



AMWA NMOS Identity & Timing

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WHAT

WHY

HOW

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2



Background

- AMWA activity involving a mix of vendors and end users
- Started April 2018
- Aims
 - Identify how content identity and timing should be modelled such that it can be carried from **'end to end'** of a system (including **live and non-live** workflows)
 - Clearly document the models and feed back any required updates to existing AMWA specifications as a result
 - Use this to inform how identifiers and timing data should be tied to streams (such as SMPTE 2110) and stored content formats



What is Identity?



- The ability to uniquely identify any resource in a networked media architecture
 - Specifically how this applies to video, audio and data content
 - Used to identify each unique piece of content, and how it relates to others
- Real world examples
 - Video on demand: Dynamic bitrate adaptation for the same content ID
 - CDNs: Download a file with a particular ID from the closest geographical location



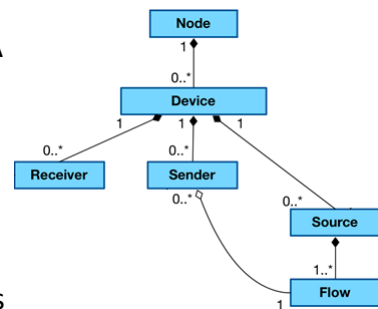
What is Timing?

- Associating a unique time value with each video frame, audio sample or data element
 - Permitting re-synchronisation of related media at the end of independent processing chains
 - Not reliant upon every process having access to a precise source of time
- It gets complicated quickly
 - Different signal paths and ‘black boxes’ impose different delays
 - Latency may vary between power cycles and firmware versions
 - Timing design for new facilities and productions can take weeks



Progress to date

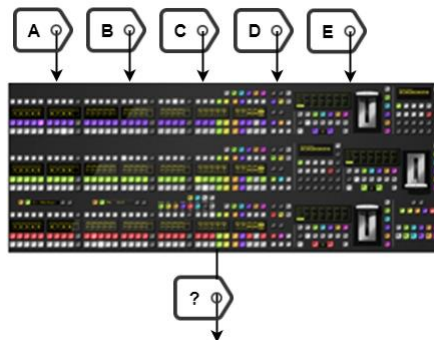
- IP transition is well underway, but much of IP and IT’s promise is yet to be realised
 - 2015/16 – JT-NM Reference Architecture, AMWA NMOS IS-04 & Content Model
 - 2017/18 – SMPTE 2110, AMWA NMOS IS-05/06
- New content related activities are now underway within AMWA
 - A more formal identity and timing specification is required





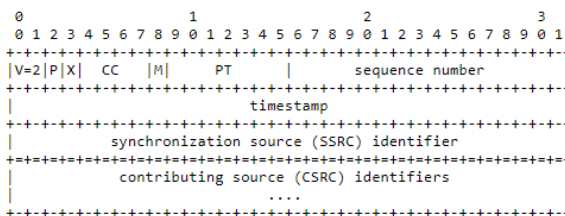
Why is it complicated?

- End to end identity and timing requires a consistent approach
- Example: Vision and audio mixing
 - Multiple content identities at input
 - Potential for timing mis-alignment at input
 - Accumulation of identity and timing data at output



Identity and Timing in RTP (ST.2110)

- Identity and timing in media streams is nothing new
 - RTP Timestamp, SSRC, CSRC
 - Originally intended to allow modelling of mixers and alike
- In the future we will need solutions which are:
 - Transport agnostic
 - Format agnostic
 - Codec agnostic
 - Bitrate agnostic





Why do we need Identity and Timing?

- IP is about far more than a different transport
 - In order to innovate, we need to be able to ignore the detail of where each 'logical wire' is connected and focus on the content
 - As more intelligent systems are used (including AI) and we make greater use of the cloud, we won't always have a choice in all aspects of the system
- Where is our time best spent?
 - Dealing with technical intricacies, or innovation in content production?
- It's not such a foreign concept
 - Each software system, file format and transport technology has its own form of identity and timing, but they don't join up

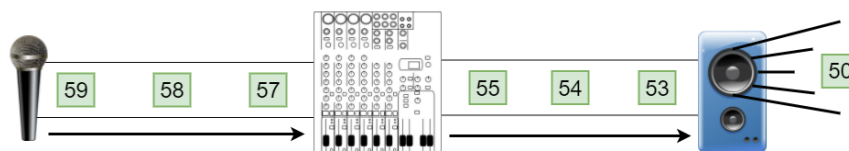
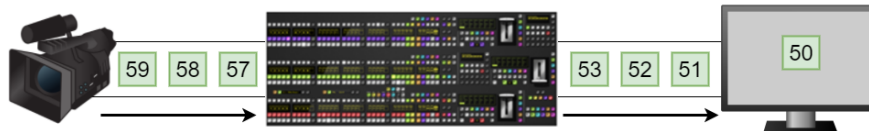


