

<i>BLUETOOTH</i> [®] DOC	Date / Year-Month-Day 2012-11-06	Approved Adopted	Revision V12	Document No DUN_SPEC
Prepared By BARB	E-mail Address barb-main@bluetooth.org			N.B.

DIAL-UP NETWORKING PROFILE

Abstract:

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.

Revision History

Revision	Date	Comments
Bluetooth V1.1	22 Feb 2001	The DUN Profile Specification as released with the adoption of Bluetooth Specification V1.1.
D12r00	15 Aug 2005	Separated into stand-alone specification document. Source document reformatted and converted to Microsoft Word Format. Revision History and Disclaimer and Copyright Notice were added.
D12r01	13 Sept 2005	Editorial updates
D12r02	31 Oct 2005	Editorial updates
D12r03	10 Nov 2005	Editorial updates
D12r04	30 Nov2005	Editorial updates
D12r05	11 July 2007	2.1 + EDR comments incorporated
D12r06	01 Oct 2007	Removed Table 5.2; removed Agere from CR
D12r07	2012-01-20	ESR01: 2196 Add to the restrictions list in section 2.3 ESR05: E284/E2473 Section 5.5.1 Editorial changes
D12r08	2012-03-26	Incorporate reviewer's(JD, AB, RWH) comments Accepted changes in Table 4.1 and deleted row at bottom (old caption) Copied RWH's from r07 comments where necessary
D12r09	2012-07-18	Created final version for BARB vote
V12	2012-11-06	Adopted by the Bluetooth SIG Board of Directors

Disclaimer and Copyright Notice

The copyright in this specification is owned by the Promoter Members of *Bluetooth®* Special Interest Group (SIG), Inc. ("*Bluetooth* SIG"). Use of these specifications and any related intellectual property (collectively, the "Specification"), is governed by the Promoters Membership Agreement among the Promoter Members and *Bluetooth* SIG (the "Promoters Agreement"), certain membership agreements between *Bluetooth* SIG and its Adopter and Associate Members (the "Membership Agreements") and the *Bluetooth* Specification Early Adopters Agreements (1.2 Early Adopters Agreements) among Early Adopter members of the unincorporated *Bluetooth* SIG and the Promoter Members (the "Early Adopters Agreement"). Certain rights and obligations of the Promoter Members under the Early Adopters Agreements have been assigned to *Bluetooth* SIG by the Promoter Members.

Use of the Specification by anyone who is not a member of *Bluetooth* SIG or a party to an Early Adopters Agreement (each such person or party, a "Member"), is prohibited. The legal rights and obligations of each Member are governed by their applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement. No license, express or implied, by estoppel or otherwise, to any intellectual property rights are granted herein.

Any use of the Specification not in compliance with the terms of the applicable Membership Agreement, Early Adopters Agreement or Promoters Agreement is prohibited and any such prohibited use may result in termination of the applicable Membership Agreement or Early Adopters Agreement and other liability permitted by the applicable agreement or by applicable law to *Bluetooth* SIG or any of its members for patent, copyright and/or trademark infringement.

THE SPECIFICATION IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, SATISFACTORY QUALITY, OR REASONABLE SKILL OR CARE, OR ANY WARRANTY ARISING OUT OF ANY COURSE OF DEALING, USAGE, TRADE PRACTICE, PROPOSAL, SPECIFICATION OR SAMPLE.

Each Member hereby acknowledges that products equipped with the *Bluetooth* technology ("*Bluetooth* products") may be subject to various regulatory controls under the laws and regulations of various governments worldwide. Such laws and regulatory controls may govern, among other things, the combination, operation, use, implementation and distribution of *Bluetooth* products. Examples of such laws and regulatory controls include, but are not limited to, airline regulatory controls, telecommunications regulations, technology transfer controls and health and safety regulations. Each Member is solely responsible for the compliance by their *Bluetooth* Products with any such laws and regulations and for obtaining any and all required authorizations, permits, or licenses for their *Bluetooth* products related to such regulations within the applicable jurisdictions. Each Member acknowledges that nothing in the Specification provides any information or assistance in connection with securing such compliance, authorizations or licenses. **NOTHING IN THE SPECIFICATION CREATES ANY WARRANTIES, EITHER EXPRESS OR IMPLIED, REGARDING SUCH LAWS OR REGULATIONS.**

