WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

WGC ASIA PAC

JAN 31 - FEB 2 2023

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

PARKROYAL, on Beach Road, Singapore

#WGCASIAPAC | #wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Tiago Rodrigues

CEO, Wireless Broadband Alliance

Welcome address

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Thank you to our Sponsors

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Today's Agenda

Time	Presenter
9:00 AM (SGT)	**CEO's Welcome Address** Tiago Rodrigues, CEO, Wireless Broadband Alliance
9:20 AM (SGT)	**6 GHz Wi-Fi Acceleration 2022-2023** Eric McLaughlin, VP & GM Wireless Solutions Group, Client Platform Solutions Division, Intel Corporation
9:45 AM (SGT)	**IMDA's Regulatory Approach: Digital Infrastructure** Hema Ramnani, Director, Market Policy & Regulation Division, Infocomm Media Development Authority (IMDA)
10:05 AM (SGT)	**Wireless First: Delivering Deterministic Experiences** Mark Grayson, Fellow, Cisco
10:30 AM (SGT)	**ICT Holds the Key to a Green Future** Luis Neves, CEO, GeSI
10:50 AM (SGT)	**COFFEE & NETWORKING**
11:20 AM (SGT)	**Next in Asia: Wi-Fi 7** Parul Singla, Director, Marketing, MaxLinear
11:45 AM (SGT)	**Delivering Secure Next-Gen Wi-Fi Experience from Public to Enterprise Wi-Fi with a Purpose** Vasudevan Venkatakrishnan, Director, Business Development Sales APAC, Ruckus Networks
12:05 PM (SGT)	**Fireside Chat: The Rising Importance of Network As A Service (Naas) for Organizations** Udit Mehotra, CEO & Managing Director, Spectra
12:25 PM (SGT)	**Overview of OpenWiFi** Howard Buzick, Business Development, Telecom Infra Project/META **Panel: TIP OpenWiFi—A Service Provider View** Romin Jain, Director, Product Management, Boingo Wireless; Udit Mehrotra, CEO & Managing Director, Spectra; Sandeep Kohli, Meta Connectivity Ecosystems Lead, India and APAC, Meta
1:05 PM (SGT)	**Connecting Massive Fans at the World Cup 2022 Qatar Stadiums & Airport** KT Ang, ANTlabs
1:25 PM (SGT)	**LUNCH & NETWORKING**

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Today's Agenda

Time	Presenter
2:30 PM (SGT)	**Session Moderator** Bruno Tomás, CTO, Wireless Broadband Alliance
2:31 PM (SGT)	**Case Study: eduroam/OpenRoaming Combined Deployment in Japan** Dr. Hideaki Goto, Associate Professor, Cyberscience Center, Tohoku University
2:45 PM (SGT)	**Overview of OpenRoaming Case Studies** Jonah Ross, Manager PMO, Wireless Broadband Alliance
3:00 PM (SGT)	**WBA Roaming Work Group** Erinn Hall, Director, Program Management, AT&T
3:15 PM (SGT)	**ICT holds the key to a green future** Peter Thornycroft, Distinguished Engineer, CTO group , HPE Aruba
3:30 PM (SGT)	**PANEL: Optimizing Public Wi-Fi Networks & Wi-Fi Roaming** BooLeng Khoo, System Engineering Manager, Ruckus Networks; Mark Grayson, Fellow, Cisco; Erinn Hall, Director, Product Management, AT&T
4:00 PM (SGT)	**COFFEE & NETWORKING**
4:30 PM (SGT)	**Session Moderator** Steve Namaseevayum, Director, Industry Alliance & Membership, Wireless Broadband Alliance.
4:31 PM (SGT)	**Wi-Fi Innovation in Indonesia : Product and Business** Gunadi Hantoro, OSM Wireless Product Management, PT Telkom Indonesia
4:50 PM (SGT)	**WBA Policy Work Group** Bruno Tomas, CTO, Wireless Broadband Alliance
5:05 PM (SGT)	**Wi-Fi 7 and Federated Onboarding Service Projects** Dr. Necati Canpolat, Sr. Staff, Next Generation and Standards, Intel Corporation
5:20 PM (SGT)	**Wi-Fi Experience for Moving Networks** Ed Kyte, Airline Propositions Manager, Inmarsat
5:35 PM (SGT)	**TIAGO RODRIGUES, CEO, WIRELESS BROADBAND ALLAINCE – EVENT CLOSE & NETWORKING**

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

WGC Executive Plenary Session

Tiago Rodrigues
Wireless Broadband Alliance

Eric McLaughlin
Intel Corporation

Hema Ramnani
Infocomm Media Development Authority (IMDA)

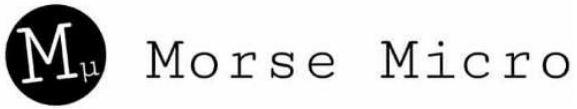
Mark Grayson
Cisco

Luis Neves
GeSI

Last Singapore Event in February 2020

Welcome to 2022 New Members

WIRELESS BROADBAND ALLIANCE



Wireless Broadband Alliance (WBA)

WBA is a nonprofit association with the vision to accelerate the development of

"Seamless and interoperable Wi-Fi services"

1. **Get OpenRoaming & Passpoint Everywhere** *for Guest-Public Wi-Fi Roaming & User Experience*

2. **Accelerate Next Gen Wi-Fi Innovations**, *Wi-Fi 7, 6Ghz, AFC, QoS, Wi-Fi Sensing, HaLow, …*

3. **Make Wi-Fi the Best Complement to 5G** *& Cellular Technologies*

Established in 2003 | 180+ MEMBERSHIP COMMUNITY | PROJECTS & PROGRAMS | 3 ANNUAL EVENTS | PROMOTION AND GO-TO-MARKET | THOUGHT LEADERSHIP & MARKET RESEARCH

WIRELESS GLOBAL CONGRESS · CARRIER WIRELESS Services Certification · OPENROAMING WIRELESS BROADBAND ALLIANCE · WORLD Wi-Fi Day · WBA INDUSTRY Awards CELEBRATING ECOSYSTEM EXCELLENCE · CONNECTED COMMUNITIES Forum

2023 Projects Roadmap

5G Work Group	IoT Work Group	NextGen Work Group	Roaming Work Group	OpenRoaming™ Task Group	Testing & Interoperability Work Group
5G & Wi-Fi Convergence in Private 5G Networks	Wi-Fi 6/6E for Industrial IoT	Wi-Fi 7	Signaling Location Information in RADIUS	OpenRoaming for Private LTE / 5G	Access Network Quality of Service
	IoT & Smart Home	Operator Managed Wi-Fi Reference Architecture	Billing and Charging Evolution (BCE)	Federated Onboarding Service for OpenRoaming	E2E QoS Management Trial
	Wi-Fi HaLow Trials	Wi-Fi Networks with Non-Fixed Backhaul	Decentralized OpenRoaming Networks	OpenRoaming for IoT	Venue Requirements for Wi-Fi User Engagement
					RADIUS Accounting Assurance

Projects in progress

New projects for 2023

Policy & Regulatory Affairs Work Group	Market Work Group	Certification Task Group	Innovation Forum by CTO Group	Connected Communities Forum	APAC Committee

2023 Projects Roadmap

5G Work Group	IoT Work Group	NextGen Work Group	Roaming Work Group	OpenRoaming™ Task Group	Testing & Interoperability Work Group
5G & Wi-Fi Convergence in Private 5G Networks	Wi-Fi 6/6E for Industrial IoT	Wi-Fi 7	Signaling Location Information in RADIUS	OpenRoaming for Private LTE / 5G	Access Network Quality of Service
	IoT & Smart Home	Operator Managed Wi-Fi Reference Architecture	Billing and Charging Evolution (BCE)	Federated Onboarding Service for OpenRoaming	E2E QoS Management Trial
	Wi-Fi HaLow Trials	Wi-Fi Networks with Non-Fixed Backhaul	Decentralized OpenRoaming Networks	OpenRoaming for IoT	Venue Requirements for Wi-Fi User Engagement
					RADIUS Accounting Assurance

Policy & Regulatory Affairs Work Group	Market Work Group	Certification Task Group	Innovation Forum by CTO Group	Connected Communities Forum	APAC Committee

WBA OpenRoaming

OpenRoaming is: i) an Open Standard, ii) a Roaming Federation for automatic connection, secure and privacy and iii) an open framework to develop new opportunities and innovations

Tracks

Wi-Fi

Release 1 (Live)	Release 2 (Live)	Release 3 (Live)	Release 4 (2023)	
• Settlement “free” traffic support • PKI Certificate Issuance / RadSec-TLS support • WBAID & RCOI	• Settled “paid” traffic support • Legal framework, T&C, Privacy Policy baseline • WBA WRIX evolution	• Scaling deployment of OpenRoaming settled & settlement free • Federation Global Database • Automated APIs	• Federated Onboarding Service (profile mgmt. and interfaces) • Network real time QoS, custom SLAs	• Membership service (Analytics and reporting) • Compliance tooling and automation • Capport user engagement

- Cybersecurity Service
- Cloud Federation
- Network Automation

Cellular / IoT

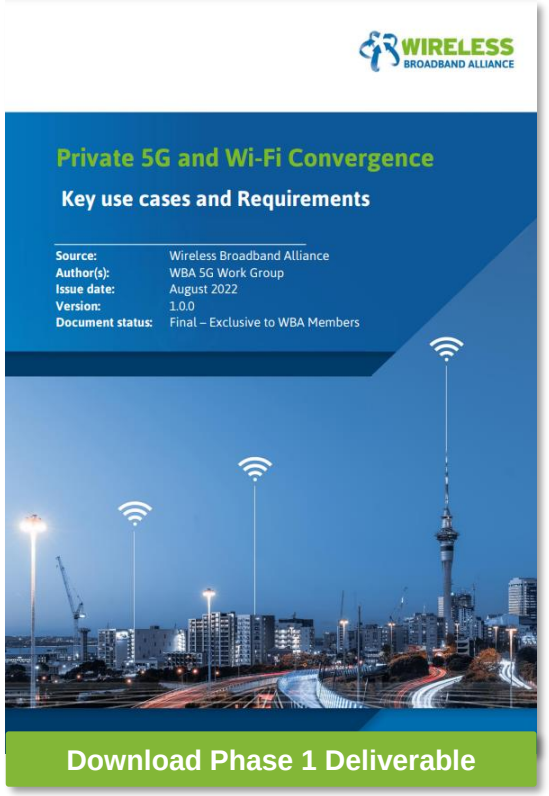
Release Private 5G (2023)	Release IoT (2023+)
• Identity management and brokerage for mobile service providers • Compatibility / turnkey for 5G private networks gear	• Advanced onboarding models IoT • Bluetooth, Matter, HaLoW

2024

OpenRoaming Converged across Technologies and Use cases

Private 5G & Wi-Fi Convergence

Enable convergence between 5G & Wi-Fi in private / enterprise environment for spectrum efficiency, networks optimization, identity management, IP preservation, fast transition, security and QoS.



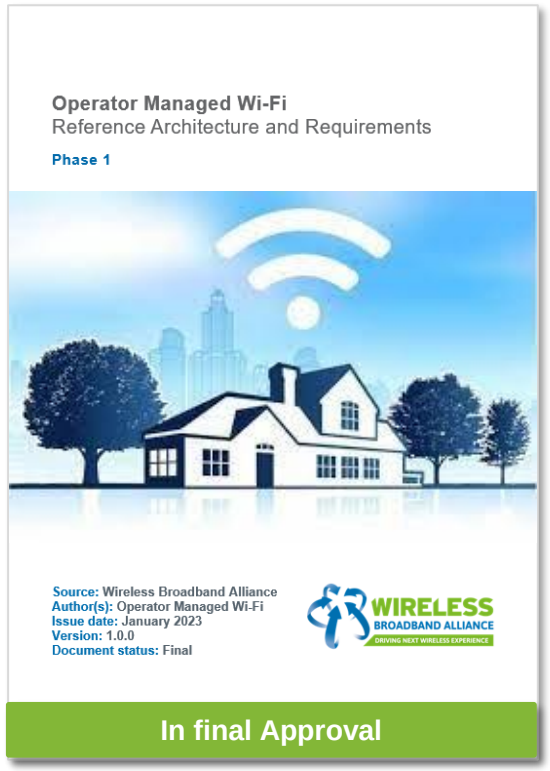
Phase 2 is in progress:

- Architecture Considerations
- Extending Wi-Fi Fast Transition Domain to include Private 5G
- Extending Singular Authentication across Private 5G & Wi-Fi
- Indication of Identical Service Across RAT
- IP Address Preservation & Seamless Mobility
- Optimized UE Paging in a Converged Wi-Fi and Private 5G environment
- QoS Convergence
- Latency management across Wi-Fi and Private 5G
- Cryptographies for Device Identification
- Trials for Wi-Fi and Private 5G

Main participants: aruba, AT&T, BROADCOM, cisco, COMMSCOPE, Google, intel, NOKIA, Plume

Operator Managed Wi-Fi Reference Architecture

Define a reference architecture with technical specifications and identification of key features required by operators to enable automated, scalable and managed Wi-Fi in residential networks.



Phase 2 starting in Q1 2023:

- Onboarding & Offboarding of APs
- Support for dynamic Multi-AP backhaul management
- Roaming between public and private networks without interruption in voice and video
- Traffic separation per SSID (VLAN)
- Prioritization of devices and traffic
- Remote enablement and disablement of service
- Automated debug logging to cloud – facilitate remote problem resolution
- Cyber security applications
- Control access to inappropriate content – parental
- Device typing, identification and user engagement

Main participants: airties, ASSIA, BT, CableLabs, Charter Spectrum, T-Mobile, Hotwire, MaxLinear, Plume, ROGERS

Wi-Fi 6E & Wi-Fi 7

Best practices and field trials development across the world to enable and test the latest Wi-Fi capabilities (Wi-Fi 6 / Wi-Fi 6E / Wi-Fi 7) across multiple deployment scenarios to accelerate market adoption.

Wi-Fi 7 work starting in Q1 2023:

- Best practices guidelines on the technical capabilities and expected business benefits.
- Develop marketing material for Wi-Fi 7 advocacy
- Provide a platform for Wi-Fi 7 trials
- Develop test plans for Wi-Fi 7 capabilities in real-life networks & applications
- Execute the trials and report the results

Main participants: airties, AT&T, BROADCOM, CableLabs, cisco, T-Mobile, Extreme networks, intel, Türk Telekom

In Summary

- The industry at large sees an increasing value on Wi-Fi
- 6Ghz spectrum for unlicensed is groundbreaking to deliver better Broadband Connectivity and the industry is moving fast towards Wi-Fi 7
- New and innovative use cases are best served in a converged environment, where Wi-Fi 6E/7 and 5G can complement each other
- OpenRoaming is instrumental to improve Wi-Fi user experience, how people & things connect to networks - automatically, securely with privacy

Thank You

Be part of WBA and help us to make Wi-Fi Easier & Better for all

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Eric McLaughlin

VP & GM Wireless Solutions Group,
Client Platform Solutions Division, Intel Corporation

6 GHz Wi-Fi Acceleration 2022-2023

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WGC ASIA PAC

Wireless Broadband Alliance

6 GHz Wi-Fi Acceleration 2022-2023

Eric McLaughlin,

VP & GM Wireless Solutions Group,
Client Platform Solutions Division,
Intel Corporation

Jan - 2023

intel

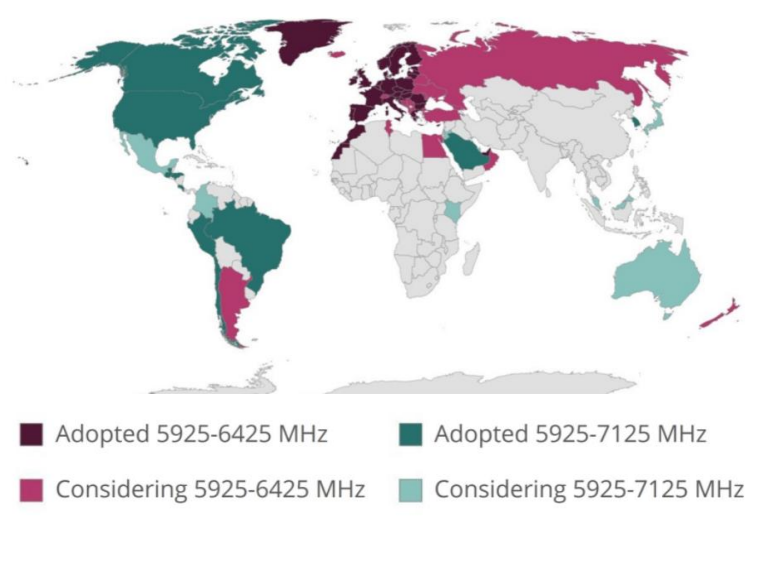
A Great Time For 6 GHz Wi-Fi

- Challenges – pandemic, supply chain, economy, unrest
- Global desire for great connectivity (speed, capacity, reliability)
- Industry “big-bets” & collaboration facilitating expansion
- 2022 successes have laid groundwork for 2023 acceleration

Let’s review…
2022 accomplishments & expected 2023 trajectory

6 GHz Wi-Fi - 2022

Jan 2022
41 countries - adopted 6 GHz for unlicensed use



wifi.org - Jan 2022

2022
Industry 6 GHz Wi-Fi Progress

Item	Jan'22	2H'22
Countries	~40	>50
Devices	~200	~1000
WBA Trials	Few	Several
Deployments	Few	Many
ISPs	Few	Many
Public Wi-Fi 7 Interop	None	2 Intel-BRCM Demos

2022
Intel-BRCM Collaboration

Intel and Broadcom Achieve Major Wi-Fi 7 Industry Milestone

Wballiance.com – Sep 2022

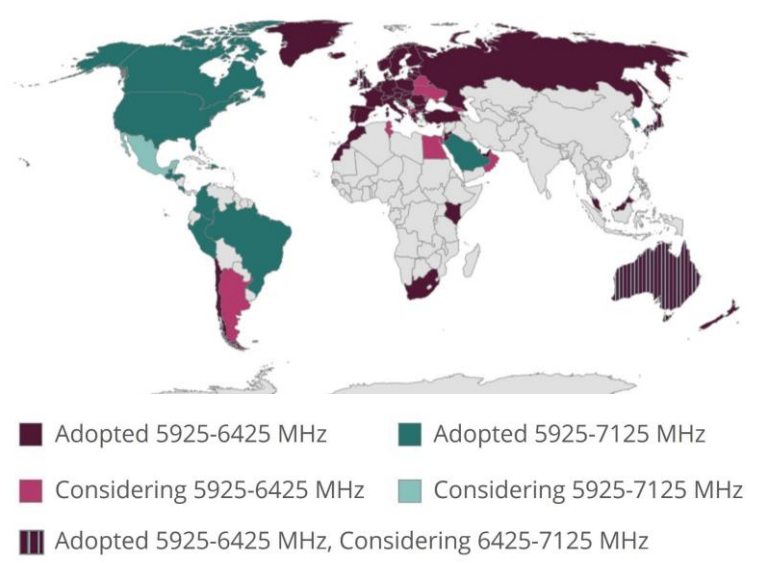
Broadcom & Intel demonstrate 5 Gbps Wi-Fi 7 to the FCC in Washington DC

Wifinowglobal.com – Nov 2022

2022 industry momentum - enables 6 GHz Wi-Fi acceleration in 2023

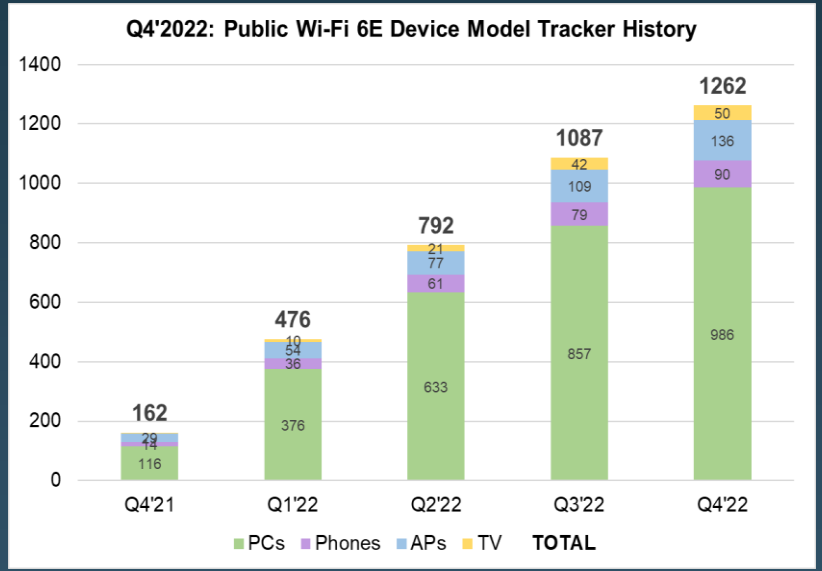
6 GHz Wi-Fi - 2023

Jan 2023
(+17) 58 countries
18 countries – considering 6GHz



wifi.org - Jan 2023

Jan 2023
Q4'22 >2.5X vs. Q1'22
Massive expansion of PCs, Phones, APs, and TVs



(Q4'22 Intel Report)

Fuel for 6GHz Wi-Fi Acceleration

- New 13th Gen Intel platforms + Wi-Fi 6E
- More Wi-Fi 6E devices of all kinds expected!

- WBA Wi-Fi 6E + OpenRoaming trials
- AFC availability + expansion (std. power)

- WBA Wi-Fi 7 program + trials
- Wi-Fi 7 Cross-vendor demos + WFA PF
- New Wi-Fi 7 product introductions / ramp

- Growth in 6 GHz country adoption

2023 is poised to be a great year for 6 GHz Wi-Fi 6E + Wi-Fi 7

We’re Excited About 2023!

- Great 6 GHz gains expected to continue
- More countries, deployments, devices, and market segments
- AFC will be a game changer for 6 GHz Wi-Fi
- Wi-Fi 7 activities will intensify, and device ramp begins

Continued industry collaboration &
Great Wi-Fi 6E & Wi-Fi 7 products and experiences

Thank You

Disclaimers

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

6 GHz Wi-Fi 6E laptop functionality requires Intel® Wi-Fi 6E products, Wi-Fi 6E APs/Routers/Gateways, Operating System support for 6 GHz operation, 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.

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

Performance varies by use, configuration and other factors.

No product or component can be absolutely secure.

Intel technologies may require enabled hardware, software, operating system, or service activation.


intel

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Hema Ramnani

Director, Market Policy & Regulation Division
Infocomm Media Development Authority (IMDA)

IMDA's Regulatory Approach: Digital Infrastructure

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Presentation at the Wireless Global Congress – Singapore
31 Jan 2023

IMDA's Regulatory Approach: Digital Infrastructure

Presented by:
Ms Hema Ramnani
Director, Market Policy & Regulation Division

INFOCOMM MEDIA DEVELOPMENT AUTHORITY

IMDA's Roles in Architecting A Digital Singapore

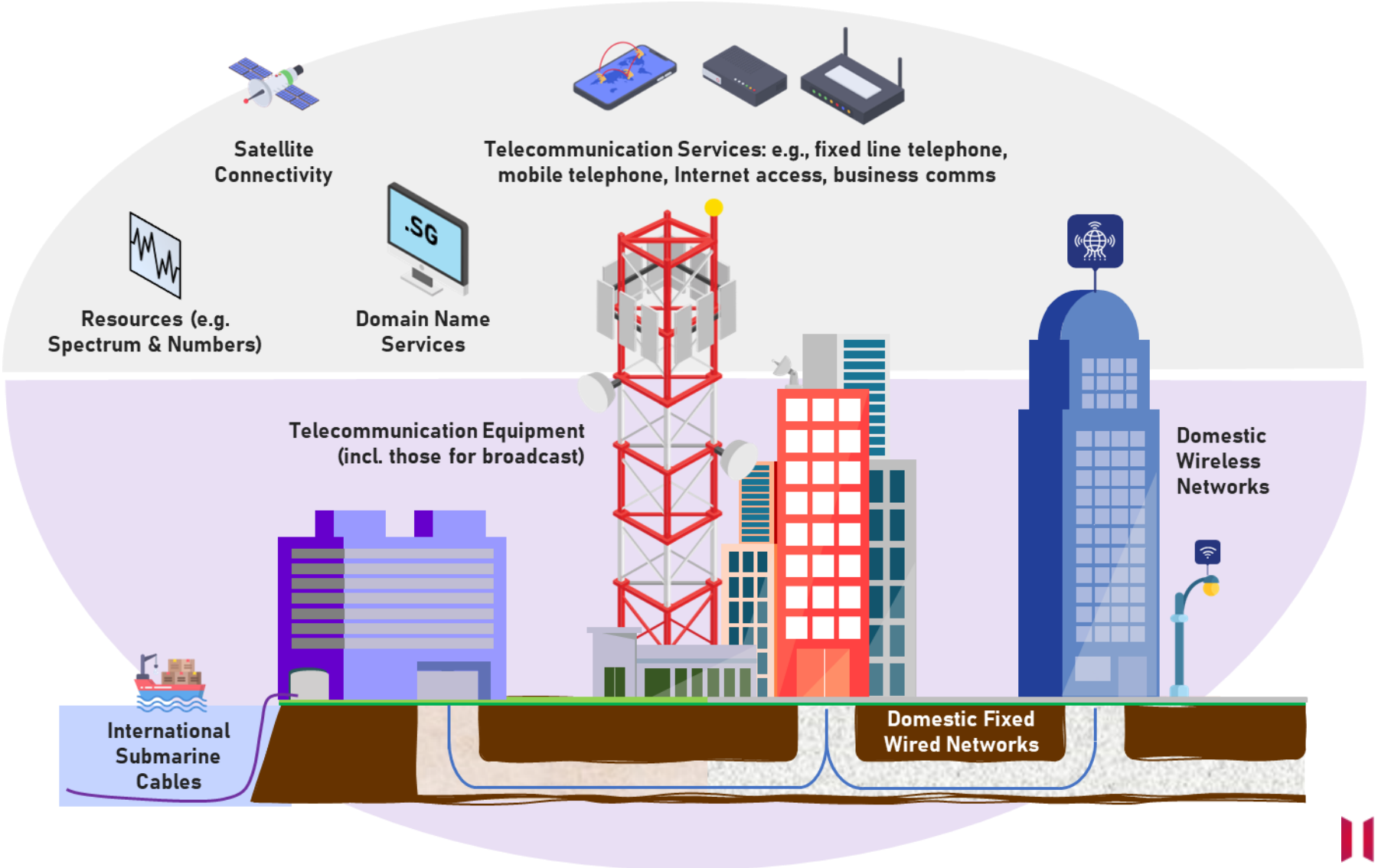
Transform Singapore's Economy through Digital		Build a Cohesive and Digitally Inclusive Society
Regulatory	**Economic**	**Social cohesion**
DIGITAL ENABLER	**TECH, INNOVATION AND DIGITAL HORIZONTAL**	
Digital Infrastructure World-leading, future ready, secure and trusted.	**Digital Innovation** World class research and cutting-edge technology that drive product/service innovation and sector transformation	**Digital Inclusion** A safe and inclusive Digital Society, where all Singaporeans can participate in the digital future and embrace digital for life.
Digital Regulation Progressive regulations that build a trusted digital space for innovation, and a safe digital space for citizens	**Digital Enterprises** Capability and confidence to use Digital to transform biz models and stay competitive	
	Digital Workforce Local core that is globally competitive	
	Powering the Media Sector Capture economic value and buzz for Singapore on the global media stage	

International
Create & expand our geo-political and economic space

The Telecommunications Industry: What IMDA regulates

Services

Infrastructure, Networks & Equipment



Liberalisation resulted in globally competitive, future-ready Digital Infrastructure

Globally Competitive

World class mobile backbone
1st for network coverage[1]. Consistently ranked among the top overall download speeds, network response times

High fibre-broadband penetration
Top 3 World's fastest broadband network nation[2]

Affordable home broadband
1Gbps fibre plan starts from $34.90/mth

Future Ready

Next bound of mobile connectivity
Three 5G SA networks with nationwide coverage

SG as Digital Hub with good access to the world
Most connected city in the region via submarine cables

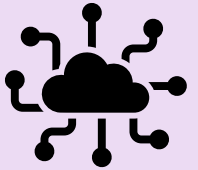
[1]Economist Intelligence Unit 2021: Technology and Telecoms Annual Report
[2]Based on median download speeds, according to Speedtest Global Index by Ookla. The other 2 countries are Chile and China.

Strong Digital Infrastructure drives our economic competitiveness

2nd

in Connectivity in Economist's Impact Global Digital Cities Index 2022

1st



in Technology Infrastructure in IMD's World Competitiveness Yearbook 2022

3rd

in IMD's World Competitiveness Ranking 2022

Increasing *importance* of Digital Infrastructure

Pivoting from Physical to Digital, accelerated by COVID-19 – fundamentally enabled by Digital Infrastructure

Work

Growing accustomed to remote working

Live

Pivoting to e-commerce for daily essentials

Play

Rise of online entertainment

Way forward – Strengthen Digital Infrastructure – duality of Fibre and Mobile

GIGABIT FIBRE

Upgrade our fibre broadband (NBN)

Investing ahead of demand

MOBILE

Strengthen our mobile connectivity

Nationwide 5G coverage and innovative use cases

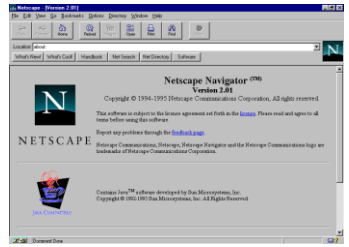
Gigabit Fibre: Upgrade our fibre broadband (NBN)

Context of NBN

Broadband landscape prior to NBN

Mainly reliant on ADSL (Singtel) and Coaxial (Starhub)

Max speeds range from 30Mbps to 100Mbps



Sufficient for general use back then – web browsing and emails

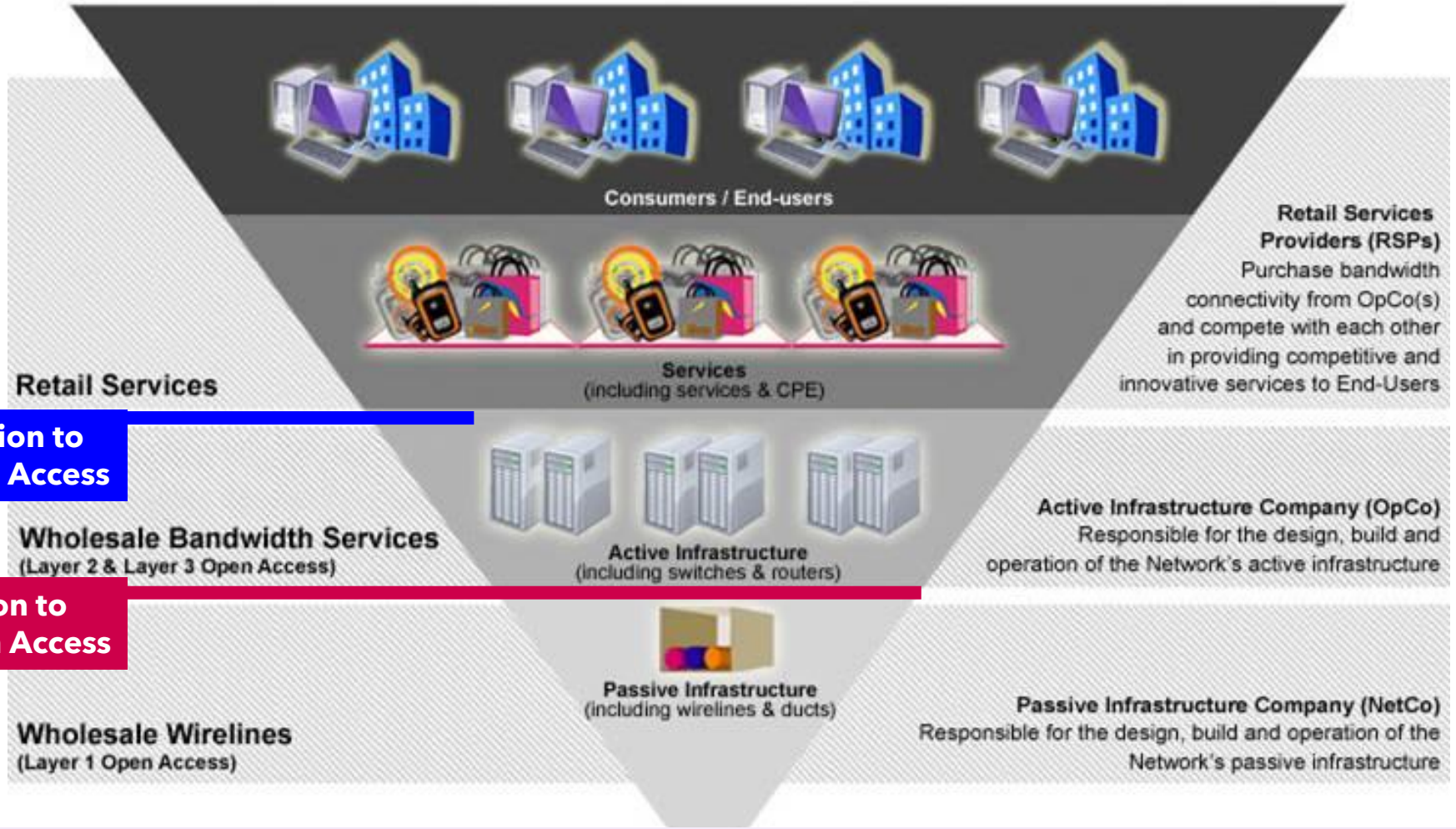
Impetus for upgrading to NBN

Future-ready
To support then-nascent services like tele-working and e-learning

More competitive broadband market
via 3-layer Open Access structure

Gigabit Fibre: Upgrade our fibre broadband (NBN)

3-layer industry structure to increase competitiveness of market



Effective Open Access structure promotes services-based competition

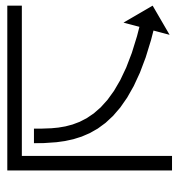
Gigabit Fibre: Upgrade our fibre broadband (NBN)

Investing ahead of demand

NBN now forms the bedrock of Digital Connectivity

Good capacity to support high demand

Able to cater to unexpected surge in demand during COVID-19

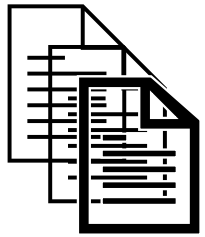


Globally competitive

Ranked 1st in Internet Speeds in IMD's Digital Competitiveness Ranking

Vibrant and competitive market

>10 broadband retailers offering wide variety of competitive packages



Invest ahead of demand, to be future ready – Upgrade NBN to 10Gbps

Enhance Wi-Fi Connectivity to Encourage Innovative Applications

Nationwide Wireless Broadband to Support Consumer and Enterprise Applications

Wireless@SGx

Approx. 20,000 hotspots (public transport facilities/MRT stations, malls, hawker centres etc.)

Upgraded from 2Mbps to 5Mbps

Faster than most public Wi-Fi services around the world

Supports an "Always Connected" Environment amongst Singaporeans

Several Enhancements focusing on consumer experience and enterprise adoption

Introduction of EAP-SIM

Use SIM card credentials to connect to Wireless@SGx network

Launch of Wireless@SGx app

Easier log on and auto connection

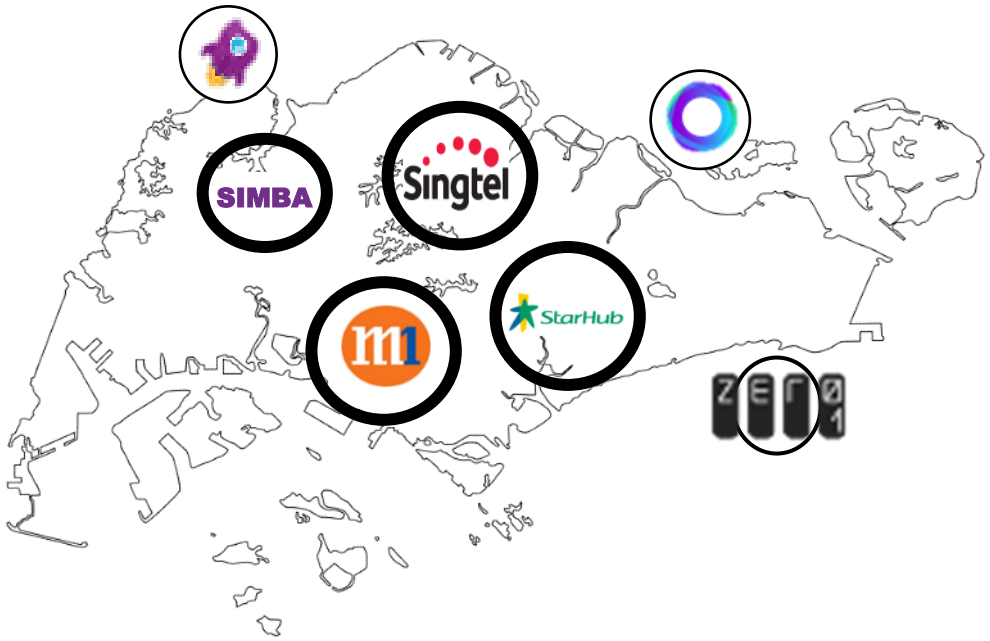
Login with SMS OTP

Increased safety and ease of access

Mobile: Strengthen our mobile connectivity (5G)

4G landscape

High mobile penetration, with competitive offerings



>160% mobile penetration rate today

- **4** mobile network operators (**MNOs**)
  - Facilitated entry of 4th network player in 2017
- **>10** key mobile virtual network operators (**MVNOs**)
- Prices of service plans have **fallen**
  - As low as S$8 for 50GB data plan (SIMBA)
- Highly competitive and innovative service plans
  - SIM-only, no contract
  - Unlimited data plans from S$25* (MyRepublic)

  ** capped at 5GB/day*

Mobile: Strengthen our mobile connectivity (5G)

Vision for 5G

5G SA (Standalone) capabilities to unlock enterprise transformation and secure SG's competitive edge

1 **Where we want to be** → 2 **How do we get there** → 3 **What do we want to achieve**

Vision: 5G for Singapore

Singapore, a global front-runner for innovation in secure 5G applications and services

Prime the ecosystem

Key focus areas facilitated by IMDA:

- **Regulatory:** Drive timely, cost-effective and robust 5G network roll-out
- **Resiliency:** Enable trusted and resilient 5G systems and services
- **Talent:** Develop talent for 5G and future networks
- **Use-cases:** To anchor SG's position in global innovation

Key outcomes

- **Move up innovation ladder** from a value-adding economy to a value-creating one
- **Enable growing digital economy** with high-speed, high-capacity connectivity
- **Become one of new smart cities** enabled with high speeds and ultra-low latency connectivity
- **Maintain competitive edge** in connectivity

Mobile: Strengthen our mobile connectivity (5G)

Securing investments in Nationwide 5G coverage ahead of demand to spur enterprise innovation

Singapore will have 3 nationwide 5G SA networks

2020 Call for Proposal (CFP)
secured 1st 2 nationwide 5G SA networks

Competitive process to get 2 best players to provide secure + resilient networks, support innovative use cases

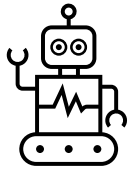
2021 Spectrum Auction
facilitated a 3rd 5G nationwide player

More spectrum to complement existing 5G networks

Support enterprise innovation and digitalisaton

New business and market models

Customisation of applications, services, products and capabilities



Increased automation

E.g., smart factories, smart ports

Productivity gains

E.g., migration to cloud, autonomous vehicles

Submarine cables for international connectivity

Top Regional Submarine Cable Hub

Continue to strengthen our position as a major submarine cable hub

IMDA's role span regulations, planning & industry development:

- Facilitate Landing of Submarine Cables in Singapore
- Manage Singapore's Landing Resources
- Ensure Resilience and Protection of Singapore's International Connectivity
- Pursue International Engagement & Initiatives

Beyond traditional areas, we are monitoring international developments on new Digital Infrastructure

Frameworks on security, resiliency and sustainability

- Increasing dependence on new digital infrastructure in digital economy, presents new issues:

Areas of Interest

Data Centres

Key nodes for digital activities – support increasing computing power and digital connectivity

Sustainability – DCs are significant energy consumers

Cloud

Increasing reliance on Cloud by businesses

Amplified risk in event of breach – due to market dominance by a few large players

- Key jurisdictions moving legislations to address new issues, in largely self-regulated industry
- International alignment is important due to borderless nature of services and companies

Thank You

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Mark Grayson

Fellow, Cisco

Wireless First: Delivering Deterministic Experiences

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Wireless First:
Delivering deterministic experiences

Wherever we work, live, play and learn

Mark Grayson
Cisco Fellow
January 2023

Wireless First in Action

Enhanced experiences – where we work, live, play and learn

Education

AR/VR/XR learning, e-learning, digital education – increasing student engagement

Public venues

High-resolution video, connectivity irrespective of carrier affiliation, new audience experiences

Hybrid workspaces

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

Healthcare

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

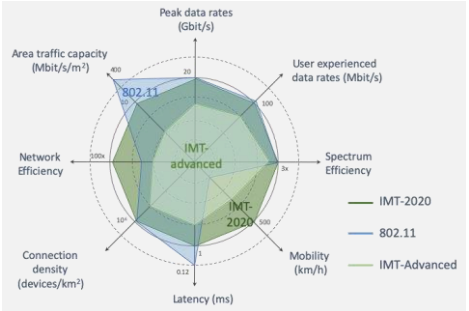
Manufacturing

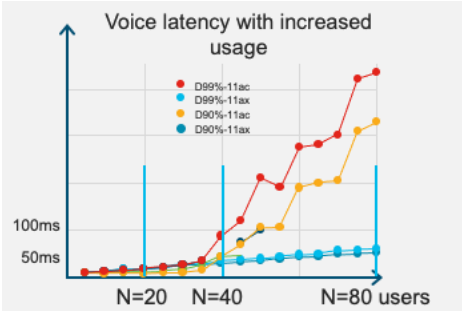
Automated and digitized operations and supply chain, robots

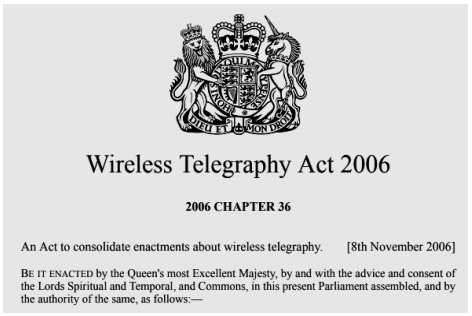
Capacity — High density — Performance — Low latency

Supported using complementary spectrum
“5G benefits” delivered by using licensed spectrum, not technology

- Wi-Fi 6 already delivers on key IMT-2020 requirements
  - Scheduled access delivers consistent performance with increasing load
- Permitted higher radiated power in licensed spectrum delivers a coverage advantage
  - Assuming low/medium traffic density scenarios experienced outdoors
- Licensed spectrum offers control over alien interference
  - Self interference can be managed to deliver more deterministic performance, especially in open environments






Wireless Telegraphy Act 2006

2006 CHAPTER 36

An Act to consolidate enactments about wireless telegraphy. [8th November 2006]

BE IT ENACTED by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

How to serve work, live, play and learn locations
The densification challenge

Over the last 15 years, the cellular business model has failed to deliver densified networks using exclusive spectrum

Wi-Fi 6E: The new chapter of an incredible story…
Delivering the next wave of wireless experiences

$3.3 trillion

2021

Economic Impact

Asia*

2021	2025
$523 billion	$769 billion

$4.9 trillion

2025

Wi Fi 6E

Contribution will be key

* Australia, India, Japan, New Zealand, Singapore, South Korea

The Wi-Fi 6E Imperative

Wi-Fi transports 92% of all fixed broadband traffic*

UK Average Monthly Data Volumes (GByte)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	CAGR
Cellular Volumes	0	1	1	2	2	3	4	5	6	30%
Fixed	30	58	97	132	190	240	315	429	453	40%

- Current 5GHz Wi-Fi channel width popularity (data from 900k APs):
  40 > 20 > 80 >> 160 (MHz)
- Equivalent for 6GHz (based on limited data set):
  80 > 40 > 160 > 20 >> 320 (MHz)
- Re-use factor (data from 900k APs): 6-12 in 5GHz

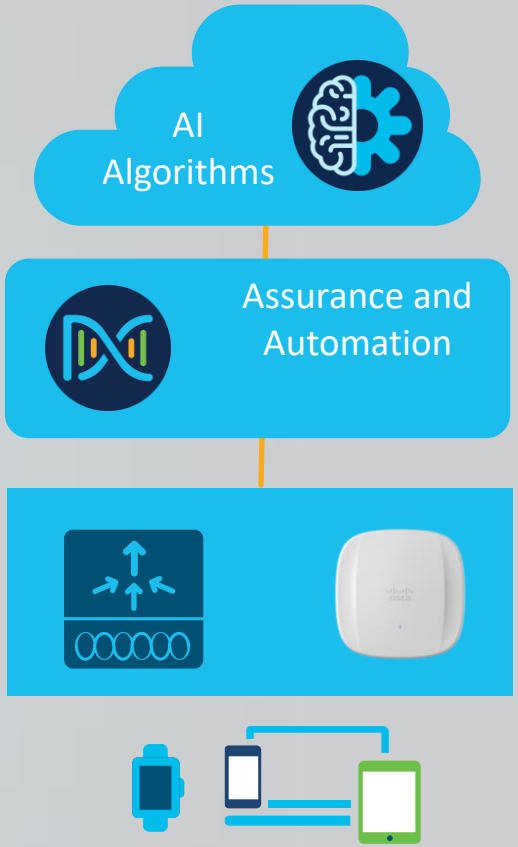
*German Ministry of Economic Affairs

Wireless First – Simplified Configuration
AI-Enhanced Self Optimizing with Improved Serviceability

The AI-Enhanced RRM algorithm is built into Cisco's AI Cloud, and RRM data is sent there for ML analysis.

