[MS-CIPROP2]:
Index Propagation Version 2 Protocol Specification

Revision Summary

Date	Revision History	Revision Class	Comments
07/13/2009	0.1	Major	Initial Availability
08/28/2009	0.2	Editorial	Revised and edited the technical content
11/06/2009	0.3	Editorial	Revised and edited the technical content
02/19/2010	1.0	Minor	Updated the technical content
03/31/2010	1.01	Editorial	Revised and edited the technical content
04/30/2010	1.02	Editorial	Revised and edited the technical content
06/07/2010	1.03	Editorial	Revised and edited the technical content
06/29/2010	1.04	Minor	Clarified the meaning of the technical content.
07/23/2010	1.04	No change	No changes to the meaning, language, or formatting of the technical content.
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01/20/2012	1.5	Minor	Clarified the meaning of the technical content.
04/11/2012	1.5	No change	No changes to the meaning, language, or formatting of the technical content.
07/16/2012	1.5	No change	No changes to the meaning, language, or formatting of the technical content.

Table of Contents

1 Introduction

This document specifies the Index Propagation Version 2 Protocol. It is a complete protocol, not an extension of an existing one. The protocol is used to replicate search index data across multiple servers and to maintain consistency among those servers in the event of changes to that data.

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]:

Coordinated Universal Time (UTC)
little-endian
Security Support Provider Interface (SSPI)
Unicode

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

back-end database server
component birth date
crawl component
datetime
document identifier
document set
farm
full-text index catalog
full-text index component
group
index identifier
query component
query topology
result set
return code
search application
search service application
security group
static rank
stored procedure
Transact-Structured Query Language (T-SQL)

The following terms are specific to this document:

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 technical documents, which are updated frequently. References to other documents include a publishing year when one is available.

1.2.1 Normative References

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

[Iseminger] Microsoft Corporation, "SQL Server 2000 Architecture and XML/Internet Support", Volume 1 of Microsoft SQL Server 2000 Reference Library, Microsoft Press, 2001, ISBN 0-7356-1280-3, http://www.microsoft.com/mspress/books/5001.aspx

[MS-CIFO] Microsoft Corporation, "Content Index Format Structure Specification".

[MSDN-TSQL-Ref] Microsoft Corporation, "Transact-SQL Reference", http://msdn.microsoft.com/en-us/library/ms189826(SQL.90).aspx

[MS-SMB] Microsoft Corporation, "Server Message Block (SMB) Protocol Specification".

[MS-SQLPGAT2] Microsoft Corporation, "SQL Gatherer Version 2 Protocol Specification".

[MS-SRCHTP] Microsoft Corporation, "Search Topology Protocol Specification".

[MS-TDS] Microsoft Corporation, "Tabular Data Stream Protocol Specification".

[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".

[MS-OFCGLOS] Microsoft Corporation, "Microsoft Office Master Glossary".

1.3 Protocol Overview (Synopsis)

This document specifies communication between a **crawl component** (the sender) and a **query component (2)** (the receiver). This protocol only applies to the activity of replicating **full-text index catalog** data from the sender into the full-text index catalog data used by the receiver serving a **search service application**.

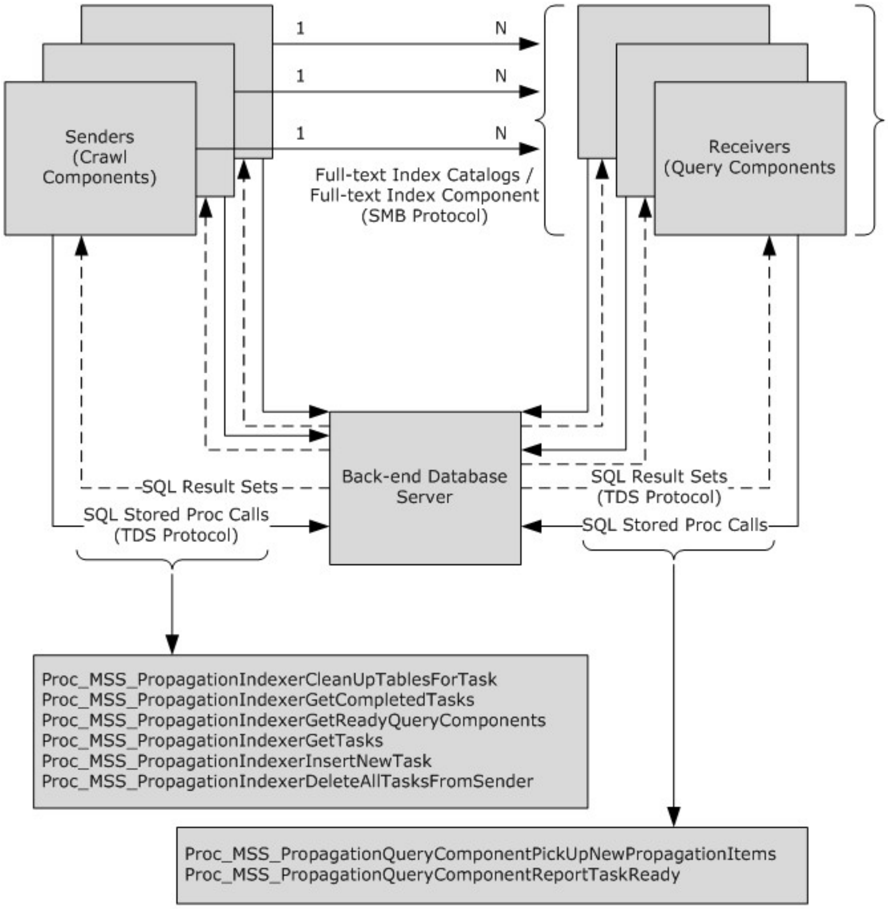
This protocol is used to synchronize changes made to a full-text index catalog from either **static rank** computation or addition of a full-text index component across receivers. The process of sending messages to receivers to ensure that the same index operation is applied to all replicated full-text index catalogs is called "propagation". These operations are referred to in this document as "propagation tasks". One of these tasks, component addition, includes additions, revisions, and removals of crawled content. Propagation of the static rank computation task is also necessary, because equivalent queries may be routed to different receivers on successive requests, and performing static rank computation on all receivers ensures retrieval of the same results across multiple requests.

Senders inform the **back-end database server** of any changes, while receivers regularly poll back-end database server for timely propagation of changes and updates. On the other hand, receivers inform the back-end database server that they are up-to-date and this information is propagated to senders through the back-end database server. Also, senders transport the full-text index catalog to receivers using the SMB protocol; the format of these catalogs is described in [MS-CIFO].

The admin server periodically interprets the current list of propagation errors and takes query components (2) offline when appropriate.

This protocol specification applies independently to each **search application**. If there are two or more search applications on a **farm**, they will all have same requirements for the implementation of this protocol and will be independent of each other.

The following figure shows a high-level view of the propagation process and the stored procedures involved.



Senders
(Crawl
Components)
1
N
1
N
1
N
Receivers
(Query Components
Full-text Index Catalogs /
Full-text Index Component
(SMB Protocol)
Back-end Database
Server
SQL Result Sets
SQL Stored Proc Calls
(TDS Protocol)
SQL Result Sets
(TDS Protocol)
SQL Stored Proc Calls
Proc_MSS_PropagationIndexerCleanUpTablesForTask
Proc_MSS_PropagationIndexerGetCompletedTasks
Proc_MSS_PropagationIndexerGetReadyQueryComponents
Proc_MSS_PropagationIndexerGetTasks
Proc_MSS_PropagationIndexerInsertNewTask
Proc_MSS_PropagationIndexerDeleteAllTasksFromSender
Proc_MSS_PropagationQueryComponentPickUpNewPropagationItems
Proc_MSS_PropagationQueryComponentReportTaskReady

Figure 1: High-level view of communication between servers

The following figure shows the sequence of events during a particular propagation instance.

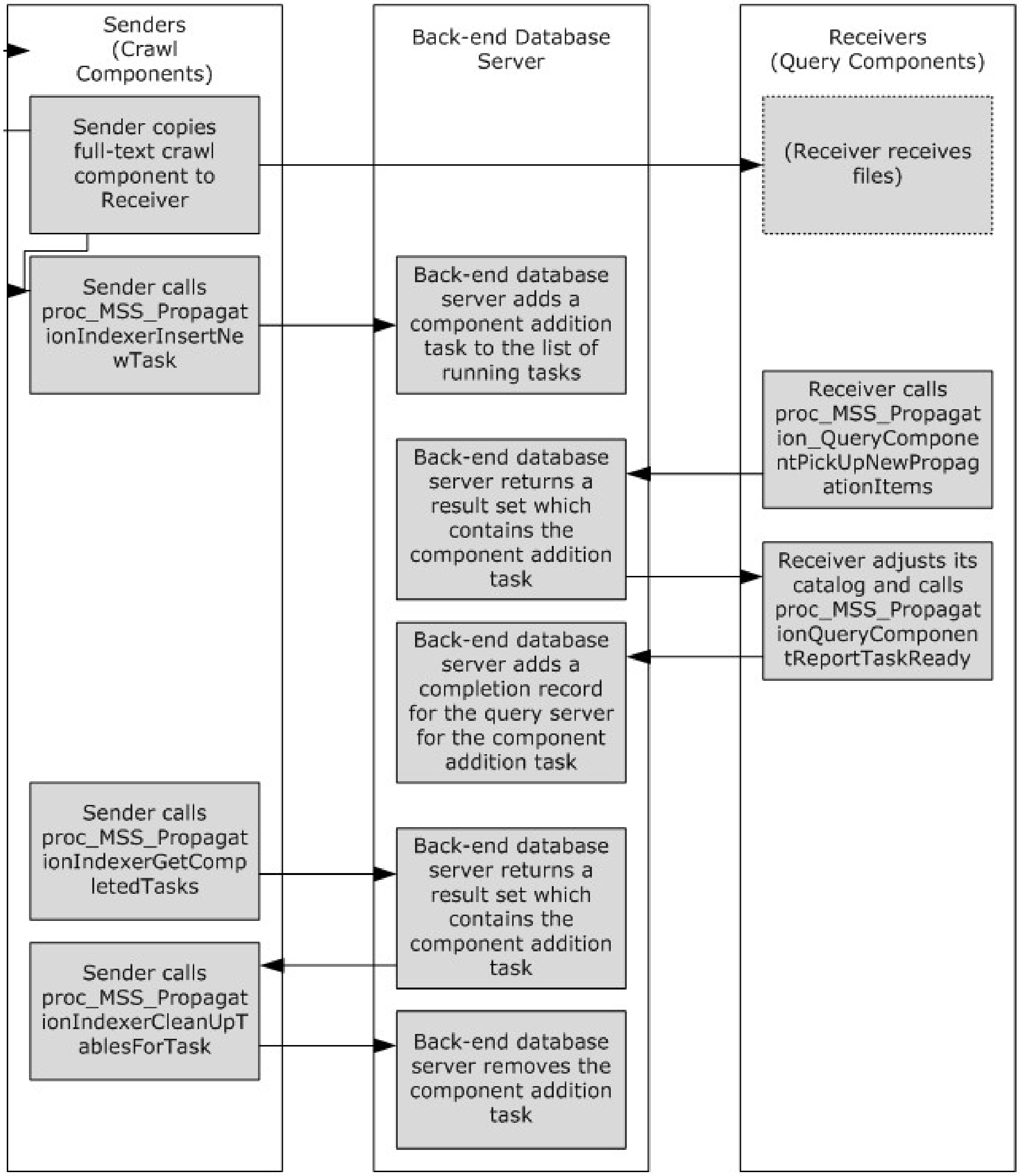

Senders (Crawl Components)
Back-end Database Server
Receivers (Query Components)
Sender copies full-text crawl component to Receiver
(Receiver receives files)
Sender calls proc_MSS_PropagationIndexerInsertNewTask
Back-end database server adds a component addition task to the list of running tasks
Receiver calls proc_MSS_Propagation_QueryComponentPickUpNewPropagationItems
Back-end database server returns a result set which contains the component addition task
Receiver adjusts its catalog and calls proc_MSS_PropagationQueryComponentReportTaskReady
Back-end database server adds a completion record for the query server for the component addition task
Sender calls proc_MSS_PropagationIndexerGetCompletedTasks
Back-end database server returns a result set which contains the component addition task
Sender calls proc_MSS_PropagationIndexerCleanUpTablesForTask
Back-end database server removes the component addition task

Figure 2: Sequence of operations used to propagate the full-text index component

1.4 Relationship to Other Protocols

The Tabular Data Stream protocol, as described in [MS-TDS], is the transport protocol used to call the **stored procedures**, query SQL views or SQL tables, return **result sets** and return codes.

