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Mobile Devices & Content

Introduction

Video-based entertainment content has grown far beyond the traditional living room environment. With the advent of smaller, more portable devices and the availability of a variety of A/V content, consumers now have more choices than ever for viewing their favorite entertainment whenever they want. Plus they're no longer tethered to the living room, as these new devices enable them to be more mobile with their entertainment.

This new mobility can be experienced in a number of ways, whether through additional viewing options throughout the house; or via a wealth of on-the-go entertainment devices for experiences outside the home. In either case, this increased flexibility offers many new business opportunities.

However, the successful adoption of these devices depends on overcoming a number of technical and political challenges inherent in each link of the entertainment chain. These include **creating** content and **preparing** it for distribution; **transferring** or copying content; and playing or **rendering** the content on various mobile devices.

As a follow-up to the DEG's technical overview on home networking and managed copy, this white paper will address this by exploring the following key factors:

- The emerging technologies that power mobile devices and identifying the various technical issues that affect their performance (eg; display resolution; color depth; memory/CPU capability; audio-video codecs; incompatible DRM schemes; etc)
- The variety of available sources for A/V content
- The various ways that content needs to be deployed to reach end users
- The different methods for accessing, storing and navigating content
- New forms of user-generated content
- Digital rights management and the critical role played by interoperability

Ultimately, this report can serve as a source for additional research into consumer behavioral patterns as it relates to new types of mobile devices.

This white paper will define mobile devices (including criteria and reasoning); audio/video entertainment issues (versus audio-only content); and encompasses a U.S.-centric perspective.

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Section 2: Device Concepts

Explanation of each type of mobile device and its unique characteristics:

Devices

There are an ever-increasing number of mobile devices entering the consumer marketplace and electronics manufacturers are striving to develop a broad range of new concepts that are specifically designed to meet the needs of consumers.

1. **Mobile phone/handsets**
   Traditional handsets now come with a variety of new features that are powered by a number of operating systems. There are a large and varied spectrum of devices available under two primary classifications: (i) Feature Phones which integrate numerous entertainment options while supporting voice communication. And (ii) Smart Phones which provide broadband applications and other data processing functions.

   a. Feature Phone
      These are typically "candy bar" or "flip" styled handhelds with a standard numeric keypad. They feature menus that can support such media streaming applications as music, games, text messaging, and digital video / imaging via a built-in camera.

   b. Smart Phone
      i. Operating systems: Symbian, Palm, WindowsMobile, RIM, MacOS. Examples: Blackberry, Treo, Motorola Q, SonyEricsson and iPhone. All of these have some type of QWERTY keyboard witon a very small form factor.

   c. Java and/or Brew applications (both types of phones):
      Java can be used to support simple games and basic media players for multiple brands of handsets. Since the processing power of each handset varies, Java applications need to be customized for each device.

      In contrast, Brew is a cross platform environment that is more efficient than Java and utilizes the full processing power for a limited number of handsets. Basic 3D games, video recording, user -generated content and video conferencing are on the horizon.

2. **Portable media players:**
   To a small number of ubiquitous MP3 devices, this category is now dominated by the Apple iPod. Although countless other media players are now available, none has established anywhere near the level of market penetration or public awareness as the iPod.

   These players offer two types of connectivity options.

   a. Tethered: These portable devices have required USB, iLink (IEEE 1394) or some other type of cabled connection to a host Mac or PC in order to transfer content. Recently a number of devices have been developed that can also achieve connectivity using wireless technology. Examples include: iPod, iPhone, PlayStation Portable (PSP)and Zune.

   b. Un-tethered: Other handheld media devices are now coming to market that no longer require a host computer. These devices can communicate via Wi-Fi directly with the retail store to obtain media content. Additionally, the use of the latest SOC ("System On Chip") technology allows digital and analog DVR capability while reducing costs. Examples include: SanSa Connect, Archos Series 5, etc.

