Why calls in Africa cost more: the need for VSATs

VSATs (Very Small Aperture Terminals) are cheaper and easier to set up than other communication technologies, and can bring phone and internet links to remote rural areas. But governments in Africa are not doing enough to make VSAT technology available for their people.

The same satellites that transmit television can also be used to access the internet and enable cheap telephone services. VSATs are a low-cost and easily available way for people to communicate via satellite.

Communication should be cheaper

In Africa today, communication is often very expensive and is not available to the majority of people in rural areas. But affordable telephone and internet communication can make a big difference – for clinics and hospitals, schools, businesses, financial services and government as well as to families and individuals in rural areas all over Africa.

A technology exists to solve this problem: VSATs. In Asia and Latin America, individuals and small enterprises in remote communities can easily be connected through VSATs, and are reaping benefits. But in Africa, government policies and laws are hampering the introduction of VSAT technology.

In the past, national laws and rules on communication were designed to create single national telephone companies and manage traditional land-based telephone lines, mostly within and between cities. Governments need to change these laws and rules if their countries are to benefit from new technological developments. They need to allow new private sector companies to offer all the variety of today's communication technologies, including VSATs. But most governments are being slow to change – partly because they want to continue protecting the old-fashioned national phone companies, and partly because they may not fully understand the opportunities offered by new technologies.

There is not much public pressure being put on governments to change their policies, because few people – including journalists – understand the technologies or the difference they could make to development. Nor do they understand the role of law and policy in making the technologies available. But public demand – supported by media – could force governments to speed up change.

Media toolkit on Information and Communication Technologies (ICTs)

This is the second in a series of short briefing documents for journalists on different aspects of ICTs and the 'information society'. This brief is produced in partnership with the CATIA programme (Catalysing Access to ICTs in Africa) and funded by the UK Department for International Development (DFID), but does not necessarily reflect DFID's views.

The series is offered as a service to journalists wishing to cover information society issues around the second stage of the World Summit on the Information Society (November 2005). Future briefs will cover other ICT governance institutions and issues, and emerging technologies. If you would like to receive future issues (by e-mail or hard copy), please contact **C4D@panos.org.uk** or find them on the Panos website **www.panos.org.uk/communication**

The term VSAT refers to a relatively small ground terminal for receiving and sending data via a satellite. The terminal consists of an outdoor unit (ODU) and an indoor unit (IDU). The Outdoor Unit includes the antenna (often a dish). The 'aperture' in the term VSAT (Very Small Aperture Terminal) refers to the area of antenna that is exposed to the satellite signal. Dishes for VSAT systems can range from 50cm to 2.4 metres in diameter. The size of antenna needed depends on the strength of the signal received from the satellite: the stronger the signal, the smaller the antenna needed. Other elements of the Outdoor Unit include a feed system for receiving and transmitting, a microwave radio known as a Block-Up-Converter (BUC), and an LNB (low noise block down converter) used to convert the signal gathered by the feed.

The Indoor Unit usually consists of a single unit called a modem, which receives signals (from a computer, phone or other device), converts the incoming data, video, or voice, and sends it to the Outdoor Unit. The Outdoor Unit transmits the data out to the satellite, from which it will be sent back to other ground stations.

Satellites

The first man-made satellite to be launched into space was Russia's Sputnik, on 4th October 1957. Since then, satellites have been used mainly for broadcasting, and for international telecommunication links. Their use for internet access is increasing. Satellites can provide broadband services over large areas. Unlike traditional wire-based telephone systems, satellite-based internet services can be cost-effective in thinly-populated areas as well as in cities.