This protocol relies on Server Message Control Block (SMB), as described in [MS-SMB], as its transport protocol to perform server-to-server copies of full-text index catalogs.

1.5 Prerequisites/Preconditions

This protocol requires that a farm be installed and configured. The operations described by the protocol operate between a client that is a part of the farm and a back-end database server on which the databases of the farm are stored.

The user that calls the stored procedures specified in this document has permission to read from and write to the databases that contain those stored procedures.

The following prerequisites are also required before the propagation protocol can be successfully invoked. This protocol assumes that the following conditions are true:

- There is a file system share on each query server that allows read and write operation by the local **security group** named "WSS_WPG" on that query server.
- The stored procedures specified in this document are present on the back-end database server.
- The servers on which the sender and receiver run are members of the farm.

1.6 Applicability Statement

This protocol is applicable only to the activity of replicating full-text index catalog data from a crawl component into the full-text index catalog data used by query components (2) serving one particular search service application. The protocol is designed for use by no more than 10 senders and 20 receivers, propagating no more than 5 **full-text index components** per second per sender.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- **Supported Transports:** This protocol uses the SMB protocol, as described in [MS-SMB], for file copies, and the TDS protocol, as described in [MS-TDS], for SQL stored procedure calls.
- **Security and Authentication Methods:** This protocol supports the **Security Support Provider Interface (SSPI)** and SQL authentication with the protocol server role described in [MS-TDS].

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

The TDS protocol, as specified in [MS-TDS], is the transport protocol used to call the stored procedures, query SQL views or SQL tables, return codes**,** and return result sets.

The SMB protocol, as specified in [MS-SMB], is the transport protocol used to copy files to another server.

2.2 Common Data Types

2.2.1 Simple Data Types and Enumerations

2.2.1.1 Task Type

A 32-bit signed **integer** used to represent the type of a propagation task. It MUST be one of the values in the following table.

Symbolic name	Value	Description
ComponentAddition	1	A full-text index component is received by each receiver.
StaticRankComputation	2	All activities performed during a static rank computation event are performed by each receiver.

2.2.1.2 Catalog ID

A 32-bit signed **integer** used to represent a full-text index catalog. It MUST be one of the values in the following table.

Value	Description
1	The main catalog, as specified in [MS-CIFO] section 2.18.1.
2	The anchor text catalog, as specified in [MS-CIFO] section 2.18.2.

2.2.1.3 Propagation Error Type

A 32-bit signed **integer** used to represent common categories of error encountered by participants in this protocol. It MUST be one of the values in the following table.

Symbolic name	Value	Description
FileCopy	0	A sender could not copy a full-text index component to a receiver.
IndexAbsorption	1	A receiver encountered an error while processing a component addition propagation task.
IndexCorruption	2	The full-text index catalog on a receiver was found to contain incorrect data.
ReceiverHang	3	At least one propagation task was not finished by a receiver in the expected time.

2.2.2 Bit Fields and Flag Structures

None.

2.2.3 Binary Structures

2.2.3.1 Full-Text Index Component Message

The unit of transfer in full-text index component propagation is a set of files. Each file in this set, except for one, is a duplicate of a file in a full-text index component, as specified in [MS-CIFO] section 2.17, in content, but the extension ".cp" is appended to the original file name to create the name of the duplicate file. Every file of a full-text index component is represented in the set.

The one file in this set that does not correspond to a full-text index component file is a propagation list file, as specified in section 2.2.3.1.1. See section 4.1 for an example.

2.2.3.1.1 Propagation List File

The ".list" file is a list of **Unicode strings** stored in the **string** list format specified in section 2.2.3.1.1.2. All **integers** and characters are stored in **little-endian** form unless specified otherwise.

2.2.3.1.1.1 String Record

										1										2										3	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
[previous record]																Number of Characters															
...																Characters (variable)															
...																															

Number of Characters (4 bytes): A 32-bit unsigned **integer** representing the number of characters in the **string**. It MUST be aligned to a 2-byte boundary.

Characters (variable): A variable-length array of 16-bit Unicode values ordered from the beginning to the end of the **string**. It MUST be aligned to a 2-byte boundary. There is no special terminating character. The length of the array is the value of the **Number of Characters** field. It MUST terminate at a 2-byte boundary.

2.2.3.1.1.2 String List

										1										2										3	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
Number of Strings																															
String Records (variable)																															
...																															

Number of Strings (4 bytes): A 32-bit unsigned **integer** representing the number of **strings** in the list. It MUST be located at the beginning of the file.

String Records (variable): A variable-length array of **string** records as specified in section 2.2.3.1.1.1. The number of **string** records in the array is the value of the **Number of Strings** field. It MUST terminate at a 2-byte boundary.

2.2.3.2 Versioned Index Identifier

This is a 32-bit unsigned integer associated with one full-text index component.

0	1	2	3	4	5	6	7	8	9	1 0	1	2	3	4	5	6	7	8	9	2 0	1	2	3	4	5	6	7	8	9	3 0	1
Reserved0								Format Version								Reserved1								Index ID							

Reserved0 (1 byte): Must be set to "0x00".

Format Version (1 byte): An 8-bit unsigned **integer** value that MUST be "0x54", if the format version of the full-text index component, as specified in [MS-CIFO] section 2.17, is "0x54". In all other cases, the value MUST be "0x01".

Reserved1 (1 byte): Must be set to "0x00".

Index ID (1 byte): An 8-bit unsigned **integer** equal to the **index identifier** of the full-text index component, as specified in [MS-CIFO] section 2.17.

2.2.4 Result Sets

All results sets are specified in section 3.1.5.

2.2.5 Tables and Views

None.

2.2.6 XML Structures

None.

2.2.6.1 Namespaces

None.

2.2.6.2 Simple Types

None.

2.2.6.3 Complex Types

None.

2.2.6.4 Elements

None.

2.2.6.5 Attributes

None.

2.2.6.6 Groups

None.

2.2.6.7 Attribute Groups

None.

3 Protocol Details

There are three roles of this protocol, as followsl:

- Back-end database server
- Sender
- Receiver

A sender has a one-to-one correspondence with a crawl component, and a receiver has a one-to-one correspondence with a query component (2).

All back-end database server, sender, and receiver state, as specified in this section, applies to one search application only. Only crawl components and query components (2) from that particular search application are represented as senders and receivers in the following sections.

The execution of this protocol for one search application is completely independent from its execution for another search application. Even if a crawl component or query component (2) from another search application is present on the same server, its behavior is specified by the same rules but with completely separate state.

Most of the messages sent and received in this protocol are stored procedure calls and the result sets they return. These stored procedure and result set messages are specified in section 3.1.5. There is one non-stored procedure related message, a file transfer from sender to receiver, that is specified in section 2.2.3.1.

3.1 Back-End Database Server Details

The back-end database server responds to stored procedure calls from the sender and the receiver. It returns result sets and return codes and never initiates communication with either the sender or the receiver.

3.1.1 Abstract Data Model

The following section specifies data and state that are sufficient to specify the behavior of the back-end database server. The only state necessary for execution of this protocol from the back-end database server is a list of ready query components, as specified in section 3.1.1.1, and a list of running tasks, as specified in section 3.1.1.2.

3.1.1.1 List of Ready Query Components

The list of all query components (2) in the query component set, as specified in [MS-SRCHTP] section 3.1.1.2, in which the **State** value, as specified in [MS-SRCHTP] section 3.1.1.2, is either "Ready" or "IndexSplitDone", as specified in [MS-SRCHTP] section 2.2.1.3, and are members of the **query topology** whose **State** value is "Active", as specified in [MS-SRCHTP] section 2.2.1.2.

3.1.1.2 List of Running Tasks

A list of zero or more running tasks. Each running task represents one propagation task that is currently being performed by all query components (2). A running task has the following properties.

taskType: The task type, as specified in section 2.2.1.1, of the propagation task.

senderID: The **CrawlComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component which created the propagation task.

catalogID: The catalog identifier, a specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

list of completions: A list of zero or more query components (2) that have finished the propagation task.

For component additions, a running task also has the following properties.

objectID: The versioned index identifier, as specified in section 2.2.3.2) of the full-text index component being added.

maxDocID: The maximum **document identifier (1)** of the full-text index component being added.

birthDate: The **component birth date** of the full-text index component being added.

time: The **UTC** time when the task was added to this list.

3.1.1.3 List of Propagation Errors

A list of zero or more propagation errors that have been reported in response to conditions encountered in the execution of this protocol. A propagation error has the following properties.

senderID: The **CrawlComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that reported the propagation error, or NULL if the error was reported by a query component (2).

receiverID: The **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2) that reported the propagation error, or the query component (2) to which full-text index components could not be copied by a crawl component.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation error applies.

type: The propagation error type, as specified in section 2.2.1.3, of the error.

message: Descriptive text about the error.

firstUtcTime: The UTC time when the error was first added to the list.

latestUtcTime: The latest UTC time when an error with the same propagation error type, as specified in section 2.2.1.3, was reported by the same sender or receiver.

3.1.2 Timers

None.

3.1.3 Initialization

Listening endpoints are set up on the back-end database server to handle inbound Tabular Data Stream (TDS) requests, as specified in [MS-TDS].

Authentication of the TDS connection to the back-end database server MUST occur before this protocol can be used.

The data structures, stored procedures, and actual data are persisted by the back-end database server within databases, so any operations to initialize the state of the database MUST occur before the back-end database server can use this protocol. This protocol requires that the search administration data already exist within the back-end database server.

3.1.4 Higher-Layer Triggered Events

None.

3.1.5 Message Processing Events and Sequencing Rules

The back-end database server MUST NOT initiate any communication. It MUST only issue messages to other servers as result sets and return values, in direct response to incoming stored procedure calls.

There are no preconditions of state to receiving any of these calls; the back-end database server MUST be able to process them in any order, at any time after initialization.

As an aid to understanding, there is a naming convention for all of the propagation-related stored procedures. Procedures beginning with the prefix "proc_MSS_PropagationIndexer" are called from the sender. Procedures beginning with "proc_MSS_PropagationQueryComponent" are called from the receiver.

3.1.5.1 proc_MSS_PropagationIndexerCleanUpTablesForTask

The **proc_MSS_PropagationIndexerCleanUpTablesForTask** stored procedure is called to remove all records related to a finished propagation task. The **T-SQL** syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerCleanUpTablesForTask(
   @SenderID          int,
   @CatalogID         int,
   @TaskType          int,
   @ObjectID          int
);
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the sender that created the propagation task.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, representing the full-text index catalog to which the propagation task applies.

