[MS-DACPAC]:
Data-Tier Application File Format Structure Specification

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Revision Summary

Date	Revision History	Revision Class	Comments
06/04/2010	0.1	Major	First release.

Contents

1   Introduction

A data-tier application (DAC) is a self-contained unit for developing, deploying, and managing data-tier objects. DAC enables data-tier developers and database administrators (DBAs) to package Microsoft® SQL Server® objects, including **database** and instance objects, into a single entity called a DAC package (dacpac), as specified in [MSDN-UNDERDAC]. A dacpac consists of multiple XML parts that represent metadata of the data-tier application and SQL Server object schema.

This document describes the file format of XML parts in a dacpac using xml schema definitions. Note that XML schema [XMLSCHEMA1] definition (**XSD**) in this document is supplemental to the data portability scenarios described in [MS-DPDACPAC].

1.1   Glossary

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

database object
XML schema (XSD)

The following terms are specific to this document:

MIME type: A method that is used by protocol clients to associate files of a certain type with applications that can open or access files of that type.

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

1.2   References

1.2.1   Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. 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.

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

[XML1.0] Bray, T., Paoli, J., Sperberg-McQueen, C.M., and Maler, E., "Extensible Markup Language (XML) 1.0 (Second Edition)", W3C Recommendation, October 2000, http://www.w3.org/TR/2000/REC-xml-20001006

[XMLSCHEMA1] Thompson, H.S., Ed., Beech, D., Ed., Maloney, M., Ed., and Mendelsohn, N., Ed., "XML Schema Part 1: Structures", W3C Recommendation, May 2001, http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/

1.2.2   Informative References

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

[MS-DPDACPAC] Microsoft Corporation, "Data-Tier Application Data Portability Overview", June 2010.

[MSDN-CDTS] Microsoft Corporation, "Create Database (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms176061(v=SQL.105).aspx

[MSDN-CFTS] Microsoft Corporation, "Create Function (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms186755(v=SQL.105).aspx

[MSDN-CHKCNST] Microsoft Corporation, "CHECK constraints", http://msdn.microsoft.com/en-us/library/ms188258(SQL.105).aspx

[MSDN-CITS] Microsoft Corporation, "Create Index (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms188783(v=SQL.105).aspx

[MSDN-CLTS] Microsoft Corporation, "Create Login (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms189751(v=SQL.105).aspx

[MSDN-CNSTS] Microsoft Corporation, "Constraints", http://msdn.microsoft.com/en-us/library/ms189862(SQL.105).aspx

[MSDN-COLLATE] Microsoft Corporation, "SQL Server Collation Name", November 2009, http://msdn.microsoft.com/en-us/library/ms180175(SQL.105).aspx

[MSDN-COLUMNPROPERTY] Microsoft Corporation, "COLUMNPROPERTY (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms174968(v=SQL.105).aspx

[MSDN-CPRTS] Microsoft Corporation, "Create Procedure (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms187926(v=SQL.105).aspx

[MSDN-CRTS] Microsoft Corporation, "Create Role (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms187936(v=SQL.105).aspx

[MSDN-CSTS] Microsoft Corporation, "Create Schema (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms189462(v=SQL.105).aspx

[MSDN-CTGTS] Microsoft Corporation, "Create Trigger (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms189799(v=SQL.105).aspx

[MSDN-CTTS] Microsoft Corporation, "Create Table (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms174979(SQL.105).aspx

[MSDN-CTYTS] Microsoft Corporation, "Create Type (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms175007(v=SQL.105).aspx

[MSDN-CUTS] Microsoft Corporation, "Create User (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms173463(v=SQL.105).aspx

[MSDN-CVTS] Microsoft Corporation, "Create View (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms187956(v=SQL.105).aspx

[MSDN-DACAPI] Microsoft Corporation, "Microsoft.SqlServer.Management.DAC Namespace", http://msdn.microsoft.com/en-us/library/microsoft.sqlserver.management.dac(SQL.105).aspx

[MSDN-DACSUPOB] Microsoft Corporation, "SQL Server Objects Supported in Data-tier Applications", http://msdn.microsoft.com/en-us/library/ee210549(SQL.105).aspx

[MSDN-DTTS] Microsoft Corporation, "Data Types (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms187752.aspx

[MSDN-EATS] Microsoft Corporation, "Execute As (Transact-SQL)", http://msdn.microsoft.com/en-us/library/ms181362(v=SQL.105).aspx

[MSDN-TVPDE] Microsoft Corporation, "Table-Valued Parameters (Database Engine)", http://msdn.microsoft.com/en-us/library/bb510489(v=SQL.105).aspx

[MSDN-TVUDF] Microsoft Corporation, "Table-Valued User-Defined Function", http://msdn.microsoft.com/en-us/library/ms191165(v=SQL.105).aspx

[MSDN-UDTT] Microsoft Corporation, "User-Defined Table Types", http://msdn.microsoft.com/en-us/library/bb522526(v=SQL.105).aspx

[MSDN-UNDERDAC] Microsoft Corporation, "Understanding Data-tier Applications", http://msdn.microsoft.com/en-us/library/ee240739(SQL.105).aspx

[MSFT-SSPS] Microsoft Corporation, "Microsoft SQL Server Community Projects & Samples", http://sqlserversamples.codeplex.com/

1.3 Structure Overview

1.3.1 Data-Tier Application XML Parts

A data-tier application consists of the following two kinds of information to represent database and instance objects:

- **Logical object definition**

- **Physical object definition**

This information is specified in the XML format, as specified in [XML1.0], that complies with the XSD that is specified in this specification.

1.3.2 Document Structure

The root element of a data-tier application XML is an Instances element. Subelements of the **Instances** element can appear in any order. A collection can have multiple instances of a subelement.

1.3.2.1 XML Namespace

The namespace URIs for a data-tier application XML are:

http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/yyyy/mm

http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/yyyy/mm

The date component (yyyy/mm) indicates the release date of particular version of data-tier application XML. The standard file name extension for XML parts in a data-tier application is *.xml. The **MIME type** to use for XML files in a data-tier application is text/xml.

1.4 Relationship to Protocols and Other Structures

The data-tier application schema definition in this document supplements the data-portability scenarios that are described in [MS-DPDACPAC].

1.5   Applicability Statement

This format is applicable for use as XML parts of a .dacpac file or for use as a user's reference.

1.6   Versioning and Localization

- The XSD versions [2009/08] for Management Model and Relational Engine are specified in Appendix A.

- The data-tier application file format contains localization-independent structures.

1.7   Vendor-Extensible Fields

The XML **schema** definition and file structure of a .dacpac file is based on the design and implementation of Microsoft® SQL Server® 2008 R2 Data-Tier Application Framework [MSDN-DACAPI]. An extension of the XML **schema** in this document can result in unexpected behavior that is not supported by SQL Server 2008 R2.

2   Structures

This section specifies the XML schema model, the Management Model (MM) and Relation Engine (RE) Model, of a data-tier application.

2.1   Management Model (MM)

Management Model (MM) is the logical structure definition of a data-tier application instance in XML. **MM** specifies instances of server and database objects. The logical structure and attributes of each server and database object is specified in the Relational Engine (RE) model. **Instance** elements in **MM** are designed to reference **RE** elements.

2.1.1   Instances

MM:Instances is the root element of a data-tier application. The **MM:Instances** element contains the subelements that are listed in the following table.

Subelements
CheckConstraint
Column
Database
DatabaseRole
DefaultConstraint
DmlTrigger
ForeignKeyColumn
ForeignKeyConstraint
IndexedColumn
Login
PrimaryKeyConstraint
RelationalIndex
ScalarParameter
ScalarValuedFunction
Schema
StoredProcedure
Table
TableParameter
TableValuedFunction
UniqueConstraint

Subelements
User
UserDefinedDataType
UserDefinedTableType
View

The following is the XML definition of the **MM:Instances** element.

```
<xs:element name="Instances"
xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08">
    <xs:complexType>
        <xs:choice minOccurs="0" maxOccurs="unbounded">
          <xs:element ref="RE:Database" maxOccurs="1" />
          <xs:element ref="RE:CheckConstraint" />
          <xs:element ref="RE:Column" />
          <xs:element ref="RE:DatabaseRole" />
          <xs:element ref="RE:DefaultConstraint" />
          <xs:element ref="RE:DmlTrigger" />
          <xs:element ref="RE:ForeignKeyColumn" />
          <xs:element ref="RE:ForeignKeyConstraint" />
          <xs:element ref="RE:IndexedColumn" />
          <xs:element ref="RE:Login" />
          <xs:element ref="RE:PrimaryKeyConstraint" />
          <xs:element ref="RE:RelationalIndex" />
          <xs:element ref="RE:ScalarParameter" />
          <xs:element ref="RE:ScalarValuedFunction" />
          <xs:element ref="RE:Schema" />
          <xs:element ref="RE:StoredProcedure" />
          <xs:element ref="RE:Table" />
          <xs:element ref="RE:TableParameter" />
          <xs:element ref="RE:TableValuedFunction" />
          <xs:element ref="RE:UniqueConstraint" />
          <xs:element ref="RE:User" />
          <xs:element ref="RE:UserDefinedDataType" />
          <xs:element ref="RE:UserDefinedTableType" />
          <xs:element ref="RE:View" />
        </xs:choice>
    </xs:complexType>
</xs:element>
```

2.1.2 Reference

The **MM:Reference** element specifies a referential relationship between two **RE** elements in a data-tier application.

