IEEE P802.11
Wireless LANs

|  |
| --- |
| Some 11ak EtherType Frame Encoding Text |
| Date: 2014-01-19 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Donald Eastlake | Huawei Technologies | 155 Beaver Street, Milford, MA 01757 USA | +1-508-333-2270 | d3e3e3@gmail.com |
|  |  |  |  |  |

Abstract

This document provides some tentative text concerning EtherType frame encoding (EPD) used by General Link (GLK) STAs for a P802.11ak draft. It uses Draft P802.11REVmc\_D2.3 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 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.***

**Table of Contents**

1 Overview 6

2 Normative references 6

3 Definitions, acronyms, and abbreviations 6

3.1 Definitions 6

3.2 Definitions specific to IEEE 802.11 6

3.3 Abbreviations and acronyms 7

4 General Description 7

4.1 General description of the architecture 7

4.2 How wireless local area networks (WLANs) are different 7

4.3 Components of the IEEE Std 802.11 architecture 7

4.3.12 STA transmission of Data frames outside the context of a BSS 7

4.3.20 General Link (GLK) 7

4.4 Logical service interfaces 8

4.5 Overview of the services 8

4.6 Multiple logical address spaces 8

4.7 Differences among ESS, PBSS, and IBSS LANs 8

4.8 Differences between ESS and MBSS LANs 8

4.9 Reference model 8

4.10 IEEE Std 802.11 and IEEE Std 802.1X-2010 8

4.11 Generic advertisement service (GAS) 8

5 MAC service definition 8

5.1 Overview of MAC services 8

5.1.1 Data service 8

5.1.2 Security services 8

5.1.3 MSDU ordering 8

5.1.4 MSDU format 8

5.1.5 MAC data service architecture 9

5.2 MAC data service specification 9

6 Layer management 9

7 PHY service specification 9

8 Frame formats 9

8.1 General requirements 9

8.2 MAC frame formats 9

8.3 Format of individual frame types 9

8.4 Management and Extension frame body components 9

8.4.1 Fields that are not elements 9

8.4.2 Elements 9

8.4.2.1 General 9

8.4.2.30 TCLAS Element 10

8.4.2.157 GLK Capabilities element 10

8.4.3 Information Subelements 11

8.4.4 Access network query protocol (ANQP) elements 11

8.5 Fields used in Management and Extension frame bodies and Control frames 11

8.6 Action frame format details 11

8.7 Aggregate MPDU (A-MPDU) 11

9 MAC sublayer functional description 11

9.1 Introduction 11

9.2 MAC architecture 11

9.2.1 General 11

9.2.2 DCF 11

9.2.3 PCF 11

9.2.4 Hybrid coordination function (HCF) 11

9.2.4.2 HCF contention based channel access (EDCA) 11

9.2.5 Mesh coordination function (MCF) 12

9.2.6 Combined use of DCF, PCF, and HCF 12

9.2.7 MAC data service 12

9.3 DCF 13

9.4 PCF 13

9.5 Fragmentation 13

9.6 Defragmentation 13

9.7 Multirate support 13

9.8 MSDU transmission restrictions 13

9.9 HT Control field operation 13

9.10 Control Wrapper operation 13

9.11 A-MSDU operation 13

9.12 A-MPDU operation 13

9.13 PPDU duration constraint 13

9.14 DMG A-PPDU operation 13

9.15 LDPC operation 13

9.16 STBC operation 13

9.17 Short GI operation 13

9.18 Greenfield operation 13

9.19 Operation across regulatory domains 13

9.20 HCF 13

9.21 Mesh coordination function (MCF) 13

9.22 Block acknowledgement (block ack) 13

9.23 No Acknowledgement (No Ack) 13

9.24 Protection mechanisms 14

9.25 MAC frame processing 14

9.26 Reverse direction protocol 14

9.27 PSMP Operation 14

9.28 Sounding PPDUs 14

9.29 Link adaptation 14

9.30 Transmit beamforming 14

9.31 Antenna selection (ASEL) 14

9.32 Null data packet (NDP) sounding 14

9.33 Mesh forwarding framework 14

9.34 DMG channel access 14

9.35 DMG AP or PCP clustering 14

9.36 DMG beamforming 14

9.37 DMG block ack with flow control 14

9.38 DMG link adaptation 14

9.39 DMG dynamic tone pairing (DTP) 14

9.40 DMG relay operation 14

10 MLME 14

11 Security 14

12 Fast BSS transition 15

13 MLME Mesh procedures 15

13.1 Mesh STA dependencies 15

13.2 Mesh discovery 15

13.3 Mesh peering management (MPM) 15

13.4 Mesh peering management finite state machine (MPM FSM) 15

13.5 Authenticated mesh peering exchange (AMPE) 15

13.6 Mesh group key handshake 15

13.7 Mesh security 15

13.8 Mesh path selection and metric framework 15

13.9 Airtime link metric 15

13.10 Hybrid wireless mesh protocol (HWMP) 15

13.11 Interworking with the DS 15

13.11.1 Overview of interworking between a mesh BSS and a DS 15

13.11.2 Gate announcement (GANN) 16

