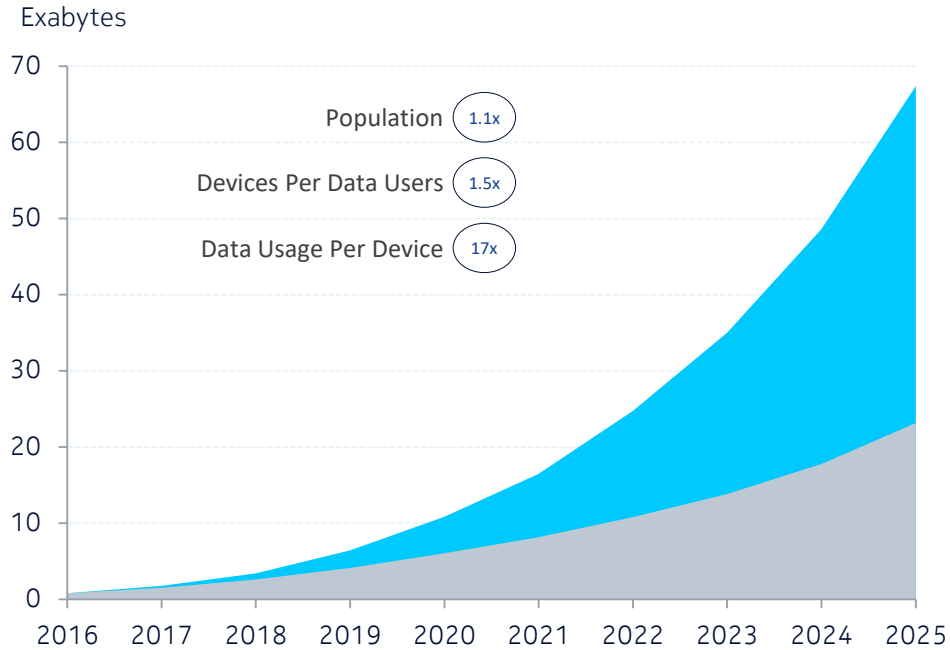# 5G : Delivering the extraordinary

– 5th G for Humans, 1st G for Machines

Randeep Raina
Chief Technology Officer
Nokia Networks - India
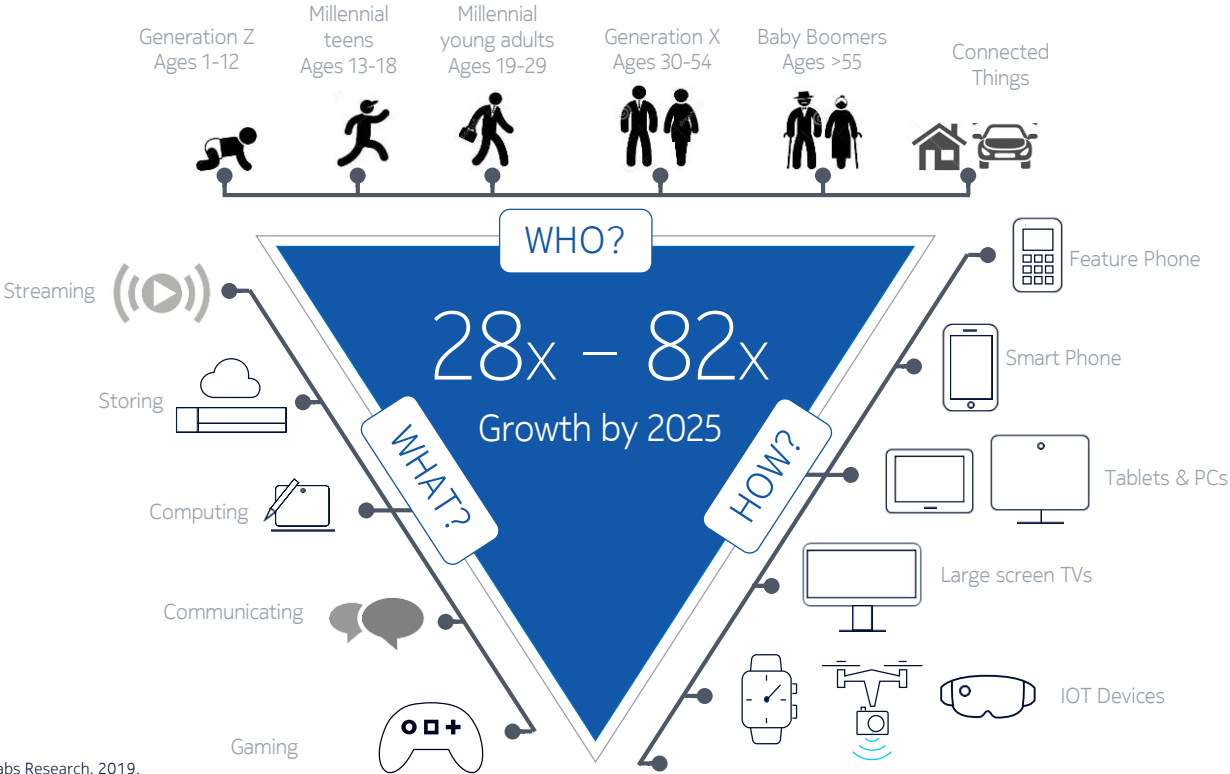
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Mobile data traffic & # devices connecting to the Internet grow exponentially
Conservative versus disruptive scenarios

