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Tech Investment Themes 2011: The Converged Digital Living Room

Summary

Consumers today are taking more control of how they use media, content and entertainment. In particular, they want to buy and generate content once and then enjoy it on any device. As more content on the Internet migrates from analog to digital format, we believe more homes will use their living room as the hub of digital content distribution and enjoyment. We call this vision "the converged digital living room."

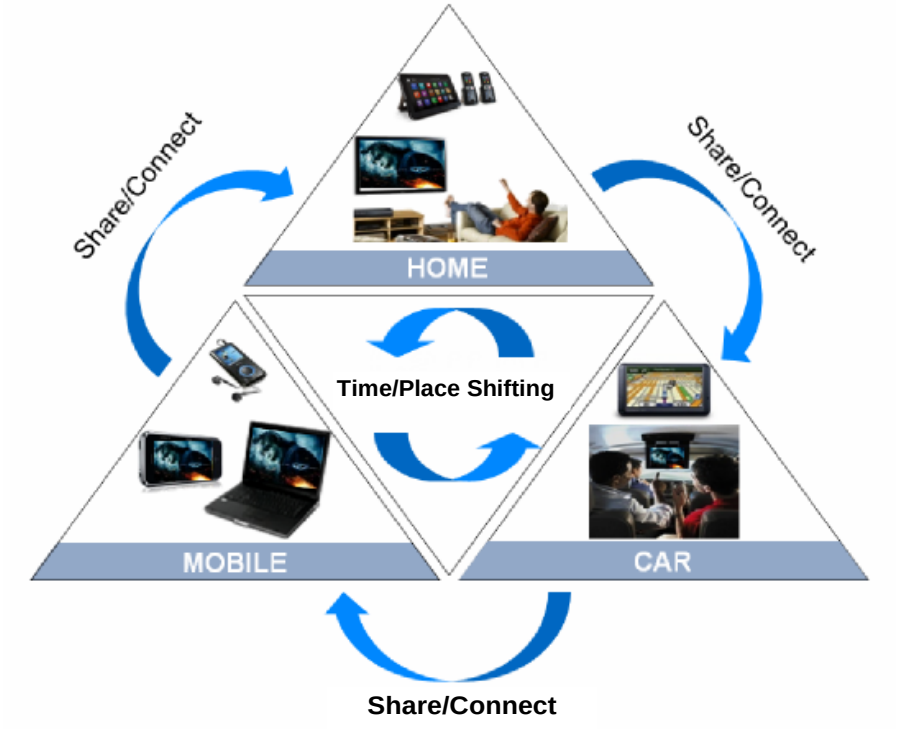
There are three underlying trends that support our thesis: First, we are going from a computing world dominated by one device (the PC) to one with many devices – smartphones, tablets, netbooks, laptops, MP3s, desktops, etc. This is known as computing device fragmentation. Second, almost all consumer electronic (CE) devices are already shipping with built-in network connections. These "smart" devices enable content in one device to be easily shared among all devices within the home network. Third, is the increasing popularity of online video streaming. As evidenced by the rapid growth of Netflix's subscriber base and the popularity of YouTube videos, more Americans are spending their time online watching movies and video clips.

Our report narrows down the broad trend of the converged digital living room to actionable ideas. We identify three companies that we believe have good exposure to a particular investment theme. Finally, it is interesting to note that the influx of more smart devices has not made our daily lives more convenient. Since the new devices have their own technology format, it makes it more confusing for the average consumer. We believe that whoever comes up with a well integrated easy-to-use interface that connects any handset and mobile device to the digital living room is well positioned to dominate the consumer electronics industry for the next decade.

I. The Converged Digital Living Room

Most consumers today want to buy and generate content once and enjoy it on any device. The bulk of audio and video content, from Hollywood to YouTube, is digitally generated, which allows it to be saved to a storage device. Apple, Netflix, BlockBuster and Amazon, among others, offer movie download or streaming services while almost any song can be purchased via iTunes, Napster and a myriad of other companies. Consumers can then watch on their living room TV the content purchased through iTunes, or generated on their phones or digital camcorders, or video files stored on their home computers. We call this vision "the converged digital living room," and we believe that this is the holy grail of the consumer electronics industry. Figure 1 shows the continuous convergence of TVs, PCs and various other mobile devices in the living room.