Cisco self optimization leverages up to 30 days of AI-processed data to make the wireless experience exceptional!

Boosting operational efficiency as outcomes are validated, RRM history is visualized and benefits quantified!



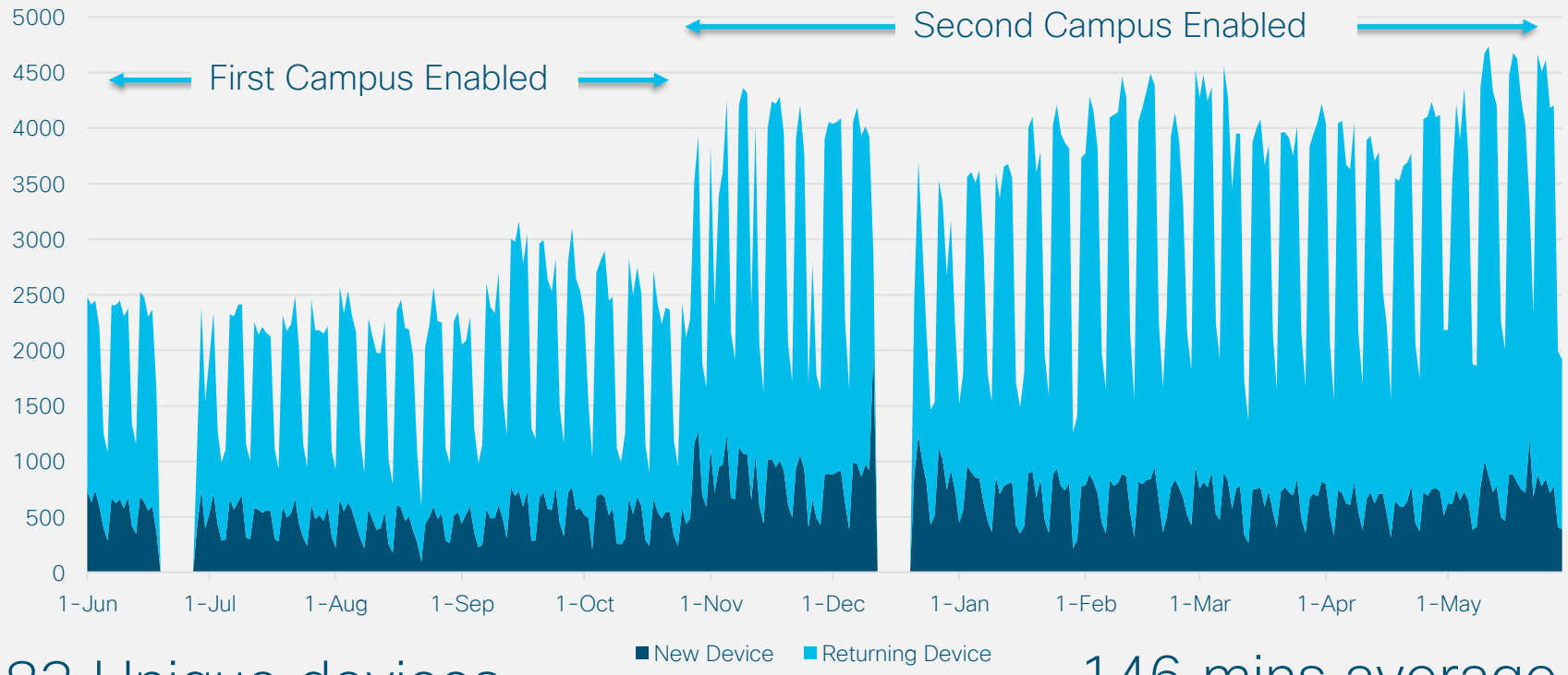
AI-Driven Self-Optimizing RF, leverages Machine Learning to find patterns and optimize your RF before issues happen.

A single indoor network to serve all wireless users

12 months of OpenRoaming at one Healthcare Business

1.05 PetaBytes of Traffic

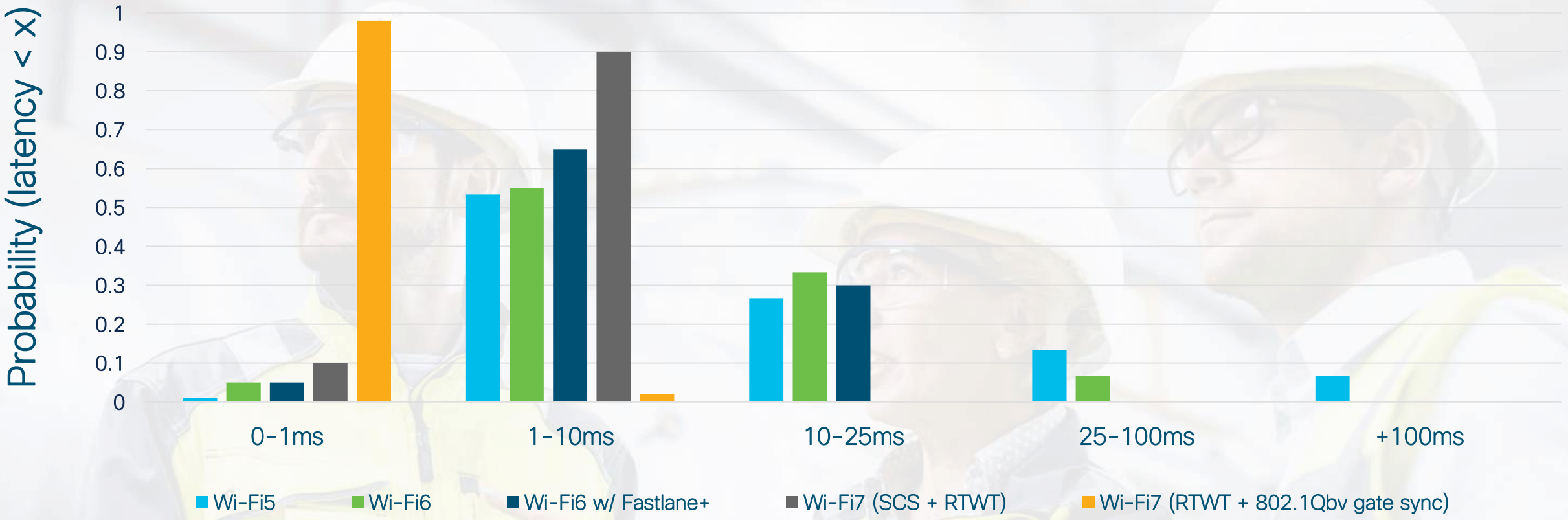
3.1 Million Connections



234,283 Unique devices

146 mins average duration

Wireless first and the path to deterministic latency and high reliability



Latency performance bounded, even in high-traffic scenarios.

Source: https://mentor.ieee.org/802.11/dcn/22/11-22-0634-00-00be-802-11be-enhancements-for-tsn-time-aware-scheduling-and-network-management-considerations.pptx

Wireless First Key Take Aways

- We need to serve traffic locations where we work, live, play and learn
  - Clear demarcation between Wi-Fi deployments and those (outdoor) long-range and medium density use cases that benefit from licensed spectrum
- Early data from 6GHz deployments point to a doubling of channel widths to 80 MHz compared with 5GHz
  - But with traffic CAGR of 40%, likely need to transition to 160 MHz in the midterm
- Industry stepping up to simplification challenge
  - Simplified configuration and management through use of AI/ML algorithms
- Wi-Fi already “sliced” to support multiple use-cases on a converged infrastructure
  - OpenRoaming is emerging as a realistic alternative to cellular DAS
  - Wi-Fi capabilities set to support deterministic use cases


CISCO

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Luis Neves

CEO, GeSI

ICT Holds the Key to a Green Future

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

GeSI ENABLING DIGITAL SUSTAINABILITY

ICT holds the key to a green future

Wireless Broadband Alliance APAC Congress
Singapore, 31st January 2023

Luis Neves
CEO, GeSI

MEMBERS


accenture


qpdc
ASSOCIAÇÃO PORTUGUESA PARA O DESENVOLVIMENTO DAS COMUNICAÇÕES


AT&T


Bell


CMAS
SYSTEMS CONSULTANTS


colt


cscp
COLLABORATING CENTRE ON SUSTAINABLE CONSUMPTION AND PRODUCTION


DASSAULT SYSTEMES


DELL


Deloitte.


Deutsche Telekom


etno


greener intelligence


HUAWEI


IBM


IMPACT ROI


LIBERTY GLOBAL


LUMEN


MTN


NEC


NOS


NTT


SUPERIOR ESSEX


swisscom


T-Mobile


Taiwan Mobile


tdc net


TELSTRA


TIM


TM AUSBAU


Türk Telekom


unipartner


verizon


ZTE

PARTNERS


arabesque


UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP


CAPITALS COALITION


CARBON TRUST


CDP
DISCLOSURE INSIGHT ACTION


cirodd
Centre interdisciplinaire de recherche en opérationnalisation du développement durable


CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK


connected devices
ALLIANCE


enerTIC


ETSI


European
DIGITAL SME
Alliance


giz
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH


GCF
Global Climate Forum


itw
GLF
GLOBAL LEADERS' FORUM


Global Sustain
People | Planet | Profit


GREEN
ELECTRONICS
COUNCIL


ICC
INTERNATIONAL CHAMBER OF COMMERCE


IEEE


iscte
INSTITUTO UNIVERSITÁRIO DE LISBOA


THE INTERNET COMMISSION


ITU


NUMANA


P4TT
Platform for Tech for SDGs


Responsible Business Alliance
Formerly the Electronic Industry Citizenship Coalition
Advancing Sustainability Globally


RIDLEY SCOTT
CREATIVE GROUP


step


SDI


United Nations
Global Compact


UNEP


WORLD
GREEN
BUILDING
COUNCIL


SUSTAINABLE DEVELOPMENT
SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS


United Nations
Climate Change


WIRELESS
BROADBAND
ALLIANCE


wbcsd


WORLD
RESOURCES
INSTITUTE


WORLD
RESOURCES
FORUM


WORLD OCEAN COUNCIL
The International Business Alliance for Corporate Ocean Responsibility

GeSI exists to bring the ICT sector together to deliver against a vision:

Foster digital innovation responsibly to transform our world for good

GeSI ENABLING DIGITAL SUSTAINABILITY

GeSI's new Vision, Core values and value proposition

GeSI

New Vision

Foster digital innovation responsibly to transform our world for good

Core Values

1. Purpose-driven
2. Digitally-enabled
3. Collaborative
4. Accountable
5. Evidence-based

Value Proposition

A leading, cross-industry sustainability initiative creating and enabling digital solutions to address society's most pressing challenges

GeSI's new strategy is guided by six tactical principles to enable and efficiently advance the ICT Sustainability agenda

1. MEMBER-CENTRIC PURPOSE

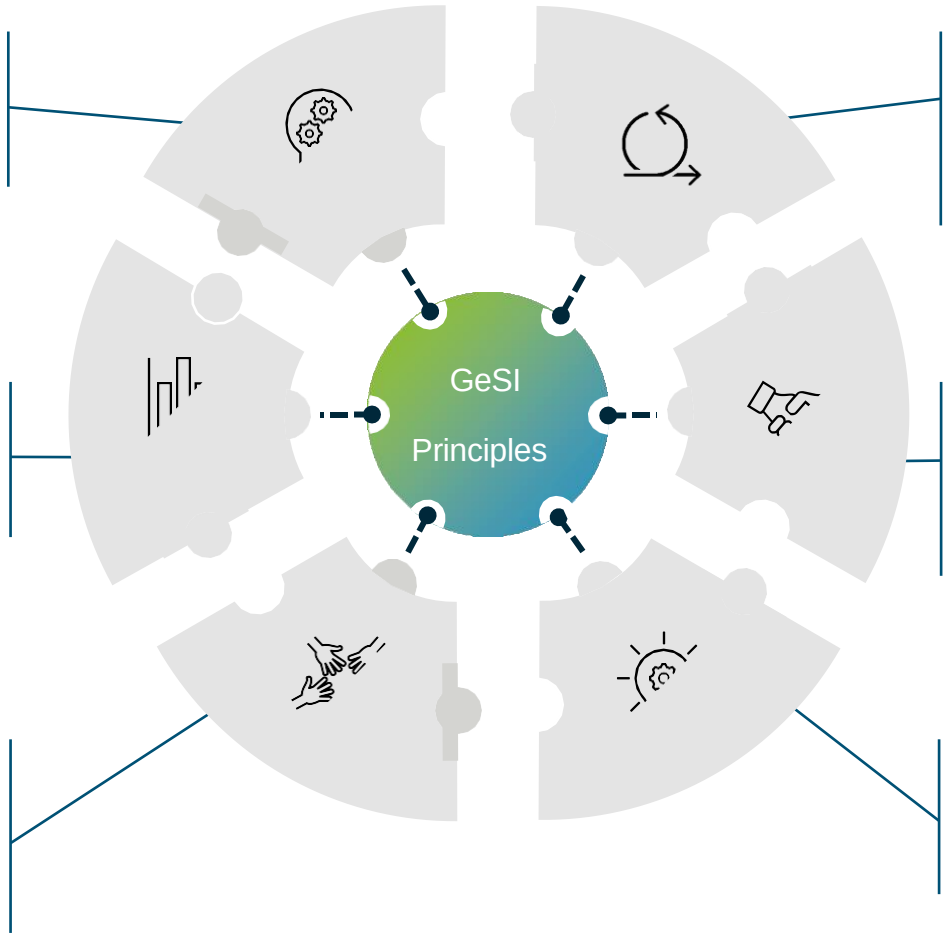
Put the member experience first and use their feedback as GeSI's North Star to align on vision, socialise investments, modify offerings, and pivot strategy when necessary

2. DATA-DRIVEN DECISIONS

Leverage data & analytics to rigorously monitor KPIs associated with offering impact (thought-leadership, events, and tool) to continuously assess asset ROI

3. GLOBAL INDUSTRY AGGREGATOR

Act as an industry aggregator bringing together the diverse parties addressing ICT issues for SMEs, not-for-profits, large for-profits, academia, policy makers, and consumers alike



4. OUTCOME-BASED PILOTS

Deploy agile principles in working groups with rapid ideation, piloting and roll-out of ambitious, yet tangible and pragmatic initiatives that will deliver real benefit to member problems

5. COLLABORATIVE WORKING

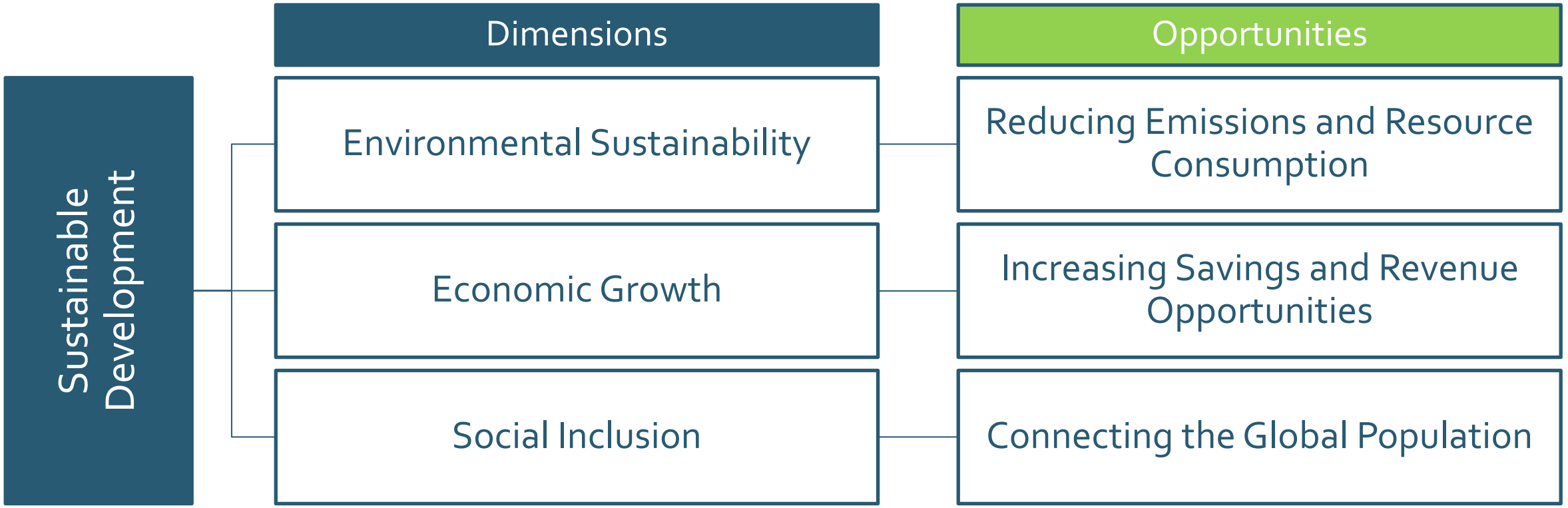
Create a safe space for members to work together in non-competitive, joint collaborative teams, inspiring and learning from each other, to create the right solution for their sustainability challenges

6. INNOVATIVE THOUGHT LEADER

Serve as a thought leader for the ICT sector, continuously pushing the agenda ahead through relevant research on behalf of the industry

GeSI ENABLING DIGITAL SUSTAINABILITY

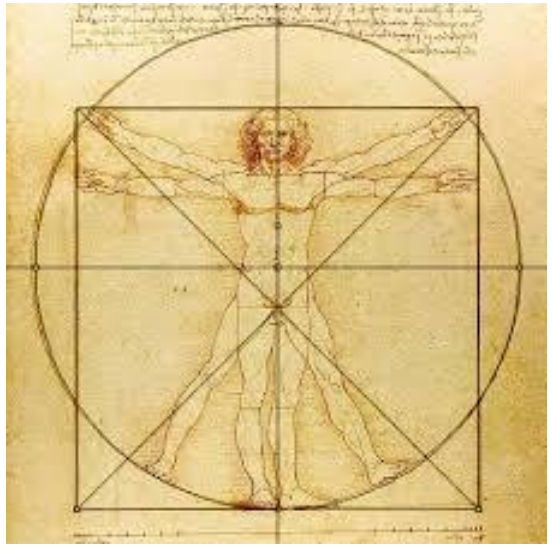
Our Concept of Sustainability is Multi-Dimensional…



GeSI ENABLING DIGITAL SUSTAINABILITY

…and People Are At the Center of it

- Sustainability is a universal human goal
- The more we connect, the more we empower



- The more we empower people through ICT, the more we break the linkage between economic growth and energy consumption

GeSI ENABLING DIGITAL SUSTAINABILITY

Building on a history of knowledge and expertise

GeSI: Enablement Methodology

Chemicals avoided emissions guidance

ICT Sector Guidance

EUROPEAN GREEN DIGITAL COALITION

2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020

SMART 2020

WWF Sweden: Climate Solver methodology development

GHG Protocol Product Standard

ICT companies: targets, reporting, methodologies

including:

BT, kpn, at&t, T..., DELL, Telefónica, vodafone, swisscom, verizon

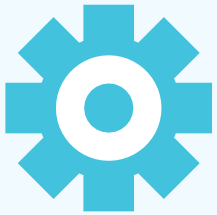
GeSI ENABLING DIGITAL SUSTAINABILITY

Our Tools

WE BRING TOGETHER SOME OF THE LARGEST AND MOST AMBITIOUS ICT BRANDS TO JOIN FORCES AND DRIVE THE SUSTAINABILITY AGENDA. BECAUSE WHEN WE STAND TOGETHER, SHOULDER TO SHOULDER, WE ARE STRONGER. WE DO MORE THAN JUST MOVE THE ICT INDUSTRY FORWARD, WE ADVANCE ALL INDUSTRIES AND ACCELERATE THE TRANSITION TO A SUSTAINABLE PLANET.

Digital Access Index

GeSI-CDP
TCFD
Scenario Analysis
Toolkit



E-TASC

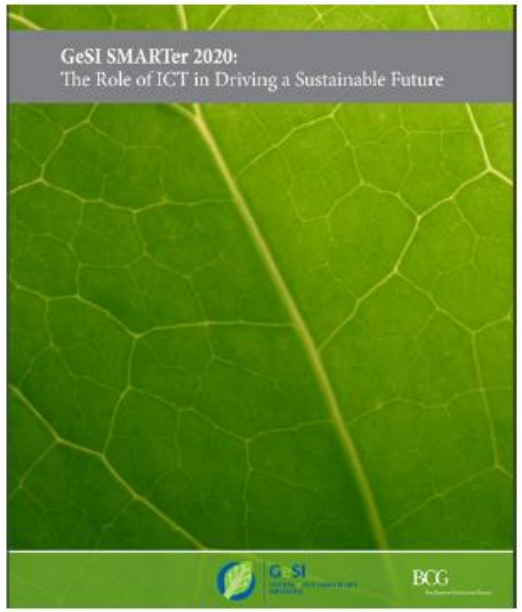
Materiality Assessment

GeSI ENABLING DIGITAL SUSTAINABILITY

Our Thought Leadership

SMART 2020

The first major study identifying the significant contribution the ICT industry can make to creating a low-carbon economy. The report also includes a series of objectives to reduce the industry's own emissions and set an example for other sectors.



SMARTER2020

Demonstrates how the increased use of ICT could cut the projected 2020 global greenhouse gas emissions. It also evaluates GHG abatement potential from ICT solutions ranging across six sectors: power, transportation, manufacturing, consumer and service, agriculture, and buildings.

SMARTER2030

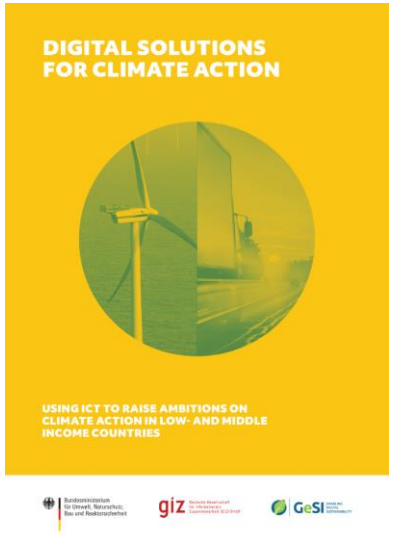
Presents how ICT has the potential to enable a 20% reduction of global CO2e emissions by 2030 and to effectively decouple economic growth from emissions growth.

Success stories

Responsible Minerals Initiative

GeSI SMART reports

EU Codes of Conduct Broadband and Data Centres



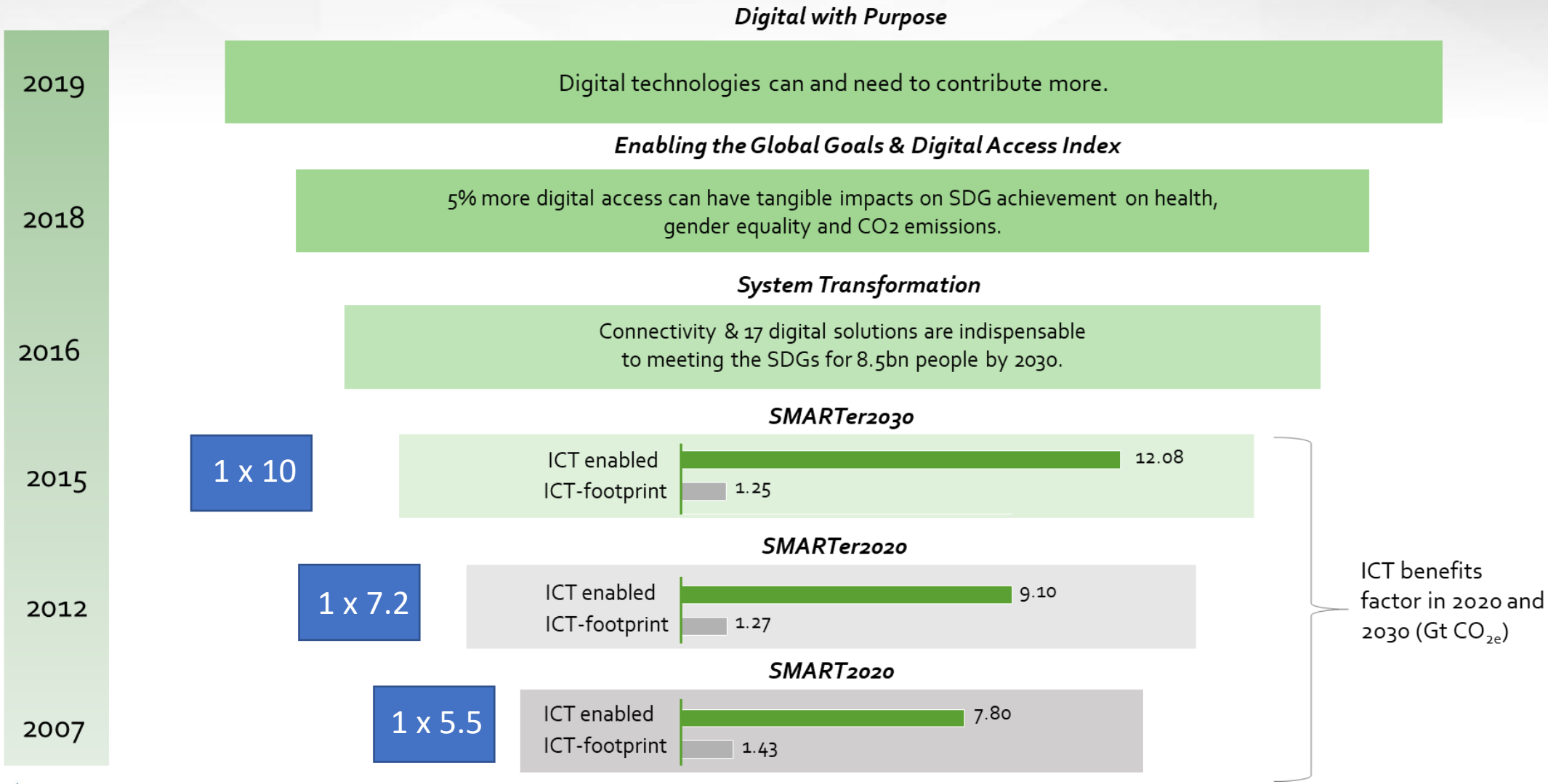
Digital with Purpose Movement

DIGITAL WITH PURPOSE

EUROPEAN GREEN DIGITAL COALITION

GeSI ENABLING DIGITAL SUSTAINABILITY

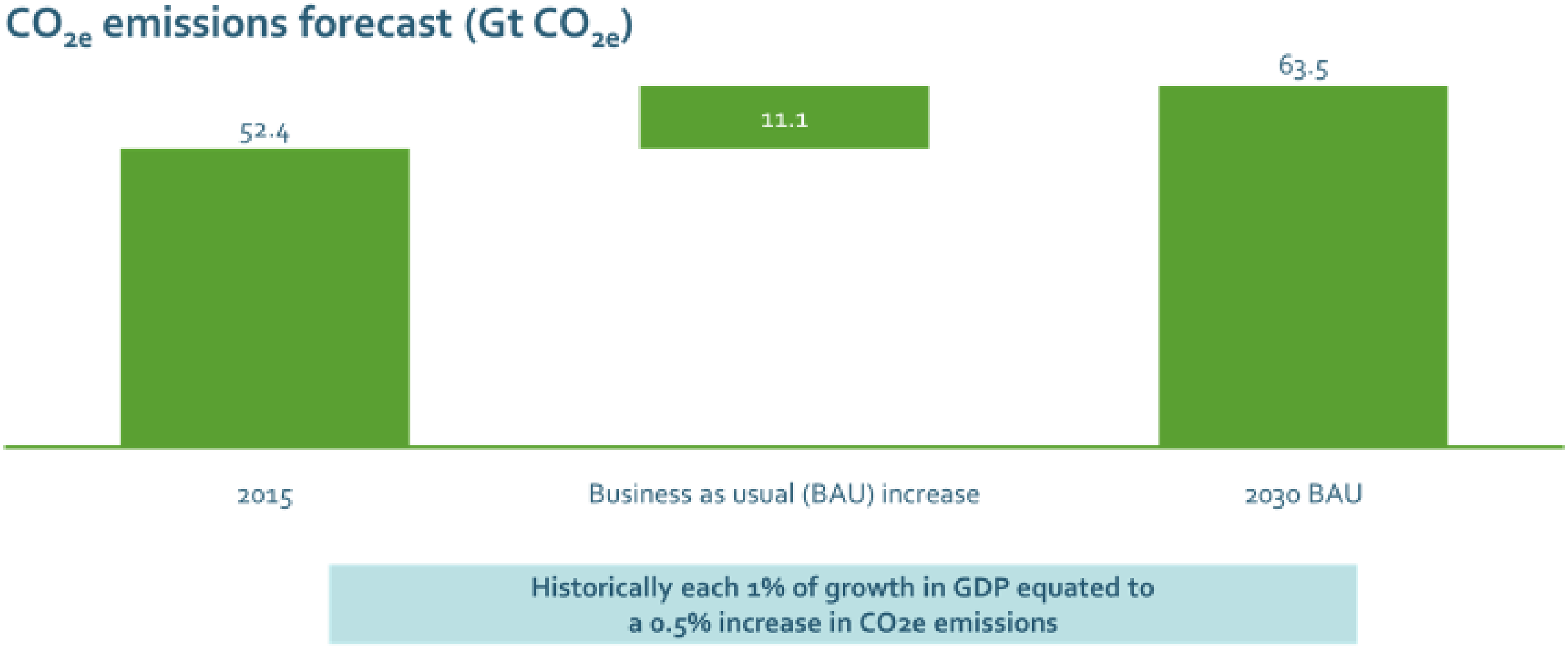
ICT – A key sector to address climate change



GeSI ENABLING DIGITAL SUSTAINABILITY

Data from GeSI reports (2007-2019)

The World is not on track:
under BAU scenarios, CO_{2e} emissions will continue to grow



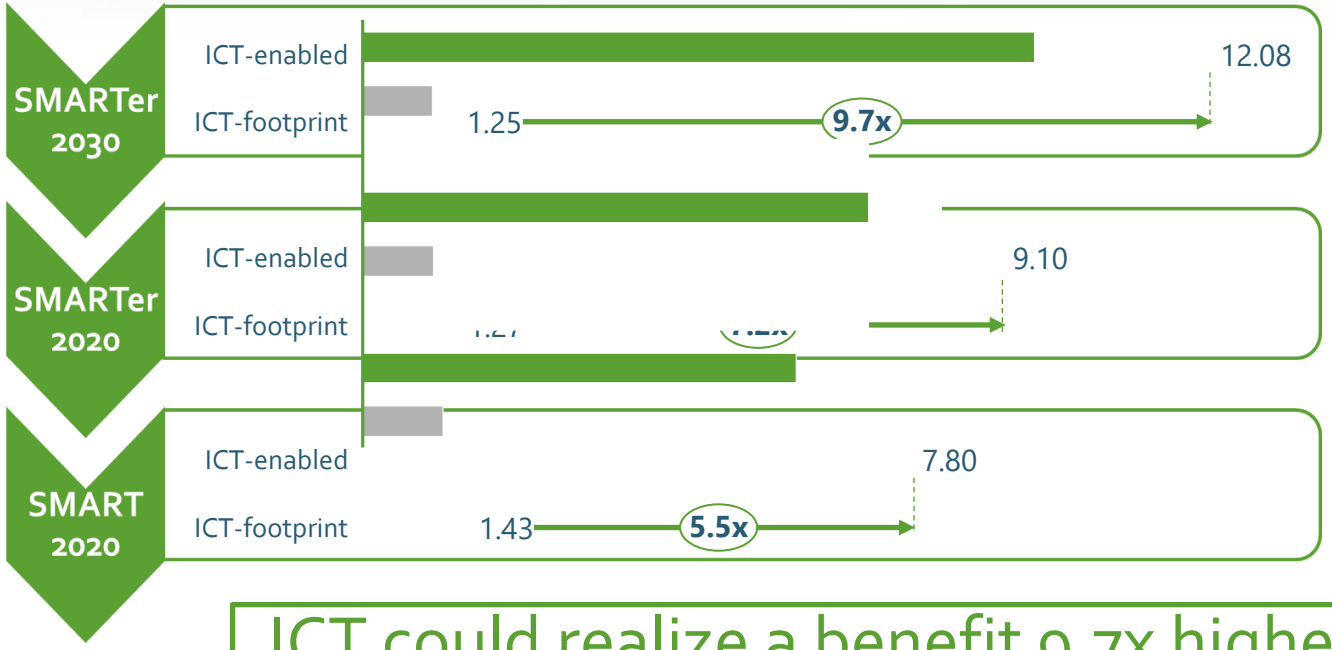
Historically each 1% of growth in GDP equated to
a 0.5% increase in CO2e emissions

GeSI ENABLING DIGITAL SUSTAINABILITY

Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

SMART Series Findings

ICT benefits factor in 2020 and 2030 (Gt CO_{2e})



Business Opportunity

ICT-enabled solutions could generate **$11.4 trillion** in sustainable economic benefits annually, comprising **$6.5 trillion in revenues** and **$4.9 trillion in cost saving opportunities**

ICT-enabled solutions offer the potential to create **29.5 million jobs** and yield **USD $1.9 trillion in savings.**

ICT-enabled energy efficiency translated to approx. **EUR 600 billion ($946.5 billion)** of cost savings **and create 15 million green jobs by 2020.**

ICT could realize a benefit 9.7x higher than its own emissions in 2030, while its own footprint is expected to fall.

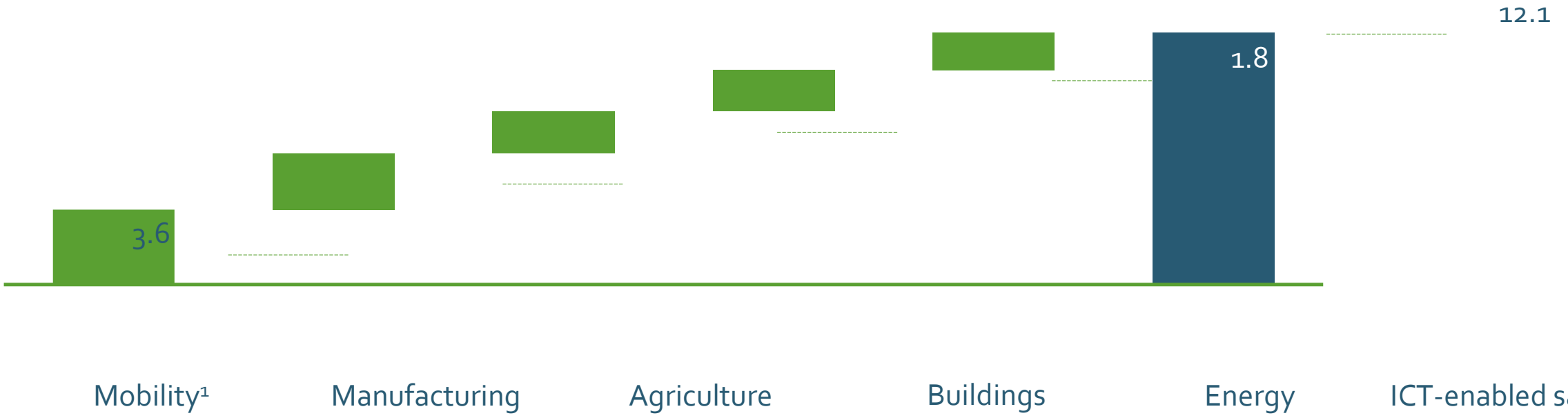
Compared to the 2030 BAU, CO2e emissions forecast from the Intergovernmental Panel on Climate Change (IPCC), ICT has the potential to enable the same level of growth even with CO2e emissions held almost at 2015 levels, decoupling the past pattern where each 1% of growth in GDP equated to an 0.5% increase in CO2e emissions.

