

NXP TOPICS FOR NETCONF 2023

802.1CB, BACKPLANES

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SECURE CONNECTIONS
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IEEE 802.1CB



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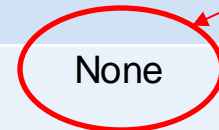
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STATUS OF TSN OFFLOADS FOR LS1028A

TSN offload	Ethernet controller	
	ENETC	Felix switch
802.1Qbv (Time Aware Shaper)	tc-taprio	tc-taprio
802.1Qbu (Frame Preemption)	tc-mqprio ("fp" argument) tc-taprio ("fp" argument)	tc-mqprio ("fp" argument) tc-taprio ("fp" argument)
802.3br (MAC Merge)	ethtool -set-mm ethtool -show-mm	ethtool -set-mm ethtool -show-mm
802.1Qav (Credit Based Shaper)	tc-cbs	tc-cbs
802.1CB (Frame Replication and Elimination for Reliability)	n/a	None
802.1Qci (Per-Stream Filtering and Policing)	tc-flower with action "police" for rate-based policing, and with action "gate" for time-based policing	tc-flower with action "police" for rate-based policing, and with action "gate" for time-based policing
Time-Specified Departure	tc-ett/SO_TXTIME	n/a

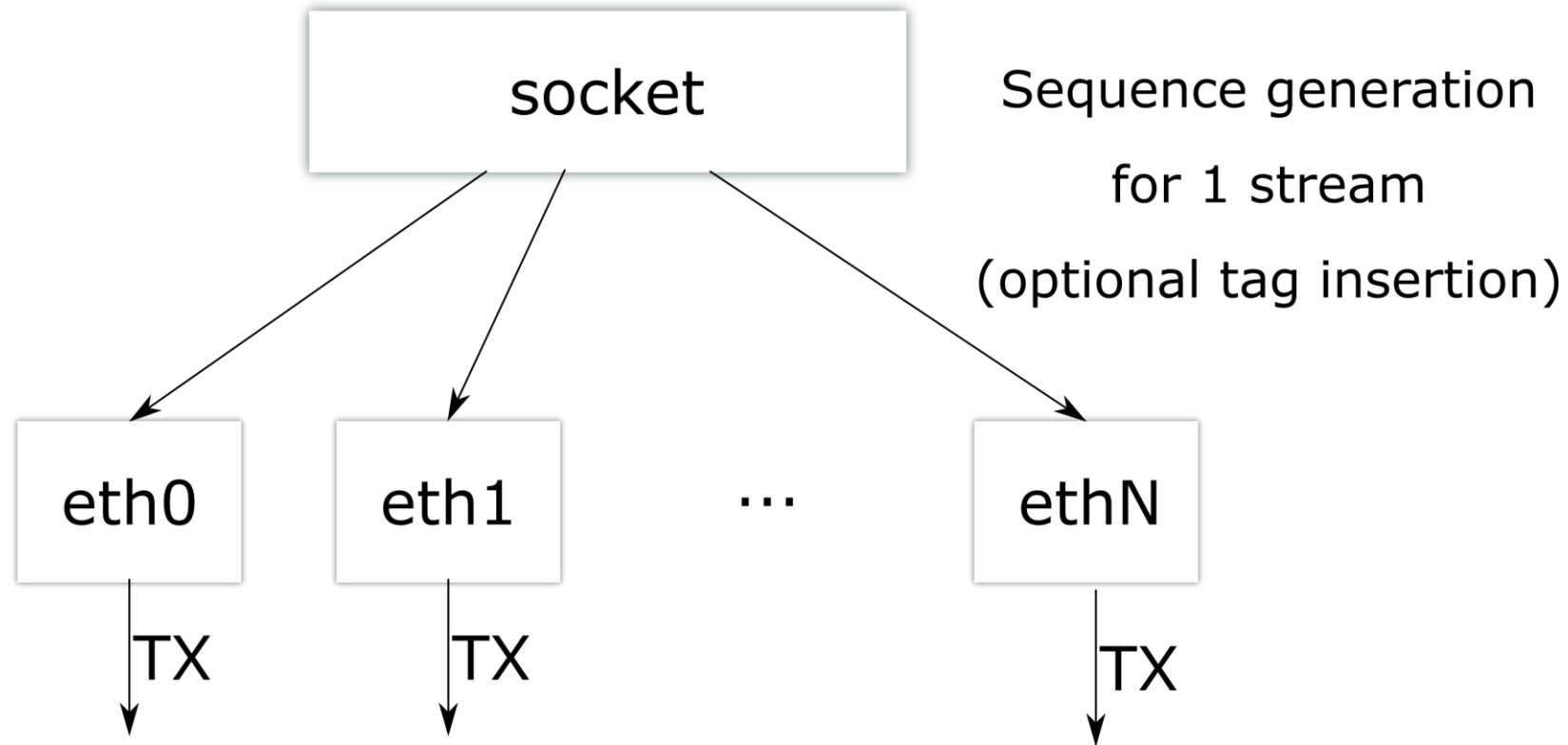
Today's topic



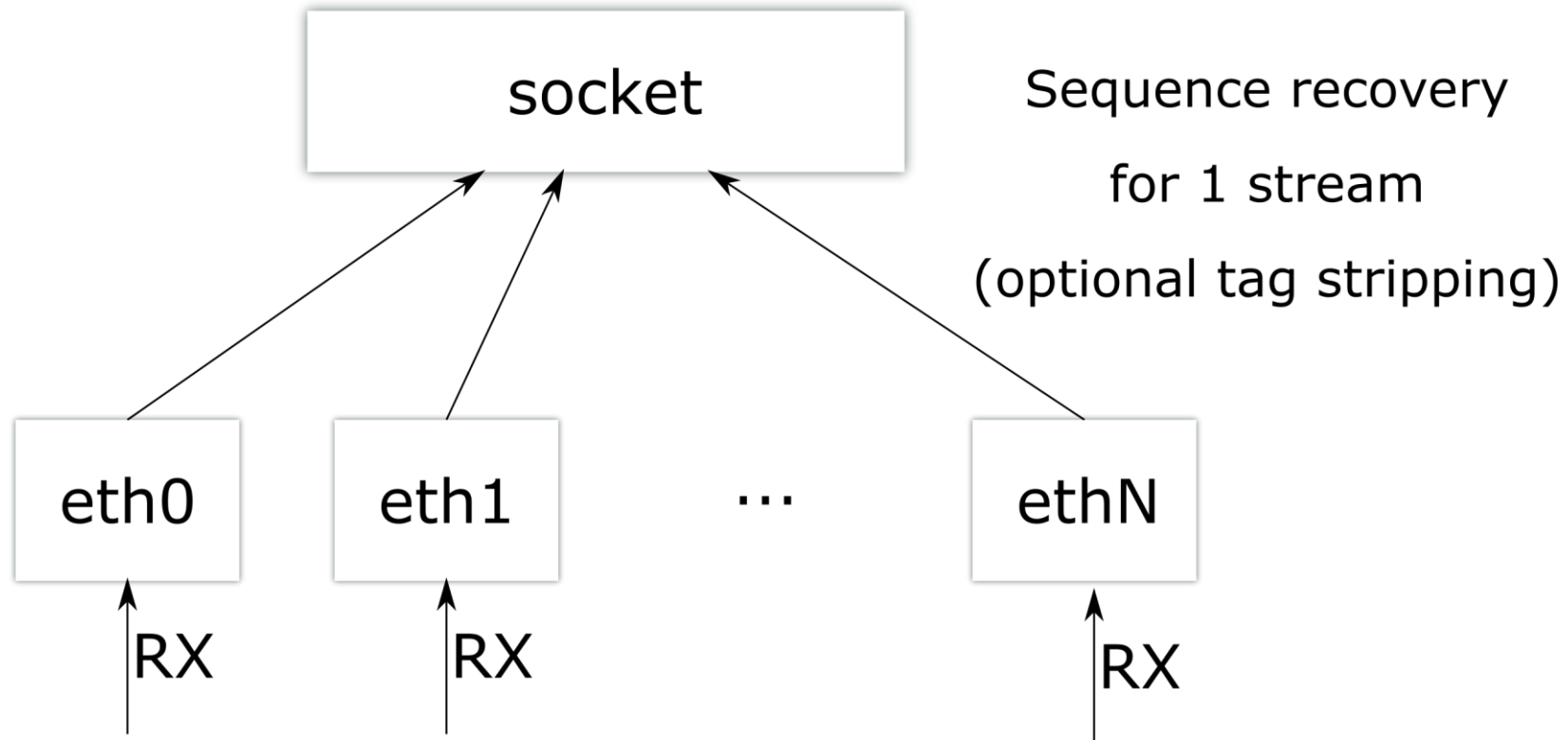
IEEE 802.1CB: PURPOSE AND USE CASES

- FRER: Frame Replication and Elimination for Reliability
- Active redundancy: zero fail-over time if one link fails
