Resolving the Single vs. Multiple Address Table Issue

IEEE 802.1q

July 7-11, 1997

Maui, Hawai'i

The Impasse

- Within the context of the current model:
- Support a range of network configurations and behaviors
  - **Leakiness and security characteristics**
  - **‘Bouncing address’ problems**
  - **Address resolution ambiguity**
- Support a variety of switch implementations
  - **# of VLANs**
  - **# of address tables**

Restate the problem

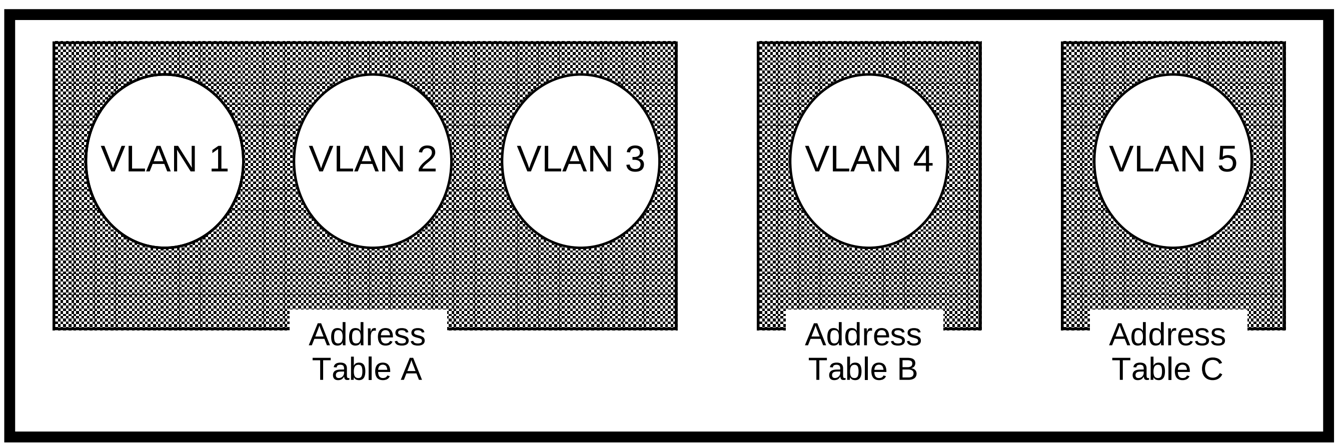
- Define two VLAN types
- Formalize VLAN to address table mapping
- Define learning behavior as a function of VLAN type

There are two types of VLANs

- ‘Asymmetric’ or ‘Leaky’
- ‘Symmetric’ or ‘Secure’

Address table mapping

- Postulate an association of VLANs to address tables within a switch



Learning behavior

- Both types of VLANs may be simultaneously supported by a single switch
- Conventional source address learning populates one or more address tables based on the VLAN type according to the following rules:

Address Table Mapping Rules

- Symmetric
  - **All symmetric VLANs supported by a switch must populate different address tables**
- Asymmetric
  - **All asymmetric VLANs supported by a switch must populate a single address table**

Indication of VLAN type

- Each VLAN must have an associated ‘symmetry’ attribute that is communicated to the switches supporting that VLAN
- Explicit indication
  - **GVRP carries the symmetry bit with each VLAN registration**
- Implicit indication
  - **Define ‘symmetry’ as a bit within the existing 12-bit VLAN tag**

We could be done here, but...

- The rules as stated above allow for the co-existence and interoperation of both types of VLANs
- However, the rules do not allow any latitude in address table assignment
- There is an additional refinement to the model to allow address table mapping to be more flexible and thereby allow the mapping to be optimized for a given switch implementation

Enhancements to the model

- Derive additional flexibility in address table usage by defining groups of VLANs of a given type
  - **Asymmetric groups**
  - **Symmetric groups**

Enhanced Address Table Mapping Rules

- Asymmetric
  - **Within a switch, all asymmetric VLANs *in a given asymmetric group* must populate a single address table**
- Symmetric
  - **Within a switch, all symmetric VLANs *in a given symmetric group* must populate address tables distinct from each other and distinct from any asymmetric group**

Two Observations on the Enhanced Rules

- Any number of asymmetric groups may share the same address table. In fact, all asymmetric groups, and therefore all asymmetric VLANs could share a single address table in all switches.
- A single address table can further be shared by any number of symmetric VLANs, provided none of them are in symmetric groups.

Two Possible Address Table Assignment Strategies

- Goal: Minimize number of address tables in use
  - **Start with the notion that all VLANs populate a single address table**
  - **Assign each symmetric VLAN in each symmetric group to additional address tables**
- Goal: Maximize number of address tables in use
  - **Start with the notion that each VLAN populates a different address table**
  - **Collapse the asymmetric VLANs in each asymmetric group into a single address table**

Additional Configuration Requirement

- Each VLAN must have an associated group number that is communicated to the switches supporting that VLAN
- Explicit indication
  - **GVRP carries the group number with each VLAN registration**
- Implicit indication
  - **Define ‘group number’ as few bits within the existing 12-bit VLAN tag**

Conclusion

- Define VLAN-to-address table assignment
- Simple model
  - **Defines VLAN types**
- Enhanced model
  - **Defines VLAN types and groupings**