[MS-IRDA]:
IrDA Object Exchange (OBEX) Protocol Profile

Revision Summary

Date	Revision History	Revision Class	Comments
07/20/2007	0.1	Major	MCPP Milestone 5 Initial Availability
09/28/2007	0.1.1	Editorial	Revised and edited the technical content.
10/23/2007	0.1.2	Editorial	Revised and edited the technical content.
11/30/2007	0.1.3	Editorial	Revised and edited the technical content.
01/25/2008	0.1.4	Editorial	Revised and edited the technical content.

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1 Introduction

The Infrared Data Association (IrDA) Object Exchange (OBEX) Protocol (**IrOBEX**) is specified by the Infrared Data Association in [IROBEX]. IrOBEX describes the two major elements of the protocol: a model for representing objects (and information that describes the objects), and a session protocol that provides a structure for the "conversation" between devices. The session protocol resides on top of **TinyTP**, as specified in [IRTTP], which provides a reliable transport between the two devices.

A major use of the IrDA OBEX protocol is a "push" or "pull" application, allowing rapid and impromptu communications between portable devices. For instance, a laptop user pushes a file to another laptop or PDA; an industrial computer pulls status and diagnostic information from a piece of factory floor machinery.

1.1 Glossary

The following terms are defined in [MS-GLOS]:

Client
Server
Universally Unique Identifier (UUID)

The following terms are specific to this document:

Information Access Service (IAS): Each device that implements the set of Infrared protocols, specifically [IRLMP], maintains an information base so that one **IrDA** device can discover what services another IrDA-compliant device offers as well as finding out about the device itself. This information is held in a number of objects in the information base and is accessed by communicating with the **IAS**.

IrDA: Infrared Data Association.

IrOBEX: An acronym for the IrDA-defined Infrared Object Exchange protocol, as specified in [IROBEX].

Link Service Access Point Selector (LSAP-SEL): A selector that distinguishes between LSAPs within a station. Legal values for an **LSAP-SEL** lie in the range 0x00-0x7F. With the exception of the special **LSAP-SEL** values 0x00 (LM-IAS), 0x70 (Connectionless Data service), 0x71-0x7E (reserved), and 0x7F (reserved for broadcast and currently not implemented), the assignment of **LSAP-SEL** values is arbitrary. More information is specified in [IRLMP] section 3.1.2.

TinyTP: Infrared Data Association Tiny Transport Protocol, as specified in [IRTTP].

Windows UUID: The **UUID** used by Windows to identify itself to the **IrOBEX server** using the WHO header. The **Windows UUID** (16 Byte) value is: b9c7fd98-e5f8-11d1-bfce-0000f8753890.

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as described in [RFC2119]. All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information. Please check the archive site, http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624, as an additional source.

[IRLMP] Infrared Data Association, "IrDA Link Management Protocol v1.1", January 1996, http://irda.org/displaycommon.cfm?an=1&subarticlenbr=7

Note There is a charge to download the specification.

[IROBEX] Infrared Data Association, "IrDA Object Exchange Protocol v1.2", March 1999, http://irda.org/displaycommon.cfm?an=1&subarticlenbr=7

Note There is a charge to download the specification.

[IRTTP] Infrared Data Association, "IrDA Tiny TP v1.1", October 1996, http://irda.org/displaycommon.cfm?an=1&subarticlenbr=7

Note There is a charge to download the specification.

[ISO-8601] International Organization for Standardization, "Data Elements and Interchange Formats - Information Interchange - Representation of Dates and Times", ISO 8601:2004, December 2004, http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=40874&ICS1=1&ICS2=140&ICS3=30

Note There is a charge to download the specification.

[MS-GLOS] Microsoft Corporation, "Windows Protocols Master Glossary", March 2007.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, http://www.ietf.org/rfc/rfc2119.txt

1.2.2 Informative References

There are no informative references.

