

***An App a Day:***

Bringing the “App Store” Concept  
from the Cloud to Every Digital STB

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## An App a Day: Bringing the “App Store” Concept from the Cloud to Every Digital STB

### **Abstract**

A scant two years after its debut, the “app store” concept has captured consumers’ fancy and become a differentiator, revenue producer and retention tool for service providers. Although Apple and mobile providers have led the way, the model has been adopted by telco video providers as well.

While cable’s video platform and existing customer base would seem to make it a strong competitor in the app store category, the industry is hindered by fragmentation of devices. Without a universal service platform, efficiently delivering and accessing applications is challenging – if not impossible – for the end user, the provider and especially the apps developer who often has to perform the same job more than once.

There also are understandable operator concerns and technical limitations surrounding the downloading of apps to set-top boxes (STBs) in the fashion that apps are downloaded to iPhones and other mobile devices. Operators recognize that it is critical that nothing disrupt the consumer’s video experience, and consequently they would require extensive testing of new applications, particularly those that would be created by the third-party vendors that have driven Apple’s success. In addition, millions of the legacy STBs in the field today possess limited processing power, which would restrict the number of apps available to any one subscriber and would force operators to choose between deploying basic apps to a wide customer base or compelling advanced apps only to those subscribers with more powerful STBs.

Operators and programmers can resolve these issues by using solutions now being deployed that combine existing Web-based technologies and processing in the network “cloud.” These solutions can:

- Allow developers – including established Web developers – to quickly create, revise and update content once using existing Web tools and standards for delivery to every digital set-top box. This approach delivers a consistent look, feel and user experience to every consumer regardless of STB make and model, and ends the need for time-consuming versioning and testing of applications.
- Stream – rather than download – apps from highly secure servers in the cloud to the STB. This eliminates the possibility that hackers or an application “bug” might compromise video service.
- Leverage the storage capabilities of the cloud to enable an unlimited number and variety of applications to be available to consumers at any one time.

### **The app store concept**

Approximately two years ago, Apple debuted the App Store as a way of increasing the functionality and value of its highly popular iPhone. Using a combination of third-party developers and its own in-house resources, Apple created a marketplace for inexpensive enhancements to the iPhone, the iPod Touch and, most recently, the iPad.

By offering an array of applications that require only a small fee or are even free, the App Store has transformed the way consumers use mobile devices. Available on the App Store today are hundreds of thousands of apps, most created by third-party developers who share the revenue they generate with Apple. Billions of applications have been downloaded to date from the Apple App Store alone, and the phrase “There’s an app for that” has quickly become part of the American vernacular.

The rapid adoption of the App Store concept is due in large part to its ability to benefit every segment of the media ecosystem:

- For Apple and its service provider partners, the App Store has helped to drive sales of portable devices and usage of mobile networks;
- For the development community, the App Store has spurred growth and innovation by providing new platforms and revenue models;
- For consumers, the App Store concept has increased functionality and utility, and has significantly changed the way devices are personalized and used.

In the wake of Apple’s rousing success with its App Store, and the store’s role in building end-user loyalty to Apple hardware and service platforms, other consumer electronics manufacturers have eagerly entered the app fray. In addition to other mobile devices, the app store concept has expanded to include electronics devices commonly found in the home, particularly game consoles, televisions, Blu-ray Disc players, and standalone devices such as Boxee, Roku and Google TV.

One of the first entrants into the consumer app marketplace was Yahoo, with its Yahoo Connected TV Widgets offering on select TV models in late 2008. Since that initial offering, the platform has expanded to include many additional devices, and boasts more than 50 applications deployed, with 150 or so in the development pipeline. Two critical factors slowing this particular rollout are the complexity of the Widget platform (it requires expensive hardware and memory to run) and the inability to bind a Widget with anything else that is happening on the TV screen.

Multiple TV manufacturers have launched or announced app platforms on their TV sets; Sony BIVL™ (Bravia Internet Video Link), Samsung Apps (“Now there’s a TV for that” ad campaign), LG NetCast™ and many more platforms are emerging. While each is unique in its hardware and software implementation, their broad similarities in applications and offerings tie all of them into a marketplace. In order to get in front of the broadest number of consumers, content owners, advertisers and interactive application developers must investigate, choose and author applications for each of these various platforms.

