



How Provenance™ can make MiFID 2 timing compliance easy

The Challenge

New MiFID 2 timing regulations for recording trade data (RTS 25)

- **Highly accurate timestamps required for high-frequency trade data**
 - Must be synchronized to UTC
 - Granularity: 1 microsecond or better
 - Maximum divergence from UTC: < 100 microseconds
- **Traceability requirements**
 - *Must be able to demonstrate traceability to UTC by documenting the system design, **functioning** and specifications*

The Problem

Timing accuracy can change over time

- Clock drift, system or network load, cross-traffic, configuration changes ..

Burden of proof is on traders

- To prove timestamps were accurate when trade data recorded

Need to continuously monitor and record timestamp accuracy

- How to do this?
- Needs to be easy to correlate with recorded trade data
- Minimize compliance overhead

The Solution - introducing Provenance

New feature of Endace DAG™ data capture cards

Watermarks recorded traffic every second with additional rich data

- **Full timing data:** time source, synchronization method, clock accuracy (drift)
- **And 150+ other data points:** hostname, location, link name, link type and many more

Provenance records automatically embedded in recorded traffic

- A permanent indelible record archived alongside recorded trade data
- Maintains full context
- Easy to reference with standard packet tools e.g. Wireshark
- Extensible format – future proof for evolving business/regulatory needs

A quick look

The screenshot shows the Wireshark interface with a capture filter applied. The main pane displays a list of network packets. The details pane is expanded to show the 'MetaERF Host Section' for a selected packet. The packet list includes:

No.	Time	Source	Destination	Protocol	Length	Info
88	14.598905522	192.168.10.12	192.168.10.110	TCP	723	55619->988 [ACK] Seq=7981 Ack=1 Win=5792 Len=665
89	14.770411654			ERF	1424	MetaERF Record
90	14.796470852	192.168.10.24	192.168.10.125	UDP	271	5660->10370 Len=225
91	14.997427815	192.168.10.54	192.168.10.164	TCP	1189	[TCP Retransmission] 9304->80 [ACK] Seq=2148767033 Ack=2146201713 Win=56472 Le
92	15.198384083	192.168.10.12	192.168.10.110	TCP	723	55619->988 [ACK] Seq=8646 Ack=1 Win=5792 Len=665
93	15.399340274	192.168.10.28	192.168.10.112	TCP	74	27269->80 [<None>] Seq=1 Win=5792 Len=0 MSS=1460 TSval=703762033 TSecr=0
94	15.600297129	192.168.10.12	192.168.10.110	TCP	723	55619->988 [ACK] Seq=9311 Ack=1 Win=5792 Len=665

The details pane shows the following structure:

- MetaERF Capture Section
 - Capture Section Header
 - Name: Example capture
 - Description: Public exmample capture with Provenance and PTP
 - User: admin
 - Application Name: dagmeta
 - Application Version: 5.5.1
 - Timezone Offset: 46800
 - Timezone Name: NZDT
- MetaERF Host Section
 - Host Section Header
 - Name: sys8000-2
 - Description: Systems test 8000-2
 - Organisation: Endace
 - Location Name: Hamilton, NZ
 - Location Description: Endace Hamilton Systems Lab
 - Hostname: sys8000-2.endace.com
 - Model: Intel Corporation NPB8000
 - Serial Number: SYS8000-2
 - Memory: 127 GiB (137356386304 bytes)

The packet bytes pane shows hexadecimal data for the selected packet, with a callout indicating that over 150 provenance data points are recorded in each record.

