



Using email over SwiftBroadband

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1 Introduction

1.1 About this guide

This document describes the use of email applications over the Inmarsat network, and includes advice on how to improve network performance and optimise email clients.

It is intended for first time end-users, distribution partners, service providers and anyone who wants to use a SwiftBroadband terminal to connect to the Inmarsat Network and use network services. A previous knowledge of email client software is required.

A previous knowledge of satellite communications is useful, but not essential.

It must be remembered that each terminal manufacturer has their own specifications of terminal and in all cases; users must consult their avionics manufacturer for further info.

The sections include:

- Introduction to email – in particular, the common email protocols.
- SwiftBroadband testing and analysis – gives the results of extensive testing of email protocols carried out over the Inmarsat Network, and lists some of the factors than can affect network performance, including latency, jitter and packet size.
- Email scenarios – shows a typical remote office scenario.

1.2 Other sources of information

- This is one of a series of SwiftBroadband user guides. These are designed to help you make the most of the SwiftBroadband service. Other user guides are available for download from inmarsat.com/support. Click on SwiftBroadband, to see a list of *How to* guides.

This web site also gives further information on the SwiftBroadband service.

- Refer to the documentation supplied with your email client software for details on changing configuration and settings.

2 Introduction to email

The SwiftBroadband service enables remote offices or users to maintain email communications with company headquarters or business partners whilst in the air. You can use the SwiftBroadband service to connect to the internet, and use the email services provided by your Internet Service Provider (ISP), including text-based email and the transfer of data attachments, such as Word documents, Excel spreadsheets or PowerPoint presentations.

Email is usually accessed using one of the following four protocols, all supported on the Inmarsat Network:

- SMTP
- POP3
- IMAP4
- HTTP

There are also a number of proprietary protocols commonly in use, including:

- MSRPC (Microsoft Remote Procedure Call) for Microsoft Exchange Server.
- NotesRPC (Remote Procedure Call) for Lotus Notes.

These protocols use the following ports:

Protocol	Source port	Destination port
SMTP	Dynamic	25 (TCP)
POP3	Dynamic	110 (TCP)
IMAP4	Dynamic	143 (TCP)
HTTP	Dynamic	80
Microsoft Exchange (MSRPC)	Dynamic	Dynamic
Lotus Notes (Notes RPC)	Dynamic	1352

SMTP, POP3 and IMAP4 are used by all Internet email clients, for example Outlook Express, (but not Exchange Server), Mozilla Thunderbird and Eudora. See section 4.0 "Optimising email clients", for details on how to maximise the performance of these clients.

Each of these protocols is described below.

2.1 SMTP

SMTP (Simple Mail Transfer Protocol) is used to upload (send) emails from a client to the ISP's mail server for delivery. If you are using Enhanced SMTP (ESMTP), it also defines the basic mechanism for transferring mail between one server and another.

SMTP operates as follows:

- a. The client sends information to the server.
- b. The server responds with an acceptance or rejection message.

If the server is using Enhanced SMTP (ESMTP) the sending server (or client) can authenticate with the receiving server, as described below:

- a. The sending server sends the originator address and recipient addresses to the receiving server.
- b. If the receiving server agrees to transfer the message from the originator to the named recipient(s), the sending server is asked to send the message data.

The message data consists of the message header and message body. The message body can be either plain text, or can be more complex and contain, for example, HTML attachments. More complex messages are encoded into a MIME (Multipurpose Internet Mail Extensions) stream.

NOTE: MIME encoding can increase the size of a message by up to 50%

TIP: Some ISPs do not support SMTP from other networks. A symptom of this is the ability to receive email but not send email. A "server not found" or "timeout" error may be reported. One possible solution to this is to subscribe to a dedicated email service from your Distribution Partner (DP). You can also use the default SMTP server provided by Inmarsat which is:

SMTP.BGAN.inmarsat.com

2.2 POP3

POP3 (Post Office Protocol v3) is the most common email download method used by ISPs. It defines how an email client interacts with a server in order to download messages, determines how many messages are waiting and defines a method to retrieve the messages.

