19 JAN - 8 FEB, 2021

ASIA TELECOM SUMMIT

WELCOME & INTRODUCTION

By Bruno Tomás

28th Jan 2021

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WIRELESS GLOBAL CONGRESS

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Asia Telecom Summit

Full Program Agenda

3rd – 4th February – WBA Members Only Working Sessions
Start time: 10:00 ET; 07:00 PT; 23::00 Singapore; 15:00 GMT

4th February – WBA Members Only Working Sessions: **Briefing for Asia-based members**
Start Time: 08:30 PST – 11:30 EST; 16:30 BST – 17:30 CET

ASIA TELECOM SUMMIT OPEN CONFERENCE Start time 16:00 Singapore; 08:00 GMT; 03:00 ET; 00:00 PT

Tuesday 19th January	Wednesday 27th January	Thursday 28th January	Tuesday 2nd February	Monday 8th February
WBA Executive Plenary	OpenRoaming™: Transforming Public & Guest Wi-Fi	Next Generation of Wi-Fi	Wi-Fi & 5G: The Path To Convergence 16:00PM Singapore Wi-Fi & 5G: The Path To Convergence 12:30 AM Singapore	Next Gen Wi-Fi & IoT

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Next Generation of Wi-Fi

Bruno Tomás

Director of Programs

Wireless Broadband Alliance

Edgar Figueroa

CEO

Wi-Fi Alliance

Jongyoon Shin

Team Leader Wired Network Development

SK Telecom

Yang Jie

Vice President of Campus Network Domain

Huawei Technologies

Zvika Haas

Vice President of Sales for Asia Pacific

AirTies

Dr. Chris Spencer

CTO

GlobalReach Technology

Next Generation of Wi-Fi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

TODAY'S AGENDA	
08:00am (GMT)	**Introduction & Welcome** Bruno Tomás, Director of Programs, Wireless Broadband Alliance
08:05am (GMT)	**Wi-Fi® for the next era** Edgar Figueroa, CEO, Wi-Fi Alliance
08:20am (GMT)	**Expanding Wi-Fi 6 Service to 6E** Jongyoon Shin, Team Leader, Wired Network Development Team, SK Telecom
08:40am (GMT)	**Transforming the campus enterprise network with Wi -Fi 6** Yang Jie, Vice President of Campus Network Domain – Huawei Technologies
09:00am (GMT)	**Smart Wi-Fi during the "Life at home" Era** Zvika Haas, VP of Sales of APAC - Airties
09:20am (GMT)	**The Assured User ID Challenge in 2021** Dr. Chris Spencer, Group Chief Information Security Officer GlobalReach Technology
09:40am (GMT)	**WBA Wi-Fi 6/6E Program for 2021** Bruno Tomás, Director of Programs, Wireless Broadband Alliance
10:00am (GMT)	**Close** Bruno Tomás, Director of Programs, Wireless Broadband Alliance

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Introduction & Welcome

BRUNO TOMÁS

DIRECTOR OF PROGRAMS, WIRELESS BROADBAND ALLIANCE

WIRELESS BROADBAND ALLIANCE
DRIVING NEXT WIRELESS EXPERIENCE

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Wi-Fi® for the next era

EDGAR FIGUEROA

CEO, WI-FI ALLIANCE

Wi-Fi ALLIANCE

Wi-Fi® for the next era

Edgar Figueroa
President & CEO
January 28, 2021

Agenda

- About Wi-Fi Alliance®
- Wi-Fi for the next era
- Wi-Fi Alliance activity in 2021

About Wi-Fi Alliance

Wi-Fi Alliance vision: connecting everyone and everything, everywhere

Wi-Fi for the next era includes …

6 GHz access

Mobility

Security

Quality Wi-Fi everywhere

The 2020 headline

Wi-Fi access in
6 GHz band

Administrations enabling 6 GHz access

EMEA

- European Union
- Jordan
- United Arab Emirates
- United Kingdom

Asia Pacific

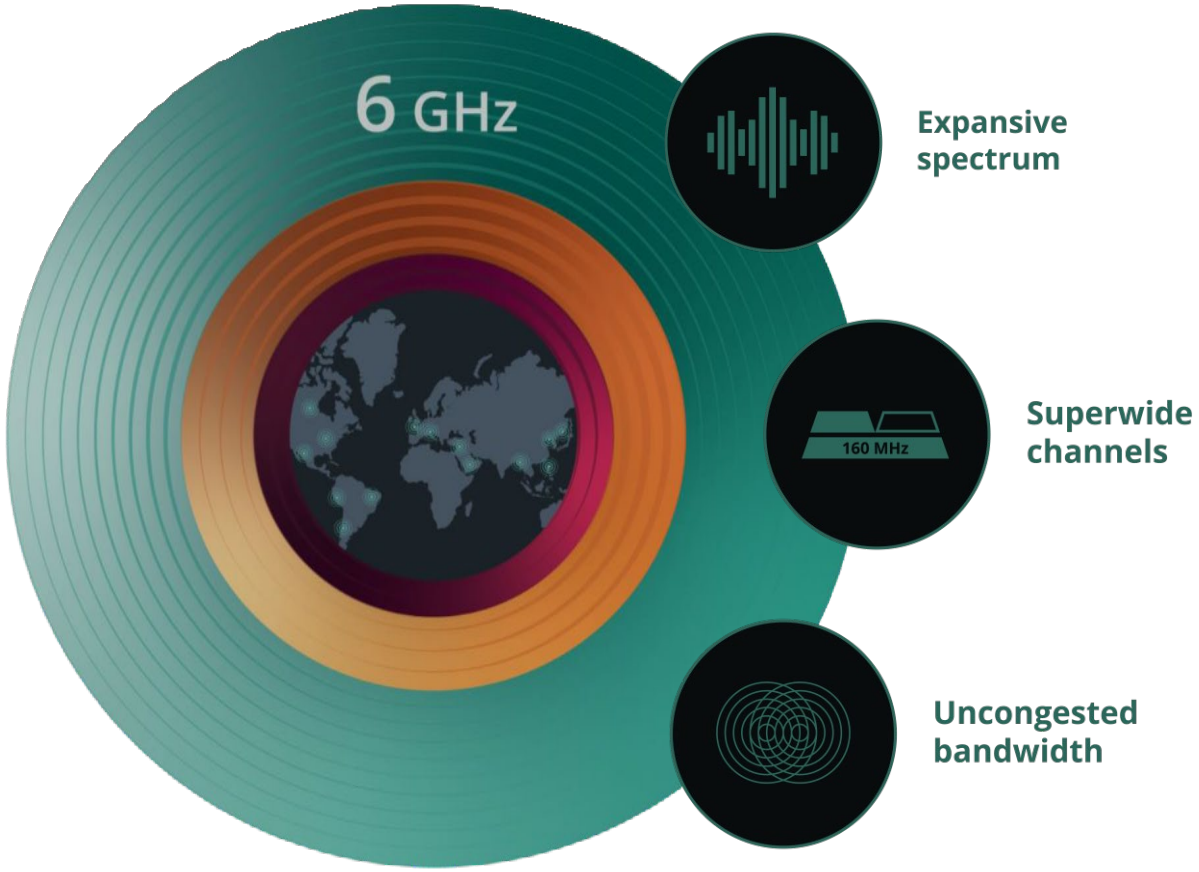
- Japan
- South Korea

Americas

- Argentina
- Brazil
- Canada
- Chile
- Colombia
- Mexico
- Peru
- United States

Many more expected in 2021

Wi-Fi 6E = growth and innovation



Wi-Fi 6E brings:

- Better speed, throughput, and latency
- Advanced connectivity experiences
- Quality in demanding environments
- New innovative possibilities

Wi-Fi Alliance galvanized around Wi-Fi 6E

- Developed and delivered in record speed as option under Wi-Fi CERTIFIED 6™
- Includes Wi-Fi CERTIFIED WPA3™
- 338+ million devices will ship in 2021*
- 7 of 12 Wi-Fi 6 routers announced at CES 2021 are Wi-Fi 6E
- Smartphones, PCs, and laptops expected in the first quarter of 2021
- TVs and VR products expected midyear

*IDC, 2020

Wi-Fi 6E interest

> *Wi-Fi 6E will see rapid adoption in 2021 with more than 338 million devices entering the market, and nearly 20 percent of all Wi-Fi 6 device shipments supporting 6 GHz by 2022.*

Phil Solis, IDC

~300M media impressions so far in 2021

The next era will bring a surge in innovation

- Wi-Fi 6 market adoption will continue soaring
- Wi-Fi Alliance members leveraging Wi-Fi 6 to bring:
  - Enterprise-class home Wi-Fi
  - Fresh use cases in telemedicine, education, AR/VR
  - Industry 4.0
- Continuing Wi-Fi and cellular services integration

> *2021 will finally see the rejection of 'Wi-Fi versus 5G battle for dominance' messaging… the two wireless technologies complement each other to provide* ***enterprise-wide****,* ***city-wide****,* ***global-wide*** *wireless services.*

Perry Correll, Extreme Networks

6 GHz access helps usher in a new era of…

Mobility

Security

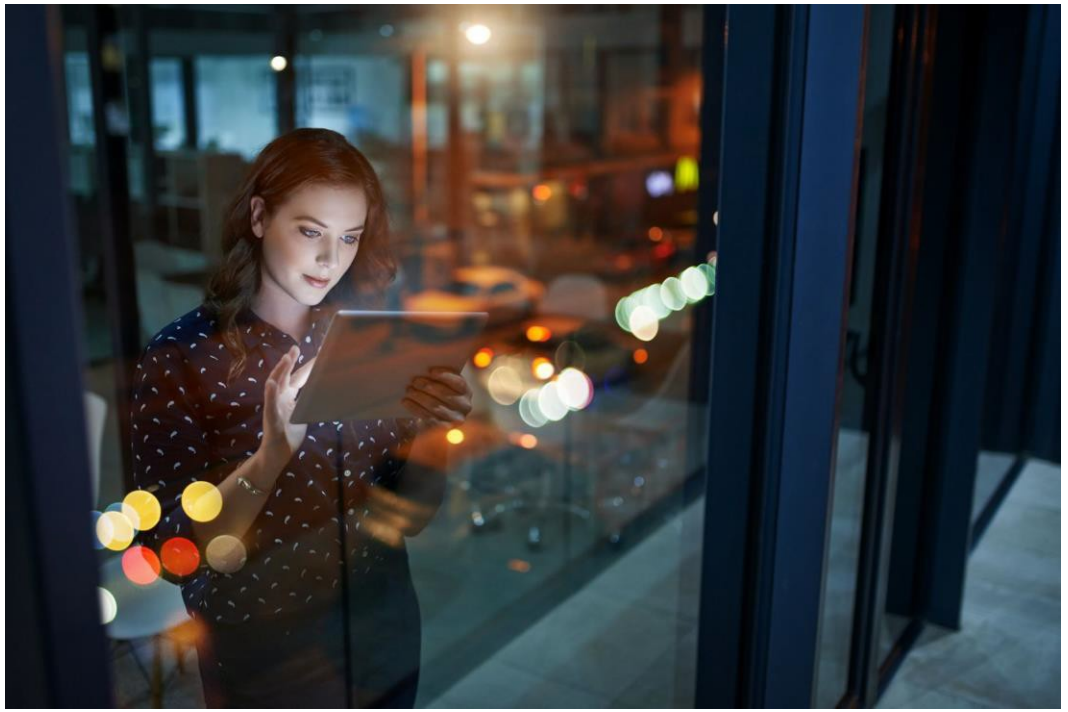
Quality Wi-Fi everywhere

Mobility advances convergence

- Performance and security as people and/or devices traverse the world
- Wi-Fi CERTIFIED Passpoint® seamless roaming experience; see WBA OpenRoaming, OrionWiFi, Airpass
- Frictionless mobility facilitates Wi-Fi delivery of 5G and broadband goals
  - Densification
  - Very low latency
  - Performance at every corner

Security, everywhere

- Secure Wi-Fi is the norm: concerted push for security for every device in every scenario continues
- WPA™
  - Wi-Fi CERTIFIED WPA3™: unequalled cryptographic strength
  - Wi-Fi security always evolving to avoid or address evolving threats
- Additional Wi-Fi Alliance programs address open networks, headless devices



Quality Wi-Fi everywhere

- Remote work, school scenarios will endure
- Nearly every place is a potential office
- Telepresence and collaboration the norm
- Key programs
  - Home: Wi-Fi CERTIFIED EasyMesh™
  - Enterprise: Wi-Fi CERTIFIED 6
  - Managed networks: Passpoint®
- Opportunities abound
  - Equipment updates / upgrades
  - Differentiated service offerings
  - New applications and services

Wi-Fi Alliance activity for 2021

Wi-Fi Alliance 2021 snapshot

6 GHz: global harmonization, market adoption

Mobility: Passpoint®, Wi-Fi Optimized Connectivity™, OpenRoaming support

Security: WPA3 evolution, Wi-Fi Easy Connect™

Quality Wi-Fi everywhere: Wi-Fi 6 and Wi-Fi 6E, Wi-Fi EasyMesh™, Wi-Fi Easy Connect, Quality of Service

Join us to drive the future of Wi-Fi!

