IEEE P802.11
Wireless LANs

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| --- |
| Some 11ak EtherType Frame Encoding Text |
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|  |  |  |  |  |

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.***

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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.

# 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

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

EtherType Protocol Discrimination (EPD): A frame format that uses an EtherType to identify the protocol of the following information.

**LLC Protocol Discrimination (LPD):** A frame format that uses a destination LSAP, a source LSAP, and a Control octet (LLC) to identify the protocol of the following information.

## 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 acronyms (maintaining alphabetical order):***

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)

GLK STAs are extensions of non-GLK STAs such that a link between two GLK STAs is suitable, insofar as the capabilities of 802.11 wireless permit, to be used as transit links 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.

Every STA is either a GLK STA or a non-GLK STA. A GLK STA is 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 and GLK SSIDs elements 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 GLK STA shall not attempt to form an infrastructure, IBSS, or PBSS association or mesh peering with any non-GLK STA.

Note: The above provisions should work well to stop non-GLK STAs from associating with GLK APs but will not stop a non-GLK Mesh STA from trying to peer with a GLK Mesh STA. We need a bit more.

## 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~~ MSDUs sent by non-GLK STAs use LPD ~~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 EPD, 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 EPD 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

### Control frames

### Data frames

### Management frames

#### Format of Management frames

#### Beacon frame format

***Change the indicated rows in* Table 8-24 – Beacon frame body *and add two new rows:***

|  |  |  |
| --- | --- | --- |
| 4 | Service Set Identifier (SSID) | If dot11MeshActivated or dot11GeneralLink is true, the SSID element is the wildcard value as described in 8.4.2.2 (SSID element). |
| 28 | Multiple BSSID | One or more Multiple BSSID elements are present if dot11RMMeasurementPilotActivated is a value between 2 and 7 and the AP is a member of a Multiple BSSID Set (see 10.11.14 (Multiple BSSID Set)) with two or more members, or if dot11MultiBSSIDActivated is true, or if dot11InterworkingServiceActivated is true and the AP is a member of a Multiple BSSID Set with two or more members and at least one dot11GASAdvertisementID MIB attribute exists. However, if dot11GeneralLink is true, the preceding references to the occurrence of the Multiple BSSID element refer to the Multiple BSSID subelement of the GLK SSIDs element. |
| 57 | GLK Capabilities | The GLK Capabilities element is present if dot11GeneralLink is true. |
| 58 | GLK SSIDs | The GLK SSIDs element is present when dot11GeneralLink is true, if assuming the STA was non-GLK, the Multiple BSSID element or a non-wildcard SSID element would be present. In those cases a Multiple BSSID subelement and/or SSID subelement are present in the GLK SSIDs element. |

#### ATIM frame format

#### Disassociation frame format

#### Association frame format

#### Reassociation Request frame format

#### Probe Request frame format

***Change the indicated rows in* Table 8-30 – Probe Request frame body *and add one new row as indicated:***

|  |  |  |
| --- | --- | --- |
| 1 | Service Set Identifier (SSID) | If dot11MeshActivated or dot11GeneralLink is true, the SSID element is the wildcard value as described in 8.4.2.2 (SSID element). |
| 10 | SSID List | The SSID List element is optionally present if dot11SSIDListActivated is true and dot11GeneralLink is false. |
| 58 | GLK SSIDs | The GLK SSIDs element is optionally present if both dot11SSIDListActivated and dot11GeneralLink are true. In that case the GLK SSIDs element contains an SSID List subelement. |

#### Probe Response frame format

***Change the indicated rows in* Table 8-24 – Probe Response frame body *and add two new rows:***

|  |  |  |
| --- | --- | --- |
| 4 | Service Set Identifier (SSID) | If dot11MeshActivated or dot11GeneralLink is true, the SSID element is the wildcard value as described in 8.4.2.2 (SSID element). |
| 21 | Multiple BSSID | One or more Multiple BSSID elements are present if dot11RMMeasurementPilotActivated is a value between 2 and 7 and the AP is a member of a Multiple BSSID Set (see 10.11.14 (Multiple BSSID Set)) with two or more members, or if dot11MultiBSSIDActivated is true, or if dot11InterworkingServiceActivated is true and the AP is a member of a Multiple BSSID Set with two or more members and at least one dot11GASAdvertisementID MIB attribute exists. However, if dot11GeneralLink is true, the preceding references to the occurrence of the Multiple BSSID element refer to the Multiple BSSID subelement of the GLK SSIDs element. |
| 57 | GLK Capabilities | The GLK Capabilities element is present if dot11GeneralLink is true. |
| 58 | GLK SSIDs | The GLK SSIDs element is present when dot11GeneralLink is true, if assuming the STA was non-GLK, the Multiple BSSID element or a non-wildcard SSID element would be present. In those cases a Multiple BSSID subelement and/or SSID subelement are present in the GLK SSIDs element. |

#### Authentication frame format

#### Deauthentication frame format

#### Action frame format

#### Action No Ack frame format

#### Timing Advertisement frame format

### Extension frames

## 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> | Yes |
| GLK SSIDs (see 8.4.2.148 (GLK SSIDs element)) | <ANA> | Subelements |

#### SSID element

***Change as follows:***

The wildcard SSID is also used in Beacon and Probe Response frames transmitted by mesh STAs and GLK STAs.

#### 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

~~CFI~~ 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 or is sending a Probe message for APs, the SSID or SSIDs are provided in the GLK SSIDs element defined in 8.4.2.158.

 Element ID Length GLK Capability Flags

Octets: 1 1 1

 **Figure 8-514a – GLK Capabilities element format**

The Element ID and Length fields are defined in 8.4.2.1.

The Length field for this element is 1.

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

GLK AP Reserved

Bits: 1 7

**Figure 8-514b – GLK Capability Flags field format**

 B0 B1 B7

The GLK AP bit indicates that the sending STA is an AP. If the GLK AP bit is zero, then the sending STA is a non-AP GLK STA.

#### 8.4.2.158 GLK SSIDs element

The SSID or SSIDs of a GLK AP or for which a GLK STA Probe message is probing are indicated through subelements of the GLK SSIDs element. Enclosure of this SSID information in the GLK SSIDs element is intended to protect it from detection by non-GLK STAs.

Element ID Length Subelements

Octets: 1 1 0-255

 **Figure 8-514c – GLK SSIDs element format**

The Element ID and Length fields are defined in 8.4.2.1.

The Length field for this element is variable depending on the subelements present.

Subelement allowed are shown in Table 8-222a. The subelement IDs and format are the same as the elements of the same name.

**Table 8-222a – Optional subelement IDs for GLK SSIDs**

|  |  |  |
| --- | --- | --- |
| Subelement ID | Name | Specification |
| 0 | SSID | 8.4.2.2 |
| 1-70 | Reserved |   |
| 71 | Multiple BSSID | 8.4.2.45 |
| 72-83 | Reserved |   |
| 84 | SSID List | 8.4.2.72 |
| 85-220 | Reserved |   |
| 221 | Vendor Specific | 8.4.2.25 |
| 222-255 | Reserved |   |

### 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)

Table 9-1 is changed below by adding a column on the left and adding a second section to the table for the GLK case.

***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)

Need to do something about the PICS.

# Annex C, ASN.1 encoding of the MAC and PHY MIB

Need to do something about the MIB.

# …

# 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).

Table V-1 is changed below by adding a new column on the right and changing the headings of the two rightmost columns.

***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

# …