

Applying NMOS to non-2110 Environments

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NMOS is great



- Networked Media Open Specifications
- Terrific work by a collection of great minds in AMWA
- Crucial to 2110 interoperable control
- What if we extended NMOS to other non-2110 signal types?



Extending to other signal types



- Today we lack unified open discovery and connection management across signal types
 - Systems are more complex than they should be
 - Multiple control systems are required
 - Slows us down
 - Costs more

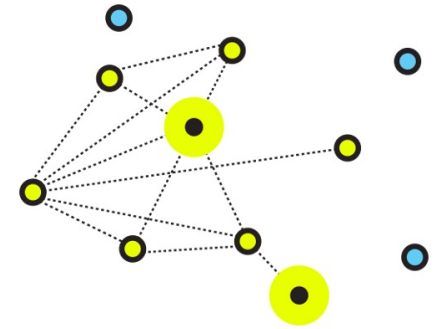


NMOS Interface Specifications

Id	Name	Spec Status	Release(s)
IS-04	Discovery & Registration	AMWA Specification (Stable)	v1.3.2 ↓ v1.2.2 ↓ v1.1.3 ↓
IS-05	Device Connection Management	AMWA Specification (Stable)	v1.1.2 ↓ v1.0.2 ↓
IS-06	Network Control	Deprecated	v1.0.1 ↓
IS-07	Event & Tally	AMWA Specification	v1.0.1 ↓
IS-08	Audio Channel Mapping	AMWA Specification (Stable)	v1.0.1 ↓
IS-09	System Parameters	AMWA Specification	v1.0.0 ↓
IS-10	Authorization	AMWA Specification	v1.0.0 ↓
IS-11	Stream Compatibility Management	Work In Progress	
IS-12	Control Protocol	Work In Progress	

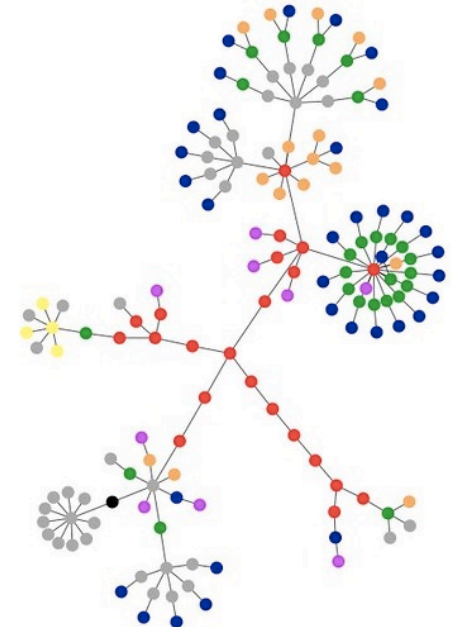
Discovery and Registration (IS-04)

- This is a critically important capability
- Devices can describe 2110 streams they have available so that NMOS-capable controllers can manage them.
- This is how you automate setup of networked systems, and dynamically deploying devices



Device Connection Management (IS-05)

- In conjunction with IS-04, this is the key to dealing with devices in a 2110 environment
- Provides transport-independent way of connecting media nodes via 2110 (RTP, WebSocket, and MQTT)
- Fills a gap left in ST2110



Is 2110 all you do?

- Probably not
- What to do for media on the cloud, for instance?
- What about other environments, particularly in cases where you have many transports you need to support?



IS-04 and IS-05

- In hybrid environments, you ideally want to be able to discover, register and manage all devices available to you.



Transports Currently Supported

- In v1.3, NMOS supports:
 - Real-time Transport Protocol (RTP)
 - RTP Multicast
 - RTP Unicast
 - Dynamic Adaptive Streaming (DASH) over HTTP
 - Message Queuing Telemetry Transport (MQTT)
 - WebSocket

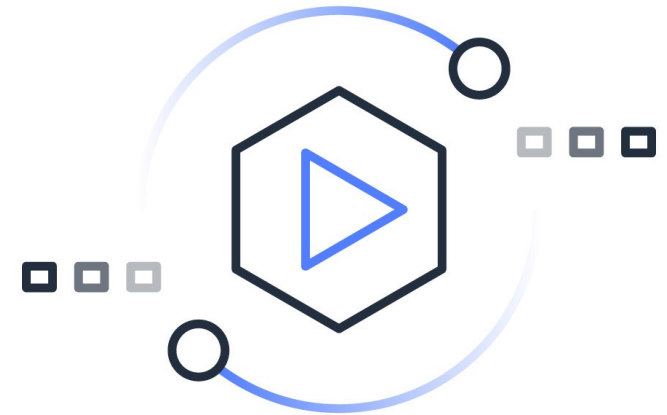
NDI – Network Device Interface

- Free SDK available
- Rapid and wide adoption
- Not a standard, but becoming a de facto standard



