Summary

The following information discusses who ViaSat Communications is as a company and the corporate mission. This Job Aid covers:

Who is ViaSat, Inc.?
How the ViaSat Service Works
ViaSat Ka-Band Satellites
ViaSat Ka-Band Architecture
ViaSat Broadband Satellite Network
Quality of Installation (QOI)
Rain Fade
Squint
ViaSat Network Service Levels
SurfBeam 2/Exede Service Levels
Exede Data Access Policy (DAP)
Exede Late Night Free Zone (LNFZ)
Exede Buy More
Exede Voice [Voice over IP (VOIP)]
SurfBeam/WildBlue Service Levels
WildBlue Data Access Policy (DAP)

This Job Aid supports all audiences.

Who is ViaSat, Inc.?

On July 17, 2004, WildBlue/Telesat successfully launched the world’s largest commercial communication satellite, the first to fully commercialize the Ka-Band frequency using Spot Beam technology.

ViaSat’s mission is “To Make Affordable Broadband Internet Access Available to Everyone in the Contiguous United States, Alaska and Hawaii.”

Service

Depending on the ViaSat Partner, the ViaSat service may come with ISP Services (i.e. Email, Web space) bundled in at no additional cost.

The ViaSat service primarily targets the 30 million customers living in small towns and rural America.

Technology

ViaSat satellites use Ka-Band spot beam technology to allow multiple reuse of the same frequency, providing high capacity at low cost. The DOCSIS (Data Over Cable Service Interface Specification) Satellite modem or WiMAX (World Interoperability for Microwave Access) Satellite modem and the digital broadcast satellite standards form the technical basis of ViaSat’s Satellite Modem and Gateways. ViaSat uses a small satellite antenna equipped with both a satellite transmitter and receiver for two-way connectivity to the Internet.

ViaSat Services are:
ViaSat Service Manual

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- Always On: ViaSat offers a connection that is always on – no wait times, no dial up hassles and no extra steps.
- Fast: ViaSat’s broadband services provide downstream speeds of up to 12 Megabits per second and upstream speeds of 3 Megabits depending on the service package purchased.
- Upgradeable: Anik F2 and WildBlue 1 satellite services with augmented gateways for enhance upload and download speeds
- Adding WiMAX protocol: WiMAX adds speeds up to 12 Megabits per second, manages the inherent delay in satellite communication, allowing for VOIP, VPN, and mobility thus providing a better customer experience.

How the ViaSat Service Works

The ViaSat satellites connect the Customer computer to the Internet by creating data paths between the Satellite Modem, Satellite, and through the ViaSat Gateway to the Internet.

The ViaSat Satellites use on-board switching to create an Uplink that allows data to flow from the Customer computer through the Satellite to the Internet.

It also creates a Downlink that allows data to flow from the Internet through the Satellite to the Customer computer.

The Uplink and Downlink data paths are created using a combination of Spot Beam technology and Bent Pipe architecture. This technology provides service reliability, high capacity, and low cost Internet access.

ViaSat Ka-Band Satellites

Each of the ViaSat Satellites has a single mission: to provide Broadband Internet Access services across the continental United States, with a particular focus on rural communities.

These highly reliable and sophisticated satellites are equipped with multiple Ka-Band transponders that create a series of Spot Beams that cover the Continental United States Hawaii and Alaska. It is the technology that allows the ViaSat customer to enjoy high-speed Internet access.

Each satellite has a Geostationary Orbit (GEO) approximately 22,300 miles above the equator of the earth. These orbits allow the satellites to appear to be stationary in the sky and allow for the customer antennas to focus on them with a precise Line of Site (LOS).
ViaSat Ka-Band Architecture

Spot Beam Technology

Using next-generation transponders, the ViaSat Satellites focus multiple Spot Beams on different geographic regions, instead of using one single beam, commonly called a Conus Beam, for the Continental United States. ViaSat satellite beams also service Alaska and Hawaii.

Bent-Pipe Architecture

ViaSat satellites are Bent-Pipe architecture satellites. The Satellite’s role is to simply receive, retune, amplify, and redirect the Radio Frequency (RF) signals between the customer’s equipment and a dedicated Gateway Earth Station (GES).

