TRENDS IN COMMUNICATION

Peter Caldera, CobCOM 2018

TRENDS IN COMMUNICATION

Data and even more Data
- A new Megatrend

Use Case - The Smart Home
- Market

Wi-Fi Design
- Architecture and Security
- Challenges
- Design Flow

Summary

TRENDS IN COMMUNICATION

#1: It's a mobile and broadband world: we are connected anywhere, anytime, with any device

#2: Unrelenting data traffic growth, mobile broadband, video acceleration, data centers

#3: The rise of smart-COs as part of the "telco cloud" to distribute functionality, allow scale, and contain next gen network functions

#4: Carriers are finally, yet slowly moving toward a single network for fixed and mobile

#5: 2017 is the year of Software defined networks (SDNs) and network functions virtualization (NFV)

#6: Big data is becoming more manageable

Each of these trends has significant security implications

Trends - IHS TECHNOLOGY Dec 2017

THE ZETTABYTE ERA

Annual global IP traffic will reach 3.3 ZB per year by 2021, or 278 exabytes (EB) per month. In 2016, the annual run rate for global IP traffic was 1.2 ZB per year, or 96 EB per month.

Global IP traffic will increase nearly threefold over the next 5 years.

Smartphone traffic will exceed PC traffic.

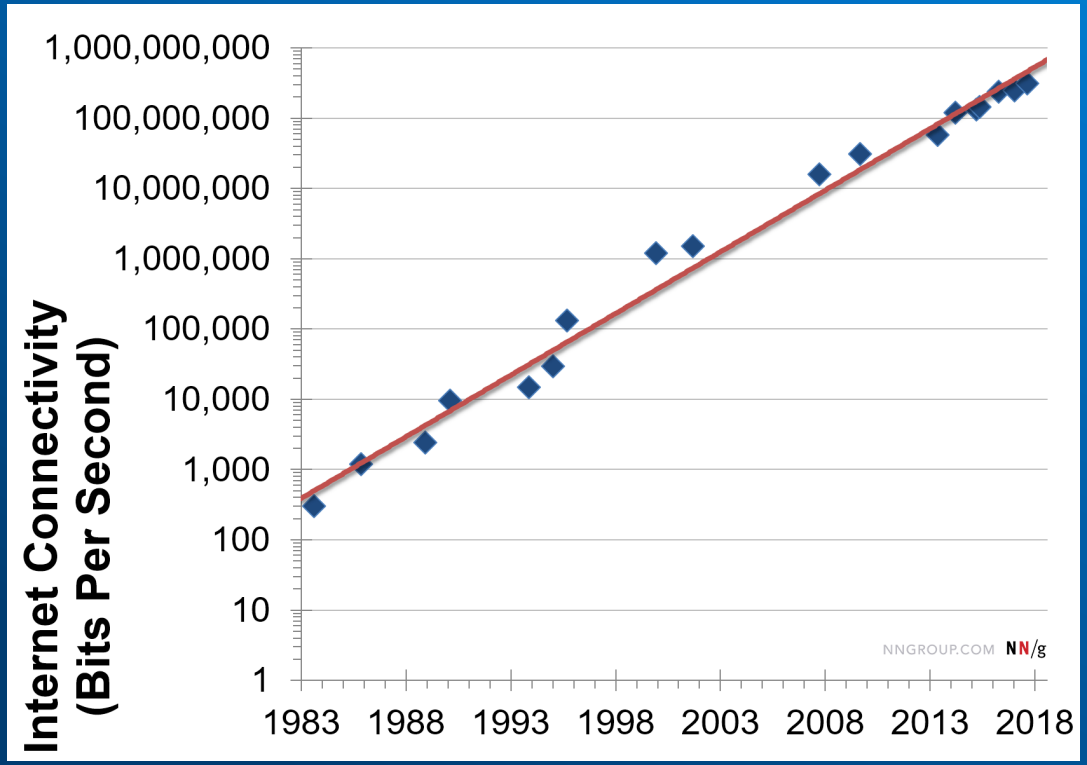
The number of devices connected to IP networks will be more than three times the global population by 2021.