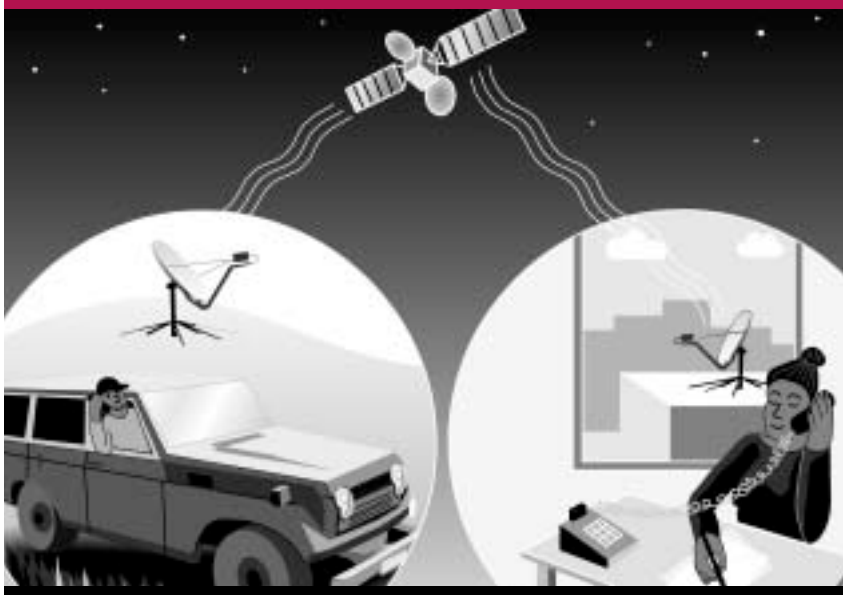
Satellites used for communication are in geo-stationary orbit around the earth (GEO). Stationed over the equator at 35,800km from the earth and orbiting at the same speed as the earth turns, to an observer on earth they appear to be stationary. This means their signals can be received continuously by fixed antennas.

Most satellites are operated by conglomerates of national or private telecommunications companies. Examples include Intelsat (www.intelsat.com), Panamsat (www.panamsat.com), Arabsat (www.arabsat.com), Eutelsat (www.eutelsat.com), and Newskies (www.newskies.com).

A satellite carries a number of transponders (wave-length converters) that receive signals sent from ground stations, translate them into different frequencies and send them back, amplified, to ground stations. Signals sent from earth to satellites are called uplinks; signals sent back from satellites to earth are called downlinks.

The ground component of a satellite system consists of a number of terminals with antennas that receive communication from a satellite either directly or through a central station or hub.

Point to Point connectivity



How satellites connect people

An antenna can be used just to receive information. In this case a large antenna at a central hub station receives signals from a satellite, and then transmits the information to a large number of smaller VSAT receiving units. (These have small antennas with low sensitivity). 'Satellite television' received in the home is a popular use of receive-only communication.

ILLUSTRATIONS BY NICOLE HEINZEL

Why VSATs are becoming more useful in Africa

Until recently, the equipment needed for high-quality satellite communication was large, expensive and difficult to install, while smaller-scale systems like VSAT produced a lower quality signal with limited usefulness. Now, however, technological developments have increased the capacity, quality and usefulness of small-scale systems while bringing down their price.

VSAT is a tried and tested technology. Nearly 70 countries, accounting for more than 60% of the world population, currently depend on satellites for their domestic as well as international telecommunication services.

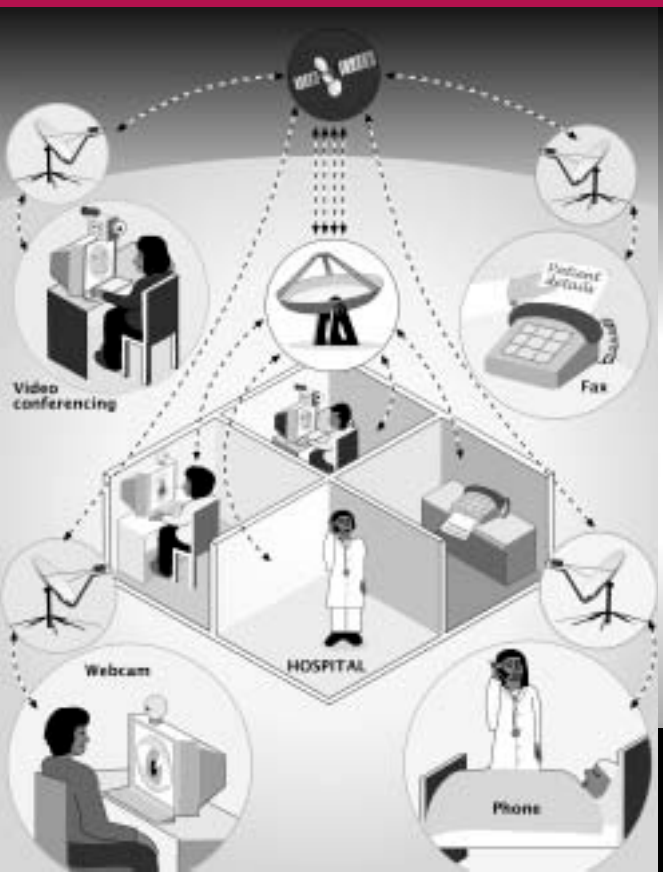
The same technology can be used for many applications, such as data for banking services like ATMs and credit cards; local networking; Digital Video Broadcasting; and internet access, telephone and fax. Telephony via the internet (using Voice Over Internet Protocol, VOIP) is becoming the cheapest way of making telephone calls, because the internet telephony can share channels simultaneously with other data flows. Digitised voice transmission requires much less capacity.

