



WHITE PAPER

Digital Fingerprinting & Video Content Recognition
Enabling New Forms of Interactive Advertising

Published by
Audible Magic Corporation
June 7, 2011



Audible Magic Corporation
985 University Avenue, Suite 35
Los Gatos, CA 95032 USA
Tel: +1.408.399.6405
Fax: +1.408.399.6406
www.audiblemagic.com

©2011



Digital Fingerprinting for Video Content Recognition

"The definition of television is clearly evolving as the TV has now become the home theater, video store, games arcade and much, much more. As a result, Smart TVs now offer a more interactive, targeted, quantifiable medium for (advertisers)."

-- Sasha Savic, Chief Commercial Officer, MPG.

70% of tablet owners and 68% of smartphone owners said they use their devices while watching television.

-- AC Nielsen Company Survey, May 2011

By 2015, more than one-third of American consumers will use a tablet PC

-- Forrester Research, January 2011

Introduction

Advertisers have always looked for a point of difference in the marketplace to allow their voice to rise above the noise level of other advertisers. With new Consumer Electronics (CE) devices providing viewers with more flexibility in their viewing choices, both on the go and in the family room, the problem is compounded as it becomes increasingly difficult for advertisers to anticipate how or when an ad may be viewed. Content Recognition (CR) based on digital fingerprinting provides a lightweight, easy-to-use solution for advertisers to engage their potential customers no matter where, when, or on what device their video advertisements are presented.

Imagine smart devices that can immediately take action based on media content or an ad being viewed regardless of its sources. These sources of media may include linear broadcast, on-demand channels, Blue-ray players, game consoles and over-the-top (OTT) Internet content. The "smart" in these devices opens a vast new world of opportunities for advertisers to engage their customers and deliver offers to them.

This white paper discusses the technology and potential use cases for the implementation of digital fingerprinting for CR. It focuses on:

- The new multi-screen viewing environment
- Emerging opportunities for interactive advertisers
- Discussion of the digital fingerprinting technology
- Suggested use cases

New Devices Present New Rules of Engagement

The era of television as a purely passive viewing experience is quickly coming to an end. A very different model is emerging as sales of "smart" TVs ramp up, handheld Internet-connected phone and tablet devices from Androids to iPads become more capable and pervasive, and content distributors and advertisers develop new approaches to engage viewers. Rather than solely broadcast-based, this new model is increasingly a broadcast/Internet-based hybrid. And, rather than passive, it is increasingly interactive. Instead of just viewing and absorbing news, sports, and entertainment programming, people are being invited to participate actively in the television experience—voting in real-time viewer polls and surveys, learning more about people and places discussed on a news program or live sports event, and even checking out additional product information and special offers from advertisers.

With CR, the consumer has the opportunity to receive offers from advertisers no matter which device they choose for their video viewing. And the advertiser has the opportunity to directly connect with their targeted consumer base no matter when or where their ads are viewed.

Simply put, CR is essential to making interactivity a larger and richer part of the viewing experience. This is because content recognition technology is the only way to identify the specific content a viewer is watching at any given moment and—depending on the device it’s embedded on—link the viewer with an associated experience of some kind. For example, imagine that a television viewer is watching a national commercial for a fast food chain. The TV automatically identifies the commercial, and then the viewer is immediately taken, on a second screen, to a very targeted special offer at the nearest outlet of that chain. To do this, the technology must be able to identify the commercial, identify the location of the TV or appliance that’s orchestrating the interaction, know about the special offer, and make all the appropriate linkages in real time.

New Viewing Environments

With the proliferation of commercial broadcast, and subscriber premium services, viewers may have from 100 to 500 channels available on their home TV. These choices also extend well beyond linear delivery. Video on demand (VoD) systems hosted by cable, telephone or satellite providers stream content through a connected TV, traditional set-top box, Roku box, mobile phone, tablet, car entertainment system or PC, enabling viewers to order from a wide menu of programs and watch them at their convenience.

