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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
62/165,782	05/22/2015		260	PW238 (83043.0653)		

CONFIRMATION NO. 5131

FILING RECEIPT

109682
Holland & Hart LLP/Qualcomm
P.O. Box 11583
Salt Lake City, UT 84147

Date Mailed: 06/22/2015

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Yan Zhou, San Diego, CA;
Gwendolyn Denise Barriac, Encinitas, CA;
Simone Merlin, Solana Beach, CA;
George Cherian, San Diego, CA;

Applicant(s)

QUALCOMM Incorporated, San Diego, CA;

Power of Attorney: The patent practitioners associated with Customer Number 109682

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 06/19/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/165,782**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	To be assigned
Filing Date	Herewith
First Named Inventor	Zhou, et al.
Title	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION
Art Unit	
Examiner Name	
Attorney Docket Number	PW238 (83043.0653)

SIGNATURE of Applicant or Patent Practitioner

Signature	/Thomas D. Anderson/	Date (Optional)	2015-05-22
Name	Thomas D. Anderson	Registration Number	56293
Title (if Applicant is a juristic entity)	Attorney		
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 109682

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

QUALCOMM Incorporated

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	9/4/14
Name	Andrea Mays		
Title	V.P., Patent Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION
First Named Inventor/Applicant Name:	Yan Zhou
Filer:	Thomas D. Anderson/Deanna Williams
Attorney Docket Number:	PW238 (83043.0653)

Filed as Large Entity

Filing Fees for Provisional

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Provisional Application Filing	1005	1	260	260
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**260**

Electronic Acknowledgement Receipt

EFS ID:	22432505
Application Number:	62165782
International Application Number:	
Confirmation Number:	5131
Title of Invention:	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION
First Named Inventor/Applicant Name:	Yan Zhou
Customer Number:	109682
Filer:	Thomas D. Anderson/Deanna Williams
Filer Authorized By:	Thomas D. Anderson
Attorney Docket Number:	PW238 (83043.0653)
Receipt Date:	22-MAY-2015
Filing Date:	
Time Stamp:	19:17:11
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$260
RAM confirmation Number	6088
Deposit Account	082623
Authorized User	ANDERSON, THOMAS D.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

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Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		PW238_App.pdf	1137583 facd372fa956b7cd88e884c9cef094d96ba69c5d	yes	86

Multipart Description/PDF files in .zip description

Document Description	Start	End
Application Data Sheet	1	7
Specification	8	53
Claims	54	64
Abstract	65	65
Drawings-only black and white line drawings	66	84
Power of Attorney	85	86

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30204 106f7ed5a5bd2420edc2c71f3af414e266a3181b	no	2

Warnings:

Information:

Total Files Size (in bytes):	1167787

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PW238 (83043.0653)
	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yan		Zhou	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	San Diego	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5775 Morehouse Drive		
Address 2			
City	San Diego	State/Province	CA
Postal Code	92121-1714	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Gwendolyn	Denise	Barriac	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Encinitas	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5775 Morehouse Drive		
Address 2			
City	San Diego	State/Province	CA
Postal Code	92121-1714	Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Simone		Merlin	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PW238 (83043.0653)
	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

City	Solana Beach	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5775 Morehouse Drive		
Address 2			
City	San Diego	State/Province	CA
Postal Code	92121-1714	Country	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	George		Cherian	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Diego	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5775 Morehouse Drive		
Address 2			
City	San Diego	State/Province	CA
Postal Code	92121-1714	Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	109682		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION		
Attorney Docket Number	PW238 (83043.0653)	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	19	Suggested Figure for Publication (if any)	3

Filing By Reference :

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PW238 (83043.0653)
	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	109682		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PW238 (83043.0653)
	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

PTO/AIA/14 (12-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	PW238 (83043.0653)
	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	QUALCOMM Incorporated

Mailing Address Information For Applicant:

Address 1	5775 Morehouse Drive		
Address 2			
City	San Diego	**State/Province**	CA
Country	US	Postal Code	92121-1714
Phone Number		Fax Number	

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	Application Number	
Title of Invention	DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION	

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DETECTION AND RESOLUTION OF A REDUCED VERSION BSS IDENTIFIER COLLISION

BACKGROUND

[0001] The following relates generally to wireless communication, for example detection and resolution of use of a same value for a reduced version of a basic service set (BSS) identifier.

[0002] Wireless communications systems are widely deployed to provide various types of communication content such as voice, video, packet data, messaging, broadcast, and so on. A wireless network, for example a wireless local area network (WLAN), may include an access point (AP) that may communicate with one or more stations (STAs) or mobile devices. The AP may be coupled to a network, such as the Internet, and may enable a mobile device to communicate via the network (or communicate with other devices coupled to the access point in a service set, *e.g.*, a BSS or extended service set (ESS)). A wireless device may communicate with a network device bi-directionally. For example, in a WLAN, a STA may communicate over a wireless medium with an associated AP via downlink (DL) and reverse link (UL). From the perspective of the STA, the DL (or forward link) may refer to the communication link from the AP to the STA, and the UL (or reverse link) may refer to the communication link from the STA to the AP. In a BSS, a single AP may serve multiple STAs within a given area (*e.g.*, the coverage area of the AP). Each BSS may be uniquely identified by a basic service set identifier (BSSID). Accordingly, a node may distinguish between communications from different BSSs by referencing the BSSID for each communication. In some cases, a wireless communication system may reduce power consumption and improve reuse by using reduced versions of BSSIDs (*e.g.*, BSSs may use *X*-bit color indicators that are smaller than BSSIDs).

[0003] In some cases, the reduced version BSSIDs for two BSS may be identical or indistinguishable (*e.g.*, an AP may initially select the same *X*-bit color indicator as a neighbor AP). In such an instance, a STA located at the intersection of two BSSs using the same reduced version BSSID may receive communications from a BSS with which the STA is unassociated, meaning that the received communications may not actually have any relevance to the STA. Nevertheless, because the received communications include a same reduced version BSSID as a

BSS with which the STA is in communication, the STA may wake up to process the transmission from the unassociated BSS even though the transmission does not include relevant data for the STA. Processing extraneous transmissions may increase power consumption and decrease system performance.

SUMMARY

[0004] Systems, methods, and apparatuses for detection and resolution of basic service set (BSS) reduced version identifier collisions are described. A wireless system may include a number of BSSs, each of which is identified by a corresponding BSS identifier (BSSID). In some cases, the wireless system may implement reduced versions of the BSSIDs. For example, the system may use *X*-bit color indicators ("colors") to distinguish one BSS over another. A wireless node may detect that two BSSs are involved in a color collision – that is, the two BSSs are using the same color bits. Based at least in part on the detection, the node may trigger a change in color bits for one of the BSSs. The node may detect the collision via color-use information conveyed via a broadcast from one of the BSSs. The node may detect the collision by determining that two received frames use the same colors but originate from different BSSs. The node may detect the collision by obtaining color-use information via backhaul communications. Once the collision has been detected, the node may trigger a change in color bits for one of the BSSs involved in the collision. The changing BSS may be associated with, or unassociated with, the detecting node.

[0005] A method of wireless communication is described. The method may include detecting that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers, and triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS. Detecting may include receiving a broadcast communication from an access point of the second BSS that includes the value for the second BS. Detecting may include receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS. Triggering may include determining a value for a reduced version of a BSS identifier that

is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs. Triggering may include determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

[0006] Triggering may include receiving a broadcast communication that includes information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations. In some examples, the method may include comparing the received broadcast information to corresponding information of the first BSS, wherein the triggering is based at least in part on the comparison. Detecting may include receiving a first frame from the first BSS and a second frame from the second BSS, and determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

[0007] An apparatus for wireless communication is described. The apparatus may include a reduced version BSSID detector for detecting that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers, and a reduced version BSSID administrator for triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS. The apparatus may include a communication for receiving a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS. The communication coordinator may facilitate detecting by receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS.

[0008] The apparatus may include a reduced version BSSID evaluator for determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second

BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs. The reduced version BSSID evaluation may determine a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS. The communication coordinator may facilitate receiving a broadcast communication comprising information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations. The reduced version BSSID evaluator may compare the received broadcast information to corresponding information of the first BSS, wherein the triggering is based at least in part on the comparison. The communication coordinator may receive a first frame from the first BSS and a second frame from the second BSS. The apparatus may include a reduced version BSSID detector for determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers. The BSSID evaluator may determine that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

[0009] The apparatus may include a BSS identification manager for identifying media access control (MAC) addresses of the first BSS in the first frame and of the second BSS in the second frame. The communication coordinator may determine, based at least in part on the identification, that the first frame and the second frame are from different BSSs, wherein the triggering is based at least in part on the determination. The communication coordinator may facilitate sending a collision report to at least one of a first access point and a second access point, the collision report indicating that the first BSS and the second BSS have the same value for reduced versions of respective BSS identifiers. The communication coordinator may facilitate communicating, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS. The BSS identification

manager may identify a BSSID of the second BSS. The communication coordinator may facilitate sending a request to the at least one of the central controller and the access point of the second BSS for the use information of the second BSS. The communication coordinator may facilitate receiving from the at least one of the central controller and the access point of the second BSS the use information of the second BSS.

[0010] The reduced version BSSID administrator may determine at least one of the first BSS and the second BSS to change values for reduced versions of respective BSS identifiers. The reduced version BSSID administrator may determine the change in the value based at least in part on a request to change the reduced version of the BSS identifier for at least one of the first BSS and the second BSS. The reduced version BSSID administrator may autonomously determine the change in the value. The communication coordinator may facilitate sending a request to the determined BSSs to change respective values for reduced versions of the BSS identifiers. The communication coordinator may facilitate transmitting an announcement of the change in the value to STAs of the at least one of the first BSS and the second BSS whose value has changed. The announcement may include a schedule change time. The announcement may include an indication of a transmission restriction mode.

[0011] A further apparatus for wireless communication is described. The apparatus may include means for detecting that a first basic service set (BSS) and a second BSS are using a same value for reduced versions of respective BSS identifiers, and means for triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS. The apparatus may include means for receiving a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS. The apparatus may include means for includes receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS. The apparatus may include means for determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs

[0012] The apparatus may include means for determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS. The apparatus may include means for receiving a broadcast communication that includes information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations. The apparatus may include means for comparing the received broadcast information to corresponding information of the first BSS, wherein the triggering is based at least in part on the comparison. The apparatus may include means for receiving a first frame from the first BSS and a second frame from the second BSS, and means for determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

[0013] The apparatus may include means for identifying MAC addresses of the first BSS in the first frame and of the second BSS in the second frame. The apparatus may include means for determining, based at least in part on the identification, that the first frame and the second frame are from different BSSs, wherein the triggering is based at least in part on the determination. The apparatus may include means for sending a collision report to at least one of a first access point and a second access point, the collision report indicating that the first BSS and the second BSS have the same value for reduced versions of respective BSS identifiers. The apparatus may include means for identifying a BSSID of the second BSS and means for communicating, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

[0014] The apparatus may include means for sending a request to the at least one of the central controller and the access point of the second BSS for the use information of the second BSS and means for receiving from the at least one of the central controller and the access point of the second BSS the use information of the second BSS. The apparatus may include means for

determining at least one of the first BSS and the second BSS to change values for reduced versions of respective BSS identifiers; and means for sending a request to the determined BSSs to change respective values for reduced versions of the BSS identifiers. The apparatus may include means for determining the change in the value based at least in part on a request to change the reduced version of the BSS identifier for at least one of the first BSS and the second BSS. The apparatus may include means for autonomously determining the change in the value.

[0015] A non-transitory computer-readable medium storing code for wireless communication is described. The code may include instructions executable to detect that a first basic service set (BSS) and a second BSS are using a same value for reduced versions of respective BSS identifiers, and trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS. Detecting may include receiving a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS. Detecting may include receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS. Triggering may include determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs. Triggering may include determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

[0016] Triggering may include receiving a broadcast communication that includes information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations. The instructions may be further executables to compare the received broadcast information to corresponding information

of the first BSS, wherein the triggering is based at least in part on the comparison. Detecting may include receiving a first frame from the first BSS and a second frame from the second BSS, and determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

[0017] In some examples of the method, apparatuses, or non-transitory computer-readable medium described herein, detecting includes identifying MAC addresses of the first BSS in the first frame and of the second BSS in the second frame, and determining, based at least in part on the identification, that the first frame and the second frame are from different BSSs, wherein the triggering is based at least in part on the determination. Additionally or alternatively, in some examples triggering includes sending a collision report to at least one of a first access point and a second access point, the collision report indicating that the first BSS and the second BSS have the same value for reduced versions of respective BSS identifiers. In some examples detecting includes identifying a BSSID of the second BSS, and communicating, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

[0018] In some examples of the method, apparatuses, or non-transitory computer-readable medium described herein, communicating includes sending a request to the at least one of the central controller and the access point of the second BSS for the use information of the second BSS. Additionally or alternatively, communicating may include receiving from the at least one of the central controller and the access point of the second BSS the use information of the second BSS. Triggering may include determining at least one of the first BSS and the second BSS to change values for reduced versions of respective BSS identifiers and sending a request to the determined BSSs to change respective values for reduced versions of the BSS identifiers. Triggering may include determining the change in the value based at least in part on a request to change the reduced version of the BSS identifier for at least one of the first BSS and the second BSS. Triggering may include autonomously determining the change in the value, and transmitting an announcement of the change in the value to STAs of the at least one of the first BSS and the second BSS whose value has changed. The announcement may include a scheduled

change time. Additionally or alternatively, the announcement may include an indication of a transmission restriction mode.

[0019] A method of wireless communication is described. The method may include receiving at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers, and adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

[0020] An apparatus for wireless communication is described. The apparatus may include a communication coordinator for facilitating receiving at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers, and a reduced version BSSID detector for adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

[0021] A further apparatus for wireless communication is described. The apparatus may include mean for receiving, at a node, a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers, and means for adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

[0022] A non-transitory computer-readable medium storing code for wireless communication is described. The code may include instructions executable to receive at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers, and adjust, based at least in part on the

communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

[0023] In some examples of the method, apparatuses, or non-transitory computer-readable medium described herein, adjusting the behavior includes entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSS identifiers. Additionally or alternatively, in some examples adjusting the behavior includes transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers.

[0024] The conception and specific examples disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present disclosure. Such equivalent constructions do not depart from the scope of the appended claims. Characteristics of the concepts disclosed herein, both their organization and method of operation, together with associated advantages will be better understood from the following description when considered in connection with the accompanying figures. Each of the figures is provided for the purpose of illustration and description only, and not as a definition of the limits of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Aspects of the disclosure are described in reference to the following figures:

[0026] FIG. 1 illustrates a wireless local area network (WLAN) for detection and resolution of a reduced version BSS identifier collision configured in accordance with various aspects of the present disclosure.

[0027] FIG. 2A illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0028] FIG. 2B illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0029] FIG. 3 illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0030] FIG. 4 illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0031] FIG. 5 illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0032] FIG. 6 illustrates an example of a wireless communications subsystem that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0033] FIG. 7 illustrates an example of a process flow that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0034] FIG. 8 illustrates an example of a process flow that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0035] FIG. 9 shows a block diagram of a device that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0036] FIG. 10 shows a block diagram of a device that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0037] FIG. 11A illustrates a block diagram of a system including a station that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0038] FIG. 11B illustrates a block diagram of a system including a station that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0039] FIG. 12A illustrates a block diagram of a system including an access point that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0040] FIG. 12B illustrates a block diagram of a system including an access point that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0041] FIG. 13 illustrates a method for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0042] FIG. 14 illustrates a method for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0043] FIG. 15 illustrates a method for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0044] FIG. 16 illustrates a method for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure;

[0045] FIG. 17 illustrates a method for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure.

DETAILED DESCRIPTION

[0046] A wireless node may detect and resolve collisions in reduced version of basic service set identifiers (BSSIDs). The collisions may be the result of multiple basic service sets (BSSs) using the same values for reduced BSS identifiers. For example, the BSSs may use the same

value for X-bit color indicators which results in a color collision if the BSSs are neighbor BSSs. When such a scenario occurs, the node may detect the collision by referencing color-use information from broadcasts or backhaul communications with one of the involved BSSs. Alternatively, the node may determine that frames from two different BSSs include the same color bits. The node may resolve the detected color collision by triggering a change in color bits for one of the involved BSSs. For example, the node may send a request to an involved BSS that indicates that the BSS should change color bits. Alternatively, the node may autonomously change the color bits in the BSS with which the node is associated. In some cases, the device may transmit a color-change announcement to stations associated with the changing BSS.

[0047] Aspects of the disclosure are initially described in the context of a wireless communication system. Specific examples are then described for basic service sets (BSSs). These and other aspects of the disclosure are further illustrated by and described with reference to apparatus diagrams, system diagrams, and flowcharts that relate to detection and resolution of a reduced version BSS identifier collision.

[0048] **FIG. 1** illustrates a wireless local area network (WLAN) 100 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The WLAN 100 may include an access point (AP) 105 and multiple associated stations (STAs) 115, which may represent devices such as mobile stations, personal digital assistant (PDAs), other handheld devices, netbooks, notebook computers, tablet computers, laptops, display devices (*e.g.*, TVs, computer monitors, *etc.*), printers, *etc*. The AP 105 and the associated stations 115 may represent a BSS or an extended service set (ESS). In a BSS a single AP 105 serves a number of STAs 115. An ESS is a set of two or more BSS that form a single subnetwork. The various STAs 115 in the network are able to communicate with one another through the AP 105. Also shown is a coverage area 125 of the AP 105, which may represent a basic service area (BSA) of the WLAN 100. An ESS associated with the WLAN 100 may be connected to a wired or wireless distribution system (DS) that may allow multiple APs 105 to be connected in an ESS.

[0049] Although not shown in FIG. 1, a STA 115 may be located in the intersection of more than one coverage area 125 and may associate with more than one AP 105. A distribution

system (DS) (not shown) may be used to connect APs 105 in an ESS. In some cases, the coverage area 125 of an AP 105 may be divided into sectors (also not shown). The WLAN 100 may include APs 105 of different types (*e.g.*, metropolitan area, home network, *etc.*), with varying and overlapping coverage areas 125. Two STAs 115 may also communicate directly via a direct wireless link 120 regardless of whether both STAs 115 are in the same coverage area 125. In some case, the STAs 115 may exchange information via the direct wireless links 120 and relay the information to APs 105. Examples of direct wireless links 120 may include Wi-Fi Direct connections, Wi-Fi Tunneled Direct Link Setup (TDLS) links, and other group connections. STAs 115 and APs 105 may communicate according to the WLAN radio and baseband protocol for physical (PHY) and medium access control (MAC) layers from IEEE 802.11 and versions including, but not limited to, 802.11b, 802.11g, 802.11a, 802.11n, 802.11ac, 802.11ad, 802.11ah, *etc.* In other implementations, peer-to-peer connections or ad hoc networks may be implemented within WLAN 100.

