

ATVEF: A Blueprint for Convergence

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ABSTRACT

The Advanced Television Enhancement Forum (ATVEF) is a consortium of leading companies in the television and computing industries, which is creating a public, worldwide specification for creating and delivering the interactive TV experience. The ATVEF specification for interactive television is designed to allow content to be authored once and delivered to a variety of platforms: intelligent TV receivers (analog and digital), set-top boxes and PCs.

INTRODUCTION

The ATVEF specification for interactive television describes a content-authoring format that supports the delivery of interactive programming over existing terrestrial analog television services (broadcast and cable), emerging DTV systems, DTH satellite formats and the Internet. It can be used in either one-way or two-way modes, and accommodates all international television formats.

Wherever possible, it incorporates existing standards to ensure compatibility, interoperability and extensibility.

THE ALLIANCE

The ATVEF specification was designed by a broadly based group of companies that includes key players in the content, delivery and consumer electronic sectors of the television and computing industries.

Fourteen founding organizations have been joined by an ever-growing list of adopters. Contact the ATVEF office¹ for the latest list of involved companies and other information².

THE SPECIFICATION

The ATVEF specification, currently in draft V1.1r26 form³, has three main purposes:

1. It contains content specifications to establish minimum requirements for receivers.
2. It includes delivery recommendations for the transport of enhanced TV content over various distribution formats.
3. It specifies a set of bindings to these respective formats.

A key design point of the specification involves the use of existing content and delivery standards whenever possible. The creation of any new methods is done only when absolutely necessary to conform to the unique requirements of a broadcast ITV architecture.

Therefore the ATVEF specification references the full existing specifications for HTML, ECMAScript, the Document Object Model (DOM), Cascading Style Sheets (CSS) and various media types in its definition of minimum content requirements. The specification does not set an upper limit on such content, however, but provides a nominal capability set for content developers, allowing them to author content once and be assured that it will play on the widest variety of receivers.

A second primary design goal is the provision of a single solution that runs on a wide variety of delivery networks. ATVEF-compliant content can be carried on both analog and digital television systems, as well as systems that do not support video at all. This includes transmission over terrestrial broadcast, cable and DTH satellite systems, as well as over the Internet.

Further, ATVEF-compliant content can bridge between networks, such as in the case of data on an analog terrestrial broadcast bridging to a digital cable system. This functionality is possible via the implementation of transport-independent content and the use of IP (Internet Protocol) as the reference binding, by way of the IP bindings already defined for various television systems.

TRANSPORT

The ATVEF specification defines two different transport modes (A and B). Transport A refers to situations where a data-return path from the user is available, while Transport B covers one-way broadcast data.

A variation of a Transport A implementation could include full web-browsing capability, allowing optional integration of e-commerce links to the ITV content.

To ensure full interoperability, the ATVEF specification requires standard bindings that its compliant content data must use when running on various delivery formats. ATVEF has designed the reference IP binding noted above, and proposed an example of an NTSC binding (more on this below). This does not preclude the design of other bindings for the carriage of the content that the ATVEF specification defines. In fact, ATVEF does not intend to define bindings for all television standards. This is more appropriately defined by the respective standards bodies.

It is important to stress that the ATVEF specification only specifies a *content* format. The transport-related elements of the ATVEF specification are simply examples of how that content might be successfully transmitted. Such transport is, of course, critical to interactive television, and an area with widely divergent parameters across the industry at present, so the ATVEF specification deals with transport issues at some depth. Nevertheless, ATVEF does not *specify* particular transport mechanisms.

TRIGGERS

Triggers are real-time events delivered for the enhanced TV program that determine the running time of various data elements, synchronized with reference to the television program they accompany. The ATVEF specification includes details for specifying these “markers” in ITV content.

Various receiver implementations can unilaterally determine how users will enable or disable display of such enhanced TV content. Trigger arrival can be used as a signal to the receiver, which can then notify the user of enhanced content availability. Alternatively, the receiver can be set to automatically display such content upon arrival.

In the one-way broadcast mode (Transport type B), *announcement* data is used to initiate or offer enhancements to the TV program. An announcement specifies the location of both the resource stream (the files that provide content) and the trigger stream for an enhancement. These files will likely have been cached in the local memory (a minimum of 1MB is specified).

