

# MEDIA INDUSTRY TRANSITION TO IP IS GAINING MOMENTUM

*Survey by TV Technology and  
Broadcast Engineering shows  
support for IP workflows to  
support 4K and beyond.*

# MEDIA INDUSTRY TRANSITION TO IP IS GAINING MOMENTUM

Survey by *TV Technology* and *Broadcast Engineering* shows support for IP workflows to support 4K and beyond.

By Wes Simpson

## Introduction

For the past three decades, the television industry has been dominated by two major technology transitions. The first, from analog to digital video signals, began in the 1980's and is now essentially complete — the methods used to deliver video to consumers have become almost exclusively digital, and professional production systems being sold today are based on digital technology. The second, from SD to HD, began about a decade later and has penetrated the television market to the extent that virtually all new professional equipment and services are designed to support HD resolution.

With both of these transitions nearly concluded, the television industry is now faced with two more technology upheavals: migrating from SDI to IP-based studio infrastructure, and upgrading video signals from HD to 4K/Ultra HD. Both of these technologies are poised to once again revolutionize the production and delivery of television content. But, just like the earlier technology migrations, the transitions to IP and 4K/UHD will take time, and each video facility will no doubt proceed at its own pace.

In January, *TV Technology* and *Broadcast Engineering Extra* magazines conducted a survey of their readerships to assess the current levels of deployment of both IP video technology and 4K/UHD technology. With over 1,500 qualified respondents across a wide range of industry sectors, this survey provided a wealth of data regarding current practices in many different broadcast facilities. Some of the more important results are:

- IP (Internet Protocol) technology is ahead of 4K/UHD

### About the Author

Wes Simpson is president of Telecom Product Consulting. He is a frequent speaker, writer, and instructor in the areas of IP video and data networking.

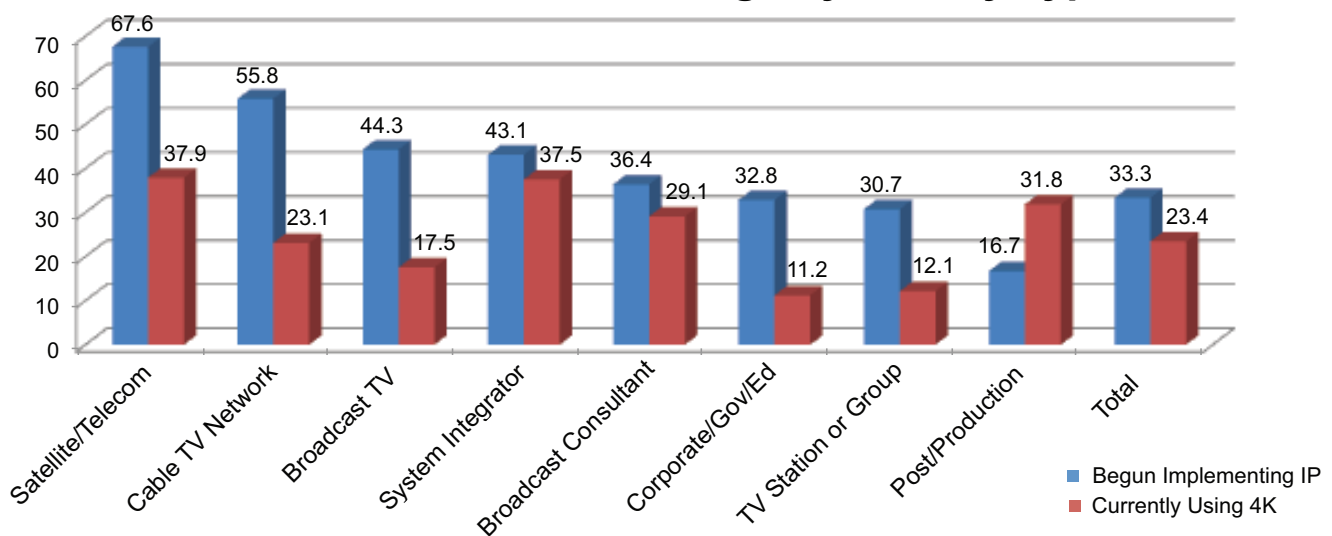
(Ultra-High Definition) technology in terms of current usage levels and future deployment plans, in part due to the belief of a majority of respondents that IP technology will help reduce costs.

- A majority of respondents have already begun migrating to IP-based production or expect to be replacing baseband equipment with IP-based equipment as early as 2015. Only a few of the respondents do not see a move to IP in the foreseeable future.
- Broadcasters seem to have gotten the message about improved pixel color characteristics, rating them almost as important as more pixels for the future of UHD.
- The majority of respondents would be willing to pay a premium, averaging over ten percent, for equipment that supports IP technology or 4K technology.

## IP and 4K Growth Paths

The survey clearly indicates that broadcasters are migrating to IP and transitioning to 4K, albeit at different rates. Overall, IP technology has already been deployed by a third of the respondents, with 4K/UHD deployments in just under a quarter of facilities. As **Figure 1** illustrates, IP is more widely deployed than 4K in seven of the eight major types of facilities, with the only exception being production/post-production houses. The largest deployment of IP is in satellite/telecom facilities, which makes sense due to the nature of these businesses and their large collection and distribution systems. Cable TV networks and broadcast networks also had significant IP deployments and relatively low usage of 4K, likely due to the advantages of IP for large-scale facilities and the low penetration of 4K technology in their audiences. Production and post-production facilities are likely to be more receptive to 4K/UHD technology if they work for the motion picture industry and if they are producing episodic programming that is being created in 4K with an eye towards future rights sales.

