Joint Task Force on Networked Media (JT-NM)
Gap Analysis Report

23 December, 2013

For more info on the *Task Force*, go to tech.ebu.ch/jt-nm.

For any question, please e-mail: jt-nm-adm@videoservicesforum.org

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Executive summary

The European Broadcasting Union (EBU), the Society of Motion Picture and Television Engineers (SMPTE), and the Video Services Forum (VSF) are co-publishing this Gap Analysis as part of the activities of the *Joint Task Force on Networked Media (JT-NM)*. The *Joint Task Force on Networked Media* [hereafter referred to as "*we*" and the *Task Force*] has been created to help manage the transition from infrastructures that are based on purpose-built broadcast equipment and interfaces (SDI, AES, etc.) to IT infrastructure and packet networks (Ethernet, IP, etc.). This effort spans the entire professional media industry and all of its applications, including live and file-based. The Task Force was an open initiative, open to all those interested.

The *Task Force* has maintained a very aggressive schedule. It issued an initial Call for Participation on April 15, 2013. It then collected business-driven User Requirements and published the Report on User Requirements on July 15, 2013. On September 12th, 2013, it issued a Request for Technology (RFT) in order to identify the Technologies, current or in development that can fulfil one or more of the User Requirements. Responses to the RFT were due on November 1, 2013. Thirty-six companies notified us that they were going to submit responses to the RFT and we received 27 actual submissions. The respondents submitted a total of 66 Technologies to be applicable to the Use Cases and User Requirements. We then conducted a gap analysis, looking at the responses to the RFT and comparing them to the User Requirements. The gap analysis was completed, and the report published on December 16, 2013.

The *Task Force* has pursued this timeline because we felt it was critical to get information about networked media technology out to the industry before it became irrelevant. We are aware that several proprietary networked media solutions exist. In spite of that fact, there is a demand in the industry for interoperable, open systems that allow the mixing and matching of products from different vendors to meet users' needs. There is a strong sentiment both in the user and manufacturer communities that managing the transition from traditional infrastructures is critical in order to provide the required user functionality and to avoid waste both in terms of cost and time.

In performing the gap analysis, we looked at the respondent's statement about which of the User Requirements their submission addressed. Some respondents stated that their proposed Technologies cover all User Requirements. The submissions were not evenly distributed across the requirements; "CONFIG" received the most and "MONETIZE" received the least.

The Gap Analysis did *not* include either a comparative analysis or qualitative comparison; the submissions by the respondents were compiled and applied as submitted. While the aggregation of all responses indicates that there are no gaps left unfilled, we believe that the overall process lacked the rigor to prove that all User Requirements are, in fact, satisfied.

Potential future activities will be discussed between the three sponsoring organizations. It is important to note that, while there may be follow-on activities in this *Task Force*, there may be activities that are carried out by individual organizations or other industry groups. The

sponsoring organizations intend to make an announcement regarding future activities sometime in the first quarter of 2014.

Finally, we provide links in this report to all of the original submissions. If you download one or two of them and find them lacking, don't give up. There is a great variation in the level of detail and in the overall thoroughness of the responses received.

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1. Notices

1.1 Disclosure of Patent Information

IT IS IMPORTANT TO CAUTION READERS THAT SEVERAL OF THE RESPONSES REFERRED TO IN THIS DOCUMENT CONTAIN DISCLOSURES OF SPECIFIC PATENT INFORMATION. SOME COMPANIES AND INDIVIDUALS MAY WANT TO LIMIT THEIR EXPOSURE TO THIS INFORMATION. THIS GAP ANALYSIS DOCUMENT DOES NOT CONTAIN ANY IDENTIFYING INFORMATION REGARDING DISCLOSED PATENTS. HOWEVER, IN THIS GAP ANALYSIS, WE PROVIDE DIRECT LINKS TO THE FULL SUBMISSIONS OF EACH RESPONDENT. FOLLOWING THOSE LINKS MAY EXPOSE THE READER TO SPECIFIC PATENT INFORMATION.

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1.2 Disclaimer

THE DRAFTING TEAM OF THE JOINT TASK FORCE ON NETWORKED MEDIA HAS MADE EVERY EFFORT TO ACCURATELY REFLECT THE INFORMATION CONTAINED IN THE RESPONSES TO THE RFT IN THIS REPORT. HOWEVER, IT IS ENTIRELY POSSIBLE THAT ERRORS HAVE BEEN MADE IN TRANSCRIBING SOME OF THE INFORMATION FROM THE SUBMISSIONS, GIVEN THE VOLUME AND FORMATTING OF THE RESPONSES RECEIVED. WE MAKE ABSOLUTELY NO REPRESENTATIONS OR WARRANTY REGARDING THE COMPLETENESS OR ACCURACY OF THE INFORMATION WHICH WE HAVE TRANSCRIBED FROM THE ACTUAL SUBMISSIONS. LINKS ARE PROVIDED IN THIS REPORT SO THAT THE READER MAY DOWNLOAD AND VIEW THE ACTUAL SUBMISSIONS FROM RESPONDENTS DIRECTLY.

2. Business-Driven User Requirements

We began our activities by collecting business-driven User Requirements for networked media using the form in Annex C. Many media organizations responded to our Call for Participation, and in the end, we collected 136 User Requirements. We made no attempt during the collection process to filter responses. However, each requirement was submitted using a standardized form to ensure that the stories all adhered to the following format: As a [ROLE] I want to [FUNCTION] so that [BUSINESS VALUE]. The form required that submitters give a business value for each function described. We hope that using this format has kept submissions focused on business objectives.

As we began to review the submissions, we noted that a number of the requirements overlapped, or touched on common themes. In order to make the process more manageable, the RFT drafting team reduced the original User Requirements to sixteen super User Requirements (Use Cases). These super User Requirements are reproduced in Section 5., "Summary of Individual Responses" of this gap analysis report. A summary of the original user stories may be found here: Original User Story Submissions.

3. Analysis of User Requirements

In this section we look at the User Requirements collected, and at how well each User Requirement was covered by the responses received.

We asked each respondent to separately identify each Technology they were submitting. We then asked them to tell us to what degree - “Fully”, “Partially”, or “Not” - they covered each User Requirement. We then tallied up the number of full or partial responses for each User Requirement, and calculated the percentage of coverage that User Requirement received based on the total number of Technologies submitted. Put another way, we calculated the percentage of submitted Technologies that addressed each User Requirement. The results are shown in Figure 1. A few responses did not use the words we asked for, and therefore they were labeled “Response Unclear”.

In the RFT, each User Requirement (CONFIG for example) was further broken down into several Use Cases (e.g. CONFIG-1, CONFIG-2, etc.). We looked at all of the Technologies submitted, and for each Use Case (e.g. CONFIG-1), we counted up the number of times a respondent said they “Fully” met that Use Case. We divided that number by the total number of Technologies submitted (sixty six), and then multiplied by 100 to convert this number to a percentage. In the case of CONFIG-1, 20 submissions said they “Fully” met that requirement, so (20/66)*100 = 30%. We did the same thing for all the “Partial” responses. In the case of CONFIG-1, 9 submissions said they “Partially” met that requirement, so (9/66)*100 = 14%. We did this for all Use Cases (e.g. CONFIG-1 through CONFIG-5). We then took the average across all of the Use Cases for “Fully” and “Partial” responses and these values were used to build the bar given in Figure 1. for the User Requirement CONFIG.

Respondents submitted more Technologies addressing CONFIG than any other User Requirement, providing a little over 41% coverage considering both “Fully” and “Partial” responses. At the other end of the spectrum, just more than 13% of the Technologies submitted covered the MONETIZE Requirement.

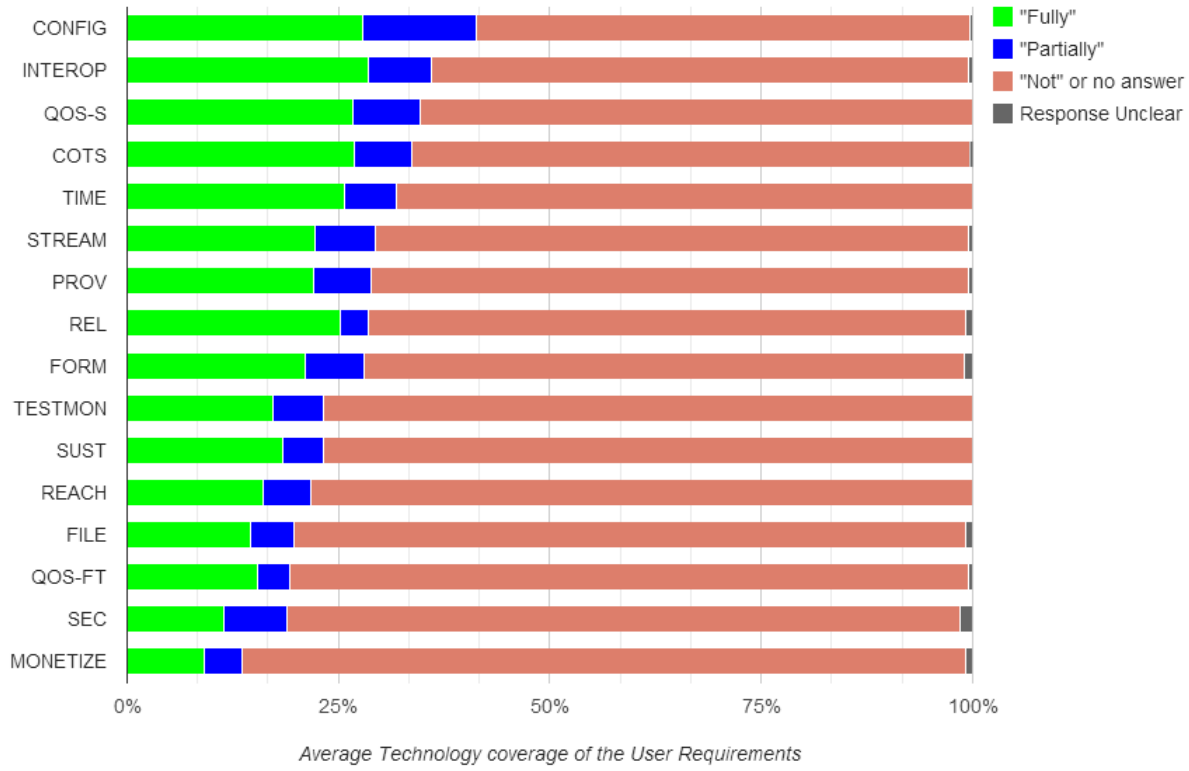

Figure 1. User Requirements and Average Technology Coverage

We compiled other graphs as well. Figure 2 is an example that shows the number of Submitted Technologies for each User Requirement where the respondents stated that they either “Fully” or “Partially” satisfied the Requirement. These graphs have been prepared for each of the User Requirements, as you will see below.

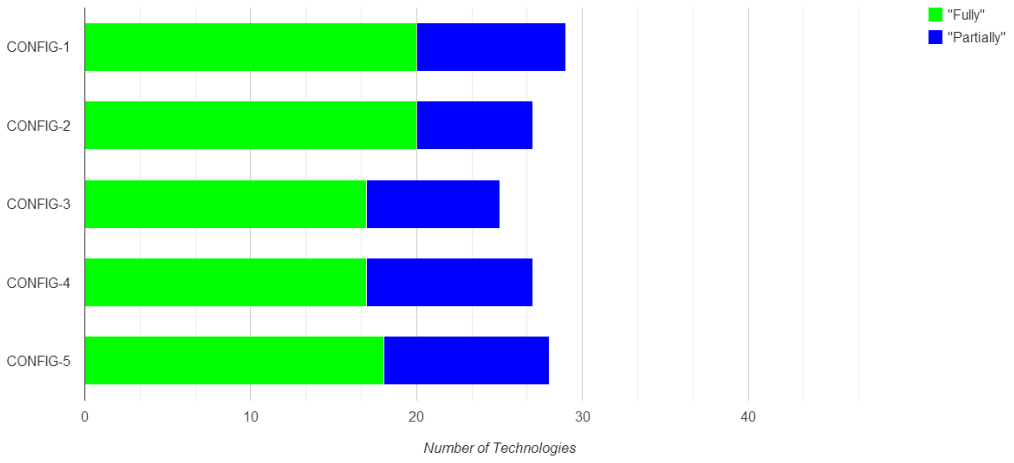

Figure 2. Example graph

For example, reading the chart above:

- The Number of Technologies submitted and identified by the respondents as “Fully” addressing the User Requirement CONFIG-2 was 20.

- The Number of Technologies submitted and identified by the respondents as “Partially” addressing the User Requirement CONFIG-2 was7 (easiest read by taking the total of ~27 and subtracting the number of “Fully” of ~20 from it).

- The total Number of Technologies submitted and identified by the respondents as “Fully” + “Partially” addressing the User Requirement CONFIG-2 was 27.

It’s important to consider, as pointed-out earlier, that the Technologies are “as submitted” by the respondents and do not reflect any review for accuracy by the members of the *Task Force*.

3.1 Configuration (CONFIG)

As a facility operator, I want to have flexible error-free configuration to:

(CONFIG-1) be able to quickly add and configure new equipment and elements;

(CONFIG-2) be able to auto-discover devices attached to the network;

(CONFIG-3) be able to have the configuration of devices be intelligent and highly automated;

(CONFIG-4) be able to have an excellent management/monitoring view of the system;

(CONFIG-5) be able to deal with the variety of formats, stream-types, and file types.

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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given CONFIG category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

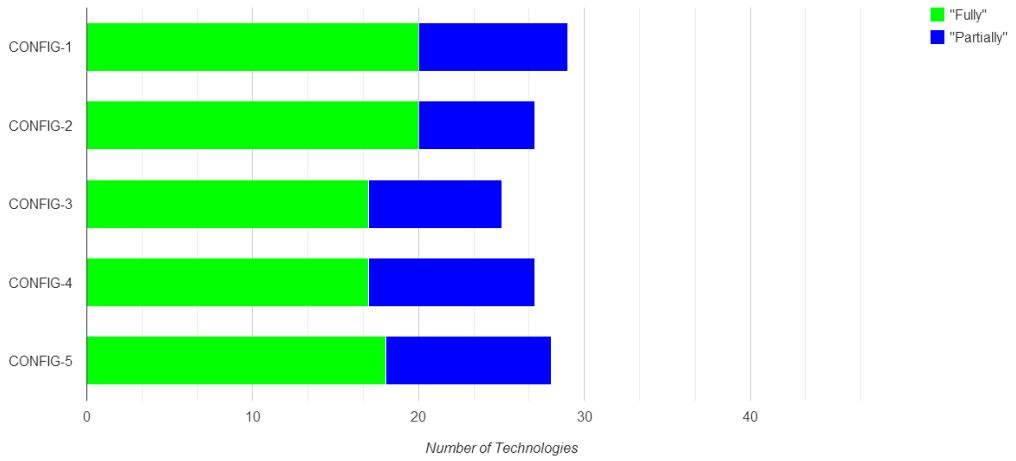

Figure 3. User Requirement CONFIG vs. the number of Technologies submitted that fully or partially met this requirement.

More respondents to the RFT indicated they satisfied this User Requirement than any other; 41% of the Technologies submitted by the respondents were asserted to either fully or partially met this requirements. Of the five CONFIG User Requirements, the top one was CONFIG-1, *"be able to quickly add and configure new equipment and elements".*

While there were a number of responses addressing the CONFIG requirements, it is important to point out that many of these submissions were for very different, non-interoperable solutions. 'A lot of' submissions does not equate to compatible, interoperable submissions, in fact, far from it. Also, many of the submissions addressing CONFIG were Grand Solution sets, meaning that they provided a wide range of solutions to the User Requirements listed in the RFT. These are typically "all or nothing" solutions which deal with configuration as part of a larger, overall system.

3.2 Commercial Off-The-Shelf (COTS)

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

(COTS-1) Take advantage of the marketplace economics of IT Technology;

(COTS-2) Make use of the extensive and well trained base of design and maintenance personnel available in this field;

(COTS-3) Deploy enterprise-class capabilities and redundancy options;

(COTS-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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given COTS category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

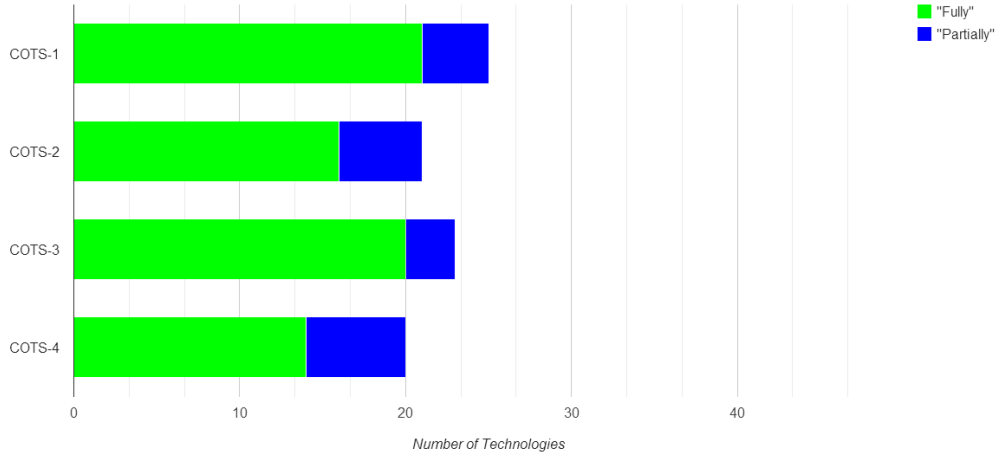

Figure 4. User Requirement COTS vs. the number of Technologies submitted that fully or partially met this requirement.

COTS received the fourth-most Number of Technologies submitted by respondents to the RFT, with about one-third (~34%) of the respondents saying they either “Fully” or “Partially” met this requirement. Of the four COTS User Requirements, the top one was COTS-1, *“Take advantage of the marketplace economics of IT Technology.”*

As with CONFIG, it makes sense that the majority of the submissions for COTS would be grand solutions sets as it is a design, interoperability and sourcing approach that would be expected to permeate an entire Technology whether it is software, interfaces, hardware, firmware or a combination.

Also, most of the respondents submitting Technologies for COTS also submitted ones for INTEROP, reflecting the connection between using COTS Technologies and approaches and the interoperability that doing so can bring.

Even with a third of the respondents submitting Technologies as “Fully” or “Partially” addressing the COTS Requirements and with more than 20 Technologies submitted for each of the COTS Requirements, it is still the case that the vast majority of solutions available today are not COTS-based (and are not INTEROPerable). As identified in the CONFIG section, very few CONFIG requirements were identified as also applying to COTS requirements.

3.3 File-based (FILE)

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

(FILE-1) be able to mix streaming-based and file-based content in the same unified packet-based system that conforms with published standardized specifications;

(FILE-2) be able to begin work on “post-production” on live content as it is being captured;

(FILE-3) be able to view what the program will look like in near real time;

(FILE-4) 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:

(FILE-5) be able to mix media of various qualities (codecs, data rates, etc.);

(FILE-6) 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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given FILE category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

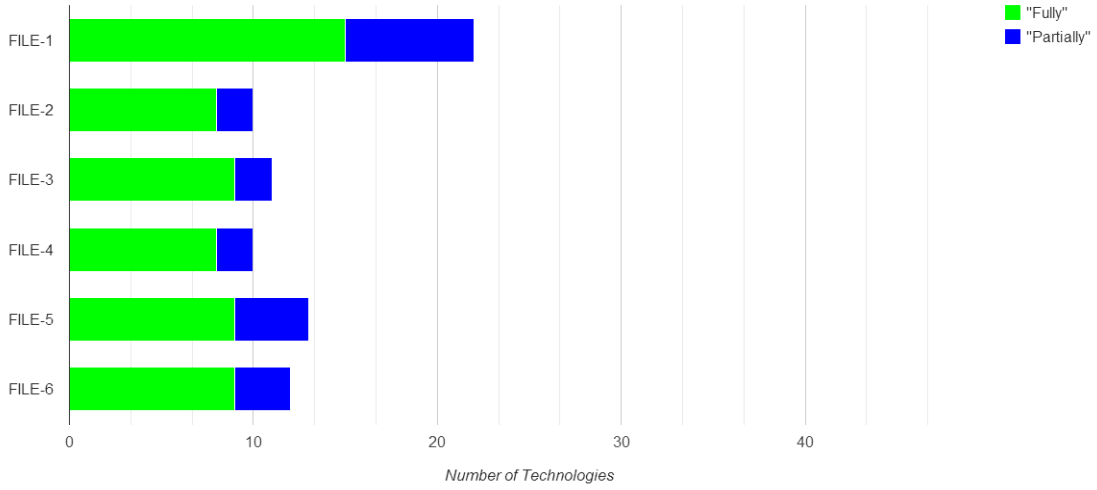

Figure 5. User Requirement FILE vs. the number of Technologies submitted that fully or partially met this requirement.

