

# [MS-RDPEGT]: Remote Desktop Protocol: Geometry Tracking Virtual Channel Protocol Extension

---

## Intellectual Property Rights Notice for Open Specifications Documentation

- **Technical Documentation.** Microsoft publishes Open Specifications documentation for protocols, file formats, languages, standards as well as overviews of the interaction among each of these technologies.
- **Copyrights.** This 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 technologies described in the Open Specifications and may distribute portions of it in your implementations using these technologies or your documentation as necessary to properly document the implementation. You may also distribute in your implementation, with or without modification, any schema, IDL's, or code samples that are included in the documentation. This permission also applies to any documents that are referenced in the Open Specifications.
- **No Trade Secrets.** Microsoft does not claim any trade secret rights in this documentation.
- **Patents.** Microsoft has patents that may cover your implementations of the technologies described in the Open Specifications. Neither this notice nor Microsoft's delivery of the documentation grants any licenses under those or any other Microsoft patents. However, a given Open Specification may be covered by Microsoft [Open Specification Promise](#) or the [Community Promise](#). If you would prefer a written license, or if the technologies described in the Open Specifications are not covered by the Open Specifications Promise or Community Promise, as applicable, patent licenses are available by contacting [iplg@microsoft.com](mailto:iplg@microsoft.com).
- **Trademarks.** 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. For a list of Microsoft trademarks, visit [www.microsoft.com/trademarks](http://www.microsoft.com/trademarks).
- **Fictitious Names.** The example companies, organizations, products, domain names, email addresses, logos, people, places, and events depicted in this documentation are fictitious. No association with any real company, organization, product, domain name, email address, logo, person, place, or event is intended or should be inferred.

**Reservation of 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.

**Tools.** The Open Specifications do 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. Certain Open Specifications are intended for use in conjunction with publicly available standard specifications and network programming art, and assumes that the reader either is familiar with the aforementioned material or has immediate access to it.

## Revision Summary

Date	Revision History	Revision Class	Comments
03/30/2012	1.0	New	Released new document.
07/12/2012	1.0	No change	No changes to the meaning, language, or formatting of the technical content.
10/25/2012	2.0	Major	Significantly changed the technical content.
01/31/2013	2.0	No change	No changes to the meaning, language, or formatting of the technical content.
08/08/2013	3.0	Major	Significantly changed the technical content.
11/14/2013	4.0	Major	Significantly changed the technical content.

# Contents

<b>1 Introduction</b> .....	<b>5</b>
1.1 Glossary .....	5
1.2 References.....	5
1.2.1 Normative References.....	5
1.2.2 Informative References .....	6
1.3 Overview .....	6
1.4 Relationship to Other Protocols.....	6
1.5 Prerequisites/Preconditions .....	6
1.6 Applicability Statement.....	6
1.7 Versioning and Capability Negotiation.....	7
1.8 Vendor-Extensible Fields.....	7
1.9 Standards Assignments .....	7
<b>2 Messages</b> .....	<b>8</b>
2.1 Transport.....	8
2.2 Message Syntax .....	8
2.2.1 Structures .....	8
2.2.1.1 MAPPED_GEOMETRY_PACKET Structure .....	8
<b>3 Protocol Details</b> .....	<b>11</b>
3.1 Common Details .....	11
3.1.1 Create or Update the Geometry Mapping for a Window .....	12
3.1.2 Create or Update the Geometry Mapping for an Arbitrary Region.....	12
3.1.3 Clear the Existing Geometry Mapping.....	12
3.1.4 Abstract Data Model .....	12
3.1.5 Timers .....	12
3.1.6 Initialization .....	13
3.1.7 Higher-Layer Triggered Events.....	13
3.1.8 Message Processing Events and Sequencing Rules.....	13
3.1.8.1 Message Validation .....	13
3.1.9 Timer Events .....	13
3.1.10 Other Local Events.....	13
3.2 Client Details.....	13
3.2.1 Abstract Data Model .....	13
3.2.2 Timers .....	13
3.2.3 Initialization .....	13
3.2.4 Higher-Layer Triggered Events.....	13
3.2.5 Message Processing Events and Sequencing Rules.....	14
3.2.6 Timer Events .....	14
3.2.7 Other Local Events .....	14
3.3 Server Details .....	14
3.3.1 Abstract Data Model .....	14
3.3.2 Timers .....	14
3.3.3 Initialization .....	14
3.3.4 Higher-Layer Triggered Events.....	14
3.3.5 Message Processing Events and Sequencing Rules.....	14
3.3.6 Timer Events .....	14
3.3.7 Other Local Events .....	14
<b>4 Protocol Examples</b> .....	<b>15</b>

