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### Revision Summary

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1 Introduction

This document specifies the Connector Database Schema. This specification describes the database schema for the JDBC indexing connector component and the Lotus Notes indexing connector component.

Sections 1.7 and 2 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in RFC 2119. All other sections and examples in this specification are informative.

1.1 Glossary

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

- access control list (ACL)
- checksum
- Coordinated Universal Time (UTC)

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

- crawl
- data source
- indexing connector
- item
- Transact-Structured Query Language (T-SQL)

The following terms are specific to this document:

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

1.2 References

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

1.2.1 Normative References

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


1.2.2 Informative References


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

1.3 Structure Overview (Synopsis)

This document describes the database definition used by the **indexing connector** components.

The JDBC indexing connector component **crawls** the JDBC **data source**(1) and passes the **items** to the Content Feeding Protocol server as described in [MS-FSCF]. The JDBC indexing connector component uses the database to store item status and to detect changes in the JDBC data source(1). A JDBC data source is described in [JDBC].

![Indexing connector item status flow chart](image)

**Figure 1: Indexing connector item status flow chart**
The Lotus Notes indexing connector component crawls the Lotus Notes data source(1), and passes the items to the Content Feeding Protocol server as described in [MS-FSCF], and the corresponding access control list (ACL) information is passed to the Search Authorization Connector Protocol Specification as described in [MS-FSSAC]. The Lotus Notes indexing connector component uses the database to store item status and detect changes in the Lotus Notes data source(1). A Lotus Notes data source is described in [LotusNotes].

1.3.1 Item Status

Item status is the status of the retrieved items, and their indexing status. The index status describes whether the item has been sent for indexing, successfully indexed, failed while indexing or has unknown status. The item status is also made available through Microsoft® SQL Server® 2008 Reporting Services.

1.3.2 State Tracking

Lotus Notes item status is stored in the state tracking tables, and describes whether items were changed.

1.3.3 Change Detection

The JDBC indexing connector component can detect changes by using persisted storage in database tables. It detects change with a checksum, which it stores in the database and compares against later checksums.

1.4 Relationship to Protocols and Other Structures

None.

1.5 Applicability Statement

The database schema described in this document can be used as a basis for alternative implementations of indexing connectors.

1.6 Versioning and Localization

None.

1.7 Vendor-Extensible Fields

None.
2 Structures

The following figure specifies the database tables for JDBC indexing connector component and Lotus Notes indexing connector component.

![Diagram of database tables]

The database tables do not contain any foreign keys, stored procedures or triggers. Each item MUST have an associated configuration name that partitions the items into tables. An indexing connector uses the same configuration name for all items coming from the same data source. The configuration name MUST consist of the characters [a-f][0-9], a minimum of 3 characters and a maximum of 32 characters.

2.1 changehash

This table stores the item checksum for change detection for later comparison. If the checksum is changed, the document has been updated. The checksum is an implementation specific hash value computed from the item elements. The table MUST be a composite of the value of changehash_ and the configuration name. The Transact-Structured Query Language (T-SQL) syntax for the table is as follows. The T-SQL definition is specified in [MSDN-TSQL-Ref].

2.1.1 Table Definition

The table is contained in a schema called "connectors". The T-SQL syntax for the table is as follows:
**TABLE connectors.changehash_<configuration name>**

(docid varchar(255) NOT NULL CONSTRAINT changehash_<configuration name>pk_docid PRIMARY KEY, valueNew varchar(255) default NULL, valueOld varchar(255) default NULL, op int default NULL, seen bigint default NULL)

**docid:** The item identifier.

**valueNew:** Stores a hash value calculated from the item.

**valueOld:** Stores a temporary hash value calculated from the previous item in case a rollback is required.

**op:** The operation status. It specifies the item change status in the index node. The column MUST have one of the values described in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Item added or updated, and successful callback received.</td>
</tr>
<tr>
<td>1</td>
<td>No update.</td>
</tr>
<tr>
<td>2</td>
<td>New update.</td>
</tr>
<tr>
<td>3</td>
<td>Update existing.</td>
</tr>
<tr>
<td>4</td>
<td>Update, but no change.</td>
</tr>
<tr>
<td>5</td>
<td>Delete.</td>
</tr>
</tbody>
</table>

**seen:** Coordinated Universal Time (UTC) time in seconds that have elapsed between 1970-01-01T00:00:00 and the time that the item was last associated with the indexing connector.

### 2.2 statetracker

This table stores state information about Lotus Notes documents and databases. The state is the crawl status and the Content Feeding Protocol, [MS-FSCF], callback information.

#### 2.2.1 Table Definition

This is the configuration name appended with the string ":statetracker". The table is contained in a schema called "connectors". The T-SQL syntax for the table is as follows:

TABLE connectors.<configuration name>_statetracker (path varchar(255) NOT NULL CONSTRAINT <configuration name>_statetrackerpk_path PRIMARY KEY, docid varchar(255) default NULL, state int default NULL)

**path:** The item identifier.

**docid:** The item identifier.

**state:** The indexing state. The column MUST have one of the values described in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Stable. Successful callback from Content Feeding Protocol, as specified in [MS-FSCF].</td>
</tr>
</tbody>
</table>
### 2.3 statetrackerdate

This table stores information about the content that was last crawled. Each row specifies when a database was last crawled.

