

## Joint Task Force on Networked Media Report on User Requirements

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*The primary objective of the Joint Task Force on Networked Media (JT-NM) is to ensure interoperability in packet-based systems (networking, equipment and software) for professional media. This includes defining an agile, on-demand, packet-based network infrastructure designed to support a variety of distributed, automated, professional media (file- and stream-based) workflows for local, regional and global production supporting any format, standards-based, for interoperability to facilitate new workflows and reduce total cost of ownership and to speed-up content time-to-market.*

*The JT-NM collected 136 unique user stories from media companies, manufacturers and consultants that identified a number of user requirements for networked professional media. This report summarizes these stories into seventeen categories. The authors have attempted to capture the overall spirit of these categories by writing “super stories” which are composites of the original 136 stories. All of the originally submitted stories are published at the end of this report.*

### **Super User Stories**

#### **Requirement 1: Commercial Off-The-Shelf (COTS)**

As a systems designer I would like to deploy commercial IT technology for use in professional media applications to:

1. take advantage of the marketplace economics of IT technology;
2. make use of the extensive and well trained base of design and maintenance personnel available in this field;
3. deploy enterprise-class capabilities and redundancy options;
4. use any one of a number of monitoring, diagnostic and troubleshooting tools that currently exist for enterprise deployments of IT infrastructure;

So that I can reduce the total cost of ownership of my professional media operations.

