

# [MS-RDPEPC]: Remote Desktop Protocol: Print Virtual Channel Extension

---

## Intellectual Property Rights Notice for Protocol Documentation

- This protocol documentation is covered by Microsoft copyrights. Regardless of any other terms that are contained in the terms of use for the Microsoft website that hosts this documentation, you may make copies of it in order to develop implementations of the protocols, and may distribute portions of it in your implementations of the protocols or your documentation as necessary to properly document the implementation. This permission also applies to any documents that are referenced in the protocol documentation.
- Microsoft does not claim any trade secret rights in this documentation.
- Microsoft has patents that may cover your implementations of the protocols. Neither this notice nor Microsoft's delivery of the documentation grants any licenses under those or any other Microsoft patents. If you are interested in obtaining a patent license, please contact [protocol@microsoft.com](mailto:protocol@microsoft.com).
- The names of companies and products contained in this documentation may be covered by trademarks or similar intellectual property rights. This notice does not grant any licenses under those rights.
- All other rights are reserved, and this notice does not grant any rights other than specifically described above, whether by implication, estoppel, or otherwise.

This protocol documentation is intended for use in conjunction with publicly available standard specifications, network programming art, and Microsoft Windows distributed systems concepts, and assumes that the reader either is familiar with the aforementioned material or has immediate access to it.

A protocol specification does not require the use of Microsoft programming tools or programming environments in order for you to develop an implementation. If you have access to Microsoft programming tools and environments you are free to take advantage of them.

## Revision Summary

Date	Revision History	Revision Class	Comments
07/20/2007	0.1	Major	MCPPE Milestone 5 Initial Availability
09/28/2007	1.0	Major	Updated and revised the technical content.
10/23/2007	1.1	Minor	Updated the technical content.
11/30/2007	1.2	Minor	Updated the technical content.

Date	Revision History	Revision Class	Comments
01/25/2008	1.2.1	Editorial	Revised and edited the technical content.

# Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>6</b>
1.1	Glossary .....	6
1.2	References .....	7
1.2.1	Normative References .....	7
1.2.2	Informative References.....	7
1.3	Protocol Overview (Synopsis).....	7
1.3.1	Purpose of Print Virtual Channel Extension.....	7
1.3.2	Protocol Initialization.....	8
1.4	Relationship to Other Protocols.....	8
1.5	Prerequisites/Preconditions.....	8
1.6	Applicability Statement .....	8
1.7	Versioning and Capability Negotiation.....	8
1.8	Vendor-Extensible Fields .....	8
1.9	Standards Assignments.....	8
<b>2</b>	<b>Messages .....</b>	<b>9</b>
2.1	Transport.....	9
2.2	Message Syntax .....	9
2.2.1	Common Data Types.....	9
2.2.1.1	Server Printer Cache Event (SERVER_PRINTER_CACHE_EVENT).....	9
2.2.2	Printer Redirection Messages .....	10
2.2.2.1	Client Device List Announce Request (DR_PRN_DEVICE_ANNOUNCE).....	10
2.2.2.2	Server Printer Set XPS Mode (DR_PRN_USING_XPS) .....	12
2.2.2.3	Add Printer Cachedata (DR_PRN_ADD_CACHEDATA) .....	12
2.2.2.4	Update Printer Cachedata (DR_PRN_UPDATE_CACHEDATA) .....	15
2.2.2.5	Delete Printer Cachedata (DR_PRN_DELETE_CACHEDATA) .....	15
2.2.2.6	Rename Printer Cachedata (DR_PRN_RENAME_CACHEDATA).....	16
2.2.2.7	Server Create Request (DR_PRN_CREATE_REQ) .....	17
2.2.2.8	Server Printer Close Request (DR_PRN_CLOSE_REQ) .....	19
2.2.2.9	Server Printer Write Request (DR_PRN_WRITE_REQ).....	19
2.2.2.10	Client Printer Create Response (DR_PRN_CREATE_RSP).....	20
2.2.2.11	Client Printer Close Response (DR_PRN_CLOSE_RSP) .....	20
2.2.2.12	Client Printer Write Response (DR_PRN_WRITE_RSP) .....	21
<b>3</b>	<b>Protocol Details .....</b>	<b>22</b>
3.1	Common Details .....	22
3.1.1	Abstract Data Model .....	22
3.1.1.1	Cached Printer Config Data .....	22
3.1.1.2	XPS Mode.....	22
3.1.2	Timers .....	22
3.1.3	Initialization .....	22
3.1.4	Higher-Layer Triggered Events.....	22
3.1.5	Message Processing Events and Sequencing Rules .....	23
3.1.6	Timer Events.....	23
3.1.7	Other Local Events.....	23
3.2	Client Details .....	23
3.2.1	Abstract Data Model .....	23
3.2.2	Timers .....	23
3.2.3	Initialization .....	23
3.2.4	Higher-Layer Triggered Events.....	23
3.2.5	Message Processing Events and Sequencing Rules .....	23
3.2.5.1	Printer Redirection Messages.....	23

3.2.5.1.1	Sending a Client Device List Announce Request Message .....	23
3.2.5.1.2	Processing a Printer Set XPS Mode Message.....	24
3.2.5.1.3	Processing an Add Printer Cachedata Message .....	24
3.2.5.1.4	Processing an Update Printer Cachedata Message .....	24
3.2.5.1.5	Processing a Delete Printer Cachedata Message.....	24
3.2.5.1.6	Processing a Rename Printer Cachedata Message .....	24
3.2.5.1.7	Processing a Create Request Message.....	24
3.2.5.1.8	Processing a Close Request Message.....	24
3.2.5.1.9	Processing a Write Request Message.....	24
3.2.5.1.10	Sending a Printer Create Response Message .....	25
3.2.5.1.11	Sending a Printer Close Response Message.....	25
3.2.5.1.12	Sending a Printer Write Response Message .....	25
3.2.6	Timer Events.....	26
3.2.7	Other Local Events.....	26
3.3	Server Details.....	26
3.3.1	Abstract Data Model .....	26
3.3.2	Timers .....	26
3.3.3	Initialization .....	26
3.3.4	Higher-Layer Triggered Events.....	26
3.3.5	Message Processing Events and Sequencing Rules .....	27
3.3.5.1	Printer Redirection Messages.....	27
3.3.5.1.1	Processing a Client Device List Announce Request Message .....	27
3.3.5.1.2	Sending a Printer Set XPS Mode Message .....	27
3.3.5.1.3	Sending an Add Printer Cachedata Message .....	27
3.3.5.1.4	Sending an Update Printer Cachedata Message .....	27
3.3.5.1.5	Sending Delete Printer Cachedata .....	27
3.3.5.1.6	Sending a Rename Printer Cachedata Message.....	27
3.3.5.1.7	Sending a Printer Create Request Message .....	27
3.3.5.1.8	Sending a Printer Close Request Message .....	27
3.3.5.1.9	Sending a Printer Write Request Message .....	28
3.3.5.1.10	Processing a Printer Create Response Message.....	28
3.3.5.1.11	Processing a Printer Close Response Message .....	28
3.3.5.1.12	Processing a Printer Write Response Message.....	28
3.3.6	Timer Events.....	28
3.3.7	Other Local Events.....	28
<b>4</b>	<b>Protocol Examples .....</b>	<b>29</b>
4.1	Annotations for Printer Redirection.....	29
4.1.1	Client Printer Device (DR_PRN_DEVICE_ANNOUNCE) .....	29
4.1.2	Server Printer Set XPS Mode (DR_PRN_USING_XPS).....	30
4.1.3	Add Printer Cachedata (DR_PRN_ADD_CACHEDATA).....	30
4.1.4	Update Printer Cachedata (DR_PRN_UPDATE_CACHEDATA) .....	31
4.1.5	Delete Printer Cachedata (DR_PRN_DELETE_CACHEDATA).....	31
4.1.6	Rename Printer Cachedata (DR_PRN_RENAME_CACHEDATA) .....	31
4.1.7	Server Printer Create Request (DR_PRN_CREATE_REQ).....	32
4.1.8	Server Printer Close Request (DR_PRN_CLOSE_REQ).....	32
4.1.9	Server Printer Write Request (DR_PRN_WRITE_REQ) .....	33
4.1.10	Client Printer Create Response (DR_PRN_CREATE_RSP) .....	33
4.1.11	Client Printer Close Response (DR_PRN_CLOSE_RSP).....	33
4.1.12	Client Printer Write Response (DR_PRN_WRITE_RSP).....	34
<b>5</b>	<b>Security .....</b>	<b>35</b>
5.1	Security Considerations for Implementers.....	35
5.2	Index of Security Parameters .....	35
<b>6</b>	<b>Appendix A: Windows Behavior .....</b>	<b>36</b>

<b>7</b>	<b>Index.....</b>	<b>37</b>
----------	-------------------	-----------

# 1 Introduction

This document specifies the Print Virtual Channel Extension to the Remote Desktop Protocol. This protocol is used to redirect printers from a **terminal client** to the **terminal server**. This allows the **server** access to printers physically connected to the **client** as if the devices were local to the server.

