13.6 Point to Multipoint Network convergence function

13.6.1 Point to Multipoint Networks

A Point to Multipoint Network (PMPN) is a time-division multiplexed-access network that supports two types of transmissions: unicast transmission for node-to-node transmission and multicast/broadcast transmission for one-node-to-other/all-nodes transmission. Each node-to-node link has its own bandwidth characteristics that could change over time.

A PMPN is physically a shared network, in that a PMPN node has a single physical port connected to the half-duplex medium, but is also a logically fully-connected one-hop mesh network, in that every node could transmit to every other node using its own link profile over the medium.

In order to easily adapt a PMPN to the large number of existing networking technologies that are optimized for networks consisting of point-to-point LANs, the PMPN convergence function makes the PMPN appear, to the higher layers, to consist of some number of virtual point-to-point virtual LANs. The networking technologies enabled by this simulation include routing, bridging, and protection switching, along with a wide range of associated networking protocols.

13.6.2 PMPN Convergence function

A system can connect to a PMPN node via the PMPN convergence function. The PMPN convergence function provides zero or more ISS SAPs to the upper layers, each one attached to a virtual point-to-point LAN connecting to another PMPN node. If the PMPN incorporates its own link security capability, rather than utilizing IEEE Std 802.1X and/or IEEE Std 802.1AE, then the PMPN convergence function offers two instances of the ISS to the system for each virtual point-to-point LAN, an Uncontrolled Port and an Uncontrolled Port. (See 13.2.2 for an example.)

The PMPN convergence function makes use of a single PMPN SAP offered by the PMPN node. The PMPN SAP is similar to the ISS, except that it includes a station vector parameter, specifying to which of the PMPN nodes (equivalently, to which of the virtual point-to-point LANs) the request is directed, or from which the indication is presented.

A PMPN SAP request primitive can be directed to any non-empty subset of the PMPN nodes, including all of them. The station vector is supplied with the request primitive so that the PMPN node 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 bandwidth usage. For the PMPN SAP indication primitive, the station vector always indicates from which single PMPN node the indication was received.

The number of virtual point-to-point LANs implemented, and thus the number of SAPs offered to the upper layers by the PMPN convergence function, are an implementation choice. PMPN nodes can be dynamically added and removed from the PMPN network, and direct links between PMPN nodes can be created or destroyed. An implementation can choose, as these events occur, to create and destroy virtual point-to-point LANs and SAPs, or it can manipulate the MAC_Operational parameters of the SAPs to make them available for use or not.

NOTE—Clause 8.6 of IEEE Std 802.1Q 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. 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 PMPN convergence function passes those parameters along to the PMPN SAP along with a station vector, indicating from which ISS instances the request primitive was received (and thus, to which virtual point-to-point LANs it is directed), and constructs an PMPN request primitive, mapping the parameters as required by the particular medium.

On receipt of a valid PMPN indication primitive and station vector, the PMPN convergence function generates an M_UNITDATA.indication primitive on the ISS instance specified by the station vector, mapping the parameters as required by the particular medium.

The ISS MAC_Operational status parameter (11.2) for both the Controlled Port and the Uncontrolled Port offered by a given PMPN virtual LAN is TRUE if virtual point-to-point LAN between the two PMPN nodes is established and authenticated, and the MAC_Enabled status parameter is TRUE, 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 PMPN General Link convergence function is TRUE.