

How To: Extend the Ed-Fi ODS / API - Student Transportation Example

In this example, we will create a new domain entity called StudentTransportation. This entity will add an Ed-Fi Extension to the Student Enrollment interchange and will be exposed in Ed-Fi ODS / API through a new API resource called **studentTransportations**. It is assumed that the Ed-Fi ODS has been successfully downloaded and is running as in a local environment per the instructions in the [Getting Started](#) documentation.

The steps can be summarized as:

- [Step 1. Author Ed-Fi Core Schema Extensions](#)
- [Step 2. Author a Custom Interchange Schema](#)
- [Step 3. Author Database Schema Extensions](#)
- [Step 4. Author API Metadata Extensions](#)
- [Step 5. Run Code Generation and Verify Changes](#)

Each step is outlined in detail, below.

Step 1. Author Ed-Fi Core Schema Extensions

Create an Extension to the Ed-Fi Core Schema, called **EXTENSION-Ed-Fi-Core.xsd**, and place it in the **C:\Ed-Fi-ODS-Implementation\Extensions\Schemas** folder. This Extension introduces new entity types for the StudentTransportation entity. It is important to note that core schema Extension file must be able to resolve the reference to the Ed-Fi Core Schema file.

EXTENSION-Ed-Fi-Core.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns="http://ed-fi.org/0220" xmlns:ann="http://ed-fi.org/annotation" xmlns:altova="http://www.altova.com/xml-schema-extensions" targetNamespace="http://ed-fi.org/0220" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:include schemaLocation="..\..\..\Ed-Fi-ODS\Application\schemas\codegen\Ed-Fi-Core.xsd"/>
  <xs:annotation>
    <xs:documentation>==== Sample Core Type Extensions ====</xs:documentation>
  </xs:annotation>
  <xs:complexType name="EXTENSION-StudentTransportation">
    <xs:annotation>
      <xs:documentation>New state-specific entity which specifies the buses that a student is expecting to use and the approximate distance.</xs:documentation>
    </xs:annotation>
    <xs:appinfo>
      <ann:TypeGroup>Domain Entity</ann:TypeGroup>
    </xs:appinfo>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base="ComplexObjectType">
        <xs:sequence>
          <xs:element name="StudentReference" type="StudentReferenceType">
            <xs:annotation>
              <xs:documentation>Student associated with the buses.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="SchoolReference" type="SchoolReferenceType">
            <xs:annotation>
              <xs:documentation>School associated with the buses.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="AMBusNumber" type="EXTENSION-BusNumber">
            <xs:annotation>
```

Downloads

The following link is a ZIP archive containing source files for this extensibility sample.

[Student Transportation Source Files](#)

```

                <xs:documentation>Bus number student rides in
morning (AM)</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="PMBusNumber" type="EXTENSION-
BusNumber">
            <xs:annotation>
                <xs:documentation>Bus number student rides in
afternoon (PM)</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="EstimatedMilesFromSchool" type="
EXTENSION-EstimatedMiles">
            <xs:annotation>
                <xs:documentation>The distance the child lives
from the school. Example, 1 Mile = 01.00 2.5 Miles = 02.50</xs:
documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:simpleType name="EXTENSION-BusNumber">
    <xs:annotation>
        <xs:documentation>Bus number student rides (see EXTENSION-
StudentTransportation - used for AM and PM bus numbers)</xs:documentation>
    <xs:appinfo>
        <ann:TypeGroup>Simple</ann:TypeGroup>
    </xs:appinfo>
</xs:annotation>
    <xs:restriction base="xs:string">
        <xs:minLength value="0"/>
        <xs:maxLength value="6"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="EXTENSION-EstimatedMiles">
    <xs:annotation>
        <xs:documentation>Estimated distance from point A to point B.
(see EXTENSION-StudentTransportation)</xs:documentation>
    <xs:appinfo>
        <ann:TypeGroup>Simple</ann:TypeGroup>
    </xs:appinfo>
</xs:annotation>
    <xs:restriction base="xs:decimal">
        <xs:minInclusive value="0.00"/>
        <xs:maxInclusive value="999.00"/>
        <xs:totalDigits value="5"/>
        <xs:fractionDigits value="2"/>
    </xs:restriction>
</xs:simpleType>
</xs:schema>

```



For more information about how to extend the Ed-Fi Core Schema, see [XML Schema - Extensions Framework Guide](#).

Step 2. Author a Custom Interchange Schema

Create a custom interchange file, called **EXTENSION-Interchange-StudentEnrollment.xsd**, and place it in the **C:\Ed-Fi-ODS-Implementation\Extensions\Schemas** folder. This file overrides the Ed-Fi [Student Enrollment Interchange](#), adding in the StudentTransportation entity into the Interchange. It is important to note that the `schemaLocation` should be a valid reference the schema file that contains the Extension definition (i.e., the `EXTENSION-Ed-Fi-Core.xsd` file created in the previous step).

EXTENSION-Interchange-StudentEnrollment.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns="http://ed-fi.
org/0220" targetNamespace="http://ed-fi.org/0220" elementFormDefault="
qualified" attributeFormDefault="unqualified">
  <xs:include schemaLocation=".\\EXTENSION-Ed-Fi-Core.xsd"/>
  <xs:annotation>
    <xs:documentation>==== Student Enrollment Interchange Model
====</xs:documentation>
  </xs:annotation>
  <xs:element name="InterchangeStudentEnrollment">
    <xs:annotation>
      <xs:documentation>The Student Enrollment interchange describes
student enrollments in schools and in sections.</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:choice maxOccurs="unbounded">
        <xs:element name="SectionReference" type="SectionReferenceType"
/>
        <xs:element name="StudentSchoolAssociation" type="
StudentSchoolAssociation"/>
        <xs:element name="StudentSectionAssociation" type="
StudentSectionAssociation"/>
        <xs:element name="GraduationPlan" type="GraduationPlan"/>
        <xs:element name="StudentEducationOrganizationAssociation"
type="StudentEducationOrganizationAssociation"/>
        <xs:element name="StudentTransportation" type="EXTENSION-
StudentTransportation"/>
      </xs:choice>
    </xs:complexType>
  </xs:element>
</xs:schema>
```



For more information about how to create a custom interchange schema, see [XML Schema - Custom Interchange Schema](#).