CDI – Cloud Digital Interface

- Amazon Web Services' answer to transporting uncompressed video inside of their cloud
- With AWS' widespread usage in the media industry, this is important





- ProAV has long been devoid of standardization, due to domination by a handful of vendors, all using HDBaseT
- Whereas broadcast has embraced fixed video formats (e.g. 720p, 1080i, 2160p), ProAV includes everything from VGA to 8K and everything imaginable in between
- The situation for audio is similar
- Users are often untrained, as opposed to professional engineers in the broadcast space
- Many, many use cases and verticals
- Traditionally, very little cross-vendor interoperability



- ST2110 is not seen as the answer for ProAV
- However, 2110 with compression and a few more ProAV-specific features fits the bill nicely
- Attempts to provide standardized means of transporting audio and video over IP in the ProAV space (one which has resisted standardization thus far)
- ST2110 and NMOS form the foundation for transport and control infrastructure

What about other transports?

SRT

SECURE
RELIABLE
TRANSPORT

 **RIST**

RELIABLE INTERNET STREAM TRANSPORT

Can we use IS-04 and IS-05 for these other transports?



Making IS-04/IS-05 work with NDI...

- Create new transport type:
 - urn:x-nmos:transport:ndi
- Sender:

```
[  
  "transport_params": [{  
    "connected": false,  
    "sender_name": "NDI Sender 2"  
  }]  
]
```


Making IS-04/IS-05 work with NDI...

- Receiver (can receive one or more essence types):

```
[  
  "transport_params": [{  
    "allow_video_fields": true,  
    "bandwidth": "highest",  
    "color_format": "fastest",  
    "sender_name": "Camera01",  
    "rec_anc": false,  
    "rec_audio": false,  
    "rec_video": true  
  }]  
]
```

What about non-IP streaming formats?



- Hold that thought*

*does require IP connectivity on the endpoints

What about non-IP transports?

- IS-11 Stream Compatibility Management (in progress)
 - Inputs associated with Senders
 - Outputs associated with Receivers
 - Can config parameters of Senders/Inputs with Receivers/Outputs
- Applicable to SDI devices, even HDMI devices
- Designed to be used alongside IS-04 and IS-05

Authorization (IS-10)

- Without security, what do we have?
- Applicable to securely control devices, despite the media transport they use underneath, allowing for a secure remote control of the infrastructure described by it
- Being widely embraced as a great approach to making sure that only authorized requests are allowed



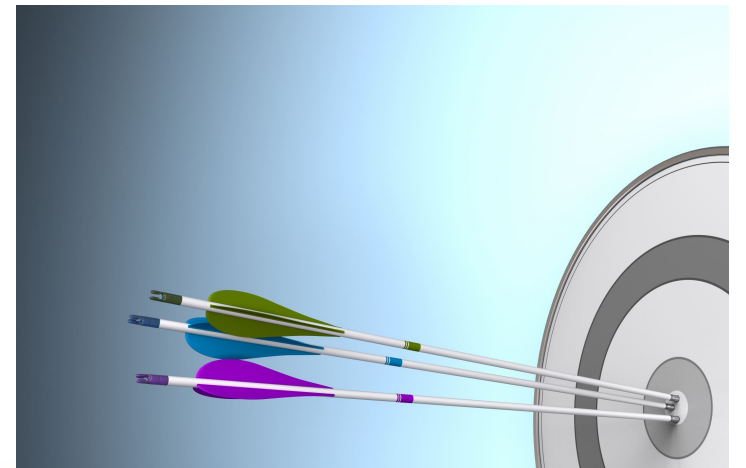
IS-10 - Authorization

- Based on Oauth 2.0 and JSON Web Tokens
 - Widely accepted industry standards
- Secures NMOS portion of your ecosystem
- Need to think about other endpoints and securing those (e.g. NDI devices)



Conclusion

- NMOS has the potential to provide unified control over signal flows of all types
- Simplifies system design
- Flexibility to work on prem and in the cloud
- Move faster, save complexity and money



Thank you!

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