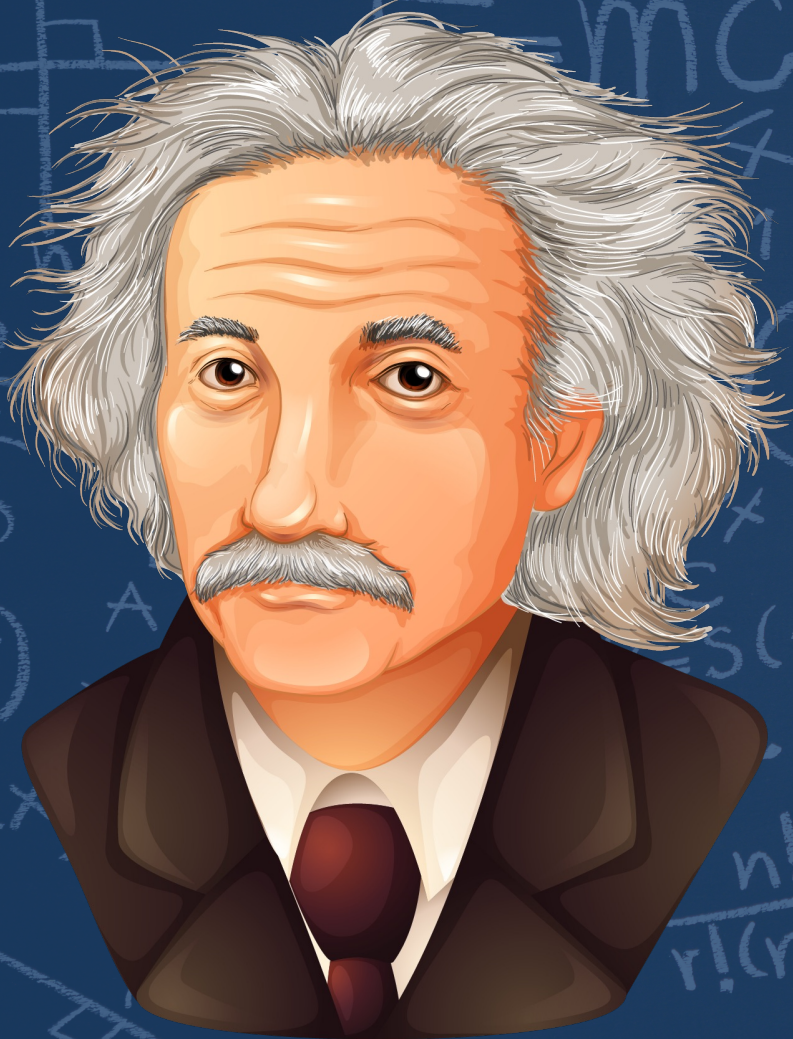




Wi-Fi 6E

The Future of Wireless

