

FUTURE OF RADIO ACCESS

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OUTLINE

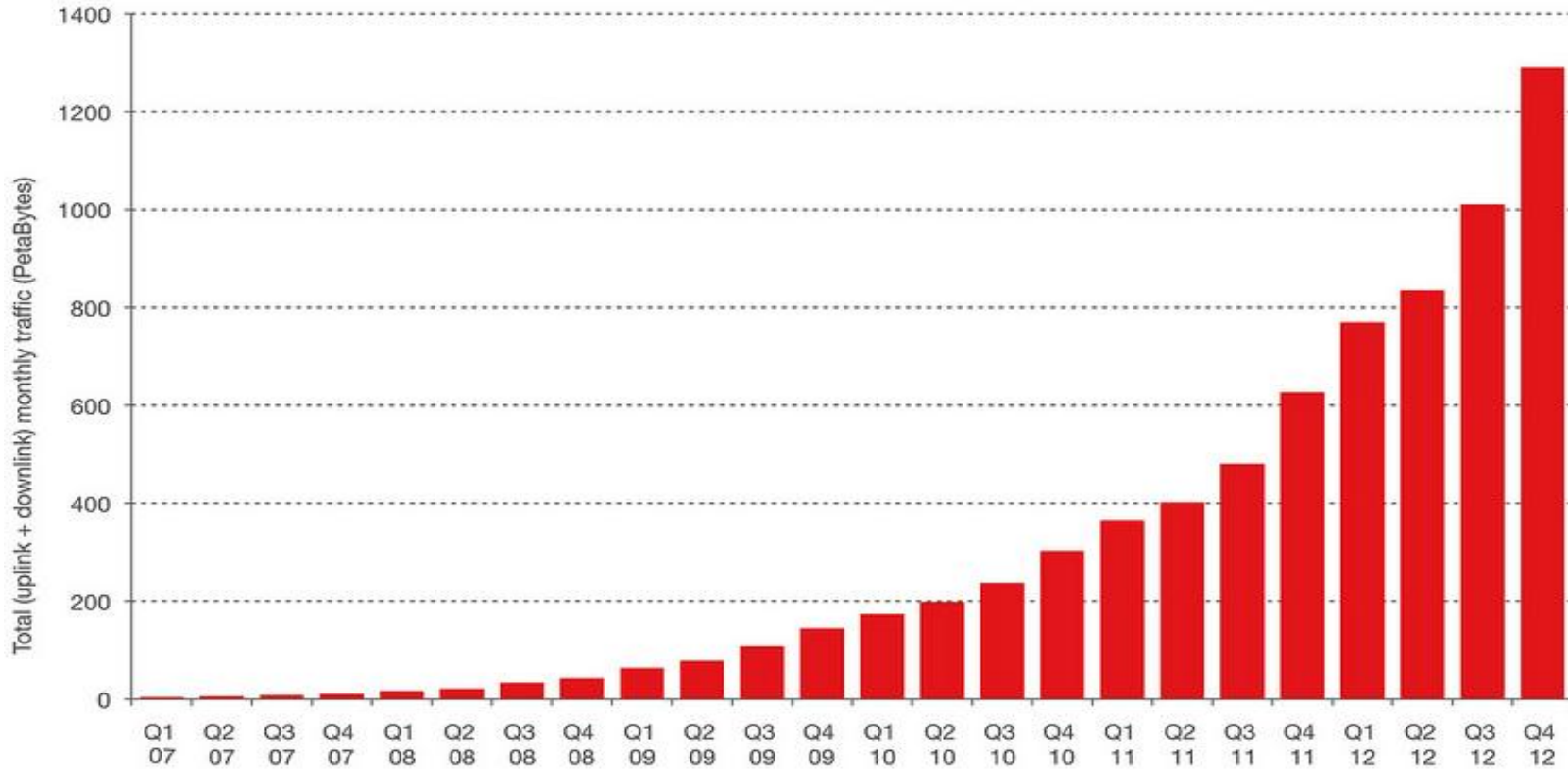


- › Cellular market update
- › Vision of the future
- › Technology status
- › Technology components for the future
- › Summary

TRAFFIC GROWTH



Source: Ericsson (February 2013)