The FILE Use Case had the fourth-from-last number of Technologies fully or partially meeting its requirements. This may be due to the fact that file-based workflows are now becoming fairly mature in the industry. It should be noted that FILE-1, to “*be able to mix streaming-based and*

file-based content in the same unified packet-based system", was the top covered User Requirement in FILE. FILE-1 combined streaming/live and file capabilities, a more novel concept.

User Requirement FILE-2, to "*be able to begin work on "post-production" on live content as it is being captured*," was one of the least responded to requirement in the FILE Use Case. This fact is interesting, because there are solutions to this requirement available from the industry today in SDI-based workflows.

FILE-4, to "*be able to transcode, analyze and transform content on-the-fly*," was tied with FILE-2 for the least responded to requirement in the FILE Use Case. Notably one respondent included a transformation service as a key part of an overall architecture, but most responses did not go into much detail regarding this User Requirement.

3.4 Formats (FORM)

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

(FORM-1) be well documented through the use of open and interoperable standards;

(FORM-2) be supportive of current media processing operations such as mixing, cross-fading, DVE, and voiceover;

(FORM-3) be compressed or uncompressed, with configurable sub-sampling and sample bit depth;

(FORM-4) if compressed, to be able to support arbitrarily good quality (up to lossless if desired) even with multiple compression concatenations of a typical chain through a broadcast plant;

(FORM-5) be based on well-understood and generally-available compression and networking Technologies;

(FORM-6) be able to address parts of signals (audio, video, metadata) in addition to whole signals;

(FORM-7) be able to support current and future image formats, frame rates, and file types;

(FORM-8) support the ancillary streams needed by some of our viewers and/or required by regulatory agencies to be carried such as Closed Captions, subtitles, audio description, and multiple languages;

(FORM-9) to allow addressing of arbitrary data events, including those synchronized with content signals;

(FORM-10) be able to flexibly deploy and interactively control both software- and hardware-based real-time signal processing and analysis modules for packet-based flows.

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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given FORM category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

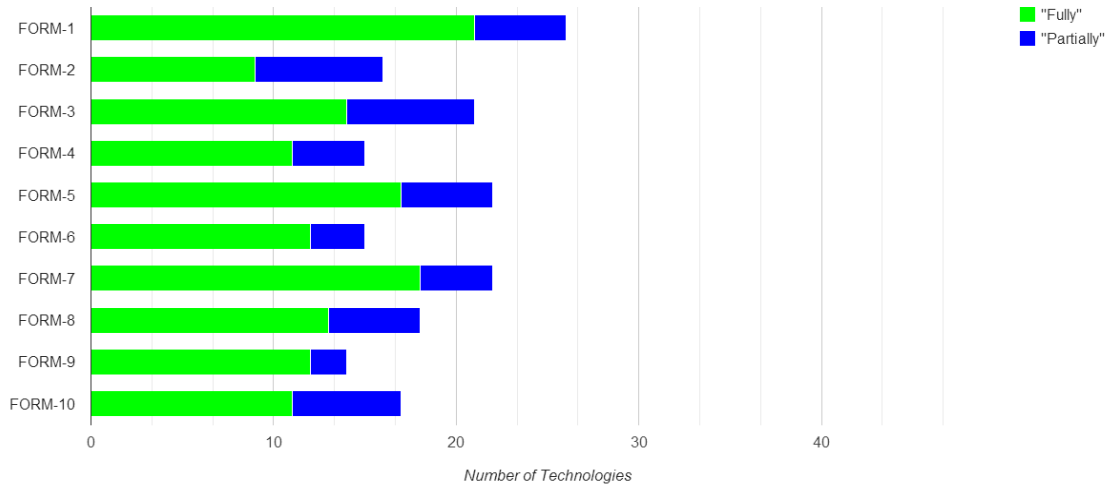

Figure 6. User Requirement FORM vs. the number of Technologies submitted that fully or partially met this requirement.

28% of the Technologies submitted are claimed to cover either fully or partially this Use Case.

Of the ten FORM User Requirements, the most covered one is FORM-1, *"be well documented through the use of open and interoperable standards;".* It is "Fully" or "Partially" addressed by 27 Technologies submitted (39% of all the Technologies submitted).

The least covered User Requirements is FORM-9 "*to allow addressing of arbitrary data events, including those synchronized with content signals;*" that is addressed by 14 Technologies submitted (21%).

3.5 Interoperability (INTEROP)

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

(INTEROP-1) be able to use readily available and accepted packet-based standards, Technology (e.g., IEEE and IETF standards for networking), interfaces (e.g., APIs), components and products in a multivendor environment;

(INTEROP-2) be able to ensure that all network-attached devices are designed and tested to operate in likely real-world scenarios;

(INTEROP-3) be able to ensure that all network-attached devices are able to appropriately handle dropped packets and out-of-order packet delivery;

(INTEROP-4) be able to have control surfaces that are conceptually decoupled from the software control APIs of the underlying infrastructure and equipment;

(INTEROP-5) be able to design and manufacture systems and test compliance to an industry-standard interoperability specification;

(INTEROP-6) be able to interoperate with key existing media, synchronization, and metadata protocols (such as, for example, SDI, AES audio, SMPTE 12M, SMPTE ST-2022 series, SMPTE RDD-6, SCTE 35);

(INTEROP-7) be able to use IPv4 or IPv6 (for an IP-based solution);

(INTEROP-8) be able to store, retrieve and exchange media and information between media production systems using media production-oriented standards-based protocols.

(INTEROP-9) be able to use “self-contained” / “self-defining” streams with software-defined connections and/or physical-only connections;

(INTEROP-10) be able to include communications (e.g., “intercom”) along with content streams;

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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given INTEROP category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

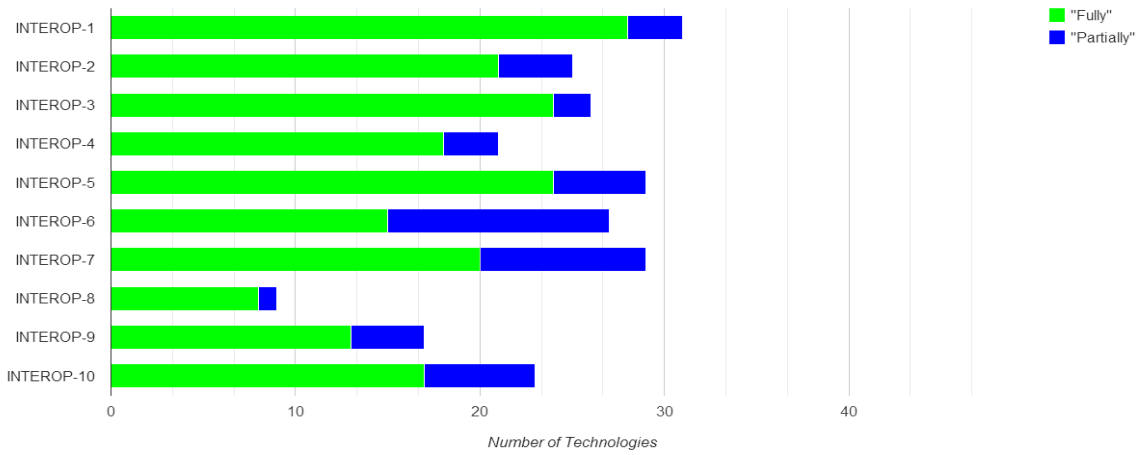

Figure 7. User Requirement INTEROP vs. the number of Technologies submitted that fully or partially met this requirement.

36% of the Technologies submitted are claimed to cover either fully or partially this Use Case.

Of the ten INTEROP User Requirements, the most covered one is INTEROP-1, *"be able to use readily available and accepted packet-based standards, Technology (e.g., IEEE and IETF standards for networking), interfaces (e.g., APIs), components and products in a multivendor environment;"* It is "Fully" or "Partially" addressed by 31 Technologies submitted (47% of all the Technologies submitted).

The least covered User Requirement is INTEROP-8 *"be able to store, retrieve and exchange media and information between media production systems using media production-oriented standards-based protocols."* that is addressed by 9 Technologies submitted (14%). This relative low coverage may indicate an area that needs some work.

Experience has shown that while some interoperability exists, it is not prevalent in this new solution space. There are many reasons why this is so but key among them is that, as with many industries implementing to a standard or industry practice, the documentation of the standards or practices are either "not tight enough" or are "too tight" (that is, not defined to close enough tolerance or not defined with enough tolerance) to be able to ensure interoperability. In addition, in complex systems, characteristics such as timing, error handling, latency (among others) can affect the degree to which components actually interoperate.

The Video Services Forum Interop Workshop Activity Group and the EBU Video Contribution over IP Group have organized a series of interop events for Technologies such as SMPTE ST 2022-5:2012, SMPTE ST 2022-6:2012, seamless protection of video over IP that is expected to be published as SMPTE ST 2022-7, and JPEG 2000 over MPEG-TS over IP (VSF TR-1). A number of interoperable SMPTE 2022-5/6/7 products have been deployed in the field.

The AVnu Alliance has announced that it "will develop compliance and interoperability certifications for the [Ethernet] AVB standards", and working in concert with the AVnu Technical

Working Group (TWG), the University of New Hampshire InterOperability Laboratory (UNH-IOL) AVnu Testing Consortium has developed test suites which can be utilized by AVnu Members for conformance and interoperability test purposes. UNH-IOL also tests conformance to the IEEE 1588-2008 PTP standard, however there are many different and potentially non-interoperable profiles of 1588 including the “default”, “telecom”, “power”, AES67-2013, draft SMPTE ST 2059-2, and IEEE 802.1AS-2011 profiles.

Regarding interoperation of SMPTE 2022 and AVB, while there is not direct interoperability between the two technologies, one respondent provided a view of how these two technologies might be used to complement one another – this is an encouraging sign.

However, we believe that there is still significant effort yet to be done to define, evaluate, “plug fest” and validate interoperability of networked media Technologies and solutions.

3.6 Monetization and Revenues (MONETIZE)

As a professional media content producer, I want to:

(MONETIZE-1) Distribute content to end users and to content aggregators over public packet-based networks, with clear traceability and rights management;

(MONETIZE-2) Be able to adapt content and advertisements to end users in real-time based on their feedback and information;

(MONETIZE-3) Allow the viewer to compose the audio/video, pull contextual data and interact with me lively;

(MONETIZE-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.

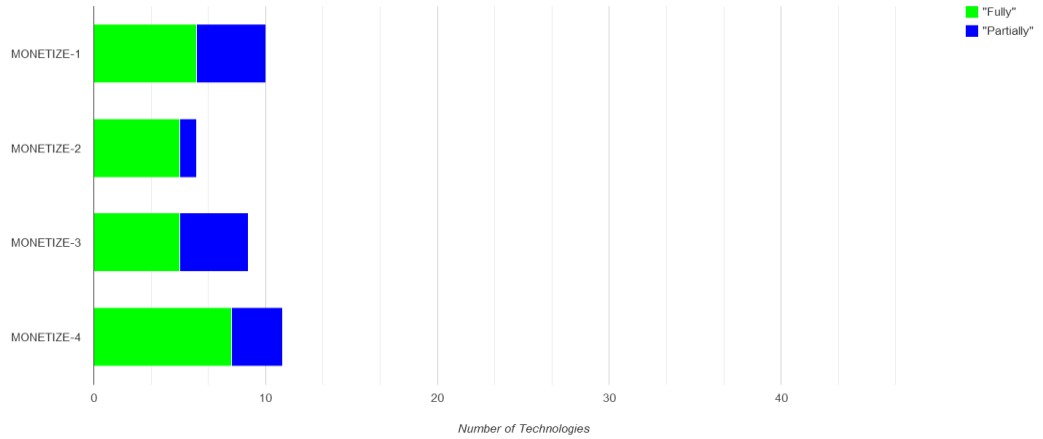

Figure 8. User Requirement MONITIZE vs. the number of Technologies submitted that fully or partially met this requirement.

MONETIZE received the fewest Number of Technologies submitted by respondents to the RFT, with just under 15% (~14%) of the respondents saying they either "Fully" or "Partially" met this requirement. Of the four MONETIZE User Requirements, the top one was MONETIZE-4, *"Monitor media resources (network/processing/storage) usage.*"

It should come as no surprise that MONETIZE-2 ("*Be able to adapt content and advertisements to end users in real-time based on their feedback and information*") is the Technology with the least number of submissions by the respondents as it requires both stored and "real-time" two-way interaction through the network with the end-users.

Interestingly, most of the respondents who submitted Technologies for MONETIZE also submitted Technologies across many of the other Use Cases.

The fact is that monetization and revenue capture, based on the respondents' submissions to the RFT, are likely to be the farthest away from solutions for the industry. This is not particularly good news given that while the movement to networked media is customer-driven, (in addition to being provider cost-driven) in order for adequate business cases to be built and the appropriate revenue captured, Technologies and solutions need to be in place to do so.

It is important to note that the RFT solicited Technologies and did not solicit financial information or financial justifications for adoption of this Technology, with the exception of this User Requirement. That said, it is clear that being able to efficiently monetize content will play a key role in the adoption of any new Technologies in the professional media environment.

3.7 Provisioning (PROV)

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

(PROV-1) be able to use state-of-the-art tools to deploy professional media connectivity whenever and wherever I need it;

(PROV-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;

(PROV-3) be able to rapidly (and in some cases, automatically) set up streams from new devices;

(PROV-4) be able to have my infrastructure scale automatically with load balancing capabilities that take advantage of various links available;

(PROV-5) be able to have my workflow automatically adjust to incorporate the correct transcoding so that when I provision a stream, the format type at the destination node is correct;

(PROV-6) be able to quickly set up efficient distribution networks that deliver the same content to multiple places;

(PROV-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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given PROV category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

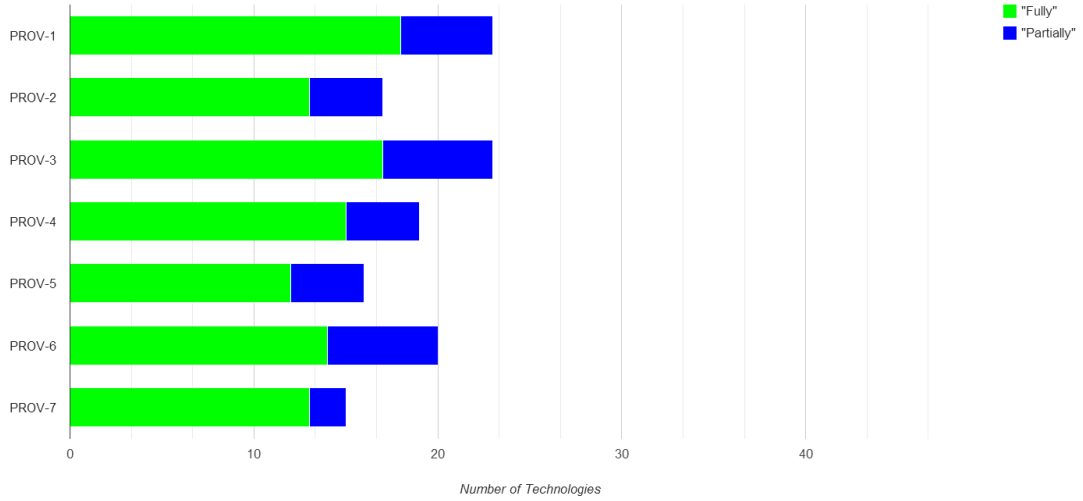

Figure 9. User Requirement PROV vs. the number of
Technologies submitted that fully or partially met this requirement.

PROV fell near the middle of the number of Technologies respondents provided to the Use Cases. PROV-1, to *"be able to use state-of-the-art tools to deploy professional media connectivity whenever and wherever I need it"* and PROV-3, to "be able to rapidly (and in some cases, automatically) set up streams from new devices," were responded to by the most submitted Technologies.

PROV-7, to *"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,"* was responded to by the fewest submitted Technologies in the PROV Use Case. However even of Technology

submissions that claimed to fulfil PROV-7, there were very few precise details on how PROV-7 should be implemented.

3.8 Quality of Service for File Transport (QOS-FT)

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:

(QOS-FT-1) adjustable and deterministic transfer time, including faster-than-real-time if desired;

(QOS-FT-2) upper-end bounded data loss; (define a max transport loss %)

(QOS-FT-3) rate-sufficient to meet the needs of current and future format payloads;

(QOS-FT-4) transport over local, campus networks and Internet;

(QOS-FT-5) multiple defined QoS levels for file transfer based on job, workflow, source or destination;

(QOS-FT-6) the ability to monitor QoS deliver-to-commit and to make adjustments by priority criteria;

(QOS-FT-7) profiles of service to support a variety of workflows. One goal is to provide deterministic file transfers with a known transfer time. For example,

a. Class A: superior QoS similar to what a lossless, high bandwidth, low latency LAN can provide today.

b. Class B: relaxed Class A profile. One or more parameters are relaxed to create a “good enough” profile for many real world use cases.

c. Other classes if needed.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given QOS-FT category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

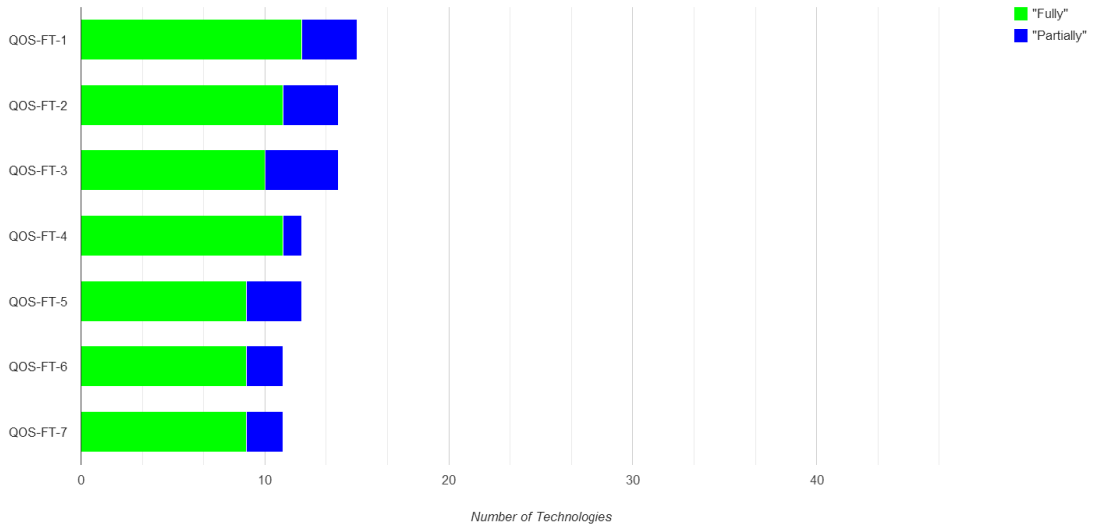

Figure 10. User Requirement QOS-FT vs. the number of Technologies submitted that fully or partially met this requirement.

QOS-FT was the Use Case with the third-to-last number of Technological fulfilment responses. Like FILE, this may be because the area of file-based workflows is becoming mature in the industry. QOS-FT-1, "*adjustable and deterministic transfer time, including faster-than-real-time if desired*," was the requirement most responded to in the Use Case.

Overall, responses to QOS-FT did not appear to provide detailed explanations as to how particular requirements would be addressed.

3.9 Quality of Service for Streams (QOS-S)

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:

(QOS-S-1) video-frame/audio-sample time accuracy (see Timing case);

(QOS-S-2) very low latency;

(QOS-S-3) lossless transport;

(QOS-S-4) a rate sufficient to meet the needs of current and future format payloads;

(QOS-S-5) transport over local and campus networks;

(QOS-S-6) each stream or group of streams having selectable QoS profile that is defined by the system configuration;

(QOS-S-7) profiles of service to support a variety of workflows. For example,

a. Class A: superior QoS similar to what the SDI ecosystem provides today. This is a “near SDI” profile but not equivalent in every aspect. This also applies to Media-Associated Data Payloads and their links, not just SDI.

b. Class B: relaxed Class A profile. One or more parameters are relaxed to create a “good enough” profile for many real world use cases that do not require the full feature set of SDI, for example.

c. Other classes if needed.

