[MS-FSCF]:
Content Feeding Protocol Specification

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Revision Summary

Date	Revision History	Revision Class	Comments
11/06/2009	0.1	Major	Initial Availability
02/19/2010	1.0	Major	Updated and revised 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
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06/29/2010	1.04	Editorial	Changed language and formatting in the technical content.
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Table of Contents

1 Introduction

This document specifies the Content Feeding Protocol. This protocol enables a protocol client to submit a set of documents to a protocol server for processing and indexing. This protocol also enables a protocol client to remove or update a set of documents from an index, and to remove a collection of documents from an index. A typical scenario for using this protocol is an application that traverses a file system and submits files to the protocol server for processing and indexing.

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]:

attribute
certificate
Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)
security identifier (SID)
UTF-16
UTF-8

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

abstract object reference (AOR)
base port
callback message
Cheetah
Cheetah checksum
Cheetah entity
claim type
claim value
client proxy
content client
content collection
content distributor
crawled property
document identifier
FAST Search Interface Definition Language (FSIDL)
host name
indexing dispatcher
indexing node
managed property
name server
search index
security principal identifier
user store identifier

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.

[MS-FSCDFT] Microsoft Corporation, "Content Distributor Fault Tolerance Protocol Specification".

[MS-FSCHT] Microsoft Corporation, "Cheetah Data Structure".

[MS-FSDP] Microsoft Corporation, "Document Processing Protocol Specification".

[MS-FSMW] Microsoft Corporation, "Middleware Protocol Specification".

[MS-FSWCU] Microsoft Corporation, "WebAnalyzer/Crawler Utility Structure Specification".

[RFC1950] Deutsch, P., and Gailly, J-L., "ZLIB Compressed Data Format Specification version 3.3", RFC 1950, May 1996, http://www.ietf.org/rfc/rfc1950.txt

[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

[RFC4648] Josefsson, S., "The Base16, Base32, and Base64 Data Encodings", RFC 4648, October 2006, http://www.ietf.org/rfc/rfc4648.txt

1.2.2 Informative References

[MSDN-SDDL] Microsoft Corporation, "Security Descriptor String Format", http://msdn.microsoft.com/en-us/library/aa379570.aspx

[MS-FSDPD] Microsoft Corporation, "Document Processing Distribution Protocol Specification".

[MS-FSPSCFG] Microsoft Corporation, "Processor Server Configuration File Format Specification".

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

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

1.3 Overview

This protocol enables a **content client** to send item operations to a **content distributor**. The content distributor sends the item operations to an item processor for processing. The item processor sends the item operations to the **indexing dispatcher** for indexing. The content client receives **callback messages** from the content distributor when item operations have been processed, stored to disk, and when item operations have been indexed. This protocol also allows the content client to remove all items in a **content collection**.

The feeding chain sequence of which this protocol is a part consists of the content client, content distributor, item processor, indexing dispatcher, and **indexing nodes**. This protocol defines the

communication between the two first components in the feeding chain, as illustrated in the following figure.

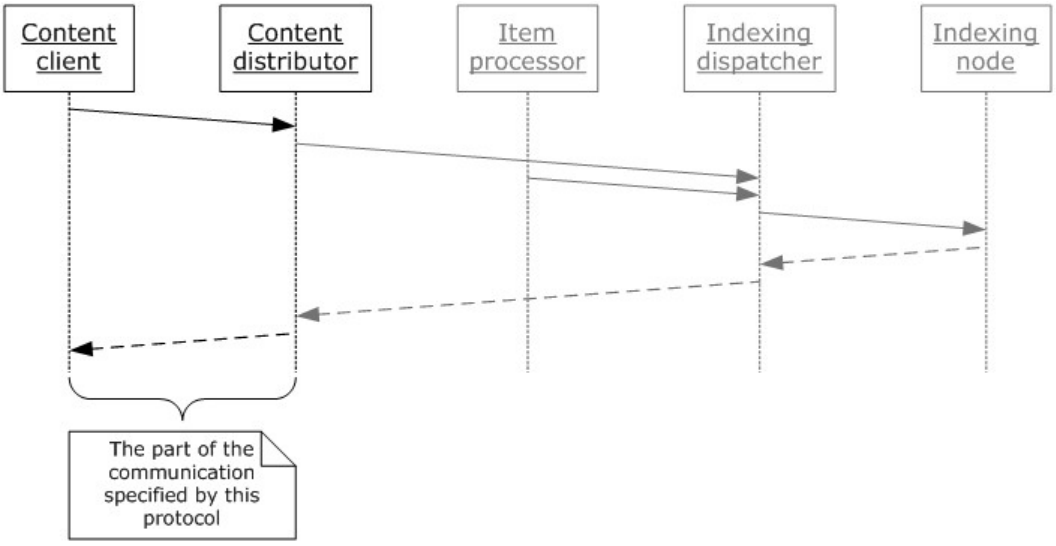


Figure 1: Protocol overview

A typical scenario for using this protocol is a content client that traverses a file system. Files in the file system that the content client has not seen are submitted to the protocol server as an item add operation. Previously updated files are submitted to protocol server as an item update operation. For files that are no longer available, the content client submits an item remove operation to the protocol server.

The content distributor sends item operations to item processor for processing. The item processor sends the item operation to the indexing dispatcher for indexing. The content client receives callback messages from the content distributor when items have been processed and indexed. The content client uses callback messages to log progress. The content client also notifies the content client user of possible errors that occurred during processing and indexing of item operations.

This protocol consists of three interfaces, as described in **processing::session_factory Server Details** (section 3.2), **processing::session Server Details** (section 3.4), and **processing::control Server Details** (section 3.6). For these three interfaces, the content client acts as the protocol client and the content distributor acts as the protocol server.

1.4 Relationship to Other Protocols

This protocol relies on the Cheetah Data Format to serialize data, as described in [MS-FSCHT], and on the Middleware Protocol to transport data, as described in [MS-FSMW]. The following diagram shows the relationship between this protocol and other protocols.

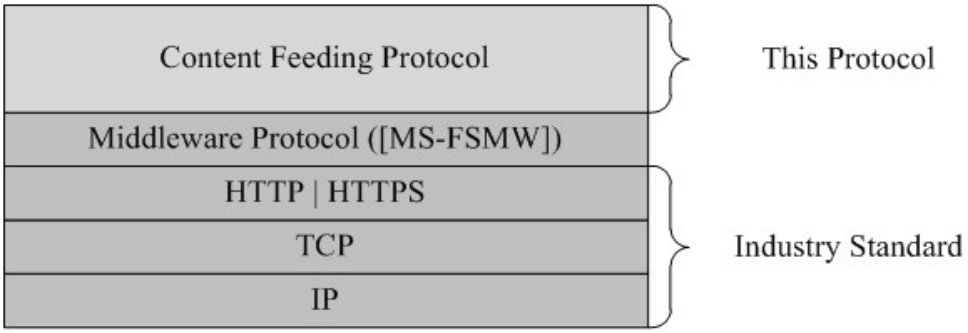


Figure 2: This protocol in relation to other protocols

1.5 Prerequisites/Preconditions

The content client is expected to know the location and connection information of the content distributor.

1.6 Applicability Statement

This protocol is designed for submitting items to the protocol server for processing and indexing. Information about status for processing and indexing of submitted items is sent back to protocol client using callback messages. This protocol also removes a content collection of items from an index.

This protocol is part of a feeding chain between an item feeding protocol client and an indexer. Using callback messages, the protocol server can send information about item status to the protocol client. This protocol is designed for the feeding chain segment between a protocol client and a protocol server.

1.7 Versioning and Capability Negotiation

Regarding capability negotiation:

- The Middleware Protocol, as described in [MS-FSMW], requires that the protocol server and the protocol client agree on the server interface version for all method invocations.
- The Cheetah Data Format, as described in [MS-FSCHT], requires that the protocol server and the protocol client agree on the Cheetah type identifiers and **Cheetah checksum** for all the **Cheetah entities** that are used by this protocol.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

Messages MUST be transported by using the Middleware Protocol Specification, as specified in [MS-FSMW]. Data serialization MUST be performed by using the Cheetah Data Format Specification, as specified in [MS-FSCHT]. The protocol server uses two ports for transport, as specified in Initialization (section 3.2.3). The protocol server uses HTTP on **base port** + 390, as specified in [MS-FSMW] section 2. The protocol server MUST use **HTTPS** and deploy a **certificate (1)** on base port + 391, as specified in [MS-FSMW] section 2.

2.2 Common Data Types

The messages of this protocol are specified by using **FAST Search Interface Definition Language (FSIDL)**. The allowed FSIDL data types are specified in [MS-FSMW].

FSIDL data types are encoded as specified in [MS-FSMW] section 2. Cheetah entities are encoded as specified in [MS-FSCHT] [MS-FSCHT] section 2. The Cheetah checksum and Cheetah type identifier for the Cheetah entities MUST be integers as specified in the following table.

Cheetah entity	Cheetah type identifier	Cheetah checksum
cht::core::guarantee	3	-1479218033
cht::core::feeding_priority	7	-1479218033
cht::core::guarantee_set	9	-1479218033
cht::documentmessages::key_value_pair	0	-211918678
cht::documentmessages::key_value_collection	1	-211918678
cht::documentmessages::bool_attribute	2	-211918678
cht::documentmessages::bool_collection	3	-211918678
cht::documentmessages::bytearray_attribute	4	-211918678
cht::documentmessages::bytearray_collection	5	-211918678
cht::documentmessages::warning	6	-211918678
cht::documentmessages::operation	7	-211918678
cht::documentmessages::document_id	11	-211918678
cht::documentmessages::document	12	-211918678
cht::documentmessages::error	15	-211918678
cht::documentmessages::float_attribute	19	-211918678
cht::documentmessages::float_collection	20	-211918678
cht::documentmessages::processing_error	21	-211918678
cht::documentmessages::format_error	22	-211918678

Cheetah entity	Cheetah type identifier	Cheetah checksum
cht::documentmessages::indexing_error	23	-211918678
cht::documentmessages::string_attribute	26	-211918678
cht::documentmessages::integer_attribute	28	-211918678
cht::documentmessages::integer_collection	30	-211918678
cht::documentmessages::invalid_content	33	-211918678
cht::documentmessages::long_attribute	34	-211918678
cht::documentmessages::long_collection	35	-211918678
cht::documentmessages::operation_dropped	36	-211918678
cht::documentmessages::operation_lost	37	-211918678
cht::documentmessages::operation_set	38	-211918678
cht::documentmessages::subsystem_id_set	39	-211918678
cht::documentmessages::operation_status_info	40	-211918678
cht::documentmessages::operation_status_info_set	41	-211918678
cht::documentmessages::partial_update_operation	42	-211918678
cht::documentmessages::remove_operation	45	-211918678
cht::documentmessages::resource_error	46	-211918678
cht::documentmessages::server_unavailable	47	-211918678
cht::documentmessages::string_collection	49	-211918678
cht::documentmessages::unknown_document	51	-211918678
cht::documentmessages::update_operation	52	-211918678
cht::documentmessages::urlschange_operation	53	-211918678
cht::documentmessages::utf8_error	54	-211918678
cht::documentmessages::xml_error	55	-211918678

The following sections specify these Cheetah entities.

