



Routing XML Virtual Documents in Productions

Version 2024.1
2024-07-02

Routing XML Virtual Documents in Productions

InterSystems IRIS Data Platform Version 2024.1 2024-07-02

Copyright © 2024 InterSystems Corporation

All rights reserved.

InterSystems®, HealthShare Care Community®, HealthShare Unified Care Record®, IntegratedML®, InterSystems Caché®, InterSystems Ensemble®, InterSystems HealthShare®, InterSystems IRIS®, and TrakCare are registered trademarks of InterSystems Corporation. HealthShare® CMS Solution Pack™ HealthShare® Health Connect Cloud™, InterSystems IRIS for Health™, InterSystems Supply Chain Orchestrator™, and InterSystems TotalView™ For Asset Management are trademarks of InterSystems Corporation. TrakCare is a registered trademark in Australia and the European Union.

All other brand or product names used herein are trademarks or registered trademarks of their respective companies or organizations.

This document contains trade secret and confidential information which is the property of InterSystems Corporation, One Memorial Drive, Cambridge, MA 02142, or its affiliates, and is furnished for the sole purpose of the operation and maintenance of the products of InterSystems Corporation. No part of this publication is to be used for any other purpose, and this publication is not to be reproduced, copied, disclosed, transmitted, stored in a retrieval system or translated into any human or computer language, in any form, by any means, in whole or in part, without the express prior written consent of InterSystems Corporation.

The copying, use and disposition of this document and the software programs described herein is prohibited except to the limited extent set forth in the standard software license agreement(s) of InterSystems Corporation covering such programs and related documentation. InterSystems Corporation makes no representations and warranties concerning such software programs other than those set forth in such standard software license agreement(s). In addition, the liability of InterSystems Corporation for any losses or damages relating to or arising out of the use of such software programs is limited in the manner set forth in such standard software license agreement(s).

THE FOREGOING IS A GENERAL SUMMARY OF THE RESTRICTIONS AND LIMITATIONS IMPOSED BY INTERSYSTEMS CORPORATION ON THE USE OF, AND LIABILITY ARISING FROM, ITS COMPUTER SOFTWARE. FOR COMPLETE INFORMATION REFERENCE SHOULD BE MADE TO THE STANDARD SOFTWARE LICENSE AGREEMENT(S) OF INTERSYSTEMS CORPORATION, COPIES OF WHICH WILL BE MADE AVAILABLE UPON REQUEST.

InterSystems Corporation disclaims responsibility for errors which may appear in this document, and it reserves the right, in its sole discretion and without notice, to make substitutions and modifications in the products and practices described in this document.

For Support questions about any InterSystems products, contact:

InterSystems Worldwide Response Center (WRC)

Tel: +1-617-621-0700

Tel: +44 (0) 844 854 2917

Email: support@InterSystems.com

Table of Contents

1 Introduction to XML Virtual Documents	1
1.1 See Also	1
2 Importing and Viewing XML Schemas (for Virtual Documents)	3
2.1 Introduction	3
2.2 Using the XML Schema Structures Page	4
2.3 Using the XML Document Viewer Page	4
2.4 Importing XML Schemas Programmatically	4
2.5 See Also	5
3 Configuring a Production to Use XML Virtual Documents	7
3.1 Loading XML Schemas into InterSystems IRIS	7
3.2 Adding a Business Service to Handle Inbound XML as Virtual Documents	7
3.3 Adding a Business Process to Handle XML Virtual Documents	8
3.4 Adding a Business Operation to Handle XML Virtual Documents	8
3.5 See Also	9
4 Overview of XML Virtual Property Paths	11
4.1 Orientation to Virtual Property Paths for XML Virtual Documents	11
4.1.1 Basic Syntax for Schema-dependent Paths	11
4.1.2 Basic Syntax for DOM-style Paths	12
4.2 Viewing Path Units for XML Virtual Documents	12
4.3 Redundant Inner Elements for Schema-dependent Paths	15
4.4 Repeating Fields	16
4.5 Repeating Sequences	17
4.6 Duplicate Names	17
4.7 Choice Structures	17
4.8 Groups Included by Reference	18
4.9 See Also	20
5 Specifying Schema-dependent Paths for XML Virtual Documents	21
5.1 Getting or Setting the Contents of an XML Element	21
5.2 Getting or Setting the Value of an XML Attribute	22
5.3 Comments and Descriptions	22
5.4 Using Mixed Content When Setting Schema-dependent Paths	23
5.5 Character Escaping When Setting Schema-dependent Paths	23
5.6 Special Variations for Repeating Elements	24
5.6.1 Iterating Through the Repeating Elements	24
5.6.2 Counting Elements	24
5.7 Testing Schema-dependent Paths in the Terminal	25
5.8 See Also	26
6 Specifying DOM-style Paths for XML Virtual Documents	27
6.1 Getting or Setting Nodes (Basic Paths)	27
6.2 Using Mixed Content When Setting DOM-style Paths	29
6.3 Using the Basic Path Modifiers	30
6.4 Using the Full() Function	32
6.5 Getting or Setting the Value of an XML Attribute	32
6.6 Using Path Modifiers to Insert or Append Nodes	33
6.7 Using the element() Function	36

6.7.1 Using element() When Getting a Value	36
6.7.2 Using element() When Setting a Value	36
6.8 Getting Positions of Elements	36
6.9 Getting Counts of Elements	36
6.10 Accessing Other Metadata	37
6.11 Summary of Path Modifiers	38
6.12 Variations for Documents That Use Namespaces	38
6.13 Testing DOM-style Paths in the Terminal	38
6.14 See Also	39
7 Defining Data Transformations for XML Virtual Documents	41
7.1 Creating a Data Transformation	41
7.2 Available Assignment Actions for XML Virtual Documents	42
7.3 Using Code	42
7.3.1 The pFormat Argument	43
7.4 Example 1: Copying Most of the Source Document	44
7.5 Example 2: Using Only a Few Parts of the Source Document	45
7.6 Example 3: Using Code and SetValueAt()	46
7.7 See Also	47
8 Defining Rule Sets for XML Virtual Documents	49
8.1 Creating a Rule Set	49
8.2 Example	50
8.3 See Also	50
9 Defining Search Tables for XML Virtual Documents	53
9.1 Introduction	53
9.2 Example	53
9.3 See Also	53
10 XML-Enabled Objects Compared to XML Virtual Documents	55
11 Classes for Use with XML Virtual Documents	57
11.1 See Also	58
XML Virtual Document Business Service and Business Operation Settings	59
Settings for XML Business Services	60
Settings for XML Business Operations	61

1

Introduction to XML Virtual Documents

InterSystems IRIS® data platform provides support for XML documents as [virtual documents](#). A *virtual document* is a kind of message that InterSystems IRIS parses only partially. This kind of message has the standard production message header and the standard message properties such as ID, Priority, and SessionId. The data in the message, however, is not available as message properties; instead it is stored directly in an internal-use global, for greater processing speed.

InterSystems IRIS provides tools so that you can access values in virtual documents, for use in data transformations, business rules, and searching and filtering messages. For background information, see [Using Virtual Documents in Productions](#).

In some cases, it may be more efficient to use XML-enabled objects in productions instead of XML [virtual documents](#). See [XML-Enabled Objects Compared to XML Virtual Documents](#). Specifically, you can treat the XML documents as *standard* production messages. To do so, you generate XML-enabled classes from the corresponding XML schema and then define message classes that inherit from those XML-enabled classes.

1.1 See Also

- [Using Virtual Documents in Productions](#)
- [XML-Enabled Objects Compared to XML Virtual Documents](#)
- [Importing and Viewing XML Schemas](#)
- [Configuring a Production to Use XML Virtual Documents](#)

2

Importing and Viewing XML Schemas (for Virtual Documents)

When using XML documents as [virtual documents](#), you usually need to import the corresponding XML schemas into InterSystems IRIS® data platform. This topic describes how to do so, as well as how to view the XML schemas.

2.1 Introduction

When using XML documents as [virtual documents](#), you should import the corresponding XML schemas into InterSystems IRIS. After doing so, you can define [data transformations](#) and specify [schema-dependent property paths](#) if needed.

Note: You can use these schemas only to support processing of XML virtual documents as described in this documentation. InterSystems IRIS does not use them for any other purpose.

Also:

- When reading XML documents, InterSystems IRIS removes the XML declaration, all processing instructions, and all comments.
- If the name of an element or attribute includes a period (.), InterSystems IRIS replaces that with a tilde (~).
For example, an XML element named `My.Element` appears as `My~Element` in InterSystems IRIS.
- InterSystems IRIS does not support XML schemas in which an element is defined via a reference (`ref`) to a type in the schema. Instead of `ref`, use `type`. For example, consider the following fragment of a schema:

```
<xs:element name="test1" ref="sometype"></xs:element>  
<xs:element name="test2" type="sometype"></xs:element>
```

When this schema is imported, the element `test1` will not be fully defined, because this form of top-level element definition is not supported. The schema viewer, for example, will not show the full element type for `test1`. In contrast, `test2` will appear in the schema as expected.

This limitation applies only to schemas used with XML virtual documents

2.2 Using the XML Schema Structures Page

The **Interoperability > Interoperate > XML > XML Schema Structures** page enables you to import and view XML schema specifications.

For general information on using this page, see [Using the Schema Structures Page](#).

Before importing a schema file, rename it so that its name is informative and unique within this namespace. The filename is used as the schema category name in the Management Portal and elsewhere. If the filename ends with the file extension `.xsd`, the file extension is omitted from the schema category name. Otherwise the file extension is included in the name.

Important: After importing a schema file, do not remove the file from its current location in the file system. The XML parser uses the schema file rather than the schema stored in the InterSystems IRIS database.

2.3 Using the XML Document Viewer Page

The **Interoperability > Interoperate > XML > XML Document Viewer** page enables you to display XML documents, parsing them in different ways, so that you can determine which DocType to use. You can also test transformations. The documents can be external files or documents from the production message archives.