POP3 is a simple protocol and usually downloads all messages in your Inbox as text streams. Normally, it does not allow you to specify which messages to download. However, some clients enable you to configure your email application so that only the first few kilobytes of each message are downloaded. In this way, you can choose to download complete messages only when required.

Most ISPs encourage the use of POP3 clients because customer mailboxes are cleared on each connection and so do not take up resources at the ISP.

2.3 IMAP4

IMAP4 (Interim Mail Access Protocol v4) offers greater functionality than POP3 and is available on some ISP servers. Instead of simply downloading all email, IMAP4 gives you the option of using the client to manage the emails held on a server. For example, you can maintain a structure of folders on the server and you can also move headers between folders without downloading the messages.

In addition, you can view message headers and select which messages you want to download immediately, select which can be deleted, and select which can be saved until you are back in the office.

In addition, if the mailbox is susceptible to junk mail and Spam mail, these messages can be deleted without downloading.

A typical IMAP session involves the following steps on the client:

- a. Authenticate with the server.
- b. Check the capabilities of the server.
- c. Check the number of messages in the Inbox.
- d. Request a list of headers for all messages in the Inbox. This list populates the client's Inbox view.
- e. When you request a message, the client sends a request to the server to download that message only.

NOTE: IMAP4 can be configured to download all messages, if required.

2.4 HTTP (WebMail)

HTTP (Hypertext Transport Protocol) is commonly available as an alternative to POP3 services. It allows you to access your mailbox through a web browser, not an email client. In addition, you can view your Inbox before downloading messages, and so you can choose the messages you want to download.

2.5 Microsoft Exchange

Microsoft Outlook clients can use the Microsoft-Remote Procedure Call (MS-RPC) to communicate with the Microsoft Exchange Server. If you use standard Exchange mode, MS-RPC must be used. In all other cases, Outlook clients can use the SMTP, POP3 and IMAP4 protocols.

NOTE: The use of the term RPC does not imply a similarity with any other RPC protocol. MS-RPC is a proprietary protocol, and has no public specification.

Note the following when using MS-RPC:

- MS-RPC is best used over a LAN, as the connection between the client and server requires a significant amount of bandwidth. It is not well suited to SwiftBroadband.
- MS-RPC has a number of security flaws, and is best used over a VPN, where possible.
- Server, client and firewall must be correctly configured, as the clients and servers allocate dynamic ports for connections.
- Microsoft Outlook should be used in remote mode, using an OST file (early versions) or cached mode (later versions).

TIP: To use Microsoft Outlook over SwiftBroadband:

- Use a VPN connection, wherever possible.
- Ensure that your client is set to cached mode.
- Consider using SMTP/IMAP when away from the office.

By default, Microsoft Outlook clients are optimised for use over a high speed, low latency network. You may need to change the configuration of your client, depending on the connection type used.

2.6 Lotus Notes

Lotus Notes clients use the NotesRPC (Remote Procedure Call) to communicate with the Notes server.

NOTE: The use of the term RPC does not imply a similarity with any other RPC protocol. NotesRPC is a proprietary protocol, and has no public specification.

Note the following when using NotesRPC:

