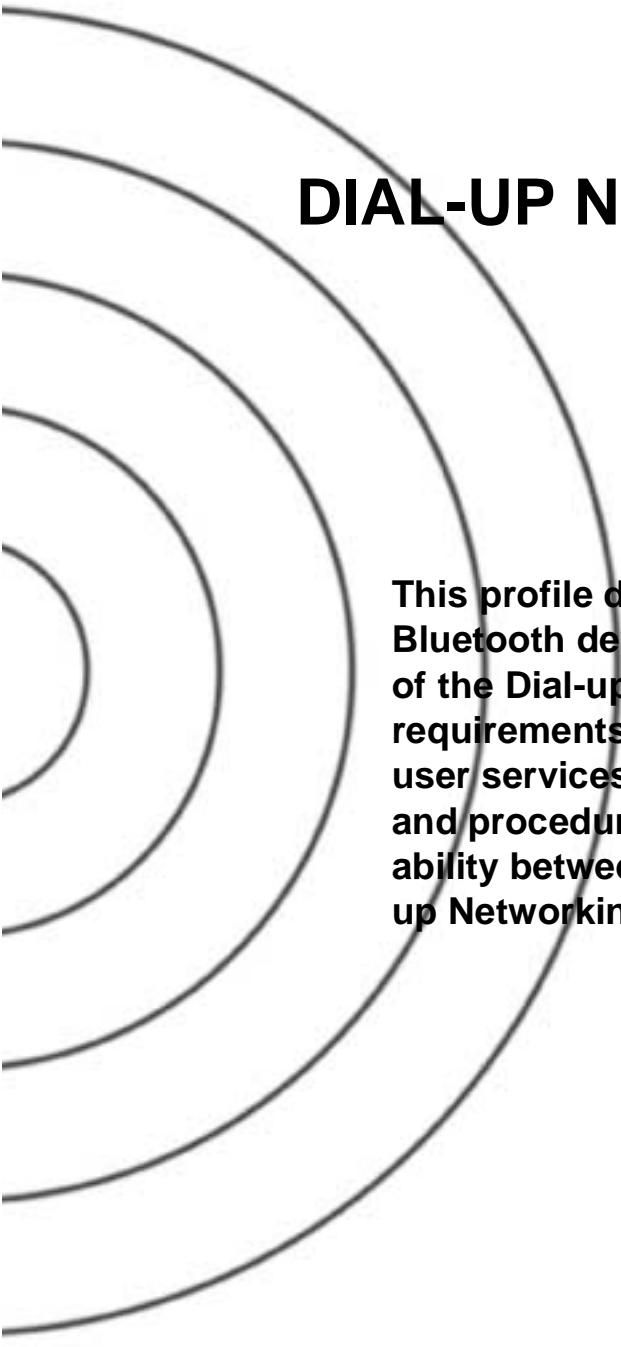# DIAL-UP NETWORKING PROFILE

This profile defines the requirements for Bluetooth devices necessary for the support of the Dial-up Networking 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 Dial-up Networking use case.

CONTENTS

1 INTRODUCTION

1.1 SCOPE

The Dial-up Networking Profile defines the protocols and procedures that shall be used by devices implementing the usage model called 'Internet Bridge' (see Bluetooth SIG MRD). The most common examples of such devices are modems and cellular phones.

The scenarios covered by this profile are the following:

- Usage of a cellular phone or modem by a computer as a wireless modem for connecting to a dial-up internet access server, or using other dial-up services