THANK YOU

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Wi-Fi Solution and Evolution in our daily life era

JONGYOON SHIN

TEAM LEADER, WIRED NETWORK DEVELOPMENT TEAM, SK TELECOM

SK telecom

T wi-fi

Expanding Wi-Fi 6 Service to 6E by SK Telecom

Jongyoon, Shin

Team Leader, Wired Network Dev. Team, SK Telecom

SK telecom

Table Of Contents

SK Telecom Overview – Market Leadership

SK Telecom is South Korea's leading ICT Company in market shares and customer satisfaction

Market Share

30.2Million **48.2%**

(2017.12)

Customer Satisfaction

21 consecutive years **1st**

(National Customer Satisfaction Index)

Dow Jones Sustainability Indices (DJSI)

11 years

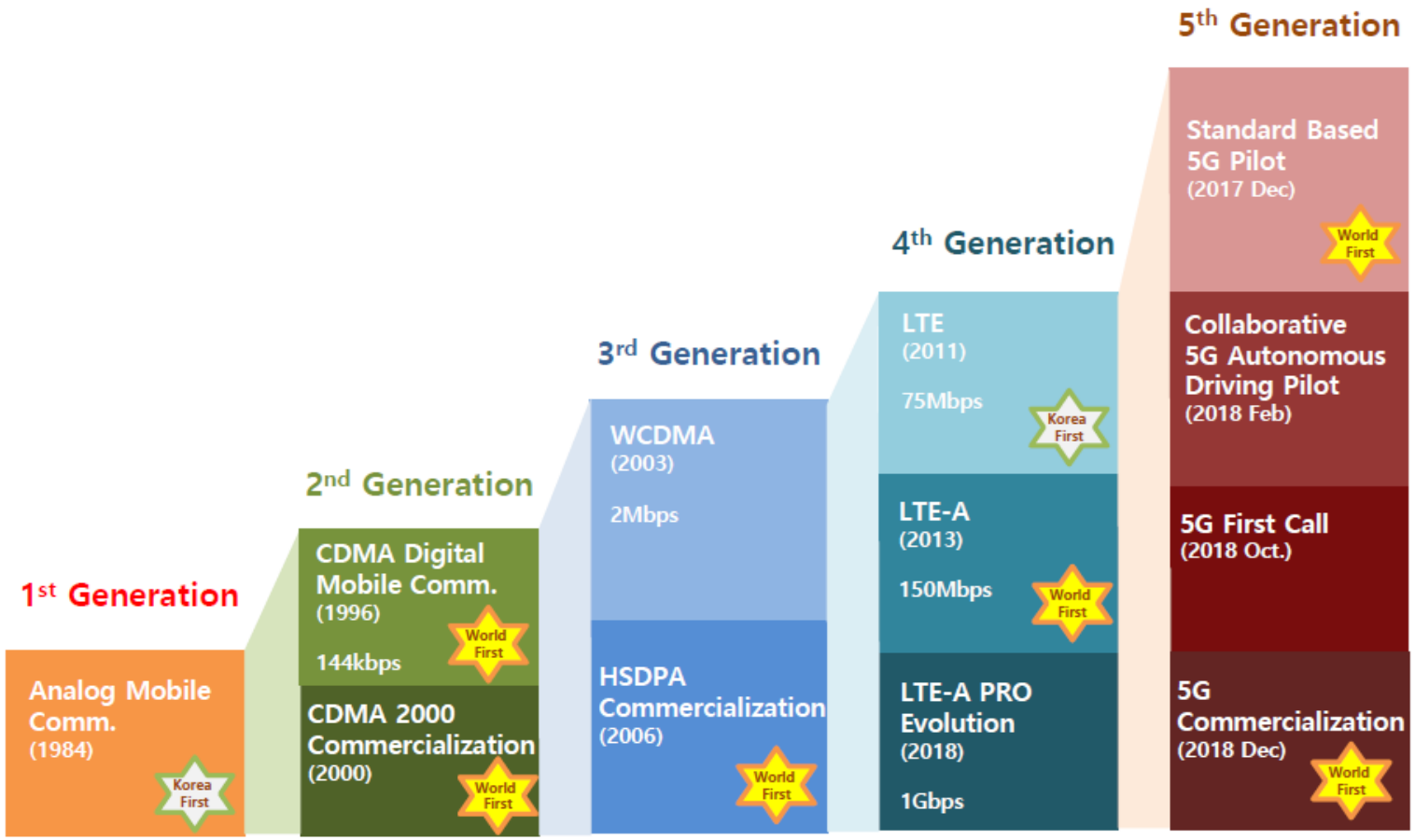
Network Quality

The Fastest LTE Service Provider in South Korea

(Communication Service Quality Assessment in South Korea, 2018)

SK Telecom Overview – Technical Leadership (Cellular N/W)

SK Telecom has been exploring the frontier of all areas of Mobile Networks and announced 5G commercialization in Dec ’18



SK Telecom Overview – Technical Leadership (Wi-Fi)

SKT has researched IEEE 802.11 standards and It has led the commercialization of the latest Wi-Fi AP according to the evolution of Wi-Fi standard.

802.11n Dual band

2.4GHz + 5GHz

October 2011

802.11ac Giga Wi-Fi

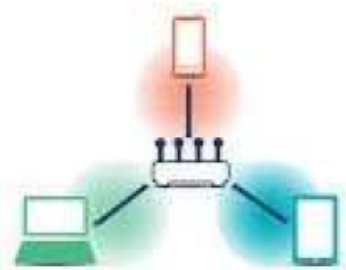
World First

256QAM, 80MHz

March 2013

802.11ac wave2

Korea First



Mu-MIMO

November 2015

802.11ax (Wi-Fi 6)

Korea First

August 2018

What Wi-Fi means for Mobile Operator is

What motivates mobile network operators to invest money
for innovative Wi-Fi solutions and to provide Free Wi-Fi service their subscribers?

Complementary Roles

for Cellular networks
(Aggregation with LTE/5G)

Customer Retention

Free Data Usage,
Differentiate to competitors

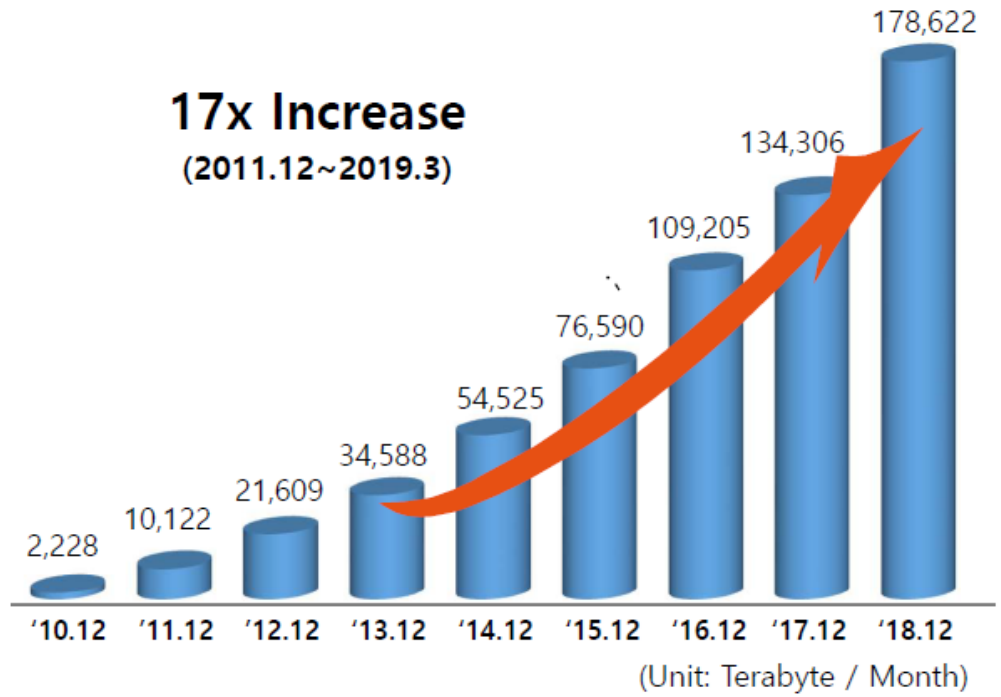
Search for New Business Opportunity

Massive and high T/P IoT,
Monetization etc.

SK Telecom's Mobile Traffic Trend

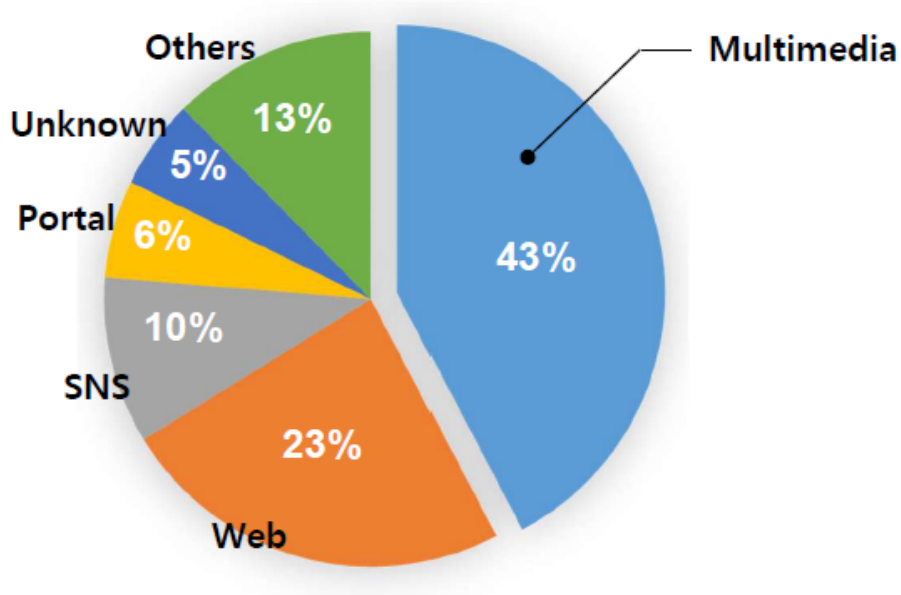
Mobile traffic has been growing explosively.
Most traffic used by SK Telecom's customers is from multimedia

SK Telecom's Mobile Traffic Trend



(Unit: Terabyte / Month)

Data Usage by SK Telecom's LTE User



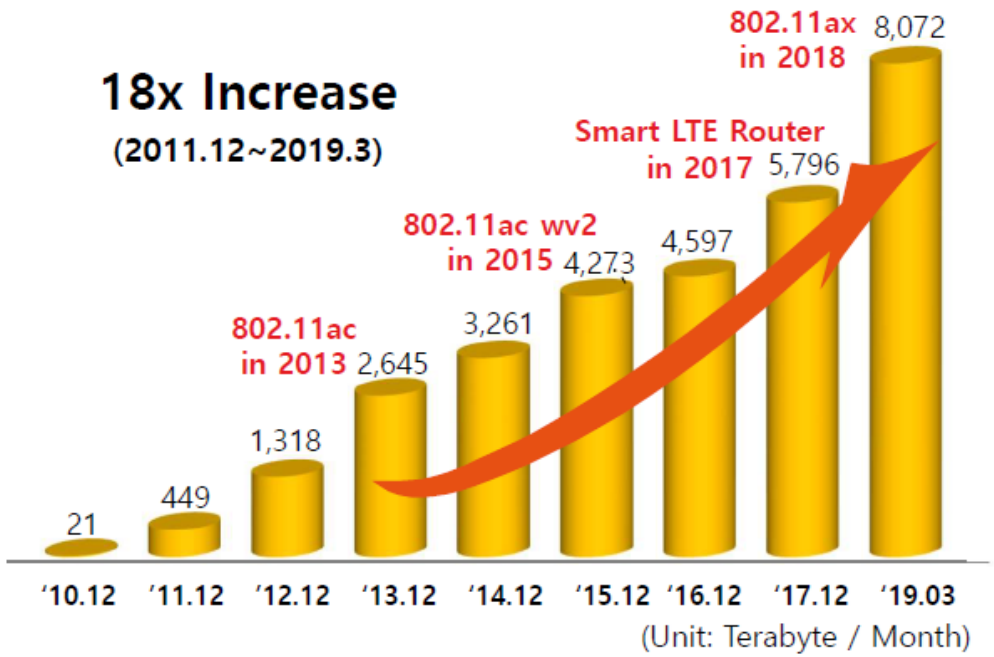
SK Telecom's Public Wi-Fi Traffic Trend

Wi-Fi Traffic also has increased rapidly.
Wi-Fi offloading is important in hotspots of public Wi-Fi zones.

SK Telecom's Public Wi-Fi Traffic Trend

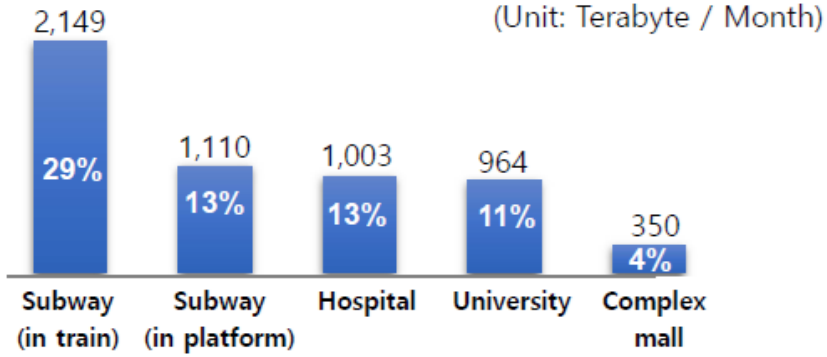
- **SKT has deployed more than 130k public Wi-Fi APs.**

> ※ **In-Home**: SKT is operating **4-million Home APs** through its subsidiary SK Broadband

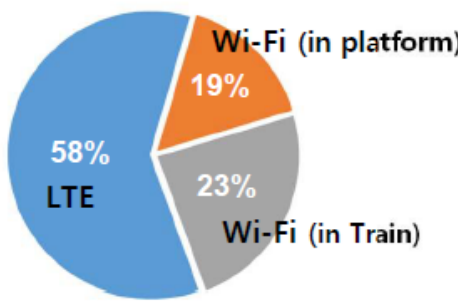


Wi-Fi Offloading Rate in Hotspots ('19.4)

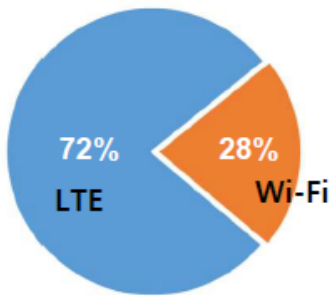
- **SKT's Hotspot ranking of public Wi-Fi zones**



- **Wi-Fi Offloading Rate in Hotspot**



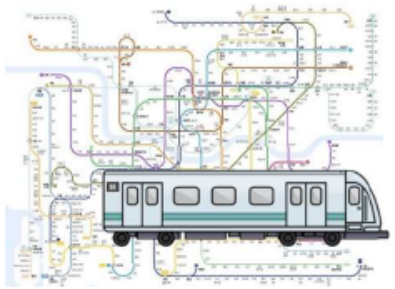
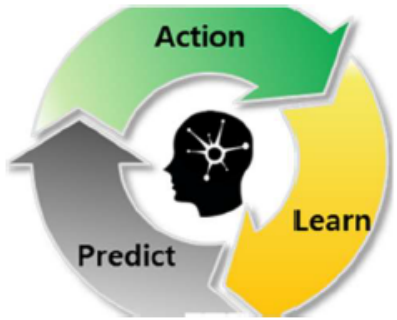
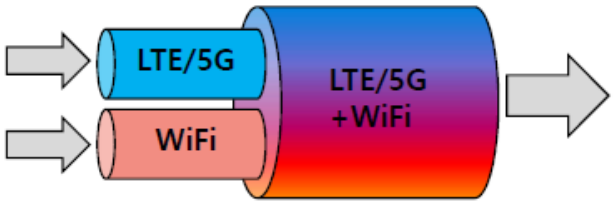
【 Subway ('19.4) 】



【 Munhak baseball stadium】
Opening game

SK Telecom's Carrier Wi-Fi solutions

SKT's carrier Wi-Fi solutions can be classified roughly into 3 areas:
① Infrastructure, ② Enhancement of QoS, and ③ New BM Search

Infrastructure	Control (Enhancement of QoS)	New BM Search
		
【 Smart LTE Router 】	【 Wi-Fi SON 】	【 Massive IoT 】
		
【 Next Generation Wi-Fi 6 】	【 Harmonized interworking with Cellular Networks 】	【 Monetization for Enterprise 】

Wi-Fi 6 Service by SK Telecom

Wi-Fi 6 can provide 4 times faster speed compared to the 11ac wave1 Wi-Fi, and enable reliable Wi-Fi service to customers anytime/anywhere.