Category Legend

| Serial Number | Reviewer | Timestamp          | Last Name  | First Name | Company                   | Affiliation - consultants, please let us know who you are representing | email address                        | As a (ROLE)                               | I want to (FUNCTION)   | so that (BUSINESS VALUE)  | Notes  | Category 1 | Category 2 | Category 3 |
|---------------|----------|--------------------|------------|------------|---------------------------|--|--------------------------------------|---|--|---|--|------------|------------|------------|
| 1             | bg       | 5/2/2013 15:35:07  | Gilmer     | Brad       | Gilmer & Associates, Inc. | VSP  | brad@gilmer.tv                       | Product designer                          | take advantage of commodity networking chipsets  | I can lower costs and take advantage of R&D expenditures in this area.  | This is a note.  | costs      |            |            |
| 2             | bg       | 5/2/2013 15:38:04  | Gilmer     | Brad       | Gilmer & Associates, Inc. | VSP  | brad@gilmer.tv                       | [Duplicate]                               | [Deleted as Duplicate]   | [Deleted as Duplicate]  | [Deleted as Duplicate]   | Duplicate  |            |            |
| 3             | bg       | 5/7/2013 12:00:39  | Luff       | John       | HD Consulting             | Public TV Stations   | john.luff@hdconsulting.tv            | System Designer                           | .connect playout devices to graphics engines in master control sources with only one I/O port  | virtualized master control will allow real time content to be shared both in and out over IP hardware.  | This will facilitate virtualizing the "broadcast factory" completely with the flexibility to build up new segments and live them down on short notice.   | stream     |            |            |
| 4             | bg       | 5/7/2013 15:06:23  | Reuss      | Edward     | Consultant                | DoCo, Signal Share, Clair Global                                       | edreuss@gmail.com                    | As a news reporter reporting a live event | want to avoid looking like a total doofus standing in front of the ENG camera with the lights in my face through several seconds of dead air after the studio talent asks me a question  | so that the covered event looks professional with a high production value, and attracts more viewers and therefore more sponsors.   | Overall latency and lip sync are critical to ENG and other contribution links, but coding/decoding and network buffering work against this goal when using IP networks.  | CoQs       | time       |            |
| 5             | bg       | 5/7/2013 15:51:49  | Daniel     | MIner      | DIRECTV                   |  | dminer@directv.com                   | As a broadcast system design engineer     | want to be able to carry video/audio between real time equipment within my broadcast center. This equipment includes video/audio processing equipment to perform format conversions (e.g. 50fps to 60fps), production (e.g. square waves, bars, and graphics insertion), and encoding.   | So that cheap Ethernet connections can be used instead of more expensive SDI interfaces   |  | costs      |            |            |
| 6             | bg       | 5/8/2013 7:19:53   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that the facility does not contain single points of failure which can impact the work in multiple studios simultaneously  | broadcasting can continue without interruption even in the event of failures (including configuration errors of shared systems)   |  | costs      |            |            |
| 7             | bg       | 5/8/2013 7:22:18   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | to ensure that a failure of one system in a studio is contained within that system and cannot affect other systems in that studio, or other studios in that facility   | cost  |  |            |            |            |
| 8             | bg       | 5/8/2013 7:24:19   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that all network-aware systems align with network engineering best practice (e.g. avoiding non-standard extensions such as jumbo frames, layer 2 discovery, broadcast packets etc.)   | standard network hardware can be used reliably  |  | costs      |            |            |
| 9             | bg       | 5/8/2013 7:34:12   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that all network-attached devices operate correctly in busy near-world scenarios, including dropped packets, and out-of-order delivery  | support effort is not squandered identifying poor network stack implementations.  |  | interop    | conf       |            |
| 10            | bg       | 5/8/2013 9:07:12   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that multiple independent video streams (e.g. cameras) remain temporally correlated with multiple independent audio streams (e.g. microphones) such that the combined output maintains accurate lipsync even when switching/mixing between different sources  | the production quality of the final output is not compromised.  |  | time       |            |            |
| 11            | bg       | 5/8/2013 9:08:57   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that the total delay from camera/microphone to studio output is as short as possible and constant   | the production values of the content produced are maintained, e.g. short challenge-response times during two-way down the line interviews.  |  | CoQs       | time       |            |
| 12            | bg       | 5/8/2013 9:12:12   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | ensure that multiple production processes (capture, effects, edit, etc.) can be cascaded with no quality loss due to generation loss effects   | the production value of the final content is maintained without compromising the desired workflow(s)  |  | time       |            |            |
| 13            | bg       | 5/8/2013 9:15:31   | Ellis      | Mike       | BBC                       |  | mike.ellis@bbc.co.uk                 | technical architect                       | enable all systems to co-exist on standard network hardware using well-supported protocols i.e. protocols such as RTP which rely on special features in network switches should be avoided   | the widest range of network hardware can be used, leveraging the mass-market rather than creating a new "broadcast niche"   |  | costs      |            |            |
| 14            | bg       | 5/13/2013 8:14:24  | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | small production company                  | want to access content contributed by third parties over IP links, which gives me flexibility over when and where I received the content   | so that my programme schedules can be more dynamic and so that I can receive high value over-the-air content last minute  |  | stream     |            |            |
| 15            | bg       | 5/13/2013 8:17:11  | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | large broadcast facility owner            | want to stream content directly over IP from any of my studios. Outside Broadcast locations or off-site facilities, so that I can use broadcast communication links and more rapidly integrate the most relevant content into my live schedules wherever I wish  | in this way, my channels will be more popular and I can generate more advertising revenue   |  | reach      |            |            |
| 16            | bg       | 5/13/2013 8:52:18  | Simpson    | Wes        | Helcom Product Consulting | Representing myself  | wsimpson@helcom.net                  | Facility Designer                         | ensure that signals that designate an high priority (such as my main linear payload signal) are transmitted with low latency and interruptions over a compressed packet-based infrastructure   | I can avoid the cost of deploying and maintaining a separate overlay network to perform that function   |  | time       |            |            |
| 17            | bg       | 5/13/2013 8:54:16  | Simpson    | Wes        | Helcom Product Consulting | Representing myself  | wsimpson@helcom.net                  | Broadcaster                               | want my free-lance contributors to be able to send any standard content directly over IP links (wired and wireless), including broadcast metadata  | so that I can be first to market with breaking news   |  | prov       | conf       | costs      |
| 18            | bg       | 5/13/2013 11:24:40 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | a news agency                             | want to stream content directly over IP from my studio cameras so that I can integrate the content directly into my editing system and enable faster post-production   | This allows me to achieve a finished product faster and cheaper than my competitors which will win me more business   |  | stream     |            |            |
| 19            | bg       | 5/13/2013 11:33:58 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | an international broadcaster              | want to access content contributed by third parties over IP links, which gives me flexibility over when and where I received the content   | so that my programme schedules can be more dynamic and so that I can receive high value over-the-air content last minute  |  | reach      | prov       | conf       |
| 20            | bg       | 5/13/2013 11:38:24 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | an international broadcaster              | want to stream content directly over IP from any of my studios. Outside Broadcast locations or off-site facilities, so that I can use broadcast communication links and more rapidly integrate the most relevant content into my live schedules wherever I wish  | in this way, my channels will be more popular and I can generate more advertising revenue   |  | reach      |            |            |
| 21            | bg       | 5/13/2013 11:36:37 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | large broadcast facility owner            | want to monitor content over IP networks anywhere in the workflow/broadcast chain, using standard IP equipment, so that I can be sure that the correct signals are being passed with the correct quality from anywhere I choose to monitor.  | This will save me staff and equipment costs which will make my business more competitive.   |  | mon        | costs      |            |
| 22            | bg       | 5/13/2013 11:40:50 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | Facility/uplink facility/teleport centre  | want to monitor content over IP networks anywhere in the workflow/broadcast chain, using standard IP equipment, so that I can be sure that the correct signals are being passed with the correct quality from anywhere I choose to monitor.  | This will save me staff and equipment costs which will make my business more competitive.   |  | mon        | costs      |            |
| 23            | bg       | 5/13/2013 11:41:47 | Walker     | Gavin      | Snell                     | Representing myself  | gavin.walker@snellgroup.com          | a small broadcaster                       | want to distribute content to end users and to content aggregators over public IP networks, with clear traceability and rights management  | so that I can gain more revenue from each of my content sources, through larger numbers of subscribers  |  | security   | accounting |            |
| 24            | bg       | 5/13/2013 12:10:53 | Wadje      | Robert     | BBC                       |  | robert.wadje@bbc.co.uk               | System Designer                           | want content surfaces that are conceptually decoupled from the software control API of the underlying infrastructure   | so that I can choose the human interfaces appropriate to my evolving workflows without changing the underlying infrastructure   | implication is that the core concepts of the software control API must be standardized   | interop    |            |            |
| 25            | bg       | 5/13/2013 12:13:42 | Wadje      | Robert     | BBC                       |  | robert.wadje@bbc.co.uk               | User                                      | want to be able to separate the physical locations of control surfaces, capture, routing and processing resources  | so that I have the freedom to deploy people and technology in the most cost- and process-efficient way  |  | Accounting | reach      |            |
