COSMOTE

IoT
Smart Networks
for
Smart Cities

**Kyros Rizoulis,
Deputy Director, Access Network Control**

OTE
GROUP OF COMPANIES

IoT Industry Reshaping
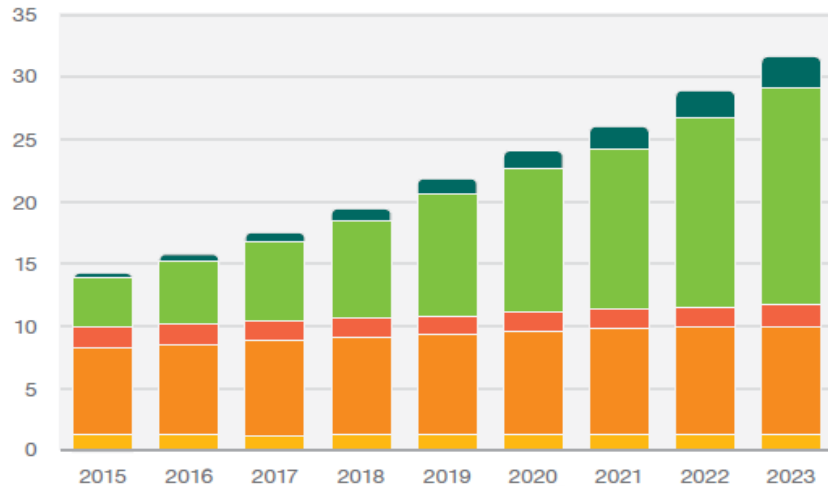## Transformational Impact on traditional Models

IoT transforms:
- business models
- value chains
- business config's
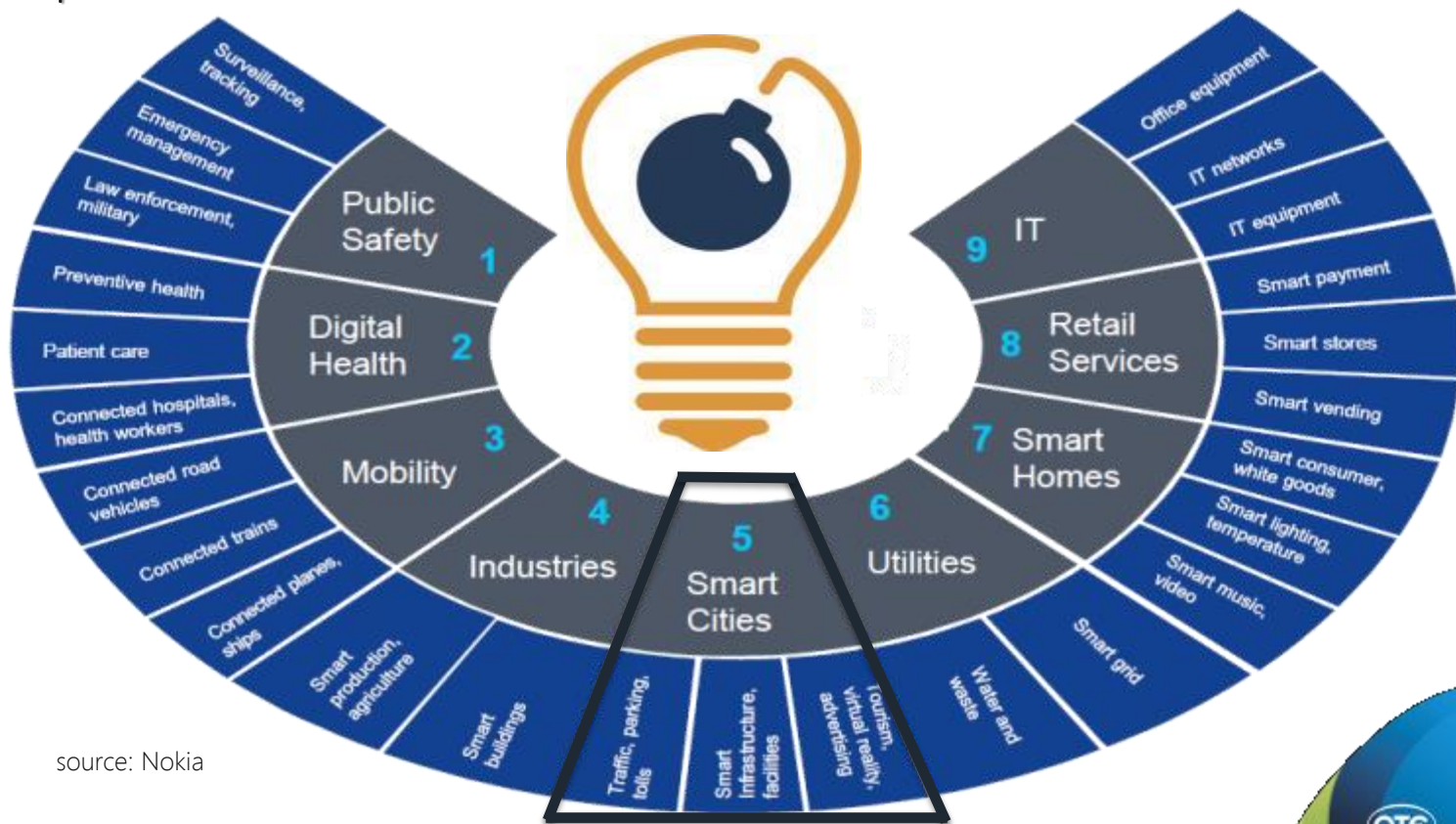
source: Nokia

