An Extendable Link Layer Frame Format for Wireless Coded Mesh Networks

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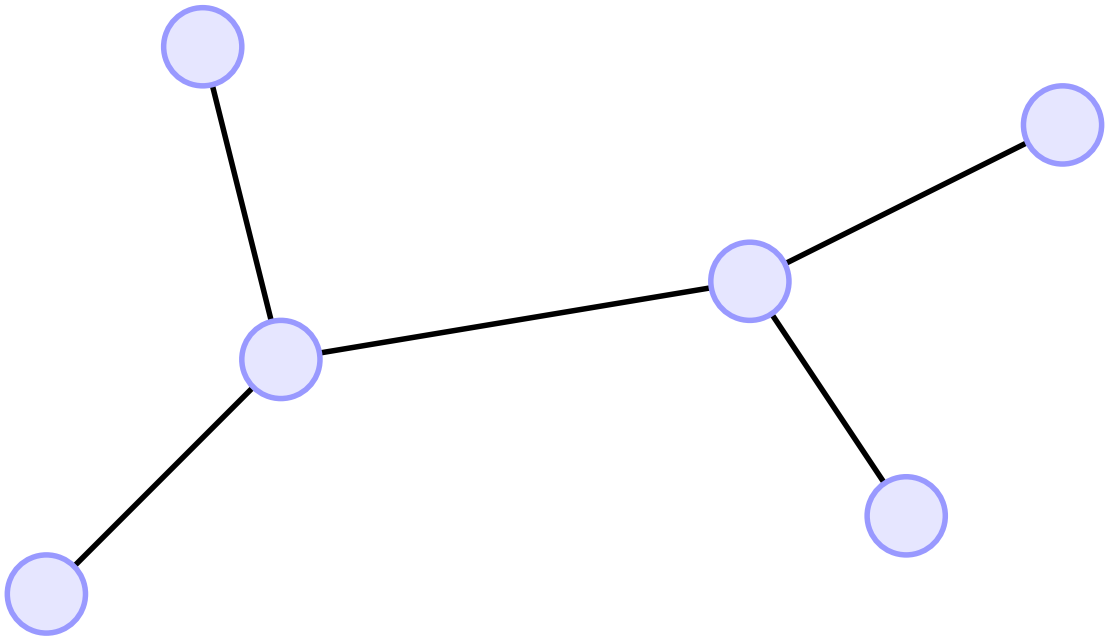
May 15, 2013

Outline

Motivation a.k.a. ”The Old Header”

What is a Wireless (Coded) Mesh-Network?

- Nodes in the network are connected wirelessly
- Many different possible routes $\Longrightarrow$ **reliability**
- Combining packets using finite field arithmetic



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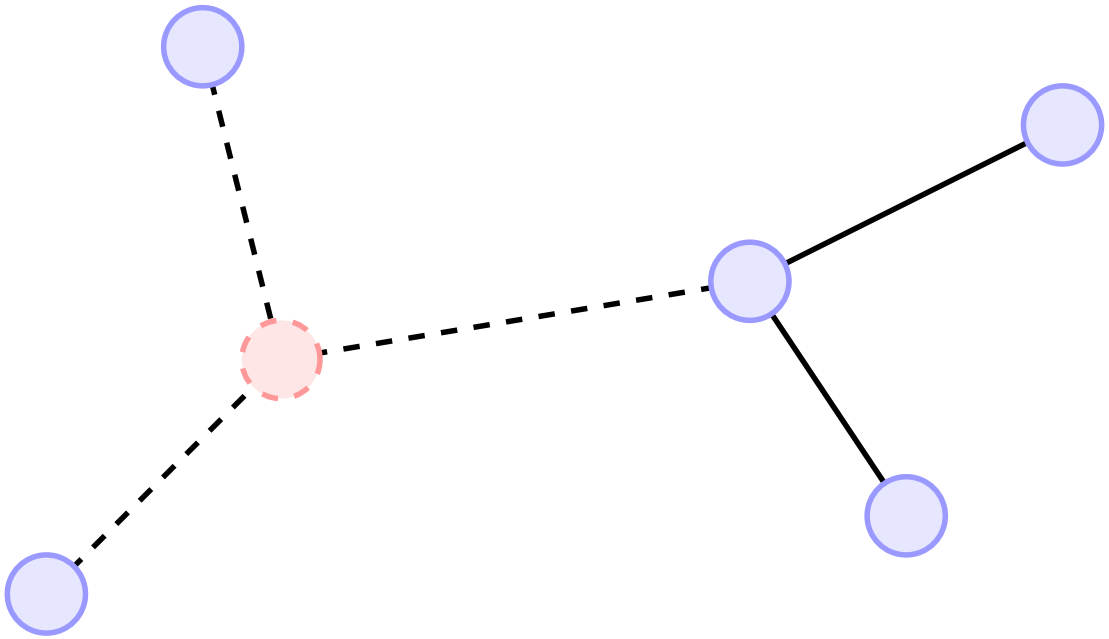

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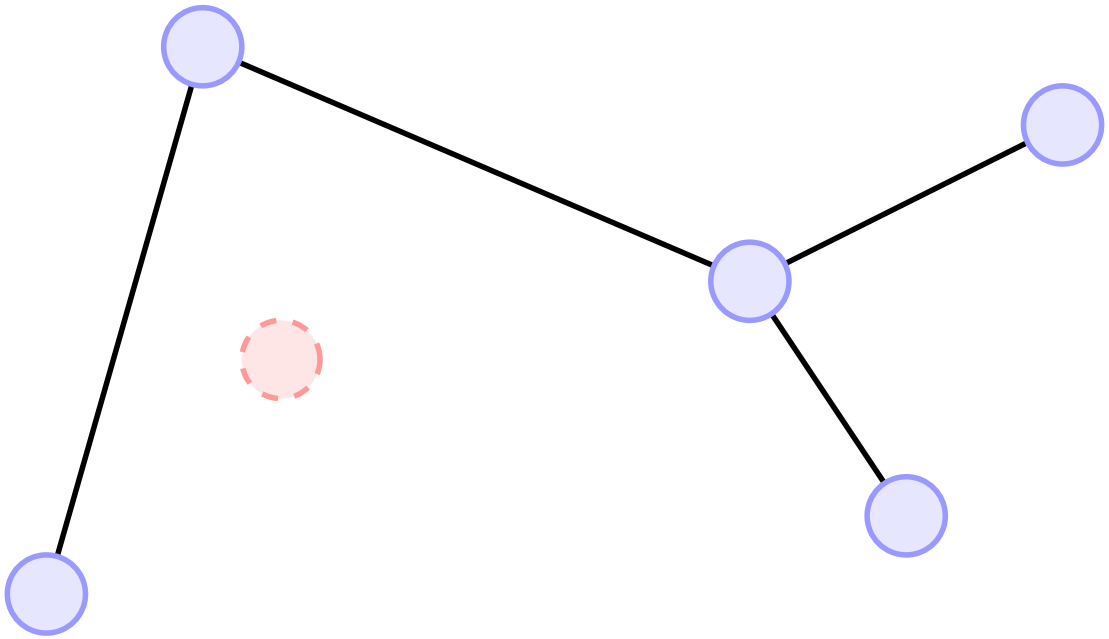

