

A blurred photograph of a modern office hallway with large glass windows and a central revolving door. Several people in business attire are walking through the hallway, their figures slightly out of focus to convey a sense of movement and activity.

SIEMENS

“How to separate multiple copies of one stream?”

CB Seamless Failover

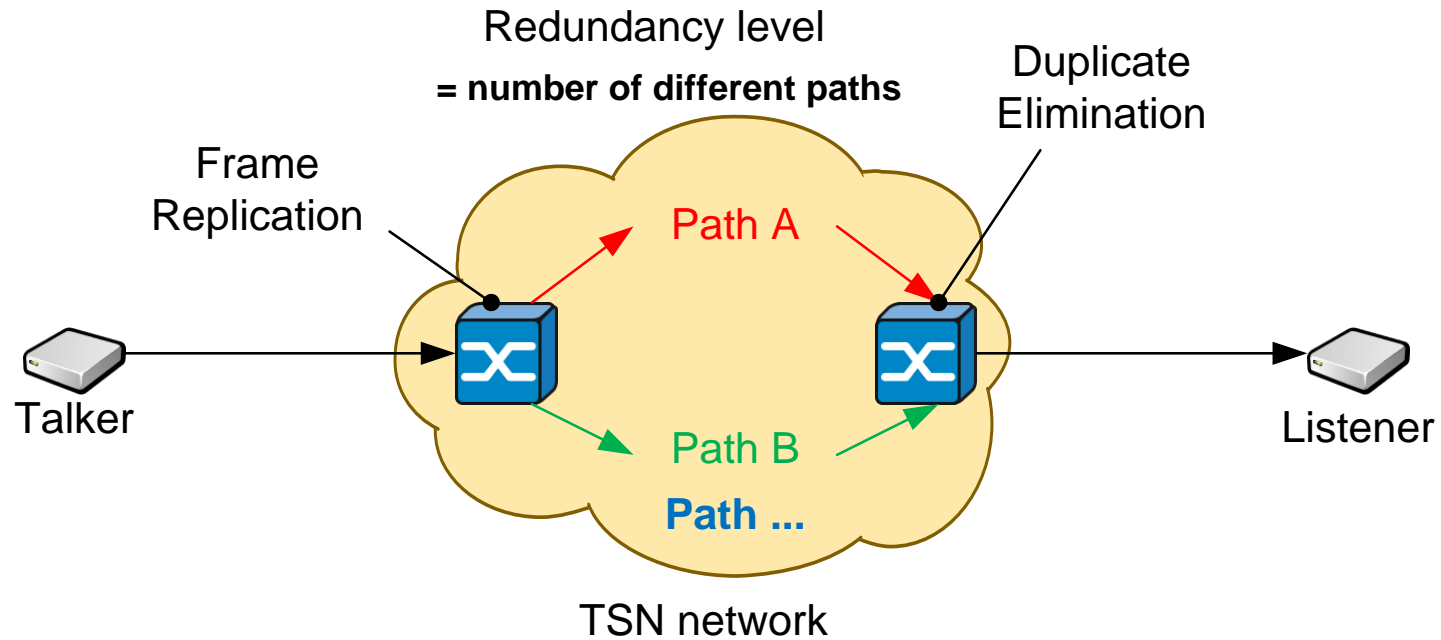
IEEE 802.3 Plenary Session – Dallas
Marcel Kiessling, Siemens AG
Franz-Josef Goetz, Siemens AG

