August, 2015
Qualcomm Technologies, Inc.

Qualcomm & OneWeb™

Extending high-performance Internet access for unserved and underserved areas around the world

QUALCOMM®
Why Wait™

Mobile is the largest technology platform in history

Bringing high-performance Internet access to more people in more places

>7 billion connections, as many as the number of people on earth[1]

A primary engine for economic growth driving a trillion dollar impact per year[2]

Evolving to connect more devices & things: cars, meters, sensors, health devices, etc.

[1] ~7.5B connections (~3.7B subs) — GSMA Intelligence, May '15; [2] Boston Consulting Group Study, Jan'15 – "The Mobile Revolution—How Mobile Technologies Drive a Trillion Dollar Impact"

Creating the connectivity fabric for everything and everyone

Rising up to meet the expanded connectivity needs of a massively connected world

Requires a new connectivity paradigm

Human communication	Scaling to connect virtually anything, **anywhere**
Devices as end-points	New and intelligent ways to connect & interact
Best effort data services	Also, new kinds of control & discovery services
Disparate networks	Convergence of access, spectrum types, services

Qualcomm & OneWeb share a vision to extend Internet access

Building a communications network via a next-gen satellite constellation in low earth orbit (LEO)

>50% of the world's population remains without Internet access[1]

One constellation, great coverage, Internet access to unserved & underserved areas

Superior user experience to existing Geosynchronous (GEO)[2] satellite solutions

Integrates with terrestrial networks to extend 3G, 4G LTE (including LTE Unlicensed) **and Wi-Fi services**

[1] Source: International Telecommunication Union (ITU), May'15; [2] Geosynchronous satellite @ 36,000 Km with an orbital period the same as Earth's rotation period

The OneWeb network extends the value of Internet access

To more people and places—creating opportunities around the world for economic growth

The mobile value chain generated almost $3.3 trillion in revenue globally in 2014

Source: "The Mobile Revolution—How Mobile Technologies Drive a Trillion Dollar Impact" – BCG Research, Jan'15 (link)

OneWeb is building key elements for network commercialization

Commercial offering expected to start in 2019[2]

Round-A funding of $500M announced[1]; Qualcomm is a founding investor & Dr. Paul Jacobs serves as a board member

Qualcomm Research is designing many of the innovations required for the OneWeb network

Joint venture with Airbus to enable volume production of satellites at economies of scale[2]

Engaged with Arianespace & Virgin Galactic to ensure timely deployment of the full satellite constellation[2]