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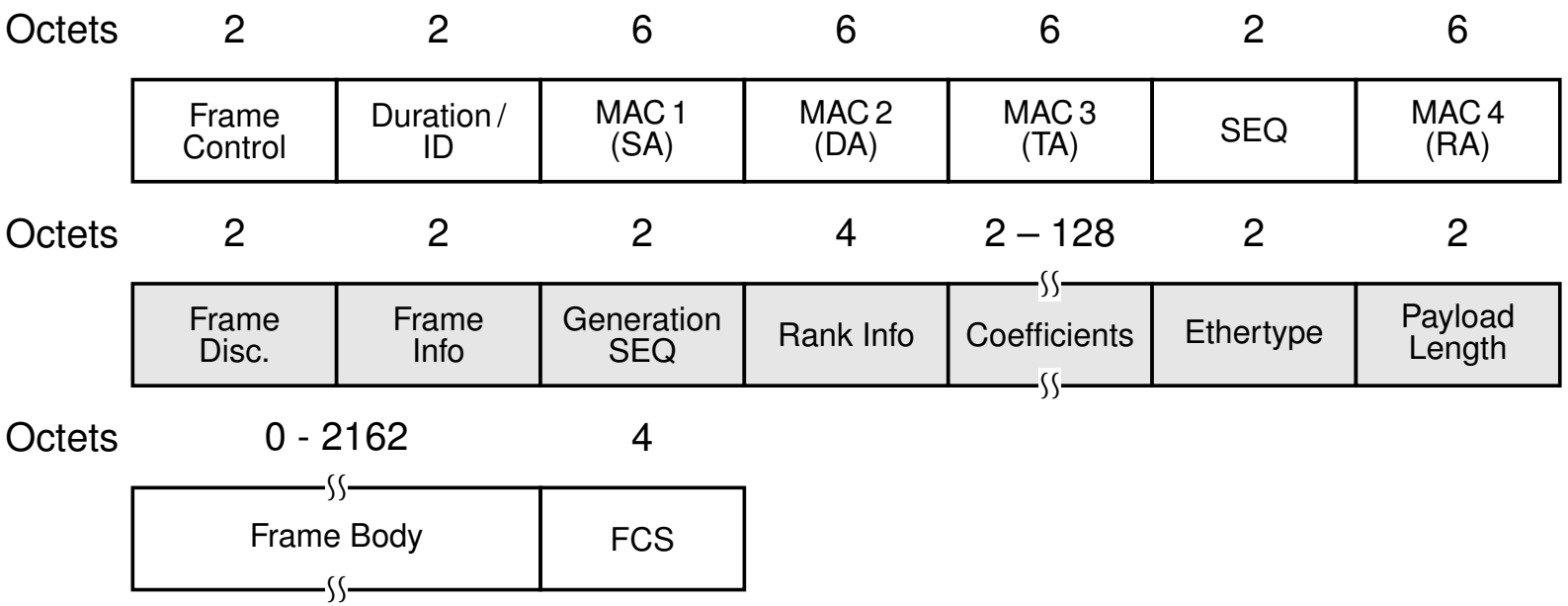

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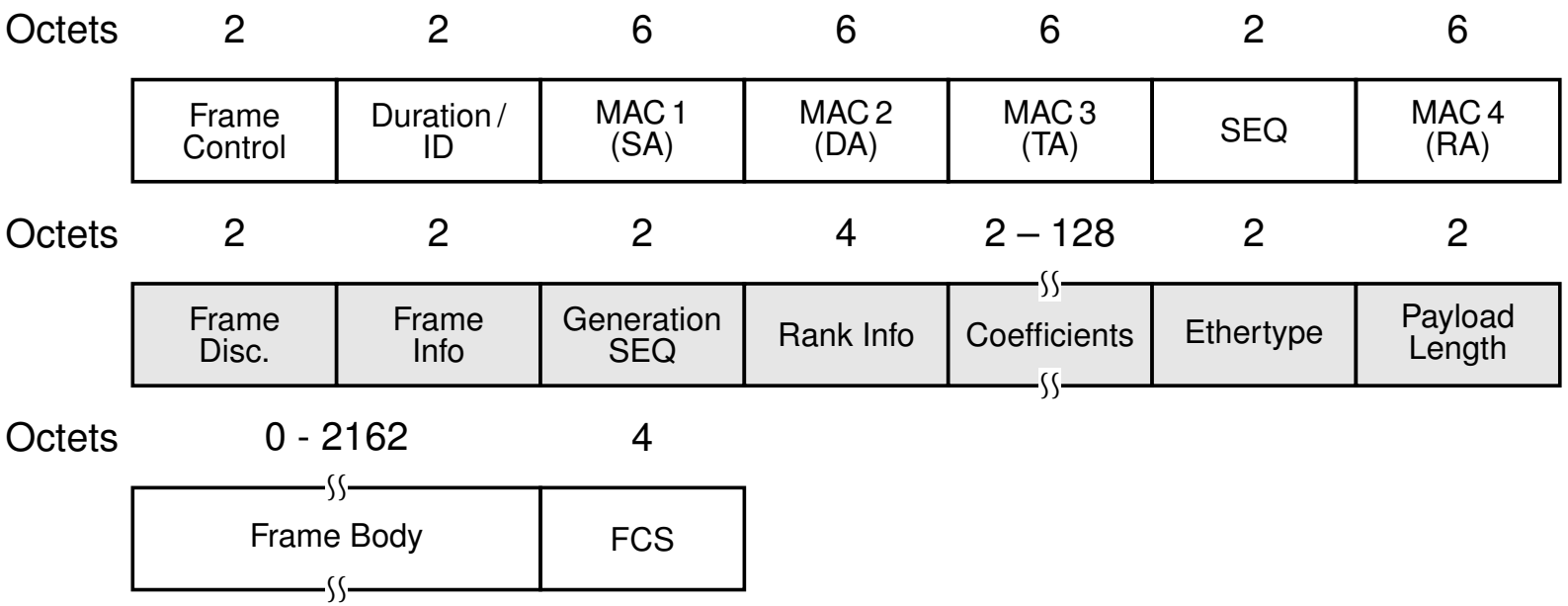