ALL LIABILITY, INCLUDING LIABILITY FOR INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OR FOR NONCOMPLIANCE WITH LAWS, RELATING TO USE OF THE SPECIFICATION IS EXPRESSLY DISCLAIMED. BY USE OF THE SPECIFICATION, EACH MEMBER EXPRESSLY WAIVES ANY CLAIM AGAINST *BLUETOOTH* SIG AND ITS PROMOTER MEMBERS RELATED TO USE OF THE SPECIFICATION.

Bluetooth SIG reserve the right to adopt any changes or alterations to the Specification as it deems necessary or appropriate.

Copyright © 2012. *Bluetooth®* SIG, Inc. All copyrights in the *Bluetooth* Specifications themselves are owned by Ericsson AB, Lenovo (Singapore) Pte. Ltd., Intel Corporation, Microsoft Corporation, Motorola Mobility, Inc., Nokia Corporation, and Toshiba Corporation.

*Other third-party brands and names are the property of their respective owners.

Contents

1	Introduction	5
1.1	Scope.....	5
1.2	Bluetooth Profile Structure.....	5
1.3	Symbols and Conventions.....	6
1.3.1	Requirement Status Symbols	6
1.3.2	Signaling Diagram Conventions.....	6
1.3.3	Notation for Timers and Counters.....	7
2	Profile Overview	8
2.1	Profile Stack.....	8
2.2	Configurations and Roles	9
2.3	User Requirements and Scenarios	10
2.4	Profile Fundamentals.....	10
2.5	Conformance	11
3	Application Layer	12
2.4	Service Overview.....	12
2.4	Data Calls	12
4	Dialing and Control Interoperability Requirements.....	13
4.1	AT command set used.....	13
4.1.1	Command Syntax.....	13
4.1.2	Commands.....	13
4.1.3	Result Codes.....	15
4.3	Escape Sequence	15
5	Serial Port Profile Interoperability Requirements.....	16
5.1	RFCOMM Interoperability Requirements	16
5.2	L2CAP Interoperability Requirements	16
5.3	SDP Interoperability Requirements	16
5.4	Link Manager (LM) Interoperability Requirements	17
5.5	Link Control (LC) Interoperability Requirements	17
5.5.1	Class of Device Usage.....	17
6	Generic Access Profile Interoperability Requirements.....	18
6.1	Modes	18
6.2	Security Aspects	18
6.3	Idle Mode Procedures	19
6.3.1	Pairing	19
7	References.....	20
8	List of Figures	21
9	List of Tables	22

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’. The most common examples of such devices are modems and cellular phones. The audio feedback feature, available in DUN 1.1 and earlier versions of this profile, has been deprecated.

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.

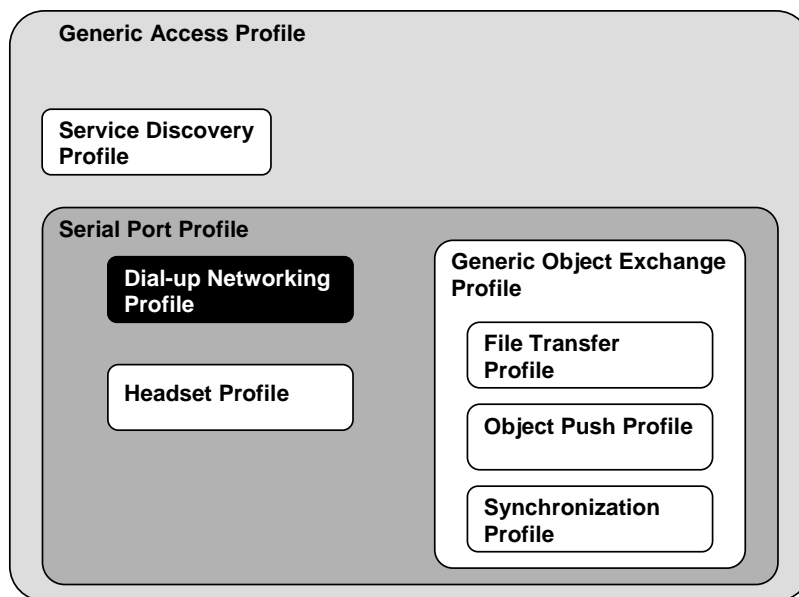


Figure 1.1: Bluetooth Profiles

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 Signaling Diagram Conventions

