A Buyer's Guide:
Next Generation Entertainment Services

HTNG White Paper

Hotel Technology Next Generation
In-Room Technology Work Group
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Media Content Team

The In-Room Technology Work Group was established by a new Hotel Technology Next Generation (HTNG) charter set forth on September 24, 2004. It set forth a mission to address four key goals relating to in-room technology:

1. To exploit key technology trends
2. To personalize the guest experience
3. To interconnect both the IP and non-IP networks
4. To simplify in-room technology

The participants of the Media Content Team consist of the principal hotel technology executives as well as the foremost entertainment technology providers. This Team surveyed peers and solicited industry and technology experts for input on specific areas in order to ensure that all appropriate points of view were considered as part of research for this white paper.

Charter

To develop a white paper that outlines the technical challenges and simplifies options hoteliers face in selecting their Next Generation Entertainment content and related technology.

Table of Contents

I. Overview

Today's Next Generation Television and Entertainment technology is arguably the most exciting since televisions went 'color' and hit the mass market. Considering the rapid availability and consumer interest toward this new technology, hoteliers should examine the various options the market has to offer. Careful analysis of guest needs and desires can help determine the extent to which these technologies should be employed.

In-room entertainment services help provide an inviting setting as part of creating the 'home away from home' comfort guests often seek. By understanding the amenities guests are willing to pay for and subsequent revenue this technology offers, hoteliers can be better informed in selecting and investing in the appropriate solutions for their hotels.

A significant shift has occurred in the Hospitality Industry in that guests were historically accustomed to experiencing new technology in a hotel room before it was available residentially. Now, with the advent of High Definition TV (HDTV), home theaters, and TiVo, hotels are challenged with the need to deliver an experience as good as, or better, than a consumer might have at home. The challenges of moving from a traditional 'television' to a HDTV environment, while taking into consideration mobile devices and new forms of entertainment can be daunting to understand and to implement. Important to consider are the advantages of upgrading entertainment technology for the purposes of offering and selling a myriad of entertainment services.

The following discussion examines various technologies and opportunities within Next Generation Entertainment services, and answers questions regarding why an upgrade may be worthwhile, how to go about upgrading services, and what questions a buyer should ask in the process.

II. When to Upgrade Television and Entertainment Services and Why

Guest Expectations and Industry Trends -- Historically in the hospitality industry, the technology featured in guest rooms was often available commercially, but not residentially. The 'wow' factor of having a 'better than in my own home' experience was an important factor in acquiring and implementing in-room entertainment systems, and justifying the costs. Today, the pace of change and availability of 'in-home' entertainment is accelerating as HDTV, portable media devices and exploding streams of content are being embraced by consumers. In private homes today, Cable / Satellite channels, Video On Demand (VOD) and home entertainment theater equipment are extensively available to households. In addition, portable consumer electronics devices are dominant in the market. The Cable and Satellite industry is driving two important trends with consequences for the hotel industry.

The first trend is the significant growth in the amount of video content being created to supply programming for new channels. This content will find its way into alternative distribution channels such as Telephone Company (Telco) TV, Internet paid downloads, Podcasts and DVDs. It includes the ability for consumers to access new ways of recording content for use when traveling. Today's superior viewing experience and variety of content choices has increased guest expectations beyond services currently available in most hotels.

The second trend is how the quality of viewing experience and the number of content choices are changing consumer expectations. Providers such as Satellite, Cable and Telco are increasing channel lineups to include more HD channels. However, most hotels still offer a limited number of Free-To-Guest (FTG) channels. Until recently, HD VOD systems for hotels were not available, so the vast majority of hotels still only offer Standard Definition (SD) VOD, which will not meet consumer expectations in the near future. The effect of this shift is apparent when examining the statistics described in the section below.

1. Cable / Satellite

Cable or Satellite television is in more homes than ever before. Per the National Cable & Telecommunications Association (NCTA), Cable or Satellite television was available in 92.6 million U.S. households (2005). Of the 92.6 million households that had Cable or Satellite, 26.0 million were digital cable subscribers.[1] Providers of both Cable and Satellite are rapidly increasing HDTV channel lineups, which will affect guest expectations.

2. Digital Video Recorder (DVR)

DVR is available for most digital Cable and Satellite subscribers, for an additional monthly charge. It provides the ability to digitally record favorite shows for viewing at convenience, with the ability to pause, rewind and fast forward live television. This technology enables viewers to watch exactly what they want, when they want, versus what is on at a particular time. As of July 2006, 12% of all U.S. households have DVR systems (over 12M) and that figure is expected to grow to 50M households by 2010. (Leichtman Research Group).[2]

3. Video On Demand (VOD)

VOD offerings include a wide variety of films that meet most consumer tastes with real-time or download viewing capability. Kagan Research estimated that at the end of 2005, 23.9 million U.S. homes had VOD access.[3] Comcast, an Internet service and Cable provider reported that the number of On Demand programs viewed in March 2005 was three times higher than in March 2004. [4] An essential segment of the VOD universe is subscription (SVOD) services such as HBO, Showtime and Starz. Research by Kagan found there were 10.5 million SVOD homes in 2005 and expected growth to reach 16.3 million by the end of 2006.

4. Home Video

Digital Entertainment Group estimates that 89 million U.S. households, or 80% of U.S. TV households, have the ability to play DVD media.[5] The popularity of DVDs is clearly evident in the Consumer Spending graphs shown below.

[1] National Cable & Telecommunications Association, 2005
[2] Leichtman Research Group
[3] Kagan Research, LLC
[4] Comcast Corporation
[5] Digital Entertainment Group

5. Consumer Spending on Home Video

Total consumer spending for DVD and VHS home entertainment in the U.S. declined in 2005 from $24.5 billion to $24.3 billion as VHS sales and rentals became essentially non-existent.

Year	DVD Sales	DVD Rental	Total Consumer Spending On DVD	Total Consumer Spending On Home Video DVD and VHS Rental and Sell Through
1999	$0.7	$0.1	$0.8	$12.8
2000	$1.9	$0.6	$2.5	$14.0
2001	$5.4	$1.4	$6.8	$16.8
2002	$8.7	$2.9	$11.6	$20.3
2003	$11.6	$4.5	$16.1	$22.5
2004	$15.5	$5.7	$21.2	$24.5
2005	$16.3	$6.5	$22.8	$24.3
2006	$16.6	$7.5	$24.1	$24.2

Figure 1: Consumer DVD Sales (in billions) *per Digital Entertainment Group*

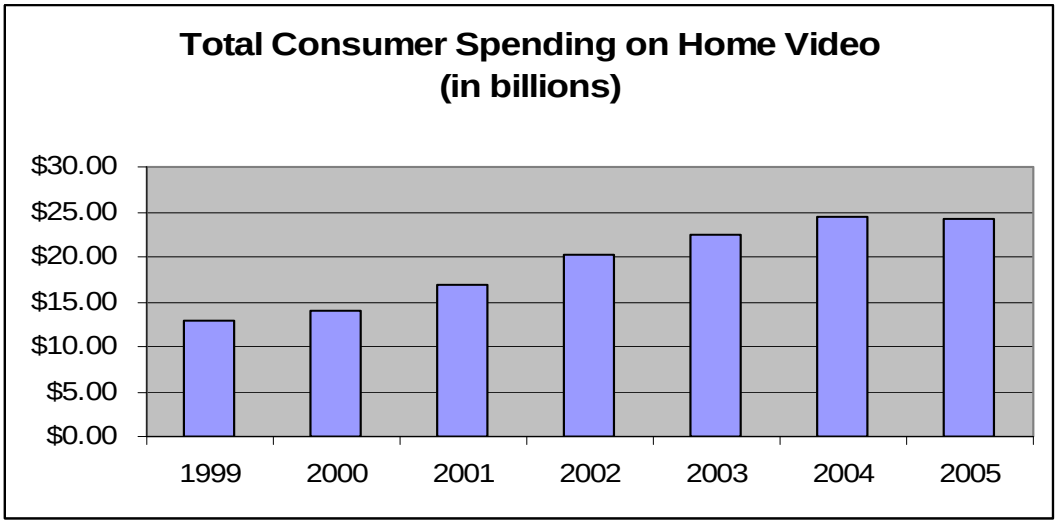

Figure 2: Consumer Spending *Per Digital Entertainment Group*

The popularity of Internet based rental services such as Netflix has been a key driver in the steady increase of DVD rentals. Netflix offers customers unlimited DVD rentals each month. In late 2006, Netflix had 8.8 million subscribers and expects to exceed 20 million over the next four to six years. [6] The popularity of optical disk based movies and portable media players are likely to increase the amount of content guests carry to hotels on

[6] Netflix

portable media players and laptop computers. This trend may result in reduced Pay-Per-View (PPV) revenue and potentially, demand for connectivity to the in-room television and audio equipment. Some hoteliers are now starting to implement guest audio visual (A / V) connectivity to their televisions. The HTNG Application and Device Integration (ADI) Team is creating specifications for an 'all-in-one' media set-top box used to convert signals into content, and a docking pod for guest mobile devices specifically for the hospitality market.

Figure 3: Plug In Box to connect portable device with television monitor

6. Home Theater Entertainment Systems

As home theater entertainment systems become more common, the average consumer's expectation of the television viewing experience is bound to increase. Television is the center point of any entertainment center, and spurred by continued lowering prices, the now affordable HDTV is more prevalent in every day households. Retailers report that demand is strong with consumers aggressively making purchases. In December 2005, Best Buy reported that sales of flat-panel TV's more than doubled from the previous year. The research firm iSuppli reported sales growth for big screen TV's as shown in the chart below.

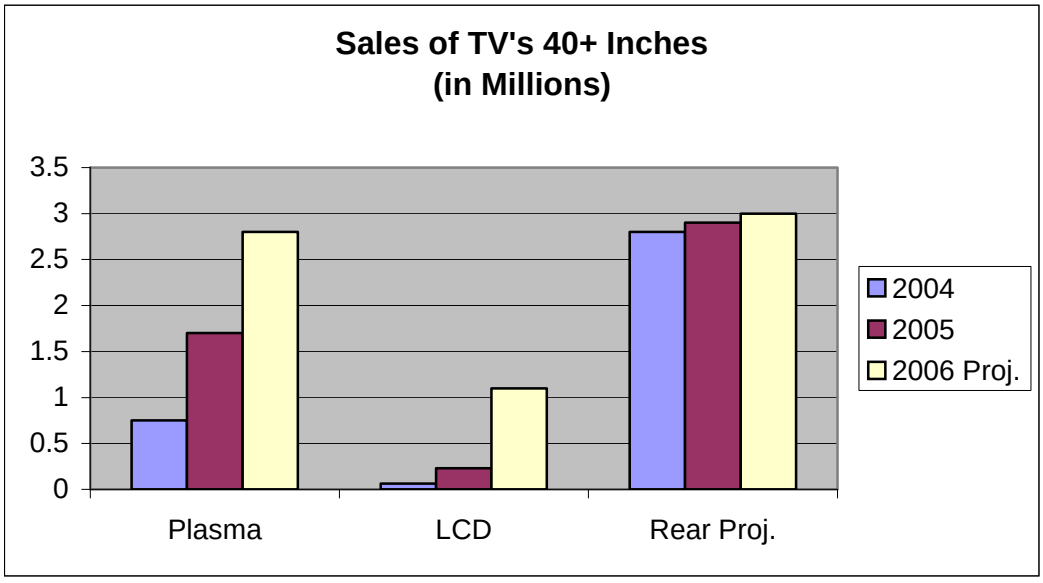

Figure 4: Sales of 40+ inch Televisions

Large screen Plasma and Liquid Crystal Display (LCD) TV sales growth more than doubled in 2005. This is projected to grow at an even faster rate in 2006/7. Declining prices make choices easier for consumers who are rapidly moving toward large screen HD televisions. In 2007, prices for LCD TV's are expected to drop by 30%. According to iSuppli, prices will continue to drop at a rate of 30% annually until 2009.