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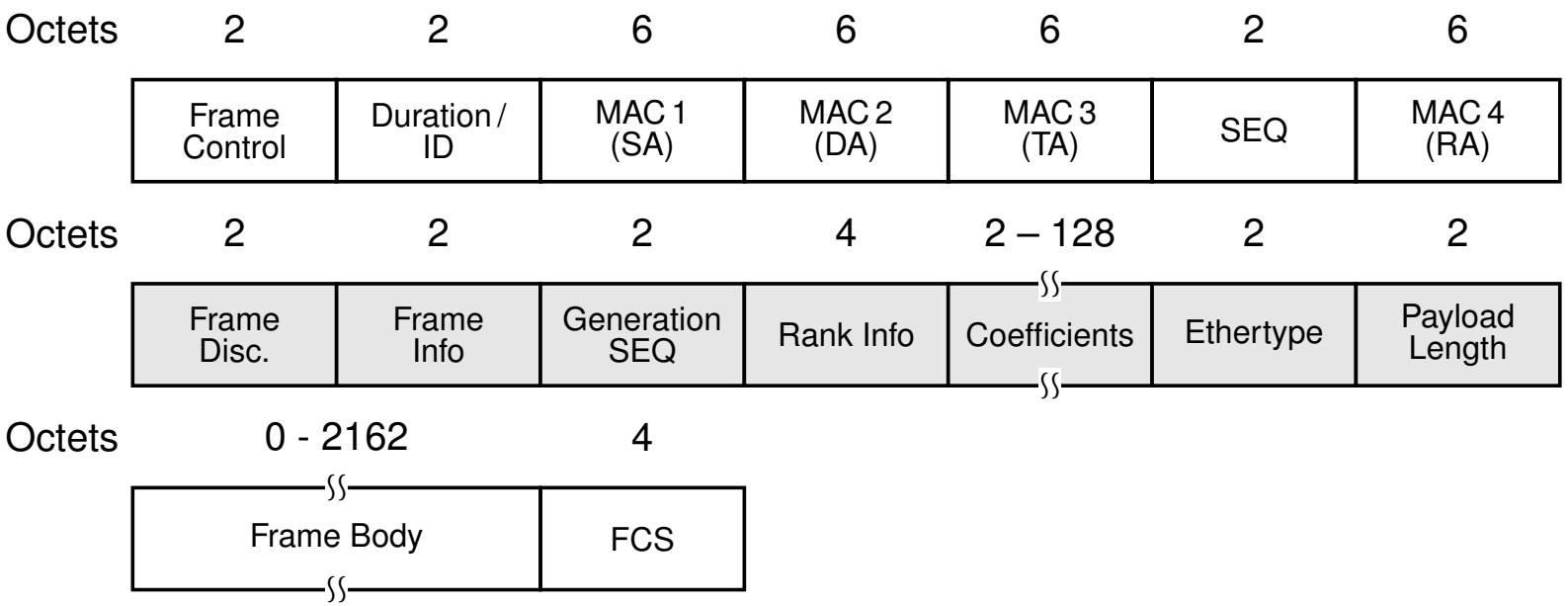

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- Disadvantage: having to ”deal” with the IEEE 802.11 header

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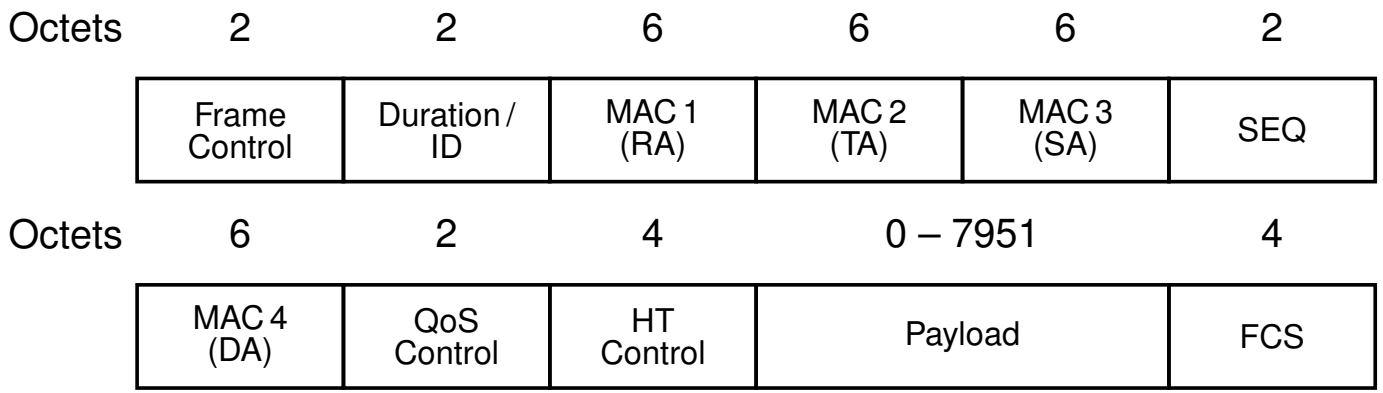

