802.1CB improvements

FRER
Improvements on R-Tag
(… and its usage)

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Topics

— State-of-the-art

— Proposal

    — Improvements of R-Tag

— Use-case examples

R-Tag as per 802.1CB-2017
State-of-the-art

Table 7-1—R-TAG EtherType

Purpose	EtherType
Redundancy tag (R-TAG)	F1-C1

R-Tag history:

— 802.1CB-2017 defines the Redundancy Tag

  — Used by Sequence encode/decode function

  — R-Tag EtherType: F1-C1

  — Note: Ethernet frame may contain multiple R-Tags

— Purpose:

  — add information to frames required by FRER functions
    (low-order 16 bits from "sequence_number" subparameter)

octet:	0	1	2	3	4	5
	EtherType (see Table 7-1)		Reserved (7.8.2)		Sequence Number (7.8.2)	

Figure 7-4—R-TAG format

— Reserved fields:

  — This field shall be transmitted with all zeros and shall be ignored on receipt.

  — It is intended that future revisions of this standard can use the most-significant bits of the Reserved field for sub-typing purposes, as described in 9.2.1 of IEEE Std 802-2014.
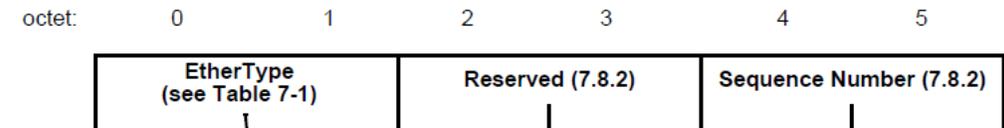
Moving towards a generalized R-Tag
Usage by extended FRER (and other) functions

Scenario: Extending FRER functions

— 9.2.1 (and 9.2.3) of IEEE Std 802-2014

— Describes sub-typing: sub-type + protocol version

— Example: FRER related enhancements

— (n)-bit: sub-type field (e.g., FRER = 0)

— Defines for what purposes the R-Tag is used

— (16-n)-bit: protocol version (+ Flags) (e.g., Seq.Num.Space.ID, Flags, …)

— Purpose specific further information

— Note: to be backward compatible, "reserved = all zero" means FRER as per IEEE 802.1CB-2017

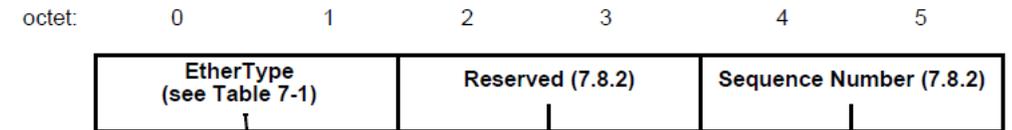— Note: Other than FRER purposes may use the Sequence Number field as well

octet: 0 1 2 3 4 5

| EtherType (see Table 7-1) | Reserved (7.8.2) | Sequence Number (7.8.2) |

Figure 7-4—R-TAG format

Moving towards a generalized R-Tag
Usage by extended FRER functions

— FRER related improvements proposed (so far):

  — https://www.ieee802.org/1/files/public/docs2019/new-varga-FRER-improvements-0719-v01.pdf

  — https://www.ieee802.org/1/files/public/docs2020/new-varga-FRER-seamless-reset-0320-v02.pdf

  — They require

    — Improved FRER functions

    — Some new indicators traveling with the frames

— Example of using the reserved field

  — (n)-bit: sub-type field (FRER = "0")

  — (16-n)-bit: protocol version (+ Flags)

    — FRER protocol version: "1" (Seamless-FRER)

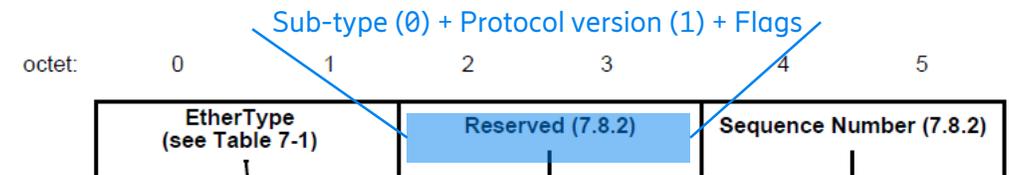   — Flags: "SeqResetFlag", "InitSeqFlag"

Sub-type (0) + Protocol version (1) + Flags

octet:	0	1	2	3	4	5
	EtherType (see Table 7-1)		Reserved (7.8.2)		Sequence Number (7.8.2)	

Figure 7-4—R-TAG format

Moving towards a generalized R-Tag
Usage by other functions

— R-Tag could be used for other purposes as well
  — Timing related information / "Timestamping"
  — Extended QoS information (e.g., advanced drop precedence)
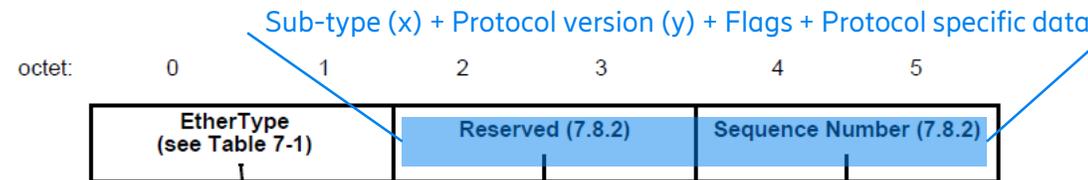 — Etc.

Sub-type (x) + Protocol version (y) + Flags + Protocol specific data

octet:	0	1	2	3	4	5

EtherType (see Table 7-1)	Reserved (7.8.2)	Sequence Number (7.8.2)

Figure 7-4—R-TAG format

— Note: to be backward compatible, "reserved field = all zero" means FRER as per IEEE 802.1CB-2017
— Note: Other than FRER purposes may use the Sequence Number field as well

802.1CB impact
What needs to be changed/added …

— When/If 802.1CB-2017 updated

    — then allow usage of reserved field in R-Tag

    — define backward compatible sub-type / protocol version values
       (i.e., all zeros for FRER as per 802.1CB-2017)

Questions …