| 26            | bg       | 5/13/2013 13:48:43 | Hughes     | Kilroy     | Microsoft                 |  | kilroy.hughes@microsoft.com          | Cloud service                             | ingest live broadcast streams over generic internet bandwidth terminating in generic virtual machines in data centers with high reliability and low latency for live encoding and adaptive streaming of audio, video, and subtitles at approximately 1080 line resolution and up to 10Mbps long GOP AVC output quality (i.e. requiring input quality roughly 2X output quality)  | Enable scalable internet TV streaming of thousands of channels worldwide using generic internet bandwidth and uplink terminators in existing data centers that provide cloud hosted computation, storage, and egress without the business barriers to adoption of leased lines, special termination equipment, and broadcast CAPEX.   | Variances of the story include:<br>1. Uplink unencrypted video<br>2. Uplink protected video for cloud encrypted DRM (instructions, such as keys and certs are unencrypted and encryption applied to encoded output streams)<br>3. Job control language to configure internet TV output channels<br>4. Uplink audit insertion for server or client ad insertion<br>5. Uplink descriptive metadata for use in content management or delivery to end user | streams    | int        | rel        |
| 27            | fp       | 5/13/2013 13:52:55 | Brightwell | Peter      | BBC                       |  | peter.brightwell@bbc.co.uk           | facility operator                         | have the systems I use automatically discover what resources are available, and how they can be configured.  | I am presented with the high-level information I need to set systems up, and spend less time on low-level configuration. This will be particularly important when I need to rapidly deploy new facilities say on a cloud infrastructure.  | Resources here could include for example video feeds and transformation services   | Conf       |            |            |
| 28            | fp       | 5/14/2013 2:46:22  | Thomas     | Edwards    | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send high-quality video streams over a packetized network (in a similar fashion to my use of SDI/HD-SDI today over coaxial cables)   | I can flexibly and rapidly reconfigure video flows in my broadcast plant to meet business needs with enhanced agility   | This could also be presented in terms of a system designer or user   | Int        | Streams    |            |
| 29            | fp       | 5/14/2013 2:47:16  | Thomas     | Edwards    | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send high-quality video streams over a packetized network (in a similar fashion to my use of SDI/HD-SDI today over coaxial cables)   | I can reduce the cost of my infrastructure by leveraging commodity IT networking products that are in wide use in many industries and thus are priced based on large economies of scale.  |  | COTS       | Streams    | CoQs       |
| 30            | fp       | 5/14/2013 2:48:10  | Thomas     | Edwards    | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send multi-high-quality video streams at the same time over a single network link using statistical multiplexing   | I can reduce the cost and complexity of my wiring infrastructure.   |  | Streams    |            |            |
| 31            | fp       | 5/14/2013 2:50:10  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send high-quality video streams over a network in a form that carries the uncompressed video data payload of SDI/HD-SDI such that there is no quality loss due to video compression at all   | our video emissions are pristine under any analysis by our most demanding business partners.  |  | Int        | Streams    |            |
| 32            | fp       | 5/14/2013 2:51:15  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send high-quality video streams over a network in a form that carries the video data in a very mild ("mezzanine") compression that shows no perceivable visual difference after a typical number of codec generations experienced in our plant, and has a low enough latency to meet all other business requirements   | our video emissions are pristine under typical visual viewing analysis, and so that more efficient use is made of our broadcast data network.   |  | Int        | Streams    |            |
| 33            | fp       | 5/14/2013 2:52:15  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send audio along with high-quality video over a network and be assured that adequate synchronization between audio and video is maintained   | so that our programming remains enjoyable to watch without annoying audio/video synchronization loss  |  | Streams    | time       | CoQs       |
| 34            | fp       | 5/14/2013 2:53:28  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | can send high-quality video streams over a packetized network without dropping any between the sender and the receiver   | I can have a high degree of confidence in this infrastructure and can enter into business contracts with vendors and advertisers regarding media products that rely on this infrastructure.   |  | CoQs       |            |            |
| 35            | fp       | 5/14/2013 2:54:08  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | can send high-quality video streams over a network with redundancy against single-point failures   | our business operational continuity is maintained.  |  | Rel        |            |            |
| 36            | fp       | 5/14/2013 2:54:50  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | send high-quality video and audio streams over a network such that "video switches/vision mixers" and "audio mixers" can still perform their job properly  | our programs continue to have the same quality of production that they have today   |  | Int        | Streams    | CoQs       |
| 37            | fp       | 5/14/2013 2:56:06  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast operations professional         | ensure high-quality video elements carried over a network can be carried from any source to any destination in the broadcast plant (as I can today using SDI/HD-SDI over coaxial cable with a crosspoint video router)   | I can route video streams from all devices as the business requires.  |  | Prov       |            |            |
| 38            | fp       | 5/14/2013 2:58:37  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast engineer                        | Send metadata elements of CEA-608 and CEA-708 Closed Captions, AFD, and video description audio over a network along with my high-quality video  | We meet the expectations of the deal community, video distributor customers, and so that we are in compliance with regulations  |  | Streams    |            |            |
| 39            | fp       | 5/14/2013 2:59:57  | Edwards    | Thomas     | FOX                       |  | thomas.edwards@fox.com               | broadcast data networking professional    | monitor my broadcast data network for usage and problems   | I can operate my network to satisfy the business requirements of those who use it.  |  | Mon        |            |            |
| 40            | fp       | 5/14/2013 3:46:06  | Williams   | Richard    | Shelter Studios Co.       |  | richard.c.williams@shelterstudios.co | Post Production                           | I want to be able to connect via any public communications network, with participating sound libraries in order to find, review and retrieve sound stems from any category, online 24x365.   | if it were possible to perform the function as described, the speed of production could be significantly enhanced by reducing the time required to gain access to and search multiple sound libraries and acquire the required sound on site. Direct savings could be made through not having to: EITHER: Procure, purchase, store and transport a wider selection of stems to a production site. OR: Pay for the additional labor or third party costs incurred when performing the search and retrieval operations today. |  | Reach      |            |            |
| 41            | fp       | 5/14/2013 9:08:38  | McCarty    | Brian      | Coral Sea Studios         |  | bimccarty@coralseastudios.com        | sound engineers                           | As a sound engineer for a radio station, I want to connect my radio remote gear directly to wifi or the internet and have my full bandwidth audio broadcasts back to the master control at the station   | This would be easier to access and cheaper than the current need to order a data line from the phone company.   |  | Reach      |            |            |
| 42            | fp       | 5/14/2013 9:11:47  | McCarty    | Brian      | Coral Sea Studios         |  | bimccarty@coralseastudios.com        | sound engineers                           | As the owner of a recording studio in a remote area, I need to interconnect my studio with others around the world to record full bandwidth audio from another studio and drop it into a current recording. This will require the transmission of the current audio to the remote location for synchronization, with the returned "overdub" audio to be coded for sample accurate insertion into the original recording.           | High-bandwidth specialty data lines are generally required to do this, although the functionality is contained in current recording technology (ProTools, Explofix System 5).   |  | Reach      |            |            |
| 43            | fp       | 5/14/2013 10:33:27 | Mahnet     | John       | Hemslabroadcast           |  | johnmahnet@hemslabroadcast.com       | Master Control Operator                   | I want to be able to watch the incoming live sporting feed from network through the multiviewer, sitting at a traditional master control panel, and drop my local commercials into the telecast at the right times by hand, so that they look uninterrupted to the viewer  | so that the advertisers feel that their ad can connect, and the as-run log indicates that the ad ran correctly.   | this is a timing user story, but with a human in the loop, the latency of the path to the operator's eyeballs and the latency of the control interfaces both matter here   | interop    | Accounting |            |
| 44            | fp       | 5/21/2013 9:38:22  | Arad       | Donor      | Melanox                   |  | donor@melanox.com                    | System architect                          | I would like to see equal consideration of IP CoS within the contribution facilities such as IP TV Headends. Specifically, an even distribution whereby the primary signal ingest might be terrestrial with a supporting secondary source ingested via satellite. Areas for consideration would be the preservation of content including metadata in addition to the signal stream.  | Complexity and pre-processing requirements are minimized if standards based practices can be adopted. This could lead to an improved VQ experience for the end user, reduced MTBF, and reduced costs.   |  | CoQs       | int        | reach      |
| 45            | fp       | 5/21/2013 15:37:11 | Titus      | Dave       | AT&T                      |  | dt1626@att.com                       | Headend Engineering                       | Define an "SDI payload" mapping over Ethernet (SPoE) to IP that new packetized streams will more easily interoperate with legacy SDI systems. Key to tempo are AVI and metadata packetized formats being a superset of what SDI streams today. This facility and metadata packetized formats being a superset of what SDI streams today. This facility and metadata packetized formats being a superset of what SDI streams today. | I never integration problems with existing SDI systems. Also, leverage existing SMPTE SDI payload standards, tools and knowledge base. Quicker time to market with packetized SDI payload compared to inventing a completely new "SDI like payload" format  | All SPoE user stories are related  | Int        | Stream     | CoQs       |
| 46            | fp       | 5/24/2013 1:41:15  | Kovalick   | Al         | Media Systems Consulting  | Fox  | kovalick@pacbell.net                 | Designer                                  | Define a CoS level for the SDI/Payload over Ethernet (SPoE) format to enable "near SDI equivalence", lossless AVI streams. Compared to SDI, this CoS has similar low valued end-to-end latency and allows stream switching during VBI lines based on SMPTE RP188.  | Creates the packetized near-equivalence of SDI to leverage the networked infrastructure of a facility and it's advantages. Replaces SDI with SPoE will result in fewer problems given their similar operating parameters.   | All SPoE user stories are related  | Int        | Stream     | CoQs       |
| 47            | fp       | 5/24/2013 1:44:17  | Kovalick   | Al         | Media Systems Consulting  | Fox  | kovalick@pacbell.net                 | Designer                                  | Define a related CoS level for SDI/Payload over Ethernet (SPoE) to enable "good enough" lossless streaming. Compared to SDI, this CoS permits increased end-to-end latency and allows stream switching during VBI lines other than those prescribed by SMPTE RP188.  | Defines the implementation costs of basic systems. No requirement for "high end" packet switches to meet the related CoS. Systems are easier to build and test given the wider range of acceptable metrics. The CoS is more cloud friendly.   | All SPoE user stories are related  | Int        | Stream     | CoQs       |

