

Integrating Television, PC and the Internet

A research paper into an emerging technology trend

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Executive summary

Introduction

2004 saw a dramatic flurry of activity across the entire value chain for integrating PC, Internet and multi-media with the TV. Why are big companies like Microsoft, Sony, NEC and Intel involved? Do consumers really want Web services on their TV set? Who are the key players and what are the different technologies? The objective of this paper is to assess the technology issues, requirements, constraints and alternatives.

This research paper was developed by Open Solutions as part of our ongoing work in tracking and analyzing emerging technology trends.

Summary

The study analyzes three technology alternatives and goes on to examine how the recommended technology fits into a competitive strategy. We follow Michael Porter's model of strategy as resting on a tightly fitting system of unique activities.

The three technology alternatives examined were:

- PC and media extender that relays content from the PC to the TV
- A media station that attaches directly to the Internet and transmits to the TV
- An IP TV set top box that enables transmission of Web content to the TV

An analysis of competitive strategies suggests that:

- Generally, this is a game for big players with a strong presence in consumer markets
- However, even small players may find opportunities in niche markets using unregulated TV over Internet or Web to TV content delivery. For example, a *media station* is an excellent way of serving up interactive Web content to underserved segments like the retired persons market that watch a lot of TV, have general interests and need to socialize.

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Background

What are the market drivers?

Why are big companies like Sony and Intel involved?

Is this consumer electronics gadget?

Are we witnessing the beginning of TV-PC-Web convergence?"

To understand the answers to these questions and others, we need to look at the motivation for change inside three groups – consumers, Telco service providers and content providers.

From the standpoint of the consumer:

1. The home PC stores growing quantities of digital media assets, but the living room experience is still the preferred choice when it comes to watching video. As a result, there is a need to convert PC content to the living room TV set.
2. Home Wifi networks are becoming prevalent and CE (consumer electronics) firms capitalized on the need for consumers to listen to music and watch video anywhere in the home without being tethered down to the PC
3. In Israel and elsewhere, consumers hate the cable companies and tolerate their ISP's. Check your email; you may have received an offer like this recently:

Dear Digital-Cable-TV Member
Did you know cable-TV-filters Permits consumers to get any-amount of in-demand-Payperview-movies, mature channels and sports for nothing.
<http://www.100100008159441947.resent.59.haynetsv.com>

4. People want freedom of choice and don't want to pay for content they don't want.

Telco service providers are threatened by cable operators; and in response are rolling out next generation IP TV networks that require new (incompatible) IP set top boxes.

From the standpoint of the content creators and providers:

1. The barrier to distribution of video and TV programming is much lower on an IP network than on a broadcast TV network
2. The creation of interactive Web content is much cheaper than developing interactive TV programs using current generation of set top boxes.

<h4>What are the product directions?</h4>

HT PC (Home theater on PC)

Media PC (package a networked PC, DVD and a TV receiver into one box)

Networked DVD, a DVD on a home Wifi network

IP TV – television over an IP network

What is happening in the industry?

Major consumer electronics firms (Sony, HP, BenQ, LG, etc) are involved with media PC's, and networked DVD's have been on the market since 2003. Major datacom manufacturers like Cisco and D-Link sell media extenders and Microsoft promotes its Windows XP Media Center 2005, which is based on the notion of taking rich media from the PC in the study to the TV in the living room. Finally, chip companies like TI, Intel, Freescale and Sigma Design are involved in this emerging industry as well as an Israeli startup, Softier (www.softier.com) that is working with TI developing "Media Linux".