Broadband speeds will nearly double by 2021. By 2021, global fixed broadband speeds will reach 53 Mbps, up from 27.5 Mbps in 2016.

1 ZB = 10^{21} bytes

Cisco: The Zettabyte Era: Trends and Analysis

NIELSEN'S LAW OF INTERNET BANDWIDTH



Users' bandwidth grows by 50% per year

10% less than Moore's Law for computer speed.

The new law fits data from 1983 to 2018.

Nielsen Norman Group

THE COMING DATA DELUGE

BY 2020...

The average internet user will generate
~1.5 GB OF TRAFFIC PER DAY

Self driving cars will generate over
4,000 GB PER DAY... EACH

Smart Homes will generate roughly
68 GB PER DAY

A connected plane will generate over
40,000 GB PER DAY

A connected factory will generate over
1,000,000 GB PER DAY

4K VIDEO	3 PEOPLE X 2 HRS/DAY	1220 GB/MONTH
WEB, GENERAL	3 PEOPLE X 2 HRS/DAY	1.6 GB/MONTH
WEB, MULTIMEDIA	3 PEOPLE X 1 HRS/DAY	2.5 GB/MONTH
WEB, AUDIO	3 PEOPLE X 0.7 HRS/DAY	3.3 GB/MONTH
GAMING, LIGHT	1 PERSON X 1 HRS/DAY	0.3 GB/MONTH
GAMING, HEAVY	1 PERSON X 1 HRS/DAY	0.6 GB/MONTH
IP CAMERA, SMART	6 CAMERAS X 384 EVENTS/DAY	2187 GB/MONTH
IP MICROPHONE, SMART	15 MICROPHONES X 384 EVENTS/DAY	110.6 GB/MONTH

Intel calculations based on 4K cameras and typical streaming activity in the home

All numbers are approximated
http://www.cisco.com/c/en/us/solutions/service-provider/vni-network-traffic-forecast/infographic.html
http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html
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http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html