The following arrows are used in diagrams describing procedures:

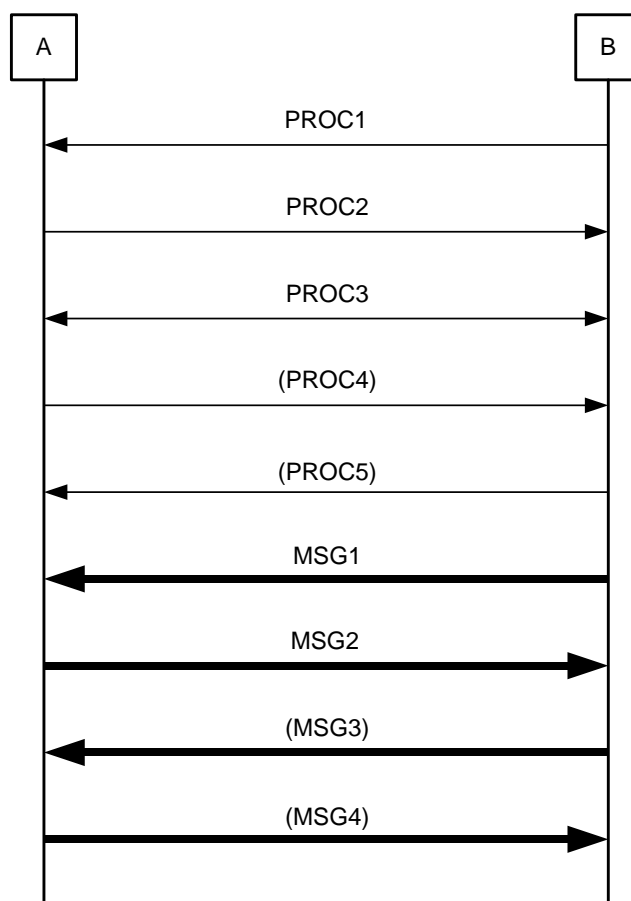


Figure 1.2: Arrows Used in Signalling Diagrams

In the figure 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

Profile Stack

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

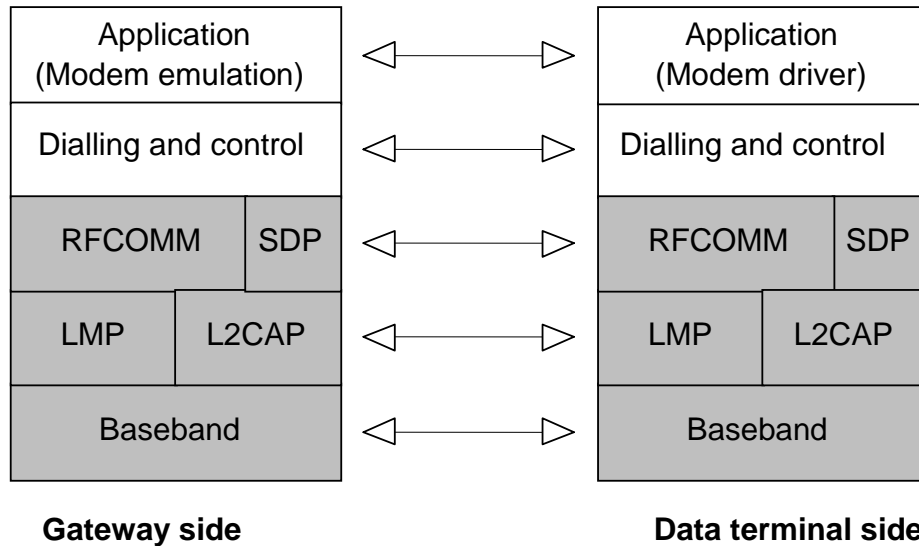


Figure 2.1: Protocol Model

The Baseband, LMP and L2CAP are the OSI layer 1 and 2 Bluetooth protocols. RFCOMM is the Bluetooth adaptation of GSM TS 07.10 [TS 101 369 \(GSM 07.10\) version 6.1.0](#), used for providing serial port emulation. SDP is the Bluetooth Service Discovery Protocol. Dialling and control (see [Dialling and Control Interoperability Requirements](#)) 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 \(\[9\]\)](#) is used as base standard. For these protocols, all requirements stated in [\[9\]](#) apply, except in those cases where this profile explicitly states deviations.

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 is optional.
- c) Only one call at a time is supported.
- d) The profile only supports point-to-point configurations.
- e) 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.
- f) This profile does not support multiple instances of its implementation in the same device.
- g) Neither the GW nor the DT is required to implement acceptance of incoming data calls.

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 pairing 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 shall always be 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 [9] 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.

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.

2.4 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
6.	Incoming calls	O	O
7.	Outgoing calls	M	M

Table 3.1: Application Layer Procedures

2.4 Data Calls

The support of data calls is mandatory for both GWs and DTs

The GW shall emulate a modem connected via a serial port. The Serial Port Profile [9] is used for RS-232 emulation, and a modem emulation entity running on top of the serial port profile provides the modem emulation.

4 Dialing 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-T V.250 [7] apply.

4.1.2 Commands

Table 4.1 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 [7]
&D	Circuit 108 (Data terminal ready) Behavior	Shall be supported as defined in [7]
&F	Set to Factory-defined Configuration	Shall be supported as defined in [7].