- Usage of a cellular phone or modem by a computer to receive data calls

1.2 BLUETOOTH PROFILE STRUCTURE

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.
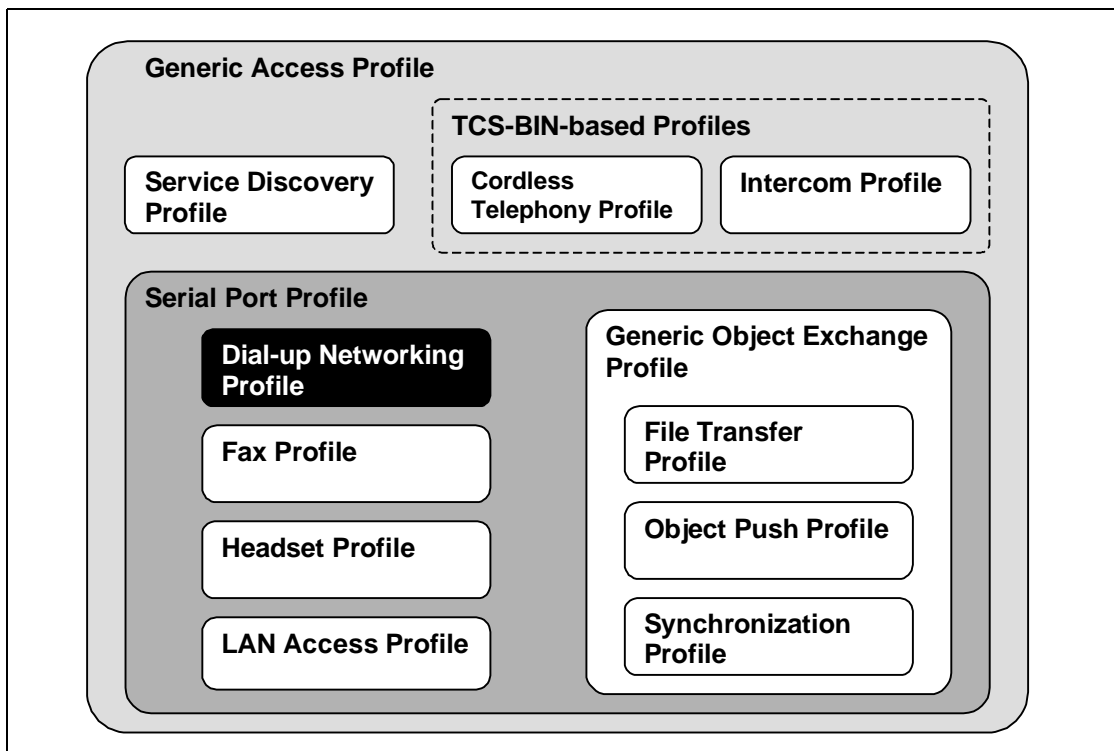
Figure 1.1: Bluetooth Profiles

1.3   SYMBOLS AND CONVENTIONS

1.3.1 Requirement status symbols

In this document, the following symbols are used:

'M' for mandatory to support (used for capabilities that shall be used in the profile);

'O' for optional to support (used for capabilities that can be used in the profile);

'C' for conditional support (used for capabilities that will be used in case a certain other capability is supported);

'X' for excluded (used for capabilities that may be supported by the unit but which shall never be used in the profile);

'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 following this profile. Therefore, these features shall never be activated while a unit is operating as a unit within this profile.