The following is the XML schema definition of the **MM:Reference** element.

```
<xs:element name="Reference" type="MM:ReferenceType" />
```

2.1.3 Key

The **MM:Key** attribute specifies the unique identifier of a **RE** element instance in a data-tier application. All elements that are extended from InstancesType MUST contain an **MM:Key** attribute.

The following is the XML schema definition of the **MM:Key** attribute.

```
<xs:attribute name="Key" type="MM:KeyPatternType" />
```

2.1.4 ReferenceKey

The **MM:ReferenceKey** attribute specifies the unique identifier of the RE element instance that is referenced by another element in a data-tier application.

The following is the XML schema definition of the **MM:ReferenceKey** attribute.

```
<xs:attribute name="ReferenceKey" type="MM:KeyPatternType" />
```

2.1.5 KeyPatternType

The **MM:KeyPatternType** simple type specifies a regular expression for MM:Key and MM:ReferenceKey in a data-tier application.

The following is the XML definition of the **MM:KeyPatternType** simple type.

```
<xs:simpleType name="KeyPatternType">
  <xs:restriction base="xs:string">
    <xs:pattern value="(\/.*\[.*\])*" />
  </xs:restriction>
</xs:simpleType>
```

2.1.6 InstancesType

The **MM:InstancesType** is a complex type to set the mandatory attributes for all <Instance> elements in a data-tier application.

The following is the XML definition of the **MM:InstancesType**complex type.

```
<xs:complexType name="InstanceType" abstract="true">
  <xs:attribute ref="MM:Key" use="required"/>
</xs:complexType>
```

2.1.7 ReferenceType

The **MM:ReferenceType** is a complex type to set the mandatory attributes for all reference elements in a data-tier application.

The following is the XML definition of the **MM:ReferenceType** complex type.

```
<xs:complexType name="ReferenceType">
  <xs:attribute ref="MM:ReferenceKey" use="required" />
</xs:complexType>
```

2.1.8 ReferencesType

The **MM:ReferencesType** is a complex type that specifies a collection of multiple reference elements in a data-tier application.

The following is the XML definition of **MM:ReferenceType** complex type.

```
<xs:complexType name="ReferencesType">
  <xs:sequence>
    <xs:element minOccurs="1" maxOccurs="unbounded" ref="MM:Reference" />
  </xs:sequence>
</xs:complexType>
```

2.2 Relational Engine (RE)

The **Relational Engine (RE)** model specifies the XML schema of server and database objects and the metadata within a data-tier application.

The following subsections specify the objects supported by the data-tier application.

2.2.1 CheckConstraint

The **RE:CheckConstraint** element specifies the metadata of a check constraint in a data-tier application. For more information, see [MSDN-CHKCNST].

The following is the XML schema definition of the **RE:CheckConstraint** element.

```
<xs:element name="CheckConstraint">
   <xs:complexType>
     <xs:complexContent>
       <xs:extension base="MM:InstanceType">
         <xs:all>
           <xs:element name="Parent" type="MM:ReferenceType" />
           <xs:element name="Name" type="xs:string" />
           <xs:element name="Text" type="xs:string" />
           <xs:element name="IsChecked" type="RE:BooleanType" />
           <xs:element name="IsEnabled" type="RE:BooleanType" />
         </xs:all>
       </xs:extension>
     </xs:complexContent>
   </xs:complexType>
</xs:element>
```

2.2.2 Column

The **RE:Column** element specifies the metadata of a table or view column in a data-tier application. For more information, see [MSDN-COLUMNPROPERTY] and [MSDN-CTTS].

The following is the XML schema definition of the **RE:Column** element.

```
<xs:element name="Column">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="DataType" type="RE:DataType" />
          <xs:element name="Nullable" type="RE:BooleanType" />
          <xs:element name="IsColumnSet" type="RE:BooleanType" />
          <xs:element name="IsSparse" type="RE:BooleanType" />
          <xs:element name="RowGuidCol" type="RE:BooleanType" />
          <xs:element name="Collation" type="RE:CollationType" minOccurs="0" />
          <xs:element name="ComputedColumnInfo" type="RE:ComputedColumnType" minOccurs="0"
/>
          <xs:element name="IdentityColumnInfo" type="RE:IdentityType" minOccurs="0"/>
          <xs:element name="DefaultValue" type="MM:ReferenceType" minOccurs="0"/>
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.3 Database

The **RE:Database** element specifies the metadata of a database in a data-tier application. Note that **RE:Database** specifies a subset of attributes that are described in [MSDN-CDTS].

The following is the XML schema definition of the **RE:Database** element.

```
<xs:element name="Database">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Collation" type="RE:CollationType" />
          <xs:element name="CompatibilityLevel" type="RE:CompatibilityLevelEnumeration" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.4 DatabaseRole

The **RE:DatabaseRole** element specifies the metadata of a database role in a data-tier application. For more information, see [MSDN-CRTS].

The following is the XML schema definition of the **RE:DatabaseRole** element.

```
<xs:element name="DatabaseRole">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Owner" type="MM:ReferenceType" minOccurs="0" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.5 DefaultConstraint

The **RE:DefaultConstraint** element specifies the metadata of a default constraint in a data-tier application. For more information, see [MSDN-CNSTS].

The following is the XML schema definition of the **RE:DefaultConstraint** element.

```
<xs:element name="DefaultConstraint">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Text" type="xs:string" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.6 DmlTrigger

The **RE:DmlTrigger** element specifies the metadata of a trigger that is associated with TABLE or VIEW DML statements in a data-tier application. For more information about trigger, see [MSDN-CTGTS].

The following is the XML schema definition of the **RE:DmlTrigger** element.

```
<xs:element name="DmlTrigger">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="BodyText" type="xs:string" />
          <xs:element name="InsteadOf" type="RE:BooleanType" />
          <xs:element name="IsEncrypted" type="RE:BooleanType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
```

```
            <xs:element name="NotForReplication" type="RE:BooleanType" />
            <xs:element name="Delete" type="RE:BooleanType" />
            <xs:element name="Insert" type="RE:BooleanType" />
            <xs:element name="Update" type="RE:BooleanType" />
            <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
  />
          </xs:all>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>
```

2.2.7   ForeignKeyColumn

The **RE:ForeignKeyColumn** element specifies the metadata of a column that is referenced by a foreign key in a data-tier application. For more information, see [MSDN-CNSTS].

The following is the XML schema definition of the **RE:ForeignKeyColumn** element.

```
  <xs:element name="ForeignKeyColumn">
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="ReferencedColumn" type="MM:ReferenceType" />
            <xs:element name="ReferencingColumn" type="MM:ReferenceType" />
          </xs:all>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>
```

2.2.8   ForeignKeyConstraint

The **RE:ForeignKeyConstraint** element specifies the metadata of a foreign key in a data-tier application. For more information, see [MSDN-CNSTS].

The following is the XML schema definition of the **RE:ForeignKeyConstraint** element.

```
  <xs:element name="ForeignKeyConstraint">
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="Parent" type="MM:ReferenceType" />
            <xs:element name="Name" type="xs:string" />
            <xs:element name="Columns" type="MM:ReferencesType" />
            <xs:element name="ReferencedTable" type="MM:ReferenceType" />
            <xs:element name="IsChecked" type="RE:BooleanType" />
            <xs:element name="IsEnabled" type="RE:BooleanType" />
            <xs:element name="NotForReplication" type="RE:BooleanType" />
            <xs:element name="DeleteAction" type="RE:DMLActionEnumeration" />
            <xs:element name="UpdateAction" type="RE:DMLActionEnumeration" />
```

```
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.9 IndexedColumn

The **RE:IndexedColumn** element specifies the metadata of an indexed column in a data-tier application. For more information, see [MSDN-CITS].

The following is the XML definition of the **RE:IndexedColumn** element.

