

# Video Conferencing over BGAN

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## I.0. Introduction

### I.1. About this guide

This document describes the use of video conferencing applications over the BGAN network, explains the protocols used and how to optimize them, and introduces some of the most commonly used software-based and hardware-based solutions. It also explains how to set up a dedicated streaming IP connection using BGAN LaunchPad.

This document is intended for end users, Distribution Partners and Service Providers who want to integrate an existing solution over BGAN, or who are looking for a new audio/video solution to use over BGAN. A previous knowledge of satellite communications is useful, but not essential.

The sections include:

- Introducing video conferencing over BGAN – lists the specific requirements of a video conferencing solution, and some of the factors to consider.
- Understanding audio/video protocols – provides an overview of codecs, bit rates and protocols, and other factors that can improve or affect performances over BGAN.
- Software-based video conferencing solutions – lists the software-based solutions tested on BGAN, outlines their performance over BGAN, provides setting up instructions, and makes recommendations for their use.
- Hardware-based video conferencing solutions – lists the hardware-based solutions tested on BGAN, outlines their performance over BGAN, provides setting up instructions, and makes recommendations for their use.
- Setting up a video conferencing connection – explains how to use BGAN LaunchPad to set up a dedicated streaming connection for your software-based video conferencing solution.

### I.2. Other sources of information

- This is one of a series of PDF documents that make up the BGAN Solutions Guide. The Solutions Guide is designed to help you make the most of your BGAN terminal. Other documents in the series are available for download from [www.inmarsat.com/bgan](http://www.inmarsat.com/bgan). Click on **BGAN support**, then click on **How to guides**.

This Web site also gives further information on the BGAN service, including Industry solutions.

- Refer to “BGAN LaunchPad Help” for details on using BGAN LaunchPad.
  - Refer to the documentation supplied with your video conferencing software for details on changing configuration and settings.
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## 2.0. Introducing video conferencing over BGAN

The BGAN service enables remote offices or users to establish audio/video communications with company headquarters or business partners anywhere in the world.

Audio/Video solutions are divided into 3 main categories. This guide covers video conferencing only. Each of the other categories is covered by its own Solutions Guide; refer to the appropriate guide for details on the other categories.

- Video conferencing solutions (Hardware or Software based) – typically, two-way video conferencing between remote and fixed office.
- Broadcasting solutions (Encoder & Decoder based)
  - Typically the one-way broadcast of live audio/video from the field.
  - Includes a high quality Store-and-Forward option for near real-time breaking news coverage.
- Remote surveillance solutions (Remote IP camera) – typically, a one-way JPEG or motion video clip from field to fixed office when motion is detected; alternatively, the fixed office can access a live video stream remotely.

**IMPORTANT: It is important that you select the correct BGAN terminal and streaming IP quality of service for the solution you want to use. Refer to the appropriate Getting Started Guide for details.**

### 2.1. Introducing conferencing solutions

Video conferencing solutions are typically used for two way visual communication between a remote and fixed office to include remote locations in meetings. It is more often employed by government users, although can be used by the broadcasters to hold two way interviews.

The two way video conferencing solution fully utilises the uplink and downlink of a BGAN streaming IP data channel. There are many off-the-shelf hardware and software solutions that can be used for video conferencing over BGAN. Hardware-based solutions are designed to deliver quality video with high performance, using a dedicated built-in processor and integral features to deliver quality video. Software-based solutions are designed for both PC and Mac platforms, and rely on the CPU power of your computer, and the other applications you are running at the time of the conference.

Software-based solutions are more prone to PC viruses, whereas hardware-based solutions are more secure and less vulnerable to viruses and trojans

#### Specific requirements

Audio/Video conferencing solutions introduce additional requirements over the ordinary transfer of data. For example, latency must be guaranteed to ensure that frames are transmitted in the form of a moving image, and sound must be synchronized with image. Audio/video conferencing solutions have following requirements:

- A large amount of information to be sent simultaneously, requiring a consistent bandwidth. This requirement is best suited to a streaming IP data connection (refer to “Selecting the right terminal and Quality of Service” on page 5).
  - Some form of data compression (refer to “Understanding codecs” on page 7).
  - A number of protocols to be used alongside the streaming IP connection to control data flow and provide additional conferencing capabilities (refer to section “Introducing protocols” on page 8).
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When these requirements are met, you can further optimize your applications based on Inmarsat's test results. Refer to "Protocol requirements" on page 9, and any of the following sections based on your preferred video broadcasting application:

**Software:**

- "Setting up Alice" on page 11.
- "Setting up iChat" on page 12.
- "Setting up MSN Messenger" on page 13.
- "Setting up Yahoo Messenger" on page 14.
- "Setting up Polycom PVX" on page 15.
- "Setting up Emblaze VCON vPoint" on page 17.

**Hardware:**

- "Setting up the Motion Media mm156" on page 20.
- "Setting up the Tandberg Tactical MXP" on page 22.
- "Setting up the SCOTTY Mobile" on page 25.
- "Setting up the Aethra Theseus" on page 26.

In addition, you can set up a streaming IP connection in BGAN LaunchPad, dedicated to your video conferencing application. Refer to "Setting up a video conferencing connection" on page 27.

## 3.0. Understanding audio/video protocols

This section explains IP data connections over BGAN, data compression algorithms, and the data transfer protocols and audio/video protocols used to ensure effective audio/video solution over BGAN.

### 3.1. Selecting the right terminal and Quality of Service

The BGAN terminal provides two classes of connection: standard IP and streaming IP.

On a standard IP connection, traffic throughput varies depending on terminal and network usage. Streaming IP differs from standard IP in that it offers a guaranteed, consistent connection rate, provided network resources are available end to end.

**TIP:** Inmarsat strongly recommends that you use a streaming IP connection for audio/video applications

**TIP:** Inmarsat strongly recommends that end-to-end QoS is supported for the required data rate. It is important that QoS is maintained across the terminal's "last mile" link as well as the satellite interface **BGAN Distribution Partners and Service Providers can provide details of available interconnect options.**



The streaming rates provided by the BGAN terminals differ, as shown in the following table:

Terminal	Standard IP (up to ...)	Streaming IP
HNS 9201 Thrane & Thrane EXPLORER 700	492kbps send 492kbps receive	32kbps, 64kbps, 128kbps, 256kbps
Thrane & Thrane EXPLORER 500	464 kbps send 448 kbps receive	32kbps, 64kbps, 128kbps
Nera WorldPro 1000/1010 Thrane & Thrane EXPLORER 300	384kbps send 240kbps receive	32kbps, 64kbps

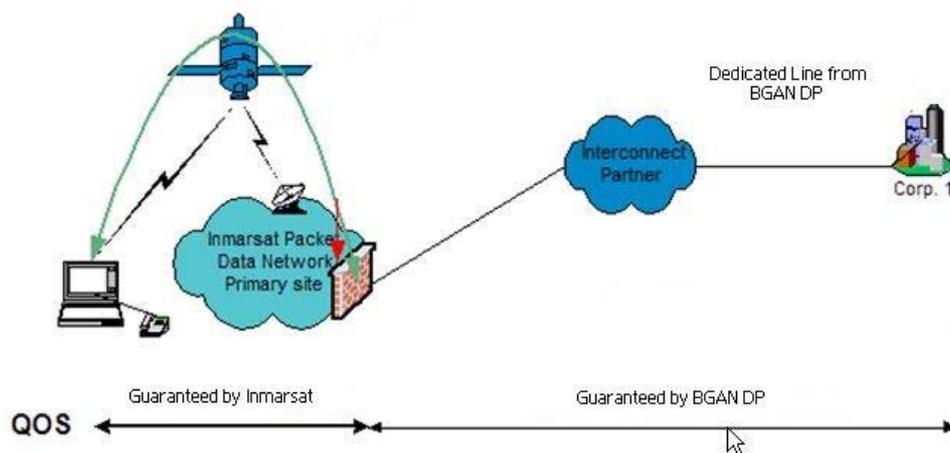
You can also link your audio/video application to a particular streaming class connection. To do this, you must configure a dedicated streaming IP connection, and use a traffic flow template to ensure that only the AV traffic is transmitted over that particular connection. All other traffic uses the standard IP connection.

