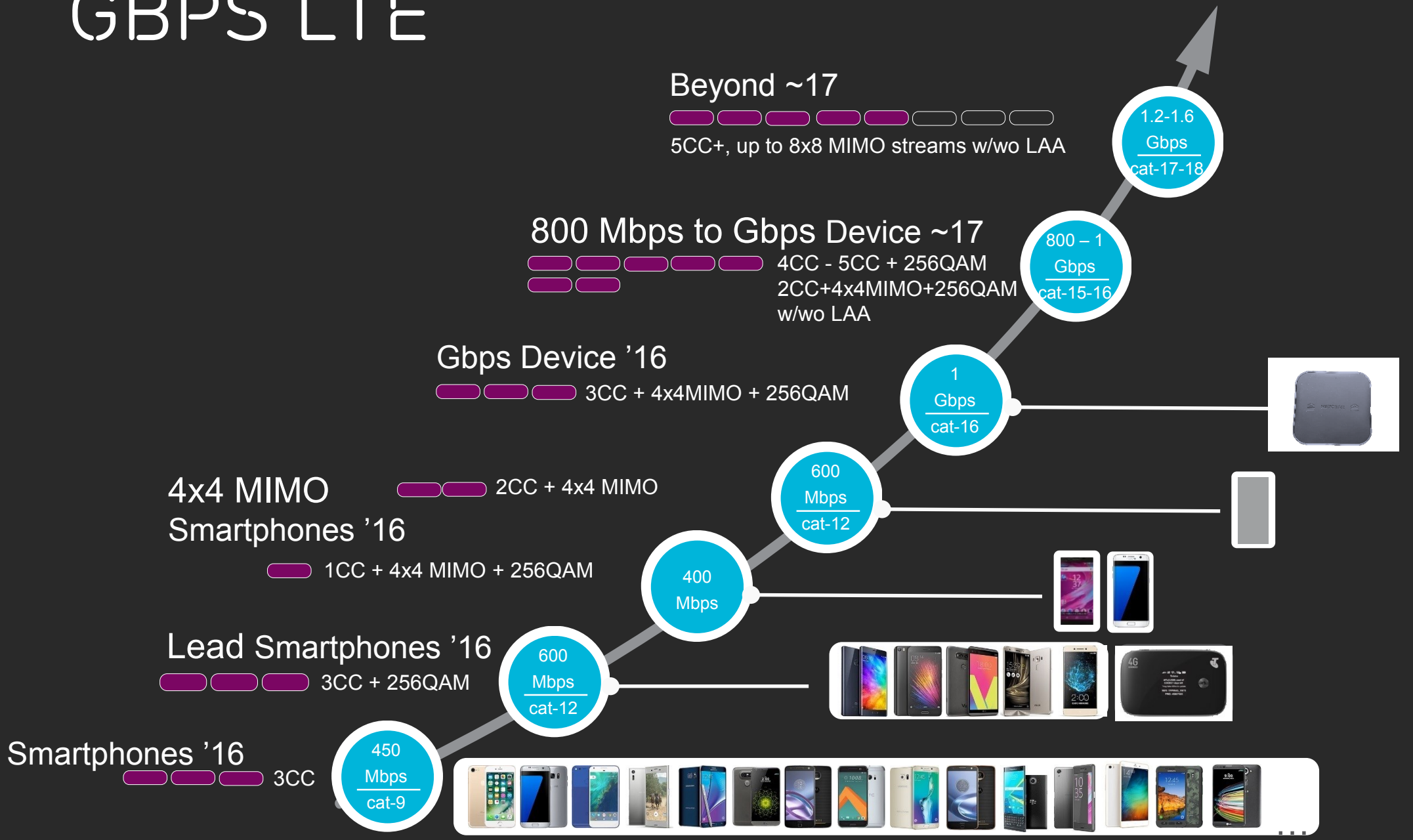
Massive MIMO

Massive IoT

LTE Advanced

LTE Advanced

GBPS LTE


Beyond ~17
5CC+, up to 8x8 MIMO streams w/wo LAA
1.2-1.6 Gbps cat-17-18
800 Mbps to Gbps Device ~17
4CC - 5CC + 256QAM
2CC+4x4MIMO+256QAM
w/wo LAA
800 – 1 Gbps cat-15-16
Gbps Device ’16
3CC + 4x4MIMO + 256QAM
1 Gbps cat-16
4x4 MIMO Smartphones ’16
2CC + 4x4 MIMO
600 Mbps cat-12
1CC + 4x4 MIMO + 256QAM
400 Mbps
Lead Smartphones ’16
3CC + 256QAM
600 Mbps cat-12
Smartphones ’16
3CC
450 Mbps cat-9

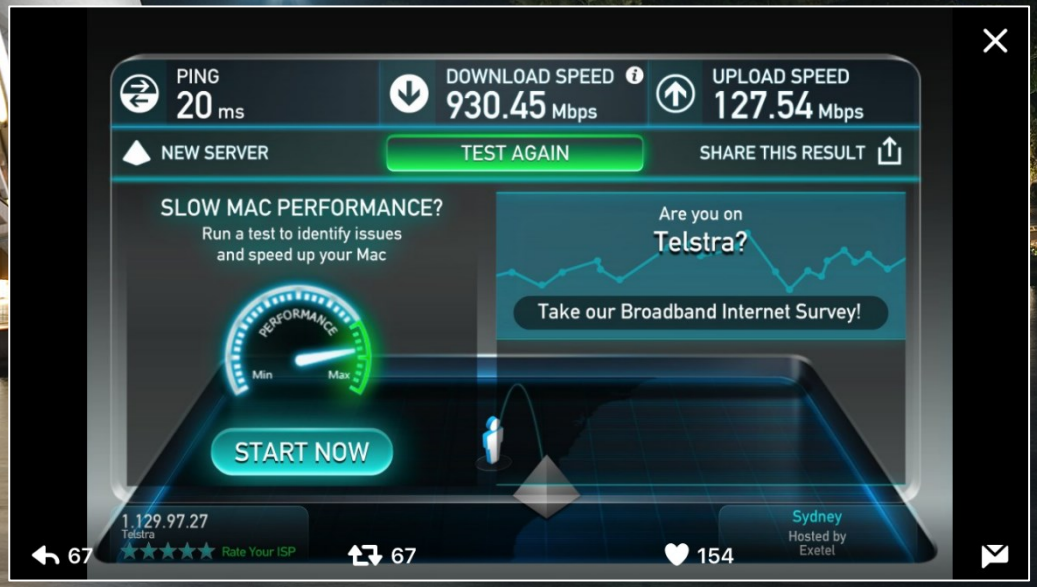
GBPS LTE

PRESS RELEASE
JANUARY 31, 2017

ERICSSON

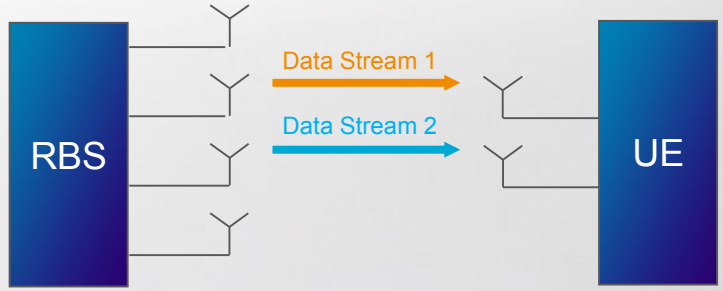
ERICSSON, QUALCOMM, AND NETGEAR LAUNCH TELSTRA'S WORLD-FIRST COMMERCIAL GIGABIT LTE NETWORK WITH 150MBPS UPLOAD SPEEDS