1.3.2 Signalling diagram conventions

The following arrows are used in diagrams describing procedures:
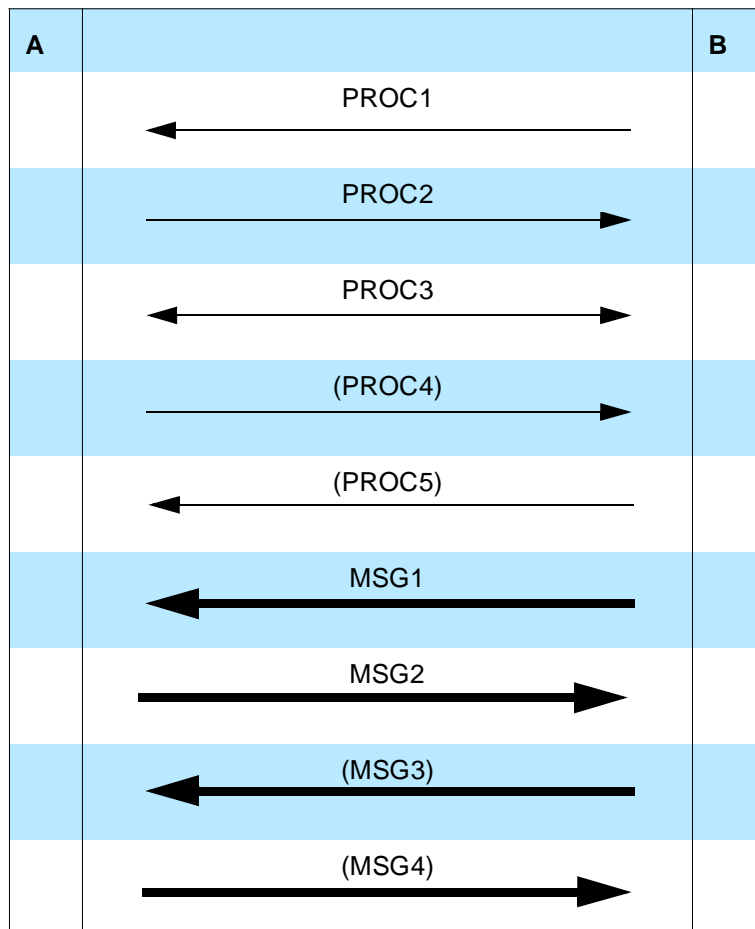
Table 1.1: Arrows used in signalling diagrams

In the table above, the following cases are shown: PROC1 is a sub-procedure initiated by B. PROC2 is a sub-procedure initiated by A. PROC3 is a sub-procedure where the initiating side is undefined (may be both A and B). PROC4 indicates an optional sub-procedure initiated by A, and PROC5 indicates an optional sub-procedure initiated by B.

MSG1 is a message sent from B to A. MSG2 is a message sent from A to B. MSG3 indicates an optional message from A to B, and MSG4 indicates an optional message from B to A.

1.3.3 Notation for timers and counters

Timers and counters may be introduced specific to this profile. To distinguish them from timers (counters) used in the Bluetooth protocol specifications and other profiles, these timers (counters) are named in the following format: '$T_{DNF}nnn$' ('$N_{DNF}nnn$').

2 PROFILE OVERVIEW

2.1 PROFILE STACK

The figure below shows the protocols and entities used in this profile.
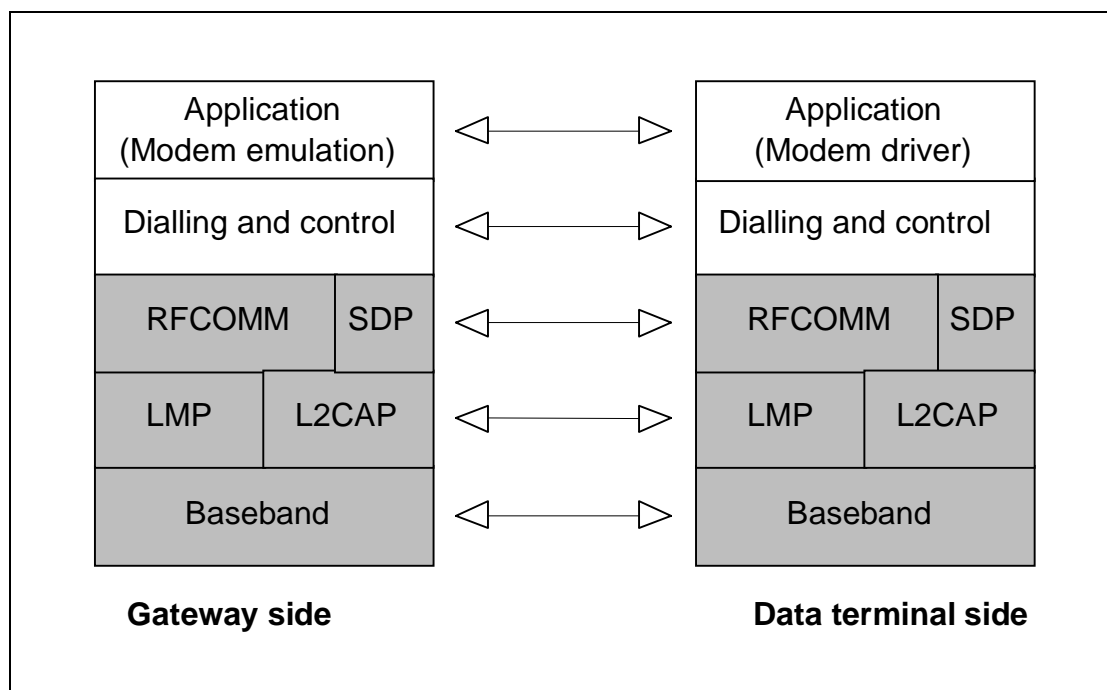
Figure 2.1: Protocol model

