



17 – 20 OCT 2022 WGC EMEA WI-FI REVOLUTION: DRIVING DIGITAL GROWTH

RAI Convention Centre, Amsterdam, Netherlands

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TIAGO RODRIGUES

CEO, WIRELESS BROADBAND ALLIANCE

CEO OPENING REMARKS





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WGC EMEA Speakers





Tiago Rodrigues Wireless Broadband Alliance



Maria Cuevas BT



Giovanni Pecora Cloud4Wi



David Coleman Extreme Networks



Parul Singla MaxLinear



Time	Presentation
9:00 AM (CET)	CEO Opening Remarks Tiago Rodrigues, CEO, Wireless Broadband Alliance
9:05 AM (CET)	The Role Operators can Play in Solving Enterprise Smart Connectivity Needs: How to be a Solutions Provider Maria Cuevas, Networks Research Director, BT Applied Research, BT
9:25 AM (CET	Taking Enterprise Wi-Fi to the Next Level Giovanni Pecora, VP Sales, Cloud4Wi
9:45 AM (CET)	Evolution of Wi-Fi and beyond David Coleman, Director, Wireless Technology, Extreme Networks
10:05 AM (CET)	Wi-Fi 7: Built for Immersive Experiences, Provides Fast, Robust and Reliable Connectivity Parul Singla, Director of Marketing – Wi-Fi, MaxLinear
	COFFEE & NETWORKING (40 minutes)

GREAT START ON DAY 1



Panel Discussion: The Union of 5G and Wi-Fi

Convergence of Technologies, Networks and Applications

Evolution of Residential Wi-Fi Architectures

Evolution of Wi-Fi, 6Ghz and Wi-Fi 7

Deterministic Wi-Fi, QoS & QoE

Role of OpenRoaming



43 CONGRESS

Wi-Fi Sensing



Time to recognize your innovations and hard work on Wi-Fi





Congratulations to all the winners, shortlisted and participants

Time to celebrate, network and have fun







MARIA CUEVAS

NETWORKS RESEARCH DIRECTOR, BT APPLIED RESEARCH, BT

THE ROLE OPERATORS CAN PLAY IN SOLVING ENTERPRISE SMART CONNECTIVITY NEEDS: HOW TO BE A SOLUTIONS PROVIDER





The Role Operators can play in solving Enterprise Smart Connectivity needs: How to be a solutions provider

Maria Cuevas

20th October 2022



Contents

Digital Transformation is driving customer needs Connectivity is key but only part of the bigger picture Businesses need to make multiple complex decisions The role of operators in the ecosystem Smart Connectivity Examples Conclusions

Digital transformation

Driving customer needs



Optimise operations

Sustainability Targets

, Health and Safety



Connectivity is key

but only art of the bigger picture



Multiple complex decisions

driving the need for an ecosystem / partnership model

- Devices
- Access and transport Technologies
- Applications
- Compute infrastructure
- Plan, design, integrate, build, expand
- Management and Operations

Solutions providers must partner with multiple players in the ecosystem to deliver end to end solutions to fulfil customers needs



Operators are in a strong position

working collaboratively with existing and new partners



- Design, plan and deploy solutions using multiple access technologies
- Migration of our own compute infrastructure to cloud-native architectures
- Integration of devices, radio and core components across multiple technologies and at different scales
- Support Mission Critical Applications Emergency Services Network
- Manage and operate fixed , wireless and cellular networks
- Coverage and footprint

Smart Connectivity Examples





Belfast Harbour Flexible surveillance Environmental sensors Sensor enabled cranes Digital Vision Drone inspections



Manufacturing



Manufacturing Technology Centre Autonomous guided vehicles and robots M2M connectivity Visual quality inspection Health



Rural communities Remote consultations Remote Ward See what I see XR



Smart Places



Commonwealth games Remote cameras Natural speech and interaction between the remote camera and studio.



