

Stacking Tags in LLC Media

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August 19, 2013 Ver. 2

(This presentation is also uploaded to 802.11 document system as document number 2013-0952-1.)

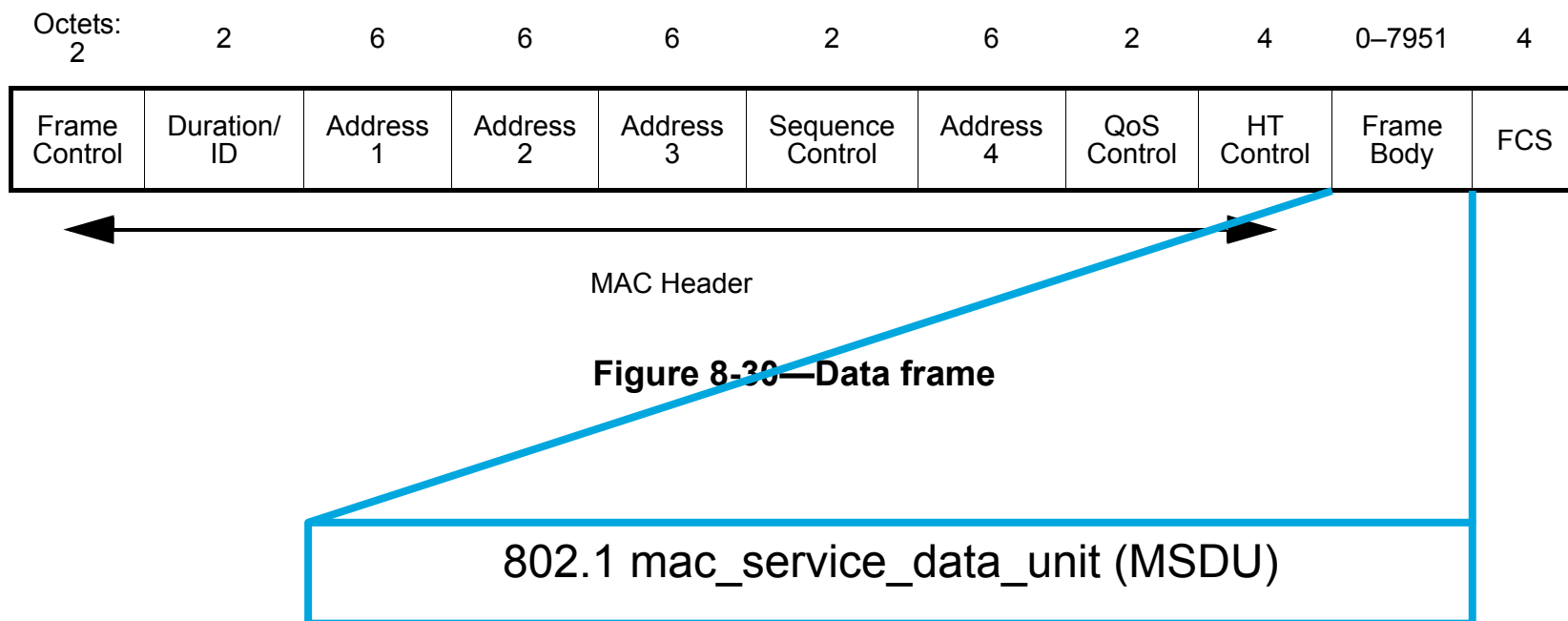
Summary

Work now in progress on P802.1Qbz and P802.11ak has shown that the method currently defined in IEEE 802.1Q for adding and removing tags (e.g., the VLAN tag) to frames on LLC media (e.g., 802.11) is untenable. A new scheme is proposed in P802.1Qbz Draft 1.2 for use by P802.11ak. **In the worst case, this change could invalidate a currently-compliant implementation of 802.11.** This presentation solicits comments from any organization or individual that might be affected by this change.