Forrester Data, a research firm hired by Best Buy, noted that HDTV's are now in 14% of American homes and 50 million HD displays are expected to be installed by 2009.[7] However, HDTV is still in its infancy, and many current owners do not utilize the full potential of their existing televisions. For example, per Forrester Data, 45% of HDTV owners do not have surround sound while 23% of HDTV owners do not subscribe to HDTV programming.[8] In the U.S. market, the required transition to 'all digital' television is driving the increased availability and price declines for new digital TV's. Additionally, cable providers are moving to Open Cable cards, which will help drive down the cost of new set-top boxes and increase availability to consumers.

7. Movie Downloading

Systems such as Windows Media Center, AppleTV, Video and iPods, along with faster Internet access through a broadband link, ensure that movie downloading will become much more viable to the consumer.

Figure 5: iPod, ISP and Zune

[7] iSuppli
[8] Forrester Data

8. Portable Entertainment

Much like DVRs and VOD, portable devices such as iPod, PlayStation Portable (PSP) and Zune cater to the public's increasing demands for entertainment that fits their schedule. Many of these devices support DVD quality video, games and music. A large and growing number of television shows, movies, games, music and entertainment are available for purchase and use on these devices.

9. Internet over Television

As bandwidth extends to households and to mobile devices, the delivery of true broadcast television channels to laptop computers and hand-held devices grows. New companies including Joost,[9] created by the founders of Skype, are delivering broadcast television channels over the Internet to multiple device types.

Summary

In the past, a guest could enjoy hotel provided entertainment and communication technologies that were superior to what they had in their own homes. Sophisticated high-end audio visual equipment systems were specialized, and often installed in Presidential suites. However, these commercial solutions have evolved into consumer products. With the growth of home theaters, Satellite television, Satellite radio, iPod and MP3 players, a significant shift has occurred in the market, and today's consumer trends set a new level of guest expectations.

[9] Joost

A. If I Get It At My House So Easy, Why Can't I Get It Here?

As consumer electronics outpace commercial-grade hospitality industry solutions for in-room entertainment, guests and hotel managers are often perplexed. The question raised is: 'Why is it so difficult to have the same services in a hotel room that are readily available in home residences?' There are a number of factors that complicate the hospitality industry's ability to deliver similar solutions in a guest room environment.

1. Rate of Change

The traditional model of investment in television entertainment is undergoing a major shift. With the rapid pace of change in technology, it is more complicated (and expensive) to justify shorter cycles of investment, as hotels transition from traditional Cathode Ray Tubes (CRT) to LCD and / or Plasma televisions. Older assets must be fully depreciated first, and the expected life cycle for a new TV is shorter today than it was five years ago, making new investments complex.

2. Home Theaters versus Guest Rooms

Anyone who has ever attempted to install a 'home theater' will attest to the fact that it is best to let the experts configure the system. Configurations are designed for personal use and translating these for hotel environments becomes extremely intricate. For instance, if the settings are constantly being changed as new guests check in and out, managing and supporting complex entertainment systems quickly becomes unwieldy. It's critical that hotels maintain a robust and flexible Property Management System (PMS) integrated with the guest room entertainment system to ensure that guest preferences and expectations can be met.

3. Content

Due to legal restrictions, the mechanisms used by providers to deliver content to home residences do not exist for hotels. These limitations prevent providers from distributing content for 'public distribution' without suitable controls.

New battles over Digital Rights Management (DRM) (See Section IV) have created the need for complex control mechanisms to ensure that content is being provided legitimately and securely, without infringing upon distribution rights and royalties. It's a challenge to

offer a wide range of entertainment on demand, on a daily basis, with the necessary security to satisfy distributors on all platforms, as a variety of content is consumed by different guests, on different platforms. Moreover, security considerations vary depending on the content provider, and there is no single 'standard' embraced by the entertainment industry. These owners are rightfully concerned about illegal downloads, copyright infringement and piracy. Also causing owner concern is the unique On Demand 'window' afforded the hotel industry, which occurs just after theatrical release and before the critical DVD sale and rental window.

4. Integration

Integrating in-room entertainment systems into an existing hotel is complex because of the possibility of legacy cabling and infrastructure. The cost of upgrading the necessary hardware components to distribute HD content and VOD is much more expensive at a commercial level. The integration for these complex systems is being addressed by the HTNG Property Web Services Work Group at the software level. This Work Group is expanding the existing integration, creating bi-directional protocols and extending the fields of data that these systems can utilize, so that guest preferences can be implemented on entertainment systems.

The quality of today's televisions, along with the open systems architecture that HTNG promotes, is opening up opportunities for new interactive services delivery via television that would not have been practical in the past. These newer interactive services are coming at a time when hotel guests are more comfortable interacting with electronic service delivery. Additionally, the HD multi-media platforms hotels can now implement offer a high quality eCommerce experience.

Summary

These are just a few examples of the challenges faced by hoteliers to keep pace with the consumer electronics market, and why guests often feel that they have better entertainment solutions in their own homes. Because of the significant changes that are occurring today in technology and especially in consumer's homes, it is increasingly important for hoteliers to upgrade and provide in-room entertainment services that meet growing guest expectation and demand.

III What Programming and Entertainment Services Do My Customers Expect?

To create a compelling in-room entertainment experience, an hotelier must start by understanding *who* their guest is and *what* their entertainment needs are. Identifying these factors is important because taste in entertainment varies between age, culture and lifestyle. For example, baby boomers consume different content through different media than a typical Generation Y guest. Preferences also vary significantly between business and leisure guests.

It is universally understood that the selection of content in hotel rooms has not kept pace with guest demands. Hoteliers attempt to stay current by providing content selected from a variety of different programming types. The number of content providers for hospitality has expanded and hoteliers are no longer limited to one or two dominant industry providers. Content is available from many sources at varying prices to the hotelier and guest.

Local / Broadcast / Premium

Local or broadcast channels are normally transmitted terrestrially (over the air), via Cable or Satellite and received at the hotel via an antenna or Satellite dish mounted on the building or Cable TV connection. These local / broadcast channels can be either Standard Definition (SD) or High Definition (HD) and are usually received and carried by the hotel free of charge to guests. In some areas, there are also broadcast premium channels available at a cost via broadcast, Cable TV or Satellite.

Premium channels offered to guests may include an additional cost to the guest. Reception of these channels usually requires special receiving equipment at the hotel and a subscription fee paid to the program provider. Some of the premium content providers may also require that special copy protection and / or DRM processes be applied to content prior to delivery. In addition, a DRM decryption device may be required in each guest room. Encryption is one of the most significant challenges hoteliers will face as they

consider entertainment solutions. Encryption for premium channels needs to be compatible with On Demand encryption requirements (See Section IV).

On Demand

The wide selection of On Demand programming is delivered in a variety of ways, ranging from Satellite to Cable TV or service provider. Content available to hoteliers now encompasses a variety of sources, from Hollywood studio and current television to adult programming. Content source availability varies between the Americas, Europe and Asia. On Demand programming may or may not be offered at an additional cost to the guest. In general, programming is provided for a fee, chargeable to the guest or hotel.

Time-Shifted

This type of programming usually refers to a Free-To-Guest (FTG) local, terrestrial, Satellite or Cable TV broadcast viewable at a time different from the original scheduled broadcast time. Time-shifting provides a premium service by allowing the guest to view programs they may have missed at a more convenient time. This programming should not automatically imply that content can be recorded or stored for later use. Through special licensed programming (like On Demand) it is made available by the content owner. Time-shifting requires an in-room or network-based device to record selected programming for later viewing. These network-based solutions require new licenses, which are purchased from television broadcasters. Obtaining these licenses can be a tedious process.

Guest expectations originate from their home experience. For instance, guests who own Personal Video Recorders (PVR), or TiVo, will certainly begin to ask hoteliers why these are not yet available in hotel rooms. Most hoteliers struggle with the feasibility of providing personal video recording equipment like these. The topic is a sensitive one for the hotel industry as a whole, coupled with the potential impact of 'Place Shifted Content,' and customers carrying their own content. Additionally, for legal reasons as well as the personal tastes of each guest, hoteliers are concerned that when a guest records specific content on an in-room device, the recorded content should not remain on the device for the next guest. Today, the integration of PVR equipment and hotel property management systems does not exist to wipe a device clean between guest stays.

Place-Shifted

Several solutions are already available to consumers for place-shifting their content. This concept is used when a consumer buys an appliance that connects to their video services at home. It allows content viewing of their home television channels, DVR content, or content stored on their PC while traveling. The most popular of these services today are Slingbox, Sony Location Free TV, and Orb Networks. However, this technology is very much in its infancy.

The impact for hoteliers to consider is that a guest may elect to circumvent all hotel provided television content and use the hotel's high speed Internet connection to bring content into the guest room. This increases the bandwidth demands on the hotel's high speed Internet services and also impacts the hotel's VOD revenue.

Regardless, place shifting technology offers a much more personal entertainment experience for travelers, and even offers the benefits of bringing domestic content on international trips where local entertainment options are not always language friendly.

International

A large number of International genre program sources are available from terrestrial, Satellite, Cable TV, and content service providers. An hotelier may want to consider specific international programming based on guest demographic and / or interest.

Games

A variety of games can be provided to guests as a value-added offering by making game consoles and modules available on a request basis. Also, many service providers offer games as part of their VOD services and may include an integrated, handheld device.

Music

Music content can be provided to guests as a value-added offering and requires specific licensing usually arranged by the content provider. In some hotels, music content is provided in public areas, and can also be made available FTG on specific television

channels. Special consideration to jurisdictional licensing requirements must be followed where this is done. FTG music videos and music video channels are also available to the hotelier.

Downloadable

Downloadable content is comprised of movies, music, pictures and other types of digital content. In general, hotel guests will be most interested in downloading movies and music. When a guest uses their own computer, content can be offered directly from the hotel's' initial 'splash page.' The splash page is the first web site that the guest sees when they log onto the data network to get to the Internet. Additionally, content could be offered on a one-time or subscription rental basis to the guest. It can also include download to 'own' rather than rent. For instance, the guest might buy a movie and download it for later viewing while traveling. Alternatively, the guest might pay for a subscription service and download a movie to enjoy during travel or download content once they are at home.

Guest Provided Content

As the digital evolution continues, guests obtain more and more ways to carry content. Some examples include: laptop with movies and DVD player, portable radios, generic MP3 players, music iPods, video iPods, DVD's, CD's, USB dongle, digital cameras and potentially many more. The common thread in these devices is finding the right physical interface. The most predominant interfaces are: RCA Composite Video & Audio, USB, VGA and Mini Stereo audio. Of course, there are many other interfaces, but these represent the large majority. If the TV can support these simple interfaces, the guest is able to display pictures, or play a movie or audio file. Many VOD providers apply a fee for these interfaces; however, in general, guest access to content is free.

Internet Content

Internet connections offer a large variety and amount of programming. Internet content is obtained by accessing a website or content aggregator such as 'YouTube.'[10] Hoteliers are faced with the question of what to do about options for guest access to Internet content. In

[10] YouTube

general, simply providing a high speed Internet connection provides the majority of the solution. However, if the hotelier wants to expand this service, they could provide a myriad of informative content such as the local weather, or weather exclusive to the guest's home address. Other types of content can be activity related and tailored to each guest's area of interest. Of course, the hotelier usually has an internal website and this is a simple portion of Internet content that should be included. This allows the splash page for services, with links to the hotel site, guest's home city, interest sites, etc. Many hoteliers offer free guest access to the hotel's preferred websites, such as the hotels' home site, e-commerce partners and ad-supported sites.

Internet Browsing on TV

'Internet over TV' is useful for guests without a laptop who want to quickly perform limited tasks. Most implementations in hotels use standard analog signals and the web content is typically hard to read. Guests also have to perform a lot of scrolling within a site to view a whole page. This is because web sites are typically a minimum resolution of 1024x768 where analog TV displays are standard 640x480. The good news is that in the last couple of years, several providers have developed HD outputs for Internet over TV. For example, one provider of integrated media systems offers Internet over TV in a resolution comparable to a computer monitor. This display resolution on a HDTV monitor results in a much better guest viewing experience. Another challenge is that guests are usually required to use a wireless keyboard with an integrated mouse. These are a little harder to control than a traditional keyboard and separate mouse. This is partially due to the fact that Infra-red (IR) systems are used, which is directionally sensitive. Bluetooth and other non-directional keyboards may offer a more useable experience. Regardless, more and more guests are demanding Internet over TV, in any form.