4.1	MAPPED_GEOMETRY_PACKET – GEOMETRY_UPDATE – Simple Geometry .....	15
4.1.1	Geometry Buffer (RGNDATA) .....	16
4.2	MAPPED_GEOMETRY_PACKET – GEOMETRY_CLEAR .....	17
<b>5</b>	<b>Security</b> .....	<b>19</b>
5.1	Security Considerations for Implementers .....	19
5.2	Index of Security Parameters .....	19
<b>6</b>	<b>Appendix A: Product Behavior</b> .....	<b>20</b>
<b>7</b>	<b>Change Tracking</b> .....	<b>21</b>
<b>8</b>	<b>Index</b> .....	<b>23</b>

# 1 Introduction

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension is an extension of the Remote Desktop Protocol: Basic Connectivity and Graphics Remoting protocol [\[MS-RDPBCGR\]](#), which runs over a dynamic virtual channel, as specified in [\[MS-RDPEDYC\]](#). The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension facilitates applications on a remote desktop host to render graphics content on a remote desktop client without having to explicitly know where the content originated. This protocol specifies the communication between a remote desktop host and a remote desktop client.

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in RFC 2119. Sections 1.5 and 1.9 are also normative but cannot contain those terms. All other sections and examples in this specification are informative.

## 1.1 Glossary

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

**protocol data unit (PDU)**  
**Remote Desktop Protocol (RDP)**  
**Transmission Control Protocol (TCP)**  
**z-order**

The following terms are specific to this document:

**terminal server:** The server to which the client initiated the remote desktop connection.

**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

References to Microsoft Open Specifications documentation do not include a publishing year because links are to the latest version of the documents, which are updated frequently. References to other documents include a publishing year when one is available.

A reference marked "(Archived)" means that the reference document was either retired and is no longer being maintained or was replaced with a new document that provides current implementation details. We archive our documents online [\[Windows Protocol\]](#).

### 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.

[MSDN-WindowsGDI] Microsoft Corporation, "Windows GDI", <http://msdn.microsoft.com/en-us/library/dd145203.aspx>

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

[MS-ERREF] Microsoft Corporation, "[Windows Error Codes](#)".

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

[MS-RDPEDYC] Microsoft Corporation, "[Remote Desktop Protocol: Dynamic Channel Virtual Channel Extension](#)".

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

### 1.2.2 Informative References

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

### 1.3 Overview

This protocol enables a protocol server to send geometry to a protocol client. The protocol client may then use this geometry to render graphics content to the area that is represented by the geometry.

Geometry, in the scope of this document, is defined as a list of rectangles on the virtual desktop. This geometry, when sent coupled with an identifier from the server to the client, allows the client to render some content to a specific location as if it was rendered on the server.

### 1.4 Relationship to Other Protocols

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension is embedded in the dynamic virtual channel transport, as defined by [\[MS-RDPEDYC\]](#). This protocol is concerned with transmitting the raw geometry of some graphics content from the server to the client.

### 1.5 Prerequisites/Preconditions

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension operates only after the dynamic virtual channel transport is fully established. If the dynamic virtual channel transport is terminated, no other communication over this protocol extension occurs.

