WBA WRIX UMBRELLA

Introduction and overview to the Wireless Roaming Intermediary eXchange (WRIX) framework

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Wireless Broadband Alliance (WBA) is the global organization that connects people with the latest Wi-Fi initiatives. Founded in 2003, the vision of the Wireless Broadband Alliance (WBA) is to drive seamless, interoperable service experiences via Wi-Fi within the global wireless ecosystem. WBA's mission is to enable collaboration between service providers, technology companies, cities, regulators and organizations to achieve that vision. WBA's membership is comprised of major operators, identity providers and leading technology companies across the Wi-Fi ecosystem with the shared vision.

WBA undertakes programs and activities to address business and technical issues, as well as opportunities, for member companies. WBA work areas include standards development, industry guidelines, trials, certification and advocacy. Its key programs include NextGen Wi-Fi, OpenRoaming, 5G, IoT, Testing & Interoperability and Policy & Regulatory Affairs, with member-led Work Groups dedicated to resolving standards and technical issues to promote end-to-end services and accelerate business opportunities.

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About this Document

This document is an integral part of the whole Wireless Roaming Intermediary eXchange (WRIX) Framework, developed by the WBA Roaming Work Group. This document defines the means by which Wireless Broadband Alliance (WBA) operators may interconnect with each other, either directly or through their respective WRIX-is, for the purposes of providing wireless broadband roaming services to their end-users.
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", “MAY", and "OPTIONAL", in this document, are to be interpreted as described in the RFC 2119 and RFC 8174.

DOCUMENT HISTORY

VERSION	REVISION DATE	REVISED BY	DESCRIPTION OF CHANGE
01.00	08.02.06	(*)	• First formal internal delivery (after Madrid meeting and including all change requests till then), coordinated with formal internal delivery for complete WBA SSS documentation set and Change Management Process.
01.01	20.04.06	(*)	• No changes approved/incorporated (VCT-01 and JTB-002 were not approved). Distribution List as a Change Management Process Annex. Change control Annex for the specific doc. Eliminated. Functional scope figure added.
01.03	01.07.07	Tommy Bertling Swisscom	• JTB-002 insertion corrected according challenges from Virginia Cortes, Telefonica – No other challenges received • VCT-01 No challenges received insertion checked • CR Orange Country Code 06.02.07, WRIX Vendor Identity CR inserted agreed in WRIX Forum • Maximum length of Operator ID changed from116 to 13 Characters = max characters in filename =50 • CR WRIX Vendor ID to the clearing document reflected in this document. The sender or recipient cannot be omitted • CR WRIX Data types • Changed version number to 01.03 in order to align the WRIX Specifications as agreed in the WRIX Forum 21 May 2007 • Spell check and all dates checked, Version is ready since 12 May 2007, Any outstanding or upcoming CRs have to be inserted in the next release

1.20	07-2013	BSG Wireless	• Updates recommended to align document with the updates to the other WRIX documents
1.30	03-2016	BSG Wireless	• Further document alignment
2.0.0	10-2019	Betty Cockrell, Single Digits	• Incorporation of WBAID
2.1.0	06-2021	Betty Cockrell, Single Digits	• WBAID fix of WBAID excluded characters
2.2.0	08-2022	Betty Cockrell, Single Digits	• Updates HSP/VNP terminology in text and diagrams; Update and replace section 4 WBA Work Areas

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Executive Summary

The Wireless Broadband Alliance (WBA) defines roaming set-up best practices for service providers and outlines the reasons for providing roaming services as well as suitable strategies to foster adoption. Standards are provided for the type of information needed from the Wi-Fi network, together with guidelines on how to exchange relevant information between involved parties. Moreover, WBA maintains a database of Operators roaming-related data, including the WBA Unique Organization Identifier (WBAID) that is solely provided and maintained by the WBA.

1 Introduction / Overview

1.1 What is Wi-Fi Roaming

Wi-Fi Roaming is a service provided by network provider/operator to end users / device owners who are not customers of that company.

For Wi-Fi roaming to occur, the network operator must have previously entered into an agreement with the company who has the relationship with the end users / device owners that are subscribers to a particular plan or offering provided by that company.

Under the terms of the relationship between the network owner and the subscriber owner, the company's subscribers are able to gain access (roam) to the provider's network as part of the prior arrangement between the two companies.

The ability to access a broader Wi-Fi footprint is a great value to end users in today's connected data-driven world.

In this type of relationship, the network provider is called the Access Network Provider (ANP) and the company who owns the end user / subscriber relationship is the 'Identity Provider (IDP)'.

The roaming process between two operators can be divided into different functional components; firstly, configuring the network and the subscriber devices to allow roaming; secondly, creating the technical interconnections between the partnering companies which allows for all real-time activities such as authentication and accounting to be performed.

Finally establishing the commercial framework for roaming, which includes billing and settlement between each company.

The growth of Carrier grade Wi-Fi platforms and Passpoint have enabled the Wi-Fi roaming ecosystem to develop new monetization strategies and business models.

The WBA has been a leader in promotion of Wi-Fi Roaming and has harnessed this opportunity to create new services and products, encouraging additional roaming usage and revenues. A managed Wi-Fi Roaming service can greatly improve the overall user experience regarding:

- Simplifying the connection to a Wi-Fi hotspot
- Seamless roaming between Wi-Fi hotspots
- Better technical performance of a Wi-Fi hotspot
- Secure authentication and connection to a Wi-Fi hotspot
- Privacy for the end-user

Access to a much larger commercial Wi-Fi network across different geographies and venue types

This document provides an overview of the framework developed by the WBA to simplify and enable Wi-Fi roaming and to assist roaming partners in effectively managing their Wi-Fi roaming relationships.

1.2 Wi-Fi Ecosystem

As a dominant unlicensed wireless technology, Wi-Fi has experienced a phenomenal growth in recent years. Not just a huge growth in number of hotspots being deployed by several operators, but also new players emerging in the ecosystem (cities, venue owners, retail brands and specific vertical market service providers) and new value-added services being deployed (Wi-Fi Calling, Location Based Services). Within the Wi-Fi ecosystem, we can identify the following players:

- Access Network Providers/ (ANP)
- Identity Providers (IDP)
- End Users
- Clearinghouse / Hub providers/Brokers
- Aggregators / Resellers

- Infrastructure vendors
- Device vendors
- Connection manager vendors
- Clearinghouses providing Data Clearing, Financial Clearing and Directory Clearing Services

Each has a particular role in the development of the Wi-Fi ecosystem and in particular on roaming business, as shown in figure 1:

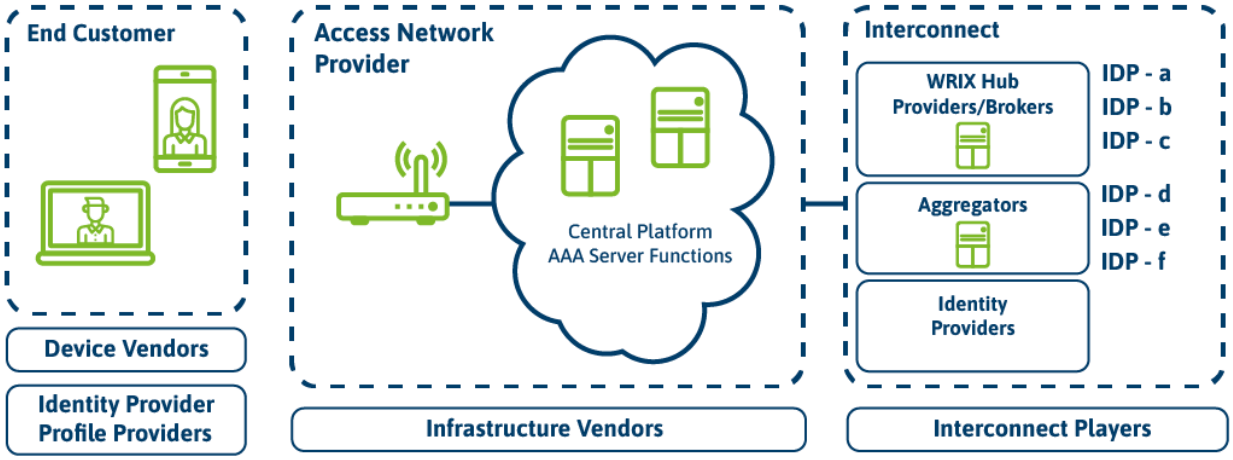

Figure 1 - Wi-Fi ecosystem

In Wi-Fi Roaming, WBA members interact online for AAA and offline for wholesale accounting and billing, according to the following figure, where the basic roles for Operators are shown (ANP and IDP):