To set up this connection, refer to 6.0 “Setting up a video conferencing connection AV connection”.

### Last mile connectivity

If you want to use BGAN for live video and audio streaming traffic using UDP-based applications, Inmarsat recommends that you investigate and implement ‘last mile’ routing arrangements which guarantee end-to-end QoS. This is particularly important for UDP-based applications running over a Streaming IP connection on BGAN. To maintain throughput and quality it is important that QoS is maintained across the terrestrial ‘last mile’ link as well as the satellite interface.

BGAN Distribution Partners and Service Providers can provide details of available interconnect options.



### Last mile connectivity



## 3.2. Understanding codecs

A codec is the name given to the encoding/decoding algorithm that compresses and decompresses audio video data. The effectiveness of a streaming IP connection is determined partly by the codec. A high compression codec will provide the data stream quickly, but at low quality. In general, compression schemes can be classified as "lossy" and "lossless."

- **Lossy compression** schemes reduce the size of the data stream by discarding some data during the encoding process before it is sent over the BGAN network. Once received on the client side, the codec attempts to reconstruct the information that was lost or discarded. Lossy compression offers data savings of around 10:1. If a voice file was compressed using lossy compression, silence would be removed, and both high and low frequency data may be lost from the data stream. The resultant file could sound different to the original (depending on how aggressive the codec was).
- **Lossless compression** simply squeezes data into smaller packets of information without permanently discarding any of the data. Lossless compression algorithms usually require more computing power to compress and decompress the data stream, and do not give the same data savings as lossy compression. If a voice file was compressed using lossless compression, it could still be encoded, in order to reduce the size, but no data would be lost. The resultant file would sound exactly the same as the original.

Codecs typically used combine elements of both compression schemes; in this way, for example, silence can be discarded from a voice file, but all non-silent parts retained and compressed.

Streaming IP applications over BGAN must therefore choose a codec that will provide the necessary quality of stream, whilst reducing the data rate as much as is possible.

The tested applications described in this document all come with their own coding schemes. Some allow you to change various settings which can make a difference in the way the application works over BGAN.

## 3.3. Understanding bit rates

Audio/Video solutions are designed to use either Constant bit rate or Variable bit rate depending upon the network behaviour. BGAN's streaming IP connection is different to ADSL-type IP networks, as the BGAN network supplies the requested Quality of Service (QoS) from the time you request the connection until you disconnect

It is important to understand the difference between Constant bit rate and Variable bit rate, as the quality of the audio/video solution over BGAN may vary depending upon whether the solution uses Constant or Variable.

### Constant Bit Rate

Constant bit rate is recommended for use with streaming applications over the BGAN streaming IP service as the output from the codec is sent in a steady stream with a fixed bit rate. Since the BGAN streaming IP service is assigned to a specific QoS (32kbps, 64kbps, 128kbps and 256kbps, depending on the terminal), Constant bit rate performs better than Variable bit rate over streaming IP. This is because on a defined BGAN channel, a Constant bit rate takes advantage of all the capacity of the streaming IP connection.

### Variable Bit Rate

Variable bit rate is designed to cope with variable network bandwidth, such as that provided by ADSL or the BGAN standard IP connection, which adjust audio/video quality according to the



available bandwidth. A Variable bit rate solution has the capability to throttle back when it detects any packet drop or loss, which typically occurs when IP traffic travels through a series of Internet routers. This throttling back reduces the speed of data transmission and results in loss of video quality. Variable bit rate solutions are therefore more suitable for a standard IP connection than a streaming IP connection.

### 3.4. Introducing protocols

Inmarsat recommends that you use a streaming IP connection to send and receive video data. A number of protocols can be used alongside the streaming connection to control the data flow and provide additional video broadcasting capabilities.

The following two transport protocols are for the general transmission of data over IP:

- TCP
- UDP

Protocols that are specific to video solutions over IP are relatively new, and still evolving. The following two main sets of call control protocol are in use by the Internet at the time of publication:

- H.323
- SIP

All these protocols are described below.

#### TCP and UDP

TCP and UDP are transport protocols that are used to transmit data over IP connections. The TCP protocol is configured to deliver data from end to end in a reliable manner. It is connection-oriented, and provides flow control and retransmission of lost packets. The UDP protocol is connectionless, and does not guarantee reliability, flow control or detection of lost packets but designed for faster delivery.

TCP/IP application will be more effective over Standard IP due to the nature of BGAN Standard IP service. Typical corporate application i.e. Email, Web browsing, FTP etc uses TCP

UDP is more suited to Streaming IP because if packets are lost, they are ignored and packet transmission continues. This may cause a slight loss of quality in the transmission, but the transmission is not interrupted. If the same packets were lost over a TCP connection, TCP would stop delivery of further packets until the lost packets are successfully been retransmitted. This would cause an unacceptable break in the flow of the application.

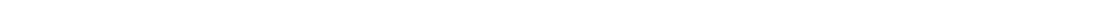
Therefore, UDP thus gives streaming applications greater control over the data flow than TCP.

These characteristics mean that majority of the audio video applications use a combination of TCP and UDP where needed. Typically, call set-up and data flow control is carried out using TCP. The audio and video data is sent using UDP.

**TIP:** **BGAN LaunchPad allows the configuration of error correction. Inmarsat recommends that you disable error correction for UDP applications, and use UDP applications over streaming IP service. Refer to “BGAN LaunchPad Help” for details.**

#### H.323

The H.323 protocol is defined by the ITU-T (International Telecommunications Union). It describes how real-time multimedia communications can be exchanged on packet-based networks. The





standard was drawn up following collaboration between traditional telephony experts and those from the computer communications arena. In addition to fully-interactive media communications such as video conferencing, H.323 also has provisions for other forms of communication, such as multi-media streaming.

The complete specification documents can be found at <http://www.itca.org>.

During a point to point H.323 call, an initial TCP connection is made (using default port 1720). Data is exchanged over this connection (using Q.931 packets) to determine which port will be used for the actual multi-media connection. Once this port has been decided, an H.245 connection is made, to the new port.

The H.245 protocol handles all of the call parameter negotiations, such as which codecs to use. H.245 also has commands that make UDP connections. Once the audio and video codecs and parameters have been negotiated, the H.245 session starts the underlying data stream.

The data stream consists of an RTCP (Real-Time Transport Connection Protocol) connection (UDP), and the actual data stream which uses the RTP (Real Time Protocol).

The H.323 protocol covers all aspects of telephony and conferencing, including capability exchange, conference control, basic signalling, Quos, registration, service discovery, gateways etc.

## SIP

SIP (Session Initiation Protocol) is defined by the IETF (Internet Engineering Task Force) and is a relatively simple protocol when compared to H.323. It is designed to be modular, allowing the protocol to be extended to cover specific applications.