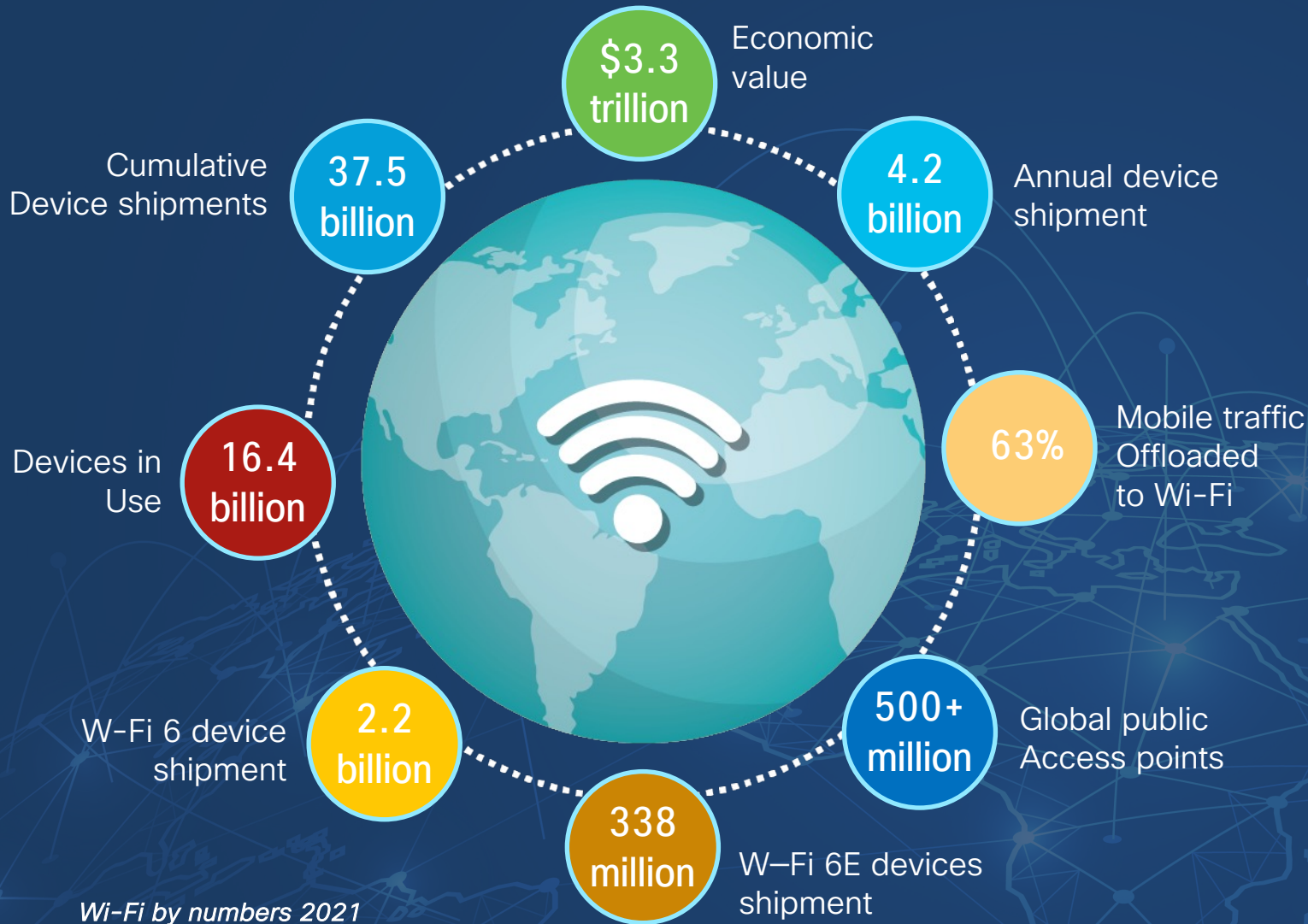
October 2021



“If you want to know the future, look at the past”

