



Building Scalable Media Systems using JT-NM TR-1001

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Scalable Media Systems ? What?

- Building IP-based media systems is a lot of work
 - Multi-Vendor systems even harder
 - Multi-Format systems even harder
 - Bigger Systems are harder than Small Systems
- How do we get to where we can leverage the scale needed in large facilities, with mixed formats, UHD, HDR, and the scale available in the large IP switching cores ?
- How do we get there on-budget and on-schedule?



Standards are Great...

(insert joke here)

- As an industry, we have build a good stack of standards for these IP Systems
 - 2110 specifies the bits on the wire PUBLISHED
 - IS-04 organizes the devices PUBLISHED
 - IS-05 controls the streams PUBLISHED
 - IS-07 adds tally and event streams PUBLISHED
 - IS-08 manages the audio channels PUBLISHED
- What is missing?



Each of those specs is very flexible...
-- (maybe too flexible)

- Not always clear what is normative
- No profiles or levels spec in 2110
- Several ways to find the registry
- Audio streams organized a lot different ways
- How do senders know their TX multicasts?
- How are PTP details distributed to devices?



Nobody Likes to Configure things by hand

- We need to specify what to do instead
- What Needs to be configured ?
 - Host IP, CIDR mask, gateway, for each interface
 - PTP Details (domain, announce timeout)
 - Where are the registries? What is the timeout?
 - Transmit address details for every sender
 - Plus all the normal stuff

Persistent Settings are Good (?)

- Tradition in television equipment is to store the current settings, and use them whenever a device starts up.
 - Good – leads to a fast recovery after reset
- This can cause problems in IP Systems
 - Rental equipment might come up with the transmit information leftover from last job
 - Spares from the closet have a similar problem



**SHOWCASE™
THEATER**

Six slides in, time for the good news

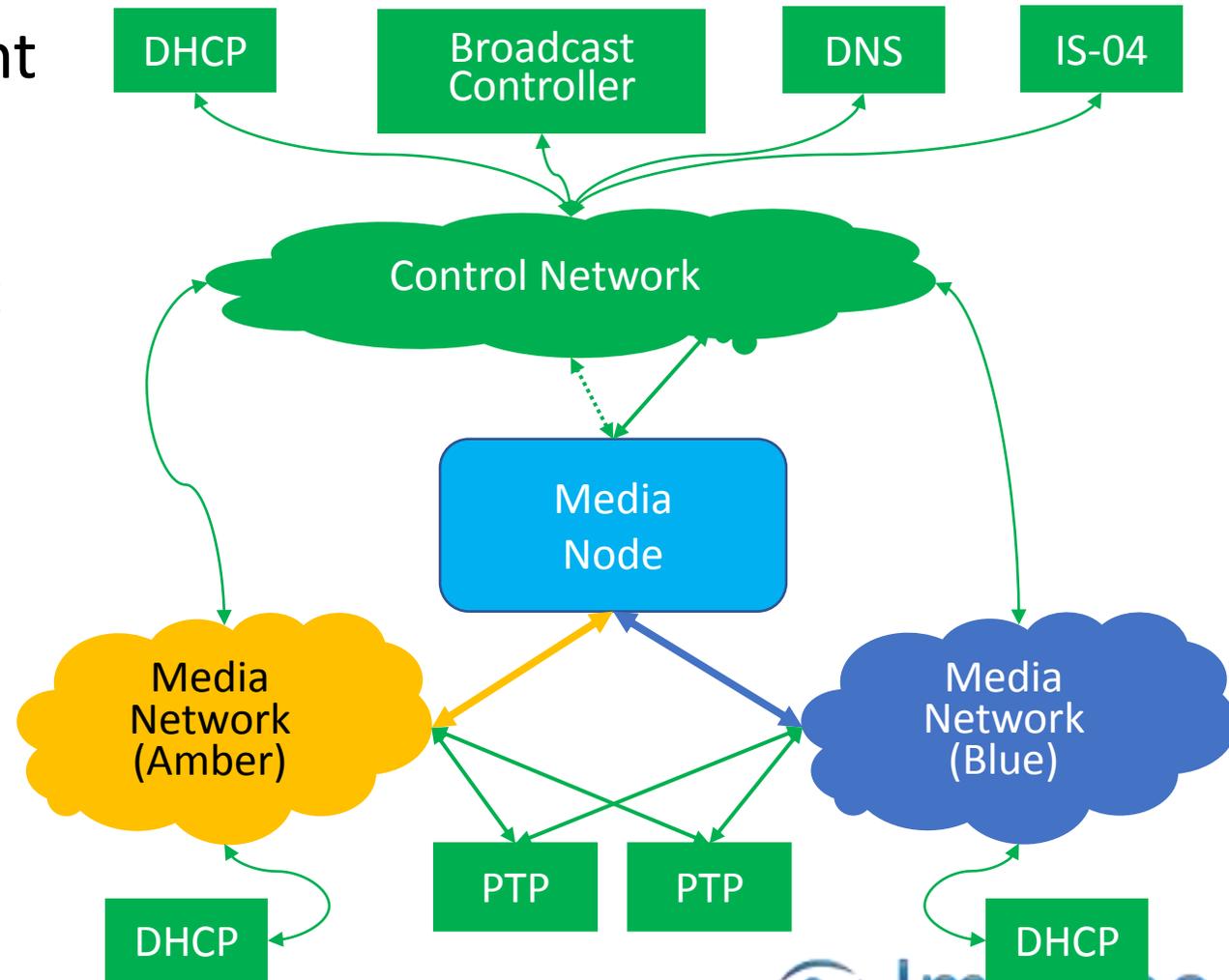
- Fall 2018, the JT-NM created and published TR-1001-1, in order to address these device behaviors that affect building systems
- It was a very fast process
 - Drafting Group formed just after IBC
 - Good cross-industry representation
 - Document published end of November