Conclusions

- Digital Transformation is driving increasingly complex customer needs
- No single player can do it alone partnerships are key
- Standards organisations and industry alliances have a key role to play
- Removing friction by flexible reference architectures, blueprints, APIs and interworking and interoperability programmes



Thank you

Maria Cuevas

Networks Research Director

20th October 2022





GIOVANNI PECORA

VICE PRESIDENT, SALES, CLOUD4WI

TAKING ENTERPRISE WI-FI TO THE NEXT LEVEL



€CLOUD4WI

Taking Enterprise Wi-Fi to the next level

Giovanni Pecora, VP Sales





17 - 20 OCT 2022

WGC EMEA

Cloud4Wi changes the way companies connect with customers

Cloud4Wi provides an enterprise Wi-Fi platform that empowers location-aware experiences in public venues



Innovative companies rely on Cloud4Wi



Agenda



Today's challenges (and opportunities) in Wi-Fi adoption for enterprises

Why enterprises should embrace Passpoint / WBA OpenRoaming

Success story: leading grocery brand in the USA

Q&A



It's all about customer experience



Captive portal = Painful experience

- Manual search of the right SSID among many
- Inconsistent and buggy experience in prompting the captive portal –across different AP vendors
- MAC Randomization issues
 - Risk of onboarding from scratch also for returning visitors
 - ONo automated connection for returning visitors
- Limited privacy/security

Usability and security are dramatically impacting the WiFi adoption and usage in public venues



The hidden danger for on-premises app experiences



Poor connectivity = Bad on-premises app experiences

 Enterprises are busy in rolling out mobile apps with on-premises specific capabilities
 Mobile apps might not work properly indoor if there is a poor cellular coverage

The threat for location-aware experiences



Low location permission rate = poor location-aware experiences

~85% of mobile users do NOT provide always-on location tracking permission, which prevents detect and reaching customers when they are in the location

Passpoint / WBA OpenRoaming: the solution?



Passpoint and WBA OpenRoaming are the solution to boost the Wi-Fi adoption

But why both technologies have been mainly adopted by carriers and not by enterprises
Additional tech stack required to adopt Passpoint/WPA OpenRoaming
No toolkits to collect data and turn Wi-Fi into a business asset



Opportunities for enterprises



Boost the Wi-Fi adoption by playing as Wi-Fi network provider

Enable your Wi-Fi network to receive millions of customer provisioned by other IdPs

A higher Wi-Fi adoption equals more customer data collected



Enhance customer experience by playing as identity provider

Provide your own Passpoint-based profile

- Multi-channel onboarding of Passpoint-based identities: Web and Mobile SDK for easy integration into brand's app (e.g Loyalty)
- Handle authentication when customers roam on partner' locations
- Get visibility on partners' locations visited by your customers (leveraging WRIX)



Collect actionable customer location data

Collect customer profile when they access WiFi in your locations, and reveal how customers behave in your and partners' locations to deliver location-aware experiences

Profiles

- Demographics
- Preferences and opinions

Moments

- Arriving at a location
- Dwelling in a location
- Leaving a location

Attributes

- Favorite location
- Favorite time / day of visit
- Frequency / recurrence of visits
- Cross shopping

Comprehensive data compliance framework



- Localizalization of consents and policies
- Advanced consent management
- Consent-based **data processing** rules
- Parametric data retention rules
- Automatic data minimization

We've already put all of the pieces in place with a real project



Success story: leading grocery brand in the USA



Company overview

- Food and drug retailer
- Multiple brands
- 2,200 stores in the USA

The challenge

- Improve WiFi experience and boost WiFi adoption
- Empower on-premises app experiences:
- ONo indoor cellular coverage OLow app location

permission rate (5%)

The solution

- WBA OpenRoaming framework
- Mobile SDK for brands' app
- Traditional captive portal

The results

Automatic and secure WiFi
 Collection of actionable customer location data
 Mobile app personalization based on the store that the customer is visiting

Conclusions



Passpoint / WBA OpenRoaming are the future of WiFi Enterprise

Enterprises have to choose the right technology partner that can successfully support them in the adoption of these technologies

Cloud4Wi helps enterprises play as WiFi network providers and identity providers, while leveraging WiFi to reach business goals

Thank you! Any questions?



➡CLOUD4WI

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DAVID COLEMAN

DIRECTOR, WIRELESS TECHNOLOGY, EXTREME NETWORKS

EVOLUTION OF WI-FI AND BEYOND



EXTREME NETWORKS

Evolution of Wi-Fi and beyond

Emerging use cases enabled by Wi-Fi 6E and Wi-Fi 7



Who am I?