3. **Notebooks/laptops/ultra-portables**
   These devices are full function PCs or Macs that support a variety of Internet media services and websites. Several of the high-speed services that are listed in the next section may be bundled with these devices or enabled by plugging in a small USB connector. Most of these devices also incorporate some form of Wi-Fi and/or wide area network (WAN) capability.

   "Ultra Mobile PCs (UMPCs)are another new very small form factor device that runs on the latest Windows operating system. Many of these devices also support short range Bluetooth wireless capability in addition to built-in Wi-Fi or Wide Area Network (WAN).

4. **Portable digital receivers**
   Like television, radio is transitioning to the digital age and new handheld receivers are now appearing that support this.. Some examples include satellite radio devices from Sirius and XM; as well as in-band on-channel (IBOC) digital terrestrial receivers from HD Radio. Many of these devices also support mobile video and/or GPS functionality.

Delivering content to mobile devices

Numerous methods exist for accessing a wide range of network-based services. (See section 5)

Storage Options

a. SD and Memory Stick cards exist in a variety of sizes with "Mini" and "Micro" being used for "side loading" and expanding storage capacity. Newer security standards are also enabling rental and sell through of digital content.
b. USB flash drives are becoming more widespread and growing in capacity. They are widely available at retail and operate at higher speeds to support more applications.

Hardware Issues

Mobile devices are evolving rapidly in terms of user interface, performance quality and storage capacity. Chipsets will continue to evolve and by fall 2007 some devices in the marketplace should have the ability to display DVD or near DVD quality images. But it will take some time before large files downloaded from the internet can achieve that level of quality.

Security Adoption

There are a variety of DRMs or security systems gaining adoption in the marketplace and on devices which can be used to secure content from unauthorized access or duplication and "feature set"/capability. Generally devices are built to accommodate one form of content protection or another. Below is a brief list of some of the major types.

- **Apple FairPlay** for use only on iPODs and with the iTunes service.
- **WindowsMedia DRM/PlayReady DRM** for use on Windows OS PCs and Smartphones. Works with a number of 3rd party services on the Internet which in some cases are accessible from handheld devices.
- **OMA** similar capability as Microsoft or FairPlay DRM backed by Nokia [others…???]. Supports secure streaming and downloading.
- **4C/CPRM** with Secure Clock. Adopted by the SD Card association for secure recording of "Copy Once" broadcast content. (footnote: Commercial TV is copy once in Japan). The standard also includes definition of a secure clock which could be used to time-out on demand usage but has not been broadly adopted in handsets to date.

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Section 3: Sources

A/V content can be distributed via a number of platforms:

1. Online video stores

Video content can be purchased on the Internet. through various online retail stores that offer movies, broadcast TV content and music videos to consumers. Some of this content is specifically aimed at portable devices, while other content requires some adaptations for portable use. Content selection is growing rapidly, although not as widely available as DVDs Examples of online video stores include Apple's iTunes Store, Wal-Mart's Video Download Store, Amazon's Unbox, and AOL-video.

Advertising supported online video sources

In order to draw consumers, the vast majority of commercial Web sites are free, and supported by advertising. Virtually every commercial Web site offers video content such as news clips, weather forecasts and movie trailers. Given their experience with advertising, TV networks have taken the lead to tap into this trend by offering clips as well as complete episodes of TV shows online. Just as with television, the more online channels to distribute content to consumers, the better.

Some of these companies are also beginning to offer content for mobile use through web browsers, which can be syndicated to online video services like AOL-Video, Yahoo!-video, Joost and Google Video.

2. Video streaming and/ or downloading through mobile carrier network

Most cell phone operators offer their own video services for a subscription fee that is added to the consumer's monthly bill. In most cases, this requires consumers to activate a specific function or application on the phone provided by the operator. Most of these services stream video directly to the phone due to limitations in storage capacity, although some offer download capability

Mobile content encompasses broadcast TV shows, news, weather and sports. Examples of mobile carrier network services include MobiTV, Verizon Wireless' V CAST, Sprint Movies and AT&T's Cellular Video.

