MAC Privacy Protection Overview

P802.1AEdk amendment to IEEE 802.1AE MAC Security.

Currently in Working Group Ballot

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MAC Privacy Goals

With standard Encryption:

Packet sizes, Frequency and addressing still allows observers to correlate activity and events

Goals: Reduce the correlation of user data frames based on:

- User MAC addresses
- Frame/packet Sizes
- Transmission timing with
  - individuals
  - network applications
  - network application details
  - levels of application activity.

Following up on exposures described in IEEE Std 802E—Recommended Practice for Privacy Considerations for IEEE 802 Technologies.

MAC Privacy protection - Background

- Privacy/confidentiality for sensitive users
  - Facing Highly motivated adversaries with considerable resources
- Today:
  - MACsec integrity + confidentiality + non-standard extensions
  - ‘Hop-by-hop’ protection
- MAC Privacy:
  - Transmission generally (not exclusively) over fixed links (fiber or service provider) with same guaranteed b/w availability
  - No need to obscure confidentiality + privacy protection use
  - Desire for a standard, readily available, solution
  - Leverage existing MACsec and PAE
  - Coexist, so far as practicable, with TSN

Privacy protection protocol

Interface stack ‘shim’ over MACsec (under Link Aggregation)

- Encapsulates user data frames (DA & SA of peer shims)
- Can be separate privacy protection device, but best as MACsec collocation
- Can pad, aggregate, and fragment user data frames before MACsec transmit
- Can use separate MACsec Secure Channels supporting preemption if required.
- Extensible Encoding of MAC Privacy Components

Reception

- Conformant receiver can recover all validly encoded user data frames
- Encoding restrictions on fragment size, in order reception, for feasibility

Transmission

- Range of transmission strategies possible, no need to negotiate with receiver
- Support of two for conformance:
  - Privacy Frame: Address encapsulation plus optional pad to boundary.
  - Privacy Channel: Regular transmission of fixed sized, aggregating PDUs
- Selection of either (or None) by user data frame priority.
- Privacy Channel tx interval shaped to allow interfering higher priority tx

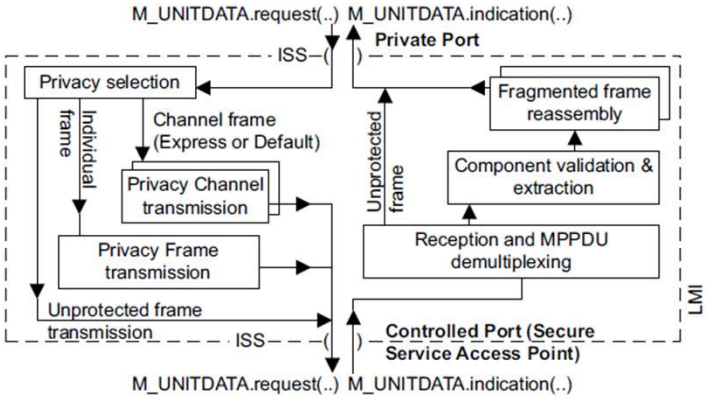
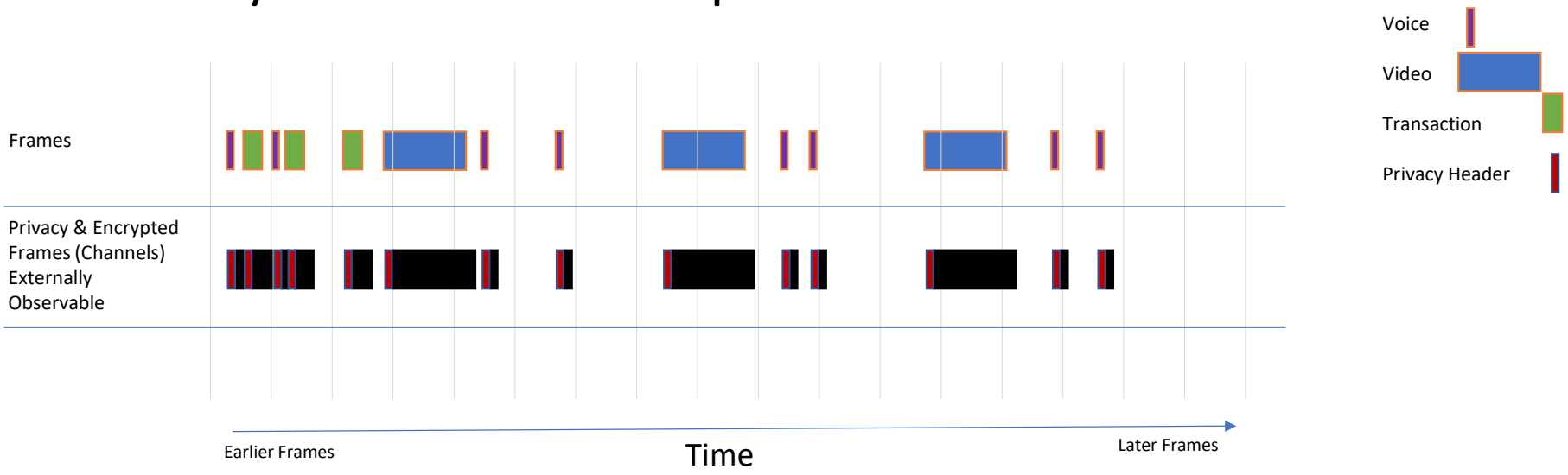


