NETWORK TECHNOLOGY SEMINAR 2016

Day 1 - Tuesday 21 June

SESSION 1: BROADCASTER'S EXPECTATIONS (MODERATOR: FÉLIX POULIN, EBU)

Simon Fell is Director of Technology & Innovation for the EBU, a position he took up in September 2013. He has more than 35 years' experience in senior broadcasting technology roles, including at British broadcaster ITV, where he was Director of Future Technologies (2008-2009) and Controller of Emerging Technologies (2004-2006).

From 1991 to 2004 Mr Fell worked for Carlton Television, the ITV franchise holder for the London region, where he held several executive roles linked to operations and emerging technologies.

Mr Fell, prior to joining the EBU, was Chairman of the Technical Council at the Digital Television Group, the industry association for digital television in the UK. He also represented UK broadcasters on the EBU Technical Committee between 2006 and 2009.

Simon Fell (EBU)

Dr Hans Hoffmann is EBU Senior Manager and head of unit on media fundamentals and production technologies in the EBU Technology and Innovation department. He has been for 9 years with the Institut fuer Rundfunktechnik (IRT) as research staff in new Television production technologies department until moving to the EBU in 2000. In the EBU he has been leading many activities on media integration, production technologies, video codec evaluations, he established the EBU HDTV testing lab, and work with EBU Members on IT based digital workflows and recently UHDTV. He has been author of many EBU Technical documents; IEEE papers and is a standing speaker and contributor to international conferences.

Hans is a fellow of the SMPTE and a member of the SID and FKT and IEEE and was the SMPTE Engineering Vice President from 2011-13.

Hans Hoffmann (EBU)

François Legrand has been with CBC/Radio-Canada since 2004. He joined the Corporation as a designer of broadcast systems and became an electronic engineer in 2005. In this role, he has been involved in a wide range of projects and has had a variety of different responsibilities, such as the design of digital, television and radio systems, the preparation of plans and specifications as well as the financial management and supervision of large-scale projects. From 2011 to 2016, he has held several management positions such as Operations Manager, Regions of Quebec, where he coordinated the technological development of Quebec's regional stations and Senior Project Manager within the Transformation Unit of CBC/Radio-Canada's French Services where he played a major role in the transition of all national news shows to automated production. Since 2015, François is now Senior Director of Media Engineering where he manages a team responsible for all capital projects related to CBC/Radio-Canada core media infrastructure.

François Legrand (CBC)

Video over IP and virtualization: what do media enterprises want?

Modern Media Enterprises needs audio / video infrastructure that brings flexibility, agility and scaleability. A "forklift" replacement of HD-SDI by IP technology will not bring those benefits. To reach its full potential, IP needs to be considered as a stepping stone for the virtualisation of current hardware equipment.

Standardization of encapsulation mechanisms is only one of the very first key requirements for the widespread adoption by broadcasters and other end users of IP technologies for the transport of real-time video traffic.

In today's reality, end users who want to use IP technologies for the transport of real-time video in

production environments need to choose between mechanisms that are incompatible with each other. Broadcast Engineers need to have a fuller understanding of them to be able to make educated choices.

The objective of this presentation is to briefly expose broadcaster's key requirements, technically and functionally compare current proposed encapsulation mechanisms in the depth required and explore how they meet end users long-term objectives.

Wouter De Cuyper (VRT)

During his 14 years at the Belgian broadcaster VRT, **Wouter** executed many different technology related roles and gained a high level of experience in a broad media spectrum (television, radio and digital products). He built a substantial part of the file based video production system and was part of starting the digital shift in distribution and production. Currently Wouter is working as technology architect responsible for implementing state of the art media facilities in VRT's new building, planned for 2020.

Views after the LiveIP experience

VRT has built together with EBU the last year a multivendor live production TV studio based on IP-equipment. We have learned a lot on the subject and are always willing to spread our lessons learned about it. So I will give you our most important findings and thoughts on the subject. For example what about automatic discovery? Or what about remote production? Or what about new business models?

SESSION 2: LIVE CASES (MODERATOR: MARKUS BERG, IRT)

Andrew Wilkinson (BBC)

Andrew Wilkinson designed and built large audio consoles and systems for Calrec Audio, until 1998, when he joined the BBC to work in studio maintenance. He moved to the BBC's capital projects team in 1999 working across a wide variety of projects in Digital Television. He continued this work under the auspices of Atos plc until 2015, when he returned to the BBC as a Production Architect in their Strategy and Architecture team.

