# Simplifying Seamless Redundancy

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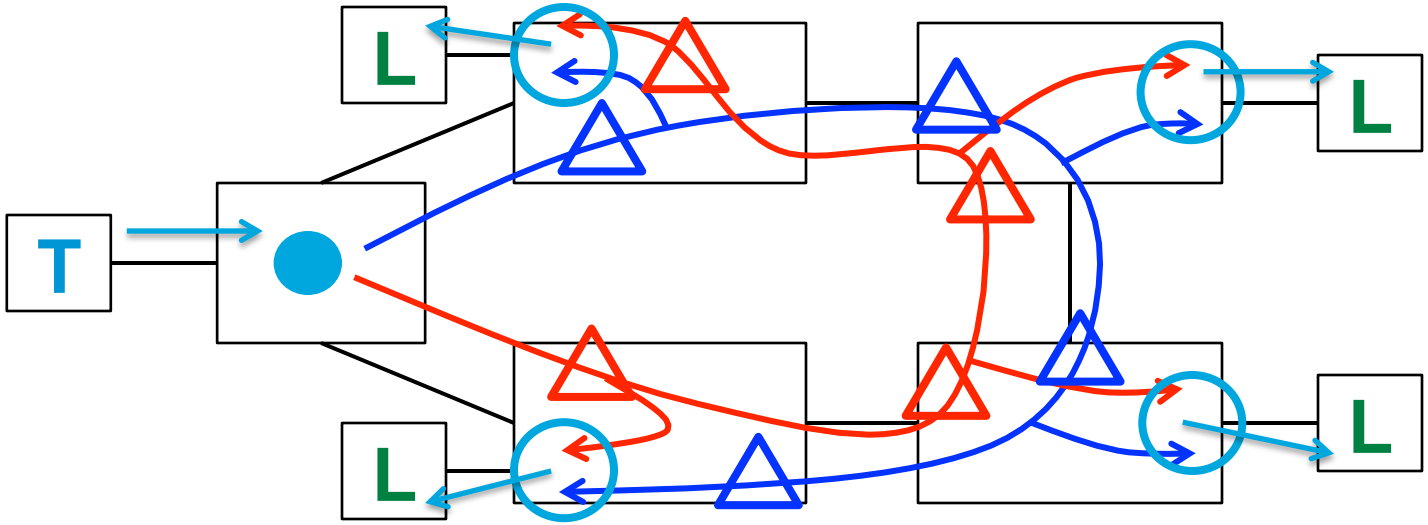
# Problem

- **This document supports a ballot comment on P802.1CB D2.1.**
- At present, configuring P802.1CB requires a massive amount of configuration.
  - Every single Stream's identification (typically {VLAN, MAC address} pair must be configured on every port on which it might be received on every bridge in the network.
  - Every port on which each Stream might be output twice has to be configured with a sequence recovery function and its parameters (e.g. timeout value).
  - Every bridge through which the Stream passes should be configured with an Individual recovery function, requiring the configuration of Stream Identification and the IRF.
- This is a real problem – it will make bringing up a new Stream take too long to meet many needs. The volume of configuration information, itself, will be an impediment to adoption by users.