To display this page, click **Interoperability**, click **Interoperate**, click **XML**. Then click **XML Document Viewer** and click **Go**.

For general information on using this page, see [Using the Document Viewer Page](#).

2.4 Importing XML Schemas Programmatically

You can also load schemas programmatically by using the `EnsLib.EDI.XML.SchemaXSD` class directly. This class provides the **Import()** class method. The first argument to this method is the name of the file to import, including its full directory path. For example:

```
set status= ##class(EnsLib.EDI.XML.SchemaXSD).Import("c:\iris\myapp.xsd")
```

The `EnsLib.EDI.XML.SchemaXSD` class also provides the **ImportFiles()** method. For this method, you can specify the first argument in either of the following ways:

- As the name of a directory to import files from. InterSystems IRIS attempts to import all files in this directory, regardless of the file extensions. For example:

```
set status=##class(EnsLib.EDI.XML.SchemaXSD).ImportFiles("c:\iris\")
```

- As a list of filenames, separated by semicolons. You must include the full directory path for the first of these, and you can use wildcards in the filenames. For example:

```
set status=##class(EnsLib.EDI.XML.SchemaXSD).ImportFiles("c:\iris\*.xsd;*.XSD")
```

For more information, see the class reference for `EnsLib.EDI.XML.SchemaXSD`.

Important: After importing a schema file, do not remove the file from its current location in the file system. The XML parser uses the schema file rather than the schema stored in the InterSystems IRIS database.

2.5 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Using the Schema Structures Page](#)
- [Using the Document Viewer Page](#)

3

Configuring a Production to Use XML Virtual Documents

This topic describes the configuration steps needed to use [XML virtual documents](#) in a production.

For information on settings not described here, see [Reference for Settings](#).

Other topics describe how to create items to use in the production: [data transformations](#), [rule sets](#), and [search tables](#).

3.1 Loading XML Schemas into InterSystems IRIS

For XML virtual documents, it is useful, but not required, to load the corresponding XML schemas into InterSystems IRIS. If the schemas are available in InterSystems IRIS, then InterSystems IRIS can validate the documents, and you can use the schema-dependent virtual property paths (rather than only the DOM-style paths). Also, the DTL editor and the Business Rule Editor provide assistance with the document structure.

To load an XML schema into InterSystems IRIS, use the [XML Schema Structures](#) page.

3.2 Adding a Business Service to Handle Inbound XML as Virtual Documents

To add a business service to handle inbound XML documents as virtual documents, do the following:

1. To your production, add a business service that is based on the class `EnsLib.EDI.XML.Service.FileService` or `EnsLib.EDI.XML.Service.FTPService`.
2. Specify where this business service will find the inbound XML documents.

For example, for `EnsLib.EDI.XML.Service.FileService`, specify the **File Path** setting, which is the directory that the business service will check for new files.

3. Optionally specify other settings as needed. In particular, you might want to specify the following:
 - **Doc Schema Category**, which specifies the XML schema that applies to the inbound documents. Select a XML schema that you have previously loaded.

You must choose a schema if you want to validate the messages. The schema can also be used if you define search tables.

- **Charset**, which specifies the character set of the inbound data. InterSystems IRIS automatically translates from this character encoding. For more options, see [Charset](#) in [Reference for Settings](#).
- **Search Table Class**. See [Defining Search Tables for XML Virtual Documents](#).

Make sure that this search table class is consistent with the kinds of messages received by this business host. For example, if the business host receives messages whose root element is <Transaction>, it would not be appropriate to use a search table class that used properties in an <Employee> element.

4. Specify where to send the XML documents. To do so, specify a comma-separated list of values for the **Target Config Names** setting. Each value should be the name of either a business process or a business operation.

3.3 Adding a Business Process to Handle XML Virtual Documents

To add a business process to handle XML virtual documents, do the following:

1. To your production, add a business process that is based on the class `EnsLib.MsgRouter.VDocRoutingEngine`.
2. For this business process, specify the **Business Rule Name** setting. Choose the appropriate business rule set that acts on XML virtual documents.

For information on defining these, see [Defining Rule Sets for XML Virtual Documents](#).

3. Optionally specify other settings as needed.
4. Configure the appropriate business host or hosts in the same production to send XML virtual documents to this business process:
 - For a business service, edit the **Target Config Names** setting to include the name of this business process.
 - For a business process, specify a **Business Rule Name** that routes messages to this business process.

3.4 Adding a Business Operation to Handle XML Virtual Documents

To add a business operation to send XML virtual documents to destinations outside of a production, do the following:

1. To your production, add a business operation that is based on the class `EnsLib.EDI.XML.Operation.FileOperation` or `EnsLib.EDI.XML.Operation.FTPOperation`.
2. Specify settings of this business operation as needed.

For example, for `EnsLib.EDI.XML.Operation.FileOperation`, specify the **File Path** setting, which is the directory to which the business operation will write the files. The directory must exist and must be accessible.

3. Optionally specify the **Search Table Class** setting. See [Defining Search Tables for XML Virtual Documents](#).

Make sure that this search table class is consistent with the kinds of messages received by this business host. For example, if the business host receives messages whose root element is <Transaction>, it would not be appropriate to use a search table class that referred to an <Employee> element.

4. Configure the appropriate business host or hosts in the same production to send XML virtual documents to this business operation:
 - For a business service, edit the **Target Config Names** setting to include the name of this business operation.
 - For a business process, specify a **Business Rule Name** that routes messages to this business operation.

You might also want to add business operations to handle bad messages (for background, see [Business Processes for Virtual Documents](#)).

3.5 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Defining Data Transformations for XML Virtual Documents](#)
- [Defining Rule Sets for XML Virtual Documents](#)
- [Defining Search Tables for XML Virtual Documents](#)
- [Overview of XML Virtual Property Paths](#)

4

Overview of XML Virtual Property Paths

This topic provides an overview of XML virtual property paths ([property paths](#) in [XML virtual documents](#)).

The next two topics describe in detail how to create XML virtual property paths.

Note: The code examples in this topic are fragments from data transformations, because data transformations generally use a richer set of property paths than do rule sets and search tables. Also, the emphasis is on DOM-style paths, because those are the paths that you must create manually. (In contrast, when you specify a schema to use, Inter-Systems IRIS® data platform displays the structure of the document and automatically generates schema-dependent paths when you drag and drop or when you use auto-completion.)

4.1 Orientation to Virtual Property Paths for XML Virtual Documents

This section briefly introduces virtual property paths for XML virtual documents.

As noted earlier, you can use schema-dependent paths only if you have loaded the corresponding XML schema. You can always use DOM-style paths, even when no schema is available.

4.1.1 Basic Syntax for Schema-dependent Paths

For XML virtual documents, a *schema-dependent path* consists of a set of *path units* separated by periods, as in the following example:

```
unit1.unit2.unit3
```

Where *unit1* is the name of a child XML element in the document, *unit2* is the name of a child element within *unit1*, and so on. The leaf unit is the name of either a child XML element or an XML attribute.

For example:

```
HomeAddress.City
```

For complete information, see [Specifying Schema-dependent Paths](#).

4.1.2 Basic Syntax for DOM-style Paths

A *DOM-style path* always starts with a slash and has the basic structure shown in the following example:

```
/root_unit/unit1/unit2/unit3
```

Each path unit has the following form.

```
namespace_identifier:name
```

Where *namespace_identifier* represents the XML namespace; this is a token that InterSystems IRIS replaces with the actual namespace URI, as discussed in [a later subsection](#). This token is needed only if the element or attribute is in a namespace.

name is the name of an XML element or attribute.

For example:

```
/$2:Patient/$2:HomeAddress/$2:City
```

For complete information, see [Specifying DOM-style Paths](#).

4.1.2.1 XML Namespace Tokens

When you load a schema into InterSystems IRIS, it establishes a set of tokens for the namespaces used in that schema, for use in any DOM-style paths.

The token \$1 is used for first namespace that is declared in the schema; this usually corresponds to the XML schema namespace (<http://www.w3.org/2001/XMLSchema>). The token \$2 is used for the next namespace that is declared in the schema, \$3 is used for the third, and so on.

InterSystems IRIS assigns namespace tokens for all namespaces declared in the schema, whether or not those namespaces are actually used. Therefore, InterSystems IRIS might use \$3 or a higher value rather than \$2 for the items of interest to you, if additional namespaces are declared in the schema. It is practical to use the Management Portal to view the individual path units, as discussed in the [next section](#), to be sure that you are using the correct token for a specific path unit.

You can use namespace tokens if you have also loaded the corresponding schema (and have configured the applicable business host to use that schema). Otherwise, you must use the namespace prefixes exactly as given in the XML document.

4.2 Viewing Path Units for XML Virtual Documents

Until you are familiar with property paths for XML virtual documents, it is useful to use the Management Portal to view the individual path units. You can do this if you have loaded the corresponding schema.