[0050] A BSS may be uniquely identified from another BSS by a basic service set identifier (BSSID). A node within a BSS may include the BSSID in transmissions in order to distinguish over transmissions from other BSSs. For example, the BSSID may be included in the front portion (*e.g.*, the preamble) of a transmitted frame (*e.g.*, the BSSID may be included in the SIG field of the PHY header of a frame) for reference by the receiving node. Accordingly, the receiving node (*e.g.*, a STA) may decode the BSSID to determine if the communication is relevant (*e.g.*, originates from a BSS with which the STA is associated). If the communication is relevant the node may continue to process the rest of the frame. However, if the communication is irrelevant (*e.g.*, the frame is from an unassociated BSS) the node may ignore the remaining part of the frame by going to sleep. Additionally or alternatively, the node may transmit or receive or communications for the remaining duration of the frame. Thus, a node may decrease power consumption or increase throughput/efficiency by selectively reusing the frame duration based at least in part on the BSSID of the frame.

[0051] WLAN 100 may reduce power consumption and increase reuse by using shorter (*e.g.*, smaller value) BSSIDs. For example, WLAN 100 may implement color bits (or "colors") (*e.g.*, *X*-bit color indicators) which are a reduced version of the BSSID. However, in some cases the

same color bits may be used by two neighbor BSSs. That is, there may be a collision, or overlap/reuse, of color bits. A color collision may refer to the scenario in which a node in a first BSS detects a frame from a node in a second neighbor BSS that has the same value of color bits as the first BSS. In such a scenario, a STA 115 located at the intersection of the two neighbor BSSs may receive and process communications from both BSSs, regardless of association. For example, a STA associated with one of the BSSs may process frames from the other BSS upon detecting that the frames use the same color bits as the BSS with which the STA is associated. Processing frames that are unintended and irrelevant may consume power and reduce communication time for a STA 115. Accordingly, wireless devices in WLAN 100 may avoid unnecessary processing of irrelevant frames by detecting and resolving color collisions. For example, a node in WLAN may detect that two BSSs are using the same color bits and direct one of the BSSs to the change color bits used to identify that BSS. Although described with reference to two BSSs, the color collision detection and resolution techniques described herein may be implemented for any number of BSSs involved in a color collision.

[0052] **FIG. 2A** illustrates an example of a wireless communications subsystem 201 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 201 may detect and resolve color collisions that result from two neighbor BSSs using the same value for a reduced version of respective BSSIDs (*e.g.*, the neighbor BSSs may use identical color bits). Wireless communications subsystem 201 includes a first BSS associated with AP 105-a and a second BSS associated with AP 105-b. AP 105-a serves STAs 115 within corresponding coverage area 125-a and AP 105-b serves STAs 115 within corresponding coverage area 125-b. STA 115-a is located at the intersection of the two coverages areas 125-a, 125-b. The APs 105 and STAs 115 may be aspects of an AP 105 and STA 115 described with reference to FIG. 1.

[0053] The BSSs of wireless communications subsystem 201 may use color bits as reduced versions of BSSIDs. In one case, the BSS associated with AP 105-b may cause a color collision with the BSS associated with AP 105-a by selecting and using the same color bits. Thus, frames sent over communication link 110-a and frames send over communication link 110-b may appear

as if they originate from a single BSS. Accordingly, STA 115-a may process frames from AP 105-a and AP 105-b even if the frames are from a BSS unassociated with STA 115-a.

[0054] Thus, a color collision may occur when two neighboring BSSs have overlapping coverage areas 125 and use the same value for color indicators. Such a scenario may be referred herein to as a "type 1" scenario. A STA 115 in a type 1 scenario may receive broadcasts from a neighbor AP 105 that include color-use information. Based at least in part on the color-use information, the STA 115, or associated AP 105, may detect the color collision and trigger a change in color bits for one of the BSSs involved in the color collision.

[0055] **FIG. 2B** illustrates an example of a wireless communications subsystem 202 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 202 may detect and resolve color collisions that result from two neighbor BSSs using the same value for a reduced version of respective BSSIDs. Wireless communications subsystem 202 includes a first BSS associated with AP 105-c and a second BSS associated with AP 105-d. AP 105-c serves STAs 115 within corresponding coverage area 125-c (*e.g.*, STA 115-b) and AP 105-d serves STAs 115 within corresponding coverage area 125-d (*e.g.*, STA 115-c). The APs 105 and STAs 115 may be aspects of an AP 105 and STA 115 described with reference to FIG. 1.

[0056] The BSSs of wireless communications subsystem 202 may use reduced versions of BSSIDs to distinguish over other BSSs. For example, the BSSs may use X-bit color indicators in lieu of BSSIDs. In some cases, a color collision may result from two neighboring BSSs using identical color bits for identification. For instance the BSS associated with AP 105-c may use the same color bits as the BSS associated with AP 105-d. Thus, frames sent over communication link 110-c and frames sent over communication link 110-d may appear as if they originate from a single BSS. In other words, a color collision may still occur when two neighboring BSS have coverage areas 125 that do not overlap but use the same value for color bit indicators. Such a scenario may be referred herein to as a "type 2" scenario. In such an scenario, the color collision may be detected via communications between two STAs 115 within the different coverage areas. For example, STA 115-c may transmit (*e.g.*, via direct wireless link 120-a) information to STA 115-b that indicates the color used by the BSS associated with AP 105-d. STA 115-b may

leverage the information to independently recognize the color collision. Alternatively, STA 115-b may relay the color information to AP 105-c for detection of the color collision. Based at least in part on the detection, one of the BSSs associated with wireless communications subsystem 202 may change its color bits.

[0057] **FIG. 3** illustrates an example of a wireless communications subsystem 300 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 300 may detect collisions in BSS color indicators and resolve the collisions by changing the value of a color indicator for one of the involved BSSs. Wireless communications subsystem 300 includes two BSSs—a first BSS associated with AP 105-e and corresponding coverage area 125-e and a second BSS associated with AP 105-f and corresponding coverage area 125-f. Although shown with BSSs that have overlapping coverage areas 125 (*e.g.*, a type 1 condition), the techniques described herein may be applied or implemented in a scenario in which neighboring BSSs have coverage areas that do not overlap (*e.g.*, a type 2 condition).

[0058] The BSSs associated with AP 105-e and AP 105-f may use the same reduced version of respective BSSIDs. For example, AP 105-e and AP 105-f may have different BSSIDs but the reduced versions of the BSSIDs may be identical. Thus, a single color indicator may be used in wireless communications subsystem 300, which may decrease the ability of a STA 115 to distinguish between the two BSSs. For instance, STA 115-d may receive a communication via communication link 110-e that has the same color bits as a transmission conveyed by communication link 110-f. STA 115-d may be associated with the BSS of AP 105-e and unassociated with AP 105-f; however, STA 115-d may still process frames from AP 105-f due to the color collision.

[0059] A node in wireless communications subsystem 300 may detect and resolve the color collision. The node may be an AP, such as AP 105-e or AP 105-f, or a STA, such as STA 115-d. The color collision may be resolved by triggering a change in color bits used by one of the BSSs. For example, AP 105-e may detect the color collision and instigate a color change 305 for the BSS associated with AP 105-f. After the color change 305 the BSS associated with AP 105-f may be associated with color bits that have a different value than color bits for the BSS of AP

105-e. For instance, frames transmitted over communication link 110-f may include a different color indicator than frames transmitted over communication link 110-e.

[0060] Whichever node detects the color collision may also facilitate the resolution by determining which BSS should change color bits. The BSS selected for the color change may be associated with or unassociated with the detecting node. For example, AP 105-e may detect the color collision and determine which BSS involved in the color collision should change color bits. The determination may be substantially random. For instance, the node that detects the color collision may compare the time stamps of beacons for AP 105-e and AP 105-f and select which BSS should change based at least in part on the comparison (*e.g.*, the BSS associated with the beacon with the larger time stamp may be selected for the color change). In another scenario, there may be a pre-determination that the BSS associated with the detecting node should change color. Alternatively, the BSS unassociated with the detecting node may be pre-determined to change color. In some cases a node will detect the color collision and another node will resolve the color collision. For example, STA 115-d may detect the color collision and report the color collision to AP 105-e (or AP 105-f), which may then resolve the color collision. The color collision report may include information that the resolving node may utilize to determine which BSS should change colors.

[0061] In certain examples, the color-change decision (*e.g.*, which BSS should change colors) may be based at least in part on the full BSSID of the associated BSSs. For instance, the node responsible for resolving the color collision may compare certain bits in the full BSSIDs for each involved BSS and select the BSS to change based at least in part on the comparison. In one example, the BSS corresponding to the BSSID with lower values of certain bits is selected for the change. In certain cases, the BSS selected for the color-change may be based at least in part on the color setup time (*e.g.*, how fast the BSS can implement the change in color bits) for each respective BSS involved in the color collision. For example, the BSS with the earlier or shorter color setup time may be selected for the change. Alternatively, the BSS selected for the color-change may be chosen based at least in part on the number of unused colors for each respective BSS. In one example, the BSS with more unused colors is selected for the color change. If

neither BSS has unused colors, each BSS may refrain from changing colors (*e.g.*, each BSS may keep the current color bits).

[0062] In some cases, the colors of associated neighbor BSSs uninvolved with the color collisions may factor into the color-change decision. For instance, the BSS associated with AP 105-f may obtain the colors bits for each neighboring BSS and determine the number of unused colors available to AP 105-f that would not result in a color collision with one of the neighboring BSSs. An unused color that does not cause a color collision with a neighboring BSS may be referred to as an available color. The node responsible for the resolution of the color collision may compare the number of available colors for each BSS involved in the color collision and select the BSS for change based at least in part on the comparison. In certain scenarios, the number of unused colors for a BSS and respective neighboring BSSs may factor into the color-change decision. For instance, the number of unused colors for each BSS neighboring AP 105-f may be added to the number of unused colors for AP 105-f. This sum may be compared to a corresponding sum for AP 105-e. The node responsible for the resolution of the color collision may select the BSS for change based at least in part on the comparison.

[0063] In certain aspects, the color change may be based at least in part on the STAs 115 associated with the BSSs. For instance, the decision regarding which BSS should change colors may be based at least in part on the number of STAs 115 associated with each respective BSS, or the number of active STAs 115. In a certain scenario, the BSS with fewer associated STAs 115 is selected for the color change. Such a selection may result in less signaling (*e.g.*, from the AP 105 to the associated STAs 115) to set up the color change. There may be times when the criteria for selecting the BSS to change are such that a tie occurs (*e.g.*, the BSSs may both have the same number of associated STAs 115). In such an instance, a tie-breaker may be implemented. For instance, each AP 105 may broadcast a random number and the AP 105 with the larger number may be selected to change colors. The information described above may be reported from nodes within wireless communications subsystem 300 to the node responsible for the resolution of the color collision. The reports may be in response to a request or independently transmitted.

[0064] If the BSS selected for the color change is associated with the AP 105 that detected the color collision the detecting AP 105 may autonomously make the chosen color change. In some cases, the AP 105 may transmit a color change announcement element (*e.g.*, in a beacon, in a response to a probe, in a color change announcement frame, *etc.*) to STAs 115 associated with the corresponding BSS. The color change announcement may include an indication of the new color with which the BSS will be associated. The color change announcement may include an indication of a scheduled time for the color change to take place. For example, the announcement may indicate that the change will happen immediately after the end of the color announcement frame, or before the next *X* target beacon transmission times (TBTTs). Thus, the associated STAs 115 may know when to expect the color change. In certain aspects, the announcement may include a transmission restriction mode indicator that indicates whether the associated STAs 115 are allowed to transmit before the scheduled change time.

[0065] If the BSS selected to change color is not associated with the detecting AP 105, the detecting AP 105 may send a color change request to the AP 105 associated with the selected BSS. The color change request may indicate that the AP 105 associated with the selected BSS should change colors. For instance, in the present example, AP 105-e may detect the color collision and determine that AP 105-f and the corresponding BSS should change color (*e.g.*, based at least in part on a criteria described above.) Accordingly, AP 105-e may transmit a color change request to AP 105-f which may trigger the color change 305. In some cases, the color change request may include color change information (*e.g.*, the color change request may indicate which color bits the changing AP 105 should use). In this or other examples, the color change request may include the color of the detecting AP 105, the color setup time of the detecting AP 105, the number of unused colors of the detecting AP 105, the number of STAs 115 associated with the detecting AP 105, or the number of active STAs 115 served by the detecting AP 105. The color change request may be sent to the neighbor AP 105 directly, via STA 115 relay, or via backhaul.

[0066] **FIG. 4** illustrates an example of a wireless communications subsystem 400 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 400 may

implement broadcast-based detection of color collision. Wireless communications subsystem 400 includes two neighbor BSSs – a first BSS associated with AP 105-g and corresponding coverage area 125-g and a second BSS associated with AP 105-h and corresponding coverage area 125-h. Wireless communications subsystem 400 may utilize or leverage broadcasts from an AP 105 to detect a color collision for type 1 conditions. Wireless communications subsystem 400 may rectify or resolve the color collision by changing the color bits for one of the BSSs such as described with respect to FIG. 3.

[0067] In the example of FIG. 4, AP 105-h may disseminate color-use information (*e.g.*, what value of color indicator AP 105-h is using) via broadcast. Some or all of the broadcast information may be received by STA 115-e and relayed to AP 105-g via communication link 110-g. The relay may be in response to a request from AP 105-g, AP 105-h, or independent of AP 105 intervention. The broadcast information may be transmitted without color bits so that any STA 115 within range of AP 105-h is able to receive the broadcast, including the STAs 115 unassociated with the BSS of AP 105-h. In certain scenarios, AP 105-g may send neighbor BSS information to STA 115-e. The information may enable the STA 115-e to selectively report broadcast color-use information for neighbor BSSs that are unknown to AP 105-g.

[0068] In an alternative, the broadcast information may be directly received by AP 105-g. For example, AP 105-g may be located such that broadcasts from AP 105-h reach AP 105-g. Regardless of how AP 105-g obtains the broadcast color-use information, AP 105-g may utilize the color-use information determine that there is a color collision. For example, the color-use information may include the AP 105-h BSS color indicator. AP 105-g may compare the color indicator of AP 105-h with the color indicator of AP 105-g and determine that the two color indicators are the same (*i.e.*, there is a color collision). Based at least in part on the color collision detection, AP 105-g may instigate a change in color bits. The change in color bits may be applicable to AP 105-g or to AP 105-h.

[0069] The color-use information may include the used and unused color indicators for the BSS associated with AP 105-h. Based at least in part on this information, AP 105-g may select a color indicator for the change. The color-use information broadcast by AP 105-h may include the color setup time—that is, the amount of time it takes AP 105-h to change color bits. The

broadcast may also include the number of STAs 115 associated with AP 105-h, or the number of active STAs 115. AP 105-g may leverage the color-use information to decide which BSS should change color, and which color should be substituted. In some cases, the detection and resolution of the color collision may all be handled by STA 115-e. Although described in terms of broadcast, color-use information may be communicated via multi-cast or uni-cast transmissions. For instance, AP 105-h may transmit color-use information to a STA 115 with directions for the STA 115 to pass the information along to AP 105-g.

[0070] **FIG. 5** illustrates an example of a wireless communications subsystem 500 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 500 may implement address-based detection of color collision. Wireless communications subsystem 500 includes a first BSS associated with AP 105-i, STA 115-f, and corresponding coverage area 125-i. Wireless communications subsystem 500 includes a second BSS associated with AP 105-r, STA 115-g and corresponding coverage area 125-j. Wireless communications subsystem 500 represents a type 2 scenario in which the coverage areas 125 do not overlap; however, the techniques described herein may be applied to a type 1 scenario in which the coverage areas 125 overlap.

[0071] A color collision may occur when AP 105-i and AP 105-r use the same color bits for identification. For example, AP 105-r may transmit frames over communication link 110-k that include the same color bits as frames sent from AP 105-i over communication link 110-h. A node (*e.g.*, STA 115-f) may detect a color collision by receiving frames from different BSSs with the same color bits. The frames may be received via broadcast, multi-cast, or uncast transmissions. For example, STA 115-f may receive frames from AP 105-i (*e.g.*, via communication link 110-h) and STA 115-g (*e.g.*, via direct wireless link 120-b) that have identical color values. STA 115-f may determine that the frames are from different BSSs by decoding and comparing the media access control (MAC) addresses included in the frames. In one example, a node may identify the BSSID from the transmitter address in a downlink frame, or a receiver address in an uplink frame. Alternatively, the node may identify the BSS of a frame from transmitter/receiver addresses of known nodes in that BSS. If the detecting node is an AP

105 (*e.g.*, AP 105-i), the AP 105 may autonomously trigger a color change for one of the BSSs. For example, the AP 105 may decide to alter the color bits of the BSS with which the AP 105 is associated. Alternatively, the AP 105 may send a color change request intended for the neighbor BSS.

[0072] If the detecting node is a STA 115 (*e.g.*, STA 115-f) the STA 115 may either autonomously rectify the color collision (*e.g.*, by sending an explicit color change request) or report the color collision to an AP 105 (*e.g.*, via communication link 110-j with AP 105-i). That is, the detecting STA 115 may send a collision report to an AP 105 involved in the color collision requesting action. In some cases, the collision report may be a single bit indicating that a collision occurred. The color collision report may include information to assist in the color change decision at an AP 105. For example, the color collision report may include neighbor BSS information such as the BSSID, the color setup time, the number of unused colors, the number of STAs 115 associated with the neighbor BSS, the number of active STAs 115, or a random number (*e.g.*, for tie-breaking). In some cases, the color collision report or the color change request may be relayed to an AP 105 via a STA 115 or AP 105 (*e.g.*, via over the air (OTA) messages or backhaul messages). Regardless of which node detects the color collision, the color collision may be resolved utilizing the techniques described with reference to FIG. 3.

[0073] **FIG. 6** illustrates an example of a wireless communications subsystem 600 that supports detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless communications subsystem 600 may implement backhaul-based detection of color collision. Wireless communications subsystem 600 includes a first BSS associated with AP 105-k and corresponding coverage area 125-k. Wireless communications subsystem 600 includes a second BSS associated with AP 105-l and corresponding coverage area 125-l. STA 115-h may be located at the intersection of coverage area 125-k and coverage area 125-l. Thus, wireless communications subsystem 600 represents a type 1 scenario; however, the techniques described herein may be applied to a type 2 scenario in which the coverage areas 125 do not overlap. The APs 105 and STAs 115 may be aspects of an AP 105 and STA 115, respectively, as described with reference to FIGs. 1-5.