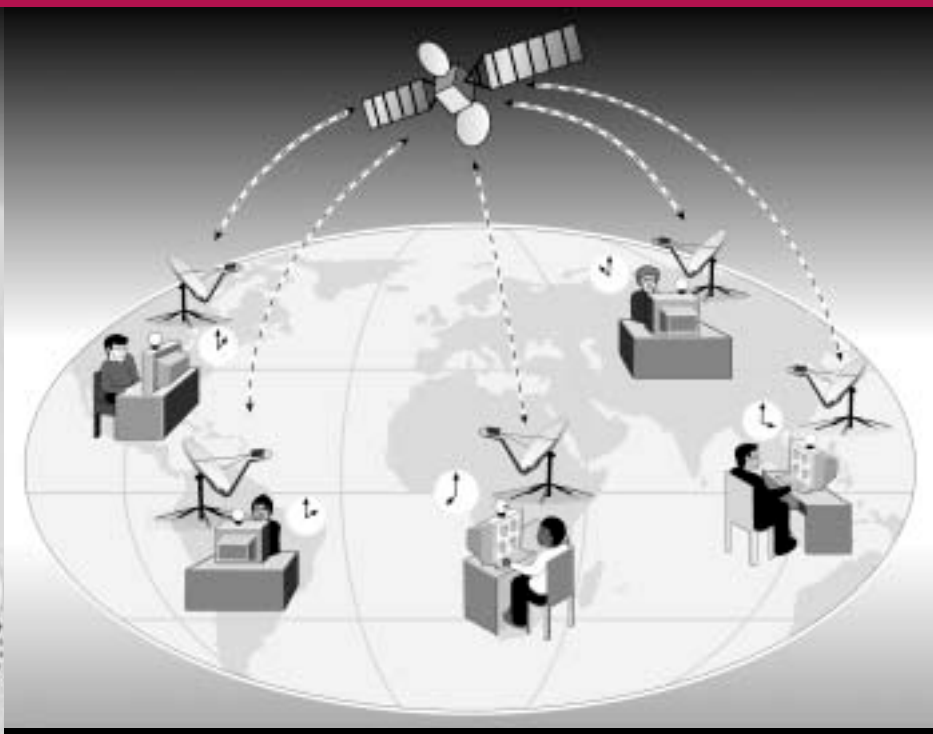
VSATs can provide access in remote areas, in difficult terrain and over wide areas where landlines (cables or wires) would be costly and difficult to install. The cost of setting up is the same for covering large distances as small ones. A new frequency can be used, known as Ku-band (see *Radio frequencies* box). This makes it possible to obtain high speed broadband connection almost anywhere in Africa.

Transmission and recovery of information by satellites' transponders has become more efficient.

Point to Multipoint connectivity

Multipoint to Multipoint connectivity





Two-way communication systems have more important uses. Here, antennas are able to both receive and transmit, providing two way services such as internet access, voice, data, or fax.

Signals can be received in most places. The 'footprint' of satellites (the area reached by the signal) covers much of Africa, though in some parts of Central Africa it is too weak to be useful.

VSATs require no prior infrastructure. Not even electricity is necessary, as they use little power and can function using solar panels.

VSAT systems are cheap to install. The cost of a VSAT terminal is less than $2,000 and with economies of scale this could fall to $750. VSAT systems are also cheap to use: using the new Ku-band satellites over Africa it is possible to obtain bandwidth about ten times more cheaply than was previously possible with C-band systems (see *Radio frequencies* box).