FIGURE 1: Digital Living Room as Central Hub of All Connected Devices



Source: Adapted from Detecon, 2010

It is interesting to note that as more smart devices play a central role in our daily routines, this would make our lives easier. However, that has not been the case so far. A variety of different technology formats – from Blu-ray, Bluetooth, MP3, HD, 3D and whatever is coming next, has instead made things more complex and confusing for the consumer, and not necessarily more convenient. In our opinion, supremacy in consumer electronics in the near term will go to whoever successfully connects handsets and mobile devices to the digital living room. At some point, the home network will further evolve where it will be required to intelligently control virtually any device in the home – from TVs to thermostats, door locks to DVRs – no matter where home owners are located, by using one easy-to-use interface. We believe the first company to create and sell a compelling, well integrated "any device solution" will dominate consumer electronics for the next decade.

A. Time and Place Shifting of TV Programming

Time Shifting of TV Programming: Time shifting is the recording of programming to a storage medium to be viewed or listened to at a time more convenient to the consumer. Typically, this refers to TV programming, but can also refer to on-line content found in YouTube or radio shows via podcasts. In recent years, the advent of the digital video recorder (DVR) has made time shifting easier, by using an electronic program guide (EPG) and recording shows onto a hard drive. Some DVRs have other possible time shifting functions, such as being able to start watching the recorded show from the beginning even if the recording is not yet complete. In the past, time shifting was done with a video cassette recorder (VCR) and its timer function, where the VCR tunes into the appropriate station and records the show onto video tape.

How Does a DVR Work?

The DVR is an advanced digital set-top box used to both digitally record, and play back programming. Your network operator (cable company, telco, satellite company, etc.) sends the content (TV shows, news, etc.) and you plug your line (feed) from your network operator into the DVR unit using a compression scheme such as MPEG. The unit saves the incoming live TV signal on its hard drive. In general, the viewer's DVR unit compresses the signal of the live TV show, saves it on the hard drive and then with a very short delay, the DVR plays it for the viewer. The viewer is literally watching TV from their hard drive, not straight from the antenna, satellite, telco or cable connection as they're used to. TiVo, DirecTV and other US cable or satellite subscription services offer DVR set-top boxes, often for an additional monthly fee.

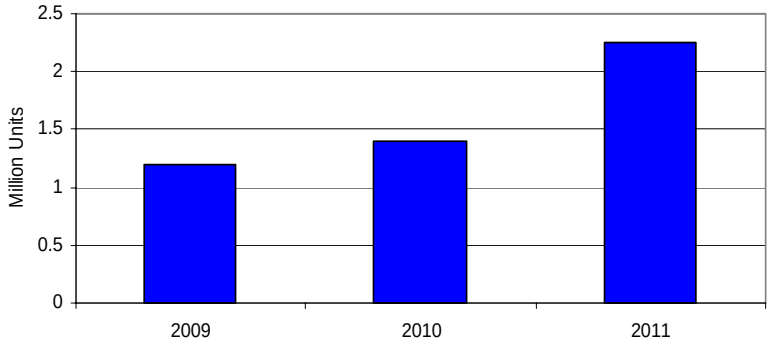
While TV time-shifting is a term most often used in regard to digital video recorders (DVRs), it can also be relevant to any video recording and viewing device that has access to an adequate-size hard drive, such as a video iPod or PC or a gaming console. With a PC-based DVR, software is typically downloaded to the computer and the computer's hard drive is utilized. (A TV tuner card or equivalent will also be necessary.) Viewers can watch TV on their PCs and stream their PC-based, or gaming console-based DVR recordings to their TV via a media extender.