**IP and 4K/UHD Usage by Facility Type**



**Figure 1**

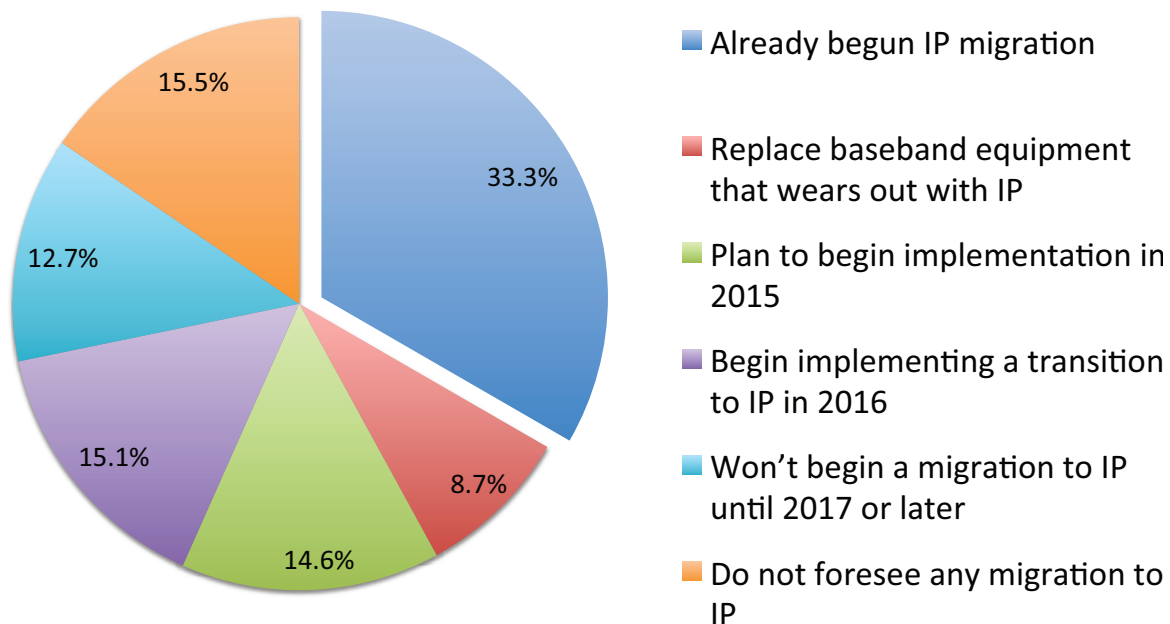
IP technologies are also seen as enablers for UHD technology, as they provide a practical means to transport intact 4K signals over a single path through a network. Today's 10 GigE links can transport 4K signals using light compression, and there is a large collection of equipment that can support 40 and 100 Gbps Ethernet links for uncompressed 4K. Efforts are also underway within the IEEE to create a 25 Gbps Ethernet standard that would conveniently handle two 12 Gbps 4k video signals. As shown in the following

section, broadcasters are busily adopting IP technology for applications where it currently makes technical and economic sense, thereby creating “islands” of IP with gateways that can be linked together using large IP switching/routing fabrics when the time is right.

### Proliferation of IP Technology

Long predicted by industry pundits, IP technology has started to move into video production facilities over the past few years. One-third of all facilities surveyed indicated that they have already begun deploying IP technology, and over half indicated that they have either begun or will begin making the transition when current equipment needs replacement or by the end of 2015. This trend shows no sign of stopping, as the majority of the remaining facilities intend to implement IP technologies beginning after 2015, as shown in **Figure 2**. Only a few holdouts, about fifteen percent of respondents, do not see a migration to IP technology in the foreseeable future. Applications of IP technology are spread widely across both signal transport and monitoring/control applications in all of the facility categories surveyed.

### Broadcaster IP Implementation Timeframes



**Figure 2**

Both within and between facilities, the top application for IP technology is transporting signals between rooms in a facility or between buildings, with over half of the respondents indicating current deployments, as shown in **Figures 3 and 4**. The growth in wide area usage is no doubt a reflection of the lower prices that carriers such as Level 3 are offering for metro and long-haul Ethernet and IP services, as compared to SONET or other legacy transport systems. CNBC’s Steve Fastook, Senior VP of Operations and Engineering, has made extensive use of IP-based video transport, both within the studio and for live connections to outside experts and commentators. He said “Whenever we build a new connection, we ask if it can be done using IP technology.”

