WIRELESS BROADBAND ALLIANCE

DRIVING NEXT WIRELESS EXPERIENCE

NGH – Hotspot 2.0

Connecting India with Next Gen Wi-Fi

9 March 2018

Established in 2003

WBA's vision is to lead the evolution of a frictionless wireless service experience for Citizens, Businesses, Cities and Things.

120+ MEMBERSHIP COMMUNITY

RAISE YOUR BUSINESS PROFILE & LEADERSHIP ROLE
Engage with the leading players in the wireless industry, reach out to your potential customers and partners and Influence the future direction of the industry

PROJECTS & PROGRAMS

INFLUENCE
the development of the industry and have 'your say' on key WBA initiatives through involvement on our working groups or on our projects

2 ANNUAL EVENTS

WIRELESS GLOBAL CONGRESS AND WORKING SESSIONS
Join the Wireless Global Congress. Connect with 1000+ global leaders at the leading event on next gen wireless, and get the latest on Wi-Fi in the 5G area Exclusive Member Working Sessions two days before each Congress.

PROMOTION AND GO-TO-MARKET

MARKETING & INDUSTRY ENGAGEMENT
Participate in the members' only "Market Work Group" to amplify your marketing strategy implementation via WBA programs, project, research, events and thought-leadership. Join our social and digital network to increase brand engagement.

THOUGHT LEADERSHIP & MARKET RESEARCH

LEARN
from combined expertise and experience of our members Get insight into global trends. Influence the development of technical specifications and frameworks. Have your say on key WBA initiatives.

WBA ACTIVITIES

Services Enablement, Develop Guidelines and Standardization

End-to-end Interoperability, Fields Trials, and Roaming

Services Certification and Compliancy

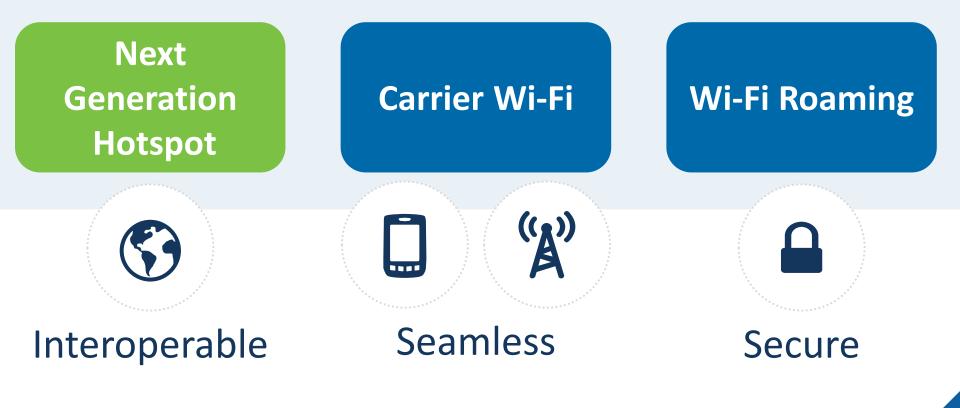| BUSINESS OPPORTUNITIES	STRATEGIC PROJECTS
CARRIER Wi-Fi SERVICES "Outstanding Wi-Fi user experience (Carrier, Enterprise, In-Home, Cities)"	**Carrier Wireless Services Certification Wi-Fi Deployment Guidelines In-Home Wi-Fi Deployments**
NEXT GENERATION WIRELESS "Unlicensed wireless and Wi-Fi role in 5G"	**802.11ax - Enhanced Wi-Fi Unlicensed Integration with 5G Networks Multi-Access Edge Computing**
INTERNET OF THINGS "Address unique IoT interoperability, provisioning, policy and identity opportunities"	**IoT Interoperability and Roaming Joint Taskforce with key IoT Forums Identity Cloud Management**
CONNECTED CITIES "Address unique evolving connected city Hetnet requirements and landscape"	**Connected City Blueprint Evolution NGH Live - City Wi-Fi Roaming Policy & Spectrum**

WBA INITATIVES

WIRELESS GLOBAL CONGRESS · NEXT GEN WIFI · CARRIER WIRELESS Services Certification · ACCELERATOR Program · CONNECTED CITY Advisory Board · WORLD Wi-Fi Day · VISION Forum · 2018