```
<xs:element name="IndexedColumn">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="ReferencedColumn" type="MM:ReferenceType" />
          <xs:element name="SortOrder" type="RE:SortOrderEnumeration" />
          <xs:element name="IsIncluded" type="xs:string" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.10 Login

The **RE:Login** element specifies the metadata of a login in a data-tier application. For more information, see [MSDN-CLTS]. Note that **RE:Login** in data-tier application supports a subset of attributes that are described in [MSDN-CLTS].

The following is the XML schema representation of the **RE:Login** element.

```
<xs:element name="Login">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="LoginType" type="RE:LoginTypeEnumeration" />
          <xs:element name="Language" type="xs:string" minOccurs="0"/>
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.11 PrimaryKeyConstraint

The **RE:PrimaryKeyConstraint** element specifies the metadata of a primary key in a data-tier application. For more information, see [MSDN-CNSTS].

The following is the XML schema representation of the **RE:PrimaryKeyConstraint** element.

```xml
<xs:element name="PrimaryKeyConstraint">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="AssociatedIndex" type="MM:ReferenceType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.12 RelationalIndex

The **RE:RelationalIndex** element specifies the metadata of an index in a data-tier application. For more information, see [MSDN-CITS].

The following is the XML schema definition of the **RE:RelationalIndex** element.

```xml
<xs:element name="RelationalIndex">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="IndexedColumns" type="MM:ReferencesType" />
          <xs:element name="CompactLargeObjects" type="RE:BooleanType" />
          <xs:element name="DisallowPageLocks" type="RE:BooleanType" />
          <xs:element name="DisallowRowLocks" type="RE:BooleanType" />
          <xs:element name="FillFactor" type="RE:FillFactorType" />
          <xs:element name="FilterDefinition" type="xs:string" />
          <xs:element name="IgnoreDuplicateKeys" type="RE:BooleanType" />
          <xs:element name="IndexKey" type="MM:ReferenceType" minOccurs="0" />
          <xs:element name="IsClustered" type="RE:BooleanType" />
          <xs:element name="IsDisabled" type="RE:BooleanType" />
          <xs:element name="IsUnique" type="RE:BooleanType" />
          <xs:element name="MaximumDegreeOfParallelism" type="xs:short" />
          <xs:element name="NoAutomaticRecomputation" type="RE:BooleanType" />
          <xs:element name="OnlineIndexOperation" type="RE:BooleanType" />
          <xs:element name="PadIndex" type="RE:BooleanType" />
          <xs:element name="SortInTempdb" type="RE:BooleanType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

```
          </xs:element>
```

2.2.13 ScalarParameter

The **RE:ScalarParameter** element specifies the metadata of a function or stored procedure parameter with scalar values in a data-tier application. For more information, refer to parameters in [MSDN-CFTS] or [MSDN-CPRTS].

The following is the XML schema definition of the **RE:ScalarParameter**.

```
    <xs:element name="ScalarParameter">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Name" type="xs:string" />
              <xs:element name="DataType" type="RE:DataType" />
              <xs:element name="IsOutput" type="RE:BooleanType" />
              <xs:element name="Nullable" type="RE:BooleanType" />
              <xs:element name="DefaultValue" type="xs:string" minOccurs="0" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>
```

2.2.14 ScalarValuedFunction

The **RE:ScalarValuedFunction** element specifies the metadata of a function that returns a scalar value in a data-tier application. For more information on function, see [MSDN-CFTS].

The following is the XML schema definition of the **RE:ScalarValuedFunction** element.

```
    <xs:element name="ScalarValuedFunction">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Parent" type="MM:ReferenceType" />
              <xs:element name="Name" type="xs:string" />
              <xs:element name="BodyText" type="xs:string" />
              <xs:element name="DataType" type="RE:DataType" />
              <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0" />
              <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
 />
              <xs:element name="IsEncrypted" type="RE:BooleanType" />
              <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
              <xs:element name="IsSchemaBound" type="RE:BooleanType" />
              <xs:element name="IsSqlClr" type="RE:BooleanType" />
              <xs:element name="Nullable" type="RE:BooleanType" />
              <xs:element name="ReturnsNullOnNullInput" type="RE:BooleanType" />
            </xs:all>
          </xs:extension>
```

```
        </xs:complexContent>
      </xs:complexType>
    </xs:element>
```

2.2.15 Schema

The **RE:Schema** element specifies the metadata of the database schema in a data-tier application.
For more information, see [MSDN-CSTS].

The following is the XML schema definition of the **RE:Schema** element.

```
<xs:element name="Schema">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Owner" type="MM:ReferenceType" minOccurs="0" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.16 StoredProcedure

The **RE:StoredProcedure** element specifies the metadata of stored procedure in a data-tier
application. For more information, see [MSDN-CPRTS].

The following is the XML schema definition of the **RE:StoredProcedure** element.

```
<xs:element name="StoredProcedure">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="BodyText" type="xs:string" />
          <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0"  />
          <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
 />
          <xs:element name="ForReplication" type="RE:BooleanType" />
          <xs:element name="IsEncrypted" type="RE:BooleanType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
          <xs:element name="IsRecompiled" type="RE:BooleanType" />
          <xs:element name="IsSqlClr" type="RE:BooleanType" />
          <xs:element name="Startup" type="RE:BooleanType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

```
        </xs:element>
```

2.2.17 Table

The **RE:Table** element specifies the metadata of a table in a data-tier application. For more information, see [MS-CTTS].

The following is the XML schema definition of the **RE:Table** element.

```
<xs:element name="Table">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Columns" type="MM:ReferencesType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.18 TableParameter

The **RE:TableParameter** element specifies the metadata of a parameter with a table value type in a data-tier application. For more information, see [MSDN-TVPDE].

The following is the XML schema definition of the **RE:TableParameter** element.

```
<xs:element name="TableParameter">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="DataType" type="RE:DataType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.19 TableValuedFunction

The **RE:TableValueFunction** element specifies the metadata of a function that returns a table value in a data-tier application. For more information, see [MSDN-TVUDF].

The following is the XML schema definition of the **RE:TableValueFunction** element.

```
<xs:element name="TableValuedFunction">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="BodyText" type="xs:string" />
          <xs:element name="Columns" type="MM:ReferencesType" />
          <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0" />
          <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
  />
          <xs:element name="IsEncrypted" type="RE:BooleanType" />
          <xs:element name="IsInline" type="RE:BooleanType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
          <xs:element name="IsSchemaBound" type="RE:BooleanType" />
          <xs:element name="IsSqlClr" type="RE:BooleanType" />
          <xs:element name="TableVariableName" type="xs:string" minOccurs="0" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.20 UniqueConstraint

The **RE:UniqueConstraint** element specifies the metadata of a unique constraint in a data-tier application. For more information, see [MSDN-CNSTS].

The following is the XML schema definition of the **RE:UniqueConstraint** element.

```
<xs:element name="UniqueConstraint">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="AssociatedIndex" type="MM:ReferenceType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.21 User

The **RE:User** element specifies the metadata of database user in a data-tier application. For more information, see [MSDN-CUTS].

The following is the XML schema definition of the **RE:User** element.

```
<xs:element name="User">
```

```
<xs:complexType>
  <xs:complexContent>
    <xs:extension base="MM:InstanceType">
      <xs:all>
        <xs:element name="Parent" type="MM:ReferenceType" />
        <xs:element name="Name" type="xs:string" />
        <xs:element name="UserType" type="RE:UserTypeEnumeration" />
        <xs:element name="Login" type="MM:ReferenceType" minOccurs="0" />
        <xs:element name="DefaultSchema" type="MM:ReferenceType" minOccurs="0" />
      </xs:all>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
</xs:element>
```

2.2.22   UserDefinedDataType

The **RE:UserDefinedDataType** element specifies the metadata of a user-defined data type in a data-tier application. For more information, see [MSDN-DTTS] and [MSDN-CTYTS].

The following is the XML schema definition of the **RE:UserDefinedDataType** element.

```
<xs:element name="UserDefinedDataType">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="BaseSystemDataType" type="RE:BaseSystemDataType" />
          <xs:element minOccurs="0" name="Nullable" type="RE:BooleanType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.23   UserDefinedTableType

The **RE:UserDefinedTableType** element specifies the metadata of a user-defined table type in a data-tier application. For more information, see [MSDN-UDTT] and [MSDN-CTYTS].

The following is the XML schema definition of the **RE:UserDefinedTableType** element.

```
<xs:element name="UserDefinedTableType">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="Columns" type="MM:ReferencesType" />
        </xs:all>
```

```
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.24   View

The **RE:View** element specifies the metadata of a view in a data-tier application. For more information, see [MSDN-CVTS].

The following is the XML schema definition of the **RE:View** element.