Place Shifting of TV Programming: Place shifting is the viewing and / or listening to live, recorded or stored media on a remote device (e.g. mobile PC, iPod, etc.) via the Internet or over a data network. Multi-room DVR services allow for both time and place shifting of recorded media. A multi-room DVR consists of one main DVR which stores a household's purchased and / or recorded media. That saved media can then be accessed by other televisions within a home. In order for secondary TVs (e.g. a TV in a bedroom) to access content saved on the home's main DVR, a home network must be configured. This networking of TVs, set-top boxes and PCs can take place using either a home's existing copper phone lines (through the HomePNA standard), existing electrical wiring (using the HomePlug standard) or a home's existing coaxial (coax) cable (via the MoCA standard).

B. Converged Digital Living Room – Potential Obstacles to Adoption

We believe the converged living room will begin to gain traction in 2011, because CE manufacturers are trying to monetize the potential of equipping their devices with network interfaces and partnering with other ecosystem players to enable Connected TV service offerings. However, there are still obstacles to rapid adoption. Over the past several years, most products designed to connect the Internet, PC and TV have had difficulties, with only market leaders Apple and Roku achieving what can at best be called moderate success. Moreover in 2010, shipments of digital content appliances were just over a million units annually (see Figure 2) – a mere pocket change in consumer electronics terms.

FIGURE 2: Worldwide Standalone Digital Content Appliance Shipments



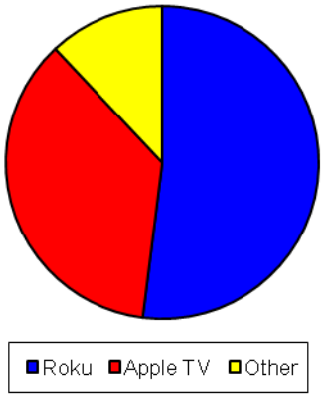
Source: Digital Digest December 2010

The key challenge for these products has not been technology or consumer desire – by most accounts consumers are interested in easily accessing programs from multiple sources. The challenge is all about existing digital entertainment business models and value chains, and how the content providers that control them can find additional revenue in this new pipeline.

For economic reasons, content providers have been highly restrictive on how they allow content to get from the Internet to the TV. Cable operators (Multiple Service Operators or MSOs) are concerned that the transfer of video content between devices could reduce the industry's revenue potential. If operators make it easy to play content from other devices on set-top boxes, it is highly likely that on-demand movie sales could suffer. On the other hand, the transfer of digital content from set-top boxes to handsets makes sense for MSOs because it does not impair their ability to rent movies. However, moving content freely between PCs and mobile devices into the set-top box would be a threat to their business model.

The relative success of Apple TV and Roku / Netflix (see Figure 3) is attributable to deals they could secure for mainstream content. The limited content also comes with access rights: Apple's model is rent or buy; Netflix only offers select titles via streaming. In both cases, content providers were offered a clear path to revenues, via transactions or subscriptions, respectively.

FIGURE 3: Worldwide Digital Content Appliance Market Share 2009



Source: Digital Digest December 2010

This is what Google TV currently lacks, and why nearly all of the major content providers (including Hulu, and most recently Fox) have blocked access of their online video content to Google TV. The platform, which may offer the most integrated Internet / TV experience, seems just too great a threat for content providers to adopt without greater assurances that existing value chains won't be cannibalized.

Another obstacle is the threat of piracy. Piracy is a concern, because it is much easier to hack digital rights management (DRM) on a PC than within the protective confines of closed systems like set-top boxes. Hence, the media industry fears that unshackling VOD content from the limits of set-top boxes may be a bad idea. It is clearly only a matter of time before the majority of broadband connections are fast enough to deliver high-definition video (HD) over IP, which would allow media companies to serve their content protected by strong DRM and around the MSOs' wall garden. However, the longer it takes for video to flow freely, the longer the MSOs can protect their current business models.

