



APPLICATION DEVELOPERS

Starter Kit

An Introduction to OpenCable™ Application Development Opportunities and the tru2way Initiative

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*Join the OpenCable
Developers Community
on Java.net*

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...Revolutionizing Cable Technology®

Published by **Interactive TV Works**

Calling All Developers

CableLabs wants to enable interactive video application developers to implement the latest technological advancements and integrate them into their business objectives. As part of that effort, it is pleased to present this Tru2way™ Starter Kit for Application Developers. The kit serves as a starting point for developers to explore tru2way background information, an overview, business rationale, perspectives from key developers, and examples of new applications.

To promote interactivity on digital television and other devices, CableLabs long ago issued OpenCable™ Application Platform (OCAP™) specifications, based upon Sun Microsystems' Java software. The OpenCable specifications form the foundation for the new tru2way brand that applies to this interactive video platform and related retail electronics.

Tru2way technology is being built into televisions, set-top boxes, and other devices, enabling cable and other application developers to write interactive applications once and see them run on any cable system that supports the specification. Cable companies, including Comcast and Time Warner Cable, have committed to deploy support for the tru2way platform in service areas covering more than 90 million U.S. homes by the end of 2008.

For content developers, this initiative offers innovation and new business opportunities. The tru2way platform supports a variety of subscription and transactional business models, and the cable industry is exploring ways to use its infrastructure to support advanced forms of addressable and on-demand advertising.

Of the more than \$70 billion spent annually on television advertising, cable's share of the local and spot advertising pie is a small \$5 billion. Separately, Internet advertising topped \$21 billion in 2007, according to the Interactive Advertising Bureau. With tru2way technology being integrated into set-top boxes and hardware, and with cable operators deploying tru2way across their networks, the business case has been established for cable ad revenue to grow. The tru2way platform provides advertisers with an interactive medium that is in front of their most captive audience.

The software platform provides an affordable means to create interactive applications that will run across TV, Internet, digital phone, mobile, PC and other device platforms. CableLabs is continuing to work on new specification versions and extensions that will support the scope of tru2way technology that consumers increasingly will see on HDTVs, DVRs, and other retail products.

CableLabs regularly holds interoperability events (known as Interops) for developers to discuss technical implementation. CableLabs also organizes developers conferences and supports online developer forums such as the OpenCable Project site that is hosted on Sun Microsystems' Java.net site (<https://opencable.dev.java.net/>).

We hope that this publication will inspire developers to use this opportunity as a launch pad for their own tru2way-based innovative thinking.



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Published by Interactive TV Works, designed by Black Walnut Design

New Opportunities for Interactive Media

Applications developers and device manufacturers have been using Java software to bring innovations to the Internet, cell phones, set-top boxes, DVDs and DVRs, totaling billions of devices worldwide. Now comes a tremendous opportunity to expand that Java experience to a device that sits in millions of U.S. homes: the television set.

The cable television industry, along with major consumer electronics manufacturers, has embarked on a mission to foster new interactive and on-demand television capabilities through tru2way technology.

Rooted in well-established OpenCable Application Platform (OCAP) specifications, tru2way technology creates a standardized, open Java-based software platform.

Using common authoring tools, developers can create interactive applications for television or any consumer electronics that are branded as having tru2way capability. In turn, it fosters a new line of TVs and other consumer electronics with plug-and-play capability on cable.

Interactivity + Convergence

The software platform enables developers to bring Internet-age innovation to an age-old medium. It allows developers to add interactive elements and more on-demand features to traditional TV programming, plus it promotes convergence across TV, Internet, digital phone, mobile and other device platforms.

Applications already targeted for television include program guides, interactive games, polling, music, advertising, shopping, navigation tools, stock information, caller ID, and enhanced news, sports and weather.

Applications can include simple informational pop-ups, blends of TV and personal media, or more immersive, multi-layered experiences. They can be "bound" to a specific TV program or "unbound" so they're free to run across multiple TV channels.

In the convergence category are such emerging capabilities as sending content from your TV to your mobile phone;

remotely programming your DVR; and using online search functions to access information on TV.

