[MS-CSDLBI]:

Conceptual Schema Definition File Format with Business Intelligence Annotations

Revision Summary

Date	Revision History	Revision Class	Comments
7/16/2012	1.0	New	Released new document.
10/8/2012	2.0	Major	Updated and revised the technical content.
10/23/2012	2.1	Minor	Clarified the meaning of the technical content.
3/26/2013	2.2	Minor	Clarified the meaning of the technical content.
6/11/2013	2.2	None	No changes to the meaning, language, or formatting of the technical content.
8/8/2013	2.3	Minor	Clarified the meaning of the technical content.
12/5/2013	3.0	Major	Updated and revised the technical content.
2/11/2014	4.0	Major	Updated and revised the technical content.
5/20/2014	5.0	Major	Updated and revised the technical content.
5/10/2016	6.0	Major	Significantly changed the technical content.
8/16/2017	7.0	Major	Significantly changed the technical content.
10/16/2019	8.0	Major	Significantly changed the technical content.
11/1/2022	9.0	Major	Significantly changed the technical content.
5/11/2023	10.0	Major	Significantly changed the technical content.
5/14/2024	11.0	Major	Significantly changed the technical content.

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1 Introduction

The conceptual **schema** definition file format with business intelligence (BI) annotations provides the structure and semantics of **conceptual schema definition language (CSDL)** annotations that are used in BI applications. CSDL is a language based on XML that can be used for defining **Entity Data Model (EDM)**-based conceptual models.

Sections 1.7 and 2 of this specification are normative. All other sections and examples in this specification are informative.

1.1 Glossary

This document uses the following terms:

annotation: Any custom, application-specific extension that is applied to an instance of a schema definition language through the use of custom attributes and elements that are not a part of that schema definition language.

association: A named independent relationship between two entity type definitions. Associations in the **Entity Data Model (EDM)** are first-class concepts and are always bidirectional. Indeed, the first-class nature of associations helps distinguish the **EDM** from the relational model. Every association includes exactly two association ends.

collection: A grouping of one or more EDM types that are type compatible.

complex type: A type that represents a set of related information. Like the entity type, it consists of one or more properties of the EDM simple type or complex types; however, unlike the entity type, the complex type does not have an EntityKey element or a NavigationProperty element.

conceptual schema definition language (CSDL): A language that is based on XML and that can be used to define conceptual models that are based on the **Entity Data Model (EDM)**.

conceptual schema definition language with business intelligence annotations (CSDLBI): A language that is based on XML and that can be used to annotate EDM-based conceptual models with specific information that is useful in business intelligence applications.

conceptual schema definition language with business intelligence annotations (CSDLBI) document: A document that contains a conceptual model that is defined by using the CSDL and CSDLBI code.

dimension: A structural attribute of a cube, which is an organized hierarchy of categories (levels) that describe data in a fact table. These categories typically describe a similar set of members upon which the user bases an analysis.

display folder: A folder within a hierarchical folder system that is used to organize properties within an entity.

entity: An instance of an EntityType element that has a unique identity and an independent existence. An entity is an operational unit of consistency.

Entity Data Model (EDM): A set of concepts that describes the structure of data, regardless of its stored form.

hierarchy: A logical tree structure that organizes the members of a dimension such that each member has one parent member and zero or more child members.

identifier: A string value that is used to uniquely identify a component of the **CSDL** and that is of type SimpleIdentifier.

language code identifier (LCID): A 32-bit number that identifies the user interface human language dialect or variation that is supported by an application or a client computer.

level: The name of a set of members in a **dimension hierarchy**, such that all members of the set are at the same distance from the root of the hierarchy.

measure: In a cube, a set of values that are typically numeric and are based on a column in the fact table of the cube. Measures are the central values that are aggregated and analyzed.

namespace: A name that is defined on the **schema** and that is subsequently used to prefix identifiers to form the namespace qualified name of a structural type.

schema: A container that defines a **namespace** that describes the scope of EDM types. All EDM types are contained within some **namespace**.

simple type: An element that can contain only text and appears as <simpleType> in an XML document or any attribute of an element. Attributes are considered simple types because they contain only text. See also **complex type**.

XML namespace: A collection of names that is used to identify elements, types, and attributes in XML documents identified in a URI reference [RFC3986]. A combination of XML namespace and local name allows XML documents to use elements, types, and attributes that have the same names but come from different sources. For more information, see [XMLNS-2ED].

XML schema: A description of a type of XML document that is typically expressed in terms of constraints on the structure and content of documents of that type, in addition to the basic syntax constraints that are imposed by XML itself. An XML schema provides a view of a document type at a relatively high level of abstraction.

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

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the Errata.

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.

[MC-CSDL] Microsoft Corporation, "Conceptual Schema Definition File Format".

[MS-SSAS-T] Microsoft Corporation, "SQL Server Analysis Services Tabular Protocol".

[MS-SSAS] Microsoft Corporation, "SQL Server Analysis Services Protocol".

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

[XML10/5] Bray, T., Paoli, J., Sperberg-McQueen, C.M., et al., Eds., "Extensible Markup Language (XML) 1.0 (Fifth Edition)", W3C Recommendation, November 2008, http://www.w3.org/TR/2008/REC-xml-20081126/

[XMLNS] Bray, T., Hollander, D., Layman, A., et al., Eds., "Namespaces in XML 1.0 (Third Edition)", W3C Recommendation, December 2009, https://www.w3.org/TR/2009/REC-xml-names-20091208/

[XMLSCHEMA1/2] Thompson, H., Beech, D., Maloney, M., and Mendelsohn, N., Eds., "XML Schema Part 1: Structures Second Edition", W3C Recommendation, October 2004, https://www.w3.org/TR/2004/REC-xmlschema-1-20041028/

1.2.2 Informative References

[MS-LCID] Microsoft Corporation, "Windows Language Code Identifier (LCID) Reference".

1.3 Overview

Conceptual schema definition language with business intelligence annotations (CSDLBI) is an XML-based file format that is used to annotate **Entity Data Model (EDM)**-based conceptual models and is based on standards that are defined in [XML10/5] and [XMLSCHEMA1/2]. Type names in CSDLBI are generally the same as in **conceptual schema definition language (CSDL)**. For details about CSDL, see [MC-CSDL].

Conceptually, a **CSDLBI document** has an overall structure that resembles the following.

```
<Schema>
    <Using/>
    <Using/>

    <ComplexType/>

    <Function/>
    <Function/>

    <EntityContainer>
        <EntitySet>
            <bi:EntitySet/>
            <bi:Cultures>
              <bi:Culture/>
            </bi:Cultures>
        <EntitySet/>

        <EntitySet>
            <bi:EntitySet/>
        <EntitySet/>

        <AssociationSet>
           <End/>
           <End/>
           <bi:AssociationSet/>
        </AssociationSet>

        <AssociationSet>
           <End/>
           <End/>
           <bi:AssociationSet/>
        </AssociationSet>

        <bi:EntityContainer>
            <bi:CompareOptions/>
        </bi:EntityContainer>
    </EntityContainer>

    <EntityType>
        <Key>
            <PropertyRef/>
        </Key>
```

```
            <Property>
                <bi:Property>
            </Property>

            <Property>
                <bi:Property>
            </Property>

            <Property>
                <bi:Measure>
                    <bi:Kpi>
                        <bi:KpiGoal>
                            <bi:PropertyRef/>
                        </bi:KpiGoal>
                        <bi:KpiStatus>
                            <bi:PropertyRef/>
                        </bi:KpiStatus>
                        <bi:KpiTrend>
                            <bi:PropertyRef/>
                        </bi:KpiTrend>
                    </bi:Kpi>
                </bi:Measure>
            </Property>

            <NavigationProperty>
                <bi:NavigationProperty/>
            </NavigationProperty>

            <bi:EntityType>
                <bi:Hierarchy>
                    <bi:Level>
                        <bi:Source>
                            <bi:PropertyRef/>
                        </bi:Source>
                    </bi:Level>
                    <bi:Level>
                        <bi:Source>
                            <bi:PropertyRef/>
                        </bi:Source>
                    </bi:Level>
                </bi:Hierarchy>
                <bi:DisplayFolders>
                  <bi:DisplayFolder>
                    <bi:PropertyRef/>
                  </bi:DisplayFolder>
                </bi:DisplayFolders>
            </bi:EntityType>
        </EntityType>

        <EntityType>
            <bi:EntityType>
                <bi:Hierarchy>
                    <bi:Level>
                        <bi:Source>
                            <bi:PropertyRef/>
                        </bi:Source>
                    </bi:Level>
                    <bi:Level>
                        <bi:Source>
                            <bi:PropertyRef/>
                        </bi:Source>
                    </bi:Level>
                </bi:Hierarchy>
            </bi:EntityType>
        </EntityType>

        <Association>
            <End/>
            <End/>
```

```
        </Association>

    <Association>
        <End/>
        <End/>
    </Association>
</Schema>
```

Note The previous example is not a detailed specification. It is meant to provide only a visual overview.

1.4   Relationship to Protocols and Other Structures

The **conceptual schema definition language with business intelligence annotations (CSDLBI)** format uses the **conceptual schema definition language (CSDL)** [MC-CSDL] to provide structure and semantics.

The CSDLBI format is used to specify SQL Server Analysis Services database metadata, as described in [MS-SSAS] and [MS-SSAS-T].

There are no **schemas**, protocols, or other structures that extend CSDLBI.

1.5   Applicability Statement

CSDLBI is a file format for defining **annotations** to **CSDL** models that support business intelligence (BI) applications.

1.6   Versioning and Localization

This document specifies the structures for the following versions of conceptual schema definition file format with business intelligence annotations (**CSDLBI**):<1>

▪   CSDLBI version 1.0 (CSDLBI 1.0)

▪   CSDLBI version 1.1 (CSDLBI 1.1)

▪   CSDLBI version 2.0 (CSDLBI 2.0)

▪   CSDLBI version 2.5 (CSDLBI 2.5)

   Note The CSDLBI 2.5 schema is the same as the CSDLBI 2.0 schema. However, when a client application requests CSDLBI 2.5 from a server, the server returns the **ReferentialConstraint** information for the **Association** object and the **Role** attribute on the **Association End** element. When the client application requests CSDLBI 2.0 from a server, these properties are not returned. For more details about these optional properties, see [MC-CSDL].

These versions are defined in Appendix A: Full XML Schema (section 5).

Aspects of later CSDLBI versions that do not apply to earlier versions are identified in the text.

1.7   Vendor-Extensible Fields

None.

2 Structures

Conceptual schema definition language (CSDL) supports application-specific customization and extension through the use of **annotations**. These annotations enable applications to embed application-specific and vendor-specific information into CSDL. The CSDL format does not specify how to process these custom-defined structures or how to distinguish structures from multiple vendors or layers. Parsers of CSDL can ignore annotations that are not expected or are not understood.

Annotations can be of two kinds:

- **AnnotationElement**, as defined in [MC-CSDL] section 2.1.22.

- **AnnotationAttribute**, as defined in [MC-CSDL] section 2.2.7.

Conceptual schema definition language with business intelligence annotations (CSDLBI), with the exception of the **SourceDescription** element, is defined by **complex types**, some of which include **simple types** and other complex types. The **SourceDescription** element is of basic xs:string type.

The CSDLBI schema defines a total of 32 complex types and 41 simple types. Section 2.1 contains a section for each complex type. The simple types that are included in complex types are defined in subsections under the complex type to which they belong. Examples of CSDL models that are annotated by using these types are provided in Section 3 of this specification.

The following CSDL elements are annotated by the corresponding CSDLBI complex types, as shown in the table.

CSDL element	CSDLBI complex type
EntityContainer	TEntityContainer
EntitySet	TEntitySet
AssociationSet	TAssociationSet
EntityType	TEntityType
Property	TProperty
NavigationProperty	TNavigationProperty

Other complex types that are defined in the CSDLBI **schema** are included in the definitions of the complex types that are listed in the preceding table. These complex types are as follows:

- TCompareOptions

- TModelCapabilities (introduced in CSDLBI 2.0)

- TBaseProperty

- TPropertyRefs

- TPropertyRef

- TMember

- TKpi (introduced in CSDLBI 1.1)

- TMemberRefs

- TMemberRef

- ▪ THierarchy (introduced in CSDLBI 1.1)

- ▪ THierarchyRef (introduced in CSDLBI 1.1)

- ▪ TLevel (introduced in CSDLBI 1.1)

- ▪ TDocumentation

- ▪ TDAXFunctions (introduced in CSDLBI 2.0)

- ▪ TPropertyStatistics (introduced in CSDLBI 2.0)

- ▪ TEntityStatistics (introduced in CSDLBI 2.0)

- ▪ TCultures (introduced in CSDLBI 2.0)

- ▪ TCulture (introduced in CSDLBI 2.0)

- ▪ TMParameters (introduced in CSDLBI 2.0)

- ▪ TMParameter (introduced in CSDLBI 2.0)

- ▪ TParameterValuesColumn (introduced in CSDLBI 2.0)

- ▪ TDistributiveBy

- ▪ TEntityRef

- ▪ TDisplayFolders

- ▪ TDisplayFolder

One more complex type that is defined in the CSDLBI schema is TMeasure. The **TMeasure** complex type is used to define the **Measure** element. The **Measure** element was introduced in CSDLBI 1.0.

Some complex types include simple types. The simple types that are defined in the CSDLBI schemas are as follows:

- ▪ TDirectQueryMode

- ▪ TCrossFilteringWithinTable (introduced in CSDLBI 2.0)

- ▪ TGroupByValidation (introduced in CSDLBI 2.0)

- ▪ TQueryAggregateUsage (introduced in CSDLBI 2.0)

- ▪ TEncourageIsEmptyDAXFunctionUsage (introduced in CSDLBI 2.0)

- ▪ TFiveStateKPIRange (introduced in CSDLBI 2.0)

- ▪ TState

- ▪ TCrossFilterDirection (introduced in CSDLBI 2.0)

- ▪ TBehavior (introduced in CSDLBI 2.0)

- ▪ TContextualNameRule

- ▪ TContents

- ▪ TDefaultAggregateFunction

- ▪ TGroupingBehavior

- TStability

- TAlignment

- TSortDirection

- TQueryBatching (introduced in CSDLBI 2.0)

- TVariables (introduced in CSDLBI 2.0)

- TSummarizeColumns (introduced in CSDLBI 2.0)

- TSubstituteWithIndex (introduced in CSDLBI 2.0)

- TLeftOuterJoin (introduced in CSDLBI 2.0)

- TBinaryMinMax (introduced in CSDLBI 2.0)

- THideMembers (introduced in CSDLBI 2.0)

- TMultiColumnFiltering (introduced in CSDLBI 2.0)

- TDiscourageCompositeModels (introduced in CSDLBI 2.0)

- TInOperator (introduced in CSDLBI 2.0)

- TTableConstructor (introduced in CSDLBI 2.0)

- TVirtualColumns (introduced in CSDLBI 2.0)

- TDataSourceVariables (introduced in CSDLBI 2.0)

- TExecutionMetrics (introduced in CSDLBI 2.0)

- TVisualCalculations (introduced in CSDLBI 2.0)

- TTreatAs (introduced in CSDLBI 2.0)

- TSampleAxisWithLocalMinMax (introduced in CSDLBI 2.0)

- TSampleCartesianPointsByCover (introduced in CSDLBI 2.0)

- TOptimizedNotInOperator (introduced in CSDLBI 2.0)

- TNonVisual (introduced in CSDLBI 2.0)

- TIsAfter (introduced in CSDLBI 2.0)

- TFormatByLocale (introduced in CSDLBI 2.0)

- TStringMinMax (introduced in CSDLBI 2.0)

- TError (introduced in CSDLBI 2.0)

- TAggregationKind

2.1   Complex and Simple Types

This section specifies each **complex type** that is defined by **conceptual schema definition language with business intelligence annotations (CSDLBI)**. Each **simple type** that is part of a complex type is defined in a subsection under the complex type to which it belongs.

The prefix bi: refers to the following **XML namespace**:
http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions.

For more information about **namespaces**, see [XMLNS].

For the types below, the "default value" refers to the value assumed when the type is unspecified.

2.1.1 TEntityContainer

The **TEntityContainer complex type** annotates the **EntityContainer** element that is defined in [MC-CSDL] section 2.1.14. The **EntityContainer** element is conceptually similar to a database or data source. It groups **EntitySet** and **AssociationSet** child elements that represent a data source.

The **TEntityContainer** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TEntityContainer">
  <xs:sequence>
    <xs:element name="CompareOptions" type="bi:TCompareOptions" />
    <xs:element name="ModelCapabilities" type="bi:TModelCapabilities" />
  </xs:sequence>
  <xs:attribute name="Caption" type="xs:string" use="optional" />
  <xs:attribute name="Culture" type="xs:string" />
  <xs:attribute name="DirectQueryMode" type="bi:TDirectQueryMode" />
  <xs:attribute name="PreferOrdinalStringEquality" type="xs:boolean" default="false" />
</xs:complexType>
```

The elements and attributes that are defined by the **TEntityContainer** complex type are specified in the following tables.

Element	Description
CompareOptions	Contains language-specific sorting and string comparison options for the model. The contents of this element are defined by the **TCompareOptions** complex type (section 2.1.2).
ModelCapabilities	In CSDLBI 2.0 and CSDLBI 2.5, contains elements that describe which new properties and features of the model or Data Analysis Expressions (DAX) are to be taken into account when the client generates DAX queries. The contents of this element are defined by the **TModelCapabilities** complex type (section 2.1.3).

Attribute	Description
Caption	Describes the database or data model.
Culture	Contains the culture name, as specified in the following table. For more information about **language code identifiers (LCIDs)**, see [MS-LCID].
DirectQueryMode	Determines which mode is used for a query. The contents of this attribute are defined by the **TDirectQueryMode** simple type (section 2.1.1.1).
PreferOrdinalStringEquality<2>	Directs clients to perform culture-invariant comparisons and ordering on string values that are returned in query results, disregarding the **Culture** attribute.

The culture name that is contained in the **Culture** attribute MUST be one of the following:

Language	LCID	Culture name
Neutral	0	en-US

Language	LCID	Culture name
Arabic	1025	ar-SA
Bengali	1093	bn-IN
Brazilian	1046	pt-BR
British English	2057	en-GB
Bulgarian	1026	bg-BG
Catalan	1027	ca-ES
Chinese – Simplified	2052	zh-CN
Chinese – Traditional	1028	zh-TW
Chinese (Hong Kong SAR, PRC)	3076	zh-HK
Chinese (Macau SAR)	5124	zh-MO
Chinese (Singapore)	4100	zh-SG
Croatian	1050	hr-HR
Dutch	1043	nl-NL
English–US	1033	en-US
French	1036	fr-FR
German	1031	de-DE
Gujarati	1095	gu-IN
Hebrew	1037	he-IL
Hindi	1081	hi-IN
Icelandic	1039	is-IS
Indonesian	1057	id-ID
Italian	1040	it-IT
Japanese	1041	ja-JP
Kannada	1099	kn-IN
Korean	1042	ko-KR
Latvian	1062	lv-LV
Lithuanian	1063	lt-LT
Malay – Malaysia	1086	ms-MY
Malayalam	1100	ml-IN
Marathi	1102	mr-IN
Norwegian (Bokmål)	1044	nb-NO
Portuguese	2070	pt-PT

Language	LCID	Culture name
Punjabi	1094	pa-IN
Romanian	1048	ro-RO
Russian	1049	ru-RU
Serbian (Cyrillic)	3098	sr-Cyrl-CS
Serbian (Latin)	2074	sr-Latn-CS
Slovak	1051	sk-SK
Slovenian	1060	sl-SI
Spanish	3082	es-ES
Swedish	1053	sv-SE
Tamil	1097	ta-IN
Telugu	1098	te-IN
Thai	1054	th-TH
Ukrainian	1058	uk-UA
Urdu	1056	ur-PK
Vietnamese	1066	vi-VN

2.1.1.1 TDirectQueryMode

The **TDirectQueryMode** simple type is an enumeration that indicates the kind of query that will be conducted in DirectQuery mode. Data stores can opt to cache database information. In that case, the client can query the cache or the backing store, depending on user instructions.

The **TDirectQueryMode** simple type is defined in the schema as follows.

```
<xs:simpleType name="TDirectQueryMode">
  <xs:restriction base="xs:string">
    <xs:enumeration value="InMemory" />
    <xs:enumeration value="InMemoryWithDirectQuery" />
    <xs:enumeration value="DirectQueryWithInMemory" />
    <xs:enumeration value="DirectQuery" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TDirectQueryMode** simple type are specified in the following table.

Value	Meaning
InMemory	Indicates that queries against the model will be conducted against the cache.
InMemoryWithDirectQuery	Indicates that queries against the model are conducted against the cache by default.
DirectQueryWithInMemory	Indicates that queries against the model primarily reference the relational data source but can use the cache, if the cache is available.

Value	Meaning
DirectQuery	Indicates that queries against the model reference only the relational data source.

2.1.2 TCompareOptions

The **TCompareOptions complex type** defines collation properties that are applied to the data model. The values for **CompareOptions** are based on the **Database.Collation** element, as defined in [MS-SSAS] section 2.2.4.2.2.5.

The **TCompareOptions** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TCompareOptions">
  <xs:attribute name="IgnoreCase" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreNonSpace" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreKanaType" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreWidth" type="xs:boolean" default="false" />
</xs:complexType>
```

The attributes that are defined by the **TCompareOptions** complex type are specified in the following table.

Attribute	Description
IgnoreCase	Indicates whether the string comparison ignores case.
IgnoreNonSpace	Indicates whether the string comparison ignores nonspacing combining characters, such as diacritics.
IgnoreKanaType	Indicates whether the string comparison ignores the Kana type.
IgnoreWidth	Indicates whether the string comparison ignores the character width.

2.1.3 TModelCapabilities

In CSDLBI 2.0 and CSDLBI 2.5, the **TModelCapabilities complex type** is a container element for other CSDLBI 2.0 and CSDLBI 2.5 elements, respectively. Those elements describe features that are specific to the model and that clients are expected to interpret and utilize when querying data from the model. These elements can be optimization hints, constraints, or enhancements made to the model.

The **TModelCapabilities** complex type is defined in the schema as follows.

