



# OPENTV GATEWAY

- ▶ Making **Communication** Protocols  
**Transparent** to Applications

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## INTRODUCTION

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OpenTV Gateway™ is a solution for network operators, content providers and developers who want an efficient way to develop and deploy applications which use transactions and messaging (such as t-commerce, e-mail, chat, polling etc.) on set-top box (STB) platforms that have limited or no support for standard messaging/communication Internet protocols.

OpenTV Gateway is a member of the OpenTV Network Solutions product family, an integrated set of software products that enable the efficient deployment and management of iTV applications creating profitable, new revenue streams for network operators. The Network Solutions components manage the generation of iTV applications, the broadcast environment and where necessary the return channel.

The components that make up OpenTV Network Solutions today are:

- OpenTV Streamer
- OpenTV Publisher
- OpenTV H2O
- OpenTV Gateway

## OPENTV STREAMER™

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OpenTV Streamer is OpenTV's solution network operators, content providers, and high-end developers seeking to broadcast interactive content using standard digital broadcast facilities. OpenTV Streamer allows broadcasters to multiplex data with audio and video signals, and performs real-time compilation of data modules, allowing up-to-the-second transmission of sports scores, stock quotes, and other time-sensitive data. For more information, please refer to the OpenTV Streamer Technical White Paper.

## OPENTV PUBLISHER™

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OpenTV Publisher combines the latest iTV technology with today's Internet protocols to create compelling interactive applications at minimum cost and with web speed. For more information, please refer to the OpenTV Publisher Technical White Paper.

## OPENTV H2O™

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OpenTV H2O is a solution which leverages existing Web infrastructure, content and skills and makes HTML/JavaScript a complete authoring solution for iTV on thin set-top boxes running OpenTV Middleware technologies. This product is due to ship during the early part of 2003 – a technical white paper will be available shortly.