## IP Applications Inside Facility

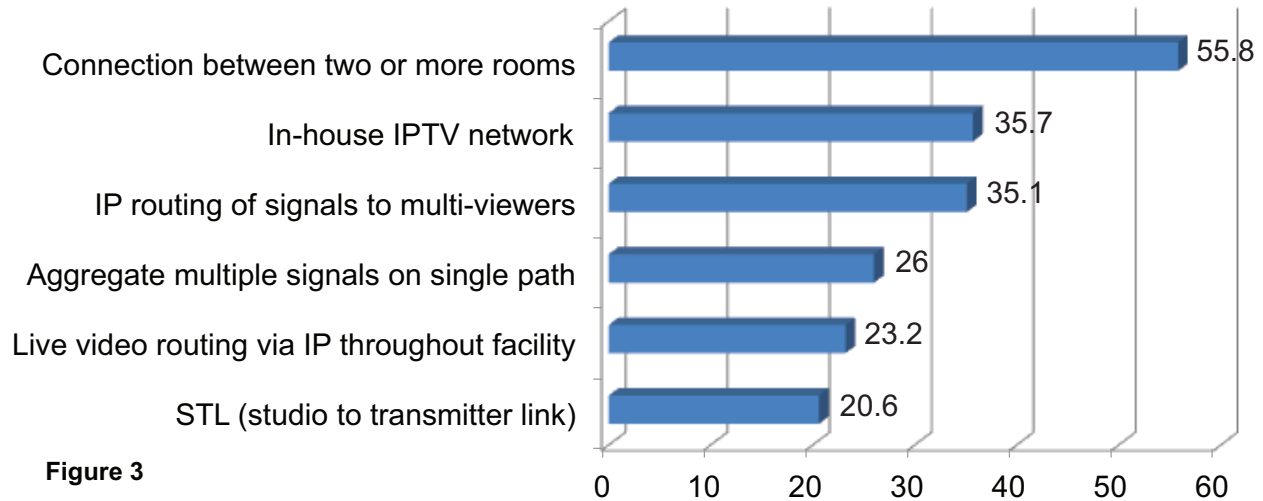


Figure 3

Within video facilities, survey results indicate that at least some media signals have migrated from SDI and other special-purpose signal formats into IP and Ethernet. As shown in [Figure 3](#), IP video technologies are being applied in supporting roles, even if they haven't yet replaced the master SDI router for full production. IPTV is being used to deliver signals to desktops and stand-alone displays in place of in-house coaxial cable TV systems, as shown by the 900-channel IPTV system installed at CNN headquarters in Atlanta that was described at the SMPTE 2014 Annual Technical Conference. One of the main triggers for CNN's transition was the high cost of upgrading the existing coax-based system to support HD signals, considering the cost

### ABOUT THE SURVEY

To investigate how changes caused by IP and 4K/UHD technology are affecting the industry, a survey by *TV Technology* and *Broadcast Engineering* editors was designed to measure current usage levels and future intentions of practicing professionals across a wide range of organizations. Subscribers to *TV Technology* and *Broadcast Engineering Extra* magazines were sent email invitations to respond to the survey in January, and the response window was open for several weeks. Overall, the response rate was high for this type of survey, with over 1,500 respondents who indicated that they were involved in purchasing equipment or services for their organization.

Almost half of the respondents were in corporate or engineering management, and about a quarter were involved with production and operations.

[Figure 14](#) shows the breakdown of these job categories, along with engineering staff, who comprised about an eighth of the respondents.

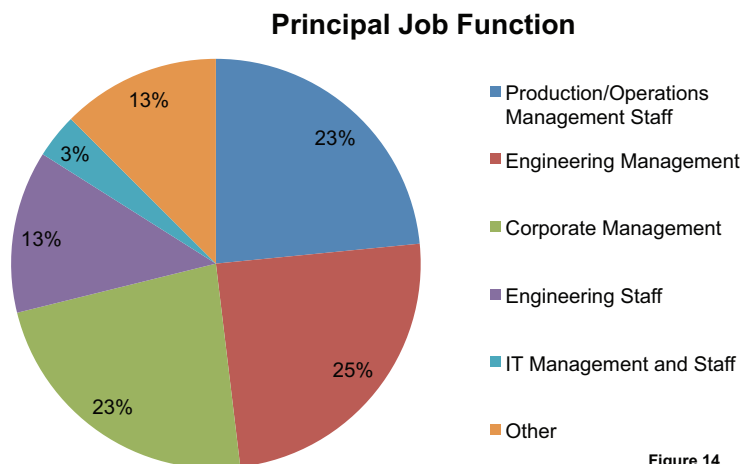


Figure 14

### IP Applications Between Facilities

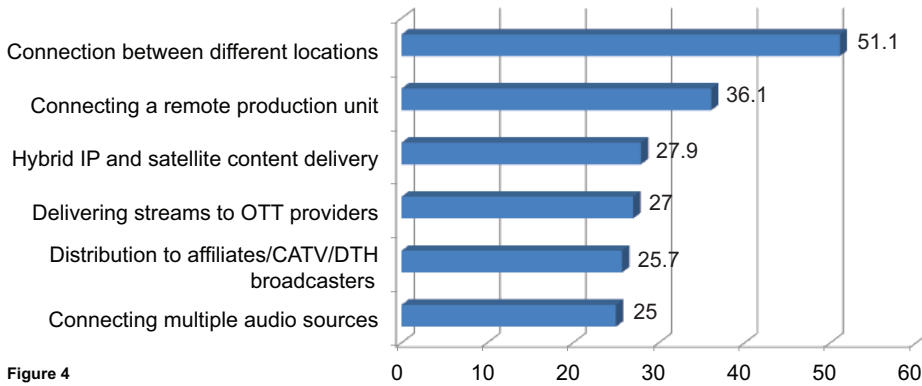


Figure 4

of digital modulators and the new set-top boxes needed to receive and display the coax signals. IP video signals are also popular for multi-viewer systems, because of their flexibility and ease of transmission over data network infrastructure, thereby avoiding the use of expensive SDI router ports.

Between facilities, popular applications include IP-

based contribution networks from remote venues, which are becoming increasingly widespread, and hybrid IP/Satellite networks for content delivery, as shown in Figure 4. Fox Networks has long used a 10 Gbps IP link between their Los Angeles and Houston facilities for file transfer, bi-directional video transport, and disaster recovery, a set of applications that would have required two or three separate networks using other technologies. More than a quarter of all survey respondents use IP for content delivery to broadcast affiliates and to OTT video providers, with that figure rising to almost half of the broadcast television networks. Clearly, IP technology has been proven to meet the performance requirements of some of the largest video content providers.