```
<xs:complexType name="TModelCapabilities">
  <xs:sequence>
    <xs:element name="CrossFilteringWithinTable" type="bi:TCrossFilteringWithinTable"
minOccurs="0" maxOccurs="1" />
    <xs:element name="GroupByValidation" type="bi:TGroupByValidation" minOccurs="0"
maxOccurs="1" />
    <xs:element name="FiveStateKPIRange" type="bi:TFiveStateKPIRange" minOccurs="0"
maxOccurs="1" />
    <xs:element name="MultiColumnFiltering" type="bi:TMultiColumnFiltering" minOccurs="0"
maxOccurs="1" />
    <xs:element name="QueryAggregateUsage" type="bi:TQueryAggregateUsage" minOccurs="0"
maxOccurs="1" />
```

```
        <xs:element name="DiscourageCompositeModels" type="bi:TDiscourageCompositeModels"
minOccurs="0" maxOccurs="1" />
        <xs:element name="EncourageIsEmptyDAXFunctionUsage"
type="bi:TEncourageIsEmptyDAXFunctionUsage" />
        <xs:element name="QueryBatching" type="bi:TQueryBatching" />
        <xs:element name="Variables" type="bi:TVariables" />
        <xs:element name="InOperator" type="bi:TInOperator" />
        <xs:element name="TableConstructor" type="bi:TTableConstructor" />
        <xs:element name="ExecutionMetrics" type="bi:TExecutionMetrics" minOccurs="0"
maxOccurs="1" />
        <xs:element name="VirtualColumns" type="bi:TVirtualColumns" minOccurs="0" maxOccurs="1"
/>
        <xs:element name="DataSourceVariables" type="bi:TDataSourceVariables" minOccurs="0"
maxOccurs="1" />
        <xs:element name="VisualCalculations" type="bi:TVisualCalculations" minOccurs="0"
maxOccurs="1" />
        <xs:element name="DAXFunctions" type="bi:TDAXFunctions" />
        <xs:element name="MParameters" type="bi:TMParameters" minOccurs="0" maxOccurs="1" />
    </xs:sequence>
</xs:complexType>
```

The elements that are defined by the **TModelCapabilities** complex type are specified in the following table.

Element	Description
CrossFilteringWithinTable	Indicates whether the model will restrict model measures. The contents of this element are defined by the **TCrossFilteringWithinTable simple type** (section 2.1.3.1).
GroupByValidation	Indicates whether the server will perform a group-by validation. The contents of this element are defined by the **TGroupByValidation** simple type (section 2.1.3.2).
FiveStateKPIRange	Indicates the range of key performance indicator (KPI) values that are used for five-states KPIs. The contents of this element are defined by the **TFiveStateKPIRange** simple type (section 2.1.3.3).
MultiColumnFiltering<3>	Indicates whether the dataset supports filtering on multiple columns. The contents of this element are defined by the **TMultiColumnFiltering** simple type (section 2.1.3.4).
QueryAggregateUsage	Indicates whether the server encourages query aggregate usage. The contents of this element are defined by the **TQueryAggregateUsage** simple type (section 2.1.3.5).
DiscourageCompositeModels<4>	Indicates whether the dataset discourages use in composite. The contents of this element are defined by the **TDiscourageCompositeModels** simple type (section 2.1.3.6).
EncourageIsEmptyDAXFunctionUsage	Indicates whether the server encourages **IsEmpty** DAX function usage. The contents of this element are defined by the **TEncourageIsEmptyDAXFunctionUsage** simple type (section 2.1.3.7).
QueryBatching<5>	Indicates whether batching is supported for DAX query requests. The contents of this element are defined by the **TQueryBatching** simple type (section 2.1.3.8).
Variables<6>	Indicates the level of support for defining variables in DAX expressions. The contents of this element are defined by the **TVariables** simple type

Element	Description
	(section 2.1.3.9).
InOperator<7>	Indicates whether the dataset supports the In operation. The contents of this element are defined by the **TInOperator** simple type (section 2.1.3.10).
TableConstructor<8>	Indicates whether the dataset supports the table constructor syntax. The contents of this element are defined by the **TTableConstructor** simple type (section 2.1.3.11).
ExecutionMetrics<9>	Indicates whether the dataset supports the generation of query execution metrics in an output rowset. The contents of this element are defined by the **TExecutionMetrics** simple type (section 2.1.3.12).
VirtualColumns<10>	Indicates whether the dataset supports virtual columns. The contents of this element are defined by the **TVirtualColumns** simple type (section 2.1.3.13).
DataSourceVariables<11>	Indicates whether the dataset supports variables for data sources. The contents of this element are defined by the **TDataSourceVariables** simple type (section 2.1.3.14).
VisualCalculations<12>	Identifies whether the dataset supports visual calculations. The contents of this element are defined by the **TVisualCalculations** complex type (section 2.1.3.15).
DAXFunctions<13>	Indicates the level of support for various DAX functions in DAX queries that are executed against the model. The contents of this element are defined by the **TDAXFunctions** complex type (section 2.1.4).
MParameters<14>	Identifies the *M* parameters that are defined for this dataset. The contents of this element are defined by the **TMParameters** complex type (section 2.1.5).

2.1.3.1 TCrossFilteringWithinTable

In CSDLBI 2.0 and CSDLBI 2.5, the **TCrossFilteringWithinTable** simple type indicates whether the model will restrict model measures.

The **TCrossFilteringWithinTable** simple type is defined in the schema as follows.

```
<xs:simpleType name="TCrossFilteringWithinTable">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Always" />
    <xs:enumeration value="Never" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TCrossFilteringWithinTable** type are specified in the following table.

Value	Meaning
Always (when **DeploymentMode** is set to	The model will restrict model measures.

Value	Meaning
0)	
Never (for Tabular)	The model will not restrict model measures. This is the default value.

2.1.3.2 TGroupByValidation

In CSDLBI 2.0 and CSDLBI 2.5, the **TGroupByValidation** simple type indicates whether the server will perform a group-by validation.

The **TGroupByValidation** simple type is defined in the schema as follows.

```
<xs:simpleType name="TGroupByValidation">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Relaxed" />
    <xs:enumeration value="Enforced" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TGroupByValidation** type are specified in the following table.

Value	Meaning
Relaxed	The server will not perform a validation of the completeness of group-by columns for each Data Analysis Expressions (DAX) query sent to the server. This is the default value.
Enforced (when **DeploymentMode** is set to 0)	The server will perform a validation of the completeness of group-by columns for each DAX query sent to the server.

2.1.3.3 TFiveStateKPIRange

In CSDLBI 2.0 and CSDLBI 2.5, the **TFiveStateKPIRange** simple type indicates the range of key performance indicator (KPI) values that are used for five-states KPIs.

The **TFiveStateKPIRange** simple type is defined in the schema as follows.

```
<xs:simpleType name="TFiveStateKPIRange">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TFiveStateKPIRange** type are specified in the following table.

Value	Meaning
0	Range of -2 to 2 (returned when **DeploymentMode** is set to 1 or 2). This is the default value.
1	Range of -1 to 1 (returned when **DeploymentMode** is set to 0).

2.1.3.4 TMultiColumnFiltering

In CSDLBI 2.0 and CSDLBI 2.5, the **TMultiColumnFiltering** simple type<15> indicates whether the dataset supports filtering on multiple columns.

The **TMultiColumnFiltering** simple type is defined in the schema as follows.

```
<xs:simpleType name="TMultiColumnFiltering">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Unrestricted" />
    <xs:enumeration value="LimitedToGroupByColumns" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TMultiColumnFiltering** type are specified in the following table.

Value	Meaning
Unrestricted	Multicolumn filters are supported for all columns. This is the default value.
LimitedToGroupByColumns	Multicolumn filters are supported for group-by columns only.

2.1.3.5 TQueryAggregateUsage

In CSDLBI 2.0 and CSDLBI 2.5, the **TQueryAggregateUsage** simple type indicates whether the server encourages query aggregate usage.

The **TQueryAggregateUsage** simple type is defined in the schema as follows.

```
<xs:simpleType name="TQueryAggregateUsage">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Encourage" />
    <xs:enumeration value="Discourage" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TQueryAggregateUsage** type are specified in the following table.

Value	Meaning
Encourage	The server encourages query aggregate usage. This is the default value.
Discourage (when **DeploymentMode** is set to 0)	The server discourages query aggregate usage.

2.1.3.6 TDiscourageCompositeModels

In CSDLBI 2.0 and CSDLBI 2.5, the **TDiscourageCompositeModels** simple type<16> indicates whether the dataset discourages use in composite models.

The **TDiscourageCompositeModels** simple type is defined in the schema as follows.

```
<xs:simpleType name="TDiscourageCompositeModels">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TDiscourageCompositeModels** type are specified in the following table.

Value	Meaning
0	Composite models are not discouraged.
1	Composite models are discouraged. This is the default value.

2.1.3.7 TEncourageIsEmptyDAXFunctionUsage

In CSDLBI 2.0 and CSDLBI 2.5, the **TEncourageIsEmptyDAXFunctionUsage** simple type indicates whether the server encourages **IsEmpty** DAX function usage.

The **TEncourageIsEmptyDAXFunctionUsage** simple type is defined in the schema as follows.

```
<xs:simpleType name="TEncourageIsEmptyDAXFunctionUsage">
  <xs:restriction base="xs:string" />
    <xs:enumeration value="false" />
    <xs:enumeration value="true" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TEncourageIsEmptyDAXFunctionUsage** type are specified in the following table.

Value	Meaning
false	**IsEmpty** DAX function usage is not encouraged. This is the default value.
true	**IsEmpty** DAX function usage is encouraged.

2.1.3.8 TQueryBatching

In CSDLBI 2.0 and CSDLBI 2.5, the **TQueryBatching** simple type<17> indicates whether batching is supported for DAX query requests.

The **TQueryBatching** simple type is defined in the schema as follows.

```
<xs:simpleType name="TQueryBatching">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TQueryBatching** type are specified in the following table.

Value	Meaning
0	Query batching is not supported. This is the default value.
1	Query batching is supported.

2.1.3.9 TVariables

In CSDLBI 2.0 and CSDLBI 2.5, the **TVariables** simple type<18> indicates the level of support for defining variables in DAX expressions.

The **TVariables** simple type is defined in the schema as follows.

```
<xs:simpleType name="TVariables">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
    <xs:enumeration value="2" />
    <xs:enumeration value="3" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TVariables** type are specified in the following table.

Value	Meaning
0	DAX variables are not supported. This is the default value.
1	Only DAX table variables are supported.
2	Only DAX scalar variables are supported.
3	Both DAX table variables and DAX scalar variables are supported.

2.1.3.10 TInOperator

In CSDLBI 2.0 and CSDLBI 2.5, the **TInOperator** simple type<19> indicates whether the dataset supports the In operation.

The **TInOperator** simple type is defined in the schema as follows.

```
<xs:simpleType name="TInOperator">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
```

```
      </xs:restriction>
    </xs:simpleType>
```

The possible values for the **TInOperator** type are specified in the following table.

Value	Meaning
0	The In operation is not supported. This is the default value.
1	The In operation is supported.

2.1.3.11 TTableConstructor

In CSDLBI 2.0 and CSDLBI 2.5, the **TTableConstructor** simple type<20> indicates whether the dataset supports the table constructor syntax.

The **TTableConstructor** simple type is defined in the schema as follows.

```
    <xs:simpleType name="TTableConstructor">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
    </xs:simpleType>
```

The possible values for the **TTableConstructor** type are specified in the following table.

Value	Meaning
0	The table constructor syntax is not supported. This is the default value.
1	The table constructor syntax is supported.

2.1.3.12 TExecutionMetrics

In CSDLBI 2.0 and CSDLBI 2.5, the **TExecutionMetrics** simple type<21> indicates whether the dataset supports the generation of query execution metrics in an output rowset.

The **TExecutionMetrics** simple type is defined in the schema as follows.

```
    <xs:simpleType name="TExecutionMetrics">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
    </xs:simpleType>
```

The possible values for the **TExecutionMetrics** type are specified in the following table.

Value	Meaning
0	Query execution metrics cannot be generated. This is the default value.
1	Query execution metrics can be generated.

2.1.3.13   TVirtualColumns

In CSDLBI 2.0 and CSDLBI 2.5, the **TVirtualColumns** simple type<22> indicates whether the dataset supports virtual columns.

The **TVirtualColumns** simple type is defined in the schema as follows.

```
<xs:simpleType name="TVirtualColumns">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TVirtualColumns** type are specified in the following table.

Value	Meaning
0	Virtual columns are not supported. This is the default value.
1	Virtual columns are supported.

2.1.3.14   TDataSourceVariables

In CSDLBI 2.0 and CSDLBI 2.5, the **TDataSourceVariables** simple type<23> indicates whether the dataset supports variables for data sources.

The **TDataSourceVariables** simple type is defined in the schema as follows.

```
<xs:simpleType name="TDataSourceVariables">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TDataSourceVariables** type are specified in the following table.

Value	Meaning
0	Data source variables are not supported. This is the default value.
1	Data source variables are supported.

2.1.3.15 TVisualCalculations

In CSDLBI 2.0 and CSDLBI 2.5, the **TVisualCalculations** simple type<24> indicates whether the dataset supports visual calculations.

The **TVisualCalculations** simple type is defined in the schema as follows.

```
<xs:simpleType name="TVisualCalculations">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TVisualCalculations** type are specified in the following table.

Value	Meaning
0	Visual calculations are not supported. This is the default value.
1	Visual calculations are supported.

2.1.4 TDAXFunctions

In CSDLBI 2.0 and CSDLBI 2.5, the **TDAXFunctions** complex type<25> is a container element for other CSDLBI 2.0 and CSDLBI 2.5 elements, respectively. These elements define the level of support for various DAX functions in DAX queries that are executed against the model.

The **TDAXFunctions** complex type is defined in the schema as follows.

```
<xs:complexType name="TDAXFunctions">
  <xs:sequence>
    <xs:element name="SummarizeColumns" type="bi:TSummarizeColumns" minOccurs="0"
maxOccurs="1" />
    <xs:element name="SubstituteWithIndex" type="bi:TSubstituteWithIndex" minOccurs="0"
maxOccurs="1" />
    <xs:element name="LeftOuterJoin" type="bi:TLeftOuterJoin" minOccurs="0" maxOccurs="1" />
    <xs:element name="StringMinMax" type="bi:TStringMinMax" minOccurs="0" maxOccurs="1" />
    <xs:element name="BinaryMinMax" type="bi:TBinaryMinMax" />
    <xs:element name="TreatAs" type="bi:TTreatAs" minOccurs="0" maxOccurs="1" />
    <xs:element name="Error" type="bi:TError" />
    <xs:element name="SampleAxisWithLocalMinMax" type="bi:TSampleAxisWithLocalMinMax" />
    <xs:element name="SampleCartesianPointsByCover" type="bi:TSampleCartesianPointsByCover"
/>
    <xs:element name="OptimizedNotInOperator" type="bi:TOptimizedNotInOperator" />
    <xs:element name="NonVisual" type="bi:TNonVisual" />
    <xs:element name="IsAfter" type="bi:TIsAfter" />
    <xs:element name="FormatByLocale" type="bi:TFormatByLocale" />
  </xs:sequence>
</xs:complexType>
```

The elements that are defined by the **TDAXFunctions** complex type are specified in the following table.

Element	Description
SummarizeColumns	Indicates whether the **SummarizeColumns** DAX function is supported. The contents of this element are defined by the **TSummarizeColumns** simple type (section 2.1.4.1).
SubstituteWithIndex	Indicates whether the **SubstituteWithIndex** DAX function is supported. The contents of this element are defined by the **TSubstituteWithIndex** simple type (section 2.1.4.2).
LeftOuterJoin	Indicates whether the **LeftOuterJoin** DAX function is supported. The contents of this element are defined by the **TLeftOuterJoin** simple type (section 2.1.4.3).
StringMinMax**<26>**	Indicates whether the DAX functions **Min, Max, MinX**, and **MaxX** support string types. The contents of this element are defined by the **TStringMinMax** simple type (section 2.1.4.4).
BinaryMinMax	Indicates the level of support for the **Min** and **Max** DAX functions. The contents of this element are defined by the **TBinaryMinMax** simple type (section 2.1.4.5).
TreatAs**<27>**	Indicates whether the **TreatAs** DAX function is supported. The contents of this element are defined by the **TTreatAs** simple type (section 2.1.4.6).
Error**<28>**	Indicates whether the **Error** DAX function is supported. The contents of this element are defined by the **TError** simple type (section 2.1.4.7).
SampleAxisWithLocalMinMax**<29>**	Indicates whether the **SampleAxisWithLocalMinMax** DAX function is supported. The contents of this element are defined by the **TSampleAxisWithLocalMinMax** simple type (section 2.1.4.8).
SampleCartesianPointsByCover**<30>**	Indicates whether the **SampleCartesianPointsByCover** DAX function is supported. The contents of this element are defined by the **TSampleCartesianPointsByCover** simple type (section 2.1.4.9).
OptimizedNotInOperator**<31>**	Indicates whether the optimized Not In operation is supported. The contents of this element are defined by the **TOptimizedNotInOperator** simple type (section 2.1.4.10).
NonVisual**<32>**	Indicates whether the **NonVisual** DAX function is supported. The contents of this element are defined by the **TNonVisual** simple type (section 2.1.4.11).
IsAfter**<33>**	Indicates whether the **IsAfter** DAX function is supported. The contents of this element are defined by the **TIsAfter** simple type (section 2.1.4.12).
FormatByLocale**<34>**	Indicates whether the dataset supports passing the locale name to the **Format** DAX function. The contents of this element are defined by the **TFormatByLocale** simple type (section 2.1.4.13).

2.1.4.1 TSummarizeColumns

In CSDLBI 2.0 and CSDLBI 2.5, the **TSummarizeColumns** simple type indicates whether the **SummarizeColumns** DAX function is supported.

The **TSummarizeColumns** simple type is defined in the schema as follows.

```
<xs:simpleType name="TSummarizeColumns">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TSummarizeColumns** type are specified in the following table.

Value	Meaning
0	The **SummarizeColumns** DAX function is not supported. This is the default value.
1	The **SummarizeColumns** DAX function is supported.

2.1.4.2 TSubstituteWithIndex

In CSDLBI 2.0 and CSDLBI 2.5, the **TSubstituteWithIndex** simple type indicates whether the **SubstituteWithIndex** DAX function is supported.

The **TSubstituteWithIndex** simple type is defined in the schema as follows.

```
<xs:simpleType name="TSubstituteWithIndex">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TSubstituteWithIndex** type are specified in the following table.

Value	Meaning
0	The **SubstituteWithIndex** DAX function is not supported. This is the default value.
1	The **SubstituteWithIndex** DAX function is supported.

2.1.4.3 TLeftOuterJoin

In CSDLBI 2.0 and CSDLBI 2.5, the **TLeftOuterJoin** simple type indicates whether the **LeftOuterJoin** DAX function is supported.

The **TLeftOuterJoin** simple type is defined in the schema as follows.

```
<xs:simpleType name="TLeftOuterJoin">
  <xs:restriction base="xs:int">
```

```
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
   </xs:simpleType>
```

The possible values for the **TLeftOuterJoin** type are specified in the following table.

Value	Meaning
0	The **LeftOuterJoin** DAX function is not supported. This is the default value.
1	The **LeftOuterJoin** DAX function is supported.

2.1.4.4 TStringMinMax

In CSDLBI 2.0 and CSDLBI 2.5, the **TStringMinMax** simple type<35> indicates whether the DAX functions **Min**, **Max**, **MinX**, and **MaxX** support string types.

The **TStringMinMax** simple type is defined in the schema as follows.

```
        <xs:simpleType name="TStringMinMax">
          <xs:restriction base="xs:int">
            <xs:enumeration value="0" />
            <xs:enumeration value="1" />
          </xs:restriction>
        </xs:simpleType>
```

The possible values for the **TStringMinMax** type are specified in the following table.

Value	Meaning
0	The DAX functions **Min**, **Max**, **MinX**, and **MaxX** do not support string types. This is the default value.
1	The DAX functions **Min**, **Max**, **MinX**, and **MaxX** support string types.

2.1.4.5 TBinaryMinMax

In CSDLBI 2.0 and CSDLBI 2.5, the **TBinaryMinMax** simple type indicates the level of support for the **Min** and **Max** DAX functions.

The **TBinaryMinMax** simple type is defined in the schema as follows.

```
    <xs:simpleType name="TBinaryMinMax">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
    </xs:simpleType>
```

The possible values for the **TBinaryMinMax** type are specified in the following table.

Value	Meaning
0	The **Min** and **Max** DAX functions support one argument. This is the default value.
1	The **Min** and **Max** DAX functions support one or two arguments.

2.1.4.6 TTreatAs

In CSDLBI 2.0 and CSDLBI 2.5, the **TTreatAs** simple type<36> indicates whether the **TreatAs** DAX function is supported.

The **TTreatAs** simple type is defined in the schema as follows.

```
<xs:simpleType name="TTreatAs">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TTreatAs** type are specified in the following table.

Value	Meaning
0	The **TreatAs** DAX function is not supported. This is the default value.
1	The **TreatAs** DAX function is supported.

2.1.4.7 TError

In CSDLBI 2.0 and CSDLBI 2.5, the **TError** simple type<37> indicates whether the **Error** DAX function is supported.

The **TError** simple type is defined in the schema as follows.

```
<xs:simpleType name="TError">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TError** type are specified in the following table.

Value	Meaning
0	The **Error** DAX function is not supported. This is the default value.
1	The **Error** DAX function is supported.

2.1.4.8 TSampleAxisWithLocalMinMax

In CSDLBI 2.0 and CSDLBI 2.5, the **TSampleAxisWithLocalMinMax** simple type[<38>](#) indicates whether the **SampleAxisWithLocalMinMax** DAX function is supported.

The **TSampleAxisWithLocalMinMax** simple type is defined in the schema as follows.

```
<xs:simpleType name="TSampleAxisWithLocalMinMax">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TSampleAxisWithLocalMinMax** type are specified in the following table.

Value	Meaning
0	The **SampleAxisWithLocalMinMax** DAX function is not supported. This is the default value.
1	The **SampleAxisWithLocalMinMax** DAX function is supported.

2.1.4.9 TSampleCartesianPointsByCover

In CSDLBI 2.0 and CSDLBI 2.5, the **TSampleCartesianPointsByCover** simple type[<39>](#) indicates whether the **SampleCartesianPointsByCover** DAX function is supported.

The **TSampleCartesianPointsByCover** simple type is defined in the schema as follows.

```
<xs:simpleType name="TSampleCartesianPointsByCover">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TSampleCartesianPointsByCover** type are specified in the following table.

Value	Meaning
0	The **SampleCartesianPointsByCover** DAX function is not supported. This is the default value.
1	The **SampleCartesianPointsByCover** DAX function is supported.

2.1.4.10 TOptimizedNotInOperator

In CSDLBI 2.0 and CSDLBI 2.5, the **TOptimizedNotInOperator** simple type[<40>](#) indicates whether the optimized Not In operation is supported.

The **TOptimizedNotInOperator** simple type is defined in the schema as follows.

```
<xs:simpleType name="TOptimizedNotInOperator">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TOptimizedNotInOperator** type are specified in the following table.

Value	Meaning
0	The optimized Not In operation is not supported. This is the default value.
1	The optimized Not In operation is supported.

2.1.4.11   TNonVisual

In CSDLBI 2.0 and CSDLBI 2.5, the **TNonVisual** simple type<41> indicates whether the **NonVisual** DAX function is supported.

The **TNonVisual** simple type is defined in the schema as follows.

```
<xs:simpleType name="TNonVisual">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TNonVisual** type are specified in the following table.

Value	Meaning
0	The **NonVisual** DAX function is not supported. This is the default value.
1	The **NonVisual** DAX function is supported.

2.1.4.12   TIsAfter

In CSDLBI 2.0 and CSDLBI 2.5, the **TIsAfter** simple type<42> indicates whether the **IsAfter** DAX function is supported.

The **TIsAfter** simple type is defined in the schema as follows.

```
<xs:simpleType name="TIsAfter">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TIsAfter** type are specified in the following table.

Value	Meaning
0	The **IsAfter** DAX function is not supported. This is the default value.
1	The **IsAfter** DAX function is supported.

2.1.4.13   TFormatByLocale

In CSDLBI 2.0 and CSDLBI 2.5, the **TFormatByLocale** simple type<43> indicates whether the dataset supports passing the locale to the **Format** DAX function.

The **TFormatByLocale** simple type is defined in the schema as follows.

```
<xs:simpleType name="TFormatByLocale">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TFormatByLocale** type are specified in the following table.

Value	Meaning
0	The dataset does not support passing the locale to the **Format** DAX function. This is the default value.
1	The dataset supports passing the locale to the **Format** DAX function.

2.1.5   TMParameters

In CSDLBI 2.0 and CSDLBI 2.5, the **TMParameters** **complex type**<44> defines a **collection** of *M* parameters in which each parameter is contained in an **MParameter** element.

The **TMParameters** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TMParameters">
  <xs:sequence>
    <xs:element name="MParameter" type="bi:TMParameter" minOccurs="1"
     maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>
```

The element that is defined by the **TMParameters** complex type is specified in the following table.

Element	Description
MParameter	A collection of *M* parameters.

2.1.6 TMParameter

In CSDLBI 2.0 and CSDLBI 2.5, the **TMParameter complex type**<45> identifies the name, type, and associated column of an *M* parameter that is contained within an **MParameter** element.

