IEEE P802.11
Wireless LANs

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| Intro to Distribution Services |
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Abstract

This document provides and overview of “Distribution Service” and related concepts, using text pulled from IEEE Std 802.11.

**What is an 802.11 Distribution System (and Portal, and other related concepts)?**

**From Std 802.11 normative text:**

**distribution system (DS):** A system used to interconnect a set of basic service sets (BSSs) and integrated local area networks (LANs) to create an extended service set (ESS).

**distribution service:** The service that, by using association information, delivers medium access control (MAC) service data units (MSDUs) within the distribution system (DS).

**distribution system service (DSS):** The set of services provided by the distribution system (DS) that enable the medium access control (MAC) to transport MAC service data units (MSDUs) between stations (STAs) that are not in direct communication with each other over a single instance of the wireless medium (WM). These services include transport of MSDUs between the access points (APs) of basic service sets (BSSs) within an extended service set (ESS), transport of MSDUs between portals and BSSs within an ESS, transport of MSDUs between mesh gates in the same or different mesh basic service sets (MBSSs), transport of MSDUs between mesh gates and APs, transport of MSDUs between mesh gates and portals, and transport of MSDUs between STAs in the same BSS in cases where the MSDU has a group destination address or where the destination is an individual address and the STA is associated with an AP.

NOTE—DSSs are provided between pairs of MACs not on the same instance of the WM.

**access point (AP):** An entity that contains one station (STA) and provides access to the distribution services, via the wireless medium (WM) for associated STAs.

**integration service:** The service that enables delivery of medium access control (MAC) service data units(MSDUs) between the distribution system (DS) and a local area network (LAN) (via a portal).

**portal:** The logical point at which the integration service is provided.

**wireless local area network (WLAN) system:** A system that includes the distribution system (DS), access points (APs), and portal entities. It is also the logical location of distribution and integration service functions of an extended service set (ESS). A WLAN system contains one or more APs and zero or more portals in addition to the DS.



The DS and infrastructure BSSs allow IEEE Std 802.11 to create a wireless network of arbitrary size and complexity. IEEE Std 802.11 refers to this type of network as the ESS network. An ESS is the union of the infrastructure BSSs with the same SSID connected by a DS. The ESS does not include the DS. The key concept is that the ESS network appears the same to an LLC layer as an IBSS network. STAs within an ESS may communicate and mobile STAs may move from one BSS to another (within the same ESS) transparently to LLC.

Nothing is assumed by IEEE Std 802.11 about the relative physical locations of the BSSs in an ESS.

The service provided by the DS is known as the DSS.

An AP and a mesh gate are logical entities, and the functions described may be shared by one or more physical entities.

The services that comprise the DSS are as follows:

a) Association (not mesh facility)

b) Disassociation (not mesh facility)

c) Distribution

d) Integration

e) Reassociation (not mesh facility)

f) QoS traffic scheduling (QoS facility only)

g) DSE

h) Interworking with the DS (mesh facility only)

**Distribution**

This is the primary service used by IEEE Std 802.11 STAs. It is conceptually invoked by every data message to or from an IEEE Std 802.11 STA operating in an ESS (when the frame is sent via the DS). Distribution is via the DSS.

Refer to the ESS network in the figure, and consider a data message being sent from STA 14 to STA 19. The message is sent from STA 14 and received by STA 13 (the “input” AP). The AP gives the message to the distribution service of the DS. It is the job of the distribution service to deliver the message within the DS in such a way that it arrives at the appropriate DS destination for the intended recipient. In this example, the message is distributed to STA 18 (the “output” AP) and STA 18 accesses the WM to send the message to STA 19 (the intended destination).

How the message is distributed within the DS is not specified by IEEE Std 802.11. All IEEE Std 802.11 is required to do is to provide the DS with enough information for the DS to be able to determine the “output” point that corresponds to the intended recipient. The necessary information is provided to the DS by the three association related services (association, reassociation, and disassociation).

The previous example was a case in which the AP that invoked the distribution service was different from

the AP that received the distributed message. If the message had been intended for a STA that was a member

of the same BSS as the sending STA, then the “input” and “output” APs for the message would have been

the same.

**Integration**

If the distribution service determines that the intended recipient of a message is a member of an integrated LAN, the “output” point of the DS would be a portal instead of an AP.

Messages that are distributed to a portal cause the DS to invoke the Integration function (conceptually after the distribution service). The Integration function is responsible for accomplishing whatever is needed to deliver a message from the DSM to the integrated LAN media (including any required media or address space translations). Integration is one of the services in the DSS.

Messages received from an integrated LAN (via a portal) by the DS for an IEEE Std 802.11 STA invoke the Integration function before the message is distributed by the distribution service.

The details of an Integration function are dependent on a specific DS implementation and are outside the

scope of this standard.

**Distribution SAP**

**From Std 802.11 informative Annexes:**

The primary functions of the DS (i.e., the DSSs) are as follows:

a) Map Mobile Unit (MU) to AP (for DS-to-MU traffic delivery).

b) Move data.

The DS’s MU-to-AP map determines which AP is to be used for a given MU’s data delivery. This function includes mapping update adjustments, which are based on notification from the APs, of changes in MU access control.

Moving data consists of moving MSDUs among the APs (including returning MSDUs to the source AP for MU-to-MU communications) and between the APs and the portal(s).

Annex R describes a distribution service SAP, provided by the DS, to the distribution service users: APs, mesh gates, and portals.

The DS SAP service interface primitives are as follows:

a) DS-UNITDATA.request

b) DS-UNITDATA.indication

c) DS-STA-NOTIFY.request

The DS-UNITDATA primitives accept and deliver IEEE Std 802.11 MSDUs, including all the parameters and data as defined in 5.2.2.2 (Semantics of the service primitive). These tuples are called *distribution system service data units* (DSSDUs).

5.2.2.2 defines these parameters as:

* source address (MAC address)
* destination address (MAC address)
* routing information (always null)
* data (an MSDU)
* priority (“Contention” or “ContentionFree” for non-QoS; 0-7 selection of UP for QoS; 8-15 for selection of TS for QoS)
* service class (ReorderableGroupAddressed or StrictlyOrdered for non-QoS STAs, QoSAck or QoSNoAck for QoS STAs)

**Some interesting quotes from another informative Annex:**

**P.4 Integration service versus bridging**

There are a number of differences between the IEEE Std 802.11 integration service and the service provided by an IEEE Std 802.1 bridge. In the IEEE Std 802.11 architecture, a portal provides the minimum connectivity between an IEEE Std 802.11 WLAN system and a non-IEEE-802.11 LAN. Requiring an IEEE Std 802.1D bridge in order to be compliant with IEEE Std 802.11 would unnecessarily render some implementations noncompliant.

The most important distinction is that a portal has only one “port” (in the sense of IEEE Std 802.1D, for example) through which it accesses the DS. This renders it unnecessary to update bridging tables inside a portal each time a STA changes its association status. In other words, the details of distributing MSDUs inside the IEEE Std 802.11 WLAN need not be exposed to the portal.

Another difference is that the DS is not an IEEE 802 LAN (although it carries IEEE 802 LLC SDUs). Requiring that the DS implements all behaviors of an IEEE 802 LAN places an undue burden on the architecture.

Finally, it is an explicit intent of this standard to permit transparent integration of an IEEE Std 802.11 WLAN into another non-IEEE-802.11 LAN, including passing bridge PDUs through a portal. While an implementer may wish to attach an IEEE Std 802.1D bridge to the portal (note that the non-IEEE-802.11 LAN interface on the bridge need not be any particular type of LAN), it is not an architectural requirement of this standard to do so.