Increasingly, viewers are turning to OTT delivery, which lets them watch content streamed from the Internet over a broadband connection. In May of 2011 one OTT provider, Netflix, announced that its user base of 23.6 million eclipsed the number of subscribers of the largest US cable company, Comcast. According to a May 2011 report by Sandvine, Netflix streaming video service now accounts for 29.7 percent of peak downstream traffic, up from 21 percent last fall.

Industry analysts believe that traditional linear broadcast TV will continue to provide the backbone of home viewing for some time, even as the TV viewing market is changing. Aside from feature movies, traditional broadcasters are the main source of original programming, and they provide the majority of the content stored on time-shifting digital video recorders (DVRs).

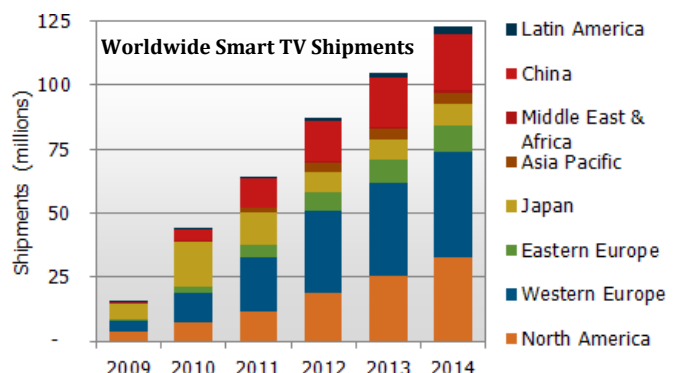
New Viewing Devices

In addition to new delivery options, viewers also have a growing array of smart gadgets, which can enrich their TV viewing experience. These range from smart TVs to PCs, to handheld Internet phones and tablet devices including the Apple iPhone, iPod and iPad, Motorola Droid, HP TouchPad, Samsung Galaxy and Motorola Xoom.

Increasingly, industry watchers are envisioning a three- or even four-screen experience in which a viewer interacts with video content through TV, phone, tablet, car video and PC screens—sometimes multiple screens at the same time.

A central part of this new experience is the smart TV, sometimes referred to as connected TV. A smart TV is a television set with integrated Internet capabilities that offers more advanced computing ability and connectivity than a contemporary basic television set. Often defined as an information appliance, a smart TV lets users easily install and run advanced apps on their TV, obtained via brand specific Internet portals or USB thumbdrives. Smart TVs run complete operating systems and/or middleware that provides a sophisticated platform for application developers. Windows OS and Linux have been two of the operating systems of choice; however, Android and Google TV are set to shake up the status quo.

Today, smart TV units are poised to experience enormous growth. Market firm DisplaySearch offered another intriguing finding, forecasting that much of smart TV sales would be in China, Latin America, and Eastern Europe, spurring true, robust global expansion. In Eastern Europe, for example, smart TV sales are estimated to grow from 2.5 million units in 2010 to more than 10 million units in 2014—an increase of more than 400 percent. “With some emerging countries having excellent broadband infrastructure,” noted Paul Gray, director of TV electronics for DisplaySearch, “the adoption of connected TV capabilities is a natural next step in TV feature innovation.”

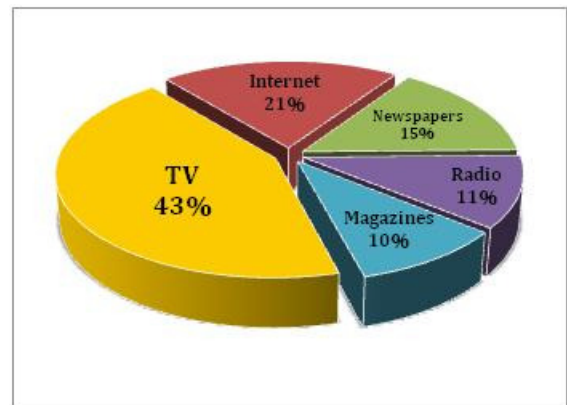


Coupled with other projections the bigger picture becomes even more positive for players in the home video electronics market. For example, market research firm In-Stat forecasts that, by 2015, there will be more than one billion stationary Web-enabled devices worldwide. Smart TVs and Blu-ray players will make up more than half the shipments of all Web-enabled consumer electronic device shipments worldwide.

