IEEE P802.11
Wireless LANs

|  |
| --- |
| TGbi Requirements Tracking |
| Date: 2022-09-13 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Carol Ansley | Cox Communications |  | +1-404-229-1672 | carol@ansley.com |

### Overview

This document tracks Requirements against Issues and Use Cases for TGbi.

|  |  |
| --- | --- |
| R0 | Initial Draft for Discussion |
| R1 | Update after discussion |
| R2 | Update after discussion, including process addition and examples |
| R3 | Adding first round of Requirements from 22/107r2 and 22/109r2 |
| R4 | Updating with Use Case/Issue list, and other items from Plenary discussions |
| R5 | Altered 22/109r2 requirements to 22/109r3 requirements text |
| R6 | Corrected typo in Req. 23 |
| R7 | Added requirements from 22/623r1 |
| R8 | Updated from discussions in May Interim sessions |
| R9 | Adding changes accumulated from last update |
| R10 | Updates from 12 Sept 2022 discussion |
| R11 | Updates from 13 Sept 2022 discussion |
| R12 | Updates from 11-22/1306r3 for discussion 14 Sept 2022 |

# Requirements

The following table summarizes the requirements for TGbi.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Requirement** | **Issue / Use Case Reference** | **Status** | **Information** |
| 1 | 11bi shall define a mechanism to prevent an eavesdropper distinguishing whether authentication exchanges between CPE Clients and CPE AP use identical **SAE credentials** or distinct SAE credentials (where a CPE AP supports multiple SAE credentials). | I1, I5 | Approved  | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 2 | 11bi shall define a mechanism to prevent an eavesdropper distinguishing whether reassociation exchanges between CPE Clients and CPE APs use identical **PMK** or distinct PMK | I1, I5 | Approved | Proposed - 22/107r2 (9 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 3 | 11bi shall define a minimal set of Elements for transmission by a CPE Client in **a probe request** prior to authentication. | I2 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 4 | 11bi shall define a mechanism for a CPE Client and CPE AP **to establish keys from an Authentication exchange** which can then be used to protect the (Re)Association Request/Response.  | I2 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 5 | 11bi shall define a mechanism for a CPE Client and CPE AP **to** **protect the (Re)Association Request/Response**.  | I2 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 6 | 11bi shall define a mechanism for a CPE Client **to change its own OTA MAC Address** when reassociating from a CPE AP to another CPE AP.12 May 2022 – May consider APs outside of ESS in other discussions. | I3 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 7 | 11bi shall define a mechanism for a CPE Client to initiate **changing** **its own OTA MAC Address** used with a CPE AP in Associate STA State 4 without any loss of connection. | I3 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 8 | ~~11bi shall define a mechanism for a CPE AP to initiate~~ **~~changing the OTA MAC Addresses of all associated CPE Client’s~~** ~~in the BSS (those CPE Clients in Associate STA State 4) simultaneously without any loss of connection~~Edited to: 11bi shall define a mechanism for a CPE AP to initiate **changing the OTA MAC Addresses of a set of associated CPE Client’s** in the BSS (those CPE Clients in Associate STA State 4) without any loss of connection. | I3 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 9 | ~~11bi shall define a mechanism for a CPE Client and CPE AP~~ **~~to change the transmitted SN~~** ~~to an uncorrelated new value on downlink and uplink to new values in Associate STA State 4, without any loss of connection.~~Edited to: 11bi shall define a mechanism for a CPE Client and CPE AP **to change the transmitted SN and the scrambler seed** on downlink and uplink to uncorrelated new values in Associate STA State 4, without any loss of connection when the OTA MAC address of the CPE Client is changed. | I3 | Approved | Proposed - 22/107r2 (9 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 10 | ~~11bi shall define a mechanism for a CPE Client and CPE AP~~ **~~to change the transmitted PN~~** ~~to an uncorrelated new value on downlink and uplink to new values in Associate STA State 4, without any loss of connection.~~Edited to: 11bi shall define a mechanism for a CPE Client and CPE AP **to change the transmitted PN** on downlink and uplink to uncorrelated new values in Associate STA State 4, without any loss of connection when the OTA MAC address of the CPE Client is changed. | I3 | Approved | Proposed - 22/107r2 (9 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 11 | ~~11bi shall define a mechanism for a CPE Client and CPE AP~~ **~~to change the CPE Client’s AID~~** ~~to an uncorrelated new value in Associate STA State 4, without any loss of connection.