SIP is defined as being responsible for basic call signalling, user location, and registration.

Whereas H.323 can operate in a peer to peer mode, two SIP users require a SIP server in order for them to communicate. SIP clients send a series of messages (defined in the Session Description Protocol) to the server in order to set-up a call with another user. The client must first register with the server, then invite the other user to join a call. The SDP message will detail what is to be included in the call; audio, video, Codecs etc.

Once the call recipient has accepted the call by responding to messages from the SIP server, the actual data connection is set-up directly between the two SIP users. The data connection uses the RTCP and RTP protocols, as for H.323.

### 3.5. Protocol requirements

Both H.323 and SIP use the same data transport protocols to send and receive data across the BGAN network.

The applications that use these protocols use different encoding techniques however. In addition, the applications normally impose a higher level protocol to control the user session. For instance, whilst Yahoo Messenger and iChat may both use the SIP protocol for audio and video, the applications must first initiate a session using their respective Instant Messaging (IM) protocols with the IM servers.

In order to use either the H.323 or SIP protocols through a firewall, based on your computer or corporate servers, the following ports must be open. Due to the dynamic nature of the lower protocols, it may be necessary to allow the whole application access through the firewall, rather than rely on specific port entries.

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Protocol	Ports
H.323	UDP ports 1718 and 1719 (discovery and registration of gatekeepers) TCP/UDP 1720 (call signalling) TCP 1300 (secure call signalling) TCP dynamic port 1024-65535 (H.245) UDP dynamic port 1024-65535 (RTCP) UDP dynamic port 1024-65535 (RTP)
SIP	TCP port 5060 (SIP) UDP dynamic port 1024-65535 (RTCP) UDP dynamic port 1024-65535 (RTP)

**NOTE: When using a streaming IP connection from a mobile client to a fixed server, the above ports refer to the firewall protecting the fixed server (any local firewall on the client must be correctly configured for outbound traffic).**

## 4.0. Software-based video conferencing solutions

This section details the performance of some software-based video conferencing solutions over the BGAN network, and gives recommendations for optimizing their use.

The solutions tested over the BGAN network include:

- Alice – Video conferencing application (Windows)
- iChat – Instant Messaging (IM) and Video conferencing application (Mac)
- MSN Messenger – Instant Messaging (IM) and Video conferencing application (Windows)
- Yahoo Messenger – Instant Messaging (IM) and Video conferencing application (Windows)
- Polycom PVX - Video conferencing application (Windows)
- Emblaze VCON vPoint - Video conferencing application (Windows)

Each of the above applications is described in greater detail in the following sections.

### 4.1. Performance over BGAN

The applications were all tested to ensure that they worked over the BGAN network. Then optimizations were applied, and the application data stream was examined to see how much bandwidth was required to run the application. Each application was also checked to see how much data was sent backwards and forwards whilst not connected to another user (where applicable).

**TIP: All these applications operate more effectively over a streaming IP connection than a standard IP connection. Note the following:**

- **Ensure that you choose a streaming IP connection that matches the data requirements or settings of your application.**
- **Do not leave the application (or the streaming connection) active when not in use.**

**NOTE: All streaming IP connections were tested using dedicated last mile service from the BGAN network to preserve end to end Quality of Service**



The typical minimum PC requirements for these applications are as follows:

- H323/H263 – Pentium III 1Ghz or P4.
- H264 – P4 / 1.7GHz upwards (Intel Duo Core recommended).
- Windows SP2.
- Direct X 10.
- Memory/RAM – 1MB-2MB recommended.
- Display – SVGA (800x600).

## 4.2. Setting up Alice

Alice supports peer to peer H.323 video conferencing, as well as H.320 video conferencing via ISDN using a connected ISDN terminal adapter (ISDN can be used on the HNS 9201 and the Thrane & Thrane EXPLORER 700 only on BGAN). It requires a standard Windows microphone and camera device connected to your computer.



Alice uses variable bit rate and adjust throughput accordingly

### Optimizations

- Ensure audio compression is on.
- Set bandwidth to 64kbps, 128kbps or 192kbps to match your connection or requirements.

### Resources used over BGAN

Test	Results	Notes
Application left idle	n/a	Application does not connect to the network until a video call is required.
Standard IP * (Alice set to 64kbps)	70kbps	Video call of good quality, no serious breaks or pauses,
64kbps Streaming IP	45kbps – 70kbps	Bandwidth varied between rates shown.
128kbps Streaming IP	100kbps – 128kbps	Alice was throttling back to 100kbps, but delivered very good video and audio quality.
256kbps streaming IP	192kbps	Very good video and audio.

\* Standard IP performance vary depending upon your location within the foot print, and user activity within the given spot beam.



## Recommendations

Using Alice in 64kbps or 128kbps modes ensures that the matching BGAN streaming IP data channels are fully utilised. However, using Alice over a 256kbps streaming channel requires that Alice be set to 192kbps mode, which means that the channel is not fully used. However, the quality of the video is more consistent due to the extra head-room for IP.

Alice also works over a BGAN ISDN connection, if clients are already configured for ISDN use only. Note that operation with ISDN is only possible at 64kbps over the BGAN network.

To use Alice over ISDN, configure you ISDN TA according to the manufacturer's instructions, then use Alice to dial your ISDN video conferencing number

### 4.3. Setting up iChat

The iChat application runs on the Mac platform. As an Instant Messaging (IM) client, it allows you to connect to a number of IM servers, including AIM, Jabber and ICQ (for Instant Messaging only).

When used as a video chat application, it uses the QuickTime video codec (H.264) via the SIP protocol. Note that to establish a video call requires iChat at both ends of the link, connected using a .MAC account.

**NOTE: iChat uses the iChat server when connecting a video call. When used over a streaming IP data connection, the client must be allowed access to the Internet via the streaming IP data connection (Unless you have the iChat corporate server inside the company network).**

### Optimisations

There is only one optimization possible in iChat:

- In Preferences, click the **Video** icon and set the bandwidth limit to the required value (for example, 100kbps).

### Resources used over BGAN

Test	Results	Notes
Standard IP	80-90kbps	iChat H.264 requires a minimum of 80kbps for stable video connection.
64kbps Streaming IP	N/A	Not suitable for two way video.
128kbps Streaming IP	80kbps	iChat set up for maximum 100kbps data rate. Video looks good in both direction
256kbps Streaming IP	80kbps	Delivers same quality as 128kbps streaming IP. Not suitable for 256K streaming IP.

**NOTE: The streaming IP data connection used was terminated via Internet to access the iChat public server. Due to Internet routing, iChat seem to throttle back when packet loss was detected, and only managed to deliver a maximum of 80kbps, even on a 256kbps streaming IP channel.**



#### 4.4. Setting up MSN Messenger

MSN Messenger allows text-based Instant Messaging (IM), as well as audio and video calls. MSN Messenger is very similar to the Windows Messenger installed as part of Windows XP, and they interact seamlessly. MSN Messenger uses proprietary Microsoft protocols. The version tested (v7.5) does not allow any changes to be made to the quality of the audio/video used.