## 1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

### Client Server

The following terms are specific to this document:

**Client Printer Driver:** An original equipment manufacturer (OEM) printer driver installed on the **client**. The **client printer driver** services actual printer hardware to render any printing information.

**Printer Name:** The term printer name is used to represent a user-assigned, arbitrary name given to a printer queue. This protocol uses the term "**printer name**" to identify a given printer queue.

**Printer Queue:** A **printer queue** refers to an instance of a printer. Each printer instance is associated with a printer driver and a printer port.

**Auto Printer Redirection:** The **terminal server client** redirects **printer queues** installed on **client** computers. This redirection is referred to as "auto printers".

**Manual Printer Redirection:** The **terminal server client** redirects printers that are not installed (that is, associated with a printer driver) on the **client**. For such redirection to work, the user must manually specify which printer driver to use.

**Remote Device:** A device attached to a remote (or **client**) machine, in contrast to a device physically attached to a machine.

**Terminal Client:** A **client** of a **terminal server**. A terminal client program that runs on the client machine.

**Terminal Server:** A **server** that provides a graphical user interface (GUI) of a desktop to terminal server clients allowing clients to remotely run applications on the server. The server transmits the GUI of the program to the client, and the client returns keyboard and mouse clicks to be processed by the server.

**XML Paper Specification (XPS):** A Microsoft XML-based document format introduced in Windows Vista. **XPS** specifies the set of conventions for the use of XML and other widely available technologies to describe the content and appearance of paginated documents.

**XPS File:** A type of file that contains **XPS** data. Such files contain all document elements as well as printer-specific rendering information.

**PRN File:** A type of file that contains a sequence of RAW bytes that are understood by the printer hardware. The printer driver produces these files and sends them to the printer port for actual printing. In the case of Terminal Server printer redirection, this stream is captured on the Terminal Server for the redirected printers and then sent to the client hardware for

printing in "Raw" mode. The contents of this stream are opaque to the Print Virtual Channel Extension.

**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](mailto: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.

[MS-DTYP] Microsoft Corporation, "[Windows Data Types](#)", January 2007.

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

[MS-RDPBCGR] Microsoft Corporation, "[Remote Desktop Protocol: Basic Connectivity and Graphics Remoting Specification](#)", June 2007.

[MS-RDPEFS] Microsoft Corporation, "[Remote Desktop Protocol: File System Virtual Channel Extension](#)", September 2007.

[MS-RDPEXPS] Microsoft Corporation, "[Remote Desktop Protocol: XML Paper Specification \(XPS\) Print Virtual Channel Extension](#)", July 2007.

[MS-RDPESP] Microsoft Corporation, "[Remote Desktop Protocol: Serial Port Virtual Channel Extension](#)", September 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

[MSFT-XMLPAPER] Microsoft Corporation, "XML Paper Specification", <http://www.microsoft.com/whdc/xps/default.mspix>

## 1.3 Protocol Overview (Synopsis)

The Print Virtual Channel Extension specifies the communication used to enable the redirection of printers between a terminal client and a terminal server. By redirecting printers from the terminal client to the terminal server, applications running on a server machine can access the **remote devices** as if they were local printers.

### 1.3.1 Purpose of Print Virtual Channel Extension

The Print Virtual Channel Extension enables printer redirection. It allows applications running a terminal server to access the printers attached to the terminal client.

### **1.3.2 Protocol Initialization**

This protocol can be considered a subprotocol within the [Remote Desktop Protocol: File System Virtual Channel Extension](#) as specified in [\[MS-RDPEFS\]](#). It follows the initialization of the File System Virtual Channel Extension to enable printer redirection.

### **1.4 Relationship to Other Protocols**

This protocol can be considered a subprotocol within the [Remote Desktop Protocol: File System Virtual Channel Extension](#). This protocol extends the File System Virtual Channel Extension to enable printer redirection.

### **1.5 Prerequisites/Preconditions**

The Print Virtual Channel Extension operates only after the [Remote Desktop Protocol: File System Virtual Channel Extension](#) transport is fully established.

### **1.6 Applicability Statement**

The Print Virtual Channel Extension is designed to be run within the context of a Remote Desktop Protocol virtual channel established between a client and server. This protocol extension is applicable when applications running on the terminal server need to access the printers physically connected to a client machine.

### **1.7 Versioning and Capability Negotiation**

This protocol relies on the [Print Virtual Channel](#) to perform basic versioning and capability negotiation.

### **1.8 Vendor-Extensible Fields**

This protocol contains no vendor-extensible fields.

### **1.9 Standards Assignments**

This protocol does not use any standards assignments.



## 2 Messages

Since this is a subprotocol of the [Remote Desktop Protocol: File System Virtual Channel Extension](#), it shares messages and common data types that are specified in [\[MS-RDPEFS\]](#) section 2. This section describes the messages and data types used by the Print Virtual Channel Extension.

### 2.1 Transport

All messages MUST be transported over an established Remote Desktop Protocol device extensions channel (as specified in [\[MS-RDPEFS\]](#) section 2.1).

### 2.2 Message Syntax

The following sections contain Print Virtual Channel Extension message syntax.

#### 2.2.1 Common Data Types

Printer redirection uses common data types defined and explained in the [Remote Desktop Protocol: File System Virtual Channel Extension](#). The following are the data types that are specific to the Print Virtual Channel Extension.

##### 2.2.1.1 Server Printer Cache Event (SERVER\_PRINTER\_CACHE\_EVENT)

The Server Printer Cache Event is used to identify various server events associated with Printer Cached Config Data (section [3.1.1.1](#)) in the messages sent from the server to the client.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
cachedata																															

**cachedata (4 bytes):** A 32-bit unsigned integer value that MUST be set to one of the following values.

Value	Meaning
RDPDR_ADD_PRINTER_EVENT 0x00000001	Add printer cachedata event.
RDPDR_UPDATE_PRINTER_EVENT 0x00000002	Update printer cachedata event.
RDPDR_DELETE_PRINTER_EVENT 0x00000003	Delete printer cachedata event.
RDPDR_RENAME_PRINTER_EVENT 0x00000004	Rename printer cachedata event.

## 2.2.2 Printer Redirection Messages

### 2.2.2.1 Client Device List Announce Request (DR\_PRN\_DEVICE\_ANNOUNCE)

This message is specified in [\[MS-RDPEFS\]](#) section 2.2.2.9 (Client Device List Announce Request). For each redirected printer, a DEVICE\_ANNOUNCE header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.3) is generated by the client printer redirection extension followed by variable printer-specific data.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceType																															
DeviceId																															
PreferredDosName																															
...																															
DeviceDataLength																															
Flags																															
CodePage																															
PnPNameLen																															
DriverNameLen																															
PrintNameLen																															
CachedFieldsLen																															
PnPName (variable)																															
...																															
DriverName (variable)																															
...																															
PrinterName (variable)																															

...
CachedPrinterConfigData (variable)
...

**DeviceType (4 bytes):** This field is defined in [\[MS-RDPEFS\]](#) section 2.2.1.3. This field MUST be set to RDPDR\_DTYP\_PRINT.

**DeviceId (4 bytes):** This field is defined in [\[MS-RDPEFS\]](#) section 2.2.1.3. The **DeviceId** field MUST be set to the unique device ID to identify this printer device. This field is later used to refer to the same printer device by both the client and the server.

**PreferredDosName (8 bytes):** This field is defined in [\[MS-RDPEFS\]](#) section 2.2.1.3. The **PreferredDosName** field MUST be set to the port name on which the printer is installed.

**DeviceDataLength (4 bytes):** This field is defined in [\[MS-RDPEFS\]](#) section 2.2.1.3. The **DeviceDataLength** field MUST be set to the length of data fields following the **DeviceDataLength** field.

