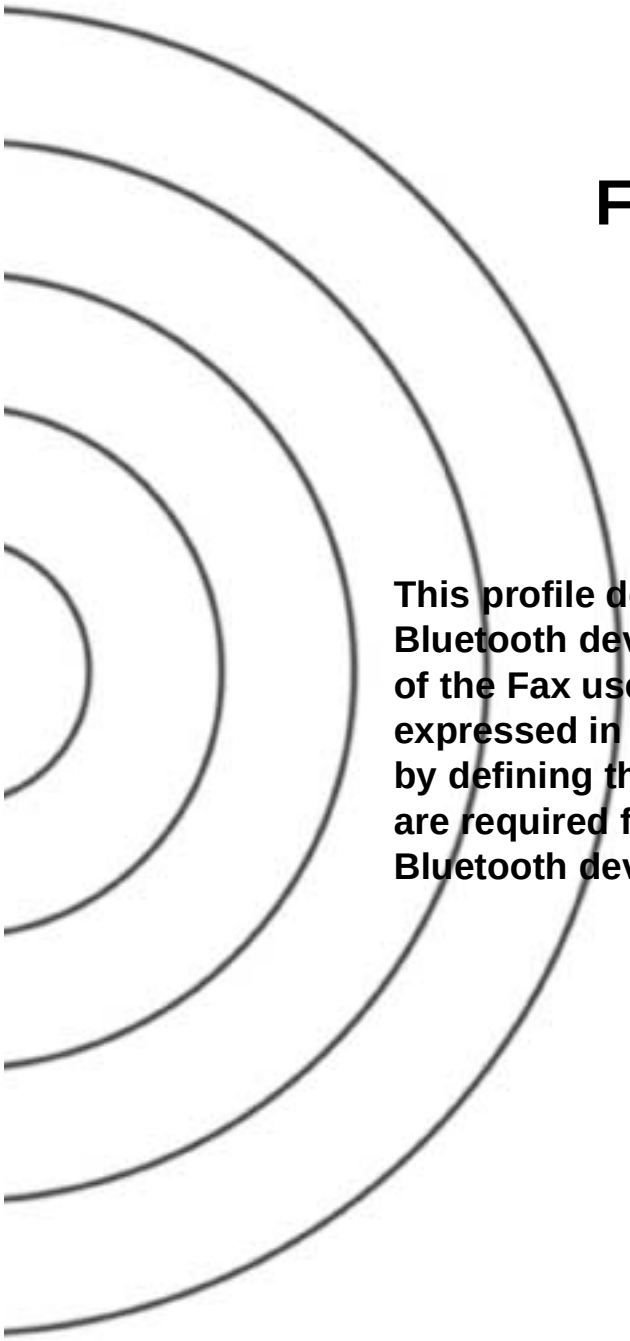
Part K:8



FAX PROFILE

This profile defines the requirements for Bluetooth devices necessary for the support of the Fax use case. The requirements are expressed in terms of end-user services, and by defining the features and procedures that are required for interoperability between Bluetooth devices in the Fax use case.

CONTENTS

1 INTRODUCTION

1.1 SCOPE

The Fax profile defines the protocols and procedures that shall be used by devices implementing the fax part of the usage model called‘Data Access Points, Wide Area Networks’ (see Bluetooth SIG MRD).

A Bluetooth cellular phone or modem may be by a computer as a wireless fax modem to send or receive a fax message.

1.2 PROFILE DEPENDENCIES

In Figure 1.1, the Bluetooth profile structure and the dependencies of the profiles are depicted. A profile is dependent upon another profile if it re-uses parts of that profile, by implicitly or explicitly referencing it. Dependency is illustrated in the figure: a profile has dependencies on the profile(s) in which it is contained – directly and indirectly.