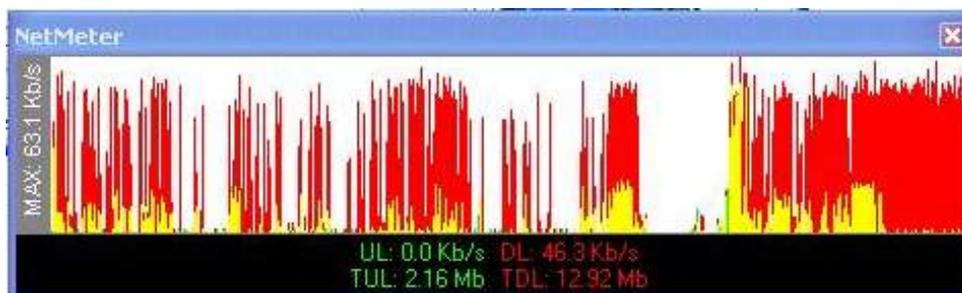
##### Optimisations

Inmarsat recommends that you stop MSN Messenger from logging on automatically. Once logged in, the client will poll the server every few minutes. To turn off auto-login, open MSN Messenger, and select **Tools > Options > General**, then uncheck both **"Automatically run..."** and **"Allow automatic sign on..."**.

##### Resources used over BGAN

Test	Results	Notes
Application left idle	200bytes every 4 minutes	When left signed in, the application generates about 3KB per hour. In addition, more data is received each time a contact refresh is carried out, or when a contact becomes available, or signs off.
Audio call	20kbps	When only audio call is placed
Standard IP/Video call	50kbps – 60kbps	The application throttled back and limited video throughput to 50-60kbps
64kbps Streaming IP/Video call	50kbps – 60kbps	Same as Standard IP
128kbps Streaming IP/Video Call	50kbps – 60kbps	Same as Standard IP
256kbps Streaming IP/Video Call	50kbps – 60kbps	Same as Standard IP

**NOTE: The streaming IP data test was conducted by terminating streaming IP via the Internet to connect to the MSN server**



##### Video pattern via bandwidth measuring utility

##### Recommendations

MSN Messenger uses a significant amount of resources when lying idle, so Inmarsat recommends that you sign-out when not actively using the application. When using an audio connection, the bandwidth used is good, when compared to other products. The video quality is average, and does not utilise full capacity of higher bandwidth IP data channels.



MSN Messenger should be used over either the Standard IP data connection or a 64kbps Streaming IP data connection.

**NOTE: Microsoft Netmeeting behaved in a similar way to MSN Messenger, and should only be used over 64kbps streaming IP.**

## 4.5. Setting up Yahoo Messenger

Yahoo Messenger is a popular Instant Messaging (IM) client, which offers audio and video chat options. Yahoo Messenger uses a proprietary protocol for IM, whilst audio and video are based around the SIP protocols.

Yahoo Messenger has a number of options that can be used to change the way it behaves over the BGAN network.

### Optimizations

In the **Preferences** option on the **Messenger** menu:

- Under **General**, uncheck **Automatically start Yahoo!...**, uncheck **Automatically start LAUNCHcast** and uncheck **Show Inside Yahoo**. Check **"Stand by and wait..."**
- Under **Connection**, set the Internet Connection to **Dial-Up**
- Under **Privacy**, uncheck **Allow Yahoo! web sites...**
- Under **Webcam**, set the camera settings to **Faster Speed**
- Under **Super Webcam**, set Broadcast my webcam to **Small image**

### Resources used over BGAN

Test	Results	Notes
Application left idle	40bytes every 5-7 minutes	When left signed in, the application generates about 0.4KB per hour. In addition, more data is received each time a contact refresh is carried out, or when a contact becomes available, or signs off.
Audio call	30kbps - 35kbps	Utilises higher bandwidth than MSN Messenger
Standard IP/Video call	25kbps –30kbps	Video quality had very low frame rate and didn't use full available bandwidth
64kbps Streaming IP	45kbps –50kbps	Video quality had very low frame rate and didn't use full available bandwidth
128kbps Streaming IP	45kbps –50kbps	Video quality had very low frame rate and didn't use full available bandwidth
256kbps Streaming IP	45kbps – 50kbps	Video quality had very low frame rate and didn't use full available bandwidth

### Recommendations

Yahoo Messenger uses few resources when left idle on the BGAN network. When used for an audio call, the bandwidth used is greater than that used for a video call. The video call is of good quality with low frame rate considering the low bandwidth usage.



Yahoo Messenger should be used over either the Standard IP data connection or a 32kbps Streaming IP data connection.

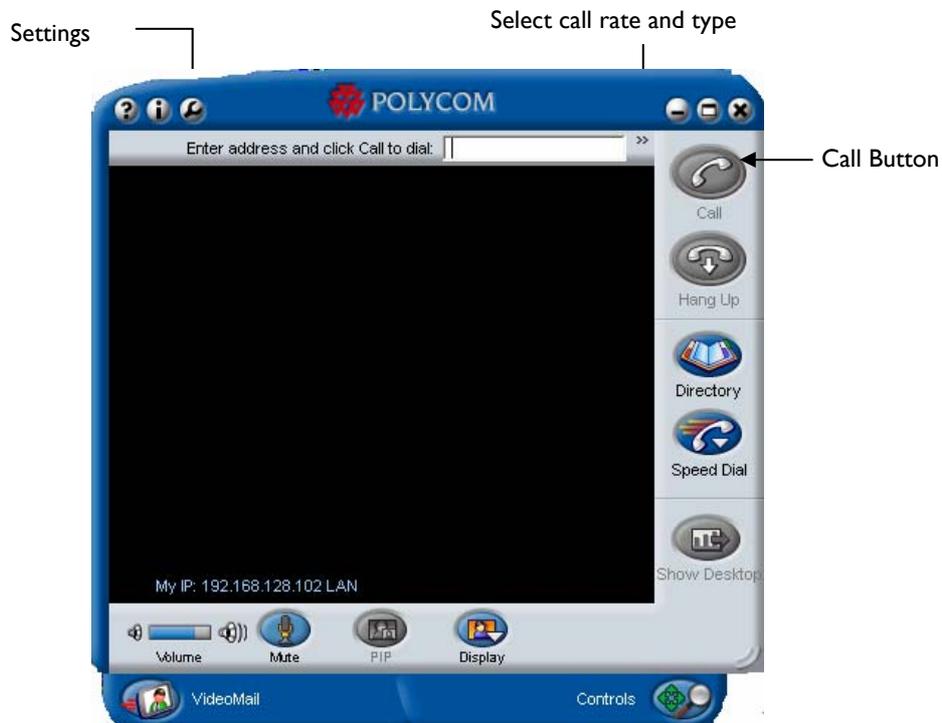
#### 4.6. Setting up Polycom PVX

Polycom PVX from industry-leading video solution company Polycom is a PC-based video conferencing application that can be deployed over the H.323 or SIP protocols. Video is delivered from PVX to PVX using the latest H.264 protocol, but the application also supports H.323, H.263, and H.261. Enhanced features include AES encryption for secure calls, and support for a variety of audio protocols including G.711, G.728 and G.722.1

#### Resources used over BGAN

Test	Results	Notes
Application left idle	N/A	System requires live connection.
Audio call	16kbps audio each way	16kbps is the lowest possible call rate for audio only, and uses the G722.1 codec.
Standard IP/Video call	N/A	Varies depending on available bandwidth. If the bandwidth is not available, the system buffers and causes delays.
64kbps Streaming IP	Video uses 40kbps Audio uses 16kbps	Uses 56kbps call rate (G722.1 and H264 codec)
128kbps Streaming IP	Video uses 80kbps Audio 16kbps	Uses 96kbps call rate (G722.1 and H264 codec )

\* Test carried out using Software release: 8.0.2.8.0.20235



## Recommendations

- The application can also be used to share desktop or files during a live video session. If this feature is not required, disable it.
- Switch off encryption if it is not needed, as it will add a 20% overhead on top of your video bandwidth
- Select the correct bandwidth for your video transmission. PVX support variety of bandwidths to support BGAN streaming IP data connections.
- PVX can also communicate with other H.323 applications, for example MMI56 or SCOTTY Mobile.
- Inmarsat recommend the following PVX bandwidth settings:
  - 56kbps for BGAN 64kbps streaming IP data connection.
  - 112kbps for BGAN 128kbps streaming IP data connection.
  - 224kbps for 256kbps streaming IP data connection.