The Baseband, LMP and L2CAP are the OSI layer 1 and 2 Bluetooth protocols. RFCOMM is the Bluetooth adaptation of GSM TS 07.10 [5], used for providing serial port emulation. SDP is the Bluetooth Service Discovery Protocol. Dialling and control (see Section 4) is 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:
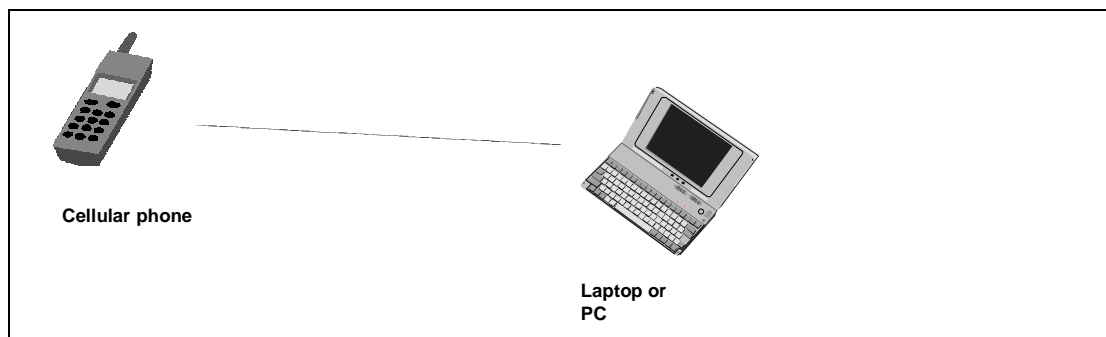
Figure 2.2: Dial-up Networking profile, example with cellular phone
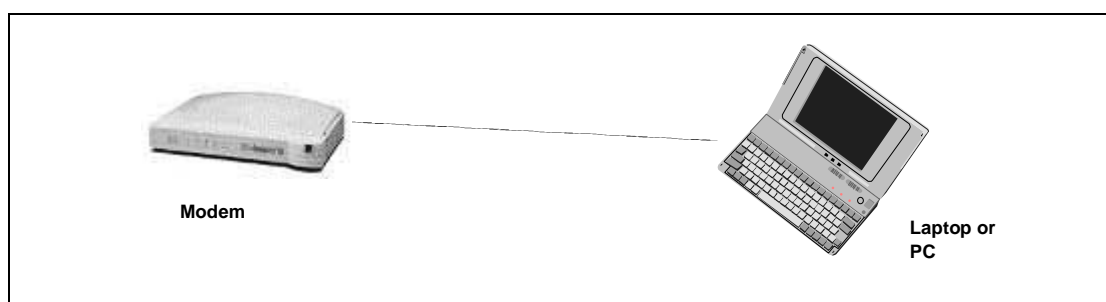
Figure 2.3: Dial-up Networking profile, example with modem

The following roles are defined for this profile:

Gateway (GW) – This is the device that provides access to the public network. Typical devices acting as gateways are cellular phones and modems.

