



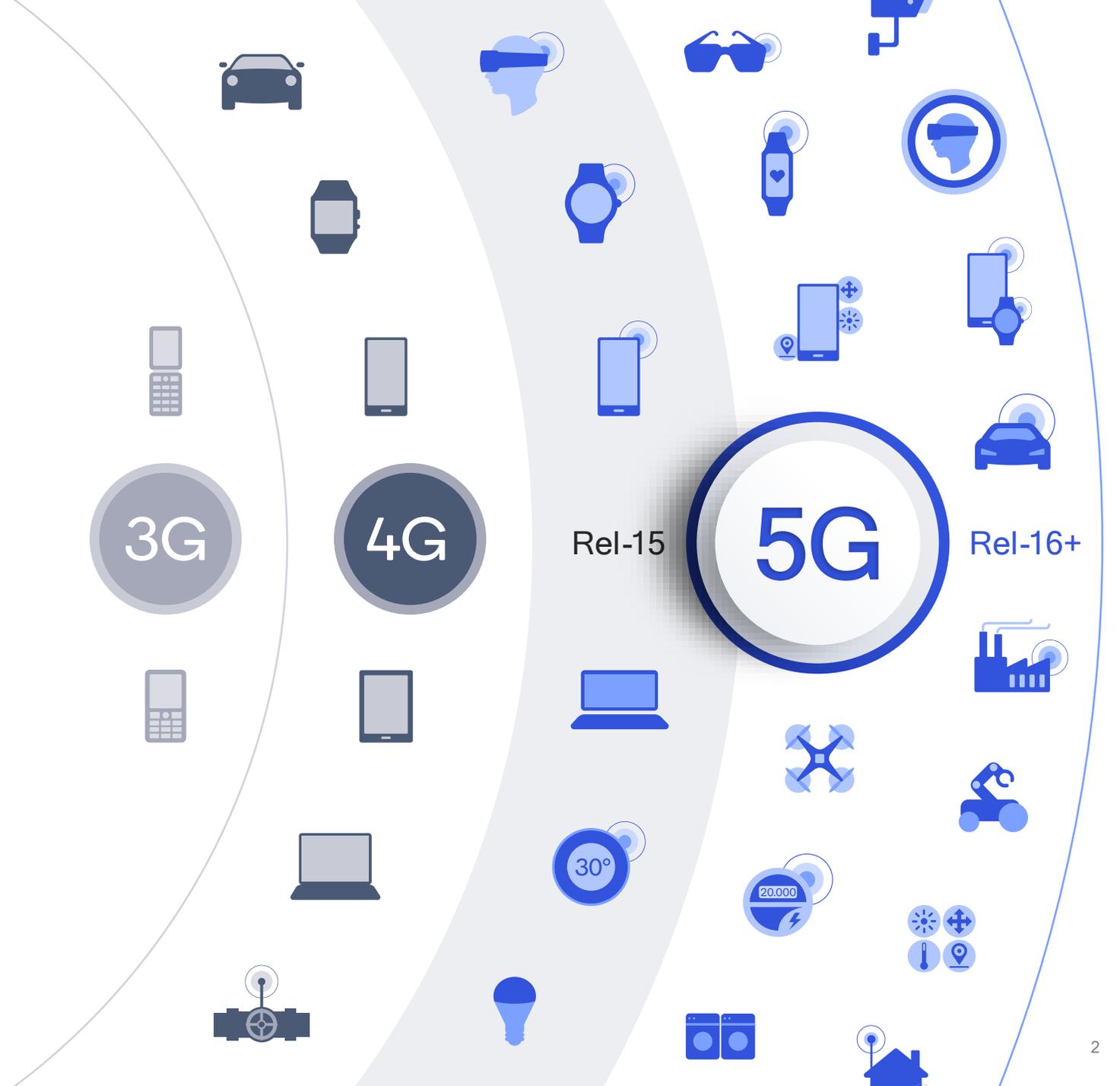
Qualcomm

Transforming the wireless edge to
realize the full potential of 5G

Learn more at www.qualcomm.com/5G

Leading society to 5G

And the expansion of the 5G ecosystem



A unifying connectivity fabric for society

Like electricity, you will just expect it everywhere



Scalable to extreme simplicity

Multi-gigabit speed

Ultra-low latency

Virtually unlimited capacity

Extreme reliability

On-device intelligence



Enabler to the factory of the future



Safer, autonomous transportation



Reliable access to remote healthcare



Precision agriculture



Efficient use of energy and utilities



Private networks for logistics, enterprises, industrial,...