@TaskType: The task type, as specified in section 2.2.1.1, of the propagation task.

@ObjectID: If *@TaskType* is "ComponentAddition", as specified in section 2.2.1.1, *@ObjectID* MUST be either zero or the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component that was propagated, as specified in section 3.2.5.9. If *@TaskType* is "StaticRankComputation", as specified in section 2.2.1.1, *@ObjectID* MUST be zero.

When the back-end database server receives this message, it does the following:

- If the **State**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that created the propagation task is either "Disabled" or "DisableForRemove", as specified in [MS-SRCHTP] section 2.2.1.7, it MUST do nothing.

- Otherwise, it MUST remove any propagation task from the list of running tasks where **senderID** equals *@SenderID,* **catalogID** equals *@CatalogID*, **taskType** equals *@TaskType*, and **objectID** equals *@ObjectID*. These parameters are specified in section 3.1.1.2.

The following table lists return code values.

Value	Description
0	The task was added to the list of running tasks.
1	The task was not removed from the list of running tasks because the crawl component was disabled.

Result Sets: MUST NOT return any result sets**.**

3.1.5.2 proc_MSS_PropagationIndexerGetCompletedTasks

The **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure is called to retrieve every propagation task for a specified full-text index catalog that has been finished by all query components (2) in the list of ready query components, as specified in section 3.1.1.1. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerGetCompletedTasks(
   @SenderID           int,
   @CatalogID          int
);
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the sender that created the propagation task.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog for which the sender receives finished propagation tasks.

Return Code Values: An **integer** that MUST be zer.

Result Sets: MUST return the result set specified in section 3.1.5.2.1.

- If the **State** value, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that created the propagation task is either "Disabled" or "DisableForRemove", as specified in [MS-SRCHTP] section 2.2.1.7, the returned result set MUST contain zero results.

- Otherwise, the returned result set MUST contain exactly one result for each propagation task that was finished by all query components (2) in the list of ready query components, as specified in section 3.1.1.1, and MUST NOT contain other results.

3.1.5.2.1 Completed Tasks Result Set

The T-SQL syntax for the result set is as follows:

```
   SenderID            int,
   CatalogID           int,
   TaskType            int,
   ObjectID            int,
   {MaxWorkID}         int,
   {BirthDate}         int
```

SenderID: The **senderID**, as specified in section 3.1.1.2, of the propagation task.

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation task.

TaskType: The **taskType**, as specified in section 3.1.1.2, of the propagation task.

ObjectID: If **taskType** is "ComponentAddition", as specified in section 2.2.1.1, **ObjectID** MUST be the **objectID**, as specified in section 3.1.1.2, of the running propagation task. If **taskType** is "StaticRankComputation", as specified in section 2.2.1.1, **ObjectID** MUST be zero.

{MaxWorkID}: An obsolete field that MUST be zero.

{BirthDate}: An obsolete field that MUST be zero.

3.1.5.3 proc_MSS_PropagationIndexerGetReadyQueryComponents

The **proc_MSS_PropagationIndexerGetReadyQueryComponents** stored procedure is called to retrieve information about all query components (2) in the list of ready query components, as specified in section 3.1.1.1. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerGetReadyQueryComponents();
```

Return Code Values: An **integer** that MUST be zero.

Result Sets: MUST return exactly one ready query components result set, as specified in section 3.1.5.3.1. This result set MUST contain exactly one result for each query component (2) in the list of ready query components, as specified in section 3.1.1.2, and MUST NOT contain other results.

3.1.5.3.1 Ready Query Components Result Set

The T-SQL syntax for the result set is as follows:

```
ServerName              nvarchar(256),
QueryComponentNumber    int,
PartitionID             uniqueidentifier,
ShareName               nvarchar(260)
```

ServerName: The **ServerName**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2).

QueryComponentNumber: The **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2).

PartitionID: The **PartitionID**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2).

ShareName: The **ShareName**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2).

3.1.5.4 proc_MSS_PropagationIndexerGetTasks

The **proc_MSS_PropagationIndexerGetTasks** stored procedure is called to retrieve every propagation task that was created by the calling crawl component for a specified full-text index catalog. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerGetCompletedTasks(
   @SenderID            int,
   @CatalogID           int
);
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the calling sender.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog for which the caller receives propagation tasks.

Return Code Values: An **integer** that MUST be zero.

Result Sets: MUST return a propagation tasks result set, as specified in section 3.1.5.4.1. The returned result set MUST contain exactly one result for each propagation task in the list of running tasks, as specified in section 3.1.1.2, and MUST NOT contain other results.

3.1.5.4.1 Propagation Tasks Result Set

The T-SQL syntax for the result set is as follows:

```
SenderID                 int,
CatalogID                int,
TaskType                 int,

ObjectID                 int,
{MaxWorkID}              int,
{BirthDate}              int
```

SenderID: The **senderID**, as specified in section 3.1.1.2, of the propagation task.

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation task.

TaskType: The **taskType**, as specified in section 3.1.1.2, of the propagation task.

ObjectID: If **taskType** is "ComponentAddition", as specified in section 2.2.1.1, **ObjectID** MUST be the **objectID**, as specified in section 3.1.1.2 of the running propagation task. If **taskType** is "StaticRankComputation", as specified in section 2.2.1.1, **ObjectID** MUST be zero.

{MaxWorkID}: An obsolete field that MUST be zero.

{BirthDate}: An obsolete field that MUST be zero.

3.1.5.5 proc_MSS_PropagationIndexerInsertNewTask

The **proc_MSS_PropagationIndexerInsertNewTask** stored procedure is called to add a new propagation task to the list of running tasks, as specified in section 3.1.1.2. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerInsertNewTask(
   @SenderID           int,
   @CatalogID          int,
   @TaskType           int,
   @ObjectID           int,
   @MaxWorkID          int,
   @BirthDate          int
```

```
 );
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the calling sender.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

@TaskType: The task type, as specified in section 2.2.1.1, of the propagation task.

@ObjectID: If *@TaskType* is "ComponentAddition", as specified in section 2.2.1.1, *@ObjectID* MUST be either zero or the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component that is being propagated, as specified in section 3.2.5.6. If *@TaskType* is "StaticRankComputation", as specified in section 2.2.1.1, *@ObjectID* MUST be zero.

@MaxWorkID: If *@TaskType* is "ComponentAddition", *@MaxWorkID* MUST be either zero or the maximum document identifier (1) in the full-text index component being propagated, as specified in section 3.2.5.6. If *@TaskType* is not "ComponentAddition", *@MaxWorkID* MUST be zero.

@BirthDate: If *@TaskType* is "ComponentAddition", *@BirthDate* MUST be either zero or the component birth date of the full-text index component being propagated, as specified in section 3.2.5.6. If *@TaskType* is not "ComponentAddition", *@BirthDate* MUST be zero.

When the back-end database server receives this message:

- If the value of **State**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that created the propagation task is either "Disabled" or "DisableForRemove", as specified in [MS-SRCHTP] section 2.2.1.7, the back-end database server MUST return 2.
- Otherwise,
  - If the *@CatalogID*, *@TaskType*, and *@ObjectID* parameters match the **catalogID**, **taskType**, and **objectID** values of a propagation task in the list of running tasks, as specified in section 3.1.1.2, the back-end database server MUST return 1.
  - Otherwise, the back-end database server MUST add a new propagation task to the list of running tasks, where **catalogID**, as specified in section 3.1.1.2, equals *@CatalogID*, **taskType**, as specified in section 3.1.1.2, equals *@TaskType*, **objectID**, as specified in section 3.1.1.2, equals *@ObjectID*, and **time**, as specified in section 3.1.1.2, equals the current local time in **datetime** format.

Return Code Values:

Value	Description
0	The propagation task was added.
1	No propagation task was added because a duplicate propagation task already existed.
2	No propagation task was added because the crawl component was disabled.

Result Set: MUST NOT return any result set.

3.1.5.6 proc_MSS_PropagationQueryComponentPickUpNewPropagationItems

The **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure is called to get information about all the running tasks for a particular full-text index catalog that have not yet been finished by a particular query component (2). The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationQueryComponentPickUpNewPropagationItems(
   @CatalogID          int,
   @ReceiverID         int
);
```

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, representing the full-text index catalog to which the retrieved propagation tasks apply.

@ReceiverID: The receiver identifier, as specified in section 3.3.1.1, of the calling receiver.

When the back-end database server receives this message, it does the following:

- If no query component (2) with @ReceiverID is in the list of ready query components, as specified in section 3.1.1.1, it MUST return 1.
- Otherwise, it MUST return zer.

Return Code Values:

Value	Description
0	A result set with the incomplete propagation tasks was returned.
1	No result set was returned because the query component was not in the list of ready query components.

Result Sets:

If no query component (2) with *@ReceiverID* is in the list of ready query components, the back-end database server MUST NOT return any result sets.

Otherwise, it MUST return exactly one propagation tasks result set, as specified in section 3.1.5.6.1. The result set MUST include exactly one result for each propagation task in the list of running tasks, as specified in section 3.1.1.2, in which the **catalogID**, as specified in section 3.1.1.2, is *@CatalogID* and whose list of completions, as specified in section 3.1.1.2, does not contain any query component with a **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, equal to *@ReceiverID*. The result set MUST NOT include any other results. The results MUST be ordered in ascending order, primarily by **senderID** values, as specified in section 3.1.5.6.1, and secondarily by **birthDate** values, as specified in section 3.1.5.6.1.

3.1.5.6.1 Propagation Tasks Result Set

The T-SQL syntax for the result set is as follows:

```
SenderID            int,
CatalogID           int,
TaskType            int,
ObjectID            int,
MaxWorkID           int,
BirthDate           int
```

SenderID: The **senderID**, as specified in section 3.1.1.2, of the propagation task.

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation task. This MUST be the same value as the input parameter *@CatalogID*.

TaskType: The **taskType**, as specified in section 3.1.1.2, of the propagation task.

ObjectID: For all results where the value of **TaskType** is "ComponentAddition", as specified in section 2.2.1.1, **ObjectID** MUST be the **objectID**, as specified in section 3.1.1.2, of the propagation task. For all results where the value of **TaskType** is not "ComponentAddition", **ObjectID** MUST be zero.

MaxWorkID: For all results where the value of **TaskType** is "ComponentAddition", as specified in section 2.2.1.1, **MaxWorkID** MUST be the value of **maxDocID**, as specified in section 3.1.1.2, of the propagation task. For all results where the **TaskType** value is not "ComponentAddition", **MaxWorkID** MUST be zero.

BirthDate: For all results where the value of **TaskType** is "ComponentAddition", as specified in section 2.2.1.1, **BirthDate** MUST be the value of **birthdate**, as specified in section 3.1.1.2, of the propagation task. For all results where the value of **TaskType** is not "ComponentAddition", **BirthDate** MUST be zero.

3.1.5.7 proc_MSS_PropagationIndexerDeleteAllTasksFromSender

The **proc_MSS_PropagationIndexerDeleteAllTasksFromSender** stored procedure is called to delete all propagation tasks from the list of running tasks, as specified in section 3.1.1.2, that were created by the calling sender. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationIndexerDeleteAllTasksFromSender(
   @SenderID           int,
   @CatalogID          int
);
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the calling sender.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog for which the propagation tasks are removed from the list of running tasks, as specified in section 3.1.1.2.

When the back-end database server receives this message, it MUST delete all propagation tasks in the list of running tasks whose **senderID** value, as specified in section 3.1.1.2, is equal to *@SenderID* and **catalogID** value, as specified in section 3.1.1.2, is equal to *@CatalogID*.

