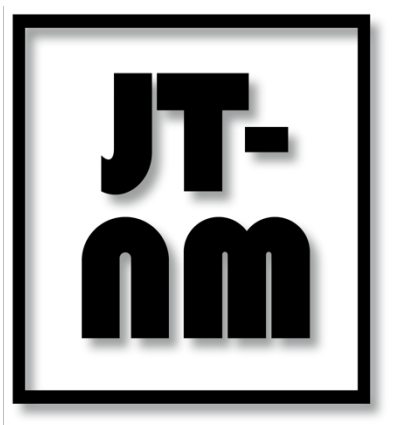


**JT-NM Tested Event**  
**IP Showcase**  
**IBC2019**





# “JT-NM Tested August 2019 Program” NMOS/TR-1001 Test Plan v.1.2

## Version 1.2 Changelog

- Update support equipment to match event
- Remove LLDP sub-test which is not applicable to TR-1001
- Indicate which NMOS testing ‘warnings’ are being classed as a ‘pass’ in this test
- Split 4.x tests’ pass criteria into two parts

## Version 1.1 Changelog

- Added AMWA IS-08 testing in section 5
- Updated support equipment and testing tool instructions

## Version 1.0 Changelog

- First draft. This document may undergo substantial changes ahead of the final version.
- AMWA IS-08 testing has been omitted from this draft, but is likely to be included in the final test plan.

## Abstract and motivation behind the program

JT-NM Tested Program returns to the IP Showcase. The JT-NM continues to partner with vendors and users to provide information that aids the transition to IP. As the industry’s use of IP matures, the JT-NM Tested program offers prospective purchasers of IP based equipment greater, more documented insight into how vendor equipment conforms to the SMPTE standards and AMWA NMOS specifications.

Sponsored by the JT-NM and administered by the EBU and IRT, two top European technical bodies, vendors who submit equipment for evaluation will have the opportunity to list that equipment in a JT-NM Tested catalog which will be made publicly available at the IP Showcase booth and on-line. This catalog will provide transparency, describing the test criteria and testing methodology, as well as the hardware and software versions of the products that were tested. This program is not a certification program; rather it is a snapshot in time of how vendor equipment conforms to key parts of SMPTE standards and AMWA NMOS specifications, providing prospective purchasers and users with a reference as they begin their equipment evaluation and qualification process.

Because this is a partnership between the JT-NM and the industry, and because this is a voluntary program, vendors will have the opportunity to decline to have the results for a specific device made



public, and/or they may choose to withdraw from the program entirely after seeing test results. Should a company choose to withdraw a product, or should that company decide to withdraw from the testing program completely, JT-NM will not disclose those corresponding results, and participating companies will be legally required to keep the results of other participants confidential.

## Acknowledgement

This Test Plan was prepared by an expert group within the Joint Task Force on Networked Media (JT-NM) with key contributions from: Andrew Bonney (BBC R&D), Arne Bönninghoff (Riedel), Bill McLaughlin (EEG), Jean Lapierre (Matrox), John Mailhot (Imagine Communications), Leigh Whitcomb (Imagine Communications), Mike Overton (Tektronix), Pedro Ferreira (Bisect), Peter Brightwell (BBC R&D), Serge Grondin (Grass Valley), Thomas Kernen (Mellanox Technologies) and Willem Vermost (EBU).

## Applicable Standards, Specifications and versions

- **IETF RFC 792** Internet Control Message Protocol
- **IETF RFC 1034** Domain Names - Concepts and Facilities
- **IETF RFC 2131** Dynamic Host Configuration Protocol
- **IETF RFC 3376** Internet Group Management Protocol, Version 3
- **IETF RFC 4566** SDP: Session Description Protocol
- **IETF RFC 6763** DNS-Based Service Discovery
- **AMWA NMOS IS-04 v1.2** NMOS Discovery and Registration Specification
- **AMWA NMOS IS-05 v1.0** NMOS Device Connection Management Specification
- **AMWA NMOS IS-08 v1.0** NMOS Audio Channel Mapping Specification
- **IEEE 802.1AB-2016** Station and Media Access Control Connectivity Discovery (LLDP)
- **IEEE 1588-2008** Precision Clock Synchronization Protocol for Networked Measurement and Control Systems
- **SMPTE ST 2059-1:2015** Generation and Alignment of Interface Signals to the SMPTE Epoch
- **SMPTE ST 2059-2:2015** SMPTE Profile for Use of IEEE-1588 Precision Time Protocol in Professional Broadcast Applications
- **SMPTE ST 2110-10:2017** Professional Media over Managed IP Networks: System Timing and Definitions
- **SMPTE ST 2110-20:2017** Professional Media over Managed IP Networks: Uncompressed Active Video
- **SMPTE ST 2110-21:2017** Professional Media over Managed IP Networks: Traffic Shaping and Delivery Timing for Video
- **SMPTE ST 2110-30:2017** Professional Media over Managed IP Networks: PCM Digital Audio
- **SMPTE ST 2110-40:2018** Professional Media over Managed IP Networks: SMPTE ST 291-1 Ancillary Data
- **JT-NM TR-1001-1:2018** System Environment and Device Behaviors For SMPTE ST 2110 Media Nodes in Engineered Networks



## Equipment used during testing

The following equipment was selected by the JT-NM Test Experts Group to support the “JT-NM Tested” event. In a number of cases, other vendor’s equipment would have worked equally well. To preserve the integrity of the testing environment, the team needed to choose one set of support equipment. The listing of a company below should not be taken to indicate that this is the only equipment that could have performed the tasks required. Note also that support equipment was *not* “JT-NM Tested” unless it is specifically listed in the test results matrix, and that no special status is awarded by the JT-NM to these companies other than to note that the JT-NM appreciates their support.

## Supporting equipment and software used during the event

The following list is subject to change as this test plan document is finalised.

- AMWA NMOS Testing Tool
  - <https://github.com/amwa-tv/nmos-testing>
  - See the Appendix for usage instructions
- SDPoker
  - <https://github.com/Streampunk/sdpoker>
- Open-Source Sony nmos-cpp IS-04 registry and TR-1001 system resource
  - <https://github.com/sony/nmos-cpp>
- ISC DHCP server v4.3.3 on Ubuntu Linux 16.04
- Glass DHCP server user interface
  - <https://github.com/Akkadius/glass-isc-dhcp>
- BIND DNS server v9.10.3 on Ubuntu Linux 16.04

## Reference senders and receivers used during the event

- DirectOut MONTONE.42
  - <https://www.directout.eu/en/products/montone42/>
- Imagine Communications SNP
  - <https://www.imaginecommunications.com/products/networking-infrastructure/processing/selenio-network-processor>
- Nevion Virtuoso
  - <https://nevision.com/products/nevision-virtuoso/>
- EEG HD492 iCap™ Encoder with Alta™ IP Video Caption Encoder
  - <https://eegent.com/products/UZNIZP3RN7GLM2GC/hd492-icapTM-encoder>



- <https://eegent.com/products/X6KO3ARIL9X1VEIU/altaTM-ip-video-caption-encoder>
- Matrox X.mio3 IP
  - [https://www.matrox.com/video/en/products/developer/hardware/xmio3\\_ip/](https://www.matrox.com/video/en/products/developer/hardware/xmio3_ip/)
- SDI source(s), SDI monitor(s), SDI DA(s), SDI router(s), audio source(s), audio monitor(s)  
TBA

## Network switches used during the event

- Arista 7060CX2-32 (EOS Version 4.21.4F)
  - [https://www.arista.com/assets/data/pdf/Datasheets/7060X\\_7260X\\_DS.pdf](https://www.arista.com/assets/data/pdf/Datasheets/7060X_7260X_DS.pdf)
- Arista 7280SR48-YC6 (EOS Version 4.21.4F)
  - <https://www.arista.com/assets/data/pdf/Datasheets/7280R-DataSheet.pdf>
- Arista 7280SR2-48YC6 (EOS Version 4.21.4F)
  - <https://www.arista.com/assets/data/pdf/Datasheets/7280R-DataSheet.pdf>
- Arista 7020TR-48 (EOS Version 4.21.4F)
  - [https://www.arista.com/assets/data/pdf/Datasheets/7020R-48\\_Datasheet.pdf](https://www.arista.com/assets/data/pdf/Datasheets/7020R-48_Datasheet.pdf)

## PTP configuration used during the event

The PTP Grandmaster(s) used during the event - Tektronix **SPG8000A**.

The network switches will be configured in a **Boundary Clock** mode.

Multicast communication mode for all messages will be used (except for management TLV responses).