Monthly charges can be as low as $150 for internet access through VSAT, and with economies of scale this could shrink to less than $100. VSAT systems could be rolled out quickly: the satellite industry already has enough resources and potential to provide universal broadband services.

Satellite communication is reliable and easy to manage. Successful connection time ('uptime') is commonly 99.5% (compared with 80-85% for traditional landlines). The small dish antenna (50cm) can easily be installed, by technicians with average skills.

Equipment manufacturers are starting to adopt common standards to allow interoperability between equipment from different suppliers. This move is happening slowly, because the suppliers are commercial companies competing with one another. However they are learning from the example of satellite TV, where it was found that increasing compatibility among different systems produced a step-change increase in the number of customers.

How VSATs can make a difference in Africa

- Rural telephones: VSATs can be used for pay-phones or phone shops
- For large and small businesses, VSATs can supply on-line services such as inventory control, point-of-sale transactions, order management, video conferencing, and employee training
- Financial services: banks, post offices, and insurance companies use VSATs for financial transfers, credit checks, price enquiries, and ATM networks
- Telemedicine and other medical centre communications: VSATs can enable many services such as management of medical insurance, bills and purchasing; medical treatment inquiries; and medical education
- VSATs can be used to meet temporary needs such as mobile communications for disaster relief or prospecting
- Utility companies, road bureaus, meteorological centres, and police stations use VSATs for management, monitoring, and information transmission
- Distance learning
- Networking and communication between central governments, regions and districts

Are there any disadvantages?

The quality of satellite communication is limited by 'latency' – the time taken for data to travel from its source to its destination. Because of the distance between satellites and earth, this delay can be significant and could be dangerous in some situations – such as distance-monitoring of a surgical operation. However, for most small business and domestic uses it does not matter.

There is a limited skills base for designing, installing and maintaining satellite communication systems. Companies have in the past kept their technical knowledge to themselves (in the same way as car manufacturers like to train and register technicians who will specialise in servicing their particular models). However, this guarding of proprietary secrets is starting to change, as manufacturers see the benefits of common standards.

Start-up costs for network operators and hubs are high. However, there are already enough network operators present in Africa to supply needs for the immediate future.

What's stopping Africa?

The main obstacle to the growth of VSAT systems at present is that governments in many countries impose legal restrictions on private investors. But in today's climate of free market competition, new services are more likely to be provided by private investors than by governments. Many uses of VSATs could be profitable and appealing to investors, if it was made easy for them to invest. Governments may be influenced to restrict private investment by their national telecommunications companies and operators of terrestrial telecommunications systems, who often "rubbish satellite solutions in general and VSAT in particular" (in the words of the Global VSAT Forum, an industry lobby group – www.gvf.org). Another factor is that governments may not be well-informed about the advantages VSAT can offer.

Why regulation is needed

Regulation is needed to allocate frequencies and avoid interference. The number of mobile phones, TV and radio transmissions keeps growing, using both terrestrial and satellite systems, and they all send their messages through the airwaves. To avoid different transmissions interfering with one another, to ensure security, and to protect some usages such as emergency services, the available range of radio frequencies – the frequency spectrum – is divided into different bands and frequencies, which are allocated for different uses. At the global level this is coordinated by the International Telecommunication Union (ITU), a United Nations agency, which also controls permitted power levels and modes of operation.

Governments also restrict and regulate service providers and users. In the past, they did this in order to preserve the monopolies of national telecommunications operators.

With liberalisation and globalisation, national regulations are increasingly disappearing in favour of global regimes. The trend is also towards simpler and less costly licensing regimes for end-user equipment (such as VSAT terminals), to facilitate the spread and use of telecommunications systems around the world.

Regulatory issues for VSAT systems

Besides radio frequency allocation, regulatory issues for VSAT systems generally include:

- establishing criteria and fees for licensing VSAT operators
- promoting 'open skies' and competition
- regional harmonisation

Operator licensing

A satellite system often consists of three entities:

- a satellite operator (or 'space segment' operator) (such as Panamsat, Eutelsat, or Newskies)
- a Satellite Network Operator: that is, a company that operates one or more gateway stations or Network Control Stations (hubs) or other ground stations (such as Gillat)
- Satellite Service Providers: companies that offer VSAT connections (such as Afsat in East Africa)

These three operators require different licensing, and all may have to be licensed before a service can be delivered.