This protocol is message-based. It assumes preservation of the packet as a whole and does not allow for fragmentation. Additionally, it assumes that no packets are lost.

It is assumed that the visible regions of all geometries sent from the server are non-overlapping. If there are any regions that overlap, then the **z-order** of those regions will be non-deterministic.

### 1.6 Applicability Statement

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension is designed to be run within the context of a **Remote Desktop Protocol (RDP)** virtual channel established between a client and a server. This protocol extension is applicable when an application running on the **terminal server** has content from a third party that should be rendered directly on the client (as opposed to being rendered on the server and then sent to the client as bitmaps via the Remote Desktop Protocol: Basic Connectivity and Graphics Remoting protocol specified in [\[MS-RDPBCGR\]](#)).

## 1.7 Versioning and Capability Negotiation

This protocol supports versioning and capability negotiation only when the underlying virtual channel attempts to open. A client that supports this protocol should allow this virtual channel to be opened, and a client that does not support this protocol should not allow this virtual channel to be opened.

## 1.8 Vendor-Extensible Fields

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension uses HRESULTs as specified in [\[MS-ERREF\]](#) section 2.1. Vendors are free to choose their own values as long as the C bit (0x20000000) is set, indicating that it is a customer code.

This protocol also uses Win32 error codes. These values are taken from the error number space as specified in [\[MS-ERREF\]](#) section 2.2. Vendors SHOULD reuse those values with their indicated meanings. Choosing any other value runs the risk of a collision in the future.

## 1.9 Standards Assignments

None.

## 2 Messages

### 2.1 Transport

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension is designed to operate over dynamic virtual channels, as specified in [\[MS-RDPEDYC\]](#). The channel name used for this protocol is "Microsoft::Windows::RDS::Geometry::v08.01". The use of channel names when opening a dynamic virtual channel is specified in [\[MS-RDPEDYC\]](#) section 2.2.2.1.

This channel MUST be implemented using a reliable protocol, such as **TCP**. Messages written to this channel are assumed to arrive in their entirety and in order on the opposite side of the connection.

### 2.2 Message Syntax

#### 2.2.1 Structures

##### 2.2.1.1 MAPPED\_GEOMETRY\_PACKET Structure

The MAPPED\_GEOMETRY\_PACKET **protocol data unit (PDU)** is the only message sent as part of this protocol. It consists of a command, geometry (rectangles), and an identifier that allows correlation of the geometry in the current message to any previous geometry the server has sent.

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
cbGeometryData																															
Version																															
MappingId																															
...																															
UpdateType																															
Flags																															
TopLevelId																															
...																															
Left																															
Top																															
Right																															
Bottom																															



TopLevelLeft
TopLevelTop
TopLevelRight
TopLevelBottom
GeometryType
cbGeometryBuffer
pGeometryBuffer (variable)
...
Reserved

**cbGeometryData (4 bytes):** UINT32. The length, in bytes, of this message.

**Version (4 bytes):** UINT32. The current version of the Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension. In RDP 8, this MUST be set to 0x01.

**MappingId (8 bytes):** UINT64. A number that uniquely identifies this geometry mapping on the server. The server MUST ensure that mapping IDs are unique across all active mappings. If a message arrives at the client with the same mapping ID as an already known mapping ID, then the geometry associated with the previous mapping MUST be updated with the geometry contained in the current mapping.

**UpdateType (4 bytes):** UINT32. A number that identifies which operation the client is to perform. The following values are supported:

- **0x01 – GEOMETRY\_UPDATE**
- **0x02 – GEOMETRY\_CLEAR**

If the command is to clear geometry, only the **MappingId**, **Version**, and **cbGeometryData** fields are valid.