3. Mobile TV

Mobile TV, like standard TV, offers one or more channels that deliver content on a pre-determined schedule. In contrast video streaming enables the selection of content on-demand.

There are two types of Mobile TV. The first is coupled to a cell phone service and requires a special type of cell phone with Mobile TV capability. Examples of these services include Verizon Wireless' V Cast Mobile TV, and Sprint's Pivot (in cooperation with Comcast). Crown Castle and Qualcomm's MediaFlo also wholesale and license content to several carriers.

The second type of service is tied to Satellite radio operators that have added TV content to their programming and require separate compatible devices.

Both Sirius and XM satellite radio operators have announced mobile satellite TV services.

4. Retail download kiosks

Downloading from retail kiosks is also being developed for portable media players and devices. This is already offered for portable game devices like Sony's PlayStation Portable (PSP) and Nintendo's Gameboy DS. the likes: new content directly to the mobile device or its flash memory card.

Other companies working on the same concept for A/V content include Microsoft (Zune downloads from the TableTop PC) and PortoMedia.

5. Prepackaged media

Portable disc players and DVDs also serve as a source for mobile content, but are not addressed in this paper due to their familiarity.

Additionally, while a limited amount of video is available for purchase on flash memory cards, this form of prepackaged media is still in its infancy.

Early initiatives include products from Kingston, Sandisk's MixDisk and ROK media. Another extremely portable optical format with prepackaging has been proposed by Vmedia Research, a miniature optical medium.

Not on the market but proposed as a carrier for pre-packaged content in a formfactor small enough to allow portable implementations is Vmedia from Vmedia Research, a miniature optical medium.

6. Time and place shifting enablers

Recently new types of mobile devices have been introduced that enable users, while traveling, to download or stream video content stored at home over the Internet.

Examples of such enablers include Sling Media's Slingbox, Sony's LocationFree TV, Orb Networks' Orb, TiVo ToGo and various PC-based Digital Video Recorder applications.

Additionally, with the advent of affordable high efficiency video encoders, a new generation of mobile devices are also available that can be taken anywhere on the go.

Regardless of their application, all of these devices have been specifically designed to respect intellectual property thanks to content protection systems like CGMS-A and Macrovision.

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Section 4: Content Adaptation

Regardless of source, A/V content must be produced or adapted for rendering on a Mobile Device. Due to the wide range of display resolutions, formats, DRMs, etc., adapting or scaling existing A/V content for playback on these devices is often necessary.

Based on the appropriate rights management system the A/V content can be prepared either offline (i.e. preprocessed prior to distribution) , or on the fly (i.e. where the video content processed in real time based on the characteristics of the target device).

Preprocessed content is content that is prepared offline by the owner (or distributor) in the desired formats. A benefit to this approach is that the server requires little processing or server power – only the bandwidth required to deliver the content. However, the downside to this is that content must be re-processed for each device and any change in delivery. This requires storing multiple versions of content for different bandwidths, interfaces, formats, etc. Depending on the complexity of the video compression employed, an offline approach may be required due to the higher cost of implementing additional processing power.

In contrast, on-the-fly adaptation can happen at the server side ('head end') prior to delivery to the mobile device, or via an intermediate device such as a PC or Set Top Box that has the power to adapt the content as needed. There are pros and cons to each approach. On-the-fly adaptation provides a flexible model for customizing content based on the target device, regardless if the capabilities of the mobile devices change over time. This also eliminates the need for storing multiple copies of content.

However, this approach also requires more processing power to adapt content. If this occurs at the head end, the servers must be able to adapt content while simultaneously supporting multiple users. If on-the-fly adaptation occurs via an intermediate device, it must also have the power to adapt both the content, as well as the appropriate rights that enable adaptation in an unsecured environment. When these devices are used, the consumer may have some level of control in the process. Typically the rights provided by the content owner govern what is and is not possible.