intel

PROLIFERATION OF CONNECTED HOME DEVICES

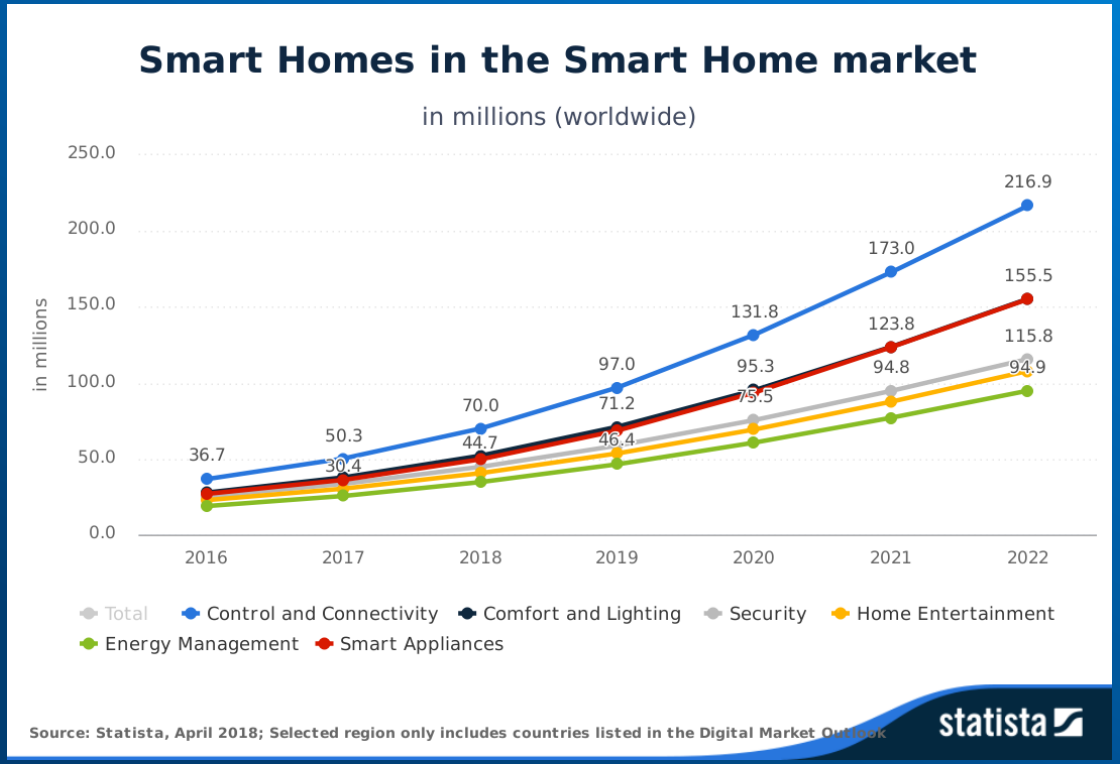
10-20

devices per home
(2016)

35+

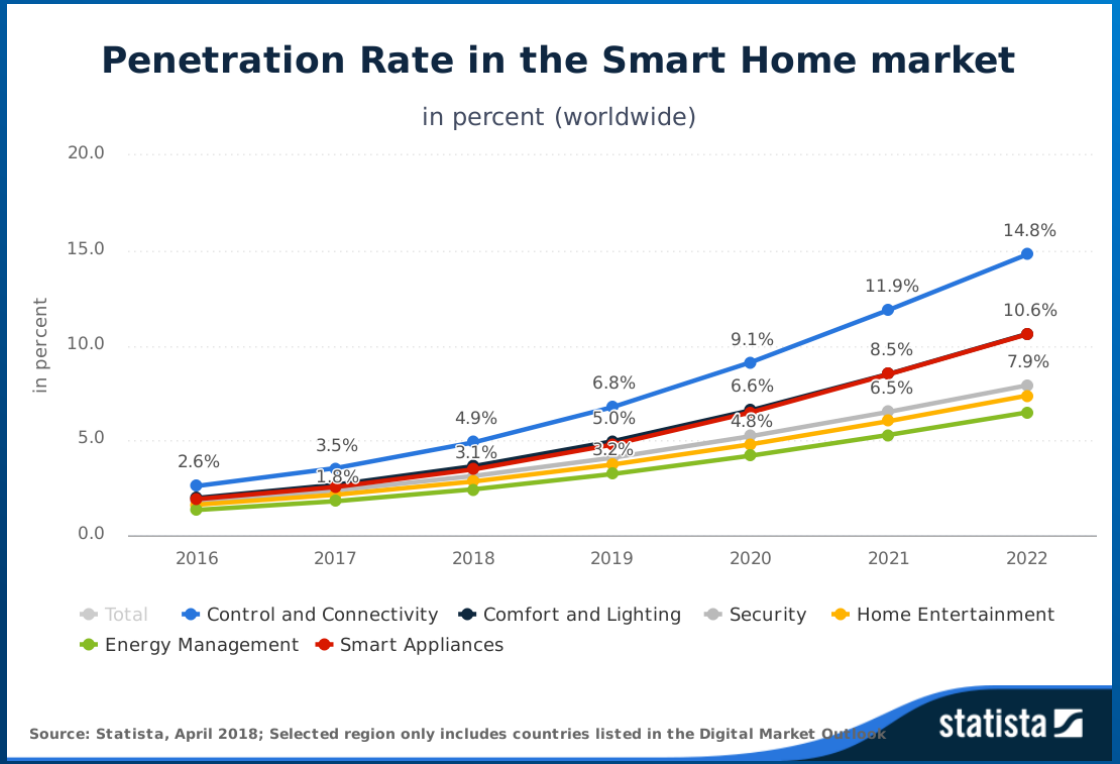
devices per home
(by 2020)

SMART HOME MARKET



In the Control and Connectivity segment, the number of active households is expected to amount to 216.9m by 2022

SMART HOME MARKET



Household penetration in the Smart Home market is at 7.5% in 2018.