Return Code Values: An **integer** that MUST be zero.

Result Sets: MUST NOT return any result set.

3.1.5.8 proc_MSS_PropagationQueryComponentReportTaskReady

The **proc_MSS_PropagationQueryComponentReportTaskReady** stored procedure is called to record that a query component (2) has finished processing a propagation task. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationQueryServerReportTaskReady(
   @SenderID           int,
   @CatalogID          int,
   @ReceiverID         int,
   @TaskType           int,
   @ObjectID           int,
);
```

@SenderID: The sender identifier, as specified in section 3.2.1.2, of the sender that created the propagation task.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

@ReceiverID: The receiver identifier, as specified in section 3.3.1.1, of the calling receiver.

@TaskType: Any value of task type, as specified in section 2.2.1.1.

@ObjectID: If *@TaskType* is "ComponentAddition", as specified in section 2.2.1.1, *@ObjectID* MUST be the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component that is being propagated. If *@TaskType* is "StaticRankComputation", as specified in section 2.2.1.1, *@ObjectID* MUST be zero.

When the back-end database server receives this message, it does the following:

- If there is no query component (2) in the list of ready components, as specified in section 3.1.1.1) with **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, equal to *@ReceiverID*, the back-end database server MUST return 1.
- Otherwise,
  - If the query component (2) with **QueryComponentNumber** equal to *@ReceiverID* is already in the list of completions for the propagation task in the list of running tasks where **catalogID** equals *@CatalogID*, **taskType** equals *@TaskType*, and **objectID** equals *@ObjectID*, the back-end database server MUST return 1. The list of completions, list of running tasks, **catalogID**, **taskType**, and **objectID** are specified in section 3.1.1.
  - Otherwise, the back-end database server MUST add the query component (2) with **QueryComponentNumber** equal to *@ReceiverID* to the list of completions for the propagation task in the list of running tasks where **catalogID** equals *@CatalogID*, **taskType** equals *@TaskType*, and **objectID** equals *@ObjectID*. In addition, if *@TaskType* is "ComponentAddition", as specified in section 2.2.1.1, and *@ObjectID* is zero, the calling receiver MUST be removed from the list of completions for all tasks in the list of running tasks whose **taskType** is "ComponentAddition". The list of completions, list of running tasks, **catalogID**, **taskType**, and **objectID** are specified in section 3.1.1.

Return code values are listed in the following table.

Value	Description
0	Successful execution.
1	No change to the list of running tasks was made, because the receiver was not in the list of ready query components, or a completion for this task was already recorded for the receiver.

Result Set: MUST NOT return any result set.

3.1.5.9 proc_MSS_PropagationReportError

The **proc_MSS_PropagationReportError** stored procedure is called to add one propagation error to the list of propagation errors, as specified in section 3.1.1.3, if that error does not already exist, or to update the error's properties if it does. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationReportError(
   @SenderID           int,
   @ReceiverID         int,
   @CatalogID          int,
   @Type               int,
   @Message            nvarchar(2048)
);
```

@SenderID: If *@Type* is "FileCopy", as specified in section 2.2.1.3, the sender identifier, as specified in section 3.2.1.2, of the calling sender. If *@Type* is "IndexCorruption" or *@Type* is "IndexAbsorption", the value is zero. If *@Type* is "ReceiverHang", it MUST be NULL.

@ReceiverID: If *@Type* is "FileCopy", as specified in section 2.2.1.3, the receiver identifier, as specified in section 3.3.1.1, of the receiver to which a full-text index component could not be copied. Otherwise, the receiver identifier of the receiver on which the error was encountered.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog for which the propagation error is removed from the list of propagation errors, as specified in section 3.1.1.3.

@Type: The propagation error type, as specified in section 2.2.1.3, of the error that was encountered.

@Message: A **string** containing descriptive text about the error.

When the back-end database server receives this message, it does the following:

- If there is no error in the list of propagation errors, as specified in section 3.1.1.3, with the **senderID** value, as specified in section 3.1.1.3, equal to *@SenderID*, **receiverID** value, as specified in section 3.1.1.3, equal to *@ReceiverID*, **catalogID** value, as specified in section 3.1.1.3, equal to *@CatalogID*, and **type**, as specified in section 3.1.1.3, equal to *@Type*, it MUST change **latestUtcTime**, as specified in section 3.1.1.3, to the current time, and it MUST change **message**, as specified in section 3.1.1.3, to *@Message.*
- Otherwise, it MUST add a new propagation error to the list of propagation errors, as specified in section 3.1.1.3, where **senderID** is set to *@SenderID*, **receiverID** is set to *@ReceiverID*, **catalogID** is set to *@CatalogID*, **message** is set to *@Message*, and both **firstUtcTime**, as specified in section 3.1.1.3, and **latestUtcTime** are set to the current time.

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST NOT return any result set.

3.1.5.10 proc_MSS_PropagationDeleteError

The **proc_MSS_PropagationDeleteError** stored procedure is called to delete one propagation error from the list of propagation errors, as specified in section 3.1.1.3. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationDeleteError(
   @SenderID           int,
   @ReceiverID         int,
   @CatalogID          int,
   @Type               int
);
```

@SenderID: If *@Type* is "FileCopy", as specified in section 2.2.1.3, the sender identifier, as specified in section 3.2.1.2, of the calling sender. If *@Type* is "IndexCorruption" or "IndexAbsorption", the value is zero. If *@Type* is "ReceiverHang", it MUST be NULL.

@ReceiverID: If *@Type* is "FileCopy", as specified in section 2.2.1.3, the receiver identifier, as specified in section 3.1.1.3, of the receiver to which a full-text index component could not be copied. Otherwise, the receiver identifier of the receiver on which the error was encountered.

@CatalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog for which the propagation error will be removed from the list of propagation errors, as specified in section 3.1.1.3.

@Type: The propagation error type, as specified in section 2.2.1.3, of the error to be removed.

When the back-end database server receives this message, it MUST delete the propagation error in the list of propagation errors, as specified in section 3.1.1.3, with the **senderID** value, as specified in section 3.1.1.3, equal to *@SenderID*, **receiverID** value, as specified in section 3.1.1.3, equal to *@ReceiverID*, and **catalogID** value, as specified in section 3.1.1.3, equal to *@CatalogID*, if such a propagation error exists.

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST NOT return any result set.

3.1.5.11 proc_MSS_PropagationDeleteErrors

The **proc_MSS_PropagationDeleteErrors** stored procedure is called to delete all propagation errors from the list of propagation errors, as specified in section 3.1.1.3 that were encountered by a particular receiver. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationDeleteErrors(
   @ReceiverID         int
);
```

@ReceiverID: The receiver identifier, as specified in section 3.3.1.1, of the receiver for which all propagation errors are to be removed.

When the back-end database server receives this message, it MUST delete all propagation errors in the list of propagation errors, as specified in section 3.1.1.3, with the **receiverID** value, as specified in section 3.1.1.3, equal to *@ReceiverID*.

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST NOT return any result set.

3.1.5.12 proc_MSS_PropagationGetErrors

The **proc_MSS_PropagationGetErrors** stored procedure is called to retrieve information about all propagation errors in the list of propagation errors, as specified in section 3.1.1.3. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationGetErrors();
```

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST return exactly one propagation errors result set, as specified in section 3.1.5.12.1. This result set MUST contain exactly one result for each propagation error in the list of propagation errors, as specified in section 3.1.1.3, and MUST NOT contain other results.

3.1.5.12.1 Propagation Errors Result Set

The T-SQL syntax for the result set is as follows:

```
SenderID             int,
ReceiverID           int,
CatalogID            int,
Type                 int,
Message              nvarchar(2048),
FirstUtcTime         datetime,
LatestUtcTime        datetime,
RowID                int
```

SenderID: The **senderID**, as specified in section 3.1.1.3, of the propagation error.

ReceiverID: The **receiverID**, as specified in section 3.1.1.3, of the propagation error

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation error.

Type: The **type**, as specified in section 3.1.1.3, of the propagation error.

Message: The **message**, as specified in section 3.1.1.3, of the propagation error.

FirstUtcTime: The **firstUtcTime**, as specified in section 3.1.1.3, of the propagation error.

LatestUtcTime: The **latestUtcTime**, as specified in section 3.1.1.3, of the propagation error.

RowID: Any **integer**. This value MUST be ignored.

3.1.5.13 proc_MSS_PropagationGetTasks

The **proc_MSS_PropagationGetTasks** stored procedure is called to retrieve information about all propagation tasks in the list of running tasks, as specified in section 3.1.1.2. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationGetTasks();
```

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST return exactly one propagation all tasks result set, as specified in section 3.1.5.13.1. This result set MUST contain exactly one result for each propagation task in the list of running tasks, as specified in section 3.1.1.2, and MUST NOT contain other results.

3.1.5.13.1 Propagation All Tasks Result Set

The T-SQL syntax for the result set is as follows:

```
SenderID                int,
CatalogID               int,
TaskType                int,
ObjectID                int,
MaxWorkID               int,
BirthDate               int,
Time                    datetime
```

SenderID: The **senderID**, as specified in section 3.1.1.2, of the propagation task.

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation task.

TaskType: The **taskType**, as specified in section 3.1.1.2, of the propagation task.

ObjectID: The **objectID**, as specified in section 3.1.1.2, of the propagation task.

MaxWorkID: The **maxDocID**, as specified in section 3.1.1.2, of the propagation task.

BirthDate: The **birthdate**, as specified in section 3.1.1.2, of the propagation task.

Time: The **time**, as specified in section 3.1.1.2, of the propagation task.

3.1.5.14 proc_MSS_PropagationGetTaskCompletions

The **proc_MSS_PropagationGetTaskCompletions** stored procedure is called to retrieve information about all propagation tasks in the list of running tasks, as specified in section 3.1.1.2, that have been finished by one or more receivers. The T-SQL syntax for the stored procedure is as follows:

```
PROCEDURE proc_MSS_PropagationGetTaskCompletions();
```

Return Code Values: An **integer** that MUST be ignored.

Result Sets: MUST return exactly one propagation task completions result set, as specified in section 3.1.5.14.1. This result set MUST contain exactly one result for each receiver in the list of completions, as specified in section 3.1.1.2, for each propagation task in the list of running tasks, as specified in section 3.1.1.2, and MUST NOT contain other results.

3.1.5.14.1 Propagation Task Completions Result Set

The T-SQL syntax for the result set is as follows:

```
ReceiverID              int,
SenderID                int,
CatalogID               int,
TaskType                int,
ObjectID                int,
MaxWorkID             int,
BirthDate             int
```

ReceiverID: The **receiverID**, as specified in section 3.1.1.2, that has finished the propagation task.

SenderID: The **senderID**, as specified in section 3.1.1.2, of the propagation task.

CatalogID: The **catalogID**, as specified in section 3.1.1.2, of the propagation task.

TaskType: The **taskType**, as specified in section 3.1.1.2, of the propagation task.

ObjectID: The **objectID**, as specified in section 3.1.1.2, of the propagation task.

MaxWorkID: The **maxDocID**, as specified in section 3.1.1.2, of the propagation task.

BirthDate: The **birthdate**, as specified in section 3.1.1.2, of the propagation task.

3.1.6 Timer Events

None.

3.1.7 Other Local Events

None.

3.2 Sender Details

The sender is implemented by a crawl component. It initiates all propagation sequences.

3.2.1 Abstract Data Model

The following section specifies data and state that are sufficient to specify the behavior of the sender. The data provided explains how the protocol behaves. Implementations do not need to adhere to this model as long as their server-to-server communication is consistent with what is specified in this document.