```
<xs:element name="View">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="QueryText" type="xs:string" />
          <xs:element name="Columns" type="MM:ReferencesType" />
          <xs:element name="HasCheckOption" type="RE:BooleanType" />
          <xs:element name="HasColumnSpecification" type="RE:BooleanType" />
          <xs:element name="IsEncrypted" type="RE:BooleanType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
          <xs:element name="IsSchemaBound" type="RE:BooleanType" />
          <xs:element name="ReturnsViewMetadata" type="RE:BooleanType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>
```

2.2.25   BooleanType

RE:BooleanType is a simple type for a Boolean type in a data-tier application.

The following is the XML schema definition of the **RE:BooleanType** simple type.

```
<xs:simpleType name="BooleanType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="True" />
    <xs:enumeration value="False" />
  </xs:restriction>
</xs:simpleType>
```

2.2.26   CompatibilityLevelEnumeration

RE:CompatibilityLevelEnumeration is a simple type that enumerates the database compatibility values in a data-tier application.

The following is the XML schema definition of **RE:CompatibilityLevelEnumeration**.

```
<xs:simpleType name="CompatibilityLevelEnumeration">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Version80" />
    <xs:enumeration value="Version90" />
    <xs:enumeration value="Version100" />
    <xs:enumeration value="Current" />
  </xs:restriction>
</xs:simpleType>
```

2.2.27   DMLActionEnumeration

RE:DMLActionEnumeration is a simple type that enumerates data manipulation language (DML) actions in a data-tier application.

The following is the XML schema definition of the **RE:DMLActionEnumeration** simple type.

```
<xs:simpleType name="DMLActionEnumeration">
  <xs:restriction base="xs:string">
    <xs:enumeration value="NoAction" />
    <xs:enumeration value="Cascade" />
    <xs:enumeration value="SetNull" />
    <xs:enumeration value="SetDefault" />
  </xs:restriction>
</xs:simpleType>
```

2.2.28   ExecuteAsEnumeration

RE:ExecuteAsEnumeration is a simple type that enumerates "EXECUTE AS" clause values in a data-tier application. For more information, see [MSDN-EATS].

The following is the XML schema definition of the **RE:ExecuteAsEnumeration** simple type.

```
<xs:simpleType name="ExecuteAsEnumeration">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Caller" />
    <xs:enumeration value="Self" />
    <xs:enumeration value="Owner" />
    <xs:enumeration value="ExecuteAsUser" />
  </xs:restriction>
</xs:simpleType>
```

2.2.29   LoginTypeEnumeration

RE:LoginTypeEnumeration is a simple type that enumerates type of logins in a data-tier application. For more information, see [MSDN-CLTS].

The following is the XML schema definition of the **RE:LoginTypeEnumeration** simple type.

```
<xs:simpleType name="LoginTypeEnumeration">
  <xs:restriction base="xs:string">
```

```
          <xs:enumeration value="Sql" />
          <xs:enumeration value="Windows" />
      </xs:restriction>
   </xs:simpleType>
```

2.2.30   SortOrderEnumeration

RE:SortOrderEnumeration is a simple type that enumerates sort-order values in a data-tier application.

The following is the XML schema definition of the **RE:SortOrderEnumeration** simple type.

```
     <xs:simpleType name="SortOrderEnumeration">
       <xs:restriction base="xs:string">
         <xs:enumeration value="Ascending" />
         <xs:enumeration value="Descending" />
       </xs:restriction>
     </xs:simpleType>
```

2.2.31   UserTypeEnumeration

RE:UserTypeEnumeration is a simple type that enumerates the types of **database** users in a data-tier application.

The following is the XML schema definition of **RE:UserTypeEnumeration** simple type.

```
     <xs:simpleType name="UserTypeEnumeration">
       <xs:restriction base="xs:string">
         <xs:enumeration value="NoLogin" />
         <xs:enumeration value="SqlLogin" />
       </xs:restriction>
     </xs:simpleType>
```

2.2.32   FillFactorType

RE:FillFactorType is a simple type that sets the value range of fill factor in a data-tier application.

The following is the XML schema definition of the **RE:FillFactorType** simple type.

```
     <!-- default 0-->
     <xs:simpleType name="FillFactorType">
       <xs:restriction base="xs:short">
         <xs:minInclusive value="0"/>
         <xs:maxInclusive value="100"/>
       </xs:restriction>
     </xs:simpleType>
```

2.2.33 MaxDopType

RE:MaxDopType is a simple type that sets the value range of the maximum degree of parallelism in a data-tier application. Note that -1 is used if the maxdop value is not set.

The following is the XML schema definition of the **RE:MaxDopType** simple type.

```
<xs:simpleType name="MaxDopType">
  <xs:restriction base="xs:short">
    <xs:minInclusive value="-1"/>
    <xs:maxInclusive value="64"/>
  </xs:restriction>
</xs:simpleType>
```

2.2.34 BaseSystemDataType

RE:BaseSystemDataType is a complex type for the system data type that is described in [MSDN-DTTS].

The following is the XML schema definition of the **RE:BaseSystemDataType** complex type.

```
<xs:complexType name="BaseSystemDataType">
  <xs:all>
    <xs:element name="SystemDataType" type="RE:SqlDataType" />
  </xs:all>
</xs:complexType>
```

2.2.35 CollationType

RE:CollationType is a complex type definition that specifies the collation value in a data-tier application.

The following is the XML schema definition of the **RE:CollationType**complex type.

```
<xs:complexType name="CollationType">
  <xs:all>
    <xs:element name="Name" type="RE:CollationEnumeration" />
  </xs:all>
</xs:complexType>
```

2.2.36 ComputedColumnType

RE:ComputedColumnType is a complex type that specifies a computed column in a data-tier application.

The following is the XML schema definition of the **RE:ComputedColumnType** complex type.

```
<xs:complexType name="ComputedColumnType">
  <xs:all>
```

```
        <xs:element name="Text" type="xs:string" />
        <xs:element name="IsPersisted" type="RE:BooleanType" />
      </xs:all>
    </xs:complexType>
```

2.2.37 DataType

RE:DataType is a complex type that specifies all supported data types in a data-tier application.

The following is the XML schema definition of the **RE:DataType** complex type.

```
<xs:complexType name="DataType">
    <xs:choice minOccurs="1" maxOccurs="1">
      <xs:element name="SystemDataType" type="RE:SqlDataType" />
      <xs:element name="XmlDataType" type="RE:SqlDataType" />
      <xs:element name="ScalarDataType" type="RE:ScalarDataType" />
    </xs:choice>
  <xs:attribute ref="MM:ReferenceKey" use="optional" />
</xs:complexType>
```

2.2.38 ExecutionContextType

RE:ExecutionContextType is a complex type that specifies the execution context in the EXECUTE AS clause in a data-tier application.

The following is the XML schema definition of the **RE:ExecutionContextType** complex type.

```
<xs:complexType name="ExecutionContextType">
  <xs:all>
    <xs:element name="ContextType" type="RE:ExecuteAsEnumeration" />
    <xs:element minOccurs="0" name="User" type="MM:ReferenceType" />
  </xs:all>
</xs:complexType>
```

2.2.39 IdentityType

RE:IdentityType is a complex type that specifies the IDENTITY column in a data-tier application.

The following is the XML schema definition of the **RE:IdentityType** complex type.

```
<xs:complexType name="IdentityType">
  <xs:sequence>
    <xs:element name="Seed" type="xs:unsignedInt" />
    <xs:element name="Increment" type="xs:unsignedInt" />
  </xs:sequence>
</xs:complexType>
```

2.2.40   ScalarDataType

RE:ScalarDataType is a complex type that specifies a scalar-valued data type in a data-tier application.

The following is the XML schema definition of the **RE:ScalarDataType** complex type.

```
<xs:complexType name="ScalarDataType">
  <xs:all>
    <xs:element name="Name" type="xs:string"/>
  </xs:all>
</xs:complexType>
```

2.2.41   SqlDataType

RE:SqlDataType is a complex type that specifies a common structure of data types in a data-tier application.

The following is the XML schema definition of the **RE:SqlDataType** complex type.