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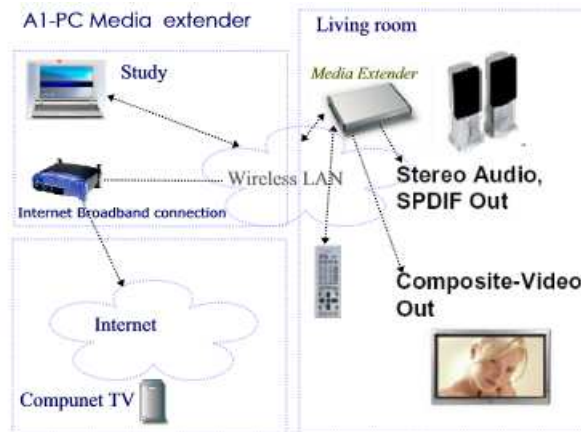
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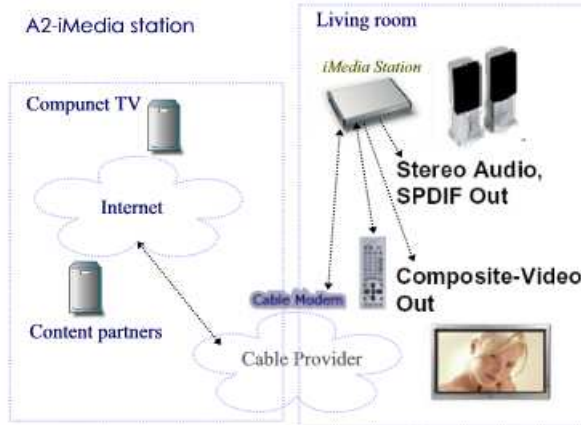
Technologies

We have identified three technology trends following conversations with vendors.

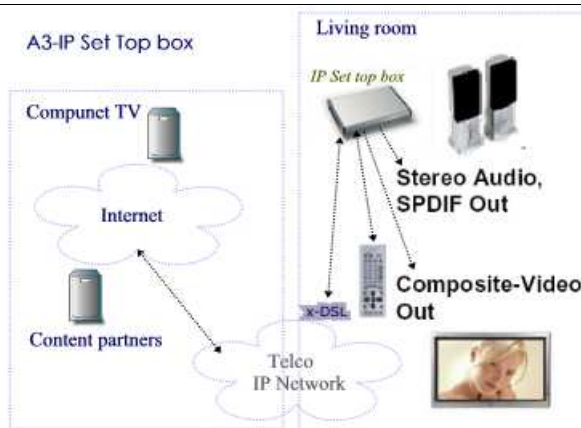
A1: Media extender that transmits content from the PC to the TV over home Wifi network.



A2: Media station that attaches *directly* to the Internet using a cable (or ADSL) modem and transmits content from Internet Web servers to the TV.



A3: IP Set top box that attaches *directly* to a Telco x-DSL modem and transmits content from the Internet Web servers to the TV over the Telco's all-IP network.



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A1: Home wireless network and media extender - how does it work?

1. Control menus are displayed on the TV set using a “10 foot user interface”
2. Using the remote, the user can choose a file to play on the TV set or an interactive game
3. In order to play a file, the PC install and run a local Web server that listens for play requests, accesses the local disk and streams the media back to the media extender that converts it into TV format.
4. In order to interact with a multi-media game that runs on the client’s Web server, requests are sent to the PC, routed to the Web server, responses are sent back to the PC and routed to the media extender. The PC “server” may perform local caching of content in order to improve the end-user experience and reduce network latency.
5. Most media extenders support Internet browsing using the remote and the TV set

Pros

Almost off-the shelf hardware

Cons

1. Most media extenders don’t support Flash and most Web content is not suited for TV
2. The current systems are not Web-interactive – i.e. they don’t send a request to the Web and return a response. They use locally downloaded files stored on the PC in order to reduce latency.
3. The user browsing experience with the media extender is terrible.
4. Global language support is poor
5. The media extenders are expensive. Compared to a digital set-top box that costs less than \$100, media extenders cost between \$250 and \$1500 (Linksys).
6. The software development environment for media extender is poor

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A2: Home media station-Internet to TV- how does it work?