- Telstra, Ericsson, Qualcomm Technologies and NETGEAR deliver the world's first commercial Gigabit LTE network and faster upload data rates, another step towards future 5G capabilities
- Extends Telstra's current network download speed leadership to Gigabit speeds (1Gbps) whilst doubling upload peak speed (~150Mbps)
- Technologies deployed support the evolution of advanced consumer and business applications

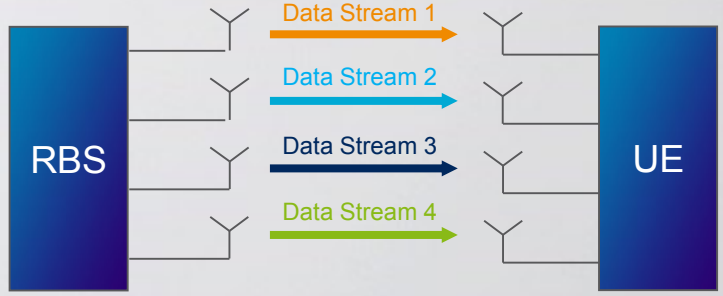


4X4 MIMO DEPLOYMENT

4x2 MIMO

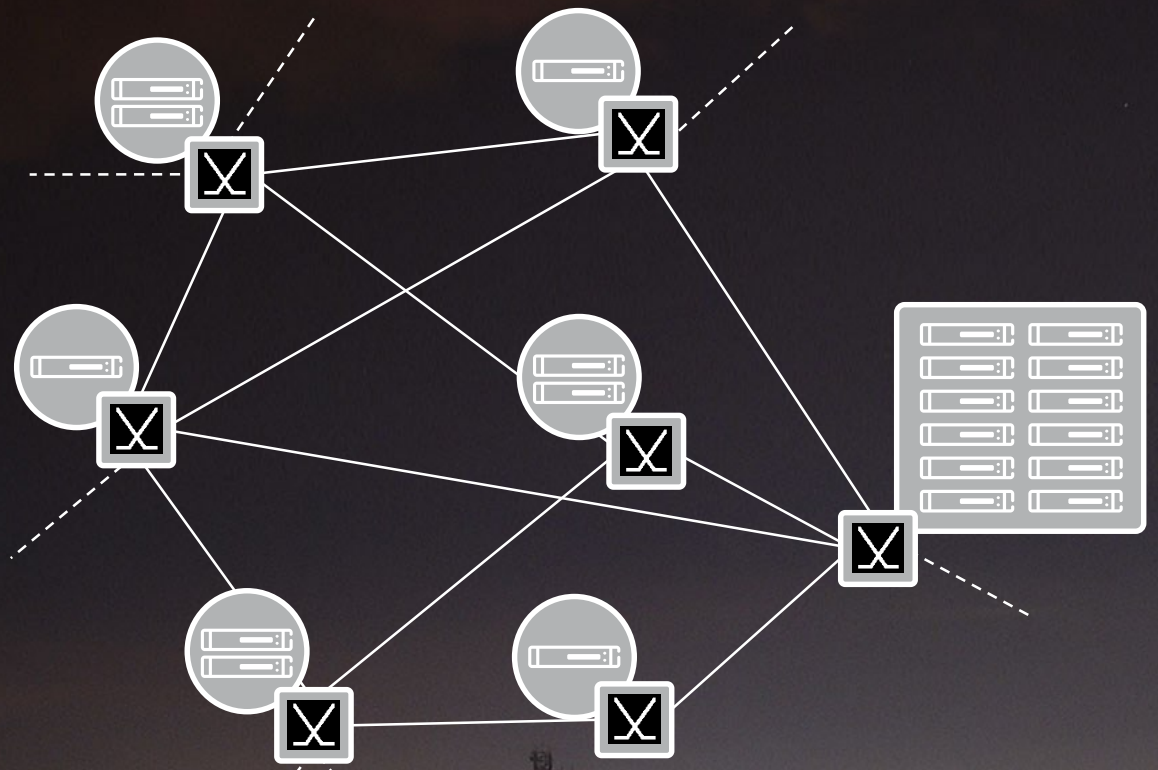


4x4 MIMO



4x4 MIMO can give additional 48% capacity gain over 4x2 MIMO

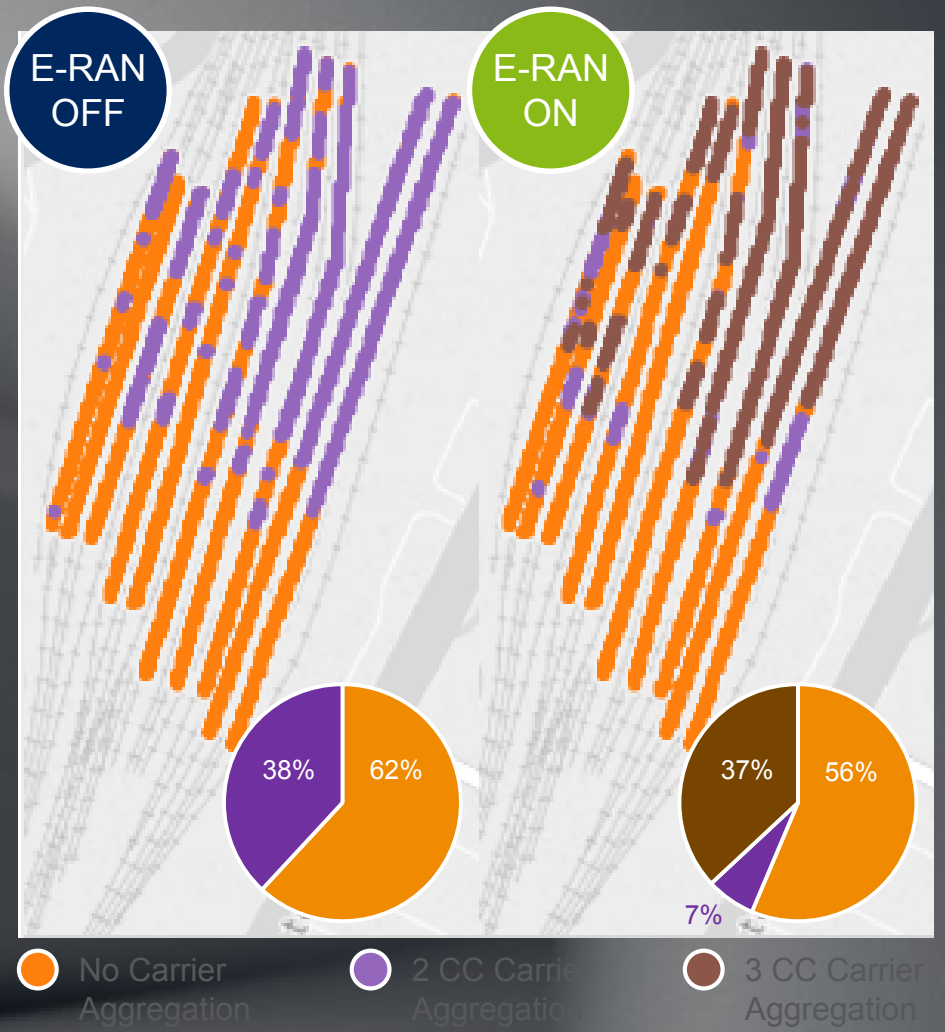
ELASTIC RAN: OVERVIEW



- Borderless coordination between neighboring sites supporting both CRAN and DRAN deployments
  - UL/DL CA, CoMP, D-MIMO
- Unlimited peer to peer architecture
- Resilient, Scalable, Flexible, Uncompromising Performance

