IEEE P802.11
Wireless LANs

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| Some Subsetting and Addressing Text |
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Abstract

This document provides some tentative text concerning solutions to the subsetting (see 11-13/0526r3) and addressing problems for a P802.11ak draft. It uses Draft P802.11REVmc\_D2.4 updated by 11-14/0004r7 as its base document.

**Editor’s notes**

The editor’s notes do not form a part of this standard. They will be removed before publication. Please do not comment on editor’s notes in any ballot on the draft, as these comments would have no effect on the published standard.

***Editor’s Note: Editor’s Notes in the body of the standard appear like this. They will be removed before*** ***publication. They indicate some item of work or comment that will be addressed prior to publication.***

***This text is based on 802.11REV-mc D2.3 [as updated by 11-14/0004] and will need to be revised in light of 802.11 amendments not incorporated in that draft and adopted after that draft but before P802.11ak.***

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NOTE — The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: ***change***, ***delete***, ***insert***, and ***replace***. Change is used to make corrections in existing text or tables. The editing instructions specify the location of the change and describe what is being changed by using ~~strike through~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editorial notes will not be carried over into future editions because the changes will be incorporated into the base standard.

# Introduction

***This section will not be included when P802.11ak is rolled into the base standard.)***

IEEE Std 802.11 was originally designed with the assumption that non-AP non-mesh STAs would be leaf nodes of the network. This amendment extends the 802.11 standard so that communication between STAs can be used as a transit link inside a general network conformant to IEEE Std 802.1Q.

Areas of extension are as follows:

1. Use of EPD, as opposed to LPD, in all MSDUs between GLK STAs
2. Facilities for a GLK AP to send an augmented A-MSDU, called a Control Block A-MSDU (CBA-MSDU).
	1. Multi-destination CBA-MSDUs include facilities to send to an arbitrary subset of an AP’s associated GLK STAs
	2. Facilities for different associated GLK STAs to see different prefix information for the MSDUs in a CBA-MSDU from a GLK AP

# Overview

# Normative references

# Definitions, acronyms, and abbreviations

## Definitions

## Definitions specific to IEEE 802.11

## Abbreviations and acronyms

***Insert the following acronyms (maintaining alphabetical order):***

CB Control Block

CBA-MDSU Control Block Aggregated MSDU

SE-CB Subsetting Exclusion CB

SI-CB Subsetting Inclusion CB

SIPD-CB Subsetting Inclusion with Prefix Data CB

# General Description

## General description of the architecture

## How wireless local area networks (WLANs) are different

## Components of the IEEE Std 802.11 architecture

### 4.3.12 STA transmission of Data frames outside the context of a BSS

### 4.3.21 General Link (GLK)

Change 4.3.21 as follows:

GLK STAs are extended non-GLK STAs such that a link between GLK STAs is suitable, insofar as the capabilities of 802.11 wireless permit, to be used as a transit link in the interior of an IEEE Std 802.1Q network. All non-GLK STAs use LPD and interpret Priority Code Points according to IEEE Std 802.1D while all GLK STAs use EPD and interpret Priority Code Points according to IEEE Std 802.1Q.

#### 4.3.21.1 GLK STA identification and general capabilities

Every STA is either a GLK STA or a non-GLK STA. A GLK STA is also an HT STA and a QoS STA. GLK STAs advertise themselves as such through the use of the GLK bit in the Capability Information field as specified in 8.4.1.4 or the GLK bit in the DMG Capabilities Information field as specified in 8.4.2.127.2. For a GLK STA, dot11GeneralLink is true. For a non-GLK station, dot11GeneralLink is false or absent.

A GLK STA does not attempt to form an infrastructure, IBSS, or PBSS association or mesh peering with any non-GLK STA. Should a non-GLK STA attempt to associate with a GLK AP, the GLK AP will refuse the association. Should a non-GLK mesh STA attempt to peer with a GLK mesh STA, the GLK STA will refuse the peering.

GLK STAs support the 4-address format.