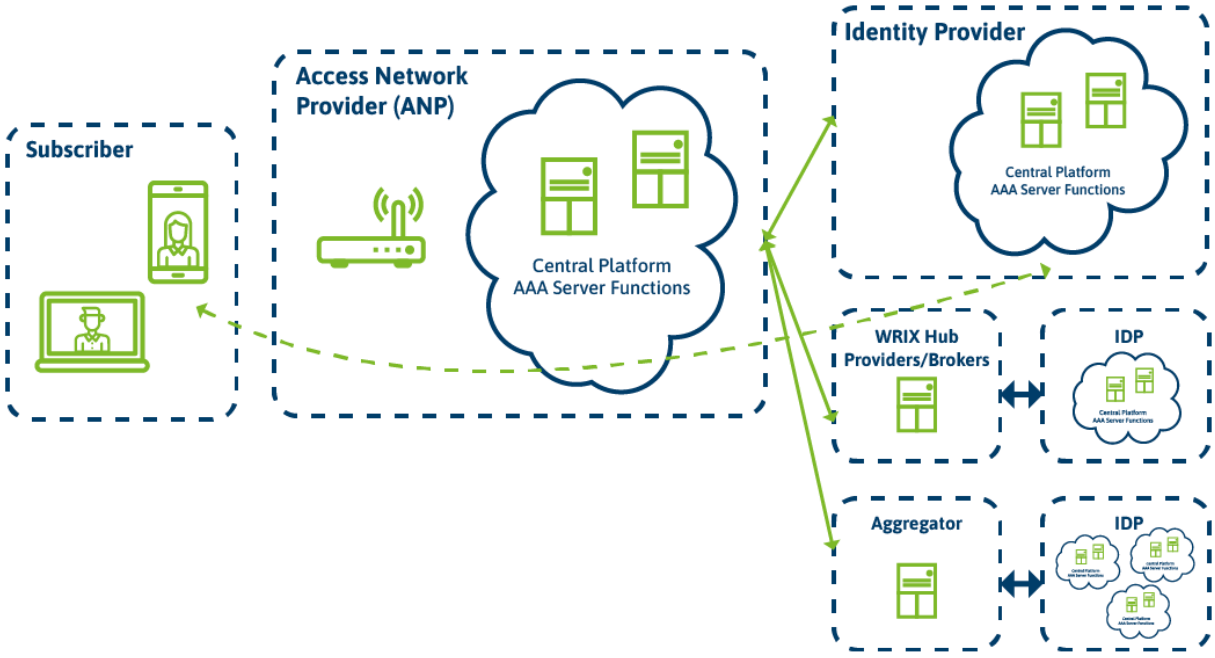

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Figure 2 - Wi-Fi roaming service ecosystem

Each has a particular role in the development of the Wi-Fi ecosystem and in particular on roaming business, as shown in figure 1.

To provide Wi-Fi roaming services, the ANP and IDP must have interoperability mechanisms in place. The visited network provides the connectivity to the client devices (owned by the end user / device owner, as the service subscriber), but redirects the initial authentication of the roaming client devices to the home network AAA servers, typically via RADIUS (Remote Authentication Dial in User Service) proxy or from the Access Controller.

Connection between the networks must be secured by means supporting the connection methods described in the WBA WRIX specifications (in the case of ANP network connection and ANP- IDP interconnection) using methods such as Virtual Private Network (VPN) tunnels or RadSec-secured interconnections.

WRIX specifications are described later in this document. The authentication is done between the home and visitor networks while the accounting and reconciliation of usage for billing purposes may be outsourced to a third party. RADIUS accounting traffic is not lossless, so accounting records between the home and visited network providers might differ from each other.

Operators may have different approaches when developing a roaming strategy. There are two main scenarios available to operators to interconnect their networks, either through a direct connection or by using a third party to facilitate that interconnection.

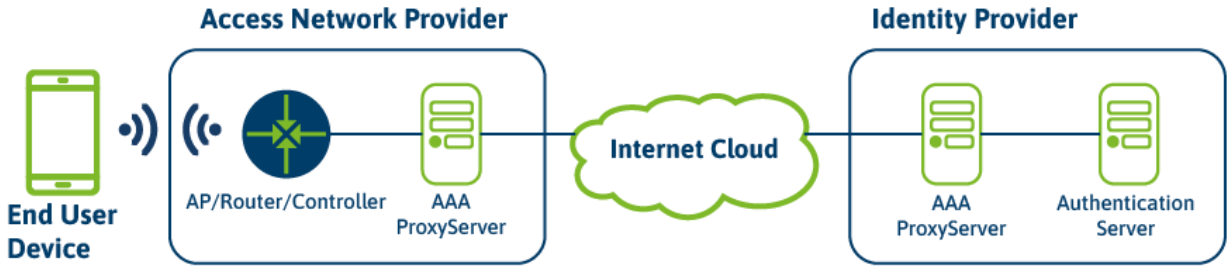


Figure 3 - WLAN roaming with direct, bilateral interconnection

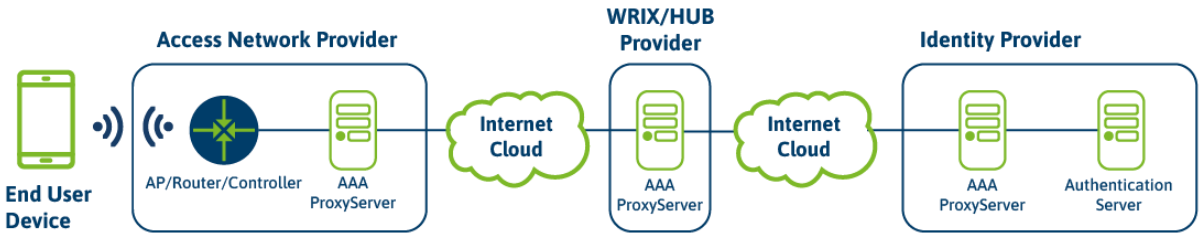


Figure 4: WLAN roaming bilateral interconnection using a WRIX Hub

In a Wi-Fi roaming environment, there are likely to be a large number of relatively small Access Network Providers. A hotel chain, an airport, a convention center, and, perhaps, other venues, may all be a part of a subscriber's Wi-Fi roaming experience.

Thus, for the Identity Provider to deliver a compelling experience, the broader and denser the visited Wi-Fi network, the greater the value delivered to the end user.

As such, the role of a Wi-Fi Roaming Hub is quite important in enabling service providers to build and consolidate Wi-Fi footprint quickly and delivering a compelling experience to the end-user. The Wi-Fi Roaming Hub providers the following benefits:

- Consolidate Wi-Fi access across multiple networks / providers into a single 'Access Network'

- Manage connectivity, accounting and access with and between a wide variety of Wi-Fi access networks
- Reconcile accounting and usage records between wide variety of networks and providers

The WBA provides a framework for the interconnection, exchange of billing and settlement information. These processes provide a common framework for the exchange of all relevant information between roaming partners. This specific entity for intermediation is called WRIX (Wireless Roaming Intermediary eXchange).

One of the main aims of WRIX is the interoperability of wireless networks. The best practices are described in the following documents maintained by the WBA:

- WBA WRIX Umbrella Document (this document)
- WBA WRIX for Network Configuration (WRIX-n)
- WBA WRIX for Radius Interconnection (WRIX-i)
- WBA WRIX for Clearing (Data and Financial Clearing) (WRIX – d/f)
- WBA Location Feed Format & File Exchange Standard (WRIX-L)

These documents are intended to help operators avoid some of the network configuration pitfalls and to standardize the approach between operators to ensure the best roaming experience for users and to promote the rapid set up of roaming agreements between operators using standardized financial and technical approaches based on the WRIX framework.

2 Overview of WRIX Interfaces

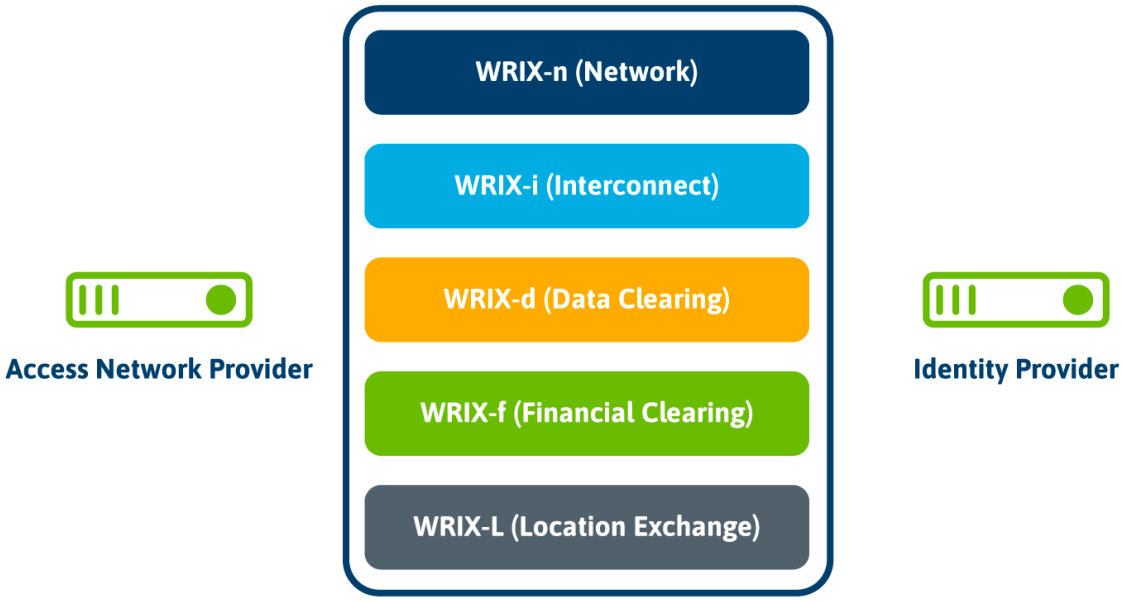
2.1 WRIX Interactions

The interactions discussed in Introduction may seem quite simple if just two companies are working together to enable roaming. As the number of relationship and the complexity of the relationships grow, having a centralized function that manages and standardizes the various roaming functions becomes a very important tool.

