

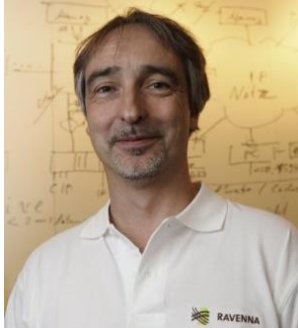


RAVENNA 2020 Webinar Series

AES67 Practical: Configuring Devices

Tue, June 16, 2020
15:00 h (CEST)

Claudio Becker-Foss, DirectOut
Andreas Hildebrand, ALC NetworX



Andreas Hildebrand, RAVENNA Technology Evangelist

- more than 25 years in the professional audio / broadcasting industry
- graduate diploma in computer science
- R&D, project & product management experience
- member of AES67 TG and SMPTE ST 2110 DG

ALC NetworX GmbH, Munich / Germany



- established 2008
- R&D center
- developing & promoting RAVENNA
- partnerships with ~ 50 manufacturers

RAVENNA



- IP media networking technology
- designed to meet requirements of professional audio / broadcasting applications
- open technology approach, license-free
- fully AES67-compliant (*built-in*)



Claudio Becker-Foss, CEO/CTO of DirectOut

- studied Audio Engineering at the Institute of Music and Media in Dusseldorf, Germany
- co-founder of DirectOut GmbH in 2008
- freelance broadcast engineer for WDR in Cologne
- recording producer
- network audio specialist
- member of AES67 standards committee



DirectOut GmbH, Mittweida / Germany

- founded in 2008
- manufacturer of professional audio and broadcast equipment
- early adopter of RAVENNA, AES67 and SMPTE ST 2110



RAVENNA Partner

- since 2009 (early adopter)



Overview

- PTP Configuration
 - General options
 - Clock modes
 - Parametrization
- “Bio Break”
- Stream Configuration
 - RAVENNA
 - AES67 / SMPTE ST 2110-30
 - Dante (in AES67 mode)
- Tools
- Q&A breaks