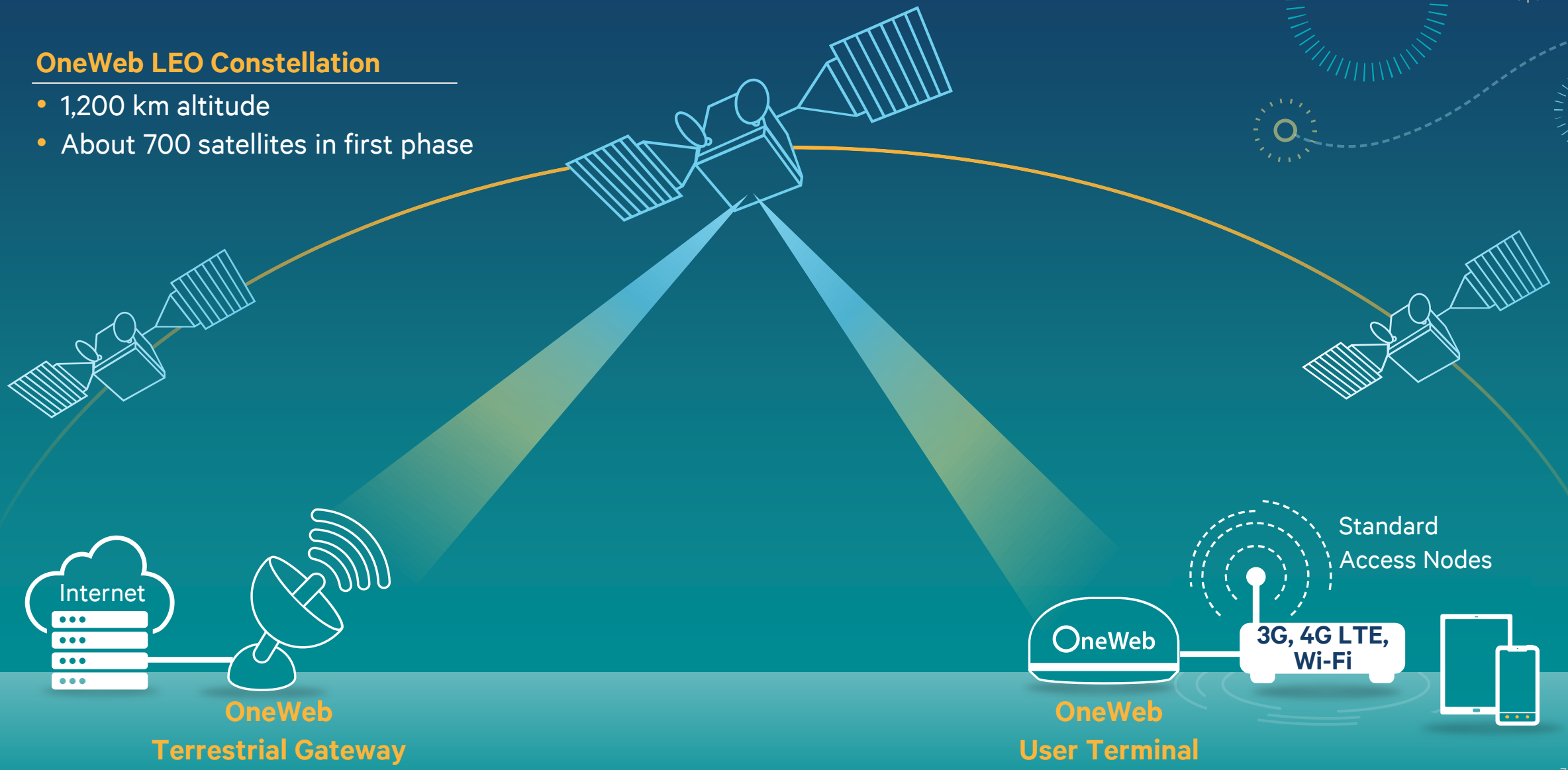
Qualcomm Research is a division of Qualcomm Technologies, Inc.

[1] OneWeb announcement June 25, 2015: OneWeb has attracted investment from Airbus Group, Bharti Enterprises, Hughes Network Systems, (Hughes), a subsidiary of EchoStar Corp., Intelsat, Qualcomm Incorporated, The Coca-Cola Company, Totalplay, a Grupo Salinas Company, owned by Ricardo B. Salinas, and Virgin Group; [2] Source: www.oneweb.world