This shift in the connected entertainment environment will result in the emergence of new advertising options as well as new measurement and targeting capabilities for TV advertisers. DisplaySearch also predicts that options for Internet-capable TVs will skyrocket in the next few years, from basic sets that can stream video to more sophisticated (and expensive) versions with apps and advanced search engines.

Trends in Media Advertising

The potential for changing viewing environments has important implications for advertisers. While over-the-top markets offer lucrative opportunities long term, the existing linear broadcast market (the lion’s share of advertising revenue, at over \$60 billion per year in the U.S.) is predicted to continue its domination of the market for many years to come. Advertisers should be looking for technology, that adapts to existing broadcasting methods and is flexible enough to respond to changes in future delivery methods.



2011 US Major Ad Spending by Media

US Major Media Ad Spending, by Media, 2009-2015							
<i>billions</i>	2009	2010	2011	2012	2013	2014	2015
TV	\$53.8	\$59.0	\$60.5	\$64.5	\$65.0	\$67.0	\$68.0
Internet	\$22.7	\$25.8	\$28.5	\$32.6	\$36.0	\$40.5	\$44.5
Newspapers*	\$24.8	\$22.8	\$21.4	\$20.7	\$20.2	\$20.0	\$19.8
Radio**	\$14.3	\$15.3	\$15.7	\$16.4	\$16.7	\$17.1	\$17.2
Directories*	\$10.3	\$9.3	\$8.2	\$7.3	\$6.5	\$5.7	\$5.0
Magazines*	\$15.5	\$14.7	\$13.9	\$13.2	\$12.6	\$12.1	\$11.6
Outdoor	\$5.9	\$6.1	\$6.4	\$6.8	\$7.1	\$7.4	\$7.6
Total	\$147.2	\$153.0	\$154.6	\$161.5	\$164.2	\$169.8	\$173.6
Note: *print only; ** excludes off-air radio & digital							
Source: eMarketer, March 2011							

Opportunities for Interactive Advertising

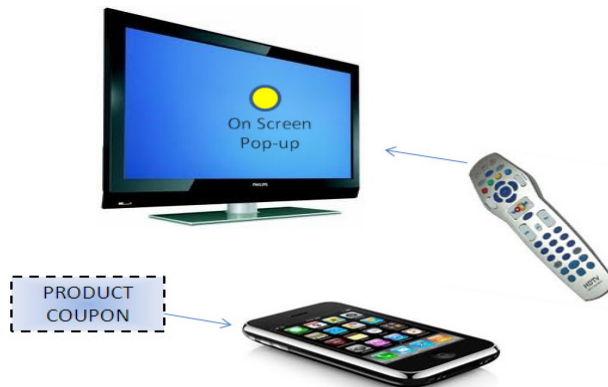
The interactive TV experience has already been with us for several years. Entertainment shows such as *American Idol* urge viewers to text in their votes to help determine winning contestants. Cable news shows routinely ask their viewers to respond, via text, FaceBook, or Twitter, to various issues discussed on a certain segment. At the end of documentaries, historical dramas, or shows that dramatize contemporary issues, links to websites appear so that curious viewers can go online to learn more about the program they’ve just watched.

For the most part, however, the amount of interactivity is usually limited. After an *American Idol* viewer votes, for example, that’s the end of the interaction. This has also been true for the most important part of the viewing experience from a corporate sponsor’s perspective: the advertisement or a product placement within the actual program. Viewers see the commercial or the product placement, but usually that is the beginning—and the end—of the experience. There isn’t the opportunity to learn more about the product, hear about special offers, or extend or deepen the viewer’s exposure to—or interest in—the product in any meaningful way.