IoT market Outlook

Strong Growth Potential

Two-Thirds of connected devices by 2023 will be IoT-related

Wide-Area IoT devices expected to quadruple in Western Europe by 2023

Mobile Networks main market is on Wide-Area IoT

Twenty networks commercially deployed

		2017	2023	CAGR
	Wide-area IoT	0.6	2.4	26%
	Short-range IoT	6.4	17.4	18%
	PC/laptop/tablet	1.6	1.7	0%
	Mobile phones	7.5	8.8	3%
	Fixed phones	1.4	1.3	0%
		17.5 billion	31.6 billion	10%

source: ERICSSON mobility report - November 2017

IoT: Smart Networks for Smart Cities

COSMOTE MBB Network

Already prepared for 2023 IoT Challenge

	2017	2023		2017	2023
	48%	16%			85%
		81%		44%	

Western Europe

Central and Eastern Europe
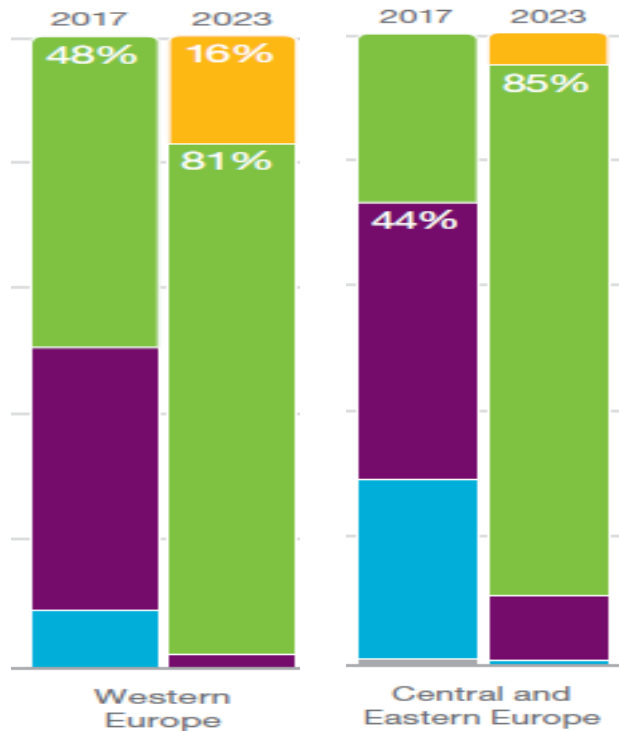
COSMOTE 4G
already supports "Area KPIs" for **2023**

>98%

COSMOTE Best MBB Network (OOKLA & P3)

source: ERICSSON mobility report - November 2017

COSMOTE Network Mobile Broadband Facts

With the highest Coverage of MBB Services

COSMOTE
Network
Premium MBB
Experience

Population Coverage

2G	**99,8%**
3G	**99,2%**
4G	**98,4%**
4G+	**92,9%**
4G++	**35,5%**

IoT: Smart Networks for Smart Cities

Unlicensed or Licensed?