- Talker replicates Ethernet frames and sends over multiple paths to Listener
- Listener provides first Ethernet frame that arrives to application and removes duplicates
- More flexible than HSR/PRP, can also be used as a superset
- No management protocol
- Main concept: (TSN) streams
 - Flexible classification: MAC DA, MAC SA, VLAN ID, IP src, IP dst, IP src port, IP dst port, ...
 - Each node has a table of streams, and actions on them: sequence generation, sequence recovery, insert redundancy tag, strip redundancy tag
 - Redundancy tag contains sequence number but not stream ID

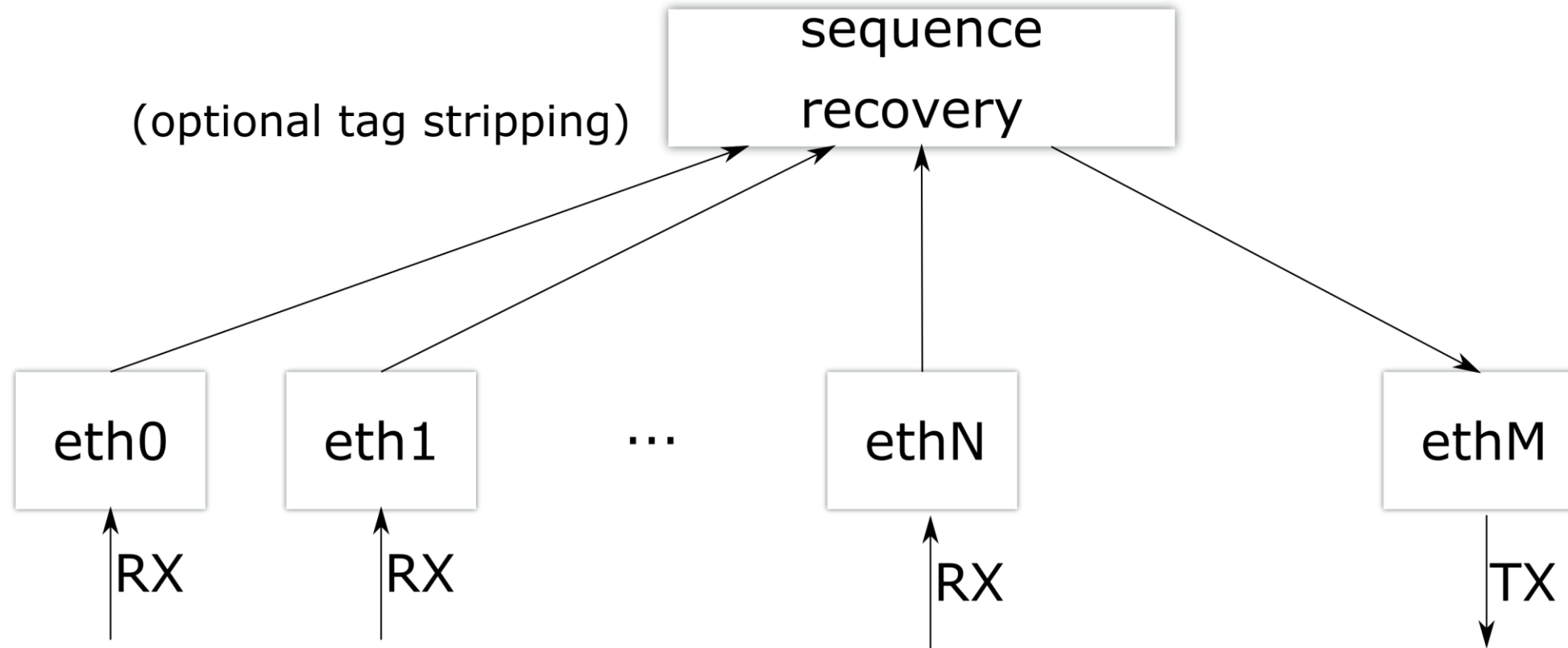
IEEE 802.1CB: SEQUENCE GENERATION FROM SOCKET