C. Rapid Rise of Over-The-Top (OTT) Video Content and IPTV Services

One way the market has gotten around the cable industry's reluctance in providing more content online is through over-the-top (OTT) content, especially long-form premium videos from providers such as Hulu, Amazon VOD, Netflix and many others. We believe OTT content providers can pressure cable MSOs and carriers to increase their IPTV offerings. Especially as cable operators realize that they could be left out of the value chain, they will begin to work on enhancing their TV or IPTV services and to integrate them with connected entertainment equipment, especially TVs. For example, Time Warner is currently running trials of IP-based video delivery using Microsoft's Mediaroom middleware, the same middleware running on IPTV set-top boxes.

Currently, hardware OEMs and content providers are moving forward in integrating OTT video content into their hardware and services. Viewers now have numerous alternatives for consuming video on their home screen, either through on-demand or in real time, long-form or

short-form, professional or amateur. Listed below are some examples where OTT content has been adopted by leading hardware OEMs and online content providers:

- Netflix members can stream movies and TV episodes to their Wii game console, a deal that follows on from similar launches with Microsoft Xbox and Sony PS3.
- Panasonic and Phillips offer Internet-connected TVs including integrated VoD software.
- Google and Intel have teamed up with Sony to develop an Android-based platform called "Google TV", letting users perform their Internet functions like search while also pulling down web programming like YouTube videos or TV shows from Hulu.
- The Boxee Box offers an interface based around a video app store and app payment solution.
- GoMees' Opera-driven mCube box and platform will enable carriers to provide personalized video content on all screens (TV, PC and mobile) with social features and widget support.
- Wal-Mart announced in February 2010, its intent to acquire online video-on-demand provider VUDU, which differentiates its service by supporting HD content (1080p format) and whose platform is already integrated with a large number of broadband-enabled TV sets and Blu-ray players.

In addition, Yahoo!, which has been actively marketing its Connected TV platform since early 2009 (more than 2 million TV sets equipped with Yahoo!'s platform sold since then), is continuing to line up industry partners to further enlarge its footprint in this segment. It has already expanded its line of partners from TV manufacturers like LG, Sony, Samsung and VIZIO and content partners such as NBC, CNBC, Napster and the Weather Channel, to chip companies like Sigma Designs (SIGM) and MIPS Technologies (MIPS). This indicates that Yahoo! intends to possibly go beyond the TV set and address various types of embedded devices on the consumer electronics field with its TV platform. In 3Q 2010, Yahoo! signed a contract with the largest TV manufacturer in Europe, the Vestel Group (which accounts for 16% of the LCD TV market and 25% of the digital set-top-box market in Europe), to ship Yahoo! Connected TV to more than 40 countries across Europe starting in 1Q 2011.

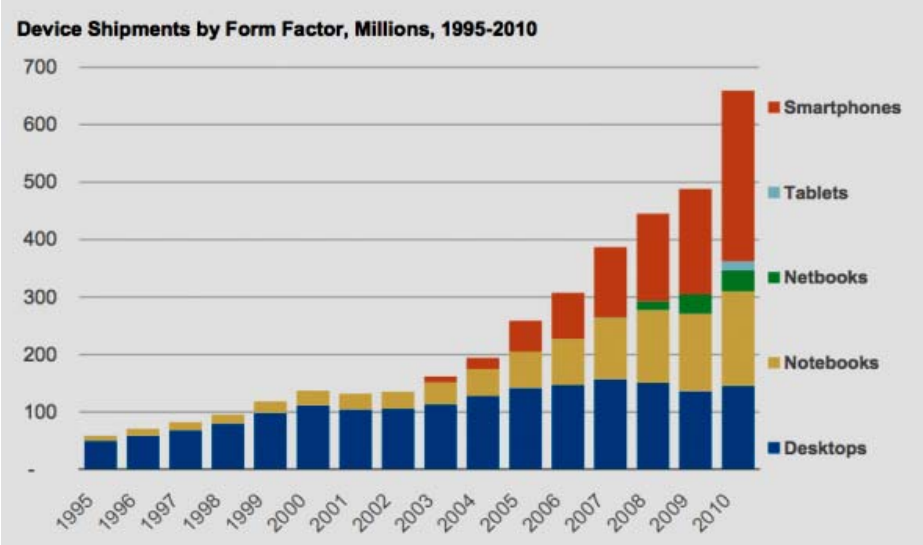
II. Key Market Drivers for the Converged Living Room

Three important catalysts will drive the trend towards the converged digital living room: 1) computing device fragmentation; 2) ubiquitous network connectivity of consumer electronic devices and 3) the increasing popularity of online video streaming.