## Setup

To set up Polycom PVX for use over BGAN:

1. Start your application by entering your email address and full name.
2. Leave the **ILS Server** prompt blank.
3. Complete the audio/video calibration screens.
4. Depending on the terminal you are using, set up the IP address as follows:
  - HNS 9201 – Use the PC's local IP address (set PC to use DHCP).
  - Thrane & Thrane terminal in NAT/Multi-user mode – use the external WAN IP address (set PC to use DHCP).
  - Thrane & Thrane terminal in Modem/Single-user mode- Use the PC's local IP address (set PC to use DHCP).

5. Set the Port as follows:
  - 1720 for H.323
  - 1503 for T.120 (if using any desktop sharing feature)
  - 5060 for SIP port 3603.
 Typical ports are 3230 -3237. It is important that you open the appropriate ports in your corporate firewall to get application working end to end
6. Enter the IP address of your other PVX device, and select the required QoS

## Settings

- Under Call Settings, set AES encryption to **OFF**.
- Set the CPU load of your video camera to **medium**. To check this, open your PVX application when it is idle, open Task Manager and check on performance and CPU usage.
- If you want to share data applications during video conferencing, enable data sharing
- Under Network/Bandwidth, set the default call rate (see “Recommendations” above).
- If you are using the standard IP data connection, then enable “Dynamic Bandwidth”.

Once setup is complete, the network administrator can lock down all the settings using the lock option

## 4.7. Setting up Emblaze VCON vPoint

Emblaze VCON vPoint is a low cost, high quality video conferencing solution which you can use for one way or two way video. It delivers supreme video quality by using H.264 through an easy and simple interface which requires almost no configuration.

## Resources used over BGAN

Test	Results	Notes
Application left idle	N/A	Application require active connection
Audio call	64kbbps audio each way	64kbps is the lowest possible call rate for audio, and uses high quality AAC codecs
Standard IP/Video call	60-62kbps /video call	Good quality video, when set up for 64kbps call
64kbps Streaming IP	N/A	64kbps minimum call rate within the solution does not allow extra room for IP overheads, and disconnects intermittently
128kbps Streaming IP	Video uses 65kbps Audio uses 24kbps	Use 96kbps call rate (G722.1 and H264 codec)
256kbps Streaming IP	Video uses 162kbps Audio uses 24kbps	Use 192k call rate (G772.1 and H264 Codec)

\* Test carried out using Software release: 7.0

## Prerequisites

- BGAN terminal.
- Windows PC (Intel Duo Core recommended. Otherwise Pentium 4 1.7Ghz with 1MB RAM).
- Webcam.
- VCON vPoint Software.



## Recommendations

- To get the best quality out of your video, Inmarsat recommend that you use a streaming IP data connection with a dedicated line.
- Switch off encryption if it is not needed, as it will add a 20% overhead on top of your video bandwidth and may cause problems with some firewalls.

## Setup

To set up vPoint:

1. The camera should be detected automatically. If it isn't, click on the **Settings** button and select the **Hardware** tab. Click on the **Camera** tab, and select the appropriate camera.



2. To make a call, either:
  - Select a number from your phone book, or
  - Click the  button.
3. Select the bandwidth that you want to use for the call. The recommended settings are explained in the Recommendations section, above.
4. Enter the IP address of the recipient and click press dial.



If you have problems getting the call through and you are behind a firewall, you may need to turn off encryption. To do this, click on **Settings > Calls > General**. Under 'Encryption Mode', select **None**.

vPoint uses the following port numbers, that you must open in the corporate firewall for end-to-end operation:

Port number	Protocol	IP addressing	Notes
1719	UDP	Static	Gatekeeper RAS
1720	TCP	Static	Q.931 (Call Setup)
5004-6004	TCP	Dynamic	H.245 (Call Parameters)
5004-6004	UDP	Dynamic	(RTP) Video Data Streams
5004-6004	UDP	Dynamic	(RTP) Audio Data Streams
5004-6004	UDP	Dynamic	(RTCP) Control Information
22136	TCP	Static	VCON MXM – Remote VCON Endpoint
389	TCP	Static	LDAP

## 5.0. Hardware-based video conferencing solutions

This section details the performance of some hardware-based video conferencing applications over the BGAN network, and gives recommendations for optimizing their use.

A number of hardware based video conferencing solutions have been tested over the network. These include:

- Motion Media mmI56
- Tandberg Tactical MXP
- SCOTTY Mobile Z470
- Aethra Theseus

Each of the above applications is described in greater detail in the following sections.



## 5.1. Performance over BGAN

The applications were all tested to ensure that they worked over the BGAN network. Then optimizations were applied, and the application data stream was examined to see how much bandwidth was required to run the application. Each application was also checked to see how much data was sent backwards and forwards whilst not connected to another user.

**TIP:** All these applications operate more effectively over a streaming IP connection than a standard IP connection. Note the following:

- Ensure that you choose a streaming IP connection that matches the data requirements or settings of your application. Leave some capacity for IP overheads when selecting bandwidth in the solution
- Do not leave the application (or the streaming IP data connection) active when not in use.
- Although the following solution supports other protocols and able to communicate with other audio/video products, best results are achieved by using the same type of unit at both ends.
- Inmarsat strongly recommends that end-to-end QoS is supported for the required data rate. It is important that QoS is maintained across the terminal's "last mile" link as well as the satellite interface BGAN Distribution Partners and Service Providers can provide details of available interconnect options.

## 5.2. Setting up the Motion Media mmI56

The Motion Media mmI56 video phone is a video conferencing hardware device that can be directly connected to a BGAN terminal. The BGAN terminal must be set-up to auto-connect, or there must be a computer available to initiate IP connection for the mmI56 over the BGAN network.

The MM156 allows the use of two different protocols: H.323, or Motion Media's proprietary protocol "Packet Buddy" when connected to another mmI56. By default, the MM156 attempts to connect using the proprietary protocol. It uses H.323 should the receiving device not support the proprietary protocol.

### Set-up

The mmI56 relies on a network connection being present when a call is made. Inmarsat recommends that you set up your terminal to auto-connect on start up; both the HNS 9201 and EXPLORER 500/700 can be configured to start up in an auto-connect mode.

Note the following:

- On the HNS 9201 – If you use an external router, you can use BGAN LaunchPad on a computer to initiate the connection, which can then be shared by the mmI56 to make a call. Router ports NAT and PAT must be configured to allow inbound video calls from the fixed to mobile direction. See the documentation supplied with your router for details.
- On the EXPLORER 500/700 – it is possible to connect the mmI56 and a computer to a hub or switch so that the device's share a single PDP context. You can use BGAN LaunchPad on a computer to initiate the connection, which can then be shared by the mmI56 to make a call.