Goal of this presentation

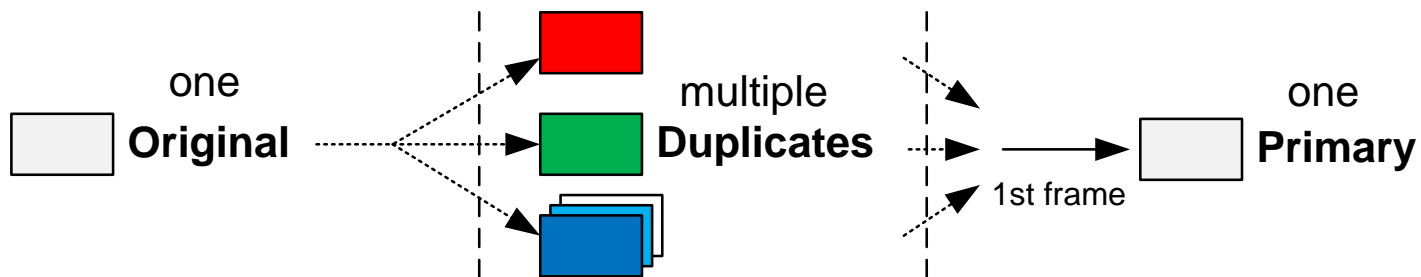
**This presentation shows two possibilities
to separate two streams and their problems**

- **multiple VLAN IDs for one stream**
- **multiple Stream Destination Addresses for one stream**

Definitions used inside this presentation



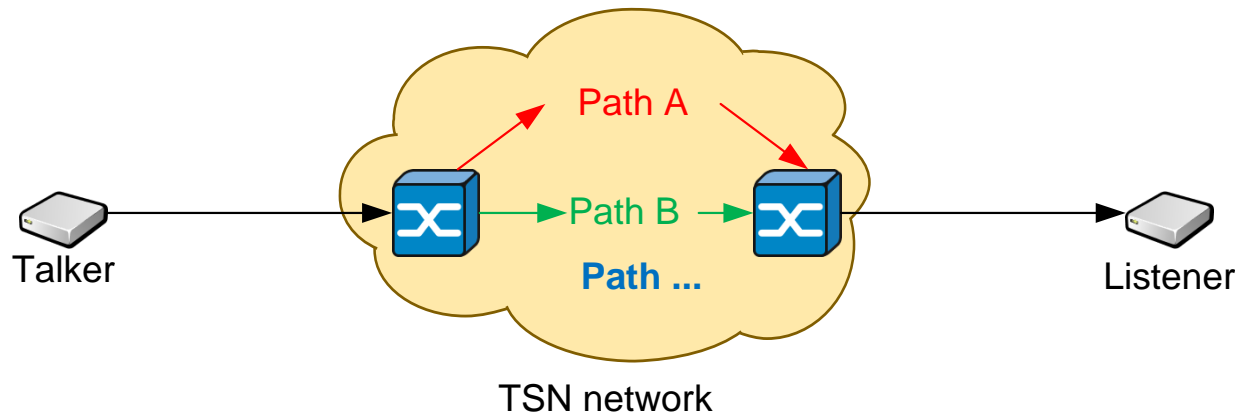
Naming of the Frames



Recap: Principle operation of CB Frame Replication and Elimination for Reliability

Basic principle:

1. Every frame of a stream (stream is identified by its stream destination address) has a sequence number (part of the redundancy tag) to be able to identify **Duplicates**
2. Duplicates are forwarded in the network on multiple (most-) disjoint paths
3. Duplicates are eliminated at a Duplicate Elimination Point



The focus of this presentation is on forwarding of duplicates within a network on multiple (most-) disjoint paths

Recap: Identification of streams

AVB Gen 1 specifies to use a unique Stream Destination Address to identify frames of the stream

- One unique Stream Destination Multicast Address to serve multiple Listener
- One unique Stream Destination Unicast Address to serve one Listener
- **MSRP** controls the FDB for successful forwarding of reserved streams

TSN Goal: support **multiple paths** for one stream.

