

Appendix B

Connection options



1. Introduction

The Internet is largely a cable network. A single marine fibre connection can have more capacity than the combined capacity of all communication satellites. Within countries, there are large networks such as the JANET (Joint Academic Network) in Britain that connects educational institutions. This network has a 10 Gbps core, and many institutions such as Bristol University connect to it via 2.5 Gbps links. Private companies have high-speed leased-line connections to their branch offices. Compared to these speeds, VSAT (Very Small Aperture Terminal) connections are tiny and overpriced.

In many, if not most, developing countries the ISP's connection to the Internet is via VSAT, either because there is no marine fibre cable connecting the country to the Internet backbone, or the infrastructure within the country does not connect the undersea cable landing point to the place where that ISP is located with a suitable link. For this reason, institutions such as universities typically connect via their own VSAT, or else via an ISP that has a VSAT connection. However, if developing countries do not invest in proper cable infrastructure, they will never achieve the same kind of Internet connectivity as elsewhere. Details of cable and overland connections to the Internet are at the links below:

<<http://www.telegeography.com/pubs/networks/reports/ib/lop.html>>

<www.tsoja.com/links.html>

<www.telegeography.com/maps/cable/index.html>

In countries where there is an undersea cable connection to the Internet backbone, it is likely that linking to it via the local telecommunications company would be the best option, rather than connecting via VSAT.

2. Connection via VSAT

Where connection via cable is not possible, institutions have to use VSAT to connect to the Internet via satellite, or connect to an ISP that has a VSAT connection. A university could investigate whether getting its own VSAT is cheaper than making a leased-line or radio-link connection to the ISP to get on the satellite link.

Institutions that access the Internet via VSAT (directly or indirectly) should ensure that they are getting a good service at the best price. Prices are going down, and the available options are increasing. Some institutions may also find that they are not getting the same access to bandwidth anymore, as a result of satellite companies or ISPs becoming oversubscribed, and too much contention taking place on the provider's bandwidth. Therefore, it is necessary for institutions to monitor whether they are getting the correct amount of bandwidth at the best price, and in some cases it may be advisable for them to change provider or else renegotiate the deal.

There are many satellite providers who lease space on satellites on behalf of customers. For larger connections, such as ISPs and universities, using Digital Video Broadcasting (DVB) for the downlink, and SCPC for the uplink appears to be emerging as a standard from many competing technologies. (See the glossary for an explanation of these terms).

When a university considers getting its own VSAT connection, it should avoid lock-in by a certain vendor. Lock-in is when the customer buys equipment that works only with the service

from that vendor. For example, if a customer buys Gilat equipment, he would have to stick to getting his Internet connection via Gilat, or a company that is a Gilat subsidiary. If another satellite provider provides a better service the customer will have to replace all the equipment before he can switch.

2.1 Satellite ISPs

AfriSat <<http://www.afrisat.co.za>>
Afsat <<http://www.afsat.com>>
Egypsat <<http://www.egyptsat.com>>
Geolink <<http://www.geolink.fr>>
Hughes <<http://www.hns.com>>
IPPlanet <<http://www.ipplanet.com>>
Iway <<http://www.iwayafrica.com>>
InfoSat <<http://www.infosat.co.za>>
IPMC <<http://www.ipmcghana.com/vsat.htm>> (Hughes DirecWay)
Link-sat <<http://www.link-sat.net>>
Newsbies <<http://www.newsbies.com>>
Qkon <<http://www.qkon.com>>
Redwing Satellite Solutions <<http://www.redwingsat.com>>
Sentech <<http://www.sentech.co.za>>
Simbanet <<http://www.simbanet.net>>
Skystreams <<http://www.skystreams.net>>
Viasat <<http://www.viasat.com>>
Web-sat <<http://www.web-sat.com>>

Many more providers are listed in the Google directory under
Business: Telecommunications: Wireless: Service Providers: Satellite

2.2 VSAT – Some technical issues

VSAT connections make use of geostationary satellites. These satellites orbit the earth above the equator at a speed which corresponds with the speed the earth turns, thus enabling them to stay above the same location on earth. When deciding on a VSAT connection, the issue of frequency band tends to arise. The bands used by geostationary satellites are typically C and Ku band. C-band is 3 to 6 GHz, while Ku-band uses frequencies of 10 to 17 GHz.

Ku-band satellites transmit signal levels at higher power levels than C-band. Because they use more power, they can use smaller antennas (dishes). This simplifies installation and lowers the cost of the receiving equipment. However, the disadvantage of Ku-band is that it is susceptible to rain fade.

Rain fade occurs because the length of the microwaves is short enough for rain or even rain-filled clouds to reduce the intensity of the incoming signal, and so Ku-band systems suffer from greater attenuation by rain than C-band systems.

To counteract the rain fade effects, Ku-band systems use an antenna larger than is needed under a clear sky. This increase in antenna size improves the reception, so the system can operate in light or moderate rain. In areas where rain is not an important factor, Ku-band is a good choice, while in tropical areas C-band may be preferable.

3. Wireless WAN networks

Wireless WAN networks have made a big impact in recent years, and may be used to link campuses, or to make a connection to the ISP. Whereas wireless networks used to be only 2 Mbps, equipment can now be obtained that reach much higher link speeds, usually 11Mbps. Since the final link to the Internet is usually much less (1.5 Mbps is the highest of the universities in this study), 11 Mbps is often sufficient unless it will be carrying a large amount of local traffic. Wireless WANs depend on line-of-sight, or relay stations where line-of-sight is not possible.

3com - <<http://www.3com.com/wireless>>
Alvarion - <<http://www.alvarion.com>> (previously
BreezeCOM and Floware)
KarlNet - <<http://www.karlnet.com>>
Mikro-tik - <<http://www.mikrotik.com>>

Articles on the Internet discussing these systems can be found at:

<http://www.isp-planet.com/fixed_wireless>
<<http://www.80211-planet.com/news/article.php/1478011>>

The photograph shows a wireless antenna in Blantyre.



4. Wireless LAN

Wireless LANs are also a good way to network a building quickly, especially if there is not a local company that can lay proper structured cabling at a reasonable price, and within a reasonable timescale.

The links below provide guidance about purchasing wireless LAN products:

<http://www.wlana.org/direct/wireless_lan_vendors.html>
<<http://www.80211-planet.com>>

5. Leased line

Whenever available, a leased-line connection to the ISP is a good option, if it is a digital connection. The bandwidth of this connection can be the same as the maximum bandwidth on the link from the ISP to the Internet (it need not be more).

6. Peering

Peering is when large networks or ISPs set up Internet Exchange Points (IXPs). These are local links to keep local traffic local (within the country), and the aim is to avoid paying large sums for international traffic.

6.1 The politics of peering

As discussed in the main document, a peering arrangement is a matter of co-operation. See also the link below:

<http://www.balancingact-africa.com/news/back/balancing-act_156.html>

More about the politics of peering, as well as how peering can eventually be done between neighbouring countries, is at <<http://www.afrispa.org>>.

6.2 Technical details

<<http://www.openpeering.nl/info/howdoesitwork.html>>

<<http://www.kixp.net/how.html>>

6.3 Selected list of IXPs, and related links

<<http://www.linx.net>>

<<http://www.kixp.net>>

<<http://www.hub.org.za>>

<<http://www.jinx.net.za>>

<<http://www.saix.net>>

A much longer list of IXPs is at <<http://www.pch.net/resources/data/exchange-points/ep-in-addr.txt>>.