Implementing the WRIX framework as a central function internally or employing a WRIX service provider (HUB / Clearinghouse) will become increasingly valuable for managing the roaming activities.

The ANP/IDP operator may implement the WRIX functionality in house, or all or part of the WRIX functionality may be outsourced to an independent company known as a WRIX Hub or Clearinghouse that provides the WRIX functionality commercially.

Since some companies may specialize in one WRIX function or several WRIX functions, a separate WRIX may be used for individual interactions. Therefore, it is possible to describe the WRIX provider by the functional area that it provides so that the different WRIX types are referred to in the following manner:



- WRIX-n – Is an organization that performs and manages the network for the ANP
- WRIX-I – Is an organization that performs and manages the implementation, testing, interconnection and troubleshooting between multiple roaming partners
- WRIX-L – is the organization the facilitates the exchange of hotspot location information between roaming partners
- WRIX-d – the organization that provides the exchange of session information needed to support wholesale billing validation, reconciliation and settlement (Data Clearing) between the roaming partners

- WRIX-f – the organization that manages the exchange of invoices, payments, and FX between roaming partners

2.2 Functional Scope of WRIX Modules

Here is a summary / high level view of the individual WRIX modules:

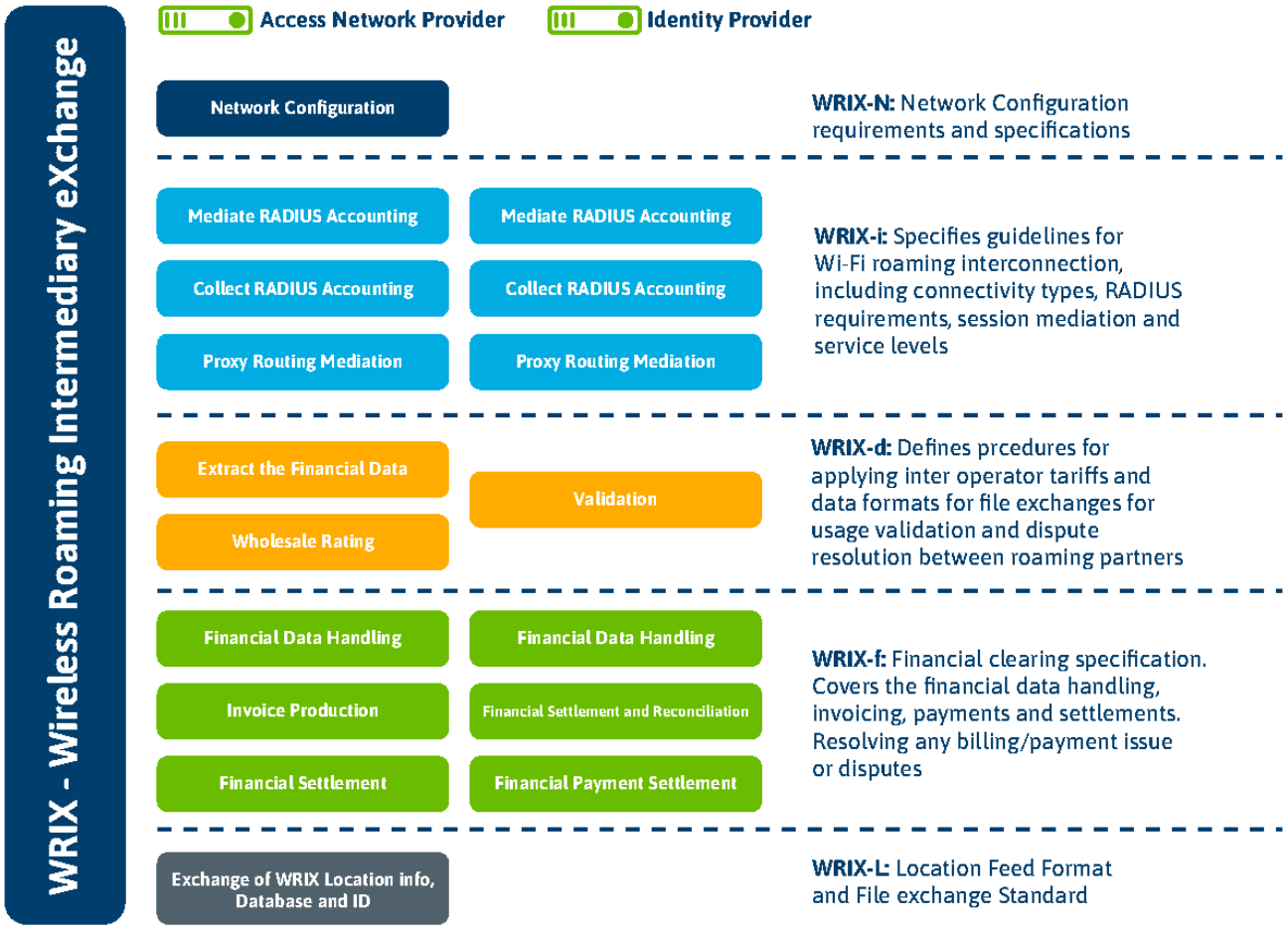


Figure 4–- Functional Scope of WRIX Modules

To more fully explain the interactions between the roaming partners:

ANP Functions	IDP Functions
WRIX-i (ANP): • On-line secure proxy routing for RADIUS messages, sent to the correspondent WRIX-i (IDP) • Collect raw RADIUS accounting records generated by the proxy routing • Mediate raw RADIUS accounting records for wholesale billing • Send those records to the WRIX-d (ANP).	**WRIX-i (IDP):** • Proxy RADIUS messages. • Receive raw RADIUS accounting records generated by the proxy routing • Optionally mediate raw RADIUS accounting records for reconciliation of wholesale billing and send those records to the WRIX-d (IDP)
WRIX-L (ANP): • Provides a location file • Distributes to roaming partners	**WRIX-L (IDP):** • Receives location file • Uses the location file in connection client software distributed to subscribers
WRIX-d (ANP): • Receive the mediated records for wholesale billing from the WRIX-i (ANP). • Rate the received mediated records for wholesale billing using the IOT as specified in the bilateral roaming agreement; • Send the rated wholesale records to the appropriate WRIX-d (IDP) • Respond to any disputes raised by WRIX-d of IDP	**WRIX-d (IDP):** • Receive rated wholesale billing records from the WRIX-d (ANP); • Validate those records and potentially trigger reconciliation mechanism. • Raise disputes when validation fails • Perform data reconciliation

ANP Functions	IDP Functions
• Extract and send the Financial Data to the WRIX-f (ANP)	
WRIX-f (ANP): • Receive Summary Financial Data sent by the WRIX-d (ANP) • Send Financial Data to the WRIX-f (IDP) • Reconcile the financial settlement together with the WRIX-f (IDP) • Calculate and create invoices for each IDP • Send invoices to the WRIX-f (IDP) • Jointly administer financial settlement with the WRIX-f (IDP) • Provide support for dispute resolution.to resolve billing problems	**WRIX-f (IDP):** • Receive Summary Financial Data sent by the WRIX-d (IDP) • Reconcile the financial settlement together with the WRIX-f(ANP) • Receive invoices sent by each WRIX-f (ANP) of the respective IDP´s roaming partners • Jointly administer financial settlement with the WRIX-f (ANP) • Provide support for dispute resolution to resolve billing problems
WRIX-n (ANP) • Network Configuration requirements	**WRIX-n (IDP)** • Device provisioning