Specialized Channels

As recently as 2006, VOD providers have been offering recently run TV shows, such as the 'Sopranos,' making them available to hotels just days after they are shown on HBO. For a nominal fee, guests can pick from a number of current TV shows. Another example of specialized channels is an offering by a company delivering targeted communications services for sports programming such as National Football League (NFL). Guests can

purchase football games and other sports from their hotel room using the same Satellite services available in their homes.

Interactive Services

Historically supplied by a VOD service provider and viewed on guest room televisions, paid Interactive Services are the typical guest services applications. This includes Account / Bill Review, Text or Voice Message retrieval, Room Checkout, Guest Surveys, Room Service, Service Requests and other similar services.

Summary

Hoteliers need to be cognizant of the fact that guests are not longer constrained when seeking video entertainment. New media options carried into the hotel by guests, along with those residing outside the hotel confines are growing. In order to meet guest expectations, hoteliers need to provide guests with the ability to enjoy their chosen media on the desired display of their choice.

IV. What Do I Need – Technology Requirements

Once an hotelier has determined which content selection to offer, they must consider how to implement the solution. This will usually involve one or more service providers along with infrastructure and hardware upgrades. Hoteliers may want to begin with an upgrade of entertainment services through new televisions; however, important steps must be taken first. This starts with choosing the most suitable service provider and determining the type of infrastructure needed before finally purchasing televisions.

Televisions…*It's more than just a buying a TV…*

Televisions, now more than ever, come in many variations and technical specifications, which make selecting a new one much more complex. These intricacies along with specific hospitality requirements make it critical to evaluate all elements and options before purchasing.

Hoteliers should coordinate with the service provider ***prior to making a purchase*** *to ensure that the television is compatible with their service.*

HDTV Overview

Since most hoteliers will be upgrading to a HDTV monitor in the future, a description is appropriate. HD is currently the highest quality format of digital television. As of 2007, the majority of countries around the globe have a detailed plan for HDTV services. In addition, most of the core technologies for these systems are common throughout the world. Global differences that exist are mostly in the area of transmission technology. What this means is that the basic digital video 'data' for all systems complies with a single, global set of standards and is generally interchangeable. HDTV has a 16:9 widescreen aspect ratio, which is similar to a movie theater screen. It also has much higher resolution than Standard Definition (SD) televisions, up to 5x's more information. Generally, it comes in three different styles: 720p, 1080i and 1080p.

What do 720p, 1080i and 1080p mean?

There are many variations of HDTV formats. HD programs are encoded with a resolution of 720p, 1080i or 1080p. The number stands for the amount of vertical lines embedded within the signal, while the letter describes the type of scan process used to display the picture. The 'i' indicates interlaced scanning, while 'p' designates progressive scanning. The number of lines on a television is important because it allows for greater image detail.

Format: HDTV / EDTV / SD

One of the first considerations when selecting a HDTV monitor is the 'native resolution.' This is the single fixed maximum resolution that the monitor actually displays. It is measured in 'pixels,' which are the smallest elements of a television display.

Type	Native Resolution (pixels)	Scan Type	Format	Aspect Ratio
1080p	1920 x 1080	Progressive	HDTV	16:9
1080i	1920 x 1080	Interlaced	HDTV	16:9
720p	1280 x 720	Progressive	HDTV	16:9
480p	852 x 480	Progressive	EDTV	16:9
PAL	720 x 576	Interlaced	SD	4:3
NTSC	720 x 486	Interlaced	SD	4:3

Figure 6: Format – HDTV / EDTV / SD

'1080p': This type is both a video format specification and a basic digital television construction technology. 1080p can provide up to twice as much video information as the generally accepted HD formats of 720p and 1080i. Blu-ray and HD-DVD formats have begun to support 1080p and television manufacturers are producing an increasing number of televisions supporting 1080p. However, to take advantage of this improvement, video content must be carefully tailored to 1080p specifications, and very little is today. Currently, no commercial system exists to create 'live' 1080p content. It is only possible to prepare pre-recorded / filmed content to 1080p standards.

Also, no commercially available TV's or set-top boxes (STB's) currently support 1080p programming, with the exception of Blu-ray and HD-DVD players. However, it is likely that all of the available video transmission technologies could support 1080p. For these reasons, hoteliers should carefully consider 1080p, as it is unlikely a substantial amount of content will be available to take advantage of these televisions. (Except from Blu-ray and HD-DVD players)

720p, 1080i and 1080p all display a great picture, despite the obvious difference in resolution. In fact, unless a very large television and excellent source material is used, the differences between any of the HDTV resolutions will be hard to detect.

Monitor Type - Plasma TV versus LCD TV -- The Differences

If flat panel televisions are being considered, hoteliers need to determine which technology to install. While there are many new technologies being developed, there are currently two main choices: LCD or Plasma. The appearance of LCD and Plasma televisions look very similar and both are capable of displaying a great image. However, that is where the similarities end.

It is important to understand that LCD and Plasma are completely different technologies. Choosing between LCD and Plasma depends entirely upon viewing preferences. Both flat panels deliver a quality image and pricing between similar sized Plasma and LCD televisions is competitive.

1. Plasma TV

Plasma TV technology involves gas plasma cells, which are energized with an electric current, causing the gas to release ultraviolet photons. These photons cause the cells phosphor coating to radiate visible light. The picture is formed by switching the cells on and off in a sequence. Altitude may affect the quality and life of the plasma display.

2. LCD TV

LCD TV technology uses a liquid crystal solution, which is trapped between two sheets of glass with backlight illumination. In addition, LCD panels use less energy and tend to have a longer lifespan than Plasmas.

3. Burn-In

Once a dominant problem with flat panel televisions, burn-in still exists today, but television manufacturers have deployed new solutions such as motion adaptive anti-burn technology to minimize this problem. Burn-in is more of an issue with Plasma than with LCD TV's, although both suffer from this phenomenon. Burn-in occurs when an image is displayed for an extended period of time without changing. Often, a logo or other similar icon is left on the screen for too long and the result is a permanent 'ghost' of the image burned into the screen. This is why most computers employ a 'screen saver' to protect the monitor. Hoteliers should ensure that any VOD system, especially Electronic Program Guide (EPG) and other similar graphics, offer screens that change over time and don't allow a static screen for more than a few minutes at a time.

Historically, Plasma displays suffered from burn-in produced by static images. If Plasma displays are used, consideration of this effect is required, and a reduction in use of static image screens (such as hotel welcome and 'still' informational channels) should be taken into account. LCD TV's traditionally do not suffer from burn-in, but can have a 'retained pixel charge' which may also produce ghosting. Stuck pixels are also possible with an LCD display. As a result, similar consideration of this effect is required, and a reduction in use of static image screens should also be taken into account. Reversal of the LCD effect is sometimes possible, but depending on the extent, may not be completely successful.

4. Viewing Angle

The television viewing angle refers to how far on either side of the television it is possible to still see a clear image. All television technologies perform differently when viewed from a position other than directly in front of the set. Through the years, manufacturers have made various claims regarding the viewing angle of their televisions. What really matters is the quality of display at the viewing angle. Therefore, hoteliers are encouraged to test televisions in as close to the actual operating viewing position as possible and avoid relying on manufacturer claims.

LCD TV's generally have a smaller viewing angle than a Plasma TV, although this gap has recently been reduced. Given the restricted viewing environment in a guest room, this is not usually a major consideration. Hoteliers should check viewing angles on smaller and

low price TV's to make sure it is adequate for room placement and appropriate for all expected guest viewing angles.

5. Viewing Distance

Digital TV's (as well as analog) use a set of horizontal lines of dots to represent a picture. These lines of dots are visible and obvious when viewed from a short distance from the screen. Conversely, as the viewing position is moved away from the screen, at some point the mind stops 'seeing' the individual dots and suddenly the picture starts looking smooth and homogeneous. The effect is a product of the spacing of the lines and dots on the TV, which are proportional to the overall size of the screen. Large screens with big gaps between the lines require a greater distance between the viewer and the screen.

4:3 Televisions: The following chart gives a rough estimate of the minimum and maximum viewing distances for regular 4:3 televisions. Typically, viewing is most comfortable when the distance of the television is between three and six times the width of the screen.

Regular 4:3 Televisions		
4:3 TV diagonal screen size	**Min. viewing distance (in feet)**	**Max. viewing distance (in feet)**
20	4	8
27	5.4	10.8
32	6.4	12.8
36	7.2	14.8
40	8	16

Figure 7: 4:3 Viewing Distances

16:9 Widescreen Televisions: Viewing can be as close as 1.5 times the screen's diagonal measurement without loss in picture quality. Viewing at a distance farther than three times the screen size will reduce the immersive feel.

16:9 Widescreen Televisions		
16:9 TV diagonal screen size	**Min. viewing distance (in feet)**	**Max. viewing distance (in feet)**
32	4.0	7.8
42	5.3	10.5
50	6.3	12.5
55	6.9	12.8
60	7.5	15
65	8.1	16.2

Figure 8: 16:9 Viewing Distances

The charts shown above provide only general guidelines for viewing distance. The best determination of viewing distance is based on a comparison between the size of the TV display and its intended environment.

Monitor Inputs: High Definition Multimedia Interface (HDMI)

HDMI is an all-digital uncompressed audio / video interface for either SD or HD signals. It provides both the audio and video in a single cable connection. HDMI interfaces are used in many set-top boxes, DVD players and other devices. By providing multi-channel audio along with digital video, it can drastically reduce cabling needs. This cable supports the two dominant encryption formats for uncompressed audio / video from a device to a display, Digital Transmission Content Protection (DTCP) and High Definition Content Protection (HDCP). (See section 4A).

In addition, HDMI has the capability of delivering serial communications over the same cable. This is critical because VOD service providers use a form of serial communication to control and manage guest room televisions and a single cable eliminates the need for additional communication wire. Though the HDMI specification allows for control of the television via an HDMI cable, the specification was written purely for home market. Therefore, the cable may be missing many of the hospitality features. Moreover, there has not been broad implementation of this feature. HTNG is actively engaged with the HDMI organization to expand the standard; however, this may not be available to HDMI v1.3+. (See 'In-Room Entertainment Compatibility')

Figure 9: High Definition Multimedia Interface (HDMI)

Digital Video Interface (DVI)

DVI is a video interface used primarily in computers, set-top boxes and projectors. It supports many video resolutions, including SD, HD and most computer resolutions, but does not support audio. DVI signals can be either analog or digital. This cable also supports the two dominant encryption formats for uncompressed audio / video from a device to a display: Digital Transmission Content Protection (DTCP) and High Definition Content Protection (HDCP).

Figure 10: Digital Video Interface (DVI)

Component

A component video connection consists of three separate analog video signals that collectively make up the video signal. There are two approaches to component video: Y/Pb/Pr, comprised of mostly consumer equipment and R/G/B, which is mostly professional equipment. Each provides the highest-quality analog signal. The cables

must be the exact same length to ensure proper timing of signals. Distance from the source and TV are limited to no more than 50 feet.

Figure 11: Component

Composite

Composite video is a single cable used to deliver SD video, typically with a RCA connector. It carries the entire video signal on the single cable and does not include audio.

Figure 12: Composite

S-Video

Super-Video (S-Video) is a video cable connection that separates color and brightness into different signals. By using a S-Video connection the video picture has a better signal than if using a single composite video connection. S-Video does not include audio.

Figure 13: S-Video

VGA / SVGA / XVGA

Video Graphics Array (VGA) is an 'analog video only' interface designed for computer displays in a 4:3 format. It is a first generation technology that is migrating toward higher resolutions. Super Video Graphics Array (SVGA) is the second generation resolution with a 4:3 format and enhanced further to eXtended Video Graphics Array (XVGA), which is a widescreen 16:9 format. Many LCD and Plasma monitors support a VGA / SVGA / XVGA connection to allow a connection between a computer and monitor and enable a large computer display.