Proof of concept in Wales

Edmond Debar (FTV)
&
Benjamin Bzdrega (Cisco)

Edmond Debar holds an engineering diploma issued by the school PolyTech Paris Sud.
In 1997 he began his career as systems and network engineer in a computer service company. In 1999 he joined France2 to implement ATM / Ethernet gateways and to implement the first SAN enterprise storage network. In 2001 he participated in the creation of the first tapeless news system, then in 2004 he leads the renewal of the infrastructure project by creating a new one organized around an Ethernet network. In 2009 he actively participated in the development of solutions to renew the news architecture and then he integrates the Innovations and Development department of France TV.
Since then he participated in the majority of the business storage projects of the FTV group and works on various topics such as cloud, object storage or, since 2015, Video over IP.

Proof of concept in France

Markus Berg joined the IRT's Digital Networks department in January 1997 after he graduated in communication engineering at the Technical University of Saarbruecken. He worked as a research engineer and project leader in the field of adaptation of broadcast applications on high speed networks, especially ATM and IP, leading projects dealing with co-operative postproduction over ATM/IP networks, Wide Area Networking Technologies, all ip PRODUCTION NETWORKS and research on QoS issues for broadcasters.

Since April 2002 he is head of IRT's "Network Technologies" department.

Markus is a regular speaker on national and international conferences and seminars on networking and is the chairman of the EBU's (European Broadcasting Union) Strategic Program on Future Networked systems

All IPRTL City Project

Markus Berg (IRT)

SESSION 3: THE STATE OF LIVE IP (MODERATOR: PHIL TUDOR, BBC)

Phil Tudor is a Principal Engineer at BBC Research & Development, London, U.K. He read Electrical and Information Sciences at Cambridge University. Phil's technical background includes video compression research, software engineering, digital television standardisation, and the development and standardisation of professional media file formats.

Phil leads a team of researchers looking at file-based workflows for production & archives, high-speed IP networking for live production, capturing richer production data sets, and the development of open standards.

He is a board member of the Advanced Media Workflow Association and vice-chair of the EBU Strategic Programme on Future Network and Storage Systems (FNS). Phil is a SMPTE fellow, a Chartered Engineer and a member of the IET.

Phil Tudor (BBC

Felix Poulin (Senior Project Manager, EBU) Felix is a topic leader for Networked Media Production at EBU Technology & Innovation. He completed his diploma in electrical engineering at Montreal's Polytechnic with his final thesis done at MIT. He began working as an audio engineer at Cirque du Soleil and other international productions. Prior to the EBU, he also worked for CBC/Radio-Canada as an adviser in new broadcast technologies. Felix co-chairs the Joint EBU/SMPTE/VSF/AMWA Task Force on Networked Media and coordinates the annual Network Technology Seminar as well as the Strategic Programme on Future Networks. He also collaborates with the VRT Sandbox LiveIP project, the AMWA Network Media Incubator and some SMPTE standards committees.

An evolutionary roadmap towards Live IP

Félix Poulin (EBU)

Peter Brightwell is a Lead Engineer at BBC's R&D Labs, where he is leading IP Studio project work on investigating the benefits and challenges of using IP networks for real-time production. Recently he led a trial of networked UHD production across the UK for the 2014 Commonwealth Games. Working mostly at R&D but also in other parts of the BBC, Peter has an extensive background in broadcast and technology, in particular video compression, file-based acquisition, networked delivery, and virtual graphics. He has been a frequent contributor to EBU projects on metadata, media services and most recently future networks.

Interoperability reports

Peter Brightwell (BBC)