The **TMParameter** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TMParameter">
  <xs:sequence>
    <xs:element name="ParameterValuesColumn" type="bi:TParameterValuesColumn"
 minOccurs="1" maxOccurs="1" />
  </xs:sequence>
  <xs:attribute name="Name" type="xs:string" use="required" />
  <xs:attribute name="LineageTag" type="xs:string" use="optional" />
  <xs:attribute name="ActualType" type="xs:string" use="required" />
</xs:complexType>
```

The element and attributes that are defined by the **TMParameter** complex type are specified in the following tables.

Element	Description
ParameterValuesColumn	The *M* parameter's associated entity and property.

Attribute	Description
Name	The name of the *M* parameter.
LineageTag	Returns a tag that represents the lineage of the *M* parameter.
ActualType	The *M* parameter's data type.

2.1.7 TParameterValuesColumn

In CSDLBI 2.0 and CSDLBI 2.5, the **TParameterValuesColumn complex type** <46>defines the *M* parameter's associated entity and property.

The **TParameterValuesColumn** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TParameterValuesColumn">
  <xs:sequence>
    <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
    <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1" maxOccurs="1"
 />
  </xs:sequence>
</xs:complexType>
```

The elements that are defined by the **TParameterValuesColumn** complex type are specified in the following table.

Element	Description
EntityRef	An element that contains a reference to the entity that contains the **PropertyRef** element of this *M* parameter.
PropertyRef	An element that contains a reference to the column that corresponds to this *M* parameter.

2.1.8 TEntitySet

The **TEntitySet complex type** annotates the **EntitySet** element, as defined in [MC-CSDL] section 2.1.18. The **EntitySet** element defines a named set that can contain instances of an **entity**. More than one **EntitySet** element for a particular **EntityType** can be defined.

The **TEntitySet** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TEntitySet">
  <xs:attribute name="Caption" type="xs:string" use="optional" />
  <xs:attribute name="CollectionCaption" type="xs:string" use="optional" />
  <xs:attribute name="ReferenceName" type="xs:string" use="optional" />
  <xs:attribute name="Hidden" type="xs:boolean" default="false" use="optional" />
  <xs:attribute name="LineageTag" type="xs:string" use="optional" />
  <xs:attribute name="Private" type="xs:boolean" default="false" use="optional" />
  <xs:attribute name="ShowAsVariationsOnly" type="xs:boolean" default="false" use="optional"
/>
</xs:complexType>
```

The attributes that are defined by the **TEntitySet** complex type are specified in the following table.

Attribute	Description
Caption	Contains a user-friendly display name for the entity. If no caption is set in the model, no caption is displayed.
CollectionCaption	Contains the plural name for the entity.
ReferenceName	Contains the unmerged and fully qualified name of the entity, that is, the original **CubeDimension** ([MS-SSAS] section 2.2.4.2.2.9.1) name before munging.
Hidden	Indicates whether the entity is hidden. If the value of this attribute is "true", the entity is hidden.
LineageTag<47>	Returns a tag that represents the lineage of the entity.
Private<48>	Indicates whether the entity is private. If the value of this attribute is "true", the entity is private.
ShowAsVariationsOnly<49>	Indicates whether the entity is referenced as a variation. If the value of the attribute is "true", the entity is shown only when it is referenced as a variation.

2.1.9 TAssociationSet

The **TAssociationSet complex type** annotates the **AssociationSet** element, as defined in [MC-CSDL] section 2.1.19. There is one **association** set for every relationship between two **entity** types

(defined by **EntityType** elements). An association set provides a definition for grouping association instances so that they can be mapped to a data source.

The **TAssociationSet** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TAssociationSet">
  <xs:attribute name="State" type="bi:TState" default="Active" />
  <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  <xs:attribute name="CrossFilterDirection" type="bi:TCrossFilterDirection" default="Single"
/>
  <xs:attribute name="Behavior" type="bi:TBehavior" />
</xs:complexType>
```

The attributes that are defined by the **TAssociationSet** complex type are specified in the following table.

Attribute	Description
State	Indicates the state of an association set. The contents of this attribute are defined by the **TState** **simple type** (section 2.1.9.1). Where multiple association sets connect two **EntitySets**, no more than one association set can be marked as active.
Hidden	Indicates whether the association set is hidden from the client. If the value of this attribute is "true", the association set is hidden.
CrossFilterDirection<50>	Indicates how selections on values from one end of an association affect the entity at the other end of the association. The contents of this attribute are defined by the **TCrossFilterDirection** simple type (section 2.1.9.2).
Behavior<51>	Indicates whether the association is limited. The contents of this attribute are defined by the **TBehavior** simple type (section 2.1.9.3).

2.1.9.1 TState

The **TState** simple type enumerates the states that can be assigned to an association set.

The **TState** simple type is defined in the schema as follows.

```
<xs:simpleType name="TState">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Active" />
    <xs:enumeration value="Inactive" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TState** simple type are specified in the following table.

Value	Meaning
Active	The association set is active. This is the default value.
Inactive	The association set is inactive.

2.1.9.2 TCrossFilterDirection

In CSDLBI 2.0 and CSDLBI 2.5, the **TCrossFilterDirection** simple type<52> describes how data selections that involve an **entity** at one end of an association affect operations that target the entity at the opposite end of the same association.

The **TCrossFilterDirection** simple type is defined in the **schema** as follows.

```
<xs:simpleType name="TCrossFilterDirection">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Single" />
    <xs:enumeration value="Both" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TCrossFilterDirection** simple type are specified in the following table.

Value	Meaning
Single	Selections on the association end that is designated by a cardinality value of "One" propagate to the other end of the association. This is the default value.
Both	Selections on either association end propagate to the entity at the opposite association end, respectively.

2.1.9.3 TBehavior

In CSDLBI 2.0 and CSDLBI 2.5, the **TBehavior** simple type<53> identifies whether the association is limited.

The **TBehavior** simple type is defined in the **schema** as follows.

```
<xs:simpleType name="TBehavior">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Default" />
    <xs:enumeration value="Weak" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TBehavior** simple type are specified in the following table.

Value	Meaning
Default	This is a regular association. This is the default value.
Weak	This association is limited.

2.1.10 TCultures

In CSDLBI 2.0 and CSDLBI 2.5, the **TCultures** complex type<54> defines a collection of the translated names and/or descriptions for different cultures.

The **TCultures** complex type is defined in the schema as follows.

```
<xs:complexType name="TCultures">
  <xs:sequence>
    <xs:element name="Culture" type="bi:TCulture" minOccurs="0" maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>
```

The element that is defined by the **TCultures** complex type is specified in the following table.

Element	Description
Culture	An optional object that contains a collection of translations for different cultures.

2.1.11 TCulture

In CSDLBI 2.0 and CSDLBI 2.5, the **TCulture** complex type<55> contains the translated names and/or descriptions for the parent element that contains this **TCulture** element.

The **TCulture** complex type is defined in the schema as follows.

```
<xs:complexType name="TCulture">
  <xs:attribute name="Name" type="xs:string" use="required" />
  <xs:attribute name="Caption" type="xs:string" />
  <xs:attribute name="Description" type="xs:string" />
</xs:complexType>
```

The attributes that are defined by the **TCulture** complex type are specified in the following table.

Attribute	Description
Name	The name of the culture.
Caption	The translated user-friendly display name of the parent element that contains this **TCulture** element.
Description	The translated description of the parent element that contains this **TCulture** element.

2.1.12 TEntityType

The **TEntityType complex type** annotates the **EntityType** element, as defined in [MC-CSDL] section 2.1.2. The **EntityType** element represents the structure of a top-level concept, such as a customer or order, in a conceptual model. An **entity** type is a template for instances of entity types in an application.

The **TEntityType** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TEntityType">
  <xs:sequence>
    <xs:element name="DisplayKey" type="bi:TMemberRefs" minOccurs="0"
        maxOccurs="1" />
    <xs:element name="DefaultDetails" type="bi:TMemberRefs" minOccurs="0"
        maxOccurs="1" />
    <xs:element name="DefaultImage" minOccurs="0" maxOccurs="1">
      <xs:complexType>
```

```
            <xs:sequence>
              <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1"
          maxOccurs="1" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="DefaultMeasure" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1"
          maxOccurs="1" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="SortMembers" type="bi:TMemberRefs" minOccurs="0"
            maxOccurs="1" />
        <xs:element name="Hierarchy" type="bi:THierarchy" minOccurs="0"
            maxOccurs="unbounded" />
        <xs:element name="DisplayFolders" type="bi:TDisplayFolders" minOccurs="0"
            maxOccurs="1" />
        <xs:element name="Statistics" type="bi:TEntityStatistics" minOccurs="0"
            maxOccurs="1" />
      </xs:sequence>
      <xs:attribute name="Contents" type="xs:string" default="Regular"
            use="optional" />
      <xs:attribute name="IsCalculationGroup" type="xs:boolean" default="false" use="optional" />
    </xs:complexType>
```

The elements and attributes that are defined by the **TEntityType** complex type are specified in the following tables.

Element	Description
DisplayKey	A list of references to columns or to role ends that constitutes a strong **identifier** that uniquely identifies an entity instance. The list is expected to be unique. However, the SQL Server Analysis Services protocol [MS-SSAS], which provides CSDLBI output, does not verify that the list is unique.
DefaultDetails	A list of property references that, together, represent the larger set of columns in the table. A single property MUST be a column or a **measure**.
DefaultImage	A reference to a column that contains the image that illustrates the entity. In the Unified Dimensional Model (UDM), this element is represented by a binary attribute on the **dimension** attribute. If this element is present, it MUST contain exactly one **MemberRef** element whose contents are defined by the **TMemberRef** complex type (section 2.1.14).
DefaultMeasure	A reference to a measure that is used as the default representation for multiple instances of the entity. If this element is present, it MUST contain exactly one **MemberRef** element whose contents are defined by the **TMemberRef** complex type (section 2.1.14).
SortMembers	A list of properties on which to sort. **TSortDirection** (section 2.1.24.2) provides a hint to the sort engine about whether the order is ascending or descending.
Hierarchy	A list of **hierarchies** (**THierarchy**, section 2.1.15).
DisplayFolders	A collection of **display folders**.
Statistics	In CSDLBI 2.0 and CSDLBI 2.5, a set of statistics from the underlying data that is associated with the entity. These statistics are defined by the **TEntityStatistics** complex type and are provided only if they are not computationally expensive to generate, as described in section 2.1.31.

Attribute	Description
Contents	The type of data in the entity.
IsCalculationGroup<56>	Identifies whether the entity contains a calculation group. If the value of the attribute is "true", the entity contains a calculation group.

2.1.13 TMemberRefs

The **TMemberRefs complex type** defines a **collection** of members in which each member is contained in a **MemberRef** element.

The **TMemberRefs** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TMemberRefs">
  <xs:sequence>
    <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1"
      maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>
```

The element that is defined by the **TMemberRefs** complex type is specified in the following table.

Element	Description
MemberRef	A collection of members.

2.1.14 TMemberRef

The **TMemberRef complex type** identifies the name of the property that is contained in a **MemberRef** element.

The **TMemberRef** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TMemberRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>
```

The attribute that is defined by the **TMemberRef** complex type is specified in the following table.

Attribute	Description
Name	The name of the property that is contained in a **MemberRef** element.

2.1.15 THierarchy

In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, the **THierarchy complex type** specifies the content of a **hierarchy**. A hierarchy exposes the same set of attributes as do other members, such as columns (that are exposed as properties) and **measures**. Therefore, the **THierarchy** type is derived from the base **TMember** type (section 2.1.19).

The **THierarchy** complex type is defined in the **schema** as follows.

```
<xs:complexType name="THierarchy">
  <xs:complexContent>
    <xs:extension base="bi:TMember">
      <xs:sequence>
        <xs:element name="Documentation" type="bi:TDocumentation"
         minOccurs="0" maxOccurs="1" />
        <xs:element name="Cultures" type="bi:TCultures" minOccurs="0" maxOccurs="1" />
        <xs:element name="Level" type="bi:TLevel" minOccurs="1"
         maxOccurs="unbounded" />
      </xs:sequence>
      <xs:attribute name="Name" type="xs:string" use="required" />
      <xs:attribute name="LineageTag" type="xs:string" use="optional" />
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

The elements and attributes that are defined by the **THierarchy** complex type are specified in the following tables.

Element	Description
Documentation	A description of the hierarchy. The contents of this element are defined by the **TDocumentation** complex type (section 2.1.20).
Cultures<57>	In CSDLBI 2.0 and CSDLBI 2.5, when the PRINT_ALL_TRANSLATIONS (as specified in [MS-SSAS] section 3.1.4.2.2.1.3.61.2) flag is set, the **Cultures** element is added for translations. The contents of this element are defined by the **TCultures** complex type (section 2.1.10).
Level	A single **level** of the hierarchy. The contents of this element are defined by the **TLevel** complex type (section 2.1.21). The minimum number of **Level** elements is 1, and there is no upper limit.

Attribute	Description
Name	The name of the hierarchy.
LineageTag<58>	Returns a tag that represents the lineage of the hierarchy.

2.1.16 THierarchyRef

In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, the **THierarchyRef complex type** identifies the name of a hierarchy.

The **THierarchyRef** complex type is defined in the **schema** as follows.

```
<xs:complexType name="THierarchyRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>
```

The attribute that is defined by the **THierarchyRef** complex type is specified in the following table.

Attribute	Description
Name	The name of the hierarchy.

2.1.17 TDisplayFolders

The **TDisplayFolders** **complex type** defines a **collection** of display folders in which each is contained in a **DisplayFolder** element.

The **TDisplayFolders** complex type is defined in the **schema** as follows.

```
    <xs:complexType name="TDisplayFolders">
  <xs:sequence>
        <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
           minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
 </xs:complexType>
```

The element that is defined by the **TDisplayFolders** complex type is specified in the following table.

Element	Description
DisplayFolder	A collection of display folders.

2.1.18 TDisplayFolder

The **TDisplayFolder** **complex type** specifies the content of a **display folder**.

The **TDisplayFolder** complex type is defined in the **schema** as follows.

```
  <xs:complexType name="TDisplayFolder">
    <xs:sequence>
      <xs:element name="PropertyRef" type="bi:TPropertyRef"
         minOccurs="0" maxOccurs="unbounded" />
      <xs:element name="HierarchyRef" type="bi:THierarchyRef"
         minOccurs="0" maxOccurs="unbounded" />
      <xs:element name="Cultures" type="bi:TCultures" minOccurs="0"
         maxOccurs="1" />
      <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
         minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
    <xs:attribute name="Name" type="xs:string" use="required" />
    <xs:attribute name="Caption" type="xs:string" use="optional" />
  </xs:complexType>
```

The elements and attributes that are defined by the **TDisplayFolder** complex type are specified in the following tables.

Element	Description
PropertyRef	A reference to a property within this folder.
HierarchyRef	In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, the **HierarchyRef** element identifies a

Element	Description
	reference to a hierarchy within this folder.
Cultures<59>	In CSDLBI 2.0 and CSDLBI 2.5, when the PRINT_ALL_TRANSLATIONS flag is set, the **Cultures** element is added for translations. The contents of this element are defined by the **TCultures** complex type (section 2.1.10).
DisplayFolder	A collection of nested child display folders.

Attribute	Description
Name	The name of the display folder.
Caption	The translated user-friendly display name for the display folder.

2.1.19 TMember

The **TMember complex type** is a base type. Its attributes can appear in columns, **measures**, navigation properties, **hierarchies**, and **levels**.

The **TMember** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TMember" abstract="true">
  <xs:attribute name="Caption" type="xs:string" use="optional" />
  <xs:attribute name="ContextualNameRule" type="bi:TContextualNameRule"
      default="None" />
  <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  <xs:attribute name="ReferenceName" type="xs:string" use="optional" />
</xs:complexType>
```

The attributes that are defined by the **TMember** complex type are specified in the following table.

Attribute	Description
Caption<60>	The display name for the member.
ContextualNameRule	The naming format that is used to disambiguate members. The contents of this attribute are defined by the **TContextualNameRule simple type** (section 2.1.19.1).
Hidden	A Boolean value that indicates whether the member is hidden from the client. If the value of this attribute is "true", the member is hidden.
ReferenceName	The **identifier** that is used to reference the member in a Data Analysis Expressions (DAX) query. If this attribute is omitted, the field name is used.

2.1.19.1   TContextualNameRule

The **TContextualNameRule** simple type enumerates the naming formats that can be used to disambiguate members. **TContextualNameRule** provides a hint to client applications for creating unambiguous names for **CalculationProperty**, as defined in [MS-SSAS] section 2.2.4.2.2.10.1.

The **TContextualNameRule** simple type is defined in the schema as follows.

```xml
<xs:simpleType name="TContextualNameRule">
  <xs:restriction base="xs:string">
    <xs:enumeration value="None" />
    <xs:enumeration value="Context" />
    <xs:enumeration value="Merge" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TContextualNameRule** simple type are specified in the following table.

Value	Meaning
None	Use the attribute name.
Context	Use the incoming relationship name.
Merge	Concatenate the incoming relationship name and the **CalculationProperty** name, in compliance with the language grammar.

2.1.20 TDocumentation

The **TDocumentation** complex type defines the contents of the **Documentation** element. The **Documentation** element provides information about an object that is defined in the parent element that contains the **Documentation** element.

The **TDocumentation** complex type is defined in the schema as follows.

```xml
<xs:complexType name="TDocumentation">
  <xs:sequence>
    <xs:element name="Summary" type="xs:string" minOccurs="0" maxOccurs="1" />
  </xs:sequence>
</xs:complexType>
```

The element that is defined by the **TDocumentation** complex type is specified in the following table.

Element	Description
Summary	A description of a parent element's object.

2.1.21 TLevel

In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, the **TLevel** complex type specifies a **hierarchy level**. The **TLevel** type is derived from the base **TMember** type (section 2.1.19).

The **TLevel** complex type is defined in the schema as follows.

```xml
<xs:complexType name="TLevel">
 <xs:complexContent>
  <xs:extension base="bi:TMember">
   <xs:sequence>
    <xs:element name="Cultures" type="bi:TCultures" minOccurs="0"
        maxOccurs="1" />
    <xs:element name="Source" minOccurs="0" maxOccurs="1">
```

```
         <xs:complexType>
          <xs:sequence>
           <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
               maxOccurs="1" />
          </xs:sequence>
         </xs:complexType>
        </xs:element>
        <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0" maxOccurs="1" />
        <xs:element name="ContainsHiddenMembers" minOccurs="0" maxOccurs="1">
         <xs:complexType>
          <xs:sequence>
           <xs:element name="HideMembers" type="bi:THideMembers" minOccurs="1" maxOccurs="1" />
          </xs:sequence>
         </xs:complexType>
        </xs:element>
       </xs:sequence>
       <xs:attribute name="Name" type="xs:string" use="required" />
       <xs:attribute name="LineageTag" type="xs:string" use="optional" />
      </xs:extension>
     </xs:complexContent>
    </xs:complexType>
```

The elements and attributes that are defined by the **TLevel** complex type are specified in the following table.

Element	Description
Cultures<61>	In CSDLBI 2.0 and CSDLBI 2.5, when the PRINT_ALL_TRANSLATIONS flag is set, the **Cultures** element is added for translations. The contents of this element are defined by the **TCultures** complex type (section 2.1.10).
Source	A container element for the **PropertyRef** element (section 2.1.26).
Source.PropertyRef	A property reference that points back to an instance property. The caption, description, name, and reference name can be drawn from the referenced instance property, if they are not specified for the **TLevel** complex type.
Documentation	A description of the level. The contents of this element are defined by the **TDocumentation** complex type (section 2.1.20).
ContainsHiddenMembers<62>	In CSDLBI 2.0 and CSDLBI 2.5, a complex type property that indicates whether hidden members are contained.
ContainsHiddenMembers.HideMembers	In CSDLBI 2.0 and CSDLBI 2.5, a simple type property that indicates whether and when a member is hidden.

Attribute	Description
Name	The name of the level.
LineageTag<63>	Returns a tag that represents the lineage of the level.

2.1.21.1   THideMembers

In CSDLBI 2.0 and CSDLBI 2.5, the **THideMembers** simple type<64> indicates whether and when a level member is hidden from client applications.

The **THideMembers** simple type is defined in the schema as follows.

```xml
<xs:simpleType name="THideMembers">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Never" />
    <xs:enumeration value="OnlyChildWithNoName" />
    <xs:enumeration value="OnlyChildWithParentName" />
    <xs:enumeration value="NoName" />
    <xs:enumeration value="ParentName" />
    <xs:enumeration value="BlankKey" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **THideMembers** simple type are specified in the following table.

Value	Meaning
Never	Members are never hidden. This is the default value.
OnlyChildWithNoName	A member is hidden when it is the only child of its parent and its name is empty.
OnlyChildWithParentName	A member is hidden when it is the only child of its parent and its name is identical to that of its parent.
NoName	A member is hidden when its name is empty.
ParentName	A member is hidden when its name is identical to that of its parent.
BlankKey	A member is hidden when the value is empty.

2.1.22 TProperty

The **TProperty** complex type annotates the **Property** element that is defined in [MC-CSDL] section 2.1.3. The **TProperty** complex type is an extension of the **TBaseProperty** complex type (section 2.1.24) that adds attributes that appear only in instance columns.

The **TProperty** complex type is defined in the schema as follows.

```xml
<xs:complexType name="TProperty">
  <xs:complexContent>
    <xs:extension base="bi:TBaseProperty">
      <xs:sequence>
        <xs:element name="DefaultValue" type="xs:anyType" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="Cultures" type="bi:TCultures" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="GroupBy" type="bi:TPropertyRefs" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="FilterNullsBy" type="bi:TPropertyRefs" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="OrderBy" type="bi:TPropertyRefs" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="RelatedTo" type="bi:TPropertyRefs" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="Statistics" type="bi:TPropertyStatistics" minOccurs="0"
         maxOccurs="1" />

      </xs:sequence>
      <xs:attribute name="Private" type="xs:boolean" default="false" use="optional" />
      <xs:attribute name="Contents" type="bi:TContents" use="optional"
      default="Regular" />
```

```
        <xs:attribute name="DefaultAggregateFunction"
        type="bi:TDefaultAggregateFunction" default="Default" />
        <xs:attribute name="GroupingBehavior" type="bi:TGroupingBehavior"
        default="GroupOnValue" />
        <xs:attribute name="Stability" type="bi:TStability" default="Stable" />
        <xs:attribute name="AggregateBehavior" type="xs:boolean" default="true"
  use="optional" />
        <xs:attribute name="LocaleImpact" type="xs:boolean" default="false" use="optional" />
        <xs:attribute name="LineageTag" type="xs:string" use="optional" />
        <xs:attribute name="IsError" type="xs:boolean" default="false" />
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
```

The elements and attributes that are defined by the **TProperty** complex type are specified in the following tables.

Element	Description
DefaultValue	In CSDLBI 2.0 and CSDLBI 2.5, a property that specifies the value that is to be used when evaluating the query. The **DefaultValue** property is optional, but it is automatically selected if the values from the member cannot be aggregated.
Cultures<65>	In CSDLBI 2.0 and CSDLBI 2.5, when the PRINT_ALL_TRANSLATIONS flag is set, the **Cultures** element is added for translations. The contents of this element are defined by the **TCultures** complex type (section 2.1.10).
GroupBy	In CSDLBI 2.0 and CSDLBI 2.5, a reference to other properties within the entity that MUST be used as group-by columns when the Data Analysis Expressions (DAX) query contains the current property. Otherwise, the query will fail.
FilterNullsBy	In CSDLBI 2.0 and CSDLBI 2.5, a reference to other properties within the entity that are to be used in DAX queries to properly construct a filter by NULL values.
OrderBy	A reference to a property within the entity that defines the sort order for that property's values. The values for the current property and the **OrderBy** property are mapped 1-to-1. Otherwise, the sort behavior is undefined. If this element is omitted, the properties are sorted based on their values.
RelatedTo	In CSDLBI 2.0 and CSDLBI 2.5, a reference to other properties within the entity that are related to the current property. This information can be used to construct DAX queries that will give the same results as equivalent multidimensional expression (MDX) queries that take attribute relationships into account.
Statistics	In CSDLBI 2.0 and CSDLBI 2.5, a set of statistics from the underlying data that is associated with the column. These statistics are defined by the **TPropertyStatistics** complex type and are provided only if they are not computationally expensive to generate, as described in section 2.1.23.