GeSI ENABLING DIGITAL SUSTAINABILITY

Source: Source: WRI, IPCC, GeSI, SMARTer2020, Accenture analysis & CO2 models

Smart solutions to mobility, manufacturing, agriculture, building and energy deliver ICT's potential of 12Gt CO_{2e}

CO_{2e} abatement potential by sector (Gt CO_{2e})

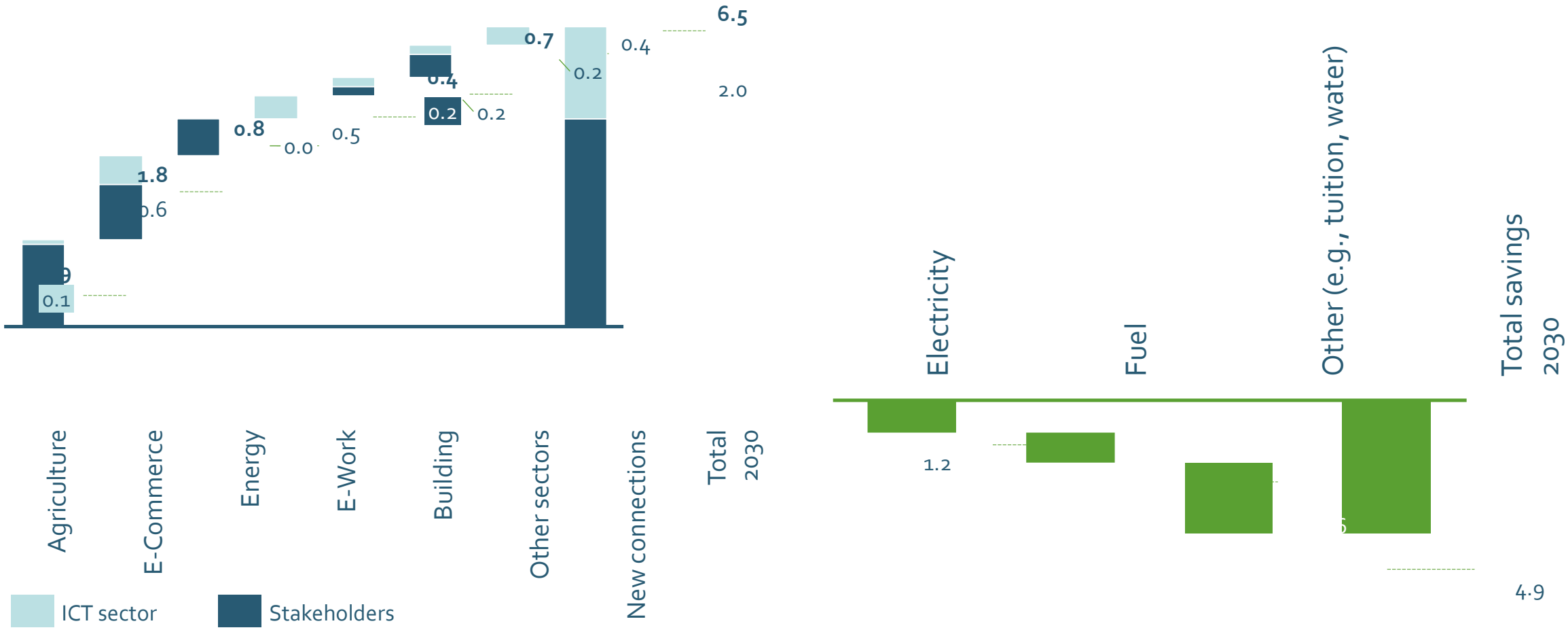


ICT has the potential to maintain global CO2e emissions at 2015 levels, decoupling economic growth from emissions growth

1 Smart mobility solutions consider improved driving efficiency but also the reduced need to travel from various sectors, including health, learning, commerce, etc.
2 12 Gt CO2e reduction in 2030 enabled by ICT include 2 Gt CO2e abatement from integration of renewable energy production into the grid. In its business as usual emissions forecast for 2030 the Intergovernmental Panel on Climate Change (IPCC) already considers the CO2e abatement potential from renewable energy. Therefore, the additional ICT-enabled CO2e reduction against the IPCC emissions forecast for 2030 is 10 Gt CO2e
Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

ICT is good for growth and could deliver over $6 trillion in revenues and close to $5 trillion USD in cost savings

ICT-enabled revenues and cost savings p.a. (2030, USD trillion)



Source: WRI, IPCC, Gartner, FAO, GeSI, Accenture analysis & CO2 models

SMARTer2030:ICT Solutions for the 21st Century Challenges

Click to view video

Objectives and participants

"Digital with Purpose" seeks to understand the impact Digital technologies have on the SDGs; and catalyse a greater contribution

GeSI sponsors & steerco

Gold sponsors

AT&T, Climate-KIC, T-Mobile, ICC International Chamber of Commerce, Telefónica, Deutsche Telekom, Verizon

Silver sponsors

swisscom, Taiwan Mobile

Steering committee

AT&T, Dell, Climate-KIC, Taiwan Mobile, Telefónica

Report leads

GeSI ENABLING DIGITAL SUSTAINABILITY

Deloitte.

Expert panel


Georg Kell


Christiana Figueres


Nick Owen


Jeffrey Sachs


Lise Fuhr


Dirk Messner


Elizabeth Corley


Carlo Jaeger


Chris Tuppen


Veerle Vandeweerd


Malcolm Johnson

Digital with Purpose: Delivering a SMARTer2030 identifies and quantifies how digital technologies can help governments, businesses, and philanthropic organizations accelerate their efforts to achieve each of the 17 SDGs.

The report considers seven digital technologies which have been chosen as broadly representative of the way digital capability will evolve in the medium term and for their critical influence on the world. These technologies include: digital access, faster internet, cloud, the internet of things (IoT), cognitive, digital reality, and blockchain. Of the 169 SDG targets, 103 are directly influenced by these technologies.

Urgent action is required and digital technologies can and need to contribute more.

The deployment of existing technologies will, on average, accelerate progress by **22%** and mitigate downwards trends by **23%.**

Of the
169 SDG targets,

103

are directly influenced
by technology.

(Source: Digital with Purpose: Delivering a Smarter 2030)


DIGITAL WITH
PURPOSE
Accelerating sustainability through digital technologies.

Open to ALL

Pledge Commitments

1. **C**ommit to supporting the United Nations Sustainable Development Goals and to establish practical and incremental steps to become a purpose-led business;

2. **T**ake and report concrete action on climate change, in line with the Paris Agreement;

3. Embrace the principles of impact transparency and report accordingly every year;

4. **D**evelop and deploy digital technology with positive societal impact.

Expectations of participants

- Make a public commitment to the four universal commitments of the movement;
- Contribute to development of the framework,
- To collaborate with others to develop and realise their ambitions to maximise their positive impact on the SDGs and to mitigate their negative impacts

Digital with Purpose

The Framework

We have developed a mechanism for scoring companies to encourage corporate commitment to the amplification and acceleration of SDG impact through digital technology. The Digital with Purpose framework comprises of three main component parts. Participants will receive an overall Digital with Purpose performance score, and access to like-minded organisations for opportunities to collaborate to overcome shared barriers and drive collective progress against the SDGs.

Purpose

Metrics covering a company's commitment to becoming a purpose-led business; connecting its core business model to a desired impact on the SDGs, working to maximise its positive contribution and minimise its negative externalities.

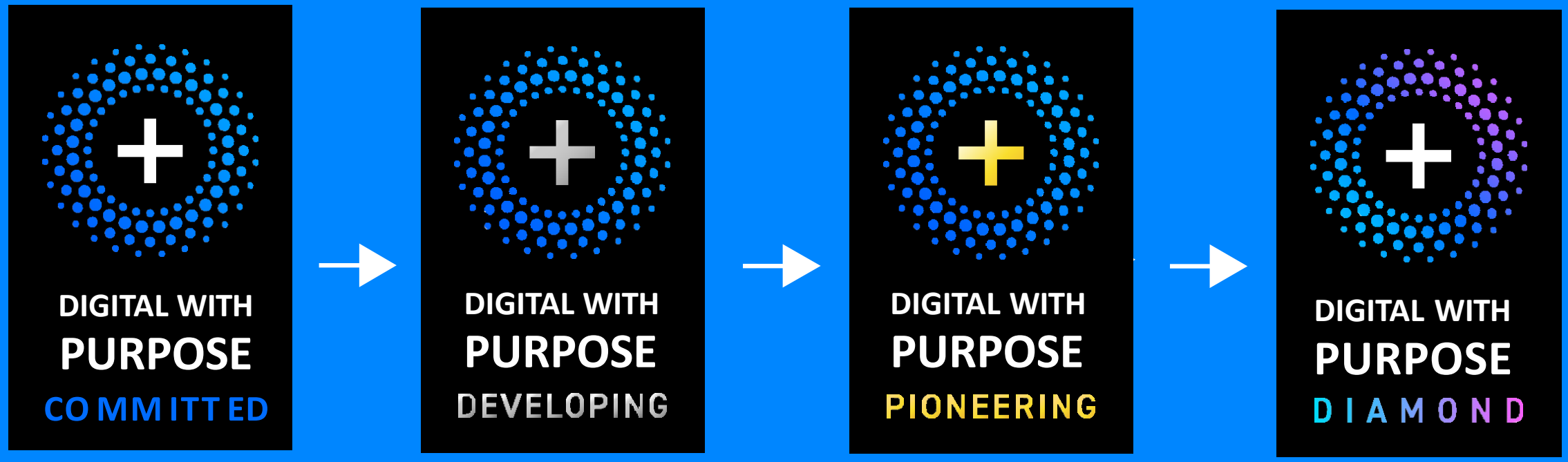
Digitally Enabled Solutions

Metrics framed by the SDGs, reflecting how a company contributes innovative digital solutions through its products, services, and core business practices, to improve the sustainability of our society and our planet.

Responsible Business

Metrics covering: Climate Change; Digital Trust and Responsibility; Circular Economy; Digital Inclusion; and Supply Chain. The metrics reflect how the business acts in a responsible manner concerning: its own operations; its interactions with its suppliers; and the design, delivery, and end of life management of its products and services.

PROGRESS AND RECOGNITION



The launch of

Digital with Purpose

Digital with Purpose Members

DIGITAL WITH PURPOSE

Digital with Purpose Partners

DIGITAL WITH PURPOSE

CAPITALS COALITION

CDP

CIRCULARITY CAPITAL

cirodd

UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

Deloitte.

European DIGITAL SME Alliance

THE INTERNET COMMISSION

iscte INSTITUTO UNIVERSITÁRIO DE LISBOA

ITU

NUMANA

P4TT
Platform for Tech for SDGs

World Benchmarking Alliance

WORLD OCEAN COUNCIL
The International Business Alliance for Corporate Ocean Responsibility

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

arabesque

The CEO's voices

Luisa Ribeiro Lopes
.PT

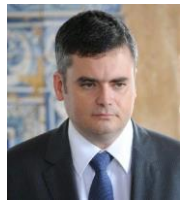
Rogerio Carapuça
APDC

Mirko Bibic
BELL Canada

Pedro Rocha Veira
Beta-i

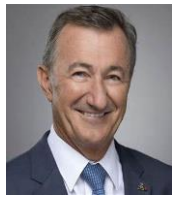
Julie Sweet
Accenture

Michael Kuhndt
CSCP



Carlos Santana
CMAS

Maria Joao Ricou
Cuatrecasas



Bernard Charlès
Dassault Systemes

Manuel Maria Correia
DXC

Miguel Stilwell d'Andrade
EDP

Andre Carvalho
Hyphen

Manuel Almeida
NOS

Vicki Brady
Telstra

Tiago Mendes Gonçalves
Innowave Technologies SA

Urs Schaeppi
Swisscom

Abhijit Dubey
NTT Ltd.

Fernando Reino da Costa
Unipartner

Pedro ANTUNES Mala Lobo
Innovagency

Ren Zhengfei
Huawei

Kai Lu Hsiung
Ridley Scott Creative Group

Brad Johnson
Superior Essex

Richard Tsai
Taiwan Mobile

Madalena Cascais Tomé
SIBS

João Vieira de Almeida
VdA

Ziyang Xu
ZTE Corporation

Partner's voices

Jeffrey Sachs
Columbia University

Dirk Messner
German Environmental Agency

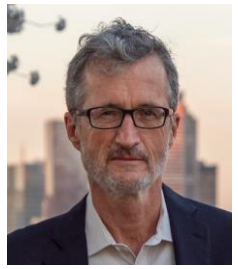
Mathieu Denis
International Science Council

Veerle Vandeweerd
P4TT

Malcolm Johnson
ITU DGS

Jake Reynolds
Cambridge Institute for Sustainable Leadership

Paul Druckman
World Benchmarking Alliance

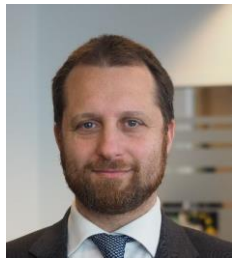


Georg Kell
Chairman Arabesque

Jose Crespo Carvalho
CEO ISCTE Executive Education

Paul Dickinson
CDP

Lise Fhur
ETNO



SebastianoToffaletti
Digital SME

Jenny Boyd
Circularity Capital

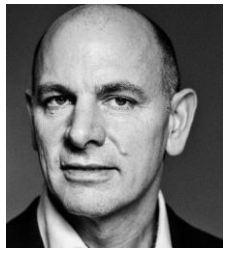
Emily Wallace
MET Office UK

Punit Renjen
Deloitte

Sergio Ribeiro
Planetiers CEO & Co Founder

Mark Gough
Capitals Coalition

Ilias Iakovidis
EU- EGDC



Jonny Shipp
Internet Commission

Ruben Eiras
Secretary General Forum Oceano

Tom Delay
The Carbon Trust

François Borrelli
Numana

Paul Holthus
World Oceans Council

Click to view video

DIGITAL
WITH
PURPOSE

GLOBAL SUMMIT 2022

GeSI Partnerships & Positioning Opportunities

WORLD ECONOMIC FORUM

EU - Japan Business Round Table
日・EUビジネス・ラウンドテーブル

15 November 2022 | BRT annual meeting in Tokyo

GeSI ENABLING DIGITAL SUSTAINABILITY

NEC

NTT

DASSAULT SYSTEMES

Climate Action

Climate Innovation Forum 2022

Sustainable Innovation Forum

CLIMATE WEEK NYC
BY THE CLIMATE GROUP

DIGITAL WITH PURPOSE | GLOBAL 20 SUMMIT 22
LISBON - ALTICE ARENA - 27 SEPT

COP27 SHARM EL-SHEIKH EGYPT 2022

United Nations Framework Convention on Climate Change

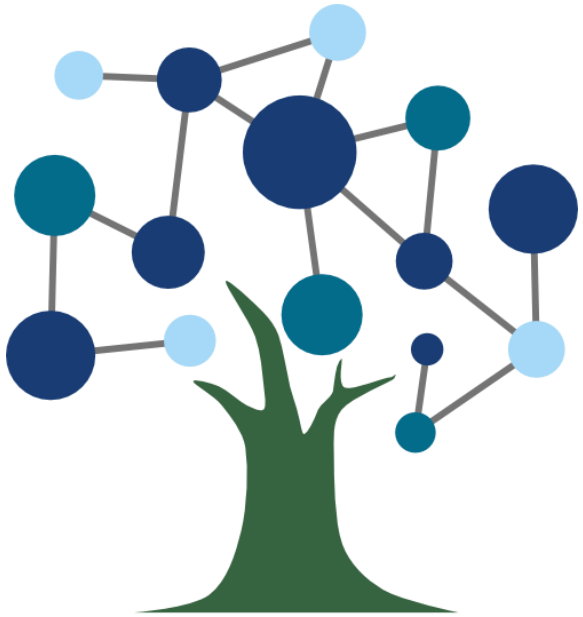
UN environment programme

Global Innovation Hub Pavillon @COP27

UN Summit of the Future in 2024

GeSI ENABLING DIGITAL SUSTAINABILITY

Coalition Members



EUROPEAN GREEN DIGITAL COALITION

A1 Telekom Austria Group
accenture
aruba.it
Atos
beyond.pl
Bolt
BT
Capgemini
cisco
DASSAULT SYSTEMES
T
ERICSSON
Google
IBM
kpn
LIBERTY GLOBAL
Microsoft
NOKIA
Scaleway
The cloud that makes sense
NOS
orange
OVHcloud
proximus
SAP
Life Is On
Schneider Electric
shift
SIEMENS
sopra steria
TDC Group
Telefónica
telenor group
Telia Company
vodafone
Uber

Funded by the European Union

DIGITAL WITH PURPOSE

JOIN GLOBAL SUMMIT 2023

September 27-29

an initiative of

GeSI ENABLING DIGITAL SUSTAINABILITY

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Coffee & Networking
Be back in 30 minutes at 11.20 am SGT

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Parul Singla
MaxLinear

Vasudevan Venkatakrishnan
Ruckus Networks

Udit Mehrotra
Spectra

Howard Buzick
Telecom Infra Project / Meta

Romin Jain
Boingo Wireless

Sandeep Kohli
Telecom Infra Project / Meta

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Parul Singla

Director, Marketing, MaxLinear

Next in Asia: Wi-Fi 7

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Next in Asia: Wi-Fi 7

Parul Singla | Director, Marketing

WBA, Singapore | Jan 2023

Growing Demand for Video, Low Latency, High Throughput Applications

Multiple XR Devices Require Multi-Gbps Throughput at 4K Resolution with Bounded Jitter

Higher Resolution Video Traffic Dominates Most Use Cases and some form basis of Metaverse

MaxLinear

Operators Could Monetize from Steps into Metaverse

Vision Enablers and Orchestrators of the Ecosystem

Investments till 2022[4]

Value creation by 2030[4]

SKT will keep innovating its subscription-based platform 'T Universe' and metaverse platform 'Ifland', and introduce a new AI-based service

- Surpassing 1.1 million monthly active users [1]

Deutsche Telekom, Orange, Telefónica and **Vodafone** spearheading the move to 3D calls (Hologram)

- holographic call was hailed as "a first but meaningful step towards the metaverse,"

Karine Dussert-Sarthe, Executive Vice President, Marketing and Design at Orange Innovation [3]

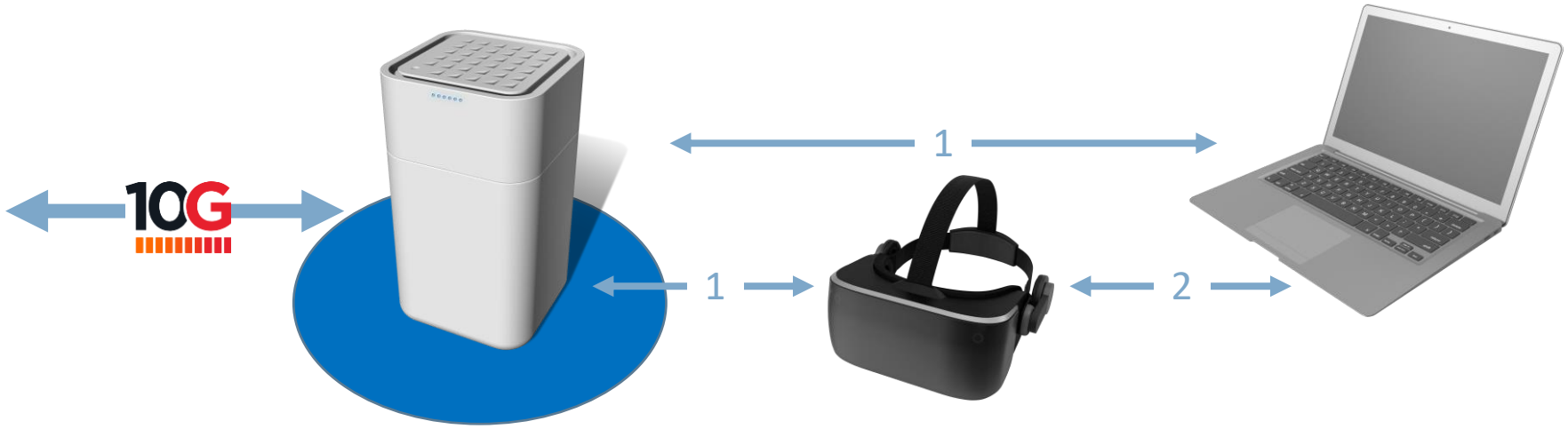
Quintar and **AT&T** will test and investigate innovative apps and second-screen capabilities in order to provide the **most immersive** and **engaging fan experiences**..for sporting events. [2]

1) https://www.sktelecom.com/en/press/press_detail.do?page.page=1&idx=1526&page.type=all&page.keyword=
2) https://www.quintar.ai/att-quintar-collaboration
3) https://newsroom.orange.com/10637-10689/?lang=en
4) https://www.mckinsey.com/capabilities/growth-marketing-and-sales/our-insights/value-creation-in-the-metaverse

MAXLINEAR

Operators Could Monetize from Steps into Metaverse

Enabled Managed Experiences



Bundled VR devices and services to consumers

Real Time Analytics
Generate new revenue sources

Edge Computing
Real time rendering and AI

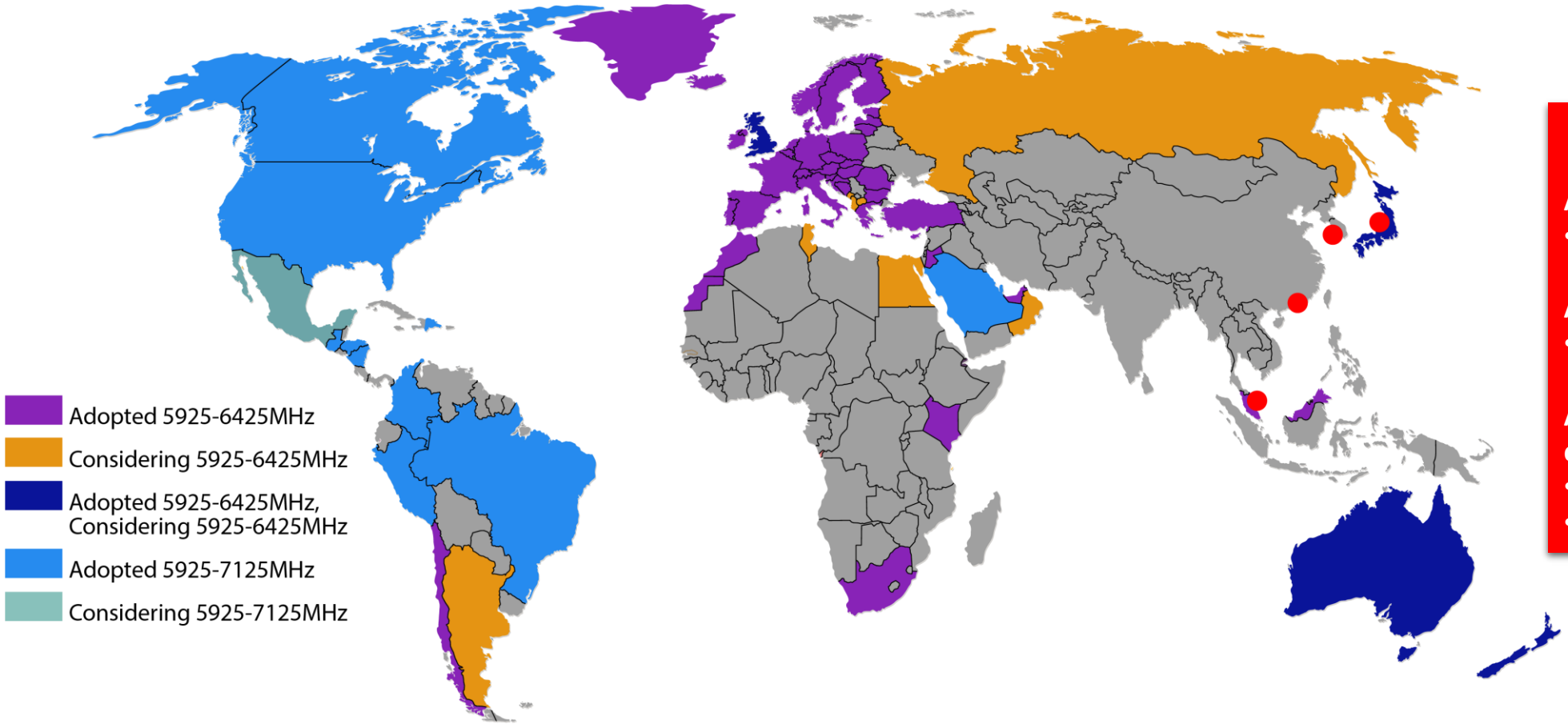
Platform Enabler connectivity fueled by Fiber and Wi-Fi

Privacy and Trust
Identity auth and management

Continued Need for More Bandwidth, Reduced Latency, Robust Connectivity, and Better Spectrum Utilization

MaxLinear

Worldwide 6GHz Adoption Status



Asian countries that

Adopted Full 6GHz
- South Korea

Adopted partial 6GHz
- Malaysia

Adopted partial 6GHz and considering full
- Hong Kong
- Japan

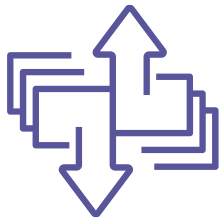
Asia can still benefit from Wi-Fi 7 features, while regulatory bodies continue to work on opening partial or full 6GHz spectrum

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

MaxLinear

Wi-Fi 7 Toolkit of Key features

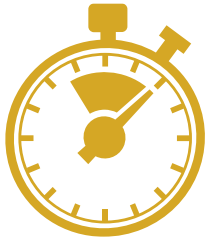
Throughput



- 6GHz: 320MHz
- 4K QAM
- MRU

Double the bandwidth to deliver more content faster

Latency Reduction



- Multi RU (MRU)
- Multi Link Operation (MLO)
- Restricted TWT

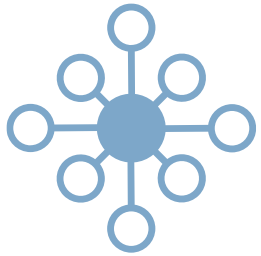
Reduced network latency for improved Metaverse experiences

Enhanced Robustness

- MRU
- MLO

Enhanced robustness for reduced interference and improved security

Reach



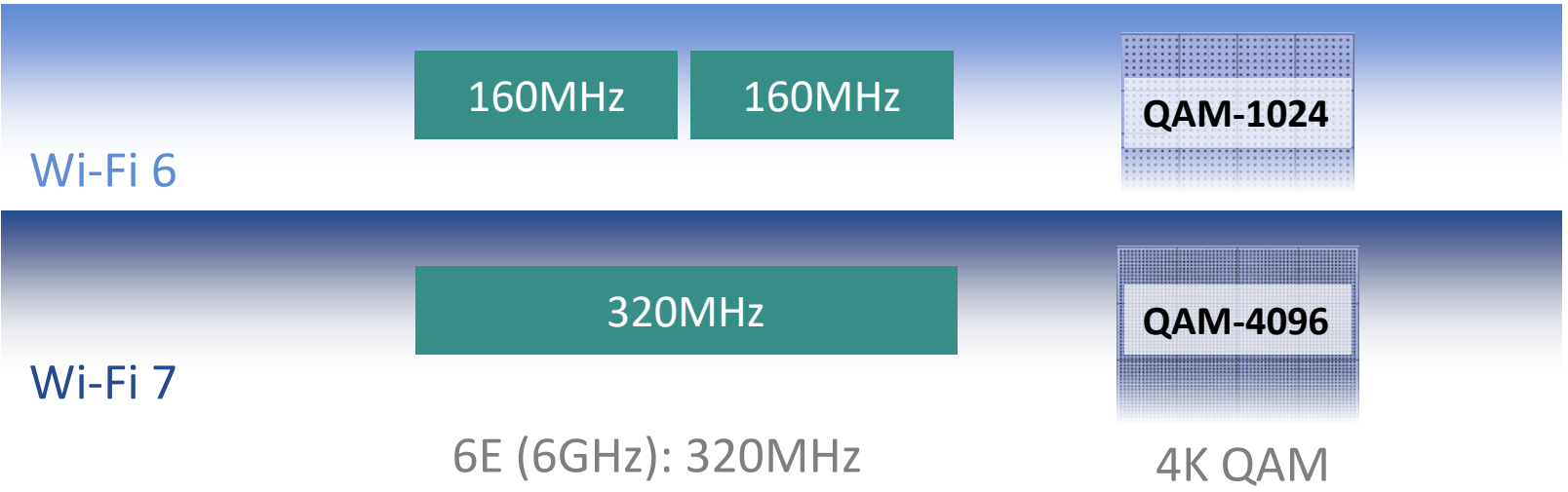
- All Bands: MCS15

Extended range for better coverage

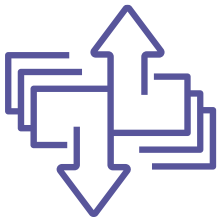
Marquee Features of Wi-Fi 7: 320MHz and MLO

MaxLinear

Throughput: 320MHz & 4K QAM



Throughput

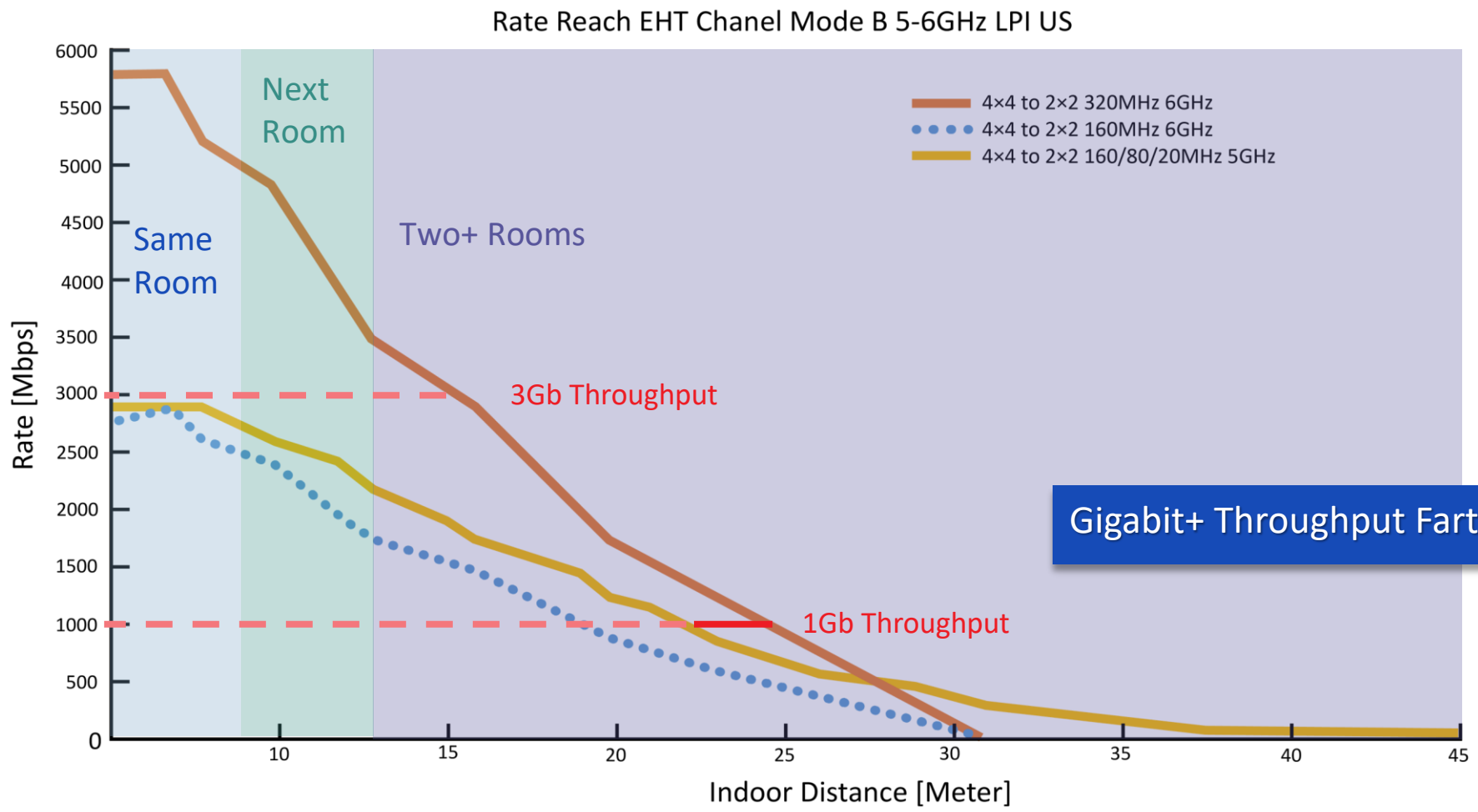


- 6GHz: 320MHz
- 4K QAM
- MRU

x2.4 TP Increase over Wi-Fi 6

Wi-Fi 7: Throughput at Range

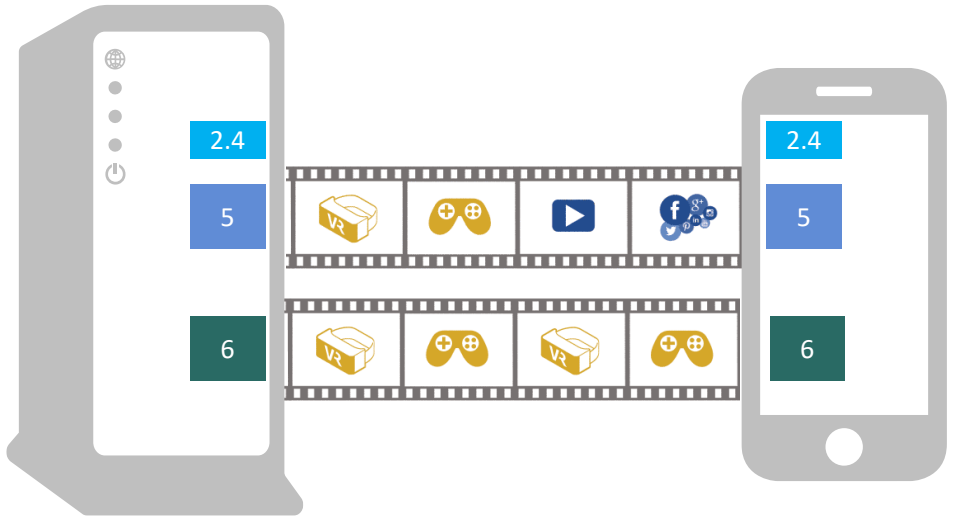
Benefit of 320MHz (6GHz) 4x4 Gateway to 2x2 Clients



Gigabit+ Throughput Farther into the House

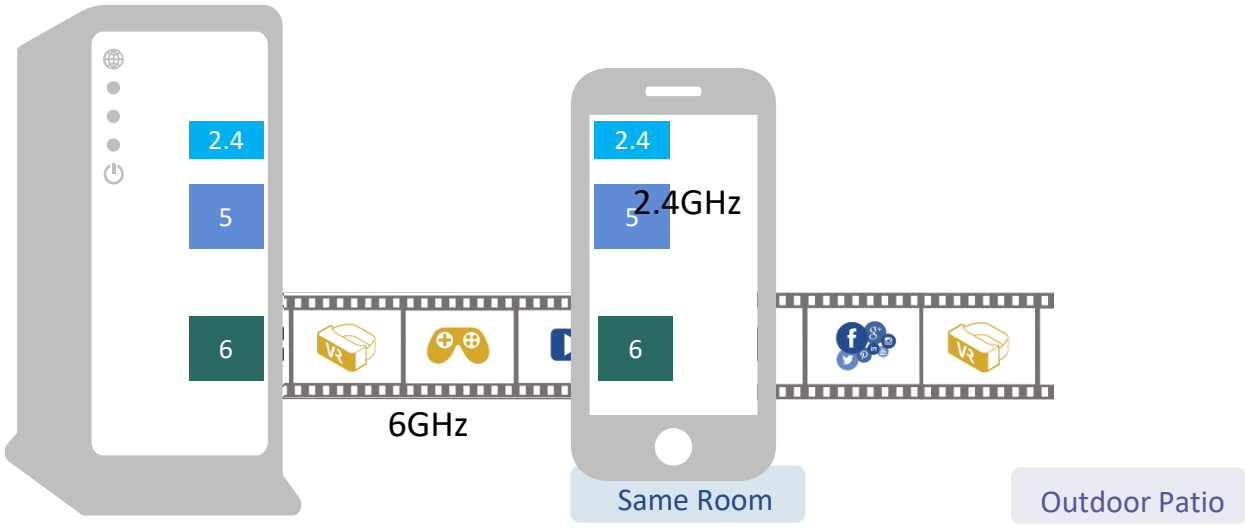
Wi-Fi 7 Provides Enhanced Robustness

Multi-Link Operation (MLO)



Tri band AP

CDB Client
(PC/Phone/HMD)



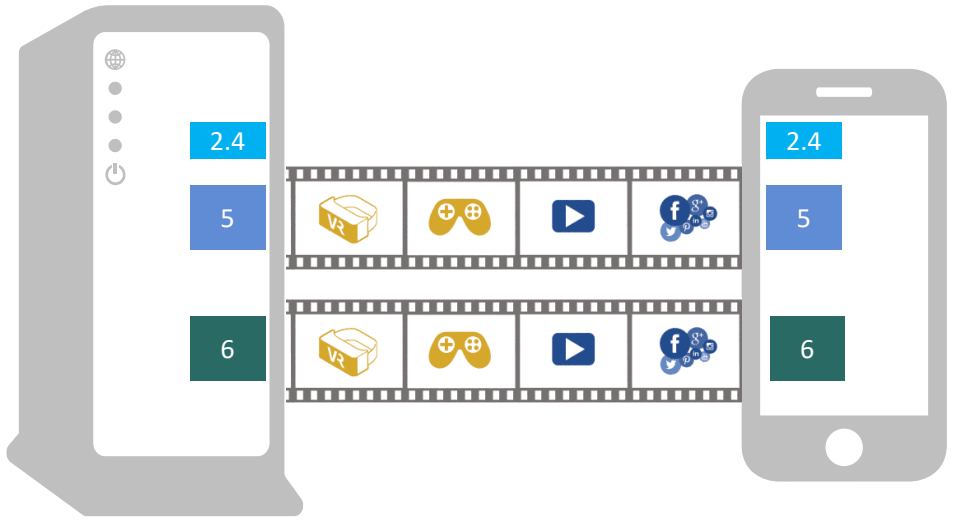
Bandwidth Aggregation

Significant and Robust TP
Increase to a Concurrent Dual Band (CDB) Client

Seamless Handover Between Links that are CDB
(no reassociation)

Improved Latency with MLO

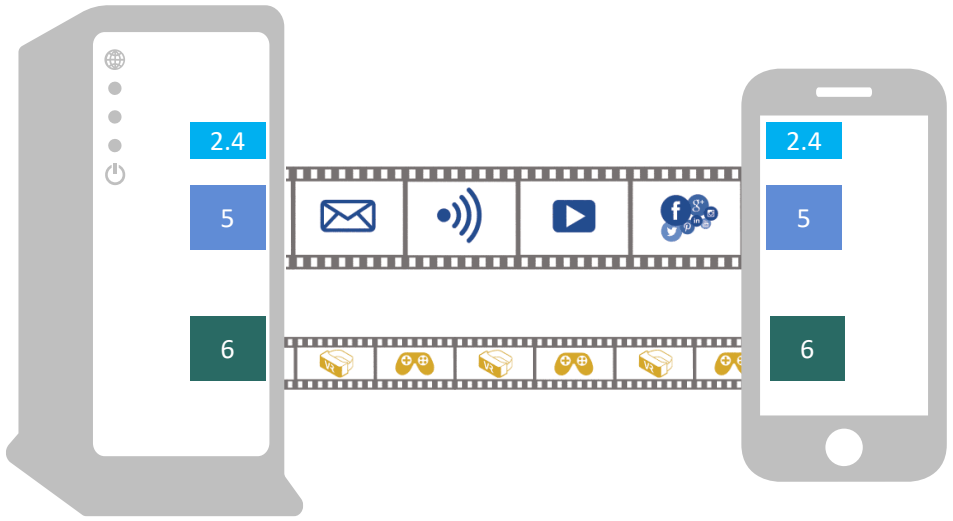
Better Neighbor with Minimum BW Expansion



Tri band AP

CDB Client (PC/Phone/HMD)

Two Links: Same BW



Tri band AP

CDB Client (PC/Phone/HMD)

During high interference (OBSS/MDUs) move latency sensitive traffic to reduced BW with lower interference

