### **IEEE P802.11 Wireless LANs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Usage Clarity | | | | |
| Date: 2024-01-15 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | Email |
| Brian Hart | Cisco Systems |  |  | brianh@cisco.com |
|  |  |  |  |  |
|  |  |  |  |  |

**Abstract**

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Additions/clarification arising during presentations
* Rev 2: Added extra clarification after offline discussion
* Rev 3: Correction to the extra clarification
* Rev 4: Extra content

REVme discussed CIDs 6070 and 6071, agreed with CID 6070 and recommended more discussion at ARC for CID 6071.

This relates to the term “noninfrastructure BSS” and how it is used with the Channel Usage feature; and also the term “infrastructure BSS” in turn.

A definition for “Infrastructure BSS” (CID 6070) is fairly easy to converge on:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***TGme editor: Please note Baseline is 11me D4.0. Edits are expressed via Word track changes:***   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 6070 | 3.1 | 189 | 28 | No definition for "infrastructure BSS" (yet "noninfrastructure BSS" is defined in terms of "infrastructure BSS") | Add a definition for infrastructure BSS - e.g. a BSS with an AP. | Revised; in general agreement with commenter; see changes under 6070 in doc 23/1924<motionedRevision>. |   ***Discussion***   |  | | --- | | 3.1 Definitions  **infrastructure**: An infrastructure comprises a distribution system (DS), one or more access points (APs), zero or one portals, and zero or more mesh gates. It is also the logical location of distribution and integration service functions of an extended service set (ESS).(#238)  4.3.5 Distribution system (DS) concepts  4.3.5.1 Overview  Instead of existing independently, an infrastructure BSS **might** also form a component of an extended form of network that is built with 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. |   Since an AP has access to the DS, therefore the existence of an AP requires the presence of a DS. Therefore, if a BSS has an AP, then infrastructure is present (i.e., a distribution system (DS), one or more access points (APs), zero or one portals, and zero or more mesh gates). Use this direction to define an infrastructure BSS.  ***Changes for CID 6070***  3.1 Definitions  infrastructure basic service set (BSS): [infrastructure BSS] A BSS that includes an access point (AP), which enables access to a distribution system (DS). |

**Non-infrastructure BSS** is then naturally the negation of this (pre-existing, no change required).

|  |
| --- |
| noninfrastructure basic service set (BSS): [noninfrastructure BSS](M118) A BSS that is not an infrastructure BSS.(#3349) |

However, the term Non-infrastructure BSS appears in the four following places:

* Its definition (as above)
  + “noninfrastructure basic service set (BSS): [noninfrastructure BSS](M118) A BSS that is not an infrastructure BSS.(#3349)”
  + Which perhaps could be clarified to explicitly list IBSS, MBSS (including when a mesh gate is present (!?)), PBSS and (so that Wi-Fi Direct counts as an infrastructure BSS) any arch characterized by the absence of an AP)?
* The definition of P2P link where IMHO it is used as a vehicle to include all links except infrastructure AP to non-AP STA links (i.e., this is consistent with the definition above)
  + “peer-to-peer (PTP) link: [PTP link] (M118)(#1752)A station-to-station (STA-to-STA) link between tunneled direct link(#2154) setup (TDLS) peer STAs in an infrastructure basic service set (BSS) or between STAs in a noninfrastructure BSS.(#3349)”
* The definition of SSID where IMHO it is used as a vehicle to include all BSSs albeit with special treatment for ESSs (i.e., this is consistent with the definition above)
  + “service set identifier: [SSID] A string used to identify the infrastructure basic service sets (BSSs) that comprise an extended service set (ESS), or to identify a noninfrastructure BSS(#3349)”
* 9.4.2.84 Channel Usage element and 11.21.15 Channel usage procedures, where here IMHO we’re talking about something else and this needs a new name (see below): basically APs that are stable (with respect to neighboring APs), and that can (& do) perform long term radio resource coordination with neighboring APs, versus APs that are less stable (e.g., more likely to move / be powered down / “APs” that might not be awake all the time / APs that do not perform radio resource coordination with other neighboring stable APs.

Consider RRM best practice: take historical measurements, identify the busy hour, determine system-wide coordinated changes for channel/power **overnight** yet **optimized for the busy hour**, and **make no changes during the busy hour** (except as required by DFS events etc). This requirement excludes a soft APs etc. Then we just need to:

* + Find a name for these two roles (“stable BSS” / “unstable BSS” or “channel-selection-aiding” / “channel-selection-aidable”, or “radio-resource-coordinating”/ “radio-resource-coordinate-able” etc?
  + Establish a useful definition for this “stable” notion, that works across the major deployment types?
  + Given the number of negatives in the definition was found to be confusing, define the stable role (to reduce the number of negatives) then define the unstable role to be the “not” of the stable role.