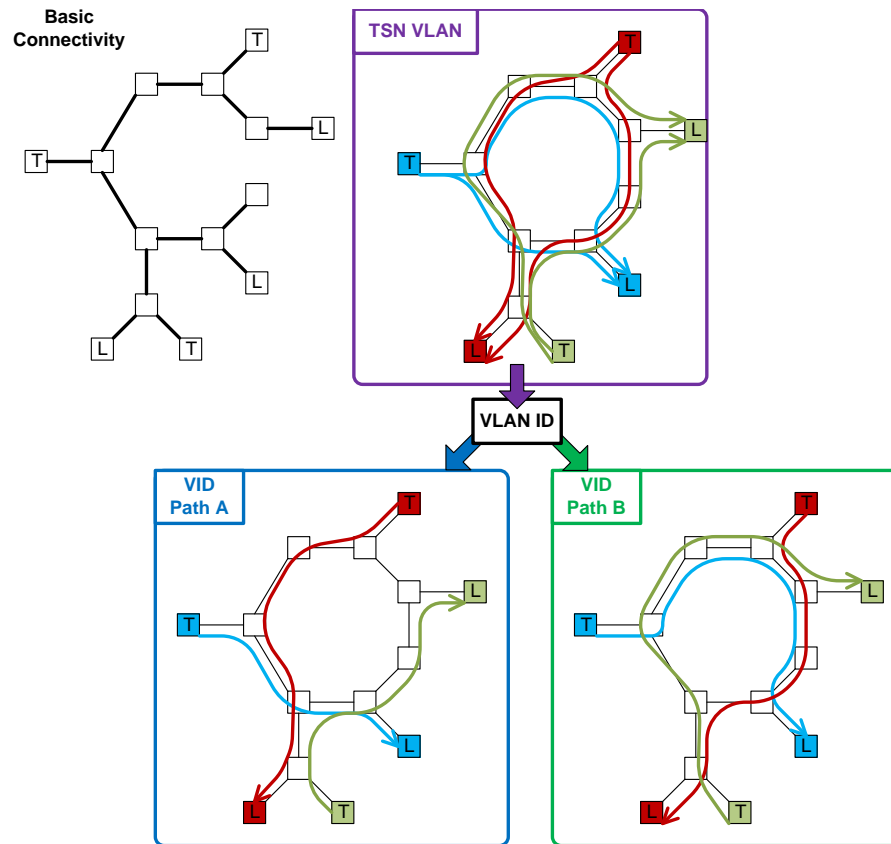
- Qca defines explicit path control to enable non-shortest redundant paths
- CB defines the “Frame Replication and Elimination for High Reliability”
- Every frame of a stream and its duplicates must be distinguishable (to be able to forward it on its path and for duplicate elimination)

Two possible ways to achieve this:

1. Use one stream destination address with **different VIDs** (one VID for each replication)
2. Use **multiple stream destination addresses** with different forwarding paths (one stream destination address for each replication)

CB with VLAN IDs

Previously presented idea with VLAN IDs:



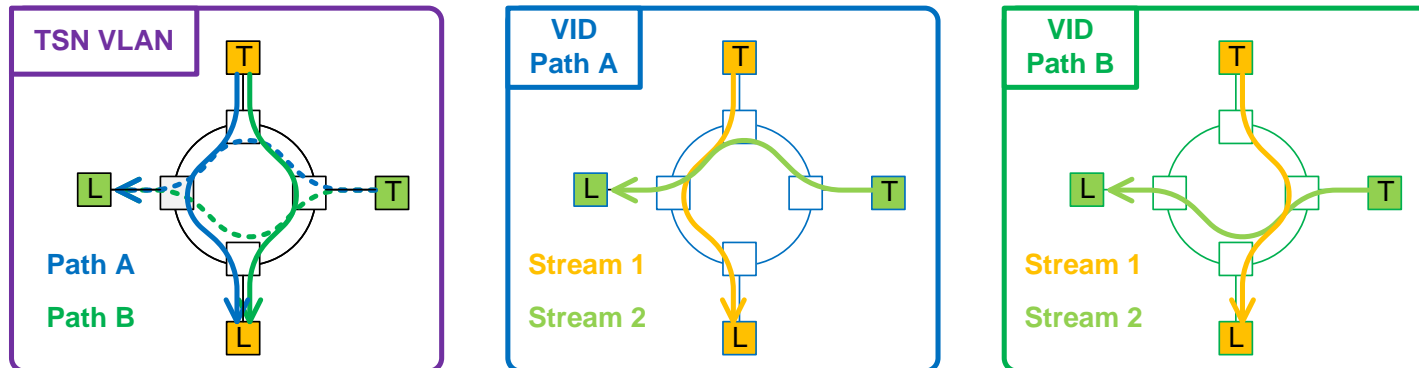
<http://www.ieee802.org/1/files/public/docs2013/ca-kiessling-ISIS-SPB-PCR-for-TSN-0713-v02.pdf>