To view the path units for the elements and attributes in a schema:

1. Load the schema as described [previously](#).

For example, consider the following XML schema, shown here for reference, for the benefit of readers who are familiar with XML schemas:

XML

```
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        elementFormDefault="qualified" targetNamespace="http://myapp.com"
        xmlns:myapp="http://myapp.com">
  <element name="Patient" type="myapp:Patient"/>
  <complexType name="Patient">
    <sequence>
```

```

    <element minOccurs="0" name="Name" type="string"/>
    <element minOccurs="0" name="FavoriteColors"
      type="myapp:ArrayOfFavoriteColorString" />
    <element minOccurs="0" name="Address" type="myapp:Address" />
    <element minOccurs="0" name="Doctor" type="myapp:Doctor" />
  </sequence>
  <attribute name="MRN" type="string"/>
  <attribute name="DL" type="string"/>
</complexType>
<complexType name="ArrayOfFavoriteColorString">
  <sequence>
    <element maxOccurs="unbounded" minOccurs="0" name="FavoriteColor"
      nillable="true" type="string"/>
  </sequence>
</complexType>
<complexType name="Address">
  <sequence>
    <element minOccurs="0" name="Street" type="string"/>
    <element minOccurs="0" name="City" type="string"/>
    <element minOccurs="0" name="State" type="string"/>
    <element minOccurs="0" name="ZIP" type="string"/>
  </sequence>
</complexType>
<complexType name="Doctor">
  <sequence>
    <element minOccurs="0" name="Name" type="string"/>
  </sequence>
</complexType>
</schema>

```

The following shows an example XML document that obeys the schema shown in this section:

XML

```

<?xml version="1.0" ?>
<Patient MRN='000111222' xmlns='http://myapp.com'>
  <Name>Georgina Hampton</Name>
  <FavoriteColors>
    <FavoriteColor>Red</FavoriteColor>
    <FavoriteColor>Green</FavoriteColor>
  </FavoriteColors>
  <Address>
    <Street>86 Bateson Way</Street>
    <City>Fall River</City>
  </Address>
  <Doctor>
    <Name>Dr. Randolph</Name>
  </Doctor>
</Patient>

```

2. Select the **Interoperability** > **Interoperate** > **XML** > **XML Schema Structures** page. The left column lists XML schemas loaded into this namespace.
3. Select **Category** link in the row corresponding to the XML schema of interest.

If we do this for the XML schema shown previously, InterSystems IRIS then displays this:

XML DocType structures in Category MyApp



4. Select the link for the document type of interest.

If we select **Patient**, InterSystems IRIS then displays this:

XML Document Structure / Document Type Definition

MyApp:Patient

Type: CT:Patient**xsd:** element:complexType**Top Element:** \$2:Patient

	Name	Type	Required	Element
1	Name		No	\$2:Name
2	FavoriteColors()	ArrayOfFavoriteColorString()	No	\$2:FavoriteColors/\$2:FavoriteColor[]
3	Address	Address	No	\$2:Address
4	Doctor	Doctor	No	\$2:Doctor/\$2:Name
5	MRN		No	@MRN
6	DL		No	@DL

On this page:

- Above the table, the value in large font displays the DocType value for this XML element. In this case, DocType is MyApp:Patient.

- The **Name** column shows path units in the format needed for schema-dependent paths.

In this case, this page tells us that we can use Name, FavoriteColors, Address, Doctor, MRN, and DL as path units in schema-dependent paths.

- The **Element** column shows path units in the format needed for DOM-style property paths.

In this case, this page tells us that we can use \$3:Name, \$2:FavoriteColors/\$2:FavoriteColor, \$2:Address, \$2:Doctor/\$2:Name, @MRN, and @DL as path units in DOM-style paths. Notice that @MRN and @DL do not have a namespace prefix; these attributes are not in any namespace.

5. Click additional sub-items as wanted.

If we click **Address** in the **Name** column, InterSystems IRIS displays this:

XML Complex Type Structure Definition

MyApp:Address

Type: CT:Address
xsd: complexType

	Name	Type	Required	Element
1	Street		No	\$2:Street
2	City		No	\$2:City
3	State		No	\$2:State
4	ZIP		No	\$2:ZIP

This page displays any additional path units within Address.

In this case, this page tells us that we can use these additional path units in combination with the path unit that we used to get to this page, for example:

Path Type	Example
Schema-dependent path (partial)	...Address.Street
DOM-style path (partial)	/.../\$2:Address/\$2:Street

The following sections note specific variations due to schema variations.

4.3 Redundant Inner Elements for Schema-dependent Paths

For schema-dependent paths, InterSystems IRIS collapses redundant inner elements. This is best explained by example:

- The `<FavoriteColors>` element contains a sequence of multiple `<FavoriteColor>` elements. On the schema viewer page, `<FavoriteColors>` is shown simply as **FavoriteColors()** in the **Name** column (which shows the path unit for schema-dependent paths). This column is displayed in blue in the following figure.

XML Document Structure / Document Type Definition

MyApp:Patient

Type: CT:Patient**xsd:** element:complexType**Top Element:** \$2:Patient

	Name	Type	Required	Element
1	Name		No	\$2:Name
2	FavoriteColors()	ArrayOfFavoriteColorString()	No	\$2:FavoriteColors/\$2:FavoriteColor[]
3	Address	Address	No	\$2:Address
4	Doctor	Doctor	No	\$2:Doctor/\$2:Name
5	MRN		No	@MRN
6	DL		No	@DL

In contrast, the same element is shown as `$2:FavoriteColors/$2:FavoriteColorsItem` in the **Element** column on the right. This column shows the path unit for DOM-style paths.

For a sequence of multiple items of the same type, the schema-dependent path does not use the name of the inner element. (In contrast, the DOM-style path uses all the element names.) More generally, any redundant inner levels found in a schema are ignored in schema-dependent paths; the following item shows another example.

- The `<Doctor>` element includes a single `<Name>` element. On the schema viewer page, the `<Doctor>` item is shown as **Doctor** in the **Name** column, as shown in the previous figure.

Notice that the schema-dependent path to the data inside `<Doctor>` does not use the name of the inner element.

In contrast, the same item is shown as `$3:Doctor/$3:Name` in the **Element** column on the right. This column shows the path unit for DOM-style paths.

Note: If there is a single, non-repeating outer element it will be collapsed. This shortens the property path to only use the inner element. If the outer element is repeating, the path will *not* be shortened, so that you can access all inner elements.

One restriction to this is that the path *will* be shortened if the outer element's type is defined *by reference*. In this case, you won't be able to access any inner elements beyond the first node of the outer element using a schema-dependent path. You will still be able to access all inner elements using the DOM-style path. To prevent this, you should not define the outer element's type by reference when it is repeating and the only outer element.

4.4 Repeating Fields

If a given element can occur multiple times, the **Name** column displays parentheses () at the end of the element name. For example, see the **FavoriteColors()** row in the preceding figure.

The **Type** and **Element** columns indicate the number of times the element can be repeated. In this case, the element can be repeated five times. If there is no number displayed in parentheses in the **Type** column, the element can be repeated any number of times.

4.5 Repeating Sequences

XML schemas can include repeating sequences that occur within the structure but do not have an element name to distinguish them from surrounding elements. This results in `sequence(rep)` appearing in VDoc property paths, but having no equivalent in the DOM path. In these cases, the property path can be used to get the value of an entire repetition of a sequence (for example, `People(1).sequence(2)`) or a value within the sequence (for example, `People(1).sequence(2).Color.Tint`). The property path can also be used to set the value of an element within a sequence.

Be aware that setting a value into the entire sequence is not supported. For example, the following returns an error and does not change any values:

```
SetValueAt("<Color><ColorName>pink</ColorName><Tint>bright</Tint></Color><Value>001</Value>", "People(1).sequence(4)")
```

4.6 Duplicate Names

If an XML schema has multiple elements at the same level that have the same name but different types, then InterSystems IRIS appends `_2`, `_3`, and so on, as needed to create unique names at that level. This procedure applies only to the schema-dependent paths. For example, consider a schema that defines the `<Person>` element to include two elements named `<Contact>`. One is of type `<Phone>` and the other is of type `<Assistant>`. InterSystems IRIS displays the schema for the `<Person>` element as follows:

Type: DS:Person
xsd: complexType

	Name	Type	Required	Element
1	Contact	Phone	No	\$2:Contact
2	Contact_2	Assistant	No	\$2:Contact

Similarly, if the schema has multiple elements at the same level but in different namespaces, then InterSystems IRIS appends `_2`, `_3`, and so on, as needed to create unique names at that level. This procedure applies only to the schema-dependent paths.

4.7 Choice Structures

Some schemas include `<choice>` structures, like the following example:

```
<xsd:choice>
  <xsd:element name="OptionA" type="my:OptionType" />
  <xsd:element name="OptionB" type="my:OptionType" />
  <xsd:element name="OptionC" type="my:OptionType" />
</xsd:choice>
```

InterSystems IRIS represents this structure differently for the two kinds of paths. The following shows an example:

Type: CT:MainType
xsd: element:complexType
Top Element: \$2:Parent

	Name	Type	Required	Element
1	choice	#1	Yes	-
2	OtherElement	OtherType	Yes	OtherElement
3	OtherAttribute	date	No	@OtherAttribute

For schema-dependent paths, the **Name** displays a generic name for the <choice> structure, and the **Type** column displays a numeric placeholder. The **Element** column does not display anything.

If we click `choice`, InterSystems IRIS then displays the following:

Type: #choice
xsd: choice

	Name	Type	Required	Element
1	OptionA	OptionType	Yes	OptionA
2	OptionB	OptionType	Yes	OptionB
3	OptionC	OptionType	Yes	OptionC

In this case, these pages tell us that we can use the following paths to access `OptionB`:

Path Type	Example
Schema-dependent path (partial)	<code>...Parent.choice.OptionB</code>
DOM-style path (partial)	<code>/.../Parent/OptionB</code>

4.8 Groups Included by Reference

A schema can include a <group> that is included via the `ref` attribute. For example:

```
<s01:complexType name="Patient">
  <s01:sequence>
    <s01:element name="Name" type="s01:string" minOccurs="0"/>
    <s01:element name="Gender" type="s01:string" minOccurs="0"/>
    <s01:element name="BirthDate" type="s01:date" minOccurs="0"/>
    <s01:element name="HomeAddress" type="s02:Address" minOccurs="0"/>
    <s01:element name="FavoriteColors"
      type="s02:ArrayOfFavoriteColorsItemString" minOccurs="0"/>
    <s01:element name="Container" type="s02:ContainerType" minOccurs="0"/>
    <s01:element name="LatestImmunization" type="s02:Immunization" minOccurs="0"/>
    <s01:element ref="s02:Insurance" minOccurs="0"/>
    <s01:group ref="s02:BoilerPlate" minOccurs="1" maxOccurs="1"/>
  </s01:sequence>
  ...
  <s01:group name="BoilerPlate">
    <s01:sequence>
      <s01:element name="One" type="s01:string"/>
      <s01:element name="Two" type="s01:string"/>
    </s01:sequence>
  </s01:group>
</s01:complexType>
```

```

    <s01:element name="Three" type="s01:string"/>
  </s01:sequence>
</s01:group>

```

InterSystems IRIS represents this structure differently for the two kinds of paths. The following shows an example:

Type: CT:Patient
xsd: element:complexType
Top Element: \$2:Patient

	Name	Type	Required	Element
1	Name		No	\$2:Name
2	Gender		No	\$2:Gender
3	BirthDate	date	No	\$2:BirthDate
4	HomeAddress	Address	No	\$2:HomeAddress/\$2:Address
5	FavoriteColors()	ArrayOfFavoriteColorsItemString()	No	\$2:FavoriteColors/\$2:FavoriteColorsItem[]
6	Container	ContainerType	No	\$2:Container/\$2:Intermediate/\$2:Final
7	LatestImmunization	Immunization	No	\$2:LatestImmunization
8	Insurance	Insurance	No	\$2:Insurance
9	BoilerPlate	#9	Yes	BoilerPlate
10	MRN		No	@MRN

For schema-dependent paths, the **Name** displays the name of the group, and the **Type** column displays a numeric placeholder. The **Element** column also displays the name of the group.