A. Market Driver #1: Computing Device Fragmentation

We're currently moving from a computing world dominated by just one device (the PC) to one with many devices (smartphones, tablets, laptops, desktops). The Consumer Electronics Show (CES) 2011 showed that we have reached an inflection point where the transition in video viewing is moving away from STBs, TVs and Blu-ray, and more towards personal devices, be they tablets or smartphones. Figure 4 shows the extent of computing device fragmentation that is currently underway.

FIGURE 4: Computing Device Fragmentation



Source: IDC, Gartner, Morgan Stanley Research

Moore's law enables flash memory to provide enough storage for a decent library and in-home networking allows mobile devices to control and to push streamed or broadcast content between boxes and screens. We believe this product cycle is still in the early stage. NPD recently found that fewer than 20% of Americans have yet to experience either a tablet or smartphone, and that might be true for most developed markets. However, the first effects of that change can now be seen by a surprising number of connected TVs that can be controlled with an iPhone or Android device.

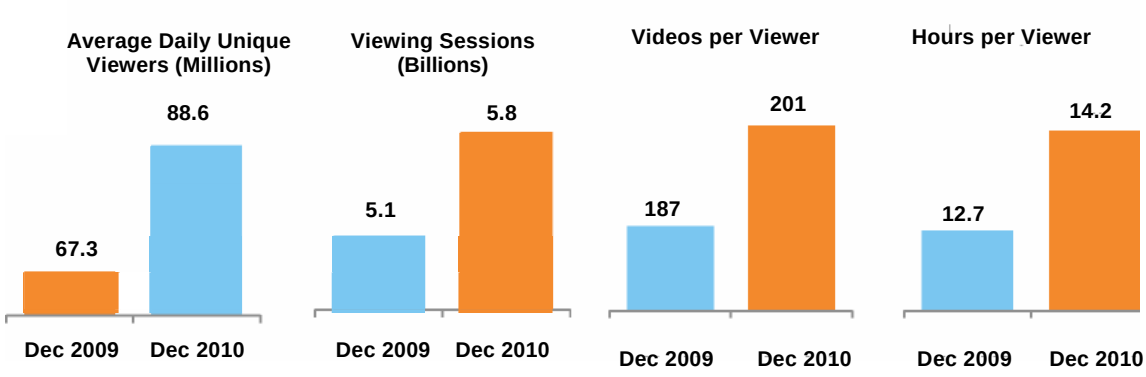
B. Market Driver #2: Network Connectivity of Consumer Electronic Devices

Most video consumer electronics devices are being designed to connect to the Internet. These "smart" devices such as Blu-ray DVD players contain WiFi to connect to services such as Netflix. Digital TVs are also adding Internet capability via WiFi. Web content today is consumed in a variety of ways over a plethora of devices. According to In-Stat, the average US consumer household will own anywhere from 5 to 10 Web-enabled CE devices by 2014. In-Stat also found that over 53 million US broadband households currently view TV programs over the Internet with 85% of these users already viewing online TV content on multiple devices, including personal computers, TVs, and mobile handsets. By 2014, there will be over 200 million Web-enabled wireline consumer electronic devices in operation in the US. When PCs and mobile devices are added in, the average US consumer will have between 5 to 10 Web-enabled devices to choose from for viewing Internet-based digital entertainment.