2.2.1 cht::core::guarantee_set

The **guarantee_set** Cheetah entity contains a collection of **guarantee** Cheetah entities, as specified in section 2.2.2. Cheetah entity specification for **guarantee_set**:

```
entity guarantee_set {
    collection guarantee guarantees;
};
```

guarantees: A collection of **guarantee** Cheetah entities.

2.2.2 cht::core::guarantee

The **guarantee** Cheetah entity is a parent class for the **feeding_priority** Cheetah entity, as specified in section 2.2.3. Cheetah entity specification for **guarantee**:

```
entity guarantee {
};
```

2.2.3 cht::core::feeding_priority

The **feeding_priority** Cheetah entity specifies the priority for feeding items to the protocol server. Cheetah entity specification for **feeding_priority**:

```
entity feeding_priority : guarantee {
    attribute int priority;
};
```

priority: An integer that MUST be 0.

2.2.4 cht::documentmessages::action

The **action Cheetah** enumeration contains constants for actions used as part of an error message. Cheetah enumeration specification for **action:**

```
enum action {
    resubmit,
    limited_resubmit,
    drop,
    terminate
};
```

The **action** Cheetah enumeration contains the following constants:

resubmit: A constant specifying that the protocol client MUST resubmit the item operation.

limited_resubmit: A constant specifying that the protocol client MUST resubmit the item operation for a limited number of times.

drop: A constant specifying that the protocol client MUST NOT resubmit the item operation.

terminate: A constant that the protocol client MUST NOT use.

2.2.5 cht::documentmessages::operation_state

The **operation_state** Cheetah enumeration contains constants for the possible states of an item operation. Cheetah enumeration specification for **operation_state**:

```
enum operation_state {
    unknown,
    received,
    secured,
```

```
    completed,
    lost
};
```

unknown: A constant specifying that the item operation is in an unknown state.

received: A constant specifying that the protocol server has received the item operation.

secured: A constant specifying that the item operation has been saved to disk.

completed: A constant specifying that the item operation has finished running.

lost: A constant specifying that the item operation was lost during processing or indexing.

2.2.6 cht::documentmessages::error

The **error** Cheetah entity contains error information for a specific item operation with a specified item operation identifier. Cheetah entity specification for **error**:

```
entity error {
    attribute int error_code;
    attribute action suggested_action;
    attribute string description;
    attribute string subsystem;
    attribute int session_id;
    attribute longint operation_id;
    collection string arguments;
};
```

error_code: An integer that contains the error code.

suggested_action: An **action** Cheetah enumeration value, as specified in section 2.2.4, containing the suggested action that the protocol client can perform to correct the item operation error.

description: A string that contains a description of the error.

subsystem: A string that describes where the error occurred. This string MUST have a value of either "indexing" or "processing". If the error was produced by either the content distributor or the item processor, the string value will be "processing". If the error was produced by either the indexing dispatcher or an indexing node, the string value will be "indexing".

session_id: An integer that uniquely identifies the session.

operation_id: An integer that uniquely identifies the item operation.

arguments: Unused. The value MUST be an empty Cheetah collection.

2.2.7 cht::documentmessages::processing_error

The **processing_error** Cheetah entity specifies errors that occur during the processing of an item operation.

The **processing_error** Cheetah entity is a subclass of the **error** Cheetah entity that is specified in section 2.2.6. The **processing_error** Cheetah entity is a common superclass for the following Cheetah entities:

- **format_error**, which is specified in section 2.2.8.
- **server_unavailable**, which is specified in section 2.2.11.
- **operation_dropped**, which is specified in section 2.2.12.

Cheetah entity specification for **processing_error**:

```
entity processing_error : error {
    attribute string processor;
};
```

processor: A string that specifies the name of the item processor stage where the error occurred.

2.2.8 cht::documentmessages::format_error

The **format_error** Cheetah entity is used when an item operation has an invalid format.

The **format_error** Cheetah entity is a subclass of the **processing_error**, Cheetah entity that is specified in section 2.2.7. The **format_error** Cheetah entity is a common superclass for the **xml_error** Cheetah entity that is specified in section 2.2.9 and the **utf8_error** Cheetah entity that is specified in section 2.2.10. Cheetah entity specification for **format_error**:

```
entity format_error : processing_error {
};
```

2.2.9 cht::documentmessages::xml_error

The **xml_error** Cheetah entity is used when an item operation contains XML that is not valid.

The **xml_error** Cheetah entity is a subclass of the **format_error**, Cheetah entity that is specified in section 2.2.8. Cheetah entity specification for **xml_error**:

```
entity xml_error : format_error {
};
```

2.2.10 cht::documentmessages::utf8_error

The **utf8_error** Cheetah entity is used when an item operation contains invalid **UTF-8** encoding.

The **utf8_error** Cheetah entity is a subclass of the **format_error** Cheetah entity that is specified in section 2.2.8. Cheetah entity specification for **utf8_error**:

```
entity utf8_error : format_error {
};
```

2.2.11 cht::documentmessages::server_unavailable

The **server_unavailable** Cheetah entity is used when a protocol client is unable to connect to a protocol server during the processing of an item operation.

The **server_unavailable** Cheetah entity is a subclass of the **processing_error**, Cheetah entity that is specified in section 2.2.7. Cheetah entity specification for **server_unavailable**:

```
entity server_unavailable : processing_error {
};
```

2.2.12 cht::documentmessages::operation_dropped

The **operation_dropped** Cheetah entity is used when item processing has identified an item operation that MUST NOT be indexed.

The **operation_dropped** Cheetah entity is a subclass of the **processing_error** Cheetah entity that is specified in section 2.2.7. Cheetah entity specification for **operation_dropped**:

```
entity operation_dropped : processing_error {
};
```

2.2.13 cht::documentmessages::operation_lost

The **operation_lost** Cheetah entity is used when an item operation has been lost during processing or indexing.

The **operation_lost** Cheetah entity is a subclass of the **error** Cheetah entity that is specified in section 2.2.6. Cheetah entity specification for **operation_lost**:

```
entity operation_lost : error {
};
```

2.2.14 cht::documentmessages::indexing_error

The **indexing_error** Cheetah entity is used when an error occurs during the indexing of an item operation.

The **indexing_error** Cheetah entity is a subclass of the **error** Cheetah entity that is specified in section 2.2.6. The **indexing_error** Cheetah entity is a common superclass for the following Cheetah entities:

- **invalid_content**, which is specified in section 2.2.15.
- **resource_error**, which specified in section 2.2.16.
- **unknown_document**, which is specified in section 2.2.17.

Cheetah entity specification for **indexing_error**:

```
entity indexing_error : error {
};
```

2.2.15 cht::documentmessages::invalid_content

An indexing node uses the **invalid_content** Cheetah entity when an item operation contains content that is not valid.

The **invalid_content** Cheetah entity is a subclass of the **indexing_error** Cheetah entity that is specified in section 2.2.14. Cheetah entity specification for **invalid_content**:

```
entity invalid_content : indexing_error {
};
```

2.2.16 cht::documentmessages::resource_error

An indexing node uses the **resource_error** Cheetah entity to indicate that a resource error occurred during the indexing of an item operation.

The **resource_error** Cheetah entity is a subclass of the **indexing_error** Cheetah entity that is specified in section 2.2.14. Cheetah entity specification for **resource_error**:

```
entity resource_error : indexing_error {
};
```

2.2.17 cht::documentmessages::unknown_document

An indexing node uses this Cheetah entity when a **remove_operation** Cheetah entity refers to an item that does not exist in the index.

The **unknown_document** Cheetah entity is a subclass of the **indexing_error** Cheetah entity as specified in section 2.2.14. Cheetah entity specification for **unknown_document**:

```
entity unknown_document : indexing_error {
};
```

2.2.18 cht::documentmessages::warning

The **warning** Cheetah entity contains warning information for an item operation with a specific operation identifier. Cheetah entity specification for **warning:**

```
entity warning {
    attribute int warning_code;
    attribute string description;
    attribute string subsystem;
    attribute int session_id;
    attribute longint operation_id;
};
```

warning_code: An integer that indicates the warning code.

description: A string that contains a description of the warning.

subsystem: A string that describes where the warning occurred. This string MUST have a value of either "indexing" or "processing". If the warning was produced by either the content distributor or the item processor, the string value will be "processing". If the warning was produced by either the indexing dispatcher or an indexing node, the string value will be "indexing".

session_id: An integer that uniquely identifies the session.

operation_id: An integer that uniquely identifies the item operation.

2.2.19 cht::documentmessages::operation

The **operation** Cheetah entity is a common superclass for the following Cheetah entities:

- **update_operation**, which is specified in section 2.2.39.
- **partial_update_operatio** , which is specified in section 2.2.40.
- **remove_operation**, which is specified in section 2.2.41.
- **urlschange_operation** Cheetah entity, which is specified in section 2.2.42.

Cheetah entity specification for **operation**:

```
entity operation {
    attribute longint id;
    collection warning warnings;
};
```

id: A long integer that uniquely identifies the item operation. The value MUST be equal to or greater than 0.

warnings: A collection of **warning** Cheetah entities, which are specified in section 2.2.18. This collection contains all the warnings for the item operation that is identified by the **id** attribute.

2.2.20 cht::documentmessages::operation_set

The **operation_set** Cheetah entity contains a set of **operation** objects, as specified in section 2.2.19. Cheetah entity specification for **operation_set**:

```
entity operation_set {
    attribute longint completed_op_id;
    collection operation operations;
};
```

completed_op_id: A long integer that contains the highest operation identifier in the sequence of operation identifiers for which the content client has received all callback messages.

operations: A collection of **operation** Cheetah entities.

2.2.21 cht::documentmessages::operation_status_info

The **operation_status_info** Cheetah entity contains status information about a collection of operations. The **operation_status** Cheetah entity is used to report the status of submitted item operations to the protocol client. Cheetah entity specification for **operation_status_info:**

```
entity operation_status_info {
    attribute longint first_op_id;
    attribute longint last_op_id;
    attribute operation_state state;
    attribute string subsystem;
    collection error errors;
    collection warning warnings;
```

```
};
```

first_op_id: A long integer that contains the operation identifier of the first operation in the sequence of item operations. This value MUST be equal to or greater than 0 as well as less than or equal to the value of the **last_op_id attribute (1)**.

last_op_id: A long integer that contains the operation identifier of the last operation in the sequence of item operations. This value MUST be equal to or greater than 0 as well as equal to or greater than the value of the **first_op_id** attribute (1).

state: An **operation_state** Cheetah enumeration constant, as specified in section 2.2.5, that represents the state of the sequence of item operations.

subsystem: A string that describes where the **operation status info** was generated. This string MUST have a value of either "indexing" or "processing". If the operation status info was produced by either the content distributor or the item processor, the string value will be "processing". If the operation status info was produced by either the indexing dispatcher or an indexing node, the string value will be "indexing".

errors: A collection of **error** Cheetah entities, which are specified in cht::documentmessages::error (section 2.2.6). This value contains the errors for the operations that are specified in the collection of item operations.

warnings: A collection of **warning** Cheetah entities, which are specified in section 2.2.18. This value contains warnings for the operations that are specified in the collection of item operations.

