

# **REINVENTING WI-FI** TECHNOLOGIES SUPPORTING THE APPLICATIONS & TRENDS OF THE FUTURE

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**Intel Confidential** 

60% cannot go one full day without Wi-Fi access before seeking a connection





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http://tech.fortune.cnn.com/2013/09/06/passengers-want-their-in-flight-wi-fi http://www.broadcom.com/press/release.php?id=s673754



50% would give up Facebook for a month for Wi-Fi connectivity



On a plane, 25% would give up a full six inches of legroom in exchange for Wi-Fi



On a plane, 13% of Americans, 17% of Brits, and 22% of Singaporeans would give up their bathroom privileges for Wi-Fi



# More than ever, Wi-Fi impacts our daily lives!





# The Wi-Fi industry technology ecosystem





#### (intel)

# Wi-Fi market penetration and economic value

### Wi-Fi chipset shipments **Wi-Fi shipments at an all time high**



### Wi-Fi economic value ~2 trillion in economic value in 2018



By 2022, ~60% of global mobile traffic will be offloaded to Wi-Fi and 51% of total IP traffic will be Wi-Fi\*

\* https://www.networkworld.com/article/3341099/wi-fi-6-5g-play-big-in-ciscos-mobile-forecast.html



# Wi-Fi 6: path to a truly brilliant Wi-Fi



11

# WI-FI 6 FOR HOME, ENTERPRISE & SMB

Improved Scalability, Reliability, Security, and Performance

Wireless Workplace Transformation Is Growing Rapidly

#### Wired Workplace

Ethernet connections and desk phones have tethered workers to their desks.

#### Wireless Workplace

Wi-Fi 6, PC (software) phones, and collaboration tools free users to work anywhere.



#### **4X** GREATER SCALABILITY

The Wi-Fi 6 OFDMA feature enables managed, reliable, efficient connectivity across more devices. This means plenty of headroom for future growth, or fewer APs required to support existing devices.

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19

#### REDUCED Interference

The Wi-Fi 6 OBSS feature helps routers and devices identify local traffic and tune out noise from other networks.





#### IMPROVED Security

Wi-Fi 6 requires new WPA3 security features, enabling next-generation authentication and military-grade encryption.



#### **3X** FASTER PERFORMANCE

1024 QAM and support for optional 160 MHz channels enable clients and routers to deliver best-in-class Gigabit speeds for the office or home.





Wi-Fi 6 helps slash lag times to give you the edge you need to win with OFDMA data management and OBSS interference avoidance features.



# Technical Comparison (1/3)



### Technical analysis (2/3) BSS coloring enables improves spatial reuse

All same-channel BSS block



#### Same-channel BSS only block on color match





# Technical Comparison (3/3)



# Wi-Fi 6 Throughput (Rx 360° test) – Intel Lab



360\* Sweetspot Test (10\*): Average RX TCP TPT on Ch 36,

Platform: Dell Latitude 5491 (CFL) Client Intel Wi-Fi 6 AX200, SW 21.10 OS: Windows 10 AP: Netgear RAX120 (QCA) FW: 1.0.0.84 intel

# Wi-Fi 6 Single User Throughput – Intel Lab



Wi-Fi 6 provides substantial performance improvement at all ranges

Single User Average Throughput: Platform: Dell Latitude 5491 Client Intel Wi-Fi 6 AX200, SW 21.0.0.4 OS: Windows 10 AP: Asus AX88U (BRCM) FW3.0.0.4.384\_5640



# Legacy AP Single User Throughput – Intel Lab



Intel AX200 increases throughput even on legacy APs

Single User TPT w/ Legacy AP: Average Rx/TX TPT 80MHz ch 161

 Platform: Dell Latitude 5491 (CFL), Win10
 11AC Client Intel 8265, SW 20.70.7.1

 11AX Client Intel AX200, SW 21.0.0.5 (PV)
 AP: Asus RT-AC66U, FW 3.0.0.4.382



# Wi-Fi 6 Multi-User Throughput – Intel Lab



Note: final SW/FW from AP vendors should enable >4X capacity improvement for multi user use cases. The 4x claim today is based on simulations.

Single User Average Throughput: Platform: Dell Latitude 5491 Client Intel Wi-Fi 6 AX200, SW 21.0.0.4 OS: Windows 10 AP: Asus AX88U (BRCM) FW3.0.0.4.384\_5640



# Wi-Fi 6 Latency & Jitter – Intel Lab



#### Lower latency improves real-time applications like VoIP and gaming Lower jitter improves the reliability of the network packets, reducing BER

\* Without optimization. With optimization (e.g., for TSN), figures can be reduced by more than 5 times

# Up Next: Wi-Fi 6E in the 6 GHz band

- Regulators around the world are looking to add significant new spectrum in 6-7 GHz band – this is known as Wi-Fi 6E
  - New frequency band reduces congestion in 2.4 and 5 GHz bands
  - Improved performance, less interference and oppty to take advantage of value of Wi-Fi 6
  - WFA expects to launch Wi-Fi 6E certification in Jan'2021

#### **6GHz benefits are not for all Wi-Fi 6 devices** (Wi-Fi 6E = Device differentiation & Backwards compatibility)



# With Wi-Fi 6E, the amount of spectrum used by Wi-Fi is almost 3X more

#### Comparing Wi-Fi Spectrum



21



- The Wi-Fi industry is at a major inflection point, where it is reinventing itself to meet the demands of an evolving market
- Wi-Fi has a complete offering in < 7 GHz & 60 GHz mmWave
- Wi-Fi ecosystem is very competitive and healthy
  - Large number of vendors; 3.1 billion chipsets sold in 2018 alone
- Next gen Wi-Fi, known as Wi-Fi 6, brings dramatic improvements
  - Managed traffic w/ key features: OFDMA, 1024QAM, OBSS, WPA3 & more
  - Pros: 3x faster vs. 11ac, 2x faster vs. GbE, 75% lower latency & better security
- Wi-Fi 6E will significantly extend capacity via the 6 GHz band

