



6 GHz Wi-Fi: Connecting to the Future

October 2022

Wi-Fi Alliance Vision: Connecting everyone and everything, everywhere



The principles that drive us



Wi-Fi Alliance: 900+ companies comprising a who's who in technology and beyond



Wi-Fi Alliance membership enables you to...

DRIVE

development and evolution of Wi-Fi technology and access worldwide

CERTIFY

devices and leverage the globally respected Wi-Fi CERTIFIED™ brand

LEARN

from Wi-Fi experts across the globe

NETWORK

with peers at exclusive events



COLLABORATE

with companies worldwide to supply quality Wi-Fi devices to market

PROMOTE

company exposure through Member Marketing Network opportunities

ADVOCATE

for global spectrum policy that encourages Wi-Fi growth

DELIVER

positive user experiences on secure devices

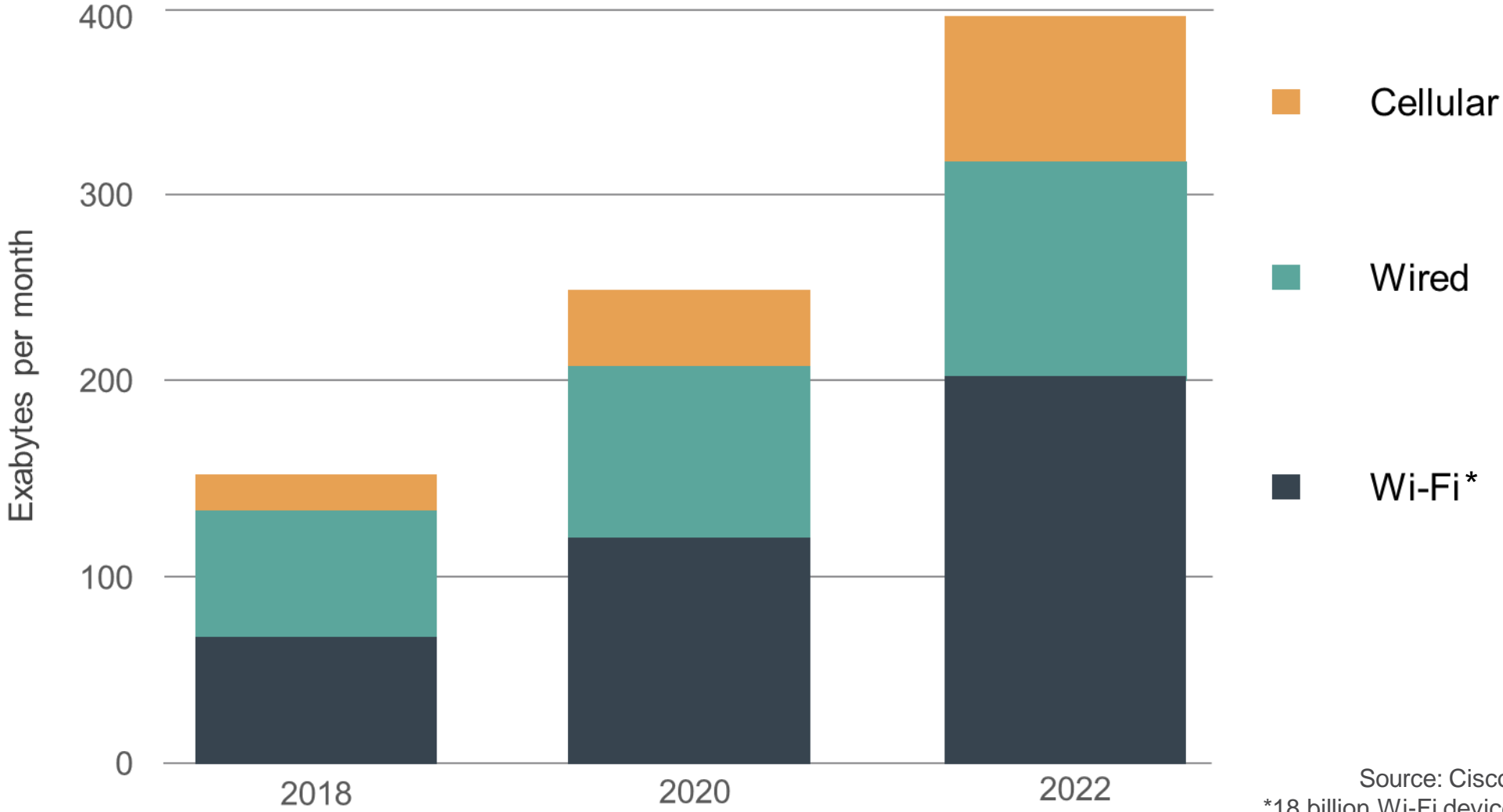
6 GHz Wi-Fi: Connecting to the Future

- Trends
- Considerations
- Conclusions



Trends

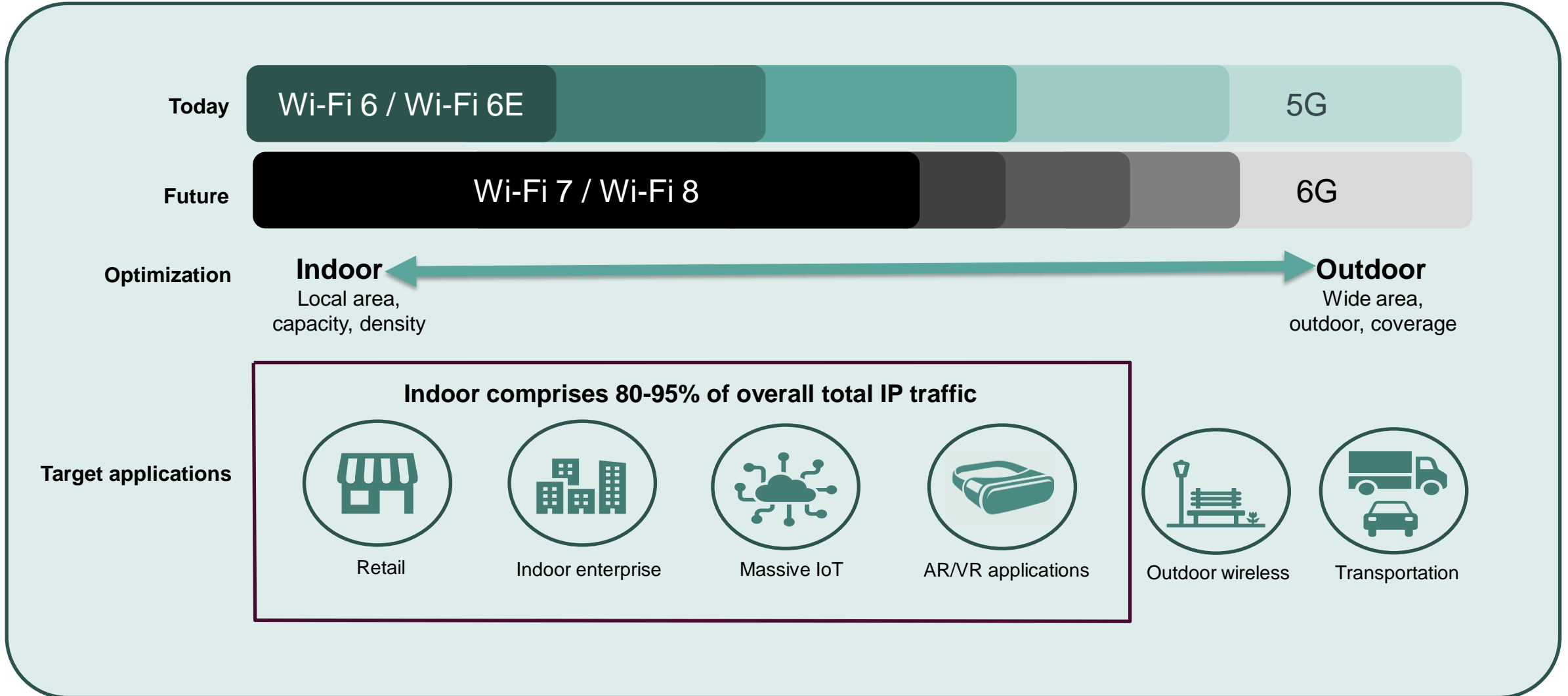
Trend #1: Data growth



Source: Cisco VNI 2017-2022
*18 billion Wi-Fi devices in use in 2022



Trend #1 corollary: Data growth now and in future predominately indoors



Trend #2: Wi-Fi traffic share increases with each cellular generation

MOBILE DEVICE TRAFFIC, 2022

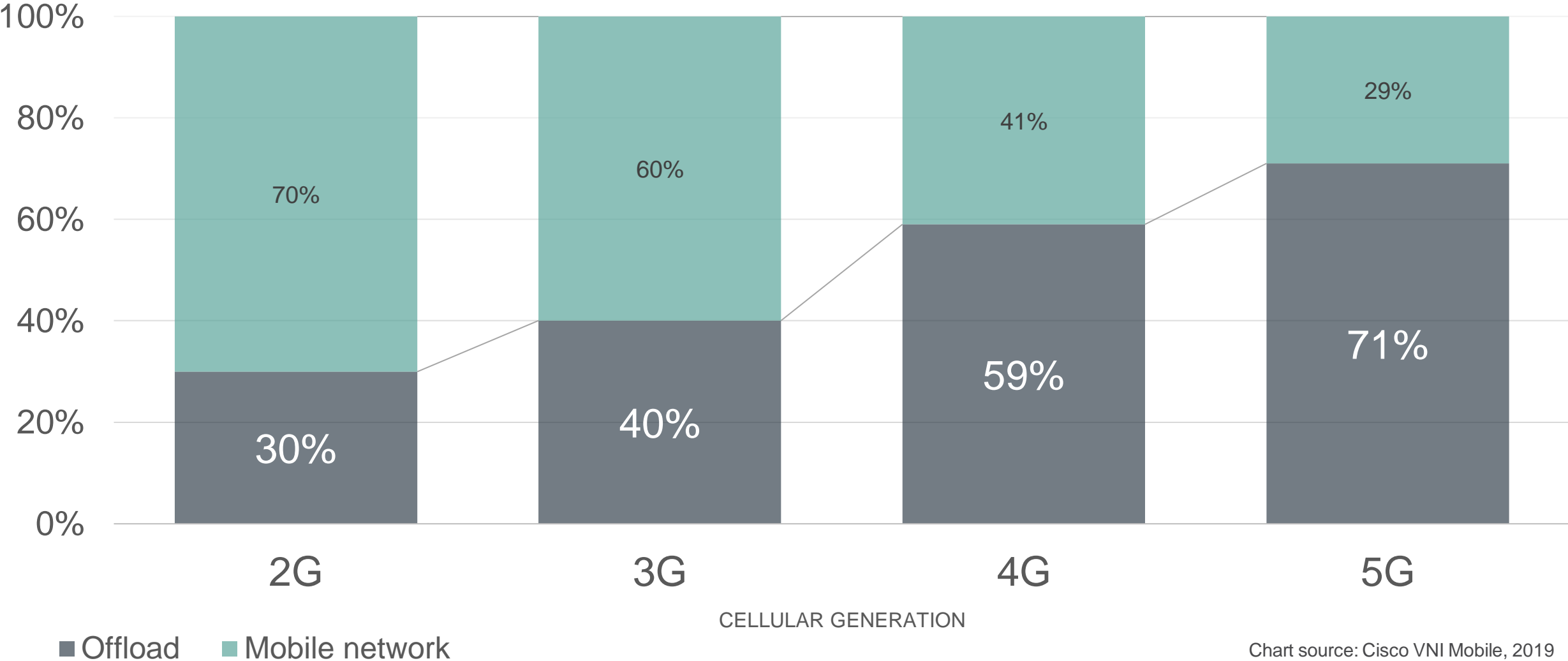


Chart source: Cisco VNI Mobile, 2019

Trend #3:

Distributed cloud computing next generation use cases

- Immersive experiences such as VR/AR/XR, telehealth, Industrial IoT / Automation, 3D-video
- Require expansive computational resources and connectivity hundreds, if not thousands, of times faster than 5G
 - Cannot be delivered by a wide-area networks such as IMT