2.3 WRIX i/d/f Functionality

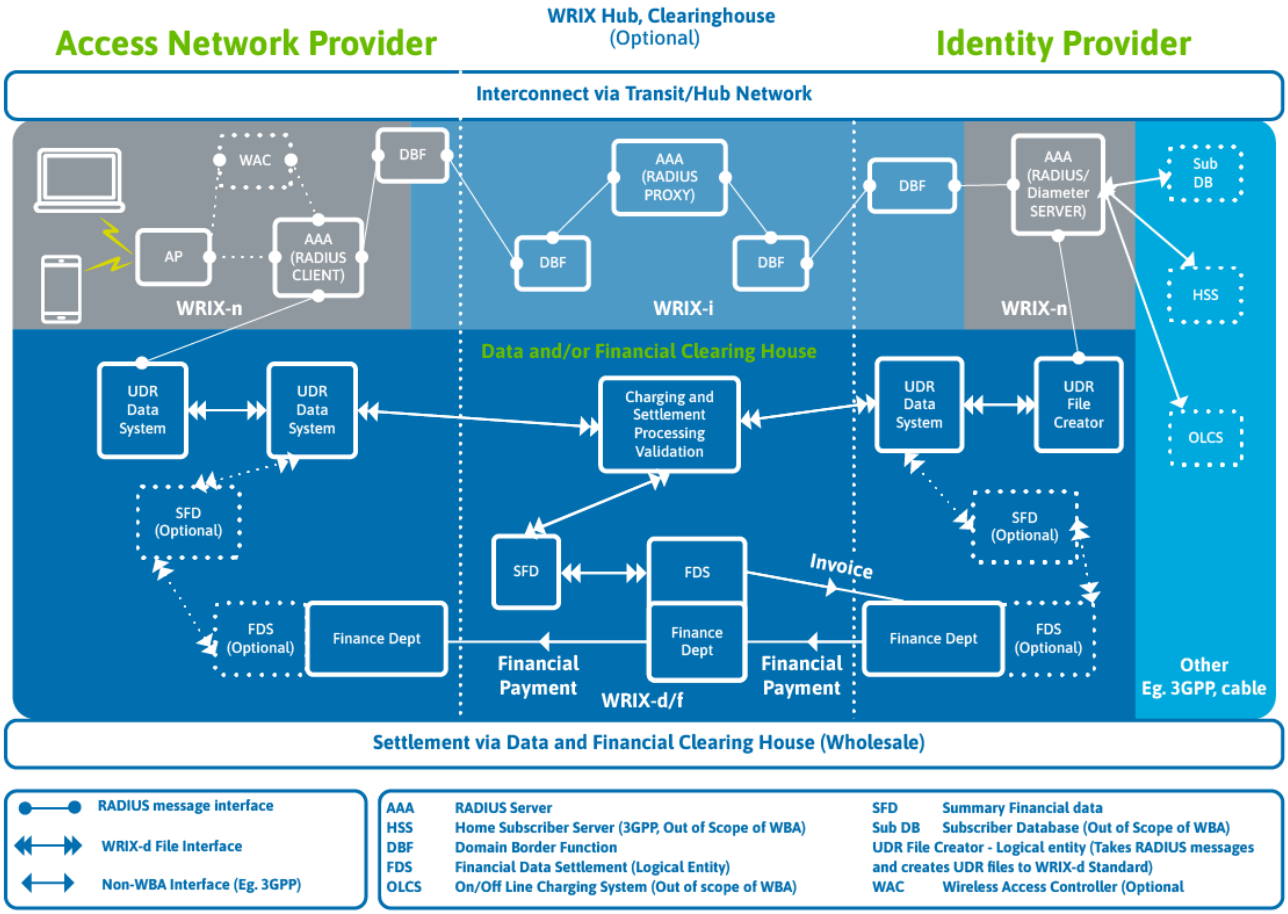
The following diagrams depict several possible implementations of WRIX functionality between roaming partners. There are many options, and these are just illustrations of several possibilities that may be utilized. The following scenarios are illustrated:

1. Fully Outsourced WRIX i/d/f Functionality
2. Outsourced WRIX-i with Direct Settlement
3. Direct Interconnect with Outsourced WRIX d/f

4. All WRIX i/d/f functionality Managed in-house
5. WRIX-L Direct exchange
6. WRIX-L via Hub

2.3.1 Fully Outsourced WRIX i/d/f Functionality

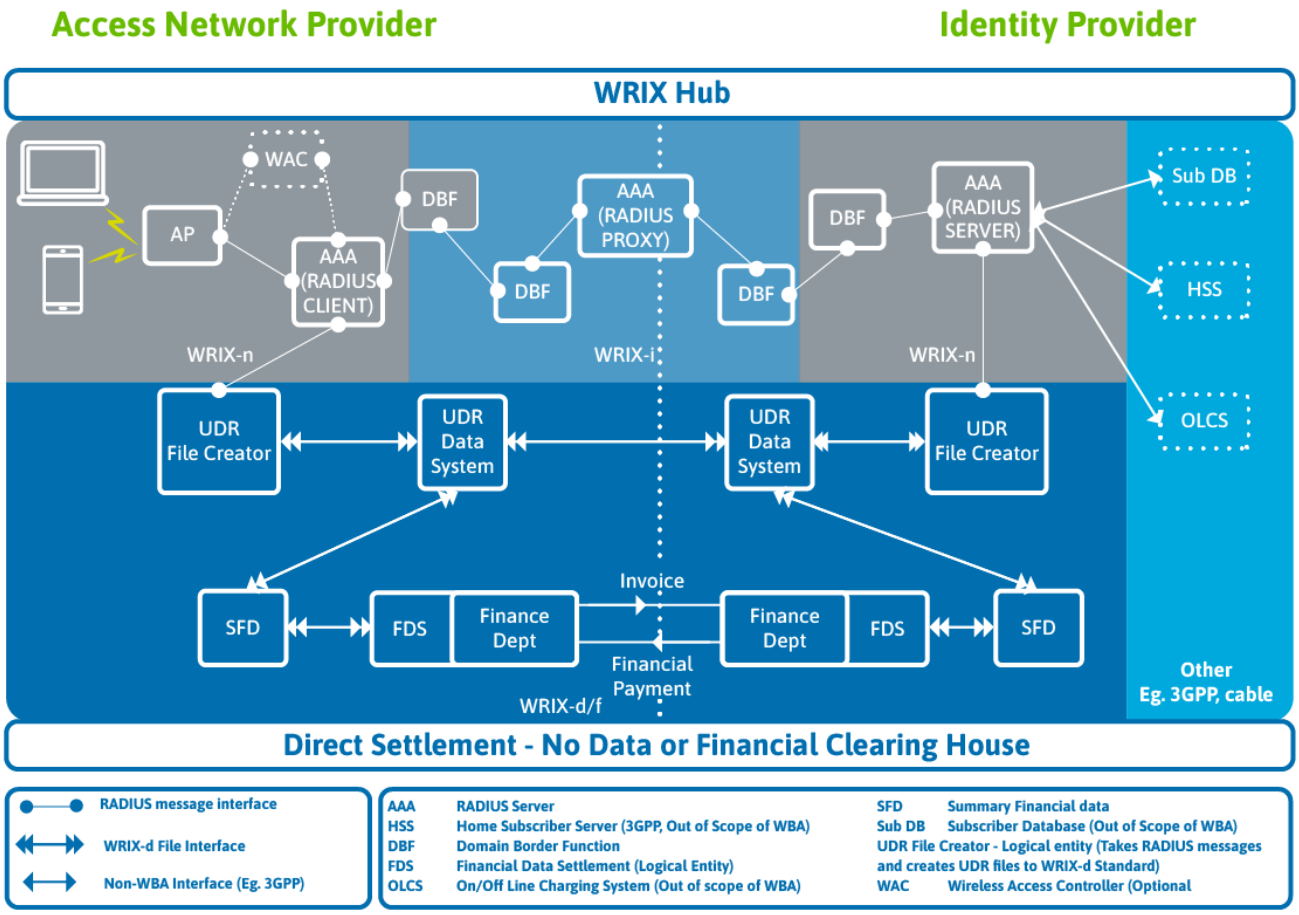
In this model the interconnect functionality is managed via a Transit/Hub Network providing connectivity between the IDPANP and their respective roaming partners. The data clearing functions are also managed through a data and financial clearing house.



For more information regarding DBF functionality, please see WRIX-n. The diagrams shown do not identify the transport function. For more information, see WRIX-i.

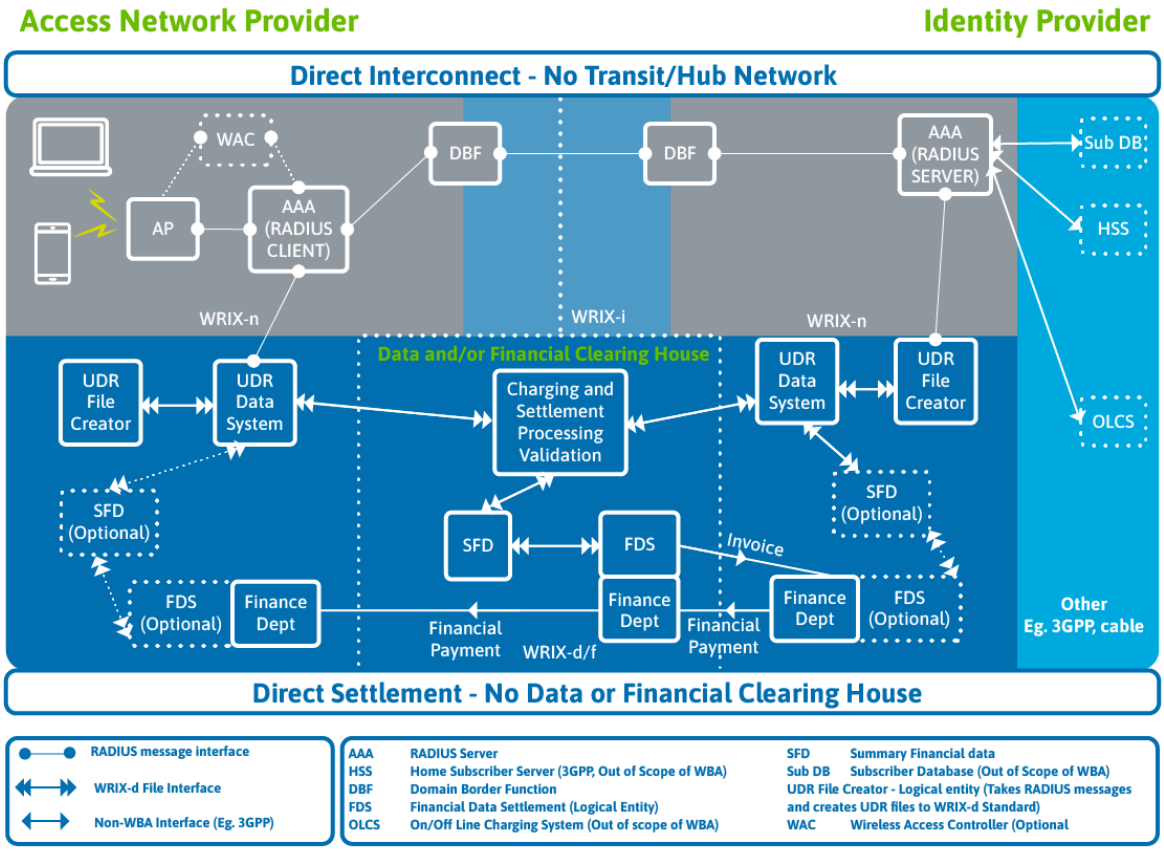
2.3.2 Outsourced WRIX-i with Direct Settlement