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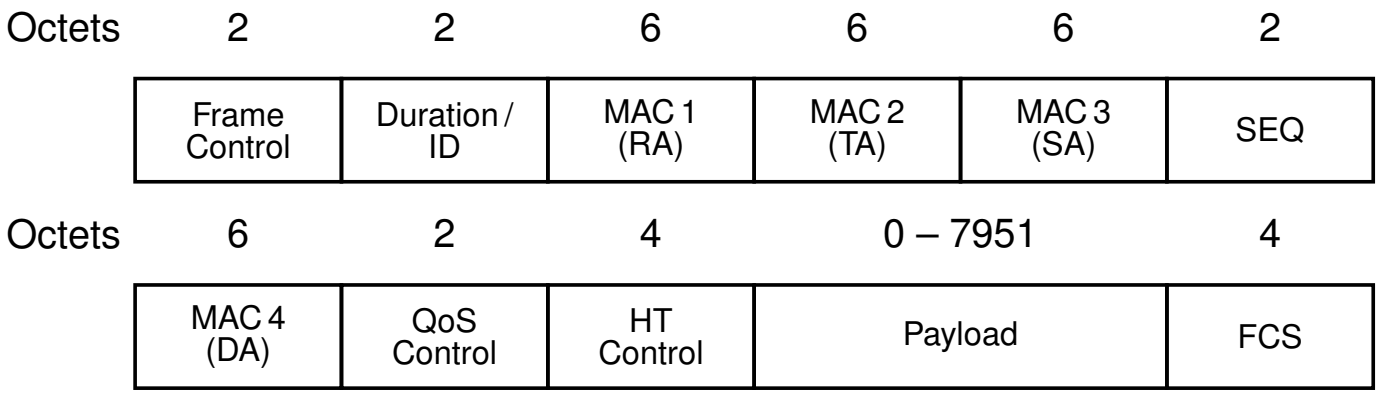
Problems due to the IEEE 802.11 header

- Frame format must adhere to the basic IEEE 802.11 structure
- A receiver must still be able to **differentiate** between moep80211 and regular frames
- Changing of some fields is not possible or causes problems elsewhere $\Longrightarrow$ **presence of unnecessary information**



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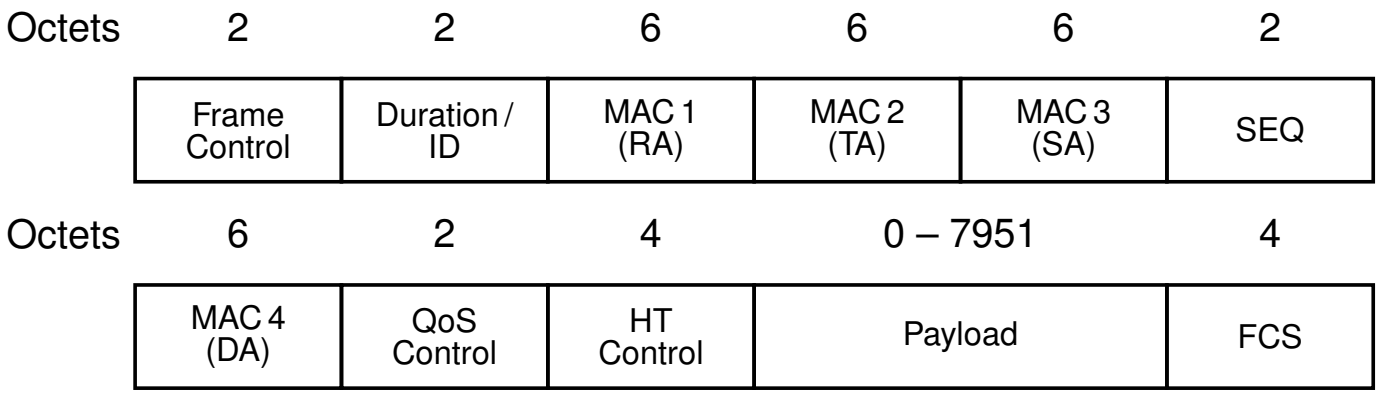

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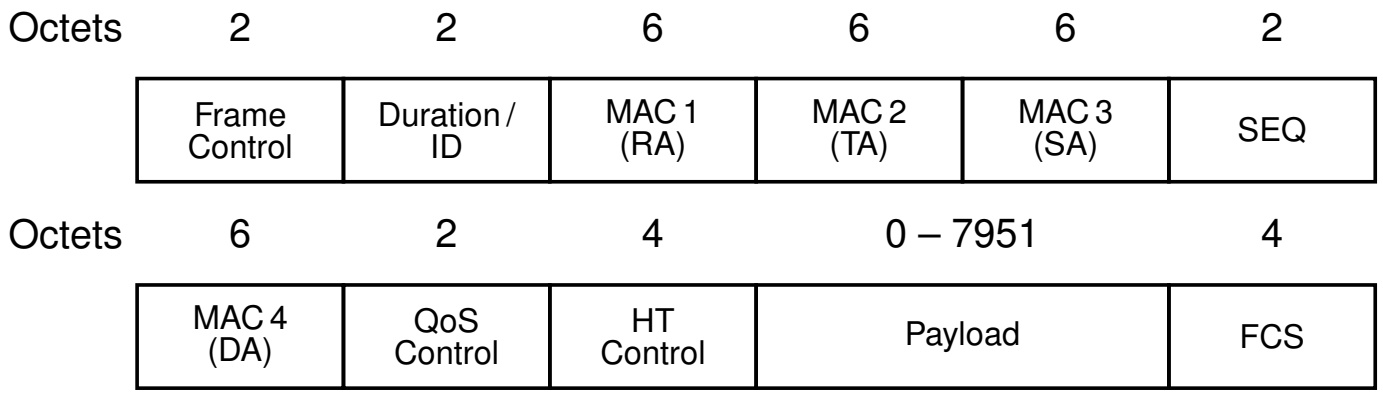

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The new Header Structure

Basic idea

The old structure was complicated and not very efficient.
Performance and expandability are improved by using following concepts:

- Use of a *generic header* that contains the basic information
- Adding of *extension headers* where special information is necessary
- Moving the frame discriminator into the third address field of the IEEE 802.11 header

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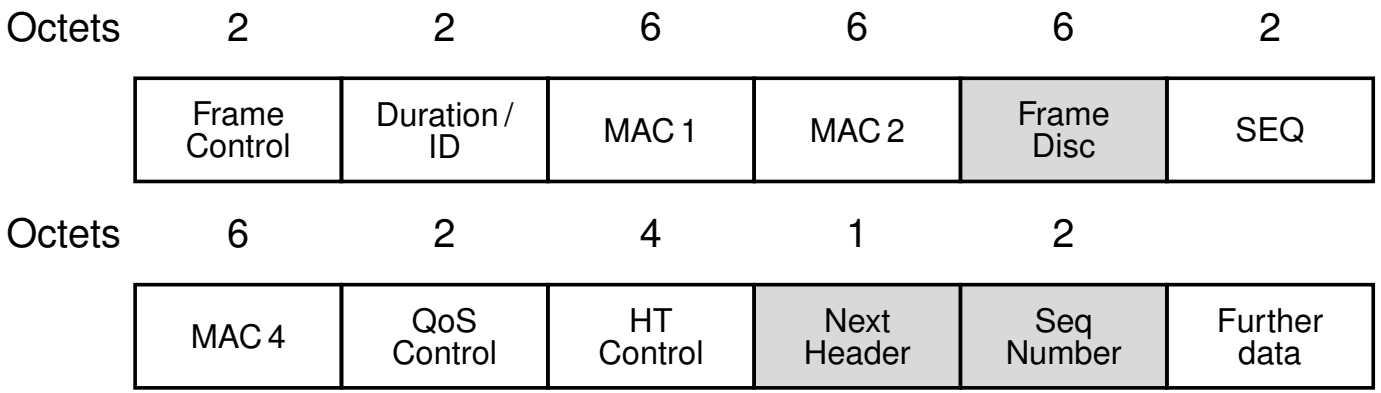

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- Third address field set to value of *fe:ff:ff:12:34:56*
- Locally administered unicast MAC address
- Should not be in regular use

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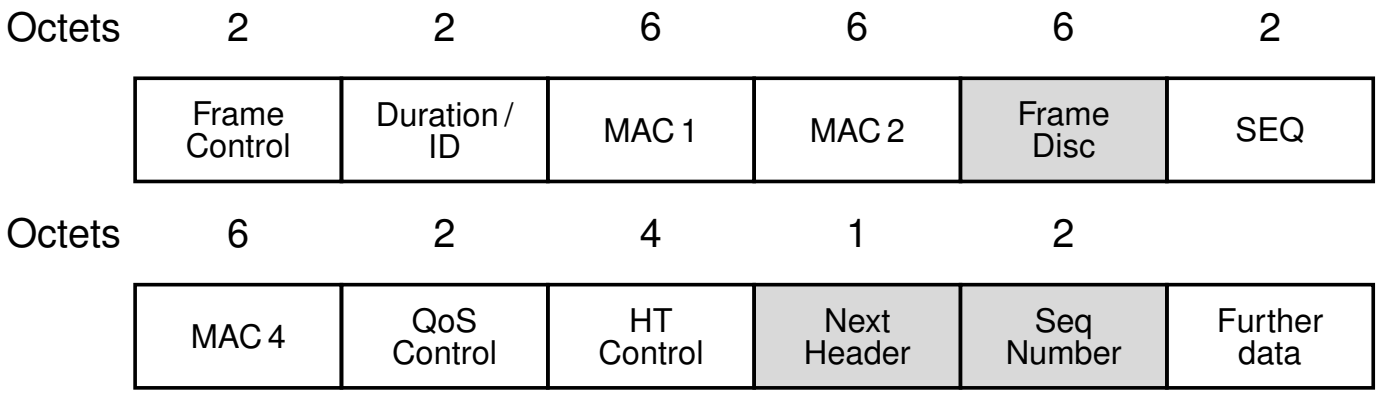

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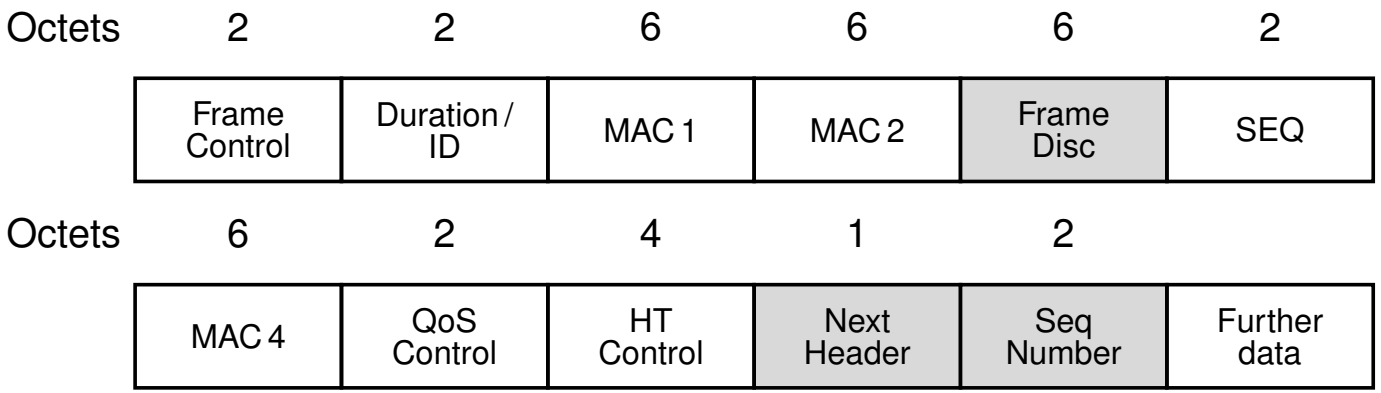