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 trade off costs and performance depending on business needs.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given QoS-S category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

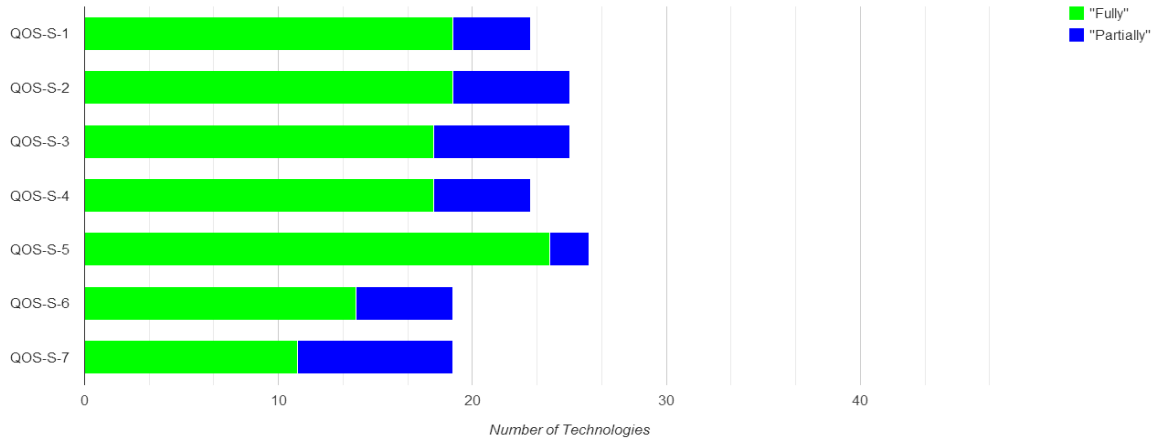

Figure 11. User Requirement QOS-S vs. the number of Technologies submitted that fully or partially met this requirement.

This use case is most related to replacing SDI with an Ethernet-based streaming version. It requires the replacement characteristics to be similar to what SDI offers. Naturally, this is a challenge and only a few respondents offered detailed solution Technology. Several responders cited use of SMPTE St2022-x and IEEE AVB families of standards. Also cited was audio streaming using AES67-2013.

3.10 Reach (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:

(REACH-1) be able to easily, securely, effectively browse media and exchange files with peers at other organizations;

(REACH-2) be able to quickly create ad-hoc live interconnections that are able to utilize the available network;

(REACH-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.

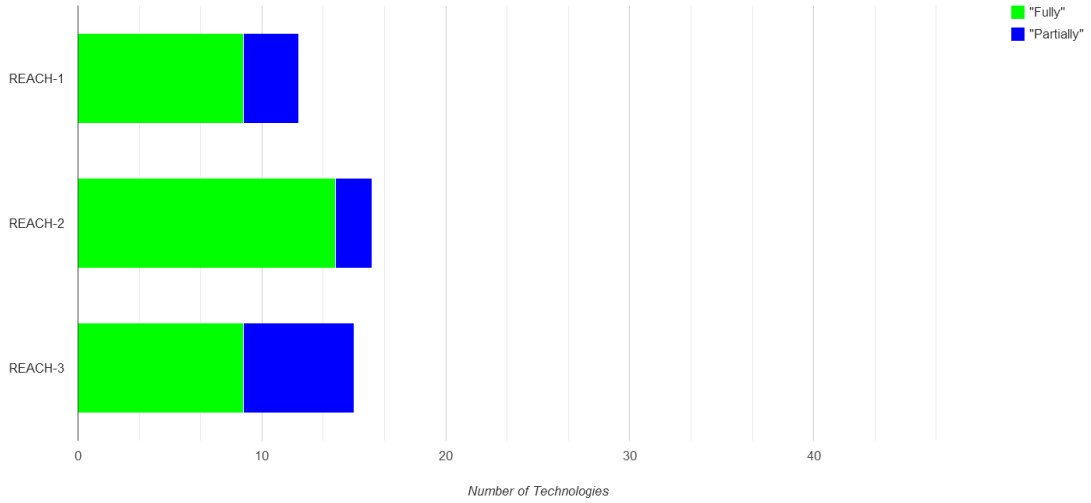

Figure 12. User Requirement REACH vs. the number of Technologies submitted that fully or partially met this requirement.

Twenty two percent of the Technologies submitted are claimed to fully or partially cover this Use Case. This relative low ranking (12th covered Use Case) may indicates that it is a challenge to interconnect with 3rd party networks, especially for using Internet for professional media.

Of the three REACH User Requirements, the most covered one is REACH-2, *"be able to quickly create ad-hoc live interconnections that are able to utilize the available network;"* It is "Fully" or "Partially" addressed by 16 Technologies submitted (24% of all the Technologies submitted).

The least covered User Requirements is REACH-1 *"be able to easily, securely, effectively browse media and exchange files with peers at other organizations;"* that is addressed by 12 Technologies submitted (18%).

3.11 Reliability (REL)

As a professional media organization, I want to:

(REL-1) implement redundant paths in my network to ensure that the facility does not contain single points of failure;

(REL-2) identify primary and backup paths of the same stream; redundancy switching among those paths should be seamless;

(REL-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;

(REL-4) eliminate making on-air mistakes;

(REL-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 administrational / override) status;

(REL-6) know the key system reliability specifications that constitute "enterprise-class" network equipment 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, so that 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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given REL category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

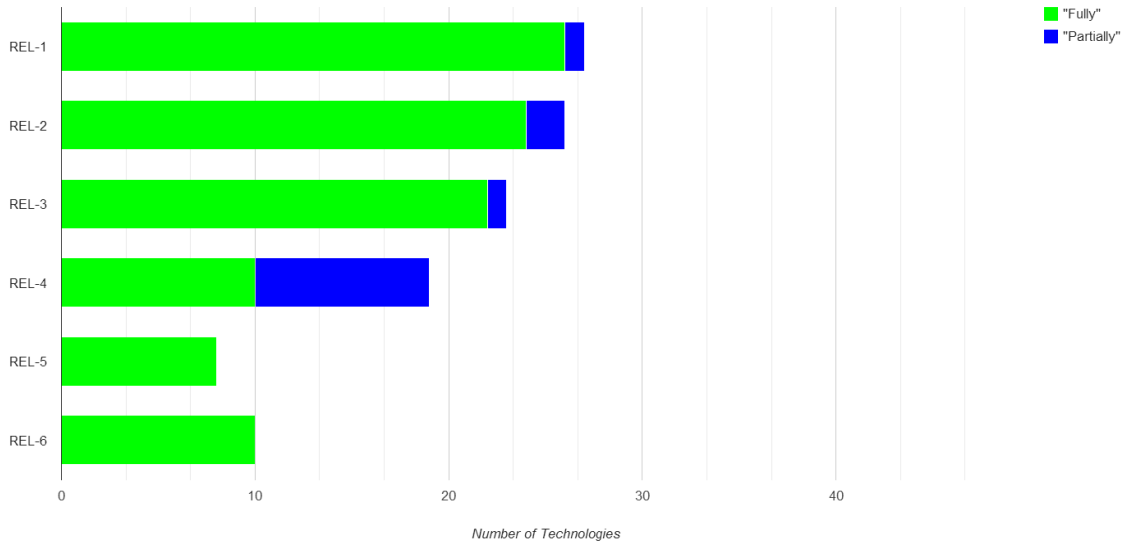

Figure 13. User Requirement REL vs. the number of Technologies submitted that fully or partially met this requirement.

At 29% of the Technologies submitted claiming to cover either fully or partially this Use Case, this is the 8th most covered.

Of the six REL User Requirements, the most covered one is REACH-1, *"implement redundant paths in my network to ensure that the facility does not contain single points of failure;"* that is an important feature of today's system architectures. It is "Fully" or "Partially" addressed by 27 Technologies submitted (41% of all the Technologies submitted).

The least covered User Requirements is REL-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 administrational / override) status;"* that is addressed by 8 Technologies submitted (12%). This makes sense since this is a more specific feature that may be required by a limited number of applications.

3.12 Security (SEC)

As a broadcast media organization, I want to:

(SEC-1) protect against unauthorized access from within the organization or from outside the organization to data, systems control, or media;

(SEC-2) protect against attacks that disrupt the proper function of the organization;

(SEC-3) have appropriate administrative control systems to support dynamic access control to organization systems;

(SEC-4) have appropriate security monitoring and alarming.

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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given SEC category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

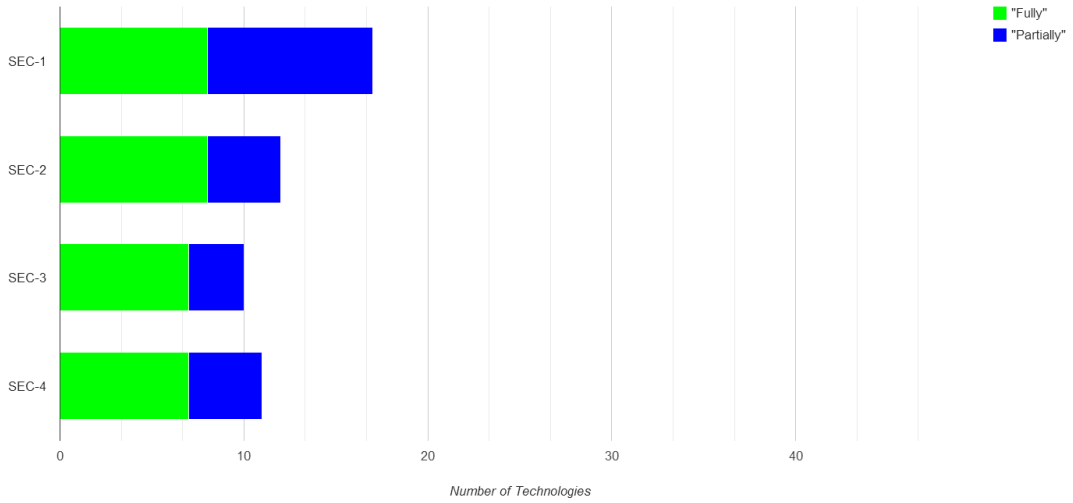

Figure 14. User Requirement SEC vs. the number of Technologies submitted that fully or partially met this requirement.

SEC was second to the last in the number of Technologies respondents provided to the Use Cases. It is likely that many respondents considered security as an issue to be handled outside of the enabling Technologies of professional media networking. Some contributions to SEC specifically called out existing security-enhanced versions of RTP, HTTP, and RTSP. Others responses suggested the use of network firewalls and access control lists.

3.13 Streams (STREAM)

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

(STREAM-1) real time audio, video, ancillary data and metadata that can be synchronized and/or multiplexed together or sent separately (see Timing case).

(STREAM-2) self-describing streams that can carry identifiers such as stream unique identifier, stream name, stream contents, and stream content owners;

(STREAM-3) virtual bundles: separate streams and data paths logically grouped as one;

(STREAM-4) nearly equivalent to SDI or other Media-Associated Data Payloads and their associated links in terms of transport functionality (see Quality of Service for Streams case);

(STREAM-5) across an infrastructure enabled to carry future payloads (such as UHDTV);

(STREAM-6) in a point-to-point or point-to-multipoint fashion as desired;

(STREAM-7) such that media is switchable on video or audio frame boundary (see Timing case);

(STREAM-8) across an infrastructure that scales from small to large installations;

(STREAM-9) between any nodes connected to the packet-based network;

(STREAM-10) and be able to use software-based real-time signal processing and analysis of streams;

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

As a video editor, I want to:

(STREAM-11) be able to mix media of various qualities (codecs, data rates, etc.);

(STREAM-12) 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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given STREAM category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

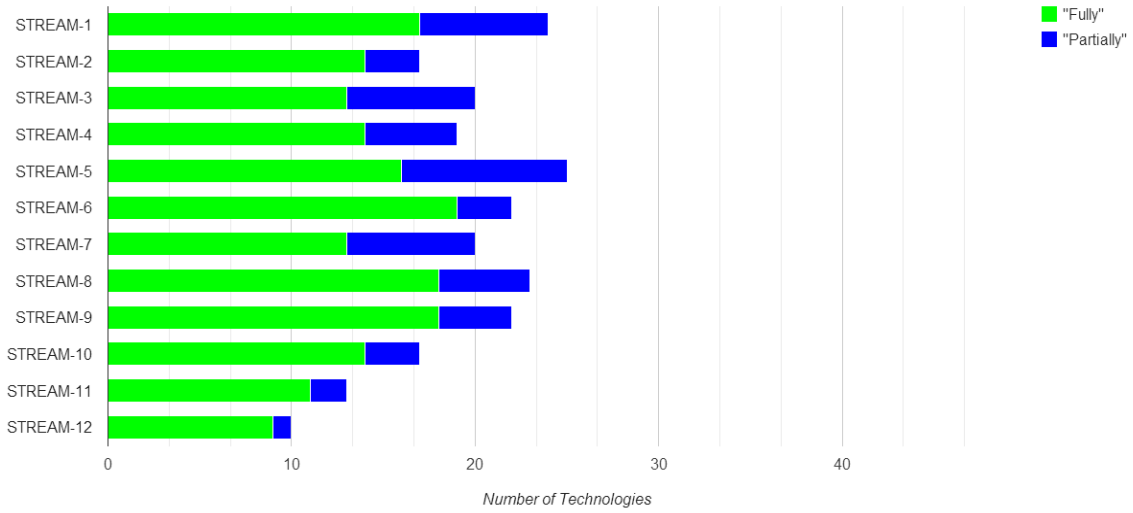

Figure 15. User Requirement STREAM vs. the number of Technologies submitted that fully or partially met this requirement.

Stream is closely related to QoS for Streams (QoS-S). 20% of respondents offered Technology to switch streams “frame accurately” as can be done using SDI routers (Stream-7). Of the 12 Stream categories, some are new functionalities such as Stream-2, 3 for self-describing streams and stream bundles and others replicate what the SDI ecosystem can do today such as Stream-6. Often the referenced Technology is not sufficiently described to appreciate exactly how a claimed “meets the user case Fully” is actually implemented.

3.14 Sustainability (SUST)

As a professional media organization, I want to:

(SUST-1) be able to separate the physical locations of control surfaces, displays, video and network processing gear to the most appropriate locations for energy usage, efficient cooling, and noise;

(SUST-2) reduce the weight and size of broadcast equipment to be deployed in the field through aggregating multiple streams on a single physical layer connection;

(SUST-3) monitor resources (network/processing/storage) usage;

(SUST-4) minimize the energy consumption of storing, streaming and moving media around the network, particularly when idle;

(SUST-5) be able to easily repair, upgrade, maintain and disassemble the equipment when decommissioned;

(SUST-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, 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.

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given SUST category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

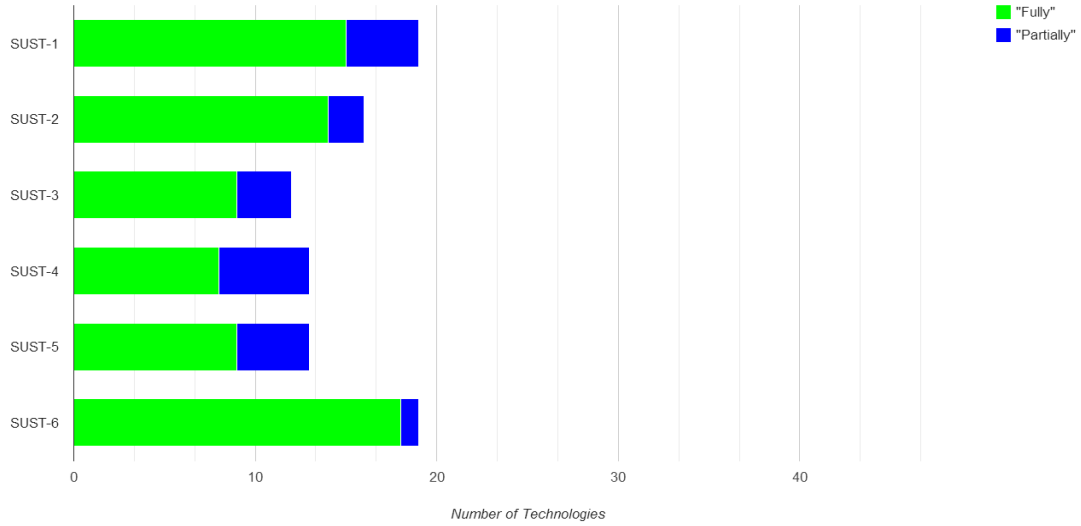

Figure 16. User Requirement SUST vs. the number of Technologies submitted that fully or partially met this requirement.

Twenty three percent of the Technologies submitted claim to cover either fully or partially this Use Case. Of the six SUST User Requirements, the most covered one is SUST-6, *“ensure the longevity of my design by using future proof Technologies;”* that is an important feature of today’s system architectures. It is “Fully” or “Partially” addressed by 19 Technologies submitted (29% of all the Technologies submitted).

The least covered User Requirement is SUST-3 “*monitor resources (network/processing/storage) usage;*” that is addressed by 12 Technologies submitted (18%). This makes sense since this is a more specific feature that may be required by a limited number of applications.

3.15 Test & Monitoring (TESTMON)

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

(TESTMON-1) be able to simply identify streams;

(TESTMON-2) be able to monitor full-quality stream audio, video, and metadata at any point in the facility by multiple simultaneous users;

(TESTMON-3) be able to monitor thumbnail views of any video stream, with audio bars and other metadata displayed;

(TESTMON-4) be able to view exception-based monitoring alerts of any stream (such as presence of video/audio/captions) and set off audible alarms based on these;

(TESTMON-5) be able to quality test streams including pass/fail non-destructively in a straightforward manner;

(TESTMON-6) be able to test encrypted and non-encrypted streams;

(TESTMON-7) be able test correctness of compressed bitstreams;

(TESTMON-8) be able to test streams for standard broadcast-style quality measures and standards and for packet-based quality measures and standards;

(TESTMON-9) be able to verify compliance of the end-to-end packet-based network infrastructure to specifications for installation, function, performance, reliability and interoperability;

(TESTMON-10) be able to monitor media network traffic;

(TESTMON-11) be able to monitor systems for compliance with QoS/SLA agreements or for system commissioning and acceptance;

(TESTMON-12) be able to observe packet-based network statistics and trends;

(TESTMON-13) be able to decouple monitoring from mechanism used for media stream transport content for reliability;

(TESTMON-14) be able to see a ‘dashboard-view’ roll-up of important routes and flows in my facility;

(TESTMON-15) be able to remotely monitor all system parameters in real time;

(TESTMON-16) have a consistent amount of delay between the time a signal is present at the source and the time it appears at a monitoring point;

So that I can ensure that these complex systems are operating as required, diagnose, support and manage to QoS agreements, minimize overall costs and downtime, provide the Quality of Experience (QoE) that my consumers expect, 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.

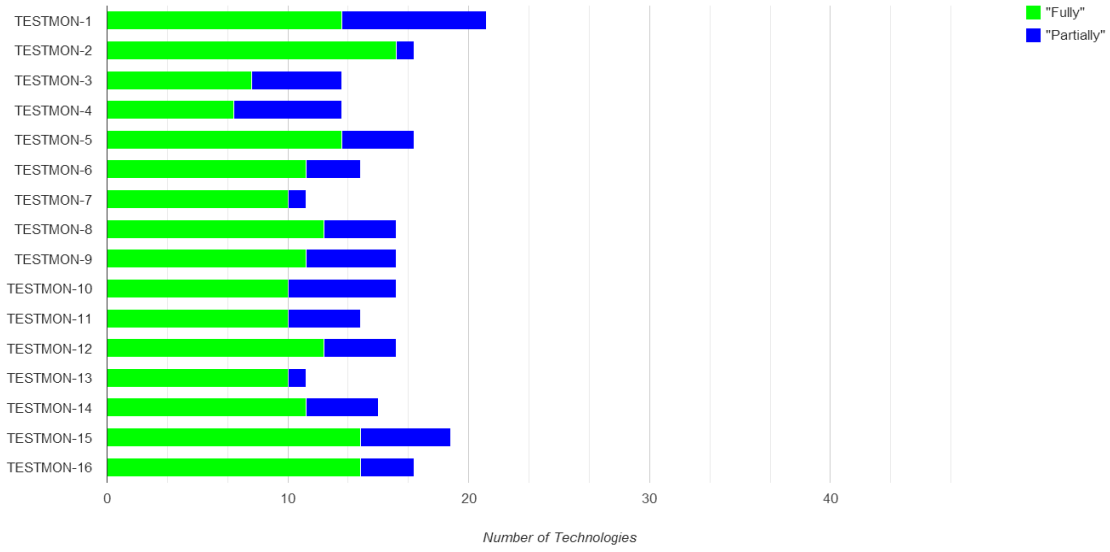

Figure 17. User Requirement TESTMON vs. the number of Technologies submitted that fully or partially met this requirement.

A little more than 17% of respondents to the RFT indicated they satisfied this User Requirement either fully or partially. Of the 16 TESTMON Use Cases, the top one was TESTMON-1, *"be able to simply identify streams"*. The second-most satisfied Use Case was TESTMON-15, *"be able to remotely monitor all system parameters in real time."*

The least satisfied Use Case was TESTMON-13, *"be able to decouple monitoring from mechanism used for media stream transport content for reliability."* Using a separate (whether in-band or out-of-band) monitoring infrastructure has been common-place in the telecommunications industry for decades, but this is a capability that is not currently deployed in most professional media applications. However, the ability to monitor in this manner is likely to be needed in the future.

It is interesting to note that TESTMON-7, *"be able to test correctness of compressed bit streams,"* was the second-least satisfied requirement - given that many Technologies currently exist to perform this function. We suppose that the reason for the low response is that there was a dearth of responses from test equipment vendors.

