

**So Much Content, So Little Time:
The New Model of Convergence for Today's Digital Subscriber**

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Abstract

Today's digital subscribers have more broadcast, linear and on-demand viewing choices than ever before. To compound the problem of ever-growing viewer choices, the Internet and mobile devices continue to "steal" eyes and hours from traditional television viewing. These are not new trends. There have been several attempts in the past to stem the tide and retain television viewers in the face of new technologies. These past attempts typically have been labeled "convergence" as they have attempted to port new functionality to the incumbent platform. Trying to make the television more like a personal computer, and vice-versa, have been stopgap solutions with limited success. This paper will describe an alternative form of convergence that exploits the capabilities of the television, the personal computer and mobile devices in order to deliver compelling new entertainment experiences.

Television – More Choices than Ever Before

Television is like the American toaster, you push the button and the same thing pops up every time.

— Alfred Hitchcock

Since its inception the television has been a passive form of leisure entertainment. In its early days it replaced the radio as a family-centered news and entertainment medium. Like the radio before it, family members gathered around the television at common, predictable times of the day, sat back and took in the experience. *What* to watch was limited by a few local channels and *when* to watch was defined by broadcaster program schedules. Early television, again like radio before it, was often performed and broadcast live to viewers at home, while simultaneously being filmed for rebroadcast later. In this way, television programming remained largely a local and regional proposition for several decades until technological advances like the low-cost, studio quality video tape recorder paved the way for the national broadcasters and studios that we know today. Because of videotape, program productions were no longer tied to air dates and times. Soon thereafter, national and syndicated programming and the rerun increased the total hours of daily programming available. After that, broadcasters starting broadcasting content 16, 18 and even 24 hours a day. Still, viewers had a limited choice of what to watch and had no say as to when to watch.

The advent of cable television meant even more channels and more programming for viewers to watch. About that same time the introduction of the home video cassette recorder (VCR) meant viewers could for the first time decide *when* they would watch programming. Further innovation, technical advancements and introductions in services throughout the past few decades has brought the television viewer videotape rentals, premium channels, pay-per-view movies and specials, satellite television, DVDs, TiVo™, hundreds of digital channels and digital

on-demand movies and programs. In just a few short decades the television went from a medium with few programming choices that had to be watched when broadcast to one that provided access to countless program choices which can be watched when the viewer wants.

All of these new viewing choices introduced over the past several decades have led to fewer viewers watching any particular program at a given time. A very good illustration of this fact is observed when one considers the top ten most viewed network primetime telecasts of all time as reported by Nielsen Media Research:

Rank	Program	Number of Households (millions)	Percentage of Households	Share	Year	Broadcaster
1	<i>M*A*S*H</i> series finale: "Goodbye, Farewell and Amen"	50.15	60.2%	77%	1983	CBS
2	<i>Dallas</i> episode: "Who Done It?" aka "Who Shot J.R.?"	41.47	53.3%	76%	1980	CBS
3	Roots Part VIII (finale)	36.38	51.1%	71%	1977	ABC
4	Super Bowl XVI (San Francisco 49ers vs. Cincinnati Bengals)	40.02	49.1%	73%	1982	CBS
5	Super Bowl XVII (Washington Redskins vs. Miami Dolphins)	40.48	48.6%	69%	1983	NBC
6	XVII Winter Olympics: Ladies' figure skating – short program featuring Nancy Kerrigan and Tonya Harding	45.69	48.5%	64%	1994	CBS
7	Super Bowl XX (Chicago Bears vs. New England Patriots)	41.49	48.3%	70%	1986	NBC
8	Gone with the Wind telecast (part 1)	33.96	47.7%	65%	1976	NBC
9	Gone with the Wind telecast (part 2)	33.75	47.4%	64%	1976	NBC
10	Super Bowl XII (Dallas Cowboys vs. Denver Broncos)	34.41	47.20%	67%	1978	CBS

Figure 1 - Top 10 network primetime telecasts of all time (1964-Present)

Today, Nielsen has ratings for cable broadcasts and on-demand viewing in addition to broadcast television, but, even when considering these additional choices, primetime broadcast viewing leads in overall shares for a given date and primetime slot. The table above shows a dramatic trend: as viewing choices have increased year after year, the percentage of households viewing the most popular programs continues to decrease. Case-in-point, the top ten most watched primetime telecasts of all time have occurred more than twenty-five years ago. If looking even deeper into the top 45 telecast programs, the most recent entry is Super Bowl XLII (New

York Giants vs. New England Patriots), ranked #43 which was televised in 2008. That program was watched by 43.1% of all television households, which at the time equaled 48.66 million viewing households. Compare and contrast that to the 2008 most popular U.S. program, American Idol, which had its highest ratings during its series finale, watched by 33.4 million viewers. Those total television households and total viewer numbers of last year are remarkably less than similar numbers two and three decades ago, even though the U.S. population has grown approximately 29% in the past twenty-five years. Put simply, as more and more television viewing choices have been introduced, the fewer people there are watching even the most popular programs.

The multitude of viewing choices provided by today's television includes a wide variety of diverse programming to satisfy the tastes of countless viewers. However, these television viewers all have one thing in common: they view televised entertainment passively, in a "lean back" manner.

The Internet – “Lean Forward” Takes Over

The Internet is just a world passing around notes in a classroom.

— Jon Stewart

The personal computer is nothing new. The PC has been around in one form or another since the mid-1970s, and by the late 1980s and early 1990s many homes had a PC. Few predicted during those early days that the personal computer would become a threat to the television. People then viewed the personal computer as a computing device, useful for word processing, simple accounting through a spreadsheet application, and a gaming system. Electronic bulletin board systems, each with an array of phone modems, were set up by some entrepreneurs wishing to share, for an hourly fee, pirated information like hacked games and risqué low resolution digital pictures. More legitimate information services like CompuServe, GENie and Prodigy provided access to more mainstream information services, like e-mail, news and electronic shopping for a monthly or hourly fee.

Events of early to mid-1990s changed all that. Companies like AOL began to move away from hourly fees and their own proprietary content and towards a monthly service fee and access to their own content and to the Internet. Before then the Internet content was mostly comprised of the USENET newsgroups and a few, emerging websites, but even then those websites were largely a novelty. The early 1990s introduced the Mosaic browser, and TCP stacks that could be added to Windows 3.1, the dominant PC operating system at that time. By the mid-1990s, Windows '95 was delivered by Microsoft and included the Internet Explorer web browser and a built-in TCP stack. This new operating system, more so than any that came before it, laid the foundation for countless Internet service providers (ISPs) to spring into existence and essentially defines the birth of the Internet for home users.