ELASTIC RAN AT TOKYO STATION

- Station area covered by three bands using different grids
- Baseband units connect with Elastic RAN to enable full inter-site Carrier Aggregation
- Results
  - Three carriers always scheduled, where available
  - 42% average user throughput increase
  - Example: 14Mbps with 2CC => 34Mbps with 3CC
  - 250% throughput increase by enabling third carrier in CA set



IOT as part of 5G

IOT – A BIG PART OF 5G

WIDE RANGE OF REQUIREMENTS

MASSIVE MTC

SMART BUILDING

LOGISTICS, TRACKING AND FLEET MANAGEMENT

SMART METER

SMART AGRICULTURE

CAPILLARY NETWORKS

CRITICAL MTC

REMOTE HEALTH CARE

TRAFFIC SAFETY & CONTROL

INDUSTRIAL APPLICATION & CONTROL

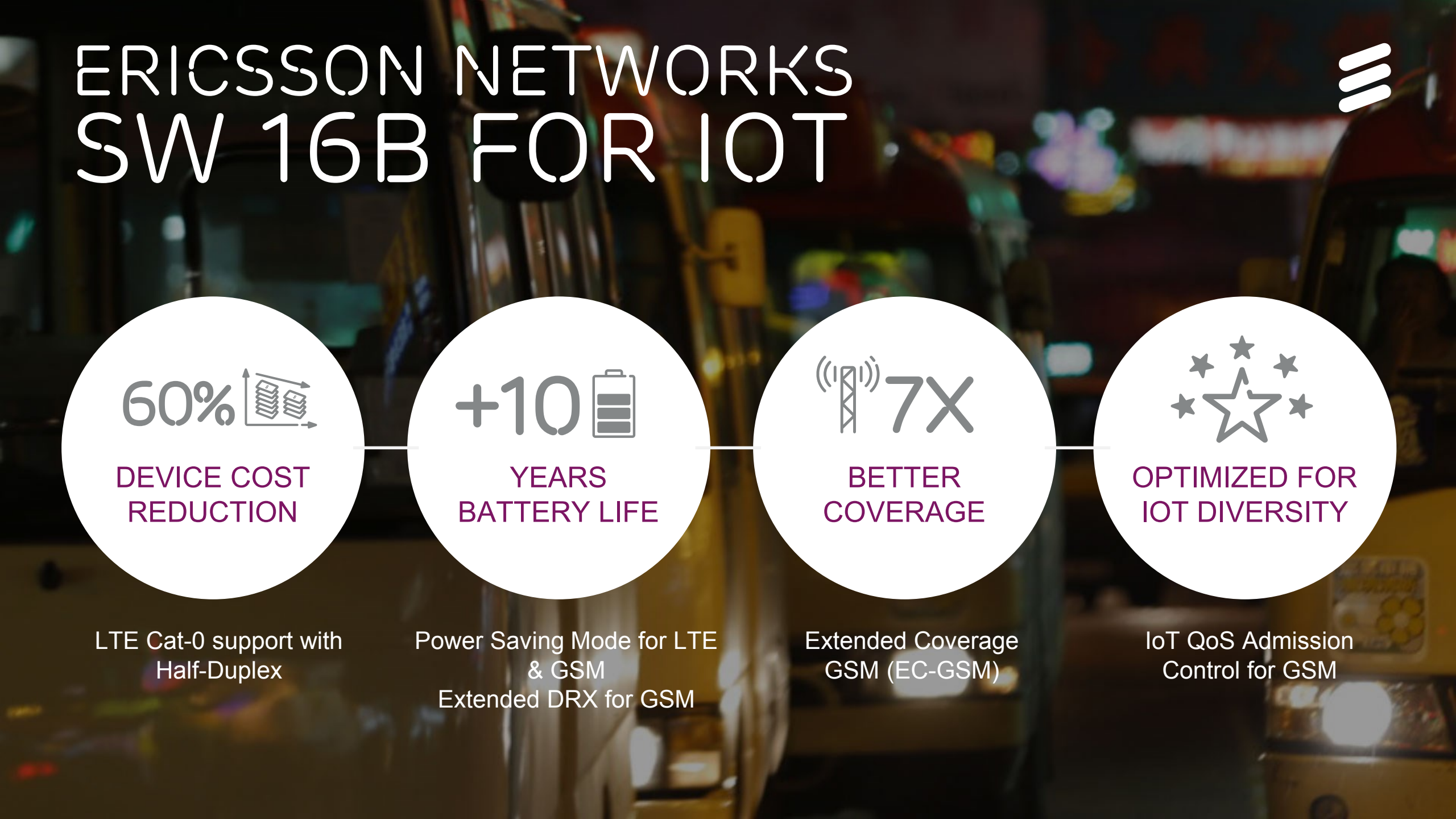
REMOTE MANUFACTURING, TRAINING, SURGERY

LOW COST, LOW ENERGY
SMALL DATA VOLUMES
MASSIVE NUMBERS

ULTRA RELIABLE
VERY LOW LATENCY
VERY HIGH AVAILABILITY

CELLULAR
IS THE
FOUNDATION
CELLULAR
FOR IOT

ERICSSON NETWORKS
SW 16B FOR IOT



60%

DEVICE COST REDUCTION

LTE Cat-0 support with Half-Duplex

+10

YEARS BATTERY LIFE

Power Saving Mode for LTE & GSM
Extended DRX for GSM

7X

BETTER COVERAGE

Extended Coverage GSM (EC-GSM)

