International Timing & Sync Forum 2021

#ITSF2021

Broadcast IP and SMPTE Transition: Moving On-time

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#ITSF2021

EUROSPORT

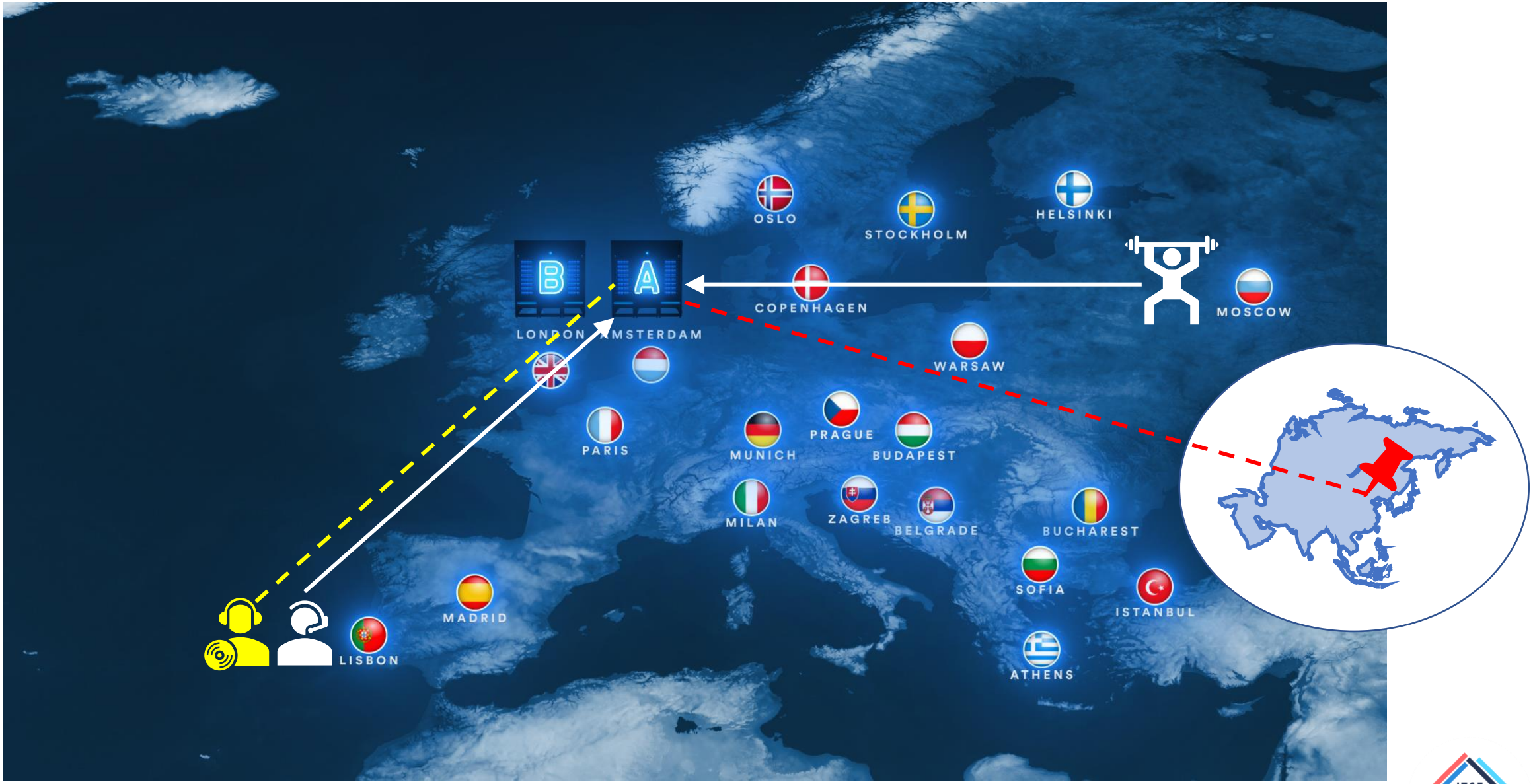
Live sports broadcaster

- Production facilities in 20 countries
- Broadcasting on multi-languages in Europe and Asia/Pacific
- Covering major events (Olympic games, Tennis grand slam) and local events (Tour de France, Bundesliga)
- More than 200 millions consumers
- Content on Linear TV and Digital (Player, On demand)

