14. Encoding of Bridge Protocol Data Units ~~Use of BPDUs by MSTP~~

<< Consistent with the long-term plan of merging .1D and .1Q, the changes to this clause to support shortest path bridging have been applied to a base text that merges 802.1D Clause 9 and 802.1Q-2005 Clause 14. The RSTP and MSTP specifications have been merged in 802.1Q Clause 13—the state machines are capable of executing either RSTP or MSTP.>>

Replace the introductory paragraph of clause 14 with the following:

This clause specifies formats, and the encoding, decoding, and validation of BPDUs exchanged by protocol entities operating RSTP, MSTP, and other protocols enhancing or designed to interoperate with STP, RSTP, or MSTP (Clause 13).

NOTE—The text of this clause was updated by the IEEE Std 802.1Qaq amendment to avoid using references and specified changes to IEEE Std 802.1D-2004 for a number of normative provisions, in order to to make the standard both easier to use and to develop, but without making technical changes in the use of BPDUs by RSTP or MSTP.

Interoperability with STP, the Spanning Tree Protocol specified in IEEE Std 802.1D-1998 (now obsolete) and prior revisions, is provided as specified by the state machines and procedures in Clause 13 of this standard. Parameter type encodings for STP BPDUs are a subset of those used for RSTP, MSTP, and SPT BPDUs, and the fields encoded in STP Configuration BPDUs are a subset of those used in RST BPDUs.

The format of MST BPDUs is compatible with that specified for RST BPDUs, with the addition of fields to convey information for the IST and each MSTI, and is shown in Figure 14-1.

The format of SPT BPDUs comprises the fields specified for MST BPDUs, with the addition of fields that communicate the Agreement Number, Discarded Agreement Number, and Agreement Digest (13.17).

The Protocol Version Identifier encoded in all BPDUs serves to distinguish RST BPDUs, MST BPDUs, and SPT BPDUs. A BPDU Type is also encoded in all BPDUs, and distinguishes the Configuration and TCN BPDUs used by STP and by the spanning tree protocols specified in this standard when interoperating with STP implementations.

Figure 14-1 shows the overall format of RST, MST, SPT and STP Configuration BPDUs. Figure 14-2 shows the format of STP TCN BPDUs

14.1 BPDU Structure

Change clause 14.1 as follows:

14.1.1 Transmission and representation of octets

All BPDUs shall contain an integral number of octets. The octets in a BPDU are numbered starting from 1 and increasing in the order they are put into a Data Link Service Data Unit (DLSDU).When bit positions in an octet or a sequence of octets encode a number, the number is encoded as an unsigned binary numeral with bit positions in lower octet numbers having more significance. Within an octet the bits are numbered from 8 to 1, where 1 is the low-order bit. Where sequences of bits are represented, high order bits are shown to the left of lower order bits in the same octet, and bits in lower octet numbers are shown to the left of bits in higher octet numbers.

	Octet
Protocol Identifier	1–2
Protocol Version Identifier	3
BPDU Type	4
CIST Flags	5
CIST Root Identifier	6–13
CIST External Path Cost	14–17
CIST Regional Root Identifier	18–25
CIST Port Identifier	26–27
Message Age	28–29
Max Age	30–31
Hello Time	32–33
Forward Delay	34–35
Version 1 Length = 0 (RST, MST, SPT BPDUs only)	36
Version 3 Length (MST, SPT BPDUs only)	37–38
MST Configuration Identifier	39–89
CIST Internal Root Path Cost	90–93
CIST Bridge Identifier	94–101
CIST Remaining Hops	102
MSTI Configuration Messages (may be absent)	103–*39 + Version 3 Length*
Version 4 Length (SPT BPDUs only)	(40 + *Version 3 Length)* – (41 + *Version 3 Length)*
SPT Agreement Number, Discarded Agreement Number, Agreement Digest (SPT BPDUs only)	(42 + *Version 3 Length)* – (41 + *Version 3 Length* + *Version 4 Length)*

NOTE—BPDUs are encoded in LLC Type 1 frames following the DSAP, LSAP, and UI fields, so if that frame is received from directly an IEEE 802.3 MAC with the MAC Addresses aligned on an even octet boundaries then the BPDU octet pairs 6 and 7, 14 and 15, 18 and 19, etc. will also be aligned on those boundaries.