The PTP profile details will be provided at the time of testing. The parameters provided will be within the values allowed by SMPTE ST 2059-2:2015.

## General statements and terms

- When validating the Device Under Test (DuT) against other reference senders and/or receivers, in case of the suspected possibility of a test failure by DuT - multiple tries with different reference devices and with various test and measurement equipment will be attempted before making final conclusions. However, the ability of the team to retest will be limited due to time and resource constraints.
- The execution of the tests will be done with common sense in mind. Ambiguities will be addressed by the test team on a case-by-case basis.
- If the DuT fails any particular test, a Vendor representative will be given an opportunity to explain and discuss the results.
- Vendor representatives will be given the configuration parameters sets at the time of testing.
- Vendor representatives will be expected to configure their equipment themselves.
- An example of IPv4 and PTP configuration that will be given to Vendors on a per-device basis may be provided.



- RTP payload type IDs will be pre-defined and communicated.
- Standard MTU size (1500 octets) will always be expected.
- All baseband signals and/or files required for the testing will be provided.
- Vendors may not change software/firmware once testing has commenced but may adjust settings on their products as necessary during the testing process.
- The Test Plan team reserves the right to update the “JT-NM Tested Program” Test Plan as required.

## Description of the tests

### 1. Media Node Startup Behaviour

#### 1.1 DHCP

**Description:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. The DUT shall participate in a DHCP negotiation with the DHCP server on each network connection. In addition to host address and CIDR mask, the DHCP server will offer a gateway route and DNS server information to each interface. A large enough DHCP pool will be used in order to ensure that each device gets a unique IP address. This test is expected to be carried out in a shared network environment.

**Validation method:** The DHCP server will be examined to find the addresses assigned to the DUT. The MAC address associated with the DHCP request will also be noted. ICMP Echo-Requests (Ping) will be sent from another subnet to each of the allocated addresses. Vendor-specific methods, if available, will also be used to examine the assigned address information.

**Pass criteria:**

- The MAC addresses in the DHCP server for each assigned address shall be unique. If vendor-specific means were available to determine the assigned addresses, these address details will be checked against the DHCP server entries.
- The DUT shall return the ICMP echo-request that is sent to each of the DHCP-assigned interface addresses. This will validate that the gateway route is used.

#### 1.2 LLDP

**Description:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. The DUT shall supply the LLDP mandatory TLV items to the attached switch on each interface. This test is expected to be carried out in a shared network environment.

**Validation method:** The LLDP information tables on the attached switches will be examined to find the information from the DUT. The presence of mandatory TLV items is checked. The reported MAC



addresses will be matched to the MAC addresses in the DHCP server, and the reported chassis-ID and port-ID information noted.

**Pass criteria:**

- The LLDP mandatory TLV items are provided. These are listed in Table 8.1 of IEEE 802.1AB-2016, and are: chassis-ID, port-ID, TTL.
- The LLDP-reported port-ID information shall be unique for each interface on the DUT.

### 1.3 System Resource Params\*

\* Note: At this event the PTP lock status of the device was not checked after performing this test as it would have required disruptive network changes. Passes were marked based upon observation of correct configuration changes in vendors' user interfaces.

**Description:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. A JT-NM TR1001-1 System Resource shall be available on the network, reachable from each network segment, and advertised in the DNS server via DNS-SD. The DUT shall have already passed the DHCP test above or otherwise be manually configured with Host, CIDR, Gateway, and DNS server information. The DUT shall use unicast DNS Service Discovery (DNS-SD) to locate the System Resource (JT-NM TR1001-1 Appendix A). The DUT shall determine the prevailing PTP domain ID from the system resource and apply it to its running configuration without any user intervention. This test is expected to be carried out in an isolated network environment.

**Validation method:** Vendor shall provide some reasonable method to observe the prevailing PTP domain and the lock status of PTP locking to that domain.

**Pass criteria:**

- The vendor-specific status shall indicate that the device is locked to the correct PTP domain.

### 1.4 Using DNS-SD to find the IS-04 Registry

**Description:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. An AMWA IS-04 v1.2 registration service shall be available on the network, reachable from each network segment, and advertised in the DNS server via DNS-SD. The DUT shall have already passed the DHCP test above or otherwise be manually configured with Host, CIDR, Gateway, and DNS server information. The DUT shall use unicast DNS Service Discovery (DNS-SD) to locate the IS-04 registration service. In order to avoid any issues with the length of the service name, the registry will be advertised identically under the service names `_nmos-registration` and `_nmos-register`. The DUT shall register into the best priority registry as determined in accordance with IS-04. This test is expected to be carried out in an isolated network environment.

**Validation Method:** The (potentially multiple advertised) registries will be examined to determine which registry the DUT has registered into (if any).

**Pass Criteria:**

- The DUT registration shall be in the correct registry.





## 2. Media Nodes & IS-04

**Description:** This set of tests validates a Media Node's ability to interact with an IS-04 registry, with discovery achieved via unicast DNS. Tests will be carried out using the NMOS Testing Tool. See the Appendix for usage instructions. These tests are expected to be carried out in an isolated network environment.

**First steps:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. The DuT will be configured with a DNS server IP address and a DNS search domain, either via DHCP or via manual configuration. These DNS addresses will match those required by the NMOS testing tool. The testing tool will be configured to use a 'DNS\_SD\_MODE' of 'unicast' and a 'DNS\_SD\_ADVERT\_TIMEOUT' sufficient to cover the DuT's boot time. The vendor will be asked to provide the IP address(es) and port which the IS-04 Node API is running on.

The following 'test suites' within the NMOS testing tool will be used to enable these tests:

- IS-04 Node API

Media Nodes will be tested using v1.2 of IS-04 only.

The following tests will not be used as they cover deprecated or unnecessary items for TR-1001:

- test\_01: Node can discover network registration service via multicast DNS
- test\_01\_01: Node does not attempt to register with an unsuitable mDNS registry
- test\_12: Node publishes its own mDNS announcement
- test\_13: Node supports IS-04 native connection management (deprecated)
- test\_14: Node supports IS-04 native connection parking (deprecated)
- test\_17\_01: IS-04 Device correctly indicates linked Senders and Receivers (deprecated)

### 2.1 Schema Conformance

**Description:** Tests that the Media Node's IS-04 API exposes all of the expected resources, and that each of these conforms to the JSON schema included in the specification.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- All auto\_ tests: Schema validation of GET requests
- test\_17: All Node resources use different UUIDs
- test\_18: All Node clocks are unique, and relate to any visible Sources' clocks
- test\_19: All Node interfaces are unique, and relate to any visible Senders and Receivers' 'interface\_bindings'
- test\_20: Node's resources correctly signal the current protocol and IP/hostname

**Pass criteria:**

- All tests indicate a 'PASS' state.





## 2.2 Unicast Discovery

**Description:** Tests that a Media Node is capable of automatically locating the IS-04 registry service using unicast DNS service discovery. This tests the same behaviour as 1.4, but is a prerequisite for further tests in this section. Test 1.4 will be carried out in a shared network segment, whereas this test will be carried out in an isolated network segment.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_02: Node can discover network registration service via unicast DNS

**Pass criteria:**

- All tests indicate a 'PASS' state.

## 2.3 Basic Registration

**Description:** Tests that a Media Node is capable of registering all of its advertised resources with an IS-04 registry service. Additionally requires that Nodes maintain themselves in the registry by using the heartbeat mechanism using the default interval of 5 seconds as specified in IS-04 (and this system resource IS-04 heartbeat\_interval will also be set to 5 seconds).

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_03: Registration API interactions use the correct Content-Type  
\* Note: Warnings about 'charset' will be marked as a pass for this test.
- test\_03\_01: Registration API interactions use the correct versioned path
- test\_04: Node can register a valid Node resource with the network registration service, matching its Node API self resource
- test\_05: Node maintains itself in the registry via periodic calls to the health resource  
\* Note: Warnings about inclusion of a Content-Type header will be marked as a pass for this test.
- test\_07: Node can register a valid Device resource with the network registration service, matching its Node API Device resource
- test\_07\_01: Registered Device was POSTed after a matching referenced Node
- test\_08: Node can register a valid Source resource with the network registration service, matching its Node API Source resource
- test\_08\_01: Registered Source was POSTed after a matching referenced Device
- test\_09: Node can register a valid Flow resource with the network registration service, matching its Node API Flow resource
- test\_09\_01: Registered Flow was POSTed after a matching referenced Device or Source
- test\_10: Node can register a valid Sender resource with the network registration service, matching its Node API Sender resource
- test\_10\_01: Registered Sender was POSTed after a matching referenced Device
- test\_11: Node can register a valid Receiver resource with the network registration service, matching its Node API Receiver resource
- test\_11\_01: Registered Receiver was POSTed after a matching referenced Device
- test\_21: Node correctly interprets a 200 code from a registry upon initial registration

**Pass criteria:**

- All tests indicate a 'PASS' state.