as part of the RAVENNA 2020 Summer Webinar Series

RAVENNA/AES67 Practical: Configuring Devices

What to consider when configuring your RAVENNA/AES67 devices

MONTONE.42 | Grandmaster



Artel 1G Quarra | PTP-aware Switch



Genelec 8430 IP | Speaker



PRODIGY.MC w/ DANTE.IO

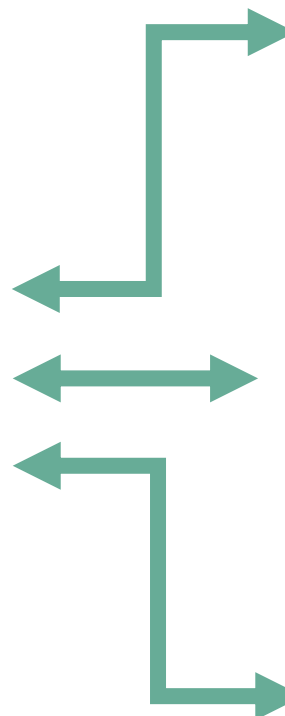


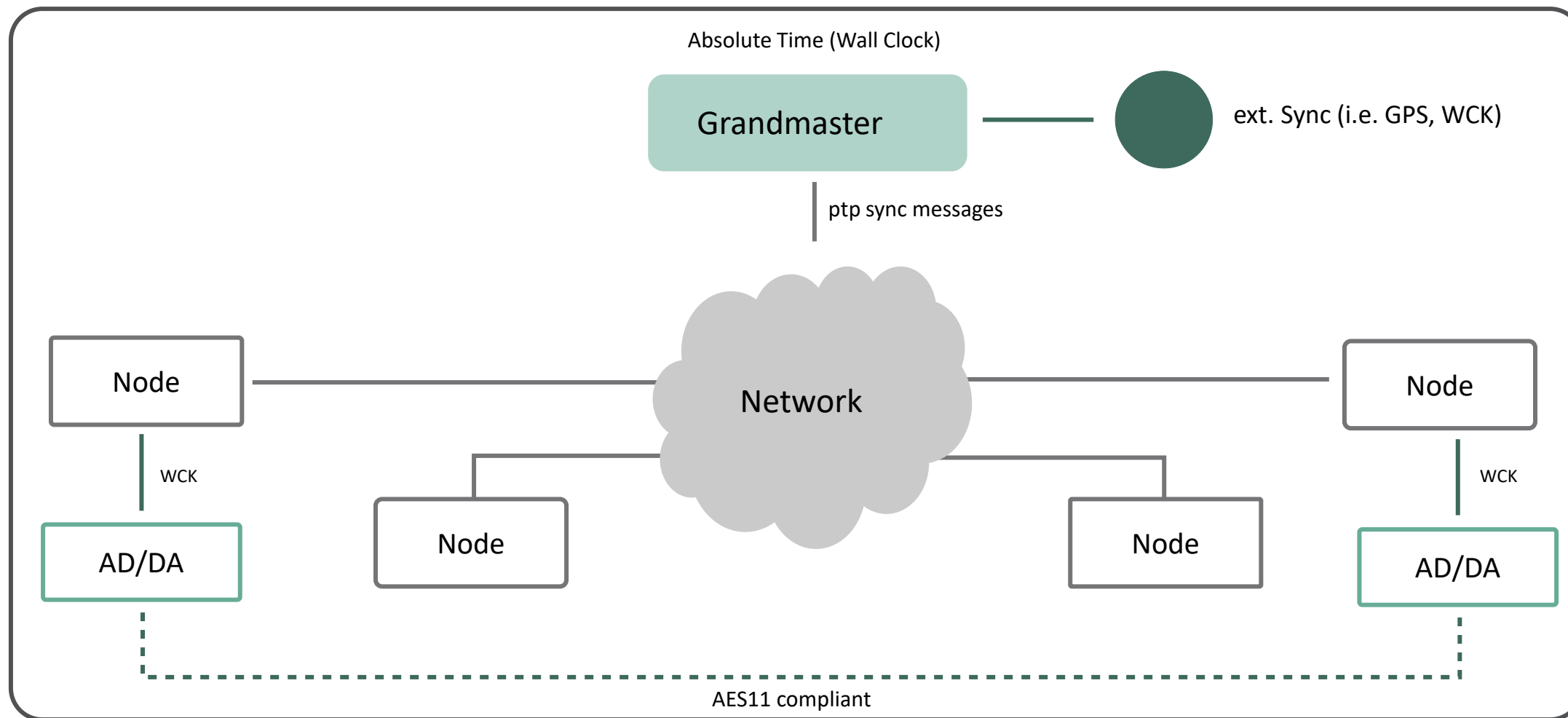
Network

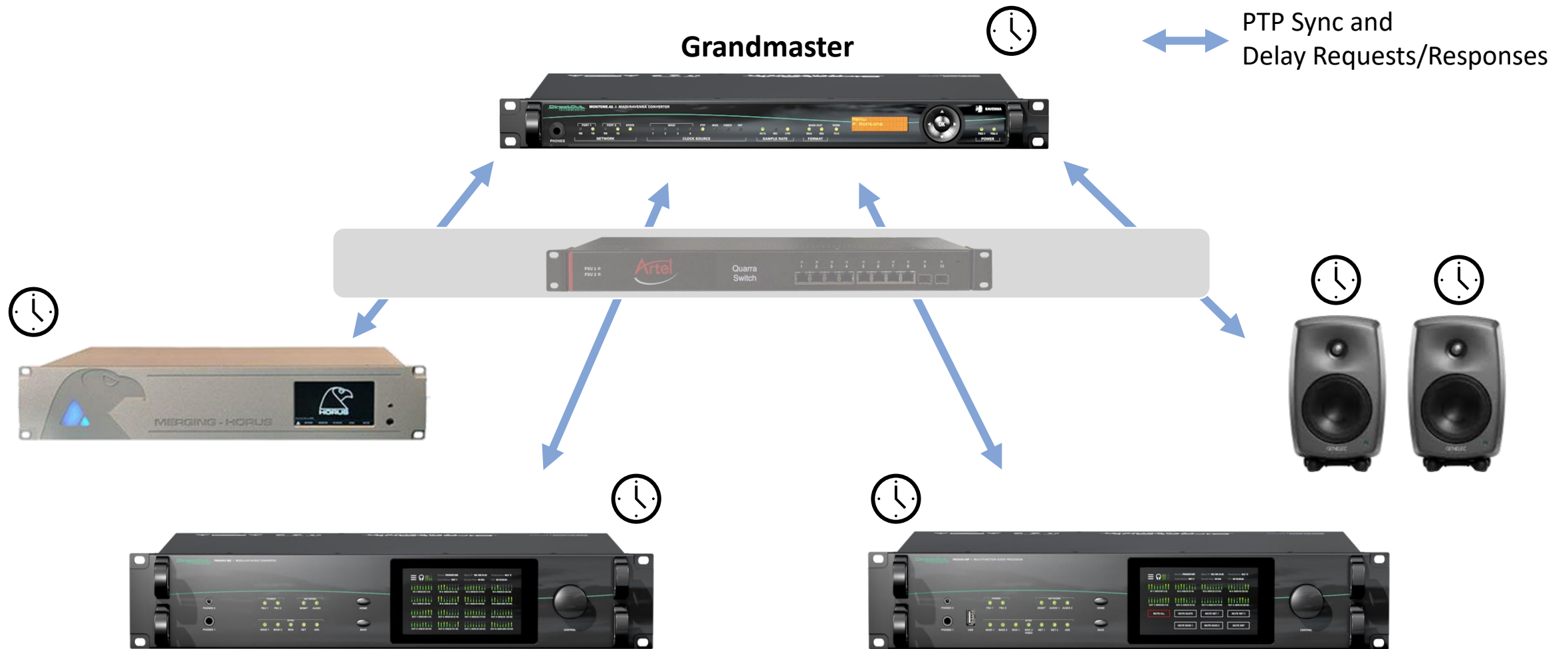
PRODIGY.MP w/ RAV.IO



Merging Horus







Time t



PTP Sync and
Delay Requests/Responses

$t + \text{Processing time } p$



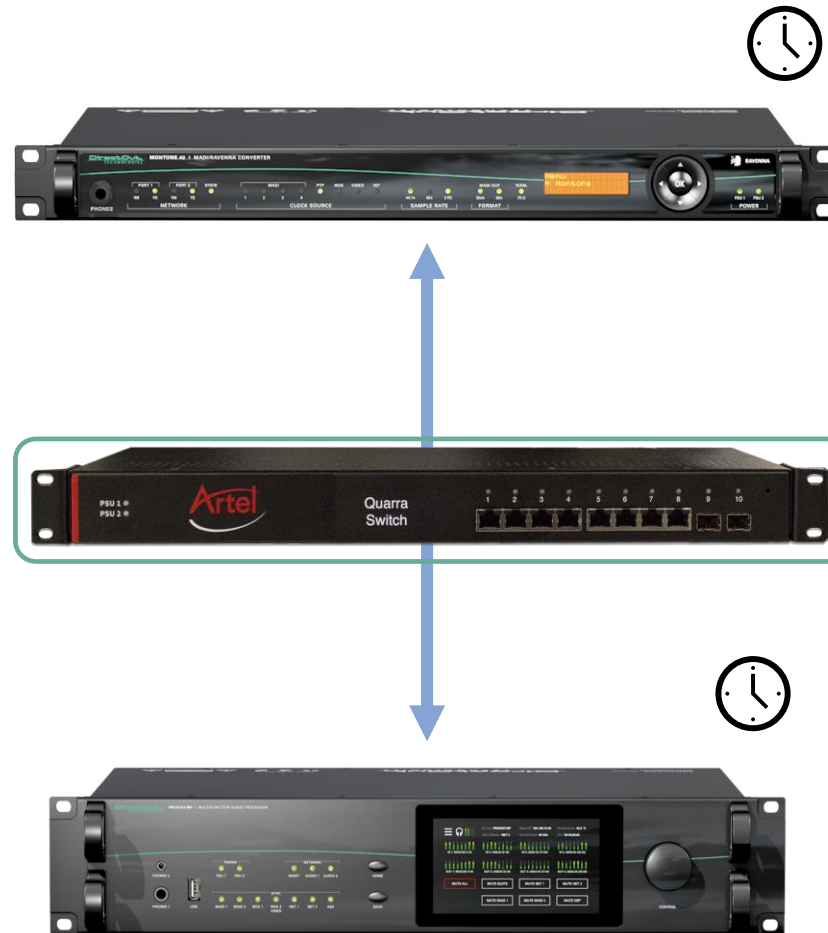
$t + p$

Time t

$t + \text{Processing time } p$

$t + p - p$

t



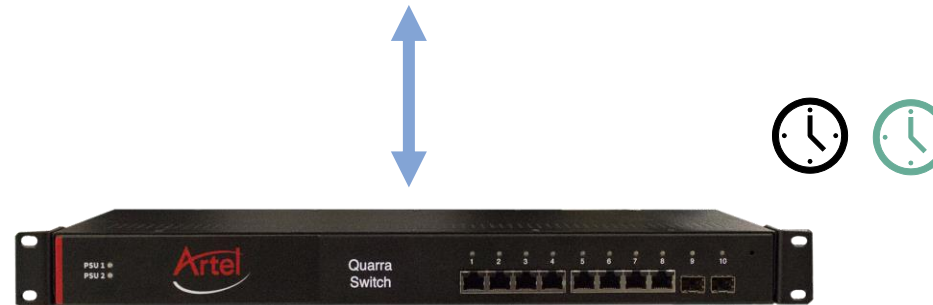
PTP Sync and
Delay Requests/Responses

Time t



t

t (b)



t (b)

PTP Configuration

<Live demo>