OPTIMIZED FOR IOT DIVERSITY

IoT QoS Admission Control for GSM

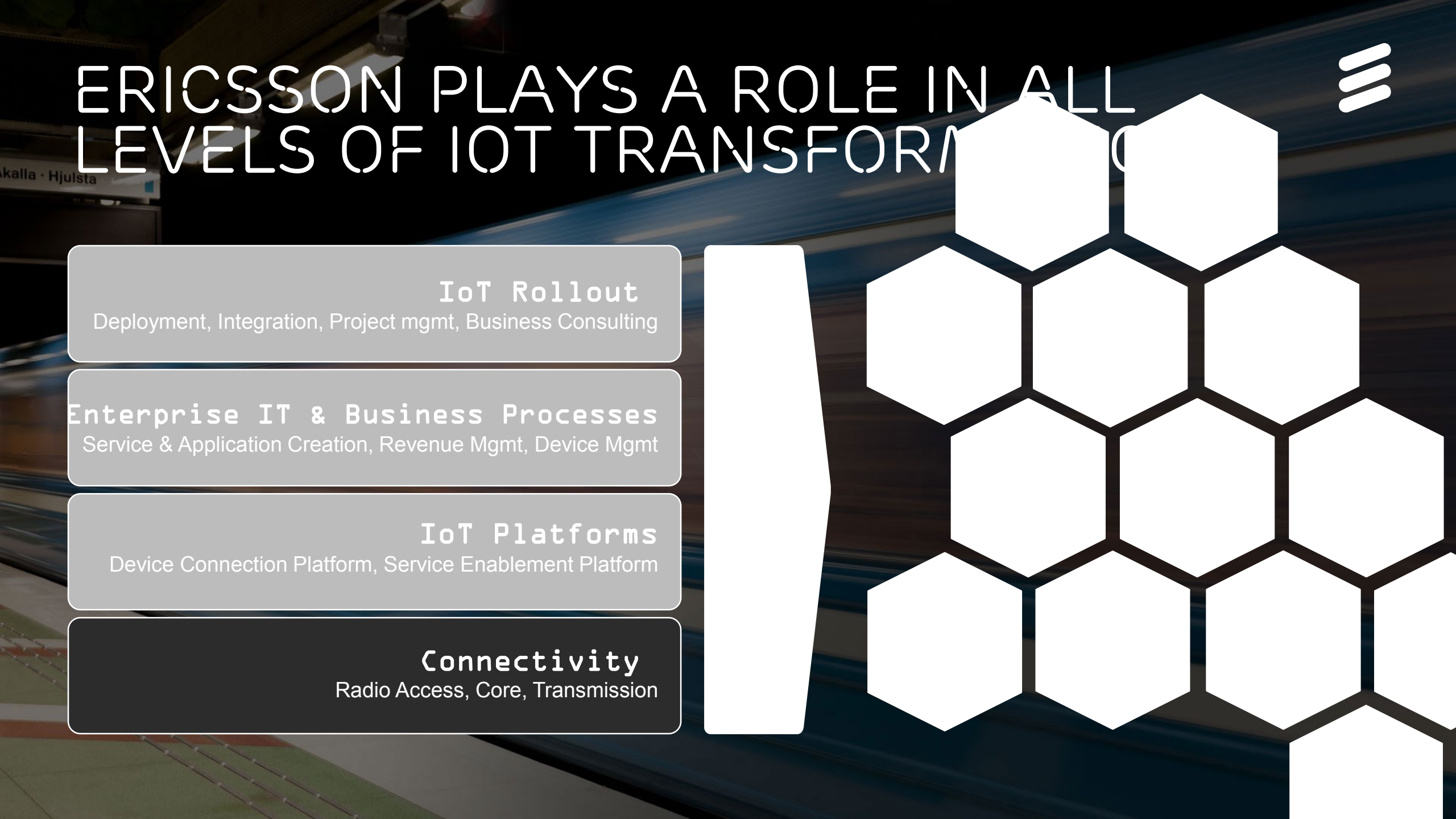
ERICSSON PLAYS A ROLE IN ALL LEVELS OF IOT TRANSFORMATION

IoT Rollout
Deployment, Integration, Project mgmt, Business Consulting

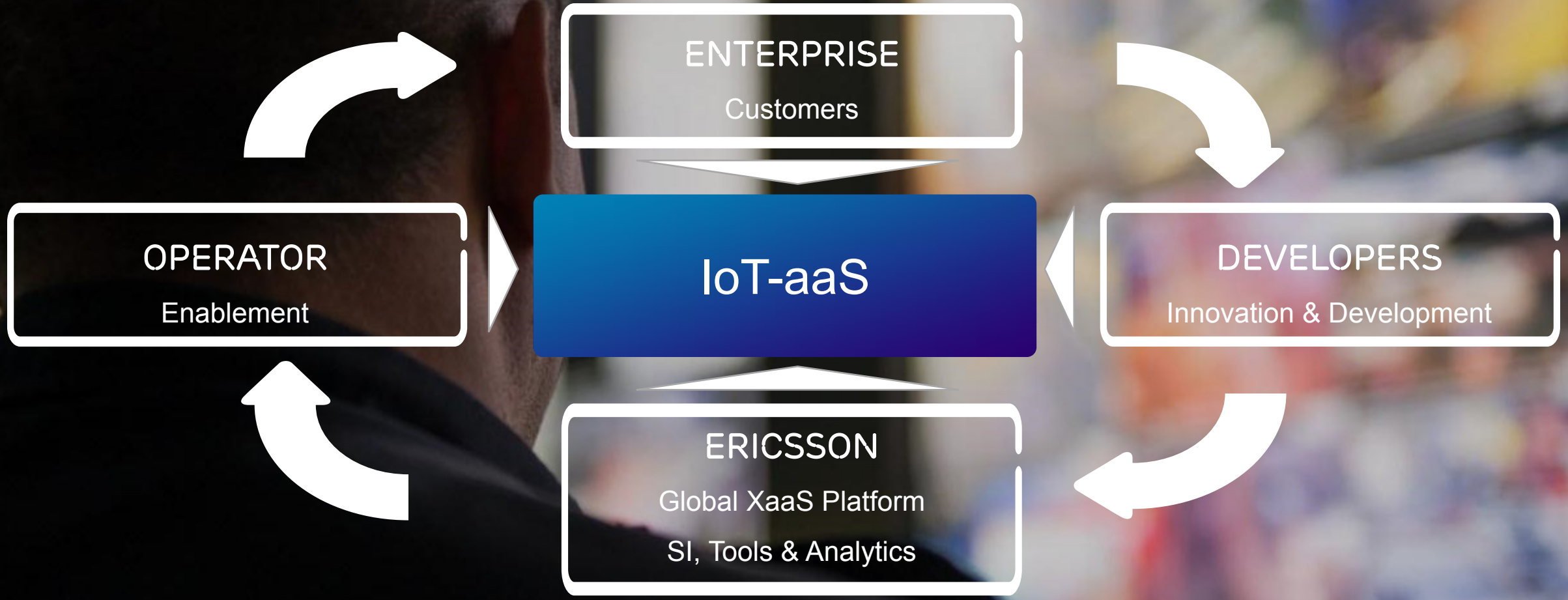
Enterprise IT & Business Processes
Service & Application Creation, Revenue Mgmt, Device Mgmt