Building the OneWeb communications network

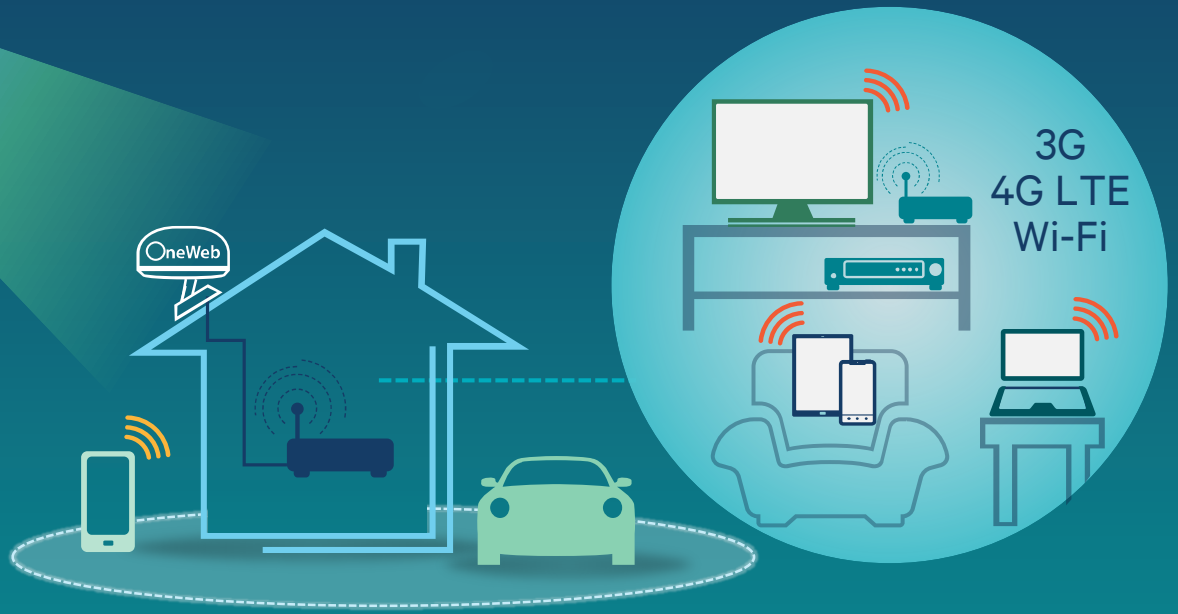
OneWeb LEO Constellation

- 1,200 km altitude
- About 700 satellites in first phase



Providing satellite backhaul for terrestrial small cells

Utilize 3G, 4G LTE (including LTE Unlicensed), and Wi-Fi technologies for end-user access



Provide Direct Access

OneWeb User Terminal installed directly on home, health centers, schools, etc.; Ethernet to standard access nodes

Extend Terrestrial Networks

Enabling mobile operators and other service providers to extend their coverage (e.g. rural/remote villages)

Also exploring in-flight connectivity and emergency service use cases

Delivering high-performance Internet access

Lower Latency

As compared to GEO satellite solutions with radio access of less than 50 ms[1]

Enables low latency applications such as VPN, interactive gaming, video calls, OTT VoIP, etc.

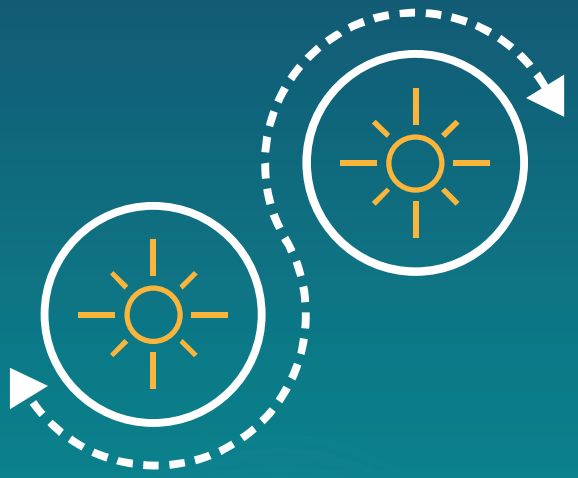
Fast data rates

Capable of data throughput of >20 Mbps

Provides broadband Internet access to unserved and underserved areas

High capacity

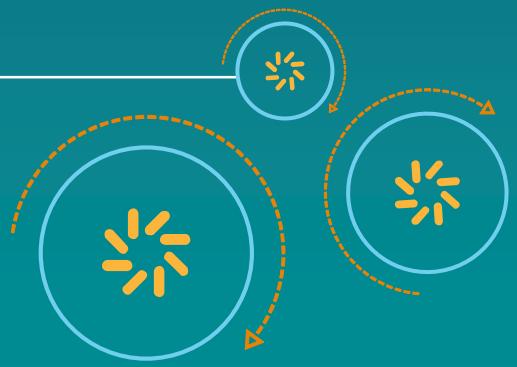
Each OneWeb satellite is envisioned to deliver Multi-Gbps of capacity



Supports data traffic demands for millions of potential users worldwide

[1] Radio access latency is from User Terminal to Terrestrial Gateway; enabled through lower altitude of LEO satellite constellation (@ 1,200 Km) versus GEO satellite solutions (@ 36,000 Km)

Qualcomm Research is playing a critical role in building the OneWeb network



Qualcomm Research is designing many of the technology innovations required for the OneWeb network