Enjoy...



Stream Standards



RAVENNA

- RTP Multicast Streaming
- PTP v2 Synchronisation
- Sample Rates 44.1kHz up to DSD
- WAN capable packet times possible
- ultra low latency packet times possible
(1 frame/packet)
- MDNS / RTSP Stream Discovery and
Connection Management



RAVENNA

- RTP Multicast Streaming
- PTP v2 Synchronisation
- Sample Rates 44.1kHz up to DSD
- WAN capable packet times possible
- ultra low latency packet times possible (1 frame/packet)
- MDNS / RTSP Stream Discovery and Connection Management

- + Unicast Streaming
- + SIP
- MDNS Discovery
- * Sample Rate 48kHz
- * packet time 1ms





RAVENNA

- RTP Multicast Streaming
- PTP v2 Synchronisation
- Sample Rates 44.1kHz up to DSD
- WAN capable packet times possible
- ultra low latency packet times possible (1 frame/packet)
- MDNS / RTSP Stream Discovery and Connection Management

+ PTP ST2059-2

+ ST2022-7

Redundancy

– Unicast

– SIP

* Media Clock Offset 0



ST2110 - 30



AES67



RAVENNA

- RTP Multicast Streaming
- PTP v2 Synchronisation
- Sample Rates 44.1kHz up to DSD
- WAN capable packet times possible
- ultra low latency packet times possible (1 frame/packet)
- MDNS / RTSP Stream Discovery and Connection Management

DirectOut RAVENNA Implementation

+ PTP ST2059-2

+ ST2022-7

Redundancy

– Unicast

– SIP

* Media Clock Offset 0



RAVENNA

Stream Configuration

Mandatory

- 48kHz
- 16 and 24 Bit
- 1-8 Channels per stream
- Multicast and Unicast streams
- Packet time: 1ms
- PTP v2 Synchronisation
- IGMP v2 (v3 for ST2110)
- QoS DSCP Markings
- SDP
- SIP (Unicast)