Figure 14-1—RST, MST, SPT and STP Configuration BPDU format

	Octet
Protocol Identifier	1–2
Protocol Version Identifier	3
BPDU Type	4

Figure 14-2—STP TCN BPDU format

14.1.2 Components

A Protocol Identifier is encoded in the initial octets of all BPDUs. The single Protocol Identifier value of 0000 0000 0000 0000 identifies the Spanning Tree family of protocols (the Spanning Tree Algorithm and Protocol, the Rapid Spanning Tree Algorithm and Protocol, and the Multiple Spanning Tree Protocol), and BPDUs whose formats are compatible with:

a) STP BPDUs, as specified in this clause (14) and IEEE Std 802.1D-1998
b) RST BPDUs, as specified in this clause and Clause 9 of IEEE Std 802.1D-2004
c) The BPDUs specified in IEEE Std 802.1G, now withdrawn

d) MST BPDUs, as specified in this clause
e) SPT BPDUs, as specified in this clause

NOTE—ISIS-SPB (27.12, 27.28, 28) sends and receives its own PDUs to support the distributed computation of symmetric SPTs.

A Protocol Version Identifier and BPDU Type are also encoded in all BPDUs.

14.2 Encoding of parameter types

Delete the introductory text of clause 14.2 (referencing 802.1D for the encoding of a number of parameter types) clauses 14.2.1 through 14.2.6 and insert replacement clauses 14.2.1 through 14.2.11 as follows:

14.2.1 Encoding of protocol identifiers

A Protocol Identifier shall be encoded in two octets.

14.2.2 Encoding of protocol version identifiers

A Protocol Version Identifier shall be encoded in one octet. If two Protocol Version Identifiers are interpreted as unsigned binary numbers, the greater identifies the more recently defined Protocol Version.

14.2.3 Encoding of BPDU types

The type of the BPDU shall be encoded as a single octet. The bit pattern contained in the octet merely serves to distinguish the type; no ordering relationship between BPDUs of different types is implied.

14.2.4 Encoding of flags

A flag shall be encoded as a bit in a single octet. A flag is set if the bit takes the value 1. A number of flags may be encoded in a single octet. Bits in the octet that do not correspond to flags defined for the BPDU's type are reset, i.e., shall take the value 0. No additional flags will be defined for a BPDU of given protocol version and type.

14.2.5 Encoding of Bridge Identifiers

A Bridge Identifier is a 64-bit unsigned integer. If two Bridge Identifiers are numerically compared, the lesser number denotes the Bridge of the better priority.

NOTE 1—Use of the terms "higher" and "lower" to describe both the relative numerical values and the relative priority of Spanning Tree information can cause confusion, as lesser numbers convey better priorities. In this clause and in Clause 13, relative numeric values are described as "least," "lesser," "equal," and "greater," and their comparisons as "less than," "equal to," or "greater than," while relative Spanning Tree priorities are described as "best," "better," "the same," "different," and "worse" and their comparisons as "better than," "the same as," "different from," and "worse than." The terms "superior" and "inferior" describe comparisons not simply based on strict ordered comparison of priority components.

The four most significant bits of a Bridge Identifier comprise a settable priority component (*13.8*), and can be modified for the CIST or for an MSTI independently of those for other MSTIs (or for the CIST), allowing the Bridge Identifier priority to be used to provide full and independent control over the configuration of each of those trees. Each SPT uses the same Bridge Identfier as the CIST, so SPT Bridge Identifiers are not separately encoded.