However, as the TV-Internet convergence becomes pervasive and other consumer entertainment technologies

evolve, the interactive experience is poised to offer advertisers many more opportunities to engage viewers more fully, keep them engaged longer, and win more of their business. Here are a few of the possibilities:

- A national retail chain runs an ad on a traditional broadcast or cable network. During the ad, a small window pops up in the corner of the screen (or second screen device). Viewers can see a product that has specific appeal in their geographic market, perhaps ribs in Texas and salads in California. Customized coupons are automatically sent to the viewers' phones or tablets. And the next time they visit the retail outlet they save.



Smart TV Sending Customer Coupon Request

- During a cat food commercial for a major brand, a small window pops up that offers to tell viewers more information about the best kind of cat food considering their cat's breed, its age, and so on. The user taps their remote control and the current video is squeezed to 60 percent of the TV screen. An application opens in the now-available screen space to guide them through the process. By providing just a few bits of information, the viewers develop a better understanding of which food is best for their pets. And personalized offers to viewers can be made right on the spot. Another tap of their remote control and the app disappears as the programming again fills the screen and more information is displayed on their mobile device.
- A best-selling suspense novelist is being interviewed on TV. A viewer is watching the show "time shifted" and doesn't view the commercials. Yet an app on the smart TV uses CR to recognize the program and offers to take the viewer to an "Amazon-like" experience—clicking to read additional reviews of the book, comments from other fans, and perhaps the novel's first couple of pages all posted on a box on the TV screen. Then, if still interested, the viewer clicks to authorize a "One-Click Buy," automatically paying online for the book and the shipping.
- A viewer has an affinity card with a grocery chain. Each time an ad from that chain is viewed a small window pops up in the corner of the screen to alert the viewer that a coupon has been added to their affinity card. The viewer is rewarded for watching the ad, the grocery chain gains additional interaction with their customer, and the viewer is again motivated to go to the store to shop.

Some observers have been critical of these ideas, saying that advertisers will just follow their audiences and that, at least for now, audiences aren't that interested in interacting with ads. However, much of the solid evidence has proven otherwise. During a recent televised Melissa Etheridge concert, for example, nearly half the people viewing—46 percent—saw an offer on their TV screens for a CDnow.com discount, went to the website and clicked through to learn more.

Increasing audience fragmentation is another rationale for advertisers to adopt interactive advertising techniques and technologies. With the proliferation of cable networks focused on attracting niche markets, the TV audience—

while still immense—keeps splintering into more and more segments. In the 1950s, for example, a show such as *Texaco Star Theater* was considered a hit because it routinely attracted 60-80 percent of the entire U.S. viewing audience. Today, no one questions that *American Idol* is a hit, even though it regularly attracts only about 15 percent of the total TV viewer audience.

The new thinking in this age of increasing fragmentation is to use new approaches to advertise more effectively. To do this, some well-known companies including Carnival Cruises are already working with interactive marketing specialists on trial initiatives to better identify and understand:

- Which segments of the connected audience have the strongest affiliations with a brand
- Of what value the expanded user experience is to advertisers
- How consumers perceive the additional face time with a brand
- What kinds of experiences consumers want from advertisers
- Whether consumers can be engaged in more meaningful ways

According to Joanna Hall, SVP of Experience and Design for TV marketer Brightline, one of the companies involved in these initiatives, such efforts are all about getting clients to “continually push the bounds of advanced TV to engage their audiences.”

A Strategically Key Component: Content Recognition Technology

Among the emerging technologies that will play crucial roles in the development of interactive advertising in the new smart-appliance, home-video entertainment environment is digital fingerprint-based content recognition.

