

White Paper

Choosing the Right Satellite Service

Broadband satellite services are the ultimate solution for connectivity requirements at remote locations where terrestrial connectivity cannot reach. There is a wide variety of satellite services available, but not all satellite platforms and services can adequately address business or other enterprise organization needs.

In fact, the bulk of VSAT solutions were designed for home and small office deployments and may fail miserably if you try to use them to support business applications. Attempting to use the wrong tool for the task will result in long application response times, erratic performance, a flood of help desk calls and unhappy users.

BusinessCom delivers enterprise-grade satellite services that can support mission-critical business and government operations at guaranteed performance levels.

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Contents

The Core Differences	3
Comparison	4
Enterprise-Grade Satellite Services	5
Frequency Bands	5
Fair Access Policies	8
Quality of Service	9
Security	10
VPN	11
Assured Service Delivery	12
SD-WAN and MPLS Extensions	12

The Core Differences

The most popular VSAT services available on the market provide shared, best-effort bandwidth service—that is, bandwidth carved out of a single pool of satellite capacity that is shared among multiple subscribers. Very few VSAT services guarantee any minimum bandwidth to their clients, and even fewer offer Service Level Agreements (SLA). Because satellite bandwidth is expensive, satellite ISPs use a variety of rate-limiting and restriction techniques to manage bandwidth in their networks and decrease service costs. This allows providers to make VSAT affordable to a wide range of users.

But while typical VSAT services are good for home and small office use where guaranteed performance is not really required, enterprise VSATs are a horse of a different color. Using “best effort” shared bandwidth VSATs for business environment is inviting trouble because:

- Performance is not guaranteed at all, so these VSAT services will slow down severely under peak traffic loads, or may even disconnect completely.
- Business applications traffic is not prioritized and will encounter congestion with background flows, such as file downloads and operating system updates.
- VoIP and Videoconferencing are generally not supported well.
- Satellite terminals are effectively unmanaged and unsecured, leaving your remote sites vulnerable to bandwidth abuse and security threats.
- These services are generally usage based, and come with data caps or limits that can seriously interfere with business operations if the site runs out of data quota prior to the end of the month.

Companies that make the mistake of trying to use low-end VSAT technology in their remote business locations end up investing time, money and effort in something that may simply result in frustrated users and reduced business efficiency.

Comparison

The table below compares an enterprise-grade service to a typical “best effort” service.

	Enterprise-grade Service	Consumer Ku-band Services	Consumer Ka-band Services
Data Volume Services that only provide a small data volume quota but fall back to slow speed afterwards are specified as Limited for fairness purposes.	Unlimited	Typically Limited	Typically Limited
Dedicated CIR Bandwidth Guarantees certain level of performance all the time.	Yes	No	No
Sharing Ratio Advertised Services with lower sharing ratio will deliver more burstable bandwidth and better user experience in average.	Yes	Usually Yes	No
Fair Access Policy Services without FAP restrictions will support any amount of computers in the LAN, with no limits on TCP sessions, protocols, applications or usage patterns.	No FAP/FUP	Restricted	Restricted
QUALITY OF SERVICE			
Business-quality VoIP and Videoconferencing	Yes	No	No
Service Level Agreement (SLA)	Yes	No	No
Multiple QoS Traffic Priorities	Yes	No	No
SaaS Application Optimization	Yes	No	No
EFFICIENCY			
LAN Bandwidth Management	Yes	No	No
RTP Header Compression	Yes	No	No
Private Networks (Pooled Bandwidth)	Yes	Varies	Varies
SECURITY			
Layer 2 LAN User Authentication	Yes	No	No
Layer 7 Application Management	Yes	No	No
Deep Packet Inspection & Monitoring	Yes	No	No
Firewall and Threat Management	Yes	No	No
Network Intrusion Detection System	Yes	No	No
Accelerated VPN	Yes	No	No
ASSURED SERVICE DELIVERY			
Packet Loss Monitoring	Yes	No	No
MPLS/SD-WAN Extensions	Yes	No	No
Remote IP-level Diagnostics	Yes	No	No
Weekly or Monthly Status Reports	Yes	No	No
MISC FEATURES			
Multi-WAN Load Balancing and Fail-over	Yes	No	No
Mobility Support	Yes	Varies	Varies