3.2.1.1 Search Application Name

The name of the search service application that the crawl component belongs to.

3.2.1.2 Sender Identification

An **integer** that uniquely identifies the sender. This MUST be equal to the **CrawlComponentNumber** of the sender, as specified in [MS-SRCHTP] section 3.1.1.3.

3.2.1.3 List of Ready Query Components

A list of zero or more query components (2) to receive full-text index component messages, as specified in section 2.2.3.1. Each ready query component has the following properties.

serverName: The **ServerName** of the query component (2), as specified in [MS-SRCHTP] section 3.1.1.2.

shareName: The **ShareName** of the query component (2), as specified in [MS-SRCHTP] section 3.1.1.2.

3.2.1.4 List of Running Tasks

A list of zero or more propagation tasks that have been issued by this sender. Each running task has the following properties.

taskType: The task type, as specified in section 2.2.1.1, of the propagation task.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

objectID: If **taskType** is "ComponentAddition", the versioned index identifier,. as specified in section 2.2.3.2, of the full-text index component being added on the query components (2). For all other values of **taskType**, the value MUST be zero.

lastPropagationTime: The time of the most recent sending of the full-text index component message, as specified in section 3.2.5.3.

3.2.1.5 List of Completed Tasks

A list of zero or more completed tasks. Each completed task has the following properties.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

taskType: The task type of the propagation task, as specified in section 2.2.1.1.

objectID: If **taskType** is "ComponentAddition", the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component being added on the query components (2). For all other values of **taskType**, the value MUST not be used.

3.2.1.6 Error Possibly Exists

A **Boolean** value that is "false" if, and only if, this sender has deleted all propagation errors for this sender from the list propagation errors, as specified in section 3.1.1.3.

3.2.2 Timers

None.

3.2.3 Initialization

The "error possibly exists" value, as specified in section 3.2.1.6, MUST be set to "true".

3.2.4 Higher-Layer Triggered Events

None.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 Sending a proc_MSS_PropagationIndexerGetReadyQueryComponents Message

The sender SHOULD call the **proc_MSS_PropagationIndexerGetReadyQueryComponents** stored procedure, as specified in section 3.1.5.3, on a periodic basis. If it does not do this, the sender MUST use another method of accurately updating its list of ready query components, as specified in section 3.2.1.3, to match the back-end database server's list of ready query components, as specified in section 3.1.1.1. No special action is required if there is a change in this list.

3.2.5.2 Receiving a Ready Query Components Result Set

This result set, as specified in section 3.1.5.3.1, is received automatically after calling the **proc_MSS_PropagationIndexerGetReadyQueryComponents** stored procedure, as specified in section 3.1.5.3. The sender MUST replace its current list of ready query components, as specified in section 3.2.1.3, with exactly one ready query component for each received result, with the following settings:

- **serverName**, as specified in section 3.2.1.3, is set to the value of **ServerName**, as specified in section 3.1.5.3.1, of the result.
- **shareName**, as specified in section 3.2.1.3, is set to the value of **ShareName**, as specified in section 3.1.5.3.1, of the result.

The sender MUST NOT add any other ready query components into its list of ready query components, as specified in section 3.2.1.3).

3.2.5.3 Sending a Full-Text Index Component Message

This is the first message of a propagation sequence for a component addition action.

This message MUST be sent either when a full-text index component is generated for a full-text index catalog on the sender, or when any propagation task in the list of running tasks, as specified in section 3.2.1.4, in which the value of **lastPropagationTime** is more than 5 minutes prior to the current time.

To send this message, the sender MUST perform the following actions:

1. The sender generates a full-text index component, as specified in [MS-CIFO] section 2.17, except that each file name contains an additional prefix, which must be a 0-prefixed, 4-digit hexadecimal representation of the sender identifier, as specified in section 3.2.1.2, plus a period. See section 4.1.2 for an example.
2. The sender generates a propagation list file, as specified in section 2.2.3.1.1, containing the file names of each of the files contained in the propagated full-text index component message other than the propagation list file itself. See section 4.1.2 for an example.
3. Using the file copying protocol specified in [MS-SMB], the sender copies the duplicated full-text index component files and the propagation list file, as specified in section 2.2.3.1.1, to a path relative to **serverName**, as specified in section 3.2.1.3, and **shareName**, as specified in section 3.2.1.3, of each ready query component in the list of ready query components, as specified in section 3.2.1.3. The destination path MUST be \\<*server*>\<*share*>\<*application*>-query-<*receiverID*>\Projects\<*catalog*>\Indexer\CiFiles\<*file*>, where the following are true:

- *<server>* is the **serverName**, as specified in section 3.2.1.3.
- *<share>* is the **shareName**, as specified in section 3.2.1.3.
- *<application>* is the search application name, as specified in section 3.2.1.1.
- *<receiverID>* is the **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2.
- *<catalog>* is one of the following:
  - "Portal_Content" if the full-text index catalog is the main catalog, as specified in [MS-CIFO] section 2.18.1.
  - "AnchorProject" if the full-text index catalog is the anchor text catalog, as specified in [MS-CIFO] section 2.18.2.
- *<file>* is the file name specified in steps 1 or 2, as appropriate.

4. If this message is sent because of the generation of a new full-text index component by the sender, and no errors occurred when performing the file copies, it MUST call the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure, as specified in section 3.1.5.5. Also, if the "error possibly exists" value, as specified in section 3.2.1.6, is true, the sender MUST call the **proc_MSS_PropagationDeleteError** stored procedure, as specified in section 3.2.5.5.

5. If this message is sent because of the generation of a new full-text index component by the sender, and any error occurred when performing the file copies, this message MUST be resent beginning at step 1. In addition, if more than five minutes have elapsed since the error was first encountered, the sender MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.2.5.4.

6. If this message is sent because the value of **lastPropagationTime**, as specified in section 3.2.1.4, of a propagation task in the list of running tasks, as specified in section 3.2.1.4, is at least 5 minutes prior to the current time, and no errors occurred when performing the file copies, the sender MUST update its **lastPropagationTime** value to the current time.

3.2.5.4 Sending a proc_MSS_PropagationReportError Message

The sender calls the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.10, after it has encountered an error while sending a full-text index component message, as specified in section 3.2.5.3, with the following parameter values:

- *@SenderID* MUST be the sender identifier, as specified in section 3.2.1.2, of this sender.
- *@ReceiverID* MUST be the receiver identifier, as specified in section 3.2.5.3, of the receiver to which the full-text index catalog component could not be copied.
- *@CatalogID* MUST be the identifier of the full-text index catalog whose full-text index catalog component could not be copied.
- *@Type* MUST be "FileCopy", as specified in section 2.2.1.3.
- *@Message* SHOULD be a string that gives additional description of the error encountered, but any string is allowed by the protocol.

After successfully sending this message, the "error possibly exists" value, as specfiied in section 3.2.1.6, SHOULD be set to "true".

3.2.5.5 Sending a proc_MSS_PropagationDeleteError Message

The sender calls the **proc_MSS_PropagationDeleteError** stored procedure, as specified in section 3.1.5.10, after it has successfully sent a full-text index component message, as specified in section 3.2.5.3, with the following parameter values:

- *@SenderID* MUST be the sender identifier, as specified in section 3.2.1.2, of this sender.
- *@ReceiverID* MUST be the receiver identifier, as specified in section 3.2.5.3, of the receiver to which the full-text index catalog component was successfully copied.
- *@CatalogID* MUST be the identifier of the full-text index catalog whose full-text index catalog component was successfully copied.
- *@Type* MUST be "FileCopy", as specified in section 2.2.1.3.

After successfully sending this message, the "error possibly exists" value, as specified in section 3.2.1.6, SHOULD be set to "false".

3.2.5.6 Sending a proc_MSS_PropagationIndexerInsertNewTask Message

This is the first message of the propagation sequence for cleaning, which is specified in the following sections, and static rank computation, and the second message of the propagation sequence for component addition actions.

For any of the following events, the receiver calls the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure, as specified in section 3.1.5.5:

- Component addition. The sender calls the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure with the following parameters:
  - *@SenderID* MUST be the sender identifier, as specified in section 3.2.1.2, of this sender.
  - *@CatalogID* MUST be the catalog identifier, as specified in section 2.2.1.2, for the full-text index catalog.
  - *@TaskType* MUST be "ComponentAddition", as specified in section 2.2.1.1.
  - *@ObjectID* MUST be the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component.
  - *@MaxWorkID* MUST be the maximum document identifier (1) in the full-text index component.
  - *@MaxWorkID* MUST be the maximum document identifier (1) in the full-text index component.
  - *@BirthDate* MUST be the component birth date of the **document set** of the full-text index component
- Cleaning. It is often desirable to ensure that all query components (2) have finished all tasks before inserting another one. For this, the sender SHOULD call the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure with the following parameters:
  - *@SenderID* MUST be the sender identifier, as specified in section 3.2.1.2, of this sender.
  - *@CatalogID* MUST be the catalog identifier, as specified in section 2.2.1.2, for the full-text index catalog.

- *@TaskType* MUST be "ComponentAddition", as specified in section 2.2.1.1.
- *@ObjectID* MUST be zero.
- *@MaxWorkID* MUST be zero.
- *@BirthDate* MUST be zero.

  No change in the behavior of the sender is necessary if it does not send this message.

- Static rank computation. The sender calls the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure with the following parameters:
  - *@SenderID* MUST be the sender identifier, as specified in section 3.2.1.2.
  - *@CatalogID* MUST be the catalog identifier, as specified in section 2.2.1.2.
  - *@TaskType* MUST be "StaticRankComputation", as specified in section 2.2.1.2.
  - *@ObjectID* MUST be zero.
  - *@MaxWorkID* MUST be zero.
  - *@BirthDate* MUST be zero.

  If the back-end database server returns the value zero or 1, the message was sent successfully. Otherwise the message was not sent successfully.

  After successfully sending this message and receiving a return value of zero, a propagation task MUST be added to the list of running tasks, as specified in section 2.2.1.2, with **taskType** set to the *@TaskType* value of the message sent, **catalogID** set to the *@CatalogID* value of the message sent, **objectID** set to the *@ObjectID* value of the message sent, and **lastPropagationTime** set to the current time.

  If the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.2.5.7 Sending a proc_MSS_PropagationIndexerGetCompletedTasks Message

This stored procedure is called to retrieve information about any propagation tasks in the list of running tasks, as specified in section 3.1.1.2, that have been finished by all query components (2), so that they can be removed from the back-end database server's list of running tasks.

The sender MUST call the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure, as specified in section 3.1.5.2, periodically, for both the main catalog, as specified in [MS-CIFO] section 2.18.1, and the anchor text catalog, as specified in [MS-CIFO] section 2.18.2. The time interval between calls SHOULD be between 3 and 30 seconds, but using another interval does not prevent the successful execution of propagation tasks.

- *@SenderID*, as specified in section 3.1.5.2, MUST be the sender identifier, as specified in section 3.2.1.2, of this sender.
- *@CatalogID*, as specified in section 3.1.5.2, MUST be the identifier of the full-text index catalog.

If the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.2.5.8 Receiving a Completed Tasks Result Set Message

A completed tasks result set, as specified in section 3.1.5.2.1, is received automatically following any call to the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure, as specified in section 3.1.5.2). The full-text index catalog to which the result set applies is evident in the value of **CatalogID**, as specified in section 3.1.5.4.1, of each result in the result set. For this full-text index catalog, the sender MUST replace its list of completed tasks, as specified in section 3.2.1.5, with a new list containing one completed task for each result in this result set, with the following settings:

- **catalogID**, as specified in section 3.2.1.5, is set to the value of **CatalogID**, as specified in section 3.1.5.2.1, of the result.
- **taskType**, as specified in section 3.2.1.5, is set to the value of **TaskType**, as specified in section 3.1.5.2.1, of the result.
- **objectID**, as specified in section 3.2.1.5, is set to the value of **ObjectID**, as specified in section 3.1.5.2.1, of the result.

