AMWA NMOS: State of Play and What's Next

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In this presentation...

- Introduction to NMOS
  - why, what, who
- The specifications:
  - IS-04, -05, -06, -07
- State of play
- New work
- NMOS in the “full stack”
Networked Media Open Specifications

- Specifications for discovering, connecting and managing resources
- Developed by AMWA, published openly via GitHub
- Tested at Networked Media Incubator workshops
- Web-friendly: JSON, REST HTTP, WebSockets, message queues...

**Specifications**: [github.com/AMWA-TV/nmos-](github.com/AMWA-TV/nmos-)
**Documentation**: [amwa-tv.github.io/nmos](amwa-tv.github.io/nmos)
**Wiki**: [github.com/AMWA-TV/nmos/wiki](github.com/AMWA-TV/nmos/wiki)

Technical challenges in an all-IP infrastructure

- **Transport** ST 2110
- **Timing** ST 2059
- **Resilience** ST 2022-7
- **Security**
- **Monitoring**
- **Automation**
- **Discovery**
- **Connection**
- **Control**
IS-04: Discovery
AMWA IS-04: Discovery and Registration

• Discovery is essential for automation at scale
  – Especially in a dynamically changing environment
• Avoid tie-in to proprietary discovery mechanism
• Defines APIs for registering and querying resources

github.com/AMWA-TV/nmos-discovery-registration
IS-05: Connection

AMWA IS-05 Device Connection Management

- Remove dependencies on proprietary and legacy routing protocols
- Support dynamic deployment and configuration
- Connect senders and receivers
- Not tied to particular transport or format
IS-04: Registry

Node
Device
Sender

Application Logic

IS-05
SDP

Multicast subscribe

ST 2110
or other stream

Registry

Send query

Node
Device
Receiver

Network control

IS-06: Network Control
Why should I care about IP Media “Network Control”?

- Enterprise Ethernet switches don’t drop packets...
- Unless flows converging on an output port add up to more bandwidth than the port can handle...
- Then you lose packets...
- And your media flows become corrupted!

AMWA IS-06: Network Control API

“Northbound” API of Network Controller to:

- Control how flows move on the network,
- Discover network topology,
- Assure bandwidth for media flows,
- Ensure network security by only allowing authorized flows, senders and destinations,
- “No packet moves on the network without authorization”
IS-07: Event & Tally

AMWA IS-07* Event & Tally API

- Provide a modern approach to GPI-type functionality
  - E.g. camera tally event information
- Event messages sent over WebSocket or Message Queue
- Builds on AMWA’s “source-flow-grain” model
- Further information: 3.30 pm today (Monday 17th)

*AMWA have reserved “IS-07” for this Work In Progress.
Scalability studies

- Testing IS-04 and IS-05 operates correctly with thousands of nodes
- Mininet simulator
- Further information: 4 pm today (Monday 17th)

*NB: IS-04 does not depend on multicast DNS*
State of specifications

- IS-04, IS-05, IS-06 are published AMWA Specifications
- IS-07 is Work In Progress

<table>
<thead>
<tr>
<th>IS-04 Version</th>
<th>Core functions</th>
<th>Peer-to-peer</th>
<th>Support HTTPS, WSS</th>
<th>Advanced queries</th>
<th>Paged queries</th>
<th>ST 2110 Flow attributes</th>
<th>Multiplexed Flows (ST 2022-6)</th>
<th>Support basic connections</th>
<th>Support IS-05 connections</th>
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NMOS Wiki

- How to find the specs and docs
- Information about available implementations and tools
- Resources for developers
- Resources for users

[github.com/AMWA-TV/nmos/wiki](https://github.com/AMWA-TV/nmos/wiki)

Available NMOS Solutions

AMWA is compiling lists of:

- Open source implementations  
  - Python, C++, Javascript...
- Freeware tools
- Support in commercial products


Disclaimer: listing on Wiki does not represent an AMWA endorsement or certification
What’s next
Grouping

- Current work: represent “natural groups” created by Device functionality

- Further work: represent human- or automation-created groups

Audio Channel Mapping

- Correct typical problems encountered today
  - E.g. swapped languages on incoming feeds

- Proposal to add basic capability to NMOS specification set

- Technical approach currently in discussion in Incubator
Identity & Timing

- Model end-to-end through production
- Build upon JT-NM reference architecture
- Help steer representation into transport
- Next presentation!

Automated testing

- Provide open-source test suites to check IS-xx interoperability.
  - Bring together previous activity
- Make it easier for developers, users, workshop organisers!
API Security

• Maybe we don’t want our IP broadcast systems hacked?
• Recommendations for interoperable secure use of NMOS APIs
  – Confidentiality, identification, integrity, authentication and authorisation
• HTTP / TLS, PKI, OAuth, JWT
• Avoids having incompatible security frameworks between vendors
• Draft specification available on GitHub:

  https://github.com/AMWA-TV/nmos-api-security

The Promise...

Swipe credit card...

Spin up broadcast channels....
NMOS in the full stack

Systems that when you “plug them in”:
- Get DHCP IP Address
- Find registry & register themselves with IS-04
- Obey IS-05 Connection Management
- Emit LLDP to ensure IS-06 Network Control functionality

Minimum Stack for IP endpoints
necessary to build and manage a full scale facility