One content distributor facing this challenge is Netflix, which is in the process of changing its business model from a mail-based DVD rental service to a streaming movie service based in the cloud. As an app developer, Netflix is trying to leverage the platforms and marketplaces that are in the early stages of their evolution. It has aggressively signed integration and deployment deals for its streaming client, and has shown no qualms in porting its interactive layer to any number of middleware and app environments. This approach has added significant complexity to the integration process, however, and it has forced consumers to choose how they want to interact with Netflix; the interactive client is completely different on a Roku box, a Wii game console, and a Samsung TV, for example.

Perhaps of most direct interest to cable operators, IPTV and telco video services such as Verizon FiOS and AT&T U-verse have also embraced the app store concept, offering “widget” apps for social networking, shopping, news and information, and more. Given the homogeneity of their networks, both Verizon and AT&T have had success in deploying applications to scale in a short period of time.

As more apps and especially OTT video offerings are available through connected TVs, other CE devices and competitive service providers, the possibility increases that a growing number of cable subscribers will “cut the cord.” Cable operators are recognizing the need to meet this threat head on by delivering the kinds of compelling apps and OTT video, along with superior user experiences, that will make it very difficult for consumers to say goodbye to cable.

Fortunately, cable is well-positioned to meet this challenge. However, it also faces significant obstacles. In the following sections, this paper will explore the industry’s advantages and disadvantages, and will address the ability of cloud-based solutions to help cable system operators deploy an App Store menu of offerings to scale.

### **Cable’s advantages in the apps sphere**

Although many manufacturers, service providers and platforms have embraced the app store concept, and Apple currently is driving the business, the provision of apps to end users is still very much a greenfield project. Cable’s opportunity, and its advantages, in the app space are significant and enormous.

With more than 61 million video customers nationwide, cable possesses the largest installed base of set-top boxes of any video service provider. Despite the presence of Internet-connected TVs and other CE components in the home, most consumers continue to use cable remotes as their primary control devices, creating a highly-attractive market for content developers. Cable also owns unparalleled relationships with linear programmers and advertisers, which heighten its opportunities to create and deploy cross-promotional and branded applications.

Because most viewers experience “TV” through cable, the potential to bind apps to programs or advertisements is extremely advantageous, as the user does not need to “exit” the viewing environment to “go to” apps, as they would with a connected television, for example. Cable can provide an experience that seamlessly merges apps with linear and on-demand programming, without ever leaving the cable environment, and using the same remote control. In addition, content providers want apps that are bound with the original airing of their content; cable can enable this experience like no other service provider can.

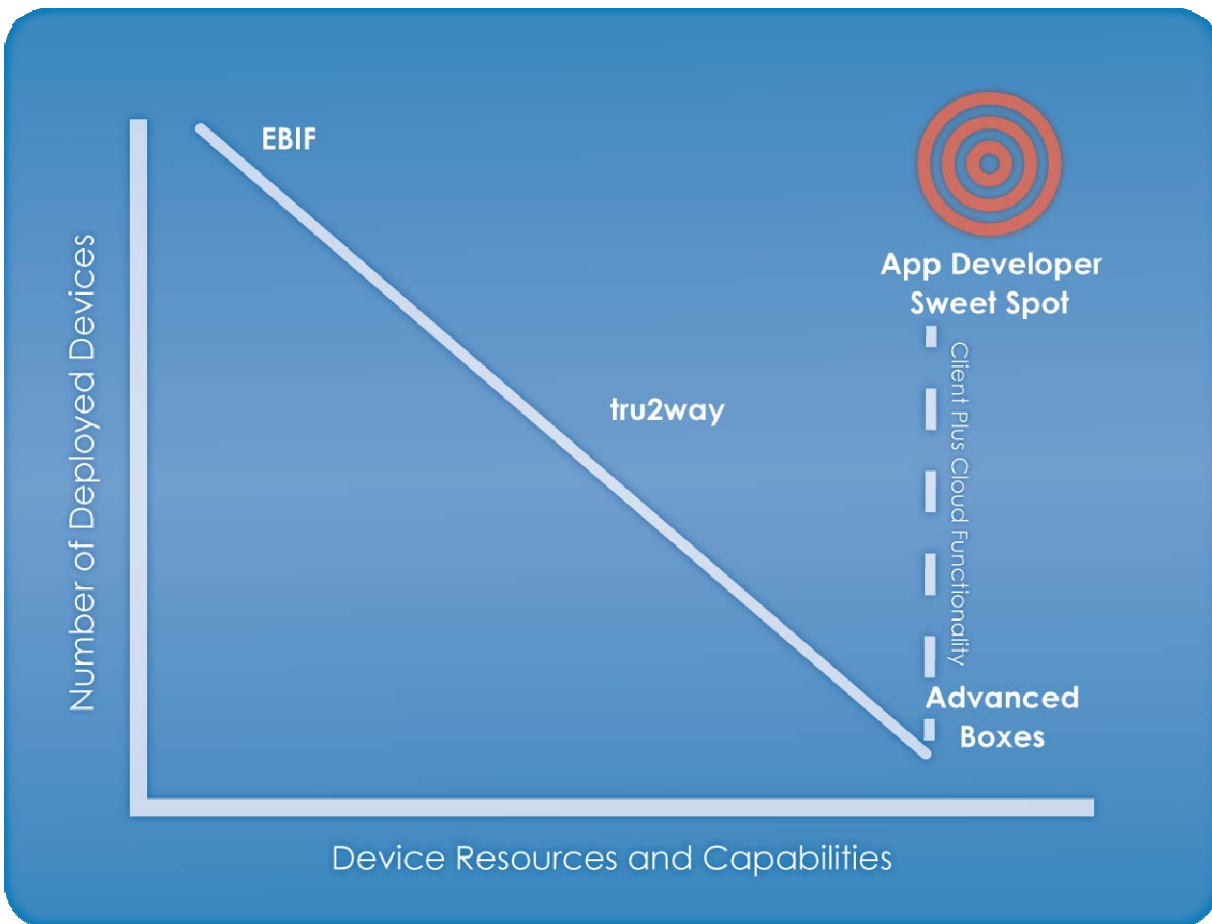
### **Cable's disadvantages in the apps sphere**