What is covered in TR-1001-1 ? (1)

- Use the Standards from SMPTE and AMWA
 - SMPTE ST 2110-10/20/21/30/31/40
 - AMWA NMOS IS-04, IS-05, BCP-002
- Use the Standards in a specific way
 - In some cases this TR constrains the standards
- How devices start-up and integrate into systems
 - This TR specifies some start-up behaviors and network services, so that device makers and system builders have a common expectation about the system

Network Architecture Flexibility

- Unicast Routing between Management and Media Networks
 - Enables a mix of devices, some with management on the media networks, and others with separate management networks
- Separate Subnets for Main and Protect Media Nets
- Specific “Network Hygiene” rules
 - Every interface has unique MAC
 - Every interface has its own Host IP
 - Must support Echo-Request (ping)



- DHCP for Management and Media Networks
 - Eliminates the need to set host IP addresses by hand
 - Avoids errors and duplications
 - Tells the nodes how to find the DNS servers
 - Can securely register the node's hostnames into DNS
- DNS (Domain Names Service)
 - Nodes use DNS Service Discovery (DNS-SD) to find the IS-04 registration service and the system resource
 - Finding the System Resource and Registration Service are vital system startup and system resiliency

Network Services

– System, NMOS, and PTP

- System Resource Service (provides global system constants)
 - Includes the PTP domain number and other PTP constants
 - Includes the registry timeout settings
 - Avoids needing to configure these by hand for every device in the system
- IS-04 (NMOS) Registration and Query Services
 - Nodes find the Registration Service using DNS-SD (not MDNS)
 - Nodes must register into the IS-04 Registry
 - Nodes should use the BCP-002 “grouphint” to signal natural groupings
 - Controllers look in the IS-04 Registry to find the nodes
 - Nodes update the Registry to signal switching events and other changes
- Precision Time Protocol (PTP)
 - as required by SMPTE ST 2110

Device – Startup Behavior

- TR-1001 specifies some “Out-of-Box” behaviour
 - How nodes find their network details (via DHCP)
 - How nodes find the System Resource (via DNS-SD)
 - How nodes find the IS-04 Registry (via DNS-SD)
 - How nodes suggest grouping using BCP-002-01
 - How to identify if the current configuration is valid, out-of-date, or out-of-place (via System Resource)
 - How senders get their TX information (via IS-05)

System Startup Behaviors

- How nodes find the System Resource
 - Look up “_nmos-system._tcp” using DNS Service Discovery (DNS-SD)
- How nodes find the IS-04 Registration Service
 - Look up “_nmos-registration._tcp” using DNS Service Discovery (DNS-SD)
- How nodes identify if their current config is valid, or out-of-date, or out-of-place
 - Check the stored “system-ID” against the current system resource (to figure out if this is a new system and the configuration is invalid)
 - Check the time of the last saved configuration against the current system resource version (in case the node spent a long time in storage)



System Startup Behaviors - Senders

- How senders get their transmit configuration
 - If the config is current and from the same system ID, use the settings you have stored and start up
 - If the config is out of date or it's a new system:
 - Mute the transmitters
 - Disconnect the receivers
 - Wait for instructions
- Nodes shall support TX configuration via IS-05
 - A controller will configure new nodes



Industry Benefits of TR-1001-1

- Add New Media Nodes to a System Easily
 - DHCP (automatically) provides network addresses
 - DNS-SD (automatically) discloses the services
 - Devices follow specified configuration start-up behaviors
 - IS-04 registration and IS-05 controls integrate the system
- Gives Users a uniform set of requirements language
 - TR-1001-1 should be referred to in RFI, RFP, RFQ
 - Eliminates customers needing to create their own unique requirements documents covering these system basics
- Gives vendors a consistent set of requirements to develop against when making IP Media System products



Future Work: Subjects in Tech Stack part 2

- Security of the Control APIs
 - Building on the work of AMWA BCP-003
- Audio Channel-level Manipulation
 - Building on the work of AMWA IS-08
- Event Flows and Tally Handling
 - Building on the work of AMWA IS-07

The logo for IP Showcase Theater features a blue stylized 'IP' with a circular arrow around it, followed by the text 'SHOWCASE THEATER' in blue and green.

IP SHOWCASE™ THEATER Questions?

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