3.16 Timing (TIME)

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

(TIME-1) keep multiple audio, video and data streams in the same transport in sync (lip sync);

(TIME-2) keep multiple media streams synced together (link sync);

(TIME-3) keep streams and end points synced to a common timing reference where required (nodal sync);

(TIME-4) enable frame (or audio sample) accurate switching of real time AV synced streams (synced switching);

(TIME-5) maintain phase-sync between audio streams (of a stereo/surround audio stream group)

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

The following graph aggregates all company/organization referenced Technologies against this user case. The X axis metric is the number of referenced Technologies for a given TIME category. Often, a single referenced Technology, from a company/organization, is claimed to meet all or most user categories.

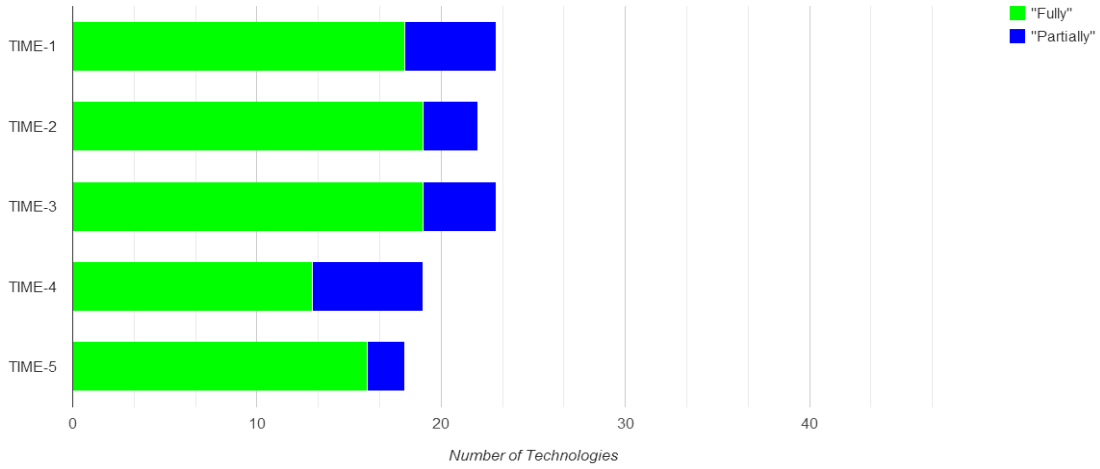

Figure 18. User Requirement TESTMON vs. the number of Technologies submitted that fully or partially met this requirement.

In nearly all cases, the IEEE Precision Time Protocol (1588v2) was referenced to support time transfer and synchronization between nodes and signals. This was often referred by draft standard SMPTE ST 2059-2, the SMPTE Profile of IEEE1588v2, in conjunction with SMPTE ST 2059-1 that defines an epoch and A/V signal alignment to the epoch.

4. Gap Analysis Summary

What is a gap? One definition is, “A hole or space where something is missing”. In the context of this report a gap consists of the missing elements not provided by the RFT responses that are needed to fulfil the 112 individual User Requirements.

A review of the responses shows that 42% of the referenced Technologies claimed to fully meet the INTEROP-1 Requirement while only 8% claimed to meet the MONITIZE-2 Requirement. The other 110 Requirements fell somewhere in-between these two extremes. Taken at face value, one view is that all requirements were met by at least one vendor/organization’s Technology so there are no gaps. While this is true at one level, it is not true in terms of an interoperable system. Technologies referenced by one response may not interoperate with those of another across a wide range of parameters.

So what’s required to build a working, gapless, practical system? Four important criteria for this are;

- *Implementable* components in software and/or hardware to meet the User Requirements
- *Interoperable* across all the Requirement spaces, as needed (implies standards and a reference architecture)
- *Integrated* with existing systems to create a seamless hybrid mix, as needed.
- *Sufficient* coverage of User Requirements to satisfy a real need; enough coverage to build a system that performs useful work

Any gap discussion needs to take into account these aspects when comparing referenced Technologies. So, what are some conclusions we can reach regarding the 27 vendors/organizations that responded to the RFT?

4.1 Where are the Gaps?

It is not our intent to provide a detailed list of gaps, big and small. Rather, to provide overall impressions of “missing pieces” across the Technology and solution domains. The end goal is to establish interoperability in a packet-based professional media ecosystem with enough specificity so that vendors can make, and users can buy, components and systems that satisfy critical business-driven User Requirements.

The RFT responses provided many separate Technologies, 66 in all. Actually, this value is conservative since many submissions identified additional Technologies within the response itself, or depended upon Technologies that were not cited in the submission.

Figure 19 shows the division of Technology across three types of solutions. 44.6% of the referenced Technologies claimed to support a “Grand Solution Set”. The intent was for this type

to cover all or large portions of the functionalities needed to implement most User Requirements.

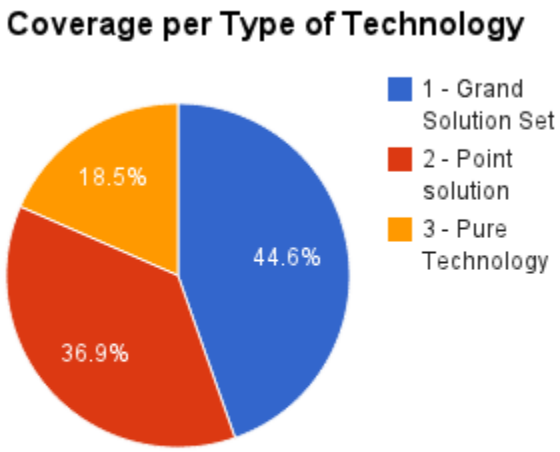

Figure 19. Coverage per Type of Technology

Claiming a **full** Requirement coverage by a Technology was an easy currency to spend and it was applied liberally. **Partial** coverage was also claimed often but without specifying where in the 1% to 99% range it applied.

Some respondents (36.9%) offered point solutions, while others (18.5%) provided pure Technology that could be used as part of a workflow solution. Tying all these disparate pieces together will be a challenge.

4.2 Some Observations

The responses are a great start towards the goal of marrying the User Requirements to their respective Technologies.

- The excellent response rate (27 respondents, 66 Technologies) indicates a positive interest in the industry to move forward. The participation in this exercise may indicate a good potential for harmonization. Let's keep the momentum!

- The companies that responded to the RFT represented a good cross section of industry and represent both the traditional broadcast manufacturer and those who manufacture IT infrastructures.

- This report provides a preview of Technologies that are likely to form the backbone of future networked media production infrastructures.

- Many of the Use Cases could be satisfied by the Technologies submitted. What remains to be done is to relate the Technologies to each other in a system perspective, to identify what is missing to build interoperable systems, and to validate that the Technologies are actually suitable in our industry.

However, there are some issues;

- There were many “petite solutions” that, in isolation, likely meet the claims made by the respondents over a specific set of User Requirement(s).

- There are many questions regarding the interoperability of submitted Technologies. It was not clear how claims of interoperation could be justified between Technologies and solutions even within a particular response.

- Without a reference architecture (we did not provide one), making apples-to-apples comparisons was difficult.

- While many companies took part in this activity, we note that, for whatever reason, some significant media companies and vendors did not participate. Therefore, this report should not be viewed as an exhaustive analysis of all use cases or all potential technological solutions.

The RFT and its responses brought together like minds and excellent referenced Technology that will find application in the near future. The responses shed light on many relevant areas and several Technologies (IEEE 1588, SMPTE ST 2022, IEEE AVB, AES67) have clear momentums. Despite the need for more solution-based clarity, the submissions should be leveraged in any future work efforts towards the same goals.

5. Summary of Individual Responses

In this section we provide a brief summary of each of the individual submissions we received from the respondents to the RFT. Readers will likely find it useful to refer to the JT-NM RFT as they read through this analysis and the responses.

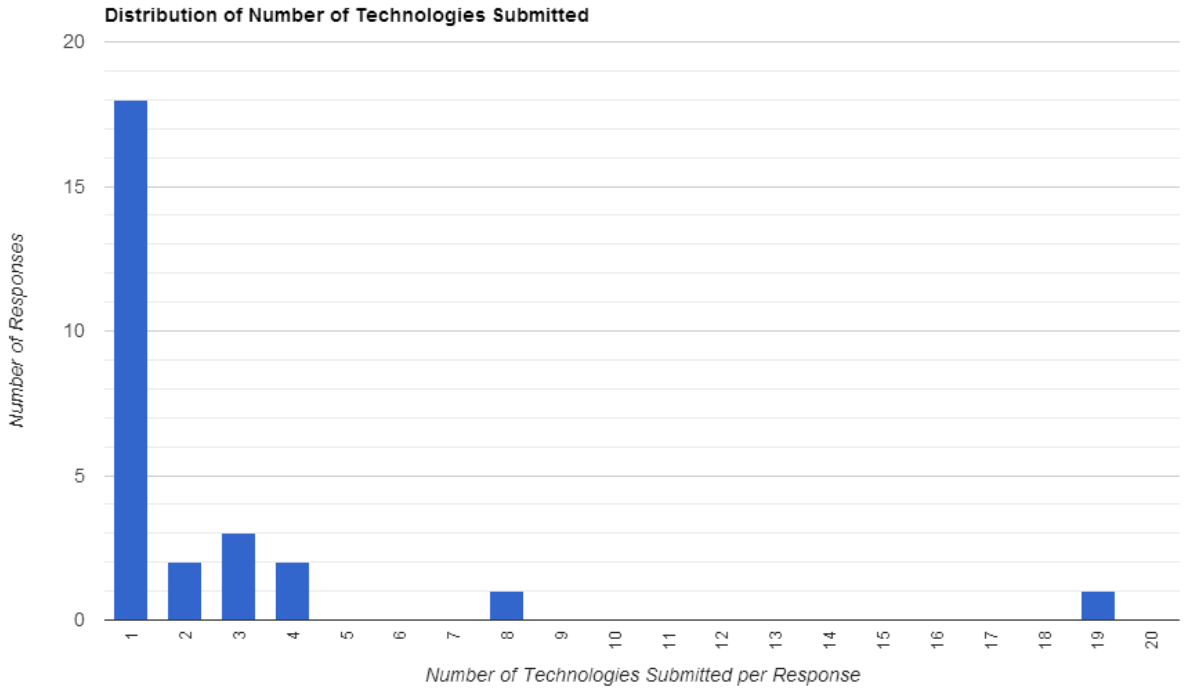

Figure 19. Number of Responses vs. Number of Technologies Submitted per Response

Figure 19 shows that the vast majority of respondents submitted a single Technology. However, one respondent submitted eight Technologies, and another submitted 19 Technologies. Readers may want to consider how the number of technologies submitted by a respondent might influence the graphs and other data in this report.

5.1 ALC NetworX

Reviewer Summary: The technology is audio-over-IP focused with no consideration for "SDI-payload", timed text or associated metadata carriage. From the audio perspective, the technology is proven and accepted by many industry players. The referenced technologies could be integrated with video components with appropriate engineering efforts.

Identification of Respondent:

Reference Number: 018

Organization (or Individual): ALC NetworX GmbH

Number of Technologies: 1

Link to Response: JTNM018-1.zip

Technology #1:

Name of the Technology: “RAVENNA – the IP-based real-time media networking technology framework”

High Level Description: “RAVENNA is a technology framework for real-time distribution of audio and other media content in IP-based network environments. Utilizing standardized network protocols and technologies, RAVENNA can operate in existing network infrastructures. Performance and capacity are scaling with the capabilities of the underlying network architecture. RAVENNA matches the stringent requirements of professional audio applications, such as low latency, full signal transparency and high reliability. While primarily targeting the professional broadcast market, RAVENNA is also suitable for deployment in other pro audio market segments like live sound, install and recording. Possible fields of application include (but are not limited to) in-house signal distribution in broadcasting houses, theaters, concert halls and other fixed installations, flexible set-ups at venues and live events, OB van support, inter-facility links across WAN connections, and in production and recording applications. [...]”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “RAVENNA technology introduced September 2010:

- Documentation on RAVENNA Operating Principles publicly available since 2011.
- First implementations commercially available since 2012 (mostly related to audio).
- AES67-compatible operating mode supported since September 2013 (with publication of AES67 standard).”

IPR Declaration: See submission

Licensing Statement: “ALC NetworX declares that they will grant a license to use the RAVENNA trademark to all implementers charging a reasonable and non-discriminatory royalty (RAND).”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.2 Audio Engineering Society

Reviewer Summary: Respondent submits the AES67-2013 standard for the carriage of professional quality, low latency audio over IP. This technology includes RTP for carriage of audio streams, timing and synchronization via IEEE 1588 PTP, stream connection management using SIP, and session description using SDP. Optional hooks are mentioned for use of AVB Ethernet as well as discovery systems such as Bonjour and SAP.

Identification of Respondent:

Reference Number: 042

Organization (or Individual): Audio Engineering Society

Number of Technologies: 1

Link to Response: JTNM042-1.zip

Technology #1:

Name of the Technology: "AES67-2013: AES standard for audio applications of networks - High- performance streaming audio- over -IP interoperability"

High Level Description: "High -performance media networks support professional quality audio (16 bit, 44.1 kHz and higher) with low latencies (less than 10 ms) compatible with live sound reinforcement. The level of network performance required to meet these requirements is available on local-area networks and is achievable on enterprise--scale networks. A number of networked audio systems have been developed to support high performance media networking but until now there were no recommendations for operating these systems in an interoperable manner. This standard provides comprehensive interoperability recommendations in the areas of synchronization; media clock identification, network transport, encoding and streaming, session description and connection management. [...]"

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : "Standard ratified 11 September 2013. First implementation claimed by ALC NetworX with the RAVENNA technology framework"

IPR Declaration: "No License Required for AES67. RAND licensing is available for IEEE 1588, a required component of AES67."

Licensing Statement: "Open standard based on other open standards. No licensing required."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X			X	X	X	X	X

5.3 AVnu Alliance

Reviewer Summary: The AVnu Alliance has submitted technology based on work by the IEEE on the carriage of time-synchronized, low-latency streams on Ethernet networks, known as Audio/Video Bridging (AVB), or more recently Time-Sensitive Networking (TSN). This technology provides for accurate timing across Ethernet networks, reservation of stream bandwidth across a fabric of switches, and traffic shaping of streams in the network to avoid congestion. Particular mappings of audio/video streams on to Ethernet is also part of this technology, as are potential links to layer 3 streaming using RTP.

Identification of Respondent:

Reference Number: 017

Organization (or Individual): AVnu Alliance

Number of Technologies: 1

Link to Response: JTNM017-2.zip

Technology #1:

Name of the Technology: “AVnu-certified Time-Sensitive Networking (also known as AVB)”

High Level Description: “The AVnu Alliance (http://www.avnu.org) has been working for several years to develop tests and certification procedures to ensure interoperability of the endpoint and infrastructure devices in an AV network based on Audio Video Bridging (AVB) standards published by the IEEE and related protocols standardized by the IETF. As integrated by AVnu, this is the first fully standardized and comprehensive architecture for a bridged, multi-technology audio/video network that is forward compatible with existing standard best effort networks. The attached document, “Heterogeneous Networks for Audio and Video, Using IEEE 802.1 Audio Video Bridging”, [...] describes the protocols and architecture, and references the corresponding standards documents.”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Fundamental technology (802-compatible layer 2 networks, 802.1 Audio Video Bridging, IEEE 1722 and IETF RTP streaming deployed and available), and IEEE 1722.1 management and control protocols are all deployed and available. The UDP/IP versions of IEEE 1722 and 1722.1 are in final definition and only prototypes are currently deployed. There is at least one open-source version of the AVB stack in active development.”

IPR Declaration: “All IEEE standards provide standard IPR declarations via “Letters of Assurance” (see http://standards.ieee.org/about/sasb/patcom/patents.html), while IETF RFCs include pointers to IPR declarations within the text of the appropriate documents. The AVnu Alliance has developed test specifications and procedures that are subject to the bylaws and IPR rules that can be downloaded from http://www.avnu.org/avb_knowledge_center. Note that these are all freely available to AVnu members.”

Licensing Statement: “There is nothing special. See the previous item for comments on the IPR declarations.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.4 Axon

Reviewer Summary: Respondent submits the Ethernet Audio Video Bridging (AVB) technology. This includes a number of IEEE standards for layer 2 transport time-sensitive streams, timing and synchronization for time-sensitive applications, and also device discovery, connection management, and control of such systems. Respondent notes that SDI formats “will be part of the upcoming revision of IEEE 1722”, the standard that defines mapping of media payloads to layer 2 frames for carriage over AVB networks. Respondent also provided suggestions regarding how SMPTE 2022-6 might be used to expand the reach of AVB technology.

Identification of Respondent:

Reference Number: 029

Organization (or Individual): Axon

Number of Technologies: 1

Link to Response: JTNM029-1.zip

Technology #1:

Name of the Technology: “Ethernet Audio Video Bridging (Ethernet AVB)”

High Level Description: “Ethernet Technology is very well known, well understood and massively deployed in (almost) every industry, market and (consumer) application. It is defined and standardized by the Institute of Electrical and Electronics Engineers (IEEE) in the IEEE802 standards family.

The AVB Technology consists of a collection of IEEE standards created in the last few years (by the IEEE Audio/Video Bridging Task Group) that enable Ethernet networks to reliably carry time-sensitive, real-time (e.g. video and audio) signals across multi-hop network topologies with very low and constant latency. An informative summary/description of the AVB Technology can be found on Wikipedia. The IEEE documents containing the related AVB standards can be obtained from the IEEE (Unfortunately IEEE copyright policy does not allow copies of these standards to be included as part of this response). [...]”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Yes, professional AVB Audio products and solutions are already deployed in the field for various applications and available from multiple vendors. Professional AVB Video implementations are currently being demonstrated in prototype form and first products will hit the market first half of 2014.”

IPR Declaration: “Axon holds no IP rights that are believed to be essential or relevant for independently implementing the Technologies as described in this RFT response.”

Licensing Statement: “RAND or RAND-Z for IEEE, according to standard IEEE Licensing policy. For specifics see: http://standards.ieee.org/develop/policies/bylaws/sect6-7.html Relevant IETF RFCs include references to IPR declarations within the text of the documents. AVnu Alliance specific elements (minimum requirements, test specifications, etc.) are available to AVnu members and subject to the AVnu Alliance IPR and bylaw rules that can be found at: http://www.avnu.org/avb_knowledge_center”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X		X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.5 Barco

Reviewer Summary: The submission by Barco is based directly on existing standards or proposals for standards.

Identification of Respondent:

Reference Number: 013

Organization (or Individual): Barco

Number of Technologies: 4

Link to Response: JTNM013-1.zip

Technology #1:

Name of the Technology: “Audio Video Bridging (AVB)”

High Level Description: “Audio Video Bridging (AVB):

http://en.wikipedia.org/wiki/Audio_Video_Bridging" http://www.avnu.org/

A set of IEEE standards to allow time-synchronized low latency streaming services consisting of:

- 802.1BA-2011 – IEEE Standard for Local and Metropolitan Area Networks – Audio Video Bridging (AVB) Systems
- 802.1AS-2011 – IEEE Standard for Local and Metropolitan Area Networks – Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks
- 802.1Q-2011 – IEEE Standard for Local and Metropolitan Area Networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks
- 802.1Qav-2009 – IEEE Standard for Local and Metropolitan Area Networks – Virtual Bridged Local Area Networks Amendment 12: Forwarding and Queuing Enhancements for Time-Sensitive Streams
- IEEE 1722-2011 – Layer 2 Transport Protocol Working Group for Time-Sensitive Streams
- 1722.1-2013 – IEEE Standard for Device Discovery Connection Management, and Control Protocol for IEEE 1722(TM) Based Devices

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: “No IPR”

Licensing Statement: “RAND or RAND-Z, according to standard IEEE Licensing Policy. For specifics, see: http://standards.ieee.org/develop/policies/bylaws/sect6-7.html “

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X		X	X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X		X		X	X

Technology #2:

Name of the Technology:

> “DHCP: Dynamic Host Configuration Protocol.
> ZeroConf: Standard Ethernet combined with the IEEE AVB extensions.
> SNMPv3: Simple Network Management Protocol (SNMP) Management Frameworks
> NETCONF: Network Configuration Protocol
> IEEE 802.1X: an IEEE Standard for Port-based Network Access Control providing an authentication mechanism to devices wishing to attach to a LAN or WLAN.”