[0074] An AP 105 may detect a color collision via backhaul communications with a neighbor AP 105 or a central controller 610. For instance, the AP 105 may determine the ID of a neighbor BSS and request (*e.g.*, via backhaul link 505) color-use information pertaining to that neighbor AP 105. The color-use information may be communicated via backhaul link 505 from the neighbor AP 105, or via communication link 110-l from the central controller 610. Based at least in part on the color-use information, the AP 105 may determine whether there is a color collision and take appropriate steps to resolve the collision. In some cases, the AP 105 may send color-use information to the contact node (*e.g.*, AP 105-l or the central controller 610) and the contact node may detect and resolve the color collision. In some cases, the central controller 610 may serve as a relay for messages between AP 105-k and AP 105-l. In other instances, the central controller 610 may coordinate color collision detection and resolution independently. For example the central controller 610 may request/receive color-use information from AP 105-k via communication link 110-l and AP 105-l via communication link 110-m. The central controller 610 may be another AP 105, the core network, or any intelligent communications device.

[0075] AP 105-k may obtain the ID of the BSS associated with AP 105-l via communications with the AP 105-l (*e.g.*, intercepted broadcasts) or STA 115-h (*e.g.*, via communication link 110-n). For example, AP 105-k may determine the ID via detection of the BSSID of AP 105-l via a broadcast from AP 105-l. Alternatively, AP 105-k may receive the identification of the BSS associated with AP 105-l directly from STA 115-h or central controller 610. For example, AP 105-k may obtain the identification information of AP 105-l during a hand-in report from STA 115-h (*e.g.*, in a re-association request). Regardless of how AP 105-k receives the BSS identification information to detect the color collision, the resolution of the color collision may be implemented using any of the techniques described with reference to FIG. 3.

[0076] **FIG. 7** illustrates an example of a process flow 700 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Process flow 700 may include AP 105-m, AP 105-n, and STA 115-i, which may be examples of an AP 105 and STA 115 described with reference to FIGs. 1-6. AP 105-m may be associated with a first BSS and AP 105-n may be associated with a second BSS.

[0077] At 705, STA 115-i may transmit, and AP 105-m may receive, a message indicating the value for a reduced version of BSSID (*e.g.,* color bits) used by the BSS associated with AP 105-n (*i.e.*, the second BSS). The message may be in response to a query or request from AP 105-m. The message may relay color or reduced version BSSID information for AP 105-n such as the setup time for reduced versions of BSS identifiers or a number of unused values for reduced versions of BSS identifiers of AP 105-n and BSSs that neighbor AP 105-n. In some cases, the message may include the number of STAs 115 associated with AP 105-n, or the a number of active STAs 115. The message may include the BSSID of AP 105-n. Additionally or alternatively, at 710 AP 105-n may broadcast, and AP 105-m may receive, the value of the reduced version of BSSID used by AP 105-n (*e.g.*, the color bits of AP 105-n). In some cases the broadcast may include information related to the reduced version of BSSID.

[0078] At 715, AP 105-m may detect that the first BSS and the second BSS are using a same value for reduced versions of respective BSS identifiers. For example, each BSS may be using the color bits. The detection may be based at least in part on messages received from STA 115-i or AP 105-n. For instance, detecting may include receiving the broadcast communication from AP 105-n of the second BSS. In such an instance, AP 105-m may compare the received broadcast information to corresponding information of the first BSS to detect the reuse (*i.e.*, collision) of the value for reduced version of BSS identifier. Or, detecting may include receiving from STA 115-i the color value for the second BSS, the color value for the second BSS having been received at STA 115-i via a broadcast communication from AP 105-n.

[0079] In some examples, a node (*e.g.*, STA 115-i or AP 105-m) may detect the use of the same color value by the two BSSs by receiving a first frame from the first BSS (*e.g.*, from AP 105-m) and a second frame from the second BSS (*e.g.*, from AP 105-n). The node may determine that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers (*i.e.*, the frames include the same color bits). In some cases, the node may identify a media access control (MAC) address of the first BSS in the first frame and a MAC address of the second BSS in the second frame. The node may determine that the frames are from two different BSSs based at least in part on the MAC addresses of the frame.

[0080] In certain aspects, AP 105-m may communicate, via backhaul, use information pertaining to reduced versions of respective BSS identifiers (*e.g.*, color-use information) with a central controller or AP 105-n. AP 105-m may communicate with AP 105-n based at least in part on the BSSID of the second BSS. In some examples communicating includes sending a request to the central controller (or AP 105-n) for the use information of the second BSS. In certain cases, communicating includes receiving from the central controller (or AP 105-n) use information of the second BSS. Communicating may include transmitting to the central controller (or AP 105-n) use information of the first BSS.

[0081] At 720, AP 105-m may trigger, based at least in part on the detection, a change in value for a reduced version BSSID. For example, AP 105-m may trigger a change in color bits for one of the BSSs. The change in value may be for the BSS associated with AP 105-m (the first BSS) or for the BSS associated with AP 105-n (the second BSS). That is, triggering may include determining at least one of the first BSS and the second BSS to change values for reduced versions of respective BSS identifiers. In some examples triggering includes determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS. In such an instance, a change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs. In certain aspects, triggering includes determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS. In such a scenario, the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS. In some cases, AP 105-m may determine, based at least in part on the identification of MAC addresses in a first and second frame, that the first frame and the second frame are from different BSSs and trigger that change based at least in part on that determination. In some examples, AP 105-m may autonomously determine the change in the value.

[0082] In some cases, STA 115-i may detect the same value of reduced BSS identifiers and trigger the change in value. For example STA 115-i may send a collision report to AP 105-m indicating that the first BSS and the second BSS have the same value for reduced versions of respective BSS identifiers (*e.g.*, the first and second BSS use identical color bits). In some

examples, STA 115-i may send the collision report to AP 105-m at 705. At 725, AP 105-m may transmit an announcement of the change in the value to STA of the BSS whose value has changed. For example, AP 105-m may send an color change announcement to STA 115-i. In some examples, the announcement includes a scheduled change time. In certain aspects, the announcement includes an indication of a transmission restriction mode. The announcement may include the color with which the changing BSS will be associated with after the change.

[0083] Alternatively, at 730, AP 105-m may send a request to the BSS selected to change value for the reduced version of the BSS identifier. For example, AP 105-m may send a change request to AP 105-n indicating that AP 105-n should change color bits. In such an example, AP 105-n may trigger the change in value based at least in part on a request to change from AP 105-m. Thus, a collision of values for reduced versions of BSS identifiers may be detected and resolved.

[0084] **FIG. 8** illustrates an example of a process flow 800 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Process flow 800 may include STA 115-j and AP 105-o, which may be examples of a STA 115 and AP 105 described with reference to FIGs. 1-7. STA 115-j may support frame filtering in which frames are processed or ignored based at least in part on the reduced version of BSS identifier included in the frame. For example, STA 115-j may decode the reduced version of the BSSID (*e.g.*, the *X*-bit color indicator) in the front portion of a frame to determine with which BSS the frame is associated. If the frame is associated with a BSS with which STA 115-j is unassociated or does not belong (*e.g.*, an overlapping BSS (OBSS)), STA 115-j may use the rest of the frame to transmit; that is, the STA 115-j may transmit over the remaining portion of the received frame.

[0085] In some cases, an AP 105 may not support frame filtering that is based at least in part of the reduced versions of BSS identifiers (*e.g.*, the AP 105 may not support color-based frame filtering). In such a scenario, a STA 115 that uses such frame filtering may attempt to transmit over a received frame to the AP 105. However, the AP 105 may not be able to receive the frame due to priority given to the received frame. Thus, the STA 115 may consume power transmitting

frames that are not received at the AP 105. Thus, a STA 115 may modify behavior based at least in part on the ability of an AP 105 to support color-based frame filtering.

[0086] At 805, STA 115-j may receive a communication from AP 105-o indicating whether AP 105-o supports frame filtering that is based at least in part on values of reduced versions of BSS identifiers (*e.g.*, color-based frame filtering). At 810, STA 115-j may determine the value of a reduced version of BSS identifier (*e.g.*, the color bits) for a received frame. The frame may include a reduced version of BSS identifier that is unassociated with STA 115-j. Accordingly, at 815, STA 115-j may determine an adjustment in behavior based at least in part on the frame filtering communication from AP 105-o. For example, if AP 105-o doesn't support frame filtering STA 115-j may enter a sleep mode for the remaining portion of the received frame. Alternatively, if AP 105-o does support frame filtering, STA 115-j may transmit over the remaining portion of the received frame to AP 105-o. For example, STA 115-j may send a transmission to AP 105-o at 825. In some cases, STA 115-j may prioritize APs 105 based at least in part on their ability to support frame filtering. For example, an AP 105 that supports frame filtering may be given higher priority that an AP 105 that does not support frame filtering. In some cases, upon determining that AP 105-o does not support frame filtering, STA 115-j may transmit to another AP 105 (*e.g.*, one that does support frame filtering) instead of entering a sleep mode.

[0087] **FIG. 9** shows a block diagram of a wireless device 900 configured for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. Wireless device 900 may be an example of aspects of an AP 105 or a STA 115 described with reference to FIGs. 1-8. Wireless device 900 may include a receiver 905, a reduced version BSSID manager 910, or a transmitter 915. Wireless device 900 may also include a processor. Each of these components may be in communication with each other.

[0088] The receiver 905 may receive information such as packets, user data, or control information associated with various information channels (*e.g.*, control channels, data channels, and information related to detection and resolution of a reduced version BSS identifier collision, *etc.*). The received packets may include reduced versions of BSS identifiers (*e.g.*, color bits).

The received information may be passed on to the reduced version BSSID manager 910, and to other components of wireless device 900.

[0089] The reduced version BSSID manager 910 may detect that a first BSS and a second BSS are using a same value (*e.g.*, color) for reduced versions of respective BSSIDs, and trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS. Detecting may include receiving a broadcast communication from an access point of the second BSS that includes the value (*e.g.*, color) for the second BSS. Detecting may include receiving, from a station associated with the first BSS, the value for the second BSS. The value for the second BSS may have been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS. In certain aspects, detecting includes receiving a first frame from the first BSS and a second frame from the second BSS and determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers (*e.g.*, the frames have identical color bits but originate from different BSSs).

[0090] In some cases, triggering may include determining a value for a reduced version of a BSSID that is not in use by the first BSS and the second BSS. That is, the reduced version BSSID manager 910 may determine which colors are not in use by either of the involved BSSs. The change in the value may be based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS or associated neighbor BSSs. In certain examples, triggering includes determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS. For example, the reduced version BSSID manager 910 may determine the unused colors for neighboring BSSs that are not involved in the color collision. The first BSS and the second BSS may be neighbor BSSs. The change in the value may be based at least in part on the value for the reduced version of the BSSID that is not in use by the neighboring BSSs. In certain aspects, triggering may involve receiving a broadcast communication that includes information associated with an access point of the second BSS. In such a scenario, the information may include a setup time for reduced versions of BSSIDs (*e.g.*, a color setup time), a number of unused values for reduced versions of BSSIDs of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active

stations. The reduced version BSSID manager 910 may compare the received broadcast information to corresponding information of the first BSS and trigger the change based at least in part on the comparison, such as described with reference to FIG. 3.

[0091] The transmitter 915 may transmit signals received from other components of wireless device 900. In some examples, the transmitter 915 may be collocated with the receiver 905 in a transceiver. The transmitter 915 may include a single antenna, or it may include a plurality of antennas.

[0092] **FIG. 10** shows a block diagram of a wireless device 1000 for detection and resolution of use of a same value for a reduced version of a BSSID in accordance with various aspects of the present disclosure. Wireless device 1000 may be an example of aspects of a wireless device 900 described with reference to FIG. 9. Wireless device 1000 may include a receiver 905-a, a reduced version BSSID manager 910-a, or a transmitter 915-a. Wireless device 1000 may also include a processor. Each of these components may be in communication with each other. The reduced version BSSID manager 910-a may be an example of the reduced version BSSID manager 910 described with reference to FIG. 9. The reduced version BSSID manager 910-a may include a reduced version BSSID detector 1005, a reduced version BSSID administrator 1010, a reduced version BSSID evaluator 1015, and a communication coordinator 1020.

[0093] The receiver 905-a may receive information which may be passed on to the reduced version BSSID manager 910-a, and to other components of wireless device 1000. The reduced version BSSID manager 910-a may perform the operations described with reference to FIG. 9. The transmitter 915-a may transmit signals received from other components of wireless device 1000.

[0094] The reduced version BSSID detector 1005 may detect that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers as described with reference to FIGs. 2A-8. That is, the reduced version BSSID detector 1005 may detect a color collision between two BSSs. In some examples, detecting includes receiving a broadcast communication from an access point of the second BSS that includes the value for the second BSS. In some examples, detecting includes receiving from a station associated with the first

BSS the value for the second BSS, the value for the second BSS having been received at the station via a broadcast communication from an access point of the second BSS. The reduced version BSSID detector 1005 may also determine that a first frame and a second frame sent from different BSSs have the same value for reduced versions of respective BSSIDs.

[0095] The reduced version BSSID detector 1005 may also adjust a behavior of the wireless device 1000. The adjustment may be based at least in part on a communication from an access point indicating the capability of the access point to support frame filtering that is based at least in part on values of reduced versions of BSSIDs. The adjustment may be with respect to an access point when a frame is detected using a value of a reduced version of a BSSID of a neighboring BSS with which the node is not associated. That is, the frame may include color bits that do not correspond to a BSS with which the node is associated. The value (*e.g.*, color bits) may be in a first portion of the frame. In some examples, adjusting the behavior includes entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSSIDs. In some examples, adjusting the behavior includes transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSSIDs.

[0096] The reduced version BSSID administrator 1010 may trigger, based at least in part on the detection of a color collision, a change in the value for at least one of the first BSS and the second BSS as described with reference to FIGs. 2A-8. In some examples, triggering includes determining at least one of the first BSS and the second BSS to change values for reduced versions of respective BSSIDs (*e.g.*, determining which involved BSS should change colors). In some examples, triggering includes determining the change in the value based at least in part on a request to change the reduced version of the BSSID for at least one of the first BSS and the second BSS. In some examples, triggering includes autonomously determining the change in the value.

[0097] The reduced version BSSID evaluator 1015 may be configured such that triggering may include determining a value for a reduced version of a BSSID that is not in use by the first BSS and the second BSS. That is, the reduced version BSSID evaluator 1015 may determine

which colors are unused by which BSSs. The change in the value may be based at least in part on the value for the reduced version of the BSSID that is not in use by the changing BSS or associated neighbor BSSs as described with reference to FIGs. 2A-8. In some examples, triggering includes determining a value for a reduced version of a BSSID that is not in use by a neighbor BSS (the first BSS and the second BSS being neighbor BSSs). In other words, triggering may involve determining a color that is unused by surrounding BSSs. Accordingly, the change in the value may be based at least in part on the value for the reduced version of the BSS identifier that may is not in use by the neighbor BSSs. The reduced version BSSID evaluator 1015 may also compare received broadcast information to corresponding information of the first BSS. Triggering the change may be based at least in part on the comparison. The reduced version BSSID evaluator 1015 may also determine, based at least in part on identification of MAC address for a first and second frame that the first frame and the second frame are from different BSSs. Accordingly, the change may be based at least in part on the determination.

[0098] The communication coordinator 1020 may be configured to facilitate receiving a broadcast communication that includes information associated with an access point of the second BSS. The information may include the setup time for reduced versions of BSSIDs (*e.g.*, a color setup time), the number of unused values for reduced versions of BSSIDs of the second BSS and BSSs that neighbor the second BSS, the number of associated stations, and the number of active stations as described with reference to FIGs. 2A-8. In some examples, the communication coordinator 1020 may, in conjunction with the receiver 905-a, receive a first frame from the first BSS and a second frame from the second BSS. The first and second frames may originate from different BSSs but include the same color bits. In some examples, the communication coordinator 1020 may, in conjunction with the transmitter 915-a, send a collision report to an access point that indicates that the first BSS and the second BSS have the same value for reduced versions of respective BSSIDs. The communication coordinator 1020 may also facilitate backhaul communications of use information (*e.g.*, color-use information) pertaining to reduced versions of respective BSSIDs with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

[0099] In some examples, the communication coordinator 1020 may facilitate transmission of a request to a central controller (or an access point of the second BSS) for the color use information of the second BSS. The communication coordinator 1020 may facilitate receiving from the central controller (or the access point of the second BSS) the use information of the second BSS. The communication coordinator 1020 may also facilitate sending a request to the determined BSSs to change respective values for reduced versions of the BSSIDs. The communication coordinator 1020 may also facilitate transmitting an announcement of the change in the value to STAs of the BSS whose value has changed. In some examples, the announcement includes a scheduled change time. In some examples, the announcement includes an indication of a transmission restriction mode. The communication coordinator 1020 may, in conjunction with receiver 905-a, receive a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSSIDs.

[0100] The components of wireless device 1000, wireless device 900, and reduced version BSSID manager 910 may, individually or collectively, be implemented with at least one application specific integrated circuit (ASIC) adapted to implement some or all of the applicable features in hardware. Alternatively, the features may be implemented by one or more other processing units (or cores), on at least one IC. In other examples, other types of integrated circuits may be used (*e.g.*, Structured/Platform ASICs, a field programmable gate array (FPGA), or another semi-custom IC), which may be programmed in any manner known in the art. The features of each unit may also be implemented, in whole or in part, with instructions embodied in a memory, formatted to be executed by one or more general or application-specific processors.

[0101] **FIG. 11A** shows a diagram 1101 including STA 115-k configured for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. STA 115-k may be an example of a wireless device 900, 1000, or STA 115 describe herein, and with reference to FIGs. 1-10. STA 115-k may include a reduced version BSSID manager 910-b, which may be an example of a reduced version BSSID manager 910 or 910-a described with reference to FIGs. 9 and 10. STA 115-k may also include components for bi-directional voice and data communications including components for transmitting communications and components for receiving communications. For example, STA 115-k may

communicate bi-directionally with AP 105-p or STA 115-l. STA 115-k may also include a processor 1125, and memory 1115 (including software (SW) 1120), a transceiver 1105, and one or more antennas 1110, each of which may communicate, directly or indirectly, with one another (*e.g.*, via buses 1130). The transceiver 1105 may communicate bi-directionally, via the antennas 1110 or wired or wireless links, with one or more networks, as described above. The transceiver 1105 may include a modem to modulate the packets and provide the modulated packets to the antennas 1110 for transmission, and to demodulate packets received from the antennas 1110. While STA 115-k may include a single antenna 1110, STA 115-k may also have multiple antennas 1110 capable of concurrently transmitting or receiving multiple wireless transmissions.

[0102] The components of the reduced version BSSID manager 910-b may, individually or collectively, be implemented with at least one ASIC adapted to implement some or all of the applicable features in hardware. Alternatively, the features may be implemented by one or more other processing units (or cores), on at least one IC. In other examples, other types of integrated circuits may be used (*e.g.*, Structured/Platform ASICs, an FPGA, or another semi-custom IC), which may be programmed in any manner known in the art. The features of each unit may also be implemented, in whole or in part, with instructions embodied in a memory, formatted to be executed by one or more general or application-specific processors.