Mobile data doubled between Q4 2011 and Q4 2012

28% Mobile data traffic growth between Q3 2012 and Q4 2012

PENETRATION



Source: Ericsson (February 2013)

140 Million net additions during Q4 2012

Global penetration 89%

TECHNOLOGIES



More than 85% of the world's population has cellular coverage

Only spots in rural areas remain

LTE will cover 50% of world's population by 2017

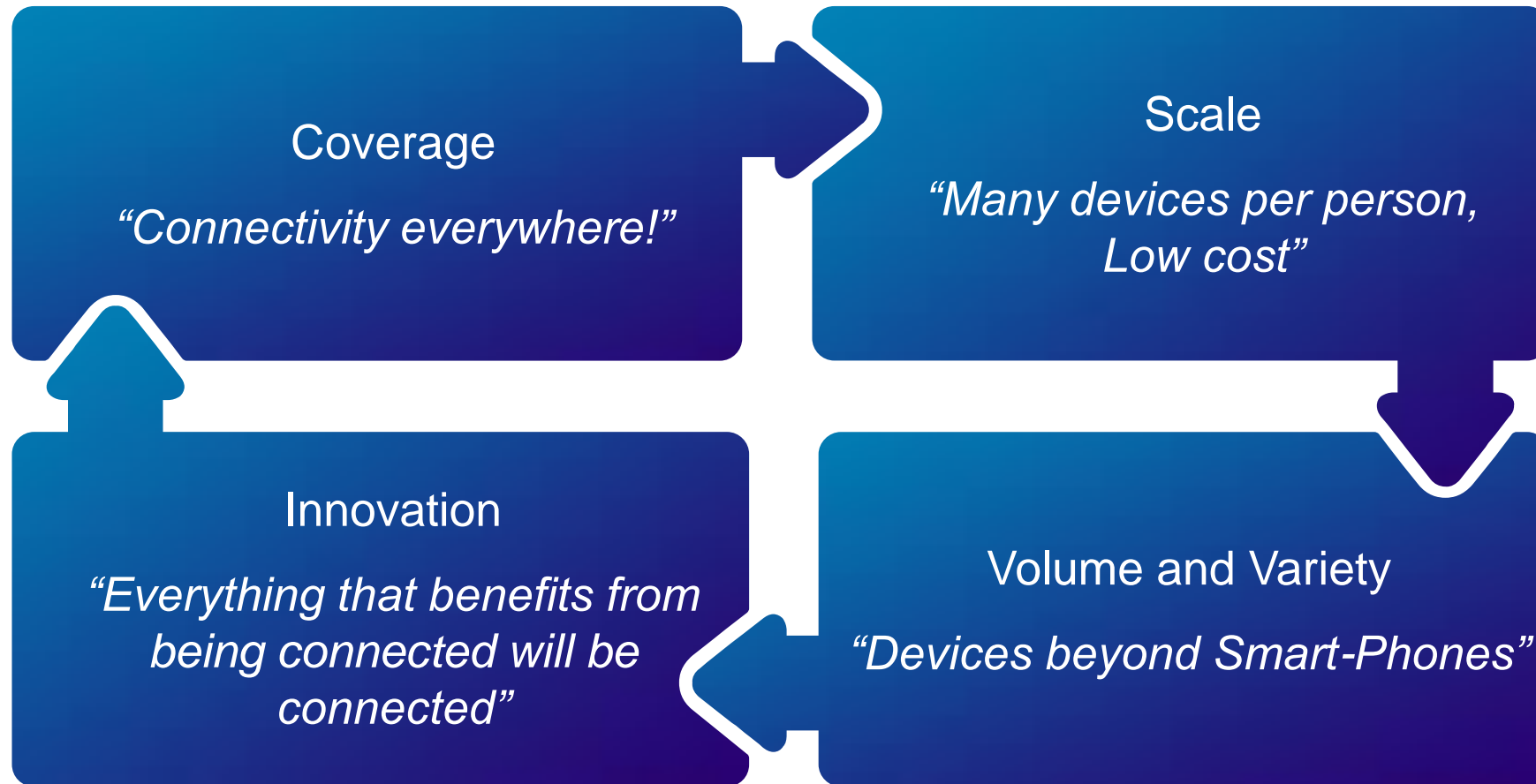
DEVICES



700 Million smart-phones Q4 2012

40% of all sold phones are smart-phones (2012)

WHERE WILL IT BRING US?