All digital signal-processing operations are on the ground making the network and its components easier to upgrade and maintain.
ViaSat Broadband Satellite Network

Spot Beam Architecture

Each ViaSat Satellite Network is supported by a set of Gateway Earth Stations (GES). Each Satellite dedicates some of its Spot-Beams for Gateway Beams that carry Gateway Links, leaving the remainder for Subscriber Beams that carry User Links.

The Satellite combines a Gateway Link with a User Link to create the Uplink or Downlink data path.

Beam Numbering

As the ViaSat Satellite Network grows, the beam numbering schema will continue to grow with it. The current Beam Numbering is as follows:

<table>
<thead>
<tr>
<th>Satellite Name</th>
<th>Satellite Number</th>
<th>Beam Number Range</th>
<th>Access Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anik F2</td>
<td>1</td>
<td>12 to 45</td>
<td>DOCSIS / SurfBeam</td>
</tr>
<tr>
<td>Anik F2</td>
<td>1</td>
<td>62 to 95</td>
<td>WiMAX / SurfBeam 2</td>
</tr>
<tr>
<td>WB 1</td>
<td>2</td>
<td>101 to 136</td>
<td>DOCSIS / SurfBeam</td>
</tr>
<tr>
<td>WB 1</td>
<td>2</td>
<td>151 to 186</td>
<td>WiMAX / SurfBeam 2</td>
</tr>
<tr>
<td>AMC 15</td>
<td>3</td>
<td>201 to 212</td>
<td>DOCSIS / SurfBeam</td>
</tr>
<tr>
<td>ViaSat 1</td>
<td>4</td>
<td>301 to 372</td>
<td>WiMAX / SurfBeam 2</td>
</tr>
</tbody>
</table>

Spot Beam Example

The example map is the Beam and Gateway layout for the Anik F2 satellite. In the map, Gateway Spot Beams are represented by the numbered white circles and Subscriber Spot Beams are represented by the colored circles.
Gateway Architecture

Each Gateway provides the connection to the Internet backbone for the Gateway Spot Beam(s) it is connected to. In addition, each Gateway manages its own Sub-network IP traffic independently from the other Gateways. Therefore, network problems on one Gateway do not migrate across the network. The ViaSat 1 satellite also employs specialized gateways called Core Nodes. The Core Node allows for better network and traffic management, while providing alternate data routing for higher network reliability.

Gateway Protocols Benefits

The gateways employ either DOCSIS or WiMAX protocols. These protocols provide modem control yielding serviceability management tools that support installation and repair processes. WiMAX provides these same tools while providing an algorithm for improving speeds and providing mobility.

Quality of Installation (QOI)

The Quality of Installation (QOI) algorithm forces the antenna point to be more precise. QOI uses the service values expected in the beam in which the modem located determines the service values. This means that the desired values the network expects from a modem are based on the installation location within the beam. The QOI measurement is used automatically during the Modem Provisioning process.

Note: During Service Call Completion, QOI is automatic for ViaSat Retail accounts but manual for other ViaSat Partner accounts.

Important: A poorly pointed antenna consumes the network space equivalent to three customers.

Potential Installation Error

Because the service is evaluated in relationship to the current values in the immediate area surrounding the installation site, the Network knows at what service values the modem should be for the current situation. This allows the Technician to complete a successful Provisioning process in less-than-perfect weather. When the weather improves the modem will attain the normal operating values without human intervention.

Rain Fade

Rain Fade is a digital modulation scheme that allows the carriers in a Beam to manage multiple Channel Widths for SurfBeam/WildBlue service, or Symbol Rates for SurfBeam 2/Exede service, at the same time. This network scheme provides the following:

- Increased network availability
- Increased network capacity
- Better network management

This also means that the network manages every modem appropriately for its weather conditions.

Important: Because of the various channel widths used in Rain Fade for the SurfBeam/WildBlue service, ViaSat cannot guarantee that a digital Satellite Signal Level Meter can be used to point the antenna. ViaSat does not support the use of digital meters. Questions about Rain Fade support should be directed to the meter manufacturer.
During a Rain-fade Condition

The Network manages modem modulation during bad weather using the adjustment scheme based on the service type and beam used in the affected area. The affected service experiences slow speeds during this time. Both SurfBeam 2/Exede Service and SurfBeam/WildBlue services make temporarily adjustments to accommodate for the changing conditions as seen in the adjustment schemes described below.