~~Edited to: 11bi shall define a mechanism for a CPE Client and CPE AP **to change the CPE Client’s AID** to an uncorrelated new value in Associate STA State 4, without any loss of connection when the OTA MAC address of the CPE Client is changed. | I3 | Approved | Proposed - 22/107r2 (9 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 12 | 11bi shall define a mechanism for a CPE Client and CPE AP to establish the CPE Client’s DS MAC Address without the CPE Client’s DS MAC Address being transmitted in the clear.12 Sept 2022 – DS MAC address term may need to be changed | I3 | Approved | Proposed - 22/107r2 (9 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 13 | 11bi shall define a mechanism for CPE Clients and CPE APs to transmit and receive the CPE Client’s DS MAC Address in SA and DA in protected form on both the downlink and uplink.Edited to: 11bi shall define or reuse a mechanism for CPE Clients and CPE APs to protect the SA/DA values from exposure OTA to 3rd parties. | I4 | Approved | Proposed - 22/107r2 (9 March 2022)To be motioned –agreed by unanimous consent 5/13/2022**Approved** (Motion #14, 13 May 2022) |
| 14 | ~~11bi shall define a mechanism for CPE Clients and CPE Aps to transmit and receive other DS MAC Addresses in SA and DA in protected form on both the downlink and uplink.~~Covered in R13. | I4 | Withdrawn  | Proposed - 22/107r2 (9 March 2022)Subsumed into R13, 13 May 2022. |
| 15 | 11bi shall define a mechanism for a BPE Client to determine which of the BPE Client’s configured networks a BPE AP belongs to (if any), while providing mitigation against an eavesdropper identifying the ESS of the BPE AP. | I6 | Proposed  | Proposed -22/107r2 (9 March 2022)(Straw poll 10Y, 2N, 8A Sep.12,2022) |
| 16 | 11bi shall define a mechanism such that the BPE AP may exclude certain TBD elements when transmitting Beacon frames. | I2, I6 | Approved  | Proposed - 22/107r2 (9 March 2022)**Approved** (Motion #16, July 13, 2022) |
| 17 |  ~~BPE AP may change its BSSID while there are no Clients associated.~~ | I6/I7 | Withdrawn  | Proposed - 22/107r2 (9 March 2022)Discussed 12 Sept 2022, agreement to remove based on #18 and/or not necessary |
| 18 | 11bi shall define a mechanism for a BPE AP to facilitate changing its AP identification information while there are Clients associated, without disrupting the connectivity from the Clients, and/or clients in the process of associating. | I6/I7 | Approved | Proposed - 22/107r2 (9 March 2022)**Approved** (Motion #17, July 13, 2022)  |
| 19 | 11bi shall define a mechanism for a BPE Client and BPE AP to establish the BPE AP’s (not-over-the-air) MAC Address without the BPE AP’s DS MAC Address being transmitted in the clear. *This will likely be the same mechanism as used in Req 12.* | I6 | Proposed  | Proposed - 22/107r2 (9 March 2022) |
| 20 | 11bi shall define a mechanism for the 11bi non-AP STA to refrain from transmitting Probe Request frames containing elements except TBD element(s) |  I2  |  Approved | Proposed – 22/109r3 (10 March 2022; SP Y15, N7, A14)Note: tracks with R3**Approved** (Motion #13, 13 May 2022) |
| 21 | 11bi shall define a mechanism to protect the Frame Body field of the (Re)Association Request frame |  I2  |  Approved | Proposed – 22/109r3 (10 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 22 | 11bi shall define a mechanism to protect the Frame Body field of the (Re)Association Response frame  | I2  |  Approved | Proposed – 22/109r3 (10 March 2022) To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 23 | ~~11bi shall define a private MAC address that is used by the 11bi non-AP STA or 11bi non-AP MLD for the DS and can be different for different ESS.~~ * ~~The private MAC address of a 11bi non-AP STA or a 11bi non-AP MLD shall not be carried in the MAC header of the frame and shall not be carried in the frame body of a frame without protection~~
	+ ~~if the frame is transmitted by the 11bi non-AP STA or any non-AP STA affiliated with the 11bi non-AP MLD or~~
	+ ~~if the frame is transmitted by the 11bi AP to the 11bi non-AP STA or by any AP affiliated with a 11bi AP MLD to any non-AP STA affiliated with the 11bi non-AP MLD~~
* ~~11bi non-AP STA or 11bi non-AP MLD can decide the lifetime of the private MAC address~~
 | I3  |  Withdrawn | Proposed– 22/109r3 (10 March 2022)Needs further discussion. 12 May 2022Withdrawn 12 Sept 2022 |
| 24 | 11bi shall define a mechanism to carry the DS MAC address of a 11bi non-AP STA or an 11bi non-AP MLD in a protected (Re)association Request frame (and any other TBD protected management frames) from the 11bi non-AP STA to a 11bi AP or from the 11bi non-AP MLD to a 11bi AP MLD. | I3  |  Approved | Proposed – 22/109r3 (10 March 2022)**Approved** (Motion #16, July 13, 2022) |