Popular online activities like social networking and posting user-generated content could find equivalent activities tailored for TV.

Content producers can benefit by integrating interactivity into their programming. An example is voting during a TV show by using a TV remote rather than depending on a mobile phone. Not only is this more convenient for a consumer, but the response mechanism no longer depends on a third-party, and often competing, service.

Advertisers also benefit by adopting interactivity. Rather than blindly purchasing spot time, advertisers will be able to take advantage of tru2way technology to engage their audience and collect response metrics, resulting in an increased return on investment.

Tru2way capabilities offer new opportunities for existing television industry players as well as third party developers, whether well-established Silicon Valley companies or individual entrepreneurs working out of a garage.

Developers can rely upon successful Java experiences from the web, mobile phones, or Blu-ray Java (BD-J). Online forums and other resources are being established to offer open source code, samples, tools, emulators, and affordable software developers kits (SDKs).

Join the tru2way Community

Developers can get resources and support for their tru2way efforts through Cabelabs' OpenCable Project on Sun Microsystems' Java.net site.

The site, at <https://opencable.dev.java.net/>, is designed primarily to help third party developers to understand the specifications, stay updated, test their work-in-progress, and exchange ideas with other application developers.

Included are developers forums, information resources, downloads, license agreements, links to suppliers, and all of the technical specifications.

Users can get involved in an application project, request a project, view project help wanted ads, publicize a project, and submit content to the site.

The online forum emulates many successful joint development experiences generated through Java.net.

Tru2way Means Business

As this technology platform grows, business opportunities blossom. New forms of interactive advertising and shopping are surfacing. Television sets and other devices are taking on new interactive features to attract new customers or to promote brand loyalty. →

Applications Gallery

Portraits of Convergence

An important part of the OCAP specifications is ETV (Enhanced TV), which uses a thinner technique called EBIF (Enhanced Binary Interchange Format, called ee-bif). ETV specifications enable applications on today's legacy digital set tops and they are compatible with tru2way devices.

Cable companies are embracing ETV as a way to launch simple interactive TV features, such as polling, traffic and weather, and as an entryway to interactive advertising, which helps to provide a financial rationale for further ITV investment.

How We Got Here

CableLabs' OpenCable effort has taken on many important roles as it has evolved from initial technical specifications to its recent elevation into the consumer spotlight through the tru2way brand.

For years, developers were constrained by proprietary or conflicting technologies to foster interactivity on TV. Simultaneously, the cable industry needed common software to ensure that interactive features on HDTV sets and other digital devices are cable-ready if consumers want to connect them without using a cable set-top box.

OCAP specifications are rooted in the open DVB-MHP (Digital Video Broadcast-Multimedia Home Platform) standards that are being used for ITV largely in Europe.

With MHP and OCAP (and OCAP's broadcast TV equivalent, ACAP), Java provides the basis for middleware that goes inside devices and for APIs that present applications.

At its core is a very simple goal: Put OCAP middleware into various devices and use OCAP authoring tools to create interactive content that runs on those devices.

With the middleware inside an HDTV, consumers can receive interactive apps that their cable provider offers, plus they can be assured that the TV features will work with a cable connection no matter where they might re-locate.

In turn, tru2way technology helps to foster a retail market for set-top boxes and other cable-connected devices sold by third party companies, which, by federal law, the cable industry is required to do.

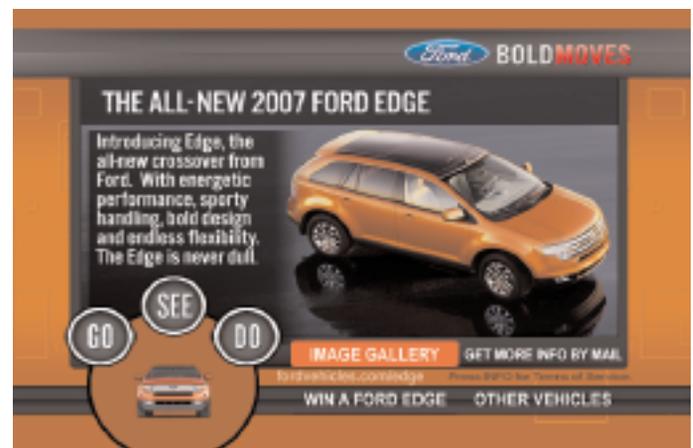
Now, with a standardized software platform, interactive applications can run on different cable systems, whether owned by Comcast, Time Warner Cable or Cox, or different makes of enabled TVs, whether from Samsung, LG or Panasonic. All of those companies are playing leading roles in tru2way deployment.