Hiroshi Yamauchi (Sony) *&* *John Mailhot (Imagine)* *&* *Brad Gilmer (VSF/AMWA)* *&* *Mo Goyal (Evertz)*	**PANEL: The great debate on Interoperability** **Hiroshi Yamauchi**, Sony Professional Solutions Europe, Senior Manager, New Technologies & Business Development Europe, 4K IP Production. Originally a hardware designer working on digital VTRs and data recorders, Hiroshi subsequently became closely involved in development of Sony's XPRI non-linear editing system as a software engineer. After managing software development teams in Japan, Hiroshi moved to Sony Professional Solutions Europe in 2011 as technical manager for the company's IT solutions business. He's now a product specialist and evangelist for the benefits of IP Live production. **Brad Gilmer** is Executive Director of the Advanced Media Workflow Association (AMWA). He is also Executive Director of the Video Services Forum (VSF), and President of Gilmer & Associates, Inc, a management and technology consulting firm, providing business and technical consulting services to the television industry. Brad is a Fellow of the Society of Motion Picture and Television Engineers and he has been an active participant within the SMPTE since 1984. He currently chairs the 32NF-60 Video over IP Working Group. Brad was previously employed as Director of Engineering and Operations at Turner Broadcasting System, Inc. in Atlanta. His staff managed all technical aspects of Turner's Entertainment networks including TBS, TNT, and Cartoon Network, worldwide. Brad is author of the monthly Computer and Networks column in Broadcast Engineering Magazine, Editor-in-Chief of the File Interchange Handbook (Focal Press), a contributor to the NAB Engineering Handbook, and is a frequent presenter at Broadcast conventions including SMPTE, VidTrans, NAB and IBC. **Mo Goyal, P. Eng - Director, Product Marketing.** Been with Evertz since 2005, with roles that include Product Manager, Modular Products and Master Control and Branding. Currently, responsible for business development and strategic marketing of new technologies (e.g. SDVN, virtualization, and file playout technologies) for all business units. Also, co-chair for the ASPEN Community which was formed in September 2015 to develop and promote the open format SMPTE RDD 37. Prior to Evertz, previous work experience includes: developing software for small to mid-size IP data routers, creating IPv6 forwarding engine for 10Gb network processor for large core routers, and introducing Ethernet services on Nortel optical transport products. Graduated with a degree in Computer Engineering from McMaster University in Hamilton, Ontario, Canada and has been a member of Professional Engineers of Ontario since 1996.

Session 4: Tutorials

Pedro Ferreira, (Eurovision Academy)	**Pedro Ferreira** was born in 1973, in Guimarães, Portugal. He has a MSc. in Telecommunications and Computer Science from the University of Porto. After graduating, Pedro worked at INESC Porto as a researcher on the use of Distributed Systems technology in Digital Television, collaborating in the ACTS ATLANTIC and BBC ORBIT projects, and engaging in standardization activities in SMPTE and Pro-MPEG. In 2002, Pedro became one of the founders MOG, where he is a member of the board of directors and has since played many roles. He was responsible for the the development of the MXF::SDK, as well as various other products and bespoke solutions for clients such as NBC Olympics and European projects such as Worldscreen, EDCine and SWITCH. Pedro published several scientific and technical papers, in particular related distributed systems in television, file formats and workflows, including a series of articles on MXF published by the European Broadcasting Union. He is also an experienced trainer, member of the Eurovision Academy Faculty and has delivered many trainings for television professionals all around the world. **From SDI to IP architectures (introductory)**

 Thomas Kernen (Cisco) *&* *John Mailhot (Imagine)*	**Thomas Kernen** is a Consulting Systems Engineer in Cisco's European Enterprise Networking architecture team. His main area of focus is defining architectures and standards for transforming the broadcast production industry to an All-IP Video infrastructure. Thomas is a member of the IEEE Communications and Broadcast Societies, the Society of Motion Picture & Television Engineers (SMPTE) and the Royal Television Society (RTS). He is active within a number of trade and industry organisations including the Digital Video Broadcasting (DVB) Project, the SMPTE Standards Committees and the European Brodcasting Union (EBU) working groups. **Real-Time Network Media Architectures (advanced)**
 Chris Perry (BBC) *&* *Andreas Metz (IRT)*	**Chris Perry** - Working my way through BBC local radio as a willing volunteer; radio is in my blood. Studied at Ravensbourne College of Communication I soon was engineering outside broadcasts for Local and Network radio alike across the North of England and the UK. Designing and commissioning projects and full studio commissions, mainly for small scale regional broadcasters. Moved to BBC TV as an engineer in 2000 and was responsible for the installation and acceptance of the BBC's studios in Leeds. Next took the fledgling Video over IP Satellite project and turned it into a day to day operational reality, then transitioned the entire BBC Yorkshires news fleet to IP delivery for radio and Regional TV with as fleet of Radio and TV vehicles. Moving to manage the BBC's Engineering team in Yorkshire then to take on the challenging Live Broadcast Vehicles project as Technical Lead. This aimed to transition all of BBC Local radio from analogue RF radio cars, regional TV from Aging SNG vehicles to IP based VSAT's and IP entwined SNG vehicles for Network News production. Now as Principal Systems Specialist BBC Live Broadcast Vehicles I aim to deliver third line support and technical authority to the BBC's Newsgathering and Audio & music broadcast vehicles. **Andreas Metz** studied electrical engineering and has been working as an engineer for the IRT in Munich since 1999. The main focus of his work was on the transmission of audio and video signals about telecommunications systems, like ATM, SDH, DTM, Ethernet and IP networks. He is project manager for Audio over IP of the IRT and ARD project live audio contribution between radio houses. **Audio over IP and SIP** Broadcasting live to cover an event or news story is becoming ever more difficult, ISDN is on the decline and the telephony providers wish to provide IP data connectivity in its place, but what are the challenges we face day to day providing these links, and what can we do to improve the choices. Satellite is an option, but at a cost, or can it be an effective option?