...and more possibilities

- Sample rates: 96 kHz, 44.1 kHz
- Packet times: 125µs, 250µs, 333µs, 4ms
- More than 8 audio channels per stream (e.g. 64ch)
- IGMP v3 (automatic fall-back to v2)
- Discovery (RTSP, Bonjour, SAP) not scope of the standard but can be added on top of AES67

<Live demo>

AES67 / ST 2110-30 Stream Configuration

- TX up to 8 channels, RX up to 64 channels
- Multicast only (no Unicast)
- Restricted Multicast IP-Range: 239.p.x.y
Default Prefix: 239.69.x.y
- Encoding: L24 (24 Bit)
- Packet time: 1ms TX / 1ms, 125µs, 250µs, 333µs RX
- Non-Standard DSCP Markings
- Dante Redundancy mode not available

! Multicast Prefix !

<Live demo>

AES67 (Dante) Stream Configuration

<Live demo>

Tools

PTP Track Hound v1.0.6

Filters: Interface(s): utun1 Protocol(s): All Domain(s): All Message(s): All Device(s): All Control

Messages (40)

No.	Interface	Time	Msg. Type	Version	Sdld/Dom.	Seq. ID	Source
21	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12637	192.168.1.12
22	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Delay Resp.	v2	0	10028	192.168.1.12
23	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Delay Resp.	v2	0	10021	192.168.1.12
24	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Delay Resp.	v2	0	10029	192.168.1.12
25	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12638	192.168.1.12
26	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12638	192.168.1.12
27	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12639	192.168.1.12
28	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12639	192.168.1.12
29	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12640	192.168.1.12
30	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12640	192.168.1.12
31	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12641	192.168.1.12
32	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12641	192.168.1.12
33	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Announce	v2	0	791	192.168.1.12
34	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Delay Resp.	v2	0	10030	192.168.1.12
35	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12642	192.168.1.12
36	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12642	192.168.1.12
37	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12643	192.168.1.12
38	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12643	192.168.1.12
39	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Sync	v2	0	12644	192.168.1.12
40	DirectOut_PRODIGY ...	2019-08-06, 18:06:42	Follow Up	v2	0	12644	192.168.1.12

Message Details

Follow Up (v2)

Length: 86 bytes

Protocol: IPv4

Domain: 0

Sequence ID: 12644

Destination: 01:00:5E:00:01:81

Source: A0:BB:3E:20:04:00

Type: IPv4 (0x0800)

0x0000 01 00 5e 00 01 81 a0 bb 3e 20 04 00 00 00 45 c0

0x0010 00 48 e2 66 40 00 01 11 f3 48 c0 a8 01 0c e0 00

0x0020 01 81 01 40 01 40 00 34 00 00 08 02 00 2c 00 00

0x0030 02 00 00 00 00 00 00 00 00 00 00 00 00 a0 bb

0x0040 3e ff fe 20 04 00 00 01 31 64 02 fd 00 00 00 00

0x0050 06 6e 00 fe d0 01

Devices (3)

Type	Identity	Address	Interface	VLAN
GM (2)	IEEE_FFFE200400	192.168.1.12	Direct....pcap	-