### IP Monitoring and Control By Facility Type

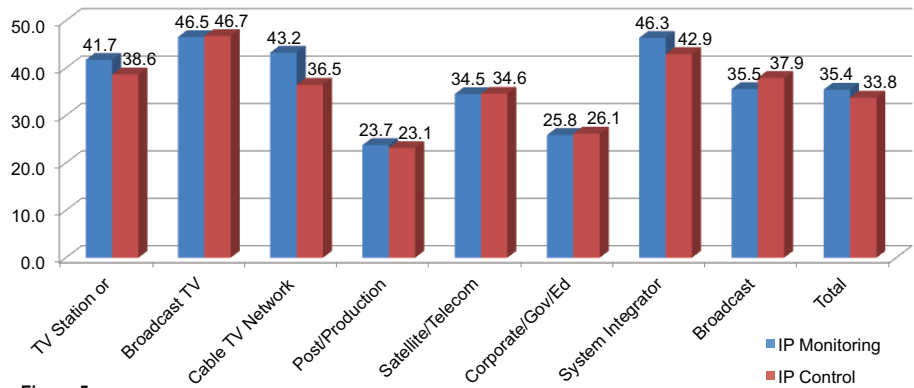


Figure 5

IP is also popular for control and monitoring applications, with broadcast networks exhibiting the highest adoption levels, as shown in Figure 5. Six different applications were used by more than forty percent of the respondents, as shown in Figure 6, including multiple devices in the

### IP Control and Monitoring Applications

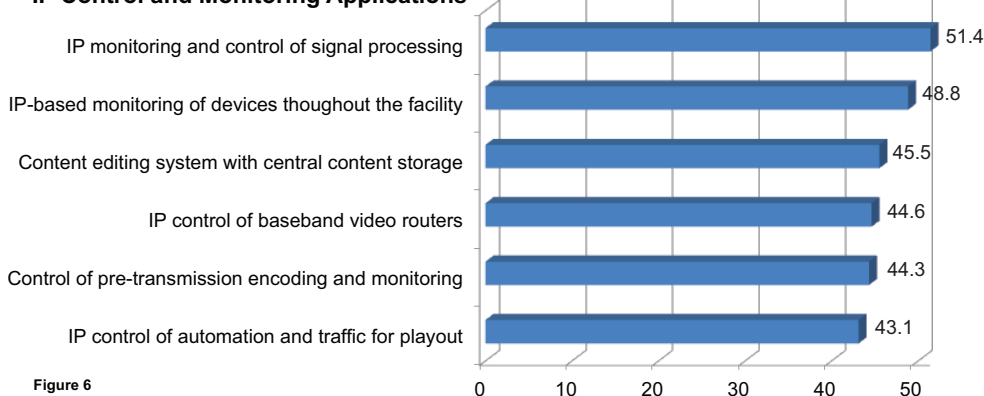


Figure 6

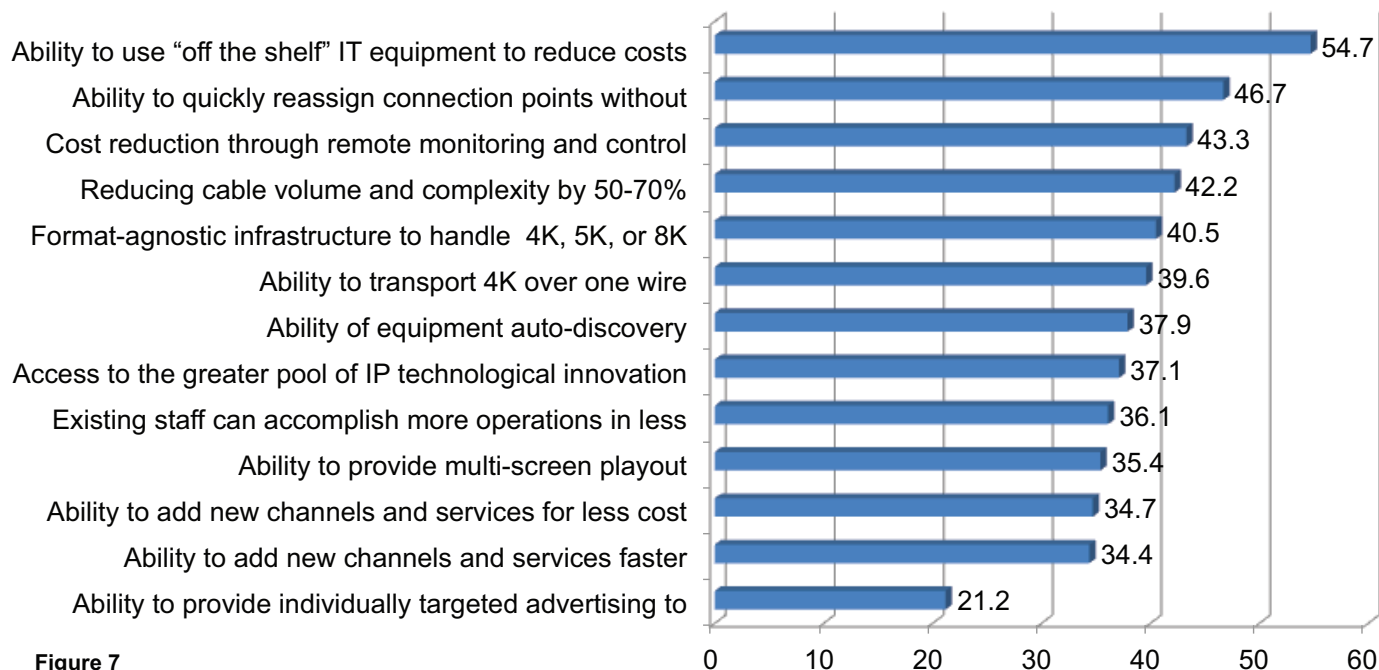


Figure 7

playout chain, covering automation, traffic, baseband routers, signal processing, and encoding. Editing systems and other devices in the facility were also commonly controlled using IP connections. This should not come as a huge surprise to industry observers, as the flexibility of IP-based systems can greatly simplify the interconnection of multiple devices, particularly when compared to multiple point-to-point serial data connections (such as RS-422) that would be needed to control even a modest collection of independent devices.

