NETW(O)RK TECHNOLOGY SEMINAR

AN EBU EVENT

YOUR NETWORKED MEDIA & IT RENDEZVOUS

PROGRAMME

TUESDAY 18 JUNE 2024

OPENING

09:45 – 10:00 (CEST) **Welcome**

KEYNOTES

Moderated by **Ievgen Kostiukevych** (EBU)

Ievgen is a member of the EBU Technology & Innovation team. He has gained more than a decade of experience in the broadcasting and sound production industry, including experience in change management, solutions architecture and AoIP integration. He is working on topics of IP networks, media over IP, PTP, networks programmability and automation, etc. Ievgen is a member of SMPTE and AES.

10:00 – 10:25 **Innovation and challenges at Paris 2024 Olympic Games**

How France Televisions will produce and broadcast the Paris 2024 Olympics in UHD/HDR with ATMOS

...vier (France Télévisions) Yannick is a 2110 Technical Leader at France Televisions and the migration's strategy of our systems to IP.This year, he is working on the production 2024 Olympics in UHD/HDR/ATMOS based on ST-2110.

10:25 – 10:50 **A path to IP and cloud for Olympic Games Broadcasting Services**

Current status of deployment of new technologies in the core broadcast infrastructure of the Olympic Games

Guillermo Jimenez Navarro Director of Broadcast Engineering, Olympic Broadcasting Services (OBS) As Director of Broadcast Engineering in OBS, Guillermo Jimenez oversees an international team of broadcast and network engineers, responsible for the planning, installation and technical set-up of the world feed which is delivered to the Olympic and ...mes' Media Rights-Holders. Part of his department's mission is to continuously ...rvices offered to the rights-holders by keeping up with the latest technological ... and adapting to new technologies that help re-define how the Games are ... enjoyed by billions of viewers around the world. Guillermo joined OBS in 2006 ... been at the heart of major technological innovations in Olympic broadcasting, from ... in Beijing 2008 to 3D production in London 2012, driving the evolution of file-based ... with the first Olympic Games to be fully produced natively in UHD HDR, with 5.1.4 ... Tokyo 2020. Guillermo started his Olympic career as a Telecom Engineer for the T... the host broadcaster of the 2006 Olympic Winter Games. Previously, Guille... ...gineer at Servicios Generales de Teledifusión in Madrid, Spain.Guillermo gradu... ...Madrid with an MSc degree in Technical Telecommunications Engineering, speci... ...in sound and image.

Arnaud Perrier (Intel) Arnaud leads Intel's Media and Entertainment business for media processing, video production and AI for media segments. Arnaud holds an MSEE/CS from University of Nantes' Polytechnic Institute, and lives in Silicon Valley.

10:50 – 11:20 **Compute trends in broadcast**

This session takes a look at how new edge compute and software architectures will transform the video production and broadcast industry and accelerate innovation through AI.

| 11:20 – 11:30 | **Sponsor & demo pitches** |

11:30 – 12:00   *Break and demos*

SESSION 2: THE APPLICATIONS

Moderated by **Phil Tudor** (BBC)

Phil is head of infrastructure research at BBC R&D, leading teams of researchers exploring live media production, IP facilities, media ecosystems, cloud computing and other national infrastructure. His technical background includes video compression research and standardisation, digital television, software engineering, distributed computing and the development and standardisation of professional media file formats. Phil is the chair of the EBU Strategic Programme on Media Infrastructures and Cybersecurity.

12:00 – 12:25 Private 5G and the wireless production revolution: what can we do and what's next?

This presentation will discuss the benefits of 5G for broadcast workflows, and talk through the successes and learnings from our own real-world 5G SA NPN (private network) deployments. The current capabilities will be highlighted, with an outlook on future events planning to use private 5G and a discussion on where the technology is going.