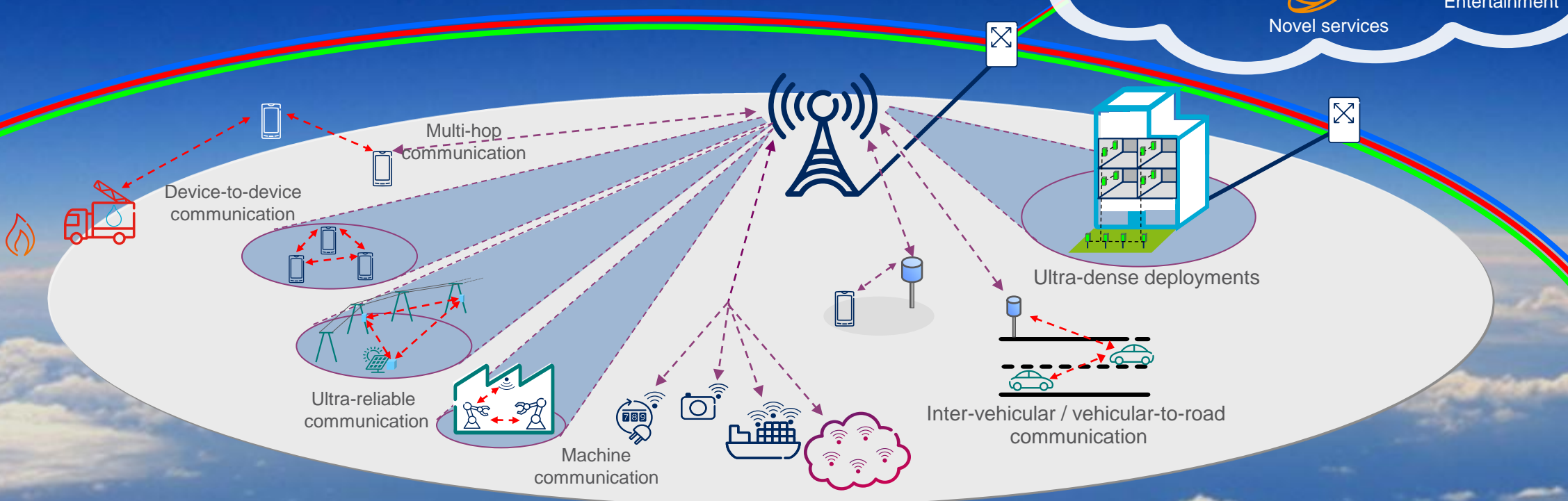
A Connected World!



IN THE NETWORKED SOCIETY PEOPLE,
KNOWLEDGE, DEVICES, AND INFORMATION ARE
NETWORKED FOR THE GROWTH OF SOCIETY,
LIFE AND BUSINESS.

CONNECTIVITY IN THE FUTURE

Multiple **Integrated** Wireless/Access Solutions enabling the long-term Networked Society



300 MHz

3 GHz

30 GHz

300 GHz

RADIO ACCESS OF THE FUTURE



KEY CHALLENGES

Massive growth in

Connected Devices

Massive amount of
“*communicating machines*”



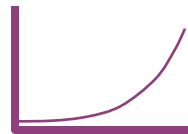
Massive growth in

Traffic Volume

Further expansion of
mobile broadband

Additional users and increased usage

Additional traffic due to
communicating machines



Wide range of

Requirements & Characteristics

Mobile broadband

Multi-Gbps in specific scenarios
Tens of Mbps generally available

New requirements and
characteristics due to
communicating machines

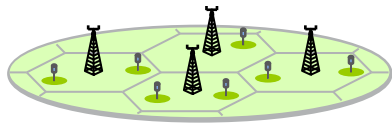


Affordable and sustainable



4G EVOLUTION

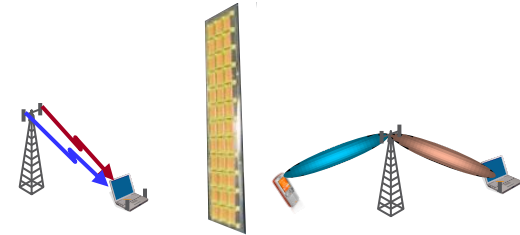
LTE REL-12 – MAJOR THEMES



Small-cell Enhancements
("Local-Area Access")



