



JT-NM Tested Test Plans and Results Explained

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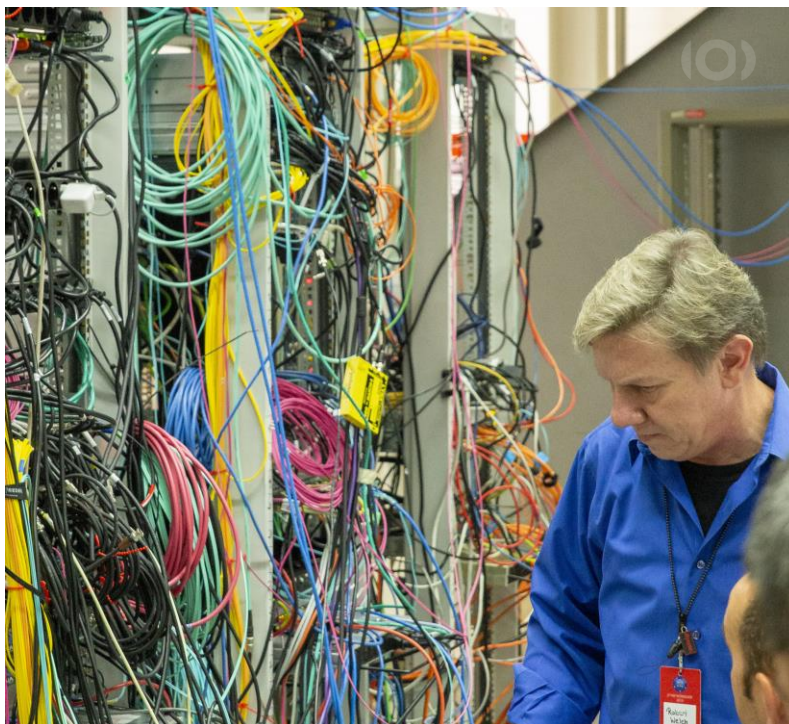
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CONTENT

- What is JT-NM Tested?
- What tests did we perform?
- Test plan - tools
- Findings
- Results
- Survey
- Conclusions



JT-NM Tested Programme – What is it?

- Offers more documented insight into how vendor equipment aligns with the SMPTE ST-2110 and SMPTE ST-2059 standards.
- Added testing of JT-NM TR-1001-1 and AMWA NMOS specifications at this event
- Documents: the test procedures, test equipment and results.
- This program is not a certification program; it is a snapshot in time of how vendor equipment conforms to key parts of standards and specifications.



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JT-NM Tested Programme - What did we test?

- 3 type of tests:
 - Data plane: Basic SMPTE 2110 behaviour
 - Control plane: AMWA NMOS and JT-NM TR-1001-I behaviour
 - Cyber Security Vulnerability Assessment
- Who attended:
 - 32 different vendors attended at Riedel
 - 71 different products were tested for the data plane basics
 - a subset of 34 products for the control plane test



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THE TECHNOLOGY PYRAMID FOR MEDIA NODES

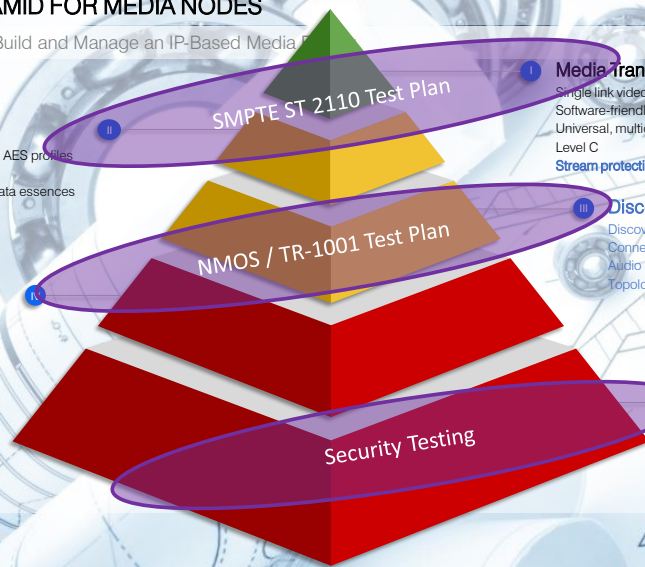
Minimum User Requirements to Build and Manage an IP-Based Media Node

Time and Sync

PTPV2 configurable within SMPTE and AES profiles
 Multi-interface PTP redundancy
 Synchronisation of audio, video and data essences

Configuration and Monitoring

IP assignment: DHCP
 Open configuration management - e.g., API, config file, SSH CLI, etc.
 Open monitoring protocol - e.g., syslog, agent, SNMPv3, etc.