[0103] STA 115-k may be associated with type 1 or type 2 conditions. STA 115-k may be part of a BSS. Accordingly, STA 115-k may be assigned a BSSID or a reduced version of the BSSID that corresponds to the BSS with which STA 115-k is associated. For example, STA 115-k may be assigned an X-bit color indicator. STA 115-k may process frames that include the value of reduced version BSSID (*e.g.*, a color indicator) that corresponds to the associated BSS. In some cases, STA 115-k may detect that more than one BSS is using a same value of a reduced version of a BSSID (*e.g.*, STA 115-k may detect a color collision). STA 115-k may facilitate correction of the color collision either independently or via communications with an AP 105. For example, STA 115-k may utilize reduced version BSSID manager 910-b for color collision and resolution. The reduced version BSSID manager 910-b may include a reduced version BSSID detector 1005-a, a reduced version BSSID administrator 1010-a, a reduced version BSSID evaluator 1015-a, and a communication coordinator 1020-a. Each of these modules may

perform the functions described with reference to FIG. 10. The reduced version BSSID manager 910-b may also include a BSS identification manager 1135.

[0104] The BSS identification manager 1135 may be configured to detect a color collision by identifying media access control (MAC) addresses in frames from different BSSs. For example, the BSS identifier may determine that the MAC addresses in a first frame and a second frame correspond to different BSSs as described with reference to FIGs. 2A-8. The frames may be passed to the BSS identification manager by the communication coordinator 1020-a. The BSS identification manager 1135 may also identify a BSSID of neighboring BSSs (*e.g.*, via communication with an AP 105 for each respective BSS). The information obtained by the BSS identification manager 1135 may be used by other components of the reduced version BSSID manager 910-b to detect and resolve color collisions as described with reference to FIGs. 2A-8.

[0105] The memory 1115 may include random access memory (RAM) and read only memory (ROM). The memory 1115 may store computer-readable, computer-executable software/firmware code 1120 including instructions that, when executed, cause the processor 1125 to implement various features described herein (*e.g.*, detect and resolve color collisions, *etc.*). Alternatively, the software/firmware code 1120 may not be directly executable by the processor 1125 but cause a computer (*e.g.*, when compiled and executed) to implement features described herein. The processor 1125 may include an intelligent hardware device (*e.g.*, a central processing unit (CPU), a microcontroller, an ASIC, *etc.*).

[0106] **FIG. 11B** shows a diagram 1102 including STA 115-m configured for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. STA 115-m may be an example of a wireless device or STA 115 described with reference to FIGs. 1-10. STA 115-m may include a processor 1125-a, memory 1115-a, transceiver 1105-a, and antenna(s) 1110-a, each of which may implement the features described above with reference to FIG. 11A, and each of which may communicate, directly or indirectly, with one another (*e.g.*, via buses 1130-a).

[0107] In the present example, the memory 1115-a may include software that implements the features of reduced version BSSID manager 910-c. For example, the memory 1115-a may

include software that, when compiled and executed, implements the features of reduced version BSSID detector 1005-b, reduced version BSSID administrator 1010-b, reduced version BSSID evaluator 1015-b, communication coordinator 1020-b, and BSS identification manager 1135-a, such as described with reference to FIGs. 9-11A. In some cases, a subset of the features of reduced version BSSID manager 910-c is included in the memory 1115-a; in other cases, all of the features may be implemented as software executed by the processor 1125-a to cause STA 115-m to implement the features of reduced version BSSID manager 910-c. For example, the features of the BSSID detector 1005-b and the reduced version BSSID administrator 1010-b may be accomplished by software included the memory 1115-a, while the features of the reduced version BSSID evaluator 1015-b, communication coordinator 1020-b, and BSS identification manager 1135-a may be accomplished using hardware. Regardless of the distribution, STA 115-m may detect collisions in reduced version BSSIDs and facilitate resolution accordingly.

[0108] **FIG. 12A** shows a diagram of a system 1200 including an AP 105-r configured for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. AP 105-r may be an example of a wireless device or AP 105 described with reference to FIGs. 1-10. AP 105-r may include a reduced version BSSID manager 910-d, which may be an example of a reduced version BSSID manager 910 or 910-a, described with reference to FIGs. 9 and 10. The reduced version BSSID manager 910-d may include a reduced version BSSID detector 1005-c, a reduced version BSSID administrator 1010-c, a reduced version BSSID evaluator 1015-c, a communication coordinator 1020-c, and BSS identification manager 1135-b, each of which may perform the functions described with reference to FIGs. 8-11B. AP 105-r may also include components for bi-directional voice and data communications including components for transmitting communications and components for receiving communications. For example, AP 105-r may communicate bi-directionally with STA 115-o or STA 115-0. In some cases, AP 105-r may communication with a central controller (not shown). AP 105-r may be in type 1 or type 2 conditions, such as described with reference to FIGs. 2A and 2B.

[0109] The AP 105-r may include a processor 1225, memory 1115 (including software (SW) 1220), transceiver 1205, and antenna(s) 1210, which each may be in communication, directly or

indirectly, with one another (*e.g.*, over bus system 1245). The transceiver 1205 may be configured to communicate bi-directionally, via the antenna(s) 1210, with the STA 115-o and STA 115-p, which may be multi-mode devices. The transceiver 1205 (or other components of AP 105-r) may also be configured to communicate bi-directionally, via the antennas 1210, with one or more other APs (not shown). The transceiver 1205 may include a modem configured to modulate the packets and provide the modulated packets to the antennas 1210 for transmission, and to demodulate packets received from the antennas 1210. The AP 105-r may include multiple transceivers 1205, each with one or more associated antennas 1210. The transceiver may be an example of a combined receiver 905 and transmitter 915 of FIG. 9. In some cases, AP 105-r may communicate with other APs (*e.g.*, via backhaul) utilizing AP communications manager 1230. In some cases, AP communications manager 1230 may include a controller or scheduler for controlling communications with STAs 115 in cooperation with other APs 105. In certain aspects, AP 105-r may communicate with the core network 1235 through network communications manager 1240. The core network 1235 may be a central controller as described with reference to FIGs. 1-8.

[0110] The memory 1215 may include RAM and ROM. The memory 1215 may also store computer-readable, computer-executable software code 1220 containing instructions that are configured to, when executed, cause the processor 1225 to implement various features described herein (*e.g.*, detect and resolve collisions of reduced version BSSIDs, *etc.*). Alternatively, the software 1220 may not be directly executable by the processor 1225 but may be configured to cause the computer (*e.g.*, when compiled and executed) to perform features described herein. The processor 1225 may include an intelligent hardware device (*e.g.*, a CPU, a microcontroller, an ASIC, *etc.*). The processor 1225 may include various special purpose processors such as encoders, queue processing modules, base band processors, radio head controllers, digital signal processor (DSPs), and the like.

[0111] **FIG. 12B** shows a diagram of a system 1202 including AP 105-s configured for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. AP 105-s may be an example of a wireless device 900, 1000 or an AP 105 described with reference to FIGs. 1-12A. AP 105-s may include a reduced version

BSSID manager 910-e, which may be an example of a reduced version BSSID manager 910 described with reference to FIGs. 9 and 10. AP 105-s may include a processor 1225-a, memory 1215-a, transceiver 1205-a, AP communications manager 1230-a, network communications manager 1240-a, and antenna(s) 1210-a, each of which may implement the features described above with reference to FIG. 12A, and each of which may communicate, directly or indirectly, with one another (*e.g.*, via bus system 1245-a).

[0112] In the present example, the memory 1215-a may include software that implements the features of reduced version BSSID manager 910-e. For example, memory 1215-a may include software that, when compiled and executed, implements the features of reduced version BSSID detector 1005-d, reduced version BSSID administrator 1010-d, reduced version BSSID evaluator 1015-d, communication coordinator 1020-d, and BSS identification manager 1135-c, such as described with reference to FIGs. 9-12A. In some cases, a subset of the features of reduced version BSSID manager 910-e is included in memory 1215-a; in other cases, all of the features may be implemented as software executed by the processor 1225-a to cause AP 105-s to implement the features of reduced version BSSID manager 910-e. For example, the features of reduced version BSSID detector 1005-d and reduced version BSSID administrator 1010-d may be accomplished by software included the memory 1215-a, while the features of reduced version BSSID evaluator 1015-d, communication coordinator 1020-d, and BSS identification manager 1135-c may be accomplished using hardware. Regardless of the distribution, AP 105-s may detect collisions in reduced version BSSIDs and facilitate resolution accordingly.

[0113] **FIG. 13** shows a flowchart illustrating a method 1300 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The operations of method 1300 may be implemented by a device 900 or its components as described with reference to FIGs. 1-12B. For example, the operations of method 1300 may be performed by the reduced version BSSID manager 910 as described with reference to FIGs. 9-12B. In some examples, a device may execute a set of codes to control the functional elements of the device to perform the functions described below. Additionally or alternatively, the device may perform aspects the functions described below using special-purpose hardware.

[0114] At block 1305, the device detects that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers as described with reference to FIGs. 2A-8. That is, the device may detect a color collision between two neighboring BSSs. In certain examples, the operations of block 1305 may be performed by the reduced version BSSID detector 1005 as described with reference to FIG. 10. At block 1310, the device triggers, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS as described with reference to FIGs. 2A-8. For example, the device may trigger a change in color bits for one of the involved BSSs. In certain examples, the operations of block 1310 may be performed by the reduced version BSSID administrator 1010 as described with reference to FIG. 10.

[0115] **FIG. 14** shows a flowchart illustrating a method 1400 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The operations of method 1400 may be implemented by a device or its components as described with reference to FIGs. 1-12B. For example, the operations of method 1400 may be performed by the reduced version BSSID manager 910 as described with reference to FIGs. 9-12B. In some examples, a device may execute a set of codes to control the functional elements of the device to perform the functions described below. Additionally or alternatively, the device may perform aspects of the functions described below using special-purpose hardware. The method 1400 may also incorporate aspects of method 1300 of FIG. 13.

[0116] At block 1405, the device receives information from a broadcast associated with an access point of a second BSS. In some cases, the device receives the broadcast information directly from the access point. In other cases, the device receives the broadcast information indirectly (*e.g.*, via a relay from a station). The broadcast information may include the value (*e.g.*, color bits) for the second BSS. In some examples, the broadcast information includes information associated with the access point of the second BSS. For instance, the broadcast information may include the setup time for reduced version identifier or a number of unused values associated with the second BSS. In certain aspects, the broadcast information may include the number of stations associated with the second BSS, or the number of active stations. In certain examples, the operations of block 1405 may be performed by the transmitter 915 in

conjunction with the communication coordinator 1020 as described with reference to FIGs. 9 and 10.

[0117] Proceeding to 1410, the device detects that a first BSS and the second BSS are using a same value for reduced versions of respective BSS identifiers as described with reference to FIGs. 2A-8. In certain examples, the operations of block 1410 may be performed by the reduced version BSSID detector 1005 as described with reference to FIG. 10. At block 1415, the device triggers, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS as described with reference to FIGs. 2A-8. In some cases, the trigger is based at least in part on a comparison of the broadcast information with corresponding information associated with the first BSS. In certain aspects, the device may send an announcement indicating the change in value to stations associated with the changing BSS. The announcement may include a scheduled change time. The announcement may indicate a restriction mode for the stations (*e.g.*, whether or not the stations may transmit before the change). In certain examples, the operations of block 1415 may be performed or facilitated by the reduced version BSSID administrator 1010 and the communication coordinator 1020 as described with reference to FIG. 10.

[0118] **FIG. 15** shows a flowchart illustrating a method 1500 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The operations of method 1500 may be implemented by a device or its components as described with reference to FIGs. 1-12B. For example, the operations of method 1500 may be performed by the reduced version BSSID manager 910 as described with reference to FIGs. 9-12B. In some examples, a device may execute a set of codes to control the functional elements of the device to perform the functions described below. Additionally or alternatively, the device may perform aspects of the functions described below using special-purpose hardware. The method 1500 may also incorporate aspects of methods 1300 and 1400 of FIGs. 13 and 14.

[0119] At block 1505, the device receives a first frame from a first BSS and second frame from a second BSS. The frame may be broadcast, multi-cast, or unicast. In some cases, the frames are relayed from a station 115. Proceeding to 1510, the device determines that the first frame and the second frame have the same value for reduced versions of BSS identifiers. For

example, the device may make such a determination by comparing the color bits of each frame. In certain examples, the operations of block 1505 and 1510 may be performed or facilitated by the communication coordinator 1020 and the BSS identification manager 1135, respectively, as described with reference to FIGs. 10 and 11.

[0120] At 1515, the device detects, based at least in part on the determination made at 1510, that the first BSS and the second BSS are using a same value for reduced versions of respective BSS identifiers as described with reference to FIGs. 2A-8. In some cases, the device detects the collision by identifying the MAC addresses for each respective frame. By comparing the MAC addresses, the device may determine that the frames originated from different BSSs and thus detect the color collision. In certain examples, the operations of block 1515 may be performed by the reduced version BSSID detector 1005 as described with reference to FIG. 10. At block 1520, the device triggers, based at least in part on the color collision detection, a change in the value for at least one of the first BSS and the second BSS as described with reference to FIGs. 2A-8. In some cases, the device may send a collision report to an access point associated with one of the colliding BSSs. The collision report may indicate that the first BSS and the second BSS have the same value for respective BSS identifiers (*i.e.*, the report may indicate a color collision between the two involved BSSs). In certain examples, the operations of block 1520 may be performed by the reduced version BSSID administrator 1010 as described with reference to FIG. 10.

[0121] **FIG. 16** shows a flowchart illustrating a method 1600 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The operations of method 1600 may be implemented by a device or its components as described with reference to FIGs. 1-12B. For example, the operations of method 1600 may be performed by the reduced version BSSID manager 910 as described with reference to FIGs. 9-12B. In some examples, a device may execute a set of codes to control the functional elements of the device to perform the functions described below. Additionally or alternatively, the device may perform aspects of the functions described below using special-purpose hardware. The method 1600 may also incorporate aspects of methods 1300, 1400, and 1500 of FIGs. 13, 14, and 15.

[0122] At block 1605, the device identifies a BSS identifier of a second BSS. For instance, the device may detect the BSS identifier from a broadcast of the second BSS. Alternatively, the device may receive the BSS identifier indirectly (*e.g.*, in a report from a station 115). Regardless of how the device identifies the BSS identifier, the device may, at 1610, communicate via backhaul use information pertaining to reduced versions of BSS identifiers (*e.g.*, color-use information). For example, the device may send a request to a central controller (or access point associated with the BSS identifier) asking for the color-use information of the second BSS. Additionally or alternatively, the device may receive the color-use information from the central controller or the second BSS access point. In certain examples, the operations of block 1605 may be performed or facilitated by the BSS identification manager 1135 and the communication coordinator 1020, respectively, as described with reference to FIG. 10.

[0123] At 1615, the device detects, based at least in part on the use information from 1610, that a first BSS and the second BSS are using a same value for reduced versions of respective BSS identifiers as described with reference to FIGs. 2A-8. In certain examples, the operations of block 1615 may be performed by the reduced version BSSID detector 1005 as described with reference to FIG. 10. At block 1620, the device triggers, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS as described with reference to FIGs. 2A-8. The triggering may be autonomous, or at request. In some cases, the device may determine which BSS should change value of reduced version of BSS identification. The determination may be based at least in part on the use information from 1610. In some cases, the device may determine the value the changing BSS should use. That is, the device may determine the color bits for the BSS. The device may send a change request to the BSS that is determined should change values. In certain examples, the operations of block 1620 may be performed by the reduced version BSSID administrator 1010 as described with reference to FIG. 10.

[0124] **FIG. 17** shows a flowchart illustrating a method 1700 for detection and resolution of a reduced version BSS identifier collision in accordance with various aspects of the present disclosure. The operations of method 1700 may be implemented by a device or its components as described with reference to FIGs. 1-12B. For example, the operations of method 1700 may be

performed by the reduced version BSSID manager 910 as described with reference to FIGs. 9-12B. In some examples, a device may execute a set of codes to control the functional elements of the device to perform the functions described below. Additionally or alternatively, the device may perform aspects of the functions described below using special-purpose hardware. The method 1600 may also incorporate aspects of methods 1300, 1400, 1500, and 1600 of FIGs. 13, 14, 15, and 16.

[0125] At block 1705, the device receives a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers as described with reference to FIGs. 2A-8. For example, the communication may indicate the capability of the access point to support color-based frame filter. In certain examples, the operations of block 1705 may be performed by the communication coordinator 1020 in conjunction with the transmitter 915 as described with reference to FIGs. 9 and 10. Proceeding to block 1710, the device adjusts, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the device is not associated as described with reference to FIGs. 2A-8. The value may be in a first portion of the frame. When the communication indicates that the access point does not support frame filtering, the adjustment may include entering a sleep mode for a second part of the frame. When the communication indicates that the access point does support frame filtering, the adjustment may include transmitting over a second portion of the frame. In certain examples, the operations of block 1710 may be performed by the reduced version BSSID detector 1005 as described with reference to FIG. 10.

[0126] Thus, methods 1300, 1400, 1500, 1600, and 1700 may provide for detection and resolution of a reduced version BSS identifier collision. It should be noted that methods 1300, 1400, 1500, 1600, and 1700 describe possible implementation, and that the operations and the steps may be rearranged or otherwise modified such that other implementations are possible. In some examples, aspects from two or more of the methods 1300, 1400, 1500, 1600, and 1700 may be combined.

[0127] The description herein provides examples, and is not limiting of the scope, applicability, or examples set forth in the claims. Changes may be made in the function and arrangement of elements discussed without departing from the scope of the disclosure. Various examples may omit, substitute, or add various procedures or components as appropriate. Also, features described with respect to some examples may be combined in other examples.

[0128] The description set forth herein, in connection with the appended drawings, describes example configurations and does not represent all the examples that may be implemented or that are within the scope of the claims. The term "exemplary" used herein means "serving as an example, instance, or illustration," and not "preferred" or "advantageous over other examples." The detailed description includes specific details for the purpose of providing an understanding of the described techniques. These techniques, however, may be practiced without these specific details. In some instances, well-known structures and devices are shown in block diagram form in order to avoid obscuring the concepts of the described examples.

[0129] In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0130] Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the above description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0131] The various illustrative blocks and modules described in connection with the disclosure herein may be implemented or performed with a general-purpose processor, a DSP, an ASIC, an FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described

herein. A general-purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices (*e.g.*, a combination of a digital signal processor (DSP) and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration).