IoT Platforms
Device Connection Platform, Service Enablement Platform

Connectivity
Radio Access, Core, Transmission



IOT-AS-A-SERVICE



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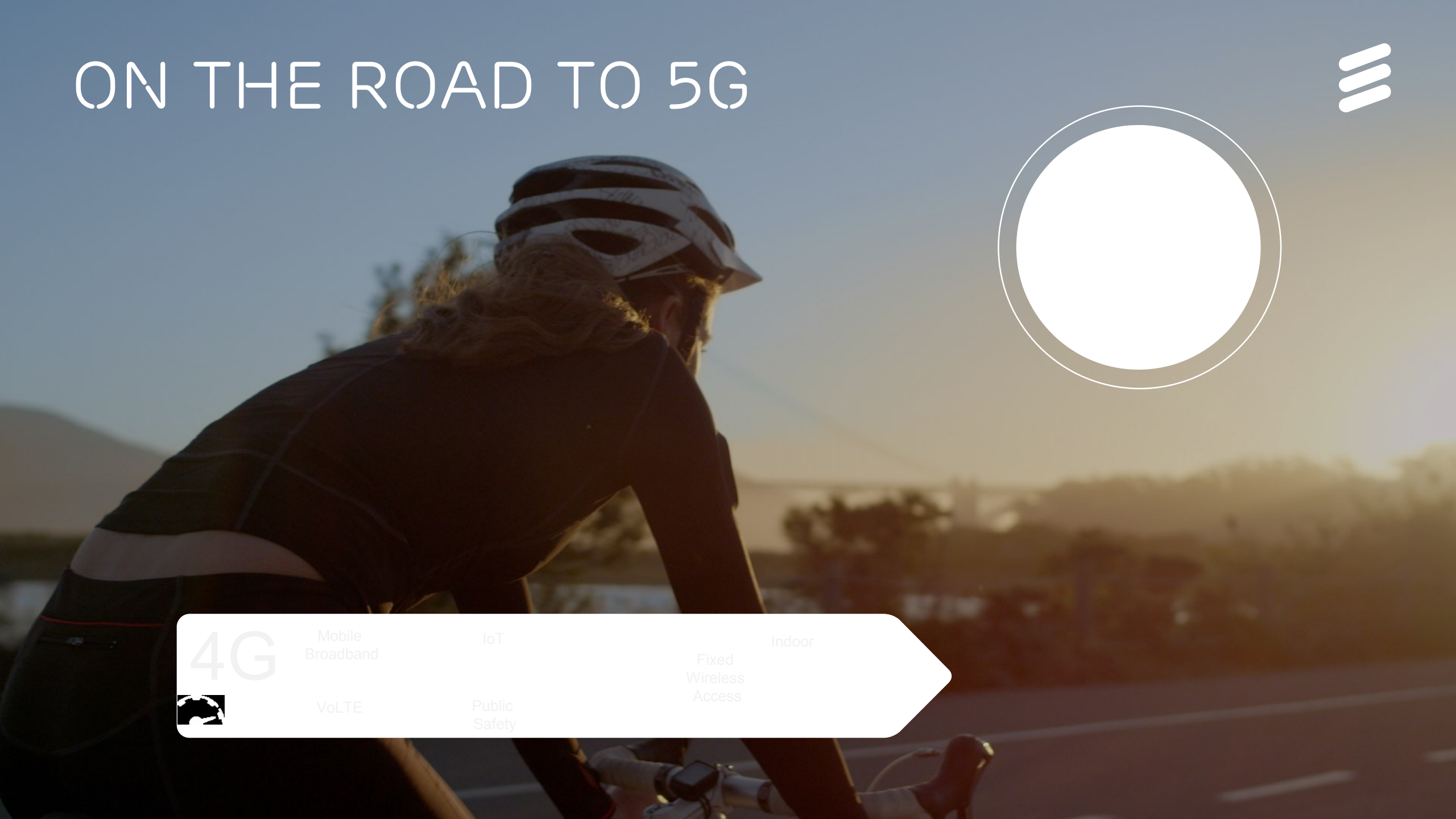
ERICSSON 5G PLUG-INS

Enabling 5G technology in the Networked Society

ON THE ROAD TO 5G



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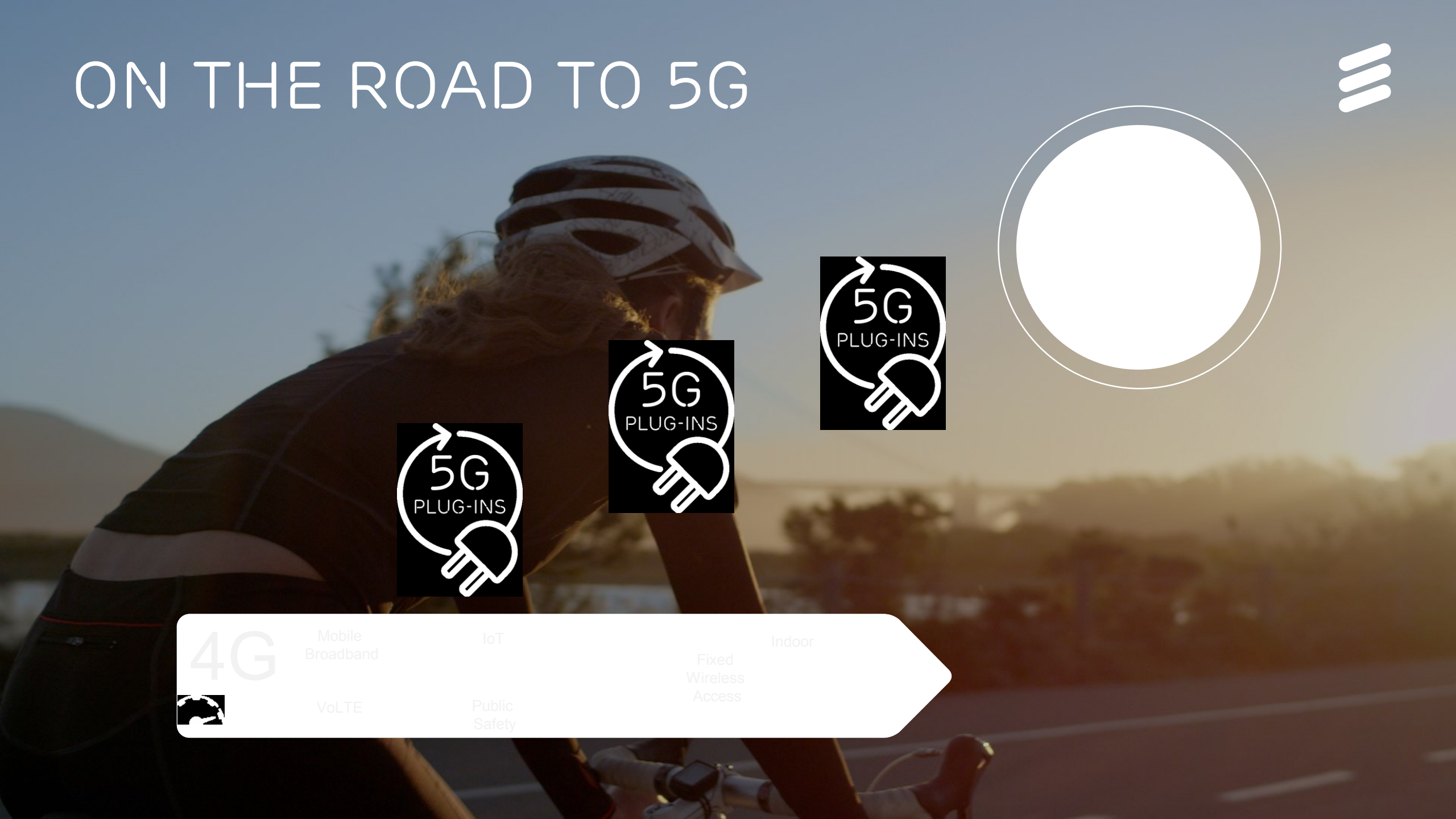