Broadcasters have also started adopting IP-based solutions to provide better visibility into the status of their current collections of equipment. There are a number of control systems on the market, from companies like Crystal Solutions, that can gather SNMP (Simple Network Management Protocol) data from a variety of devices via IP device-control ports and give detailed reports on their status. Other solutions focus on distributing IP-connected measurement devices to monitor key network performance parameters and report back to a centralized system. This type of solution has been implemented across a geographically large video collection network used by Time Warner Cable for broadcast signal collection, which was described at VidTrans 2015. An even more basic system has been implemented in a number of CNBC locations; it uses intelligent IP-connected power strips to monitor the status of any device that draws power. In the event that a power load on an outlet changes significantly, a report can be generated for analysis without requiring a software interface for each piece of equipment. This is particularly useful for proactively servicing devices that have redundant power supplies, to allow single supply failures to be caught and repaired before they become service-affecting.

The survey also asked respondents to identify their underlying reasons for making the transition to using IP. Over half of the respondents (as shown in Figure 7) indicated that they were interested in the ability to use "off-the-shelf" equipment to help reduce costs. This same theme was echoed through several of the other popular responses, including anticipation of cost reductions from remote monitoring and control, more efficient use of staff, and the ability to add new channels for a lower initial outlay. These responses show that broadcasters' equipment needs are increasingly being met with devices built from commercial IT industry components.

## Facility Router Plans in Three Years

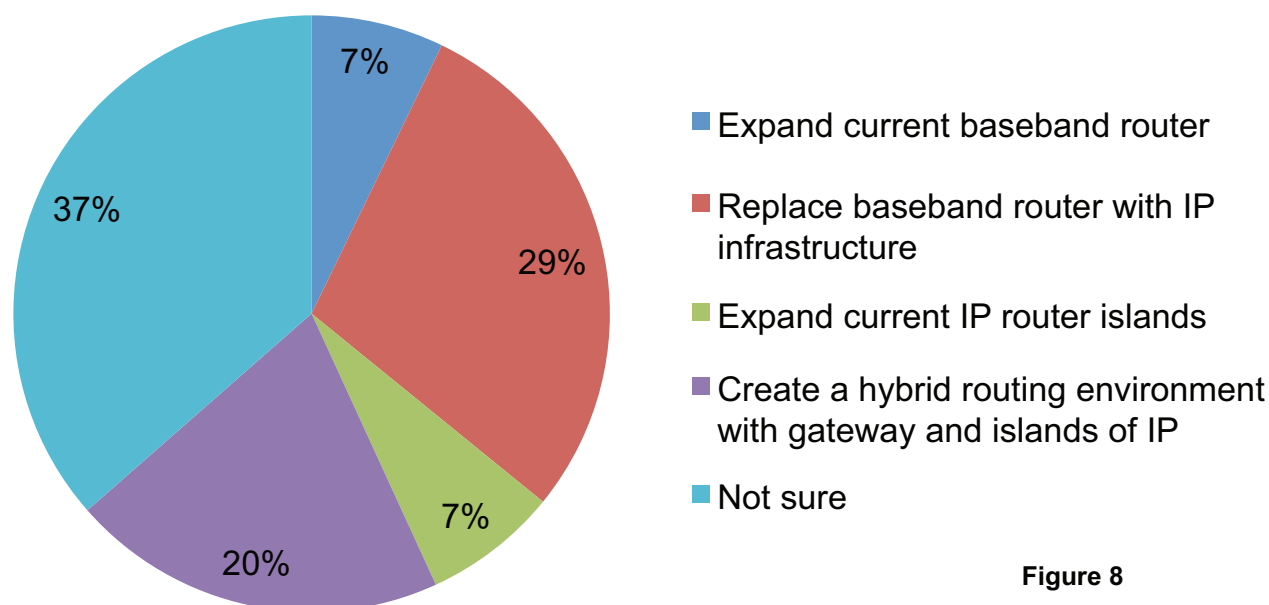


Figure 8

A number of broadcasters are seeking ways to use commercial IP routers and switches to augment and eventually replace their existing SDI routers with IP routers and switches. Most broadcasters foresee a move to IP-based video routing solutions; when surveyed, only seven percent of survey respondents indicated that they would expand their current baseband video router if system replacement was required in three years, as shown in [Figure 8](#). This trend is also apparent in the push to implement Software Defined Networks (SDN) to provide a single control plane that works across both IP and SDI-based routers from multiple manufacturers. Both Cisco and Brocade made presentations during VidTrans 2015 that explained critical technologies inside their products that support SDN and high-bitrate backplanes that are particularly needed as video bandwidths expand beyond 10 Gbps to accommodate 4K/UHD signals.

Another common survey response focused on the flexibility of IP networks and their ability to easily reassign connection points. This capability can drive cost savings in two ways. First, the costs of re-cabling equipment connections to adapt to changing workflows is virtually eliminated by the ability of today's modular Ethernet switches to accept a wide range of different signal types on a single interface. Second, as video processing equipment is upgraded or replaced, IP signal paths can be cost-effectively reconfigured to accommodate new traffic patterns and signal flows through a broadcast plant. Facility owners have indicated that improved flexibility may be the most tangible benefit of migrating to an IP infrastructure in related market research on this topic.

Other features of IP networks that resonated with broadcasters included their ability to adapt to the new infrastructure challenges of 4K and beyond, as well as benefits such as equipment auto-discovery and the improved ability to provide multi-screen playout for viewers using non-traditional devices. All of these functions would be difficult or potentially impossible to implement without the benefits of IP technology.