Wi-Fi 6 Access Point
by SK Telecom

Main Specifications

- **Standard: IEEE 802.11ax/** ac/n/a/g/b
- **Frequency Band: 2.4GHz/5GHz dual-band**
- **Peak Rate: 4.8Gbps**
  - by using 160MHz channel bandwidth, 4 SS, 1024 QAM
- **Wi-Fi 6 Features: UL/DL OFDMA**, 1024QAM etc.

【 Wi-Fi Indicator 】

【 UI at Galaxy S10 】

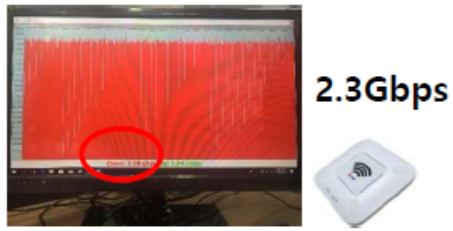
The average TCP throughput was measured to about 1Gbps at smartphone. Also, throughput has become stable thanks to OFDMA.

Average TCP Throughput

- **Specifications**

Parameters	AP	Smartphone
Standard	**802.11ax**/ ac/n/a/g/b	
MIMO	4 SS	2 SS
Bandwidth	160MHz	80MHz
MCS	1024 QAM, 5/6 Codes	
Data Rate (@PHY)	**4.8 Gbps**	**1.2 Gbps**

- **Performance Results**



2.3Gbps

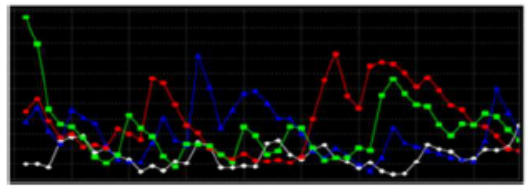
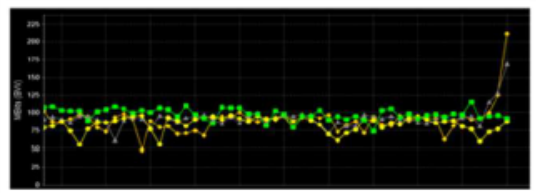
[AP Station mode]

850Mbps

[Samsung Galaxy S10]

Latency (w/ OFDMA vs w/o OFDMA)

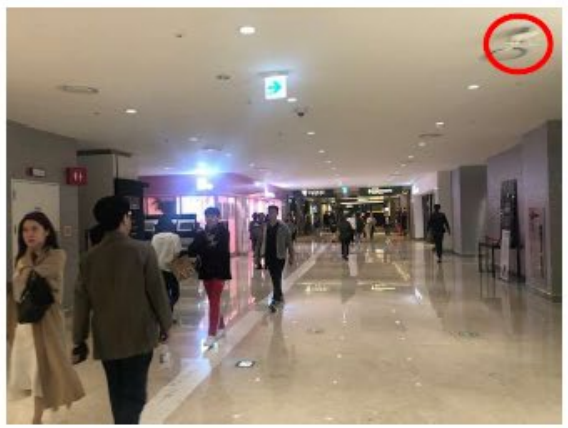
- **Test Environments**
  - AP & Smartphone: Wi-Fi 6 support
  - # of Smartphones: 4 (& background interference traffic)
- **Performance Results**
  - Latency is reduced by about 80%.
  - Throughput fluctuation per user is reduced thanks to OFDMA.

	Latency	Throughput Variation per user
w/o OFDMA	21 ms	
w/ OFDMA	4 ms	

Wi-Fi 6 Service by SK Telecom

- In October 2017, SK Telecom developed the nation's first 802.11ax Wi-Fi technology delivering quadrupled speed.

- In August 2018, SK telecom obtained nation's first commercial certificate with local vendor from South Korea's ministry of Science, Technology and Information.



【 Wi-Fi 6 in a Complex mall 】

방송통신기자재등의 적합인증서

Certificate of Broadcasting and Communication Equipments

상호 또는 성명 (Trade Name or Applicant): (주) 에치에프알

기자재명칭(명칭) (Equipment Name): 특정소출력 무선기기(무선랜을 포함한 무선접속시스템용 무선기기)

기본모델명 (Basic Model Number): H834AX

파생모델명 (Sales Model Number):

인증번호 (Certification No.): R-C-HFR-H834AX

제조자/제조국가 (Manufacturer/Country of Origin): (주) 에치에프알 / 한국

인증연월일 (Date of Certification): 2018-08-31

기타 (Others):

위 기자재는 「전파법」 제58조의2 제2항에 따라 인증되었음을 증명합니다.

It is verified that foregoing equipment has been certificated under the Clause 2, Article 58-2 of Radio Waves Act.

2018년(Year) 08월(Month) 31일(Day)

국립전파연구원장

Director General of National Radio Research Agency

SKT prepares to launch next-generation Wi-Fi in 2018

24 OCT 2017

AUTHOR

Wi-Fi NOW

ABOUT US EVENTS EXPO

Korea's SKT unveils plans for gigabit Wi-Fi with 802.11ax

[BREAKING NEWS] by Claus Hetting | October 29, 2017

By Claus Het ... CEO & Chairman

NETMANIAS

Analyze Trends, Technologies and Market

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Section 5G 4G LTE C-RAN/Fronthaul Gigabit Internet IPTV/Video Streaming IoT SDN/NFV

CHANNELS HFR | Mobile Fronthaul Solution | Carrier Ethernet Solution | Resources

KOREA ICT / KOREAN ICT NEWS

SK Telecom develops the nation's first Wi-Fi technology delivering quadrupled speed

10/23/2017 | By Netmanias (tech@netmanias.com)

Share Tweet Like

SK Telecom today announced the introduction of a new technology for the next generation Wi-

Expanding Wi-Fi 6 Service Coverage

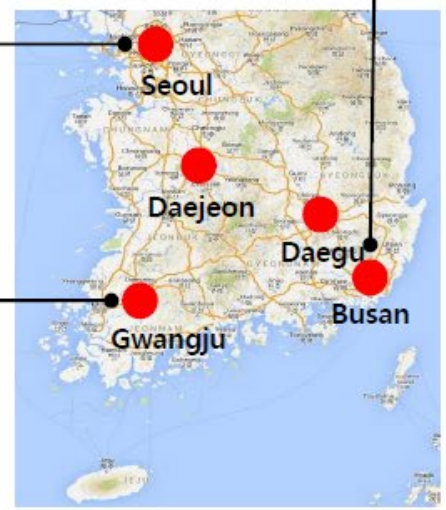
Expanding service area from metropolitan to small and medium-sized city,
From dense area(500 places) to traditional markets and public facilities(6K)

Until 2019

COEX-mall (@Seoul)

Sajik Stadium (@Busan)

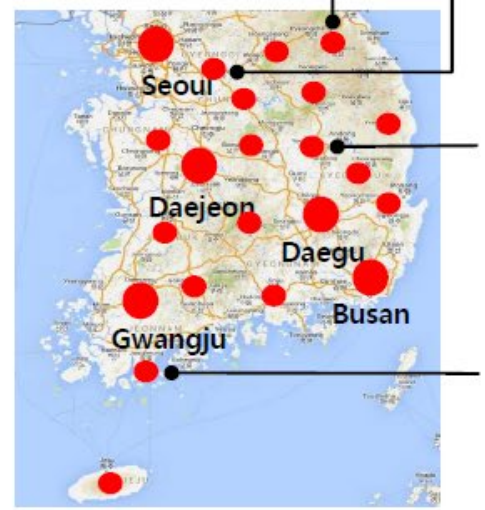
U-Square (@Gwangju)



Since 2020

Traditional Market (@Wonjoo)

Baksuk Library(@Goyang)



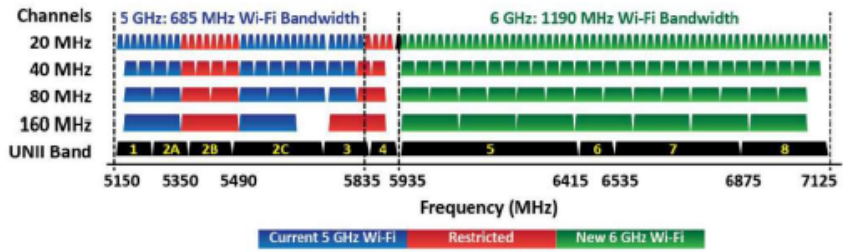
Insect Museum(@Yechon)

Culture and Art Center
(@Haenam)

Wi-Fi 6E Status & Trials

6GHz approved by Korean government in Oct. 2020 for 1.2Ghz bandwidth
In SKT 6E trials, max throughput was record 1.78Gbps at Galaxy S21

- '20.10.15 6GHz band approved by Ministry of Science and ICT
  - 1.2 GHz of Band (5,925Mhz ~ 7,125Mhz)
  - 500Mhz of Band (5925Mhz ~ 6455Mhz) for tethering



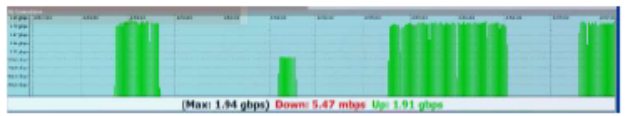
- '20.10.30 SKT 6GHz Test AP Ready

SKT 6E Test AP Specifications

- **Standard: IEEE 802.11ax/** ac/n/a/g/b
- **Frequency Band: 2.4GHz/6GHz dual-band**
- **Peak Rate: 4.8Gbps**
  - by using 160MHz channel bandwidth, 4 SS, 1024 QAM
- **Wi-Fi 6E Features: UL/DL OFDMA**, 1024QAM etc.

【 Wi-Fi 6E AP to AP (`20.10)】

Max T/P 1.91 Gbps 2T2R



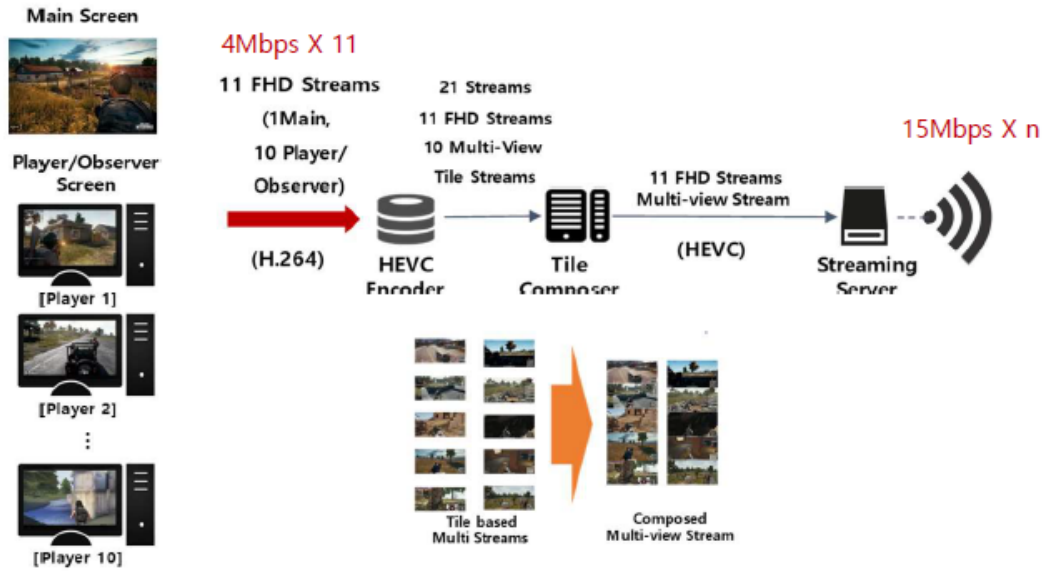
【 Galaxy S21 (`20.11) 】

Max T/P 1.78 Gbps

Wi-Fi 6 Service by SK Telecom

The needs of UHD based media streaming for people who wants to get more information and presence in the stadium leads launching Wi-Fi 6 service.

