Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

WGC EMEA

OCT 23 - 26 2023

WI-FI INNOVATION:
FOR OPERATORS, ENTERPRISE, PLACES AND THINGS

Paris Expo Porte de Versailles, Paris, France

#WGCEMEA | #wifirevolution | #lovewifi

Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

Tiago Rodrigues

President & CEO, Wireless Broadband Alliance

Welcome address

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Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

WGC EMEA Speakers

Tiago Rodrigues
President & CEO
Wireless Broadband Alliance

Rida Zouaoui
Head of New Business Strategy
Orange

Ryan Granchalek
Sr. Director and GM
Intel Corporation

Matthew MacPherson
Wireless CTO
Cisco

Dr Derek Peterson
CTO
Boingo Wireless

Time	Presentation
9:00 AM (CET)	**President & CEO Open Address** Tiago Rodrigues, President & CEO, Wireless Broadband Alliance.
9:15 AM (CET)	**Operator Address** Rida Zouaoui, Head of New Business Strategy, Orange
9:35 AM (CET	**Wireless Innovation at a Torrid Pace - A Giant Leap for PC Clients** Ryan Granchalek, Sr. Director and GM, Intel.
9:55 AM (CET)	**Why OpenRoaming? Unifying Access across SP and Enterprise** Matt MacPherson, Wireless CTO, Cisco.
10:15 AM (CET)	**Connecting the Enterprise with 5G & AI** Dr. Derek Peterson, CTO, Boingo Wireless.
10:35 AM (CET)	**COFFEE & NETWORKING**

20TH ANNIVERSARY | Wireless Broadband Alliance

Welcome to
Wireless Global Congress EMEA

Tiago Rodrigues

WBA LAUNCH

20th March 2003

20th ANNIVERSARY

20th June 2023

WBA 20th Anniversary

Wireless Broadband Alliance

20th Anniversary Recognition Awards

Steve Dyett
BT

JR Wilson
AT&T

Chris Bruce
Former BT

Derek Peterson
Boingo

Mark Grayson
Cisco

Michael Sym
Single Digits

Luther Smith
CableLabs

Cédric Gonin
Orange

HALL OF HONOR

Shrikant Shenwai
CEO of WBA
2003 - 2019

Edgar Figueroa
CEO of Wi-Fi Alliance
2007 - 2023

Nigel Bird
Orange

kt BT Group AT&T intel boingo wireless CISCO SINGLE DIGITS

Thank You

for all the support and dedication to WBA

In 2023 WBA updated it's logo and branding

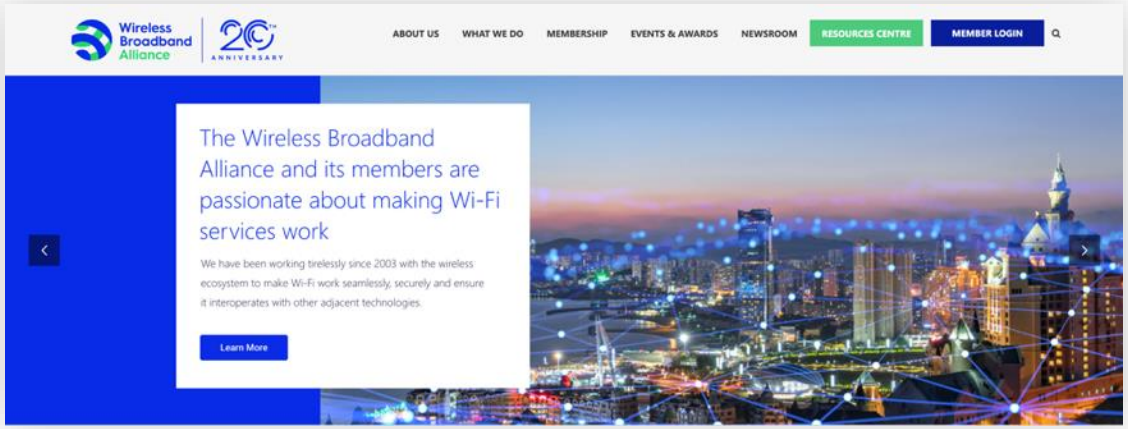
Wireless Broadband Alliance

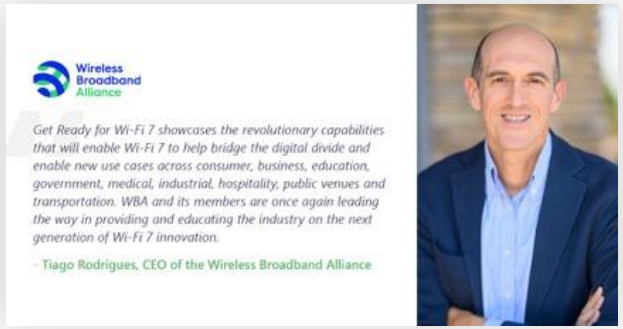
Wireless Global Congress
Wireless Broadband Alliance

Wireless Global Congress
Asia PAC

Wireless Global Congress
Americas

Wireless Global Congress
EMEA





In 2023 WBA overpassed the 200 members for the first time in its history

Thank You and Big Welcome to All New Members!

Allied Telesis
LIBERTY GLOBAL
Itaú
SES your satellite company
SATINSO
AIRWAVZ SOLUTIONS Building Mobility
Air Pro
meshii wifi
NG-EXPERT CREATING EXPERTS
WORLDVUE
NEXCOMM Systems
Wi2 Wire & Wireless
RDK
SILICON LABS
Hechtman Venture Development
Peraton LABS
nimbus networks
Methods 2 Business
AIRBUS
XIBER
ORIGIN™
WAYRU
WAGENINGEN UNIVERSITY & RESEARCH
PAVLOV media
fanswifi
MetaBlox
Tecexpert
BROWAN
ACT FIBERNET

2023 was a very successful year for the programs & projects of WBA

18 PROJECTS FINALIZED

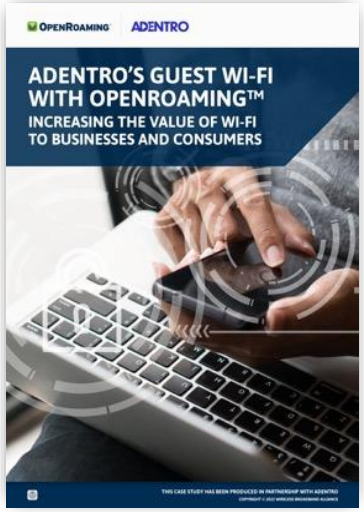
+15% MEMBERS PARTICIPATING

+60% NEW MEMBERS INVOLVED

+20% 2000+ EXTRANET USERS

+30% INDIVIDUALS ATTENDING MEETINGS

2023 has been a turning point for the adoption of OpenRoaming™and Passpoint



+3,5 MIL WI-FI NETWORKS LIVE

+1,500 PKI CERTIFICATES ISSUED

+600 END-ENTITIES

+200 POCS IN PROGRESS

APAC Task Group

To provide our members in APAC a platform to fully engage in the WBA activities to further enhance the growth of APAC wireless industry.

- **Open to all members** looking into APAC market and interested in making Wi-Fi Better & Easier!!!
- **+20 companies** contributing and participating
- **Monthly** meetings in progress
- **Be part** of the community, come and join!!!

Empower enterprises, with public guest Wi-Fi, to use the power of Wi-Fi and OpenRoaming to revolutionize the experience and drive business growth.

- **Open to all members and enterprises** interested in making Wi-Fi Experience Better & Easier!!!
- **Kick-off tomorrow (26th Oct)** WGC afternoon session.
- **Be part** of the community, come and join!!!

Wi-Fi is Better & Easier than Ever

TOP 3

Drivers to improve In-home Wi-Fi:

1. **Quality of Service** (QoS)
2. **Wi-Fi Mesh / Multi-AP**
3. **End-to-end security**

TOP 3

Drivers to adopt OpenRoaming-Passpoint:

1. **Automatic experience**
2. **Security**
3. **Quality of Experience** (QoE)

76% More confident in investing in Wi-Fi (+55% comparing with one year ago)

68% Plan to invest in OpenRoaming (+10% comparing with one year ago)

88% Agreed that 6 GHz spectrum is important or critical

92% Are planning to deploy Wi-Fi Sensing and AI solutions

Source: 2023 WBA Annual Industry Survey

Wireless Broadband Alliance

WBA Vision

WBA IS A NONPROFIT ASSOCIATION WITH THE VISION FOI

"SEAMLESS AND INTEROPERABLE WI-FI SERVICES"

OpenRoaming-Passpoint in Public-Guest Wi-Fi

Convergence & Coexistence of Wi-Fi and Cellular

Next Generation Wireless Networks

JOIN AND BE PART OF THIS REVOLUTION

ESTABLISHED **IN 2003**

200+ MEMBERSHIP **COMMUNITY**

PROJECTS & **PROGRAMS**

3 ANNUAL **EVENTS**

PROMOTION & **GO-TO-MARKET**

THOUGHT LEADERSHIP **& MARKET RESEARCH**

Wireless Broadband Alliance | APAC FORUM | OPENROAMING | WORLD Wi-Fi Day | WBA INDUSTRY AWARDS | CONNECTED COMMUNITIES Forum | INNOVATION FORUM POWERED BY WBA CTO GROUP

Thank you

Tiago Rodrigues, WBA President & CEO

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Wireless Broadband Alliance

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Rida Zouaoui

Head of New Business Strategy, Orange.

Operators Address

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Building a more valuable Wi-Fi for consumers

Network X / Wireless Global Congress

25th October 2023

Rida ZOUAOUI

orange™

What does Wi-Fi mean for European consumers?

Consumers have a basic understanding of Wi-Fi …
… and that's OK!

"Wi-Fi is …"

…a wireless network

…wireless internet access

…a service delivered by a telecom provider

…a signal connecting devices which allows you to move around freely

Consumers’ attachment for Wi-Fi is real

Consumers **rely on home Wi-Fi for every aspect of their life**: work, leisure, house chores, security etc.

Due to this strong reliance on Wi-Fi at home, it is an **emotionally charged relationship** ❤️

The consequences of loss of Wi-Fi extends further than the home.

Easy set-up for home users is important and still requires some improvements

Required connectivity thanks to speed, coverage, and **stability**

Need for Green Wi-Fi & Can Wi-Fi play a role for more sustainability?

Wi-Fi power consumption

3,65 kWh / year

87,6 kWh / year

Emissions related to the energy consumption of boxes are 24 times higher than that of mobiles

Wi-Fi power consumption is 40% of CPE, but Wi-Fi is always ON with full performances

Wi-Fi and Sustainability

Power saving functions

Mobile offload

Life-cycle of current and future Wi-Fi generations

Merci

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Ryan Granchalek

Sr. Director and GM, Intel Corporation

Wireless Innovation at a Torrid Pace – A Giant Leap for PC Clients

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Wireless Innovation at a Torrid Pace - A Giant Leap for PC Clients

Ryan Granchalek

Sr. Dir and General Manager Wi-Fi and Bluetooth Products,

CCG - Wireless Solutions Group, Intel Corporation

October 2023

Introduction: Ryan Granchalek

Best Buy
Geek Squad
Service Technician
2003

Intel Corporation
Sr. Director and GM
Wireless Products
2023

Fighting to improve PC Wireless User Experience for 20 Years…

Agenda

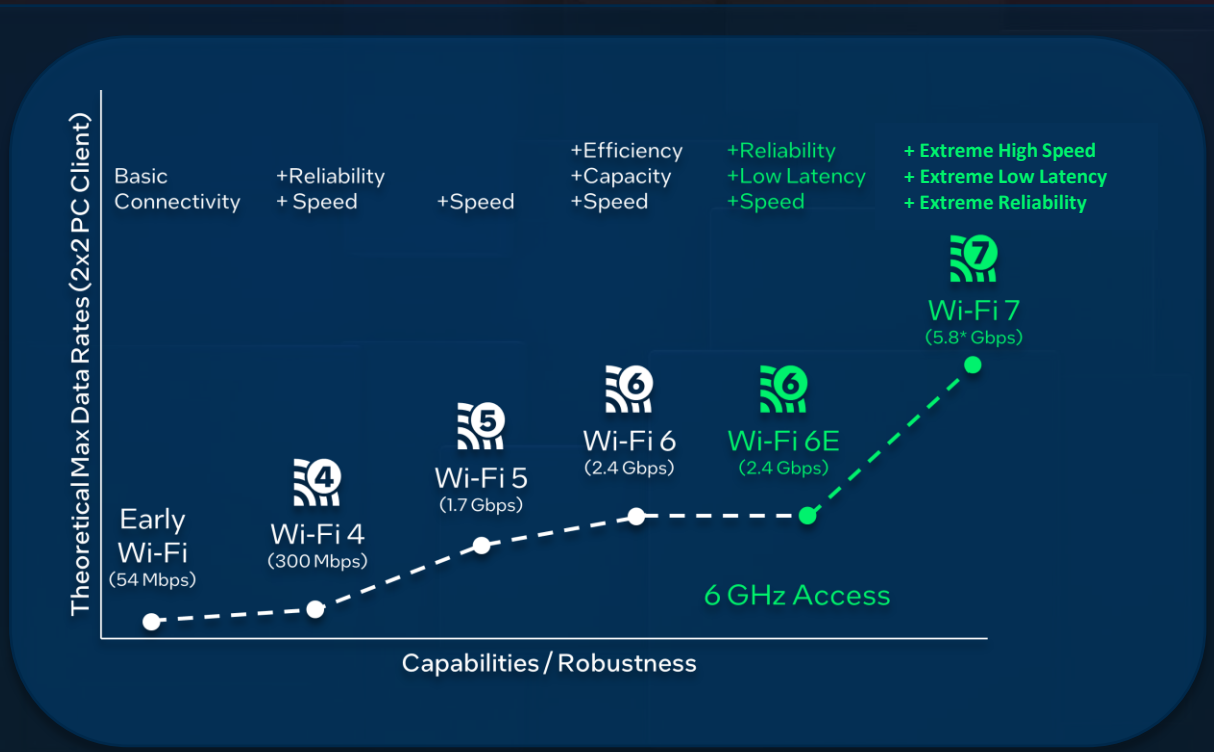
- Importance of Wi-Fi
- Intel® Wi-Fi 7 Update
- Intel Innovations & Industry Collaboration

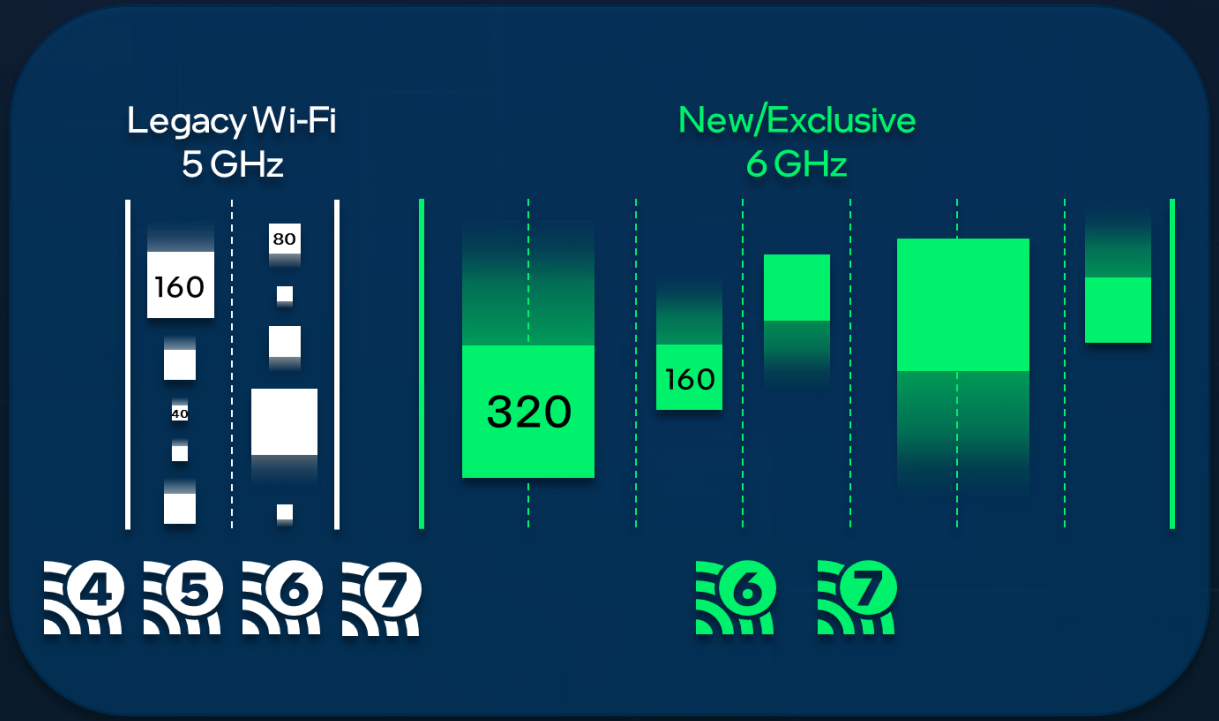
Great Wi-Fi Performance is a Top Priority!

- "Bad Wi-Fi" is in the top 3[1] complaints for remote workers
- "Optimized Wi-Fi" is a top 5[2] feature for new laptop purchase

1) https://techgenix.com/complaints-from-remote-workers/
2) Intel research "2022 Laptop Feature Prioritization Study", June 2022, * 19 features tested. Top features are relatively consistent across consumer groups, price points

Wi-Fi Standards & Technologies Are Rapidly Evolving





Wi-Fi 7 will revolutionize the enterprise wireless user experience

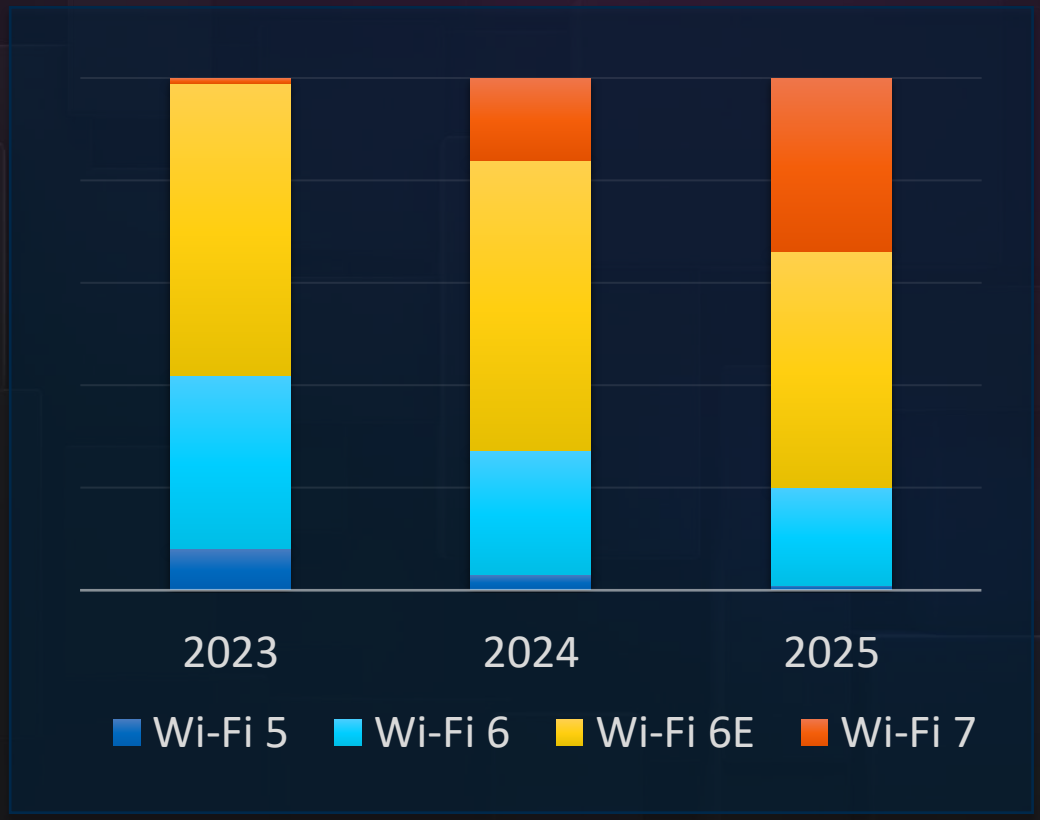
* Based on the current draft of the 802.11be specification's theoretical maximum data rate for 2x2 devices

Next-Generation Intel® Wi-Fi 7 (5 Gig)

intel.

Wi-Fi 7
5 Gig

Intel® Wi-Fi 7 BE200



>140 PCs Design Wins on Intel Wi-Fi 7 YTD
Wi-Fi 7 is expected to represent >1/3 of all Intel PC volume by 2025

* Full Wi-Fi7 functionality is dependent on OS support

Enhancing the Enterprise User Experience

Enterprise Wi-Fi Vision

- Hybrid Work
- Multiple Devices
- Wi-Fi & Private Cellular Networks
- Location / Security
- Spectrum Sharing

Intel Innovations for PC Clients

Intel® Connectivity Performance Suite	• Traffic Prioritization / QoS • Dynamic Connection Optimization • Future - Historical / Predictive + IT Controls
Intel® Bluetooth® Improvements	• Audio Quality / Broadcasts / Accessibility • Ecosystem Optimization Program • Future - Extended BT Range
Intel® Unison™	• Multi-Device Experiences • Simple, Seamless, Secure • Future – Device + Use Case Expansion
Intel Connectivity Analytics (ICA)	• Delivers real-time networking insights • Understand local network conditions • Lowers costs to IT and Service Providers
Intel® Wi-Fi Sensing	• Convenience / Security • Future - Location, Gesture Control

The PC is the enterprise user's primary experience hub

Wrap Up…

High quality Wi-Fi connectivity is critically for your customers

6 GHz & Wi-Fi technology advancements will help accelerate innovation

Industry collaboration is critical to create the best enterprise user experience!

Thank You!

Questions?

Notices & Disclaimers

Wi-Fi 6E device tracking summary is public information compiled by Intel from vendor websites, press announcements, and third-party device reviews. Intel provides this assessment for informational purposes only, can not guarantee its accuracy, and it's subject to change without notice.

6 GHz Wi-Fi 6E and Wi-Fi 7 laptop functionality require Intel® Wi-Fi 6E/7 products, Wi-Fi 6E/7 APs/Routers/Gateways, and Operating System support, along with country-specific 6 GHz spectrum allocation for non-licensed use and associated regional regulatory approvals. 6 GHz may not be available in some countries.

While Wi-Fi 7 is backward compatible with previous generations, new Wi-Fi 7 features require PCs configured with Intel Wi-Fi 7 solutions, PC OEM enabling, operating system support, and use with appropriate Wi-Fi 7 routers/APs/gateways.

Wi-Fi 7 products can access 320 MHz channels in 6 GHz and new 160 MHz channel combinations in both 5 and 6 GHz with new Multi-Resource Unit Puncturing capabilities.

Based on IEEE 802.11be draft specification, the maximum theoretical data rates for 2-stream devices that support 320 MHz channels and 4K QAM is 5.8 Gbps.

Intel engineering simulations of congested network environments indicate major latency reduction is possible with new Wi-Fi 7 Multi-Link Operation capabilities.

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All product plans and roadmaps are subject to change without notice.

Statements in this document that refer to future plans or expectations are forward-looking statements. These statements are based on current expectations and involve many risks and uncertainties that could cause actual results to differ materially from those expressed or implied in such statements. For more information on the factors that could cause actual results to differ materially, see our most recent earnings release and SEC filings at www.intc.com.

For additional details, please visit www.intel.com/performance-wireless

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Matt MacPherson

Wireless CTO, Cisco.

Why OpenRoaming? Unifying Access Across SP and Enterprise

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Why OpenRoaming?

Unifying Access across SP and Enterprise

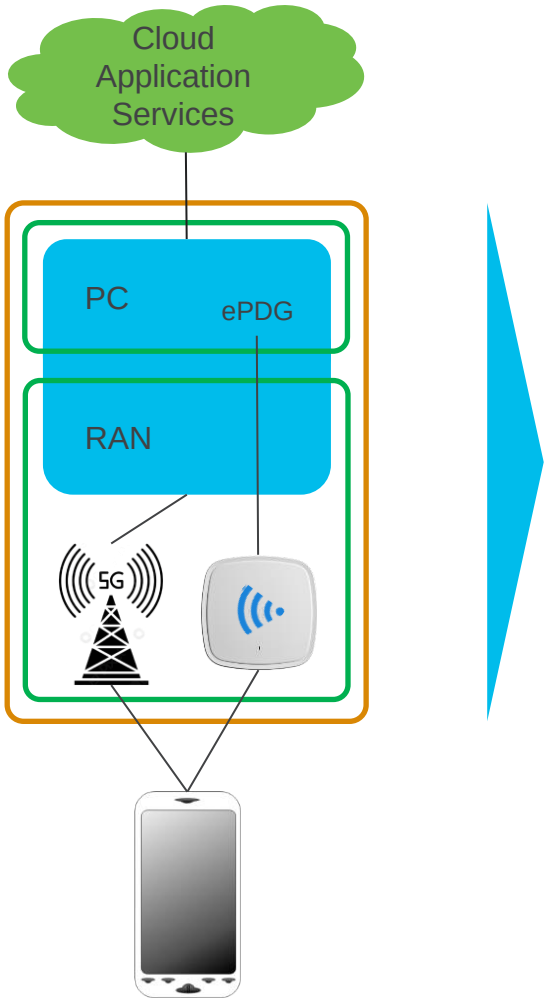
Matt MacPherson, Cisco Wireless CTO

WBA Wireless Global Congress – Paris

October 2023

Wireless Access as a Service

“Tightly Coupled” Access Model

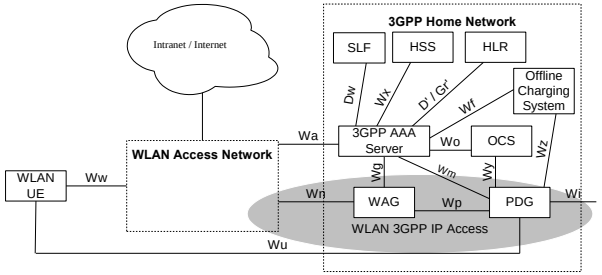


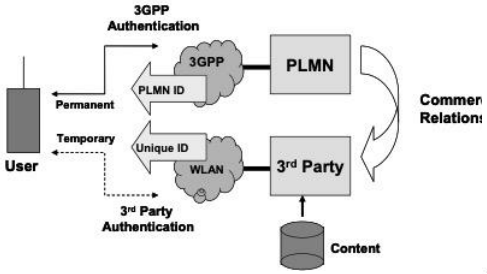
Advantage:

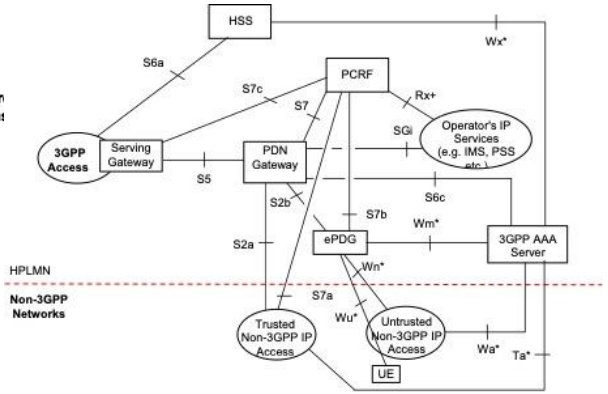
- Network Manages Path
- Network Manages Mobility
- Network is optimized for maximum number of users
- Network Manages Experience (Carrier Class)

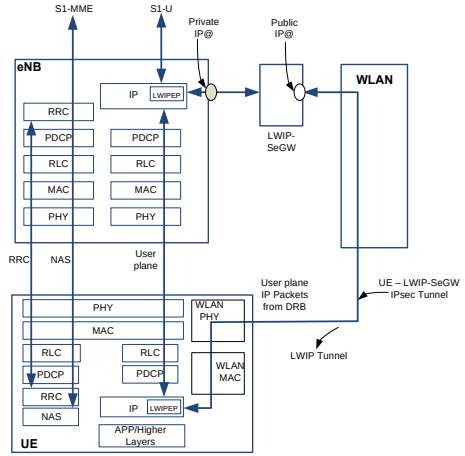
“Simplifying” Tightly Coupled Wi-Fi/Cellular Integration

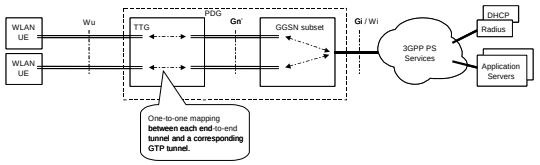
20 years of fragmentation and failures…

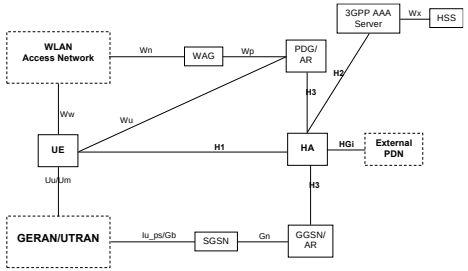


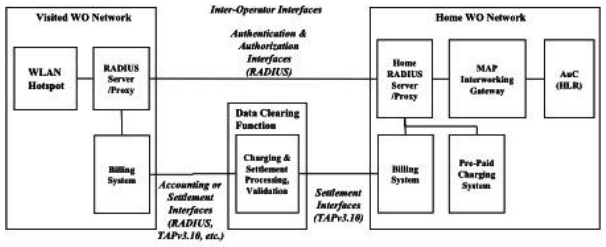


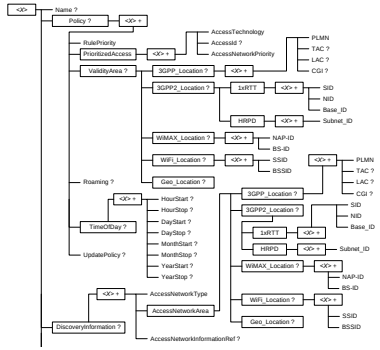


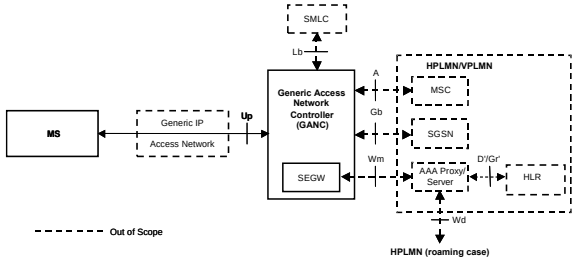


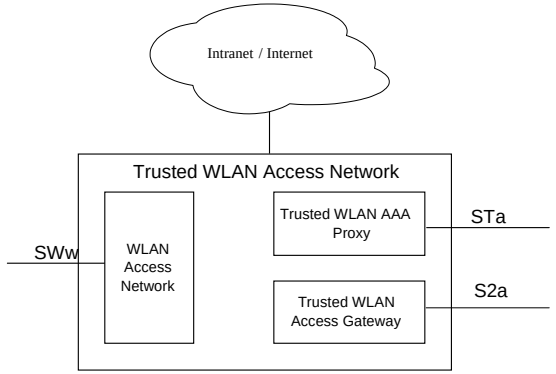


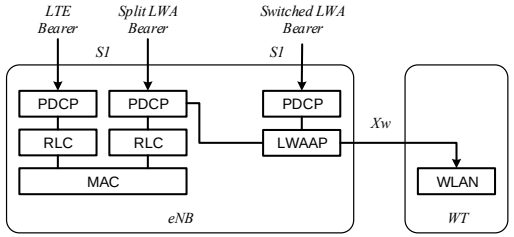


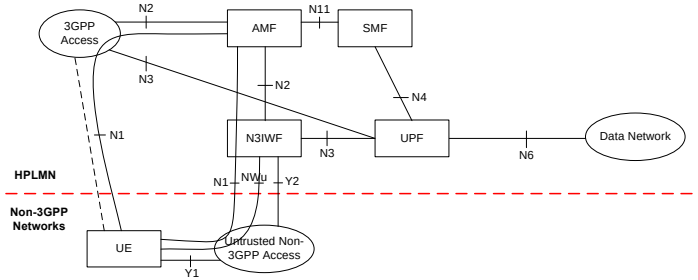


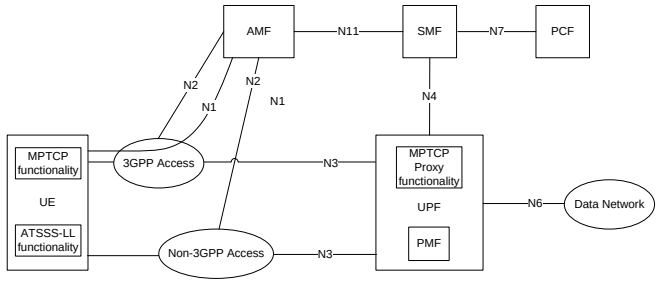






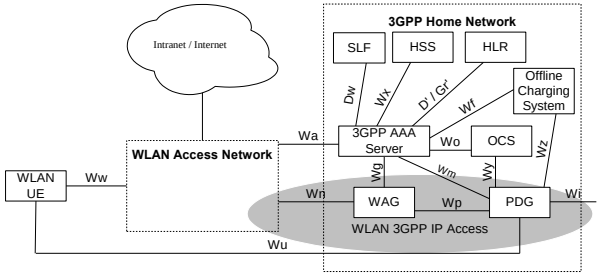


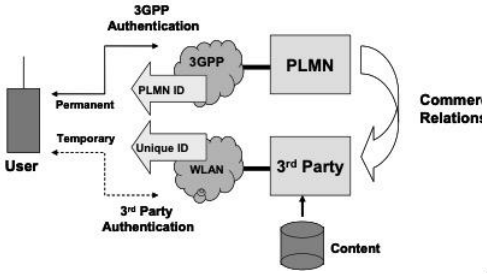


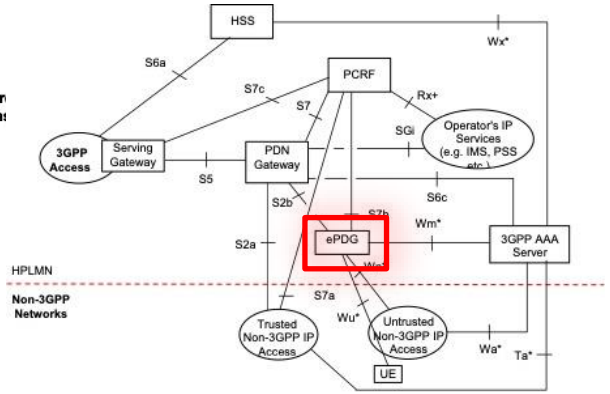


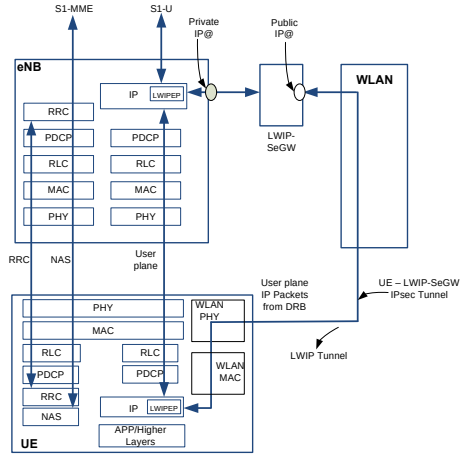
“Simplifying” Tightly Coupled Wi-Fi/Cellular Integration