If we click `BoilerPlate`, InterSystems IRIS then displays the following:

Type: CG:BoilerPlate
xsd: sequence:group

	Name	Type	Required	Element	Default	Description
1	One		Yes	\$2:One		
2	Two		Yes	\$2:Two		
3	Three		Yes	\$2:Three		

In this case, these pages tell us that we can use the following paths to access `Two`:

Path Type	Example
Schema-dependent path (partial)	...Patient.BoilerPlate.Two
DOM-style path (partial)	/.../\$2:Patient/\$2:Two

4.9 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Specifying Schema-dependent Paths for XML Virtual Documents](#)
- [Specifying DOM-style Paths for XML Virtual Documents](#)

5

Specifying Schema-dependent Paths for XML Virtual Documents

This topic describes how to specify schema-dependent [XML virtual property paths](#) (property paths for [XML virtual documents](#)).

You can use these paths to access values and to set values.

The examples in this topic use the schema shown in the [previous topic](#).

5.1 Getting or Setting the Contents of an XML Element

To access the contents of an element, you can use one of the following schema-dependent paths. You also use these paths when you create more complex schema-dependent paths as discussed in later subsections.

Syntax	Refers to
<i>element_name</i>	Contents of the given element. <i>element_name</i> must be a child of the root element.
<i>parent.element_name</i>	Contents of the given element. <i>parent</i> is the full path to an element—that is, any syntax shown in this table. In this case, <i>element_name</i> is a child of the element referred to by <i>parent</i> .
<i>parent.element_name</i> (<i>n</i>)	Contents of the <i>n</i> th element with the name <i>element_name</i> within the given parent.
<i>parent.element_name</i> (-)	Contents of the last element with the name <i>element_name</i> within the given parent.

Consider the following XML document:

XML

```

<?xml version="1.0" ?>
<Patient MRN='000111222' xmlns='http://myapp.com'>
  <Name>Georgina Hampton</Name>
  <FavoriteColors>
    <FavoriteColor>Red</FavoriteColor>
    <FavoriteColor>Green</FavoriteColor>
  </FavoriteColors>
  <Address>
    <Street>86 Bateson Way</Street>
    <City>Fall River</City>
  </Address>
  <Doctor>
    <Name>Dr. Randolph</Name>
  </Doctor>
</Patient>

```

The following table shows some example paths for this document:

Example Path	Current Path Value
Name	Georgina Hampton
FavoriteColors(1)	Red
FavoriteColors(2)	Green
FavoriteColors(-)	Green
Address	86 Bateson WayFall River
Address.Street	86 Bateson Way
Doctor	Dr. Randolph

5.2 Getting or Setting the Value of an XML Attribute

To access the value of an attribute, you can use one of the following schema-dependent paths. Here (and in the rest of this section), *element_reference* is a complete schema-dependent path as described in the previous table.

Syntax	Refers to
<i>element_reference.attribute_name</i>	Value of the <i>attribute_name</i> attribute of the element indicated by <i>element_reference</i> .

The following table shows an example path for the previous document:

Example Path	Current Path Value
MRN	000111222

5.3 Comments and Descriptions

InterSystems IRIS® removes the comments when it reads XML files. Consequently, you should not use comments to document the schema. Instead of using comments, you can use the description or altdesc attributes available on most schema elements.

Although it is not useful in most cases, you can access a comment by using one of the following schema-dependent paths:

Syntax	Refers to
<code>element_reference.#</code>	Text of the first comment of the given element.
<code>element_reference.#(n)</code>	Text of the <i>n</i> th comment of the given element.
<code>element_reference.#(-)</code>	Text of the last comment.

Note: InterSystems IRIS removes all comments when it reads in XML files. The only comments that can be present are comments that have been added since the XML file was read. To add a comment, use **SetValueAt()** with a path like one shown in the preceding table.

5.4 Using Mixed Content When Setting Schema-dependent Paths

You can set paths to values that include both element and text nodes, for example:

ObjectScript

```
set mixed="SOME TEXT<HOMETOWN>BELMONT</HOMETOWN>"
set status=target.SetValueAt(mixed,"Address")
```

A combination of element and text nodes is called *mixed content*.

For schema-dependent paths, InterSystems IRIS determines that a value is mixed content if it contains a left angle bracket (<) character followed by one of the following sets of characters:

- forward slash and right angle bracket (/>)
- left angle bracket and forward slash (</)

The following table describes how InterSystems IRIS handles mixed content for different types of schema-dependent paths:

Path Refers to	How InterSystems IRIS Handles the Mixed Content
element or comment	InterSystems IRIS replaces the current contents of the element or comment with the given mixed content
attribute	Not supported

For information about mixed content in DOM-style paths, see [Using Mixed Content When Setting DOM-style Paths](#).

5.5 Character Escaping When Setting Schema-dependent Paths

If you set a schema-dependent path to a value that includes a left angle bracket (<) character and the value does not meet the criteria for mixed content, InterSystems IRIS replaces the character with the corresponding character entity reference

(< ;). You do not need to explicitly escape left angle brackets. For example, if you specify the value of a schema-dependent path as "sample value < 20%", the system sets the path to "sample value < 20%".

Note: InterSystems IRIS does not automatically escape left angle bracket characters when you set DOM-style paths.

5.6 Special Variations for Repeating Elements

This section describes variations of virtual property paths that apply when you are referring to a repeating element.

5.6.1 Iterating Through the Repeating Elements

If the path refers to a repeating element, you can use the following syntax to iterate through every instance of that element.

Syntax	Refers to
<code>element_name()</code>	Iterates through the elements of the given name, within the given context.

Suppose that we now use a data transformation that contains only the following code:

ObjectScript

```
set status=target.SetValueAt("REPLACED COLOR","FavoriteColors()")
if 'status {do $system.Status.DisplayError(status) quit}
```

This line of code transforms the document shown previously in this topic to the following:

XML

```
<?xml version="1.0" ?>
<Patient MRN='000111222' xmlns='http://myapp.com'>
  <Name>Georgina Hampton</Name>
  <FavoriteColors>
    <FavoriteColor>REPLACED COLOR</FavoriteColor>
    <FavoriteColor>REPLACED COLOR</FavoriteColor>
  </FavoriteColors>
  <Address>
    <Street>86 Bateson Way</Street>
    <City>Fall River</City>
  </Address>
  <Doctor>
    <Name>Dr. Randolph</Name>
  </Doctor>
</Patient>
```

5.6.2 Counting Elements

If the path refers to a repeating element, you can use the following syntax to return the number of elements.

Syntax	Refers to
<code>element_name(*)</code>	Number of elements of the given name, within the given context. This syntax is valid only if the schema defines <i>element_name</i> as a repeating element.
<code>element_name.*</code>	Number of elements of the given name, within the given context. This syntax is valid for any <i>element_name</i> .

The following table shows example paths for the document shown previously in this topic:

Example Path	Current Path Value
FavoriteColors.*	2
FavoriteColors(*)	2

5.7 Testing Schema-dependent Paths in the Terminal

It can be useful to test virtual document property paths in the Terminal before using them in business processes, data transformations, and so on, particularly when you are getting familiar with the syntax. To do so for schema-dependent XML paths, do the following:

1. Load the corresponding XML schema or schemas into InterSystems IRIS. To do so, use the [XML Schema Structures](#) page.
2. Use the Management Portal to find the DocType value for the root element of the documents that you plan to test. For example:

XML Document Structure / Document Type Definition
MyApp:Patient

See [Viewing Path Units for XML Virtual Documents](#).

3. In the Terminal or in test code:
 - a. Create a string that contains the text of a suitable XML document.
 - b. Use the **ImportFromString()** method of `EnsLib.EDI.XML.Document` to create an instance of an XML virtual document from this string.
 - c. Set the `DocType` property of this instance.
 - d. Use the **GetValueAt()** and **SetValueAt()** methods of this instance.

The following method demonstrates step 3:

```
ClassMethod TestSchemaPath()
{
    set string="<Patient xmlns='http://myapp.com'>"
    _"<Name>Jack Brown</Name>"
    _"<Address><Street>233 Main St</Street></Address>"
    _"</Patient>"
    set target=##class(EnsLib.EDI.XML.Document).ImportFromString(string,.status)
    if 'status {do $system.Status.DisplayError(status) quit}

    //Use the DocType displayed in the Management Portal
    set target.DocType="MyApp:Patient"

    set pathvalue=target.GetValueAt("Address.Street",,.status)
    if 'status {do $system.Status.DisplayError(status) quit}
    write pathvalue
}
```

The following shows output from this method:

```
SAMPLES>d ##class(Demo.CheckPaths).TestSchemaPath()
233 Main St
```

For additional options for **GetValueAt()**, see [The pFormat Argument](#).