**Flags (4 bytes):** A 32-bit unsigned integer that indicates the properties of the client **printer queue**. This bitfield MUST be a valid combination of any of the following values:

Value	Meaning
RDPDR_PRINTER_ANNOUNCE_FLAG_ASCII 0x00000001	The <b>DriverName</b> field is in ASCII characters. If not set, it will be in Unicode.
RDPDR_PRINTER_ANNOUNCE_FLAG_DEFAULTPRINTER 0x00000002	The printer is set as default. There can be only one printer with this flag set.
RDPDR_PRINTER_ANNOUNCE_FLAG_NETWORKPRINTER 0x00000004	This printer is from the network.
RDPDR_PRINTER_ANNOUNCE_FLAG_TSPRINTER 0x00000008	This flag is set when the printer to be redirected is not a local or network printer, but is a Terminal Server client printer. This can happen in nested TS sessions; that is, this can happen when a TS connection is made from within a TS session.
RDPDR_PRINTER_ANNOUNCE_FLAG_XPSFORMAT 0x00000010	This client/printer supports <b>XPS</b> format.

**CodePage (4 bytes):** A 32-bit unsigned integer. Reserved for future use. This field MUST be set to 0.

**PnPNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **PnPName** field, including its null terminator.

**DriverNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **DriverName** field, including its null terminator.

**PrintNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **PrintName** field, including its null terminator.

**CachedFieldsLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **CachedPrinterConfigData** field.

**PnPName (variable):** A null-terminated Unicode string. This field can be set to any valid Unicode string, and MUST be ignored on receipt.

**DriverName (variable):** An array of characters. The type of characters is determined by the RDPDR\_PRINTER\_ANNOUNCE\_FLAG\_ASCII flag. If the flag is set, the **DriverName** field is a null-terminated ASCII string; otherwise, it is a null-terminated Unicode string. The **DriverName** field specifies the driver used by the client for this printer. This name is used by the Terminal Server to determine the appropriate matching driver for the redirected printer, which is to be used on the server. [<1>](#)

**PrinterName (variable):** The **PrinterName** field is a null-terminated Unicode string. The client SHOULD specify the user-assigned printer name of the local printer in this field. This name is used by the server to generate the server-side redirected printer queue.

**CachedPrinterConfigData (variable):** A variable-length array of bytes. This field is a BLOB of data that describes the cached printer configuration (see section [3.1.1.1](#)).

### 2.2.2.2 Server Printer Set XPS Mode (DR\_PRN\_USING\_XPS)

This message is sent from server to client to set the device in XPS mode (see section [3.1.1.2](#)).

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Header																															
PrinterId																															
Flags																															

**Header (4 bytes):** The common message header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.1). The **Component** field MUST be set to RDPDR\_CTYP\_PRN and the **PacketId** field MUST be set to PAKID\_PRN\_USING\_XPS.

**PrinterId (4 bytes):** A 32-bit unsigned integer. This message is handled by the Print Virtual Channel Extension only if the **PrinterId** field matches the previously established **DeviceId** field for a printer device, see [\[MS-RDPEFS\]](#) section 3.1.1.

**Flags (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.

### 2.2.2.3 Add Printer Cachedata (DR\_PRN\_ADD\_CACHEDATA)

This message is sent from the server to the client when a printer queue is created manually on the redirected port (port redirection is explained in [\[MS-RDPESP\]](#) on the server).

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Header																															
EventId																															
PortDosName																															
...																															
PnPNameLen																															
DriverNameLen																															
PrintNameLen																															
CachedFieldsLen																															
PnPName (variable)																															
...																															
DriverName (variable)																															
...																															
PrinterName (variable)																															
...																															
CachedPrinterConfigData (variable)																															
...																															

**Header (4 bytes):** The common message header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.1). The **Component** field MUST be set to RDPDR\_CTYP\_PRN and the **PacketId** field MUST be set to PAKID\_PRN\_CACHE\_DATA.

**EventId (4 bytes):** A SERVER\_PRINTER\_CACHE\_EVENT (section [2.2.1.1](#)) packet. The **cachedata** field MUST be set to RDPDR\_ADD\_PRINTER\_EVENT (0x00000001).

**PortDosName (8 bytes):** A string of ASCII characters with a maximum length of 8 characters that represent the name of the device as it appears on the client. This field might not be null-terminated.

**PnPNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **PnPName** field, including its null terminator.

**DriverNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **DriverName** field, including its null terminator.

**PrintNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **PrintName** field, including its null terminator.

**CachedFieldsLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **CachedPrinterConfigData** field.

**PnPName (variable):** A null-terminated Unicode string. This field can be set to any valid Unicode string, and MUST be ignored on receipt.

**DriverName (variable):** A null-terminated Unicode string. This string specifies the printer driver name that is associated with the printer configuration data.

**PrinterName (variable):** A null-terminated Unicode string that specifies the client printer, which was sent for this configuration data message.

**CachedPrinterConfigData (variable):** A variable-length array of bytes. This field is a BLOB of data that describes the cached printer configuration (see section [3.1.1.1](#)).

#### 2.2.2.4 Update Printer Cachedata (DR\_PRN\_UPDATE\_CACHEDATA)

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
Header																															
EventId																															
PrinterNameLen																															
ConfigDataLen																															
PrinterName (variable)																															
...																															
CachedPrinterConfigData (variable)																															
...																															

**Header (4 bytes):** The common message header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.1). The **Component** field MUST be set to RDPDR\_CTYP\_PRN and the **PacketId** field MUST be set to PAKID\_PRN\_CACHE\_DATA.

**EventId (4 bytes):** A SERVER\_PRINTER\_CACHE\_EVENT (section [2.2.1.1](#)) event. The **cachedata** field MUST be set to RDPDR\_UPDATE\_PRINTER\_EVENT (0x00000002).

**PrinterNameLen (4 bytes):** A 32-bit unsigned integer specifying the number of bytes in the **PrinterName** field, including its null terminator.

**ConfigDataLen (4 bytes):** A 32-bit unsigned integer specifying the number of bytes in the **CachedPrinterConfigData** field.

**PrinterName (variable):** A null-terminated Unicode string that specifies the printer, for which the updated printer configuration data is sent.

**CachedPrinterConfigData (variable):** A variable-length array of bytes. This field is a BLOB of data that describes the cached printer configuration (see section [3.1.1.1](#)).

#### 2.2.2.5 Delete Printer Cachedata (DR\_PRN\_DELETE\_CACHEDATA)

This message is sent by the server when a manually created printer on the redirected port is deleted.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Header																															
EventId																															
PrinterNameLen																															
PrinterName (variable)																															
...																															

**Header (4 bytes):** The common message header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.1). The **Component** field MUST be set to RDPDR\_CTYP\_PRN and the **PacketId** field MUST be set to PAKID\_PRN\_CACHE\_DATA.

**EventId (4 bytes):** A SERVER\_PRINTER\_CACHE\_EVENT (section [2.2.1.1](#)) event. The **cachedata** field MUST be set to RDPDR\_DELETE\_PRINTER\_EVENT (0x00000003).

**PrinterNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **PrinterName** field, including its null terminator.

**PrinterName (variable):** A null-terminated Unicode string that specifies the printer that was deleted.

## 2.2.2.6 Rename Printer Cachedata (DR\_PRN\_RENAME\_CACHEDATA)

This message is sent by the server when the user renames a redirected printer.



0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Header																															
EventId																															
OldPrinterNameLen																															
NewPrinterNameLen																															
OldPrinterName (variable)																															
...																															
NewPrinterName (variable)																															
...																															

**Header (4 bytes):** The common message header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.1). The **Component** field MUST be set to RDPDR\_CTYP\_PRN and the **PacketId** field MUST be set to PAKID\_PRN\_CACHE\_DATA.

**EventId (4 bytes):** A SERVER\_PRINTER\_CACHE\_EVENT (section [2.2.1.1](#)) event. The **cachedata** field MUST be set to RDPDR\_RENAME\_PRINTER\_EVENT (0x00000004).

**OldPrinterNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **OldPrinterName** field, including its null terminator.

**NewPrinterNameLen (4 bytes):** A 32-bit unsigned integer that specifies the number of bytes in the **NewPrinterName** field, including its null terminator.

**OldPrinterName (variable):** A null-terminated Unicode string that specifies the printer name before the rename operation.

**NewPrinterName (variable):** A null-terminated Unicode string that specifies the printer name after the rename operation.