Technology suitable for Smart City Apps

Unlicensed
LoRa
SigFox
ZigBee
6LoWPAN

Coverage
QoS
Security

Licensed
Cellular

Low energy consumption
Up to 10 years of
battery-powered operation

Deep indoor penetration
+20dB link budget
(compared to GSM)

Lower module costs
Radio module <$5
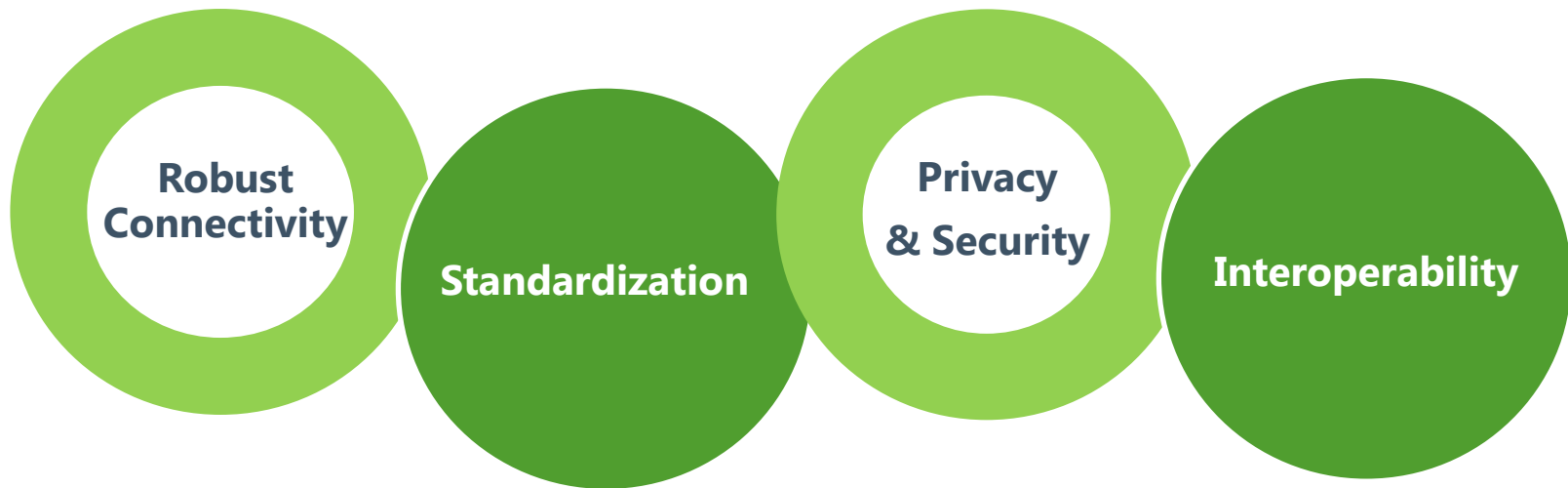(industry target)

A Solid Background is necessary for the Market

To fully capitalize on the opportunity, new network challenges have to be addressed:

Robust Connectivity

Standardization

Privacy & Security

Interoperability

- ☑ High number of devices
- ☑ Low data rates
- ☑ Infrequent data transmission
- ☑ Latency is uncritical
- ☑ Deep indoor penetration
- ☑ Low power consumption/long battery lifetime
- ☑ No external wake-up function needed
- ☑ No voice or SMS needed