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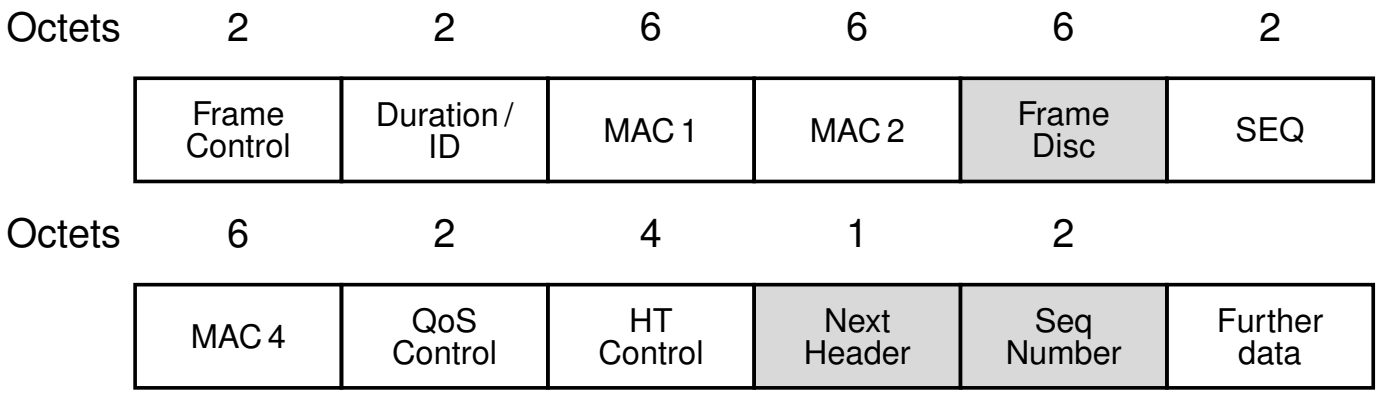

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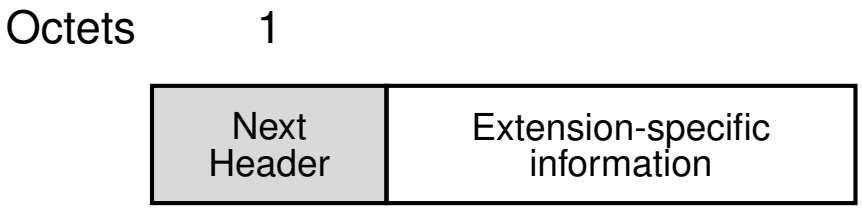

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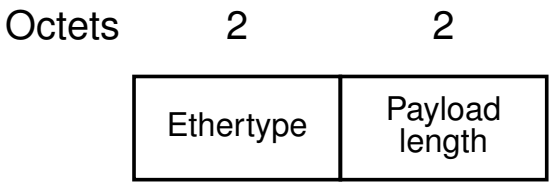
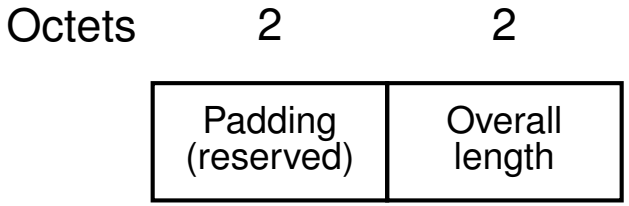
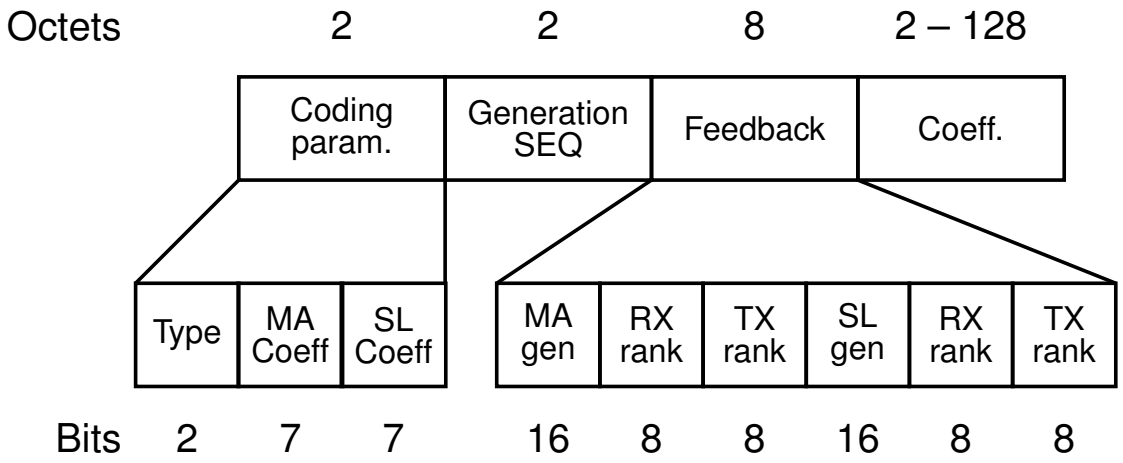
Existing extensions