Most preprocessed video today, already provides the necessary technical format for the target device. On the other hand, intermediary devices, like PCs, enable consumers to have some level of control over the adaptation process. Of course, there may also be examples of both on-the-fly and preprocessing models that offer the advantages of both.

The primary methods and areas in which video may need to be adapted for playback on mobile devices are as follows:

- **Scaling**: the process of converting a video signal from one resolution to another. If the source material has a 1920x1080 resolution, the source material must be scaled or rendered for display on a portable device with a lower resolution (640X480).
- **Color space conversion**: the process of translating from one color space to another. Different color spaces are better for different applications; and some types of equipment has limiting factors that dictate the size and type of color space that can be used.
- **Transcoding**: the process of converting one digital codec (compression/decompression) of a movie into another. The original format is first decoded and then re-encoded into the desired format. By way of example, a video source using MPEG2 will need to be transcoded into a format such as Windows Media Video (WMV) or AVC. Transcoding may or may not be transparent (lossless).
- **Transrating**: the process of transferring video from one bit rate to another. This is often required because some video formats and portable devices can only support specific data rates. This process can also impact the size of the data file (the lower the bit rate, the smaller the file size).

- **Transcrypting**: the process of converting from one encryption scheme (often referred to as DRM) to another. Portable devices may often be limited to specific DRM formats, For example, Apple iPods use Fairplay DRM, whereas Microsoft Zune devices use Windows Media DRM. In order for music content to play properly on these devices, they must be transcrypted into the appropriate format.

As stated earlier, the rights granted by the content holder (DRM) may define what type of adaptation can be used. Some DRM schemes can be made 'compatible' through licensing agreements, including the following:

- CSS: A/V content using CSS can be unscrambled and re-wrapped in Windows DRM in authorized devices;
- AACS Managed Copy: A/V content can be copied from an HD DVD or Blu-ray disc with the appropriate granted rights; and
- Microsoft Media Center: which allows certain content to be transcrypted for streaming between authored MCE devices (using WMV)

More explanation of digital rights management issues are discussed in Section 6.

While this section explains how and why content needs to be adapted, ultimately the approach and underlying technology should be hidden as much as possible from the consumer. The consumer ultimately wants to have the best experience possible on their device, regardless of what is actually happening in order to make that experience happen.

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Section 5: Content Delivery

Methods for obtaining A/V content, and moving this content to mobile devices.

1. Direct to mobile device
    a. Carrier network
    Internet access directly from cell phones approaching mainstream capability. However, this requires a separate data plan and fees on top of the voice plan. For either online video stores or advertising-supported online video sources the user selects the service either through the phone's web browser or media player applications. They can also be provided with a separate application, which is typically proprietary to the video service provider. The user must determine which service and content works with their respective phone. Most mobile carrier networks also offer their own video streaming and/or downloading service. This generally requires an additional fee on top of the voice and data plans, and the application is often pre-loaded on the phone prior to purchase.

    There are two types of carrier networks in the U.S.; one related to the GSM (Global System for Mobile communication) standard and the other describing the CDMA (Code-Division Multiple Access) standard. Originally designed for voice telephony, these standards operate at a very low data rate. For data communication new protocols have been added which run at higher data rates in order to increase efficiency. Both standards can also support a new high speed protocol known as 3G.

    GSM services include GPRS (General Packet Radio System); EDGE (Enhanced Data GSM Environment); and HSPDA (High-Speed Downlink Packet Access), which is sometimes referred to as UMTS (Universal Mobile Telecommunications Service). The primary GSM based operators in the U.S. are AT&T and T-Mobile.

    The CDMA-based services include W(wideband)-CDMA and EV-DO (Evolution-Data Optimized). The primary CDMA based operators in the U.S. are Verizon and Sprint.

    b. Mobile TV
    While Mobile TV is also offered by carrier networks, this service is technically and physically separate from their voice and data services. Phones that support Mobile TV can be considered hybrid devices.