Complementary Cellular Technologies

Meeting Diversity of Use Case Requirements

SPEED		LOW LATENCY
1Gbps	5G NR low latency high reliability	
10 Mbps	LTE Cat-4 & beyond	
1 Mbps	LTE Cat-1	MOBILITY & VOICE
100s kbps	Cat-M1	
10s kbps	NB-IoT/EC-GSM	STATIONARY
	Unlicensed LPWA	

SMART GRID MANAGEMENT

VOICE SERVICES CONNECTED ELEVATORS

CONNECTED CAR

KIDS/ELDERLY/PET/VIP TRACKING

WEARABLES

VEHICLE/ASSET TRACKING

SMART CITY LIGHTING, WASTE MANAGEMENT SMART PARKING

ENIRONMENTAL MONITORING, SMART AGRICULTURE

SMART METERING, SMART BUILDING, HOME AUTOMATION

Mass market IoT can take off using LTE infrastructure with R13 SW/HW ✓

source: Ericsson

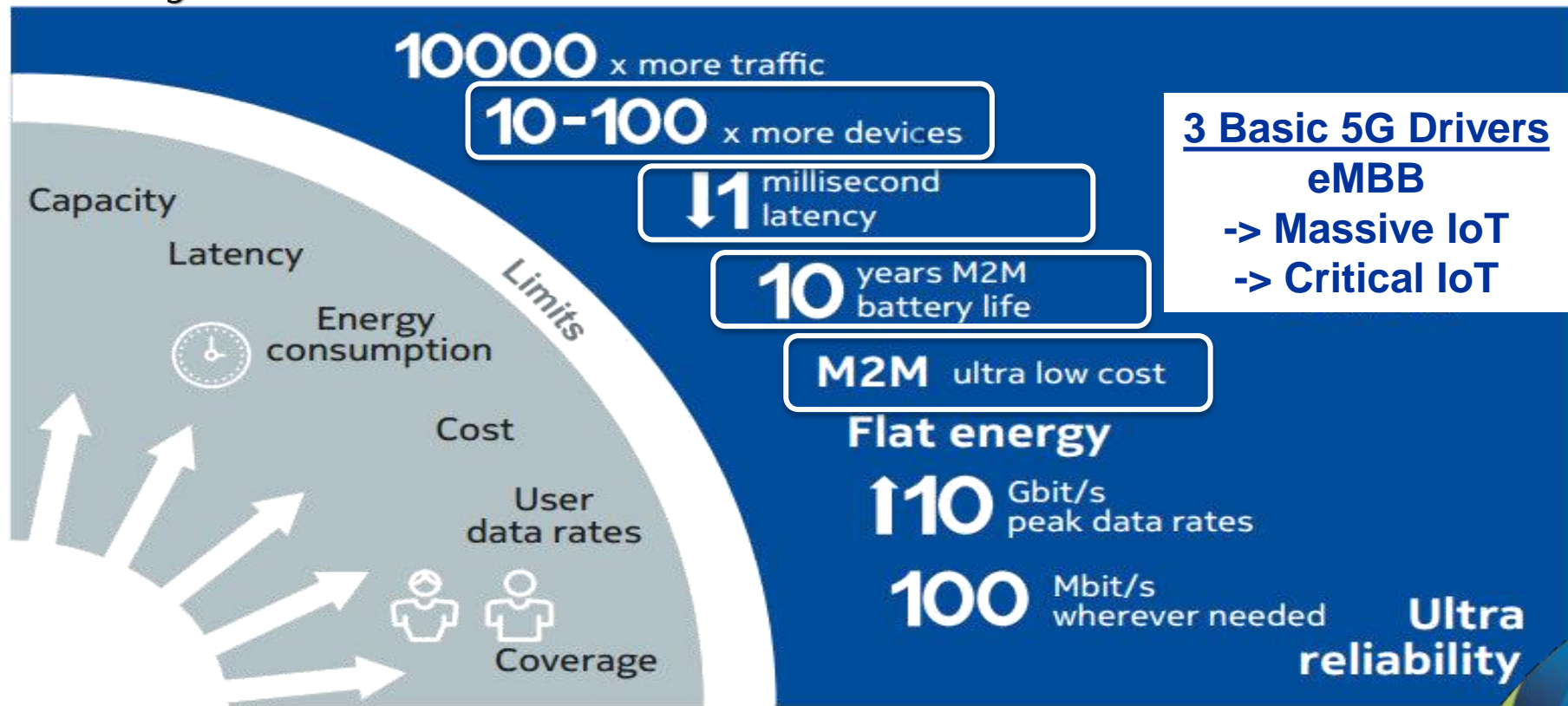# IoT @ 5G

Driving two of the three basic 5G Business Areas

10000 x more traffic

10-100 x more devices

↓**1** millisecond latency

10 years M2M battery life

M2M ultra low cost