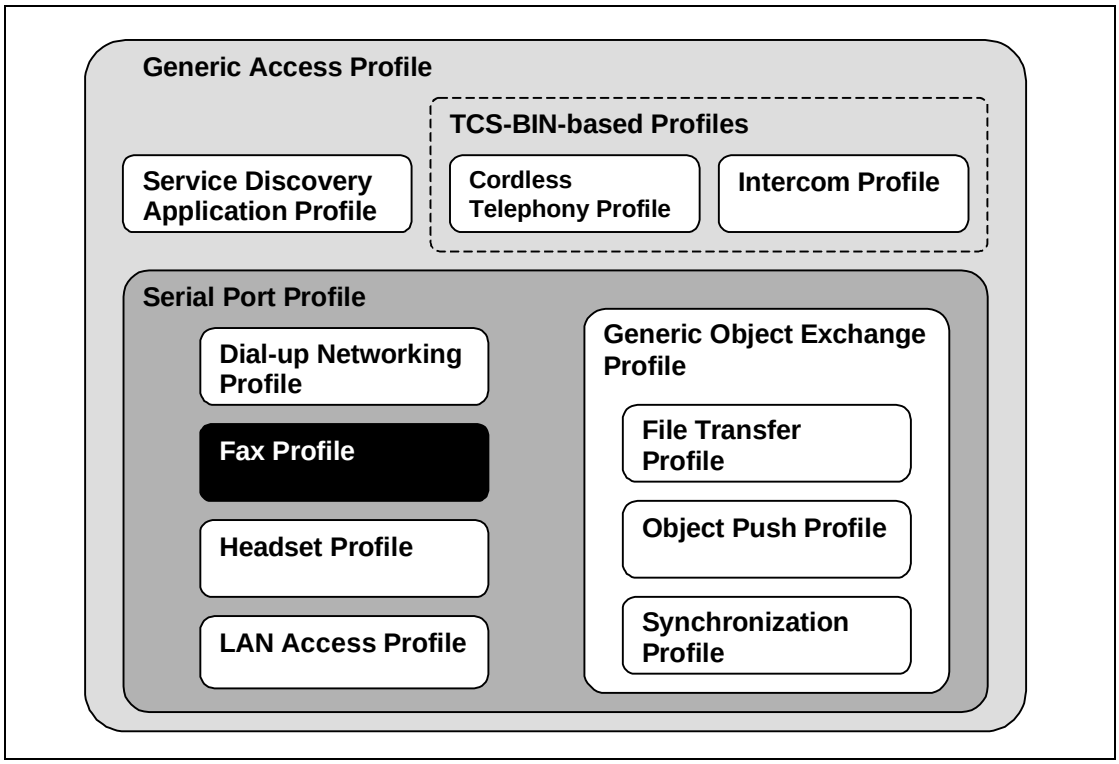


Figure 1.1: Bluetooth Profiles

As indicated in the figure, the Fax profile is dependent upon both the Serial Port Profile and the Generic access profile – details are provided in Section 5 Serial Port Profile on page 265 and Section 6 Generic Access Profile Interoperability Requirements on page 268.

1.3 SYMBOLS AND CONVENTIONS

1.3.1 Requirement status symbols

In this document, the following symbols are used:

- ‘M’ for mandatory to support
- ‘O’ for optional to support
- ‘X’ for excluded (used for capabilities that may be supported by the unit but which shall never be used in the use case)
- ‘C’ for conditional to support
- ‘N/A’ for not applicable (in the given context it is impossible to use this capability)

Some excluded capabilities are capabilities that, according to the relevant Bluetooth specification, are mandatory. These are features that may degrade operation of devices in this use case. Therefore, these features shall never be activated while a unit is operating as a unit within this use case.

Within the scope of this Fax profile, the expression ‘Fax class” is used as a shortcut to ‘facsimile service class” as defined by [2], [3], [4] and [4]. This is not to be confused with Bluetooth service class.