C. Market Driver #3: Popularity of On-Line Video / TV Streaming

Online video streaming has seen a continued increase in adoption. While Hulu continues to drive a large portion of the online TV viewing activity, other major broadcast TV sites are playing an increasing role. In Q4 2010, Hulu accounted for 19.4 billion minutes (323 million hours) of online TV viewing, up 17% from the previous year. Together the five major broadcast TV sites (ABC, CBS, NBC, Fox and the CW) account for 9.7 billion minutes (162 million hours), which equates to half of the total time spent viewing video on Hulu, but grew at approximately five times the rate at 82%. The total combined time spent viewing online TV on Hulu and the five network sites grew 33% over the past year. Figure 5 shows the growth in US online video market from December 2009 through 2010.

FIGURE 5: Growth in Total US Online Video Market



Source: comScore Video Matrix

The online video market continued to gain momentum in 2010, with an average of 179 million Americans watching video each month. Engagement levels also rose during the year, with viewers watching online videos more frequently. More than 88.6 million people watched online video on an average day in December 2010 (up 32% from December 2009), while viewing sessions totaled 5.8 billion for the month (up 13%). Americans also spent a significantly higher number of hours viewing online video in 2010 versus the prior year due to higher content and

more video ad streams. The average American spent more than 14 hours watching online video in December 2010, a 12% increase from last year, and streamed a record 201 videos, an 8% increase.

III. Investment Themes / Favorite Names

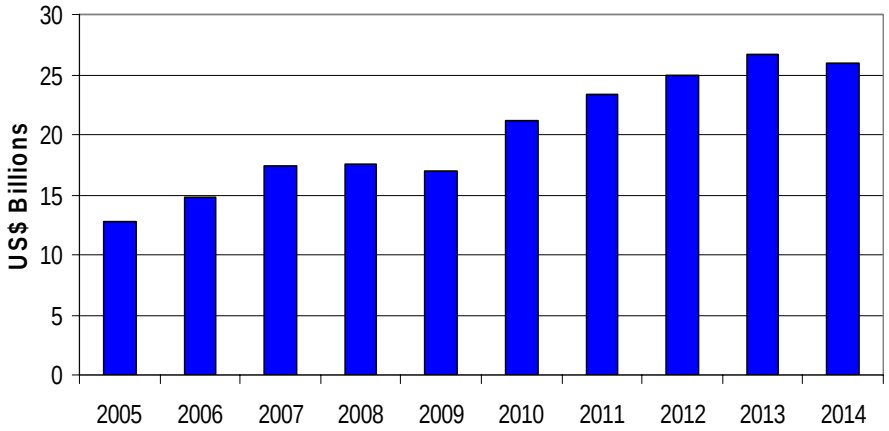
Table 1 summarizes the three investment themes based on our overall thesis of the converged digital living room along with three companies that we believe have good exposure to a particular theme.

TABLE 1	
Investment Theme	**Favorite Names**
1) Consumer SoC	Cypress Semiconductor (CY) Sigma Designs (SIGM)
2) Digital Set-Top Box	Cypress Semiconductor (CY) Sigma Designs (SIGM)
3) Smart TV / IPTV	Logitech Intl. (LOGI)

A. Investment Theme #1: Consumer System-on-Chip (SoC) Market

Growth in networked high-definition (HD) video requires the use of media and video processors. These processors are based on a system-on-a-chip (SOC) designed to deal with digital data streaming in real-time. Unlike graphics processing units (GPUs) which are used for computer displays, media and video processors are meant for digital televisions, Blu-ray players, digital media adapters and set-top boxes. Telecommunication service providers like AT&T were the first to roll out HD video services over IP-based networks. Figure 6 shows the total addressable market for consumer electronics SoCs – portable media players, digital TVs, game systems, set-top boxes, DVD and other CE devices. This market approximates $27 billion and is forecasted to grow at a 7.25% CAGR over the next five years.

