Shared Spanning Trees

GOAL

- **Continue operating without loops in any physical connection topology including shared spanning tree switches, 802.1Q mono spanning tree switches, and others.**

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Shared Spanning Trees

(Definitions)

- **MST: Mono Spanning Tree (current 802.1Q)**

- **SST: Shared Spanning Tree (proposed 802.1Q)**

- **PVST: Per-VLAN Spanning Tree (in common use)**

- **CST: Common Spanning Tree. The spanning tree for VLAN 1, the only current 802.1Q spanning tree.**

- **Access Port: Only one VLAN, not tagged.**

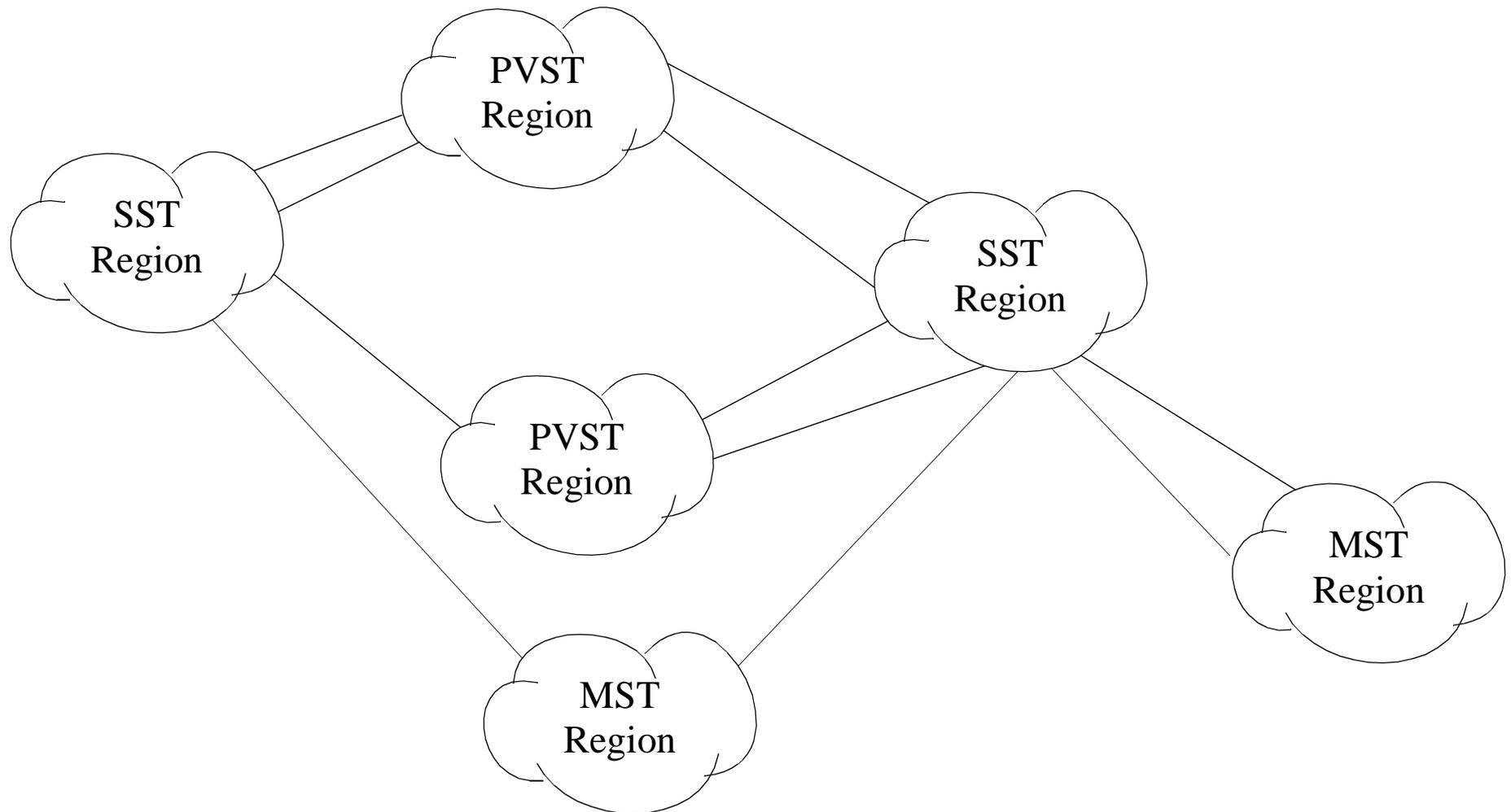- **Trunk Port: Perhaps multiple VLANs, perhaps tagged.**

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Figure 1. Interconnected Regions