1.3 Protocol Overview (Synopsis)

IrOBEX is used to transport opaque data objects over TinyTP. The primary use of the protocol, as specified in [IROBEX], is to connect two devices using an infrared link and to allow sending and receiving of opaque data objects across the infrared link.

[IROBEX] describes the message and header formats and defines how the **client** and **server** SHOULD exchange messages. The IrDA Object Exchange (OBEX) Protocol profile specification [MS-IRDA] describes the additional, user-defined, header introduced in the Windows implementation; the implementation details in light of the additional header; and the portions of [IROBEX] that are not implemented.

1.4 Relationship to Other Protocols

The IrDA OBEX Protocol profile, as specified in [MS-IRDA], does not introduce any new dependencies on lower layer or parallel protocols beyond those specified in [IROBEX] section 1.3.

1.5 Prerequisites/Preconditions

Although not explicitly specified in [IROBEX], as part of the initialization an IrOBEX server MUST register a Service Access Point (SAP) with the **IAS**, as specified in [IRLMP] section 3.1.2, for clients to be able to discover the service provided by the server.

1.6 Applicability Statement

The applicability of the IrDA OBEX Protocol profile, as specified in [MS-IRDA], is limited in the following ways:

- Data objects, specifically files, can only be "pushed" to the PC or by the PC. The reasons for this limitation are specified in section 3.1.5. In brief, the IrDA OBEX Protocol profile, as specified in [MS-IRDA], does not implement the GET operations defined in [IROBEX] section 3.3.4.
- Devices that implement this IrDA OBEX Protocol profile, cannot exchange data objects with devices that require IrOBEX authentication as specified in [IROBEX] section 3.5. The reasons for this limitation are specified in sections 3.1.5 and 3.2.5. In brief, the IrDA OBEX Protocol profile, as specified in [MS-IRDA], does not implement the authentication sequence as specified in [IROBEX] section 3.5.

1.7 Versioning and Capability Negotiation

The IrDA OBEX Protocol profile, as specified in [MS-IRDA], does not introduce any new versioning issues.<1>

1.8 Vendor-Extensible Fields

Portions of the IrDA OBEX Protocol profile, as specified in [MS-IRDA], use Win32 error codes. These values are taken from the Windows error number space defined in [MS-ERREF]. Vendors SHOULD reuse those values with their indicated meaning. Choosing any other value runs the risk of a collision in the future.

Section 3.1.5.1 describes how a CONNECT message that contains a WHO header is parsed.<2>

Vendors who wish to receive Win32 error codes (in addition to the IrOBEX error codes as specified in [IROBEX] section 3.2.1), using the Win32 Error Message header as specified in section 2.2.1.1, MUST use a specific **UUID** in a WHO header.<3> The effect of using this UUID in a WHO header is specified in sections 3.1.5 and 3.2.5.

1.9 Standards Assignments

There are no standards assignments other than what is specified in [IROBEX] section 6.

2 Messages

2.1 Transport

All IrOBEX messages are transported over TinyTP, as specified in [IROBEX] section 1.4.1.

2.2 Message Syntax

The message syntax remains unchanged and as specified in [IROBEX] sections 3.1 and 3.2.