13.11.3 Data forwarding at proxy mesh gates 16

13.11.4 Proxy information and proxy update 16

13.11.5 Mesh STA collocation 16

13.12 Intra-mesh congestion control 16

13.13 Synchronization and beaconing in MBSSs 16

13.14 Power save in mesh BSS 16

14 Frequency-Hopping spread spectrum (FHSS) PHY specification for the 2.4 GHz industrial, scientific, and medical (ISM) band 16

15 Infrared (IR) PHY specification 16

16 DSSS PHY specification for the 2.4 GHz band designated for ISM applications 16

17 High rate direct sequence spread spectrum (HR/DSSS) PHY specification 16

18 Orthogonal frequency division multiplexing (OFDM) PHY specification 16

19 Extended Rat PHY (ERP) specification 16

20 High Throughput (HT) PHY specification 17

21 Directional multi-gigabit (DMG) PHY specification 17

Annex A, Bibliography 17

Annex B, Protocol Implementation Conformance Statement (PICS) 17

… 17

Annex P, Integration Function 17

P.1 Introduction 17

P.2 Ethernet V2.0/IEEE Std 802.3 LAN integration function 17

P.3 Example 17

P.4 Integration service versus bridging 18

… 18

Annex V, Interworking with external networks 18

V.1 General 18

V.2 Network discovery and selection 18

V.3 QoS mapping guidelines for interworking with external networks 18

V.3.3 Example of QoS mapping from different networks 18

V.4 Interworking and SSPN interface support 18

V.5 Interworking with external networks and emergency call support 18

V.6 Peer information 18

… 18

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.

# Overview

# Normative references

***Insert the following references (maintaining alphabetic order):***

IEEE Std 802.1AC-tbd, “Media Access Control (MAC) Service Definition”

IEEE Std 802.1Qbz™-tbd, “Virtual Bridged Local Area Networks — Amendment: Enhancements to Bridging of 802.11 Media”

# Definitions, acronyms, and abbreviations

## Definitions

The following definitions are from 802.1Qbz D1.4:

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

EtherType Protocol Discrimination (EPD): A method for identifying the protocol contained in a frame in which the first two octets are an EtherType.

**LLC Protocol Discrimination (LPD):** A method for identifying the protocol contained in a frame in which the first three octets are a destination LSAP, a source LSAP, and a Control octet (LLC).

## Definitions specific to IEEE 802.11

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

**General link (GLK):** Communication between two stations (STAs) over the wireless medium that can be used as a link in the middle of an IEEE Std. 802.1Q conformant network.

## Abbreviations and acronyms

***Insert the following acronym definitions (maintaining alphabetical order):***

DEI Drop Eligibility Indicator

EPD EtherType Protocol Discrimination

GLK General Link

LPD LLC Protocol Discrimination

VID VLAN ID

# 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

Note: I am told that users of this service are anxious to save every bit they can. Thus it seems likely they will want to use 802.11ak (EtherType) formatted data frames.

Insert a new sub-Clause at the end of Clause 4.3 as follows:

### 4.3.20 General Link (GLK)

IEEE Std 802.11 was originally designed with the assumption that non-AP non-mesh STAs would be leaf nodes of the network. GLK STAs are extended so that a link between two GLK STAs is suitable, insofar as the capabilities of 802.11 wireless permit, to be used in the interior of an IEEE Std 802.1Q network. All non-GLK STAs us 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.

Every STA is either a GLK STA or a non-GLK STA. Except as otherwise provide, being a GLK STA is independent of what other services are offered by a STA. A GLK STA must be a QoS STA and an HT STA. GLK STAs advertise themselves as such and provide further information on their capabilities through the use of the GLK Capabilities Element in Beacons and other appropriate MPDUs.

A GLK AP assures that non-GLK STAs will not try to associate with it by using the wildcard SSID and advertising its actual SSID in the GLK Capabilities Element. Should a non-GLK STA attempt to associate with a GLK AP, the GLK AP will refuse the association.

A non-AP GLK STA shall not attempt to form an infrastructure, IBSS, or PBSS association or mesh peering with any non-GLK STA.