1.3.2 Signalling diagram conventions

The following arrows are used in diagrams describing procedures:

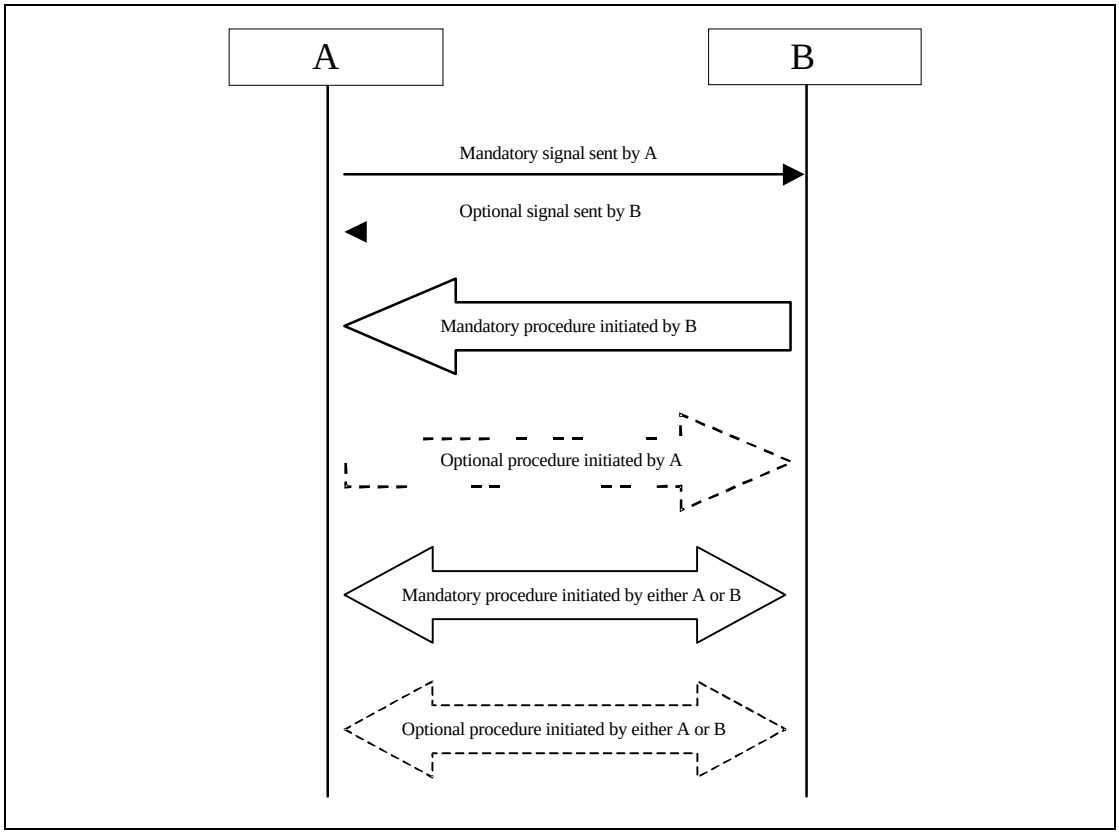


Figure 1-2 Arrows used in signalling diagrams

2 PROFILE OVERVIEW

2.1 PROFILE STACK

The figure below shows the protocols and entities used in this profile.

