TSL Products

IP – THE BUSINESS CASE:

How did we get here and where are we going?

A educational white paper based on the knowledge of Mark Davies, Director of Products and Technology at TSL Products and Steve Brownsill, Audio Product Manager at TSL Products.

Written by Josh Gordon, President of the Josh Gordon Group

PREFACE

This white paper was based on the information shared during an educational webinar sponsored by TSL Products entitled "**IP – THE BUSINESS CASE:** 'How Did We Get Here And Where Are We Going?'" which was presented in Europe on November 28, 2018.

Most of the content in this white paper was created from comments by the two webinar participants: Mark Davies, Director of Products and Technology at TSL Products and Steve Brownsill, Audio Product Manager at TSL Products. Additional context was provided by the writer, Josh Gordon, a well-known television industry consultant

INTRODUCTION

The television industry is not the first communication industry to use IP technology to create and distribute content. Radio broadcasting has already been operating full IP production studios and inter-facility networks for 10 years. During the same decade, telecoms have also had IP networks passing video. With the economies of scale and achievable interoperability in place, IP is now coming to the broadcast industry. This whitepaper will look at it's impact, from the commercial and operational advantages and help you asses whether it is the right fit for your organization.

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WHY IP NOW?

Here are three basic reasons why the IP transition is happening now:

IP Bandwidth Capability Has Passed A Tipping Point

IP technology is used in the IT market, it has rigorously followed Moore's law which states that computer processing power doubles approximately every two years. On the chart below, we see the parallel development of IP (Ethernet) and SDI. In the 1990's, when television first did SDI, standard definition video was at 270 MB/S, which doesn't sound like much these days. But back then, IP systems only could pass 1 to 10 MB/S. So, the television industry has had to develop its own standards and chipsets.

When television moved to HD around the early 2000's, SDI systems were hitting 1.5 GB/S. By then the efficiency of IP was not far behind and fast catching up. By 2002, IP technology had passed a tipping point and could run faster than SDI. In the years that followed, even though SDI performance continued to improve, the massive investment in IP from the IT industry pushed Ethernet technology further ahead still.

"IP technology is used in the IT market, it has very rigorously followed Moore's law which states that computer processing power doubles approximately every two years."

Says Mark Davies, Director of Products and Technology at TSL Professional Products Ltd., "When we talk about IP technology we are not talking about a static set of tools or benefits. IP technology is advancing rapidly on the back of IT technology, which dwarfs the amount of money spent on proprietary broadcast technology by a staggering degree. It is moving forward and evolving at ever increasing speeds."

Today, IP can easily handle uncompressed digital video, and 10 GB/S, 25 GB/S, and even 100 GB/S nodes in standard switches can be bought economically. The chart below shows the tipping point where IP (Ethernet) technology speeds passed SDI.

IP Can No Longer Be Ignored

The rate of 'bandwidth' progress being demonstrated by IT industry port speeds is far oustripping those made available by broadcast manufacturers. Those who have been traditionally responsible for the manufacturing of SDI infrastructure (Routers and DA's etc.) simply cannot keep pace with the port speeds offered by IT hardware.
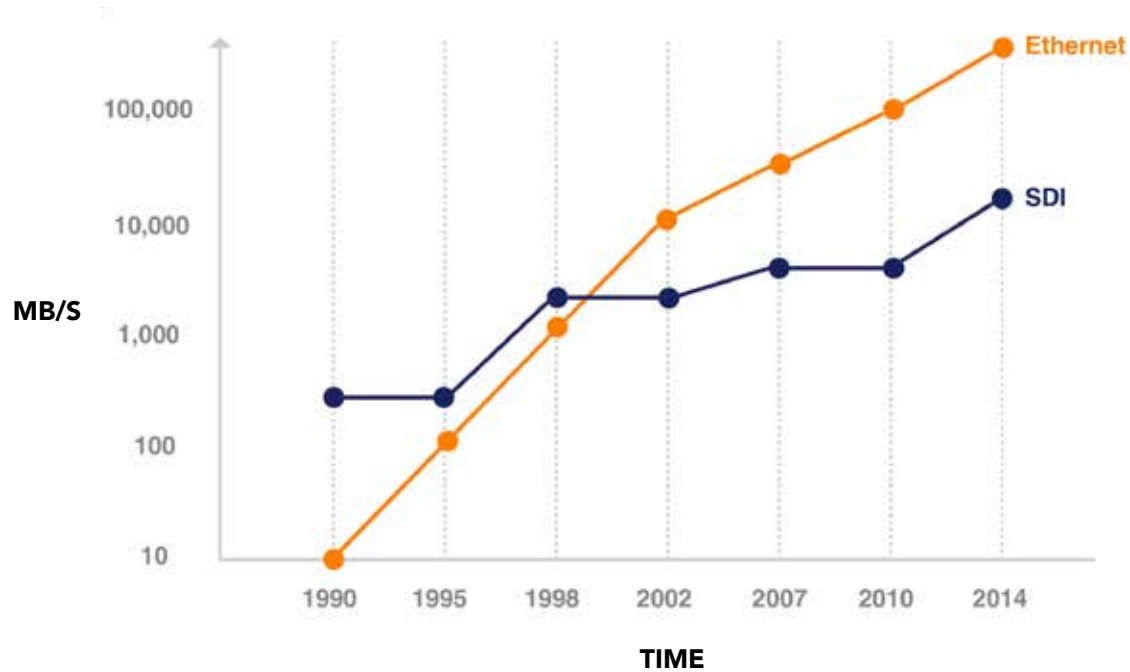
IP Standards Are Settling