How is the forwarding process with VLAN IDs?

Wished behavior:

The forwarding decision (set of destination ports) should be defined by the MAC + VLAN ID (VLAN is part of the address in the FDB) **from the FDB**

Simple Use-Case:

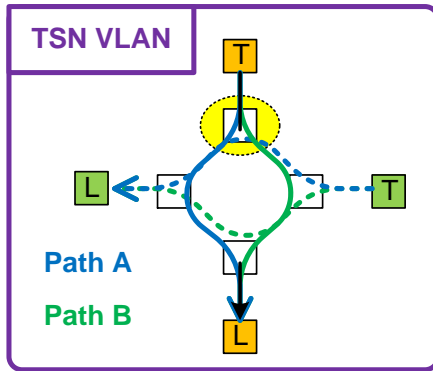


The Forwarding Process takes filtering decisions, i.e., reduces the set of potential transmission Ports (8.6.1), for each received frame on the basis of

- Destination MAC Address;
- VID;
- The information contained in the Filtering Database for that MAC Address and VID;
- The default Group filtering behavior for the potential transmission Port (8.8.6);

<http://www.ieee802.org/1/files/private/q-rev-drafts/d1/IEEE802-1Q-REV-2013-d1-3.pdf>

How is the forwarding process with VLAN IDs?



Forwarding inside the Bridge:

All ports belong to both VLANs (the TSN VLAN)

VLANs of Duplicates differ (Path A or Path B)

How is the mechanism for Frame filtering specified in IEEE 802.1-Q Rev2013?