Exabytes

Population	1.1x
Devices Per Data Users	1.5x
Data Usage Per Device	17x

70
60
50
40
30
20
10
0

2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
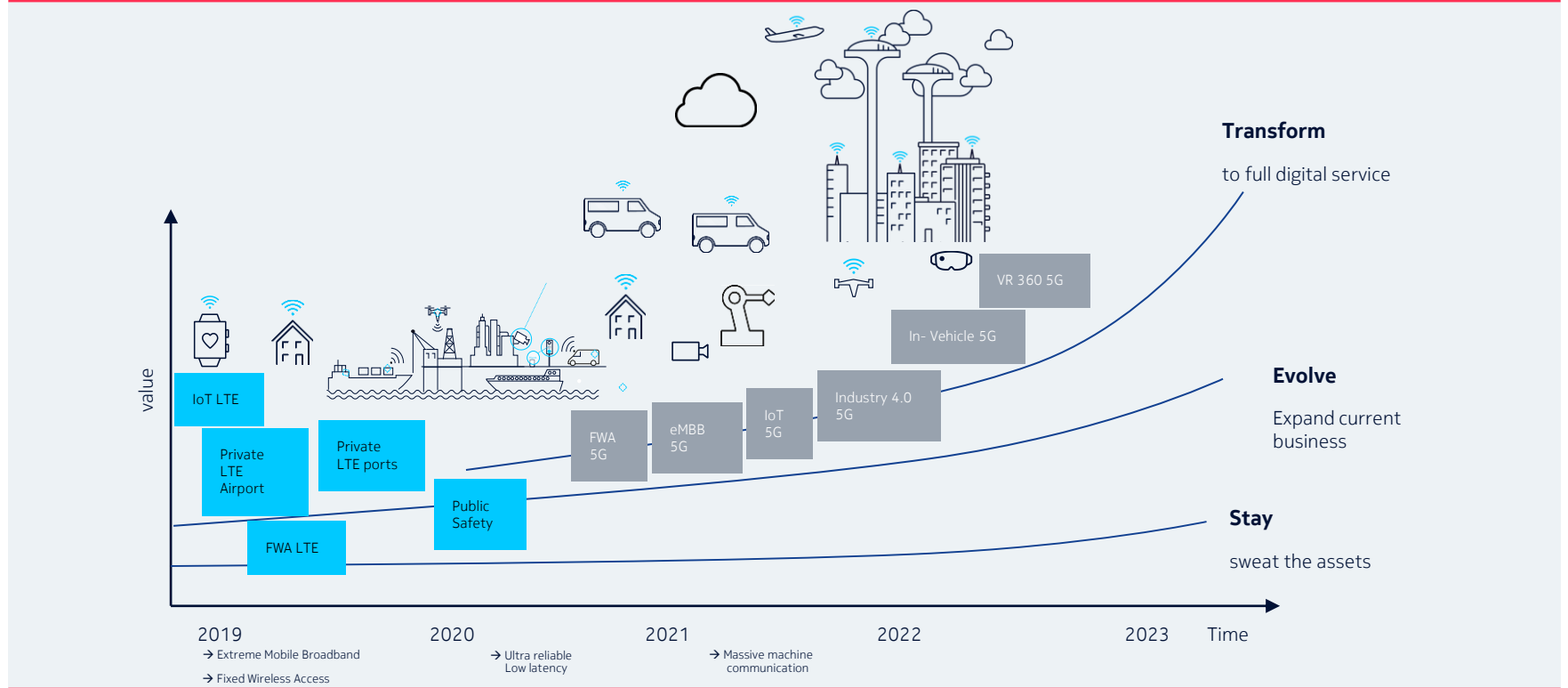
2019-2025
growth = 28x-82x