When a new communication technology emerges, establishing standards is an essential step in building confidence for end users to accept it. Says Davies, "The television industry had a bit of disruption at the beginning as suppliers trying to be first to market introduced their own de facto of standards. Eventually, initiatives from the EBU and SMPTE set up a joint task force to set universal IP standards."
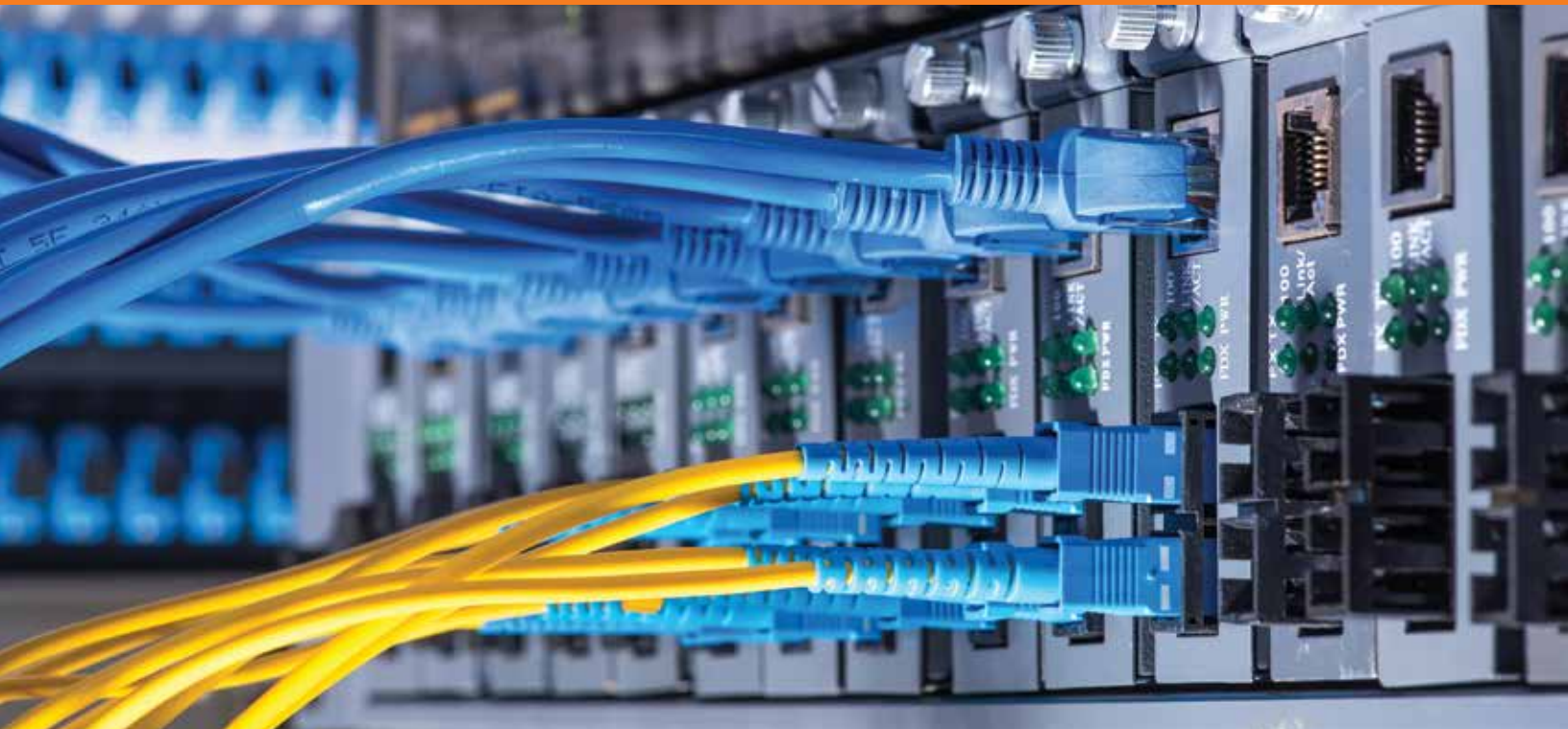
A Joint IP Task Force