Sam Yoffe (Neutral Wireless)

Sam received his undergraduate and PhD degrees in mathematical physics from the University of Edinburgh, before moving to the University of Strathclyde where he spent 10 years working on laser and plasma physics, and the development of next-generation particle accelerators. He is passionate about photography, filmmaking, and audio production. Sam started engaging with the software-defined radio group at the University of Strathclyde in early 2021, working on low latency video encoding and transmission over 5G, before joining the team in October 2021. Since then, he has led many video-over-5G deployments working with international broadcasters and production companies, including the award-winning IBC 2022 Media Accelerator project and the world's largest pop-up standalone non-public network for media contributions at the Coronation of HM King Charles III. Sam is a research associate in the University of Strathclyde's software-defined radio group (StrathSDR) and a Senior Systems Engineer at the university spin-out company, Neutral Wireless Ltd. Sam specialises in private 5G networks and systems design to support and improve broadcast and media production workflows. linkedin.com/in/samyoffe

12:25 – 12:50 Driving innovation at BBC Northern Ireland: introducing our IP OB Solution

Design decisions, lessons learned and network infrastructure on BBC Northern Ireland's new IP OB Vehicle.

Ian Morgan, an engineer at BBC Northern Ireland with 25+ years of experience in communications design and deployment.

Roland Rodgers, member of the BBC Architecture and Supply team. presently seconded to the BBCNI Transformation Program.

12:50 – 14:15   *Buffet lunch and demos*

SESSION 3: THE FLAVOURS
Moderated by **Mark Patrick** (BBC)

Mark has worked on a number of major projects for the BBC, most recently the ST2110 based Cardiff Central Square project. Mark specialises in broadcast infrastructure including control systems, routing, networking, MCRs and central areas.

14:15 – 14:40 **EBU New Builders in review**

Key drivers & lessons learned from EBU Members' new building projects

by Matta (EBU) A graduate in Political Science and International Relations from Sciences Po in Paris, I have more than 20 years experience in developing and producing training & development programmes for media professionals. As part of my role at EBU Acedemy, I have also developed a taste and some expertise acting as a mediator between technologists, creatives and strategists in transversal projects and communities of practice such as Integrated Newsrooms, Implementing Open Innovation (IOI) and New Builders

Willem Vermost (VRT) Willem serves as head of Media Production Facilities at VRT. Prior to this role, he was the topic lead on the transition to IP-based studios at the European Broadcasting Union (EBU). He received a master's degree in electronic engineering and in applied computer science. With over two decades of experience in broadcasting, he has worked on various projects, including the multiple award-winning VRT Live IP proof of concepts, the Joint Task Force on Networked Media (JT-NM) Tested Program, and started the open-source project EBU Live IP Software Toolkit (LIST). He acted as a deputy on the JT-NM admin board and the AWMA board of directors. Willem is the co-chair of several EBU strategic groups and is an active member of SMPTE and a SMPTE Fellow. As a faculty member of the EBU Academy, he provides training on the transition to live-IP-based media facilities. Recent efforts at VRT focus on On-Set Virtual Productions and new workflows using the concept of "Dynamic Media Facilities".Founder of CURIO.

14:40 – 15:05 **IPMX for broadcasters**

The publication of the first TR-10 recommendations from VSF has created an extension to ST2110 which primarily targets proAV applications. This now creates additional possibilities in a broadcast environment exploiting 1 and 10Gbps networks both with and without PTP.

Rob Moodey (Matrox) Rob has a long career in broadcast-related technology. His career started at EEV as an video and RF engineer working on the UHF klystrons that powered the analogue TV transmitters of the day. He transitioned to the measurement industry – working in progressive sales and marketing roles initially for Rohde & Schwarz and subsequently for Tektronix – combining baseband, RF, and optical competences – at production, contribution and distribution levels. Hs tenure crossed the introduction of many digital technologies to our industry - including SDI, AES, MPEG2 and DVB. He rose to become the EMEA Business Manager for TV Test.He has been with Matrox Video for nearly twenty years, where he has contributed to the evolution of the primarily 'IT desktop' side of the company into a broader-based AV operation. He is currently Manager of Strategic Partnerships, a headquarters role which includes alignment of technologies with those of future partners, in as yet unknown projects. This role straddles the AV and Broadcast dimensions of Matrox Video.

15:05 – 15:30 **Multivendor cloud production with VSF TR-11 – there and back again**

VSF TR-11 (draft) is the first initiative to provide an API and associated technology for multivendor cloud production. This presentation will go into the details of the current VSF draft document.

Kieran Kunhya (Open Broadcast Systems)

Kieran is the Founder and CEO of Open Broadcast Systems, a developer of software-based encoding and decoding products for B2B sports, news and linear channel transport. He has led numerous product developments including the company's high-performance multivendor ST- 2110 stack and in-house developed SDI boards. He is also an FFmpeg and x264 Open Source project developer.