ERICSSON 5G PLUG-INS

Software innovations applying 5G technology concepts

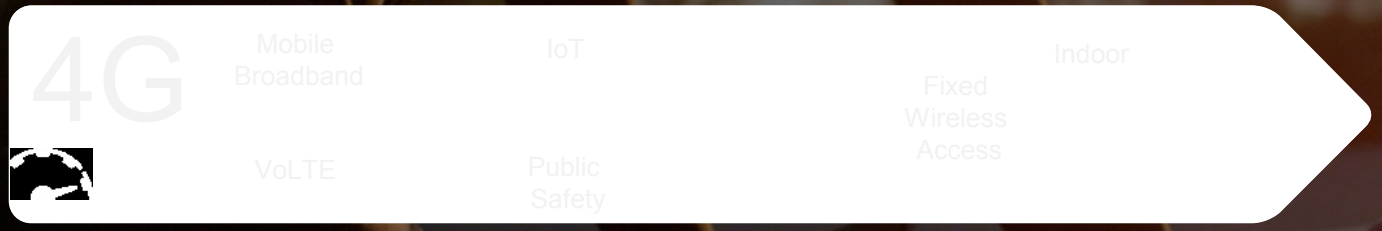
MASSIVE MIMO

MULTI-USER MIMO

RAN VIRTUALIZATION

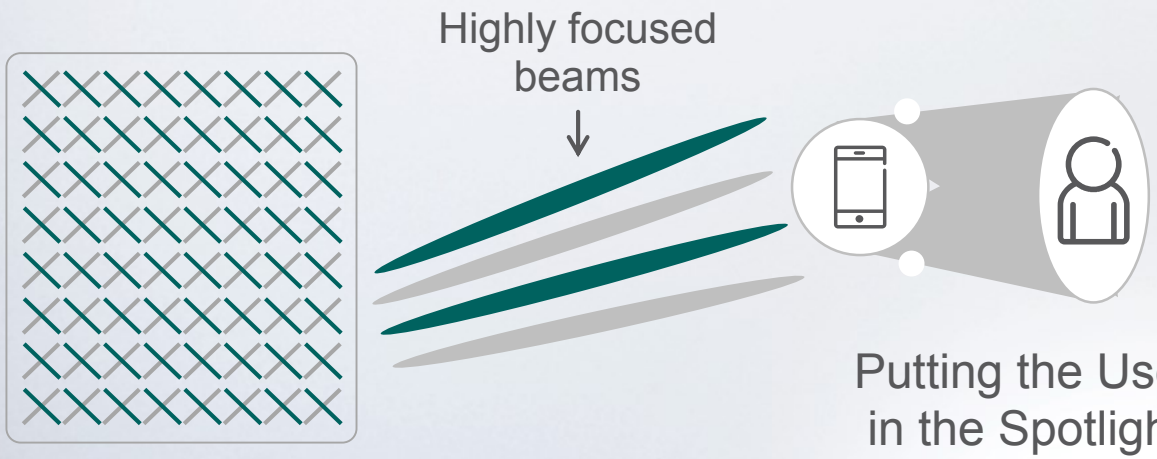
LATENCY REDUCTION

INTELLIGENT CONNECTIVITY



MASSIVE MIMO PLUG-IN

- Multiple transmission points with many dynamically steerable antennas
- Information sent directly to the device instead of broadcasting across the cell
- Significantly increases data throughput & capacity

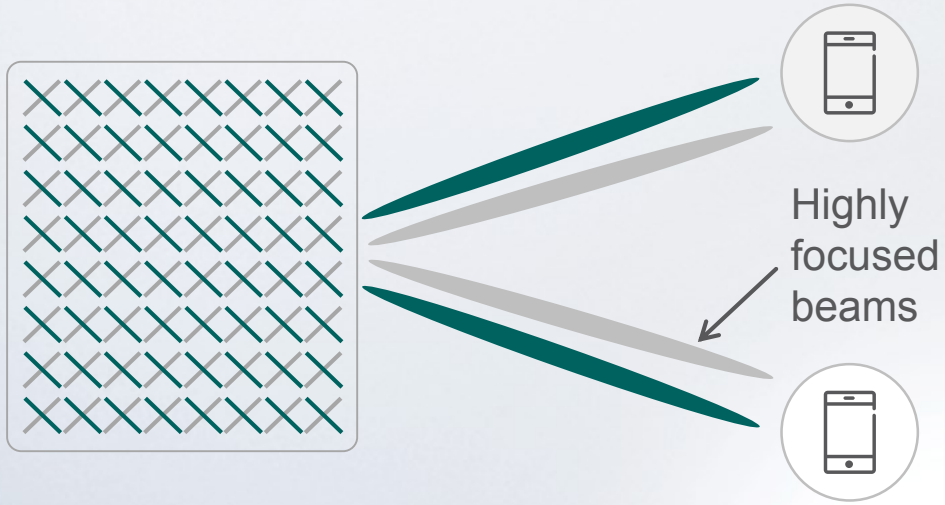


Massive MIMO Plug-in benefits

- High Capacity
- Good Cell Edge Performance
- Faster Data Throughput

MULTI-USER MIMO PLUG-IN

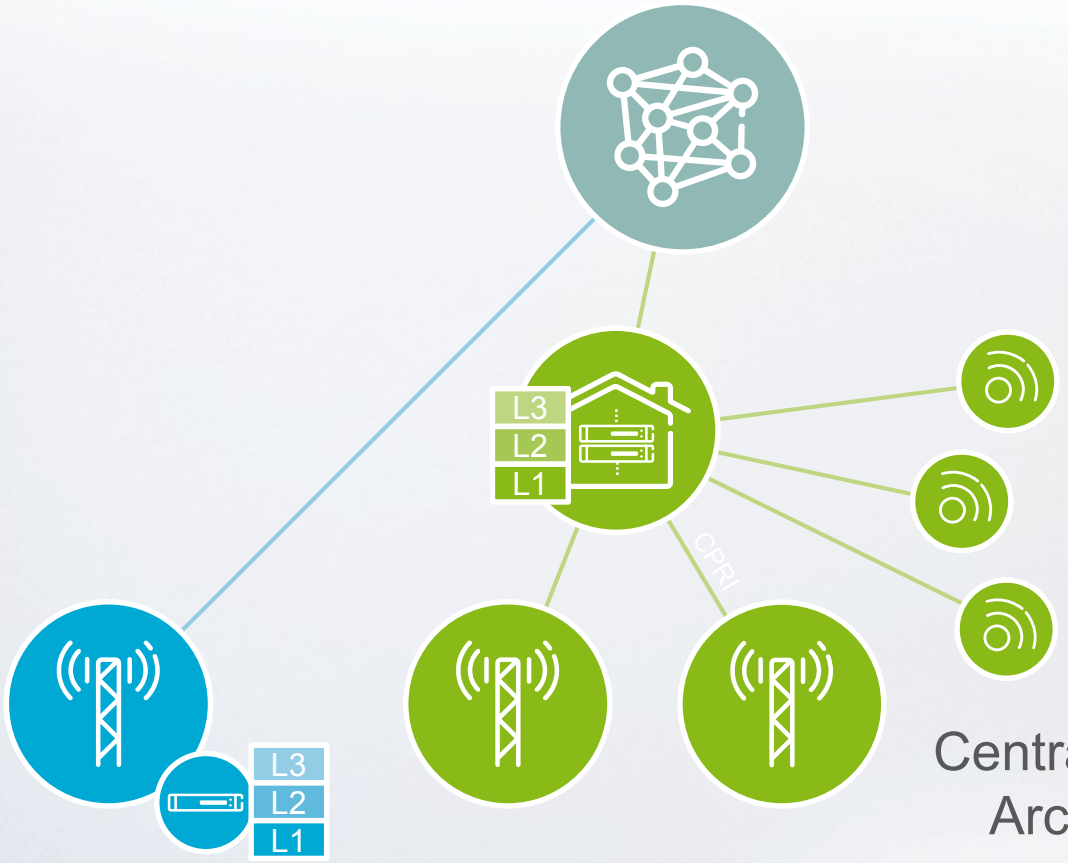
- Increase capacity with multiple users on the same resource
- Manage interference with user specific beam forms to spatially separate users
- Maximize performance by dynamically switching between single user and multi user MIMO