Sustainable smart cities and infrastructure



Digitized logistics and retail

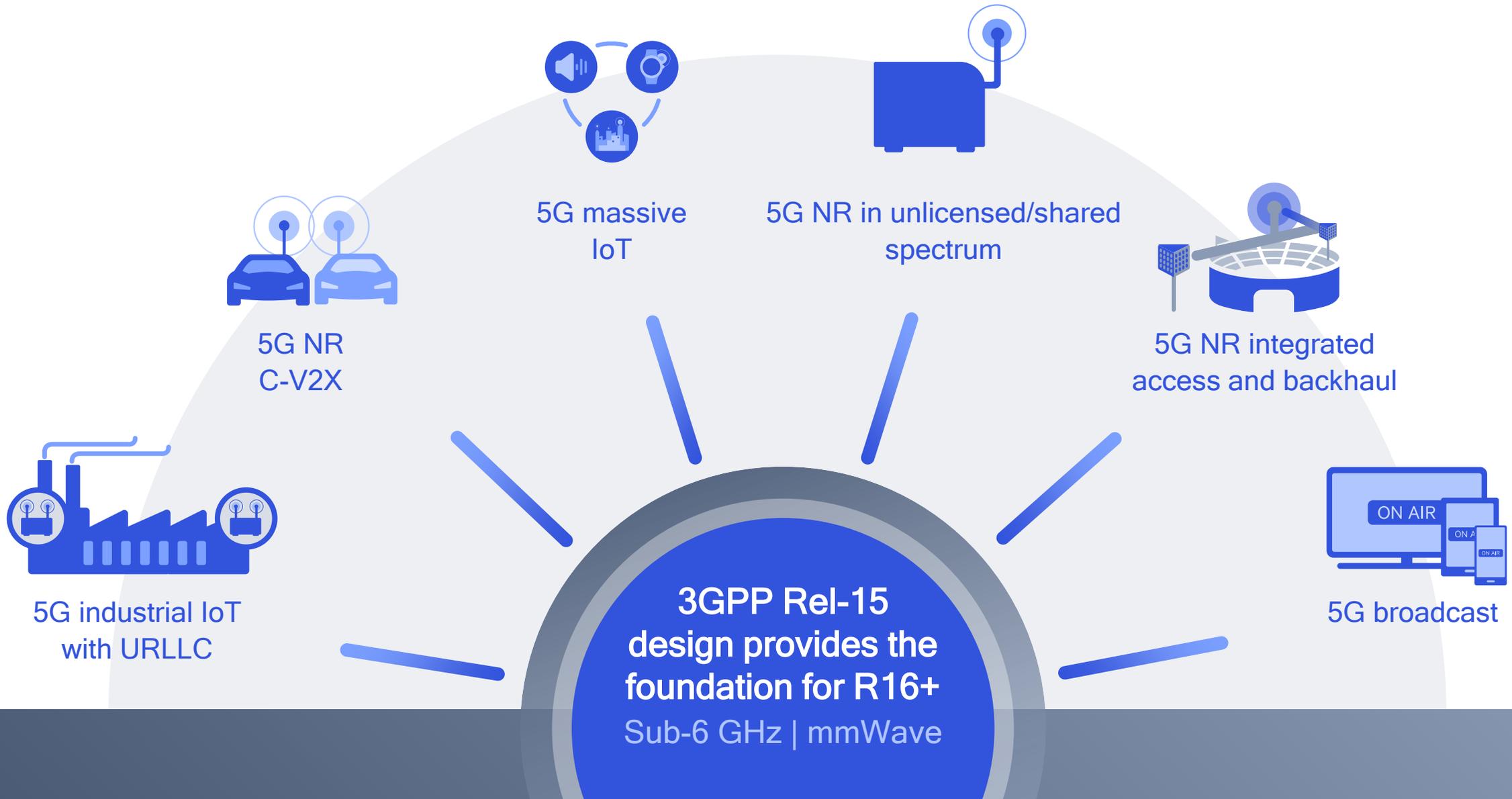


5G will expand the mobile ecosystem to new industries

Powering the digital economy > \$12 Trillion In goods and services by 2035*

* The 5G Economy, an independent study from IHS Markit, Penn Schoen Berland and Berkeley Research Group, commissioned by Qualcomm

Driving a rich 5G roadmap in Release 16 and beyond



Private 5G networks for Industrial IoT use cases

Optimizing LTE today

New opportunities with 5G NR



Ultra-reliable
low-latency



Time-sensitive
networking



mmWave and
sub-6GHz eMBB



Wireline ethernet
replacement

Optimized

Tailored for industrial applications,
e.g., QoS, latency

Dedicated

Local 'edge' network, easy to
deploy, independently managed

Secure

Industrial grade security
with LTE and 5G NR



Container ports



Oil refineries



Manufacturing



Construction



Mines



Warehouses



Wind farms



Oil rigs

>\$5 Trillion¹

Global economic output in 2035 enabled by 5G in the following five categories



Manufacturing
\$3,364B



Transport
\$659B



Construction
\$742B



Utilities
\$273B



Mining
\$249B

1. "The 5G economy: How 5G technology will contribute to the global economy" by IHS Economics / IHS Technology