#### 4.3.20.2 CBA-MSDU Support

GLK STAs use the Control Block (CB) Aggregated MSDUs (CBA-MSDUs, 8.3.2.3) format for all A-MSDUs they send and GLK STAs include support of SE-CB, SI-CB, and SIPD-CB. This provides for the inclusion of additional information with a CBA-MSDU that determines which receivers of a group addressed CBA-MSDU should accept that frame. In addition, prefix information can be provided for the MSDUs in a CBA-MSDU that differs per receiving STA.

Support for SE-CB and SI-CB CBA-MSDUs is required of all GLK STAs. The ability to receive and process SIPB-CB CBA-MSDUs is required while the ability to create and transmit SIPD-CB CBA-MSDUs is optional.

## Logical service interfaces

## Overview of the services

## Multiple logical address spaces

## Differences among ESS, PBSS, and IBSS LANs

## Differences between ESS and MBSS LANs

## Reference model

## IEEE Std 802.11 and IEEE Std 802.1X-2010

## Generic advertisement service (GAS)

# MAC service definition

## Overview of MAC services

### Data service

### Security services

### MSDU ordering

### MSDU format

### MAC data service architecture

May need minor tweak to Figures 5-1 and 5-2.

Change text as follows:

The MAC data plane architecture (i.e., processes that involve transport of all or part of an MSDU) is shown in Figure 5-2 (MAC data plane architecture (transparent FST)) for when transparent FST is used and shown in Figure 5-1 (MAC data plane architecture) otherwise. During transmission, an MSDU goes through some or all of the following processes: MSDU rate limiting, aggregate MSDU (A-MSDU) aggregation including CBA-MSDU contruction, frame delivery deferral during power save mode, sequence number assignment, fragmentation, encryption, integrity protection, frame formatting, and aggregate MAC protocol data unit (A-MPDU) aggregation. When transparent FST is used, an MSDU goes through an additional transparent FST entity that contains a demultiplexing process that forwards the MSDU down to the selected TX MSDU Rate Limiting process and thence further MAC data plane processing. IEEE Std 802.1X-2010 may block the MSDU at the Controlled Port. At some point, the Data frames that contain all or part of the MSDU are queued per AC/TS.

During reception, a received Data frame goes through processes of possible A-MPDU deaggregation, MPDU header and cyclic redundancy code (CRC) validation, duplicate removal, possible reordering if the block ack mechanism is used, decryption, defragmentation, integrity checking, and replay detection. After replay detection (or defragmentation if security is not used), possible A-MSDU deaggregation including CBA-MSDU processing, and possible MSDU rate limiting, ~~one~~ zero or more MSDUs are, delivered to the MAC\_SAP or to the DS. When transparent FST is used, MSDUs originating from different PHY-SAPs go through an additional transparent FST entity that contains a multiplexing process before forwarding the MSDU to the MSDU rate limiting process. The IEEE 802.1X Controlled Port discards any received MSDU if the Controlled Port is not enabled. The Uncontrolled Port admits the frame for use if it is an IEEE Std 802.1X frame and optionally for other protocols that use the Uncontrolled Port. Frame order enforcement provided by the enhanced data cryptographic encapsulation mechanisms occurs after decryption, but prior to MSDU defragmentation; therefore, defragmentation fails if MPDUs arrive out of order.

## MAC data service specification

# Layer management

# PHY service specification

# Frame formats

## General requirements

## MAC frame formats

### Basic components

### Conventions

### General frame format

### Frame fields

#### 8.2.4.1.4 To DS and From DS fields

***Change the last row in Table 8-4 – To/From DS combination in Data frames***

|  |  |
| --- | --- |
| To DS = 1From DS = 1 | A Data frame using the four-address MAC header format. This standard defines procedures for using this combination of field values only in a mesh BSS or by a GLK STA.This is the only valid combination for individually addressed Data frames transmitted by a mesh STA. |

### Duration/ID field (QoS STA)

## Format of individual frame types

### Control frames

### Data frames

#### Data frame format

***Change text as follows:***

NOTE 2—If a DA or SA value also appears in any of these address fields in a Data frame sent by a non-GLK STA, the value is necessarily the same for all MSDUs within the A-MSDU because this is guaranteed by the To DS and From DS field settings.