Multi-User MIMO Plug-in benefits

- Good Cell Edge Performance
- High Capacity

CURRENT RAN ARCHITECTURE



Distributed RAN Architecture

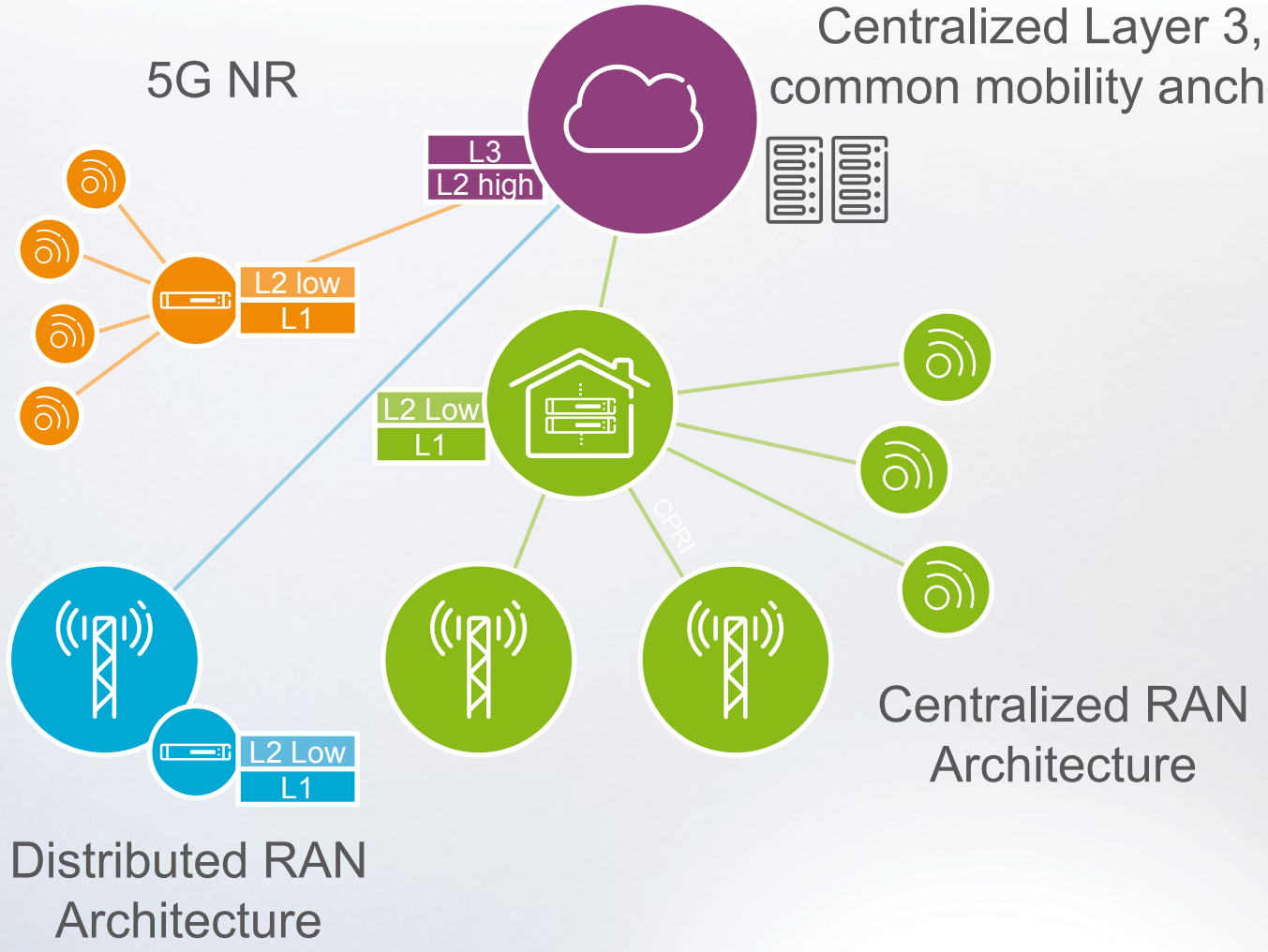
Centralized RAN Architecture

RAN Virtualization Plug-in benefits

- High Capacity
- High Availability

Ericsson Commercial in Confidence | © Ericsson AB 2016

RAN VIRTUALIZATION PLUG-IN



RAN Virtualization Plug-in benefits

- High Capacity
- High Availability

Ericsson Commercial in Confidence | © Ericsson AB 2016

LATENCY REDUCTION PLUG-IN

- Instantaneous channel access
- Modified frame structure with reduced signaling
- Reduces time to content
- Enables real-time machine communications for latency sensitive apps

