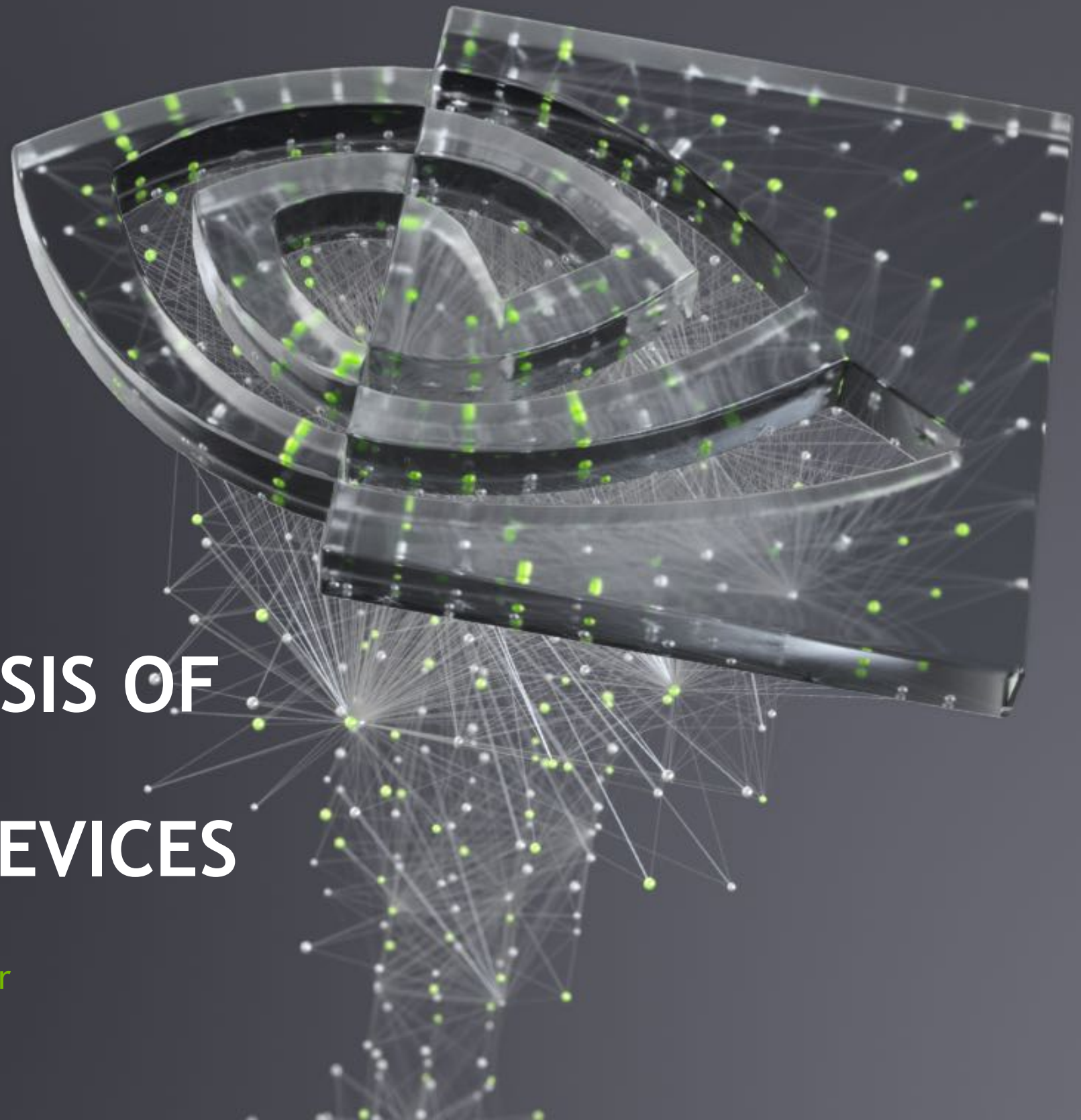# MONITORING & ANALYSIS OF SMPTE ST 2059-2 PTP