

1 *To the definitions and Abbreviations clauses, add:*  
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3 **General Link (GLK):** (From IEEE Std 802.11ak) Communication between two stations (STAs) over the  
4 wireless medium suitable for use as a link in the middle of an IEEE Std. 802.1Q conformant network.  
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6 *These headers are here to provide targets for cross-references:*  
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9 **11.1 Service primitives and parameters**

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12 **11.2 Status parameters**

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15 **11.3 Point-to-point parameters**

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17 *This is the suggested new header for Clause 12*  
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19  
20 **12. Media Access Method Dependent Convergence Functions**

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23 **12. ~~Support of the Internal Sublayer Service by specific MAC procedures~~**  
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25 << Commenter's note: In reviewing the 802.3 section to use as a guide for 802.11, it struck me that the stuff  
26 that used to be in 802.1D is out of date, left over from when a) the 802.3 MAC service did not match the ISS's  
27 needs and b) link aggregation was still in 802.3. Seems to me that the following would be a much better way  
28 to do 12.1. The following is offered for the consideration of the Task Group. >>  
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30 *Replace the text of Clause 12.1 as follows:*  
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32  
33 **12.1 IEEE Std 802.3-2012 Ethernet convergence function**  
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35 The IEEE 802.3 convergence function presents a single instance of the ISS to upper layers, and uses a single  
36 instance of the IEEE 802.3 MAC service as defined in IEEE Std 802.3-2012 Clause 2.3.  
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38 When the IEEE 802.3 convergence function receives an ISS M\_UNITDATA.request primitive, it generates a  
39 corresponding IEEE 802.3 MA\_DATA.request as follows:  
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- 41 a) The ISS M\_UNITDATA destination\_address, source\_address, mac\_service\_data\_unit and  
42 frame\_check\_sequence parameters are passed verbatim to the corresponding IEEE 802.3  
43 MA\_DATA parameters.  
44 b) The ISS M\_UNITDATA priority, drop\_eligible, service\_access\_point\_identifier, and  
45 connection\_identifier parameters are ignored.  
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47 When the IEEE 802.3 convergence function receives an IEEE 802.3 MA\_DATA.indication primitive, it  
48 generates a corresponding ISS M\_UNITDATA.indication as follows:  
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- 50 a) The IEEE 802.3 MA\_DATA destination\_address, source\_address, mac\_service\_data\_unit, and  
51 frame\_check\_sequence parameters are passed verbatim.  
52 b) The ISS M\_UNITDATA drop\_eligible parameter is False.  
53 c) The ISS M\_UNITDATA priority parameter shall take the value of the Default Priority parameter for  
54 the SAP on which the MA\_DATA.indication was received. The default value of this parameter is 0.

1 This parameter may be set by management in which case the capability to set it to any of the values  
2 0 through 7 shall be provided.

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4 The values of the MAC\_Enabled and MAC\_Operational parameters are determined as follows:

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6 d) For IEEE 802.3 MAC entities that support the medium attachment unit (MAU) managed Object  
7 Class (30.5.1 in IEEE Std 802.3-2012):  
8 1) The value of MAC\_Enabled is TRUE.  
9 2) The value of MAC\_Operational is TRUE if the attribute aMediaAvailable carries the value  
10 available.  
11 3) The value of MAC\_Operational is FALSE if the attribute aMediaAvailable carries any value  
12 other than available.  
13 e) Otherwise:  
14 1) The value of MAC\_Enabled is TRUE.  
15 2) The value of MAC\_Operational is TRUE. From the point of view of determining the value of  
16 operPointToPointMAC (11.36.6.3 in IEEE Std 802.1Q-2011), the MAC is considered to be  
17 connected to a point-to-point LAN if any of the following conditions are true:  
18 f) The MAC entity concerned supports auto negotiation (e.g., Clauses 28, 37, and 73 of IEEE Std  
19 802.3-2012), and the auto negotiation function has determined that the LAN is to be operated in full  
20 duplex mode; or  
21 g) The MAC entity has been configured by management means for full duplex operation.  
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23 Otherwise, the MAC is considered to be connected to a LAN that is not point-to-point.