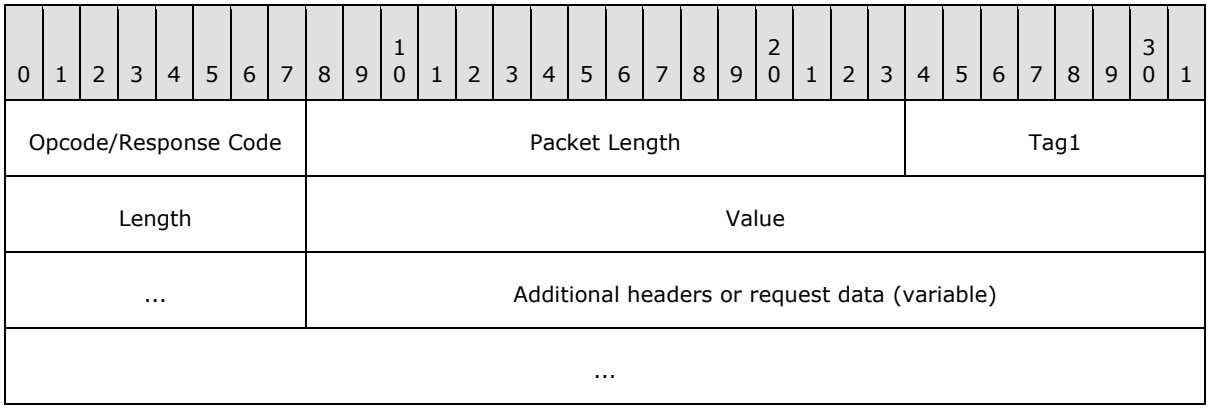
2.2.1 Header Types

Information on how a custom IrOBEX header can be constructed and used is specified in [IROBEX] sections 2.1 and 2.2.12. The custom header used by Windows (as specified in section 3) is specified in section 2.2.1.1.

Beyond this, the header types and syntax remain unchanged and as specified in [IROBEX] section 2.1.

2.2.1.1 Win32 Error Message Header

The custom IrOBEX header 'Win32 Error Message', referred in the rest of this document as the WIN32ERR header, is defined following the semantics specified in [IROBEX] section 2.2.12. The WIN32ERR header can be part of both a request message and response message, as specified in [IROBEX] sections 3.1 and 3.2 respectively.



Opcode/Response Code (1 byte): This value can be used as an opcode (in the request message) or as a response code (in the response message), and it defines the IrOBEX operation associated with this packet, as defined in [IROBEX] section 3.3. If this message is a response message, as defined in [IROBEX] section 3.2, the response code value MUST be taken from [IROBEX] section 3.2.1.

Packet Length (2 bytes): Describes the length (in bytes) of the entire packet including the opcode, packet length, all optional headers, and data. More information is specified in [IROBEX] section 3.1.

Tag1 (1 byte): Describes the implementation-defined header identifier. The value for this field is 0xF0. This value is the bitwise OR of 0x30 and 0xC0. This signifies that the header identifier is "user-defined" (0x30) and that the length of the **Value** field is 4 bytes (0xC0). The values:

0xC0 and 0xF0 and the bitwise OR operation used to arrive at the final value of 0xF0 for this field are specified in [IROBEX] section 2.1.

Length (1 byte): A one-byte value as defined in [IROBEX] section 2.2.12. The value of this field MUST be zero and MUST be ignored by the receiver.

Value (4 bytes): A four-byte value containing a Win32 error code as specified in section 1.8.

Additional headers or request data (variable): This variable length segment contains the rest of the IrOBEX message, as specified in [IROBEX] section 3.1 and 3.2.

2.2.2 Message Types

The message types and syntax remain unchanged and as specified in [IROBEX] section 3.

3 Protocol Details

The protocol details for both client and server are specified in [IROBEX]. The purpose of this section is to provide a context for implementation-specific notes about the client and server sides of the IrDA OBEX Protocol profile, as specified in [MS-IRDA].

3.1 Server Details

3.1.1 Abstract Data Model

No state is necessary other than that specified in [IROBEX] section 2.

3.1.2 Timers

No new timers are required beyond those in the base protocol, as specified in [IROBEX] section 3.4.

3.1.3 Initialization

No initialization is necessary other than that specified in [IROBEX]. <4>.

3.1.4 Higher-Layer Triggered Events

No higher-layer triggered events are required other than those specified in [IROBEX].