The sender MUST also remove the propagation task with **catalogID** equal to the value of **CatalogID**, as specified in section 3.1.5.2.1, of the result, and **objectID** equal to the value of **ObjectID**, as specified in section 3.1.5.2.1, of the result, from the list of running tasks, as specified in section 3.2.1.4.

3.2.5.9 Sending a proc_MSS_PropagationIndexerCleanUpTablesForTask Message

This is the final message sent in the propagation sequence of any propagation task.

Whenever there is at least one propagation task in the list of completed tasks, as specified in section 3.2.1.5, the **proc_MSS_PropagationIndexerCleanUpTablesForTask** stored procedure, as specified in section 3.1.5.1, MUST be called once for each completed task, using the following parameters:

- *@CatalogID*, as specified in section 3.1.5.1, is set to the **catalogID** value, as specified in section 3.2.1.5, of the completed task.
- *@TaskType*, as specified in section 3.1.5.1, is set to the **taskType** value, as specified in section 3.2.1.5, of the completed task.
- *@ObjectID*, as specified in section 3.1.5.1, is set to the **objectID** value, as specified in section 3.2.1.5, of the completed task.

After successfully sending this message, the sender MUST also remove the propagation task with **catalogID** equal to the **CatalogID** value, as specified in section 3.1.5.2.1, of the result, and **objectID** equal to the **ObjectID** value, as specified in section 3.1.5.2.1, of the result, from the list of completed tasks, as specified in section 3.2.1.5.

If the **proc_MSS_PropagationIndexerCleanUpTablesForTask** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.2.5.10 Sending the proc_MSS_PropagationIndexerGetTasks Message

The sender calls the **proc_MSS_PropagationIndexerGetTasks** stored procedure, as specified in section 3.1.5.4, at any time, with no precondition. Processes on the sender use this to get the back-end database server's list of all running tasks, as specified in section 3.1.1.2. The *@SenderID* parameter, as specified in section 3.1.5.4, MUST be the sender's sender identifier, as specified in section 3.2.1.2. The *@CatalogID* parameter, as specified in section 3.1.5.4, MUST be the catalog identifier, as specified in section 2.2.1.2, of a full-text index catalog.

If the **proc_MSS_PropagationIndexerGetTasks** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.2.5.11 Receiving a Propagation Tasks Result Set

This result set is received automatically after calling the **proc_MSS_PropagationIndexerGetTasks** stored procedure, as specified in section 3.2.5.10.

Receiving this message MUST NOT affect the state of the sender that is specified in section 3.2.1.

3.2.5.12 Sending the proc_MSS_PropagationIndexerDeleteAllTasksFromSender Message

The sender calls the **proc_MSS_PropagationDeleteAllTasksFromSender** stored procedure, as specified in section 3.1.5.7, at any time, with no precondition, using the following parameters:

- *@SenderID*, as specified in section 3.1.5.7, is set to the **senderID** value, as specified in section 3.2.1.2, of the sender.
- *@CatalogID*, as specified in section 3.1.5.7, is set to the **catalogID** value, as specified in section 2.2.1.2, of the full-text index catalog for which the propagation tasks are to be removed from the list of running tasks, as specified in section 3.1.1.2.

3.2.6 Timer Events

None.

3.2.7 Other Local Events

None.

3.3 Receiver Details

The receiver is implemented by a query component (2). A receiver uses the protocol to apply changes to its full-text index catalogs and to perform static rank computation on its full-text index catalogs.

3.3.1 Abstract Data Model

The following section specifies data and state that are sufficient to specify the behavior of the receiver. Implementations do not need to adhere to this model as long as their server-to-server communication is consistent with that which is specified in this document.

3.3.1.1 Receiver Identifier

An integer that uniquely identifies the receiver. This MUST be equal to the **QueryComponentNumber** of the query component (2), as specified in [MS-SRCHTP] section 3.1.1.2.

3.3.1.2 List of Incomplete Tasks

A list of zero or more incomplete tasks. An incomplete task has the following properties.

senderID: The sender identifier, as specified in section 3.2.1.2, of the sender that created the propagation task.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

taskType: The task type of the propagation task, as specified in section 2.2.1.1.

objectID: If **taskType** is "ComponentAddition", as specified in section 2.2.1.1, the versioned index identifier, as specified in section 2.2.3.2, of the full-text index component being added on the query components (2). For all other values of **taskType**, the value is not used.

maxWorkID: If **taskType** is "ComponentAddition", as specified in section 2.2.1.1, the maximum document identifier (1) in the full-text index component. For all other values of **taskType**, the value is not used.

birthDate: If **taskType** is "ComponentAddition", as specified in section 2.2.1.1, the component birth date of the document set of the full-text index component. For all other values of **taskType**, the value is not used.

3.3.1.3 Error Possibly Exists

A **Boolean** value that is "false" if, and only if, this receiver has deleted all propagation errors for this receiver from the list propagation errors, as specified in section 3.1.1.3.

3.3.2 Timers

None.

3.3.3 Initialization

The "error possibly exists" value, as specified in section 3.3.1.3, MUST be set to "true".

3.3.4 Higher-Layer Triggered Events

None.

3.3.5 Message Processing Events and Sequencing Rules

3.3.5.1 Sending a proc_MSS_PropagationQueryComponentPickUpNewPropagationItems Message

All activity on a query component (2) for a propagation sequence begins with this call.

The receiver MUST call the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure, as specified in section 3.1.5.6, periodically, for both the main catalog, as specified in [MS-CIFO] section 2.18.1, and the anchor text catalog, as specified in [MS-CIFO] section 2.18.2. The time interval between calls SHOULD be between 3 and 30 seconds, but using another interval does not prevent the successful execution of propagation tasks. The procedure MUST be called with the following parameters:

- *@ReceiverID*, as specified in section 3.1.5.6, MUST be the receiver identifier, as specified in section 3.3.1.1, of this receiver.
- *@CatalogID*, as specified in section 3.1.5.6, MUST be the identifier of the full-text index catalog.

If the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.3.5.2 Receiving a Propagation Tasks Result Set

A propagation tasks result set is received automatically after sending a **proc_MSS_PropagationQueryServerPickUpNewPropagationItems** message, as specified in section 3.1.5.6. The full-text index catalog to which the result set applies is specified in the value of **CatalogID**, as specified in section 3.1.5.4.1, of each result in the result set. For this full-text index catalog, the query component (2) MUST replace its list of incomplete tasks, as specified in section 3.3.1.2, with a new list that contains one incomplete task for each result in this result set, where the following are true:

- **senderID**, as specified in section 3.3.1.2, is set to the value of **SenderID**, as specified in section 3.1.5.6, of the result.
- **catalogID**, as specified in section 3.3.1.2, is set to the value of **CatalogID**, as specified in section 3.1.5.6, of the result.
- **taskType**, as specified in section 3.3.1.2. is set to the value of **TaskType**, as specified in section 3.1.5.6, of the result.
- **objectID**, as specified in section 3.3.1.2, is set to the value of **ObjectID**, as specified in section 3.1.5.6, of the result.
- **maxWorkID**, as specified in section 3.3.1.2, is set to the value of **MaxWorkID**, as specified in section 3.1.5.6, of the result.
- **birthdate**, as specified in section 3.3.1.2, is the value of **BirthDate**, as specified in section 3.1.5.6, of the result.

3.3.5.3 Sending a proc_MSS_PropagationReportError Message

If the receiver encounters an error while processing the propagation task, it MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.10, with the following parameter values:

- *@SenderID* MUST be zero.
- *@ReceiverID* MUST be the receiver identifier, as specified in section 3.3.1.1.
- *@CatalogID* MUST be the identifier of the full-text index catalog whose full-text index catalog component could not be absorbed.
- *@Type* MUST be "IndexAbsorption", as specified in section 2.2.1.3.
- *@Message* SHOULD be a **string** that gives additional description of the error encountered, but any **string** is allowed by the protocol.

After successfully sending this message, the "error possibly exists" value, as specified in section 3.3.1.3, should be set to "true".

The receiver also calls the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.10, after it has encountered any data that is not valid in the full-text index catalog, with the following parameter values:

- *@SenderID* MUST be zero.
- *@ReceiverID* MUST be the receiver **identifier, as specified in** section 3.3.1.1.
- *@CatalogID* MUST be the identifier of the full-text index catalog that has been found to contain data that is not valid.
- *@Type* MUST be "IndexCorruption", as specified in section 2.2.1.3.

@Message MUST be text that gives additional description of the error encountered.

3.3.5.4 Sending a proc_MSS_PropagationDeleteError Message

If the receiver has successfully processed a propagation task, and the "error possibly exists" value, as specified in section 3.3.1.3, is "true", the receiver MUST call the **proc_MSS_PropagationDeleteError** stored procedure, as specified in section 3.1.5.10, with the following parameter values:

- *@SenderID* MUST be zero.
- *@ReceiverID* MUST be the receiver identifier, as specified in section 3.3.1.1.
- *@CatalogID* MUST be the identifier of the full-text index catalog with the full-text index catalog component that could not be absorbed.
- *@Type* MUST be "IndexAbsorption", as specified in section 2.2.1.3.

After successfully sending this message, the "error possibly exists" value, as specified in section 3.3.1.3, should be set to "false".

3.3.5.5 Sending a proc_MSS_PropagationQueryComponentReportTaskReady Message

This message is the last message sent by a receiver in the propagation sequence.

The **proc_MSS_PropagationQueryComponentReportTaskReady** stored procedure, as specified in section 3.1.5.8, MUST be called once for each incomplete task in the receiver's list of incomplete tasks, as specified in section 3.3.1.2, with the following parameter values:

- *@SenderID*, as specified in section 3.1.5.8, is set to the value of **senderID**, as specified in section 3.3.1.2, of the incomplete task.
- *@ReceiverID*, as specified in section 3.1.5.8, is set to the receiver identifier, as specified in section 3.3.1.1.
- *@CatalogID*, as specified in section 3.1.5.8, is set to the value of **catalogID**, as specified in section 3.3.1.2, of the incomplete task.
- *@TaskType*, as specified in section 3.1.5.8, is set to the value of **taskType**, as specified in section 3.3.1.2, of the incomplete task.
- *@ObjectID*, as specified in section 3.1.5.8, is set to the value of **objectID**, as specified in section 3.3.1.2, of the incomplete task.

If the **proc_MSS_PropagationQueryComponentReportTaskReady** stored procedure could not be called successfully, the call MUST be retried using the same parameters. The retry interval SHOULD be at least 3 seconds. There MUST NOT be a limit on the number of retries.

3.3.6 Timer Events

None.

3.3.7 Other Local Events

None.

3.4 Admin Server Details

The admin server MUST be implemented on the server where the administration component exists. The admin server periodically interprets the current list of propagation errors and takes query components (2) offline when appropriate.

3.4.1 Abstract Data Model

The following section specifies data and state that are sufficient to specify the behavior of the admin server. Implementations do not need to adhere to this model as long as their server-to-server communication is consistent with that which is specified in this document.

3.4.1.1 List of Running Tasks

A list of zero or more running tasks. Each running task represents one propagation task that is currently being performed by all query components (2). A running task has the following properties.

taskType: The task type, as specified in section 2.2.1.1, of the propagation task.

senderID: The **CrawlComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that created the propagation task.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

objectID: The versioned index identifier, as specified in section 2.2.3.2, of the full-text index component being added.

maxDocID: The maximum document identifier (1) of the full-text index component being added.

birthDate: The component birth date of the full-text index component being added.

time: The UTC time when the task was added to this list.