### 4K/Ultra-High Definition

Although the transition to 4K technology is not as far advanced as the transition to IP, there are still plenty of video facilities that have already installed this technology. In fact, there seem to be four main areas where 4K/UHD is gaining a foothold.



The first area is original program creation for current television series that anticipate having a long run in syndication, where 4K is anticipated to be a future broadcast requirement.

The second area consists of facilities that are producing programming that is being commissioned in 4K by streaming services such as Netflix (*House of Cards*, *Marco Polo*, etc.), Amazon (*Transparent*, *Mozart in the Jungle*, etc.), and many more to come in 2015. The third area is in sports programming, where broadcasters like CBS capture video images in 4K and then zoom in to subsets of the overall image area of interest while still being able to produce an HD-quality output signal.

The fourth area is made up of facilities that may not yet have a business reason for working with 4K, but are investigating the technology for potential future uses.

Not all facilities are waiting to deploy 4K/UHD technology. When asked when they plan to begin

production of 4K content, almost half of the respondents indicated that they either already do so or will begin in one or two years, as shown in **Figure 9**. When only responses from production/post-production facilities are analyzed, almost two-thirds (64 percent) of the respondents indicated that they either already have or would begin 4K/UHD production within two years. This unusually strong showing is likely because many small and mid-sized production facilities do not need full IP infrastructure to deploy 4K. If they only need to shoot and edit on 4K, and then ship out the files, their IP infrastructure can be minimal.

Industry observers, such as the European Broadcasting Union and the BBC, have done subjective testing to analyze how viewers react to different image characteristics of Ultra HD television, including color space rendition, frame rates, and higher pixel counts. The published results from the EBU compellingly showed that viewers have a more strongly positive reaction to improvements in aspects such as higher frame rates and better color performance, as compared to an increased number of pixels.

Studies have shown that improved pixels have a big impact on viewers. In recent presentations, Sean McCarthy, a well-respected image scientist, showed that perception of high dynamic range is intricately linked to other factors, such as screen brightness and amount of motion in an image. Pete Routhier of Creat3 described the difficulties that current generation 4K image sensors have in capturing picture details when shooting rapid motion sporting events. In fact (perhaps counterintuitively), 4K cameras need to be panned more slowly across a scene than their HD counterparts in order to deliver their specified levels of image resolution. The relationships between shutter speeds, depth of field, imager sensitivity and camera/subject motion (the optical flow) are complex, and simply increasing the number of pixels

### 4K/UHD Production Plans

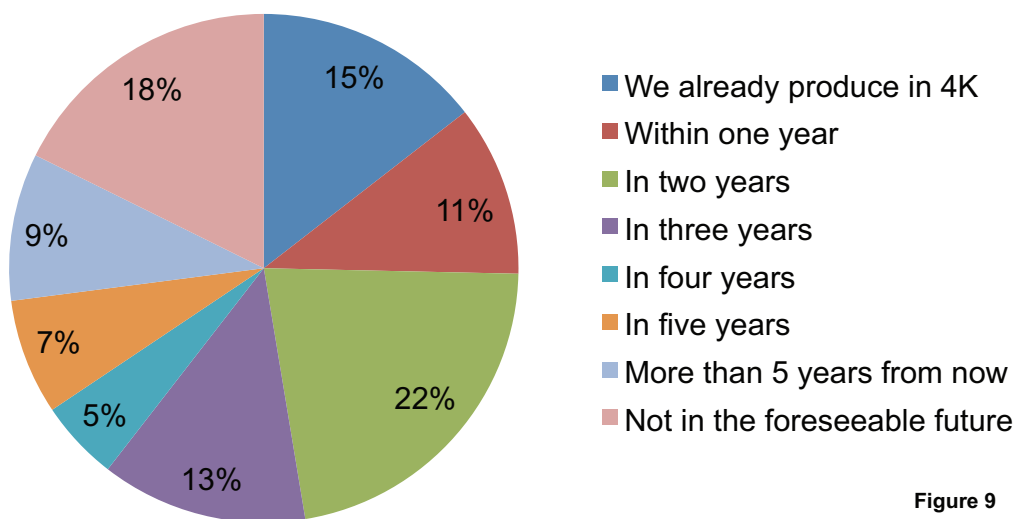


Figure 9

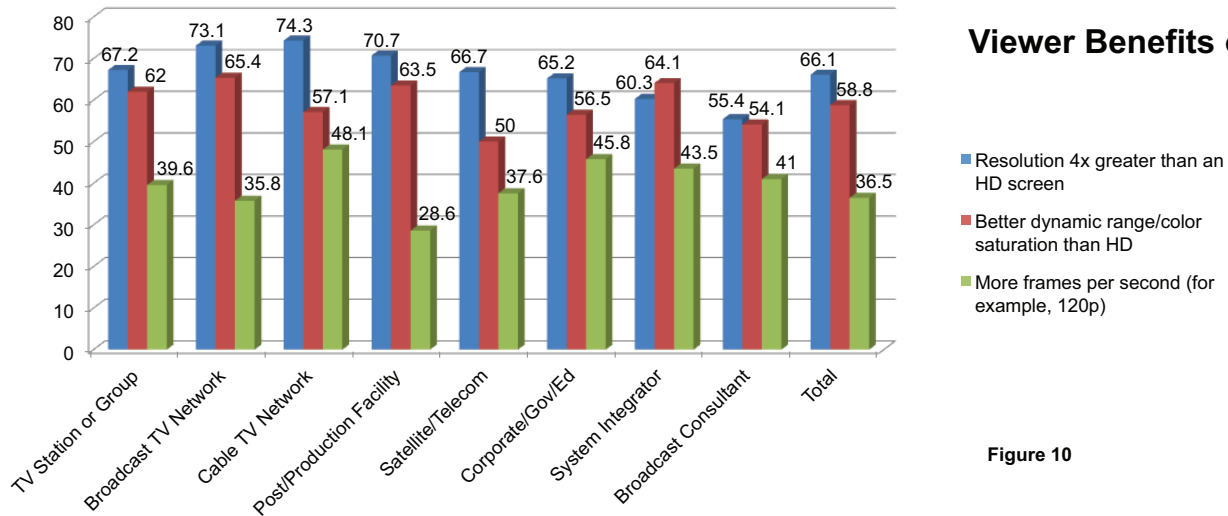


Figure 10

in an image does not automatically lead to an improved viewer experience. This is further borne out by the recent announcement that Ultra HD Blu-ray will support 10-bit 4:4:4 color space and High Dynamic Range, all in time for the holidays in 2015.