NOTE 2—To maintain management compatibility with implementations of IEEE Std 802.1D-1998 and prior revisions, and of IEEE Std 802.1Q prior to the IEEE Std 802.1s-2002 amendment, the priority component is considered to be a 16-bit value for management purposes, but the values that it can be set to are restricted to only those values where the least significant 12 bits are zero (i.e., only the most significant 4 bits are settable).

The next most significant twelve bits of a Bridge Identifier (when encoded, the four least significant bits of the most significant octet plus the second most significant octet) comprise a locally assigned system ID extension, that provides a distinct Bridge Identifier for each MSTI. The CIST is identified by the system ID extension of zero. Each MSTI has a system ID extension value equal to its MSTID, a convention used to convey the MSTID for each MSTI parameter set in an MST BPDU.

The forty eight least significant bits of the Bridge Identifier ensure its uniqueness and are derived from the globally unique Bridge Address (*8.13.8*) and are encoded in the third through eight most significant octets of the encoded identifier according to the following procedure.

The third most significant octet is derived from the initial octet of the MAC Address; the least significant bit of the octet (Bit 1) is assigned the value of the first bit of the Bridge Address, the next most significant bit is assigned the value of the second bit of the Bridge Address, and so on. The fourth through eighth octets are similarly assigned the values of the second to the sixth octets of the Bridge Address.

14.2.6 Encoding of External Root Path Cost and Internal Root Path Cost

The External Root Path Cost shall be encoded in four octets as a number of arbitrary cost units. The Internal Root Path Cost is similarly encoded in four octets. Clause 13.18 recommends Port Path Cost values so that a common interpretation can be placed on path cost values, and reasonable spanning tree configurations obtained without explicit management.

NOTE—IEEE 802.1D refers to the External Root Path Cost as Root Path Cost, and does not use Internal Root Path Cost.

14.2.7 Encoding of Port Identifiers

A Port Identifier is a 16-bit unsigned integer. If two Port Identifiers are numerically compared, the lesser number denotes the port of better priority. The four most significant bits of a Port Identifier is a settable priority component that permits the relative priority of ports on the same bridge to be managed (*13.8*), and can be modified independently for the CIST and each MSTI. The less significant twelve bits is the Port Number expressed as an unsigned binary number, and is same for the CIST and all MSTIs. The value 0 is not used as a Port Number.

The Port Identifier for the CIST is encoded in two octets, comprising both the CIST's priority component and the Port Number used for all spanning trees. The four bit priority component for each MSTI is encoded as a binary number, in the MSTI Configuration Message for that MSTI. Each SPT uses the same Port Identifier as the CIST, so SPT Port Identifiers are not separately encoded.

NOTE—IEEE Std 802.1D-1998 and prior revisions specified a priority component of 8 bits and a Port Number of 8 bits. To maintain management compatibility with prior implementations the priority component is still considered to be an 8-bit value, but its values are restricted to those where the least significant 4 bits are zero (and hence ignored in encoding).

14.2.8 Encoding of Timer Values

Timer Values shall be encoded in two octets, taken to represent an unsigned binary number multiplied by a unit of time of 1/256 of a second. This permits times in the range 0 to, but not including, 256 s to be represented.

14.2.9 Encoding of Port Role values

Port Role values shall be encoded in two consecutive flag bits, taken to represent an unsigned integer, as follows:

a) A value of 0 indicates Master Port;
b) A value of 1 indicates Alternate or Backup;
c) A value of 2 indicates Root;
d) A value of 3 indicates Designated.

NOTE—IEEE Std 802.1D-2004 identified the Port Role value of 0 as Unknown, as it not used as a CIST Port Role in transmitted BPDUs. A received BPDU with a CIST Port Role value of 0 is identfied as a Configuration BPDU.

14.2.10 Encoding of Length Values

Version 1 Length Values are encoded in one octet, taken to represent an unsigned binary number. No further length values are encoded for Version 2. Length Values for Version 3 and 4 are encoded in two octets.

14.2.11 Encoding of Hop Counts

The number of remaining Hops parameter shall be encoded in a single octet.

