

ECN

— the EBU Expert Community on Networks and Infrastructure

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Networks are everywhere in broadcast production, contribution and distribution, and network islands are becoming connected together. The use of high-bitrate file transfer is increasing and as HDTV “enters” the networks, 3D-TV will surely follow. While network traffic is increasing rapidly, the networks are getting more and more complex with more and more broadcasters operating their own networks.

It was therefore only natural, in the re-organization process of EBU Technical, that the Expert Community on Networks and Infrastructure (ECN) was established ... with a new mandate.

One of the major goals of ECN is to build interoperable network infrastructures to ensure seamless production, contribution and primary distribution. ECN is *the* think tank for EBU Members (and also

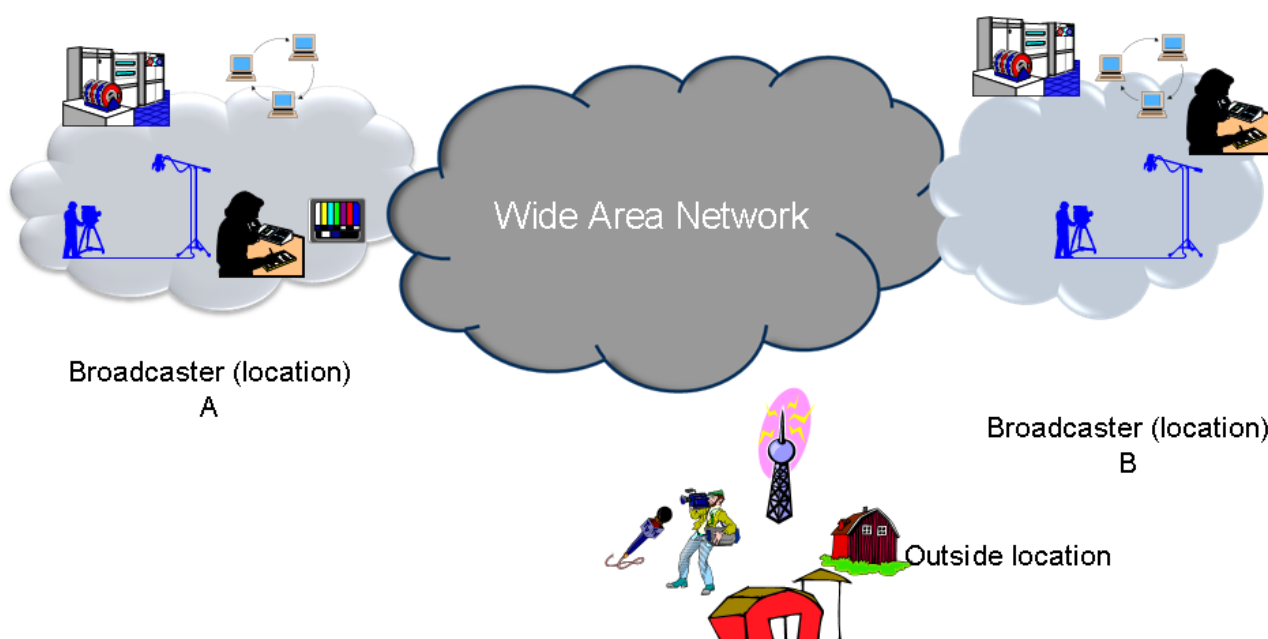


Figure 1
ECN network areas

for non-members) to discuss and solve all kinds of network and infrastructure problems and issues. We are **the** place for the experts to meet, discuss, create and finally to solve our problems!

ECN will work with networking technology in all areas of broadcast production, contribution and primary distribution ... from production and campus networks at broadcasters' premises over wide-area contribution networks ... to networks from, at and to outside locations or events ... and also from and to points of transmission (i.e. transmitters etc.).

The work of ECN

Following on from the former Network Management Committee (NMC), ECN has the following actual projects:

- **ECN-ACIP** (Audio Contribution over IP) – *Chaired by Lars Jonsson, SR*
This project has created an interoperability standard, [Tech Doc 3326](#), which is now implemented by more than 15 manufacturers. The continuing work will focus on advice to members about using Audio over IP in order to replace ISDN and other old audio networking technologies.
- **ECN VCIP** (Video Contribution over IP) – *Chaired by Markus Berg, IRT*
VCIP has the goal to secure interoperability between different equipment for the real-time exchange of A/V for video contribution over IP in the EBU (for example between different EBU Members) by specifying a minimum set of common features to be used in this kind of equipment (A/V network adapters). A first EBU recommendation ([R130](#)) for MPEG2-TS over IP has been published. Recommendations for uncompressed SD/HD, MXF streaming and low bitrate contribution are the next steps.
- **ECN-I3P** (Intercom Interoperability over IP) – *Chaired by Claire Merienne, France Télévisions*
The mission of ECN I3P is to incite intercom manufacturers to join the work that has been done on Audio over IP interoperability for production – inside ACIP – and to adapt this work to the specific needs of intercoms. Actually, most broadcasters use two or more different brands of intercom, so they need a minimum interoperability level of communications over IP inside their company and for third-party communications.
A draft document was presented at IBC last year. Since then, broadcasters have worked to clarify their requirements in order to issue a first publication at the end of this year, after holding a second meeting with manufacturers, planned for IBC 2010.
- **ECN-IPM** (IP Measurements) – *Chaired by Yuan-Xing Zheng, BBC*
This group is covering a wide range of issues concerning different aspects of measurement in IP networks. It is creating a new MIB standard in order to be able to monitor (multicast) flows through IP networks and the status/problems/configuration of A/V devices over IP. This draft

Abbreviations

A/V	Audio / Video (Visual)	MIB	Management Information Base
AES	Audio Engineering Society http://www.aes.org/	MXF	Material eXchange Format
ECN	(EBU) Expert Community on Networks and Infrastructure	OB	Outside Broadcast
IEC	International Electrotechnical Commission http://www.iec.ch/	QoS	Quality of Service
IETF	Internet Engineering Task Force http://www.ietf.org/	RF	Radio-Frequency
IP	Internet Protocol	SDI	Serial Digital Interface
LTE	Long Term Evolution (4th generation mobile networks)	SLA	Service Level Agreement
		SNMP	Simple Network Management Protocol
		TCP	Transmission Control Protocol
		VSAT	Very Small Aperture Terminal
		WLAN	Wireless Local Area Network

new MIB standard for audio and video over IP equipment has been sent to ECN manufacturers for comments. This new standard will be part 7 of the IEC 62379 standard.

Further on, a new end-to-end media-flow monitoring software has been developed and successfully tested in the BBC R&D and VRT (Belgium) live networks. More tests are planned. This software provides a unique solution for multicast monitoring for broadcasters.

A new parameter had been proposed for measuring variable bitrate IP streams. Already published as [EBU Tech Doc 3337](#), it has also been submitted to IETF for review.

○ **ECN-3GSDI** – *Chaired by Andy Qusted, BBC*

ECN-HIPS-3GSDI is a subgroup of the SP-HIPS strategic programme focusing on the harmonisation of 3G SDI levels (the different 3G levels are NOT interoperable!). It will provide an EBU Technical Paper on the use of 3G SDI, the choice of levels and the 3G connectivity requirements of broadcasters.

○ **ECN-CNCS** (Common Network Command and Control) – *Chaired by Chris Chambers, BBC*

The primary objective for the setting up of this group originally was to provide a path for members to be able to contribute to the work of IEC 62379. This IEC group is developing a common control standard using SNMP for network-attached Audio and Video equipment. In the future, this work item possibly will be found in a new group with a wider scope on network management and monitoring (see *Fig. 2*).