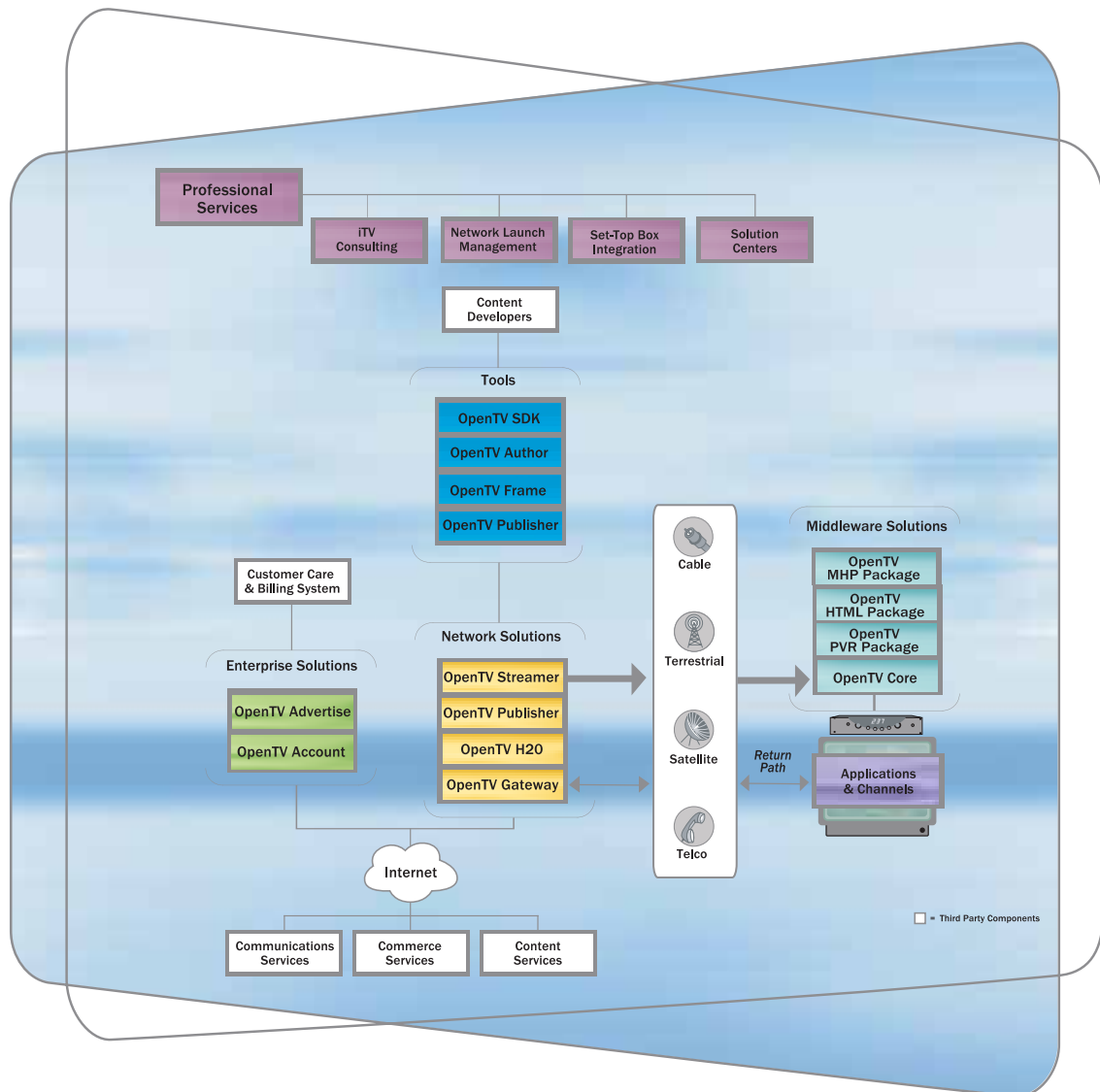


Figure 1: Network Solutions and OpenTV Gateway as part of the OpenTV Complete iTV Solution

## OPENTV GATEWAY OVERVIEW

OpenTV Gateway is the return path-enabling component of OpenTV Network Solutions for non-IP enabled set-top boxes. It connects the set-top box (STB) with multiple content provider backend systems. Messages are forwarded to content provider backend systems using standard Internet protocols including HTTP and SMTP. The software uses protocol adapters to translate between the low-level communications protocol used by the set-top box and the higher-level Internet protocols.

OpenTV Gateway offers networks a cost-efficient way to expand iTV services to transactions and messaging using low-end, existing platforms. The low cost, highly scalable architecture allows network to greatly increase the revenue potential of their existing infrastructure without replacing set-top boxes. In addition, it offers a uniform communications solution across low-end, mid-size and high-end set-top boxes, accelerating the deployment of more demanding iTV infrastructures while retaining the current set-top box population and customers.

OpenTV Gateway today supports the following set-top box return path networks/communication protocols :

- Motorola Aloha/UDP - Most Motorola-based US cable networks use the Aloha/UDP return path. This includes all DCT2000-based cable operators.
- SMTP – This is the common protocol for e-mail services on the Internet. SMTP enables developers to write messaging applications.
- IMAP – e-mail protocol
- TCP/IP (Broadband cable and DSL)
- Raw Modem (PSTN) – Public Switch Telephony Network return path
- PPP including CHAP & PAP – Point-to-Point-Protocol (PPP) allows the use of existing Internet Service provider modem pools to connect STBs. PPP is the default Point-to-Point-Protocol for Internet modems. CHAP & PAP are authentication protocols.
- HTTP – This is the predominant Internet protocol for transaction services. HTTP enables t-commerce, polling, data retrieval, etc.

OpenTV Gateway allows set-top box applications to communicate with standard HTTP servers without the need to support a full PPP/TCP-IP communications stack within the STBs. This saves valuable STB resources and enables low-end STBs', unable to support such a communication stack, to interact with standard Internet applications servers.

OpenTV Gateway can be utilized both by OpenTV Publisher applications using the Transaction Gadget Kit and by any Software Development Kit (SDK) application. SDK applications use a set of libraries to communicate with OpenTV Gateway.