Cable's unique situation with customer premises equipment muddies its app deployment picture. Specifically, because of the long-standing nature of its business, especially when compared to its competitors, cable is hindered in app development and deployment by a number of factors: the lack of a universal service platform, the technical limitations of much of its installed base of digital set-top boxes, the wide disparity of software and hardware in that installed base, and consumer expectations of a seamless, always-on video experience.

Digital cable set-top boxes are well into their second decade of existence. Until fairly recently, they've existed as "thin clients" that lag well behind most computing devices. Many of them lack sufficient processing power and memory to enable immersive, media-rich applications; moreover, even were they upgraded to handle today's more complex tasks, it is a given that the principles of Moore's Law and the demands of future applications would soon surpass their capabilities yet again.

It clearly is not in the best interest of operators to incur the time and money expenditures necessary to deploy new set-top boxes at any reasonable frequency. Thus, cable's "legacy" boxes in fact have value, in the sense that they save operators money on the truck rolls needed to deploy new equipment, and they save customers the time of waiting for those trucks. Furthermore, because of the rapid pace of electronics innovation, it makes even less economic sense to replace "secondary" boxes in bedrooms or other non-living-room locations with more advanced boxes.

Given this, the installed base of digital set-top boxes presents a "lowest common denominator" problem for app development and software version control, as seen in Figure 1. Building apps only for high-end boxes reduces potential reach, depriving developers of the critical mass they require to generate a sustainable business; building an app that can run on all set-top variations reduces the application's attractiveness to the lowest common denominator of graphics chips, processing power and memory. A middle ground – providing versions that can run on different set-top boxes – would incur increased development time and money, and would compromise effectiveness by creating a multitude of user experiences, even on two different devices in the same household.



**Figure 1**

Unlike many of its more nascent competitors in the app space, cable must also deal with a more stringent set of customer expectations and requirements. As Internet and mobile video and applications have become commonplace, consumers are showing a greater tolerance for “bugs” that affect the user experience. Paradoxically, those same customers have a low tolerance for service outages and glitches from their cable providers, so apps must be fully integrated into the cable experience, easy to access, and must run smoothly every time. Consequently, the cable industry has been rightfully cautious regarding relationships with third-party developers, as well as with the availability of application downloads to set-top boxes.

In short, several impediments restrict the efficient, robust, straightforward development and deployment of rich, bound apps to all cable customers’ digital set-top boxes. The solution to this problem is the cloud.

### **Cable, apps and the cloud**

The language of the computing “cloud” is typically associated with the Internet, even though the term itself pre-dates the Internet by at least two decades, when computer scientists recognized the need to share processing workload over clustered computers. Cloud computing has become a staple of the Web world, with applications such as Web-based email, YouTube and countless

others removing the burden from client devices and leveraging the power (and storage capabilities) of the cloud.

