

# 3GPP SOLUTIONS AND SPECTRUM FOR IOT/MTC



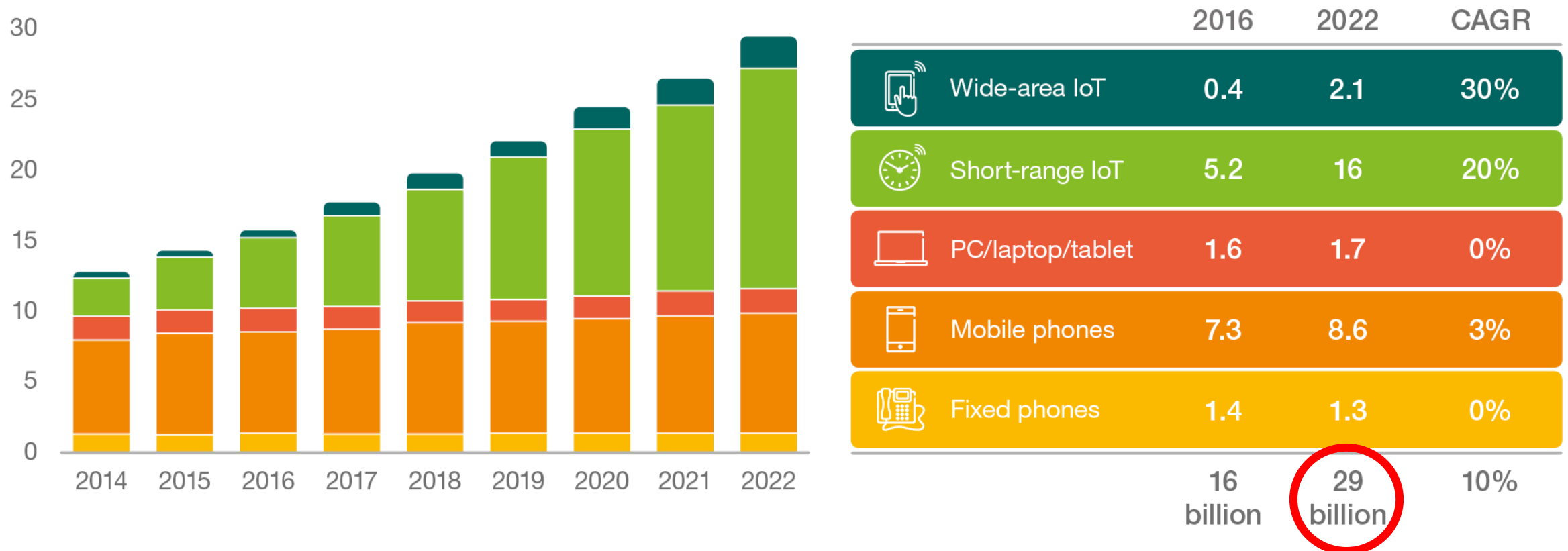
Hakan Ohlsen

Ericsson Group Function Technology & Emerging Business

# 70% OF WIDE-AREAS IOT DEVICES WILL USE CELLULAR TECHNOLOGY IN 2022



Connected devices (billions)



# SPECTRUM MOTIVATIONS



## **extreme Mobile Broadband (xMBB)**

- capacity, coverage, and latency

## **massive Machine-Type Communications (mMTC)**

- 50 B devices, coverage including deep indoor

## **ultra-reliable Machine-Type Communications (cMTC)**

- reliable, resilient, and latency

Understanding the 5G motivations and challenges while exploring spectrum requirements

**Capacity** extremely wide bandwidth of contiguous spectrum using “higher” bands

**Coverage** ubiquitous access using “lower” bands while providing for a “5G experience” and IoT

**Reliability** QoS in dedicated licensed spectrum using multiple bands and sites in both “lower” and “higher” spectrum

**Resilient** critical services robust against intentional obstructions using multiple bands, sites and/or repetition of transmissions