| Serial Number | Reviewer | Timestamp          | Last Name | First Name | Company                    | Affiliation consultants, please let us know who you are representing | email address                  | As a (ROLE)                       | I want to (FUNCTION)  | so that (BUSINESS VALUE)  | Notes   | Category 1 | Category 2   | Category 3 |
|---------------|----------|--------------------|-----------|------------|----------------------------|--|--------------------------------|-----------------------------------|---|---|---|------------|--------------|------------|
| 49            | fp       | 5/24/2013 15:25    | Kovalick  | Al         | Media Systems Consulting   | Fox  | kovalick@pacbell.net           | Designer                          | Define CoQs levels for file transfer. Today we often rely on PTHH (PTCP) for reliable transfer but without metrics to guarantee transfer times. So spec. say 4 levels of performance when using local (2 levels) and remote (2 levels) file transfer. The number of levels and their metrics are TBD.   | Guaranteed CoQs levels are necessary for deterministic file-based workflows. Providing a choice of CoQs levels permits trading off cost and complexity for reduced/extended transfer times.                                       |   | File       | CoQs         |            |
| 50            | fp       | 5/24/2013 14:42:16 | Simon     | Tuff       | BBC                        | EBU SPO STB  | simon.tuff@bbc.co.uk           | Engineering Manager               | To understand and thus reduce the energy consumption of storing, streaming and moving media around the network. We estimate BBC's HD TV uses at least 3 times the energy per user hour over DTT and this is a real issue if we want to scale this technology across the business and to many and points. What techniques are available to design and engineer efficient way to move user behavior to be energy efficient?   | In managing this we save money [energy & carbon taxes], we build a reputation as responsible public servants [CSR], we protect ourselves against possible future resource shortages or security issues and we do the right thing! | This may not be quite the type of story you were expecting but I'm happy to refine this to be the most useful if required. Felix Pousin of the made the suggestion to attempt to engage with the process in my role as chair of the EBU SPO on sustainable technology | Accounting |              |            |
| 51            | fp       | 5/30/2013 14:41:42 | Simpson   | Wes        | Telecom Product Consulting | Self   | wsimpson@optonline.net         | broadcaster                       | How do key system attributes and performance specifications that constitute an "enterprise-class" IP router that will be able to transport high-bitrate video signals in a live television production environment   | can effectively communicate with suppliers to explain my requirements and appropriately evaluate products to use in my facility.  |   | CoQs       | Rel          | CoTS       |
| 52            | fp       | 6/3/2013 9:05:51   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the streams to identify primary and backup paths of the same content to facilitate redundancy and reliability within a facility / workflow path, switching among those paths should be seamless, (synchronous)   | Value of redundancy in a facility is a critical economic and technical value.   |   | Interop    | Time         | Rel        |
| 53            | fp       | 6/3/2013 9:07:29   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the streams to be "self-contained" so that I can join a stream via, perhaps, a physical-only connection and know all there is to know about it (for other content consumption, testing, transcoding, downstream processing)  | Facility simplicity is a business value that will benefit "small" users and reduce cost and complexity.   |   | Interop    | Streams      | Prov       |
| 54            | fp       | 6/3/2013 9:08:54   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the streams to identify what they are along the workflow path with a persistent identifier(s) - internal house number and/or a destination identifier such as SDN and/or external identifier such as Nielsen watermark - both intermediate and/or final distributor codes; however, the streams may be raw material for other feeds (e.g. regional feeds / across regions / sub-zones / time-zones / split / language version)   | Value is derived of multiple variants of a workflow can be created and processed in a highly-secure and efficient manner.   |   | Streams    | Conf         |            |
| 55            | fp       | 6/3/2013 9:10:50   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the system to include an equivalent of the broadcast "only" system in the IP (IT-type) domain so that devices downstream or, in a routing infrastructure, can understand a bidirectional (upstream/downstream and vice-versa) status of "on-air", so that inadvertent system changes could be locked-out (or prioritized to administrative / override) status.   | Value of reliability and redundancy needs to be maintained in an IT-type infrastructure to keep "mission critical" nature of content streams.   |   | Interop    | Streams      | Rel        |
| 56            | fp       | 6/3/2013 9:12:17   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the system to include provisions for communications to accompany the content streams - this could be a URL/LINK for an origination facility and/or address for a device, or an intercom destination that could be an internal facility communications system and/or speaker-box.   | Communications, especially in a live or near-live production environment is an important value in the production process.   |   | Interop    | Streams      |            |
| 57            | ks       | 6/3/2013 9:13:54   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the streams to facilitate simple identification and testing - i.e. permitting "bridging" a signal that would include a humbong or other "help" to allow a cheap / unsophisticated test device to pass/fail a signal non-destructively (may be multi-level for encrypted signals where health and test signals are open, but the video and audio essence is not), this would include "bad packets" in a stream even if concealed by other error handling mechanisms.  | Simple and quick testing / troubleshooting is a great value in complex systems that are over-clocked and minimize overall cost and downtime.  |   | Testing    | CoQs         | Mon        |
| 58            | ks       | 6/3/2013 9:18:04   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the system to have one interface (e.g. RJ-45) that can be both "smart" and "dumb" - smart = full host device in a fully-functional network; dumb = RJ-45 plug that auto-configures source-to-sink as easily as a BNC connects connects a baseband video stream from "source" to "sink" device with configuration of network or other parameters. The "dumb" interface could presume, for transition and legacy, that there is only an IP to HD-SDI device to enable transition from legacy infrastructure to IT infrastructure one functional block at a time. | Understanding both the legacy transition as well as a "simple versus complex" facility designs are necessary design values to reduce operational cost.  | [ks] sub-category of Interop is simplicity  | Conf       | Interop      |            |
| 59            | ks       | 6/3/2013 9:19:32   | Cutner    | Craig      | HBO                        |  | craig.cutner@hbo.com           | facility owner                    | need the system to drop and add components, e.g. SCTE triggers, audio metadata and/or other metadata.   | Currently, individual "boxes" are needed to perform disparate functionality. Cost and complexity could be reduced if an overall system design took this need into account at this early stage.                                    | [ks] sub-category of Streams is Virtual Bundles   | Interop    | Open Systems | Streams    |
| 60            | ks       | 6/7/2013 15:16:36  | Doan      | Michael    | Dolby                      |  | md.1@newtbb.com                | product designer                  | Send audio metadata (e.g. RDD-6) over a network along with the audio essence.   | Maintain audio quality, enable loudness management, comply with US FCC CALM reqs.   | [ks] sub-category of Interop is standards   | Interop    |              |            |
| 61            | ks       | 6/10/2013 5:57:16  | Adell     | Quarrel    | TVC                        |  | cadell@t3.cat                  | system engineer                   | would like to use a converged network (local and wide) where high-quality video and audio (as HDSDD), time code synchronized in real-time   | to decrease media production costs meanwhile increasing functionalities and flexibility.  | [ks] sub-category of Streams is Stream Flows  | Prov       | Conf         | Time       |
| 62            | ks       | 6/10/2013 5:58:19  | Adell     | Christian  | TVC                        |  | cadell@t3.cat                  | content provider                  | would simplify how I deliver media streaming (live and on demand) through Internet, automating coding adaptation and file management (classification) using metadata.   | to achieve the production CoQs for end users minimizing our IT system infrastructure.   | [ks] I expect that "minimizing our IT..." was meant to be "optimizing our IT..."  | Streams    | Conf         | Prov       |
| 63            | ks       | 6/10/2013 5:59:11  | Adell     | Christian  | TVC                        |  | cadell@t3.cat                  | content provider                  | would be able to monitor content delivery in real-time and simulate proactively user contexts.  | to improve content delivery workflows and management  | [ks] sub-category of Streams is Virtual Bundles   | Mon        | CoQs         | Conf       |
| 64            | ks       | 6/10/2013 5:59:57  | Adell     | Christian  | TVC                        |  | cadell@t3.cat                  | content provider                  | would have automatic and complete feedback from end users to control audiences from streaming and broadcasting (connected-TV) and be able to adapt adjustments to end users in real-time.   | to maximize benefits for us getting better advertiser's satisfaction.   | [ks] This one doesn't actually fit any of the categories from v4 directly.  | Mon        | Accounting   |            |
| 65            | ks       | 6/10/2013 6:00:42  | Adell     | Christian  | TVC                        |  | cadell@t3.cat                  | system engineer                   | would want an exchange information between media production systems to achieve a more optimal performance.  | to improve media edition workflows.   | [ks] sub-category of Interop is Open Systems  | CoTS       | Interop      |            |
| 66            | ks       | 6/10/2013 6:01:27  | Adell     | Christian  | TVC                        |  | cadell@t3.cat                  | content provider                  | would be able to deliver streaming over Internet without previous commitments (CDN), opening media distribution opportunity to whatever platform interested to deliver content to end users (getting reward from content provider depending on dynamic SLAs)  | The goal will be decrease streaming costs for content providers or at least not increase costs security to end users because an open environment always favor competence.   | [ks] sub-category of Streams is Virtual Bundles   | Interop    | Open Systems | Streams    |
| 67            | ks       | 6/10/2013 10:42:02 | WILLIAMS  | Richard    | Shelter Studios Co.        |  | rich@shelterstudios.com        | As a producer                     | want to be able to capture 40 discrete channels of HD live sound broadcast, with a worst case concurrent accuracy of 3 samples across all channels and with an inter-channel accuracy of no more than 1 sample. HD in this scenario, is taken as meaning, a sampling rate of at least 192kHz at a depth of 24bits.  | So that I can leverage a number of smaller and virtual studio units as part of a production and reduce the associated infrastructure and ancillary costs.   | [ks] sub-category of Interop is Standards   | Interop    | CoQs         |            |