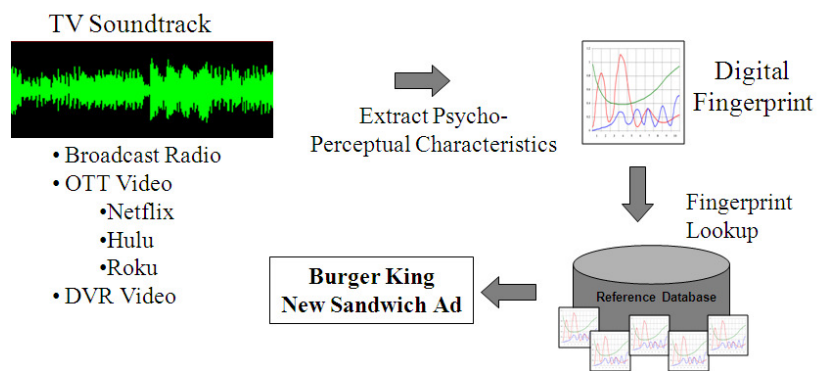
Content recognition is a way for the smart hardware to recognize the program or advertisement that’s played on the screen at any given moment. The TV acts as a portal to many sources of content including a cable box and maybe a Blu-ray player, TiVo, PlayStation, and/or PC/media player box. Therefore the issue is determining what is actually being shown and viewed on the TV screen. Simply put, an interactive application running on a TV, smart phone or tablet is not useful if it can’t react in real time to what a person is watching.

Considering the essential role that content recognition technology will play in an increasingly interactive TV experience, the opportunities are significant for companies who embed it into their products. Eventually, *all* the devices we use to watch and interact with video may have some form of content recognition technology embedded in them.

These opportunities are also near-term as well as long-term. One of the very appealing aspects of this technology is that it is applicable to *any* TV delivery system from linear or appointment TV, which will continue to dominate in the viewing world for the near future, to over-the-top systems, which will eventually dominate. Advertisers can reap immediate rewards, and can continue to reap rewards even as TV content distribution systems dramatically change.

For the hardware or software developer who chooses the technology, however, there are also several issues to consider. And perhaps the foremost among these is the method used to recognize the content.

Perceptual fingerprinting is the technology of choice for CR in smart TVs. Perceptual fingerprinting uses very fast and fine-grained measurements of the content, which are then matched to a reference database of fingerprints to quickly identify the content as it is being viewed.



Perceptual Fingerprint Matching

Perceptual fingerprints do not require any modification of the content that is broadcast. As a result, the technology can be used by apps on a smart TV or phone without having to engage the broadcaster or cable provider. This freedom to innovate allows the advertiser and developer to produce unique and creative approaches to engage the viewer.

Perceptual fingerprinting is a mature technology. All the major music and movie studios have used perceptual fingerprinting for years in their Internet based activities. Now this technology is available for app developers to use inside the smart TV set itself or on a second screen device. Imagine what an app in your TV or second screen could do if it knew exactly what was being watched.

Cloud Based Fingerprint CR Database

There are significant advantages to storing large databases containing millions of reference fingerprints in the cloud. This is especially valuable when attempting to recognize a music video, movie, or television. An advertiser can then easily target ads based on content.