Enabling reliable wireless IoT connectivity at transport hubs



Local management for low latency and protection of sensitive data

Real-time inventory

- Lumber
- Manufacturing
- Produce
- Technology
- Hardware
- Automotive
- Earth/Soil
- Retail

AR-guided execution

Reliable robotic control

UHD surveillance

Reliable, autonomous AGVs

On-premise compute and storage

Updating

Real-time asset tracking

At port (Days): 3

Location: [Map]

Spools shipped: [Table]

Capacity: [Table]

Camera: [Image]

On-device intelligence

5G NR Private network

Seamless interworking with public network

The reconfigurable factory of the future will thrive on the wireless edge

 **XR** Guided execution

 Ultra reliable, low-latency wireless connection

 Surveillance

 Dynamic factory reconfigurability

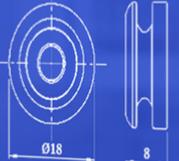
 Real-time supply chain visibility

 **5G NR**
Private network

 Predictive maintenance

Demand fulfillment 

Quantity Button # 513217

 3 

Procedure  Final 

You don't want your device to confirm with the cloud to take action

On-device intelligence is key for today's and future autonomous cars





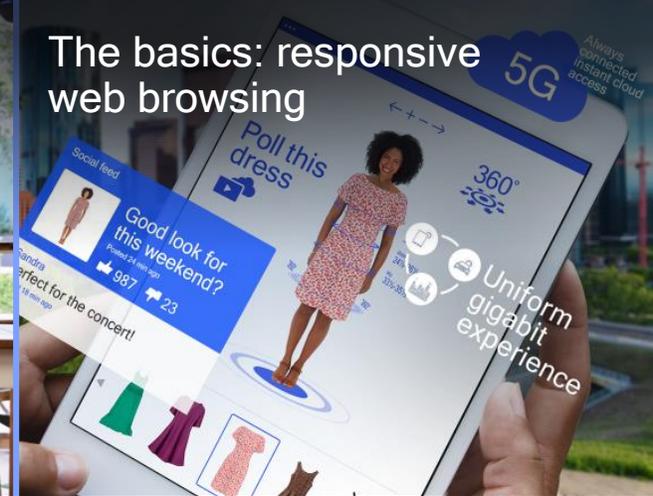
Instant access to media and entertainment



