

# [MS-DPDACPAC]:

## Data-Tier Application Data Portability Overview

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## Revision Summary

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Date	Revision History	Revision Class	Comments
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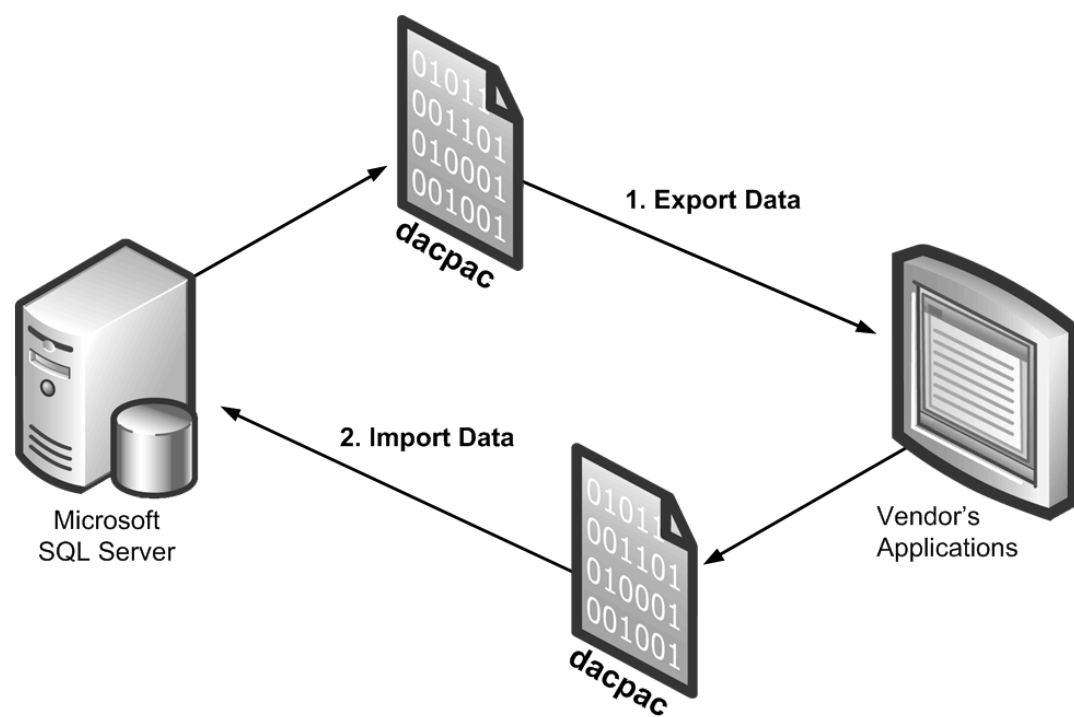
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# 1 Introduction

The Data-Tier Application Data Portability Overview document provides an overview of data portability scenarios for data export and import between Microsoft SQL Server and a vendor's application by using a data-tier application (DAC) package (a .dacpac file) as a portable artifact.

A data-tier application (DAC) is a self-contained unit of deployment that enables data-tier developers and database administrators (DBAs) to package SQL Server objects, including **database objects** and instance objects, into a single entity called a DAC package (a .dacpac file), as specified in [\[MSDN-UNDERDAC\]](#). A .dacpac file consists of a package of XML parts that represents metadata of the data-tier application and SQL Server object **schema** [\[MS-DACPAC\]](#).

In the data portability scenarios, a vendor is required to provide API or **XML** transformation methodology to produce or consume the .dacpac file within the vendor's application, unless it is implemented by using the Microsoft DAC API [\[MSDN-DACAPI\]](#).



**Figure 1: Conceptual overview of export and import data portability**

In the export data scenario in the figure, a vendor implements an application by using the DAC API as specified in [\[MSDN-DACAPI\]](#) to export SQL Server objects to a .dacpac file. The methodology is described in section [2.1](#).

In the import data scenario, a vendor implements an application by using the DAC API as specified in [\[MSDN-DACAPI\]](#) to import the vendor-produced .dacpac file into SQL Server. This methodology is described in section [2.2](#).

## 1.1 Glossary

This document uses the following terms:

**database object:** A representation of a named set of attribute value pairs that a protocol exposes.

**schema:** The set of attributes and object classes that govern the creation and update of objects.

**XML:** The Extensible Markup Language, as described in [\[XML1.0\]](#).

## 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](#).

[MS-DACPAC] Microsoft Corporation, "[Data-Tier Application Schema File Format](#)".