**Flags (4 bytes):** UINT32. This field is reserved and MUST be set to 0x0.

**TopLevelId (8 bytes):** UINT64. If window tracking mode is in effect (see section [3.1.1](#)), this field MUST be set to the window handle of the top-level parent of the window being tracked, or to the window handle of the window itself, if it is a top-level window. If window tracking mode is not in effect (see section [3.1.2](#)), this field MUST be set to 0x0. When window tracking mode is in effect, this field SHOULD be used to create a window hierarchy between the tracked window and top-level window only if the top-level window information is available through other channels. If the top-level window information is not available, this value SHOULD be ignored.

**Left (4 bytes):** INT32. The position of the left edge of the tracked rectangle, relative to the top-level parent rectangle (labeled Left in Figure 1).

**Top (4 bytes):** INT32. The position of the top edge of the tracked rectangle, relative to the top-level parent rectangle (labeled Top in Figure 1).

**Right (4 bytes):** INT32. The position of the right edge of the tracked rectangle relative to the top-level parent rectangle (see Left + Tracked-rectangle width in Figure 1).

**Bottom (4 bytes):** INT32. The position of the bottom edge of the tracked rectangle, relative to the top-level parent rectangle (see Top + Tracked-rectangle height in Figure 1).

**TopLevelLeft (4 bytes):** INT32. The position of the left edge of the top-level rectangle in virtual desktop coordinates (labeled TopLevelLeft in Figure 1 and Figure 2).

**TopLevelTop (4 bytes):** INT32. The position of the top edge of the top-level rectangle in virtual desktop coordinates (labeled TopLevelTop in Figure 1 and Figure 2).

**TopLevelRight (4 bytes):** INT32. The position of the right edge of the top-level rectangle in virtual desktop coordinates (see TopLevelLeft + Top-level parent rectangle width in Figure 1).

**TopLevelBottom (4 bytes):** INT32. The position of the bottom edge of the top-level rectangle in virtual desktop coordinates (see TopLevelTop + Top-level parent rectangle height in Figure 1).

**GeometryType (4 bytes):** UINT32. This MUST be set to 0x02 in RDP 8.

**cbGeometryBuffer (4 bytes):** UINT32. The length of the **pGeometryBuffer** appended to this message.

**pGeometryBuffer (variable):** Array of UINT8 ([\[MS-DTYP\]](#) section 2.2.47). This field contains a RGNDATA structure, as specified in [\[MSDN-WindowsGDI\]](#). The rectangles in this structure are relative to the tracked rectangle, and represent the parts of the tracked rectangle that are visible. If window tracking mode is not in effect, the **rcBound** field in the RGNDATA structure MUST be ignored. The total number of bytes in this field is set in the **cbGeometryBuffer** field.

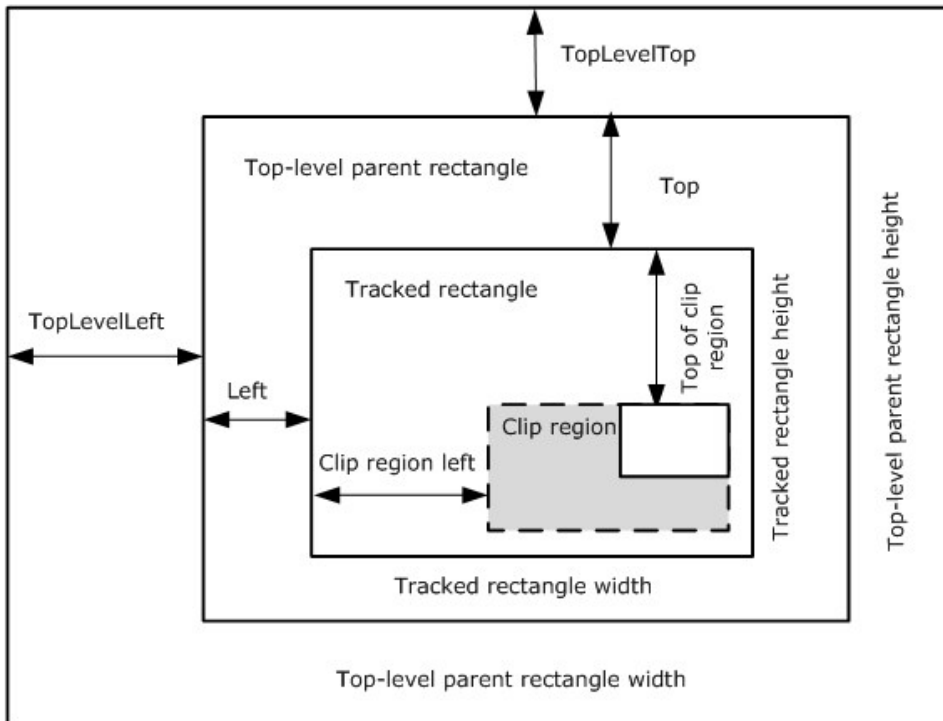
**Reserved (1 byte):** UINT8 ([\[MS-DTYP\]](#) section 2.2.47). This field is reserved and MUST be ignored.

