IEEE P802.11
Wireless LANs

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| Liaison to REVmd on ESS |
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##### This is a liaison from 802.11’s ARC SC to 802.11’s REVmd, with proposals for modification of Draft Standard text on the definition and introductory discussion of the concepts “ESS” and “HESS”.

##### Revision history:

##### R0 – Initial draft

##### R1 – Updated during review by ARC SC at 802.11 F2F, January 2020, Irvine, CA, USA

##### R2 – Updated references to be against REVmd D4.0 (was D3.0). (Only change is the reference to subclause 11.22.2.)

##### R3 – Per REVmd telecon on Sep 14, 2020: Now a personal contribution, with the following changes:

* Minor changes to 4.3.5.2 proposed text (highlighted in yellow).
* Explicitly listed the additional locations to change “homogeneous ESS” (checking for various spellings) with “HeSS”. (Changes highlighted in yellow.)
* Added discussion of how the contents of 4.3.20 and 4.5.9 could be further updated in this general direction, and why that is suggested to be deferred, for now.

R4 – From off-line comments, two minor editorial changes, marked in blue.

R5 – Removed historical changes tracking (highlights, etc., as described above). Added references to Wi-Fi Alliance specs, and discussion of potential additions to connect the HeSS concepts to the Wi-Fi Alliance uses, as examples. Minor editorial changes, per ARC SC call on Jan 11, 2021.

**Liaison from ARC SC to TGmd/REVmd CRC**

Dorothy, et al,

Some time ago (approx. May 2016), during joint discussions between ARC SC, TGak, and 802.1, the question was asked “What [really] is an ESS?” The ARC SC has been researching and debating this question as a background task ever since, and has finally reached some conclusions/recommendations – just in time for REVmd’s Sponsor Ballot process!

From our review, we recommend the following changes, to be considered by TGmd/REVmd CRC. While these changes appear to be a significant re-definition of a very fundamental concept to IEEE Std 802.11, we believe that the changes are, conceptually, really not that different – it is a matter of using correct terminology and being consistent with terms and usage elsewhere in the Standard, and with most experts’ conceptual model of an ESS. Hence, we believe these changes are appropriate (or at least acceptable) at the current stage of REVmd’s revision process.

If the task group is interested in background and history of this discussion, our working document can be found here: <https://mentor.ieee.org/802.11/dcn/18/11-18-1051-13-0arc-what-is-an-ess.pptx>

Thank you for your time and consideration.

Mark Hamilton, Chair ARC SC

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All references are to REVmd D5.0.

**Modify the definition of ESS (in clause 3):**

* + - From:

“A set of one or more interconnected basic service sets (BSSs) that appears as a single BSS to the logical link control (LLC) layer at any station (STA) associated with one of those BSSs.”

* + - To:

“A set of one or more basic service sets (BSSs) that are interconnected by a single distribution system (DS); an ESS appears as a single IEEE Std 802™ access domain to the logical link control (LLC) sublayer.”

**Modify text in 4.3.5.1 (the “Overview” subclause of the “DS concepts” subclause):**

* + - From:

“The DS enables mobile device support by providing the logical services necessary to handle address to destination mapping and seamless integration of multiple BSSs.

An access point (AP) is any entity that has STA functionality and a distribution system access function (DSAF), which enables access to the DS, via the WM for associated STAs.”

* + - To:

“The DS enables mobile device support by providing the logical services necessary to handle address to destination mapping and seamless integration of multiple BSSs.

An access point (AP) is any entity that has STA functionality and a distribution system access function (DSAF), which enables access to the DS, via the WM for associated STAs. To access the DS, a non-AP STA joins a BSS and associates to the AP operating that BSS. This causes the AP to notify the DS of the non-AP STA’s location within the network. The non-AP STA moves to another BSS operated by an AP connected to the same DS in another location by reassociating to this new AP. The new AP updates the DS with the non-AP STA’s new location at the completion of the reassociation.

The STA’s location information is internal to the DS, thus STA mobility is transparent to upper layers. See 4.3.5.2 (Extended service set (ESS): the large coverage network).”

**Modify text in 4.3.5.2 (“Extended service set (ESS): the large coverage network”):**

* + - From:

“The DS and infrastructure BSSs allow IEEE Std 802.11 to create a wireless network of arbitrary size and complexity. IEEE Std 802.11 refers to this type of network as the ESS. An ESS is the union of the infrastructure BSSs with the same SSID connected by a DS. The ESS does not include the DS.

The key concept is that the ESS appears the same to an LLC layer as an IBSS. STAs within an ESS can communicate and mobile STAs might move from one BSS to another (within the same ESS) transparently to LLC.”

* + - To:

“The DS and infrastructure BSSs allow IEEE Std 802.11 to create a wireless network of arbitrary size and complexity. IEEE Std 802.11 refers to this type of network as the ESS. An ESS is the union of the infrastructure BSSs with the same SSID connected by a single DS. All BSSs in an ESS have the same SSID. The ESS does not include the DS.

The key concept is that the ESS appears to be a single IEEE Std 802™ access domain to the LLC sublayer ~~the same to an LLC layer as an IBSS~~. STAs within an ESS can communicate and mobile STAs might move from one BSS to another (within the same ESS) transparently to the LLC sublayer.