Session 5: Tutorials

Pedro Ferreira (Eurovision Academy)	**An overview of the main standards (introductory)**
Wes Simpson (Telecom Product Consulting)	**Precision Time Protocol - PTP – IEEE 1588 in Theory and Practice**

Michel de Wolf (VRT) *&* *Paul Robinson (Tektronix)* *&* *Andy Rayner (Nevion)*	Currently working as a project manager at VRT's Technology & Operations department, **Karel De Bondt** is involved in VRT's technology accelerator program called Sandbox (sandbox.vrt.be/liveip). Sandbox engages in short-term innovative collaborations with start-ups. Together they implement and try-out their new products and ideas in VRT's media ecosystem. Next to that he's managing projects where technology, operations and content production meet. Typically this involves introducing new workflows and implementing new technology infrastructures. Karel has also worked as a business analyst & business relationships manager at VRT In that role he acted as a go-between and mediator between the technology division, the TV facilities provider and the TV production division. The work ranged from ad hoc problem solving over initiation of and follow-up on projects, to negotiating the long term technology investment plans. **Andrew Rayner** is director of product management for Media Networks at Nevion. His responsibility is for providing technical direction for the evolution of the company's media transport capabilities. Andrew also heads up the Nevion UK development team based at Adastral Park, Martlesham. Prior to joining Nevion in November 2010, Andrew was head of the Broadcast Solutions team at BT. In this role he was responsible for the design of the BT Global Media Network and oversaw the development of key video interfacing, monitoring and protection technology. During his time with BT he held several patents and was awarded the Martlesham Gold Medal for technical innovation.

Session 6: Tutorials

 Willem Vermost (EBU)	**Willem** joined EBU Technology & Innovation as Network IP Media Technology Architect in 2016. He obtained a Master's degree in electronic engineering and a Master's degree in applied computer science. Before this, Willem gained 16 years of experience at the Belgian public broadcaster VRT in different roles. He has always sought to combine broadcast and IT technology in the best possible ways and in many different projects. Willem is a member of SMPTE and the AES. **Streaming Workshop (hands-on)**
Stuart Grace (BBC) *&* *Andy Rayner (Nevion)*	**High performance network access (advanced)** Aggregation of high bit rate real-time UDP-IP flows in media networks has so far assumed absolute linearity of the streams (which has generally been inherent due to the linear baseband flows they have been derived from). Moving forwards, with more software-based media nodes, the absolute linearity is not guaranteed and indeed by default does not happen. This session will explore the challenges, some of the options for controlling this and the impact on solutions.
 Richard Cartwright (Streampunk) *&* *Peter Brightwell (BBC)*	**Richard** is an innovator and entrepreneur whose passion is applying cutting edge computer science to professional media and entertainment technology. He is founder and CTO at Streampunk Media Ltd, a startup company that wants to democratize content production with commodity infrastructure. Richard wants to lead a wave of technology that creates a new business models for television based on personalized Immersive Social Television, where the picture is tailored to who is watching. An author of the Joint Taskforce for Networked Media Reference Architecture (www.jt-nm.org) and an AMWA board member instrumental in the creation of the Networked Media Open Specifications (www.nmos.tv) project and incubators, Richard and his colleagues are rapidly building a suite of open-source Node.js software (github.com/Streampunk & nmpjs.com/~streampunk) that demonstrates the emerging architectures from the ground up. Richard's career started at BBC R&D where he joined at the launch of digital television. He specialized in interactive television, eventually becoming technical architect for the BBC's

interactive offerings, including research projects into cross-platform authoring.