Attribute	Description
Private<66>	Indicates whether the property is private. If the value of this attribute is "true", the property is private.
Contents	Specifies the type of data in a column. This value is drawn from the **DimensionAttribute** complex type, as defined in [MS-SSAS] section 2.2.4.2.2.8.1. The contents of this attribute are defined by the **TContents** simple type (section 2.1.22.1).
DefaultAggregateFunction	Indicates the default aggregate function, if any, that is typically used to summarize properties. The contents of this attribute are defined by the

Attribute	Description
	TDefaultAggregateFunction simple type (section 2.1.22.2).
GroupingBehavior	Specifies how query results are grouped. The attribute's contents are defined by the **TGroupingBehavior** simple type (section 2.1.22.3).
Stability	Specifies the stability of a declared property between refresh operations. This attribute is set on columns that contain a row number or other volatile value (such as NOW()). This attribute is emitted only for an unstable value. The contents of this attribute are defined by the **TStability** simple type (section 2.1.22.4).
AggregateBehavior	Indicates whether to avoid aggregations over this property. If the value of this attribute is "false", aggregations of other properties over this property is to be avoided.
LocaleImpact	Indicates whether this property is automatically affected by the locale.
LineageTag<67>	Returns a tag that represents the lineage of the property.
IsError<68>	Indicates that the property has an error in its expression.

2.1.22.1   TContents

The **TContents** simple type is a string that contains the possible types of data in a column. The **TContents** value is derived from the **DimensionAttributeTypeEnumType** simple type that is included in the definition of the **DimensionAttribute** complex type, as specified in [MS-SSAS] section 2.2.4.2.2.8.1. If the enumeration value in **DimensionAttributeTypeEnumType** is "ExtendedType", the **TContents** value is derived from the **ExtendedType** element of **DimensionAttribute**. The client is not required to respond to these values.

The **TContents** simple type is defined in the schema as follows.

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

2.1.22.2   TDefaultAggregateFunction

The **TDefaultAggregateFunction** simple type enumerates the aggregate functions that can be used by reporting tools to summarize attribute values.

The **TDefaultAggregateFunction** simple type is defined in the schema as follows.

```
<xs:simpleType name="TDefaultAggregateFunction">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Default" />
    <xs:enumeration value="None" />
    <xs:enumeration value="Sum" />
    <xs:enumeration value="Count" />
    <xs:enumeration value="Average" />
    <xs:enumeration value="Min" />
    <xs:enumeration value="Max" />
    <xs:enumeration value="DistinctCount" />
  </xs:restriction>

</xs:simpleType>
```

The possible values for the **TDefaultAggregateFunction** simple type are specified in the following table.

Value	Meaning
Default	Automatically selects the appropriate aggregate function based on the data type.
None	Does not use aggregate functions.
Sum	Uses the aggregate function **Sum**.
Count	Uses the aggregate function **Count**.
Average	Uses the aggregate function **Average**.
Min	Uses the aggregate function **Min**.
Max	Uses the aggregate function **Max**.
DistinctCount	Uses the aggregate function **DistinctCount**.

2.1.22.3   TGroupingBehavior

The **TGroupingBehavior** simple type enumerates the options that are available for building queries in a hierarchy.

The **TGroupingBehavior** simple type is defined in the schema as follows.

```
<xs:simpleType name="TGroupingBehavior">
  <xs:restriction base="xs:string">
    <xs:enumeration value="GroupOnValue" />
    <xs:enumeration value="GroupOnEntityKey" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TGroupingBehavior** simple type are specified in the following table.

Value	Meaning
GroupOnValue	Group by value.
GroupOnEntityKey	Group by entity key.

The meaning of these two values can be illustrated by considering a query to show the total payroll deductions for an employee named "Brian Smith" in a company that has several employees named "Brian Smith". If the value "GroupOnValue" is used, the result shows the combined total of payroll deductions for all employees named "Brian Smith" that are represented in the database. If the value "GroupOnEntityKey" is used, the result shows the separate payroll deductions for each employee named "Brian Smith" in the database.

2.1.22.4   TStability

The **TStability** simple type enumerates the acceptable values for specifying the stability of a declared property between refresh operations.

The **TStability** simple type is defined in the schema as follows.

```
<xs:simpleType name="TStability">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Stable" />
    <xs:enumeration value="RowNumber" />
   <xs:enumeration value="Volatile" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TStability** simple type are specified in the following table.

Value	Meaning
Stable	The property remains constant between refresh operations.
RowNumber	The property contains a row number.
Volatile	The property might not remain constant between refresh operations.

2.1.23 TPropertyStatistics

In CSDLBI 2.0 and CSDLBI 2.5, the **TPropertyStatistics** complex type defines statistics that are computed over the data that is associated with a column.

Statistics are provided only if the computation is not prevented by use of certain advanced product features such as dimension security, row-level security, and columns with non-ordered attribute hierarchies. Because statistics are not provided if they are computationally expensive to generate, the response is not guaranteed to include statistics.

The **TPropertyStatistics** complex type is defined in the schema as follows.

```
<xs:complexType name="TPropertyStatistics">
  <xs:sequence>
    <xs:element name="MinValue" type="xs:anyType" minOccurs="0" maxOccurs="1" />
    <xs:element name="MaxValue" type="xs:anyType" minOccurs="0" maxOccurs="1" />
  </xs:sequence>
  <xs:attribute name="DistinctValueCount" type="xs:long" use="optional" />
  <xs:attribute name="StringValueMaxLength" type="xs:long" use="optional" />
</xs:complexType>
```

The elements and attributes that are defined by the **TPropertyStatistics** complex type are specified in the following tables.

Element	Description
MinValue	The smallest data value present in the column. The type of this value varies to match the data type of the column. Note that the ordering of values in the column is based on the attribute hierarchy for the column.
MaxValue	The largest data value present in the column. The type of this value varies to match the data type of the column. Note that the ordering of values in the column is based on the attribute hierarchy for the column.

Attribute	Description
DistinctValueCount	The number of unique values present in the column.
StringValueMaxLength	An upper bound on the maximum length of any string value in the column. Note that this value can be larger than the longest string length but cannot be shorter than the longest string length.

2.1.24 TBaseProperty

The **TBaseProperty** complex type is an extension of the **TMember** type (section 2.1.19) that adds attributes that appear only in columns and measures.

The **TBaseProperty** complex type is defined in the schema as follows.

```
<xs:complexType name="TBaseProperty" abstract="true">
  <xs:complexContent>
    <xs:extension base="bi:TMember">
      <xs:attribute name="Alignment" type="bi:TAlignment" use="optional" />
      <xs:attribute name="FormatString" type="xs:string" use="optional" />
      <xs:attribute name="Units" type="xs:string" use="optional" />
      <xs:attribute name="SortDirection" type="bi:TSortDirection"
            default="Default" />
      <xs:attribute name="IsRightToLeft" type="xs:boolean" default="false" />
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

The attributes that are defined by the **TBaseProperty** complex type are specified in the following table.

Attribute	Description
Alignment	A value that indicates how the field values are to be aligned in a tabular presentation. If this attribute is omitted, the default determines the alignment based on the field's data type. The contents of this attribute are defined by the **TAlignment** simple type (section 2.1.24.1).
FormatString	A format string that defines the default client formatting for date and time values. If this attribute is omitted, the following format string values are assumed: ▪ Integer fields: "g" ▪ Decimal data type fields: "#,0.00" ▪ Double data type fields: "#,0.00" ▪ Date and time fields: "d" For all other kinds of fields, no format string applies.
Units	The symbol that is applied to field values to express units. If this attribute is omitted, the units are assumed to be unknown.
SortDirection	A value that indicates how the field values are typically sorted. If this attribute is omitted, the default value assigns a sort direction based on the field's data type. The contents of this attribute are defined by the **TSortDirection** simple type (section 2.1.24.2).
IsRightToLeft	A Boolean value that indicates whether the field contains text that can be read from right to left. If this attribute is omitted, the model setting is assumed.

2.1.24.1   TAlignment

The **TAlignment** simple type enumerates the types of justification that can be used in a column.

The **TAlignment** simple type is defined in the schema as follows.

```
<xs:simpleType name="TAlignment">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Default" />
    <xs:enumeration value="Left" />
    <xs:enumeration value="Right" />
    <xs:enumeration value="Center" />
  </xs:restriction>
</xs:simpleType>
```

The possible values for the **TAlignment** simple type are specified in the following table.

Value	Meaning
Default	Automatically sets the appropriate justification that corresponds to the data type.
Left	Sets the justification to left aligned.
Right	Sets the justification to right aligned.
Center	Sets the justification to center aligned.

2.1.24.2   TSortDirection

The **TSortDirection** simple type enumerates sort directions.

The **TSortDirection** simple type is defined in the schema as follows.

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

The possible values for the **TSortDirection** simple type are specified in the following table.

Value	Meaning
Default	The default sort direction. The default is based on data type.
Ascending	The ascending sort direction.
Descending	The descending sort direction.

2.1.25 TPropertyRefs

The **TPropertyRefs complex type** defines a **collection** of properties, with each property contained in a **PropertyRef** element.

The **TPropertyRefs** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TPropertyRefs">
  <xs:sequence>
    <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
      maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>
```

The element that is defined by the **TPropertyRefs** complex type is specified in the following table.

Element	Description
PropertyRef	A collection of properties.

2.1.26 TPropertyRef

The **TPropertyRef** complex type identifies the name of the property that is contained in a **PropertyRef** element. The **PropertyRef** name MUST match the name of one of the **Property** elements within the same **EntityType** element, as defined in [MC-CSDL] section 2.1.2.

The **TPropertyRef** complex type is defined in the schema as follows.

```
<xs:complexType name="TPropertyRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>
```

The attribute that is defined by the **TPropertyRef** complex type is specified in the following table.

Attribute	Description
Name	The name of a property that is contained in a **PropertyRef** element.

2.1.27 TMeasure

The **TMeasure** complex type is an extension of the **TBaseProperty** type (section 2.1.24), adding components that appear only in measures.

The **TMeasure** complex type is defined in the schema as follows.

```
<xs:complexType name="TMeasure">
  <xs:complexContent>
    <xs:extension base="bi:TBaseProperty">
      <xs:sequence>
        <xs:element name="Cultures" type="bi:TCultures" minOccurs="0"
         maxOccurs="1" />
        <xs:element name="Kpi" type="bi:TKpi" minOccurs="0" maxOccurs="1" />
        <xs:element name="FormatBy" type="bi:TPropertyRefs" minOccurs="0"
```

```
     maxOccurs="1" />
    <xs:element name="ApplyCulture" type="bi:TPropertyRefs" minOccurs="0"
     maxOccurs="1" />
    <xs:element name="ContainsDetailRows" type="xs:boolean" minOccurs="0"
     maxOccurs="1" />
    <xs:element name="DistributiveBy" type="bi:TDistributiveBy" minOccurs="0"
     maxOccurs="1" />
   </xs:sequence>
   <xs:attribute name="Private" type="xs:boolean" default="true" use="optional" />
   <xs:attribute name="IsSimpleMeasure" type="xs:boolean" default="true" />
   <xs:attribute name="ActualType" type="xs:string" />
   <xs:attribute name="Contents" type="xs:string" />
   <xs:attribute name="LineageTag" type="xs:string" use="optional" />
   <xs:attribute name="IsError" type="xs:boolean" default="false" />
  </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

The elements and attributes that are defined by the **TMeasure** complex type are specified in the following tables.

Element	Description
Cultures<69>	In CSDLBI 2.0 and CSDLBI 2.5, when the PRINT_ALL_TRANSLATIONS flag is set, the **Cultures** element is added for translations. The contents of this element are defined by the **TCultures** complex type (section 2.1.10).
Kpi	In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, a key performance indicator (KPI). The contents of this element are defined by the **TKpi** complex type (section 2.1.29).
FormatBy	In CSDLBI 2.0 and CSDLBI 2.5, a reference to a measure within the entity that contains a format string for the current measure. It can be used to apply proper formatting to the values of the current measure.
ApplyCulture	In CSDLBI 2.0 and CSDLBI 2.5, a reference to a measure within the entity that contains a culture for each value of the current measure. It can be used to apply proper transformation on the values of current measure in order to display them properly.
ContainsDetailRows<70>	In CSDLBI 2.0 and CSDLBI 2.5, a Boolean value that indicates whether the measure contains a user-defined **DetailRows** expression, as specified in [MS-SSAS-T] section 2.2.5.28. A value of "true" means that a **DetailRows** expression is defined either on this measure or on the table that owns this measure and that the **DetailRows** expression does not refer to any restricted objects in the model.
DistributiveBy<71>	Indicates the entity over which the parent measure is additive. The contents of this element are defined by the **TDistributiveBy** complex type (section 2.1.28).

Attribute	Description
Private<72>	Indicates whether the measure is private. If the value of this attribute is "true", this measure is private.
IsSimpleMeasure	A Boolean value that indicates whether the formula that is used in the measure is one of the simple aggregations (Sum, Count, Min, Max, Avg, DistinctCount). The value "true" means that one of the simple aggregations is used. The actual value is derived from the **IsSimpleMeasure** element in the model, as specified in [MS-SSAS] section 2.2.4.2.2.10.2.
ActualType	In CSDLBI 2.0 and CSDLBI 2.5, a string value that, if present, contains "Any" as the only possible value, which indicates that the actual measure type could change for each value. If

Attribute	Description
	so, the **Type** attribute of the **Property** element (see [MC-CSDL] section 2.1.3) is only a suggestion of what default data type is to be used when the client attempts to visualize values.
Contents<73>	The type of data in the measure.
LineageTag<74>	Returns a tag that represents the lineage of the measure.
IsError<75>	Indicates that the measure has an error in its expression.

2.1.28 TDistributiveBy

The **TDistributiveBy complex type**<76> indicates the entity over which the parent measure is additive.

The **TDistributiveBy** complex type is defined in the **schema** as follows.

```
<xs:complexType name="TDistributiveBy">
  <xs:sequence>
    <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
  </xs:sequence>
  <xs:attribute name="AggregationKind" type="bi:TAggregationKind" use="required" />
</xs:complexType>
```

The element and attribute that are defined by the **TDistributiveBy** complex type are specified in the following tables.

Element	Description
EntityRef	The entity over which the measure is additive.

Attribute	Description
AggregationKind<77>	Indicates the aggregation used in the parent measure. The contents of this element are defined by the **TAggregationKind** simple type (section 2.1.28.1).

2.1.28.1   TAggregationKind

The **TAggregationKind** simple type<78> indicates the aggregation used in the parent measure.

The **TAggregationKind** simple type is defined in the schema as follows.

```
<xs:simpleType name="TAggregationKind">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Sum" />
    <xs:enumeration value="Min" />
    <xs:enumeration value="Max" />
    <xs:enumeration value="Count" />
  </xs:restriction>
```

```
      </xs:simpleType>
```

The possible values for the **TAggregationKind** simple type are specified in the following table.

Value	Meaning
Sum	Uses the aggregate function **Sum**.
Min	Uses the aggregate function **Min**.
Max	Uses the aggregate function **Max**.
Count	Uses the aggregate function **Count**.

2.1.29 TKpi

In CSDLBI 1.1, CSDLBI 2.0, and CSDLBI 2.5, the **TKpi** complex type defines a calculation that can be used as a key performance indicator (KPI). In a business intelligence data model, a KPI is based on a measure. The definition of the KPI contains all the metadata that is associated with measures and information that is needed for the presentation of the KPI values.

The **TKpi** complex type does not specify the formula that is contained in the measure definition. Instead, it specifies the additional metadata that is associated with measures that are used as KPIs. After a measure is designated as a KPI, it is exposed only as a KPI.

The **TKpi** complex type lists attributes that are included only with a **TMeasure** complex type (section 2.1.27).

The **TKpi** complex type is defined in the schema as follows.

```
<xs:complexType name="TKpi">
  <xs:sequence>
    <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0"
      maxOccurs="1" />
    <xs:element name="KpiGoal" minOccurs="0" maxOccurs="1">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
          maxOccurs="1" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name="KpiStatus" minOccurs="0" maxOccurs="1">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1" maxOccurs="1"
/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name="KpiTrend" minOccurs="0" maxOccurs="1">
      <xs:complexType>

        <xs:sequence>
          <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
            maxOccurs="1" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
```

```
              <xs:attribute name="StatusGraphic" type="xs:string" use="optional" />
              <xs:attribute name="TrendGraphic" type="xs:string" use="optional" />
      </xs:complexType>
```

The elements and attributes that are defined by the **TKpi** complex type are specified in the following tables.

Element	Description
Documentation	An element that contains information about the KPI. The contents of this element are defined by the **TDocumentation** complex type (section 2.1.20).
KpiGoal	An element that contains the reference to the property that contains the KPI goal value. This element MUST contain exactly one **PropertyRef** element. The contents of this element are defined by the **TPropertyRef** complex type (section 2.1.26).
KpiStatus	An element that contains the reference to a property that contains the value as the status indicator in a KPI. This element MUST contain exactly one **PropertyRef** element. The contents of this element are defined by the **TPropertyRef** complex type (section 2.1.26).
KpiTrend	In CSDLBI 2.0 and CSDLBI 2.5, an element that contains the reference to a property that contains the KPI trend. This element MUST contain exactly one **PropertyRef** element. The contents of this element are defined by the **TPropertyRef** complex type (section 2.1.26).

Attribute	Description
StatusGraphic	A reference to an image that indicates negative, neutral, or positive progress against the targets defined in the KPI.
TrendGraphic	In CSDLBI 2.0 and CSDLBI 2.5, a reference to an image that indicates the KPI trend.

2.1.30 TNavigationProperty

The **TNavigationProperty** complex type annotates the **NavigationProperty** element, as defined in [MC-CSDL] section 2.1.4. The **TNavigationProperty** complex type is an extension of the **TMember** complex type (section 2.1.19), adding an attribute that appears only in navigation properties.

The **TNavigationProperty** complex type is defined in the schema as follows.

```
      <xs:complexType name="TNavigationProperty">
        <xs:complexContent>
          <xs:extension base="bi:TMember">
            <xs:attribute name="CollectionCaption" type="xs:string" use="optional" />
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>
```

The attribute that is defined by the **TNavigationProperty** complex type is specified in the following table.

Attribute	Description
CollectionCaption	Plural name for referring to a set of instances of the navigation property. If this attribute is omitted, the **TMember.Caption** attribute is used.

2.1.31 TEntityStatistics

In CSDLBI 2.0 and CSDLBI 2.5, the **TEntityStatistics** complex type defines statistics that are computed over the data that is associated with the entity.

Statistics are provided only if the computation is not prevented by use of certain advanced product features such as dimension security and row-level security. Because statistics are not provided if they are computationally expensive to generate, the response is not guaranteed to include statistics.

The **TEntityStatistics** complex type is defined in the schema as follows.

```
<xs:complexType name="TEntityStatistics">
  <xs:attribute name="RowCount" type="xs:long" use="optional" />
</xs:complexType>
```

The attribute that is defined by the **TEntityStatistics** complex type is specified in the following table.

Attribute	Description
RowCount	The number of rows present in the table described by the entity.

2.1.32 TEntityRef

The **TEntityRef** complex type identifies the name of an entity.

The **TEntityRef** complex type is defined in the schema as follows.

```
<xs:complexType name="TEntityRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>
```

The attribute that is defined by the **TEntityRef** complex type is specified in the following table.

Attribute	Description
Name	The name of the entity.

3   Structure Examples

The following samples of **CSDLBI** code are annotated structures that are populated with values that represent common use cases. The examples illustrate the structures that are specified in this document but do not cover all possible usage scenarios. These samples are not intended to replace this specification but only to clarify and enhance the specification.

3.1   CSDLBI 1.0

```
        <Schema xmlns="http://schemas.microsoft.com/ado/2008/09/edm"
xmlns:edm_annotation="http://schemas.microsoft.com/ado/2009/02/edm/annotation"
xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions" bi:Version="1.0"
Namespace="Sandbox">
            <EntityContainer Name="Sandbox">
              <Documentation>
                <Summary>DescriptionRolePlayingDimensionsDB</Summary>
              </Documentation>
              <EntitySet Name="DimCustomer" EntityType="Sandbox.DimCustomer">
                <Documentation>
                   <Summary>Description_Dimension_DimCustomer</Summary>
                </Documentation>
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimEmployee" EntityType="Sandbox.DimEmployee">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimGeography" EntityType="Sandbox.DimGeography">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimProduct" EntityType="Sandbox.DimProduct">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimProductCategory" EntityType="Sandbox.DimProductCategory">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimProductSubcategory"
EntityType="Sandbox.DimProductSubcategory">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimStore" EntityType="Sandbox.DimStore">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="DimTime" EntityType="Sandbox.DimTime">
                <bi:EntitySet />
              </EntitySet>
              <EntitySet Name="FactInternetSales" EntityType="Sandbox.FactInternetSales">
                <bi:EntitySet />
              </EntitySet>
              <AssociationSet Name="DimCustomer DimGeography Geography"
Association="Sandbox.DimCustomer_DimGeography_Geography">
                <End EntitySet="DimCustomer" />
                <End EntitySet="DimGeography" />
                <bi:AssociationSet />
              </AssociationSet>
              <AssociationSet Name="DimProduct DimProductSubcategory Subcategory"
Association="Sandbox.DimProduct_DimProductSubcategory_Subcategory">
                <End EntitySet="DimProduct" />
                <End EntitySet="DimProductSubcategory" />
                <bi:AssociationSet />
              </AssociationSet>
              <AssociationSet Name="DimProductSubcategory DimProductCategory Category"
Association="Sandbox.DimProductSubcategory_DimProductCategory_Category">
                <End EntitySet="DimProductSubcategory" />
                <End EntitySet="DimProductCategory" />
                <bi:AssociationSet />
              </AssociationSet>
```

```
            <AssociationSet Name="DimStore DimGeography Geography2"
Association="Sandbox.DimStore_DimGeography_Geography2">
                <End EntitySet="DimStore" />
                <End EntitySet="DimGeography" />
                <bi:AssociationSet State="Inactive" />
            </AssociationSet>
            <AssociationSet Name="FactInternetSales_DimCustomer_Customer2"
Association="Sandbox.FactInternetSales_DimCustomer_Customer2">
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            <AssociationSet Name="FactInternetSales_DimCustomer_Customer_2"
Association="Sandbox.FactInternetSales_DimCustomer_Customer_2">
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                <End EntitySet="DimCustomer" />
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            <AssociationSet Name="FactInternetSales DimTime Time 3"
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Association="Sandbox.FactInternetSales_DimProduct_Product2">
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/>
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        </Property>
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        </Property>
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ToRole="Geography">
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                    </Documentation>
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ContextualNameRule="Context" />
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                        <bi:MemberRef Name="Title" />
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```xml
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```xml
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ToRole="Subcategory">
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            <Property Name="SalesAmount" Type="Decimal" Precision="19" Scale="4">
              <bi:Property />
            </Property>
            <Property Name="TaxAmt" Type="Decimal" Precision="19" Scale="4">
              <bi:Property />
            </Property>
            <Property Name="Freight" Type="Decimal" Precision="19" Scale="4">
              <bi:Property />
            </Property>
            <Property Name="CarrierTrackingNumber" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="CustomerPONumber" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="EmployeeKey" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="BillingCustomerKey" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="StoreKey" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="TotalSales" Type="Int64">
              <Documentation>
                <Summary>DescriptionRolePlayingDimensionsDB</Summary>
              </Documentation>
              <bi:Measure Caption="CaptionRolePlayingDimensionsDB"
ContextualNameRule="Context" Alignment="Right"
```