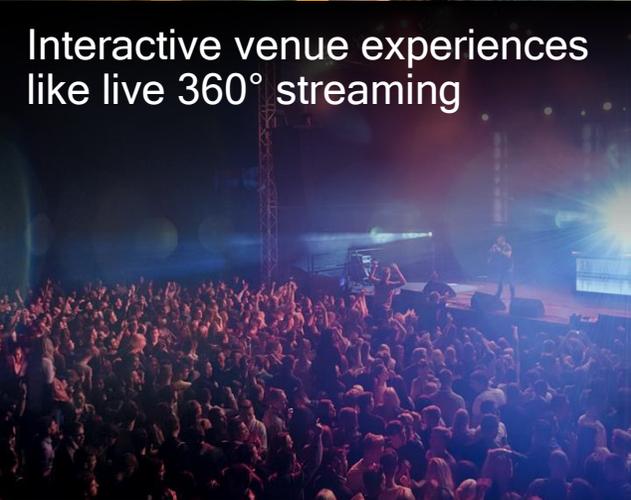
Connected cloud computing



Low latency online multiplayer gaming



The basics: responsive web browsing



Interactive venue experiences like live 360° streaming



Rich real-time user-generated content, like video sharing



Mobile immersive experiences



Distributed processing for boundless photorealistic XR



- Fiber-like data speeds
- Low latency
- Uniform performance
- Massive capacity

+

- Content/control closer to user
- Realization of low latency
- Customized local value
- Augment on-device processing

=

Enhanced and entirely new experiences

5G's capacity and latency for shared venue experiences



Augment on-device processing for boundless photorealistic mobile XR



Real-time insights

Days to market

Production estimate

37

2.3M

Distribution (K)

Color swatches

Orders (K)

Bust
33-34½

Waist
24½-26½

Hip
33½-35½

360°

Bathilde
São Paulo

Aylin
Istanbul

Six degrees
of freedom

XR



Edge cloud
for low latency,
processing, content,...



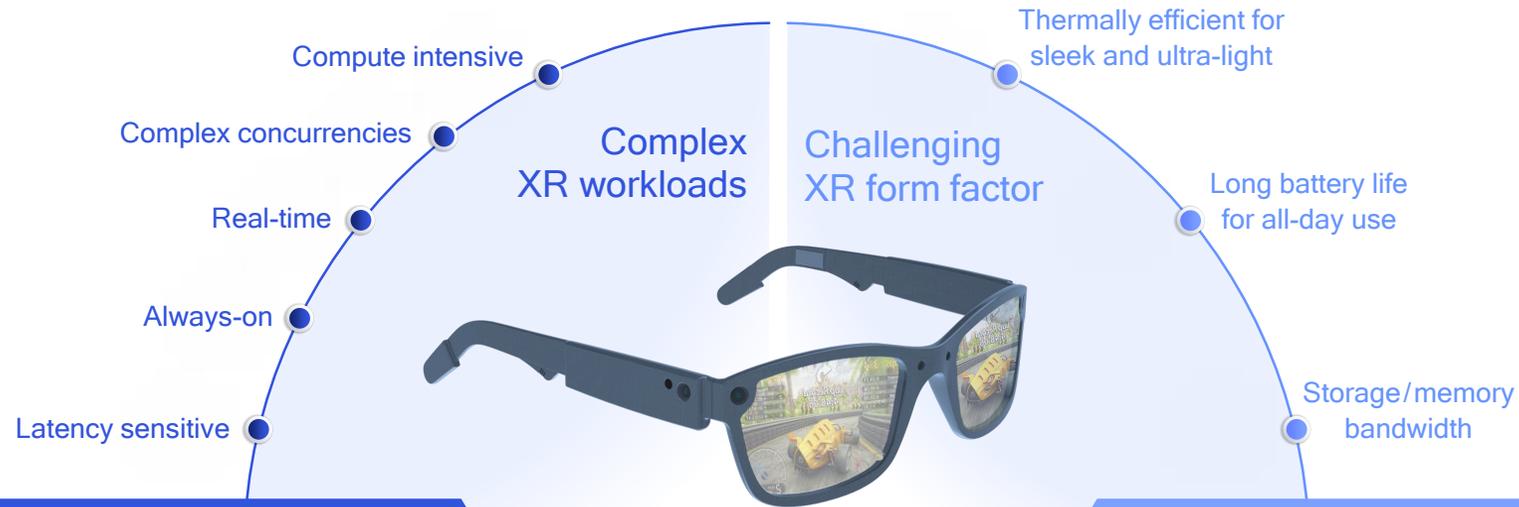
Augmenting
on-device processing
and intelligence

A glimpse into the future – sleek and stylish XR glasses

How do we get there?



