

VSAT TECHNOLOGY; EMPOWERING THE EDUCATIONAL SECTOR

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Abstract

The recent explosion in application of information technology in different spheres of human endeavour has actually changed the way things were done to the benefit of mankind (K. Agbasi, S. Anigbogu, 2002). You are all part of this new information age; and at the heart of this age lies the Personal Computer, the software that runs it, and the Internet that connects it to the rest of the world. The VSAT (Very Small Aperture Terminal) has the ability to connect remote areas spread over dispersed geographical locations and inaccessible through terrestrial infrastructure makes VSAT technology a national option for communications especially in the educational sector. Considering the VSAT technology - How it works, How to set up its network, selecting the service provider, and the prospects in education and national development forms the aims and objectives of this paper.

Introduction

The VSAT is a welcome technology for rural and national empowerment because companies setting up branches in the emerging countries have to find ways to extend their network to wherever their financial interests will take them. Other considerations such as reliability and speed of data access are embodied features of the VSAT. A 99.5% plus percent uptime standard ensures that VSAT's support mission-critical applications such as electronic payment system, on line billing applications, etc. Its speed of data delivery is up to 30mbps i.e. 1,000 times faster than that provided via ordinary 33.6kbps modem over phone lines.

The selection of a VSAT service provider is crucial in deciding on the appropriate technology as the services play a vital role in the successful implementation and optimal utilization of your network.

Aspects that need consideration are as follows:

- Program management and installation capability.
- Network and applications integration ability.
- Process and infrastructure for delivering consistent services.
- Ongoing service reports and review procedures.

There is no doubt that the VSAT employs the satellite for effective transmission of data. Generally, satellite communications are preferred for transmitting large quantities of terrestrial microwave transmission station. Satellite communications orbiting more than 22,000 miles above the earth can receive, amplify, and retransmit microwave signals; and this makes it act as relay station for the earth.

Satellite communication has a disadvantage in that, it is not optimal for problem requiring extremely rapid exchange of data, as a result of delays occurring when data are sent thousands of miles up into space and back down again. Yet, it has the following advantages:

- Very appropriate for transmission of large quantity of information in one direction at a time.
- Satellite networks are typically employed for communication in large organization with many locations that will be difficult to be connected together through cabling medium.

In the case of a VSAT satellite system, it employs a satellite, which orbits over the equator. At the central site, a hub earth station and the host computer with a front end processor manages the system. At the remote site, there can be hundreds of desks - an outdoor VSAT or antennae links the remote site with a central location by picking up transmission from the satellite. A control center at the remote site handles data from telephone, facsimile, machine and closed circuit TV broadcasts. VSAT can transmit up to a capacity of 256 kilobits per second to 1.544 megabits per second. VSAT satellite systems have earned

reputation as versatile tools for managing voice and data, and have provided veritable solutions to managing financial applications from bank branch automation and teller services to online trading and credit checks. It is now emerging as one-stop shop for data networks spanning several countries.

Right now, the cost of VSAT satellite services and equivalent terrestrial offering such as leased lines and packet switching services is on the high side because of few operators; yet the market is still in the very early stages of development with international services, coverage remains spotty.

VSAT links are typically priced in comparison to terrestrial circuits and as such its services are having the biggest impact in countries where getting reliable service is a problem. The ability to deploy VSAT quickly allows the integrator or service provider to meet or exceed the time-to-market and time-to-revenue goals of the venture.

VSAT Technologies

There are two basic VSAT technologies:

- Single Channel Per Carrier (SCPC).
- Time Division Multiple Access (TDMA).

1. Single Channel Per Carrier (SCPC)

Is a point network technology, equivalent to conventional leased lines. With SCPC, sites with VSAT dishes communicate directly with each other using dedicated satellite bandwidth. Because channels are dedicated, SCPC can deliver bandwidths as high as 2 mbps between stations

2. Time-Division Multiple Access (TDMA)

VSAT based on TDMA are roughly equivalent to conventional packet-switched networks, in which numerous remote sites communicate with a central site that acts as a hub. With TDMA two or more remote sites equipped with a central satellite earth station is in turn connected to the customers' hub site, this connection can be established by leased lines or another VSAT link. Under the TDMA approach, remote sites contend for access to the hub. The issue of shared access makes services based on TDMA less expensive than those based on SCPC, but the bandwidth available to individual remote sites typically is restricted to 192 kbps or less and can burst up to 64kbps.