A short fourteen years later the online world has evolved in ways that few could have imagined. In the second half of the 1990s Internet users largely used the new medium in a read-only fashion. “Lean back” was still alive in those early days. Back then, people *consumed* the Internet, much like they consumed a television or a radio program. In his book, “*REMIX*,” Lawrence Lessig described the notion of a read-only (RO) culture when discussing this type of consumption. “We listen to music. We watch a movie. We read a book. With each we’re not expected to do much more than simply consume.” In those early days, that’s largely what was going on. “Web surfing” was just that; an activity of looking for things to consume, with a majority of people online consuming. To most people at the time, the World Wide Web was just a more vast set of channels to consume. Sure, online shopping sites were a diversion and used by many, especially sites like Amazon.com, but for the most part, people online in the late 90s were consuming, not contributing, content and information.

During the late 1990s some technical individuals started to contribute to the World Wide Web. Those early individual web contributors were typically journalists and artists publishing their own online diaries. They often had to purchase their own web domains, a daunting task at the time. It wasn’t until 1998 that the “Open Diary” website was born and soon grew to thousands of online diaries. At the dawn of the new millennium, those online diary and journaling activities gave way to full-fledged “blogging,” short for “web logging,” with the introduction of sites like Blogger.com. Diary websites, vanity sites and blogs all pioneered what we now refer to as “social networking.” With social networking, Internet users became contributors, inundating the web with new content. Almost overnight the Internet became the RW (read write) medium we know today. Statistics shown at Netcraft.com, a World Wide Web survey company, indicate that the number of new active websites has been leveling off the last

few years, while the introduction of new content to those sites continues to grow at a dramatic rate. Such content is being user-generated and placed on a few social network sites like Twitter and Facebook. Many Internet users are spending hours a week, some hours a day, contributing all types of user-generated content (text, images, photos, music and video) and posting it on the web for others to consume.

In a May 2008, Cisco Systems surveyed broadband-connected households in Australia, New Zealand, various European countries and the United States. The survey showed connected users are spending as much as 22 hours a week on the Internet, while as few as 10 hours per week watching television. Recent Nielsen Media statistics show that the typical U.S. household watches about 28 hours of television a week. These statistics show an alarming trend that is only likely to continue; as people spend more time online, creating and consuming digital content, they spend less time watching television. The Internet has stolen eyes and viewing hours from television.

Mobile Devices – Entertainment “On the Go”

Yeah, you'll be the coolest person in the room when you pull one out and show it around, but that gets old fast when three other people have them and one person somehow has one that glows in the dark.

— John C. Dvorak
(American columnist and broadcaster, speaking of the iPhone)

We have become a very mobile culture during the last century. Railways, subways, regional bus lines and the automobile have all torn down regional barriers and made travel cheap and efficient. In addition, cheap transportation has literally paved the way for suburban sprawl in areas where large cities are surrounded by outlying communities with lower population densities. The age of the commuter has come. People are more mobile now than they were at the dawn of the last century; whether they are traveling on business, for pleasure, or to simply go back and forth to work. Communications technologies, in particular the cell phone, have allowed people to “keep in touch” while “on the go.” The continued miniaturization of computer processors and memory, as well as significant advancements in LCD (liquid crystal device) manufacturing and VLSI (very large scale integration) techniques have combined to create mobile devices today that blur the lines between the personal computer, the cell phone and the personal entertainment device.

Today, with the iPhone, the Blackberry and a plethora of other mobile devices, people can take their digital entertainment with them wherever they go and constantly be entertained. The consumer using these mobile devices now is their own content provider, ripping CDs or DVDs to “lossy,” lower resolution digital media files for later “downloading” to the mobile device. Often this task of repurposing content is too daunting for many, and they simply go without, or they pay extra in order to download content that they already own from a value-added service like iTunes.

Today's mobile devices are capable of an ever increasing array of entertainment options, and those companies that learn how to cheaply and effectively deliver those options to consumers should find prosperity in the future. The mobile devices of today are used to allow people to stay connected and to consume the content that they have placed within, but that is only the tip of the iceberg of what these devices can do and will do in the very near future.

Ten+ Years of Convergence– Is It Working?

Insanity is doing the same thing over and over again, but expecting different results.

— Rita Mae Browne
(Author, in her book “*Sudden Death*,” 1983)

The quote above is most credibly attributed to the author Rita Mae Browne but it has also been attributed to such notable figures as Albert Einstein and Benjamin Franklin. Regardless of the origin, the quote is instructive in that it warns against continually performing the same action once it has proven not to work. Susan Powter, motivational speaker and infomercial guru, came to fame in the early 1990s with her “Stop the Insanity” mantra through which she implored her followers to stop their old, destructive ways. A considerable amount of planning and work has been done the past decade to unify the television and the personal computer. One common notion is that the consumer is better served with fewer information appliances within the home, and that the consumer would rather have a PC that has all the capabilities of a television, or a television that can be used like a PC. Attempts at the unification of the PC and television platforms are generically referred to as *convergence*. This section will discuss some prior attempts at convergence. Some of these attempts have met with limited success while others have been extremely successful and are worth considering for the future.

WebTV – Making the TV a PC

WebTV, now a part of Microsoft’s Web TV 2 product and service offering, was one of the earliest and longest-lived attempts at convergence geared around the theme of making the TV more like a PC.

The concept for WebTV came as founder Steve Perlman was watching television one evening and saw a Campbell’s Soup commercial that ended by displaying the website address for

the sponsor company. He wondered why Campbell's would provide a website tease to a television audience. He dreamed of a new "appliance" that augmented the television and could act as the conduit between the television broadcast and the World Wide Web, taking the viewer directly from the teaser commercial to the sponsor's website. The idea for WebTV was born.

WebTV was introduced the fall of 1996. Within the first holiday season, WebTV had 12,000 subscribers, each paying \$20 per month for service. The WebTV box included a 33.6 kbit/s modem used to connect to the WebTV Service, no hard drive, and only 8 MB of RAM making it rather limited when compared to the average PC of that era.

WebTV proved to be a victim of poor timing and unpredictable changes in technology and the marketplace. The use of slow dial-up and a low-powered set-top box made for a lackluster user experience. To make matters worse, as PC prices decreased and access to broadband increased, the demand for a low-cost alternative to the PC dwindled.

Another major issue facing WebTV and proprietary Internet appliances like it was the ever changing protocols and standards of the Internet. Such appliances typically have their own built-in browser, and that browser supports only a subset of the full list of standards on the Internet. Standards like Java, Real Audio, Adobe Acrobat, Flash and others are all rapidly changing. As Internet protocols and standards change, the Internet appliance is often stalled with back-level support or no support at all and therefore is unable to run new and exciting types of applications and websites.