MORE BANDWIDTH:
THE GROWING WI-FI DEMANDS

25B

Connected devices

6.5M

New Wi-Fi devices ship every day

4 GB

Average smartphone traffic per month

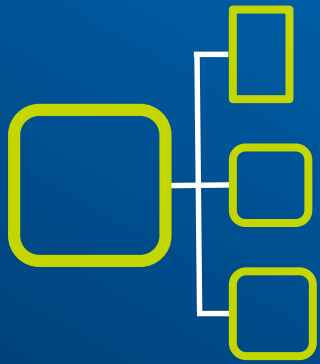
4.2M

Apps offered in Android* and Apple stores

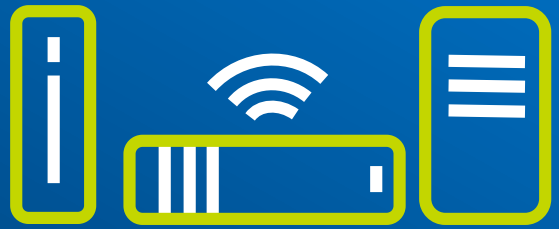
Sources: Gartner, Cisco, Statista.

CHALLENGES

GETTING THERE HAS MANY CHALLENGES



Fragmented networks



Multiple CPE devices

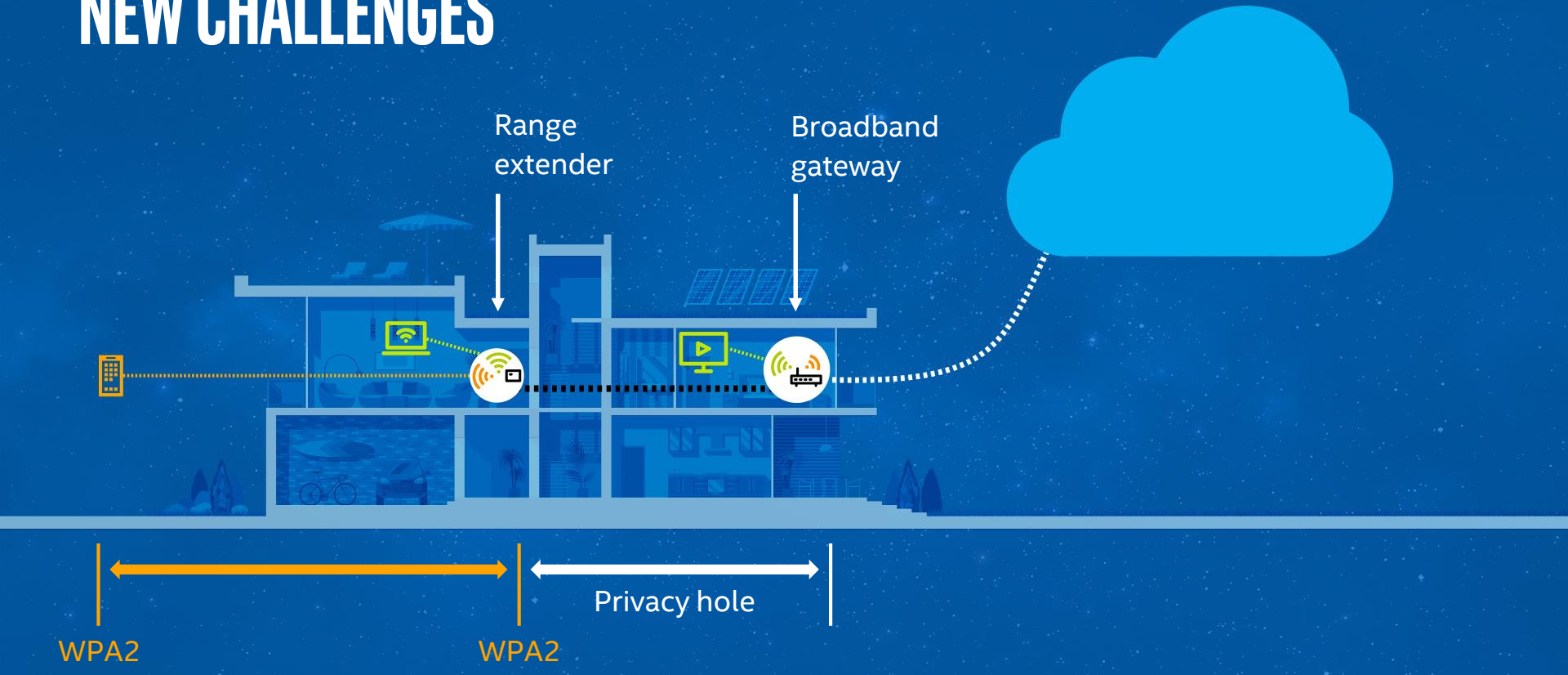
Calls and truck roll outs due to Wi-Fi Issues

