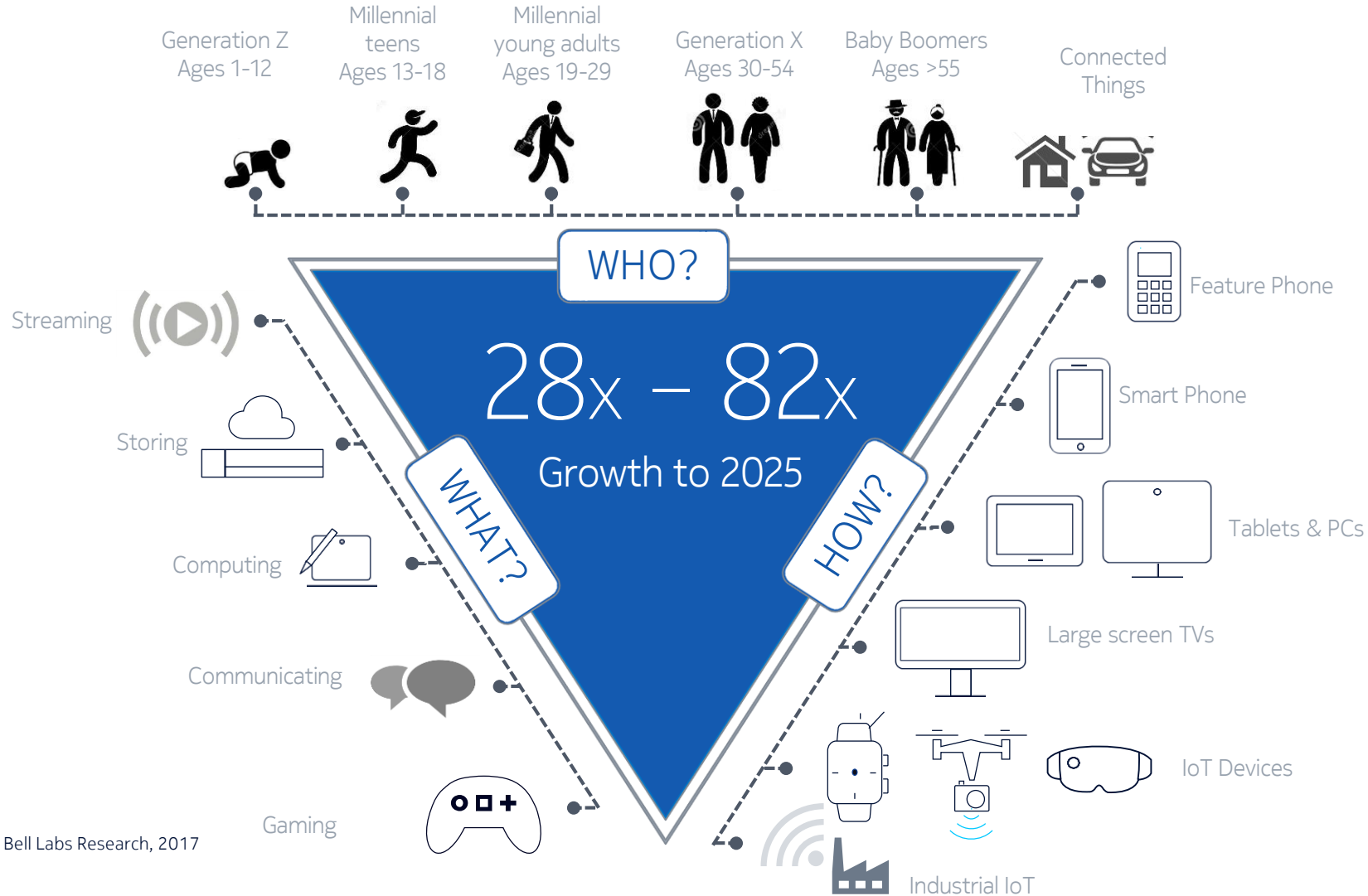


More people and devices will connect online or stream

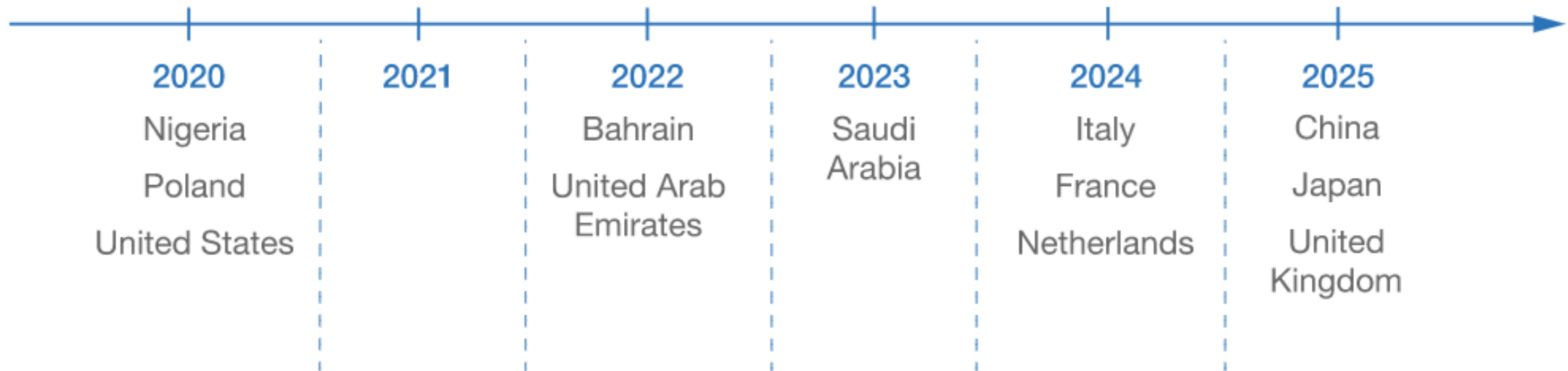
Entertainment, gaming, shopping and accessing information



Source: Wireless Traffic Growth, Bell Labs Research, 2017

We are running out of 4G capacity

The point when operators begin to run out of capacity in at least 50 percent of sites will vary country by country.