5.8 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Overview of XML Virtual Property Paths](#)
- [Specifying DOM-style Paths for XML Virtual Documents](#)

6

Specifying DOM-style Paths for XML Virtual Documents

This topic describes how to specify DOM-style [XML virtual property paths](#) (property paths for [XML virtual documents](#)).

You can use these paths to access values and to set values (with noted exceptions).

Most of the following sections assume that the document does not use any XML namespaces. The [last section](#) gives information on adapting these paths for a document that does use XML namespaces.

The examples in this topic use the schema shown in [Overview of XML Virtual Property Paths](#).

6.1 Getting or Setting Nodes (Basic Paths)

In an XML virtual document, there are five kinds of nodes: the root node, elements, text nodes, comments, and processing instructions. The root node and any element can have child nodes of any type. The other kinds of nodes cannot have child nodes. Attributes are not nodes.

The following table lists basic DOM-style paths to get or set many of the nodes of an XML virtual document. When there are multiple nodes of the same type or with the same name, and when you do not want the first one, see the [next section](#).

You also use these paths when you create more complex DOM-style paths as discussed in later subsections.

Syntax	Refers to
/	Contents of the root node. You can also use " ", if the context makes it clear that you are using a DOM-style path (that is, if no schema is loaded).
/ <i>root_element_name</i>	Contents of the root element, whose name is <i>root_element_name</i> .
<i>parent/element_name</i>	Contents of the first element of the given name (<i>element_name</i>), within the given parent. Here <i>parent</i> is the full path to its parent element, including (as always) the initial slash.
<i>element_reference</i> /text()	First text node in the element indicated by <i>element_reference</i> .

Syntax	Refers to
<i>element_reference</i> /comment()	<p>First comment in the element indicated by <i>element_reference</i>.</p> <p>The value returned does not include the opening syntax (<!--) or the closing syntax (-->). Similarly, do not include the opening or closing syntax when setting the value.</p> <p>InterSystems IRIS® removes all comments when it reads in XML files. The only comments that can be present are comments that you add. (To add them, use SetValueAt() with a path like the one shown here.)</p>
<i>element_reference</i> /instruction()	<p>First processing instruction in the element indicated by <i>element_reference</i>.</p> <p>The value returned does not include the opening syntax (<?) or the closing syntax (?>). Similarly, do not include the opening or closing syntax when setting the value.</p> <p>InterSystems IRIS removes all processing instructions when it reads in XML files. The only instructions that can be present are instructions that you add. (To add them, use SetValueAt() with a path like the one shown here.)</p>

Consider the following XML document:

XML

```
<?xml version="1.0" ?>
<Patient xmlns='http://myapp.com'>Sample text node
  <!--Sample comment-->
  <!--Another comment-->
  <Name>Jane Doe</Name>
  <Address>
    <Street>100 Blank Way</Street>
  </Address>
</Patient>
```

The following table shows some example paths for this document:

Example Path	Current Path Value
/Patient/Name	Jane Doe
/Patient/Address	<p><Street>100 Blank Way</Street></p> <p>In this case, the referenced element contains a child element (in contrast to the previous example). Note that InterSystems IRIS ignores whitespace when comparing DOM-style paths to values. That is, the value here matches the given path whether or not the document contains line breaks and indentation.</p>
/Patient/Address/Street	100 Blank Way
/Patient/text()	Sample text node
/Patient/comment()	Sample comment

Suppose that we now use a data transformation that contains only the following code:

ObjectScript

```
set status=target.SetValueAt("892 Broadway","/Patient/Address/Street")
if 'status {do $system.Status.DisplayError(status) quit}
set status=target.SetValueAt("Dr. Badge","/Patient/Doctor/Name")
if 'status {do $system.Status.DisplayError(status) quit}
```

Notice that one of these paths already exists and the other does not; both paths are valid. After we use this transformation, the new document would then look like the following:

XML

```
<?xml version="1.0" ?>
<Patient xmlns='http://myapp.com'>Sample text node
  <!--Sample comment-->
  <!--Another comment-->
  <Name>Jane Doe</Name>
  <Address>892 Broadway</Address>
  <Doctor>
    <Name>Dr. Badge</Name>
  </Doctor>
</Patient>
```

6.2 Using Mixed Content When Setting DOM-style Paths

You can set paths to values that include both element and text nodes, for example:

ObjectScript

```
set mixed="SOME TEXT<HOMETOWN>BELMONT</HOMETOWN>"
set status=target.SetValueAt(mixed,"/Patient/Address/Street")
```

A combination of element and text nodes is called *mixed content*.

For DOM-style paths, InterSystems IRIS determines that a value is mixed content if it contains a left angle bracket (<) character. Consequently, if you must set a DOM-style path to a value that includes a left angle bracket and is not valid XML, use the (<) character entity reference to avoid an error.

The following table describes how InterSystems IRIS handles mixed content for different types of nodes:

Node Type	How InterSystems IRIS Handles Mixed Content Provided for the Node Value
root	Not supported
element or comment	InterSystems IRIS replaces the current contents of the node with the given mixed content
text node or instruction	InterSystems IRIS escapes the XML special characters and then replaces the current contents of the given node

Note: Attributes are not nodes.

For information about mixed content in schema-dependent paths, see [Using Mixed Content When Setting Schema-dependent Paths](#).

6.3 Using the Basic Path Modifiers

You can add the following basic path modifiers to the end of basic paths (listed in the [previous section](#)), with noted exceptions. You can use the resulting paths in the same way that you use any of the basic paths.

[*n*]

Refers to an item by item position. Only instances of that item are counted; items of other types are ignored.

- When you get a value, this syntax returns the *n*th instance of the item to which the basic path refers (or an empty string otherwise).
- When you set a value, this syntax either overwrites or creates the *n*th instance of the item to which the basic path refers.

You can substitute a hyphen (-) to access the last instance. You can also omit the square brackets.

/*[n]*

Refers to a child element by child element position.

You can substitute a hyphen (-) to access the last child. You can also omit the square brackets.

Restrictions:

- You can use this only with a basic path that refers to an element; that is, you cannot use it with functions such as `comment()`.
- You can use this syntax only when getting a value, not when setting a value.

You can combine this path modifier with the other path modifiers, if you use the `/ [n]` modifier as the *last* modifier.

[*\$n*]

Refers to an item by node position.

- When you get a value, this syntax returns the *n*th node, if that node is an instance of the item to which the basic path refers. Otherwise the path is invalid, and an error is returned.
- When you set a value, this syntax overwrites the *n*th node, if that node is an instance of the item to which the basic path refers. Otherwise the path is invalid, and an error is returned.

Different path modifiers, listed in a [later section](#), enable you to insert or append nodes. (Also see [Summary of Path Modifiers](#).)

Consider the following XML document:

XML

```
<?xml version="1.0" ?>
<Patient xmlns='http://myapp.com'>
  <!--Sample comment-->
  <!--Another comment-->
  Sample text node
  <Name>Fred Williams</Name>
  <FavoriteColors>
    <FavoriteColor>Red</FavoriteColor>
    <FavoriteColor>Green</FavoriteColor>
  </FavoriteColors>
  <Doctor>
    <Name>Dr. Arnold</Name>
  </Doctor>
</Patient>
```

The following table shows some example paths for this document:

Example Path	Current Path Value	Notes
/Patient/Name	Fred Williams	
/[1]/[1]	Fred Williams	This path accesses the first child element within the first element of the document (which is the only element in the document, according to the XML standard). The square brackets are optional here.
/Patient/FavoriteColors/[1]	Red	The square brackets are optional here.
/Patient/FavoriteColors/[2]	Green	The square brackets are optional here.
/[1]/[2]/[1]	Red	The square brackets are optional here.
/[1]/[2]/[2]	Green	The square brackets are optional here.
/Patient/Name[\$1]	An empty string	This path is invalid. The first node within <Patient> is not a <Name> element.
/Patient/Name[\$4]	Fred Williams	
/Patient/Doctor[\$6]	<Name xmlns='http://myapp.com'>Dr. Arnold</Name>	
/Patient/4	An empty string	This path is invalid. <Patient> does not have a fourth element.
/Patient/comment()[1]	Sample comment	The square brackets are required, because without square brackets, this path would be interpreted as an element name.
/Patient/comment()[2]	Another comment	The square brackets are required, because without square brackets, this path would be interpreted as an element name.
/Patient/comment()[\$2]	Another comment	The square brackets are required, because without square brackets, this path would be interpreted as an element name.

Example Path	Current Path Value	Notes
/Patient/comment() [-]	Another comment	The square brackets are required, because without square brackets, this path would be interpreted as an element name.

6.4 Using the Full() Function

For a path that refers to an element (either a [basic path](#) or a path that uses [basic modifiers](#)), you can also obtain the opening and closing tags of the element. To do so, add `full()` to the end of the path.

You can use the `full()` function when you are setting a value. Within DTL, this is permitted only within a data transformation that uses the `append` action; see [Assignment Actions for XML Virtual Documents](#).

Consider the following XML document:

XML

```
<?xml version="1.0" ?>
<Patient xmlns='http://myapp.com'>
  <Name>Jack Brown</Name>
  <Address>
    <Street>233 Main St</Street>
  </Address>
</Patient>
```

The following table shows some example paths for this document:

Example Path	Current Path Value
/Patient/Name/full()	<Name xmlns='http://myapp.com'>Jack Brown</Name>
/Patient/Address/full()	<Address xmlns='http://myapp.com'><Street>233 Main St</Street></Address>
/Patient/Address/Street/full()	<Street xmlns='http://myapp.com'>233 Main St</Street>

For the root note, use of the `full()` function is implied. That is, the following two paths are equivalent:

```
/
/full()
```

Note: If you use `GetValueAt()`, you can also specify an additional format argument (`£`) that retrieves the full element. For details, see [The pFormat Argument](#).