Radio frequencies

The whole radio frequency range has been divided into sections ('bands') and given names by the International Telecommunication Union. The most commonly used satellite frequency bands are C-band (4-8 GHz), Ku-band (10-18 GHz) and Ka-band (18-31 GHz). Satellite systems that use the C-band have to employ large antennas with a minimum diameter of 2–3 metres. These give a very high-quality signal and are mostly used by large corporations such as oil companies. They are also used in telemedicine: a surgical operation being supervised at a distance needs absolutely reliable and high-quality satellite images. Allocation of the C-band frequency has to be coordinated at national level, because the frequency is shared with other microwave equipment.

In the higher frequency bands, Ku-band and Ka-band, wavelengths are shorter and so smaller antennas can be used to receive the signal. These bands have come into widespread use more recently. The quality of signal is lower, but this is acceptable for most domestic and small-business uses. Most broadcasting uses Ku-band, as do internet connections from servers to users with terrestrial return links. Ka-band potentially offers higher bandwidth than Ku-band, and can use very small antennas, but the signals are liable to suffer from fading and are weakened by rain. Ku-band and Ka-band frequencies are coordinated at international level. They do not need tight regulation at national level, because they are not shared with other types of equipment.

'Open Skies' and competition in access to satellites

Some governments have policies to protect their countries' satellite systems and the national monopoly telecommunications companies. These 'Closed Skies' policies require VSAT service providers to pass through certain locally-owned satellite hubs. However, it is becoming increasingly clear that the demand for internet, data, voice, video and other services can be best satisfied with policies that permit open and direct access to all satellite resources. Such policies, by creating an open and competitive market and ending protection, would cut costs, improve choice for users and maximise access to services by the poor.

Because the 'footprints' of satellites do not match national borders, it is necessary to regulate access to them through international agreements such as those developed by the ITU. This approach is referred to as 'Open Skies', and it is being adopted by most governments in the world, particularly in Europe.

What governments can do

In some countries in Africa VSAT is allowed, but still hampered by licensing restrictions. For instance, it may be more difficult for a national company to gain a license than an international one. These countries include Botswana, Mauritius, and South Africa. Some countries, including Nigeria, Ghana, Uganda and Senegal, are in the process of opening up their legislation. In others, such as Ethiopia and Zimbabwe, telecommunications are still in the hands of a national monopoly provider.

Lack of regional harmonisation also creates obstacles for VSAT providers.

Direct On PC in Nigeria

In 2000 the Bhojrai Chanrai Group in Nigeria began to use Ku-band VSAT to improve its internal communications. Soon the company started offering VSAT services to consumers throughout Nigeria, and this led to the creation of a new company, *Direct On PC Ltd*, launched in June 2002. Employing over 150 staff, *Direct On PC* has around 1,300 customers, including SMEs, multinationals, government agencies, financial institutions, insurance companies, medical services and cybercafés. It is present in 85 cities in Nigeria and seven other countries in West Africa. Besides impressive commercial success, the company has promoted technology transfer, built local capacity and brought communications to remote regions of Nigeria.

Governments can do several things to create an enabling environment for the growth of VSAT services. They should recognise that private sector investment has the greatest potential for providing affordable country-wide connectivity ('universal access'). They should adopt policies to facilitate such entrepreneurial investment.

Specific policy measures include:

- ending any prohibition on the use of satellite technologies for social and economic development
- ending any prohibition on the use of VSAT for international communication
- introducing 'blanket licensing' for VSATs

  Most governments have so far required every VSAT or mobile terminal to be licensed individually, as well as requiring the network operator to be licensed. A new approach known as 'blanket licensing' or 'blanket exemption' has been introduced in Europe, North and South America, Asia, and parts of Africa. In this system, technical criteria are established such as for power levels and frequency of VSATs, to ensure safety and minimise the risk of interference. As long as they all comply with these criteria, a large number of VSAT terminals can be covered by a single 'blanket' license. Minimal administration is necessary. This approach has worked well for the regulator, for the industry and for users wherever it has been introduced. However, many African governments say they are not yet ready to introduce this system: they have not yet developed guidelines, and a rapid proliferation of terminals without appropriate guidelines and criteria would be dangerous.
- working with other governments in the region to harmonise regulation of satellite technologies (i.e. to agree together to introduce the same regulatory systems throughout the region)

