Stacking Tags in LLC Media

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

Current tagging situation

Back to basics: The 802.11 Data Frame

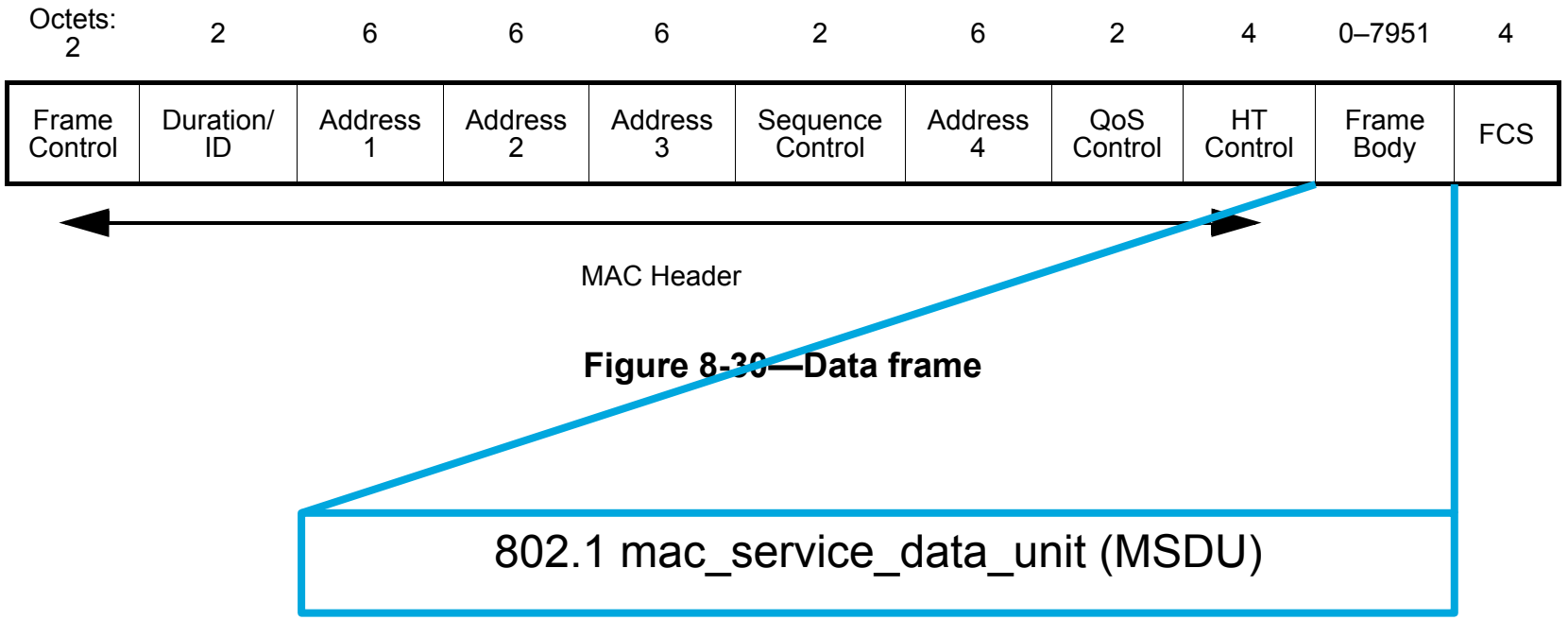
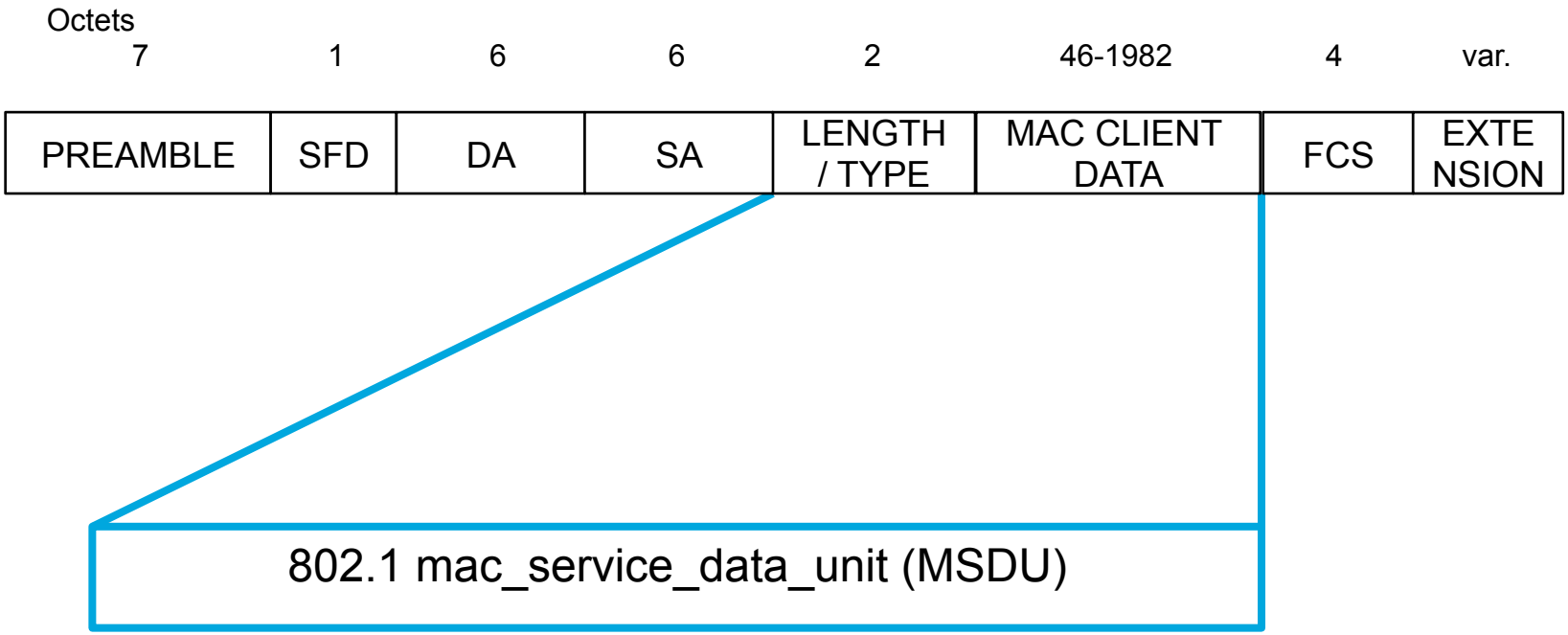