FIGURE 6: Consumer System-on-Chip (SoC) Market



Source: IDC, Benchmark Co. LLC estimates

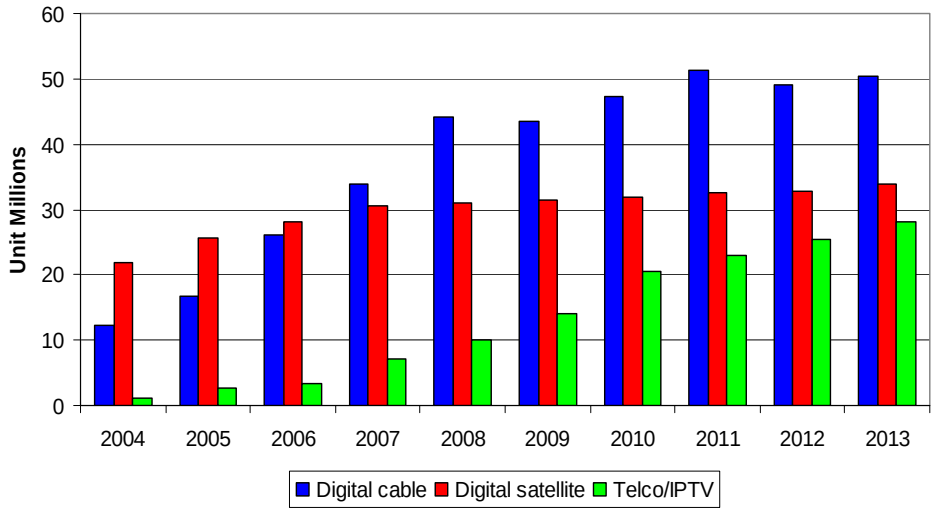
Besides IPTV services, there are two other growth drivers for HD video content over IP-based networks. First, cable MSOs are gradually ramping up their IP-based delivery systems. Time Warner is currently running trials of IP-based video delivery using Microsoft's Mediaroom middleware, the same middleware running on IPTV set-top boxes. Second, most video consumer electronics devices are connecting to the Internet. Devices such as Blu-ray DVD players contain WiFi in order to connect to services such as Netflix. Digital TVs are increasingly adding WiFi in order to stream HD video around the home.

Favorite Names:
1) Cypress Semiconductor (CY) – Cypress manufactures touchscreen modules for the smartphone and tablet markets. We believe that as a user interface, touchscreen functionality will become increasingly popular with consumer electronic devices. The company entered the touch screen market in 2008 and rapidly gained share at key handset OEMs such as LG, Samsung, HTC and RIMM. The Computation and Consumer Division (CCD) supplies touch screen modules and makes up about 40% of CY's total revenue. The division focuses on PSoCs (programmable systems-on-chips) for multiple applications, especially touch handsets, which we believe will be the largest driver for CY as the touch screen handset market continues to grow in 2011. PSoC products are used in consumer applications such as handsets, MP3 players, mass storage, household appliances, laptop computers, and toys. We expect CCD to be a large revenue contributor (20-25%+ y/y) in 2011 as demand for PSoCs continues to gain momentum.
2) Sigma Designs (SIGM) – More than two-thirds of Sigma Designs' revenue is derived from the sale of media and video processors. These media processors are targeted for digital televisions, Blu-ray players, digital media adapters and set-top boxes. In particular, Sigma's chips are geared toward processing high-definition video over IP-based networks. We believe that as more video centric devices are designed for streaming HD video around the home, Sigma's media processor design wins should increase. The specific niche SIGM targets is about $600 million in size and should grow at a 20% CAGR over the next five years.

B. Investment Theme #2: Worldwide Digital Set-Top Box Unit Sales

The size of the IPTV set-top box market in 2010 is estimated at around 20 million units globally and is the fastest growing segment of the digital set-top box market. This market will continue to be fueled by net new subscriber growth for IPTV services in regions such as the US, Europe, India, China and Korea. While the IPTV set-top box market grew fastest between 2005 and 2010 (see Figure 7), IDC expects unit growth to continue at a 17% CAGR through 2013.