In this model the interconnect functionality is managed via a Transit / Hub Network providing connectivity between the IDPANP and their respective roaming partners. The data clearing functions are managed in-house and settlement is done directly.



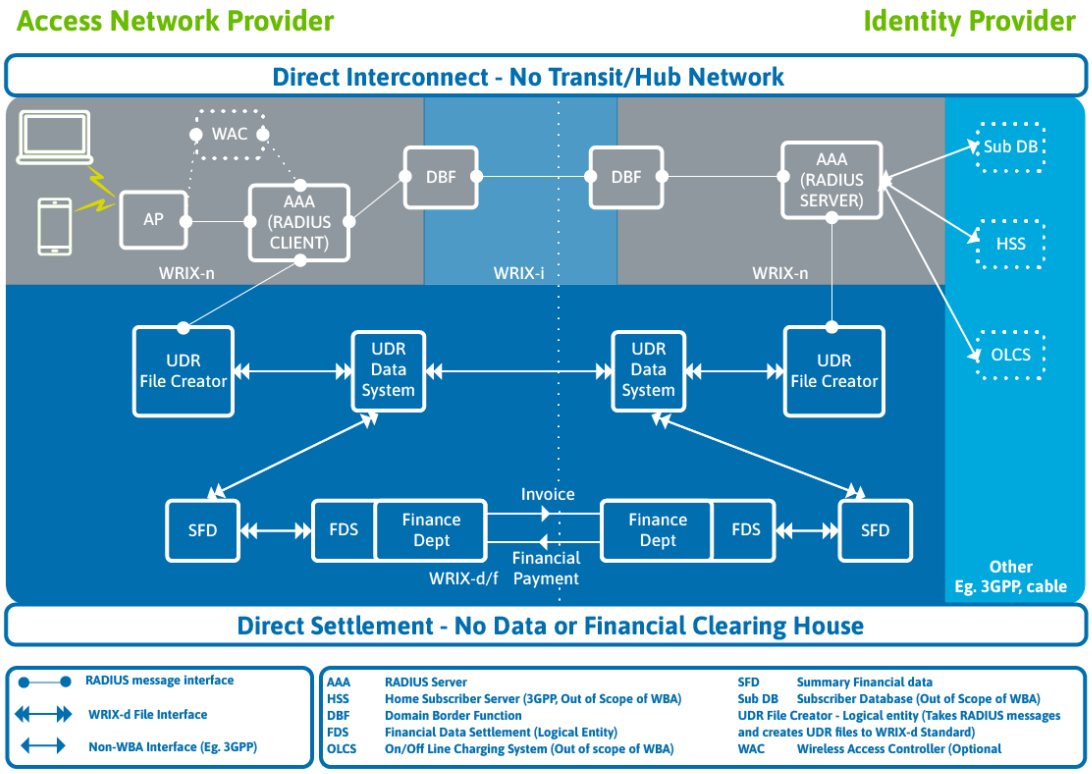
2.3.3 Direct WRIX-i with Outsourced WRIX-d/f

In this model the interconnect functionality is managed in house individually managing the connectivity between the IDP or ANP and their respective roaming partners. The data clearing and settlement functions are outsourced to a hub or clearinghouse.



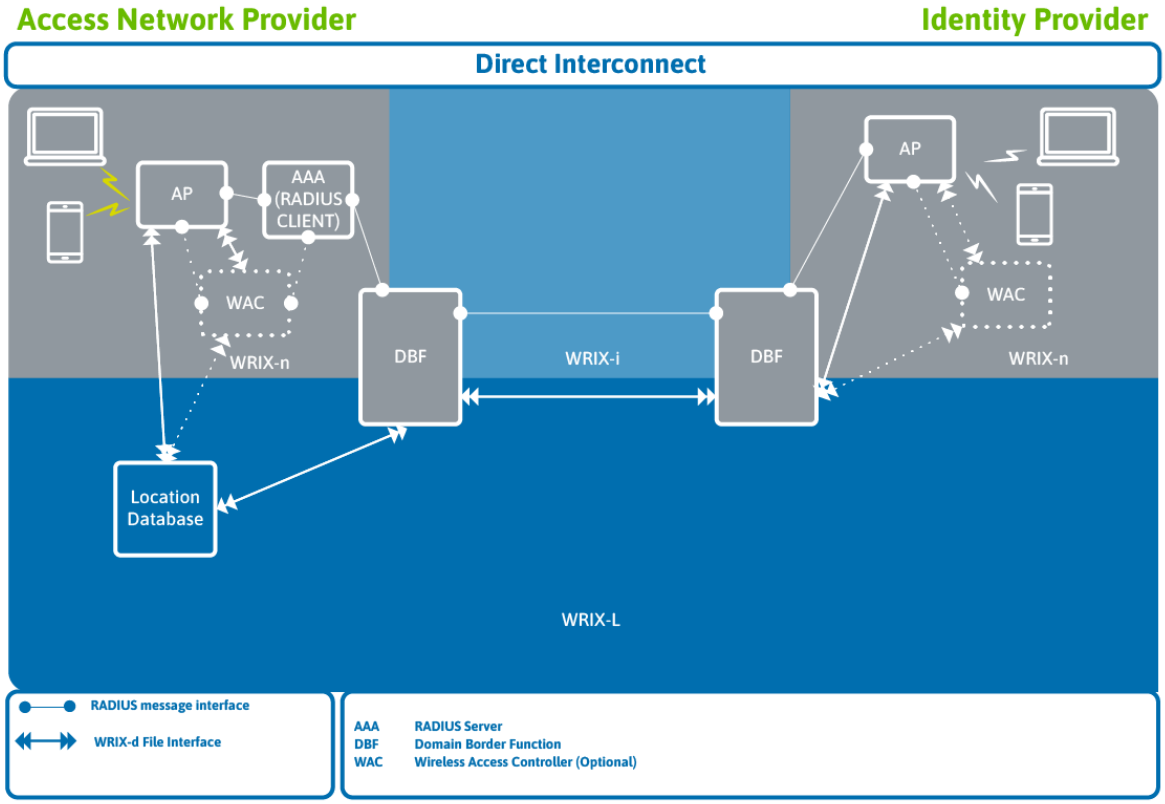
2.3.4 All WRIX i/d/f Functionality Managed In-House

In this model the interconnect functionality is managed in house to provide connectivity between the IDP or ANP and their respective roaming partners. The data clearing functions are also managed in-house and settlement is done directly.