# SAME CITY WIDE RANGE OF REQUIREMENTS



## MASSIVE MTC



SMART BUILDING



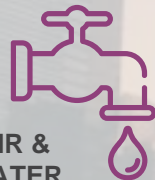
LOGISTICS AND FLEET MANAGEMENT



SMART  
METER &  
SENSORS



SMART  
AGRICULTURE



AIR &  
WATER  
QUALITY

## CRITICAL MTC



REMOTE HEALTH  
CARE



TRAFFIC SAFETY & CONTROL



TACTILE  
NETWORKS



REMOTE  
CONTROL



GRID  
CONTROL

LOW COST, LOW ENERGY  
SMALL DATA VOLUMES  
MASSIVE NUMBERS

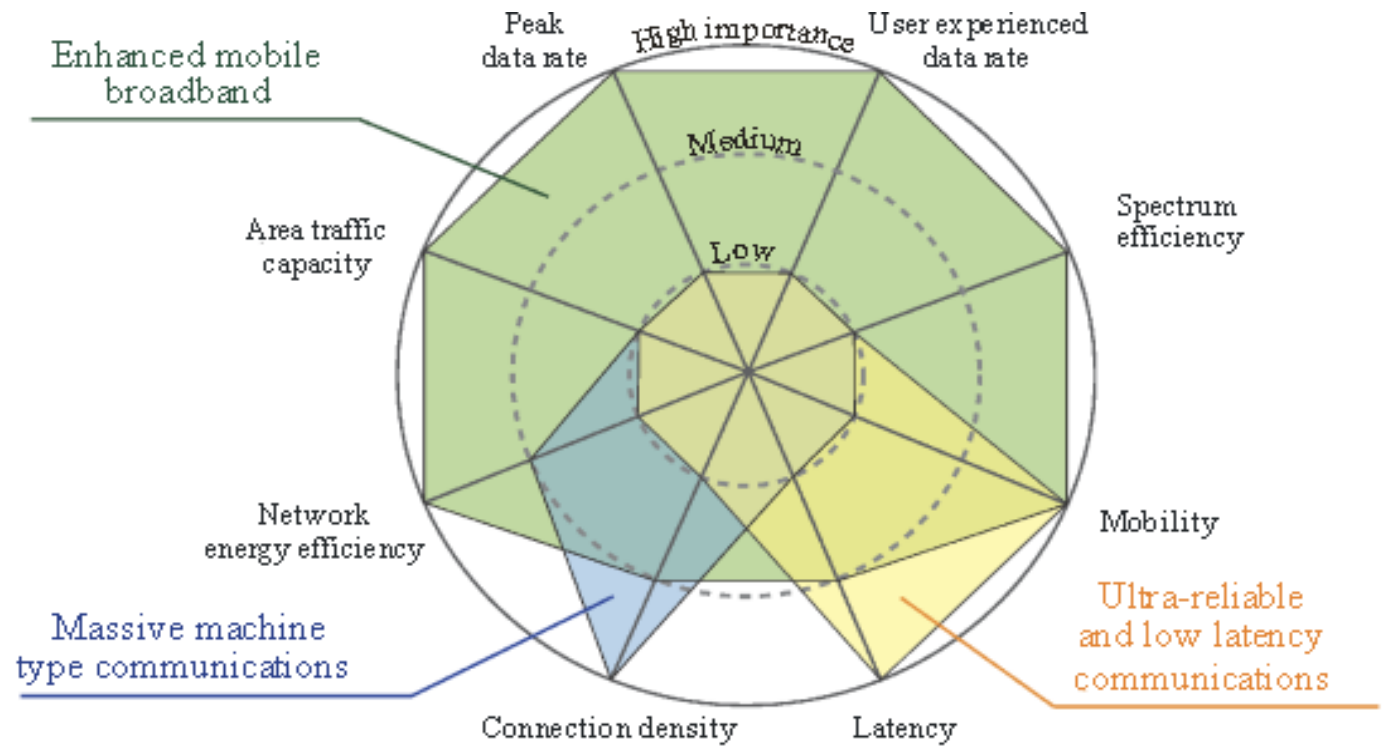
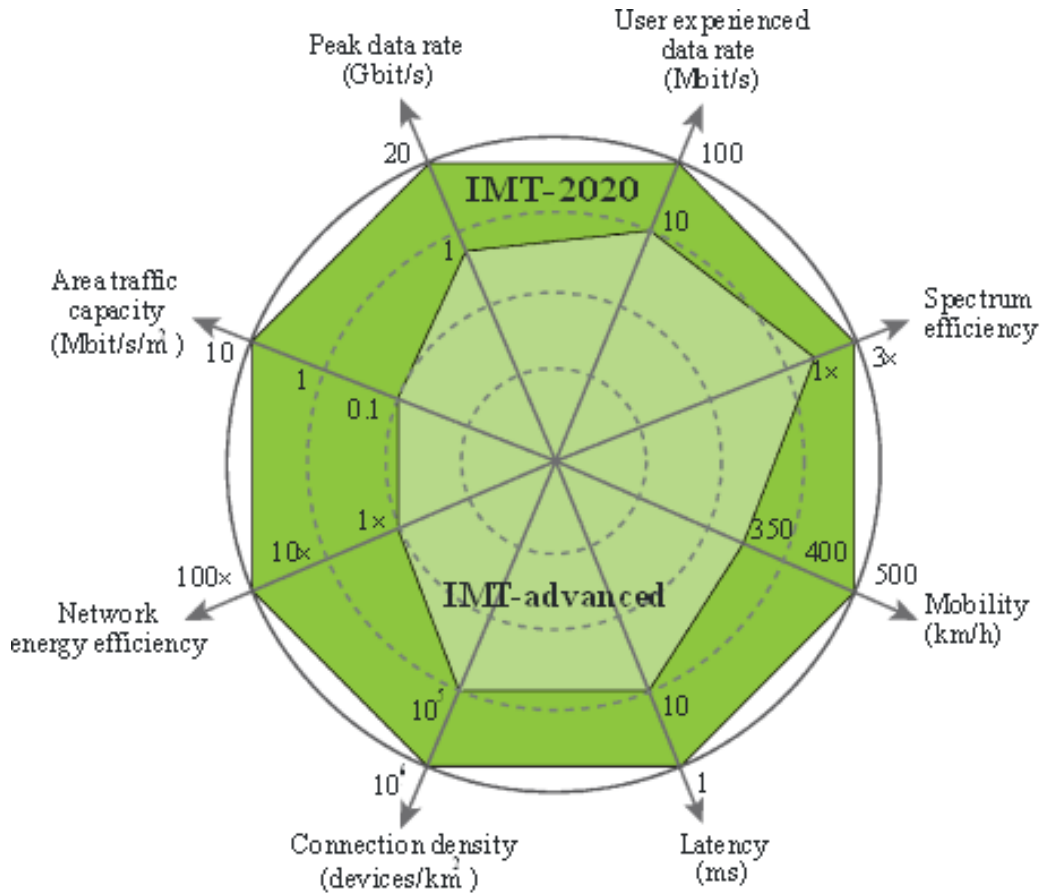
ULTRA RELIABLE  
VERY LOW LATENCY  
VERY HIGH AVAILABILITY

