



Product Description

The term Set-Top Box (STB) refers to devices that connect to a television and some external broadcasted signal source. The Set-Top Box demodulates the broadcasted signal into audiovisual content that can either be displayed on a monitor or captured and recorded. The broadcasted signal source can be sent via satellite, a cable connection, a telephone line, or an ordinary VHF or UHF antenna. Content may include any combination of video and audio formats, internet web pages or interactive games.

Evolution of the Set Top Box

The STB industry has its roots in the Table box legacy device, where a user can use a hand-held remote control to communicate with this device to select among a wide range of analog television channels. Over time, as the networks and service providers added additional digital channels, satellite broadcast services, internet access and other options, the STB was introduced in the market to support all of these new channels and services brought about, for the main part, by technological advances. In recent years, the rise in digital consumer services is quickly transforming the STB into a multifunction device. With the advent of digital television and high definition TV, the broadcasting and reception of high quality video is now possible. Today digital broadcasts use all three main media: cable, terrestrial antenna and satellite. Each medium has its own scheme of transmission, reception, and error correction methods. Previously, communication was unidirectional from the service provider to the STB, and an analog television was at the output stage of the STB. Currently, it not only maintains legacy functionality but also provides a bi-directional communication channel with the service provider, as well as outputting a digital television signal for modern TVs. Some intended features of an STB include controlling home appliances, using the television as a display monitor and the use of a data modem to carry control commands from the Set-Top Box back to the service provider. To realize these advanced features, today digital STB units are being equipped with powerful microprocessors and sophisticated hardware.



The STB Market

In the last decade, there has been an extremely rapid growth in cable and satellite STB market due to the advanced features, supported media, and ease of billing. It can be observed that since 1998, there has been tremendous popularity of satellite and cable boxes that has stimulated demand for this technology. Statistics show, a clear trend that there is an increase in the unit sales while the \$/unit value of each STB has decreased significantly, further stimulating demand for this technology.

Demand for digital cable Set-Top Boxes continues to be strong in 2006. An increasing number of cable TV operators around the world are ordering and deploying cable Set-Top Box products, particularly in conjunction with digital cable video service and with new high-definition and interactive TV services. Rise in demand in 2006 comes after the digital cable Set-Top Box market experienced a record year in 2005. Led by increasing demand from North American cable TV operators and new deployments by Chinese TV cable operators, total worldwide unit shipments in 2005 reached 15.5 million, an increase of 44% over 2004.

The worldwide retail value of all Digital Terrestrial (DT) Set-Top Boxes will "blast off" during 2006, and revenues are expected to reach more than US\$ 10 billion during 2009.

Satellite Set Top Boxes

Today, basic satellite STB units are equipped with interactive features such as video-on-demand (VOD), electronic program guide (EPG), and digital rights management (DRM). More advanced units go a step further to provide a suite of interactive and multimedia services directly through a user television system, for example Internet browsing, email, instant messaging (IM), and voice over IP (VoIP) in addition to basic functionality. A typical satellite STB connection scenario is depicted in Figure 1.

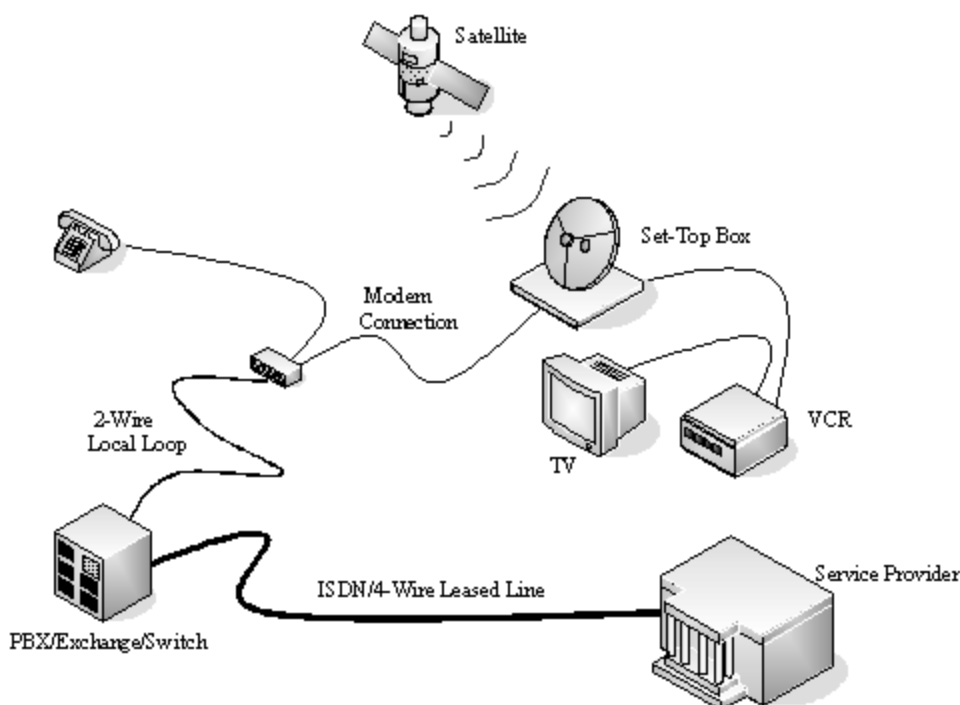


Figure 1 – Typical Scenario for Satellite Set-Top Box Operation

Embedded Modem for Billing and Interactive Gaming

For interactive features such as VOD, the bandwidth of a satellite up-link is usually not available; hence, an auxiliary device is used to communicate with the service provider to include an alternate connection. Satellite Set-Top Boxes contain embedded analog dial-up modems that operate through a conventional two-wire line. Such embedded modems provide for both low and high-speed modem requirements and are suitable for deployment in any full line of satellite Set-Top Boxes.