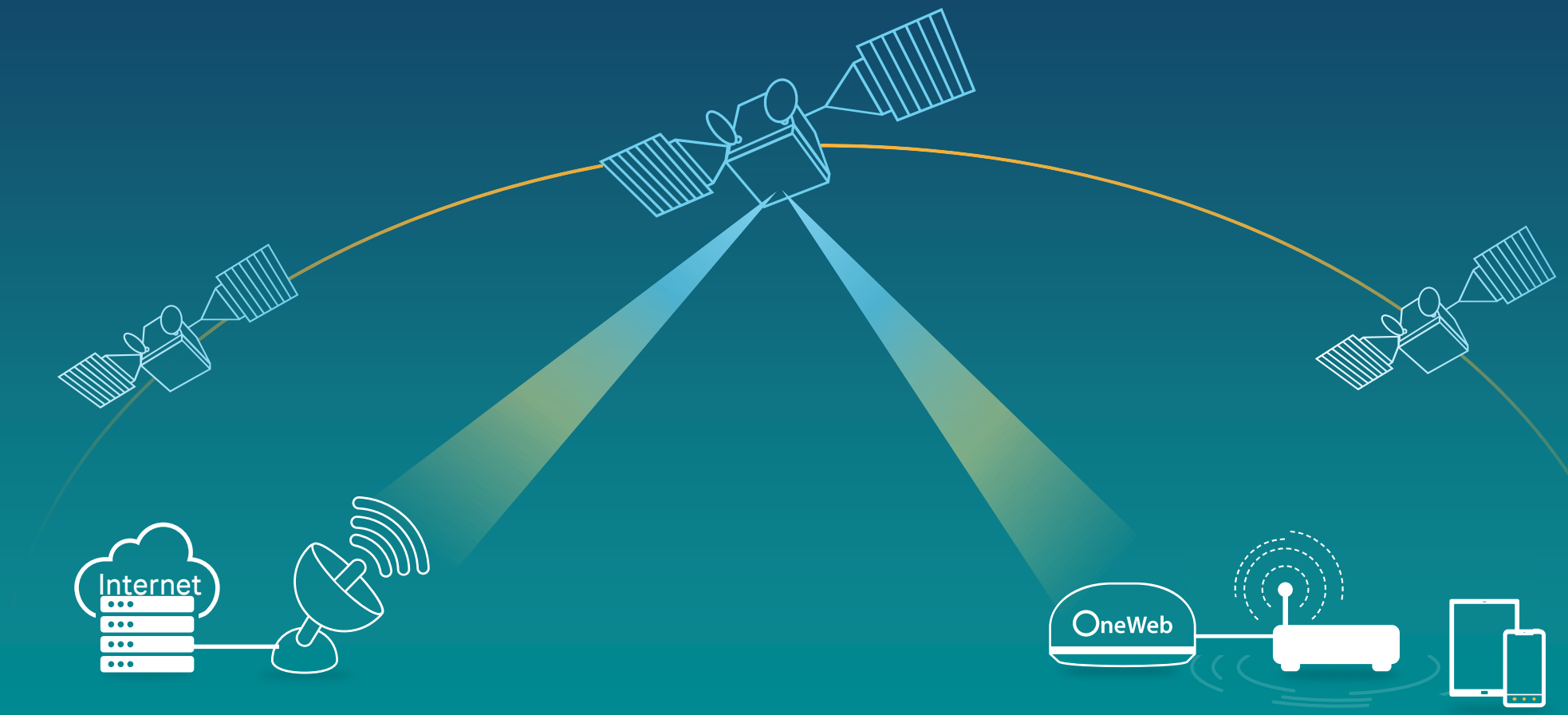
Developing a new, high-performance wireless air interface for end-to-end satellite communications

Developing the modem hardware and software reference design for the OneWeb User Terminal

Performing end-to-end system analysis and optimizations for communications between OneWeb consumers & the Internet

Developing a new, high-performance wireless air interface

For end-to-end (ground-to-satellite & satellite-to-ground) OneWeb satellite communications



System design and implementation of coding, modulation and protocols

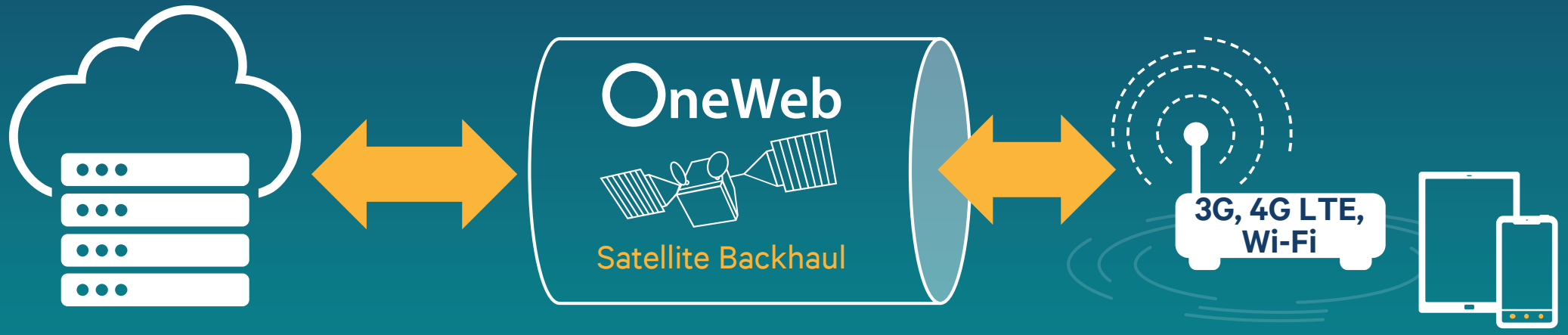
Reliable intra-satellite, inter-satellite and inter-gateway handoffs