[0132] The functions described herein may be implemented in hardware, software executed by a processor, firmware, or any combination thereof. If implemented in software executed by a processor, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described above can be implemented using software executed by a processor, hardware, firmware, hardwiring, or combinations of any of these. Features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations. Also, as used herein, including in the claims, "or" as used in a list of items (for example, a list of items prefaced by a phrase such as "at least one of" or "one or more of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (*i.e.*, A and B and C).

[0133] Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, non-transitory computer-readable media can comprise RAM, ROM, electrically erasable programmable read only memory (EEPROM), compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other non-transitory medium that can be used to carry or store desired program code means in the form of instructions or data structures and that can be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line

(DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, include CD, laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers. Combinations of the above are also included within the scope of computer-readable media.

[0134] The description herein is provided to enable a person skilled in the art to make or use the disclosure. Various modifications to the disclosure will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not to be limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. A method of communication at a wireless device, comprising:

detecting that a first basic service set (BSS) and a second BSS are using a same value for reduced versions of respective BSS identifiers; and

triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS.

2. The method of claim 1, wherein detecting comprises:

receiving a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS.

3. The method of claim 1, wherein detecting comprises:

receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS.

4. The method of claim 1, wherein triggering comprises:

determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs.

5. The method of claim 1, wherein triggering comprises:

determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

6. The method of claim 1, wherein triggering comprises:

receiving a broadcast communication comprising information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations.

7. The method of claim 6, further comprising:

comparing the received broadcast information to corresponding information of the first BSS, wherein the triggering is based at least in part on the comparison.

8. The method of claim 1, wherein detecting comprises:

receiving a first frame from the first BSS and a second frame from the second BSS; and

the method further comprising determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

9. The method of claim 8, wherein detecting comprises:

identifying media access control (MAC) addresses of the first BSS in the first frame and of the second BSS in the second frame; and

the method further comprising determining, based at least in part on the identification, that the first frame and the second frame are from different BSSs, wherein the triggering is based at least in part on the determination.

10. The method of claim 9, wherein triggering comprises:

sending a collision report to at least one of a first access point and a second access point, the collision report indicating that the first BSS and the second BSS have the same value for reduced versions of respective BSS identifiers.

11. The method of claim 1, wherein detecting comprises:

identifying a BSS identifier (BSSID) of the second BSS; and

the method further comprising

communicating, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

12. The method of claim 11, wherein communicating comprises:

sending a request to the at least one of the central controller and the access point of the second BSS for the use information of the second BSS.

13. The method of claim 11, wherein communicating comprises:

receiving from the at least one of the central controller and the access point of the second BSS the use information of the second BSS.

14. The method of claim 1, wherein triggering comprises:

determining at least one of the first BSS and the second BSS to change values for reduced versions of respective BSS identifiers; and

the method further comprising

sending a request to the determined BSSs to change respective values for reduced versions of the BSS identifiers.

15. The method of claim 1, wherein triggering comprises:

determining the change in the value based at least in part on a request to change the reduced version of the BSS identifier for at least one of the first BSS and the second BSS.

16. The method of claim 1, wherein triggering comprises:

autonomously determining the change in the value.

17. The method of claim 1, further comprising:

transmitting an announcement of the change in the value to STAs of the at least one of the first BSS and the second BSS whose value has changed.

18. The method of claim 17, wherein the announcement further comprises a scheduled change time.

19. The method of claim 17, wherein the announcement further comprises an indication of a transmission restriction mode.

20. A method of communication at a wireless device, comprising:

receiving at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of basic service set (BSS) identifiers; and

adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

21. The method of claim 20, wherein adjusting the behavior comprises:

entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSS identifiers.

22. The method of claim 20, wherein adjusting the behavior comprises:

transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers.

23. An apparatus for wireless communication at a wireless device, comprising:

means for detecting that a first basic service set (BSS) and a second BSS are using a same value for reduced versions of respective BSS identifiers; and

means for triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS.

24. The apparatus of claim 23, wherein the means for detecting comprises:

means for receiving a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS.

25. The apparatus of claim 23, wherein the means for detecting comprises:

means for receiving from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS.

26. The apparatus of claim 23, wherein the means for triggering comprises:

means for determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs.

27. The apparatus of claim 23, wherein the means for triggering comprises:

means for determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

28. The apparatus of claim 23, wherein the means for triggering comprises:

means for receiving a broadcast communication comprising information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations.

29. The apparatus of claim 23, wherein the means for detecting comprises:

means for receiving a first frame from the first BSS and a second frame from the second BSS; and

means for determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

30. The apparatus of claim 23, wherein the means for detecting comprises:

means for identifying a BSS identifier (BSSID) of the second BSS; and

means for communicating, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

31. An apparatus for wireless communication at a wireless device, comprising:

means for receiving at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of basic service set (BSS) identifiers; and

means for adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

32. The apparatus of claim 31, wherein the means for adjusting the behavior comprise:

means for entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSS identifiers.

33. The apparatus of claim 31, wherein the means for adjusting the behavior comprise:

means for transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers.

34. An apparatus for communication comprising:

a reduced version basic service set identifier (BSSID) detector for detecting that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers; and

a reduced version BSSID administrator for triggering, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS.

35. The apparatus of claim 34, further comprising:

a communication coordinator for facilitating receipt of a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS.

36. The apparatus of claim 34, further comprising:

a communication coordinator for facilitating receipt, from a station associated with the first BSS, of the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS.

37. The apparatus of claim 34, further comprising:

a reduced version BSSID evaluator for determining a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs.

38. The apparatus of claim 34, further comprising:

a reduced version BSSID evaluator for determining a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

39. The apparatus of claim 34, further comprising:

a communication coordinator for facilitating receipt of a broadcast communication comprising information associated with an access point of the second BSS,

wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations.

40. The apparatus of claim 34, further comprising:

a communication coordinator for facilitating receipt of a first frame from the first BSS and a second frame from the second BSS; and

a reduced version BSSID evaluator for determining that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

41. The apparatus of claim 34, further comprising:

a BSS identification manager for identifying a BSS identifier (BSSID) of the second BSS; and

a communication coordinator for facilitating communication, via backhaul, of use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

42. An apparatus for communication, comprising:

a communication coordinator for facilitating receipt, at a node, of a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of basic service set (BSS) identifiers; and

a reduced version BSSID detector for adjusting, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

43. The apparatus of claim 42, wherein the reduced version BSSID detector further comprises:

a mode operator for entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSS identifiers.

44. The apparatus of claim 42, wherein the reduced version BSSID detector further comprises:

a mode operator for transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers.

45. A non-transitory computer-readable medium storing code for communication at a wireless device, the code comprising instructions executable to:

detect that a first basic service set (BSS) and a second BSS are using a same value for reduced versions of respective BSS identifiers; and

trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS.

46. The non-transitory computer-readable medium of claim 45, wherein the instructions for detecting comprise instructions executable to:

receive a broadcast communication from an access point of the second BSS, wherein the broadcast communication includes the value for the second BSS.

47. The non-transitory computer-readable medium of claim 45, wherein the instructions for detecting comprise instructions executable to:

receive from a station associated with the first BSS the value for the second BSS, the value for the second BSS having been received at the station associated with the first BSS via a broadcast communication from an access point of the second BSS.

48. The non-transitory computer-readable medium of claim 45, wherein the instructions for triggering comprise instructions executable to:

determine a value for a reduced version of a BSS identifier that is not in use by the first BSS and the second BSS, wherein the change in the value is based at least in part on the

value for the reduced version of the BSS identifier that is not in use by the changing BSS and associated neighbor BSSs.

49. The non-transitory computer-readable medium of claim 45, wherein the instructions for triggering comprise instructions executable to:

determine a value for a reduced version of a BSS identifier that is not in use by a neighbor BSS, the first BSS and the second BSS being neighbor BSSs, wherein the change in the value is based at least in part on the value for the reduced version of the BSS identifier that is not in use by the neighbor BSS.

50. The non-transitory computer-readable medium of claim 45, wherein the instructions for triggering comprise instructions executable to:

receive a broadcast communication comprising information associated with an access point of the second BSS, wherein the information includes at least one of a setup time for reduced versions of BSS identifiers, a number of unused values for reduced versions of BSS identifiers of the second BSS and BSSs that neighbor the second BSS, a number of associated stations, and a number of active stations.

51. The non-transitory computer-readable medium of claim 45, wherein the instructions for detecting comprise instructions executable to:

receiving a first frame from the first BSS and a second frame from the second BSS; and

wherein the instructions are executable to determine that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers.

52. The non-transitory computer-readable medium of claim 45, wherein the instructions for detecting comprise instructions executable to:

identifying a BSS identifier (BSSID) of the second BSS; and

wherein the instructions are executable to

communicate, via backhaul, use information pertaining to reduced versions of respective BSS identifiers with at least one of a central controller and an access point of the second BSS based at least in part on the BSSID of the second BSS.

53. A non-transitory computer-readable medium storing code for communication at a wireless device, the code comprising instructions executable to:

receive at a node a communication from an access point indicating whether the access point supports frame filtering based at least in part on values of reduced versions of basic service set (BSS) identifiers; and

adjust, based at least in part on the communication, a behavior of the node with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the node is not associated, the value being in a first portion of the frame.

54. The non-transitory computer-readable medium of claim 53, wherein the instructions for adjusting the behavior comprise instructions executable to:

entering a sleep mode in a second portion of the frame when the communication indicates that the access point does not support frame filtering based at least in part on values of reduced versions of BSS identifiers.

55. The non-transitory computer-readable medium of claim 53, wherein instructions for adjusting the behavior comprise instructions executable to:

transmitting on top of the frame in a second portion of the frame when the communication indicates that the access point supports frame filtering based at least in part on values of reduced versions of BSS identifiers.

ABSTRACT OF THE DISCLOSURE

Methods, systems, and devices are described for wireless communication. A wireless node may detect and resolve collisions in reduced version of basic service set identifiers (BSSIDs). The collisions may be the result of multiple basic service sets (BSSs) using the same values for reduced versions of BSSIDs. For example, the BSSs may use the same value for X-bit color indicators which results in a color collision if the BSSs are neighbor BSSs. When such a scenario occurs, the node may detect the collision by referencing reduced version BSSID information from broadcasts or backhaul communications with one of the involved BSSs. Alternatively, the node may determine that frames from two different BSSs include the same color bits. The node may resolve the detected color collision by triggering a change in the reduced version BSS identifier for one of the involved BSSs.

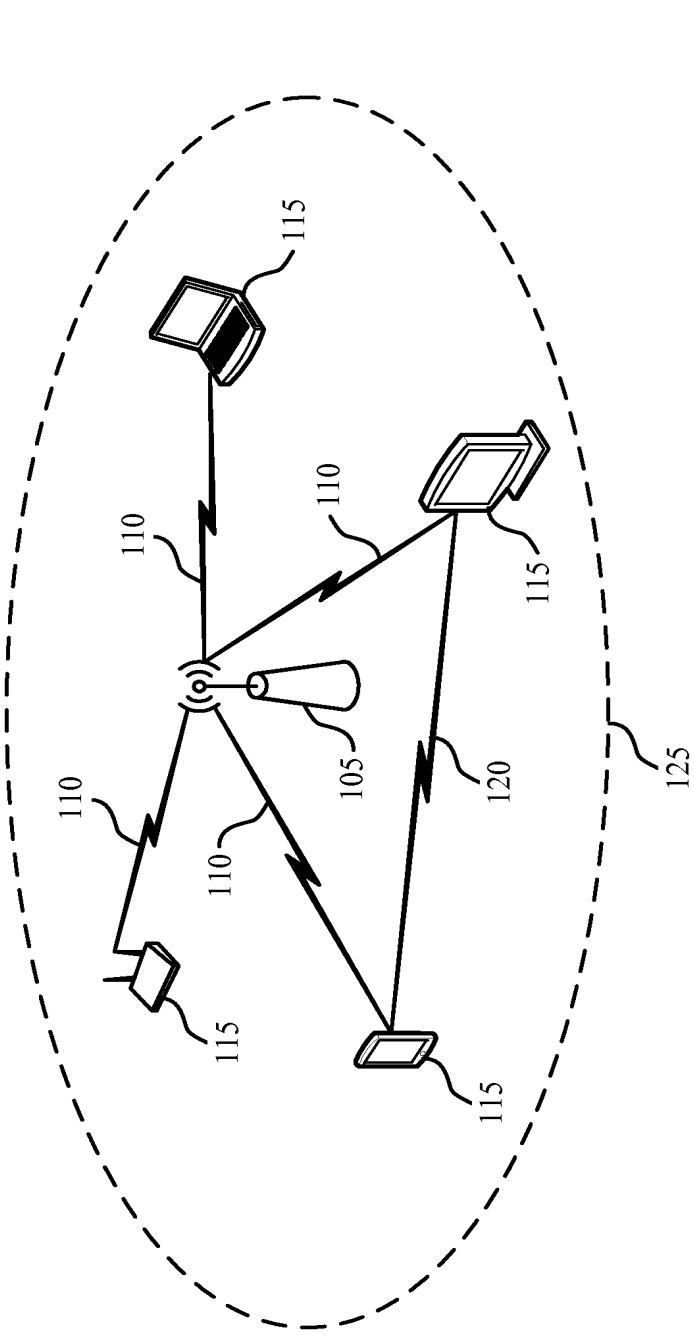

FIG. 1

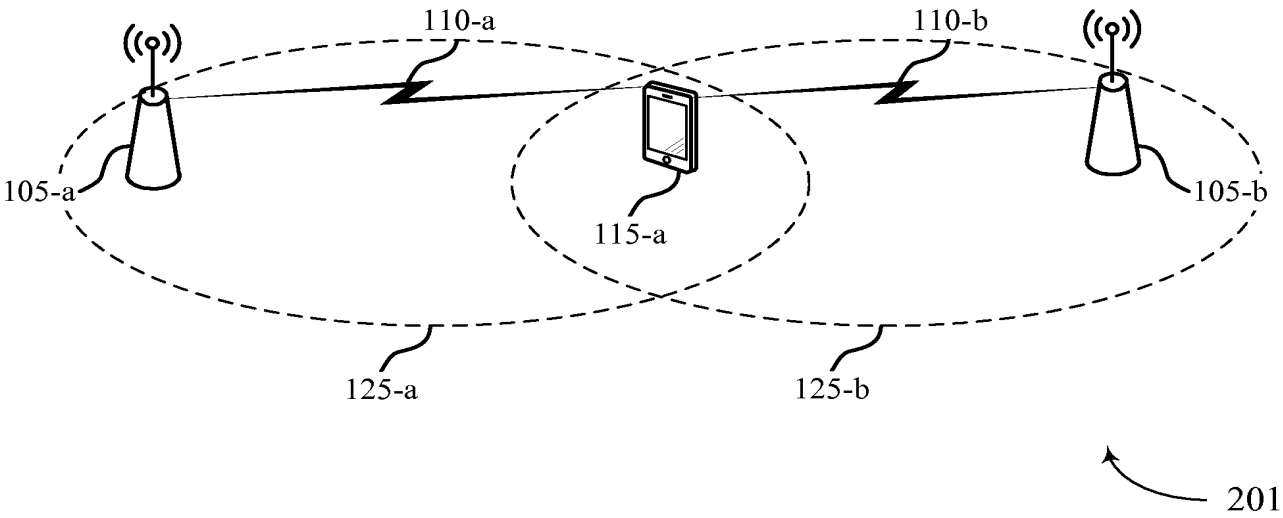
110-a
110-b
105-a
105-b
115-a
125-a
125-b
201

FIG. 2A

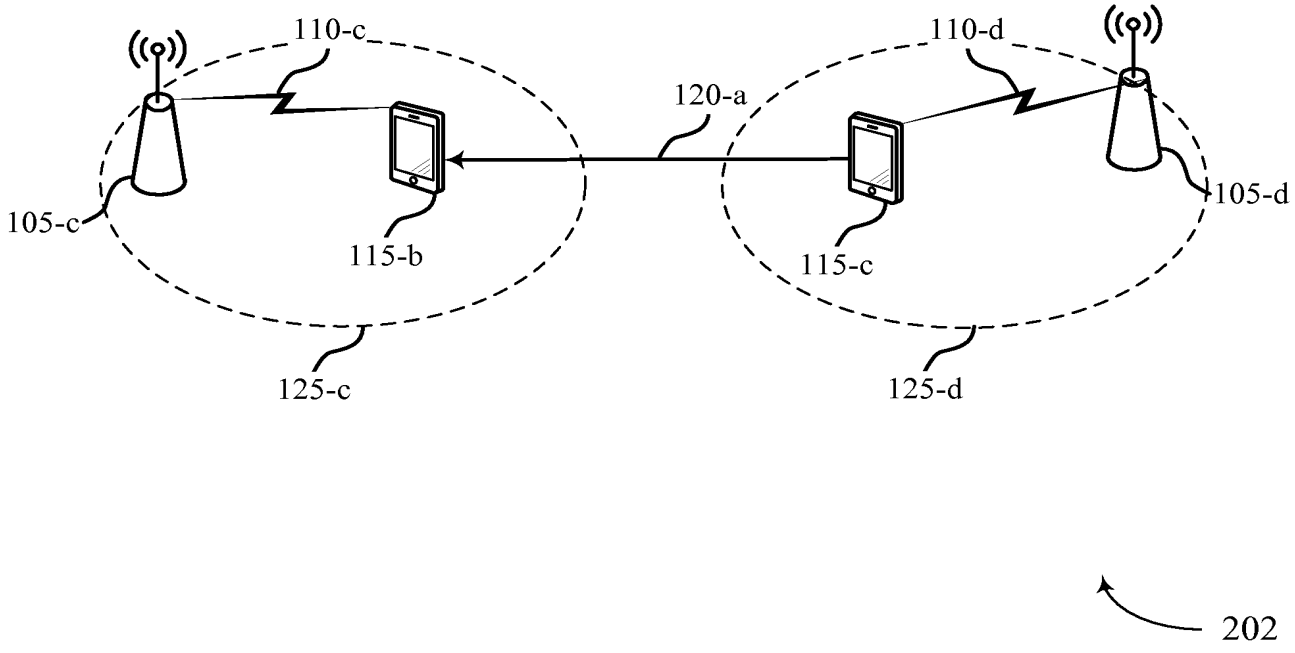
110-c
110-d
120-a
105-c
105-d
115-b
115-c
125-c
125-d
202