WIRELESS BROADBAND ALLIANCE

BOARD MEMBERS

at&t · boingo · BT · CISCO · COMCAST · (intel) · kt · LIBERTY GLOBAL · docomo · orange

OPERATOR MEMBERS

airmesh · AlwaysOn · Bell · bemol · BSNL · sky · Charter Spectrum · 中国电信 China Telecom · China Unicom · COX · CTM · HOTSPOT

docomo DOCOMO PACIFIC · 3indote · Firefly · fon · HKT · Linktel · m3connect · SoftBank · world SPACEWIRELESS · meteor network · Mi-Fi · progresif · Jio

ROGERS · Shaw · sitwifi · Singtel · SK telecom · Smart · SoftBank · world SPACEWIRELESS · Sprint · StarHub · swisscom · TalkTalk Group · TATA COMMUNICATIONS

TATA · Telkom Indonesia · Personal · Telstra · TELUS · T··Mobile · true · Türk Telekom · TTNET · VAST · ViaSat

TECHNOLOGY PROVIDER MEMBERS

Accuris · acom · affirmed · AirSense Wireless · ANTlabs · aptilo · aruba · bandwidth · benu NETWORKS · boosty · BROADCOM · BSG Wireless · Colony

CableLabs · Cirrent · CLOUD4WI · Cobalt · DEKRA · device scape · digicert · ERICSSON · facebook · frontporch · globalreach · Google

Gotell · HUAWEI · iBwave · iPass · JULY · KYRIO · Microsoft · mojo · Mosaik SOLUTIONS · neustar · NOKIA · nominum

NTTBP · OPENET · Panasonic · POINT DUME · purple · QUALCOMM · Ruckus · GEMTECH · SANDVINE · SINGLEDIGITS · SMITHMICRO SOFTWARE · SPIRENT · Sterlite Tech

Syniverse · TeleWorld Solutions · UL · VENIAM · wyless · ZTE 中兴

WBA Membership as of January, 2018.

Driving the Next Generation Wi-Fi Experience

Next Generation Hotspot	Carrier Wi-Fi	Wi-Fi Roaming

Interoperable   Seamless   Secure

- Next Generation Hotspot (NGH) is a WBA Program that makes the process of finding and gaining access and roaming to Wi-Fi networks a **seamless experience.** It leverages on Passpoint™ certified equipment that among other features provides as well WPA2™ **security protection to user connections**

- Passpoint is a Wi-Fi standard developed by the Wi-Fi Alliance (WFA) and supported by the Wireless Broadband Alliance (WBA) to bring the latest technology advances to Wi-Fi

- Mobile devices, such as handsets and tablets, which are certified for Passpoint, can still be used in existing hotspots. However, when the users are in a Passpoint enabled hotspot, they'll discover a newly-smooth connectivity experience

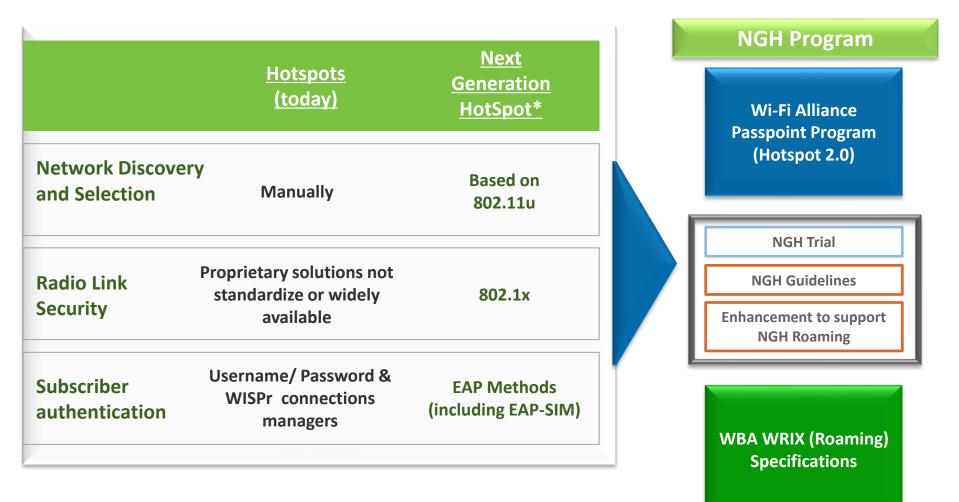More information @ www.wballiance.com/key-activites/next-generation-hotspot/