Current tagging situation

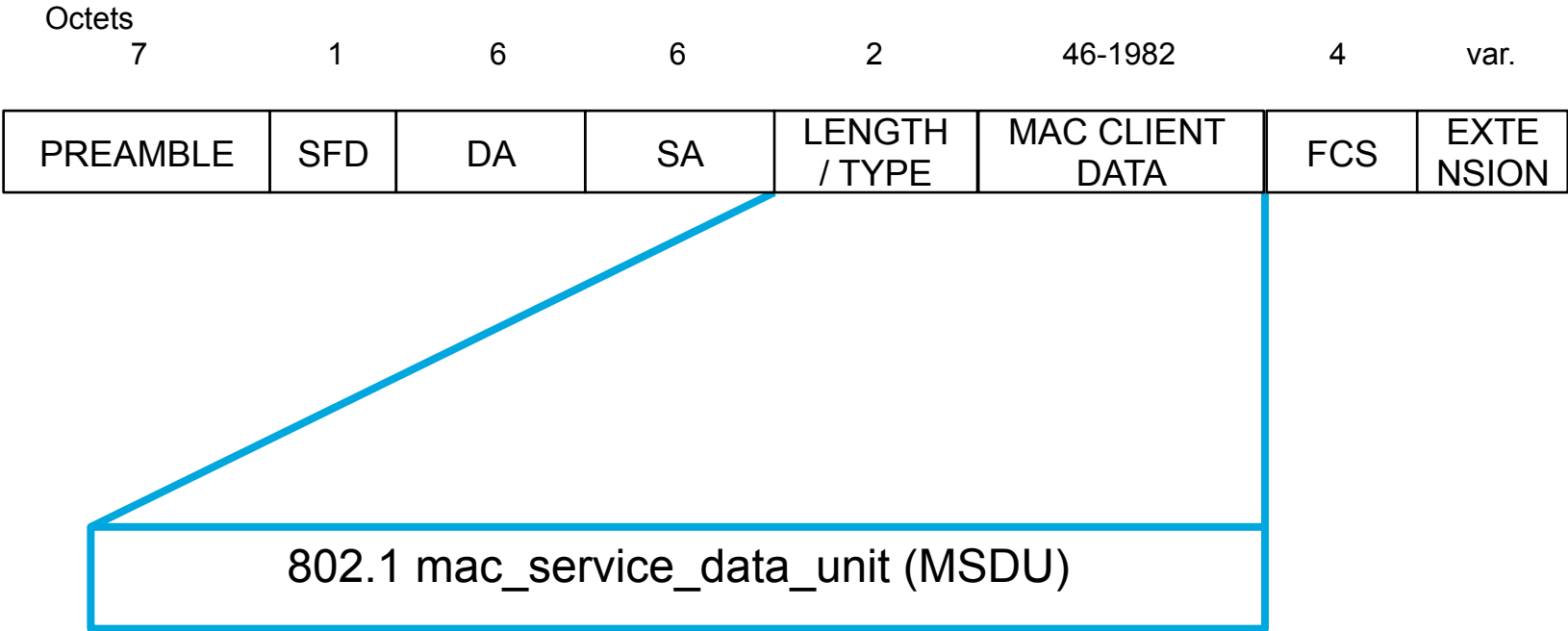


Back to basics: The 802.11 Data Frame



- IEEE Std 802.11-2011

Back to basics: The 802.3 Data Frame



- IEEE Std 802.3-2008

Back to basics: 802.3 Length/Type MSDU

- EtherType data (e.g. IP packet):

2	<i>M</i>	
LENGTH / TYPE	MAC CLIENT DATA	
TYPE > 05-FF	MAC CLIENT DATA	
08-00	IP header	IP data

- LLC data (e.g. Bridge Protocol Data Unit [BPDU]):

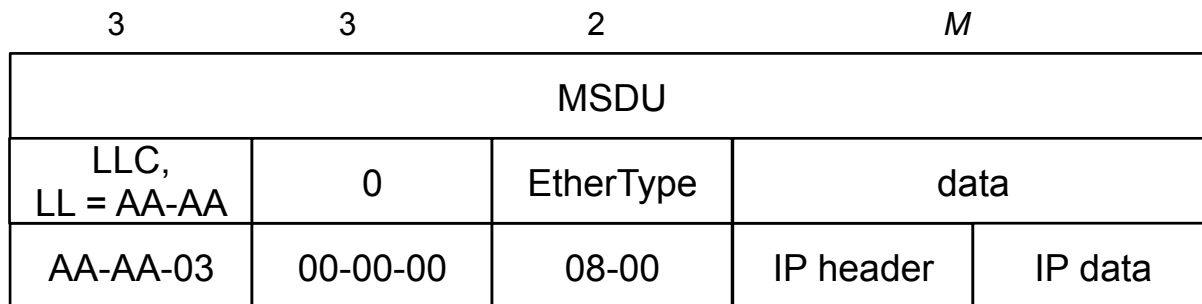
2	3	<i>N-3</i>
LENGTH / TYPE	MAC CLIENT DATA	
LENGTH < 05-DD	LLC, LL ≠ AA-AA	data
<i>N</i>	42-42-03	BPDU

- SNAP:

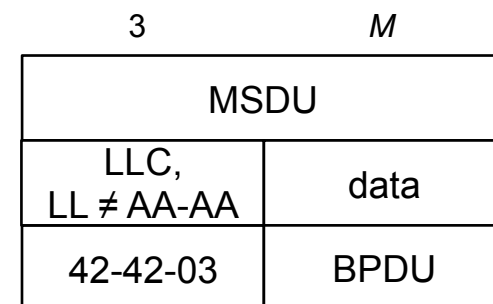
2	3	3	2	<i>N-8</i>	
LENGTH / TYPE	MAC CLIENT DATA				
LENGTH < 05-DD	LLC, LL = AA-AA	OUI or 0	EtherType or subtype	data	
<i>N</i>	AA-AA-03	00-00-00	08-00	IP header	IP data

Back to basics: 802.2/802.11 LLC MSDU

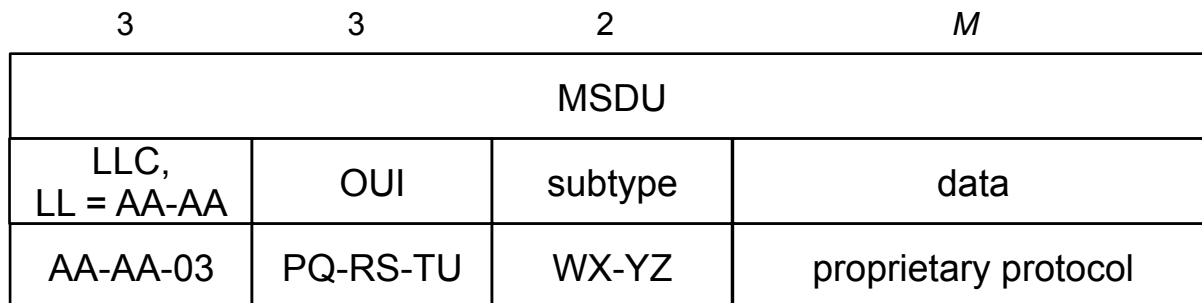
- EtherType data (e.g. IP packet):



- LLC data (e.g. Bridge Protocol Data Unit [BPDU]):



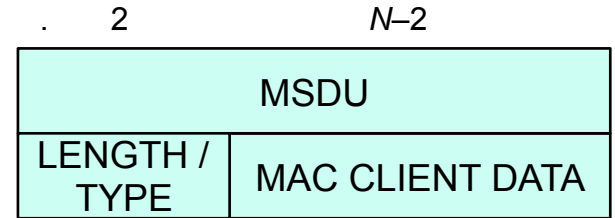
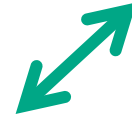
- Other SNAP:



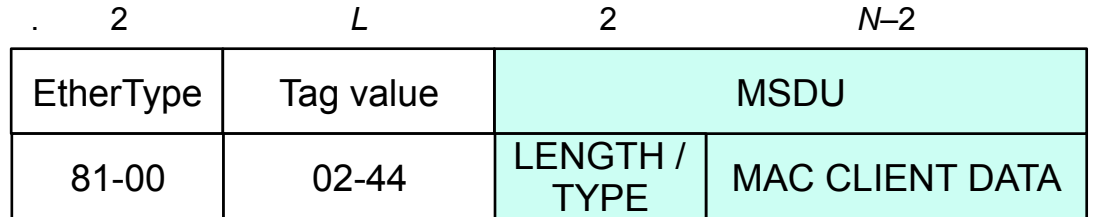
Old tagging process IEEE Std 802.1Q-2011

- Length/Type no tag:

Simply add or remove tag; MSDU is unchanged.

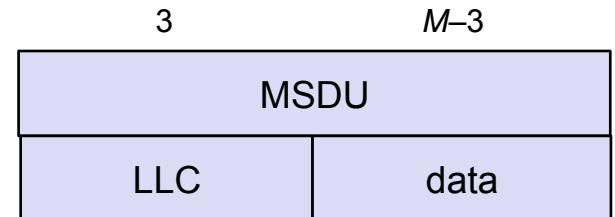


- Length/Type tagged:

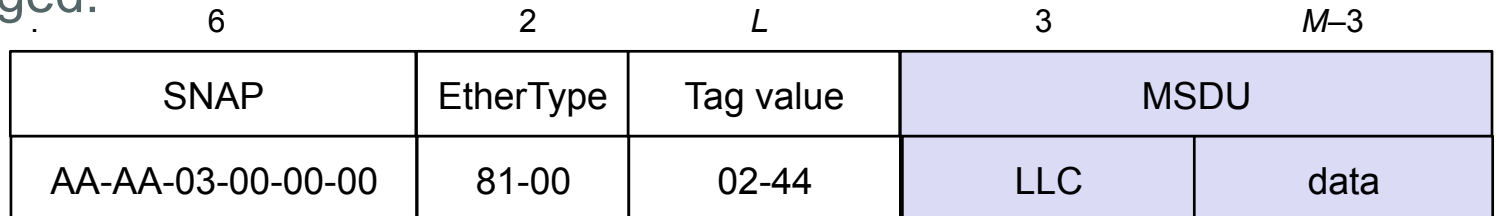


- LLC no tag:

Simply add or remove tag; MSDU is unchanged.



- LLC tagged:



Old tagging process IEEE Std 802.1Q-2011

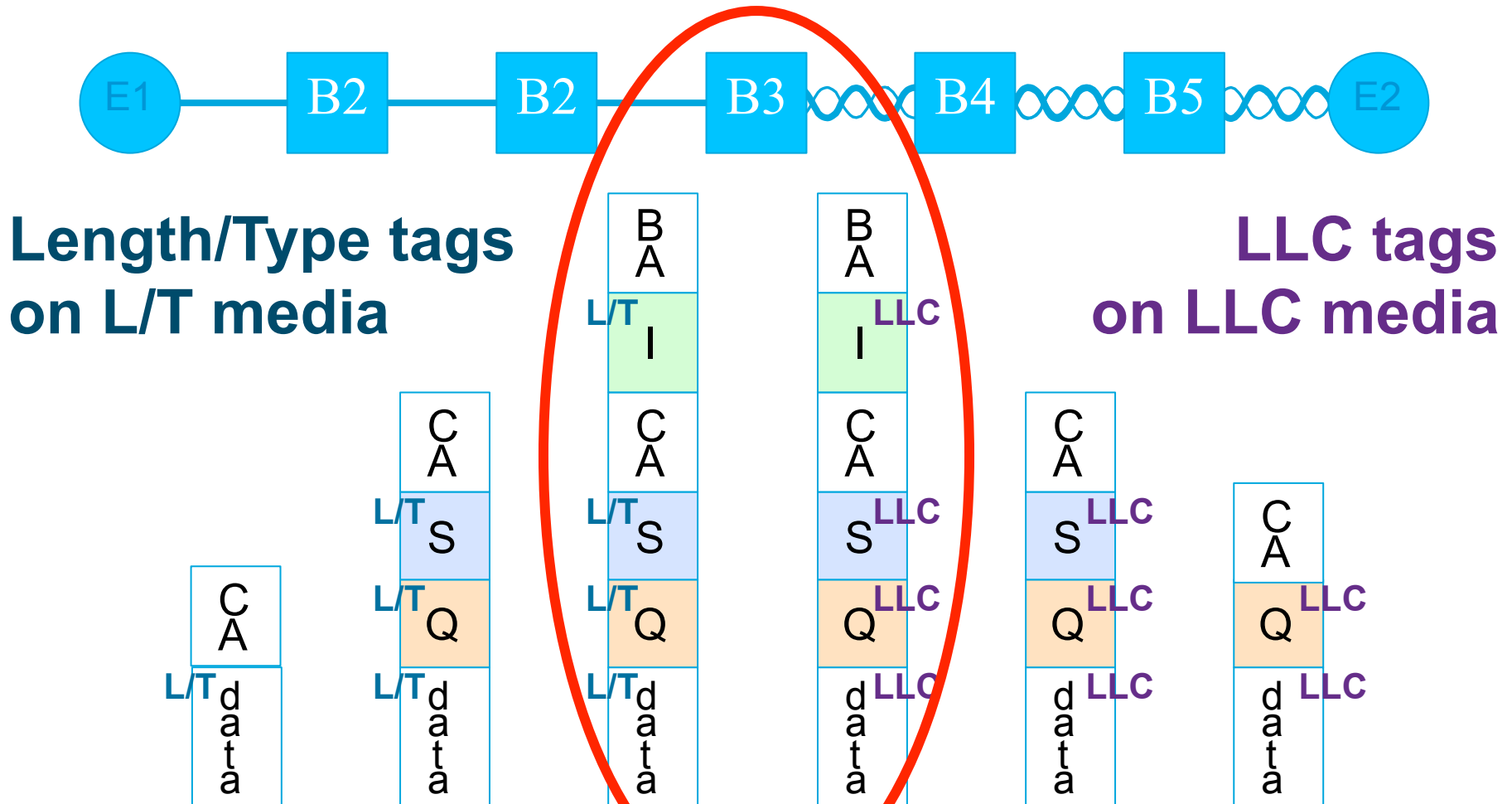
- On LLC media, the first 3 bytes following **every tag** are LLC.
- On Length/Type media, the first 2 bytes following **every tag** are a Length/Type.
- You know how to decode the whole frame, because you know whether the medium is LLC or Length/Type.
- **You cannot tell** from the data, itself, whether the bytes following a tag are LLC or Length/Type, because there are many two-bytes values that are valid in both formats. Knowledge of the media type is essential.