FIG. 2B

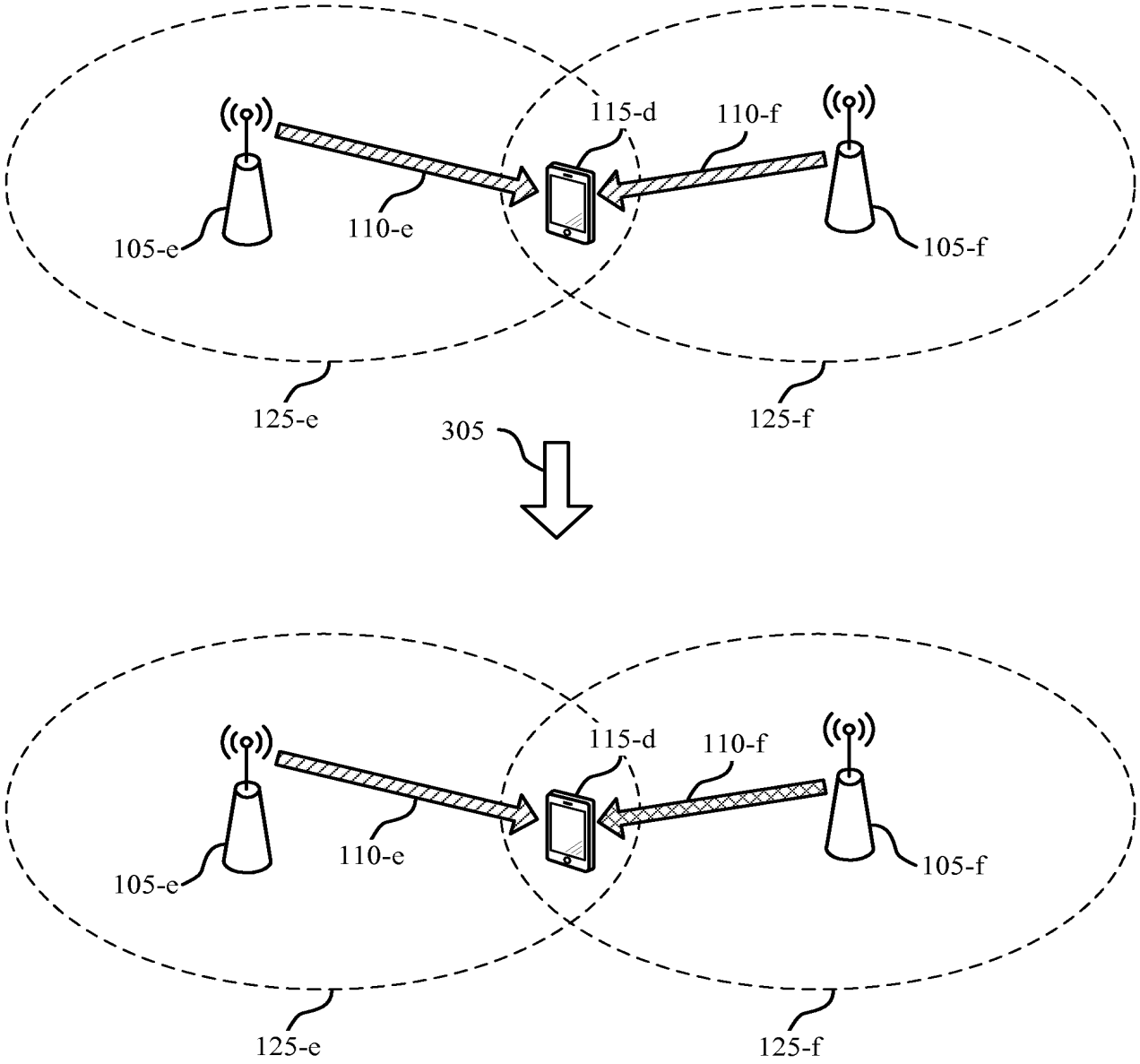
115-d
110-f
105-e
110-e
105-f
125-e
125-f
305
115-d
110-f
105-e
110-e
105-f
125-e
125-f
300

FIG. 3

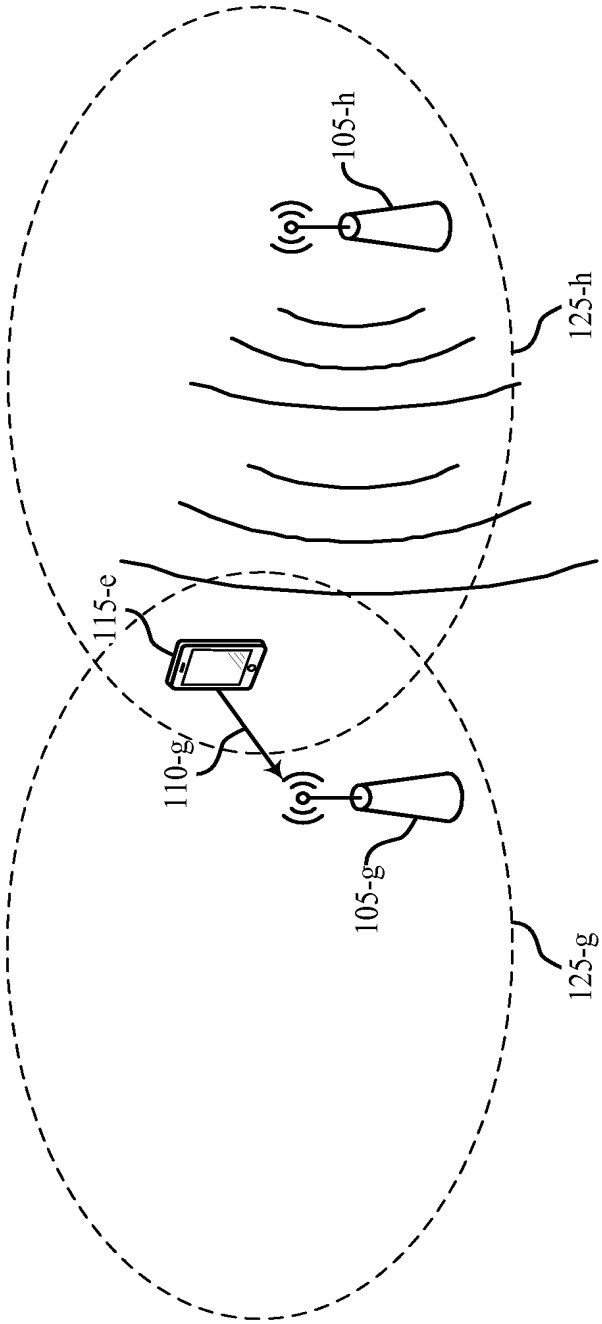

FIG. 4

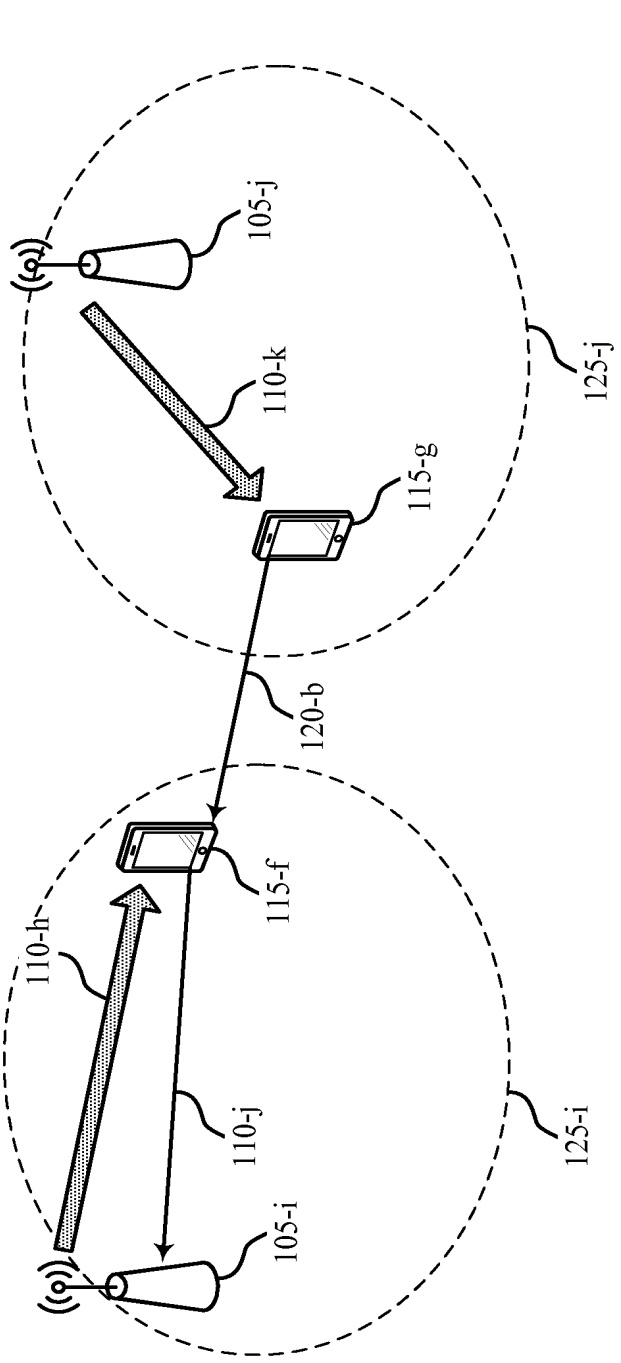

FIG. 5

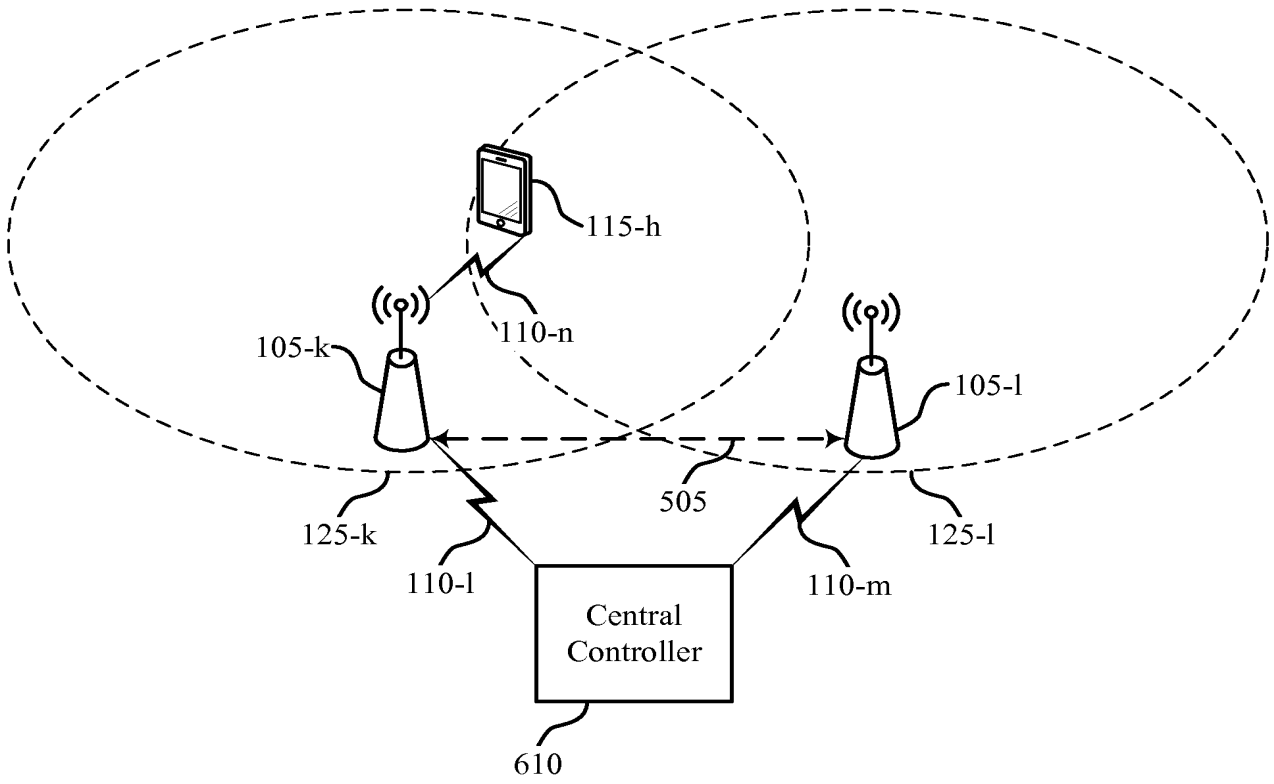
115-h
110-n
105-k
105-l
505
125-k
125-l
110-l
110-m
Central Controller
610
600

FIG. 6

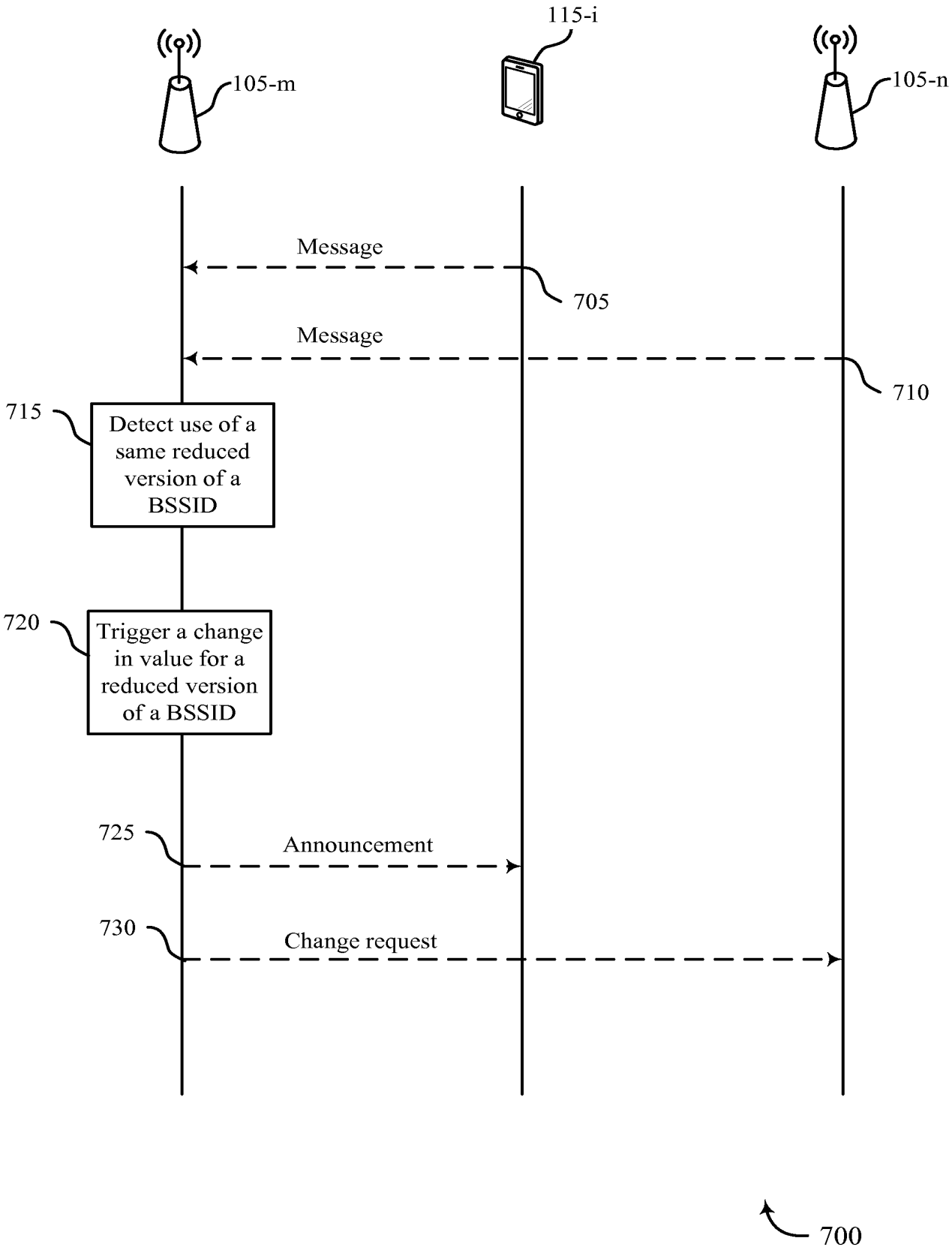
115-i
105-m
105-n
Message
705
Message
710
715
Detect use of a same reduced version of a BSSID
720
Trigger a change in value for a reduced version of a BSSID
725
Announcement
730
Change request
700

FIG. 7

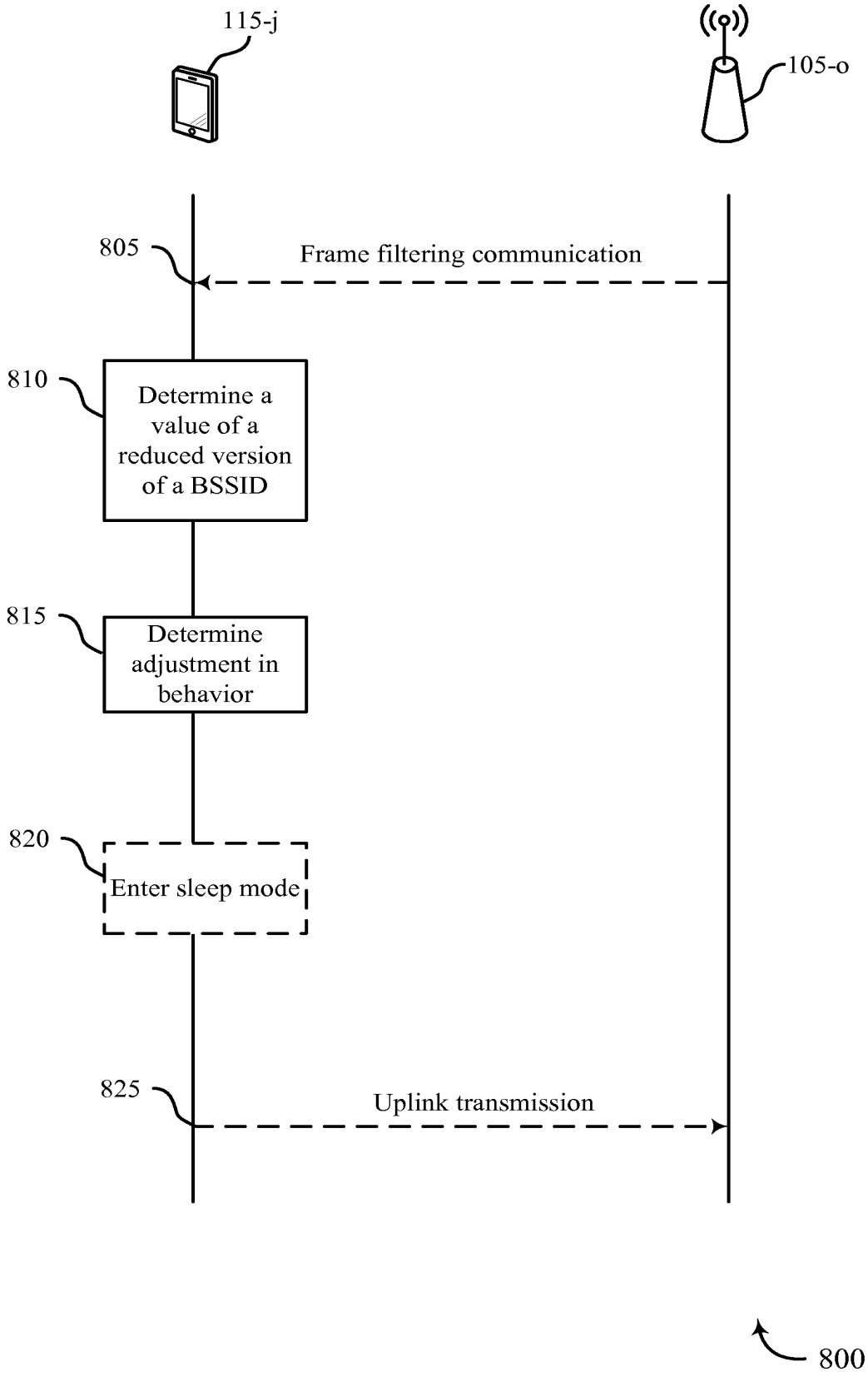
115-j
105-o
805
Frame filtering communication
810
Determine a value of a reduced version of a BSSID
815
Determine adjustment in behavior
820
Enter sleep mode
825
Uplink transmission
800

