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Fundamentals of Vsat Installation

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Abstract:- Satellites for communication services have evolved quite significantly in size and power since the launch of the first commercial satellites in 1965. This has permitted a consequent reduction in the size of earth stations, and hence their cost, with a consequent increase in number. Small stations, with antennas in the order of 1.2–1.8 m, have become very popular under the acronym VSAT, which stands for 'Very Small Aperture Terminals'. Such stations can easily be installed at the customer's premises and, considering the inherent capability of a satellite to collect and broadcast signals over large areas, are being widely used to support a large range of services. Examples are broadcast and distribution services for data, image, audio and video, collection and monitoring for data, image and video, two-way interactive services for computer transactions, data base inquiry, internet access and voice communications. This work will give brief summary of the installation process of VSAT.

Keywords:- VSAT, Networks, Computers, Antenna, Modem, Receiver, Transmitter, etc.

I. INTRODUCTION

VSAT, now a well established acronym for Very Small Aperture Terminal, was initially a trademark for a small earth station marketed in the 1980s by Telcom General in the USA. Its success as a generic name probably comes from the appealing association of its first letter V, which establishes a 'victorious' context, or may be perceived as a friendly sign of participation, and SAT which definitely establishes some reference to satellite communications.

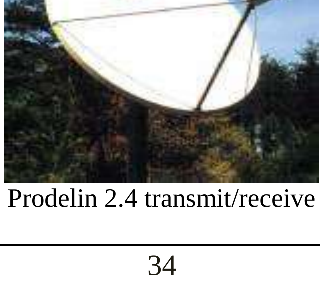
The use of the word 'terminal' which appears in the clarification of the acronym will be replaced by '*earth station*', or station for short, which is the more common designation in the field of satellite communications for the equipment assembly allowing reception from or transmission to a satellite. The word *terminal* will be used to designate the end user equipment (telephone set, facsimile machine, television set, computer, etc.) which generates or accepts the traffic that is conveyed within VSAT networks.
This complies with regulatory texts, such as those of the International Telecommunications Union (ITU), where for instance equipment generating data traffic, such as computers, are named '*Data Terminal Equipment*' (DTE).

VSATs are one of the intermediary steps of the general trend in earth station size reduction that has been observed in satellite communications since the launch of the first communication satellites in the mid 1960s. Indeed, earth stations have evolved from the large INTELSAT Standard A earth stations equipped with antennas 30 m wide, to today's receive-only stations with antennas as small as 60 cm for direct reception of television transmitted by broadcasting satellites, or hand held terminals for radiolocation such as the Global Positioning System (GPS) receivers. Present day hand held satellite phones (IRIDIUM, GLOBALSTAR) are pocket size. Therefore, VSATs are at the lower end of a product line which offers a large variety of communication services.

VSAT Equipment Components

The three major components are the antenna, the transceiver and the modem.

The VSAT Antenna



Prodelin 2.4 transmit/receive

The antenna choice depends upon the type of service that the client will provide to his clients. A cyber café with 15 to 30computers in a location with good satellite signal will be content with a Prodelin 2.4m antenna. We choose Prodelin or Andrews because of construction strength and accuracy of manufacturer. Incidentally, they are also approved by all of the satellite operators. Installations that require high volume connections of 1MB or greater will find savings by installing the larger 3.8m or 4.5m antennas. Although these antennas cost more to purchase and more to ship, there will be savings on the re-occurring monthly bandwidth cost. Users of the smaller antenna can be penalized when they try to push larger data volumes through their link.

The VSAT Transceiver

Anacom's C-Band Transceiver

Anacom has the entire transreceiver mounted in a single unit, making it simpler to install on the antenna.

Transceivers are the radios that transmit the signal from the earth station up to the satellite. Small antennas transmitting high bandwidth require powerful transceivers; larger antennas with smaller bandwidth require less power.

Transceivers are sold by their power rating; our existing clients use transceivers in the range from 5 watts to 60 watts. The choice is also influenced by the strength of the satellite signal at the client's location in addition to the bandwidth and antenna size.

The VSAT Modem

Paradise P300 Shown -cover removed

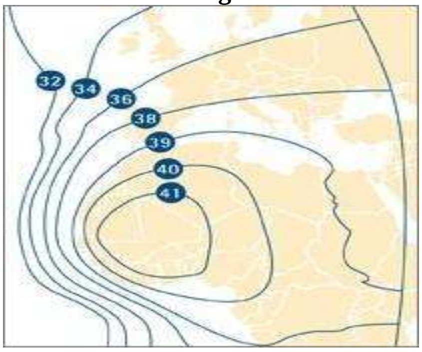
The modem at one teleport communicates directly with the modem at our client's location. Although most modems are compatible with each other, we try to make it a rule that the modem type at our client's teleport is of the same type that we use. Often we have to instruct technicians , who are not familiar with the modem, how to set it up. It is easier to accomplish this if both sets of technicians are using identical equipment. We work with a wide range of modem types; Paradise, Datum, EF Data and Comstream are the most common. The client who has already purchased modems before coming to us often determines the choice of modem. Modems have a host of features that can cause their price to jump by a factor of three if the more exotic choices are made. It is important that the modem features are matched to the needs of the satellite; incorrect modem settings can lead to the client paying a premium for the monthly cost of space segment.