**NOTE:** For inbound calling or single device deployment, the EXPLORER 500/700 should be set to Modem mode with a static IP address, and the mmI56 configured with a DHCP IP address for both inbound and outbound calling. Once the EXPLORER terminal is connected to the BGAN network, the terminal will use DHCP to send the network static IP address to the mmI56



**TIP:** If you use the mm156 with the HNS 9201, and set the terminal to operate in auto-mode, make sure the mm156 has a static IP address of 192.168.128.101, with a Gateway of 192.168.128.100. This is because the HNS 9201 can only automatically activate the first IP context, and map that to 192.168.128.101. The mm156 can be configured to obtain an address via DHCP from the terminal, or you can set a static IP address in the terminal's address range.

Do the following to set up the mm156 for use on a BGAN terminal:

1. Plug one end of the supplied Ethernet cable into the BGAN terminal (or into a hub, switch or router), and plug the other end into the mm156.
2. Configure the terminal to auto-connect with the network, if possible.
3. Turn on the mm156.
4. Select the **Menu** button on the mm156.
5. Select **2** to enter the Communications Setup.
6. Select **2** to set the Max Data Speed. Use the left and right cursor keys to select a setting, and then select **Enter**. The setting you choose here limits the data speed on all outgoing or incoming calls.
7. Select **1** to enter the Network Setup menu.
8. Select **1** to change the IP address (if required by the setup). Use the left cursor key to delete the existing characters, then type in the new IP address as:
  - 192#168#128#101 (for static IP using the HNS 9201).
  - DHCP IP address (if using the EXPLORER 500/700).
9. Select the down cursor key to exit the IP address field. All hashes change to dots.
10. Enter the Subnet Mask as:
  - 255#255#255#0
11. Select the down cursor key to exit this field. All hashes change to dots.
  - Enter the Gateway address as:  
192#168#128#100 (for the HNS 9201).
12. Select the down cursor key to exit this field.
13. Select **Enter** twice to save changes to the Network Setup.
14. Select **Enter** to save changes to the Communications Setup.
15. Select **Exit** to exit the menu screens

Now, set-up a phone book entry for the phone(s) that you wish to connect to:

1. Select **Menu** followed by **1** to enter the Phone Book Options. Select **1** again to Edit the Phone book.
2. Select the right cursor key if necessary to open to a blank entry.
3. Select the down cursor key to edit the **Name** field. Use the left cursor key to remove any existing characters and then enter a name. Each character is entered by selecting the appropriate number key repeatedly until the required letter appears. Then select the right cursor key to move onto the next character position.
4. When the name is complete, select the down cursor key to move to the **Type** field.
5. Use the left and right cursor keys to select a speed of **64K** or **128K**, depending on your requirements, then select the down cursor key to move to the address field.
6. Enter the IP address of the remote phone. If you are using a non standard UDP Port on the remote phone, enter that also. For example,
 

Addr:	161#30#162#254
Address with port:	161#30#162#254#5000

 The hashes will be converted into dots and colons as appropriate.
7. Select the down cursor key to move to the PIN field.
8. Enter a PIN number for this entry if required.
9. Select **Enter** twice to save the phone book changes, then select **Exit** twice to leave the menus. You are now ready to place a call.



10. Select **Start** to open the speed dial menu. Then press the number key that matches your phone book entry.

A call is placed to the remote phone.

### Optimizations

- Ensure that the maximum data speed and correct speed for the call is selected, as described above

### Resources used over BGAN – mm156 to mm156

Test	Results	Notes
Application left idle	N/A	Need live connection for application to work
Standard IP	107kbps – 115kbps	Recipient speed set to 128kbps
64kbps Streaming IP	58kbps – 60kbps	Recipient speed set to 64kbps
128kbps Streaming IP	107kbps-115kbps	Recipient speed set to 128kbps
256kbps Streaming IP	188kbps-190kbps	Recipient speed set to 192kbps

### Recommendations

The mm156 works well over BGAN with a 64kbps speed selected. 64kbps gave good results on the built-in display. The mm156 also has the ability to use a plug in screen. 128kbps with the built-in display gives very good quality, but is more effective with a larger display.

The mm156 phone should be used over 64kbps, 128kbps or 256kbps streaming IP connection, depending on the chosen settings.

## 5.3. Setting up the Tandberg Tactical MXP

Tandberg Tactical MXP delivers significant benefits to organizations concerned with public health, security and safety. It supports variety of audio and video protocols including AES and DES encryption for secure calls. The protocols supported are listed in the following table:

Protocol/Standard	Notes
Support call initiation protocol	H.323/RTP & SIP (SIP require a SIP server)
Video protocols	H.264 and H.263
Audio protocols	Audio has precedence over video and always take certain amount of bandwidth (see below) from the data channel. G.711 – 56kbps G.728 – 16kbps G.722 – 56kbps G.722.1 – 24-32kbps AACLD – 64-128kbps



Encryption Standard Supported	<p>If you want to use encryption, you must set it up on both the mobile and fixed Tactical MXP units, otherwise the call cannot be established. Encryption adds an additional 20% overhead on the data channel.</p> <p>AES – 128bit DES – 64bit</p> <p>Ports: Call setup – TCP 1720, UDP 1719 Audio/Video – 2326 – 2373 and 5555-6000 (TCP/UDP)</p>
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## Setup

The Tandberg Tactical MXP relies on a network connection being present when a call is made. Inmarsat recommends that you set up your terminal to auto-connect on start up. Both the HNS 9201 and EXPLORER 500/700 can be configured to start up in an auto-connect mode.

Note the following:

- On the HNS 9201 – If you use an external router, you can use BGAN LaunchPad on a computer to initiate the connection, which can then be shared by the Tandberg Tactical MXP to make a call. Router ports NAT and PAT must be configured to allow inbound video calls from the fixed to mobile direction. See the documentation supplied with your router for details.
- On the EXPLORER 500/700 – it is possible to connect the Tandberg Tactical MXP and a computer to a hub or switch so that the devices share a single PDP context. You can use BGAN LaunchPad on a computer to initiate the connection, which can then be shared by the Tandberg MXP to make a call.

**NOTE:** For inbound calling or single device deployment, the **EXPLORER 500/700** should be set to **Modem mode** with a **static IP address**, and the **Tactical MXP** configured with a **DHCP IP address** for both inbound and outbound calling. **Once the EXPLORER terminal is connected to the BGAN network, the terminal will use DHCP to send the network static IP address to the Tactical MXP.**

**TIP:** If you use the **Tactical MXP** with the **HNS 9201**, and set the terminal to operate in **auto-mode**, make sure the **Tactical MXP** has a **static IP address** of **192.168.128.101**, with a **Gateway** of **192.168.128.100**. This is because the **HNS 9201** can only automatically activate the first IP context, and map that to **192.168.128.101**. **The Tactical MXP can be configured to obtain an address via DHCP from the terminal, or you can set a static IP address in the terminal's address range.**

Do the following to set up the Tandberg tactical MXP for use on a BGAN terminal:

1. Set up your BGAN terminal in automatic PDP activation mode, using BGAN LaunchPad. Make sure **Error Correction** is switched On for a streaming IP data connection. (Testing indicated that the Tandberg Tactical MXP performs better with Packet retransmission switched On.)
2. Power up your Tactical MXP unit, and select **Control Panel** using a remote control.
3. Select **Administrator Settings**, then select **Network**.
4. Under **Network**, select **LAN settings** and then **IP settings**.  
If you are using the HNS 9201 in auto-mode, then use the following IP address settings:
  - Static IP address – 192.168.128.101
  - Subnet – 255.255.255.0
  - Gateway – 192.168.128.100