 - Require local-area, short range communications such as the next generation Wi-Fi technologies designed for extremely high throughput and spectral reuse

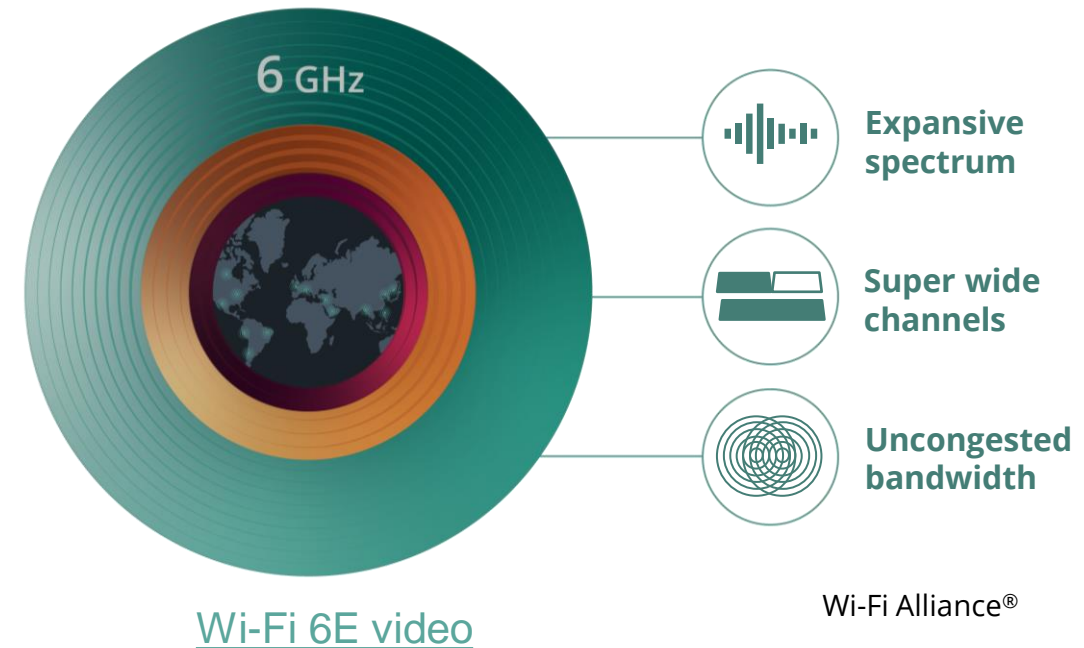




Considerations

Consideration #1: 6 GHz is transforming Wi-Fi technology**

- [Wi-Fi 6E](#): capabilities required for advanced use cases: faster speed, lower latency, higher efficiency, higher density
 - In 2022 over 1.5 million Wi-Fi 6E access points and 350 million Wi-Fi 6E devices*
 - In 2024 over 5.2 million Wi-Fi 6E access points and over 1 billion devices*
- [Wi-Fi 7](#): enhanced VR/AR/XR, Industrial IoT, automotive, telepresence, immersive 3-D support with higher data rates, stringent latency, reliability, and QoS
 - Data transfers rates up to 30 Gbps
 - 92 million units expected to ship in 2024