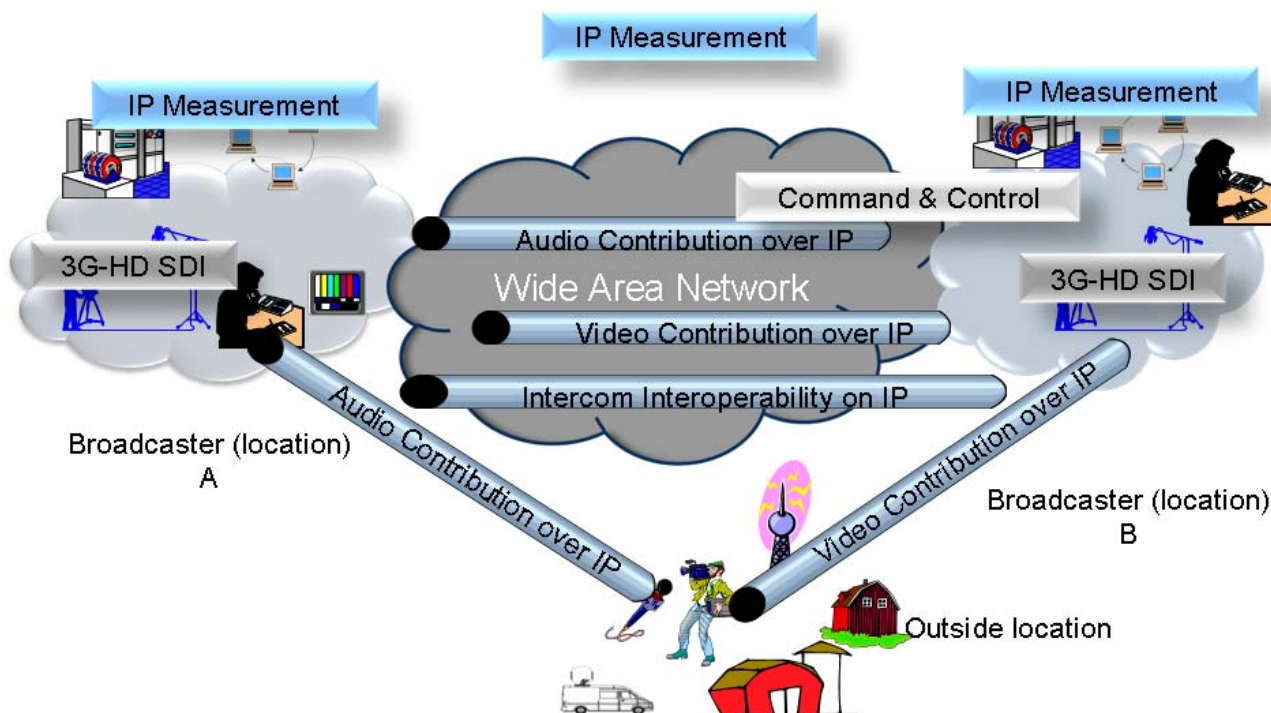


Figure 2
Actual ECN groups in the network map

New challenges

During the initial discussions and at the ECN Kick-Off Meeting (21 June 2010 in Geneva), the following tentative future topics/challenges/problems to be solved were identified and a lot of new questions were raised.

Network management and planning, SLA handling and networks interconnection

More and more broadcasters are operating their networks by themselves and more and more equipment is attached to these networks (even equipment not used for networking but with an Ethernet

port for control purposes). In the future it will get more and more difficult for administrators to manage and control these new network structures. So, good management systems are needed in order to use the networks in an efficient and cost-effective way.

Another aspect is to work with other industry and standards bodies, to study and propose common methods of system and product control for broadcast and production purposes. As new networked systems are introduced into our business and virtual services along with third party resources start to form elements within workflows, it becomes vital to be able to manage and monitor the service delivered. So what are the requirements of Members to ascertain and recommend common (and hopefully standardized) solutions to processes and systems needed both technically and contractually?

The next big question is: How to plan these new networks? Are there any tools available helping broadcasters to dimension and structure them? How to define the Quality of Service (QoS) in these networks? How to plan the bandwidth, the physical structures and the fail-over concepts?

We need to monitor the flows at different layers in order to ensure availability and hence our workflows.

How to negotiate network SLAs when buying network capacity or connections or even whole networks from providers? What parameters are needed to define and specify what you buy? How can we check if the specifications are fulfilled by the operator?

And what happens when we use networks from different carriers? This is getting more and more common these days. How is the QoS flow over the network borders? Can my service quality be guaranteed over interconnected networks belonging to different network operators? They often use different QoS mechanisms, and we need to signal QoS from our broadcasting-end codecs. Different multicast rules exist. Often, when something goes wrong it's always "the other provider's fault!" Broadcasters must understand the detailed technologies for QoS signalling to be able to negotiate with providers.

Next-generation studio network infrastructure

Right now, the "good old" AES/EBU and SDI infrastructures in the studio and production environments are "under attack". Some manufacturers of network equipment claim: "Everything can be done via IP/Ethernet!" Well ... not quite everything, yet, but there are new possibilities and opportunities and, with the increased usage of file-based production, these new networks surely move closer to the studios and deeper into the production networks.

New storage infrastructure

Storage volumes are still increasing rapidly. File-based media production (based on IP networks) is a well-established workflow. More and more content has to be accessed "on-line". More and more content is distributed (even on home devices). How can all this content be hosted by the content owners in the future? Will there be more virtual storage systems distributed over several storage service providers? What are the implications on networks by the possible new storage architectures, both at the broadcaster's premises and distributed?

Security

Wherever IP networks with all the nice new applications (Skype, Twitter...) and opportunities evolve, we have to talk about security. When archives are opened to a wider usage, when former isolated networks are interconnected, when virtual storage gets deployed all over different networks, lots of new potential risks will appear. How can broadcasters protect themselves efficiently without destroying their easy-to-use workflows?

Power efficiency, green networking and virtualisation and cloud computing

We all have to save money and we all want to optimize our workflows. Is there a relation between these two facts? Well, yes! Virtualisation is a possible solution which can help save money AND improve and ease workflows (but only when implemented at the right place with the right planning). But what and how to virtualise (server, client, network virtualisation?). Can we even virtualise complete production processes? Are there new security holes created?