GSM

Example: GSM Phone

Turn on phone and get secure cellular connectivity

Next Generation Hotspot (NGH)

Example: Device with Wi-Fi

Turn on device and get secure Wi-Fi connectivity

A cellular-like secure Wi-Fi roaming experience

WIRELESS BROADBAND ALLIANCE

	Hotspots (today)	Next Generation HotSpot*
Network Discovery and Selection	Manually	Based on 802.11u
Radio Link Security	Proprietary solutions not standardize or widely available	802.1x
Subscriber authentication	Username/ Password & WISPr connections managers	EAP Methods (including EAP-SIM)

NGH Program

Wi-Fi Alliance Passpoint Program (Hotspot 2.0)

NGH Trial

NGH Guidelines

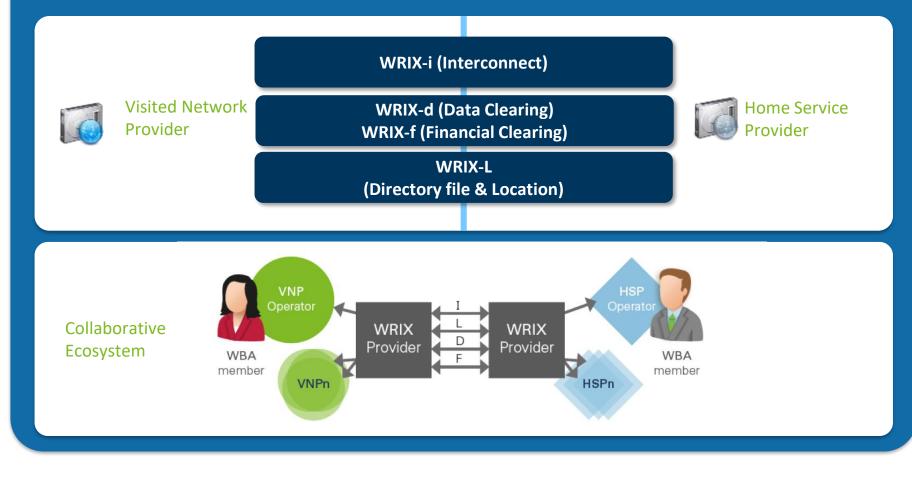Enhancement to support NGH Roaming

WBA WRIX (Roaming) Specifications

*NOTE: *: Industry standards used for supporting the above functionalities include 802.1x, 802.11u and EAP-SIM/AKA & EAP-TLS/TTLS authentication methods as expected to be certified under Wi-Fi Alliance Passpoint program*
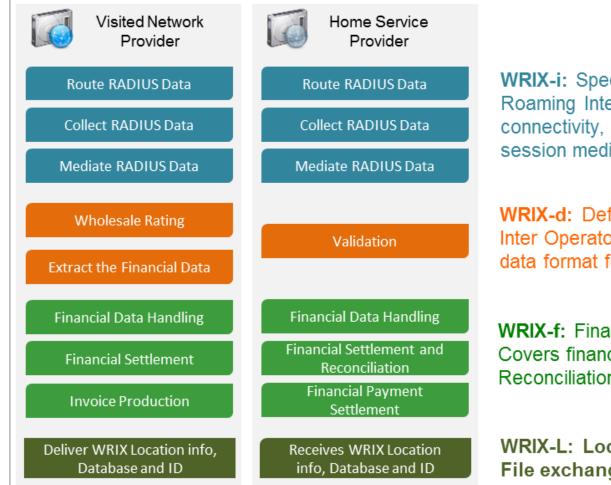
- The WBA roaming process is summarized under the term WRIX (Wireless Roaming Intermediary Exchange)

- The WRIX roaming process consists of the following functional blocks:

