

Using VSATs to improve Wide Area Network availability

A modern broadband VSAT has many features which, combined with good service management, allows the delivery of surprisingly good SLA's.

What is a modern broadband VSAT?

A broadband VSAT consists of a small indoor device which is essentially a broadband router with some clever components to send and receive the information over a satellite connection rather than a phone line. This is connected by one or two small cables, similar to those used for satellite TV, to a satellite antenna (dish) with a special radio system.



The main suppliers of such equipment include Hughes, Viasat, Gilat and iDirect.

How do they work?

From an end user perspective it is very simple. Once the system is installed just plug in to the Ethernet port, wait a few seconds for everything to settle down and then start work.

Inside the box of course there is a lot of sophistication. Depending on the supplier and end user requirements these broadband VSAT's can provide many router like features to allow the integration in to most possible networks. They also provide for different levels of data security to provide appropriate protection.

In addition these broadband VSATs have a number of features specific to satellite communications, two of these are;

- a) Data acceleration – this uses a variety of techniques designed to minimise the impact of satellite delay. Most common business applications can benefit from this so the end user experience is very good.

- b) Adaptive links – like any radio link a satellite connection is affected to some degree by the weather. A modern broadband VSAT system is able to measure the impact and compensate to significantly reduce this and minimise the resultant service impacts.

Adaptive links

Imagine talking to a friend in a quiet room – you will talk fast at a normal volume. The a few more people arrive and you will find yourself raising your voice a bit to make sure you are heard. As the party grows you might talk a little slower to ensure your friend can hear you properly. As it gets really loud you will need to repeat yourself to be heard clearly.

The data is sent by radio signals which are reduced by rainfallⁱ, this reduces the level of the signal and increases the background noise. Most modern broadband VSAT systems use technologies often known as adaptive coding and modulation (or ACM)ⁱⁱ to reduce the impact of rainfall. A typical implementation works as follows;

- a) The transmit power is increased – this will help increase the signal so that after the attenuated signal level is close to the required level. This is analogous to raising your voice.
- b) All satellite data links employ a technology known as forward error correction (FEC). This uses complex mathematical processes to send some extra bytes along with the data such that if a byte of data is lost the extra bytes allow the receiver to automatically repair the data packet. During clear sky operation the system needs perhaps 15% to 20% extra bytes of FEC. As the attenuation increases ACM will increase the amount of FEC data so that during the hardest rain half the data transmitted is FEC information. This is essentially the same as repeating yourself in that noisy room.
- c) The final trick employed is to slow down the data signal – ACM does this by reducing amount of information sent per secondⁱⁱⁱ. This is same as if you are talking more slowly in that noisy room.

So what does this mean?

It is not possible to know when rain will happen much ahead of time, good statistical data exists making it possible to predict how much it will rain at any given location. This information is used to calculate the network availability.

A modern system will have a calculated link availability of 99.9% in Europe^{iv}; combine this with reliable VSAT equipment with a mean time between failures measured in years and a service provider offering next business day repairs allows for truly excellent network wide availability.

And in the real world?

Real world operational data confirms the technical predictions and across thousands of sites a modern broadband VSAT system will deliver availability of around 99.9% or even better if so designed.

This can be favourably compared with a network delivered over ADSL where the supplier commitment and real world delivery is likely to be around 99%.

For more information

Please feel free to contact the author on s.watts@cn21.co.uk.

Notes

ⁱ Rainfall and other precipitation absorb radio waves. In general the higher the frequency the greater the impact of the rain, and of course the harder the rain the greater than impact. The reduction in signal level is called attenuation.

ⁱⁱ Adaptive coding and modulation is specified in the DVB S2

ⁱⁱⁱ Technically speaking this is done by reducing the modulation from 8PSK (or higher) down to QPSK which reduces the number of bits per symbol transmitted.

^{iv} A Ku band network such as that used for the UK lottery may well be much better.