3.1.5 Message Processing Events and Sequencing Rules

Message processing events MUST remain the same as specified in [IROBEX] section 3, except as described in this section.<5>

3.1.5.1 Receiving a CONNECT Message

CONNECT messages MUST be parsed as specified in [IROBEX] section 3.3.1 and MAY parse the optional headers as specified in [IROBEX] section 2.1. As a result of receiving a CONNECT message, the server MUST respond with a CONNECT Response message as specified in section 3.1.5.2.<6>

[IROBEX] section 2.2.7 asserts that a TARGET header MAY be used in conjunction with a WHO header.<7>

3.1.5.2 Sending a CONNECT Response Message

A CONNECT Response message MUST be sent as specified in [IROBEX] section 3.3.1.8.<8>

3.1.5.3 Receiving a PUT Message

A PUT message MUST be handled as specified in [IROBEX] section 3.3.3.1 and MAY parse optional headers as specified in [IROBEX] section 2.1.<9>

3.1.5.4 Sending a PUT Response Message

A PUT Response message MUST be handled as specified in [IROBEX] section 3.3.3.2 and MAY parse optional headers as specified in [IROBEX] section 2.1.<10>

3.1.5.5 Receiving a GET Message

A GET message MUST be handled as specified in [IROBEX] section 3.3.4.<11>

3.1.5.6 Receiving a SETPATH Message

A SETPATH message MUST be handled as specified in [IROBEX] section 3.3.6.

3.1.5.7 Sending a SETPATH Response Message

A SETPATH Response message MUST be handled as specified in [IROBEX] section 3.3.6 and MAY parse optional headers as specified in [IROBEX] section 2.1.<12>

3.1.6 Timer Events

No new timer events are required beyond those in the base protocol, as specified in [IROBEX] section 3.4.

3.1.7 Other Local Events

None.

3.2 Client Details

3.2.1 Abstract Data Model

No state is necessary other than that specified in [IROBEX] section 2.

3.2.2 Timers

No new timers are required beyond those in the base protocol, as specified in [IROBEX] section 3.4.

3.2.3 Initialization

No initialization is necessary other than that specified in [IROBEX].

Although not explicitly stated in [IROBEX], a client wishing to establish a TinyTP connection, to be used by the IrDA OBEX protocol profile, MUST perform an IAS **GetValueByClass** call on the class name "OBEX" or "OBEX:IrXfer", attribute "IrDA:TinyTP:LsapSel", as specified in [IRLMP] section 4.2.4. The client MUST initiate the TinyTP connection to the **LSAP-SEL** value returned by the server, as specified in [IRTTP] section 2.2.1.

3.2.4 Higher-Layer Triggered Events

No higher-layer triggered events are required other than those specified in [IROBEX].

3.2.5 Message Processing Events and Sequencing Rules

Message processing events remain the same as specified in [IROBEX] section 3, except as described in this section.

3.2.5.1 Sending a CONNECT Message

The CONNECT message MUST be sent as specified in [IROBEX], section 3.3.1 and MAY send optional headers as specified in [IROBEX] section 2.1.<13>

3.2.5.2 Sending a PUT Message

The PUT message MUST be sent as specified in [IROBEX] section 3.3.3 and MAY send optional headers as specified in [IROBEX] section 2.1.<14>

3.2.5.3 Receiving a PUT Response Message

The PUT Response message MUST be handled as specified in [IROBEX] section 3.3.3.2.<15>

3.2.6 Timer Events

No new timer events are required beyond those in the base protocol as specified in [IROBEX] section 3.4.

3.2.7 Other Local Events

None.

4 Protocol Examples

Protocol examples are specified in [IROBEX] section 7.

5 Security

5.1 Security Considerations for Implementers

This protocol profile does not implement any security function specified in [IROBEX]. As a result, devices attempting to interoperate with the protocol profile MUST NOT implement the authentication challenge as specified in [IROBEX] section 2.2.13.

Caution should be exercised when using this protocol profile. The mandatory physical proximity of 1 meter and line-of-sight positioning between the IrOBEX devices mitigates the potential security issues.

Protocol implementers SHOULD consider allowing users to turn off the functionality provided by this protocol profile.

5.1.1 Index of Security Parameters

None.

6 Appendix A: Windows Behavior

The information in this specification is applicable to the following versions of Windows:

- Windows Vista
- Windows Server 2003
- Windows XP
- Windows 2000
- Windows NT

Exceptions, if any, are noted below. Unless otherwise specified, any statement of optional behavior in this specification prescribed using the terms SHOULD or SHOULD NOT implies Windows behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that Windows does not follow the prescription.