Source: Bell Labs Consulting

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More people and devices want to connect online or stream
Entertainment, gaming, shopping and accessing information

Generation Z
Ages 1-12

Millennial teens
Ages 13-18

Millennial young adults
Ages 19-29

Generation X
Ages 30-54

Baby Boomers
Ages >55

Connected Things

WHO?

Streaming

Storing

Computing

Communicating

Gaming

WHAT?

28x – 82x
Growth by 2025

HOW?

Feature Phone

Smart Phone

Tablets & PCs

Large screen TVs

IOT Devices

Source: Wireless Traffic Growth, Bell Labs Research, 2019.

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Possible business scenarios
Stay, Evolve or Transform

Transform

to full digital service

Evolve

Expand current business

Stay

sweat the assets

value

VR 360 5G

In- Vehicle 5G

Industry 4.0 5G

IoT LTE

Private LTE Airport

Private LTE ports

FWA 5G

eMBB 5G

IoT 5G

Public Safety

FWA LTE

2019	2020	2021	2022	2023	Time

→ Extreme Mobile Broadband

→ Fixed Wireless Access

→ Ultra reliable Low latency

→ Massive machine communication

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Future Network Currencies and Capabilities Powered by 5G

Driven by Industrial Automation

Driven by IoT

Driven by Video Consumption

Driven by AI/ML

On Demand Efficient, Open

Service based

5G

Reliability
99.999%

Peak Data Rate
10Gb/s

Data Volume
10Tb/s/sq.km

Service deployment time
1hr

Efficiency TCO/bit/s
20% vs 4G

Devices density
1M/sq.km

Mobility
500km/h
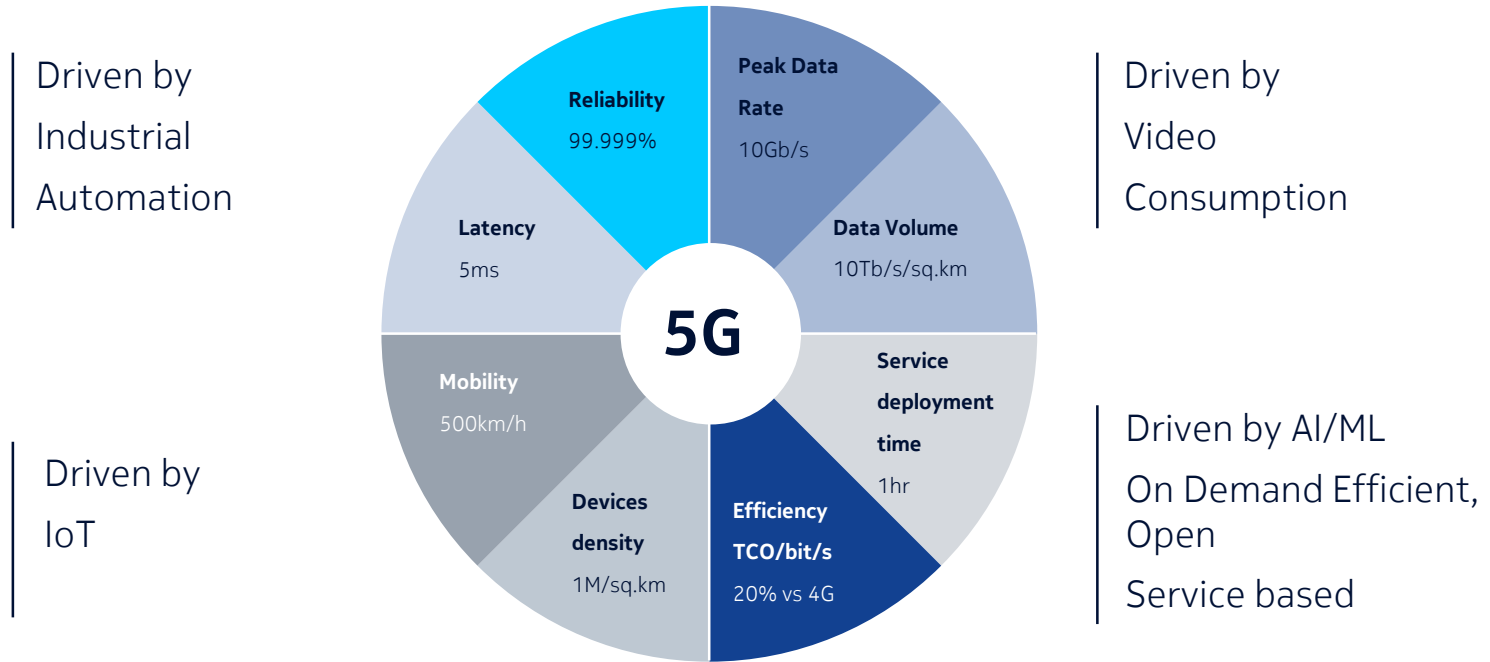
Latency
5ms

Enabling use cases for consumers and enterprises.

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5G is a giant leap

Endless possibilities

	Today	2020-25	
Users	10M people	+100M 'things'	
Speed	100 Mbps	100x faster	
Latency	>>10 ms	10x less	
NW service level	Best effort for all	Committed SLAs	
Logical networks	1	Many (slices)	

Smart home

Mobile gaming

Industry 4.0

Connected cars

Drones
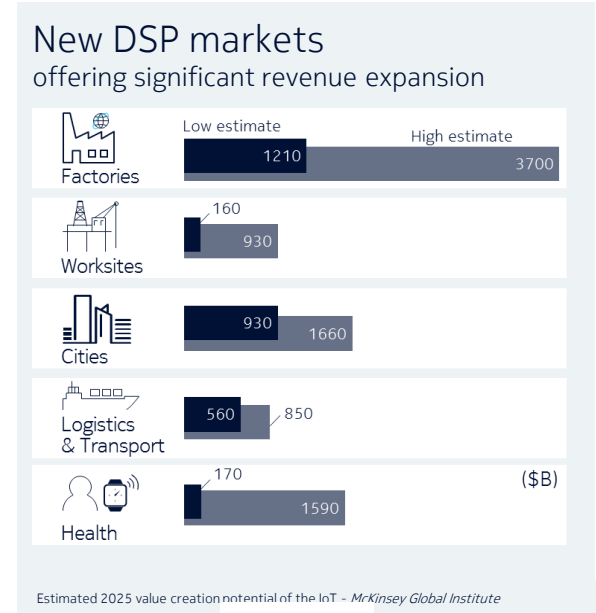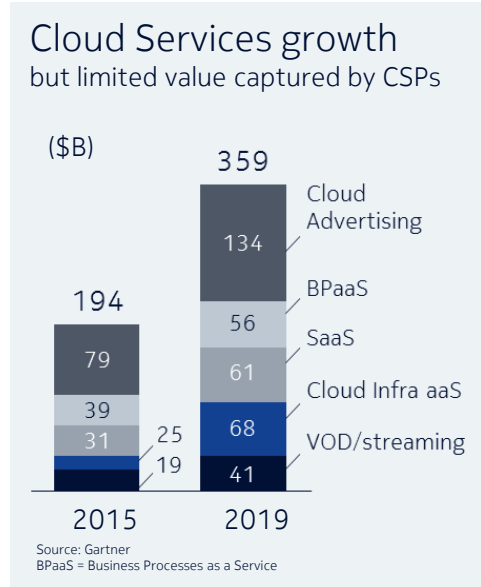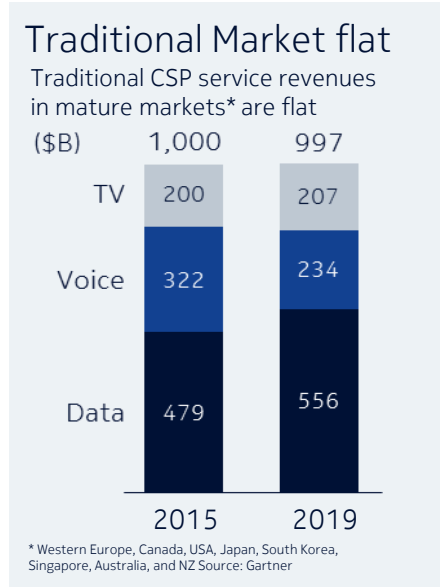
IoT wearables