```
FormatString="&quot;$&quot;#,0.00;(&quot;$&quot;#,0.00);&quot;$&quot;#,0.00" Units="money"
SortDirection="Ascending" IsRightToLeft="true" IsSimpleMeasure="true" />
            </Property>
            <NavigationProperty Name="Customer2"
Relationship="Sandbox.FactInternetSales_DimCustomer_Customer2" FromRole="Sales"
ToRole="Customer2">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Customer_2"
Relationship="Sandbox.FactInternetSales DimCustomer Customer 2" FromRole="Sales2"
ToRole="Customer_2">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Time"
Relationship="Sandbox.FactInternetSales_DimTime_Time" FromRole="Sales3" ToRole="Time">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Time_2"
Relationship="Sandbox.FactInternetSales_DimTime_Time_2" FromRole="Sales4" ToRole="Time_2">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Time 3"
Relationship="Sandbox.FactInternetSales_DimTime_Time_3" FromRole="Sales5" ToRole="Time_3">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Store2"
Relationship="Sandbox.FactInternetSales DimStore Store2" FromRole="Sales6" ToRole="Store2">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Employee"
Relationship="Sandbox.FactInternetSales_DimEmployee_Employee" FromRole="Sales7"
ToRole="Employee">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <NavigationProperty Name="Product2"
Relationship="Sandbox.FactInternetSales_DimProduct_Product2" FromRole="FactInternetSales"
ToRole="Product2">
                <bi:NavigationProperty ContextualNameRule="Merge" />
            </NavigationProperty>
            <bi:EntityType>
              <bi:DefaultDetails>
                <bi:MemberRef Name="TotalSales" />
              </bi:DefaultDetails>
              <bi:DefaultMeasure>
                <bi:MemberRef Name="TotalSales" />
              </bi:DefaultMeasure>
            </bi:EntityType>
          </EntityType>
          <Association Name="DimCustomer_DimGeography_Geography">
            <End Role="Customer" Type="Sandbox.DimCustomer" Multiplicity="*" />
            <End Role="Geography" Type="Sandbox.DimGeography" Multiplicity="0..1" />
          </Association>
          <Association Name="DimProduct_DimProductSubcategory_Subcategory">
            <End Role="Product" Type="Sandbox.DimProduct" Multiplicity="*" />
            <End Role="Subcategory" Type="Sandbox.DimProductSubcategory" Multiplicity="0..1"
/>
          </Association>
          <Association Name="DimProductSubcategory DimProductCategory Category">
            <End Role="Subcategory2" Type="Sandbox.DimProductSubcategory" Multiplicity="*" />
            <End Role="Category" Type="Sandbox.DimProductCategory" Multiplicity="0..1" />
          </Association>
          <Association Name="DimStore DimGeography Geography2">
            <End Role="Store" Type="Sandbox.DimStore" Multiplicity="*" />
            <End Role="Geography2" Type="Sandbox.DimGeography" Multiplicity="0..1" />
          </Association>
          <Association Name="FactInternetSales_DimCustomer_Customer2">
            <End Role="Sales" Type="Sandbox.FactInternetSales" Multiplicity="*" />
            <End Role="Customer2" Type="Sandbox.DimCustomer" Multiplicity="0..1" />
          </Association>
          <Association Name="FactInternetSales_DimCustomer_Customer_2">
```

```
                <End Role="Sales2" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Customer_2" Type="Sandbox.DimCustomer" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimTime_Time">
                <End Role="Sales3" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Time" Type="Sandbox.DimTime" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimTime_Time_2">
                <End Role="Sales4" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Time_2" Type="Sandbox.DimTime" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimTime_Time_3">
                <End Role="Sales5" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Time_3" Type="Sandbox.DimTime" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimStore_Store2">
                <End Role="Sales6" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Store2" Type="Sandbox.DimStore" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimEmployee_Employee">
                <End Role="Sales7" Type="Sandbox.FactInternetSales" Multiplicity="*" />
                <End Role="Employee" Type="Sandbox.DimEmployee" Multiplicity="0..1" />
            </Association>
            <Association Name="FactInternetSales_DimProduct_Product2">
                <End Role="FactInternetSales" Type="Sandbox.FactInternetSales" Multiplicity="*"
 />
                <End Role="Product2" Type="Sandbox.DimProduct" Multiplicity="0..1" />
            </Association>
        </Schema>
```

3.2   CSDLBI 1.1

```
    <Schema xmlns="http://schemas.microsoft.com/ado/2008/09/edm"
xmlns:edm_annotation="http://schemas.microsoft.com/ado/2009/02/edm/annotation"
xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions" bi:Version="1.1"
Namespace="Sandbox">
        <EntityContainer Name="Sandbox">
            <EntitySet Name="Bike" EntityType="Sandbox.Bike">
                <bi:EntitySet Hidden="true" />
            </EntitySet>
            <EntitySet Name="BikeSales" EntityType="Sandbox.BikeSales">
                <bi:EntitySet />
            </EntitySet>
            <EntitySet Name="BikeSubcategory" EntityType="Sandbox.BikeSubcategory">
                <bi:EntitySet />
            </EntitySet>
            <EntitySet Name="CalendarQuarter" EntityType="Sandbox.CalendarQuarter">
                <bi:EntitySet />
            </EntitySet>
            <EntitySet Name="Country" EntityType="Sandbox.Country">
                <bi:EntitySet />
            </EntitySet>
            <EntitySet Name="Currency" EntityType="Sandbox.Currency">
                <bi:EntitySet />
            </EntitySet>
            <EntitySet Name="SalesChannel" EntityType="Sandbox.SalesChannel">
                <bi:EntitySet />
            </EntitySet>
            <AssociationSet Name="Bike_BikeSubcategory_BikeSubcategory_ProductSubcategoryKey"
   Association="Sandbox.Bike_BikeSubcategory_BikeSubcategory_ProductSubcategoryKey">
                <End EntitySet="Bike" />
                <End EntitySet="BikeSubcategory" />
                <bi:AssociationSet Hidden="true" />
            </AssociationSet>
            <AssociationSet Name="BikeSales_Bike_Bike_ProductKey"
   Association="Sandbox.BikeSales_Bike_Bike_ProductKey">
                <End EntitySet="BikeSales" />
```

```
                    <End EntitySet="Bike" />
                    <bi:AssociationSet />
                </AssociationSet>
                <AssociationSet Name="BikeSales_CalendarQuarter_CalendarQuarter_CalendarQuarter"
    Association="Sandbox.BikeSales_CalendarQuarter_CalendarQuarter_CalendarQuarter">
                    <End EntitySet="BikeSales" />
                    <End EntitySet="CalendarQuarter" />
                    <bi:AssociationSet />
                </AssociationSet>
                <AssociationSet Name="BikeSales_Country_Country_CountryCode"
    Association="Sandbox.BikeSales_Country_Country_CountryCode">
                    <End EntitySet="BikeSales" />
                    <End EntitySet="Country" />
                    <bi:AssociationSet />
                </AssociationSet>
                <AssociationSet Name="BikeSales_Currency_Currency_CurrencyKey"
    Association="Sandbox.BikeSales_Currency_Currency_CurrencyKey">
                    <End EntitySet="BikeSales" />
                    <End EntitySet="Currency" />
                    <bi:AssociationSet />
                </AssociationSet>
                <AssociationSet Name="BikeSales_SalesChannel_SalesChannel_SalesChannelCode"
    Association="Sandbox.BikeSales_SalesChannel_SalesChannel_SalesChannelCode">
                    <End EntitySet="BikeSales" />
                    <End EntitySet="SalesChannel" />
                    <bi:AssociationSet State="Inactive" />
                </AssociationSet>
                <bi:EntityContainer Caption="CSDLTest" Culture="en-US">
                    <bi:CompareOptions IgnoreCase="true" />
                </bi:EntityContainer>
            </EntityContainer>
            <EntityType Name="Bike">
                <Key>
                    <PropertyRef Name="RowNumber" />
                </Key>
                <Property Name="RowNumber" Type="Int64" Nullable="false">
                    <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
                </Property>
                <Property Name="ProductKey" Type="Int64" Nullable="false">
                    <bi:Property />
                </Property>
                <Property Name="ProductAlternateKey" Type="String" MaxLength="Max" Unicode="true"
    FixedLength="false">
                    <bi:Property />
                </Property>
                <Property Name="ProductSubcategoryKey" Type="Int64">
                    <bi:Property />
                </Property>
                <Property Name="ProductName" Type="String" MaxLength="Max" Unicode="true"
    FixedLength="false">
                    <bi:Property />
                </Property>
                <Property Name="StandardCost" Type="Decimal" Precision="19" Scale="4">
                    <bi:Property />
                </Property>
                <Property Name="FinishedGoodsFlag" Type="Boolean">
                    <bi:Property />
                </Property>
                <Property Name="Color" Type="String" MaxLength="Max" Unicode="true"
    FixedLength="false">
                    <bi:Property ContextualNameRule="Context" Alignment="Left" Units="counts"
    SortDirection="Descending" IsRightToLeft="true" DefaultAggregateFunction="Max" />
                </Property>
                <Property Name="ListPrice" Type="Decimal" Precision="19" Scale="4">
                    <bi:Property />
                </Property>
                <Property Name="Size" Type="String" MaxLength="Max" Unicode="true"
    FixedLength="false">
                    <bi:Property />
```

```
            </Property>
            <Property Name="SizeRange" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="Weight" Type="Double">
              <bi:Property />
            </Property>
            <Property Name="DealerPrice" Type="Decimal" Precision="19" Scale="4">
              <bi:Property />
            </Property>
            <Property Name="Class" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="Style" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="ModelName" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="Description" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="WeightUnitMeasureCode" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="SizeUnitMeasureCode" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <Property Name="SafetyStockLevel" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="ReorderPoint" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="DaysToManufacture" Type="Int64">
              <bi:Property />
            </Property>
            <Property Name="ProductLine" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
              <bi:Property />
            </Property>
            <NavigationProperty Name="BikeSubcategory_ProductSubcategoryKey"
Relationship="Sandbox.Bike_BikeSubcategory_BikeSubcategory_ProductSubcategoryKey"
FromRole="Bike_ProductSubcategoryKey" ToRole="BikeSubcategory_ProductSubcategoryKey">
              <bi:NavigationProperty />
            </NavigationProperty>
            <bi:EntityType>
                <bi:DisplayKey>
                  <bi:MemberRef Name="Color" />
                </bi:DisplayKey>
              <bi:DefaultDetails>
                <bi:MemberRef Name="Color" />
              </bi:DefaultDetails>
              <bi:SortMembers>
                <bi:MemberRef Name="Color" />
              </bi:SortMembers>
              <bi:Hierarchy Name="Product_Hierarchy" Caption="Product Hierarchy"
ReferenceName="Product Hierarchy">
                  <bi:Documentation>
                    <bi:Summary>DESCRIPTION_ProductModelCateg_Hierarchies</bi:Summary>
                  </bi:Documentation>
                  <bi:Level Name="ProductLine">
```

```
              <bi:Source>
                <bi:PropertyRef Name="ProductLine" />
              </bi:Source>
            </bi:Level>
            <bi:Level Name="ModelName">
              <bi:Source>
                <bi:PropertyRef Name="ModelName" />
              </bi:Source>
            </bi:Level>
          </bi:Hierarchy>
        </bi:EntityType>
      </EntityType>
      <EntityType Name="BikeSales">
        <Key>
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
          <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
        </Property>
        <Property Name="SalesOrderNumber" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <Property Name="SalesOrderLineNumber" Type="Int64">
          <bi:Property />
        </Property>
        <Property Name="RevisionNumber" Type="Int64">
          <bi:Property />
        </Property>
        <Property Name="ProductKey" Type="Int64">
          <bi:Property />
        </Property>
        <Property Name="CountryCode" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <Property Name="CurrencyKey" Type="Int64">
          <bi:Property />
        </Property>
        <Property Name="CalendarQuarter" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <Property Name="SalesChannelCode" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <Property Name="OrderQuantity" Type="Int64">
          <bi:Property />
        </Property>
        <Property Name="UnitPrice" Type="Decimal" Precision="19" Scale="4">
          <bi:Property />
        </Property>
        <Property Name="ExtendedAmount" Type="Decimal" Precision="19" Scale="4">
          <bi:Property />
        </Property>
        <Property Name="UnitPriceDiscountPct" Type="Double">
          <bi:Property />
        </Property>
        <Property Name="DiscountAmount" Type="Double">
          <bi:Property />
        </Property>
        <Property Name="ProductStandardCost" Type="Decimal" Precision="19" Scale="4">
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        </Property>
        <Property Name="TotalProductCost" Type="Decimal" Precision="19" Scale="4">
          <bi:Property />
        </Property>
        <Property Name="SalesAmount" Type="Decimal" Precision="19" Scale="4">
```

```
            <bi:Property />
          </Property>
          <Property Name="TaxAmt" Type="Decimal" Precision="19" Scale="4">
            <bi:Property />
          </Property>
          <Property Name="Freight" Type="Decimal" Precision="19" Scale="4">
            <bi:Property />
          </Property>
          <Property Name="CarrierTrackingNumber" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Property />
          </Property>
          <Property Name="CustomerPONumber" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
            <bi:Property />
          </Property>
          <Property Name="CustomerAccountNumber" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Property />
          </Property>
          <Property Name="Sum_of_TotalProductCost" Type="Decimal" Precision="19" Scale="4">
            <bi:Measure Caption="Sum of TotalProductCost" ReferenceName="Sum of
TotalProductCost" FormatString="\$#,0.00;(\$#,0.00);\$#,0.00" />
          </Property>
          <Property Name="Sum_of_SalesAmount" Type="Decimal" Precision="19" Scale="4">
            <Documentation>
              <Summary>KPI Description</Summary>
            </Documentation>
            <bi:Measure Caption="Sum of SalesAmount" ReferenceName="Sum of SalesAmount"
FormatString="\$#,0.00;(\$#,0.00);\$#,0.00">
              <bi:Kpi StatusGraphic="Three Circles Colored">
                <bi:KpiGoal>
                  <bi:PropertyRef Name="v_Sum_of_SalesAmount_Goal" />
                </bi:KpiGoal>
                <bi:KpiStatus>
                  <bi:PropertyRef Name="v Sum of SalesAmount Status" />
                </bi:KpiStatus>
              </bi:Kpi>
            </bi:Measure>
          </Property>
          <NavigationProperty Name="Bike_ProductKey"
Relationship="Sandbox.BikeSales Bike Bike ProductKey" FromRole="BikeSales ProductKey"
ToRole="Bike_ProductKey">
            <bi:NavigationProperty />
          </NavigationProperty>
          <NavigationProperty Name="CalendarQuarter CalendarQuarter"
Relationship="Sandbox.BikeSales_CalendarQuarter_CalendarQuarter_CalendarQuarter"
FromRole="BikeSales CalendarQuarter" ToRole="CalendarQuarter CalendarQuarter">
            <bi:NavigationProperty />
          </NavigationProperty>
          <NavigationProperty Name="Country_CountryCode"
Relationship="Sandbox.BikeSales Country Country CountryCode" FromRole="BikeSales CountryCode"
ToRole="Country_CountryCode">
            <bi:NavigationProperty />
          </NavigationProperty>
          <NavigationProperty Name="Currency_CurrencyKey"
Relationship="Sandbox.BikeSales Currency Currency CurrencyKey"
FromRole="BikeSales_CurrencyKey" ToRole="Currency_CurrencyKey">
            <bi:NavigationProperty />
          </NavigationProperty>
          <NavigationProperty Name="SalesChannel_SalesChannelCode"
Relationship="Sandbox.BikeSales_SalesChannel_SalesChannel_SalesChannelCode"
FromRole="BikeSales SalesChannelCode" ToRole="SalesChannel SalesChannelCode">
            <bi:NavigationProperty />
          </NavigationProperty>
          <bi:EntityType />
        </EntityType>
        <EntityType Name="BikeSubcategory">
          <Key>
```

```
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
          <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
        </Property>
        <Property Name="ProductSubcategoryKey" Type="Int64" Nullable="false">
          <bi:Property />
        </Property>
        <Property Name="Subcategory" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <bi:EntityType />
      </EntityType>
      <EntityType Name="CalendarQuarter">
        <Key>
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
          <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
        </Property>
        <Property Name="CalendarQuarter2" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false" Nullable="false">
          <bi:Property Caption="CalendarQuarter" ReferenceName="CalendarQuarter" />
        </Property>
        <bi:EntityType />
      </EntityType>
      <EntityType Name="Country">
        <Key>
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
          <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
        </Property>
        <Property Name="CountryCode" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false" Nullable="false">
          <bi:Property />
        </Property>
        <Property Name="CountryName" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <bi:EntityType />
      </EntityType>
      <EntityType Name="Currency">
        <Key>
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
          <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
        </Property>
        <Property Name="CurrencyKey" Type="Int64" Nullable="false">
          <bi:Property />
        </Property>
        <Property Name="CurrencyAlternateKey" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
          <bi:Property />
        </Property>
        <Property Name="CurrencyName" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
          <bi:Property />
        </Property>
        <bi:EntityType />
      </EntityType>
      <EntityType Name="SalesChannel">
        <Key>
          <PropertyRef Name="RowNumber" />
        </Key>
        <Property Name="RowNumber" Type="Int64" Nullable="false">
```

```
            <bi:Property Hidden="true" Contents="RowNumber" Stability="RowNumber" />
          </Property>
          <Property Name="SalesChannelCode" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false" Nullable="false">
            <bi:Property />
          </Property>
          <Property Name="SalesChannelName" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false">
            <bi:Property />
          </Property>
          <bi:EntityType />
        </EntityType>
        <Association Name="Bike_BikeSubcategory_BikeSubcategory_ProductSubcategoryKey">
          <End Role="Bike_ProductSubcategoryKey" Type="Sandbox.Bike" Multiplicity="*" />
          <End Role="BikeSubcategory_ProductSubcategoryKey" Type="Sandbox.BikeSubcategory"
Multiplicity="0..1" />
        </Association>
        <Association Name="BikeSales_Bike_Bike_ProductKey">
          <End Role="BikeSales ProductKey" Type="Sandbox.BikeSales" Multiplicity="*" />
          <End Role="Bike_ProductKey" Type="Sandbox.Bike" Multiplicity="0..1" />
        </Association>
        <Association Name="BikeSales_CalendarQuarter_CalendarQuarter_CalendarQuarter">
          <End Role="BikeSales CalendarQuarter" Type="Sandbox.BikeSales" Multiplicity="*"
/>
          <End Role="CalendarQuarter_CalendarQuarter" Type="Sandbox.CalendarQuarter"
Multiplicity="0..1" />
        </Association>
        <Association Name="BikeSales_Country_Country_CountryCode">
          <End Role="BikeSales CountryCode" Type="Sandbox.BikeSales" Multiplicity="*" />
          <End Role="Country_CountryCode" Type="Sandbox.Country" Multiplicity="0..1" />
        </Association>
        <Association Name="BikeSales_Currency_Currency_CurrencyKey">
          <End Role="BikeSales_CurrencyKey" Type="Sandbox.BikeSales" Multiplicity="*" />
          <End Role="Currency CurrencyKey" Type="Sandbox.Currency" Multiplicity="0..1" />
        </Association>
        <Association Name="BikeSales SalesChannel SalesChannel SalesChannelCode">
          <End Role="BikeSales_SalesChannelCode" Type="Sandbox.BikeSales" Multiplicity="*"
/>
          <End Role="SalesChannel_SalesChannelCode" Type="Sandbox.SalesChannel"
Multiplicity="0..1" />
        </Association>
      </Schema>
```

3.3 CSDLBI 2.0 and CSDLBI 2.5

Note The CSDLBI 2.5 schema is the same as the CSDLBI 2.0 schema. However, when a client application requests CSDLBI 2.5 from a server, the server returns the **ReferentialConstraint** information for the **Association** object and the **Role** attribute on the **Association End** element. When the client application requests CSDLBI 2.0 from a server, these properties are not returned. For more details about these optional properties, see [MC-CSDL].