It's all very well proposing that we climb on board and take advantage of increasing port speeds, but industry standards are paramount if we are to consider using IP to carry uncompressed video and audio.

Just in the last few years, we've seen standards now starting to stabilize, thanks to the good work done by AIMS, the EBU, SMPTE the Video Services Forum, key manufacturers, and other standards bodies.

Says Steve Brownsill, Audio Product Manager at TSL, "In the early proof of concepts, one of the key concerns from customers was interoperability. If ST ST 2022-6 achieved anything, it proved that interoperability was achievable. In hindsight, interoperability between different vendors came very quickly, so in that sense, ST 2022-6 was the right standard at the right time."

Delivering Audio And Video Over IP

SMPTE ST 2022-6 is the simplest and most ubiquitous standard.

The VSF Technical recommendation – TR – 04 – consists of standards SMPTE ST 2022-6 for video and AES67 for separate audio, which offers a direct connection to audio equipment.

VSF TR-03 presents essence based transport, using RTP based standard RFC-4175, for video essence transport, AES67 for audio, SMPTE 2059 (based on IEEE 1588 PTP) for timing and SMPTE 291 for ANC data. All of these pieces are already open, completed standards. ST2110 describes how to use them together and for more intelligent and economic use of bandwidth across a network.

For example, there's little point in having an audio console subscribe to multiple 1.5 GB/S HD video streams encapsulated by SMPTE ST 2022-6 when all it needs is the AES67 streams.

Says Davies, "For many customers, particularly those involved in production and live production, SMPTE 2110 makes absolute sense.However, not everybody is involved in production or live production. For them, continuing to use SMPTE ST 2022-6 going forward could make sense."

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According to Davies, "With standards like ST 2022-6 and more recently 2110, we are confident, and the customers can be confident, that all of these pieces are going to talk to each other, and the problems and the stories that people have heard about early adoptions are behind us. Moving forward, we can carry on with the same confidence and decorum that we have had in SDI for the last 30 years.

New Business Models Emerge That Require IP Infrastructure

Aside from standards and bandwidth, there are business drivers motivating organizations to move to IP infrastructure. IP technology simply enables a growing number of business strategies that would otherwise be impractical, difficult, or too expensive using SDI infrastructure. Following are some of them' to 'To follow, here are some of them:

Premium 4K/UHD Services

 A number of streaming services now charge a monthly premium when their service includes 4K/UHD content, while many pay per view (PPV) services charge a premium to deliver individual movies and sporting events. In both cases, if creating or delivering content in 4K/UHD is part of the business model, IP infrastructure is what makes execution practical.

Ever Larger Scale Routing

As major live productions and internal routing at major broadcast centers add more channels to accommodate the growing number of audience delivery options, system designers are reaching a point where IP infrastructure simply makes practical economic sense. Some systems are so large it is difficult to even buy an SDI router at a reasonable price. But in the long term, it is the lack of flexibility of SDI routing that is problematic. If the number of channels continues to grow after a new SDI router is installed, what then? When very large systems cannot grow or change quickly, business opportunities are lost.

Meeting The OTT Competition

In 2014, OTT service providers started making a notable business impact on US traditional broadcast viewership. In the same year that Netflix achieved 50 million US subscribers and other OTT providers continued to grow theirs, the Nielsen rating service started reporting a slow but steady decline among almost all US linear TV viewers.