Extreme Networks Office of the CTO Director of Wireless





DAVID COLEMAN CWNE #4

CWNA Study Guide – 6th edition



Amazon: https://bit.ly/CWNA-108



Wi-Fi 6E - Wi-Fi 6 technology arrives in the 6 GHz frequency band



Europe

480 MHz of new frequency space





(24) 20 MHz channels(12) 40 MHz channels(6) 80 MHz channels(3) 160 MHz channels

Wi-Fi 6E – Low Power Indoor (LPI) class devices - USA



Low-Power APs: 30 dBm

PSD is 5 dBm/MHz



LPI Clients: 24 dBm PSD is -1 dBm/MHz

UNII-5	UNII-6	UNII-7	UNII-8

Wi-Fi 6E – Low Power Indoor (LPI) class devices – EU



Low-Power APs: 23 dBm EIRP

PSD is 10 dBm/MHz





LPI Clients: 23 dBm EIRP PSD is 10 dBm/MHz

UNII-5	UNII-6	UNII-7	UNII-8

Critical Applications will thrive in 6 GHz





Wi-Fi 6E – Standard power class devices - USA





Automated Frequency Coordination (AFC) required

- AFC required
- External antenna connectors allowed
- Weatherized enclosure allowed

Automated Frequency Coordination (AFC)





AFC demo – Gillette Stadium





A DECADE OF MILESTONES



Today's Connected Venue Environment





Stadium applications of the future





Wi-Fi 6E clients with 6 GHz connectivity



650+ laptops from Samsung, Lenovo, Dell and more using the Intel AX210 or AX 211 radio

60+ smartphones



Samsung Galaxy S21 Ultra smartphone using a Broadcom 6 GHz radio

And now the Galaxy S22



Google Pixel 6 and 6 Pro smartphone using a Broadcom 6 GHz radio

Design & Troubleshooting Tools









Read this blog



Wi-Fi 6E and MultiGig



- Do we now need 2.5 or 5 MultiGig (802.3bz) Ethernet ports?
- Will Tri-band APs will make the need for MultiGig a requirement???
- Probably not yet, but think of it as future-proofing



PoE is the more important wired conversation

 The extra radio chains of tri-band radios will require more power

 802.3at PoE Plus power of 25 watts will be required in tri-band 2x2x2 APs









Best Practice: 6 GHz effective range





Different levels of Security and Different SSIDs

5 GHz channel (100)

- SSID: employee

 WPA2-Enterprise (802.1X)
- SSID: BYOD

 WPA2-Personal (PSK)
- SSID: guest
 Open

2.4 GHz channel (6)





6 GHz channel (37)

- SSID: employee-6

 WPA3-Enterprise (802.1X)
- SSID: BYOD

 WPA3-Personal (SAE)
- SSID: guest-6

 Enhanced Open

Vertical challenges due to 6 GHz LPI rules



- Freezers: AP is mounted outside of freezer and the freezer doors. However external antennas are placed inside the freezer.
- Warehouse ceilings: The ceiling heights are very high and so external antennas are often needed.
- Warehouse aisles: External antennas use directional and sector antennas mounted on walls for directional coverage down aisles in warehouses.



Test and use out-of-the-box design strategies with the 6 GHz spectrum

Wi-Fi 7 and beyond

Timeline



320 MHz Channels



4K QAM



Multi-Link Operation (MLO) – multiple bands and multiple channels



MLO Goals



Goal	MLO method
Higher Throughput	Link aggregation
Lower Latency	Link steering
Increases Reliability	Link redundancy

STR MLMR channel access



simultaneous transmit and receive multi-link multi-radio (STR MLMR)

Upgrade Fatigue





6 GHz – The Wi-Fi superhighway for Wi-Fi 6E, Wi-Fi 7, Wi-Fi 8, Wi-Fi 9.....

It's not the features.... It's the spectrum

Wi-Fi 6 and 6E for Dummies



Download your free copy:

https://bit.ly/WiFi6E-Dummies



6 GHz – a new beginning for Wi-Fi





Rosalie Bibona - Senior WLAN Product Director





GARTNER MQ

LEADER IN WIRED AND WIRELESS INFRASTRUCTURE



OFFICIAL WI-FI SOLUTIONS PROVIDER OF THE NFL



OFFICIAL WI-FI SOLUTIONS PROVIDER OF MAJOR LEAGUE BASEBALL



Cloud-Managed Network Solution




PARUL SINGLA

DIRECTOR OF MARKETING – WI-FI, MAXLINEAR

WI-FI 7: BUILT FOR IMMERSIVE EXPERIENCES, PROVIDES FAST, ROBUST AND RELIABLE CONNECTIVITY





Wi-Fi 7: Built for Immersive Experiences Provides Fast, Robust and Reliable Connectivity

Parul Singla | Director, Marketing

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



Operators Could Monetize from Steps into Metaverse Vision Enablers and Orchestrators of the Ecosystem

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)