[Service Scenario – Multi-view Streaming]



[Wi-Fi AP Bandwidth Requirements]

10 players view point makes 10 more needs of video streaming

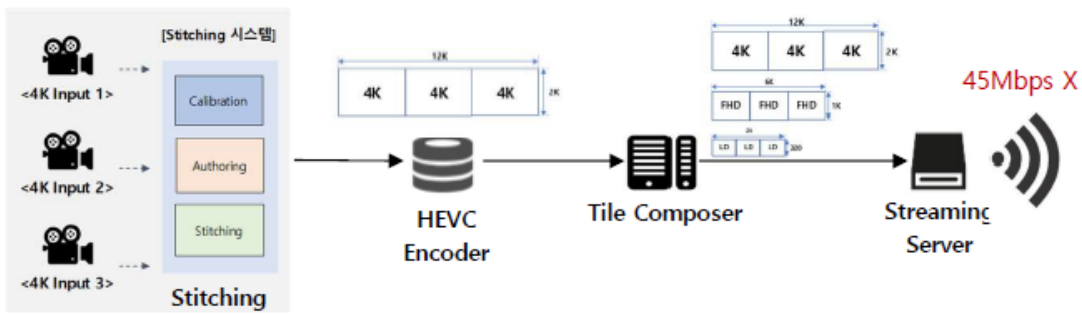
The size of video is UHD (UHD: 14~15Mbps)

Massive Bandwidth
- 15 ~ 50Mbps/each streaming

Low Latency
- fast stream switching

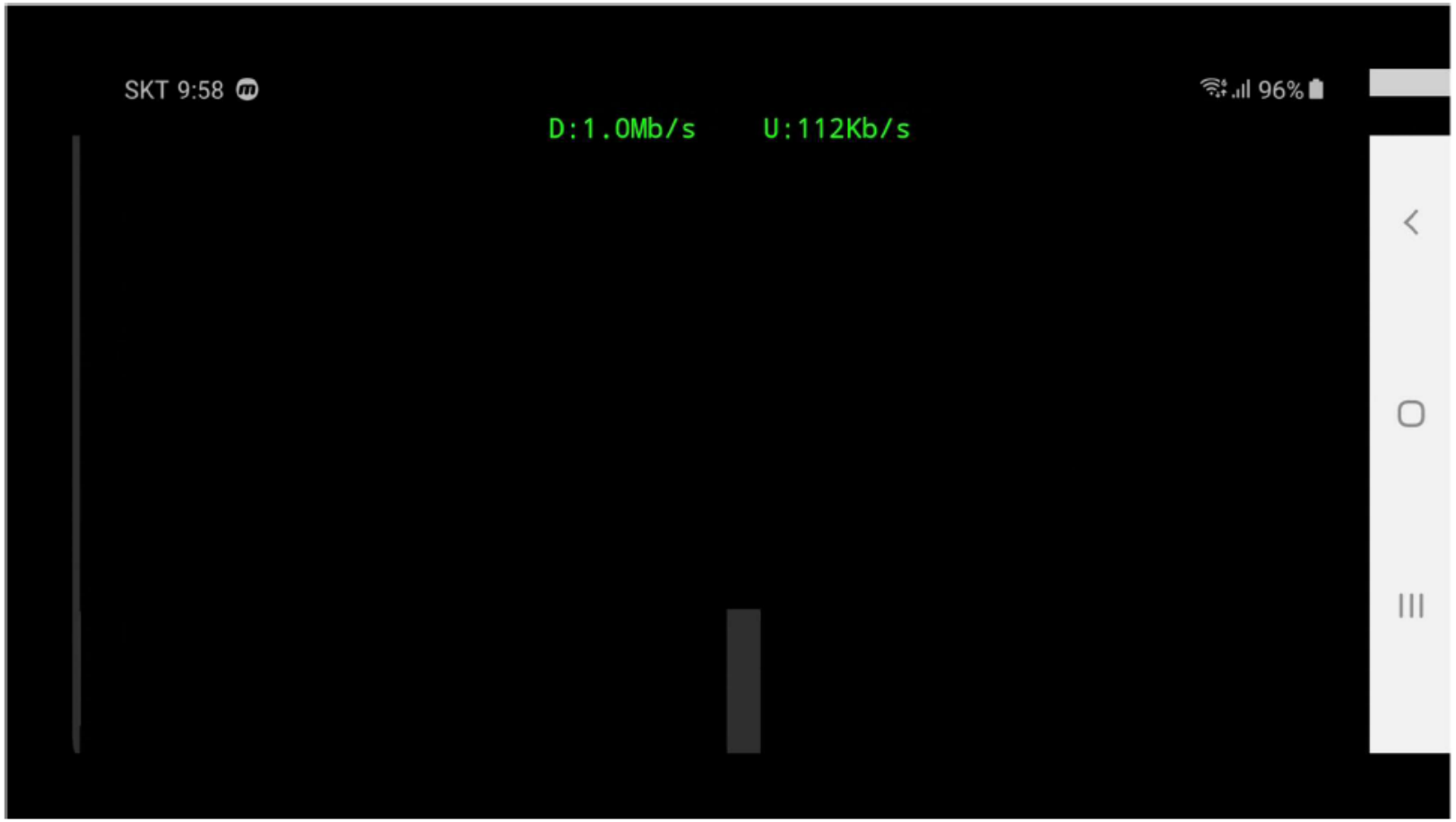
Low Packet Loss & Jitter
- ultra low delay(< 3s) streaming

[Service Scenario – Ultra Wide-View Streaming]



The size of video is 3 x UHD (3 x UHD: 40~45Mbps)

Wi-Fi 6 Service by SK Telecom



Next to do

- SK Telecom has been engaging Wi-Fi 6 service that can provide reliable service to customer anytime/anywhere and come up with new technologies and Business model.

- What we're going to do,,,
  - Expanding Wi-Fi 6 service coverage
  - Combining Wi-Fi and AI technology to create new values
  - Enable big data analysis on the back end to create new values

SK Telecom will provide our customers to the best quality Wi-Fi service, and try to make customers feel new experiences consistently.

Thank You

SK telecom

Transforming the campus enterprise network with Wi-Fi 6

YANG JIE

VICE PRESIDENT, CAMPUS NETWORK DOMAIN,
HUAWEI TECHNOLOGIES

Transforming Enterprise Networks with Wi-Fi 6

Yang Jie
Vice President of Campus Network Domain, Huawei

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Three New Challenges Faced by Enterprise Networks

IoT

100 billion network connections by 2025

337 million VR/AR users by 2025

Many concurrent terminals = High bandwidth requirements

How can networks ensure high-speed access for vast quantities of devices?

Cloud

100% of enterprises will use cloud technology by 2025

85% of enterprise applications will be cloud-based by 2025

Different applications = Different QoS requirements on latency and roaming

How can networks ensure required experience?

AI

97% of enterprises will use AI for business by 2025

80% of data the enterprises product will be efficiently utilized by 2025

Complex network = Difficult management and troubleshooting

How can networks use AI to improve O&M efficiency?

Source: Huawei GIV @ 2025

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It's Time to Upgrade Networks and Build Future-Proof Intelligent Campuses

Autonomous driving

High network availability

AS-IS

- Manual deployment
- Manual troubleshooting
- Manual optimization

TO-BE

- Automatic registration and visualized management of terminals
- E2E AI: planning, deployment, maintenance, and optimization
- Intelligent and automatic network optimization

Intent identification

Intelligent experience

Better experience assurance

AS-IS

- No assurance for application experience
- Unable to identify intents
- Static configuration of resources

TO-BE

- Application experience assurance
- Automatic discovery and identification of terminals
- On-demand automatic policy delivery

Bandwidth resources

Super capacity

Ensuring bandwidth resources

AS-IS

- Wi-Fi 5 + GE switch
- Continuous replacement of network cables
- IoT: manual network connectivity

TO-BE

- Wi-Fi 6 (high bandwidth) + multi-GE switch
- Hybrid copper-fiber cable
- IoT: seamless and automatic network connectivity

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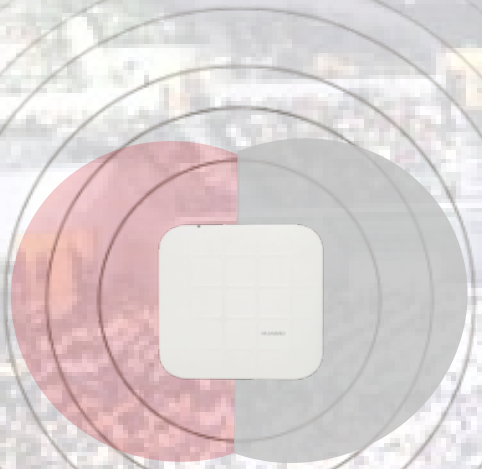
Super Capacity: SDR Provides On-Demand Wi-Fi

Common scenarios

Dual-radio: 4 + 12



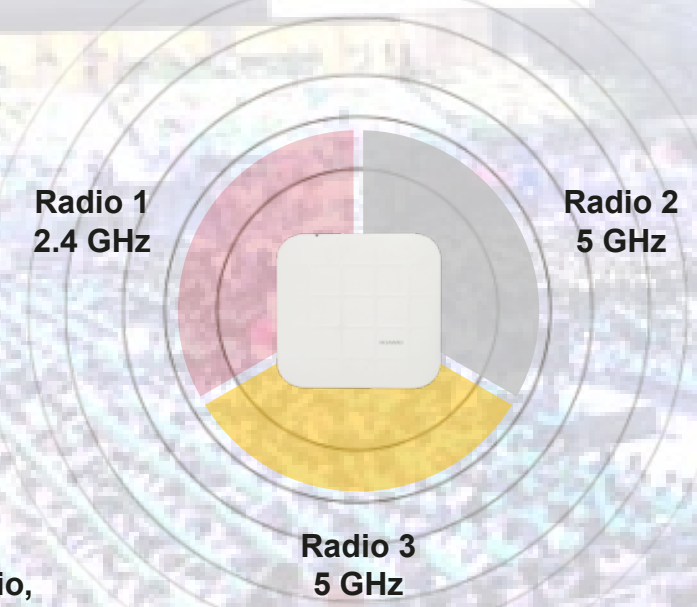
Higher bandwidth for users

SDR

- SDR, ideal for all scenarios
- Flexible switchover between multiple radio modes: dual-radio, triple-radio, and dual-radio + scanning radio

High-density scenarios

Triple-radio: 4 + 8 + 4



More concurrent users

Note: Huawei AirEngine 8760 is used as an example.

Hybrid Copper-Fiber Cable Enables Long-Distance PoE++, Facilitating Campus Network Evolution

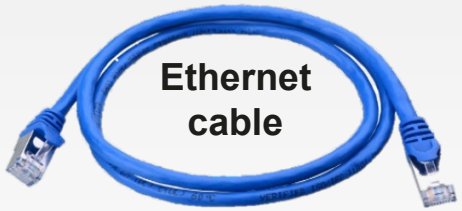
Network upgrade is a continuous process

2019
- **802.11ax**
- 5GE &10GE/PoE++
- **Cat6a/7**

2016
- **802.11ac Wave 2**
- 2.5GE/PoE+
- **Cat5E/6STP**

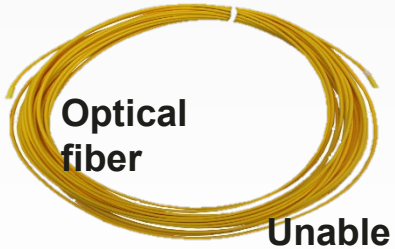
2013
- **802.11ac Wave 1**
- 2 x GE/PoE+
- **Cat5E/6UTP**

2009
- **802.11n**
- GE/PoE
- **Cat5**



100 m

PoE



100+ m

Unable to provide power

Hybrid copper-fiber cable

300 m (10 Gbps)

PoE++ (60 W power supply)

Cat5 and Cat6 cables are no longer needed. Hybrid copper-fiber cables do not need to be replaced for **a decade**.

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AI-Powered Application Experience Assurance, Low Latency, and Zero Packet Loss for Key Services

Difficult to identify and guarantee ever-increasing encrypted and private applications