#### 2.3.1 Table Definition

The table MUST be the same as the configuration name and appended with the string constant ",_statetracker_entitydates". The table is contained in a schema called "connectors". The T-SQL syntax for the table is as follows:

```sql
TABLE connectors.<configuration_name>_statetracker_entitydates (path varchar(255) NOT NULL
CONSTRAINT <configuration_name>_statetracker_entitydatespk_path2 PRIMARY KEY,
datelast varchar(255) default NULL )
```

- **path**: Path to the [LotusNotes] database.
- **datelast**: Last date the database was crawled. The value of the **datelast** variable is stored as UTC time in seconds that have elapsed since 1970-01-01T00:00:00.

### 2.4 statustracker

This table contains information about the item status. The item status MUST be created during crawl, and updated based on the callback by the Content Feeding Protocol, as specified in [MS-FSCF]. Statustracker item status is not required for the product to operate.

#### 2.4.1 Table Definition

The table is contained in a schema called "connectors". The T-SQL syntax for the table is as follows:

```sql
TABLE connectors.statustracker ( Id bigint NOT NULL IDENTITY,DocId nvarchar(200) default NULL,URL nvarchar(2000) default '',ConfigName nvarchar(200) default '',Message nvarchar(4000) default '',Status nvarchar(50) default '',Logtime datetime default NULL )
```

- **id**: A unique identifier assigned to the status tracker.
- **DocId**: The item identifier.
- **URL**: The URL to the item.
- **ConfigName**: The name of the configuration used to extract the item.
- **Message**: Index status message reported by the Indexer node.


**Status:** Item index status. The column MUST contain one of the values described in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pending - add/update</td>
<td>Item added, and waiting for feedback from index node</td>
</tr>
<tr>
<td>Pending – delete</td>
<td>Item deleted, and waiting for feedback from index node</td>
</tr>
<tr>
<td>Failed - add/update</td>
<td>Indexer node failed to add or update item</td>
</tr>
<tr>
<td>Failed – delete</td>
<td>Indexer node failed to delete item</td>
</tr>
<tr>
<td>Success - add/update</td>
<td>Indexer node successfully added or updated item</td>
</tr>
<tr>
<td>Success – delete</td>
<td>Indexer node successfully deleted item</td>
</tr>
<tr>
<td>Failed - unknown operation</td>
<td>Indexer node returned failure for unknown item</td>
</tr>
<tr>
<td>Success - unknown operation</td>
<td>Indexer node returned success for unknown item</td>
</tr>
</tbody>
</table>

**Logtime:** The date and time when the entry was updated.
3 Structure Examples

3.1 Add a New Pending Item to statustracker

Adding or updating an item to an indexer node also adds a new entry to the statustracker database table. The following T-SQL statement creates a new database table row where p0 is the item identifier and p1 is the configuration name.

```
INSERT INTO connectors.statustracker (DocId, ConfigName, Status, Logtime) VALUES( @p0, @p1, 'Pending - add/update', CURRENT_TIMESTAMP )
```

3.2 Update Pending Item Status

Updating an item to a status successfully indexed also updates the statustracker database table. The following T-SQL statement updates the database row, where p0 is the item identifier of the pending item.

```
UPDATE connectors.statustracker SET Status = 'Success - add/update', Logtime = CURRENT_TIMESTAMP WHERE DocId = @p0
```

3.3 Add a New Item to statetracker Database Table

Adding a new item also adds a new entry to the statetracker database table. The following T-SQL statement creates a new database table row where p0 is the path, and p1 is the item identifier.

```
INSERT INTO connectors.<configuration_name>_statetracker (path, docid, state) VALUES( @p0, @p1, 1 )
```

3.4 Update the Pending Item Status

Updating the status of an item to a value of "successfully indexed" will also update the statetracker database table. The following T-SQL statement updates the database table row where p0 is the path, and p1 is the item identifier.

```
UPDATE connectors.<configuration_name>_statustracker SET state = 0 WHERE path=@p0 AND docid=@p1
```

3.5 Add a New Entry to statetracker_entitydates Database Table

Completing a crawl of a Lotus Notes database will also update the statetracker_entitydates database table. The following T-SQL statement creates a new database table row where p0 is the path to the database, and p1 is when the database was last updated.

```
INSERT INTO connectors.<configuration_name>_statustracker_entitydates( path, datelast ) VALUES( @p0, @p1 )
```
4 Security Considerations

Only the user account that hosts the indexing connector component implementation is granted access to the database instance that hosts the database schema specified by this protocol.
5 Appendix A: Product Behavior

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

- Microsoft® 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.
6 Change Tracking

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