(a) EthertypeLength header



(b) Multipacket header



(c) Coding header

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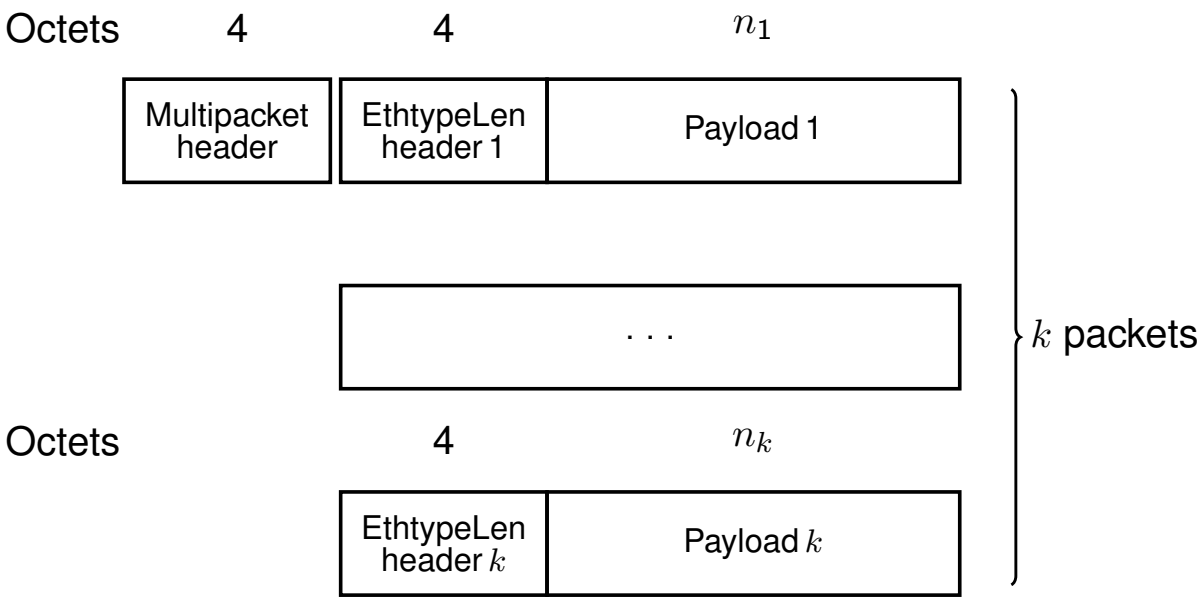
Multipacket frame format



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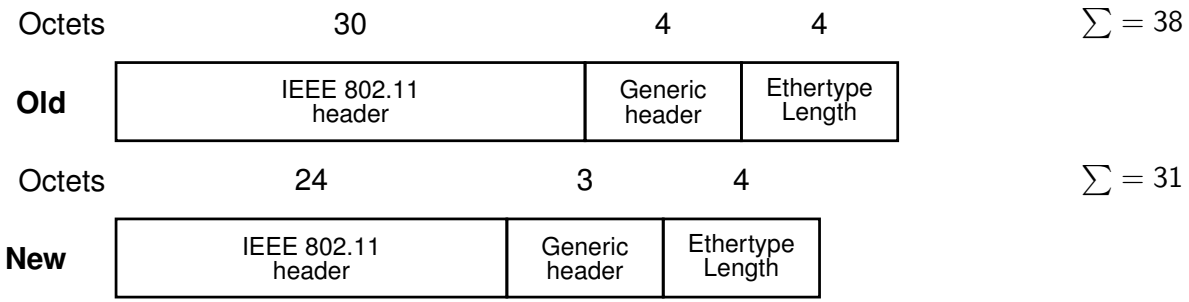
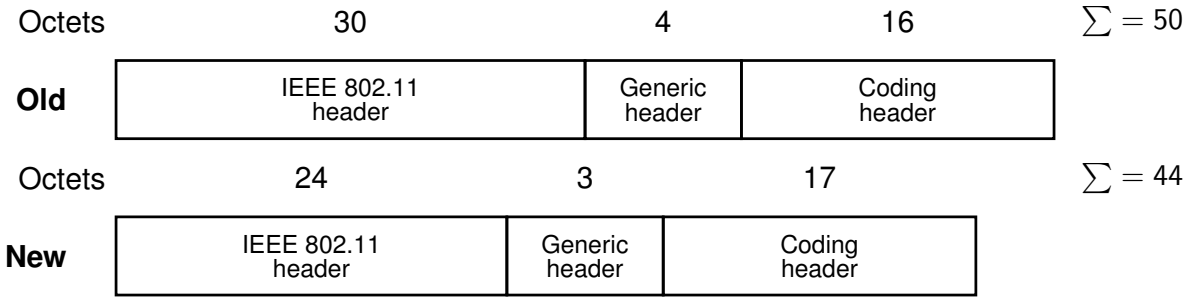
Comparison of header sizes