6.5 Getting or Setting the Value of an XML Attribute

To access the value of an attribute, you can use one of the following DOM-style paths. Here (and in the rest of this section), *element_reference* is a complete DOM-style path to an element.

Syntax	Refers to
<code>element_reference/@attribute_name</code>	Value of the given attribute of the given element.
<code>element_reference/@[n]</code>	(For use only when retrieving values) Value of the <i>n</i> th attribute (in alphabetical order) of the given element.
<code>element_reference/@[-]</code>	Value of the last attribute of the given element.

You can omit the square brackets.

For example, consider the following XML document:

XML

```
<?xml version="1.0" ?>
<Patient MRN='000111222' DL='123-45-6789' xmlns='http://myapp.com' >
  <Name>Liz Jones</Name>
</Patient>
```

The following table shows some example paths for this document:

Example Path	Current Path Value
<code>/Patient/@MRN</code>	000111222
<code>/Patient/@[1]</code>	000111222
<code>/Patient/@2</code>	123-45-6789

6.6 Using Path Modifiers to Insert or Append Nodes

To insert or append nodes, add the following path modifiers to the end of [basic paths](#). Use the path modifiers listed here only when you are setting a value.

Also see the [next section](#) for a couple of additional options.

[~n]

Inserts an instance of the item to which the basic path refers, right before the *n*th instance of that item, in the given context. Nothing is overwritten. See the following table for details.

Here and in the rest of this subsection, *n* is an integer.

Example Path	Behavior
<code>/Patient/Episode[~5]</code>	<p>Inserts a new <code><Episode></code> element within <code><Patient></code>, before the existing fifth <code><Episode></code> element.</p> <p>If <code><Patient></code> does not include five <code><Episode></code> elements, InterSystems IRIS performs <i>padding</i>; it creates empty <code><Episode></code> elements so that the inserted <code><Episode></code> is the fifth <code><Episode></code>. All the newly inserted elements are at the end of the <code><Patient></code> element.</p> <p>If the path refers to intermediate, nonexistent elements, InterSystems IRIS creates those.</p>

Example Path	Behavior
/Patient/element(Episode)[~5]	Inserts an <Episode> element within <Patient>, before the existing fifth element. If <Patient> does not include five elements (of any type), this path is invalid. The element() function does not generate empty elements for padding.
/Patient/[~5]	Not allowed, because there is no information about the kind of element to insert.
/Patient/element()[~5]	

For example, consider the following XML document:

XML

```
<?xml version="1.0" ?>
<Patient xmlns='http://myapp.com'>
  <Name>Betty Hodgkins</Name>
  <FavoriteColors>
    <FavoriteColor>Purple</FavoriteColor>
  </FavoriteColors>
</Patient>
```

Also consider the following code from within a data transformation:

ObjectScript

```
set status=target.SetValueAt("INSERTED COLOR","/Patient/FavoriteColors/FavoriteColor[~4]")
if 'status {do $system.Status.DisplayError(status) quit}
```

This line of code transforms the original document into the following:

XML

```
<?xml version="1.0" ?>
<Patient>
  <Name>Betty Hodgkins</Name>
  <FavoriteColors>
    <FavoriteColor>Purple</FavoriteColor>
    <FavoriteColor/>
    <FavoriteColor/>
    <FavoriteColor>INSERTED COLOR</FavoriteColor>
  </FavoriteColors>
</Patient>
```

For another example, consider the following XML document:

XML

```
<Patient xmlns='http://myapp.com'>
  <Name>Colin McMasters</Name>
  <Address>
    <Street>102 Windermere Lane</Street>
  </Address>
</Patient>
```

Also considering the following code from within a data transformation:

ObjectScript

```
set status=target.SetValueAt("INSERTED ADDRESS","/Patient/Address/Street[~2]")
if 'status {do $system.Status.DisplayError(status) quit}
```

This line of code transforms the original document into the following:

```
<?xml version="1.0" ?>
<Patient>
  <Name>Colin McMasters</Name>
  <Address>
    <Street>102 Windermere Lane</Street>
    <Street>INSERTED ADDRESS</Street>
  </Address>
</Patient>
```

[~\$n]

Inserts an instance of the item to which the basic path refers, right before the n th node in the given parent. Nothing is overwritten. The path is invalid if the parent does not contain at least n nodes.

Example Path	Behavior
/Patient/Episode[~\$3]	Inserts a new <Episode> element within <Patient>, before the existing third node in that parent. The path is invalid if the parent does not have three nodes.
/Patient/element(Episode)[~\$3]	Not allowed. The element() function works only with element positions.
/Patient/[~3]	Not allowed, because there is no information about the kind of element to insert.
/Patient/element()[~3]	Not allowed for multiple reasons; see above items.

[~]

Appends an instance of the item to which the basic path refers, as the (new) last node of the given parent. Nothing is overwritten.

Example Path	Behavior
/Patient/Episode[~]	Appends a new <Episode> element within <Patient>, as the last node in that parent. If the path refers to intermediate, nonexistent elements, InterSystems IRIS creates those.
/Patient/element(Episode)[~]	Appends an <Episode> element within <Patient>, as the last node in that parent. If the path refers to intermediate, nonexistent elements, the path is invalid.
/Patient/[~]	Not allowed, because there is no information about the kind of element to append.
/Patient/element()[~]	Not allowed, because there is no information about the kind of element to append.

For example, the following shows part of a code element in a data transformation:

ObjectScript

```
set status=target.SetValueAt("orange","/Patient/FavoriteColors/Color[~]")
if 'status {do $system.Status.DisplayError(status) quit}
set status=SetValueAt("pink","/Patient/FavoriteColors/Color[~]")
if 'status {do $system.Status.DisplayError(status) quit}
```

This adds two new <Color> children to the <FavoriteColors> element. If the <FavoriteColors> element does not exist, InterSystems IRIS creates it.

Also see [Summary of Path Modifiers](#).

6.7 Using the `element()` Function

You can use the `element()` function when getting or setting values.

6.7.1 Using `element()` When Getting a Value

Syntax	Behavior
<code>element_reference/element()</code>	Returns the first child element of the given element.
<code>element_reference/element()[n]</code>	Returns the <i>n</i> th child element of the given element.
<code>element_reference/element()[-]</code>	Returns the last child element of the given element.

6.7.2 Using `element()` When Setting a Value

Syntax	Behavior
<code>parent_element/element(element_name)[~n]</code>	Inserts the specified element (given by the <i>element_name</i> argument) right before the <i>n</i> th child element of the given parent. This path is invalid if the given element does not have at least <i>n</i> child elements.
<code>parent_element/element(element_name)[~]</code>	Appends the specified element (given by the <i>element_name</i> argument) as the last node in the given parent.

6.8 Getting Positions of Elements

You can use the following syntaxes to get positions of elements.

Syntax	Returns
<code>element_reference/position()</code>	Element position of the given element within its parent.
<code>element_reference/node-position()</code>	Node position of the given element within its parent. For <i>node position</i> , InterSystems IRIS considers all kinds of nodes, not just elements.

6.9 Getting Counts of Elements

You can use the following syntaxes to get counts of elements.

Syntax	Returns
<ul style="list-style-type: none"> <code>element_reference/[*]</code> <code>element_reference/count ()</code> 	Count of child elements within the given parent.
<ul style="list-style-type: none"> <code>parent/element_name[*]</code> <code>parent/element_name.count ()</code> 	Count of elements <i>of the given name</i> , within the given parent. Notice that there is no slash after the name of the element (in contrast with the previous set of paths).
<ul style="list-style-type: none"> <code>element_reference/[\$*]</code> <code>element_reference/node-count ()</code> 	Count of child nodes of the given element.
<ul style="list-style-type: none"> <code>element_reference/@[*]</code> <code>element_reference/@.count ()</code> 	Count of attributes of the given element.

You can omit the square brackets in all cases except for `[*]`. Note that InterSystems IRIS also supports the **last()** function (equivalent to **count()**) and the **node-last()** function (equivalent to **node-count()**); you might prefer to use **last()** and **node-last()** if you are familiar with XPATH, which has a similar **last()** function.

6.10 Accessing Other Metadata

You can use the following functions to access other metadata of the XML virtual document. You can use these functions only at the *end* of a path.

Function	Returns
<code>/node-type ()</code>	Type of the given node. This function returns one of the following values: <ul style="list-style-type: none"> <code>root</code> <code>element</code> <code>text</code> <code>comment</code> <code>instruction</code>
<code>/name ()</code>	Full name of the given node. For example: <code>s01:Patient</code>
<code>/local-name ()</code>	Local name of the given node. For example: <code>Patient</code>
<code>/prefix ()</code>	Namespace prefix of the given node. For example: <code>s01</code>
<code>/namespace-uri ()</code>	URI of the namespace to which the given node belongs. For example: <code>www.myapp.org</code>
<code>/prefixes ()</code>	All the namespace prefixes and their corresponding URIs, in the scope of the given element. This information is returned as a comma-separated list. Each list item consists of the namespace prefix, followed by an equal sign (=), followed by the URI. The default namespace URI is listed first without a prefix. For example: <code>=http://tempuri.org,s01=http://mysns.com</code>

6.11 Summary of Path Modifiers

The following table summarizes the path modifier for DOM-style paths:

Path modifier	Uses	Methods that can use paths that contain this modifier	Provides padding (as needed) when used with SetValueAt()?
[n]	Getting or setting <i>n</i> th instance	GetValueAt() and SetValueAt()	Yes
/[n]	Getting <i>n</i> th child element	GetValueAt()	Not applicable
[~n]	Inserting <i>n</i> th instance	SetValueAt()	Yes
[~]	Appending instance	SetValueAt()	No
[\$n]	Getting or setting instance at <i>n</i> th node position	GetValueAt() and SetValueAt()	No
[~\$n]	Inserting instance at <i>n</i> th node position	SetValueAt()	No

6.12 Variations for Documents That Use Namespaces

If the document uses XML namespaces, for each element or attribute that is in a namespace, you must modify that section of the path to include a namespace prefix, followed by colon (:). A namespace prefix is one of the following:

- If you have loaded the corresponding XML schema, use a namespace token as described in [XML Namespace Tokens](#). For example: use `$2:element_name` rather than `element_name`
- If you have not loaded the XML schema, use the namespace prefix exactly as it appears in the document. For example: `s01:Patient`
- Use the wildcard `*` to ignore the namespace. For example: `*:Patient`

Another option is to ignore all namespaces in the document. To do this, start the path with the wildcard `*:/` rather than `/`

For example: `*:/Patient/@MRN`

You cannot use any wildcards in a path when you are setting the value for that path.