# What we want:




Seq. Gen. Sequence Recovery Individual Recovery

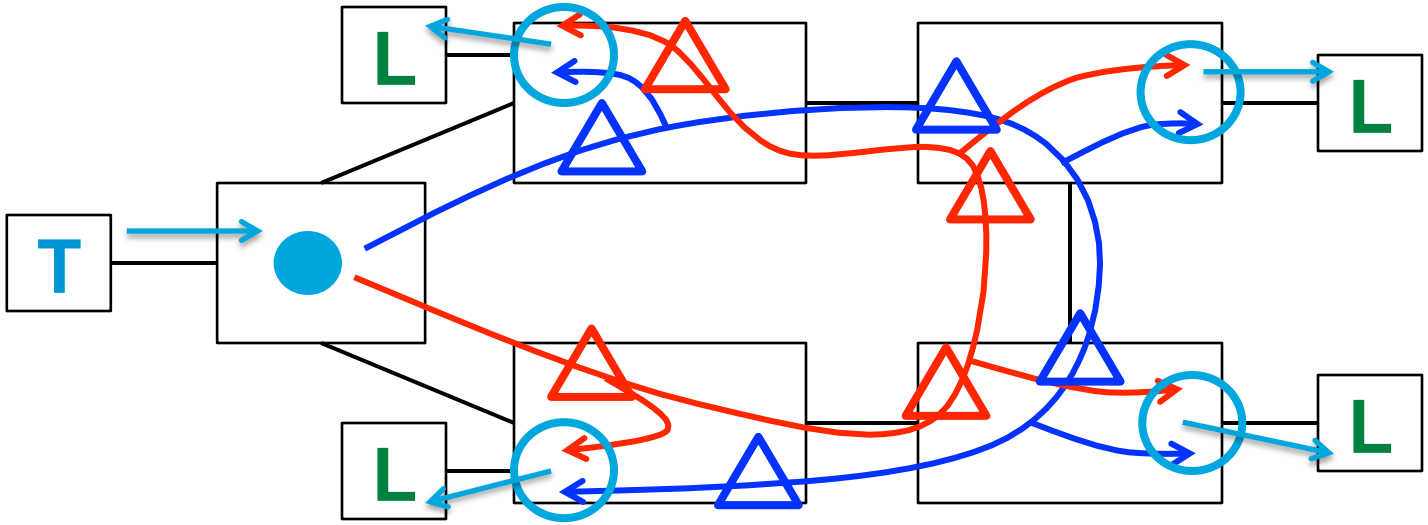
- Each Listener gets only one copy. Packets are not discarded until just before output to the Listeners, so that latent errors can be detected.

# What we want

- We would like Sequence Recovery and Individual Recovery to auto-configure themselves.
- This means that an instance of one or both of these state machines pops into existence whenever a new Stream (for Individual recovery) or a new Seamless Stream (for Sequence recovery) is seen, using default parameters specified by (a little bit of) configuration.
- When the timeout expires, sending a state machine into “accept any” mode, the state machine can be destroyed.
- We must identify the **Seamless Stream** to auto-configure **Sequence Recovery** functions, and we must identify the individual **Stream** for **Individual Recovery** functions.
- We must also distinguish (as we will see) on which ports recovery functions are to be applied.

# Problem 1:
# On what do you base auto-configuration of Sequence and Individual Recovery?

# Which streams are paired?




Seq. Gen. Sequence Recovery Individual Recovery

- **There are > 2 streams in the network! How do you know that red and blue are a pair (belong to the same Seamless Stream)?**

# On what do we base auto-configuration?

| | Sequence Recov. based on | Individual Recovery based on | Comments |
|---|---|---|---|
| 1. | {VLAN, Dest} | {VLAN, Dest, Port} | Hard to debug. Can't use current topology protocols to set up paths; they're not trees. |
| 2. | {VLAN, Dest} | {VLAN, Dest, A/B tag} | Not easy to debug. Can't use current topology protocols to set up paths; they're not trees. |
| 3. | {Dest} | {VLAN, Dest} | I *think* that the number of VLANs are not an issue. |
| 4. | {Source, VLAN} | {Source, VLAN, Dest} | Per-source sequencing, not per-Stream. |
| 5. | {Source, VLAN} | {Source, VLAN, A/B tag} | Per-source sequencing, not per-Stream. Destination not used by auto-config. |

- NOTES: Always, only frames with CB-tags are processed.
- "A/B tag" means HSR-like bit(s) in the sequence tag identifying the path taken.