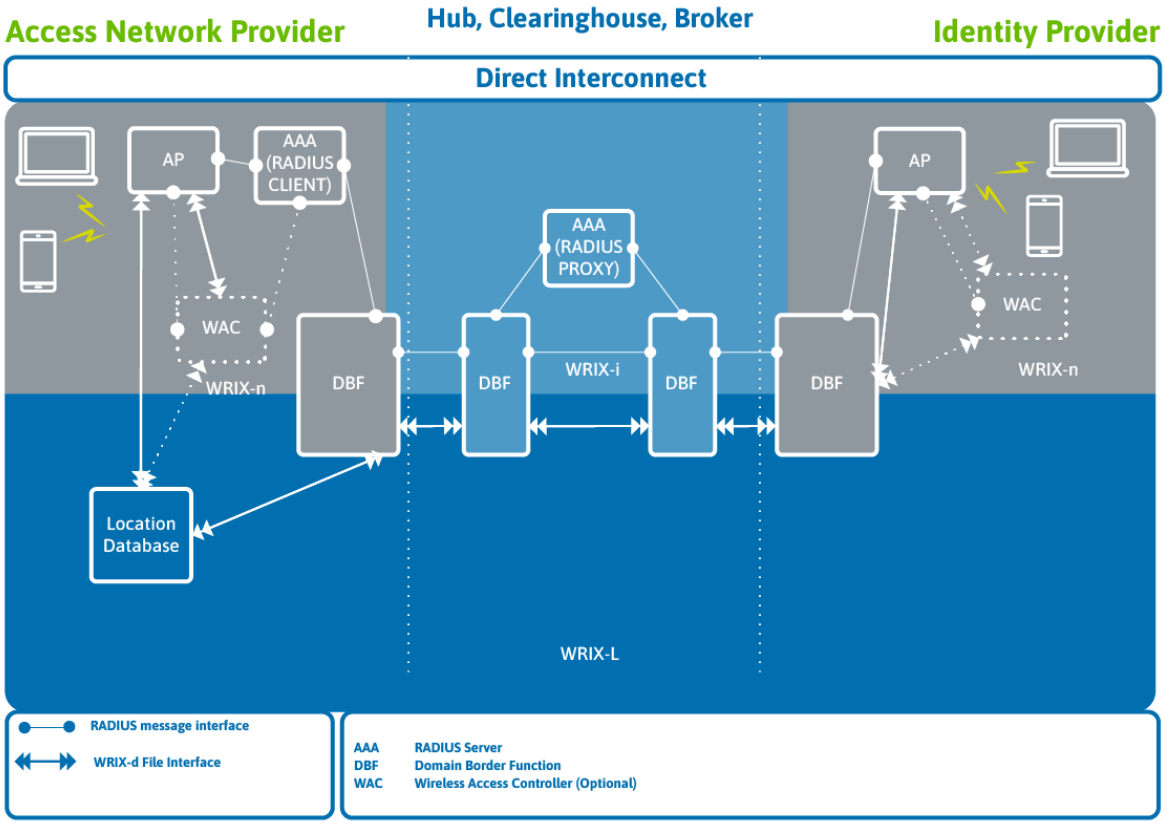
2.3.5 All WRIX-L Direct Exchange

In this model the exchange of hotspot directory files is managed in-house. The ANP distributes their directory file to each roaming partner via a direct interface.



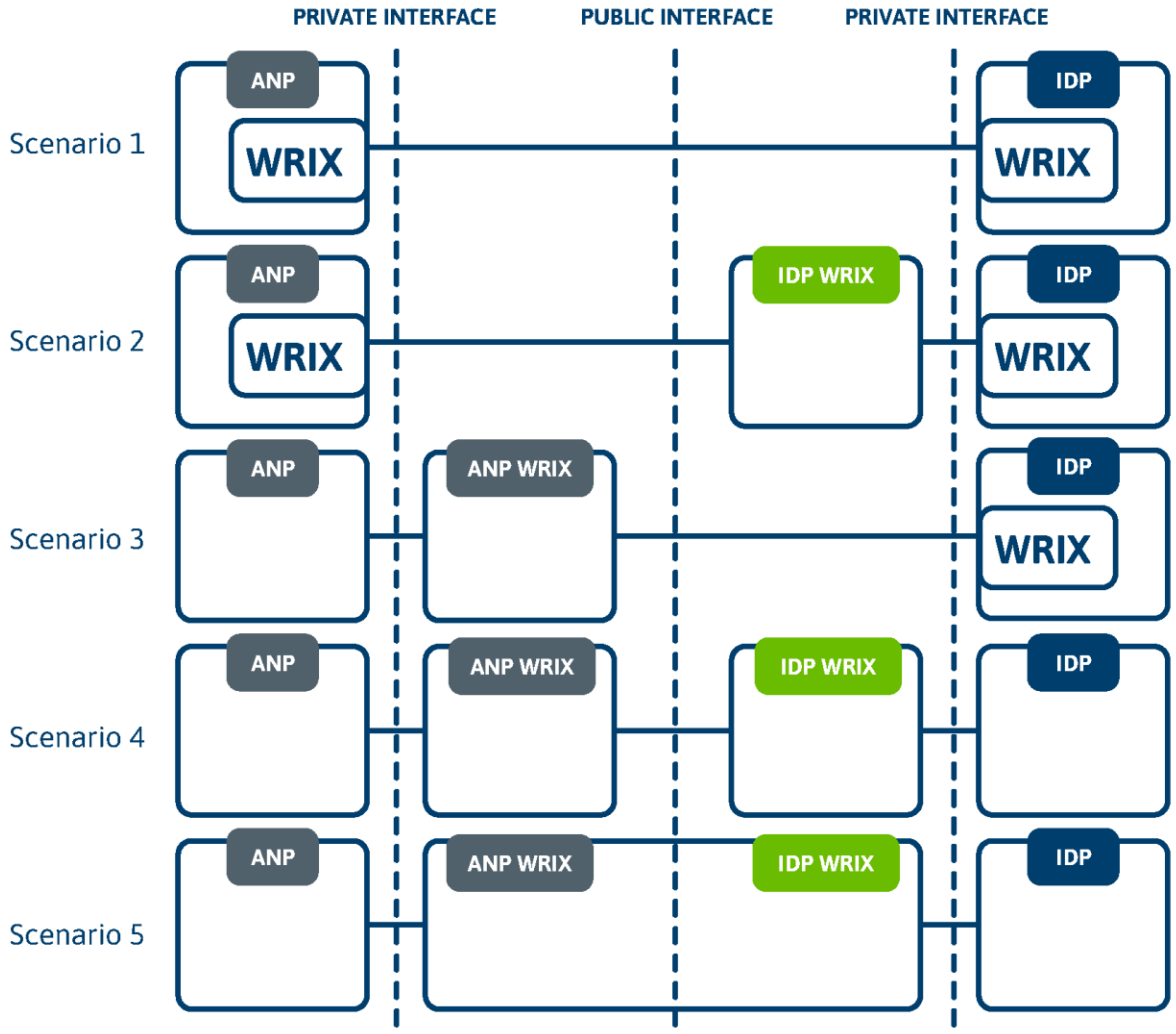
2.3.6 WRIX-L via Hub

In this model the exchange of hotspot directory files is managed by a third party WRIX-L provider. The ANP sends their file to their WRIX-L provider who manages the distribution of the files to each roaming partner.



2.4 WRIX Provides Flexible Implementations Options

The WRIX framework has been designed to provide companies with optimum flexibility in developing their own roaming interfaces depending on their business needs in order to minimize the impact to their existing processes. Public interfaces should comply with WBA's WRIX Guidelines. This flexibility can be seen in the different implementation models, with private and public interfaces as shown in the following figure:



2.5 Areas Out of Scope for WRIX

The present scope for WBA WRIX is the definition of the Operator and provider network requirements (n), Radius interconnection (i) Location exchange (L) and Clearing (d&f) interactions between WRIXs. Items currently out of scope for the WBA WRIX are:

- Any commercial issues beyond the implementation scope of the interface: prices, etc.
- To enhance the attractiveness of roaming service, a hub may propose and offer additional services to the IDP (and their end users), that are absent in the earlier arrangements, after reaching agreement with the IDP and ANP. The hub may offer supplementary services unique to the host, unique not only in the literal sense, but, for example, associated with the peculiarities of the local legislation and so forth. In addition, it may be due to the technical features of the ANP network.

3 Defining WRIX Entities

3.1 The Need for End Entity Identification

In order to facilitate roaming and to identify the companies involved, both the ANP and the IDP must be identified as a part of all WRIX interactions through the use of an identification code. For companies using the WRIX framework for the interaction, both parties will have a WBAID assigned or use a compatible mutually agreed identification code such as a GSMA TADIG code. The identification of the roaming partners involved in each WRIX exchange is mandatory. Each access request sent by a visited network should contain the network's identification should contain an assigned WBAID.

3.2 Where WBAID is used

Here is a diagram detailing all the WRIX interactions where the WBAID is exchanged:

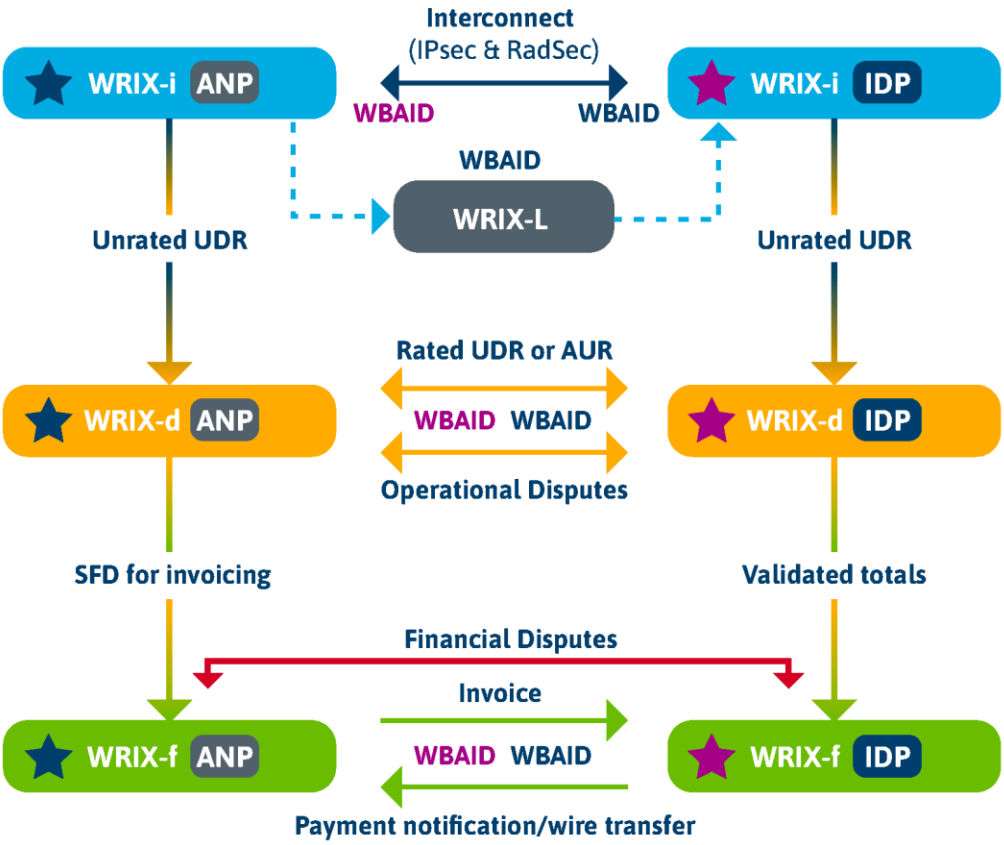


Figure 5 – WBAID Interactions

The interactions are defined as follows:

- WRIX-n:

  WRIX-n covers network configuration and the RADIUS attributes that originate in a access network. The RADIUS attributes that are relevant to the interconnect between two networks are covered in WRIX-i. Some of the information originally in WRIX-i is now to be found in the WRIX-n document

- WRIX-i:

  The provider identifier (WBA-ID or other mutually agreed code) will be exchanged as defined in the WRIX-i specification. The WRIX-i ANP and the WRIX-i IDP will ensure both entities are identified. If the WRIX-i is a Hub, the hub will ensure that the codes exchanged are that of either the ANP or the IDP and not the hub's

- WRIX-L

  The WRIX-L of the ANP will provide the WBAID associated with each WRIX-L file exchange

- WRIX-d

  The WRIX-d should identify the WBAID for each ANP/IDP level file exchanged between the WRIX-d's.

- WRIX-F

  The WBAID is identified on each SFD file exchanged and clearly identified on the invoices sent for billing as well as the Payment Notification files.

3.3 The WBAID Format

The WBAID is comprised of two parts, a mandatory "WBA Primary Member ID" which is assigned by the WBA when a company joins the WBA, and may have a prepended optional SubID that is allocated by a WBA Agent.

The WBA Primary Member ID portion of the WBAID is administered and assigned by the Wireless Broadband Alliance. Companies are assigned their code when they join the WBA.

The WBA Primary Member ID is defined as follows: <Operator ID>:<country code> where:

> Operator ID is an alphanumeric string (ISO/IEC 646) excluding the excluding the ':' (colon), '.' (period/decimal point/fullstop),"‟"" (spacing underscore/low line), '#' (number sign/pound), '£' (pound sterling sign), '*' (asterisk) or '"' (double quotation mark) identifying the operator. The length of the Operator ID should not exceed 12 characters and shall be unique within the WBA community. The Operator ID should be selected in a manner that reduces the likelihood of requiring changes due to internal reorganisation or rebranding.
>
> The Country Code is optional but if present will contain the ISO 3166 2-character code of the home country of the legal entity of the operator. If a company has business operations in multiple countries this portion of the WBAID can be omitted. If the Country Code is omitted then the ":" is also omitted. The length of the complete WBAID must not exceed 128 characters to prevent any issues with the transport of the information in the RADIUS attributes.

Example (WBAID with only Primary Member ID used)

ATT:US

COMCAST:US

TELKOM:IN

WiFiOperator

The SubID is assigned by a WBA Agent may include numbers and letters excluding the ‘:’ (colon), ‘.’ (period/decimal point/fullstop),“"”" (spacing underscore/low line), ‘#’ (number sign/pound), ‘£’ (pound sterling sign), ‘*’ (asterisk) or ‘”’ (double quotation mark)

Example (WBAID with SubID included):

WV0123.SingleDigits:US

Sample1234.Orange

Sample4567.DT:TO

3.4 Where the WBAID Is Used

In the network exchange, covered by WRIX-i and WRIX-n, the WBAID is used in the end to end communication and passed in the Radius attribute, Operator Name #126. It is also used in the attribute, Chargeable User Identity, #89 combined with the user information and the WBAID Access-Accept in the Identity-Provider Vendor Specific Attribute (#26, Vendor 14122, Type 15).

In WRIX-d the WBAID is passed in the IDP and ANP identifiers in the usage exchange records as well as the financial information managed by the WRIX-f. The WBAID is exchanged in the Provider_Identifier field in WRIX-l.

Other supporting processes such as when requesting a PKI or the exchange of configuration details also require the WBAID. For more information regarding the use and format see the relevant sections in the other WRIX documents.

3.5 Use of Other Recognized Industry Codes

The use of alternate codes should be agreed to in the roaming contract negotiated between the ANP and IDP. Currently, the WBAID is only compatible with TADIG (Transferred Account Data Interchange Group) codes, as defined by the GSMA (GSMA PRD TD.13). See applicable WRIX-i section for more details.

3.6 Obtaining a WBAID

A WBAID may be obtained in one of two methods, either directly from the WBA or through a WBA authorized Agent. WBA members receive a WBAID with their company identified in the Primary Member ID portion of the code as part of their WBA membership. Companies who are unable to join the WBA can obtain a WBAID from an authorized agent.

To obtain a WBAID from an authorized agent, the applicant will need to contact one of the WBA Agents and complete an application form and submit that form to the agent. The agent will verify the information provided on the form and explain the WRIX-i requirements. The agent will register the company's WBAID with the WBA under their WBAID as a SubID. The WBA will confirm that availability of the assigned WBAID – SubID combination and authorize the issuance of the new WBAID and enter it into the WBAID database. The agent will then issue the WBAID to the submitter.

3.7 WBA Authorized Agents

A WBA authorized agent is a member of the WBA that has been granted authorization by the WBA to grant WBAIDs. It is the duty of the agent to issue WBAIDs to qualified applicants.

In order to qualify to receive a WBAID from an authorized Agent, the applicant must be a company who either operates a Wi-Fi network or maintains a subscriber base of users identities who will roam across networks. The entity receiving a WBAID from the Agent will complete the registration form, (see appendix), pay a registration fee and also must be willing to support the WRIX Guidelines. The Authorized Agent will assign a unique "SubID" that will be prepended to that agent's WBAID as defined in Section 3.3**Error! Reference source not found.**. The Agent will then submit the new WBAID to the WBA who will ensure that the WBAID is unique and available. The agent will also provide a copy of the application in conjunction with submitting the WBAID. Once the WBA has confirmed that availability of the WBAID the agent will provide that WBAID to the submitter.

3.8 Access to the WBAID Information

The WBAID and associated information is maintained by the WBA in the WBAID database. A subset of this database is available to all WBA members and any entities who have received a WBAID from an Authorized Agent. The WBAID database contains the following attributes:

Attribute	Shared	Comment
SUBID.WBAID	Y	Fully qualified WBAID with SubID if applicable
Company Name	Y	Name of the assignee (organization)
Address Street	N	Street address
Address City	N	City Name
Address State	N	State or province
Address Postal Code	N	Postal code
Address Country	Y	Country code
Name	N	Point of contact for the assignee
Email	N	POC email address
Phone	N	POC phone number
Name of assigner	Y	Point of contact for the Agent
Date assigned	Y	Date WBAID assigned

While the format in which the database is maintained is dependent on the WBA, the database must have an option of providing a Comma-Separated Variable output format. This is to allow ease of importing the information into individual databases.

3.8.1 The End Entity Location Information

RFC 5580 Attribute #128 is used to exchange the physical location-data information of the hotspot using civic location format. At a minimum, attribute #128 shall be used to signal the two-letter ISO 3166 country code, this is different from the WBAID optional country identifier.

4 WBA Work Areas

WBA undertakes programs and activities to address business and technical issues, as well as opportunities, for member companies in order to enable collaboration among service providers, technology companies, cities, venue partners and organizations. Our key Work Groups include technical programs in the areas of NextGen Wi-Fi, 5G, IoT, Testing & Interoperability and Roaming. This latter maintains and evolves the WRIX framework.

These member-led Work Groups are dedicated to resolving standards and technical issues to promote end-to-end services and accelerate business opportunities. To learn more please consult our booklet: **https://wballiance.com/what-we-do**

The WBA provides a number of resources for its members that are available on the member's only site at **https://extranet.wballiance.com**

Also, information that is made available to the public such as the WRIX framework is stored on the WBA institutional website here: **www.wballiance.com**

4.1 Testing & Interoperability Work Group

Building on WBA legacy around the Next Generation Hotspot (NGH) initiative, WBA members have decided to maintain a work group in WBA around the core end-testing capabilities for Wi-Fi networks, with a particular eye into the latest available features, and developing work streams that enhance the user experience and security.

4.2 WBA OpenRoaming Technical Standards

WBA OpenRoaming™ is a roaming federation service that provides a worldwide, autonomous, and secure Wi-Fi experience, built on top of Passpoint technology. WBA members are establishing an open connection architecture and legal framework for all companies in the wireless ecosystem with WBA OpenRoaming to enable a disruptive massification of roaming, allowing identity providers to connect their subscribers with networks and venues with whom they have never talked before, in an automated fashion.