Figure 14: VGA / SVGA / XVGA

Television Inputs				
Interface	**Supported Formats**	**Video**	**Audio**	**Copy Protection**
HDMI	SD / HD	Digital	Digital	Yes
DVI	SD / HD	Digital or Analog	N/A	Optional
Component	SD / HD	Analog	N/A	Optional
Composite	SD (NTSC/PAL)	Analog	N/A	Optional
S-Video	SD (NTSC/PAL)	Analog	N/A	Optional
VGA	720 x 480	Analog	N/A	N/A
SVGA	800 x 600	Analog	N/A	N/A
XVGA	1024 x 768	Analog	N/A	N/A

Figure 15: Television Inputs

Tuners

In the past, TV's almost always came with an analog NTSC or PAL tuner. However, as TV's and computer monitors converge in capabilities, it is not uncommon to find digital displays (monitors) without tuners. The tuner inside the TV is typically used for viewing FTG channels. Additionally, many current VOD systems use this same tuner to view On Demand premium content. If HD FTG content is desired, the TV or STB must have a digital tuner / decoder. (e.g. QAM, ATSC, DVB-T, IPTV or other tuner) The hotelier must ensure that the TV or the set-top box has a tuner or a method to tune to each channel that is compatible with the inbound signals. It is critical to check for this compatibility, since service providers do not transmit the signals in the same format.

Digital Video Broadcasting (DVB-T)

DVB-T is a European technology used throughout Europe, the Middle East and Asia Pacific. There are various forms including: DVB-T (terrestrial), DVB-C (cable) and DVB-S (Satellite). Other variants include capability for return channel (DVB-RC) used for voice applications and Internet protocols plus support for legacy applications like Teletext and VBI. DVB-T provides support for Standard and HDTV of up to 15~20Mbps.

Integrated Services Digital Broadcasting (ISDB)

ISDB is a system developed in and currently exclusive to Japan. It includes various forms such as: ISDB-S, ISDB-T and ISDB-C. Its methodology uses 5.6 MHz bandwidth to provide up to 19Mbps of digital television in Standard and HD.

Aspect Ratio

Television aspect ratio refers to the relationship between the width and height of televisions or programming. SD content utilizes a 4:3 aspect ratio, while HDTV and SD widescreen content use a 16:9 aspect ratio. As televisions grow in overall size, the aspect ratio remains the same.

Standard Definition (SD) Content on HDTV Monitor

Since SD content is produced in 4:3 aspect and the new HD monitors are in 16:9 widescreen appearance, hoteliers will need to decide how 4:3 SD content should be

displayed on a 16:9 HDTV. Choices include 'Pillarboxing' and 'Full' display of images. These options are described below.

PILLARBOXING

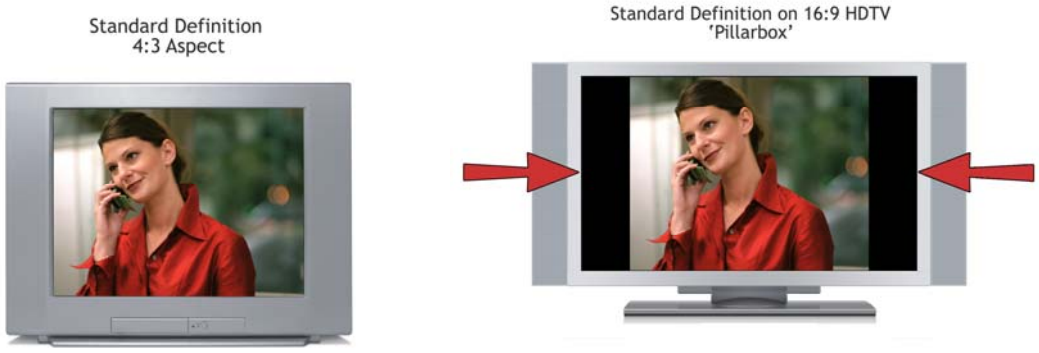

Figure 16: SD on 4:3 Monitor and 16:9 Monitor in 'Pillarbox' mode

When 'Pillarbox' mode is used, video will be displayed in the correct aspect (i.e. circles will continue to be circles). However, black bars or 'pillars' appear on the left and right sides of the screen.

'FULL' MODE

Figure 17: SD on 4:3 Monitor and 16:9 Monitor in 'Full' mode

The picture takes up the entire screen when the 'Full' look is used. It expands the left and right sides of the image to fill up the screen, thus changing / distorting the aspect ratio of the SD content, which in turn makes circles oblong. The Full look will make people appear shorter and wider than normal. Some monitors have additional settings that are between Pillarbox and Full modes, while some have manual adjustments.

Hoteliers will need to determine which aspect ratio is preferable for guest viewing of SD content. Most 16:9 televisions and service providers can display the SD content in either Pillarbox or Full mode. Many times it is not difficult to change from one mode to the other, but hoteliers should check with their service provider.

Television Power Consumption

Digital television power consumption and subsequent room cooling requirements should be an important consideration for all hoteliers for obvious reasons. Manufacturers are paying increased attention to this issue and are expected to continue to dramatically reduce television power consumption in the coming years.

Audio

High quality audio is an equally important feature to a good entertainment system. Delivering the best audio possible in today's hotel environment is often a technical challenge. High fidelity is often accompanied by high volume. This requires sound insulation to prevent audio in one guest room from disrupting another. Installation of audio that does not interfere with another guest room could be as costly as the actual audio solution itself. HDTV audio is delivered in Dolby Digital 5.1 Surround Sound. A full implementation requires that each hotel room deploy a center speaker, two front speakers, two rear speakers and a sub-woofer. This increases the sources of sound in the room, with placement of speakers on walls that have adjacent hotel rooms.

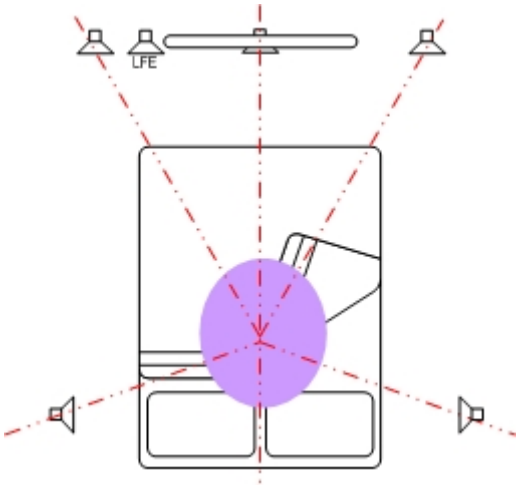

Figure 18: Location of speakers in a 5.1 audio system

Many manufacturers are creating 'sound bars,' which attach to the bottom of the monitor and reduce the required amount of separate speakers and cabling. Very few audio solutions today are designed for hospitality use, and this presents another challenge with delivering a full HDTV home theatre experience.

Commercial features, such as volume limits, turn on audio volume defaults, and integration to the VOD service provider system and remote control are required. Connectivity of the audio system is important for the best audio performance. The use of analog connection, such as RCA type connectors for left and right audio channels is prone to noise interference and limited to two channels.

For multiple-channels, the use of the Sony / Philips Digital Interface Format (SPDIF) is a minimum recommendation. HDMI supports up to eight channels of digital audio and is the preferred method of connecting equipment. It utilizes one wire to transport video, audio and control between all hotel equipment.

DVD Player Selection

There a number of factors to consider with a HDTV environment when purchasing a new DVD player for use in hotels. The current 'competing' standards for HD-DVD players are Blu-ray Disc™ and HD DVD. These are new high-definition disc formats designed to maximize the viewing experience available from today's HDTV's. Similar to the Beta versus VHS debate, a single standard for a high definition DVD player has not yet been established. One option is to purchase a DVD player with video 'upconversion.' These players can 'upconvert' DVD video content to a resolution that more closely matches that of HDTV. The signal remains digital as it travels through digital video connections to a compatible high-definition TV for the cleanest possible transfer.

A. Digital Rights Management (DRM)

Digital Rights Management (DRM) is security used to protect valuable video and audio content. There are various DRM solutions for either analog or digital signals depending on the delivery method, set-top box and television.

If planning on working with a VOD or content service provider, it is critical to ensure that the vendor implement a robust DRM solution to satisfy today's content owner requirements and flexible enough to meet potential future DRM advances during the life of the service agreement.

Analog Encryption

There are several technologies for analog encryption. However, most VOD providers do not encrypt analog signals. The one exception is digital IP distribution in hotels. For IP-VOD service providers, the content owners require content encryption for storage, distribution, and display. The IP-VOD providers use an analog encryption inside their set-top-boxes and modify the video output to the TV with copy controls such as Macrovision or Dwight Cavendish. This method insures that guests cannot make a copy of the analog output of the set-top-box.

Copy Protection: is the method describing the ability to restrict or prevent duplication of video or audio content. This includes copying to VHS tape, DVD or HDD, and is one of the main piracy concerns studios have. There are a number of methods to enable Copy Protection.

Macrovision: is the main Analog Copy Protection method. Macrovision renders the recorded content to poor or unacceptable quality. This method is mainly used for CVBS or S-Video outputs. Another similar method is available using technology provided by Dwight Cavendish.

Content scrambling: renders content completely un-viewable on video used for CVBS, S-Video or RF outputs.

Digital Encryption

There are numerous encryption standards in the market. AES 128 and DES are commonly used as well as proprietary methods. The important thing to consider is that any advanced digital content, namely HD, probably needs content protection, as it is a

requirement of the content owner. Therefore, the VOD system must provide appropriate content encryption as required by the studios and broadcasters. One of the biggest complaints about these systems is their lack of interoperability. Content legitimately obtained and protected using one system is not typically compatible with another system. This incompatibility and lack of standardization adds cost and extra effort. Work continues on technologies to overcome this limitation. Since content service providers are typically solely responsible for the protection of the content they resell, it's these companies that often define the security system to be used. For a number of reasons, these companies may choose different technologies. Because of this, it is critical that hoteliers discuss content security with their content service provider.

Recently, in the music community, there has been an on-going discussion about the 'real' value of these technologies for the protection of music and it is unclear how that discussion will evolve. What is clear is that for the near future, HD Digital Video Content in the Hospitality Release Window will require a strong level of protection. A number of systems now exist that can provide this level of protection in both Digital Coax and IP infrastructures. Several of these are mentioned below:

Digital Rights Management: Typically, a DRM system protects intellectual property by either encrypting the data so that it can only be accessed by authorized users or marking the content with a digital watermark or similar method so that the content cannot be freely distributed. Encryption is the procedure used to convert normal or usable data into un-usable or secure data to prevent unauthorized users from reading that data, or in short, the conversion of data to secret code. There are many types of data encryption. Common types include Public-key encryption and Data Encryption Standard (DES). A 'key' is created as a part of the process to 'lock' the data. Decryption is the procedure used to convert secure data into normal or usable data to allow authorized users to read that data. A 'key' is needed to 'un-lock' or use the data. Keys or special characters are used to Encrypt or Decrypt data (such as passwords). The longer the key, the stronger and more difficult it is for an outside party to break the code.

High-Bandwidth Digital Content Protection (HDCP): is used to prevent copying of signals over DVI or HDMI connections. HDCP generally is used only on devices capable of supporting HD content via the DVI or HDMI connections to secure both video and audio signals. Both digital source (STB or DVD Player) and display (LCD / PDP) must support HDCP.

Digital Transmission Content Protection (DTCP): is used to prevent copying of audio and video signals over FireWire, USB, IP, WiFi, and Bluetooth. The sending device such as a PC, set-top-box or DVR device and the receiving display such as a monitor or television both need to support DTCP.

Don't confuse DRM and Copy Protection.

DRM restricts the ability to read or view data to authorized users only. With DRM, it is still possible to copy a file, but it cannot be read without proper authentication.

Copy Protection prevents the ability to make another viewable / playable copy of a movie or music program. Copy Protection will still allow a user to copy or record the content, but the copied or recorded content will have such poor quality no one can watch it.