NETWORKS & MEDIA DEVICES

Thomas Kernen

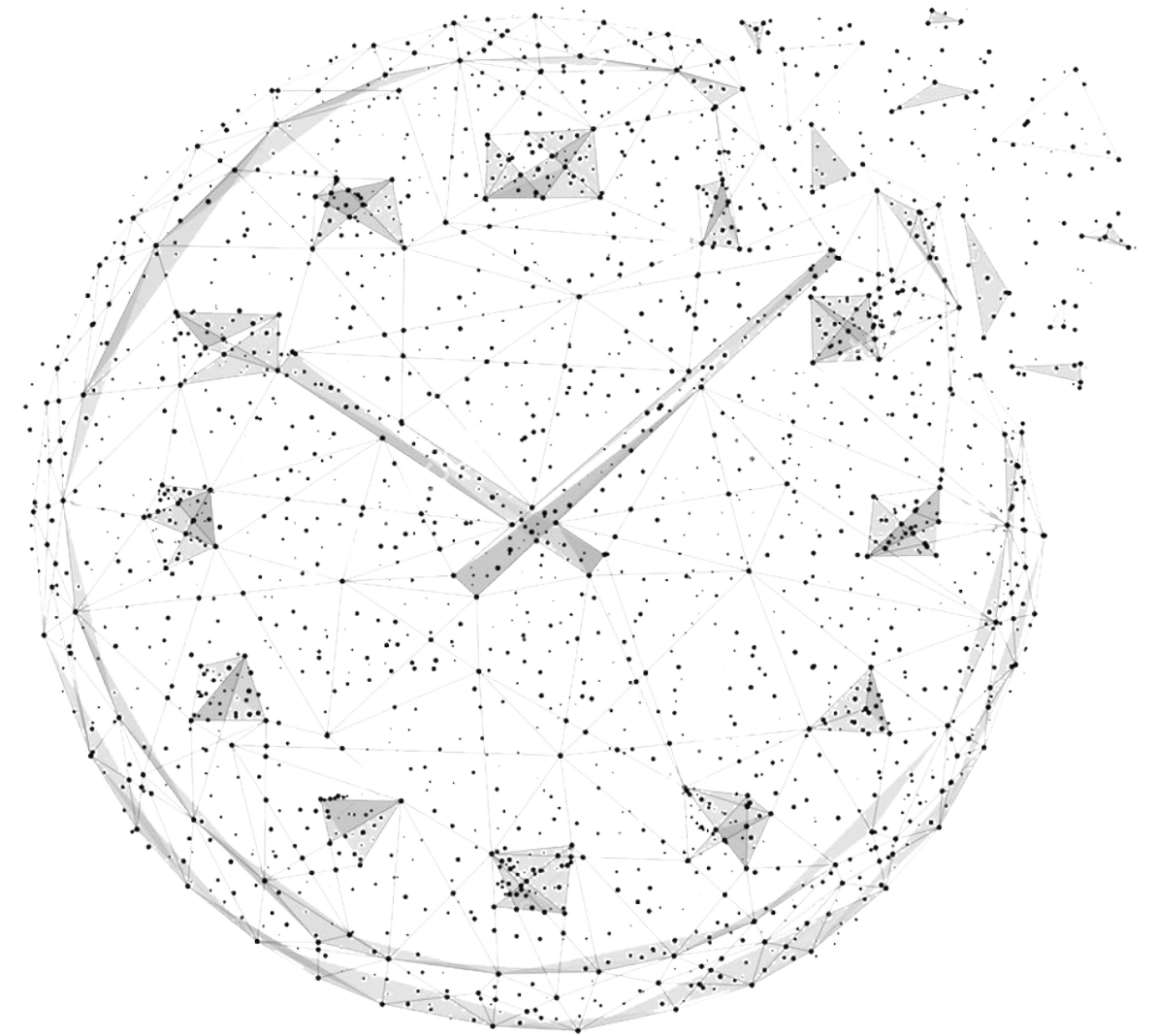