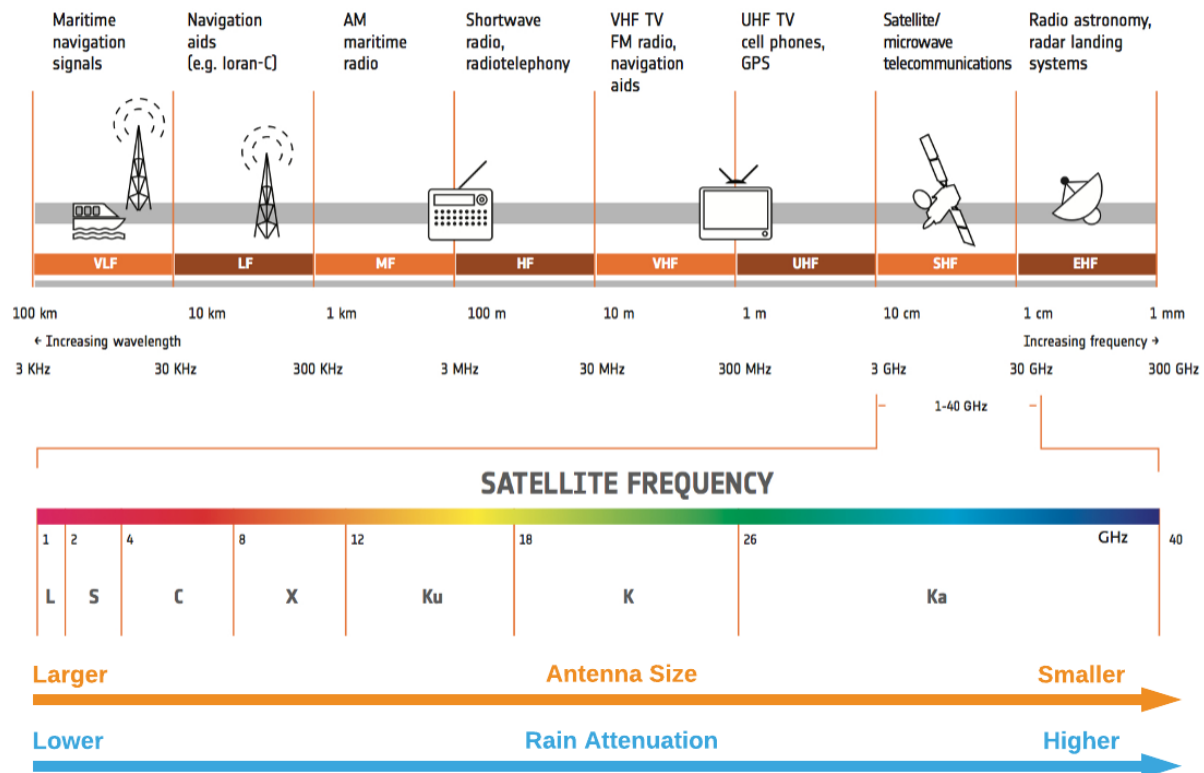
Enterprise-Grade Satellite Services

The key to supporting global business outposts is finding a VSAT solution that features multiple key characteristics:

- Appropriate frequency band choice
- Unlimited data volume without FAP/FUP restrictions
- Dedicated CIR bandwidth and network uptime guaranteed by SLA
- Multi-level traffic prioritization via Quality of Service (QoS)
- SaaS Application Delivery Optimization
- Secured terminals
- Centralized monitoring and reporting

Using four teleport networks in London, Munich, Bogota and Miami, BusinessCom offers VSAT broadband services that satisfy all these criteria. The VSAT service, once the terminal is deployed at the remote site, is configured to match client's business traffic and deliver guaranteed level of performance.