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⁾ 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⁾



2) https://www.quintar.ai/att-quintar-collaboration

76

3) https://newsroom.orange.com/10637-10689/?lang=en

¹⁾ https://www.sktelecom.com/en/press/press_detail.do?page.page=1&idx=1526&page.type=all&page.keyword=

Operators Could Monetize from Steps into Metaverse Enabled Managed Experiences



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



Wi-Fi 7 Toolkit of Key features



deliver more content faster

improved Metaverse experiences

reduced interference and improved security

coverage

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



Throughput: 320MHz & 4K QAM



x2.4 TP Increase over Wi-Fi 6



Wi-Fi 7: Throughput at Range (Downlink; Europe LPI) Benefit of 320MHz (6GHz) 4x4 Gateway to 2x2 Clients



ENVISIONING • EMPOWERING • EXCELLING

Wi-Fi 7 Provides Enhanced Robustness

Multi-Link Operation (MLO)



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 Bandwidth Expansion



Two Links: Same BW

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

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









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



"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+



MaxLinear Wi-Fi 6E Gateways

Delivers Complete Platform for MultiWAN and DOCSIS

MultiWAN GW with **AnyWAN™ URX + Wi-Fi 6E**

Cable Gateway with Puma + Wi-Fi 6E



MaxLinear Wi-Fi 7 Gateways Delivers Complete Platform for MultiWAN and DOCSIS

MultiWAN GW with AnyWAN™ URX + Wi-Fi 7

Cable Gateway with Puma + Wi-Fi 7



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



MAXLINEAR

Connecting the World

Thank You



WGC EMEA WI-FI REVOLUTION: DRIVING DIGITAL GROWTH

COFFEE & NETWORKING BE BACK IN 35 MINUTES AT 11.00 AM CET



STEVE NAMASEEVAYUM

DIRECTOR, MEMBERSHIP, INDUSTRY & ALLIANCES, WIRELESS BROADBAND ALLIANCE

MODERATOR





Time	Presentation
11:05 AM (CET)	The future of Wi-Fi and benefits of Wi-Fi 6E and 7 in the home environment Arjan van der Vegt, Senior Manager Connectivity CPE, Liberty Global
11:25 AM (CET)	Case Study: Ahold Delhaize: Delivering Wi-Fi Excellence in Retail with OpenRoaming Bart Brinckman, Distinguished Engineer, Cisco Rolf Vanden Eynde, Manager CoE Infrastructure Engineering, Ahold Delhaize Mattias Demeyere, IT Project Manager, Ahold Delhaize
11:45 AM (CET)	5G/Wi-Fi Convergence Without Compromise Blaz Vavpetic, Business Development & Strategic Partnerships
12:00 PM (CET)	Panel Discussion: Enhancing the Enterprise Wi-Fi Experience Steve Namaseevayum, Membership & Industry Alliances, Wireless Broadband Alliance Irvind Ghai, Vice President of Product Marketing, onsemi Chris Elliott, EMEA Channel Director, CommScope Blaz Vavpetic, Business Development & Strategic Partnerships
	LUNCH & NETWORKING (70 minutes)



WGC EMEA Speakers



Arjan van der Vegt Liberty Global



Rolf Vanden Eynde Ahold Delhaize



Mattias Demeyere Ahold Delhaize



Blaz Vavpetic Galgus



Irvind Ghai onsemi



Chris Elliott CommScope



ARJAN VAN DER VEGT

SENIOR MANAGER CONNECTIVITY CPE, LIBERTY GLOBAL

THE FUTURE OF WI-FI AND BENEFITS OF WI-FI 6E AND 7 IN THE HOME ENVIRONMENT



THE FUTURE OF WI-FI

How to distribute 10 Gbps to the clients in the home environment?



THE ROAD TO 10G

It is challenging to distribute 10 Gbps to the clients in the home over Wi-Fi

Innovation should not be constrained by a lack of network capacity

- XGS-PON and DOCSIS 4.0 bring ~ 10 Gbps to the home
- For most of our customers, we need to distribute that 10 Gbps to the clients in the home over Wi-Fi
- Thanks to the introduction of the 6 GHz band with Wi-Fi 6E we can more than double the throughput to the clients over Wi-Fi compared to Wi-Fi 6
- Still a significant gap between the 10 Gbps on the WAN side and the capacity of the WLAN
- One of the questions that I would like to discuss today is:

Will Wi-Fi 7 in practice close the gap with 10G WAN?