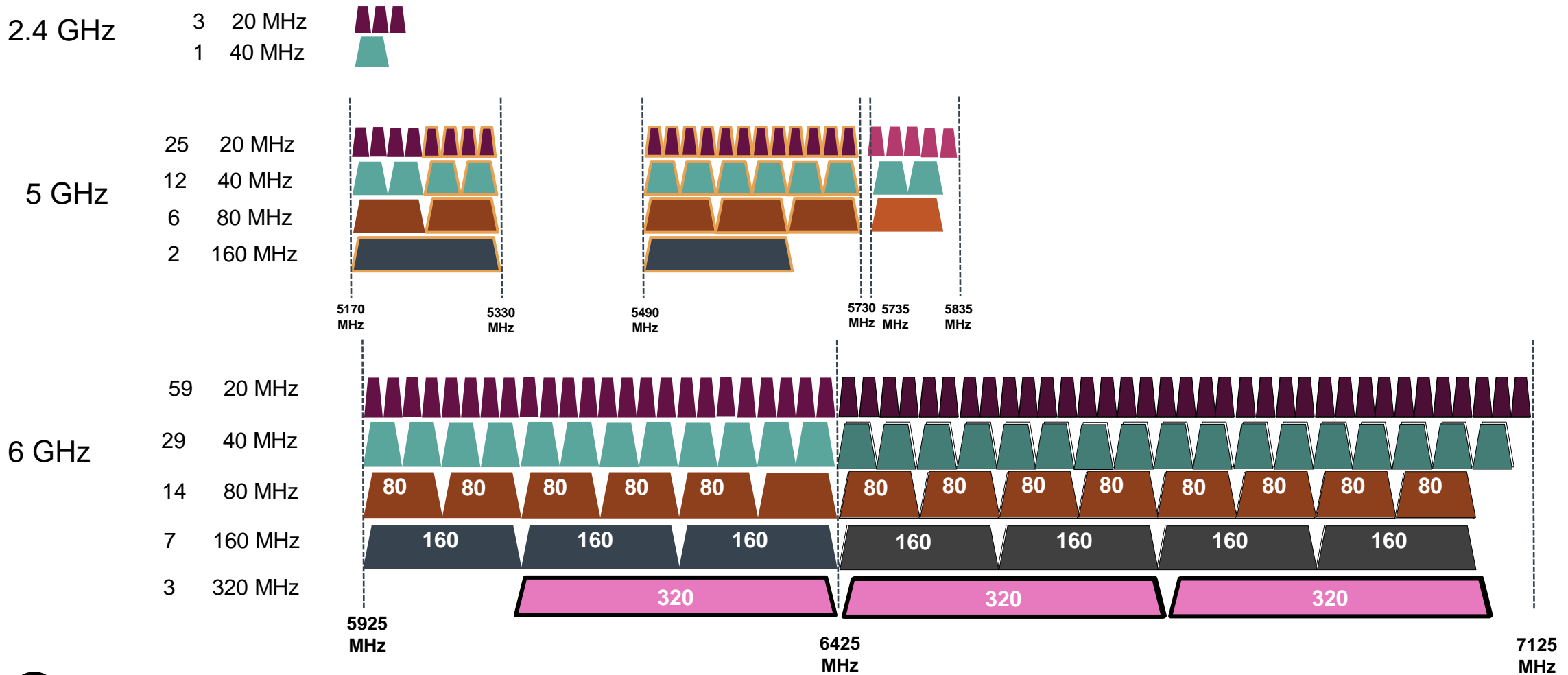


*Source: IDC Research, Jan 2022

**In a recent survey, 58% of companies said 6 GHz is critical or very important to their strategy
Intel predicts in 2022 around 30 percent of their product mix will be Wi-Fi 6E

Consideration #2:

6 GHz frequency band is uniquely suited to meet growing demand for Wi-Fi connectivity – no alternative spectrum now or in the future



Consideration #3:

IMT networks in 6.425-7.125 GHz are not feasible

- Countries in all regions are deploying Wi-Fi in 6.425 - 7.125 GHz
 - IMT frequency harmonization cannot be achieved; no interoperability
- Market fragmentation precludes economies of scale necessary for a viable IMT ecosystem in 6 GHz
 - billions of \$ to design and produce cellular chipsets for 6.425-7.125 GHz
 - billions of \$ to integrate chipsets into devices and bring them to market
 - billions of \$ to deploy IMT technology network
 - billions of \$ to operate IMT network