A screenshot of a computer

Description automatically generated

Example of why the term “non-infrastructure BSS” is wrong for channel usage:

* Neither an enterprise deployment nor a coordinated deployment of apartment APs can recommend channels to a smartphone doing Wi-Fi tethering (since the smartphone’s BSS is an infrastructure BSS aka is not a non-infrastructure BSS). This is clearly misaligned with the intent of the Channel Usage feature.
* Similarly, a smartphone doing Wi-Fi tethering, being an infrastructure BSS, can recommend channels to other STAs performing mesh/IBSS. Again, this is clearly outside the intent of the Channel Usage feature.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | 6071 | 9.4.2.84 | 1125 | 43 | Especially for Channel Usage, what is really meant by "noninfrastructure BSS" since Wi-Fi Direct group, Wi-Fi tethering are both in this P2P bucket but both are BSSes with an AP (or similar) | Try "A BSS whose AP has connectivity to a DS and thence a portal BSS and where the AP of the BSS either is a non-mobile AP or is a mobile AP in the ongoing absence of non-mobile APs." | Revised; in general agreement with commenter; see changes under 6071 in doc 23/1924<motionedRevision>. |   ***Discussion***   |  | | --- | | noninfrastructure basic service set (BSS): [noninfrastructure BSS](M118) A BSS that is not an infrastructure BSS.(#3349) |   Given the preceding definition of an infrastructure BSS, this definition doesn’t really work for the Channel Usage feature.  Since the channel assignment portion of radio resource management is a slow process (to minimize disruption to clients), the Channel Usage feature was designed to be consumed by the classes of devices that are marked as AP in “noninfrastructure BSS” (below) and not by the other classes of devices. Certain cells are highlighted, to denote that they make it more difficult to establish a general rule.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Example device | Preferred outcome | Has connectivity to a portal | Fixed | Fixed wrt an isolated mobile platform | C, Power from external device required during operation | | Smartphone tethering | AP in an “unstable BSS” | Y | N | N | N | | Windows/Linux/macOS laptop operating as a Wi-Fi Direct Group Owner or similar | AP in an “unstable BSS” | Only when bridging from 802.11 to another LAN technology (e.g., 802.3) | N | N | N | | AP in a car/enterprise AP in a bus | AP in an “unstable BSS” | Y (quite likely) | N | N (rarely isolated) | Y | | Printer / projector with P2P connectivity | AP in an “unstable BSS” | N | Y | Y and N | Y | | IBSS | STA in an “unstable BSS” | N | Y and N | Y and N | Y and N | | Enterprise AP on a train/plane/(cruise) ship in an urban environment | Since it is liable to zooming past homes etc, almost always this should be an “unstable BSS” | Y | N | N (rarely isolated) | Y | | Enterprise AP on a train/plane/(cruise) ship in an isolated environment (Australian outback, in the air about 10 000 ft or similar, at sea far from port) | AP in a “stable BSS” | Y | N | Y | Y | | Wired home AP | AP in a stable BSS | Y | Y | N | Y | | Wired mesh enterprise AP | AP in a stable BSS | Y | Y | Y and N | Y | | Wired classic enterprise AP | AP in a stable BSS | Y | Y | Y and N | Y | |

An *initial* definition for all these cases is:

“Stable BSS”: An infrastructure BSS whose DS is connected to a Portal and whose AP is either immobile with respect to the nearest planetary object or is immobile with respect to a mobile platform that is not within the BSA of APs that are immobile with respect to the nearest planetary object.”

ARC discussion suggested we incorporate the notion of *coordinating* multiple non-co-hosted APs on a band. This leads to an update:

“Stable BSS”: An infrastructure BSS a) whose AP performs channel coordination with other non-co-hosted APs with overlapping BSAs and b) whose AP is either immobile with respect to the nearest planetary object or is immobile with respect to a mobile platform that is not within the BSA of APs that are immobile with respect to the nearest planetary object.”

“Non-Stable BSS”: A BSS that is not a Stable BSS

ARC discussion queried whether the “non” definition was redundant.

Stable / unstable

Moored / unmoored

Anchored / unanchored

Coordinating / coordinate-able // but keep for 11bn

Aiding / aidable

Channel-Usage-Aiding / Channel-Usage-Aidable