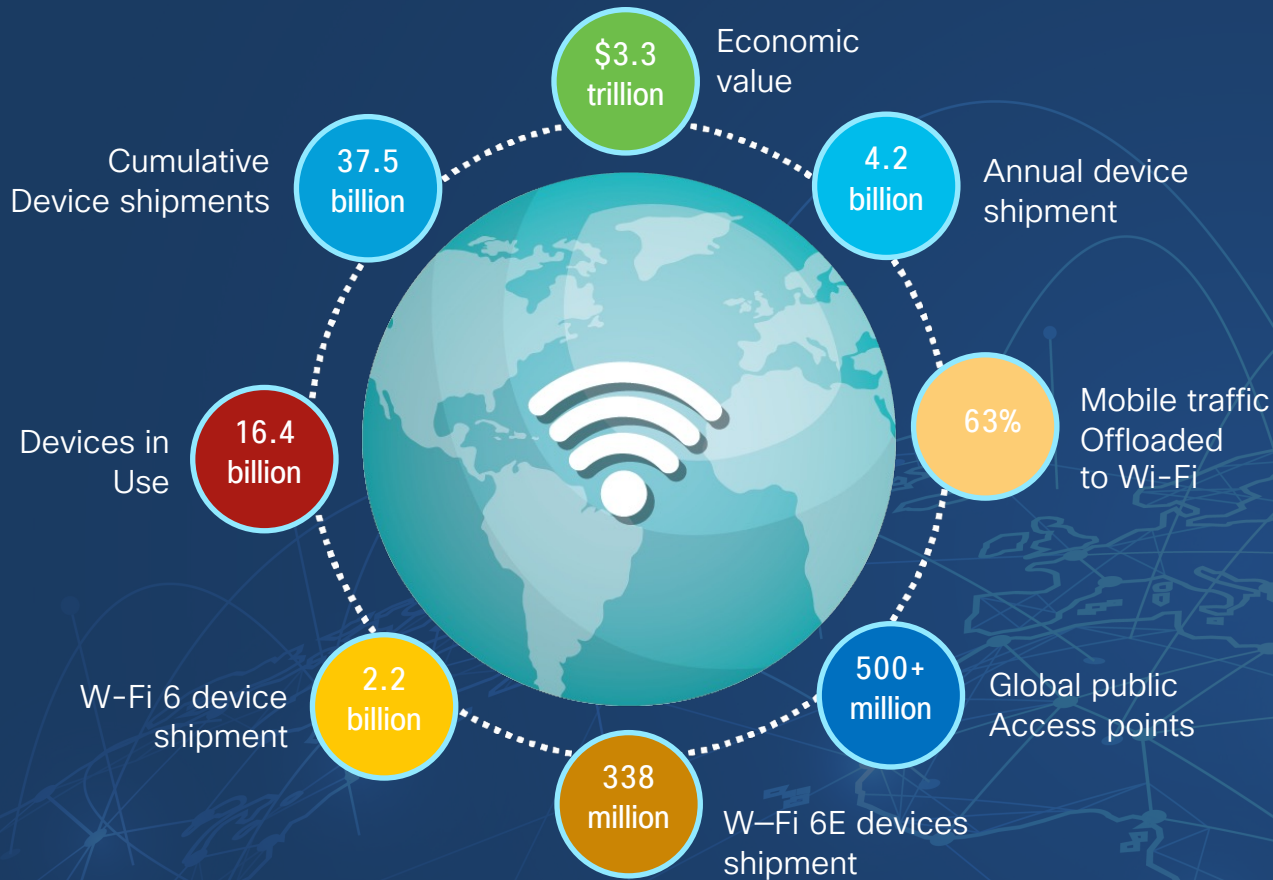
– Albert Einstein

Global Economic Value of Wi-Fi



- The world runs on Wi-Fi
- Wi-Fi has proven to be a key driver of digital innovation
- Wi-Fi is foundational to consumer, enterprise networks, as well as the Internet of Things (IoT).
- Wi-Fi is also recognized as an essential part of delivering 5G service
- And in this pandemic, Wi-Fi has been critical in building social and economic resilience

Global Economic Value of Wi-Fi



Global Value of Wi-Fi®									
2021 \$3.3 trillion					2025 \$4.9 trillion				
AUSTRALIA		BRAZIL		CAMEROON		COLOMBIA		DRC	
2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
\$35 billion	\$42 billion	\$105 billion	\$124 billion	\$1 billion	\$3 billion	\$19 billion	\$41 billion	\$1 billion	\$2 billion
EGYPT		EUROPEAN UNION		FRANCE		GABON		GERMANY	
2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
\$9 billion	\$17 billion	\$458 billion	\$637 billion	\$63 billion	\$104 billion	\$0.6 billion	\$1.2 billion	\$135 billion	\$173 billion
INDIA		JAPAN		JORDAN		KENYA		MEXICO	
2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
\$131 billion	\$240 billion	\$251 billion	\$325 billion	\$2 billion	\$4 billion	\$12 billion	\$16 billion	\$57 billion	\$118 billion
MOROCCO		NEW ZEALAND		NIGERIA		OMAN		POLAND	
2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
\$6 billion	\$8 billion	\$7 billion	\$10 billion	\$16 billion	\$33 billion	\$2.6 billion	\$3 billion	\$16 billion	\$22 billion
SAUDI ARABIA		SENEGAL		SINGAPORE		SOUTH AFRICA		SOUTH KOREA	
2021	2025	2021	2025	2021	2025	2021	2025	2021	2025
\$17 billion	\$24 billion	\$1 billion	\$3 billion	\$11 billion	\$12 billion	\$31 billion	\$44 billion	\$89 billion	\$140 billion
SPAIN		UGANDA		UNITED KINGDOM		UNITED STATES			
2021	2025	2021	2025	2021	2025	2021	2025		
\$40 billion	\$54 billion	\$1 billion	\$4 billion	\$99 billion	\$109 billion	\$995 billion	\$1.6 trillion		



www.valueofwifi.com

Wi-Fi 6E: The New Chapter of an Incredible Story...