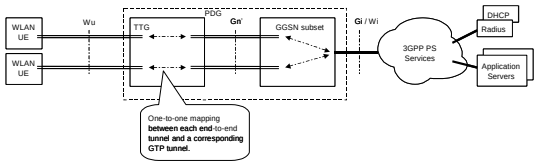
20 years of fragmentation and failures…

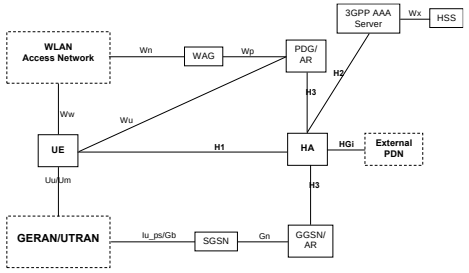


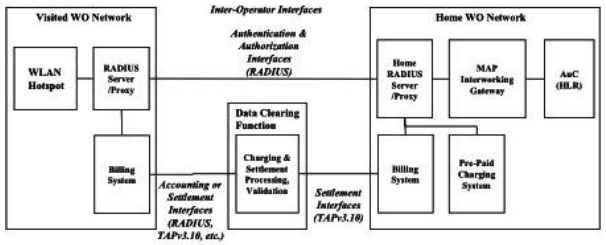


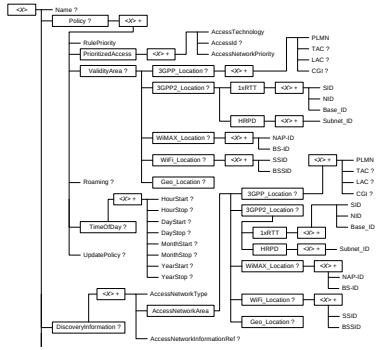


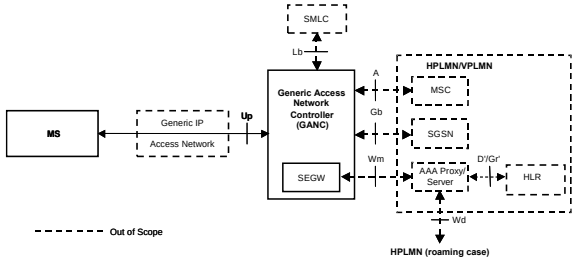


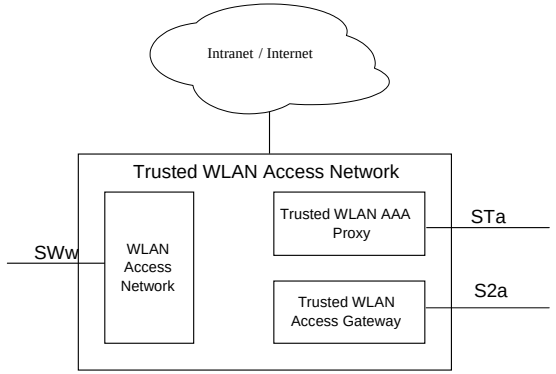


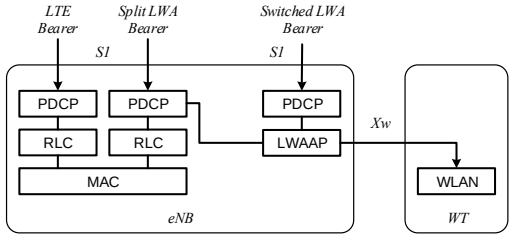


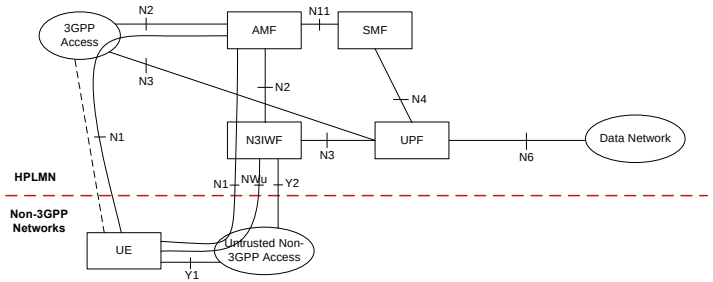


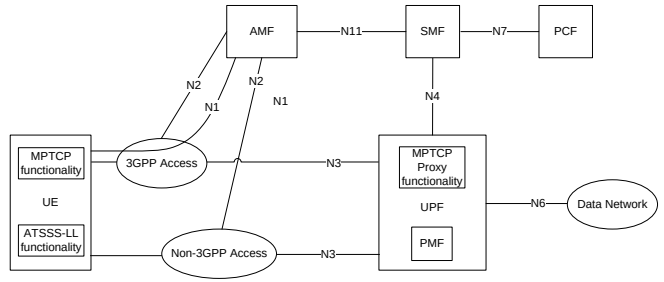






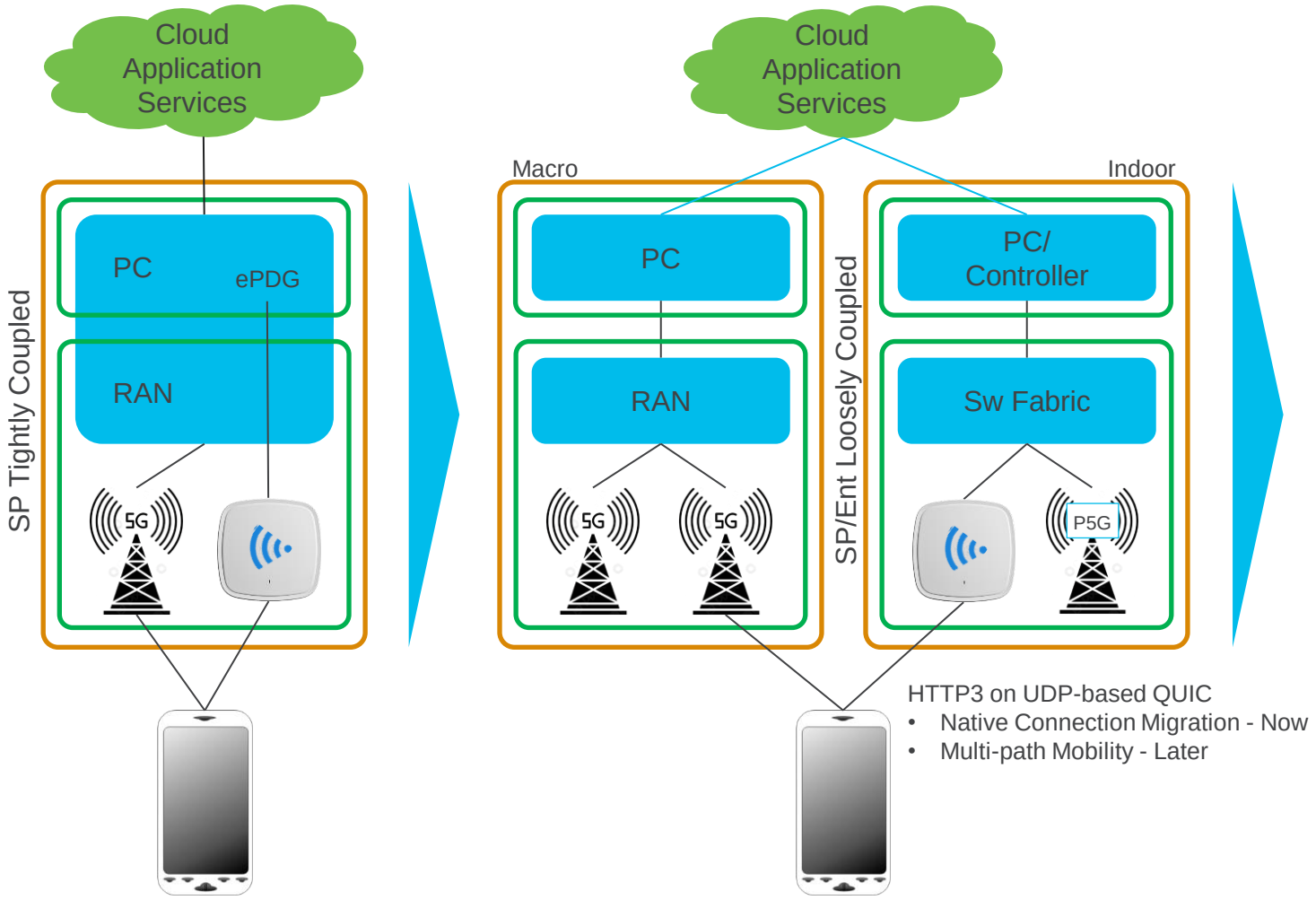






Wireless Roaming as a Service

"Loosely Coupled" Access Model



Loosely Coupled…

- Is the dominant use-case
  - We all live loosely coupled today
  - Doing a portal is loosely coupled
- Enables OTT Application mobility
- Solves the tightly coupled objective
- Requires all paths to be connected

…but… connectivity is a manual* process
…until… OpenRoaming

evolved Packet Data Gateway (ePDG) is used to support Wi-Fi Calling

*manual process – for user and for roaming agreements

Portal Pain

Onboarding is top pain point for IT

- The Good…
  - Can collect user information
  - Can advertise/monetize
  - T&Cs Acceptance
  - Billing Interface
- The Bad…
  - Don’t work consistently across device platforms
  - Can “black-hole” your data
  - Users hate portals - #1 complaint from guest users
- The Ugly…
  - Breaks loosely-coupled seamless mobility
  - Users don’t connect to your network – poor attach
  - Users turn off Wi-Fi

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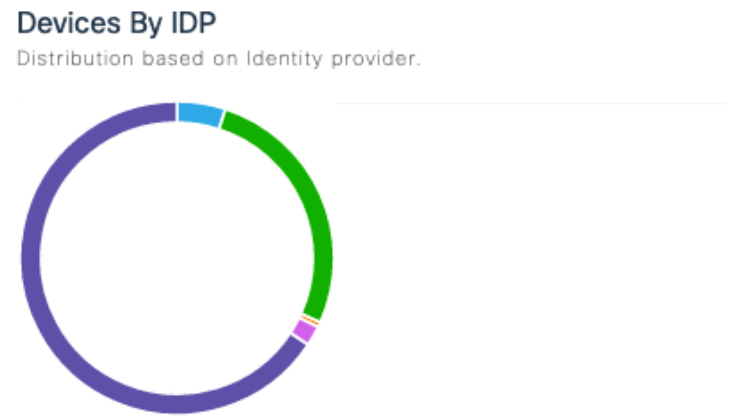
Information Classification: General

OpenRoaming: We must attach!

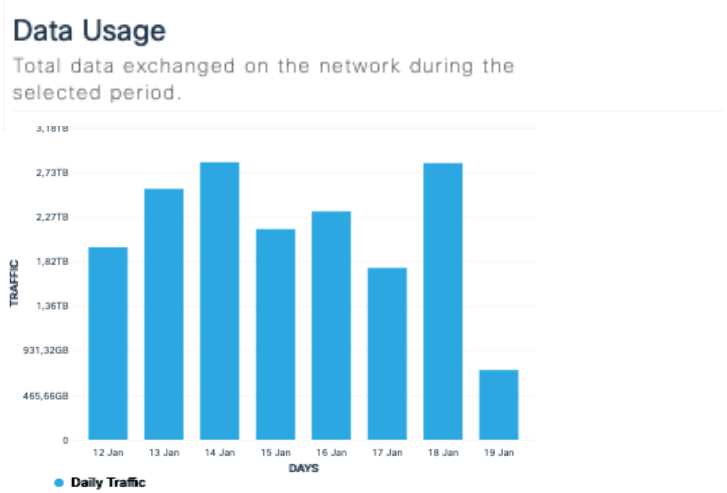
Enables new convergence models between Enterprise and SP (e.g. indoor coverage)

Healthcare Example: indoor coverage issues solved

SP's and Cloud IDP's



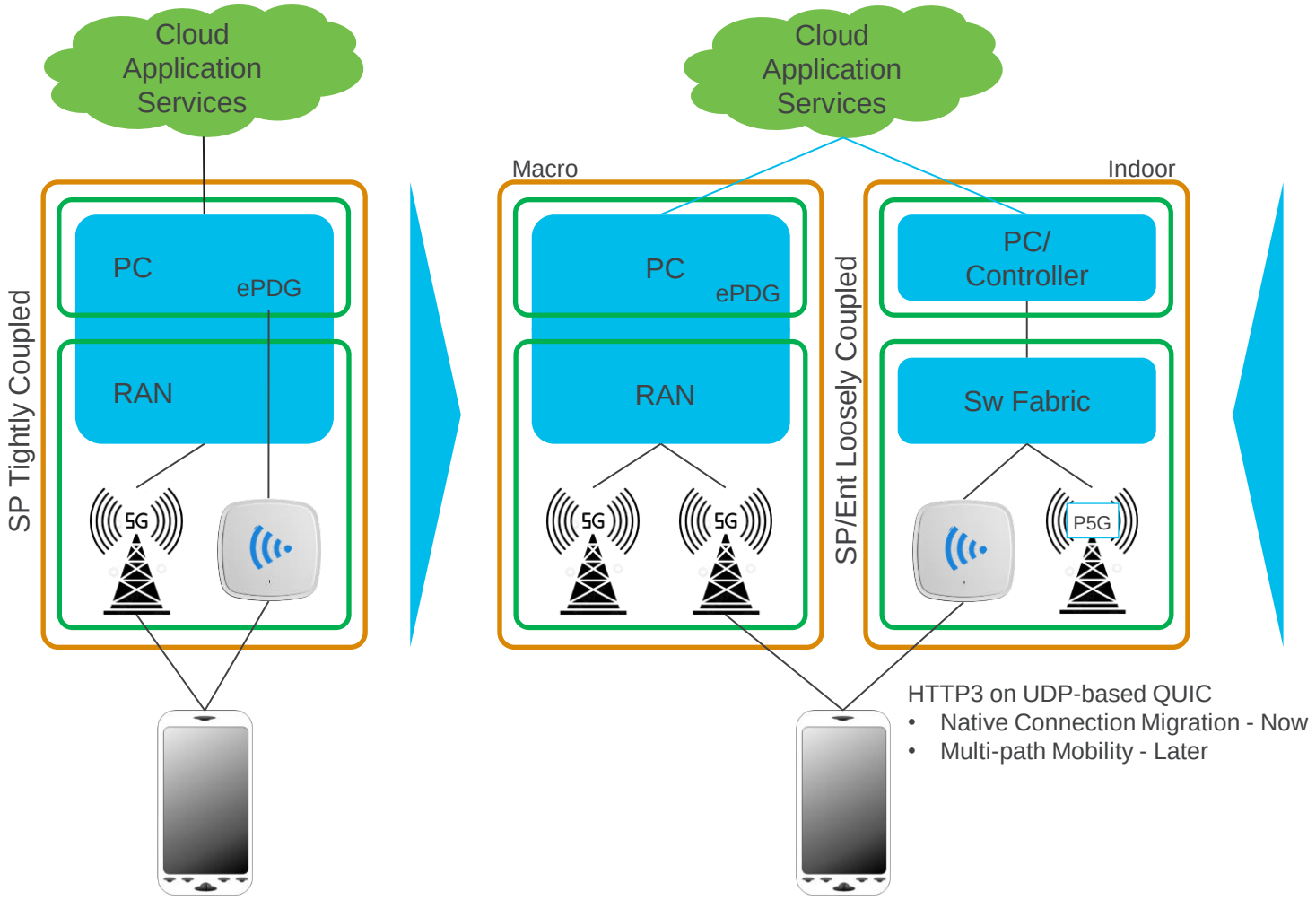
High Usage



Customers Say…

- Happy visitors and patients
- Some users do not notice they are on Wi-Fi, but they notice good data / voice
- Reduced visitor coverage complaints
- Clinical staff can focus on core tasks instead of getting people connected
- Lower burden on IT staff
- Fast and cost-effective indoor coverage

Loosely-Coupled Wins



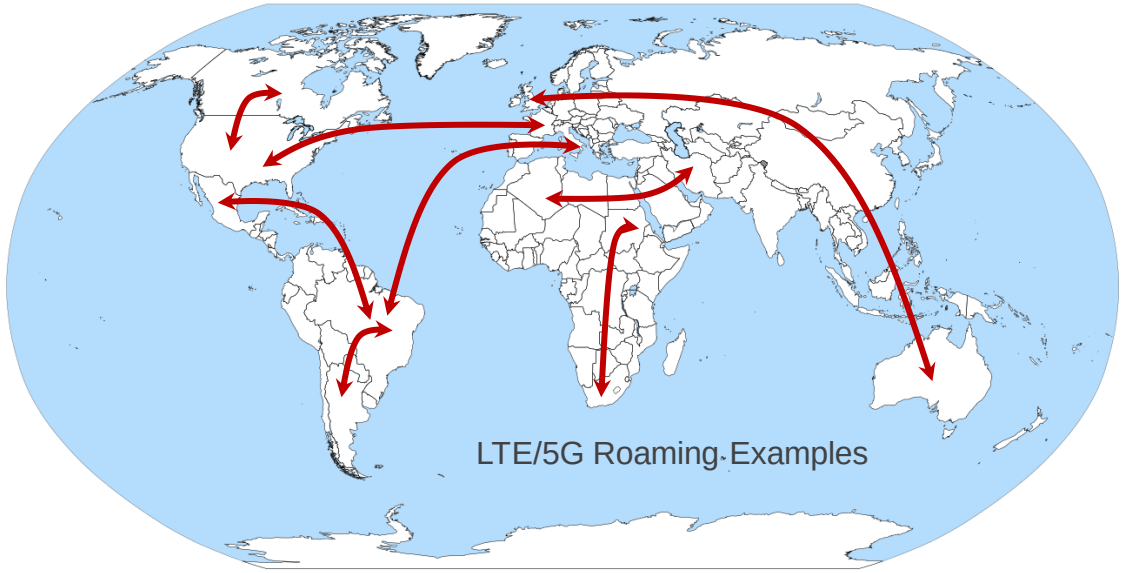
Loosely Coupled with OpenRoaming:

- Access Networks can have different owners
- Access Networks can use different identities
- Users gain access to all spectrum
- Device-based path selection (with some user control – Wi-Fi Assist) is solved*
- Roaming represents business relationships
  - OpenRoaming enables easy business
  - Enables new monetization capabilities
- Scales – enables distributed and centralized access convergence

*solved – QUIC Native Connection Migration

Seamless Mobility

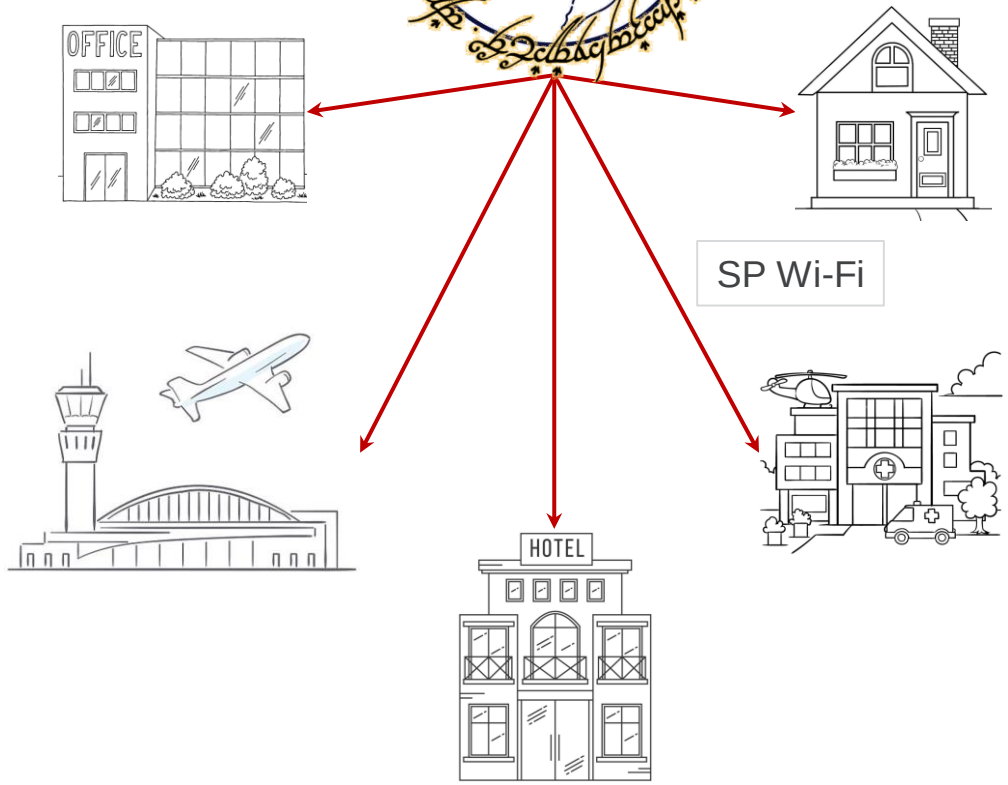
Homogeneous vs Heterogeneous



- Homogeneous Roaming (5G to 5G)
- Relatively small number of access networks <700

One ring to rule them all…
One ring to bind them…

"My Precious" – Gollum
(3GPP)



- Heterogeneous Roaming (multi-access, multi-identity)
- 5G is ubiquitous, hotspots for capacity & penetration
- Very large number of access networks >600,000,000

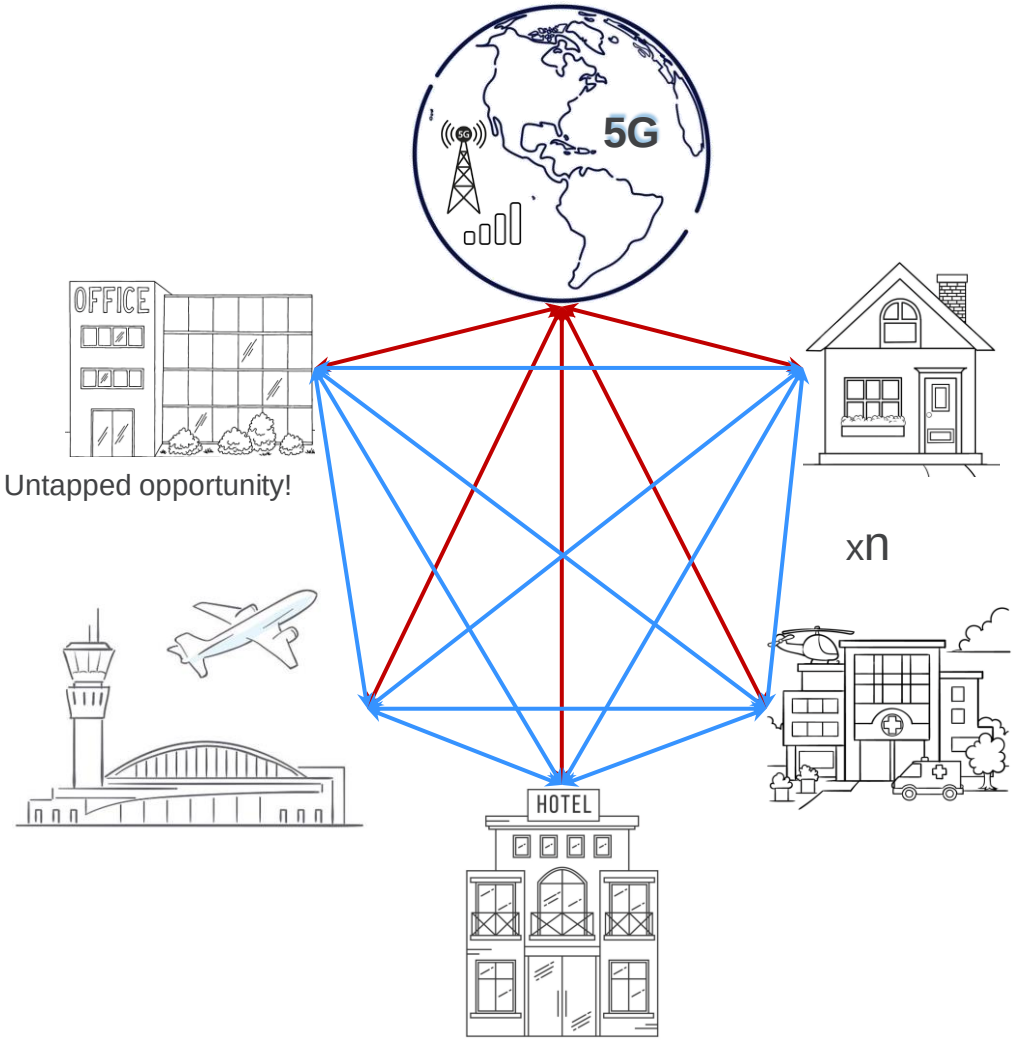
Federating Roaming

Crossing the homogeneous identity divide

- Why a Federation?
  - Scale
    - >600M wireless access roaming partners
      - Multi-Access (Wi-Fi, 5G, …)
      - Multi-Identity (MNO, MSO, ISP, Public, Loyalty, Social, Cloud)
    - Distribute network onboarding function
  - Easy
    - Standard T&C's
    - Goes up and down market
    - Simple network connection to federation
  - New Business Models
    - New monetization opportunities
    - Why just do B2C billing when you can do B2C and B2B?

Would enterprise pay for enterprise-class productivity while roaming?
They already do!

Would enterprise allow roaming onto their guest network?
They already do! (usually manually)



Cisco Example:
- 6% connections to Wi-Fi is guest
- Access is 10x over-provisioned
- OpenRoaming increases attach 4x
- Guest consumes 2.4% of Wi-Fi capacity!

What drives all IT decisions for enterprise networking?
Increased Productivity

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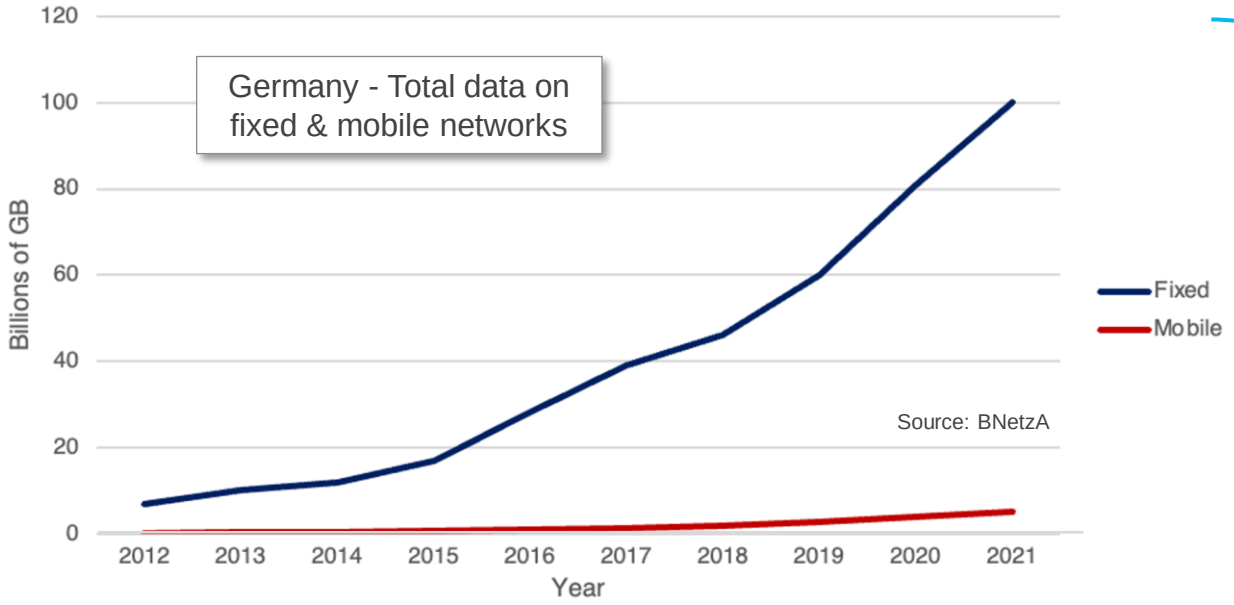
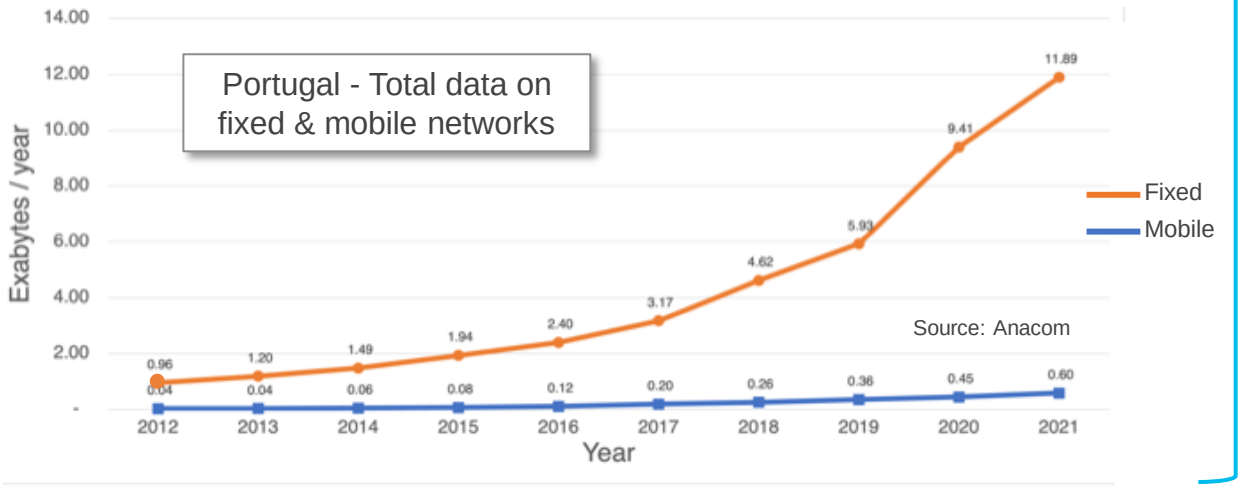
Meeting Digitization Demand

Maximizing Spectrum Capacity – cost effectively

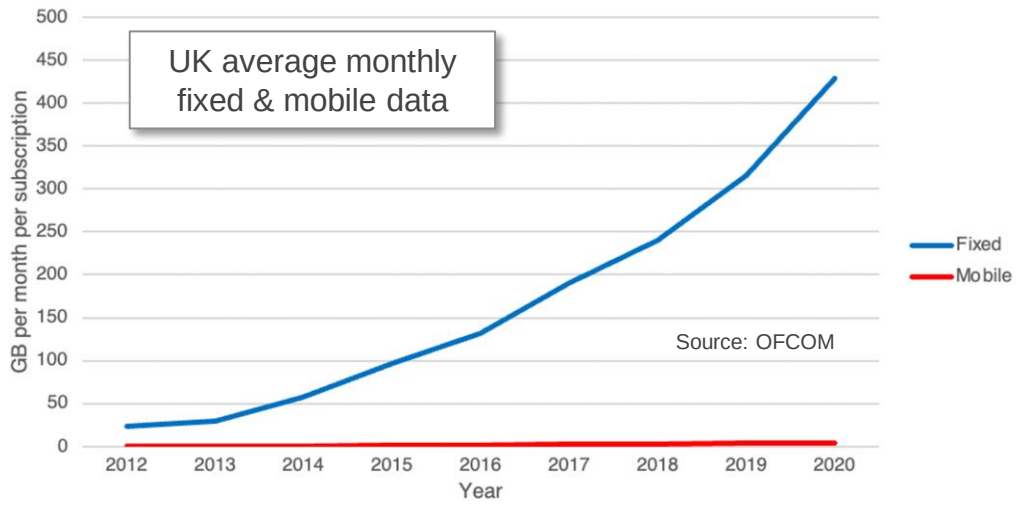




Country Consumption

Wi-Fi relays 92.3% of the overall fixed broadband traffic in Europe

Subscriber Consumption

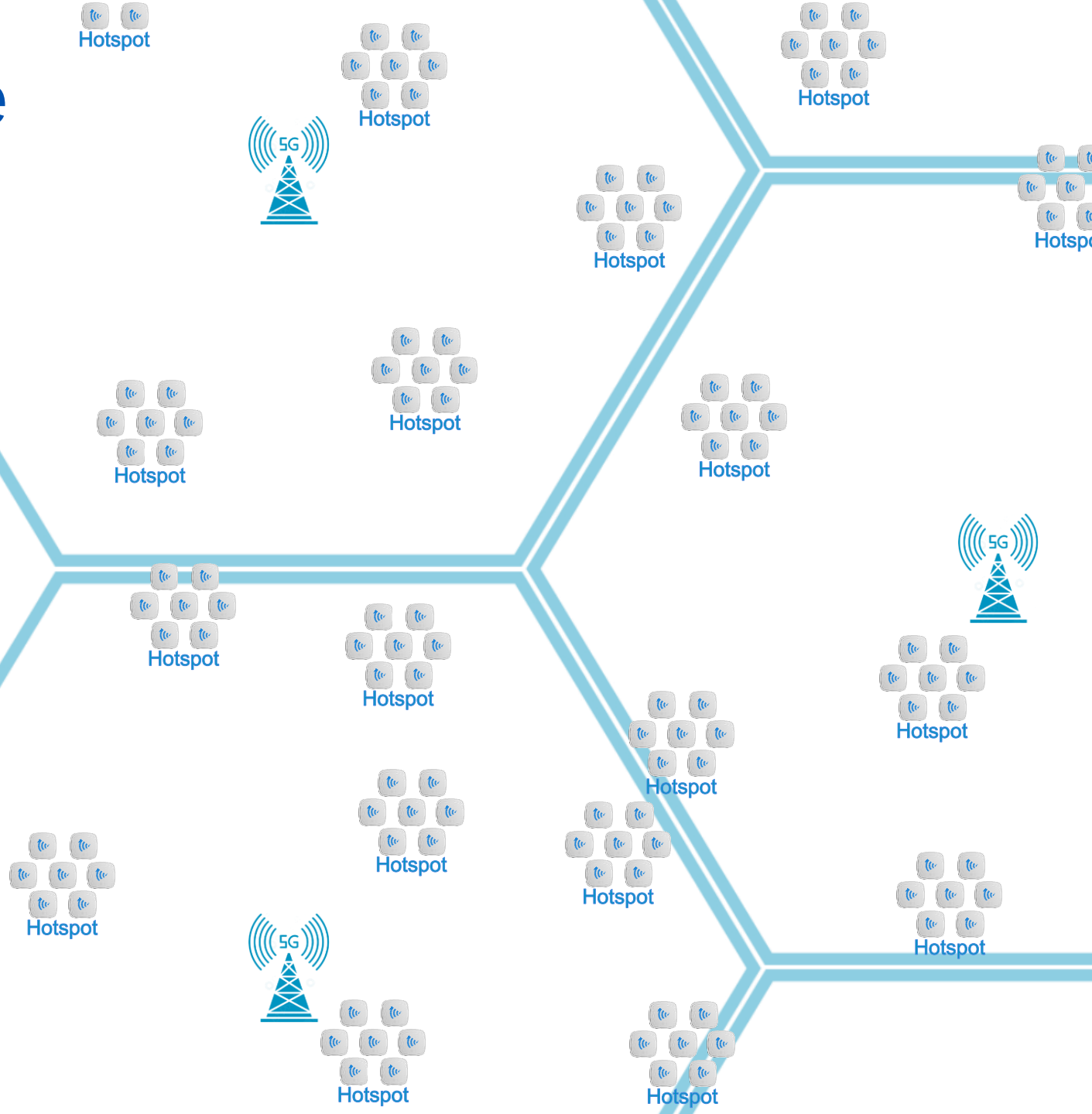


Wi-Fi as a cost-effective densification strategy

It already is!