Frequency Bands



Several frequency options are available in the satellite telecommunications industry:

LOW-FREQUENCY SYSTEMS

Low-frequency bands (L, S and C) are the most tolerant to bad weather conditions because they are based on longer radio wavelengths in which rain droplets are transparent. Low-frequency systems are almost entirely unaffected by rain and should, hence, be preferred in tropical or equatorial climate zones. The use of C-band requires larger antennas, typically 1.8 m to 2.4 m in diameter, and more powerful transmitters (BUCs), so the C-band VSAT equipment is generally more

expensive than Ku or Ka. For large companies, or those with mission-critical objectives, C-band is usually the preferred solution.

It is worth noting that the whole C-band range is subdivided into multiple frequency bands: Standard, Extended, Palapa and Insat C-band. Some, like Extended C-band, for example, may interfere with 5 GHz wireless links. Hence, in densely populated areas or for networks with wireless extensions Standard C-band is the best choice.

There are filters available to block wireless interference, however their efficacy is somewhat limited, so if the VSAT system must be deployed in proximity to wireless terrestrial networks then Standard C-band should be preferred. Military radars may often interfere as well.

HIGH-FREQUENCY SYSTEMS

The primary advantage of high-frequency bands (X, Ku, Ka and K) is that they allow clients to use smaller antennas, typically from 1.0 to 1.2 m, and less powerful transmitters, reducing the VSAT equipment costs. The signal attenuation by rain is significantly more pronounced in Ku and Ka-band, hence we generally recommend Ku-band for clients located in temperate climate zones, and very high-frequency Ka-band for climates with arid conditions.

Some satellite providers may say their Ku- and Ka-band services work well in wet climates, however that is generally only applicable to lower-end markets, like home and SOHO users, where a few minutes or hours of downtime per day during the wet season are acceptable, in return for lower hardware prices.

Most of the satellite platforms today feature a technology called Adaptive Coding & Modulation (ACM). These satellite links will downshift modulation and increase Forward Error Correction (FEC) overhead on the fly depending on the actual weather conditions observed at both the remote location and the teleport. ACM allows high-frequency links to survive light to moderate rains, by sacrificing link throughput. Basically, whenever it rains, the ACM-enabled link will slow down instead of disconnecting completely.

High-frequency ACM links cannot, under any circumstances, be considered as a substitute to C-band. In fact, research by Harris Corporation has shown that it is more expensive to deliver the same level of network uptime over Ka-band in

tropical climate zones, as compared to C-band, despite Ka-band satellites offering less expensive cost per MHz.

Fair Access Policies

Despite frequently being presented as an advantage, Fair Access or Usage Policies (FAP/FUP) are intended to impose limits on the subscribers themselves, to suppress the load on the satellite provider's shared bandwidth pools. These artificial limits rarely work well for business users. Among the most popular FAP/FUP techniques are:

- Advertising the service as having unlimited traffic, however, providing only some portion of monthly traffic quota at full speed, then dropping to low priority.
- Limiting the number of concurrent TCP sessions, which indirectly limits the number of devices allowed to share the satellite link.
- Blocking certain ports and protocols, such as UDP.
- Blocking or limiting streaming, FTP and other bandwidth-intensive applications.
- De-prioritizing traffic on all ports and protocols except on the most common ones.
- "Smart" shaping (rate-limiting) of IP sessions supporting continuous data flows, such as file transfers – session starts at full speed, however, throughput declines with time.
- Blocking VPNs.

