

Using FTP over BGAN

on Windows clients

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I.0. Introduction

I.1. About this guide

This document introduces Windows FTP clients that have been tested on the BGAN network, gives advice on how to optimize your FTP application for use over BGAN, and provides recommendations for the use of FTP.

It is intended for first time end-users, Distribution Partners, Service Providers and anyone who wants to use a BGAN terminal to connect to the BGAN network and use network services. A previous knowledge VPNs and VPN client software, and of the BGAN LaunchPad application is required. A previous knowledge of satellite communications is useful, but not essential.

This document assumes that the VPN client is connected to the BGAN terminal via the Ethernet interface.

The sections include:

- Introduction to FTP – explains what FTP does, and how it works.
- Using FTP clients on BGAN – gives the comparative results of test performed on the BGAN network using various FTP clients, and provides recommendations based on the test results.

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. 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 FTP application for details on changing configuration and settings.
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2.0. Introduction to FTP

File Transfer Protocol (FTP) is commonly used to transfer data between client and server, and between server and client. It is one of the most effective TCP protocols for moving data, as it has very low overheads.

There are many FTP clients (and servers) available, which are sometimes chosen for their user interfaces. However, in tests over the BGAN network, and other Inmarsat networks, it has been found that the performance of the standard DOS FTP client is better than other FTP clients.

This document analyses tests performed on some of the commonly used FTP clients on the BGAN network, and compares them to the DOS client.

2.1. About FTP

The FTP protocol uses two TCP connections to establish communications between the client and server.

- A **command** connection – used by the client to send commands to the server, and by the server to send responses.
- A **data** connection – created when a command is given to send or receive a file. As its name suggests, this connection is concerned with the actual data transmission.

There are no modifications that can be made to the FTP protocol that can improve performance. However, note that the FTP client and server do not ordinarily compress data before transmission, and that the use of a compression program can improve performance.

TIP: The most cost-effective way to send large attachments over a packet network that is billed by volume or time is to compress the file with a standard utility such as:

- **WINZIP™**, available from <http://www.winzip.com> or
- **Winrar**, available from <http://www.rarlab.com>.

Compressing files is only of benefit if the content is not already compressed, and the recipient has a utility to de-compress the attachments.

The FTP data connection can be established in either active or passive mode:

- **Active** mode – The client sets up a command connection from a random local port (>1024) to the command port on the server (port 21). The client informs the server that its data connection is available on the random local port +1. When a data connection is required, the server connects to the data port on the client. Note that because the client does not establish a connection with the data port of the server, the client's firewall often sees the server as an external system trying to establish a connection, and blocks it. Therefore, you must configure any firewall on the client to allow traffic from the server.
- **Passive** mode – the client sets up a command connection from a random local port (>1024) to the command port on the server (port 21). The client sends the PASV command. The server allocates a random port for the data connection, and informs the client. The client then initiates the data connection directly to this port on the server.



3.0. Using FTP clients over BGAN

3.1. FTP clients tested

The following Windows FTP clients have been tested on the BGAN network:

- CuteFTP from Globalscape (www.cuteftp.com)
- WS_FTP (www.ipswitch.com)
- SmartFTP (www.smartftp.com)
- Command line FTP client, Windows XP
16k buffers were used (ftp -w:16384)

3.2. Tests carried out

One 500KB file was sent and received three times to and from the test server over a standard IP connection in an operational environment (multiple terminals in a single spot beam). Different buffer sizes were used and the average taken. Inmarsat's BGAN test tool was used to measure Simple Network Management Protocol (SNMP) time, packet and byte count. For the purposes of clarity, logon, changing directory and logging off are not included in the figures.

The DOS FTP client was set to a 16KB buffer size as, from previous studies this has proved to be slightly more efficient than the standard buffer size of 4KB.

All the other FTP applications were used with default settings initially, then advanced settings were changed, where possible, as detailed below.

3.3. Test results

FTP PUT

The results for sending data were as follows:

Client	Time (seconds)	% Overhead
CuteFTP	81.7	8
WS_FTP	61.7	57
SmartFTP	104.7	14
DOS FTP	44.3	8

- On further analysis, it was seen that a combination of bad packet filing and timing issues caused the reduced performance. In addition, the DOS FTP application forces TCP time-stamping, which can aid the efficient flow of data over high latency networks.
 - CuteFTP has options to change the buffer size used. In tests with large buffers set (128KB), the PUT time was reduced to 51 seconds. This still falls short of the DOS FTP performance.
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FTP GET

The results for receiving data were as follows:

Client	Time (seconds)	% Overhead
CuteFTP	41.3	7
WS_FTP	55.3	38
SmartFTP	68.7	9
DOS FTP	30	8

- Again, CuteFTP, WS_FTP and SmartFTP do not match the performance of DOS FTP. In the GET direction, the both WS_FTP and CuteFTP come closest to matching DOS FTP.
- The CuteFTP buffers were again changed, and it was found that this reduced performance in the GET direction.

3.4. Conclusions

Different FTP clients gave very different results over the BGAN network. Note that most graphical FTP clients are designed for their ease of use, rather than for the optimal speed over high latency networks.

It is also worth noting the overheads for the different applications; WS_FTP showed overheads of 38% or 57%. Whilst this does not greatly impact throughput, it does affect the cost greatly – using this FTP client can add up to 50% to the cost.

The DOS client out-performed some of the most well known graphical FTP clients. Due to this, Inmarsat's solutions team undertook a search for a graphical FTP client that worked as well as the DOS client. In this process, the following clients were tested informally:

- FTP Explorer
- LeechFTP
- FileZilla
- FTPRush
- CoreFTP

Of these clients, CoreFTP performs best, and also has the ability to configure the send and receive buffers with minute precision.

CoreFTP set-up

The default buffers for CoreFTP are:

- Send – 512 Bytes
- Receive – 4096 Bytes

Changing the receive buffer does not greatly affect performance, although setting this to a higher value may show a small improvement when using large TCP window sizes.

The send buffer is very important, and determines the size of packets used by TCP in the transfers. For best general usage set the buffer to 32768.

**TIP:**

- **Set the receive buffer to 32768**
- **Buffers can be changes on a per site basis, so ensure that you change these options either before creating any site profiles, or edit those that you already have (the advanced button).**

3.5. Recommendations

When using FTP over BGAN, check that your chosen FTP client matches the performance of DOS FTP. If you are unsure, use the CoreFTP package, and modify the buffers.