CHALLENGES WITH THE 6 GHZ BAND

Combination of WPA3 only on 6 GHz and WPA3 transition mode on the 2.4 and 5 GHz band will impact customer experience

6 GHz band results in tri-band or even quad-band AP architecture where:

- 6 GHz supports WPA3-only security
- 2.4 and 5 GHz must support both WPA2 and WPA3 clients due to legacy devices in the home: WPA3 transition mode (WPA3-TM)

The recommendation from a security perspective is to introduce a new network name (SSID) for Wi-Fi 6E devices

From a customer perspective one common SSID across the three bands is a must mainly in order to avoid confusion

Roaming between bands will be problematic when moving for example between the 6 GHz band with WPA3-only and the 5 GHz band with WPA3-transition mode

Client behavior: for example, showing 2 SSIDs with the same name: one with WPA2 security and another one with WPA3 security (see screenshot)



Google Pixel 6 Pro showing 2 SSIDs with the same name

CHALLENGES WITH THE 6 GHZ BAND

Given the propagation characteristics of the 6 GHz band, there is a slight reduction in coverage compared to 5 GHz



It's best to use the 6 GHz band in the context of a Wi-Fi mesh:

- · Given the propagation characteristics of the 6 GHz band, there is a slight reduction in coverage
- The mesh will reduce the need to roam between bands
- Using a Wi-Fi mesh improves latency, thanks to the ability to stay at higher MCS rates compared to gateway only

Despite the challenges: the introduction of the 6 GHz band is the best thing that happened to Wi-Fi since it's inception

97

WI-FI 7: KEY FEATURES

Benefits and challenges of Wi-Fi 7 features in the home environment

4K QAM

- Benefit: 20% throughput increase compared to 1024-QAM if a Wi-Fi 7 client is positioned at a short distance and in line of sight from the Wi-Fi 7 gateway
- Challenge: Coverage of 1024-QAM is single room, coverage of 4K QAM is even smaller.

320 MHz

- Benefit: doubling throughput compared to 160 MHz bandwidth
- Challenge: only 1 channel available in Europe

Preamble puncturing

- · Benefit: optimizes use of 5 GHz band
- Challenge: neighboring Wi-Fi 7 APs will optimize as well, minimizes the impact of interference on the throughput

Multi-Link Capabilities

- Opportunistic link selection: use of 5 OR 6 GHz band depending on availability
- Link aggregation: use of 5 AND 6 GHz band at the same time
- Challenge: combination with WPA3 transition mode on 5 GHz band as well as impact on usage in a Wi-Fi mesh



HOME FLOORPLAN

1 entrance, 2 utilities, 3 stairs, 4 closet, 5 toilet, 6 kitchen, 7 living room location of Wi-Fi AP

WI-FI 7: MULTI LINK CAPABILITIES

What is the impact of using multi link capabilities in a Wi-Fi mesh?



- Fronthaul: for example phone communication with the mesh node
- Backhaul: the mesh nodes communicating with each other
- What will happen if the mobile phones start using both the 5 GHz and the 6 GHz band?
- Potential negative impact when using multi link capabilities in the context of a Wi-Fi mesh

99

HOW TO CLOSE THE GAP WITH 10G WAN?

The spectrum crunch is still there

The benefit of Wi-Fi 7 features will be limited compared to the significant leap we're making from Wi-Fi 6 to 6E, so how are we going to close the gap with 10G WAN?:

- More streams:
 - From a technical perspective a way forward could be to explore antenna configurations beyond 4x4, even though that brings challenges with the form factor
- More spectrum:
 - Need to release the upper 6 GHz spectrum in Europe as well, this will bring the number of 320 MHz channels from 1 to 3
 - Use another unlicensed part of the spectrum: visible light for example to offload Wi-Fi in a mesh by using Li-Fi on the fronthaul for line of sight clients



INCREASED FOCUS ON LATENCY

We should also look beyond throughput to other metrics, in particular latency and jitter

In September 2022, the Wi-Fi Alliance published Wi-Fi Device Metrics recommending how results can be collected and presented in a statistical manner to give a clearer view of the spread of these results to gain a better understanding of the likely overall user experience.

For example, for One-Way Delay (OWD) latency measurements:



The CDF plot shows that the latency of the Wi-Fi system is 1.5 msec or better for 90% of the collected samples.