3.4.1.2 List of Task Completions

A list of zero or more records of the completion of a propagation task by a particular receiver. A task completion has the following properties.

receiverID: The **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component (2) that finished the propagation task.

taskType: The task type, as specified in section 2.2.1.1, of the propagation task.

senderID: The **CrawlComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component which created the propagation task.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation task applies.

objectID: The versioned index identifier, as specified in section 2.2.3.2, of the full-text index component being added.

maxDocID: The maximum document identifier (1) of the full-text index component being added.

birthDate: The component birth date of the full-text index component being added.

3.4.1.3 List of Propagation Errors

A list of zero or more propagation errors that have been reported in response to conditions encountered in the execution of this protocol. A propagation error has the following properties.

senderID: The **CrawlComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.3, of the crawl component that reported the propagation error, or NULL if the error was reported by a query component (2).

receiverID: The **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, of the query component that reported the propagation error, or the query component (2) to which full-text index components could not be copied by a crawl component.

catalogID: The catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog to which the propagation error applies.

type: The propagation error type, as specified in section 2.2.1.3, of the error.

firstUtcTime: The UTC time when the error was first added to the list.

latestUtcTime: The latest UTC time when an error with the same propagation error type, as specified in section 2.2.1.3, was reported by the same sender or receiver.

3.4.1.4 List of Receivers

A list of receivers. A receiver has the following properties.

receiverID: The **QueryComponentNumber**, as specified in [MS-SRCHTP] section 3.1.1.2, of the receiver.

receiverGuid: The **QueryComponentID**, as specified in [MS-SRCHTP] section 3.1.1.2, of the receiver.

state: The **State**, as specified in [MS-SRCHTP] section 3.1.1.2, of the receiver.

upToDate: A **Boolean** value that is "true" if, and only if, the receiver does not have any outstanding component activity, as specified in [MS-SQLPGAT2] section 3.1.1.35, to do.

hung: A **Boolean** value that is "true" if, and only if, the receiver has failed to complete at least one component addition propagation task for more than five minutes.

3.4.2 Timers

None.

3.4.3 Initialization

None.

3.4.4 Higher-Layer Triggered Events

None.

3.4.5 Message Processing Events and Sequencing Rules

The following actions MUST be taken by the admin server on a recurring basis, starting with section 3.4.5.1 and ending with section 3.4.5.12. The recurrences SHOULD be one minute apart, but all finite time intervals are allowed by the protocol.

3.4.5.1 Sending a proc_MSS_PropagationGetTasks Message

The admin server calls the **proc_MSS_PropagationGetTasks** stored procedure, as specified in section 3.1.5.13, with no parameters.

3.4.5.2 Receiving a Propagation All Tasks Result Set

The admin server receives this result set as a result of a call to **proc_MSS_PropagationGetTasks**, as specified in section 3.4.5.1. When it receives this result set, it MUST replace its current list of running tasks, as specified in section 3.4.1.1, with a new list that contains one running task for each result in this result set, with the following settings:

- **senderID**, as specified in section 3.4.1.1, is set to the value of **SenderID**, as specified in section 3.4.5.2, of the result.
- **catalogID**, as specified in section 3.4.1.1, is set to the value of **CatalogID**, as specified in section 3.4.5.2, of the result.
- **taskType**, as specified in section 3.4.1.1, is set to the value of **TaskType**, as specified in section 3.4.5.2, of the result.
- **objectID**, as specified in section 3.4.1.1, is set to the value of **ObjectID**, as specified in section 3.4.5.2, of the result.
- **maxWorkID**, as specified in section 3.4.1.1, is set to the value of **MaxWorkID**, as specified in section 3.4.5.2) of the result.
- **birthdate**, as specified in section 3.4.1.1, is the value of **BirthDate**, as specified in section 3.4.5.2, of the result.
- **time**, as specified in section 3.4.1.1, is set to the value of **Time**, as specified in section 3.4.5.2, of the result.

3.4.5.3 Sending a proc_MSS_PropagationGetTaskCompletions Message

The admin server calls the **proc_MSS_PropagationGetTaskCompletions** stored procedure, as specified in section 3.1.5.14, with no parameters.

3.4.5.4 Receiving a Propagation Task Completions Result Set

The admin server receives this result set as a result of a call to **proc_MSS_PropagationGetTaskCompletions**, as specified in section 3.4.5.3. When it receives this result set, it MUST replace its current list of task completions, as specified in section 3.4.1.2, with a new list that contains one task completion for each result in this result set, with the following settings:

- **receiverID**, as specified in section 3.4.1.2, is set to the value of **ReceiverID**, as specified in section 3.1.5.14.1, of the result.
- **senderID**, as specified in section 3.4.1.2, is set to the value of **SenderID**, as specified in section 3.1.5.14.1, of the result.
- **catalogID**, as specified in section 3.4.1.2, is set to the value of **CatalogID**, as specified in section 3.1.5.14.1, of the result.
- **taskType**, as specified in section 3.4.1.2, is set to the value of **TaskType**, as specified in section 3.1.5.14.1, of the result.
- **objectID**, as specified in section 3.4.1.2, is set to the value of **ObjectID**, as specified in section 3.1.5.14.1, of the result.
- **maxWorkID**, as specified in section 3.4.1.2, is set to the value of **MaxWorkID**, as specified in section 3.1.5.14.1, of the result.
- **birthdate**, as specified in section 3.4.1.2, is the value of **BirthDate**, as specified in section 3.1.5.14.1, of the result.

3.4.5.5 Sending a proc_MSS_PropagationGetErrors Message

The admin server MUST call the **proc_MSS_PropagationGetErrors** stored procedure, as specified in section 3.1.5.12, with no parameters.

3.4.5.6 Receiving a Propagation Errors Result Set

The admin server receives this result set as a result of a call to **proc_MSS_PropagationGetErrors**, as specified in section 3.4.5.5. When it receives this result set, it MUST replace its current list of propagation errors, as specified in section 3.4.1.3, with a new list that contains one propagation error for each result in this result set, with the following settings:

- **senderID**, as specified in section 3.4.1.3, is set to the value of **SenderID**, as specified in section 3.1.5.12.1, of the result.
- **receiverID**, as specified in section 3.4.1.3, is set to the value of **ReceiverID**, as specified in section 3.1.5.12.1, of the result.
- **catalogID**, as specified in section 3.4.1.3, is set to the value of **CatalogID**, as specified in section 3.1.5.12.1, of the result.
- **type**, as specified in section 3.4.1.2, is set to the value of **Type**, as specified in section 3.1.5.12.1, of the result.
- **firstUtcTime**, as specified in section 3.4.1.3, is set to the value of **FirstUtcTime**, as specified in section 3.1.5.12.1, of the result.
- **latestUtcTime**, as specified in section 3.4.1.3, is set to the value of **LatestUtcTime**, as specified in section 3.1.5.12.1, of the result.

3.4.5.7 Sending a proc_MSS_GetQueryComponents Message

The admin server calls the **proc_MSS_GetQueryComponents** stored procedure, as specified in [MS-SRCHTP] section 3.1.5.51, with no parameters.

3.4.5.8 Receiving a Query Components Result Set Message

The admin server receives this result set, as specified in [MS-SRCHTP] section 2.2.4.2, as a result of a call to **proc_MSS_GetQueryComponents**, as specified in section 3.4.5.7. When it receives this result set, it MUST replace its current list of receivers, as specified in section 3.4.1.4, with a new list that contains one receiver for each result in this result set whose **State** value, as specified in [MS-SRCHTP] section 2.2.4.2, is either "Ready" or "IndexSplitDone", as specified in [MS-SRCHTP] section 2.2.1.3, with the following settings:

- **receiverID**, as specified in section 3.4.1.4, is set to the **QueryComponentNumber** value, as specified in [MS-SRCHTP] section 2.2.4.2, of the result.
- **receiverGuid**, as specified in section 3.4.1.4, is set to the **QueryComponentID** value, as specified in [MS-SRCHTP] section 2.2.4.2, of the result.
- **upToDate**, as specified in section 3.4.1.4, is set to "true".
- **hung**, as specified in section 3.4.1.4, is set to "false".

3.4.5.9 Sending a proc_MSS_GetComponentStatusUpToDate Message

The admin server MUST call the **proc_MSS_GetComponentStatusUpToDate** stored procedure, as specified in [MS-SQLPGAT2] section 3.1.5.18, twice for each receiver in the list of receivers, as specified in section 3.4.1.4.

The first call MUST be made with the following parameters:

- *@ComponentType*, as specified in [MS-SQLPGAT2] section 3.1.5.18, MUST be "1".
- *@ReceiverID*, as specified in [MS-SQLPGAT2] section 3.1.5.18. MUST be the value of **receiverID**, as specified in section 3.4.1.4.
- *@ProjectName*, as specified in [MS-SQLPGAT2] section 3.1.5.18, MUST be "Portal_Content".

If the value of the output parameter *@UpToDate* is "false", the **upToDate** value of the receiver MUST be set to "false".

The second call MUST be made with the following parameters:

- *@ComponentType*, as specified in [MS-SQLPGAT2] section 3.1.5.18, MUST be "1".
- *@ReceiverID*, as specified in [MS-SQLPGAT2] section 3.1.5.18, MUST be the value of **receiverID**, as specified in section 3.4.1.4.
- *@ProjectName*, as specified in [MS-SQLPGAT2] section 3.1.5.18, MUST be "AnchorProject".

If the value of the output parameter *@UpToDate* is "false", the **upToDate** value, as specified in section 3.4.1.4, of the receiver MUST be set to "false".

3.4.5.10 Sending a proc_MSS_PropagationReportError Message

For each full-text index catalog **Portal_Content** and **AnchorProject**, as specified in [MS-CIFO], of each receiver in the list of receivers, as specified in section 3.4.1.4, the admin server MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.9, in the following cases.

If the receiver's value of **hung**, as specified in section 3.4.1.4, is "true", and there is no propagation error in the list of propagation errors, as specified in section 3.4.1.3, in which the **receiverID** value, as specified in section 3.4.1.3, is the **receiverID**, as specified in section 3.4.1.4, of the receiver, **catalogID** value, as specified in section 3.4.1.3, is the catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog, **type** value, as specified in section 3.4.1.3, is "ReceiverHang", as specified in section 2.2.1.3, and **latestUtcTime** value, as specified in section 3.4.1.3, is less than five minutes before the current time, the admin server MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.9, with the following parameters:

- *@SenderID*, as specified in section 3.1.5.9, MUST be NULL.
- *@ReceiverID*, as specified in section 3.1.5.9, MUST be the value of **receiverID**, as specified in section 3.4.1.4.
- *@CatalogID*, as specified in section 3.1.5.9, MUST be the catalog identifier, as specified in section 2.2.1.2, corresponding to the full-text index catalog.
- *@Type*, as specified in section 3.1.5.9, MUST be "ReceiverHang", as specified in section 2.2.1.3.
- *@Message*, as specified in section 3.1.5.9, SHOULD be "not completing tasks", but any text is allowed by this protocol.