| 68            | ks       | 6/12/2013 11:08:51 | Zheng     | Yuanxing   | BBC                        |  | yuan.xing.zheng@bbc.co.uk      | Architect                         | replace SDN network for both contribution & distribution, audio & video with packeted network. Need to be reliable low delay, and give user confidence.   | cost saving, flexible, integrate with business traffic, agile   |   | Fmt        | CoQs         | Reach      |
| 69            | ks       | 6/12/2013 14:26:25 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production equipment manufacturer | need an interoperability standard including a compliance test system  | I can manufacture plug-and-play products for professional media customers.  | [ks] sub-category of Interop is Standards   | Interop    | CoQs         | Mon        |
| 70            | ks       | 6/12/2013 14:28:24 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need a standard packet-based network infrastructure capable of supporting any media format (audio/video/codec/control/metadata) for interoperability  | I can facilitate new workflows.   | [ks] sub-category of Interop is Open Systems; sub-category of Streams is Virtual Bundles  | Interop    | Streams      | Conf       |
| 71            | ks       | 6/12/2013 14:30:20 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need a standard packet-based network infrastructure capable of supporting any media format at greater-than-or-equal to real-time  | I can accelerate content time-to-market.  | [ks] sub-category of Interop is Open Systems; sub-category of Streams is Virtual Bundles  | Interop    | Streams      | Conf       |
| 72            | ks       | 6/12/2013 14:32:03 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need a standard packet-based network infrastructure capable of supporting any media format that utilizes off-the-shelf IT equipment, software and services  | I can reduce the total cost of ownership.   | [ks] sub-category of Interop is Open Systems; sub-category of Streams is Virtual Bundles  | CoTS       | Interop      | Conf       |
| 73            | ks       | 6/12/2013 14:33:21 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | media system reseller             | verify compliance of end-to-end packet-based network infrastructure installation, certifying functional, performance and reliability to standard interoperability specifications  | I can commission new installations.   |   | CoQs       | Mon          | Testing    |
| 74            | ks       | 6/12/2013 14:35:08 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | live production company owner     | need an infrastructure that guarantees sub-frame delivery latency and frame accuracy of video, audio and ancillary data   | I can increase production value, distribute live content and garner higher revenues for timely program delivery.  | [ks] sub-category of Streams is Stream Flows  | CoQs       | Streams      | Time       |
| 75            | ks       | 6/12/2013 14:36:26 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need a wireless network that guarantees delivery latency and frame accuracy of video, audio and ancillary data  | I can accelerate acquisition set-up, collaboration access, and review & approval workflows to reduce production cost.   | [ks] sub-category of Streams is Stream Flows  | CoQs       | Streams      | Time       |
| 76            | ks       | 6/12/2013 14:39:33 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | network operator or administrator | need connection setup and teardown times to be 0.25 seconds or less   | there is no perceptible lag in the collaboration workflows.   | This addresses the case of using the packet protocol for sharing the video playback on box or more editing systems for collaboration during the editing process   | CoQs       | Conf         | Prov       |
| 77            | ks       | 6/12/2013 14:41:11 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | network operator or administrator | monitor media network traffic   | I can diagnose, support and manage to CoQs agreements.  |   | Mon        | CoQs         | Testing    |
| 78            | ks       | 6/12/2013 14:42:29 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | network operator or administrator | be able to maintain guaranteed latency for media on a mixed-used network  | I do not have to bear the cost of a dedicated/private network for media.  | [ks] sub-category of Streams is Stream Flows  | CoQs       | Mon          | Streams    |
| 79            | ks       | 6/12/2013 14:43:32 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | network operator or administrator | monitor media network usage   | I can account and bill to service agreements.   | [ks] sub-category of Streams is Virtual Bundles   | Mon        | Accounting   | Streams    |
| 80            | ks       | 6/12/2013 14:44:40 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need a scalable infrastructure that load balances to changing simultaneous streams or file transfers and supports auto-configuration of additional resources and functions  | my infrastructure can economically match project needs.   | [ks] sub-category of Streams is Virtual Bundles   | Streams    | Prov         | Reach      |
| 81            | ks       | 6/12/2013 14:45:54 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | production company owner          | need an extensible infrastructure that can address evolving media formats, workflows and interoperability standards without requiring equipment replacement   | my investment is future-proof to the greatest extent possible.  | [ks] sub-category of Interop is Simplicity  | Interop    | Conf         | Reach      |
| 82            | ks       | 6/12/2013 14:46:59 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | video editor / broadcaster        | be able to begin working with material while it is still being transferred  | I can reduce the time to bring a program to air   | [ks] sub-category of Streams is Stream Flows  | Streams    |              |            |
| 83            | ks       | 6/12/2013 14:47:54 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | video editor                      | transform my material through various error-resilient processes without needing to utilize intermediate files between each processing step  | I can reduce the time to bring a program to air   | [ks] sub-categories of Streams are Stream Flows & Virtual Bundles   | Streams    | Prov         |            |
| 84            | ks       | 6/12/2013 14:48:09 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | video editor                      | transform my material through various error-resilient processes without needing to utilize intermediate files between each processing step  | can work with large amounts of material of a wide variety of formats more efficiently.  | [ks] sub-categories of Streams are Stream Flows & Virtual Bundles   | Interop    | Streams      |            |
| 85            | ak       | 6/12/2013 14:50:47 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | facility / plant owner-operator   | synchronize video/audio equipment using the network infrastructure  | I do not need a separate infrastructure for synchronization in order to reduce cost of ownership.   |   | Time       |              |            |
| 86            | ak       | 6/12/2013 14:52:01 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | facility / plant owner-operator   | utilize a protocol for encoding the media signal in such a way that would be suitable for IT equipment to do synchronous switching and routing  | I can avoid the cost of dedicated routing equipment.  |   | Time       | CoQs         |            |
| 87            | ak       | 6/12/2013 14:53:49 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | facility / plant owner-operator   | implement redundant paths in my network   | I can recover from a link failure without having time gaps in the media.  |   | rel        |              |            |
| 88            | ak       | 6/12/2013 14:56:36 | Wallace   | Ron        | Avid                       |  | ron.wallace@avid.com           | video editor                      | be the network infrastructure to be able to mix various qualities of signal in order to change between streaming and high-quality transfers   | I can get the best quality while editing on low-bandwidth connections.  |   | streams    | file         | CoQs       |
| 89            | ak       | 6/13/2013 4:52:24  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to record SMPTE2022 stream to the server directly via 10G Ethernet network.  | We can remove BNC cable from the server and can connect the stream distribution network   | We can remove BNC cable from the server and can connect the stream distribution network. In video editing system,   | streams    | fmt          |            |
| 90            | ak       | 6/13/2013 4:54:19  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to get the data broadcasting of ISDB for monitoring use in a IP based broadcasting station.  | Broadcaster people can check the exact content they are broadcasting.   |   | streams    |              |            |
| 91            | ak       | 6/13/2013 4:59:19  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to ensure that all video transmitting/receiving products are fully interoperable with SMPTE2022 specifications.  | Using many vendors product in one system is possible and the cost can be reduced.   |   | interop    | fmt          |            |
| 92            | ak       | 6/13/2013 5:00:28  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to place TS over IP traffic and standard IP traffic on the same network.   | Hybridcasting can be done over one IP network.  |   | streams    | fmt          |            |
| 93            | ak       | 6/13/2013 5:02:32  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to use IPv6 in the broadcasting station.   | We can avoid IP address number issue of IPv4  |   | interop    |              |            |
| 94            | ak       | 6/13/2013 5:04:36  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to use 4K and 8K contents which can be upconverted or downconverted from current contents.   | 4K and 8K can be supported on the existing network in future.   |   | fmt        |              |            |
| 95            | ak       | 6/13/2013 5:06:40  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to get the specifications of operation for mixing use of uncompressed and compressed contents in unified IP based system   | We can change all system to IP based and reduce total cost.   |   | fmt        | streams      |            |
| 96            | ak       | 6/13/2013 5:06:49  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to have IP based monitoring system which supports program selection and daisy-casting and EPO like with STB for PTV.   | New monitor wall system can be built with lower cost.   |   | streams    |              |            |
| 97            | ak       | 6/13/2013 5:08:17  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to get the specifications of operation for mixing use of streaming contents and file based contents in unified IP based system   | All system can be moved to IP based and total cost can be reduced.  |   | streams    | file         |            |
| 98            | ak       | 6/13/2013 5:09:19  | Kazunori  | Nakamura   | Media Global Links         |  | kazu_nakamura@medialinks.co.jp | Product Marketing                 | want to get the recommended specifications of the network design and multicast method for streaming contents to wide area   | Unified inter-broadcaster network with lower cost can be built.   |   | streams    |              |            |
| 99            | ak       | 6/13/2013 5:40:52  | Fletcher  | John       | BBC                        |  | john.fletcher@bbc.co.uk        | Camera Operator                   | Connect my camera to a packet-based network and have it operational within 10 seconds.  | There is no undue delay when re-positioning a camera.   | With current analog/digital connections for video, sync and timecode, there is very little delay from plugging in a camera to it being operational. A packet-based network architecture should maintain this performance.   | interop    | conf         | prov       |
| 100           | ak       | 6/13/2013 6:56:22  | Fletcher  | John       | BBC                        |  | john.fletcher@bbc.co.uk        | Facility Operator                 | Send video and other streams efficiently to multiple destinations.  | Best use is made of available network bandwidth.  | Looking for best practice on use of multicast.  | interop    |              |            |