That's a lot of billions that no one is going to risk without a stable regulatory framework that offers market scope and scale
- No 6 GHz IMT equipment on the market now or in the near future



Upcoming Wi-Fi advances

Wi-Fi® delivers an IoT advantage

- **Standards-based, interoperable technology:** Wi-Fi provides a common platform to deliver a growing range of IoT applications that vary in performance, power, and latency requirements
- **Pervasive connectivity:** IoT systems are often controlled through mobile devices: Wi-Fi allows seamless control of smartphones, tablets, and 18 billion Wi-Fi devices already in use today
- **Proven WPA3™ security:** Wi-Fi delivers proven, [WPA3™ security](#) to protect information exchanged in personal and enterprise environments
- **Cost effective, simple deployment:** Wi-Fi is an easy-to-deploy and cost-effective foundation that requires no separate gateways or specialized skills to deliver IoT applications
- Backward compatibility, location awareness, sophistication among other [core competencies for IoT](#)



[Learn more](#) about Wi-Fi's role in IoT

Wi-Fi 7

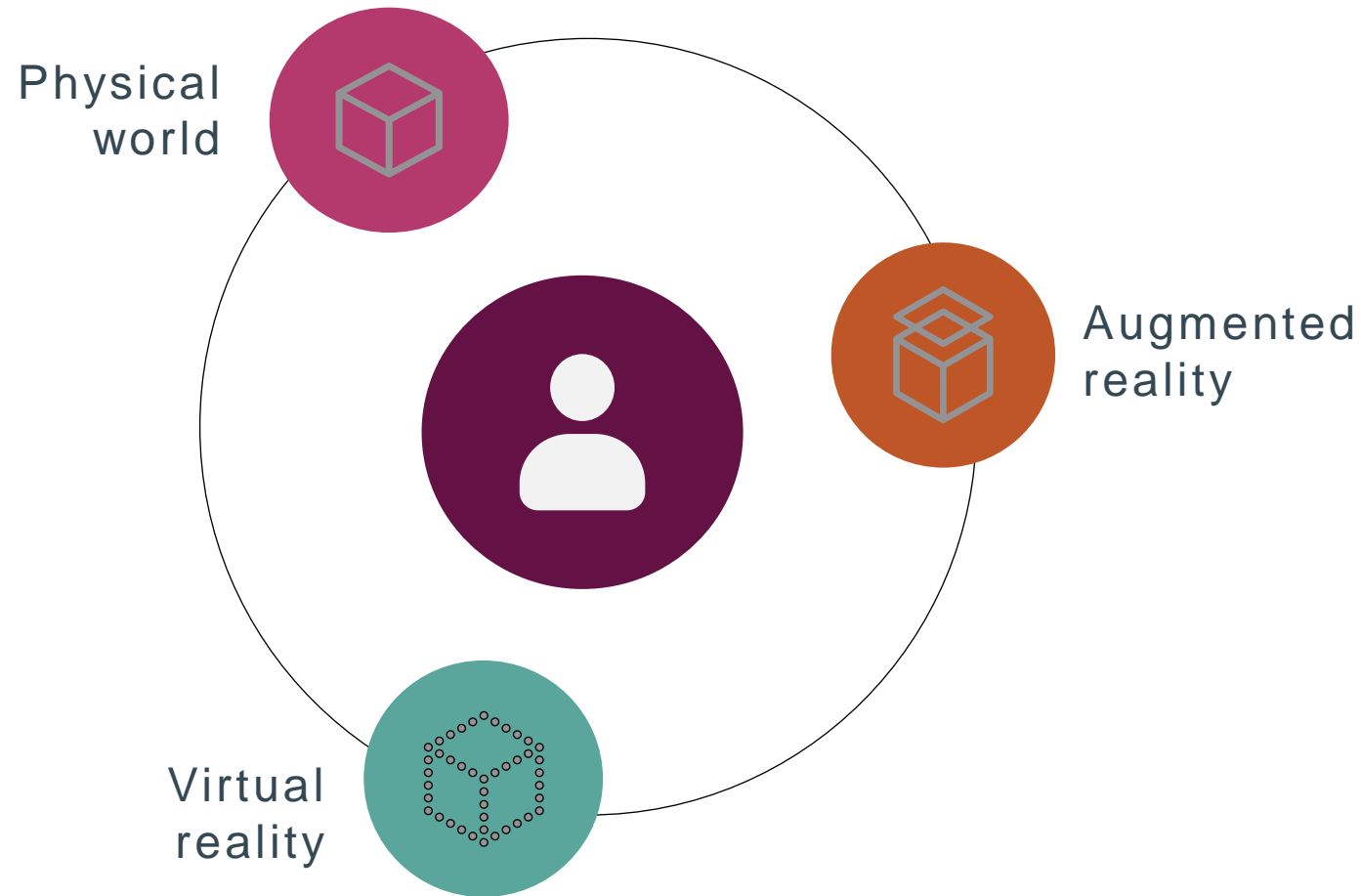
- Expect extremely high throughputs, low latency and jitter, and high-reliability
- Wi-Fi Alliance certification
 - Essential for interoperability, and the inflection point for mass market adoption
 - Will be based on the IEEE 802.11be standard
 - Technical development phase began mid-year 2022 and typically marks 18-24 months until certification program is completed
- Analysts predict Wi-Fi 7 shipments will comprise about 2% of all Wi-Fi shipments in 2024*