One-Way Delay Cumulative Distribution Function (CDF)



Case Study - Ahold Delhaize: Delivering Wi-Fi Excellence in Retail with OpenRoaming



BART BRINCKMAN

DISNTINGUISHED ENGINEER, CISCO



MATTIAS DEMEYERE

IT PROJECT MANAGER, AHOLD DELHAIZE



ROLF VANDEN EYNDE

MANAGER, COE INFRASTRUCTURE ENGINEERING, AHOLD DELHAIZE



BLAZ VAVPETIC

BUSINESS DEVELOPMENT & STRATEGIC PARTNERSHIPS, GALGUS

5G / WI-FI CONVERGENCE WITHOUT COMPROMISE







5G / Wi-Fi Convergence Without Compromise

Blaz Vavpetic, Galgus

WBA Wireless Global Congress Amsterdam, October 2022

The Road to Convergence

aximizing wireless





Trust Issues

Untrusted Non-3GPP Access

- Why so skeptical?
 - Shared Spectrum
 - Technical Weakness
 - No Standards
 - Limited Visibility
 - Subset of Services



Can I trust my brand to that?



What Do They Mean?

Shared Spectrum

Technical Weakness

No Standards

Limited Visibility

Subset of Services

Provider has no control over the wireless spectrum. Service is subject to degraded quality from interference.

Protocol is inefficient resulting in poor performance under load. Wi-Fi is not secure, making my users vulnerable.

Every network and each provider are different. Too much effort is required to implement off-load partnerships

I have no idea what kind of performance or experience my subscribers are having.

I cannot deliver all of the same services to subscribers when they are on Wi-Fi.



So Why Bother?



- Global standard for consumer broadband service
- Spectrum supply to meet exploding wireless data demand
- Available to deliver 5G services in places 5G isn't yet.
- Brings precision to locationbased services
- Economics




Addressing the Gaps



Recipe for Convergence

- > User Experience
 - Passpoint[®]
- > Control
 - R15 AMF, Persistent Context
- Performance / Resilience
 - R15 Spectrum flexibility
 - Wi-Fi 6 OFDAM, Efficiency
 - R16 ATSSS
 - Wi-Fi 6E 6 GHz spectrum
 - Wi-Fi 7 Multi-Link Operations
- Standardization
 - OpenRoaming[™]
- Deterministic Behavior
 - RAN Measurement / Optimization



5G Architecture Improvements



Compromises Prior to 5G	5G Improvements (3GPP Release 15 / 16)		
Ambiguous Non-3GPP Integration	Clear Non-3GPP Integration (N3IWF / Y1 / Y2)		
Devices in either 3GPP or Non-3GPP context	Devices maintain 3GPP context (AMF / N1 / N2)		
Data session only on 3GPP or Non-3GPP access	Data sessions on both 3GPP & Non-3GPP access (N3)		
Support for SIM-based authentication only	Extensible authentication capability (SIM / TLS currently)		



1aximizing wireless





Access Traffic Steering, Switching & Splitting





STREERING

Choosing the best available network based on speed, cost, and latency.

SWITCHING

- Choosing the best available network based on speed, cost, and latency.

SPLITTING

Ŷ

Splitting the traffic over 5G and Wi-Fi, the split can be set by policies.





Multi-Link Operation (MLO)





- Enables devices to simultaneously send and receive data across different frequency bands and channels.
- ➢ Works in 2.4 GHz, 5 GHz, and 6 GHz bands
- Dynamically selects channels
- Increases throughput, reduces latency, and improves reliability.
- It is ideal for congested environments and low-latency use cases
- UE power management will be key





Peak Performance





- Wi-Fi 7 Multi-Link Operation dynamically selects the best performing channels optimize Wi-Fi throughput and latency
- 5G Access Traffic Steering, Switching and Splitting evaluates Wi-Fi and 5G performance and uses policies, including QoS assignments, to utilizes both RANs simultaneous and achieve optimum results
- Access from both can be anchored in the 5G Session Management
 Function for true RAN convergence.





Understanding Wi-Fi RAN Health

- RF Problems account for half of all Wi-Fi performance issues
- Wi-Fi 7 reacts to mitigate the impact, but solutions needed for the 'pre-7' world

- WBA Access Network Metrics WG
 - What measurable attributes reflect RAN health
 - White-paper to provide guidance on what to measure and how to interpret







Galgus Dynamic RAN Optimization

- > Digital Transformation is driving wireless data consumption
- Degraded RF can affect many users before a problem is known
 - Brands are damaged when problems linger
 - Real-time assessment / remediation not possible in some environments

➢ Galgus Cognitive Hotspot Technology™ creates self-healing Wi-Fi

- Decentralized control plane running at the edge
- Radio telemetry from all APs in a location to detect degrading RAN performance
- AlOps methods automatically adjust radio resources to mitigate issues
- Delivered as software and Galgus access points.