+GCAP	Request Complete Capabilities List	Shall be supported as defined in [7].
+GMI	Request Manufacturer Identification	Shall be supported as defined in [7].
+GMM	Request Model Identification	Shall be supported as defined in [7]
+GMR	Request Revision Identification	Shall be supported as defined in [7]
A	Answer	Should be supported as defined in [7] .
D	Dial	Shall be supported <i>either</i> as defined in [7] <i>or</i> as defined in ETS 300 916 (GSM 07.07) version 5.6.0.
E	Command Echo	Shall be supported as defined in [7].
H	Hook Control	Shall be supported as defined in [7].
L	Monitor Speaker Loudness	Shall be supported as defined in [7].
M	Monitor Speaker Mode	Shall be supported as defined in [7].
O	Return to Online Data State	Shall be supported as defined in [7].
P	Select Pulse Dialing	Shall be supported as defined in [7].
Q	Result Code Suppression	Shall be supported as defined in [7].
S0	Automatic Answer	Should be supported as defined in [7].
S10	Automatic Disconnect Delay	Shall be supported as defined in [7].
S3	Command Line Termination Character	Shall be supported as defined in [7].
S4	Response Formatting Character	Shall be supported as defined in [7].
S5	Command Line Editing Character	Shall be supported as defined in [7].
S6	Pause Before Blind Dialing	Shall be supported as defined in [7].

Name	Description	Reference
S7	Connection Completion Timeout	The setting of this parameter may be ignored. If not ignored, it shall be supported as defined in [7].
S8	Comma Dial Modifier Time	Shall be supported as defined in [7].
T	Select Tone Dialing	Shall be supported as defined in [7].
V	DCE Response Format	Shall be supported as defined in [7].
X	Result Code Selection and Call Progress Monitoring Control	Shall be supported as defined in [7].
Z	Reset To Default Configuration	Shall be supported as defined in [7].

Table 4.1: Commands Supported by the GW

4.1.3 Result Codes

Table 4.2 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 [7].
CONNECT	Connection has been established.	Shall be supported as defined in [7].
RING	The DCE has detected an incoming call signal from the network.	Should be supported as defined in [7].
NO CARRIER	The connection has been terminated, or the attempt to establish a connection failed.	Shall be supported as defined in [7].
ERROR	Error.	Shall be supported as defined in [7].
NO DIALTONE	No dial-tone detected.	Shall be supported as defined in [7].
BUSY	Busy signal detected.	Shall be supported as defined in [7].