### 2.2.2.7 Server Create Request (DR\_PRN\_CREATE\_REQ)

This message is sent by the server to request the opening of the client printer queue and to prepare for receiving print data.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceIoRequest																															
...																															
...																															
...																															
...																															
DesiredAccess																															
AllocationSize																															
...																															
FileAttributes																															
SharedAccess																															
Disposition																															
CreateOptions																															
PathLength																															

**DeviceIoRequest (24 bytes):** A DR\_DEVICE\_IOREQUEST header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.4).

The **MajorFunction** in this header MUST be set to IRP\_MJ\_CREATE.

This message is handled by the Print Virtual Channel Extension only if the **DeviceId** field matches the previously established **DeviceId** for a printer device, see [\[MS-RDPEFS\]](#) section 3.1.1.

**DesiredAccess (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.

**AllocationSize (8 bytes):** A 64-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.

- FileAttributes (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.
- SharedAccess (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.
- Disposition (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.
- CreateOptions (4 bytes):** A 32-bit unsigned integer. Unused. This field can contain any value and MUST be ignored upon receipt.
- PathLength (4 bytes):** A 32-bit unsigned integer. This field MUST be set to 0 for the printer devices.

### 2.2.2.8 Server Printer Close Request (DR\_PRN\_CLOSE\_REQ)

This message is sent by the server to request the closing of the printer queue that was previously created by a DR\_PRN\_CREATE\_REQ (section [2.2.2.7](#)).

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceCloseRequest																															
...																															
...																															
...																															
...																															
...																															
...																															
(DeviceCloseRequest cont'd for 6 rows)																															

**DeviceCloseRequest (56 bytes):** A DR\_CLOSE\_REQ message (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.4.2). This request closes a printer opened by DR\_PRN\_CREATE\_REQ (section [2.2.2.7](#)).

### 2.2.2.9 Server Printer Write Request (DR\_PRN\_WRITE\_REQ)

This message is sent from the server to send the print data to the client printer.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceWriteRequest (variable)																															
...																															

**DeviceWriteRequest (variable):** A DR\_WRITE\_REQ request (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.4.4). The **Offset** field of this request is unused and reserved for future use. The **Offset** field can contain any value, and MUST be ignored upon receipt.

The actual print data follows the packet. The data could be in either **PRN file** format or in **XPS file** format.

#### 2.2.2.10 Client Printer Create Response (DR\_PRN\_CREATE\_RSP)

The client responds to the [DR\\_PRN\\_CREATE\\_REQ](#) with this message.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceIoReply																															
...																															
...																															
...																															
FileId																															

**DeviceIoReply (16 bytes):** A DR\_DEVICE\_IOCOMPLETION header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5). The **CompletionId** field of this header MUST match a Device I/O Request message that had the **MajorFunction** field set to IRP\_MJ\_CREATE.

**FileId (4 bytes):** A 32-bit unsigned integer that specifies a unique ID that identifies the created file object. The ID can be reused after sending a Device Close Response (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5.2).

#### 2.2.2.11 Client Printer Close Response (DR\_PRN\_CLOSE\_RSP)

The client responds to the [DR\\_PRN\\_CLOSE\\_REQ](#) with this message.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceIoReply																															
...																															
...																															
...																															
Padding																															

**DeviceIoReply (16 bytes):** A DR\_DEVICE\_IOCOMPLETION header (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5). The **CompletionId** field of this header MUST match a Device I/O Request message that had the **MajorFunction** field set to IRP\_MJ\_CLOSE.

**Padding (4 bytes):** An array of 4 bytes. This field is reserved for future use.

## 2.2.2.12 Client Printer Write Response (DR\_PRN\_WRITE\_RSP)

The client responds to the [DR\\_PRN\\_WRITE\\_REQ](#) with this message.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DeviceWriteRsp																															
...																															
...																															
...																															
...																															
...																															

**DeviceWriteRsp (21 bytes):** A DR\_WRITE\_RSP request (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5.4). The **Length** field of this response is equal to the **Length** field of the Write Request (as specified in [\[MS-RDPEFS\]](#) section 2.2.3.3.4).

## 3 Protocol Details

The following sections specify protocol details, including abstract data models and message processing rules.

### 3.1 Common Details

#### 3.1.1 Abstract Data Model

This section describes a conceptual model of possible data organization that an implementation maintains to participate in this protocol. The organization is provided to explain how the protocol behaves. This document does not mandate that implementations adhere to this model as long as their external behavior is consistent with that described in this document.

The Remote Desktop Protocol: Print Virtual Channel Extension follows the abstract data model specified in [\[MS-RDPEFS\]](#) section 3.1.1. The following abstract entities are specific to this protocol.

##### 3.1.1.1 Cached Printer Config Data

Printer drivers store default printing preferences for each printer. The format of these preferences is driver-specific. For the redirected printers, when a user modifies printing preferences on the server side, these modified printing preferences are sent back to the client and are cached there. When such a printer is redirected again, this cached data is sent by the client to the server along with other printer information.

The cached configuration information SHOULD be treated as an opaque data BLOB by the client. The client SHOULD treat the printer name and data BLOB pairs as records in a database. The server sends packets to the client to add, rename, delete or update the printer name or the data BLOB of an existing record.

##### 3.1.1.2 XPS Mode

When a client redirects printers, it adds a special flag (RDPDR\_PRINTER\_ANNOUNCE\_FLAG\_XPSFORMAT) if the client can handle the XPS format for the given printer. For these printers, the server can choose to use either the XPS format or the printer driver-specific format. The server MUST notify the client with the message [DR\\_PRN\\_USING\\_XPS \(section 2.2.2.2\)](#) if it chooses to use the XPS format. When this type of message is received, the client marks the printer in XPS mode.

### 3.1.2 Timers

No common timers are used.

### 3.1.3 Initialization

The Print Virtual Channel Extension protocol must be initialized before the printer can be redirected.

### 3.1.4 Higher-Layer Triggered Events

No higher-layer triggered events are used.

### 3.1.5 Message Processing Events and Sequencing Rules

The common message processing events and rules that are described in [\[MS-RDPEFS\]](#) section 3.1.5 apply to this protocol. For client- and server-specific message processing, see sections [3.2.5](#) and [3.3.5](#).

### 3.1.6 Timer Events

No common timer events are used.

### 3.1.7 Other Local Events

There are no common local events.

## 3.2 Client Details

### 3.2.1 Abstract Data Model

The abstract data model is specified in section [3.1.1](#).

### 3.2.2 Timers

No timers are used.

### 3.2.3 Initialization

Initialization is specified in section [3.1.3](#).

### 3.2.4 Higher-Layer Triggered Events

No client higher-layer triggered events are used.

### 3.2.5 Message Processing Events and Sequencing Rules

#### 3.2.5.1 Printer Redirection Messages

##### 3.2.5.1.1 Sending a Client Device List Announce Request Message

After the [Remote Desktop Protocol: File System Virtual Channel Extension](#) completes its initialization, the client sends a DR\_DEVICELIST\_ANNOUNCE\_REQ message to the server with information for various devices. This message is specified in [\[MS-RDPEFS\]](#) section 2.2.2.9. The Print Virtual Channel Extension prepares the printer device information that goes into this packet. The printer-specific structure is specified in section [2.2.2.1](#).

The printer redirection extension enumerates the printer queues and manually configured printers (**manual printer redirection**) and determines the devices to be redirected. For each printer, the client collects the following information and prepares DR\_PRN\_DEVICE\_ANNOUNCE (section [2.2.2.1](#)) packet. This packet contains:

1. Name of the printer queue assigned by the user.
2. Name of the printer driver assigned by the driver manufacturer.
3. Various flags associated with the printer.

4. Printer cache data, if this data exists. See section [3.1.1.1](#).

#### **3.2.5.1.2 Processing a Printer Set XPS Mode Message**

This message MUST be received only for the printers that were marked with `RDPDR_PRINTER_ANNOUNCE_FLAG_XPSFORMAT`. When a server chooses to use an XPS driver for the redirected printer, it notifies the client using this message. The client MUST then mark the printer to be in XPS mode (see section [3.1.1.2](#)). When printer data arrives for these printers it MUST be treated as an XPS file and not a PRN file. For other printers, the I/O data should be treated as a PRN file.

#### **3.2.5.1.3 Processing an Add Printer Cachedata Message**

This message is received when a printer queue is manually installed on the server on the client's redirected port. The name of the port is stored in the **PortDosName** field. The client SHOULD store this manual printer configuration in its persistent storage, and SHOULD use this configuration to redirect the printer the next time the client connects to the same server.