discovery+ Discovery SPORTS EVENTS EUROSPORT

GCN GMBN GolfDigest GOLFTV

ITSF 2021


OSLO
STOCKHOLM
HELSINKI
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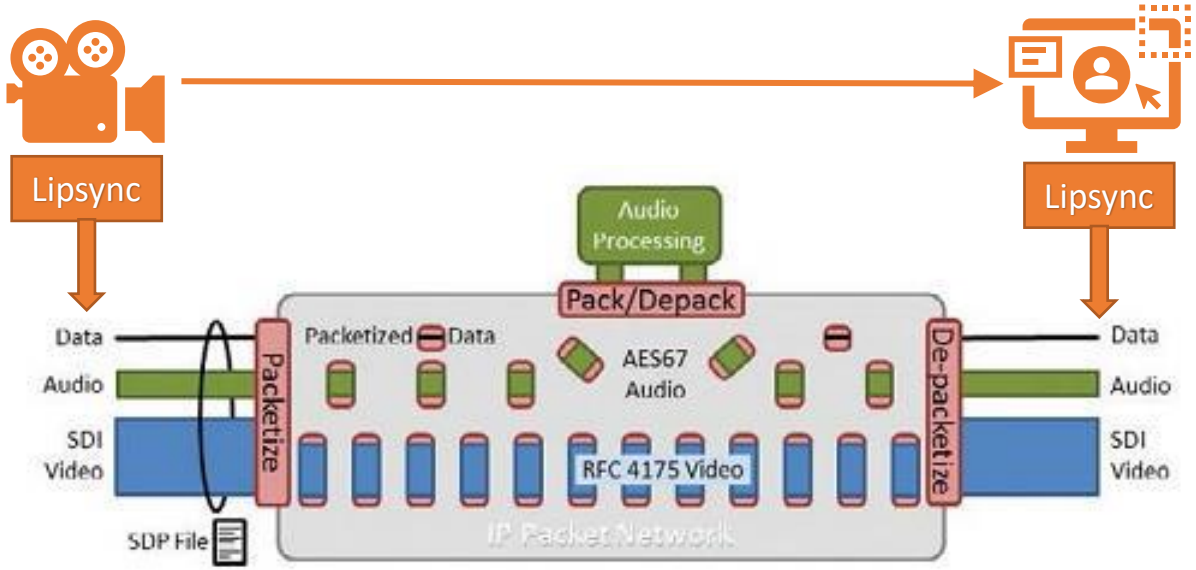
COPENHAGEN
MOSCOW
LONDON
AMSTERDAM
WARSAW
PARIS
MUNICH
PRAGUE
BUDAPEST
MILAN
ZAGREB
BELGRADE
BUCHAREST
SOFIA
ISTANBUL
MADRID
LISBON
ATHENS

IP Transition

Media over IP

SMPTE ST 2110

- Released in 2017, defining media transport in IP broadcast facilities
- Each medias streams are separates (Audio, Video, Data…)
- Timestamping based Precision Time Protocole IEEE1588-2008 (PTP v2)
- SMPTE ST 2059-2, the PTP “media” profile



Essences architecture

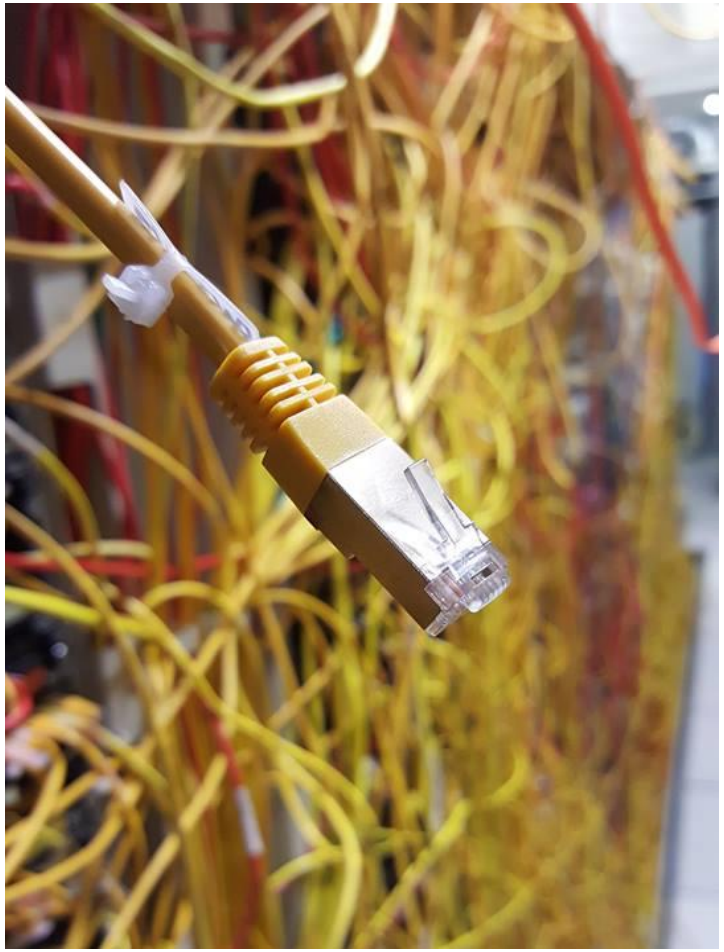
- 2110-10: Time reference (SMPTE 2059)
- 2110-20: Video uncompress (RFC4175)
- 2110-30: Audio uncompress (AES67)
- 2022-7: Hitless redundancy