New Carrier Type
("Lean Carrier")



Multi-antenna
Enhancements



Device-to-Device
Communication

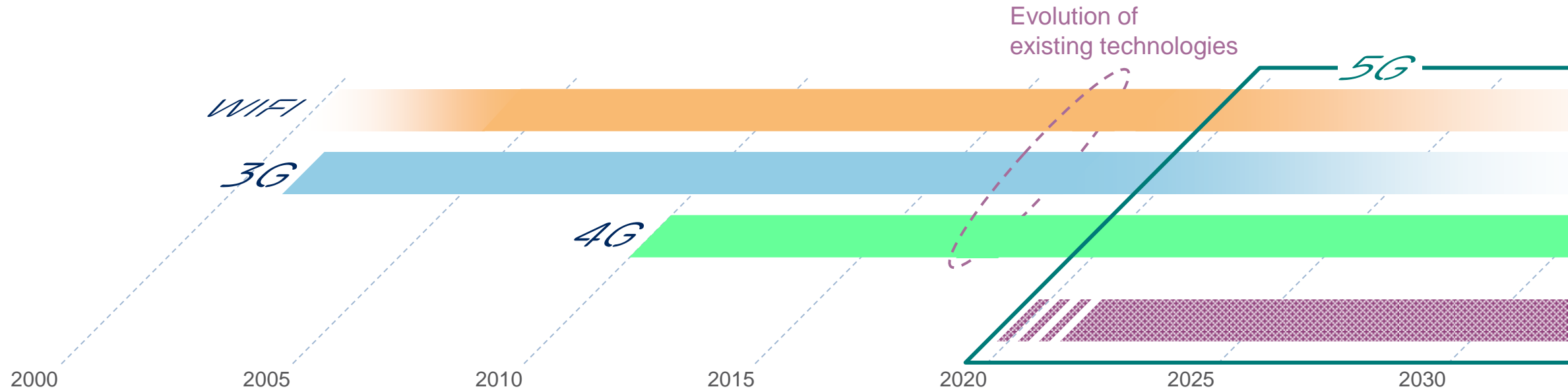


Machine-type
Communication



General Enhancements

FUTURE ("5G") RADIO ACCESS



- › Extreme mobile broadband targeting ultra-hotspot scenarios
 - Extreme traffic capacity / Extreme multi-Gbps end-user throughput
- › Specific scenarios and use cases
 - › Sensor communication
 - › New frequency regimes and spectrum access

Complement to the evolution of existing radio access

METIS PROJECT



- › **M**obile and wireless communications **E**nablers for the **T**wenty-twenty **I**nformation **S**ociety
- › **EU Consortium** (29 partners) **initiated and led by Ericsson**
 - ALU, Huawei, Nokia, NSN, DoCoMo, Deutsche Telekom, France Telecom, Telecom Italia, Telefonica, BMW, Elektrobit, Academia
- › Ensure a global forum and build an early global consensus



www.metis2020.com



METIS PROJECT

SCIENCE AND TECHNOLOGY OBJECTIVES

To develop a concept for the future mobile and wireless communications system that supports the connected information society

To provide a versatile and scalable system concept that supports

- 1000x higher mobile data volumes
- 10x to 100x higher number of connected devices
- 10x to 100x higher typical end-user data rates
- 10x longer battery life for low-power connected “machines”
- 5x lower end-to-end latency
- *with similar overall cost and energy consumption as the networks of today*