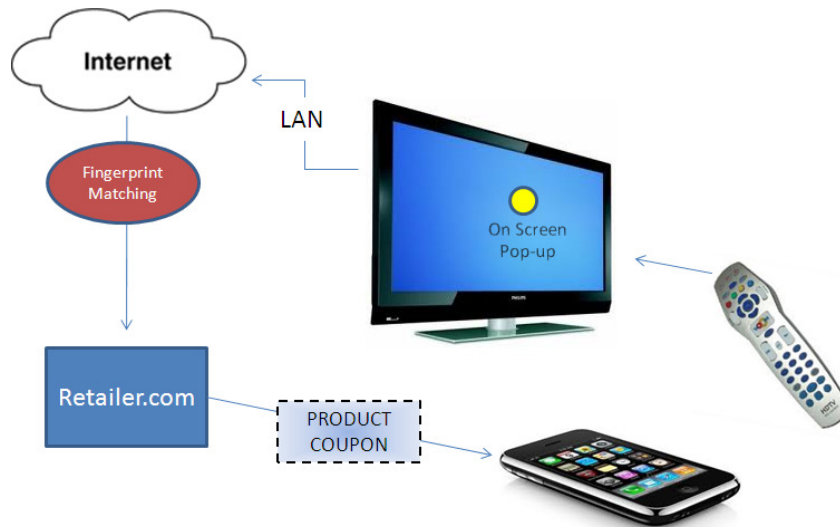
Lookup times need to be accomplished as quickly as possible. A match must be made in a few seconds. Therefore, as consumer usage increases, the enabling platform of cloud servers can be scaled to accept the increased load and bandwidth requirements.

An example of this type of implementation is pictured below.

Example of CR Using Cloud Based Fingerprinting with Smart TV and LAN Connection

In the example pictured below, an agency has created a digital fingerprint for their specific TV commercial.

- When the fingerprint of the content playing on the screen is detected, a pop-up overlay dialog box is triggered on top of the advertisement asking the viewer if they want to take advantage of the coupon being offered on screen.
- By pressing their TV remote select button the viewer confirms they would like the coupon offered.
- Using the LAN connection, a coupon request is sent via the internet to the retail web site.
- The requested coupon is sent by the retailer to the viewer's smart phone



Cloud Based Fingerprint ID

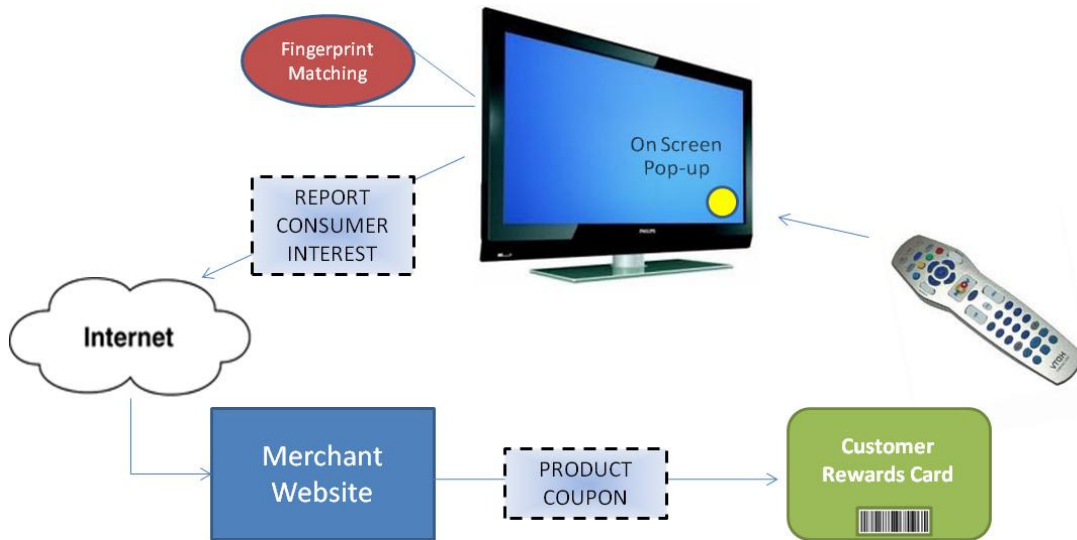
Internal Cache for CR Fingerprint Matching

Some applications may be optimized using a small fingerprint database of target content residing entirely on a smart phone, tablet or car infotainment system. For instance, a large restaurant chain may have an app, that includes a small, pre-loadable database of their ads' fingerprints. Once the database is installed on the consumer's smart device, a coupon can be generated whenever a fingerprint for the restaurant is identified. This enabling platform can support these lightweight apps using iOS and Android operating systems and can work as shown in the example below.