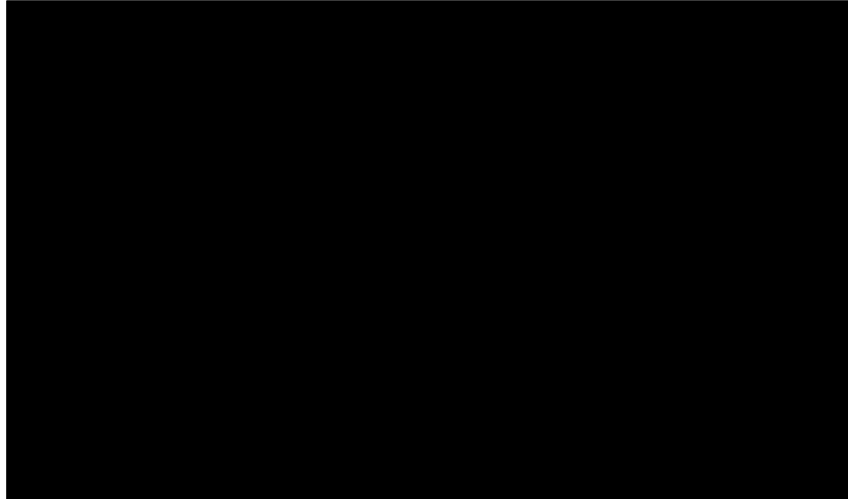
- NotesRPC is best used over a LAN, as the connection between the client and server requires a significant amount of bandwidth. It is not well suited to SwiftBroadband.
- Notes can be used in Island mode, only replicating data from the server when required.

TIP: To use Lotus Notes over SwiftBroadband:

- Use a VPN connection, wherever possible.
- Ensure that your client is set to island mode.
- Consider using SMTP/IMAP when away from the office.

3 SwiftBroadband testing and analysis

The SMTP, POP and IMAP protocols have been extensively tested over the Inmarsat Network. The following graph shows the POP and IMAP protocols, compared with FTP GET:



The above graph indicates that POP and IMAP compare favourably with the FTP GET protocol. However, the overheads are greater and result in more data being sent:

- POP and IMAP overheads vary between 37% and 60%, depending on the message size.
- FTP GET overheads vary between 2% and 10%, depending on the message size.

3.1 Factors affecting performance

By default, email applications are configured to operate over low latency and very high bandwidth networks. Some network characteristics impact the performance of the protocols in such a way that optimisation usually becomes necessary.

You can achieve a more cost-effective email service by ensuring that your email client and server settings have been optimised for satellite networks. Most ISPs do not specifically tailor their services to wireless users. Your distribution partners offers a wide range of value-added services that help you maintain customised and optimised services for email and other applications.

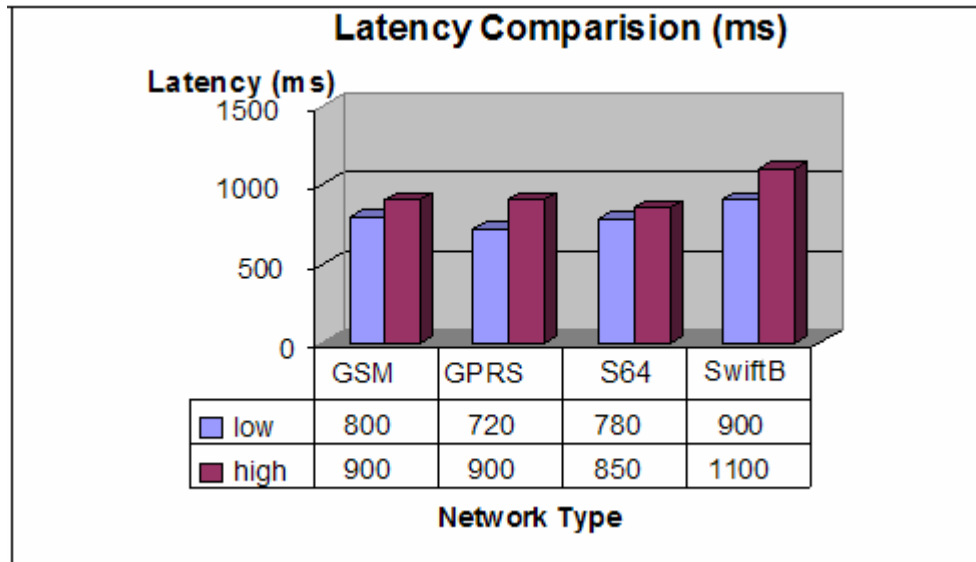
Some of the characteristics that impact email protocols include:

- Latency
- Jitter
- Overheads
- Dynamic Packet Size

Each of these is described briefly in the following sections.