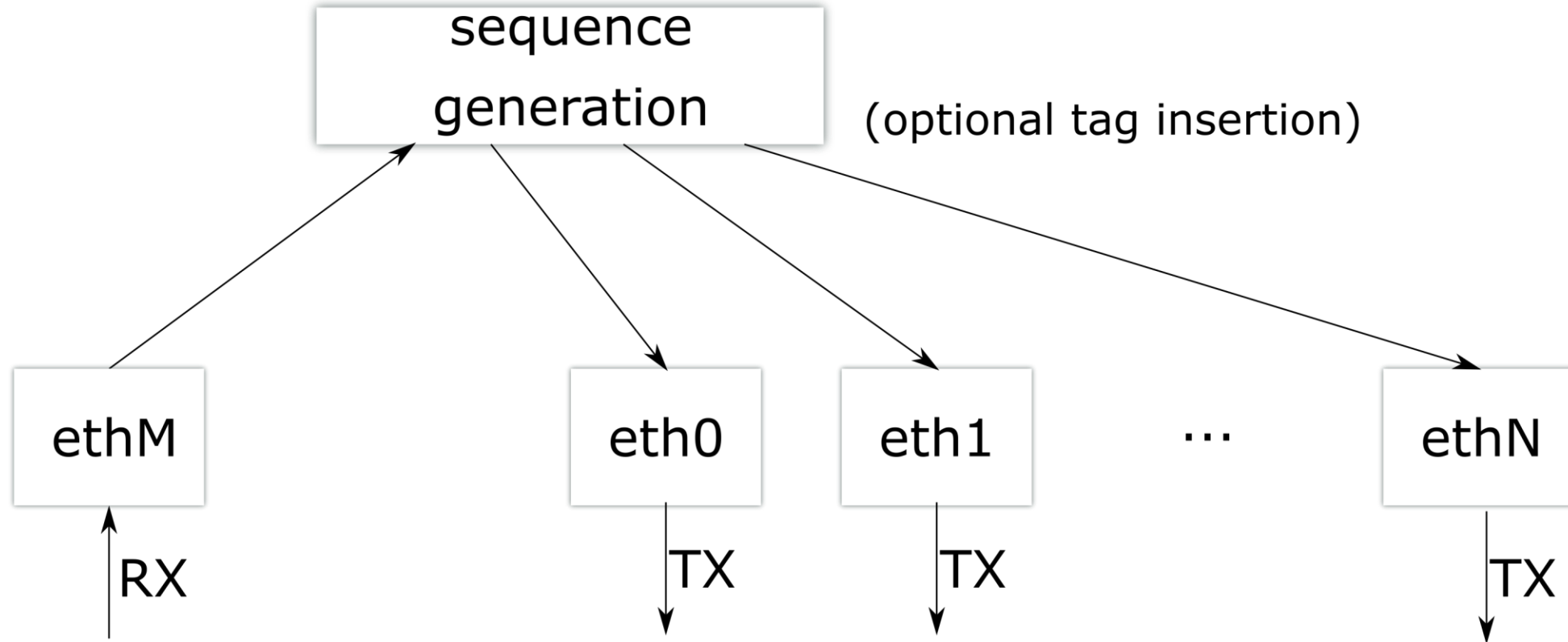
IEEE 802.1CB: SEQUENCE RECOVERY TO SOCKET