***Change text as follows:***

An A-MSDU contains only MSDUs whose DA and SA parameter values map to the same receiver address (RA) and transmitter address (TA) values, i.e., all the MSDUs are intended to be received by a single receiver if individually addressed and the same set of receivers if group addressed, and necessarily they are all transmitted by the same transmitter. The rules for determining RA and TA are independent of whether the frame body carries an A-MSDU.

#### Aggregate MSDU (A-MSDU) format

#### 8.3.2.2.1 General

***Add the following text to the beginning of Clause 8.3.2.2.1***

There are four variations of the A-MSDU format. If the transmitter is a GLK STA, the CBA-MSDU format or Short CBA-MSDU format is used as specified in Clause 8.3.2.3. The the transmitter is a non-GLK STA, the A-MSDU or Short A-MSDU format is used as described in the remainder of Clause 8.3.2.2.

***Insert the following new clause 8.3.2.3:***

#### Control Block (CB) A-MSDU (CBA-MSDU) format

Note: The capability to send multi-destination MSDUs to an arbitrary sub-set of the non-AP STAs in an infrastructure BSS is important in 11ak so that the communication to each non-AP STA can emulate a point-to-point link. See new Clause 4.3.21.

Note: There was some controversy in the 11ak Task Group concerning the details of the CB mechanism. In particular, questions were raised on the following points on which members of the WG may wish to comment:

 1. Does the CB mechanism need to be as extensible as currently provided?

 2. Is the SIPD-CB type really needed?

A CBA-MSDU is a sequence of Control Blocks (CBs) followed by a sequence of A-MSDU subframes as shown in Figure 8-48a (CBA-MSDU structure). A DMG GLK STA may send Short CBA-MSDUs that use Short A-MSDU subframes as specified in Clause 8.3.2.2.3.

NOTE: Using CB types specified herein, excluding the Vendor Specific CB, there will be exactly one CB in a CBA-MSDU and the More CBs bit specified below will be zero.

CB 1

 **Figure 8-48a – CBA-MSDU structure**

CB n

•••

A-MSDU sub-frames

Octets: 2 – 1028 2 – 1028 2 – 1028

CB 2

The CBs influence handling of the CBA-MSDU at a receiving STA. Each CB consists of a CB Header, a variable size CB Data field, and from 0 to 3 octets of padding such that the length of every CB is a multiple of 4 octets as shown in Figure 8-48b (CB structure).

CB Header

 **Figure 8-48b – CB structure**

Padding

Octets: 2 0 – 1023 0 – 3

CB Data

The structure of the CB Header is as shown in Figure 8-48c (CB Header structure).

CB Type

More CBs

CB Data Length

 B0 B3 B5 B6 B15

Bits: 1 5 10

 **Figure 8-48c – CB Header structure**

The CB Data Length is an unsigned 10-bit value giving the number of octets of CB Data in the CB after the CB Header. The CB Type is a 5-bit field that, in conjunction with the CB Data, specifies the effect of the CB at a receiver of the CBA-MSDU as listed in Table 8-23a.

**Table 8-23a, CB Types**

|  |  |  |
| --- | --- | --- |
| **Type** | **Name** | **Clause** |
| 0 | Reserved | N/A |
| 1 | Subsetting Exclusion (SE-CB) | 8.3.2.3.1 |
| 2 | Subsetting Inclusion (SI-CB) | 8.3.2.3.2 |
| 3 | Subsetting Inclusion with Prefix Data (SIPD-CB) | 8.3.2.3.3 |
| 4-29 | Reserved | N/A |
| 30 | Vendor Specific | 8.3.2.3.4 |
| 31 | Reserved | N/A |

If there is a CB Type in a CBA-MSDU that is not implemented by the receiving STA, that STA discards that CBA-MSDU.

If the More CBs bit is zero, the CB is the last CB in that CBA-MSDU and is followed by the A-MSDU. If the More CBs bit is one, another CB follows the CB.

#### 8.3.2.3.1 Subsetting Exclusion CB (SE-CB)

The Subsetting Exclusion CB (SE-CB) is CB type 1. It provides facilities to cause a group addressed CBA-MSDU to be accepted by a subset of the receiving STAs specified by exclusion.