**\$3.3
trillion**

2021

33%

20.08

43.21

57%

72.66

**\$4.9
trillion**

2025

89%

99.96

+9.91

-87.12

+7.01

-54.23

+4.59

-26.34



Contribution will be the key

Introducing the Power of





Experience

It's all About the Wireless **Experience!**

- More and more IoT devices, MtoM communication, more high density – coping with more devices
- SLA bound applications > cannot keep with delay and jitter. Video and delay sensitive applications – need for less latency
- Gaming and high resolution – more throughput
- Result? The Need for the 2nd “**E**” of WiFi 6 Efficiency





Efficiency

It's all About the Wireless **Efficiency!**

- Multi-user traffic Management (OFDMA, MU-MIMO)
- Battery saving > better battery life for mobile and IoT devices (TWT)
- Strong security: Security (WPA3) is mandatory

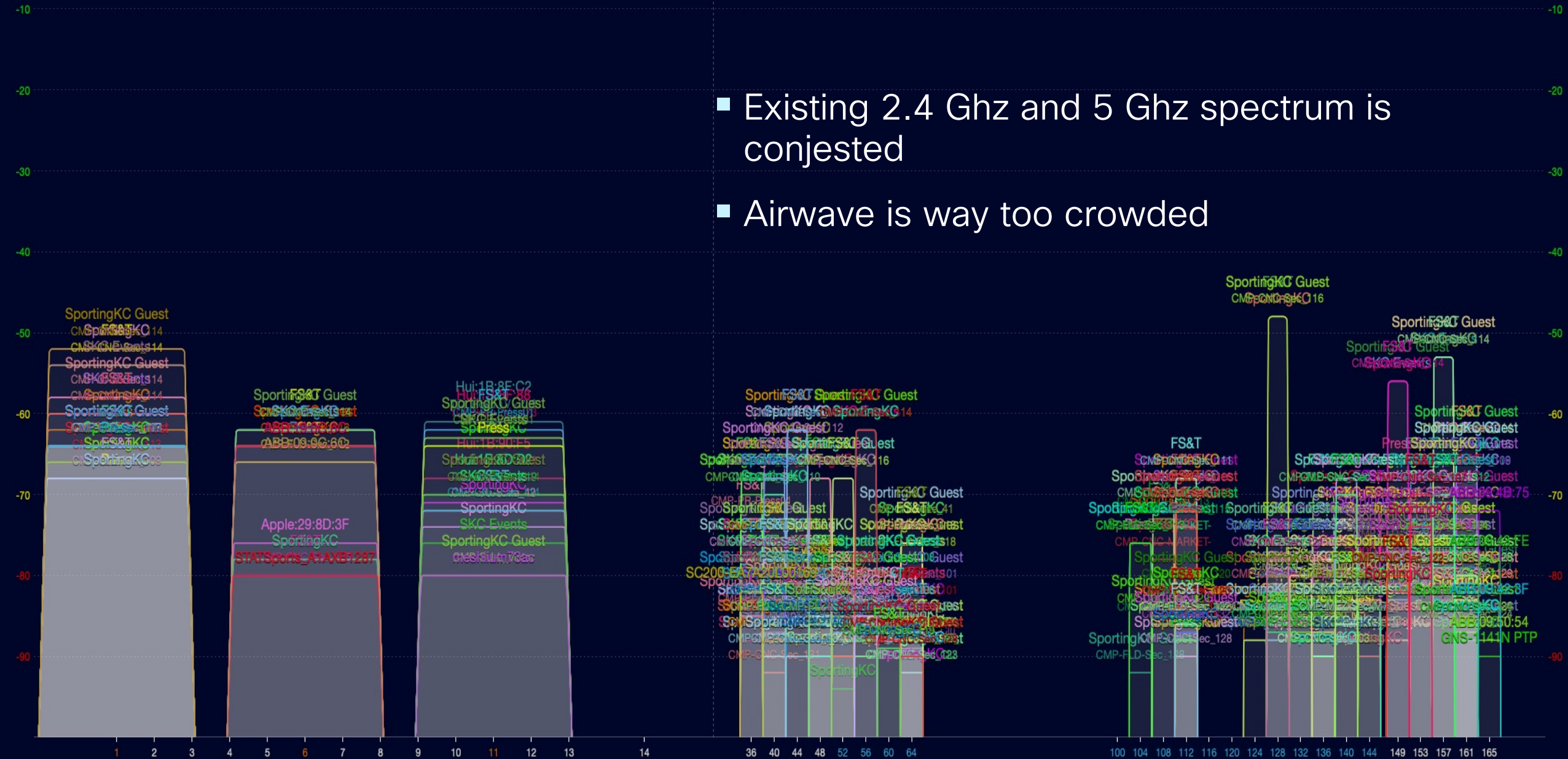




Extended

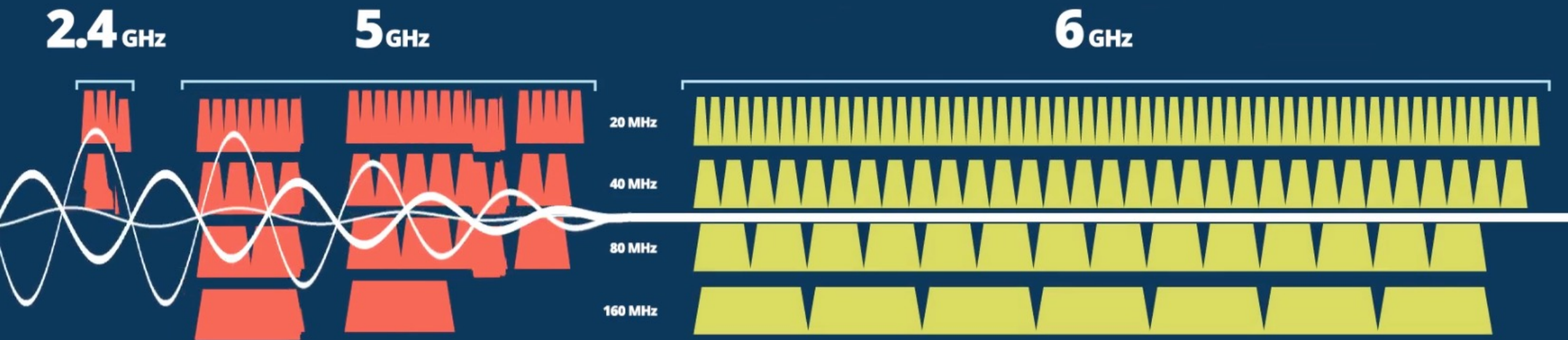
What is the Problem?

- Existing 2.4 Ghz and 5 Ghz spectrum is congested
- Airwave is way too crowded



Extending the Capabilities of Wi-Fi 6E

6E = CLEAN CHANNELS





Enhanced

Enhanced Experience Through Wi-Fi 6E

Wi-Fi 6E
(7x 160 MHz channels)



Wi-Fi 6 vs. Wi-Fi 6E



- Orthogonal frequency-division multiple access (OFDMA)
- High-bandwidth traffic efficiency with eight-stream multi-user-multiple-input multiple-output (MU-MIMO).
- Improvements through higher order modulation (1024-QAM).
- Extended battery for mobile and smart home devices with target wake time (TWT)

- All of the Wi-Fi 6 features, plus:
- Additional spectrum
- More high-bandwidth channels.
- No DFS scanning required
- No legacy (WiFi 3/4/5/6) devices on 6 GHz.
- Mandatory Wi-Fi Protected Access (WPA) 3

Enhanced Experience Through Wi-Fi 6E

Education



AR/VR/XR learning,
e-learning, digital
educations

Public Venues



High resolution video,
cellular offload, Wi-Fi
calling, Sidelines
communication

Workspaces



Digital collaboration
(video conference, digital
white boards, etc.),
teleworking