    There are several technologies in this area. MediaFlo is a proprietary service offered by Qualcomm, who also provide the infrastructure and programming to Mobile carriers. DVB-H (Digital Video Broadcast - Handheld) is an adaptation of the European terrestrial digital TV standard. from the European based DVB project. Recently the Advanced Television Standards Committee (ATSC), which adopted the Digital TV standards for the U.S., has launched an effort to develop its own mobile DTV standard.

    c. Wireless access
    There are several methods to access video for mobile devices via the Internet. Wireless Local Area Network (WLAN), can connect to video services, for video streaming video or download video to a storage device. WLANs can work at home, where users have installed their own wireless access points; or in public places where wireless "hotspots" provide network access. Compatibility issues may occasionally impact the performance of some applications and devices.

    Another group of technologies known as WiFi have also proven to be quite popular. Although 802.11b is the most ubiquitous and is widely employed today for mobile and portable applications, 802.11a, 802.11g and 802.11n are growing in popularity, particularly for home network use.

Another relatively new technology known as WiMax, is being employed to provide high data rate capability over a wide geographic area. Although it uses unregulated spectrum operators will emerge that maintain the infrastructure much like city-wide WiFi networks today.

d. Physical media
Whether Flash-Rom or Vmedia the usage model is like DVDs, pop them in a slot of the device and enjoy the content.

SD Cards and Memory Sticks exist in a variety of formats with *Mini*, *Micro*, *Pro* and *Duo* format factor variants. They can be used as the primary storage of a device or as memory capacity expansion and, as indicated above, as prepackaged media. Newer security standards are also enabling rental and sell through of digital content.

e. Retail kiosk
The basic idea of the retail kiosk is that video is transferred to the storage function of the mobile device. If the storage function can be detached, like a flash memory card, it can be inserted into a slot on the kiosk. Some mobile devices can also be directly docked to the kiosk. Wireless options for connecting mobile device to kiosks include Infrared (IR), WiFi and Bluetooth.

f. Additional or ancillary costs (Freight, bandwidth, switching, etc.)

2. Using an intermediate device
    a. In this scenario video content is acquired from a non-mobile device that is connected to the Internet, such as a PC, or specialized set-top box, and then transferred to the mobile device. Depending on the application, the transfer process ranges from predominantly manual, (i.e. selecting files, copying, etc.) to fully automated, (i.e. when the mobile device is connected the entire library on the intermediary device is synchronized with the mobile device).

    If the content acquired on the intermediate device is not be compatible with the mobile device conversion may be necessary. Some mobile devices come bundled with conversion software that runs on PCs. From a service provider's perspective, this may eliminate the need for storing multiple copies of content on a server, or providing more sophisticated transcoding, transrating or transcrypting capabilities. There are various ways to connect the mobile device to the intermediate device.

        i. Physical cable: USB (Universal Serial Bus) or IEEE1394
        ii. Wireless point-to-point connections: Bluetooth or Wireless USB.
        iii. Home network: WiFi

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Section 6: Content Creation for Mobile Devices

While content traditionally created for TV displays may be adapted on portable devices, more and more content providers are producing content specifically for mobile devices. This enables end users to enjoy content that has been designed for different lifestyle environments. Combined with the fact that small screen displays don't offer the same resolution and fidelity as TV displays, it may be more advantageous to create experiences are specifically designed for these unique mobile requirements.

As content producers target mobile devices, there is an impact on creative, scripting, budgeting and production. For example, the 'Mobi-sodes' for "24" (specifically targeted for mobile devices) are very different than the traditional episodes one would normally see on TV.

Some of the factors that affect content creation and production processes are described below.