High Level Description: The Description is provided as definitions from the following web sites for each:

“DHCP, automatic, dynamic configuration of IP addresses

> http://tools.ietf.org/html/rfc2131
> http://tools.ietf.org/html/rfc3315
> http://en.wikipedia.org/wiki/DHCP

ZeroConf, zero configuration networking

> http://www.ietf.org/rfc/rfc3927.txt
> http://www.ietf.org/rfc/rfc2462.txt
> http://en.wikipedia.org/wiki/Zero-configuration_networking

SNMPv3, Simple Network Management Protocol (SNMP) Management Frameworks

> http://tools.ietf.org/html/rfc3411

http://tools.ietf.org/html/rfc3418

NETCONF: Network Configuration Protocol

http://en.wikipedia.org/wiki/NETCONF
http://www.netconfcentral.org/

IEEE 802.1X: an IEEE Standard for Port-based Network Access Control providing an authentication mechanism to devices wishing to attach to a LAN or WLAN.

http://en.wikipedia.org/wiki/IEEE_802.1X "
http://www.ieee802.org/1/pages/802.1x.html

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : "Yes"

IPR Declaration: "No IPR"

Licensing Statement: "No Licensing statements"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X			X	X		

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X			X		X	X	

Technology #3:

Name of the Technology: "**HDCP:** High-bandwidth Digital Content Protection"

High Level Description: "HDCP: High-bandwidth Digital Content Protection

http://www.digital---cp.com/

High-bandwidth Digital Content Protection (HDCP) protects digital content against unauthorized interception and copying. HDCP is a specification developed by Intel Corporation to protect digital entertainment across the digital interfaces."

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : "Yes"

IPR Declaration: "No IPR by Barco"

Licensing Statement: "See http://www.digital-cp.com/licensing"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
					X		

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME

Technology #4:

Name of the Technology:

"RTP/RTCP, Real Time Protocol / Real Time Control Protocol

SRTP, Secure Real Time Protocol

SDP, Session Description Protocol, **SAP**, Session Announcement Protocol

MPEG-DASH, Dynamic Adaptive Streaming over HTTP (DASH), also known as MPEG-DASH/

RTSP, Real Time Streaming Protocol

H.264 / AVC, Advanced Video Coding

H.265 / HEVC, High Efficiency Video Coding

MPEG-TS, MPEG Transport Stream

PTP, precision time protocol"

High Level Description: The Description is provided as definitions from the following web sites for each:

"RTP/RTCP, Real Time Protocol / Real Time Control Protocol

http://tools.ietf.org/html/rfc6184
http://tools.ietf.org/html/rfc3550
http://en.wikipedia.org/wiki/Real-time_Transport_Protocol

SRTP, Secure Real Time Protocol

http://tools.ietf.org/html/rfc3711
http://en.wikipedia.org/wiki/Secure_Real-time_Transport_Protocol

SDP, Session Description Protocol,

http://tools.ietf.org/html/rfc4566
http://en.wikipedia.org/wiki/Session_Description_Protocol

SAP, Session Announcement Protocol

http://tools.ietf.org/html/rfc2974
http://en.wikipedia.org/wiki/Session_Announcement_Protocol

MPEG-DASH, Dynamic Adaptive Streaming over HTTP (DASH), also known as MPEG-DASH/ ISO/IEC DIS 23009---1:2

http://dashif.org/mpeg-dash
http://en.wikipedia.org/wiki/Dynamic_Adaptive_Streaming_over_HTTP

RTSP, Real Time Streaming Protocol

http://www.ietf.org/rfc/rfc2326.txt
http://en.wikipedia.org/wiki/Real_Time_Streaming_Protocol

H.264 / AVC, Advanced Video Coding

http://en.wikipedia.org/wiki/H264

H.265 / HEVC , High Efficiency Video Coding

http://en.wikipedia.org/wiki/H265

MPEG-TS, MPEG Transport Stream

http://en.wikipedia.org/wiki/MPEG_transport_stream

PTP, Precision Time Protocol

http://en.wikipedia.org/wiki/Precision_Time_Protocol

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : "Yes"

IPR Declaration: "No IPR by Barco"

Licensing Statement: No Response

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X		X	X

5.6 BBC R&D

Reviewer Summary: BBC R&D submitted a response to the RFT based on an over-arching IP Studio concept. This includes a framework and three component models, each described in detail and applied to specific Use Cases and User Requirements. The submission also includes an overarching White Paper that provides a walk-through of the concept and submission.

Identification of Respondent:

Reference Number: 015

Organization (or Individual): BBC R&D

Number of Technologies: 3*

* BBC submitted three technologies, along with the use cases that the combined technologies addressed. It was not possible to tell from the submission which User Requirements were addressed by the individual technologies submitted. Therefore, the "Analysis of User Requirements" above is based on the combination of all three submitted technologies

Link to Response: JTNM015-2.zip

Technology #1:

Name of the Technology: “IP Studio Content Model”

High Level Description: “This technology consists of a logical model for an IP-based environment that can provide immediate and later access to any content generated in a production. This can include not only audio and video, but also metadata and time-related data events.

The content model treats each frame or section of video, audio or other content, and each data event, as an object called a **Grain**. Grains are individually time- stamped and identifiable within **Flows** of time-sequential information between **Sources** and **Destinations**.

Grains can be accessed in real-time as they are created, or can be retrieved later based on their identification and timestamps.

The content model provides the ability to logically group and access related Flows of Grains and their Sources, and to support synchronization using Grain timestamps. For example, full-resolution and proxy video Flows from a particular camera are related.

Parts of this content model are incorporated in the RTP extensions (below) and the IP Studio component architecture (below) makes use of this model.

An outline of the content model is presented in JTNM015-1-b.pdf”

Type of Solution: 3- Pure Technology for reuse

Is available / implementable now? If not, when? : “This is a logical model and so is implementable now. Although not part of the Response, BBC R&D has implemented a prototype IP Studio to demonstrate and validate many parts of this model.”

IPR Declaration: “The model is the intellectual property of BBC.

The outline document is © BBC 2013.

The model is a logical model and to my knowledge does not depend on other organisatons' intellectual property for its implementaton.”

Licensing Statement: “No licence required”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
		X	X	X	X	X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X		X		X	X

Technology #2:

Name of the Technology: “IP Studio RTP streaming method”

High Level Description: “This technology consists of a method of RTP streaming suitable for in-studio use, for example for real-tme monitoring of live video and audio.

The approach implements parts of the IP Studio's content model in a live streaming context. Video, audio and other content Flows are streamed in elemental form (not multplexed into a transport stream).

Extensions to RTP (RFC 3550) are specifed to carry identfcaton and tmestamp informaton from the Grains of the IP Studio content model.

Specifc mappings are specifed for AVC-I / Intra H.264 and uncompressed audio.

Streaming will typically use multcast UDP, although this is not required. An accompanying RTCP channel is not required.

An outline of the approach and RTP extensions is presented in JTNM015-1-c.pdf”

Type of Solution: 3- Pure Technology for reuse

Is available / implementable now? If not, when? : “This is an outline of a method that is implementable now. Although not part of the Response, BBC R&D has implemented transmiters and receivers based on this method.”

IPR Declaration: “The method is the intellectual property of BBC.

The outline document is © BBC 2013.

Implementaton of H.264 and AVC-I essence mappings depends on intellectual property of MPEG-LA. AVC-I essence mapping may also depend on Panasonic intellectual property.”

Licensing Statement: “Unwilling to commit”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
				X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X	x	X	X

Technology #3:

Name of the Technology: “IP Studio component model”

High Level Description: “This technology consists of a logical model for distributed processing of producton video, audio, data events and other content for live and non-live applicatons.

Pipelines of **Processor Instances** work on Flows of individual objects, such as the Grains of the IP Studio content model).

Examples of Pipelines include:

- Encoding and multcast streaming of video and audio Flows
- Receiving and compositng of multple Flows to produce new Flows
- Analysis of video/audio Flows to produce data Flows.

Pipelines are hosted on logical Nodes, which can be instantated on physical or virtual machines.

Each Node provides a web service API for configuraton and control of the Pipelines, and the ability to discover and introspect the Node and its resources.

An outline of the model is presented in JTNM015-1-d.pdf”

Type of Solution: 3- Pure Technology for reuse

Is available / implementable now? If not, when? : “This is a logical model and so is implementable now. Although not part of the Response, BBC R&D has implemented a prototype IP Studio to demonstrate and validate many parts of this model.”

IPR Declaration: “The model is the intellectual property of BBC.

The outline document is © BBC 2013.

The model is a logical model and to my knowledge does not depend on other organisatons' intellectual property for its implementaton.”

Licensing Statement: “No licence required”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X			X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X		X	x	X	

5.7 Cisco

Reviewer Summary: The Technologies were provided in a white paper format.

Identification of Respondent:

Reference Number: 022

Organization (or Individual): Cisco

Number of Technologies: 8

Link to Response: JTNM022-1.zip

Technology #1:

Name of the Technology: “Production Media Data Center” (PMDC)

High Level Description: “PMDC is a Cisco project that applied Datacenter technologies to real world production workflows. PMDC is an evolutional architectural platform that applies datacenter technologies to greatly improve performance, operational efficiencies and workflow flexibility for media production and distribution. Designed to introduce the concept of scalable computing, fast / dense networking, and optimized and virtualized media applications. Designed as an open platform to support media-centric applications from third parties.”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Available now with on-going development efforts.”

IPR Declaration: “Cisco has the necessary IP rights to grant the licenses set forth herein.”

Licensing Statement: “Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X			X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
			X				

Technology #2:

Name of the Technology: "Private Cloud"

High Level Description: Based on the NIST standard of Cloud Computing, Cisco has delivered a working Private Cloud architecture. Taking the traditional IT datacenter, the following "essential characteristics" are added: Measured Service, Rapid Elasticity, On-Demand Self Service, Broad Network Access and Resource Pooling. Private Clouds are being widely implemented because of their economic impact on IT organizations. Private Clouds can be implemented based on commercially available or open source orchestrators. The Private Cloud can be a tenant in the Multi-tenant Data Center.

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Available now"

IPR Declaration: "Cisco has the necessary IP rights to grant the licenses set forth herein."

Licensing Statement: "Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions.

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X						

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
					X		

Technology #3:

Name of the Technology: "Cisco Open Network Environment / Software Defined Networking"

High Level Description: “Cisco Open Network Environment (ONE) is a comprehensive solution to help networks become more open, programmable, and application-aware. The broad capabilities of Cisco ONE help meet the needs of numerous market segments, including emerging concepts such as software-defined networking (SDN).

- Cisco OnePK: Comprehensive, powerful platform APIs with deep full-duplex programmatic access to Cisco devices and software.
- Cisco Extensible Network Controller (XNC): Network and fabric controller and agent technologies to facilitate the development of customized features applications.
- Overlay network technologies to support scalable, multi-tenant cloud infrastructures with consistent operations between physical, virtual and environments.

Cisco ONE creates a dynamic feedback loop that gathers network intelligence and programs individual network layers to optimize user experiences. You can tailor the solution for any number of individual applications.

Further information:

http://www.cisco.com/web/solutions/trends/open_network_environment/indepth.html”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Available now”

IPR Declaration: “Cisco has the necessary IP rights to grant the licenses set forth herein.”

Licensing Statement: “Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X				X	

Technology #4:

Name of the Technology: “Lossless Video Delivery”

High Level Description: “This section provides an overview of three Cisco technologies for optimizing medianets, specifically Cisco® Multicast-Only Fast Reroute (MoFRR), which provides a simple and efficient method for transport of reliable video streams in secondary distribution

video applications; hitless switchover or Cisco Live - Live, which provides spatial redundancy for video streams and is useful in contribution video applications and FEC which is useful to repair bit errors but less useful for convergence scenarios where frame loss is sequential and measured in milliseconds or longer (the overhead required by FEC to recover from continuous loss is substantial). Furthermore, the latency that FEC encoding introduces to the content stream is not acceptable for uncompressed contribution content especially in live production environments."

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : "Available now"

IPR Declaration: "Cisco has the necessary IP rights to grant the licenses set forth herein."

Licensing Statement: "Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
				X			X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X							

Technology #5:

Name of the Technology: "Media Endpoint Manager"

High Level Description: "Media Endpoint Manager provides a solution for contribution and distribution type video service management. Rather than focusing on individual network components, it operates at a higher level to deliver a service -oriented view of the network. The Connection Management function provides a solution for contribution type functionality adding an abstraction layer that allows to provision and monitor services without having to consider detailed configuration settings in each network element.

The Distribution Service Manager function allows for channel configuration and line-up management that manage linear-live content that must be processed to fit into the appropriate delivery network. Through lifetime management of the content, operators perform frequent configurations and reconfigurations of multiple devices throughout their video processing platforms.

The Media Endpoint Manager exposes 2 series of APIs:

Northbound API: Integration with applications such as booking, external orchestration, automation, MOM (Manager of Manager) for alarm collection and correlation. The API is a typical RESTful API with XML over HTTP type interface.

Southbound API: Integration with the Video Processing Elements, such as Encoders, Decoders, Mux and Adapters. This API can be [sentence not completed in the submitted White Paper]

East-Westbound API: The Media Endpoint Manager integrates with the WAN orchestrator for end -to-end service creation over the WAN network, asking the WAN for the shortest path through the network in a redundant way."

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Yes, available and implemented on both Service Provider and Content Provider (Programmers) environments."

IPR Declaration: "Cisco has the necessary IP rights to grant the licenses set forth herein."

Licensing Statement: "Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME

Technology #6:

Name of the Technology: "WAN Orchestrator"

High Level Description: "A WAN Orchestrator is a platform that provides near real -time visibility, analysis and control across the NGN IP network infrastructure.

WAN Orchestrator constructs a near real -time model of the network (and its different layers) and exposes the network as a set of abstractions accessible via a RESTful API.

At the highest level, the abstractions will allow applications to interact with the network simply by considering services, locations and demands. The abstract model of the network will be accessible to applications via a REST API allowing applications to query and program the network using familiar language mechanisms.

This allows lightweight applications developed by Cisco, 3rd party vendors and customers can control and configure networks.

These would be applications designed with the explicit goal of fitting both transient and permanent traffic demands to network capacity in optimal fashion. [...]"

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Collection and Modelling capabilities are available today as stand – alone functions. Integrated capabilities with programming and API support will be available in 1H2014."

IPR Declaration: "Cisco has the necessary IP rights to grant the licenses set forth herein."

Licensing Statement: "Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME

Technology #7:

Name of the Technology: "Signal Processing Orchestrator"

High Level Description: "The Signal Processing Orchestrator acts as the virtual router / switcher in the Media Processing Data Center. It serves as mediator between the Video and Audio (media) present in the Media Datacenter SDN and the applications typically present in the OB vans, studios and media (live and recorded) center. The applications are part of the "Workflow Automation, Edit and Play out" suite applications. [....]"

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Currently not available as a product, this is an evolutionally design we are investigating with industry partners."

IPR Declaration: "Cisco has the necessary IP rights to grant the licenses set forth herein"

Licensing Statement: Cisco will grant a license to the applicable IP pursuant to customary License Terms and Conditions.

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME

Technology #8:

Name of the Technology: “Reliability”

High Level Description: [Not provided]

Type of Solution: [Not provided]

Is available / implementable now? If not, when? : [Not provided]

IPR Declaration: No Response

Licensing Statement: No Response

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X					

5.8 Dolby Laboratories

Reviewer Summary: Due to a lack of detail, it was difficult to determine the applicability of the submission to the Use Cases and specific User Requirements. It is based on currently available audio Technology.

Identification of Respondent:

Reference Number: 021

Organization (or Individual): Dolby Laboratories

Number of Technologies: 1

Link to Response: JTNM021-1.zip

Technology #1:

Name of the Technology: "Audio"

High Level Description: "This technology covers audio coding, metadata, and its IP transport using existing technology and standards."

Type of Solution: Not provided

Is available / implementable now? If not, when? : "Available now."

IPR Declaration: See submission

Licensing Statement: "Reasonable and Non-Discriminatory License (RAND)"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
			X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			

5.9 EBU

Reviewer Summary: The Technologies submitted are previously-published EBU Technology Standards and White Papers.

Identification of Respondent:

Reference Number: 026

Organization (or Individual): European Broadcasting Union (EBU)

Number of Technologies: 4

Link to Response: JTNM026-1.zip

Technology #1:

Name of the Technology: "EBU Tech 3345 – Standardised MIB for broadcast equipment"

High Level Description: “A common set of MIB parameters for all broadcast equipment so that it is easier for broadcasters to control and monitor. (A Management Information Base (MIB) is a database used for managing the entities in a communications network.)

At the moment to control/monitor each piece of broadcast equipment, the broadcaster has to develop specific driver because MIB structure of each piece of equipment is very different. This generates lots of unnecessary burden to the users. Tech 3345 tries to address this problem by standardising MIB structure so that a common set or parameters are in identical position within MIB regardless which manufacturer’s equipment user is trying to control/monitor. The standard does not attempt to standardise everything within a MIB instead only the key parameters that are important for control / monitoring purpose are specified.”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Yes, manufacturers can implement it now.”

IPR Declaration: “No known patents”

Licensing Statement: “No license required”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
				X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
						X	

Technology #2:

Name of the Technology: “EisStream software”

High Level Description: “EBU Integrated Monitoring Solution for Media Streams on IP Networks (EisStream) provides a universal software platform capable of monitoring any device port for a media stream. It was developed by BBC R&D.

EBU Tech 3346 describes EisStream. The software executable and JAVA source code is available at http://eisstream.sourceforge.net/ . Together with EBU Tech 3345, an integrated solution for fully audiovisual-oriented network monitoring is possible.”

Type of Solution: 2- Point solution

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: “No known patents”

Licensing Statement: “No license required open source code.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X				X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
						X	

Technology #3:

Name of the Technology: “EBU Tech 3326: ACIP - Audio Contribution over IP”

High Level Description: “Set of standards to provide contribution of audio (speech , music) into the studio using IP networks (public and private ones)”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: “No patents, specification published by EBU”

Licensing Statement: “No license required. Some optional third party codecs if included by the manufacturer may require licensing.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X			X	X		

Technology #4:

Name of the Technology: “EBU Tech 3347: I3P - Intercom Interoperability over IP”

High Level Description: “Set of standards to provide interoperability of intercoms in the studio using IP networks instead of 4-wire. It is derived from the ACIP standard (EBU Tech 3326)”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: “No patents, specification published by EBU”

Licensing Statement: “No license required. Some optional third party codecs if included by the manufacturer may require licensing.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
	X			X	X		

5.10 EBU/AMWA FIMS project

Reviewer Summary: The FIMS Standard Body submitted the “FIMS API Interfaces”. This is a SOA framework tuned for media workflows. It does not cover SDI replacement or file/stream transport issues. Its scope is a narrow coverage of the use cases. Nonetheless, it has applicable Technology appropriate to some use cases.

Identification of Respondent:

Reference Number: 030

Organization (or Individual): FIMS Standard Body

Number of Technologies: 1

Link to Response: JTNM030-1.zip

Technology #1:

Name of the Technology: “FIMS Interfaces”

High Level Description: “FIMS Interfaces are composed of:

- a set of objects representing a media oriented domain model
- a set of service definitions modeling media transaction for Transform, Transfer, Capture and Repository

- a set of base operations handling generic interaction with services for job/queue/exception management supporting synchronous and asynchronous message patterns."

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : "Now"

IPR Declaration: "http://wiki.amwa.tv/ebu/index.php/PA"

Licensing Statement: "http://www.apache.org/licenses/LICENSE-2.0"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X		X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X		X	X		X	

5.11 Evertz

Reviewer Summary: The respondent has submitted three Technologies for consideration - Software Defined Connections, MPEG-TS over IP for Streaming Media Encapsulation, and Timing Reference. The respondent says that the technologies fully satisfy all of the User Requirements listed in the RFT. However, it is not possible to tell from the submission which sub-category of User Requirement is satisfied by the responses (e.g. CONFIG-1, CONFIG-2, etc.)

Identification of Respondent:

Reference Number: 035

Organization (or Individual): Evertz Technology

Number of Technologies: 3

Link to Response: JTNM035-3.zip

Technology #1:

Name of the Technology: "Software Defined Connections"

High Level Description: “The use of Software defined connections utilizing a centralized, out-of-band control system (like we have today in baseband SDI routers) on L2/L3 packet based switching equipment...”

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : “Available now”

IPR Declaration: “TBD”

Licensing Statement: “Unwilling to Commit to any of the Above Options”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X		X	X	X	X	X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X		X	X

Technology #2:

Name of the Technology: “MPEG-TS over IP for streaming media encapsulation”

High Level Description: “The use of MPEG-2 TS over IP as the protocol for encapsulating compressed and uncompressed Video, Audio and ANC data over 1 G/10 GbE..”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Implementable now”

IPR Declaration: “Unwilling to Commit to any of the Above Options”

Licensing Statement: “TBD”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X		X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X		X	X

Technology #3:

Name of the Technology: “Timing Reference”

High Level Description: “Use of a timing reference (e.g. Black burst) supplied to Ethernet switching and subsequent video processing equipment with 1/10GE IO to ensure synchronization for switching and processing.”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Implementable now”

IPR Declaration: “Unwilling to Commit to any of the Above Options”

Licensing Statement: “TBD”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
							X

5.12 Ether2

Reviewer Summary: THIS SUBMISSION CONTAINS REFERENCES TO SPECIFIC PATENTS. Distributed Queuing was originally invented for packet-based transport on Cable TV before DOCSIS was chosen as the Cable TV standard. Today, it can be applied to any contentious network application, provisioning synchronous and asynchronous traffic flows as the same time on a shared channel such as shared packet networks, but with fixed overhead for stable QoS and strict determinism in next generation broadcast networks. Further, the specification is capable of backwards compatibility for legacy IEEE 802.x devices or any other future network upper layer protocols that will need an interleaving coexistence strategy.

