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 recognizing General Link (GLK) STAs, basic properties of GLK STAs, their use of EtherType frame encoding (EPD, etc., for a P802.11ak draft. It uses Draft P802.11REVmc\_D2.4 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 optionally extends the 802.11 standard so that communication between STAs are usable as a transit link inside a general network conformant to IEEE Std 802.1Q.

# Overview

## Scope

## Purpose

## Supplementary Information on Purpose

***Add the following at the end of Clause 1.3:\***

* Define the mechanisms for using IEEE 802.11 media as transit links in a bridged LAN.

## Word Usage

## Mathematical Usage

# 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 suitable for use 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

PVID Port VLAN ID

VID VLAN ID

# General Description

## General description of the architecture

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

### Introduction

### Wireless station (STA)

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

~~In the design of wired LANs it is implicitly assumed that an address is equivalent to a physical location. In wireless networks, this is not always the case.~~ In IEEE Std 802.11, the addressable unit is a station (STA). The term implies no more than the origin or/and destination of a message. Physical and operational characteristics are defined by modifiers that are placed in front of the term STA. For example, in the case of location and mobility, the addressable units are the fixed STA, the portable STA, and the mobile STA. The STA is a message destination, but not (in general) a fixed location.

### Media impact on design and performance

### The impact of handling mobile STAs

### Interaction with other IEEE 802® layers

### Interaction with non-IEEE-802 protocols

## Components of the IEEE Std 802.11 architecture

## 4.3.5 Distribution system (DS) concepts

### 4.3.13 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 is possible 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:

### 4.3.21 General Link (GLK)

This is probably the right section for a high-level architecture GLK figure…

VLANs…

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.

Every STA is either a GLK STA or a non-GLK STA. A GLK STA is also an HT STA and an 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. 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.

## Logical service interfaces

### General

***Change text as follows:***

A DS may be created from many different technologies or combinations of technologies including ~~current~~ IEEE 802.1Q virtual bridging ~~wired LANs~~ or IETF IP routing. IEEE Std 802.11 does not constrain the DS to be either data link or network layer based. Nor does IEEE Std 802.11 constrain a DS to be either centralized or distributed in nature.

### SS

### PBSS control point service (PCPS)

### DSS

## Overview of the services

May need something in 4.5.3.3 and 4.5.3.5 (and/or 4.5.4.2 and 4.5.4.3) about association/disassociation causing bridge ports to go up/down.

## Multiple logical address spaces

***Change text as follows:***

IEEE Std 802.11 has chosen to use the IEEE 802 48-bit address space (see 8.2.4.3.2 (Address representation)). Thus IEEE Std 802.11 addresses are compatible with the address space used by the IEEE 802 LAN family. For GLK STAs, these 48-bit addresses are considered qualified by a 12-bit VID that may appear on the WM as a VLAN tag in an MSDU.

## Differences among ESS, PBSS, and IBSS LANs

May need to include GLK case in Figure 4-14, IEEE Std 802.11 architecture (again).

## Differences between ESS and MBSS LANs

## Reference model

May need to include GLK case in Figure 4-19, ESS link illustration.

## 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?

#### 5.1.1.2 Determination of UP

Change text 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. An MSDU with a particular UP is said to belong to a traffic category (TC) with that UP. The UP is provided with each MSDU at the medium access control service access point (MAC\_SAP) eith directly, in the UP parameter, or indirectly, in a TSPEC or SCS Descriptor element designated by the UP parameter.

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

#### 5.1.1.6 Interpretation of VLAN parameter in MAC service primitives

The parameter is only present for GLK STAs.

GLK STAs label every MSDU with a 12-bit VLAN ID (VID). The VID of an MSDU received is determined in a manner analogous to that used in IEEE Std 802.1Q. If a received MSDU contains a VLAN tag, that specifies the VID of the MSDU, otherwise the default VID for the port on which the MSDU is received is used. This default VLAN is known as the Port VLAN ID (PVID).

When a GLK STA transmits an MSDU over the WM or to the DS, it either labels it with the MSDU’s VID by the inclusion of a VLAN tag (see IEEE Std 802.1Q) or transmits it untagged depending on the port’s configuration. The default is to send the MSDU untagged if its VID is the PVID and tagged if it has some other VID.

### Security services

### MSDU ordering

### MSDU format

***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

***Change text as follows:***

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, and possible MSDU rate limiting, one 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~~/Uncontrolled~~ Port~~s~~ discards any received MSDU if the Controlled Port is not enabled. The Uncontrolled Port admits the frame for use if it is ~~and if the MSDU does not represent~~ 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

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

To cover the GLK case, we need to model as an AP port per associated STA or primitives below need to be enhanced with a list of receiving STAs or new parallel primitives specified.