- Wireless Capacity is solved by –
  - Improving L1
    - modulation, coding, power, beamforming, interference mitigation – incremental gain, replacing network and devices is expensive
  - Adding spectrum – high gain, but hard to get
  - AP/Cell Densification – high gain, but expensive
- Leverage All Investment
  - $B's in investment in Wi-Fi hotspots deployments
    - adds spectrum, high re-use, solves densification
  - $B's in investment in Cellular deployments
    - ubiquitous coverage, connects the hotspots

The best service provides access across all loosely coupled networks



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Information Classification: General

OpenRoaming

Connecting Our Digital Future

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The bridge to possible

Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

Dr. Derek Peterson

CTO, Boingo Wireless.

Connecting the Enterprise with 5G & AI

#WGCEMEA | #wifirevolution | #lovewifi

Connecting the Enterprise with 5G & AI

October 2023

Dr. Derek Peterson, Boingo Wireless CTO

boingo wireless

Boingo simplifies complex wireless challenges to connect people, business and things.

20+ Years Pioneering Wireless

LARGEST
DAS Operator
Largest indoor DAS provider in the U.S.

40,500
Small cell nodes

LARGEST
Wi-Fi Operator
Largest operator of airport Wi-Fi networks in the world

1+ MM
Hotspots worldwide

LARGEST
Military Provider
Largest Wi-Fi & Cell Tower provider to US Military bases

2,000+ Buildings

340,000 Beds

FIRST
Commercial DAS Network
to market ('99)

FIRST
Passpoint Network
to market ('14)

FIRST
CBRS Airport Private Network
to market ('18)

FIRST
Wi-Fi 6 Airport Network
to market ('19)

1+ BILLION CUSTOMER REACH/YEAR

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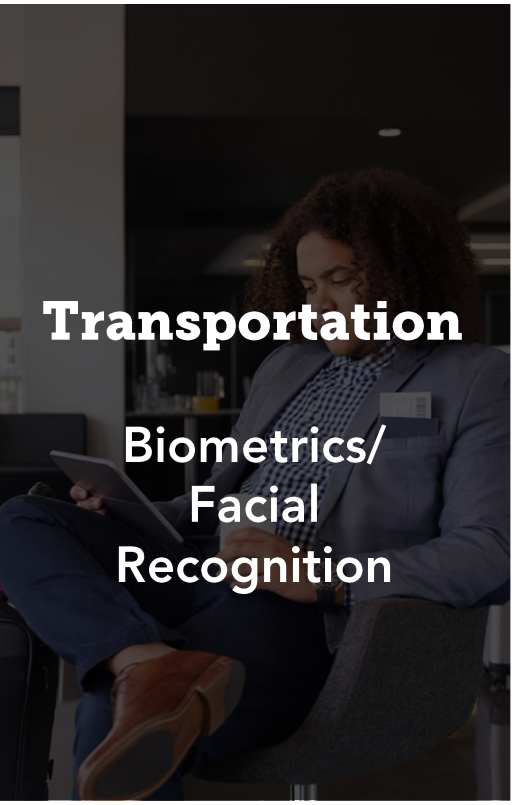
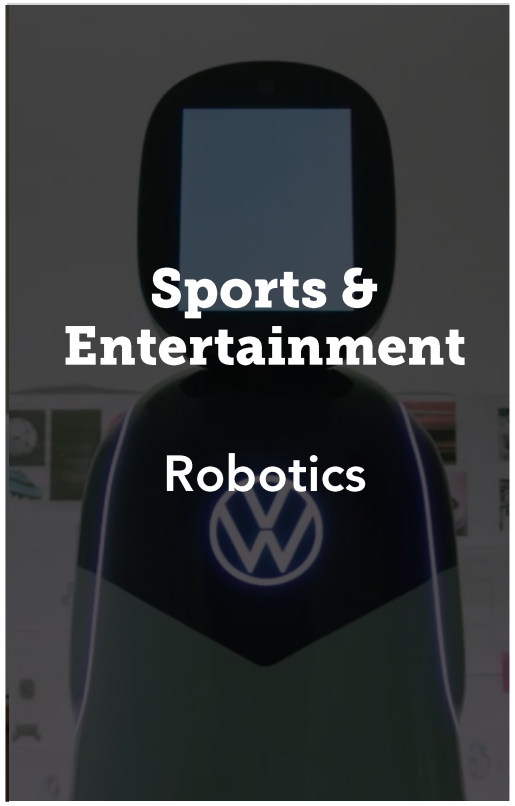
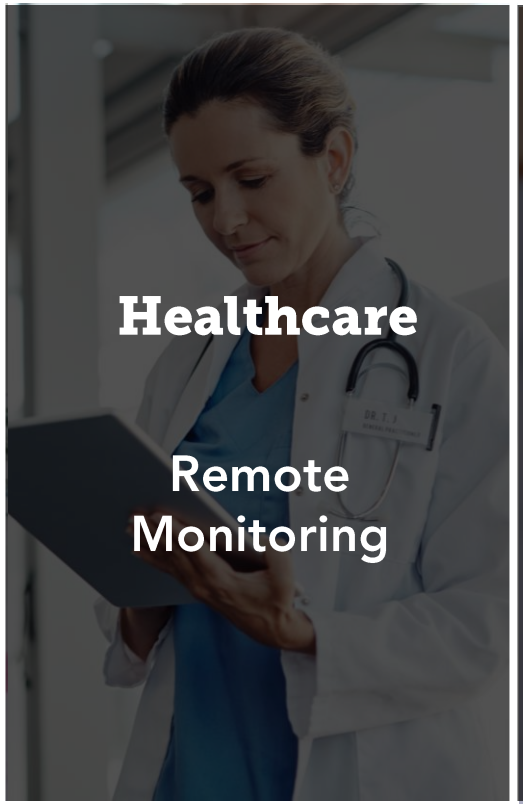
5G is Here







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CONNECTING EVERYTHING

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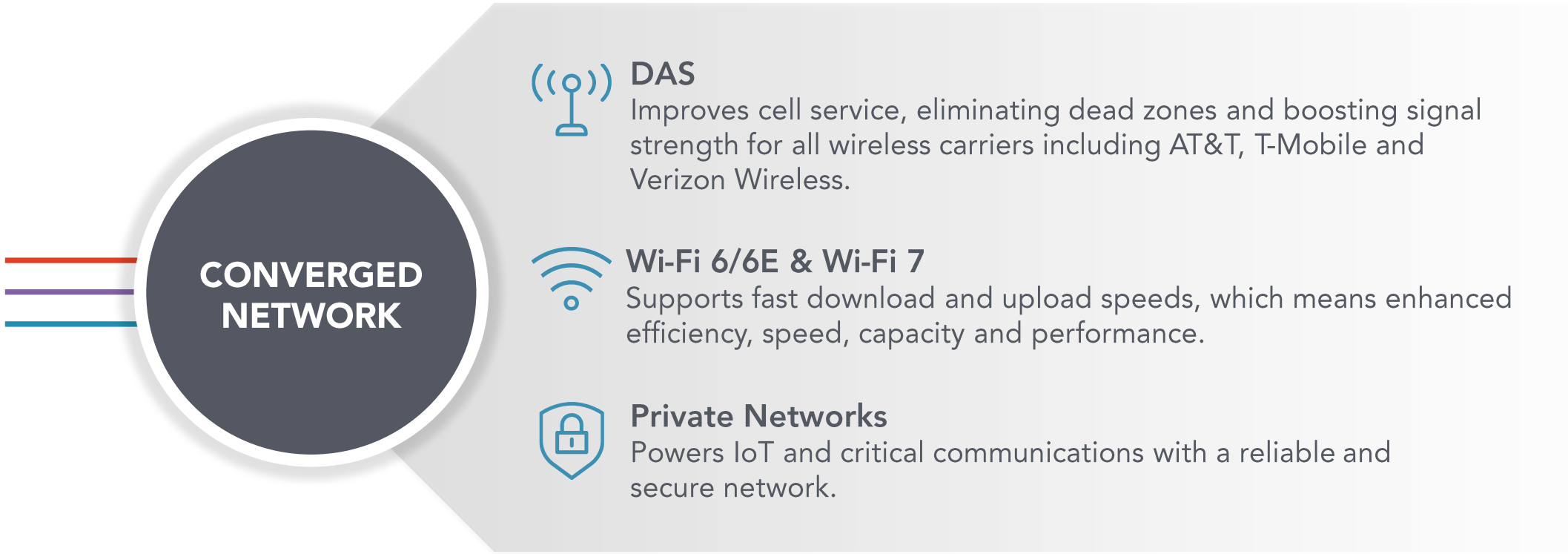
wireless

Converging Cellular & Wi-Fi

Network convergence brings all technologies together under one platform to achieve enterprise-wide connectivity and power connected use cases.



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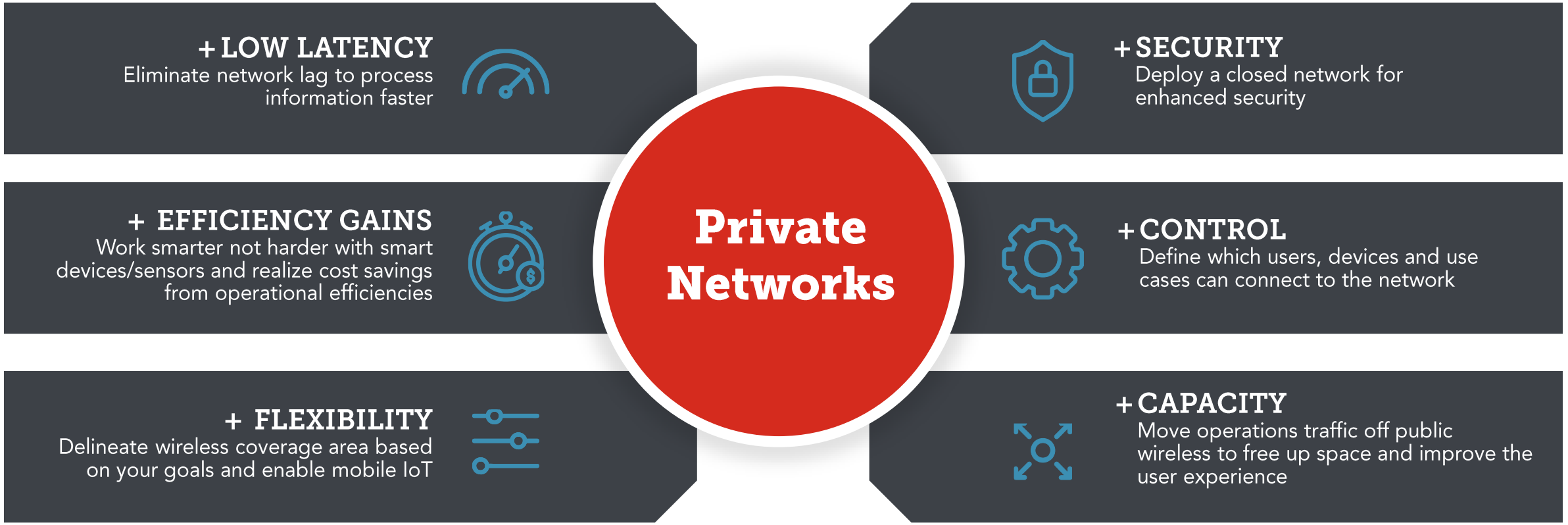
Private 5G

Private cellular solutions power **digital operations, securely connect smart devices and drive operational efficiencies.**



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Newark Airport Terminal A

$2.7 billion, 1+ million square-foot terminal is expected to handle 14 million passengers annually.

CHALLENGES

- Connectivity needed for passengers
- Network for critical operations – bag reconciliation systems, bag scanners, digital signage, staff iPads
- Coverage needed on the tarmac
- Capacity and security to support use cases

SOLUTIONS

- Converged DAS, Wi-Fi 6 and Private LTE networks
- CBRS for dedicated location on the tarmac
- DAS & Wi-Fi for streaming, social media, mobile apps
- Wi-Fi to enable standard IoT devices

OUTCOMES

- Cost and time savings
- Seamless digital journey for enhanced passenger experience
- Scalable network
- Layered cybersecurity platform

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Padres Petco Park

Better Guest Experience. Better Bottom Line.

~30%
Less Wait Time in Line

~50%
Less Line Abandonment

~10%
Increase in Bottom Line

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ADAPTIVE AI

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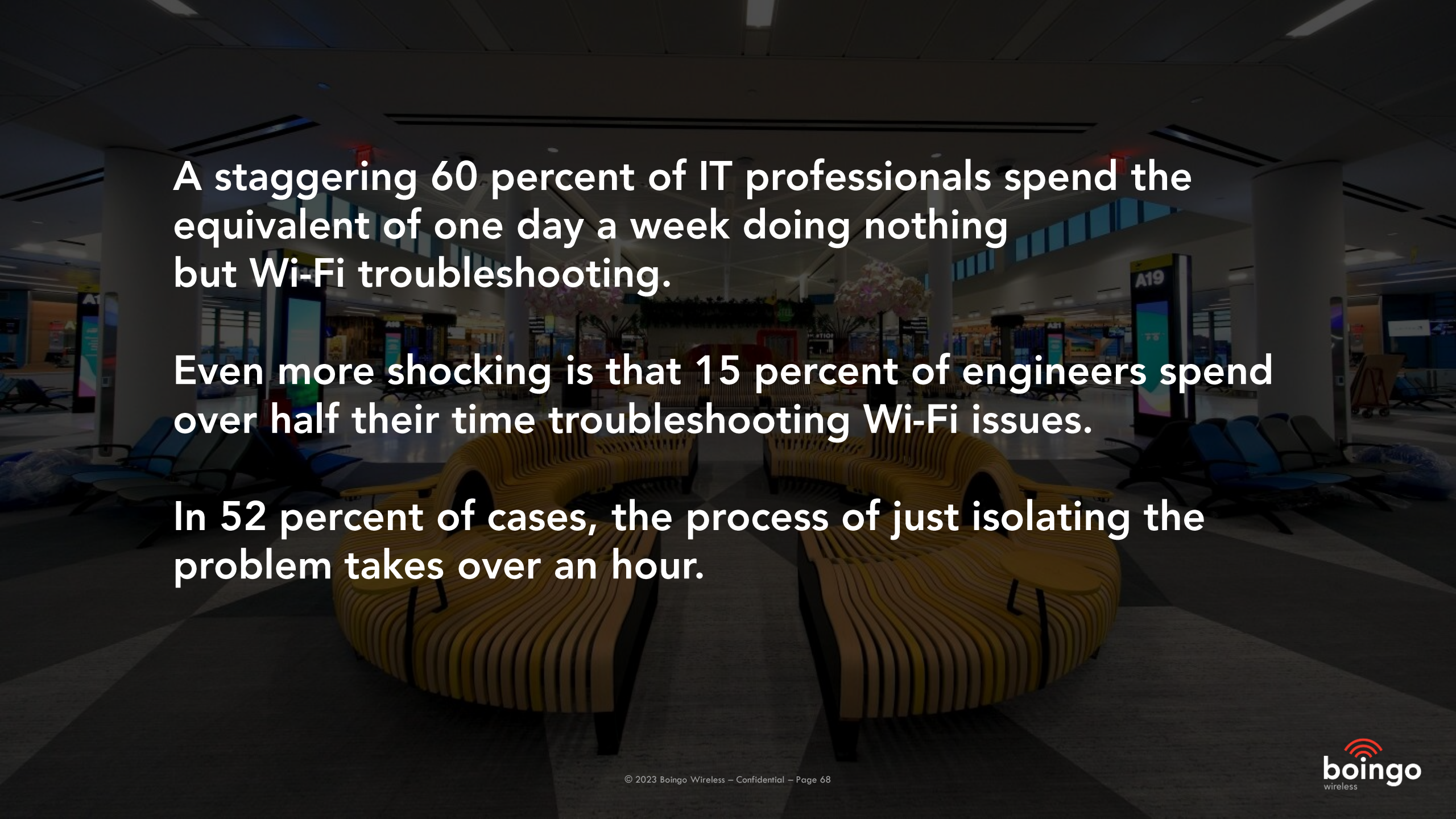

A staggering 60 percent of IT professionals spend the equivalent of one day a week doing nothing but Wi-Fi troubleshooting.

Even more shocking is that 15 percent of engineers spend over half their time troubleshooting Wi-Fi issues.

In 52 percent of cases, the process of just isolating the problem takes over an hour.

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Understanding Quality of Service (QoS)

QoS technology allows the network to automatically prioritize the most important data functions.

- Ensures seamless connectivity for the things that matter most
- Acts as a layer of connectivity insurance for priority items
- Applies only when network demand surpasses a certain threshold
- Addresses bandwidth limitations in dense, congested indoor environments

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Data + AI is a Powerful IT Tool

Leverage data to make IT more effective, proactive and predicative.
The end goal is faster business outcomes and unified tools across all teams.

Speed Up Investigations

Spot trends and pinpoint root causes leveraging metrics and logs

Streamline Monitoring

Visibility to services, apps, physical, virtual, and cloud infrastructure

Analyze System Health

Service insights & event analytics to focus on what's important, not just what's noisy

Act & Increase Productivity

Smart collaboration, orchestration and automation

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Securing Digital Transformation

Zero trust architecture and comprehensive data privacy practices.

Security Policies
Strictly implemented and reviewed annually.

24/7/365 Monitoring
Sophisticated technologies give network operations team critical insights should rapid response to a compromised network be required.

Intrusion Prevention and Detection
Systems for intrusion prevention and detection.

Protected Access
Layer 2 encryption for Passpoint connections.

Vulnerability Scans
Network vulnerability scans are performed for network control.

Client Isolation
Blocks attackers and infected devices brought on from Peer to Peer (P2P) networking.

NIST Cybersecurity Framework
Alignment of organizational goals and objectives to NIST cybersecurity framework with quarterly tier evaluation.

Security Awareness Education
Practice safe cyber habits and employ mandatory cybersecurity training.

Firewall Protection
Enterprise firewalls placed internally and externally at ingress/egress points.

Risk Management
Endpoint protection software and security patches are installed on all data processing servers and computer workstations and are automatically updated.

Critical Systems Encryption
All confidential data is encrypted.

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Download Boingo's eBooks for IT pros

HEALTHCARE

AIRPORTS

SPORTS & ENTERTAINMENT

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Thank You

Let's connect

Dr. Derek Peterson
Boingo Wireless CTO
dpeterson@boingo.com

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Wireless Broadband Alliance

NETWORK X

WGC EMEA

COFFEE BREAK & NETWORKING
BE BACK IN 30 MINUTES AT
11.05 AM CET

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NETWORK X

Dean Bubley

Founder – Disruptive Analysis

Session Moderator

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NETWORKX

WGC EMEA Speakers

Maria Cuevas
Networks Research Director
BT

Stephen McCann
IEEE 802.11 Working Group
Secretary
IEEE

Chetan Hebbalae
VP of Products & Network Technology
Kyrio

Jason Lauer
VP of Engineering & Operations
Kyrio.

Mark Henry
Director of Network &
Spectrum Strategy
BT

Andy Gowans
Spectrum Regulatory Policy
Team Leader
Cisco

Detlef Fuehrer
Senior Manager, Spectrum Mgt
& Regulatory Affairs
HPE Aruba

Ted Kaplan
CEO
RKF Engineering Solutions

Time	Presentation
11:05 AM (CET)	**Role of Wi-Fi in 6G** Maria Cuevas, Networks Research Director, BT
11:25 AM (CET)	**Wi-Fi 7 - When Will It Be a Commercial Reality - Future of Wi-Fi Standards** Stephen McCann, IEEE 802.11 Working Group Secretary, IEEE.
11:45 AM (CET)	**Powering Convergence NOW!** Chetan Hebbalae, VP of Products & Network Technology, Kyrio; Jason Lauer, VP of Engineering & Operations, Kyrio.
12:10 PM (CET)	**Panel: Spectrum and Use Cases of 6 Ghz Wi-Fi** Mark Henry, Director of Network & Spectrum Strategy, BT; Andy Gowans, Spectrum Regulatory Policy Team Leader, Cisco; Detlef Fuehrer, Senior Manager, Spectrum Mgt & Regulatory Affairs, HPE Aruba; Ted Kaplan, CEO, RKF Engineering Solutions.
1:00 PM (CET)	**NETWORKING LUNCH**

Wireless Global Congress
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NETWORK X

Maria Cuevas

Network Research Director, BT.

Role of Wi-Fi In 6G

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The role of Wi-Fi in 6G

Maria Cuevas

Networks Research Director

25/10/2023

BT Group

Agenda

- ❑ The beginning of the journey towards 6G
  - ✓ Next Generation Mobile Networks Alliance
  - ✓ UK 6G foundational projects
  - ✓ UK National Wireless Strategy
- ❑ Network of Networks
- ❑ Lesson from the past and messages for the future

The beginning of the journey towards 6G

surprise and wonder → mobile voice for the mass market → expectation: voice, text, internet → dependency for everyday life → wireless connectivity is essential

1G TACS → 2G GSM → 3G UMTS → 4G LTE → 5G

10-year lifecycles

- Research - standards - product development
- Semiconductor evolution
- Spectrum availability and allocation

NGMN

6G Position Statement
An Operator View
–
v1.0
www.ngmn.org

NGMN, established in 2006, is a global, operator-led alliance of over 80 companies and organisation spanning operators, manufacturers, consultancies and academia.

NGMN_6G_Position_Statement.pdf

New Services and innovation

- ★ New features
- Network APIs
- ★ Seamless integration with satellite and fixed

Operational priorities

- ★ Network Simplification
- ★ Energy reduction
- Automated operations
- Proactive management for user experience
- Quantum-safe

Guiding Principles

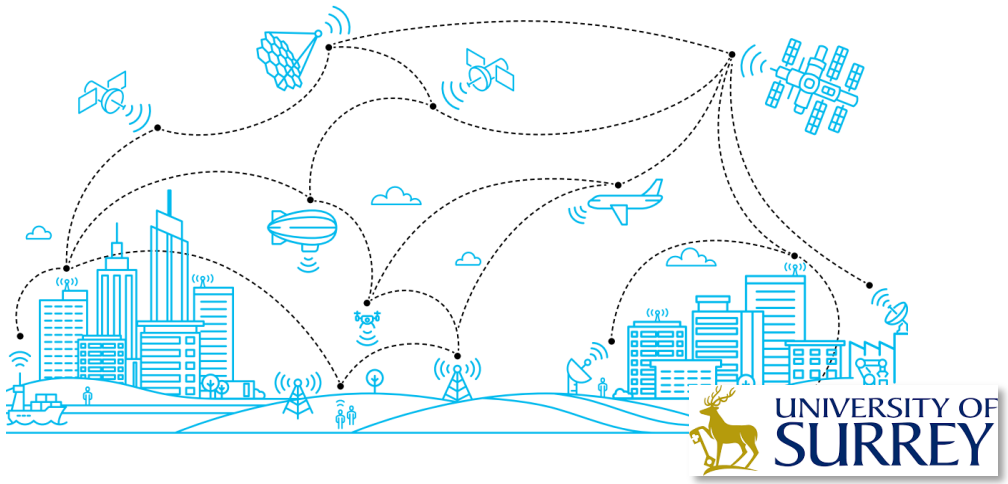
- Global harmonization
- No hardware upgrade
- Software upgrades
- No degradation to 5G
- No service impact
- ★ Customer needs across mobile, fixed and NTNs
- ★ Backward compatibility
- Robust security by design

Spectrum

- Sub 7GHz remain essential for coverage
- 6-15 GHz licensed for IMT-2020 and beyond
- Sub-THz bands may adopt a new IMT-20230 radio technology

★ Wi-Fi has a role to play

Surrey secures £12m research grant to make future telecommunications network greener, more resilient and ubiquitous



TUDOR (Towards Ubiquitous 3D Open Resilient Networks)

5/6GIC The University of Surrey
Amazon Web Services (AWS)
AWTG
BAE Systems (BAE)
British Telecom (BT)
Ericsson
InterDigital Europe (IDE)
Mavenir
Nokia
OneWeb (OW)
Tactical Wireless
Toshiba
Viavi Solutions
VirginMedia O2 (VMO2)
National Physical Laboratory
Satellite Catapult (SatApps)
Imperial College London (IC)
King's College London (KCL)
Lancaster University (LU)
Queen's University Belfast (QUB)
Strathclyde University (SU)
University College London (UCL)
University of Glasgow (UoG)
AMD
Qualcomm

REASON (Realising Enabling Architectures and Solutions for Open Networks)

University of Bristol
University of Strathclyde
King's College London
Queens University Belfast
University of Southampton
Compound Semiconductor Centre-CSC
Digital Catapult
British Telecom-BT
British Broadcasting Corporation-BBC
Ericsson
Nokia
Samsung
Parallel Wireless Limited
Thales UK
Weaver Labs Limited
Real Wireless Limited

University of Bristol-led consortium to receive nearly £12 million to unlock 6G technology potential

Policy paper

UK Wireless Infrastructure Strategy

Published 11 April 2023

Department for Science, Innovation, & Technology

Network of Networks

Local and private networks built by a wider range of entities: Increasingly, wireless networks are being deployed for local and private needs, with denser networks of cells both indoors and outdoors, deployed by shared infrastructure companies (neutral hosts) and by enterprises for their own needs. 6G should be designed from the onset to fully reflect these new usage and deployment scenarios.

Integrated, converged networks: There are several dimensions in which 6G could bring together previously separate technologies and deployment styles:

- **non-terrestrial networks**: Networks increasingly use a combination of terrestrial infrastructure with non-terrestrial network segments, including satellites, airborne base stations on unmanned aerial vehicles (‘drones’) and high altitude platforms (balloons), plus base stations on moving platforms such as trains, buses and ships
- **cellular and short-range technologies**: In the past, mobile **cellular** technologies and short-range technologies such as **Wi-Fi** developed on predominantly separate paths. The expanded range of applications for wireless technology however suggests an even greater role for converged integration and interworking between these technologies than we are seeing today
- **incorporate local area and indoor applications**: The use of spectrum such as sub-terahertz and millimetre wave, as well as applications such as sensing, suggest that 6G should explicitly take greater account of local area and indoor applications, some of which may not even be connected to a wider network.

6G should natively support all of these use cases with full integration to maximise the options for **cost-efficient deployment** and to extend the reach of networks to all environments. It should allow different **network segments** – terrestrial, satellite, **indoor**, licensed, **unlicensed**, public and private – to be **interconnected seamlessly and securely**.

Key benefits of a Network of Networks

A BT perspective

Reliable service, where customers need it, when they need it

Always best-connected seamless user experience

Efficient traffic delivery (including energy consumption)

Net zero

We've pledged to become a net zero business by the end of March 2031 and we're targeting net zero for our supply chain and customer emissions by the end of March 2041.

Enable new business models and overall industry growth

New network-as-a-service enables customers to boost performance, cost, security and sustainability

Lessons learnt and key messages

Industry **fragmentation** can lead to silo innovation, sub-optimal industry economics, and **customer confusion**.

Opportunity for **disruptive** technology providers being **solution-driven** and not technology-led.

End to end solutions, including **device** support are key – also beyond smartphones !

Industry solutions must be a **win-win** for all parts of the ecosystem – open device architectures welcome !

Efficient delivery of traffic is key to a sustainable future.

Our industry needs **both** continuous efficiency improvements as well as growth

New feature deployment must be **business case-driven** via software updates (ideally across multiple technologies).

Open architectures, automation, Network APIs and multi-access solutions are key enablers to **business model innovation** as fuel for growth

Thank you

Maria Cuevas

Networks Research Director

25/10/2023

BT Group

Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

Stephen McCann

Work Group Chair - 802.11, IEEE.

Wi-Fi 7 - When Will It Be a Commercial Reality - Future of Wi-Fi Standards

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Wi-Fi 7 - When will it be a commercial reality

(+ IEEE 802.11: Future of Wi-Fi Standards)

2023 October

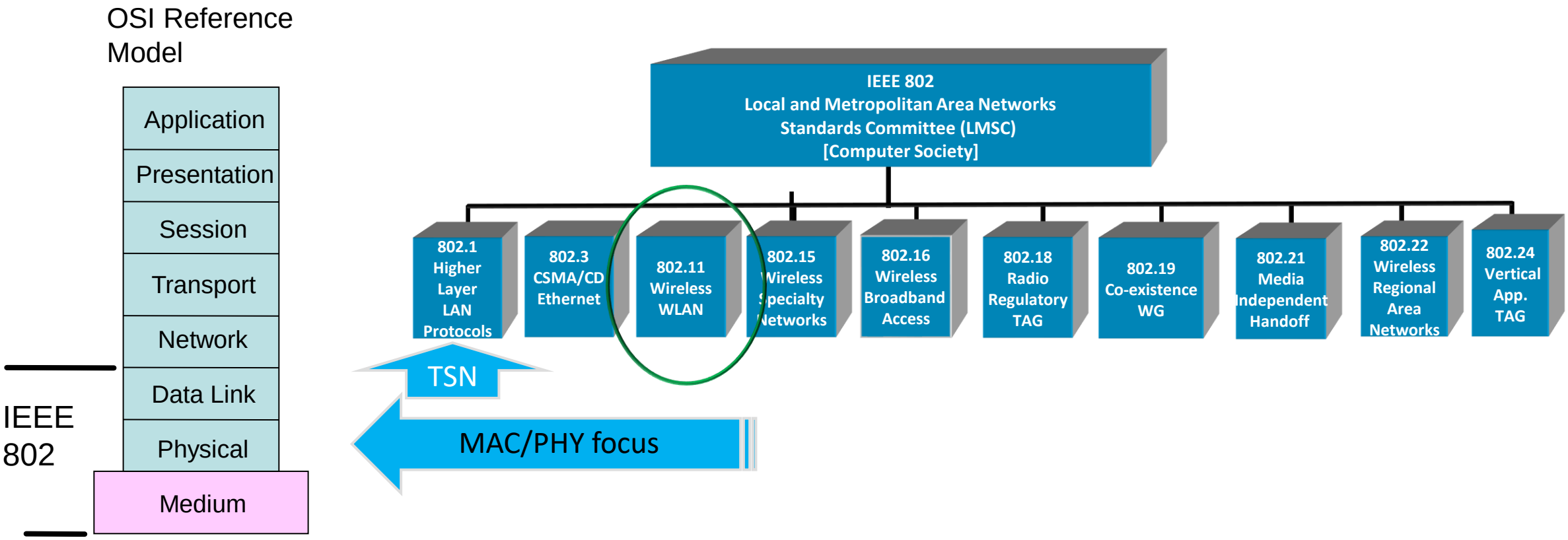
Stephen McCann, IEEE 802.11 Working Group Secretary

Wireless Broadband Alliance

“At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.” IEEE-SA Standards Board Operation Manual (subclause 5.9.3)

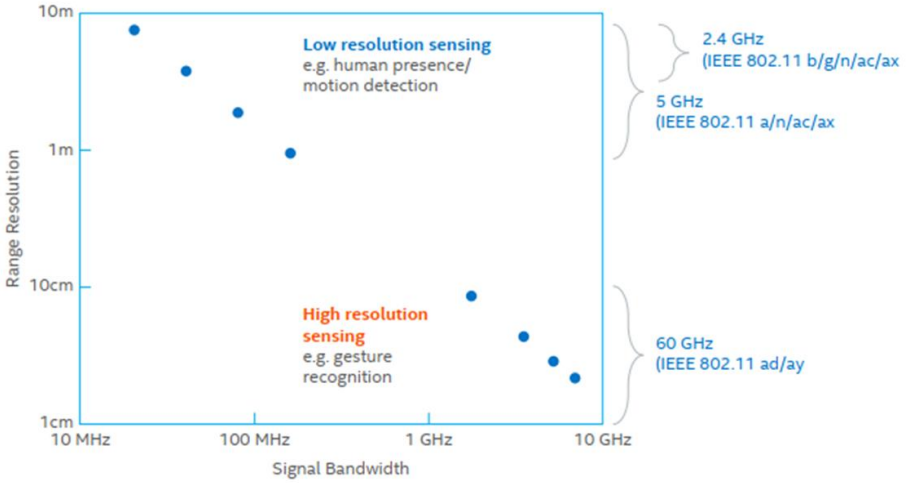
IEEE 802 LAN/MAN Standards Committee standard development covers both Wireless & Wired Media

- Focus on **link and physical layers** of the network stack
- Leverage IETF protocols for upper layers



New 802.11 Radio technologies are under development to meet expanding market needs and leverage new technologies

- 802.11bb – Light Communications (2023)
- 802.11bc – Enhanced Broadcast Service (2023)
- 802.11bd – Enhancements for Next Generation V2X (2022)
- 802.11be – Extremely High Throughput in 2.4, 5 and 6 GHz bands **– Wi-Fi 7**
- 802.11bf – WLAN Sensing
- 802.11bh – Randomized MAC Addresses
- 802.11bi – Enhanced Data Privacy
- 802.11bk – 320 MHz Ranging
- 802.11bn – Ultra High Reliability **– Wi-Fi 8**



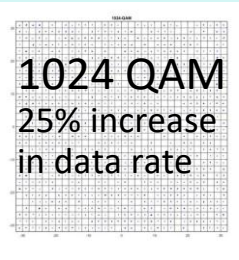
IEEE 802.11 Wi-Fi standard evolution

802.11n (2009) Wi-Fi 4	802.11ac (2013) Wi-Fi 5	802.11ax (2021) Wi-Fi 6, 6E	802.11be (est. Q4 2024) Wi-Fi 7
• 2.4GHz and 5GHz supported • Wider channels (40MHz) • Modulation (64-QAM) • Additional streams (Up to 4) • Backward compatibility with 11a/b/g • Standard supports up to 600Mbps	• 5GHz only • Wider channels (80, 160MHz) • Modulation (256-QAM) • Additional streams (Up to 8, implemented up to 4) • Backward compatibility with 11a/b/g/n • Standard supports up to 7Gbps	• **2.4GHz, 5GHz and 6GHz supported** • Wider channels (80, 160MHz) • Modulation (1024-QAM) • Additional streams (Up to 8, implemented) • Backward compatibility with 11a/b/g/n/ac • Standard supports up to 9.6Gbps	• **2.4GHz, 5GHz and 6GHz supported** • Wider channels (40, 80, 160, 240, **320MHz**) • Higher modulation (**4096-QAM**) • Backward compatibility with 11a/b/g/n/ac/ax • Standard targets throughput minimum of 30Gbps, expect 40Gbps+

(Ratification date) Products available in the market typically ~18 months prior

Products implementing 802.11ax-2021 are in the market now: Wi-Fi 6, 6E
2022: 2.3 Billion Wi-Fi 6 devices, 350 Million Wi-Fi 6E, 4.4Billion devices total

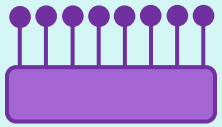
Spectral Efficiency & Area Throughput

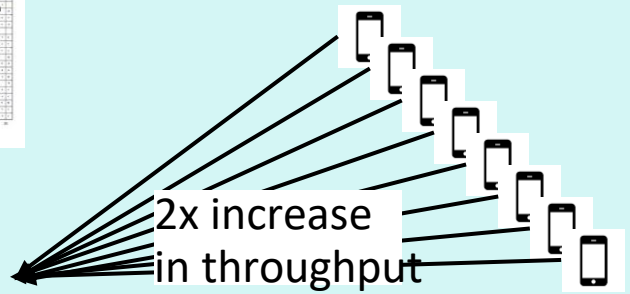


1024 QAM
25% increase
in data rate

DL/UL MU-MIMO
w/ 8 clients

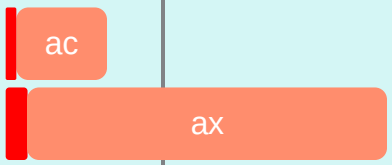
8x8 AP





2x increase
in throughput

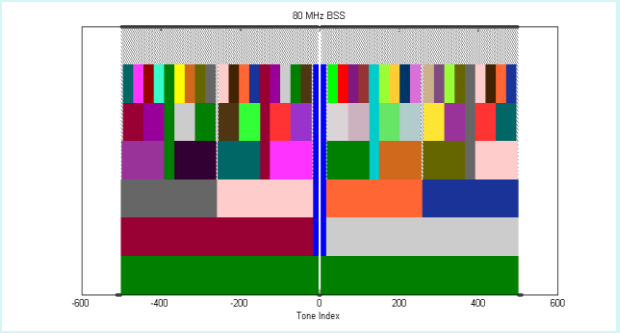
Long OFDM Symbol



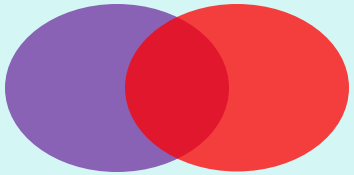
Up to 20%
increase
in data rate

High Density

OFDMA

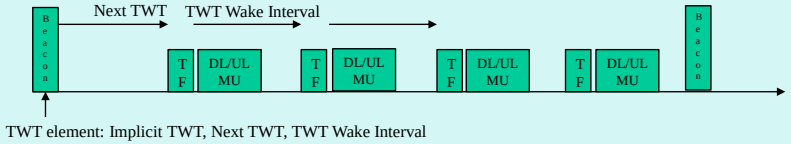


Spatial Reuse



Power Saving

Scheduled sleep and wake times



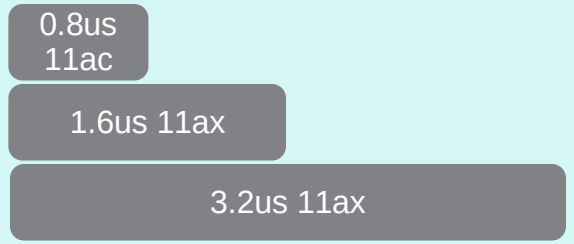
TWT element: Implicit TWT, Next TWT, TWT Wake Interval

20 MHz-only clients

Outdoor / Longer range

Extended range packet structure

Enhanced delay
spread protection-
long guard interval



Wi-Fi 7: Commercial reality

- 2023 Q4 – Initial Infrastructure products
- 2024 Q1 – Initial Devices
- 2024 Q4 – Market builds (802.11be standard ratified)
- 2025 – Commercial Reality ??