This “new MAC” is not directly compatible with existing Ethernet “COTS” switches in the market. Many user cases claim “Fully” met. However, the provided Technology (per use case) is often not sufficiently declared to establish clear proof of the claims. Since most of the Technology relates to MAC protocol and access aspects, unclear how this can be expanded to meet the many claimed user cases. For example, there is no mention of how to switch a video stream frame accurately, yet there is claimed support in TIME-4.

Identification of Respondent:

Reference Number: 011

Organization (or Individual): Ether2

Number of Technologies: 1

Link to Response: JTNM011-1.zip

Technology #1:

Name of the Technology: “Distributed Queue Wireless Arbiter (DQWA)”

High Level Description: “A near-perfect universal MAC (Medium Access Control) which combines the best features of circuit and packet-switched networks with a migration path for legacy IEEE 802.x devices, and for wired or wireless implementations.”

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : “The protocol specification is available and ready for implementation in a wired or static wireless framework by any skilled in the art of low level network ASIC/FPGA design, C code, deeply embedded systems, some machine language for debugging, Java and Linux drivers.”

IPR Declaration: This submission contains specific patent numbers in their declaration. Please see the submission for more information.

Licensing Statement: “Ether2 shares our intellectual property under a Reasonable and Non-Discriminatory license.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.13 Harris Broadcast

Reviewer Summary: The submission focuses on reuse of SMPTE ST 2022-5, 6, 7 transport standards to replace the SDI/AES3 system of transport and switching. In addition a switching and transport ecosystem is described using IEEE/IETF standards to achieve “SDI-like” and “AES3-like” performance. Metadata is carried in HANC/VANC of the SDI payloads. Proposed SMPTE ST 2059-1, 2 for sync and timing also submitted.

Identification of Respondent:

Reference Number: 027

Organization (or Individual): Harris Broadcast

Number of Technologies: 1

Link to Response: JTNM027-1.zip

Technology #1:

Name of the Technology: “Networking of Uncompressed Video over IP / Ethernet”

High Level Description: “Use SMPTE 2022-5, 2022-6, and 2022-7, on appropriately configured networks of COTS Ethernet Switches including those with IP routing capabilities”

Type of Solution: 3 - Pure Technology for reuse and 4- Configuration for COTS equipment

Is available / implementable now? If not, when? : “Immediate”

IPR Declaration: “Harris Broadcast was a participant in the development of 2022-5, -6, -7 and 2059-1, -2 within SMPTE and in that context agreed to the SMPTE IPR policies for the contents of these standards. Harris Broadcast has disclosed patents which relate to these standards.”

Licensing Statement: “Harris Broadcast has filed RAND statements with SMPTE in regards to its patents related to the standards above.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
	X		X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X		X	X	X	X

5.14 intoPix SA

Reviewer Summary: THIS SUBMISSION CONTAINS REFERENCES TO SPECIFIC PATENTS. The submitted Technology covers compressed video streams and files using JPEG 2000 and the proprietary TICO compression Technology. Video streams could use either compression format to reduce the required link bandwidth per stream. The classic image quality versus data rate applies. Also of import is extreme low latency encoding methods and the TICO method claims this. Use of compression may be

leveraged for achieving practical link rates (< 10 Gbit/s) when transporting UHDTV and 4k formats for production.

Identification of Respondent:

Reference Number: 012

Organization (or Individual): intoPIX SA

Number of Technologies: 2

Link to Response: JTNM012-1.zip

Technology #1:

Name of the Technology: "JPEG 2000 (ISO 15-444-1)"

High Level Description: "JPEG 2000 (ISO 15-444-1) is an image coding system that uses state-of-the-art compression techniques based on wavelet technology. JPEG 2000 offers higher compression without compromising quality. [...]"

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Available, deployed"

IPR Declaration: "intoPIX is aware that even though the JPEG committee stated that no license is required for the use of the JPEG 2000 (ISO 15444-1) technology (which is therefore royalty free), some IPR claims may be associated with the use of the JPEG 2000 (ISO 15444-1). [...]"

Licensing Statement: "Since intoPIX is not the owner of the JPEG 2000 technology, no licensing statement is made according to Article 13.1 of the Request for Technology"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
			X	X			X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X	X		X

Technology #2:

Name of the Technology: "TICO compression"

High Level Description: “TICO is an ultra-light visually lossless compression technology, tiny in hardware, powerful in CPU and designed by intoPIX for industry-wide adoption. The algorithm has been designed to efficiently and invisibly tackle important cost and bandwidth challenges faced by our industry.[...]”

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : “Technology is implementable. (intoPIX codec SDK and FPGA/ASIC implementation will be available in Q2 2014)”

IPR Declaration: This submission contains specific patent numbers in their declaration. Please see the submission for more information.

Licensing Statement: “RAND / Unwilling to Commit to Any of the Above Options”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
			X	X			X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X	X		X

5.15 L2TEK

Reviewer Summary: THIS SUBMISSION CONTAINS REFERENCES TO SPECIFIC PATENTS. This submission describes a product that is currently available on the market. The product description includes protocols used and performance data, along with capabilities and a description of a “Technology eco-system”. Individual use cases from the RFT are listed along with responses detailing the level of fulfilment of those responses along with a description of how the Technology fulfils the requirements.

Identification of Respondent:

Reference Number: 028

Organization (or Individual): L2tek (Leading Light Technologies, Ltd)

Number of Technologies: 1

Link to Response: JTNM028-1.zip

Technology #1:

Name of the Technology: “Stagebox”

High Level Description: "Originally conceived as a camera back product designed to stream high quality video, audio and associated data, time synchronized content over an IP infrastructure; Stagebox has developed into a technology eco-system enabling IP workflows from the camera through to final production and distribution. [...]"

Type of Solution: 1 - Grand solution set and 4 - Configuration for COTS equipment

Is available / implementable now? If not, when? : "Stagebox camera back units are available and shipping now..."

IPR Declaration: "Stagebox uses IPR developed exclusively by BBC Research and Development and CoreEL Technologies..."

Licensing Statement: "Where standards have been followed they are to the best of our knowledge, license free. No license required for supporting use cases (Stagebox is a product available to the end user)"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X			X	X	X	X

5.16 Macnica

Reviewer Summary: The respondent has presented three Technologies for consideration, all based around the SMPTE 2022-6 Standard. The respondent identifies the specific use cases that are covered by each response, and describes the need for each of the Technologies. Respondent then provides a description of the solution provided, along with recommendations on how to implement the Technology. It is not clear from this response whether these Technologies have already been implemented.

Identification of Respondent:

Reference Number: 024

Organization (or Individual): Macnica

Number of Technologies: 3

Link to Response: JTNM024-3.zip

Technology #1:

Name of the Technology: “Stream Synchronization / Genlock for SMPTE 2022-6 systems”

High Level Description: “A method of aligning video streams using a precision time protocol (like IEEE1588), and genlocking synchronized streams.”

Type of Solution: No response

Is available / implementable now? If not, when? : No response

IPR Declaration: “As far as I (Marc Levy) know, this RFT does not violate any existing patents – and I do not believe a patent search is warranted. Macnica has not, and does not plan to, file any patents related to the technology presented in this RFT.”

Licensing Statement: See above.

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			X

Technology #2:

Name of the Technology: “Glitch free switching of SMPTE 2022-6 streams”

High Level Description: “A method of switching SMPTE2022-6 streams at the SMPTE2022-6 receiver.”

Type of Solution: No response

Is available / implementable now? If not, when? : No response

IPR Declaration: “As far as I (Marc Levy) know, this RFT does not violate any existing patents – and I do not believe a patent search is warranted. Macnica has not, and does not plan to, file any patents related to the technology presented in this RFT.”

Licensing Statement: See above.

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			X

Technology #3:

Name of the Technology: "Transport Stream Null Packet Packing"

High Level Description: "A method of saving network bandwidth when transporting Transport Streams over IP networks."

Type of Solution: No response

Is available / implementable now? If not, when? : No response

IPR Declaration: "As far as I (Marc Levy) know, this RFT does not violate any existing patents – and I do not believe a patent search is warranted. Macnica has not, and does not plan to, file any patents related to the technology presented in this RFT."

Licensing Statement: See above.

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
					X		

5.17 Media Links

Reviewer Summary: The respondent has provided what looks to be a roadmap for a product that routes professional video over IP networks. As such, it provides a "worked example" of what Technologies might be required to support several of the User Requirements presented in the RFT. Because the device described implements many of the SMPTE 2022 standards, and because extensive interoperability demonstrations have been conducted around this standard, interoperability of professional video over IP using these Technologies has already been demonstrated. The respondent does not list

interoperability as a major part of the User Requirements that are satisfied by their submissions, but it is worth noting that several of the Technologies submitted by this respondent already have a proven interoperability track record.

The device handles both video and data routing, in a managed way. The proposal deals with three types of traffic - real time video, high priority data, and best effort data. A large number of Technologies are submitted - nineteen - the most submitted by anyone in response to the RFT. Taken as a whole, the Technologies address many issues regarding video over IP, and seem to paint a pretty realistic picture of the breadth of Technologies that would be required in these sorts of products.

Identification of Respondent:

Reference Number: 020

Organization (or Individual): Media Links

Number of Technologies: 19

Link to Response: JTNM020-2.zip

Technology #1:

Name of the Technology: “Perfect Non-blocking Technology (Bandwidth guarantee)”

High Level Description: “The integrity of broadcast contents needs to be maintained without fail. The transportation bandwidth for video contents, therefore, must be secured end-to-end.

In order to secure the end-to-end transportation bandwidth, every device to constitute the network infrastructure should be capable of performing the non-blocking routing.

If a device in the network cannot perform the non-blocking routing but the end-to-end bandwidth needs to be secured, the management system must manage intra-device bandwidth control besides the control of circuit interface bandwidth. If, for example, an IP router to have 24 * 10 Gbit/s interfaces is capable of only 100 Gbit/s routing, the bandwidth management must limit all input data rate to 10 Gbit/s or less and, at the same time, it must limit the aggregate traffic data rate to 100 Gbit/s or less.

This kind of network management may logically exist but as the number of routers increases, such control becomes complex, and will become unrealistic in the real life.

One thing to note on the non-blocking routing is that whether or not the function works for multicast. Many IT-based IP routers on the market are advertised to support the non-blocking routing, but in almost all cases this is applicable only for unicast because multicast is exceptional for IT-based traffic. In most cases the non-blocking routing of IT-based routers does not work for multicast and cannot guarantee the required bandwidth.

MGL's MDX2040 performs the perfect non-blocking routing for multicast traffic through a combination of the uniquely developed "PNT Clos" routing Technology and the network management system."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Products available"

IPR Declaration: "Yes"

Licensing Statement: "Unwilling to Commit to Any of the Above Options"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
		X					

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			

Technology #2:

Name of the Technology: "Ultra high-speed provisioning"

High Level Description: "Broadcast networks consisting of conventional video cross point routers are required to complete a route switching within one video frame time. Similarly, Media Link's IP video routers enable the network to complete a route switch within one video frame. This cannot be achieved without discarding conventional data routing algorithms. The switching time is defined as the duration between the issuance of switching instruction and the completion of the instructed switching.

Ordinary IP routers take 3 to 4 seconds to register a static entry to the routing table. This is not acceptable to broadcast applications. Media Link's IP video router can complete switching within one video frame time (30 ms or less) through employing an MGL unique protocol. Further, the conventional IP routers perform routing only within the IP layer without sensing the upper layer (video) contents. Therefore the switching by conventional IP routers may disrupt the continuity of the video signal, which will prolong the duration of service interruption.

In order to avoid the video signal discontinuity, the IP video router needs to perform switching with the knowledge of the application layer contents. This means that the IP video router must recognize video-signal information such as a video frame or time code and must perform switching in such a manner as to preserve the continuity of the video signal and to provide a seamless routing service."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? “Products available for the high-speed provisioning; Switching with the knowledge of the application layer contents to be developed in the future.”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
		X					

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			X

Technology #3:

Name of the Technology: “Multimedia Edge Adaptation device”

High Level Description: “Adopting the architecture of a “center switch” with “modules,” the “multimedia IP transport device” has an IP network around the center switch within the device. The layer-2 center switch and interface modules are connected with general-purpose Ethernet interfaces, the architecture of which promises the wide expandability of both intra-device and inter-device networks.

Besides stream-type content such as video/audio signals, file-type data must also be transported. The multimedia IP transport device can handle both stream-type and file-type contents simultaneously and the user can give priority of transportation to each content independently.

Since the multimedia IP transport device supports SMPTE 2022 for the transportation of the stream-type content, the interoperability among products supplied by vendors to support the same standard can be maintained.

Major formats for the stream-type contents such as SDI and AES are all supported and both unicast and multicast (to deliver contents to multiple destinations) are also supported. Further the multimedia IP transport device can perform the bulk transportation over logically unified multiple paths to allow flexible network structure.

Plus, following the Ethernet (IEEE 802.x) -based international standards, e.g.,

SDI over IP: SMPTE 2022-5/6;

MPEG-2 TS over IP: SMPTE 2022-1/2/3/4; and

JPEG 2000 over IP: ISO15444-1 over MPEG-2TS over SMPTE 2022-1/2/3/4, etc...

for both stream-type and file-type content transportation, the multimedia IP transport device can maintain the interoperability among foreign products to allow easy introductions of currently required new functions as well as possible functions to satisfy future requirements."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Products available. Transcoder will be planned for support in 2017"

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
		X	X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			X

Technology #4:

Name of the Technology: "Hitless"

High Level Description: "If a transportation source device makes multiple copies of the content and transmits each of the copies through separate transportation circuits, the transportation of the content can continue normally even when, for example, one of the transportation circuits fails. Further, if the transportation destination device performs the "Hitless" switching process over the received IP streams, it can maintain non-disrupted content output as long as at least one of the routes is instantaneously working normally. The "Hitless" process is a Technology to continue non-disrupted content output through adjusting the phase differences between received identical IP streams and through continuously selecting a normal stream. With this capability, normal transportation can continue even when an element (circuit, router, etc.) to constitute the transportation path fails.

Media Links adopted SMPTE 2022-6 as our transportation protocol, which promises the following benefits:

1. Interoperability including the "Hitless" capability can be maintained among the products supplied by vendors to support the SMPTE standard;
2. The "identity of multiple copies of a stream" can be verified with a general purpose method because RTP is used for the upper layer protocol (SSRC); and
3. The standard defines the primary and secondary paths discrimination mechanism.
4. The standard is extendable to allow RP-168 switch point indication”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Products available for 1+1 redundancy””

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X					

Technology #5:

Name of the Technology: “Auto Protection”

High Level Description: “A method of redundancy transportation to transmit content through a normally operating circuit and when the circuit fails, to transmit contents through another normally operating circuit. This method does not simultaneously transmit multiple copies over a network, with two significant benefits: minimize the duration of downtime due to protection switching, minimize the required bandwidth for stream protection. Only minimal bandwidth is required for status monitor packets on the primary and protect paths.

In order to identify a normally operating circuit, system-generated low-bit-rate (Kbit/s order) monitor packets are transmitted and received through assigned circuits to exchange circuit condition information. The transmitting device selects one of the normally operating circuits for use.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Products available for 1+1 redundancy”

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X					

Technology #6:

Name of the Technology: "FEC"

High Level Description: "An error correction method where a transmitting device generates additional packets based on the contents of user packets and sends them accompanying the user packets for use by the receiving device to correct packets erred due to transportation circuit malfunction to continue normal output.

This method allows to continue normal content output as long as erred packets are correctable or re-constructible even when some packet losses occur in the transportation circuit.

Interoperability of this method can be maintained among the products supplied by vendors to support the SMPTE 2022-1/3/4/5 standards."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Products available"

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X					

Technology #7:

Name of the Technology: “Inter-device redundancy”

High Level Description: “In order to protect the safety of transport contents it is essential to eliminate any possibility of single point failure. Media Links' MD8000 device at present can be equipped with redundant power supply units, center packet switches, and network interface modules within a chassis to eliminate the possibility of single point failure to secure safe transportation services.

As for the inter-device redundancy, it is planned to supply a system to transmit identical, synchronized IP streams from multiple devices. With the conventional Technology the timing information embedded in IP packets transmitted from separate devices cannot be the same, and therefore the receiving device cannot synchronize multiple received streams and is unable to perform the Hitless circuit switching.

The inter-device Technology is expected to cope with all of transportation anomalies together with the intra-device Technology and will be one of the key elements to materialize a perfectly redundant transportation system.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support before 2018”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X					

Technology #8:

Name of the Technology: “Self-diagnosis”

High Level Description: “The "self-diagnosis" will help maintain the integrity of operation of individual devices.

Conventionally since the device ability to autonomously diagnose its operational condition has been inadequate, the isolation of a failed part or point has required human intervention and therefore it takes much time to recover the normal operation.

Through the "self-diagnosis" function to diagnose and report problems of every part of its own device, the network management system and the user can immediately identify which part of which device is in a problematic condition. This autonomous function should continue to work without affecting normal network operation."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Planned for support before 2017"

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X				X	

Technology #9:

Name of the Technology: "Predictive-diagnosis"

High Level Description: "Predictive-diagnosis" detects, during normal operation, points that are likely to fail or cause a problem in advance in order to help prevent a sudden service disruption due to equipment failure. The "predictive-diagnosis" may be categorized into two areas, "failure prediction" and "abnormality prediction." The "failure prediction" reports on device operational conditions such as power voltage, fan rotation speed, operational temperature. The "abnormality prediction" reports on external interfaces such as electrical and optical signal characteristics and physical circuit conditions.

"Conventionally such problems could not be detected until they actually occur and disrupt the service, but the information gained from "predictive-diagnosis" will give users a wide range of alternatives to prepare for such possible problems and will allow much more flexible network operation."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support before 2017”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X				X	

Technology #10:

Name of the Technology: “Automatic restoration”

High Level Description: “The "automatic restoration" can be achieved using the information collected by the "self-diagnosis" and "predictive-diagnosis" functions.

When network operation is disrupted, conventionally the user understands the problem, studies and applies the remedy, and resumes the operation.

One popular method to shorten such recovery time is to install a protective system besides the primary system. When the primary system malfunctions, the protection system takes over the operation during which time the user analyzes the problem of the primary system. This method, however, has many disadvantages such as a high cost for installing a protective system or the fact that there is no protective system until the failed primary system recovers.

The "automatic restoration" function will solve the problems mentioned above. It will automatically restore the system when the “self-diagnosis” or “predictive-diagnosis” detects operational anomaly.

This function will minimize the duration of service interruption and will make user’s effort for problem analysis and remedy works unnecessary.”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Planned for support before 2019”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X				X	

Technology #11:

Name of the Technology: “Firewall”

High Level Description: “In Layer-2, Ethernet frames can be filtered to reject unauthorized ones using "VLAN ID," "Source MAC Address," and "Destination MAC Address" parameters.

Each parameter value can be flexibly specifiable without restrictions to:

1. Reject or accept frames to belong to a specified VLAN group;
2. Reject or accept specified unicast/multicast frames; and
3. Reject or accept frames with a specified vendor code.

In Layer-3, IP packets can be filtered to reject unauthorized ones using "Source IP Address" and "Destination MAC Address" parameters.

Each parameter value can be flexibly specifiable without restrictions to:

1. Reject/accept specified unicast/multicast IP packets;
2. Reject/accept IP packets with a specified destination; and
3. Reject/accept IP packets on a specified subnet.

In Layer-4, TCP/UDP packets can be filtered to reject unauthorized ones using "Source Port Number" and "Destination Port Number" parameters.”

The range of parameter values can be specified to:

1. Reject/accept specified application packets.

Both TCP and UDP packets can be simultaneously supported. These functions operate in a full-wire rate of over 10 Gbit/s Ethernet interface.”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? : “Product available”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
			X				

Technology #12:

Name of the Technology: “Authentication/encryption”

High Level Description: “The legitimacy of a requested connection can be verified by the server through authenticating the client to intend to initiate content transportation. If the authentication is successful, the requested connection is established and the transportation will start. If it is unsuccessful, the client's request is denied.

After the successful authentication the server gives a key to the client which can be used for decrypting the encrypted contents. This kind of Technology is already popular and commercialized for IT-based infrastructures, so we can adopt same architecture for authentication and key exchange. The point is that encryption functions operate in a full-wire rate of over 10 Gbit/s Ethernet interface.”

Type of Solution: 3 - Pure Technology for reuse

Is available / implementable now? If not, when? “Planned for support in or before 2017”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
			X				

Technology #13:

Name of the Technology: “Media Links dynamic provisioning”

High Level Description: “This is a Technology to allow the management system to dynamically specify the behavior of devices to constitute the network infrastructure.