Why that is a problem



The end-to-end tag stacking problem

All tags must be translated at once



The end-to-end tag solution

- Tagging near the edges of the network must be in the format expected by the medium in that area.
 - Otherwise, they cannot decode the tag stack.
 - We cannot, ex post facto, require every bridge and tag-aware end station to start translating between encapsulations.
 - Heuristics to do the translation are possible, but not reliable.
- We could ask the bridge that connects to two media types to convert **all** tags **and** the original MSDU.
 - That is difficult to do in high speed in ASICs.
 - **It makes it impossible to deploy new tags at the edge**, because the core devices will not know how long those tags are.
 - That's how you know it is a **violation of the principles of layering**.

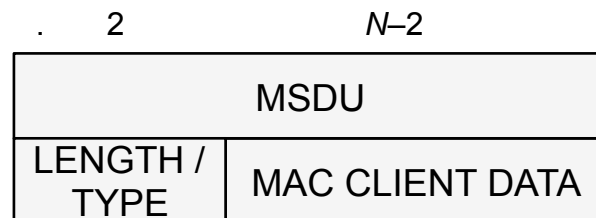
New proposal for tagging in P802.1Qbz D1.2



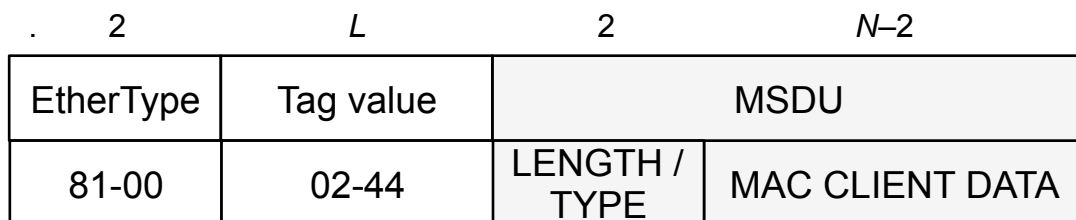
Tagging process P802.1Qbz Draft 1.2

- Length/Type no tag:

Simply add or remove tag; MSDU is unchanged.

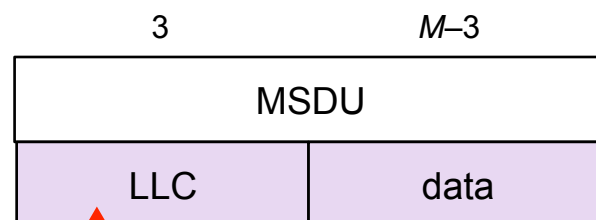


- Length/Type tagged:

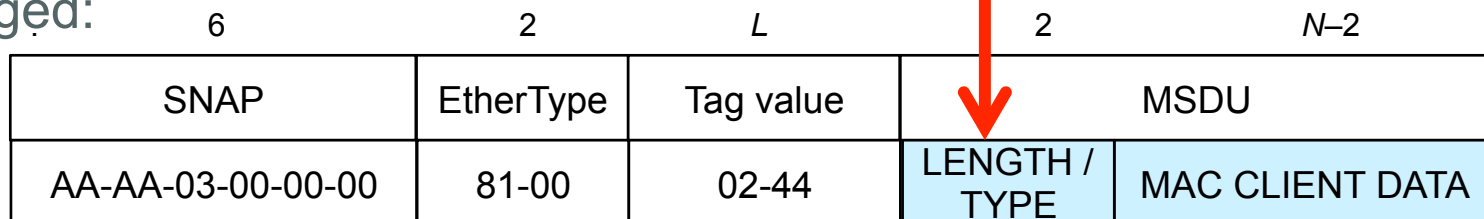


- LLC no tag:

Change MSDU when adding or removing a tag.