Media Transport

Single link video SMPTE ST 2110-20
 Software-friendly SMPTE ST 2110-21 Wide video receivers
 Universal, multichannel and low latency audio SMPTE ST 2110-30 Level C
 Stream protection with SMPTE ST 2022-7

Discovery and Registration

Discover and Registration: AMWA IS-04
 Connection Management: AMWA IS-05
 Audio channel mapping: AMWA IS-08
 Topology discovery: LLDP

Security

EBU R 148 Security Tests
 EBU R 143 Security Safeguards
 Secure HTTPS API calls

Widely available
Partially available
Rarely available

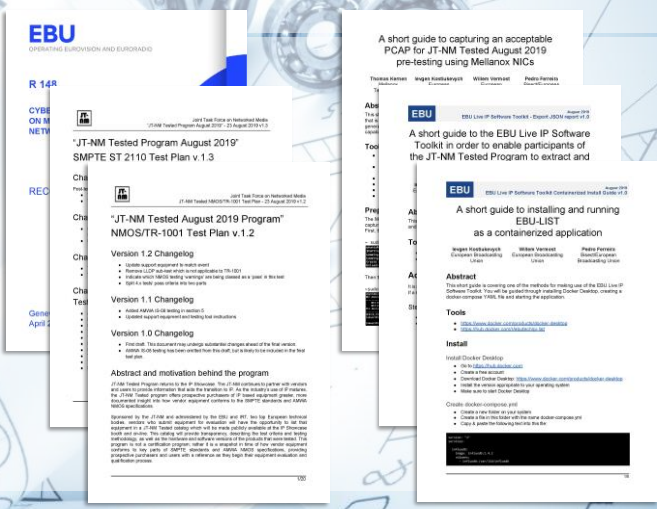


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JT-NM Tested Programme – Test Plan & Tools

- **Test Plans:**
 - SMPTE ST 2110 Test plan
 - NMOS/TR-1001 Test plan
 - EBU R 148
- **Pre-testing documents:**
 - Capturing guide
 - How to use EBU LIST
 - How to use the NMOS test suite
- **Tools:**
 - EBU LIST
 - NMOS Testing Tool



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ST 2110 Test Plan

- Basic management and media network configurability and behaviour
- ST 2059 Basic PTP configurability and behaviour
- ST 2110-10 testing, including IGMP and SDP and timestamping
- ST 2110-20 testing, including visual validation
- ST 2110-21 testing, C and VRX
- ST 2110-30 testing, including audible validation
- ST 2110-40 testing
- ST 2022-7 testing, both basic and recovery
- UHD testing



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NMOS/TR-1001 Test Plan

- Dynamic Host Configuration Protocol (DHCP)
- Link Layer Discovery Protocol (LLDP)
- TR-1001-1 System Resource (future IS-09)
 - PTP configuration discovery
- IS-04 Discovery & Registration
 - Using unicast DNS Service Discovery (DNS-SD)
- IS-05 Connection Management
 - Including stream tests
- IS-08 Audio Channel Mapping
 - Where implemented



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FINDINGS AND RESULTS

RIEDEL Communications , Wuppertal, Germany - August 19 - 23, 2019



Findings – SMPTE ST 2110 Test Plan

- 100% pass rate: 31 out of 71 devices
- All but 22 devices achieved > 90% pass rate across the board
- The worst test results were 2022-7 related
- Video Tx devices (34):
 - KPI should be 0 devices failing these critical tests:
 - 21% (7) fail the 2110-21 test. This is critical in order to have interoperability and reliability.
 - 26% (9) fail to deliver an SDP file or deliver a faulty SDP file

Common Issues – ST 2110

- Biggest fail rate was in ST 2022-7 testing
- Disturbing fail rate in ST 2110-21 and ST 2110-10 which are fundamental
- A lot of products are still struggling with RTP timestamping – can be linked to the ambiguity in the standard
- Still not a lot of UHD-capable products