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25 << Commenter's note: Here's the latest version of the 802.11 text. I've done my best to follow the instructions  
26 from the 802.1AC-REV D0.2 comment resolution, but some changes proposed, here, because of refinements  
27 in the architecture, have superseded some of the comment resolutions. >>  
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## 30 **12.2 IEEE Std 802.11 (Wireless LAN) convergence functions**

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32 << Commenter's note: In Clause 12.2 and its subclauses, the notation "TBD" is used to denote information  
33 that is "To Be Determined". >>  
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35 The wireless LAN access method is specified in IEEE Std 802.11-2012. Clause 5.2 of that standard specifies  
36 the IEEE 802.11 MAC service definition, Clause 4.4.4 introduces the distribution system, and IEEE Std  
37 802.11ak-20XX Annex TBD specifies the points in the IEEE 802.11 architecture at which the MAC service  
38 is offered. Following are the media access method dependent convergence functions used with IEEE Std  
39 802.11 and amendments:  
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- 41 a) The IEEE 802.11 portal convergence function (12.2.1) supports an IEEE 802.11 portal, offers an  
42 instance of the ISS to the upper layers, and uses an instance of the Distribution Service SAP  
43 (DS SAP) offered by an IEEE 802.11 distribution system. The distribution system in turn provides  
44 connectivity to some number of IEEE 802.11 access points and IEEE 802.11 mesh gates, and via  
45 those, to some number of associated IEEE 802.11 non-AP stations (12.2.1).  
46 b) The IEEE 802.11 Genral Link (GLK) convergence function (12.2.2) attached to an IEEE 802.11  
47 access point or IEEE 802.11 non-AP station presents an array of GLK SAPs, one for each of a set of  
48 virtual point-to-point LANs, where each LAN connects to:  
49 1) zero or one associated IEEE 802.11 non-AP stations when the LANs are provided by an access  
50 point; or  
51 2) zero or one associated IEEE 802.11 access points, or zero or one other non-AP stations, when  
52 the LANs are provided by a non-AP station.  
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- c) The IEEE 802.11 non-GLK non-AP convergence function (12.2.3) offers an instance of the ISS to the upper layers, and uses an instance of the IEEE 802.11 MAC Service interface offered by a non-AP station that does not support GLK SAPs.

NOTE 1—The native service provided by an IEEE 802.11 non-AP non-GLK station (IEEE Std 802.11-2012 Clause 9.3.6) cannot be adapted to the ISS by a media access method dependent convergence function, because frames with a destination address that is a group address are reflected back to the non-AP station by its associated IEEE 802.11 access point. This behavior is prohibited for an ISS (11.1).

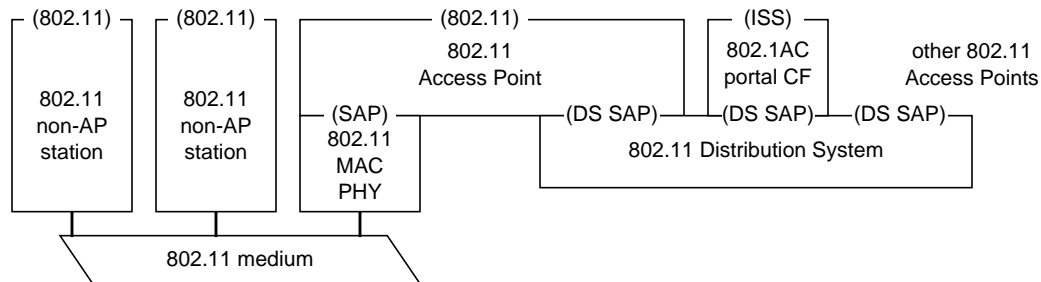
NOTE 2—No convergence function is defined for an IEEE 802.11 Independent BSS or Personal BSS.

<< Editor's note: This may change, if the current work on P802.11ak decides to define the GLK for an IBSS or PBSS. >>

All of the convergence functions defined in this clause use the same mapping of ISS parameters to and from IEEE 802.11 service instance primitives, which is defined in 12.2.4.

### 12.2.1 IEEE 802.11 portal convergence function

As shown in Figure 12-1, the IEEE 802.11 portal convergence function offers an instance of the ISS to upper layers, connecting to an IEEE 802.11 distribution system through an instance of the DS SAP interface defined in IEEE Std 802.11-2012 Clause R.1. IEEE 802.11 non-AP stations are associated to the distribution system via one or more IEEE 802.11 access points. For a description of the IEEE 802.11 architecture, see Clause 4 of IEEE Std 802.11-2012. The IEEE 802.11 portal convergence function, together with the upper layers to which it offers a service via the ISS, constitute an IEEE 802.11 portal.



**Figure 12-1—IEEE 802.11 portal convergence function method**

The DS SAP offers the DS-UNITDATA.request and DS-UNITDATA.indication primitives, defined in IEEE Std 802.11-2012 Annex R.1. The “data” parameter of the request and indication are Length/Type encoded. IEEE Std 802.11-2012 Annex Q.6 specifies that an integration service in the distribution system converts between the Length/Type encoding and the LLC encoding used on IEEE 802.11 media. The IEEE 802.11 portal convergence function makes no use of the DS-STA-NOTIFY.request primitive offered by the DS SAP.