Metadata records inserted every second

150+ Provenance data points recorded in each record

A quick look

```
> Clock Source: PTP (5)
> Clock Input Port Protocol: Ethernet (4)
> Clock State: Unsynchronized (1)
> Clock Threshold: 596 nanoseconds
> Clock PHC Index: 7
> Clock PHC Offset: 36.00000000 seconds
> Clock Timebase: UTC
> Clock Description: Symmetricom XLi IEEE 1588 Grandmaster
> Clock Output Source: Internal (6)
> Clock Link Cable Mode: Disabled Master (3)
> PTP Domain Number: 0
> PTP Steps Removed: 1
> PTP Offset From Master: 0.011442476 seconds
> PTP Mean Path Delay: 1494 nanoseconds
> PTP Parent Clock Identity: Symmetri_ff:fe:01:c1:7a (00:a0:69:ff:fe:01:c1:7a)
> PTP Parent Port Number: 1
> PTP Grandmaster Identity: Symmetri_ff:fe:01:c1:7a (00:a0:69:ff:fe:01:c1:7a)
v PTP Grandmaster Clock Quality: 0x062142ba, Clock Class: 6, Clock Accuracy: The time is accurate to within 100 ns (0000 0110 .... .. = Clock Class: 6
    .... .. 0010 0001 .... .. = Clock Accuracy: The time is accurate to within 100 ns (0000 0110 .... .. = Offset Scaled Log Variance: 17082
    Tag Type: ptp_gm_clock_quality (406)
    Tag Length: 4
> PTP Current UTC Offset: 36.00000000 seconds
> PTP Time Properties: 0x0000003c, Current UTC Offset Valid, PTP Timescale, Time Traceable, Frequency
> PTP Time Source: GPS (32)
> PTP Clock Identity: EndaceT_e:ff:fe:01:70:a8 (00:0e:a7:ff:fe:01:70:a8)
> PTP Port Number: 1
> PTP Port State: UNCALIBRATED (8)
> PTP Delay Mechanism: E2E (1)
```

```
0080 00 19 00 04 00 00 b6 d0 00 1a 00 05 4e 5a 44 54
0090 00 00 00 ff 01 00 04 00 00 01 40 00 0c 00 0a
00a0 73 79 73 38 30 30 30 2d 32 00 00 00 0d 00 14
00b0 53 79 73 74 65 6d 73 20 74 65 73 74 20 38 30 30
00c0 30 2d 32 00 00 0b 00 07 45 6e 64 61 63 65 00 00
00d0 00 22 00 0d 48 61 6d 69 6c 74 6f 6e 2c 20 4e 5a
00e0 00 00 00 00 02 00 1c 45 6e 64 61 63 65 20 48
00f0 61 6d 69 6c 74 6f 6e 20 53 79 73 74 65 6d 73 20
0100 4c 61 62 00 00 12 00 15 73 79 73 38 30 30 30 2d
    33 6f 6d 00 00 00
    20 43 6f 72 70 6f 72
    38 30 30 30 00 00
    30 30 2d 32 00 00
    14 20 00 00 31 00 2a
    38 65 6f 6e 28 52 29
    36 38 30 20 76 32 20
0180 40 20 32 2e 38 30 47 48 7a 00 00 00 32 00 04
0190 00 00 00 14 00 33 00 04 00 00 00 02 00 11 00 26
01a0 43 65 6e 74 4f 53 20 4c 69 6e 75 78 20 72 65 6c
01b0 65 61 73 65 20 37 2e 32 2e 31 35 31 31 20 28 43
01c0 6f 72 65 29 20 00 00 00 00 35 00 06 35 2e 35 2e
01d0 31 00 00 00 ff 02 00 04 00 00 01 ac 00 1e 00 04
01e0 00 00 00 01 00 14 00 0b 44 41 47 20 31 30 58 34
01f0 2d 50 00 00 00 15 00 3d 64 31 30 78 34 2d 61 37
0200 70 63 69 5f 65 74 68 2d 34 30 67 65 5f 53 32 2e
0210 31 30 20 35 61 67 7a 6d 65 37 68 32 66 33 35 63
0220 33 20 32 30 31 36 2f 30 38 2f 32 36 20 31 36 3a
0230 30 31 3a 30 36 00 00 00 00 16 00 0b 33 31 34 33
0240 33 30 30 30 34 38 00 00 00 2c 00 04 64 61 67 31
0250 00 2d 00 09 2f 64 65 76 2f 64 61 67 31 00 00 00
0260 00 08 00 04 00 00 00 20 00 25 00 04 00 00 00 05
0270 00 26 00 04 00 00 00 01 80 00 04 00 00 00 05
0280 01 9e 00 04 00 00 00 04 01 81 00 04 00 00 00 01
0290 01 82 00 08 00 0a 00 00 00 00 00 00 01 89 00 04
```

Including extensive
Timing Data

How do I get Provenance?

- Available **NOW** on all DAG 10X cards



- Dual port: DAG 10X2-S and DAG 10X2-P
- Quad port: DAG 10X4-P

- **Q1, 2017** on EndaceProbe Network Recorders



- New OSm release 6.3 in Q1, 2017

New Pricing!

DAG 10X2-S

- Dual port 1/10 GbE card
- 100% accurate recording
- Nanosecond-level accurate hardware time-stamping
- Dedicated SFP Time Sync Port

Now just US\$2500 per card



Questions?

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