Delete the prior clause 14.3 and renumber 14.5 as 14.3, with changes as follows:

14.3 Transmission of BPDUs

An MST Bridge Protocol Entity shall encode 0000 0000 0000 0000 in Octets 1 and 2 (conveying the Protocol Identifier), the remaining fields shall be encoded to convey an STP Configuration BPDU, an STP TCN BPDU, an RST BPDU, or an MST BDU as required by the Force Protocol Version parameter, the Port Protocol Migration state machine, and other protocol parameters, all as specified in Clause 13.

a) If transmission of an STP Configuration BPDU is required, the Protocol Version Identifier shall be 0, and the BPDU Type shall be 0000 0000.
b) If transmission of an STP TCN BPDU is required, the Protocol Version Identifier shall be 0, and the BPDU Type shall be 1000 0000.
c) If transmission of an RST BPDU is required, the Protocol Version Identifier shall be 2, and the BPDU Type shall be 0000 0010.
d) If transmission of an MST BPDU is required, the Protocol Version Identifier shall be 3, and the BPDU Type shall be 0000 0010.
e) If transmission of an STP BPDU is required, the Protocol Version Identifier shall be 4, and the BPDU Type shall be 0000 0010.

The remaining parameters for STP Configuration, RST, ~~and~~ MST, and SPT BPDUs shall be encoded as specified below (14.4).

14.4 Encoding and decoding of STP Configuration, RST, and MST, and SPT BPDUs

STP Configuration, RST, ~~and~~ MST, and SPT BPDU protocol parameters are encoded for transmission, and decoded, checked or ignored on receipt as follows:

a) Bit 1 of Octet 5 conveys the CIST Topology Change flag.
b) Bit 2 of Octet 5 conveys the CIST Proposal flag in RST, ~~and~~ MST, and SPT BPDUs. It is unused in STP Configuration BPDUs, and shall be transmitted as 0 and ignored on receipt.

c) Bits 3 and 4 of Octet 5 conveys the CIST Port Role in RST, ~~and~~ MST, and SPT BPDUs. It is unused in STP Configuration BPDUs, and shall be transmitted as 0 and ignored on receipt.
d) Bit 5 of Octet 5 conveys the CIST Learning flag in RST, ~~and~~ MST, and SPT BPDUs. It is unused in STP Configuration BPDUs, and shall be transmitted as 0 and ignored on receipt.
e) Bit 6 of Octet 5 conveys the CIST Forwarding flag in RST, ~~and~~ MST, and SPT BPDUs. It is unused in STP Configuration BPDUs, and shall be transmitted as 0 and ignored on receipt.
f) Bit 7 of Octet 5 conveys the CIST Agreement flag in RST, ~~and~~ MST, and SPT BPDUs. It is unused in STP Configuration BPDUs, and shall be transmitted as 0 and ignored on receipt.
g) Bit 8 of Octet 5 conveys the Topology Change Acknowledge Flag in STP Configuration BPDUs. It is unused in RST, ~~and~~ MST, and SPT BPDUs, and shall be transmitted as 0 and ignored on receipt.
h) Octets 6 through 13 convey the CIST Root Identifier.

NOTE 1—The 12 bit system id extension component of the CIST Root Identifier can be received and subsequently transmitted as an arbitrary value, even in MST BPDUs, since the CIST Root may be an STP Bridge.

i) Octets 14 through 17 convey the CIST External Root Path Cost.
j) Octets 18 through 25 shall take the value of the CIST Regional Root Identifier when transmitted in RST and MST BPDUs, and the value of the CIST Bridge Identifier of the transmitting bridge when transmitted in STP Configuration BPDUs. On receipt of an STP Configuration or RST BPDU both the CIST Regional Root Identifier and the CIST Designated Bridge Identifier shall be decoded from this field. On receipt of an MST BPDU the CIST Regional Root Identifier shall be decoded from this field.
k) Octets 26 and 27 convey the CIST Port Identifier of the transmitting Bridge Port.
l) Octets 28 and 29 convey the Message Age timer value.
m) Octets 30 and 31 convey the Max Age timer value.
n) Octets 32 and 33 convey the Hello Time timer value used by the transmitting Bridge Port.
o) Octets 34 and 35 convey the Max Age timer value.