2.2.22 cht::documentmessages::operation_status_info_set

The **operation_status_info_set** Cheetah entity contains operations status information for a collection of item operation collections. Cheetah entity specification for **operation_status_info_set**:

```
entity operation_status_info_set {
    collection operation_status_info status;
};
```

status: A collection of **operation_status_info** Cheetah entities, as specified in section 2.2.21

2.2.23 cht::documentmessages::key_value_pair

The **key_value_pair** Cheetah entity is a common superclass that associates a key with a value that can be one of various types. Cheetah entity specification for **key_value_pair**:

```
entity key_value_pair {
    attribute string key;
};
```

key: A string that contains the key.

2.2.24 cht::documentmessages::key_value_collection

The **key_value_collection** Cheetah entity forms an association between a single key and a **key_value_pair** collection.

The **key_value_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, which is specified in section 2.2.23. Cheetah entity specification for **key_value_collection**:

```
entity key_value_collection : key_value_pair {
    collection key_value_pair values;
};
```

values: A collection of **key_value_pair** Cheetah entities.

2.2.25 cht::documentmessages::document_id

The **document_id** Cheetah entity uniquely identifies an item. The **document_id** Cheetah entity represents the **document identifier (3)** of the item. Cheetah entity specification for **document_id**:

```
entity document_id {
    attribute string id;
    collection key_value_pair routing_attributes;
};
```

id: A string that uniquely identifies the item.

routing_attributes: Unused. The value MUST be an empty Cheetah collection.

2.2.26 cht::documentmessages::string_attribute

The **string_attribute** Cheetah entity forms an association between a key and a string value.

The **string_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, which is specified in section 2.2.23. Cheetah entity specification for **string_attribute**:

```
entity string_attribute : key_value_pair {
    attribute string value;
};
```

value: A string that contains the value.

2.2.27 cht::documentmessages::bool_attribute

The **bool_attribute** forms an association between a string key and a Boolean value.

The **bool_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, specified in section 2.2.23. Cheetah entity specification for **bool_attribute**:

```
entity bool_attribute : key_value_pair {
    attribute bool value;
};
```

value: A Boolean that contains the value.

2.2.28 cht::documentmessages::float_attribute

The **float_attribute** forms an association between a string key and a float value.

The **float_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **float_attribute**:

```
entity float_attribute : key_value_pair {
    attribute float value;
};
```

value: A float that contains the value.

2.2.29 cht::documentmessages::integer_attribute

The **integer_attribute** forms an association between a string key and an integer value.

The **integer_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity that is specified in section 2.2.23. Cheetah entity specification for **integer_attribute**:

```
entity integer_attribute : key_value_pair {
    attribute integer value;
};
```

value: An integer that contains the value.

2.2.30 cht::documentmessages::long_attribute

The **long_attribute** forms an association between a string key and a **longint** value.

The **long_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **long_attribute**:

```
entity long_attribute : key_value_pair {
    attribute longint value;
};
```

value: A long that contains the value.

2.2.31 cht::documentmessages::bytearray_attribute

The **bytearray_attribute** forms an association between a string key and a byte array value.

The **bytearray_attribute** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **bytearray_attribute**:

```
entity bytearray_attribute : key_value_pair {
    attribute bytearray value;
};
```

value: A Cheetah byte array that contains the value.

2.2.32 cht::documentmessages::string_collection

The **string_collection** forms an association between a string key and a string collection.

The **string_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **string_collection**:

```
entity string_collection : key_value_pair {
    collection string values;
};
```

values: A string collection that contains the values.

2.2.33 cht::documentmessages::bool_collection

The **bool_collection** forms an association between a string key and a Boolean collection.

The **bool_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **bool_collection**:

```
entity bool_collection : key_value_pair {
    collection bool values;
};
```

values: A Boolean collection that contains the values.

2.2.34 cht::documentmessages::float_collection

The **float_collection** forms an association between a string key and a float collection.

The **float_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity, as specified in section 2.2.23. Cheetah entity specification for **float_collection**:

```
entity float_collection : key_value_pair {
    collection float values;
};
```

values: A float collection that contains the values.

2.2.35 cht::documentmessages::integer_collection

The **integer_collection** forms an association between a string key and a integer collection.

The **integer_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity that is specified in section 2.2.23. Cheetah entity specification for **integer_collection**:

```
entity integer_collection : key_value_pair {
    collection integer values;
};
```

values: A integer collection containing the values.

2.2.36 cht::documentmessages::long_collection

The **long_collection** forms an association between a string key and a longint collection.

The **long_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity that is specified in section 2.2.23. Cheetah entity specification for **long_collection**:

```
entity long_collection : key_value_pair {
    collection longint values;
};
```

values: A long collection containing the values.

2.2.37 cht::documentmessages::bytearray_collection

The **bytearray_collection** forms an association between a string key and a byte array collection

The **bytearray_collection** Cheetah entity is a subclass of the **key_value_pair** Cheetah entity that is specified in section 2.2.23) Cheetah entity specification for **bytearray_collection**:

```
entity bytearray_collection : key_value_pair {
    collection bytearray values;
};
```

values: A Cheetah byte array collection that contains the values.

2.2.38 cht::documentmessages::document

The **document** Cheetah entity contains information about one item. Cheetah entity specification for **document**:

```
entity document {
    attribute document_id doc_id;
    collection key_value_pair document_attributes;
};
```

doc_id: A **document_id** Cheetah entity as specified in cht::documentmessages::document_id (section 2.2.25), that uniquely identifies the item.

document_attributes: A collection of **key_value_pair** Cheetah entities, as specified in section 2.2.23, that contain the attributes (1) of the item.

Crawled properties in the **document_attributes** collection are converted to **managed properties** in item processing. See [MS-FSPSCFG] for more information.

The attributes in the following table SHOULD be added to the **document_attributes** attribute of the **doc** attribute of the following Cheetah entities:

- **cht::documentmessages::update_operation**, as specified in cht::documentmessages::update_operation (section 2.2.39).
- **cht::documentmessages::partial_update_operation**, as specified in cht::documentmessages::partial_update_operation (section 2.2.40).

- **cht::documentmessages::urlschange_operation**, as specified in cht::documentmessages::urlschange_operation (section 2.2.42).

Attribute key	Attribute type	Attribute value
url	**cht::documentmessages::string_attribute**	URL of the item.
size	**cht::documentmessages::integer_attribute**	Size of item (bytes).
crawltime	**cht::documentmessages::integer_attribute**	Timestamp for when item was last crawled.
mime	**cht::documentmessages::string_attribute**	Item MIME type.
ip	**cht::documentmessages::string_attribute**	IP of server item was downloaded from.
http_header	**cht::documentmessages::string_attribute**	Raw HTTP header including GET line.
300redirects	**cht::documentmessages::string_collection**	Absolute URIs that redirected to this URI as a HTTP status code 300.
301redirects	**cht::documentmessages::string_collection**	Absolute URIs that redirected to this URI as a HTTP status code 301.
302redirects	**cht::documentmessages::string_collection**	Absolute URIs that redirected to this URI as a HTTP status code 302.
htmlredirects	**cht::documentmessages::string_collection**	Absolute URIs that redirected to this URI as a HTML META refresh.
duplicates	**cht::documentmessages::string_collection**	Absolute URIs detected as duplicates of this URI.
encoding	**cht::documentmessages::string_attribute**	MUST be either "deflate" or None to indicate if data is compressed. If compressed, zlib is used as specified in [RFC1950].
crawllinks	**cht::documentmessages::string_collection**	Absolute URIs extracted as links from this item.
mirrorsites	**cht::documentmessages::string_collection**	FQDN mirrors, either automatically detected or specified by configuration.
referrers	**cht::documentmessages::string_collection**	Referrer URLs in the item.
data	**cht::documentmessages::bytearray_attribute**	Item data. Content that is not represented as other key-value pairs.
extra_data	**cht::documentmessages::bytearray_attribute**	Attribute used for RSS feeds and sitemaps, as specified in the following table.

The **extra_data** attribute is encoded using the data structure as specified in [MS-FSWCU]. The **extra_data** attribute SHOULD contain the keys in the following table for web items.

Key name	Attribute type	Attribute value
rs	dictionary	**rs** data dictionary, as specified in the following table.
sm	dictionary	**sitemap** dictionary, as specified in the following table.

The **rs** data dictionary MAY contain the keys described in the following table.

Key name	Attribute type	Attribute value
Key name is the URL of the item.	dictionary	Item **rss** dictionary, as specified in the following table.

The item **rss** dictionary MAY contain the keys described in the following table.

Key name	Attribute type	Attribute value
gl	dictionary	Global dictionary, as specified in the following table.
lo	dictionary	Local dictionary, as specified in the following table.

The global dictionary MAY contain the keys in the following table.

Key name	Attribute type	Attribute value
Name of the key is tag in the **channel** section of the referring RSS feed.	string	Attribute value is the tag value in the **channel** section of the referring RSS feed.

The local dictionary MAY contain the keys in the following table.

Key name	Attribute type	Attribute value
Name of the key is the tag in the **item** section of the referring RSS feed.	string	Attribute value is the tag value in the **item** section of the referring RSS feed.

The **sm** dictionary MAY contain the keys in the following table.

Key name	Attribute type	Attribute value
Name of the key is the tag in the **url** section of the sitemap document describing this specific item.	string	Attribute value is the tag value in the **url** section of the sitemap document describing this specific item.

The attribute in the following table that specifies the permissions of an item MUST be added to the **document_attributes** attribute of the **doc** attribute of the following Cheetah entities:

- **cht::documentmessages::update_operation**, as specified in section 2.2.39.
- **cht::documentmessages::partial_update_operation**, as specified in section 2.2.40.
- **cht::documentmessages::urlschange_operation**, as specified in section 2.2.42.