Because of TDMA ability to include numerous remote sites, VSAT operations offer it for domestic services.

Companies that have been able to match their network need to the right VAST provider say that VAST services deliver connectivity that conventional network solution can't match.

How to Set Up a VAST Network

They are two types: Dedicated Hub networks and shared hubs.

In a Dedicated Hub: The hub's infrastructure is utilized by a single corporate entity with all the VSAT in the network sharing the dedicated resource available. Purchase of such hub is warranted only when the number of sites is large and the application is specific to the company, e.g. banks, stock exchange etc.

In a Shared Hub: Different users share the hub's infrastructure. A VSAT system consists of a satellite transponder, central hub or a master earth station, and remote VSATs. The VSAT terminal has the capability to receive as well as transmit signals via the satellite to other VSATs in the network. Depending on the access technology used, the signals are either sent directly to a central hub or directly to VSAT with the hub being used for monitoring and control.

The VSAT comprises of two modules- and outdoor and indoor units. The outdoor unit consists of an antenna and Radio Frequency Trans receiver (RPT). The antenna size is 1.8/2.4 metres in diameter.

The indoor unit functions as a modem and also interfaces with end-user equipment like stand alone PCs, LANs, Telephones, Fax, or an EPABX.

VSAT Internet Connection

VSAT stands for "Very Small Aperture Terminal" and refers to receive/transmit terminals installed at dispersed sites connecting to a central hub via satellite using small diameter dishes between 0.6 to 3.8 metre. VSAT technology represents a cost effective solution for users seeking an independent communications network connecting a large number of geographically dispersed sites. VSAT networks offer value-added satellite-based services capable of supporting the Internet, Data, LAN, Voice/fax communications, and can provide powerful, dependable private and public network communications solutions. Generally, these systems operate in the Ku-band and C-band frequencies.

- Ku-band based networks, are used primarily in Europe and North America and utilize the smaller sizes of VSAT antennas.
 - C-band, used extensively in Asia, Africa and Latin America, require larger antenna.

There are three components in a VSAT network. The first is called the Master Earth Station, which is the network control centre for the entire VSAT network. The configuration, monitoring and management of the VSAT network are done at this location.

The Master Earth Station also has a large six-metre antenna, a fully redundant electronics, self-contained backup power system, and, a regulated air conditioning system. This Master Earth Station is manned 24 x 7 days throughout the year.

The second component is the VSAT Remote Earth Station. This is the hardware installed at the customer's premises that includes the outdoor unit (ODU), the indoor unit (IDU) and the interfacility link (IFL). The VSAT outdoor unit consist of a standard 1.8 metre offset feed antenna, a solid state amplifier (SSPA), a Low Noise Amplifier (LNA), and a feedhorn. The indoor unit is a VCR-sized unit that houses the communications electronics that includes interface with the customer's equipment such as computers or telephones. The IFL consists of coaxial cables that connects or telephones the outdoor unit to the indoor unit.

The third component of a VSAT network is the satellite itself. All signals sent between the VSAT earth stations are beamed through the satellite. The VSAT system uses a geostationary satellite, which is orbiting at 36,000 km above the ground.

VSAT is becoming an increasingly popular method of Internet connection for Internet cafes. This is largely due to the fact that the survival or successful operations of an Internet cafe depends mainly on the speed of Internet connectivity provided to the computers used for access. VSAT provides a comparable higher Internet access speeds in the ranges of 64kbps to over 2mbps (megabytes per second). Also quality compared to dial-up or radio connections.

In remote areas around the country where no Internet Service Provider maintains a point of presence, setting up a typical VSAT connection for an Internet Cafe will require the following equipment:

- Satellite Antenna (Ku-band or C-band).
- Satellite Modem/Router.
- Mount kit and accessories.
- Earthing.
- Site activation (from bandwidth providers).
- Bandwidth subscription.

It is important to note that the Ku Band VSAT is often affected by weather changes especially rainfall and windstorms. Even though it comes at a much more lower cost than the C-band VSAT, its performance in bad weather conditions should be considered before implementing for an Internet cafe connection.