## 2.4 Advanced Registration

**Description:** Tests that a Media Node is capable of handling the presence of multiple clustered registries on a network. It should be able to demonstrate selection of the preferred registry using the defined priority order, and demonstrate an ability to failover between the available instances in the event that one registry indicates an error state.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_02\_01: Node does not attempt to register with an unsuitable unicas DNS registry
- test\_15: Node correctly selects a Registration API based on advertised priorities
- test\_16: Node correctly fails over between advertised Registration APIs when one fails
- test\_16\_01: Node correctly handles Registration APIs whose connections time out

**Pass criteria:**

- All tests indicate a 'PASS' state.

## 2.5 Consistency of UUIDs

**Description:** This test validates that Media Nodes expose the same UUID values after a reboot or restart event, even when the Media Node has moved to a new network environment.

**Validation method:** During initial setup in the “zoo” environment, with the consent of the unit under test, a snapshot will be taken of the UUIDs for the Node and its Devices, Senders, and Receivers. In the later “clean room” test, when the Media Node is on a different subnet, attached to a different registry, the UUIDs will be compared against the previous snapshot.

**Pass Criteria:**

- The UUID values for Node, Devices, Senders, and Receivers shall be the same, for elements of the Media Node which are in the same configuration.

## 3. Media Nodes & IS-05

**Description:** This set of tests validates a Media Node’s ability to be controlled by a Broadcast Controller using the IS-05 Connection Management API. Tests will be carried out using the NMOS Testing Tool. See the Appendix for usage instructions. These tests are expected to be carried out in a shared network environment.

**First steps:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. The vendor will be asked to provide the IP address(es) and port(s) which the IS-04 Node API and IS-05 Connection Management API are running on. The vendor will be asked to configure their device as necessary, with the option to have the test run with or without ST.2022-7 support enabled (if this option is available). The tests will not be run twice to cover both modes due to time constraints.

The following ‘test suites’ within the NMOS testing tool will be used to enable these tests:

- IS-05 Connection Management API (used by 3.1 through 3.6 below)
- IS-05 Interaction with Node API (used by 3.7 only below)



Media Nodes will be tested using v1.2 of IS-04 and v1.0 of IS-05 only.

## 3.1 Schema Conformance

**Description:** Tests that the Media Node's IS-05 API exposes all of the expected resources, and that each of these conforms to the JSON schema included in the specification.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- All auto\_ tests: Schema validation of GET requests
- test\_01: API root matches spec
- test\_02: Single endpoint root matches the spec
- test\_03: Root of /single/senders/ matches the spec
- test\_04: Root of /single/receivers/ matches the spec
- test\_05: Index of /single/senders/{senderId}/ matches the spec
- test\_06: Index of /single/receivers/{receiverId}/ matches the spec
- test\_07: Return of /single/senders/{senderId}/constraints/ meets the schema
- test\_08: Return of /single/receivers/{receiverId}/constraints/ meets the schema
- test\_09: All params listed in /single/senders/{senderId}/constraints/ matches /staged/ and /active/
- test\_10: All params listed in /single/receivers/{receiverId}/constraints/ matches /staged/ and /active/
- test\_11: Senders are using valid combination of parameters
- test\_12: Receiver are using valid combination of parameters
- test\_13: Return of /single/senders/{senderId}/staged/ meets the schema
- test\_14: Return of /single/receivers/{receiverId}/staged/ meets the schema
- test\_31: Sender active response schema is valid
- test\_32: Receiver active response schema is valid
- test\_40: Only valid transport types for a given API version are advertised

**Pass criteria:**

- All tests indicate a 'PASS' state.

## 3.2 Single Sender Routing

**Description:** Tests that a Media Node with a ST.2110 transmission capability can have its configuration managed via the IS-05 'single' resource.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_15: Staged parameters for senders comply with constraints
- test\_17: Sender patch response schema is valid
- test\_19: Sender invalid patch is refused
- test\_22: Receiver id on staged sender is changeable
- test\_23: Sender transport parameters are changeable
- test\_25: Immediate activation of a sender is possible
- test\_38: Number of legs matches on constraints, staged and active endpoint for senders



- test\_41: SDP transport files pass SDPoker tests\*
- \* Note: Whitespace warnings will be marked as a pass for this test

**Pass criteria:**

- All tests indicate a 'PASS' state.

### 3.3 Single Receiver Routing

**Description:** Tests that a Media Node with a ST.2110 reception capability can have its configuration managed via the IS-05 'single' resource.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_16: Staged parameters for receivers comply with constraints
- test\_18: Receiver patch response schema is valid
- test\_20: Receiver invalid patch is refused
- test\_21: Sender id on staged receiver is changeable
- test\_24: Receiver transport parameters are changeable
- test\_26: Immediate activation of a receiver is possible
- test\_39: Number of legs matches on constraints, staged and active endpoint for receivers

**Pass criteria:**

- All tests indicate a 'PASS' state.

### 3.4 Scheduled Activation

**Description:** Tests that the Media Node permits activation of new IS-05 transmission or reception parameters after a relative time offset or at an absolute time instant. This is in addition to immediate activations which are tested in 4.2 and 4.3.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_27: Relative activation of a sender is possible
- test\_28: Relative activation of a receiver is possible
- test\_29: Absolute activation of a sender is possible
- test\_30: Absolute activation of a receiver is possible

**Pass criteria:**

- All tests indicate a 'PASS' state.

### 3.5 Bulk Sender Routing

**Description:** Tests that a Media Node with a ST.2110 transmission capability can have its configuration managed via the IS-05 'bulk' resource, which allows multiple Senders to be re-configured at the same time.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_33: /bulk/ endpoint returns correct JSON
- test\_34: GET on /bulk/senders returns 405
- test\_36: Bulk interface can be used to change destination port on all senders

**Pass criteria:**



- All tests indicate a 'PASS' state.

### 3.6 Bulk Receiver Routing

**Description:** Tests that a Media Node with a ST.2110 reception capability can have its configuration managed via the IS-05 'bulk' resource, which allows multiple Receivers to be re-configured at the same time.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_33: /bulk/ endpoint returns correct JSON
- test\_35: GET on /bulk/receivers returns 405
- test\_37: Bulk interface can be used to change destination port on all receivers

**Pass criteria:**

- All tests indicate a 'PASS' state.

### 3.7 Integration with IS-04

**Description:** Tests that the IS-05 Connection Management API is correctly advertised via the IS-04 Node API, and that the Senders and Receivers advertised in IS-05 match those in IS-04. This test also ensures that when the IS-05 configuration is updated, the matching IS-04 resources are updated to reflect any changes to their state (parked/unparked) and which remote Sender or Receiver they are currently connected to.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_01: Check that version 1.2 or greater of the Node API is available
- test\_02: At least one Device is showing an IS-05 control advertisement matching the API under test
- test\_03: Receivers shown in Connection API matches those shown in Node API
- test\_04: Senders shown in Connection API matches those shown in Node API
- test\_05: Activation of a receiver increments the version timestamp
- test\_06: Activation of a sender increments the version timestamp
- test\_07: Activation of a receiver from an NMOS sender updates the IS-04 subscription
- test\_08: Activation of a receiver from a non-NMOS sender updates the IS-04 subscription
- test\_09: Activation of a sender to a multicast address updates the IS-04 subscription
- test\_10: Activation of a sender to a unicast NMOS receiver updates the IS-04 subscription
- test\_11: Activation of a sender to a unicast non-NMOS receiver updates the IS-04 subscription
- test\_12: IS-04 interface bindings array matches length of IS-05 transport\_params array
- test\_13: IS-04 manifest\_href matches IS-05 transportfile

**Pass criteria:**

- All tests indicate a 'PASS' state.



## 4. Media Node Streams

**Description:** This set of tests validates that IS-05 usage on the DuT matches the production or consumption of real ST.2110 streams on the network. These tests are expected to be carried out in a shared network environment. All media streams shall remain confined to the media portion of the IP network.

**First steps:**

The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. At the time of testing the vendor should provide the following:

- A sender and/or receiver (adhering to ST.2110-20/30/40) registered in the provided IS-04 registry.
- The DuT is expected to support IGMPv3 and be configured to use it if this is not automatic.