THE HOME WI-FI EVOLUTION

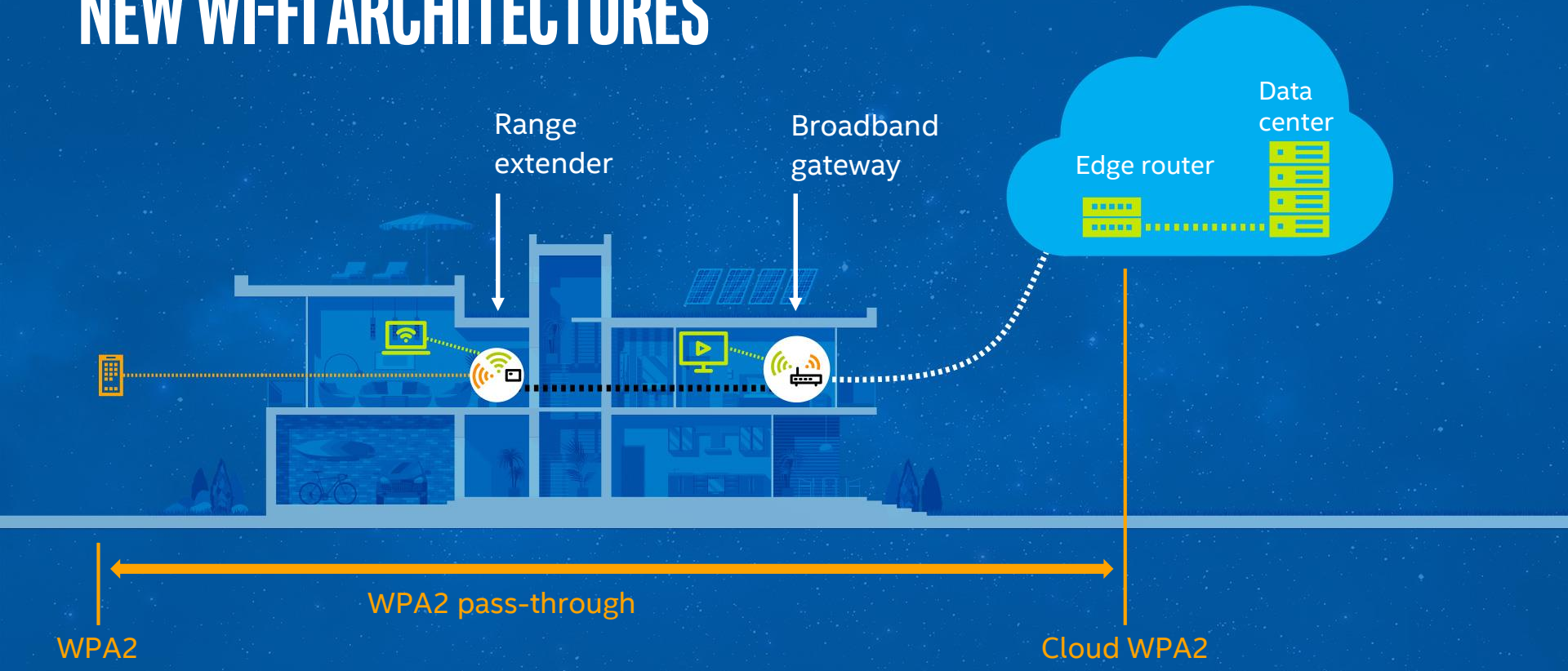
Shift in expectations from Wi-Fi speed to Wi-Fi anywhere

2005–2015	2016–2020
• **Great** speed near the access point • Super MIMO monolithic access point	• **Good** speed in every room • Distributed “multi room” access point