Data Terminal (DT) – This is the device that uses the dial-up 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 Dial-up Networking 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 scenarios covered by this profile are the following:

- Usage of a GW by a DT as a wireless modem for connecting to a dial-up internet access server or using other dial-up services

- Usage of a GW by a DT to receive data calls

The following restrictions apply to this profile:

a) The 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) There is no way defined in this profile to discriminate between two SCO channels originating from the same device. It is therefore manufacturer-specific as to how to deal with the situation where there are multiple applications requiring the use of multiple SCO channels originating from the same device.

f) Before a cellphone or modem can be used with a PC/Laptop for the first time, an initialization procedure must be performed. This typically involves manually activating initialization support, and entering a PIN code on the PC/Laptop keyboard (see Generic Access Profile for more details). This procedure may have to be repeated under certain circumstances.

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

Security is ensured by authenticating the other party upon connection establishment, and by encrypting all user data. The baseband and LMP mechanisms for authentication and encryption are used.

2.4   PROFILE FUNDAMENTALS

Before a DT can use the services of a GW for the first time, the two devices have to initialize. Initialization includes exchanging a PIN code, creation of link keys and service discovery.

A link has to be established before calls can be initiated or received. This requires paging of the other device. Link establishment is always initiated by the DT.

There are no fixed master/slave roles.

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.

An SCO link is used to transport audio.

For security purposes, authentication is used, and all user data is encrypted. For this, the baseband/LMP mechanisms are used.

2.5   CONFORMANCE

If 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 Dial-up Networking 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	M	M
2.	Data call with audio feedback	O	O
3.	Fax services without audio feedback	N/A	N/A
4.	Fax services with audio feedback	N/A	N/A
5.	Voice call	N/A	N/A

Table 3.1: Application layer procedures

3.2 DATA CALLS

The support of data calls is mandatory for both GWs and DTs. 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 a modem emulation entity running on top of the serial port profile provides the modem emulation.

3.3 FAX SERVICE

The support of fax is not covered by this profile. Refer to Fax Profile.

3.4 VOICE CALLS

The support of voice calls is not covered by this 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 following sub-clauses.

The commands are based on ITU-T V.250 and GSM 07.07.

4.1.1 Command syntax

For the exchange of the commands, responses and unsolicited results codes, the format, syntax and procedures of ITU-TV.250 [6] apply.

4.1.2 Commands

The table below lists all commands that shall be supported by the GW.

Name	Description	Reference
&C	Circuit 109 (Received line signal detector) Behavior	Shall be supported as defined in [6].
&D	Circuit 108 (Data terminal ready) Behavior	Shall be supported as defined in [6].
&F	Set to Factory-defined Configuration	Shall be supported as defined in [6].
+GCAP	Request Complete Capabilities List	Shall be supported as defined in [6].
+GMI	Request Manufacturer Identification	Shall be supported as defined in [6].
+GMM	Request Model Identification	Shall be supported as defined in [6].
+GMR	Request Revision Identification	Shall be supported as defined in [6].
A	Answer	Shall be supported as defined in [6].
D	Dial	Shall be supported *either* as defined in [6] *or* as defined in [10].
E	Command Echo	Shall be supported as defined in [6].
H	Hook Control	Shall be supported as defined in [6].
L	Monitor Speaker Loudness	Shall be supported as defined in [6].
M	Monitor Speaker Mode	Shall be supported as defined in [6].