Satellite Set-Top Boxes that provide only standard services are usually equipped with a low speed modem for cost optimization since data transmission is for relatively shorter duration and involves only a small chunk of data. For more advanced services where more data needs to be transferred, the use of high-speed modems becomes necessary. Since modems are a mature technology and make use of the regular Public Switched Telephone Network (PSTN) lines, the use of high-speed modems becomes a viable, economical choice for STB manufacturers and service providers.



Capturing the STB Market

Disadvantage of using Hardware Modem Chipsets

A chipset is a group of integrated circuits that are designed to work together in performing one or more related functions, and they are usually marketed as a single product. Traditional fax modem chipsets require a host processor, which itself may require a separate crystal as its clock, external memory and other discrete electronic components. Additional circuitry will be required between these extra components. A hardware interface will also need to be designed to interface the modem chipset with the host processor. Each of these components takes up valuable space on the PCB, adds to the overall weight, draws additional power and emits heat, and most importantly, adds to the overall cost. By using a chipset for fax functions, the host processor is not being utilized efficiently. Modern processors can handle multiple tasks concurrently such as running a fax modem data-pump while simultaneously driving other features of the end device. This eliminates the need for additional hardware components to provide fax functions and presents obvious advantages of a smaller PCB footprint, lower weight, and lower power consumption.

Capturing Market Opportunity with GAO Softmodem

Set-Top Boxes feature modem connections for billing and verification of the subscriber as well as for interactive features. As can be seen in a wide array of modem implementations provided by GAO Research Inc., the GAO Softmodem is the ideal solution for satellite and cable STB units. Lower speed modems, using V.22 or V.22bis standards, provide a speedy hand-shaking process and because a typical data transaction such as a VOD authorization, EPG update, and DRM controls require relatively low bandwidth, these standards provide a sufficient bit rate to complete the user request within seconds. High-speed modem specifications offered by GAO include V.34, V.90, and V.92, having maximum downstream data rates of 33.6 kbps and 56 kbps respectively, with V.92 being capable of a higher upstream data rate of 48 kbps. These high-speed specifications are suitable for the transfer of data for interactive STB applications that require real-time response such as interactive gaming and Internet/email/IM access. GAO high-speed softmodems are typically deployed in high-end satellite Set-Top Boxes in order to support those advanced interactive features such as VoIP, IM, Web browsing and email which, in order to meet desirable response times, require higher bit rates.



Soft-Modem Solution

GAO Modem solution is more economical, flexible and reliable than conventional chipsets. Software as well as chipset solutions are generally designed to be compliant to a specific ITU-T standard, and yield comparable reliability and quality. The advantage of GAO software is its intention of being run on a DSP or processor along with other control software and only requires an analog front-end. In contrast, a chipset translates into additional hardware, which translates to an increased per-unit cost and amounts to significant accumulated overhead.

GAO software solution provides flexibility in accommodating the ever-evolving communications standards, changing command interfaces, the need for improved support and. This is not possible in a chipset solution other than upgrading the hardware, which would have a significant cost associated with it.

Versatility and Interoperability

GAO modem solution can operate within a multi-tasking environment or as a stand-alone task and is optimized for fixed-point arithmetic. GAO Modem solution supports most commercial analog front ends (AFE) as well as various discrete DAAs with codecs, depending on the application.

GAO software solutions are modular, re-locatable and reentrant to support multi-channel capability and are optimized for all common embedded hardware platforms. By reducing the processing and memory requirements of a process intensive modem scheme like V.92 for interactive gaming, more features can be implemented on a less powerful processor. GAO code is highly modular allowing for flexibility in customizing the desired capabilities. For example, extra modulation capabilities, and telephony features can be added to higher-end systems, or a reduced modem set can be chosen for a smaller memory footprint on lower-end systems.

Leadership in Embedded Communications Software

With over a decade of experience, GAO leads the embedded communications software market by providing comprehensive modem, fax, speech, and telephony technologies; broad technical expertise; and unsurpassed support to our world-class customers including electronics, communications, and semiconductor companies across the globe. GAO's software integrates easily with MP3, MPEG, TCP/IP, and most popular real-time operating systems.



Rigorous Testing

GAO's testing facilities are equipped with state-of-the-art test equipment. Our software is rigorously tested on TAS, Consultronics, Rochelle, Advent and Telegra equipment under various channel models according to the relevant ITU or TIA standards. All GAO's speech software has passed the test vectors specified by the ITU. Our telephony software meets all appropriate TIA, EIA, BellCore, and Mitel standards.

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Toll Free (USA & Canada)

1-877-585-9555

All Other Areas

416-292-0038

Ext. 206 for Sales

sales@gaoresearch.com