| Serial Number | Reviewer | Timestamp          | Last Name  | First Name    | Company                           | Affiliation - consultants, please let us know who you are representing | email address                      | As a (ROLE)                     | I want to (FUNCTION)  | so that (BUSINESS VALUE)  | Notes  | Category 1 | Category 2 | Category 3 |  |
|---------------|----------|--------------------|------------|---------------|-----------------------------------|--|------------------------------------|---------------------------------|---|---|--|------------|------------|------------|--|
| 101           | ak       | 6/13/2013 9:39:48  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | studio engineer                 | want to be able to reference and access my media as individual elemental streams of video, audio and data   | so that I preserve as much flexibility as possible to mix, switch and recombine at any point in the broadcast chain   |  | streams    | int        |            |  |
| 102           | ak       | 6/13/2013 9:40:44  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | studio engineer                 | want to be able to group my individual elemental streams of video, audio and data into bundles of heterogeneous content   | so that I can simplify my routing configuration by reducing the number of independent entities where possible   |  | streams    | int        |            |  |
| 103           | ak       | 6/13/2013 9:42:02  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | studio engineer                 | want simple signal-flow based configuration and automatic deployment that makes decisions based on current system resource utilization/reservation  | so that I can treat the system as a black box, the internals of which I don't need to understand  |  | conf       |            |            |  |
| 104           | ak       | 6/13/2013 9:43:55  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | system engineer                 | want to have access to diagnostic, monitoring and visualization of system in layers from user level signal routing/processing configuration down to the metal on which it's deployed  | so that I can have confidence that it's working correctly and can diagnose problems quickly when they occur   | Deployment of IP systems can be very opaque, intentionally so in the case of cloud-based services. It should "just work" but what about when it doesn't? | mon        | conf       |            |  |
| 105           | ak       | 6/13/2013 9:47:36  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | studio engineer                 | want network transport of streams to be agnostic to the internal format of the video, audio and metadata that is being carried  | so that I can seamlessly transport different media on the same infrastructure and simultaneously provide media to downstream clients in different formats that are appropriate to them  |  | streams    | int        |            |  |
| 106           | ak       | 6/13/2013 9:49:28  | Wadge      | Robert        | BBC                               |  | robert.wadge@bbc.co.uk             | system engineer                 | want to be able to flexibly deploy software-based real-time signal processing and analysis modules in my IP-based flows   | so that I can transcode, analyze and transform my media on the fly to meet the needs of downstream consumers of that media (be that downstream client in my facility or network subscribers)  |  | interop    | streams    | file       |  |
| 107           | ak       | 6/13/2013 10:54:42 | Chandana   | Aljira        | BBC                               |  | ajira@rd.bbc.co.uk                 | system designer                 | minimize the energy use of the network, particularly when idle  | in order to save money and minimize greenhouse gas emissions (and carbon tax).  |  | Accounting |            |            |  |
| 108           | ak       | 6/13/2013 10:56:58 | Chandana   | Aljira        | BBC                               |  | ajira@rd.bbc.co.uk                 | system designer                 | be sure that the equipment used can be easily repaired and maintained rather than having to be replaced   | fewer material resources are used   |  | conf       | Accounting |            |  |
| 109           | ak       | 6/13/2013 10:58:41 | Chandana   | Aljira        | BBC                               |  | ajira@rd.bbc.co.uk                 | system designer                 | be able to easily disassemble the equipment   | it can be remanufactured or recycled  |  | Accounting |            |            |  |
| 110           | ak       | 6/13/2013 12:48:51 | Brightwell | Peter         | BBC                               |  | peter.brightwell@bbc.co.uk         | broadcast producer              | have a consistent approach to real-time control/monitoring events that is decoupled from the mechanism used to ingest the video and audio   | adding real-time information to our content across multiple delivery platforms is simplified.   |  | time       |            |            |  |
| 111           | ak       | 6/13/2013 12:51:07 | Brightwell | Peter         | BBC                               |  | peter.brightwell@bbc.co.uk         | system designer                 | support future coming UHD/TV resolutions using a compression that enable me to manage the production workflow in a smart way with scalable access to ease proxy creation for editing, monitoring and production, to enable fast transcoding or downscaling to HD, and without any visual loss in quality after multiple generation of compression.  | changes to network and format technologies have minimal impact on my control/monitoring infrastructure  |  | mon        |            |            |  |
| 112           | ak       | 6/26/2013 7:45:50  | Lorent     | Jean-Baptiste | intPOX                            |  | ju.lorent@intpox.com               | broadcast engineer              | want to keep the quality of uncompressed video with the benefits of a compression that is easy to implement on existing infrastructure, that offers a visually lossless quality with a low compression ratio, a low complexity, and a latency that does not affect my current infrastructure.   | so that I can have efficient, high quality and economic delivery and content management of current HDTV and future UHD/TV resolutions.  |  | int        |            |            |  |
| 113           | jm       | 6/26/2013 7:55:31  | Lorent     | Jean-Baptiste | intPOX                            |  | ju.lorent@intpox.com               | broadcast engineer              | have open and standardised interfaces   | I can build and adapt systems consisting of different vendor's equipment easily.  | (From Geneva meeting)  | interop    | int        | COTS       |  |
| 114           | jm       | 6/27/2013 5:23:41  | Opfemann   | Hartmut       | Dimension Data Germany            |  | hartmut.opfemann@dimensiondata.com | System integrator               | want to look (and get) a reliable contribution circuit at reasonable costs from any - even remote - location  | a journalist can feed his material to the studio  | (From Geneva meeting)  | Reach      | Prov       | Ref        |  |
| 115           | jm       | 6/27/2013 5:26:52  | Amatucci   | Gaetano       | HR                                |  | gamatucci@hr-online.de             | system engineer                 | use components that use open/standardized interfaces  | I am not locked into a particular vendor's products   | (From Geneva meeting)  | interop    | int        | COTS       |  |
| 116           | jm       | 6/27/2013 5:28:11  | Brightwell | Peter         | BBC                               |  | peter.brightwell@bbc.co.uk         | system designer                 | design engineer, facility owner   | Be able to keep pace with increased quality and platform requirements while meeting required sustainability regulations and reducing energy OPEX costs.   | (From Geneva meeting)  | Accounting |            |            |  |
| 117           | jm       | 6/27/2013 5:29:08  | Chambers   | Chris         | BBC                               | BBC RAD  | chris.chambers@rd.bbc.co.uk        | design engineer, facility owner | Use the same synchronization protocol to all of my video- and audio equipment   | I don't have to spend time and money to implement different standards in my facility.   | (From Geneva meeting)  | interop    | Time       |            |  |
| 118           | jm       | 6/27/2013 5:29:23  | Storaas    | Tore          | TV 2                              |  | tor@tv2.no                         | System designer                 | Assist or not hinder the creative process through use of technology   | I have more programming ideas to choose from and fresher material coming from the ideas I've chosen   | (From Geneva meeting)  | Prov       | Conf       |            |  |
| 119           | jm       | 6/27/2013 5:31:12  | Gross      | Kevin         | AVA Networks                      |  | kevin.gross@avanw.com              | Production supervisor           | never make on-air mistakes  | productions can be set up quickly   | (From Geneva meeting)  | Ref        | Prov       |            |  |
| 120           | jm       | 6/27/2013 5:33:20  | Kevin      | Gross         | AVA Networks                      |  | kevin.gross@avanw.com              | Operations manager              | convert a camera or other source into a network port and start using it with minimal manual intervention  | Greatly simplify Media Transfer operations.   | (From Geneva meeting)  | Conf       | Prov       | Interop    |  |
| 121           | jm       | 6/27/2013 5:35:03  | Brightwell | Peter         | BBC                               |  | peter.brightwell@bbc.co.uk         | facility operator               | reduce technical design and operations staff to the bare minimum  | reduce overhead and improve operating margins   | (From Geneva meeting)  | interop    | Conf       | COTS       |  |
| 122           | jm       | 6/27/2013 5:35:28  | Rodgers    | Roland        | BBC NI                            |  | roland.rodders@bbc.co.uk           | Director                        | avoid vendor lock-in  | use competition to reduce cost and increase innovation from vendors   | (From Geneva meeting)  | interop    | int        | COTS       |  |
| 123           | jm       | 6/27/2013 5:35:44  | Kevin      | Gross         | AVA Networks                      |  | kevin.gross@avanw.com              | company owner                   | blind media IDs such as AD-ID and EIDR to media   | reliably identify media elements, accurately fulfill distribution, and enhance audience measurement   | (From Geneva meeting)  | Streams    | int        |            |  |
| 124           | jm       | 6/27/2013 5:37:43  | Gross      | Kevin         | AVA Networks                      |  | kevin.gross@avanw.com              | Facility designer               | Where near-instant delivery of high-quality content is not possible (e.g. bandwidth restrictions), I want a low-quality version to be made available very quickly, with progressively higher-quality versions following on automatically.   | This will allow adequate coverage of "breaking news" type events to be carried as quickly as possible, while still preserving the quality of the content held in the archive.   | (From Geneva meeting)  | Streams    | Prov       | Reach      |  |
| 125           | jm       | 6/27/2013 5:38:30  | Edwards    | Thomas        | FOX                               |  | thomas.edwards@fox.com             | Content distributor             | restricted or sensitive material does not leak outside the authorized users.  | For example materials where rights are not available in certain regions, obligatory elements, or material used for research into programs on sensitive topics (e.g. child porn). (From Geneva meeting)  | (From Geneva meeting)  | Security   | Interop    | Best       |  |
| 126           | jm       | 6/27/2013 5:39:42  | Ellis      | Mike          | BBC                               |  | mike.ellis@bbc.co.uk               | technical architect             | Parallelism   | Link costs and service requirements to deliver the best user experience using the appropriate connectivity as they become available.  | (From Geneva meeting)  | COTS       | int        | Prov       |  |
| 127           | jm       | 6/27/2013 5:43:50  | Ellis      | Mike          | BBC                               |  | mike.ellis@bbc.co.uk               | technical architect             | Use IT and communication transport technologies at the lower layers for what they are good at. Convergence could and should occur at the policy, security and management levels.  | Many current systems only inter-operate by converting to SDI and back again   | (From Geneva meeting)  | COTS       | Interop    | int        |  |
| 128           | jm       | 6/27/2013 5:45:08  | Chambers   | Chris         | BBC                               | BBC RAD  | chris.chambers@rd.bbc.co.uk        | Research, Design engineer       | use commodity technologies as easily as I use the lingua franca SDI today   | our team can (re)view what will the programme will look like asap and shorten the production cycle  | (From Geneva meeting)  | interop    | File       | Conf       |  |
| 129           | jm       | 6/27/2013 5:47:04  | Ellis      | Mike          | BBC                               |  | mike.ellis@bbc.co.uk               | technical architect             | be able to start work on "post-production" on live content as it is being captured  | The current limit of ~1100 square SDI video routers no longer hampers station design  | (From Geneva meeting)  | interop    | Conf       | COTS       |  |
| 130           | jm       | 6/27/2013 5:50:37  | Brightwell | Peter         | BBC                               |  | peter.brightwell@bbc.co.uk         | production user                 | A solution which scales up massive routing solutions  | Flows must be managed in terms of provisioning and configuration. Without these functions, path QoS and security will be sacrificed. This ability is mandatory in a well-managed facility and should be part of the recommendations from the JTF. | (From Geneva meeting)  | Conf       | COTS       | Streams    |  |
| 131           | jm       | 6/27/2013 6:13:06  | Ellis      | Mike          | BBC                               |  | mike.ellis@bbc.co.uk               | technical architect             | The need to easily provision a media facility is network flows including AV streams, file transfers, real-time control, storage access, and intermittent non-media traffic. Each flow type should be characterized by one or more of: (1) guaranteed set bandwidth and other QoS params including lossless and best effort, (2) connection end point permissions, (3) point to multipoint configuration, (4) segmenting flows into virtual groups, and (5) security profiles per flow or group. Additionally, the entire system configuration should be adjustable on demand. | This category falls into the management plane of the 3 plane model.   | (From Geneva meeting)  | Conf       | COTS       | Streams    |  |
| 132           | jm       | 6/27/2013 11:24:20 | Kovalick   | Al            | Media Systems Consulting          | Fox TV Network   | kovalick@pacbell.net               | Facility Owner                  | real-time connection from event points to the broadcasting organization   | that I can reduce the complexity and cost of OB vans on location  | (From Geneva meeting)  | Prov       |            |            |  |
| 133           | jm       | 6/28/2013 13:14:47 | Poulin     | Felix         | EBU - European Broadcasting Union |  | poulin@ebu.ch                      | Media Producer                  | Remote control my cameras   | I can save not sending cameramen on site  | (From Geneva meeting)  | Streams    | Prov       | Interop    |  |
| 134           | jm       | 6/28/2013 13:17:29 | Poulin     | Felix         | EBU - European Broadcasting Union |  | poulin@ebu.ch                      | Media Producer                  | to get the visibility on the media signals (audio/video/time and fixed data/control)  | I can troubleshoot and fix problems as quickly as in the SDI world  | (From Geneva meeting)  | Mon        | int        |            |  |
| 135           | jm       | 6/28/2013 13:20:09 | Poulin     | Felix         | EBU - European Broadcasting Union |  | poulin@ebu.ch                      | Operation technician            | to be able to compose the audio/video, pull contextual data and interact with the content producer live   | I can monetize (or add value) for personalized user experience  | (From Geneva meeting)  | Streams    | Prov       | Reach      |  |
| 136           | jm       | 6/28/2013 13:25:15 | Poulin     | Felix         | EBU - European Broadcasting Union |  | poulin@ebu.ch                      | Content producer                | be able to send light and compact fly away kit that requires minimal installing staff and that is quick to setup and troubleshoot and that can be operated remotely from the production house   | I save on transport cost, installation time and on location staff   | (From Geneva meeting)  | COTS       | Conf       | Accounting |  |
| 137           | jm       | 6/28/2013 13:29:46 | Poulin     | Felix         | EBU - European Broadcasting Union |  | poulin@ebu.ch                      | Media Producer                  |   |   |  |            |            |            |  |