Advanced interference avoidance to meet spectrum requirements

Performing end-to-end system analysis and optimizations

For communications between OneWeb consumers and the Internet

Coverage/Capacity/Latency Optimizations



Definition of network elements for satellite communication & core network connectivity

Integration with terrestrial 3GPP (3G/4G LTE) mobile networks

Contributing to the OneWeb network architecture

Together with OneWeb and other industry leaders

QUALCOMM® Why Wait™

An essential innovator and accelerator of mobile and beyond

Working to solve the 1000x data challenge

Innovative small cells and spectrum solutions

More Capacity

- Small cells and self organizing technology
- LTE in unlicensed spectrum, MuLTEfire™
- LTE Advanced carrier aggregation, dual connectivity
- Advanced receivers and interference management
- Spectrum innovations like LSA
- Wi-Fi – 11ac, 11ad, MU-MIMO, OCE, 11ax
- 3G

Creating the connectivity fabric for everything

Intelligently connect everything/everyone, empower new services, drive convergence

A new connectivity paradigm

- LTE-M (Machine-Type Communications), Clean-slate IoT
- LTE Direct device-to-device
- LTE Broadcast
- LTE – Wi-Fi Convergence
- Wi-Fi – 11ah, 11ad, Wi-Fi Aware, Wi-Fi Direct, DSRC
- Bluetooth Smart
- OneWeb
- 5G

Bringing cognitive technologies to life

Devices and things that perceive, reason and act intuitively

Next level of intelligence

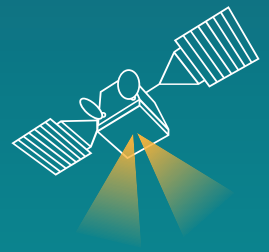
- Machine learning
- Computer vision
- Always-on sensing
- Immersive multimedia
- Cognitive connectivity
- Intuitive security
- Heterogeneous computing

Qualcomm and OneWeb are working together to achieve our shared vision to extend the reach of the Internet and Mobile

1

OneWeb is building a next generation LEO satellite network for 2019 commercialization

2



Providing high-performance Internet access at a superior user experience to GEO solutions

3

QUALCOMM® Why Wait™

Qualcomm Research is designing many of the technology innovations for the OneWeb network

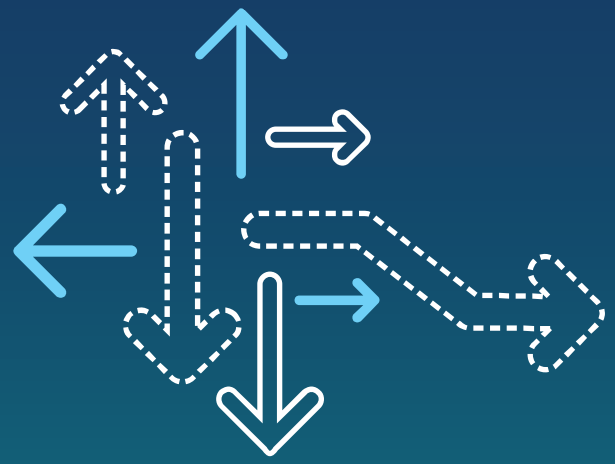
4

The OneWeb network integrates with terrestrial networks to extend 3G, 4G LTE (including LTE Unlicensed), and Wi-Fi services

Learn more at: www.oneweb.world

LEO = Low Earth Orbit; GEO = Geosynchronous

Questions? - Connect with Us



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