Earthing is also a very important feature to be considered in the set up of a VSAT Internet connection. Due to the high cost of equipment required in setting up a VSAT connection, it is important to protect these investments by ensuring that a proper earthing is provided for these equipment. Earthing prevents damage that can be caused by lightning to the sensitive VSAT equipment during a thunderstorm.

Selecting the Service Provider

Apart from decisions on the appropriate technology, the selected of a VSAT service provider is crucial as the services play a, vital role in the successful implementation and optimal utilization of your network.

In an infrastructure project such as a VSAT network, buyers cannot easily shift from one service provider to another since the technology platform is proprietary. Hence, one has to carefully evaluate the above

criteria when choosing a VSAT service provider.

While finalizing on the network design aspects regarding VSAT topology, other networking module requirement and network protocol usage, it is essential to keep the bandwidth request in perspective.

Some of factors are:

1. Type of application.
2. Type of transaction (interactive/batch).
3. Number of simultaneous users on the network.
4. Transaction size.
5. Response time expected.

Once the order has been placed on a VSAT service provider, site surveys are commissioned where the various site locations are evaluated for feasibility of installation. Site commission, systems integration and application integration.

VSAT Network Application

Banking and finances, Broadcasting information, new distribution, camcot, InAoffiiry; LAN, WAN-LAN, videoconferencing, Digital broadcasting system, Multimedia s>fsteoi\$, Mes»^c system etc.

Revenue Generation Targets

The following services rendered within an Internet cafe will no doubt serve **as a source of** high revenue generation target for the organization within a given period. They include:

IP Telephony

International telephone calls and fax through the Internet.

Web Browsing

This is the most popular option of generating revenue from the Internet cafe business. For most Internet cafes', browsing the Internet turns out to be the primary (and in most cases) the only option available for generating revenue. Generating revenue from web browsing normally entails the Internet cafe charging customers a fee for using the computer systems to browse the Internet. The important thing to ensure against is loss of revenue due to improper assessment of the amount of time being used by a customer when browsing the Internet. The most effective way of ensuring that customers pay for time they use is to employ billing software to manage time for the customers. A billing software typically comes with the following features:

- Automatically generated accounts (including user names and password for log on by customers)
- Flexible account usage options to allow customers use the time remaining on their account at a later date.
- Allows the creation of reporting records over specified period of time. For example creating a report that shows money generated over the last three weeks.

Domain Name Registration/E-Mail

Allows users to be registered to the net by way of post office registration.

Internet Usage Training

Training on how to send or receive e-mail, browsing the Internet, chatting, searching for information etc.

Video Chat/Internet Conferencing

Allowing customers to transmit real time pictures of themselves through the Internet while chatting or calling. This feature requires a web camera to be installed and configured on the workstation.

Web Site Design

Allows users to create a webpage for individuals or corporate organizations.

VSAT Prospects

Wide area coverage across borders within the satellite-coverage area, satellite communication offers border-less connectivity.

- Rapid deployment of new sites- within an existing network.
- Independent of terrestrial infrastructure- the global deregulation of satellite communication service is being a fact.
- No local loop issues- VSAT systems are installed directly at the customer sites.
- " High degree of reliability.
- ^m Flexibility- changes in network configuration such a bandwidth interfaces; data rates etc can easily be performed.
- Distance independent cost- the cost for a VSAT network and data transmission are independent of distances and country.

References

Agbasi, K. and Anigbogu, S. (2002), Network Technologies & Electronic Payment System Security, CAON Conference Series. Vol. 13. Pp179.

Balkens Computer Training Institute (2004), ETF-ICT Capacity Building Programme. Pp 15-18, 28-32.

Gates, B. (1995), *Business at I he Speed of Thought*. Microsoft Publication USA. Gates,

B. (1999), *Road Ahead* Microsoft Publication USA.

Ezeji, M. (1999), Wireless and Satellite Communication: The General Challenges and the VSAT Alternative. NCS Conference Series. Vol.10, Pp 225-228.

Ugboaja, U.C.A. (2001), Computerization Challenges and Future Prospects. A Seminar Paper Presented During the NACOSS week, AIFPU.

Inyiama, H.C. (2000), *Computer Applications and Information Technology*. Pp 94.

Pimedia Business Magazine and Media Inc. (2002): The VSAT ka-Band John Sweitzer Broadband.
<http://Ayww.thgroadbandecoriomy.com/magazineartict.asp>