SMPTE 2110

Eurosport transition

- <u>Goals:</u>
  - Flexibility
  - Scalability
  - Real Time transport (low latency)

- <u>Limitations:</u>
  - Private WAN networks, Layer 3
  - Delay between markets (from 4ms to 150ms)
  - Synchronisation distribution (not base band)

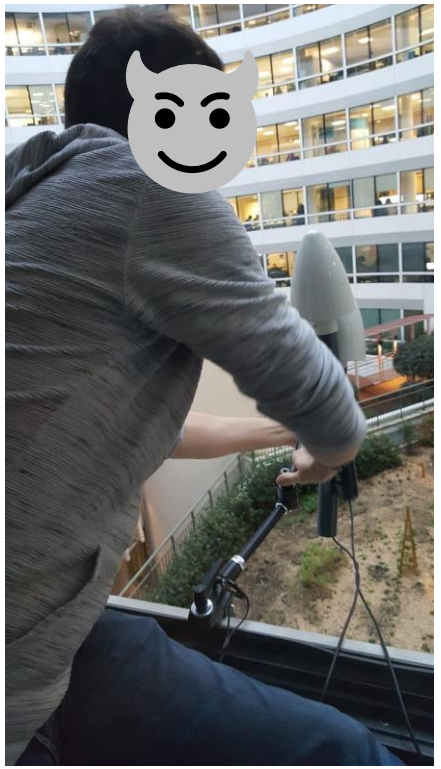


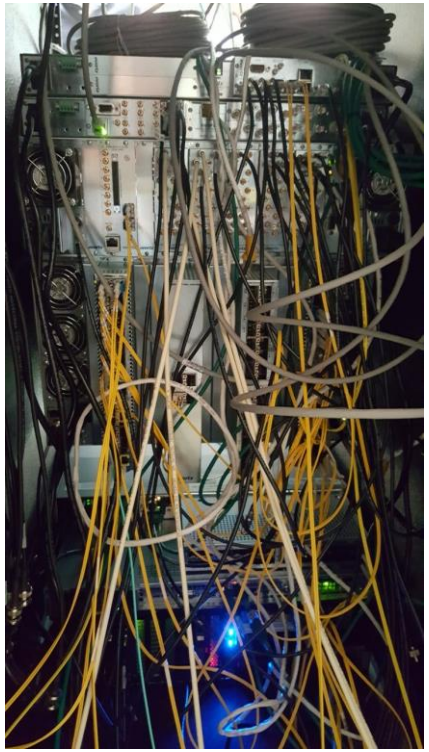
Sync

Proof of Concept

Be a Grand Master

- Understand the PTP protocol and limitation (Learning, POC Moscow <> Paris)
- Tests PTP aware switches (Boundary clock mode)
- Fixing software bugs on switches & GM
- Test interoperability on end-devices
- Test redundancy & accuracy