An article by McKinsey, 2018: The road to 5G: The inevitable growth of infrastructure cost

Note: Includes examples of select countries. Assumes current spectrum ownership. The years shown represent the point when at least one operator in a country runs out of capacity.

Reference to the McKinsey article in this presentation does not equate to Nokia's unreserved endorsement.

What 5G offers?

5G is a big step up in performance versus 4G

5G	4G
10Gbits/s	100Mbits/s
100Mbits/s	10Mbits/s
3x	1x
1ms	10ms
500km/h	350km/h

5G vs 4G table of key handset parameters

Examples of new 5G technology building blocks

New spectrum options



<3 GHz, 3-6 GHz, cm/mmWave

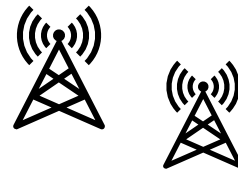
Massive MIMO & beamforming



Flexible air interface



Multi-connectivity



Aggregation and duplication

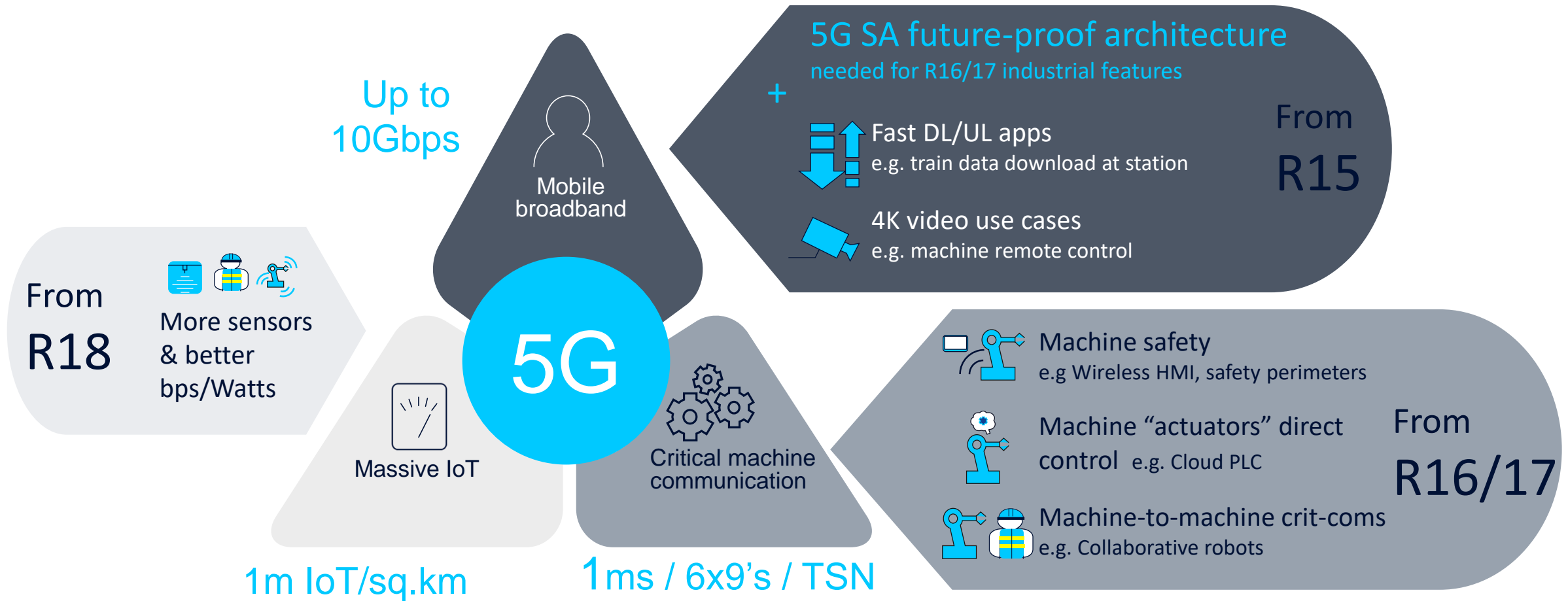
Low Latency



Energy efficiency



Capabilities and industrial use case enabled by 5G



Enterprises have started to evolve their digitalization journey with 5G



Lufthansa Technik

Germany, maintenance, repair, and overhaul (MRO) services for aircraft (21 facilities worldwide)

Deployment in Hamburg site hangar



Sweden, Underground mine machine manufacturer

Deployment in Sandvik underground test mine in Tempere, Finland



Japan, Largest car manufacturer & System integrator

Deployment in TEPC, Toyota Production Engineering facility in Fukuoka, Japan



German rail operator

Track coverage at and around Bergedorf station, Hamburg

Nokia's 5G leadership

8 Gbps

World's fastest 5G

€129bn

in R&D investment (past
two decades)

3,500+

Patent families declared
essential for 5G

3GPP
leader

#1

in telco
software*

#2

in global telecom
infrastructure**

1st global RAN
vendor to join

Open RAN
POLICY COALITION

O-RAN
ALLIANCE

*Analysys Mason Oct 2019 [report](#) (2018 market share)

**Dell'Oro 1Q2020 Lightwave [article](#)

Thank you

Sonja London

Head of Consumer Electronics Licensing

Nokia Technologies