Today, with broadband to the home and full-fledged PCs with crisp LCD monitors costing under \$300, the market for a \$200 device that turns the television into a scaled-down PC is very small. Because of this, WebTV was never a certified hit. Even with the lackluster adoption of WebTV, digital set-top manufacturers have tried to make their devices more and more like PCs

the last few years. The set-top manufacturers have introduced new capabilities through standards and technologies with names like OCAP, EBIF and the friendlier sounding “Tru2way.” These technologies and standards all attempt to make the television more interactive, and have paved the way for interesting set-top applications like home shopping, Internet auctions and Internet search. Even with these recent set-top advancements, the result is that the television is *still* trying to deliver the functionality that the PC and the Internet have been providing for years, and is still and will always be playing a game of “catch up.”

Tivo, Apple TV, Netflix Player by Roku

Today there are numerous media extenders, like the Wii, and the Xbox 360 and the PS3 that provide access to the World Wide Web through a television and deliver other PC-like functions to the television viewer. Some of these devices also can be used to download digital entertainment content from an Internet service or portal. Such digital devices include Apple TV, Netflix Player by Roku and now Tivo. That’s right! Tivo, which started as a digital video recorder, now supports download of video content from their portal.

Many of these attempts at convergence are too new to determine if they will be successful. Netflix Roku player is compelling, but the depth of the library that Netflix allows for streaming to the device is very limited. Apple TV doesn’t provide recording of television programs like Tivo but it does allow for the download of purchased content from iTunes. The Apple TV device hasn’t been a huge hit in the market since its introduction over a year ago. Opponents are quick to point out that few consumers want to pay Apple \$1.99 for a TV program when they can buy (or lease) a DVR and record the same program for free.

All of these devices are compelling, but each caters to a slightly different niche and provides access to its own proprietary library of content. Apple’s iTunes provides the most

comprehensive library, but Apple TV seems to be the least attractive of the devices as indicated by marketplace adoption. Clearly content alone is not the main factor in consumer acceptance of these television-attached devices.

Another thing that these devices have in common is that each requires broadband access and each utilizes Internet standards and portals for accessing content which is ultimately downloaded or streamed for viewing on a television. Unlike the WebTV box which attempts to be an Internet appliance providing access to the entire Internet, these devices provide special-purpose downloading and streaming of content and are tightly coupled with the manufacturer's content portal. By their very nature, these special-purpose devices are "media-centric."

These media-centric devices have yet to catch on in a big way, due largely in part to their "siloeed" media libraries, or their relatively high cost for content which is otherwise free or less expensive if obtained through alternative methods like recording through a DVR, watching through a broadcaster website, or renting or buying as DVDs.

YouTube

Devices like Apple TV illustrate how companies are trying to exploit the cheap distribution and long-tail library capabilities of the Internet to bring content to the television in new and exciting ways. Still, like WebTV before them, these devices are trying to make the television more like a PC, or at the very least have the television learn "new tricks" from the Internet.

YouTube is an example of just the opposite; here, the PC is becoming the TV. Yes, there have been countless entries into Internet video and dozens of personal computer models with integrated TV tuners prior to YouTube. Yet it wasn't until the advent of YouTube that broadcasters and media companies really began to fear the Internet and the PC. Why? Television just can't compete on the same level as YouTube. YouTube is social. YouTube's content is

largely user-generated. YouTube is TV for the social networking Internet generation. With television, viewers had no other choices but to “lean back” and consume the programming provided by large studios and broadcasters. But with YouTube, the viewer can “lean forward” and contribute content - and boy, do YouTube users contribute content!

The complaint from many broadcasters and media outlets is that their copyrights are being violated by YouTube contributors, and in many cases that may be so. But what are the real damages when a video of Grandpa singing “You Light Up My Life” to Grandma at their 50th wedding anniversary party gets placed on YouTube? Does Debbie Boone, the artist who made the song famous, or Joe Brooks, the song’s writer, or Curb Records, Boone’s record label, incur any financial damages from such user-generated content? Does Twentieth Century Fox or George Lucas’ Lucasfilms studio incur any real financial damages if a “fanboy” stitches together scenes from a Star Wars movie into his own parody? The discussion of these legal questions is another paper in itself, but on any given day there are more hours of video contributed to YouTube than are available during that same day on the entire digital channel lineup provided by any service provider. YouTube has reached over 1 billion total viewings per day, making YouTube the true “king of all media.”

Attempts to deliver PC capabilities like email, web browsing and chat to the television have been made increasingly unsuccessful by the cheap PC and widespread availability of broadband to the home. Specialized devices for bringing Internet-based digital media to the television have been introduced and so far have had limited niche appeal. Studios and broadcasters have made their primetime content available in an ad-sponsored format on the Internet, but that ad revenue pales in comparison to what they garner in broadcast ad revenue. YouTube has taken off in ways that have baffled the media giants, causing everyone to scurry because the “thirty and under”

crowd is now spending more time per week viewing and contributing to online content than watching traditional television.

Convergence, to date in all its forms (see below), simply hasn't converged much of anything. Viewing of prime-time broadcast TV is still mostly done on the television. Viewing of user-generated content is done mostly on the PC. Consumers have not shown avid interest in appliances and services which enable delivery of digital media directly to the television. All that convergence has done so far is to introduce more devices and more platforms for viewing different silos of content.

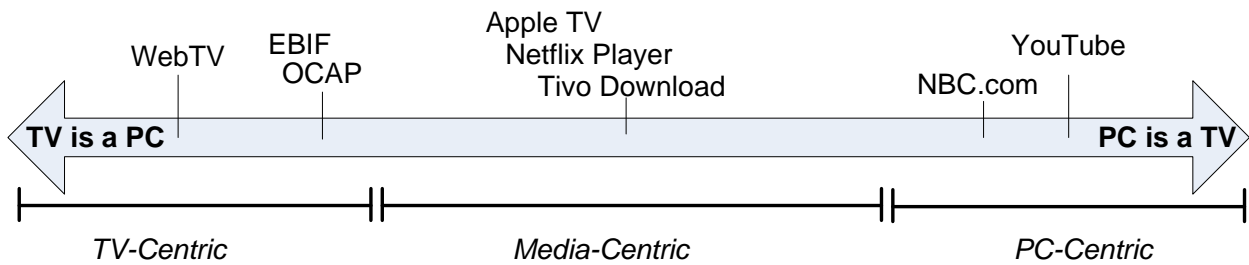


Figure 2 – Convergence spectrum

What Should Convergence Look Like?