5. Open the **H.323** menu. If you are not using the H.323 Gateway, then select **Direct**.
6. Under the H.323 **Advanced** settings, switch off the NAT.
7. Set H.323 ports to **Dynamic**.
8. Switch off **SIP**, unless you are using SIP gateway.
9. In the **Security** menu, make sure encryption is **Off** (or set to **Auto**). Make sure encryption is Off at both the fixed and mobile ends, otherwise call will not be established successfully
10. Under **Call Quality**, set up the Max stream rate as follows:
  - 256kbps streaming IP data (BGAN) – 210kbps
  - 128kbps streaming IP data class (BGAN) – 110kbps
  - 64kbps streaming IP data (BGAN) – 56kbps

**NOTE: Max Upstream Rate (kbps) defines the desired maximum transmitted call rate over H.323. This limits the outgoing (transmit) bandwidth, whilst retaining the maximum incoming (receive) bandwidth. To set this up, under default call setting, enter the following:**

  - **Network – H.323**
  - **Bandwidth – 192kbps if you are using the BGAN 256kbps streaming IP data rate.**
11. Under **General**, switch on **auto answer**.
12. Shut down your Tactical MXP unit, and connect the unit to the BGAN terminal using an Ethernet cable. Power up your BGAN terminal, then power up the Tactical MXP. You are now ready to make a live audio/video call over BGAN UT

**NOTE: If the Ethernet connection does not work, check your cable or reboot Tactical MXP.**

## Optimizations

- Ensure that the maximum data speed, and correct speed for the call is selected, as described in Setup above.

## Resources used over BGAN –Tactical MXP to Tactical MXP

Test	Results	Notes
256kbps Streaming IP	Video: 192kbps H2.64 Audio: 24kbps G722.1	Good quality audio/video achieved in both directions.

\* Tactical MXP Firmware used: F4.IPAL, SECURITY

## Recommendations

- Set Max upstream to correct data rates, as explained in Setup above.
- A dedicated “last mile” connection is important for the delivery of consistent video over the Tactical MXP. The Tactical MXP uses variable bit rate, and if traffic is routed over the Internet it may result in reduced throughput and degraded video quality.
- Switch on error correction (packet retransmission) using BGAN LaunchPad for a streaming IP data connection before opening the data connection.
- Switch off encryption.
- Open the required ports in the corporate firewall to allow end-to-end transmission.
- If the BGAN terminal is in automatic mode, you must switch off the terminal to disconnect the streaming IP data connection once you have finished video call.



## 5.4. Setting up the SCOTTY Mobile

The SCOTTY Mobile is a ruggedized, shock-resistant (military-tested), video communication unit with a high intensity fifteen inch industrial display. SCOTTY Mobile features a full ruggedized PC, with high speed video conferencing and data transfer capability. The unit's Windows operating system allows you to install BGAN LaunchPad onto SCOTTY Mobile, and use it as a single control unit, to manage BGAN streaming IP data connections as well as live broadcasts.

The unit supports various industry-standard audio/video protocols, including H.264. The protocols supported are listed in the following table:

Protocol/Standard	Notes
Video protocols	H.261, H.263, and H.264
Audio protocols	Audio has precedence over video and always takes a certain amount of bandwidth (see below) from the data channel. G.711 – 56kbps G.728 – 16kbps G.722 – 56kbps G.723.1 – 24-32kbps
Supported data protocols	Data T.120

### Setup

You can install BGAN LaunchPad direct onto the SCOTTY Mobile desktop, which can then perform the function of a PC. This enables you to use SCOTTY Mobile to activate and deactivate streaming IP data connections more efficiently, and to receive all the relevant error messages. You can connect the BGAN terminal to SCOTTY Mobile over Ethernet or USB.

Note the following:

- On the EXPLORER 500, make sure the terminal is operating in Modem mode, to allow a two-way H.323 call. In Modem mode, the terminal assigns the client an internal IP address first, but when you open an IP data connection, the terminal re-assigns an external IP address to the client. (The external IP address is supplied by your Distribution Partner.) The client then has a routable IP-address, which is directly accessible from the Internet.

**TIP:** Inbound calling uses a static IP address on BGAN. You must request this from your Distribution Partner/Service Provider at the time of SIM provisioning

Do the following to set up the Scotty Mobile for use on a BGAN terminal:

1. Install BGAN Launch Pad onto SCOTTY Mobile, and open a Streaming IP data connection.
2. Click on **Teleport LAN** icon to launch the SCOTTY Video conferencing application.
3. Enter the IP address of the destination unit in the **Number** text box.
4. Select the required data rate, as follows:
  - 192kbps, for 256kbps BGAN Streaming IP data connection.
  - 128kbps, for 128kbps BGAN Streaming IP data connection.
  - 64kbps, for 64kbps BGAN Streaming IP data connection.
5. Select **LAN**, and click on **Dial**.



## Resources used over BGAN

Test	Results	Notes
64kbps Streaming IP	55-56kbps	Video quality reasonably good for 64kbps connection.
128kbps Streaming IP	104-110kbps	Good quality video.
256kbps Streaming IP	188-190kbps	Good quality video.

### Recommendations:

Make sure error correction is switched off for the BGAN Streaming IP data connection

## 5.5. Setting up the Aethra Theseus



Aethra Theseus™ is a compactly designed videophone that offers ISDN 64K and IP-based video conferencing over BGAN. Theseus has been tested successfully over BGAN streaming IP as well as BGAN ISDN, and fully conforms to the H.320, H.323 and H.263 international standards (with transmission rates up to 384kbps over IP).

A TV screen connection is also provided for applications requiring larger presentation. For video input, a built-in camera with manual focus and automatic white balance uses a 1/4" CCD sensor to capture high quality 15 fps video. The unit also supports the AES encryption standard and has a data port to share PPT presentation slides during live video conference

The on-screen user interface is quite simple and easy-to-use, but does not allow you to change or modify audio video options.

## Resources used over BGAN

Test	Results	Notes
Standard IP/Video call	N/A	The solution works over standard IP, but throughput varies depending on the nature of standard IP service.
64kbps Streaming IP	N/A	Theseus is not suitable for a 64kbps video call, as it tries to push 64kbps data over the 64kbps streaming connection, and does not leave enough capacity for IP overheads.
128kbps Streaming IP	98-104kbps	If you select a 128kbps data rate for the call, Theseus automatically adjusts for the extra IP overhead.