And everything has to be “green” nowadays, but what is “green networking/IT” ... how can it really help to save power consumption and money?

Wireless and mobile networks

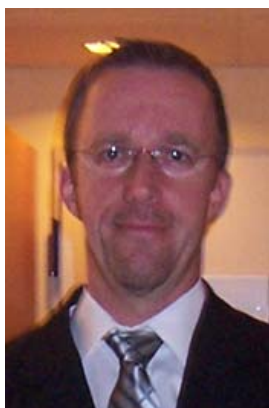
Always on, always connected, always online! With all the new mobile and wireless networks, broadcasters get new exciting opportunities to connect mobile journalists etc. in an easy and cost-effective way. But which of the technologies (WLAN, 3G, 4G/LTE, RF links, satellite...) offers sufficient robustness and quality of service and good mobility? How can broadcasters improve their mobile workflows without compromising uninterrupted transmission?

Networks for events, OBs

The availability of high-speed networks at event locations is also growing. Broadcasters either can get wired or wireless connectivity to almost everywhere in the world. But is the capacity really enough for big events when many different broadcasters want to be there, and connected? How reliable is the Internet? Can every location really be connected? What is the future of outside broadcasting – is IP also taking over there? Are the same Quality of Service mechanisms possible to use for OB and in fixed contribution networks?

Satellite networks

How will satellite networks and their usage develop over the next few years? It's a mature technology and broadcasters are used to working with it. What are the new features and use cases? How will VSAT technology evolve? How can the automatic on-demand assignment of capacity be



Markus Berg joined the IRT's Digital Networks department in January 1997 after he graduated in communication engineering at the Technical University of Saarbruecken, Germany. 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 various projects dealing with co-operative postproduction over ATM/IP networks, Wide Area Networking Technologies and research on QoS issues for broadcasters.

Since April 2002 he has been head of the IRT's “Network Technologies” department.

Mr Berg is a regular speaker at national and international conferences and seminars on networking, and is chairman of the EBU's new ECN (Expert Community on Networks and Infrastructure) and chairman of the EBU project group ECN-VCIP (Video Contribution over IP).

Lars Jonsson was born in 1949 and received an M.Sc in Electronic Engineering at the Royal Institute of Technology in Stockholm, Sweden, in 1972. Since then, he has worked within the development environment of Swedish Public Service TV and Radio Broadcasting.

During the last decade, Mr Jonsson's main areas of work have been digital radio, archiving, audio computer infrastructure and IP network projects within Swedish Radio. He has been active in many standards working groups within the Audio Engineering Society and the EBU. In 2006 he became chairman of the EBU Audio Contribution over IP working group, ECN-ACIP. He is now also the vice-chair of the new Expert Community on Networks and Infrastructure, ECN.



handled? What new technology developments have to be considered (light-weight end units for contribution from reporters, low earth orbit systems for emission etc ...)?

File transfer acceleration

Broadcasters already are used to working in a file-based environment and with tapeless production. HD is gradually becoming a standard in our video workflows. High-speed networks are widely available ... BUT ... HD-video results in huge files which have to be transported via worldwide networks suffering from long delays and possibly packet loss and unacceptable congestion. Since most of the file transfers work with old protocols (like TCP), they may not be able to handle long delays and network errors properly. So, what new technologies are available to speed up our file transfers? Are there open standards to use? What future workflows have to be taken into account? And, don't forget, what are the new possible security risks with the new protocols?

Working methods and conclusions

All the above-mentioned issues are potential work areas for ECN. We now have to set priorities for these topics/issues and focus on the most important work items which may lead to new ECN project groups. The existing groups will also possibly get new extended mandates or will merge into some of the new groups to be created. Of course, enough resources have to be made available in order to establish possible new working groups addressing these questions.

By opening the Expert Community also to non-EBU members, we will gain the opportunity to work closer together with the industry (manufacturers, network operators etc.) and so, both sides can profit from the expertises and experiences of a whole new kind of co-operation in the community.

ECN will work both with physical meetings and online (WebEX) meetings in order to be as flexible and effective as possible and also to give the Members, who may have travel restrictions, the possibility to be an active and valuable member of the ECN and its working groups.

Please go to <http://tech.ebu.ch/groups/ecn> and visit our projects for updated information.

The projects which are lead by EBU-ECN need your hands to solve many of the tasks. During the next year, more network projects will be started, after discussions, with feedback and advice coming from the EBU Members. Network seminars and workshops on specific topics will also be arranged.

This version: 18 August 2010

Published by the European Broadcasting Union, Geneva, Switzerland

ISSN: 1609-1469

Editeur Responsable: Lieven Vermaele

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