Devices do not carry configuration files to determine their behavior but the management system dynamically load such configuration files to the devices so that the specifying a device behavior can be done at the same time of user provisioning.

Since the configuration files can be loaded to every connected device, all connected devices can be remotely controlled regardless of the network structure.

The configuration files are managed by the management system and can be transferred to target devices through the control network (Ethernet).

Since each device extracts necessary parts from the transferred and received configuration file and directly and instantly configures such components as FPGA or DSP without using any storage media such as flash memory, the user can start operation without waiting for hardware reconfiguration.

In order to realize the above mentioned mechanisms as flexibly as possible, hardware components of the devices are designed to be common to multiple functions.

For example, all interfaces are limited to IP interfaces and general purpose devices such as FPGA, DSP, and storage are employed in order to avoid giving unique properties to the hardware.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Redundancy and compression functions are available. Functions including transcoding, video processing, monitoring and security will be supported one by one from 2014.”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
			X				

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
					X		

Technology #14:

Name of the Technology: “Monitoring hierarchy classification”

High Level Description: “Essentially the definition of “necessary information” will vary depending on the environment surrounding the “requesting person.”

- Service layer: Service provider;
- Network layer: System operator; and
- Individual device layer: Maintenance engineer.

What is expected for “monitoring” is to report necessary information in an individually understandable way to each of requesting entities.

For example in the service layer, service oriented information such as:

- Service provisioning status; and
- Quality of transported content

will be required.

In the system layer, system operation oriented information such as:

- Network operation status;
- Network failure point; and
- Network traffic condition

will be required.

In the individual device layer, information on the behavior of individual devices such as:

- Operation status such as the behavior and I/F status; and

- Equipment status including the power voltage, current, temperature, fan rotation speed, cumulative operation time, component configuration, and failed point

will be required.

Through such classification as mentioned above based on the monitoring hierarchy, collected information can be “intuitively” and “visually” passed to individual users.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support in 2015”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
						X	

Technology #15:

Name of the Technology: “Monitor policy localization”

High Level Description: “The network management system will be able to customize the monitored and collected information for each of individual users or service objectives.

Conventional products and management systems cannot customize monitored information to satisfy individual User Requirements. All users do not adopt the same monitoring policy. One user may treat a phenomenon as the most critical problem but another user may not want to treat the same phenomenon as a problem.

Through the ability to flexibly customize collected information in terms of classification or degree of importance, best fit logical networks can be provided to individual users, individual services and individual sub networks.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support in 2015”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
						X	

Technology #16:

Name of the Technology: “Monitoring the content-by-content service legitimacy”

High Level Description: “The idea of end-to-end is not only for service establishment. In order to verify the legitimacy of a service on a content-by-content basis, the service needs to be monitored end-to-end. For that purpose, the network management system must link the service layer to the physical layer. This function can be achieved through the network configuration management so that the network configuration and transport routes can all be managed by the network management system.

The network management system can verify beforehand whether or not the intended end-to-end service fits the network restrictions. This function plays an important role in case where many streams are exchanged in a complicated manner in a large network.

The following information need to be collected for service legitimacy verification:

- Edge normality:

    1. Transportation delay;
    2. Delay variance;
    3. Number of data losses;
    4. Data loss rate;
    5. Data error rate;
    6. Number of data duplicates;
    7. Number of disordered data arrivals; and
    8. Throughput.

- Network normality

    1. Number of data losses; and
    2. Throughput.

Collecting the above information will enable the network management system to monitor operational conditions on a stream-by-stream basis."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Planned for support in 2018"

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
						X	

Technology #17:

Name of the Technology: "Network configuration management"

High Level Description: "The whole network configuration management will be performed by the network management system based on the given User Requirements. It recognizes the condition and configuration of every device through device polling. The network configuration will be defined by the user in the network management system."

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : "Planned for support in 2015"

IPR Declaration: "None"

Licensing Statement: "None"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME

Technology #18:

Name of the Technology: “End-to-end service establishment”

High Level Description: “Fulfilling automatically the request to deliver “this content will dramatically improve user’s network operation flow.

The automatic route search function of the network management system will autonomously determine the transport route. Together with the Media Links dynamic provisioning function to load the required function to the in path device, the network management system always maintains the functionally and operationally optimal transport route.

Parameters required for determining the transport route are:

- Required bandwidth;
- Transportation delay;
- Number of hops;
- Level of power consumption;
- Video compression requirement;
- Security requirement; and
- Self-diagnosis results.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support in 2017”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X						X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			

Technology #19:

Name of the Technology: “Stream-by-stream service grade definition”

High Level Description: “The network management system will be able to accept the stream-by-stream service grade definition through “integrating” and perfectly “controlling” the broadcast infrastructure subsystems.

The transport policy to determine the grade of service can be defined through specifying values of such parameters as:

- Degree of importance
- How many copies should be retained in the network?
- Priority
- Which priority should be given?
- Options

Which option (redundancy, compression, etc.) should be selected?

This mechanism will help construct a new broadcast infrastructure where users can define the degree of transportation reliability while benefitting from the advantage of IP networks such as expandability and flexibility.”

Type of Solution: 2 - Point Solution

Is available / implementable now? If not, when? : “Planned for support in 2017”

IPR Declaration: “None”

Licensing Statement: “None”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
							X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X				X			

5.18 Mellanox

Reviewer Summary: This is a submission of InfiniBand, a deployed high performance connectivity solution that is widely deployed in data centers.

Identification of Respondent:

Reference Number: 034

Organization (or Individual): Mellanox

Number of Technologies: 1

Link to Response: JTNM034-1.zip

Technology #1:

Name of the Technology: “InfiniBand/VPI”

High Level Description: “High performance server-storage inter-connect technology”

Type of Solution: 1 - Grand Solution Set

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: “No license required”

Licensing Statement: No response

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X		X		X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X	X	X	X	X	X

5.19 Net Insight

Reviewer Summary: THIS SUBMISSION CONTAINS REFERENCES TO SPECIFIC PATENTS. Respondent proposes a framework whose foundation is a complementary service model adding a strict media service class based on widely accepted class-based QoS architectures. The media service class provides a model for lossless IP media transport with low jitter and works together with DiffServ to provide a flexible, resource efficient IP system supporting a variety of services spanning from Best Effort to studio quality, with guaranteed transport.

Identification of Respondent:

Reference Number: 036

Organization (or Individual): Net Insight

Number of Technologies: 1

Link to Response: JTNM036-1.zip

Technology #1:

Name of the Technology: "SAMN [Service Aware Media Networks]"

High Level Description: "Net Insight proposes a complete IP media framework offering an efficient and unified transport solution for file and stream media services. A key aspect of this framework is to enable media intense networks to utilize COTS packet-based IT technology. The foundation of the framework is a complementary service model adding a strict media service class based on widely accepted class-based QoS architectures, such as DiffServ.

The media service class provides a model for lossless IP media transport with low jitter and works together with DiffServ to provide a flexible, resource efficient IP system supporting a variety of services spanning from Best Effort to studio quality, guaranteed transport."

Type of Solution: 1 - Grand solution set & 2 - Point solution

Is available / implementable now? If not, when? : "Implementable now"

IPR Declaration: "In accordance with Section 16.1, Net Insight hereby informs the RFT team that it is Net Insight's present belief that the IPR:s (the "Essential IPR") below is or may become essential in relation to the Technology submitted by Net Insight[...]."

Licensing Statement: "Reasonable and non-discriminatory license (RAND). Applicable for all Net Insight IPR used in the proposed technologies in this document"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
	X	X		X		X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X		X			X

5.20 Nevion

Reviewer Summary: The solutions rely on SMPTE ST 2022-6, 7 links for carriage of AV (SDI payload). This is proven Technology for WAN and campus hops for AV transport. This proposal is not an "SDI ecosystem" replacement solution for the core of a media facility. Rather, the links and associated management functionality would extend the core facility to connect to other domains.

Identification of Respondent:

Reference Number: 025

Organization (or Individual): Nevion Europe AS

Number of Technologies: 1

Link to Response: JTNM025-1.zip

Technology #1:

Name of the Technology: “Managed Media Services”

High Level Description: “Nevion Managed Media Services platform is a modular, integrated hardware/software solution for delivering fully Managed Media Services. Combining market-proven transport hardware with flexible management and control software, the system provides the intelligence, network awareness and control capability needed to bridge the gap between a transport infrastructure and the core services of a media transport service provider - all from an intuitive Web-based interface.

VideoIPath completes the Managed Media Services solution by adding a number of software applications including service provisioning, connection management, service analytics and inventory management, as well as fault-, configuration- and performance-management functions. These range from small to medium-sized broadcast solutions, as well as large service provider networks. This secure solution protects access to critical network resources by authentication, authorization and privacy mechanisms […]”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Yes”

IPR Declaration: This submission contains specific patent numbers in their declaration. Please see the submission for more information.

Licensing Statement: “Unwilling to commit to any of the above options”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X		X	X	X	X

5.21 Nine Tiles

Reviewer Summary: This response proposes a next generation network Technology and standardized protocols that are claimed better adapted to media than IP. It uses the same physical layers and includes a migration path for interoperability with legacy networks. It borrows some concepts from SDN (separation of control and data planes) and ATM with circuit switching and real-time/low latency support. Conceptually interesting, it certainly faces the challenge of a wide adoption while IP is dominating.

Identification of Respondent:

Reference Number: 010

Organization (or Individual): Nine Tiles

Number of Technologies: 3

Link to Response: JTNM010-1.zip

Technology #1:

Name of the Technology: “Flexilink”

High Level Description: “Byte stream format and routing protocol providing guaranteed minimal latency for media flows; also called “AV-friendly IP”. It uses existing physical layers, so interfaces can revert to legacy protocols when connected to legacy equipment.

Audio, video, and other traffics that need to send a regular stream of data have locations in the byte stream allocated to their “synchronous” packets; all the bytes that are not part of a synchronous packet form a “background” byte stream which carries “asynchronous” (best-effort) packets including tunneled Ethernet packets and IP datagrams.

Synchronous packets are routed according to their position in the byte stream, which eliminates queuing and minimizes per-packet overheads. Asynchronous packets are label routed; this provides a clean separation between control and data planes and has lower overheads (in both size of headers and complexity of forwarding logic) than current connectionless routing technologies, without compromising performance of protocols such as HTTP. [...]”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Proof-of-concept implementation over Gigabit Ethernet (fibre or copper) and SDI cabling (at up to 3G) currently in development, expected by end of 2013. Production equipment (interfaces and switches) and implementations over other bearers (including 10G Ethernet) expected in 2014.”

IPR Declaration: “Respondent is not aware of any IP essential for implementation of the specification; basic technology is in the public domain.”

Licensing Statement: “n/a”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

Technology #2:

Name of the Technology: “IEC 62379-5-2”

High Level Description: “Signaling protocol supporting the facilities required in new network technologies, including QoS negotiation between end-systems and the network, and negotiation (where appropriate, otherwise notification) of data formats and parameters between end-systems.

It uses a tag-length-value format, so is more appropriate for implementation by small embedded processors than text-based formats such as SIP and SDP. [...]”

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : “due to be published as an IS by the end of 2013”

IPR Declaration: “Respondent is not aware of any essential IP”

Licensing Statement: “n/a”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X	X	X		X	

Technology #3:

Name of the Technology: “IEC 62379 (except Part 5-2)”

High Level Description: “Common Control Interface for networked digital audio and video products. It is a protocol based on SNMP, for managing generic audio and video equipment attached to a network, and was originally developed for radio studios.”

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : “Part 1 (General), which includes a mechanism for uploading software updates, and Part 2 (Audio) have been published. Part 3 (Video) is at CD stage. Part 5-1 (Transmission over networks – General), which covers management of media streams in end-systems, is at CDV stage.”

IPR Declaration: “Respondent is not aware of any essential IP”

Licensing Statement: “n/a”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
				X			

5.22 OCA Alliance

Reviewer Summary: This response submits a framework and architecture for system control and monitoring over networks. It is originally focused on audio devices (being standardized by the AES-X.210). The proposal could be expanded to any kind of media-related equipment. There are possible overlaps with other efforts in this domain, including SMPTE TC-34CS (proposed ST 2059-1, 2). Harmonization is desired to avoid the proliferation of control standards that are not interoperable.

Identification of Respondent:

Reference Number: 014

Organization (or Individual): OCA Alliance

Number of Technologies: 1

Link to Response: JTNM014-1.zip

Technology #1:

Name of the Technology: “Open Control Architecture (OCA)”

High Level Description: “The Open Control Architecture is a foundation for the definition of media system control protocols for various network types. It is intended for use in professional media networks of 2 to 10,000 nodes, including but not limited to mission-critical networks that may be involved in life-safety systems and may extend over large areas.”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Available now as a recommended standard, as an official standard for audio systems in ~18 months.”

IPR Declaration: “No applicable patents... Through its membership agreement, the OCA Alliance has an automatic perpetual nonexclusive royalty-free license to all IP developed in the collaborative drafting of OCA, and to all I-P contributed to OCA by member companies.”

Licensing Statement: “No license required. Open public standard.”

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X	X		

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
		X	X		X	X	

5.23 Quantel, Ltd.

Reviewer Summary: Respondent has submitted a Technology called “Internetworking Media Platform (IMP)”, a configuration of COTS networking Technology to provide what respondent calls “Internet of Frames”. IMP depends on pulling content rather than pushing, and transporting frames and samples out of order and/or in parallel over multiple network paths in an optimal fashion. The platform consists of an Orchestrator of workflows, a Media Aware Naming Service (MANS), as well as source and recording devices. Based on an orchestration request to record a particular feed, a recorder can request information about feed sources from the MANS. The recorder then requests a manifest from the proper source describing its essence streams, along with essence stream average chunk size. The recorder then begins requesting essence stream chunks from the source.

Identification of Respondent:

Reference Number: 019

Organization (or Individual): Quantel Ltd

Number of Technologies: 1

Link to Response: JTNM019-1.zip

Special Copyright Notice /Approval email(s): None

Technology #1:

Name of the Technology: “Internetworking Media Platform (IMP)”

High Level Description: “A platform that exploits all layers The Internet's Technology for the production and transport of professional media content. As scalable and dynamic as The Internet, IMP can be deployed to replace fixed physical infrastructure running on dedicated hardware with flexible, virtualized infrastructure. IMP incorporates dynamic media source (e.g. feed) and service (e.g. transform) discovery through a Media Aware Naming Service, with the composition of services-as-functions on-the-fly.

TCP protocols are available on, and optimally implemented in, most computers, smartphones and tablets, allowing the reliable transport of content with low overhead and up to nearly line speed. IMP is not a technology in its own right, rather it is a configuration of today's COTS networking technology to provide Quantel's concept of an Internet of Frames [3, 4]. Requiring only today's commodity hardware, IMP provides media-specific applications with building blocks: a common naming model, a protocol and a domain-specific language for media processing (IMP DSL).

IMP turns many concepts of established media technology, such as SDI, on their heads, including:

- pulling content rather than pushing, with a clock run at the target rather than a source;
- transporting frames and samples out of order and/or in parallel down multiple network paths;
- dynamically establishing optimal and global routes.

These fundamental changes are essential parts of fully exploiting Internet technology that is optimized for the pull- oriented HTTP protocol. If the correct architecture is adopted, almost all of the billions of dollars of spend by the IT industry on building and optimizing The Internet is available to the media industry…”

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : “Compared to developing specialized technology for media from scratch that exploits packets, 99% of the general technology behind the IMP is COTS. Quantel can contribute the detail of the media-specific 1% for further development into a suite of specifications and/or standards.

Today, Quantel has prototype implementations of the Media Aware Naming Service (QStack), a recording service (Scamp), dynamic transcoding services (QTube Transformer) and clients (QTube browser/edit/API). These will be brought together into products that provide the IMP as part of RevolutionQ product launches throughout 2014."

IPR Declaration: "Richard Cartwright and James Cain have no personal knowledge of any intellectual property that would be essential to the implementation of the Internetworking Media Platform, either owned by Quantel Ltd or another entity. Quantel Ltd owns no such intellectual property. No exhaustive patent search has been carried out.

Note that Quantel Ltd reserves the right to protect intellectual property of behalf of itself and the broader media industry. If Quantel Ltd chooses to apply protection to intellectual property that is essential to the implementation of the Internetworking Media Platform in the future, Quantel intend to make a RAND-Z license available to all implementers."

Licensing Statement: "Compensation-Free, Reasonable and Non-Discriminatory License (RAND-Z). Quantel Ltd declares that they will grant a license to all implementers regarding the Internetworking Media Platform technology submitted in this RFT Response without a requirement for monetary compensation (i.e. no royalty or other fee)."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.24 Scalable Video Systems

Reviewer Summary: The Technology submitted in this response redesigns the live production switcher around COTS components and optimal usage of packet networks. The proposed Technology claims a Grand Solution set that covers many User Requirements, but the information is limited on how the requirements are achieved. The IPR situation is unclear at this point, making it hard to appreciate if this Technology can be integrated with third parties in a complex production environment.

Identification of Respondent:

Reference Number: 037

Organization (or Individual): Scalable Video Systems GmbH

Number of Technologies: 1

Link to Response: JTNM037-1.zip

Technology #1:

Name of the Technology: "IT-TV-LIVE – an IT-based Distributed Live Production System"

High Level Description: "Technology Environment IT-TV-LIVE describes a new concept to realize IT-Based Live Productions as they are realized today in TV-Studios around a Video Switcher environment, taking advantage of the latest available IT technologies like hardware components (High Performance Servers), software tools/packages and the global infrastructure (networks) and put them into one production system. All processing is software based and gets rid of that kind of internal processing- and routing hardware in today's broadcast technologies that are restricted by its architecture and forcing the user's workflow to adapt. [...]"

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : "IT-TV-LIVE has been shown on IBC'13 already, including distributed live remote production between Amsterdam and Frankfurt. Product launch will be in 2014."

IPR Declaration: "IT-TV-LIVE Technology is a high level system solution and touches a lot of Technology areas. The key concept of optimized bandwidth usage addresses codecs, protocols and more which must be considered.

Scalable Video Systems has filed [patents] algorithms dedicated to IT-TV-LIVE. These candidates for patent are not published- and not granted yet through the patent process."

Licensing Statement: "No commitment to any license declaration statement today"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X		X	X		X	

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X						X	X

5.25 SDVI

Reviewer Summary: Respondent suggests that a single Technology ensemble of "Cloud, Virtualization & Software Defined Networking (SDN) [Enterprise Software]" can fully or partially address every Use Case and most Requirements from the RFT.

Identification of Respondent:

Reference Number: 016

Organization (or Individual): SDVI Corporation

Number of Technologies: 1

Link to Response: JTNM016-1.zip

Special Copyright Notice /Approval email(s): None

Technology #1:

Name of the Technology: "Cloud, Virtualization & Software Defined Networking (SDN) [Enterprise Software]"

High Level Description: "The SDVI submission represents the capabilities of software currently under development by SDVI. The SDVI software suite is based upon an integrated ensemble of cloud, virtualization, and software defined networking technology."

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : "2014"

IPR Declaration: "The Technology described in this submission is being developed by SDVI and its development partners. The Technology includes proprietary intellectual property owned by SDVI, and/or its partners."

Licensing Statement: "SDVI declines to consider any of the licensing arrangements described in the JT-NM RFI until after the SDVI software suite is introduced in 2014."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X	X	X	X	X	X	X

5.26 Sony

Reviewer Summary: Respondent has submitted two Technologies, "SDI-IP Mapping" and "Network Synchronization". SDI-IP Mapping allows video, audio, and metadata to be placed in separate datagrams so that they can be dealt with individually. Protection compatible with video switching can be provided by SMPTE 2022-7 redundancy or a FEC method that is frame boundary aware and also transmitted in one session (unlike

SMPTE 2022-5). SDI-IP mapping supports the transfer of compressed video if it meets conditions of low latency less than one frame, compression ratio, and high picture quality. Network Synchronization is based on "the draft standard SMPTE ST 2059-2, the SMPTE Profile of IEEE 1588, in conjunction with SMPTE ST 2059-1 that defines an epoch and A/V signal alignment to the epoch." Respondent claims that their implementation of Network Synchronization can realize sufficient synchronization accuracy under high network load using general Ethernet switches. A legacy synchronization signal such as black burst could be the time source for an IEEE 1588 system during a migration of facility to network synchronization.

Identification of Respondent:

Reference Number: 023

Organization (or Individual): Sony Corporation

Number of Technologies: 2

Link to Response: JTNM023-1.zip

Special Copyright Notice /Approval email(s): None

Technology #1:

Name of the Technology: "SDI-IP Mapping"

High Level Description: "Sony is developing Real Time IP Production Technologies to cover the workflows and operational practices of a conventional SDI-based environment.

These are based on existing and draft standards and are complemented by new Technology proposals including SDI-IP mapping..."

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Integrated with Sony's Real Time IP Production, this will be available by December 2014."