SurfBeam 2/Exede Service Rain Fade adjustments:

- **Target RL Symbol Rate** - In good weather conditions a well pointed antenna will support a RL Symbol Rate of at least 5000 kilo symbols per second (ksps). With the working symbol rate somewhere between 5000 ksps and 10000 ksps depending on the beam location. This symbol rate supports all service speeds.
- **Mid RL Symbol Rate** - The RL Symbol Rate moves down as poor atmospheric conditions set in. With the working symbol rate somewhere between approximately 1000 ksps and 5000 ksps there will be more error correction than when the target symbol rate is used and service speed is slightly affected.
- **Rain Fade RL Symbol Rate** - If the weather is deep enough, the modem will finally go to a 625 ksps symbol rate and then try to operate at different modulation-code points to get the best possible service speed. This symbol rate has the greatest error connection then either the target or mid symbol rate and only supports the lowest service level and the lowest service speed.

SurfBeam/WildBlue Service Rain Fade adjustments:

- **First Channel** – the first level decrease, with Upstream Channel widths of 2560 kbps. This channel will support all service levels at their respective speeds using a mid-range channel power. This level is used during minor weather issues.
- **Second Channel** – the second service level decrease, with Upstream Channel widths of 1280 kbps. This channel has more error correction than the First Channel and slightly lower Upstream Channel Power.
- **Rain Fade Channel** – the last and most severe service level decrease, with Upstream Channel widths of 320 kbps. This channel has the greatest error connection and the slowest Upstream Channel Power. It will support only the lowest service level and the lowest speed using the lowest signal power. This level is used during the most severe weather interruptions.

After Rain-fade Condition

If the antenna installation was done properly, the modem recovers to the appropriate Channel Width or RL Symbol Rate on its own and the service speed returns to normal, usually within 30 minutes.

Potential Installation Error

A modem with a poorly mounted, cabled, or pointed antenna will often experience issues returning from Rain Fade modulation. This causes the customer to experience slow speeds unnecessarily. The Technician is responsible to ensure the antenna mount is stable, the antenna is properly cabled and the antenna point is fine tuned.
Squint

The **satellite** transmits a circular polarized downstream signal to the modem through the antenna (Receive, RX, red). The **modem** transmits a circular polarized signal to the satellite through the antenna (Transmit, TX, green).

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The transmission between the modem and the satellite occurs simultaneously.</td>
</tr>
<tr>
<td>2.</td>
<td>The signals do not interfere with one another because of the offset. This offset is called <strong>Squint</strong>.</td>
</tr>
<tr>
<td>3.</td>
<td>When pointing and peaking the antenna, the downstream or Receive signal is used because the receive frequency is static. Said another way, the receive signal is constant and stable. Because the Receive frequency is static, a correctly pointed antenna will use the same downstream signal, as a result, when the antenna is precisely pointed at the Receive Center point Frequency. The appropriate upstream signal is available.</td>
</tr>
<tr>
<td>Step</td>
<td>Action (continued)</td>
</tr>
<tr>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>4.</td>
<td>The modem manages the offset between the transmit and receive signals as long as the antenna is correctly pointed. The upstream signal provides a set of available transmit frequencies because the Transmit is dynamic. The modem only uses a Transmit Frequency when data is being transmitted. The modem searches for the first available Transmit Frequency when preparing to transmit data.</td>
</tr>
<tr>
<td>5.</td>
<td>When a pointing error occurs it impacts the ability of the Downstream signal to function properly, the upstream signal is impacted almost <strong>two times more</strong>, because of the Squint.</td>
</tr>
</tbody>
</table>
| 6.   | A pointing error in the opposite direction impacts the Downstream signal just as much as in the previous pointing error, but, because of the Squint, it doesn't impact upstream as much.  
   In any case, Pointing errors must be avoided. They cause poor performance, service outages, and customer dissatisfaction. |
ViaSat Network Service Levels

Recall that the ViaSat mission and its network are designed to support Internet Access Service. Using its inherent network technology, ViaSat offers a set of Service Levels with downstream speeds up to 12 Mbps and upload speeds up to 3 Mbps. These Service Levels are sold within various Sales Offers through ViaSat Retail and ViaSat Partners using unique Offer names.

**Note:** High Speed Plans are only offered to new customers in small areas where the Broadband Plans are not available. However, customers with older accounts can choose to stay on the legacy High Speed Plans. Also, partners may choose to offer their own service levels, which may or may not coincide with those offered through ViaSat.