Healthcare



Telemedicine, robotics,
smart IoT devices and
wearables, asset
tracking

Manufacturing



Automated and digitized
operations and supply
chain, robots

Capacity

High Density

Performance

Low latency



Demo Speed
App with >1Gbps
Speed on Phone



Exceeding

Exceeding Market Expectations

Cisco Catalyst 9136AX Series – Most Advanced W-Fi 6E Access Point in the Market



Cisco® Catalyst® 9136AX Series
Flagship 6 GHz Quad Radio Access Point

Six Radios Architecture

- 2.4 GHz Radio (Slot 0): 4x4:4SS
- 5 GHz Radio (Slot 1 + Slot 2): 8x8:8SS / Dual 5 GHz Radio (Slot 1 and slot 2) 4x4:4SS (*)
- 6 GHz Radio (Slot 3): 4x4:4SS
- Dedicated “AI/ML assisted” Scanning Radio
- 2.4 GHz IoT Radio (*)

Unmatched Wi-Fi Experience

- Concurrent tri-radio, 16 Spatial Stream
- 400 clients per radio > 1200 total

Dual PoE backhaul with Power Redundancy

- 2 x 5 Gig PoE ports. 802.3 Link Aggregation

Internet of Things capabilities

- Only AP with Air Quality, Temperature, Humidity sensors
- Application Hosting with 2 x USB power (9W)

Smart Power Consumption (*)

AI/ML assisted scanning radio

6E with no compromises on 2.4/5GHz

Catalyst Wireless Innovations **Advantage**



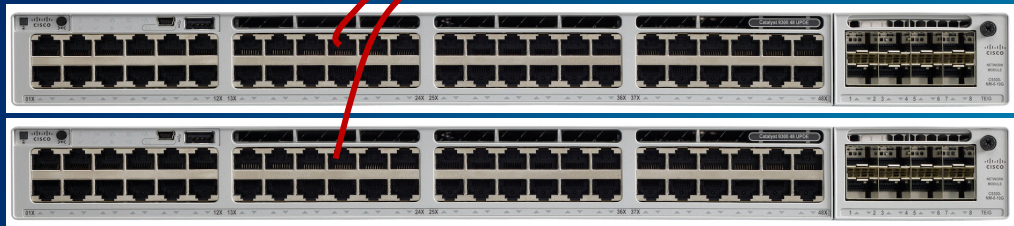
- **DNA Advantages to 6GHz band:** DNAC Centre Automation and Assurance, iCAP., Rogue, aWIPS, etc. DNA Center (2.3.2)
- **Smart Building** – Env Sensors plus DNA Spaces, enabling innovative use cases without overlay network. DNAS connector (2.3.2)
- **AI/ML Assisted at every layer**– AI scan radio, AI Enhanced RRM, Endpoint Analytics, Trust Analytics, AI Analytics
- **No RF Compromises** – Best in class Enterprise AP for your existing 2.4 and 5Ghz clients. Up 16 x Spatial Stream
- **Easy Migration** – Use the existing mounting options!
- **Client Ecosystem** – Working with Apple, Samsung, Intel on beyond-standards Wi-Fi 6E steering mechanisms

AI/ML assisted at every layer

Catalyst Full Stack Innovations

Intent Based Networking

Catalyst 9136 Smart Power Consumption (*)



PoE Power Profiles*

PoE Power policy flexibility to address customer requirements

Green AP*

Optimized power consumption based on network load

Power profiles example

Available post FCS(*)

Power Source	# of Spatial Streams	2.4 GHz Radio (Slot 0)	Primary 5 GHz Radio (Slot 1)	Secondary 5 GHz Radio (Slot 2)	6 GHz Radio (Slot 3)	mGig PHY 0 Link Speed	mGig PHY 1 Link Speed	USB	Auxiliary Radio	Max Power Draw
802.3bt (alternative scenario)	16	4x4	8x8 or Dual 4x4		4x4	5 Gig	5 Gig	Yes (Disabled)	Y	47.3W (37.3W)
802.3at ([alternative scenarios])	8 (4) [6]	2x2 (2x2) [2x2]	2x2 (2x2) [4x4]	Disabled (Disabled) [Disabled]	4x4 (Disabled) [Disabled]	2.5 Gig (1 Gig) [2.5 Gig]	Disabled (1 Gig) [Disabled]	Disabled (Disabled) [Yes - 4.5W]	Y	24.4 W (24.9W)
802.3af	0	Disabled	Disabled	Disabled	Disabled	1 Gig	Disabled	Disabled	Y	14W