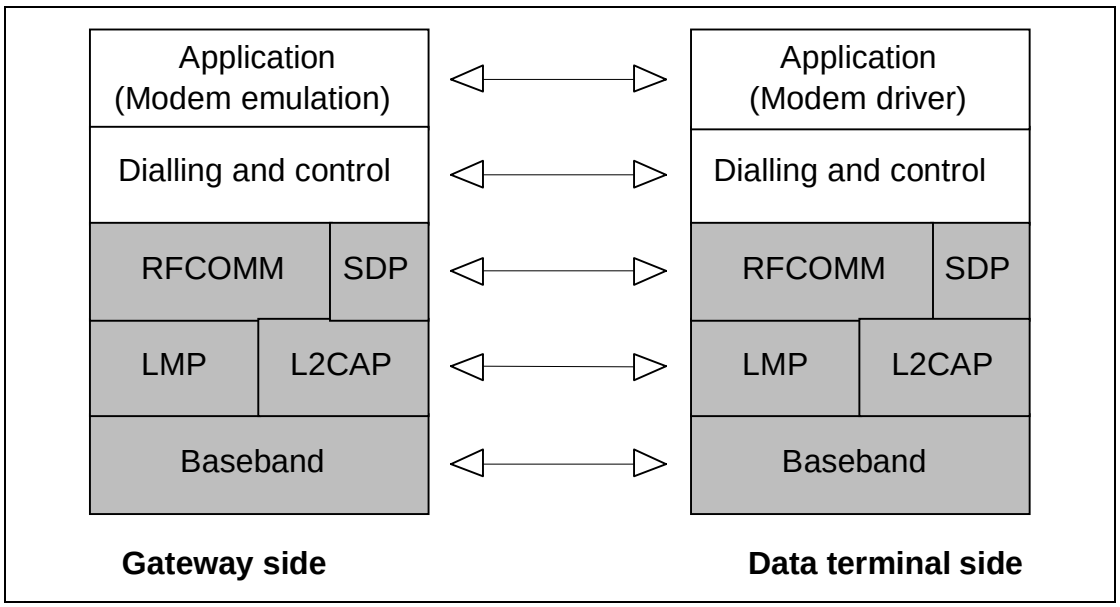


Figure 2.1: Protocol model

The Baseband, LMP and L2CAP are the OSI layer 1 and 2 Bluetooth protocols. RFCOMM is the Bluetooth adaptation of GSM TS 07.10 [1], used for providing serial port emulation. SDP is the Bluetooth Service Discovery Protocol. Dialling and control (see Section 4) defines the commands and procedures used for automatic dialling and control over the asynchronous serial link provided by the lower layers.

The modem emulation layer shown in Figure 2.1 is the entity emulating the modem, and the modem driver is the driver software in the data terminal.

For the shaded protocols/entities in Figure 2.1, The Serial Port Profile is used as base standard. For these protocols, all requirements stated in Serial Port Profile apply, except in those cases where this profile explicitly states deviations.

Note: Although not shown in the model above, it is assumed by this profile that the application layer has access to some lower layer procedures (for example SCO link establishment).

2.2 CONFIGURATIONS AND ROLES

The figures below show two typical configurations of devices for this profile:

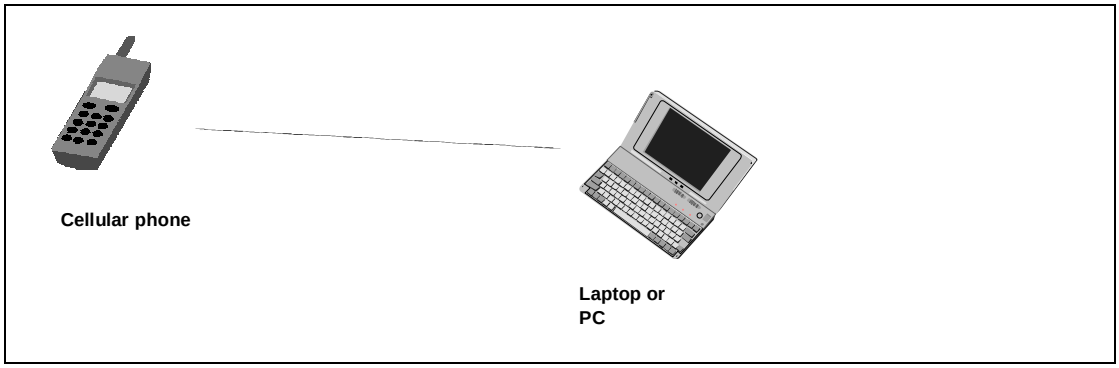


Figure 2.2: Fax profile, example with cellular phone

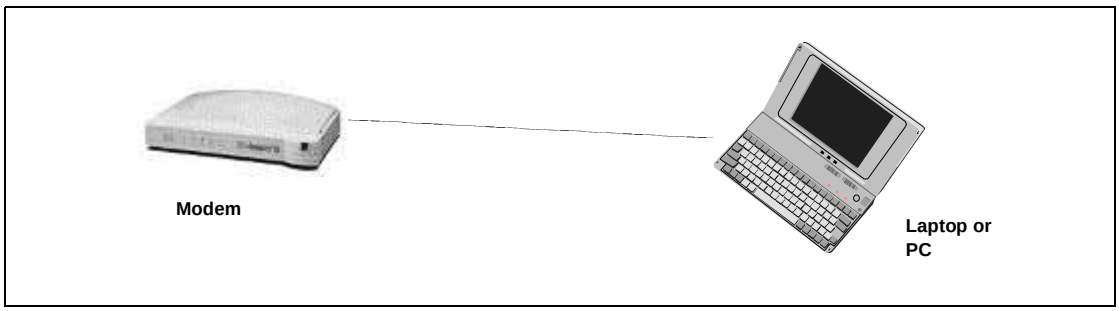


Figure 2.3: Fax profile, example with modem

The following roles are defined for this profile:

Gateway (GW) – This is the device that provides facsimile services. Typical devices acting as gateway are cellular phones and modems.

Data Terminal (DT) – This is the device that uses the facsimile services of the gateway. Typical devices acting as data terminals are laptops and desktop PCs.

In the rest of this document, these terms are only used to designate these roles.

For purposes of mapping the Fax profile to the conventional modem system architecture, the GW is considered Data Circuit Endpoint (DCE), and the DT is considered Data Terminal Endpoint (DTE).

2.3 USER REQUIREMENTS AND SCENARIOS

The Fax profile defines the usage of a GW by a DT as a wireless modem to send or receive fax messages

The following restrictions apply to this profile:

a) The GW (cellphone or modem) is not required to be able to report and/or discriminate between different call types for incoming calls.

b) This profile requires support for one-slot packets only. This means that this profile ensures that data rates up to 128 kbps can be used. Support for higher rates are optional.

c) Only one call at a time is supported.

d) The profile only supports point-to-point configurations.

e) Since in this profile there is no way defined to discriminate between 2 SCO channels originating from the same device, it is manufacturer specific as to deal with the situation where there are multiple applications requiring the use of multiple SCO channels originating from the same device.

f) This profile does not support multiple instances of its implementation in the same device.

2.4 PROFILE FUNDAMENTALS

Here is a brief summary of the interactions that take place when a DT wants to use the facsimile services of a GW.

1. If the DT does not have the Bluetooth Address of the GW, the DT has to obtain the address; e.g. using the Device discovery procedure, see Section 6.4 of Generic Access profile.
2. The Fax profile mandates the use of a secure connection through the authentication procedure (see Section 5.1 of Generic Access profile), and encryption of all user data through the baseband / LMP encryption mechanisms (see Section 8 of the Generic Access profile).
3. Link establishment is always initiated by the DT.
4. There are no fixed master / slave roles.
5. The fax call is established.
6. The GW and DT provide serial port emulation. For the serial port emulation, the serial port profile (see Serial Port Profile) is used. The serial port emulation is used to transport the user data, modem control signals and AT commands between the GW and the DT. AT-commands are parsed by the GW and responses are sent to the DT.
7. An optional SCO link may be used to transport fax audio feedback.
8. After the fax call has been cleared, the channel and link will be released as well.

2.5 CONFORMANCE

When conformance to this profile is claimed, all capabilities indicated mandatory for this profile shall be supported in the specified manner (process mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities, for which support is indicated, are subject to verification as part of the Bluetooth certification program.

3 APPLICATION LAYER

This section describes the service requirements on units active in the Fax profile.

3.1 SERVICE OVERVIEW

Table 3.1 shows the required services:

	Services	Support in DT	Support in GW
1.	Data call without audio feedback	N/A	N/A
2.	Data call with audio feedback	N/A	N/A
3.	Fax services without audio feedback	M	M
4.	Fax services with audio feedback	O	O
5.	Voice call	N/A	N/A

Table 3.1: Application layer procedures

3.2 DATA CALLS

The support of data calls is not covered by this profile.
Refer to Dial-up Networking Profile.

3.3 FAX SERVICE

At least one of the following fax classes of service is mandatory for both the GW and the paired DT (see Section 4.1.2):

Fax Class 1 TIA-578-A[2] and ITU T.31 [4]

Fax Class 2.0 TIA-592 [3]and ITU T.32 [5]

Fax Service Class 2 – No industry standard exists (manufacturer specific).

Optionally, audio feedback may be provided (see Section 4.2).