**Auxillary Add-on Services:** ISP, dial-up and/or Email services differ between ViaSat partners.

SurfBeam 2/Exede Service Levels

ViaSat offers two service levels with downstream speeds up to 12 Mbps and upload speeds up to 3 Mbps. The 5/1 Plan is supported on the augmented beam of the WildBlue and Anik F2 satellites, while the 12/3 plan is supported on the ViaSat 1 satellite. ViaSat Partners can define their own plan parameters based on their client needs as long as the parameters are in the appropriate range for the supporting satellite.

<table>
<thead>
<tr>
<th>Data Path</th>
<th>5/1 Plan</th>
<th>12/3 Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream</td>
<td>Up to 5 Mbps</td>
<td>Up to 12 Mbps</td>
</tr>
<tr>
<td>Upstream</td>
<td>Up to 1 Mbps</td>
<td>Up to 3 Mbps</td>
</tr>
</tbody>
</table>

Exede Data Access Policy (DAP)

To ensure that all ViaSat customers have equitable access to the ViaSat network, ViaSat uses a **Data Access Policy (DAP)**. When an account goes past the account data usage threshold, ViaSat temporarily limits the upload and download speeds. The consequences for exceeding the usage threshold are as follows:

- Service is stopped during Peak period when the cap is exceeded
- Service remains available during Off-Peak periods
- DAP reset is tied to the account 30-day billing period; resetting to zero on each monthly billing cycle date.
- Extreme and continued violation of the Data Access Policy can lead to termination. Refer to the Data Access Policy on [www.exede.com](http://www.exede.com) for more detail.

**Exede Data Access Policy Business Rule:**

While the ViaSat Data Access Policy Parameters apply to all service levels and Partners, usage thresholds vary between Small Business, Residential, and Enterprise/Commercial accounts, not Partner association.
**Exede Late Night Free Zone (LNFZ)**

ViaSat sets usage thresholds on the amount of data customers can upload and download. Data usage for the threshold is only measured during Peak hours. **Late Night Free Zone (LNFZ)** is in effect in Off-peak hours of 12AM to 5AM, customer’s local time; data usage in this time frame is not measured for the usage threshold.

**Note:** This service may not be available from all partners and it is not available to customers with SurfBeam/WildBlue service.

**Exede Buy More**

When a customer finds that they occasionally need more data in a single month than comes with their Exede Data Allowance Plan, the Buy More tool allows them to purchase more allowance. Each purchase costs $9.99 and provides 1 GB of additional data allowance.

**Note:** This service may not be available from all partners and it is not available to customers with SurfBeam/WildBlue service.

**Exede Voice [Voice over IP (VOIP)]**

Customers with Exede accounts can choose to have their voice telephone service delivered over the ViaSat service. This service is an after-installation add-on feature that the customer self-installs. To activate the service the customer is shipped an Analogue Terminal Adapter (ATA) device to connect to the Ethernet connector of the modem. The Technician will not install the VOIP service. VOIP service data usage is not measured for the account usage threshold.

**Note:** This service may not be available from all partners and it is not available to customers with SurfBeam/WildBlue service.

**SurfBeam/WildBlue Service Levels**

ViaSat offers a singular service level with downstream speeds up to 3 Mbps and upload speeds up to 256 Kbps.

### SurfBeam Service Levels

<table>
<thead>
<tr>
<th>Data Path</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream</td>
<td>2.5-3 Mbps</td>
</tr>
<tr>
<td>Upstream</td>
<td>256 Kbps</td>
</tr>
</tbody>
</table>

**WildBlue Data Access Policy (DAP)**

Through the use of the Wildblue Fair Access Policy, available on [www.wildblue.com](http://www.wildblue.com), customers’ bandwidth usage is monitored to ensure optimum performance for all customers. Currently, these limits are 17,000MB Download capacity and 5,000 MB Upload capacity. Customers can monitor their usage for the past 30 days using a tool on Wildblue.net. If customers exceed their data limits, service may be restricted or their speed reduced until the plan resets to zero at the end of the 30-day cycle.

**WildBlue Data Access Policy Business Rule:**

While the ViaSat Data Access Policy Parameters apply to all service levels and Partners, usage thresholds vary between Small Business, Residential, and Enterprise/Commercial accounts, not Partner association.