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5G Deployment Driven By Use Cases

	Use Case		Delivered By
Application	Examples	Cost Sensitivity	Targeted Coverage / Mobility
Mobile Broadband	UHD video streaming	Medium	mass / High
Fixed Wireless Access	Fibre like service	High	targeted / none
Gaming	Online games Stadia, Azure	Medium	mass / low
Critical automation	· Collaborative robots/drones	Low	mass / medium
Tele-operation	· Video-based remote control	Medium	targeted / medium
Mass sensor arrays	telemetry, basic control	Very High	mass / low

Consumer

Industry

5th G for Humans & 1st G for Machines

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Telco Market Opportunity and New Value Creation

7M Base Stations

14M Industrial Sites

Consumers ⟷ Industries

Traditional Market flat
Traditional CSP service revenues in mature markets* are flat

($B)

	2015	2019
	1,000	997
TV	200	207
Voice	322	234
Data	479	556

* Western Europe, Canada, USA, Japan, South Korea, Singapore, Australia, and NZ Source: Gartner

Cloud Services growth
but limited value captured by CSPs

($B)

194 (2015): 79, 39, 31, 25, 19

359 (2019):
- Cloud Advertising: 134
- BPaaS: 56
- SaaS: 61
- Cloud Infra aaS: 68
- VOD/streaming: 41

Source: Gartner
BPaaS = Business Processes as a Service

x 3

New DSP markets
offering significant revenue expansion

Low estimate — High estimate

	Low estimate	High estimate
Factories	1210	3700
Worksites	160	930
Cities	930	1660
Logistics & Transport	560	850
Health	170	1590

($B)

Estimated 2025 value creation potential of the IoT – *McKinsey Global Institute*

MUST DO ⟷ MUST BECOME

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AR/VR will impact many industry verticals…

…creating diverse and massive business opportunities – depending on 5G deployments