Note: The output document of a DTL does not necessarily use the same namespace prefixes as the input document. The namespaces are the same, but the prefixes are generated. According to the XML standard, there is no significance to the choice of prefix.

6.13 Testing DOM-style Paths in the Terminal

It can be useful to test virtual document property paths in the Terminal before using them in business processes, data transformations, and so on, particularly when you are getting familiar with the syntax. To do so for DOM-style XML paths, do the following in the Terminal or in test code:

1. Create a string that contains the text of a suitable XML document.

2. Use the **ImportFromString()** method of `EnsLib.EDI.XML.Document` to create an instance of an XML virtual document from this string.
3. Use the **GetValueAt()** and **SetValueAt()** methods of this instance.

The following method demonstrates these steps:

```
ClassMethod TestDOMPath()
{
    set string="<Patient xmlns='http://myapp.com'>"
    _ "<Name>Jolene Bennett</Name>"
    _ "<Address><Street>899 Pandora Boulevard</Street></Address>"
    _ "</Patient>"
    set target=##class(EnsLib.EDI.XML.Document).ImportFromString(string,.status)
    if 'status {do $system.Status.DisplayError(status) quit}

    set pathvalue=target.GetValueAt("/Patient/Name",,.status)
    if 'status {do $system.Status.DisplayError(status) quit}
    write pathvalue
}
```

The following shows output from this method:

```
SAMPLES>d ##class(Demo.CheckPaths).TestDOMPath()
Jolene Bennett
```

For additional options for **GetValueAt()**, see [The pFormat Argument](#).

6.14 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Overview of XML Virtual Property Paths](#)
- [Specifying Schema-dependent Paths for XML Virtual Documents](#)

7

Defining Data Transformations for XML Virtual Documents

This topic discusses how to create data transformations (specifically DTL-based transformations) for [XML virtual documents](#), for use in [rule sets](#). These use [XML virtual property paths](#) (property paths for [XML virtual documents](#)).

7.1 Creating a Data Transformation

To create a data transformation for XML virtual documents:

1. Optionally load the applicable XML schema or schemas into InterSystems IRIS®.
See [Loading XML Schemas into InterSystems IRIS](#).
2. Use the DTL editor in the Management Portal or in an IDE, as described in [Developing DTL Transformations](#).
3. Within the data transformation, use the following values:
 - For **Source Class** and **Target Class**, use **EnsLib.EDI.XML.Document**, the class with which InterSystems IRIS represents XML virtual documents.
 - For **Source Document Type**, optionally select the XML type expected in the message. Choose an XML type from one of the XML schemas you have loaded into InterSystems IRIS.
Leave this value blank if you do not have or do not want to use the schema.
 - For **Target Document Type**, optionally select a different XML type or remove the value.
InterSystems IRIS initializes **Target Document Type** with the value you select for **Source Document Type**, if any.
4. Create actions within the data transformation as usual, using the XML property paths described in the [previous topic](#). There are two basic scenarios:
 - If you have loaded the schemas and have specified the source and target document types, the DTL editor displays each document structure as a tree. Then you can drag and drop to create the transformation. InterSystems IRIS creates actions that use schema-dependent paths. You can edit these to use DOM-style paths instead, if those are needed for some reason.
 - If you do not specify the document types, the document structures are not displayed as trees. In this case, it is necessary to add and edit the actions manually. You can use only DOM-style paths.

In either case, you can add code elements to support more complex processing.

After you save and compile the data transformation, it is available for use in a rule set; see [Defining Rule Sets for XML Virtual Documents](#).

7.2 Available Assignment Actions for XML Virtual Documents

For XML virtual documents, InterSystems IRIS supports the following assignment actions:

- **set**—Sets a value. If the type of the target element is "any", then the text can include XML markup. The XML markup must be well formed, but it will not be validated against any schema.

If you set the target element to the value of a source property path, the source property path must exist. Alternatively, InterSystems IRIS does not set the target and returns an error, which you can optionally ignore by enabling the **Ignore missing source segments and properties** setting. For more information, see [Specifying Transformation Details](#).

- **append**—Appends the new value to the target element, after any subnodes in that element.
- **clear**—Clears the text context of the target but retains the element and any children. Or, if the target is an attribute, the action clears its value but retains the attribute.
- **remove**—Removes the target element or attribute.

Note that **insert** is not supported.

7.3 Using Code

If you need to add code elements to support more complex processing, you directly invoke the **GetValueAt()** and **SetValueAt()** methods of the *source* and *target* variables. For `EnsLib.EDI.XML.Document`, these methods are as follows:

GetValueAt()

```
method GetValueAt(pPropertyPath As %String,  
                 pFormat As %String,  
                 Output pStatus As %Status) as %String
```

Where:

- *pPropertyPath* is an XML property path, as described [earlier](#).
- *pFormat* is a set of flags that control the format of the returned string. See the [following subsection](#).
- *pStatus* is a status that indicates success or failure.

This method returns the current value at the given property path, or returns an empty string if the path is not valid.

SetValueAt()

```
method SetValueAt(pValue As %String,  
                 pPropertyPath As %String,  
                 pAction As %String = "set",  
                 pKey As %String = "") as %Status
```

Where:

- *pValue* is a suitable value for the given XML property path.
- *pPropertyPath* is an XML property path, as described in the [previous topic](#).
- *pAction* is either "set", "append", "clear", or "remove". For details, see the [previous section](#).
- *pKey* is not used for XML virtual documents.

This method evaluates the given property path, and (if the path is valid), uses *pValue* and *pAction* to modify the value at that path.

Important: It is useful to check the status values returned by these methods. The status contains specific information when you specify invalid paths or attempt actions that are not permitted. This information is particularly useful when you are debugging and can save you time.

7.3.1 The pFormat Argument

The *pFormat* argument for `GetValueAt()` is an optional string that controls the format of the returned string. This string can contain any suitable combination of the characters in the following table:

General Description	Character to Include in Format Setting	Specific Behavior
Line feeds and carriage returns	w	Adds a Windows-style carriage return and line feed combination after every text-free element.
Line feeds and carriage returns	r	Uses the stored line feeds and carriage returns. This option takes precedence over the options w and n.
Line feeds and carriage returns	n	Includes a new line (line feed) after every text-free element. In contrast to w, this option does not add a carriage return.
Indentation. Note that these options are used only if the output includes new lines.	i	Indents each new line with four spaces.
Indentation	Any integer from 1 to 9	Indents each new line with this number of spaces. This option takes precedence over the previous indentation option.
Indentation	t	Indents each new line with a tab. This option takes precedence over both of the previous indentation options.
Indentation	s	Uses the stored indentation whitespace. This option takes precedence over the previous indentation options.
Handling attributes	a	Alphabetizes the attributes in an element.
Handling attributes	q	Uses double quotes (rather than single quotes) to set off attribute values if possible.
Handling namespaces	p	Suppresses output of namespace prefixes.
Handling namespaces	x	Suppresses output of namespace declarations.

General Description	Character to Include in Format Setting	Specific Behavior
Handling empty elements	e	Generates output for each empty element with an open tag and close tag pair. If this option is not set, empty elements are output as a single empty tag. This option takes precedence over option g.
Handling empty elements	g	Suppresses output of empty tags.
Other	c	Canonical output. This option takes precedence over the options e i n t w.
Other	f	Generates the full element (including both the starting and ending tags), not just the contents within the element.
Other	l	Includes information about the location of the schema file that was loaded into InterSystems IRIS. This option takes effect only if you use f.
Other	o	Includes any XML entities as is, rather than performing XML escaping for those entities.
Other	C (e)	Generates an XML header line that declares the given character encoding; e is the non-quoted name of a character encoding such as UTF-8. If e is empty, use the encoding defined by the adapter. If e begins with ! then force the encoding of the output stream. Note that this will be applied automatically for file operations configured with a non-UTF-8 character set.

As noted above, the *pFormat* argument can equal a combination of these items. For example, if you use the value C (UTF-8) g, the outbound document is in the UTF-8 character set and attributes are set off with double quotes. For another example, if you use the value C (UTF-16) a, the outbound document is in the UTF-16 character set and attributes are alphabetized.

Note: This information also applies to the [Format](#) setting of an XML business operation.

7.4 Example 1: Copying Most of the Source Document

To easily define a data transformation that copies most of a source document, do the following in the Data Transformation Builder:

- On the **Transform** tab, select **copy** from the **Create** drop-down list.
Then, by default, the new document will be a copy of the original document.
- Define actions that partly or fully remove selected elements or attributes. To define such an action:
 1. In **Add Action**, click **clear** or **remove**.
 2. Double-click the target property that you want to clear or remove.
 3. Enter any value into **Value**; this field is required but is ignored in this case.

The following shows an example that uses schema-dependent paths:

```
Class Demo02.MyDTL Extends Ens.DataTransformDTL
{
XData DTL [ XMLNamespace = "http://www.intersystems.com/dtl" ]
{
<transform sourceClass='EnsLib.EDI.XML.Document' targetClass='EnsLib.EDI.XML.Document'
sourceDocType='Demo02:Patient' targetDocType='Demo02:Patient' create='copy' language='objectscript' >
<assign value="this value is ignored" property='target.{WorkAddress}' action='remove' />
<assign value="this value is ignored" property='target.{HomeAddress}' action='remove' />
</transform>
}
Parameter REPORTERRORS = 1;
}
```

This data transformation copies the source document to the target and then removes the <WorkAddress> and <HomeAddress> elements from the target.