```
<Schema xmlns="http://schemas.microsoft.com/ado/2008/09/edm"
xmlns:edm_annotation="http://schemas.microsoft.com/ado/2009/02/edm/annotation"
xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions" bi:Version="2.0"
Namespace="Sandbox">
  <EntityContainer Name="Sandbox">
    <Documentation>
      <Summary>A Unified Dimensional Model that encompasses the Adventure Works data
warehouse.</Summary>
    </Documentation>
    <EntitySet Name="Measures" EntityType="Sandbox.Measures">
      <bi:EntitySet Hidden="true" />
    </EntitySet>
    <EntitySet Name="Date" EntityType="Sandbox.Date">
      <bi:EntitySet />
```

```
      </EntitySet>
      <EntitySet Name="Customer" EntityType="Sandbox.Customer">
        <bi:EntitySet />
      </EntitySet>
      <EntitySet Name="Product" EntityType="Sandbox.Product">
        <bi:EntitySet />
      </EntitySet>
      <EntitySet Name="Internet_Sales" EntityType="Sandbox.Internet_Sales">
        <bi:EntitySet Caption="Internet Sales" ReferenceName="Internet Sales" />
      </EntitySet>
      <AssociationSet Name="Internet Sales Product Product Product"
  Association="Sandbox.Internet_Sales_Product_Product_Product">
        <End EntitySet="Internet_Sales" />
        <End EntitySet="Product" />
        <bi:AssociationSet />
      </AssociationSet>
      <AssociationSet Name="Internet Sales Customer Customer Customer"
  Association="Sandbox.Internet_Sales_Customer_Customer_Customer">
        <End EntitySet="Internet Sales" />
        <End EntitySet="Customer" />
        <bi:AssociationSet />
      </AssociationSet>
      <AssociationSet Name="Internet Sales Date Date Date"
  Association="Sandbox.Internet_Sales_Date_Date_Date">
        <End EntitySet="Internet_Sales" />
        <End EntitySet="Date" />
        <bi:AssociationSet />
      </AssociationSet>
      <bi:EntityContainer Caption="Adventure Works DW 2008" Culture="en-US">
        <bi:CompareOptions IgnoreCase="true" IgnoreKanaType="true" IgnoreWidth="true" />
        <bi:ModelCapabilities>
          <bi:CrossFilteringWithinTable>Always</bi:CrossFilteringWithinTable>
          <bi:GroupByValidation>Enforced</bi:GroupByValidation>
          <bi:FiveStateKPIRange>1</bi:FiveStateKPIRange>
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            <bi:PropertyRef Name="Education" />
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            <bi:PropertyRef Name="Gender" />
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        <bi:PropertyRef Name="Safety_Stock_Level" />
        <bi:PropertyRef Name="Reorder_Point" />
        <bi:PropertyRef Name="List_Price" />
        <bi:PropertyRef Name="Size" />
        <bi:PropertyRef Name="Size Range" />
        <bi:PropertyRef Name="Weight" />
        <bi:PropertyRef Name="Days_to_Manufacture" />
        <bi:PropertyRef Name="Dealer_Price" />
        <bi:PropertyRef Name="Class" />
        <bi:PropertyRef Name="Style" />
        <bi:PropertyRef Name="Model Name" />
        <bi:PropertyRef Name="Subcategory" />
        <bi:PropertyRef Name="Status" />
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        <bi:PropertyRef Name="End_Date" />
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      </Property>
      <Property Name="End_Date_Key0" Type="DateTime">
        <bi:Property Hidden="true" ReferenceName="End Date.Key0" />
      </Property>
      <Property Name="End_Date" Type="String" MaxLength="Max" Unicode="true"
FixedLength="false" Nullable="false">
        <bi:Property Caption="End Date" ReferenceName="End Date" Contents="ScdEndDate">
          <bi:GroupBy>
            <bi:PropertyRef Name="End_Date_Key0" />
          </bi:GroupBy>
          <bi:OrderBy>
            <bi:PropertyRef Name="End Date Key0" />
          </bi:OrderBy>
        </bi:Property>
      </Property>
      <Property Name="End_Date_Value" Type="DateTime">
        <bi:Property Caption="End Date.Value" ReferenceName="End Date.Value"
Contents="ScdEndDate">
```

```xml
          <bi:GroupBy>
            <bi:PropertyRef Name="End_Date_Key0" />
          </bi:GroupBy>
          <bi:OrderBy>
            <bi:PropertyRef Name="End_Date_Key0" />
          </bi:OrderBy>
        </bi:Property>
      </Property>
      <Property Name="Large_Photo" Type="Int64">
        <bi:Property Caption="Large Photo" ReferenceName="Large Photo" />
      </Property>
      <bi:EntityType Contents="Products">
        <bi:Hierarchy Name="Product_Categories" Caption="Product Categories"
  ReferenceName="Product Categories">
          <bi:Level Name="Category">
            <bi:Source>
              <bi:PropertyRef Name="Category" />
            </bi:Source>
          </bi:Level>
          <bi:Level Name="Subcategory">
            <bi:Source>
              <bi:PropertyRef Name="Subcategory" />
            </bi:Source>
          </bi:Level>
          <bi:Level Name="Product">
            <bi:Source>
              <bi:PropertyRef Name="Product2" />
            </bi:Source>
          </bi:Level>
        </bi:Hierarchy>
        <bi:Hierarchy Name="Product Model Lines" Caption="Product Model Lines"
  ReferenceName="Product Model Lines">
          <bi:Level Name="Product_Line" Caption="Product Line" ReferenceName="Product Line">
            <bi:Source>
              <bi:PropertyRef Name="Product_Line" />
            </bi:Source>
          </bi:Level>
          <bi:Level Name="Model">
            <bi:Source>
              <bi:PropertyRef Name="Model Name" />
            </bi:Source>
          </bi:Level>
        </bi:Hierarchy>
        <bi:Hierarchy Name="Stock_Level" Caption="Stock Level" ReferenceName="Stock Level">
          <bi:Level Name="Safety_Stock_Level" Caption="Safety Stock Level"
  ReferenceName="Safety Stock Level">
            <bi:Source>
              <bi:PropertyRef Name="Safety Stock Level" />
            </bi:Source>
          </bi:Level>
          <bi:Level Name="Product">
            <bi:Source>
              <bi:PropertyRef Name="Product2" />
            </bi:Source>
          </bi:Level>
        </bi:Hierarchy>
        <bi:DisplayFolders>
          <bi:DisplayFolder Name="Financial">
            <bi:PropertyRef Name="Standard Cost" />
            <bi:PropertyRef Name="List_Price" />
            <bi:PropertyRef Name="Dealer_Price" />
          </bi:DisplayFolder>
          <bi:DisplayFolder Name="Stocking">
            <bi:PropertyRef Name="Color" />
            <bi:PropertyRef Name="Safety Stock Level" />
            <bi:PropertyRef Name="Reorder_Point" />
            <bi:PropertyRef Name="Size" />
            <bi:PropertyRef Name="Size_Range" />
            <bi:PropertyRef Name="Weight" />
```

```
            <bi:PropertyRef Name="Weight Value" />
            <bi:PropertyRef Name="Days_to_Manufacture" />
            <bi:PropertyRef Name="Class" />
            <bi:HierarchyRef Name="Stock_Level" />
          </bi:DisplayFolder>
          <bi:DisplayFolder Name="History">
            <bi:PropertyRef Name="Status" />
            <bi:PropertyRef Name="Start_Date" />
            <bi:PropertyRef Name="Start_Date_Value" />
            <bi:PropertyRef Name="End_Date" />
            <bi:PropertyRef Name="End_Date_Value" />
          </bi:DisplayFolder>
        </bi:DisplayFolders>
      </bi:EntityType>
    </EntityType>
    <EntityType Name="Internet_Sales">
      <Key>
        <PropertyRef Name="RowNumber" />
      </Key>
      <Property Name="RowNumber" Type="Int64" Nullable="false">
        <bi:Property Hidden="true" Stability="RowNumber" />
      </Property>
      <Property Name="Internet Gross Profit" Type="Double">
        <bi:Measure Caption="Internet Gross Profit" ReferenceName="Internet Gross Profit"
ActualType="Any">
          <bi:FormatBy>
            <bi:PropertyRef Name="Internet_Gross_Profit_FormatString" />
          </bi:FormatBy>
          <bi:ApplyCulture>
            <bi:PropertyRef Name="Internet_Gross_Profit_ApplyCulture" />
          </bi:ApplyCulture>
        </bi:Measure>
      </Property>
      <Property Name="Internet Gross Profit Margin" Type="Double">
        <bi:Measure Caption="Internet Gross Profit Margin" ReferenceName="Internet Gross Profit
Margin" ActualType="Any">
          <bi:FormatBy>
            <bi:PropertyRef Name="Internet_Gross_Profit_Margin_FormatString" />
          </bi:FormatBy>
          <bi:ApplyCulture>
            <bi:PropertyRef Name="Internet_Gross_Profit_Margin_ApplyCulture" />
          </bi:ApplyCulture>
        </bi:Measure>
      </Property>
      <Property Name="Internet_Average_Unit_Price" Type="Double">
        <bi:Measure Caption="Internet Average Unit Price" ReferenceName="Internet Average Unit
Price" ActualType="Any">
          <bi:FormatBy>
            <bi:PropertyRef Name="Internet_Average_Unit_Price_FormatString" />
          </bi:FormatBy>
          <bi:ApplyCulture>
            <bi:PropertyRef Name="Internet Average Unit Price ApplyCulture" />
          </bi:ApplyCulture>
        </bi:Measure>
      </Property>
      <Property Name="Internet_Average_Sales_Amount" Type="Double">
        <bi:Measure Caption="Internet Average Sales Amount" ReferenceName="Internet Average
Sales Amount" ActualType="Any">
          <bi:FormatBy>
            <bi:PropertyRef Name="Internet_Average_Sales_Amount_FormatString" />
          </bi:FormatBy>
          <bi:ApplyCulture>
            <bi:PropertyRef Name="Internet Average Sales Amount ApplyCulture" />
          </bi:ApplyCulture>
        </bi:Measure>
      </Property>
      <Property Name="Internet_Ratio_to_All_Products" Type="Double">
        <bi:Measure Caption="Internet Ratio to All Products" ReferenceName="Internet Ratio to
All Products" ActualType="Any">
```

```
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Ratio_to_All_Products_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Ratio_to_All_Products_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Internet_Ratio_to_Parent_Product" Type="Double">
    <bi:Measure Caption="Internet Ratio to Parent Product" ReferenceName="Internet Ratio to
Parent Product" ActualType="Any">
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Ratio_to_Parent_Product_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Ratio_to_Parent_Product_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Growth_in_Customer_Base" Type="Double">
    <bi:Measure Caption="Growth in Customer Base" ReferenceName="Growth in Customer Base"
ActualType="Any">
      <bi:FormatBy>
        <bi:PropertyRef Name="Growth_in_Customer_Base_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Growth_in_Customer_Base_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="v   Growth in Customer Base Value" Type="Double">
    <bi:Measure Caption="Growth in Customer Base" ReferenceName="___Growth in Customer Base
Value" ActualType="Any">
      <bi:Kpi StatusGraphic="Road Signs" TrendGraphic="Standard Arrow">
        <bi:Documentation>
          <bi:Summary>The ratio between the customer count in the current period to that of
the previous period.</bi:Summary>
        </bi:Documentation>
        <bi:KpiGoal>
          <bi:PropertyRef Name="Growth in Customer Base Goal" />
        </bi:KpiGoal>
        <bi:KpiStatus>
          <bi:PropertyRef Name="Growth_in_Customer_Base_Status" />
        </bi:KpiStatus>
        <bi:KpiTrend>
          <bi:PropertyRef Name="Growth in Customer Base Trend" />
        </bi:KpiTrend>
      </bi:Kpi>
      <bi:FormatBy>
        <bi:PropertyRef Name="v___Growth_in_Customer_Base_Value_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="v___Growth_in_Customer_Base_Value_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Growth in Customer Base Goal" Type="Double">
    <bi:Measure Caption="Growth in Customer Base Goal" Hidden="true" ReferenceName="Growth
in Customer Base Goal" ActualType="Any">
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Growth_in_Customer_Base_Goal_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Growth in Customer Base Status" Type="Double">
    <bi:Measure Caption="Growth in Customer Base Status" Hidden="true"
ReferenceName="Growth in Customer Base Status" ActualType="Any">
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Growth_in_Customer_Base_Status_ApplyCulture" />
```

```
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Growth_in_Customer_Base_Trend" Type="Double">
      <bi:Measure Caption="Growth in Customer Base Trend" Hidden="true" ReferenceName="Growth
in Customer Base Trend" ActualType="Any">
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Growth_in_Customer_Base_Trend_ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet_Sales_Amount" Type="Decimal" Precision="19" Scale="4">
      <bi:Measure Caption="Internet Sales Amount" ReferenceName="Internet Sales Amount"
ActualType="Any">
        <bi:FormatBy>
          <bi:PropertyRef Name="Internet_Sales_Amount_FormatString" />
        </bi:FormatBy>
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Internet Sales Amount ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet Order Quantity" Type="Int64">
      <bi:Measure Caption="Internet Order Quantity" ReferenceName="Internet Order Quantity"
ActualType="Any">
        <bi:FormatBy>
          <bi:PropertyRef Name="Internet_Order_Quantity_FormatString" />
        </bi:FormatBy>
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Internet_Order_Quantity_ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet Extended Amount" Type="Decimal" Precision="19" Scale="4">
      <bi:Measure Caption="Internet Extended Amount" ReferenceName="Internet Extended Amount"
ActualType="Any">
        <bi:FormatBy>
          <bi:PropertyRef Name="Internet_Extended_Amount_FormatString" />
        </bi:FormatBy>
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Internet_Extended_Amount_ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet_Tax_Amount" Type="Decimal" Precision="19" Scale="4">
      <bi:Measure Caption="Internet Tax Amount" ReferenceName="Internet Tax Amount"
ActualType="Any">
        <bi:FormatBy>
          <bi:PropertyRef Name="Internet_Tax_Amount_FormatString" />
        </bi:FormatBy>
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Internet Tax Amount ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet_Freight_Cost" Type="Decimal" Precision="19" Scale="4">
      <bi:Measure Caption="Internet Freight Cost" ReferenceName="Internet Freight Cost"
ActualType="Any">
        <bi:FormatBy>
          <bi:PropertyRef Name="Internet_Freight_Cost_FormatString" />
        </bi:FormatBy>
        <bi:ApplyCulture>
          <bi:PropertyRef Name="Internet Freight Cost ApplyCulture" />
        </bi:ApplyCulture>
      </bi:Measure>
    </Property>
    <Property Name="Internet_Unit_Price" Type="Decimal" Precision="19" Scale="4">
      <bi:Measure Caption="Internet Unit Price" Hidden="true" ReferenceName="Internet Unit
Price" ActualType="Any">
```

```xml
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Unit_Price_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Unit_Price_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Internet_Total_Product_Cost" Type="Decimal" Precision="19" Scale="4">
    <bi:Measure Caption="Internet Total Product Cost" ReferenceName="Internet Total Product
Cost" ActualType="Any">
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Total_Product_Cost_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Total_Product_Cost_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Internet_Standard_Product_Cost" Type="Decimal" Precision="19" Scale="4">
    <bi:Measure Caption="Internet Standard Product Cost" ReferenceName="Internet Standard
Product Cost" ActualType="Any">
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Standard_Product_Cost_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Standard_Product_Cost_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Internet Transaction Count" Type="Int64">
    <bi:Measure Caption="Internet Transaction Count" Hidden="true" ReferenceName="Internet
Transaction Count" ActualType="Any">
      <bi:FormatBy>
        <bi:PropertyRef Name="Internet_Transaction_Count_FormatString" />
      </bi:FormatBy>
      <bi:ApplyCulture>
        <bi:PropertyRef Name="Internet_Transaction_Count_ApplyCulture" />
      </bi:ApplyCulture>
    </bi:Measure>
  </Property>
  <Property Name="Internet Gross Profit FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Gross Profit.FormatString" />
  </Property>
  <Property Name="Internet Gross Profit ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Gross Profit.ApplyCulture" />
  </Property>
  <Property Name="Internet_Gross_Profit_Margin_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Gross Profit Margin.FormatString" />
  </Property>
  <Property Name="Internet Gross Profit Margin ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Gross Profit Margin.ApplyCulture" />
  </Property>
  <Property Name="Internet_Average_Unit_Price_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Average Unit Price.FormatString" />
  </Property>
  <Property Name="Internet_Average_Unit_Price_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Average Unit Price.ApplyCulture" />
  </Property>
  <Property Name="Internet_Average_Sales_Amount_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
    <bi:Measure Hidden="true" ReferenceName="Internet Average Sales Amount.FormatString" />
  </Property>
```

```xml
    <Property Name="Internet Average Sales Amount ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Average Sales Amount.ApplyCulture" />
    </Property>
    <Property Name="Internet_Ratio_to_All_Products_FormatString" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Ratio to All Products.FormatString"
/>
    </Property>
    <Property Name="Internet_Ratio_to_All_Products_ApplyCulture" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Ratio to All Products.ApplyCulture"
/>
    </Property>
    <Property Name="Internet_Ratio_to_Parent_Product_FormatString" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Ratio to Parent Product.FormatString"
/>
    </Property>
    <Property Name="Internet_Ratio_to_Parent_Product_ApplyCulture" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Ratio to Parent Product.ApplyCulture"
/>
    </Property>
    <Property Name="Growth_in_Customer_Base_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Growth in Customer Base.FormatString" />
    </Property>
    <Property Name="Growth in Customer Base ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Growth in Customer Base.ApplyCulture" />
    </Property>
    <Property Name="v___Growth_in_Customer_Base_Value_FormatString" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="___Growth in Customer Base Value.FormatString"
/>
    </Property>
    <Property Name="v___Growth_in_Customer_Base_Value_ApplyCulture" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="   Growth in Customer Base Value.ApplyCulture"
/>
    </Property>
    <Property Name="Growth_in_Customer_Base_Goal_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Growth in Customer Base Goal.ApplyCulture" />
    </Property>
    <Property Name="Growth_in_Customer_Base_Status_ApplyCulture" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Growth in Customer Base Status.ApplyCulture"
/>
    </Property>
    <Property Name="Growth in Customer Base Trend ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Growth in Customer Base Trend.ApplyCulture" />
    </Property>
    <Property Name="Internet_Sales_Amount_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Sales Amount.FormatString" />
    </Property>
    <Property Name="Internet_Sales_Amount_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Sales Amount.ApplyCulture" />
    </Property>
    <Property Name="Internet_Order_Quantity_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
      <bi:Measure Hidden="true" ReferenceName="Internet Order Quantity.FormatString" />
    </Property>
    <Property Name="Internet_Order_Quantity_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
```

```
            <bi:Measure Hidden="true" ReferenceName="Internet Order Quantity.ApplyCulture" />
        </Property>
        <Property Name="Internet_Extended_Amount_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Extended Amount.FormatString" />
        </Property>
        <Property Name="Internet_Extended_Amount_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Extended Amount.ApplyCulture" />
        </Property>
        <Property Name="Internet Tax Amount FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Tax Amount.FormatString" />
        </Property>
        <Property Name="Internet_Tax_Amount_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Tax Amount.ApplyCulture" />
        </Property>
        <Property Name="Internet Freight Cost FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Freight Cost.FormatString" />
        </Property>
        <Property Name="Internet Freight Cost ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Freight Cost.ApplyCulture" />
        </Property>
        <Property Name="Internet_Unit_Price_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Unit Price.FormatString" />
        </Property>
        <Property Name="Internet Unit Price ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Unit Price.ApplyCulture" />
        </Property>
        <Property Name="Internet_Total_Product_Cost_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Total Product Cost.FormatString" />
        </Property>
        <Property Name="Internet_Total_Product_Cost_ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Total Product Cost.ApplyCulture" />
        </Property>
        <Property Name="Internet_Standard_Product_Cost_FormatString" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Standard Product Cost.FormatString"
/>
        </Property>
        <Property Name="Internet Standard Product Cost ApplyCulture" Type="String"
MaxLength="Max" Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Standard Product Cost.ApplyCulture"
/>
        </Property>
        <Property Name="Internet_Transaction_Count_FormatString" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Transaction Count.FormatString" />
        </Property>
        <Property Name="Internet Transaction Count ApplyCulture" Type="String" MaxLength="Max"
Unicode="true" FixedLength="false">
            <bi:Measure Hidden="true" ReferenceName="Internet Transaction Count.ApplyCulture" />
        </Property>
        <NavigationProperty Name="Product_Product"
Relationship="Sandbox.Internet_Sales_Product_Product_Product"
FromRole="Internet Sales Product Product" ToRole="Product Product">
            <bi:NavigationProperty />
        </NavigationProperty>
        <NavigationProperty Name="Customer_Customer"
Relationship="Sandbox.Internet_Sales_Customer_Customer_Customer"
FromRole="Internet_Sales_Customer_Customer" ToRole="Customer_Customer">
            <bi:NavigationProperty />
```

```
        </NavigationProperty>
        <NavigationProperty Name="Date_Date" Relationship="Sandbox.Internet_Sales_Date_Date_Date"
    FromRole="Internet_Sales_Date_Date" ToRole="Date_Date">
            <bi:NavigationProperty />
        </NavigationProperty>
        <bi:EntityType Contents="Sales">
            <bi:DisplayFolders>
                <bi:DisplayFolder Name="Customer_Perspective" Caption="Customer Perspective">
                    <bi:DisplayFolder Name="Expand_Customer_Base" Caption="Expand Customer Base">
                        <bi:PropertyRef Name="v___Growth_in_Customer_Base_Value" />
                    </bi:DisplayFolder>
                </bi:DisplayFolder>
            </bi:DisplayFolders>
        </bi:EntityType>
    </EntityType>
    <Association Name="Internet_Sales_Product_Product_Product">
        <End Role="Internet Sales Product Product" Type="Sandbox.Internet Sales" Multiplicity="*"
    />
        <End Role="Product Product" Type="Sandbox.Product" Multiplicity="0..1" />
    </Association>
    <Association Name="Internet_Sales_Customer_Customer_Customer">
        <End Role="Internet_Sales_Customer_Customer" Type="Sandbox.Internet_Sales"
    Multiplicity="*" />
        <End Role="Customer_Customer" Type="Sandbox.Customer" Multiplicity="0..1" />
    </Association>
    <Association Name="Internet_Sales_Date_Date_Date">
        <End Role="Internet_Sales_Date_Date" Type="Sandbox.Internet_Sales" Multiplicity="*" />
        <End Role="Date_Date" Type="Sandbox.Date" Multiplicity="0..1" />
    </Association>
</Schema>
```

4 Security

4.1 Security Considerations for Implementers

There are no known security considerations that are not covered in the preceding sections.

4.2 Index of Security Fields

None.

5   Appendix A: Full XML Schema

For ease of implementation, the following are the full **XML schemas** for this protocol.

Schema name	Prefix	Section
CSDLBI Schema 1.0	xs:	section 5.1
CSDLBI Schema 1.1	xs:	section 5.2
CSDLBI Schema 2.0 CSDLBI Schema 2.5	xs:	section 5.3

5.1   CSDLBI Schema 1.0

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="bi"
    targetNamespace="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    elementFormDefault="qualified"
    xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    xmlns:edm="http://schemas.microsoft.com/ado/2008/09/edm"
    xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:import namespace="http://schemas.microsoft.com/ado/2008/09/edm"
schemaLocation="System.Data.Resources.CSDLSchema_2.xs"/>

  <xs:element name="EntityContainer" type="bi:TEntityContainer"/>
  <xs:element name="EntitySet" type="bi:TEntitySet"/>
  <xs:element name="AssociationSet" type="bi:TAssociationSet"/>
  <xs:element name="EntityType" type="bi:TEntityType"/>
  <xs:element name="Property" type="bi:TProperty"/>
  <xs:element name="NavigationProperty" type="bi:TNavigationProperty"/>
  <xs:element name="Measure" type="bi:TMeasure"/>
  <xs:element name="SourceDescription" type="xs:string" />

  <xs:complexType name="TEntityContainer">
    <xs:sequence>
      <xs:element name="CompareOptions" type="bi:TCompareOptions" />
    </xs:sequence>
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="Culture" type="xs:string" />
    <xs:attribute name="DirectQueryMode" type="bi:TDirectQueryMode" />
  </xs:complexType>

  <xs:simpleType name="TDirectQueryMode">
    <xs:restriction base="xs:string">
      <xs:enumeration value="InMemory" />
      <xs:enumeration value="InMemoryWithDirectQuery" />
      <xs:enumeration value="DirectQueryWithInMemory" />
      <xs:enumeration value="DirectQuery" />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TCompareOptions">
    <xs:attribute name="IgnoreCase" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreNonSpace" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreKanaType" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreWidth" type="xs:boolean" default="false" />
  </xs:complexType>

  <xs:complexType name="TEntitySet">
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
```

```xml
            <xs:attribute name="ReferenceName" type="xs:string" use="optional"/>
            <xs:attribute name="Hidden" type="xs:boolean" default="false" use="optional"/>
            <xs:attribute name="LineageTag" type="xs:string" use="optional"/>
            <xs:attribute name="Private" type="xs:boolean" default="false" use="optional"/>
            <xs:attribute name="ShowAsVariationsOnly" type="xs:boolean" default="false"
use="optional"/>
  </xs:complexType>

  <xs:complexType name="TAssociationSet">
    <xs:attribute name="State" type="bi:TState" default="Active"/>
    <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  </xs:complexType>

  <xs:simpleType name="TState">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Active" />
      <xs:enumeration value="Inactive" />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TEntityType">
    <xs:sequence>
      <xs:element name="DisplayKey" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="DefaultDetails" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1"/>
      <xs:element name="DefaultImage" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="DefaultMeasure" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="SortMembers" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="DisplayFolders" type="bi:TDisplayFolders" minOccurs="0" maxOccurs="1"
/>
    </xs:sequence>
    <xs:attribute name="Contents" type="xs:string" default="Regular" use="optional"/>
    <xs:attribute name="IsCalculationGroup" type="xs:boolean" default="false"
use="optional"/>
  </xs:complexType>

  <xs:complexType name="TDisplayFolders">
    <xs:sequence>
     <xs:element name="DisplayFolder" type="bi:TDisplayFolder" minOccurs="0"
maxOccurs="unbounded" />
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="TDisplayFolder">
    <xs:sequence>
     <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="0"
maxOccurs="unbounded" />
     <xs:element name="DisplayFolder" type="bi:TDisplayFolder" minOccurs="0"
maxOccurs="unbounded" />
    </xs:sequence>
    <xs:attribute name="Name" type="xs:string" use="required" />
    <xs:attribute name="Caption" type="xs:string" use="optional" />
  </xs:complexType>

  <xs:complexType name="TMemberRefs">
    <xs:sequence>
      <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="unbounded"
/>
```

```xml
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="TMemberRef">
    <xs:attribute name="Name" type="xs:string" use="required" />
  </xs:complexType>

  <xs:complexType name="TMember" abstract="true">
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="ContextualNameRule" type="bi:TContextualNameRule" default="None" />
    <xs:attribute name="Hidden" type="xs:boolean" default="false" />
    <xs:attribute name="ReferenceName" type="xs:string" use="optional" />
  </xs:complexType>

  <xs:simpleType name="TContextualNameRule">
    <xs:restriction base="xs:string">
      <xs:enumeration value="None" />
      <xs:enumeration value="Context" />
      <xs:enumeration value="Merge" />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TDocumentation">
    <xs:sequence>
      <xs:element name="Summary" type="xs:string" minOccurs="0" maxOccurs="1" />
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="TProperty">
    <xs:complexContent>
      <xs:extension base="bi:TBaseProperty">
        <xs:sequence>
          <xs:element name="OrderBy" type="bi:TPropertyRefs" minOccurs="0" maxOccurs="1"/>
        </xs:sequence>
        <xs:attribute name="Private" type="xs:boolean" default="false" use="optional"/>
        <xs:attribute name="Contents" type="bi:TContents" use="optional" default="Regular"/>
        <xs:attribute name="DefaultAggregateFunction" type="bi:TDefaultAggregateFunction"
default="Default" />
        <xs:attribute name="GroupingBehavior" type="bi:TGroupingBehavior"
default="GroupOnValue"/>
        <xs:attribute name="Stability" type="bi:TStability" default="Stable"/>
        <xs:attribute name="AggregateBehavior" type="xs:boolean" default="true"
use="optional"/>
        <xs:attribute name="LocaleImpact" type="xs:boolean" default="false" use="optional"/>
        <xs:attribute name="LineageTag" type="xs:string" use="optional" />
        <xs:attribute name="IsError" type="xs:boolean" default="false" />
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

  <xs:simpleType name="TContents">
    <xs:restriction base="xs:string" />
  </xs:simpleType>

  <xs:simpleType name="TDefaultAggregateFunction">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Default" />
      <xs:enumeration value="None" />
      <xs:enumeration value="Sum" />
      <xs:enumeration value="Count" />
      <xs:enumeration value="Average" />
      <xs:enumeration value="Min" />
      <xs:enumeration value="Max" />
      <xs:enumeration value="DistinctCount" />
    </xs:restriction>
  </xs:simpleType>

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