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SST backbone

PVST
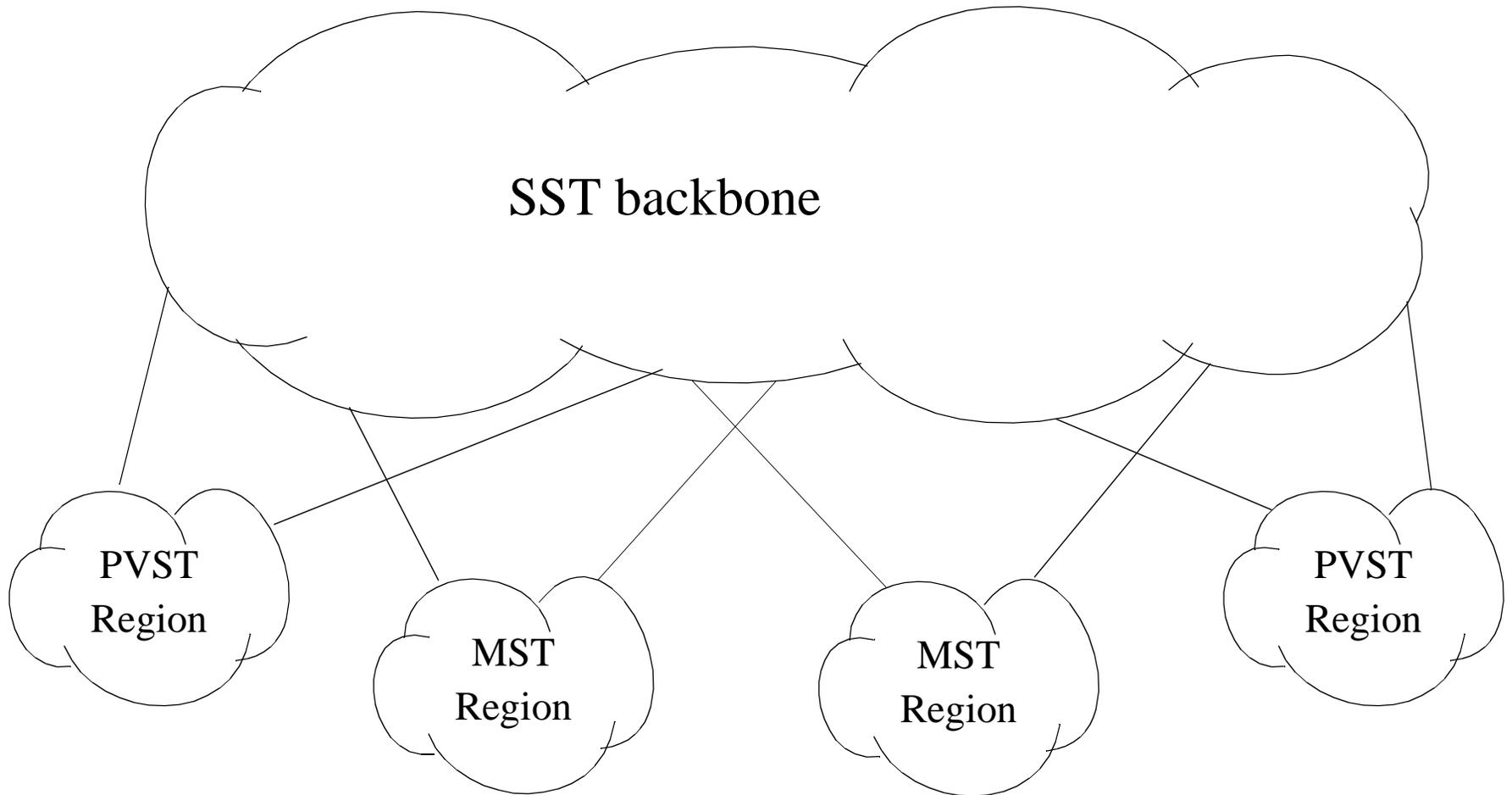Region

MST
Region

MST
Region

PVST
Region
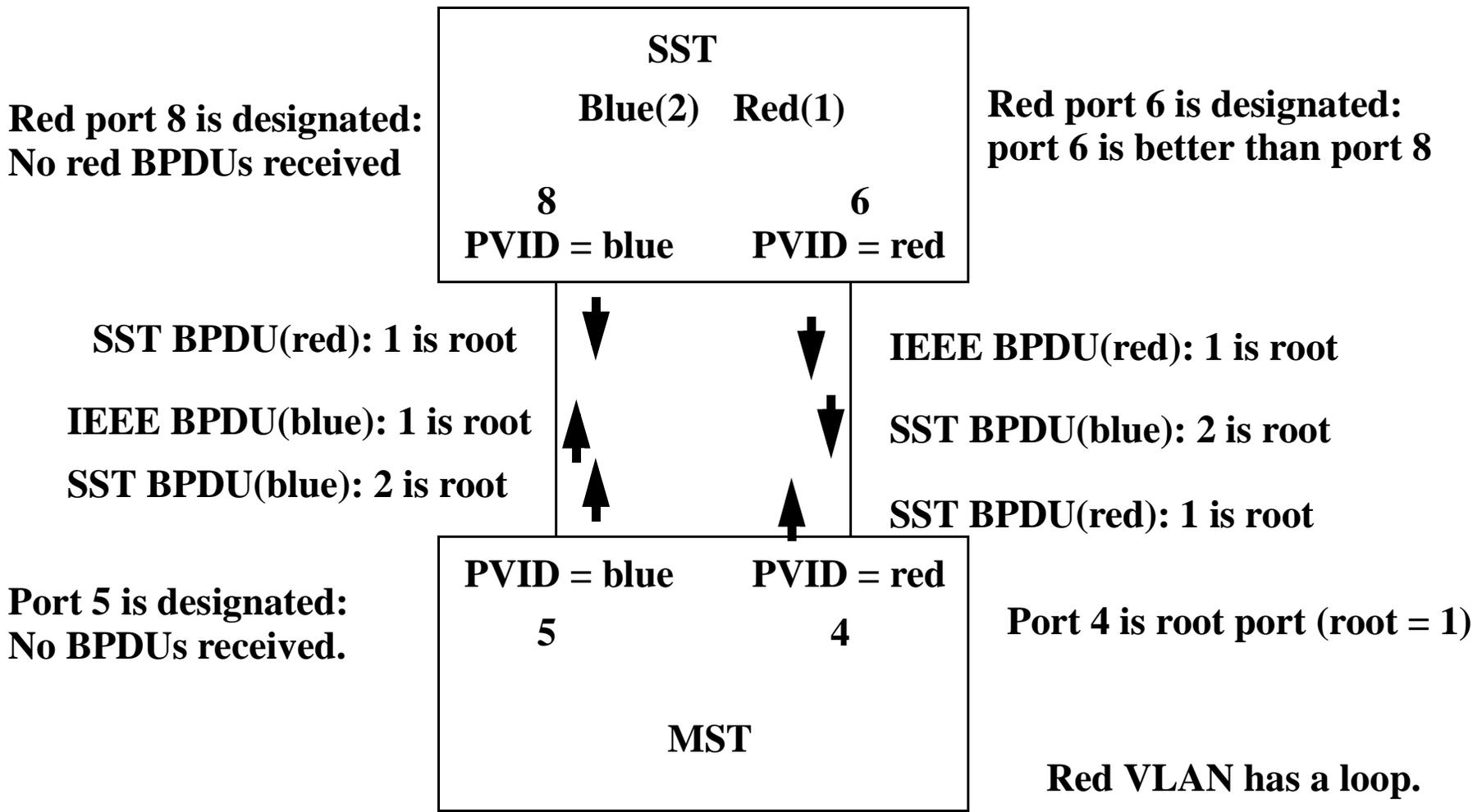
Figure 2. Most Common Situation

Basic Plan

- **BPDUs for SST regions are tunnelled through MST regions. We use a new destination MAC address for SST BPDUs.**

  — **Because MST region will combine all BPDUs sent to old address into a single spanning tree.**

- **All MST spanning trees are mapped to the CST.**

- **Temporary loops occur in 802.1D when wires come and go.**

- **Interruptions in data transmission caused by 802.1D/Q spanning tree disruptions are equivalent to wire changes for tunnelled BPDUs.**

Preventing Temporary Loops

- **SST switches get "more important" root priority, to keep the spanning tree roots in the backbone.**

  — **This forces MST regions with multiple connections to the SST backbone to partition.**

- **SST region meshed so single failures won't partition it.**

- **CST only has shorter forward delay time.**

  — **Provides insurance against root bridge being in an MST cloud.**

Nasty Loop

SST

Blue(2)   **Red(1)**

Red port 8 is designated:
No red BPDUs received

Red port 6 is designated:
port 6 is better than port 8

8
PVID = blue

6
PVID = red

SST BPDU(red): 1 is root

IEEE BPDU(red): 1 is root

IEEE BPDU(blue): 1 is root

SST BPDU(blue): 2 is root

SST BPDU(blue): 2 is root

SST BPDU(red): 1 is root

PVID = blue
5

PVID = red
4

Port 5 is designated:
No BPDUs received.

Port 4 is root port (root = 1)

MST

Red VLAN has a loop.