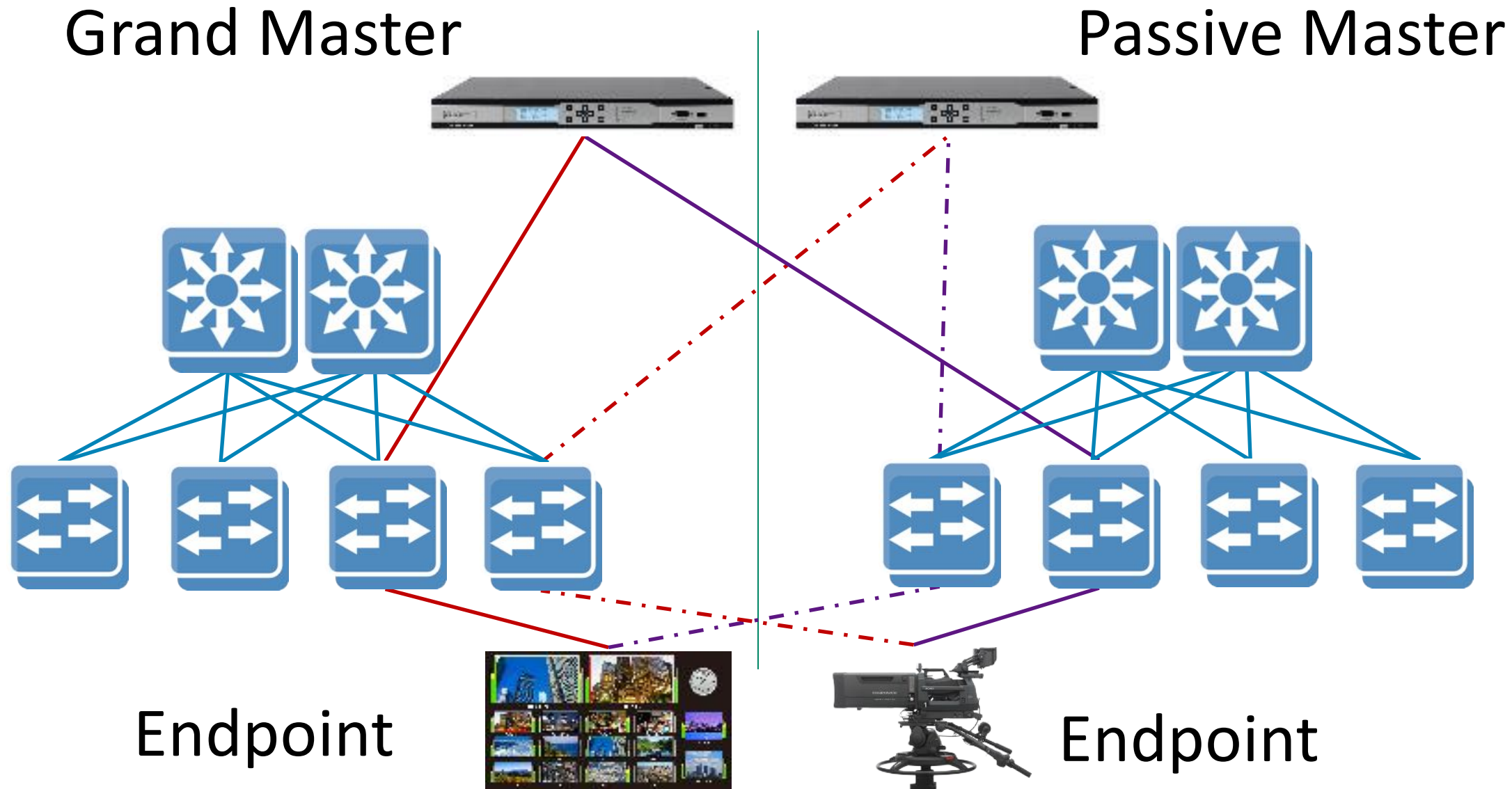SMPTE Fellow, 32NF TC Chair & ST 2059-15 DG Chair