```xml
            <xs:enumeration value="GroupOnValue" />
            <xs:enumeration value="GroupOnEntityKey" />
        </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TStability">
        <xs:restriction base="xs:string">
            <xs:enumeration value="Stable" />
            <xs:enumeration value="RowNumber" />
            <xs:enumeration value="Volatile" />
        </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="TBaseProperty" abstract="true">
        <xs:complexContent>
            <xs:extension base="bi:TMember">
                <xs:attribute name="Alignment" type="bi:TAlignment" use="optional"/>
                <xs:attribute name="FormatString" type="xs:string" use="optional"/>
                <xs:attribute name="Units" type="xs:string" use="optional" />
                <xs:attribute name="SortDirection" type="bi:TSortDirection" default="Default"/>
                <xs:attribute name="IsRightToLeft" type="xs:boolean" default="false"/>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:simpleType name="TAlignment">
        <xs:restriction base="xs:string">
            <xs:enumeration value="Default" />
            <xs:enumeration value="Left" />
            <xs:enumeration value="Right" />
            <xs:enumeration value="Center" />
        </xs:restriction>
    </xs:simpleType>

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

    <xs:complexType name="TPropertyRefs">
        <xs:sequence>
            <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="TPropertyRef">
        <xs:attribute name="Name" type="xs:string" use="required" />
    </xs:complexType>

    <xs:complexType name="TMeasure">
        <xs:complexContent>
            <xs:extension base="bi:TBaseProperty">
                <xs:sequence>
                <xs:element name="DistributiveBy" type="bi:TDistributiveBy" minOccurs="0"
maxOccurs="1"/>
                </xs:sequence>
                <xs:attribute name="Private" type="xs:boolean" default="false" use="optional" />
                <xs:attribute name="IsSimpleMeasure" type="xs:boolean" default="true"/>
                <xs:attribute name="Contents" type="xs:string" />
                <xs:attribute name="LineageTag" type="xs:string" use="optional" />
                <xs:attribute name="IsError" type="xs:boolean" default="false"/>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>
```

```
<xs:complexType name="TDistributiveBy">
  <xs:sequence>
    <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
  </xs:sequence>
  <xs:attribute name="AggregationKind" type="bi:TAggregationKind" use="required" />
</xs:complexType>

<xs:simpleType name="TAggregationKind">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Sum" />
    <xs:enumeration value="Min" />
    <xs:enumeration value="Max" />
    <xs:enumeration value="Count" />
  </xs:restriction>
</xs:simpleType>

<xs:complexType name="TEntityRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>

<xs:complexType name="TNavigationProperty">
  <xs:complexContent>
    <xs:extension  base="bi:TMember">
      <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

</xs:schema>
```

5.2   CSDLBI Schema 1.1

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="bi"
    targetNamespace="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    elementFormDefault="qualified"
    xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    xmlns:edm="http://schemas.microsoft.com/ado/2008/09/edm"
    xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:import namespace="http://schemas.microsoft.com/ado/2008/09/edm"
schemaLocation="System.Data.Resources.CSDLSchema 2.xs"/>

  <xs:element name="EntityContainer" type="bi:TEntityContainer"/>
  <xs:element name="EntitySet" type="bi:TEntitySet"/>
  <xs:element name="AssociationSet" type="bi:TAssociationSet"/>
  <xs:element name="EntityType" type="bi:TEntityType"/>
  <xs:element name="Property" type="bi:TProperty"/>
  <xs:element name="NavigationProperty" type="bi:TNavigationProperty"/>
  <xs:element name="Measure" type="bi:TMeasure"/>
  <xs:element name="SourceDescription" type="xs:string" />

  <xs:complexType name="TEntityContainer">
    <xs:sequence>
      <xs:element name="CompareOptions" type="bi:TCompareOptions" />
    </xs:sequence>
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="Culture" type="xs:string" />
    <xs:attribute name="DirectQueryMode" type="bi:TDirectQueryMode" />
  </xs:complexType>

  <xs:simpleType name="TDirectQueryMode">
    <xs:restriction base="xs:string">
      <xs:enumeration value="InMemory" />
      <xs:enumeration value="InMemoryWithDirectQuery" />
      <xs:enumeration value="DirectQueryWithInMemory" />
      <xs:enumeration value="DirectQuery" />
```

```xml
        </xs:restriction>
      </xs:simpleType>

  <xs:complexType name="TCompareOptions">
    <xs:attribute name="IgnoreCase" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreNonSpace" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreKanaType" type="xs:boolean" default="false" />
    <xs:attribute name="IgnoreWidth" type="xs:boolean" default="false" />
  </xs:complexType>

  <xs:complexType name="TEntitySet">
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
    <xs:attribute name="ReferenceName" type="xs:string" use="optional"/>
    <xs:attribute name="Hidden" type="xs:boolean" default="false" use="optional"/>
    <xs:attribute name="LineageTag" type="xs:string" use="optional"/>
    <xs:attribute name="Private" type="xs:boolean" default="false" use="optional"/>
    <xs:attribute name="ShowAsVariationsOnly" type="xs:boolean" default="false"
use="optional"/>
  </xs:complexType>

  <xs:complexType name="TAssociationSet">
    <xs:attribute name="State" type="bi:TState" default="Active"/>
    <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  </xs:complexType>

  <xs:simpleType name="TState">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Active" />
      <xs:enumeration value="Inactive" />
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TEntityType">
    <xs:sequence>
      <xs:element name="DisplayKey" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="DefaultDetails" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1"/>
      <xs:element name="DefaultImage" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="DefaultMeasure" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="SortMembers" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="Hierarchy" type="bi:THierarchy" minOccurs="0" maxOccurs="unbounded"
/>
      <xs:element name="DisplayFolders" type="bi:TDisplayFolders" minOccurs="0" maxOccurs="1"
/>
    </xs:sequence>
    <xs:attribute name="Contents" type="xs:string" default="Regular" use="optional"/>
    <xs:attribute name="IsCalculationGroup" type="xs:boolean" default="false"
use="optional"/>
  </xs:complexType>

  <xs:complexType name="TDisplayFolders">
    <xs:sequence>
     <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
            minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
  </xs:complexType>
```

```xml
<xs:complexType name="TDisplayFolder">
  <xs:sequence>
    <xs:element name="PropertyRef" type="bi:TPropertyRef"
          minOccurs="0" maxOccurs="unbounded" />
    <xs:element name="HierarchyRef" type="bi:THierarchyRef"
          minOccurs="0" maxOccurs="unbounded" />
    <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
        minOccurs="0" maxOccurs="unbounded" />
  </xs:sequence>
  <xs:attribute name="Name" type="xs:string" use="required" />
  <xs:attribute name="Caption" type="xs:string" use="optional" />
</xs:complexType>


<xs:complexType name="TMemberRefs">
  <xs:sequence>
    <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="unbounded"
/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="TMemberRef">
  <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>

<xs:complexType name="THierarchy">
  <xs:complexContent>
    <xs:extension base="bi:TMember">
      <xs:sequence>
        <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0"
maxOccurs="1" />
        <xs:element name="Level" type="bi:TLevel" minOccurs="1" maxOccurs="unbounded" />
      </xs:sequence>
      <xs:attribute name="Name" type="xs:string" use="required"/>
      <xs:attribute name="LineageTag" type="xs:string" use="optional" />
    </xs:extension>
  </xs:complexContent>
</xs:complexType>


<xs:complexType name="THierarchyRef">
    <xs:attribute name="Name" type="xs:string" use="required"/>
</xs:complexType>


<xs:complexType name="TMember" abstract="true">
  <xs:attribute name="Caption" type="xs:string" use="optional"/>
  <xs:attribute name="ContextualNameRule" type="bi:TContextualNameRule" default="None" />
  <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  <xs:attribute name="ReferenceName" type="xs:string" use="optional" />
</xs:complexType>

<xs:simpleType name="TContextualNameRule">
  <xs:restriction base="xs:string">
    <xs:enumeration value="None" />
    <xs:enumeration value="Context" />
    <xs:enumeration value="Merge" />
  </xs:restriction>
</xs:simpleType>

<xs:complexType name="TDocumentation">
  <xs:sequence>
    <xs:element name="Summary" type="xs:string" minOccurs="0" maxOccurs="1" />
  </xs:sequence>
</xs:complexType>

<xs:complexType name="TLevel">
 <xs:complexContent>
   <xs:extension base="bi:TMember">
```

```
      <xs:sequence>
       <xs:element name="Source" minOccurs="0" maxOccurs="1">
        <xs:complexType>
         <xs:sequence>
          <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
              maxOccurs="1" />
         </xs:sequence>
        </xs:complexType>
       </xs:element>
       <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0" maxOccurs="1"
/>
      </xs:sequence>
      <xs:attribute name="Name" type="xs:string" use="required"/>
      <xs:attribute name="LineageTag" type="xs:string" use="optional" />
     </xs:extension>
    </xs:complexContent>
   </xs:complexType>

   <xs:complexType name="TProperty">
     <xs:complexContent>
       <xs:extension base="bi:TBaseProperty">
         <xs:sequence>
           <xs:element name="OrderBy" type="bi:TPropertyRefs" minOccurs="0" maxOccurs="1"/>
         </xs:sequence>
         <xs:attribute name="Private" type="xs:boolean" default="false" use="optional"/>
         <xs:attribute name="Contents" type="bi:TContents" use="optional" default="Regular"/>
         <xs:attribute name="DefaultAggregateFunction" type="bi:TDefaultAggregateFunction"
default="Default" />
         <xs:attribute name="GroupingBehavior" type="bi:TGroupingBehavior"
default="GroupOnValue"/>
         <xs:attribute name="Stability" type="bi:TStability" default="Stable"/>
         <xs:attribute name="AggregateBehavior" type="xs:boolean" default="true"
use="optional"/>
         <xs:attribute name="LocaleImpact" type="xs:boolean" default="false" use="optional"/>
         <xs:attribute name="LineageTag" type="xs:string" use="optional" />
         <xs:attribute name="IsError" type="xs:boolean" default="false"/>
       </xs:extension>
     </xs:complexContent>
   </xs:complexType>

   <xs:simpleType name="TContents">
     <xs:restriction base="xs:string" />
   </xs:simpleType>

   <xs:simpleType name="TDefaultAggregateFunction">
     <xs:restriction base="xs:string">
       <xs:enumeration value="Default" />
       <xs:enumeration value="None" />
       <xs:enumeration value="Sum" />
       <xs:enumeration value="Count" />
       <xs:enumeration value="Average" />
       <xs:enumeration value="Min" />
       <xs:enumeration value="Max" />
       <xs:enumeration value="DistinctCount" />
     </xs:restriction>
   </xs:simpleType>

   <xs:simpleType name="TGroupingBehavior">
     <xs:restriction base="xs:string">
       <xs:enumeration value="GroupOnValue" />
       <xs:enumeration value="GroupOnEntityKey" />
     </xs:restriction>
   </xs:simpleType>

   <xs:simpleType name="TStability">
     <xs:restriction base="xs:string">
       <xs:enumeration value="Stable" />
       <xs:enumeration value="RowNumber" />
       <xs:enumeration value="Volatile" />
```

```
      </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="TBaseProperty" abstract="true">
      <xs:complexContent>
        <xs:extension base="bi:TMember">
          <xs:attribute name="Alignment" type="bi:TAlignment" use="optional"/>
          <xs:attribute name="FormatString" type="xs:string" use="optional"/>
          <xs:attribute name="Units" type="xs:string" use="optional" />
          <xs:attribute name="SortDirection" type="bi:TSortDirection" default="Default"/>
          <xs:attribute name="IsRightToLeft" type="xs:boolean" default="false"/>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:simpleType name="TAlignment">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Default" />
        <xs:enumeration value="Left" />
        <xs:enumeration value="Right" />
        <xs:enumeration value="Center" />
      </xs:restriction>
    </xs:simpleType>

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

    <xs:complexType name="TPropertyRefs">
      <xs:sequence>
        <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="unbounded" />
      </xs:sequence>
    </xs:complexType>

    <xs:complexType name="TPropertyRef">
      <xs:attribute name="Name" type="xs:string" use="required" />
    </xs:complexType>

    <xs:complexType name="TMeasure">
      <xs:complexContent>
        <xs:extension base="bi:TBaseProperty">
          <xs:sequence>
            <xs:element name="Kpi" type="bi:TKpi" minOccurs="0" maxOccurs="1" />
            <xs:element name="DistributiveBy" type="bi:TDistributiveBy" minOccurs="0"
maxOccurs="1" />
          </xs:sequence>
          <xs:attribute name="Private" type="xs:boolean" default="false" use="optional" />
          <xs:attribute name="IsSimpleMeasure" type="xs:boolean" default="true"/>
          <xs:attribute name="Contents" type="xs:string"/>
          <xs:attribute name="LineageTag" type="xs:string" use="optional" />
          <xs:attribute name="IsError" type="xs:boolean" default="false" />
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TKpi">
      <xs:sequence>
        <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0" maxOccurs="1"
/>
        <xs:element name="KpiGoal" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1" maxOccurs="1"
/>
```

```
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="KpiStatus" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1" maxOccurs="1"
/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
      <xs:attribute name="StatusGraphic" type="xs:string" use="optional"/>
  </xs:complexType>


  <xs:complexType name="TDistributiveBy">
    <xs:sequence>
      <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
    </xs:sequence>
    <xs:attribute name="AggregationKind" type="bi:TAggregationKind" use="required" />
  </xs:complexType>

  <xs:simpleType name="TAggregationKind">
    <xs:restriction base="xs:string">
     <xs:enumeration value="Sum" />
     <xs:enumeration value="Min" />
     <xs:enumeration value="Max" />
     <xs:enumeration value="Count" />
    </xs:restriction>
   </xs:simpleType>

  <xs:complexType name="TEntityRef">
     <xs:attribute name="Name" type="xs:string" use="required" />
   </xs:complexType>


  <xs:complexType name="TNavigationProperty">
    <xs:complexContent>
      <xs:extension base="bi:TMember">
        <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

</xs:schema>
```

5.3 CSDLBI Schema 2.0 and CSDLBI Schema 2.5

Note The CSDLBI 2.5 schema is the same as the CSDLBI 2.0 schema. However, when a client application requests CSDLBI 2.5 from a server, the server returns the **ReferentialConstraint** information for the **Association** object and the **Role** attribute on the **Association End** element. When the client application requests CSDLBI 2.0 from a server, these properties are not returned. For more details about these optional properties, see [MC-CSDL].

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="bi"
    targetNamespace="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    elementFormDefault="qualified"
    xmlns:bi="http://schemas.microsoft.com/sqlbi/2010/10/edm/extensions"
    xmlns:edm="http://schemas.microsoft.com/ado/2008/09/edm"
    xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:import namespace="http://schemas.microsoft.com/ado/2008/09/edm"
schemaLocation="System.Data.Resources.CSDLSchema 2.xs"/>
```

```xml
<xs:element name="EntityContainer" type="bi:TEntityContainer"/>
<xs:element name="EntitySet" type="bi:TEntitySet"/>
<xs:element name="Cultures" type="bi:TCultures"/>
<xs:element name="AssociationSet" type="bi:TAssociationSet"/>
<xs:element name="EntityType" type="bi:TEntityType"/>
<xs:element name="Property" type="bi:TProperty"/>
<xs:element name="NavigationProperty" type="bi:TNavigationProperty"/>
<xs:element name="Measure" type="bi:TMeasure"/>
<xs:element name="SourceDescription" type="xs:string" />

<xs:complexType name="TEntityContainer">
  <xs:sequence>
    <xs:element name="CompareOptions" type="bi:TCompareOptions" />
    <xs:element name="ModelCapabilities" type="bi:TModelCapabilities" />
  </xs:sequence>
  <xs:attribute name="Caption" type="xs:string" use="optional"/>
  <xs:attribute name="Culture" type="xs:string" />
  <xs:attribute name="DirectQueryMode" type="bi:TDirectQueryMode" />
  <xs:attribute name="PreferOrdinalStringEquality" type="xs:boolean" default="false"/>
</xs:complexType>

<xs:simpleType name="TDirectQueryMode">
  <xs:restriction base="xs:string">
    <xs:enumeration value="InMemory" />
    <xs:enumeration value="InMemoryWithDirectQuery" />
    <xs:enumeration value="DirectQueryWithInMemory" />
    <xs:enumeration value="DirectQuery" />
  </xs:restriction>
</xs:simpleType>

<xs:complexType name="TCompareOptions">
  <xs:attribute name="IgnoreCase" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreNonSpace" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreKanaType" type="xs:boolean" default="false" />
  <xs:attribute name="IgnoreWidth" type="xs:boolean" default="false" />
</xs:complexType>

<xs:complexType name="TModelCapabilities">
  <xs:sequence>
    <xs:element name="CrossFilteringWithinTable" type="bi:TCrossFilteringWithinTable"
minOccurs="0" maxOccurs="1" />
    <xs:element name="GroupByValidation" type="bi:TGroupByValidation" minOccurs="0"
maxOccurs="1" />
    <xs:element name="FiveStateKPIRange" type="bi:TFiveStateKPIRange" minOccurs="0"
maxOccurs="1" />
    <xs:element name="MultiColumnFiltering" type="bi:TMultiColumnFiltering"
minOccurs="0" maxOccurs="1" />
    <xs:element name="QueryAggregateUsage" type="bi:TQueryAggregateUsage" minOccurs="0"
maxOccurs="1" />
    <xs:element name="DiscourageCompositeModels" type="bi:TDiscourageCompositeModels"
minOccurs="0" maxOccurs="1" />
    <xs:element name="EncourageIsEmptyDAXFunctionUsage"
     type="bi:TEncourageIsEmptyDAXFunctionUsage" />
    <xs:element name="QueryBatching" type="bi:TQueryBatching" />
    <xs:element name="Variables" type="bi:TVariables" />
    <xs:element name="InOperator" type="bi:TInOperator" />
    <xs:element name="TableConstructor" type="bi:TTableConstructor" />
    <xs:element name="ExecutionMetrics" type="bi:TExecutionMetrics" minOccurs="0"
maxOccurs="1" />
    <xs:element name="VirtualColumns" type="bi:TVirtualColumns" minOccurs="0"
maxOccurs="1" />
    <xs:element name="DataSourceVariables" type="bi:TDataSourceVariables" minOccurs="0"
maxOccurs="1" />

    <xs:element name="VisualCalculations" type="bi:TVisualCalculations"
minOccurs="0" maxOccurs="1" />
    <xs:element name="DAXFunctions" type="bi:TDAXFunctions" />
```

```
                <xs:element name="MParameters" type="bi:TMParameters" minOccurs="0"
maxOccurs="1" />

            </xs:sequence>
        </xs:complexType>


    <xs:simpleType name="TCrossFilteringWithinTable">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Always" />
        <xs:enumeration value="Never" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TGroupByValidation">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Relaxed" />
        <xs:enumeration value="Enforced" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TQueryAggregateUsage">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Encourage" />
        <xs:enumeration value="Discourage" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TEncourageIsEmptyDAXFunctionUsage">
      <xs:restriction base="xs:string">
        <xs:enumeration value="false" />
        <xs:enumeration value="true" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TFiveStateKPIRange">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TQueryBatching">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TVariables">
      <xs:restriction base="xs:int">
        <xs:enumeration value="0" />
        <xs:enumeration value="1" />
        <xs:enumeration value="2" />
        <xs:enumeration value="3" />
      </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="TDAXFunctions">
      <xs:sequence>
        <xs:element name="SummarizeColumns" type="bi:TSummarizeColumns" minOccurs="0"
maxOccurs="1"/>
        <xs:element name="SubstituteWithIndex" type="bi:TSubstituteWithIndex" minOccurs="0"
maxOccurs="1"/>
        <xs:element name="LeftOuterJoin" type="bi:TLeftOuterJoin" minOccurs="0"
maxOccurs="1"/>
        <xs:element name="StringMinMax" type="bi:TStringMinMax" minOccurs="0"
maxOccurs="1" />
        <xs:element name="BinaryMinMax" type="bi:TBinaryMinMax" />
        <xs:element name="TreatAs" type="bi:TTreatAs" minOccurs="0" maxOccurs="1" />
```

```
        <xs:element name="Error" type="bi:TError" />
        <xs:element name="SampleAxisWithLocalMinMax" type="bi:TSampleAxisWithLocalMinMax"
/>
        <xs:element name="SampleCartesianPointsByCover"
type="bi:TSampleCartesianPointsByCover" />
        <xs:element name="OptimizedNotInOperator" type="bi:TOptimizedNotInOperator" />
        <xs:element name="NonVisual" type="bi:TNonVisual" />
        <xs:element name="IsAfter" type="bi:TIsAfter" />
        <xs:element name="FormatByLocale" type="bi:TFormatByLocale" />
    </xs:sequence>
  </xs:complexType>

  <xs:simpleType name="TSummarizeColumns">
    <xs:restriction base="xs:int">
      <xs:enumeration value="0" />
      <xs:enumeration value="1" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="TSubstituteWithIndex">
    <xs:restriction base="xs:int">
      <xs:enumeration value="0" />
      <xs:enumeration value="1" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="TLeftOuterJoin">
    <xs:restriction base="xs:int">
      <xs:enumeration value="0" />
      <xs:enumeration value="1" />
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="TBinaryMinMax">
    <xs:restriction base="xs:int">
      <xs:enumeration value="0" />
      <xs:enumeration value="1" />
    </xs:restriction>
  </xs:simpleType>

      <xs:simpleType name="TTreatAs">
        <xs:restriction base="xs:int">
          <xs:enumeration value="0" />
          <xs:enumeration value="1" />
        </xs:restriction>
      </xs:simpleType>

      <xs:simpleType name="TSampleAxisWithLocalMinMax">
        <xs:restriction base="xs:int">
          <xs:enumeration value="0" />
          <xs:enumeration value="1" />
        </xs:restriction>
      </xs:simpleType>