But the effort isn't limited to the TV set. Tru2way software can be used in virtually any digital device, so that interactive applications can run on a TV, a Media Center PC, a DVR, a mobile phone, or a portable player. And that's where things are getting even more exciting.

Tru2way technology not only supports interactive applications on TV, it also enables content on multiple distribution platforms. Content can be displayed on various devices, travel from one device to another, or provide new forms of blended media. Here are a few examples of developers' works and the types of applications that can be produced.

Advanced Advertising

Advanced advertising has become a high priority for the cable industry. Developers are seeking to use cable's distribution capabilities to foster new forms of interactive, on-demand and multi-platform advertising and commerce. In turn, new ad revenues provide a business rationale and financial stream to support further interactive investments.



A prime example of an interactive ad application is the Ford Edge iAd. Ensequence, in partnership with Ford and Turner Media Group, created and deployed an interactive ad that enabled viewers to "Go, See, and Do" more things with the Ford Edge and five other autos.

With clicks of the TV remote, viewers can review product photos, get more information, enter a sweepstakes, and request brochures. They also can enter their mobile number to download content onto their phone.

The app includes 10 pages, animated navigation and six RFIs (request for information) that are fulfilled by sending set-top box data upstream over a back channel so that, for example, car brochures can be mailed to requesters.

Ensequence has tested the app on a variety of OCAP stacks and set-top boxes as well as EBIF-capable boxes.

“All original application functionality was replicated in OCAP and EBIF environments,” Ensequence reports. “The higher-end EBIF boxes displayed the rich graphics well. The OCAP boxes provided the richest experience overall.”

Internet-on-TV

Tru2way interfaces provide a graphically rich TV framework for Internet-based content. They might even make your worst family photos look better!

Photo sharing is one of the most popular applications on the web. Online photos can be viewed on your big-screen HDTV in an application involving Flickr, the photo sharing site owned by Yahoo!

TVPhoto, an application from Zodiac Interactive, enables viewers to use Flickr to see their own photos on TV, set up slide shows, and browse Flickr’s unique community of shared pics. The interface provides the ability to mashup other web services or photo sharing sites.



In addition, the interface provides for advertisements that can be addressed to users based upon the keyword tags (a form of meta-data) that are used in photo

searches. So the service can remain free for users while providing a revenue stream for service providers.

Zodiac and other developers are combining tru2way capabilities and popular web activities to create new blends of the best of web and TV experiences.

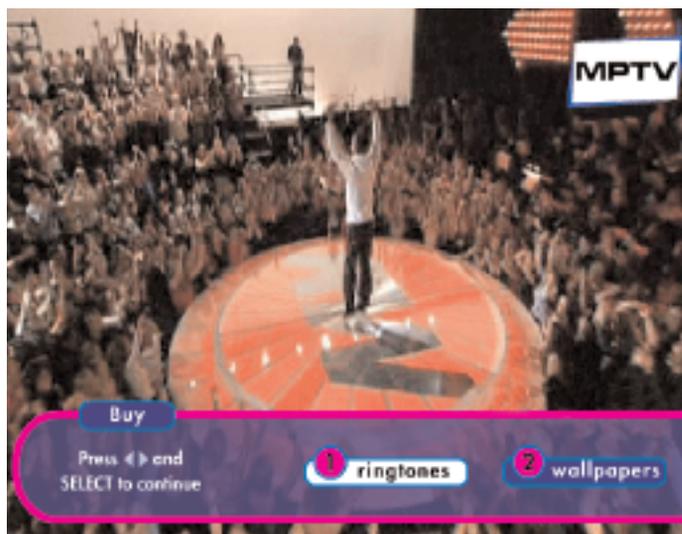
Mobile TV

Content is going mobile, and tru2way technology supports this trend. The tru2way platform can extend to mobile phones and portable players to deliver authorized content beyond the TV screen.