The existence and availability of cloud-based applications have reduced the need for many users to own PCs or laptops with large amounts of storage and memory; indeed, the rising popularity of relatively stripped-down, lightweight “netbooks” is testament to the power and utility of the cloud. Productivity applications that were once only available when resident on a PC, including word processing, spreadsheets and email, now can be accessed exclusively through the cloud. Multimedia storage and backup, which once required the consumer to regularly expand his or her on-site storage capabilities with CD-ROMs, zip drives, USB drives, PC storage upgrades and external hard drives, is now safely and securely provided via the cloud.

Now that we live in a fully digital television world, the cloud concept applies just as much to TV, as we’re essentially dealing with data and nothing more. The cloud TV concept can remove workflow gaps and bridge the application and media processing requirements between head-ends and set-tops. A cloud approach also enables app developers to use familiar, Web-based development tools that are similar to, or the same as, those used to provide interactivity within a Web site.

Server-side functionality, such as large-scale data manipulations (for example, deep keyword searches on hundreds of thousands or millions of records), recommendation engines and ad decision engines, already exists for Web applications. These technologies can be applied as-is to the cable infrastructure. Familiar client authoring functionality, such as DHTML, JavaScript, CSS, Ajax and JSON, can be used in existing deployments by moving much or all of the “client” processing into the cloud.

A cloud-based approach offers cable operators greater flexibility and implementation of bound apps now, the ability to grab market share against competition as quickly as possible, and a solid foundation for the future. It also combines the mass audience of all two-way cable boxes with the features and functionality that content developers and advertisers need to meet their brand and marketing requirements.

By tapping into a cloud-based app development and deployment solution, content companies can leverage cable’s enormous installed base to deliver apps of all kinds to any cable digital-set-top box. Because the apps are not downloaded, but instead are streamed from the cloud, numerous advantages result that are consistent with cable’s need for a universal, high-quality user experience. These include:

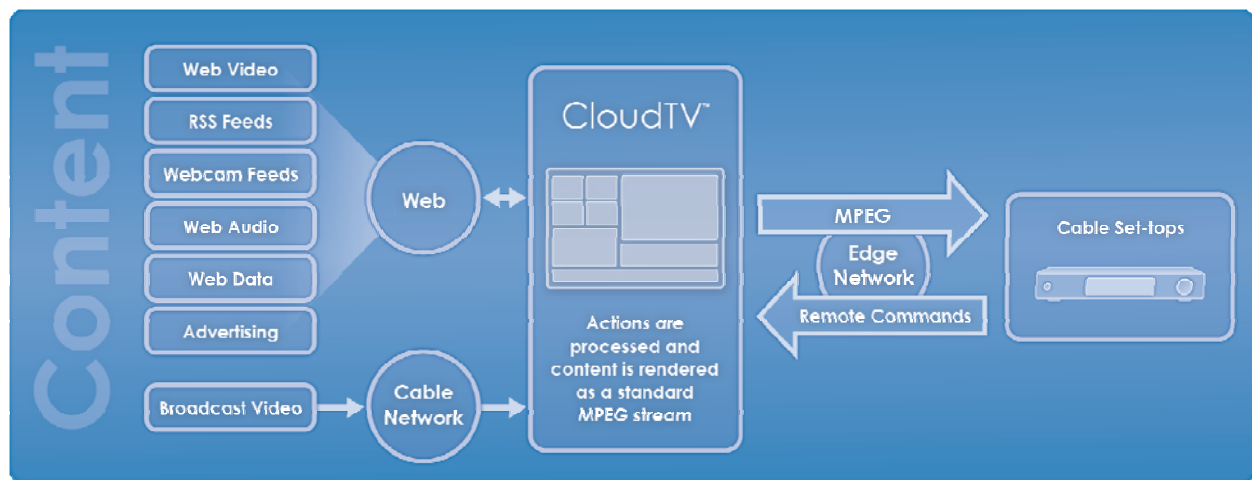
- Delivery of content to any digital set-top box, rendering processing and storage limitations irrelevant;
- Minimization or even elimination of the possibility of “bugs” that might affect the performance of an individual set-top box;
- The ability for application developers to write content once for delivery to every digital set-top box; and
- The ability for cable system operators to deliver a common look and feel to every digital device on their video networks.



A cloud-based app solution enables cable operators to roll out more apps than ever before, much more quickly than ever before. The cloud allows cable to solve its fragmented installed base problem and deliver a potentially unlimited number of apps to subscribers in a relatively short amount of time.