Device Details

Port Identity: - Port State: -

Address: - Delay Mech.: -

Vendor: - Ann. Rate: -

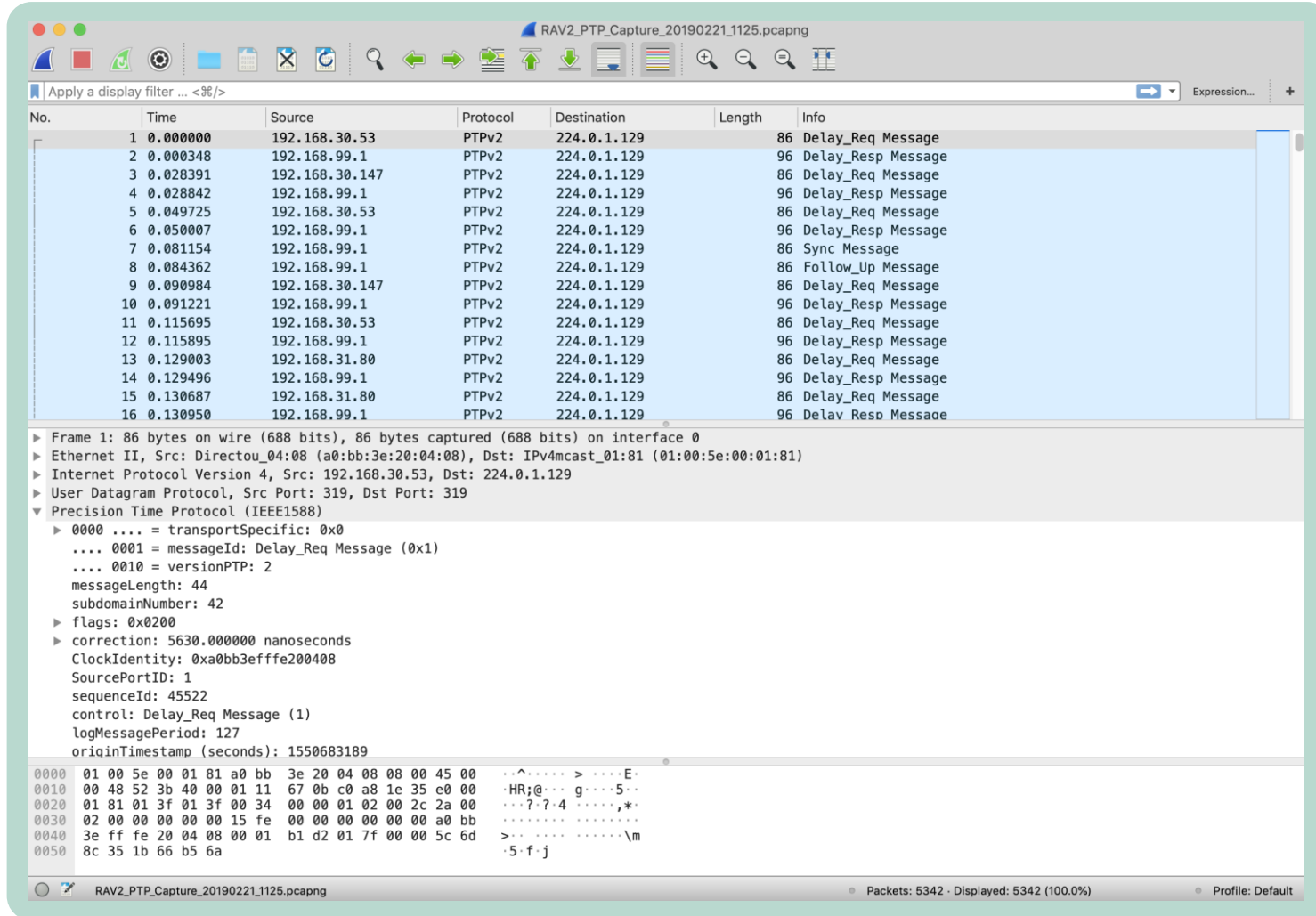
Device: - Sync Rate: -

Management: - Req. Rate: -

GM Clock Quality: -

Events

No.	Time	Global	Details
6	2019-08-06, 18:06:43.871	Global	Type changed from Unknown to Grandmaster
5	2019-08-06, 18:06:42.199	IEEE_FFFE200003	New device (Slave, unknown) detected
4	2019-08-06, 18:06:41.053	Global	New device (Slave, unknown) detected
3	2019-08-06, 18:06:41.053	IEEE_FFFE200400	New device (Unknown, 192.168.1.12) detected
2	2019-11-05, 15:49:48.919	Global	Live capture has been paused
1	2019-11-05, 15:48:22.402	Global	Live capture has been paused



RAV2_PTP_Capture_20190221_1125.pcapng

Apply a display filter ... <?/?> Expression...