So if you’re watching music videos on TV and your favorite band comes on with a new song, you can download the video and make that song your ringtone. MPTV (mobile products and television), an application from itaas, offers this capability.

Using a simple tru2way-based TV interface, a viewer can select whether to download a video, a ringtone or a wall-

paper shot to their mobile phone (games and advertising have been added too). Users punch in their mobile phone number and their selection gets delivered to their phone.



Such applications open up new revenue possibilities. The application can integrate with phone or cable billing systems so providers can charge for the ringtones or other content, or even offer cross-platform ads and purchases.

Transactions

Home shopping and other forms of instant commerce are a click away with tru2way technology. Even eBay online auctions can be brought to the TV.

eBay on TV, an application developed by Biap Systems and trialed by Time Warner Cable (branded as eBay Anywhere), enables registered eBay users to access current auctions, watch lists and recent history.



The application enables eBay users to submit bids and check the status of their accounts—all in real time and from any channel.

Users get alerts notifying

them if they have been outbid, or if they have won an item. If they’re outbid, they can immediately submit new bids without ever leaving the television.

BIAP provides an EBIF user agent, a behavioral profiling engine and a presentation engine. The results of the consumer activity provide additional opportunities for addressable advertising and measurement.

Views From the Tru2way Front

Tony Istvan, Comcast

Tony Istvan, senior director for advanced development at Comcast, runs a tru2way (OCAP) development shop in Denver, Colo. He's been integral to developing Comcast's OCAP-based user interface and working through development issues. In this Q&A, he discusses developing with OCAP software and how to improve performance.



Q. As an OCAP developer yourself, what are some of the obstacles you encountered, and how did you resolve them?

The embedded environment—in many ways, it's a black art. A lot of it is just trying things out, to get a feel for the box, and whether the performance is acceptable or not.

Sometimes you have to try almost wacky things, to see which approach works the best. What we've done is to come up with ways to do things better, and faster, and just learn from experience.

Sometimes you'll see development groups accept limitations, and sort of give up. Whereas the truth is, if it doesn't work one way, try another.

Q. How so?

Realign the code. We try to keep to very short (development) cycles. Short meaning: you work on it for a day, benchmark it, see what you get. If it's not good, try something different. Lots of small, incremental developments, so that you always know what's going on, and you don't let performance issues get too far away. Performance issues are really hard to fix if you're schedule-driven.

Q. What's an example of that?

My first OCAP application wasn't built at Comcast, but it was for set-top navigation. I was using a pretty well-known guide data feed. For starters, I was doing the development on my laptop, so I immediately factored in that my laptop would be 10 times faster than the set-top box. I did all this string parsing on the laptop.

Pulling in two weeks of guide data was taking around 14 minutes, on the set-top. On the laptop, it was almost simultaneous.

So I thought, maybe it's a problem with how strings are done in Java. I created an optimized version of the string

parsing, and it was 40 times faster.

Q. So part of it is a matter of pushing limits?

Yes. It's not necessarily intuitive. Another thing that helps a lot is working on multiple platforms. Some development shops will say, "Oh, the box is slow, OCAP is slow." It becomes a foregone conclusion. They blame it all on the box, and then the middleware.

Well, if you're running on different platforms, you can see what's a hardware problem, what's a software problem, what's an applications problem.

Q. How many platforms?

At (2008) CES, we ran on 8 platforms, with 5 different OCAP stacks. When it all came into the lab, as we were getting ready for CES, they all had real differences in performance. Because we'd been working on so many boxes, we knew what was a stack issue versus an apps issue.

We could pinpoint it, and say, you could be doing this function three times faster. We knew because our box was based on the same chip. It's important to understand what's really outside your control and what isn't.

Q. Tell us about your team.

We're our own little unit. We write everything we need ourselves. For that reason, we can be nimble, and can respond really quickly.

Q. Do you foresee a way for cable to emulate cellular in building a third-party developer environment? Could TV viewers get out of the box via an embedded cable modem to go to particular sites to download apps?