802.11be: Supports increased throughput and performance **(Wi-Fi 7)**

Throughput and spectral efficiency

- 320 MHz bandwidth operation
- 8 Spatial Streams and 4096-QAM (Quadrature Amplitude Modulation)
- Multi-Link Operation (MLO)
- Multiple Resource Unit Operation (MRU)
- MIMO protocol enhancements, Enhanced Sounding protocol

Low latency

- Multi-band/multi-channel aggregation and operation (MLO)
- Target Wait Time (TWT) enhancements - crosslink and aligned TWT
- TXOP Sharing
- Stream Classification Service Enhancements
- National Security and Emergency Preparedness (NSEP) priority access operation

Enhancements re: 6 GHz support

- Static Puncturing to avoid pre-defined 20 MHz subchannels, supports efficient, higher bandwidth 6GHz operation
- GCMP-256 support (High performance cipher)

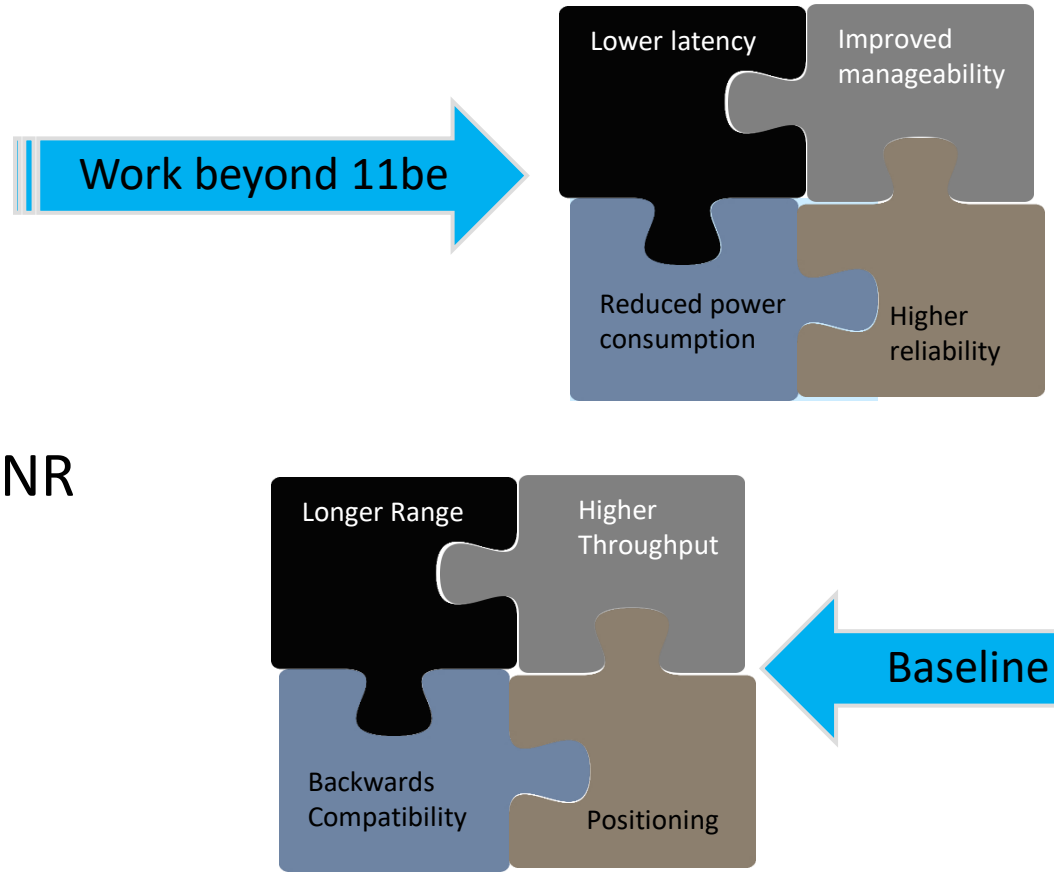
Use Cases:

- Home, enterprise, industrial, IoT
- Outdoor
- AR/VR
- 4K and 8K video streaming
- Remote office
- Cloud computing
- Video calling and conferencing

802.11bn: Ultra High Reliability Task Group to start in November 2023 defining next MAC/PHY project **(Wi-Fi 8)**

The Study Group investigated technology to:

- improve reliability of WLAN connectivity
- reduce latencies
- increase manageability,
- increase throughput including at different SNR levels
- reduce device level power consumption
- reduce packet loss rate



IMMW: Integrated Millimeter Wave

- New study group to meet in November 2023
- Aim is to “specify carrier frequency operation between 42.5 and 71 GHz that leverages the MAC/PHY specifications in the existing Sub 7 GHz bands (including 802.11bn)”
- Re-use 11ac (Wi-Fi 5), 11ax (Wi-Fi 6E), 11be (Wi-Fi 7) and 11bn (Wi-Fi 8) PHY updates in the millimetric bands.

AIML TIG: Investigate WLAN support of Artificial Intelligence/ Machine Learning

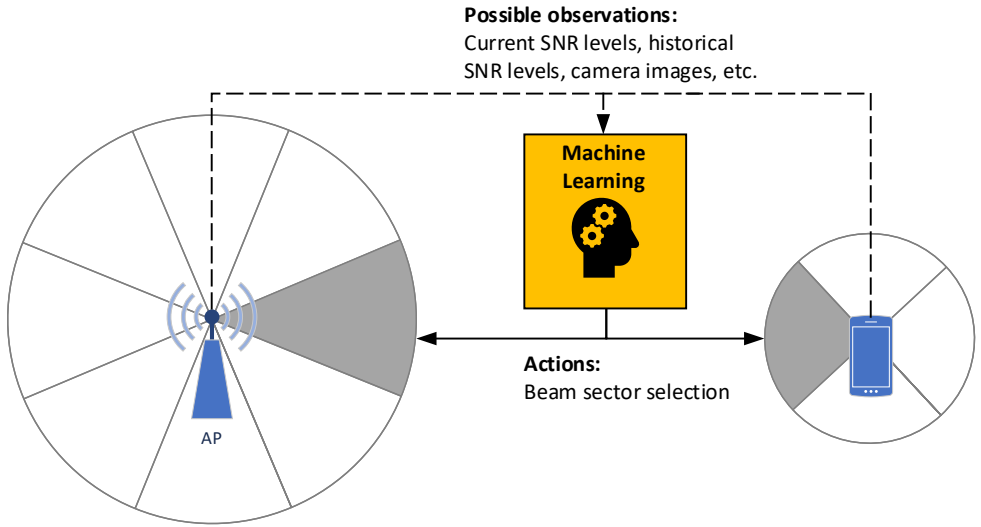
Use of AIML for 802.11 applications is an active area of work in the research community. See Applying ML to 802.11: Current Research and Emerging Use Cases

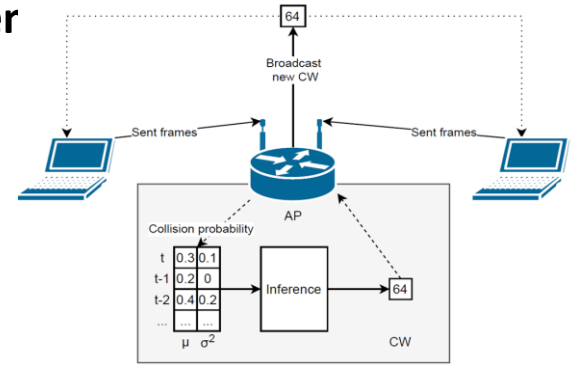
Current applications focus on performance improvement parameter selection for channel access control and link adaptation, multi-user parameters, contention window sizes, channel usage, improved BSS transition

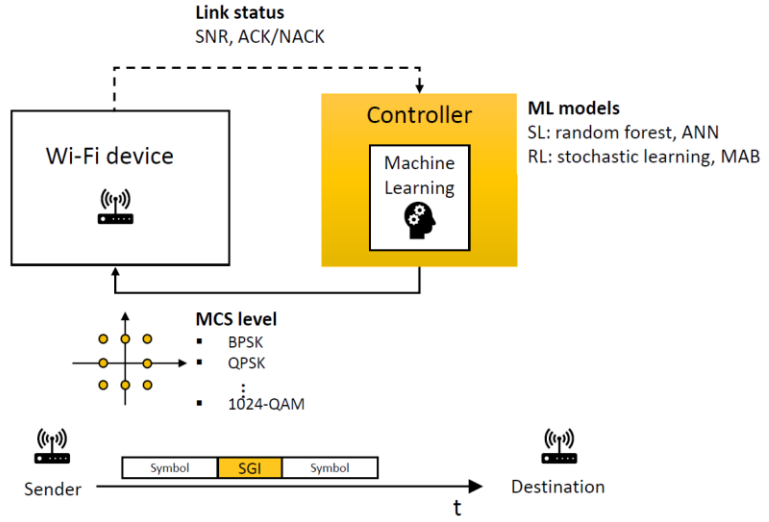
Focus of the 802.11 AIML Topic Interest Group is to

Describe use cases for Artificial Intelligence/Machine Learning (AI/ML) applicability in 802.11 syster

Investigate the technical feasibility of features enabling support of AI/ML.







AMP SG: Investigate WLAN support of Ambient Power

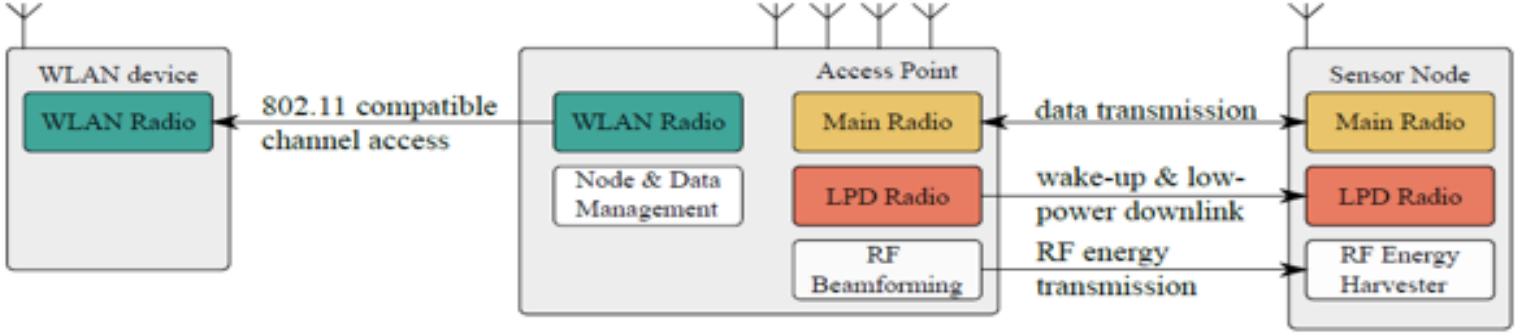
Research into ambient power (energy harvesting) and prototype development has been ongoing using 802.11 based devices

Optimizing M2M Energy Efficiency in IEEE 802.11ah, IEEE GLOBECOM 2015

"the battery dependency of an 802.11ah sensor is significantly lowered by energy harvesting provided that the sensor size and energy harvesting efficiency are sufficient for the utilized ambient energy source."

Low-Power Downlink for the Internet of Things using IEEE 802.11-compliant Wake-Up Receivers, IEEE INFOCOM 2021

Use Cases include Smart Home, Logistics/Warehouse/Inventory, Industrial Wireless Sensor Networks

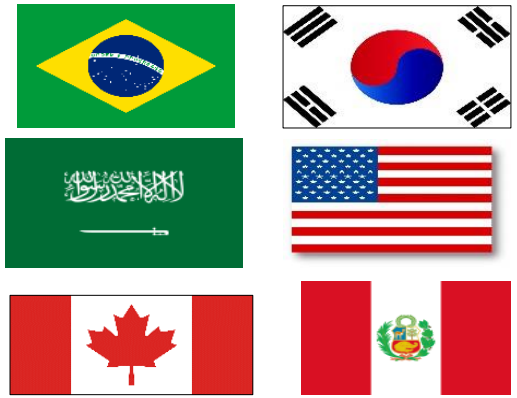


See https://mentor.ieee.org/802.11/dcn/23/11-23-0436-00-0amp-technical-report-on-support-of-amp-iot-devices-in-wlan.docx

Wi-Fi evolution needs 1200 MHz of global harmonized 6 GHz spectrum to support next generation use cases

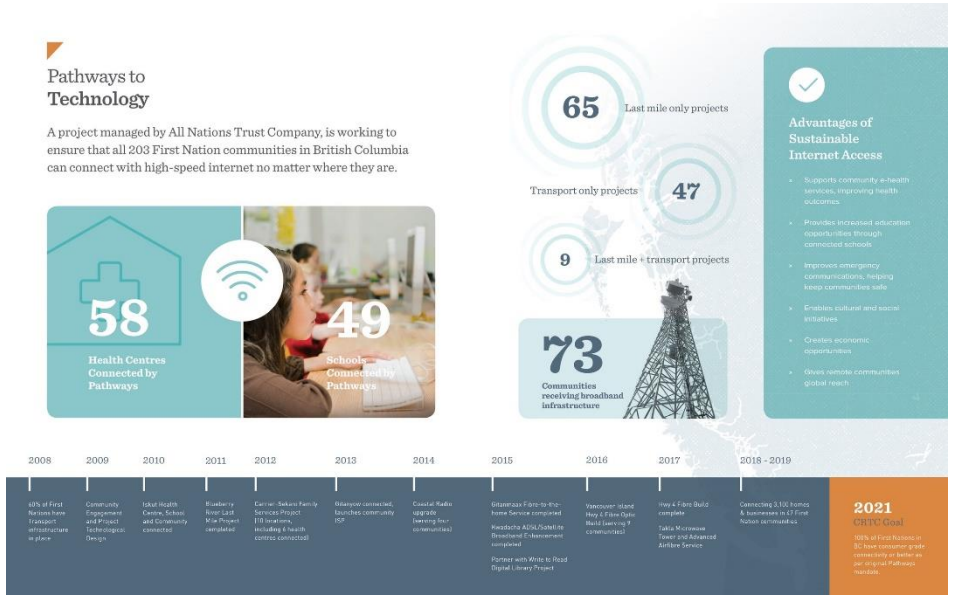
- Future connectivity and economic value increase will depend on Wi-Fi 6E and Wi-Fi 7
- 6 GHz band is uniquely suited (no alternative) to support growing Wi-Fi spectrum needs
- Next use cases: immersive AR/VR/XR for training, industrial, telehealth, automation, 3-D video, also supports dense deployments
- Standard Power Devices with AFC is the most efficient and practical solution to deliver connectivity to underserved areas while coexisting with existing fixed services in the band.

- See https://www.wi-fi.org/countries-enabling-wi-fi-in-6-ghz-wi-fi-6e



Wi-Fi networks are being deployed globally to extend Broadband wired and wireless backhaul

- Smart Villages in Niger connected via satellite and Wi-Fi (Smart Africa).
- Provision of fast, affordable, and reliable access to the internet over Wi-Fi in Rwanda, South Africa, Ghana, and Nigeria
- Wi-Fi reach for schools: Enabling e-learning in Mali
- Wi-Fi Community networks, https://villagetelco.org/deployments/mankosi-south-africa/
- AND in rural, underserved areas in developed countries

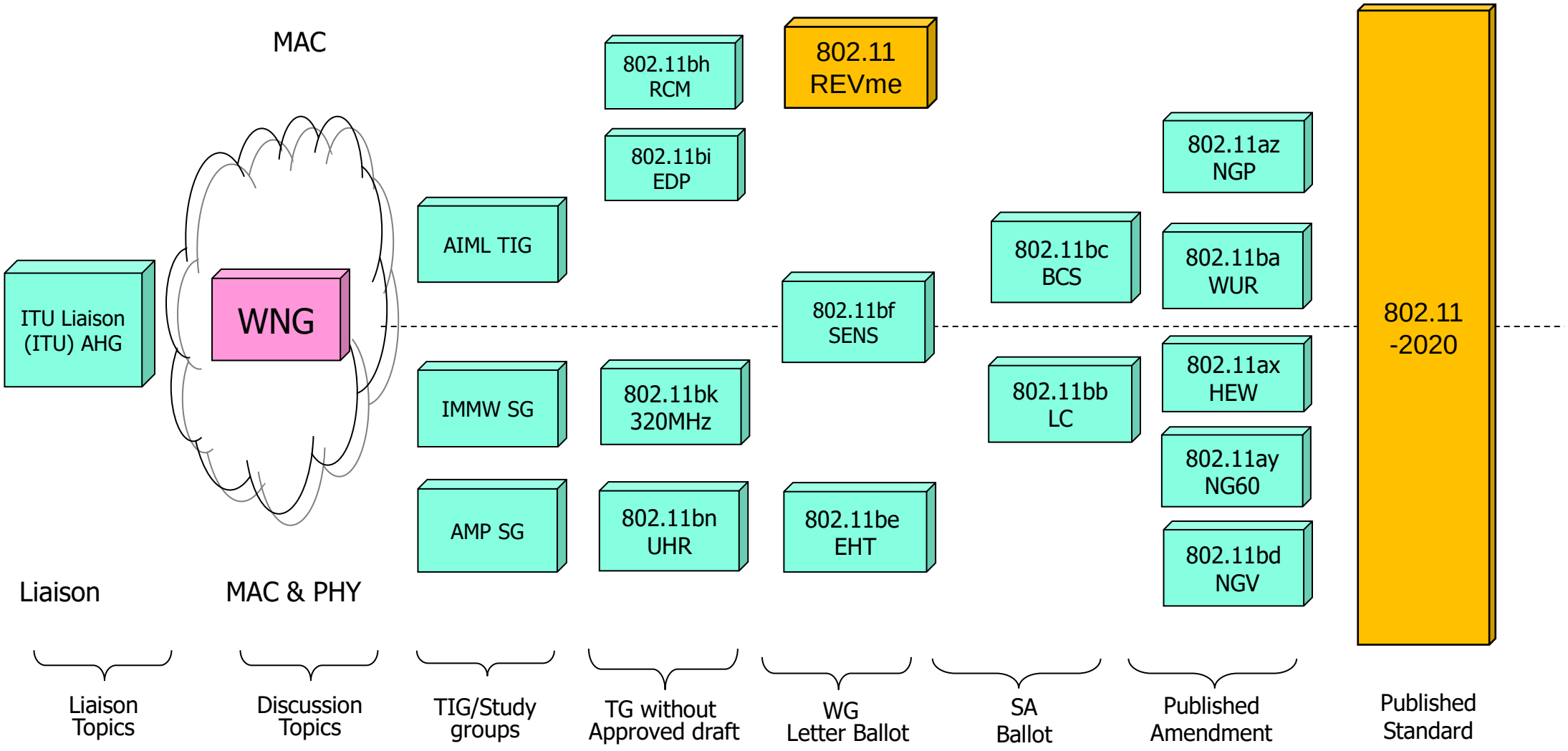


THANK YOU

QUESTIONS

Information Classification: General

IEEE 802.11 Standards Pipeline



Information Classification: General

Useful Links

- 802 home page: http://www.ieee802.org/
- 802.11 home page: http://ieee802.org/11/
- Help if you want to contribute: http://www.ieee802.org/11/help.html
- 802.11 document server: https://mentor.ieee.org/802.11/documents
- Wi-Fi Alliance http://www.wi-fi.org/
- Get 802.11 standards:
  - http://standards.ieee.org/about/get/802/802.11.html
  - http://www.techstreet.com/ieee

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Powering Convergence NOW!

Chetan Hebbalae

VP of Products & Network Technology, Kyrio.

Jason Lauer

VP of Engineering & Operations, Kyrio.

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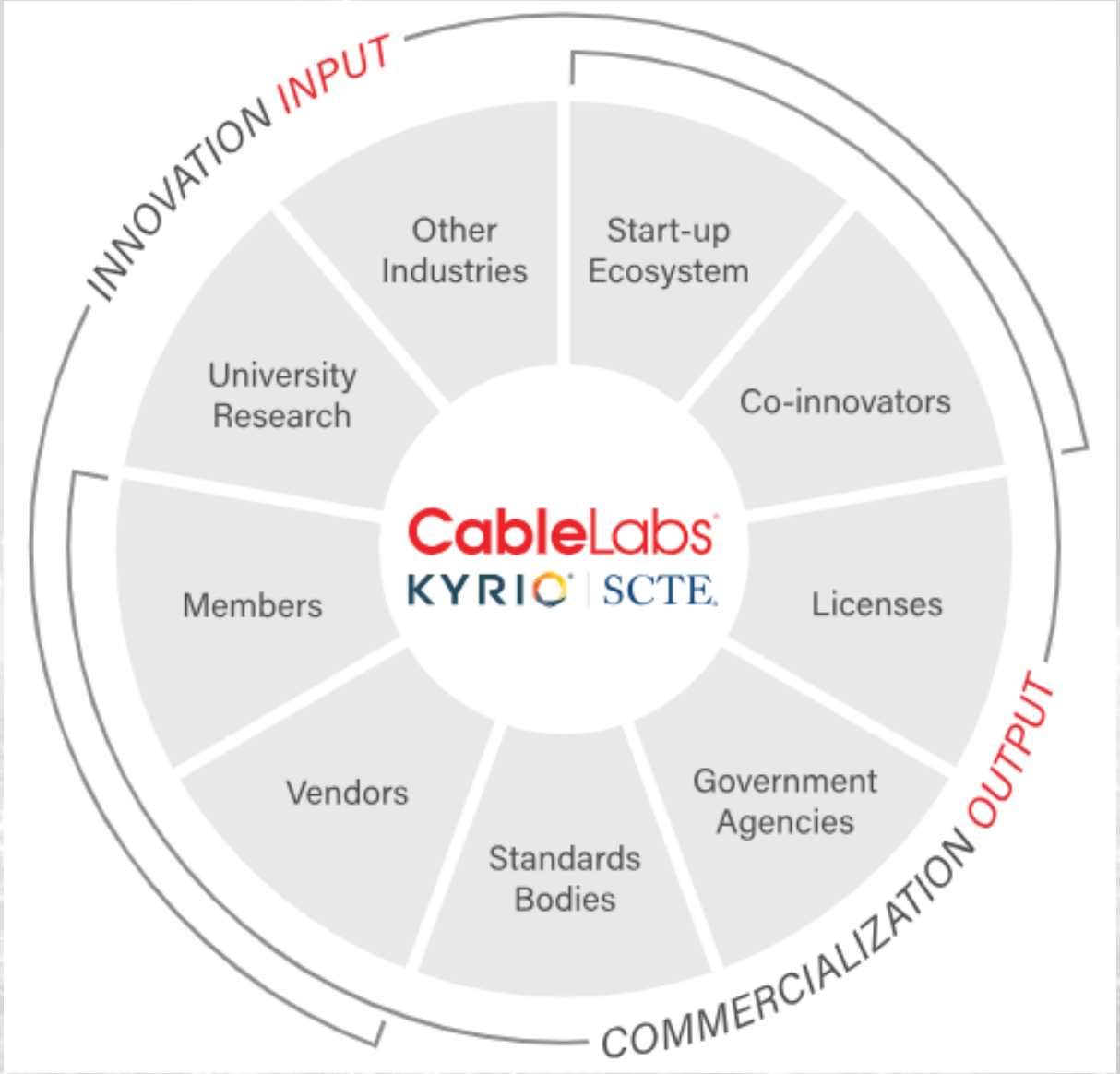
INNOVATION INPUT
Other Industries
Start-up Ecosystem
University Research
Co-innovators
Members
Licenses
Vendors
Government Agencies
Standards Bodies
COMMERCIALIZATION OUTPUT
CableLabs
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Strengthening CONVERGENCE Globally

$460 billion

industry influenced by CableLabs

610+

granted patents over 30+ years

Over half a billion

individuals use one or more CableLabs technologies every day

Over 66%

of internet-connected U.S. households and over half of all Canadian households use CableLabs technology

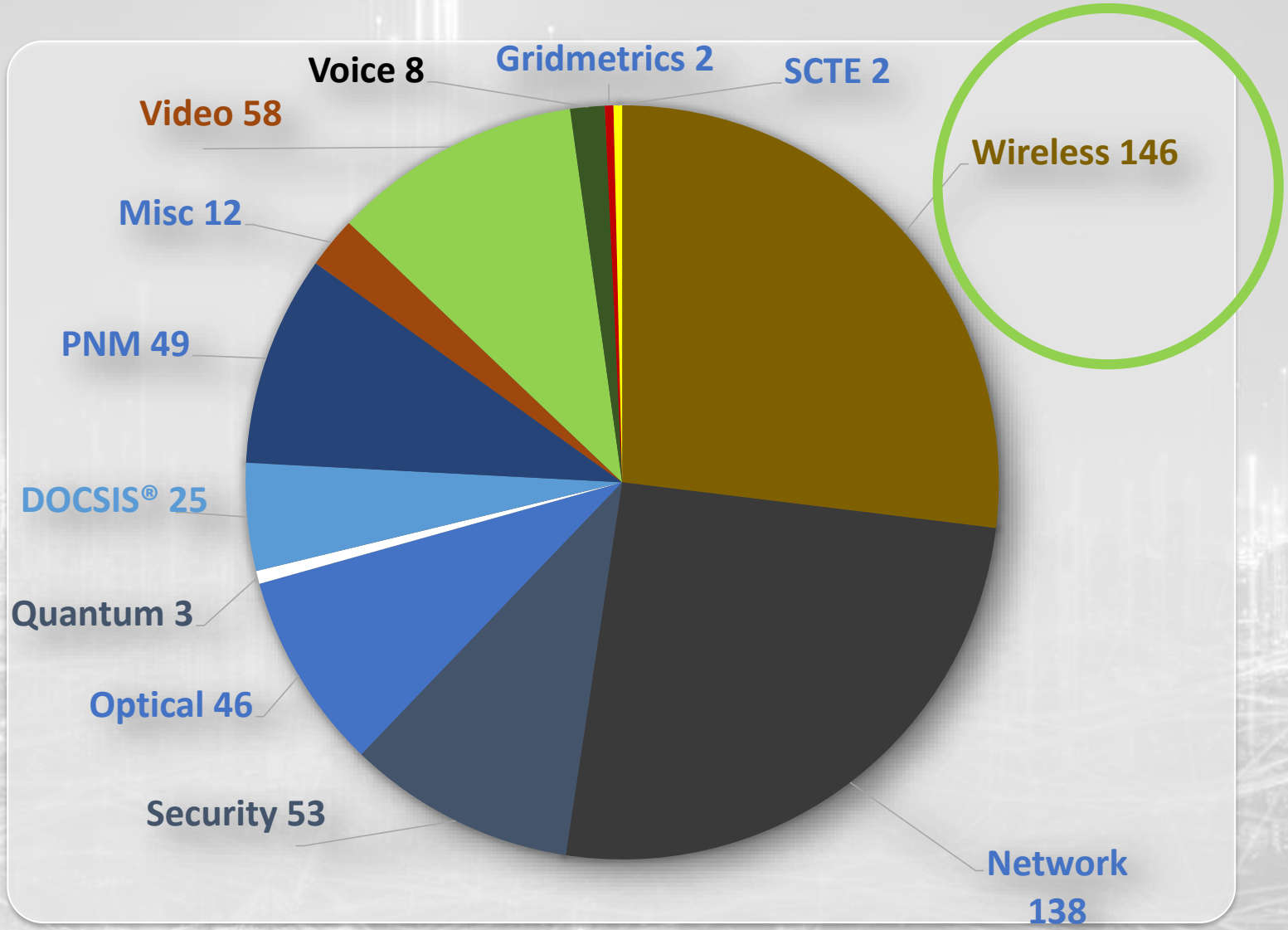
2200+

vendor companies are actively engaged with CableLabs

More than 550 million

devices have been shipped based on CableLabs' cable modem specification

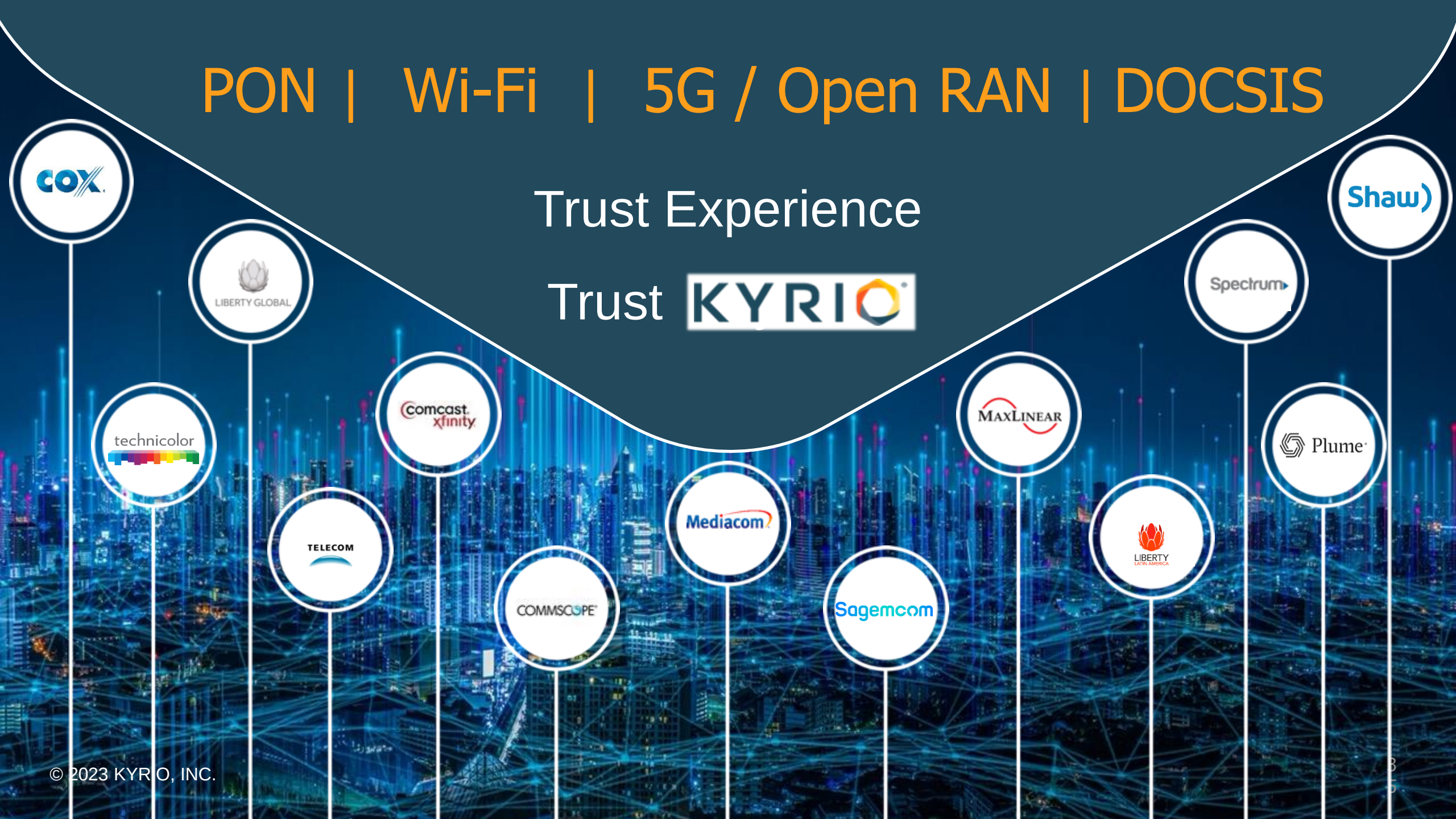
Holistic & Converged



PON | Wi-Fi | 5G / Open RAN | DOCSIS

Trust Experience

Trust KYRIO



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Testing & Certification

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5G CHALLENGE

O-RAN ALLIANCE

OPEN TESTING AND INTEGRATION CENTRE

OnGo

Wireless Broadband Alliance

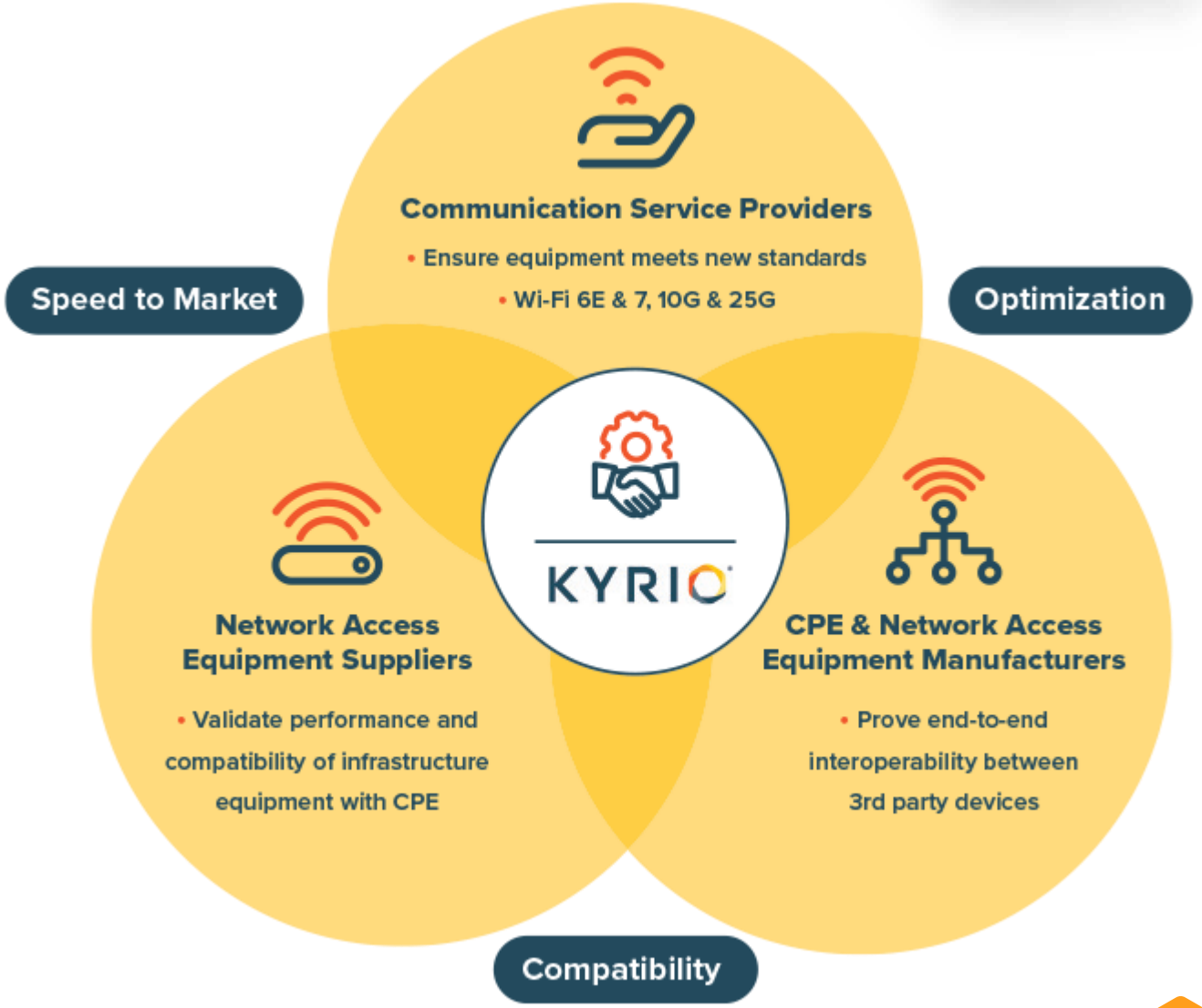
comcast xfinity

CableLabs Certified

Charter Spectrum
TV | INTERNET | VOICE

Trust. Quality. Confidence.