4.3 5G Work Group

A critical group in WBA looks to the convergence and coexistence between the cellular world, particularly 5G, and the Wi-Fi.

This group has had multiple layers of work over the years, going from network slicing to global architecture and policy for licensed 5G, and lately entering within the enterprise sector, looking at the use cases and deployment scenarios for private 5G networks.

As the work evolves, the team will carry on its mission of understanding what are the best technical options and models to provide balancing and technical convergence for operators and enterprises to optimize their connectivity model and benefit from both access technologies.

4.4 Roaming Work Group

The Roaming Work Group (RWG) is the umbrella group that addresses all matters connected to Wi-Fi Roaming.

RWG has weekly calls to discuss and analyses changes to the Wireless Roaming Intermediary eXchange (WRIX) specification, as well as the development of network identification, interconnection, data, and financial clearing to assist the industry in eventually developing their Wi-Fi Roaming business.

4.5 NextGen Work Group

The NextGen Work Group, on its end, looks at the latest generations of Wi-Fi technology, both in terms of studying them and advocating to the industry their impact and benefits, but also trailing the equipment in real live deployments, and helping different stakeholders across the world visualizing, in practice, the possibilities of new Wi-Fi technology.

Besides this NextGen work, the group is also responsible for looking at new applications for Wi-Fi technology, in general, such as Sensing, AR, VR, etc.

And, finally, this is also the group responsible for developing all the residential Wi-Fi work.

5 Operational Information

For a full copy of the WRIX specification, please contact us through **pmo@wballiance.com**.

Find the WBA Roaming Work Group on the Extranet.

Appendix

Appendix – WBAID Application

The following is the WBAID application to be used by an entity that is applying for a WBAID through a WBA Authorized Agent. For a list of WBA Authorized Agents contact us through the **pmo@wballiance.com**.

Label	Value
Organization Name	
Business Address	
Street	
City	
State	
Postal Code	
Country	
Point of Contact	
Name	
Email	
Phone	
Other Information	

Acronyms and abbreviations

Item	Description
AAA	Authentication, Authorization and Accounting A method for transmitting roaming access requests in the form of user credentials (typically user@domain and password) service authorization, and session accounting details between devices and networks in a real-time manner.
AP	Access Point
Authentication Server	An authentication server is an application that facilitates the authentication of an entity that attempts to access a network.
CDR	Call Data Record
Clearing-House Operator	Operator that offers intermediation services to Network Providers and Service Providers, providing them a single contact point. The Clearing-House Operator does not own Hotspots infrastructure nor has end users. Replaced by WRIX-c in WBA WRIX context.
FTP Push	The Push method of the File Transfer Protocol (FTP). FTP Push is an ideal way to collect CDR data because it eliminates the need for a polling computer.
Home Network Operator	Service Provider (retail service to end users); see IDP
Host Operator	Network Provider (infrastructure service); see ANP
Hot Spot	A location where it is provided Wi-Fi public access network to Wi-Fi enabled customers. Examples of hotspots include hotel lobbies, coffee shops and airports.
Hotspot Operator	Network Provider
HSO	Hot Spot Operator; equivalent to NP or ANP
IDP	Home Service Provider, equivalent to SP
IBAN Code	The International Bank Account Number (IBAN) is an international standard for numbering bank accounts. It was originally adopted by the European Committee for Banking Standards, and was later adopted as ISO 13616:1997. The IBAN consists of a two letter ISO 3166-1 country code, followed by two check digits, and up to thirty alphanumeric characters for the domestic bank account number, called the BBAN (Basic Bank Account Number).
IDP "Identity Provider" (IDP)	IDP "Identity Provider" (IDP), means a service provider which enrolls end-users and/or devices and manages credentials for mobile device subscriptions. The IDP authenticates the mobile device and may bill the end- user for usage.
IETF	Internet Engineering Taskforce (specifying e.g. RADIUS RFCs)
IOT	Inter-Operator Tariff
IPSec	IPSec (IP security) is a standard for securing Internet Protocol (IP) communications by encrypting and/or authenticating all IP packets. IPSec provides security at the network layer.

Item	Description
ISO 4217	ISO 4217 is an international standard describing three letter codes to define the names of currencies established by the International Organization for Standardization (ISO). The first two letters of the code are the two letters of ISO 3166-1 alpha-2 country codes (which are similar to those used for national top-level domains on the Internet) and the third is usually the initial of the currency itself. So Japan's currency code becomes JPY—JP for Japan and Y for yen. This eliminates the problem caused by the names dollar, franc and pound being used in dozens of different countries, all with wildly differing values.
ISO 9362	ISO 9362 (also known as SWIFT code) is a standard list of Bank Identifier Codes approved by the International Organization for Standardization. These codes are used when transferring money to a bank account in another country.
MAC	Media Access Control
NAI	Network Access Identifier
NAS	Network Access Server
NASID	Network Access Server Identifier
Network Access Identifier (NAI)	Defined in RFC 2486 – Is the user ID submitted by the client during PPP authentication. In roaming, the purpose of the NAI is to identify the user as well as to assist in the routing of the authentication request.
NP	Network Provider
OFR	Outstanding File Report
PAC	Public Access Controller
PAC Gateway	Public Access Control Gateway may be used by Hotspot Operator to provide the access and service control in their Wifi network. The PAC Gateway may perform several key functions for the Hotspot Operator in order to support the Universal Access Methodology.
Proxy	Server that protects a local area network (LAN) against attacks or intrusions coming from Internet. Proxy is usually located near the protected LAN.
PWI-FI	Public WI-FI
RADIUS	Remote Authentication Dial In User Services (RADIUS) Defined in RFC 2865, RFC 2866 and RFC 2869
RFC 2865	IETF Request for comments Specification for RADIUS
RFC 2866	IETF Request for comments Specification for RADIUS Accounting
RFC 2869	IETF Request for comments Specification for RADIUS Extensions
Roaming	The ability of an end-user with a Wi-Fi device to use the service of an operator other than the one with which they have an account relationship.

Item	Description
Roaming Page	Page where the user chooses his SP, from a list of available ones. The user has contracted the roaming service with his SP and it is who finally authorizes the service access. Roaming page can be located in the NP, or an intermediary.
SDWG	Service Delivery Working Group under the Wireless Broadband Alliance
Service Provider (SP)	The entity which the end-user has an authentication and/or billing relationship. The Service Provider need not be a network provider, but must support the RADIUS functionality required to authenticate and account for usage of their clients that roam. In roaming, IDP
SFD	Summary Financial Data
SLA	Service Level Agreement
Smart Client	A software solution which resides on user's access device and facilitates his connection to Public Access Networks, whether via browser, signalling protocol or other proprietary method of access.
SSID	Service Set Identifier
UDR	Usage Detail Record
UTC	Coordinated Universal Time or UTC, also sometimes referred to as“"Zulu tim”", is an atomic realization of Universal Time (UT) or Greenwich Mean Time, the astronomical basis for civil time. Time zones around the world are expressed as positive and negative offsets from UT. UTC differs by an integral number of seconds from International Atomic Time (TAI), as measured by atomic clocks and a fractional number of seconds from UT.
VAT	Value Added Tax Value added tax (VAT) is a sales tax levied on the sale of goods and services. In some countries, including Singapore, Australia, New Zealand and Canada, this tax is known as "Goods and Services Tax" or GST. VAT is an indirect tax, in that the tax is collected from someone other than the person who actually bears the cost of the tax.
Visited Operator	Network Provider
Visited Network Provider (VNP)	Operator that offers Internet access public service through a directly operated set of Hotspots. Also called Hotspot Operator (HSO). In roaming, VNP is
VoWi-Fi	Voice over WI-FI
VPN	Virtual Private Network
VSA	Vendor Specific Attribute
WBA	Wireless Broadband Alliance
Wi-Fi	Wireless Fidelity–- A trademark for set of product compatibility standards for wireless local area networks (Wi-Fi).

WISP	Wireless Internet Service Provider; in WBA WRIX, a case for ANP
WISPr	Wireless Internet Service Provider roaming Wireless Internet Service Provider roaming. A Wi-Fi Alliance Committee established to identify recommended best practices for support of wireless roaming between providers of networks employing Wi-Fi technology.
WI-FI	Wireless Local Area Network
WRIX	Wireless Roaming Intermediary eXchange. The name used in WBA WRIX to indicate and intermediation service provider for any kind of interaction (interconnection, clearing) on behalf of ANP or IDP.
WRIX Hub	A company that provides one or more WRIX functions as an out managed service.
WRIX–i	The company providing the WRIX function for Interconnection
WRIX–d	The company providing the WRIX function for Data Clearing (previously named DCH)
WRIX–f	The company providing the WRIX function for Financial Clearing (previously named FCH)
WRIX-L	The company providing the WRIX function for the exchange and management of directory information
WRIX-n	The company providing the WRIX function for the exchange and management of RADIUS information and related network configuration information, in setting up operator – to – WRIX connections.
XML	eXtensible Markup Language