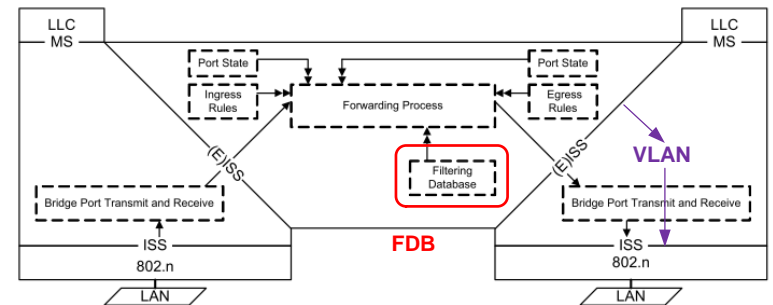
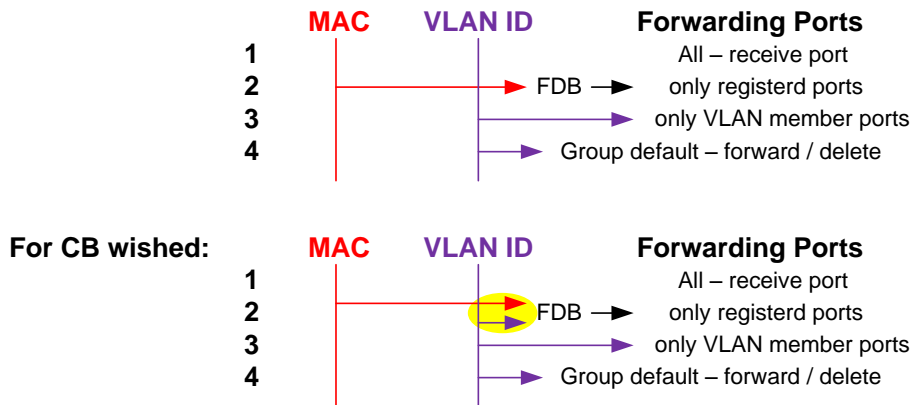
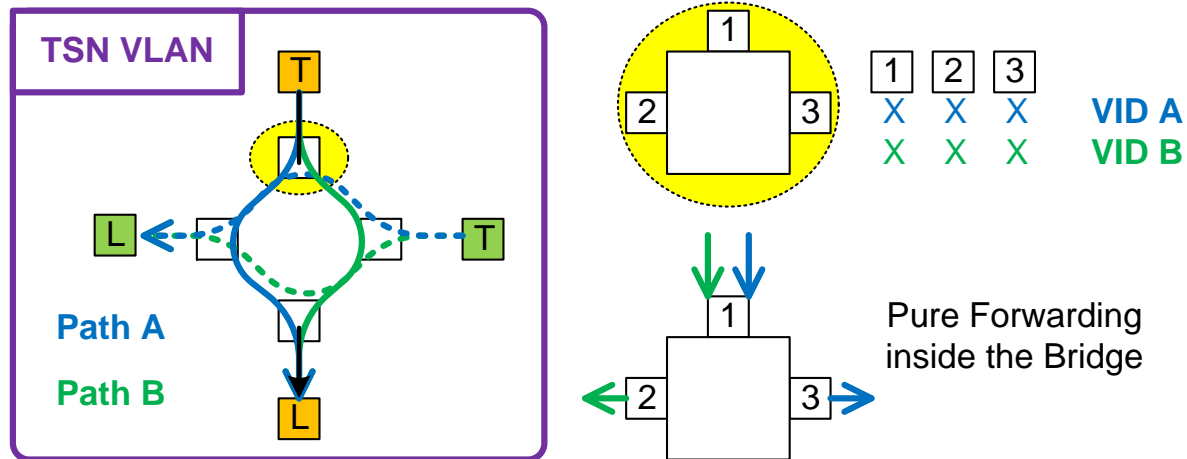


Figure 8-4—Relaying MAC frames

How is the forwarding process with VLAN IDs?



Forwarding inside the Bridge:

One Stream Destination Address

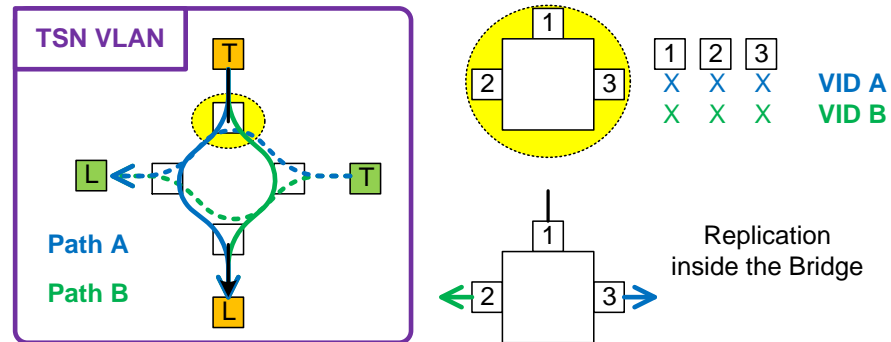
2 VIDs – Active Topology for VID is the complete network