[MSDN-DACAPI] Microsoft Corporation, "Microsoft.SqlServer.Management.Dac Namespace", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee212127\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee212127(v=sql.105))

[MSDN-DACERROR] Microsoft Corporation, "Troubleshooting Data-tier Applications", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee240741\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee240741(v=sql.105))

[MSDN-DACEXCON] Microsoft Corporation, "DacExtractionUnit Constructor", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee641786\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee641786(v=sql.105))

[MSDN-DACEXT] Microsoft Corporation, "DacExtractionUnit Class", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee225691\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee225691(v=sql.105))

[MSDN-DACEXUEX] Microsoft Corporation, "DacExtractionUnit.Extract Method", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee642289\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee642289(v=sql.105))

[MSDN-DACSTIN] Microsoft Corporation, "DacStore.Install Method", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee642060\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee642060(v=sql.105))

[MSDN-DACSUPOB] Microsoft Corporation, "DAC Support For SQL Server Objects and Versions", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee210549\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee210549(v=sql.105))

[MSDN-DacTyCon] Microsoft Corporation, "DacType Constructor", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ff498965\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ff498965(v=sql.105))

[MSDN-DacType] Microsoft Corporation, "DacType Class", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee641771\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee641771(v=sql.105))

[MSDN-DBState] Microsoft Corporation, "Database States", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ms190442\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ms190442(v=sql.105))

[MSDN-PACKGET] Microsoft Corporation, "Package.GetPart(Uri) Method", <https://learn.microsoft.com/en-us/dotnet/api/system.io.packaging.package.getpart>

[MSDN-PACKOP] Microsoft Corporation, "Package.Open Method", <https://learn.microsoft.com/en-us/dotnet/api/system.io.packaging.package.open>

[MSDN-PACKPARTCON] Microsoft Corporation, "PackagePart Class - Constructors", <https://learn.microsoft.com/en-us/dotnet/api/system.io.packaging.packagepart#constructors>

[MSDN-SIOPN] Microsoft Corporation, "System.IO.Packaging Namespace", <https://learn.microsoft.com/en-us/dotnet/api/system.io.packaging>

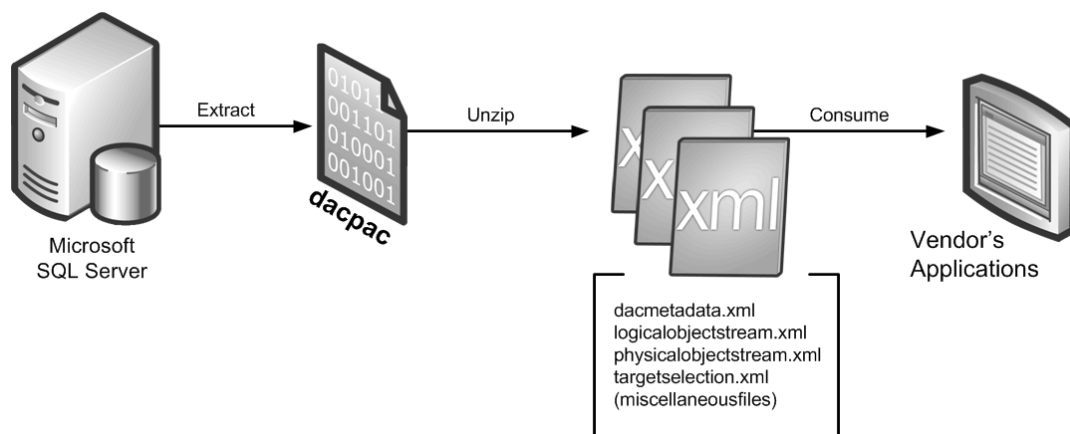
[MSDN-UNDERDAC] Microsoft Corporation, "Understanding Data-tier Applications", [https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee240739\(v=sql.105\)](https://learn.microsoft.com/en-us/previous-versions/sql/sql-server-2008-r2/ee240739(v=sql.105))

## 2 Data Portability Scenarios

### 2.1 Export Data

The data export scenario describes export customer data from Microsoft SQL Server to a .dacpac file so that a vendor can consume it within the vendor's application. As shown in the following figure, a .dacpac file can be created by extracting SQL Server objects and then unzipped to **XML** parts. A vendor can consume the XML parts of a .dacpac file as a native XML format. In this case, the vendor is required to implement the methodology to consume the .dacpac file within the vendor's application.

As shown in the following figure, a .dacpac file consists of dacmetadata.xml, logicalobjectstream.xml, physicalobjectstream.xml. It can contain targetselection.xml and miscellaneous files, such as Transact-SQL scripts. Refer to [\[MS-DACPAC\]](#) for more detail of the file format structure.