1. Creating content specifically targeted for playback on smaller displays. Watching video on a small screen can be difficult not only because of the size, but also because of the type of scenes (within the video content. Content producers are now producing content and specific shots that are targeted for smaller resolution screens. The same shot on a 2" display can often lose its desired effect since it is so difficult to view. To overcome this, some content producers are now shooting the same scenes twice, for both portable/mobile devices as well as large-screen TVs.

2. Short-form vs long-form content. Most consumers do not have the time to watch an entire 2-hour movie on a handheld device while on the go. While there are many applications for long form content on portable devices, many content producers are taking advantage of this by delivering shorter form content to consumers, using all of the delivery methods described above. Examples include new clips, episodic content, sports highlights, and more.

3. Interactive experiences. While most content delivered to the portable device involves linear content, there is potential for these devices to deliver a more robust interactive end-user experience (interactive menus, chapter marks, subtitles, audio tracks, and bonus content, can now be delivered in a variety of ways, including new portable media formats, like Sony's UMD (for PSP devices). Microsoft's recently released Silverlight also offers such an interactive framework, using its Windows Media Video technology combined with HTML-like markup for interactivity and graphics animation. As interactive experiences achieve broader adoption, portable devices will play an even more significant role by providing a wide level of support for this capability.

Finally, when considering mobile devices and content, a number of other variables should also be noted. These include data file size; bit rates; compression schemes; as well as the overall resolution of the display. All of this can impact the ultimate quality of the user experience.

When delivering A/V content over an online connection, it is often necessary for the content producer or distributor to balance several technical issues to deliver an optimal consumer experience. While quality is often the ultimate goal, several things can impact the quality of the consumer experience: bitrate, audio and video codec selections, screen resolution, and more.

Generally, the higher the quality, the higher the bitrate and the larger the A/V file for delivery to the consumer. Likewise, the larger the screen resolution, the larger the file size. Of course, larger sizes and higher bitrates mean longer times to download or stream. While downloading of A/V content can occur in the background (while a consumer performs another task), the performance of streaming A/V content is directly dependent on the available bandwidth of the user's online connection. Therefore, the content must not be too large (or have too high of a bitrate and resolution) as to impact streaming quality for the user. Of course, this throttling of bitrate based on bandwidth can have a dramatic impact on the consumer experience and overall quality as well.

To make matters more complicated, the video compression scheme can also impact the bitrates and quality metrics, as certain compression schemes can achieve higher quality at lower bitrates, thus maximizing bandwidth. However, the video compression scheme can significantly increase the complexity (and hardware cost) of decoding on the portable device. This makes retrofitting new compression schemes into legacy portable devices very difficult, and often impossible.

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Section 7: Mobile Device DRM

Mobile devices represent a much more complex ecosystem than delivering content to PCs or set top boxes. These handheld products require robust digital rights management (DRM) systems to enable the various business models that content providers offer.

1. "Untethered" devices – Because they are untethered, mobile devices can encounter a number of challenging global licensing issues. Depending on the type of content, some service providers may not own the rights to distribute content outside of a specific territory. For example if a service provider may only have rights to specific content in the United States, they would be in breach of their licensing agreement if they attempted to offer the same content abroad. To address this, filtering has been traditionally used whereby the IP address of the customer is checked in order to determine where they are geographically. If the request is being made outside a valid territory, the delivery is not allowed to proceed.

   Mobile devices represent yet an additional challenge in that the cellular network may appear as being inside a valid territory when in fact it's not. Therefore, current geofiltering technologies need to be revised or new ones even developed to reduce this risk.

2. Lack of standardization – Given the vast array of mobile devices available there is very little standardization across the industry, although several platforms have significant market share. Market share is a critical factor for content providers since it requires significant resources to develop and deliver the types of applications that are necessary to engage end users.

3. Compatibility concerns – Mobile devices are designed to support many platforms, and this diversity often leads to compatibility issues that limit the consumption of content.