Visited Network Provider

WRIX-i (Interconnect)

WRIX-d (Data Clearing)
WRIX-f (Financial Clearing)

WRIX-L
(Directory file & Location)

Home Service Provider

Collaborative Ecosystem

Visited Network Provider

- Route RADIUS Data
- Collect RADIUS Data
- Mediate RADIUS Data
- Wholesale Rating
- Extract the Financial Data
- Financial Data Handling
- Financial Settlement
- Invoice Production
- Deliver WRIX Location info, Database and ID

Home Service Provider

- Route RADIUS Data
- Collect RADIUS Data
- Mediate RADIUS Data
- Validation
- Financial Data Handling
- Financial Settlement and Reconciliation
- Financial Payment Settlement
- Receives WRIX Location info, Database and ID

WRIX-i: Specifies guidelines for a Wi-Fi Roaming Interconnect, including IP connectivity, RADIUS connectivity, WLAN session mediation, and service levels.

WRIX-d: Defines procedures for applying Inter Operator Tariffs and an XML-based data format for UDR file exchange.

WRIX-f: Financial clearing specification. Covers financial data handling, Invoicing, Reconciliation & Payment settlement.

WRIX-L: Location Feed Format and File exchange Standard

Facilitates national and international roaming for Indian carries

Key initiatives to the Globalization of Wi-Fi Roaming

WBA framework for Wi-Fi Roaming

1

- **WRIX (Wireless Roaming Intermediary Exchange)**

- Roaming Contract Templates

- Technical Exchange Document (TED)

- Commercial Business Exchange Document (CBED)

- User Experience (UE) Recommendations

- Fault Management, Troubleshooting and Customer Care Guidelines
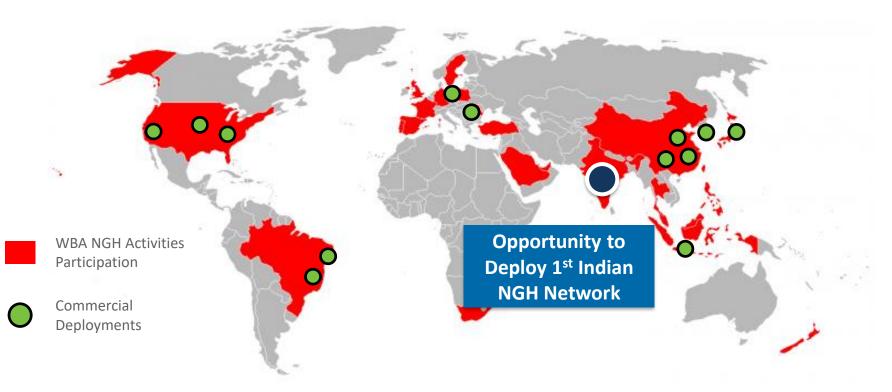
Interoperability Compliancy Program (ICP)

2

- Facilitate and simplify the growth of Wi-Fi roaming

- Enable fast and efficient technical integrations

- Streamline Technical Information Exchange

- Offer different levels of compliancy

- Self assessment form validated by WBA PMO

- Periodic updates and revision

NGH - Roadmap of Activities

	2011-14	**2015-16**	**2017 & Beyond**
Trials	• NGH Trial Phase 1 & 2, pre-certified equipment (15 operators & 7 vendors)	• NGH Trial Phase 3, commercial equipment (30 operators & 17 vendors)	• NGH Trial Phase 4 – "Carrier Wi-Fi Roaming testing" expanded scope
Live	• WBA & Wi-Fi Alliance Cooperation framework	• NGH Live @ major industry events, e.g. Mobile World Congress	• NGH permanently live in cities and venues (e.g. San Jose)
Commercial	• NGH Operator Guidelines Release 1	• Operators commercial roll-outs – 10 globally	• Globalization program for commercial roll-outs