When TV executives took a serious look at the trend, they realized that OTT delivery needed to be a part of their delivery options. IP technology is what makes this possible.

Here's a chart showing Netflix subscriber growth:
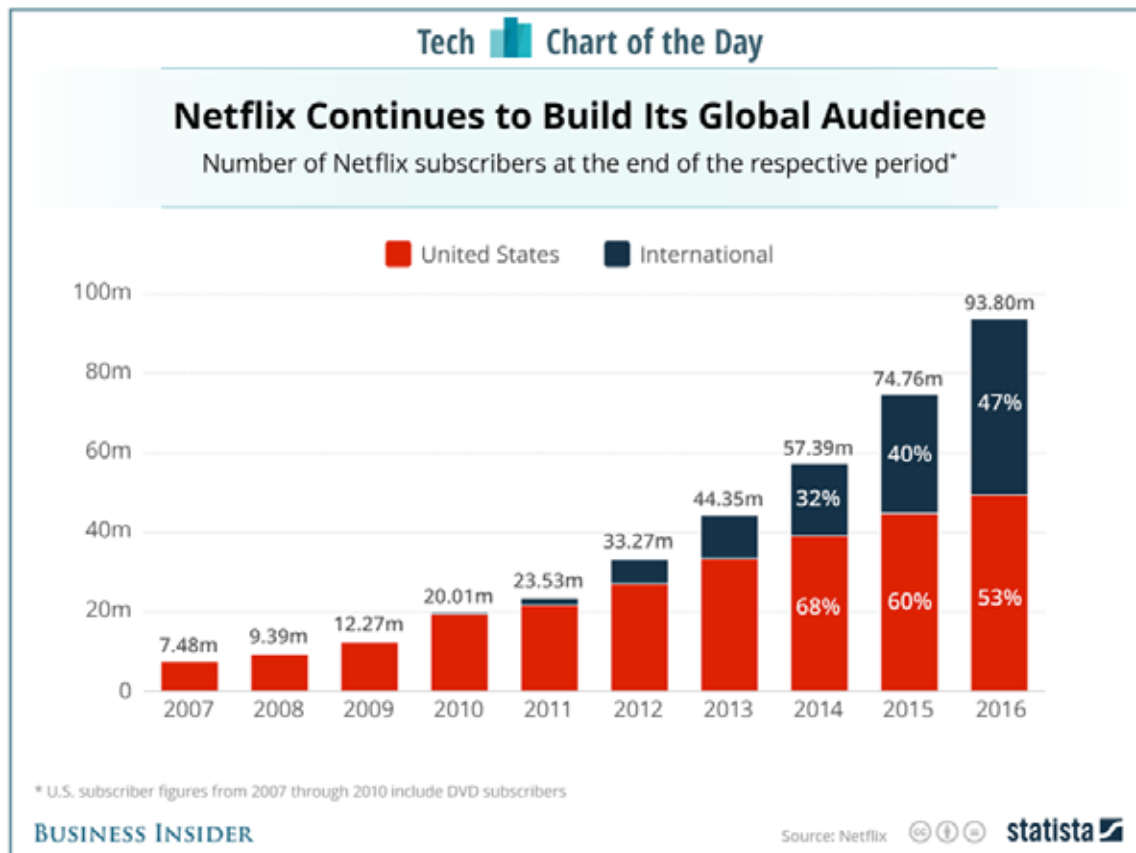
WHAT ARE THE BUSINESS BENEFITS OF IP?

Here are the basic advantages IP infrastructure can give an organization.

Scalability

The most basic advantage of IP is that you can ramp up and down the size of a television workflow or digital distribution network very quickly. Explains Davies, "Let's say you are a broadcaster at the Olympics and want to add 50 digital channels for a month, and after the event take them away. With commercial SDI infrastructure, you would have to forklift in a huge dedicated temporary router and buy all the connecting hardware components, probably for a one time use. Using IP technology you can extend your existing routing and control infrastructure, built on an expandable leaf and spine technology, simply by adding a few extra leafs."

Brownsill adds, "Leaf and spine architecture is like having a classic SDI router cross point card that has been made elastic. You can stretch it out and expand it without having to replace your router. You can also add extra capacity and remove it. The same expansion in SDI would mean either replacing your router with a larger one or introducing additional routers around the main router through tielines."

"IP enables an organization to launch a new channel or reformat the workflow of an existing one to take advantage quickly."