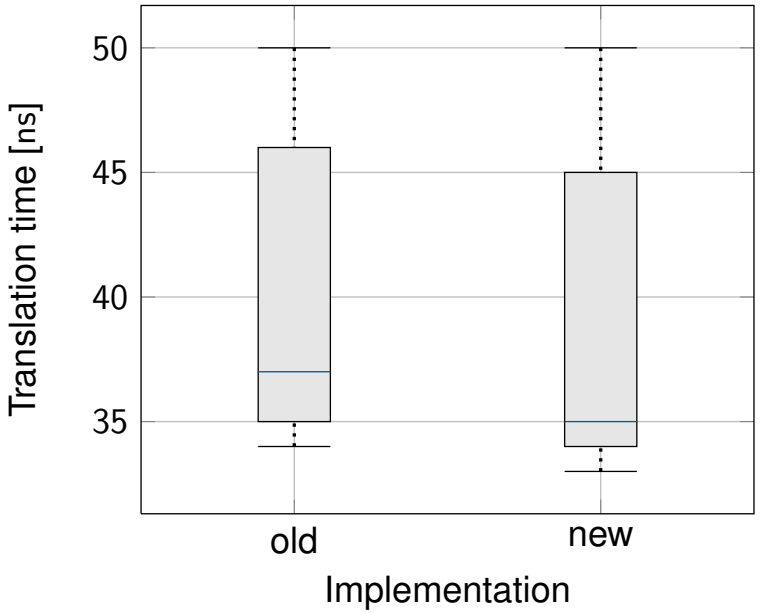
(a) Comparison of uncoded PTM headers



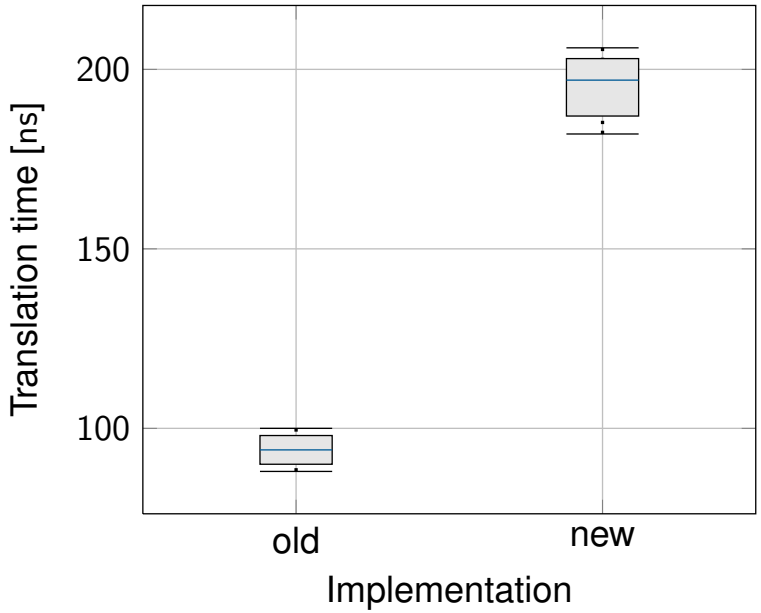
(b) Comparison of coded NCM headers

Evaluation

Efficiency of header generation



(a) PTM translation times for moep80211 to IEEE 802.11



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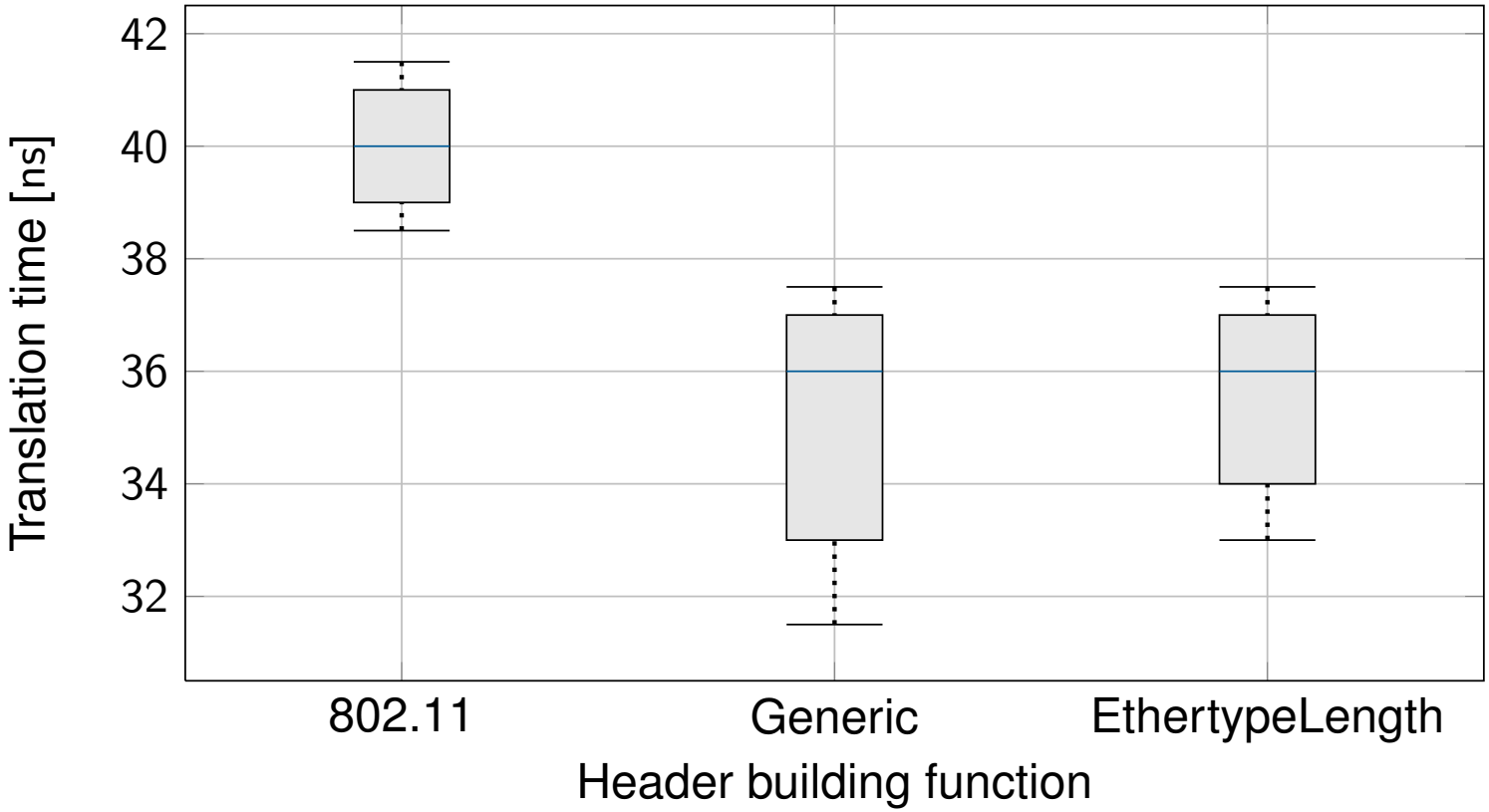

Figure: Evaluation of the functions generating the different header

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Conclusion

Have the goals been reached?

- **Unified structure:** all frames use the same format and add extensions where needed
- **Smaller headers:** the new structure is in many cases significantly smaller
- **Efficency:** conversion is not significantly slower
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Figure: Encrypted session data format (by Julius Michaelis)

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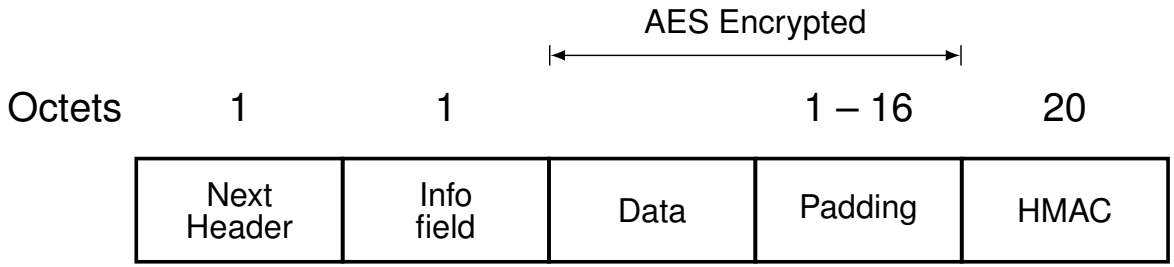

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