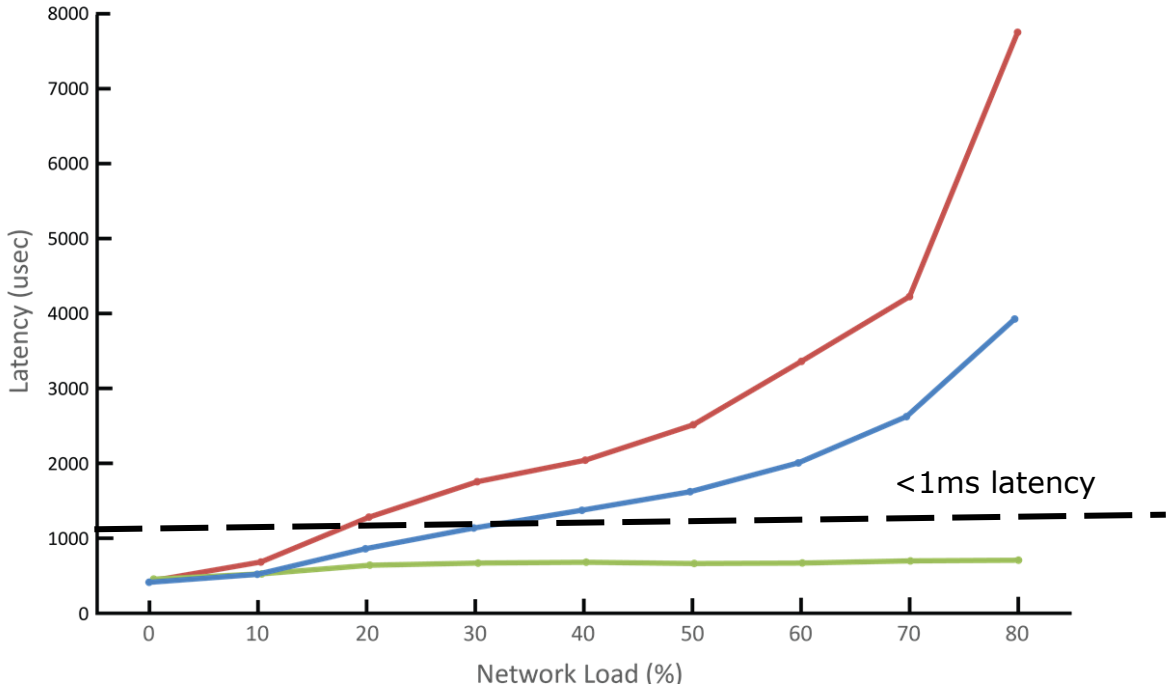
Better Neighbor by Minimizing the BW Usage for AR/VR/Gaming while keeping Low Latency and Sufficiently High TP

“Optimal” Multi-Link Operation Drives <1ms Latency

Under MDU Environment with High Interference

Drives **<1ms latency** for latency sensitive applications such as AR/VR and Gaming

- “True” Multi-Link: up to 30% OBSS interference
- “True” Multi-Link+: in >30% OBSS interference



Single Link vs. “True” Multi-Link vs. “True” Multi-Link+

World's 1st Single-Chip Wi-Fi 7 Solutions for Home Gateways

Enables Best-in-Class Throughput, Reach, and Performance

Single-chip solution **reduces board complexity** and BOM cost

"Optimal" Multi-Link Operation (MLO) on all bands enables **50% more throughput** and **<1ms latency**

Dedicated Zero Wait DFS (ZWDFS) **reduces dead spots**

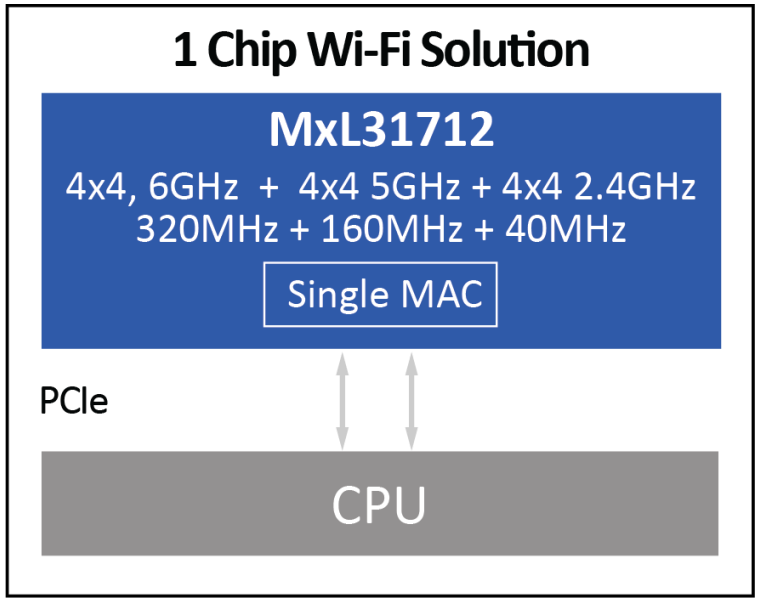
On-the-fly MAC architecture optimizes packet scheduling for enhanced network efficiency

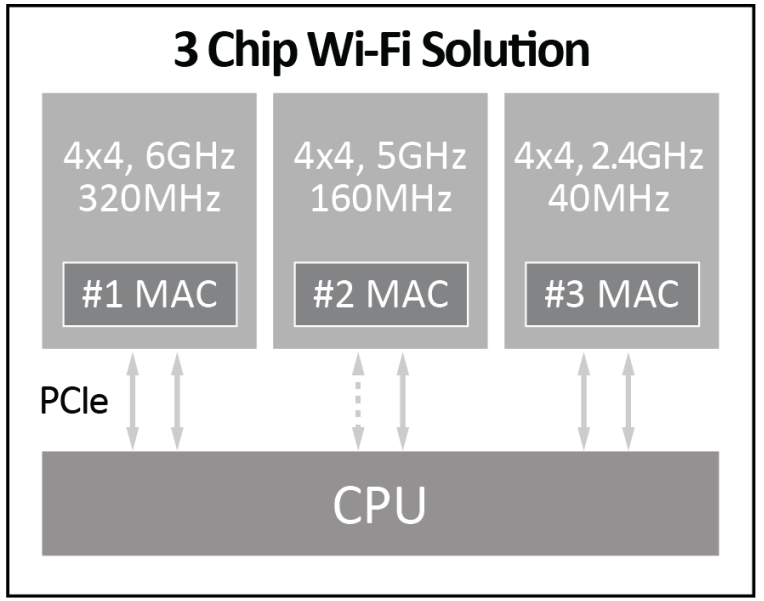
Wi-Fi 7 Tri-Band
MxL31712

Wi-Fi 7 Dual-Band
MxL31708

MaxLinear

Single-Chip Delivers Optimal Multi-Link Experience





"Optimal" Multi Link

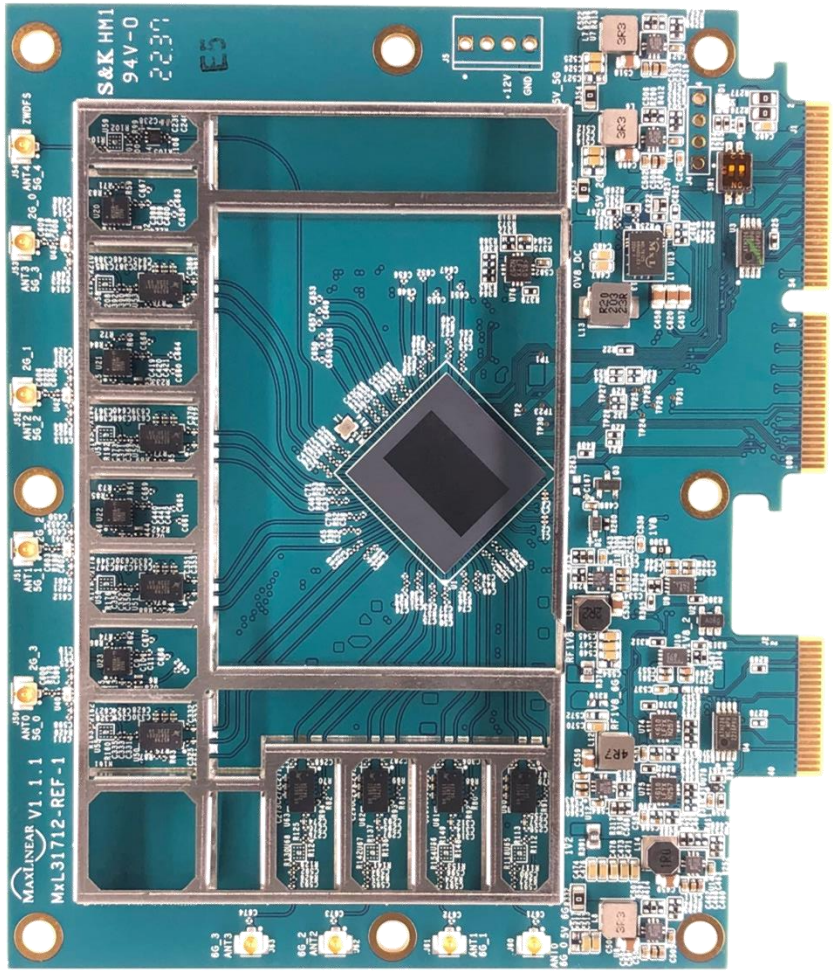
- Seamless pkt view over single MAC for 3 bands
- Reduces latency and overheads (SU and MU)

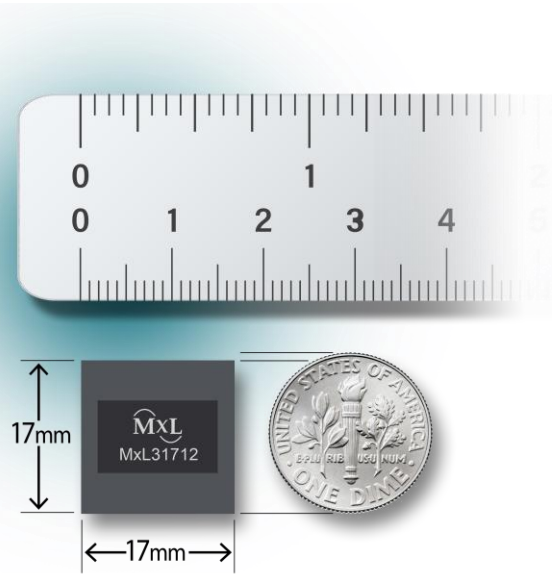
Competition Multi Link

- Complex synchronization over 3 MACs
- Non-optimal latency and additional overheads
- Slower recovery from retransmission (MU)

"Optimal" Multi-Link Operation in All Bands for Faster, more Robust Performance and Lower Latency

Wi-Fi 7 MxL31712 Reference Design





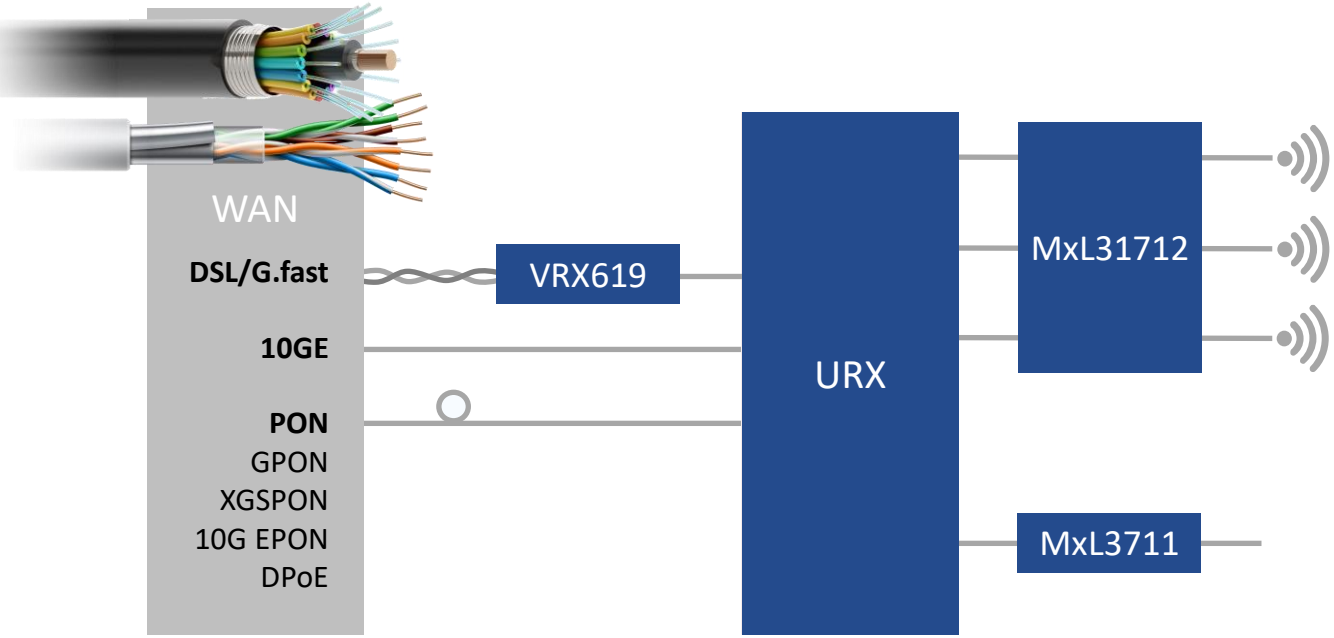
Samples Available!

MAXLINEAR

MaxLinear Wi-Fi 7 Gateways

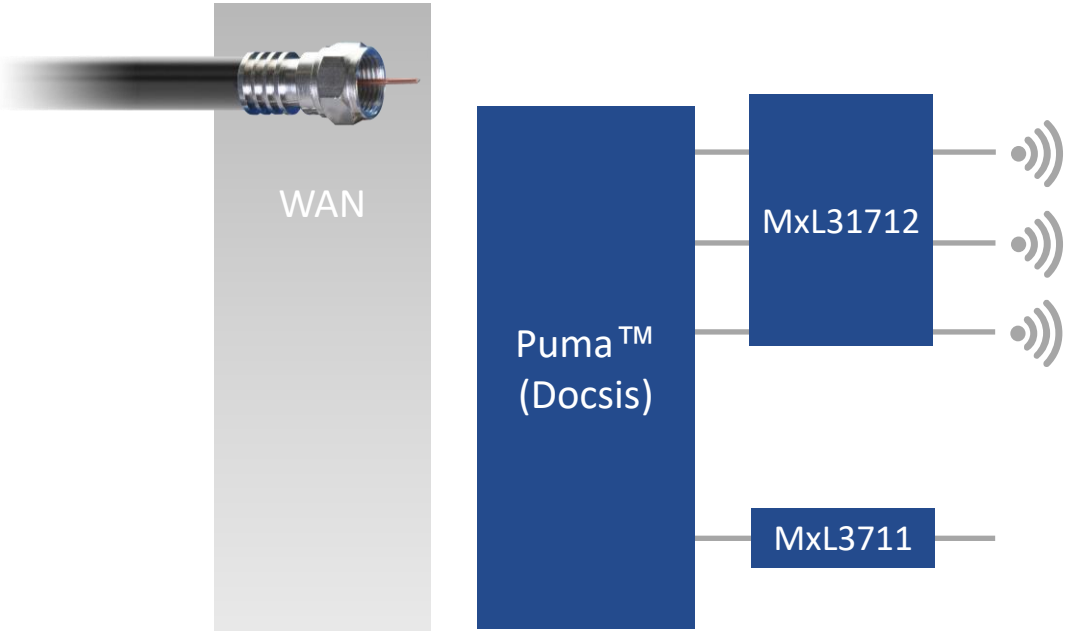
Delivers Complete Platform for MultiWAN and DOCSIS

MultiWAN GW with **AnyWAN™ URX + Wi-Fi 7**



~18Gbps PHY TP

Cable Gateway with **Puma + Wi-Fi 7**



~18Gbps PHY TP

Wi-Fi 7 Leverages Shipping Platform
Optimized for Broadband and Wi-Fi experiences

Thank You

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Vasudevan Venkatakrishnan

Business Development Director (Sales Acceleration - Cloud & Analytics) APAC, Ruckus Networks

Delivering Secure Next-Generation Wi-Fi Experience from Public to Enterprise Wi-Fi with a Purpose

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

RUCKUS®
COMMSCOPE

RUCKUS

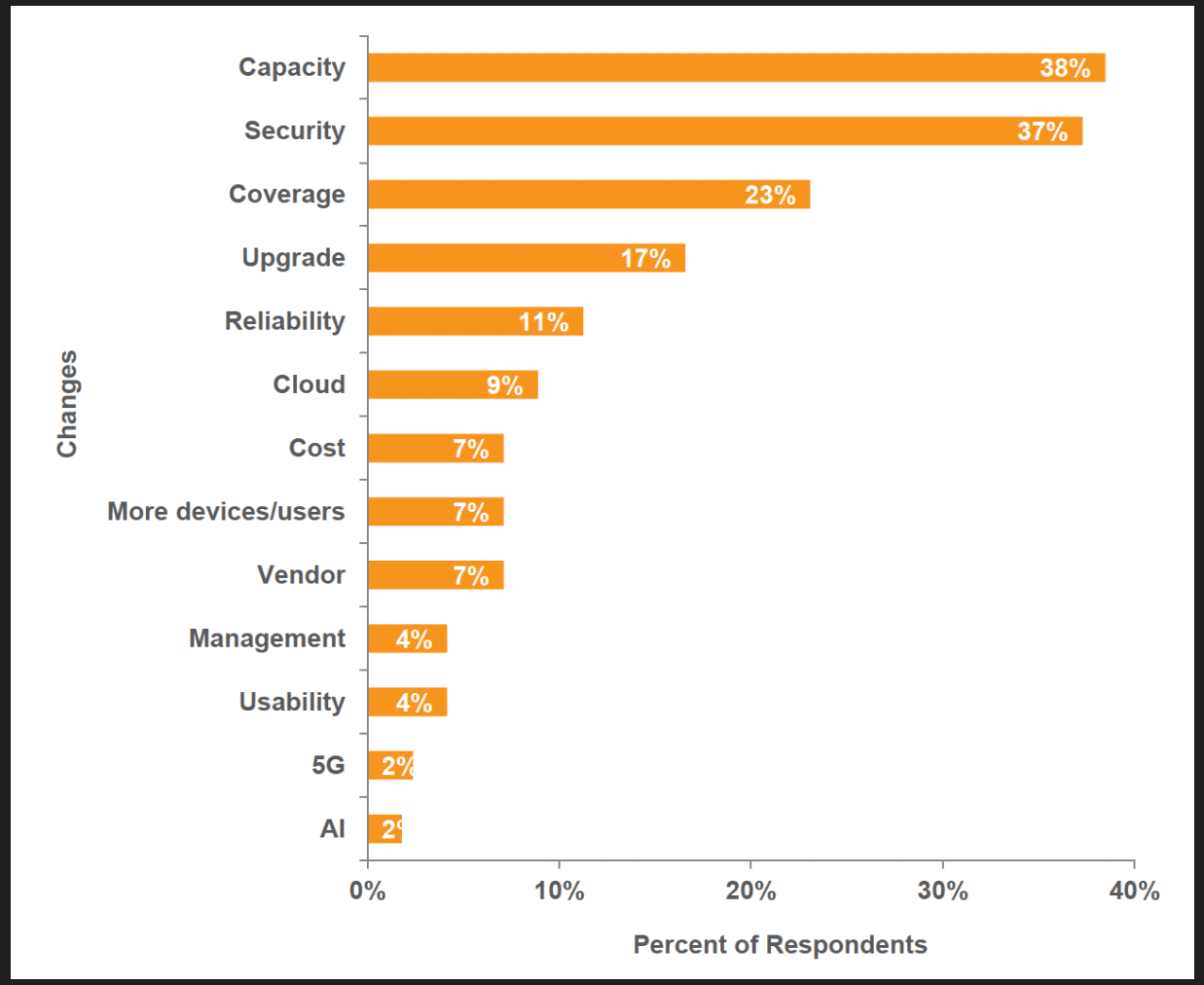
Delivering Secure next-Gen WiFi experience from public to enterprise WiFi with a Purpose

31st January 2023

Vasudevan Venkatakrishnan

Director, Business Development Sales APAC

Performance, security are top WLAN challenges

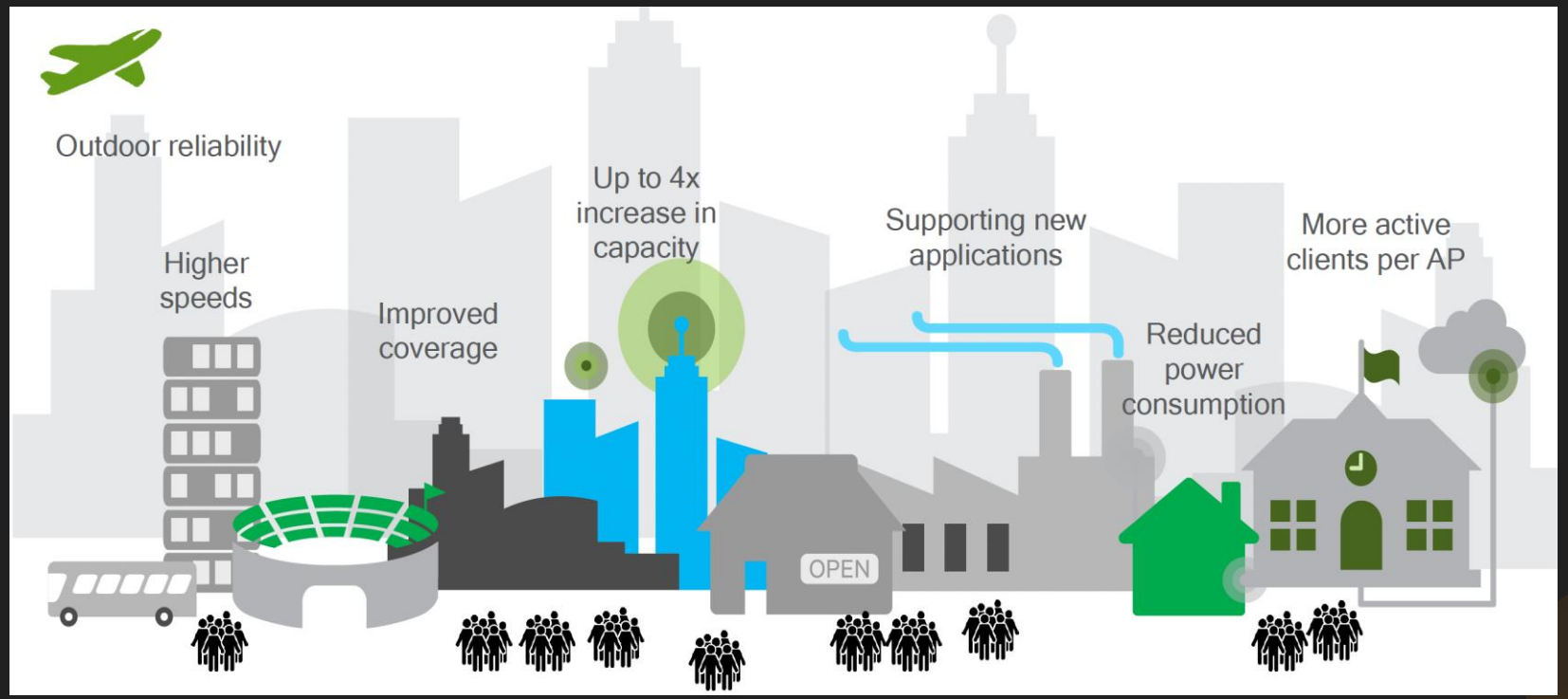


Source: IHS Markit | Technology, now part of Informa Tech, WLAN strategies North American enterprise survey, August 2019

- More capacity + reliability = better performance
- With better coverage, the utility of the network and applications increases as employees can communicate and access information from more locations
- Security remains a major concern

Innovation with a Purpose

RUCKUS® COMMSCOPE



Today's WiFi network from public to enterprises are highly congested

Solve for the **most challenging** use cases…

in the **most unpredictable environments**…

in the **industries we serve**

to deliver great end user experiences

Innovation for Public to Enterprise WiFi Networks

Any User

Any Device

Any Network

Addressing Challenges at Public to Enterprise WiFi Networks

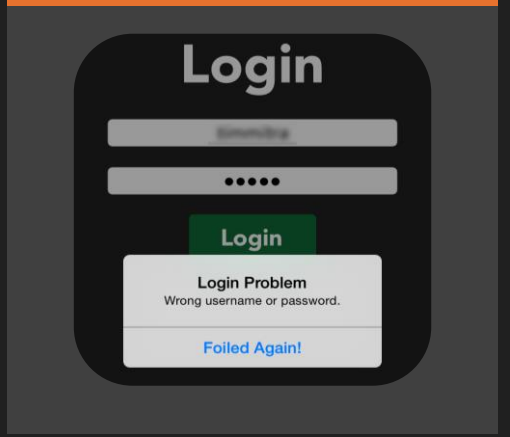
IT Helpdesk Headaches

- Helpdesk tickets for network access
- Device diversity and volume
- Manual processes

Security Threats

- Lack of visibility
- Insecure devices
- Unauthorized access
- Password sharing
- Inability to revoke access
- Undifferentiated access
- Unencrypted data traffic

User Experience

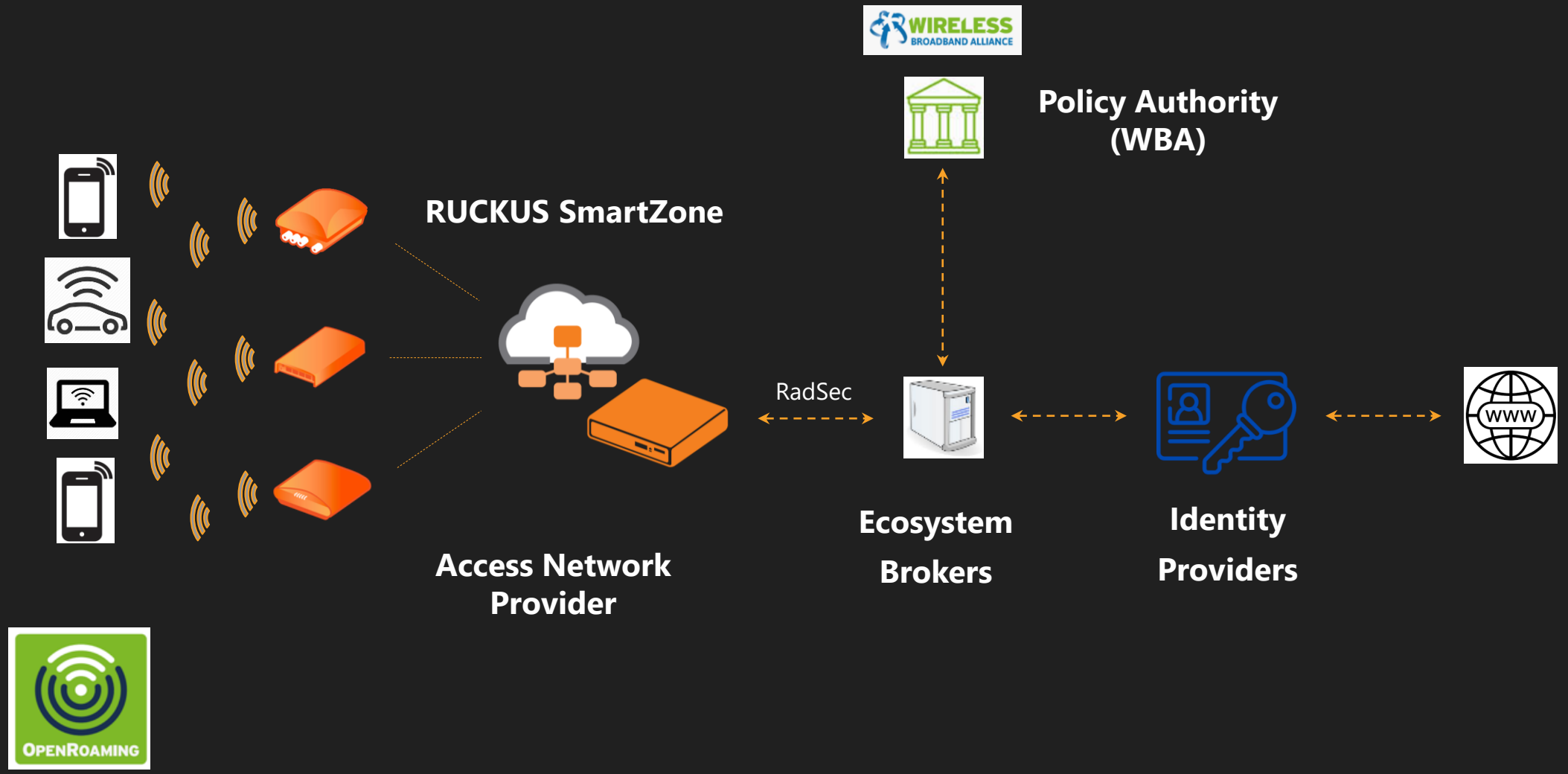


- Unintuitive onboarding
- Forgotten passwords
- Mistyped passwords

OpenRoaming™

We've got a winner!

RUCKUS OpenRoaming across networks



 |

Summary of Passpoint Releases Features

Features	Release 1	Release 2	Release 3
Wi-Fi Network Discovery and Selection	✔	✔	✔
Automatic Network Access	✔	✔	✔
Automatic Network Access	✔	✔	✔
Immediate Account Provisioning & Secure Registration		✔	✔
Operator Policy		✔	✔
Simplified online sign-up			✔
Venue-specific information			✔
Expanded enterprise-level security			✔
Operator-specific policies			✔

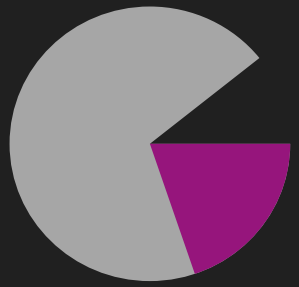
 |

Ruckus innovations – delivering better end user experiences

Per-packet adaptive transmit power

Adaptive Wi-Fi cell sizing

Transient client management



Airtime decongestion

Network capacity utilization

Next generation network requirements

Secure over-the-air traffic with encrypted WPA2/WPA3-Enterprise

Deny unapproved access with digital certificate-based authentication

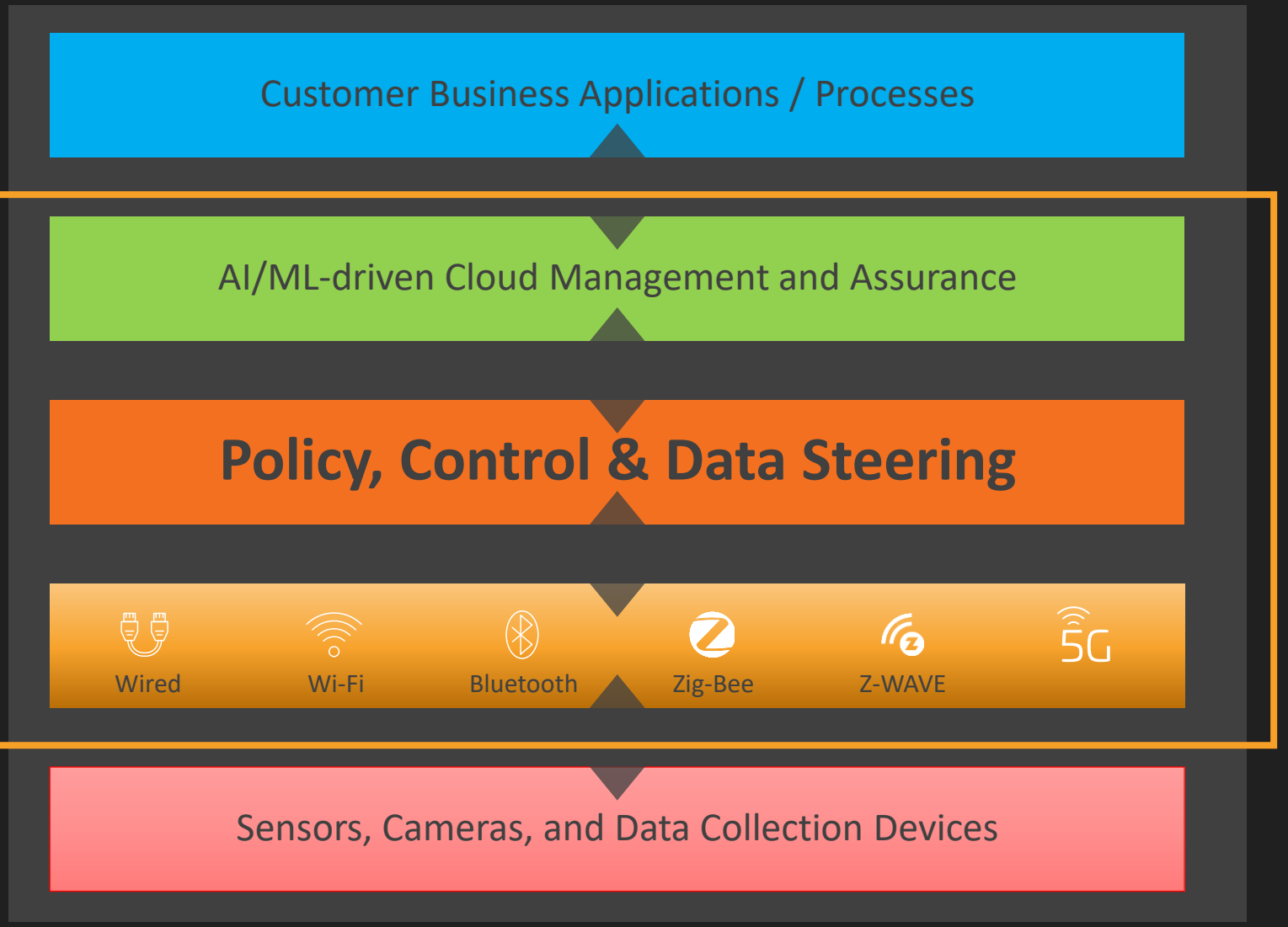
Ensures devices are safe with up-front posture check

Let users see only what they should see with policy-based access

Increase IT control with device visibility and access revocation

RUCKUS Technology Vision

Be innovative and deliver the right technology for the job while securely connecting business applications



 |

RUCKUS Networks

Mix and match right kind of Technologies

- Indoor and outdoor coverage for small to very large campuses by deploying right kind and combination of Wi-Fi, IoT Radios, CBRS & 5G Radios

Autonomous, on-premises wireless networks to centralized or hybrid cloud architectures

AI/ML Driven Analytics to enable rich data insights and digital automation

One-stop provider for a powerful end-to-end enterprise network

PURPOSE-DRIVEN
ENTERPRISE NETWORKS

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Udit Mehotra

CEO & Managing Director, Spectra

Fireside Chat: The Rising Importance of Network As A Service (Naas) for Organizations

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Howard Buzick

Business Development, Telecom Infra Project

Overview of OpenWiFi

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

TELECOM INFRA PROJECT

OpenWiFi

Open WiFi
Open for Business

NON-PROFIT FOUNDATION

FOUNDED 2016

1,000+ members

COLLABORATIVE ECO-SYSTEM APPROACH

Founding Members

Vodafone

Intel

Meta

Telefónica

Deutsche Telekom

British Telecom

FOCUSED ON REAL WORLD SOLUTIONS

TIP OpenWiFi

300

Participating Organizations

Diverse Open Source Membership

SERVICE PROVIDERS

TECHNOLOGY PARTNERS

SYSTEM INTEGRATORS

CONNECTIVITY STAKEHOLDERS

Participants

1050

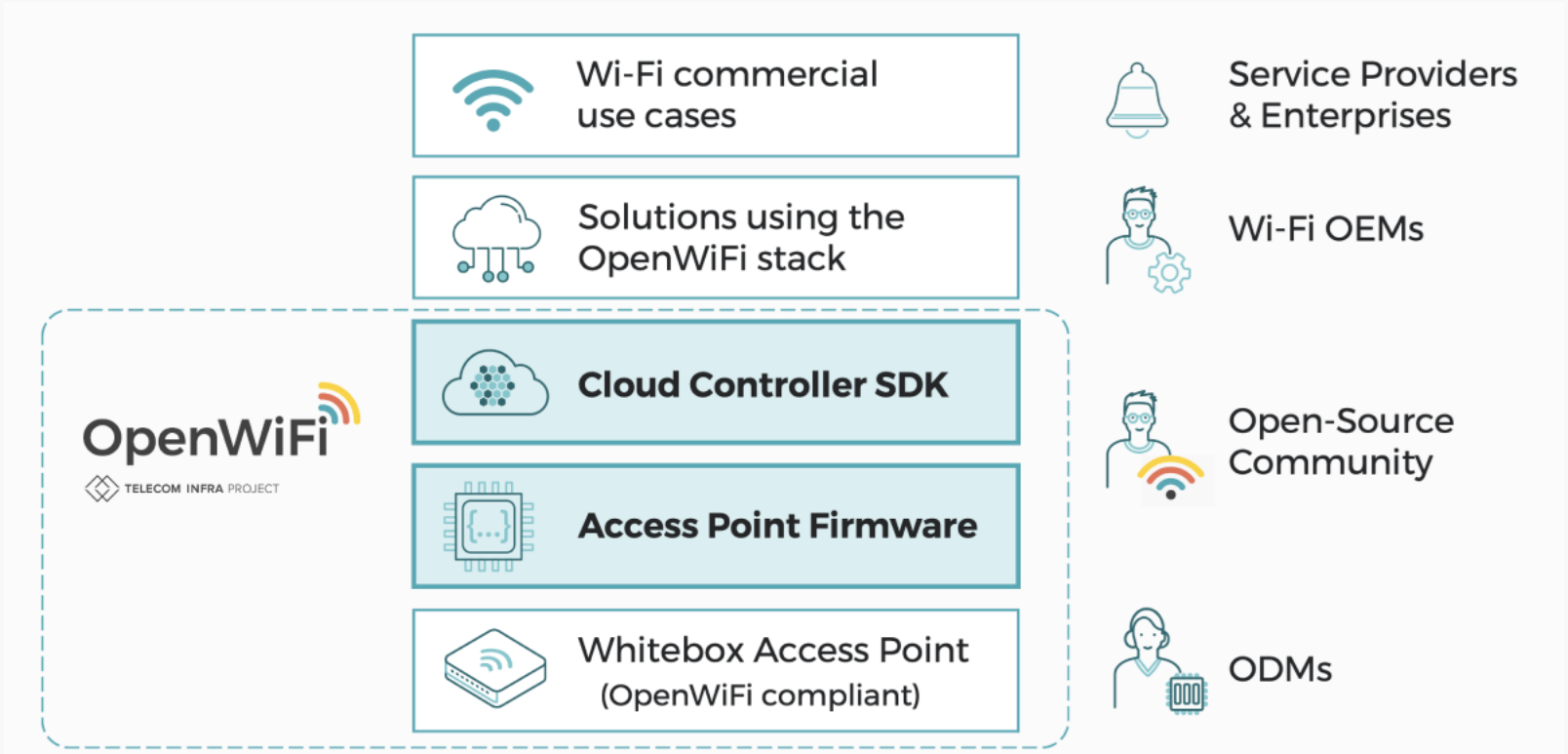
New Participants ’22

350

FOCUSED ON OPERATOR DEPLOYMENTS

TIP OpenWiFi

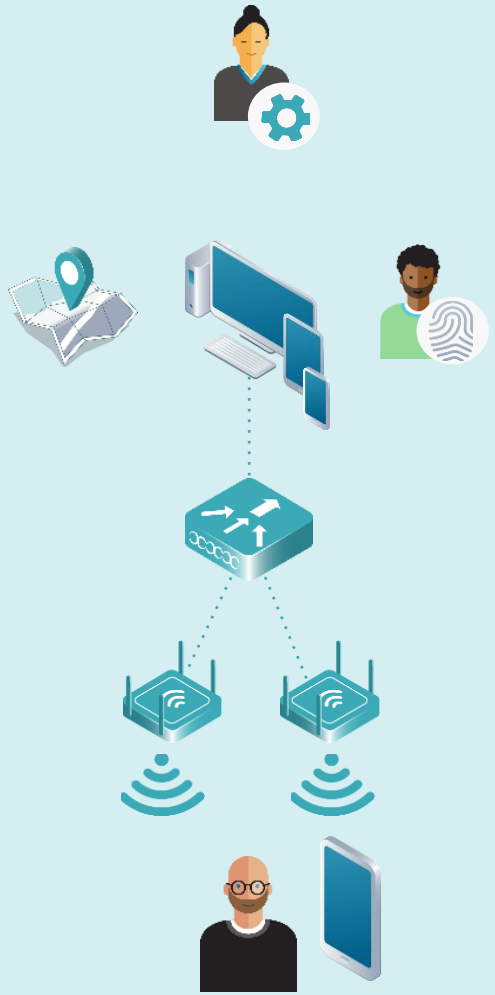
What is TIP OpenWiFi?



OpenWiFi is a community-developed, disaggregated Wi-Fi software system, offered as free open-source software, that includes both a **cloud SDK** and an **Enterprise-grade Service Provider Access Point (AP) firmware**, designed and validated to work seamlessly together.