#### **3.2.5.1.4 Processing an Update Printer Cachedata Message**

This message is received when the configuration information of a redirected printer queue is updated on the server. The client SHOULD store the updated **CachedPrinterConfigData** field (see section [3.1.1.1](#)) and SHOULD use it when redirecting the printer next time.

#### **3.2.5.1.5 Processing a Delete Printer Cachedata Message**

This message is received when a redirected printer queue is deleted by the server. The client SHOULD delete the cached configuration data previously stored for this printer.

#### **3.2.5.1.6 Processing a Rename Printer Cachedata Message**

This message is received when the user renames the redirected printer on the server. The client SHOULD modify its local cached data for this printer to reflect this change, and the client SHOULD rename the local printer queue.

#### **3.2.5.1.7 Processing a Create Request Message**

When the server starts a print job on a redirected printer, before sending the actual printing data it sends a create request. The client MUST prepare the printer specified by the **DeviceId** field to receive the printer output.

#### **3.2.5.1.8 Processing a Close Request Message**

When the server finishes sending a print job to a redirected printer, it sends a close request. The client SHOULD end the printing process initiated when the create request was made.

#### **3.2.5.1.9 Processing a Write Request Message**

Multiple write requests are received along with the printing data. These write requests are sent between create and close requests. The client should send the data associated with the write requests to the corresponding printer queue. The format of this data could be either printer driver-specific (non-XPS mode) or XPS format (XPS mode).



### 3.2.5.1.10 Sending a Printer Create Response Message

The client MUST fill out the various members of the DR\_DEVICE\_IOCTLCOMPLETION message (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5) as follows:

For the RDPDR\_HEADER:

- The **Component** field MUST be set to RDPDR\_CTYP\_CORE.
- The **PacketId** field MUST be set to DR\_CORE\_DEVICE\_IOCTLCOMPLETION.

For the DR\_DEVICE\_IOCTLCOMPLETION header:

- The **CompletionId** field MUST be set to match the **CompletionId** field from the corresponding I/O Request (section [3.2.5.1.7](#)).
- The **DeviceId** field MUST be set to match the corresponding **DeviceId** field from the I/O request.
- The **IoStatus** field MUST be set to the NTSTATUS indicating the result of the operation.

### 3.2.5.1.11 Sending a Printer Close Response Message

The client MUST fill out the various members of the DR\_DEVICE\_IOCTLCOMPLETION message (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5) as follows:

For the RDPDR\_HEADER:

- The **Component** field MUST be set to RDPDR\_CTYP\_CORE.
- The **PacketId** field MUST be set to DR\_CORE\_DEVICE\_IOCTLCOMPLETION.

For the DR\_DEVICE\_IOCTLCOMPLETION header:

- The **CompletionId** field MUST be set to match the **CompletionId** field from the corresponding I/O Request (section [3.2.5.1.8](#)).
- The **DeviceId** MUST be set to match the corresponding **DeviceId** from the I/O request.
- The **IoStatus** field MUST be set to the NTSTATUS indicating the result of the operation.

### 3.2.5.1.12 Sending a Printer Write Response Message

The client MUST fill out the various members of the DR\_DEVICE\_IOCTLCOMPLETION message (as specified in [\[MS-RDPEFS\]](#) section 2.2.1.5) as follows:

For the RDPDR\_HEADER:

- The **Component** field MUST be set to RDPDR\_CTYP\_CORE.
- The **PacketId** field MUST be set to DR\_CORE\_DEVICE\_IOCTLCOMPLETION.

For the DR\_DEVICE\_IOCTLCOMPLETION header:

- The **CompletionId** field MUST be set to match the **CompletionId** field from the corresponding IO Request (section [3.2.5.1.9](#)).
- The **DeviceId** field MUST be set to match the corresponding **DeviceId** field from the IO request.

- The **IoStatus** field MUST be set to the NTSTATUS indicating the result of the operation.

The client MUST set the **Length** field of DR\_WRITE\_RSP (see [\[MS-RDPEFS\]](#) section 2.2.1.5.4) to the bytes written successfully to the printer device.

### 3.2.6 Timer Events

No timer events are used.

### 3.2.7 Other Local Events

There are no other local events.

## 3.3 Server Details

### 3.3.1 Abstract Data Model

The abstract data model is specified in section [3.1.1](#).

### 3.3.2 Timers

No timers are used.

### 3.3.3 Initialization

Initialization is specified in section [3.1.3](#).

### 3.3.4 Higher-Layer Triggered Events

The server sends various messages to the client in response to the following application and user-driven events:

- When a printer is installed manually for the redirected port, the server sends an add printer cachedata message to the client (see section [3.3.5.1.3](#)).
- When the user modifies the redirected printer queue configuration, the server sends an update printer cachedata message to the client (see section [3.3.5.1.4](#)).
- When the user deletes the redirected printer queue, the server sends a delete printer cachedata message to the client (see section [3.3.5.1.5](#)).
- When the user renames the redirected printer queue, the server sends a rename printer cachedata message to the client (see section [3.3.5.1.6](#)).
- When an application running on the server opens the redirected printer queue for printing, the server sends a printer create request to the client (see section [3.3.5.1.7](#)).
- When an application running on the server closes the redirected printer queue, the server sends a printer close request to the client (see section [3.3.5.1.8](#)).
- When an application running on the server sends data to the redirected printer queue for printing, the server sends printer write requests to the client (see section [3.3.5.1.9](#)).

## 3.3.5 Message Processing Events and Sequencing Rules

### 3.3.5.1 Printer Redirection Messages

#### 3.3.5.1.1 Processing a Client Device List Announce Request Message

After receiving a [Client Device List Announce Request \(section 2.2.2.1\)](#), the server creates a pseudo printer queue to represent each client-side printer device. The server **MUST** use the appropriate driver for this redirected printer queue. The server **SHOULD** use a pseudo driver that produces XPS-format output if the `RDPDR_PRINTER_ANNOUNCE_FLAG_XPSFORMAT` flag is supplied for the device. If this flag is not supplied, the server **SHOULD** use the **DriverName** field specified in this message to choose the appropriate printer driver on the server. If this message contains a **CachedPrinterConfigData** field, the server **SHOULD** use the information contained to configure the instance of the printer queue. The server **SHOULD** use the **PrinterName** field specified in the message to generate the name for the redirected printer queue.

#### 3.3.5.1.2 Sending a Printer Set XPS Mode Message

If the client printer supports XPS format, it indicates this support using the `RDPDR_PRINTER_ANNOUNCE_FLAG_XPSFORMAT` flag when redirecting this printer (see section [2.2.2.1](#)). For these redirected printers, the server can choose to send print job output in XPS format. If the server chooses to send print data in XPS format, then the server **MUST** send this message to the client prior to sending any data in the write request messages (section [2.2.2.1](#)).

#### 3.3.5.1.3 Sending an Add Printer Cachedata Message

When a user manually installs a printer driver for the redirected port, the server collects the configuration data for such a printer queue and sends it to the client using this message.

#### 3.3.5.1.4 Sending an Update Printer Cachedata Message

When a user modifies the configuration data, such as the printing preferences for the redirected printer queue, the server sends this message along with the configuration data to inform the client.

#### 3.3.5.1.5 Sending Delete Printer Cachedata

When a user deletes the printer queue, the server sends this message to the client.

#### 3.3.5.1.6 Sending a Rename Printer Cachedata Message

When a user manually renames the redirected printer queue, the server sends this message to the client specifying old and new printer names.

#### 3.3.5.1.7 Sending a Printer Create Request Message

When a server application starts printing to the redirected printer queue, the server **MUST** send this message to the client before sending any printer data so that the client can prepare for receiving printer data.

#### 3.3.5.1.8 Sending a Printer Close Request Message

When the server application is done with a printing job, the server **MUST** send this message to the client.

#### **3.3.5.1.9 Sending a Printer Write Request Message**

As a server application prints to the redirected printer queue, the server **MUST** send the printer job data to the client. A print job can be distributed over multiple write requests. This message **SHOULD** be sent only after the [DR\\_PRN\\_CREATE\\_RSP \(section 2.2.2.10\)](#) message is received.

#### **3.3.5.1.10 Processing a Printer Create Response Message**

The server **SHOULD** inspect the result of the printer create operation and abort/fail the printer operation if the create request failed.

#### **3.3.5.1.11 Processing a Printer Close Response Message**

The server **SHOULD** ignore this message.

#### **3.3.5.1.12 Processing a Printer Write Response Message**

The server **SHOULD** inspect the amount of data written and send the next packet of data if there are any packets remaining.

### **3.3.6 Timer Events**

There are no timer events used.