Television Protection and Cleaning

Plasma and LCD televisions have sensitive surfaces and can be damaged easily. It is highly advised to have a protective cover over the screen to prevent physical damage from someone or something hitting or touching the screen. It is equally important to understand that traditional cleaning solvents can and most likely will permanently damage the screen surface. There are solvents and cloths specially designed for LCD and Plasma televisions.

In-Room Entertainment Compatibility

After the major points of Plasma versus LCD, size, price, and physical aesthetics have all been considered, hoteliers need to consider compatibility of the TV with the in-room entertainment provider. Hotels provide a unique set of challenges for the TV and require features that are not normally found in the consumer market. At a bare minimum,

providers require an interface that allows them to remotely power the television on and off, control the volume, change channels and inputs, lock out guests from administrative functions and utilize the existing infrared receiver to pass signals to multiple devices.

Hotels also require a unique set of TV management features. For comfort of the guests, hotels often look to set limits on the maximum volume and a low volume default 'turn on' that the television powers on to limit disturbances. Televisions need to support a default 'turn on' channel so that guests always land on a consistent home screen. Hotels also have the unique challenge of having to manage changes to the cable lineup across all rooms. Selected TV's should provide some mechanism to program the channel lineup and channel labels known as On Screen Display (OSD).

Finally, most modern hospitality televisions support a 'cloning' capability. This allows hotels to create a 'master television' with channel lineup, volume defaults, in-room entertainment provider settings and clone all televisions to this set up. Cloning is especially helpful when staff is required to change a failed unit.

Which Brand to Buy?

With the recent increase in LCD and Plasma sales, many vendors have released hospitality grade televisions. Though Philips SmartPlug™ and LG MPI™ technologies have existed for many years; many commercial brands have joined with hospitality grade televisions of their own. Companies such as RCA, Panasonic, Samsung, LG, Philips, Sony, Sharp, Polaroid and Hitachi have all released hospitality televisions in the past several years. This is by no means a complete list, but with the rapid growth of Original Equipment Manufacturer (OEM) flat panel production, new brands are appearing with hospitality grade televisions, which will expand the choices for hoteliers.

When choosing a brand, hoteliers should ask service providers for a current list of supported televisions or provide the television model(s) as part of the Request for Proposal (RFP). Some providers will also provide custom integration with consumer displays; however, this may be at an additional cost, with a longer delivery time.

Mixing Televisions Models and Brands

Televisions can vary from room to room in some hotels. It is important to check with the in-room entertainment system provider to ensure that all the television models in the hotel can be supported. It is also important to consider whether the provider can support mixing of models or even different brands and if there will be a maintenance impact.

The most important consideration if mixing models and brands, especially if doing so in a single guestroom, is remote control compatibility. Guests will be frustrated if there are two separate remote controls for the bedroom and living room. Even if installing different brands of TV's is deemed necessary as a partial hotel upgrade strategy, engineering and housekeeping must be diligent to keep the correct remote controls in the proper rooms.

And, as long as a hotel uses both analog and HDTV's, the hotel's head-end infrastructure must support both technologies. Any new construction hotel should seriously consider the impact of implementing a mix of analog and digital television services. Many hotels may consider a phased approach to upgrading with Flat Panel TV's or perhaps only upgrade suites. In this case, hoteliers should contact the provider with the following questions:

1. Is the new television supported?
2. Can HD and SD televisions be supported in the same hotel and how are the two display formats supported?
3. Will I be able to get HD Content on this television, while the rest of my system remains analog? If so, what HD Content will be available?
4. Will I need a software / hardware upgrade to support this?
5. Will this television support an upgrade to an HD system in the future?
6. What HD Content is available?
7. What are the additional start-up and ongoing costs?
8. Does every TV need a set-top box? (bathroom TV's usually don't allow for the space)

This discussion pertains to guest room televisions. Hoteliers should be aware of issues relating to other types such as televisions in bathroom mirrors, in and on gym workout equipment, in outdoor environments, and in common / public areas.

B. Infrastructure

Ability to deliver the content requires a physical transport mechanism.

Digital Video Transmission Infrastructure

This area of technology primarily involves the infrastructure in a hotel and can represent a substantial investment to change or upgrade. The two primary competing technologies in this area are Digital Coax and IP (Internet Protocol). While it is beyond the scope of this paper to debate the merits of each technology, it is important to emphasize that the exact same video information is delivered by either technology and assuming each is implemented well, there is no difference in picture quality between the two technologies.

Furthermore, while there are differences in how each technology scales with capacity, both offer sufficient capacity for any video service currently contemplated. Therefore, hoteliers generally must take into consideration factors other than video performance when choosing a Digital Video Transmission Technology. These factors include upfront costs and additional services other than Digital Video. It is also possible to consider infrastructures where an existing Digital Coax infrastructure is used for Linear Channels and an IP infrastructure is used for VOD and advanced services.

1. CAT-5 / Fiber versus Coax versus Wireless

Today, FTG and On Demand content and programming can be delivered on a variety of physical layers, CAT-5e/6, fiber, or Coax. On an Ethernet transport physical network, a minimum of CAT-6 should be considered for any new installation or refit of an Ethernet network. The difference between CAT5, CAT5e, CAT6, or fiber applies to the specification of the cable and the termination of the cable end-points, with fiber having the highest bandwidth (and better quality) carrying capacity. For coaxial transport, RG6 cable should be used for guest room distribution. RG11 cables should be used from the Satellite or

cables from the content provider used to the hotel head-end. The coaxial network should have no less than 850 MHz capacity and a preferred capacity of 1 GHz.

2. Analog versus Digital

When referring to infrastructure, analog versus digital generally means the content delivery method (such as a television channel) from a central location to each guest room or display device. The main difference between analog and digital transmission deals with the ability to recover the transmitted signal. Analog signals are prone to interference, which in turn degrades the quality of the signal to the viewer.

On the other hand, digital transmission is less affected by unwanted interference, or noise. When interference is encountered with a digital signal, Forward Error Correction (FEC) automatically helps correct many transmission errors. Also, because it is a digital signal, the audio and video are reconstructed at the receiver, which eliminates all analog noise and signal interference. If the decoder receives the signal, then it will be as good as the original encoding. Digital delivery can be accomplished over both COAX and CAT-5 physical transport mechanisms.

3. Digital does not mean HD

Digital television 'digitizes' the analog signal for broadcast via terrestrial, Cable, Satellite or IPTV. Digitizing improves quality of the received signal, as the digital signal is not as susceptible to signal degradation effects as an analog signal. The received digital signal is virtually the same as the signal broadcast from the origin.

It is important to understand that just because a signal is digital, it does not mean it is HD. Both HD and SD signals can be digitized. It refers to 'how' a signal is transmitted from one location to another.

Digitization also allows for compression of the original signal and provides increased transmission capacity. A typical analog channel carries one video and audio program in a single channel space. The process of digitizing the channel allows between 4 and 8 video and audio programs to be carried in the same channel space. These video and audio

programs are generally in Standard Definition (4:3 NTSC or PAL), but are delivered digitally.

4. Existing versus Rebuild

The decision to use existing infrastructure or to rebuild will be influenced by a number of variables. Some of these include vendor or service provider preferences and the unique infrastructure requirements they may have or need in order to provide service to the hotel. Other factors will be cost, not only in the new or upgraded infrastructure, but also any other costs involved in installation and re-instatement of the original guest room design and appearance. Careful consideration and planning should also include future upgrades and the chosen application or service dependencies.

5. Set-top Boxes (STB)

The transport method, as well as other requirements used by the hotel (IP or RF) will dictate the requirement or type of STB needed to provide content to guests. Today, for IPVOD / IPTV, an external type interface / STB or specialized television with built-in IP receiver is required. Based on the service provider, for RF VOD / TV, an external STB is often replaced by a Set-Back-Card that slides inside the hospitality television much like a PCI card slides into a personal computer. Today, depending on the territory, there are a large number of industry specific (hospitality) version display devices / televisions. The advantage of these televisions is they support service provider interfaces allowing them to install interface devices on the television and alleviate the requirement for an external STB. Where an interface is not available, an external STB is required. In some cases, an STB can have advantages from a service and repair standpoint and / or additional functionality or future services may be able to be supported.

V. Regional Considerations

Depending on the content being acquired, the legalities and requirements to provide content to guests will vary considerably depending on the location of the hotel, the specific type of content being provided or offered, or the arrangements and obligations of the service provider.

As of today, acquisition of most theatrical content (First Run movies) will require implementation of DRM / encryption and copy protection. The method of implementation of either of these is varied among vendors with no specific standard. At this time, a multitude of existing DRM / copy protection vendors has been deemed acceptable by the various content providers. These accepted applications apply almost exclusively to SD content and while there is a push towards HD content, there are limited options depending on the type of content to be offered. In the U.S., some Hollywood studios will allow limited exhibition of HD content, provided the system delivering the content supports an accepted DRM / copy protection mechanism.

In Europe, as well as other territories outside North America, HD Hollywood theatrical content is currently not available. It is widely believed that HD content in Europe from International providers such as Filmbank and UIP will not be accessible any time soon because most guest rooms are still mainly analog based. International providers have only recently started offering SD 16:9 materials in addition to the more commonly used 4:3 materials. It is imperative that service providers in these markets switch to digital as soon as possible, as guaranteed VHS stock will no longer be available after December 2008.

Many other countries also have restrictive censorship requirements, limiting the availability of some content options, increasing the costs and management of providing services in these countries. Most censored markets also have specific licensing requirements on both the service provider and the property (hotel). Careful consideration and investigation is strongly advised depending on the hotels area of operation. Due to restrictive

requirements and / or inability to source content, provision of service in Mainland China, Vietnam, Laos and Cambodia is not widely available.

Some countries will also have specific censorship requirements on many types of erotic content. For the most part, provision of any form of erotic content in religiously sensitive counties is not allowed. This restriction on exhibition of high-take rate programming will often severely limit the ability of a provider to offer service to a customer in these markets under a traditional revenue share model. It also may require a property to guarantee a minimum revenue level. Japan requires all erotic content to be censored using pixelization. Some countries including Thailand, Hong Kong, South Korea and Taiwan have restrictions on what level of erotic level content can be exhibited starting at light-erotic or cable version, whereas selected territories in Australia, New Zealand, Philippines, South Africa and most of Europe will allow completely un-censored programming. In general, erotic level programming is not allowed in most countries in the Middle East or North Africa, with the exception of South Africa and Israel. Censorship on all other forms of content is required to legally provide service in these countries as well.

While there are several vendors offering FTG Satellite or cable content in North America and parts of Europe, there is currently no region-wide provider of FTG Satellite or cable content throughout Asia Pacific, Middle East or Africa, leaving most properties in these areas with the responsibility to directly license from these content providers. This is often licensed either directly from the program vendor (CNN, BBC, etc) or from a local in-country Cable TV provider or Satellite distributor.

VI. Understanding Service Providers

Hoteliers can build their own system, but designing, implementing and operating in-room entertainment services can be extremely challenging, so most hoteliers utilize services from third party providers. Hoteliers can choose from a number of service providers whose services range from à la carte to full service and many variations in between.

Hospitality Network and Service Providers (HNSP)

HNSPs are often referred to as full service providers who provide programming, as well as provision and manage on-site equipment and infrastructure. They are a 'one-stop-shop' for the in-room entertainment services. Typically, they deliver FTG, VOD, HSIA, EPG, Games, Interactive services and more.

The advantage with a HNSP is that hoteliers are guaranteed an integrated solution and a single service provider to call in the event of service interruption. The potential disadvantage is that it may limit the hotelier to that provider's solution, services and customization without the ability to integrate additional services.

HSIA / VOD Providers

In the past, the HSIAs were limited to Internet access, but recently there has been a trend for these providers to offer video and VOD services. Many of these providers are delivering their video services via IP (IPTV) to the guest room. They now offer many of the same services as a traditional HNSP. Many times the services can be combined with other third party providers to create a full compliment of entertainment offerings.