1. The media station runs the Linux operating system and can run applications such as a Web browser or an interactive game client that communicates with a Web server. The media station outputs TV grade video supporting standard codecs for Windows Media Player 9, H.264, MPEG4 and MPEG2.
2. The media station hooks directly to a cable modem, next to the TV set and accesses content on Web servers using the http protocol and streams the media to the TV.
3. Control menus are displayed on the TV set using a “10 foot user interface”
4. Content is supplied from Internet Web servers; such as digital photos (www.ofoto.com) and educational games (<http://www.renaissanceconnection.org>)
5. In order to interact with a multi-media game that runs on the client’s Web server, requests are sent to the media station using a remote and routed to the Web server. The media station may perform local caching of content in order to improve the end-user experience and reduce network latency.

Pros

1. Simpler solution than the media extender that does not require integration with the PC or having a home Wifi network.
2. Provides better value than a media extender - can run videophone, a local Web server and as a CE product is easier to use than a PC.
3. Compatible with future solutions for IP set-top boxes.
4. Excellent and familiar application software development environment
5. Can OEM client software into potentially very large install base of Telcos.

Cons

6. New technology – you’re at the bleeding edge
7. Still need to make sure the content is “TV-friendly”

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A3: IP Set top box - how does it work?

1. The IP STB runs the Linux operating system and can run applications such as a Web browser or an interactive game client that communicates with a Web server. The media station outputs TV grade video supporting standard codecs for Windows Media Player 9, H.264, MPEG4 and MPEG2. It uses the same platform as the media station.
2. The media station hooks directly to the Telco IP network using a x-DSL modem, next to the TV set, accesses content on Web servers using http and streams the media to the TV.
3. Control menus are displayed on the TV set using a “10 foot user interface”
4. Content is supplied from Internet Web servers; such as digital photos (www.ofoto.com) and educational games (<http://www.renaissanceconnection.org>)
5. In order to interact with a multi-media game that runs on the client’s Web server, requests are sent to the media station using a remote and routed to the Web server. The media station may perform local caching of content in order to improve the end-user experience and reduce network latency.

Pros

1. Direct connection to a digital IP network of a Telco provider; better and more reliable connection than cable modems.
2. Provides better value than a media extender.
3. IP STB is owned by the Telco; providing and provisioning the box is not your problem
4. Can OEM client software into potentially very large install base

Cons

5. Few Telco service providers are ready with the network
6. The IP set-top boxes are still quite new and not widely available
7. New technology – you’re at the bleeding edge
8. Still need to make sure the content is “TV-friendly”

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Requirements/Alternative Matrix

Technology alternative recommendation

There are three alternatives as described above: the media extender + PC approach, the media station and the IP STB (Set-top box) alternatives. We recommend A2 for several reasons:

1. Simpler than A1 to install and deploy. Since it is based on Web server/browser architecture – all software and content is managed centrally - reducing cost of operation and customer support.
2. Available now, as opposed to A3, which depends on the Telco to provide IP TV service.
3. Can run local application software. While not a PC, it provides more value than a media extender as can be seen from the comparison matrix.
4. Advantage of working with a local vendor (Softier) as opposed to working with a Korean or US vendor.