### 3 Protocol Details

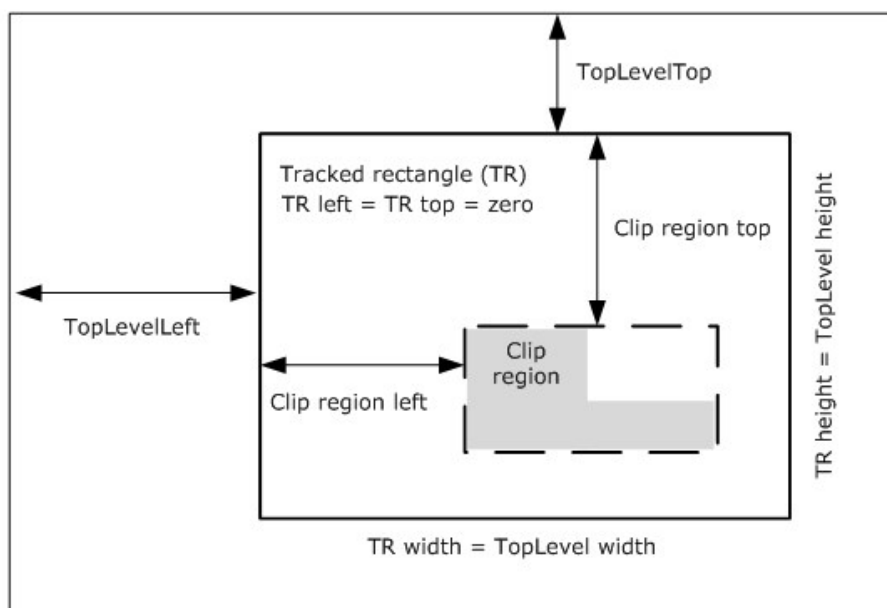
#### 3.1 Common Details

The Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension consists of a single message that is sent from the server to the client with different parameters in order to signal different states to the client. These states are as follows:

- Create or update a geometry mapping for a window.
- Create or update a geometry mapping for an arbitrary region of a window.
- Clear an existing geometry mapping.



**Figure 1: Complete window tracking**



**Figure 2: Partial window tracking**

### 3.1.1 Create or Update the Geometry Mapping for a Window

In this mode, it is assumed that the region being tracked represents the visible area of a window on the server. In this case, the window being tracked corresponds to the tracked rectangle, and its top-level parent corresponds to the top-level parent rectangle.

### 3.1.2 Create or Update the Geometry Mapping for an Arbitrary Region

In this mode, it is assumed that the region being tracked is arbitrary. In this mode, the tracked rectangle is the width and height of the region of interest, with the top-level parent rectangle controlling the position.

