

Distance Learning – Proven Broadband Technology Matched with Innovation and a Successful Deployment Track-record Create a Winning Combination

A VIASAT WHITE PAPER

ViaSat's vast experience in successfully delivering dozens of distance learning networks world-wide and deploying very large-scale satellite-based broadband Internet networks helps to ensure the success of your Interactive Distance Learning Project

A significant positive trend in the understanding of the effectiveness and importance of distance learning and e-learning has emerged over the past five years. As a result many governments and private organizations world-wide are funding and deploying distance learning projects with great success. Through a combination of the Internet, satellite-based interactive broadband networks, and integration with distance learning software packages and educational content, the “distance” has been removed and advanced learning is reaching millions upon millions outside of major population centers. And the growth trend is expected to continue for the next five years—as education continues to prove itself as a cornerstone to economic advancement in countries around the world.

And over the past five years, ViaSat has provided satellite-based broadband networking equipment and integration support to dozens of service providers, NGOs and government entities to implement distance learning at many tens of thousands of locations across Asia, South and Central America, and Africa. In total, ViaSat has delivered over 450,000 VSAT systems that provide access through our service provider partners world-wide.

This whitepaper details the particular requirements of the distance learning market and how these networks can be successfully implemented with careful consideration and selection of the proper technology. Additionally, the paper highlights a number of key client networks to enable you to more clearly appreciate the magnitude of the success of the organizations using our distance learning systems on a global basis.

DISTANCE LEARNING & MARKET NEEDS

There are a number of motivating factors for the recent surge in distance learning. Many governments, both national and regional, have come to understand the importance of knowledge-based education and the positive impact it has on the local, regional and national economies. With increased costs of travel, limited numbers of subject-matter experts, the significant increase of Internet connectivity and improved distance learning tools, distance learning has become a valuable and viable means of educating large numbers of people across diverse geographical-dispersed areas.



Distance Learning

By integrating interactive distance learning tools, educational content, and Internet access with the geographical reach and the compelling economics of wireless broadband satellite networking, educating large populations over tens of thousands of square kilometers is not only possible but has been delivered to multiple-dozens of ViaSat customers for the past four years.

There is a fairly wide range of applications and desired functionality for distance education systems. Our experience has been that each project tends to have very specific requirements, but in general they can be grouped into the following categories:

- Virtual Classroom is the separation of teacher and students from a physical face-to-face education yet maintains the interactive environment of the student-teacher relationship. The use of a computer network to present or distribute educational content and the provision of two-way communication via a computer network to enable students to benefit from interaction with each other, teachers, and staff. This environment distinguishes itself from self-study and private tutoring.
- Online Education is training material or educational content that is web-based or accessed through the Internet. This may be self-study computer-based instruction or include live or pre-programmed Internet broadcasts of information meant to function in a teaching capacity.
- Internet access for research or access to material specific to an educational assignment as directed by an instructor. Typically Internet content is carefully filtered to permit access to only specific sites or acceptable/relevant educational material.
- Database access and directed research provides access to specific collections of data institutionally housed or shared in a cooperative educational network.
- Video-on-Demand (VoD) is a technology to view video/multi-media rich content as required or when directed within a classroom setting, conference room or individual setting. Users typically navigate menus with a remote control to select content. Variations of this include video over IP/streaming video, which may be packaged as part of online education.



Each of the above application categories requires the dissemination of access to end-users or students in a cost-effective and timely means no matter where the students are physically located. With the advent in the past five years of lower-cost, higher capacity IP-based interactive VSAT equipment, satellite-based distance learning networks have become the mainstay technology for implementing distance learning networks over wide geographical regions or to locations where existing communications infrastructure is lacking.

Typically a broadband satellite system implemented for distance learning needs to provide:

- an ability to reach any remote location regardless of the lack of telecommunications

infrastructure

- a high-speed teacher-to-student (outbound) IP-based data link that can provide ample bandwidth for high quality video and audio of the instructor and the accompanying educational content
- IP multicast/broadcast features to efficiently send content from the teacher location to the entire student population or selected group of students simultaneously
- an advanced ability to manage bandwidth-on-demand for efficient and rapid accommodation of return data for students asking questions, sending messages, sharing applications with the teacher or assignment/test submissions
- an ability to manage remote locations and scale to support hundreds or thousands of virtual classrooms, ten-of-thousands of remote sites, and hundreds-of-thousands of computers and students



However, just satisfying these technical capabilities is not sufficient to ensure success when designing and deploying a distance education network. The satellite equipment provider needs to have considerable experience in integrating the various head-end subsystems such as multimedia equipment, interactive distance learning software packages, database and application servers, content filtering, firewalls, remote site access and subscriber management systems. Additionally, integration with remote location computer systems, network switches, distance learning applications, video equipment, etc. is also essential. Before success can be claimed, smooth and repeatable end-to-end operation must be achieved.