The CB Data of an SE-CB is a sequence of AIDs, as shown in Figure 8-48d (SE-CB and SI-CB data structure).

Octets: 2 2 2

AID 1

 **Figure 8-48d – SE-CB and SI-CB data structure**

AID 2

•••

AID n

The CB Data length of the SE-CB specifies the length of the list of AIDs. If the CB Data Length is not an even number, a receiving STA shall discard the CBA-MSDU. If more than one SE-CB or both an SE-CB and an SI-CB or an SIPD-CB occur in a CBA-MSDU, a receiving STA shall discard the CBA-MSDU.

A STA receiving a CBA-MSDU on an association whose AID appears in the SE-CB in that CBA-MSDU shall discard the CBA-MSDU. A STA receiving a CBA-MSDU on an association whose AID does not so appear in the SE-CB accepts the CBA-MSDU. An empty AID list, which is indicated by a CB Data Length of zero, indicates no receiver exclusions so all receiving STAs associated with the transmitter will accept the CBA-MSDU.

#### 8.3.2.3.2 Subsetting Inclusion CB (SI-CB)

The Subsetting Inclusion CB (SI-CB) is CB type 2. It provides facilities to cause a group addressed CBA-MSDU to be accepted by a subset of the receiving STAs specified by inclusion.

The CB Data of an SI-CB is a sequence of AIDs, as shown in Figure 8-48d (SE-CB and SI-CB data structure).

The CB Data length of the SI-CB specifies the length of the list of AIDs. If the CB Data Length is not an even number, a receiving STA shall discard the CBA-MSDU. If more than one SI-CB or both an SI-CB and an SE-CB or an SIPD-CB occur in a CBA-MSDU, a receiving STA shall discard the CBA-MSDU.

A STA receiving a CBA-MSDU on an association whose AID does not appear in the SI-CB in that CBA-MSDU discards the CBA-MSDU. A STA receiving a CBA-MSDU on an association whose AID appears in the SI-CB in that CBA-MSDU accepts the CBA-MSDU. An empty AID list, which is indicated by a CB data length of zero, indicates no receiver inclusions so all receiving STAs will discard the CBA-SMDU.

#### 8.3.2.3.3 Subsetting Inclusion with Prefix Data CB (SIPD-CB)

The Subsetting Inclusion with Prefix Data CB (SIPD-CB) is CB type 3. Prefix Data means a sequence of octets that are treated as if they were the first octets of the MSDU, after the A-MSDU subframe header. The SIPD-CB is similar to the SI-CB but in addition provides for different Prefix information for each receiver as identified by AID.

The CB Data of a SIPD-CB is a sequence of AID Items, as show in Figure 8-48e (SIPD-CB Data structure).

AID Item 1

AID Item 2

Octets: 3 – 18 3 – 18 3 – 18

 **Figure 8-48e – SIPD-CB Data structure**

AID Item n

•••

The format of an AID Item is as shown in Figure 8-48f (AID Item structure).

Octets: 2 1 0-15

AID

AID Item Control

Prefix Data

 **Figure 8-48f – AID Item structure**

The format of the AID Item Control field is as shown in Figure 89-48g (AID Item Control structure).

Reserved

Prefix Data Length

 B0 B1 B3 B4 B7

Bits: 4 4

 **Figure 8-48g – AID Item Control structure**

Copy Prefix

The CB Data length of the SIPD-CB specifies the length of the AID Item List field. If more than one SIPD-CB or both a SIPD-CB and an SE-CB or an SI-CB occur in a CBA-MSDU, a receiving STA shall discard the CBA-MSDU.

As with the SI-CB, a receiving STA accepts a CBA-MSDU if the AID of its association with the transmitter appears in the AID Item list; however, with a SIPD-CB, the Prefix Data is prefixed to each MSDU in an A-MSDU sub-frame in the CBA-MSDU for the processing of the A-MSDU subframe by the receiving STA. The Prefix Data may be null (zero length).

The AID Items are processed from left to right. The Copy Prefix bit set to one in the AID Item Control for an AID Item means that the most recently specified Prefix Data in an earlier AID Item is to be used. If the Copy Prefix bit is one in the first AID Item, the CBA-MSDU is discarded. If the Copy Prefix bit in any AID Item is one and the Prefix Data Length in that same AID Item is non-zero, the CBA-MSDU is discarded.