| 25 | 11bi shall define a mechanism to randomize over the air MAC address of the 11bi non-AP STA or 11bi non-AP MLD (carried in Address 1 field or Address 2 field of the MAC header) during BSS transition.(related to R6) | I3  |  Approved | Proposed – 22/109r3 (10 March 2022)To be motioned –agreed by unanimous consent 4/21/2022**Approved** (Motion #13, 13 May 2022) |
| 26 | 11bi shall define an optional protected version of the following unicast management frames between a CPE AP and an associated CPE Client:* Notify Channel Width frame
* SM Power save frame
* CSI frame
* Noncompressed Beamforming frame
* Compressed Beamforming frame
* VHT Compressed Beamforming frame
* Group ID Management frame
* Operating Mode Notification frame
* HE Compressed Beamforming/CQI frame
* Quiet Time Period Action frame
* EHT Compressed Beamforming/CQI frame
 | I2 | Approved | Proposed – 22/623r2 (14 April 2022)**Approved** (Motion #16, July 13, 2022) |
| 27 | ~~11bi shall define a mechanism for a CPE Client to reset the scrambled when its MAC address is changed in Associate STA State 4, without any loss of connection.~~(9)-11bi shall define a mechanism for a CPE Client and CPE AP **to change the transmitted SN and the scrambler seed** on downlink and uplink to uncorrelated new values in Associate STA State 4, without any loss of connection when the OTA MAC address of the CPE Client is changed. | I3, I2 | Withdrawn  | Proposed – 22/623r2 (14 April 2022)Subsumed into R9 (already motioned) |
| 28 | *11bi shall define a mechanism for CPE Clients to use separate MAC addresses for ongoing PASN protected sensing measurements versus data transmissions with the same AP. (TGbf sensing, TGaz location determination) – new text 12 Sept 2022 proposal* | I2, I8 | Proposed  | Proposed – 22/623r2 (14 April 2022)No action for now. 12 May 2022Straw poll: 13Y, 5N, 3ASept. 13, 2022 |
| 29 | ~~11bi shall define a mechanism to protect transmitted sensing measurement frames against eavesdropper sensing estimations, i.e., the frames are protected from the eavesdroppers to perform sensing or ranging from the received frames.~~ | I2, I8 | Withdrawn | Proposed – 22/623r2 (14 April 2022)No action for now. 12 May 2022Withdrawn 13 Sept 2022 |
| 30 | 11bi shall define a mechanism for a CPE Client and CPE AP to obfuscate the transmitted TID to an uncorrelated new value on downlink and uplink to new values in Associate STA State 4, without any loss of connection. | I7 | Approved | Proposed – 22/623r2 (14 April 2022)To be motioned –agreed by unanimous consent 13/5/2022**Approved** (Motion #14, 13 May 2022) |
| 31 | 11bi shall define a mechanism for CPE Clients and CPE APs to encrypt or obfuscate (TBD) power save related MAC Header fields (PM, EOSP, MD).straw poll 1New proposal:11bi shall define a mechanism for CPE Clients and CPE APs to encrypt or obfuscate (TBD) a subset of MAC Header fields (specific fields TBD) ~~(power save related fields, HT Control field, etc.).~~Straw poll 2: 16Y, 0N, 4A | I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Needs further discussion, 13 May 2022Straw poll 1: 10Y, 5N, 6A 13 Sept 2022Straw poll 2: 16Y, 0N, 4A 13 Sept 2022 |
| 32 | 11bi shall define a mechanism for CPE Clients and CPE APs to encrypt the +HTC field and the HT Control field. | I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Needs further discussion, 13 May 2022Straw poll 12Y, 4N, 6A |
| 33 | ~~11bi shall define a mechanism for CPE Clients and CPE APs to encrypt the Retry bit.~~ | I7 | Withdrawn | Proposed – 22/623r2 (14 April 2022)Needs further discussion, 13 May 2022Withdrawn 13 Sept 2022 |
| 34 | ~~11bi shall define a mechanism for the BPE AP to transmit encrypted management frames.~~ ~~Edited to: 11bi shall define a mechanism for the BPE AP to transmit only encrypted management frames, for example beacons, discovery frames, etc.~~  | I2, I6 | Withdrawn  | Proposed – 22/623r2 (14 April 2022)Needs more discussion. May 12, 2022.Withdrawn 13 Sept 2022 |
| 35 | ~~11bi shall define a mechanism to randomize Beacon transmission times. (mobile AP)~~11bi requires that a BPE AP shall change its Beacon TBTT when the BPE AP identification information changes in the Beacon.  | I2, I6 | Proposed  | Proposed – 22/623r2 (14 April 2022) Needs more discussion. May 12, 2022.Straw poll on second paragraph – unanimous consent13 Sept 2022 |
| 36 | ~~11bi shall define a mechanism for the BPE Client and BPE AP to fast active and passive scan available BPE APs in the channel.~~ | I2, I6 | Withdrawn  | Proposed – 22/623r2 (14 April 2022)Needs more discussion. May 12, 2022. |