Optimizing for Interoperability



Trust Experience.
Trust Kyrio.

Innovation

Commercial Scale

Convergence

Hide the How!

Trust Experience.
Trust Kyrio.

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ARC™
Adaptive Route Control

Hotspot

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What If ?

- used ML to create network experiences that anticipate **user** & the **Operator's** needs?

- opened up our interfaces to let Others innovate?

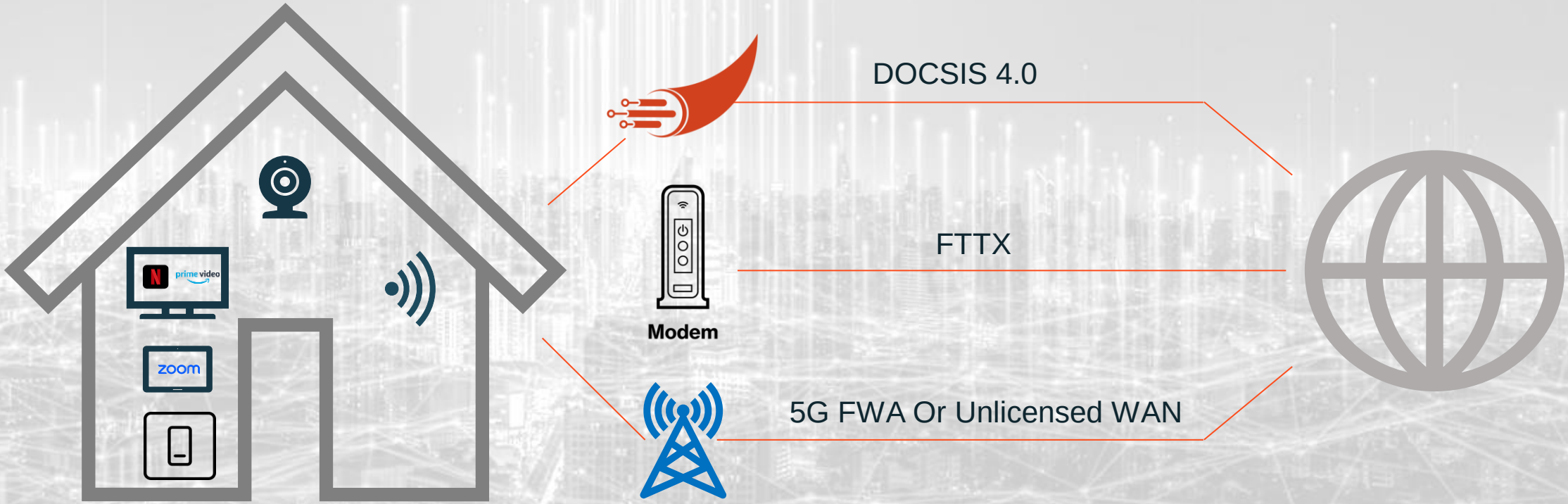
Framework for Convergence

CableLabs KYRIO SCTE

The smart Edge Wi-Fi

Open APIs

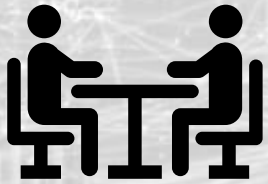
Insights: AI & ML



You are invited to collaborate

Want to integrate? Let's talk!

Help us define APIs?



Meet us at our Exhibit D9

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Thank You

Chetan Hebbalae

VP of Products & Network Technology

Jason Lauer

VP of Engineering & Operations

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Wireless Broadband Alliance

NETWORK X

Panel: Spectrum, Benefits and Use Cases of 6Ghz Wi-Fi

Mark Henry

Director of Network & Spectrum, BT.

Andy Gowans

Spectrum Regulatory Policy Team Leader, Cisco.

Detlef Fuehrer

Senior Manager, Spectrum Mgt & Regulatory Affairs, EMEA, HPE Aruba

Ted Kaplan

CEO,RKF Engineering Solutions.

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BE BACK IN 60 MINUTES AT
2.00 PM CET

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Steve Namaseevayum

Vice President, Membership and Industry Alliances.
Wireless Broadband Alliance.

Session Moderator

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WGC EMEA Speakers

Mittal Parekh
Senior Director, Product Marketing
RUCKUS Networks, CommScope

Blaz Vaveptic
Business Development & Partnerships
Galgus

Marc Merlini
Business Development Director
JCDecaux

Time	Presentation
2:00 PM (CET)	**Wireless Wonders: The Role of Artificial Intelligence in Delivering the Best Enterprise Wi-Fi Experience in 2023** Mittal Parekh, Senior Director, Product Marketing, RUCKUS Networks, CommScope.
2:20 PM (CET)	**Putting the 'Smart' in Cities and Transportation** Blaz Vavpetic, Business Development & Partnerships, Galgus.
2:40 PM (CET)	**Smart Infrastructure in Cities** Marc Merlini, Business Development Director, JCDecaux
2:50 PM (CET)	**COFFEE & NETWORKING**

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Mittal Parekh

Senior Director, Product Marketing,
RUCKUS Wireless/CommScope.

Wireless Wonders: The Role of Artificial Intelligence in Delivering the Best Enterprise Wi-Fi Experience in 2023

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Wireless Wonders:
The role of Artificial Intelligence in delivering the best enterprise Wi-Fi experience in 2023

Date: Oct 25th, 2023

Mittal Parekh

Senior Director, Products
RUCKUS Networks, CommScope

A New Era of Networking is Upon Us!

- Modern Networks are getting ***more diverse and complex***
- IT is getting ***leaner***
- It's all about ***SLAs*** and ***accountability***
- Service Disruptions are getting ***costlier***
- Helpdesk is getting ***costlier to manage***
- Subject Matter Expertise (SME) is getting ***expensive***

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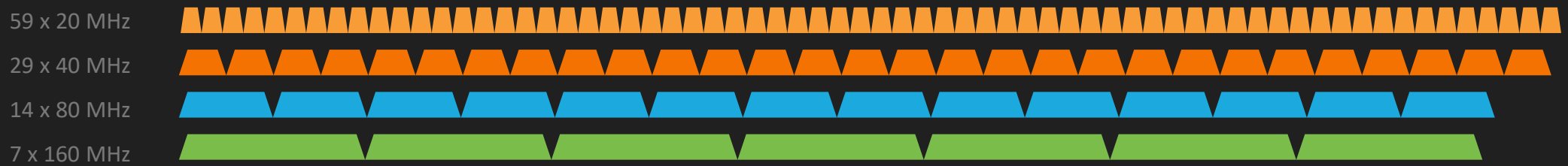
6 GHz: No free lunch!

6 GHz Band – Total Spectrum 1200 MHz



5 GHz Band – Total Spectrum 500 MHz (180 MHz without DFS)

2.4 GHz Band – Total Spectrum 80 MHz

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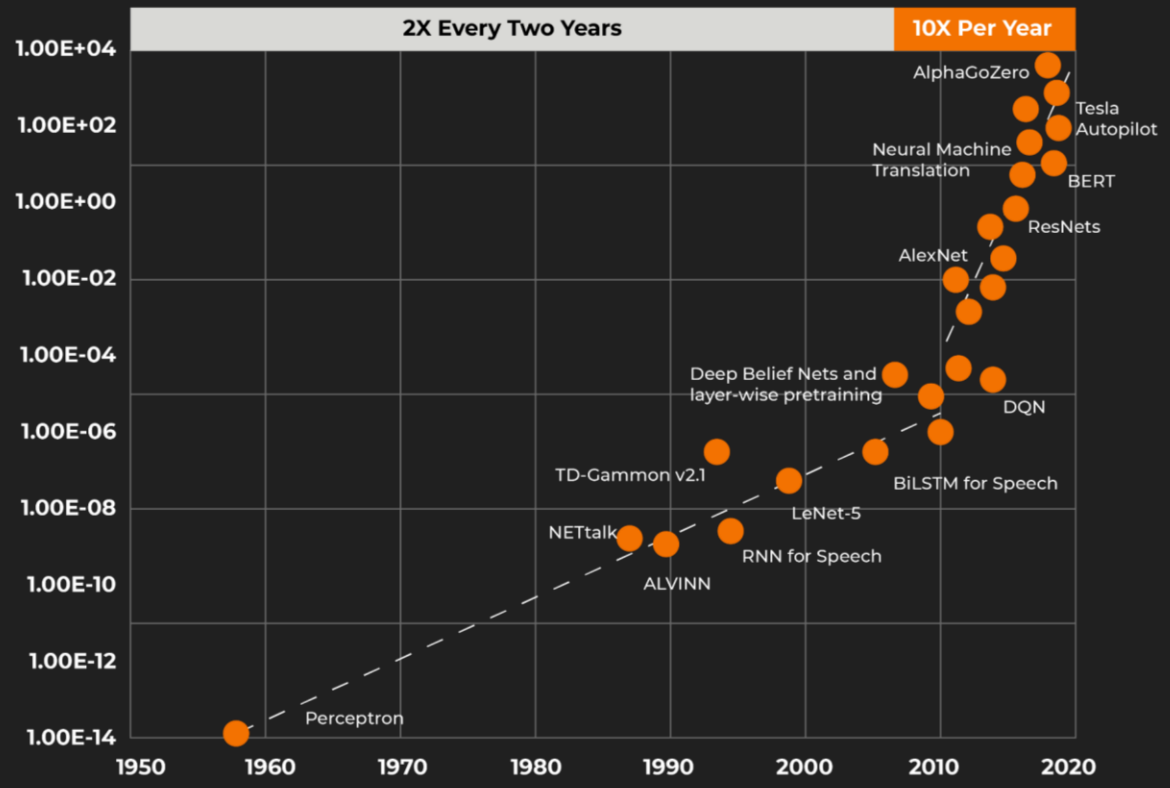
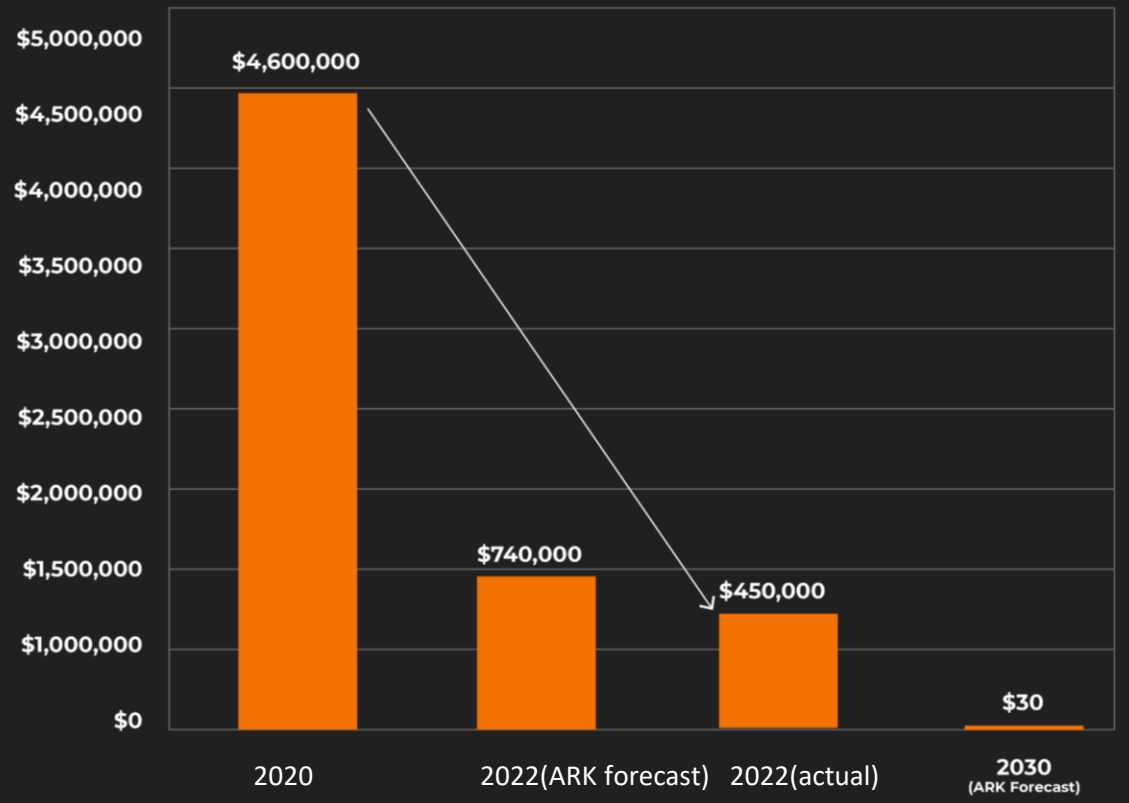
AI: The Time is NOW

Two Eras of Compute Usage in Training AI Systems



Cost to train GPT-3 level Performance [ARK Invest Big Ideas 2023]



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AI Costs are plummeting since 2020

- Training costs – 70% Down YoY
- Compute needed to train halved every 16 mo
- Training hardware costs down by 57% annually
- Training software costs down by 47% annually
- “Pay-as-you-go” model = Affordability

The Impact of Declining AI Training Costs

- Mass Adoption of sophisticated AI Chatbots
- Increased Use of Generative AI
- Better Usage of Training Data

AI Driving Purpose Driven Solutions

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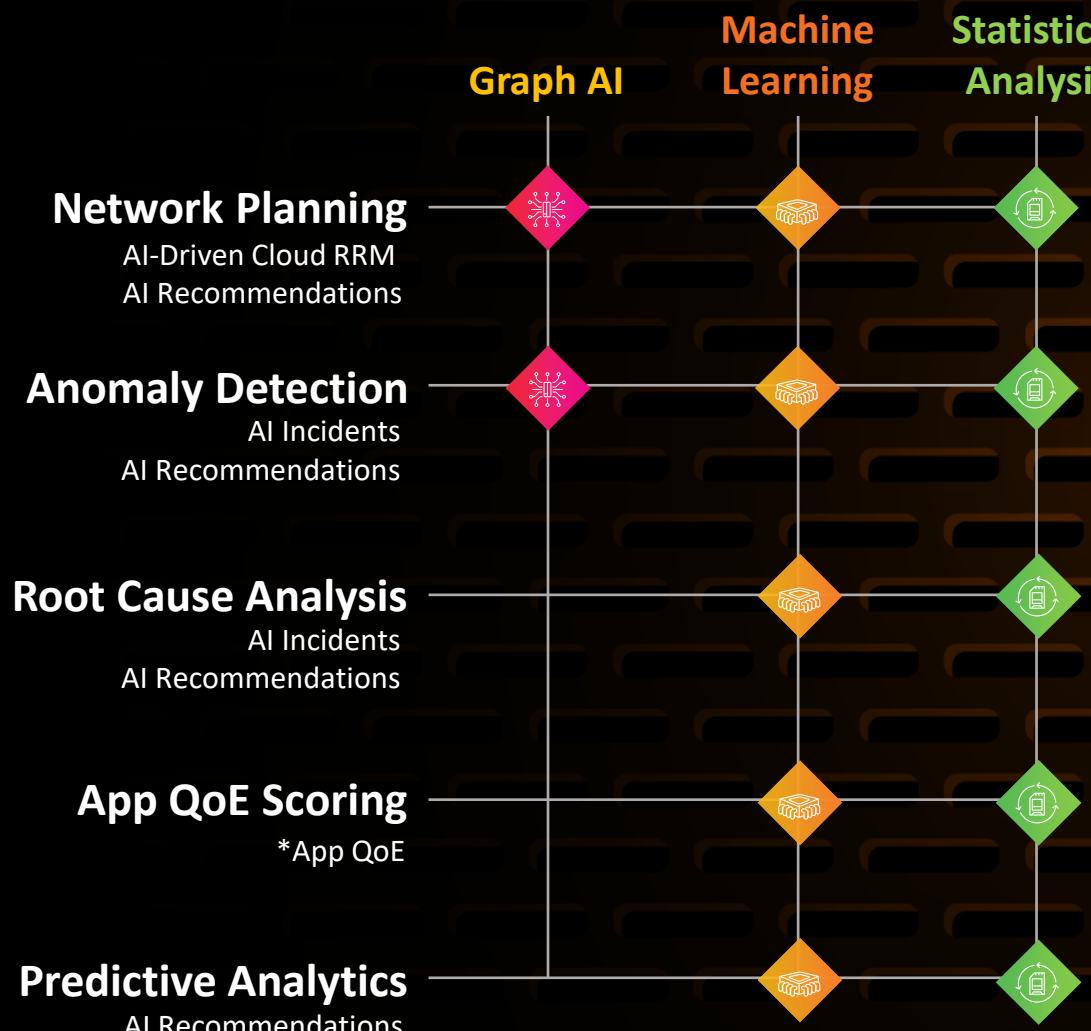
RUCKUS AI: It's Not Magic!



Graph AI

Personalized Pagerank, Label Propagation, Louvain Clustering, Betweenness Centrality, Graph Embedding, Weakly Connected Components

Machine Learning

Decision Tree, Reinforcement Learning, Hybrid Federated Learning, Jenks Optimization, Logistic Regression, Local & Isotonic Regression, Dimension Reduction, Mean Shift Clustering

Statistical Analysis

Maximum Likelihood Estimation, Seasonality decomposition, Bayesian Inference, Event Density Analysis, Complex Event Processing

RUCKUS AI Growth

Seeds

AI/ML Incidents, Insights, Root cause and Recommendations

- AI/Machine Learning
- Statistical Analysis

Seedling

AI Recommendations, Configuration Analysis, Network Health, Explainable AI, Melissa

- AI/Machine Learning
- Statistical Analysis
- Natural Language Processing (NLP)

Tree

AI-Driven Cloud RRM, Autonomous networking

- AI/Machine Learning
- Statistical Analysis
- Natural Language Processing (NLP)
- Graph AI

Fruit

AI-Driven Predictions, AI-Driven App QoE, AI Based Purpose-Driven Network Orchestrated from RUCKUS One

- AI/Machine Learning
- Statistical Analysis
- Natural Language Processing (NLP)
- Graph AI
- Hybrid Federated Machine Learning (HFML)
- Generative AI (integrate LLM)

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RUCKUS AI for Network Efficiency

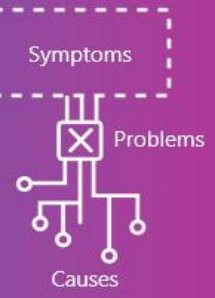
Surface issues before they blow up

ML-driven incident and anomaly detection

Address the most urgent issues first

AI-driven prioritization

Fix them fast



ML-driven root cause and recommendations

Compare network KPIs before and after a change to analyze the impact

Config change analysis

Let the system make recommendations on changes to improve network performance

AI-recommendations

Let Cloud RRM drive down interference and maximize capacity every day.

AI-Driven Cloud RRM

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AI-driven Incident Detection, Prioritization, and Resolution

RUCKUS COMMSCOPE

Incident Details P1 | High AP-Controller connection failures in AP Group: Jeanne-Lajoie Secondaire

1

2

INSIGHTS

ROOT CAUSE ANALYSIS

System has detected high number of AP-controller connection failures. This can occur due to following reasons:

1. Intermittent or permanent loss of connectivity between AP and controller. Losing consecutive heartbeat/keepalive messages from the AP will result in AP-controller connection failures.
2. Improperly configured Firewall or NAT device or a network switch can cause the AP-controller communication failure.
3. Lack of reachability from AP to controller over a WAN connection or cloud would cause APs to disconnect from controller.
4. In rare cases, AP certificate is invalid which forces controller to deny the incoming connection from the AP.

RECOMMENDED ACTION

To remediate the problems identified above, follow the corresponding recommended actions:

1. Test network connection between AP and controller.
2. Ensure that there is clear communication on all required ports.
3. Test WAN connection health to ensure there is a route from AP to the controller and there is no or acceptable packet loss.
4. Ensure that AP certificate is valid. Work with Ruckus customer support to identify and resolve this condition.

3

INCIDENT INFO

AP Impact Count	36 of 36 APs (100%)	view details
Incident Category	Infrastructure	
Incident Sub-Category	Service Availability	
Type	AP Group	
Scope	Jeanne-Lajoie Secondaire	
Duration	23h 54m	
Event Start Time	Jun 21 2022 08:39	
Event End Time	Jun 22 2022 08:33	

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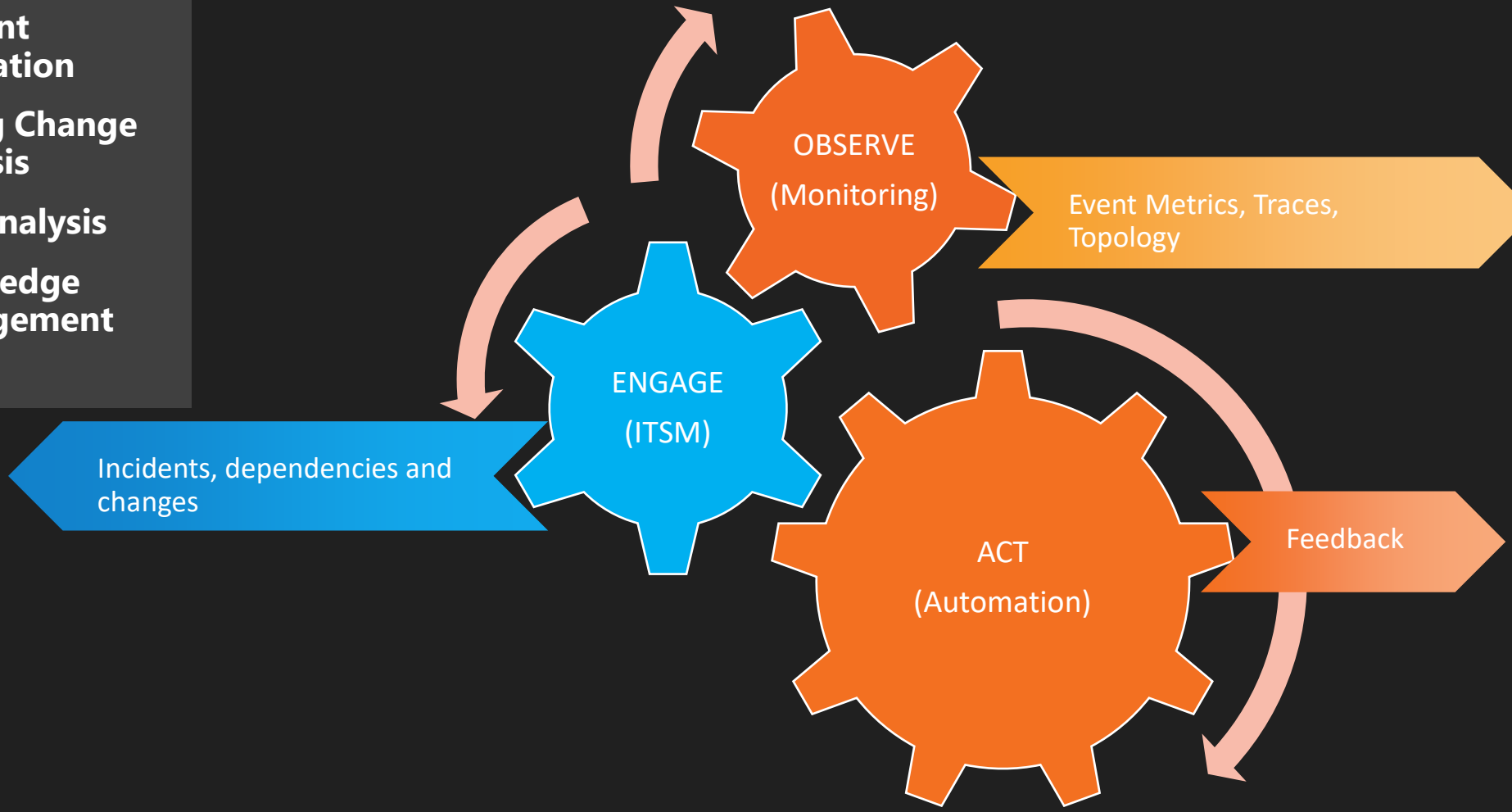
RUCKUS AI: AIOPs For Operational Efficiency

- Incident generation
- Config Change Analysis
- Risk Analysis
- Knowledge Management



- Real Time data
- Historical data
- Anomaly Detection
- Performance Analysis
- Correlation and Context

- Scripts
- Runbooks
- App Release Automation (ARA)

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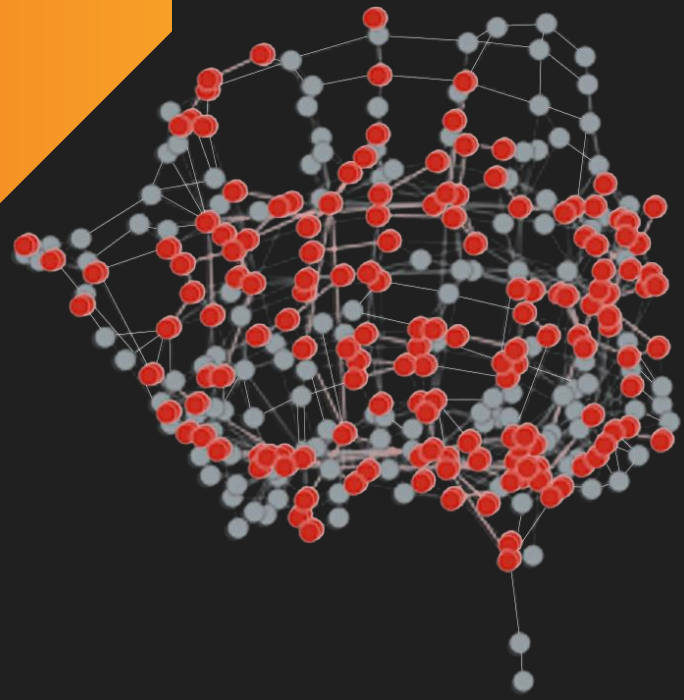
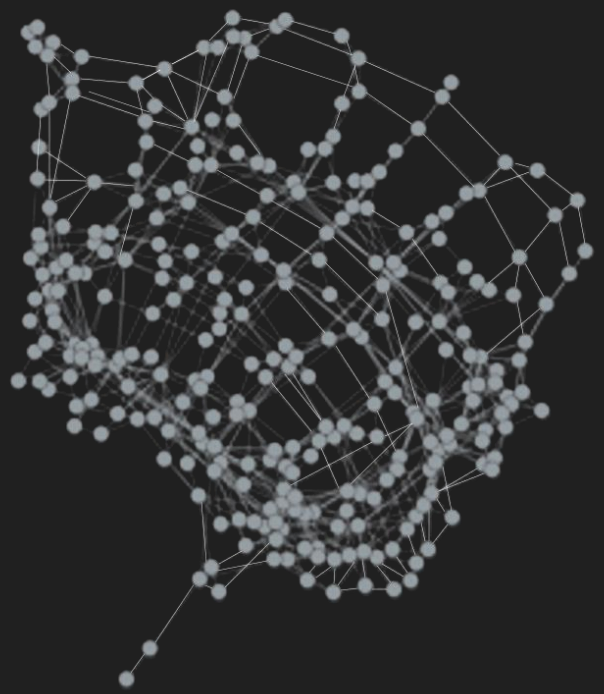
AI-Driven Cloud RRM





- Channel
- Channel Width
- Transmit Power

Greater AP Capacity	**Higher** client throughput	**Lower** Airtime Utilization	**Higher** Reliability	Operate APs at **MAX** capability

Proactive, Network Performance Optimization

Biggest advancement in Radio Management since BeamFlex® technology!