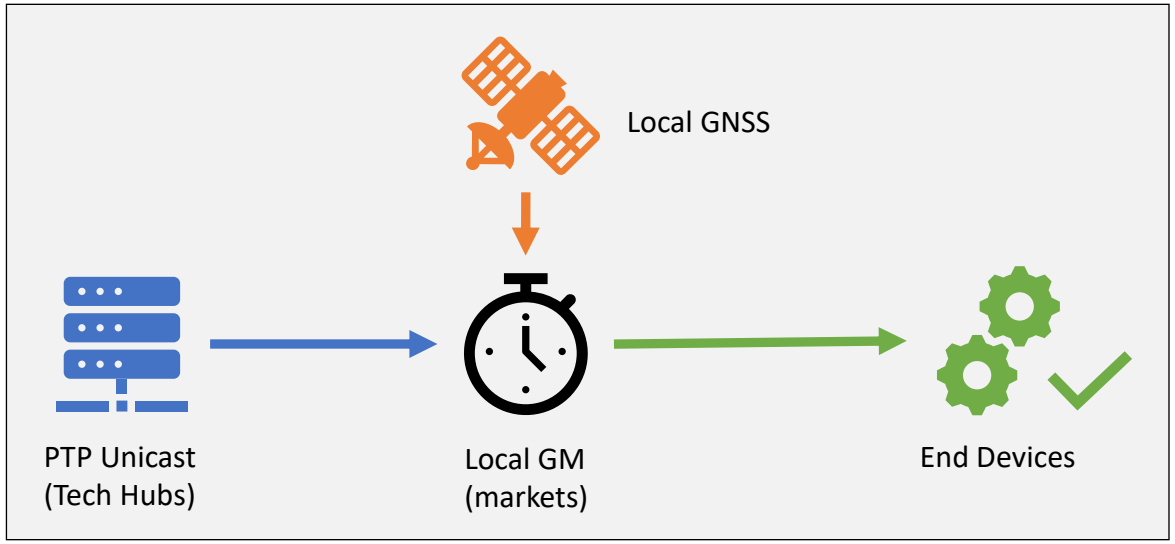


```
EPA-WSP-LF27#show ptp
PTP Mode: Boundary Clock
PTP Profile: Default ( IEEE1588 )
Clock Identity: 0x98:5d:82:ff:ff:c8:40:c1
Grandmaster Clock Identity: 0xec:46:70:ff:fe:0a:9c:6f
Number of slave ports: 1
Number of master ports: 14
Slave port: Ethernet52
Offset From Master: 6
Mean Path Delay (nanoseconds): 349
Steps Removed: 3
Skew (estimated local-to-master clock frequency ratio): 1.000012216O5
Last Sync Time: 15:03:43 UTC Jun 11 2021
Current PTP System Time: 15:03:43 UTC Jun 11 2021
    Interface        State        Transport    Delay
                                                Mechanism
--------------- ------------ --------------- ---------
    Et25           Master         ipv4          e2e
    Et26           Master         ipv4          e2e
    Et27           Master         ipv4          e2e
    Et28           Master         ipv4          e2e
    Et29           Master         ipv4          e2e
    Et30           Master         ipv4          e2e
    Et31           Master         ipv4          e2e
    Et32           Disabled       ipv4          e2e
    Et33           Master         ipv4          e2e
    Et34           Disabled       ipv4          e2e
    Et35           Disabled       ipv4          e2e
    Et36           Disabled       ipv4          e2e
    Et37           Disabled       ipv4          e2e
    Et38           Disabled       ipv4          e2e
    Et39           Disabled       ipv4          e2e
    Et40           Disabled       ipv4          e2e
    Et41           Master         ipv4          e2e
    Et43           Master         ipv4          e2e
    Et44           Master         ipv4          e2e
    Et45           Master         ipv4          e2e
    Et46           Master         ipv4          e2e
    Et47           Master         ipv4          e2e
    Et51           Passive        ipv4          e2e
    Et52           Slave          ipv4          e2e



EPA-WSP-LF28#show ptp
PTP Mode: Boundary Clock
PTP Profile: Default ( IEEE1588 )
Clock Identity: 0x98:5d:82:ff:ff:c8:37:59
Grandmaster Clock Identity: 0xec:46:70:ff:fe:0a:9c:6f
Number of slave ports: 1
Number of master ports: 13
Slave port: Ethernet52
Offset From Master: 17
Mean Path Delay (nanoseconds): 354
Steps Removed: 3
Skew (estimated local-to-master clock frequency ratio): 1.0000085799
Last Sync Time: 15:04:57 UTC Jun 11 2021
Current PTP System Time: 15:04:57 UTC Jun 11 2021
    Interface        State        Transport    Delay
                                                Mechanism
--------------- ------------ --------------- ---------
    Et25           Master         ipv4          e2e
    Et26           Master         ipv4          e2e
```