### **Integrating a cloud-based app system into a cable operator's infrastructure**

A successfully deployed cloud-based app system integrates into the cable infrastructure at a few basic touchpoints, shown in Figure 2. The primary components are located in the headend, where standard Web technologies are leveraged to create interactive applications, and the resulting user experience is transmitted as a simple MPEG stream to the set-top box. The existing VOD infrastructure is used to connect the cloud streaming servers to set-top boxes, while the back-end is able to leverage existing Web services.



**Figure 1**

Using a cloud-based approach such as this, system-wide app development, testing and deployment becomes much simpler. App developers are free to use standard Web development tools to create apps. Because the apps are delivered to the set-top boxes from the cloud as standard MPEG streams, they are supported by (and have a consistent look and feel on) almost every set-top box in the field. Developers and operators no longer need to test the apps on every single model of set-top box that is in the field or under development.

Because the set-top boxes are simply downloading MPEG streams from highly secured servers in the cloud, and sending only remote control clicks back to those cloud-based servers, the burden of processing and storage is removed from the set-top box and shifted almost entirely to the cloud. An added benefit is that because the cloud, and not the customer premises equipment, is handling storage and processing, an unlimited number of apps can be made available to any set-top box.

One concern that often is raised regarding a cloud-based app deployment system is that of latency. By running the application logic in the network, a consistent, minimal base latency is added to every interaction. From the key-press on the remote to seeing a change on the screen, the system must pass the key from the set-top box to the network, apply the key to the application logic, and send any resulting visual or audible changes back to the set-top, which then must decode and display the results. This resulting latency, however, is small (in typical

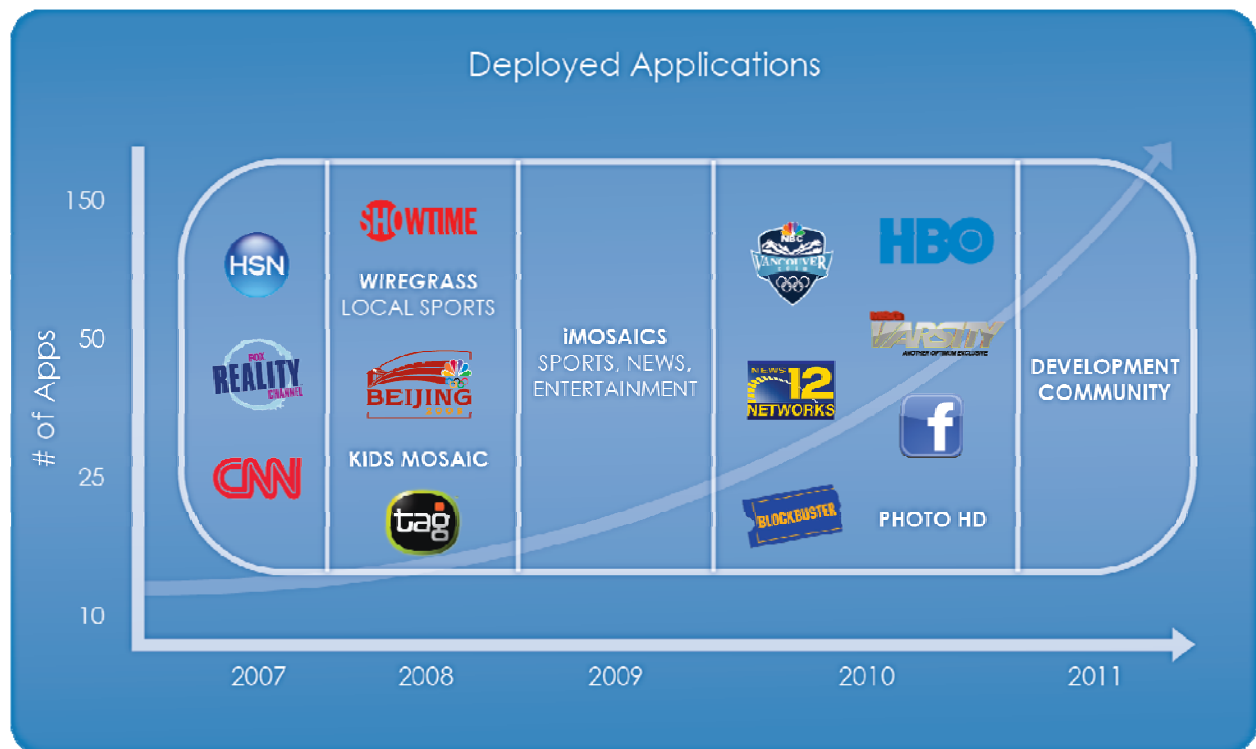


systems, just a few hundred milliseconds). More importantly, it is consistent. Rather than tasking a small local processor with a complex request that may take many seconds to respond, powerful servers handle the application logic and deliver a smooth experience that meets the expectations of subscribers every time, and on every set-top box.