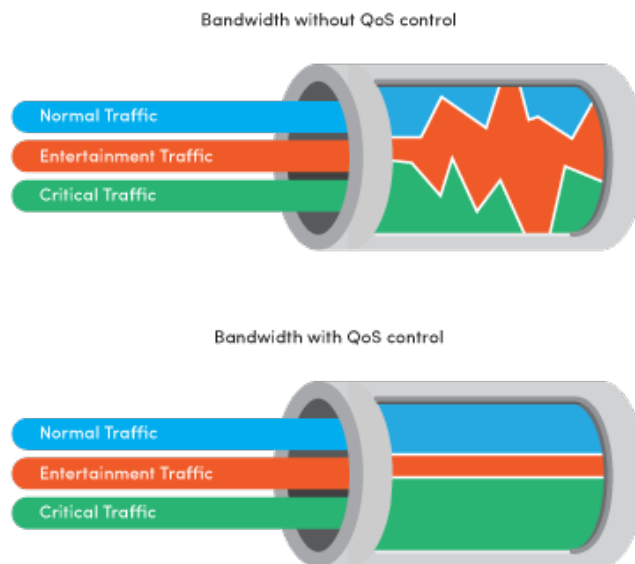
Many of these techniques are often not announced to the client or are hidden behind vague marketing curtains. In some cases, the ISP's sales personnel are even unaware their company has such policies implemented. Of course, FAP/FUP allows satellite providers to decrease the prime cost of their service by cramming more users into the same block of capacity on the satellite, placing revenue over performance and customer satisfaction – but these are "commodity" services.

Few will argue with the fact that these restrictions are unacceptable in most business environments. Shared satellite links without FAP/FUP are more expensive, as they are expected to handle heavy-duty loads and require more capacity on the satellite per each Mbps advertised. However, in many cases it is even more expensive to let important business operations fail because of unreliable communications.

BusinessCom's Broadband services have no FAP or FUP.

Quality of Service

Bandwidth management is critical for businesses wishing to optimize the use of their satellite bandwidth. A key component of managing bandwidth depends on supporting, and having expertise applying, Quality of Service (QoS). The main principle behind the QoS concept is prioritizing important traffic types:



Generally, business users prefer to grant VoIP, videoconferencing and other real-time applications the highest priority – in order to guarantee that voice and video packets arrive in time, to deliver smooth, even performance.

The second priority is generally allocated to business traffic. This can be web browsing, e-mails and applications critical to client's business, such as CRM, ERP, database traffic, VPNs, private clouds, data storage, and so on.

Finally, the last priority is left to everything else. This could be unimportant, background or even entertainment traffic.

Typical VSAT services, often including those marketed for business, don't support QoS at all. Some satellite providers advertise QoS support, however, they do not allow users to modify the rules, leaving all terminals running in the default "one size fits all" profile, which renders the whole concept void. Connectivity without QoS can be very detrimental for businesses wherein multiple users are sharing the same satellite connection, especially if there is a variety of applications involved. Maximum link congestion normally occurs during the peak busy hours. Being able to manage your bandwidth in order to prioritize the important applications during these busy periods may impact the efficiency or even success of the business or organization.

BusinessCom's Broadband services support QoS in both directions – download and upload. Some operators will only offer QoS on the download, if they offer it at all. We configure QoS on a per-terminal basis.

Our Network Operations Center (NOC) works with every client to understand traffic profiles and custom tailor the VSAT service to the actual requirements. This can be done on a per-site basis, or for a group of sites. We also allow our clients to modify QoS profiles at any time during the contract term, at no surcharge.

Security

Due to restricted bandwidth VSATs are often vulnerable targets for DDoS attacks, malware and P2P applications, creating poor user experience. Given that satellite links are usually installed at very remote locations, troubleshooting unsecured terminals may be problematic, and on-site visits expensive.

Most satellite service providers leave security on the customer's shoulders. Some clients, even, connect their LAN switch directly to the satellite router and let it handle the NAT and the DHCP for the entire network. Some use small branch routers. This ad-hoc approach to security may work for small networks with a handful of PCs but will inevitably fail in a typical business environment.

A bandwidth and protocol monitoring system with a firewall and a network intrusion detection system (NIDS) comprise the core of a typical threat

management solution. There is a wide variety of appliances available on the market combining these functions. They will come at an additional cost per each remote site, which can be rather substantial, as well as recurring costs to deploy, monitor and manage them for every location.

BusinessCom VSAT systems include an appliance called Sentinel to handle security. It provides an IP firewall, NIDS and comprehensive monitoring system with a graphical user interface. All BusinessCom Broadband satellite services include our NOC monitoring and managing the Sentinel appliances at the remote sites.