B2C

Gaming

Entertainment, esports

Healthcare

AR/VR opportunity space

Global AR/VR spending in 2019
$10.5B
Source: IDC

77%
5-year CAGR 2019-23
Source: IDC

Manufacturing, design

Aerospace

Military, Defence

Education

Telepresence

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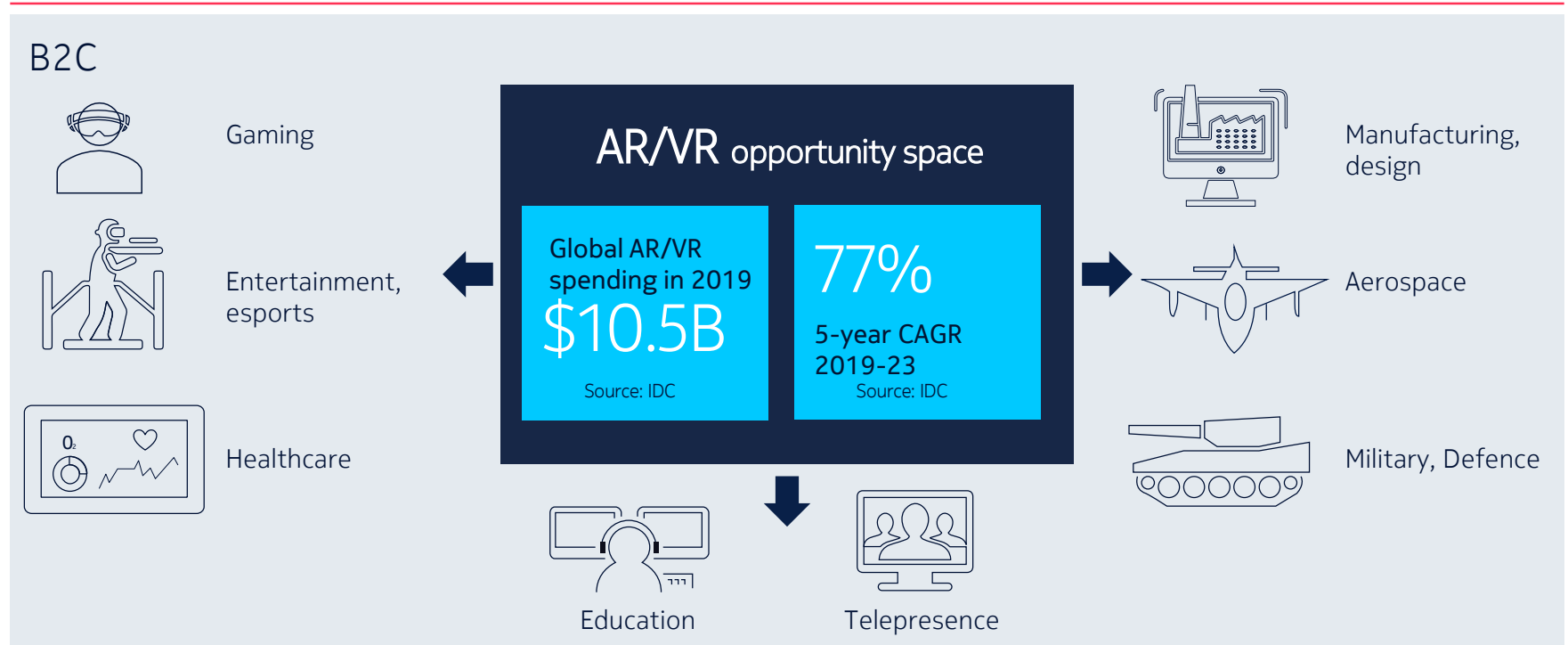
The future of digital transformation: how to plan for it?

It's not just about technology

1. Prepare for big changes

2. Address the digital skills gap

3. Ride the wave

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5G will transform human possibilities, industrial control and operations
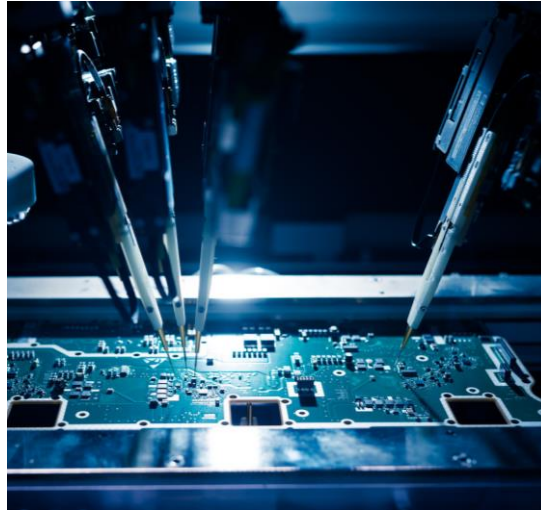
Nokia's technology leadership ensures that 5G impact

Join us on the journey to the next industrial revolution!

"We sit on the cusp of a revolution in Information..."