### 3.1.3 Clear the Existing Geometry Mapping

When clearing a mapping, the server is expressing intent to no longer send any updates for the mapping ID indicated in the message. Any and all geometry associated with that mapping MUST be deleted, and the screen MUST be updated accordingly. If no geometry is associated with the mapping ID indicated in the message, then the message MUST be ignored.

### 3.1.4 Abstract Data Model

None.

### 3.1.5 Timers

None.

### **3.1.6 Initialization**

There is no specific initialization for the Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension. Each message is wholly self-contained and, since the network transport is assumed to be lossless, current. Each message will contain either geometry specific to a particular mapping (which MUST then be either updated if known or created if not known) or instructions to clear a mapping if it exists. Aside from this logic, there is no additional handling or processing necessary.

### **3.1.7 Higher-Layer Triggered Events**

None.

### **3.1.8 Message Processing Events and Sequencing Rules**

#### **3.1.8.1 Message Validation**

In all cases, the protocol endpoints MUST validate messages received from the network by validating:

- That the length of the message matches the specified type.
- That the message is received at an appropriate time in the sequence.
- The message content.

### **3.1.9 Timer Events**

None.

### **3.1.10 Other Local Events**

None.

## **3.2 Client Details**

### **3.2.1 Abstract Data Model**

The abstract data model is as specified in section [3.1.4](#).

### **3.2.2 Timers**

None.

### **3.2.3 Initialization**

There is no specific initialization for the Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension. Each message is wholly self-contained and, since the network transport is assumed to be lossless, current.

### **3.2.4 Higher-Layer Triggered Events**

None.

### **3.2.5 Message Processing Events and Sequencing Rules**

### **3.2.6 Timer Events**

None.

### **3.2.7 Other Local Events**

None.

## **3.3 Server Details**

### **3.3.1 Abstract Data Model**

The abstract data model is as specified in section [3.1.4](#).

### **3.3.2 Timers**

None.

### **3.3.3 Initialization**

There is no specific initialization for the Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension. Each message is wholly self-contained and, since the network transport is assumed to be lossless, current.

### **3.3.4 Higher-Layer Triggered Events**

None.

### **3.3.5 Message Processing Events and Sequencing Rules**

### **3.3.6 Timer Events**

None.

### **3.3.7 Other Local Events**

None.

## 4 Protocol Examples

In this section, two packets will be examined. The first example shows a MAPPED\_GEOMETRY\_PACKET with the **UpdateType** field set to **GEOMETRY\_UPDATE** and a simple geometry. The second example shows a MAPPED\_GEOMETRY\_PACKET with the **UpdateType** field set to **GEOMETRY\_CLEAR**.

### 4.1 MAPPED\_GEOMETRY\_PACKET – GEOMETRY\_UPDATE – Simple Geometry

This example shows geometry that expresses a simple rectangle of size 480x244 pixels. The raw packet data is as follows:

```
78000000 01000000 22020400 BA7A0080 01000000 00000000 E2010300 00000000
10000000 8A000000 F0010000 7E010000 23010000 72000000 78040000 CA020000
02000000 30000000 20000000 01000000 01000000 00000000 00000000 00000000
E0010000 F4000000 00000000 00000000 E0010000 F4000000 00
```

MAPPED\_GEOMETRY\_PACKET:

UINT32 **cbGeometryData** – 78000000

0x00000078 = 120 (bytes)

UINT32 **Version** – 01000000

0x00000001 = 1

UINT64 **MappingId** - 22020400 BA7A0080

0x80007ABA00040222

UINT32 **UpdateType** – 01000000

0x00000001 = 1 (GEOMETRY\_UPDATE)