Table 4.2: Commands Supported by the GW

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 [9]. 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, defines the requirements with regards to this profile, in addition to the requirements defined in Serial Port Profile [9].

RFCOMM Interoperability Requirements

For RFCOMM, no additions to the requirements stated in Serial Port Profile [9] apply.

L2CAP Interoperability Requirements

For the L2CAP layer, no additions to the requirements stated in Serial Port Profile [9] apply.

SDP Interoperability Requirements

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	
Parameter for Protocol #1	Server Channel	UInt8	1,2,3,...,30	M	
Service Name	Displayable Text name	String	Service-provider defined	O	'Dial-Up networking'
Escape Sequence		String	Non-localizable	O	False
BluetoothProfile-DescriptorList				M	
Profile #0		UUID	Dial-Up Networking	M	
Parameter for Profile #0	Version	UInt16	0x0100	M	

Table 5.1: Interoperability Requirements

Table 5.2 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					
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	
Parameter for Protocol #1	Server Channel	UInt8	1,2,3,...,30	M	
Service Name	Displayable Text name	String	Service-provider defined	O	‘Dial-Up networking’
Audio Feedback Support		Boolean	True/False	O	False
BluetoothProfile-DescriptorList				M	
Profile #0		UUID	Dial-Up Networking	M	
Parameter for Profile #0	Version	UInt16	0x0102 ¹	M	

Table 5.2: Service Database Entries

5.4 Link Manager (LM) Interoperability Requirements

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

5.5 Link Control (LC) Interoperability Requirements

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

5.5.1 Class of Device Usage

A device which is active in the GW role of the Dial-Up Networking profile shall set the ‘Telephony’ and ‘Networking’ bits in the Service Class field of the Class of Device value.

A device that implements the GW role of the Dial-up Networking profile may indicate ‘Phone’ as the Major device class (see [Bluetooth Assigned Numbers](#)).

¹ Indicating version 1.2

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

Table 6.1 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	M
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

Table 6.2 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
	Security mode 4	C2	C2

Table 6.2: Security Aspects

C1: Support for at least one of the security modes 2 and 3 is mandatory if the Controller and Host do not support Secure Simple Pairing (SSP). If SSP is supported, Security Mode 3 is excluded and Security Mode 2 may be used for backwards compatibility when the remote device does not support SSP.

C2: Support for Security Mode 4 is Mandatory if the Controller and Host support SSP.

6.3 Idle Mode Procedures

Table 6.3 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	Pairing	M (Note 1)	M (Note 1)

Table 6.3: Idle Mode Procedures

Note 1: See section 6.3.1.

6.3.1 Pairing

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

7 References

Number	Reference
[2]	Bluetooth Baseband specification
[3]	Bluetooth Link Manager Protocol
[4]	Bluetooth Logical Link Control and Adaptation Protocol Specification
[5]	RFCOMM with TS 07.10
[6]	TS 101 369 (GSM 07.10) version 6.1.0
[7]	International Telecommunication Union, "ITU-T Recommendation V.250"
[8]	Bluetooth Service Discovery Protocol
[9]	Bluetooth Serial Port Profile
[10]	ETS 300 916 (GSM 07.07) version 5.6.0
[11]	Bluetooth Fax Profile
[12]	Bluetooth Assigned Numbers

8 List of Figures

Figure 1.1: Bluetooth Profiles.....	5
Figure 1.2: Arrows Used in Signalling Diagrams	7
Figure 2.1: Protocol Model.....	8
Figure 2.2: Dial-Up Networking Profile, Example with Cellular Phone	9
Figure 2.3: Dial-Up Networking Profile, Example with Modem	9

9 List of Tables

Table 3.1: Application Layer Procedures	12
Table 4.1: Commands Supported by the GW	14
Table 4.2: Commands Supported by the GW	15
Table 5.1: Interoperability Requirements	16
Table 5.2: Service Database Entries	17
Table 6.1: Modes	18
Table 6.2: Security Aspects	18
Table 6.3: Idle Mode Procedures	19