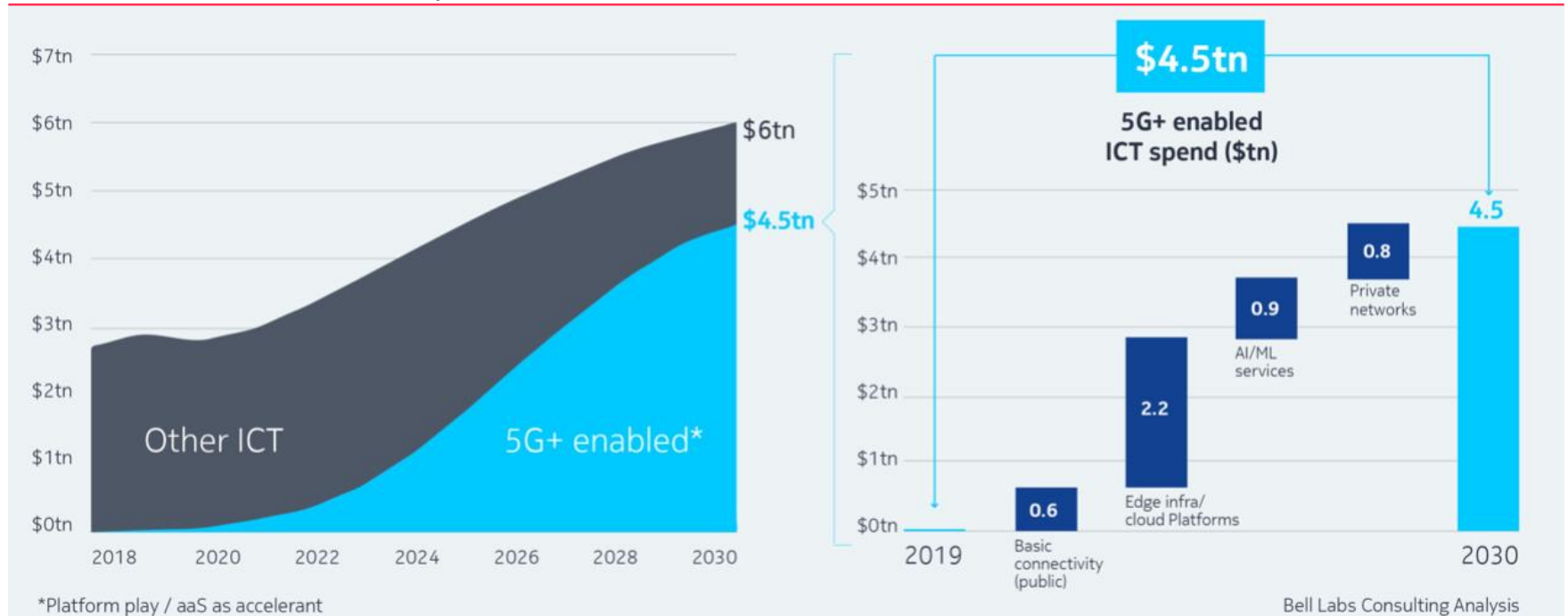Data & information becoming instant.

Big data becoming small.

Intelligence becoming augmented.

Information is the communication or reception of knowledge

© 2020 Nokia

Nokia internal use

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Show me the money!
Bell Labs Research Report

$7tn

$6tn — $6tn
$5tn
$4tn — $4.5tn
$3tn
$2tn
$1tn
$0tn
2018 2020 2022 2024 2026 2028 2030

Other ICT

5G+ enabled*

*Platform play / aaS as accelerant

$4.5tn

5G+ enabled ICT spend ($tn)

$5tn   4.5
$4tn   0.8
                                  Private
$3tn   0.9   networks
                          AI/ML
$2tn   2.2   services
$1tn
$0tn   0.6   Edge infra/
              cloud Platforms
2019   2030
Basic
connectivity
(public)

Bell Labs Consulting Analysis

5G + = E2E 5G + Edge cloud + Private networks + Augmented intelligence + Automation + PaaS

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