**Figure 2: Export data**

This section provides a step-by-step description and references for exporting data to a .dacpac file and obtaining XML parts using APIs.

#### 2.1.1 Data Description

##### Customer data

The customer data is a **schema** representation of a SQL Server database and instances in SQL Server. In this version, a .dacpac file supports a subset of SQL Server objects, as specified in [\[MSDN-DACSUPOB\]](#).

##### Intended user

The intended user is a vendor who can export SQL Server object schema from SQL Server to a .dacpac file format to consume it within the vendor's application.

#### 2.1.2 Format and Protocol Summary

The following table provides a comprehensive list of the formats and protocols used in the export data portability scenario.

Protocol or format name	Description	Reference
Data-Tier Application File (.dacpac file) Format	The data-tier application file format is a package of XML files that serves as the packaging format for the data-	<a href="#">[MS-DACPAC]</a>

Protocol or format name	Description	Reference
	tier application.	
Microsoft.SqlServer.Management.DAC Namespace	The <b>Microsoft.SqlServer.Management.Dac</b> namespace contains classes that represent the DAC objects.	<a href="#">[MSDN-DACAPI]</a>
System.IO.Packaging Namespace	The <b>System.IO.Packaging</b> namespace provides classes that support storage of multiple data objects in a single container.	<a href="#">[MSDN-SIOPN]</a>

### 2.1.3 Data Portability Methodology

The data portability methodology describes the steps to extract and unzip a data-tier application using the DAC API and **System.IO.Packaging**. The vendor's proprietary implementation for consuming the .dacpac file is outside the scope of this section.

#### Extract a data-tier application

To extract a data-tier application, follow these steps:

1. Initialize a new instance of the **DacType** [\[MSDN-DacType\]](#). For more information, refer to the **DacType** constructor [\[MSDN-DacTyCon\]](#).
2. Initialize a new instance of the **DacExtractionUnit** class and connect to the SQL Server database [\[MSDN-DACEXT\]](#). For more information, refer to the **DacExtractionUnit** constructor [\[MSDN-DACEXCON\]](#).
3. Extract the database to the **DacType** [\[MSDN-DACEXT\]](#). For more information, refer to the **DacExtractionUnit.Extract** method [\[MSDN-DACEXUEX\]](#).
4. Save the **DacType** as a .dacpac file. For more information, refer to the **DacType.Save** method [\[MSDN-DacType\]](#).

#### Unzip a data-tier application

To unzip a data-tier application by using **System.IO.Packaging**, follow these steps:

1. Initialize a new instance of **Package** class and open the .dacpac file [\[MSDN-SIOPN\]](#). For more information, refer to the **Package.Open** method [\[MSDN-PACKOP\]](#).
2. Save package parts by using a specific folder [\[MSDN-SIOPN\]](#). For more information, refer to the **Package.GetPart** method [\[MSDN-PACKGET\]](#).

After XML parts are created in the specified folder, a vendor's application can load it as a standard XML file for further proprietary processing.

#### 2.1.3.1 Preconditions

The SQL Server database is required to be ONLINE as specified in [\[MSDN-DBState\]](#).

#### 2.1.3.2 Versioning

This version of the export data scenario is applicable to Microsoft SQL Server 2008 R2 and Microsoft SQL Server 2012.



### 2.1.3.3 Error Handling

Data-tier application error handling and troubleshooting are described in [\[MSDN-DACERROR\]](#).

### 2.1.3.4 Coherency Requirements

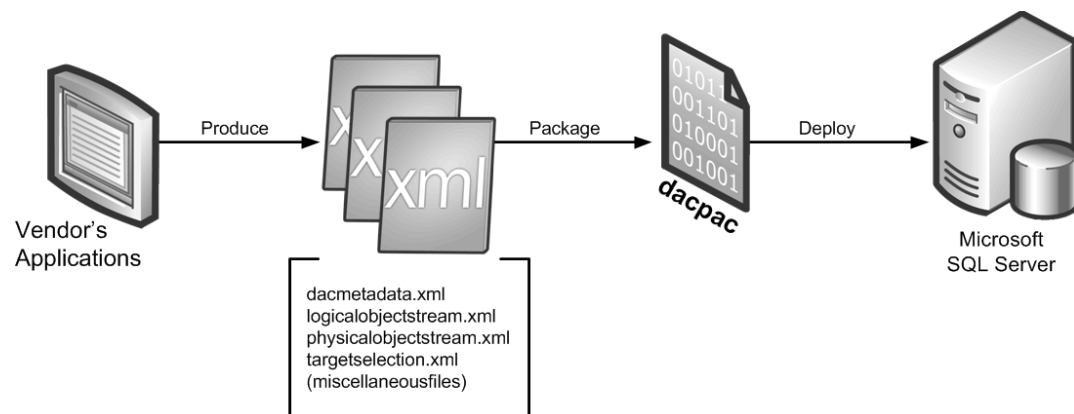
The SQL Server object is required to be listed as a supported object in [\[MSDN-DACSUPOB\]](#).