80%

Percentage of encrypted applications

— *Gartner*

150%

Growth rate of enterprise private applications in the past five years

— *Statista*

>>

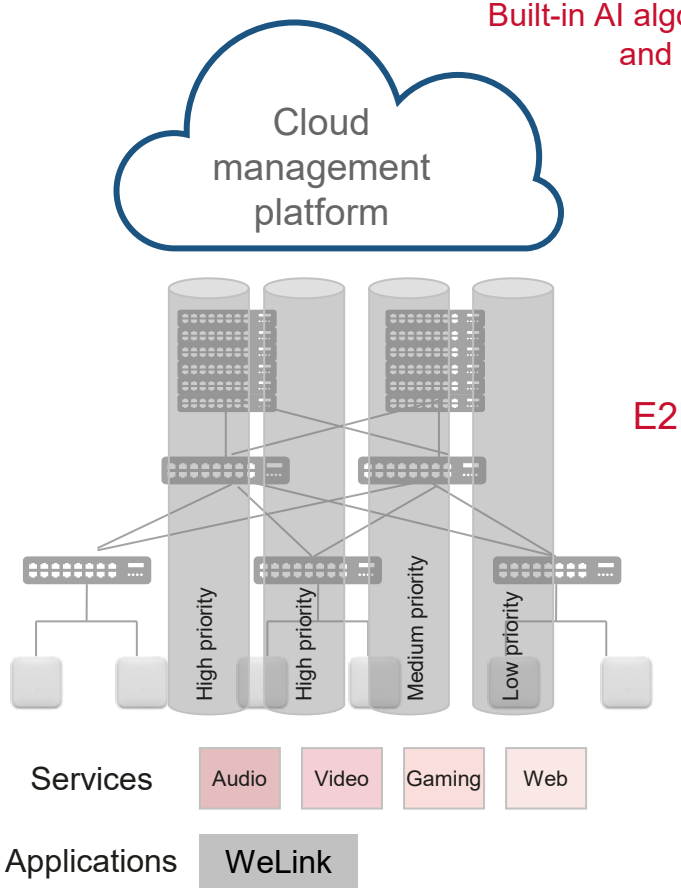
Challenges

Unable to identify encrypted and private applications

Port mapping | Static signature database

Key private applications are processed as common services

Built-in AI algorithms precisely identify private and encrypted applications



E2E priority-based scheduling

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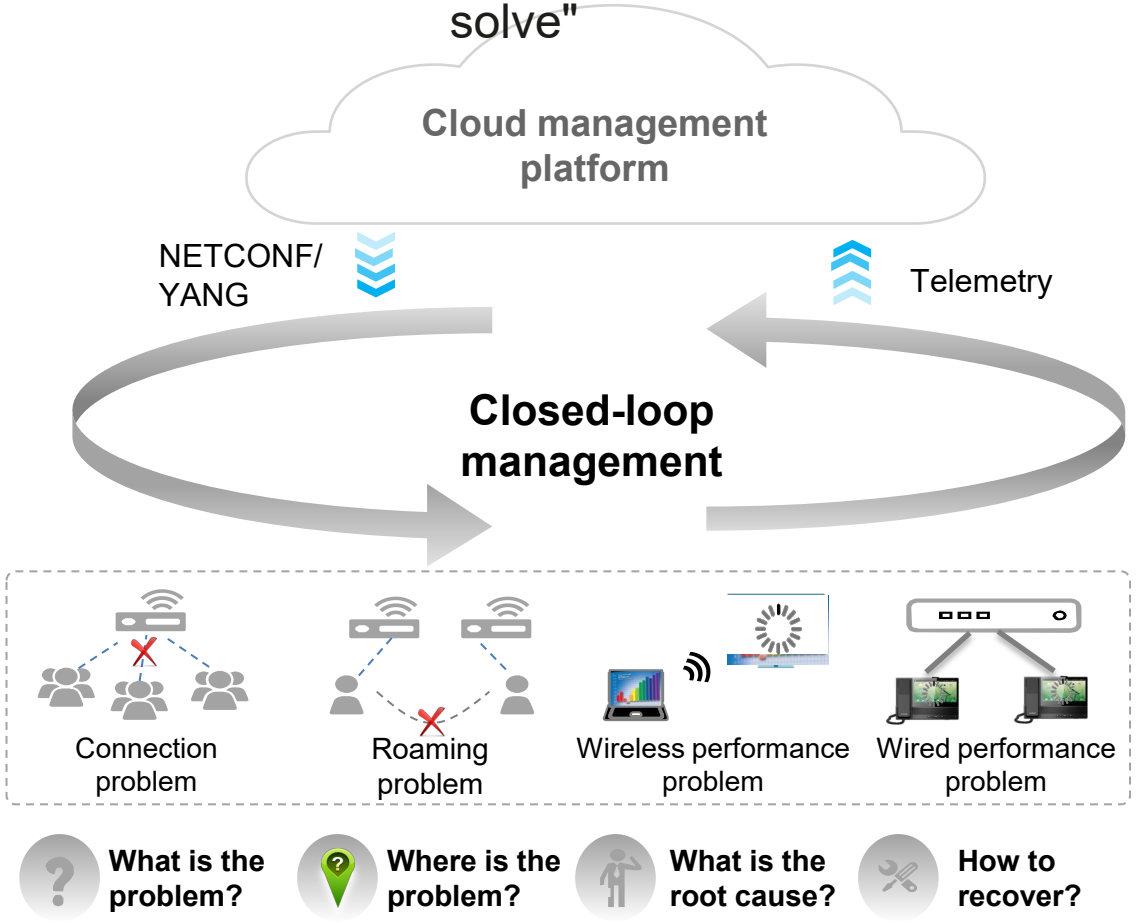
AI-Powered Fault Prediction for Automatic Network Optimization

Value of AI: "solves problems that people cannot solve"



Days → Minutes
Fault repair

Hours → Minutes
Fault locating & root cause analysis

Fault prediction
Detection of potential faults and auto-optimization

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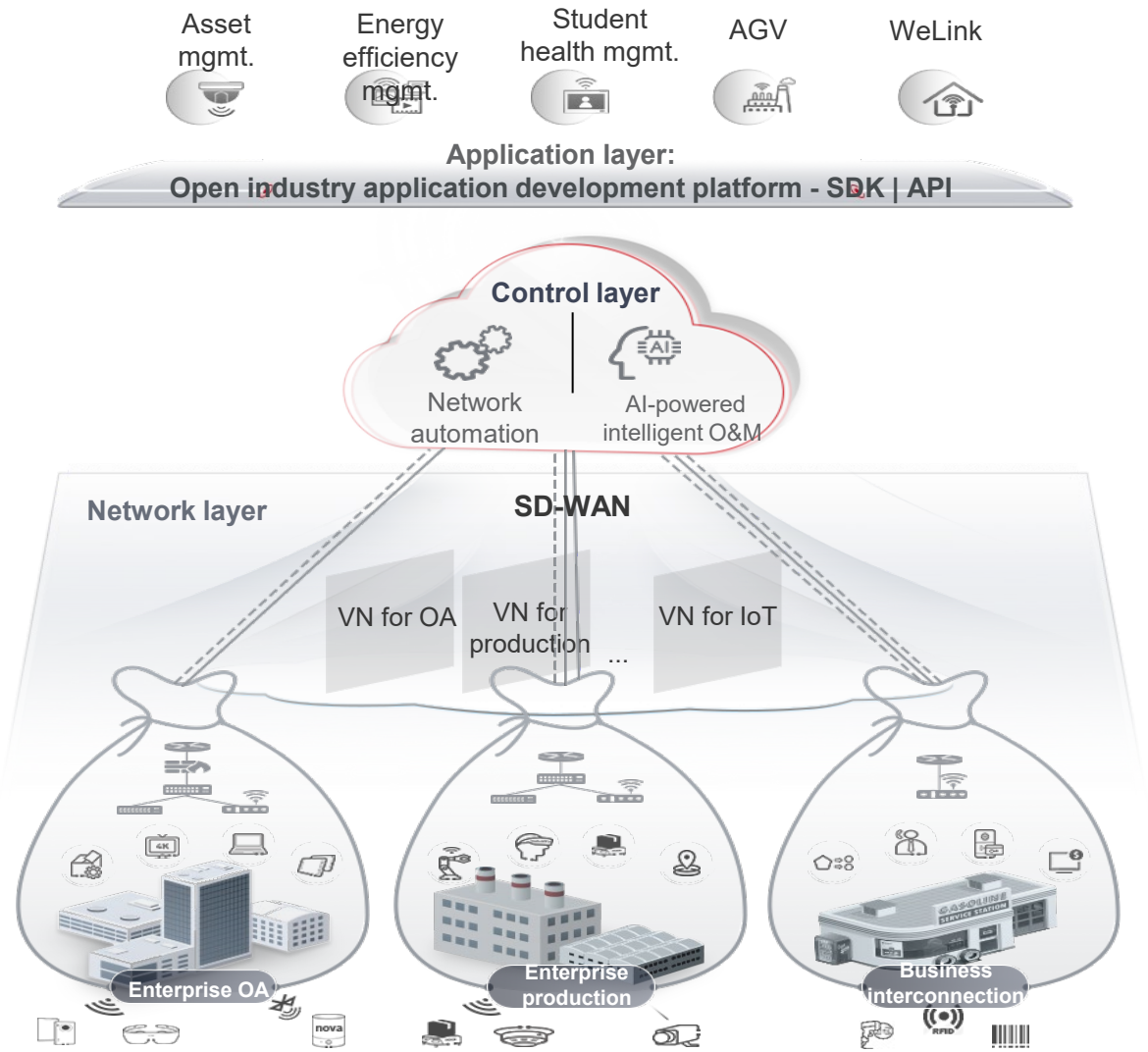
Building an Intelligent Enterprise Network with All Things Connected



One-stop management, OPEX 80% ↓

AI-powered application identification and scheduling

Proactively detecting **85%** potential faults with AI

One hop to cloud, zero packet loss

SD-WAN intelligent traffic steering, **unified policy**

AI-powered IoT detection to fend off rogue IoT terminals

Application experience assurance

Unified access, TCO 50% ↓

Wi-Fi 6

IoT

Fiber for wired

5G Uplink

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Use Case: Huawei AirEngine Wi-Fi 6 Drives Digital Transformation of Manufacturing Factories

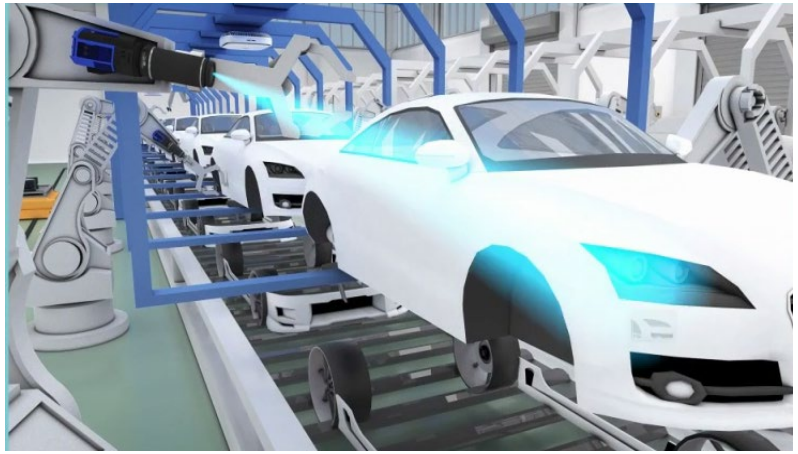
What can we do in one minute?

20s

45s

60s

- **Lossless roaming:** interruption-free AGV services for higher production efficiency
- **High speed:** automated optical inspection (AOI), wired □ wireless
- **Low latency:** terminal auto-upgrading and testing
- **Super capacity:** Wi-Fi & IoT convergence
- **AI-powered network:** always-on network



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Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。
Bring digital to every person, home and organization for a fully connected, intelligent world.

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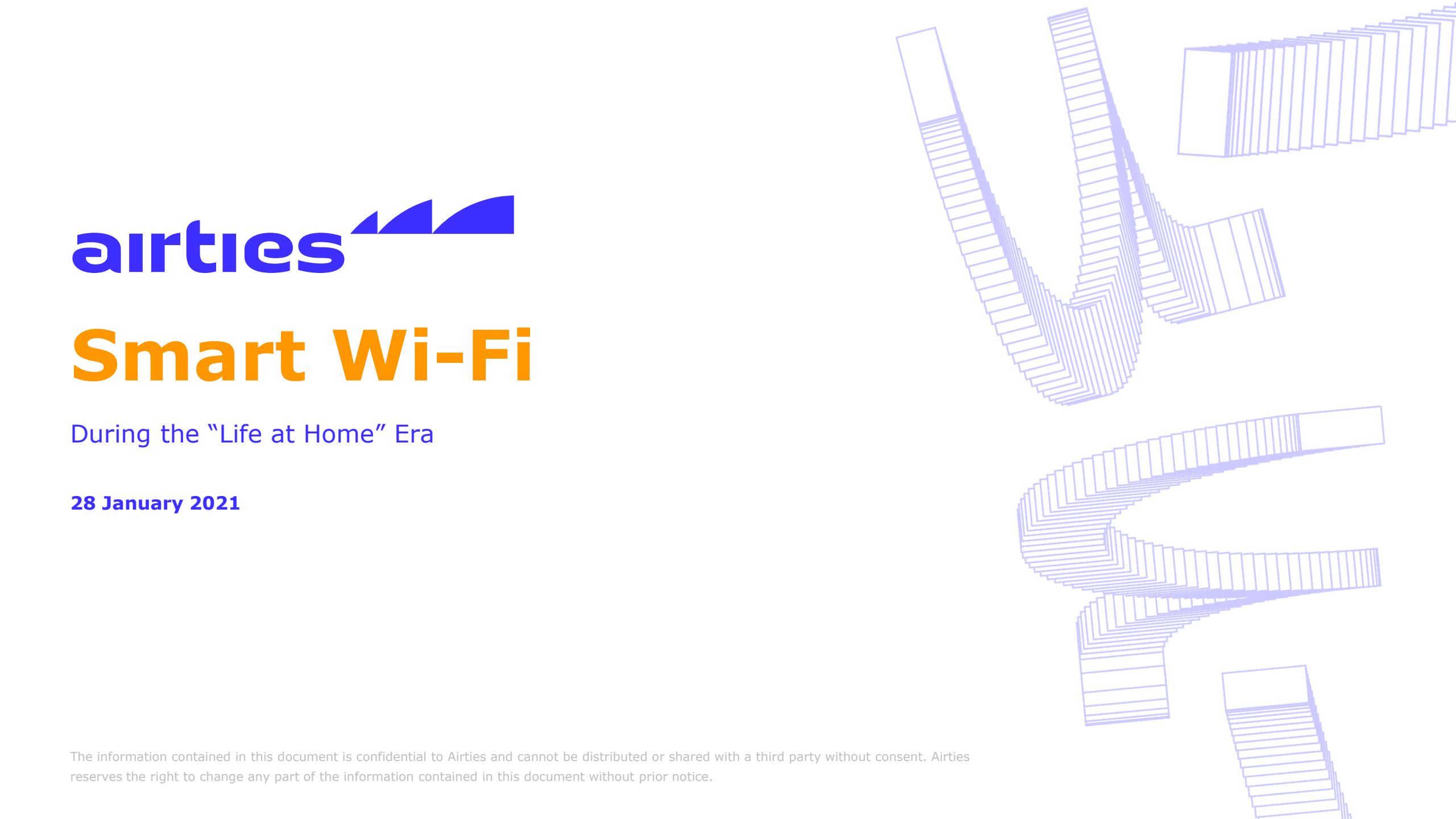
WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Smart Wi-Fi: During the “Life at home” Era

ZVIKA HAAS

VICE PRESIDENT OF SALES FOR APAC - AIRTIES

AirTies



Smart Wi-Fi

During the “Life at Home” Era

28 January 2021

#wifintelligence

Most widely deployed provider of managed Wi-Fi solutions to service providers globally, with

25M+ homes managed by Airties Cloud

- **Smart Wi-Fi edge software for CPEs**
- **Cloud-based management platform**
- **Wi-Fi management apps**
- **Mesh extenders**
- **Professional engineering services: Integration, customization, testing**

More than 50 operator deployments across continents

The Multipurpose Home

96%

of people stayed home during the lockdown or restrictive measures*

80%

increase in data usage for New Year’s eve celebrations**

Over 50% increase in WhatsApp voice calls compared to previous New Year’s eve***

40%

exercised more at home*

*Report by Ipsos MORI on behalf of Ingka Holding B.V. – IKEA Group
**Vodafone New Zealand report – Jan 2021
*** Report by Facebook, Jan 2021

“Life at Home”