No further octets shall be encoded in STP Configuration BPDUs. Additional octets in received BPDUs identified by the validation procedure (14.5) as STP Configuration BPDUs shall be ignored. The specification of encoding or decoding of further octets in this subclause refers only to RST, ~~and~~ MST, and SPT BPDUs.

p) Octet 36 conveys the Version 1 Length. This shall be transmitted as 0. It is checked on receipt by the validation procedure (14.5).

No further octets shall be encoded in RST BPDUs. Additional octets in received BPDUs identified by the validation procedure (14.5) as RST BPDUs shall be ignored. The specification of encoding or decoding of further octets in this subclause refers only to MST and SPT BPDUs.

NOTE 2—As Version 2 does not specify any additional fields beyond the end of the Version 0 information, there is no Version 2 Length field specified in Version 2 of the protocol (see Clause 9 of IEEE Std 802.1D), and therefore no need for a Version 2 length field here.

q) Octets 37 and 38 convey the Version 3 Length. Its value is the number of octets taken by the parameters that follow in the BPDU. It is checked on receipt by the validation procedure (14.5).
r) Octets 39 through 89 convey the elements of the MST Configuration Identifier (13.7):
    1) The Configuration Identifier Format Selector is encoded in octet 39 and shall take the value 0000 0000;
    2) The Configuration Name is encoded in octets 40 through 71;
    3) The Revision Level is encoded as a number in octets 72 through 73;
    4) The Configuration Digest is encoded in octets 74 through 89.
s) Octets 90 through 93 convey the CIST Internal Root Path Cost.

t) Octets 94 through 101 convey the CIST Bridge Identifier of the transmitting bridge. The 12 bit system id extension component of the CIST Bridge Identifier shall be transmitted as 0. The behavior on receipt is unspecified if it is non-zero.

NOTE 3—The 4 most significant bits of the Bridge Identifier constitute the manageable priority component for each MSTI and are separately encoded in MSTI Configuration Messages in the BPDU.

NOTE 4—The 4 most significant bits constitute the manageable priority component of each MSTI and are separately encoded in MSTI Configuration Messages in the BPDU.

u) Octet 102 encodes the value of remaining Hops for the CIST.

v) A sequence of zero or more, up to a maximum of 64, MSTI Configuration Messages follows, each encoded as specified below (14.4.1).

No further octets shall be encoded in MST Configuration BPDUs. Additional octets in received BPDUs identified by the validation procedure (14.5) as MST Configuration BPDUs shall be ignored. The specification of encoding or decoding of further octets in this subclause refers only to SPT BPDUs.

w) Octets 1 and 2 following the Version 3 information convey the Version 4 Length. Its value is the number of octets that follow the Version 4 Length in the BPDU, up to but not including octets added by subsequent revisions of this standard and associated with Versions 5 or greater. It is checked on receipt by the validation procedure (14.5).

x) Octets 1 and 2 following the Version 4 Length are encoded (if present) as follows:

1) Bits 1 and 2 of Octet 1 convey the Agreement Number (13.17, 13.27.10).

2) Bits 3 and 4 of Octet 1 convey the Discarded Agreement Number (13.17, 13.27.10).

3) Bits 5 through 8 of Octet 1 are unused, and shall be transmitted as 0 and ignored on receipt.

4) Octet 2 is unused, and shall be transmitted as 0 and ignored on receipt.

y) The remaining Octets following the Version 4 Length and covered by that length comprise the Agreement Digest (13.17.1).

No further octets shall be encoded in BPDUs. Additional octets in received BPDUs shall be ignored.