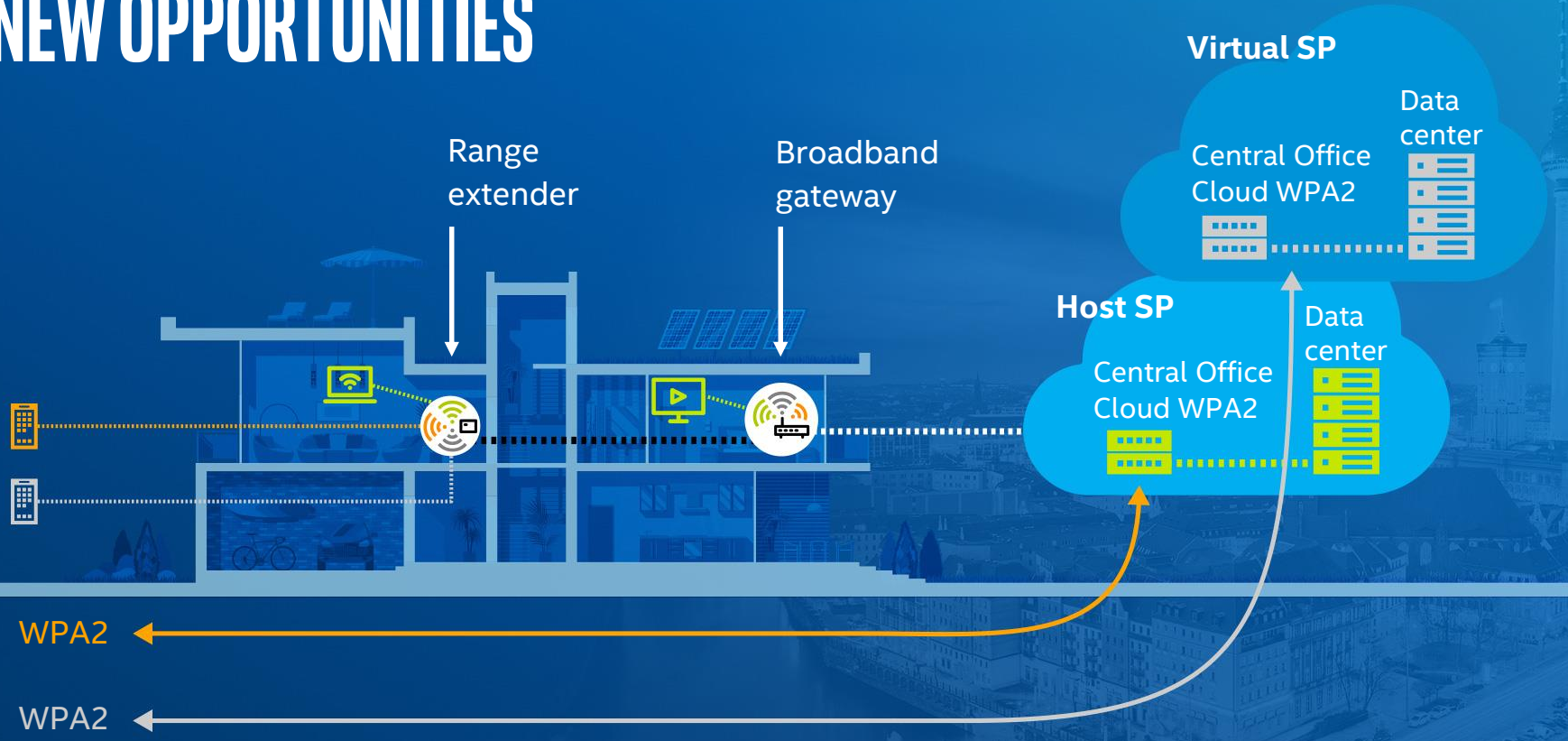
NEW CHALLENGES



NEW WI-FI ARCHITECTURES



NEW OPPORTUNITIES



802.11 AC COMPARED TO 802.11 AX

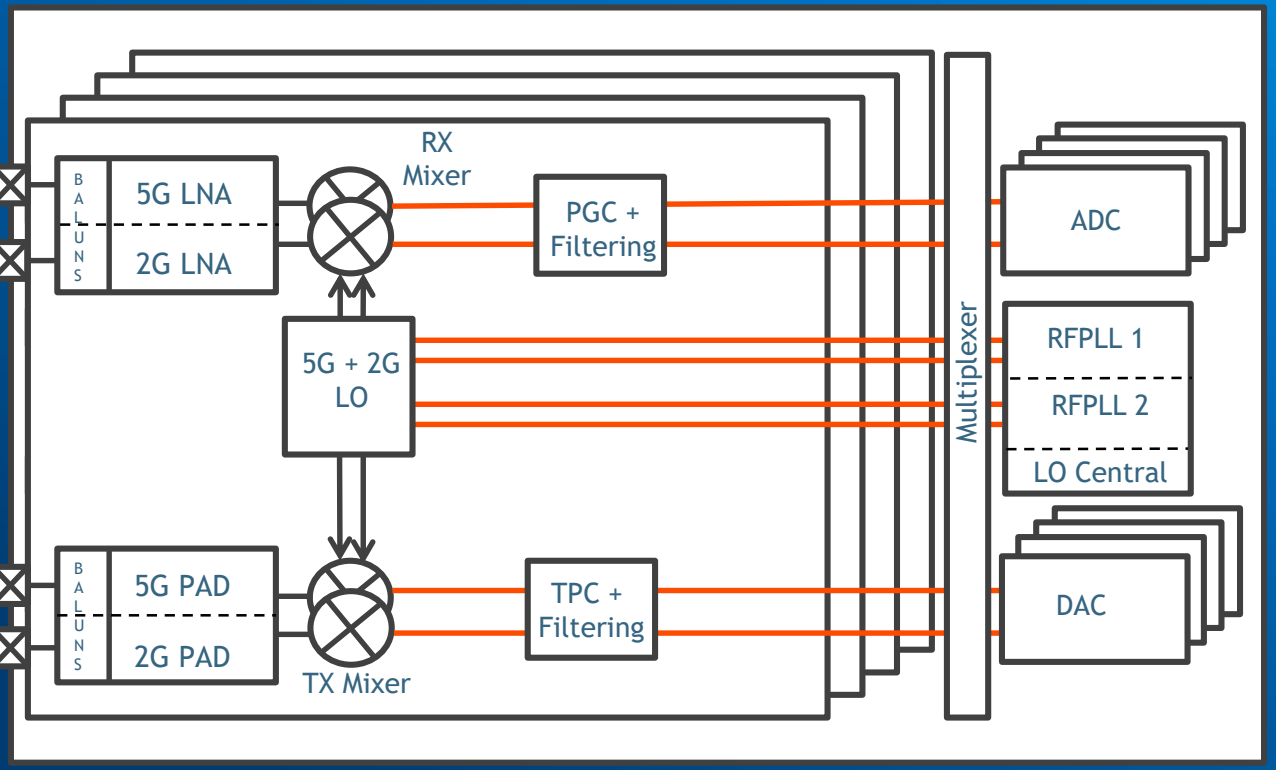
PHY rates of four spatial stream 802.11ac 80 MHz is 1.73 Gbps for majority of infrastructure products in the installed base and four stream

802.11ax 160 MHz is 4.8 Gbps, which is ~2.7 times increase over 802.11ac.

Collision avoidance of TCP Ack (small) packets in uplink is increased by a factor of ~1.4, providing total downlink efficiency increase of up to four times.

Collision avoidance in upstream improves throughput by a factor of ~2 to 2.5 times, providing total uplink efficiency increase of up to six times.