Step 3. Author Database Schema Extensions

Create an Extension SQL script called **0001-Extensions.sql** and place it in the **C:\Ed-Fi-ODS-Implementation\Database\Structure\EdFi** folder. This script defines the database schema for the Extension.

0001-Extensions.sql

```
IF NOT EXISTS (SELECT 1 FROM sys.schemas WHERE name = 'extension')
BEGIN
    EXEC('CREATE SCHEMA [extension] AUTHORIZATION dbo')
END
GO

IF OBJECT_ID('extension.FK_StudentTransportation_SchoolId') IS NOT NULL
    ALTER TABLE extension.StudentTransportation DROP CONSTRAINT
    FK_StudentTransportation_SchoolId;

IF OBJECT_ID('extension.FK_StudentTransportation_StudentUSI') IS NOT NULL
    ALTER TABLE extension.StudentTransportation DROP CONSTRAINT
    FK_StudentTransportation_StudentUSI;

IF EXISTS (SELECT 1 FROM sys.tables WHERE SCHEMA_NAME(schema_id) =
'extension' AND OBJECT_NAME(object_id) = 'StudentTransportation')
    DROP TABLE extension.StudentTransportation;

IF NOT EXISTS (SELECT 1 FROM sys.tables WHERE SCHEMA_NAME(schema_id) =
'extension' AND OBJECT_NAME(object_id) = 'StudentTransportation')
BEGIN
    CREATE TABLE extension.StudentTransportation (
        Id uniqueidentifier NOT NULL CONSTRAINT
        StudentTransportation_DF_Id DEFAULT newid()
        ,SchoolId INT NOT NULL
        ,StudentUSI INT NOT NULL
        ,AMBusNumber VARCHAR(6) CONSTRAINT
        StudentTransportation_DF_AMBusNumber DEFAULT '-' NOT NULL
        ,PMBusNumber VARCHAR(6) CONSTRAINT
        StudentTransportation_DF_PMBusNumber DEFAULT '-' NOT NULL
        ,EstimatedMilesFromSchool DECIMAL(5,2) NOT NULL
        ,CreateDate datetime NOT NULL CONSTRAINT
        StudentTransportation_DF_CreateDate DEFAULT getdate()
        ,LastModifiedDate datetime NOT NULL CONSTRAINT
        StudentTransportation_DF_LastModifiedDate DEFAULT getdate()
        ,CONSTRAINT StudentTransportation_PK PRIMARY KEY CLUSTERED
        (SchoolId,StudentUSI,AMBusNumber,PMBusNumber)
        ,CONSTRAINT FK_StudentTransportation_SchoolId FOREIGN KEY
        (SchoolId) REFERENCES edfi.School (SchoolId)
        ,CONSTRAINT FK_StudentTransportation_StudentUSI FOREIGN KEY
        (StudentUSI) REFERENCES edfi.Student (StudentUSI)
    )
    CREATE UNIQUE NONCLUSTERED INDEX GUID_StudentTransportation ON
    extension.StudentTransportation (Id);
END
GO

EXEC sys.sp_addextendedproperty 'MS_Description', 'A designation of the
transportation a student uses to get to and from school.', 'schema',
'extension', 'table', 'StudentTransportation'
GO
```



When modeling the Ed-Fi Extension database tables, it is important to follow the patterns that already exist in the database.

Step 4. Author API Metadata Extensions

Create an Extension API metadata file called **DomainMetadata-Extension.xml** and place it in the **C:\Ed-Fi-ODS-Implementation\Extensions\Metadata** folder. This file will register the StudentTransportation entity as a domain aggregate and ensure the code generation process will process the entity.

DomainMetadata-Extension.xml

```
<?xml version="1.0" encoding="utf-8" ?>
<AggregateExtensions>
  <Aggregate root="StudentTransportation">
    <Entity table="StudentTransportation" schema="extension" />
  </Aggregate>
</AggregateExtensions>
```

Step 5. Run Code Generation and Verify Changes

Re-run the code generation steps outlined in the Getting Started Guide, (i.e., from a PowerShell prompt run `Initialize-PowershellForDevelopment.ps` script, followed by the `initdev` command). Then run the application and view the Ed-Fi ODS / API using Swagger. The following new API resource should be visible:

studentTransportations :		Show/Hide	List Operations	Expand Operations	Raw
GET	/studentTransportations		Retrieves resources based with paging capabilities (using the "Get All" pattern).		
GET	/studentTransportations		Retrieves a specific resource using the values of the resource's natural key (using the "Get By Key" pattern).		
POST	/studentTransportations		Creates or updates resources based on the natural key values of the supplied resource.		
GET	/studentTransportations/{id}		Retrieves a specific resource using the resource's identifier (using the "Get By Id" pattern).		
PUT	/studentTransportations/{id}		Updates an existing resource based on the resource identifier.		
DELETE	/studentTransportations/{id}		Deletes an existing resource using the resource identifier.		