Flat energy

↑**10** Gbit/s peak data rates

100 Mbit/s wherever needed

Ultra reliability

Capacity
Latency
Energy consumption
Cost
User data rates
Coverage
Limits

3 Basic 5G Drivers
eMBB
-> Massive IoT
-> Critical IoT

IoT: Smart Networks for Smart Cities

Cosmote at IoT Forefront

1st in Greece, 3rd in Europe

- Presented at Infocom conference (Nov. 2016)
- Smart Parking Application on any Android device

"NB-IoT Journey" Objectives
- *to demo "Smart City" apps*
- *to validate the technological benefits*
- *to foster the IoT apps & sensors ecosystem*
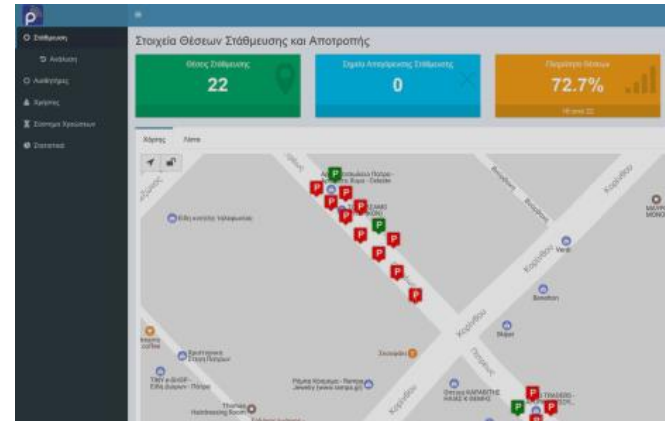
Patra Smart City Trial

3 Smart City Apps

"Smart City" concept tested in Patra. Three applications deployed in selected city areas:
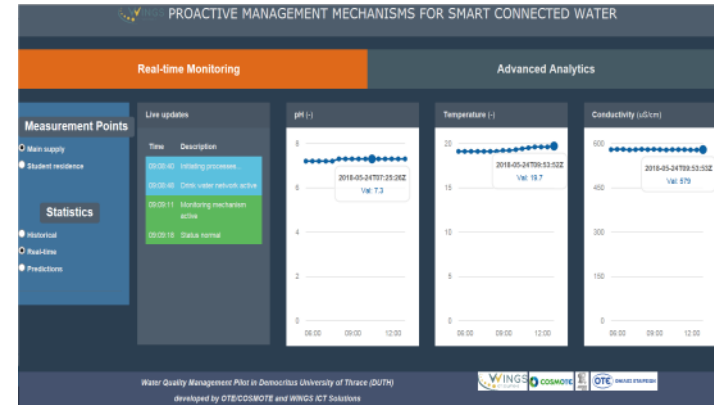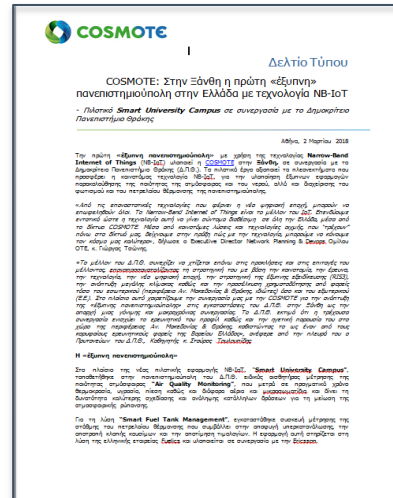- Smart Parking
- Smart Lighting
- Air Quality Monitoring