# Choosing an auto-configuration solution

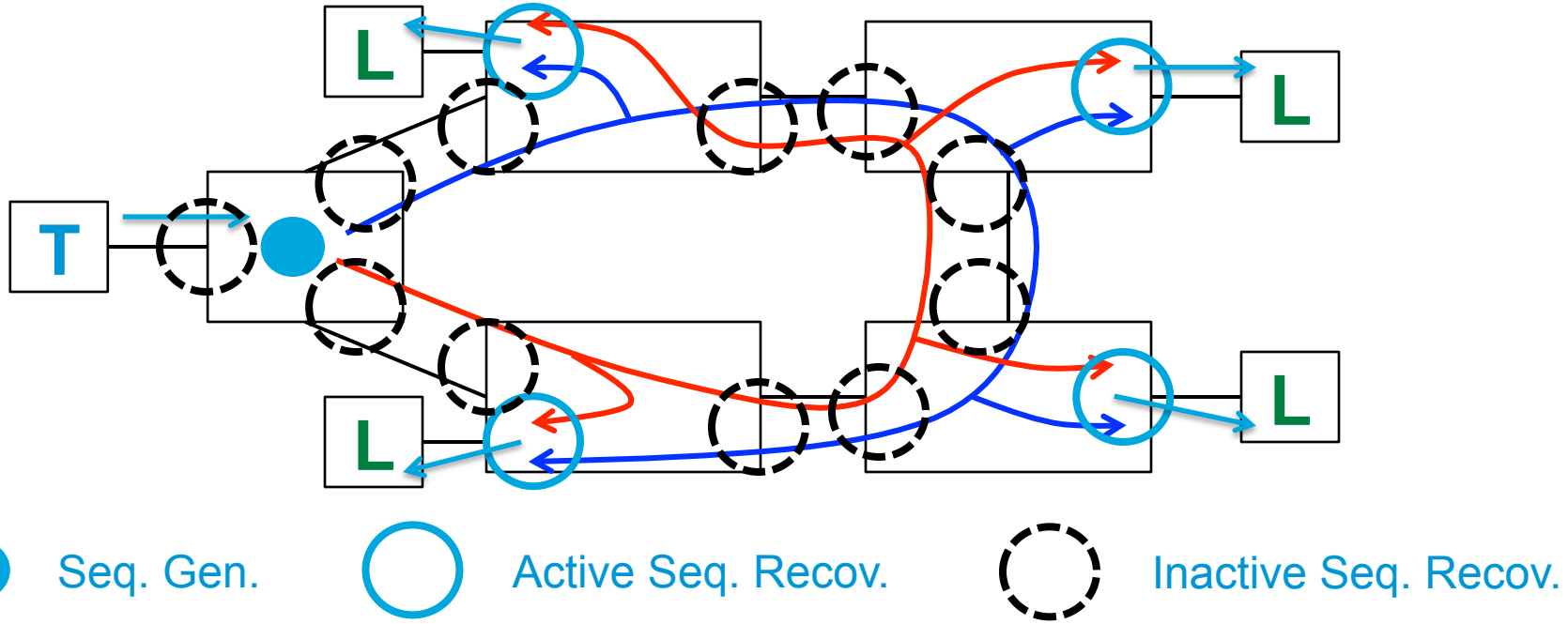
- In this author's opinion:
- 1 & 2 (almost identical packets) are not good, because they have identical (or identical except for the CB-tag) packets criss-crossing through the network. Among other difficulties, this is incompatible with reverse path checking for multicast pruning.
- 3 & 4 (DA identifies Stream within the group) conflates forwarding with stream identification. The DA must be a multicast if one Listener receives > 1 stream. While this is necessary for Bandwidth reservation, 802.1CB can be useful without bandwidth reservation. 3 seems best if per-Stream sequencing is required.
- 5. Author's favorite: Although this uses per-source sequencing, it allows multiple Streams per Listener without requiring a multicast DA, thus separating 802.1CB from MSRP.
- Summary on next slide.

# Author's opinion

| • | Sequence Recov. based on | Individual Recovery based on | Comments |
|---|---|---|---|
| 1. | {VLAN, Dest} | {VLAN, Dest, Port} | **Non-starter.** Identical packets are criss-crossing through the network. |
| 2. | {VLAN, Dest} | {VLAN, Dest, A/B tag} | **Non-starter.** Almost-identical packets are criss-crossing through the network. (The A/B bits in the tag are not used by forwarding.) |
| 3. | {Dest} | {VLAN, Dest} | → **contender**. SR cannot be used except on multicast streams, and multicast DAs are required (now) only for bandwidth reservation. |
| 4. | {Source, VLAN} | {Source, VLAN, Dest} | No. Requires multicast DAs without gaining advantages of per-Stream sequencing. |
| 5. | {Source, VLAN} | {Source, VLAN, A/B tag} | → **Compatible with HSR/PRP. Seamless Redundancy not locked to MSRP.** |