```
<xs:complexType name="SqlDataType">
  <xs:all>
    <xs:element name="Length" type="xs:unsignedByte" />
    <xs:element name="NumericPrecision" type="xs:unsignedByte" />
    <xs:element name="NumericScale" type="xs:unsignedByte" />
    <xs:element name="TypeSpec" type="xs:string" />
  </xs:all>
</xs:complexType>
```

3   Structure Examples

This section provides a sample XML in a data-tier application. A data-tier application consists of logicalobjectstream.xml and physicalobjectstream.xml to specify its management and relational engine model. The following sample consists of a subset of the pubs database to demonstrate the simple usage of a data-tier application. The pubs database can be downloaded from [MSFT-SSPS].

3.1   Pubs database (simplified)

The sample data-tier application XML creates [pubs] database with following objects.

- [pubs] database

- [employee] table in [dbo] schema and its columns

- [empid] user-defined datatype

- PrimaryKey on [emp_id] column

- Default Constraint on [job_id] column

3.2   Logical object sample

```xml
<?xml version="1.0" encoding="utf-8"?>
<MM:Instances
xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08">
    <RE:Database MM:Key="/Database[pubs]">
        <RE:Collation>
            <RE:Name>SQL_Latin1_General_CP1_CI_AS</RE:Name>
        </RE:Collation>
        <RE:CompatibilityLevel>Version100</RE:CompatibilityLevel>
        <RE:Name>pubs</RE:Name>
    </RE:Database>
    <RE:Schema MM:Key="/Database[pubs]/Schema[dbo]">
        <RE:Parent MM:ReferenceKey="/Database[pubs]" />
        <RE:Name>dbo</RE:Name>
        <RE:Owner MM:ReferenceKey="/Database[pubs]/User[dbo]" />
    </RE:Schema>
    <RE:Table MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]">
        <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]" />
        <RE:Columns>
            <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[emp_id]" />
            <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[fname]" />
            <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[lname]" />
            <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[job_id]" />
        </RE:Columns>
        <RE:IsQuotedIdentifierOn>True</RE:IsQuotedIdentifierOn>
        <RE:Name>employee</RE:Name>
    </RE:Table>
    <RE:UserDefinedDataType MM:Key="/Database[pubs]/Schema[dbo]/UserDefinedDataType[empid]">
        <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]" />
```

```
            <RE:BaseSystemDataType>
                <RE:SystemDataType>
                    <RE:Length>9</RE:Length>
                    <RE:NumericPrecision>0</RE:NumericPrecision>
                    <RE:NumericScale>0</RE:NumericScale>
                    <RE:TypeSpec>Char</RE:TypeSpec>
                </RE:SystemDataType>
            </RE:BaseSystemDataType>
            <RE:Name>empid</RE:Name>
            <RE:Nullable>False</RE:Nullable>
        </RE:UserDefinedDataType>
        <RE:Column MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/Column[emp_id]">
            <RE:Collation>
                <RE:Name>SQL_Latin1_General_CP1_CI_AS</RE:Name>
            </RE:Collation>
            <RE:DataType MM:ReferenceKey="/Database[pubs]/Schema[dbo]/UserDefinedDataType[empid]"
  />
            <RE:IsColumnSet>False</RE:IsColumnSet>
            <RE:IsSparse>False</RE:IsSparse>
            <RE:Name>emp_id</RE:Name>
            <RE:Nullable>False</RE:Nullable>
            <RE:RowGuidCol>False</RE:RowGuidCol>
        </RE:Column>
        <RE:Column MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/Column[fname]">
            <RE:Collation>
                <RE:Name>SQL_Latin1_General_CP1_CI_AS</RE:Name>
            </RE:Collation>
            <RE:DataType>
                <RE:SystemDataType>
                    <RE:Length>20</RE:Length>
                    <RE:NumericPrecision>0</RE:NumericPrecision>
                    <RE:NumericScale>0</RE:NumericScale>
                    <RE:TypeSpec>VarChar</RE:TypeSpec>
                </RE:SystemDataType>
            </RE:DataType>
            <RE:IsColumnSet>False</RE:IsColumnSet>
            <RE:IsSparse>False</RE:IsSparse>
            <RE:Name>fname</RE:Name>
            <RE:Nullable>False</RE:Nullable>
            <RE:RowGuidCol>False</RE:RowGuidCol>
        </RE:Column>
        <RE:Column MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/Column[lname]">
            <RE:Collation>
                <RE:Name>SQL_Latin1_General_CP1_CI_AS</RE:Name>
            </RE:Collation>
            <RE:DataType>
                <RE:SystemDataType>
                    <RE:Length>30</RE:Length>
                    <RE:NumericPrecision>0</RE:NumericPrecision>
                    <RE:NumericScale>0</RE:NumericScale>
                    <RE:TypeSpec>VarChar</RE:TypeSpec>
                </RE:SystemDataType>
            </RE:DataType>
            <RE:IsColumnSet>False</RE:IsColumnSet>
            <RE:IsSparse>False</RE:IsSparse>
            <RE:Name>lname</RE:Name>
            <RE:Nullable>False</RE:Nullable>
            <RE:RowGuidCol>False</RE:RowGuidCol>
        </RE:Column>
```

```
<RE:Column MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/Column[job_id]">
    <RE:DataType>
        <RE:SystemDataType>
            <RE:Length>0</RE:Length>
            <RE:NumericPrecision>0</RE:NumericPrecision>
            <RE:NumericScale>0</RE:NumericScale>
            <RE:TypeSpec>SmallInt</RE:TypeSpec>
        </RE:SystemDataType>
    </RE:DataType>
    <RE:DefaultValue
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[job_id]/DefaultConstraint
[DF_job_id]" />
    <RE:IsColumnSet>False</RE:IsColumnSet>
    <RE:IsSparse>False</RE:IsSparse>
    <RE:Name>job_id</RE:Name>
    <RE:Nullable>False</RE:Nullable>
    <RE:RowGuidCol>False</RE:RowGuidCol>
</RE:Column>
<RE:CheckConstraint
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/CheckConstraint[CK_emp_id]">
    <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]" />
    <RE:IsChecked>True</RE:IsChecked>
    <RE:IsEnabled>True</RE:IsEnabled>
    <RE:Name>CK_emp_id</RE:Name>
    <RE:Text>([emp_id] like '[A-Z][A-Z][A-Z][1-9][0-9][0-9][0-9][FM]' OR [emp_id]
like '[A-Z]-[A-Z][1-9][0-9][0-9][0-9][0-9][FM]')</RE:Text>
</RE:CheckConstraint>
<RE:PrimaryKeyConstraint
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/PrimaryKeyConstraint[PK_emp_id]">
    <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]" />
    <RE:AssociatedIndex
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[PK_emp_id]" />
    <RE:Name>PK_emp_id</RE:Name>
</RE:PrimaryKeyConstraint>
<RE:DefaultConstraint
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/Column[job_id]/DefaultConstraint[DF_job_i
d]">
    <RE:Name>DF_job_id</RE:Name>
    <RE:Text>((1))</RE:Text>
</RE:DefaultConstraint>
</MM:Instances>
```

3.3 Physical object sample

```
<?xml version="1.0" encoding="utf-8"?>
<MM:Instances
xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08">
    <RE:RelationalIndex
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[employee_ind]">
        <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]" />
        <RE:CompactLargeObjects>True</RE:CompactLargeObjects>
        <RE:DisallowPageLocks>False</RE:DisallowPageLocks>
        <RE:DisallowRowLocks>False</RE:DisallowRowLocks>
        <RE:FillFactor>0</RE:FillFactor>
        <RE:FilterDefinition></RE:FilterDefinition>
        <RE:IgnoreDuplicateKeys>False</RE:IgnoreDuplicateKeys>
```

```
            <RE:IndexedColumns>
                <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[employee_ind]/In
dexedColumn[lname]" />
                <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[employee_ind]/In
dexedColumn[fname]" />
            </RE:IndexedColumns>
            <RE:IsClustered>True</RE:IsClustered>
            <RE:IsDisabled>False</RE:IsDisabled>
            <RE:IsUnique>False</RE:IsUnique>
            <RE:MaximumDegreeOfParallelism>-1</RE:MaximumDegreeOfParallelism>
            <RE:Name>employee_ind</RE:Name>
            <RE:NoAutomaticRecomputation>False</RE:NoAutomaticRecomputation>
            <RE:OnlineIndexOperation>False</RE:OnlineIndexOperation>
            <RE:PadIndex>False</RE:PadIndex>
            <RE:SortInTempdb>False</RE:SortInTempdb>
        </RE:RelationalIndex>
        <RE:RelationalIndex
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[PK_emp_id]">
            <RE:Parent MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]" />
            <RE:CompactLargeObjects>True</RE:CompactLargeObjects>
            <RE:DisallowPageLocks>False</RE:DisallowPageLocks>
            <RE:DisallowRowLocks>False</RE:DisallowRowLocks>
            <RE:FillFactor>0</RE:FillFactor>
            <RE:FilterDefinition></RE:FilterDefinition>
            <RE:IgnoreDuplicateKeys>False</RE:IgnoreDuplicateKeys>
            <RE:IndexKey
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/PrimaryKeyConstraint[PK_emp_id]"
/>
            <RE:IndexedColumns>
                <MM:Reference
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[PK_emp_id]/Index
edColumn[emp_id]" />
            </RE:IndexedColumns>
            <RE:IsClustered>False</RE:IsClustered>
            <RE:IsDisabled>False</RE:IsDisabled>
            <RE:IsUnique>True</RE:IsUnique>
            <RE:MaximumDegreeOfParallelism>-1</RE:MaximumDegreeOfParallelism>
            <RE:Name>PK_emp_id</RE:Name>
            <RE:NoAutomaticRecomputation>False</RE:NoAutomaticRecomputation>
            <RE:OnlineIndexOperation>False</RE:OnlineIndexOperation>
            <RE:PadIndex>False</RE:PadIndex>
            <RE:SortInTempdb>False</RE:SortInTempdb>
        </RE:RelationalIndex>
        <RE:IndexedColumn
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[employee_ind]/IndexedColu
mn[lname]">
            <RE:IsIncluded>False</RE:IsIncluded>
            <RE:ReferencedColumn
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[lname]" />
            <RE:SortOrder>Ascending</RE:SortOrder>
        </RE:IndexedColumn>
        <RE:IndexedColumn
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[employee_ind]/IndexedColu
mn[fname]">
            <RE:IsIncluded>False</RE:IsIncluded>
            <RE:ReferencedColumn
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[fname]" />
            <RE:SortOrder>Ascending</RE:SortOrder>
```