| Requirements | Alternatives | | |
|--|--|--|---|
| | A1-Media extender | A2-iMedia station | A3-IP STB |
| Macro-economic | | | |
| Cost | \$200-1500 | \$200-250 | < \$100 in large quantity |
| Availability | Now | 3-6 months | 12-18 months |
| Requires home Wifi network | Yes | No | No |
| Service provider synergy | Arguable | ISP | Telco |
| TV Content delivery | | | |
| Serve a number of TV sets in the home | One/TV | One/TV | One/TV |
| Enable a user to run a PC application and pipe output to TV | Yes | No | No |
| Support wireless access of 200 square meter living unit | Yes | - | - |
| Enable split screen – TV (normal reception from cable provider) and Internet content | No | Yes | Yes |
| Video phone option in split screen | No | Yes | Yes |
| Enable surfing the net without a PC | No | Yes | Yes |
| Transmit to an unused channel (55, 66, 77) | Yes | Yes | Yes |
| Ability to send messages between units | PC to Web site | Via Web site | Via Web site |
| Download TV programs into PC (or PTV) hard disk | Yes | With PVR | With PVR |
| Remote control | | | |
| System login starts with operator home page | Yes | Yes | Yes |
| After login RC startup overrides current TV programming | Yes | Yes | Yes |
| Switch between Internet, TV, Split screen | TV or PC | Yes | Yes |
| Optional keyboard and mouse | Yes | Yes | Yes |
| Optional double remote that can be split into two halves for two people to play games against each other | Requires custom remote, PC software and Web server software. | Requires custom remote, iMedia station software and Web server software. | Requires custom remote, STB software and Web server software. |
| Optional touch pad, game stick | Yes | Yes | Yes |
| Indicator lights – ON (current user online), OTHERS (other users are online) | Requires custom remote, PC software and Web server software. | Requires custom remote, iMedia station software and Web server software. | Requires custom remote, STB software and Web server software. |
| USB slot for external attached storage | Yes | Yes | Yes |
| Web site personalization: Timed, push content delivery to personal home page for later viewing | Custom PC software, Web server software | Custom iMedia station software, Web server software | Custom STB station software, Web server software |
| Web Site | | | |
| Interactive web site for games | Yes | Yes | Yes |
| Home page for system users | Yes | Yes | Yes |
| Personalized home page with Syndicated content, RSS feeds, links to other sites | Yes | Yes | Yes |
| Site statistics | Yes | Yes | Yes |
| Scheduled delivery of banner ads to TV or browser or both | Custom PC software, Web server software | Custom iMedia station software, Web server software | Custom STB station software, Web server software |
| Enable remote disk storage services | Complex | Virtual folder on Web server | Virtual folder on Web server |

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The essence of strategy is choosing what *not* to do.

Michael Porter

In this section, we examine products, markets, positioning and unique activity system for a competitive strategy. First question, what are we selling here?

We believe that low cost or high technology on their own are *not* sufficient and that the winning proposition is unique content to niche markets, delivered to TV over the Web.

Products what *not*:

1. Low-cost consumer electronics media extenders
 - No margin at those prices and in a highly competitive market
 - Client doesn't have distribution channels
 - Manufacturers are busy developing new products for media extender/station/IP STB; use their work to your best advantage. Focus on application software development.
2. High-tech consumer electronics; for example, a consumer electronics device for Internet media that delivers a better TV experience than a media PC with fewer headaches. *Do you want to compete with Sony, Dell, Microsoft and Intel?*

Products what *yes*:

1. Find and serve an underserved segment – like the retired persons market. Many have money, they watch a lot of TV and they have hobbies, interests and need to socialize.
2. Provide interactive content. Add *unique services* that can be coded into media station software that would provide P2P game interaction, secure file-storage, presence (are you home?) etc...
3. Deliver content from your Web server to the TV set in the living room
4. Implement a Web site, rich media and interactive content, remote control and media extender into a single integrated system.
5. Use highly automated operations for advertising, provisioning and billing

Customers and channels

Next question, whom are we selling *to*?

| Market State | Market Position | Product Application | Price points | Customers and need | Channel and motivation |
|-----------------------------|---------------------------------|---|--|---|--|
| Over priced and over served | Cable TV | Media extender from PC to TV | \$150-250 | Households who are angry at cable providers: Get alternative | Bezeq: Compete and preserve their incumbent investments |
| Under served, under priced | PC to TV | Media extender from PC to TV | \$150-250 + Pay per view | Early adopters: Techno lust | Blockbuster: Grow sales |
| Under-served, under-priced | Interactive TV for niche groups | Integrated service of home media station and Web content. | Media Station \$200-250 + Monthly access fee | Retired people: Social outlet and connectivity with others | Retirement communities, worker committees: Grow revenue |

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Next question number three – what should be your market positioning?