WORK
STUDY
VIRTUAL EVENTS
EXERCISE
TELEMEDICINE
STREAMING and GAMING

Changes in Home Wi-Fi Usage During the Pandemic

5.9 ↑ 6.6

number of **actively used Wi-Fi devices**

116% **Increase in upstream traffic**

With **video calls** and online **file sharing/storage** usage

5 **Simultaneously connected devices**

30%-40% increase on pre-lockdown working days

Average Volume Data increased by **62%**

From 6.5 GB (weekdays) to over 11 GB (every day)

Up to ↑ 94%

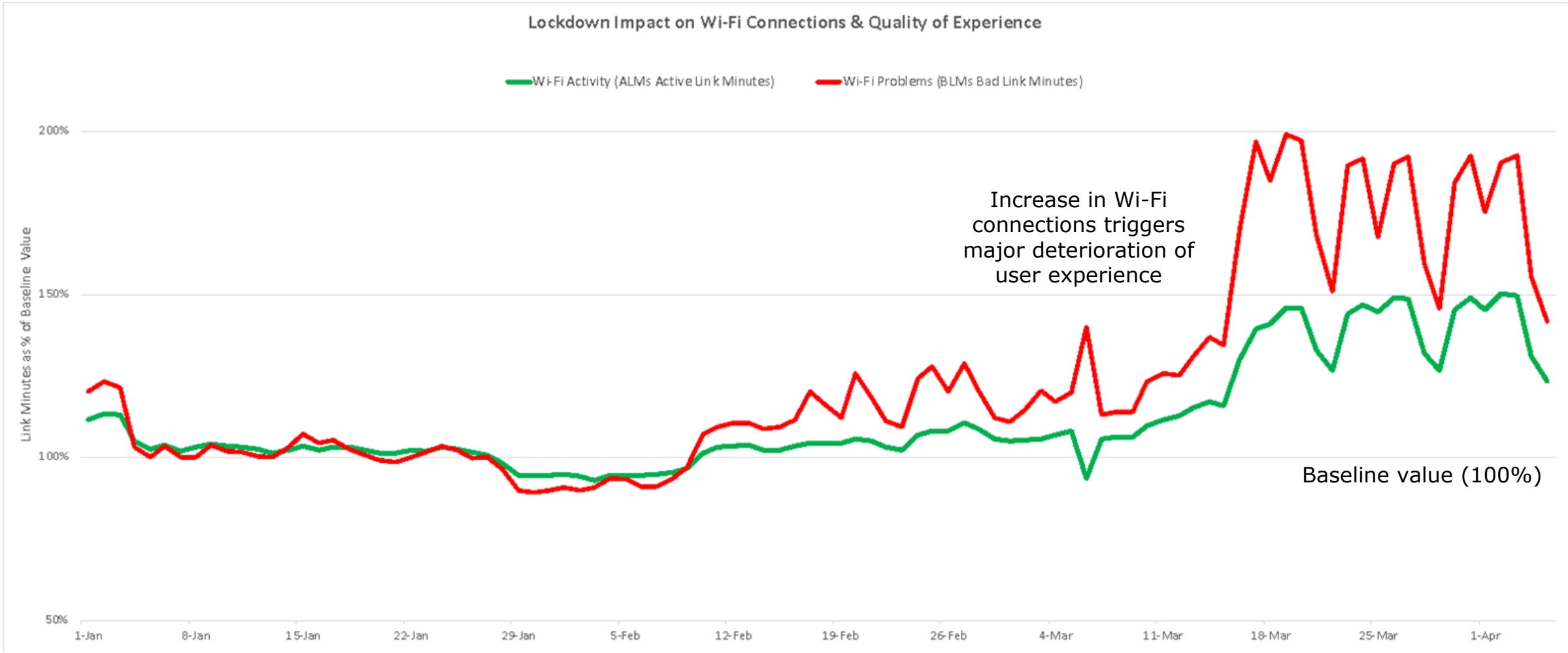
Increase in Wi-Fi activity compared to pre-lockdown (during working hours)

32% **Had measurable Wi-Fi coverage issues**

Compared to 19% before lockdown

*Data from Airties Catalyst Effect White Paper 2020

The Catalyst Effect



*Data from Airties Catalyst Effect White Paper 2020

Wi-Fi Challenge

Increased demands & higher expectations

Increased demands on the in-home connectivity infrastructure

Simultaneous with

Higher expectations from consumers

Tackling 4 main challenges simultaneously to fix the Wi-Fi experience

Coverage & Speed

Airties turns gateways, set-top boxes and access points into a unified, multi-node Wi-Fi Mesh network

Device Connectivity

"Steering" sticky Wi-Fi client devices to more suitable access points and Wi-Fi bands, eliminating bad apples. Smart management of Wi-Fi 6 devices vs. older devices

Interference / Congestion Mitigation

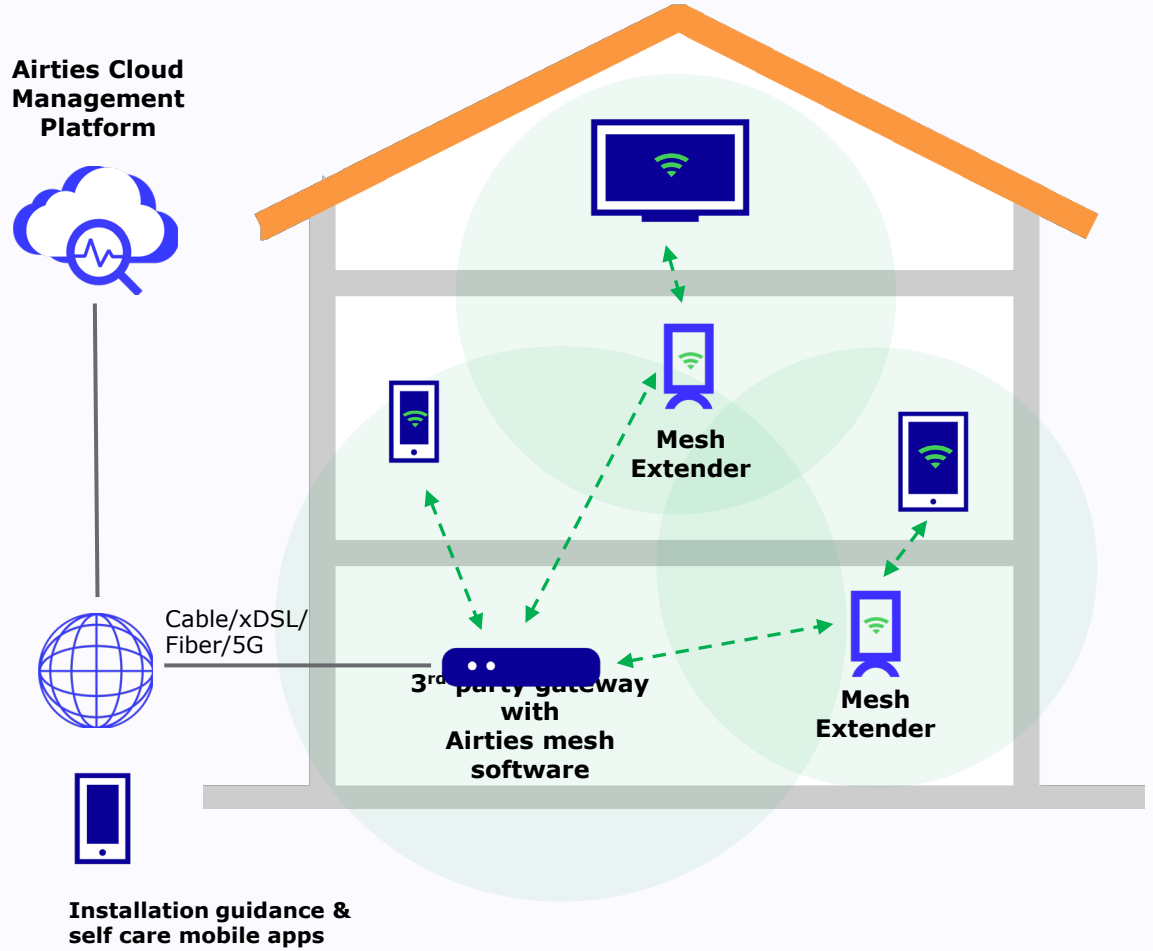
Airties uses advanced Wi-Fi Channel Management techniques with DFS support and interference reduction technology

Wi-Fi Management

Airties devices seamlessly configure, while the Airties Vision mobile app and Airties Cloud system provide visibility and diagnostics of the in-home network

Airties' unique hybrid Cloud-Edge architecture allows full Wi-Fi coverage and performance

Example below of home set up with 2 mesh APs



Thank You!

and Stay Healthy

For more information:

Zvika Haas, VP Sales APAC

zvika.haas@airties.com

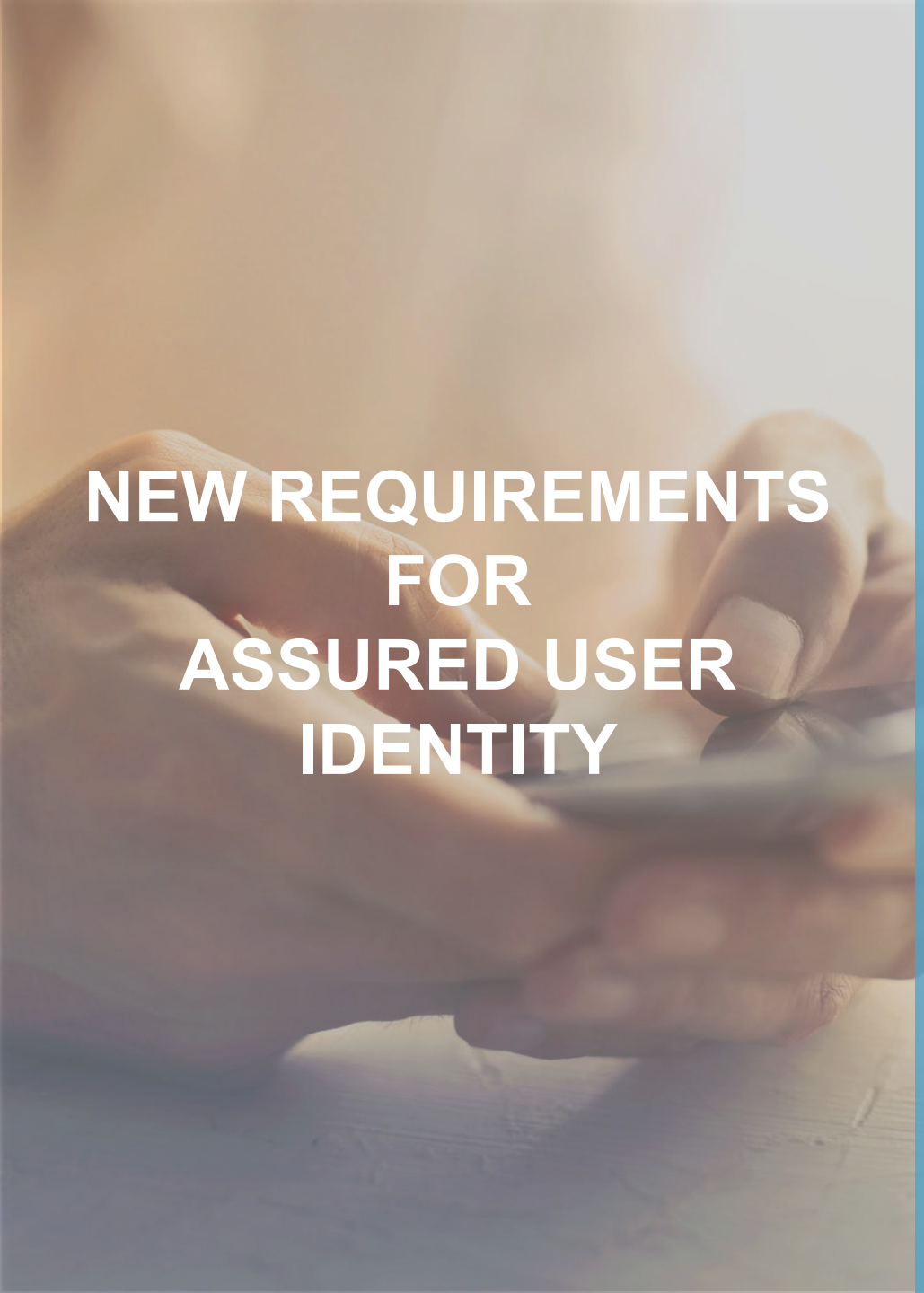
The Assured User ID Challenge in 2021

DR. CHRIS SPENCER

CTO, GLOBALREACH TECHNOLOGY

The Assured User ID Challenge in 2021

Dr Chris Spencer
Group Chief Information Security Officer



NEW REQUIREMENTS FOR ASSURED USER IDENTITY

International laws ask users to prove their ID as a condition of purchasing a mobile SIM.

Mandatory ID includes personal ID incl. valid ID or biometrics.

Allows the country/state to identify the SIM card owner & to infer who is most likely making a call/sending a message at any given time.

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INTERNATIONAL SIM CARD REGISTRATION LAWS: PROOF OF ID

By March 2020, **155 governments** required some form of proof of identity before a person could **purchase a SIM** card.

As of March 2020, the following countries have mandatory SIM card registration laws: Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, China, Congo, Costa Rica, Côte d'Ivoire, Cuba, Democratic Republic of Congo, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Fiji, France, French Guiana, Gabon, Gambia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Italy, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Kyrgyzstan, Laos, Lebanon, Lesotho, Liberia, Libya, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Nauru, Nepal, Niger, Nigeria, North Korea, Norway, Oman, Pakistan, Palestine, Panama, Papua New Guinea, Peru, Poland, Qatar, Russia, Rwanda, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Somalia, South Africa, South Sudan, South Korea, Slovakia, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Svalbard, Swaziland, Switzerland, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Zambia, Zimbabwe. .