### 4.1 Configuring Senders and successful reception of configured ST.2110-20/30/40 stream via IS-05

A reference receiver that supports 2022-7 will be used to validate the sender configuration. If DuTs support a 2022-7 and non-2022-7 mode, the participant may choose which one of these is tested. If the DuT supports video, audio and ANC only one of these will be tested.

**Description:** The Test validates that IS-05 transport parameters can be used to successfully set a multicast destination on the sender. The following steps will be done in IS-05 single mode. Where a 2022-7 capable sender is being tested, the same checks and configuration will be performed for both the 'primary' and 'secondary' streams.

**Validation method:**

- DuT starts with a "no streaming" state. Active state should return 'master\_enable' as false.
- Validate that the reference receiver can not receive the stream at the configured multicast destination.
- Stage and activate the DuT sender with one multicast destination per stream with 'master\_enable' set to true.
- Validate that the reference receiver can now receive the stream at the configured multicast destination.
- Stage and activate the DuT sender with 'master\_enable' set to false.
- Validate that the stream has stopped on the reference receiver.

**Pass criteria:**



- The DuT accepts the configuration and can be seen to send a stream using the correct multicast configuration.
- The DuT could be successfully enabled and disabled using the 'master\_enable' flag.

## 4.2 Configuring Receivers and successful reception of a ST.2110-20/30/40 stream using an SDP file via IS-05

A reference sender that supports ST.2022-7 will be used to validate the receiver configuration. If DuTs support a 2022-7 and non-2022-7 mode, the participant may choose which one of these is tested. If the DuT supports video, audio and ANC only one of these will be tested.

**Description:** The Test validates that IS-05 can be used to assign a configuration to a receiver using the 'transport\_file' parameter. The following steps will be done in IS-05 single mode. Where a 2022-7 capable receiver is being tested, the same checks and configuration will be performed for both the 'primary' and 'secondary' streams.

**Validation method:**

- DuT starts with a "no streaming" state. Active state should return 'master\_enable' as false.
- Validate that the DuT receiver is not receiving anything.
- Stage and activate the DuT receiver by providing the reference sender's SDP in the 'transport\_file' staging. 'master\_enable' will be set to true during this step.
- Validate that the DuT receiver can now receive the stream at the multicast destination.
- Stage and activate the DuT receiver with 'master\_enable' set to false.
- Validate that the stream has stopped on the DuT receiver.

**Pass criteria:**

- The DuT accepts the configuration and can be seen to receive the stream.
- The DuT could be successfully enabled and disabled using the 'master\_enable' flag.

## 4.3 IGMPv3 including source addresses

**Description:** The Test validates that IS-05 can be used to assign a 'source\_ip' to a receiver by using SDP files containing multicast source-filters. The receiver should use IGMPv3 in order to select the right source.

**Validation method:**

- Validate that the receiver is not receiving anything.
- Stage and activate the receiver using the SDP transport\_file of a reference sender, including a valid source-filter line.
- Validate that the IGMP snooping table in the switch indicates that the source IP address from the SDP file was included in the IGMPv3 request.





- Validate that the receiver can now receive the stream at the multicast destination.

**Pass criteria:**

- The DuT sends a valid IGMPv3 request for the requested multicast group and can be seen to receive the stream.
- The IGMPv3 request includes a filter matching the source IP address.

## 4.4 SDP files including source-filters in senders

**Description:** The Test validates that usage of source-filters in SDPs match the stream being sent by the sender.

**Validation method:**

- Get the SDP file from the DuT using the IS-05 /transportfile resource.
- Validate that the stream generated by the DuT is sending packets from a source IP address which matches the SDP source-filter line provided by the sender.

**Pass criteria:**

- The DuT is providing an SDP with a source-filter present.
- The source-filter line(s) match the source interface IP addresses.

## 5. Media Nodes & IS-08

**Description:** This set of tests validates a Media Node's ability to re-map audio channels either prior to sending a stream onto the network, or after receiving one. Tests will be carried out using the NMOS Testing Tool. See the Appendix for usage instructions. These tests are expected to be carried out in a shared network environment.

**First steps:** The management interface(s) and media interface(s) of the Device Under Test (DUT) will be connected to network ports of appropriate speed and media type. The vendor will be asked to provide the IP address(es) and port(s) which the IS-04 Node API and IS-08 Audio Channel Mapping API are running on. The vendor will be asked to configure their device as necessary.

The following 'test suites' within the NMOS testing tool will be used to enable these tests:

- IS-08 Audio Channel Mapping API (used by 5.1 through 5.3 below)
- IS-08 Interaction with Node API (used by 5.4 only below)

Media Nodes will be tested using v1.2 of IS-04 and v1.0 of IS-08 only.



## 5.1 Schema Conformance

**Description:** Tests that the Media Node's IS-08 API exposes all of the expected resources, and that each of these conforms to the JSON schema included in the specification.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- All `auto_` tests: Schema validation of GET requests
- `test_01`: Content of the `/io` view matches resources elsewhere in the API

**Pass criteria:**

- All tests indicate a 'PASS' state.

## 5.2 Activations

**Description:** Tests that the Media Node permits activation of new IS-08 parameters either immediately, or after a time offset.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- `test_02`: Immediate activation can be called on the API
- `test_03`: Relative offset activations can be called on the API
- `test_04`: Absolute offset activations can be called on the API
- `test_05`: Activations can be deleted once created
- `test_06`: Attempting to change a locked route results in a 423 response

**Pass criteria:**

- All tests indicate a 'PASS' state.

## 5.3 API Behaviour

**Description:** Tests that the IS-08 API does not expose an invalid configuration, and that violations of the advertised constraints are not permitted.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- `test_07`: Channels in the active resource where no input channel is routed have ``null`` set as the ``input`` and ``channel_index``
- `test_08`: If the device allows re-entrant matrices, the constraints are set such that it is not possible to create a loop
- `test_11`: Inputs have at least one channel represented in their channels resource
- `test_12`: Outputs have at least one channel represented in their channels resource
- `test_13`: Attempting to violate routing constraints results in an HTTP 400 response
- `test_14`: It is not possible to re-order channels when re-ordering is set to ``false``
- `test_15`: It is not possible to make an out-of-block route when `block_size` is anything other than 1

**Pass criteria:**

- All tests indicate a 'PASS' state.



## 5.4 Integration with IS-04

**Description:** Tests that the IS-08 Audio Channel Mapping API is correctly advertised via the IS-04 Node API, and that the Source and Receiver IDs advertised in IS-08 match those in IS-04. This test also ensures that when the IS-08 configuration is updated, the matching IS-04 resources are updated to reflect any changes to their state.

**Validation method:** Execution of the NMOS testing tool, using the following tests:

- test\_01: Activations result in a Device version number increment
- test\_02: API is correctly advertised as a control endpoint
- test\_03: All Output Source IDs match up to the IS-04 Node API
- test\_04: All Input Source/Receiver IDs match up to the IS-04 Node API

**Pass criteria:**

- All tests indicate a 'PASS' state.



## Appendix: Using the NMOS testing tool

The majority of AMWA NMOS testing will be carried out using the automated NMOS testing tool, available from <https://github.com/AMWA-TV/nmos-testing>. If you intend to participate in TR-1001 testing, please use this tool in advance of the event to confirm your Media Node's adherence to the specifications.

The tool can be used to test a range of NMOS specifications, but the following instructions target how to use it for the specific IS-04, IS-05 and IS-08 testing which will be carried out at the JT-NM Tested event. The testing tool is written in Python and is known to work on Linux and Windows.

### Installation

- Install Python 3.5 or above onto a computer on the same network as the Media Node (via <https://www.python.org/downloads/> or a Linux package manager)
- Install the Git version control software (via <https://git-scm.com/download> or a Linux package manager)
- Download the testing tool via <https://github.com/AMWA-TV/nmos-testing/archive/master.zip>
- Unzip the downloaded archive into a directory of your choice
- Using the command prompt, change directory into the location of the testing tool (where you will find a file called 'requirements.txt')
- Install the tool's dependencies using Python's 'pip' package manager as follows: 'python -m pip install -r requirements.txt'

### Configuration

By default, the testing tool tests IS-04 Nodes in multicast discovery mode. For the purposes of testing TR-1001 we need to use 'unicast' mode which does not make any multicast DNS advertisements, but does run a mock DNS server on the testing host. Please consult <https://github.com/AMWA-TV/nmos-testing#testing-unicast-discovery> for instructions on how to configure the testing tool and your Media Node (unit under test) for this mode. If your Node cannot be configured to ignore mDNS announcements you will need to run this testing on a network segment which is isolated from any IS-04 registry mDNS announcements.