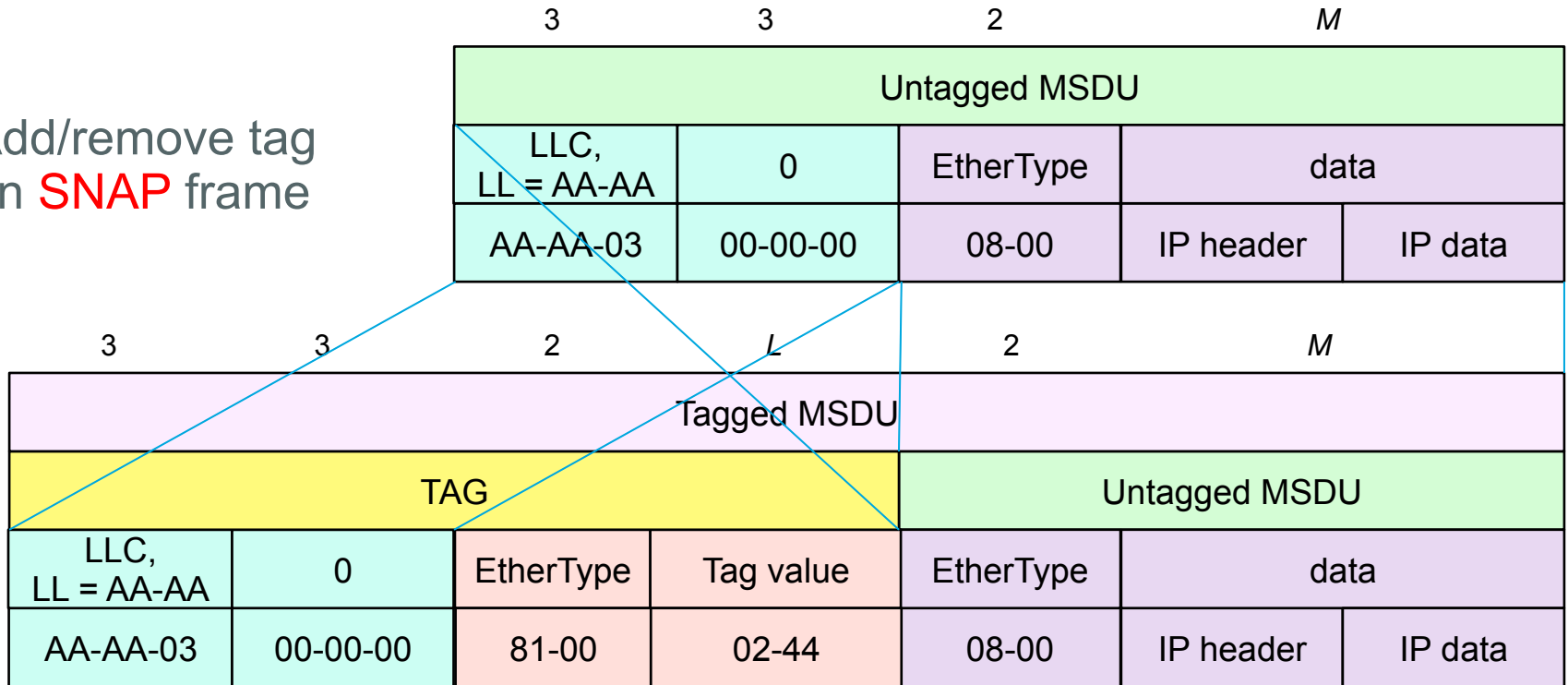


- LLC tagged:



LLC tagging process P802.1Qbz Draft 1.2

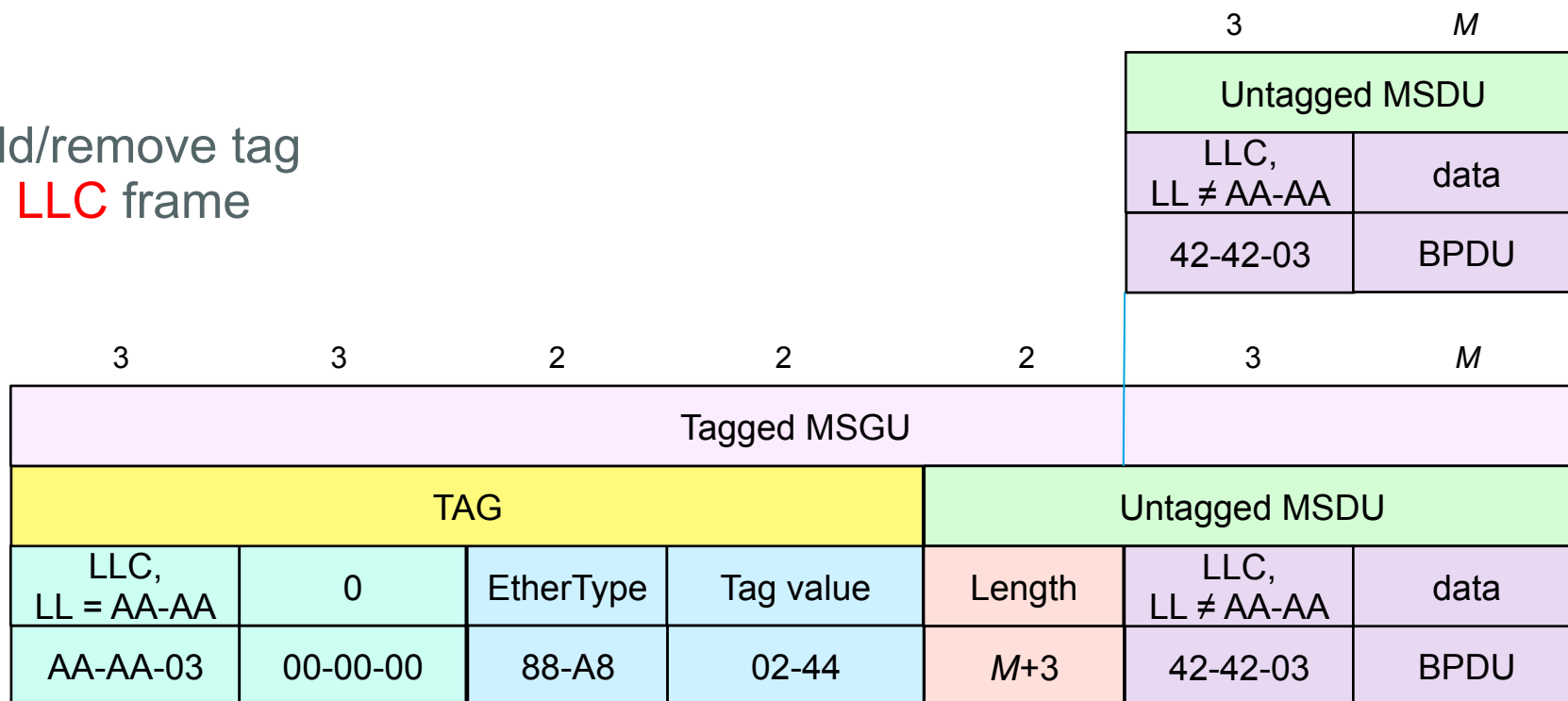
- Add/remove tag on **SNAP** frame



- Add: Convert old outer item LLC → L/T, add LLC tag.
- Remove: Delete LLC tag, convert new outer item L/T → LLC.
- OR: Add/remove tag between LLC-SNAP and MSDU.

LLC tagging process P802.1Qbz Draft 1.2

- Add/remove tag on **LLC** frame



- Add or remove both the **LLC tag** and the **Length field**.