Following the BBC, Richard was an independent consultant and author of the open source Media Authoring with Java API (github.com/AMWA-TV/maj), a Java implementation of the MXF and AAF standards that are used widely in professional media standards. As chairman of the AMWA technical steering committee, he helped to complete may important specifications, including AAF, AS-02 and its contribution to IMF, AS-03, AS-10 and the original AS-11 - the backbone of the UK-DPP file interchange format. Through contracts with Red Bee Media, BBC and CBC, Richard applied SOA concepts to file-based production to create automated media factories. Richard used this experience to contribute to the Framework for Interoperable Media Services (FIMS), leading the introduction of REST/JSON mappings. He jointly chairs the ongoing work as a technical architect.

Prior to Streampunk Media, Richard was Principal Software Architect at Quantel Ltd (now Snell Advanced Media) where he developed a software-only replacement for a broadcast server, applying functional programming (Scala), REST, automated testing and continuous deployment techniques. Richard holds a PhD in Computer Science on the topic of virtual reality from the University of Warwick, UK and a degree in Mathematics & Theoretical Computer Science, also from Warwick. Richard lives with his family on a croft in the Highlands of Scotland, is an amateur lumberjack and part time captain of his traditional 52ft narrowboat 'Ailsa Craig Too'.

Discovery & Registration

Session 7: Secure your Cloud (moderator: Andreas Schneider, SRG-SSR)

Security in the cloud from a vendor perspective

Sascha Quillet, Swiss TXT

Andreas Schneider, born and raised in Munich, Germany, entered the field of IT Security at an early stage. Having completed his apprenticeship (System Programmer), he soon was responsible for a regional bank institute's entire mainframe landscape security. He continued specializing in the field of IT Security and IT Risk Management ever since throughout different roles and branches and after more than 10 years of international experience currently holds the position of Chief Information Security Officer (CISO) at SRG SSR, Switzerland's nationwide broadcasting corporation. He further holds several well-respected professional certifications, such as the C-CISO, CISM, CISSP, and is also certified in ISO 27001 as well as ITIL V3. He lives with his wife in Zurich, Switzerland.

Security in the cloud from a broadcaster perspective

Andeas Schneider (SRG-SSR)

Session 8: Future openings & closing (Moderator: Félix Poulin, EBU)

Sean O'Halpin is the Lead Engineer in the BBC R&D Internet Research and Future Services section. He has over 20 years experience in the media industry, specialising in distributed processing, messaging and control systems.
At the BBC, he designed how iPlayer for Radio is scheduled, the data feeds and control systems for Visualising Radio and helped build the XMPP pubsub infrastructure. He has also worked on the DAB LiveText and Slideshow systems. Since joining BBC R&D, he has worked on various projects including media bookmarking, ingesting the Twitter Firehose, designing the RadioTAG protocol, authentication for limited input devices, a prototype of a programmable TV and the EU FP7 project MediaScape.

Sean O'Halpin (BBC/EBU)

Sean is chair of the EBU Cross Platform Authentication group and on the Steering Board of RadioDNS. He is also editor of ETSI TS 103 407 Cross Platform Authentication and principal author of the RadioDNS RadioTAG specification.

He is currently on secondment to the EBU where he is leading a group of engineers investigating advanced uses of the Interoperable Master Format (IMF).

The State of the Cloud

Loic Barbou, Triskel

Loic Barbou is the founder and managing director of Triskel Inc, a company providing expertise in complex system design and implementation for the media industry. His innovations have driven Triskel Inc as a well known pioneer in creating the media technologies of tomorrow. The Triskel team assists media corporations in defining their technology strategies by coaching executives, training technical staff and augmenting the level of expertise across the organization. Loic has also maintained a deep knowledge in System Architecture and Application Design as he held the title of Chief Architect for several large global corporations. His forward thinking has allowed him to drive the creation of several industry standards.

Loic Barbou has been in software and system development for the later part of his career after switching from leading research projects in the field of artificial intelligence use for media content recognition.

Converging Live/File-based workflows