      <xs:simpleType name="TSampleCartesianPointsByCover">
        <xs:restriction base="xs:int">
          <xs:enumeration value="0" />
          <xs:enumeration value="1" />
        </xs:restriction>
      </xs:simpleType>

      <xs:simpleType name="TOptimizedNotInOperator">
        <xs:restriction base="xs:int">
          <xs:enumeration value="0" />
          <xs:enumeration value="1" />
        </xs:restriction>
      </xs:simpleType>
```

```xml
<xs:simpleType name="TNonVisual">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TIsAfter">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TFormatByLocale">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TStringMinMax">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TError">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TMultiColumnFiltering">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Unrestricted" />
    <xs:enumeration value="LimitedToGroupByColumns" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TDiscourageCompositeModels">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TInOperator">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TTableConstructor">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TVirtualColumns">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>
```

```xml
<xs:simpleType name="TDataSourceVariables">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TVisualCalculations">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="TExecutionMetrics">
  <xs:restriction base="xs:int">
    <xs:enumeration value="0" />
    <xs:enumeration value="1" />
  </xs:restriction>
</xs:simpleType>

<xs:complexType name="TMParameters">
  <xs:sequence>
    <xs:element name="MParameter" type="bi:TMParameter" minOccurs="1"
maxOccurs="unbounded" />
  </xs:sequence>
</xs:complexType>

<xs:complexType name="TMParameter">
  <xs:sequence>
    <xs:element name="ParameterValuesColumn" type="bi:TParameterValuesColumn" />
  </xs:sequence>
  <xs:attribute name="Name" type="xs:string" use="required"/>
  <xs:attribute name="LineageTag" type="xs:string" use="optional"/>
  <xs:attribute name="ActualType" type="xs:string" use="required"/>
</xs:complexType>

<xs:complexType name="TParameterValuesColumn">
  <xs:sequence>
    <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
    <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="1" />
  </xs:sequence>
</xs:complexType>

<xs:complexType name="TEntitySet">
  <xs:attribute name="Caption" type="xs:string" use="optional"/>
  <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
  <xs:attribute name="ReferenceName" type="xs:string" use="optional"/>
  <xs:attribute name="Hidden" type="xs:boolean" default="false" use="optional"/>
  <xs:attribute name="LineageTag" type="xs:string" use="optional"/>
  <xs:attribute name="Private" type="xs:boolean" default="false" use="optional"/>
  <xs:attribute name="ShowAsVariationsOnly" type="xs:boolean" default="false"
use="optional"/>
</xs:complexType>

<xs:complexType name="TAssociationSet">
  <xs:attribute name="State" type="bi:TState" default="Active"/>
  <xs:attribute name="Hidden" type="xs:boolean" default="false" />
  <xs:attribute name="CrossFilterDirection" type="bi:TCrossFilterDirection"
              default="Single"/>
  <xs:attribute name="Behavior" type="bi:TBehavior"/>
</xs:complexType>

<xs:simpleType name="TState">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Active" />
```

```xml
        <xs:enumeration value="Inactive" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TCrossFilterDirection">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Single" />
        <xs:enumeration value="Both" />
      </xs:restriction>
    </xs:simpleType>

      <xs:simpleType name="TBehavior">
        <xs:restriction base="xs:string">
          <xs:enumeration value="Default" />
          <xs:enumeration value="Weak" />
        </xs:restriction>
      </xs:simpleType>


  <xs:complexType name="TEntityType">
    <xs:sequence>
      <xs:element name="DisplayKey" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="DefaultDetails" type="bi:TMemberRefs" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="DefaultImage" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1"
/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="DefaultMeasure" minOccurs="0" maxOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1" maxOccurs="1"
/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="SortMembers" type="bi:TMemberRefs" minOccurs="0" maxOccurs="1" />
      <xs:element name="Hierarchy" type="bi:THierarchy" minOccurs="0"
maxOccurs="unbounded" />
      <xs:element name="DisplayFolders" type="bi:TDisplayFolders" minOccurs="0"
maxOccurs="1" />
      <xs:element name="Statistics" type="bi:TEntityStatistics" minOccurs="0"
maxOccurs="1" />
    </xs:sequence>
    <xs:attribute name="Contents" type="xs:string" default="Regular" use="optional"/>
    <xs:attribute name="IsCalculationGroup" type="xs:boolean" default="false"
use="optional"/>
  </xs:complexType>


      <xs:complexType name="TDisplayFolders">
  <xs:sequence>
        <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
            minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
</xs:complexType>

      <xs:complexType name="TDisplayFolder">
  <xs:sequence>
        <xs:element name="PropertyRef" type="bi:TPropertyRef"
            minOccurs="0" maxOccurs="unbounded" />
        <xs:element name="HierarchyRef" type="bi:THierarchyRef"
            minOccurs="0" maxOccurs="unbounded" />
        <xs:element name="Cultures" type="bi:TCultures" minOccurs="0"
            maxOccurs="1"/>
```

```xml
        <xs:element name="DisplayFolder" type="bi:TDisplayFolder"
      minOccurs="0" maxOccurs="unbounded" />
      </xs:sequence>
      <xs:attribute name="Name" type="xs:string" use="required" />
      <xs:attribute name="Caption" type="xs:string" use="optional" />
  </xs:complexType>


  <xs:complexType name="TMemberRefs">
     <xs:sequence>
        <xs:element name="MemberRef" type="bi:TMemberRef" minOccurs="1"
maxOccurs="unbounded" />
     </xs:sequence>
  </xs:complexType>

  <xs:complexType name="TMemberRef">
     <xs:attribute name="Name" type="xs:string" use="required" />
  </xs:complexType>

  <xs:complexType name="THierarchy">
     <xs:complexContent>
        <xs:extension  base="bi:TMember">
          <xs:sequence>
            <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0"
maxOccurs="1" />
            <xs:element name="Cultures" type="bi:TCultures" minOccurs="0" maxOccurs="1" />
            <xs:element name="Level" type="bi:TLevel" minOccurs="1" maxOccurs="unbounded"
/>
         </xs:sequence>
         <xs:attribute name="Name" type="xs:string" use="required" />
         <xs:attribute name="LineageTag" type="xs:string" use="optional" />
       </xs:extension>
     </xs:complexContent>
  </xs:complexType>


    <xs:complexType name="THierarchyRef">
     <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>


  <xs:complexType name="TMember" abstract="true">
     <xs:attribute name="Caption" type="xs:string" use="optional"/>
     <xs:attribute name="ContextualNameRule" type="bi:TContextualNameRule" default="None"
/>
     <xs:attribute name="Hidden" type="xs:boolean" default="false" />
     <xs:attribute name="ReferenceName" type="xs:string" use="optional" />
  </xs:complexType>

  <xs:simpleType name="TContextualNameRule">
     <xs:restriction base="xs:string">
       <xs:enumeration value="None" />
       <xs:enumeration value="Context" />
       <xs:enumeration value="Merge" />
     </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TDocumentation">
     <xs:sequence>
       <xs:element name="Summary" type="xs:string" minOccurs="0" maxOccurs="1" />
     </xs:sequence>
  </xs:complexType>

  <xs:complexType name="TLevel">
     <xs:complexContent>
       <xs:extension base="bi:TMember">
         <xs:sequence>
           <xs:element name="Cultures" type="bi:TCultures" minOccurs="0" maxOccurs="1" />
           <xs:element name="Source" minOccurs="0" maxOccurs="1">
             <xs:complexType>
```

```
              <xs:sequence>
                <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
                    maxOccurs="1" />
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0"
maxOccurs="1" />
          <xs:element name="ContainsHiddenMembers" minOccurs="0" maxOccurs="1">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="HideMembers" type="bi:THideMembers" minOccurs="1"
maxOccurs="1"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
        <xs:attribute name="Name" type="xs:string" use="required" />
        <xs:attribute name="LineageTag" type="xs:string" use="optional" />
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

  <xs:simpleType name="THideMembers">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Never" />
      <xs:enumeration value="OnlyChildWithNoName" />
      <xs:enumeration value="OnlyChildWithParentName" />
      <xs:enumeration value="NoName" />
      <xs:enumeration value="ParentName" />
      <xs:enumeration value="BlankKey" />
    </xs:restriction>
  </xs:simpleType>

<xs:complexType name="TCultures">
    <xs:sequence>
      <xs:element name="Culture" type="bi:TCulture" minOccurs="1" maxOccurs="unbounded" />
    </xs:sequence>
</xs:complexType>
<xs:complexType name="TCulture">
    <xs:attribute name="Name" type="xs:string" use="required"/>
    <xs:attribute name="Caption" type="xs:string" use="optional"/>
    <xs:attribute name="Description" type="xs:string" use="optional"/>
</xs:complexType>

  <xs:complexType name="TProperty">
    <xs:complexContent>
      <xs:extension  base="bi:TBaseProperty">
        <xs:sequence>
        <xs:element name="DefaultValue" type="xs:anyType" minOccurs="0" maxOccurs="1"/>
        <xs:element name="Cultures" type="bi:TCultures" minOccurs="0" maxOccurs="1"/>
        <xs:element name="GroupBy" type="bi:TPropertyRefs" minOccurs="0" maxOccurs="1"/>
        <xs:element name="FilterNullsBy" type="bi:TPropertyRefs" minOccurs="0"
maxOccurs="1"/>
          <xs:element name="OrderBy" type="bi:TPropertyRefs" minOccurs="0"
maxOccurs="1"/>
          <xs:element name="RelatedTo" type="bi:TPropertyRefs" minOccurs="0"
      maxOccurs="1"/>
          <xs:element name="Statistics" type="bi:TPropertyStatistics" minOccurs="0"
      maxOccurs="1"/>
        </xs:sequence>
        <xs:attribute name="Private" type="xs:boolean" default="false" use="optional" />
        <xs:attribute name="Contents" type="bi:TContents" use="optional"
default="Regular"/>
        <xs:attribute name="DefaultAggregateFunction" type="bi:TDefaultAggregateFunction"
default="Default" />
        <xs:attribute name="GroupingBehavior" type="bi:TGroupingBehavior"
default="GroupOnValue"/>
        <xs:attribute name="Stability" type="bi:TStability" default="Stable"/>
```

```xml
            <xs:attribute name="AggregateBehavior" type="xs:boolean" default="true"
use="optional" />
<xs:attribute name="LocaleImpact" type="xs:boolean" default="false" use="optional" />
<xs:attribute name="LineageTag" type="xs:string" use="optional" />
<xs:attribute name="IsError" type="xs:boolean" default="false" />
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:simpleType name="TContents">
      <xs:restriction base="xs:string" />
    </xs:simpleType>

    <xs:simpleType name="TDefaultAggregateFunction">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Default" />
        <xs:enumeration value="None" />
        <xs:enumeration value="Sum" />
        <xs:enumeration value="Count" />
        <xs:enumeration value="Average" />
        <xs:enumeration value="Min" />
        <xs:enumeration value="Max" />
        <xs:enumeration value="DistinctCount" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TGroupingBehavior">
      <xs:restriction base="xs:string">
        <xs:enumeration value="GroupOnValue" />
        <xs:enumeration value="GroupOnEntityKey" />
      </xs:restriction>
    </xs:simpleType>

    <xs:simpleType name="TStability">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Stable" />
        <xs:enumeration value="RowNumber" />
        <xs:enumeration value="Volatile" />
      </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="TPropertyStatistics">
      <xs:sequence>
        <xs:element name="MinValue" type="xs:anyType" minOccurs="0" maxOccurs="1" />
        <xs:element name="MaxValue" type="xs:anyType" minOccurs="0" maxOccurs="1" />
      </xs:sequence>
      <xs:attribute name="DistinctValueCount" type="xs:long" use="optional"/>
      <xs:attribute name="StringValueMaxLength" type="xs:long" use="optional"/>
    </xs:complexType>

    <xs:complexType name="TBaseProperty" abstract="true">
      <xs:complexContent>
        <xs:extension  base="bi:TMember">
          <xs:attribute name="Alignment" type="bi:TAlignment" use="optional"/>
          <xs:attribute name="FormatString" type="xs:string" use="optional"/>
          <xs:attribute name="Units" type="xs:string" use="optional" />
          <xs:attribute name="SortDirection" type="bi:TSortDirection" default="Default"/>
          <xs:attribute name="IsRightToLeft" type="xs:boolean" default="false"/>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:simpleType name="TAlignment">
      <xs:restriction base="xs:string">
        <xs:enumeration value="Default" />
        <xs:enumeration value="Left" />
        <xs:enumeration value="Right" />
        <xs:enumeration value="Center" />
      </xs:restriction>
```

```
        </xs:simpleType>

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

    <xs:complexType name="TPropertyRefs">
      <xs:sequence>
        <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="unbounded" />
      </xs:sequence>
    </xs:complexType>

    <xs:complexType name="TPropertyRef">
      <xs:attribute name="Name" type="xs:string" use="required" />
    </xs:complexType>

    <xs:complexType name="TMeasure">
      <xs:complexContent>
        <xs:extension base="bi:TBaseProperty">
          <xs:sequence>
            <xs:element name="Cultures" type="bi:TCultures" minOccurs="0" maxOccurs="1" />
            <xs:element name="Kpi" type="bi:TKpi" minOccurs="0" maxOccurs="1" />
            <xs:element name="FormatBy" type="bi:TPropertyRefs" minOccurs="0"
             maxOccurs="1"/>
            <xs:element name="ApplyCulture" type="bi:TPropertyRefs" minOccurs="0"
             maxOccurs="1"/>
            <xs:element name="ContainsDetailRows" type="xs:boolean" minOccurs="0"
             maxOccurs="1"/>
            <xs:element name="DistributiveBy" type="bi:DistributiveBy" minOccurs="0"
maxOccurs="1" />
          </xs:sequence>
          <xs:attribute name="Private" type="xs:boolean" default="true" use="optional" />
          <xs:attribute name="IsSimpleMeasure" type="xs:boolean" default="true"/>
          <xs:attribute name="ActualType" type="xs:string"/>
          <xs:attribute name="Contents" type="xs:string"/>
          <xs:attribute name="LineageTag" type="xs:string" use="optional" />
          <xs:attribute name="IsError" type="xs:boolean" default="false" />
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TKpi">
      <xs:sequence>
        <xs:element name="Documentation" type="bi:TDocumentation" minOccurs="0"
maxOccurs="1" />
        <xs:element name="KpiGoal" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="1" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="KpiStatus" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
maxOccurs="1" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>

<xs:element name="KpiTrend" minOccurs="0" maxOccurs="1">
```

```
        <xs:complexType>
         <xs:sequence>
          <xs:element name="PropertyRef" type="bi:TPropertyRef" minOccurs="1"
               maxOccurs="1" />
         </xs:sequence>
        </xs:complexType>
       </xs:element>
      </xs:sequence>
      <xs:attribute name="StatusGraphic" type="xs:string" use="optional"/>
      <xs:attribute name="TrendGraphic" type="xs:string" use="optional"/>
    </xs:complexType>

  <xs:complexType name="TDistributiveBy">
      <xs:sequence>
        <xs:element name="EntityRef" type="bi:TEntityRef" minOccurs="1" maxOccurs="1" />
      </xs:sequence>
      <xs:attribute name="AggregationKind" type="bi:TAggregationKind" use="required" />
    </xs:complexType>

  <xs:simpleType name="TAggregationKind">
    <xs:restriction base="xs:string">
      <xs:enumeration value="Sum" />
      <xs:enumeration value="Min" />
      <xs:enumeration value="Max" />
      <xs:enumeration value="Count" />
    </xs:restriction>
</xs:simpleType>

<xs:complexType name="TEntityRef">
   <xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>


  <xs:complexType name="TNavigationProperty">
    <xs:complexContent>
      <xs:extension  base="bi:TMember">
        <xs:attribute name="CollectionCaption" type="xs:string" use="optional"/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="TEntityStatistics">
    <xs:attribute name="RowCount" type="xs:long" use="optional" />
  </xs:complexType>
</xs:schema>
```

6   Appendix B: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include updates to those products.

- Microsoft Excel 2013

- Microsoft Excel 2016

- Microsoft SQL Server 2012

- Microsoft SQL Server 2014

- Microsoft SQL Server 2016

- Microsoft SQL Server 2017

- Microsoft SQL Server 2019

- Microsoft SQL Server 2022

Exceptions, if any, are noted in this section. If an update version, service pack or Knowledge Base (KB) number appears with a product name, the behavior changed in that update. The new behavior also applies to subsequent updates 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.

<1> Section 1.6: The following table describes versions of conceptual schema definition language with business intelligence annotations (CSDLBI) and when they were introduced. Newer releases of SQL Server support previous CSDLBI versions. For example, SQL Server 2022 supports all previous CSDLBI versions.

Schema version	Release introduced
CSDLBI 1.0	SQL Server 2012
CSDLBI 1.1	Microsoft SQL Server 2012 Service Pack 1 (SP1); Excel 2013
CSDLBI 2.0	SQL Server 2012 SP1 Cumulative Update 4 (CU4); Microsoft Excel 2013 Service Pack 1 (SP1)
CSDLBI 2.5	SQL Server 2016

<2> Section 2.1.1: Microsoft SQL Server Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **PreferOrdinalStringEquality** attribute.

<3> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **MultiColumnFiltering** element.

<4> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **DiscourageCompositeModels** element.

<5> Section 2.1.3: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **QueryBatching** element.

<6> Section 2.1.3: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **Variables** element.

<7> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **InOperator** element.

<8> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TableConstructor** element.

<9> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **ExecutionMetrics** element.

<10> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **VirtualColumns** element.

<11> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **DataSourceVariables** element.

<12> Section 2.1.3: Analysis Services in Microsoft SQL Server does not support the **VisualCalculations** element.

<13> Section 2.1.3: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **DAXFunctions** element.

<14> Section 2.1.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **MParameters** element.

<15> Section 2.1.3.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TMultiColumnFiltering** simple type.

<16> Section 2.1.3.6: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TDiscourageCompositeModels** simple type.

<17> Section 2.1.3.8: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TQueryBatching** simple type.

<18> Section 2.1.3.9: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **TVariables** simple type.

<19> Section 2.1.3.10: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TInOperator** simple type.

<20> Section 2.1.3.11: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TTableConstructor** simple type.

<21> Section 2.1.3.12: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TExecutionMetrics** simple type.

<22> Section 2.1.3.13: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TVirtualColumns** simple type.

<23> Section 2.1.3.14: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TDataSourceVariables** simple type.

<24> Section 2.1.3.15: Analysis Services in SQL Server does not support the **TVisualCalculations** simple type.

<25> Section 2.1.4: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **TDAXFunctions** complex type.

<26> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **StringMinMax** element.

<27> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TreatAs** element.

<28> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **Error** element.

<29> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **SampleAxisWithLocalMinMax** element.

<30> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **SampleCartesianPointsByCover** element.

<31> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **OptimizedNotInOperator** element.

<32> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **NonVisual** element.

<33> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **IsAfter** element.

<34> Section 2.1.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **FormatByLocale** element.

<35> Section 2.1.4.4: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TStringMinMax** simple type.

<36> Section 2.1.4.6: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TTreatAs** simple type.

<37> Section 2.1.4.7: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TError** simple type.

<38> Section 2.1.4.8: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TSampleAxisWithLocalMinMax** simple type.

<39> Section 2.1.4.9: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TSampleCartesianPointsByCover** simple type.

<40> Section 2.1.4.10: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TOptimizedNotInOperator** simple type.

<41> Section 2.1.4.11: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TNonVisual** simple type.

<42> Section 2.1.4.12: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TIsAfter** simple type.

<43> Section 2.1.4.13: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TFormatByLocale** simple type.

<44> Section 2.1.5: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TMParameters** complex type.

<45> Section 2.1.6: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TMParameter** complex type.

<46> Section 2.1.7: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TParameterValuesColumn** complex type.

<47> Section 2.1.8: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **LineageTag** attribute.

<48> Section 2.1.8: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **Private** attribute for the **TEntitySet** complex type.

<49> Section 2.1.8: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **ShowAsVariationsOnly** attribute.

<50> Section 2.1.9: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **CrossFilterDirection** attribute.

<51> Section 2.1.9: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **Behavior** attribute.

<52> Section 2.1.9.2: Analysis Services in SQL Server 2012 and SQL Server 2014 does not support the **TCrossFilterDirection** simple type.

<53> Section 2.1.9.3: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **TBehavior** simple type.

<54> Section 2.1.10: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TCultures** complex type.

<55> Section 2.1.11: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **TCulture** complex type.

<56> Section 2.1.12: Analysis Services in SQL Server does not support the **IsCalculationGroup** attribute.

<57> Section 2.1.15: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **Cultures** element.

<58> Section 2.1.15: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **LineageTag** attribute.

<59> Section 2.1.18: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **Cultures** element.

<60> Section 2.1.19: Analysis Services does not support the **Caption** attribute.

<61> Section 2.1.21: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **Cultures** element.

<62> Section 2.1.21: Analysis Services in SQL Server 2012, SQL Server 2014, and SQL Server 2016 does not support the **ContainsHiddenMembers** element.

<63> Section 2.1.21: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **LineageTag** attribute.

<64> Section 2.1.21.1: Analysis Services in SQL Server 2012, SQL Server 2014, and SQL Server 2016 does not support the **THideMembers** simple type.

<65> Section 2.1.22: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **Cultures** element.

<66> Section 2.1.22: Analysis Services in SQL Server does not support the **Private** attribute.

<67> Section 2.1.22: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **LineageTag** attribute.

<68> Section 2.1.22: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **IsError** attribute.

<69> Section 2.1.27: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **Cultures** element.

<70> Section 2.1.27: Analysis Services in SQL Server 2012, SQL Server 2014, and SQL Server 2016 does not support the **ContainsDetailRows** element.

<71> Section 2.1.27: Analysis Services in SQL Server does not support the **DistributiveBy** element.

<72> Section 2.1.27: Analysis Services in SQL Server does not support the **Private** attribute.

<73> Section 2.1.27: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, and SQL Server 2017 does not support the **Contents** attribute.

<74> Section 2.1.27: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **LineageTag** attribute.

<75> Section 2.1.27: Analysis Services in SQL Server 2012, SQL Server 2014, SQL Server 2016, SQL Server 2017, and SQL Server 2019 does not support the **IsError** attribute.

<76> Section 2.1.28: Analysis Services in SQL Server does not support the **TDistributiveBy** complex type.

<77> Section 2.1.28: Analysis Services in SQL Server does not support the **AggregationKind** attribute.

<78> Section 2.1.28.1: Analysis Services in SQL Server does not support the **TAggregationKind** simple type.

7 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as Major, Minor, or None.

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

- A document revision that incorporates changes to interoperability requirements.
- A document revision that captures changes to protocol functionality.

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

The revision class **None** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the relevant technical content is identical to the last released version.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

Section	Description	Revision class
2.1.4 TDAXFunctions	Added missing bi: prefix to the TDAXFunctions schema.	Major
2.1.9 TAssociationSet	Specified default values in the TAssociationSet schema.	Major
2.1.10 TCultures	Changed the minOccurs value; corrected the element name in the table.	Major
2.1.11 TCulture	Added use="required" to the TCulture schema.	Major
2.1.15 THierarchy	Specified default values in the TAssociationSet schema. Updated the Cultures and Level element descriptions for the THierarchy complex type.	Major
2.1.21 TLevel	Updated the ContainsHiddenMembers and ContainsHiddenMembers.HideMembers element descriptions for the TLevel complex type.	Major
2.1.27 TMeasure	Changed the default value of the Private attribute to "true".	Major
2.1.32 TEntityRef	Updated version applicability in the TEntityRef complex type description.	Major
5 Appendix A: Full XML Schema	Aligned schemas for the TMember, TProperty, THierarchy, and TLevel complex types and the TAggregationKind simple type. Added TDistributiveBy complex type.	Major

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