Ultimately, yes. That's sort of how OCAP was designed. It's based on MHP, and MHP didn't have unbound apps. It was always bound to a programming stream. So it's not a hard thing to do an HTTP download of the application to the box. The bigger issue we have is: what's going to be the effect of that application on the box? What will it do to memory usage, how does it interact with other active applications? For obvious reasons, we need apps that are well-behaved. For operators, the infrastructure is the hard part, more so than the app.

Q. Do you see a path in that direction?

Once we get more comfortable with these things, yes, it'll get easier. If you went to the shows a year or two ago, all the OCAP demos were pretty lame. Slow, clunky stuff. What we've worked on is, how do we make things work at a higher performance, and how do we make them more interesting?

Sherisse Hawkins, Time Warner Cable

Sherisse Hawkins is vice president of software engineering for Time Warner Cable's Advanced Technology Group (ATG), in the Denver area. She and her team spent the last two years building and launching a series of consumer-facing TV applications using OCAP. In this Q&A, she discusses what it took to get there, and where things are positioned to go next.



Q. What applications has Time Warner Cable launched so far?

Our first steps were to re-code the applications that were already out there with customers. On our existing base of digital set-top boxes, for instance, the biggie is a product we built called the Digital Navigator, which combines the traditional grid guide with ways for people to intelligently browse channels, get information, and order on-demand content. It is the way customers control what they want to watch on TV. So that was the first to get rewritten in Java.

Within the OCAP environment, we've included things like caller ID to the TV, customer care features, and commerce. Also, we put on some diagnostics and utility-type stuff. Not real sexy, but useful, plus they prove that this open standard stuff really does work.

Q. Why it was necessary and important to do the navigator, ODN, first?

We needed to prove out the overall infrastructure and make sure that we'd have that as a basis for customers to spring-board from. It's the first place where customers "come in."

Like on our access menu, we made that data-driven—so as new, cool things come into place, there's a spot for them to land and to encourage people to engage. It's like a parking place for the new stuff.

Q. In early 2008, Time Warner Cable reported having active OCAP capability in over 600,000 U.S. homes. What's the outlook for growth?

Every box that Time Warner Cable is purchasing and deploying is OCAP compliant, and has been, since July of 2007. Literally, everything going forward is OCAP capable.

Q. What are the top things you've learned that would be useful to a third-party developer interested in writing apps for cable TV?

One is to keep in mind the enormous amount of overall up-time of a device like a set-top box. People keep their set-top boxes on for a long time. They don't turn them off at night.

They also don't want to be interrupted in their TV experience.

Two, is to think about the screen that your app will play on. It's probably big. On cable, we have a pretty straightforward way to get information and entertainment to customers, and we have a rich way to display it. So, colors, pixels, options—think about it carefully. If you are transferring some applications from the web, or from a phone, you'll probably notice pretty quickly that it isn't such great resolution on an HD plasma.

HD is really cool. Take advantage of it. Think about the app in terms of how big the screen is. You can blow people away. They're in a relaxed mode, watching a beautiful big screen. Wow them. Entertain them.

Q. Are there any applicable punch-list items, along the lines of "best not to do this" or "definitely do this"?

Definitely test on a real platform. If a set-top box is your target, and you come to me and describe your app and then tell me you've never actually put it on a set-top box... well, you'd probably get some loud non-verbals. At the least, an eyebrow would go up!

There are places to go to get tools and emulators. Even if it runs great on your PC, you're not doing yourself any selling favors by not trying it in as-real-as-possible conditions.

Q. How would you anticipate that the third-party developer community get engaged with cable?

It's a difficult question. Historically, there has been a gap.

That gap existed because we on the cable operator side had been so busy getting it to work that we haven't yet focused on getting the infrastructure ready for outside developers. We're at the very beginning! And we're working on (attracting developers), as an industry.

There are ongoing interoperability tests, of course, at CableLabs, and that's good. We'll need to do more.

It's important to us to engage the third-party developer community, and it's the thing that needs to happen next. Last year was about getting the volume, and getting it working. Now we can look at how to expand that, to continue to find applications that delight our customers.