* Source: IDC

Extended-Reality (XR): An emerging exciting opportunity

- Promising immersive applications emerging, e.g., [How VR Is Helping Heal Soldiers With PTSD](#)
- Wi-Fi XR device development with Wi-Fi 6 and Wi-Fi 6E reported at [Apple](#), [Samsung](#), [Meta](#), [Google](#), [Amazon](#) and more...
- \$125 B market by 2026



Fantastic Power Efficiency – Multi GBPS Performance –
Ultra Low-Latency - Extreme Reliability

XR experiences require high performance Wi-Fi

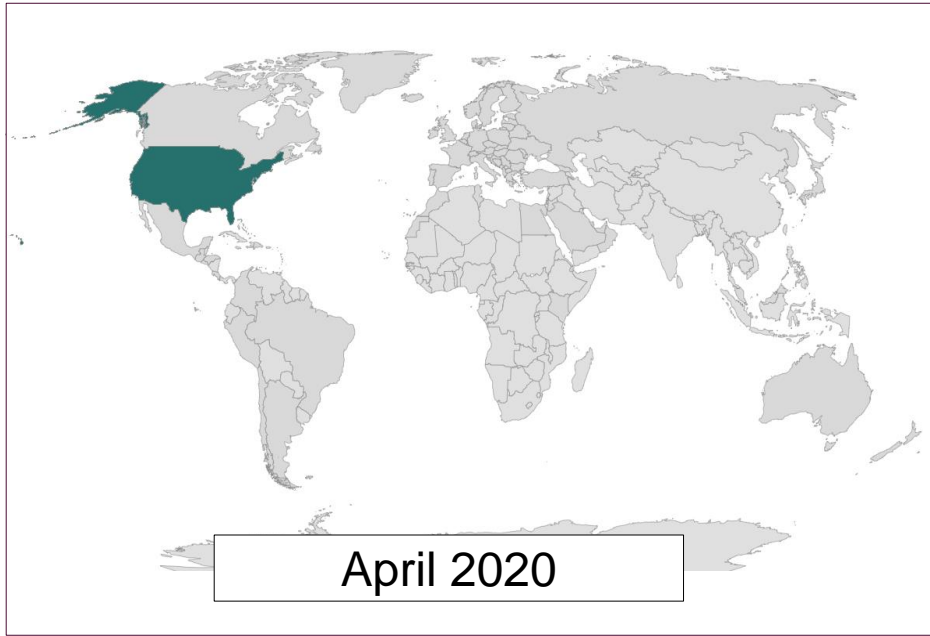
- Advanced Power Efficiency
- Multi-Gigabit Performance
- Ultra Low-Latency
- Extreme Reliability