As new opportunities emerge, IP infrastructure enables a faster reaction time to take advantage of them. For example, if a new on-demand audience is identified, a new advertising market emerges, or a compelling programming idea is created, IP enables an organization to launch a new channel or reformat the workflow of an existing one to take advantage quickly.

New Standards, No Problem

Since the time broadcasters went from black and white to color, every time a new production format standard was introduced, broadcasters had to completely rebuild facilities. Says Davies, "With IP, upgrading to the next video standard no longer means a system rebuild, it could just be a software tweak. With SDI, when a new production standard came along we had to rebuild infrastructure. Take out an HD router and put in a 3 gig router, or take out the 3 GB/S router and put in a 4K one. Thanks to IP, those days are behind us because IP is format agnostic."

"Once you have your video in all of those IP Packets, it does not matter if the format is 4K or 8K, the fundamental architecture remains unchanged."

However, just because we now have 4K it doesn't mean there won't be new standards arriving to improve image and audio quality that will require facility upgrades. Says Davies, "We will never be done with format and standard changes. On the horizon is high dynamic range (HDR), high frame rate, and even 8K and VR. But once you have your video in all of those IP packets, it does not matter if the format is 4K or 8K, the fundamental architecture remains unchanged."

Predicting Viewer Behavior

IP delivery can give television organizations a detailed understanding of current customer behavior that can be used to predict programming preferences. In 2011, Netflix outbid HBO for the rights to produce a US-based version of the BBC TV series, House of Cards. The math of the deal surprised many: Netflix had only 20 million streaming subscribers paying $7.99 a month at the time. Out-bidding HBO cost Netflix $100 million dollars, and that was just for the production rights. How could they be sure this big risk for a company of that size was worth it?

The insight for this business decision was based on an analysis of Netflix user behavior. Netflix had previously purchased the rights to stream the original BBC version of House of Cards and knew their subscribers loved it. In addition, they had analyzed the work of the series director, David Fincher and noted that Netflix subscribers enjoyed other films he had directed. In addition they noted that Netflix subscribers loved movies starring Kevin Spacey.

With those data points, Netflix outbid HBO, and produced the hit series initially using the same director from the BBC series, and starring Kevin Spacey. Having direct access to live, detailed viewer behavior analytics gave Netflix an advantage in predicting programming success.

Less Costly Program Testing

The ability to add or remove production workflows and digital distribution at will gives the opportunity to test new programming ideas without building physical infrastructure. Explains Davies, "If someone wanted to dip their toe in the water and test a 4K sports channel, they could add a 4K channel as a leaf on the edge of their system while they did the experiments. If the experiments proved their 4K channel could become mainstream, it would be easy to migrate extra blocks of the system to define the whole system as 4K." The ease of re-configuring workflow and distribution could usher in a renaissance of television programming experimentation.

Now, consider this the combination of the last two benefits: Combining a better understanding of viewer preference via IP distribution, with the ability to test new programming without building dedicated infrastructure, can give a competitive advantage in creating hit TV programming.

WHY PARTNERSHIPS ARE MORE ESSENTIAL

As you begin a migration to IP, Davies advises to look for partnerships: "Make sure you have your switch vendor, your broadcast supplier, and your system integrator engaged early and use their resources. All these partners have experience and presale information that can help with the design, avoid common pitfalls, and make the deployment easier."

Says Brownsill, end users want a partnership between switch manufacturers, broadcast vendors, and system integrators so they can deliver a complete working system, "The last thing they want is a vendor, a switch supplier, and systems integrator all saying they have the best offerings yet assemble working bits that don't form a working system. Partnerships give end users the confidence to move forward with new technology."

"Partners have experience and presale information that can help with the design, avoid common pitfalls, and make the deployment easier."

Implementing IP technology requires a shift in the user/vendor relationship towards longer term relationships. In the SDI world, once infrastructure was built and certified, there was often little ongoing interaction with suppliers until a problem arose and customer service was needed. But IP and virtual infrastructure can result in more after-sale interdependency. As more IP technologies are sold as software licenses, or as hardware components run by software are subject to updating, a different after-sale relationship is taking shape. This can involve ongoing payment, frequent upgrades, requests for new features, bug fixes, security concerns, and fast changing feature sets. With many IP suppliers, the relationship becomes more of an interdependent partnership, and less of a series of transactions.