SMPTE ST 2059 PROFILE

- A single PTP profile to cover all application scenarios

  - Different topologies: Small networks vs. large studios vs. Outdoor Broadcast

- "Fast locking" requirement

  - Max offset less than 1μs (+/-500 ns) within 5s, provide an SDI like "feel"

- Transfer of Synchronization Metadata

  - Frame rate, Daylight Savings Time, daily jam time …

  - PTP MGMT TLV metadata defined in ST 2059-1

- Default SMPTE ST 2059-2 message rates

  - Announce: 4 per second (log -2)

  - Sync: 8 per second (log -3)

  - Delay_Req/Resp: 8 per second (log -3)

  - Management: 1 per second (log 0)

DUAL NETWORKS: ENDPOINT TIMING REDUNDANCY

Grand Master
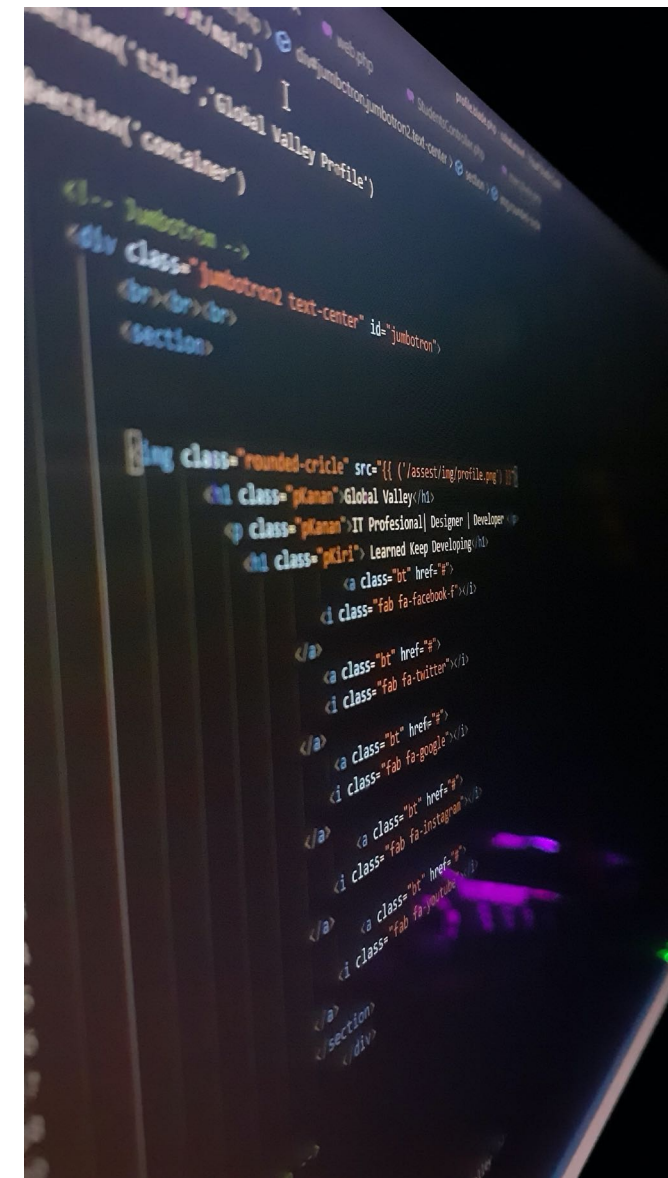
Passive Master

Endpoint

Endpoint

IN-BAND VS. OUT-OF-BAND MONITORING

- Querying the offset of a "SLAVE" reveals only so much

    - They will merely report their notion of time (offset)

    - Asymmetries in time transfer remain undetected

    - Likewise for problems within the control loop

- Respective clocks must be compared with each other

    - Absolute value & clock rate!