Figure 8-30—Data frame

- IEEE Std 802.11-2011

Back to basics: The 802.3 Data Frame



- IEEE Std 802.3-2008

Back to basics: 802.11 Length/Type MSDU

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

. 2		*M*
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	*N*–3
LENGTH / TYPE	MAC CLIENT DATA	
LENGTH < 05-DD	LLC, LL ≠ AA-AA	data
N	42-42-03	BPDU

- SNAP:

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

Back to basics: 802.2 LLC MSDU

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

3	3	2	M	
MSDU				
LLC, LL = AA-AA	0	EtherType	data	
AA-AA-03	00-00-00	08-00	IP header	IP data

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

3	M
MSDU	
LLC, LL ≠ AA-AA	data
42-42-03	BPDU

- Other SNAP:

3	3	2	M
MSDU			
LLC, LL = AA-AA	OUI	subtype	data
AA-AA-03	PQ-RS-TU	WX-YZ	proprietary protocol

Old tagging process IEEE Std 802.1Q-2011

- Length/Type no tag:

Simply add or remove tag; MSDU is unchanged.

.	2	*N*–2
MSDU		
LENGTH / TYPE	MAC CLIENT DATA	

- Length/Type tagged:

.	2	*L*	2	*N*–2
EtherType	Tag value	MSDU		
81-00	02-44	LENGTH / TYPE	MAC CLIENT DATA	

- LLC no tag:

Simply add or remove tag; MSDU is unchanged.