TIP OpenWiFi

Service Provider Inputs on Lock-In

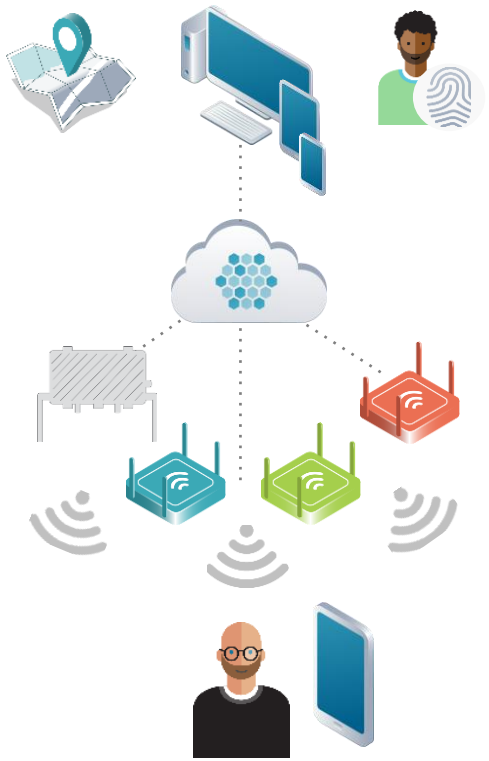


Typical Wi-Fi Vendor lockup

- Proprietary APIs
- Closed implementation
- Proprietary interface
- Vendor HW only
- Standard air interface certified by Wi-Fi Alliance

OpenWiFi

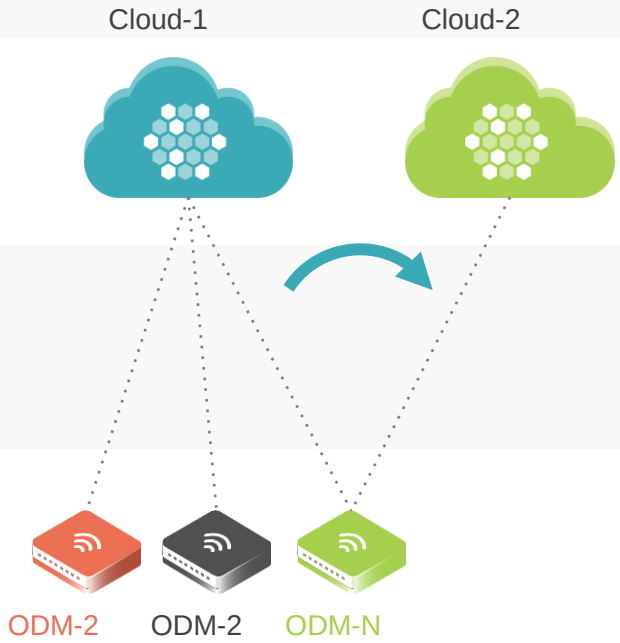
TELECOM INFRA PROJECT



- Industry Seamless Offload
  OpenRoaming – Every Device
- Open APIs
  Integrate once, works cross vendor
- Open-source core, choice in controller
- Contribute, secure, examine
- Interoperable interface
- Choice of HW
- Standard air interface certified by Wi-Fi Alliance

TIP OpenWiFi

Choice of Cloud & Choice of Device



Choice in Cloud:

- Deployed whitebox gear can move between different commercial / private Clouds of Controllers consuming OpenWiFi
- API driven migration, ZTP over public internet
- No truck rolls or HW rip and replace

“Multi-vendor” AP support:

- Different whitebox platforms, from different vendors (ODM’s) mixed in the same deployment
- Same OpenWiFi SW used across whitebox platforms (e.g.: Mesh, RRM, WDS, Advanced Data plane)
- Common data model and telemetry

TIP OpenWiFi

2022 Updates By The Numbers

2 Open-Source Tri-Band Wi-Fi6E
4x4 MIMO IoT Radio 5GBe+2.5GBe
Internal & External Antennas available

23 New SKUs in 2022 Wi-Fi 6

14 New SKUs in 2022 Wi-Fi 6E

5 Controller Partners Integrated to SDK

2 Major Releases Supporting Mobile Offload

TIP OpenWiFi at 2022 WBA Industry Awards

WBA (Wireless Broadband Alliance) Industry Awards

- Winner: Best Wi-Fi Innovation
- Finalist: Best Wi-Fi Network Technology

OpenWiFi
TELECOM INFRA PROJECT

TIP OpenWiFi

Over 300 Companies in a Growing Ecosystem

Thank You!

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

PANEL: TIP OpenWiFi - A Service Provider View

ROMIN JAIN

DIRECTOR PRODUCT MGT & BUSINESS DEVELOPMENT

BOINGO WIRELESS

UDIT MEHROTRA

CEO & MANAGING DIRECTOR

SPECTRA

SANDEEP KOHLI

META CONNECTIVITY ECOSYSTEMS LEAD, INDIA AND APAC

META

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

K T Ang

Co-Founder, Product & Marketing, ANTlabs

Connecting Massive Fans at the World Cup 2022 Qatar Stadiums & Airport

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

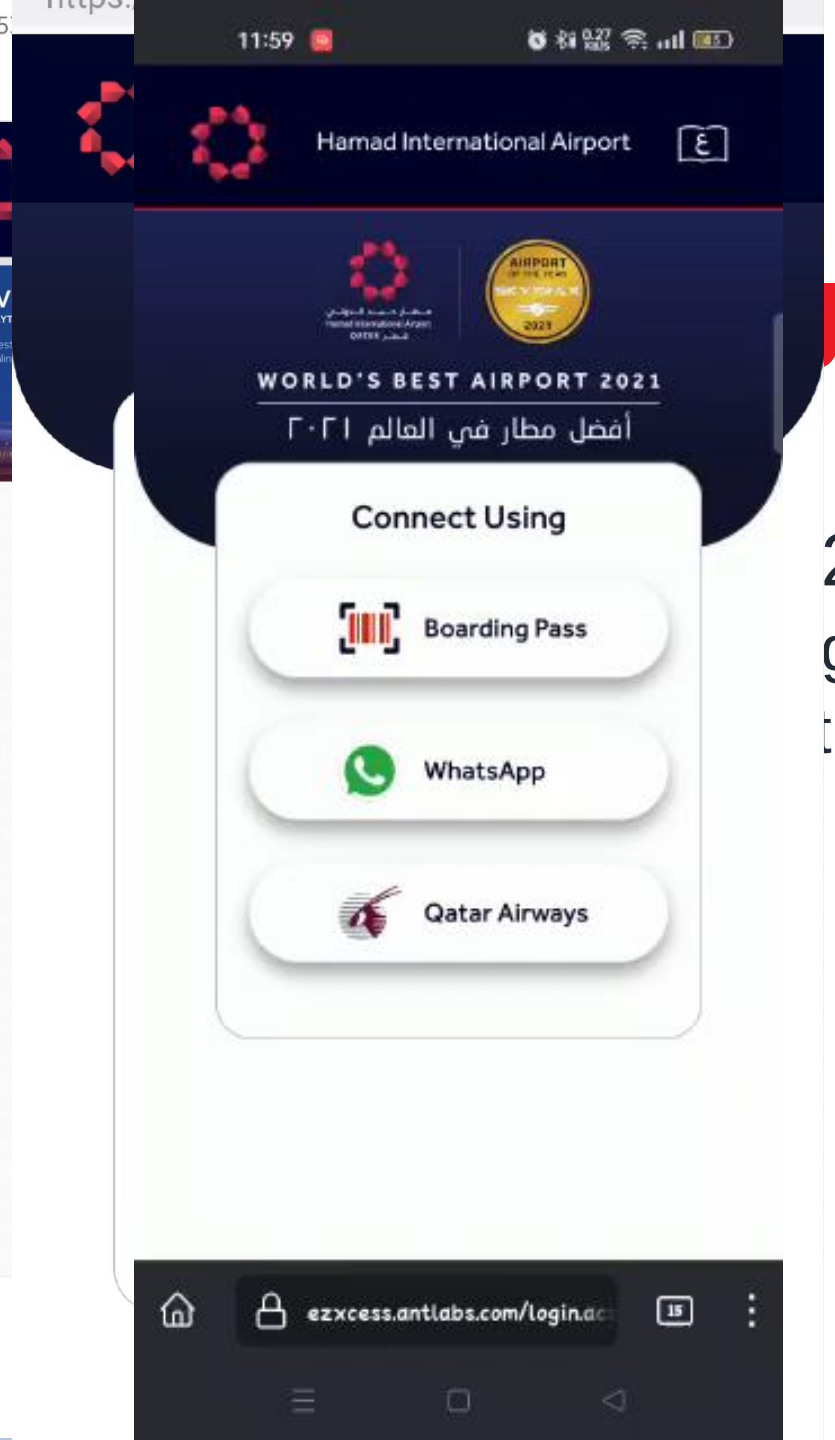
Connecting Fans at the 2022 World Cup in Qatar

By: Kwang Tat ANG
Product & Marketing Director

Providing Seamless Connectivity at 8 World Cup Stadiums & HIA Airport

ANTlabs

- Started in 1999 in Singapore
- Innovator of guest WiFi and networking solutions for SPs
  - Hospitality Gateways
  - WiFi Services Management Platform / SaaS
  - Carrier AAA, DHCP, DNS servers



the World!

2020

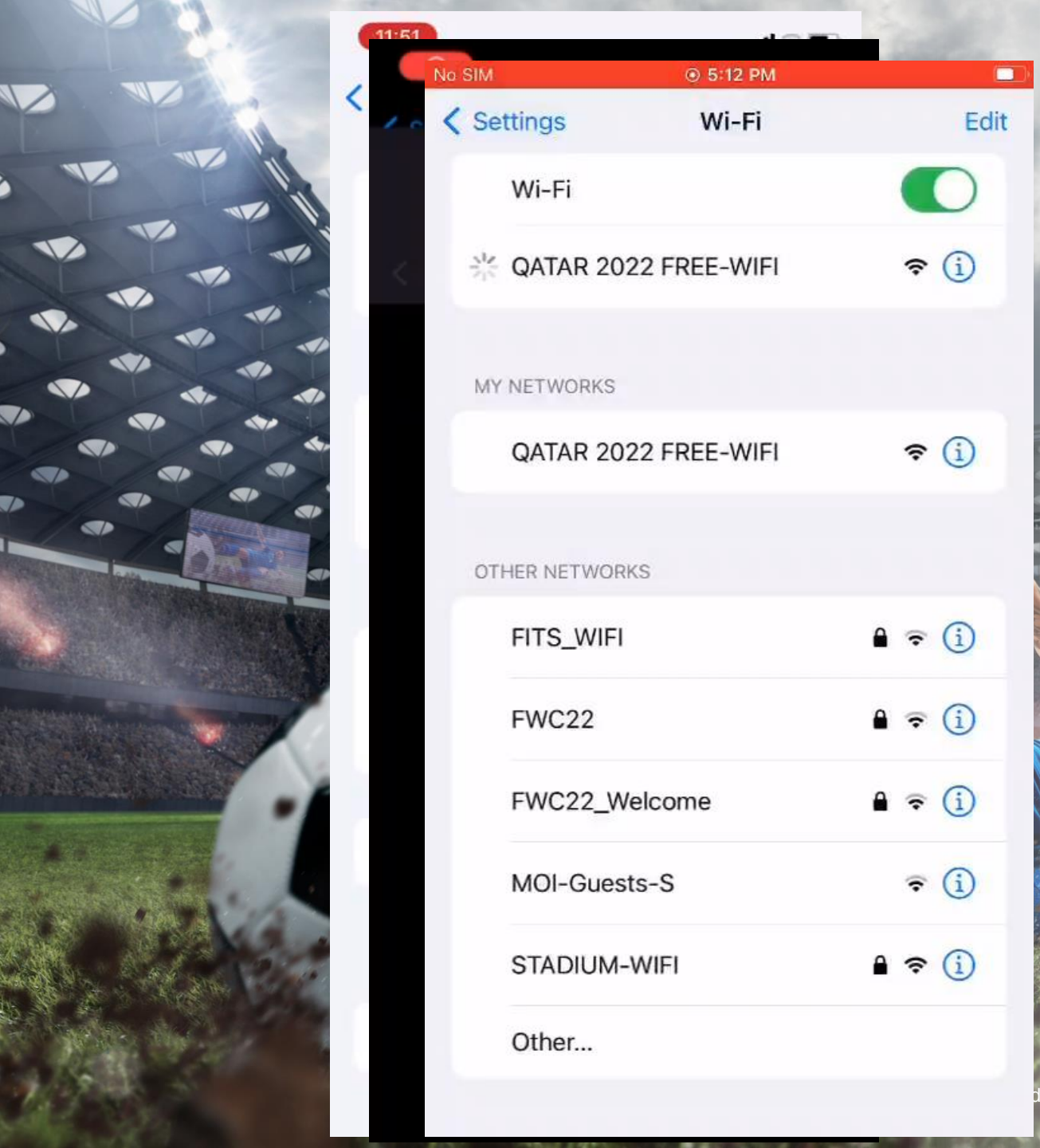
g of boarding pass

ticket number

Connecting the World!

3 million fans expected

- Multiple use cases of login authentication
- 8 World Cup Stadiums
  - Native device support
    - AppleID login
    - Google login
  - Social Media login : Facebook
  - SMS OTP

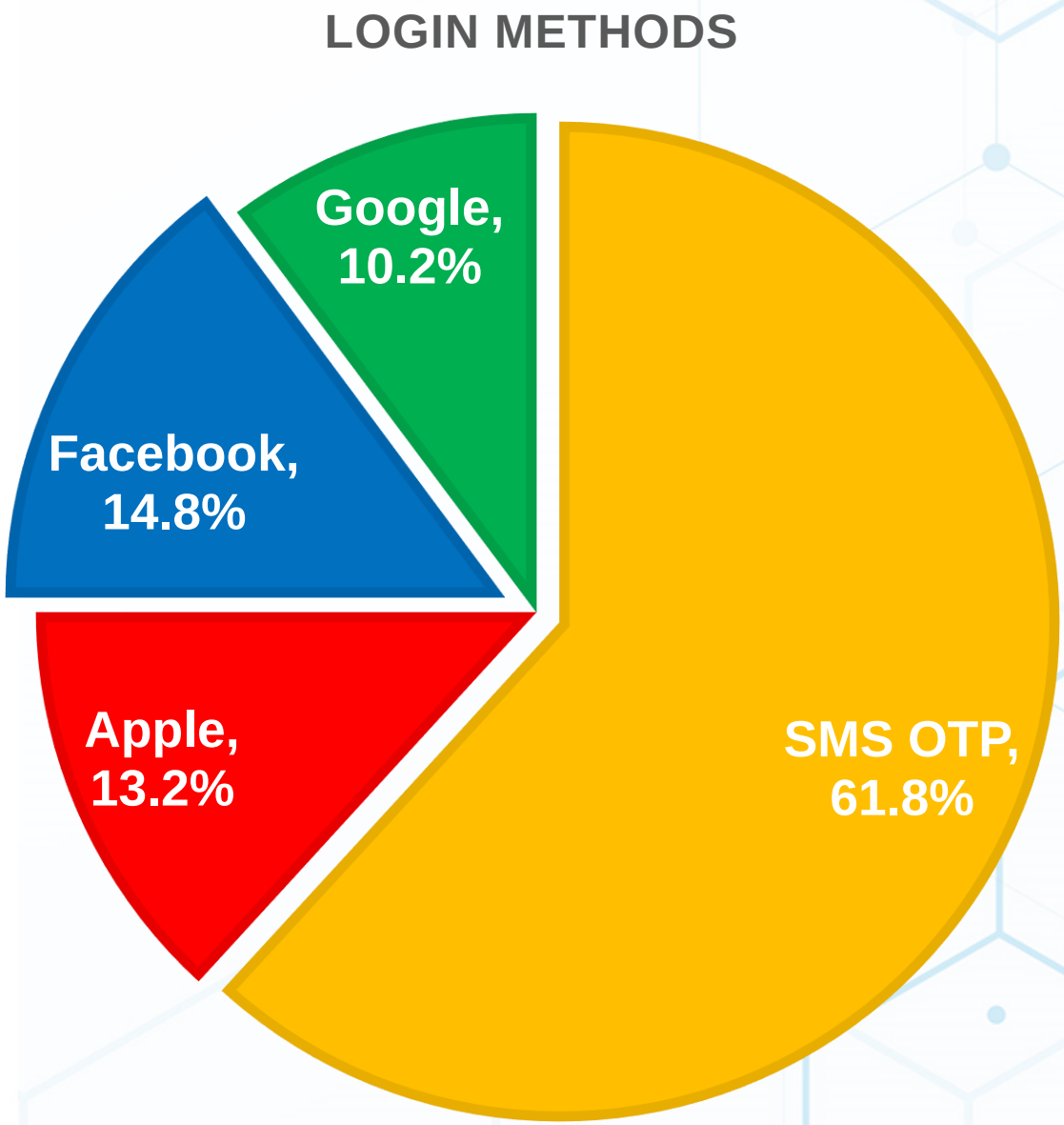


User Experience

- Native device support
  - Google login
  - AppleID login
- Social Media
  - Facebook Login

Statistics

- Lusail Stadium (80,000 capacity)
- ~440K login/relogin sessions
- ~110K authentication attempts
- ~1.5 - 2 million sessions across 8 stadiums



Challenges

- Apple and Google login
  - Designed for websites to easily authenticate native device login
  - Assumes user device already has internet, or worse, mobile data
  - Creates havoc when used with a captive portal
  - Authentication services on devices fail in pseudo-browser
- Large venue with a high density of users
  - Requires a robust and powerful network service (DHCP / DNS)
  - Authentication engines must be fast and handle high TPS
- With our R&D and networking expertise solved the issue with a combination of software, network equipment, and HSIA gateway

Benefits

- Large international events create challenging logistics for WiFi and internet services
- Good user experience when signing on to WiFi paramount
- Onboarding of users must be convenient and offer consistent connectivity
- A variety of login methods to cater for a global audience
- Usable internet even at peak user traffic or during major Finals
- WhatsApp offers a cost-effective solution at the HIA airport

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Lunch Break
We will reconvene at 2.30 pm SGT

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Bruno Tomás

CTO, Wireless Broadband Alliance

Session Moderator

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Dr. Hideaki Goto

Associate Professor, Cyberscience Center of Tohoku University

Case Study: eduroam/OpenRoaming combined deployment in Japan

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Case Study:
eduroam/OpenRoaming combined deployment in Japan

Hideaki Goto　Tohoku University / Cityroam

A part of this work was supported by the Beyond 5G R&D Promotion program at National Institute of Information and Communications Technology (NICT) in Japan.

Nationwide Cityroam deployment in Japan

- Cityroam, a federation providing secure roaming system for Public Wi-Fi since 2018.
- All venues provide both eduroam and OpenRoaming (2020-).
- Unique venues across the nation. (90+ spots)

cityroam (as of Jan. 2023)

WBA OpenRoaming

- **eduroam-like, seamless connection experience for everyone,** not limited to Research&Education community.
  - eduroam since 2003, now 100+ countries/territories.
- **Advanced and multipurpose** than eduroam (RFC 6614, 7593).
- Based on Passpoint and WRIX framework.
- PKI and RadSec + Dynamic Peer Discovery
  - Similar to eduroam, but in larger scale.
- Two policies using different RCOIs
  - Settled: Accounting and intermediary are required.
  - Settlement-free: No roaming fee. Much easier adoption.

RCOI: Roaming Consortium Organization Identifier

Cityroam federation in Japan

- Affordable roaming platform with Simplified interface.
  - IdP: eduroam, ANYROAM, Cityroam Cloud IdP, etc.
    (planned: telcos/ISPs and cities overseas via OpenRoaming)
- Multi-operator, multi-vendor
- eduroam/OpenRoaming combined architecture
- Our strategies:

  No roaming fee.

  (make the most of local ecosystem)

  Utilize existing identities.

  (telcos, ISPs, federated identities)

cityroam

eduroam vs OpenRoaming™ WIRELESS BROADBAND ALLIANCE

eduroam is only for R&E,
while OpenRoaming is for everyone… Then,

Is OpenRoaming alone enough? 

No!

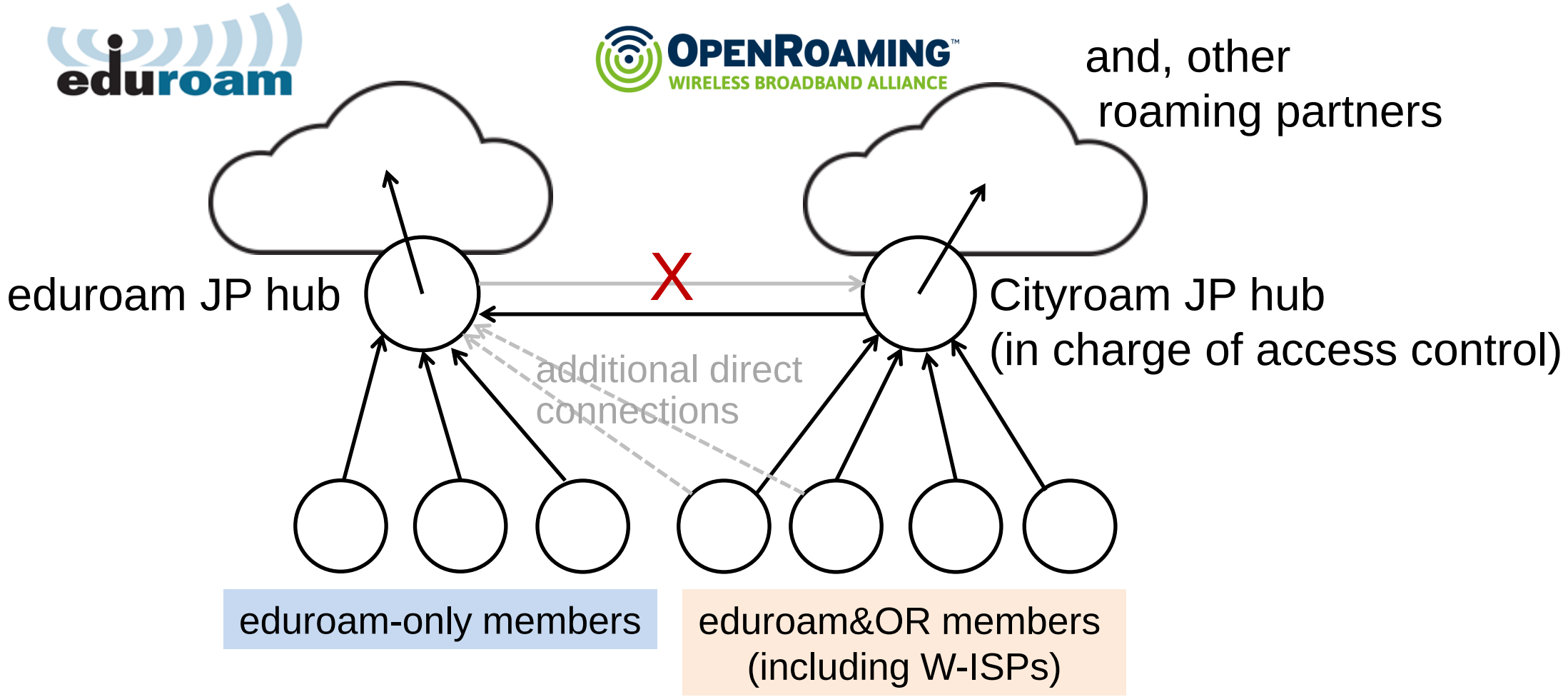
Why eduroam/OpenRoaming combination?

- eduroam has a matured **autonomy**.
  - Virtually monolithic.
    If you see “eduroam” SSID, **the service is always there**.
  - Single basic policy + minor variants.
    (won’t bother users so much)
  - eduroam can be “**a group of reliable IdPs**”
    that provides good credentials with strict user verification,
    probably accompanied with enlightenment.

- Many students and staff are carrying devices already configured with eduroam.

Great advantage

eduroam/OpenRoaming combined architecture

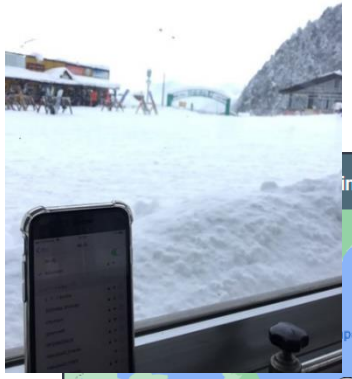


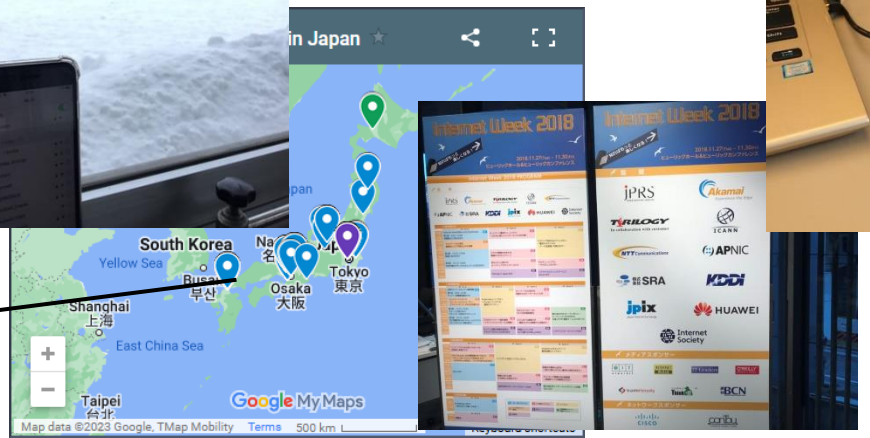
Cityroam venues

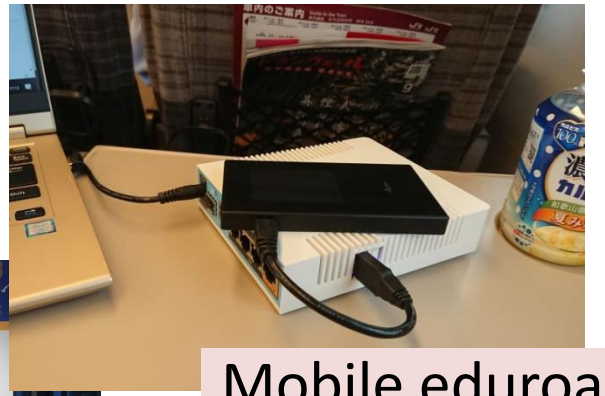
- Cafes, hotels, shopping malls, etc.
- Sapporo Gakuin University (for better services for residents)
- Ski resorts (Hakuba47)
- Kita-Kyushu Monorail stations
- Conference venues (temporary deployment)
  Internet Week 2018 & 2019, AXIES 2018, 2021, 2022,
  Comic Market 95th-97th, 99th-101st, etc.

New direction:
Univ.&Schools
should provide
Public Wi-Fi, too.

Cityroam supports quick deployment of eduroam + Public Wi-Fi.

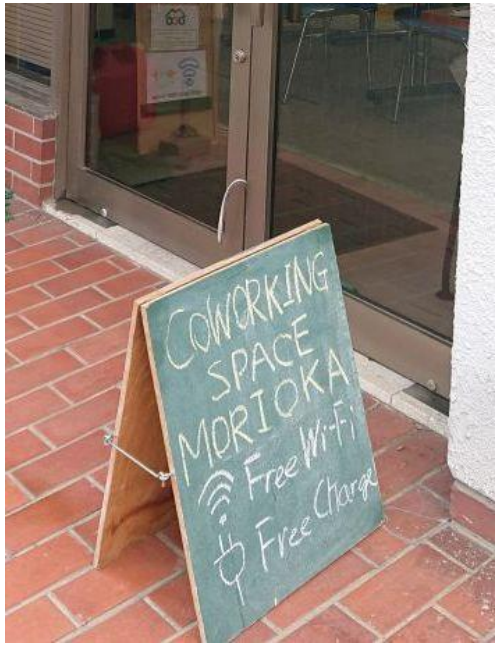






Mobile eduroam
/OpenRoaming AP
(over 4G & VPN)

Cityroam venues



Co-working space in Morioka
(OpenRoaming was added
in 2020)

Conference Center in Nagano
(May 2021)

Hot Spring facility in Nagano
(May 2021)

Resort Hotel & Complex in Ise
(Feb. 2022)

Vending machines in
Kyoto City Parks
(May 2020)

A trial: eduroam and OpenRoaming on buses

- First OpenRoaming deployment on buses.
  - Sightseeing / chartered buses in Ibaraki Prefecture.
  - 4G/LTE backhaul network & remote management via VPN.
  - Power stabilizer for continuous operation.

Tsubasa-kanko Co., Ltd.
and Telhi Corporation (a member of Cityroam)
Dec. 2021

Nishi-Shinjuku Smart Poles by Tokyo Met. Govt.

- PoC and pilot service in Smart City project.
- eduroam, Cityroam, and OpenRoaming on 22 smart poles. (2021-2020)
- **Pilot for the next generation Free Wi-Fi in Tokyo.** (2022-2023)

eduroam accesses: 75%

Our key success factors

- eduroam/OpenRoaming combined architecture
  - eduroam has a strong value proposition.
  - Collaboration with schools will probably be important.
- Multi-operator scheme
- Simplicity + Managed systems
- Existing identities
  - eduroam, SIM, device-built-in OSU, and Social Accounts

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Jonah Ross

Manager, PMO, Wireless Broadband Alliance.

Overview of OpenRoaming Case Studies

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

OVERVIEW OF OPENROAMING™ CASE STUDIES

Jonah Ross
WBA Program Manager

AGENDA

Introduction

- WBA Members Vision - What is OpenRoaming?
- OpenRoaming Live Concept
- High-Level Architecture

Case Studies

- OpenRoaming At Park Royal Singapore
- OpenRoaming At Lake Oconee Church
- OpenRoaming At WGC EMEA Amsterdam
- OpenRoaming In The City Of Dublin (Phase 1)

Conclusion

- OpenRoaming Accomplishments
- Call For Participation

WHAT IS WBA OPENROAMING™?

WBA OpenRoaming™ is based on a set of business and technical components that enables the function of the roaming federation

OPENROAMING™
WIRELESS BROADBAND ALLIANCE

WBA OpenRoaming creates the framework to connect billions of users and things to millions of Wi-Fi networks globally.

It is a roaming federation service enabling an automatic and secure Wi-Fi experience globally. With WBA OpenRoaming, we are creating an open connectivity framework for all organizations in the wireless ecosystem to power new opportunities in the 5G era.

WBA OpenRoaming™ Dimensions	3 Key Components & Standard & Technical specs
 **Cybersecurity Service**	Cloud federation creates a federation of networks and identity providers to enable automatic roaming and user onboarding on Wi-Fi. Based on WBA's Wireless Roaming Intermediary eXchange (WRIX) standards to scale and facilitate different business models under a harmonized framework.
 **Cloud Federation**	Cyber Security enables simple, secure and scalable Wi-Fi connections amongst different organizations that are part of WBA OpenRoaming™. Allowing automatic and secure roaming between millions of networks, nationally and globally with secured interconnection and encrypted communications.
 **Network Automation**	Network automation defines an automated roaming consortium codes framework (RCOI) to support policy provision on devices and networks. Organizations that manage a Wi-Fi CERTIFIED Passpoint®-enabled network may become part of the WBA OpenRoaming™ federation

WBA VISION: OPENROAMING LIVE

VISION - Provide Wi-Fi access (based on OpenRoaming-Passpoint) with wide support across locations for attendees to experience an automatic, easy login, secure and interoperable Wi-Fi service.

Enabling OpenRoaming live bring a series of benefits to partners involved (Hotel, IT integrators):

1. Objective to include OpenRoaming Live during WBA Wireless Global Congress throughout the entire venue for the week of the event (conference and hotel rooms)
2. Benchmark leading venue in the world with best Wi-Fi experience possible for citizens and attendees
3. Expand connectivity to more locations, such as the Airport and City Wi-Fi, along with other partners
4. In advance marketing communications and onsite signage throughout venue areas / hotel with local authorities' support
5. Case study and promotion materials of world leading OpenRoaming Live deployment
6. Plan to keep positioning Singapore as the connected city and carry on with live network after the week of the event
7. No costs involved (potentially re-use existing infrastructure and circuits)

Global Roaming **Innovation** **Easy of use** **Security**

HIGH LEVEL ARCHITECTURE: PARK ROYAL PROPOSAL

WIRELESS BROADBAND ALLIANCE

Location 1
Park Royal Hotel

OpenRoaming Connector

Location 2
Changi Airport

OpenRoaming Connector

Location 3
Gardens By The Bay

OpenRoaming Connector

VISION

INTERCONNECTION

Cloud IDs

agreeya · boingo wireless · cisco · CLOUD4WI · globalreach · Google · wefi · SINGLEDIGITS

Ecosystem Brokers

AAA RADIUS Server

3. OTHER & SERVICE PROVIDERS

AAA

AAA

Operators Enterprises

Operators Enterprises

AT&T

T-Mobile

CASE STUDIES

OPENROAMING AT PARK ROYAL SINGAPORE

As the WBA do at all the WGC events, we have deployed OpenRoaming networks to showcase the functionalities and features of OpenRoaming.

Park Royal is now part of the 2,000,000+ OpenRoaming live locations worldwide providing seamless, secure Wi-Fi using CommScope R720 access points proxied to a US CommScope RadSec infrastructure. Configured by Linkbroad.

RUCKUS COMMSCOPE

LinkBroad

Wireless Broadband Alliance

1

Challenges

- Working in sync with multiple parties
- Configurations
- Time zones

2

Solution

- Convene at suitable times that work for everyone
- Provide as much support offline

3

Results

- Success on another OR deployment
- Building new relationships
- Took us under two months to get everything set up

OPENROAMING AT LAKE OCONEE CHURCH

Lake Oconee Church has created a seamless, safe and secure Wi-Fi networking environment, working with companies with a reputation for high quality and secure products, LOC chose Cisco Meraki MR36 Wi-Fi 6 APs to provide the latest high-performance network which can connect more devices simultaneously, better handle the data to avoid impacting speed and can use multiple channels at once if bandwidth is available.

LAKE OCONEE .CHURCH

cisco Meraki

Wireless Broadband Alliance

1

Challenges

- Requestee working remotely from South Africa
- Financial component
- Providing the support on configurations

2

Solution

- Worked with our members to provide support
- WBA project management end to end support
- Internal documentation created guides/video step-by-step guides

3

Results

- End to end deployment from a PoC > live deployment took 2 months
- OpenRoaming progression, LOC is now expanding its network to 52,000 sq ft

OPENROAMING AT WGC EMEA AMSTERDAM

The OpenRoaming network completed at the RAI has provided a benchmark to continue the ongoing work within the WBA and OpenRoaming.

The initial feedback from members on the OpenRoaming experience was second to none and one of the best OR experiences members and ourself have experienced at any event/congresses hosted.

rai AMSTERDAM

CISCO

Wireless Broadband Alliance

1

Challenges

- Provisioning of users onto the network unsure discussions
- Getting the realms working on the controller
- Configuring multiple APs over a short space of time

2

Solution

- Deciding on one logical solution to use in terms of provisioning
- Working with all parties to find a way to broadcast the realms
- Internal testing prior to arrival

3

Results

- 1,139 unique devices connected
- 60 Cisco catalyst access points OpenRoaming enabled
- Users entering RAI were connecting to the OpenRoaming network each time they came in range of an AP
- Capport: option 113 - Enabled

OPENROAMING IN THE CITY OF DUBLIN (PHASE 1)

Deployed at Bernardo Square, Dame Street and the City Council's Amphitheatre, WBA OpenRoaming enables residents and visitors to log in only once and then maintain seamless connectivity as their smartphones, tablets and other Wi-Fi devices automatically switch between different public Wi-Fi hotspots. The success of the trial will pave the way for a larger city-wide deployment.

1

Challenges

- Approval processes from all parties
- Selecting locations to initially deploy in
- Provisioning of users

2

Solution

- Patience and working together to get things approved
- Tactical decisions that are logical
- IDP solution

3

Results

- Two live locations enabled with OR in Dublin (Barnardo Square & Amphitheatre
- Phase 1 allowed us to a phase 2
- Hundreds of users connecting daily
- Will path the way to create more smart cities
- Providing communities, residents and businesses with seamless high-quality connectivity

OPENROAMING™ PROVISIONING

CONCLUSION

OPENROAMING ACCOMPLISHMENTS

WIRELESS BROADBAND ALLIANCE

Achievements

Approaching OpenRoaming Scale

+1000

Live Networks across the Globe

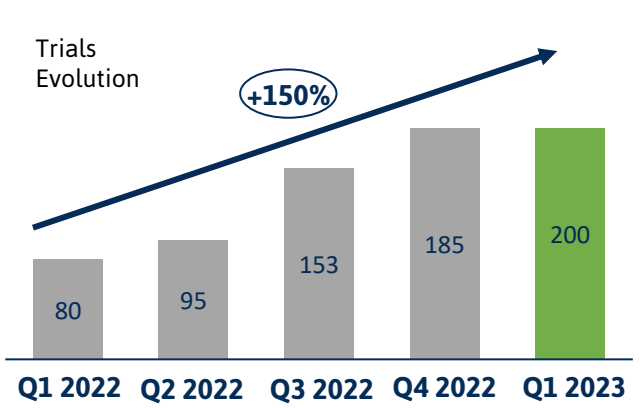
+2 Million

Live Hotspots

~300

Companies, Cities, Enterprise involved

Momentum around global trials and deployments



Wide Range Availability

Truly holistic OpenRoaming standard, key industry players delivering

airties, Cambium Networks, Cisco, CommScope, Extreme networks, EZELINK, galgus, HUAWEI, Juniper Networks, LANCOM Systems

10 Vendor OEM Implementing

+20

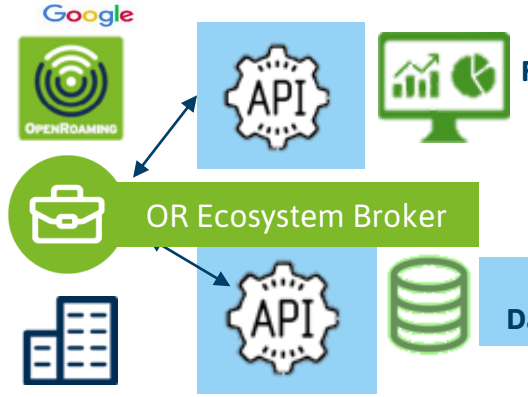
Identity Providers

Google, intel, SAMSUNG

wballiance.com/openroaming-signup/

Identity Provider massification with key players virtually covering all the market (smartphones, tablets)

Fostering standards compliance acting the Policy Authority to make sure the foundational components of the federation are used globally



Federation Members Portal available

OpenRoaming Global Database fully functional

OpenRoaming leading the Public-Guest Wi-Fi > Focusing on evolving horizontally and vertically

HOW TO PARTICIPATE

WIRELESS BROADBAND ALLIANCE

OPENROAMING™
WIRELESS BROADBAND ALLIANCE

One Global Wi-Fi Network

VISION: Provide Automatic & Secure Wi-Fi Everywhere to Everyone

MISSION: Create an open framework for all types of players to develop their Wi-Fi services and business

STEP 1 Sign up for WBA OpenRoaming™ *(Inclusive for WBA Members)*

STEP 2 Adopt the WBA OpenRoaming™ framework and standards

STEP 3 Choose the interconnect model and technologies

STEP 4 Select your business model and partners that are members of WBA OpenRoaming™

STEP 5 Configure your network and/or customer devices

STEP 6 You are now part of the WBA OpenRoaming™ brand and are **ready** to **ROAM!** Congratulations!

www.wballiance.com/openroaming/join

THANK YOU

Jonah Ross
WBA Program Manager
Jonah@wballiance.com

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Erinn Hall

Director, Program Management, AT&T

WBA Roaming Work Group

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WBA ROAMING WORK GROUP UPDATE

Co-Chair: **Erinn Hall (AT&T)**

Co-Chair: **Betty Cockrell (Single Digits)**

VERSION V1.0

Agenda

- Overview of the Roaming Work Group
- WRIX (Wireless Roaming Intermediary Exchange) & Document Library
- 2022 Accomplishments
- Planning for 2023 – Carry over and new projects
- Join the WBA and Roaming Work Group!
- Questions

Roaming Work Group Overview

The Roaming Work Group (RWG) addresses Wi-Fi Roaming

Focus Areas:

- Wireless Roaming Intermediary eXchange (WRIX)
- WBAID
- RadSec
- Support for OpenRoaming™ Settled
- Promote alignment with other industry forums (i.e., GSMA)
- Maintenance of the WBA Document Library

Deliverables

- Promote best practices for roaming
- Maintain and drive the evolution of the WRIX specifications
- Support roaming business models
- Promote compliance and best practices

Leading Participants

AT&T, aruba, boingo, CableLabs, Cisco, eduroam, eleven, ER-TELECOM, globalreach, Google, SINGLEDIGITS

Document Library

WRIX Framework

- WRIX Umbrella
- WRIX-n – Network
- WRIX-i – Interconnection
- WRIX-L – Location
- WRIX-d&f – Data Clearing

Support Information

- WBA Unique Organization Identifier (WBAID)
- Roaming Agreement Templates
- Technical Exchange Document (TED) & Guide
- Commercial Business Exchange Document (CBED) & Guide

PKI RadSec Guidelines

- WRIX PKI Certificate Policy
- WBA Certificate Validation and TLS profiles
- PKI RadSec Operator Deployment
- PKI RadSec End-Entity Deployment Guidelines
- PKI Registration Authority (RA) Agreement
- Issuing Intermediate Certificate Authority (Issuing I-CA) Provider Agreement
- Root CA Provision Agreement

2022 Accomplishments

2022 Accomplishments:

Finalized Settled Contract Structure & Liaised to OpenRoaming Standards Team

Finalize Language & Mandatory Terminology for Open Roaming Settled

OpenRoaming TED & CBED

Mandatory/Required for OpenRoaming in WRIX

WRIX Document Updates

Updated Dispute Management & Resolution Document

Planning for 2023

Carryover from 2022

- Clarify handling of session date UTC vs. Local
- Clarify session start/end for traffic month
- Address any questions regarding Mandatory/Required for OpenRoaming in WRIX

Planning for 2023

New Initiatives:

- Signaling Location Information In RADIUS
  - Determine accurate location information for Wi-Fi APs and how to pass information to the RADIUS Servers and UE as applicable.
- Billing and Charging Evolution
  - Simplify and Align Wi-Fi Roaming settlement processes and align across industries.
- Decentralized OpenRoaming Networks
  - Explore possibilities of using a new decentralized identifiers (DID), verifiable credentials (VC), and blockchain opportunities to enhance adoption of OpenRoaming.