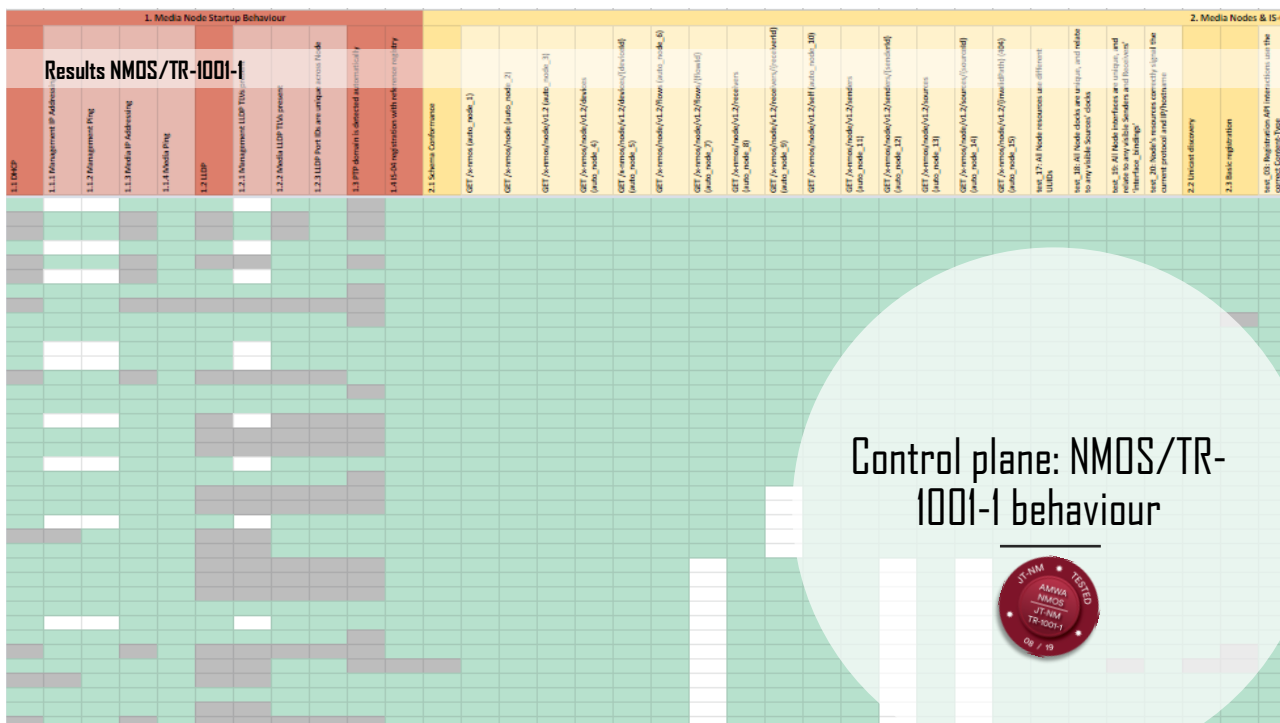


Lessons Learned – ST 2110

- Overall the success rate is much better than last time
- Vendors recognized the need and value of mandatory self-testing
- PTP stability was much better this time
- Pod testing can be optimized
- It is critically important to feed the results and findings back into SMPTE for ambiguities resolution



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Findings – NMOS / TR-1001-1 Test Plan (Results: Andrew Bonney, James Gibson)

- 100% pass rate: 6 out of 34 devices - global
- 100% pass rate: 20 out of 34 devices - NMOS IS-04 and IS-05
- All but 4 devices achieved >90% pass rate across the board
- LLDP had the worst results
 - 39% pass rate for management interfaces
- DHCP support was better
 - 92% support on management interfaces
 - 78% support for media interfaces
- Almost 8000 individual tests carried out, with around 90% carried out using automated means

Common Issues – NMOS / TR-1001-1

- Very few common failures across devices beyond items which simply hadn't been implemented
- There were some issues with:
 - IS-04 UUID consistency
 - IS-05 changes taking effect in streams & use of IGMPv3 source filters
- We observed DHCP configuration confusion across Nodes with multiple network interfaces



Lessons Learned – NMOS / TR-1001-1

- Stream and discovery testing
 - Slow, but valuable – some of the most important test results to observe
 - We aim to further automate this process
- Pre-testing makes a big difference!
 - Vendors could work on issues well in advance and become familiar with the process
 - Issues were quickly identified if devices failed to match their pre-testing results
- Fully featured implementations were quick to test
 - Proving the principles of JT-NM TR-1001-1