3	*M*–3
MSDU	
LLC	data

- LLC tagged:

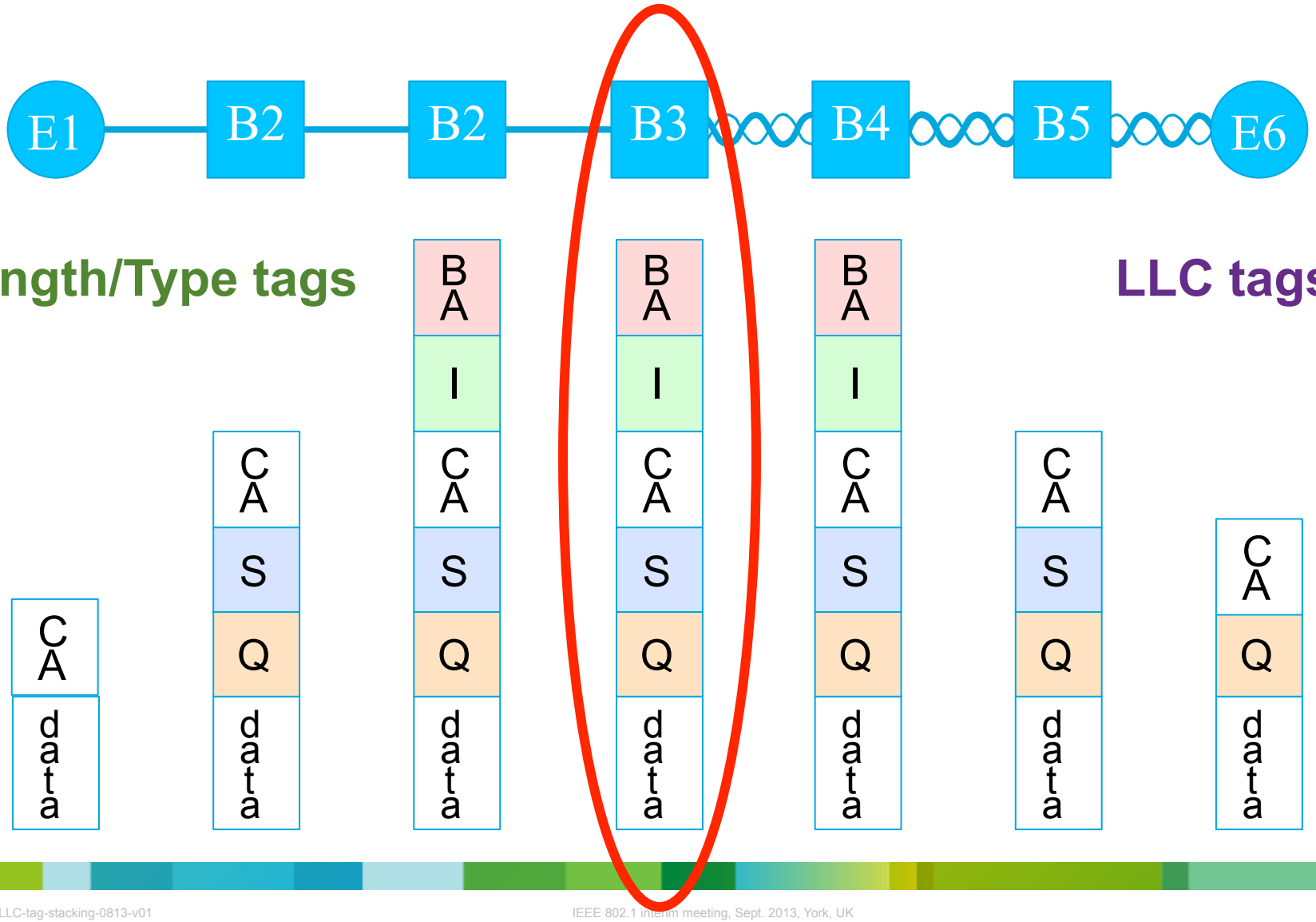
6	2	*L*	3	*M*–3
SNAP	EtherType	Tag value	MSDU	
AA-AA-03-00-00-00	81-00	02-44	LLC	data

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.

Why that is a problem

The end-to-end tag stacking problem



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.
- 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 how long those tags are.
  - It is a fundamental violation of the principles of layering.

New proposal for tagging

New tagging process P802.1Qbz Draft 1.2

- Length/Type no tag:

Simply add or remove tag; MSDU is unchanged.

.	2	*N*–2
MSDU		
LENGTH / TYPE	MAC CLIENT DATA	

- Length/Type tagged:

.	2	*L*	2	*N*–2
EtherType	Tag value	MSDU		
81-00	02-44	LENGTH / TYPE	MAC CLIENT DATA	

- LLC no tag:

Change MSDU when adding or removing a tag.