Opportunity to Deploy 1st Indian NGH Network

WBA NGH Activities Participation
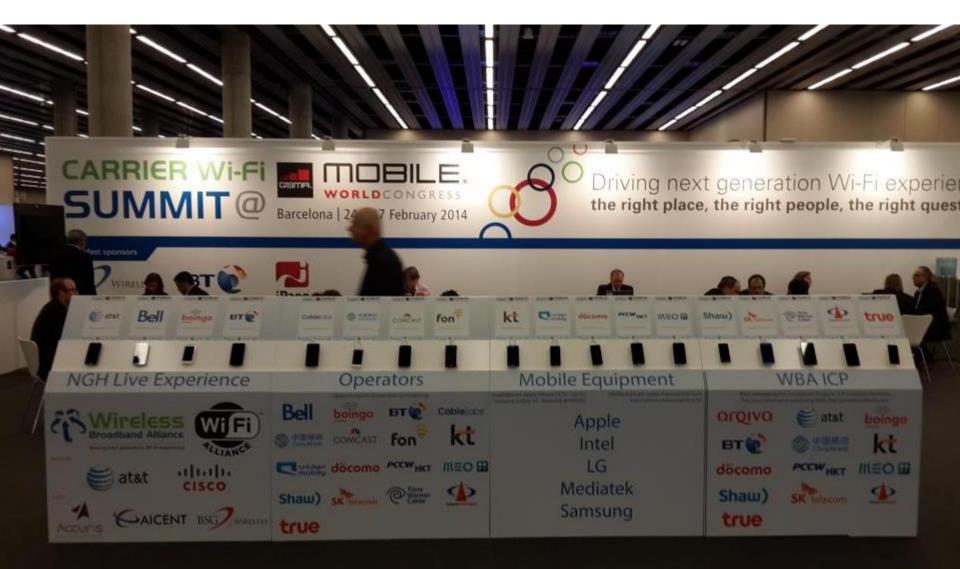
Commercial Deployments

+50 Global Participants (Operators, Infrastructure and Device Vendors)
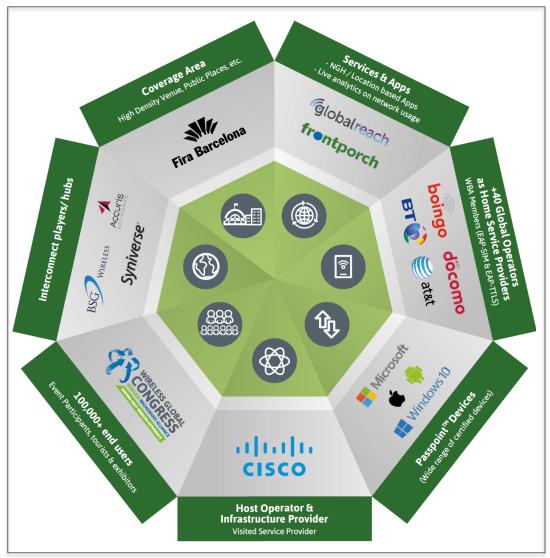
Live Commercial Deployments (non exhaustive):

- America: Multiple cities in the USA, including New York, San Francisco, San Jose and Los Angeles, Rio Janeiro & Sao Paulo in Brazil
- Asia: Beijing in China, Tokyo in Japan, Seoul in Korea, Bali in Indonesia
- Europe: London in the UK, Cities in Poland, Romania and Czech Republic

Largest Ecosystem Engagement

Coverage Area
High Density Venue, Public Places, etc.

Services & Apps
- NGH / Location based Apps
- Live analytics on network usage

Fira Barcelona

globalreach

frontporch

+40 Global Operators as Home Service Providers
WBA Members (EAP-SIM & EAP-TTLS)

BT boingo

docomo NTT

at&t

Interconnect players/ hubs

Accuris

Syniverse

BSG WIRELESS

100,000+ end users
Event Participants, tourists & exhibitors

WIRELESS GLOBAL CONGRESS

Passpoint™ Devices
(Wide range of certified devices)

Microsoft

Windows 10

Host Operator & Infrastructure Provider
Visited Service Provider

CISCO

Innovation Streams

New venue – Fira/Montjuic, fully leveraged on NGH network. Primary source of Wi-Fi for the attendees (~~more 20k attendees~~)

Featured on **GSMA communication** newsletter to attendees advertising captive portal

