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Proposed PAR: PBN MAC Scaling

The Project is a: Amendment to Std 802.1ad

Scope of Proposed Project:

This standard specifies protocols, procedures, and managed objects supporting the scaling of MAC addresses within the Provider Bridged Network (PBN). There are two defined applications. The first defined application is the prevention of Filtering Database (FDB) overflow, and associated broadcast traffic generation, at bridges within the PBN. The second defined application is the separation of customer-associated MAC addresses from provider-associated MAC addresses (specifically the ‘hiding’ of customer MAC addresses) within the PBN for administrative and/or security purposes. The scope of the project includes only amendment of P802.1ad provider bridges function, static (ie., provisioned) or dynamic determination as to whether or not a particular provider-bridge port performs the scaling function, and the means to learn the association between Customer MAC addresses at a remote site and the provider MAC address, if any, by which they are represented

Is the completion of this document contingent upon the completion of another document? Yes

Functions specified by this amendment to P802.1ad may correspond, in part, to functions specified by P802.1ah. In such cases, the amendment may reference P802.1ah.

Purpose of Proposed Project:

This project allows a customer-facing provider-edge bridge port MAC address to represent the collection of customer MAC addresses associated with the locally attached customer site. This provides an efficient means of MAC scaling when the customer site exposes more than one (or in general more than N) customer MAC address to the PBN.

Frames forwarded by the local Provider Edge Bridge towards a remote Provider Edge Bridge (1) encapsulate the Customer Source MAC if the local customer-facing Provider-Edge Bridge port is designated to perform the scaling function and/or (2) encapsulate the Customer Destination MAC if the remote customer-facing Provider-Edge Bridge port is designated to perform the scaling function.

For applications in which the objective is the separation of Customer and Provider MAC addresses, all Provider-Edge ports perform the scaling function. For applications in which the objective is only the minimization of FDB size requirements, MAC scaling can be made active on customer-facing provider-edge bridge ports serving customer sites having more than one (or in general more than N) Customer MAC addresses.

Reason for the standardization project:

Service Provider Networks (P802.1ad) represent an important application space for IEEE 802 technologies. One advantage of this technology is that it allows the interconnection of customer sites to be performed entirely at layer-2. That is, the enterprise network can be designed as an extended VLAN. This eliminates the need for L3 access devices, and the added provisioning and operations burden implied by such devices.

This type of design poses a challenge to the provider network in that all Customer MACs are exposed to the bridges within the provider network. Providers supporting multiple customers having thousands of users risk overflowing the FDB of, at least some, bridges in the customer network. This results in the generation of broadcast traffic and poor network performance and utilization.

MAC scaling has been addressed for the case of the Provider Backbone Network (PBBN) by P802.1ah. MAC-in-MAC encapsulation in the PBBN eliminates provider visibility to customer MAC addresses. Since a PBB edge bridge generally aggregates traffic from multiple PBNs, it will, in general, ‘represent’ multiple customer MAC addresses. This is the case whether the enterprise network is designed as an

extended VLAN or a collection of L3-interconnected sites (although the number of customer MAC addresses 'represented' will be smaller in the case of L3-interconnection). In the case of MAC scaling in the PBN, the situation is somewhat different. L3-attached customer sites are associated with only a single customer MAC address, while L2-attached customer sites may expose many customer addresses to the PBN. This suggests a requirement (or an option) to perform MAC scaling by encapsulating the Source Customer MAC address, encapsulating the Destination Customer MAC address, performing no encapsulation, or encapsulating both Source and Destination MAC addresses. This feature is particularly useful in environments where most Customer Sites are L3-attached to the Provider Network. The feature may be described as 'selective' encapsulation or 'asymmetric' encapsulation. When a customer-facing Provider Edge Bridge Port 'represents' a site having multiple Customer MAC addresses, the port can be thought-of as providing a 'proxy' for the multiple Customer MACs.

In general, the arguments suggesting that MAC scaling is needed in the Provider Backbone Network, also suggest that MAC scaling is needed throughout the Service Provider Domain. Although it is clear that the FDB of Provider Backbone switches is vulnerable to overflow, if this problem is fixed by scaling measures only in the backbone, the (non-backbone) Provider Network is also exposed. If Backbone Providers have a requirement to limit visibility to Customer MAC addresses, then it is likely that Provider Networks will have a similar requirement.