# ONE NETWORK FULFILLING THE CITY NEEDS



A common network platform with  
dynamic and secure Network Slices

# KEY CAPABILITIES ENHANCEMENTS



Reference: [Recommendation ITU-R M.2083](#) "IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond"



# CELLULAR IS THE FOUNDATION



GLOBAL  
REACH



QUALITY OF  
SERVICE



ECOSYSTEM



TOTAL COST OF  
OWNERSHIP



SCALABILITY



DIVERSITY



SECURITY

# FULL RANGE OF SOLUTIONS

Addressing diversity of use cases



**EC-GSM**

Global cellular IoT for all GSM markets

**LTE-M**

Wide range of Massive IoT applications

**NB-IoT**

Low-bitrate Massive IoT applications

**5G NR**

Critical Machine-Type Communication

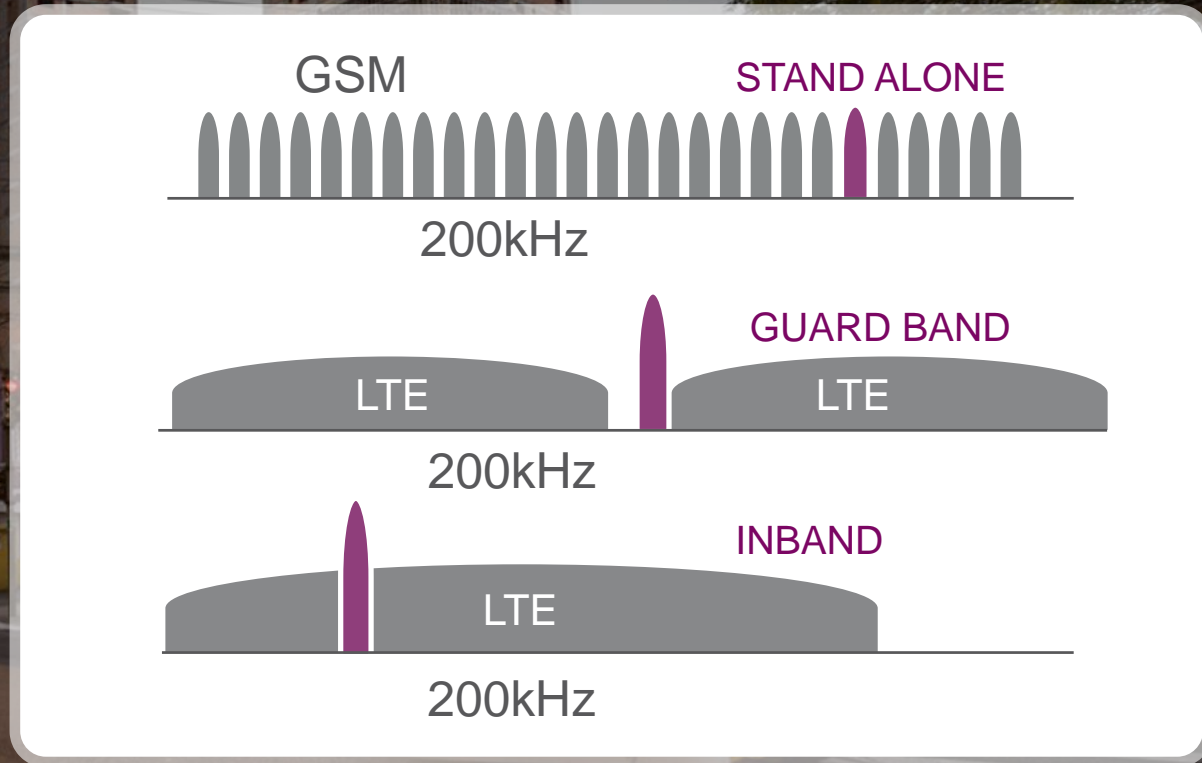


# FLEXIBLE DEPLOYMENT

Enabled by new software on LTE installed base



NB-IoT



Device receives NB-IoT carrier  
The capacity of NB-IoT carrier is shared by all devices  
Capacity is scalable by adding additional NB-IoT carriers

# 3GPP DEVELOPING TO HANDLE IOT



Modem cost

\$40  
Multimode  
cat 4

\$20-\$30  
cat 4

\$15  
cat 1

\$10-\$15  
cat 0

\$5

\$5

< \$5

\$5-\$10  
cat M

< \$5

< \$5  
NB-IoT

\$4

\$4

\$4

\$3

2015

2016

2017



Significantly reduced device complexity, functionality and capability, thus cost

Battery Life  
10+  
years



**LTE**  
**GSM**  
**LPWAN**









- Reduced Device Cost
- Improved Coverage
- Improved Battery Life





# LTE-M AND NB-IOT



## LTE-M (Cat-1) NB-IoT

## LTE-M (Cat-1) NB-IoT

	SW upgrade on LTE installed base		
	UE Complexity	LOW	ULTRA LOW
	Bandwidth Operation	1.4/20 MHz	200 kHz
	10+ Year Battery Lifetime		

	Extended Coverage	+0 dB (+15dB with EC)	+20 dB
	Deployment	LTE Carrier	FLEXIBLE
	Peak rate (DL/UL)	10/5 1/1 Mbps	128/64 kbps
	Capacity for applications	1M+ per cell	200k per cell

LTE (Cat-M1): HD/FD-1,2, 2, 3, 4, 5, 7, 8, 11, 12, 13, 18, 19, 20, 21, 25, 26, 27, 28, 31 / TDD-39, 40, 41

NB-IoT: HD-1, 2, 3, 5, 8, 11, 12, 13, 17, 18, 19, 20, 25, 26, 28, 31, 66, 70

3GPP Bands

DIVERSE CELLULAR SOLUTIONS FOR MASSIVE IOT

# INTERNET OF THINGS – IoT MACHINE TYPE COMMUNICATIONS - MTC



- › Regulatory schemes; Licensed / Light Licensed / Local licenses / Unlicensed
- › Different bands needed depending on application
- › mMTC: 450 MHz to 6 GHz, in particular re-using commercial spectrum
- › cMTC/URLLC: 5G frequency bands – low and high frequencies
- › ITS: Dedicated spectrum as well as licensed spectrum for vehicle-to-infrastructure



**ERICSSON**