15:30 – 15:55 AES67 over WAN/cloud – where are we? Why?

This presentation explores the current state and future potential of implementing AES67 over WAN and cloud infrastructures. It highlights the advantages of cloud technology, such as enhanced flexibility and scalability for media networks. We will address key challenges, including infrastructure limitations, firewall configurations, and security concerns. Additionally, we will redefine synchronization concepts for distributed environments. Practical applications and case studies will illustrate successful deployments and provide actionable insights for professionals.

Nicolas Sturmel is a Senior Media Network Technologist at DirectOut GmbH and the owner of NSI2 Consulting. With over 10 years of experience in media over IP, he has worked for Digigram and Merging Technologies, always aiming to simplify the end-user workflow. Nicolas is also actively involved in promoting and adopting the AES67 and ST2110-30 standards. He holds a PhD and has received training from renowned institutions such as IRCAM, École Normale Supérieure, and Université Paris-Saclay.

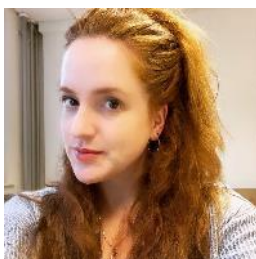|	
15:55 – 16:15	**Q&A PANEL**

16:15 – 16:45   *Break and demos*

SESSION 4: THE INGREDIENTS
Moderated by **Jemma Dalmau** (BBC)

Jemma is a Lead Architect at the BBC working primarily with colleagues on Strategic plans for Radio and Control Systems. She has been working in around Broadcasting for over 25 years and during that time has had a variety of roles, including as a Graphics Developer, Operator, Trainer and Engineer. (BBC)

16:45 – 17:10 Faster networks for video streaming

I will discuss the latest network technologies for streaming video

Andreas Bechtolsheim (Arista Networks)

Andreas "Andy" Bechtolsheim is Co-Founder and Chief Architect of Arista Networks. He is responsible for advanced AI, silicon and optics initiatives. Previously Andy was a Co-Founder and Chief System Architect at Sun Microsystems, responsible for next generation server, storage, and network architectures.

Andy received a M.S. in Computer Engineering from Carnegie Mellon University in 1976 and was a doctoral student in Computer Engineering at Stanford University from 1977 to 1982. He has been honored with a Fulbright scholarship, the Stanford Entrepreneur Company of the year award, the Smithsonian Leadership Award for Innovation, the EY 2015 US Entrepreneur of the Year Award (together with Jayshree Ullal) and is a member of the National Academy of Engineering.

17:10 – 17:35 Towards converged BBC site network templates

An overview of the approach being taken by the BBC to create mostly converged network architectures covering media, control and enterprise workloads.

Andy Gatward (BBC)

Andy is a Network, Security and Infrastructure professional with over 25 years deep technical experience. Currently working for the BBC, Andy is one of the lead architects responsible for the evolution of the network and connectivity to support modern media production workflows. Prior to joining the BBC in September 2023, Andy worked in senior technical roles in the service provider, aviation, and higher education sectors. Andy also holds a Ph.D in cybernetic systems engineering.

17:35 – 18:00 The state of NMOS

Challenges of transition to IP , Why was NMOS created?, How to find resources, Additional challenges , NMOS as a complete control profile

Félix Poulin (CBC/Radio-Canada)

Félix is with the national public broadcaster CBC/Radio-Canada where he leads the Media over IP Architecture team and the Technology Lab, busy with MoIP transition projects. Before that mandate, Felix was lead expert on Live IP at the EBU. Felix completed his diploma in electrical engineering at Montreal's Polytechnique with his final thesis done at Massachusetts Institute of Technology. Felix is an active contributor to EBU, user-chair of the Networked Media Open Specifications (NMOS) Steering board on the Board of Directors of the Advanced Media Workflow Association (AMWA) and Fellow of the Society of Motion Picture and Television (SMPTE).

Tim Hall (dB Broadcast) is a Solution Architect based in the UK.Tim brings a strong operational background to inform the design of broadcast facilities. He has spent many years working on the design and implementation of operational workflows for live broadcast and how they are realised by control systems, and more recently how continuous configuration has become part of the same equation. He is drawn to large and complex projects and for the last eight years has been manipulating large data sets that are typically associated with broadcast IP installations.He is an active participant on a number of initiatives within the AMWA NMOS community.