The message concerning better pixels has gotten through to the respondents to this survey. Respondents were asked “Which of the following benefits of the 4K/UHD viewing experience do you believe TV consumers will find more appealing than HD?” Several different answers were provided, and multiple selections were allowed. Figure 10 shows the three most popular responses to this question categorized by facility type. The top answer across all facility types was resolution four times greater than HD. The (close) second most popular answer in all cases was better dynamic range and color saturation. System integrators actually ranked pixel color quality as being more important to viewers than more pixels. The third most popular answer was higher frame rates. Taken together, these responses mean that the message about better pixels being as important to viewers as more pixels is gaining traction within the industry.

Another survey question looked for the trigger points that would initiate 4K switchover among the respondents. The most popular answer was when 4K cameras become the same price as HD cameras, as shown in Figure 11. The time frame for this to happen may not be very far into the future, as a number of low-cost 4K cameras have been announced. The third most popular answer covered cameras as well,

### Triggers for 4K Transition

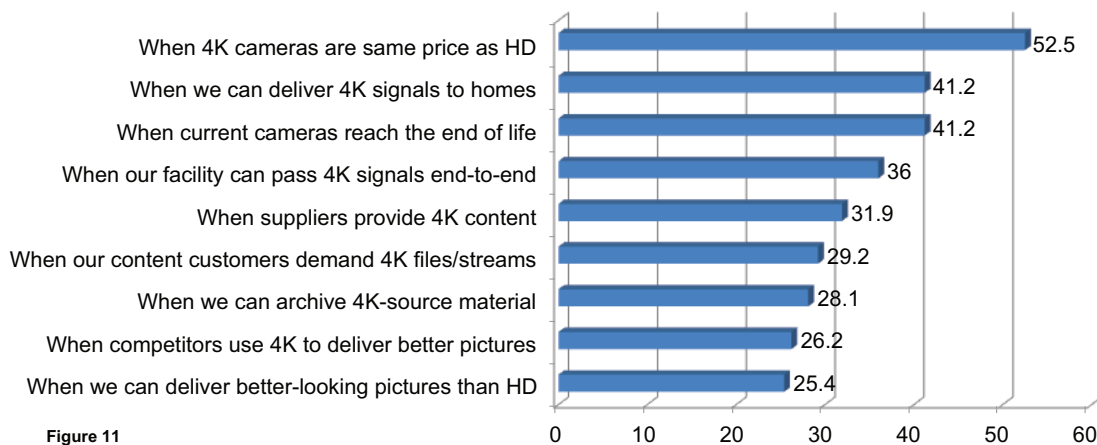
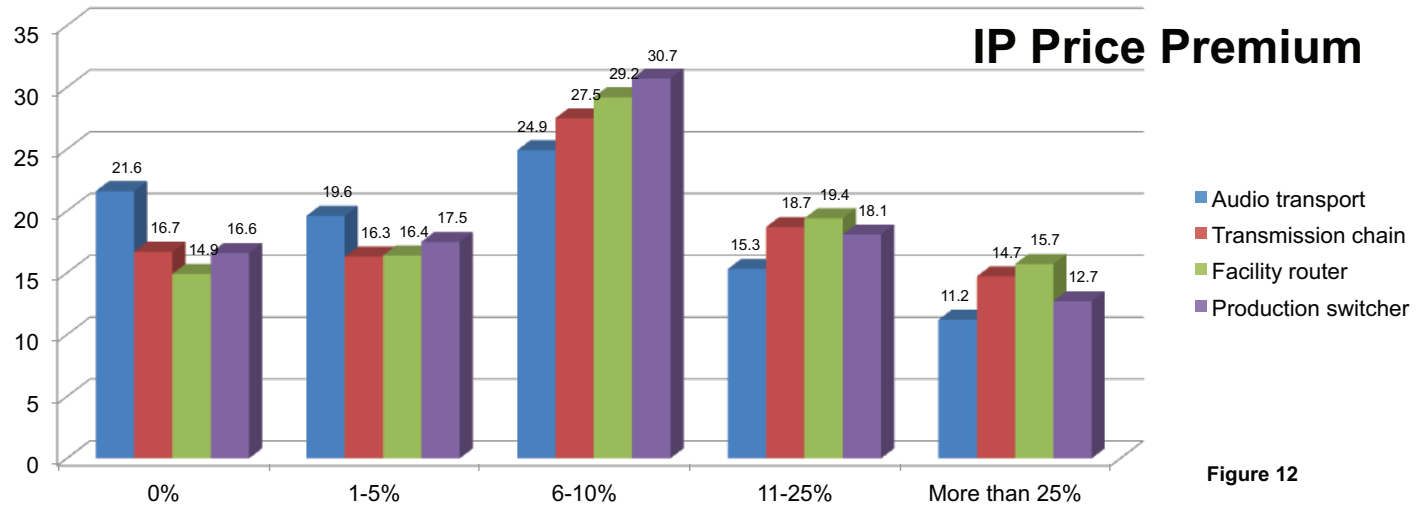