FTG / Content Providers

These providers are aggregators of many sources of content and may work alongside another provider (e.g. HSIA / VOD) to combine for a full complement of services. The advantage to this approach is that an hotelier can customize the exact service they desire. On the other hand, some integration and testing between providers may be required to make sure the complete system works properly.

Business Models

Typically, most providers will have the following fees:

1. Upfront capital expense and installation fee
2. On-going programming fee *
3. On-going maintenance fee *
4. Revenue sharing model for PPV content **

* Many of these fees are based upon the number of guest rooms, FTG channels, channel lineup, premium channels, etc.

** Many providers will have different splits based upon the type of content (e.g. adult / non-adult)

Bundling and Triple / Quadruple Play

There has been a noticeable shift in provider services as hotels reevaluate their networking strategies for guest rooms. This includes telephony, VOD, and wireless services, as well as traditional high-speed Internet services.

Several VOD vendors are merging with other companies to bundle services to provide a 'Triple Play' solution of VOD, telephony, and HSIA. A 'Quadruple Play' solution separates HSIA from WiFi services.

Build versus Buy

Most hoteliers have yet to experience designing and building their own hospitality network and system infrastructure. This may be an option or even requirement for the most discriminating hotelier. The defined value and competitive differentiation may bring great improvement to the guest experience with realized revenue over time. A build versus buy analysis and business case is in order.

Source Content Providers

An option for hoteliers is the ability to source their own content directly from content creators and distributors, known as source content providers. This can be time consuming

and hoteliers may need to modify or encode this content to make it compatible / available on the property's system. Respective business models vary widely; however, the range of models appears to be fairly straightforward. Providers range from a model where there is a fixed percentage of revenue, sliding scales as a percentage of revenue and / or flat rate costs.

At one end of the spectrum, the content provider offers content on a percentage of gross revenue basis, commonly known as a simple royalty fee. This is very typical for First Run (theatrical) and other Hollywood content. These costs vary by release window as well. Typically, the royalty percentage goes up, as the title release window gets closer to the theatrical release date.

Flat rate content fees are also available for FTG and some Pay-Per-View content or even syndicated content. Usually this is a per-room, per-month fee for broadcast channels or premium linear programming like ESPN, Discovery, Disney, etc. One time fees for content can usually be found for adult oriented content. The operator pays once for a title for the privilege of using that content for a fixed period, usually one year. Of course, all of the above can be adjusted by using a sliding scale. For example, the royalty on a movie might drop once a certain number of sales are made.

World Region Content Considerations

Unfortunately, content licensing is regionally dependent. For example, Hollywood First Run movies are not necessarily available internationally in the early release window. Also, when looking at licensing outside the U.S., it may be easier to use an aggregator like Filmbank or UIP (which are owned by U.S. studios) as they have already worked through the regional issues. Usually with providers such as UIP and Filmbank, a royalty and minimum per room, per month guarantees are required in order to license content.

Content type may also affect licensing to a great extent. For example, licensing of analog movies, FTG and other On Demand type programming has lower royalty fees and earlier window release periods. Additionally, analog content is more widely available in multiple regions. Digital content is more difficult and potentially more expensive to acquire and

security requirements for digital are much higher than for analog content. HD content is the hardest and the most expensive to acquire. Also, when it comes to First Run movies, studios tend to push the availability of HD content into the 'residential release window,' which is usually six months after the theatrical release.

Summary

Third party service providers play a critical role in the in-room entertainment experience. These companies provide programming, technologies, user interfaces, as well as control and operational software to create the optimal guest experience. It is important to research and understand all options regarding service providers, so that hoteliers can create the most personalized and appropriate experience for their guests.

VII Questions to ask Providers

Hoteliers should ask service providers questions in order to understand the services and customization available from each provider. The following is a starting list.

General

- Clearly outline all services that are available.
- Can the provider include other services like HSIA? (via web browser or wireless)
- What billing choices does the guest have for HSIA, PPV or other services? (Credit Card / Bill to Room)
- What is the Service Level Agreement (SLA) for service?
- What is the SLA for outages? What is the definition of an outage?

Content

- What Hollywood content is available?
- How often is the Hollywood content refreshed?
- What release window will that content be available? (First Run, home release)
- Will FTG be provided by the VOD provider?
- What formats are available? (Analog / Digital / SD / HD)
- How will the hotel integrate 'marketing channels'? (Are they able to integrate?)
- What types of content are available?
- Who is responsible for 'community standards'?
- How often is each type of content refreshed?
- What TV / special programs are available?
- How often will the special programs be refreshed?
- How will the hotel receive FTG programming?
- Can the hotel supply content for placement on the system? (training / emergency escape videos)
- Is there an Electronic Programming Guide (EPG)?
- Is the 'Look & Feel' of the EPG customizable?
- Is there guide data for all channels?

Technical

- Will a concise 'hotel requirements' document be provided? (Including: space, power, roof, cabling, etc.)
- What kind of picture quality is available and what is required? (Analog / Digital / SD / HD)
- What are the TV requirements? (Tuners / Inputs / Resolution / etc)
- Do the intended TV's have Smartports?
- Are the TV's residential or commercial models?
- What television standards are supported? (NTSC / PAL / 720p / 1080i / 1080p)
- Does the providers EPG and overall UI take in consideration monitor 'Burn-In'?
- What are the options for SD aspect on 16:9 monitor?
- Can each channel have a separate setting for aspect ratio? (i.e. one channel set for 16:9 and another for 4:3)
- Is SD 16:9 (anamorphic) content supported?
- What infrastructure is in the hotel?
    - Coax, Ethernet and twisted pair wiring require different video system solutions.
- What are the sparing requirements?
- What is the providers failure / backup system and how is it implemented in case of failure? (i.e. remotely or work with on-site hotel IT or roll truck)
- If a web browser is supported, what formats will it display?
    - Which Flash versions does it support?
    - Which QuickTime formats?
    - Which Microsoft formats?
- Does the browser work well with AOL, Yahoo, Hotmail, Google email?
- Does the browser clear the last usage information?
- What will the transport for Internet and TV Internet services be and who will provide it?
- Can the provider include other services like phone? (IP / TDM)
- Does the hotel want a keyboard in the guest room?
- What other interfaces does the system need? (e.g. USB for photos, music, IPOD)
- What is the install time frame?
- Who will do the physical 'STB' install?

- Who is responsible for plant repairs or upgrades needed to install the system?
- What DRM solutions are supported?

Financial / Business

- What is the length of the Contract?
- What are the service fees? (capital expense / operational)
- What are the maintenance costs?
- What records can the hotel get on usage for guest dispute purposes?
- What records can the hotel get on usage for legal purposes?
- What does the front desk terminal offer for reports on demand and for nightly audits?
- What PMS interface is required?
- What PMS systems and releases are supported?
- Does the provider update interfaces to new PMS releases?
- Will credit card billing be needed?
- What E-commerce or advanced PMS interface needs does the hotel have? (e.g. reservations / ticket sales / CRM)
- What are the costs for installation?
- What are the costs for remediation of the existing infrastructure?
- What does the provider do to support ancillary systems like lock systems, etc.?

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Glossary of Terms

3:2 Pulldown: a feature used in some televisions to improve image quality and create a more 'film-like' experience. Proper conversion between 24 fps and 60fps (or 30 fps) requires a process where for each frame of 24 fps film an alternating sequence of 3 duplicate television frames or 2 duplicate television frames are placed in the resulting video. Both processes are referred to as '3:2 Pulldown.' Traditional Hollywood filmmakers prefer '24 frames per second' filming for a number of creative reasons. Television designers and broadcasters prefer '60 fields per second' or '30 frames per second' for technical reasons.

AC-3: an audio compression technology and format developed and owned by Dolby Labs, which is specified as the digital audio format for ATSC transmission and other standards. The format is a glossy compression method that can provide up to 8 channels of audio. Requires the appropriate license for use.

Advanced Access Content System (AACS): is the new standard for content distribution and digital rights management adopted by both the Blu-ray and HD-DVD consortia. It is a system for content protection targeting High Definition Discs and designed to allow copying and re-distribution of material by employing a 'key' that can be distributed across the Internet.

Advanced Encryption Standard (AES): an advanced cryptographic protection system that is described in U.S. Federal Information Processing Standard 197 (FIPS-197). This system has many uses but has also found favor in video content protection systems because of its universal characteristics and level of protection that can be provided. Most content protection systems use a 128-bit key structure also known as AES128. There is no publicly known feasible method to 'break' a 128-bit AES key. AES is the successor technology to DES.

American Television Standards Committee (ATSC): refers to both the management entity American Television Standards Committee and the standard for Digital Television in the U.S. and by additional laws Canada and Mexico. Currently utilizes MPEG2 video compression, DVB transport stream multiplexing, AC-3 Audio, 8T-VSB modulation and terrestrial broadcast.

Anamorphic: a process used by film and video to condense an image. This can result in 16:9 being condensed down to 4:3 for transport and manipulation and restored to the original 16:9 with little or no distortion. It is sometimes used in displays to produce 'screen-filling' 16:9 images from 4:3 content without distorting the center of the image, but creating a large distortion in the margin.

Asynchronous Serial Interface (ASI): a standard for physical transport of data, including video data principally used in post processing and head-end equipment interconnections. ASI is capable of up to 270Mbs and easily 'mappable' into RF, ATM, IP or other formats. Also known as: DVB-ASI, SMPTE 259M, ETSI TR 101 891.

Audio Decoder: a full system that exists in either hardware or software or both that decodes a compression technology into playable audio. An iPod is said to have an Audio Decoder inside.

Audio Encoder: a full system that exists in either hardware or software or both that compresses Audio using a particular Audio compression technology.

Bit Rate: refers to when audio / video production and distribution audio / video information are reduced to a digital 'stream' of bits. This includes: 1). the level of compression that may have occurred in a prior step, 2.) the number of bits / second that result from a compression operation and 3). the required number of digital video information bits / second that must be successfully transmitted and / or received in order for the audio / video to be properly decoded and displayed. *(Also known as: 'Data Rate,' 'Stream Size') (See also: Frame Rate, Resolution, Encoding Rate, Compression, Decoding, Encoding)*

Blu-ray: refers to both a technology and a consortium of manufacturers to deliver HD and large capacity disks to consumers. Capacity ranges up to 50GB per disk when both layers are used. Disk players typically can play the older DVD format, but not the competing HD-DVD format.

B- Picture: one type of information, which is temporarily in between I-Frames. B-Pictures contain only difference information from preceding or following video information and must have the preceding or following information to display a frame. Also referred to as 'B-Frame,' however, the term B-Picture is more accurate since the information contained does not represent an entire frame of video information. Most video compression systems such as MPEG2 use a method where a complete original frame containing an image is only shown every nth frame, or I-Frames. Unlike 'P'-Pictures, 'B'-Pictures contain information useful to displaying video in forward and reverse play. Depending on the application, reduction of B-Pictures can result in lower bit rates for equivalent quality when only forward play is required.

Broadcast Flag: refers directly to a complete system implemented as U.S. Federal Communications Commission rules, but later overturned in court, that sought to allow content owners to define copy and playback rules for broadcast content. It is implemented in some forms and in some equipment with functionally identical to the Image Constraint Token.

Conditional Access (CA): a specific term referring to the mechanisms and systems required to actively and selectively enable access to content for a specified user or device or period of time. Such systems are typically based on cryptographic protection schemes where content is encrypted then distributed separately from the 'full' cryptographic key, which can be used to unlock the content. It is important to note that many systems use fragments of the cryptographic key required to unlock the content, which must be properly combined to unlock the content. *(Also known as: CAS)*

Cable TV: a term for TV systems exclusively using a cable oriented transmission system, although a number of hybrid IP / Cable / Satellite / Air systems are possible and in use.

Cathode Ray Tube (CRT): the picture tube commonly found in traditional televisions using video display technology that has been in use from the beginning of television. CRT uses a steerable electron beam to selectively excite phosphorescent dots on a surface in a glass tube. When the phosphorescent dots are excited they glow causing an image to be formed. These displays are generally considered to have the best overall visual performance of all TV technologies, but suffer from several practical limitations. They are very heavy and expensive in sizes greater than approximately 25" and are necessarily deep to accommodate the electron beam 'gun.' CRTs suffer from degradation of the phosphorescent dots over time, including burn-in.