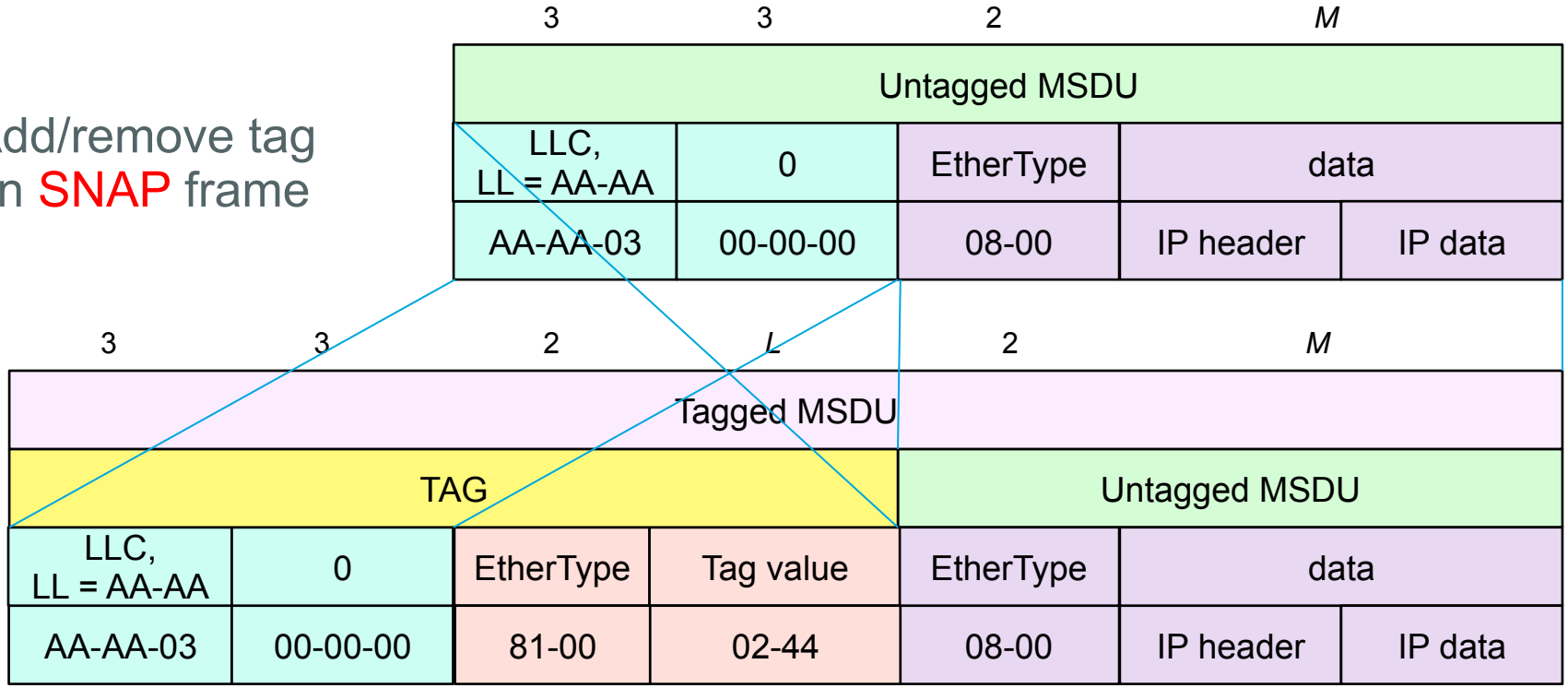
3	*M*–3
MSDU	
LLC	data

- LLC tagged:

6	2	*L*	2	*N*–2
SNAP	EtherType	Tag value	MSDU	
AA-AA-03-00-00-00	81-00	02-44	LENGTH / TYPE	MAC CLIENT DATA