#### 8.3.2.3.4 Vendor Specific CB

The Vendor Specific CB is CB Type 30.

The CB Data field of the Vendor Specific CB starts with a 3 octet OUI. The meaning of any additional CB Data and the effect of the Vendor Specific CB are specified by the organization to which the OUI is assigned. STAs discard a received CBA-MSDU if the CB Data length is less than 3.

NOTE: It is suggested that the OUI be followed by a 1-octet sub-type field and a 1-octet version field to accommodate multiple and evolving uses under an OUI.

### Management frames

### Extension frames

## Management and Extension frame body components

### Fields that are not elements

### Elements

### Information Subelements

### Access network query protocol (ANQP) elements

## Fields used in Management and Extension frame bodies and Control frames

## Action frame format details

## Aggregate MPDU (A-MPDU)

# MAC sublayer functional description

## Introduction

## MAC architecture

### General

### DCF

### PCF

### Hybrid coordination function (HCF)

### Mesh coordination function (MCF)

### Combined use of DCF, PCF, and HCF

### MAC data service

## DCF

## PCF

## Fragmentation

## Defragmentation

## Multirate support

## MSDU transmission restrictions

## HT Control field operation

## Control Wrapper operation

## A-MSDU operation

***Change text as follows:***

The Address 1 field of an MPDU carrying an A-MSDU transmitted by a non-GLK STA shall be set to an individual address or to the GCR concealment address. If such an MPDU is transmitted by a GLK STA, the Address 1 field may be group addressed.

## A-MPDU operation

### A-MPDU contents

### A-MPDU length limit rules

### Minimum MPDU Start Spacing field

### A-MPDU aggregation of group addressed Data

***Change text as follows:***

A STA that is a DMG STA or a GLK STA may transmit an A-MPDU containing MPDUs with a group addressed RA.

### Transport of A-MPDU by the PHY data service

## PPDU duration constraint

## DMG A-PPDU operation

## LDPC operation

## STBC operation

## Short GI operation

## Greenfield operation

## Group ID and partial AID in VHT PPDUs

## Operation across regulatory domains

## HCF

## Mesh coordination function (MCF)

## Block acknowledgement (block ack)

## No Acknowledgement (No Ack)

## Protection mechanisms

## MAC frame processing

## Reverse direction protocol

## PSMP Operation

## Sounding PPDUs

## Link adaptation

## Transmit beamforming

## Antenna selection (ASEL)

## Null data packet (NDP) sounding

## Mesh forwarding framework

## DMG channel access

## DMG AP or PCP clustering

## DMG beamforming

## DMG block ack with flow control

## DMG link adaptation

## DMG dynamic tone pairing (DTP)

## DMG relay operation

## GLK operation

# MLME

# Security

# Fast BSS transition

# MLME Mesh procedures

## Mesh STA dependencies

## Mesh discovery

## Mesh peering management (MPM)

## Mesh peering management finite state machine (MPM FSM)

## Authenticated mesh peering exchange (AMPE)

## Mesh group key handshake

## Mesh security

## Mesh path selection and metric framework

## Airtime link metric

## Hybrid wireless mesh protocol (HWMP)

## Interworking with the DS

### Overview of interworking between a mesh BSS and a DS

### Gate announcement (GANN)

### Data forwarding at proxy mesh gates

### Proxy information and proxy update

### Mesh STA collocation

## Intra-mesh congestion control

## Synchronization and beaconing in MBSSs

## Power save in mesh BSS

# Frequency-Hopping spread spectrum (FHSS) PHY specification for the 2.4 GHz industrial, scientific, and medical (ISM) band

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# Orthogonal frequency division multiplexing (OFDM) PHY specification

# Extended Rat PHY (ERP) specification

# High Throughput (HT) PHY specification

# Directional multi-gigabit (DMG) PHY specification

# Annex A, Bibliography

# Annex B, Protocol Implementation Conformance Statement (PICS)

Need to do something about the PICS.

# …