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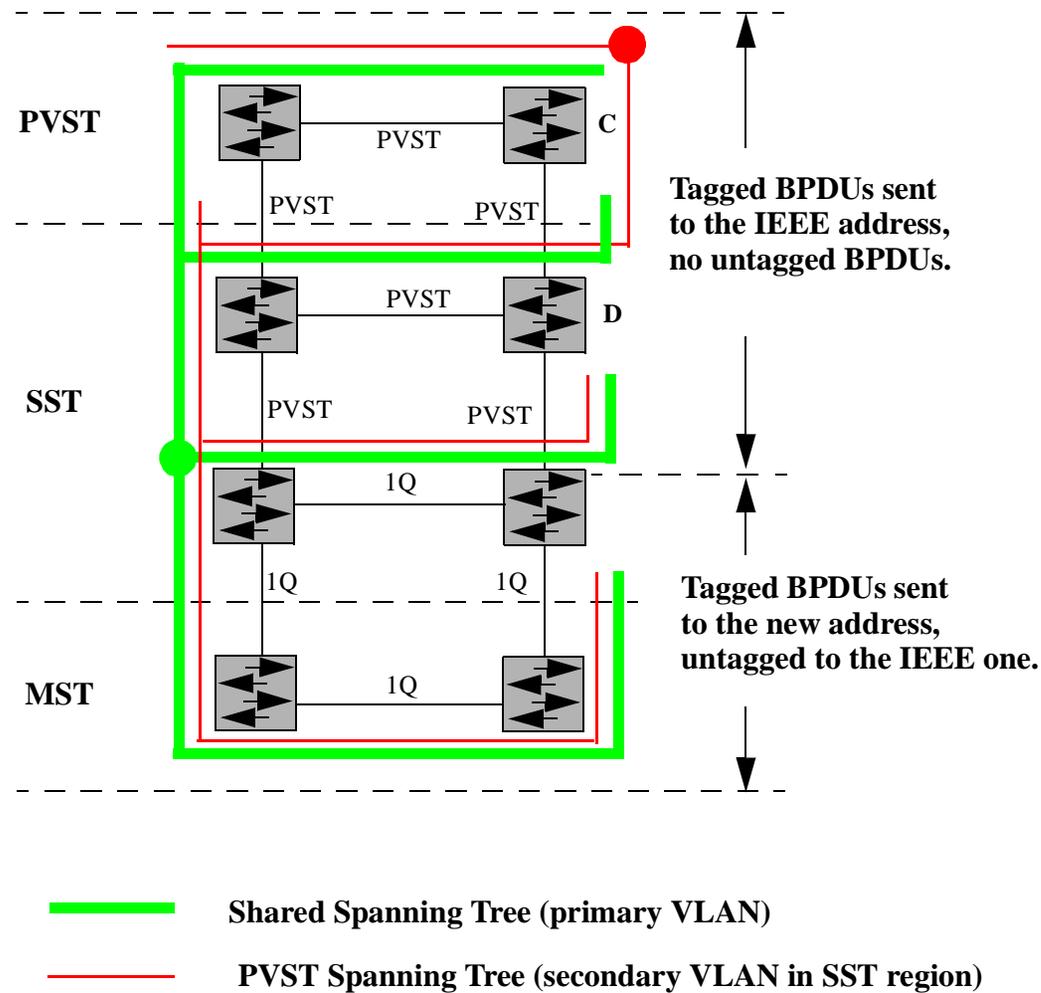
Nasty Loop (continued)

- ## This is why MST spanning trees are assigned to CST.

  — **If all IEEE BPDUs are CST, and not red or blue, loop goes away.**

- ## This is why the distinction between access ports and trunk ports.

  — **Trunk ports really need to stay up.**

  — **Access ports are a common reality.**

  — **Detecting the reception of anomalous BPDUs and blocking the port is acceptable for access ports.**

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Normal Configuration

PVST

PVST C

PVST   PVST

Tagged BPDUs sent to the IEEE address, no untagged BPDUs.

PVST

D

SST

PVST   PVST

1Q

1Q   1Q

Tagged BPDUs sent to the new address, untagged to the IEEE one.

MST

1Q

Shared Spanning Tree (primary VLAN)

PVST Spanning Tree (secondary VLAN in SST region)

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BPDU Rules for SST bridge (transmit)

- **When sending BPDU on trunk port:**

  — **If CST BPDU, use 802.1D address, untagged.**

  — **If non-CST non-PVID BPDU, use new address, tagged.**

  — **If non-CST PVID BPDU, use new address, untagged.**

- **When sending BPDU on access port:**

  — **If primary VLAN in group, use 802.1D address, untagged.**

  — **If secondary VLAN in group, use new address, untagged.**

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BPDU Rules for SST bridge (receive)

- ## From trunk port:

    — **If untagged IEEE BPDU, assign to CST.**

    — **If sent to SST address, process according to which VLAN (spanning tree group) it belongs to.**

- ## From access port:

    — **If IEEE BPDU and port PVID is primary VLAN of spanning tree group, assign to that spanning tree.**

    — **If sent to SST address, block the port.**

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