When an ISS M\_UNITDATA.request primitive is received, the IEEE 802.11 portal convergence function (12.2.1) generates a corresponding 802.11 DS-UNITDATA.request as described in 12.2.4.

When an IEEE 802.11 DS-UNITDATA.indication primitive is received, the IEEE 802.11 portal convergence function (12.2.1) generates a corresponding ISS M\_UNITDATA.indication as described in 12.2.4.

NOTE—As shown in Figure 12-1, the IEEE 802.11 portal convergence function does not supply the Controlled and Uncontrolled Ports of the IEEE 802.11 infrastructure convergence function (12.2.2). This is because the DS SAP is a service offered by the IEEE 802.11 distribution system, not a service whose peer is below the distribution system; the

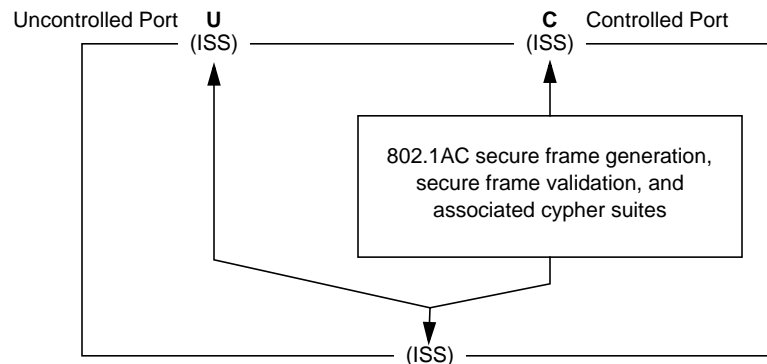
peers of a SecY attached to an IEEE 802.11 portal are the IEEE 802.11 non-AP stations associated to the IEEE 802.11 access points attached to the distribution system. Typically, the SecY would duplicate the function of the 802.11 security layer. (See also IEEE Std 802.11-2012 Figure R-1.)

The ISS MAC\_Operational status parameter (11.2) for the IEEE 802.11 portal convergence function is TRUE if the MAC\_Enabled parameter is TURE, else MAC\_Operational is FALSE.

If the adminPointToPointMAC parameter has the value Auto (11.3), then the operPointToPointMAC parameter for any ISS offered by the IEEE 802.11 portal convergence function is FALSE.

### 12.2.2 IEEE 802.11 General Link convergence function

The IEEE 802.1AE SecY layer is illustrated in Figure 12-2, which is a simplified version of IEEE Std 802.1AE-2006 Figure 10-1. The SecY provides two instances of the ISS to the layers above it, and utilizes a single instance of the ISS to access the layers below it. The two ISS instances above the SecY are the Controlled Port (C) and the Uncontrolled Port (U). The Controlled Port can supply cryptologically secured MAC service, and the Uncontrolled Port supplies unsecured MAC service.