### Operation

The testing tool can be run by typing 'python nmos-test.py' at the command prompt from the testing tool's working directory. Note that in order to test with unicast DNS you will need to run this command with elevated permissions. On Linux this can be achieved by prefixing the command with 'sudo'. On Windows you will need to open an elevated command prompt (otherwise known as administrator mode).



Having started the testing tool, browse to <http://127.0.0.1:5000> in a web browser on the machine hosting the tool.

The following 'test suites' listed in the dropdown will be used during the JT-NM Tested event for the purposes of IS-04, IS-05 and IS-08 testing. Additional listed 'test suites' may be used if the event includes testing of further AMWA NMOS specifications.

- IS-04 Node API
- IS-05 Connection Management API
- IS-05 Interaction with Node API
- IS-08 Audio Channel Mapping API
- IS-08 Interaction with Node API

Select a test suite, and enter the IP address and port of the Node under test into the boxes. Ensure that 'all' is selected in 'Test Selection' and press 'Run'. When the tests complete, press the 'Download JSON' button at the top right of the page to download a copy of the results.

When executing the 'IS-04 Node API' test suite, note that you may need to restart your Media Node after having pressed 'Run' in order to force it to discover the test suite's mock IS-04 registries. As noted in <https://github.com/AMWA-TV/nmos-testing#testing-unicast-discovery>, you can increase the testing tool's 'TEST\_START\_DELAY' in order to allow enough time for your Media Node to reboot when performing this test.

## Support

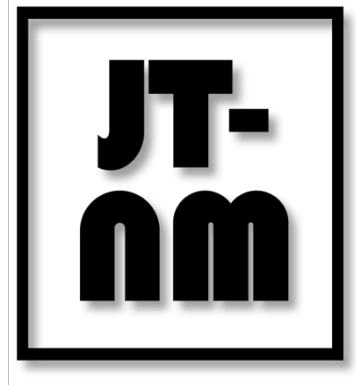
If you encounter issues using the testing tool, please create an issue at <https://github.com/AMWA-TV/nmos-testing/issues> and the team will be happy to assist.

## Appendix: Additional NMOS Testing

The automated NMOS testing tool may additionally be used to test the following during the event. Due to time constraints we are unlikely to conduct formal testing of these items.

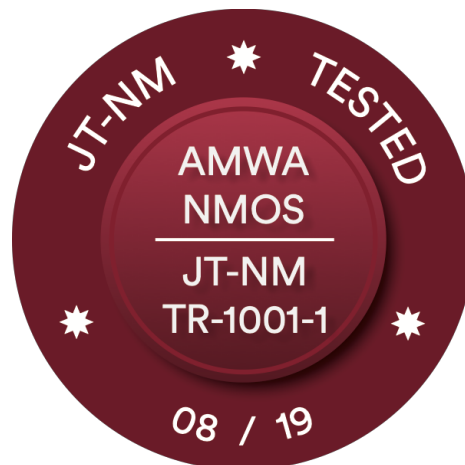
- IS-04 Registry APIs
- IS-09 System API
- BCP-003-01 Secure API Communications

At the time of writing, in depth automated tests for the AMWA IS-06 and IS-07 specifications are not available.



## Appendix

# JT-NM Tested Event August 2019 AMWA NMOS/JT-NM TR-1001-1 Results IBC2019



JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                |                 | REPORT | 1. Media Node Startup Behaviour |                                |                       |                           |                  |          |                                    |                               |  |  |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|--------|---------------------------------|--------------------------------|-----------------------|---------------------------|------------------|----------|------------------------------------|-------------------------------|--|--|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx, Rx, Tx/Rx   |        | 1.1 DHCP                        | 1.1.1 Management IP Addressing | 1.1.2 Management Ping | 1.1.3 Media IP Addressing | 1.1.4 Media Ping | 1.2 LLDP | 1.2.1 Management LLDP TLVs present | 1.2.2 Media LLDP TLVs present | 1.2.3 LLDP Port IDs are unique across Node | 1.3 PTP domain is detected automatically | 1.4 IS-04 registration with reference registry |
| Adeas/Nextera            | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | KonaIP                       | v1.0            | v15.2          | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IoIP                         | v1.0            | v15.2          | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ          | v0.260         | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Nevion                   | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Pebble Beach Systems     | Dolphin                      | N/A             | V1.13          | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | V8.0           | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Riedel Communications    | MediorNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Sony                     | HDCU Series                  | V2.23           | V2.23          | Tx/Rx           |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Net Insight              | NG40-Tx                      | A1              | FX-j2kapp.6    | Tx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IPR-10G-HDMI                 | v1.0            | v2.2           | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IPR-10G2-HDMI                | v1.0            | v2.2           | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| AJA                      | IPR-10G2-SDI                 | v1.0            | v2.2           | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Bridge Technologies      | VB440                        | Rev A           | v5.3.6         | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Grass Valley             | Kaleido-IP                   | X320            | v11.0          | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Imagine Communications   | EPI-C-MV                     | A               | v1.4.4.7       | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Net Insight              | NG40-Rx                      | A1              | FX-j2kapp.6    | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| PHABRIX Ltd.             | Qx                           | Main 9          | v3.4           | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |
| Tektronix/Telestream     | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |        |                                 |                                |                       |                           |                  |          |                                    |                               |  |  |  |

LEGEND

- Green square = test passed
- Grey square = test failed or not tested
- White square = test not applicable



JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                | REPORT          | 2. Media Nodes & IS-04 |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|------------------------|----------------------------|--------------------------------|-------------------------------------|---|--|---|--|---|--|---|--|---|--|---|---|---|---|---|---|-----------------------|------------------------|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx, Rx, Tx/Rx   | 2.1 Schema Conformance | GET /x-rmos/ (auto_node_1) | GET /x-rmos/node (auto_node_2) | GET /x-rmos/node/v1.2 (auto_node_3) | GET /x-rmos/node/v1.2/devices (auto_node_4) | GET /x-rmos/node/v1.2/devices/deviceid (auto_node_5) | GET /x-rmos/node/v1.2/flows (auto_node_6) | GET /x-rmos/node/v1.2/flows/flowid (auto_node_7) | GET /x-rmos/node/v1.2/receivers (auto_node_8) | GET /x-rmos/node/v1.2/receivers/receiverid (auto_node_9) | GET /x-rmos/node/v1.2/self (auto_node_10) | GET /x-rmos/node/v1.2/senders (auto_node_11) | GET /x-rmos/node/v1.2/senders/senderid (auto_node_12) | GET /x-rmos/node/v1.2/sources (auto_node_13) | GET /x-rmos/node/v1.2/sources/sourceid (auto_node_14) | GET /x-rmos/node/v1.2/availablepaths (auto_node_15) | test_17: All Node resources use different UUIDs | test_18: All Node clocks are unique, and relate to any visible Sources clocks | test_19: All Node interfaces are unique, and relate to any visible Senders and Receivers' 'inter face_bindings' | test_20: Node's resources correctly signal the current protocol and IP/hostname | 2.2 Unicast discovery | 2.3 Basic registration |  |
| Adeas/Nextera            | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | KonaIP                       | v1.0            | v1.0           | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IolIP                        | v1.0            | v1.0           | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| EVS                      | XT-VIA                       | 16.2            | 16.2           | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev A1          | v0.260         | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Matrox                   | X-mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Matrox                   | DSX LES D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Matrox                   | X-mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Nevion                   | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Pebble Beach Systems     | Dolphin                      | N/A             | V1.13          | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | V8.0           | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Riedel Communications    | MedionNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Sony                     | HDCU Series                  | V2.23           | v2.23          | Tx/Rx           |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Net Insight              | N640-Tx                      | A1              | FX-jkapp.6     | Tx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IPT-10G-HDMI                 | v1.0            | v2.2           | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Bridge Technologies      | V8440                        | Rev A           | v5.3.6         | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Grass Valley             | Kaleido-IP                   | X320            | v11.0          | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Imagine Communications   | EPIC-MV                      | A               | v1.4.4.7       | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Net Insight              | N640-Rx                      | A1              | FX-jkapp.6     | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| PHABRIX Ltd.             | Qx                           | Main 9          | v3.4           | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |                        |                            |                                |                                     |   |  |   |  |   |  |   |  |   |  |   |   |   |   |   |   |                       |                        |  |