If multiple BSSs are configured with the same SSID, but the APs are not interconnected by a common DS, there is no guarantee of seamless mobility for STAs between those BSSs. However, such a deployment may have a common LLC sublayer interconnection, in which case, communication with location transparency to the LLC sublayer (a single access domain) is generally still possible, but such communication could be disrupted at times when a mobile STA moves between BSSs.”

**Replace the definition of “homogeneous extended service set (ESS)” (in clause 3):**

**Change from:**

* + “homogeneous extended service set (ESS): A collection of basic service sets (BSSs), which may or may not be within the same extended service set (ESS), in which every subscription service provider network (SSPN) or other external network reachable at one BSS is reachable at all of them”

**To:**

* + “HeSS: A collection of basic service sets (BSSs) that provide access to a set of higher-layer services using a given set of authentication credentials
	+ NOTE1—HeSS is an orthogonal concept to extended service set (ESS). Membership of a given BSS in an HeSS is independent of any ESS membership.
	+ NOTE2—“HeSS” is not an abbreviation for anything.

**And update the abbreviation:**

**Change from:**

* HESSID (#1352)homogeneous extended service set identifier

**To:**

* HESSID HeSS identifier

**In 9.4.2.91 (Interworking element) change:**

The HESSID field, which is the identifier for a homogeneous ESS, specifies the value of HESSID; …

**to**

The HESSID field, which is the identifier for an HeSS, specifies the value of HESSID; …

**In the HESS discussion text (in 11.22.2):**

**Replace:**

* + In an infrastructure BSS, the Interworking element contains signaling for Homogeneous ESSs. The HESSID is a 6-octet MAC address that identifies the homogeneous ESS. The HESSID value shall be identical to one of the BSSIDs in the homogeneous ESS. Thus, it is a globally unique identifier that, in conjunction with the SSID, may be used to provide network identification for an SSPN.
	+ NOTE—This standard assumes that the HESSID field in the Interworking element is administered consistently across all BSSs in a homogeneous ESS.

**With:**

* + In an infrastructure BSS, the Interworking element contains signaling for HeSSs. The HESSID is a 6-octet MAC address that identifies the HeSS. The HESSID value shall be identical to one of the BSSIDs in the HeSS. The HESSID is a globally unique identifier that identifies a set of higher-layer services and the authentication credentials required to access them.
	+ NOTE—This standard assumes that the HESSID field in the Interworking element is administered consistently across all BSSs in an HeSS.

**In the MIB, change (in the DESCRIPTION of dot11HESSID):**

This attribute is used by an AP and is the 6-octet homogeneous ESS identifier field, whose value is set to one of the BSSIDs in the ESS. It is required that the same value of HESSID be used for all BSSs in the homogeneous ESS.

**to:**

This attribute is used by an AP and is the 6-octet HeSS identifier field, whose value is set to one of the BSSIDs in the HeSS. It is required that the same value of HESSID be used for all BSSs in the HeSS."

**[Consider?] Add an informative reference to the Annex A Bibliography:**

[Bx] Wi-Fi Alliance Passpoint Specification, Version 3.2

[By] Wi-Fi Alliance, Wi-Fi CERTIFIED Passpoint Deployment Guildelines Rev 1.3

**and add mention of the orthogonality of HESSID and SSID (in 11.22.2?). Include discussion that the Wi-Fi Alliance documents [Bx] and [By] are an example use of these concepts, including relationships between SSID and HESSID.**

<We really should suggest specific text. After reviewing the Wi-Fi Alliance documents, I’m not sure what to say. (Wi-Fi Alliance documents can be found here: **<https://www.wi-fi.org/file/passpoint-specification-package-release-3>** and here: **<https://www.wi-fi.org/file/wi-fi-certified-passpoint-deployment-guidelines>**.) >

**Do we also suggest adding clarifications on ANQP usage (behavior across all APs in an HeSS should be the same, etc.)?**

**Deferred changes:**

**Subclause 4.3.20 is “Subscription service provider network (SSPN) interface”.**

There are two paragraphs in this subclause and one Figure (Figure 4-8) which are meant to help describe the concept of an SSPN. It mentions concepts such as how the SSPN and AP exchange authentication information (outside the scope of this standard). It also describes that the SSPN interface (a logical ‘link’ between the SSPN and the non-AP STA) “provides the non-AP STA with access to the services provisioned in the SSPN.”

Deeper review of these paragraphs may result in some suggestions from Interworking experts to help connect the concept of HeSS into these paragraphs. There is currently no mention of the HeSS concept in this subclause.

There is a reference to “ESS” in Figure 4-8, which is arguably possible/allowed, but not really relevant to the subclause’s concepts. This could be changed to “HeSS”, perhaps. We should coordinate that with overall review/update of this subclause in conjunction with Interworking experts.

**Subclause 4.5.9 is “Interworking with external networks”.**

This subclause is more extensive than 4.3.20. Topics are focused around the general concepts of Interworking, including PAD, and other services. This subclause also has mention of the SSPN interface and access to SSPN, and might also benefit from some more explanation of how HeSS fits into the concepts.

There is currently no discussion of the HeSS concept in this subclause.

There is a reference to “ESS” in subclause 4.5.9.2.4 (Service information registry), which might be correctly HeSS. This should also be discussed with Interworking experts, as part of any expansion/correction of subclause 4.5.9.