Proper training in installation, network operations and maintenance is essential in ensuring long term success. ViaSat and our partners have service centers across Asia, South America, Europe, Africa and North America.

VIASAT PROVIDES YEARS OF DELIVERING THE RIGHT SYSTEM

The selection of either ViaSat satellite networking systems by many distance learning projects has proven the ability of these products to provide the above mentioned key system functions and ViaSat's ability to deliver fully integrated and operational network systems. Whether the need is for 500, 5,000, or 50,000 locations, ViaSat has the expertise and the proven track record to meet your project requirements.



Typically our SurfBeam product is used for networks that expect to operate more than 10,000 locations. Our LinkStar product easily supports networks sized between several hundred and 5,000 to 10,000 locations. Table 1 on the next page provides an example listing of some of our distance learning projects that have been rolled out in the past few years.



SurfBeam



LinkStar

Our LinkStar and SurfBeam systems have been integrated and tested with distance learning software packages, such as ONE TOUCH® Front Row. The combination enables powerful, yet easy-to-use, distance learning for both teacher and student. These software applications call on the satellite system to support multicast; Q&A interaction with virtual “hand raising”; voice calls; shared Internet connections; fast exchange of spreadsheets, presentations, and diagrams; and quiz sessions to validate the learning.

Service providers in India, Malaysia, Mexico, Colombia, Puerto Rico, Ecuador, and Brazil are reaching new generations of students – many who never have had the opportunity before – because of the efficient economics and rich features of ViaSat systems.

Table 1 - Example Distance Education Networks

Country	Site Count	Seat Count	Served Students	Virtual Classroom	Online Education	Internet Access	Database Access	VOD/ Streaming Video	Enhanced Features
Mexico (Enciclomedia)	22,000	~220,000	500,000+	v		v		v	v
Columbia	5,500	~80,000	~350,000						
India	2,000+ (Phase I)	~50,000	~200,000	v	v	v	v	v	v
Malaysia	2,200	~50,000	~200,000		v	v			
Mexico (e-Mexico)	3,500	~70,000	~300,000			v			
Ecuador	1,200	~12,000	~60,000			v			v
Brazil	3,200	~35,000	~180,000			v		v	v
Puerto Rico	1,500	~15,000	~75,000			v			v

ENCICLOMEDIA

For nationalized distance learning projects, satellite may be used to augment existing infrastructure, rather than implement the entire network. The Enciclomedia project in Mexico is a good example.

The mission of the Enciclomedia initiative is to modernize rural, suburban and urban schools throughout Mexico by installing electronic blackboards, computers, UPS (Uninterrupted Power Supplies), and sensors to monitor classroom activity. The project identifies, organizes, and integrates resources and tools for primary education. Originally focused on bringing federal government printed textbooks online, it is adding new digital sources. Videos, images, maps, music, and virtual activities are now all part of the educational database, creating and offering meaningful knowledge to students anywhere.

The communications problem is in cost-effectively providing Internet access to each site and monitoring the use classroom equipment and activity as well. Service

provider Pegaso Banda Ancha and satellite operator PanAmSat (now Intelsat) were tasked with solving that problem and bringing Enciclomedia to life. In mid-2006, Pegaso chose the ViaSat SurfBeam® DOCSIS®-for-satellite broadband satellite networking system to connect 13,000-plus school sites.

Large Network Size Requires A New Kind of VSAT System

One of the largest challenges for Pegaso is the scale of the network. With over 14,000 terminals now delivered and a goal of reaching tens of thousands more, a traditional VSAT networking system is not practical. Other VSAT networks require extensive configuration and parameter programming to bring each terminal online. In such a large network, imagine the effort and expense of sending technical personnel to each site, especially when most modems are to be installed in the most remote and hard to reach locations.

The SurfBeam system, by virtue of its adaptation of the cable modem networking standard called DOCSIS® (Data-Over-Cable Service Interface Specifications), does not require individual configuration of network terminals. Once the antenna is installed and pointed, the connected terminal automatically commissions itself and is up and running in minutes. There is no need to enter latitudes and longitudes or other parameters into the SurfBeam modem (SM).

In addition, the DOCSIS-for-satellite system is more cost effective because the DOCSIS broadband networking standard is already used by millions of terrestrial cable customers, so the technology is highly developed and low-cost in terms of modem chipsets, hub (head end) hardware, installation, and customer support.