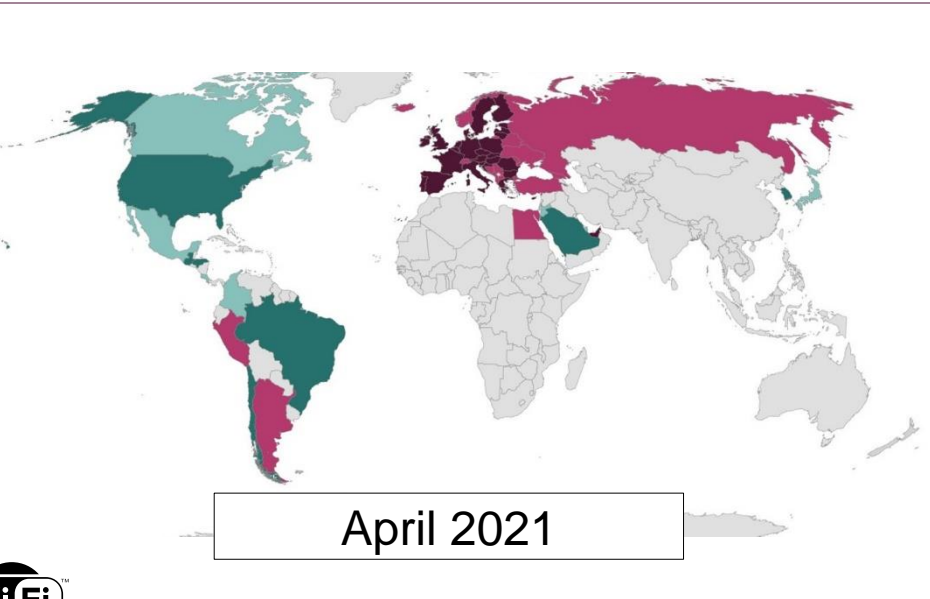


Wi-Fi and regulatory considerations

6 GHz in 2020-2022

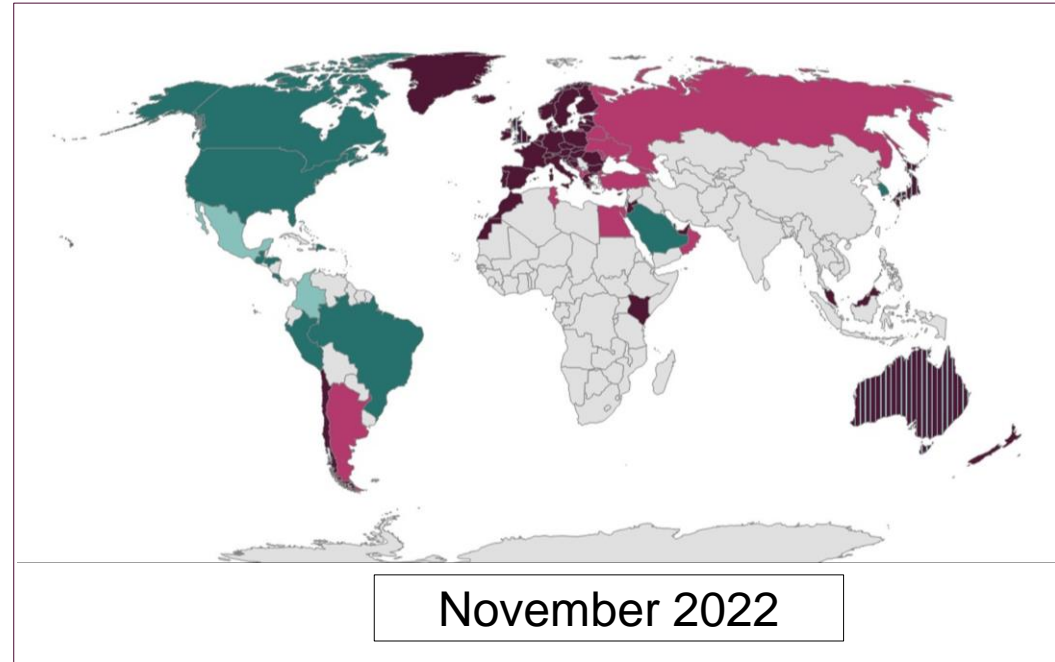


April 2020



April 2021

- Adopted 5925-6425 MHz
- Adopted 5925-7125 MHz
- Considering 5925-6425 MHz
- Considering 5925-7125 MHz
- Adopted 5925-6425 MHz, Considering 6425-7125 MHz



November 2022

Follow 6 GHz progress at "[Countries Enabling Wi-Fi 6E](#)"

6 GHz Regulatory Update

■ Adopted 5925-6425 MHz

■ Adopted 5925-7125 MHz

■ Considering 5925-6425 MHz

■ Considering 5925-7125 MHz

Americas	APAC	Europe	MENA
<ul style="list-style-type: none"> • <u>Argentina</u> • <u>Brazil</u> • <u>Canada</u> • <u>Chile</u> • <u>Colombia</u> • <u>Costa Rica</u> • <u>Dominican Republic</u> • <u>Guatemala</u> • <u>Honduras</u> • <u>Mexico</u> • <u>Peru</u> • <u>United States</u> 	<ul style="list-style-type: none"> • <u>Australia</u> * • <u>Hong Kong</u> • <u>Japan</u> * • <u>Malaysia</u> • <u>New Zealand</u> • <u>South Korea</u> 	<ul style="list-style-type: none"> • <u>European Union</u> • <u>Norway</u> • <u>Switzerland</u> • <u>Turkey</u> • <u>United Kingdom</u> * 	<ul style="list-style-type: none"> • <u>Egypt</u> • <u>Jordan</u> • <u>Kenya</u> • <u>Morocco</u> • <u>Oman</u> • <u>Qatar</u> • <u>Saudi Arabia</u> • <u>Tunisia</u> • <u>UAE</u>

* considering 6425-7125 MHz



6 GHz: Regulatory Framework

Countries regulatory framework for 6 GHz RLAN devices converged on three regulatory-classifications:

1. **Very Low Power (VLP) devices:** (25 mW)
2. **Low Power Indoor-only (LPI) devices:** low-power (200 mW)
 - Restricted to indoor use only
3. **Standard Power Devices (SPD):** standard power (1000 W)
 - Restricted to operate under control of Automated Frequency Coordination System (AFC)
 - Limit transmit power at 30 deg. elevation angle