Join the WBA & the Roaming Working Group

Thank You!

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Peter Thornycroft

Distinguished Engineer, CTO Group. HPE, Aruba

Testing & Interoperability Work Group

User experience, onboarding and addressing MAC randomization Group

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS BROADBAND ALLIANCE

TESTING & INTEROPERABILITY WORK GROUP

MICHAEL SYM (SINGLE DIGITS) CHAIR
ERINN HALL (AT&T) CO-CHAIR
PETER THORNYCROFT (HPE ARUBA) CO-CHAIR

31 JANUARY 2023

VERSION V1.0

Agenda

- 2022 results
- Work in Progress
- 2023 plans
- Operational Information

Testing & Interoperability work group 2022

WBA WORK GROUPS & PROJECTS

5G Work Group	IoT Work Group	NextGen Work Group	Roaming Work Group	OpenRoaming™ Task Group	Testing & Interoperability Work Group
5G & Wi-Fi Convergence in Private 5G Networks	Wi-Fi 6/6E for Industrial IoT	Wi-Fi 6E & Wi-Fi 7	In-Flight Connectivity Continuous Experience	Federated Onboarding Service for OpenRoaming	Access Network QoS
	Smart Home 2.0	Operator Managed Wi-Fi Reference Architecture	Profiles & RCOIs Prioritization	OpenRoaming for Private LTE / 5G	E2E QoS Management Trial
		Rural Wi-Fi		OpenRoaming for IoT	ANQP Elements Guidelines
					Wi-Fi Devices Identification

Testing & Interoperability Work Group

Industry interop and latest Wi-Fi features

Michael Sym
Single Digits / Chair

Erinn Hall
AT&T / Co-Chair

Peter Thornycroft
HPE Aruba / Co-Chair

Recent Work

- **Wi-Fi IMSI Privacy Protection**
  - Revised to v1.1

- **3GPP Dynamic Peer Discovery OpenRoaming POC**
  - GSMA confirmed wlan.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org subdomain for OpenRoaming in IR.67
  - Response to a request by the WBA, tested by WBA members

- **Device ID (MAC Randomization) Next Steps**
  - Discuss next steps for Device ID work.
  - Possibly evolving current Device ID whitepaper or launching a new work area.
  - Look at Overall Privacy issues (such as fingerprinting) and OS/Industry Updates like IEEE 802.11bh and 802.11bi. (https://datatracker.ietf.org/meeting/112/materials/slides-112-madinas-ieee-80211bhbi-update-01)

Work In Progress

- **Deauthentication Imminent**
  - Wi-Fi AlliancePasspoint r3 feature can reduce unnecessary authentication attempts
  - T&I tested the feature end-to-end and made recommendations on implementation
  - Further testing planned leading to a short white paper explaining best practices

- **IETF RADEXTRA for reverse CoA and RADIUS Accounting**
  - CoA and DM (e.g.) from home server to NAS behind a firewall or NAT gateway
  - WBA-identified need for OpenRoaming
  - Coordinating with IETF author
  - Add/Clarify RADIUS Accounting requirements in an RFC

- **DPP based Passpoint Provisioning**
  - Increase applicability of Passpoint for IoT, headless devices
  - Considering enterprise use cases

- **Joint Meetings with the WFA**
  - Regular collaborative meetings with WFA on areas such as Passpoint, OSU, IMSI Privacy, new ANQP Elements.

TESTING & INTEROPERABILITY WORK GROUP 2023

WIRELESS BROADBAND ALLIANCE

WBA WORK GROUPS & PROJECTS

5G Work Group	IoT Work Group	NextGen Work Group	Roaming Work Group	OpenRoaming™ Work Group	Testing & Interoperability Work Group
Leading Wi-Fi and 5G RAN Convergence	Augmenting Wi-Fi role in IoT	Advocate and standardize Wi-Fi tech	Standardize Wi-Fi Roaming business	Massify and scale Wi-Fi roaming globally	Enhance device and services interoperability
5G & Wi-Fi Convergence for Private 5G Networks	Smart Home 2.0	Passenger Experience & Roaming Evolution	Billing and Charging Evolution (BCE)	Federated Onboarding Service for OpenRoaming	Access Network Metrics
	Wi-Fi 6/6E for Industrial IoT	Operator Managed Wi-Fi Reference Architecture	Signaling Location Information in RADIUS	WBA OpenRoaming for Private LTE / 5G	E2E Wi-Fi Quality of Service
	Wi-Fi HaLow Technology & Trials	Wi-Fi 7	Decentralized OpenRoaming Networks	WBA OpenRoaming for IoT	RADIUS Accounting Assurance
					Venue Requirements for User Engagement

Policy & Regulatory Affairs Work Group	Market Work Group	WBA Compliance / Certification
Industry liaison and spectrum advocacy	Marketing activities and industry dissemination	Addressing interoperability to foster adoption

New Task Groups for 2023

- **RADIUS Accounting Assurance**
  - Deliver a whitepaper showing how to detect and handle RADIUS accounting sessions that do not accurately report usage as well as create test cases to ensure a RADIUS client is correctly and accurately generating accounting messages.
  - Liaise guidelines with IETF RADEXTRA to try and get them included in new RADIUS RFC drafts.

- **Venue Requirements for User Engagement**
  - Best practices for public venue WLAN configuration with Passpoint, Capport etc
  - Streamline the user's journey
  - Consider venue managers' requirements

OPERATIONAL INFORMATION

Project Leadership:

- Project Leader – Michael Sym (Single Digits)
- Project Co-Lead & Chief Editor – Peter Thornycroft (HPE Aruba)
- Project Co-Lead – Erinn Hall (AT&T)

Time	Tuesday	
8am **PT** 11am **ET** 3pm **GMT** 5pm **CET**	**Industrial IoT**	**Policy & Regulatory Affairs** Work Group
9am **PT** Noon **ET** 4pm **GMT** 6pm **CET**	**Testing&Interop** Work Group	

T&I always open to new topics

We have labs around the globe able to test various connectivity scenarios - including E2E roaming – across a variety of end user devices, AP/WLC vendors, and EAP authentication types.

Join Extranet Group:

- https://extranet.wballiance.com/communities/community-home?communitykey=2f5e7d1a-643d-47a4-a2a7-75104912421f&tab=groupdetails

T&I Mtgs Restart 14 Feb 2023 @ 9a PT - THANK YOU!

WBA Testing & Interop Workgroup
Chair: **Michael Sym (Single Digits)**
Co-Chair: **Erinn Hall (AT&T)**
Co-Chair: **Peter Thornycroft (HPE Aruba)**

Meeting Facilitated by WBA PMO
Bruno Tomas – bruno@wballiance.com
Pedro Mouta – pedro@wballiance.com

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

PANEL: Optimising Public Wi-Fi Networks & Wi-Fi Roaming

BOOLENG KHOO

SYSTEMS ENGINEERING MANAGER

RUCKUS NETWORKS

MARK GRAYSON

FELLOW

CISCO

ERINN HALL

DIRECTOR, PRODUCT MANAGEMENT

AT&T

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Coffee & Networking
Be back in 30 minutes at 4.00 pm SGT

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Steve Namaseevayum

Director, Industry Alliances & Membership,
Wireless Broadband Alliance

Session Moderator

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Gunadi Hantoro

OSM Wireless Product Management, PT Telekomunikasi Indonesia

Wi-Fi Innovation in Indonesia : Product and Business

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

@wifi.id
Indonesia WiFi

Telkom Indonesia
the world in your hand

WIRELESS GLOBAL CONGRESS

Wi-Fi Innovation in Indonesia : Product and Business

Gunadi Dwi Hantoro

Operational Senior Manager of Wireless Product Management

PT. Telkom Indonesia

Outline Presentation

1. Telkom Indonesia at a Glance
2. Indonesia WiFi Profile
3. Indonesia WiFi Network Readiness & Business Portfolio
4. Indonesia WiFi Innovation & Service Roadmap

Telkom Indonesia at a Glance

Ownership

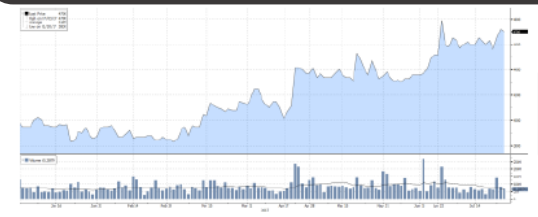
Government	52.1%
Public	47.9%

Telkom Indonesia is listed at

IDX Indonesia Stock Exchange

NYSE

Shared Performance



Share price (January 23rd 2023): IDX= **IDR 3.870**
Market Cap: **IDR 383,37 Tn (Top-5 in IDX)**

Financial Performance FY21

Telkom Indonesia — the world in your hand

(in IDR Bn)

Revenue	143.2	YoY Gr.	5%
EBITDA	76	YoY Gr.	5%
Net Inc.	24.8	YoY Gr.	19%

Customer Profile

1. **Broadband : 129 Mio**
   - **Fixed = 8,6 Mio**
   - **Mobil data user = 120,5 Mio**
2. **Cellular : 176 Mio**
3. **Corporate: 1.5K**
4. **SME: 358K**
5. **Government: 930**

10 International Footprints

Product Portfolio – based on Five Bold Moves Framework

DIGITAL CONNECTIVITY

FMC

InfraCo – Fiber

DIGITAL PLATFORM

Data Center Co

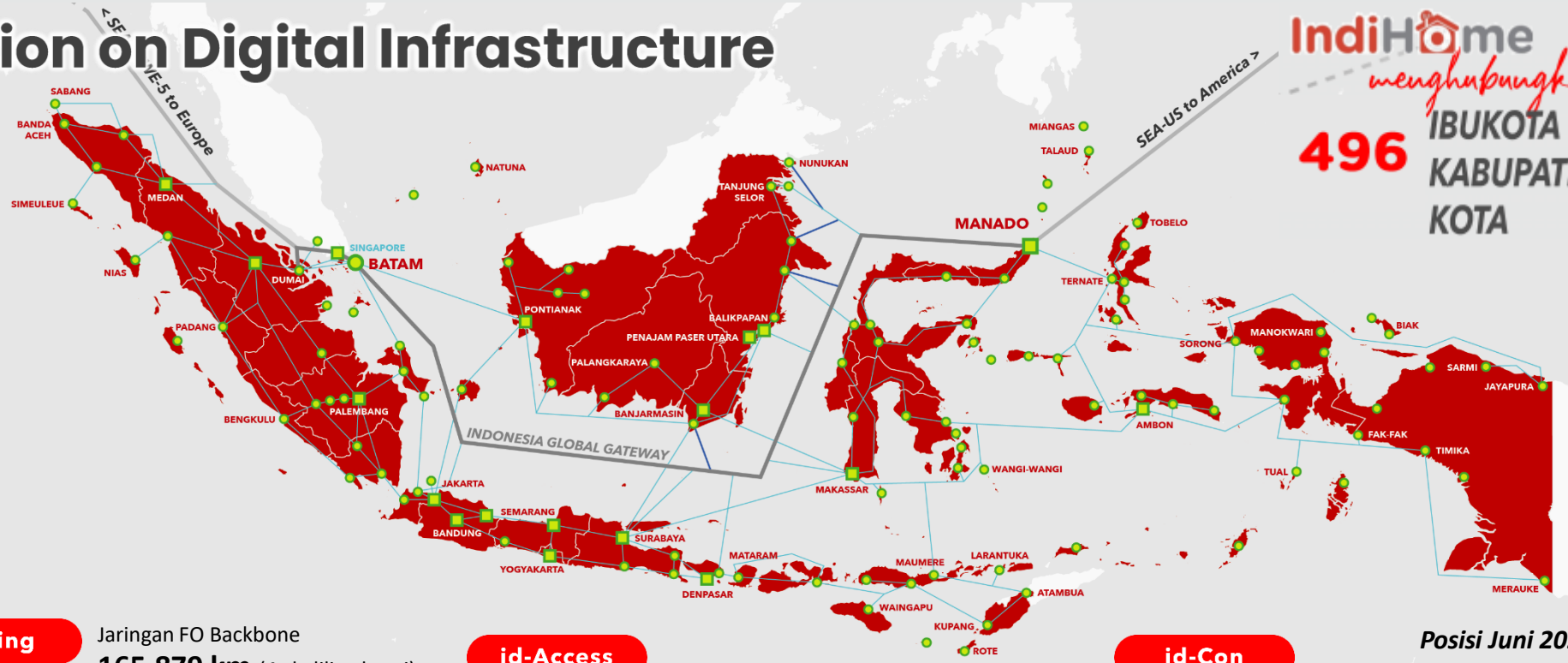
B2B Digital IT Service Co

DIGITAL SERVICE

DigiCos

Telkom Contribution on Digital Infrastructure

INDONESIA DIGITAL NETWORK



IndiHome menghubungkan
496 IBUKOTA KABUPATEN KOTA

165.879 km FIBER OPTIC
setara 4 kali keliling Bumi
dari Sabang sampai Meranke

9 GLOBAL OFFICES

- Singapura
- Hongkong
- Timor Leste
- Taiwan
- Malaysia
- Australia
- Myanmar
- USA
- New Zealand

id-Ring

Jaringan FO Backbone
165.879 km (4x keliling bumi)
Domestik 101.179 km
Internasional 64.700 km
Jangkauan IKK Backbone **458 IKK**

4x Earth Circumference

133 Transponder
Telkom-2 24 Transponder
Telkom-3S 49 Transponder Merah Putih 60 Transponder

Satellite

Point of Presence
56 PoP Domestik, **1.426** MetroE
59 Pop Internasional

id-Access

228.066 BTS
(50.297 BTS 2G dan 177.769 BTS 3G&4G)
49.584 Node Radio IP

Mobile Network

34.025 Tower
- 18.000 Tower Telkomsel
- 16.025 Tower Mitratel

Indonesia WiFi

Fiber Optic Access Network
IndiHome
- **11,8** Juta Optical Port
- **383.876** Access Point Wifi.id

Home Passed **28,3** juta

id-Con

22 Data Center (106.9K Sqm)
- 5 Data Center termasuk 1 tier 4 (luar negeri)
- 3 Data Center (dalam negeri)
- 14 Data Center neuCentrix (dalam negeri)

Data Center

Digital Platform
- Cloud
- Data Center/CDN
- Security
- Big Data

Posisi Juni 2020

Indonesia Wifi Profile

Telkom Indonesia
the world in your hand

Business *Journey*

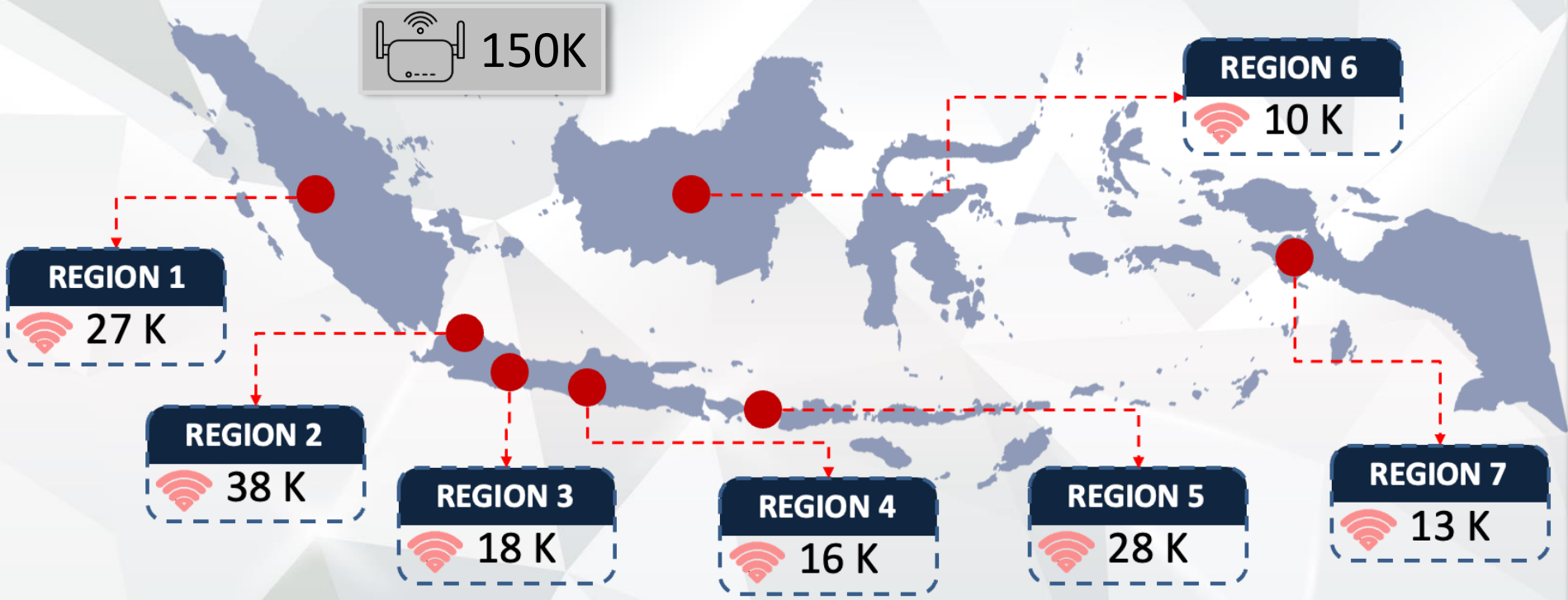
- **2012** — Establish and focus on mobile offload business plan
- **2013** — Setup deployment 1 Mio Wifi
- **2014** — Bizplan for support mobile offload failed, start to change focus on retail business monetizing
- **RED ALERT**
- **2015** — Bizpro simplification & provisioning enhancement (preconfig & autoprov), service delivery improvement
- **2016** — Redefined bizplan to start focus on Wifi Manage Service & VAS development
- **TURN AROUND**
- **2017** — New DTP initiative launched (for venue owner)
- **2018**
- **2019** — New initiative for Wifi digital business
- **2020** — DTP's CX & OX improvement, creating new business models to increase profitability
- **2021** — Wifi NFV Initiatives
- **2022** — Home Wifi Business Infrastructure Initiative trough Mesh Wifi
- **2023** — Market expansion to rural areas & more focus on B2B product solution

CAGR 2013 - 2021

59%

AP Total (end of 2021)

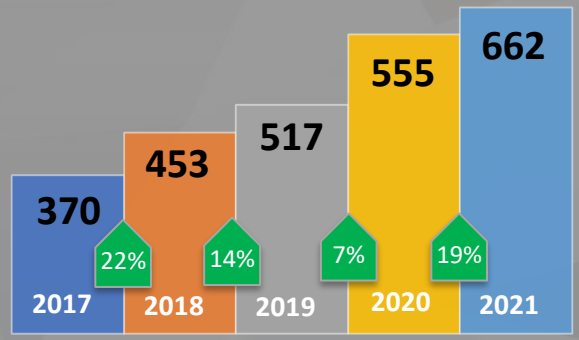
150K



Top 4 Segments

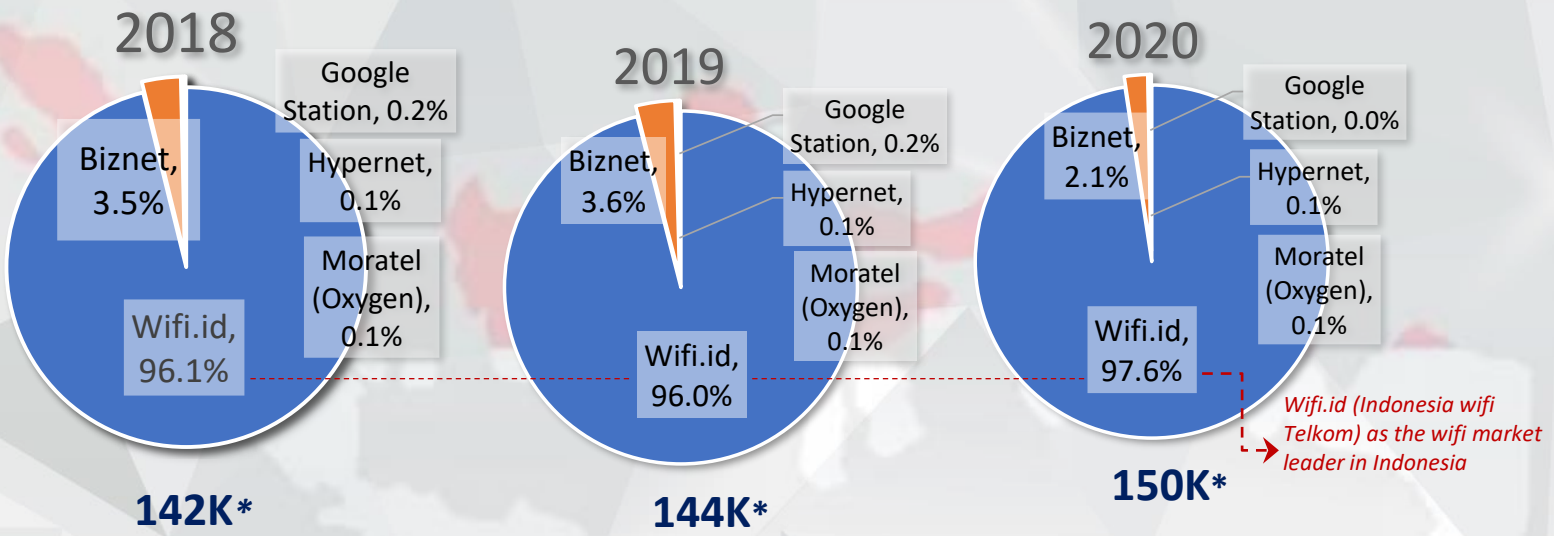
- ENTERPRISE — 30%
- GOVERMENT — 12%
- PUBLIC — 8%
- EDUCATION — 4%

Revenue (Bn Rupiah)



Wifi Market Insight in Indonesia

Market Size



***) number of hotspot** *(Source : Market Research SPIRE)*

2014 s.d 2020
CAGR Wifi
42%

Brand Differentiation *(Local Player)*

- **Biznet** — public areas (tourism), relocating hotspots
- **molecool balifiber** — marketing in Jabodetabek (millennial), corporate, SMEs
- **Google Station CBN** — collaboration with local in public areas, smart city Bali, corporate private WiFi
- **HYPERNET** — Hospitality & tourism, retail, education, health, manufacturing. Papua & East Leste Expansion
- **iFORTE** — Jabodetabek, government segment
- **umawifi** — Wifi vouchers, millennial, rebranding, government & UKM private wifi
- **wificolony** — Collaboration with ISPs/providers, SMEs, retail (malls, salons, restaurants)

Wifi Indonesia Market Movement

- Increasing marketing activities through digital ads
- Improved locations in urban areas through infrastructure collaboration between providers
- Infrastructure expansion occurred in new areas along with fiber penetration, especially in Java
- ISP company merger to expand coverage
- Penetration of tourist areas following government programs.

Indonesia Wifi Supported Event

Designing and deploying high quality wifi solutions for high density locations to support various important international events

- *Dual homing configuration*
- *Provide an operation team on site & the national command center*
- *Provide Various dashboards and tools*

APEC INDONESIA 2013

Asian African Conference Commemoration Indonesia 2015

wonderful indonesia

ANNUAL MEETINGS 2018 | indonesia
INTERNATIONAL MONETARY FUND
WORLD BANK GROUP

ASIAN GAMES 2018 | Jakarta Palembang

INDONESIA 2018 ASIAN PARA GAMES

INDONESIA-AFRICA INFRASTRUCTURE DIALOGUE 2019
CONNECTING FOR PROSPERITY
BALI, 20-21 AUGUST 2019

PON XX PEKAN OLAHRAGA NASIONAL PAPUA 2020

motoGP™

G20 INDONESIA 2022 RECOVER TOGETHER RECOVER STRONGER

Indonesia Wifi for Socio Economic

INDONESIA WIFI DELIVERS VALUE FOR SOCIETY

Telkom Indonesia

Indonesia WiFi enhance accessibility for Indonesian people through Smart city program support and create a socio economic impact for the community through its product called WICO (wifi corner)

Data from Ministry of Cooperatives and SMEs of Indonesia in January 2018, there are 59.69 million SMEs listed and only 3.97 Million already go online and hopefully will achieve more than 8 Million SMEs online by the end 2020 . NDY, CNN Indonesia | Tuesday, 24/04/2018 15:46 WIB.

One of wico location used by local school students to get online to support research

Online ojek "gojek/grab gather in small kiosk with wico service to buy wico voucher

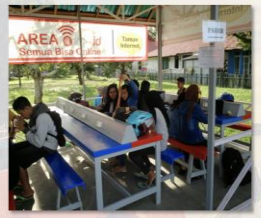
WIFI CORNER AT PUBLIC AREA

Telkom Indonesia

@wifi.id Indonesia WiFi

Telkom provides Wifi.id services in public areas, such as parks, tourist attractions, meeting halls, crowds, and places of worship, for public to be able to experience fast and cheap internet services anywhere and for anyone.

Access Point Wifi
20 k AP for public places
Accross Indonesia



4

INDONESIA WIFI FOR SOCIAL SERVICE

Telkom Indonesia

As a form of social service, Telkom provides Free wifi access at every location as an emergency connection assistance after disaster.

Telkom Grup Command Center at Palu to monitor infrastucture recovery

Gempa & Tsunami Palu – Donggala
28 September 2018; 7,7 SR

Access Point Wifi
- 548 AP FREE Wifi *telkomCARES* at 456 location
- FREE Wifi at 27 Telkom Command post

Gempa Lombok
5 Agustus 2018; 7,0 SR

Access Point Wifi
- FREE Wifi TelkomCares at 6 Telkom Command post

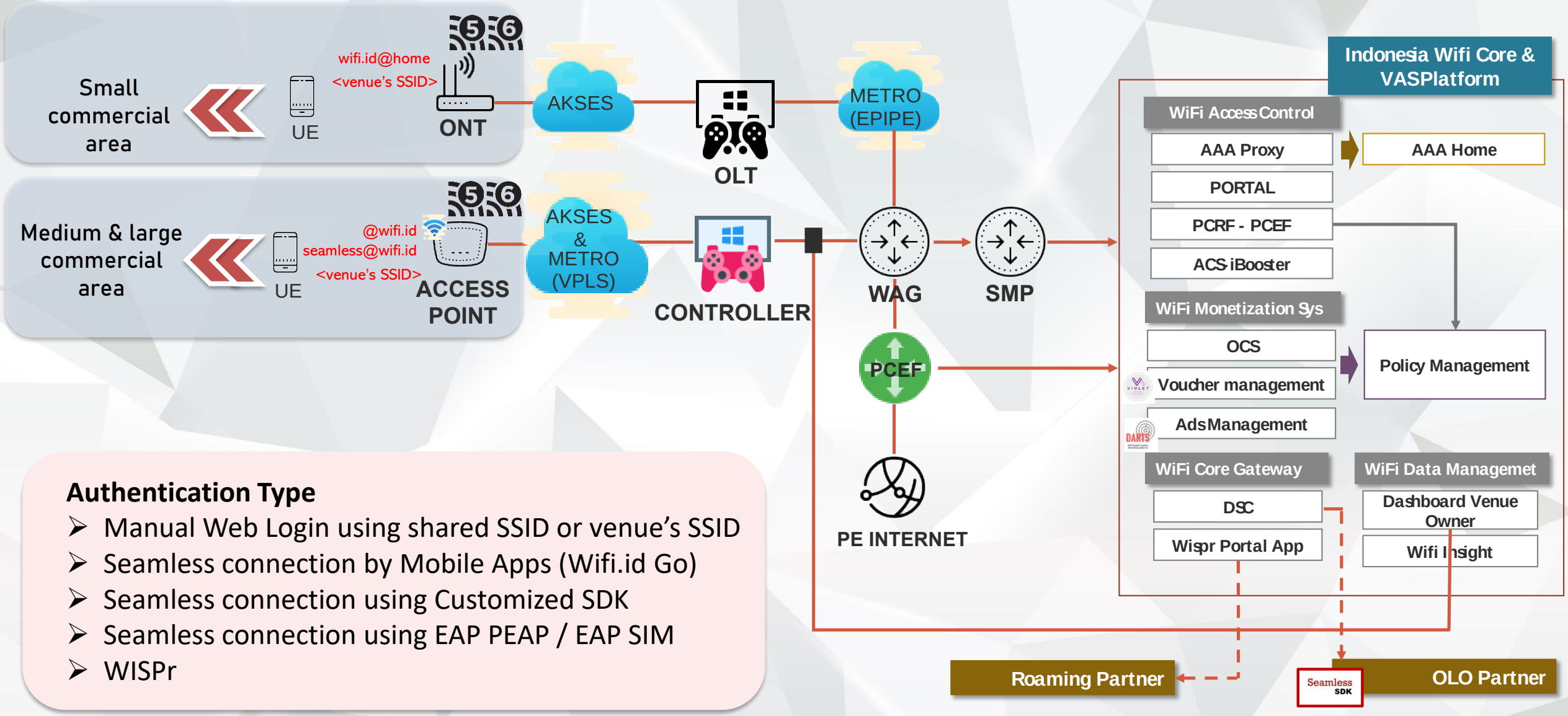
Tsunami Banten
21 Desember 2018

Access Point Wifi
- FREE Wifi TelkomCares at 6 Telkom Command post

5

Indonesia Wifi Network Readiness

Telkom Indonesia
the world in your hand



Authentication Type

- Manual Web Login using shared SSID or venue's SSID
- Seamless connection by Mobile Apps (Wifi.id Go)
- Seamless connection using Customized SDK
- Seamless connection using EAP PEAP / EAP SIM
- WISPr

Indonesia WiFi Business Portfolio

Telkom Indonesia
the world in your hand

Indonesia WiFi (Wifi.id)

DigiCon Portfolio	Product Root	Derivative		
	Wifi.id Managed Service	B2B	**AP Based**	Speed up to ➢ 20 - 100 Mbps (FO based) ➢ 5 - 20 Mbps (Satellite based)
			ONT Based	Speed up to ➢ 20 - 100 Mbps
			Wifi VAS	Voucher Managed Service
				Welcome Page Mgmt
				User Profiling
				Olive
				Wifi Performance Dashboard
				Security type management
	Wifi.id Retail	B2C	**B2B2C Bizmod**	Wico 2.0
				SooltanWifi
		B2B2C	**B2C Bizmod**	Voucher @wifi.id
				Voucher Homespot
				Voucher Wifi.id Gamer
				Wise Prepaid
				Wifi.id Seamless
	Wifi.id Internet Wholesale	B2B	**Carrier Segment, Usage Based**	Wifi Offload
				Wifi International Roaming in
			Enterprise Segment, User Based	Wifi Community
				Wifi Sponsorship
	Wifi.id Extra	B2B	**Cloud Based**	Mesh Wifi Wifi IoT Portal on Cloud Voucher on CLoud
			Ads & content based	Wifi Digital Advertising

Wifi Digital Touch Point

For end user

wifi.id GO
Connection Manager

Website
https://wifi.id

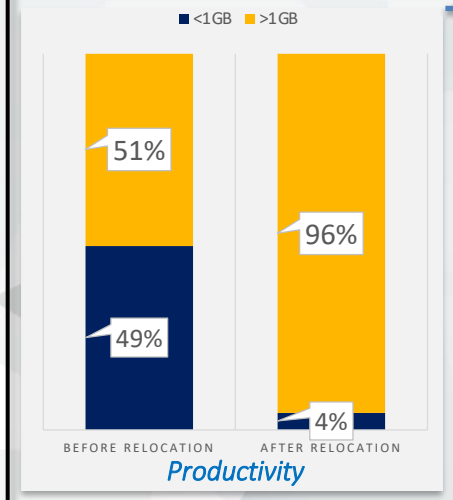
For venue owner

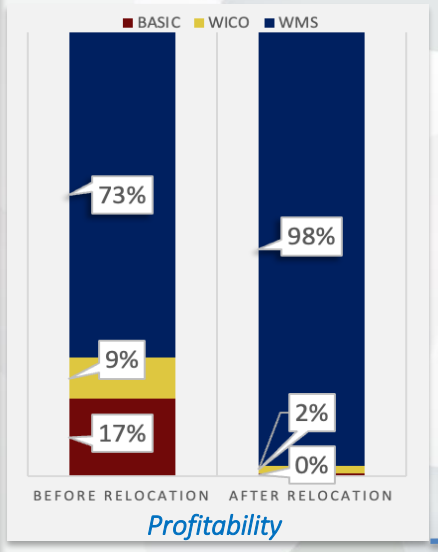
My wifi.id
Wifi.id Corner
WP GEN
VIOLET
DVO

Indonesia Wifi Innovation

Revitalization Program

Relocate low productive AP to a better business scheme or location

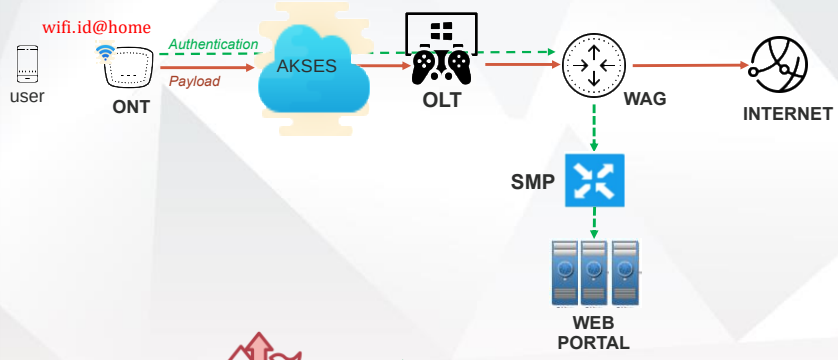




ARPU
22%

Homespot Product

Optimizing ONT for **telephony customers** based on fiber optics through **activating public wifi** services (SSID : wifi.id@home). The topology connect the ONT with wifi capability to OLT and directly to WAG for allocating IP address and redirect to portal engine (bring up the login page). Internet users can buy prepaid wifi vouchers to use wifi.id@home.

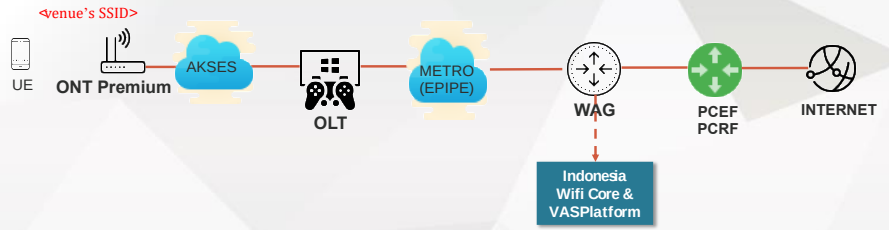


ARPU
1%

(shared ONT for voice & wifi)

Wifi.id Managed Service Lite Product

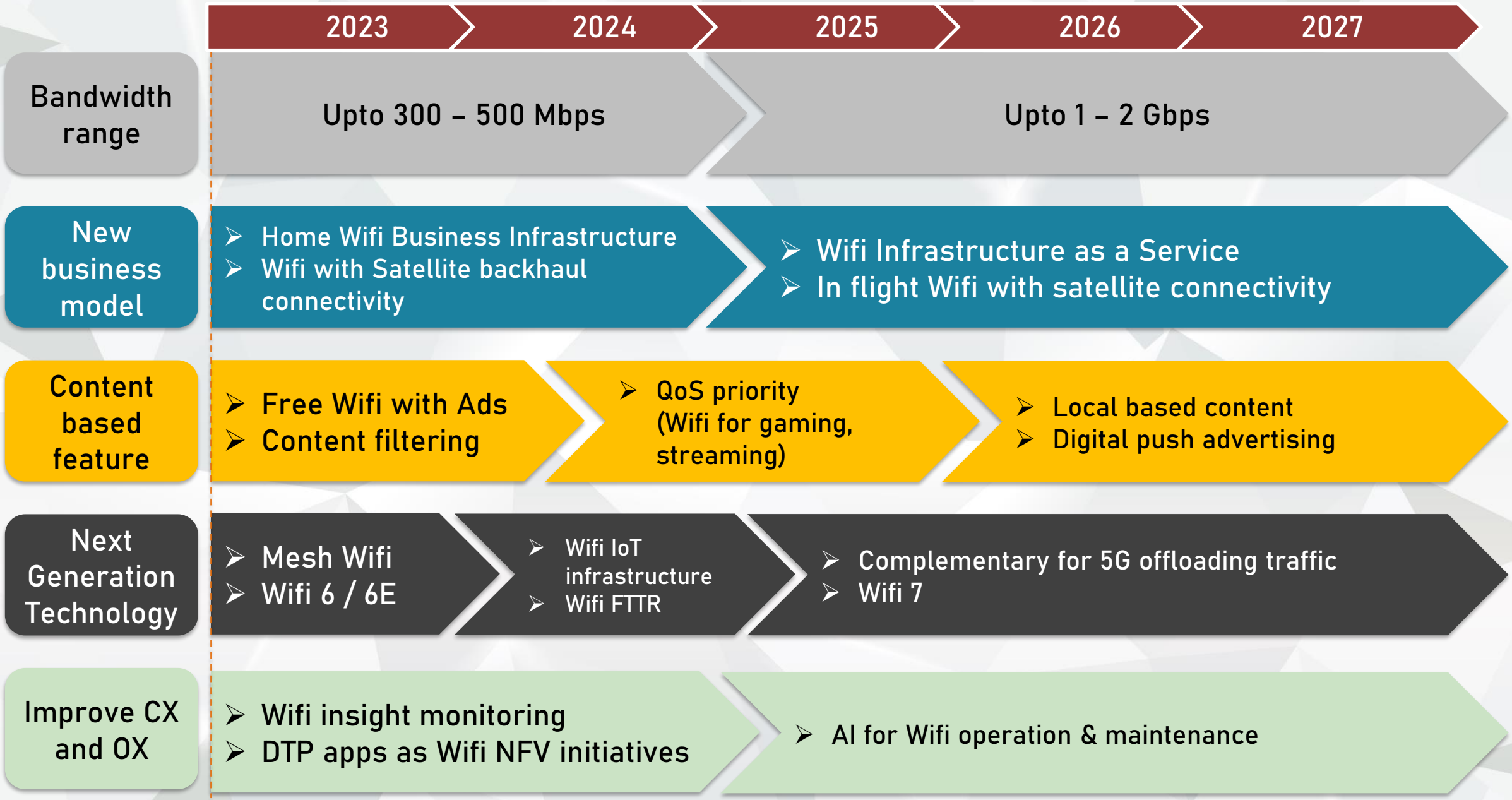
By maximizing the wlan feature, Telkom issued a standardization of **ONT specifications to replace the need for access points** by making OLT as a controller and directly integrated to the WAG. Each ONT can emit a different SSID according to the venue's wants and bring up a login page according to the venue's needs.
This breakthrough **reduce the cost** and **simplify the O&M** without reducing quality of experience. This is one of solution on how Telkom Indonesia adapts to the new normal where services **shift from public spaces to customer premises at a more affordable price**.