- Comparing 1 PPS signals is one common and viable solution

    - 1 PPS may not be available for all PTP devices

    - Lots of dedicated cabling required

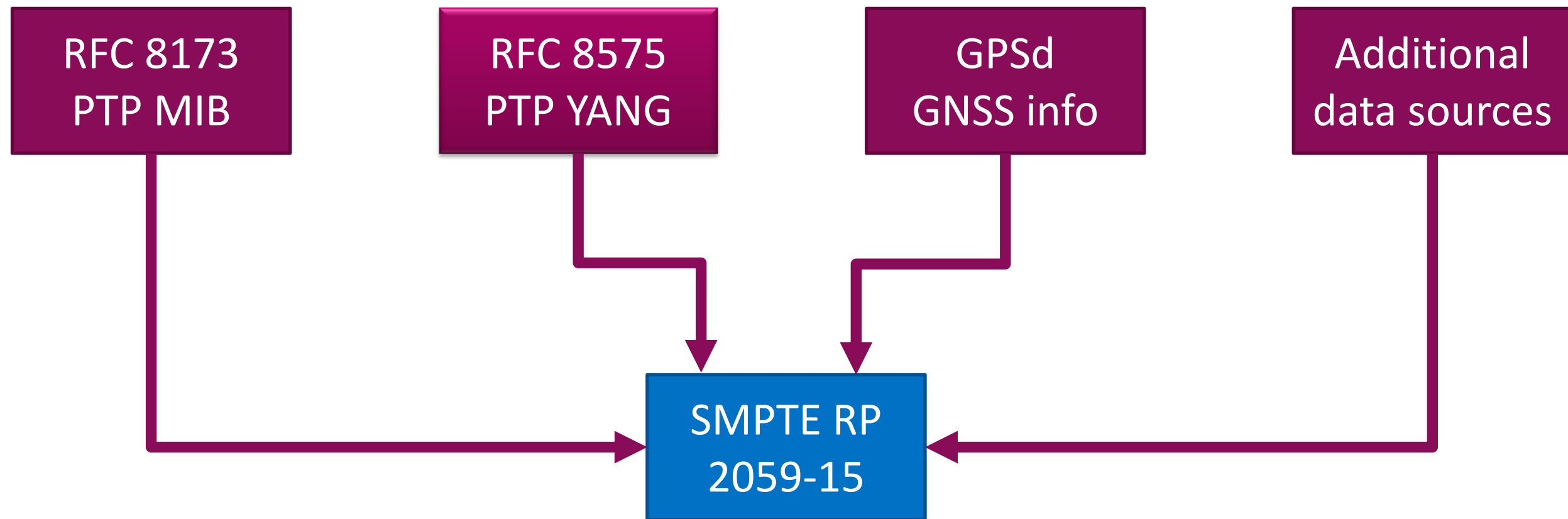NVIDIA.

UNIFIED MONITORING MODEL (I)

- Many methods for collecting & aggregating PTP information

  - Vendor specific implementations

  - IETF RFC 8173 (SNMP MIB for PTP)

  - IETF RFC 8575 (PTP YANG Data model)

- PTP monitoring requires consistency:

  - Data definition and representation

  - Compare and validate collected data

- Requirement's analysis:

  - Model that can scale for large data sets

  - Pull/push/stream at scale (10s of thousands of nodes)

UNIFIED MONITORING MODEL (II)

- Trend towards YANG Data model definitions

- IEEE 802 & ITU-T SG15 Joint Workshop (Jan 2020)

  - Session on YANG data modeling

- IEEE Standards Association approved P1588 WG PAR for MIB and YANG Data model (Sept 2020)

- SMPTE for broadcast & media

  - Focused on monitoring end to end PTP capabilities

UNIFIED MONITORING MODEL (III)

RFC 8173
PTP MIB

RFC 8575
PTP YANG

GPSd
GNSS info

Additional
data sources

SMPTE RP
2059-15

Standardized model for monitoring ST 2059 systems

SMPTE RP 2059-15 YANG DATA MODEL (I)

- YANG data model approach

  - Include PTP, GNSS and ST 2059 specifics

- Work in progress: Public Committee Draft (PCD)

  - Anyone can review and contribute

  - Allows for feedback beyond SMPTE Technology Committee members

  - To be shared with SDOs, SW developers, implementers

- Provide consistent & repeatable monitoring method

  - Across all PTP capable devices

NVIDIA.

SMPTE RP 2059-15 YANG DATA MODEL (II)

- Containers: child nodes define the data sets

  - ptp (read-write)

  - gnss-monitoring-ds (read only data set)

  - st-2059-2-monitoring-ds (read only data set)

  - grandmaster-monitoring-ds (read only data set)

  - rfc-8173-ds (read only data set)

- R/O focused for monitoring

  - Not preventing R/W usage of the data sets where applicable

SUMMARY

- Establish a common End to End PTP monitoring framework

- Minimize uncertainties for reported information: values & fields

- Data collection for reactive, proactive and historical use cases

- Critical for successful validation, verification and supervision

- Share work with other 1588 industry initiatives around monitoring

- Converge efforts to reduce overlapping or duplicate solutions

- Industry collaboration & feedback welcomed