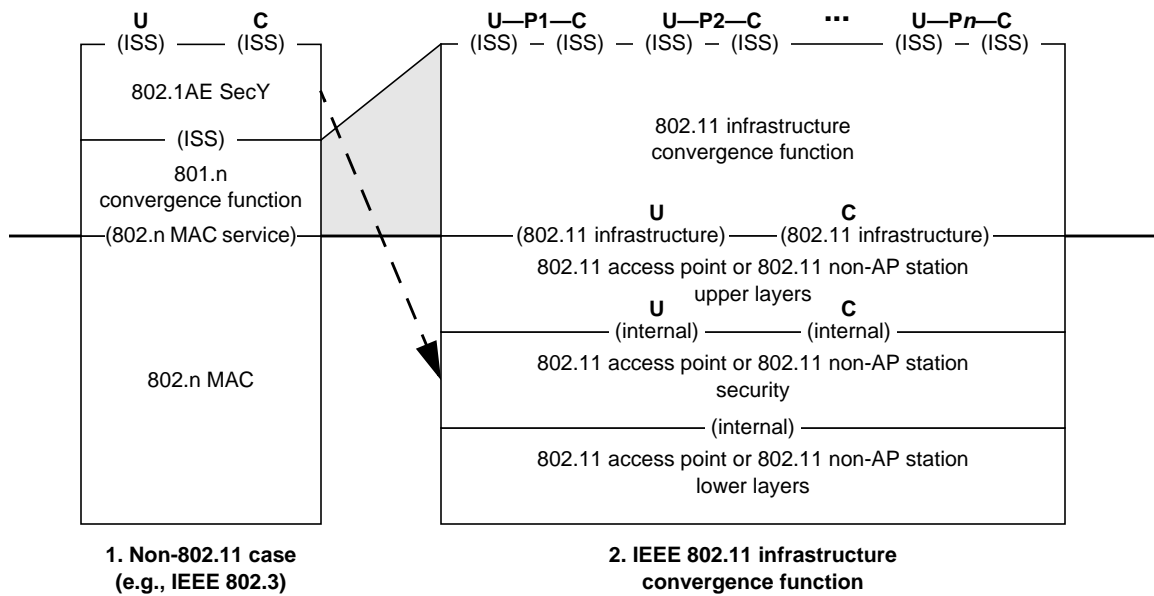


**Figure 12-2—Simplified IEEE 802.1AE SecY**

The SecY is used on some IEEE 802 media, including IEEE 802.3, but not including IEEE 802.11, in the manner illustrated in part 1 of Figure 12-3. IEEE 802.11, however, necessarily places its security layer, with Controlled and Uncontrolled ports similar to those of the IEEE 802.1AE SecY, below the IEEE 802.11 SAP. This is because IEEE 802.11 systems protect fragments of frames, not whole frames, and those segments are created or assembled in layers between the SAP and the security layer. Therefore, the IEEE 802.1AE SecY is not typically used on IEEE 802.11 media. In order to utilize the IEEE 802.11 security layer, but provide the same services to the upper layers for IEEE 802.11 media that are provided by the SecY for other media, the IEEE 802.11 infrastructure convergence function provides an Uncontrolled Port and a Controlled Port for each virtual point-to-point LAN, which is to say, for each of the other 802.11 stations to which its access point or non-AP station is associated. This is illustrated in part 2 of Figure 12-3.

A system may connect to an IEEE 802.11 station via the IEEE 802.11 infrastructure convergence function. The infrastructure convergence function provides connections to zero or more virtual point-to-point LANs, each to another IEEE 802.11 station. The infrastructure convergence function offers two instances of the ISS to the system for each LAN, an Uncontrolled Port and an Uncontrolled Port. Figure 12-3, part 2, illustrates the infrastructure method applied to an IEEE 802.11 access point (or non-AP station) with  $n$  associated IEEE 802.11 stations.

The service interface presented by the 802.11 station (whether an access point or a non-AP station) to the infrastructure convergence function is identical to the two instances of the service interface, a Controlled Port and an Uncontrolled Port, presented by the IEEE 802.11 MAC SAP, except that every MA-UNITDATA.request and MA-UNITDATA.indication primitive is accompanied by a station vector,



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**Figure 12-3—MAC security and IEEE 802.11 media**

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specifying to which of the 802.11 stations the request is directed, or from which the indication is presented. A request can be directed to any non-empty subset of the associated 802.11 stations, including all of them. The station vector is supplied with a request primitive so that the 802.11 station can make the determination of whether to execute the request in a single transmission or more than one transmission, in order to balance considerations such as reliability of delivery versus bandwidth utilized. For the indication primitive, the station vector always indicates arrival from a single 802.11 station.

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The number of virtual point-to-point LANs implemented, and thus the number of Controlled and Uncontrolled Ports and ultimately, Bridge Ports, are an implementation choice. IEEE 802.11 non-AP stations can be associated and disassociated with IEEE 802.1 access points, and direct links among non-AP stations can be created or destroyed. An implementation can choose, as these events occur, to create and destroy virtual point-to-point LANs and ports, or it can manipulate the MAC\_Operational parameters of the SAPs to make them available for use or not.

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The data parameter of the IEEE 802.11 infrastructure MAC service, and the mac\_service\_data\_unit parameter of the ISS, are Length/Type encoded. IEEE Std 802.11ak-20XX Clause TBD specifies that the infrastructure service interface converts between the Length/Type encoding and the LLC encoding used on IEEE 802.11 media.

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NOTE—IEEE Std 802.1Q Clause 8.6 discusses the process of forwarding frames through a bridge in terms of the creation, at the time a frame is received, of a vector of ports on which the frame can be output. The process of deciding on what port or ports the frame is to be output is described in terms of removing ports from this vector. IEEE 802.11 Clause TBD describes service primitives that accept a frame along with this same vector of output ports. The following paragraph is a formalism, not a description of an intended implementation method. The purpose of this formalism is to resolve the conflict between multiple virtual Bridge Ports and a single physical interface.