```
        </RE:IndexedColumn>
    <RE:IndexedColumn
MM:Key="/Database[pubs]/Schema[dbo]/Table[employee]/RelationalIndex[PK_emp_id]/IndexedColumn[
emp_id]">
        <RE:IsIncluded>False</RE:IsIncluded>
        <RE:ReferencedColumn
MM:ReferenceKey="/Database[pubs]/Schema[dbo]/Table[employee]/Column[emp_id]" />
        <RE:SortOrder>Ascending</RE:SortOrder>
    </RE:IndexedColumn>
</MM:Instances>
```

4 Security Considerations

None.

5   Appendix A: XML Schema

For ease of implementation, full XML schemas are provided in the following sections.

Schema name	Prefix	Section
Management Model XML Schema for Version 2009/08	xs:	5.1
Relational Engine XML Schema for Version 2009/08	xs:	5.2

5.1   Management Model XML Schema for Version 2009/08

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08"
attributeFormDefault="unqualified" elementFormDefault="qualified"
targetNamespace="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08
" xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xsd:annotation>
    <xsd:documentation>

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PUNITIVE OR SPECIAL DAMAGES, WHETHER OR NOT MICROSOFT HAS BEEN ADVISED OF
SUCH DAMAGES.

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    </xsd:documentation>
  </xsd:annotation>




  <xs:import
namespace="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08" />

  <!-- Management Model simpleTypes -->
  <xs:simpleType name="KeyPatternType">
    <xs:restriction base="xs:string">
      <xs:pattern value="(\/.*\[.*\])*" />
    </xs:restriction>
  </xs:simpleType>
```

```xml
    <!-- Management Model complexTypes -->
    <xs:complexType name="InstanceType" abstract="true">
      <xs:attribute ref="MM:Key" use="required"/>
    </xs:complexType>
    <xs:complexType name="ReferenceType">
      <xs:attribute ref="MM:ReferenceKey" use="required" />
    </xs:complexType>
    <xs:complexType name="ReferencesType">
      <xs:sequence>
        <xs:element minOccurs="1" maxOccurs="unbounded" ref="MM:Reference" />
      </xs:sequence>
    </xs:complexType>

    <!-- Management Model attributes-->
    <xs:attribute name="Key" type="MM:KeyPatternType" />
    <xs:attribute name="ReferenceKey" type="MM:KeyPatternType" />

    <!-- Management Model Elements -->
    <!--<xs:element name="Instance" type="MM:InstanceType"/>-->

    <xs:element name="Instances"
 xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
 xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08">
      <xs:complexType>
        <!--<xs:sequence>-->
          <xs:choice minOccurs="0" maxOccurs="unbounded">
            <xs:element ref="RE:Database" maxOccurs="1" />
            <xs:element ref="RE:CheckConstraint" />
            <xs:element ref="RE:Column" />
            <xs:element ref="RE:DatabaseRole" />
            <xs:element ref="RE:DefaultConstraint" />
            <xs:element ref="RE:DmlTrigger" />
            <xs:element ref="RE:ForeignKeyColumn" />
            <xs:element ref="RE:ForeignKeyConstraint" />
            <xs:element ref="RE:IndexedColumn" />
            <xs:element ref="RE:Login" />
            <xs:element ref="RE:PrimaryKeyConstraint" />
            <xs:element ref="RE:RelationalIndex" />
            <xs:element ref="RE:ScalarParameter" />
            <xs:element ref="RE:ScalarValuedFunction" />
            <xs:element ref="RE:Schema" />
            <xs:element ref="RE:StoredProcedure" />
            <xs:element ref="RE:Table" />
            <xs:element ref="RE:TableParameter" />
            <xs:element ref="RE:TableValuedFunction" />
            <xs:element ref="RE:UniqueConstraint" />
            <xs:element ref="RE:User" />
            <xs:element ref="RE:UserDefinedDataType" />
            <xs:element ref="RE:UserDefinedTableType" />
            <xs:element ref="RE:View" />
          </xs:choice>
        <!--</xs:sequence>-->
      </xs:complexType>
    </xs:element>

  <xs:element name="Reference" type="MM:ReferenceType" />
  </xs:schema>
```

5.2 Relational Engine XML Schema for Version 2009/08

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
xmlns:RE="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/08"
xmlns:MM="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08"
attributeFormDefault="unqualified" elementFormDefault="qualified"
targetNamespace="http://schemas.microsoft.com/sqlserver/RelationalEngine/Serialization/2009/0
8" xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:annotation>
    <xs:documentation>
  THE SCHEMA IS PROVIDED TO YOU ON AN "AS IS" BASIS, AND MICROSOFT
  DISCLAIMS ALL WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING,
  WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS
  FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT, AS TO THE SCHEMA OR ANY
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</xs:documentation>
  </xs:annotation>



  <xs:import
namespace="http://schemas.microsoft.com/sqlserver/ManagementModel/Serialization/2009/08" />

  <!--Relational model simple types: alphabetical order-->

  <xs:simpleType name="BooleanType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="True" />
      <xs:enumeration value="False" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="CompatibilityLevelEnumeration">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Version80" />
      <xs:enumeration value="Version90" />
      <xs:enumeration value="Version100" />
      <xs:enumeration value="Current" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="DMLActionEnumeration">
    <xs:restriction base="xs:string">
```

```xml
      <xs:enumeration value="NoAction" />
      <xs:enumeration value="Cascade" />
      <xs:enumeration value="SetNull" />
      <xs:enumeration value="SetDefault" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="ExecuteAsEnumeration">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Caller" />
      <xs:enumeration value="Self" />
      <xs:enumeration value="Owner" />
      <xs:enumeration value="ExecuteAsUser" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="LoginTypeEnumeration">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Sql" />
      <xs:enumeration value="Windows" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="SortOrderEnumeration">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Ascending" />
      <xs:enumeration value="Descending" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="UserTypeEnumeration">
    <xs:restriction base="xs:string">
      <xs:enumeration value="NoLogin" />
      <xs:enumeration value="SqlLogin" />
    </xs:restriction>
  </xs:simpleType>

  <!-- default 0-->
  <xs:simpleType name="FillFactorType">
    <xs:restriction base="xs:short">
      <xs:minInclusive value="0"/>
      <xs:maxInclusive value="100"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="MaxDopType">
    <xs:restriction base="xs:short">
      <xs:minInclusive value="-1"/>
      <xs:maxInclusive value="64"/>
    </xs:restriction>
  </xs:simpleType>

  <!-- Relational model complex types: alphabetical order-->

  <xs:complexType name="BaseSystemDataType">
    <xs:all>
      <xs:element name="SystemDataType" type="RE:SqlDataType" />
    </xs:all>
  </xs:complexType>
```

```
<xs:complexType name="CollationType">
  <xs:all>
    <xs:element name="Name" type="RE:CollationEnumeration" />
  </xs:all>
</xs:complexType>

<xs:complexType name="ComputedColumnType">
  <xs:all>
    <xs:element name="Text" type="xs:string" />
    <xs:element name="IsPersisted" type="RE:BooleanType" />
  </xs:all>
</xs:complexType>

<xs:complexType name="DataType">
  <xs:sequence minOccurs="0" maxOccurs="1">
    <xs:choice minOccurs="1" maxOccurs="1">
      <xs:element name="SystemDataType" type="RE:SqlDataType" />
      <xs:element name="XmlDataType" type="RE:SqlDataType" />
      <xs:element name="ScalarDataType" type="RE:ScalarDataType" />
    </xs:choice>
  </xs:sequence>
  <xs:attribute ref="MM:ReferenceKey" use="optional" />
</xs:complexType>