Source: privacyinternational.org, 2020

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INTERNATIONAL SIM CARD REGISTRATION LAWS: BIOMETRICS

As of March 2020, the following countries have mandatory biometric SIM registration laws: Bahrain, Bangladesh, China, Nigeria, Pakistan, Peru, Saudi Arabia, Tanzania, Uganda, United Arab Emirates, Zambia

Nigeria wants national ID numbers of mobile phone users added to their SIM cards

Source: privacyinternational.org, March 2020; BiometricUpdate.com, Dec 2020

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LEVELS OF IDENTITY ASSURANCE

LEVEL	ASSURANCE	ISO/IEC 29115	IDENTITY METHODS	EXAMPLES
1	LOW	Little or no confidence in the asserted identity	Anonymous	Self filled in form with no validation
2	MEDIUM	Some confidence in the asserted identity	Validated registration	Email or SMS verification
3	HIGH	High confidence in the asserted identity	Validated Government documents online	KYC (Know Your Customer) process
4	VERY HIGH	Very high confidence in the asserted identity	Validated Government documents personally	Passport office, physical confirmation by authority figure

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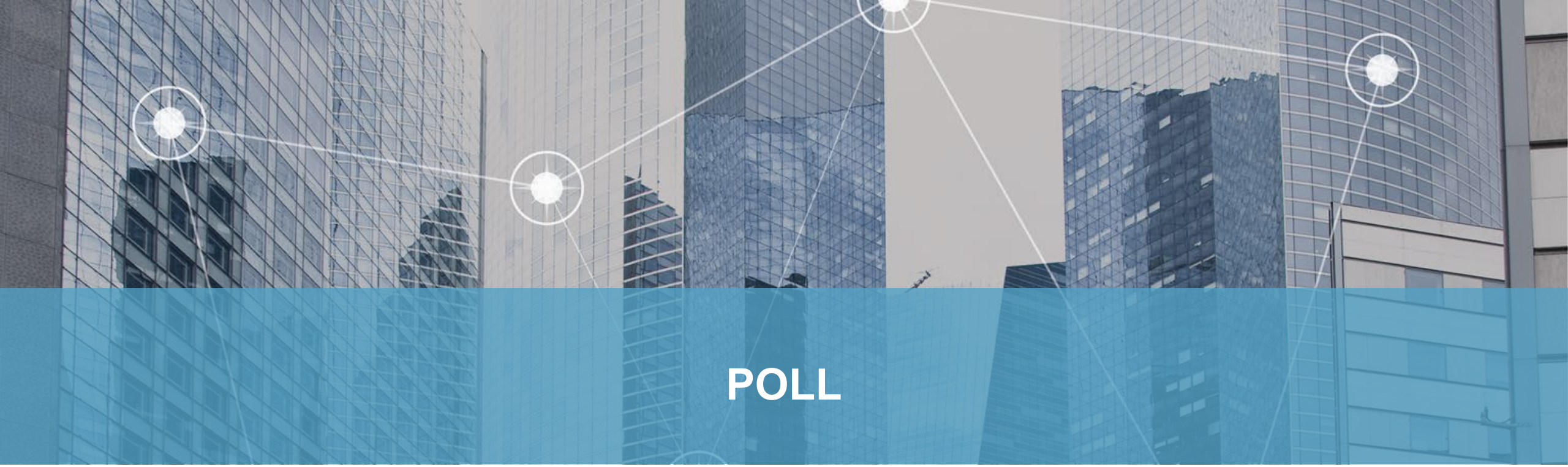

POLL

Does your organisation have an identity assurance program in place?

- YES
- WE PLAN TO IN 2021
- NO
- WE HAVE NO PLANS

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ASSURED USER IDENTITY REQUIREMENTS

1

SECURELY ASSOCIATE THE DEVICE TO THE USER (SIM OR NON-SIM).

2

PROVE ASSURED ID TO MEET SIM CARD REGISTRATION LAW.

3

MEET ISO SECURITY ASSURANCE LEVELS 1-4.

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AN ASSURED ID PROPOSITION FOR THE NETWORK OPERATOR

- Compliance with current mandatory laws and future mobile and Wi-Fi legislation.
- Assure the identity of your customers and their entitlement to access your network.
- Give seamless internet connectivity to known customer categories e.g. loyalty programmes.
- Manage permissions for access to services.
- Secure wallet where customers enrol once and use many times.
- Remove friction for access of additional services.
- Granular accuracy in identifying user presence and movement, to verify location and activity.
- Revenue opportunity for network operators (as providers of verified identities) to a marketplace of services e.g. digital services, hotels, restaurants, airlines, car hire.

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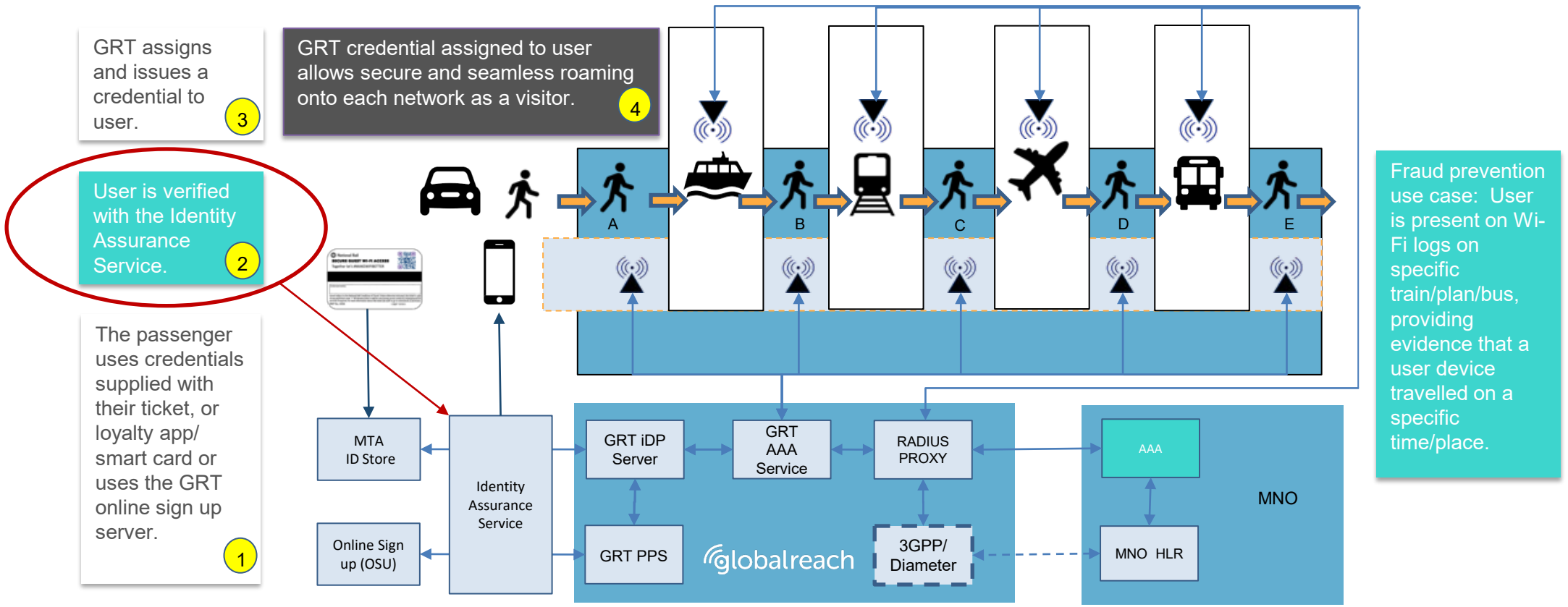
NON-SIM ASSURED IDENTITY WITH SSO: EXAMPLE USE CASE

GlobalReach can deliver secure internet access based on a **single sign on (SSO) and credential management capability** to provide an enhanced user experience.



** Illustrative example to shown potential*

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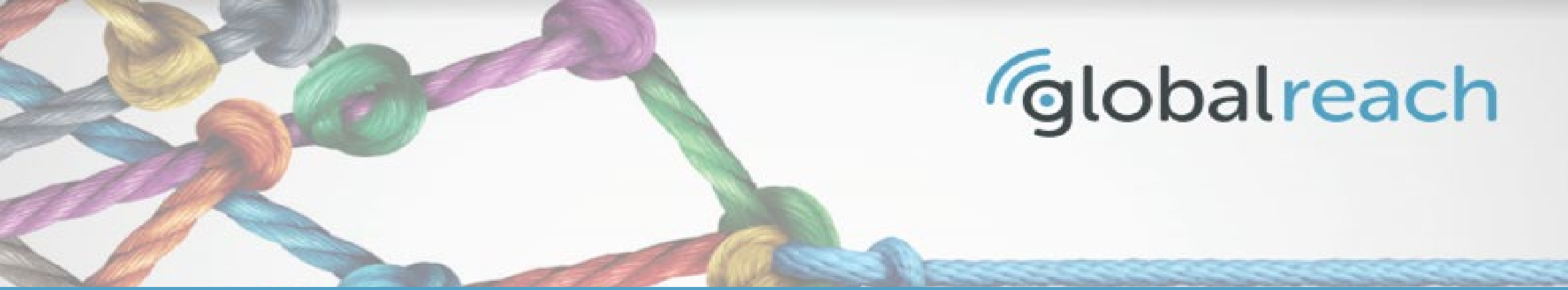

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PASSPOINT PROFILING SERVICE (PPS)

A managed service to easily create Passpoint user credentials.

- Allows any enterprise providing Wi-Fi to **create identity-assured** Passpoint user profiles.
- Accelerates **seamless, secure** onboarding.
- Ability to take advantage of federated Wi-Fi, incl. WBA **OpenRoaming**.
- Built for high Passpoint API volumes.
- Profiles built in the correct device format.
- Integrated with web portal incl. an OSU.
- Integrate with loyalty app/other third-party app.

EXPERT VIEW

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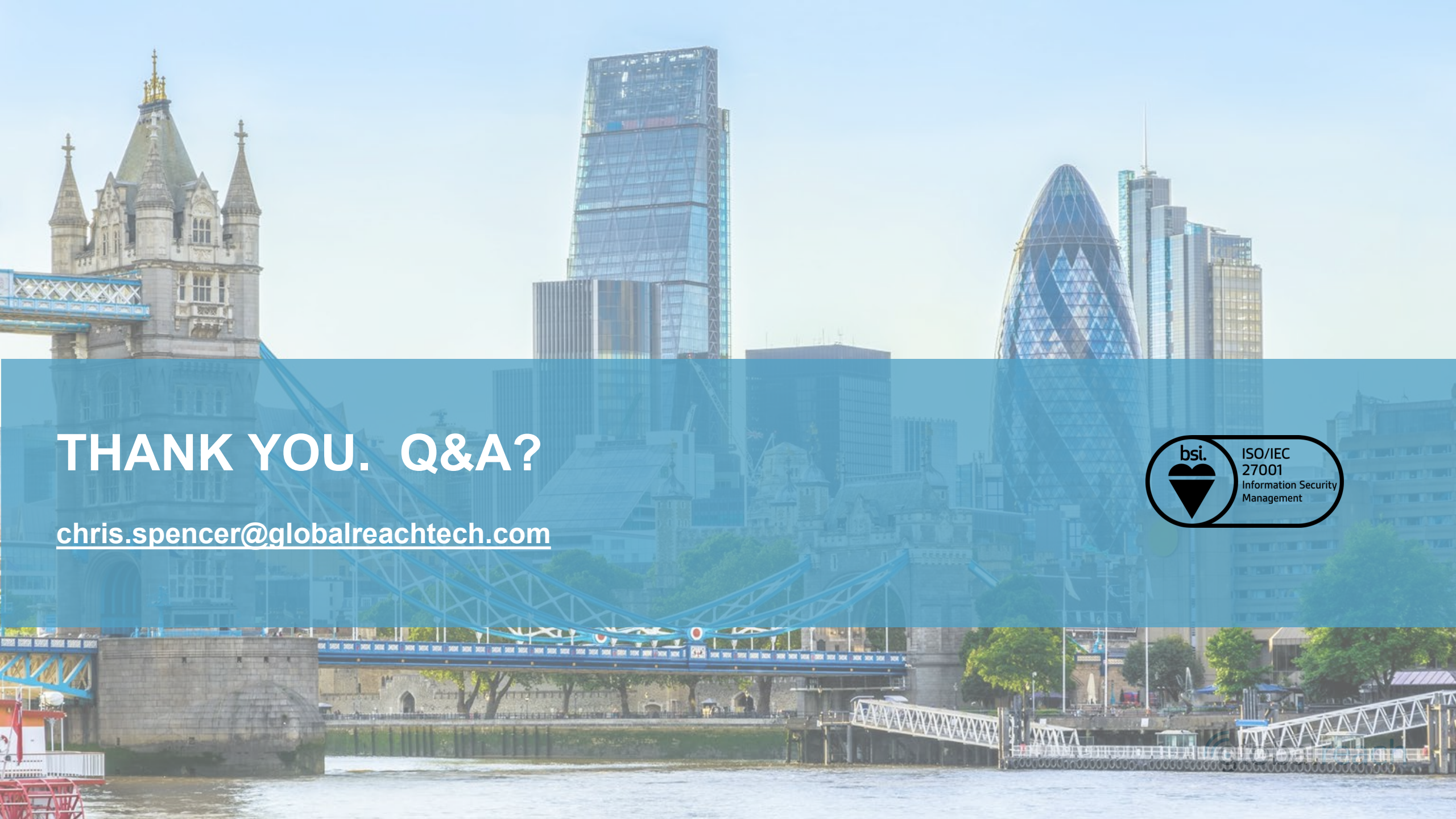


THANK YOU. Q&A?

chris.spencer@globalreachtech.com

bsi. ISO/IEC 27001 Information Security Management

WBA Wi-Fi 6/6E Program for 2021

BRUNO TOMÁS

DIRECTOR OF PROGRAMS, WIRELESS BROADBAND ALLIANCE

WIRELESS BROADBAND ALLIANCE

DRIVING NEXT WIRELESS EXPERIENCE

NEXT GEN WiFi

Call to Action

Bruno Tomas, WBA PMO

WBA ROADMAP 2021

WBA WORK GROUPS & PROJECTS

5G
Work Group

Leading Wi-Fi and 5G RAN Convergence

- 5G & Wi-Fi Convergence in Private 5G Networks

IoT
Work Group

Augmenting Wi-Fi role in IoT

- Wi-Fi 6/6E for Industrial IoT
- Rural Wi-Fi
  Starts Q3/ Q4
- AR & VR
  Requirements
  Starts Q4

NextGen
Work Group

Fast-tracking Wi-Fi deployments for operators

- Wi-Fi 6E
  Trials
- In-Home
  Multi-AP Solutions
- Wi-Fi Sensing
  Deployment Guidelines
- Trackside Connectivity & Spectrum
  Starts Q4

Roaming
Work Group

Incubating new business opportunities

- Roaming Evolution
  PKI RadSec
- In-Flight Connectivity
- Profiles & RCOIs Prioritization
  Starts Q1
- OpenRoaming for Private LTE/5G
  Starts Q3

Testing & Interoperability
Work Group

Achieving interoperable Wi-Fi services

- Captive Portal
  Onboarding Evolution
- Wi-Fi IMSI Privacy Protection
- Wi-Fi & Devices Identification

In progress | Pipeline project

WBA OpenRoaming™
Task Group

Development of standards, federation governance and trials

Policy & Regulatory Affairs
Work Group

Industry liaison and advocacy of WBA global programs

Market
Work Group

Marketing activities and industry dissemination

WBA Certification
Task Group

Addressing interoperability to foster adoption

WBA WI-FI 6 & 6E PROGRAM

Fast-tracking Wi-Fi 6 & Wi-Fi 6E leveraging Carrier-Grade capabilities.