Solving today's problems: Lip sync

- Differing latency requirements for the studio floor, galleries and programme output
- Differing delays imposed by processes in the production chain
- End to end timing provides the means to automatically identify and correct synchronisation errors



Solving today's problems: Lip sync

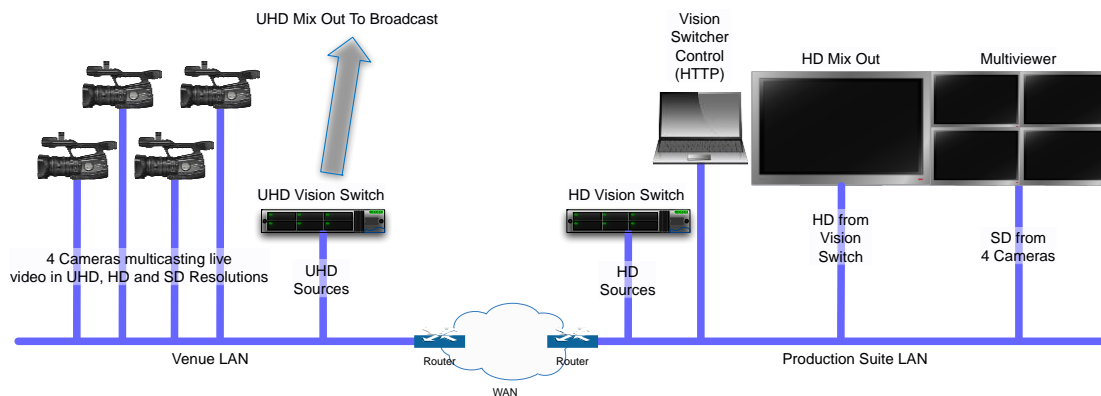


Solving today's problems: Remote production

- Sending large production teams to venues is expensive and restricts the number of events which can be covered
- End to end identity provides the means to work against proxy content and replicate the edit decisions against higher quality output



Solving today's problems: Remote production



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13



Solving today's problems

- There are many more cases where identity and timing can help:
 - Rights tracking
 - Maintaining relationships between related content
 - Associating logging/markup with a media timeline
 - Multi-versioned content and on-the-fly creation of new versions
 - and more...

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14

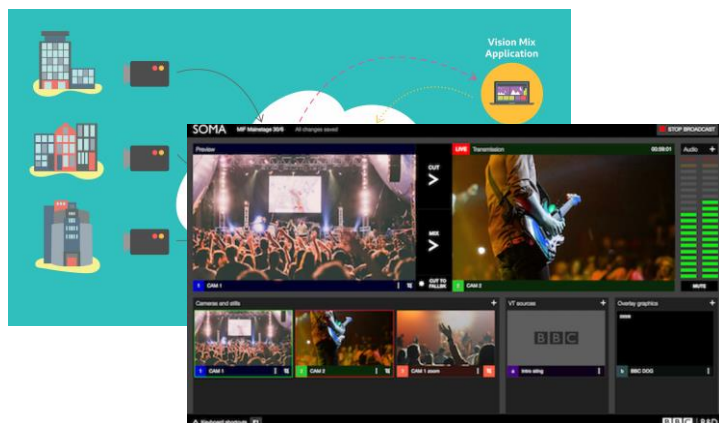


Longer term benefits

- This is about to get a whole lot more complex
- In the cloud...
 - Microservice architectures
 - Distributed object storage
 - Message queues
 - No streams?
- In the home...
 - Elemental distribution
 - Client side rendering



It's not just theoretical





Activity update

- Working towards a modelling toolbox or 'kit of parts' for tracking identity and timing
 - Using the existing concepts of **Sources** and **Flows**, building upon their definitions and identifying clearly how these relate to common production operations
 - Defining how **'Time Values'** relate to content, and how they need to change at the boundaries of facilities, productions etc.
 - Investigating how we make use of **'Ancestry'** and **'Grouping'** to handle more complex identity and timing requirements
 - Documenting all of these concepts and how to apply them 'from end to end' in live and non-live environments



What's next?

- Carriage of consistent identity and timing with content is critical
 - Work on mappings for ST.2110 and other transports and file formats will follow this activity
 - Definition of content APIs will provide common interfaces to media in cloud architectures
- There needs to be buy in from both end users and vendors



When will this be possible?

- These concepts are already part of AMWA NMOS IS-04, which is available in products today
 - Using this equipment builds the foundation for common identity and timing between physical hardware and dematerialised facilities



Summary

- Identity and Timing enables us to define workflows in terms of the content of business value rather than the systems processing it
 - With this foundation we can let the IT technology we are building upon worry about the underlying complexity of getting it from A to B
 - This approach is critical to ensure we can develop multi-vendor cloud solutions which interoperate and scale
- There is scope for countless new production techniques and new products built upon this foundation



Thank You

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