### **3.3.7 Other Local Events**

There are no other local events.

## 4 Protocol Examples

The following sections describe several operations used in common scenarios that illustrate the function of the Print Virtual Channel Extension.

### 4.1 Annotations for Printer Redirection

#### 4.1.1 Client Printer Device (DR\_PRN\_DEVICE\_ANNOUNCE)

The client sends this message to the server to indicate the list of printers that it wants to redirect.

```
Channel Name = RDPDR, 264, Client to server
00000000 72 44 41 44 03 00 00 00 04 00 00 00 04 00 00 00
00000010 50 52 4e 34 00 00 00 00 50 00 00 00 10 00 00 00
00000020 00 00 00 00 00 00 00 00 1c 00 00 00 1c 00 00 00
00000030 00 00 00 00 41 00 70 00 6f 00 6c 00 6c 00 6f 00
00000040 20 00 50 00 2d 00 31 00 32 00 30 00 30 00 00 00
00000050 41 00 70 00 6f 00 6c 00 6c 00 6f 00 20 00 50 00
00000060 2d 00 31 00 32 00 30 00 30 00 00 00 04 00 00 00
00000070 03 00 00 00 50 52 4e 33 00 00 00 00 74 00 00 00
00000080 12 00 00 00 00 00 00 00 00 00 00 00 2e 00 00 00
00000090 2e 00 00 00 00 00 00 00 43 00 61 00 6e 00 6f 00
000000a0 6e 00 20 00 42 00 75 00 62 00 62 00 6c 00 65 00
000000b0 2d 00 4a 00 65 00 74 00 20 00 42 00 4a 00 2d 00
000000c0 33 00 30 00 00 00 43 00 61 00 6e 00 6f 00 6e 00
000000d0 20 00 42 00 75 00 62 00 62 00 6c 00 65 00 2d 00
000000e0 4a 00 65 00 74 00 20 00 42 00 4a 00 2d 00 33 00
000000f0 30 00 00 00 02 00 00 00 02 00 00 00 4c 50 54 31
00000100 00 00 00 00 00 00 00 00

72 44          -> RDPDR CTYP CORE                      = 0x4472
41 44          -> PAKID CORE DEVICELIST ANNOUNCE        = 0x4441
03 00 00 00    -> DeviceCount                          = 0x00000003
04 00 00 00    -> DeviceType (RDPDR_DTYP_PRINT)         = 0x00000004
04 00 00 00    -> DeviceId                              = 0x00000004
50 52 4e 34 00 00 00 00 -> PreferredDosName (8 characters)
50 00 00 00    -> DeviceDataLength                      = 0x00000050
10 00 00 00    -> Flags (RDPDR PRINTER ANNOUNCE FLAG XPSFORMAT)
= 0x00000010
00 00 00 00    -> CodePage                              = 0x00000000
00 00 00 00    -> PnpNameLen                          = 0x00000000
1c 00 00 00    -> DriverNameLen                        = 0x0000001c
1c 00 00 00    -> PrinterNameLen                      = 0x0000001c
00 00 00 00    -> CachedFieldsLen                     = 0x00000000
41 00 70 00 6f 00 6c 00 6c 00 6f 00 20 00 50 00 2d 00 31 00 32 00 30 00 30 00 00 00
                                -> DriverName (28 bytes)
41 00 70 00 6f 00 6c 00 6c 00 6f 00 20 00 50 00 2d 00 31 00 32 00 30 00 30 00 00 00
                                -> PrinterName (28 bytes)

04 00 00 00    -> DeviceType (RDPDR DTYP PRINT)         = 0x00000004
03 00 00 00    -> DeviceId                              = 0x00000003
50 52 4e 33 00 00 00 00 -> PreferredDosName (8 characters)
74 00 00 00    -> DeviceDataLength                      = 0x00000074
12 00 00 00    -> Flags (RDPDR PRINTER ANNOUNCE FLAG DEFAULTPRINTER |
RDPDR PRINTER ANNOUNCE FLAG XPSFORMAT)                =
0x00000012
00 00 00 00    -> CodePage                              = 0x00000000
00 00 00 00    -> PnpNameLen                          = 0x00000000
2e 00 00 00    -> DriverNameLen                        = 0x0000002e
2e 00 00 00    -> PrinterNameLen                      = 0x0000002e
00 00 00 00    -> CachedFieldsLen                     = 0x00000000
```

```

43 00 61 00 6e 00 6f 00 6e 00 20 00 42 00 75 00 62 00 62 00 6c 00 65 00 2d 00
4a 00 65 00 74 00 20 00 42 00 4a 00 2d 00 33 00 30 00 00 00
    -> DriverName (46 bytes)
43 00 61 00 6e 00 6f 00 6e 00 20 00 42 00 75 00 62 00 62 00 6c 00 65 00 2d 00
4a 00 65 00 74 00 20 00 42 00 4a 00 2d 00 33 00 30 00 00 00
    -> PrinterName (46 bytes)

02 00 00 00          -> DeviceType (RDPDR_DTYP_PARALLEL)      = 0x00000002
02 00 00 00          -> DeviceId                               = 0x00000002
4c 50 54 31 00 00 00 00 -> PreferredDosName (8 characters)      = 0x00000000
00 00 00 00          -> DeviceDataLength                     = 0x00000000

```

#### 4.1.2 Server Printer Set XPS Mode (DR\_PRN\_USING\_XPS)

When the server decides to use the XPS format for the output, it sends this message to prepare the client.

```

Channel Name = RDPDR, 12, Server to client
00000000 52 50 43 55 01 00 00 00 f8 5b fa 7f

52 50          -> RDPDR_CTYP_PRN          = 0x5052
43 55          -> PAKID_PRN_USING_XPS     = 0x5543
01 00 00 00    -> PrinterId               = 0x00000001
f8 5b fa 7f    -> Flags                   = 0x7ffa5bf8

```

#### 4.1.3 Add Printer Cachedata (DR\_PRN\_ADD\_CACHEDATA)

When a printer is manually installed on the redirected port, the server sends this message to allow the client an opportunity to cache the configuration.

```

Channel Name = RDPDR, 116, Server to client
00000000 52 50 43 50 01 00 00 00 43 4f 4d 32 00 00 3a 00
00000010 00 00 00 00 2a 00 00 00 2a 00 00 00 00 00 00 00
00000020 42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00
00000030 44 00 43 00 50 00 2d 00 31 00 30 00 30 00 30 00
00000040 20 00 55 00 53 00 42 00 00 00 42 00 72 00 6f 00
00000050 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50 00
00000060 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00
00000070 42 00 00 00

52 50          -> RDPDR CTYP PRN          = 0x5052
43 50          -> PAKID PRN CACHE DATA    = 0x5043
01 00 00 00    -> RDPDR ADD PRINTER EVENT  = 0x00000001
43 4f 4d 32 00 00 3a 00 -> PortDosName (64 bits)
00 00 00 00    -> PnPNameLen                = 0x00000000
2a 00 00 00    -> DriverNameLen            = 0x0000002a
2a 00 00 00    -> PrintNameLen            = 0x0000002a
00 00 00 00    -> CachedFieldsLen          = 0x00000000
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00 42 00 00 00
    -> DriverName (variable - 42 bytes)
    = "Brother DCP-1000 USB"
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00 42 00 00 00
    -> PrinterName (variable - 42 bytes)
    = "Brother DCP-1000 USB"

```

#### 4.1.4 Update Printer Cachedata (DR\_PRN\_UPDATE\_CACHEDATA)

When printing preferences or other configuration settings are modified on the server for a redirected printer, the server notifies the client with the configuration data.

```
Channel Name = RDPDR, 16330, Server to client
00000000 52 50 43 50 02 00 00 00 2a 00 00 00 90 3f 00 00
00000010 42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00
00000020 44 00 43 00 50 00 2d 00 31 00 30 00 30 00 30 00
00000030 20 00 55 00 53 00 42 00 00 00 48 00 00 00 00 00
00000040 00 00 94 20 00 00 00 00 00 00 37 00 00 00 00 00

52 50          -> RDPDR_CTYP_PRN          = 0x5052
43 50          -> PAKID_PRN_CACHE_DATA    = 0x5043
02 00 00 00    -> RDPDR_UPDATE_PRINTER_EVENT = 0x00000002
2a 00 00 00    -> PrinterNameLen          = 0x0000003a
90 3f 00 00    -> ConfigDataLen          = 0x000039e4
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00 42 00 00 00
                    -> PrinterName (42 bytes)
                        = "Brother DCP-1000 USB"
48 00 00 00 00 00 ... -> ConfigData (variable)
```