Announcements also provide information about the enhancement's language, its start and stop times, its bandwidth and its peak storage size needed for incoming resources, along with other data. Among the latter, an option exists for the identification of another broadcast channel for cases in which ATVEF-compliant content is sent separately from the audio/video TV program. The receiver must be able to start receiving data using only the description broadcast in the announcement.

A single ITV program may support both Transport A and B simultaneously. In other words, it carries enhancement data intended for bidirectional IP-type connections as well as for one-way, broadcast-only receivers. This would allow maximum reach for at least some of the interactive enhancements to the program. Receivers can choose between these formats when both are encountered.

An additional element of timing involves how to cancel previously delivered enhancement data once it has expired. A methodology for this function is also detailed by the ATVEF specification.

BINDINGS

Bindings in the ATVEF specification define how ATVEF-compliant content will run on a given network. The binding may support either or both Transport types A and B. It is necessary that a standard ATVEF binding exist for each transmission network so receivers and

broadcast tools can be developed independently but remain interoperable.

The criteria for ATVEF-compliant bindings include all the data needed to build a compliant, interoperable receiver for a given network. The binding provides the "glue" between the network's spec and the ATVEF spec, in cases where the network specification doesn't contain all the necessary information for such data carriage.

Because carriage of IP is already included in the specs of many media-transmission systems, ATVEF defines its binding to IP as the reference binding. This implies that one way to build an ATVEF binding for a particular network is to simply define how IP runs on that network when associated with a particular video program.

The current ATVEF specification also includes a model of how to build a binding specific to a network standard (NTSC). The example binding defines Transport A using an NTSC-specific method, and defines Transport B using the IP reference binding.

As implied above, this example NTSC binding was created by merely referencing the IP-over-VBI specification created earlier by the Internet Engineering Task Force (IETF).

UHTTP

An Appendix to the ATVEF specification defines a one-way, IP-Multicast based, resource transfer protocol called the *Unidirectional Hypertext Transfer Protocol* (UHTTP). It is designed to efficiently deliver resource data in a one-way broadcast-only environment. It can be used to carry IP Multicast data on an analog TV signal's vertical blanking interval (IPVBI), or in the MPEG-2 DTV stream, as well as other unidirectional transport systems.

This IP Multicast stream can carry web pages and their related resources (including scripts) alongside the related TV signal. A session announcement broadcast by the TV service tells the receiver which IP Multicast address and port to monitor for the associated data.

CONCLUSIONS

Enhanced or interactive television is comprised of three major components: *Announcements* of the existence of enhancement data to the receiver, the enhancement *content* itself, and *triggers* telling the receiver when to display various elements of the data. An ideal and comprehensive ITV content format should accommodate all these components, and further define how they should be carried on as many distribution systems as possible (both current and emerging).

The ATVEF specification achieves these objectives, and does so by incorporating standards and systems that already exist. Just as the current success of the Web can be attributed to its extension of already existing and widely deployed telephone services, modems and personal computers, the ATVEF approach extends existing television and Internet systems into a converged context. This should allow a simple and rapid acceptance of enhanced television services.

ATVEF has defined content specifications for such enhancements, and recommended methods for such content's carriage over various transmission systems. ATVEF documentation also includes recommendations and examples of applications for enhancement and interactivity in television programming⁴, along with a set of references and a glossary of terms⁵.

The success of interactive TV depends on the ability of content providers to produce compelling interactive programming in a simple and efficient manner, and the ability of TV

service providers to deliver it uniformly on a variety of systems and receivers. The ATVEF specification addresses each of these issues, and serves as the foundation for what could become an extremely successful and valuable new industry segment.

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² See also www.microsoft.com/atvef for additional ATVEF information.

³ For the complete ATVEF specification text, see: http://www.atvef.com/atvef_spec/TVE-public-1-1r26.htm

⁴ http://www.atvef.com/atvef_spec/TVE-public-1-1r26.htm#example

⁵ http://www.atvef.com/atvef_spec/TVE-public-1-1r26.htm#Glossary