**LEGEND**  
 Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                | REPORT          | 2. Media Nodes & IS-04  |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|---|--|---|--|---|---|---|---|---|---|---|---|---|---|---|---------------------------|---|---|--|---|-------------------------|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx/Rx, Tx/Rx    | test_03: Registration API Interactions use the correct Content-Type | test_03_01: Registration API Interactions use the correct versioned path | test_04: Node can register a valid Node resource with the network registration service, matching its Node API self resource | test_05: Node maintains itself in the registry via periodic calls to the health resource | test_07: Node can register a valid Device resource with the network registration service, matching its Node API Device resource | test_07_01: Registered Device was POSTed after a matching referenced Node | test_08: Node can register a valid Source resource with the network registration service, matching its Node API Source resource | test_08_01: Registered Source was POSTed after a matching referenced Device | test_09: Node can register a valid Flow resource with the network registration service, matching its Node API Flow resource | test_09_01: Registered Flow was POSTed after a matching referenced Device or Source | test_10: Node can register a valid Sender resource with the network registration service, matching its Node API Sender resource | test_10_01: Registered Sender was POSTed after a matching referenced Device | test_11: Node can register a valid Receiver resource with the network registration service, matching its Node API Receiver resource | test_11_01: Registered Receiver was POSTed after a matching referenced Device | test_21: Node correctly interprets a 200 code from a registry upon initial registration | 2.4 Advanced registration | test_02_01: Node does not attempt to register with an unsuitable unicast DNS registry | test_15: Node correctly selects a Registration API based on advertised priorities | test_16: Node correctly fails over between advertised Registration APIs when one fails | test_16_01: Node correctly handles R registration APIs whose connections time out | 2.5 Consistency of UUIs |  |
| Adeas/Nexera             | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | KonaIP                       | v1.0            | v15.2          | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IoIP                         | v1.0            | v15.2          | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ          | v0.260         | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Hamonic                  | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Nevion                   | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Pebble Beach Systems     | Dolphin                      | N/A             | V1.13          | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | V8.0           | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Riedel Communications    | MediorNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Sony                     | HDCL Series                  | V2.23           | V2.23          | Tx/Rx           |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Net Insight              | N640-Tx                      | A1              | FX-2kapp.6     | Tx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IPR-10G-HDMI                 | v1.0            | v2.2           | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IPR-10G2-HDMI                | v1.0            | v2.2           | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| AJA                      | IPR-10G2-SDI                 | v1.0            | v2.2           | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Bridge Technologies      | VB440                        | Rev A           | v5.3.6         | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Grass Valley             | Kaleido-IP                   | X320            | v11.0          | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Imagine Communications   | EPIC-MV                      | A               | v1.4.4.7       | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Net Insight              | N640-Rx                      | A1              | FX-2kapp.6     | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| PHABRIX Ltd.             | Ox                           | Main 9          | v3.4           | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |   |  |   |  |   |   |   |   |   |   |   |   |   |   |   |                           |   |   |  |   |                         |  |

**LEGEND**  
 Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                |                 | REPORT                   | 3. Media Nodes & IS-05          |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|--------------------------|---------------------------------|--|---|--|--|--|--|---|--|--|---|--|---|--|---|---|--------------------------------|--|---|--|---|---|---|---|---|--|--|--|--|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx/Rx/TV/Rx     | Test Case                | Test Case                       | Test Case                                  | Test Case                                       | Test Case  | Test Case  | Test Case  | Test Case  | Test Case   | Test Case  | Test Case  | Test Case   | Test Case  | Test Case   | Test Case  | Test Case   | Test Case   | Test Case                      | Test Case                                      | Test Case   | Test Case  |   |   |   |   |   |  |  |  |  |  |
| Adveas/Nextera           | SDII IP Gateway              | V2.2            | V2.2           | Tx/Rx           | 3.1 Schema conf mismatch | GET /A-nmos (auto_connection_1) | GET /A-nmos/connection (auto_connection_2) | GET /A-nmos/connection/v1.0 (auto_connection_3) | GET /A-nmos/connection/v1.0/bulk (auto_connection_4) | GET /A-nmos/connection/v1.0/single (auto_connection_5) | GET /A-nmos/connection/v1.0/single/receivers (auto_connection_6) | GET /A-nmos/connection/v1.0/single/receivers/recvierId (auto_connection_7) | GET /A-nmos/connection/v1.0/single/receivers/recvierId/active (auto_connection_8) | GET /A-nmos/connection/v1.0/single/receivers/recvierId/constraints (auto_connection_9) | GET /A-nmos/connection/v1.0/single/receivers/recvierId/etag (auto_connection_10) | GET /A-nmos/connection/v1.0/single/senders (auto_connection_11) | GET /A-nmos/connection/v1.0/single/senders/senderId (auto_connection_12) | GET /A-nmos/connection/v1.0/single/senders/senderId/active (auto_connection_13) | GET /A-nmos/connection/v1.0/single/senders/senderId/constraints (auto_connection_14) | GET /A-nmos/connection/v1.0/single/senders/senderId/etag (auto_connection_15) | GET /A-nmos/connection/v1.0/single/senders/senderId/etag (auto_connection_16) | test_01: API root matches spec | test_02: Single endpoint root matches the spec | test_03: Return of /single/senders matches the spec | test_04: root of /single/receivers/ matches the spec | test_05: Index of /single/sender/senderId/ matches the spec | test_06: Index of /single/receivers/recvierId/ matches the spec | test_07: Return of /single/senders/senderId/constraints/ meets the schema | test_08: Return of /single/receivers/recvierId/ constraints/ meets the schema | test_09: All params listed in /single/senders/senderId/constraints/ matches /single/active/ |  |  |  |  |  |
| AJIA                     | KonaIP                       | V1.0            | V15.2          | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | tuIP                         | V1.0            | V15.2          | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2 2019       | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev A1          | v0.260         | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Macnica ATD              | Media over IP Package        | V1.1.2          | V1.1.1         | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Nevidio                  | Virtualoso MI                | MI V1.0         | V1.1.25        | Tx/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Parkside Beach Systems   | Dolphin                      | N/A             | V1.13          | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Riedel Communications    | Artist 32/E4/128 G2          | N/A             | V8.0           | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Riedel Communications    | MeditorNet MicroN IP         | N/A             | V6.1.1         | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Sony                     | HDCU Series                  | V2.23           | V2.23          | Tv/Rx           |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | IPT-10G2-HDMI                | V1.0            | V2.2           | Tx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | IPT-10G2-SDI                 | V1.0            | V2.2           | Tx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Net Insight              | N640-Tx                      | A1              | FX-j2kapp.6    | Tx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | IPR-10G-HDMI                 | V1.0            | V2.2           | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | IPR-10G2-HDMI                | V1.0            | V2.2           | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| AJA                      | IPR-10G2-SDI                 | V1.0            | V2.2           | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Bridge Technologies      | VB440                        | Rev A           | V5.3.6         | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Grass Valley             | Kaleido-IP                   | X320            | V11.0          | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Imagine Communications   | EPIC-MV                      | A               | V1.4.4.7       | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | V3.4           | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Net Insight              | N640-Rx                      | A1              | FX-j2kapp.6    | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| PHABRIX Ltd.             | Ox                           | Main 9          | V3.4           | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |                          |                                 |  |   |  |  |  |  |   |  |  |   |  |   |  |   |   |                                |  |   |  |   |   |   |   |   |  |  |  |  |  |