ARPU
27%

ARPU : Average Revenue Per Unit (Unit refers to Access Point or ONT Premium)

Indonesia Wifi Service Roadmap (2023 – 2027)




Telkom
Indonesia
the world in your hand
Thank You

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Bruno Tomás

CTO, Wireless Broadband Alliance

AFC For Wi-Fi 6E & Wi-Fi 7

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS BROADBAND ALLIANCE

AFC FOR WI-FI 6E & WI-FI 7

BRUNO TOMAS, WBA CTO

JAN 31ST , 2023

VERSION V1.0

Wi-Fi Unprecedented Growth

Market adoption of Wi-Fi 6 & Wi-Fi 6E

58% said 6 GHz plays a critical or very important role for their Wi-Fi strategy

High interest for Wi-Fi 6 & 6E
83% have deployed or planning to do it in 2022

OpenRoaming & Wi-Fi Roaming

Wi-Fi Security, Privacy and Identity management across verticals

Growth of OpenRoaming & Passpoint
40% already deployed or plan to deploy in 2021

Next Generation Wi-Fi & New Capabilities

56% are more confident about investing in Wi-Fi in the coming years

Wi-Fi Sensing, Mesh Wi-Fi, Wi-Fi 7, Wi-Fi HaLow, AFC, IoT, OpenWiFi

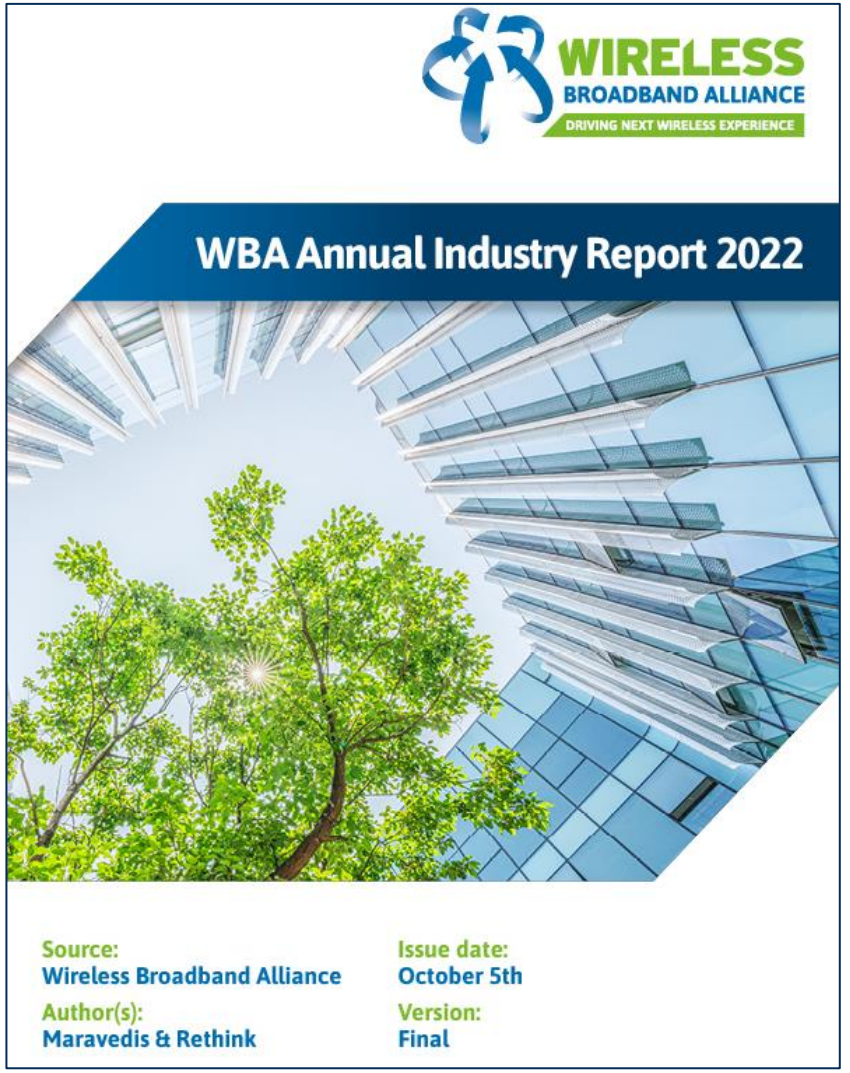
Cellular & Wi-Fi Convergence

Wi-Fi experience becoming more deterministic, QoS / QoE, OpenRAN, HetNet

98% aimed to implement both 5G and Wi-Fi 6, and 39% aimed for integration

WBA Annual Industry Report 2022

wballiance.com/resource/wba-annual-industry-report-2022



Unleashing Opportunities Across Verticals With AFC

Lead the development of ***"Seamless and interoperable services experience on Wi-Fi within the global wireless ecosystem" ...***

5G Work Group

Leading Wi-Fi and 5G RAN Convergence

IoT Work Group

Augmenting Wi-Fi role in IoT

NextGen Work Group

Fast-tracking Wi-Fi deployments for operators

Roaming Work Group

Incubating new business opportunities

Testing & Interop Work Group

Achieving interoperable Wi-Fi services

WBA WORK GROUPS

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

Certification Task Group

Addressing interoperability to foster adoption

More Information about WBA projects - https://wballiance.com/what-we-do

Wi-Fi 6 & 6E Trials Program – Global Demand

WIRELESS BROADBAND ALLIANCE

non-exhaustive

+20 Trials across the globe on Wi-Fi 6 / 6E

Chipset and Infrastructure Equipment

CISCO · Extreme · BROADCOM

End User Equipment

SAMSUNG · intel

Smartphones

Laptops

Coordinated trials execution with reporting across use cases

Entertainment (Stadia)

AT&T

Transportation Hub

boingo · COMCAST

Residential (Single and multi units)

CableLabs · kt · Türk Telekom

Industrial

METTIS AEROSPACE · T-Mobile · linktel

Smart Villages/ Last mile

C-DOT · BOFINET

Smart Cities (Outdoor)

SK telecom · BORDEAUX MÉTROPOLE · WIONGO · CITC

WIRELESS BROADBAND ALLIANCE

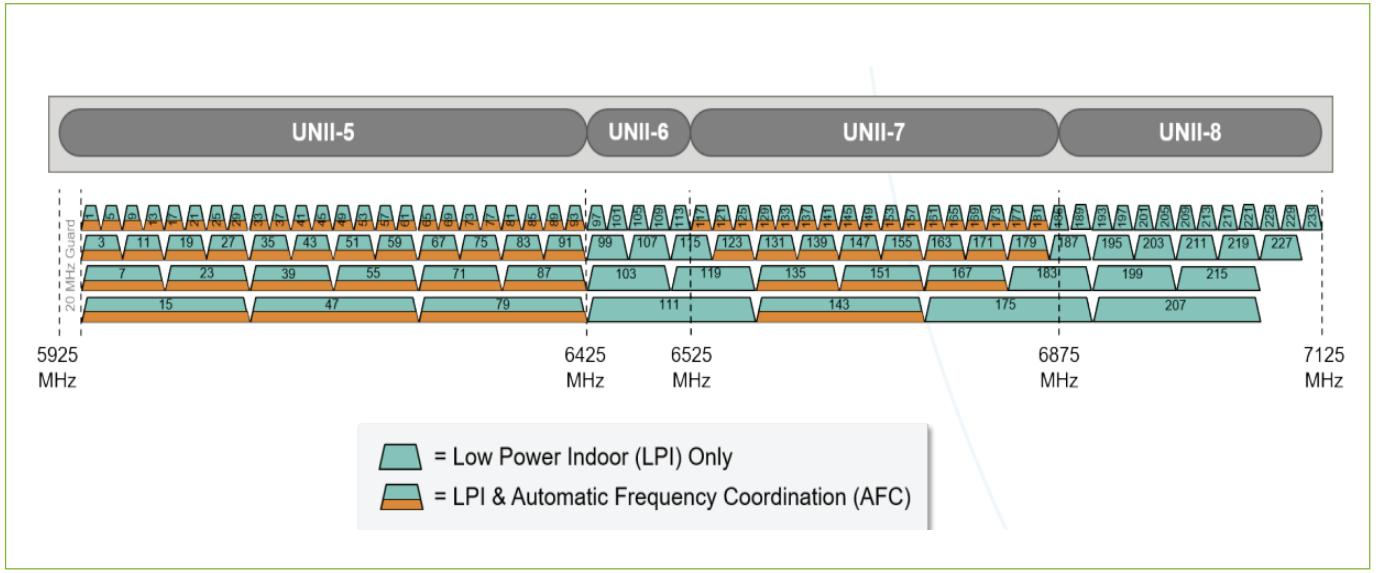
WBA AFC PLATFORM

Work Program Overview

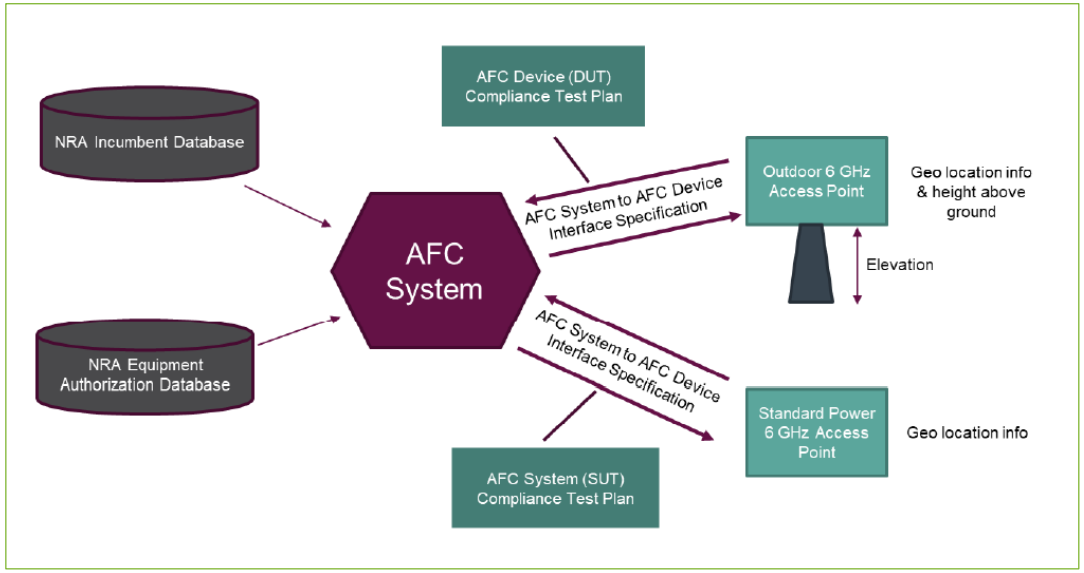
AFC Scope and Building Blocks

- 6 GHz available **outdoors will require a spectrum database solution called an automatic frequency coordinator (AFC).** For successful introduction of 6 GHz the industry need to complete the technical and regulatory work to permit AFC operations to commence, based on **each country regulator specific rules**.
- Channel availability is further **dependent on what incumbents are operating nearby**. In most metro areas in the U.S., there are hundreds of incumbents, meaning that the AFC may report completely **different channel availability on a block-by-block basis**.
- It is assumed AFC Operators will play a pivotal role in guaranteeing the **ecosystem performs in line with established rules and procedures**, and align with **broader stakeholders' objectives, on an independent setting.**

Allowed Outdoor AFC Channels in the US (Orange Stripes)



AFC System Architecture



Sources: FCC, Wi-Fi Alliance, Aruba HPE, WBA Industry Report

WBA Leadership on 6 GHz Wi-Fi & AFC

Industry Progress

Future Wi-Fi Generations Scoping

- IEEE Wi-Fi 6E & Wi-Fi 7 Standards
- WFA Certification Program
- WFA & Open AFC Specifications
- Regulatory work on 6 GHz rules & procedures

Industry Milestone

Global Action on AFC & Deployments

- FCC opened a call for candidates to run AFC in US
- Global countries expected to follow US soon, with Korea, Canada on the forefront
- All incumbents' operators and Wi-Fi vendors should get involved

AFC

Critical development for the success and deployment of 6 GHz wireless technology

WBA Actuation

Commercialization Work

- Operator deployment guidelines
- Test plans & field trials across verticals
- Close cooperation and submissions to regulators globally (e.g. CITC 6E Trial)

WBA is developing an AFC system based on Open AFC and open to present candidatures globally

Open AFC

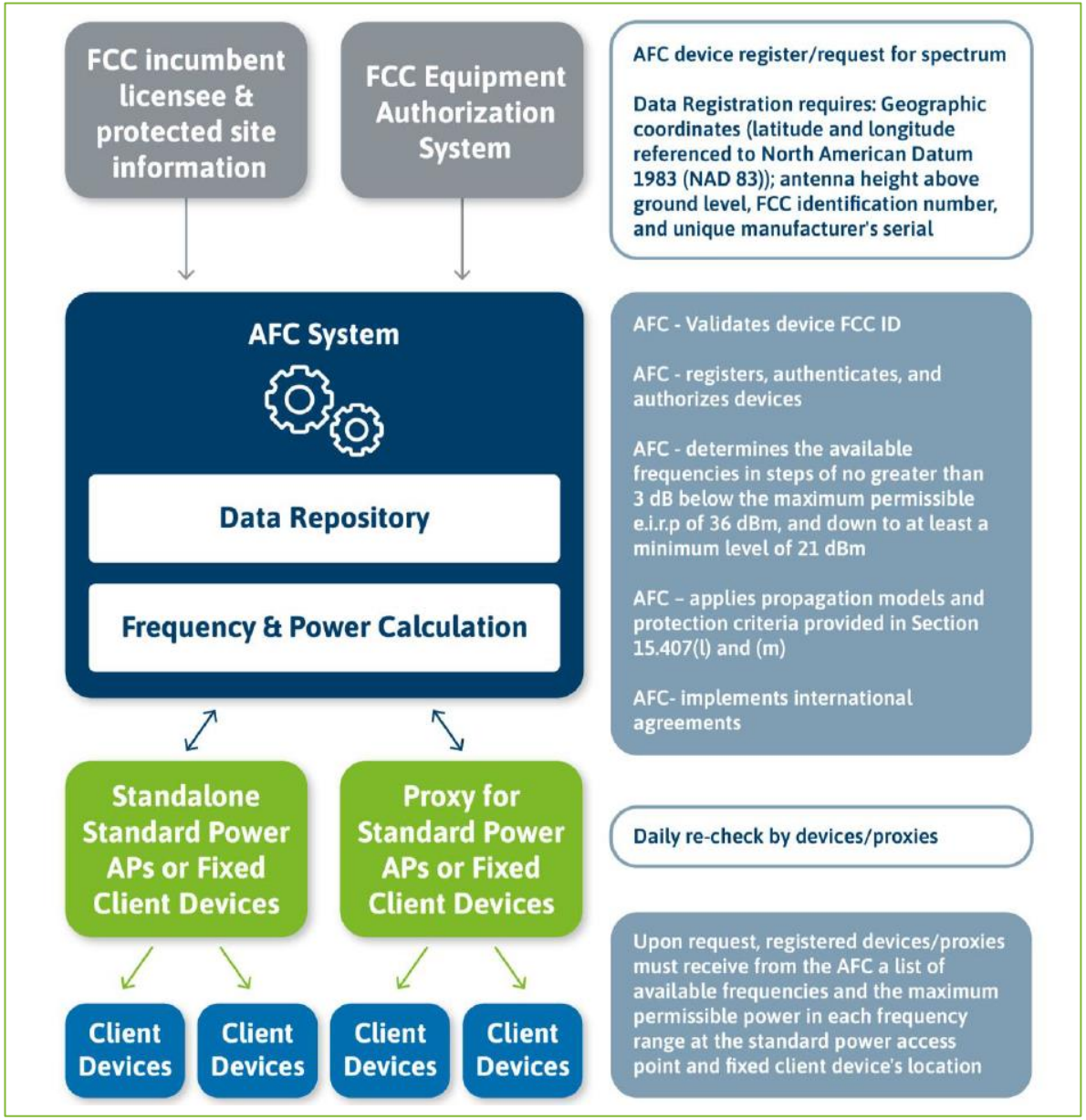
- WBA has a large community of operators, chipset vendors and AP vendors – the key players to make AFC work
- All incumbents' operators and Wi-Fi vendors should get involved now

WBA is eager to make AFC, Wi-Fi 6E and Wi-Fi 7 successful, and will be championing this work globally

WBA Open AFC System Solution

WBA proposed AFC system follows Open AFC specification available through the Telecom Infra Project (TIP)

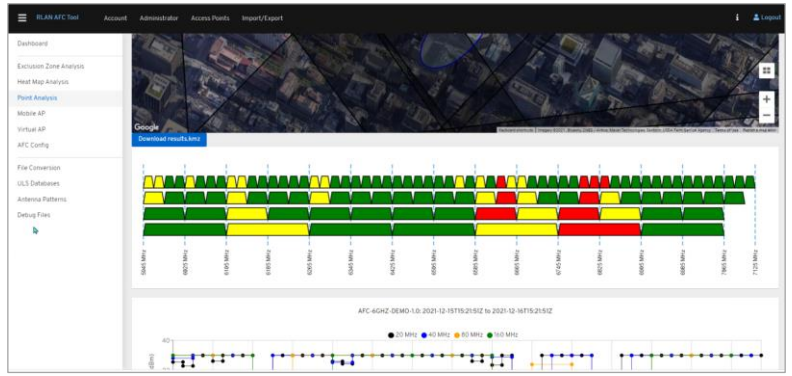
- WBA's proposed AFC System will comply with the requirements and core functions described in Section 15.407(k) of the Commission's rules and the 6 GHz Report and Order
- AFC system implements a series of rules aligned with AFC regulatory requirements/key elements for AFC calculations
- AFC system includes geolocation capability from associated devices
- AFC system provide Standard Power registered devices both available frequencies and associated maximum transmit power levels - This will guarantee unlicensed operations in the U-NII-5 and U-NII-7 bands



Open AFC System Architecture

OpenAFC Tool Frontend

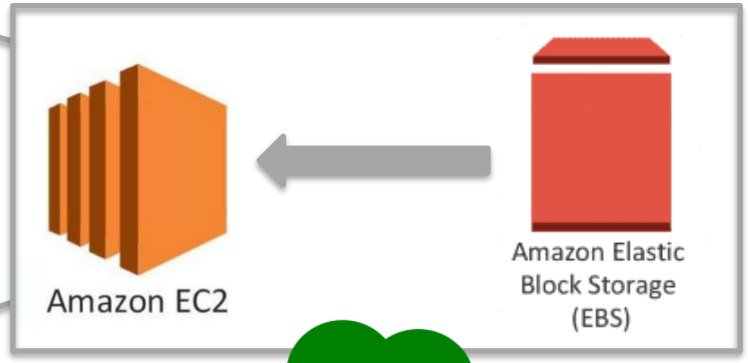
Accessible through https (custom domain)

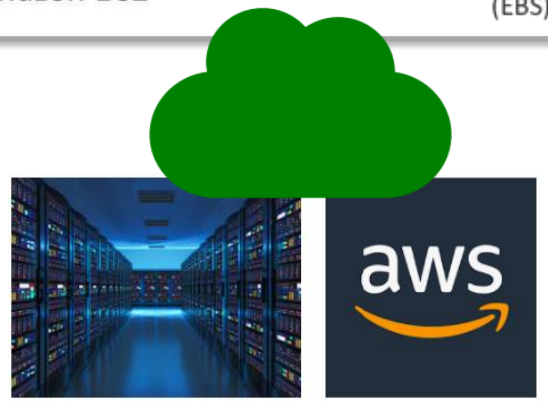


https

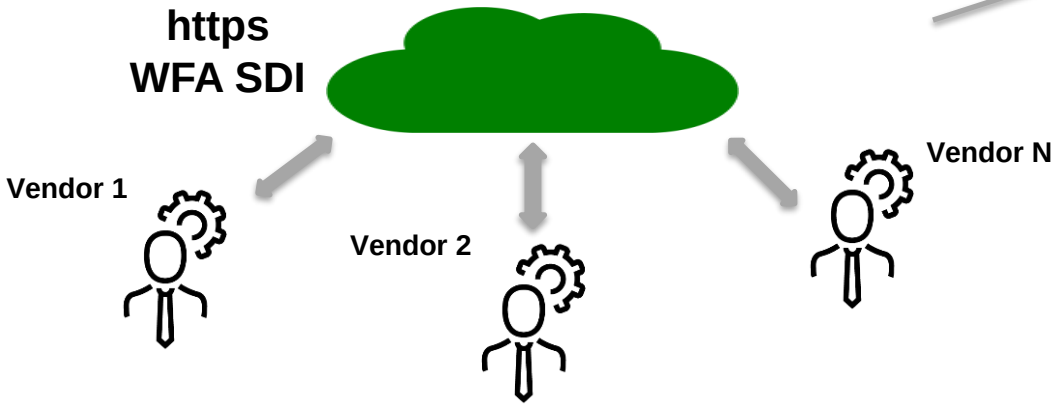
Virtual Machine running the Platform

Drives mounted with databases info (FCC and other complementary data)

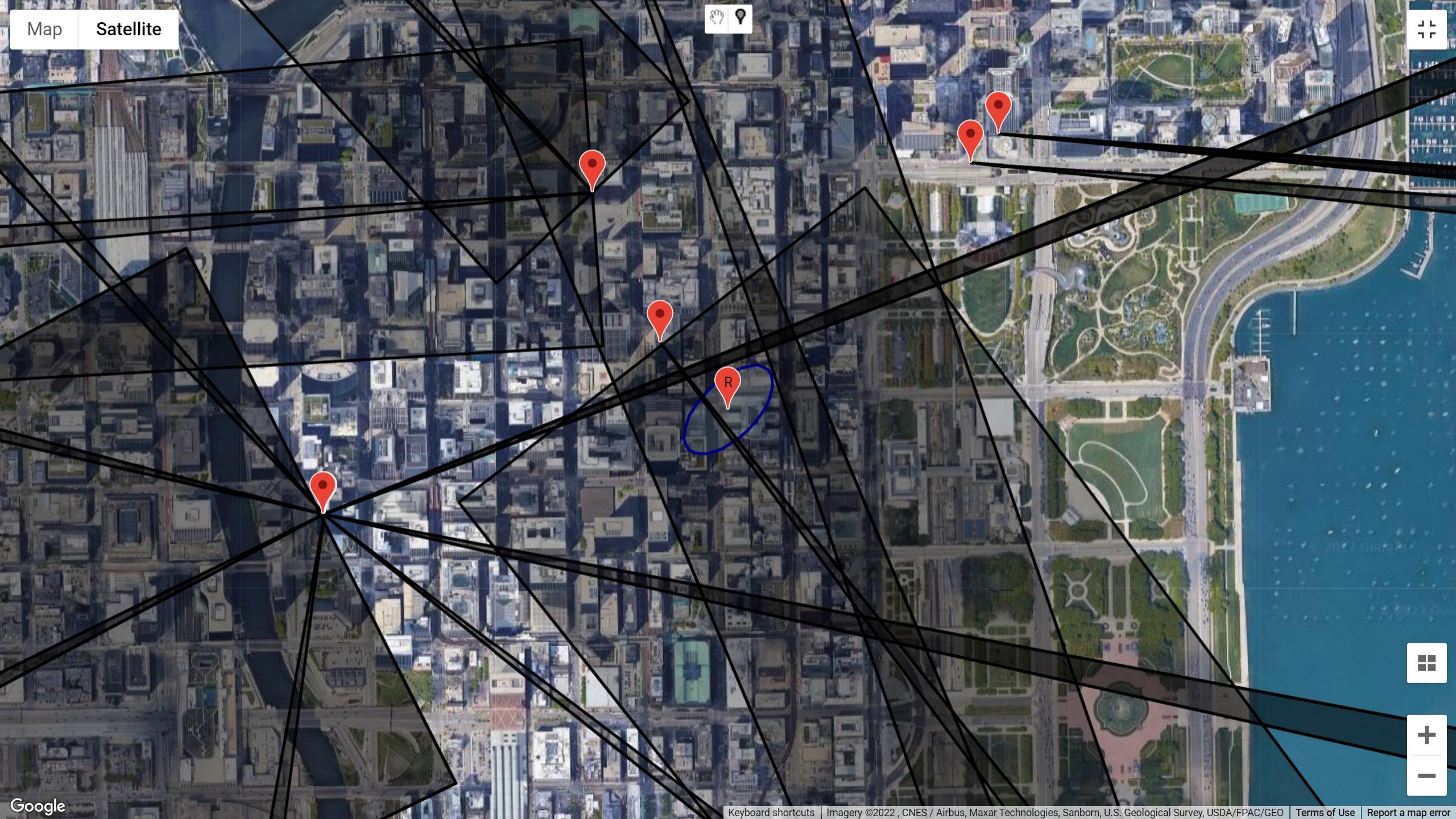


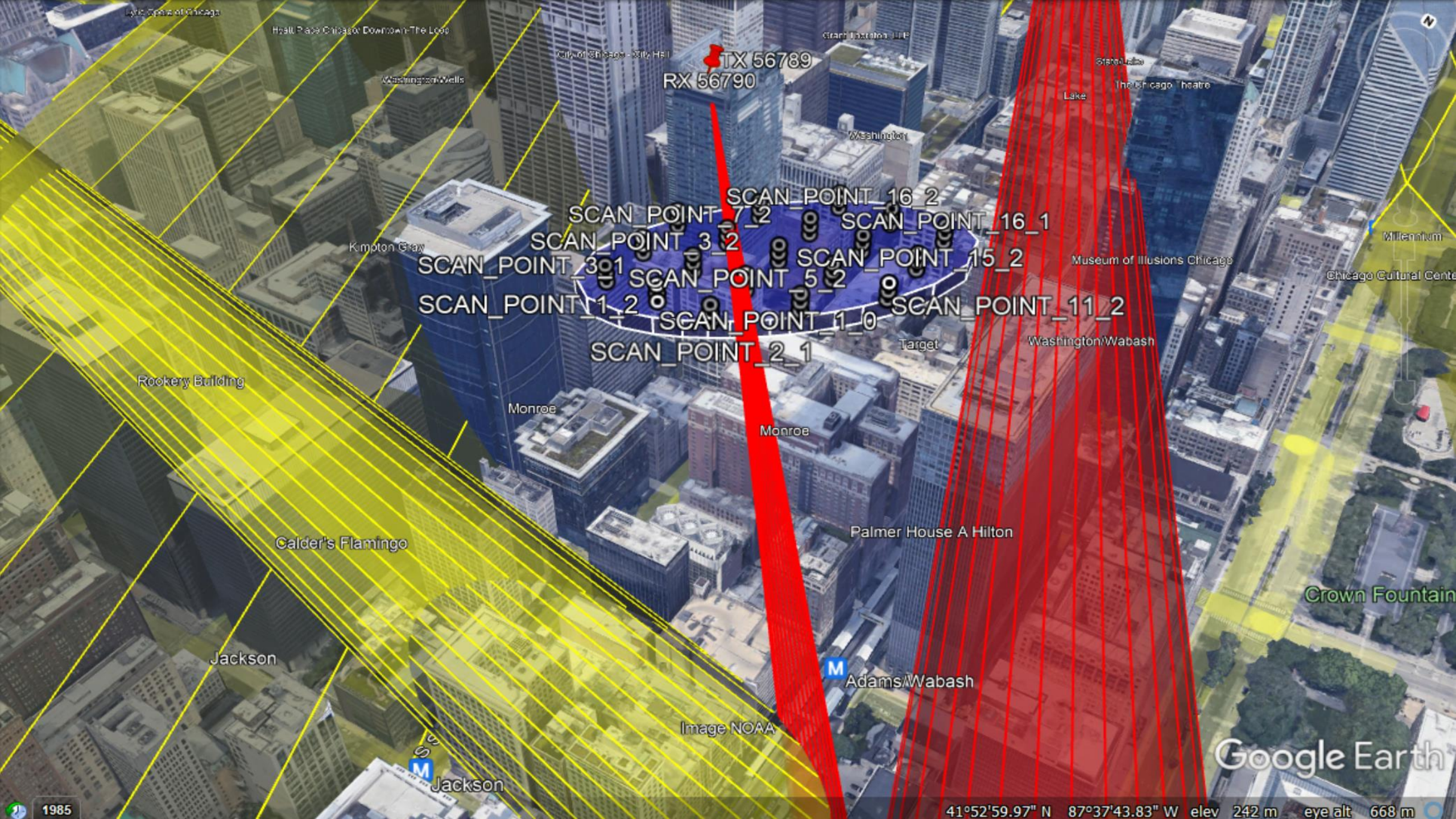


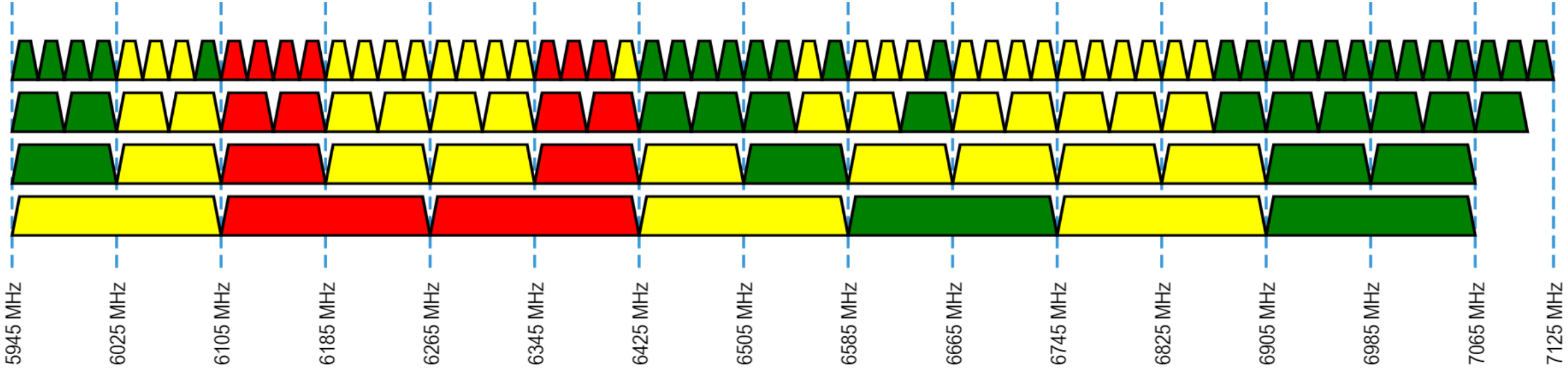
Data center running server instance high processing power and redundancy (type c5.4xlarge)

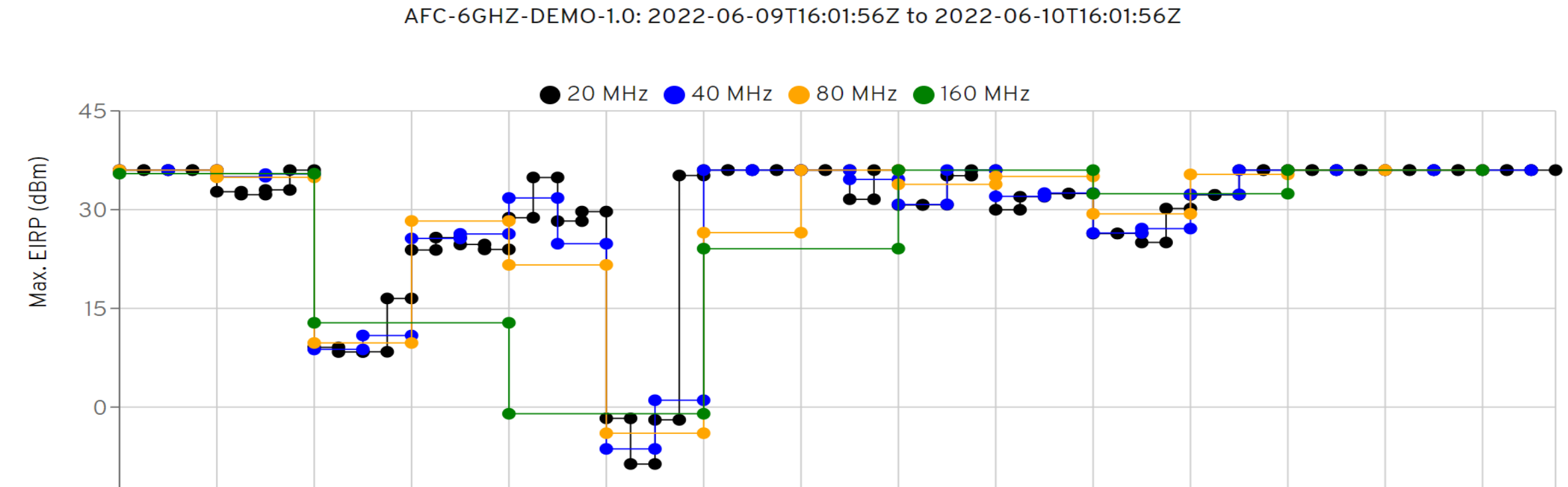


Possible to set up hosts based on domain


Map
Satellite
R
Google
Keyboard shortcuts
Imagery ©2022 , CNES / Airbus, Maxar Technologies, Sanborn, U.S. Geological Survey, USDA/FPAC/GEO
Terms of Use
Report a map error


TX 56789
RX 56790
SCAN_POINT_16_2
SCAN_POINT_7_2
SCAN_POINT_16_1
SCAN_POINT_3_2
SCAN_POINT_15_2
SCAN_POINT_3_1
SCAN_POINT_5_2
SCAN_POINT_1_2
SCAN_POINT_11_2
SCAN_POINT_1_0
SCAN_POINT_2_1
Kimpton Gray
Museum of Illusions Chicago
Millennium
Chicago Cultural Cente
Target
Washington/Wabash
Rookery Building
Monroe
Monroe
Palmer House A Hilton
Calder's Flamingo
Crown Fountain
Jackson
Adams/Wabash
Image NOAA
Jackson
Google Earth
1985
41°52'59.97" N 87°37'43.83" W elev 242 m eye alt 668 m


5945 MHz
6025 MHz
6105 MHz
6185 MHz
6265 MHz
6345 MHz
6425 MHz
6505 MHz
6585 MHz
6665 MHz
6745 MHz
6825 MHz
6905 MHz
6985 MHz
7065 MHz
7125 MHz


AFC-6GHZ-DEMO-1.0: 2022-06-09T16:01:56Z to 2022-06-10T16:01:56Z
20 MHz
40 MHz
80 MHz
160 MHz
Max. EIRP (dBm)
45
30
15
0

Join the AFC Tiger Team & Participate on Trials

End - 2021 ✓

- Tiger team develops the WBA Application
- Submission to the FCC

2022 ✓

- WBA Open AFC Platform beta available for public trials with 6 GHz equipment

Q2-2023 

- Prepare for public trials (Wi-Fi 6E commercial and Wi-Fi 7 beta)
- Follow regulators certification progress

- Tiger team working on a fully functional Open AFC system platform
- Field trials with Vendor OEM and verticals partners

Immediate Engagement Opportunities

Active work group meeting regularly (e.g. Broadcom, Cisco, Meta, Intel, MaxLinear, Extreme Networks)

Scope your own testing environment and trial WBA Open AFC platform

Leverage WBA 6 GHz live trials platforms working with regulators globally

Thank you

Bruno Tomas

bruno@wballiance.com

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Dr. Necati Canpolat

Sr. Staff, Next Generation and Standards, Intel Corporation

Wi-Fi 7 and Federated Onboarding Service Projects

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Wi-Fi 7 and Federated Onboarding Service Projects

Chair: Necati Canpolat (Intel)

Announcing the WBA Wi-Fi 7 Kick off!!!

Wi-Fi 7 Standards, Certification and Industry Status

- IEEE 802.11be
  - Latest draft is P802.11be_D2.3.
  - Working on comment resolutions
- WFA Wi-Fi 7
  - Going thru plug fests
  - Expecting certification launch end of the year
- Industry and Wi-Fi 7
  - Early pre-certification product announcements
  - Interops between some vendors

Wi-Fi 7 Program

Objectives:

Drive global Wi-Fi 7 adoption

- Develop marketing material for Wi-Fi 7 advocacy
- Provide a platform for Wi-Fi 7 trials
- Develop testing Wi-Fi 7 capabilities in real-life networks/applications
- Execute the trials
- Report the results
- PRs

Previous Wi-Fi 6/6E Work

The trials spanned all around the world and across multiple market segments such as:

- Industrial IoT/Manufacturing
- Residential,
- Transportation
- Public Venues
- Education
- Enterprises

Executed the trials

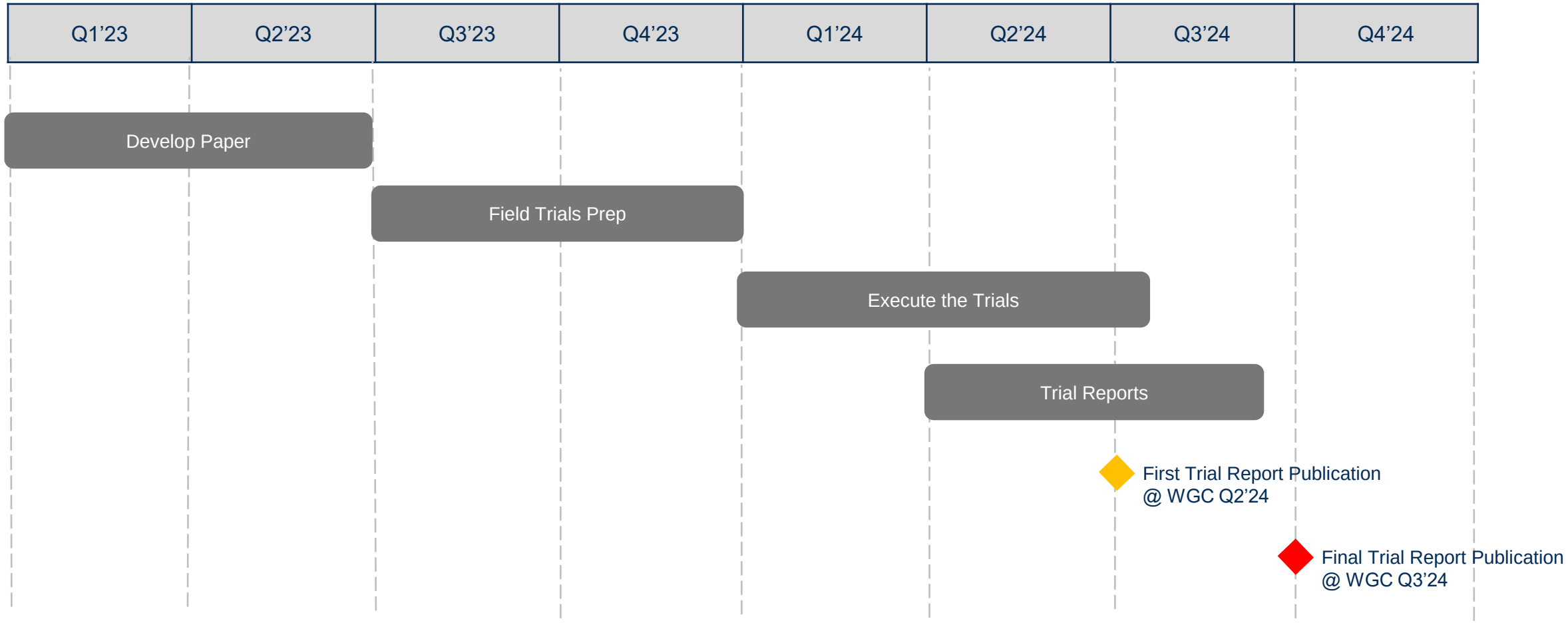
Reported the results

PRs

Wi-Fi 7 Work Phases

- Phase 1: Develop a Paper
- Phase 2: Field Trials Prep
- Phase 3: Setup the trials
- Phase 4: Execute the trials
- Phase 5: Report the results
- Phase 6: PRs

Timeline for Wi-Fi 7 Phases



Get Ready for Wi-Fi 7!

Federated Onboarding Service Project

Federated Onboarding Service Project

Roaming and onboarding are two big challenges for public Wi-Fi network access for many years

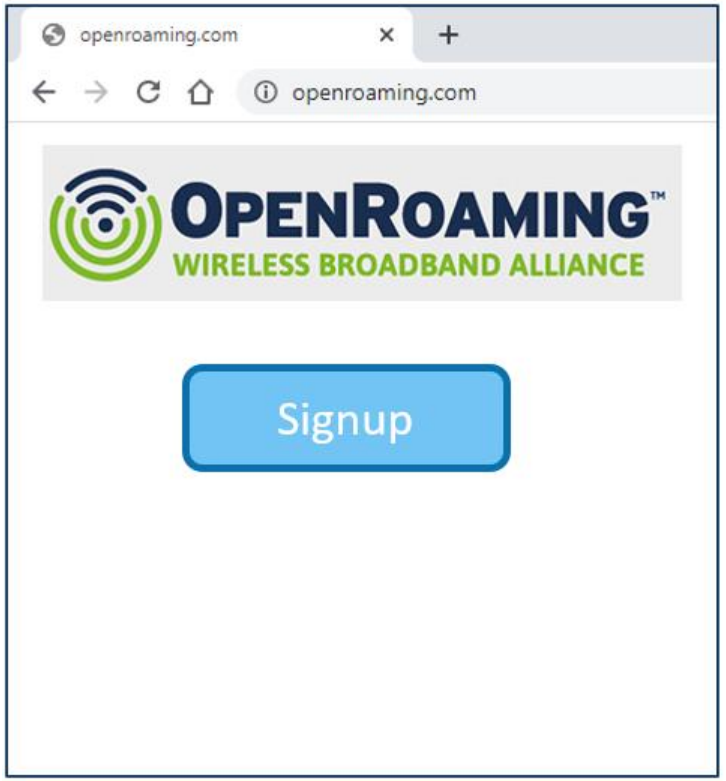
Roaming: Bilateral roaming agreement is a long and tedious process involving technical, business, financial and legal steps. With hundreds of thousands of providers it is very difficult to enable bilateral roaming. OpenRoaming is addressing the issue.