18:00 – 18:15	**Day 1 wrap-up**

19:00 – 23:00	*Evening social event*

La Brasserie des Halles de L'Ile

Place de L'Ile 1

1204 Geneva

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TUTORIALS SESSION	(run in parallel)
09:00 – 10:00 ROOM MONTREUX	**Media infrastructure as code for maintainable IT-based facilities** Transitioning our traditional broadcast facilities to IT-based infrastructures brought a multitude of changes. During our move to our new building in Montreal, it became clear that we needed a fresh approach to documenting, deploying, and maintaining our new systems, encompassing thousands of devices, tens of thousands of flows, and hundreds of thousands of parameters. We turned to methods from the IT datacenter and cloud industries to address similar issues. This tutorial will cover Media Infrastructure as Code, explain its significance, and introduce the key tools. We'll demonstrate some of our implementations and share lessons learned in hopes of inspiring others and helping them avoid the pitfalls we encountered. Additionally, we'll introduce the community of users we've gathered to exchange insights on these challenges. **Félix Poulin & Sunday Nyamweno** (CBC/Radio-Canada)
09:00 – 10:00 ROOM GENEVA	**Timing and synchronization** A typical PTP deployment is built in a life demo demonstrating how to configure devices and how to monitor the PTP performance efficiently **Thomas Kernen** (NVIDIA) Thomas is a Principal Architect at NVIDIA focused on Media and Entertainment, Networking and Time Transfer. Building upon 25+ years of experience in networking, a decade on time transfer and being a Fellow at the Society of Motion Pictures and Television Engineers (SMPTE), he enjoys mixing things up and architecting cross boundary solutions. He's authored numerous publications in journals and conference papers, and holds multiple patents that cover networking, timing and video coding optimisations. **Nikolaus Kerö** (Oregano Systems) Nikolaus Kerö received a master's degree in Communication engineering with distinction from the Vienna University of Technology. After graduating, he led the ASIC design division at the University's Institute of Industrial Electronics, successfully managing numerous research projects and industry collaborations. His research activities centered on distributed systems design, especially highly accurate and fault-tolerant clock synchronization. In 2001, he cofounded Oregano Systems Design & Consulting Ltd as a university spin-off. While offering embedded systems design services to customers, Oregano transferred the group's research results into a complete product suite for highly accurate clock synchronization under the brand name syn1588, for which he manages both development and marketing. Oregano Systems is located in Vienna, Austria; in 2019 it has been acquired by Meinberg. He is an active member of the IEEE 1588 standardization committee and the SMPTE 32NF standards group and holds frequent seminars on clock synchronization for both industry and academia.
10:00 – 10:10	*Break and demos*
10:10 – 11:10 ROOM MONTREUX	**Dynamic Media Facilities**

The EBU's Dynamic Media Facility project envisions a future where live media production leverages interoperable, platform-agnostic software functions deployed on demand. We'll review progress since last year's white paper, showcasing member use cases for scalability, resilience, and flexibility, industry activities, and a proposed reference architecture. Additionally, we'll demonstrate DMF concepts in a "pathfinder" implementation using containerization technologies like Kubernetes.

Peter Brightwell (BBC)

Peter is a Lead Engineer at BBC where he leads research and specification work for BBC's transition to live IP. He has an extensive background in broadcast and technology, in particular video compression, file-based acquisition, networked delivery, and virtual graphics. He is a frequent contributor to industry work on interoperability, was a co-author of the JT-NM Networked Media Reference Architecture, and is chair of the AMWA Networked Media Incubator and co-chair of the EBU System Design & Automation project

Willem Vermost (VRT)

10:10 – 11:10 ROOM GENEVA	**Security vulnerabilities: discovery and disclosure** Vulnerabilities are inevitable. The industry needs to be transparent and work together on discovery and disclosure. **Gerben Dierick** is the CISO of VRT and co-chair of EBU's Media Cybersecurity group. **Milan Duric** (EBU) is a software engineer and a cyber security enthusiast. He is on track to obtain his MSC in Cyber Security from the Swiss federal institute in Lausanne (EPFL). His interests lie in the area of vulnerability research, offensive security and penetration testing. During the past year, he worked as part of the EBU T&I department specializing in these topics. He is the author of 3 CVEs and a contributor to the security of various open-source projects, some of them including the Solidity compiler, Yara, Lua, MRuby and Hermes.