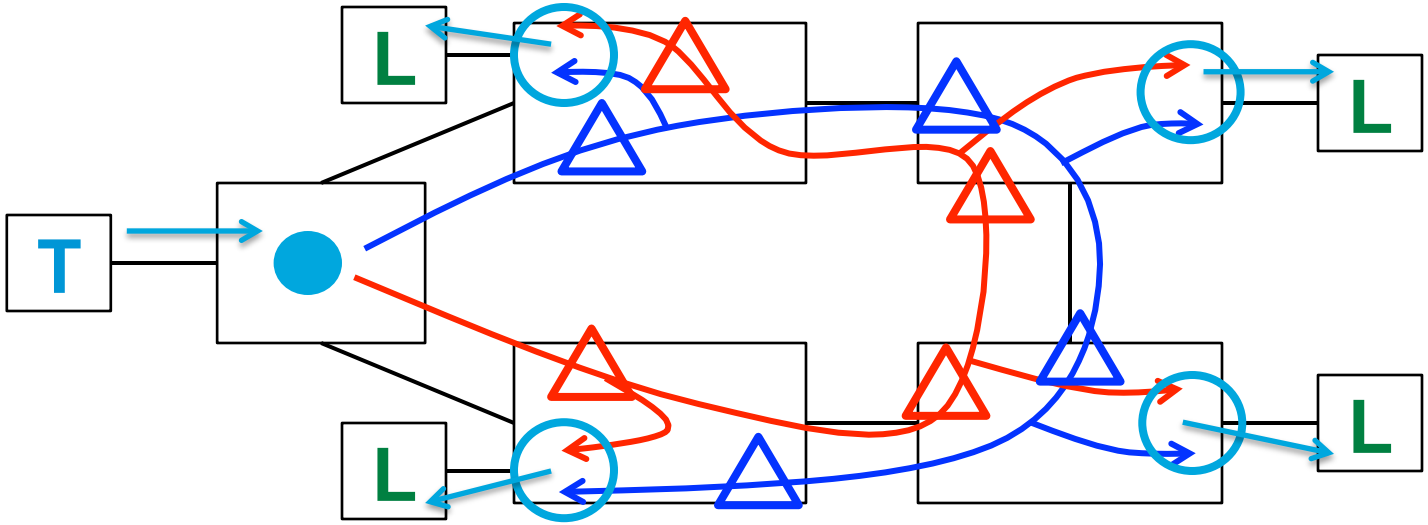
# Problem 2: On which ports do you perform Sequence Recovery?

# Which ports are sequence filtered?




- **You can auto-configure Sequence Recovery on every port!**
- The dotted circles are functional, but never discard a packet, because the two streams **do not both egress** on those ports.