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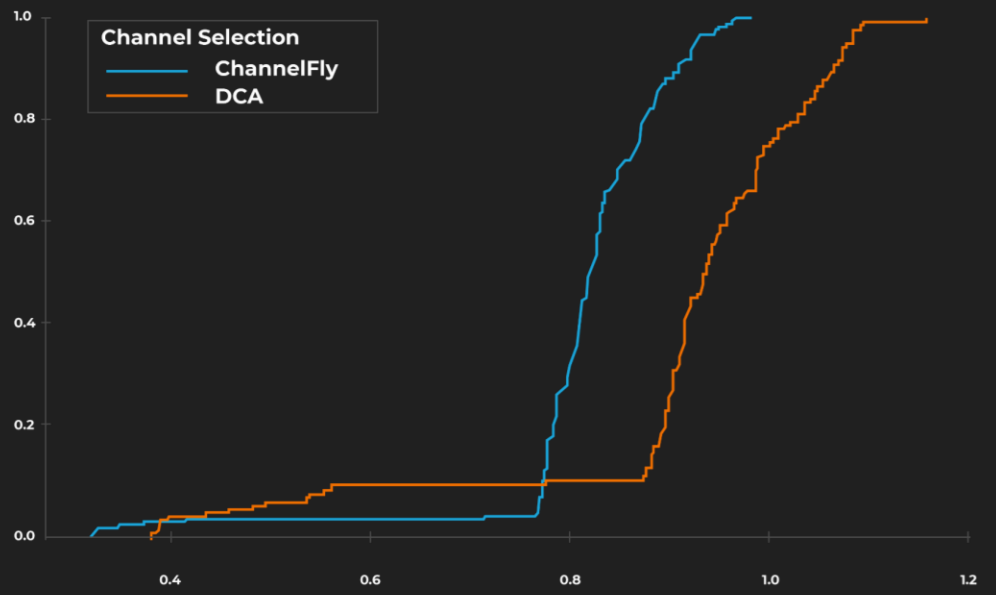
RUCKUS AI: 18% Boost in Wi-Fi Capacity

Avg 5 GHz Capacity: 70.06 Mbps

Wi-Fi AP Capacity

	Traditional	Cloud RRM	Improvement
Average	85.11Mbps	91.68Mbps	7.72%
Max	98.68Mbps	116.58Mbps	18.14%

ECDF of AP Capacity



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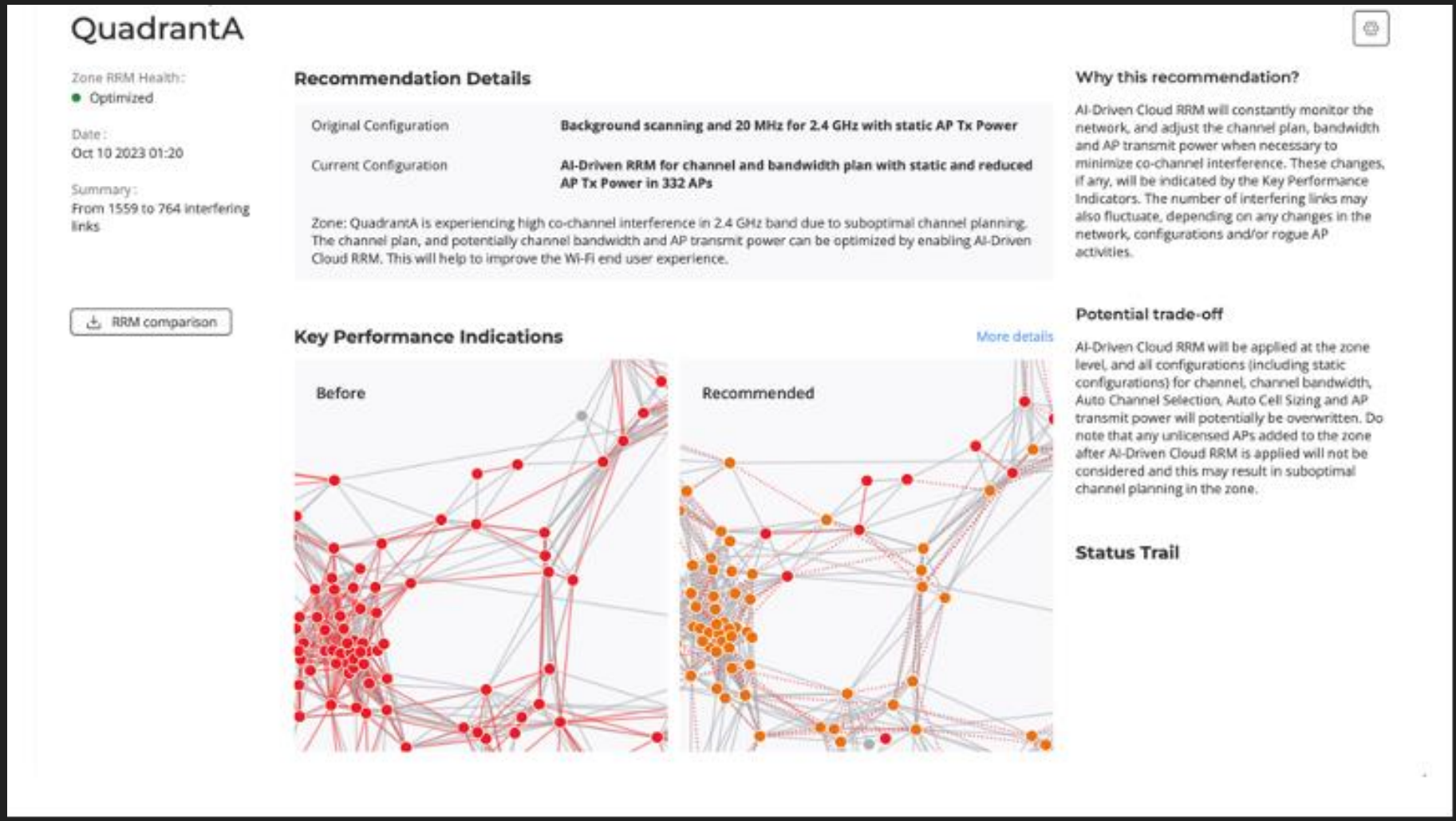
RUCKUS AI: Digital Twin



Where AI-Recommendations meets AIOps

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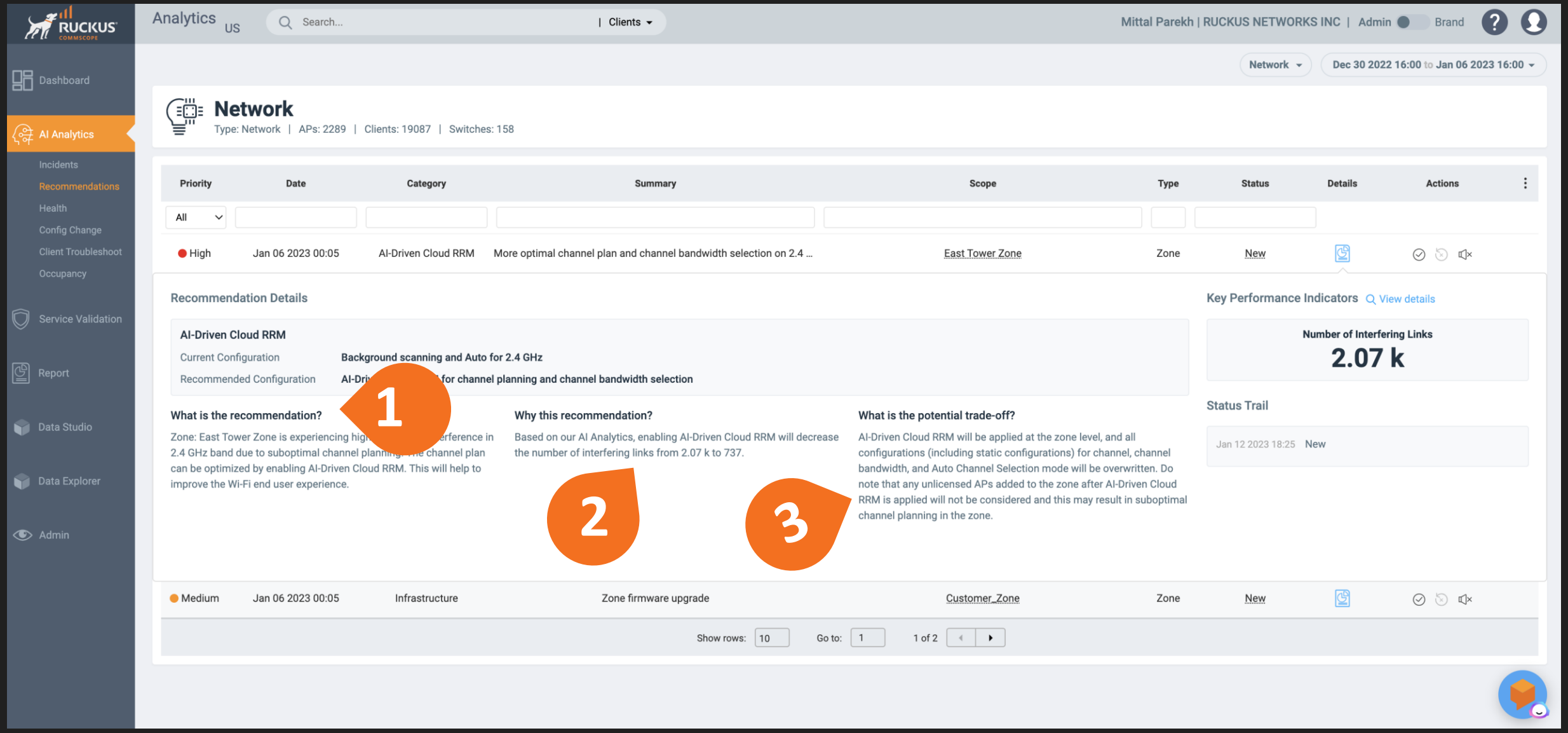
Explainable AI by RUCKUS



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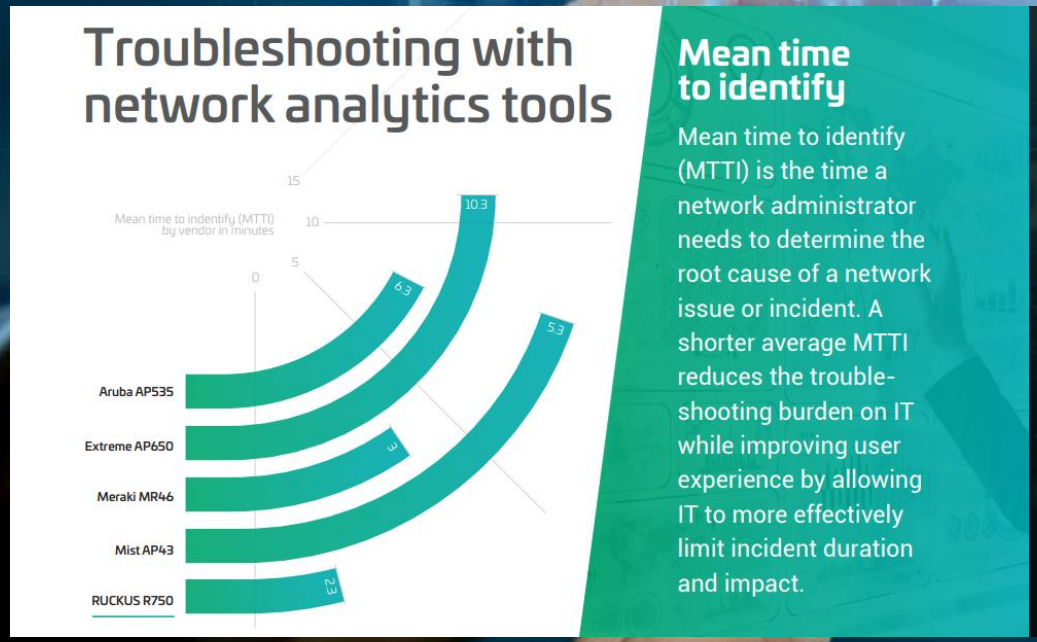
RUCKUS AI Benefits

Lowest MTTI

(Mean Time to Identification)



- **67%** Reduction in mean time to resolution
- **40%** Reduction in time prioritizing & triaging
- **20%** Fewer helpdesk tickets
- **60%** Savings of SME IT time
- **50%** Reduction in new IT hire training
- **80%** Reduction in customer churn

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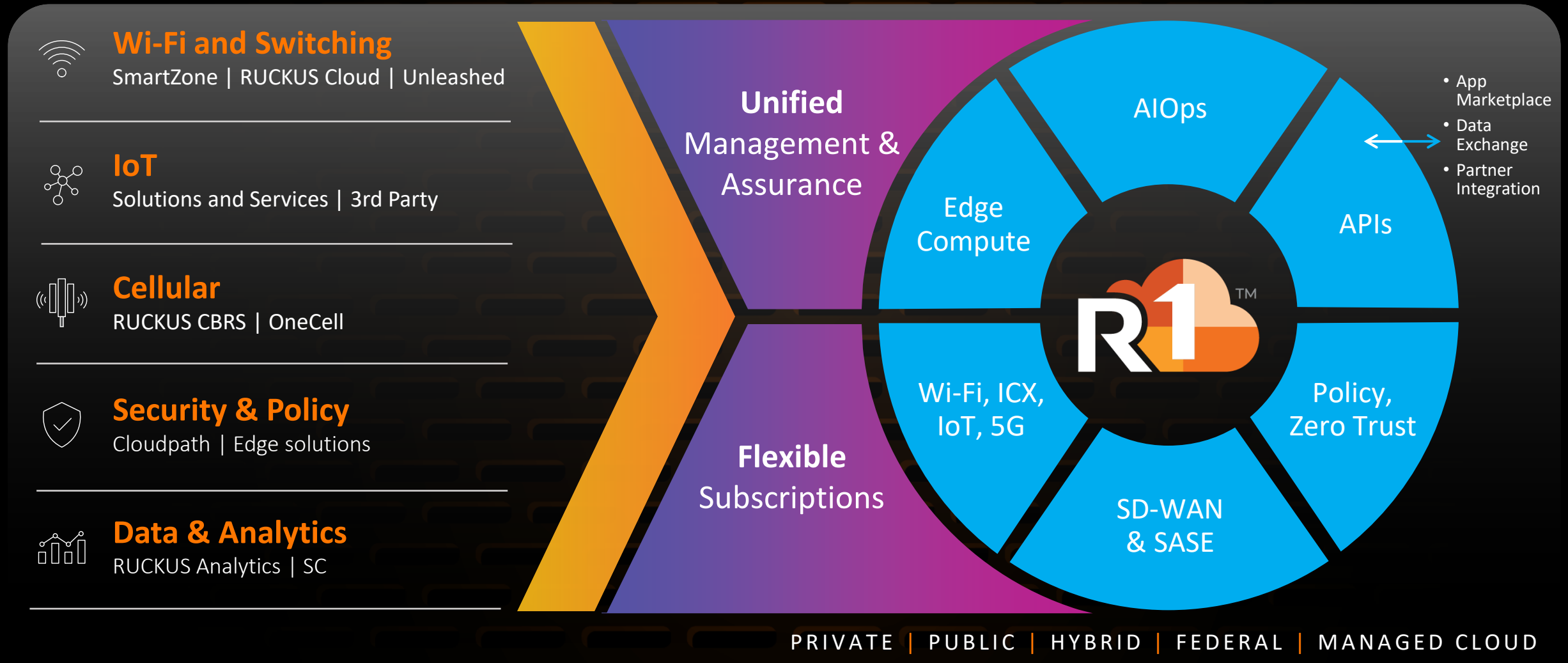
RUCKUS One with Built-in RUCKUS AI engine

Management and Assurance platform



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RUCKUS R770

AI-Driven, Enterprise-class
Wi-Fi 7 Indoor AP
with Multigigabit Backhaul

- Tri-Radio, Tri-Band (2.4GHz/5GHz/6GHz), Concurrent
- 10Gbps backhaul
- Multi-Link Operations on all 3 bands
- RUCKUS Patented Technologies – BeamFlex+ & more
- IoT Support – ZigBee, BLE, Matter, Thread
- 4 Control & Management Options
- AFC ready
- Advanced security: RUCKUS Dynamic PSK™ with WPA3
- AI-Driven Network Assurance
- Hybrid Federated Machine Learning
- AI-Driven Probe Suppression
- AI-Driven Radio Resource Management
- AI-Driven Wi-Fi 7 Resiliency

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PURPOSE-DRIVEN
ENTERPRISE NETWORKS

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Business Development & Partnerships, Galgus.

Putting the ‘Smart’ in Cities

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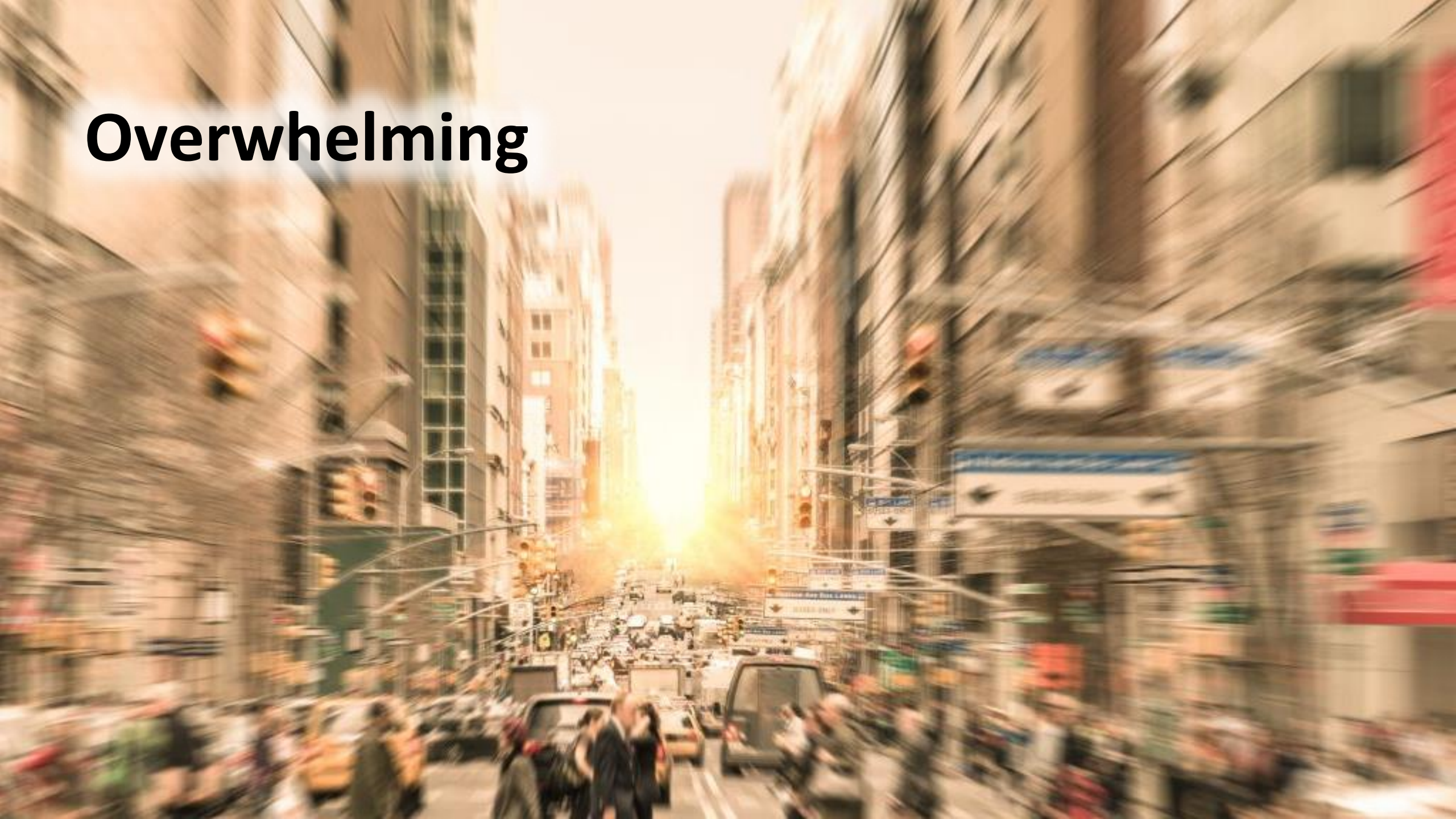
Putting the *SMART* in Cities and Transportation

Blaz Vavpetic, Galgus

WBA Wireless Global Congress
Paris, October 2023

Overwhelming



Know Your Objective(s)

- ❑ Use Cases
- ❑ Scope
- ❑ Outcomes
- ❑ KPIs

Operational Efficiency

- ❑ Event / Public Safety Staffing
- ❑ Venue Density / Capacity
- ❑ Footfall patterns
- ❑ Queue depths & wait times
- ❑ Intrusion Detection

Audience Engagement

The right message to the right audience at the right time and place

- ❑ Transit schedules
- ❑ Available seats on an arriving bus or train
- ❑ Digital Out-Of-Home Advertising
- ❑ Upcoming Events
- ❑ Public Safety Announcements

Audience Connectivity

- ❑ Passengers / Guests
- ❑ Loyalty Members
- ❑ Ticket Holders
- ❑ Employees

Every Mode of Transportation & Every Platform, Station, Terminal, Hub, Airport, etc…

Cross-Country Rail

City Bus

Commuter Ferry

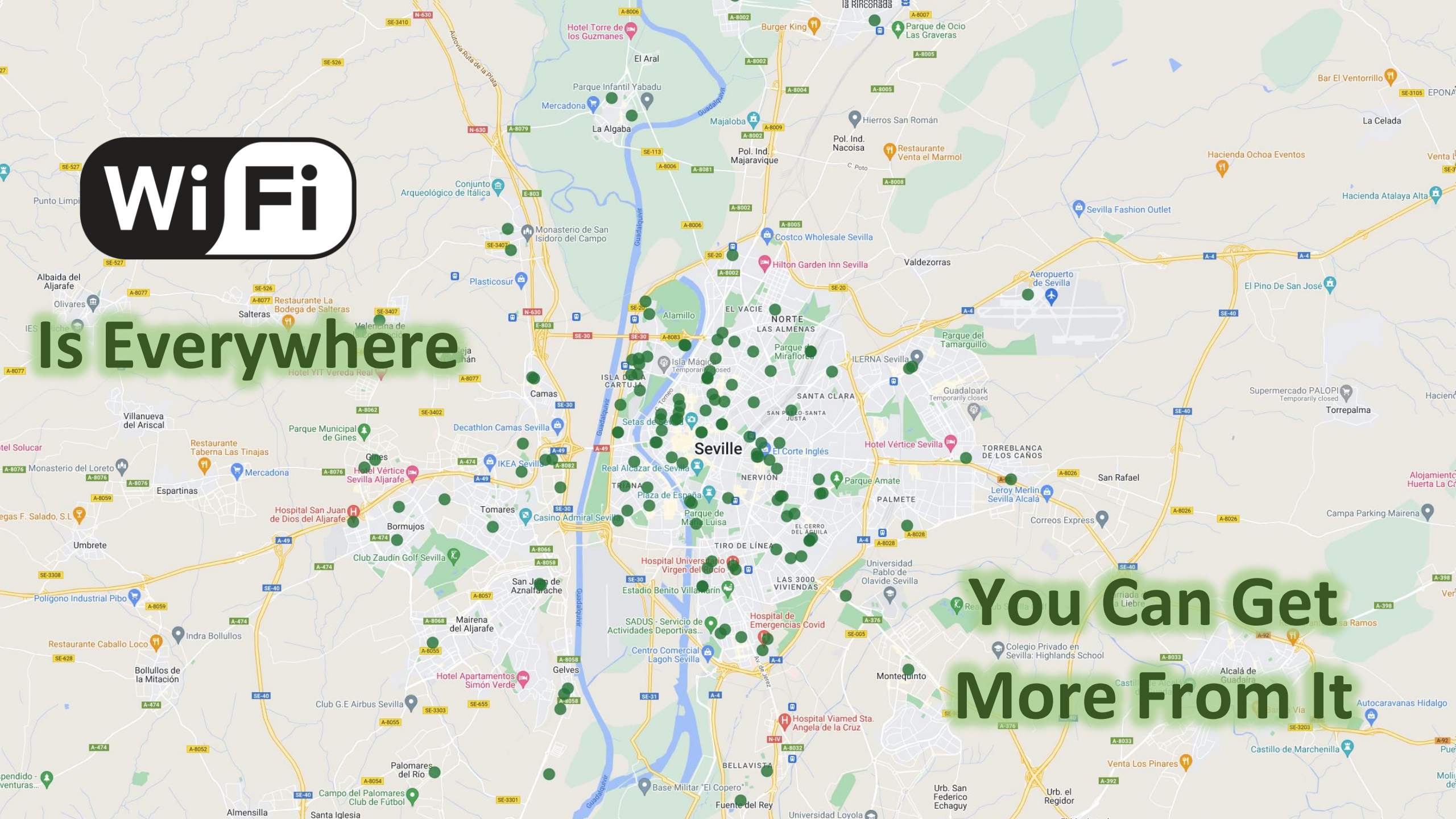
Airplane

Subway Car

Commuter Rail

School Bus

Deep Sea Cruise


WiFi
Is Everywhere
You Can Get
More From It
Seville
Hotel Torre de los Guzmanes
Burger King
Parque de Ocio Las Graveras
El Aral
Parque Infantil Yabadu
Mercadona
La Algaba
Majaloba
Hierros San Román
Pol. Ind. Nacoisa
Pol. Ind. Majaravique
Restaurante Venta el Marmol
Bar El Ventorrillo
La Celada
Hacienda Ochoa Eventos
Hacienda Atalaya Alta
Sevilla Fashion Outlet
Conjunto Arqueológico de Itálica
Monasterio de San Isidoro del Campo
Costco Wholesale Sevilla
Hilton Garden Inn Sevilla
Valdezorras
Aeropuerto de Sevilla
El Pino De San José
Plasticosur
Albaida del Aljarafe
Olivares
Salteras
Restaurante La Bodega de Salteras
Alamillo
EL VACIE
NORTE
LAS ALMENAS
Parque del Tamarguillo
Parque de Miraflores
ILERNA Sevilla
Isla Mágica
Temporarily closed
ISLA DE LA CARTUJA
Camas
SANTA CLARA
Guadalpark
Temporarily closed
Supermercado PALOPI
Temporarily closed
Torrepalma
Villanueva del Ariscal
Parque Municipal de Gines
Decathlon Camas Sevilla
Setas de Sevilla
SAN PABLO-SANTA JUSTA
Restaurante Taberna Las Tinajas
Gines
Monasterio del Loreto
Mercadona
Hotel Vértice Sevilla Aljarafe
IKEA Sevilla
Real Alcazar de Sevilla
El Corte Inglés
Hotel Vértice Sevilla
TORREBLANCA DE LOS CAÑOS
Espartinas
TRIANA
NERVIÓN
Plaza de España
Parque Amate
San Rafael
Leroy Merlin Sevilla Alcalá
Hospital San Juan de Dios del Aljarafe
Tomares
Casino Admiral Sevilla
Parque de María Luisa
PALMETE
Correos Express
Campa Parking Mairena
Bormujos
Umbrete
Club Zaudín Golf Sevilla
EL CERRO DEL ÁGUILA
TIRO DE LÍNEA
Hospital Universitario Virgen del Rocío
Universidad Pablo de Olavide Sevilla
Polígono Industrial Pibo
San Juan de Aznalfarache
Estadio Benito Villamarín
LAS 3000 VIVIENDAS
Mairena del Aljarafe
SADUS - Servicio de Actividades Deportivas...
Hospital de Emergencias Covid
Restaurante Caballo Loco
Indra Bollullos
Bollullos de la Mitación
Centro Comercial Lagoh Sevilla
Montequinto
Colegio Privado en Sevilla: Highlands School
Alcalá de Guadaíra
Hotel Apartamentos Simón Verde
Gelves
Club G.E Airbus Sevilla
Hospital Viamed Sta. Angela de la Cruz
Autocaravanas Hidalgo
Castillo de Marchenilla
Palomares del Río
Campo del Palomares Club de Fútbol
Base Militar "El Copero"
BELLAVISTA
Venta Los Pinares
Urb. San Federico Echaguy
Urb. el Regidor
Fuente del Rey
Universidad Loyola
Almensilla
Santa Iglesia

Know the Outcomes You Desire

- Expected Result
  - Visibility
  - Attribution
  - Connection Quality
- How to Measure

What Do You Need To Measure to be *SMART?*

- In the relevant places
  - Real Measurement
  - In relevant time
- With Accuracy
- Not Samples or Estimates

What Do You Need To Measure to be *SMART*?

- In the relevant places
  - Real Measurement
  - In relevant time
- With Accuracy
- Not Samples or Estimates

What's Relevant to be *SMART*?

How Dynamic ❯ Rapidly changing conditions require continuous measurement
Wi-Fi sees every device with high frequency.

How Broad ❯ What kind of sensor coverage do I need?
Wi-Fi is deployed and deployable everywhere.

How Accurate ❯ How important is data accuracy to achieving the result?
Not all Wi-Fi is created equal, but it can be transformed.

How Quickly ❯ Need a real-time result? 1st party data and AI the only way?
Your Wi-Fi, your network, your data… Quickly.

How Economical ❯ Can I generate myself or do I need to buy it? Cost / benefit?
You're deploying Wi-Fi anyways. Recognize the full value.

What To Watch

IEEE 802.11az – Micro-location positioning (decimeter level accuracy).
802.11 family. No overlay networks, same skill-set, common infrastructure.

IEEE 802.11ah (HaLow) – long-range low frequency Wi-Fi ideal for industrial, commercial and consumer IoT.
Sub-1GHz managed with same tools and techniques as 2.4GHz , 5GHz and 6 GHz

IEEE 802.11ax/be in 6GHz – Standard power (outdoor), Low Power (indoor), *Very Low Power* (anywhere)
Short distance, high speed. Micro-location, AR/VR use cases. Augmented reality providing supplemental information to audiences in a more natural way.

Related WBA Initiatives…

- Wi-Fi Experience for Moving Networks
- Venue Requirements for User Engagement

Practical requirements and methods for engaging passengers given the technical dynamics and marketing requirements of the venue owners. Not everybody desires ‘seamless’.

Thank You

Blaz Vavpetic
Business Development & Partnerships

blaz.vavpetic@galgus.ai

Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

Marc Mellini

Business Development Director, JCDecaux.

Smart Infrastructure in Cities

#WGCEMEA | #wifirevolution | #lovewifi

JCDecaux Link

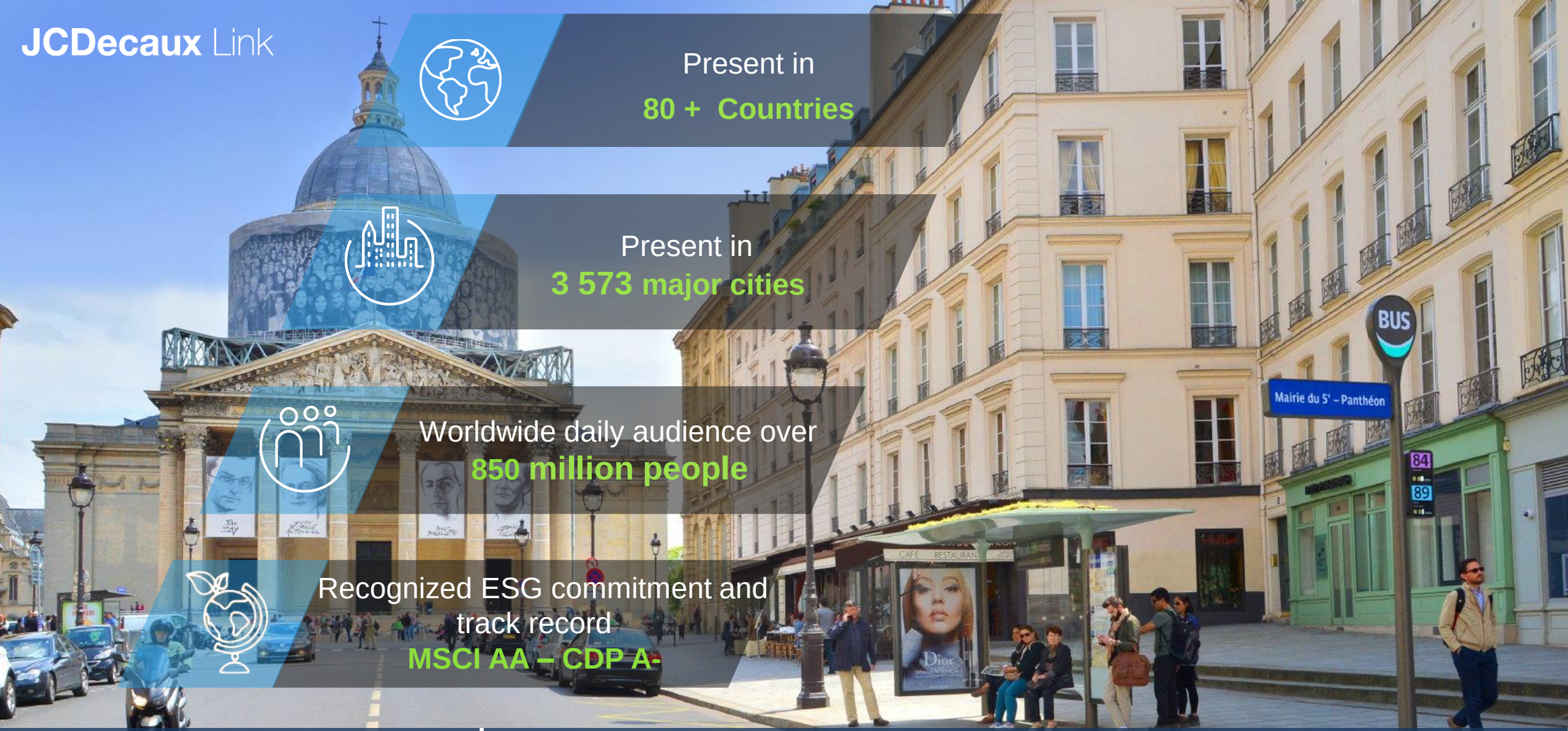
SMART INFRASTRUCTURE IN CITIES I WGC EMAE 2023

1964, AN IDEA

Jean-Claude Decaux invented an unprecedented business model

To offer cities high-quality street furniture with free-of-charge maintenance, in exchange for exclusive advertising rights in premium locations

JCDecaux Link



Present in
80 + Countries

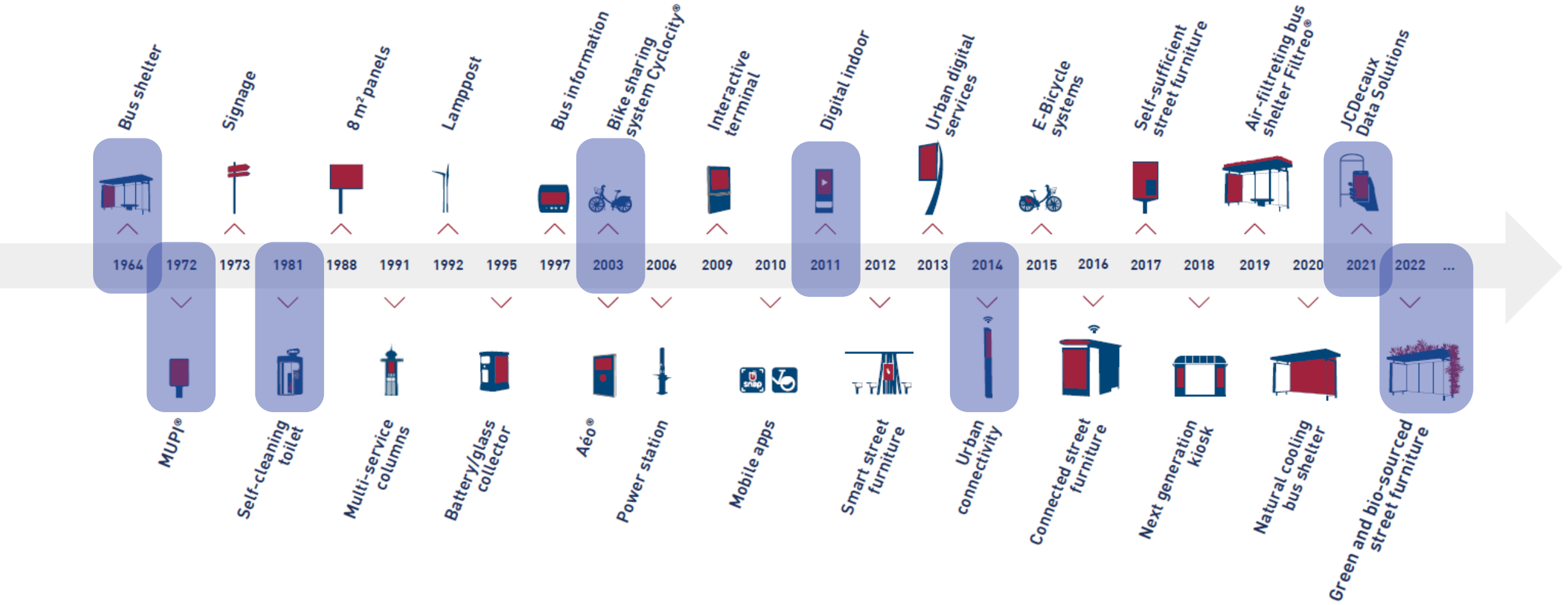
Present in
3 573 major cities

Worldwide daily audience over
850 million people

Recognized ESG commitment and track record
MSCI AA – CDP A-

A unique position in a fast-changing world

JCDecaux is the global leader in out of home communication with an inventory over 1 million assets worldwide with fast growing digital communication