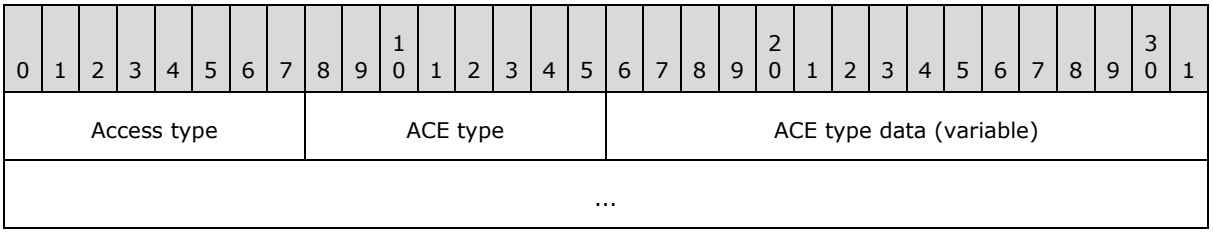
Attribute key	Attribute type	Attribute value
docaclsystemids	**cht::documentmessages::string_attribute**	The docaclsystemids field is a user store identifier of the item.

One of the attributes in the following table that specifies the permissions of an item MUST be added to the **document_attributes** attribute of the **doc** attribute of the following Cheetah entities:

- **cht::documentmessages::update_operation**, as specified in section 2.2.39.
- **cht::documentmessages::partial_update_operation**, as specified in section 2.2.40.
- **cht::documentmessages::urlschange_operation**, as specified in section 2.2.42.

Attribute key	Attribute type	Attribute value
docacl	**cht::documentmessages::string_attribute**	The docacl attribute MUST contain a list of space separated entries in the following format: *<deniedRightFlag><userStoreID><securityIdentifier>*. *<deniedRightFlag>* is 9 if the rest indicates a deny permission or "" if it is a grant permission. *<userStoreID>* is the **user store identifier** of the user/group given in *<securityIdentifier>*. *<securityIdentifier>* is the user or group **security principal identifier** that was granted or denied permission to the item. A docacl value MUST only contain alphanumeric characters. If the *<securityIdentifier>* contains other characters, the *<securityIdentifier>* MUST be encoded with a base-32 variant of [RFC4648] using an alphabet with a-z and 1-6 and no equal sign (=) padding at the end.
docaclmss	**cht::documentmessages::string_attribute**	The **docaclms** field MUST contain security descriptor strings. See [MSDN-SDDL].
spacl	**cht::documentmessages::bytearray_attribute**	**spacl** value, as specified in the following section.

The **spacl** value contains a list of binary **Ace values**. **Ace value** is specified in the following table.



Access type (1 byte): 0 if allowed; 1 if denied.

ACE type (1 byte): 0 if nt; 1 if claim.

ACE type data (variable): If **ACE type** is 0, **ACE nt value**. If **ACE type** is 1, **ACE claim value**.

The **ACE nt value** is specified in the following table.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
SID length
SID (variable)
...

SID length (4 bytes): A variable of type INT32 that represents the length of the SID string.

SID (variable): An **UTF-16** string that represents the **security identifier (SID)**.

The **ACE claim value** is specified in the following table.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
Value length
Value (variable)
...
ClaimType length
ClaimType (variable)
...
ValueType length
ValueType(variable)
...
OriginalIssuer length
OriginalIssuer(variable)
...

Value length (4 bytes): A variable of type INT32 that represents the length of the **claim value**.

Value (variable): A UTF-16 string that represents the claim value.

ClaimType length (4 bytes): A variable of type INT32 that represents the length of the **claim type**.

ClaimType (variable): A UTF-16 string that represents the claim type.

ValueType length (4 bytes): A variable of type INT32 that represents the length of the value type.

ValueType (variable): A UTF-16 string that represents the value type.

OriginalIssuer length (4 bytes): A variable of type INT32 that represents the length of the original issuer.

OriginalIssuer (variable): A UTF-16 string that represents the original issuer.

2.2.39 cht::documentmessages::update_operation

The **update_operation** Cheetah entity adds or replaces a specific item in the index. If an item with the specified **document id** already exists in the **search index**, it is replaced.

The **update_operation** Cheetah entity is a subclass of the Cheetah entity **operation** that is specified in section 2.2.19. Cheetah entity specification for **update_operation**:

```
entity update_operation : operation {
    attribute document doc;
};
```

doc: A **document** Cheetah entity, as specified in section 2.2.38, that represents the item to add or replace.

2.2.40 cht::documentmessages::partial_update_operation

The **partial_update_operation** Cheetah entity updates one or more of the attributes (1) of a specific item in the search index.

The **update_operation** Cheetah entity is a subclass of the Cheetah entity **operation** that is specified in section 2.2.19. Cheetah entity specification for **partial_update_operation**:

```
entity partial_update_operation : operation {
    attribute document doc;
};
```

The **partial_update_operation** has the following attribute:

doc: A **document** Cheetah entity, as specified in section 2.2.38, that contains attributes to update.

2.2.41 cht::documentmessages::remove_operation

The **remove_operation** Cheetah entity removes a specific item from the search index.

The **update_operation** Cheetah entity is a subclass of the Cheetah entity **operation** that is specified in section 2.2.19. Cheetah entity specification for **remove_operation**:

```
entity remove_operation : operation {
    attribute document_id doc_id;
```

```
};
```

doc_id: A **document_id** Cheetah entity, as specified in **cht::documentmessages::document_id** (section 2.2.25), that uniquely identifies the item.

2.2.42 cht::documentmessages::urlschange_operation

The **urlschange_operation** Cheetah entity updates one or more of the attributes (1) of a specific item in the search index.

The **urlschange_operation** Cheetah entity is a subclass of the Cheetah entity **partial_update_operation** that is specified in section 2.2.40. Cheetah entity specification for **urlschange_operation**:

```
entity urlschange_operation : partial_update_operation {
};
```

2.2.43 cht::documentmessages::subsystem_id_set

The **subsystem_id_set** Cheetah entity contains a collection of names. Cheetah entity specification for **subsystem_id_set** is as follows:

```
entity subsystem_id_set {
    collection string ids;
};
```

ids: A collection that MUST consist of either an empty Cheetah collection or a single element that contains the string "indexing".

2.2.44 core::unsupported_guarantee_set

The **unsupported_guarantee_set** exception specifies that the protocol server is unable to create or recreate a session. The **unsupported_guarantee_set** exception is specified by the following FSIDL specification:

```
exception unsupported_guarantee_set {
    string what;
};
```

what: A string that explains the cause of the exception.

2.2.45 coreprocessing::timed_out

The **timed_out** exception states that the protocol server is unable to find an available item processor before a given timeout. The **timed_out** exception is specified by the following FSIDL specification:

```
exception timed_out {
    long id;
    string message;
};
```

id: A long variable that contains the identifier for the exception.

message: A string that explains the cause of the exception.

2.2.46 coreprocessing::service_unavailable

The **service_unavailable** exception states that the protocol server is unable to perform the method invocation. The **service_unavailable** exception is specified by the following FSIDL specification:

```
exception service_unavailable {
    long id;
    string message;
};
```

id: A **long** variable that contains the identifier for the exception.

message: A string that explains the cause of the exception.

2.2.47 coreprocessing::format_error

The **format_error** exception indicates that an argument to a method invocation has format that is not valid. The **format_error** exception is specified by the following FSIDL specification:

```
exception format_error {
    long id;
    string message;
};
```

id: A **long** variable that contains the identifier for the exception.

message: A string that explains the cause of the exception.

2.2.48 coreprocessing::no_resources

The **no_resources** exception states that the protocol server does not have any resources available to process the method invocation. The **no_resources** exception is specified by the following FSIDL specification:

```
exception no_resources {
    long id;
    string message;
};
```

id: A **long** variable that contains the identifier for the exception.

message: A string that explains the cause of the exception.

2.2.49 coreprocessing::unknown_collection_error

The **unknown_collection_error** states that the content collection is unknown. The **unknown_collection_error** exception is specified by the following FSIDL specification:

```
exception unknown_collection_error {
```

```
};
```

2.2.50 coreprocessing:.operation_failed

The **operation_failed** exception states that the protocol server is unable to perform the given operation. The **operation_failed** exception is specified by the following FSIDL specification:

```
exception operation_failed {
    long id;
    string message;
};
```

id: Identifier of the exception.

message: String explaining cause of exception.

3 Protocol Details

This protocol consists of the three interfaces **processing::session_factory**, **processing::session**, and **coreprocessing::control**. For these three interfaces, the content client acts as the protocol client and the content distributor acts as the protocol server.

The protocol client communicates synchronously with a protocol server, setting up a new **processing::session** using the **processing::session_factory** interface, then feeding item operations and receiving callback messages using this **processing::session** interface. The protocol client uses the **coreprocessing::control** interface to remove all items in a content collection.

The protocol server of this protocol MUST implement the three interfaces **processing::session_factory**, as specified in section 3.2, **processing::session**, as specified in section 3.4, and **coreprocessing::control**, as specified in section 3.6.

The client side of the **processing::session_factory** interface is specified in section 3.3. The client side of the **processing::session** interface is specified in section 3.5. The client side of the **coreprocessing::control** interface is simply a pass-through. That is, no additional timers or other state is required on the client side of this protocol. Calls made by the higher-layer protocol or application are passed directly to the transport, and the results returned by the transport are passed directly back to the higher-layer protocol or application.

3.1 Common Server Details

The protocol client communicates with a protocol server as part of a larger session based feeding chain between a protocol client, protocol server, indexing dispatcher, and indexing node as specified in Overview (section 1.3).

3.1.1 Abstract Data Model

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

The abstract data model specified is common for the implementation of the three protocol server interfaces **processing::session_factory**, as specified in section 3.2, **processing::session**, as specified in section 3.4, and **coreprocessing::control**, as specified in section 3.6.

The protocol server maintains the following states:

session factory holder: A **processing::session_factory** server object used by protocol clients that employ unencrypted HTTP transport, as defined in section 2.1.

session factory external client holder: A **processing::session_factory** server object used by protocol clients that employ encrypted HTTPS transport, as defined in section 2.1.

session holder: A set of **processing::session** server objects, where each server object can be referenced by a **session id** value. The **session id** value is generated in the **session id generator**.

session id generator: An integer used to generate unique identifiers for **processing::session** server objects. At startup, protocol server MUST call **coreprocessing::session_factory::get_highest_session_id**, as specified in [MS-FSDP] section 3, to receive the initial value for the **session id generator**. The initial value is the return value from invoking **coreprocessing::session_factory::get_highest_session_id** +1. For each invocation of

the **processing::session_factory::create** method, as specified in processing::session_factory::create (section 3.2.4.2), the value is increased by 1.

recreating holder: A collection of **session ids**. Contains **session ids** of sessions being recreated.

master mode: A Boolean value that specifies whether the protocol server is running in master mode or in dispatcher mode. When there are multiple protocol servers, one protocol server MUST be running in master mode at any given time. If there is only one protocol server, it MUST be running in master mode all the time. [MS-FSCDFT] specifies the protocol the protocol server uses to switch between dispatcher and master mode.

collection holder: A collection of strings that represents content collection names. The protocol server MUST use **collection holder** to keep track of available content collections.

collection suspended holder: Contains a collection of strings that represent content collection names. The protocol server MUST use **collection suspended holder** to keep track of content collections where feeding has been suspended.

operation timeout: An integer that contains a timeout for the protocol server that specifies the maximum time to find an available item processor for a sequence of item operations.