A new era in distributed processing



Essential on-device processing

Split rendering

Augment by edge cloud processing

Optimized under strict power, thermal, size constraints

Premium experiences today that continuously improve



Low latency
High capacity
Reliable link

Significant higher power envelope—beyond PC class

Augment on-device rendering with edge cloud rendering

Voice is the transformative user interface (UI) we've been waiting for

Designed to be

Always-on

Conversational

Personal

Private

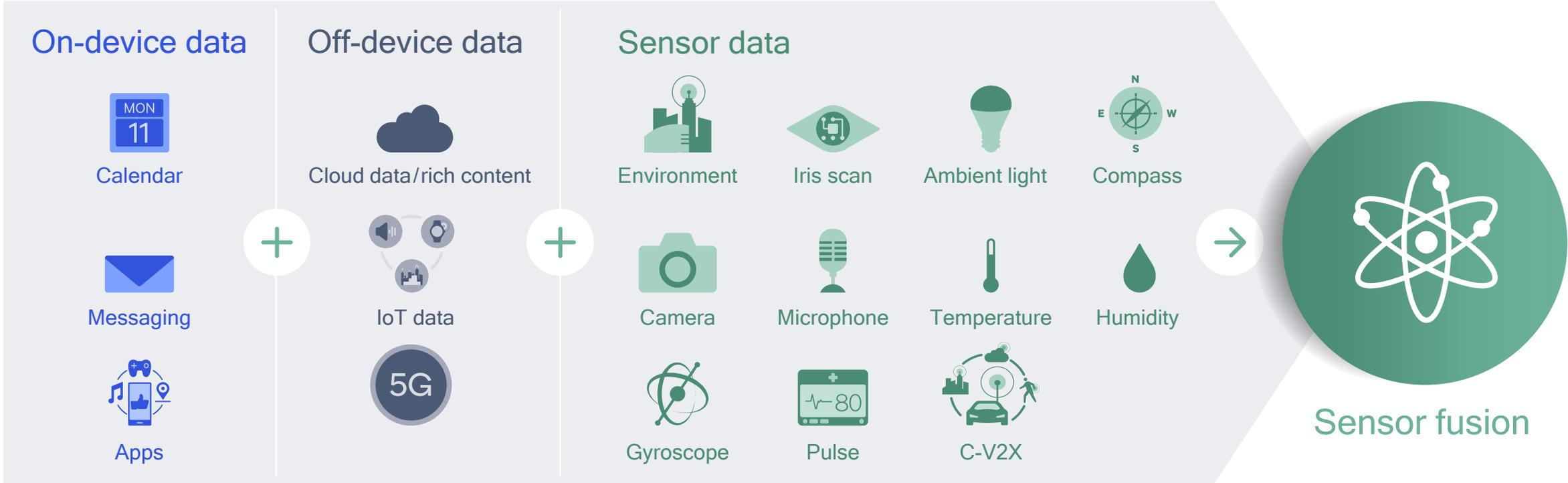
Critical to create a true virtual assistant