**LEGEND**  
 Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                |                 | REPORT   | 3. Media Nodes & IS-05                                     |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|--|--|---|---|---|---|---|--|---------------------------|--|--|--|---|---|---|--|--|-----------------------------|--|--|--|---|---|---|--|--------------------------|--|--|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx, Rx, Tx/Rx   | test_10: All params listed in /single/receivers/(receiverId)/constraints/ matches /stageId/ and /active/ | test_11: Senders are using valid combination of parameters | test_12: Receiver are using valid combination of parameters | test_13: Return of /single/senders/(senderId)/stageId/ meets the schema | test_14: Return of /single/receivers/(receiverId)/stageId/ meets the schema | test_15: Sender active response schema is valid | test_16: Receiver active response schema is valid | test_18: Only valid transport types for a given API version are returned | 3.2 Single Sender routing | test_15: Staged parameters for senders comply with constraints | test_17: Sender patch response schema is valid | test_18: Sender invalid patch is refused | test_22: Receiver id on staged sender is changeable | test_23: Sender transport parameters are changeable | test_25: Immediate activation of a sender is possible | test_26: Number of tags matches on constraints, staged and active endpoint for senders | test_21: SDP transport filter pass SDPoker tests | 3.3 Single Receiver routing | test_16: Staged parameters for receivers comply with constraints | test_18: Receiver patch response schema is valid | test_20: Receiver invalid patch is refused | test_21: Sender id on staged receiver is changeable | test_24: Receiver transport parameters are changeable | test_26: Immediate activation of a receiver is possible | test_30: Number of tags matches on constraints, staged and active endpoint for receivers | 3.4 Scheduled activation |  |  |  |
| Adcast/Nextera           | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | KonaIP                       | V1.0            | V15.2          | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IotIP                        | V1.0            | V15.2          | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   |                 | Rev A1         | v0.260          |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Neveion                  | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Pebble Beach Systems     | Dolphin                      | N/A             | v1.13          | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Riedel Communications    | Antix 32/64/128 G2           | N/A             | V8.0           | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Riedel Communications    | MediorNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Sony                     | HDCL Series                  | V2.23           | V2.23          | Tx/Rx           |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IPT-10G2-HDMI                | V1.0            | v2.2           | Tx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IPT-10G2-SDI                 | V1.0            | v2.2           | Tx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Net Insight              | N640-Tx                      | A1              | FX-j2kapp.6    | Tx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IPR-10G-HDMI                 | V1.0            | v2.2           | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IPR-10G2-HDMI                | V1.0            | v2.2           | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| AJA                      | IPR-10G2-SDI                 | V1.0            | v2.2           | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Bridge Technologies      | V8440                        | Rev A           | V5.3.6         | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Grass Valley             | Kaleido-IP                   | A               | V11.0          | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Imagine Communications   | EPIC-MV                      | A               | v1.4.4.7       | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Net Insight              | N640-Rx                      | A1              | FX-j2kapp.6    | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| PHABRIX Ltd.             | Gx                           | Main 9          | v3.4           | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |  |  |   |   |   |   |   |  |                           |  |  |  |   |   |   |  |  |                             |  |  |  |   |   |   |  |                          |  |  |  |

**LEGEND**  
 Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                | REPORT          | 3. Media Nodes & IS-05                                |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|---|---|---|---|-------------------------|--|--|--|---------------------------|--|--|--|----------------------------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx, Rx, T/Rx    | test_L27: Relative activation of a sender is possible | test_L28: Relative activation of a receiver is possible | test_L29: Absolute activation of a sender is possible | test_L30: Absolute activation of a receiver is possible | 3.5 Bulk Sender routing | test_L33: bulk/endpoint returns correct JSON | test_L34: GET on /bulk/senders returns 405 | test_L36: Bulk interface can be used to change destination part on all senders | 3.6 Bulk Receiver routing | test_L33: bulk/endpoint returns correct JSON | test_L35: GET on /bulk/receivers returns 405 | test_L37: Bulk interface can be used to change destination part on all receivers | 3.7 Integration with IS-04 | test_L1: Check that version 1.2 or greater of the Node API is available | test_L02: At least one Device is showing an IS-05 control advertisement matching the API under test | test_L03: Receivers shown in Connection API matches those shown in Node API | test_L04: Senders shown in Connection API matches those shown in Node API | test_L05: Activation of a receiver increments the version timestamp | test_L06: Activation of a sender increments the version timestamp | test_L07: Activation of a receiver from an NMOS sender updates the IS-04 subscription | test_L08: Activation of a receiver from a non-NMOS sender updates the IS-04 subscription | test_L09: Activation of a sender to a multicast address updates the IS-04 subscription | test_L10: Activation of a sender to a unicast NMOS receiver updates the IS-04 subscription | test_L11: Activation of a sender to a unicast non-NMOS receiver updates the IS-04 subscription | test_L12: IS-04 interface bindings array matches length of IS-05 transportParameters array | test_L13: IS-04 manifest_href matches IS-05 transportUri |  |  |  |  |  |  |  |  |
| Adesa/Nextera            | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | KonaIP                       | v1.0            | v15.2          | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | tuIP                         | v1.0            | v15.2          | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ          | v0.260         | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Nevison                  | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Palube Beach Systems     | Dolphin                      | N/A             | v1.13          | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | v8.0           | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Riedel Communications    | MediorNet MicroNIP           | N/A             | v6.1.1         | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sony                     | HDCU Series                  | V2.23           | V2.23          | Tx/Rx           |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Net Insight              | N640-Tx                      | A1              | FX-j2kapp.6    | Tx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | IPR-10G-HDMI                 | v1.0            | v2.2           | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | IPR-10G2-HDMI                | v1.0            | v2.2           | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AJA                      | IPR-10G2-SDI                 | v1.0            | v2.2           | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bridge Technologies      | V8440                        | Rev A           | v5.3.6         | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Grass Valley             | kaleido-IP                   | X320            | v11.0          | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Imagine Communications   | EPIc-MV                      | A               | v1.4.4.7       | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Net Insight              | N640-Rx                      | A1              | FX-j2kapp.6    | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PHABRIX Ltd.             | Ox                           | Main 9          | v3.4           | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |   |   |   |   |                         |  |  |  |                           |  |  |  |                            |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

LEGEND

- Green square = test passed
- Grey square = test failed or not tested
- White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                | REPORT          | 4. Media Node Streams                  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
|--------------------------|------------------------------|-----------------|----------------|-----------------|--|-------------------------------------|-----------------------------------|--|-------------------------------|-----------------------------------|------------|------------|-------------------------------------|------------------------|-----------------------|---|
| Vendor Name              | Model                        | HW Version      | SW Version     | Tx, Rx, Tx/Rx   | 4.1 Sender configuration and streaming | Sender stream matches configuration | Master_enable functions correctly | 4.2 Receiver configuration and reception | Receiver joins correct stream | Master_enable functions correctly | 4.3 IGMPv3 | Use IGMPv3 | Source filter matches SDP source IP | 4.4 SDP source-filters | SDP has source-filter | Source-filter matches interface source IP |
| Adeas/Nextera            | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | KonaIP                       | v1.0            | v15.2          | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IoIP                         | v1.0            | v15.2          | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| EVS                      | XT-VIA                       | XT-VIA          | 16.2           | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ          | v0.260         | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Hammonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Matrox                   | DSX LES D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Neveon                   | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Pebble Beach Systems     | Dolphin                      | N/A             | V1.13          | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | V8.0           | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Riedel Communications    | MediorNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Sony                     | HDCU Series                  | V2.23           | V2.23          | Tx/Rx           |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Net Insight              | N640-Tx                      | A1              | FX-j2kapp.6    | Tx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IPR-10G-HDMI                 | v1.0            | v2.2           | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IPR-10G2-HDMI                | v1.0            | v2.2           | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| AJA                      | IPR-10G2-SDI                 | v1.0            | v2.2           | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Bridge Technologies      | VB440                        | Rev A           | v5.3.6         | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Grass Valley             | Kaleido-IP                   | X320            | v11.0          | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Imagine Communications   | EPIC-MV                      | A               | v1.4.4.7       | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Net Insight              | N640-Rx                      | A1              | FX-j2kapp.6    | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| PHABRIX Ltd.             | Qx                           | Main 9          | v3.4           | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |
| Tektronix/Teletream      | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |  |                                     |                                   |  |                               |                                   |            |            |                                     |                        |                       |   |