<xs:complexType name="ExecutionContextType">
  <xs:all>
    <xs:element name="ContextType" type="RE:ExecuteAsEnumeration" />
    <xs:element minOccurs="0" name="User" type="MM:ReferenceType" />
  </xs:all>
</xs:complexType>

<xs:complexType name="IdentityType">
  <xs:sequence>
    <xs:element name="Seed" type="xs:unsignedInt" />
    <xs:element name="Increment" type="xs:unsignedInt" />
  </xs:sequence>
</xs:complexType>

<xs:complexType name="ScalarDataType">
  <xs:all>
    <xs:element name="Name" type="xs:string"/>
  </xs:all>
</xs:complexType>

<xs:complexType name="SqlDataType">
  <xs:all>
    <xs:element name="Length" type="xs:unsignedByte" />
    <xs:element name="NumericPrecision" type="xs:unsignedByte" />
    <xs:element name="NumericScale" type="xs:unsignedByte" />
    <xs:element name="TypeSpec" type="xs:string" />
  </xs:all>
</xs:complexType>

<!--Relational model elements: alphabetical order-->

<xs:element name="CheckConstraint">
  <xs:complexType>
    <xs:complexContent>
```

```
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="Parent" type="MM:ReferenceType" />
            <xs:element name="Name" type="xs:string" />
            <xs:element name="Text" type="xs:string" />
            <xs:element name="IsChecked" type="RE:BooleanType" />
            <xs:element name="IsEnabled" type="RE:BooleanType" />
          </xs:all>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>

  <xs:element name="Column">
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="Name" type="xs:string" />
            <xs:element name="DataType" type="RE:DataType" />
            <xs:element name="Nullable" type="RE:BooleanType" />
            <xs:element name="IsColumnSet" type="RE:BooleanType" />
            <xs:element name="IsSparse" type="RE:BooleanType" />
            <xs:element name="RowGuidCol" type="RE:BooleanType" />
            <xs:element name="Collation" type="RE:CollationType" minOccurs="0" />
            <xs:element name="ComputedColumnInfo" type="RE:ComputedColumnType" minOccurs="0"
 />
            <xs:element name="IdentityColumnInfo" type="RE:IdentityType" minOccurs="0"/>
            <xs:element name="DefaultValue" type="MM:ReferenceType" minOccurs="0"/>
          </xs:all>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>

  <xs:element name="Database">
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="Name" type="xs:string" />
            <xs:element name="Collation" type="RE:CollationType" />
            <xs:element name="CompatibilityLevel" type="RE:CompatibilityLevelEnumeration" />
          </xs:all>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>

  <xs:element name="DatabaseRole">
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="MM:InstanceType">
          <xs:all>
            <xs:element name="Parent" type="MM:ReferenceType" />
            <xs:element name="Name" type="xs:string" />
            <xs:element name="Owner" type="MM:ReferenceType" minOccurs="0" />
          </xs:all>
        </xs:extension>
```

```
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="DefaultConstraint">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Name" type="xs:string" />
              <xs:element name="Text" type="xs:string" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="DmlTrigger">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Parent" type="MM:ReferenceType" />
              <!-- reference to On {table | view} -->
              <xs:element name="Name" type="xs:string" />
              <xs:element name="BodyText" type="xs:string" />
              <xs:element name="InsteadOf" type="RE:BooleanType" />
              <xs:element name="IsEncrypted" type="RE:BooleanType" />
              <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
              <xs:element name="NotForReplication" type="RE:BooleanType" />
              <xs:element name="Delete" type="RE:BooleanType" />
              <xs:element name="Insert" type="RE:BooleanType" />
              <xs:element name="Update" type="RE:BooleanType" />
              <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
  />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="ForeignKeyColumn">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="ReferencedColumn" type="MM:ReferenceType" />
              <xs:element name="ReferencingColumn" type="MM:ReferenceType" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="ForeignKeyConstraint">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
```

```xml
                    <xs:element name="Parent" type="MM:ReferenceType" />
                    <xs:element name="Name" type="xs:string" />
                    <xs:element name="Columns" type="MM:ReferencesType" />
                    <xs:element name="ReferencedTable" type="MM:ReferenceType" />
                    <xs:element name="IsChecked" type="RE:BooleanType" />
                    <xs:element name="IsEnabled" type="RE:BooleanType" />
                    <xs:element name="NotForReplication" type="RE:BooleanType" />
                    <xs:element name="DeleteAction" type="RE:DMLActionEnumeration" />
                    <xs:element name="UpdateAction" type="RE:DMLActionEnumeration" />
                  </xs:all>
                </xs:extension>
            </xs:complexContent>
          </xs:complexType>
      </xs:element>

      <xs:element name="IndexedColumn">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="ReferencedColumn" type="MM:ReferenceType" />
                <xs:element name="SortOrder" type="RE:SortOrderEnumeration" />
                <xs:element name="IsIncluded" type="xs:string" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="Login">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Name" type="xs:string" />
                <xs:element name="LoginType" type="RE:LoginTypeEnumeration" />
                <xs:element name="Language" type="xs:string" minOccurs="0"/>
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="PrimaryKeyConstraint">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="AssociatedIndex" type="MM:ReferenceType" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="RelationalIndex">
        <xs:complexType>
```

```xml
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="IndexedColumns" type="MM:ReferencesType" />
                <xs:element name="CompactLargeObjects" type="RE:BooleanType" />
                <xs:element name="DisallowPageLocks" type="RE:BooleanType" />
                <xs:element name="DisallowRowLocks" type="RE:BooleanType" />
                <xs:element name="FillFactor" type="RE:FillFactorType" />
                <xs:element name="FilterDefinition" type="xs:string" />
                <xs:element name="IgnoreDuplicateKeys" type="RE:BooleanType" />
                <xs:element name="IndexKey" type="MM:ReferenceType" minOccurs="0" />
                <xs:element name="IsClustered" type="RE:BooleanType" />
                <xs:element name="IsDisabled" type="RE:BooleanType" />
                <xs:element name="IsUnique" type="RE:BooleanType" />
                <xs:element name="MaximumDegreeOfParallelism" type="xs:short" />
                <xs:element name="NoAutomaticRecomputation" type="RE:BooleanType" />
                <xs:element name="OnlineIndexOperation" type="RE:BooleanType" />
                <xs:element name="PadIndex" type="RE:BooleanType" />
                <xs:element name="SortInTempdb" type="RE:BooleanType" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="ScalarParameter">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Name" type="xs:string" />
                <xs:element name="DataType" type="RE:DataType" />
                <xs:element name="IsOutput" type="RE:BooleanType" />
                <xs:element name="Nullable" type="RE:BooleanType" />
                <xs:element name="DefaultValue" type="xs:string" minOccurs="0" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="ScalarValuedFunction">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="BodyText" type="xs:string" />
                <xs:element name="DataType" type="RE:DataType" />
                <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0" />
                <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
 />
                <xs:element name="IsEncrypted" type="RE:BooleanType" />
                <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
                <xs:element name="IsSchemaBound" type="RE:BooleanType" />
                <xs:element name="IsSqlClr" type="RE:BooleanType" />
```

```
                <xs:element name="Nullable" type="RE:BooleanType" />
                <xs:element name="ReturnsNullOnNullInput" type="RE:BooleanType" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="Schema">
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          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="Owner" type="MM:ReferenceType" minOccurs="0" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="StoredProcedure">
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          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="BodyText" type="xs:string" />
                <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0"  />
                <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
 />
                <xs:element name="ForReplication" type="RE:BooleanType" />
                <xs:element name="IsEncrypted" type="RE:BooleanType" />
                <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
                <xs:element name="IsRecompiled" type="RE:BooleanType" />
                <xs:element name="IsSqlClr" type="RE:BooleanType" />
                <xs:element name="Startup" type="RE:BooleanType" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>

      <xs:element name="Table">
        <xs:complexType>
          <xs:complexContent>
            <xs:extension base="MM:InstanceType">
              <xs:all>
                <xs:element name="Parent" type="MM:ReferenceType" />
                <xs:element name="Name" type="xs:string" />
                <xs:element name="Columns" type="MM:ReferencesType" />
                <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
              </xs:all>
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>
      </xs:element>
```

```
<xs:element name="TableParameter">
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    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Name" type="xs:string" />
          <xs:element name="DataType" type="RE:DataType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>

<xs:element name="TableValuedFunction">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="BodyText" type="xs:string" />
          <xs:element name="Columns" type="MM:ReferencesType" />
          <xs:element name="Parameters" type="MM:ReferencesType" minOccurs="0" />
          <xs:element name="ExecutionContext" type="RE:ExecutionContextType" minOccurs="0"
 />
          <xs:element name="IsEncrypted" type="RE:BooleanType" />
          <xs:element name="IsInline" type="RE:BooleanType" />
          <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
          <xs:element name="IsSchemaBound" type="RE:BooleanType" />
          <xs:element name="IsSqlClr" type="RE:BooleanType" />
          <xs:element name="TableVariableName" type="xs:string" minOccurs="0" />
        </xs:all>
      </xs:extension>
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  </xs:complexType>
</xs:element>