Table 4.1: Required commands

Name	Description	Reference
O	Return to Online Data State	Shall be supported as defined in [6].
P	Select Pulse Dialling	Shall be supported as defined in [6].
Q	Result Code Suppression	Shall be supported as defined in [6].
S0	Automatic Answer	Shall be supported as defined in [6].
S10	Automatic Disconnect Delay	Shall be supported as defined in [6].
S3	Command Line Termination Character	Shall be supported as defined in [6].
S4	Response Formatting Character	Shall be supported as defined in [6].
S5	Command Line Editing Character	Shall be supported as defined in [6].
S6	Pause Before Blind Dialling	Shall be supported as defined in [6].
S7	Connection Completion Timeout	The setting of this parameter may be ignored. If not ignored, it shall be supported as defined in [6].
S8	Comma Dial Modifier Time	Shall be supported as defined in [6].
T	Select Tone Dialling	Shall be supported as defined in [6].
V	DCE Response Format	Shall be supported as defined in [6].
X	Result Code Selection and Call Progress Monitoring Control	Shall be supported as defined in [6].
Z	Reset To Default Configuration	Shall be supported as defined in [6].

Table 4.1: Required commands

4.1.3 Result codes

The table below lists all result codes that shall be supported by the GW.

Name	Description	Reference
OK	Acknowledges execution of a command.	Shall be supported as defined in [6].
CONNECT	Connection has been established.	Shall be supported as defined in [6].
RING	The DCE has detected an incoming call signal from the network.	Shall be supported as defined in [6].
NO CARRIER	The connection has been termi-nated, or the attempt to establish a connection failed.	Shall be supported as defined in [6].
ERROR	Error.	Shall be supported as defined in [6].
NO DIALTONE	No dial-tone detected.	Shall be supported as defined in [6].
BUSY	Busy signal detected.	Shall be supported as defined in[6].

Table 4.2: Required result codes

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 audio feedback is provided by the GW.

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 which uses SCO links while it is operating in the Dial-up Networking profile. Therefore, the behavior in a situation where multiple SCO links are established simultaneously is undefined.

4.3 ESCAPE SEQUENCE

It is recommended that the GW supports an escape sequence (i.e. a sequence of characters which causes the GW to leave the online data state and go to the online command state). This profile does not mandate a particular escape sequence – it is up to the implementer of the profile if and how returning to command mode is supported.

5 SERIAL PORT PROFILE INTEROPERABILITY REQUIREMENTS

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 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 the Bluetooth Assigned Numbers section.

Item	Definition:	Type:	Value:	Status	Default
Service Class ID List				M	
Service Class #0		UUID	Dial-up Networking	M	
Service Class #1		UUID	Generic Networking	O	
Protocol Descriptor List				M	
Protocol #0		UUID	L2CAP	M	
Protocol #1		UUID	RFCOMM	M	

Table 5.1: Service Database Entries

Item	Definition:	Type:	Value:	Status	Default
Parameter for Protocol #1	Server Channel	UInt8	1,2,3,...,30	M	
Service Name	Displayable Text name	String	Service-pro-vider defined	O	'Dial-up network-ing'
Audio Feedback Support		Boolean	True/False	O	False
BluetoothProfile-DescriptorList				M	
Profile #0		UUID	Dial-up Net-working	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 Dial-up Networking profile shall, in the Class of Device field:

1. Set the bits 'Telephony' and 'Networking' 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

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]   Bluetooth Baseband specification

[2]   Bluetooth Link Manager Protocol

[3]   Bluetooth Logical Link Control and Adaptation Protocol Specification

[4]   RFCOMM with TS 07.10

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

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

[7]   Bluetooth Service Discovery Protocol

[8]   John Webb, "Bluetooth SIG MRD", version 1.0 Draft

[9]   Bluetooth Serial Port Profile

[10] ETS 300 916 (GSM 07.07) version 5.6.0

[11] Bluetooth Fax Profile

[12] Bluetooth Assigned Numbers
      http://www.bluetooth.org/assigned-numbers.htm

Dial-up Networking Profile

8 LIST OF FIGURES

9 LIST OF TABLES