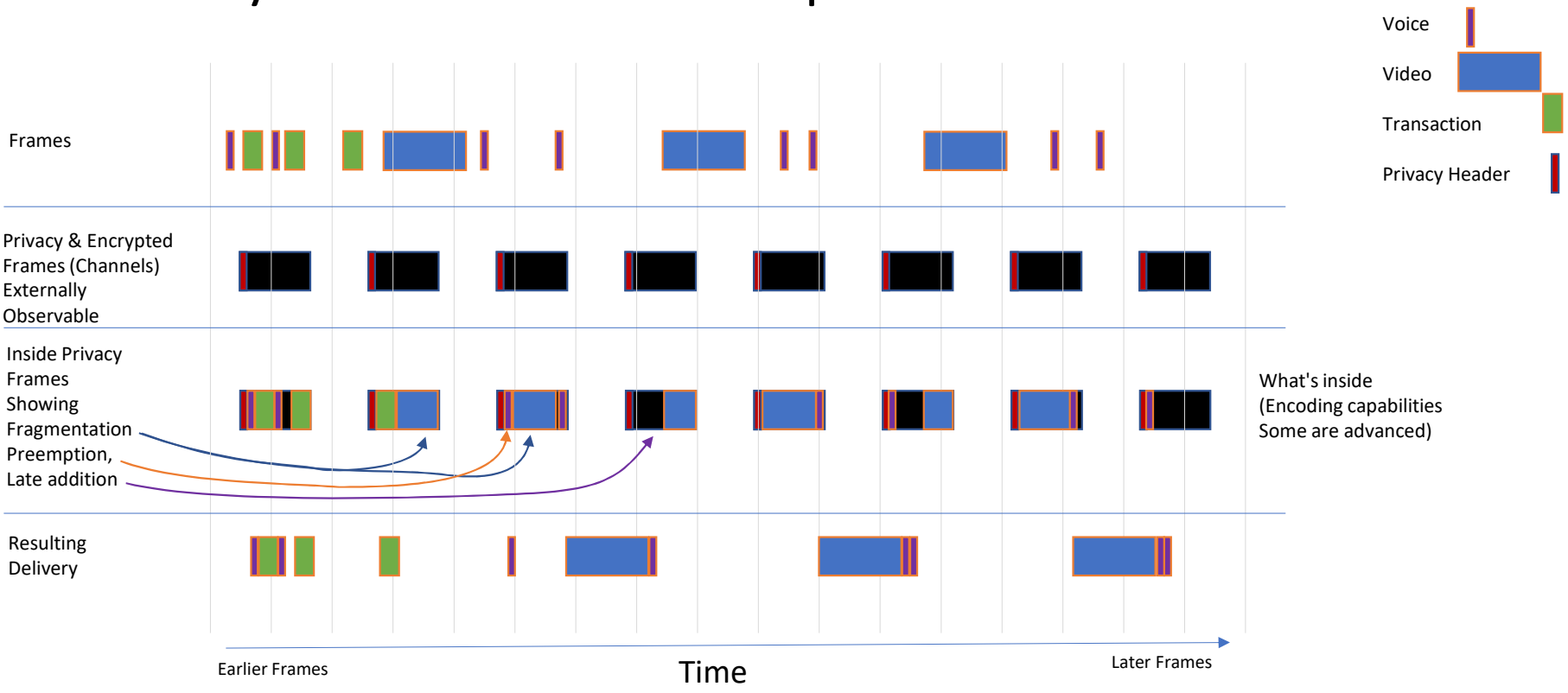
Figure 20-2—PrY architecture

Privacy Frame Example



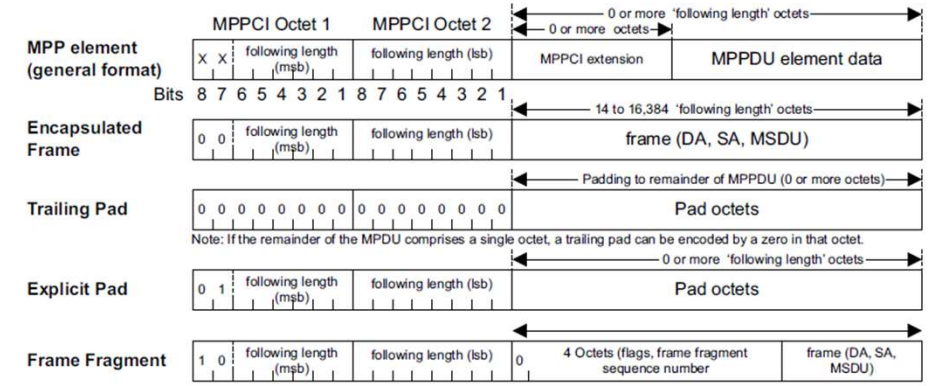
Privacy Frames hide original Frame Headers while adding a little delay (Similar to Existing MACsec)

Privacy Channels Examples



Channel Privacy Hides the complete outward appearance at the cost of some added delay

Encoding Details



An Encapsulated Frame has a following length of 14 octets or greater (19.5.1). While this encoding is capable of encapsulating user data frames with lengths from 14 to 16,383 octets in length, that does not imply that any specific media access control method can support frames with that entire range of lengths.

Each Frame Fragment conveys a fragment of a frame that is at least 64 octets in length (19.5.4).

The use of the bit pattern 11 in bits 8 and 7 of Octet 1 is reserved for future specification, as is the use of 10 in those bits with 1 in bit 8 of the third octet of the component.

Figure 19-5—MPPDU component encoding

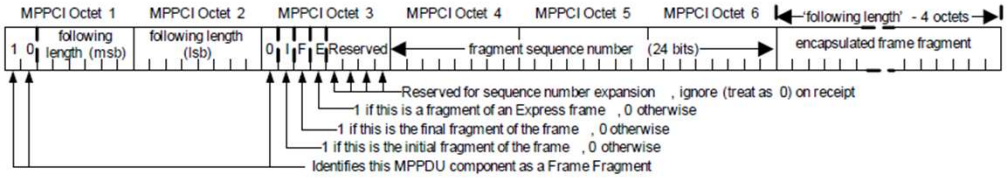


Figure 19-6—Frame Fragment