4. Delivery Methods – There are many ways to get content to mobile devices with some products even allowing for more than one delivery method. As improvements in technology promote greater bandwidth, some carriers will be required to maintain support to their current networks to protect their installed base of customers. Wi-Fi Internet access is yet another reason why it requires significant coordination to protect content while in transition to a designated device.

The Basics of DRM

As outlined in a recent DEG report, the basics of DRM are as follows:

1. Content – the specific media file that the provider is renting/selling
2. Encryption – a data protection scheme that prevents unauthorized use and cannot be decrypted without a key
3. License – an authorization that includes a decryption key which enables content to be played on an approved device.
4. Usage Rules – outlines the rights defined in the license and governs the conditions under which the content can be used.

Given the different delivery systems available, no single DRM can address all of the channels a content provider may want to support. There are four primary methods.

1. Streaming – content is transmitted to a device but not permanently stored. The encryption must be strong enough to provide protection without significant additional data that could negatively impact the end user experience.

2. Downloading – Content is sent directly to a device where it is stored for a period of time. In this scenario, the encryption needs to be stronger since the content will reside indefinitely, on a consumer device.

3. Transferring – Here content is acquired by an intermediary product (PC, set-top box); then digitally transmitted to a mobile device. In addition to the challenges associated with both streaming and downloading encryption, this scenario requires a level of protection during the transferring process as well (e.g. HDMI, HDCP, etc).

4. Physical – Both the content and encrypted data are placed on the appropriate storage media; then inserted into a compatible device for playback. This is just like a download but with the opportunity for more devices than mobile devices being able to read the content like PCs.

The Current DRM Marketplace

Several proprietary DRM systems are available including:

1. Windows Media DRM – Numerous providers use a portable variant of Windows DRM to protect their content on compatible portable media players. A scheduled update will also allow for protected distribution to cell phones and other mobile devices. Key aspects are as follows:

    a. Primarily used in download to PC business models and can be transferred to portable devices.

    b. Business model is usage based, with rights for downloading expressed in a separate license file from the protected content file.

    c. Currently, can be used with portable devices by first sending content to a PC or other intermediary product; then transferring the content to a portable device. Some mobile phones can support the downloading of content and licenses directly depending on the operating system.

2. Apple Fairplay – Fairplay is the designated DRM for Apple's iTunes – the most popular commercial content delivery service currently available. Fairplay's key aspects are as follows:

    a. Closed ecosystem - only Apple-approved devices and third-party applications can be used to playback content.

    b. Allows multiple PCs, set-top-boxes, and unlimited portable devices to playback content tied to the same account. The same content can also be sent to iPods and iPhones.

    c. Business model is primarily domain based.

3. Open Mobile Alliance (OMA) – Specifically designed for the mobile market, OMA represents a consortium of companies.

    a. Reportedly can export/import between otherwise non-interoperable DRM systems. Agnostic of specific cellular networks with technology licensing being conducted at the individual device level.

    b. Does not provide robustness and compliance rules, which must be provided by a third-party, such as CMLA.

2. AACS Managed Copy – Currently protects High Definition content on Blu-ray Disc and HD DVD.

    a. Provides a secure way to copy content from BD or HD DVD to a PC or another device.

    b. Final specifications TBD.

3. TrustedFlash Media – Allows for content to be securely stored on flash-based media or drives which can then be played back on a variety of compliant devices.

    a. Physical media protection for content stored on a trusted flash drive or card (
    b. Content is stored in an encrypted form on the flash media with the decryption keys stored separately.

    c. Allows for content to be bound to specific media for viewing exclusively.

4. Coral Consortium – Established to develop interoperability conditions for many of the current DRM technologies on the market.

    a. Offers an interoperable framework for DRMs by acting as a trusted “go-between” among various compliant technologies.

    b. Capable of creating virtual domains for consumers that encompass different technologies.

5. Conditional access systems – Traditional systems that are primarily used to protect cable and satellite broadcast signals. Examples: NDS, Irdeto, Viaccess, etc.