“Some men see things as they are and ask why. Others dream things that never were and ask why not.”

— George Bernard Shaw

As previously discussed, attempts at platform convergence and the unification of entertainment and viewing experiences have met with limited success. We have seen personal computer functionality moved into set-top boxes, and video streamed to personal computers and mobile devices. Through it all an increased number of devices, platforms and silos of viewing choices have emerged creating divergence instead of the promised convergence. Clearly the idea of converging to a single platform has proven unrealistic. There is a real desire to watch high-definition video in surround sound on a 50” home theater screen, while at the same time there is the desire to watch much lower resolution video on a home computer or on a mobile phone when “on the go.” Therefore, we should expect to see multiple platforms and devices, each optimized for a given type and quality of experience.

So if convergence is not about combining platforms and devices, what exactly is it? During the remainder of this paper a new form of convergence will be discussed, that form being called “convergence of experience.” As shown throughout the first half of this paper, the traditional attempts at converging devices were successive losing battles. Trying to make all platforms and devices able to perform the same functions as all the other platforms and devices met with limited success, meaning that convergence of function is also not a realistic objective. (However, specialization of form and function has its value.) This leaves only *substance* and *experience* as candidates for convergence. In the digital media world, substance is the content, and experience is defined by the ease at which the consumer can consume content and perform specific functions.

So what should this convergence of experience entail? What are the tenants of such convergence?

Any Place

Today's subscriber to digital services and consumer of digital media wants to be able to view their purchases virtually anywhere they go. Such locations include viewing at home within the home theater or on the personal computer; on a laptop in a WiFi hotspot while on the road; in the car on a family vacation; or on a smartphone when virtually anywhere.

Any Time

For many consumers, the linear broadcast schedule has become a thing of the past. People today have more hectic and irregular schedules than ever before. No longer is a majority of the television viewing audience assured to be seated in front of the set during primetime hours. Viewers want to watch programs when they want instead of when broadcasters think they should.

Any Choice

Regardless of where they are and what time it is, the viewers want access to everything, within reason, of course. They want to be able to make any choice from the list of all possible viewing choices. They want access to everything, not just what the platform allows, and not just what they have previously decided to record. However, viewers especially want access to their previously recorded programs, regardless the time or the place.

The Challenges of Any Place, Any Time, Any Choice...

“I have little patience with scientists who take a board of wood, look for its thinnest part, and drill a great number of holes where drilling is easy.”

— Albert Einstein

Providing digital media consumers with access to any choice of content, any time at any place will revolutionize several industries. Such a revolution won't be easy. It will require significant planning and investment, but the payoffs will be huge. Products, technologies and standards have already emerged and more are being developed that allow providers to assemble product and service solutions that tear down the silos, making any place, any time, any choice a true reality. To be effective products, technologies and standards must address several challenges as discussed in this section.

In order to deliver true *any place* viewing experiences, products and technologies must embrace and support diverse modes of transport and storage. Media must be securely transferred and streamed across provider networks as well as within the home network of the consumer. In addition, digital media must be securely transferred and streamed through public networks, both physical and wireless. In all these cases, security is essential. Only those that have the appropriate rights for viewing media should be able to view it, or copy it. Meeting these challenges will mean embracing a diverse set of distribution and security protocols. It is not the intent of this paper to describe in detail the products and standards required for transport and security, but it is instead the intent to define an awareness of the challenges and needs.

Delivering on the challenge of *any time* will require that all of the programs that are broadcast today, and that have been broadcast in the past, must be provided to the consumer in an on-demand fashion. Realizing such a goal is a daunting challenge given the thousands of hours of

new programming introduced by the typical channel lineup each day. Assuring advertisement revenue models and protecting licensed content are also major challenges when trying to make all broadcast programs available all the time. These challenges can be overcome, and once the naysayers have been pacified by actual secure field examples, the floodgates are expected to open and more and more programming will be made available on-demand.

Once the consumer can watch virtually any choice of programming, and has an increased number of hours to do so by being given an increased number of places for viewing programs, the new challenge facing the consumer will be in selecting *what* to watch. Having unbridled consumers from the limitations of “when” to watch, and “where” to watch, their new frustration will then be “what” to watch. To ease this frustration, providers will need to create new, more effective mechanisms that allow the consumer to find the content they will enjoy viewing.

A New Model of Convergence

“Innovation is the creation of the new or the re-arranging of the old in a new way.”

— Michael Vance

To realize convergence of experience and to deliver *any time, any place, any choice*, a new model must emerge, one which will include and will require new products, new technologies and new standards. Like all complex models, the new model of convergence can best be understood by first defining the high-level building blocks:

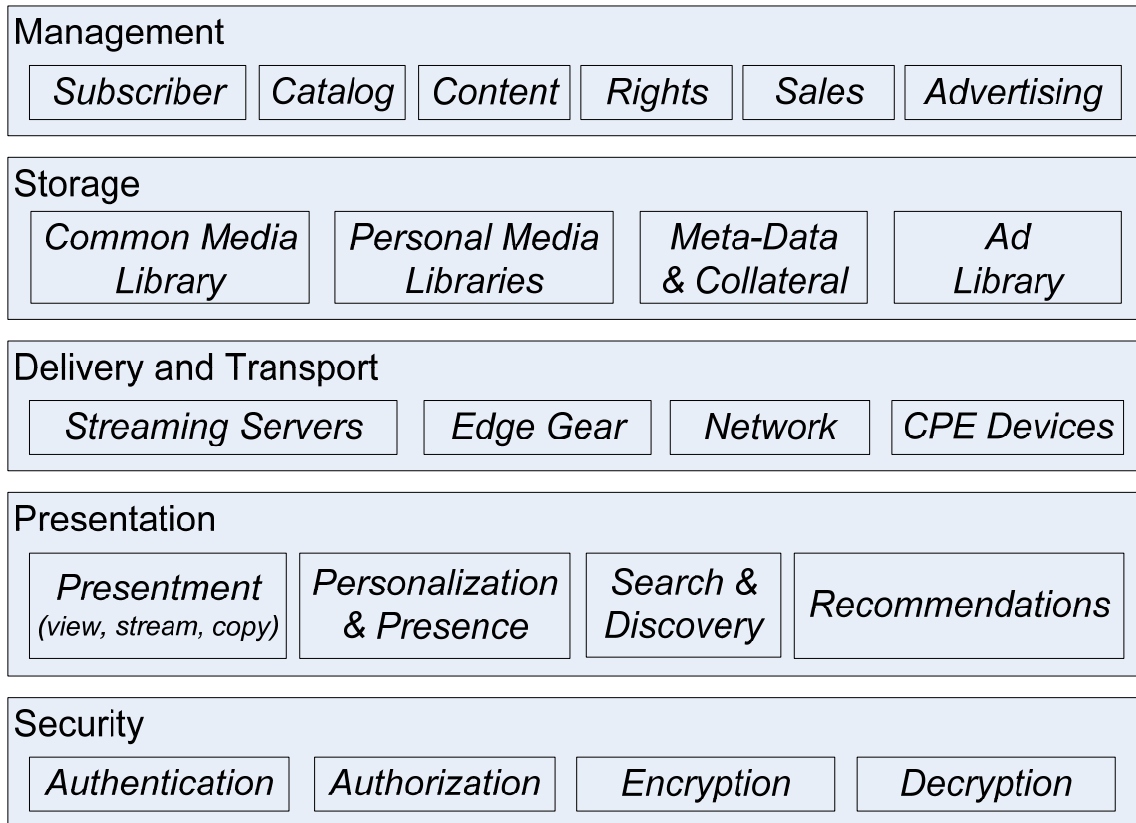


Figure 3 – New convergence model

The model above is a logical model and its component blocks are not necessarily meant to be strict boundaries. For example, encryption or decryption might be included in the storage area as well as in the security area where it is currently displayed. The intent of a logical model like

the one above is to display functional areas of the overall solution model, as well as to display examples of functions found within each area. A further intent of the model is to provide a framework and set of placeholders for future new products and standards.

The major functional areas of the logical model are described below.

Management

The management area includes products and technologies for managing subscribers; the cataloging and showcasing of media products available; the digital media content; the digital rights for said content; sales and other revenue related aspects of the content offerings; and advertising campaigns and advertising collateral. The management area encompasses all the products and technology components that are used to manage entities within the converged system.

Storage

The storage functional area provides technologies and products that deliver a common media library in which all consumers access a common set of digital media. In addition, personal media libraries must be supported. The storage of meta-data and other collateral associated with digital media must be stored; including collateral such as album cover artwork, movie posters, movie descriptions, and the like. Lastly, a repository for advertisements must be provided which should include support for banner ads as well as digital media clips.

Delivery and Transport

The delivery and transport functional area defines products, standards and technologies for transporting digital media content. Such products as streaming servers, edge gear and consumer

premise equipment are maintained in this functional area. In addition, this is where the network and all the physical components and products comprised may be found.

Presentation

The presentation functional area is all about the end-user experience. This is where products and technologies associated with guides and other user interfaces reside so that digital media may be searched for, presented and recommended. In addition, a cross-platform presence subsystem should be included (more on that topic later in this paper). One key aspect of the presentation functional area is that care must be taken to provide a common look and feel, a branded UI experience across platforms and devices, with each experience tailored to the restrictions and strengths of the device and platform at hand.

Security

The security area delivers all the functions related to authentication, authorization and enforcement of restrictions, including decryption of encrypted media and content if authorized.

A valuable way to better understand the convergence model is to put it through its paces. The next few sections describe the convergence model in action, with each section describing a different real-world product solution.

Convergence Model in Action – Network DVR

The new model allows for compelling new convergence capabilities. Take, for example, a digital subscriber with a DVR connected to their home theater. Let’s suppose that the subscriber sets the DVR to record a program. In a converged model that DVR might be a network-DVR (nDVR), storing the program in the “Personal Media Library” for the subscriber, or possibly only a “shadow copy” is recorded to the Personal Media Library while a copy is also recorded to the subscriber’s consumer-premise DVR. Either way, Digital Rights Management and content encryption must be applied to the program as it is recorded to the Personal Media Library. Once recorded, that program would be securely available to the DVR set-top box, a PC and the mobile phone of the consumer.

The logical model of such a solution is displayed below.

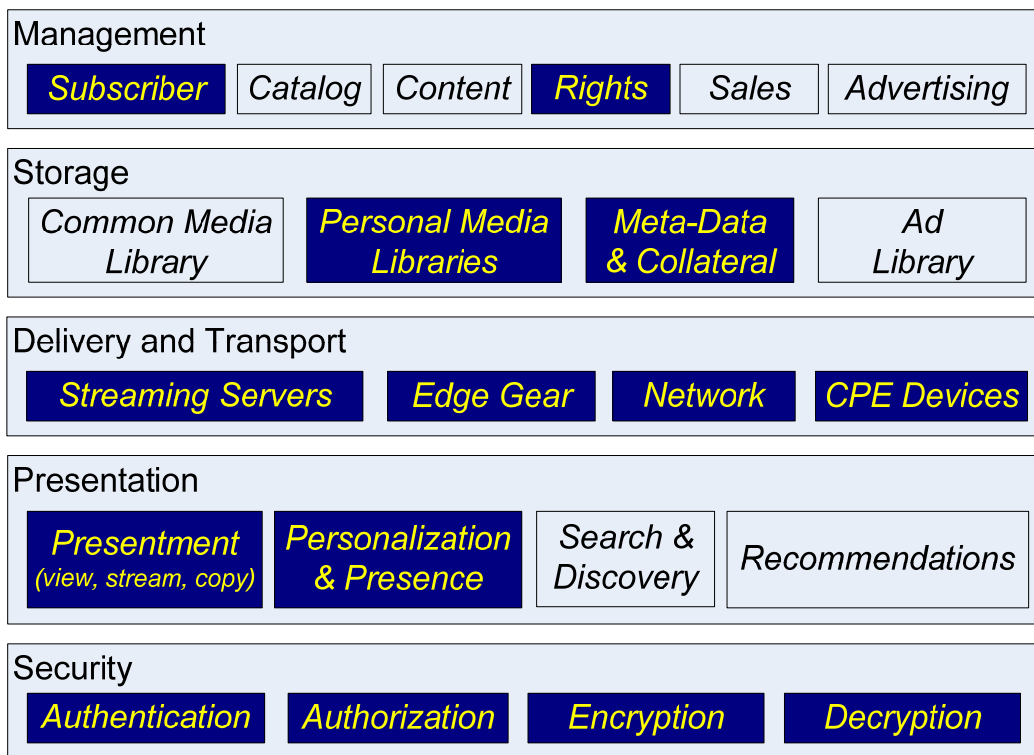


Figure 4 - Logical convergence model - network DVR

The logical model above is easy to understand; however, the physical diagram of a total solution that delivers network DVR capabilities through which recorded programs can be viewed on a digital set-top, a PC, or a mobile phone is a little more complicated, as shown below.