=> Forwarding must be defined for MAC Address and VID **combination**

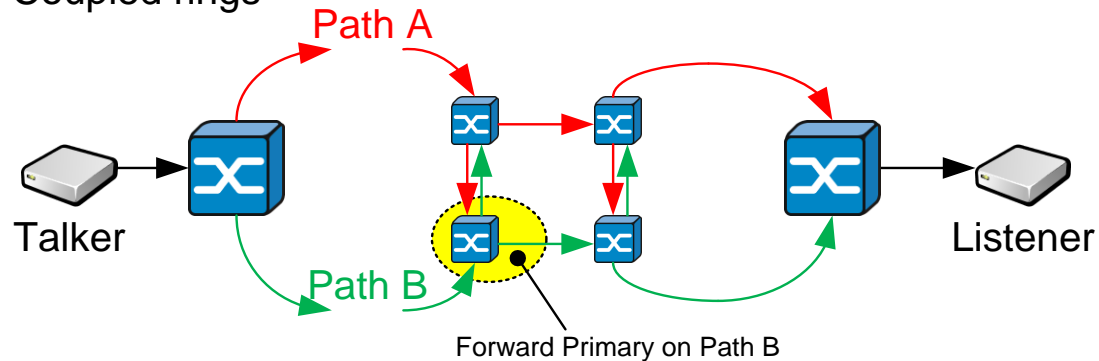
VIDs needs to change if the used Path change:

During Replication inside the first bridge with multiple paths

During Duplicate Elimination (CB in concatenation for high availability of substructures)



Coupled rings



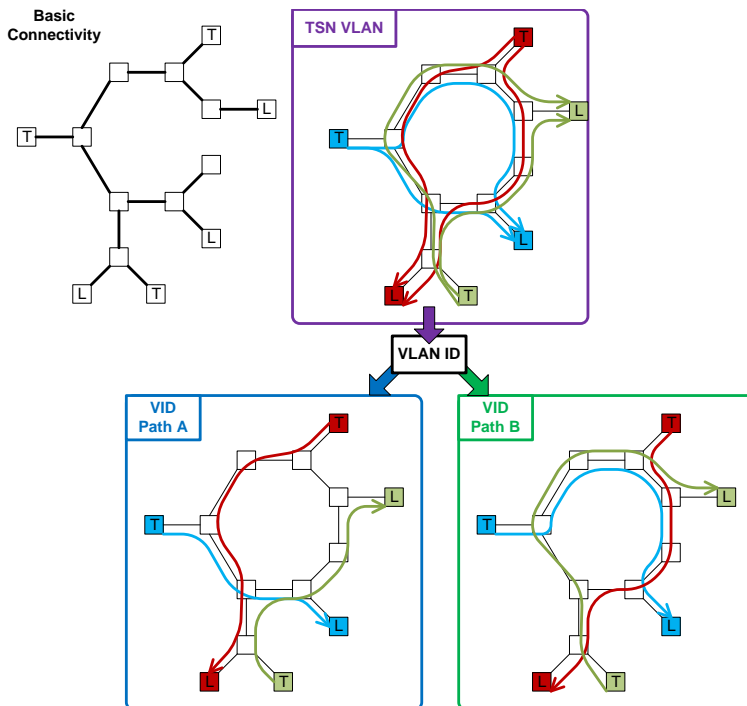
How many VLAN IDs are needed?

Wished: Only one VLAN ID per redundancy level – used for every stream

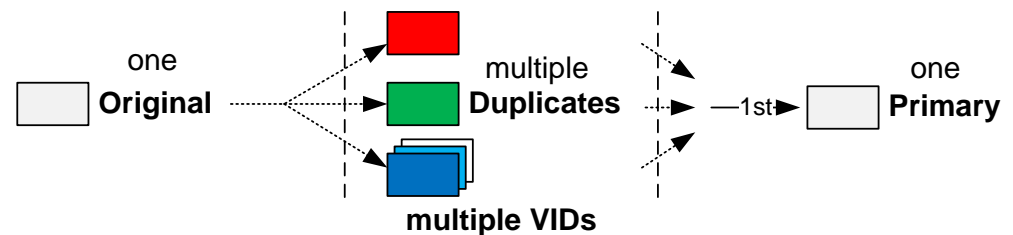
Primary's **of a stream** should be forwarded with a specified VLAN ID

Originals can get a VID during Replication

Duplicates should be forwarded unchanged in the network



1 Stream with 1 Stream destination address



Example shows multiple Streams

Only 2 VLANs to be able to setup 2 disjoint paths for every stream (→ redundancy level = 2)

More than 2 VLANs if multiple (>2) paths are used (only two disjoint path in one ring possible)