256kbps Streaming IP	184-192kbps	Theseus delivers best quality video over a 256kbps streaming connection. You must select the 192kbps data rate from the Calling menu. Theseus uses H.263/CIF for video, and G.722-1 for audio.
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\* Test carried out using Theseus Software release: 5.02.0020

### Recommendations

- From **Menu > Settings > User Settings > Video Quality**, switch on Aethra Error Fluency, and set the slider to **Max**.
- Make sure that encryption is turned off.
- Theseus works well with the Polycom PVX soft solution, using H.323 and Motion Media mm156.
- Make sure error correction is switched off for the BGAN streaming IP connection.
- For ISDN, make sure you select the correct menu in **Call Settings**, and enter # after the ISDN number, for example 00442077281252#

## 6.0. Setting up a video conferencing connection

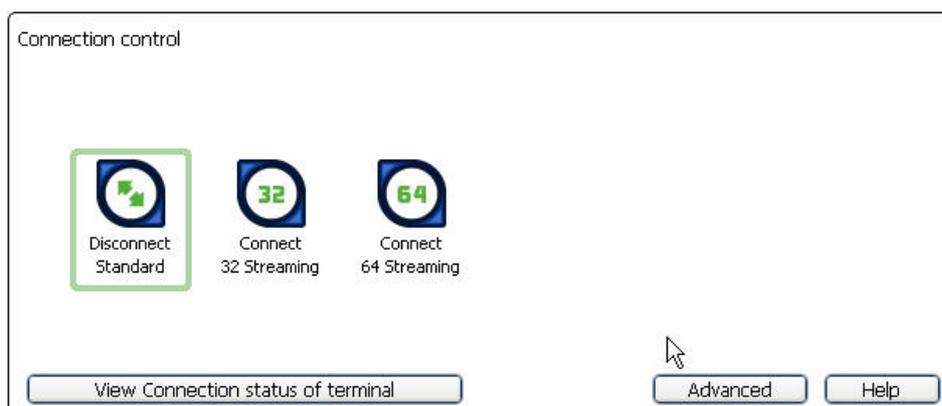
Inmarsat recommends that you configure a data connection in BGAN LaunchPad that is dedicated to your video conferencing application. You can then open a video conferencing connection when required by clicking on an icon in BGAN LaunchPad.

To do this:

1. Open BGAN LaunchPad, and click on the **Data** icon:

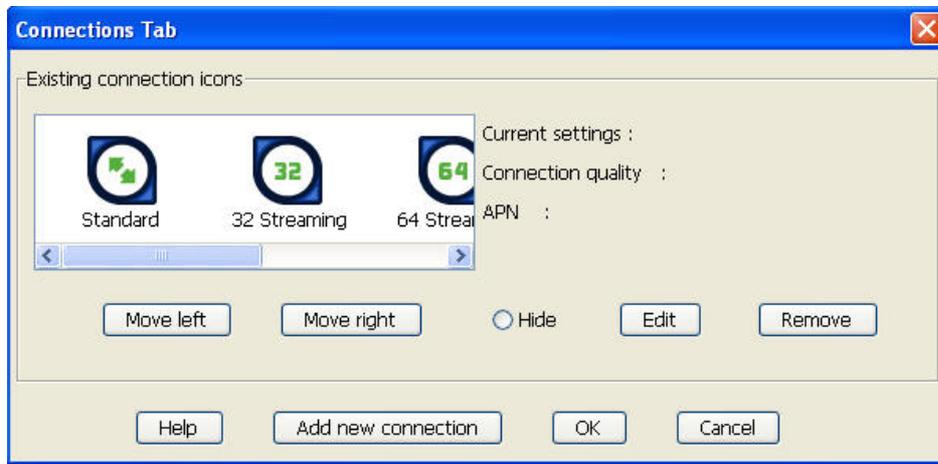


A screen similar to the following is displayed:



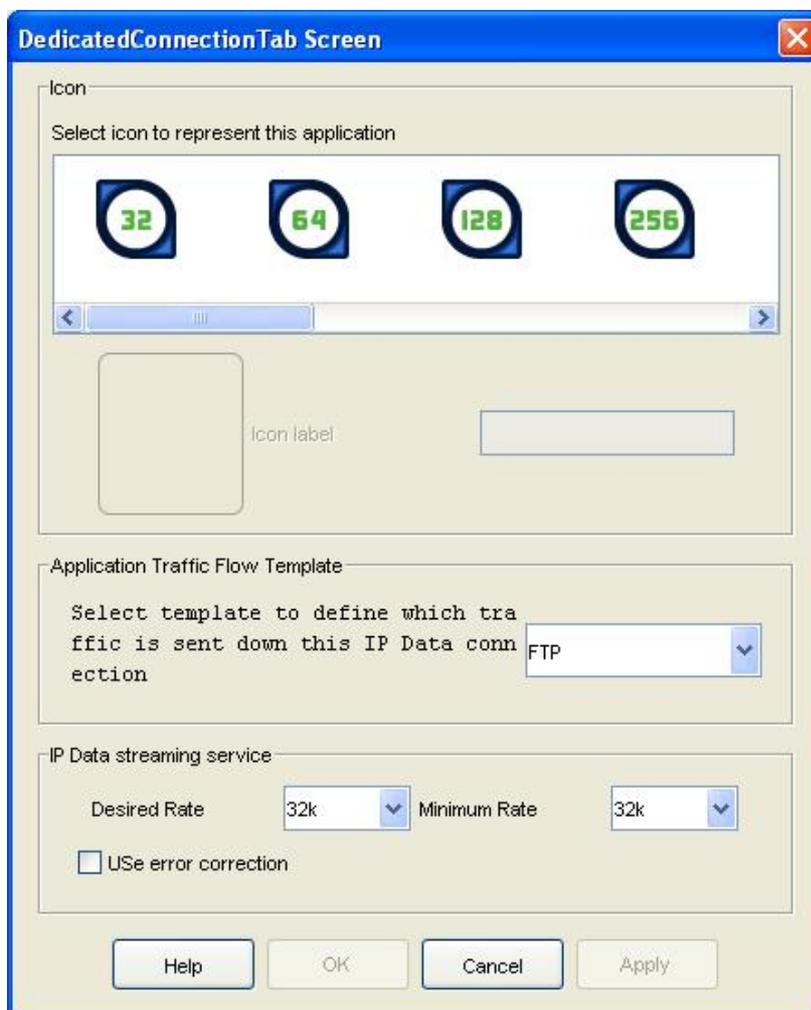


2. Click on **Advanced**. The following screen is displayed:



3. Click on **Add new connection**. The Connection Configuration screen is displayed.

- Select **Create new Dedicated IP Data connection**, and click on **OK**. The **Dedicated Connection Tab** screen is displayed, as shown below:



- From the **Icon** menu, select an icon to associate with your video conferencing application. In the **Icon label** text box, enter a name for this connection.
- Select the video conferencing application you want to associate with this icon and icon label from the **Application Traffic Flow Template** check box. The traffic flow template ensures that only traffic associated with the application can use this dedicated connection.  
**NOTE: Contact your Service Provider if you require a TFT for a video conferencing application.**
- Select the **Desired Rate** from the drop-down list. This is the QoS that you want to use for this connection.
- Select the **Minimum Rate** from the drop-down list. This is the minimum QoS that you will accept for this connection. Inmarsat recommends that you set the Minimum Rate to the same as the Desired Rate, to ensure that you are allocated the data rate that you require.
- If required, change the error correction setting. By default, error correction is switched off because UDP applications do not require re-transmission.
- Click on **OK** to save these settings.



The new icon is displayed in the Data connections screen in BGAN LaunchPad. This connection is associated exclusively with your video conferencing application. Your video conferencing application does not share the connection with any other traffic.

To open the video conferencing connection from BGAN LaunchPad, click on the icon that you created.

To close the data connection and the video conferencing application (and therefore your conferencing call), click on the video conferencing icon again.

**NOTE: If you close your video conferencing application only, the BGAN data connection remains open.**

**NOTE; You can also start a conference call by connecting to the BGAN network using one of the pre-configured data connections, and then opening the video conferencing application in the normal way. However, the video conferencing application has to share this connection with other terminal traffic.**

## 7.0. Support and feedback

**For help with the BGAN service, contact:**

Customer\_Care@inmarsat.com

**For feedback on this document, and suggestions for improvement, contact:**

Nadeem\_Khan@inmarsat.com

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