11:10 – 11:50   *Break and demos*

KEYNOTE
Moderated by **Lucille Verbaere (EBU)**

Lucille joined EBU as Senior Project Manager, coordinating Media Cybersecurity activities. She has 20y-experience in Cybersecurity, Telecommunications, Air Transport and Semiconductor industries: she started as an R&D engineer at ST Microelectronics, doing research on wireless telecom systems (Today's IoT domain). Then Lucille joined SITA as program and product manager for infrastructure and cloud-based data management services to airports and airlines worldwide. In her last position at ID Quantique in Geneva, Lucille was responsible for a portfolio of cybersecurity products, based on quantum physics.

11:50 – 12:15 **Rethinking the Toronto Broadcast Center for flexibility**

François Legrand joined CBC/Radio-Canada in 2004 as a broadcast systems designer. In this role, he has been involved in a wide range of projects and has had various responsibilities, including the design of digital, television, and radio systems, as well as project management across different scales.

From 2011 to 2016, he held several management positions where he coordinated the technological development of Quebec's regional stations and played a pivotal role in transitioning all national news shows to automated production.

François is currently the Senior Director of Engineering, where he oversees the team responsible for implementing all CBC/Radio-Canada IT and Broadcast infrastructure projects.

In his free time, François is an avid maker with interests in 3D printing, CNCmachining, and microcontroller-based electronics. He also serves as the lead mentor of the First Robotics Competition Team 9234 - Les Aigles d'or - hoping to inspire the next generation of engineers.

12:15 – 12:40 Building out dynamic media infrastructure

The adoption to SMPTE ST 2110 IP based infrastructure has been well embraced by broadcasters globally, however the evolution of agile media infrastructure using general purpose compute is still to be realised. Until now.

Phillip Myers (LAWO) Currently holding the role of Chief Technology Officer at LAWO, Phil has in excess of 20 years' experience of product management and business development and has held a number of technology leadership roles within the industry, most recently for Snell Advanced Media (SAM) and Grass Valley within the EMEA region where he was responsible for architecting digital media workflows and IP solutions. He previously worked at CVP Group, Pinnacle Systems, Sony and co-founded Oddfish Films in 1997.

12:40 – 13:20 **EU Cloud panel**

Federated edge infrastructures for broadcasting

A federation of Cloud and Telecom infrastructures interconnected, interoperable and with a common European trust framework can greatly enhance interaction with users, content production/distribution and the development of new integrated services.

Emile Christopher Chalouhi (Opiquad) Co-Founder and CEO of Opiquad, European Cloud Service Provider with offices in Italy and the USA – member of CISPE and Gaia-X and participant in Structura-X, Gaia-X lighthouse project for European Cloud Infrastructures. Co-Founder of Fulcrum, The Universal Cloud Federation, compliant with the European Trust Framework.

Olivier Breton (OVHcloud) Olivier has extensive work experience in sales and management roles. After starting his career in Telecommunications & Networks as a sales representative, he held several senior management positions at International Telecom Operators (Colt, SFR, Level3, Zayo). Olivier Breton has a diverse education history. In 2022, he attended the Institut des Hautes Etudes de Défense Nationale (IHEDN). He is graduated in Sales, Marketing, and Finance at INSEEC (Institut des Hautes Etudes Economiques et Commerciales). Before that, he obtained a Diplôme Universitaire de Technologie in Sales and International Business from the IUT from Paris (Institut Universitaire de Technologie Paris V). Since January 2020, Olivier currently serves as Unit Lead at OVHcloud and has the responsibility of the Large Accounts (public & private) + Channel business worldwide except US.

13:20 – 14:20   *Lunch break and demos*

SESSION 4: GOING FORWARD
Moderated by **Markus Berg** (SWR)

Markus is a consulting expert in ARD's Competence Center "Production & Infrastructure", covering such topics as media over IP networks, 5G for media production, cloud production etc.. Before that, he was (among other stations) head of the department of network technologies at the Institut für Rundfunktechnik (IRT) for over 20 years and in this role also chaired numerous EBU working groups.

14:20 – 14:45 **SVT's production platform vision**

SVT's production platform vision

Dennis Buhr (SVT) Been in the industry for 22 years this year. Started of as a photographer for OB sports. Service owner at SVT for the production tech.