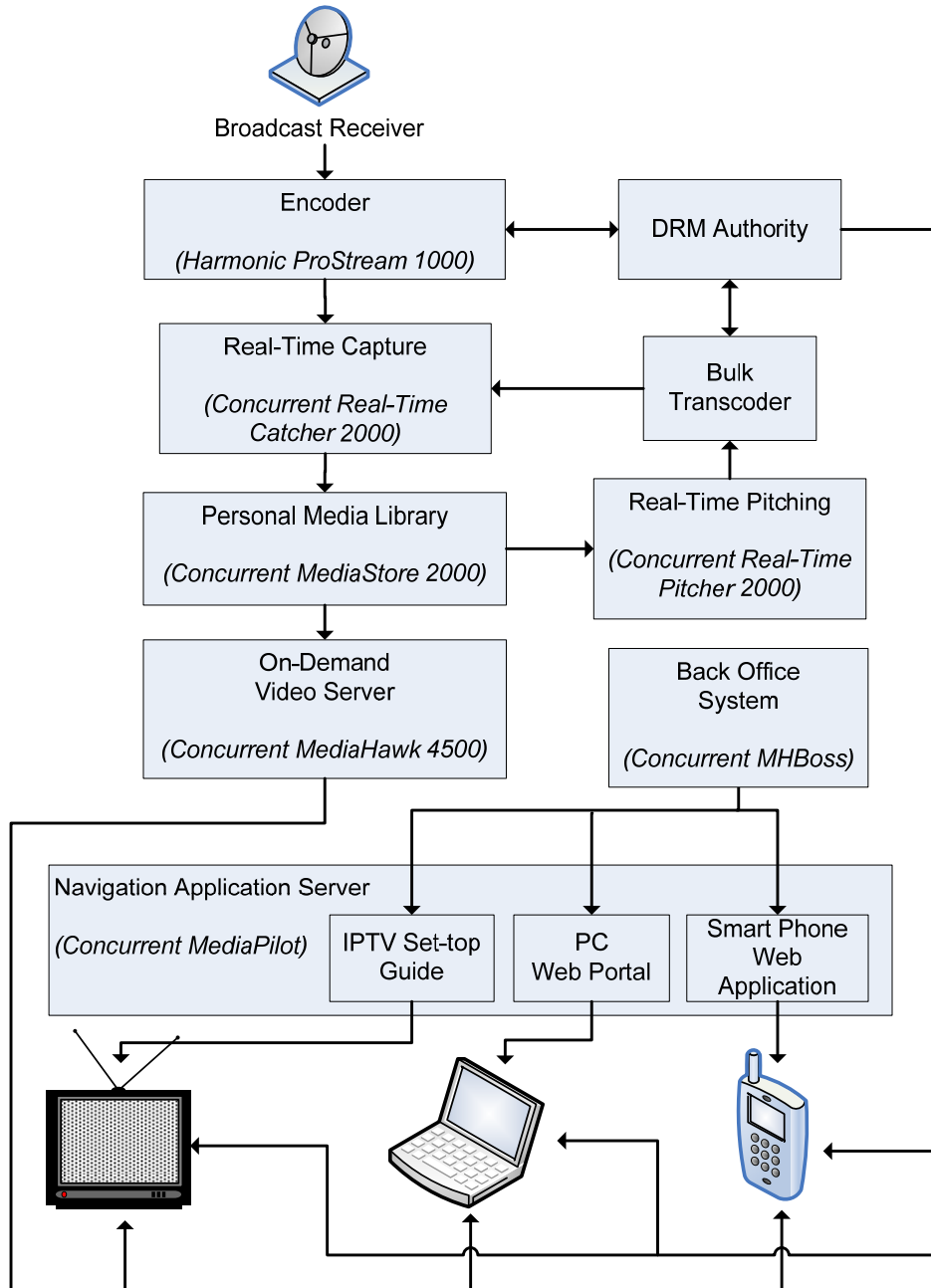


Figure 5 - Network DVR example

Several key aspects of a converged Network DVR product solution are worth reviewing.

1. A consolidated user experience must be provided through a common “look and feel” across each of the platforms. A product like the *Concurrent MHPilot* provides a scalable web server solution that can host:
 - a. a guide and DVR application used by an IPTV set-top box with built-in Internet browser
 - b. a Web Portal that can be accessed by the subscriber across the Internet using virtually any personal computer
 - c. a scaled-down version of the DVR application for use by a smartphone with built-in browser and 3G network access
2. All guide and DVR applications, regardless their intended platform, must utilize back office information provided by a common source. Look for products like the *Concurrent MHBoss* back-office product that provides a scalable open platform for this feature.
3. Instead of encoding and capturing programs blindly or en masse, the encoding and capture of specific programs must be at the explicit request of the subscriber or due to recurring recording instructions from the subscriber in order to fall under “fair use.”
4. Digital Rights Management must be applied to the recorded and transcoded programs to ensure that potentially licensed materials are secured. This will require that the platforms in question (set-top, PC, smartphone) each be able to securely participate in acquiring rights to the protected content.
5. In order for the streaming of recorded programs to *not* be considered the retransmission of copyrighted materials, each subscriber’s recorded programs must be segregated just as they would be if stored locally on a cassette, recordable DVD or the hard disk of a consumer-premise DVR.
6. Rather than encode and store multiple versions of each program for each subscriber, initially only the highest resolution version of a subscriber’s program is recorded and stored. Alternate formats for other platforms are transcoded in real-time only as needed per the request of the subscriber.
7. The diagram above does not show all system components. Of particular note is the absence of edge gear that sits between the video server and the subscriber devices.

Convergence Model in Action – Search Portal and Viewing Recommendations

Another compelling functional example that highlights the potential of convergence is the integration of a “Search Portal” accessed through the PC, and corresponding “Viewing Recommendations” provided within an IPTV guide, regardless which platform that guide be accessed from.

In today’s “bundled services” world, many subscribers have a single vendor for broadband, digital television and digital phone services, thereby dramatically increasing the potential for convergence. Any provider that offers such bundled services certainly should provide its own portal and provide significant subscriber incentive for that portal to be used as the subscriber’s home page and primary Internet search engine. Developing such a portal sounds like a daunting task, but in reality, technologies and standards have emerged to make it quite tractable

1. Cloud computing, like that provided by Amazon EC2, allows a provider to host a scalable web offering without purchasing or leasing their own hardware or software services.
2. Google and Yahoo provide APIs and branding tools that allow a provider to develop their own portal (using state-of-the-art, industry leading search technologies hosted by the leaders in the industry) and provide these features within their own web applications. These types of web applications are called “mashups” because they mash together functionality and services from other web sites.
3. Cross-platform integration, including the ability to securely post search criteria from the portal to other platforms and applications is easily within reach of most developers using RESTful web services and similar technologies and standards.
4. Recommendation engines may be custom-developed, or purchased and integrated from companies like Baynote, Inc (www.baynote.com). All such engines have three things in common: awareness of an inventory of products and consumer choices; engagement of consumer interests whether that be from search portals or shopping websites; and finally,

using these consumer interests, execution of predictive algorithms to come up with a candidate list of products and content in which the consumer is likely to be interested.