### General

### MA-UNITDATA.request

#### 5.2.2.2 Semantics of the service primitive

***Change text as follows:***

MA-UNITDATA.request(

 source address,

 destination address,

 routing information,

 data,

 priority ,

 service class,

 VLAN

 )

***Add the following as the 2nd to last paragraph of 5.2.2.2:***

The VLAN parameter specifies the VLAN desired for the data unit transfer. The allowed values of VLAN are described in 5.1.1.6 (Interpretation of priority parameter in MAC service primitives).

### MA-UNITDATA.indication

#### 5.2.3.2 Semantics of the service primitive

***Change text as follows:***

MA-UNITDATA.indication(

 source address,

 destination address,

 routing information,

 data,

 receiption status,

 priority ,

 service class,

 VLAN

 )

***Add the following as the 2nd to last paragraph of 5.2.3.2:***

The VLAN parameter is only present if dot11GeneralLink is true and specifies the VLAN receive processing priority that was used for the data unit transfer. The allowed values of VLAN are described in 5.1.1.6 (Interpretation of priority parameter in MAC service primitives).

### MA-UNITDATA-STATUS.indication

#### 5.2.4.2 Semantics of the service primitive

***Change text as follows:***

MA-UNITDATA-STATUS.indication(

 source address,

 destination address,

 transmission status,

 provided priority,

 provided service class,

 provided VLAN

)

***Add the following as the last paragraph of 5.2.4.2:***

The provided VLAN parameter is only present if dot11GeneralLink is true.

# Layer management

## Overview of management model

## Generic management privitives

## MLME SAP interface

Need appropriate additional parameter and corresponding changes in 6.3.3, Scan (both request and confirm) and 6.3.11, MLME-START.request. Might also need something in 6.3.4 MLME-JOIN, (request and confirm), 6.3.7 MLME-ASSOCIATE, and MLME-REASSOCIATE.

## MAC state generic convergence function (MSGCF)

## PLME SAP interface

# PHY service specification

# Frame formats

## General requirements

## MAC frame formats

## Format of individual frame types

### Control frames

### Data frames

### Management frames

### Extension frames

## Management and Extension frame body components

### Fields that are not elements

#### 8.4.1.4 Capability Information field

Note: Add B13 as General link bit. This is pending ANA assignment of that bit to GLK.

***Change* Figure 8-65—Capability Information field (non-DMG STA) *and* Figure 8-66—Capability Information field (DMG STA) *as follows:***

ESS

 B0 B1 B2 B3 B4 B5 B6 B7

 **Figure 8-65—Capability Information field (non-DMG STA)**

CF Pollable

CF-Poll Request

Short Preamble

Reserved

IBSS

Privacy

Reserved

Spectrum Management

 B8 B9 B10 B11 B12 B13 B14 B15

QoS

Radio Measurement

GLK

APSD

Delayed Block Ack

Short Slot Time

Immediate Block Ack

DMG Parameters

 B0 B7 B8 B9 B11 B12 B13 B14 B15

Reserved

GLK

Reserved

Spectrum Management

Radio Measurement

 **Figure 8-66—Capability Information field (DMG STA)**

***Add the following as the 2nd to last paragraph of Clause 8.4.1.4:***

A STA sets the GLK sub-field in the Capabilities Information field to 1 when do11GeneralLink is true and sets it to 0 otherwise.

### Elements

#### 8.4.2.3 Supported Rates element

***Add a row at the end of* Table 8-75—BSS membership selector value encoding*:***

|  |  |  |
| --- | --- | --- |
| 125 | GLK | Support for the features of Clause 9.42 (GLK operation) is required in order to join the BSS that was the source of the Supported Rates element or Extended Supported Rates element containing this value.  |

#### 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.

### 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)

***Change the first paragraph in 9.2.4.2 as follows:***

The EDCA mechanism provides differentiated, distributed access to the WM for STAs using eight different UPs. The EDCA mechanism defines four access categories (ACs) that provide support for the delivery of traffic with UPs at the STAs. Six transmit queues are defined when dot11AlternateEDCAActivated is true, and four transmit queues otherwise. The transmit queue and AC are derived from the UPs as shown in Table 9-1 (UP-to-AC mappings) for non-GLK STAs. For GLK STAs, Table 9-1 gives the default mapping of Ups to AC but other mappings are configurable.

Table 9-1 is changed as shown 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

### Fragmentation/defragmentation overview

### 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

## 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

***Add new Clause 9.42:***

## GLK operation

A GLK STA shall set dot11GeneralLink to true.

# 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

# Very High Throughput IVHT) PHY

# 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

Probably need to add more for “port” VLAN configuration.

***Add the following entry at the end of the* dot11StationConfigEntry SEQUENCE*:***

dot11GeneralLink TruthValue

# …

# 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

# …