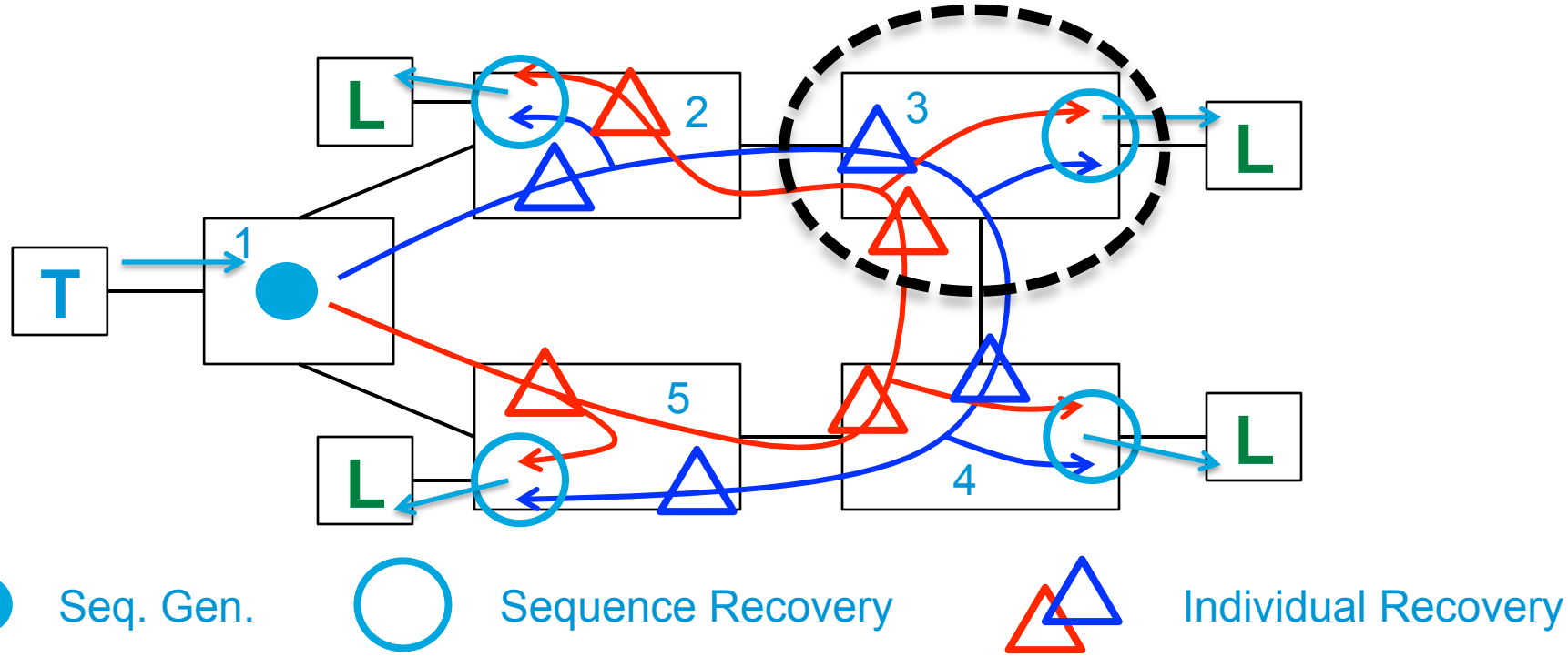
# Which ports are sequence filtered?




Seq. Gen. Sequence Recovery Individual Recovery

- **You can auto-configure an Individual Recovery function in every forwarding function, separate from any particular port.**
- **IF** identical packets entering different ports are the same Stream.

# Sequence Recovery on every port ≠ Sequence Recovery in Relay Function




- We do want to filter packets going to the Listener.
- We do not want to filter packets on the ring – that can lead to latent errors.

# Sequence Recovery on every port ≠ Sequence Recovery in Relay Function

- In the previous slide, in bridge 3, you
  - **Do** want to discard duplicates sent to the Listener.
  - **Do not** want to discard duplicates on the ports to Bridges 2 and 4.
- A single Sequence Recovery function in the bridge 3 relay function that does not pay attention to individual ports **could**:
  1. Receive red packet #10 from bridge 4, and relay it to L and bridge 2.
  2. Receive blue packet #10 from bridge 2, discard it as a duplicate, and not send it either to L or to bridge 4.
- In one sense, this is no problem, because we know that bridge 4 has already received packet #10. It also makes more bandwidth available for best-effort traffic.
- But, if link 1—5 fails, we don't know for sure that packet #11 will reach bridge 5; there may be a "**latent error**", e.g. a misconfiguration that blocks blue packets on link 4—5.

# Suggested Remedy

# Suggested remedy

- Put managed objects into Clause 9 to support auto-configuration:
  - Administrator selects a Default Stream/Seamless Stream identification and Default sequence number encapsulation plan for the relay system.
  - Sequence Recovery is then auto-configured on all ports as shown in Figure 8-1. (This can still be represented as a function inside the relay as in Figure 8-2. It just means that that the in-the-relay function has to pay attention to the entry and exit ports.)
  - Individual recovery is also auto-configured for all streams, without regard to port. Note that this function can ignore entry vs. exit port.
  - Support for plan 5 (above) using the HSR tag is required. Plan 3 using the CB tag is optional.
- An implementation may (optionally) support the detailed per-Stream configuration of the current Clause 9, with auto-configuration, if turned on, handling the Streams that miss the detailed configuration.

Thank you.