A context aware and personalized "digital me" sitting on the device



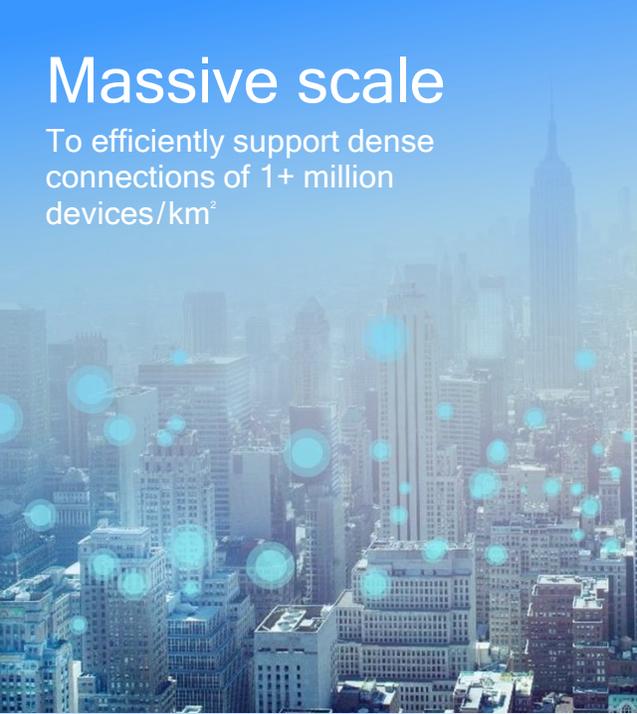
Contextual intelligence required for personalization



The local fusion of many types of sensors and personal information

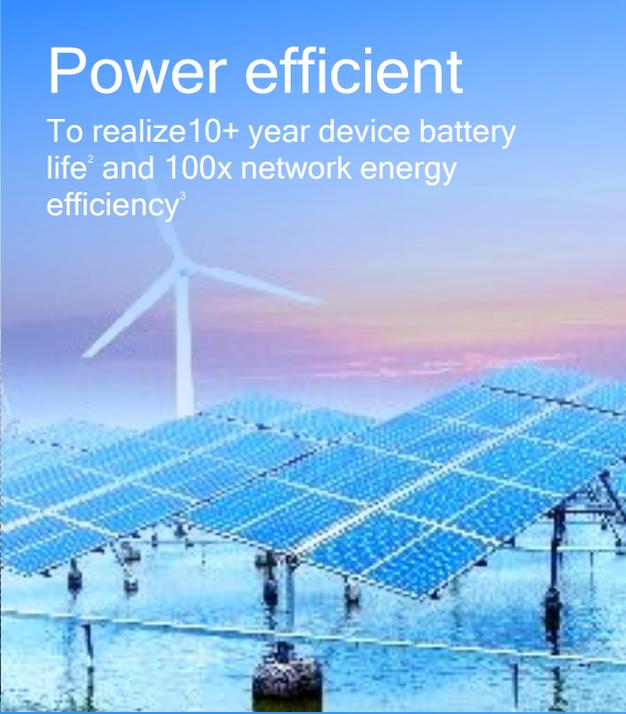
Massive scale

To efficiently support dense connections of 1+ million devices/km²



Power efficient

To realize 10+ year device battery life² and 100x network energy efficiency³



Long range

To reach challenging locations by achieving device link budget of 164 dB¹



Extreme simplicity

To allow scaling to the lowest-end use cases with e.g., single Rx antenna



Scaling for the massive Internet of Things



Addressing growing needs of low-power, wide-area IoT use cases

1. Maximum Coupling Loss, assuming data rate of 160bps
2. Assuming 200B UL + 20B DL per day at 164 MCL with 5Wh battery
3. Compared to IMT-Advanced



AI in here. And everywhere.

Advanced camera processing, powerful machine learning, and computer vision at the edge will allow new applications that push the boundaries of our connected world.



Intelligent cameras monitor and track what's inside.



Local at the edge processing means low latency and max efficiency.



Neural networks watch and learn your preferences.



Ubiquitous connectivity helps you avoid running out of critical food supplies



Thank you!

Follow us on: **f** **🐦** **in**

For more information, visit us at:

www.qualcomm.com & www.qualcomm.com/blog

Nothing in these materials is an offer to sell any of the components or devices referenced herein.

©2018 Qualcomm Technologies, Inc. and/or its affiliated companies. All Rights Reserved.

Qualcomm and Snapdragon are trademarks of Qualcomm Incorporated, registered in the United States and other countries. Other products and brand names may be trademarks or registered trademarks of their respective owners.

References in this presentation to “Qualcomm” may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Incorporated includes Qualcomm’s licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm’s engineering, research and development functions, and substantially all of its product and services businesses, including its semiconductor business, QCT.