Onboarding: To ensure the success of OpenRoaming, we need to address onboarding of devices/users

WBA's Federated Onboarding Service work aims to:

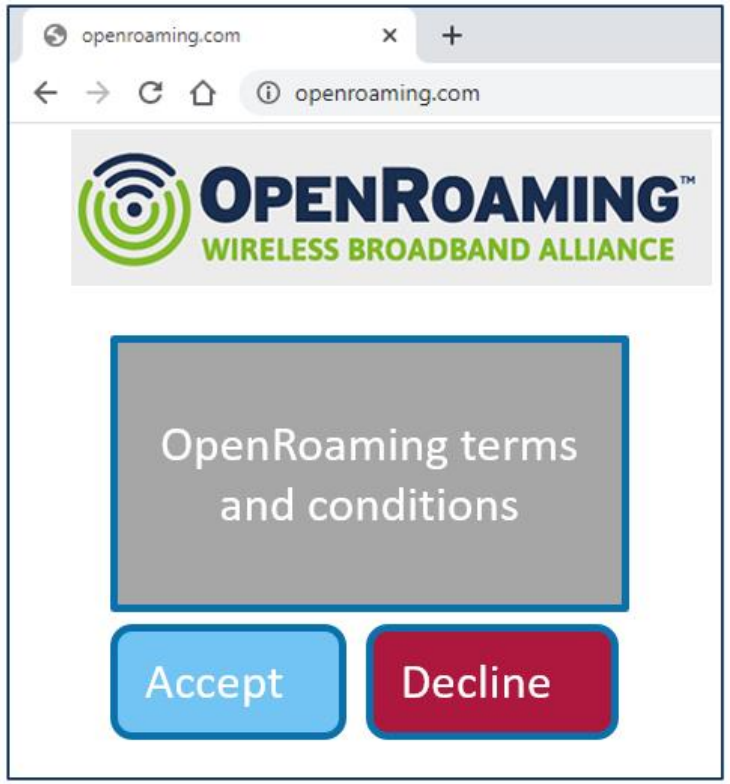
- Develop use cases and requirements to address the market needs
- Develop technical specification on which we can enable the federated onboarding/authentication service

Use Case-1: Remote Onboarding for OpenRoaming

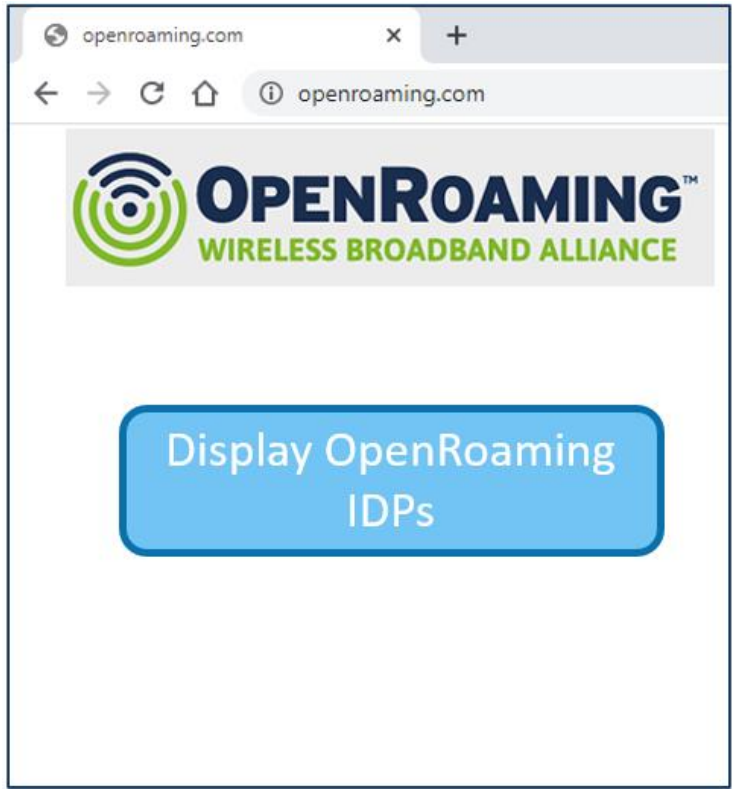


- Jane is at home and her laptop is connected to Internet
- She wants to sign up with WBA OpenRoaming to connect to Wi-Fi networks when she is outside of her house
- She launches her browser and goes to “OpenRoaming” portal
- OpenRoaming portal page has a “Signup” button.
- She clicks on it

Use Case-1: Remote Onboarding for OpenRoaming



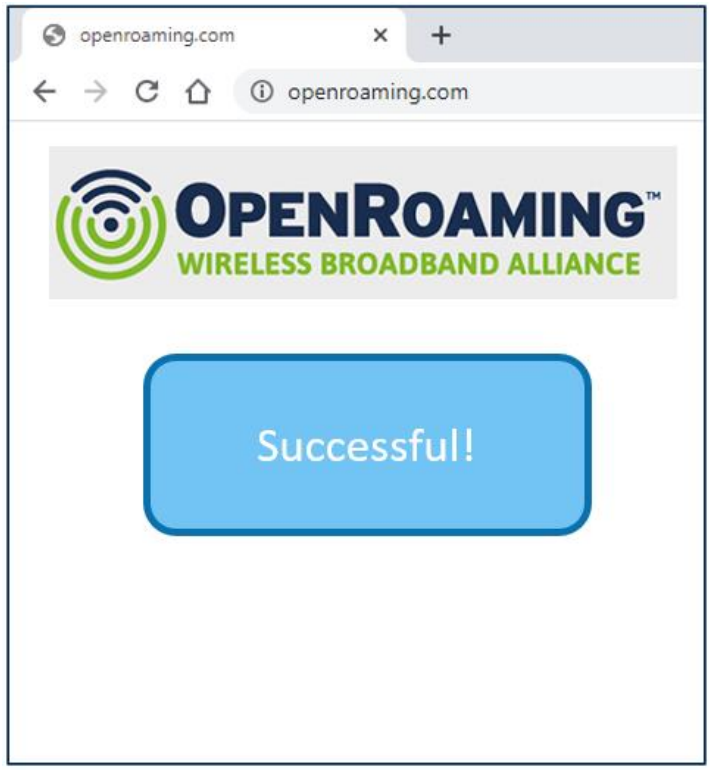
Jane is prompted to accept the OpenRoaming terms and conditions.
She accepts it.



She selects an IDP which she already has an established account

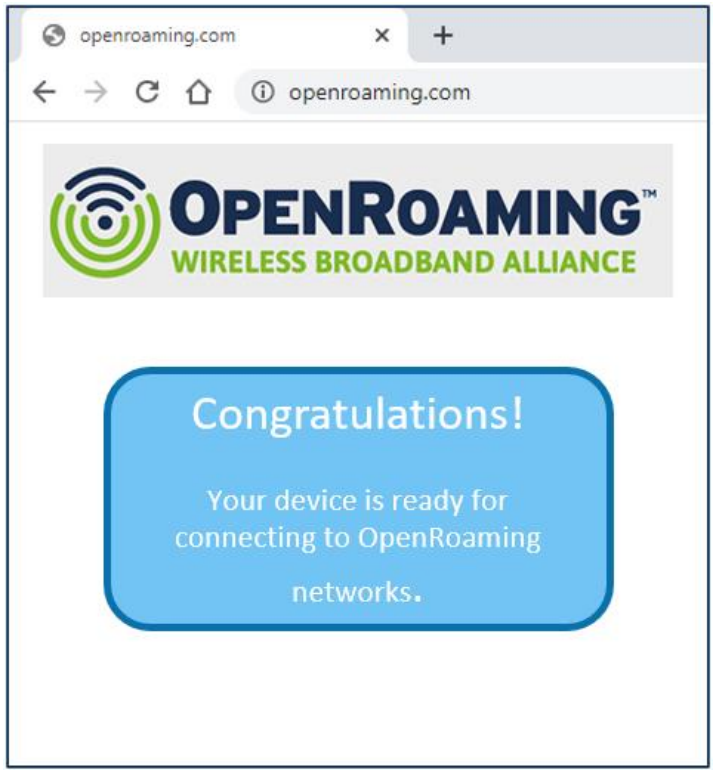
The OR portal prompts her to sign in with her IDP
Using her already established credentials

Use Case-1: Remote Onboarding for OpenRoaming



Jane is validated by her IDP.

An OpenRoaming profile for her operating system on her laptop is created.



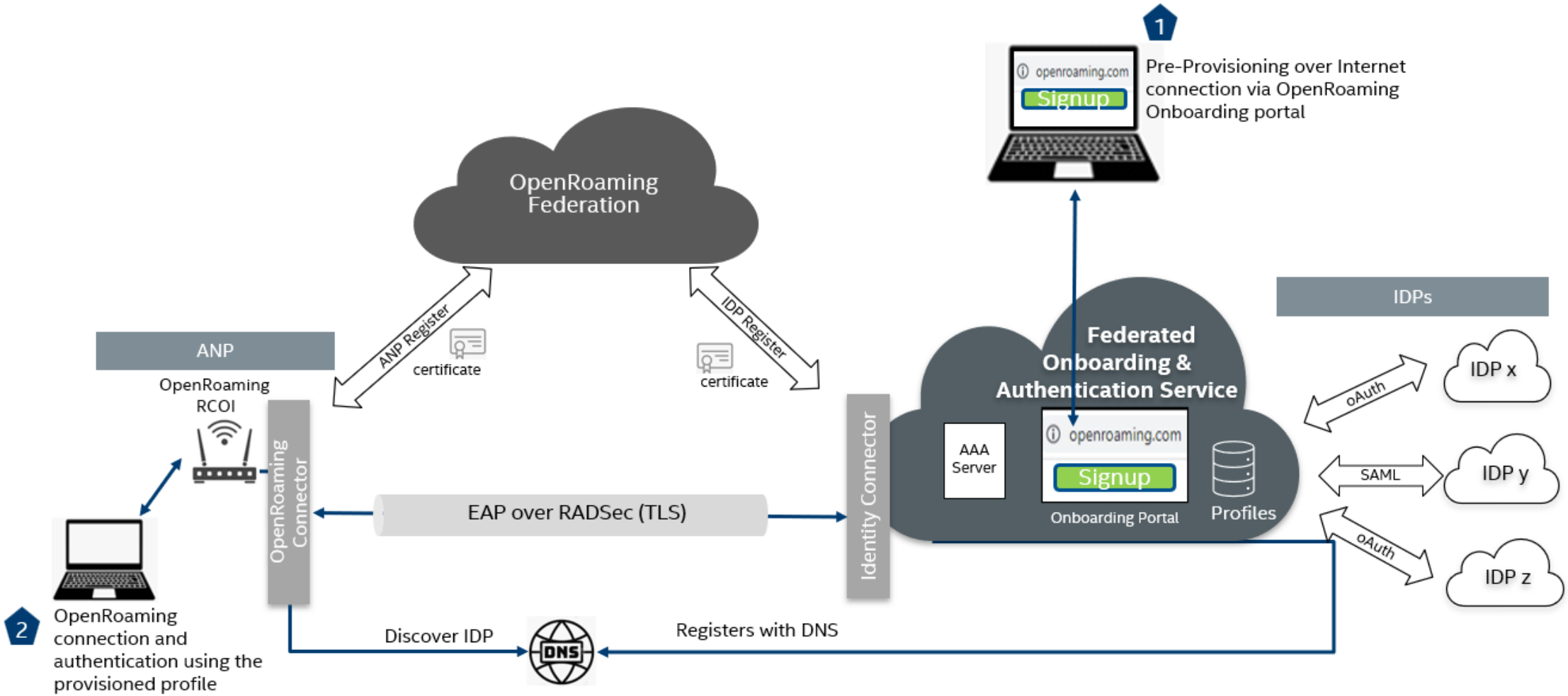
OpenRoaming profile is installed on Jane's laptop using the network setup API supported over the portal.

Jane's laptop is ready for connecting to OpenRoaming networks in the future.

Use Case 2: Federated Authentication for OR

- We have many organizations that can perform user authentications such as:
  - social Media – Facebook, LinkedIn, Twitter…
  - emails – gmail, hotmail….
  - loyalty memberships…
  - retails…
  - others
- They can be an IDP of OpenRoaming
- Users can connect to OpenRoaming networks using credentials from these organizations

Federated Onboarding and Authentication Service Architecture



Come and Join Us!!!!

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Ed Kyte

Airline Propositions Manager, Inmarsat

Wi-Fi Experience for Moving Networks

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

Wi-Fi Experience for Moving Networks

January 2023

BUILT TO FLY

inmarsat AVIATION

Inmarsat Introduction

Market Leading for Generations

30 years in aviation

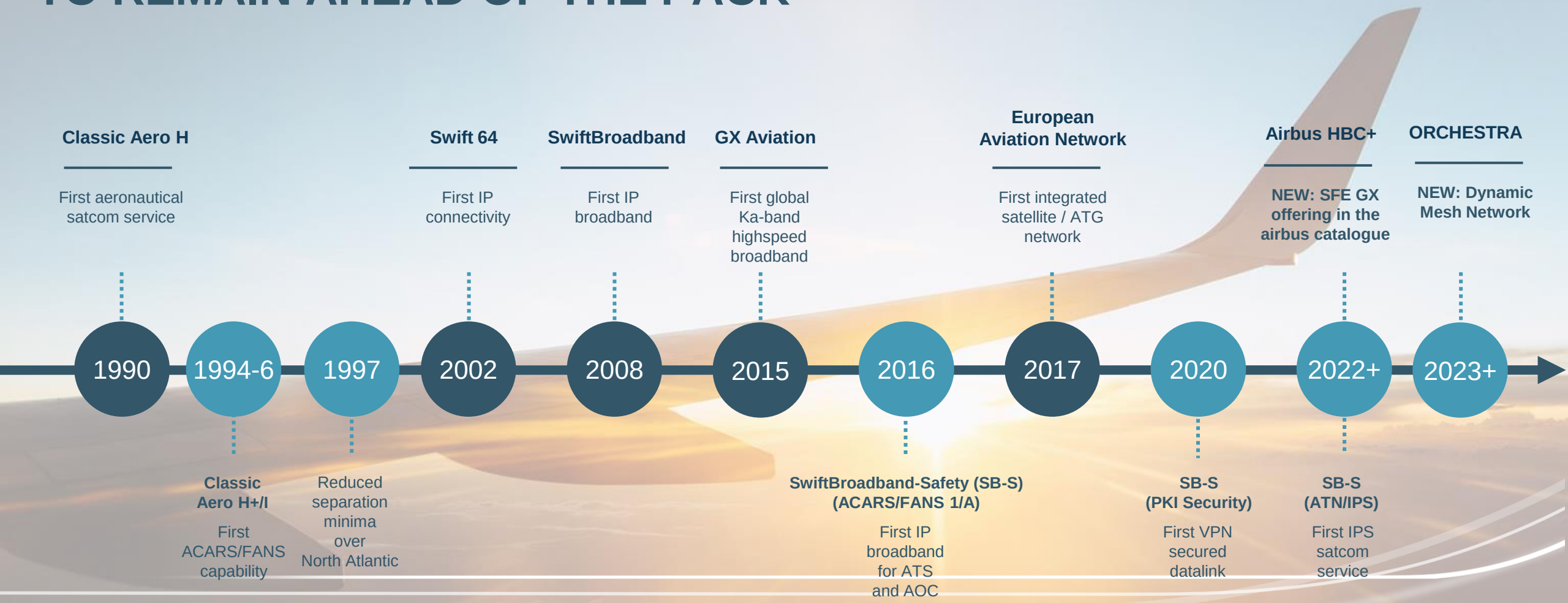
200 airlines & over 12,000 aircraft

Safety, Operational & Cabin

Rapidly growing Satellite Network

GX Aviation & EAN: 800+ aircraft flying today

30+ YEARS OF CONSTANT INNOVATION TO REMAIN AHEAD OF THE PACK



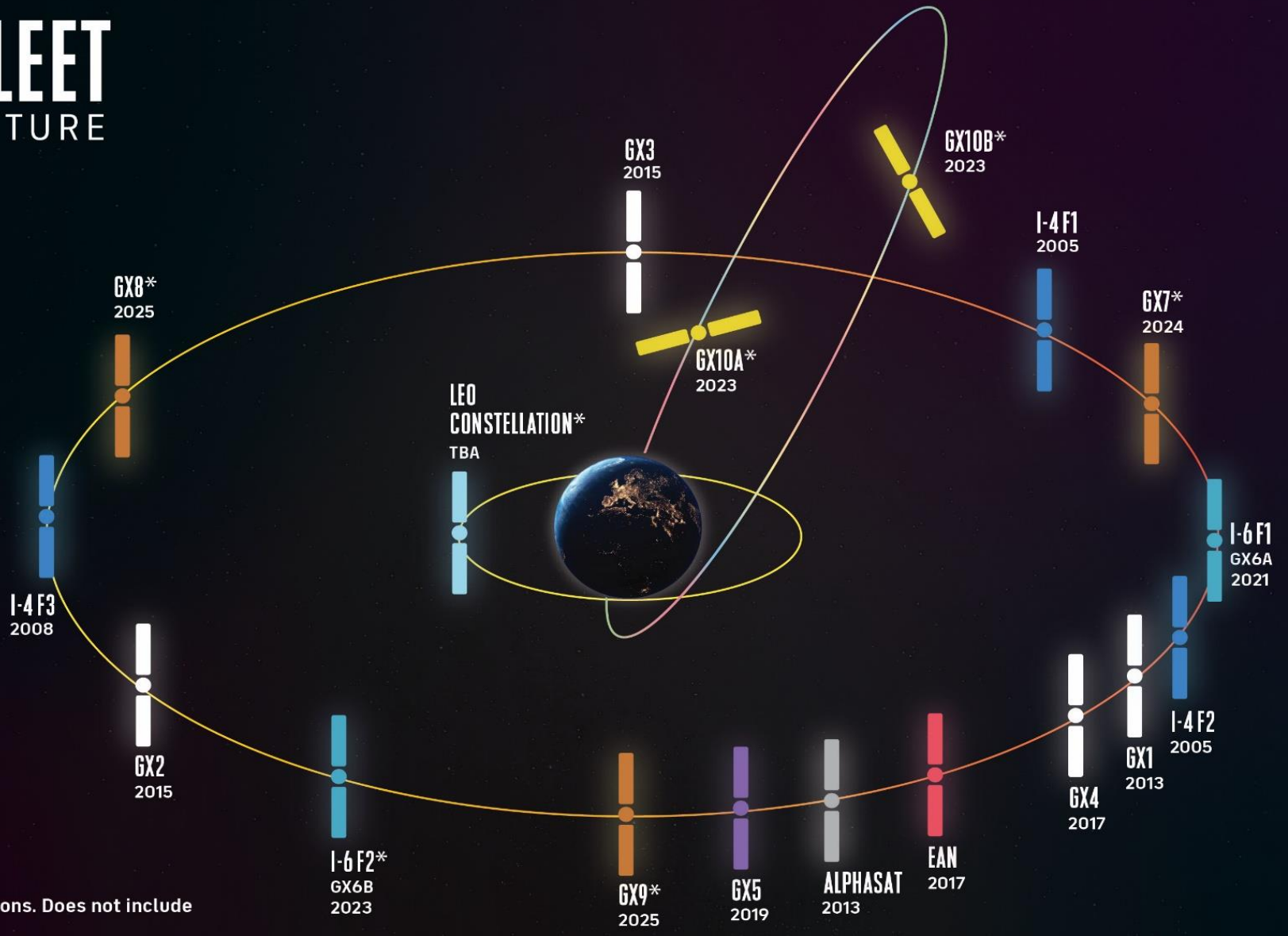
BUILT TO FLY

inmarsat AVIATION

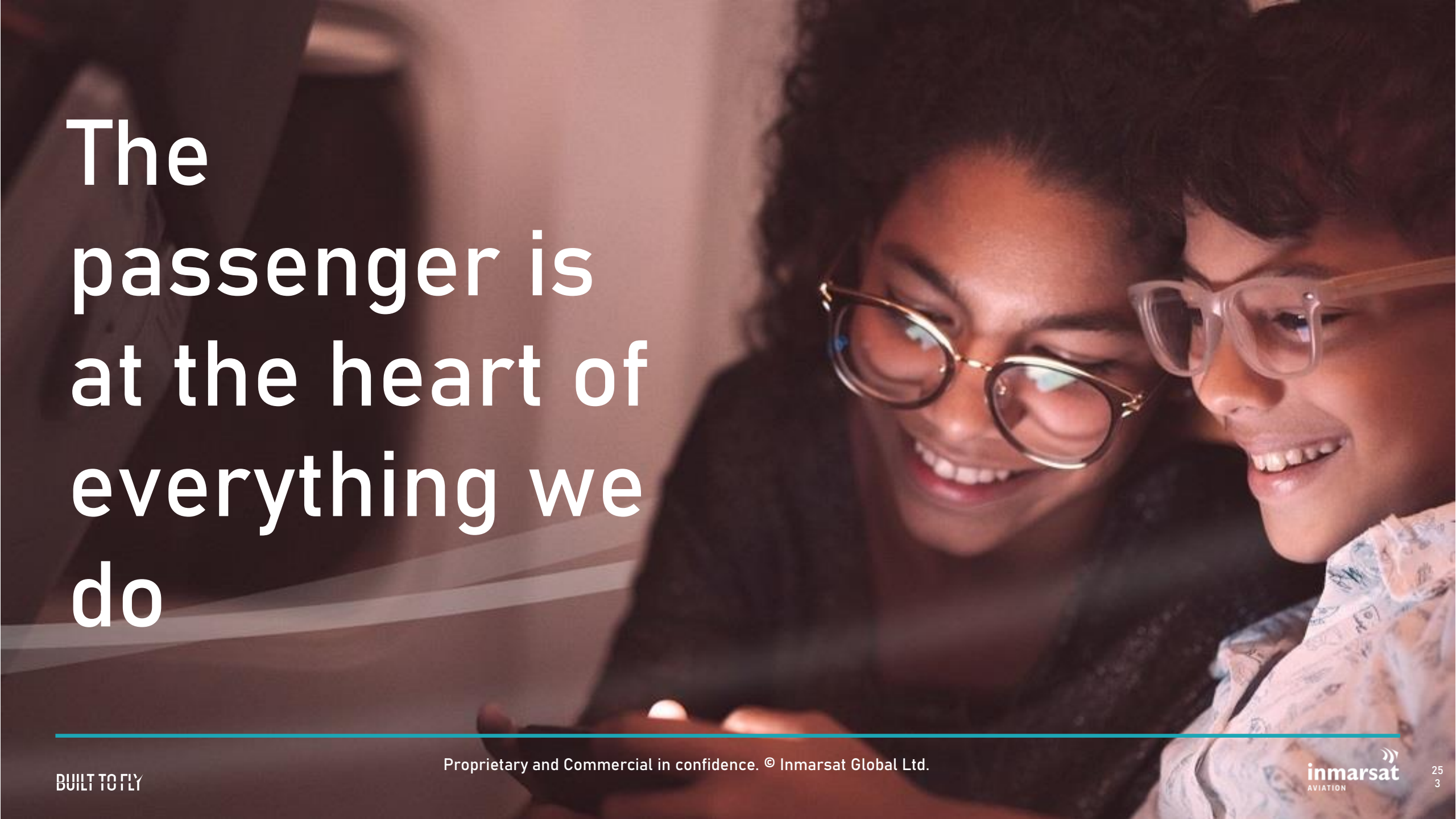
SATELLITE FLEET
CURRENT AND FUTURE

Updated: 24-02-22

inmarsat

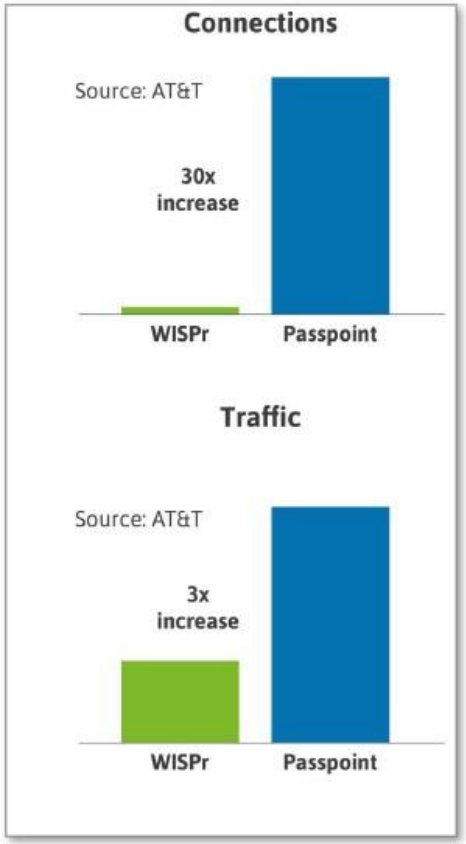


Please note: these are indicative positions. Does not include narrowband backup satellites.
*Future locations and dates subject to change.



WBA wants to solve the same problems as Inmarsat

- People travelling want to stay connected
- Friction in the passenger journey can prevent this
- The experience to connect can reduce take rates
- The passenger connection experience needs to be easy
- Passpoint is the best way to do this



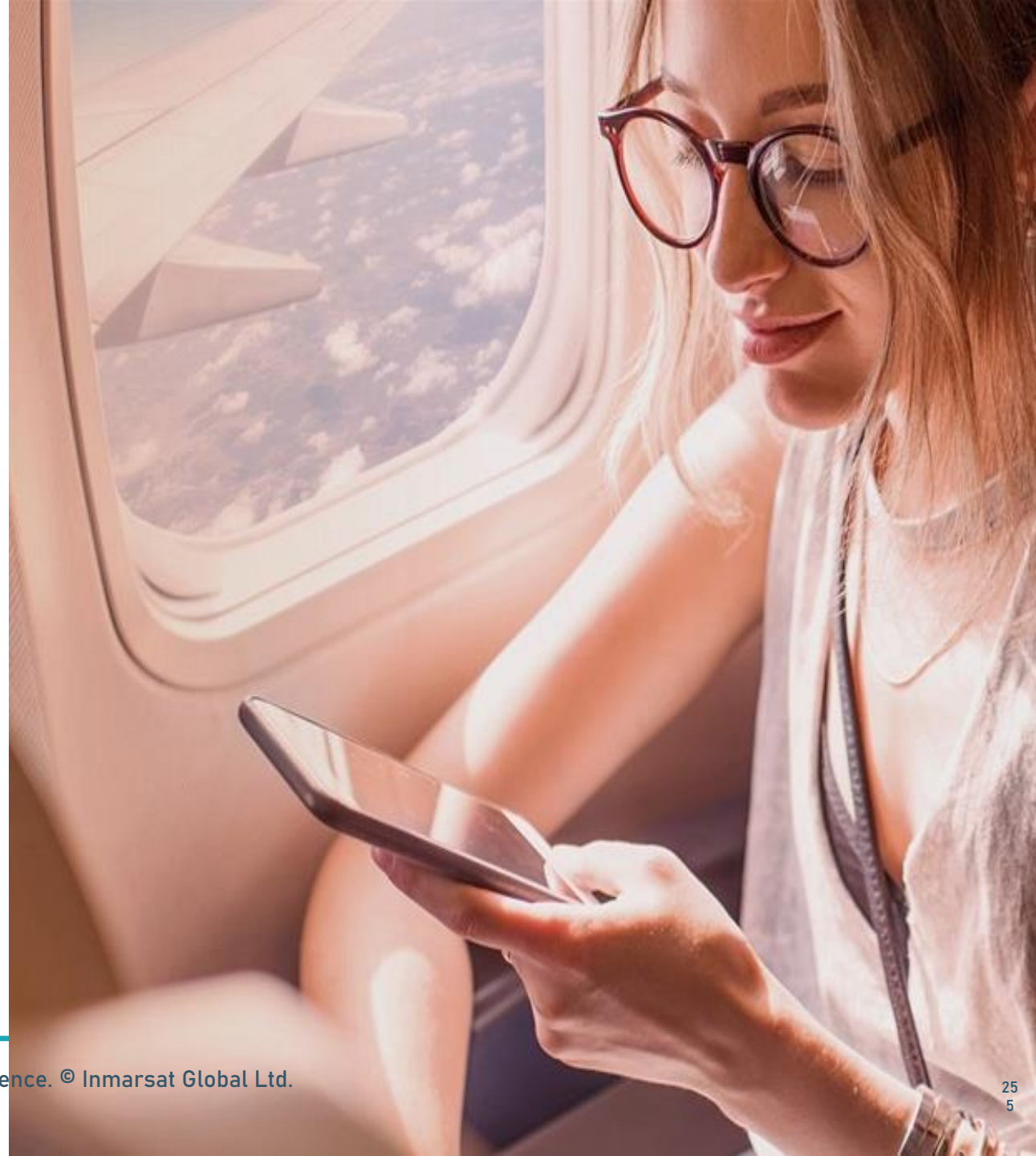
2022 In-Flight Activities

- Our new Whitepaper was released in October

In-flight Wi-Fi is a nightmare, but fixes could be on the way

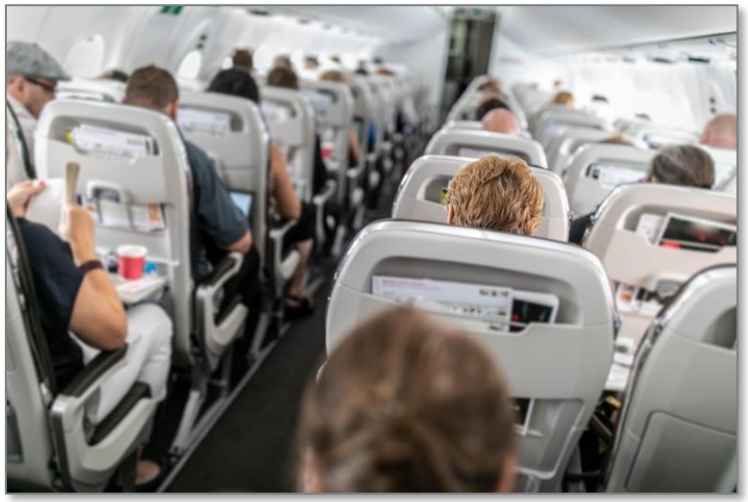
A new Wireless Broadband Alliance (WBA) report has developed a game plan that could solve all of your in-flight connectivity issues.

Inflight Wi-Fi: New framework paves the way for interoperable connectivity



- ✓ More passengers connecting
- ✓ Increased engagement with the portal
- ✓ Gives options for accessing the internet
- ✓ Opportunities for IDPs to offer services to their customers

Who for…



The passenger

MNO's

Airlines

Other IDPs

How…

1

Hotspot 2.0 Passpoint 802.11u

- Easy way to connect
- Improve Wi-Fi experience/satisfaction
- Connect those who would not connect
- Increase traffic to portal
- Use existing Wi-Fi equipment

2

CapPort API

- Alert users that Wi-Fi is available
- Encourage engagement with the portal
- Offer an easy way to navigate back to the portal

3

OpenRoaming™ Wireless Broadband Alliance

- Where appropriate, enable OpenRoaming
- Maximise the connections through Identity Providers offering OpenRoaming to their subscribers

2023 Problems

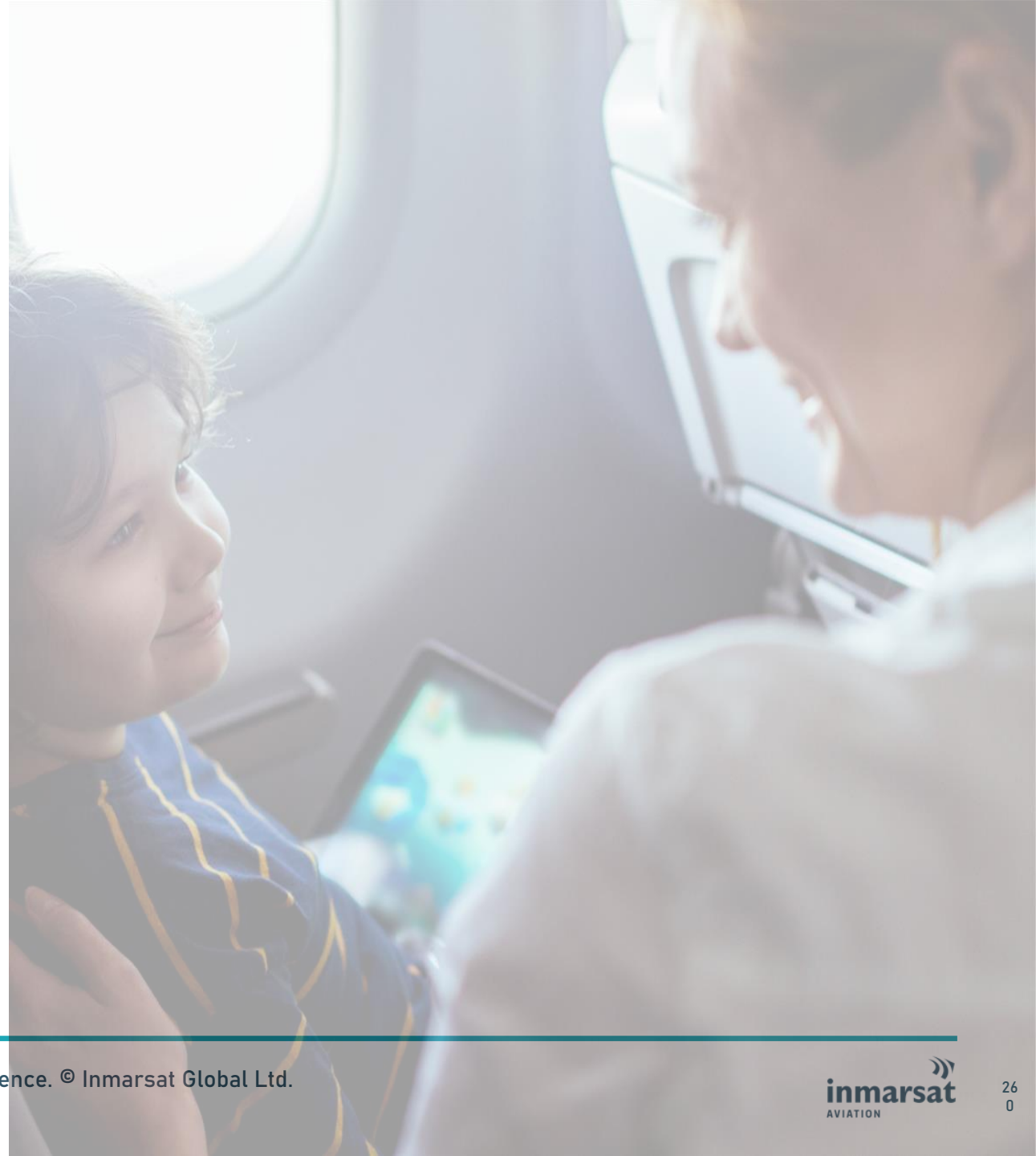
- In aviation the problems are still the same…
  - ✘ Take Rates are too low
  - ✘ Friction to connect remains a barrier
  - ✘ Authentication challenges
  - ✘ More limited bandwidth
  - ✘ Higher latency and contention

…BUT

All transportation have these problems

What will 2023 look like

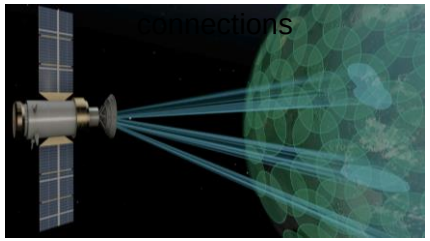
1. Move to a live environment trial
2. Demonstrate the enhanced customer benefits with real data and not theory
3. Prove to IDPs how this will solve their problems, and why they should care



Taking into account collective challenges

Local Authentication

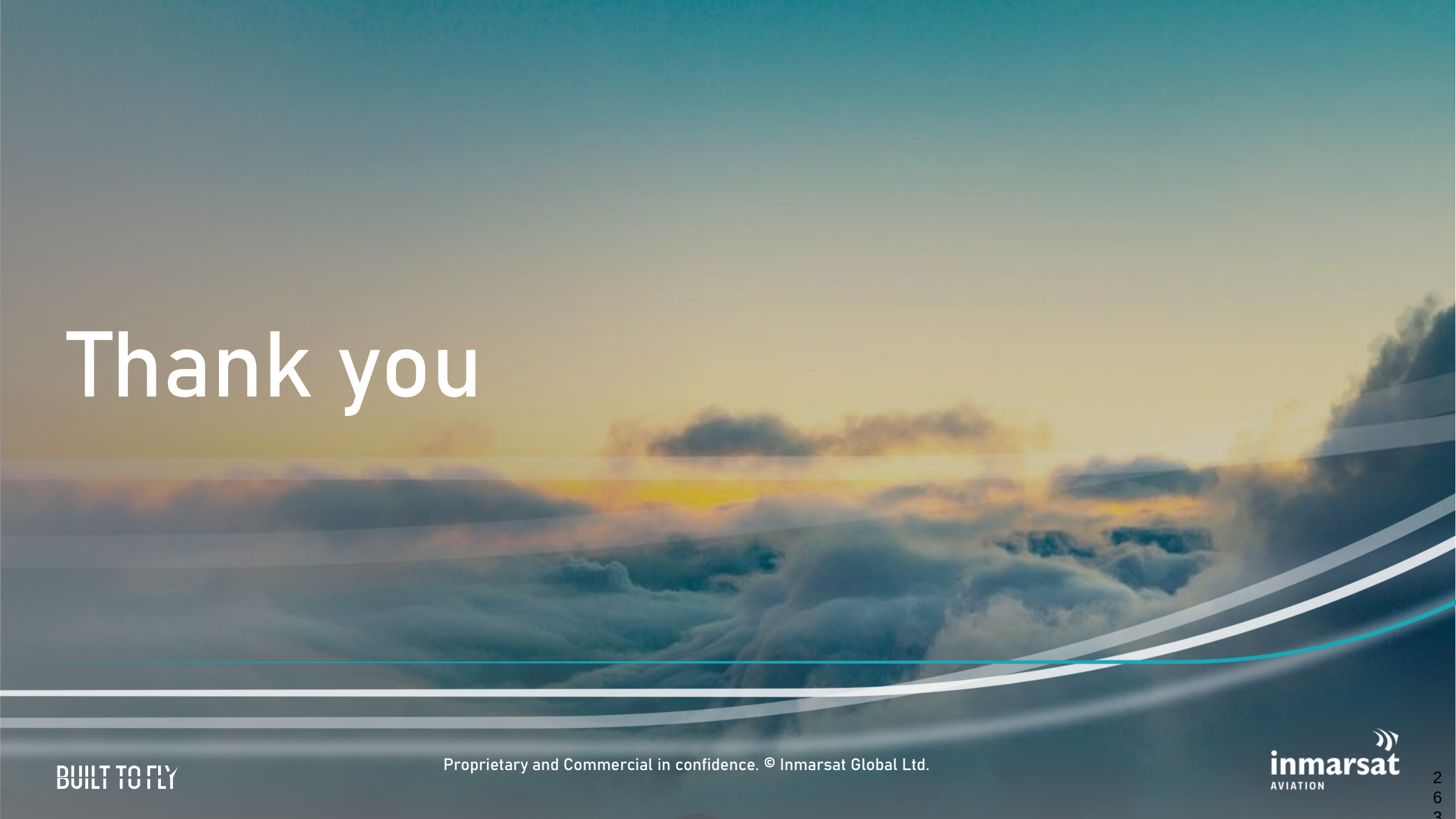
Transition of backhaul connections



Methods of user notification

User Experience is key

People will persist with a poor connection for 90 seconds before abandoning the journey forever



WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Tiago Rodrigues

CEO, Wireless Broadband Alliance

Event Close & Networking

WIRELESS BROADBAND ALLIANCE

#wifirevolution | #lovewifi

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Thank you to our Sponsors

WBA 2023 Events Plan

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

Q1 2023

Wireless Global Congress — APAC
SINGAPORE
(PARKROYAL, on Beach Road)

31 JAN — Open Congress

1-2 FEB — Working Sessions
(Strictly Members Only)

Virtual and Physical Attendance

Q2 2023

Wireless Global Congress — Americas
LAS VEGAS, USA
Renaissance Las Vegas Hotel

19-20 JUNE — Working Sessions
(Strictly Members Only)

21-22 JUNE — Open Congress

Virtual and Physical Attendance

Q4 2023

Wireless Global Congress — EMEA
PARIS, FRANCE
The Paris Expo Porte de Versailles

23-24 OCT — Working Sessions*
(Strictly Members Only)

25-26 OCT — Open Congress*

Virtual and Physical Attendance
**Prices subject to confirmation*

WIRELESS GLOBAL CONGRESS
WIRELESS BROADBAND ALLIANCE

WGC AMERICAS

JUNE 19 - 22 2023

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

https://www.wirelessglobalcongress.com/wgc-americas-2023/

Renaissance Las Vegas Hotel, USA

#WGCAMERICAS | #wifirevolution | #lovewifi

SEE YOU THERE !