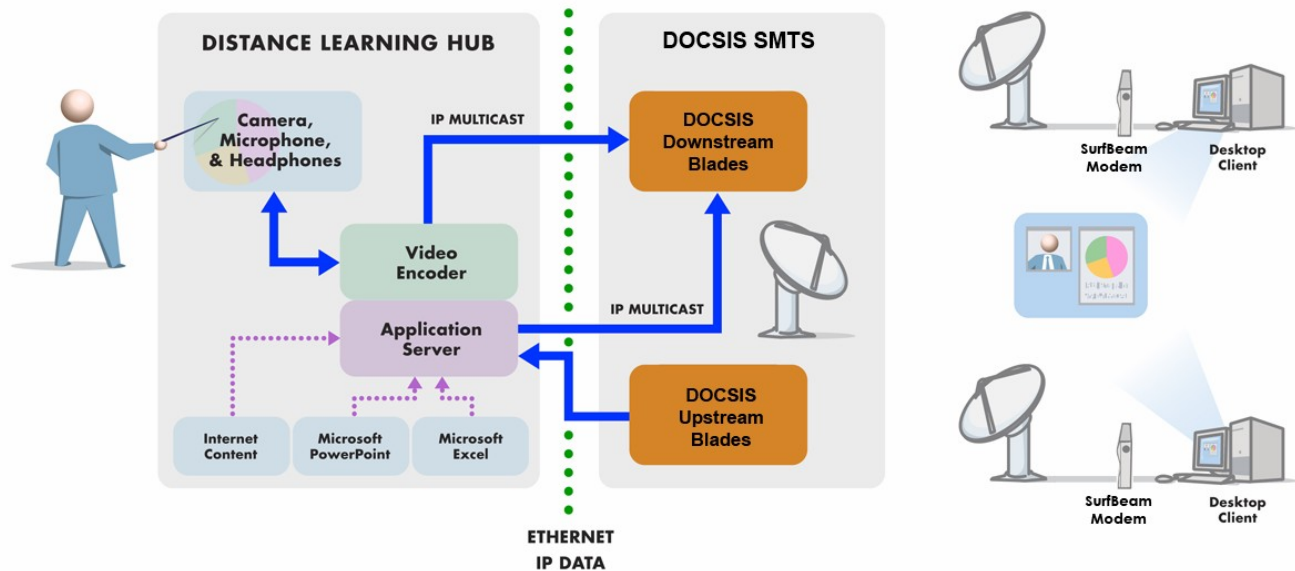
The head end, called the Satellite Modem Termination System (SMTS), is based on a blade architecture whereby operators can add new network capacity by simply adding uplink or downlink blades to slots in the SMTS chassis. For Pegaso, 13 blades provide an aggregate 40 Mbps downstream to modems in the network and 20 Mbps for upstream (return) channels from sites requesting content.

Each school site includes several high-tech learning devices: video screens, electronic blackboards, and a server/PC. The school-site server logs activity from all devices so Enciclomedia managers can monitor use of the equipment. Rather than constantly returning this data to the SMTS and flooding the network with polling data, a router connected to each SM returns data only at designated intervals, usually at off peak hours. In this way the data is collected, but bandwidth is reserved for students.

Pegaso Banda Ancha is connecting the Enciclomedia network to the Internet backbone through the Intelsat teleport in Atlanta, Georgia, using extended Ku-band capacity on the PAS-1R satellite. The Atlanta teleport is the primary satellite transmissions gateway for Intelsat to Africa, Europe, Latin America and North America.

In summing up the project, Javier Braun Burillo, general director of Pegaso Banda Ancha said, "Through our strategic relationships with ViaSat and Intelsat, we are able to provide service to this very important project that is contributing to the progress of education in every corner of Mexico."

Distance Learning with SurfBeam



An Example Distance Education Broadband VSAT Network

And if your needs go beyond what we've implemented in the past, that's no problem, as we thrive on innovation and implementing new ideas and concepts. ViaSat has a long history and reputation for innovative thinking and creative ideas — that's how we've become the market leader and our senior management team is dedicated to ensuring that ViaSat remains innovative and successful.

VIA SAT: THE RIGHT TECHNOLOGY, THE RIGHT PARTNER

ViaSat has over 40,000 distance learning sites that are in operation in many networks around the world. We have very purposefully integrated our SurfBeam and LinkStar products within an overall distance education learning environment to ensure that our customers are successful and our reputation for world-class broadband satellite networks is furthered with each project we deploy. Our track record includes long-term partnerships with service providers, private industry and government agencies. ViaSat has a focused and effective senior executive team to ensure that our widely acknowledged technology innovation and industry leadership position stays strong and continues forward in the years ahead. We want an opportunity to be your distance learning partner.