6 GHz: Decisions - Adopted Regulations

VLP	LPI	SPD with AFC
<ul style="list-style-type: none"> • <u>Australia</u> • <u>Brazil</u> • <u>Canada</u> • <u>Costa Rica</u> • <u>European Union</u> • <u>Hong Kong</u> • <u>Japan</u> • <u>Jordan</u> • <u>Malaysia</u> • <u>Morocco</u> • <u>Norway</u> • <u>Qatar</u> • <u>Saudi Arabia</u> • <u>South Korea</u> • <u>Switzerland</u> • <u>United Kingdom</u> 	<ul style="list-style-type: none"> • <u>Australia</u> • <u>Brazil</u> • <u>Canada</u> • <u>Chile</u> • <u>Costa Rica</u> • <u>European Union</u> • <u>Guatemala</u> • <u>Honduras</u> • <u>Hong Kong</u> • <u>Japan</u> • <u>Jordan</u> • <u>Malaysia</u> • <u>Morocco</u> • <u>Norway</u> • <u>Peru</u> • <u>Qatar</u> • <u>Saudi Arabia</u> • <u>South Korea</u> • <u>Switzerland</u> • <u>UAE</u> • <u>United Kingdom</u> • <u>United States</u> 	<ul style="list-style-type: none"> • <u>Canada</u> • <u>United States</u>

Conclusion

- Wi-Fi is optimized for high performance indoor, and therefore delivers the bulk of the world's data traffic, including most data traffic on mobile devices. Demand for Wi-Fi will continue to grow with increased fiber deployments and cellular generations
- Wi-Fi 6E is a resounding success and by 2024 there will be billions of devices installed globally able to operate from 5.925 to 7.125 GHz. Only countries that allow Wi-Fi access to the entire 6 GHz spectrum range will get the most benefits
- Wi-Fi 7 and Wi-Fi 8 will depend on 6GHz access, and 320 MHz channels will be optimized for demanding emerging use cases
- 6GHz is perfectly suited for Wi-Fi to continue to deliver the connectivity users need, there is no alternative spectrum for Wi-Fi, and 6GHz is unsuitable for IMT

Thank you

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References

Global economic value of Wi-Fi® to reach \$5 trillion in 2025

Wi-Fi® worldwide economic value has grown beyond expectations

In 2021, the global economic value provided by Wi-Fi will reach \$3.3 trillion USD and is expected to grow to almost \$5 trillion by 2025, according to a new study commissioned by Wi-Fi Alliance®. This growth represents a 150 percent increase from the 2018 value of \$1.38 trillion to the projected value in 2025, underscoring Wi-Fi's critical role in economies across the globe.

The study, developed by Wi-Fi Alliance's economists at Telecom Advisory Services focuses on 15 economies: Australia, Brazil, Colombia, France, Germany, Japan, Mexico, New Zealand, Poland, Singapore, South Korea, Spain, the United Kingdom, and the United States, as well as an estimate for the European Union.

The economic value of Wi-Fi for each economy studied was developed by assessing several key factors, plus global developments that have impacted the Wi-Fi industry including: the growing adoption of 5G and cloud-based computing capabilities; opening of the 6 GHz band; and increased use. The study also considers public regulatory agency announcements in value estimates, asserting that countries allowing Wi-Fi use in all 1000 MHz of the 6 GHz band will maximize the economic benefits that Wi-Fi provides.

Global Value of Wi-Fi®		2021		2025	
Region	Value	Region	Value	Region	Value
Global	\$3.3	USA	\$1.2	USA	\$1.5
EU	\$0.8	UK	\$0.2	UK	\$0.3
Japan	\$0.4	China	\$0.3	China	\$0.4
India	\$0.3	South Korea	\$0.2	South Korea	\$0.3
France	\$0.2	Germany	\$0.1	Germany	\$0.1
Spain	\$0.1	Italy	\$0.1	Italy	\$0.1
Canada	\$0.1	Other	\$0.1	Other	\$0.1

Wi-Fi 6 and 6 GHz band bring new opportunities, economic resilience

Due to its connectivity, Wi-Fi has proven to be a critical enabler of economic and innovation during the COVID-19 pandemic. The study results reveal that industry-wide support for Wi-Fi growth and development is essential to continue realizing the benefits Wi-Fi technology provides. By the end of 2021, there will be 1.4 billion Wi-Fi devices in use. Market adoption of Wi-Fi 6E will grow to 2.2 billion shipments in 2023, including nearly 340 million Wi-Fi 6E products which are capable of operating in the 6 GHz band. Wi-Fi 6E and access to the 6 GHz band enables a suite of advanced applications—such as intelligent video streaming, unified communications, cloud computing, and remote operations—the combined effects of which could collectively increase Wi-Fi value by years to come.

Defining and quantifying economic value of Wi-Fi

Researchers compiled calculations based on key factors listed below for each economy to develop the economic value, all reported in USD. Once values for each country and the European Union were determined, the economists aggregated a global value of Wi-Fi.

Highlights sheet

Global Economic Value of Wi-Fi® 2021 – 2025

February 2021

Study summary

The Economic Value of Wi-Fi®: A global view (2021 – 2025)

Developed for Wi-Fi Alliance® by TELECOM ADVISORY SERVICES

February 2021

Study details

TELECOM ADVISORY SERVICES

New York - Buenos Aires - Madrid - Bogotá

COVID-19 AND THE ECONOMIC VALUE OF Wi-Fi

December 2020

COVID-19 and Wi-Fi