IP STAFFING AND SKILL SETS

What if your current staff does not understand IP technology? In most cases, replacing your current staff with IT technical people is impractical. First off, you would soon discover that most IT trained people do not know much about the challenges of IP television. For new hires the frequent debate is this: Is it better to hire IT people and teach them about IP, or train your current staff on IP?

"Do not forget that command and control in broadcast has been internet and IP based for the last 10 years, so broadcast engineers already know most of the fundamentals. "

Both Davies and Brownsill favor broadcast engineers. Says Davies, "It is easy to underestimate broadcast engineers. They are clever people with a real thirst for knowledge and they take to this like a duck to water. Do not forget that command and control in broadcast has been internet and

IP based for the last 10 years, so broadcast engineers already know most of the fundamentals. Also, passing uncompressed video using an off-the-shelf switch is very different than what IT people are trained to do."

Another consideration is that operator level technical people do not need an intimate knowledge of IP technology, because IP interfaces hide most of the complexity of the system. Says Brownsill, "It's no different from an SDI facility today. You don't necessarily want your operators to know how to manage an SDI router database. As long as they can make routes, and route cameras into sources and destinations, all is well and good. It is no different for controlling IP infrastructure."

The challenge for control system suppliers is to design interfaces that assure the overall user experience remains the same, even as the technology behind the screen changes. Says Brownsill, "The onus is on the manufacturers to hide that complexity."

DOES IP TECHNOLOGY MAKE SENSE FOR YOUR ORGANIZATION?

The transition to IP technology may be the most talked about topic on the tech side of the television industry. But that does not mean it makes sense for all organizations. Advises Davies, "As you consider starting a transition to IP, ask why you want to go with it. What benefit are you expecting? Once you understand that, stay focused on it, and don't get distracted. The benefits of IP vary widely."

According to Davies, the level of benefit an organization receives will depend on their business goals: "Some organizations will find no significant improvement because after you add in the overhead and cost of conversion, the differentials can be small." He shared two examples of where an IP transition makes sense:

- "If you run a subscription service which makes revenue by providing the latest and greatest technology. With this case, format agnostic abilities of IP would be a really good idea to easily give subscribers access to any new format that comes along: 4K, High Dynamic Range (HDR) and virtual reality services.

- A specialty sport event broadcaster, which needs to add extra channels and take them away. Not having to build out physical infrastructure would be a huge advantage."

Davies contrasts these with an example where IP would make little difference: "For a regional news broadcaster who has shooters capturing news in SD and has plans to upgrade their technology every 10 to 20 years, I probably would not recommend IP right now."

Brownsill advises, "Most traditional broadcasters face the challenge of balancing the use of SDI heritage equipment, bought with the expectation it would be amortized over a period of time, against investing in the next generation of IP technology. It's a much clearer business case for planning greenfield sites. When creating a new facility, studio, or production truck the opportunity to build with a format agnostic infrastructure is difficult to ignore. It is just not possible to do with classic SDI infrastructure."

IN CONCLUSION

Experienced system builders like TSL's Mark Davies and Steven Brownsill have seen many infrastructure upgrades before. The migration to HD, to digital, to 3G, and to 4K were simply upgrades to the next production standard to improve image and sound quality, yet again.

However, the migration to IP is more than just about quality and efficiency improvement because it adds capabilities that impact how business is conducted.

Let's consider the fate of two competing broadcasters: One implements IP infrastructure and can do all of the things we have described in this white paper, while the other does not.

The IP facility can skip disruptive system upgrades for new standards, and quickly ramp up new workflows and distribution to take advantage of fast-breaking opportunities, all while having a detailed understanding of how viewers are reacting to new programming with real-time user metrics.

Now, imagine trying to compete with an organization with those capabilities if your organization does not have them. The challenge for heritage television organizations will be to balance the business advantages of acquiring IP infrastructure against the cost, disruption, and risk of the transition.

ABOUT TSL PRODUCTS

For over 30 years we have worked directly with the world's leading broadcasters and content creators to design, manufacture and market a range of broadcast workflow solutions that serve to simplify operations within the television broadcast, cable, satellite, IP and IT industries. Specialising in audio monitoring, broadcast control systems and power management tools, we ensure that our solutions satisfy and exceed the commercial, technical and operational requirements that exist in IT-based and traditional workflows to help our customers lower costs, generate revenue and streamline operations.

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This white paper was written for TSL Products
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