Example of Internal Database in Smart TV and LAN Connection for CR Using Fingerprint Matching

In the example pictured below, an agency has created a digital fingerprint for their specific TV commercial.

- When the fingerprint of the video content is matched by the internal TV application, a pop-up overlay is triggered on the TV screen asking the viewer if they want the coupon being offered on screen.
- By pressing their TV remote's select button the viewer confirms they would like the coupon.
- Using the LAN connection, a coupon request is sent via the Internet to the retail web site.
- The requested coupon may then be added to the viewer's retail reward card account.



Smart TV Internal Fingerprint ID

Example of Smart Phone App for CR Using Fingerprint Matching

In the example pictured below, an agency has created a digital fingerprint for their specific TV commercial.

- The digital fingerprint is detected by the smart phone's microphone
- A product coupon for that advertiser is loaded into the phone's coupon storage locker
- While shopping, the consumer checks their coupon locker for special offers and coupons based on the TV ads that were detected by their smart phone application.



Smart Phone App for Fingerprint ID

User-Initiated vs. Continuous Monitoring

As developers, advertisers and ad-based tools companies optimize their use cases, they will want to decide which content recognition model works best: one where the identification is user-initiated, or one where content is continuously monitored. In the case of user-initiated lookups, a user must launch an app or click a button on a remote control to initiate the process of recognizing content. In the case of continuous monitoring, the smart device may be continuously monitoring content being played, comparing it against a small local fingerprint database. In this case, the device will initiate an activity or action whenever targeted content is recognized.

Summary

While industry forecasters may quibble about specifics, virtually no one disputes that a fundamental transformation is taking place in the “lean back” home video entertainment environment. The passive TV viewing experience is giving way to a far more interactive one. This is being driven by the rapid convergence of the traditional TV and Internet worlds, by the development of new “smart” products from phones to tablets to TVs, and by the growing desire among content providers and advertisers to make interactive programming and advertising pervasive new realities.

In response, companies are looking closely at a host of new technologies to support the numerous new applications that will make the interactive experience more varied, intriguing, useful, and entertaining for viewers and more profitable for advertisers. And, among these technologies, one of special strategic importance is content recognition—the technology that, in real time, enables the hardware to identify the specific content being shown.

Digital fingerprinting represents an opportunity for advertisers and agencies to implement CR as a new method of consumer interaction on current devices and it gives them the flexibility to extend the technology to future products. Existing commercials need only have their digital fingerprints created and stored, then they are ready for recognition on enabled TV devices. Fingerprinting-based CR applications supporting new use cases can be written for both Android and iOS operating systems.

About Audible Magic®

Headquartered in Los Gatos, California, Audible Magic is recognized as the de facto leader in digital audio and video fingerprinting for monetizing, protecting, measuring, and verifying content — in all their forms, including radio and television broadcasts, Internet and satellite streams, stored digital files, consumer devices and via network file transfers.

The flexibility of Audible Magic's patented CopySense® content identification technology allows for the creation and development of new solutions across numerous applications such as smart TVs, set-top boxes, smart phones, and content search.

Audible Magic processes over 12 million look-up transactions per day. Over 7 billion transactions to-date have been processed with an ever expanding database of 11 million digital titles of music, movies, and television shows.

Customers Include: Facebook, Verizon, MySpace, Soundcloud, Dailymotion, AOL, MTV and Photobucket

Content Owners Include: Universal Music, Disney, Fox, Viacom, Warner Music, NBC Universal, Canal+, Merlin, Tunecore, EMI, The Orchard, IODA, IRIS, Beggars, INGrooves, BFM, MyVideoRights, and RTL Group

For more information, visit Audible Magic's website at www.audiblemagic.com



Audible Magic Corporation
985 University Avenue Suite 35
Los Gatos, CA 95032 USA
Tel: +1.408.399.6405
Fax: +1.408.399.6406