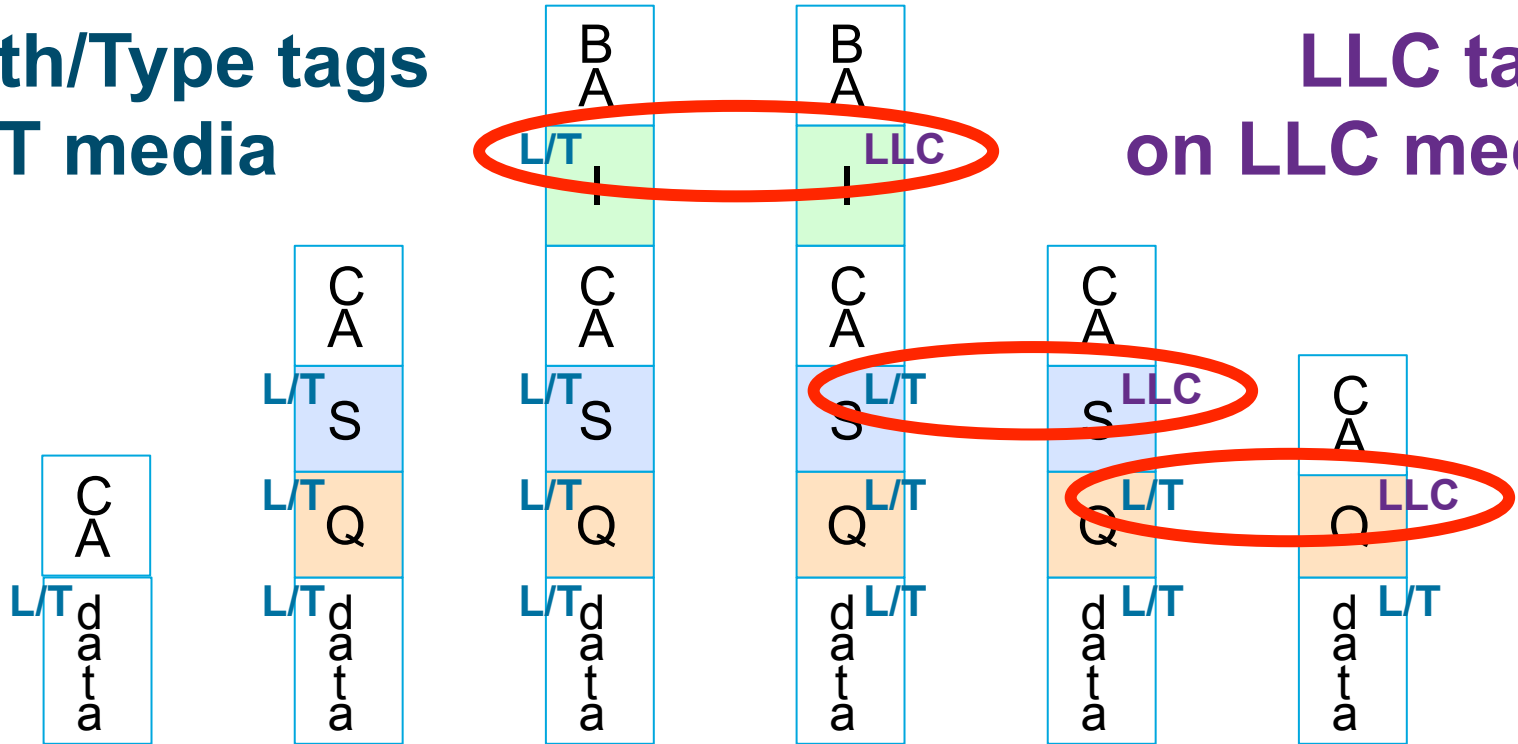
The end-to-end tag stacking solution

One translation per tag or media change



Length/Type tags
on L/T media

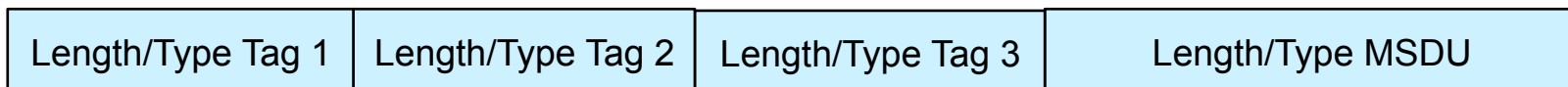
LLC tags
on LLC media



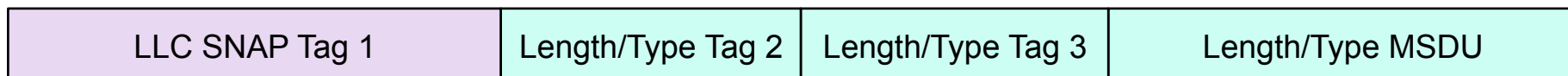
802.1Q decoder ring: BA = Backbone Addresses, I = I-tag, CA = Customer Addresses, S = Service VLAN tags, Q = Customer VLAN tags.

The net effect

- Multiple tags on Length/Type (802.3) frame:



- Multiple tags on LLC (802.11) frame:



- Only the **first item** is LLC-encoded on an LLC medium; all other items are Length/Type-encoded.
- (An untagged MSDU is LLC or Length/Type, by medium.)

The end-to-end tag solution

- We keep the whole stack, except for the outermost item, in Length/Type format.
- Every device knows how to encode/decode frames.
- Only **one item** is converted per tag added or removed.
- The outermost item still follows the rules for the medium in question.
- We could equally well have used the LLC format in all except the outermost item, except that 802.3 devices already use multiple tags and (as far as this author knows) **802.11 devices do not use LLC-stacked tags.**
- (There is also a new EtherType defined in P802.1Qbz D1.2 to encode an LLC MSDU longer than 1500 bytes.)

A plea

- If any actual use of the LLC-stacked tag format is known, please let 802.1 Interworking TG and 802.11 TGak know about it, because **we propose to remove this format from the standards:**

6	2	L	6	2	M	
SNAP	EtherType	Tag value	SNAP	EtherType	data	
AA-AA-03-00-00-00	81-00	02-44	AA-AA-03-00-00-00	08-00	IP header	IP data



No length field!

- If there is such a use, then we will have to re-examine our options.

Thank you.