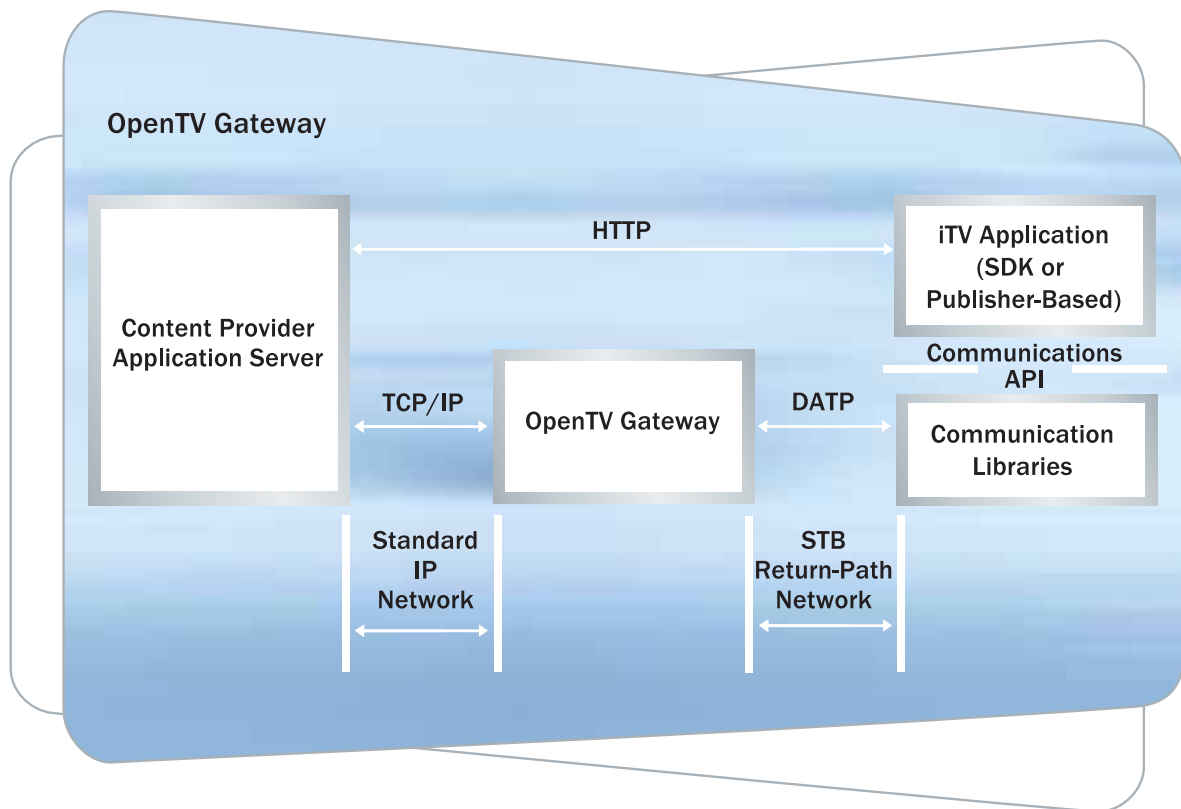


Figure 2: OpenTV Gateway Technical Overview

Figure 2 shows the relationship between set-top box applications, OpenTV Gateway and HTTP base application servers. Through the communication libraries provided with OpenTV Gateway, iTV applications are able to communicate via OpenTV Gateway with HTTP based application servers. The logic of the application assumes a direct HTTP connection with the application server. OpenTV Gateway uses an efficient and lightweight protocol called DATP (Digital TV Application Transfer Protocol) to transport messages over the set-top box return path network. DATP is then translated into TCP/IP and HTTP to transport the messages over standard IP-based networks. These networks can be the open Internet, a VPN (Virtual Private Network) or closed WAN (Wide Area Network).

DATP is used to overcome the processing limitations of, and the low data rates available from low-end set-top boxes. The DATP protocol used to optimize the communication between the set-top box and the OpenTV Gateway server is extremely efficient, maintaining a large portion of the IP protocol feature set, but without the overhead of features not used in this type of dedicated network sessions. As a result, the protocol has value even in IP-enabled networks and to support extensions for secure communication or other performance heavy protocol extensions

OpenTV Gateway integrates directly with the Point of Presence (POP) and headends of network operators for PSTN and cable return path networks respectively. OpenTV Gateway can be used in conjunction with standard PPP-based access servers, providing a solution to leverage existing network connectivity for interactive television.

OpenTV Gateway could also be used as a protocol translation proxy for networks with high-end set-top boxes. This would accelerate the support of new protocols because it is easier to download new o-code transport libraries with interactive applications than to constantly update the runtime. It may also improve set-top box performance by moving heavy computations from CPU limited set-top boxes to fast OpenTV Gateway servers, which in turn could reduce the cost of set-top box deployments because they would be able to use less expensive, less advanced set-top boxes. OpenTV Gateway could also ease the deployment of new high-end set-top boxes in existing networks because OpenTV Gateway offers a uniform back-channel capability across the existing low-end set-top boxes and the new high-end models.

OpenTV Gateway components are:

- A client DATP stack, libraries and lightweight versions of Internet protocols, which translates between the proprietary small footprint DATP messages and standard IP messaging. A client is downloaded to the set-top box running OpenTV Core with each messaging or communication application.
- The Gateway Server, which manages sessions between DATP clients on set-top boxes and converts the DATP lightweight protocols to standard IP services like HTTP, SMTP, IRC etc. running transaction and messaging servers. The Gateway server contains a number of third party standard, open source communication services, such as HTTP, SMTP and others.