FIG. 8

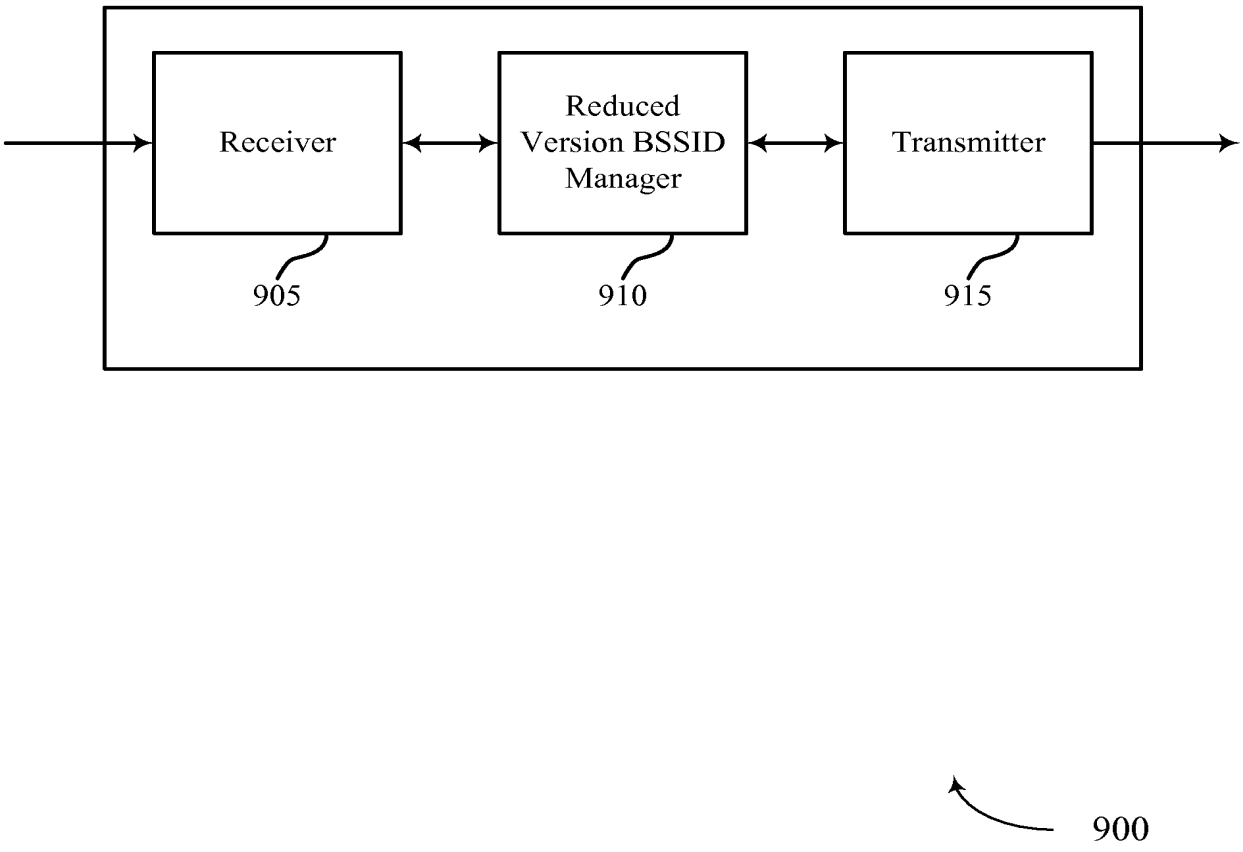
Receiver
Reduced Version BSSID Manager
Transmitter
905
910
915
900

FIG. 9

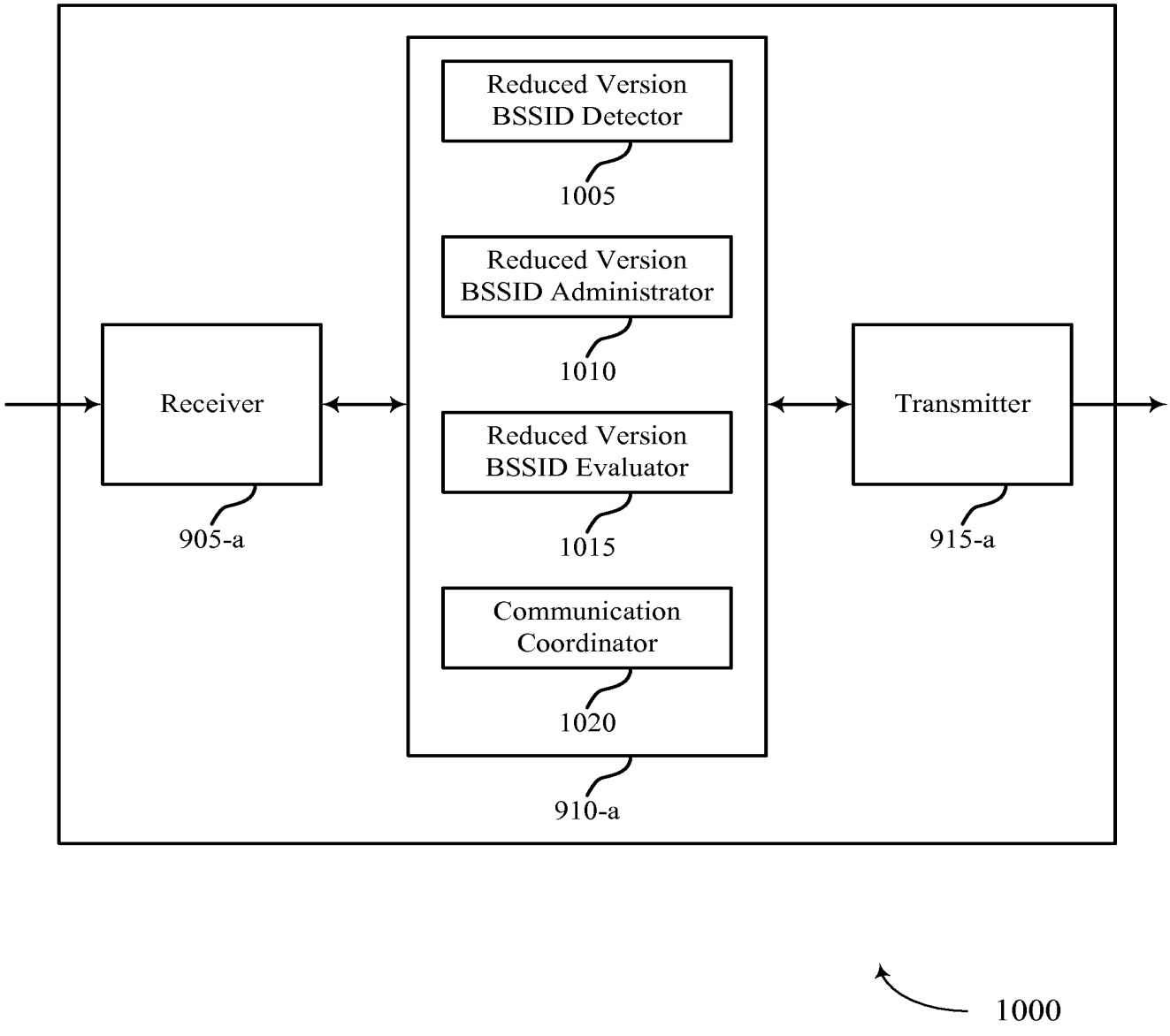
Reduced Version BSSID Detector
1005
Reduced Version BSSID Administrator
1010
Reduced Version BSSID Evaluator
1015
Communication Coordinator
1020
910-a
Receiver
905-a
Transmitter
915-a
1000

FIG. 10

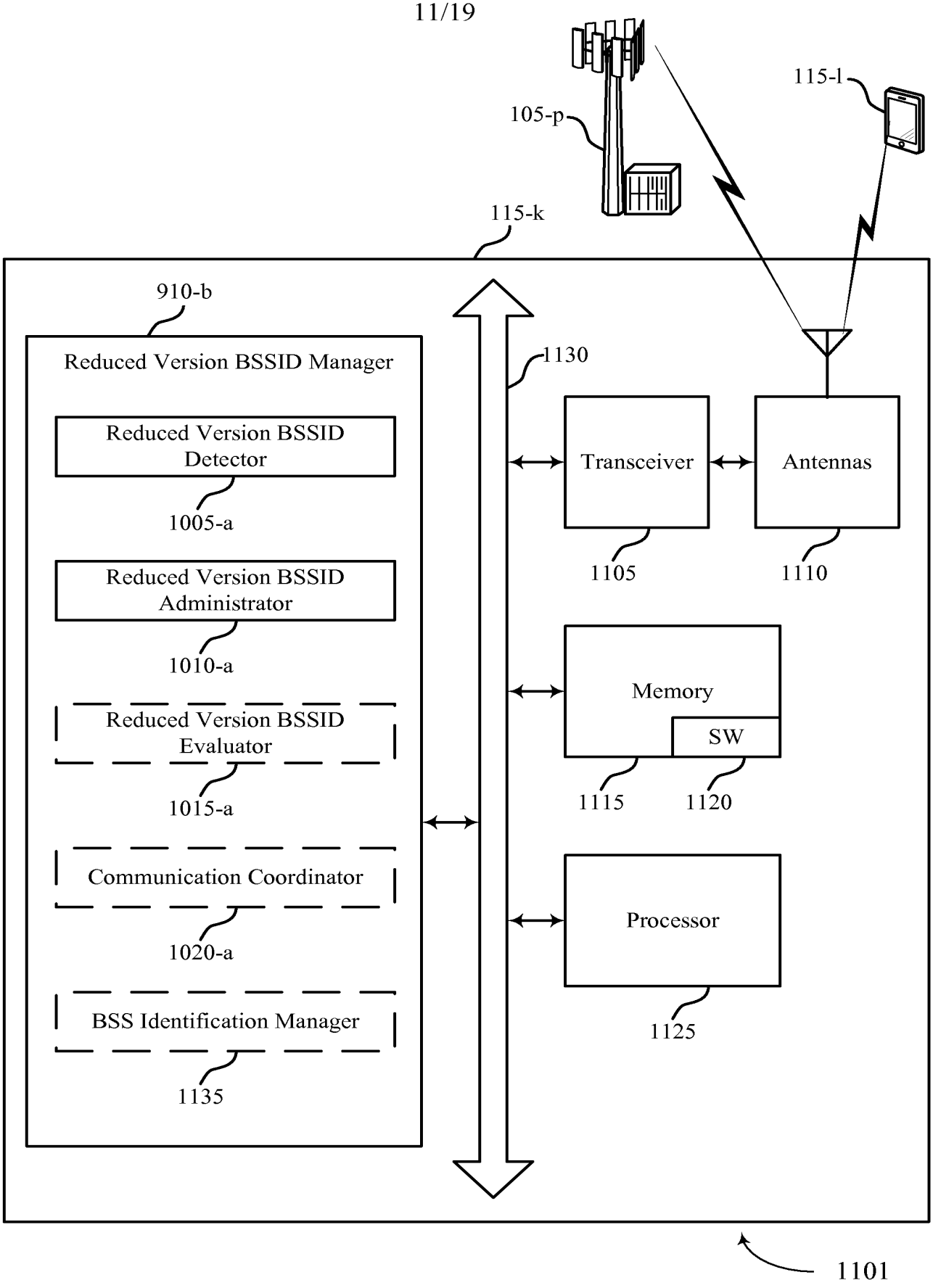
105-p
115-l
115-k
910-b
Reduced Version BSSID Manager
Reduced Version BSSID Detector
1005-a
Reduced Version BSSID Administrator
1010-a
Reduced Version BSSID Evaluator
1015-a
Communication Coordinator
1020-a
BSS Identification Manager
1135
1130
Transceiver
Antennas
1105
1110
Memory
SW
1115
1120
Processor
1125
1101

FIG. 11A

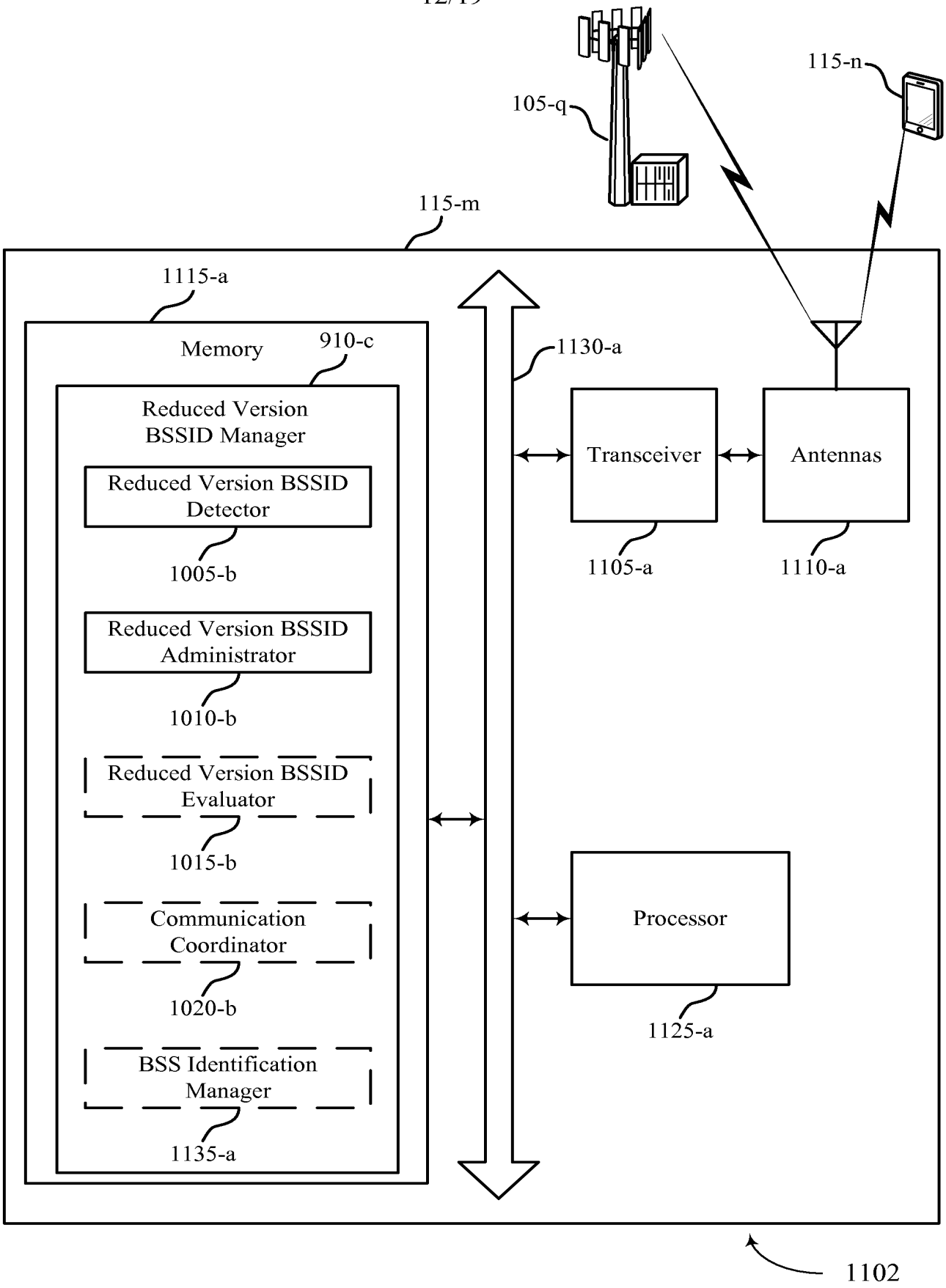
115-n
105-q
115-m
1115-a
Memory
910-c
Reduced Version BSSID Manager
Reduced Version BSSID Detector
1005-b
Reduced Version BSSID Administrator
1010-b
Reduced Version BSSID Evaluator
1015-b
Communication Coordinator
1020-b
BSS Identification Manager
1135-a
1130-a
Transceiver
Antennas
1105-a
1110-a
Processor
1125-a
1102