For each **processing::session** server object in the **session holder** state, the protocol server MUST maintain the following states:

operation id generator: An integer state. The protocol server MUST use the **operation id generator** to assign increasing item operation identifier numbers to item operations received from the **processing::session** protocol client.

callback holder: A collection that contains callback messages received by item processor, indexing dispatcher and callback messages generated by protocol server. The protocol server MUST add callback messages to this state when they are received in the **coreprocessing::operation_callback::status_changed** method as specified in [MS-FSDP] section 3. Callback messages generated by the content distributor when an item processor is restarted, as specified in [MS-FSDP] section 3, MUST also be added to this state.

session id: An integer state that contains the **processing::session** server object identifier.

content collection id: A string state that contains the content collection name of the **processing::session** server object.

3.1.2 Timers

None.

3.1.3 Initialization

None.

3.1.4 Message Processing Events and Sequencing Rules

None.

3.1.5 Timer Events

None.

3.1.6 Other Local Events

None.

3.2 processing::session_factory Server Details

3.2.1 Abstract Data Model

For more information about common abstract data model for protocol server, see Abstract Data Model (section 3.1.1).

3.2.2 Timers

None.

3.2.3 Initialization

The protocol server MUST initialize two **processing::session_factory** server objects.

The **processing::session_factory** server object to be inserted in the **session factory holder** MUST be initialized using the following **abstract object reference (AOR)**, as specified in [MS-FSMW] section 2.

object_id: An integer value that MUST be 1.

host: A string that contains the **host name** of the server object on the protocol server. The value is implementation specific of the higher level application.

port: The base port plus 390.

interface_type: A string value that MUST be "processing::session_factory".

interface_version: A string value that MUST be "5.1".

The **processing::session_factory** server object to be inserted in the **session factory external client holder** MUST be initialized using the following AOR, as specified in [MS-FSMW] section 2.

object id: An integer value that MUST be 1.

host: A string that contains the host name of the server object on the protocol server. The value is implementation specific of the higher level application.

port: The base port plus 391.

interface_type: A string value that MUST be "processing::session_factory".

interface_version: A string value that MUST be "5.1".

The protocol server MUST initialize the **processing::session_factory** server objects as specified in [MS-FSMW] section 3.

3.2.4 Message Processing Events and Sequencing Rules

The **processing::session_factory** interface specifies the methods that are listed in the following table.

Method	Description
is_master	Checks if protocol server is running in master mode.
create	Returns a new **processing::session client proxy**.
recreate	Returns a **processing::session** client proxy with a given identifier.
close	Closes and removes a session.

3.2.4.1 processing::session_factory::is_master

A protocol server MUST be running in one of two modes, either master mode or dispatcher mode. This method checks what mode the protocol server currently is running in. The method is specified by the following FSIDL specification:

```
boolean is_master();
```

Return value: true if protocol server is running in master mode, **false** if the protocol server is running in dispatcher mode.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

The protocol server MUST return the value of the **master_mode** state.

[MS-FSCDFT] specifies the protocol that the protocol server uses to switch between dispatcher and master mode.

3.2.4.2 processing::session_factory::create

This method creates a feeding session and returns a new **processing::session** client proxy. The method is specified by the following FSIDL specification:

```
processing::session create(in string collection,
                           in cht::core::guarantee_set guarantees)
raises (coreprocessing::unknown_collection_error,
        core::unsupported_guarantee_set);
```

collection: A string that contains the name of the content collection for which to create the session.

guarantees: The guarantees attribute of the guarantees input value, MUST contain either one **cht::core::feeding_priority** Cheetah entity that specifies priority for this feeding session or an empty collection.

Return value: A **processing::session** client proxy instantiated with the AOR specified in section 3.5.3.

Exceptions

coreprocessing::unknown_collection_error: Raised if the specified content collection is unknown. Raised if feeding to this content collection has been suspended, as specified in section 3.6.4.1.

core::unsupported_guarantee_set: Raised if the protocol server is unable to create the feeding session.

When the protocol server receives a **create** method invocation it MUST create and return a new **processing::session** client proxy to the protocol client and activate the new **processing::session** server object. The client proxy returned MUST be instantiated with the AOR specified in Initialization (section 3.4.3).

If the **create** method invocation is received on the **processing::session_factory** server object in the **session factory holder**, the **processing::session** server object MUST be activated on base port plus 390.

If the **create** method invocation is received on the **processing::session_factory** server object in the **session factory external client holder**, the **processing::session** server object MUST be activated on base port plus 391.

The protocol server MUST verify that the **collection** input value exists in the **collection holder** state. If a **collection** input value does not exist in the **collection_holder** state, the protocol server MUST raise a coreprocessing::unknown_collection_error exception.

The protocol server MUST verify that the **collection** input value does not exist in the **collection suspended holder** state. If a **collection** input value does exist in the **collection suspended holder** state, the protocol server MUST raise a coreprocessing::unknown_collection_error exception.

The protocol server MUST use the **session id generator** state to create a new **session id** for the new **processing::session** server object**.**

The protocol server MUST store the **processing::session** server object in a **session holder** state with the **session id** as the unique key.

The protocol server MUST be running in master mode.

3.2.4.3 processing::session_factory::recreate

Recreate a feeding session with a given identifier. A session with this **session id** MUST have been created previously with **processing::session_factory::create**, as specified in section 3.2.4.2. The method is specified by the following FSIDL specification:

```
processing::session recreate(in long id,
                             in string collection,
                             in cht::core::guarantee_set guarantees)
raises (coreprocessing::unknown_collection_error,
        core::unsupported_guarantee_set);
```

id: Identifier for session. Identifier MUST be equal to identifier for session already created.

collection: A string that contains the name of the content collection for which to create the session.

guarantees: The guarantees attribute of the guarantees input value, MUST contain either one **cht::core::feeding_priority** Cheetah entity that specifies priority for this feeding session or an empty collection.

Return value: A **processing::session** client proxy instantiated with the AOR specified in Initialization (section 3.4.3).

Exceptions

coreprocessing::unknown_collection_error: Raised if the specified content collection is unknown.

core::unsupported_guarantee_set: Raised if the protocol server is unable to create the feeding session. Raised if feeding to this content collection has been suspended, as specified in section 3.6.4.1.

When the protocol server receives a **recreate** method invocation, the protocol server MUST validate the **session holder** state. If the **session holder** state contains a **processing::session** server object with the specified **session id**, the protocol server MUST return a client proxy to the existing **processing::session** server object. If no session with the specified **session id** exists, the protocol server MUST create and return a new **processing::session** client proxy to the protocol client and then activate the new **processing::session** server object. The client proxy returned MUST be instantiated with the AOR specified in section 3.4.3.

If the **recreate** method invocation is received on the **processing::session_factory** server object in the **session factory holder**, the **processing::session** server object MUST be activated on base port plus 390.

If the **recreate** method invocation is received on the **processing::session_factory** server object in the **session factory external client holder**, the **processing::session** server object MUST be activated on base port plus 391.

The protocol server MUST check that the **collection** input value exists in the **collection holder** state. If **collection** input value does not exist in the **collection_holder** state, the exception coreprocessing::unknown_collection_error is raised.

The protocol server MUST verify that the **collection** input value does not exist in the **collection suspended holder** state. If a **collection** input value does exist in the **collection suspended holder** state, the protocol server MUST raise a **coreprocessing::unknown_collection_error** exception.

If the **id** input parameter exists in the recreating holder state, the protocol server MUST raise a **core::unsupported_guarantee_set** exception.

When the recreate method is called, the protocol server MUST call the **coreprocessing::session_factory::recreate** method in the indexing dispatcher, as specified in [MS-FSDP]. If the **coreprocessing::session_factory::recreate** method raises an exception, the protocol server MUST add the **id** input parameter to the recreating holder state and raise the exception **core::unsupported_guarantee_set**. The protocol server MUST continue to call the **coreprocessing::session_factory::recreate** method in the indexing dispatcher. When no exception is raised when invoking the **coreprocessing::session_factory::recreate** method, the protocol server MUST remove the **id** input parameter from the recreating holder state.

The protocol server MUST store the **processing::session** server object in a **session holder** state, with the **session_id** input value as unique key.

The protocol server MUST be running in master mode.

3.2.4.4 processing::session_factory::close

The **close** method closes a session in the protocol server. A session with the specified identifier MUST have been created earlier with the **processing::session_factory::create**, as specified in section 3.2.4.2. The method is specified by the following FSIDL specification:

```
void close(in long id);
```

id: Identifier for session. The identifier MUST represent an already created session.

Return value: None.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

The protocol server MUST remove the **processing::session** server object with the specified **session id** from the **session holder** state.

The protocol server MUST be running in master mode.

3.2.5 Timer Events

None.

3.2.6 Other Local Events

None.

3.3 processing::session_factory Client Details

3.3.1 Abstract Data Model

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

The content client, acting as protocol client for the **processing::session_factory** interface, MUST maintain the following states for each session instance:

session client holder: A state containing a collection of **processing::session** client proxies.

3.3.2 Timers

None.

3.3.3 Initialization

The **processing::session_factory** client is a client proxy that calls remote methods on a **processing::session_factory** server. To call remote methods on the server, a client MUST first create the client proxy based on an AOR to the **processing::session_factory** server object, as specified in section 3.2.

The AOR for the **processing::session_factory** server object MUST be provided by a higher layer of the implementation as an **AbstractObjectReference** record, as specified in [MS-FSMW] section 2. The **InterfaceType** field of the **AbstractObjectReference** record MUST be "processing::session_factory", the **ServerObjectId** field MUST be 0, and the **InterfaceVersion** MUST be "5.1". If using unencrypted transport, as specified in section 2.1, the **Port** field of the

AbstractObjectReference MUST be base port plus 390. If using encrypted transport, as specified in section 2.1, the **Port** field of the **AbstractObjectReference** MUST be base port plus 391.

3.3.4 Message Processing Events and Sequencing Rules

The **processing::session_factory** interface specifies the methods that are listed in the following table.

Method	Description
is_master	Check if protocol server is running in master mode.
create	Returns a new processing::session client proxy.
recreate	Returns a processing::session client proxy with a given identifier.
close	Closes and removes a session.

The protocol client MUST call the **is_master** method prior to any of the other methods, and only call **create**, **recreate** or **close** if **is_master** returns **true**.

3.3.4.1 processing::session_factory::is_master

The **is_master** method is specified in processing::session_factory::is_master (section 3.2.4.1).

3.3.4.2 processing::session_factory::create

The **create** method is specified in processing::session_factory::create (section 3.3.4.2). The return value of the **create** method MUST be stored in the **session client holder**.