OpenTV Gateway also contains a web-based administration interface to assist in easy set up and maintenance of the protocols supported. Examples of administration screens can be found in Appendix A at the end of this document.

It will be possible to extend the protocol support in a modular fashion, so requirements for yet unknown protocols can be added to the product without upgrading.

## MARKET OPPORTUNITY AND TARGET MARKETS

The market opportunity for OpenTV Gateway is made up of the following sectors:

- Current OpenTV network operators who have deployed on early, low-end set-top boxes and have a large number in the field that they do not want to upgrade or switch-out. Most currently deployed networks with low-end set-top boxes are very interested in being able to develop applications using standard IP communications protocols, such as PPP, TCP/IP, SMTP and IRC on these set-top boxes with limited resources. They require a small footprint intermediate protocol, which enables standard IP communication application transparently between the set-top box clients, and existing IP protocol-based servers.



- The cable market in the US that has deployed the memory constrained Motorola DCT2000 set-top box with a narrowband/out-of-band proprietary protocol (Aloha). This market also currently has more than 20 million set-top boxes and is continuing to grow, as the introduction of high-end set-top boxes like the DCT5000 appears to have stalled.
- Developers targeting these markets with transaction and communications applications.

Longer range target groups include:

- Networks who want to implement various processor or memory-intensive protocols, where the processing may be shifted to a central server or light versions of the protocol can be achieved using the DATP intermediate protocol.
- Networks who want to deploy secure applications on set-top boxes with limited resources. Since most low-end set-top boxes do not have enough computing power to use standard key-based encryption schemes, such as SSL, the market is looking for an encrypted communication path between client and server that does not require client-side computing power. This is true even for medium set-top boxes that support IP protocols, but may not have enough power for full SSL key encryption schemes.
- A potential market is the possibility of introducing an extension, which would support an RTSP client/server protocol to allow VOD vendors to use OpenTV Gateway as a common Gateway for VOD applications on low-end cable set-top boxes, such as the DCT2000.

## THE COMPETITIVE EDGE

OpenTV's challenge is to prove the cost savings of the OpenTV Gateway solution over various "home spun" solutions from manufacturers and developers. A number of set-top box manufacturers, like SAGEM, Thompson and Nokia have developed proprietary PPP and TCP/IP "light" versions with early OpenTV Core releases. Some manufacturers have developed light solutions of IP stacks in their port of OpenTV Core and offered these to the networks before OpenTV had a full IP stack available. The solution is integrated in the set-top box and offers IP stack functionality using a small footprint. A strength for customers who have large existing populations of these boxes in the field, it is a low risk, low cost solution. But, the weakness is that most of these implementations are proprietary to the manufacturers and it is extremely difficult to have multiple manufacturers agree to offer a common API across multiple set-top boxes. This is especially apparent where a single manufacturer has a large market share with a single network customer, who then wants to introduce a second or third supplier of set-top boxes. Often, due to the lack of computing power in the set-top box, these solutions lack the performance of the OpenTV Gateway solution. Due to the client side processing architecture it is difficult to add additional protocol support, such as secure communication, RTSP, SOAP etc.

There are some small software companies who have developed light versions of IP stacks for low-end set-top boxes. They offer a light solution to put IP stacks on top of OpenTV Core in low-end set-top boxes. The solution promises transparent IP protocol support for low-end set-top boxes and back end IP based servers. The solution we have seen has a much lower performance than the OpenTV Gateway solution.

There are no other comparable products to OpenTV Gateway currently on the market.

## TECHNICAL REQUIREMENTS

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The server side of OpenTV Gateway runs on the Sun Microsystems's Solaris™ operating system. Linear scalability and high availability is achieved by accessing the OpenTV Gateway servers via a load balancing router. An OpenTV Gateway Solaris server is able to scale to 1000 concurrent connections. A connect rate of 0.5% equates to support for 200,000 users. A typical load balancing router is able to scale to 1 million concurrent connections.

Availability is achieved by arranging the servers in a n+1 redundancy configuration. A small configuration would use two Solaris servers. By using two network cards in each server the internal network is protected from the set-top box network.

## HARDWARE & SOFTWARE CONFIGURATION

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The hardware & software configuration for OpenTV Gateway to support 1000 concurrent connections is a Sun workstation with:

- Solaris 2.7 (64bit version)
- Minimum 300MHz CPU
- Minimum 512MB of RAM
- 100MB/sec Base-T Ethernet cards(s) or higher
- 4GB Hard Disk Space

Future versions of OpenTV Gateway will support alternative hardware and operating systems including Windows 2000.





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