Latency

Latency is the delay experienced in network communications. Latency impacts the performance of acknowledgements and therefore of packet sizes. The Inmarsat Network typically provides a Latency of between 900 – 1100 msec. This compares favourably with other networks (in the diagrams below: Swift = SwiftBroadband):

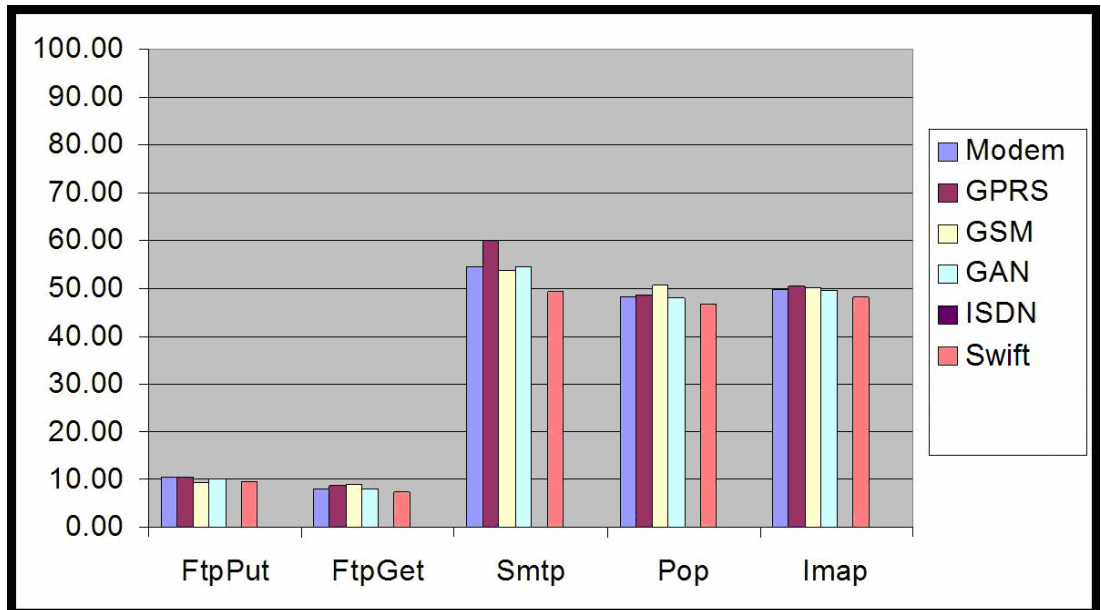


Jitter

Jitter is the range by which the latency of a network varies. The greater the variation the higher the jitter and therefore the higher the impact on the protocols used. A Standard IP data connection tends to have higher jitter than a Streaming IP data connection.

Overheads

When a protocol sends email, there is overhead associated with the email, for example in the use of headers and packet acknowledgements. The percentage size of the overhead varies depending on the protocol and on the network. The following graph shows that the Inmarsat Network compares favourably with other networks, and that the impact on cost and volume of transmissions is minimised.



An example of overheads, based on figures shown in the graph above, is given below.

- If you send a 1MB file over FTP, the overheads for FTP are approximately 10% across all network types, therefore you would be charged for 1.1MB of data.
- If you send a 1MB file over SMTP, the overheads for SMTP are approximately 55% across all network types, therefore you would be charged for 1.55MB of data.

Note that if you send data over a VPN (or another secure network) the overhead is approximately 18% - 40%. This is in addition to the percentage overhead shown in the above graph for the protocol used.

It is therefore very important to select the most efficient method of transmitting data, based on the nature of the traffic you are sending.

Dynamic Packet size

Dynamic packet size determines the volume of data that can be sent per packet in comparison to the error correction information. Dynamic packet size varies depending on the protocol, but plays a significant role in data transfer. It enables throughput to vary depending upon the quality of the service or channel.