FIGURE 7: Worldwide Digital STB Unit Sales



Source: IDC, Benchmark Co. LLC and Sigma Designs

Favorite Names:
1) Cypress Semiconductor (CY) – Cypress participates in the STB market through its Data Communications Division (DCD), which makes up approximately 12% of total revenue. The DCD manufactures the West Bridge peripheral controllers that are currently used in RIMM and Motorola smartphones. As more CE devices become network-enabled, consumers will download Web content to these devices and eventually stream them over to their TVs. These controllers connect the various peripherals, creating ultra-fast digital file transfers while at the same time relieving the main processor in these devices from the data-intensive operations. We expect DCD to be a large revenue growth driver in 2011, with revenue likely increasing between 20–25%+ y/y, driven by the growth of Web-enabled devices and the ever growing trend of streaming digital content from the Web to the TV.
2) Sigma Designs (SIGM) – Sigma's multimedia chips are commonly found in set-top boxes and high-end television sets. Whether the system runs on vanilla Linux software, some variant of the Google Android platform, or even a mobile version of Microsoft Windows – whatever media delivery product an OEM wants to build, there's probably a Sigma design for it. In fact, the company is a market leader in this niche. Its customer list includes Motorola Mobility, Cisco Systems, and Samsung among others. Telecoms with Internet-based TV services are a particular market of interest, as those system partners are shipping Sigma-based boxes to IPTV solutions like AT&T's U-Verse. Verizon is even expanding beyond IPTV by using Sigma's chips in new home monitoring services. As digital TV services expand worldwide, Sigma is perhaps the purest play on that market. SIGM's competitors in this space include ST Micro and Broadcom. Due to a product line restructuring, management projects that the next couple of quarters in 2011 will be slow – but we think the weakness will not last long after that.

C. Investment Theme #3: Potential Upside for Connected TV ("Smart TV")

Connected TV provides television along with built-in access to the Internet. According to channel checks, launches of connected TVs should further accelerate over the next two years. Depending on further technological development, connected TV could potentially perform the following functions:

- ***Movie rentals and purchases:*** Allow users to select movies directly from their couch.
- ***Video calls from the couch:*** Make video calls a standard for each living room. This might be possible either through an external camera positioned somewhere in the living room or a TV integrated camera (similar to notebook integrated cameras).
- ***Surf the Internet while watching TV:*** A multi-window display allows watching TV while at the same time accessing networking sites like Facebook, video sites like YouTube, online auctions sites like eBay, or online photo albums.
- ***Listen to PC music over the home theater system:*** Access music, video and photos on the PC and music streaming to the home theater system.

We believe the key to success for the connected TV is increased user friendliness. An all-in-one device – simple to navigate – would reduce the complexity of the home entertainment system and make the digital living room a reality for users with limited IT knowledge. By 2015, In-Stat predicts there will be 1 billion Web-enabled, stationary CE devices in operation worldwide. Moreover, smart TVs and Blu-ray players (that support online apps) will constitute over 50% of all Web-enabled CE device shipments worldwide. North America and Europe will remain the primary regional markets for Web-enabled CE devices. Over the next five years, both the North American and European markets will exhibit a 23% CAGR and account for nearly 70% of the global market.

Favorite Name:
1) Logitech International (LOGI) – Logitech is the leading pure play in branded hardware peripherals for the PC / Mobile and DTV markets, and the global leader in computer mice and webcams. The Harmony and Revue products position the firm as a leading supplier of peripherals for use in the digital living room, for connecting the consumer to the internet, digital music, and for controlling multiple devices. The connected living room is at the cusp of a major disruption with major OEMs committing to making the majority of HDTVs and Blu-ray players Internet connected by 2012. LOGI, with the Harmony acquisition, has already tapped into demand for products that unify remote controls of the typical home theater system. The "Google TV" Revue product begins to provide a powerful user-interface for consuming digital media from the Internet via the DVR. We believe the likely development of an application ecosystem for DVRs and broader access to premium Internet video content will spur adoption of the Revue product. Moreover, there are adjacent opportunities for LOGI in home energy management, security, and smart grid connectivity. Finally, the LifeSize solution propels LOGI into the fast-growth video teleconferencing and telepresence market with a solution that has a low total cost of ownership and that seems well positioned for the under-penetrated SMB / Enterprise market.