If the requirements to make the first call in the preceding description were not met, the **upToDate** value, as specified in section 3.4.1.4, of the receiver is "false", and there is no propagation error in the list of propagation errors, as specified in section 3.4.1.3, in which the **receiverID** value, as specified in section 3.4.1.3, is the **receiverID**, as specified in section 3.4.1.4, of the receiver, **catalogID** value, as specified in section 3.4.1.3, is the catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog, type value, as specified in section 3.4.1.3, is "ReceiverHang", as specified in section 2.2.1.3, and **latestUtcTime** value, as specified in section 3.4.1.3, is less than five minutes before the current time, the admin server MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.9, with the following parameters:

- *@SenderID*, as specified in section 3.1.5.9, MUST be NULL.
- *@ReceiverID*, as specified in section 3.1.5.9, MUST be the value of **receiverID**, as specified in section 3.4.1.4.
- *@CatalogID*, as specified in section 3.1.5.9, MUST be the catalog identifier, as specified in section 2.2.1.2, corresponding to the full-text index catalog.
- *@Type*, as specified in section 3.1.5.9, MUST be "ReceiverHang", as specified in section 2.2.1.3.
- *@Message*, as specified in section 3.1.5.9, SHOULD be "not pausing, resuming, or resetting", but any text is allowed by this protocol.

3.4.5.11 Sending a proc_MSS_PropagationDeleteError Message

For each full-text index catalog **Portal_Content** and **AnchorProject**, as specified in [MS-CIFO], of each receiver in the list of receivers, as specified in section 3.4.1.4, the admin server MUST call the **proc_MSS_PropagationDeleteError** stored procedure, as specified in section 3.1.5.10, for the following case.

If the **upToDate** value, as specified in section 3.4.1.4, of the receiver is "true", and the value of **hung**, as specified in section 3.4.1.4, is "false", and there is a propagation error in the list of propagation errors, as specified in section 3.4.1.3, whose **receiverID** value, as specified in section 3.4.1.3, is the receiver identifier, as specified in section 3.4.1.4, of the receiver, **catalogID** value, as specified in section 3.4.1.3, is the catalog identifier, as specified in section 2.2.1.2, of the full-text index catalog, and type value, as specified in section 3.4.1.3, is "ReceiverHang", as specified in section 2.2.1.3, the admin server MUST call the **proc_MSS_PropagationReportError** stored procedure, as specified in section 3.1.5.10, with the following parameters:

- *@SenderID*, as specified in section 3.1.5.10, MUST be NULL.
- *@ReceiverID*, as specified in section 3.1.5.10, MUST be the receiver identifier, as specified in section 3.4.1.4.
- *@CatalogID*, as specified in section 3.1.5.10 MUST be the catalog identifier, as specified in section 2.2.1.2, corresponding to the full-text index catalog.
- *@Type*, as specified in section 3.1.5.10, MUST be "ReceiverHang".

3.4.5.12 Sending a proc_MSS_SetQueryComponent Message

For each receiver in the list of receivers, as specified in section 3.4.1.4, for which there is at least one propagation error in the list of propagation errors, as specified in section 3.4.1.3, where receiver identifier, as specified in section 3.4.1.3, is the receiver identifier, as specified in section 3.4.1.4, and **firstUtcTime**, as specified in section 3.4.1.3, is more than one hour before the current time, the admin server MUST call the **proc_MSS_SetQueryComponent** stored procedure, as specified in [MS-SRCHTP] section 3.1.5.87, with the following parameters:

- *@QueryComponentID* MUST be the **receiverGuid**, as specified in section 3.4.1.4, of the receiver.
- *@State* MUST be "Offline", as specified in [MS-SRCHTP] section 2.2.1.3.
- All other parameters MUST be NULL.

3.4.6 Timer Events

None.

3.4.7 Other Local Events

None.

4 Protocol Examples

4.1 Component Addition Propagation

For the example in the following subsections, a search application is demonstrated that has the following four actors:

- **DB-1**: a back-end database server**.**
- **SEN-1**: a sender.
- **REC-1**: a query component.
- **REC-2**: another query component.

4.1.1 Initial State

4.1.1.1 DB-1

4.1.1.1.1 List of Ready Query Components

The list contains the following two query components:

1. REC-1
    1. **QueryComponentNumber** is zero.
    2. **ServerName** is "REC-1".
    3. **State** is "Ready".
    4. **ShareName** is "4c436ee0-b809-4e8a-b00b-be776306e0ee-query-0".
2. REC-2
    1. **QueryComponentNumber** is "1".
    2. **ServerName** is "REC-2".
    3. **State** is "Ready".
    4. **ShareName** is "4c436ee0-b809-4e8a-b00b-be776306e0ee-query-1".

4.1.1.1.2 List of Running Tasks

The list is empty.

4.1.1.2 SEN-1

4.1.1.2.1 Search Application Name

The name is "4c436ee0-b809-4e8a-b00b-be776306e0ee".

4.1.1.2.2 Sender Identifier

The sender identifier is zero.

4.1.1.2.3 List of Ready Query Components

The list contains the following two query components:

1. REC-1
    1. **serverName** is "REC-1".
    2. **shareName** is "4c436ee0-b809-4e8a-b00b-be776306e0ee-query-0".
2. REC-2
    1. **serverName** is "REC-2".
    2. **shareName** is "4c436ee0-b809-4e8a-b00b-be776306e0ee-query-1".

4.1.1.2.4 List of Completed Tasks

The list is empty.

4.1.1.3 REC-1

4.1.1.3.1 Receiver Identifier

The receiver identifier is zero.

4.1.1.3.2 List of Incomplete Tasks

The list is empty.

4.1.1.4 REC-2

4.1.1.4.1 Receiver Identifier

The receiver identifier is "1".

4.1.1.4.2 List of Incomplete Tasks

The list is empty.

4.1.2 Sequence of Events

Events 1 through 6 are not necessary for the propagation sequence to occur, but are presented to demonstrate the steady state of the system that would be recurring in cycles before the propagation sequence begins in event 7.

Event 1: SEN-1 polls DB-1 every 30 seconds by calling the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure with *@CatalogID* set to "1". DB-1 returns zero.

Event 2: DB-1 replies with an empty completed tasks result set, indicating that there are no completed tasks for the main catalog.

Event 3: REC-1 polls DB-1 every 30 seconds by calling the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure with *@CatalogID* set to "1". DB-1 returns zero.

Event 4: DB-1 replies with an empty incomplete tasks result set, indicating that there are currently no propagation tasks for REC-1 to perform.

Event 5: REC-2 polls DB-1 every 30 seconds by calling the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure with *@CatalogID* set to zero. DB-1 returns zero.

Event 6: DB-1 replies with an empty incomplete tasks result set, indicating that there are currently no propagation tasks for REC-2 to perform.

At this point, the sender has generated a new full-text index component and propagates the component. The full-text index component has index identifier "0x0001001A", versioned index identifier "0x0054001A", maximum document identifier (1) "471952", and component birth date "414".

Event 7: SEN-1 writes the full-text index component files listed in the following table. All file names begin with the sender identifier zero, contain one of the file names of a full-text index component, and end with the "cp" extension.

File name
0000.0001001A.ci.cp
0000.0001001A.dir.cp
0000.0001001A.bsi.cp
0000.0001001A.bsd.cp
0000.0001001A.csi.cp
0000.0001001A.csd.cp
0000.0001001A.wid.cp
0000.0001001A.list.cp

to both of the following file paths:

Shared folder
\\REC-1\4c436ee0-b809-4e8a-b00b-be776306e0ee-query-0\4c436ee0-b809-4e8a-b00b-be776306e0ee-query-0\Projects\Portal_Content\Indexer\Cifiles
\\REC-2\4c436ee0-b809-4e8a-b00b-be776306e0ee-query-1\4c436ee0-b809-4e8a-b00b-be776306e0ee-query-1\Projects\Portal_Content\Indexer\Cifiles

Event 8: SEN-1 calls the **proc_MSS_PropagationIndexerInsertNewTask** stored procedure with the following parameters:

- *@SenderID* is set to zero.
- *@CatalogID* is set to "1".
- *@TaskType* is set to "ComponentAddition".

- *@ObjectID* is set to "5505050" (hexadecimal equivalent: 0x0054001A).
- *@MaxWorkID* is set to "471952".
- *@BirthDate* is set to "414".

DB-1 returns zero.

Event 9: REC-1 calls the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure with *@ReceiverID* set to zero and *@CatalogID* set to "1". DB-1 returns zero.

Event 10: DB-1 sends a propagation tasks result set with one result with the following settings:

- **SenderID** is set to zero.
- **CatalogID** is set to "1".
- **TaskType** is set to "ComponentAddition".
- **ObjectID** is set to "5505050" (hexadecimal equivalent: 0x0054001A).
- **MaxWorkID** is set to "471952".
- **Birthdate** is set to "414".

Event 11: REC-1 applies the full-text index component and calls the **proc_MSS_PropagationQueryComponentReportTaskReady** stored procedure with the following parameters:

- *@ReceiverID* is set to zero.
- *@SenderID* is set to zero.
- *@CatalogID* is set to "1".
- *@TaskType* is set to "ComponentAddition".
- *@ObjectID* is set to "5505050".

DB-1 returns zero.

Event 12: SEN-1 polls DB-1 again by calling the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure with *@CatalogID* set to "1". DB-1 returns zero.

Event 13: DB-1 sends an empty completed tasks result set, indicating that there are no completed tasks for the main catalog.

Event 14: REC-2 calls the **proc_MSS_PropagationQueryComponentPickUpNewPropagationItems** stored procedure with *@ReceiverID* set to "1" and *@CatalogID* set to "1".

Event 15: DB-1 returns the following propagation tasks result set:

- **SenderID** is set to zero.
- **CatalogID** is set to "1".

- **TaskType** is set to "ComponentAddition".
- **ObjectID** is set to "5505050".
- **MaxWorkID** is set to "471952".
- **Birthdate** is set to "414".

Event 16: REC-2 applies the full-text index component and calls the **proc_MSS_PropagationQueryComponentReportTaskReady** stored procedure with the following parameters:

- *@ReceiverID* is set to "1".
- *@SenderID* is set to "1".
- *@CatalogID* is set to "1".
- *@TaskType* is set to "ComponentAddition".
- *@ObjectID* is set to "5505050".

DB-1 returns zero.

Event 17: The index server SEN-1 polls DB-1 again by calling the **proc_MSS_PropagationIndexerGetCompletedTasks** stored procedure with *@SenderID* set to zero and *@CatalogID* set to "1". DB-1 returns zero.

Event 18: DB-1 returns the following completed tasks result set:

- **SenderID** is set to zero.
- **CatalogID** is set to "1".
- **TaskType** is set to "ComponentAddition".
- **ObjectID** is set to "5505050".
- **{MaxWorkID}** is set to zero.
- **{Birthdate}** is set to zero.

Event 19: The index server SEN-1 then calls the **proc_MSS_PropagationIndexerCleanUpTablesForTask** stored procedure with the following parameters:

- *@SenderID* is set to zero.
- *@CatalogID* is set to "1".
- *@TaskType* is set to "ComponentAddition".
- *@ObjectID* is set to "5505050".

DB-1 returns zero.

Event 20: DB-1 deletes the propagation task from its list of running propagation tasks.

5 Security

5.1 Security Considerations for Implementers

Security for this protocol is controlled by the access rights to the databases on the back-end database server, which is negotiated as part of the TDS protocol, as described in [MS-TDS].

To call stored procedures, the sender and receiver runs as an account that has read and write permissions on the back-end database server. That account is a member of the local security **group (2)** named "WSS_WPG".

5.2 Index of Security Parameters

None.

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:

- Microsoft® SharePoint® Server 2010
- Microsoft® SQL Server® 2005
- Microsoft® SQL Server® 2008
- Microsoft® SQL Server® 2008 R2

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

No table of changes is available. The document is either new or has had no changes since its last release.

8 Index