IPR Declaration: "As of October 31, 2013, there is no intellectual property which Sony believes to be essential to the implementation of this Technology."

Licensing Statement: "Not applicable to Sony."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
	X		X	X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X		X			

Technology #2:

Name of the Technology: "Network Synchronization"

High Level Description: "One of the most important technologies in the current workflow and operational practice of SDI-based systems is synchronization. All devices in the system are synchronized with each other using a common synchronization signal. This guarantees the same output signal phases from each device. SMPTE is developing a set of standards in Technology Committee 33TS for time and frequency synchronization in a professional broadcast environment.

Real Time IP Production uses network synchronization Technology from the draft standard SMPTE ST 2059-2, the SMPTE Profile of IEEE 1588, in conjunction with SMPTE ST 2059-1 that defines an epoch and A/V signal alignment to the epoch.[…]"

Type of Solution: 2 - Point solution

Is available / implementable now? If not, when? : "Integrated with Sony's Real Time IP Production, this will be available by December 2014."

IPR Declaration: "As of October 31, 2013, there is no intellectual property which Sony believes to be essential to the implementation of this Technology."

Licensing Statement: "Not applicable to Sony."

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
	X			X			

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X		X					X

5.27 Xilinx

Reviewer Summary: Respondent submits the Technology "SMPTE 2022-5, 6 Core & Reference Design". This allows Xilinx FPGAs to encapsulate and de-encapsulate multichannel SDI over 10 GbE along with FEC protection if desired using SMPTE 2022-5 & 2022-6.

Identification of Respondent:

Reference Number: 038

Organization (or Individual): Xilinx Inc.

Number of Technologies: 1

Link to Response: JTNM038-1.zip

Technology #1:

Name of the Technology: "SMPTE 2022-5, 6 Core & Reference Design"

High Level Description: "An intellectual property core and associated system level reference design which implements multichannel SDI over 10 Gbit/s Ethernet (10 GbE) using a Xilinx FPGA. The design focuses on high bit rate media transport over 10 GbE with a built-in FEC engine. The design is able to support multiple SD/HD/3G-SDI streams which are multiplexed and encapsulated into fixed-size datagrams by the SMPTE 2022- 5/6 video over IP transmitter and sent out through the 10 GbE MAC. On the receive side, the Ethernet datagrams are collected at the 10 GbE MAC. The SMPTE 2022-5/6 video over IP receiver filters the datagrams, de-encapsulates and de-multiplexes the datagrams into individual streams which are output through the SMPTE SD/HD/3G-SDI interfaces."

Type of Solution: 1 - Grand solution set

Is available / implementable now? If not, when? : "Available now"

IPR Declaration: "Unwilling to Commit to Any of the Above Options"

Licensing Statement: "The respondent is unwilling to commit to any of the license declaration statements (pending Xilinx legal review to confirm RAND statement is acceptable)"

Use Cases that are addressed by this Technology:

CONFIG	COTS	FILE	FORM	INTEROP	MONETIZE	PROV	QOS-FT
X	X	X	X	X	X	X	X

QOS-S	REACH	REL	SEC	STREAM	SUST	TESTMON	TIME
X	X			X	X	X	

6. Conclusion

This *Task Force* was created to help manage the transition from infrastructures that are based on purpose-built broadcast equipment and interfaces (SDI, AES, etc.) to IT infrastructure and packet networks (Ethernet, IP, etc.) There is a demand in the industry for interoperable, open systems that allow the mixing and matching of products from different vendors to meet users' needs. There is a strong sentiment both in the user and manufacturer communities that managing the transition from traditional infrastructures is critical in order to provide the required user functionality and to avoid waste both in terms of cost and time.

There were 36 companies who notified us that they were going to submit responses to the RFT and we received 27 submissions. We recognize that some respondents made a significant investment in time and effort in order to produce the responses we received. We thank those respondents, and hope that the summaries in our report reflect on the amount of effort expended. We also recognize that, for commercial reasons, some companies may have decided it was necessary to keep their Technologies "close to the vest". We hope that in the future they will reconsider and disclose more information for the benefit of their customers and for the industry as a whole. That said, there were submissions that were challenging to analyze as they were not as detailed as some others. Finally, there were several companies who have a major influence in the industry - some of whom have working products in this area - who chose not to respond or chose not to engage with the Joint Task Force. This is unfortunate, and we hope that they will choose to participate in industry activities in the future.

On the plus side, the respondents to the RFT submitted a total of 66 Technologies that they represented as being applicable to the Use Cases and User Requirements. Some Respondents stated that their submission covered all Use Cases and all User Requirements.

Most respondents submitted a small number of Technologies, but we received one submission containing eight technologies, and another containing 19 technologies. These two outlier submissions could affect the graphs and data in this report so readers are encouraged to consider this as they interpret the results.

The Gap Analysis did *not* include either a comparative analysis or qualitative comparison; the submissions by the respondents were compiled and applied "as is". While the responses indicate that there are no gaps left unfilled, we believe that the overall process lacked the rigor to prove that all User Requirements are, in fact, satisfied. Without a fixed system reference architecture (one was not provided by us as part of the RFT process), making apples-to-apples comparisons proved to be very difficult. In the end, the industry needs to be able to implement complete solutions that meet user's requirements by applying the appropriate mix of Technologies.

The submissions were not evenly distributed across the requirements: "CONFIG" (the "configuration" Use Case) received the most and "MONETIZE" (the "monetization" Use Case) received the least. Some respondents (36.9%) offered point solution islands for pieces of a

grand solution while others (18.5%) provided pure Technology that could be used as part of a workflow solution.

Several respondents clamed to provide grand solution sets, although in some cases, it was difficult to determine the basis of this claim from the material provided.

The responses to the RFT brought together like minds and excellent referenced Technology that will find application in the near future. The responses shed light on many relevant areas and several Technologies (IEEE 1588, SMPTE ST 2022, IEEE AVB) have clear momentums. Despite the need for more clarity regarding overall solutions, the submissions should be leveraged in future work efforts towards the same goals.

Next Steps

In this report, a landscape of potential Technology solutions has been drawn. Many of the Use Cases are satisfied by the Technologies submitted. In order to achieve the goal of interoperability, the Technologies need to be studied from a system perspective. And, there is still a need to validate that many of those Technologies are actually suitable in our industry.

Potential future activities will be discussed between the three sponsoring organizations. It is important to note that, while there may be follow-on activities in this Task Force, there may be activities that are carried out by individual organizations or other industry groups. The sponsoring organizations intend to have a discussion regarding future activities and make an announcement sometime in the first quarter of 2014. We solicit feedback in this regard from readers of this report.

Annex A: RFT Submissions

The following companies indicated that they would intend to the RFT. The 27 companies in ***bold*** returned a response.

ALC NetworX GmbH

AVA Networks

AVnu Alliance

Audio Engineering Society

Axon Digital Design

Barco NV

BBC R&D

Broadcom Corporation

Bluebell Opticom Limited

Cisco Systems

Dolby Laboratories

EBU/AMWA FIMS Project

Ether 2

European Broadcasting Union

Evertz

Grass Valley

Harris Broadcast

intoPIX SA

L2tek

Macnica Americas

Media Links

Mellanox Technologies

Net Insight

Nevion Europe AS

Nine Tiles

OCA Alliance

Quantel Ltd

Scalable Video Systems GmbH

SDNsquare

SDVI Corporation

Sony Corporation

Suitcase TV Ltd

Xilinx

Annex B: JT-NM Vision / Mission and Timeline

Project Summary: (A short summary of the project.)

The Joint Task Force on Networked Media has been created to help manage the transition from broadcast infrastructures that are based on specialty broadcast equipment and interfaces (SDI, AES, etc.) to IT-based packet networks (Ethernet, IP, etc.). This effort spans the entire professional media industry and all of its applications including live and file-based. We intend to accomplish this objective by collecting business-driven User Requirements, releasing a Request for Technology, and then by publishing the results of a gap analysis between the User Requirements and the results of the RFT.

Sponsors: (Entities that are responsible for the Task Force.)

The sponsors of the Task Force are the European Broadcasting Union (EBU), the Society of Motion Picture and Television Engineers (SMPTE), and the Video Services Forum (VSF).

Vision: (A statement based in the future, assuming that the effort is successful.)

New business opportunities are enabled through the exchange of professional media, including file-based and live content, across a network taking advantage of the benefits of IT-based Technology at an affordable price.

Mission Statement: (A statement that describes what the effort will accomplish.)

In an open, participatory environment, help to drive development of a packet-based network infrastructure for the professional media industry by bringing together manufacturers, broadcasters and industry organizations (standards bodies and trade associations) with the objective to create, store, transfer and stream professional media.

Objectives: (The main thing the effort seeks to achieve.)

The primary objective of this Task Force is to identify gaps that exist between user's business driven requirements for a packet-based network infrastructure for professional media, and the responses from manufacturers when queried about their ability to fulfil the User Requirements. Other objectives include promoting interoperability in packet-based systems (networking, equipment and software) for professional media. The ultimate objective for the industry is to help manage the transition between broadcast infrastructures that are based on specialty broadcast equipment and interfaces to 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.

Method & Approach:

The scope of work of the Task Force is as follows:

- Collect business-driven use cases and requirements to help the industry prioritize and to focus efforts. Publish these use cases
- Issue a Request for Technology (RFT) in order to collect information about Technology that can be used to meet the challenges posed by the use cases collected above.
- Look for areas where there are unmet User Requirements, and publish these unmet requirements as a gap analysis report, along with the complete text of all RFT responses
- Other work items as defined by the above tasks
- Evaluation point: validate that the Task Force has achieved the items in the scope of work above

Based upon the successful accomplishment of the scope of work above, the sponsoring organizations will evaluate industry needs and potential future areas of work.

Out of Scope

The following areas are *Out of Scope* for the Task Force:

- The Task Force will not write standards
- The Task Force will not work on signal processing/transformation
- The Task Force will not define Universal Codecs
- The Task Force will not be an *exclusive* group
- The Task Force will not duplicate work done by other groups

Figure 1 shows the project timeline of the JT-NM.

Here are some key dates:

- Call for participation 15 April, 2013
- Complete User Requirements collection 30 June, 2013
- Publish User Requirements 15 August, 2013

- Publish RFT 12 September, 2013
- Publish gap analysis 30 November, 2013

The timeline may be downloaded here.

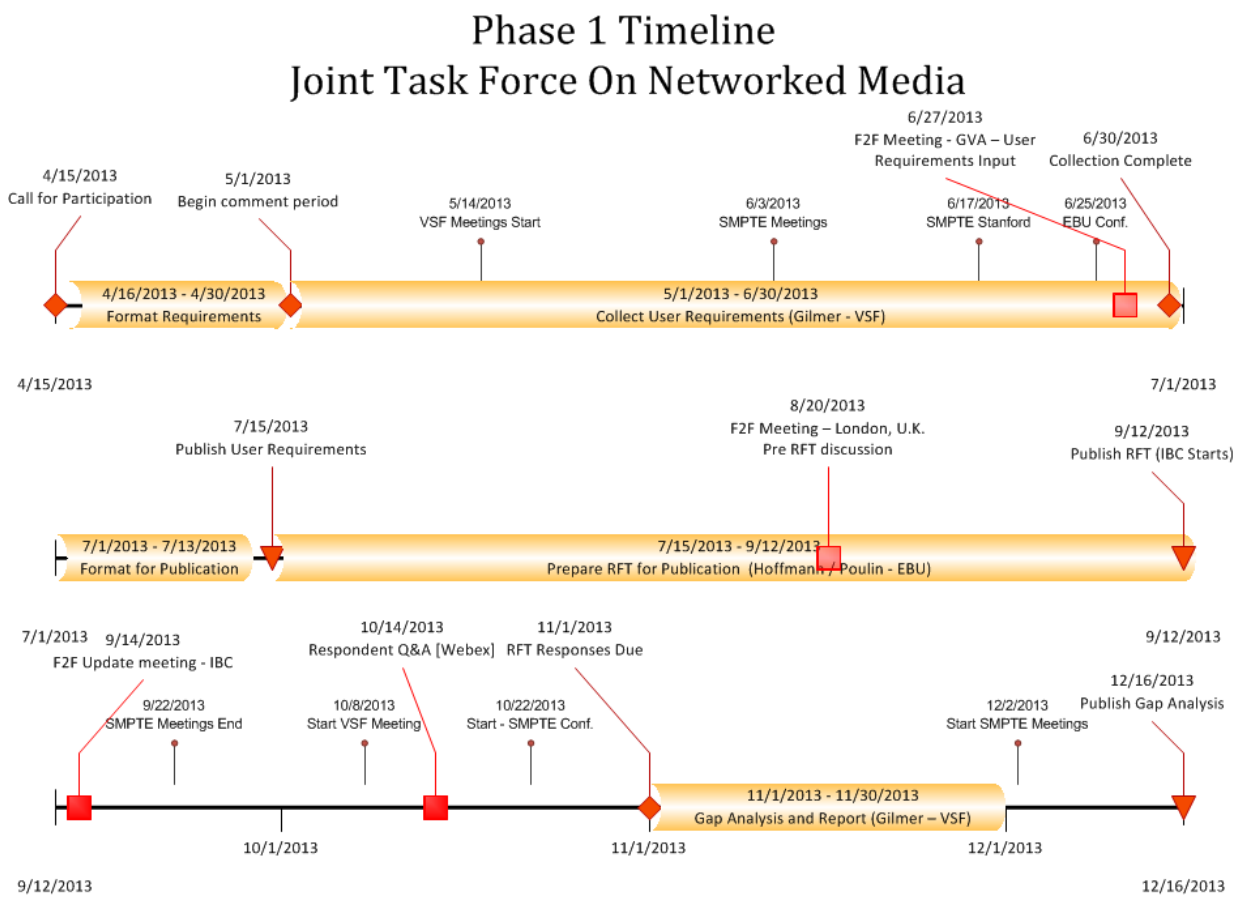

Figure 1 JT-NM Timeline

Annex C: User Story Submission Form

Joint Task Force on Networked Media - User Story Submission

The form below may be used to submit user stories to the Joint Task Force on Networked Media.

The Joint Task Force on Networked Media is jointly sponsored by the European Broadcasting Union (EBU), the Society of Motion Picture and Television Engineers (SMPTE) and the Video Service Forum (VSF).

Joint Task Force Vision:
New business opportunities are enabled through the exchange of professional media, including file-based and live content, across a network taking advantage of the benefits of IT-based Technology at an affordable price.

Joint Task Force Mission:
In an open, participatory environment, map out a strategy for developing a packet-based network infrastructure for the professional media industry by bringing together manufacturers, broadcasters and industry organizations (standards bodies and trade associations) with the objective to create, store, transfer and stream professional media.

In order to achieve our vision and mission, our first step is to collect user stories related to the use of packet-based video (and audio, of course) network infrastructures in professional media applications. We would very much appreciate any contribution you might want to make to this effort. Stories should be applicable in the time frame from now through the next three to five years.

You may use this form to submit user stories to the Joint Task Force on Networked Media [JT-NM]. Please be sure to share your contact information. You DO NOT have to be a user to submit a user story!

Stories MUST follow the form, "As a [ROLE], I want to [FUNCTION] so that [BUSINESS VALUE]. Expressing a business value for your story makes it much more valuable, so to ensure that your user story is considered, please follow this format. Generic user stories are not as helpful as ones that are specific and address a particular problem or issue.

Example: As a camera person [this is the ROLE] I want to be able to connect a news camera directly to a WiFi access point and send professional quality video back to the studio [this is the FUNCTION] so that I can save money on special RF or terrestrial video transport links [this is the BUSINESS VALUE].

These user stories will be made public. Similar stories may be merged, and it is possible that some stories will not be used. It is the intent of the Task Force to produce a Request for Technology based upon the requirements expressed in these user stories.

For information on the Task Force or to join the effort, please contact:
Bob Ruhl bob.ruhl1@verizon.net.

* Required

Last Name *

First Name *

Company * (or Affiliation - consultants, please let us know who you are representing.)

e-mail address *

As a [ROLE] *

Typical ROLES might be user, design engineer, product designer, facility owner, etc.

I want to [FUNCTION] *

The FUNCTION is WHAT the user story accomplishes

so that [BUSINESS VALUE] *

This is the business value created if the ROLE is able to achieve the FUNCTION listed above

Notes

Please enter additional information here. For example, if you have several stories that are linked together, you can let us know using this field.

Annex D: Copyright Permissions

Some of the submissions we received in response to the RFT contained copyright notices. We contacted the copyright holders to obtain permission to publish these copyrighted works in this report. The letters of permission are contained in this annex.

BBC

From: Peter Brightwell [mailto:peter.brightwell@bbc.co.uk]

Sent: Monday, November 04, 2013 1:25 PM

To: Bob Ruhl

Subject: JTNM015-1 Submission

Dear Bob,

The BBC would like to submit certain documents to the EBU/SMPTE/VSF Joint Task Force on Networked Media ("JT-NM").

With regard to the BBC's IP Studio documents- number JTNM015-1 (the "BBC Copyright Material"), I would like to confirm that the JT-NM has permission to do (a) publish the BBC Copyright Material in JT-NM's final gap analysis report under JT-NM copyright; and (b) extract parts of the BBC Copyright Material to make derivative work as part of JT-NM's final gap analysis report.

Yours sincerely,

Peter Brightwell

--

Peter Brightwell, Lead Research Engineer

BBC Research & Development

D4.29 Centre House, 56 Wood Lane

London W12 7SB, UK

Tel: +44 3030 409551, Mobile: +44 7834 845762

BBC Mobex: 07139569

L2TEK

From: Mark Scott-South [mailto:mark@l2tek.co.uk]

Sent: Wednesday, November 06, 2013 11:56 AM

To: 'Bob Ruhl'

Subject: RE: Your JTNM028-1 Submission?

<SNIP>

please accept this email as full permission for the Joint Task-Force - Networked Media (JT-NM) to publish the copyrighted submission in our final report, under your copyright.

Best regards

Mark

Annex E: List of attendees at kick off meeting

Meeting held at Turner, March 18 & 19, 2013.

Avid	Ron	Wallace
BBC	Phil	Tudor
BBC	Robert	Wadge
CBS	Robert	Seidel
Cinegy	Jan	Weigner
Cobalt Digital Inc.	Gene	Zimmerman
Devoncroft Partners	Joe	Zaller
EBU	Hans	Hoffmann
EBU	Felix	Poulin
ESPN	Emory	Strilkauskas
ESPN	Ted	Szypulski
Evertz	Eric	Fankhauser
Evertz	Alan	Lambshead
Fox	Thomas	Edwards
Fox	Richard	Friedel
Grass Valley	Steve	Dupaix
Harris	John	Mailhot
Level 3	Ryan	Korte
Media Links, Inc.	John	Dale
Media Systems Consulting	Alan	Kovalick
Miranda	Bob	Hudelson
Miranda	Sara	Kudrle
Quantel	James	Cain
SDVI Corporation	Larry	Kaplan
SMPTE	Peter	Symes
Sony Europe Ltd	Morgan	David

System Resource	Carl	Ostrom
TechNova Consulting LLC	Karl	Schubert
Turner	Rick	Ackermans
Turner	Ken	Brady
Turner	Michael	Koetter
Turner	Dave	Silver
Univision	Chuck	Marino
VSF	Brad	Gilmer
VSF	Bob	Ruhl

Annex F - List of participants in the *Task Force*

JT-NM Administration Team

Brad Gilmer – VSF - co-chair

Richard Friedel - FOX - co-chair

Hans Hoffmann – EBU - co-chair

Felix Poulin - EBU

Bob Ruhl - VSF

Peter Symes - SMPTE - co-chair

RFT Management Team

Markus Berg – IRT

Thomas Edwards - FOX

Brad Gilmer - VSF

Al Kovalick - Media Systems Consulting

Sonja Langhans - IRT

Felix Poulin - EBU - Leading

Bob Ruhl - VSF

Karl Schubert - TechNova Consulting LLC

Gap Analysis Team (this report)

Thomas Edwards - FOX

Brad Gilmer - VSF - Leading

Al Kovalick - Media Systems Consulting

Felix Poulin - EBU

Bob Ruhl - VSF

Karl Schubert - TechNova Consulting LLC

The Joint Task-Force Networked Media (JT-NM) was created during a face-to face meeting held at Turner Broadcasting on March 18 and 19, 2013 (See the list of attendees on Annex E). On April 7, 2013 the EBU, SMPTE and VSF issued a joint press release to announce they were co-sponsoring this effort.

Over a nine month period the group conducted 5 webinars and over 50 conference calls. There were also face-to-face meetings held during VSF, SMPTE and EBU Meetings. Special face-to-face meetings were conducted at the BBC in London, Fox in Los Angeles, and in Amsterdam during IBC to discuss this effort and respond to questions initiated by the over 200 entities that have been participants of the JT-NM. It is estimated that participants have expended well over 2,000 man hours up to the point of the release of this Gap Analysis report. This does not take into account the time respondents put into reading and responding to the RFT.