Anticipating needs

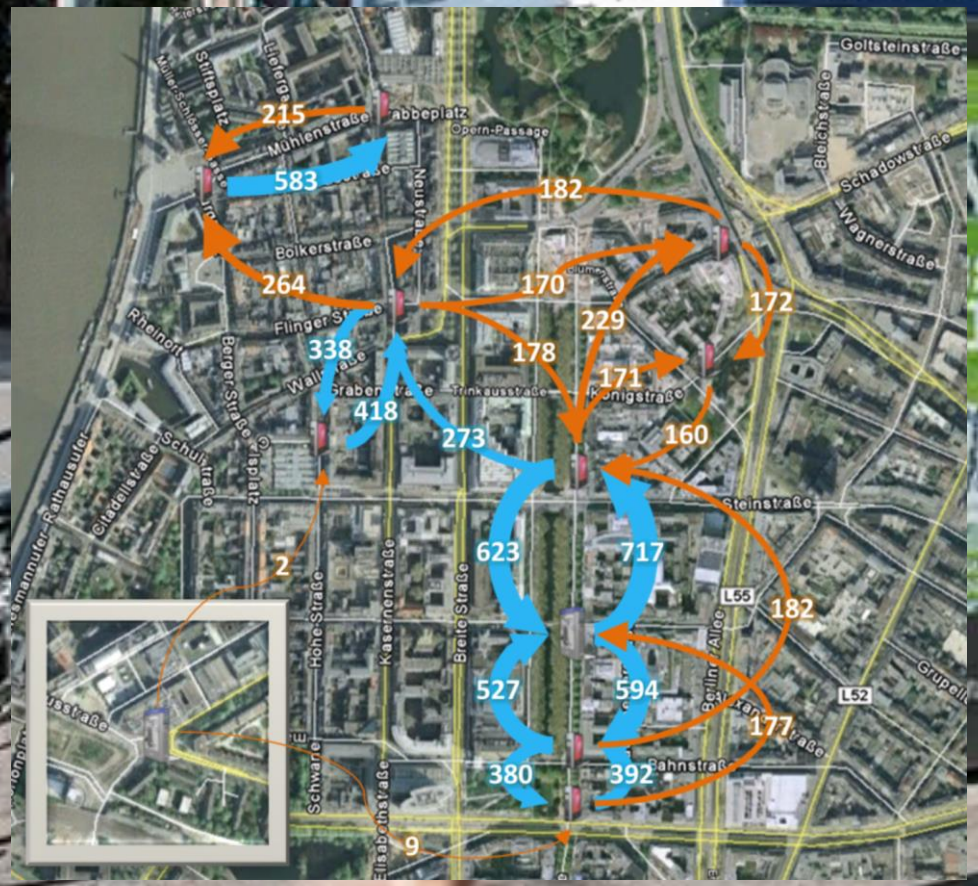
Almost 60 years of innovative services for all stakeholders

Offering connected services in Düsseldorf

Usage is location driven and site selection is key with the limited coverage of Wi-Fi hotspots and an average of 30 connexions per hotspot/day

The association with a mobile application and interactive screens extends the range of services to citizens and tourist while offering a new communication channel for the City

Data collected through Wi-Fi can feed Big Data analytics to support city planning



Confidential

Düsseldorf, Germany

Improving 4G connectivity in Amsterdam

Ability to deploy 200 sites in 12 months while it would have taken 24 months to build 1 roof top macro site

Improved capacity leads to increased data usage mainly driven by video with 80% faster network and 40% more usage

Accepted by the citizens

Vendors Small Cells were not adapted for an aesthetic and multi-operators integration

Confidential

Amsterdam, Netherlands

Reinventing public phones in UK

400 InFocus communication hubs will be deployed in UK by end of 2023 with Wi-Fi to be added to all by end of Q1 2024

Currently Wi-Fi services are live at 124 sites and used by over 8500 people per week who connect, on average, for 4 to 5 minutes

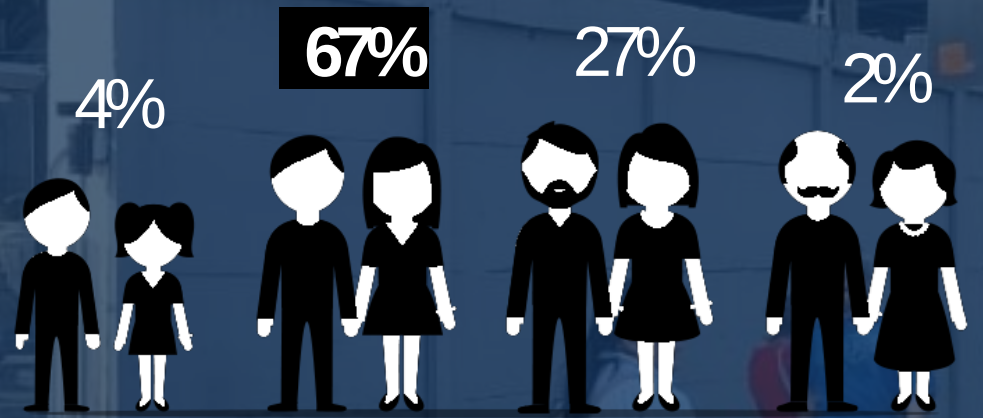
InFocus communication hubs can provide up to 15 branded Wi-Fi networks at the same time allowing for networks to be created specifically for displayed advertising campaigns

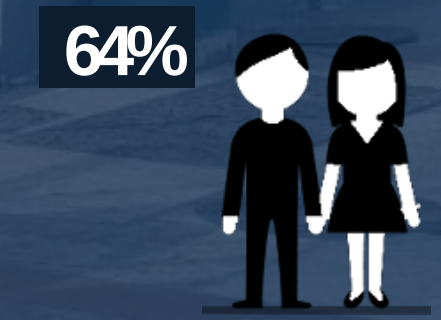
Each communication hub also provides wireless charging for mobile devices, lifesaving defibrillators, a free to use telephone and, interactive city themed Livetouch screen with community focused apps

Manchester, UK

Contributing to Public internet in Guayaquil

Guayaquil has actively addressed the connectivity issue and JCDecaux contributes to this objective providing 350 access points on bus Shelters and over 1m monthly connexions





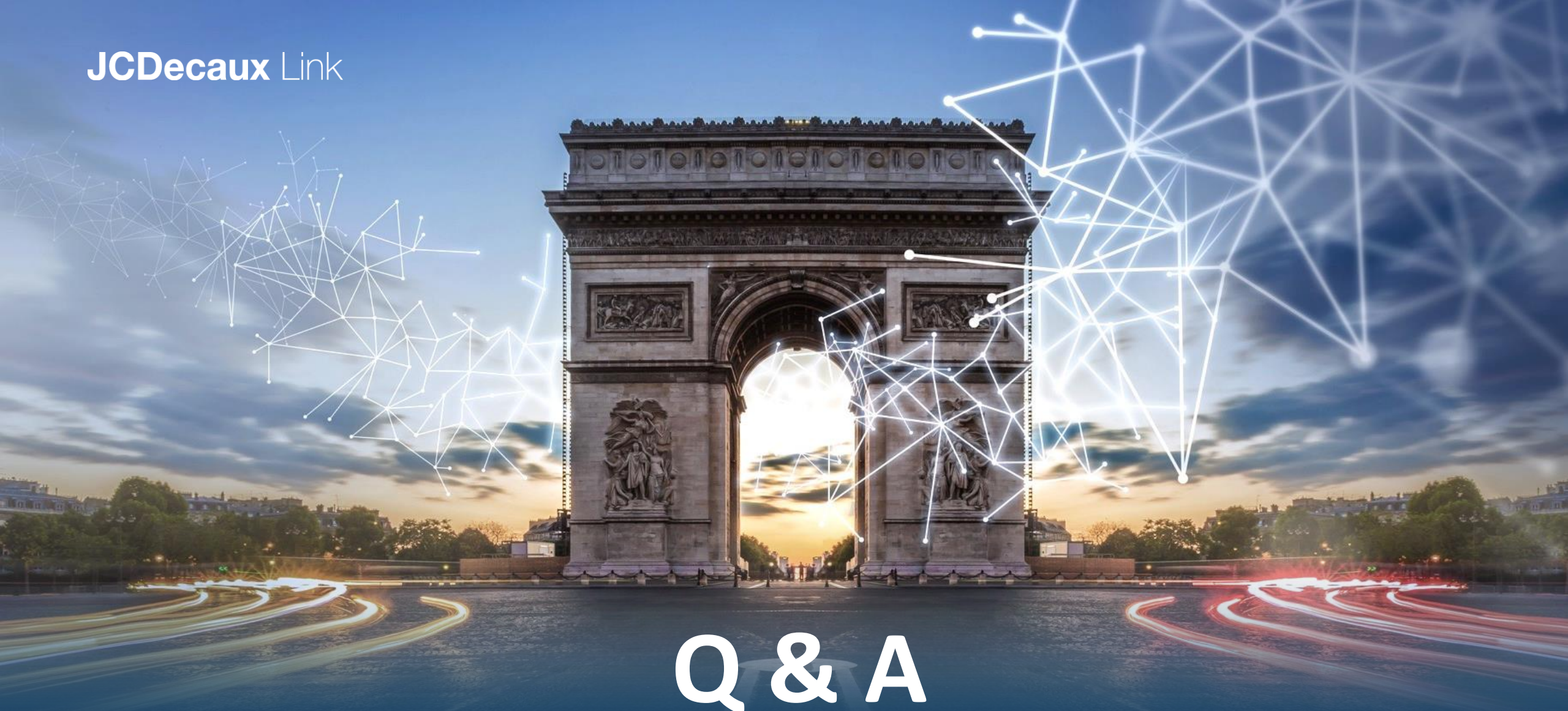
Supporting global connectivity services in Bogota

3000+ bus shelter and bus stops providing connectivity and interactive services

Fibre connectivity offering high quality Wi-Fi together with 4G/5G small cells densification opportunities

Street furniture are turning into connectivity and Smart Services hubs

JCDecaux Link



Q & A

SMART INFRASTRUCTURE IN CITIES I WGC EMEA 2023

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NETWORK X

WGC EMEA

COFFEE BREAK & NETWORKING

BE BACK AT 3.10 PM CET

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WGC EMEA

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Steve Andrews

Chairman of Luminet Networks and WBA Board Advisor

Session Moderator

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Wireless Broadband Alliance

NETWORK X

WGC EMEA Speakers

Brian Mecum
VP Device Technology Organization
Verizon

Tobin Richardson
President & CEO
Connectivity Standards Alliance.

Ha Uk Chang
Project Manager, Device Business Unit Customer Group KT

Patrick Ribardiere
Sr. Director, Product Marketing
Qualcomm

Joseph Valencia
Chief Product Officer
Origin Wireless

Metin Taskin
CEO
Airties

Oscar Gallego
Head of Home & Security Products
Vodafone

Willem van Kempen
Senior Manager Connectivity Products and Enablers
Liberty Global

Time	Presentation
3:10 PM (CET)	**Consumer Needs and Expectations for Future In-Home Connectivity** Brian Mecum, Vice President - Device Technology Organization, Verizon; Tobin Richardson, President & CEO, Connectivity Standards Alliance.
3:25 PM (CET)	**Wi-Fi 7: How ISP can Create Customer Value** Ha Uk Chang, Project Manager, Device Business Unit Customer Group, KT.
3:40 PM (CET	**Wireless The Future of Broadband Services in the Wi-Fi 7 Era** Patrick Ribardiere, Senior Director, Product Marketing, Qualcomm.

4:00 PM (CET)	**Beyond Connectivity: How WiFi Sensing is Shaping Modern Homes** Joseph Valencia, Chief Product Officer, Origin Wireless.
4:20 PM (CET)	**Panel: Next Gen Wi-Fi Transforming the Smart home** Metin Taskin, CEO, Airties; Oscar Gallego, Head of Home & Security Products, Vodafone; Willem van Kempen, Senior Manager Connectivity Products and Enablers; Liberty Global; Patrick Ribardiere, Senior Director Product Marketing; Qualcomm.
5:00 PM (CET)	**WBA Industry Awards**
5:30 PM (CET)	**END OF DAY 1 OPEN CONGRESS**

Wireless Global Congress
Wireless Broadband Alliance

NETWORK X

Consumer Needs and Expectations for Future In-Home Connectivity

Brian Mecum

Vice President, Device Technology Organization, Verizon.

Tobin Richardson

President & CEO,
Connectivity Standards Alliance

#WGCEMEA | #wifirevolution | #lovewifi

Consumer Needs and Expectations for Future In-Home Connectivity

Tobin Richardson

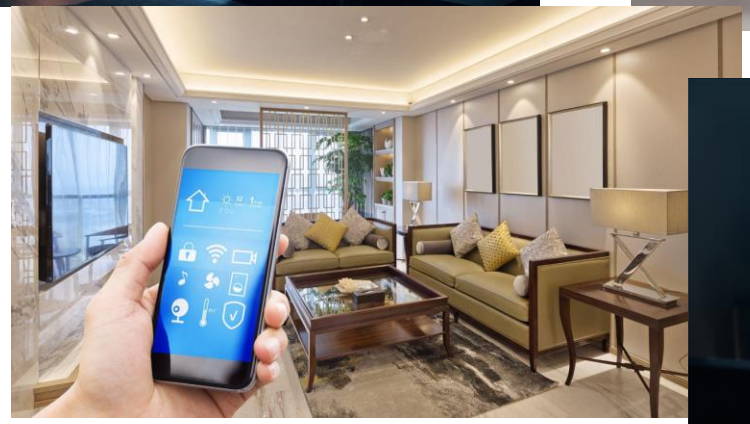
President and CEO, Connectivity Standards Alliance

Brian Mecum

Vice President of Device Technology, Verizon

Consumer Needs & Expectations

- **High Speed Internet**
- **Seamless Connectivity**
- **Smart Home Integration**
- **Privacy and Security**



The future of home connectivity will be marked by a desire for speed, reliability, integration, and security.

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Consumer Needs & Expectations

- Remote Work and Learning
- Healthcare and Telemedicine
- Innovation

Consumers will increasingly expect technology to enhance their quality of life.

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verizon

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Wireless Broadband Alliance

NETWORK X

Ha Uk Chang

Project Manager,
Device Business Unit Customer Group, KT.

Wi-Fi 7: How ISP can Create Customer Value

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Wi-Fi 7 :
How ISP can create customer value

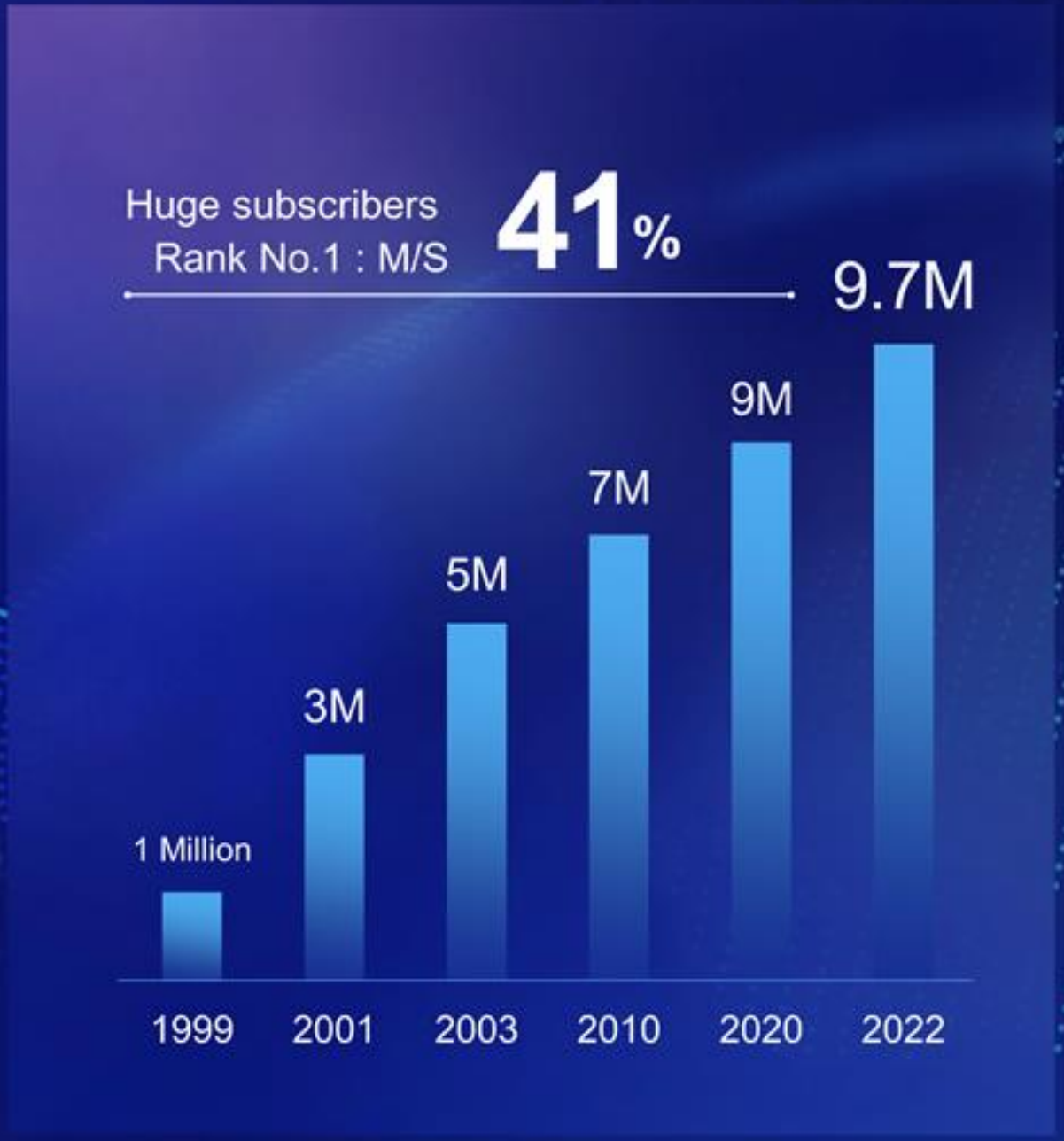
DIGICO KT

KT Internet

Over 9.7million subscribers In 2022

No. 1 Market Share from 2000 to 2022

Contributing to making
South Korea the world's largest
information and telecommunications power nations



KT Home AP

2015
GiGA WiFi home

802.11ac 2x2
Max. Speed 867Mbps

2016
GiGA WiFi Premium

802.11ac 4x4
Max. Speed 1.7Gbps
MU-MIMO

2017
GiGA WiFi Wave 2

802.11ac 2x2
Max. Speed 867Mbps
MU-MIMO

2018
GiGA WiFi Premium 1.7

802.11ac 4x4
Max. Speed 1.7Gbps
MU-MIMO

2019
GiGA WiFi Premium 2.4

802.11ax 4x4
Max. Speed 2.4Gbps
OFDMA

2020
GiGA WiFi home ax

802.11ax 2x2
Max. Speed 1.2Gbps
OFDMA, EasyMesh

2021
GiGA WiFi Buddy ax

802.11ax 2x2
Max. Speed 1.2Gbps
OFDMA,
EasyMesh(Agent)

2022
GiGA WiFi home 6E

802.11ax 2x2
Max. Speed 2.4Gbps
WiFi 6GHz,
OFDMA, EasyMesh

2023
GiGA WiFi Premium 7

802.11be 4x4
Max. Speed 11.5Gbps
WiFi 6GHz,
OFDMA, EasyMesh
4KQAM, MLO

IEEE 802.11	802.11ac	802.11ax		802.11be
Wi Fi	Wi-Fi 5	Wi-Fi 6	Wi-Fi 6E	Wi-Fi 7

Wi-Fi 7 technology

7th Standard Technology with Wi-Fi

Speed up

320 MHz

Increase the bandwidth of 'Wi-Fi 6GHz' to'320MHz' for maximum 11.5Gbps (based on 4 antennas) and support up to 16 antennas

Enhanced QoS (Quality of Service)

Improve the method of critical data transmission through data-specific granular transfer priorities

Wi-Fi 7
(802.11be)

Wi-Fi connection

- WiFi frequencies (2.4 GHz, 5 GHz, 6 GHz) can be used simultaneously to maximize the frequency
- Add current-reducing actions for multiple connections

Use Wi-Fi effectively

- OFDMA multi-data transmission technology increases Wi-Fi usability (Multi-RU)
- Static Preamble Puncturing technology enables Wi-Fi to be used without a Wi-Fi bottleneck in interference-intensive environments

Wi-Fi 7 Service

Increase speed and bandwidth to increase data usage and connectivity

Remote Meeting	Remote Wireless Office	VR	AR	8K video
Home Mesh	Emergency room medical equipment	IoT device	Multiple Connections	

Increase multimedia usability

E-Game	E-Sports	XR eXtended Reality	16K video	MPS Multimedia Priority Service

GiGA WiFi Premium 7

- First carrier to support Wi-Fi 7 integration to clients
- Maximize reliable Wi-Fi performance with Wi-Fi 7 enabled device connection
  (currently available for laptop connections)

GiGA WiFi Premium 7

- Up to 11.5Gbps speed with 320MHz bandwidth on Wi-Fi 7
- World's leading RF and Wi-Fi technologies
  (6GHz frequency, QoS, OFDMA, MU-MIMO, IPTV over WLAN, etc.)
- Multiple concurrent connections (2.4 GHz, 5 GHz, 6 GHz)
  (Multiple connections enable Wi-Fi Full-Duplex)
- Reliable speed and QoS for Wi-Fi interference-intensive environments
- Available not only for home customers, but also for B2B and AI robots

GiGA WiFi Premium 7 Throughput

MWC 2023 KT Booth - KT Wi-Fi 7 (GiGA WiFi Premium 7)

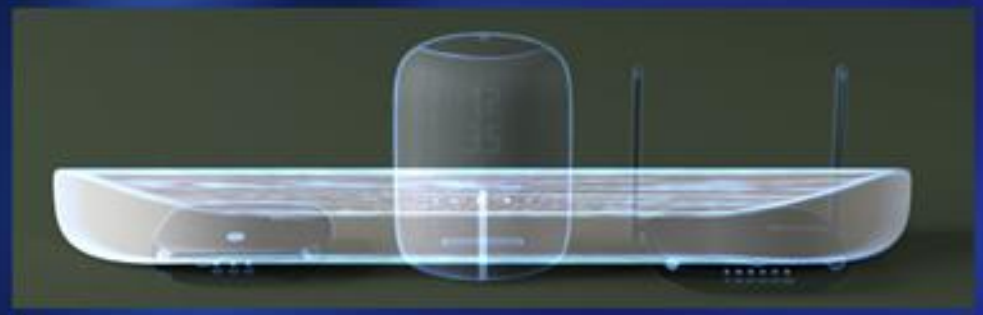
KT booth

KT Wi-Fi 7 booth with Intel Client

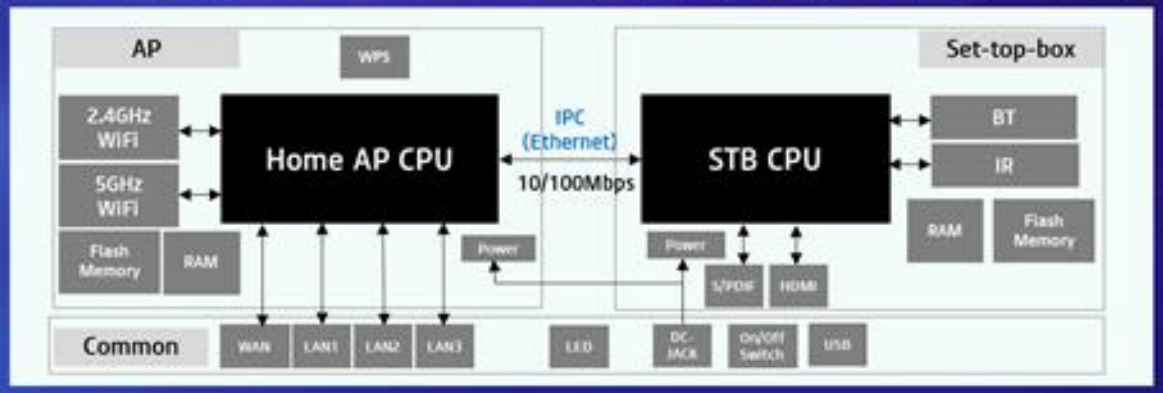
Korean famous influencer ‘ITSub’ Visit KT Wi-Fi 7 booth
https://youtu.be/phz-he5Zyng?t=651

KT, Intel join hands to launch world's first Wi-Fi 7
https://www.koreaherald.com/view.php?ud=20230302000855

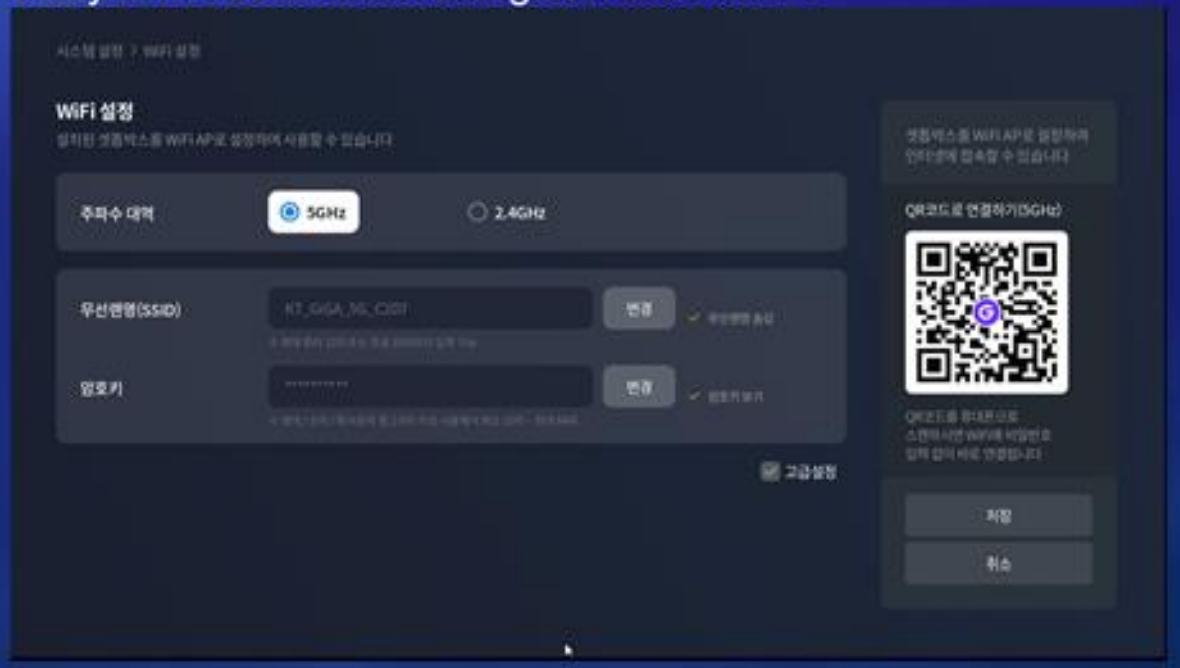
Genie TV All-in-One Sounder



AP and Set-top-box internal communication Flow (KT's Patents)



Easy Wi-Fi connection using QR code on TV



Hi-order for Store

KT GiGA WiFi home ax and GiGA WiFi home Buddy ax with EasyMesh

KT combines tablet ordering system with restaurant service robots
https://www.ajudaily.com/view/20230509110742274

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Wireless Broadband Alliance

NETWORK X

Patrick Ribardiere

Senior Director, Product Marketing, Qualcomm.

The Future of Broadband Services in the Wi-Fi 7 Era

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Qualcomm

WGC EMEA

October 25, 2023

The future of broadband services in the Wi-Fi 7 era

Patrick Ribardiere

Senior Director, Product Marketing, Qualcomm France S.A.R.L.

@qualcomm

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The Wi-Fi 7 era is here!

Qualcomm FastConnect 7800 Wi-Fi 7

Mobile

Compute

XR

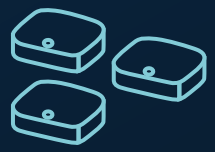
190+ Designs launched or in dev

350+ Total designs all categories

Qualcomm networking pro series Wi-Fi 7

Qualcomm immersive home platform Wi-Fi 7

160+


Mesh Wi-Fi

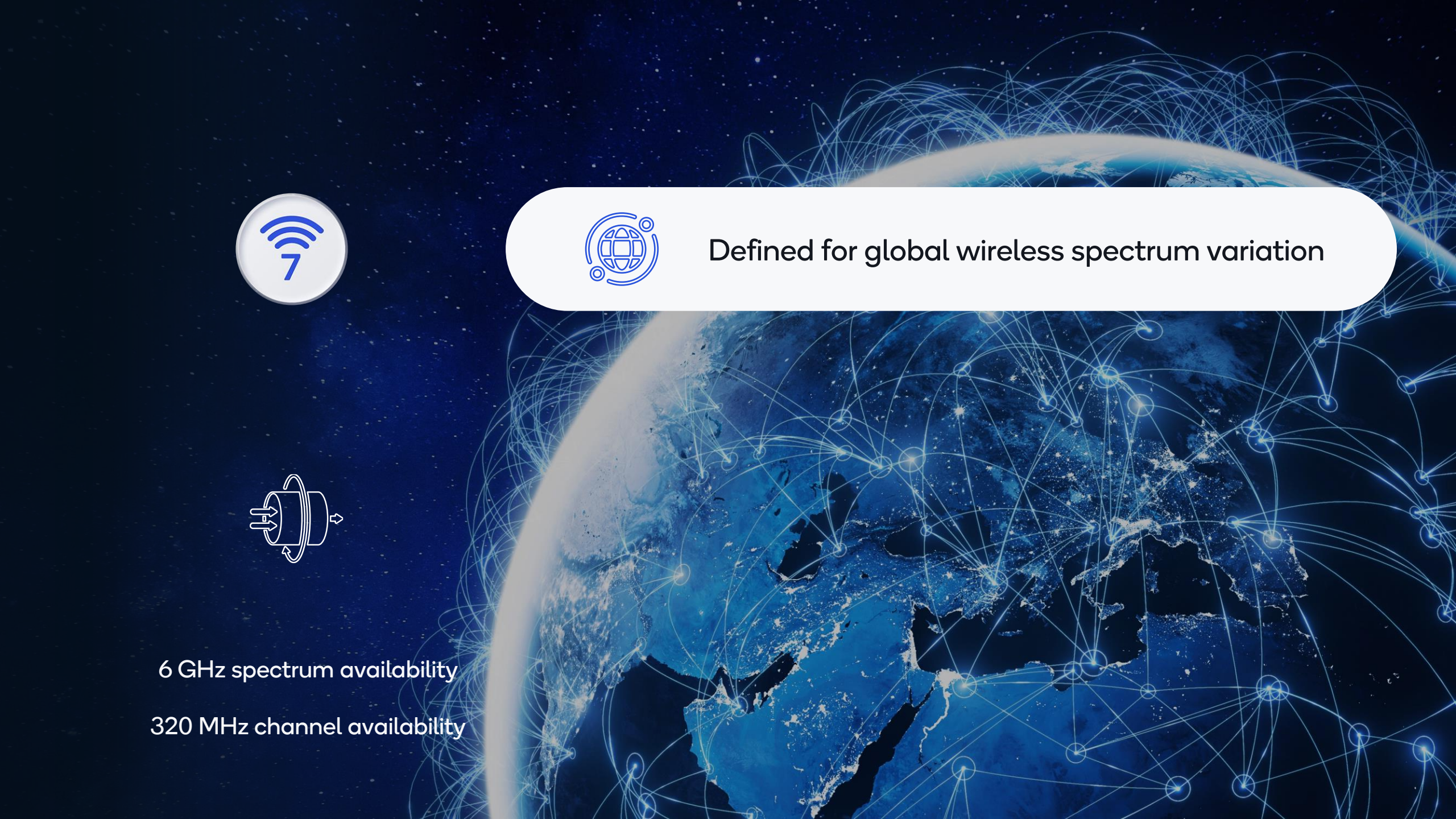
Gateway

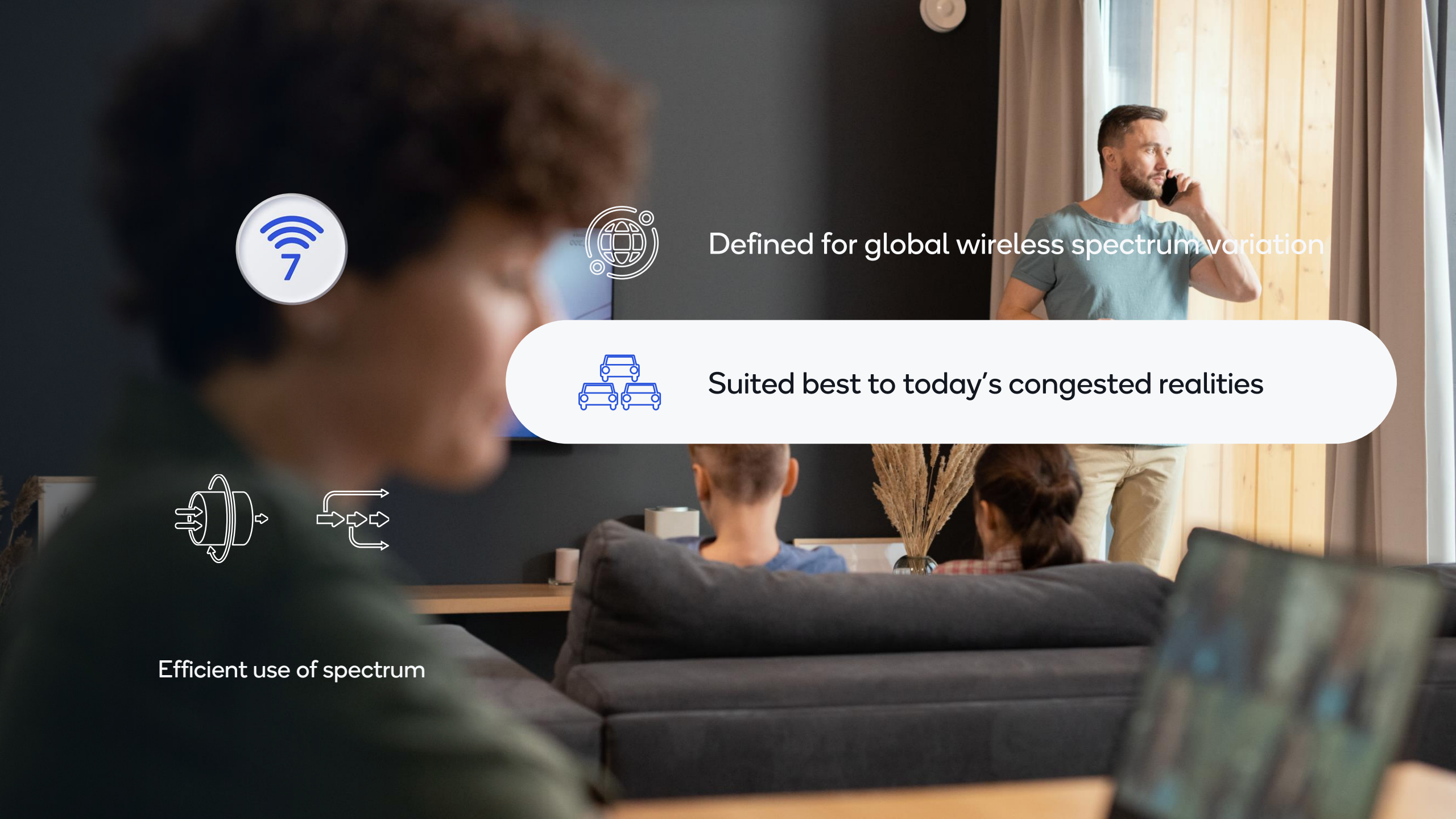
Enterprise

Qualcomm Technologies, Inc. Internal data

Wi-Fi 7

matters more than any Wi-Fi before

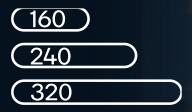

7
Defined for global wireless spectrum variation
6 GHz spectrum availability
320 MHz channel availability


7
Defined for global wireless spectrum variation
Suited best to today’s congested realities
Efficient use of spectrum

Defined for global wireless spectrum variation

Suited best to today's congested realities

Essential enabler of next-gen applications



Unprecedented speed

Wire-like latency

From connectivity platform

To services platform

From connectivity platform

Connect

To services platform

From connectivity platform

To services platform

Connect

10G connectivity to and through the home

Experience

With service awareness and real-time optimization

Innovate

With programmable software defined architecture

Profiling next-gen Quality of Experience

Current approaches

Wi-Fi Multimedia
(WMM QoS)