<1> Section 1.7: Windows implements IrDA OBEX protocol version 1.0.

<2> Section 1.8: The WHO header contains the **Windows UUID**, which is: b9c7fd98-e5f8-11d1-bfce-0000f8753890.

<3> Section 1.8: The WHO header MUST contain the Windows UUID: b9c7fd98-e5f8-11d1-bfce-0000f8753890.

<4> Section 3.1.3: At initialization time, Windows registers two class names for the IrOBEX service in the IAS store: OBEX and OBEX:IrXfer as specified in [IROBEX] section 6.1. There is no difference in behavior by the server irrespective of which class name the client uses to connect to the server.

<5> Section 3.1.5: [IROBEX] section 3 does not explicitly state that any headers MUST be supported.

Unless otherwise stated, Windows:

1. Discards all headers it receives.
2. Does not include any headers in messages it sends over the link.

<6> Section 3.1.5.1: Windows parses the following optional headers as part of a CONNECT message as specified in [IROBEX] section 2.1.

1. NAME header
2. LENGTH header
3. TIME header

   Note Both [ISO-8601] and UNIX time formats are parsed.

4. WHO Header

A device that relies on authenticating the server will not interoperate with the Windows implementation of IrDA OBEX protocol profile, specified in [MS-IRDA], because the authentication header in a CONNECT message is discarded.

<7> Section 3.1.5.1: Windows does not use or rely on the TARGET header but rather relies solely on the WHO header for identification that the IrOBEX client is also a Windows computer.

<8> Section 3.1.5.2: If the CONNECT message contained a WHO header carrying a Windows UUID, the CONNECT Response message also contains a WHO header carrying the Windows UUID. In addition, the WIN32ERR header, as specified in section 2.2.1.1, is appended to the CONNECT Response message.

<9> Section 3.1.5.3: [IROBEX] section 3.3.1.10 states that IrOBEX implementations MAY choose to accept PUT and GET operations without first requiring a CONNECT operation by assuming default values for the connection parameters.

Windows supports accepting PUT operations without requiring a CONNECT operation.

Windows parses the following optional headers as part of a CONNECT message as specified in [IROBEX] section 2.1.

1. NAME header
2. LENGTH header
3. TIME header

Note Both [ISO-8601] and UNIX time formats are parsed.

<10> Section 3.1.5.4: If the PUT Response message was preceded by a CONNECT - CONNECT Response exchange that contained a WHO header carrying the Windows UUID, the PUT Response message contains WIN32ERR header as specified in section 2.2.1.1 in the cases when PUT Response is returning one of the IrOBEX error response codes.

<11> Section 3.1.5.5: Windows does not support processing GET messages. Specifically, Windows discards the GET message by responding with a "Not implemented" IrOBEX response code (0xD1), as specified in section 3.2.1.

<12> Section 3.1.5.7: If the SETPATH message was preceded by a CONNECT - CONNECT Response exchange that contained a WHO header carrying the Windows UUID, Windows appends the WIN32ERR header, as specified in section 2.2.1.1, to the SETPATH Response message.

<13> Section 3.2.5.1: Windows uses the following values and optional headers in a CONNECT message:

- Maximum IrOBEX packet length = 32 672 Bytes.
- WHO header carrying the Windows UUID as defined in section 1.8.

<14> Section 3.2.5.2: Windows sends the following optional headers in a PUT message:

- NAME header
- LENGTH header
- TIME header: Windows uses [ISO-8601] time format as specified in [IROBEX] section 2.2.5.

<15> Section 3.2.5.3: If the PUT Response message was preceded by a CONNECT - CONNECT Response exchange that contained a WHO header carrying the Windows UUID, the PUT Response message will contain the WIN32ERR header as specified in section 2.2.1.1 in the cases when PUT Response is returning one of the IrOBEX error response codes.

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