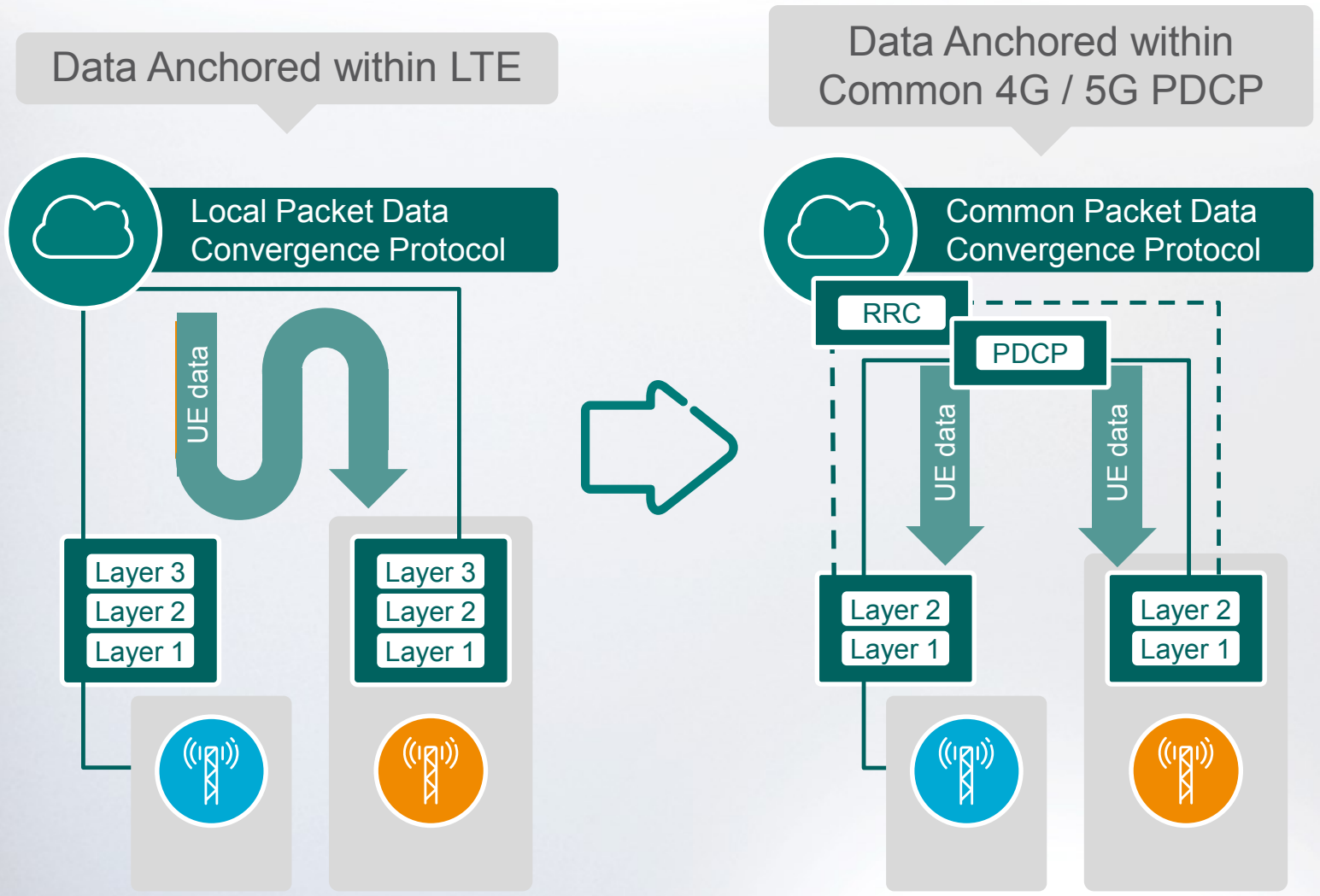
Latency Reduction Plug-in benefits

Low Latency

Reduced Signaling

Quality Uplink

INTELLIGENT CONNECTIVITY PLUG-IN



Intelligent Connectivity Plug-in benefits

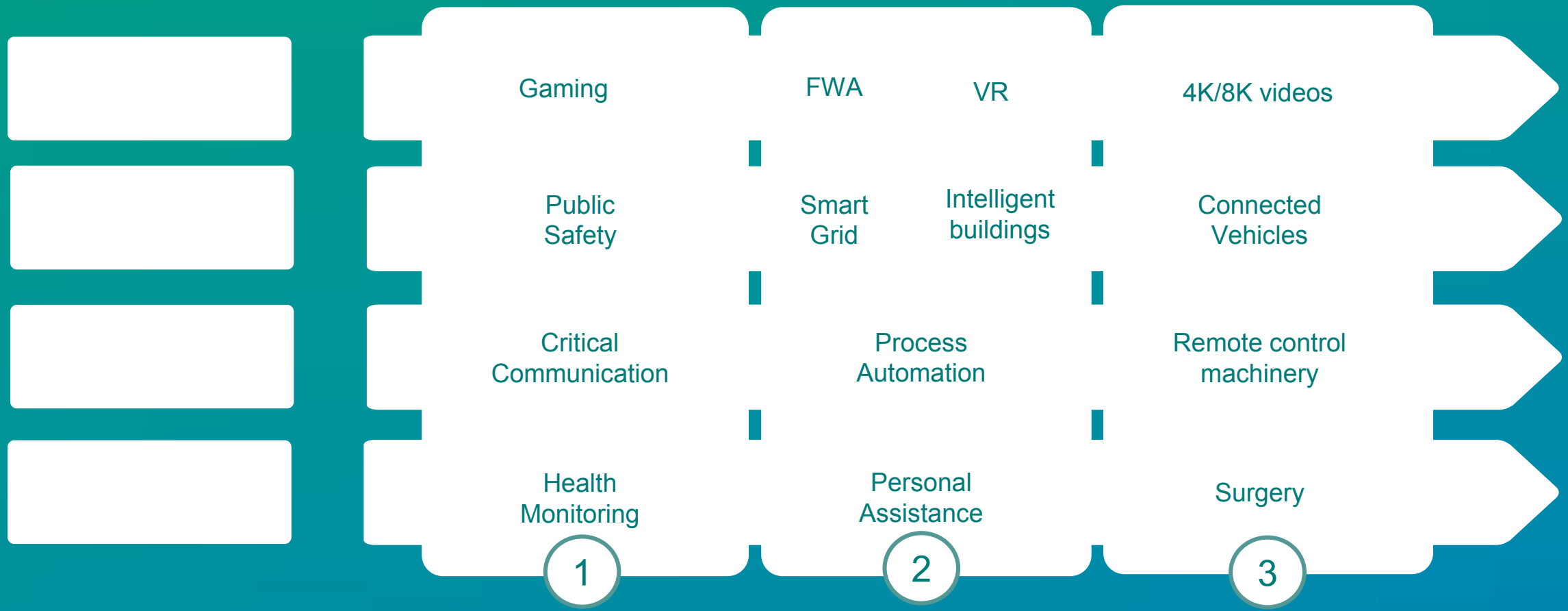
- Access to New Spectrum
- Faster Data Throughput

Deploying 5G

TECHNOLOGY EVOLVES BECAUSE USE CASES EVOLVE

Relevance of applications also depends on market maturity

ENGAGEMENT TIMING



ERICSSON 5G ROADMAP

Moving 5G technology from test to commercial deployment

Ericsson 5G
Radio Test Bed Win!

Biggest Contribution to 5G Development

LTE Asia Awards
October 2015

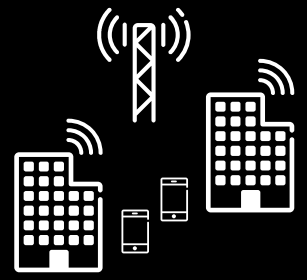
1st 5 Gbps throughput – June 2014

1st Dual Connectivity LTE-5G

1st Multipoint Connectivity with distributed MIMO

5G Radio Prototype field trials in 2016

Ericsson 5G field trial gear achieves peak downlink throughput over 25 Gbps with MU-MIMO



5G Plug-Ins

2014 | PHASE 1

- Key technology features testing
- System level evaluation
- Four 5G Radio Testbeds (US, Japan, Korea, Sweden)

2015-2016 | PHASE 2

- Test application of 5G for key use cases
- Advance technology development

2017+ | PHASE 3

- Complete trial network
- Form factor for pre-commercial deployment

PARTNERSHIP WITH OPERATORS

26

SIGNED 5G OPERATOR AGREEMENTS

*As of June 2016

PARTNERSHIP WITH OTHER INDUSTRIES

5G-ENABLED WORLD CLASS MANUFACTURING

- Evaluate 5G technology in manufacturing industry
  - Wireless factory communication
  - Industrial Internet of Things (IIoT)
  - Mission critical clouds (MCC)
  - Data analytics

⇩

- Improved production efficiency
- Increased flexibility
- Excellent traceability

SKF CHALMERS ERICSSON

INDUSTRIAL MOBILE COMMUNICATION IN MINING

- Evaluate mobile communication infrastructure in an industrial context
- Consider strict requirements on safety and robustness in underground mining

⇩

- Increased productivity
- Improved Safety
- Industrial 5G requirements
- Understanding new eco system, business models, etc.

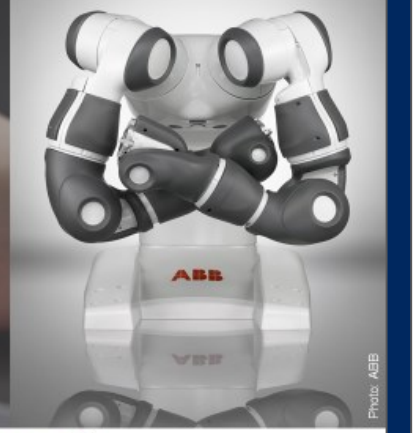
ABB BOLIDEN ERICSSON TeliaSonera VOLVO WOLFIT

ABB
REMOTE OPERATION OF ROBOTS

- Evaluate potential of mobile communication for industrial use
- Consider requirements from mission critical operation

⇩

- Industrial 5G requirements
- Transformation benefits
  - Central utilization of expertise
  - Minimize personnel in hazardous environments
  - Increased productivity



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CONNECTED MOBILITY ARENA STOCKHOLM

- Create Europe's leading test site for connected mobility
  - Open innovation platform
  - Open cellular radio connectivity
  - Management and control platform
  - Efficient management of test activities (system configuration, road authority, etc.)

⇩

- Emergency vehicle prioritization
- Remote-controlling of platoons
- Automatic service orchestration

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