Channel Slot: an individual sub-set of RF spectrum in a RF distribution system dedicated to a single transmission and managed by standard conventions as to spacing, center frequency, guard bands etc. *(Also known as: Major Channel)*

Coax Cable: the most common building cabling system for RF based analog or digital television. It uses a physical shielding as opposed to an electromagnetic shield. Depending on the depth of modulation, effective digital throughputs can be in excess of 5Gbs (QAM256 or equivalent). When used in 'digital cable' applications, it provides effective 'isochronous' data delivery in multiple isolated channels. Can be used in a 'daisy chain' fashion to reduce cost of installation, plus typical applications have very few active components not located in the central equipment room, however, this results in a shared bandwidth across multiple drops.

CODEC (enCOder/DECoder): a device that exists in either hardware or software or both that applies and / or decodes a compression technology for either audio or video. A DVD player is said to have an MPEG2 'codec' inside.

Coded Orthogonal Frequency Division Modulation (COFDM): a modulation scheme used in several DVB-T, DVB-H and other worldwide standards.

Component Video: a form of baseband interconnect between video play out devices and televisions or recorders. It is capable of HD resolutions but only effective for short distances and where content protection is not required. Generally, less preferred for HD video than DVI or HDMI. Used in both analog and digital forms. Cables need to be the exact same length to maintain proper timing.

Composite Video: a form of baseband video interconnect between video playout devices and televisions, recorders or other processors. Only capable of NTSC / PAL video resolutions and provide no content security.

Computer Display: a video display optimized for use on a computing device. These optimizations take the form of input limitations, resolutions and color tables that are inconsistent with television and overall form factors. Computer displays often utilize square pixels where as television displays use non-square shaped pixels.

Content Scramble System (CSS): the copy protection system developed for use on DVDs. Hacked several years ago with a program called DeCSS. CSS allows for region coding of DVDs to prevent playback outside the global region specified by the DVD manufacturer.

Digital Coax: refers to transmission systems using coax for digital video / data transmission but not for analog video. Typically employs a deep digital modulation scheme such as QAM, VSB or CODFM. *(See: Coax)*

Digital Encryption Standard (DES): the older 64-bit digital content encryption system developed and used by the U.S. federal government since the late 1970's. Federal Information Processing Standard 46 describes DES. 'Triple' DES is the most common encryption standard in the world today and uses the original DES encryption standard with the exception that it is applied sequentially 3 times to effectively form a 192-bit key system. It is probable that 'single' DES can be broken with common systems; however, 'triple' DES is considered too complex for this type of attack. AES was developed as a successor to DES.

Digital Light Projection (DLP): is a patented digital micro-mirror display technology from Texas Instruments. It is a popular alternative to flat panel technology such as Plasma or LCD, particularly in large screen sizes where 'flat' is less important and the TV can have a deeper package.

Digital Rights Management (DRM): describes many mechanisms and systems to protect the distribution and use of content.

Digital TV: a general term referring to mechanisms, products and services to deliver video to televisions in digital form all the way to the television display.

Digital Video Broadcasting (DVB): a consortium of over 270 members as part of the DVB project created to establish and manage standards, including transmission systems, content, encryption and protection, software platform and return channel. The ATSC standards reference DVB transmission standards. DVB Standards are adopted by the European Telecommunications Institute (ESTI), European Committee for Electrotechnical Standardization (CENELEC), and the European Broadcasting Union (EBU).

Digital Video Interface (DVI): a new interface technology and refers to a set of standards. It refers to both a technology and a consortium of manufacturers to deliver uncompressed HD video and televisions and other devices. It optionally includes HDCP as a link protection system. Three distinct and somewhat inoperable 'sub-standards' exist: (DVI-D (Digital), DVI-A (Analog/RGB) and DVD-I (Interchangeable Digital or Analog). Also available but rarely used is a 'Dual Link' feature allowing two simultaneous HD capable data paths. These can be used to provide two separate video programs or 'both halves' of the video information required for very high bit rate applications.

Digital Video Recorder (DVR): consists of a broad class of devices that record video broadcasts that can be played back at a later time. Made popular by services such as TiVo and RePlayTV, DVR is often combined with program guide information to make selection of broadcasts easy. It has been the subject of extensive patent litigation in recent years and may require licensing from one or more entities to use, operate or distribute.

Dolby Digital: digital surround sound technology developed and owned by Dolby Labs and specified as the digital audio format for ATSC transmission and other standards. The format is a glossy compression method that can provide up to 8 channels of audio. Use requires the appropriate license. *(Also known as: AC-3)*

Down Conversion: refers to any process that reduces digital video information, presumably in order to make the video more appropriate for a lower resolution display. Beware of this term, as it must be specifically explained to have any meaning.
DVB-Cable (DVB-C): a sub-set of the DVB standards designed specifically for cable operations.

DVB-Handheld (DVB –H): is a new sub-set of the DVB standards designed to specifically address low speed hand-held devices with video capability.

DVB-Satellite (DVB-S): a sub-set of the DVB standards designed specifically for Satellite operations.

DVB-Terrestrial (DVB-T): a sub-set of the DVB standards designed to address terrestrial digital video.

ECM / EMM: the MPEG2 transport stream open standard format for delivering conditional access information messages.

Enhanced Definition (EDTV): refers to the technical characteristics of a format of digital video with a somewhat higher video quality than traditional video, but less than HD video. Early in the deployment of digital video, many televisions used the enhanced definition formats, but these have declined in popularity as HD has risen. However, a Progressive Scan DVD player operating at '480P' can be described as enhanced definition.

Frame Rate: the measurement of frequency (images per second) a whole complete image is able to display.

Free-To-Air (FTA): signals available to a user or receiver able to receive the broadcast. In the U.S., these FTA signals are exclusively broadcast from terrestrial transmitters. In other countries, some Satellite signals are also freely available to any user or receiver able to receive them. (*See also: OTA*)

Free-To-Guest (FTG): service of broadcast channels provided to hotel guests without a separate charge as part of the room rental. (*See also: PPV*)

Full HD: is a marketing term referring to the highest level of video format quality defined in Table A3 of ATSC Specification A / 53. This is also referred to as '1080P.'

Glossy Compression: the process or the result of the removal of digital video information to reduce the size of a digital file or stream. Typically, raw digital video contains a portion of the information such that when removed there is no visual impact. When that removal reaches a level where the reduction is visible, it is said to be glossy compression. *(See also: MPEG2, MPEG4, QT, WM, RM)*

High-Bandwidth Digital Content Protection (HDCP): a method of preventing unauthorized distribution and use of uncompressed HD Video Information. It dynamically establishes a shared cryptographic secret between a playback device and a display device, so the content can only be 'replayed' with the same equipment used to record it. HDCP is proprietary to Intel Corporation and requires the appropriate license. HDCP is widely specified by content providers to prevent unauthorized copying of content.

High Definition (HD): refers to the technical characteristics of a format of digital video with the highest generally available video quality format. Any entry in Table A3 of ATSC Specification A / 53 where the vertical size value is either 720 or 1080 define these formats. However, this definition only specifies video format and does not include definition of specific video compression and pre-processing characteristics, which can and often does dramatically affect the observed quality of digital video.

High Definition – Digital Versatile Disc (HD-DVD): refers to both a technology and a consortium of manufacturers to deliver HD and large capacity disks to consumers. Capacity ranges up to 30GB per disk with both layers used. Disk players typically can play the older DVD format discs, but not the competing Blu-ray format.

High Definition Multimedia Interface (HDMI): refers to both a technology and a consortium of manufacturers to deliver uncompressed HD video (or lower resolution) and digital audio to televisions and other devices called High Definition Multimedia Interface. Video signaling of versions 1.0 to 1.2 is identical to DVI-D. Version 1.3 greatly expands the digital audio / video capacity of the interface. Also includes HDCP as a link protection system. HDMI is an improvement over prior cabling solutions because of the reduced size of the connectors and cabling along with the inclusion of audio in a single interface cable. HDMI includes the Dual Link capabilities from DVI and version 1.3 expands to Quad Link capability.

High Definition Television (HDTV): is defined in the U.S. and Canada as television programming in the 16:9 screen format and with a pixel resolution equal to or greater than 720v by 1280h. Usually the definition also includes digital audio with at least 6 channels of audio (5.1).

Image Constraint Token (ICT): a digital flag within the AACS (Advanced Access Content System) that determines how Blu-ray and HD-DVD players output high definition video signals through the player's component outputs.

Initial Frame (I-Frame): a method used by most video compression systems such as MPEG2 where a complete original frame containing an image is only shown every 'nth' frame, or 'I-Frame.' Additional information temporally in between I-Frames is displayed using much less than 100% of the video information used to display an I-frame. The additional frames are typically composed of P-Pictures and / or B-Pictures. *(See also: MPEG2, MPEG4, QT, RM, WM)*

Interlaced Scan: a video technology where individual video frames are painted on the display sequentially, top to bottom. The top of the screen starts with progressing odd lines all the way to the bottom and then even lines from top to bottom.

Internet Protocol (IP): the virtually ubiquitous packet switched network layer scheme and protocol used to provide services on the Internet. Typically considered a 'synchronous' or 'data oriented' protocol where time and order of packet arrival are less important than connection and switching efficiency. However, various techniques such as Assured Quality of Service, Forward Error Correction and / or receiver buffering can provide data transmission characteristics that are effectively similar to an isochronous system.

Internet Protocol Television (IPTV): a term used to describe virtually any audio / video system using IP as the network layer protocol.

Internet TV: typically considered a sub-set of IPTV where the audio / video service crosses the Internet. Forms of Internet TV include YouTube and Akimbo service.

Light Emitting Diode Liquid Crystal Display (LED LCD): a new family of LCD display technology where the backlighting source is replaced with Light Emitting Diodes. It is generally expected to improve contrast ratios and lower power and heat from the television.

Link Encryption: a system where the encryption and decryption keys are used to lock and unlock the link connecting various devices or systems. This is as opposed to systems where keys are used to lock or unlock the actual content regardless of the transportation system. These systems take information from a secure point (inside a STB for example) and transfer that information securely to another secure point (inside a TV for example). HDMI provides a link encryption system called HDCP when connected between HDCP compliant devices.

Liquid Crystal Display (LCD): family of television display technologies where liquid crystals are use to control the transmission of light through a display. This makes LCD a 'transmissive' technology. The backlighting is typically provided by a fluorescent light source. Control of the individual 'cells' in modern displays is provided through an active 'grid' matrix of transistors to prevent separate control lines to each being required. Primary weakness of the LCD design is leakage of light through the crystal when closed resulting in gray instead of pure black and the sluggishness of the crystal when opening although this has been substantially reduced in recent years.

Lossless Compression: the process or result of the removal of digital video information to reduce the size of a digital file or stream. Typically, raw digital video contains a portion of the information so there is no

visual impact at removal. When removal does not produce a visual effect, it is said to be a 'lossless' compression.

Macrovison: a company providing a suite of video security services and products. Products include Conditional Access, Copy Protection and Forensic marking. Macrovision products and services require the appropriate license from Macrovision Inc.

MPEG2: a widely used video compression scheme described by ISO standard 13388. It is currently the only standard specified by the ATSC Digital Television specifications and DVD formats. Use requires the appropriate license from MPEG-LA (Licensing Authority). Performance has improved significantly in recent years through improved encoding devices, resulting in improved video quality, particularly lower bit rates.

MPEG2 Transport Stream: the standard format for delivering video, audio and other ancillary information including secondary audio, guide data, security controls and other information from transmission point to television receiver. This format transcends the method of delivery and is used in coax, air and IP delivery systems. It supports video and audio and conditional access controls in any form including MPEG4, VC-1. MPEG2 Transport stream also supports multiple programs or channels per stream. *(See also: DVB – Transport Stream)*

MPEG4: a video compression scheme widely believed to be the next generation of technology after MPEG2. In most applications can result in a 50% bandwidth / quality improvement over similar bandwidth / quality MPEG2 video.