Positioning: What *not*:

- Blockbuster streaming video servers –failed in past (2001), trying again.
- File-sharing – too many digital rights issues
- DRM – too sticky, better to leverage an open source approach
- Music, general media playing – no relative advantage

Positioning: What *yes*:

- Variety-based position: interactive content, person to game, person to person
- Access-based position: ethnic, retired, other segments that use TV intensively
- Provide the network and interactive products
 - a. In-house
 - b. Partnership with content producers
- Provide standard setup package (media station, software and remote) with no options.
- Content is provided on a subscription basis, either fixed or pay per use.
 - a. Subscription fixed price/month for unlimited content is a simple scheme but may reduce loyalty since it is too similar to cable providers
 - b. Pay per days used may result in lower revenue per consumer but may increase consumer loyalty and total revenue overall.
 - c. Subscription doesn't subsidize setup

Activity system: tight-fitting, optimized and difficult to copy

1. Provide interactive games and educational content: person to game, person to person.
2. Sell to carefully selected customer segments, for example retired persons that need to socialize, connect and tend to spend more time watching TV
3. Operate Web site for customers (content, news, forums, downloads). Users can access the content using a standard browser (Firefox or Explorer) and use the self-service applications to view their bill and get assistance.
4. Use Web services for provisioning and billing enable the operator to easily register and activate new users that plug in their new media station and measure system usage.
5. Use standard welcome kit (Media station and remote control), ready to be plugged into a cable modem. No options available.
6. Implement proprietary media station software that processes remote control commands and caches content in order to reduce latency.
7. Utilize distributed file storage based on a decentralized architecture to pool unused disk space on the users' desktop computers. This is not an absolute requirement for the system, as we can implement the file storage in a central Web server farm; however it may prove to be an economical way of improving scalability and an attractive feature that enables content users and creators to store files in anonymity.

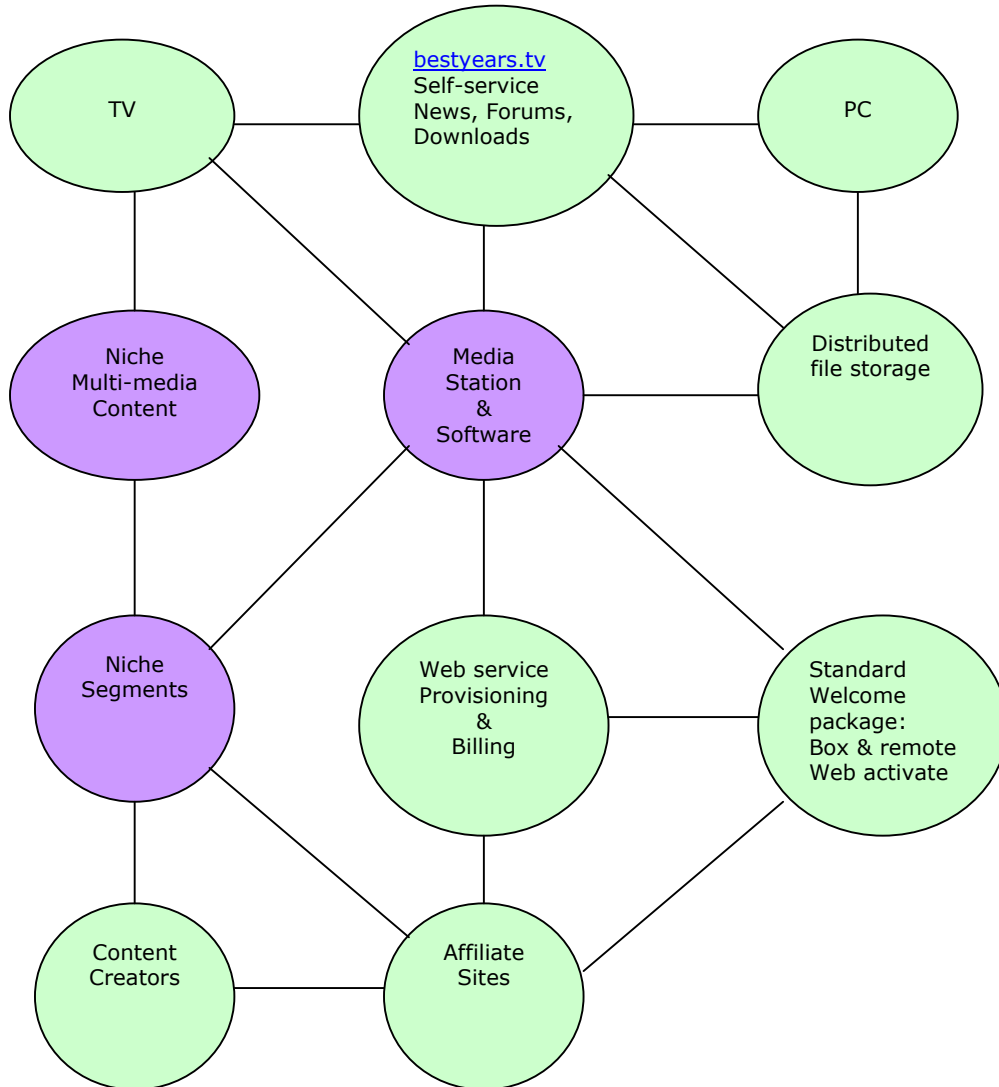
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Graphical view of the activity system