3.3.4.3 processing::session_factory::recreate

The **recreate** method is specified in processing::session_factory::create (section 3.2.4.2). The return value of the **recreate** method MUST be stored in the **session client holder**. If the protocol server raises an **core::unsupported_guarantee_set** exception when the protocol client calls this method, the protocol client MUST continue to call the **recreate** method on the protocol server until this exception is no longer raised.

3.3.4.4 processing::session_factory::close

The **close** method is specified in section processing::session_factory::close (section 3.2.4.4).

3.3.5 Timer Events

None.

3.3.6 Other Local Events

None.

3.4 processing::session Server Details

3.4.1 Abstract Data Model

For more information about common abstract data model for the protocol server, see section 3.1.1.

3.4.2 Timers

The operation timeout timer measures the time it takes for the protocol server to find an available item processor when protocol server receives a **processing::session::process** method invocation as specified in section 3.4.4.5. The default value for the operation timeout is 60 seconds.

3.4.3 Initialization

The protocol server MUST initialize the **processing::session** server object using the following AOR, as specified in [MS-FSMW]

object_id: The value is implementation specific of the higher level application.

host: A string that contains the host name of the server object on the protocol server. The value is implementation specific of the higher level application.

port: If the **processing::session** server object is created by the server object in the **session factory holder**, the port MUST be base port plus 390. If the **processing::session** server object is created by the server object in the **external session factory holder**, the port MUST be base port plus 391.

interface_type: A string value that MUST be "processing::session".

interface_version: A string value that MUST be "5.2".

The protocol server MUST initialize the **processing::session** server object as specified in [MS-FSMW] section 3.

3.4.4 Message Processing Events and Sequencing Rules

The **processing::session** interface specifies the methods that are listed in the following table.

Method	Description
get_operation_timeout	Returns timeout used in **process** method.
get_session_id	Returns identifier of session interface.
get_system_ids	Returns a fixed string.
poll_callbacks	Returns callback messages.
process	Process and index a sequence of item operations. Callback messages are returned.

3.4.4.1 processing::session::get_operation_timeout

The **get_operation_timeout** method returns the timeout, in seconds, that the protocol server uses in the process::session::process method (section 3.4.4.5). The method is specified by the following FSIDL specification:

```
long get_operation_timeout()
```

Input values: None.

Return value: Timeout, in seconds.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

When the protocol server receives a **get_operation_timeout** method invocation on the **processing::session** server object, it MUST return the value of the **operation timeout** state.

3.4.4.2 processing::session::get_session_id

The **get_session_id** method returns the identifier of the session. The method is specified by the following FSIDL specification:

```
long get_session_id();
```

Return value: Identifier of the session.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

When the protocol server receives a **get_session_id** method invocation on the **processing::session** server object, it MUST return the value of the **session id** state.

3.4.4.3 processing::session::get_system_ids

The **get_system_ids** method returns a description of callback messages given by the protocol server and the indexer. The method is specified by the following FSIDL specification:

```
cht::documentmessages::subsystem_id_set get_system_ids();
```

Return value: The **ids** collection of the **cht::documentmessages::subsystem_id_set**, as specified in section 2.2.42, MUST contain one string that contains the value "processing:0:1,indexing:1:1". This string describes the callback messages given as defined in section 3.4.4.4.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

3.4.4.4 processing::session::poll_callbacks

The **poll_callbacks** method returns callback messages for submitted item operations. The protocol server MUST return all new callback messages received from indexer and item processor and all callback messages generated by protocol server from the last **processing::session::process** or **processing::session::poll_callbacks** method invocation. The method is specified by the following FSIDL specification:

```
cht::documentmessages::operation_status_info_set poll_callbacks();
```

Return value: cht::documentmessages::operation_status_info_set, as specified in section 2.2.22 containing new callbacks generated by indexing dispatcher, item processor and protocol server from the last **session::poll_callback** or **session::process** method invocation, as specified in section 3.4.4.5. Each callback message is represented as one **cht::documentmessages::operation_status_info**, Cheetah entity, as specified in section 2.2.21. If there are no callbacks, the **operations** attribute of the

cht::documentmessages::operation_status_info_set Cheetah entity MUST be an empty collection.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

When the protocol server receives a **poll_callbacks** method invocation on the **processing::session** server object, it MUST return the **callback holder** state. The value of the **callback holder** state MUST be reset after the return has been sent to the protocol client.

For each **session::process** method invocation, as specified in section processing::session::process (section 3.4.4.5), the following callback messages are generated by the protocol server, the item processor and the indexing dispatcher.

Completed by processing

The callback message received by the protocol server when the item processor has finished processing a sequence of item operations submitted in one **processing::session::process** method invocation, as specified in section 3.4.4.5. The **cht::documentmessages::operation_status_info** Cheetah entity that represents the callback message contains the following attributes:

- **first_op_id:** Item operation identifier assigned by the protocol server to the first item operation in the submitted sequence of item operations.
- **last_op_id:** Item operation identifier assigned by the protocol server to the last item operation in the submitted sequence of item operations.
- **state:** The value for this attribute MUST be Cheetah enumeration value **cht::documentmessages::completed**, as specified in section 2.2.5.
- **subsystem:** A string that MUST have the value "processing".
- **errors:** Errors for item operations provided by the item processor. The **operation_id** attribute of the **cht::documentmessages::error** Cheetah entity identifies the item operation to which an error refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.
- **warnings:** Warnings for item operations provided by the item processor. The **operation_id** attribute of the **cht::documentmessages::warning** Cheetah entity identifies the item operation to which an warning refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.

Secured by indexing

The callback message received by the protocol server when the indexing nodes have stored the sequence of item operations submitted in one **processing::session::process** method invocation, as specified in section 3.4.4.5, to disk. The **cht::documentmessages::operation_status_info** Cheetah entity that represents the callback message contains the following attributes:

- **first_op_id:** Item operation identifier assigned by the protocol server to the first item operation in the submitted sequence of item operations.
- **last_op_id:** Item operation identifier assigned by the protocol server to the last item operation in the submitted sequence of item operations.
- **state:** The value for this attribute MUST be Cheetah enumeration value **cht::documentmessages::secured**, as specified in section 2.2.5.

- **subsystem:** A string that MUST have the value "indexing".
- **errors:** Errors for item operations provided by the indexing dispatcher. The **operation_id** attribute of the **cht::documentmessages::error** Cheetah entity identifies the item operation to which an error refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.
- **warnings:** Warnings for item operations provided by the indexing dispatcher. The **operation_id** attribute of the **cht::documentmessages::warning** Cheetah entity identifies the item operation to which an warning refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.

Completed by indexing

The callback message received by the protocol server when the indexing nodes have processed the sequence of item operations, submitted in one **processing::session::process** method invocation, as specified in section 3.4.4.5, and the actions that were triggered by the item operations are visible in the search index. The **cht::documentmessages::operation_status_info** Cheetah entity that represents the callback message contains the following attributes:

- **first_op_id:** Item operation identifier assigned by the protocol server to the first item operation in the submitted sequence of item operations.
- **last_op_id:** Item operation identifier assigned by the protocol server to the last item operation in the submitted sequence of item operations.
- **state:** The value for this attribute MUST be Cheetah enumeration value **cht::documentmessages::completed**, as specified in section 2.2.5.
- **subsystem:** A string that MUST have the value "indexing".
- **errors:** Errors for item operations provided by the indexing dispatcher. The **operation_id** attribute of the **cht::documentmessages::error** Cheetah entity identifies the item operation to which an error refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.
- **warnings:** Warnings for item operations provided by the indexing dispatcher. The **operation_id** attribute of the **cht::documentmessages::warning** Cheetah entity identifies the item operation to which an warning refers to. The protocol server assigns an item operation identifier to each item operation in the **processing::session::process** method, as specified in section 3.4.4.5.

3.4.4.5 processing::session::process

The protocol client sends a sequence of item operations to the protocol server for processing and indexing. The return value contains the item operation identifier for the item operations, and callbacks for previously submitted item operation sequences. The method is specified by the following FSIDL specification:

```
cht::documentmessages::operation_status_info_set
    process(in cht::documentmessages::operation_set batch,
              in cht::documentmessages::subsystem_id_set subsystems)
raises (coreprocessing::timed_out,
         coreprocessing::service_unavailable,
         coreprocessing::format_error,
         coreprocessing::no_resources);
```

batch: Sequence of item operations.

subsystems: The **ids** attribute of the **cht::documentmessages::subsystem_id_set** Cheetah entity MUST be empty collection or contain the string "indexing".

Return value: A **cht::documentmessages::operation_status_info_set** Cheetah entity, as specified in section 2.2.22, containing operation identifier of submitted operations and callback messages received from indexer, item processor and protocol server from the time when the **processing::session::process** or **processing::session::poll_callbacks** method was last called. The first **cht::documentmessages::operation_status_info** Cheetah entity in the **operations** attribute of the **cht::documentmessages::operation_status_info_set** describes the operation identifiers assigned to the submitted item operations. The first **cht::documentmessages::operation_status_info** Cheetah entity in the **operations** attribute MUST have the following attributes:

first_op_id: Item operation identifier assigned by the protocol server to the first item operation in the submitted sequence of item operations. The next item operation in the submitted sequence of item operations has operation identifier **first_op_id** plus 1 and so on.

last_op_id: An integer that MUST be -1.

state: The value for this attribute MUST be **cht::documentmessages::completed**, as specified in section 2.2.5.

subsystem: A string that MUST have the value "firstopid".

errors: The value for this attribute MUST be empty collection.

warnings: The value for this attribute MUST be empty collection.

The rest if the **cht::documentmessages::operation_status_info** Cheetah entities in the **cht::documentmessages::operation_status_info_set** Cheetah entity are callback as specified in section 3.4.4.4.

Exceptions

coreprocessing::timed_out: Raised if the protocol server is unable to submit item operations to an item processor before operation timeout is reached, as specified in section 3.4.2. For more information about the protocol between item processor and protocol server, see [MS-FSDPD].

coreprocessing::service_unavailable: Raised if the session has been closed or when the protocol server is shutting down.

coreprocessing::format_error: Raised if submitted sequence of item operations does not contain any operations.

coreprocessing::no_resources: Raised if no item processor is registered in the protocol server. For more information about the protocol between the item processor and the protocol server, see [MS-FSDPD].

When the protocol server receives a **process** method invocation on the **processing::session** server object, it MUST use the **operation id generator** to assign unique operation identifiers to the item operations in the **batch** input value.

The protocol server MUST return the **callback holder** state. The value of the **callback holder** state MUST be reset after the return value has been sent to the protocol client.

3.4.5 Timer Events

The operation timeout event terminates the **processing::session::process** method invocation by raising exception **coreprocessing::timed_out**.

3.4.6 Other Local Events

None.