UINT32 **Flags** – 00000000

0x00000000 = 0

UINT64 **TopLevelId** - E2010300 00000000

0x00000000'000301E2

INT32 **Left** – 10000000

0x00000010 = 16

INT32 **Top** – 8A000000

0x0000008A = 138

INT32 **Right** – F0010000

0x000001F0 = 496

INT32 **Bottom** - 7E010000  
0x0000017E = 382  
INT32 **TopLevelLeft** - 23010000  
0x00000123 = 291  
INT32 **TopLevelTop** - 71000000  
0x00000071 = 114  
INT32 **TopLevelRight** - 78040000  
0x00000478 = 1144  
INT32 **TopLevelBottom** - CA010000  
0x000001CA = 714  
UINT32 **GeometryType** - 02000000  
0x00000002 = 2 (GEOMETRY\_TYPE\_REGION)  
UINT32 **cbGeometryBuffer** - 30000000  
0x00000030 = 48 (bytes)  
BYTE **pGeometryBuffer[48]** - (Cast to RGNDATA)  
UINT8 **Reserved** - 00

#### 4.1.1 Geometry Buffer (RGNDATA)

UINT32 **RGNDATA.rdh.dwSize** - 20000000  
0x00000020 = 32 (bytes)  
UINT32 **RGNDATA.rdh.iType** - 01000000  
0x00000001 = 1 (RDH\_RECTANGLES)  
UINT32 **RGNDATA.rdh.nCount** - 01000000  
0x00000001 = 1  
UINT32 **RGNDATA.rdh.nRgnSize** - 00000000  
0x00000000 = 0  
INT32 **RGNDATA.rdh.rcBound.left** - 00000000  
0x00000000 = 0  
INT32 **RGNDATA.rdh.rcBound.top** - 00000000  
0x00000000 = 0



INT32 **RGNDATA.rdh.rcBound.right** - E0010000

0x000001E0 = 480

INT32 **RGNDATA.rdh.rcBound.bottom** - F4000000

0x000000F4 = 244

INT32 **((RECT\*)RGNDATA.Buffer)[0].left** - 00000000

0x00000000 = 0

INT32 **((RECT\*)RGNDATA.Buffer)[0].top** - 00000000

0x00000000 = 0

INT32 **((RECT\*)RGNDATA.Buffer)[0].right** - E0010000

0x000001E0 = 480

INT32 **((RECT\*)RGNDATA.Buffer)[0].bottom** - F4000000

0x000000F4 = 244

## 4.2 MAPPED\_GEOMETRY\_PACKET - GEOMETRY\_CLEAR

This example shows geometry that clears an existing mapping. The raw packet data is as follows:

```
48000000 01000000 22020400 BA7A0080 02000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00
```

MAPPED\_GEOMETRY\_PACKET:

UINT32 **cbGeometryData** - 48000000

0x00000048 = 72 (bytes)

UINT32 **Version** - 01000000

0x00000001 = 1

UINT64 **MappingId** - 22020400 BA7A0080

0x80007ABA00040222

UINT32 **UpdateType** - 02000000

2 (GEOMETRY\_CLEAR)

UINT32 **Flags** - 00000000

0x00000000 = 0

UINT64 **TopLevelId** - 00000000 00000000

0x00000000'00000000 = 0x0  
INT32 **Left** - 00000000  
0x00000000 = 0  
INT32 **Top** - 00000000  
0x00000000 = 0  
INT32 **Right** - 00000000  
0x00000000 = 0  
INT32 **Bottom** - 00000000  
0x00000000 = 0  
INT32 **TopLevelLeft** - 00000000  
0x00000000 = 0  
INT32 **TopLevelTop** - 00000000  
0x00000000 = 0  
INT32 **TopLevelRight** - 00000000  
0x00000000 = 0  
INT32 **TopLevelBottom** - 00000000  
0x00000000 = 0  
UINT32 **GeometryType** - 00000000  
0x00000000 = 0  
UINT32 **cbGeometryBuffer** - 00000000  
0x00000000 = 0 (bytes)  
UINT8 **Reserved** - 00

## 5 Security

### 5.1 Security Considerations for Implementers

There are no security considerations for the Remote Desktop Protocol: Geometry Tracking Virtual Channel Extension messages because all traffic is secured by the underlying RDP core protocol. For information about the security-related mechanisms that are implemented in the RDP core protocol, see [\[MS-RDPBCGR\]](#) section 5.