14.4.1 MSTI Configuration Messages

A single instance of the following set of parameters is encoded for each MSTI supported by the transmitting bridge.

a) Bits 1, 2, 3 and 4, 5, 6, 7, and 8, respectively, of Octet 1 convey the Topology Change flag, Proposal flag, Port Role, Learning flag, Forwarding flag, Agreement flag, and Master flag for this MSTI.

b) Octets 2 through 9 convey the Regional Root Identifier (13.24.2). This includes the value of the MSTID for this Configuration Message encoded in bits 4 through 1 of Octet 1, and bits 8 through 1 of Octet 2.

NOTE—The 4 most significant bits of each MSTI's Regional Root Identifier constitute a manageable priority component.

c) Octets 10 through 13 convey the Internal Root Path Cost.

d) Bits 5 through 8 of Octet 14 convey the value of the Bridge Identifier Priority for this MSTI. Bits 1 through 4 of Octet 14 shall be transmitted as 0, and ignored on receipt.

e) Bits 5 through 8 of Octet 15 convey the value of the Port Identifier Priority for this MSTI. Bits 1 through 4 of Octet 15 shall be transmitted as 0, and ignored on receipt.

Octet 16 conveys the value of remainingHops for this MSTI (13.24.3).

	Octet
MSTI Flags	1
MSTI Regional Root Identifier	2–9
MSTI Internal Root Path Cost	10–13
MSTI Bridge Priority	14
MSTI Port Priority	15
MSTI Remaining Hops	16

Figure 14-3—MSTI Configuration Message parameters and format

14.5 Validation of received BPDUs

The receiving protocol entity ~~An MST Bridge Protocol Entity~~ shall examine Octets 1 and 2 (conveying the Protocol Identifier), Octet 3 (conveying the Protocol Version Identifier encoded as a number), Octet 4 (conveying the BPDU Type) and the total length of the received BPDU (including the preceding fields, but none prior to the Protocol Identifier) to determine the further processing required as follows:

a) If the Protocol Identifier is 0000 0000 0000 0000, the BPDU Type is 0000 0000, and the BPDU contains 35 or more octets, it shall be decoded as an STP Configuration BPDU.

b) If the Protocol Identifier is 0000 0000 0000 0000, the BPDU Type is 1000 0000 (where bit 8 is shown at the left of the sequence), and the BPDU contains 4 or more octets, it shall be decoded as an STP TCN BPDU (9.3.2 of IEEE Std 802.1D).

c) If the Protocol Identifier is 0000 0000 0000 0000, the Protocol Version Identifier is 2, and the BPDU Type is 0000 0010 (where bit 8 is shown at the left of the sequence), and the BPDU contains 36 or more octets, it shall be decoded as an RST BPDU.

d) If the Protocol Identifier is 0000 0000 0000 0000, the Protocol Version Identifier is 3 or greater, ~~and~~ the BPDU Type is 0000 0010, and the bridge is configured as an MST Bridge or an SPT Bridge or according to a future revision of this standard that intends to provide interoperability with prior revisions, and the BPDU:

   1) Contains 35 or more but less than 103 octets; or
   2) Contains a Version 1 Length that is not 0; or
   3) Contains a Version 3 length that does not represent an integral number, from 0 to 64 inclusive, of MSTI Configuration Messages;

   it shall be decoded as an RST BPDU.

e) If the Protocol Identifier is 0000 0000 0000 0000, the Protocol Version Identifier is 3 or greater ~~and~~ the bridge is configured as an MST Bridge or the Protocol Version Identifier is 3 and the bridge is configured as an SPT Bridge or according to a future revision of this standard that intends to provide interoperability with prior revisions, and the BPDU Type is 0000 0010, and the BPDU contains:

   1) 102 or more octets; and
   2) A Version 1 Length of 0; and
   3) A Version 3 length representing an integral number, from 0 to 64 inclusive, of MSTI Configuration Messages;

   it shall be decoded as an MST BPDU.

f) If the Protocol Identifier is 0000 0000 0000 0000, the Protocol Version Identifier is 3 or greater, and the BPDU Type is 0000 0010, and the bridge is configured as an SPT Bridge or according to a future revision of this standard that intends to provide interoperability with prior revisions, and the BPDU contains:

   1) 102 or more octets; and
   2) A Version 1 Length of 0; and

3) A Version 3 length representing an integral number, from 0 to 64 inclusive, of MSTI Configuration Messages;
4) and is not a well-formed an SPT BPDU, i.e.:
   i) contains less than 6 octets following the octets specified by the Version 3 length
   ii) has a Version 4 length that is less than 4
   iii) does not contain an MST Configuration Identifier Format Selector of 1.

it shall be decoded as an MST BPDU.

g) If the Protocol Identifier is 0000 0000 0000 0000, the Protocol Version Identifier is 4 or greater, and the BPDU Type is 0000 0010, and the bridge is configured as an MST Bridge or an SPT Bridge or according to a future revision of this standard that intends to provide interoperability with prior revisions, and the BPDU contains:
   1) 106 or more octets; and
   2) A Version 1 Length of 0; and
   3) A Version 3 length representing an integral number, from 0 to 64 inclusive, of MSTI Configuration Messages;
   4) and is a well-formed an SPT BPDU, i.e. contains:
      i) at least 6 octets following the octets specified by the Version 3 length
      ii) a Version 4 length of 4 or greater
      iii) an MST Configuration Identifier Format Selector of 1.

   it shall be decoded as an SPT BPDU.

h) Otherwise the BPDU shall be discarded and not processed.

NOTE 1—The LLC LSAP that identifies BPDUs is reserved for standard protocols, no other protocols using that LSAP have been standardized though they may be at some future time. At that time BPDUs with different Protocol Identifiers may be processed according to the rules of those protocols, but will still be discarded from the point of view of MSTP.

NOTE 2—These validation rules do not contain a loopback check of the form specified for use with STP Configuration BPDUs in 9.3.4 of IEEE Std 802.1D-2004.

14.6 Validation and interoperability

The validation rules above (14.5) follow a consistent general approach that allows future version enhancements to be made while retaining backwards compatibility. In particular tests (a) and (b) in 14.5 above do not check the Protocol Version Identifier.

In general, for an implementation that supports version A of a given protocol, a received PDU of a given type that carries a protocol version number B is interpreted as follows:

i) Where B is greater than or equal to A, the PDU shall be interpreted as if it carried the supported version number, A. Specifically:
   1) All PDU types, parameters, and flags that are defined in version A shall be interpreted in the manner specified for version A of the protocol for the given BPDU type.
   2) All PDU types, parameters, and flags that are undefined in version A for the given BPDU type shall be ignored.
   3) All octets that appear in the PDU beyond the largest numbered octet defined for version A for the given BPDU type shall be ignored.

j) Where B is less than A, the PDU shall be interpreted as specified for the version number, B, carried in the BPDU. Specifically:
   1) All PDU parameters and flags shall be interpreted in the manner specified for version B of the protocol for the given PDU type.
   2) All PDU parameters and flags that are undefined in version B for the given BPDU type shall be ignored.
   3) All octets that appear in the PDU beyond the largest numbered octet defined for version B for the given BPDU type shall be ignored.

NOTE 3—In other words, if the protocol version implemented differs from the protocol version number carried in the PDU, then only those PDU types, parameters, and flags that are specified within the lesser numbered protocol version are interpreted by the implementation (in accordance with the lesser numbered protocol version's specification), and no attempt is made to interpret any additional PDU types, parameters, and flags that may be specified within the greater numbered protocol version. In the specific case of STP (version 0) and RSTP (version 2), as there is only a single RST BPDU type defined in version 2, and as the RST BPDU type is undefined in version 0, a version 0 implementation will ignore all RST BPDUs. Version 2 implementations, however, recognize and process both version 0 and version 2 BPDUs. As version 2 makes no changes to the BPDU types defined for version 0 (and always transmits such BPDU types with 0 as the version identifier), version 0 BPDUs are always interpreted by version 2 implementations according to their version 0 definition.