Multicast: an IP addressing and routing scheme that allows for reception at multiple simultaneous receivers. Typically defined as an Internet Group where users can join a transmission. It differs from a broadcast in that individual users can join or not join where a broadcast requires all users to participate. Specifically useful in IPTV applications where multiple channels are simultaneously being transmitted. Multicast allows receivers to join a single channel without incurring the bandwidth requirement for all channels.

Multiplexer: a device that exists in hardware or software (or both) that interleaves different data 'channels' into a single 'channel.' In this manner hundreds of separate channels of digital data can be transmitted in a single serial transmission. In video applications this can mean multiple channels of video and audio along with many associated channels of supporting data. *(Also known as: MUX)*

National Television Standards Committee (NTSC): refers to both the management entity (National Television Standards Committee) and the standard for Analog Television in the U.S. and by additional laws in Canada and Mexico.

Organic Light Emitting Diode OLED: a new display technology utilizing various organic materials that emit light when electrically stimulated. It promises to use much less electrical energy and produce deep blacks with its 'emissive' technology. Currently, is not considered ready to compete directly with other TV technologies and is only used in specialized applications.

P-Picture: a type of information temporarily 'in between' I-Frames, which contain only difference information from preceding or following video information. P-Picture must have the preceding or following information to display a frame. Most video compression systems such as MPEG2 use a method where a complete original frame containing an image is only shown every 'nth' frame, or 'I-Frame. Also known as 'P-Frame, however, the term P-Picture is more accurate since it does not represent an entire frame of video

information. Unlike 'B-Pictures,' 'P-Pictures' contain information useful to displaying video only in forward play.

Pay-Per-View (PPV): are video based services, but the term often includes other amenities delivered through the TV hotel services where the guest is expected to incur a separate and unique charge for viewing access.

Phase Alternating Line (PAL): the standard color encoding television technology used generally in 'western leaning' countries. It is considered to be slightly better than NTSC television in a number of areas, is more reliable at consistently reproducing colors and has approximately 20% more lines of detail. It operates at 25 frames per second (50 interlaced fields per second). Most Hollywood movies are filmed at 24 frames per second, and the PAL frame rate results in the 'PAL Speed Up Phenomenon' where movies play slightly faster (4.2%). The audio is also at a slightly higher pitch for the same reason.

Pixel Format: used by computer displays and televisions. Computers rigorously use square pixels to process and display images while televisions are less rigorous, often displaying non-square pixels. Current televisions are able to properly present video content as square or non-square without distortions. Earlier televisions and computer monitors produced distorted images when video content was mismatched to the display.

Pixelization: a typical digital video error where less than 100% of the required video data was delivered and decoded. The video decoder must estimate what data is required for an area of the image resulting in a fuzzy 'cell' or 'cells' of video. Pixelization occurs to digital video in any circumstance. *(Also known as: Macro Blocking)*

Plasma: a family of flat panel video display technology that uses small tubes filled with a special gas that is electrically stimulated. When the gas inside the tube turns to plasma, an internal reaction occurs with a colored phosphor coating inside. This reaction produces light corresponding to the color of the phosphor. Red, green and blue colored phosphor coated tubes are arranged in groups to create the required colors for each 'pixel.' Due to production maturity, plasma generally costs less per square inch than comparable LCD technology, has better 'black' performance than LCD and has very fast on / off performance. However, due to its phosphor origins, it suffers from 'burn-in' and other degradations over time that is virtually identical to traditional CRT performance. Plasma is considered an 'emissive' technology. *(Also known as: 'Gas' Plasma)*

Program: a complete set of audio and video information often included in separate audio and video streams, which produce a viewable video presentation when combined properly in sequence and timing.

Progressive Scan: a video technology where individual video frames are painted on the display sequentially starting from the top of the screen and progressing line by line to the bottom of the display.

Pro:Idiom: a new content security system designed specifically for the hospitality industry by Zenith Electronics, Inc (LG Electronics) in cooperation with major PPV service providers. It is offered on a RAND basis to any service provider or equipment provider with the purchase of a standard license from Zenith. The system has approvals from major Hollywood studios and premium cable providers for HD content in the hospitality window. It is capable of protecting content throughout the entire distribution process all the way to the TV and can operate on either RF or IP networks.

Pulse Code Modulation (PCM): the generalized process of producing a digital representation of an analog signal such as sound, through the quantization of uniformly distributed sample values. Process produces a

decimal measurement of the input signal's value, which can be reproduced later by reversing the quantization process. Varying the time between sample values produces more or less sample values, which correspond to increased or decreased quality and a corresponding change in the amount of data required. It is used to refer to 'CD Quality' audio, which operates at 44.1 KHz sampling with a 16-bit sample value.

Quadrature Amplitude Modulation (QAM): a set of modulation schemes often used in digital Radio Frequency video transmission over coaxial cable or air. QAM modulation can provide a reliable 24Mbs of data (QAM64) for long distances and up to over 36Mbs in shorter distances (QAM256) or particularly 'clean' RF environments and systems. When combined with common error correction technique provides effective isochronous data delivery. Typically defined in ANSI / SCTE 07 2000.

QuickTime (QT): a family of video compression and management technology from Apple Computer based extensively on Industry Standard Technology. This includes both video distribution and content management functions. QuickTime products and services require the appropriate license; however, with the exception of certain content management features such as FairPlay, most components of QuickTime are available from Apple as open source.

RealMedia (RM): a family of video compression and management technology from RealNetworks, Inc. It includes both video distribution and content management functions. RealNetworks products and services require the appropriate license; however, with the exception of certain content management features; most components of RealMedia are available from RealNetworks as open source.

Real Time Streaming Protocol (RTSP): a simple but standardized set of bi-directional commands to initiate and control a digital video streaming service in a two way environment. *(See also: RTP)*

Resolution: defines the number of pixels in the horizontal and vertical directions in video content and display systems. Video content must match a display device in order for an image to be produced. Current generation televisions are increasingly capable of 'scaling' video content as required to match the display devices. Older televisions are less capable of scaling these resolution differences and thus may produce distorted images or no image at all when the video content fails to match the display.

Satellite TV: refers to any television service, which 'broadcasts' via space based transmitters to viewing televisions. Other mechanisms may be used to 'collect' the signals transmitted but the final broadcast must be space based.

Set-top box: device similar to a cable converter box that serves as intermediary between an external signal and television to deliver content.

Sequential Color with Memory (SECAM) an analog color television technology developed in France and used outside North America, generally in 'eastern leaning' countries such as Russia and Slovakia. Many countries such as Greece, Poland, East Germany have transitioned out of SECAM into PAL in recent years. It is generally considered equivalent or worse in quality to NTSC, particularly in terms of color reproduction. SECAM is also difficult to edit.

Simulcrypt: a system adopted by the DVB that allows multiple content scrambling and protection systems to be used simultaneously in a single broadcast system. These multiple system features are used to allow multiple content encryptors and CA systems not necessarily co-located, to operate seamlessly to the user.

The system is not tied to a single encryption or conditional access system but instead creates an open environment. See DVB Document A045 for more information. *(Also known as: DVB Simulcrypt)*

Standard Definition (SD): refers to the technical characteristics of 'traditional video.' Typically used interchangeably for traditional analog video as well as digital video of a corresponding technical format. *(Also known as: SD or SDTV)*

Stream: a continuous sequential arrangement of digital bits conforming to a structure recognizable by a receiving system. Typically refers to a common structure that defines each bits meaning relative to time of arrival relative to other structures know to both the transmitter and receiver. May also describe bit structures where multiple individual streams are included within a larger structure. *(See also: MPEG2 Transport Stream, DVB, Bit Rate)*

Sub Channel: represents a time division or statistical division multiplexed complete data path sufficient to carry a complete program that is a component of a larger data path. *(Also known as: Minor Channel)*

Terrestrial TV: refers to any television service, which 'broadcasts' via earth based transmitters to viewing televisions. Other mechanisms may be used to 'collect' the signals transmitted, but the final broadcast must be earth based.

THX: a theater certification system designed to ensure that what is recorded is what is heard when played back.

Transcoding: refers to any process that alters the form of digital video. This can be conversion from speech into text or from analog video into digital frames.

Twisted Pair (Ethernet): the most common cabling system for Ethernet traffic (by definition digital). The system uses electromagnetic shielding derived from the twisted nature of the cable as opposed to systems with a physical shield. It can achieve over 750Mbs effective throughput depending on the equipment used. Typical installations utilize a 'home-run' configuration where each drop is a separate cable to an active device ensuring that the segment is capable of full bandwidth to that drop. Because of equipment and distance considerations, most hotel installations require Intermediate Distribution Facilities (IDFs) containing active (powered) equipment located throughout a premise. Ethernet does not guarantee time or order of data delivery and these functions must be implemented at the application level.

Unicast: an IP addressing and routing scheme where a one-to-one relationship between two devices exists only for the length of time required by the two participants. Unicast is the IP addressing and routing scheme most often used for IP Video On Demand.

Up Conversion: refers to any process that attempts to increase digital video information in order to make the video more appropriate for a higher resolution display. This process must involve some form of estimation since additional video information must be created where less existed before. The resulting video depends on the skill of the engineers and the percentage of video information that must be estimated. In some cases, this term is used when the video content itself is unchanged but it has been changed only as required to be transported or displayed on higher resolution displays.

VC-1: a derivative of Microsoft Windows Media Video Compression technology submitted as an Industry Standard for Video Compression by SMPTE and other organizations.

Verimatrix: a company providing a suite of video security services and products. Products include Conditional Access and Analog Survivable Session Watermarking. Verimatrix products and services require appropriate license.

Vestigial Side–Band modulation (VSB): a set of modulation schemes often used in radio frequency video transmission over coaxial cable or air. 8T-VSB can typically provide a reliable 20Mbs of data for long distances over the appropriate coaxial cable or air. It provides effective isochronous data delivery when combined with common error correction techniques. 8T-VSB refers to the specific VSB RF modulation scheme specified in the ATSC standard for over-the-air transmission. 8T-VSB was developed and is owned by Zenith Electronics Inc. and requires the appropriate license.

Video Decoder: a full system that exists in either hardware or software or both that decodes a compression technology into playable video. A DVD player is said to have a Video Decoder inside.

Video Encoder: a full system that exists in either hardware or software or both that compresses video using a particular video compression technology.

Video On Demand (VOD): an interactive audio / video service that allows guests to choose from a listing of specific programs and view a chosen item immediately. Many VOD systems include the ability to pause, fast forward and rewind. *(See also: PPV, FTG)*

Watermark: a mark used to facilitate analysis of pirated material to determine a pirate's identity, location and time of receipt. Watermarks must be visible in some manner in order to survive the recording process; however, some technological advances allow these marks to be effectively invisible to the casual observer. These and other advances can protect the watermark from being eliminated by the pirate through advanced video processing. All video content must be displayed openly on a device to an end user as the final step in distribution. It is at this point that the content can be recorded using an optical recorder, such as a Camcorder. *(Also known as: Session Based Watermarking, Analog Survivable Watermark, Forensic Marking)*

Widescreen Signaling (WSS): a system of codes inserted into the Video Blanking Interval (VBI) used by televisions supporting the standard to provide widescreen viewing for content presented as non-widescreen. Since NTSC video formats do not support widescreen video formats, this system was developed to allow optimization of 4:3 video content on 16:9 (or 15:9) displays by activating TV specific features to enable widescreen viewing such as anamorphic display. It is sometimes used on DVDs but has failed to be widely or consistently supported.

Windows Media (WM): a family of video compression and management technology from Microsoft Corporation. This includes both video distribution and content management functions. Windows Media products and services require the appropriate license. *(Also known as: WMV, WMA)*

Wireless: a broad description of technologies to move data between devices without using a wired physical interconnection. Wireless technologies are generally less secure due to their lack of physical connection requirement and less reliable due to their susceptibility to environmental interference. This interference can result from spectral intrusion or masking.