#### 4.1.5 Delete Printer Cachedata (DR\_PRN\_DELETE\_CACHEDATA)

The redirected printer was deleted manually.

```
Channel Name = RDPDR, 54, Server to client
00000000 52 50 43 50 03 00 00 00 2a 00 00 00 42 00 72 00
00000010 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00
00000020 50 00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00
00000030 53 00 42 00 00 00

52 50          -> RDPDR CTYP PRN          = 0x5052
43 50          -> PAKID PRN CACHE DATA    = 0x5043
03 00 00 00    -> RDPDR DELETE PRINTER EVENT
                        = 0x00000003
2a 00 00 00    -> PrinterNameLen          = 0x0000002a
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 20 00 55 00 53 00 42 00 00 00
                    -> PrinterName (42 bytes)
                        = "Brother DCP-1000 USB"
```

#### 4.1.6 Rename Printer Cachedata (DR\_PRN\_RENAME\_CACHEDATA)

The redirected printer was renamed.

```
Channel Name = RDPDR, 120, Server to client
00000000 52 50 43 50 04 00 00 00 2a 00 00 00 3e 00 00 00
00000010 42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00
00000020 44 00 43 00 50 00 2d 00 31 00 30 00 30 00 30 00
00000030 20 00 55 00 53 00 42 00 00 00 42 00 72 00 6f 00
00000040 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50 00
00000050 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00
00000060 42 00 20 00 28 00 72 00 65 00 6e 00 61 00 6d 00
00000070 65 00 64 00 29 00 00 00
```

```

52 50          -> RDPDR_CTYP_PRN          = 0x5052
43 50          -> PAKID_PRN_CACHE_DATA    = 0x5043
04 00 00 00    -> RDPDR_RENAME_PRINTER_EVENT
                  = 0x00000004

2a 00 00 00    -> OldPrinterNameLen        = 0x0000002a
3e 00 00 00    -> NewPrinterNameLen      = 0x0000003e
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00 42 00 00 00
                  -> OldPrinterName (42 bytes)
                      = "Brother DCP-1000 USB"
42 00 72 00 6f 00 74 00 68 00 65 00 72 00 20 00 44 00 43 00 50
00 2d 00 31 00 30 00 30 00 30 00 20 00 55 00 53 00 42 00 20 00
28 00 72 00 65 00 6e 00 61 00 6d 00 65 00 64 00 29 00 00 00
                  -> NewPrinterName (62 bytes)
                      = "Brother DCP-1000 USB (renamed)"

```

#### 4.1.7 Server Printer Create Request (DR\_PRN\_CREATE\_REQ)

The server sends a create request before starting a print job.

```

Channel Name = RDPDR, 56, Server to client
00000000 72 44 52 49 02 00 00 00 00 00 00 00 00 00 00 00
00000010 00 00 00 00 00 00 00 00 9f 01 12 00 00 00 00 00
00000020 00 00 00 00 00 00 00 00 03 00 00 00 01 00 00 00
00000030 40 00 00 00 00 00 00 00

72 44          -> RDPDR_CTYP_CORE          = 0x4472
52 49          -> PAKID_CORE_DEVICE_IOREQUEST = 0x4952
02 00 00 00    -> DeviceId                  = 0x00000002
00 00 00 00    -> FileId                    = 0x00000000
00 00 00 00    -> CompletionId              = 0x00000000
00 00 00 00    -> MajorFunction (IRP_MJ_CREATE) = 0x00000000
00 00 00 00    -> MinorFunction              = 0x00000000
9f 01 12 00    -> DesiredAccess              = 0x0012019f
00 00 00 00 00 00 00 00 -> AllocationSize (8 bytes)
00 00 00 00    -> FileAttributes              = 0x00000000
03 00 00 00    -> SharedAccess                = 0x00000003
01 00 00 00    -> Disposition                = 0x00000001
40 00 00 00    -> CreateOptions              = 0x00000004
00 00 00 00    -> PathLength                = 0x00000000

```

#### 4.1.8 Server Printer Close Request (DR\_PRN\_CLOSE\_REQ)

The server sends close message when it finishes sending print job.

```

Channel Name = RDPDR, 56, Server to client
00000000 72 44 52 49 02 00 00 00 00 00 00 00 00 00 00 00
00000010 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000030 00 00 00 00 00 00 00 00

72 44          -> RDPDR_CTYP_CORE          = 0x4472
52 49          -> PAKID_CORE_DEVICE_IOREQUEST = 0x4952
02 00 00 00    -> DeviceId                  = 0x00000002
00 00 00 00    -> FileId                    = 0x00000000
00 00 00 00    -> CompletionId              = 0x00000000
02 00 00 00    -> MajorFunction (IRP_MJ_CLOSE) = 0x00000002

```



```

00 00 00 00      -> MinorFunction          = 0x00000000
00 00 .....      -> Padding (32 bytes)

```

#### 4.1.9 Server Printer Write Request (DR\_PRN\_WRITE\_REQ)

The server sends multiple write requests to send the print job to the client.

```

Channel Name = RDPDR, 65592, Server to client
00000000 72 44 52 49 02 00 00 00 00 00 00 00 00 00 00 00
00000010 04 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00
00000020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000030 00 00 00 00 00 00 00 00 .....

72 44          -> RDPDR_CTYP_CORE          = 0x4472
52 49          -> PAKID_CORE_DEVICE_IOREQUEST = 0x4952
02 00 00 00    -> DeviceId                  = 0x00000002
00 00 00 00    -> FileId                    = 0x00000000
00 00 00 00    -> CompletionId              = 0x00000000
04 00 00 00    -> MajorFunction (IRP MJ WRITE) = 0x00000004
00 00 00 00    -> MinorFunction              = 0x00000000
00 00 01 00    -> Length                    = 0x00010000
00 00 00 00 00 00 00 00 -> Offset (8 bytes)
00 00 ....      -> Padding (20 bytes)

(skipped)

```

#### 4.1.10 Client Printer Create Response (DR\_PRN\_CREATE\_RSP)

The client responds with the create request from the server.

```

Channel Name = RDPDR, 20, Client to server
00000000 72 44 43 49 02 00 00 00 00 00 00 00 00 00 00 00
00000010 00 00 00 00

72 44          -> RDPDR CTYP CORE          = 0x4472
43 49          -> PAKID CORE DEVICE IOCOMPLETION = 0x4943
02 00 00 00    -> DeviceId                  = 0x00000002
00 00 00 00    -> CompletionId              = 0x00000000
00 00 00 00    -> IoStatus                  = 0x00000000
00 00 00 00    -> FileId                    = 0x00000000

```

#### 4.1.11 Client Printer Close Response (DR\_PRN\_CLOSE\_RSP)

The client responds to the close request.

```

Channel Name = RDPDR, 20, Client to server
00000000 72 44 43 49 02 00 00 00 00 00 00 00 00 00 00 00
00000010 00 00 00 00

72 44          -> RDPDR CTYP CORE          = 0x4472
43 49          -> PAKID_CORE_DEVICE_IOCOMPLETION = 0x4943
02 00 00 00    -> DeviceId                  = 0x00000002
00 00 00 00    -> CompletionId              = 0x00000000
00 00 00 00    -> IoStatus                  = 0x00000000

```

00 00 00 00                   -> Padding                   = 0x00000000

#### 4.1.12 Client Printer Write Response (DR\_PRN\_WRITE\_RSP)

The client responds to the write request.

Channel Name = RDPDR, 21, Client to server  
00000000 72 44 43 49 02 00 00 00 00 00 00 00 00 00 00 00  
00000010 00 00 01 00 00

72 44	-> RDPDR CTYP CORE	= 0x4472
43 49	-> PAKID CORE DEVICE IOCOMPLETION	= 0x4943
02 00 00 00	-> DeviceId	= 0x00000002
00 00 00 00	-> CompletionId	= 0x00000000
00 00 00 00	-> IoStatus	= 0x00000000
00 00 01 00	-> Length	= 0x00010000

## 5 Security

The following sections specify security considerations for implementers of the Print Virtual Channel Extension.

### 5.1 Security Considerations for Implementers

There are no security considerations for Print Virtual Channel Extension.

### 5.2 Index of Security Parameters

There are no security parameters in the Remote Desktop Protocol: Print Virtual Channel Extension.