With such a portal, search terms and even shopping website “wish list” items can drive recommendations of programs to watch. Such recommendations solve one major problem facing subscribers - the problem of wading through thousands of titles trying to find something of interest to watch.

In order to better understand how the new convergence model can deliver the functionality described, we will forego the mapping to the logical model and jump directly into a more physical model. This model of convergence is called the “mashup” model.

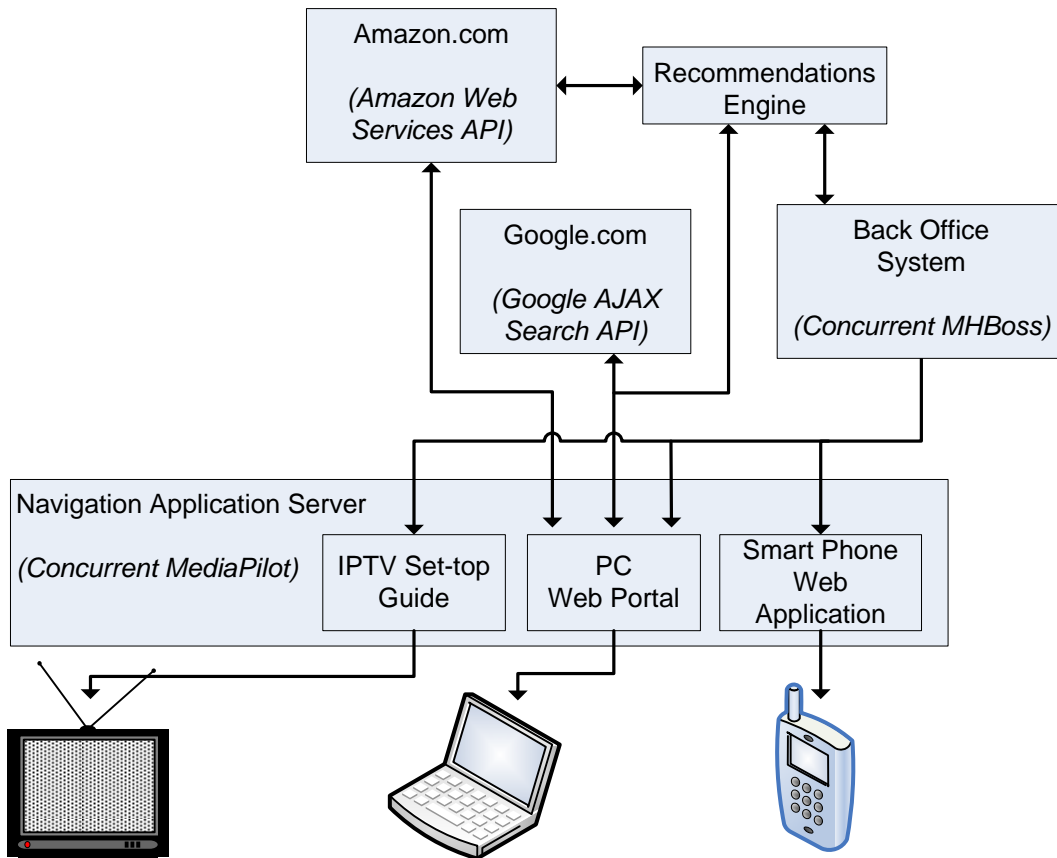


Figure 6 – “Mashup” model of convergence

In the mashup model of convergence, integration of multiple website services can and should be performed at various levels as described below.

1. The provider establishes its own web portal, with Google (for example) integrated search capability. Search terms can be stored in the back office system and provided to a recommendations engine. Again, some incentive must exist for the subscriber to use the provider's search portal. One such incentive could be a reduced monthly bill based on a minimum level of portal activity for that month.
2. Integration with Google search can easily be achieved through the use of the *Google AJAX Search API*. Yahoo has a similar API.
3. A scaled down, limited functionality version of the provider's web portal can be hosted and accessed through the subscriber's smartphone. This version of the portal is technically identical to the PC version, but limited to search and presence functionality only and with pages optimized for the limited real estate of the smaller device.
4. Amazon.com shopping information including subscriber wish list items can be made available to the recommendations engine. The configuration of subscriber preferences, including Amazon.com wish list access, can be performed through the PC web portal by the subscriber. In other words, the subscriber can "opt in" to sharing their shopping information in order to enrich the recommendations. Once shared, Amazon wish list items can drive recommendations in meaningful ways.
5. The back office system obtains subscriber-specific viewing recommendations from the recommendations engine. These recommendations are based on portal search terms, Amazon wish list items and information related to past programs viewed. For example, a subscriber could add a book about Abraham Lincoln or the DVD "Gettysburg" to their Amazon.com wish list. Likewise, the subscriber could use the portal to search for items related to the American Civil War. These wish list items and search terms would drive recommendations for on-demand programs and movies related to the American Civil War and Abraham Lincoln.

6. The Recommendations Engine can be a relatively simple piece of custom-developed software that simply matches search term keywords with keywords in program metadata (such as genre, etc), or it can be a sophisticated rules-based system that is purchased from a vendor having subject area expertise and is then integrated into the overall system solution.
7. The IPTV set-top guide can display the list of on-demand recommendations for the subscribers. Likewise, a PC portal can display a dashboard-style interface that includes the same list of currently recommended on-demand programs. The concept is that regardless of the platform the list of recommendations may be viewed and launched.

Convergence Model in Action – Converged Presence

The old model of convergence attempted to make devices do what they were not invented to do. There were attempts to make the television like a computer and the computer like a television. A newer, more effective model of convergence allows devices and platforms to do what they do best, but integrate them in such a way that the experiences in one platform and device “spill over” into other platforms and devices. A good example of just such “spill over” is evident in social networking.