Managed
Wi-Fi

A new era of Quality of Experience management

Current approaches

Wi-Fi Multimedia (WMM QoS)

Managed Wi-Fi

Next-gen necessities

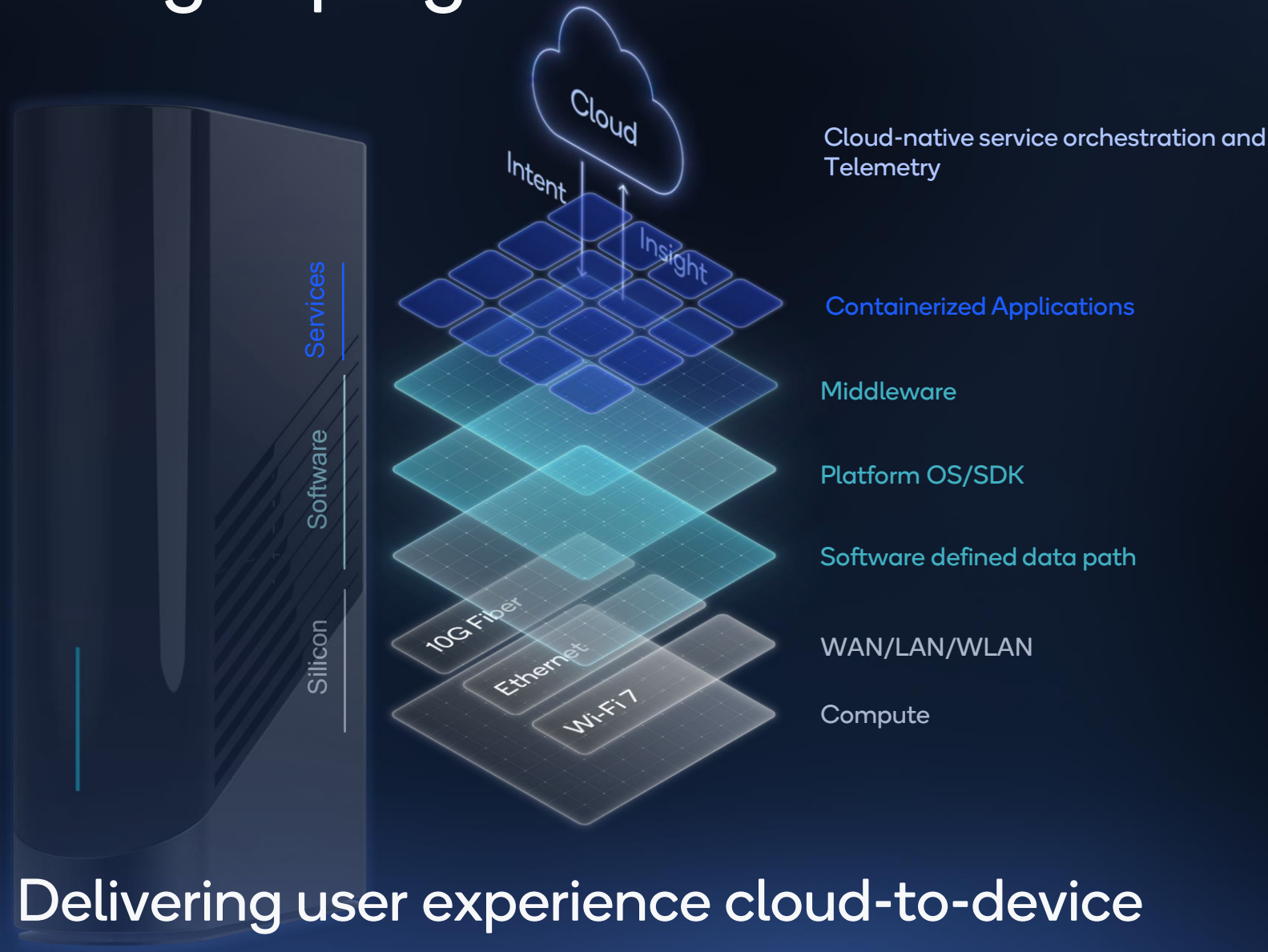
Service Awareness

Real-time Optimizations

All devices generations and types

End-to-end service management

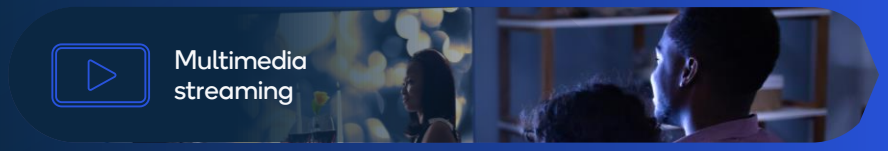
Profiling next-gen programmable architecture

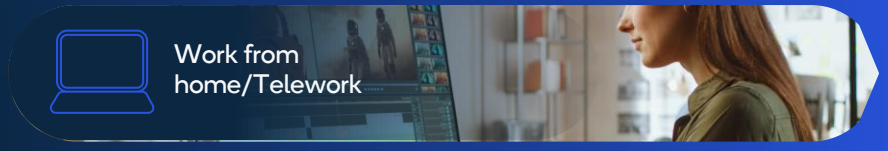


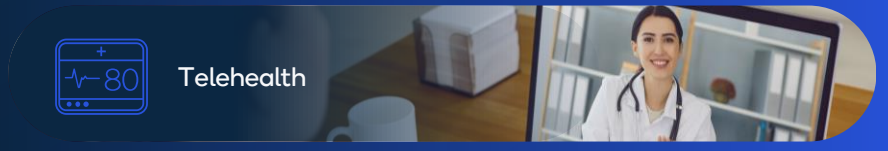
Delivering user experience cloud-to-device

The future of broadband services

Premium optimized services







Increased Service Assurance

Smart Home app ecosystem

Qualcomm ® 10G Fiber Gateway Platform

Superior Connectivity

- 10G-PON technology
- Proven interoperability with leading operator OLTs
- BBF .247 certified

- Up to Quad-Band/16-streams
- Up to 33 Gbps peak aggregate wireless system capacity

Redefining the future of broadband services

Exceptional User Experience

Qualcomm® Service Defined Wi-Fi

Orchestrate

Classify, Prioritize & Schedule

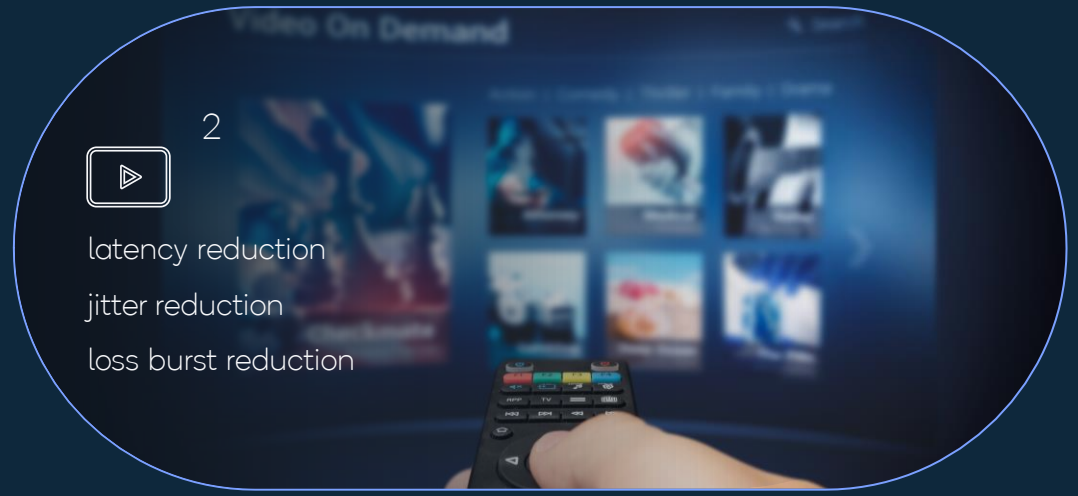
Insights

1

latency reduction

jitter reduction

loss burst reduction

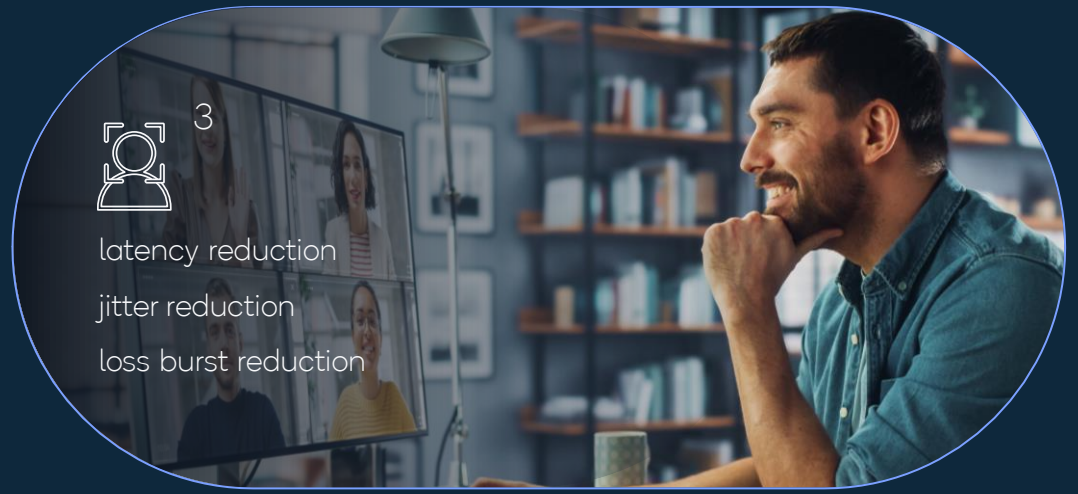


2

latency reduction

jitter reduction

loss burst reduction

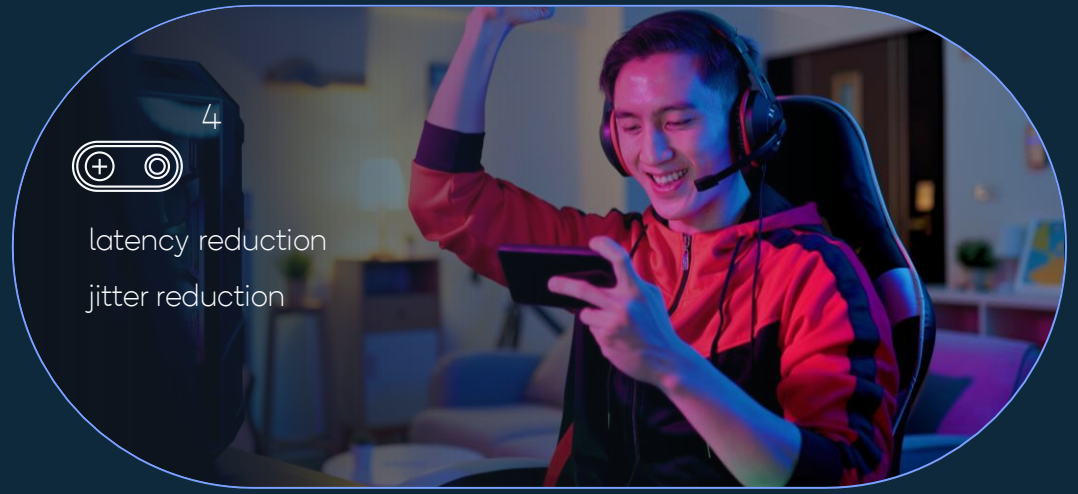


3

latency reduction

jitter reduction

loss burst reduction



4

latency reduction

jitter reduction

Optimized user experience for the most demanding apps

Qualcomm Technologies analysis. Measurements compare performance with and without Service Defined Wi-Fi, full channel background traffic. Measured average DL latency, maximum jitter, maximum consecutive datagram loss
[1]Wi-Fi6 XR 40 Mbps downlink and 20 Mbps uplink [2] Wi-Fi6 4K Video 40 Mbps downlink [3] Wi-Fi6 HD Video 20 Mbps bi-directional [4]Wi-Fi6 Gaming 60 kbps bi-directional

Thank you

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Joesph Valencia

Chief Product Officer, Origin Wireless.

Beyond Connectivity: How Wi-Fi Sensing is Shaping Modern Homes

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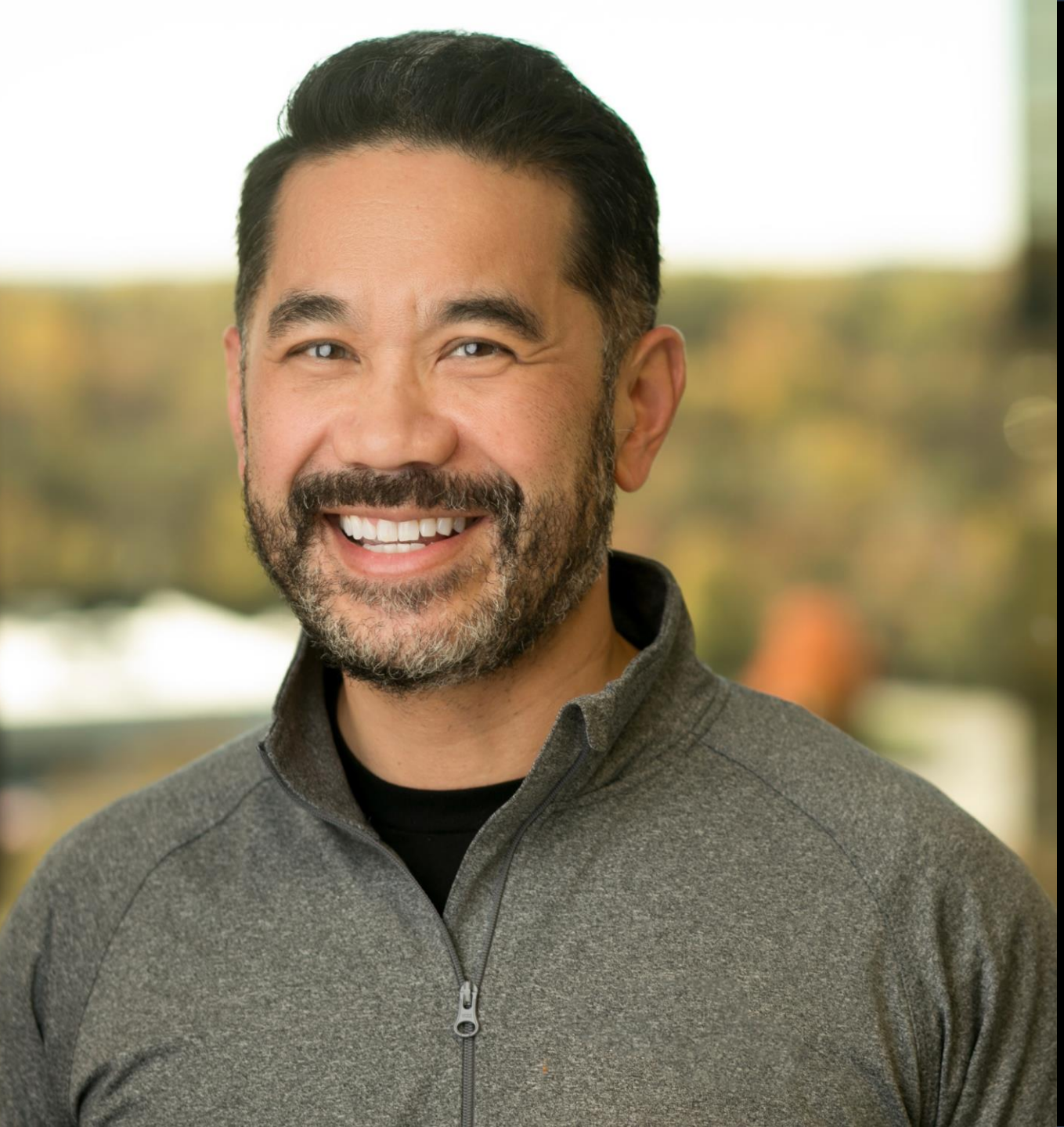
Beyond Connectivity - How WiFi Sensing is Shaping Modern Homes



Joseph Valencia

Chief Product Officer

20+ years technology & telecom

- Product Management
- Business Development
- Strategy
- Innovation

verizon Microsoft

T-Mobile hp

ORIGIN™

About Origin

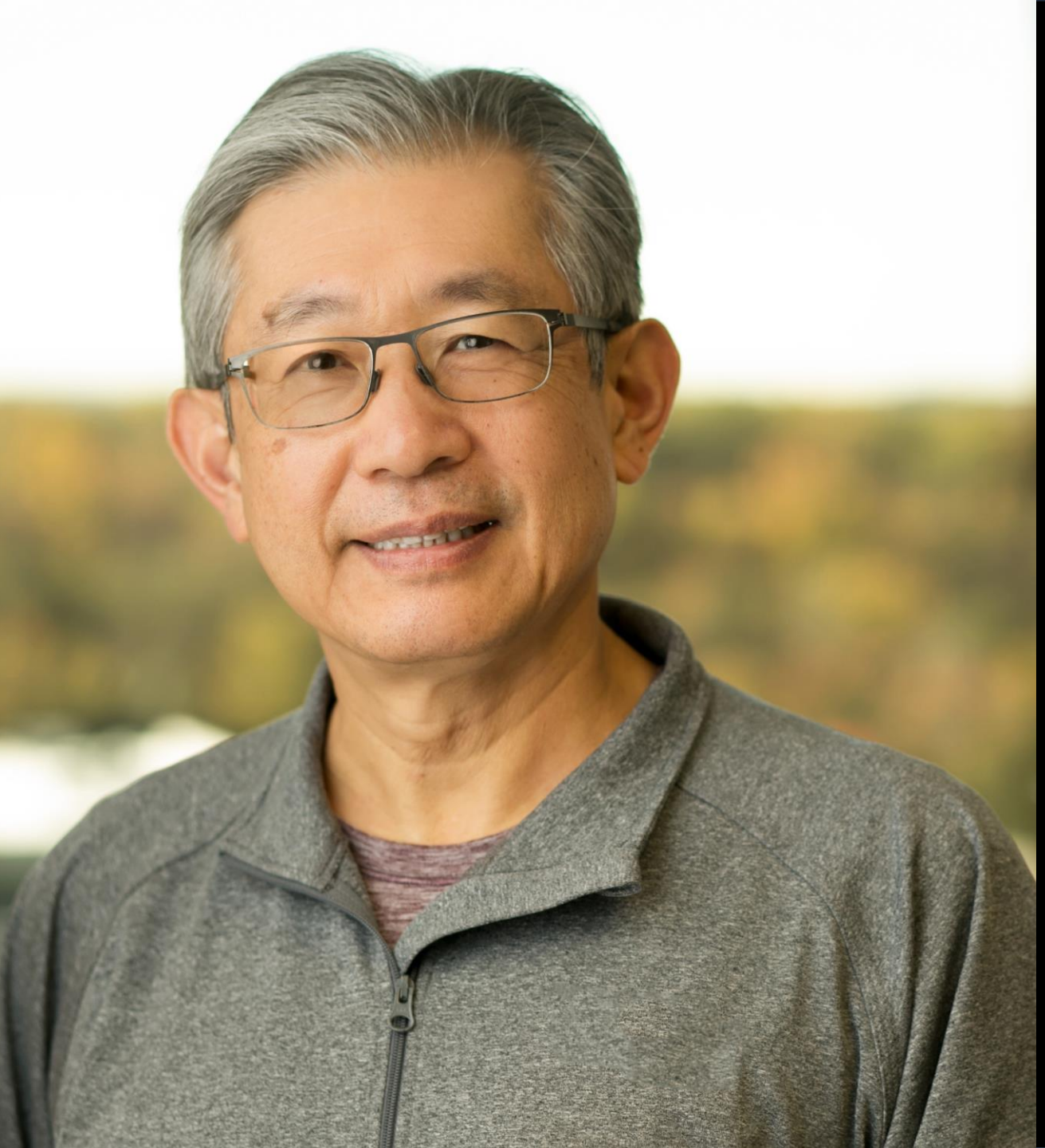
The inventors of WiFi Sensing

The fastest growing WiFi Sensing company in the world

Most robust roadmap in the industry

60+ patents granted/allowed & ~140 filed

ORIGIN™



Dr. Ray Liu

Chief Technology Officer, Founder & Chairman

UNIVERSITY OF MARYLAND

Distinguished Professor

Christine Kim Professor of Information Technology

IEEE

President 2022

Fourier Award 2021

Fellow 2003

ORIGIN™

WiFi can do more.

ORIGIN™

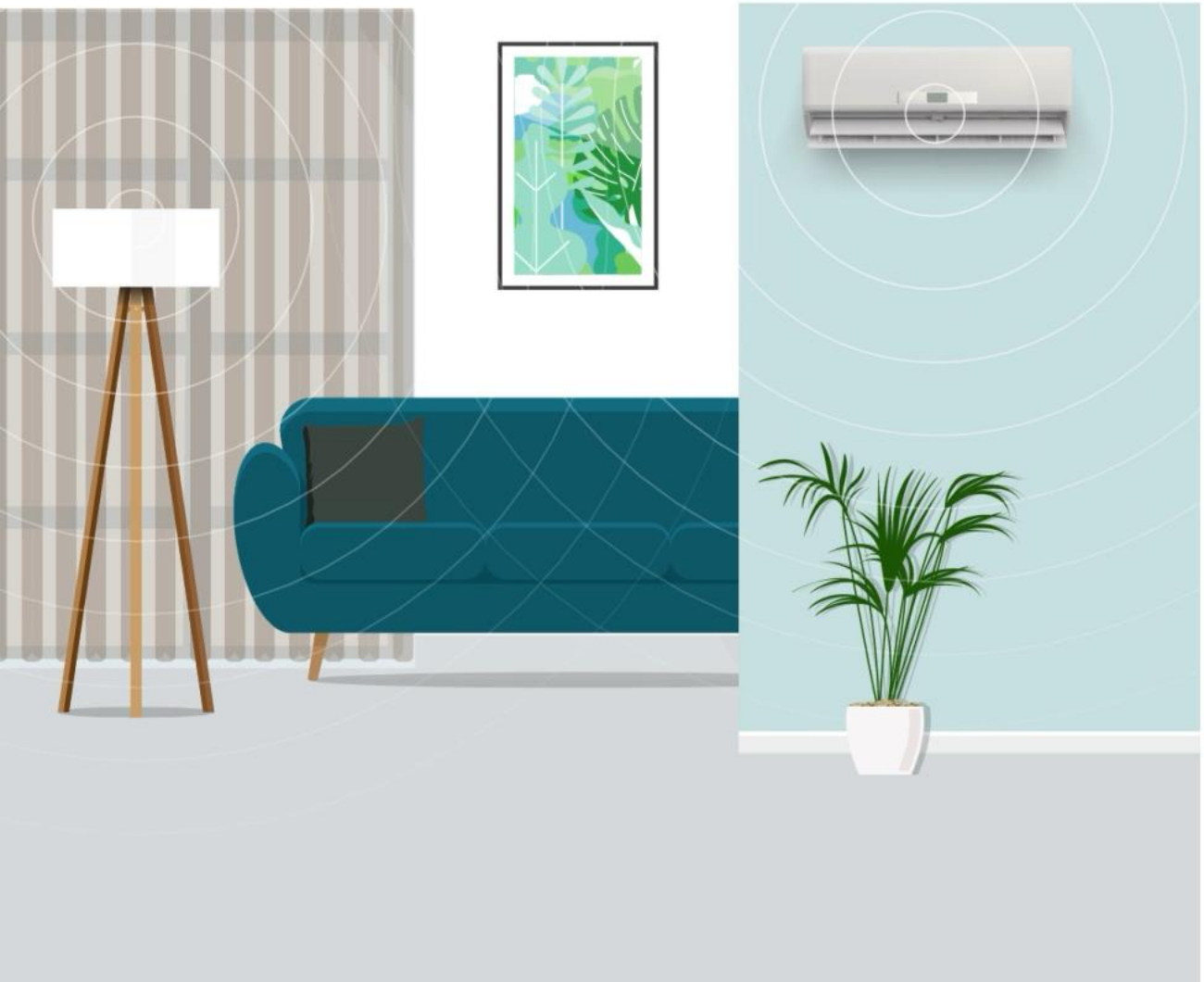
We believe
that Origin will leave a legacy of making
peoples lives easier, safer, and more secure

Introducing WiFi Sensing

Leveraging existing WiFi networks to sense, understand, and act

Enhancing Smart Homes and Beyond

Witness how WiFi Sensing effortlessly tailors environments



TruPresence™ Sensing data layer

Determines if there is a human in a space using the existing WiFi

Intrusion

- The most advanced intrusion detection solution to verify human presence in a space
- Using patented AI, we filter out non-human motion such as pets, fans, and mechanical motion for the lower false alarm rates

Occupancy

- Highly accurate human presence detection that verifies if a person is in a space, or not.
- We enable energy efficiency for HVAC, smart automations, and lighting controls in homes and businesses

ORIGIN™

How WiFi Sensing is Shaping Modern Homes

ORIGIN™

Our Goal

Create data layers to redefine the User Experience
to create Intelligent Homes. Not smart ones.

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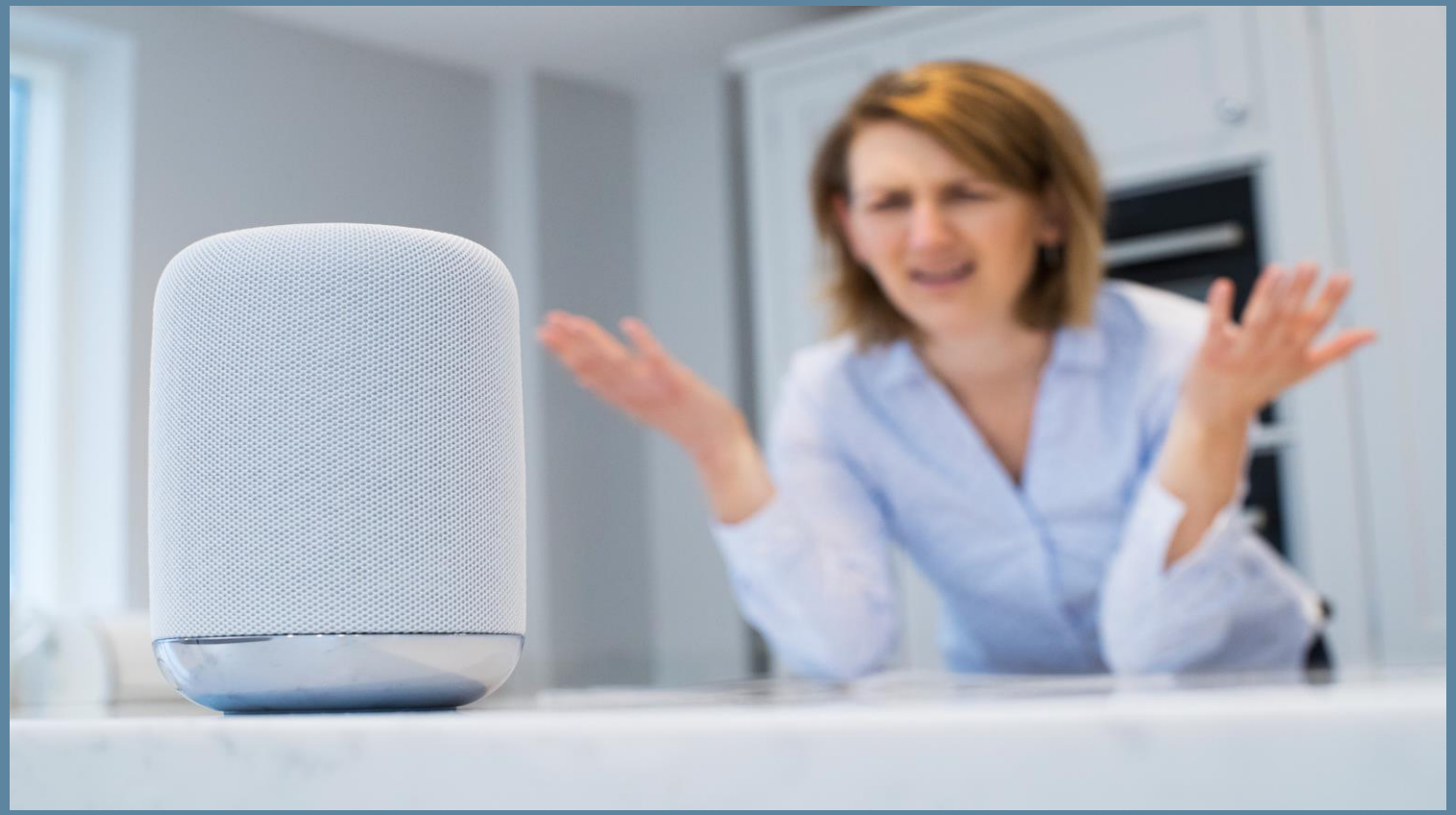
What we were promised

But instead of this. . .

ORIGIN™

We got this



ORIGIN™

We can deliver the promise.

ORIGIN™

Always ready, connected,
and fast. JUST ~~ASK.~~ BEK.

ORIGIN™

Sensing

A revolutionary way to connect with your home.

ORIGIN™

Before you even ask... Sensing knows.

ORIGIN™

Sensing knows...

Sensing knows...

ORIGIN™

Sensing knows...
ORIGIN™

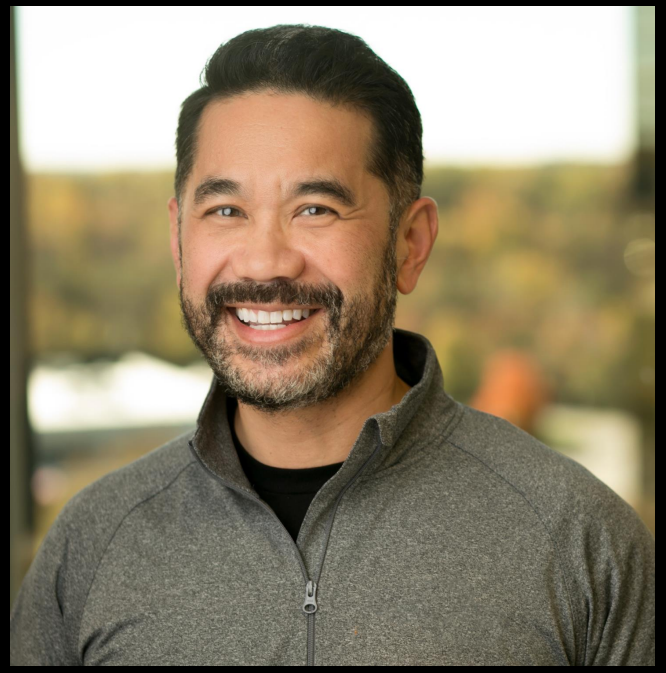
Sensing knows...
ORIGIN™

ORIGIN™

Sensing knows...

Sensing

POWERED BY ORIGIN™



Joseph Valencia

Chief Product Officer

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- LinkedIn

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Wireless Broadband Alliance

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Panel: Next Gen Wi-Fi Transforming the Smart Home

Metin Taskin

CEO, Airties.

Willem van Kempen

Senior Manager Connectivity Products and Enablers, Liberty Global.

Oscar Gallego

Head of Home & Security Products, Vodafone.

Patrick Ribardiere

Senior Director, Product Marketing, Qualcomm.

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WBA INDUSTRY AWARDS

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Broadband
Alliance
WBA
INDUSTRY
AWARDS
Welcome to the 11th
WBA INDUSTRY AWARDS

Wireless Broadband Alliance

WBA INDUSTRY AWARDS

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST WI-FI NETWORK OPERATOR

WBA INDUSTRY AWARDS

WINNER!

Wireless Broadband Alliance

BEST WI-FI NETWORK OPERATOR

KT Corporation

KT Wi-Fi 7 & All-in-One Wi-Fi Services

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST WI-FI NETWORK TECHNOLOGY

WBA INDUSTRY AWARDS

WINNER!

Wireless Broadband Alliance

BEST WI-FI NETWORK TECHNOLOGY

TIP OpenWiFi

Opens the Door to Better Wi-Fi Technology–Wi-Fi Network Technology is Now Open and Disaggregated Around the World

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST IN-HOME WI-FI NETWORK

WBA INDUSTRY AWARDS

WINNER!

Wireless Broadband Alliance

BEST IN-HOME WI-FI NETWORK

Ambeent & Vodafone

Real-Time Engagement and Hyper-Personalization: Ambeent and Vodafone's Customer-Centric Solutions

vodafone

Ambeent

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST ENTERPRISE WI-FI NETWORK

WBA INDUSTRY AWARDS

WINNERS!

Wireless Broadband Alliance

BEST ENTERPRISE WI-FI NETWORK

Huawei Helps Shenzhen Talent Institute

Huawei Helps Shenzhen Talent Institute Deploy High-Quality Wi-Fi 7 Networks

HUAWEI

深圳市人才研修院
SHENZHEN TALENT INSTITUTE

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST WI-FI FOR SOCIAL IMPACT

WBA INDUSTRY AWARDS

WINNER!

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BEST WI-FI FOR SOCIAL IMPACT

TIP OpenWiFi

Opens the Door to Digital Equity–A Perfect Public Private Partnership Solution for Social Impact

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST WI-FI INNOVATION

WBA INDUSTRY AWARDS

WINNER!

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BEST WI-FI INNOVATION

Airties

The Hybrid Cloud-Edge Architecture of Airties Smart Wi-Fi Solution

WBA INDUSTRY AWARDS

Wireless Broadband Alliance

BEST WI-FI CUSTOMER EXPERIENCE

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BEST WI-FI CUSTOMER EXPERIENCE

Cognitive Systems

Cognitive Systems Best WiFi Experience 2023

COGNITIVE

WBA INDUSTRY AWARDS

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CTO OF THE YEAR

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CTO OF THE YEAR

Matt MacPherson

Leadership, vision, and a commitment to providing better wireless experiences for all

Wireless
Broadband
Alliance
WBA
INDUSTRY
AWARDS
CONGRATULATIONS TO ALL
OUR WINNERS!
Thank you and see you next year

Thank you to our Sponsors

airties
boingo wireless
BROWAN
CISCO
CLOUD4WI
COGNITIVE
ENEA
galgus
Hub One Digital Technologies
intel
KYRIO
OpenWiFi TELECOM INFRA PROJECT
ORIGIN™
Qualcomm
RUCKUS COMMSCOPE

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NETWORKING **DRINKS RECEPTION**

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Wireless Broadband Alliance

SPONSORED BY:

CISCO

boingo wireless

JOIN US

VENUE: Speaker & VIP Lounge

TIME: 25th October 2023 - 17:30

Wireless Global Congress
Wireless Broadband Alliance

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See You Tomorrow for WGC EMEA at 9 a.m. (CET)

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