## 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

Note: In 802.11, the priority for an MSPU sent by a QoS STA is encoded into the TID (TID 0 to 7) or into a TSPEC referenced by the TID (TID 8 to 15). If a frame is tagged, should the TID default to the priority in the tag with some facility for mapping or the like?

Change the first sentence of Clause 5.1.1.2 as follows:

The QoS facility supports eight priority values, referred to as UPs. The values a UP may take are the integer values from 0 to 7 and are identical to the IEEE Std 802.1D priority ~~tags~~ values for non-GLK STAs and to the IEEE Std 802.1Q priority values for GLK STAs.

### Security services

### MSDU ordering

### MSDU format

Note: Further changes may be required here.

***Change Clause 5.1.4 as follows:***

~~This standard is part of the IEEE 802 family of LAN standards, and as such~~ All ~~all~~ non-GLK STA MSDUs use LPC ~~are LLC PDUs~~ as defined in IEEE Std 802.1Qbz~~ISO/IEC 8802-2: 1998~~. In order to achieve interoperability between non-GLK STAs and networks using EPC, implementers are recommended to apply the procedures described in ISO/IEC Technical Report 11802-5:1997(E) (previously known as IEEE Std 802.1H-1997 [B21]), along with a selective translation table (STT) that handles a few specific network protocols, with specific attention to the operations required when passing MSDUs to or from LANs or operating system components that use EPD ~~the Ethernet frame format~~. Note that such translations might be required in a STA. All GLK STA MSDUs use EPC as specified in IEEE Std 802.1Qbz.

### MAC data service architecture

## MAC data service specification

Note: Should Drop Eligibility be added to the service primitive interfaces?

# Layer management

# PHY service specification

# Frame formats

## General requirements

## MAC frame formats

## Format of individual frame types

## Management and Extension frame body components

### Fields that are not elements

### Elements

#### General

***Add the following to Table 8-62 – Element IDs maintaining order by Element ID number:***

|  |  |  |
| --- | --- | --- |
| GLK Capabilities (see 8.4.2.147 (GLK Capabilities element)) | <ANA> |   |

#### 8.4.2.30 TCLAS Element

Note: PCP used below and in 802.1 means Priority Code Point but in 802.11 it means PBSS Control Point. I have expanded or dropped PCP to avoid this conflict.

***Change text in Clause 8.4.2.30 as follows:***

For Classifier Type 5, the classifier parameters are the following parameters in an IEEE Std 802.1D/Q~~-2003~~ [B22] tag header: Priority Code Point (~~PCP;~~ equivalent to IEEE Std 802.1D/Q~~-2004~~ [B20] User Priority), ~~Canonical Format Indicator (CFI)~~ Drop Eligibility Indicator (DEI), and VLAN ID (VID).

***Change Figure 8-238 as follows:***

Classifier Type (5)

Octets: 1 1 1 1 1

 **Figure 8-238—Frame Classifier field of Classifier Type 5**

Classifier Mask

802.1Q ~~PCP~~ Priority
Code Point

802.1Q ~~PCP~~ DEI

802.1Q VID

***Change text in Clause 8.4.2.30 as follows:***

The ~~PCP~~ Priority Code Point subfield contains the value in the 4 LSBs; the 4 MSBs are reserved.

The ~~CFI~~ DEI subfield contains the value in the LSB; the 7 MSBs are reserved.

***Add the following new Clause:***

#### 8.4.2.157 GLK Capabilities element

The presence of the GLK Capabilities element in a Beacon, Probe, Probe Response, Associate, Association Response, Re-Associate, Reassociation Response, Mesh Peering Open, or Mesh Peering Confirm indicates that the transmitting STA is a GLK STA (and therefore uses the EPD MSDU format) and indicates by non-zero bits in the flag octet whether or not that STA is an AP and what additional GLK capabilities it may have if any. If the STA is a GLK AP, the SSID is also provided.

Element ID Length Flags SSID

Octets: 1 1 1 0-32

 **Figure 8-514a**

The Element ID and Length fields are defined in 8.4.2.1.

The Length field for this element holds a value between 1 and 33.

The Flag bits are as show in Figure 8-514b.

GLK AP Reserved

Bits: 1 7

**Figure 8-514b**

 B0 B1 B7

The GLK AP bit indicates that the sending STA is an AP and the SSID sub-element has the same meaning as specified in clause 8.4.2.2. If the GLK AP bit is zero, then the sending STA is a non-AP GLK STA, the Length field should be 1, and the SSID sub-element shall be ignored.