+45 Global Operators confirmed, **spanning across 5 different continents**. First-time participants: Axiata, Etisalat, TATA Communications, Saudi Telecom, Airtel, MTN
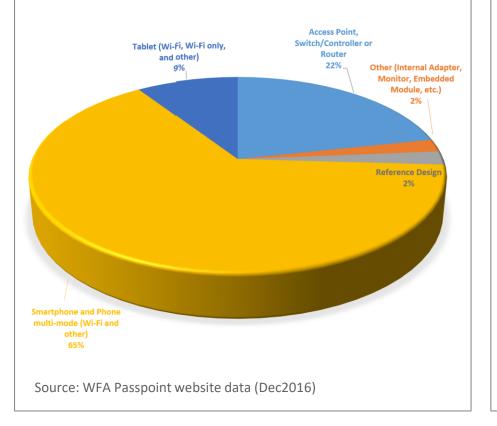
Wide range of supported devices, Apple, HTC, LG, Samsung, Intel, Mediatek, Sony, Microsoft, Google

Revamped Captive Portal, engage here:
https://mwc.odyssys.net

Over 1180 end user devices, (smartphones, tablets, laptops) are Passpoint™ certified (100% growth compared to early 2015)

Tablet (Wi-Fi, Wi-Fi only, and other) 9%

Access Point, Switch/Controller or Router 22%

Other (Internal Adapter, Monitor, Embedded Module, etc.) 2%

Reference Design 2%

Smartphone and Phone multi-mode (Wi-Fi and other) 65%

Source: WFA Passpoint website data (Dec2016)

List of end users devices to be widely supported officially by the project on the BYOD scenario
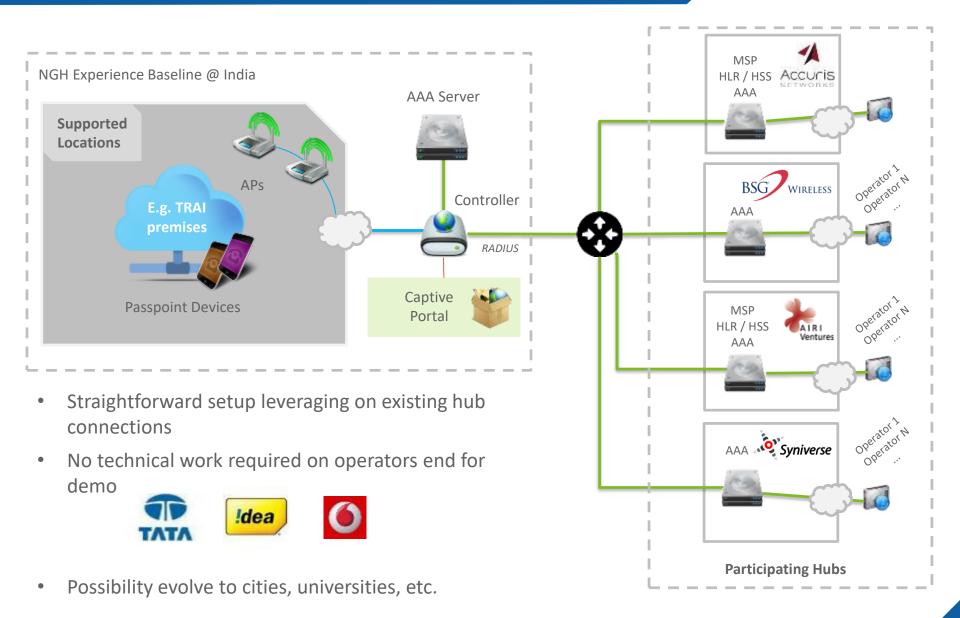
Smartphones (non-exhaustive)

- Apple iPhones
- Samsung Android phones range
- HTC
- LG
- Sony Xperia range
- Google phones

Tablets/Laptops

- Apple iPads
- Samsung Galaxy tabs
- Google nexus tablets
- Microsoft Windows 10 devices
- Intel laptops

NGH Experience Baseline @ India

Supported Locations

APs

E.g. TRAI premises

Passpoint Devices

AAA Server

Controller

RADIUS

Captive Portal

MSP HLR / HSS AAA

BSG WIRELESS

AAA

Operator 1 Operator N ...