Deliver industry guidelines and end-to-end live trials with multiple ecosystem players.

*Not exhaustive

Latest Projects

I. Wi-Fi 6 Overview, Use Cases, Features, 5G Context

II. Wi-Fi 6 Deployment Guidelines & Scenarios

Leveraging most relevant use cases, Wi-Fi 6 deployment confirms the technology evolution is set to deliver systems that are ready to support key 5G requirements

Current Work

III. Wi-Fi 6 Trials: Real-world end-to-end testing of key features and new services to raise confidence and adoption in the technology

Deployment Scenarios	Use Cases
Enterprise - Industrial 4.0	High-density connectivity / latency
Transportation hub	Improved roaming behavior
Residential/MDU	Multi stream live video monitoring (facilities / campus)
Smart Cities/Rural	Real time energy monitoring
Transportation hub	IoT sensor networks
Public Wi-Fi	Ultra-reliable low latency communications / critical sensors
University Campus	Augmented reality for trouble shooting
Stadium	Gaming / Health devices > improved latency for key target
Entertainment	Virtual classroom/venue - UHD video intercampus
Wi-Fi 6E – 6GHz	

*Leading Members

Wi-Fi 6 Global Trials– Progress

20+

Trials

Wi-Fi 6

&

6Ghz

Vendor support

BROADCOM
intel
SAMSUNG
CISCO
iBwave

Entertainment (Stadia)
AT&T
Transportation
boingo
MaximaTelecom
bai communications
COMCAST
Residential (Single and multi units)
CableLabs
kt
Industrial
METTIS AEROSPACE
Smart Villages/ Last Mile
सी-डॉट C-DOT
Smart Cities (Outdoor)
SK telecom
BORDEAUX MÉTROPOLE

WI-FI 6 & 6E TIMELINE & DELIVERABLES

WIRELESS BROADBAND ALLIANCE

3 Wi-Fi 6 Trials

Virtual Congress

2021

Asia Sessions

2018 - 2019

2020 >>> Aug Sep Oct Nov Dec Jan Feb Mar Apr Jun

1 Wi-Fi 6 Features Overview

2 Wi-Fi 6 Deployment Guidelines

- RF planning & design
- Seamless Mobility
- KPIs
- Case studies
- Convergence
- Deployment Scenarios

Wi-Fi 6 2.4 & 5GHz
- Wi-Fi 6 Trials Wave 1 Complete (Baseline Features)
- Wi-Fi 6 Trials Wave 2 (OFDMA, TWT, IoT)

Wi-Fi 6E 6GHz
- Wi-Fi 6E Lab Trial
- Wi-Fi 6E Wave 1 (Industrial IoT, Residential, AR/VR)
- Wi-Fi 6E Trials & Tests Baseline Features
- Wi-Fi 6E Tests Verticals & Evolved Use Cases

Industry Deliverable & Liaison
- Wave 1 Report & Promotion
- Wave 2 Report & Promotion
- 6 Ghz Available US FCC
- 6 GHz Developments EU/LATAM/Asia/Africa

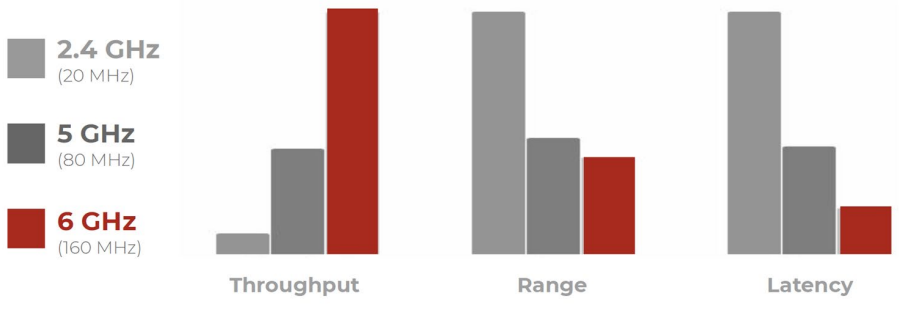
Deployments Progress

METTIS AEROSPACE	Industrial 4.0
boingo	Transportation
CableLabs	Residential/MDU
सी-डॉट C-DOT	Smart Cities - Rural
cisco	Outdoor Sports
bai communications / Transit Wireless	Transportation
BORDEAUX MÉTROPOLE	Smart City
AT&T	Stadium/City
boingo intel BROADCOM COMCAST	Transportation
MaximaTelecom	Transportation
SK telecom	Shopping/Chain

Wi-Fi 6 E (6 GHz) – New Series of WBA Trials

Description: Wi-Fi 6 further expands to being able to use up to 1200 MHz of spectrum enables reliable access to 160 MHz channels, makes **high throughput** and **low latency easily achievable** enabling applications such as **AR/VR**

Phase 1 – Lab testing (Confirmed)



BROADCOM

intel

Phase 2 – Field trials

FCC "Innovation Zone"

Transit Wireless

Residential Trial

CableLabs

Deployment Scenarios & Use Cases

Deployment Scenarios
Enterprise - Industrial 4.0
Transportation hub
Residential/MDU
Smart Cities/Rural
Transportation hub
Public Venues (including University Campus)
Stadium
Entertainment
Public Wi-Fi

Use Cases	Wi-Fi 6/ 6E readiness
High-density connectivity / latency	WIP
Improved roaming behavior	WIP
Multi stream live video monitoring (facilities / campus)	WIP
Real time energy monitoring	WIP
IoT sensor networks	WIP
Ultra-reliable low latency communications with sensors on critical systems	WIP
Augmented reality for trouble shooting	WIP
Gaming / Health devices > improved latency for key target	WIP
Virtual classroom/venue - UHD video intercampus	WIP
Backward compatibility (previous generations 11n, 11ac)	WIP

Deployment scenarios leveraging common use cases and respective tests

IN-HOME WI-FI – MULTI-AP SOLUTIONS TRIAL

BACKGROUND & INDUSTRY CHALLENGES

With the rise of Multi-AP solutions and the concept of mesh networks, there is a growing demand for open interoperability in the home environment, which escalates further with the introduction of the IoT devices

This project will define a set of performance metrics and subsequent test plans which will be collected from a group of operators' live use cases, conducted in a real operating environment

These range from enhanced Wi-Fi coverage, critical diagnostic information needed by operators for remote management, dynamic KPI reporting, simple deployment per subscriber, among others

BUSINESS OPPORTUNITIES & BENEFITS

- Tackle the challenges that have contributed to inconsistent performance in home environment Wi-Fi deployments, including a lack of uniform coverage and visibility into the in-home Wi-Fi experience
- Help operators understand the in-home transformation (including IoT) and increase customer satisfaction through a better quality of experience

EXPECTED DELIVERABLES

- Define operator requirements and test cases under various deployment environments including Private Wi-Fi, Guest Wi-Fi and Community Wi-Fi
- Address the deployment challenges, home network security issues and define requirements with multi-AP solutions

LEADING PARTICIPANTS

AirTies
ASSIA
BT
CableLabs
Charter COMMUNICATIONS
Google
MEDIATEK
Plume

RELEVANT PROJECTS

Understand more about In-Home Wi-Fi

Multi -AP Trial Use Cases Scope Document

Wi-Fi Sensing Whitepaper

In-Home Wi-Fi Guidelines

Project Leaders

Leader: John Bahr
CableLabs

Co-Leader: Koen Van Oost
AirTies

Co-Leader: Tim Twell
BT

2021 Trial Kick Off — Trial Report

Q1	Q2	Q3	Q4

To learn more about the initiative, please use the online FORMor, if a WBA Member, join the group on WBA's EXTRANET

WI-FI SENSING DEPLOYMENT GUIDELINES

BACKGROUND & INDUSTRY CHALLENGES

The last year has seen significant momentum gained in the area of Wi-Fi Sensing. This year's WBA Wi-Fi Sensing project has seen a definition of KPI and test procedures focused on a home monitoring use-case, plus a successful deployment and evaluation performed by CableLabs. This year has also seen multiple new products launched in this space

With the generation of KPIs and test procedures to evaluate them, one large gap identified during the Wi-Fi Sensing Phase 2 project, was the lack of guidelines, procedures, or recommendations for how to optimally deploy a sensing network in a home environment

By expanding on the work performed in 2020 by the Wi-Fi Sensing group, a focus can be placed on evaluating system performance given different deployment scenarios. By evaluating the results, guidelines or recommendations can be derived

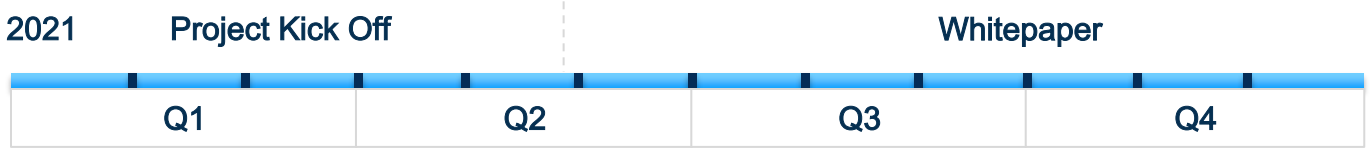
BUSINESS OPPORTUNITIES & BENEFITS

- Evaluate motion sensing capabilities being examined within the home environment, under distinct scenarios, to fast-track deployments
- Help industry understanding better the sensing technology opportunity and accelerate go-to-market of new home solutions

EXPECTED DELIVERABLES

The expected deliverable is a deployment guideline document outlining recommendations on deploying a W-Fi Sensing network, based on experimental results

In addition, given the active work being done by IEEE, this group would like to openly contribute any information deemed relevant. This could include targeted deployment use-cases, measurement results, or desired functionality of which standard support can help improve



LEADING PARTICIPANTS

Aerial
CableLabs
C-DOT
COGNITIVE
COMCAST
intel
MEDIATEK
Qualcomm
ROGERS

RELEVANT PROJECTS

Understand more about Wi-Fi Sensing

Wi-Fi 6 Deployment Guidelines

Enhanced Wi-Fi 6 Decoded

In-Home Wi-Fi Industry Guidelines

Project Leaders

Leader: Chris Beg
Cognitive Systems

Co-Leader: Sandeep Agrawal
C-DOT

Co-Leader: Suresh Parathi
Comcast

Co-Leader: Michel Allegue
Aerial

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WI-FI 6 FOR INDUSTRIAL IOT

BACKGROUND & INDUSTRY CHALLENGES

- The global industrial IoT (IIoT) market is expected to exceed USD 750B by 2020, growing at a CAGR of ~23% from 2017 to 2023. As part of the industrial IoT (IIoT) including Industry 4.0 and Connected Factory (CF) transformation, wireless connectivity is estimated to become an integral ingredient growing at the fastest rate with a CAGR of over 25%
- Wi-Fi is the most prevalent wireless technology in industrial environments providing access to mobile employees and contractors as well as access to mobile automation and control devices and applications
- However, there are wide range of applications with latency and reliability requirements unmet with existing wireless capabilities; hence, the footprint of wireless solutions in manufacturing for automation applications has been limited due to the challenge of meeting the stringent latency and reliability requirements

BUSINESS OPPORTUNITIES & BENEFITS

- Identify Wi-Fi 6/6E enterprise use cases which require high determinism and low latency, including mission critical voice and video applications
- Leverage Wi-Fi 6/6E new features which result in improved performance and make Wi-Fi 6/6E specifically applicable to IIoT networks and applications, including increased determinism, scalability, low power consumption, and improved environmental robustness
- Wi-Fi 6E introduces operation in greenfield 6 GHz band that can be used to meet the majority of the stringent low latency requirements of IIoT usage

EXPECTED DELIVERABLES

- Industry guidelines for Wi-Fi 6 & Wi-Fi 6E deployment in industrial environments, IIoT and enterprise scenarios
- Demonstrate high quality Wi-Fi use for high determinism enterprise applications and showcasing Wi-Fi 6/6E features pertaining to IIoT, specifically increased determinism and support for ultra-low latency applications
- Develop and execute trials based on the identified key scenarios; Aggregate and analyze the trial to provide recommendations for IIoT and enterprise application

LEADING PARTICIPANTS

Aerial, American Tower, aruba a Hewlett Packard Enterprise company, Cisco, Charter, eleven, intel, orange

RELEVANT PROJECTS

- Understand more about Wi-Fi 6 for Industrial IoT
- Wi-Fi 6 Trials Report
- Wi-Fi & LoRaWAN Trials Report
- Connected Vehicle

Project Leaders

Leader: Bahar Sadeghi
Intel

Co-Leader: Malcom Smith
Cisco

2021 Project Kick off — Whitepaper — Trial Report

Q1	Q2	Q3	Q4

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THANK YOU

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THANKS FOR ATTENDING

Next event:

February 2nd – Wi-Fi to 5G : The Path to Convergence
(08:00 GMT and 16:30 GMT)

Register: https://wballiance.com/asia -telecom-summit/

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