The GW shall emulate a modem connected via a serial port. The Serial Port Profile is used for RS-232 emulation, and RFCOMM running on top of the serial port profile provides the modem emulation.

3.4 VOICE CALLS

The support of voice calls is not covered by this profile. Refer to Cordless Telephony Profile.

4 DIALLING AND CONTROL INTEROPERABILITY REQUIREMENTS

4.1 AT COMMAND SET USED

To guarantee that basic functionality can always be provided, it is required that a GW device supports the commands and responses as defined in the supported fax class of service(s):

Fax Class 1 TIA-578-A [2] and ITU T.31 [4]

Fax Class 2.0 TIA-592 [3]] and ITU T.32 [5]

Fax Service Class 2 – No industry standard exists (manufacturer specific).

4.1.1 Command syntax, Protocols and Result Codes

Refer to each specific implemented fax service class document for a description of the required commands, protocols and result codes.

4.1.2 Fax Service Class selection procedure

This profile does not require a specific service class of fax. This profile supports 2 standards-based fax ‘classes’ – fax class 1 [2], [4] and fax class 2.0 [3], [5] – and a third manufacturer-specific pseudo-standard, fax class 2 (no industry reference standard exists).

The DT shall check the GW SDP or perform an ‘AT+FCLASS” command to discover the fax class of service(s) supported by the GW.

Bluetooth devices implementing this profile must support a minimum of one fax service class, but may support any or all fax services classes.

4.2 CALL PROGRESS AUDIO FEEDBACK

The GW or DT may optionally be able to provide audio feedback during call establishment. This clause applies only to gateways/data terminals that are able to provide audio feedback.

SCO links are used to transport the digitized audio over the Bluetooth link. The GW shall take all initiatives for SCO link establishment. The setting of the M parameter (see [6], Section 6.3.14) controls whether the GW provides audio feedback.

If a GW provides audio feedback for a call, the GW shall use the ‘initiate SCO link’ procedure (see Link Manager protocol) to establish the audio link when the DCE goes off-hook.

Depending on the setting of the M parameter, the GW releases the audio link when the DCE has detected a carrier or when the DCE goes on-hook. The ‘remove SCO link’ procedure (see [Link Manager protocol]) shall be used for audio link release.

If SCO link establishment fails, the call establishment shall proceed without the audio feedback.

This profile assumes that the DT is not active in any other profile that uses SCO links while it is operating in the Fax profile. Therefore, behavior is not defined for a situation where multiple SCO links are established simultaneously.

5 SERIAL PORT PROFILE

This profile requires compliance to the Serial Port Profile. For the purposes of reading the Serial Port Profile, the GW shall always be considered to be Device B and the DT shall always be considered to be Device A.

The following text together with the associated sub-clauses define the requirements with regards to this profile in addition to the requirements defined in the Serial Port Profile.

5.1 RFCOMM INTEROPERABILITY REQUIREMENTS

For RFCOMM, no additions to the requirements stated in Serial Port Profile apply.

5.2 L2CAP INTEROPERABILITY REQUIREMENTS

For the L2CAP layer, no additions to the requirements stated in Serial Port Profile apply.

5.3 SDP INTEROPERABILITY REQUIREMENTS

Table 5.1 lists all entries in the SDP database of the GW defined by this profile. The ‘Status’ column indicates whether the presence of this field is mandatory or optional.

The codes assigned to the mnemonics used in the ‘Value’ column and the codes assigned to the attribute identifiers can be found in Bluetooth Assigned Numbers.

Item	Definition:	Type:	Value:	Status	Default
Service Class ID List				M	
Service Class #0		UUID	Fax	M	
Service Class #1		UUID	Generic Telephony	O	
Protocol Descriptor List				M	
Protocol #0		UUID	L2CAP	M	
Protocol #1		UUID	RFCOMM	M	
Parameter for Protocol #1	Server Channel	UInt8	N = server channel #	M	
Service Name	Displayable Text name	String	Service-provider defined	O	'Fax'
Audio Feedback Support		Boolean	True/False	O	False
Fax Class 1 Support		Boolean	True/False	O	False
Fax Class 2.0 Support		Boolean	True/False	O	False
Fax Class 2 Support		Boolean	True/False	O	False
BluetoothProfile Descrip-torList				M	
Profile #0		UUID	Fax	M	
Parameter for Profile #0	Version	UInt16	0x0100*	O	0x100