### 2.1.3.5 Additional Considerations

There are no additional considerations.

## 2.2 Import Data

The data import scenario describes importing vendor's data to a .dacpac file so that the data can be deployed to SQL Server as a data-tier application. As shown in the following figure, a vendor can produce **XML** parts that conform to [\[MS-DACPAC\]](#) structure format and package it to a .dacpac file. Note that the vendor is required to implement the methodology producing the XML parts within the vendor's application.



**Figure 3: Import data**

A vendor can package the XML parts to a .dacpac file by using the API that is specified in System.IO.Packaging [\[MSDN-SIOPN\]](#) and can deploy the .dacpac file to SQL Server by using the DAC API. To create a .dacpac file that can be deployed to SQL Server, a vendor's .dacpac file is required to contain dacmetadata.xml, logicalobjectstream.xml, physicalobjectstream.xml, and, optionally, targetselection.xml.

### 2.2.1 Data Description

#### Customer data

The customer data is a schema of a vendor's proprietary data to be imported into a SQL Server database. In this version, supported objects are required to be specified in [\[MSDN-DACSUPOB\]](#).

#### Intended user

The intended user is a vendor who can import a vendor's proprietary data to a SQL Server database by using the .dacpac file format.

## 2.2.2 Format and Protocol Summary

The following table provides a comprehensive list of the formats and protocols used in an import data portability scenario.

Protocol or format name	Description	Reference
Data-Tier Application File (.dacpac) Format	The data-tier application file format is a package of XML files that serves as the packaging format for the data-tier application.	<a href="#">[MS-DACPAC]</a>
Microsoft.SqlServer.Management.DAC Namespace	The <b>Microsoft.SqlServer.Management.Dac</b> namespace contains classes that represent the DAC objects.	<a href="#">[MSDN-DACAPI]</a>
System.IO.Packaging Namespace	The <b>System.IO.Packaging</b> namespace provides classes that support storage of multiple data objects in a single container.	<a href="#">[MSDN-SIOPN]</a>

## 2.2.3 Data Portability Methodology

The data portability methodology describes the packaging and deployment steps to take when using DAC API. A vendor is required to provide its proprietary methodology to produce XML parts to be packaged in a .dacpac file. The XML parts and .dacpac files that are produced by the vendor's proprietary methodology is required to be compatible with [\[MS-DACPAC\]](#).

### Package a data-tier application

To package a data-tier application, follow these steps:

1. Initialize a new instance of the **System.IO.Packaging.Package** class [\[MSDN-SIOPN\]](#).
2. Create a **PackagePart** class for the XML part file stream in the package [\[MSDN-PACKPARTCON\]](#). **PackageParts** is required to include logicalobjectstream.xml, physicalobjectstream.xml, dacmetadata.xml, and, optionally, targetselection.xml, as specified in [\[MS-DACPAC\]](#).
3. Close the package. The package is required to be saved with the \*.dacpac file name extension [\[MSDN-SIOPN\]](#).

### Deploy a data-tier application

To deploy a data-tier application, load the .dacpac file, and then install it to a SQL Server database [\[MSDN-DacType\]](#). For more information, refer to the **DacStore.Install** method [\[MSDN-DACSTIN\]](#).

#### 2.2.3.1 Preconditions

A SQL Server user is required to be a member of the **dbcreator** fixed server role and have ALTER ANY LOGIN server permission on the SQL Server instance to deploy the .dacpac file.

A vendor is required to create .dacpac file XML parts that are compatible with the format that is specified in [\[MS-DACPAC\]](#).

A .dacpac file created by a vendor is required to be compatible with the package format that is specified in [\[MSDN-SIOPN\]](#).

#### 2.2.3.2 Versioning

This version of import data scenario is applicable to SQL Server 2008 R2 and SQL Server 2012.

### **2.2.3.3 Error Handling**

Data-tier application error handling and troubleshooting are described in [\[MSDN-DACERROR\]](#).

### **2.2.3.4 Coherency Requirements**

Imported data is required to be specified in SQL Server object list [\[MSDN-DACSUPOB\]](#).

### **2.2.3.5 Additional Considerations**

There are no additional considerations.

### 3 Change Tracking

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

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