On the WAN side, all our services include Deep Packet Inspection (DPI) monitoring, which can optionally be enabled on the LAN, on a per-site basis. This allows technicians to identify and prevent bandwidth abuse within the local network – before malicious traffic gets out to the satellite, often wasting valuable bandwidth.

VPN

VPNs always require additional attention when implementing them over satellite links. Over a satellite, it takes a long time for the TCP acknowledgments to come back from the VPN server. Satellite latency is about 1/2 second round trip, not counting any of the router, switch, gateway and other devices adding normal latency in an Internet connection. The latency is a result of the long distance the signal has to travel divided by the speed of light (23,000 miles x 4) divided by 186,000 miles per second = .495 seconds and it's usually longer as the remote site and teleport are seldom directly under the satellite on the equator. Because of the delayed ACK, the TCP protocol thinks it is on a very slow or very congested link, and it won't ramp up to full speed, regardless of how much satellite bandwidth is available. Typical service providers just ignore the problem. There are third party VPN acceleration appliances available on the market, which may add thousands of dollars in additional costs per each location.

BusinessCom has a fully accelerated VPN solution included. Any VSAT can become part of the Hub-and-spoke private network. We can host a VPN server at our teleport, or even provide and host the server, and manage the whole VPN infrastructure for you. Our engineers will examine the requirements and work with the client to propose viable solutions that minimize cost and maximize throughput.

Assured Service Delivery

Once the VSAT is deployed at a remote location, how can you be certain everything is running well? User feedback can often be very limited, especially if there are no IT-qualified personnel at the remote site. Typically, VSAT service providers provide some basic monitoring facilities, such as bandwidth usage and signal level charts. But consider these questions that may occur at any time during performance reviews:

- Am I getting the full burst or is the bandwidth simply not being requested in the LAN?
- Is bandwidth shared evenly in the LAN – does everyone get a fair piece of the pie?
- How many outages were there in the last month?

Typical VSAT solutions will leave the user in the dark. All they know is that it's not working and there is no information or assistance from the operator to help diagnose the problem.

BusinessCom VSAT solutions deliver much more than simple charts. Packet loss is monitored and charted, and bandwidth usage is provided within the LAN at the remote site. Bandwidth and protocol usage statistics are available on a per-host basis in the LAN, and even DPI statistics can be made available on a per-host basis, if needed. Weekly or monthly status reports on the health of the entire system can be distributed via e-mail. A bandwidth test can be conducted remotely on any VSAT at any time, without relying on local personnel.

SD-WAN and MPLS Extensions

If you are running a critical application and need to backhaul traffic to your headquarters, data center or cloud, relying on Internet as the middle mile can be inadequate as there is no way to enforce an SLA on the whole path. For example, using Internet as a middle mile from East Asia to the U.S. West Coast will result in a typical application response time of about 4 seconds, with a whopping 153% variation. Switching to an SD-WAN backhaul will reduce that to 0.3 seconds (plus satellite latency) and only 25% variation.

Typical VSAT solutions hand off to the local backbone Internet service provider and provide no options to integrate with any private networking infrastructure.

BusinessCom offers multiple options to handle terrestrial backhauls for you:

- We can work with your service provider of choice, establishing direct connection between your headquarters and one of our teleports.
- We can provide you with an MPLS or Ethernet extension directly to your headquarters.
- BusinessCom can deliver a fully managed SD-WAN solution as-a-service.

This technology is replacing traditional private circuits at an increasing pace, as it is faster to deploy and provides significant savings, as compared to traditional MPLS circuits. The main principle behind SD-WAN delivered as-a-service is that your remote site uses local ISPs or BusinessCom VSAT service to reach SD-WAN network edge, and we replace the unknown Internet middle mile with an international connectivity service with SLA and QoS. Within the SD-WAN network the data is optimized, compressed, accelerated and backhauled to the desired PoP. The SD-WAN solution provides 99.99% SLA. With service level enforced all the way from the remote VSAT to your central location, the combination of VSAT and SD-WAN provide end-to-end reliable connectivity solution.

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