A Layer 2 Gateway Port Mechanism

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Garden Grove 802.1 IEEE Interim, September 2005
Problem definition

- A & B are two independent bridged domains (not running any STP the one with the other)
- B is redundantly connected to A, via ports \( b_1, b_2 \ldots b_n \)
- B wants to elect a unique gateway \( b_i \) to A, while keeping the others ports in standby for redundancy
- There must never be a bridging loop, even temporarily
Run B’s STP over A

- A very common solution consists in running B’s STP over domain A: B’s BPDUs are considered as data traffic by A

Drawbacks:
- Not necessarily obvious to get \( b_1 \) or \( b_2 \) to block
- B’s stability depends on A (what if A drops B’s BPDUs?)
- B’s STP has to be “slower” than A’s in order to prevent temporary loops when A reconverges. It is not even enough…
Run B’s STP over A: transient loop

- If A gets partitioned, both b1 and b2 will end up designated forwarding.
- When A heals, there will be a temporary bridging loop until b1 receives a BPDU from b2. This may last up to STP B’s hello-time (if domain A is intelligent enough to prioritize B’s BPDU). Here, we would rather want B’s STP to be fast…
A hello protocol

- Gateway ports start from a discarding state and exchange hellos in order to elect the designated one

**Advantage:**
- Does not rely on region A at all

**Drawback:**
- Suffers from the same potential transient loop issue as the previous solution
A hello protocol: transient loop

- In fact, this is the same solution as “STP B on the top of domain A”. This is: “hello protocol on the top domain B”

- If B is partitioned, the same transient loop can occur when it heals

The hello protocol would need to be understood by each and every bridge of B to prevent this issue

The two parts of B are connected while b1 and b2 are forwarding: there is a loop until the hellos from b1 reach b2
Layer 2 Gateway Ports

- The Layer 2 Gateway Port solution consists in using the STP of domain B as this hello protocol:
- We define a Layer 2 Gateway Port (L2GP) as a regular port handled by STP, having the two following additional properties:
  1. As long as it is up, an L2GP pretends it is continuously receiving BPDUs, the root bridge ID of which is configured by the user
  2. An L2GP with a designated role is always discarding
L2GP Example

• \( b1 \) and \( b2 \) are L2GPs configured with a fake bridge ID R1 and R2 respectively

• R1 is better than R2, and R2 is better than any bridge in domain B

• As a result:
  - \( b1 \) is a root port, forwarding
    (because its bridge “receives” its best BPDU on \( b1 \))
  - \( b2 \) is a designated port, discarding (rule #2)
L2GP Example: domain healing with no loop

Domain B is split, \( b1 \) and \( b2 \) are root forwarding. A link is then brought up between the two parts.

The STP sync mechanism prevents any temporary loop: the designated discarding port “travels toward” \( b2 \).

When the designated discarding port has reached \( b2 \), the domain has converged to its final topology.
GVRP/MVRP for propagating TCs

- GVRP/MVRP can still be used at the vlan level to prune unnecessary traffic and advertise topology changes
Advantages

- Simple: very light modification to the STP
- Only the bridges hosting the gateway ports need this particular feature
- No transient loop during reconvergence
- Does not require cooperation from the outside domain
- An easy way to ensure that the domain is never a transit domain for its neighbors
Drawbacks

- The Root Bridge is seen as outside the domain, and practically, is at the edge of the domain (physically).
- Granularity of the instance, not the vlan
- Only tracks the physical state of the Gateway Port (may be enhanced)
- The BPDUs received on a L2GP are ignored. The following misconfiguration creates a loop:

  Port b1 is configured as a L2GP, it ignores the BPDUs it receives and goes unconditionally to root forwarding
Possible enhancements

- Tracking mechanism: the priority of the fake Root ID could vary depending on external parameters

- For instance some kind of polling (CFM?) could be achieved through the L2GPs to determine their relative priority
Possible enhancements

- Rule #1 could be optional. The BPDUs from domain A would select the forwarding L2GP:
  - Interesting to just prevent the domain from being a transit area
  - Useful for stability purposes, even in an enterprise network

If the uplinks of the access bridges are configured as L2GPs, the access will never provide redundancy for the distribution.
Possible enhancements

• A L2GP can stay in discarding when it receives its own information (protect against misconfiguration)