  Harmonisation measures could include:

  - introducing the same requirements and fees for operator licenses across the region. This would make it easier for a company already operating in one country to begin operations in a neighbouring country.
  - adopting the same terminology across the region. At present, terms such as 'small terminal' and 'medium terminal' mean different things in different countries.
  - facilitating movement of equipment across borders, by countries agreeing to recognise one another's test results for specific types of equipment. This is known as 'type approval'.
- making it easier for the public and potential investors to find out about licensing requirements and about what other private companies are doing, and to submit license applications

  One way of doing this would be to set up a one-stop-shop on the internet to provide information about developments and licensing requirements across the continent and to facilitate the submission of license applications.

What journalists should know

- Which Ministries in your country are involved in the Communications Policy? It is likely to be the Ministry of Communication, Ministry of Finance, and/or Ministry of Science and Technology.
- Are there obstacles to the roll-out of VSAT in the country? What are they?
- Other Ministries whose areas of work would benefit from availability of VSAT include the Ministries of Health, Agriculture, Rural Development, Trade and Economy. Are these Ministries aware of the potential benefits of VSAT? Are they lobbying for changes to the law and regulatory regime?
- What is the national policy on Access to Information? Does it include use of VSAT?
- Which internet service providers and other communication service providers are operating in your country? Are they using VSAT, or lobbying for its introduction?

There are regional Associations of Regulatory bodies, whose regular meetings are the most important fora for advocacy and decision-making. Meetings are usually open, and press briefings are issued:

- West African Telecommunications Regulators Association (WATRA): www.watra.org
- Telecommunications Regulators Association of Southern Africa (TRASA): www.trasa.org.bw
- East African Regulatory Postal Telecommunications Organisation (EARPTO): via www.ucc.co.ug

Lishan Adam – an independent ICT for development consultant based in Addis Ababa – provided the information for this brief. He is available for interview on +25 19 400510, or by email: lishan@bitsct.com

Useful websites for more information

www.balancingact-africa.com
Balancing Act supports the policy and regulatory changes required to produce an effective digital infrastructure on the continent.

www.catia.ws
The CATIA programme aims to enable poor people in Africa to gain maximum benefit from the opportunities offered by Information and Communication Technology (ICT) and to act as a strong catalyst for reform.

www.gvf.org
Global VSAT forum: A global association consisting of over 160 members and 50 different countries to facilitate the provision of VSAT based communications solutions throughout their country or region.

http://web.idrc.ca/en/ev-53486-201-1-DO_TOPIC.html
International Development Research Centre's research on VSAT: Canadian donor agency on Africa satellite policy.

http://link.wits.ac.za/research/research.html
Link centre research on VSAT: Southern Africa's leading ICT policy, regulation and management hub.

www.uneca.org/disd/ictmaps.htm
African Information Society Initiative (AISI) – An association that promotes information and communication activities in Africa since 1996.

Panos London is not responsible for facts and views expressed on external internet sites.

Panos is a global network of independent NGOs working with the media to stimulate debate on global development issues. Panos works from offices in 16 countries.

All photographs available from Panos Pictures
Designed by John F McGill
Printed by Digital-Brookdale

For further information contact:

External Relations Unit
Panos London
9 White Lion Street
London N1 9PD
UK

Tel: **+44 (0)20 7278 1111**
Fax: **+44 (0)20 7278 0345**
www.panos.org.uk

Press:
media@panos.org.uk

Communication for Development Programme:
C4D@panos.org.uk

This Media Toolkit has been published by Panos London's Communication for Development Programme, supported by the Department for International Development, UK.

Panos Ltd (English original, April 2005)

Panos Media Toolkit on ICTs

1 Who rules the internet? Understanding ICANN

2 Why calls in Africa cost more: the need for VSATs

CATIA
Catalysing Access to ICTs in Africa