Partners from first round of hub:raum

Democritus University of Thrace Pilot

4 Smart City Apps

"Smart University Campus" concept tested at
ΔΠΘ. Four applications deployed in campus areas:

- Water Quality Measurement
- Smart Fuel Tank Monitoring
- Air Quality Monitoring
- Smart Lighting

Kyr-Yanni Winery Pilot

Smart Wine App

- "Smart Wine" concept tested at "Kyr-Yanni" winery
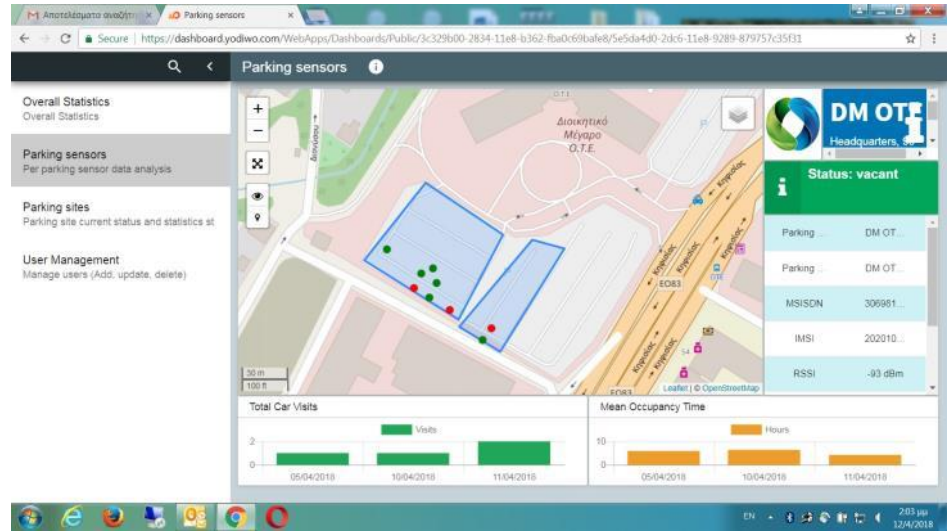- Wine Route environmental conditions monitoring

OTE HQ Pilot

Smart Parking App

Smart Parking solution deployed

Fostering the Ecosystem

Giving our Partners the Chance to develop

- NB-IoT solution prototyping test-lab set up for:
  - Sensor & app development
  - Compatibility testing against actual network
  - Validation of partner readiness
- Solutions validated in eight verticals

Lessons learned

Key Takeaways

"NB-IoT is a fully mature technology"

"Delivers on promise"
- Penetration
- Power Consumption
- Ease of Deployment

"Ideally suited for Smart City apps"

"Already live in areas around Greece and deploying further"

Thank You!

Kyros Rizoulis,
Deputy Director, Access Control Network

LPWA Technologies Comparison

		2G/3G/LTE	NB-IoT ᴛ··	sigfox	LoRa
Licensed spectrum		✓	✓	✗	✗
Industry standard		✓	✓	✗	✗
Security level [1]		✓	✓	✓	✓
Downlink (e.g. for SW updates)		✓	✓	✓	✓
Peak data rate	Downlink	300 Mbit/s	250 Kbit/s	600 bit/s	50 Kbit/s
	Uplink	50 Mbit/s	230 Kbit/s	100 bit/s	50 Kbit/s
Indoor penetration		Standard 144 dB	+20 dB	+16 dB	+13 dB
Radio module (target) cost		high (15–45 €)	low (< 5 €)	low (3–5 €)	low (< 5 €)
Battery lifetime		Up to 2–3 years	Up to 10 years	Up to10 years	Up to10 years

Low-Power-Wide-Area (LPWA) Technologies

1) Mechanisms in place for confidentiality, integrity and availability