VoIP Equipment

Cisco AS5300 VoIP Router

The largest family of VoIP routers is the Cisco 5300 series. The5300 can be configured for 4 T1 or 4 E1 digital lines and are perfect for high volume digital environments, such as telephone companies. The5350 has a maximum capacity of 8 E1 or 8 T1 connections.
The majority of our clients operate Cyber Café's with 8 to 16 analog telephone lines. In this case the Cisco product is unsuitable, instead we recommend the Quintum Tenor A800 VoIP Gateway. Quintum will connect directly to analog lines. These units are reliable and relatively easy to configure.

Determining dish size



The antenna size limits the amount of data that you can carry over a circuit. It is a complicated calculation based upon a client's location relative to the satellite power footprint. When we know your requirements we can guide you to your decision.
Satellite bandwidth is not cheap and some companies have designed a product that seems to offer cheap bandwidth. Their solution is to sell shared bandwidth. In other words they will buy 1 Meg from the satellite owner and resell this same bandwidth ten times – they gamble that not all of their clients will need bandwidth at the same time. This gamble often fails at peak times and the clients are left competing for the same space. If the client is running voice, the conversation is broken up and choppy, if they are running data the download speed becomes very slow.
Each satellite beam coverage pattern has power and sensitivity contours which are fundamental to the dish size required so your location is important. At the outer, lower level contours larger dish sizes are required. In order to transmit a sufficiently powerful signal to the satellite you need a combination of transmitter power (from the Block Up Converter or BUC) measured in watts, plus a dish size with enough gain. There may be a trade off to be done, if there is the possibility of a smaller dish and high power amplifier or larger dish and low power amplifier.

Optimising costs

Paradise P300 - cover removed

To minimise long term monthly costs it is critical to make efficient use of the satellite capacity and power available.
If you have a very small dish you will need more power from the satellite to carry the same required bit rate. Dish is the key factor. Doubling the dish area (approx 1.4 times larger diameter) will reduce your satellite power required by half !
The way your digital signals are transmitted and received is also critical. Choice of the right VSAT modem is important. A wide variety of old and new modulation methods are possible. Modern modulation schemes and forward error correction (FEC) techniques allow more bits/s to be squeezed out of the available satellite capacity.

VSAT Installation

Installation of a VSAT system can be a challenge unless the installer has considerable experience in performing the task. An experienced installer will be able to unpack the equipment, assemble the antenna, modem and transceiver, line up the satellite and get a signal lock in 5 to 7 working days.

There are several stages involved in building a VSAT facility:

1. Inspection of the VSAT equipments
2. Preparation of the site for VSAT installation
3. VSAT equipment installation
4. VSAT antenna alignment
5. Commissioning and start of VSAT service

Step 1. Inspect the VSAT equipment

If the equipment has been purchased from several different vendors, small items like cables may not have been provided.

The installer must perform a full inspection of the equipment immediately upon its arrival; any missing items can be identified and ordered while the initial work of installation is proceeding.

1-) Site preparation

Professional installer begins assembly of an Andrew 4.5m

Step 2. Preparation of the antenna site

The installer will contact the EX4U teleport & satellite operator inorder to get the settings for the azimuth, which is the compass bearing from the client's location to the satellite, and the elevation, which is the angle in an upward direction that is necessary for the antenna to hit the satellite.

This information will confirm that there are no trees, buildings or other obstructions that prevent the antenna from having a clear view of the satellite.

The antenna site must be positioned conveniently close to the main building that will house the electronics and provide the electrical power to the antenna.

Larger antennas need special concrete pads built for them, but the smaller antennas of 3.8m or less can often sit on the roof of a building or on a firm flat piece of ground.

Excavating the whole for the antenna   Building the concrete pad

2-) Dish alignment

Installing the antenna on the support frame

Step3. VSAT Equipment mounting

Building the antenna is time consuming, depending upon its size it may take from one day to three days. The larger antennas may need the help of a crane to position them on the mounting supports. The bolts that control the antenna position should be left loose to enable final alignment with the satellite.

Typically the transceiver is mounted on the antenna support frame, with the IF cables being connected back into the building where the modem and Internet routers are housed.

All items of equipment should be powered via a UPS to prevent damage in the event of power cuts.

Step 4. AntennaAlignment

Alignment of the antenna

An experienced engineer using a spectrum analyzer best performs this task. The satellites are located a few degrees apart, finding the target satellite is a very difficult task. A professional installer will find a satellite in a matter of a few hours. Installers with less experience can take weeks of frustrating effort before getting the correct alignment.

The final step in alignment is the Peak and Pole procedure with the satellite operations centre. They will insist on co rrect alignment of the antenna and the polarizer in order to insure that the antenna is not interfering with adjacent satellites or with other poles on the same satellite.

II. CONCLUSION

On the circuit commencement date, the duty engineers set-up a conference call between the satellite operator and the client, in order to fully activate the link. Each sides ends up a test transmission at the approved frequencies. The satellite operator measures the strength of signals and requests any power adjustments that may be required.

When both sides have achieved signal lock and the signal levels are running at the correct level, the satellite operator gives approval for commencement of service.
The final step is the connection of the data port at EX4U teleport to the Internet routers to enable the client to begin voice or Internet services.

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