IEEE 802.1CB: SEQUENCE RECOVERY AND FORWARDING



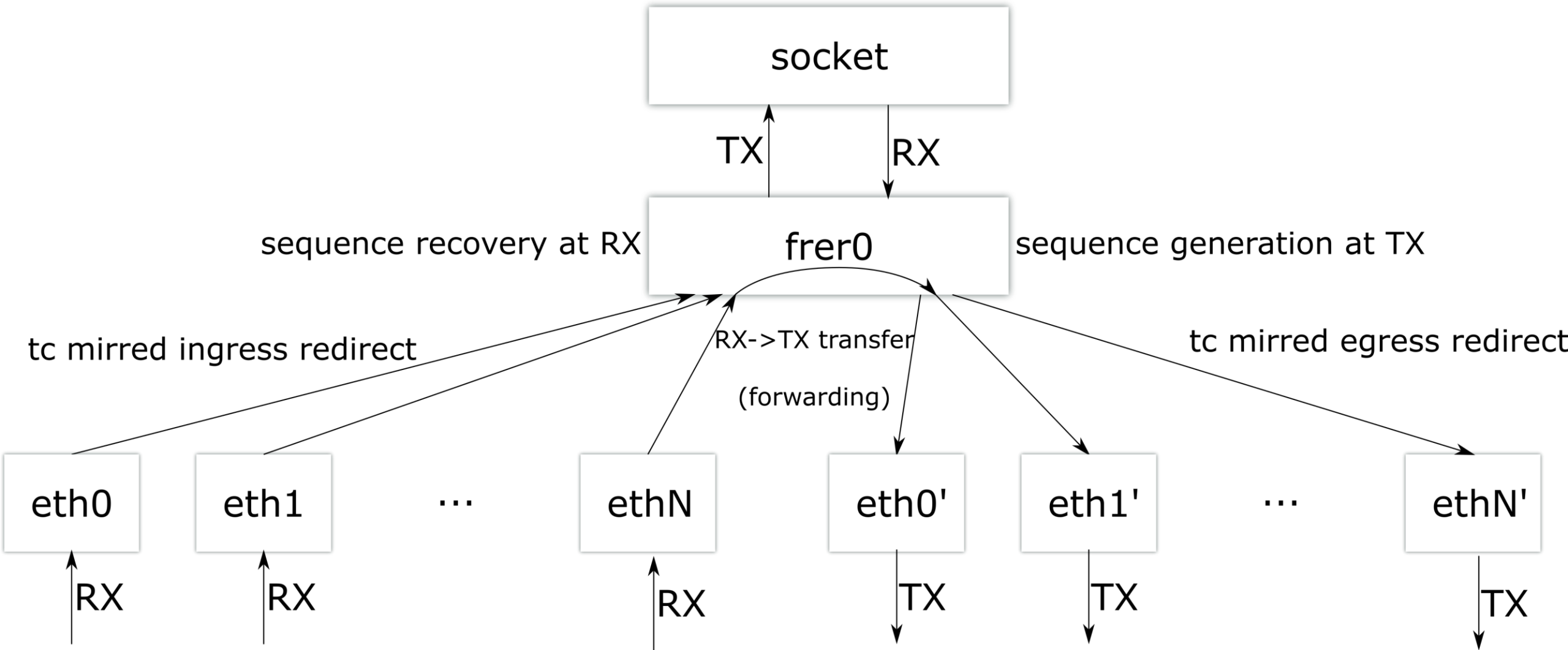
IEEE 802.1CB: SEQUENCE GENERATION AND FORWARDING



IEEE 802.1CB: EXISTING RFCS AND THEIR PROBLEMS

Proposal	Pros	Cons
tc-frer (Xiaoliang Yang @ NXP)	<ul style="list-style-type: none">• tc filters have flexible classifiers• handles forwarding	<ul style="list-style-type: none">• does not handle termination• possible to share the same tc action for stream recovery on multiple ingress ports?• how to handle offloading?
hanic (Steve Williams @ GetCruise)	<ul style="list-style-type: none">• handles termination• inflexible built-in stream classification• needs 802.1Q uppers as termination points for {MAC, VLAN} addresses => doesn't scale for other stream types• makes assumptions about usage (is ARP-aware)	<ul style="list-style-type: none">• does not handle forwarding• how to handle offloading?

IEEE 802.1CB: A NETDEV PER STREAM?



IEEE 802.1CB: A NETDEV PER STREAM?

- Pros
 - Stream classification done by tc
 - Forwarding works, termination works
- Cons
 - frer0 netdev not in upper/lower relationship with the other netdevs
 - How to restrict stream to frer netdev mapping?
 - Offloading even harder

Ethernet over backplane links



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ETHERNET OVER BACKPLANE LINKS

- Short range media type with no specific MDI or connector definition from IEEE
 - can be Samtec/FireFly connectors, PCIe bridges with M.2 keys etc, or as simple as PCB traces
- Clause 73 auto-negotiation is required



CHALLENGES SUPPORTING BACKPLANES ON LAYERSCAPE SOCS

- [Phylib](#) or [phylink](#)? Sent one RFC series to illustrate both approaches
- What phy-mode to use to describe the MAC link to the backplane internal PHY?
“internal“?
 - Should we go through phylink major reconfiguration and PCS selection on C73 autoneg resolution?
- How to select the media type of a port? Is the "fsl,backplane-mode" device tree property okay?
- IEEE specifies clause 73 autoneg also for SFP28 modules (25GBase-CR). What do other vendors do with SFP28/QSFP28 modules? What does phylink do? Interop?
- DesignWare XPCS and its C73 autoneg support - is it standard-compatible?



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