Systems & Network Training

Total SMPTE 2110 for engineers

A 5 day Hands on training course

Save on expenses. This course is also available on your premises.

Description

This practical hands on course provides a comprehensive introduction to SMPTE ST 2110 and its role in modern IP based media systems. The course covers uncompressed video, Audio-over-IP, and ancillary data as separate essences, with comparisons to compressed workflows via ST 2110-22. Participants will explore key standards including ST 2110-10 to -60, PTP-based timing and synchronisation, QoS, multicast delivery, and AMWA NMOS (IS-04 to IS-10) with recommended practices. Each module is reinforced with hands-on labs involving packet analysis, stream inspection, and protocol troubleshooting.

Key outcomes

By the end of the course delegates will be able to:

- ✔ Explain how ST-2110 transports video, audio and data over IP.
- ✔ Analyse essence flows with Wireshark.
- ✔ Troubleshoot and test multicast networks.
- ✔ Explain the role of PTP in ST 2110.
- ✔ Compare uncompressed and compressed work-flows including ST 2110-22.
- ✔ Use AMWA NMOS to discover, register and connect ST 2110 devices.

Training approach

This structured course uses Instructor Led Training to provide the best possible learning experience. Small class sizes ensure students benefit from our engaging and interactive style of teaching with delegates encouraged to ask questions throughout the course. Quizzes follow each major section allowing checking of learning. Hands on sessions are used throughout to allow delegates to consolidate their new skills.

Details

Who will benefit? Broadcast engineers.
AV engineers

Prerequisites: TCP/IP foundation for engineers

Duration: 5 days

Customer rating: New course

Generic training	Small class sizes	Hands On training	Our courseware	Customise your course
Generic training complements product specific courses covering the complete picture of all relevant devices including the protocols “on the wire”.	We limit our maximum class size to 8 delegates; often we have less than this. This ensures optimal interactivity between delegates and instructor.	The majority of our courses use hands on sessions to reinforce the theory.	We write our own courses; courseware does not just consist of slides and our slides are diagrams not bullet point text.	Please contact us if you would like a course to be customised to meet your specific requirements. Have the course your way.
“*Friendly environment with expert teaching that teaches the why before the how.*” G.C. Fasthosts	*“Excellent course. The small class size was a great benefit...”* M.B. IBM	*“Not many courses have practice added to it. Normally just the theoretical stuff is covered.”* J.W. Vodafone	*“Comprehensive materials that made the course easy to follow and will be used as a reference point.”* V.B. Rockwell Collins	*“I was very impressed by the combination of practical and theory. Very informative. Friendly approachable environment, lots of hands on.”* S.R. Qinetiq

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Course content

IP in media and broadcast
Traditional SDI broadcast vs IP workflows, What is IP? IP broadcast architectures: Contribution, production, distribution, delivery. Spine leaf fabrics. **Hands on:** Base IP connectivity, VLC test streams.

SMPTE 2110 standards and ecosystem
Who are SMPTE, SMPTE standards, SMPTE 2022, 2110. Where 2022 and 2110 are used. The ST 2110 parts: ST 2110-10 to ST 2110-60. RP 2110-10 to 40. AMWA NMOS: IS-04 to IS-10.

ST-2110 protocol stack overview
IP, UDP, RTP. IPv6. Bandwidth requirements. **Hands on:** Video packet analysis with Wireshark.

IP challenges in media networks
IP is not deterministic. Quality vs. bandwidth. Bandwidth, bit rates: HD, 4k, 8K, delay, latency, jitter, signalling. Routers. QoS, IP DSCP field, 802.1Q. Redundancy. ST 2022-7 hitless switching. **Hands on:** Analysing performance issues.

UDP versus TCP
Reliable, unreliable, connections, connectionless. Broadcasts, multicasts and unicasts. **Hands on:** UDP ports and packet inspection.

RTP
RTP, ports, mixers, translators, RTCP, SMPTE, ST 2022-5 FEC vs 2022-7. **Hands on:** RTP flow capture and analysis in Wireshark.

ST 2110-10: Timing
Synchronisation in one stream versus many streams. NTP accuracy, PTP, how PTP works, PTP clock types: OC, BC, TC. PTP timestamps. Synchronising RTP timestamps. SDP. ST 2110-60 synchronisation parameters. PTP profiles for broadcast. ST 2059-1 and 2. **Hands on:** linuxptp. Wireshark PTP analysis. GM failover.

ST-2110 and the protocol stack
2110 and need for packet loss prevention. Essences vs 2022-6/MPEG2-TS. TR-04/2022-8 transition. ST2110-23. SDP. ST 2110-21 traffic shaping and delivery timing for video. Timing classes, Receive Buffer Model, packet timing. **Hands on:** Analysing essences, SDP, NS/WS pacing.

ST-2110-20 Video
Uncompressed active video. ST 2110-20. SDI over IP. RFC 4175. Bandwidth requirements. Video payload identification: ST 2110-50. Compressed video. Inter versus intra frame compression. ST 2110-22, Codec agnostic, low latency focus. JPEG XS. VC-2. Comparison of uncompressed, JPEG-XS and MPEG4. RTP payload mapping. **Hands on:** Wireshark analysis.

ST 2110-30 / -31 Audio
Uncompressed PCM, bandwidth, AES3. AES67. SMPTE 2110-30 and 31. When and where each is used. Interoperation with Dante and others. **Hands on:** Format comparison 30 vs 31, AV sync. Fault injection.

ST-2110-40 Ancillary data
Ancillary data as an essence: ST 2110-40, Closed captions, timecodes, other meta data. Fast meta data ST 2110-41. **Hands on:** Wireshark dissectors, analysing 2110-40.

Multicasting
Multicasting compared to unicasting and broadcasting, when to use and when not to use multicasting. Multicast addressing. **Hands on:** Multicast troubleshooting tools.

Multicast architecture
The big picture, IGMPv1/v2/v3, PIM-SM, SSM. MLD. SAP/SDP. **Hands on:** IGMP snooping, Building & analysing a routed multicast network.

AMWA NMOS foundation
What is NMOS? Role in 2110: Control and orchestration. REST APIs, IS-04 to IS-10. IS-04 discovery and registration: Nodes, resources, registry, UUIDs. IS-05 connection management: activate sender/receiver links. **Hands on:** nmos-cpp and postman.

NMOS in action
IS-08 Audio channel mapping, IS-09 system parameters, IS-10 Network control. **Hands on:** Using postman to issue IS-05 request to activate a flow. Register a stream and use IS-08 to map some channels to a receiver. IS-04 discovery.

Security
Segmentation, VLANs, VRFs, ACLS, Firewalls, NMOS security and BCP-003 series. **Hands on:** BCP-003: NMOS calls over TLS.

Putting it all together
TR-1001 as an operational checklist.