That process is getting underway. There's an OCAP community forming within Java.net (<https://opencable.dev.java.net>) and there's an independent developer web site called OEDN, which stands for OCAP/EBIF Developer Network (www.OEDN.net). So things are moving in the right direction. But again, it's still pretty early in the game.

Will Cable Emulate Mobile Apps?

By Leslie Ellis

So far, the development community for building OCAP applications is growing nicely. As of early 2008, perhaps a dozen third-party companies are building applications to run within the OCAP environment and efforts like Java.net's OpenCable Community are designed to attract more developers.

The installed base of OCAP-ready set-top boxes also is on the rise. Most cable operators have upgraded their head-ends to accommodate OCAP.

Cable operators are exploring ETV as a way to offer simple applications and interactive advertising on existing digital set-tops, but they're just beginning to roll out OCAP-outfitted boxes that provide for richer apps. Tru2way HDTV sets are just starting to emerge. Time Warner Cable is the farthest ahead, with 750,000 fielded OCAP boxes, as of March, 2008.

Most cable operators also spent the last two to three years re-coding all of their existing set-top applications in Java. That means the guide, the on-demand ordering system, the DVR control system, etc.

Beyond home-grown applications, however, is the sometimes off-putting fact that each individual cable provider—sometimes at the corporate and local levels—must test, approve, and “do the deal” with a third-party provider before that application gets any appreciable air-time.

The good news is, that can change. For starters, the mobile industry did it.

So far, 1.7 billion handsets are in consumers' hands, which, along with 20 million digital set-top boxes, are enabled by Java software, the foundation for OCAP. More than 200 service providers (mobile and TV) are providing Java-enabled services, worldwide.

Mobile carriers, structurally, are much like cable operators. They serve millions of customers on a managed network, which they built and must maintain.

Both industries share concerns about the security and integrity of their networks. They worry about a rogue app that would harm the network, or flood customer care lines with unanswerable questions about unsupported apps.

Nonetheless, some mobile carriers opted to take the risk, including NTT DoCoMo, in Japan; Vodafone Group Plc.; and China United Telecommunications Corp. Domestically, both AT&T and Sprint essentially are open networks.

Opening mobile networks to third-party developers involves outfitting mobile phones with Java-based software: J2ME

(Java 2, Micro Edition), a group of specifications that pertain to Java on small devices; CLDC (Connected Limited Device Configuration), and MIDP (Mobile Information Device Profile), which adds APIs for application life cycle, user interface, networking, and persistent storage.

Business arrangements range by carrier and by type of app—from a revenue cut to a per-download fee. In the case of Apple's iPhone SDK, for instance, it's been published that Apple assumes a 30% revenue cut, and it covers all overhead, such as credit card fees.

Drawing the Parallels

From a consumer perspective, going from a closed system to open means being able to “browse” for applications, in addition to using the “walled garden” features provided by the service provider.

Technically, and in the mobile sense, it works by opening a linkage to the Internet, for WAP-based access to sites that contain applications for download. Thousands of such applications already exist for mobile phones, sometimes aggregated on sites (like Handango, as one example.)

A more TV oriented example is MobiTV, which enables mobile customers to stream popular television programming to their mobile devices.

How might cable take a similar path? It would require a strategic decision to establish permit-user initiated connectivity from the digital set-top box.

Most advanced digital boxes entering the market today include a DOCSIS cable modem; currently, that out-of-band path is used exclusively for business-facing data transfer—guide data, conditional access, etc.

For cable to parallel mobile's endeavors, the destination for that path would be a website or portal specifically oriented to offer downloadable, OCAP-based apps.

Before that can happen, a mechanism will likely be required to test third-party apps, largely to protect cable customers from rogue apps that take down their service.

Those are among the next steps for cable's pursuit of a third-party development community. The building blocks are being put into place through OCAP rollouts and with the recent addition of OCAP to the Java.net community. It's nascent, but it's heading in a known and strong direction.

Leslie Ellis of Ellis Edits is an independent technology analyst, columnist and author who serves as senior technology advisor to the Cable & Telecommunications Association for Marketing (CTAM).