TECHNOLOGY COMPONENTS

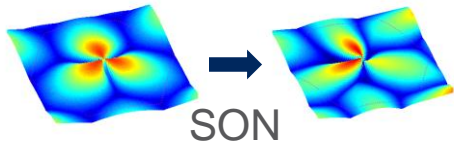
ANTENNAS



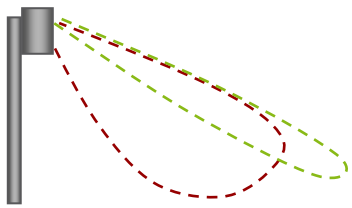
FUNCTIONALITY

Cell specific BF

Reconfigurability

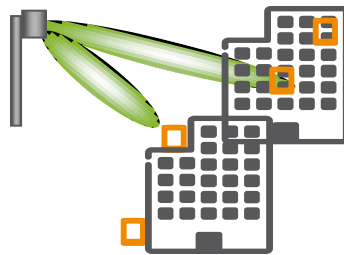


Beam shaping

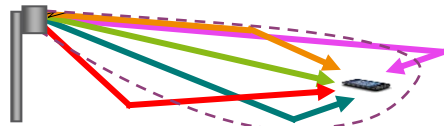


User specific BF

3D beamforming



Massive (FD) MIMO



IMPLEMENTATION

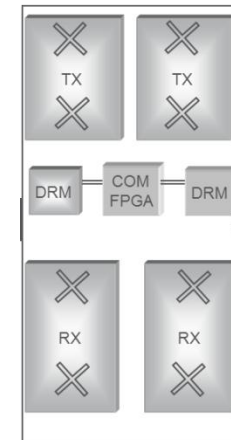
Passive antennas

High frequency antennas for wireless backhaul



Active antennas

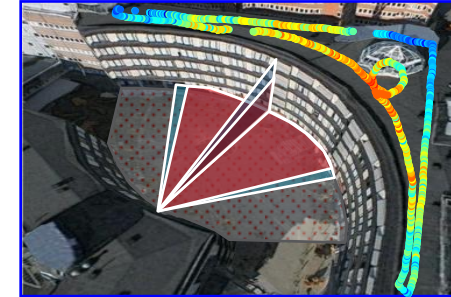
Antenna-radio integration



ANTENNAS – SYSTEM PERSPECTIVE



WIDE RANGE OF SCENARIOS



TRANSMISSION MODES

- MIMO
- TX diversity
- Beamforming
- ...

ALGORITHMS / SOLUTIONS

- Reconfigurability
- Beamshaping
- Self Organizing Networks
- ...

DEPLOYMENT

- Sectorization
- Small cells solutions
- Size/Visibility
- ...

IMPLEMENTATION

- Active antennas
- High frequency, low loss
- Antennas on devices
- ...

FUTURE RADIO ACCESS *SPECTRUM*



Spectrum is key to what we do ... and there is never enough!

2020 – *Extended spectrum availability up to 6 GHz*



Evolution of LTE

FUTURE RADIO ACCESS *SPECTRUM*



Spectrum is key to what we do ... and there is never enough!