Design

SMPTE 2059-2: the PTP “media”

- Defined an interoperability profile (standard compliance on end-devices)
- Defined a PTP distribution (Spine/Leaf)
- Defined change over mechanism (Priority and SMPTE 2022-7)
- Defined timing reference:
  - Local Grand Master on GPS
  - Redundancy through PTP Unicast



Deployment

On-air since 2018

Master Control Room

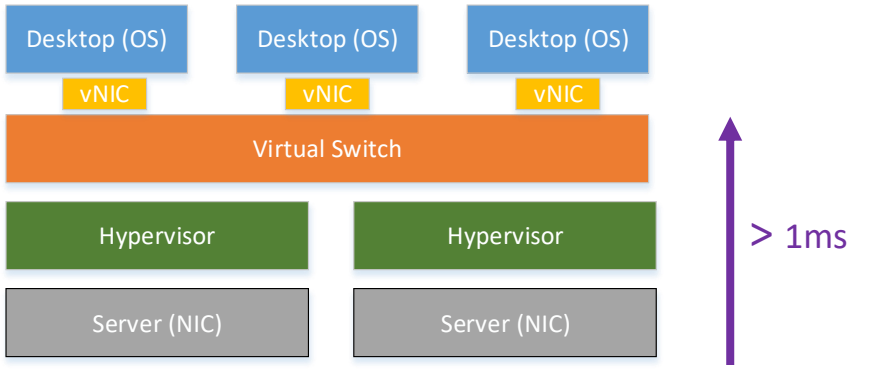
Sound Control Room

Next step

Virtual Machine

Challenge of the virtualization

- Virtualization is time consuming
- ST 2110 designed for hardware:
  IP packets every 0,125ms (up to 1ms)
- Virtual switch not PTP aware
- PTP is not on the Cloud
  (even if GPS is on the sky)

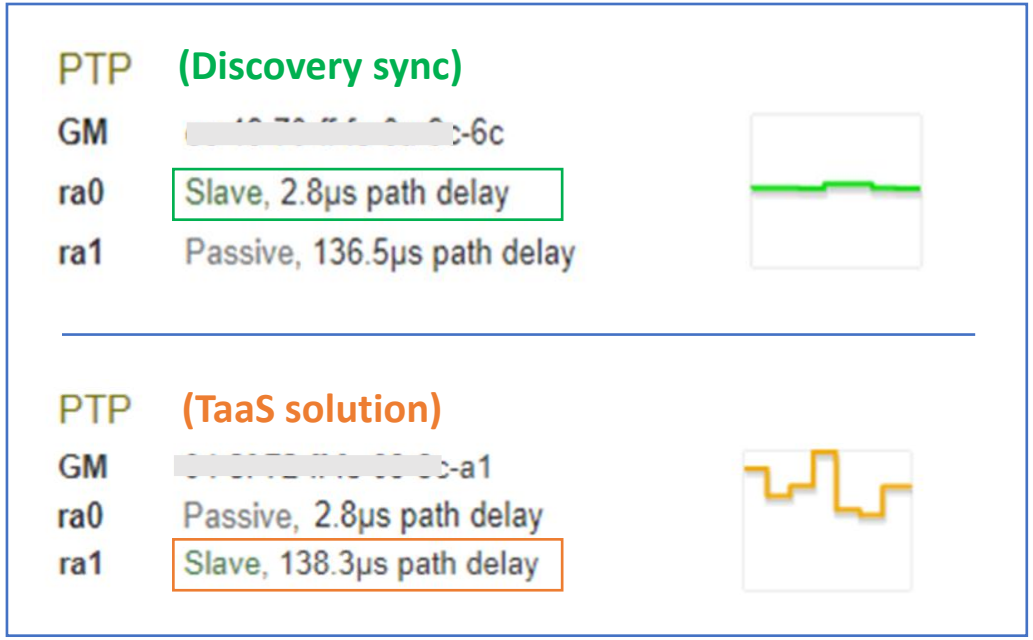


TaaS

Time as a Service

- ❑ Strenghts
  - Accurate for broadcast (measure > 135µs)
  - Resiliency
  - GNSS antenna impossible on Datacenter

- ❑ Weaknesses
  - PDV higher than our insourcing system
  - Interoperability Users / TaaS provider:
    - TAI vs UTC (offset flag, leapsecond)
    - Metadata (frame rate 50/60hz)
    - Domain, announce, sync/request



THANK YOU