MSP HLR / HSS AAA

Operator 1 Operator N ...

AAA Syniverse

Operator 1 Operator N ...

Participating Hubs

- Straightforward setup leveraging on existing hub connections

- No technical work required on operators end for demo

- Possibility evolve to cities, universities, etc.

Dynamic onboarding process throughout event cycle (1-time process)

A. Before the event/demo

B. During the event/demo

Process/flow:

1. Go to this portal via the web browsing (on mobile):

http://wba.odyssys.net/ (example to be updated)

2. Show small list with operators, confirm If you operator is on the list, if yes please download Operator profile, if not download TRAI/WBA Generic profile:
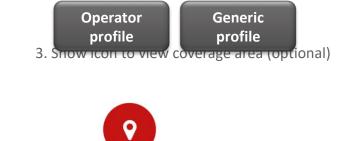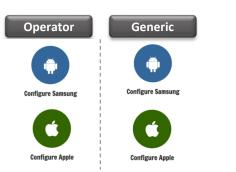
Process/flow:

1. Auto-redirect to portal
and portal auto-detect device model/brand, enhanced secure access

2. Confirm if your operator is on the list, if yes: please download Operator profile, if no: download TRAI/WBA Generic profile:

Operator profile   **Generic profile**

3. Show icon to view coverage area (optional)

Operator   **Generic**

Configure Samsung   Configure Samsung

Configure Apple   Configure Apple

View Coverage Area

Profile already installed? View the coverage area
where you will connect automatically.

View Wi-Fi Map ▶

Simplified on-boarding process with one click effort in all scenarios for end users

Next Steps – Action Plan

#	Action	Owner	Due Date
1	Identify main technical contacts points for TRAI, Operators and Vendors	TRAI / All	tbd
2	Close network architecture with partners	TRAI / WBA / Vendors	tbd
3	Identify backhaul provider	TRAI / All	tbd
4	Vendors to align infrastructure required and site survey	Vendors	tbd
5	Establish VPN/IPSEC Tunnel for AAA/RADIUS	Vendors	tbd
6	Confirm local coverage	TRAI / All	tbd
7	Configuration of all operators information locally on the venue(s)	Vendors / WBA	tbd
8	Captive portal customization and profile updated	WBA / Partner	tbd
10	Network deployment start	Vendors	tbd
11	Onsite testing with devices and all partners	All	tbd

Carrier Wireless Services Certification

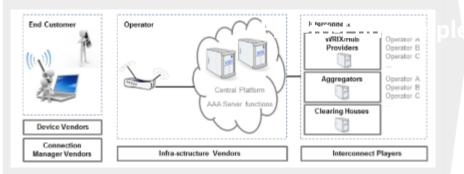Value Proposition

CWSC is a new model maintaining a permanent NGH Trial test bed open to all members and run by independent labs

NGH Trials (2011-2017)

Bringing the entire Ecosystem in a end-to-end trial, simulating carrier services with real life scenarios, credentails and devices

Phase 4 wrapped-up on **Oct 2017** ending a cycle of NGH trials – Total of 20 vendors and 50 operators have participated
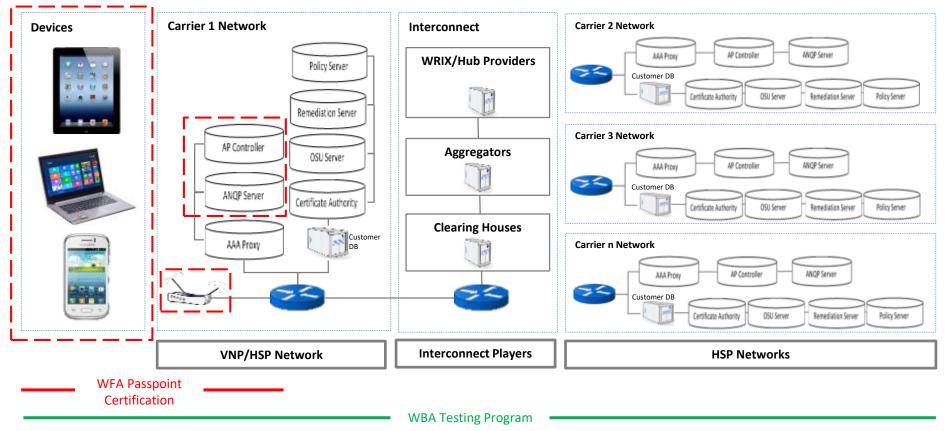
CWSC (2017-)