## 6 Appendix A: Windows Behavior

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

- Windows Server 2008
- Windows Vista
- Windows Server 2003
- Windows XP
- Windows 2000

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 2.2.2.1:](#) Windows Server looks at the driver name specified by the client, and performs an exact ASCII string comparison to find the matching printer driver on the server. The matching printer driver might not be available on the server for various reasons. If the matching printer driver is not available, the server cannot reliably load an appropriate printer driver, and it fails to redirect the printer. This is an early design limitation, which was fixed for the Windows Server 2008. For printer redirection in the Windows Server 2008, XPS-based drivers are recommended. When a client supports the XPS format (that is, the RDPDR\_PRINTER\_ANNOUNCE\_FLAG\_XPSFORMAT flag is set in the [Client Device List Announce Request \(section 2.2.2.1\)](#) message), Windows implementations use the Terminal Server-specific XPS-capable printer driver, and ignore the **DriverName** field.

## 7 Index

### A

Abstract data model

client ([section 3.1.1](#), [section 3.2.1](#))

server ([section 3.1.1](#), [section 3.3.1](#))

[Add printer cachedata \(DR\\_PRN\\_ADD\\_CACHEDATA\)](#)

[Annotations - printer redirection overview](#)

[Applicability](#)

### C

[Cached printer config data](#)

[Capability negotiation](#)

Client

abstract data model ([section 3.1.1](#), [section 3.2.1](#))

higher-layer triggered events ([section 3.1.4](#), [section 3.2.4](#))

initialization ([section 3.1.3](#), [section 3.2.3](#))

local events ([section 3.1.7](#), [section 3.2.7](#))

message processing ([section 3.1.5](#), [section 3.2.5](#))

overview ([section 3.1](#), [section 3.2](#))

[printer redirection messages](#)

sequencing rules ([section 3.1.5](#), [section 3.2.5](#))

timer events ([section 3.1.6](#), [section 3.2.6](#))

timers ([section 3.1.2](#), [section 3.2.2](#))

Client printer

[close response \(DR\\_PRN\\_CLOSE\\_RSP\)](#)

[device \(DR\\_PRN\\_DEVICE\\_ANNOUNCE\)](#)

[write response \(DR\\_PRN\\_WRITE\\_RSP\)](#)

[Client printer create response \(DR\\_PRN\\_CREATE\\_RSP\)](#)

[Common data types](#)

### D

Data model - abstract

client ([section 3.1.1](#), [section 3.2.1](#))

server ([section 3.1.1](#), [section 3.3.1](#))

[Data types](#)

[Delete printer cachedata](#)

([DR\\_PRN\\_DELETE\\_CACHEDATA](#))

[DR\\_PRN\\_ADD\\_CACHEDATA](#)

[DR\\_PRN\\_ADD\\_CACHEDATA packet](#)

[DR\\_PRN\\_CLOSE\\_REQ](#)

[DR\\_PRN\\_CLOSE\\_REQ packet](#)

[DR\\_PRN\\_CLOSE\\_RSP](#)

[DR\\_PRN\\_CLOSE\\_RSP packet](#)

[DR\\_PRN\\_CREATE\\_REQ](#)

[DR\\_PRN\\_CREATE\\_REQ packet](#)

[DR\\_PRN\\_CREATE\\_RSP](#)

[DR\\_PRN\\_CREATE\\_RSP packet](#)

[DR\\_PRN\\_DELETE\\_CACHEDATA](#)

[DR\\_PRN\\_DELETE\\_CACHEDATA packet](#)

[DR\\_PRN\\_DEVICE\\_ANNOUNCE](#)

[DR\\_PRN\\_DEVICE\\_ANNOUNCE packet](#)

[DR\\_PRN\\_RENAME\\_CACHEDATA](#)

[DR\\_PRN\\_RENAME\\_CACHEDATA packet](#)

[DR\\_PRN\\_UPDATE\\_CACHEDATA](#)

[DR\\_PRN\\_UPDATE\\_CACHEDATA packet](#)

[DR\\_PRN\\_USING\\_XPS](#)

[DR\\_PRN\\_USING\\_XPS packet](#)

[DR\\_PRN\\_WRITE\\_REQ](#)

[DR\\_PRN\\_WRITE\\_REQ packet](#)

[DR\\_PRN\\_WRITE\\_RSP](#)

[DR\\_PRN\\_WRITE\\_RSP packet](#)

### E

[Examples - overview](#)

### F

[Fields - vendor-extensible](#)

### G

[Glossary](#)

### H

Higher-layer triggered events

client ([section 3.1.4](#), [section 3.2.4](#))

server ([section 3.1.4](#), [section 3.3.4](#))

### I

[Implementer - security considerations](#)

[Index of security parameters](#)

[Informative references](#)

Initialization

client ([section 3.1.3](#), [section 3.2.3](#))

server ([section 3.1.3](#), [section 3.3.3](#))

[Introduction](#)

### L

Local events

client ([section 3.1.7](#), [section 3.2.7](#))

server ([section 3.1.7](#), [section 3.3.7](#))

### M

Message processing

client ([section 3.1.5](#), [section 3.2.5](#))

server ([section 3.1.5](#), [section 3.3.5](#))

Messages

[data types](#)

[overview](#)

[printer redirection messages](#)

[syntax](#)

[transport](#)

### N

[Normative references](#)

## O

[Overview \(synopsis\)](#)

## P

[Parameters - security index](#)

[Preconditions](#)

[Prerequisites](#)

[Print Virtual Channel Extension](#)

[Printer redirection - overview of annotations](#)

[Printer redirection messages](#)

[Printer redirection messages - client](#)

[Printer redirection messages - server](#)

Processing message

[add printer cachedata](#)

[client device list announce request](#)

[close request](#)

[create request](#)

[delete printer cachedata](#)

[printer close response](#)

[printer create response](#)

[printer set XPS mode](#)

[printer write response](#)

[rename printer cachedata](#)

[update printer cachedata](#)

[write request](#)

## R

[RDPEFS - subprotocol within](#)

References

[informative](#)

[normative](#)

[overview](#)

[Relationship to other protocols](#)

[Rename printer cachedata](#)

[\(DR\\_PRN\\_RENAME\\_CACHEDATA\)](#)

## S

Security

[implementer considerations](#)

[overview](#)

[parameter index](#)

Sending message

[add printer cachedata](#)

[add printer create request](#)

[client device list announce request](#)

[delete printer cachedata](#)

[printer close request](#)

[printer close response](#)

[printer create response](#)

[printer set XPS mode](#)

[printer write response](#)

[rename printer cachedata](#)

[sending printer write request](#)

[update printer cachedata](#)

Sequencing rules

client ([section 3.1.5](#), [section 3.2.5](#))

server ([section 3.1.5](#), [section 3.3.5](#))

Server

abstract data model ([section 3.1.1](#), [section 3.3.1](#))

higher-layer triggered events ([section 3.1.4](#), [section 3.3.4](#))

initialization ([section 3.1.3](#), [section 3.3.3](#))

local events ([section 3.1.7](#), [section 3.3.7](#))

message processing ([section 3.1.5](#), [section 3.3.5](#))

overview ([section 3.1](#), [section 3.3](#))

[printer redirection messages](#)

sequencing rules ([section 3.1.5](#), [section 3.3.5](#))

timer events ([section 3.1.6](#), [section 3.3.6](#))

timers ([section 3.1.2](#), [section 3.3.2](#))

Server printer

[close request \(DR\\_PRN\\_CLOSE\\_REQ\)](#)

[create Request \(DR\\_PRN\\_CREATE\\_REQ\)](#)

[set XPS Mode \(DR\\_PRN\\_USING\\_XPS\)](#)

[Server printer write request \(DR\\_PRN\\_WRITE\\_REQ\)](#)

[SERVER\\_PRINTER\\_CACHE\\_EVENT packet](#)

[Standards assignments](#)

[Syntax](#)

## T

Timer events

client ([section 3.1.6](#), [section 3.2.6](#))

server ([section 3.1.6](#), [section 3.3.6](#))

Timers

client ([section 3.1.2](#), [section 3.2.2](#))

server ([section 3.1.2](#), [section 3.3.2](#))

[Transport](#)

Triggered events - higher-layer

client ([section 3.1.4](#), [section 3.2.4](#))

server ([section 3.1.4](#), [section 3.3.4](#))

## U

[Update printer cachedata](#)

[\(DR\\_PRN\\_UPDATE\\_CACHEDATA\)](#)

## V

[Vendor-extensible fields](#)

[Versioning](#)

## W

[Windows behavior](#)

## X

[XPS mode](#)