Table 5.1: Service Database Entries

*. Indicating version 1.0

5.4 LINK MANAGER (LM) INTEROPERABILITY REQUIREMENTS

In addition to the requirements for the Link Manager as stated in the "Serial Port Profile" on page 171, this profile requires support for SCO links, in both the GW and DT. The support is conditional upon the ability to provide audio feedback."

5.5 LINK CONTROL (LC) INTEROPERABILITY REQUIREMENTS

In the table below, all LC capabilities required by this profile are listed.

	Capabilities	Support in GW	Support in DT
5.	Packet types		
N	HV3 packet	C1	C2
7.	Voice codec		
C	CVSD	C1	C2
C1: The support for this capability is mandatory for gateways that are able to provide audio feedback to the DT. C2: The support for this capability is mandatory for data terminals that are able to provide audio feedback to the user.			

Table 5.2: Baseband/LC capabilities

5.5.1 Class of Device usage

A device which is active in the GW role of the Fax profile shall, in the Class of Device field:

1. Set the ‘Telephony’ bit in the Service Class field (see Bluetooth Assigned Numbers)
2. Indicate ‘Phone’ as Major Device class (see Bluetooth Assigned Numbers)

This may be used by an inquiring device to filter the inquiry responses.

6 GENERIC ACCESS PROFILE INTEROPERABILITY REQUIREMENTS

This profile requires compliance to the Generic Access Profile.

This section defines the support requirements with regards to procedures and capabilities defined in Generic Access Profile.

6.1 MODES

The table shows the support status for Modes within this profile.

	Procedure	**Support in DT**	**Support in GW**
1	Discoverability modes		
	Non-discoverable mode	N/A	O
	Limited discoverable mode	N/A	O
	General discoverable mode	N/A	O
2	Connectability modes		
	Non-connectable mode	N/A	X
	Connectable mode	N/A	M
3	Pairing modes		
	Non-pairable mode	M	O
	Pairable mode	O	M
C1: If limited discoverable mode is supported, non-discoverable mode is mandatory, otherwise optional.			
C2: A Bluetooth device shall support at least one discoverable mode (limited or/and general).			
C3: If the bonding procedure is supported, support for pairable mode is mandatory, otherwise optional.			

Table 6.1: Modes

6.2 SECURITY ASPECTS

The table shows the support status for Security aspects within this profile.

	Procedure	Support in DT	Support in GW
1	Authentication	M	M
2	Security modes		
	Security mode 1	N/A	X
	Security mode 2	C1	C1
	Security mode 3	C1	C1
C1: Support for at least one of the security modes 2 and 3 is mandatory			

Table 6.2: Security aspects

6.3 IDLE MODE PROCEDURES

The table shows the support status for Idle mode procedures within this profile.

	Procedure	Support in DT	Support in GW
1	General inquiry	M	N/A
2	Limited inquiry	O	N/A
3	Name discovery	O	N/A
4	Device discovery	O	N/A
5	Bonding	M (Note 1)	M (Note 1)
Note 1: See section 6.3.1			

Table 6.3: Idle mode procedures

6.3.1 Bonding

It is mandatory for the DT to support initiation of bonding, and for the GW to accept bonding.

7 REFERENCES

[1] TS 101 369 (GSM 07.10) version 6.1.0

[2] TIA-578-A Facsimile Digital Interface. Asynchronous Facsimile DCE Control Standard, Service Class 1

[3] TIA-592 Facsimile Digital Interface. Asynchronous Facsimile DCE Control Standard, Service Class 2

[4] ITU T.31 Asynchronous Facsimile DCE Control – Service Class 1

[5] ITU T.32 Asynchronous Facsimile DCE Control – Service Class 2

[6] International Telecommunication Union, “ITU-T Recommendation V.250”

8 LIST OF FIGURES

9 LIST OF TABLES