Search for "Galgus CHT" on YouTube





Convergence without Compromise

Shared Spectrum

Technical Weakness

No Standards

Limited Visibility

Subset of Services

Wi-Fi 7 MLO and 5G ATSSS deliver network performance and resilience

OFDMA introduced with Wi-Fi 6 delivers protocol efficiency. 802.1x/EAP authentication provides identity and data protection

Passpoint®, OpenRoaming[™] and 3GPP Release 15 provide the framework for standard solutions. Roaming hubs normalize partner differences

WBA Access Network Metrics and E2E QoS working groups are focused on characterizing and reporting network quality

Anchoring 3GPP and Non-3GPP access in 5GC Session Management Function enables delivery of 5G Services over Wi-Fi







Thank You

Blaz Vavpetic Business Development & Partnerships

blaz.vavpetic@galgus.net



Panel Discussion: Enhancing the Enterprise Wi-Fi Experience



STEVE NAMASEEVAYUM

DIRECTOR, MEMBERSHIP & INDUSTRY ALLIANCES WIRELESS BROADBAND ALLIANCE



IRVIND GHAI

VICE PRESIDENT OF PRODUCT MARKETING ONSEMI



CHRIS ELLIOTT

EMEA CHANNEL DIRECTOR, COMMSCOPE



BLAZ VAVPETIC

BUSINESS DEVELOPMENT & STRATEGIC PARTNERSHIPS GALGUS



WGC EMEA WI-FI REVOLUTION: DRIVING DIGITAL GROWTH

LUNCH & NETWORKING BE BACK IN 70 MINUTES AT 1.30 PM CET



PEDRO MOUTA

SENIOR MANAGER, PMO, WIRELESS BROADBAND ALLIANCE

MODERATOR





Time	Presentation
1:30 PM (CET)	Building future-proof CSP-managed Wi-Fi solutions Justin Doucette, Head of Nokia Wi-Fi, Fixed Networks, Nokia
1:50 PM (CET)	Fireside Chat: Getting Ahead of the Threat: Securing Public Wi-Fi Pedro Mouta, Senior Manager, PMO, Wireless Broadband Alliance Rutger van Haastert, Consultant Security, KPN Bart Brinckman, Distinguished Engineer, Cisco
2:20 PM (CET	Panel Discussion: Spectrum Today vs. Spectrum Tomorrow Matt MacPherson, Wireless CTO, Cisco (Moderator) Ziyad Al-Dobaian, System Engineer, Communications and Information Technology Commission Burhan Masood, Business Development & Product Management, Broadcom Scott Blue, Director of Global Wireless Policy, Cisco
3:00 PM (CET)	Closing Remarks Tiago Rodrigues, CEO, Wireless Broadband Alliance
	WGC EMEA CLOSE



WGC EMEA Speakers



Justin Doucette Nokia



Rutger van Haastert KPN



Bart Brinckman Cisco



Matt MacPherson Cisco



Ziyad A Al-Dobaian CITC



Burhan Masood Broadcom



Scott Blue Cisco



JUSTIN DOUCETTE

HEAD OF WOKIA WI-FI, FIXZED NETWORKS, NOKIA

BUILDING FUTURE-PROOF CSP-MANAGED WI-FI SOLUTIONS



NOKIA

Building future-proof CSP-managed Wi-Fi solutions

Wireless Global Congress Justin Doucette 20-Oct-22

Current challenges with residential Wi-Fi



For end-users:

- 1. (Lack of) Fast Wi-Fi
- 2. (Lack of) Coverage
- 3. (Lack of) Ease of use



For CSPs:

- 1. (Lack of) OPEX/CAPEX
- 2. (Lack of) Monetization
- 3. (Lack of) Remote visibility



Wi-Fi is ubiquitous

- Demand for Wi-Fi continues to grow and will keep on growing in the future
- Wi-Fi is an unlicensed spectrum
- 2.4GHz and 5GHz are already congested
- It is only a matter of time before 6GHz becomes congested too
- For CSPs to provide a great Wi-Fi user experience in a cost-effective way, managed Wi-Fi will be required / mandatory



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Wi-Fi makes or breaks the broadband experience

Non-managed Wi-Fi

Negative impact on OPEX

- Performance issues and complexity
- Lack of visibility on the in-home network

Potential revenue loss

- Customer churn
- Unlikely to upgrade to higher BB tiers
- Unlikely to take value-add services

Managed Wi-Fi

Reduced OPEX

- Helpdesk calls -30%
- Truck rolls -30%

Revenue generation

- Reduced customer churn
- NPS +10-40 points
- +30-45% more premium customers
- Foundation for value-add services

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Wi-Fi management platforms

Transitioning from proprietary interfaces to standards



Why TR-369 is optimal for Wi-Fi management versus TR-069?

