



Hardware Timestamp Insertion to aid Certification

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Objective

- Prior ethernet based time scheduled aerospace networks (such as TTP – Time Triggered Protocol) required specialized test infrastructure to capture timestamps “on the wire”
 - Ethernet timestamp is necessary but not sufficient
 - Complements software payload timestamp / metadata
- Propose hardware timestamp insertion by bridges and end points

Existing Implementations

- Vendor locked layer 1 schemes
 - Extends layer 1 preamble / FCS / trailer
- IEEE standardized layer 2 header chaining
 - i.e., [Cisco ttag](#) (Ethertype 0x8905)
- Timestamp insertion should be as close to wire as possible
 - After gate control

Wireshark Cisco ttag sample

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.145.105.1	239.1.37.11	UDP	118	50371 → 50371 Len=64

> Frame 1: 118 bytes on wire (944 bits), 118 bytes captured (944 bits)

- ✓ Ethernet II, Src: Cisco_23:64:c1 (00:1c:58:23:64:c1), Dst: Cisco_64:33:41 (00:15:62:64:33:41)
 - > Destination: Cisco_64:33:41 (00:15:62:64:33:41)
 - > Source: Cisco_23:64:c1 (00:1c:58:23:64:c1)
 - Type: Unknown (0x8905)
- > Cisco ttag, Timestamp: 75866.308934056
- > 802.1Q Virtual LAN, PRI: 7, DEI: 1, ID: 2472
- > Internet Protocol Version 4, Src: 10.145.105.1, Dst: 239.1.37.11
- > User Datagram Protocol, Src Port: 50371, Dst Port: 50371
- > Data (64 bytes)

```
0000  00 15 62 64 33 41 00 1c 58 23 64 c1 89 05 45 00  ··bd3A·· X#d···E·
0010  00 64 f9 a8 81 00 f9 a8 08 00 45 00 00 5c 90 4e  ·d····· ··E·\·N
0020  00 00 01 11 a0 d8 0a 91 69 01 ef 01 25 0b c4 c3  ········ i···%···
0030  c4 c3 00 48 0e 0d 01 00 00 00 00 00 00 34 ea e4  ···H···· ·····4···
0040  f0 00 42 9a 9e c2 42 52 e4 d4 42 4a 90 51 42 59  ··B···BR ··BJ·QBY
0050  a7 3c 42 03 e6 44 42 06 97 82 42 8d f2 eb 42 aa  ·<B··DB· ··B··B·
0060  b6 d1 00 01 1f ff 42 0c 49 24 42 06 c2 99 42 03  ······B· I$B···B·
0070  e6 44 42 06 97 82  ·DB···
```

Packets: 1 · Displayed: 1 (100.0%) Profile: Default

Proposal

- Consider specifying timestamp insertion in aerospace profile
- Could be optional feature (“may”), but needs to be defined in the standard for interoperability.
- Last resort – informative annex as guidance?
- Discussion/feedback?