| 37 | ~~11bi shall define new RNR element to include obfuscated BPE AP identifiers for out-of-the-band discovery of the BPE AP.~~  | I2, I6 | Withdrawn  | Proposed – 22/623r2 (14 April 2022)Needs more discussion. May 12, 2022. |
| 38 | 11bi shall define a mechanism to obfuscate affiliated BPE APs parameters so that eavesdropping STAs cannot determine that they belong to the same AP MLD. | I2, I6 | Proposed  | Proposed – 22/623r2 (14 April 2022)Needs more discussion. May 12, 2022.Straw poll – unanimous consent13 Sept 2022 |
| 39 | 11bi shall define a mechanism for a BPE AP and a BPE Client to change the OTA MAC addresses, SN and PN they use for unicast transmissions. | I6, I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 40 | 11bi shall define a mechanism for a BPE AP to obfuscate the RA, SN and PN of the group frames to avoid BPE AP tracking. | I6, I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 40a | 11bi shall define a mechanism for a BPE AP to change the OTA TSF (e.g., the TSF that is transmitted in the beacon) by a random value. |  | Approved | **Approved** (Motion #16, July 13, 2022) |
| 41 | BPE Clients and BPE APs shall reset the Scrambler Seed on individual and group addressed frames when a TA MAC address is changed. | I6, I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 42 | 11bi shall define a mechanism for BPE APs and BPE Clients to use different MAC addresses for ongoing sensing measurements and data transmissions.  | I2, I6, I7, I8 | Proposed  | Proposed – 22/623r2 (14 April 2022)Needs more discussion. May 12, 2022. |
| 43 | ~~11bi shall define a mechanism to protect transmitted sensing measurement frames against eavesdropper sensing estimations, i.e., the frames are protected from the eavesdroppers to perform sensing or ranging from the received frames.~~ | I2, I6, I7, I8 | Withdrawn  | Proposed – 22/623r2 (14 April 2022)Postponed for now. May 12, 2022. |
| 44 | ~~11bi shall define a mechanism for a BPE Client and BPE AP to obfuscate the transmitted TID to an uncorrelated new value of Associated STA in State 4, without any loss of connection.~~11bi shall define a mechanism for a BPE Client and BPE AP to obfuscate the transmitted TID to an uncorrelated new value on downlink and uplink to new values in Associate STA State 4, without any loss of connection. | I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 45 | ~~11bi shall define a mechanism for BPE Clients and BPE APs to encrypt power save related MAC Header fields (PM, EOSP, MD).~~New text:11bi shall define a mechanism for BPE Clients and BPE APs to encrypt or obfuscate (TBD) a subset of MAC Header fields (specific fields TBD). | I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 46 | 11bi shall define a mechanism for BPE Clients and BPE APs to encrypt the +HTC field and the HT Control field. | I7 | Proposed  | Proposed – 22/623r2 (14 April 2022)Straw poll – unanimous consent13 Sept 2022 |
| 47 | ~~11bi shall define a mechanism for BPE Clients and BPE APs to encrypt the Retry bit.~~ | I7 | Withdrawn | Proposed – 22/623r2 (14 April 2022) |
| 48 | 11bi shall define a mechanism for a CPE Client and CPE AP to carry 802.1X EAPOL PDUs in Authentication frames to perform IEEE 802.1X authentication. | I2 | Proposed | Proposed 22/1221r1 (11/August 2022)Straw poll – unanimous consent13 Sept 2022 |
| 49 | 11bi shall define a mechanism for a CPE non-AP STA to request capabilities and operation parameters of the associated CPE AP or a CPE non-AP MLD to request capabilities and operation parameters of APs affiliated with the associated CPE AP MLD using an individually addressed protected request/response action frame. | I7 | Proposed | Proposed 22/1221r1 (11/August 2022)Straw poll – unanimous consent13 Sept 2022 |
| NEW | 11bi shall define a Beacon frame that includes a secure hash outcome value to identify the BPE AP. The 802.11bi specification shall specify the rule to calculate secure Hash value. The hash algorithm and the input parameters are TBD. |  I6 | proposed | BPE |
| NEW | 11bi shall define a new type of encrypted Beacon frame and define a mechanism for the BPE AP to transmit the new type of encrypted Beacon frame. |  I6 | proposed | BPE |
| NEW | 11bi shall define a mechanism for the BPE Client to send a broadcast non-encrypted request frame to solicit encrypted Beacon frame from the BPE AP.  | I2, I6 | proposed | BPE |
| NEW | 11bi shall define a mechanism for the BPE Client to send a broadcast non-encrypted request frame to solicit encrypted Beacons from the BPE APs in the channel.  | I2, I6 | proposed | BPE |
| NEW, similar to 49 | 11bi shall define a mechanism for a 11bi non-AP MLD to request capabilities and operation parameters of APs affiliated with the associated 11bi AP MLD using a protected request/response action frame. | I2, I6, I7 | proposed | BPE |