### 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)

#### 9.2.4.2 HCF contention based channel access (EDCA)

***Replace Table 9-1 with the following:***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Type | Priority | UP | 802.1 | AC | Transmit queue | Transmit queue | Designation (informative) |
| Non-GLK (802.1D UP) | LowestHighest | 1 | BK | AC\_BK | BK | BK | Background |
| 2 | — | AC\_BK | BK | BK | Background |
| 0 | BE | AC\_BE | BE | BE | Best Effort |
| 3 | EE | AC\_BE | BE | BE | Best Effort |
| 4 | CL | AC\_VI | VI | A\_VI | Video (alternate) |
| 5 | VI | AC\_VI | VI | VI | Video |
| 6 | VO | AC\_VO | VO | VO | Voice |
| 7 | NC | AC\_VO | VO | A\_VO | Voice (alternate) |
| GLK (802.1Q UP) | LowestHighest | 1 | BK | AC\_BK | BK | BK | Background |
| 0 | BE | AC\_BE | BE | BE | Best Effort |
| 2 | EE | AC\_BE | BE | BE | Best Effort |
| 3 | CA | AC\_VI | VI | A\_VI | Video (alternate) |
| 4 | VI | AC\_VI | VI | VI | Video |
| 5 | VO | AC\_VO | VO | VO | Voice |
| 6 | IC | AC\_VO | VO | VO | Voice |
| 7 | NC | AC\_VO | VO | A\_VO | Voice (alternate) |

### 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

## A-MPDU operation

## PPDU duration constraint

## DMG A-PPDU operation

## LDPC operation

## STBC operation

## Short GI operation

## Greenfield operation

## 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

# 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

***Change first paragraph as follows:***

A mesh STA that has access to a DS is called a mesh gate. Mesh STAs in an MBSS access the DS via the mesh gate. An MBSS functions like an IEEE 802 LAN segment that is compatible with IEEE Std 802.1D if the MBSS is composed of non-GLK mesh STAs and compatible with IEEE Std 802.1Q if the MBSS is composed of GLK mesh STAs. The MBSS appears as a single access domain.

### 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

# Infrared (IR) PHY specification

# DSSS PHY specification for the 2.4 GHz band designated for ISM applications

# High rate direct sequence spread spectrum (HR/DSSS) PHY specification

# 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)

# …

# Annex P, Integration Function

Note: More extensive changes in Annex P may be required.

## P.1 Introduction

***Replace the contents of P.1 with the following:***

The purpose of this annex is to guide the implementer of a non-GLK WLAN system that includes a portal that integrates the WLAN systems with a wired LAN. This annex does not apply to GLK WLAN systems.

## P.2 Ethernet V2.0/IEEE Std 802.3 LAN integration function

## P.3 Example

***Change the second paragraph as follows:***

In the tables below the rows that have a 81-00 Type/Length field value represent bridging between an Ethernet/IEEE Std 802.3 LAN and an IEEE Std 802.11 LAN. Both LANs are carrying VLAN-tagged MSDUs (User Priority=4, ~~CFI-~~DEI=0, VLAN ID=1893).

## P.4 Integration service versus bridging

# …

# Annex V, Interworking with external networks

## V.1 General

## V.2 Network discovery and selection

## V.3 QoS mapping guidelines for interworking with external networks

### V.3.3 Example of QoS mapping from different networks

***Change the first sentence of Clause V.3.3 as follows:***

IEEE Std 802.1D/Q UPs map to EDCA ACs, as described in Table 9-1 (UP-to-AC mappings).

***Change Table V-1 to the following:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 3GPP QoS Information | DiffServ PHB | DSCP | QoS Requirement on GPRS Roaming Exchange | EDCA Access Category | UP (non-GLK 802.1D) | UP (GLK 802.1Q) |
| Traffic Class | THP |   |   | Max Delay | Max Jitter | MSDU Loss |  MSDU Error Rate |   |   |   |
| Conversational | N/A | EF | 101110 | 20 ms | 5 ms | 0.5% | 1.0E-05 | AC\_VO | 7, 6 | 7, 6, 5 |
| Streaming | N/A | AF41 | 100010 | 40 ms | 5 ms | 0.5% | 1.0E-05 | AC\_VI | 5, 4 | 4, 3 |
| Interactive | 1 | AF31 | 011010 | 250 ms | N/A | 0.1% | 1.0E-07 | AC\_BE | 3 | 2 |
|   | 2 | AF21 | 010010 | 300 ms | N/A | 0.1% | 1.0E-07 | AC\_BE | 3 | 2 |
|   | 3 | AF11 | 001010 | 350 ms | N/A | 0.1% | 1.0E-07 | AC\_BE | 0 | 0 |
| Background | N/A | BE | 000000 | 400 ms | N/A | 0.1% | 1.0E-07 | AC\_BK | 2, 1 | 1 |

## V.4 Interworking and SSPN interface support

## V.5 Interworking with external networks and emergency call support

## V.6 Peer information

# …