## **Requirement 2: Formats**

As a participant in the television equipment food chain (vendor, integrator, architect, operator), I want the signal formats inside the packet-based media networks of the future television plant to:

1. be well documented in an interoperable-standards-actually-followed sense
2. be supportive of current media operations such as mixing, cross-fading, DVE, and voice-over;
3. be able to manage compression concatenations, and supporting arbitrarily good picture quality (up to lossless when conditions allow);
4. be based on well-understood and generally-available compression and networking technologies;
5. be able to address parts of signals (audio, video, metadata) in addition to whole signals;
6. be able to support the expected hegemony of current and future image formats, frame rates, and file types;
7. provide easy, fast, reliable connections;

So that high-functionality facilities can be constructed using equipment from multiple vendors with an expectation of excellent interoperability and a high-quality output signal.

## **Requirement 3: Streams**

As a system designer or facility operator I want facility-wide media/data real-time streaming so I can stream:

1. real time audio+video+data muxed and synced streams (see Time story);
2. self-describing streams that identify: stream ID, contents, owners, other;
3. virtual bundles: separate streams and data paths logically grouped as one;
4. nearly equivalent SDI functionality (see QoS story);
5. legacy SDI payloads carried in a stream (backwards compatibility);
6. across an infrastructure enabled to carry future (4K+) payloads;
7. using multicast support (as with SDI today);
8. media switchable on video frame or audio frame boundary by COTS (Commercial Off-the-Shelf) switches (see Time story);
9. media switched in facility router using COTS products and components
10. packet-based network switches (see COTS story);
11. across an infrastructure that scales from small to large installations;
12. provisioned with ease (see Provisioning story);
13. configured with ease (see Configuration story);

14. in a payload agnostic manner; compressed or uncompressed support;
15. with easy access from any node connected to the packet-based network;

So that I can build agile, real time, lossless, low latency, workflows with the ability to trade off QoS, formats, and reach.

#### **Requirement 4: File**

As a system architect, product designer, manufacturer, or system engineer, I want to:

1. be able to mix streaming-based and file-based content in the same unified packet-based system to published standardized specifications;
2. be able to define QoS levels for file transfer for local, remote and local/remote file transfers;
3. be able to have multiple levels of file transfer QoS;
4. be able to monitor QoS deliver-to-commit and make adjustments by level criteria;

So that I can use files and streams in a unified packet-based system and to ensure that files are consistently delivered when they are needed and am able to make the trade-offs of cost and complexity for reduced/extended transfer times.

As a facility or production company owner, a producer or content provider, or a system engineer, I want to:

5. be able to begin work on “post-production” on live content as it is being captured;
6. be able to (re)view what the program will look like in near real time;
7. be able to use software-based real-time signal processing and analysis modules in the packet-based file-based flows;
8. be able to transcode, analyze and transform content on-the-fly;

So that I can shorten the production cycle and meet the needs of the downstream consumers of media.

As a video editor, I want to:

9. be able to mix various qualities of signal;
10. be able to change dynamically between streaming and high-quality transfers;

So that I can get the best signal and content quality while editing on low-bandwidth connections.

## **Requirement 5: Reach**

I want to exploit the near-ubiquitous reach and rapidly increasing bandwidth of the globally connected packet-based networks (including private leased links and also the public internet) in order to:

1. be able to easily, securely, effectively browse media and exchange files with peers at other organizations;
2. be able to quickly create ad-hoc live interconnections that are able to utilize the available network;
3. be able to combine the above to leverage geographically distributed content, staff, and equipment as if they were inside my four walls;

So that I can improve time-to-air and improve staff, equipment, and budget utilization.

## **Requirement 6: Interoperability**

As a system architect, product designer or manufacturer, I want to:

1. be able to use readily available and accepted packet-based standards, technology (e.g., standardized compression), interfaces (e.g., APIs), components and products in a multi-vendor environment;
2. be able to use software-based real-time signal processing and analysis modules in the packet-based file-based flows;
3. be able to ensure that all network-attached devices are designed and tested to operate in likely real-world scenarios;
4. be able to ensure that all network-attached devices are able to manage through and deal with dropped packets and out-of-order delivery;
5. be able to have control surfaces that are conceptually decoupled from the software control APIs of the underlying infrastructure and equipment;
6. be able to use “format agnostic” technologies;
7. be able to send audio (e.g., RDD-6) and audio essence through the entire network;
8. be able to design and manufacture systems and test compliance to an industry-standard interoperability specification;
9. be able to ensure that network-attached devices transmitting / receiving video are fully interoperable with SMPTE 2022, existing synchronization protocols for video and audio, and other relevant specifications;
10. be able to use IPv6 for the packet-based network;
11. be able to store, retrieve and exchange media and information between media production systems using media production-oriented standards-based protocols;

So that my operations are optimized, I can have maximum vendor sourcing flexibility through “plug-and-play”, “future proof” my system designs, I can choose the appropriate human interfaces for the evolving workflows independently of core infrastructure, maintain quality and compliance with broadcast regulations (e.g., US FCC CALM), I can manage the large (and growing) number of network-attached device addresses, and I can meet the media format needs of my downstream customers.

As a facility or production company owner or producer or content provider, I want to:

12. be able to identify primary and backup paths for the content throughout the packet-based network in a “federated” manner;
13. be able to use “self-contained” / “self-defining” streams with software-defined connections and/or physical-only connections;
14. be able to have the equivalent of the broadcast “tally” system in the packet-based network that provides downstream/upstream “on-air” status;
15. be able to include communications (e.g., “intercom”) along with content streams,
16. be able to dynamically add and remove components (e.g., SCTE triggers, audio and/or other metadata) from the system;
17. be able to dynamically decide to deliver streaming media over the public Internet using a Content Delivery Network (CDN) through a standards-based ecosystem including the dynamic negotiation of SLAs;
18. be able to capture a specified number of discrete channels of HD live video and sound broadcast with a specified accuracy and sampling rate and bit depth;
19. be able have a standards-based packet-based network infrastructure capable of supporting any media format at greater-than or less-than real-time, “format agnostic”, including capability for timecode, control and metadata;

So that I can have the redundancy, resiliency, reliability, simplicity, scalability, serviceability in the IT environment but with the “mission critical” real-time nature of broadcast in a live or near-live production environment in a way that allows me to repurpose “boxes” and “functionality” as my needs change regardless of “real” versus “virtual” studios to accelerate time-to-market of my content.