LLC tagging process P802.1Qbz Draft 1.2

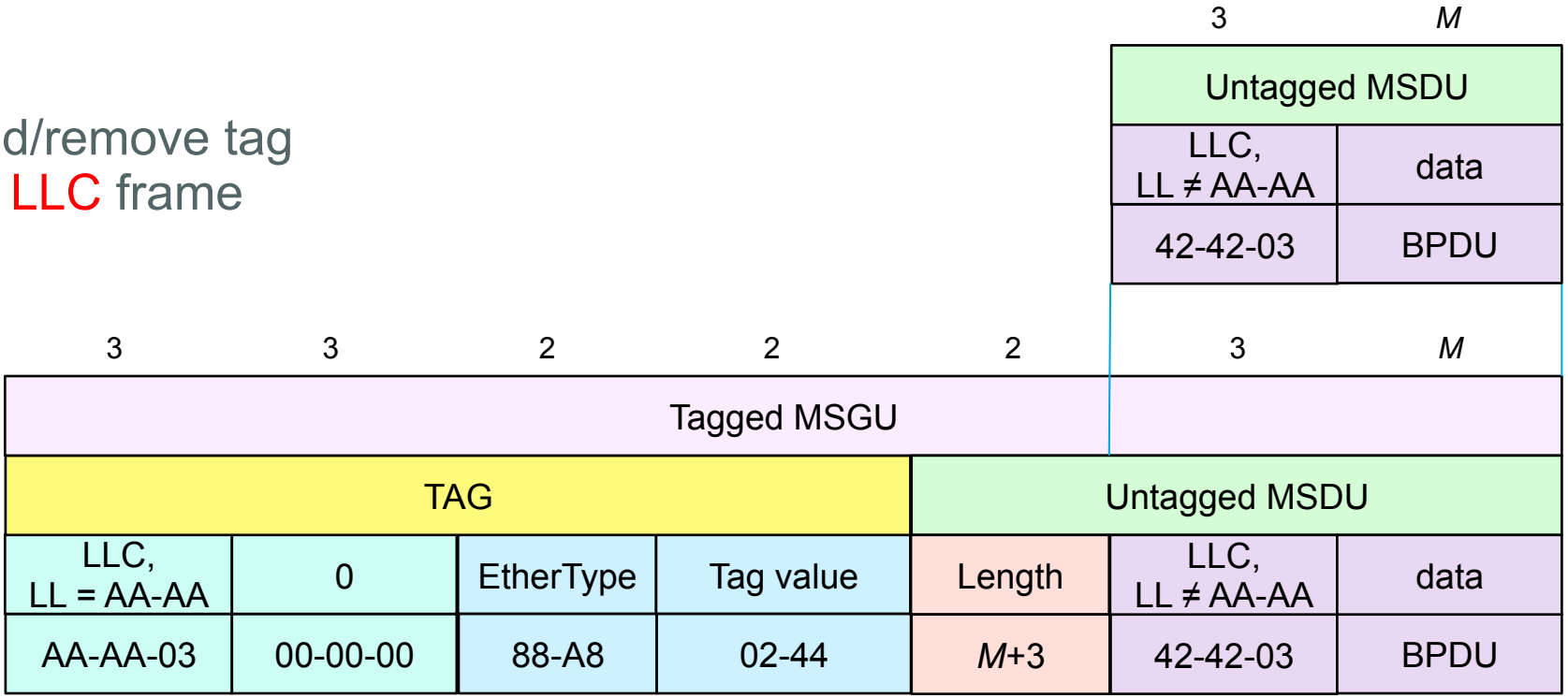
- Add/remove tag on SNAP frame



- 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

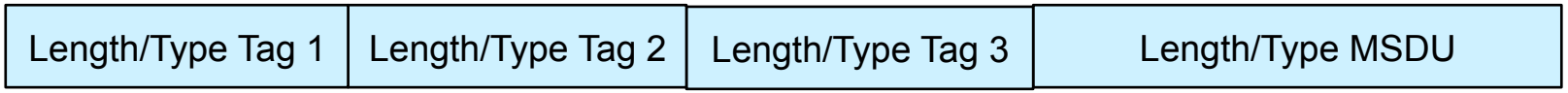
- Add/remove tag on LLC frame



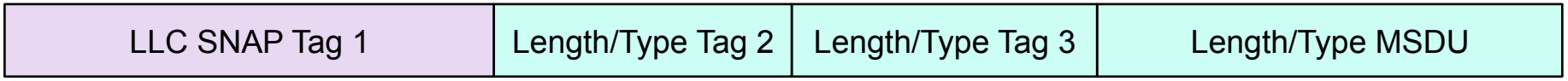
- Add or remove both the LLC tag and the Length field.

The 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.

A plea

- If any actual use of the LLC-stacked tag format is known, please let TGak know about it, because we propose to make this format “illegal”.

. 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

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

Thank you.