### 5.2 Index of Security Parameters

The security considerations are the same as those in [\[MS-RDPBCGR\]](#). The Virtual Channel security considerations that this protocol uses are covered under that protocol.

## 6 Appendix A: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs:

- Windows 8 operating system
- Windows Server 2012 operating system
- Windows 8.1 operating system
- Windows Server 2012 R2 operating system

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

## 7 Change Tracking

This section identifies changes that were made to the [MS-RDPEGT] protocol document between the August 2013 and November 2013 releases. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- An extensive rewrite, addition, or deletion of major portions of content.
- The removal of a document from the documentation set.
- Changes made for template compliance.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the language and formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical or language changes were introduced. The technical content of the document is identical to the last released version, but minor editorial and formatting changes, as well as updates to the header and footer information, and to the revision summary, may have been made.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.

- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- New content added for template compliance.
- Content updated for template compliance.
- Content removed for template compliance.
- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact [protocol@microsoft.com](mailto:protocol@microsoft.com).

<b>Section</b>	<b>Tracking number (if applicable) and description</b>	<b>Major change (Y or N)</b>	<b>Change type</b>
<a href="#">3.1.3 Clear the Existing Geometry Mapping</a>	69579 Updated processing description.	Y	Content updated.

## 8 Index

### A

Abstract data model  
[client](#) 13  
[server](#) 14  
[Applicability](#) 6

### C

[Capability negotiation](#) 7  
[Change tracking](#) 21  
Client  
[abstract data model](#) 13  
[higher-layer triggered events](#) 13  
[initialization](#) 13  
message processing  
[validation](#) 13  
[other local events](#) 14  
[overview](#) 11  
sequencing rules  
[validating messages](#) 13  
[timer events](#) 14  
[timers](#) 13

### D

Data model - abstract  
[client](#) 13  
[server](#) 14

### F

[Fields - vendor-extensible](#) 7

### G

[Glossary](#) 5

### H

Higher-layer triggered events  
[client](#) 13  
[server](#) 14

### I

[Implementer - security considerations](#) 19  
[Index of security parameters](#) 19  
[Informative references](#) 6  
Initialization  
[client](#) 13  
[server](#) 14  
[Introduction](#) 5

### M

Message processing  
client

[validating messages](#) 13  
server  
[validating messages](#) 13

Messages  
[transport](#) 8

### N

[Normative references](#) 5

### O

Other local events  
[client](#) 14  
[server](#) 14  
[Overview \(synopsis\)](#) 6

### P

[Parameters - security index](#) 19  
[Preconditions](#) 6  
[Prerequisites](#) 6  
[Product behavior](#) 20  
Proxy  
[overview](#) 11

### R

References  
[informative](#) 6  
[normative](#) 5  
[Relationship to other protocols](#) 6

### S

Security  
[implementer considerations](#) 19  
[parameter index](#) 19  
Sequencing rules  
client  
[validating messages](#) 13  
server  
[validating messages](#) 13  
Server  
[abstract data model](#) 14  
[higher-layer triggered events](#) 14  
[initialization](#) 14  
message processing  
[validation](#) 13  
[other local events](#) 14  
[overview](#) 11  
sequencing rules  
[validating messages](#) 13  
[timer events](#) 14  
[timers](#) 14  
[Standards assignments](#) 7

### T

Timer events

[client](#) 14

[server](#) 14

Timers

[client](#) 13

[server](#) 14

[Tracking changes](#) 21

[Transport](#) 8

Triggered events - higher-layer

[client](#) 13

[server](#) 14

## **V**

Validating messages ([section 3.1.8.1](#) 13, [section 3.1.8.1](#) 13)

[Vendor-extensible fields](#) 7

[Versioning](#) 7