# References:

The following table contains relevant reference information including:

1. Motioned Use cases/Issues document
2. Minutes
3. Presentations

|  |  |  |
| --- | --- | --- |
|  | **References** | **Relevant Requirement(s)****(optional)** |
| 1 | **11-21-641r7 Proposed Issues** | R1-19 |
| 2 | **11-21-1848r2 Requirements Document** | R1-19 |
| 3 | **11-21-0109r1 Proposed 11bi Requirements** | R1-19 |
| 4 | 11-22/0606r4 Agenda from May Interim with Motions |  |
| 5 |  |  |

# List of Use Cases and Issues:

The following table contains a list of use cases and issues from the latest motioned Use cases/Issues document.

|  |  |
| --- | --- |
|  | **Issues/Use Cases** |
| I1 | **Protecting password identifiers** |
| I2 | **Avoid element fingerprint** |
| I3 | **STA MAC address persistence within an ESS** |
| I4 | **Tracking SA and DA OTA** |
| I5 | **Protecting authentication identifiers and key identifiers** |
| I6 | **Mobile AP privacy** |
| I7 | **Protecting behavioral figerprinting while associated** |
| I8 | **PHY/RF related privacy** |
| U1 | **Smart home environment** |
| U2 | **Remote stalking in public places** |
| U3 | **Avoid fingerprinting from SSID elements or SSID list elements in probe requests** |

# Requirements Tracking Document Process:

Proposed Requirements from Submissions:

1. A submission can propose requirements related to one or more issues or use cases from the Use Case Document (21/641).
2. A presenter may ask for one or more straw polls on a requirement to determine the level of consensus on that requirement.
3. A presenter may ask for a requirement that has been presented to the group to be added to the Requirements Table as a proposed requirement.
	1. No specific straw poll results or other indicators are required for a requirement to be added to the Requirements table.
	2. A presenter may choose to work further on a requirement instead of asking for it to be added to the Requirements Tracking document.

Brainstorming for Requirements

1. Chair may dedicate one or more meetings to review existing requirements and lead brainstorming for additional requirements, if needed

Conversion of Proposed Requirements to Approved Requirements

1. A presenter may initiate a motion to approve one or more proposed requirements.
	1. The approval metric is the standard Y>=.75(Y+N).
2. With notice, the chair may dedicate one or more meetings to review existing requirements and motion one or more proposed requirements for approval.
3. If a motion to approve a requirement fails, the status of that requirement is updated to Failed in the table.

Examples:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Requirement** | **Issue / Use case Reference** | **Status** | **Information** |
| 1 | STA may make a loud noise when unassociated. | I-1,2,5 | Proposed | **Proposed** (12 Nov 2021; SP Y4 ,N16) |
| 2 | STA may play music while associated. | I-1,2,5 U-3 | Approved | Proposed (14 Nov 2021; SP Y13, N2)**Approved** (Motion #12, 14 May 2022) |
| 3 | STA must make a loud noise when unassociated. | I-2 | Failed  | Proposed (14 Nov 2021; SP Y13, N2)**Failed** (Motion #1, 14 May 2022) |