LEGEND

Green square = test passed

Grey square = test failed or not tested

White square = test not applicable

JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |            |                | REPORT          | 5. Media Nodes & IS-08  |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
|--------------------------|------------------------------|------------|----------------|-----------------|-------------------------|-------------------------------------|--|---|--|--|--|---|---|---|---|---|---|-------------------------------------|--|--|--|--|--|---|--|--|--|--|--|--|--|
| Vendor Name              | Model                        | HW Version | SW Version     | Tx/Rx Tx/Rx     | 5.1. Schema conformance | GET /n-nmos/{auto_channelmapping_1} | GET /n-nmos/channelmapping/{auto_channelmapping_2} | GET /n-nmos/channelmapping/v1.0/{auto_channelmapping_3} | GET /n-nmos/channelmapping/v1.0/inputs | GET /n-nmos/channelmapping/v1.0/inputs/{auto_channelmapping_4} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId}/caps/{auto_channelmapping_5} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId}/channels/{auto_channelmapping_6} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId}/parent/{auto_channelmapping_7} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId}/properties/{auto_channelmapping_8} | GET /n-nmos/channelmapping/v1.0/inputs/{inputId}/properties/{auto_channelmapping_9} | GET /n-nmos/channelmapping/v1.0/inputs/{auto_channelmapping_10} | GET /n-nmos/channelmapping/v1.0/map | GET /n-nmos/channelmapping/v1.0/map/{auto_channelmapping_11} | GET /n-nmos/channelmapping/v1.0/map/activations/{auto_channelmapping_12} | OPTIONS /n-nmos/channelmapping/v1.0/map/activations/{auto_channelmapping_13} | GET /n-nmos/channelmapping/v1.0/map/activation-ef/{auto_channelmapping_14} | OPTIONS /n-nmos/channelmapping/v1.0/map/activation-ef/{auto_channelmapping_15} | GET /n-nmos/channelmapping/v1.0/map/active/{auto_channelmapping_16} | GET /n-nmos/channelmapping/v1.0/outputs/{auto_channelmapping_17} | GET /n-nmos/channelmapping/v1.0/outputs/{outputId} | GET /n-nmos/channelmapping/v1.0/outputs/{outputId}/caps/{auto_channelmapping_18} | GET /n-nmos/channelmapping/v1.0/outputs/{outputId}/channels/{auto_channelmapping_19} | GET /n-nmos/channelmapping/v1.0/outputs/{outputId}/properties/{auto_channelmapping_20} | GET /n-nmos/channelmapping/v1.0/outputs/{outputId}/properties/{auto_channelmapping_21} |  |
| Adeas/Nextera            | SDI IP Gateway               | V2.2       | V2.2           | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | KonaIP                       |            | v1.0           | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IolP                         |            | v1.0           | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| EEG                      | HD492 Alta                   |            | 1.57           | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| EVS                      | XT-VIA                       |            | 16.2           | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Embrionix                | emFusion                     |            | 200            | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ     | v0.260         | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Harmonic                 | Spectrum X                   |            | 9              | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Imagine Communications   | SNP                          |            | v1.3.0         | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Macnica ATD              | Media over IP Package        |            | v1.1.2         | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Matrox                   | X.mio5 Q25                   | RevA       | 10.1.040.24351 | Multicast Tx/Rx |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Matrox                   | DSX LE5 D25                  | RevA       | 10.1.040.24351 | Multicast Tx/Rx |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Matrox                   | X.mio3 IP                    | RevA       | 10.1.040.24350 | Multicast Tx/Rx |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Nevion                   | Virtuoso M1                  |            | M1 V1.0        | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Pebble Beach Systems     | Dolphin                      |            | N/A            | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Riedel Communications    | Artist 32/64/128 G2          |            | N/A            | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Riedel Communications    | MediorNet MicroN IP          |            | N/A            | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Sony                     | HDCU Series                  |            | V2.23          | Tx/Rx           |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| vizrt                    | VizEngine 3.14               |            | 3.14           | Multicast Tx/Rx |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IPT-10G2-HDMI                |            | v1.0           | Tx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IPT-10G2-SDI                 |            | v1.0           | Tx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) |            | 100            | Tx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Net Insight              | N640-Tx                      |            | A1             | Fx-j2kapp.6     |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IPR-10G-HDMI                 |            | v1.0           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IPR-10G2-HDMI                |            | v1.0           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| AJA                      | IPR-10G2-SDI                 |            | v1.0           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Bridge Technologies      | VB440                        | Rev A      | v5.3.6         | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) |            | 100            | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Grass Valley             | Kaleido-IP                   |            | X320           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Imagine Communications   | EPIC-MV                      |            | A              | v1.4.4.7        | Rx                      |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A      | v3.4           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Net Insight              | N640-Rx                      |            | A1             | Fx-j2kapp.6     |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| PHABRIX Ltd.             | Ox                           | Main 9     | v3.4           | Rx              |                         |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |
| Tektronik/Teletream      | PRISM MPI2-10                |            | MPI2-10        | 1.9             | Rx                      |                                     |  |   |  |  |  |   |   |   |   |   |   |                                     |  |  |  |  |  |   |  |  |  |  |  |  |  |

**LEGEND**

Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable



JT-NM Tested Event August 2019 – AMWA NMOS/JT-NM TR-1001-1 Results

| Device Under Test        |                              |                 |                | REPORT          | 5. Media Nodes & IS-08   |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
|--------------------------|------------------------------|-----------------|----------------|-----------------|--|--|--|-----------------|--|---|---|--|--|-------------------|--|--|--|---|---|---|--|----------------------------|--|--|---|---|--|--|
| Vendor Name              | Model                        | HW Version      | SW Version     | Rx, Tx, Tx/Rx   | GET /x-nmos/channels/mapping/v1.0/outputs/{outputId}/sourceId (auto_channelmapping_22) | GET /x-nmos/channels/mapping/v1.0/{eventIdPath} (404) (auto_channelmapping_23) | test_01: Content of the /to view matches resource elsewhere in the API | 5.2 Activations | test_02: Immediate activation can be called on the API | test_03: Relative offset activations can be called on the API | test_04: Absolute offset activations can be called on the API | test_05: Activations can be deleted once created | test_06: Attempting to change a locked route results in a 423 response | 5.3 API behaviour | test_07: Channels in the active resource where no input channel is routed have 'null' set as the 'input' and 'channel_index' | test_08: If the device allows re-entrant matrices, the constraints are set such that it is not possible to create a loop | test_11: Inputs have at least one channel represented in their channels resource | test_12: Outputs have at least one channel represented in their channels resource | test_13: Attempting to validate routing constraints results in an HTTP 400 response | test_14: It is not possible to re-order channels when re-ordering is set to 'false' | test_15: It is not possible to make an out-of-block route when block_size is anything other than 1 | 5.4 Integration with IS-04 | test_01: Activations result in a Device version number increment | test_02: API is correctly advertised as a control endpoint | test_03: All Output Source IDs match up to the IS-04 Node API | test_04: All Input Source/Receiver IDs match up to the IS-04 Node API |  |  |
| Adeas/Nextera            | SDI IP Gateway               | V2.2            | V2.2           | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | KonaIP                       | v1.0            | v15.2          | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IaIP                         | v1.0            | v15.2          | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| EEG                      | HD492 Alta                   | 1.57            | 8.2.2019       | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| EVS                      | XT-VIA                       | 16.2            | 16.2           | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Embrionix                | emFusion                     | 200             | 2.5            | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Grass Valley             | XIP-3901 + XIP-3901-UDC-IP   | Rev AJ          | v0.260         | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Harmonic                 | Spectrum X                   | Spectrum X 1 RU | 9              | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Imagine Communications   | SNP                          | A               | v1.3.0         | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Macnica ATD              | Media over IP Package        | v1.1.2          | v1.1.1         | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Matrox                   | X.mio5 Q25                   | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Matrox                   | DSX LE5 D25                  | RevA            | 10.1.040.24351 | Multicast Tx/Rx |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Matrox                   | X.mio3 IP                    | RevA            | 10.1.040.24350 | Multicast Tx/Rx |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Neveon                   | Virtuoso MI                  | MI V1.0         | v1.1.25        | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Pebble Beach Systems     | Dolphin                      | N/A             | V1.13          | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Riedel Communications    | Artist 32/64/128 G2          | N/A             | V8.0           | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Riedel Communications    | MediorNet MicroN IP          | N/A             | V6.1.1         | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Sony                     | HDCU Series                  | V2.23           | V2.23          | Tx/Rx           |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| vizrt                    | VizEngine 3.14               | 3.14            | 3.14           | Multicast Tx/Rx |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IPT-10G2-HDMI                | v1.0            | v2.2           | Tx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IPT-10G2-SDI                 | v1.0            | v2.2           | Tx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Embrionix                | ST2110 Encapsulator (HD-SDI) | 100             | 3.1            | Tx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Net Insight              | N640-Tx                      | A1              | FX-j2kapp.6    | Tx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IPR-10G-HDMI                 | v1.0            | v2.2           | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IPR-10G2-HDMI                | v1.0            | v2.2           | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| AJA                      | IPR-10G2-SDI                 | v1.0            | v2.2           | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Bridge Technologies      | VB440                        | Rev A           | v5.3.6         | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Embrionix                | ST2110 Decapsulator (HD-SDI) | 100             | 3.1            | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Grass Valley             | Kaleido-IP                   | X320            | v11.0          | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Imagine Communications   | EPIC-MV                      | A               | v1.4.4.7       | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Leader Electronics Corp. | LV5600                       | Rev A           | v3.4           | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Net Insight              | N640-Rx                      | A1              | FX-j2kapp.6    | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| PHABRIX Ltd.             | Qx                           | Main 9          | v3.4           | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |
| Tektronix/Telestream     | PRISM MPI2-10                | MPI2-10         | 1.9            | Rx              |  |  |  |                 |  |   |   |  |  |                   |  |  |  |   |   |   |  |                            |  |  |   |   |  |  |

**LEGEND**  
 Green square = test passed  
 Grey square = test failed or not tested  
 White square = test not applicable