As a video editor or camera operator, I want to:

20. be able to transform my media material and content through error-resilient processes without needing to use intermediate files between each processing step;
21. be able to connect my camera to a packet-based network and have it operational “immediately”;



So that I can work with large quantities of material in a wide variety of formats simultaneously and effectively and I am able to capture material in a timely manner even when repositioning the camera(s).

### **Requirement 7: Configuration**

As a Facility Operator, I want to have flexible error-free configuration to:

1. be able to quickly add and configure new equipment and elements;
2. be able to have the additions be intelligent and highly automated;
3. be able to have an excellent management/monitoring view of the system;
4. be able to deal with the variety of formats, stream-types, and file types likely to come in the future in a “format agnostic” manner;

So that I can be on-air quickly, avoid the human mistakes and errors associated with high-complexity repetitive engineering tasks, to understand faults in a timely manner and to be “future proofed.”

### **Requirement 8: Testing**

As a facility owner, a media system reseller, or a network operator or administrator I want to:

1. be able to simply identify streams;
2. be able to see streams visually;
3. be able to quality test streams including pass/fail non-destructively in a straight-forward manner;
4. be able to test encrypted and non-encrypted streams;
5. be able to test streams for standard broadcast-style quality measures and standards and for packet-based quality measures and standards;
6. be able to verify compliance of the end-to-end packet-based network infrastructure to installation, function, performance, reliability and interoperability specifications;
7. be able to monitor media network traffic;

So that I can ensure that these complex systems are operating as required, diagnose, support and manage to QoS agreements, and minimize overall costs and downtime.

## **Requirement 9: Provisioning**

As the systems engineer of a professional media facility I want to:

1. be able to use state-of-the-art tools to deploy professional media connectivity whenever and wherever I need it;
2. be able to send professional content over the Internet, meeting our quality needs, but taking advantage of the self-routing and self-provisioning capabilities of the Internet;
3. be able to set up a feed from a remote camera (which can be robotically controlled) within 10 seconds from the time it is first connected to the network;
4. be able to have my infrastructure scale automatically with load balancing capabilities that take advantage of various links available;
5. be able to have my workflow automatically adjust to incorporate the correct transcoding so that when I provision a circuit to a destination the format type is correct;
6. be able to quickly set up efficient distribution networks that deliver the same content to multiple places;
7. be able to provision a link at a low quality initially, if that is all that is available, but then allow the quality to improve as resources become available;

So that I can rapidly meet the business-driven operational needs of my company and make economical decisions about the links I use for transport of professional media.

## **Requirement 10: Security**

As a broadcast media organization, I want to:

1. protect content and infrastructure from unauthorized access

So that restricted or sensitive material does not leak to unauthorized users, I can prevent my operation from being disturbed by malicious actions and no one can conduct unauthorized activities under the name of my organization.

## **Requirement 11: Reliability**

As a professional media organization, I want to:

1. implement redundant paths in my network to ensure that the facility does not contain single points of failure which can impact the work in multiple studios simultaneously;

2. identify primary and backup paths of the same stream; switching among those paths should be seamless;
3. ensure that a failure of one system in a studio is contained within that system and cannot affect other systems in that studio, or other studios in that facility;
4. eliminate making on-air mistakes;
5. include an equivalent function of the broadcast “tally” system in the packet-based network so that devices downstream or, in a routing infrastructure, can understand a bidirectional (upstream/downstream and vice-versa) status of “on-air” so that inadvertent system changes could be locked-out (or prioritized to administrative / override) status;
6. know the key system reliability specifications that constitute an "enterprise-class" network switch/router that will be able to transport high-bitrate video signals in a live television production environment;

So that broadcasting can continue without interruption even in the event of failures (including configuration errors) of shared systems and I can recover from a link failure without having time gaps in the media. And, so that I can effectively communicate with suppliers to explain my requirements and appropriately evaluate products for use in my facility.

### **Requirement 12: Monitoring**

As a maintenance person or as a facility operator of a professional media facility I want to:

1. be able to see decoded video and audio at any point in my facility;
2. be able to determine correctness of MPEG or other compression bit streams at any point in my facility;
3. be able to monitor and analyze packet-based network or Ethernet errors at any point in my facility;
4. be able to simply identify and test signals at any point in my facility (e.g. see a thumbnail view of the video, verify presence of audio - simple pass/fail);
5. be able to monitor systems for compliance with QoS agreements or for system commissioning and acceptance;
6. be able to observe packet-based network statistics and trends;
7. be able to decouple monitoring from mechanism used to transport content;
8. be able to deploy automated monitoring and alarm systems;
9. be able to allow multiple users to simultaneously monitor the same point in a system;
10. be able to see a ‘dashboard-view’ roll-up of important routes and flows in my facility;
11. be able to remotely monitor video, audio, metadata and network performance parameters in real time;

12. count on a constant amount of delay between the time a signal is present at the source and the time it appears at a monitoring point (zero delay would be preferable);

So that I can provide the Quality of Experience (QoE) that my business management expects me to maintain for consumers of our media products, so that I can quickly determine the location of errors or outages and take appropriate remedial action, and so that I can quickly and simply verify the presence or absence of critical systems to be able to troubleshoot and restore media services.

### **Requirement 13: Quality of Service (QoS) for Streams**

As a system designer or facility operator I want to transport synchronized, end-to-end, real-time, muxed or individual, audio/video/metadata streams over the packet-based network with:

1. video-frame/audio-sample time accuracy;
2. very low latency;
3. lossless transport;
4. rate-sufficient to meet the needs of current and future format payloads;
5. transport over local and campus networks;
6. each stream or group of streams having selectable QoS profile that is defined by the system configuration;
7. the ability to support a high profile with SDI-like (or AES3-like) performance and lower level profiles that sacrifice SDI-like (or AES3-like) performance in one or more degrees;

So that I can configure agile media workflows and transport real-time AV streams using the packet-based network in my facility and be able to select QoS profiles and tradeoff costs and performance depending on business needs.

### **Requirement 14: Quality of Service (QoS) for File Transport**

As a system designer or facility operator I want to transport media files between endpoints in non-real-time using a packet-based network with:

1. adjustable and deterministic transfer time;
2. bounded loss;
3. rate-sufficient to meet the needs of current and future format payloads;
4. with transport over local, campus networks and Internet;

So that I can configure agile file-based media workflows and transport media files using the packet-based network in my facility and be able to select between QoS profiles and tradeoff costs and performance depending on business needs.

### **Requirement 15: Time**

As a system designer I want facility-wide timing methods such that I can accomplish the following:

1. keep multiple A+V streams in the same transport in sync (lip sync);
2. keep multiple, separate A+V stream transports, synced together (link sync);
3. keep streams and end points synced to a house reference (nodal sync);
4. enable frame (or audio sample) accurate switching of real time AV synced streams (synced switching);

So that I can coordinate facility streams in lock step for sourcing, sinking, mixing, displaying and grooming to create agile real time workflows.

### **Requirement 16: Accounting / Monetization and Revenues**

As a professional media content producer, I want to:

1. distribute content to end users and to content aggregators over public packet-based networks, with clear traceability and rights management;
2. be able to adapt content and advertisements to end user in real-time based on their feedback and information;
3. allow the viewer to compose the audio/video, pull contextual data and interact with me lively;
4. monitor media resources (network/processing/storage) usage;

So that I can gain more revenue from each of my content sources, through larger numbers of subscribers, maximize benefits for us getting better advertiser's satisfaction and personalized user experience and I can bill to service usage.

## Requirement 17: Accounting / Expense Control and Sustainability

As a professional media organization, I want to:

1. be able to separate the physical locations of control surfaces, capture, routing and processing resources;
2. replace O/B van functionality by light and compact fly away kit that requires minimal installation staff and that is quick to setup and troubleshoot and that can be operated remotely from the production house;
3. monitor resources (network/processing/storage) usage;
4. minimize the energy consumption of storing, streaming and moving media around the network, particularly when idle;
5. be able to easily repair, upgrade, maintain and disassemble the equipment when decommissioned;
6. ensure the longevity of my design by using future proof technologies;

So that I have the freedom to deploy people and technology in the most cost and process-efficient way, save on transport cost, installation time and travelling of operating staff, and pay only for the resources that I use. I can also meet “carbon consumption” regulations, reduce OpEx on energy spend and carbon tax and protect myself against possible future resource shortages. And so that the system being built will remain valid when the requirements gets stricter (e.g., when I am required to support a higher resolution picture, I will have enough bandwidth to do so).

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