FIG. 11B

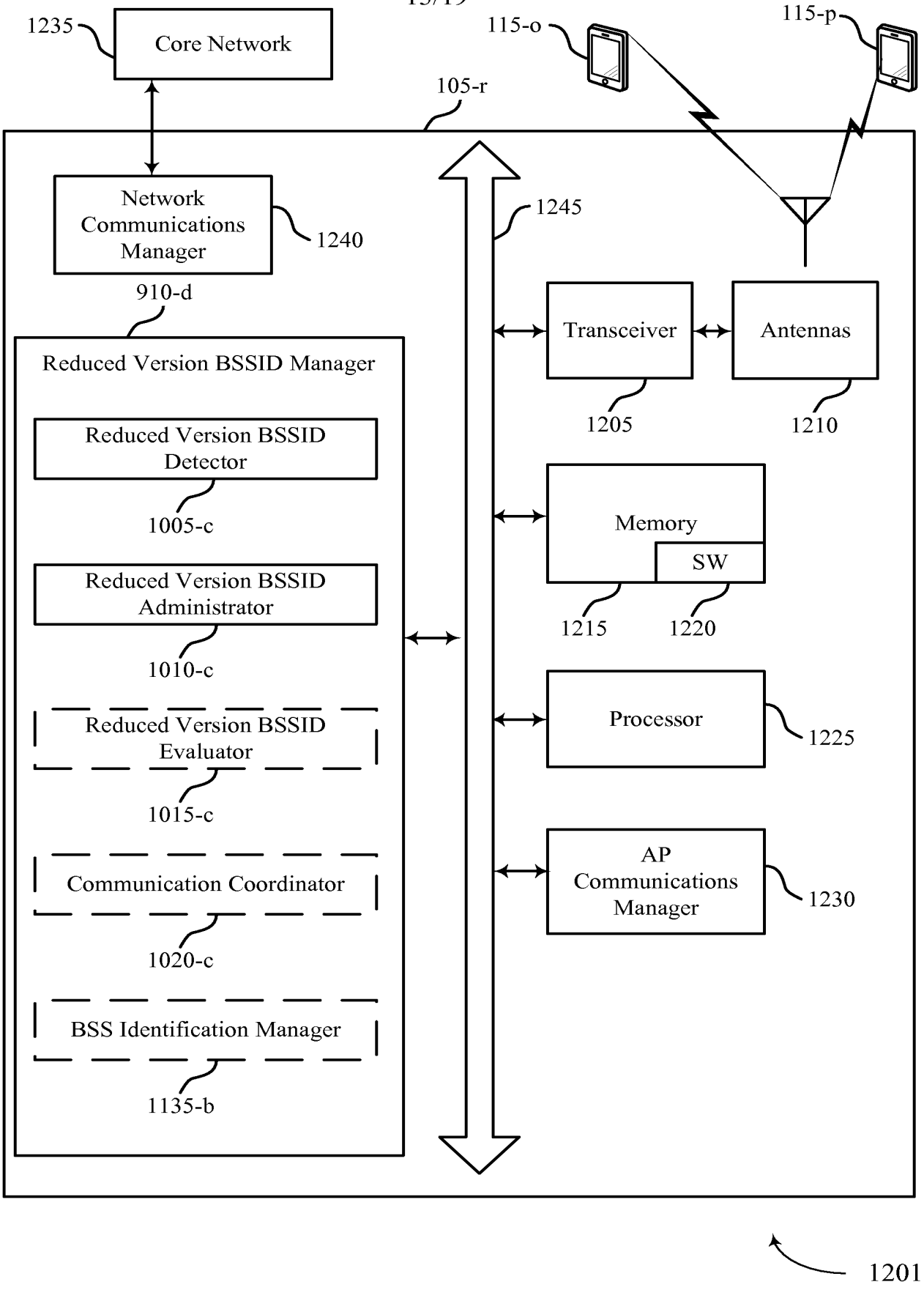
1235
Core Network
115-o
115-p
105-r
Network Communications Manager
1240
1245
910-d
Reduced Version BSSID Manager
Transceiver
Antennas
1205
1210
Reduced Version BSSID Detector
1005-c
Memory
SW
1215
1220
Reduced Version BSSID Administrator
1010-c
Reduced Version BSSID Evaluator
1015-c
Processor
1225
Communication Coordinator
1020-c
AP Communications Manager
1230
BSS Identification Manager
1135-b
1201

FIG. 12A

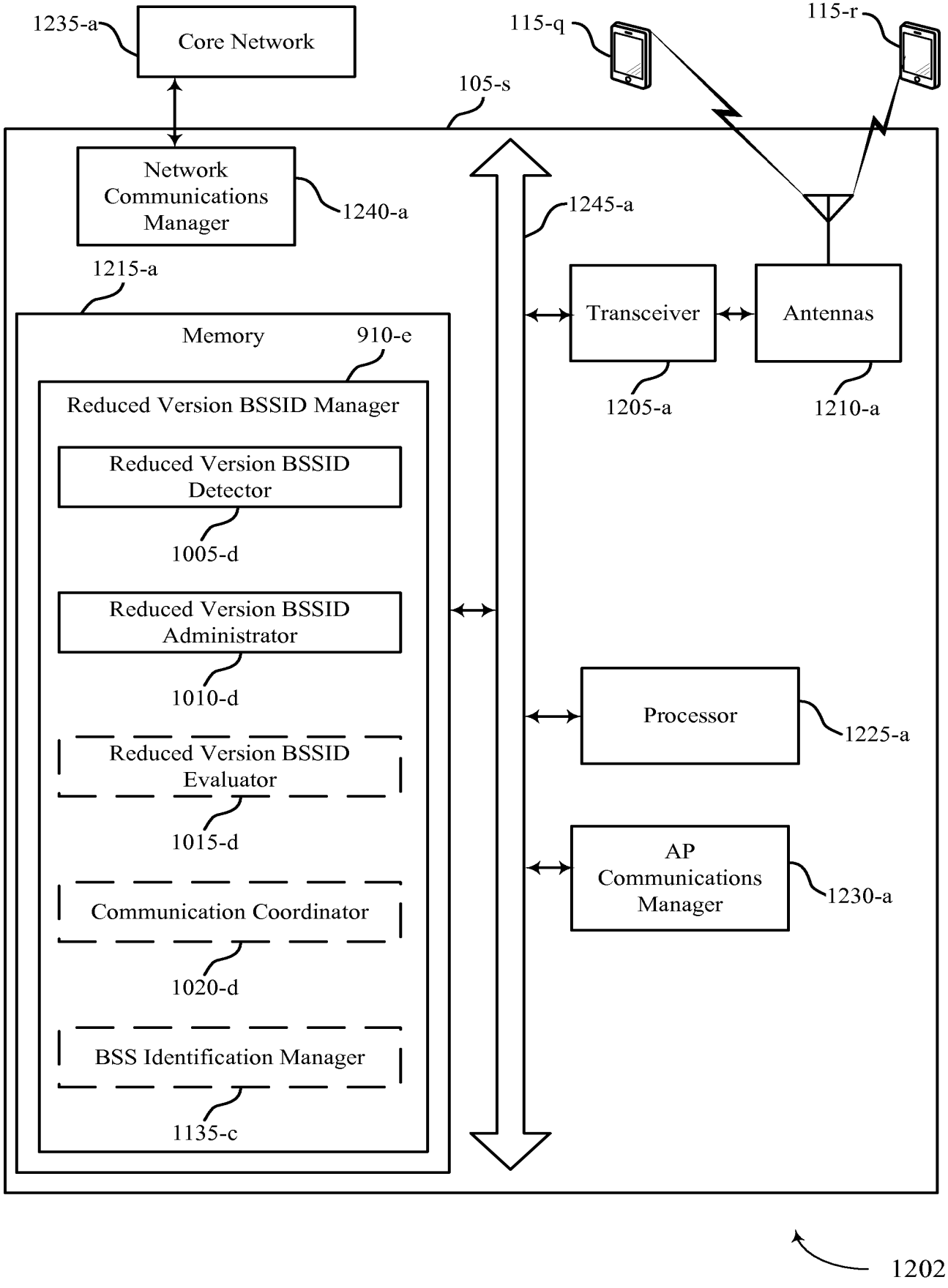
1235-a
Core Network
115-q
115-r
105-s
Network Communications Manager
1240-a
1245-a
1215-a
Transceiver
Antennas
Memory
910-e
1205-a
1210-a
Reduced Version BSSID Manager
Reduced Version BSSID Detector
1005-d
Reduced Version BSSID Administrator
1010-d
Processor
1225-a
Reduced Version BSSID Evaluator
1015-d
AP Communications Manager
1230-a
Communication Coordinator
1020-d
BSS Identification Manager
1135-c
1202

FIG. 12B

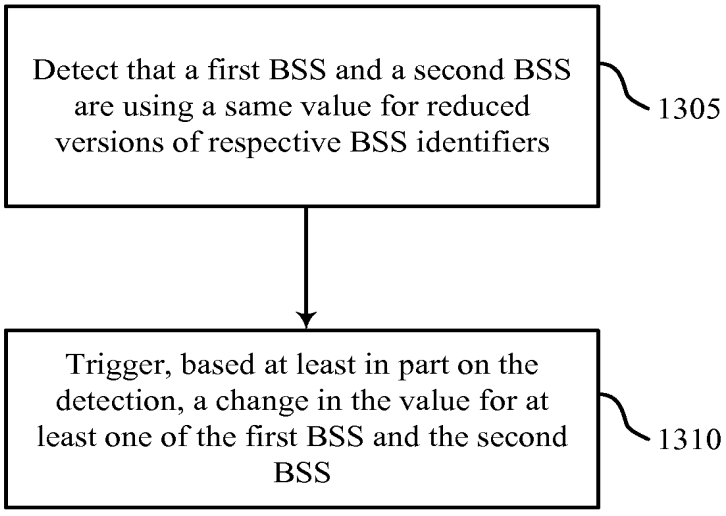
Detect that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers
1305
Trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS
1310
1300

FIG. 13

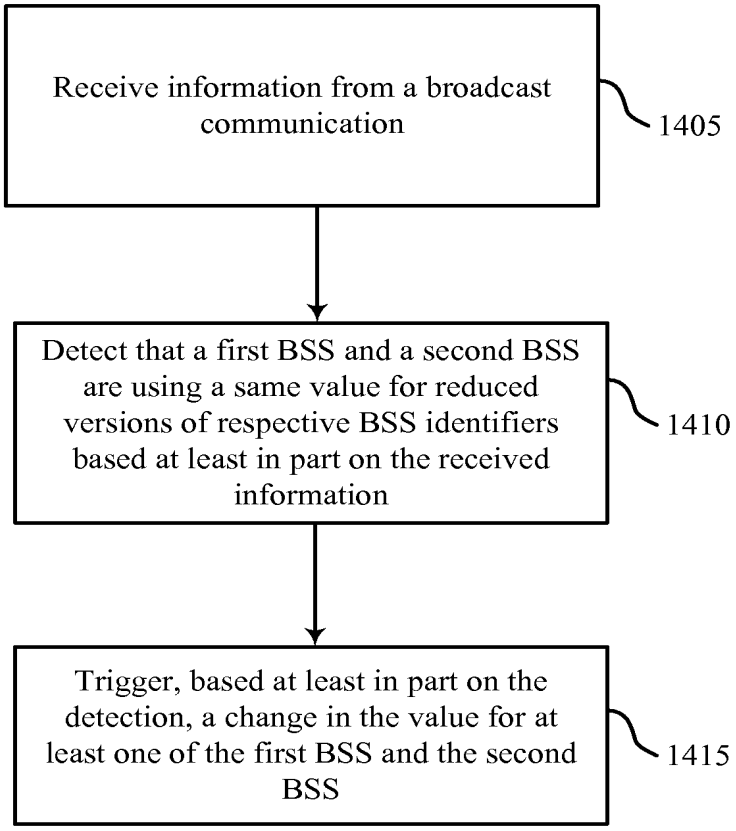
Receive information from a broadcast communication
1405
Detect that a first BSS and a second BSS are using a same value for reduced versions of respective BSS identifiers based at least in part on the received information
1410
Trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS
1415
1400

Fig. 14

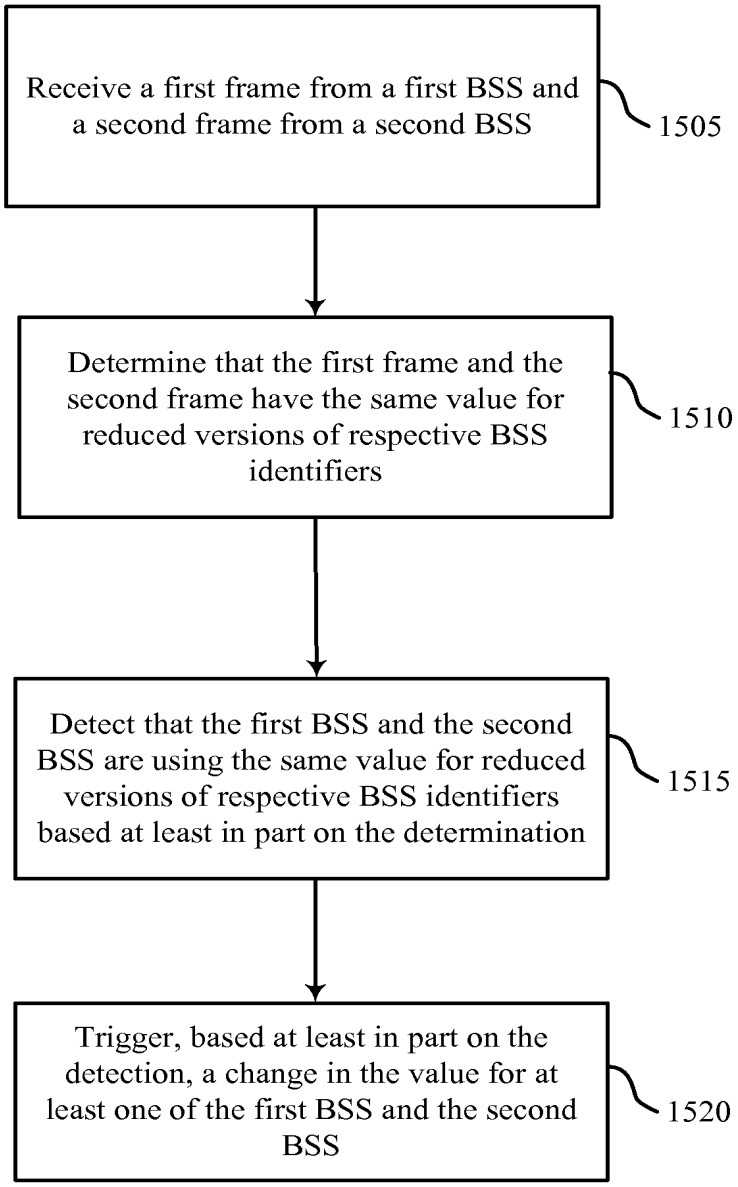
Receive a first frame from a first BSS and a second frame from a second BSS
1505
Determine that the first frame and the second frame have the same value for reduced versions of respective BSS identifiers
1510
Detect that the first BSS and the second BSS are using the same value for reduced versions of respective BSS identifiers based at least in part on the determination
1515
Trigger, based at least in part on the detection, a change in the value for at least one of the first BSS and the second BSS
1520
1500

FIG. 15

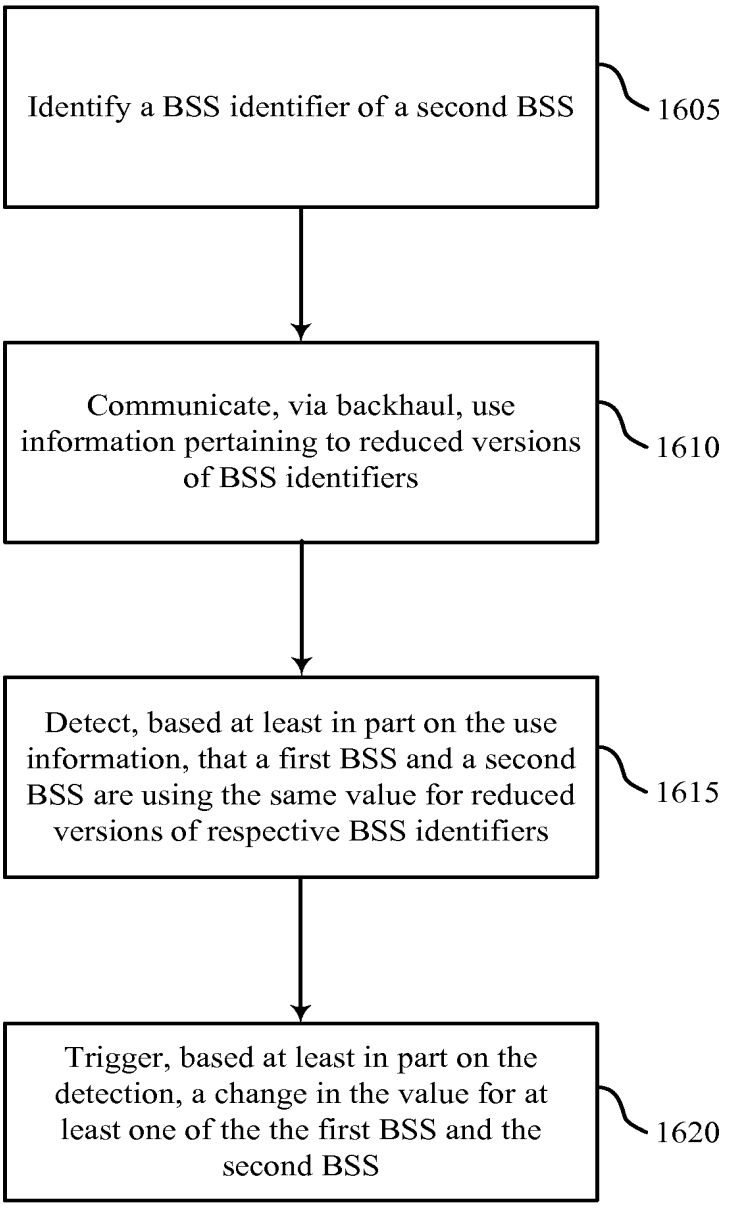
Identify a BSS identifier of a second BSS
1605
Communicate, via backhaul, use information pertaining to reduced versions of BSS identifiers
1610
Detect, based at least in part on the use information, that a first BSS and a second BSS are using the same value for reduced versions of respective BSS identifiers
1615
Trigger, based at least in part on the detection, a change in the value for at least one of the the first BSS and the second BSS
1620
1600

FIG. 16

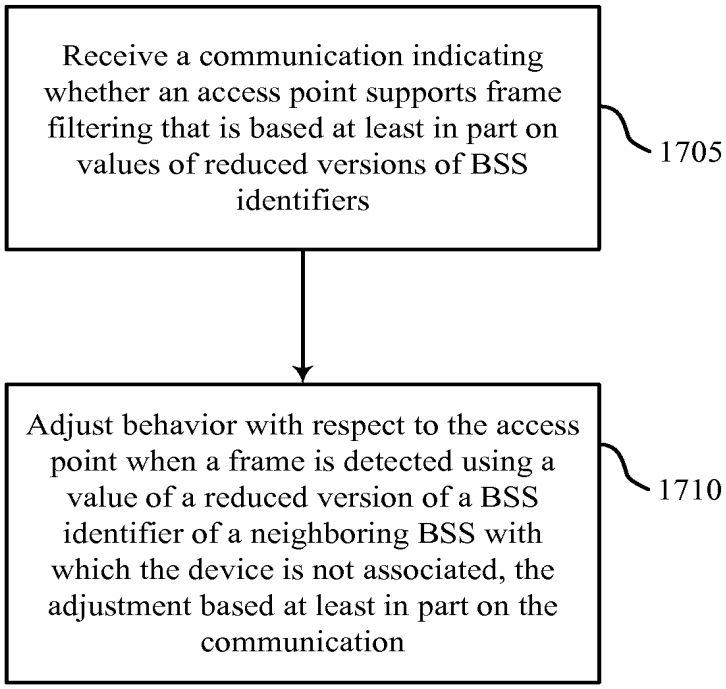
Receive a communication indicating whether an access point supports frame filtering that is based at least in part on values of reduced versions of BSS identifiers
1705
Adjust behavior with respect to the access point when a frame is detected using a value of a reduced version of a BSS identifier of a neighboring BSS with which the device is not associated, the adjustment based at least in part on the communication
1710
1700

FIG. 17