14:45 – 15:10 **Media anywhere with a media mesh**

It all starts with a single frame. Using the innovation and architecture of the Internet, how can we build scalable and reliable workflows, unconstrained by where and how our content is stored and processed?

Richard Cartwright (Media-anywhere)

Richard holds a PhD in Computer Science and a career in broadcast technology that spans interactive TV, channel origination, video editing, newsroom automation and live production, working for manufacturers and broadcasters. Previously, Richard was Technical Steering Committee chair of AMWA and has authored many open source libraries. Now, with his co-founders, he is building the Internet of Frames.

15:10 – 15:35 **How to simplify sustainable media production models for media companies at Proximus**

Ordering a contribution link for an event or long term connectivity today bears quite some challenges. From knowing the exact QoS to the right access points, interfaces and the required redundancy setup usually implies many emails, phone calls and meetings. Video and Audio signals require many non-standard telecom products, but most importantly a quick setup, as events cannot wait. Production models, like remote or distributed production are key for media companies to produce more efficiently with a reduced carbon footprint, connectivity and content exchange are today challenging and costly. But is it really so hard? At Proximus we put together a core group of people from the Telco and the Media side with one goal in mind: make the order for media contribution, either for Fiber or 5G as simple as a phone call. As the premium telecom for all connectivity across Belgium, the goal is to make access for media companies as simple as possible. This presentation will discuss the challenges of the Telecom and the Media side to deliver those services efficiently, and share across several use cases, how this can be achieved efficiently and sustainable by both sides.

Larissa Görner-Meeus (Proximus MH)

Larissa is Chief Technology Officer at Proximus Media House, a 100% affiliate of Proximus group, Belgium's leading Telecom company. She joined the broadcasting industry in 2001 starting her career as R&D engineer at IRT, the R&D institute of the public broadcasters in Germany, Austria and Switzerland. In this role, she was an active contributor at EBU and SMPTE and later took on the role as General Manager for contracted research at IRT.

After several roles in product management and the CTO office at Net Insight, she joined Grass Valley in 2019 as Director for Advanced Live solutions and further as Senior Director of Product Management overseeing Grass Valley's Cloud platform AMPP, Playout and Asset Management solutions.

She has been active as freelancer for more than 20 years in live-production and technical operations at national and international sport productions and events, like the Olympic Games or the Eurovision Song Contest.

She holds a master's degree in electrical engineering and an MBA, is the Chair of the European Advisory Board of Rise and received the honour of becoming a SMPTE fellow in 2022.

15:35 – 16:00 **From isolation to integration: ensuring continuous media flows in federated systems**

Concept of federation - actual and future needs for broadcaster in daily IP-living

Andreas Fraundorfer (ORF) Nearly 25 years experience in planning of broadcast-equipment (focus on mobile production, ob-vans and galleries). introducing regular hdtv production in ORF in the year 2007/2008 with regular start of hdtv-transmission for the european football championships 2008.Upgrading the federal galleries of Austria 2014-2019 to hdtv.project manager for the first ip-based ob-van based on smpte 2110 in orf, on air since 12/2019.Head of planning department since 08/2021.Head of Broadcast System Design & Support – Production since 05/2023

Haci Mehmet Cengiz (Sony / Nevion) During my studies at the RheinMain University of Applied Sciences, I was able to accompany the first live IP distribution projects and wrote my diploma thesis on real-time applications in IP networks. For the last 10 years I have been involved in the migration from SDI to IP to Cloud and 5G networks and have been able to expand my experience in various projects. Since joining Nevion in 2013, I continue to work on comprehensive end-to-end workflows over IP networks and their orchestration.

16:00 – 16:10   **Wrap-up and end of NTS 2024**

DEMOS

1	**Riedel**	
2	**LAWO**	
3	**Calnex Solutions**	
4	**Pebble TV**	
5	**Skyline Communications**	
6	**NVIDIA Holoscan**	NVIDIA
7	**Intelligen Wave Incorporated**	
8	**IBC Connect & Produce Anywhere**	IBC Accelerator
9	**IP Media Sandbox**	EBU T&I
10	**Cybersecurity pentesting demo**	EBU T&I
11	**Unreal Engine ST 2110 plugin demo**	NVIDIA/EBU T&I