3.5 processing::session Client Details

3.5.1 Abstract Data Model

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

The protocol client maintains the following states:

item operation map: A key-value map for sequences of item operations. The key is a integer value, value is a structure named **item operation callback holder** with the following attributes:

- **submitted_operations**: A Cheetah entity **cht::documentmessages::operation_set**, as specified in section 2.2.20. Contains a sequence of item operations submitted by invoking the in **processing::session::process** method, as specified in section 3.4.4.5.
- **num_callbacks**: An integer that represents the number of callback messages received for the **submitted_operations** sequence of item operations.
- **num_errors**: An integer that represents the number of errors received in callback messages for the **submitted_operations** sequence of item operations.

item operation identifier to document identifier map: The protocol client MUST keep a map from document identifier of submitted items to the item operation identifier assigned by the protocol server in the **processing::session::process** method, as specified in section 3.4.4.5.

session id: An integer that represents the session.

3.5.2 Timers

None.

3.5.3 Initialization

The protocol client that uses the **processing::session** interface MUST create the **session** client proxy using the **processing::session_factory::create** method, as specified in section 3.2.4.2 or the **processing::session_factory::recreate** method, as specified in section 3.2.4.3.

3.5.4 Message Processing Events and Sequencing Rules

This **processing::session** interface specifies the methods that are listed in the following table.

Method	Description
get_operation_timeout	Returns timeout used in process method.
get_session_id	Returns identifier of session interface.
get_system_ids	Returns a fixed string.
poll_callbacks	Returns callback messages.
process	Process and index a sequence of item operations. Callback messages are returned.
__ping	Tests whether a server object is available.

3.5.4.1 processing::session::get_operation_timeout

The **get_operation_timeout** method is defined in section 3.4.4.1.

3.5.4.2 processing::session::get_session_id

The **get_session_id** method is specified in section 3.4.4.2. After invoking **create**, as defined in section 3.3.4.2, the protocol client MUST call **get_session_id** to update the **session id** state.

3.5.4.3 processing::session::get_system_ids

The **get_system_ids** method is specified in section 3.4.4.3.

3.5.4.4 processing::session::poll_callbacks

The **poll_callbacks** method is specified in processing::session::poll_callbacks (section 3.4.4.4). When the protocol client sends the **processing::session::poll_callbacks** method invocation, as specified in section 3.4.4.4, it MUST use the **operation id to document identifier mapping table** to map operation identifiers in errors and warnings in callback messages to document identifiers of item operations.

The protocol client MUST update the **item operation map** as specified in section 3.4.4.5.

3.5.4.5 processing::session::process

The **process** method is specified in section 3.4.4.5. When the protocol client calls the **processing::session::process** on the protocol server, as specified in section 3.4.4.5. the protocol client MUST use the return value to update the **item operation identifier to document identifier mapping** state.

The protocol client MUST insert an entry into the **item operation map**. The key is the **first_op_id** integer attribute of the first **cht::documentmessages::operation_status_info** Cheetah entity in the **status** attribute of the **cht::documentmessages::operation_status_info_set** return value of the **process** method, as specified in section 3.4.4.5. The value associated with the key in the **item operation map** is an **operation_set_status** structure, as defined in section 3.5.1, with the following attributes:

- **submitted_operations** is set to the value of the **cht::documentmessages::operation_set** input value to the **processing::session::process** method.
- **num_callbacks** is set to 0.

- **num_errors** is set to 0.

For the other **cht::documentmessages::operation_status_info** Cheetah entities in the **status** attribute of the **cht::documentmessages::operation_status_info_set** return value of the **process** method, protocol client MUST update the **item operation map** as follows:

- Use the **first_op_id** attribute of the **cht::documentmessages::operation_status_info** to find the **operation_set_status** structure for this collection of item operations.
- Increase **num_errors** attribute of the **operation_set_status** structure by the number of errors in the **cht::documentmessages::operation_status_info** Cheetah entity.
- Increase **num_callbacks** attributes in the **operation_set_status** structure by 1.
- If the **num_callbacks** attribute equals 3, the protocol client MUST remove this entry from the map.
- If the **num_errors** attribute equals the number of item operations in the **submitted_operations** attribute, the protocol client MUST remove the **operation_set_status** structure from the map.

The protocol client MUST use the **item operation identifier to document identifier map** to map item operation identifiers in **errors** and **warnings** in callback messages to the document identifier of item operation.

3.5.4.6 processing::session::__ping

The protocol client MUST call the **processing::session::__ping** method to the **processing::session** server object at regular intervals. The **__ping** method is provided by all server objects as specified in [MS-FSMW] section 2. If invoking the **__ping** method raises an exception, the protocol client MUST recreate the session as described in section 3.5.6.

3.5.5 Timer Events

None.

3.5.6 Other Local Events

If any of the methods in the **processing::session** interface, as specified in section 3.4.4 raises a system exception, as specified in [MS-FSMW], the protocol client MUST perform the following steps:

1. Recreate the feeding session by calling the protocol server method **processing::session_factory::recreate**, as specified in section 3.2.4.3.

2. For all item operation sequences in the **item operation map**, protocol client MUST resubmit the item operation sequences using the **processing::session::process** method, as specified in section 3.4.4.5.

3. Reset the item operation map.

4. Reset the item operation identifier to document identifier map.

3.6 coreprocessing::control Server Details

3.6.1 Abstract Data Model

See common abstract data model for more information about protocol server as specified in section 3.1.1.

3.6.2 Timers

None.

3.6.3 Initialization

The protocol server MUST use the Middleware **bind** method to register a **coreprocessing::control** server object in the **name server**, as specified in [MS-FSMW] section 2.

The input values for the **bind** method are encapsulated in an AOR, as specified in [MS-FSMW] section 2.

name: A string value that MUST be "esp/subsystems/processing/dispatcher".

object_id: An integer value that MUST be unique for each server object.

host: A string that contains the host name of the server object on the protocol server. The value is implementation specific of the higher level application.

port: base port plus 390.

interface_type: A string value that MUST be "coreprocessing::control".

interface_version: A string value that MUST be "5.1".

3.6.4 Message Processing Events and Sequencing Rules

The **coreprocessing::control** interface specifies the methods that are listed in the following table.

Method	Description
suspend_feeding	Suspends feeding to a given content collection.
resume_feeding	Enables feeding to a given content collection that has been suspended.
clear_collection	Clears all items in given content collection from the search index.

3.6.4.1 coreprocessing::control::suspend_feeding

Suspends feeding to a given content collection. All existing **session** objects using this content collection MUST be closed and removed from the protocol server. The method is specified by the following FSIDL specification:

```
void suspend_feeding(in string collection);
```

collection: Name of content collection to suspend feeding for.

Return value: None.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

The protocol server MUST NOT allow any **processing::session_factory::create**, as specified in section 3.3.4.2 and **processing::session_factory::recreate**, as specified in section 3.2.4.3 to succeed for the given content collection until **coreprocessing::control::resume_feeding**, as specified in section 3.6.4.2 with the given content collection has been called.

When the protocol server receives a **suspend_feeding** method invocation from the protocol client on the **coreprocessing::control** server object, it MUST add the content collection name given in the **collection** input value to the **collection suspended holder** state.

The protocol server MUST deactivate all **processing::session** server objects in the **session holder** state where the **collection id** of the **processing::session** server object is equal to the **collection** input value.

The **collection** input value MUST be added to the **collection suspended** holder.

The protocol server MUST call the **coreprocessing::session::close** method in the indexing dispatcher, as defined in [MS-FSDP] section 3 for all **processing::session** server objects in the **session holder** state where the **collection id** of the **processing::session** server object is equal to the **collection** input value.

3.6.4.2 coreprocessing::control::resume_feeding

Resumes feeding to a given content collection. The method is specified by the following FSIDL specification:

```
void resume_feeding(in string collection);
```

collection: Name of content collection to resume feeding for.

Return value: None.

Exceptions: No exceptions are raised beyond those raised by the underlying Middleware Protocol, as specified in [MS-FSMW].

When the protocol server receives a **resume_feeding** method invocation from the protocol client on the **control** server object, it MUST remove the content collection name given in the **collection** input value from the **collection suspended holder** state.

3.6.4.3 coreprocessing::control::clear_collection

This method removes all items from a given content collection in the search index. The method is specified by the following FSIDL specification:

```
void clear_collection(
     in string collection,
     in cht::documentmessages::subsystem_id_set subsystems,
     in boolean wait_for_completed)
raises (coreprocessing::timed_out,
        coreprocessing::unknown_collection_error,
        coreprocessing::operation_failed,
        core::unsupported_guarantee_set);
```

collection: Identifier of the content collection to remove all items from.

subsystems: The **ids** attribute of the **cht::documentmessages::subsystem_id_set** Cheetah entity MUST be an empty collection.

wait_for_completed: If **true**, this method blocks until the indexer nodes have given a **Completed by indexing** callback message for the remove operation of all items in the given content collection. If **false**, this method blocks until the indexer nodes have given a **Secured by indexing** callback message for the remove operation of all items in the given content collection.

Return value: None.

Exceptions

coreprocessing::timed_out: Raised if the protocol server is unable to find an available item processor before the operation timeout is reached. For more information about operation timeout, see section 3.4.2. For more information about the protocol between the item processor and the protocol server, see [MS-FSDPD].

coreprocessing::unknown_collection_error: Raised if given content collection is unknown.

coreprocessing::operation_failed: Raised if the protocol server is unable to perform **clear_collection** method invocation.

core::unsupported_guarantee_set: Raised if the protocol server is unable to create the feeding session with indexing dispatcher using the **coreprocessing::session_factory::create** method as specified in [MS-FSDP] section 3.

This method MUST only be called after feeding to the given collection has been suspended using the **coreprocessing::control::suspend_feeding** method.

The protocol server MUST raise the exception **coreprocessing::unknown_collection_error** if the given content collection does not exist in the **collection holder** state.

When the protocol server receives this method invocation from the protocol client, the protocol server MUST call the **coreprocessing::session_factory::create** method in the indexing dispatcher, as specified in [MS-FSDP] section 3. The **collection** input value to the **coreprocessing::session_factory::create** method MUST be equal to the collection input value. The protocol server MUST then use the **coreprocessing::session** client proxy returned from the **coreprocessing::session_factory::create** method to call the **coreprocessing::session::process** method, as specified in [MS-FSDP] section 3. The input parameters to the **coreprocessing::session::process** method MUST be as follows:

batch: A **cht::documentmessages::operation_set** Cheetah entity, as specified in section 2.2.20, that contains one **cht::documentmessages::clear_collection** Cheetah entity, as specified in [MS-FSDP] section 2.

subsystems: The **ids** attribute of the **subsystems** input value MUST be an empty collection.

3.6.5 Timer Events

None.

3.6.6 Other Local Events

None.

4 Protocol Examples

4.1 Sending Item Operations and Receiving Callback Messages

This example describes how to create and set up a session, feed item operations on this session, receive callback messages about the status of the items, recreate the session when a system exception is raised, as specified in [MS-FSMW], and then close the session.