Figure 11

with 4K adoption being triggered by current cameras' end-of-life. Several of the other highly-rated adoption triggers concerned the overall market drivers for 4K technology, including the ability to deliver 4K to homes, when content suppliers

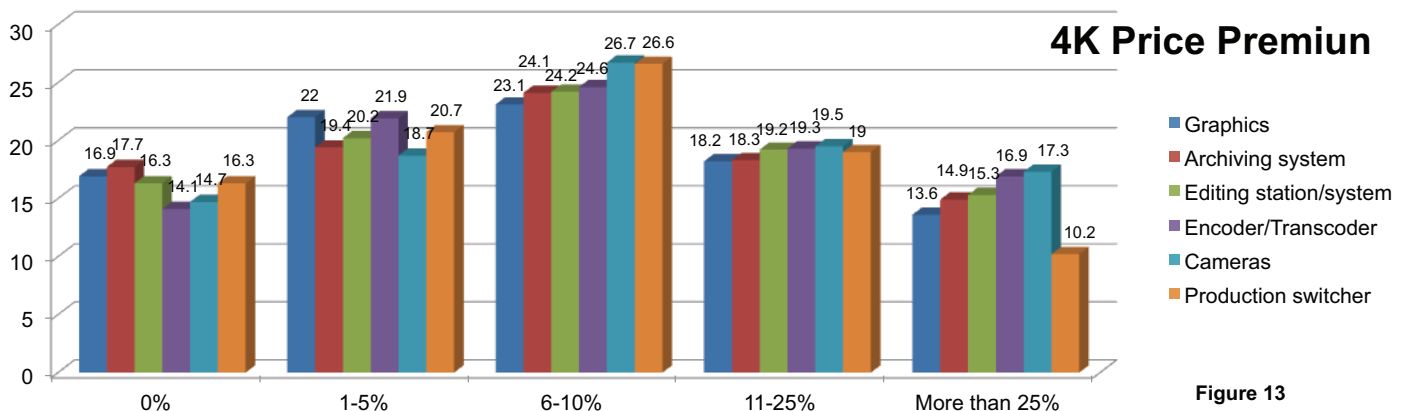


offer 4K, when customers demand 4K, or when competitive forces drive the adoption of 4K. Taken together, these answers indicate that upgrading facilities to use 4K will be based on sound business justifications, not simply on a desire to keep up with current industry trends. It is also possible that the lessons learned when 3D technology failed to overtake the market have made broadcasters somewhat more risk-averse and prone to taking a “wait and see” attitude towards new trends in viewer habits.

### Price Sensitivity

Perhaps fortunately for manufacturers, survey respondents indicated a willingness to pay a small premium for devices that incorporate IP or 4K/UHD technologies. **Figures 12 and 13** show the willingness of respondents to pay a premium for various types of products that could be used by facilities that wanted to deploy the two technologies. The acceptable price premiums for the various technologies were tightly grouped in the 11 to 12 percent range, with a significant number of respondents indicating that they would be willing to pay a premium of 25 percent or more for products that offered IP or 4K capabilities. For example, 19 percent would pay more than 25 percent for new IP facility routers and 17 percent would pay the same for 4K cameras.

In the IP category, audio equipment purchasers showed the most reluctance to pay a price premium, probably because of the already competitive market for IP-enabled audio devices. (Standards like AES 67 and product offerings like Dante and Ravenna that transport hundreds of channels of uncompressed audio over gigabit Ethernet networks have already deeply penetrated the professional audio market.) In the 4K market, respondents appeared most willing to pay price premiums for cameras and encoders/transcoders, perhaps because they recognize that these devices will be heavily stressed to accommodate larger image sizes.



While a small minority (amounting to five percent of respondents) indicated that they would not be willing to pay any price premium at all for either technology, it was interesting to note that over a third of the respondents who would not pay anything extra for IP technology were willing to pay a price premium for 4K/UHD technology. Similarly, a third of the respondents who would not be willing to pay any premium for 4K/UHD products would be willing to pay a price premium for IP-based ones.

## Conclusion

Overall, this survey shows a high level of market awareness of both IP and 4K/UHD technology, and highlights that a significant minority of facilities have already installed equipment with these capabilities. This share is expected to double over the next two years in the case of IP and triple in the case of 4K, which is starting from a smaller installed base. Based on these survey results, we would expect about half of the facilities should be, at a minimum, beginning to deploy IP in various parts of their broadcast infrastructure by 2016, and just short of 50 percent are also committed to transitioning to 4K by that time as well.

## ABOUT TV TECHNOLOGY

For more than 30 years, *TV Technology* has been serving the Broadcast, Cable, Production, Post-Production, Business, and New Media markets worldwide. It's published in five editions, including the flagship U.S. title, *TV Technology Europe*, *TV Technology Asia*, and *TV Technology Japan*.

## ABOUT GRASS VALLEY, A BELDEN BRAND

Grass Valley, a Belden Brand, keeps you future-ready as you navigate the changing landscape of today's media. With the industry's most comprehensive portfolio of solutions and services, we deliver the agility and efficiency you need to be competitive today — and the technological foresight you need to keep pace with consumers' desires for more content on more channels and more devices.

At Grass Valley, our size and stability gives us the strength to withstand the cyclical nature of the broadcast/media business while continuing to invest in innovation. This means we can deliver new technologies for efficiency today and innovation tomorrow.

Headquartered in Montreal, Grass Valley is part of St. Louis-based Belden Inc. As a proven, strategic leader in industrial, enterprise and broadcast market solutions, Belden gives Grass Valley the ability to scale rapidly and invest in innovations that are driving the industry forward.

For more information, please visit [www.grassvalley.com](http://www.grassvalley.com).