Token Ring Source Routing Support in IEEE 802.1Q Bridges

Anoop Ghanwani, Wayne Pace, Jeff Lynch, Bob Love
IBM Corporation

This memo discusses the requirements for source routing support in 802.1Q bridges.

On token ring media, the RII bit in the FC field of the frame is used to indicate whether a frame is a source routed frame or a transparently bridged frame. When the RII bit is reset it indicates that the frame is a transparently bridged one, and when set, it indicates that the frame is source routed. There are three types of source routed frames: all routes explorer (ARE), spanning tree explorer (STE), and specifically routed frames (SRF). Support for source routing must specify completely the semantics for handling each of these frame types.

Frame Forwarding Rules

In an 802.1Q bridge *every* user frame is classified as being on exactly one VLAN. For VLAN tagged frames, this is the VLAN specified in the VLAN ID. Untagged frames are classified as being on the VLAN specified by the PVID of the bridge port on which the frame was received. The handling of transparently bridged frames (RII=0) must be done as specified in the current 802.1Q standard. The following specifies the frames handling for source routed frames (RII=1).

- ARE and STE frames must be recognized and processed by the bridge and the RIF must be modified as is currently done in 802.1D source routed bridges.
- STE frames must be sent out on all bridge ports that are on the spanning tree, which also have the frame's VLAN ID in their egress list.
- ARE frames must be sent out on all bridge ports which have the frame's VLAN ID in their egress list regardless of the spanning tree state for that bridge port.
- SRF frames are forwarded based on the contents of the RIF. Note that the RIF is determined by the paths of the ARE or STE and those frames comply with VLAN membership information as contained in the port egress lists.

The above rules extend the capabilities of an 802.1Q bridge to perform source routing for token ring media. A source routing 802.1Q bridge modifies and parses the RIF field of source routed frames. Adding source routing support to an 802.1Q bridge is expected to add the same amount of complexity as adding source routing function to an 802.1D bridge.

Implications for GVRP for Propagation of VLAN Membership

A source routing bridge will typically run the spanning tree algorithm to insure loop free connectivity for traffic addressed to broadcast, multicast and functional addresses. However, ARE and SRF frames are allowed to override the spanning tree port state; i.e. ARE and SRF frames may be sent out ports which are in the blocked state as far as the spanning tree is concerned. This property must be preserved in 802.1Q source routing bridges.

802.1Q VLANs operate in the context of a single spanning tree where the set of bridge ports in a VLAN is some subset of all the bridge ports on the spanning tree. GVRP (GARP VLAN Registration Protocol) is used to propagate VLAN membership information across bridges. The current specification requires that GVRP operate in the context of the spanning tree. This means that in a network that relies on GVRP for dynamic propagation of VLAN membership information, the AREs will essentially be constrained to finding and reporting only the path along the spanning tree.