Initializating the session

The **processing::session_factory** protocol server creates a server object implementing the **processing::session_factory** interface, and activates it. The **processing::session_factory** protocol client acquires a client proxy to this **processing::session_ factory** interface by instantiating an AOR. This is possible because both the protocol client and protocol server have agreed a priori on the attributes of the AOR. Both protocol client and protocol server uses unencrypted HTTP transport and the port base port plus 390, as specified in section 2.1.

Setting up the session

The protocol client creates the feeding session by calling the **processing::session_factory** protocol server using the **create** method.

The **processing::session_factory** protocol server receives the **create** method invocation, creates, activates, and returns a **session** client proxy, stores the **processing::session** server object in the **session holder** state.

The **processing::session_factory** protocol client stores the returned **session** client proxy in the **session client holder** state.

Using the session

The **processing::session** protocol client retrieves a **session** client proxy from the **session client holder** state, and uses the **session::process** message to send the item operations to the **processing::session** protocol server. The protocol client updates the **item operation map** state when the **process** method returns.

Receiving callbacks

The **processing::session** protocol server receives the callback messages from the item processor and indexing dispatcher and stores the callback messages in the **callback holder** state.

The **processing::session** protocol client receives the callback messages when calling **poll_callbacks** and **process** to the protocol server. The protocol client updates the **callback holder** state when receiving the callback messages.

Recreating the session and resubmitting operations

When the protocol client calls the **processing::session::process** method on the protocol server, and the method raises a system exception, the **processing::session** protocol client recreates the session by calling **recreate** to the **processing::session_factory** protocol server. The protocol client resubmits all sequences of item operations in the **callback holder** state to the **processing::session** protocol server using the **process** method.

Closing the session

The **processing::session** protocol client closes the session when the **callback holder** state is empty. The session is closed by calling the **close** method on the **processing::session_factory** protocol server.

4.1.1 Sample code

4.1.1.1 session_factory Protocol Server Initialization

```
SET session_factory_server_object_instance TO INSTANCE OF processing::session_factory SERVER
OBJECT

SET session_factory_server_object_host TO "myserver.mydomain.com"

SET session_factory_server_object_port TO "13390"

SET session_factory_server_object_interface_type TO "processing::session_factory"

SET session_factory_server_object_interface_version TO "5.1"

SET session_factory_server_object_object_id TO 1

SET session_factory_server_object_aor TO session_factory_server_object_host,
session_factory_server_object_port, session_factory_server_object_interface_type,
session_factory_server_object_interface_version AND session_factory_server_object_id

CALL middleware.activate WITH session_factory_server_object_instance
```

4.1.1.2 session_factory Protocol Client Initialization

```
SET session_factory_client_proxy _instance TO INSTANCE OF processing::session_factory SERVER
OBJECT

SET session_factory_client_proxy_host TO "myserver.mydomain.com"

SET session_factory_client_proxy_port TO "13390"

SET session_factory_client_proxy_interface_type TO "processing::session_factory"

SET session_factory_client_proxy_interface_version TO "5.1"

SET session_factory_client_proxy_object_id TO 1
```

4.1.1.3 session_factory Protocol Client Message

```
SET collection TO "mycollection"

SET guarantees to cht::core::guarantee_set
CALL session_factory_client_proxy.create WITH collection AND guarantees RETURNING
session_client_proxy

ADD session_client_proxy TO session_client_holder_state
```

4.1.1.4 session_factory Protocol Server Response

```
SET session_id TO session_id_generator

SET session_id_generator TO session_id_generator + 1

SET session_server_object_instance TO INSTANCE OF processing::session SERVER OBJECT

SET session_server_object_instance TO session id

RETURN session_server_object_instance
```

4.1.1.5 session Factory Protocol Server Response

```
GET session_client_proxy FROM session_client_holder_state

SET session_id_generator TO session_id_generator + 1

SET session_server_object_instance TO INSTANCE OF processing::session SERVER OBJECT

SET session_server_object_instance TO session id

RETURN session_server_object_instance
```

4.1.1.6 session Protocol Client process Method Invocation

```
SET operations TO OPERATION_SET_OBJECT_WITH_10_OPERATIONS

SET operations.completed_op_id TO 0

SET subsystem_id_set TO subystem_id_set_object

SET subysystem_id_set.ids to EMPTY COLLECTION

CALL session_client_proxy.process WITH operations AND subsystem_id_set RETURN
operation_status_info_set

SET retval TO RETURNED operation_status_info_set

SET first_op_id = retval[0].first_op_id

SET item_operation_callback_holder TO item_operation_callback_holder_object

SET item_operation_callback_holder.submitted_operations TO operations

SET item_operation_callback_holder.num_callbacks TO 0

SET item_operation_callback_holder.num_errors TO 0

SET item_operation_map[first_op_id] = item_operation_callback_holder

FOR i = 1, i < retval.status.size; i++
   SET key = retval.status[i].first_op_id
   SET item_operation_map[key].num_callbacks = item_operation_map[key] + 1
   SET item_operation_map[key].num_errors = item_operation_map[key].num_errors
                                            + retval.status[i].errors.count
```

```
   IF item_operation_map[key].num_callback = 3 OR
      item_operation_map[key].num_errors =
      item_operation_map[key].submitted_operations.count THEN
           item_operation_map.remove(key)
```

4.1.1.7 session Protocol Server process Method Response

```
RECEIVE input values batch and subsystems

SET first_op_id = operation_id_generator

FOR i = 0, i < batch.operations.size, i++
  batch.operations[i].id = operation_id_generator
  operation_id_generator = operation_id_generator + 1

SEND operation to item processor for processing

SET retval TO operation_status_info_set

SET opstatus TO operation_status_info

SET opstatus.first_op_id TO first_op_id

SET opstatus.last_op_id TO -1

SET opstatus.stat TO cht::documentmessages::completed

SET opstatus.subsystem TO "firstopid"

ADD opstatus to retval.status

ADD callback_holder to retval.status

CLEAR callback_holder

RETURN retval
```

4.1.1.8 session Protocol Client poll_callbacks Method Invocation

```
CALL session_client_proxy.poll_callbacks RETURN operation_status_info_set

SET retval TO RETURNED operation_status_info_set

FOR i = 0, i < retval.status.size; i++

   SET key = retval.status[i].first_op_id
   SET item_operation_map[key].num_callbacks = item_operation_map[key] + 1
   SET item_operation_map[key].num_errors = item_operation_map[key].num_errors
+                                           retval.status[i].errors.count
   IF item_operation_map[key].num_callback = 3 OR
      item_operation_map[key].num_errors =
      item_operation_map[key].submitted_operations.count THEN
           item_operation_map.remove(key)
```

4.1.1.9 session Protocol Server poll_callbacks Method Response

```
SET retval TO operation_status_info_set

ADD callback_holder to retval.status

CLEAR callback_holder
```

4.1.1.10 session Protocol Server poll_callbacks Method Invocation with System Exception

```
CALL session_client_proxy.poll_callbacks RAISE system_exception

SET collection TO "mycollection"

SET guarantees to cht::core::guarantee_set

CALL session_factory_client_proxy.recreate WITH session_id AND collection AND guarantees
RETURNING session_client_proxy

ADD session_client_proxy TO session_client_holder_state

SET old_item_operation_map = item_operation_map

CALL item_operation_map.reset

FOR i = 0, i < old_item_operation_map.size, i++
   SET operations TO old_item_operation_map[i].operations
   SET operations.completed_op_id TO 0
   SET subsystem_id_set TO subystem_id_set_object
   SET subysystem_id_set.ids to EMPTY COLLECTION
   CALL session_client_proxy.process WITH operations AND subsystem_id_set
   RETURN operation_status_info_set
   SET retval TO RETURNED operation_status_info_set
   SET first_op_id = retval[0].first_op_id
   SET item_operation_callback_holder TO item_operation_callback_holder_object
   SET item_operation_callback_holder.submitted_operations TO operations
   SET item_operation_callback_holder.num_callbacks TO 0
   SET item_operation_callback_holder.num_errors TO 0
   SET item_operation_map[first_op_id] = item_operation_callback_holder
   FOR j = 1, j < retval.status.size; i++
     SET key = retval.status[j].first_op_id
     SET item_operation_map[key].num_callbacks = item_operation_map[key] + 1
     SET item_operation_map[key].num_errors = item_operation_map[key].num_errors
                                              + retval.status[i].errors.count
     IF item_operation_map[key].num_callback = 3 OR
        item_operation_map[key].num_errors =
        item_operation_map[key].submitted_operations.count THEN
        item_operation_map.remove(key)
```

4.1.1.11 session_factory Protocol Client Close

```
CALL session_factory_client_proxy.close WITH session_id
```

4.1.1.12 session_factory Protocol Server Close

```
GET session_server_object_instance FROM session_server_state FOR session_id

REMOVE session_server_object_instance FROM session_server_state

DEACTIVATE session_server_object_instance
```

5 Security

5.1 Security Considerations for Implementers

Section 2.1 specifies how to secure the transport between protocol client and protocol server.

5.2 Index of Security Parameters

None.

6 Appendix A: Full FSIDL

For ease of implementation, the full FSIDL is provided below.

```
module interfaces
{
   module core
   {
      exception unsupported_guarantee_set
      {
         string what;
      };
   };
   module coreprocessing
   {
      exception unknown_collection
      {
         string what;
      };
      exception timed_out
      {
         long id;
         string message;
      };
      exception service_unavailable
      {
         long id;
         string message;
      };
      exception format_error
      {
         long id;
         string message;
      }
      exception no_resources
      {
         long id;
         string message;
      };
   };
   module processing
   {
      interface session_factory
      {
         #pragma version session_factory 5.1
         boolean is_master();
         session create(
            in /*collection_id*/ string collection,
            in cht::core::guarantee_set guarantees)
            raises (coreprocessing::unknown_collection_error,
                    core::unsupported_guarantee_set);
            session recreate(in long id,
                             in /*collection_id*/ string collection,
                             in cht::core::guarantee_set guarantees)
            raises (coreprocessing::unknown_collection_error,
                    core::unsupported_guarantee_set);
            void close(in /*session_id*/ long id);
      };
```

```
        interface session
        {
           #pragma version session 5.1
           long get_session_id();
           long get_operation_timeout();
           cht::documentmessages::operation_status_info_set
           process(in cht::documentmessages::operation_set batch,
                   in cht::documentmessages::subsystem_id_set subsystems)
           raises (coreprocessing::timed_out,
                   coreprocessing::service_unavailable,
                   coreprocessing::format_error, coreprocessing::no_resources);
           cht::documentmessages::subsystem_id_set get_system_ids();
           cht::documentmessages::operation_status_info_set poll_callbacks();
        };
     };
  };
```

7 Appendix B: 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® FAST™ Search Server 2010

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.

8 Change Tracking

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

9 Index

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