- Always-on communications based on real time transport protocols such as MQTT
- Real time management capabilities and visibility on the home network
- Improves customer care agent ability to support Wi-Fi issues
- Allows the end user to self- manage

- Enables multiple controllers.
- Wi-Fi management platform can be deployed along side other controllers
 - Device Management (ACS)
 - Mobile App
 - Browser UI

- Allows restricted the access to specific parts of the data model per USP controller
- A primary USP controller (e.g. device management platform) can grant access to other controllers depending on their scope (Wi-Fi management platform, mobile app, etc.)

Access control mechanisms

Always-on communication

Multiple access servers



Transitioning from proprietary interfaces to standards

Enable a standard management interface between the management platform and the Wi-Fi access points to facilitate the integration with any device





This approach is benefitting the whole industry

Standard vs. Proprietary agent

Pros

Standard vs. Proprietary agent

- ✓ Higher return of investment
- ✓ Shorter integration times and time to market
- ✓ Easier and lower cost maintenance over time
- ✓ TR-181 data model maturity and reusability
- ✓ Clearer definition of functions in standard specs
- ✓ Broader industry benefits through wider adoption

Cons

Standard vs. Proprietary agent

× Dependency on standards evolution (i.e. gaps)



High level requirements for Wi-Fi enabled gateways and extenders

USP Agent

- Real time management and event based (MQTT)
- USP Bulk provisioning (JSON over https)
- Multi USP controllers support (optional)

TR-181 Data Model

- Data Elements for mesh topologies
- Some proprietary objects are needed (see "Gaps in the standards")

EasyMesh

For multi-AP
deployments

 Client steering management, extender APs' metrics & management

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Nokia broadband solutions



Seamless, end-to-end services for residential Wi-Fi



Devices

- Open and scalable
- 3rd party development

Cloud

- Visibility & intelligence
- Operations & administration

User Experience

- For the end-user...
- For the CSP...



Cloud services platform for broadband devices

CSP Backend Services		OSS/BSS/CRM	Dashboards	Authentication	Data Pools
Interfaces		\$		1	
Nokia WiFi		RRM Algorithms	Bulk Data ingestion	Lifecyle Management	Campaign Manager
Cloud Controller		Real-time visibility	Configuration	Provisioning	Recommendations
USP (TR-369)	10		1	1604	210
Devices	m	USP Agent	TR-181 Data Model	EasyMesh	DataElements
	-	STATE DO			

Sint

- Rendered

10000

- Training

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Wi-Fi gateways, FWA gateways and fiber gateways





By the numbers...

Broadband Devices	Wi-Fi Devices		
>135M broadband devices shipped	40%		
17%	no Wi-	^{Fi} Mesh Tech	Wi-Fi Tech
of ONT shipments is 10G PON	600/	27%	L1060/
10x	0070	no Me	esh
growth of FWA in past two years		73%	
>15M			
mesh Wi-Fi devices shipped	Wi-	Fi	esh Wi-Fi 6 YoY



Thank you









Fireside Chat: Getting ahead of the Threat: Securing Public Wi-Fi



PEDRO MOUTA

SENIOR MANAGER, PMO WIRELESS BROADBAND ALLIANCE



RUTGER VAN HAASTERT

CONSULTANT SECURITY, KPN



BART BRINCKMAN DISTINGUISHED ENGINEER CISCO



Panel Discussion: Spectrum Today vs Spectrum Tomorrow



ZIYAD AL-DOBAIAN

SYSTEM ENGINEER, COMMUNICATIONS & INFORMATION TECHNOLOGY COMMISSION



BURHAN MASOOD

BUSINESS DEVELOPMENT & PRODUCT MANAGEMENT, BROADCOM



SCOTT BLUE

DIRECTOR OF GLOBAL WIRELESS POLICY, CISCO



MATT MACPHERSON WIRELESS CTO, CISCO



TIAGO RODRIGUES

CEO, WIRELESS BROADBAND ALLIANCE

CLOSING REMARKS





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