EXAMPLE OF 802.11AX WITH 4X4 MIMO



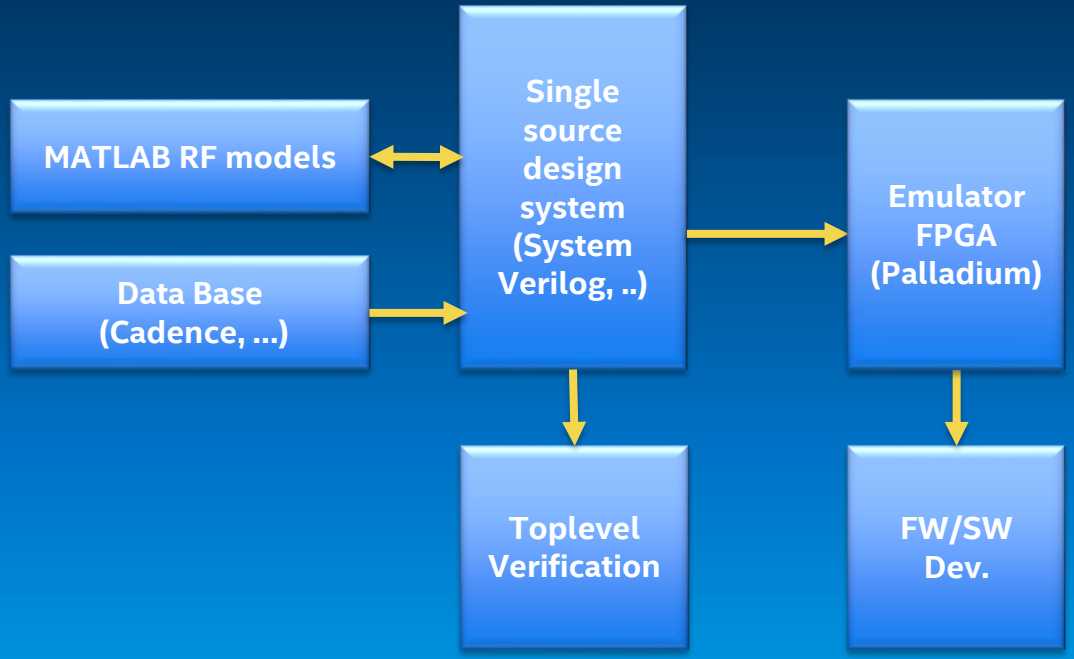
Dualband Concurrent Operation

→ 2G+5G at the same time
→ two RF Synthesizer and
→ double LO transmission

160MHz RF / 80MHz BB frequency support

TPC: Transmit Power control
PGC: Programmable Gain Controller

WORKFLOW OVERVIEW



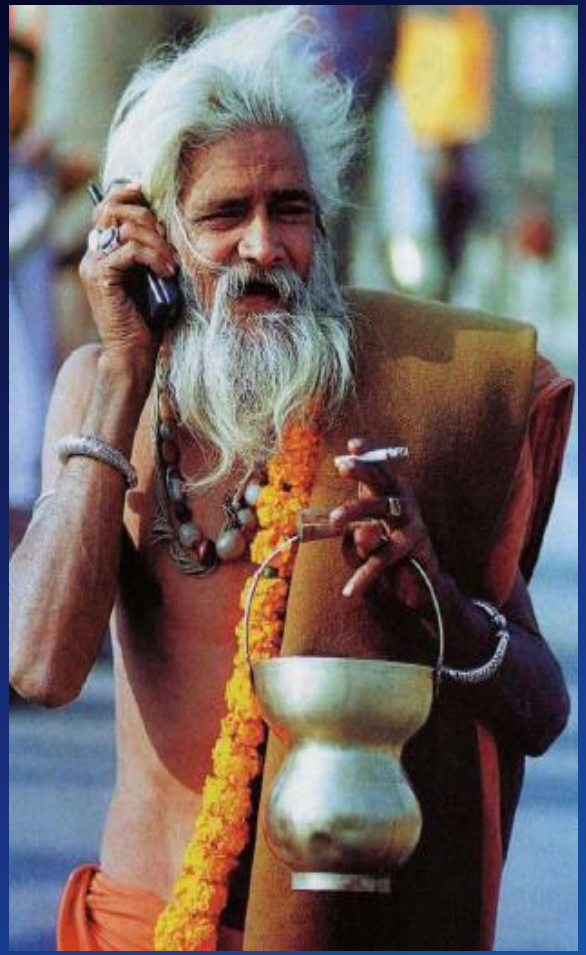
SUMMARY

Future communication will be

- Faster: more devices, lower latency, higher throughput
- Mobile: Wi-Fi, 5G, ZigBee, BLE,
- Secure: soft and hardware based

This requires the development of new

- Technologies
- Architectures
- Methodologies
- Standards



Thank you for your attention…

And

“Forever Young”

the prophet said

Questions?