Catalyst 9136 + DNA Spaces = **Enable Smart Building**



Air Quality

The built-in Renesas ZMOD4410 Gas Sensor Module will enable the reading of TVOC concentration, IAQ rating, and CO2 levels.



Humidity

The built-in Renesas HS3002 module is a fully calibrated sensor with the ability to measure the humidity in the air.



Temperature

The built-in Renesas HS3002 module can also capture the temperature to provide a reading of the environment remotely.

Extend DNA Advantages to 6GHz

Toggle to View 6 GHz Spectrum

Client Health by Wi-Fi 6E

Cisco DNA Center

Overall Network Client Application Network Services SD-Access

Global/San Francisco 24 Hours Filter (0)

SSID (0/8)

2.4 GHz

5 GHz

6 GHz

Wireless Clients

100% Healthy

TOTAL: 4 Active: 4

RF Profile by Wi-Fi 6E

Wireless > Create RF Profile

6 GHz

Channel Width Best

DCA Channel

Select All

UNII-1 1-49

UNII-2 53-145

UNII-3 149-233

Supported Data Rate

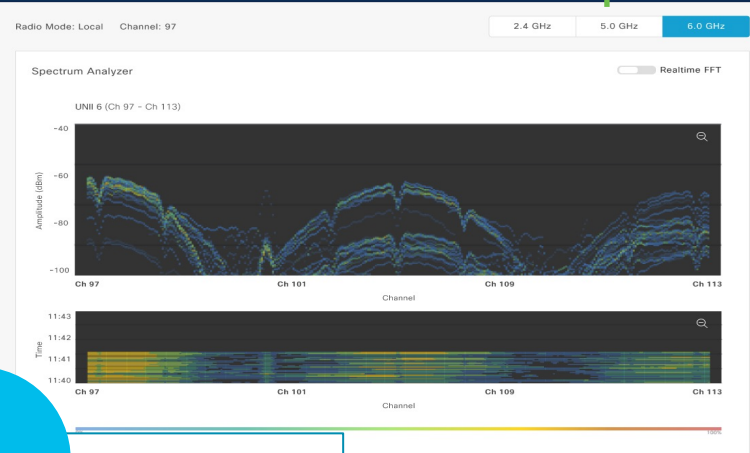
6

Mandatory Data Rates

6 9 12 18 24 36 48 54

TX Power Configuration

Power Level -10



Device 360 by Wi-Fi 6E

Detail Information

Device Connectivity RF

Radio Specific KPIs

Radio 0 Radio 1 Radio 2 Radio 3

Current Channel 1 Extended Channel(s) 5,9,13 Mode Local RF Profile default-rf-profile-6ghz

Band 6 GHz Tx Power 23 dBm Clean Air Status --

Current Channel Width 80 MHz

Channel Utilization

Utilization (%)

Time (Day/Hrs)

Oct 25, 2021 10:50 AM

Channel Utilization: 0

Baseline Threshold: 2.00

Mean: 0.92

Channel(s): 1,5,9,13



2D Map Support by Wi-Fi 6E

Cisco DNA Center

Find Hierarchy

Floor 1 2D 3D 6 GHz Add/Edit

5 GHz

6 GHz

2.4 GHz

2.4 & 5 G...



Embrace

Are You Ready to Embrace Wi-Fi 6E?



- ✓ Client adoption
- ✓ Regulatory domains
- ✓ 6GH signal propagation
- ✓ Upgrade areas
- ✓ And more...

- ✓ Increased PoE requirement > switch power budget
- ✓ Wi-Fi Higher speed > mGig port upgrade
- ✓ Dual port LAG > increased port density
- ✓ Translate Wi-Fi 6E better security to network segmentation
- ✓ And more...