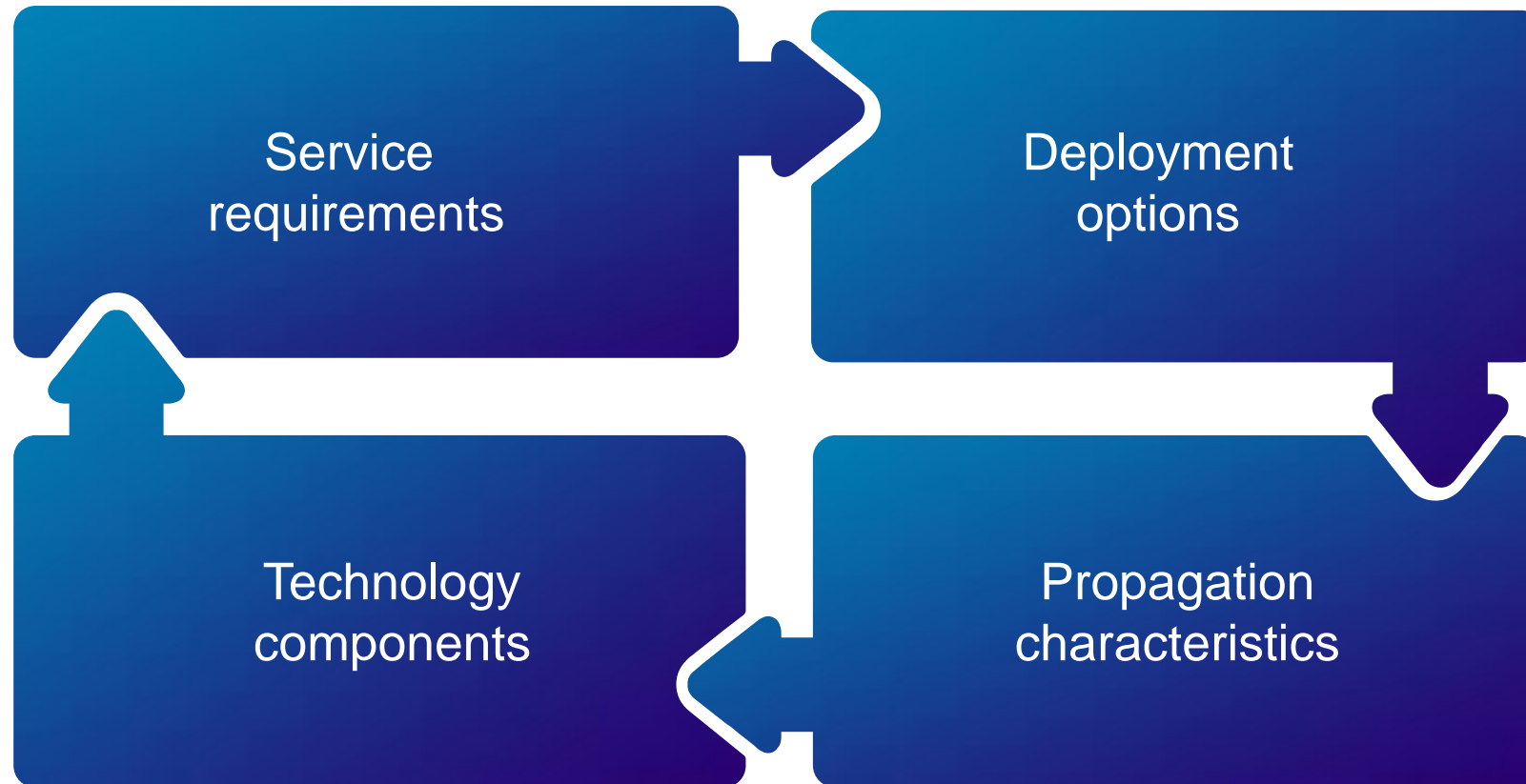
Beyond 2020 – *Extension beyond 6 GHz into mmw frequencies*



- › Large amount of spectrum available ⇒ Further massive increase in traffic capacity
- › Potential for very large bandwidths ⇒ Enabler of extreme data rates
- › Small wave length ⇒ Enabler for massive antenna solutions

ULTRA-HIGH FREQUENCIES

CAN IT BE MADE?

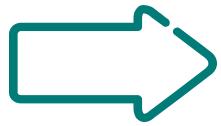


Match needed!

ULTRA-DENSE DEPLOYMENTS



- › Massive number of access points indoor and in outdoor hotspots



MASSIVE TRAFFIC CAPACITY

ULTRA-HIGH USER THROUGHPUT

- › High frequency bands
 - Beyond 3 GHz and migrating beyond 10 GHz
- › Simple antenna deployments
 - Self organized and self aligned beam patterns
- › Flexible backhaul

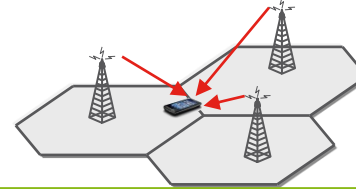


TECHNOLOGY COMPONENTS

OTHER IMPORTANT AREAS



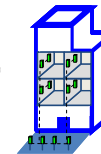
Multi-site coordination



Energy Efficiency



Simple deployment of very dense networks



Flexible backhaul solutions

Self-organization

Self-configuration

Robust mobility

Multi-RAT (Integration of technologies)



SUMMARY



- Everything will be connected!
- Key challenges:
 - Traffic growth
 - Number of devices and services
 - Large variety of requirements
- 5G will be multiple integrated wireless solutions



ERICSSON