Upon (in theory) the simultaneous receipt of one or more identical M\_UNITDATA.request primitives on the ISS instances from the upper layers, the infrastructure convergence function constructs a single MAC Service Data Unit and a station vector, indicating from which ISS instances the request primitive was received, and constructs an IEEE 802.11 MA-UNITDATA.request primitive, mapping the parameters as specified in 12.2.4.

1 On receipt of a valid IEEE 802.11 MA-UNITDATA.indication primitive and station vector (see IEEE Std  
2 802.11-2012 Clauses 5, 8 and 9), the infrastructure convergence function generates an  
3 M\_UNITDATA.indication primitive on the ISS instance specified by the station vector, mapping the  
4 parameters as specified in 12.2.4.  
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6 The ISS MAC\_Operational status parameter (11.2) for both the Controlled Port and the Uncontrolled Port  
7 offered by a given IEEE 802.11 infrastructure virtual LAN is TRUE if the IEEE 802.11 access point or non-  
8 AP station is both associated to (IEEE Std 802.11-2012 Clause 4.5.3.3) and authenticated to (IEEE Std  
9 802.11-2012 Clause 4.5.4.2) the remote station, and the MAC\_Enabled status parameter is TRUE, else  
10 MAC\_Operational is FALSE.  
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12 If the adminPointToPointMAC parameter has the value Auto (11.3), then the operPointToPointMAC  
13 parameter for any ISS offered by the IEEE 802.11 infrastructure convergence function is TRUE.  
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### 15 **12.2.3 IEEE 802.11 non-GLK non-AP convergence function**

16 The IEEE 802.11 non-GLK non-AP convergence function offers an instance of the ISS to the upper layers,  
17 and uses an instance of the MA-UNITDATA service offered by an underlying non-GLK non-AP IEEE  
18 802.11 station.  
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20 When an ISS M\_UNITDATA.request primitive is received, the IEEE 802.11 non-GLK non-AP convergence  
21 function generates a corresponding 802.11 MA-UNITDATA.request as described in 12.2.4.  
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24 When an IEEE 802.11 MA-UNITDATA.indication primitive is received, the IEEE 802.11 non-GLK non-AP  
25 convergence function generates a corresponding ISS M\_UNITDATA.indication as described in 12.2.4.  
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### 27 **12.2.4 IEEE 802.11 parameter mapping**

28 When an ISS M\_UNITDATA.request primitive is received, the IEEE 802.11 convergence function (12.2.1,  
29 12.2.2, or 12.2.3) generates a corresponding IEEE 802.11 MA-UNITDATA.request or IEEE 802.11  
30 DS-UNITDATA.request as follows:  
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- 32 a) The destination\_address, source\_address, priority, and frame\_check\_sequence parameters are  
33 passed verbatim as the destination address, source address, priority, and frame check sequence  
34 parameters, respectively.
- 35 b) The M\_UNITDATA mac\_service\_data\_unit parameter is passed verbatim as the MA-UNITDATA  
36 or DS-UNITDATA data parameter.
- 37 c) The ISS M\_UNITDATA drop\_eligible, service\_access\_point\_identifier, and connection\_identifier  
38 parameters are ignored.  
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41 NOTE—Drop eligibility is a capability defined in IEEE Std 802.11aa. However, it is not represented in the  
42 M\_UNITDATA service interfaces.  
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- 44 d) The IEEE 802.11 MA-UNITDATA or DS-UNITDATA routing information parameter is null.
- 45 e) The value of the IEEE 802.11 MA-UNITDATA or DS-UNITDATA service class parameter is  
46 QoSack.  
47

48 When an IEEE 802.11 MA-UNITDATA.indication or DS-UNITDATA.indication primitive is received, the  
49 IEEE 802.11 convergence function (12.2.1, 12.2.2, or 12.2.3) generates a corresponding ISS  
50 M\_UNITDATA.indication as follows:  
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- 52 a) The destination address, source address, priority, and frame check sequence parameters are passed  
53 verbatim as the destination\_address, source\_address, priority, and frame\_check\_sequence  
54 parameters, respectively.

- 1           b) The MA-UNITDATA or DS-UNITDATA data parameter is passed verbatim as the M\_UNITDATA  
2           mac\_service\_data\_unit parameter.  
3           c) The ISS M\_UNITDATA drop\_eligible parameter is False.  
4           d) The ISS M\_UNITDATA service\_access\_point\_identifier and connection\_identifier parameters are  
5           null.  
6           e) The IEEE 802.11 MA-UNITDATA or DS-UNITDATA routing information and service class  
7           parameters are ignored.  
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