No.	Time	Source	Protocol	Destination	Length	Info
1	0.000000	192.168.30.53	PTPv2	224.0.1.129	86	Delay_Req Message
2	0.000348	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
3	0.028391	192.168.30.147	PTPv2	224.0.1.129	86	Delay_Req Message
4	0.028842	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
5	0.049725	192.168.30.53	PTPv2	224.0.1.129	86	Delay_Req Message
6	0.050007	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
7	0.081154	192.168.99.1	PTPv2	224.0.1.129	86	Sync Message
8	0.084362	192.168.99.1	PTPv2	224.0.1.129	86	Follow_Up Message
9	0.090984	192.168.30.147	PTPv2	224.0.1.129	86	Delay_Req Message
10	0.091221	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
11	0.115695	192.168.30.53	PTPv2	224.0.1.129	86	Delay_Req Message
12	0.115895	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
13	0.129003	192.168.31.80	PTPv2	224.0.1.129	86	Delay_Req Message
14	0.129496	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message
15	0.130687	192.168.31.80	PTPv2	224.0.1.129	86	Delay_Req Message
16	0.130950	192.168.99.1	PTPv2	224.0.1.129	96	Delay_Resp Message

Frame 1: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on interface 0

Ethernet II, Src: Directou_04:08 (a0:bb:3e:20:04:08), Dst: IPv4mcast_01:81 (01:00:5e:00:01:81)

Internet Protocol Version 4, Src: 192.168.30.53, Dst: 224.0.1.129

User Datagram Protocol, Src Port: 319, Dst Port: 319

Precision Time Protocol (IEEE1588)

- transportSpecific: 0x0
- messageId: Delay_Req Message (0x1)
- versionPTP: 2
- messageLength: 44
- subdomainNumber: 42
- flags: 0x0200
- correction: 5630.000000 nanoseconds
- ClockIdentity: 0xa0bb3efffe200408
- SourcePortID: 1
- sequenceId: 45522
- control: Delay_Req Message (1)
- logMessagePeriod: 127
- originTimestamp (seconds): 1550683189

```

0000  01 00 5e 00 01 81 a0 bb 3e 20 04 08 08 00 45 00  ..^....>....E.
0010  00 48 52 3b 40 00 01 11 67 0b c0 a8 1e 35 e0 00  HR;@...g...5..
0020  01 81 01 3f 01 3f 00 34 00 00 01 02 00 2c 2a 00  ...?..4...*,*
0030  02 00 00 00 00 00 15 fe 00 00 00 00 00 a0 bb    .....
0040  3e ff fe 20 04 08 00 01 b1 d2 01 7f 00 00 5c 6d  >...f...m
0050  8c 35 1b 66 b5 6a                                .5.f.j
  
```

RAV2_PTP_Capture_20190221_1125.pcapng

Packets: 5342 · Displayed: 5342 (100.0%)

Profile: Default

EBU

Streams

DirectOut_MONTONE42_30_A_direct.pcap

Download PCAP

Download SDP

Go Back

☰

⚙

PTP

No Streams Found

Video

No Streams Found

Audio

S 192.168.1.211:58114 / UNDEFINED

D 239.69.151.2:5004 / UNDEFINED

L24 8ch 48 kHz

RTP sequence undefined

EBU TS-DF

Ancillary Data

No Streams Found

Unknown

S 192.168.1.211:5005 / UNDEFINED

D 239.69.151.2:5005 / UNDEFINED

🔧

```
CBF:sdps cbf$ sdpoker invalid.sdp
Found 1 error(s) in SDP file:
1: Line 19: For stream 1, no connection data ("c=") field was found, as per RFC 4566 Section 5.7.
CBF:sdps cbf$
```


<Live demo>

Questions?



More answers...



RAVENNA / AES67 / SMPTE ST 2110 Resources:



www.ravenna-network.com/resources



www.directout.eu

You've made it!

Contact information:

Andreas Hildebrand
ALC NetworX GmbH

ravenna@alcnetworx.de



CELEBRATING 10 YEARS
RAVENNA
AES67 & ST 2110 built-in

www.ravenna-network.com