The other concern regards bandwidth usage. Obviously, running every instance of an interactive application in the cloud means that a unicast MPEG stream must be generated and transmitted whenever a consumer is using the app. However, it is now possible for multiple unicast MPEG streams to be transmitted within the bandwidth necessary for a single VOD channel.

### Learnings and results

Cloud-based app solutions have already been deployed successfully in the field. For example, one cable operator has used the cloud system-wide to offer to its subscribers an extensive menu of personalized television content, such as hyper-local sports and news, advertising showcases, and mosaics. Using content development kits based on standard Web tools and its own internal technical resources, the operator has created more than two dozen applications within a matter of months.



**Figure 2**

The rapid availability of numerous cloud-based apps has enabled the operator to offer highly-differentiated services that have increased its competitiveness in the marketplace. These services include:

- News, Sports and Children's Programming mosaics that allow consumers to navigate through multiple tiles of live programming on a single screen;

- A sports channel application that leverages Web-based development tools and relationships with local high schools to enable viewers to watch an unprecedented number of local athletic events; and
- An interactive news channel application that provides in-depth and on-demand coverage of events of interest to subscribers within the operator's footprint.

The content for these applications combines professionally-produced programming with Web-based content generated from non-professional sources. Viewers can become active participants and contributors.

In all cases, subscribers use standard remote controls to search for, select and engage with the video and information on the application just as they can on the Web, but within the "lean-back" environment of television. In addition, the apps can easily be "bound" to the existing television experience: For example, a shopping channel application's interactive t-commerce application is accessible with a single click on the remote, making it easy for viewers to extend their experiences and easily purchase products without the need to hunt through TV menus or switch to laptops for more information. They use nothing but their cable remotes to interact.

The ability to quickly and inexpensively write and modify content using standard Web authoring tools, as well as stream content to any digital set-top box or Web-connected CE device, creates several benefits for the cable industry. Among them:

- Existing Web applications that are driving online use can quickly be brought to the television, building value for cable operators' video bundles;
- Content creation becomes accessible to individuals, local organizations and small businesses. This provides the type of coverage people once enjoyed from local publications and media outlets, enables the dynamism that has characterized the growth of the Web, and strengthens cable's bonds with its customers;
- By gaining the ability to modify app content in real time, advertisers and cable system operators can respond flexibly and rapidly to changes in the marketplace. For example, they can much more easily change promotional emphasis or sale prices to create or account for consumer demand.

### **Advertising**

There are two critical benefits for advertisers in an app-friendly marketplace. First and foremost, many apps serve as de facto advertising vehicles, in that they are mechanisms that create and extend consumer awareness of a brand, strengthen the relationship between awareness and action, and even result in monetized transactions.

Secondly, third-party applications are gateways for advertisers to engage with consumers who are already interacting with the TV. One app in particular – TAG Games – has leveraged the relationship between the consumer and the TV (playing fun games alone or with others with a touch of the remote) into a demonstrably successful advertising platform that consumers have clearly accepted.

In a P. Nuttles advertising campaign recently run in a major cable market, 14 percent of consumers who were exposed to an ad offering a free candy bar actually responded. Compare

this with a standard Web banner ad response rate of two percent, and the value of putting an interactive advertisement in front of a cable consumer is clear.

### **Conclusion**

Cable has taken a few key steps on the path of interactivity so far: It has deployed a few hand-crafted, hard-coded applications on proprietary platforms, added cable-industry-standard platforms for interactivity (EBIF, tru2way™) in large-scale deployments, and most recently has begun to test cloud-based platforms that leverage the Web. In each of these phases, success stories have driven further innovation and increased the scope of what is planned and deployed.

In today's world, the definition of success for an application platform is closely tied to how open it is for third-party developers, as well as how easy it is to develop and deploy new apps for that platform in a timely manner. Apple and Google have epitomized the incredible success that can result from this type of open, rapidly deployable environment; other platforms have struggled to maintain relevance due to difficulties in deployment and the lack of good developer communities. By leveraging the cloud, and by fostering highly Web-centric application development and deployment platforms, cable has a tantalizing opportunity to leverage its current successes into a new era of highly personal, highly profitable interactive television.