Social networking websites like Twitter and Facebook have taken off providing new forms of web interaction and community. One common aspect of social networking is “presence,” also called “telepresence.” Presence in this form is loosely defined as the ability within applications to project to other users a sense that you are in a shared space together, or that you were once within the space that is occupied by others now. This presence is included in features like “Friends” and “Buddy Lists” that show online versus offline status. Another example is Facebook’s “What are you doing right now?” feature that allows friends to share what they are doing at any moment. Twitter takes such blogging activity to an extreme, taking the “What are you doing right now?” feature from passive, where the recipient must reach out and engage the information proactively, to active, where the information is actively and immediately pushed out to the recipient.

Most subscribers don’t want each and every thing they do projected to other subscribers. However, many do want to share presence and certain recent activities with their friends. For example, most people wouldn’t object to sharing the names of programs they are watching with others, or share that they are “on the phone” or “surfing the web” with their friends.

In many ways, shared presence across platforms is technically just another form of a “mashup” given that many websites like Facebook already have presence capabilities that can be accessed from an API and integrated within another web application or portal. However, it is more likely that for many new applications not all the presence functionality needed will be provided by any single website API currently available. Therefore, where functionality dictates, a telepresence server solution may be required as shown in the diagram below.

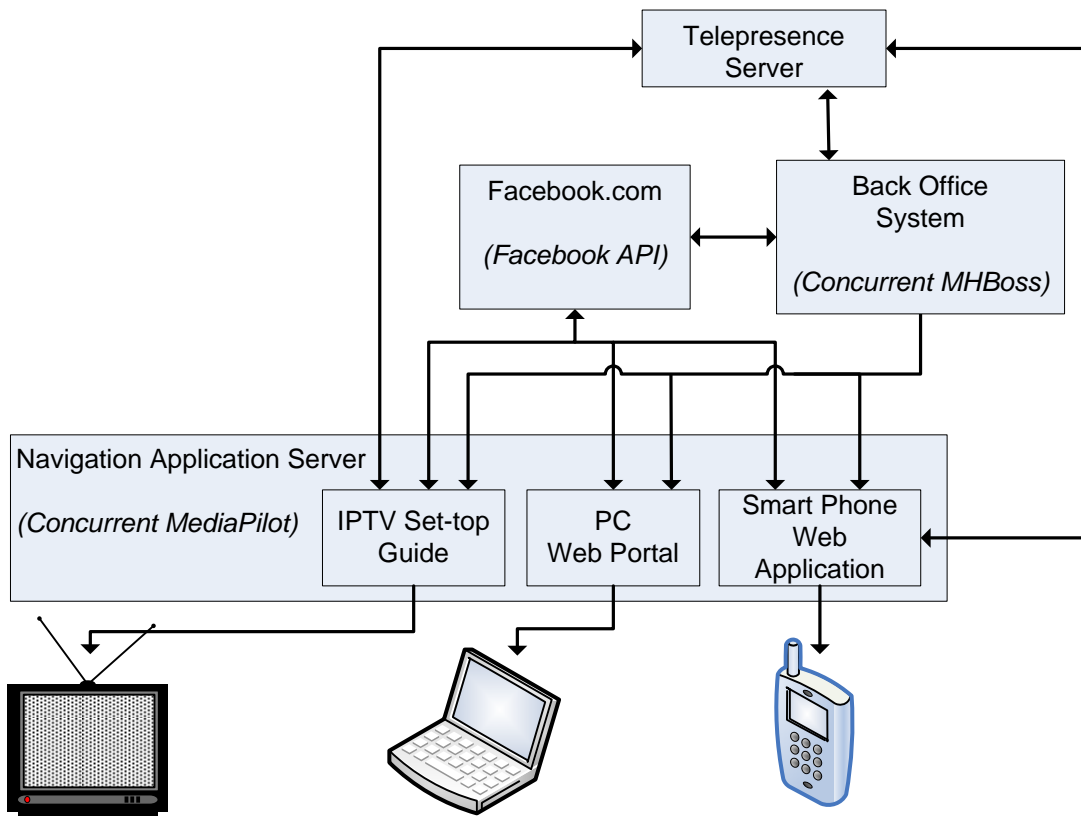


Figure 7 - Convergence of presence

Providing a converged sense of telepresence across platforms and devices is relatively straightforward as described below:

1. Social networking websites like Facebook and Twitter provide their own APIs in the form of web services that allow presence within those websites to be extended to a custom

website like the PC web portal, the IPTV set-top guide and the smartphone web application. These APIs provide “out of the box” access to a world of new potential subscribers.

2. Tighter integration with mobile devices or the set-top guide and a *telepresence server* might be desired in order to deliver platform specific activity status (e.g. “on the phone,” “watching television,” etc.) in addition to website specific activity status (e.g. Facebook). The choice to use a telepresence server or service is made clear when it is evident that your subscribers are demanding additional presence and status information beyond what can be provided intrinsically by a website like Facebook or Twitter.
3. A telepresence server can be developed and hosted using web services and cloud computing such as Amazon’s EC2, or can be purchased from a telepresence service provider. With such a service, custom presence and activity states and status may be hosted in a secure, scalable and cross-application manner. This means new capabilities surrounding presence and activity state. For example, friends and families can watch the same program at the same time, and even comment to one another through instant messaging. Or, you can avoid the phone call to a friend to ask them “are you watching,” or “did you just see” types of questions. The possibilities are endless.

In Conclusion

“When all is said and done, more is said than done.”

— Lou Holtz

In a previous section, a network DVR solution was described that exploited convergence. In such a solution recorded programs can be streamed securely to the IPTV set-top, the PC browser and a mobile device like a smartphone. Technologies and standards exist today for building this converged solution. Additionally, a “mashup” solution was presented, which marries search terms, shopping website wish lists and a recommendations engine in order to solve one crucial problem facing the consumer.. Solving the problem of “what to watch” is within the grasp of most organizations today as the standards and technologies are largely common and off-the-shelf. Lastly, a “converged presence” solution was presented that described how the consumer and his activities can be tracked across platforms and across devices in order to unite subscribers and drive new subscriptions.

In summary, there are several key “take away” items from the converged solutions and convergence model described.

1. Products, technologies and standards exist today to realize the converged solutions described and therefore there are very few reasons to wait.
2. The “browser” has become the ubiquitous platform available on all devices. That means that W3C standards are critical to getting multi-platform solutions deployed quickly.
3. The key delivery a converged experience is to develop multiple web applications today, one for each platform (IPTV set-top, PC portal, and smartphone guide), and integrate *aspects* of common features like presence, network DVR and recommendations across each platform and device.

4. The convergence is at the function and the experience level. Make the devices and the platforms work together, gaining capabilities and values as a whole from by exploiting the strengths of each individual platform and device.

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