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Keywords and Links

IPTV – IP Television distribution

1. <http://www.dave.tv/> TV over IP network, launching Jan 2005
2. http://www.microsoft.com/tv/content/Solutions/IPTV/mstv_IPTV_Overview.msp
3. www.digeo.com -

Windows XP Media Center 2005

4. <http://www.microsoft.com/windowsxp/mediacenter/default.msp> XP Media Center
5. http://digitaljoy.com/2_1.htm HP Digital Entertainment center

Home Media Networking

6. http://www.cnet.com/4520-10602_1-5619005-1.html Review of CES 2004.
7. www.ucentric.com Home media networking software for CE media centers and media gateways; whole-home applications: multi-TV, PVR and music.
8. www.sonos.com Digital music system for the home.
9. <http://www.tomsnetworking.com/Reviews-157-ProdID-PLAYATTV.php> A network media player that sits between your computer and your television. It translates the computer-based audio, video and picture formats into a format that the television can understand
10. <http://www.kiss-technology.com/>
11. <http://www.sigmadesigns.com/>

Games for TV <http://www.gametime.tv/>

On-Line/Internet - PC/TV Combinations

12. www.benq.com AV playback, TV, Web, PC, wireless keyboard and mouse
13. http://www.visson.com.tw/e-prod-smartv_spec.html - SmarTV 2010
14. <http://www.neuston.com/en/mc500.asp>
15. http://www.dmuze.com/product/dmc_en.php
16. <http://forums.eyo.com.au/showthread.php?t=58439>
17. <http://linuxdevices.com/news/NS8570522277.html>
18. <http://www.ezhometech.com/>
19. <http://graphics.tomshardware.com/video/20020621/sigma-01.html>

Software and remote control products

20. Software - <http://www.snapstream.com/Products/beyondtv/>
21. Remotes <http://www.globalsources.com/si/6008816262086/CompanyProfile.htm>
22. Remotes <http://www.ruwido.com/en/oem.htm>.

Shows and other online resources

23. Streaming Media Show - May 17-18, 2005 <http://www.streamingmedia.com/east/exhibitors.asp>
24. Digital Content online resource <http://www.econtentmag.com/>