- Testing done in real network environment

- Simulation of end customer usability (using real credentials & authentication)

- Focus on carrier services (phase 1)
    1. Wi-Fi Roaming Services
    2. Wi-Fi Offload Services
    3. AAA/Radius/Authentication Services
    4. Provisioning/Online Sign-up

Open market opportunity having WBA members as pioneers certifying products and/or validating end-to-end services
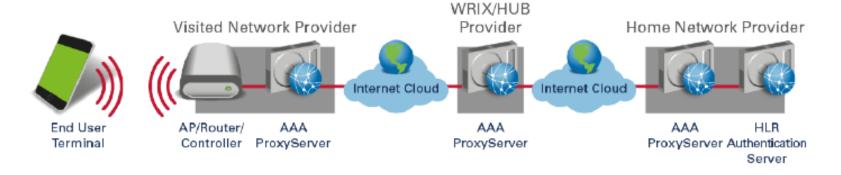
No Industry body is looking at the Public WLAN ecosystem from an end-to-end basis, WBA has been filling this gap with the NGH Trials on a one time effort

Devices

Carrier 1 Network

Policy Server
Remediation Server
AP Controller
OSU Server
ANQP Server
Certificate Authority
AAA Proxy
Customer DB

Interconnect

WRIX/Hub Providers

Aggregators

Clearing Houses

Carrier 2 Network

AAA Proxy
AP Controller
ANQP Server
Customer DB
Certificate Authority
OSU Server
Remediation Server
Policy Server

Carrier 3 Network

AAA Proxy
AP Controller
ANQP Server
Customer DB
Certificate Authority
OSU Server
Remediation Server
Policy Server

Carrier n Network

AAA Proxy
AP Controller
ANQP Server
Customer DB
Certificate Authority
OSU Server
Remediation Server
Policy Server

VNP/HSP Network **Interconnect Players** **HSP Networks**

WFA Passpoint
Certification

WBA Testing Program

The end-to-end architecture for Testing Wi-Fi Roaming/Offload Services

- For Wi-Fi Roaming & Offload services, **more 4.000 devices/infrastructure are targets**
- There **25+ NGH/HS2.0 worldwide deployments** and **certification is key to ecosystem grow**
- **New services on the roadmap** (Wi-Fi Calling , Quality of Service, Policy interworking (ANDSF & HS2.0)
- **5G Building blocks test program** in the near term aligned with trend of unlicensed wireless role in 5G

Carrier Wi-Fi Services Certifications (Currently Available)			
Test Cases Categories*	**Wi-Fi Roaming Services**	**Wi-Fi Offload / AAA / Authentication Services**	**Online Sign-up / Provisioning Services**
Policy	✅	✅	--
AAA / Radius	✅	✅	--
Provisioning	✅	--	✅
User Experience	✅	--	--
Performance	✅	--	--

*Test case selection is tailored according to specific capabilities/features of different platforms/systems in the market

Make sure the service, equipment & configurations you deliver to your customers works properly in your network and roaming partners

Test your Wi-Fi service from end-to-end (from provisioning till billing) against different equipment & credentials. Including roaming partners (with real authentication)

Avoid complaints & minimize customer care support to your customers

Make sure the equipment & configurations you deliver to carriers works properly in theirs networks and roaming partners

Test your equipment:
a) In real carrier networks (Wi-Fi Offload & Roaming services), and
b) across multi-carriers networks (with different authentication)

Avoid endless testing with carriers and gain time to market

Test Bed

Company	Signed version
AT&T	Received
Boingo Wireless	Received
Shaw	Received
Aruba	Received
Cisco	Received
Ruckus	Received

Labs

WBA Public Website:

http://www.wballiance.com/what-we-do/next-generation-wi-fi/

Thank you