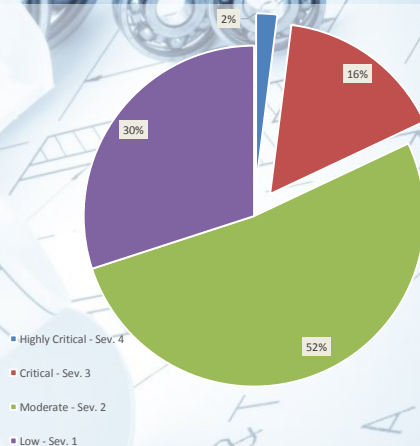


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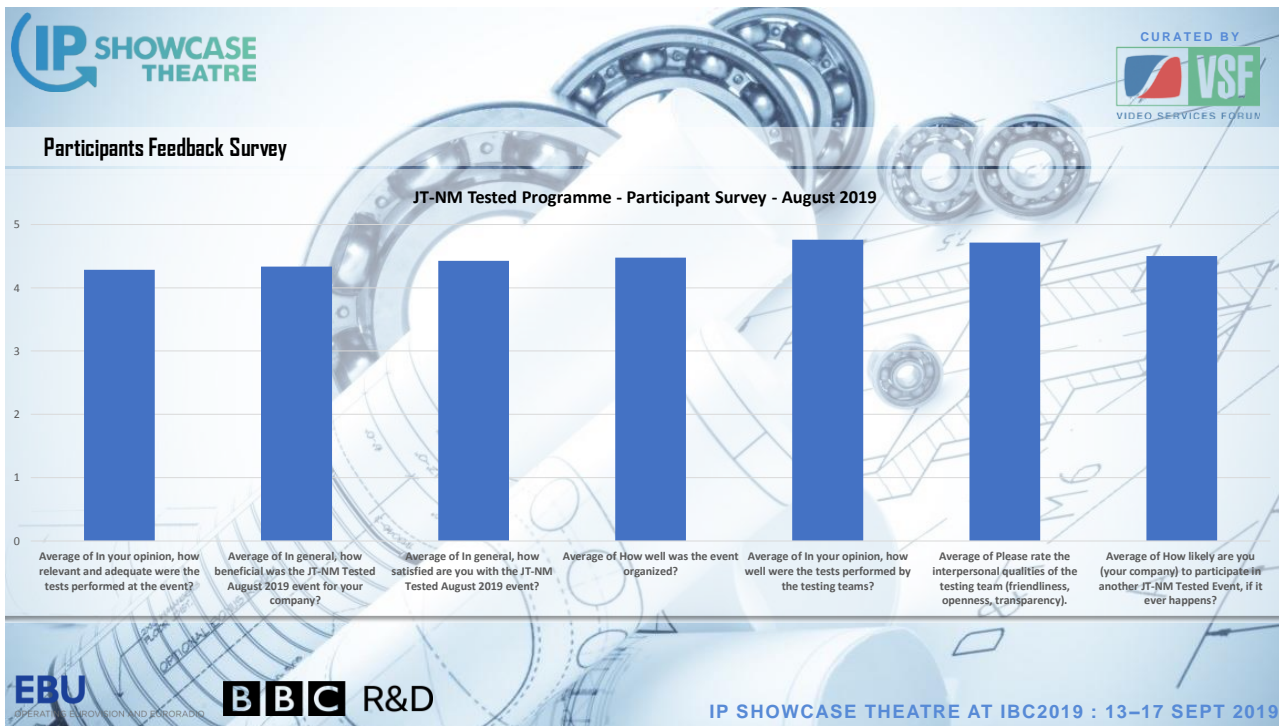


Findings – Cyber Security Vulnerability Assessment (Results: Gerben Dierick, Alvaro Santos, Adi Kouadio)

- 387 Vulnerabilities found
 - 18% of the vulnerabilities are critical to highly critical and shall be handled immediately by the IO vendors concerned
 - 80% of the vulnerabilities found are moderated but can be exploited to cause harm. Can be fixed by following traditional IT best practices.
- Find out more by attending their talk!



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- ### Potential Future Tests
- ST 2110
 - ST 2110-31, ST 2110-22
 - NMOS/TR-1001-1
 - IS-04 registry and client testing
 - IS-08 stream testing
 - Configuration consistency between vendors' UIs, IS-0X and SDP files
 - More serious PTP testing has to be considered
 - Pod approach can be deprecated in favour of fully routed network
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Conclusion

- Improved results compared to the first test event
- The industry starts to see the need for a common control plane
- Mandatory self-testing is essential for implementations improving
- This event needs to be repeated in order:
 - To get better quality implementations
 - To get for more of the needed features of the pyramid
- Value Created for the industry and for end clients:
 - Getting the current state of implementations
 - Improving the implementations
 - Safeguarding the investments for new facilities

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Thank you

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Thank you to our Media Partners



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