<xs:element name="UniqueConstraint">
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    <xs:complexContent>
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        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
          <xs:element name="AssociatedIndex" type="MM:ReferenceType" />
        </xs:all>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>

<xs:element name="User">
  <xs:complexType>
    <xs:complexContent>
      <xs:extension base="MM:InstanceType">
        <xs:all>
          <xs:element name="Parent" type="MM:ReferenceType" />
          <xs:element name="Name" type="xs:string" />
```

```
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              <xs:element name="Login" type="MM:ReferenceType" minOccurs="0" />
              <xs:element name="DefaultSchema" type="MM:ReferenceType" minOccurs="0" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="UserDefinedDataType">
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        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Parent" type="MM:ReferenceType" />
              <xs:element name="Name" type="xs:string" />
              <xs:element name="BaseSystemDataType" type="RE:BaseSystemDataType" />
              <xs:element minOccurs="0" name="Nullable" type="RE:BooleanType" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="UserDefinedTableType">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Parent" type="MM:ReferenceType" />
              <xs:element name="Name" type="xs:string" />
              <xs:element name="Columns" type="MM:ReferencesType" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>

    <xs:element name="View">
      <xs:complexType>
        <xs:complexContent>
          <xs:extension base="MM:InstanceType">
            <xs:all>
              <xs:element name="Parent" type="MM:ReferenceType" />
              <xs:element name="Name" type="xs:string" />
              <xs:element name="QueryText" type="xs:string" />
              <xs:element name="Columns" type="MM:ReferencesType" />
              <xs:element name="HasCheckOption" type="RE:BooleanType" />
              <xs:element name="HasColumnSpecification" type="RE:BooleanType" />
              <xs:element name="IsEncrypted" type="RE:BooleanType" />
              <xs:element name="IsQuotedIdentifierOn" type="RE:BooleanType" />
              <xs:element name="IsSchemaBound" type="RE:BooleanType" />
              <xs:element name="ReturnsViewMetadata" type="RE:BooleanType" />
            </xs:all>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
    </xs:element>
```

```xml
<xs:simpleType name="CollationEnumeration">
  <xs:restriction base="xs:string">
    <xs:enumeration value="SQL_Latin1_General_CP437_BIN" />
    <xs:enumeration value="SQL_Latin1_General_CP437_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP437_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_Pref_CP437_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP437_CI_AI" />
    <xs:enumeration value="SQL_Latin1_General_CP850_BIN" />
    <xs:enumeration value="SQL_Latin1_General_CP850_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP850_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_Pref_CP850_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP850_CI_AI" />
    <xs:enumeration value="SQL_1Xcompat_CP850_CI_AS" />
    <xs:enumeration value="Latin1_General_BIN" />
    <xs:enumeration value="SQL_Latin1_General_CP1_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP1_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_Pref_CP1_CI_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP1_CI_AI" />
    <xs:enumeration value="SQL_AltDiction_CP850_CS_AS" />
    <xs:enumeration value="SQL_AltDiction_Pref_CP850_CI_AS" />
    <xs:enumeration value="SQL_AltDiction_CP850_CI_AI" />
    <xs:enumeration value="SQL_Scandinavian_Pref_CP850_CI_AS" />
    <xs:enumeration value="SQL_Scandinavian_CP850_CS_AS" />
    <xs:enumeration value="SQL_Scandinavian_CP850_CI_AS" />
    <xs:enumeration value="SQL_AltDiction_CP850_CI_AS" />
    <xs:enumeration value="Latin1_General_CS_AS" />
    <xs:enumeration value="Latin1_General_CI_AS" />
    <xs:enumeration value="Danish_Norwegian_CS_AS" />
    <xs:enumeration value="Finnish_Swedish_CS_AS" />
    <xs:enumeration value="Icelandic_CS_AS" />
    <xs:enumeration value="Hungarian_BIN" />
    <xs:enumeration value="Albanian_BIN" />
    <xs:enumeration value="Czech_BIN" />
    <xs:enumeration value="SQL_Latin1_General_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Czech_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Czech_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Hungarian_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Hungarian_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Polish_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Polish_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Romanian_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Romanian_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Croatian_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Croatian_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Slovak_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Slovak_CP1250_CI_AS" />
    <xs:enumeration value="SQL_Slovenian_CP1250_CS_AS" />
    <xs:enumeration value="SQL_Slovenian_CP1250_CI_AS" />
    <xs:enumeration value="Cyrillic_General_BIN" />
    <xs:enumeration value="Ukrainian_BIN" />
    <xs:enumeration value="Macedonian_FYROM_90_BIN)" />
    <xs:enumeration value="SQL_Latin1_General_CP1251_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP1251_CI_AS" />
    <xs:enumeration value="SQL_Ukrainian_CP1251_CS_AS" />
    <xs:enumeration value="SQL_Ukrainian_CP1251_CI_AS" />
    <xs:enumeration value="Greek_BIN" />
    <xs:enumeration value="SQL_Latin1_General_CP1253_CS_AS" />
    <xs:enumeration value="SQL_Latin1_General_CP1253_CI_AS" />
```

```
        <xs:enumeration value="SQL_MixDiction_CP1253_CS_AS" />
        <xs:enumeration value="SQL_AltDiction_CP1253_CS_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1253_CI_AI" />
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        <xs:enumeration value="SQL_Latin1_General_CP1254_CS_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1254_CI_AS" />
        <xs:enumeration value="Hebrew_BIN" />
        <xs:enumeration value="SQL_Latin1_General_CP1255_CS_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1255_CI_AS" />
        <xs:enumeration value="Arabic_BIN" />
        <xs:enumeration value="SQL_Latin1_General_CP1256_CS_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1256_CI_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1257_CS_AS" />
        <xs:enumeration value="SQL_Latin1_General_CP1257_CI_AS" />
        <xs:enumeration value="SQL_Estonian_CP1257_CS_AS" />
        <xs:enumeration value="SQL_Estonian_CP1257_CI_AS" />
        <xs:enumeration value="SQL_Latvian_CP1257_CS_AS" />
        <xs:enumeration value="SQL_Latvian_CP1257_CI_AS" />
        <xs:enumeration value="SQL_Lithuanian_CP1257_CS_AS" />
        <xs:enumeration value="SQL_Lithuanian_CP1257_CI_AS" />
        <xs:enumeration value="SQL_Danish_Pref_CP1_CI_AS" />
        <xs:enumeration value="SQL_SwedishPhone_Pref_CP1_CI_AS" />
        <xs:enumeration value="SQL_SwedishStd_Pref_CP1_CI_AS" />
        <xs:enumeration value="SQL_Icelandic_Pref_CP1_CI_AS" />
        <xs:enumeration value="Japanese_BIN" />
        <xs:enumeration value="Japanese_CI_AS" />
        <xs:enumeration value="Korean_Wansung_BIN" />
        <xs:enumeration value="Korean_Wansung_CI_AS" />
        <xs:enumeration value="Chinese_Taiwan_Stroke_BIN" />
        <xs:enumeration value="Chinese_Taiwan_Stroke_CI_AS" />
        <xs:enumeration value="Chinese_PRC_BIN" />
        <xs:enumeration value="Chinese_PRC_CI_AS" />
        <xs:enumeration value="Japanese_CS_AS" />
        <xs:enumeration value="Korean_Wansung_CS_AS" />
        <xs:enumeration value="Chinese_Taiwan_Stroke_CS_AS" />
        <xs:enumeration value="Chinese_PRC_CS_AS" />
        <xs:enumeration value="Thai_BIN" />
        <xs:enumeration value="Thai_CI_AS" />
        <xs:enumeration value="Thai_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC037_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC273_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC277_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC278_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC280_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC284_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC285_CP1_CS_AS" />
        <xs:enumeration value="SQL_EBCDIC297_CP1_CS_AS" />
    </xs:restriction>
  </xs:simpleType>
  </xs:schema>
```

6   Appendix B: Product Behavior

The information in this specification is applicable to the following product versions. References to product versions include released service packs.

▪ Microsoft® SQL Server® 2008 R2

Exceptions, if any, are noted below. If a service pack number appears with the product version, behavior changed in that service pack. The new behavior also applies to subsequent service packs of the product unless otherwise specified.

Unless otherwise specified, any statement of optional behavior in this specification 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 product does not follow the prescription.

7 Change Tracking

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

8 Index

<1> Section 1: Windows NT and Windows 2000 set cWidgets to 0.

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