The following shows an equivalent example that uses DOM-style property paths:

```
Class Demo02A.MyDTL Extends Ens.DataTransformDTL
{
XData DTL [ XMLNamespace = "http://www.intersystems.com/dtl" ]
{
<transform sourceClass='EnsLib.EDI.XML.Document' targetClass='EnsLib.EDI.XML.Document'
create='copy' language='objectscript' >
<assign value="this value is ignored" property='target.{/Patient/WorkAddress}' action='remove' />
<assign value="this value is ignored" property='target.{/Patient/HomeAddress}' action='remove' />
</transform>
}
Parameter REPORTERRORS = 1;
}
```

Notice that in this case, the data transformation does not specify the document types because they are unnecessary here.

7.5 Example 2: Using Only a Few Parts of the Source Document

To easily define a data transformation that uses only a few parts of a source document, do the following in the Data Transformation Builder:

- On the **Transform** tab, select **new** from the **Create** drop-down list.
Then, by default, the new document will be empty.
- Define actions that copy selected elements or attributes. To define such an action, drag and drop from the source document area to the target document area. Each action that you add this way is a **set** action.

The following shows an example that uses schema-dependent paths:

```
Class Demo05.MyDTL Extends Ens.DataTransformDTL
{
XData DTL [ XMLNamespace = "http://www.intersystems.com/dtl" ]
{
<transform sourceClass='EnsLib.EDI.XML.Document' targetClass='EnsLib.EDI.XML.Document'
sourceDocType='Demo05:Patient' targetDocType='Demo05:Patient' create='new' language='objectscript' >
<assign value='source.{MRN}' property='target.{MRN}' action='set' />
<assign value='source.{PrimaryCarePhysician}' property='target.{PrimaryCarePhysician}' action='set' />
</transform>
}
Parameter REPORTERRORS = 1;
}
```

This data transformation copies only the MRN and PrimaryCarePhysician properties from the source to the target.

The following shows an equivalent example that uses DOM-style property paths:

```
Class Demo05A.MyDTL Extends Ens.DataTransformDTL
{
XData DTL [ XMLNamespace = "http://www.intersystems.com/dtl" ]
{
<transform sourceClass='EnsLib.EDI.XML.Document' targetClass='EnsLib.EDI.XML.Document'
create='new' language='objectscript' >
<assign value='source.{/Patient/MRN}' property='target.{/Patient/MRN}' action='set' />
<assign value='source.{/Patient/PrimaryCarePhysician}'
property='target.{/Patient/PrimaryCarePhysician}' action='set' />
</transform>
}
Parameter REPORTERRORS = 1;
}
```

7.6 Example 3: Using Code and SetValueAt()

The following example uses the **code** action type and uses a DOM-style path. It adds an attribute and an XML comment to the root element:

```
Class Demo06.MyDTL Extends Ens.DataTransformDTL
{
XData DTL [ XMLNamespace = "http://www.intersystems.com/dtl" ]
{
<transform sourceClass='EnsLib.EDI.XML.Document' targetClass='EnsLib.EDI.XML.Document'
create='copy' language='objectscript' >
<code>
<![CDATA[
//this part adds an attribute to the document
set path="/1/@NewAttribute"
set status=target.SetValueAt("New attribute value",path)
if 'status {do ##class(MyApp.Utils).Trace("Demo06.MyDTL","Error setting path: ",path)}

//this part adds a comment to the document
set path="/1/comment()"
set status=target.SetValueAt("This is an XML comment",path)
if 'status {do ##class(MyApp.Utils).Trace("Demo06.MyDTL","Error setting path: ",path)}
]]>
</code>
</transform>
}
Parameter REPORTERRORS = 1;
}
```

If the **SetValueAt()** method returns an error, this transformation uses a utility method to record the details.

7.7 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)
- [Developing DTL Transformations](#)
- [Overview of XML Virtual Property Paths](#)
- [Specifying Schema-dependent Paths for XML Virtual Documents](#)
- [Specifying DOM-style Paths for XML Virtual Documents](#)

8

Defining Rule Sets for XML Virtual Documents

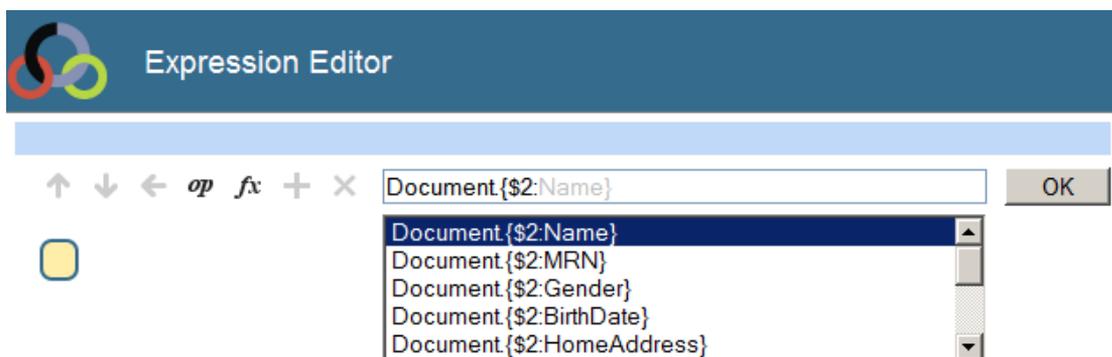
This topic discusses how to create rule sets for [XML virtual documents](#), for use in [business processes](#). These use [XML virtual property paths](#) (property paths for [XML virtual documents](#)).

To configure a business process to use a rule set, specify its **Business Rule Name** setting; see [Adding a Business Process to Handle XML Virtual Documents](#).

8.1 Creating a Rule Set

To create a rule set for XML virtual documents:

1. Optionally load the applicable XML schema or schemas into InterSystems IRIS® data platform.
See [Loading XML Schemas into InterSystems IRIS](#).
2. Use the Rule Set editor in the Management Portal or in an IDE, as described in [Developing Business Rules](#).
3. For the rule set basic definition, use **Virtual Document Message Routing Rule** for **Type**.
This choice sets **Context Class** to `EnsLib.MsgRouter.VDocRoutingEngine`. It also sets **Rule Assist Class** to `EnsLib.MsgRouter.VDocRuleAssist`.
4. For any rule constraint in the rule set, use the following values:
 - For **Message Class**, use **EnsLib.EDI.XML.Document**, the class with which InterSystems IRIS represents XML virtual documents.
 - For **Schema Category**, optionally select an XML schema that you have previously loaded into InterSystems IRIS.
Leave this value blank if you do not have or do not want to use the schema.
 - For **Document Name**, optionally select a document type defined in that schema.
Leave this value blank if you have not specified **Schema Category**.
5. Create rules as usual, using the XML property paths described [earlier](#). There are two basic scenarios:
 - If you have loaded the schema and have specified the target document type, the Expression Editor provides assistance when you start typing `Document`.



Notice that these property paths are schema-dependent paths, although you could edit them to be DOM-style paths instead, if those are needed for some reason.

- If you have not loaded the schema and specified the document type, you must type the path manually. You can use either schema-dependent paths or DOM-style paths.

After you save and compile the rule set, it is available for use in a business process.

8.2 Example

The following shows the class definition for a simple rule set. This rule set has one rule that uses a DOM-style path to check the <MRN> element of the <Patient> document. Depending on the returned value, the rule routes the message to either FileOut1 or FileOut2. Notice that in this case, the rule constraint does not refer to the XML schema or type.

```

Class Demo09.MyRules Extends Ens.Rule.Definition
{
    Parameter RuleAssistClass = "EnsLib.MsgRouter.VDocRuleAssist";

    XData RuleDefinition [ XMLNamespace = "http://www.intersystems.com/rule" ]
    {
        <ruleDefinition alias="" context="EnsLib.MsgRouter.VDocRoutingEngine">
        <ruleSet name="" effectiveBegin="" effectiveEnd="">
        <rule name="CheckMRN" disabled="false">
        <constraint name="msgClass" value="EnsLib.EDI.XML.Document"></constraint>
        <when condition="Document.{ /$2:Patient/$2:MRN }=&quot;123456789&quot; ">
        <send transform="" target="FileOut1"></send>
        <return></return>
        </when>
        <when condition="Document.{ /$2:Patient/$2:MRN }!=&quot;123456789&quot; ">
        <send transform="" target="FileOut2"></send>
        <return></return>
        </when>
        </rule>
        </ruleSet>
        </ruleDefinition>
    }
}

```

8.3 See Also

- [Using Virtual Documents in Productions](#)

- [Introduction to XML Virtual Documents](#)
- [Developing Business Rules](#)
- [Overview of XML Virtual Property Paths](#)
- [Specifying Schema-dependent Paths for XML Virtual Documents](#)
- [Specifying DOM-style Paths for XML Virtual Documents](#)

9

Defining Search Tables for XML Virtual Documents

This topic describes briefly how to define search tables for [XML virtual documents](#). These use [XML virtual property paths](#) (property paths for [XML virtual documents](#)).

To configure a business service or business operation to use a search table class, specify the **Search Table Class** setting of that business host. See [Configuration Steps](#).

9.1 Introduction

The XML search table class, `EnsLib.EDI.XML.SearchTable` indexes only the name of the root element of the XML documents. If you need more items to search, you can create a subclass. For details, see [Defining a Search Table Class](#).

Note: InterSystems IRIS® does not retroactively index messages that were received before you added the search table class.

9.2 Example

The following shows an example:

```
XData SearchSpec [ XMLNamespace = "http://www.intersystems.com/EnsSearchTable" ]
{
  <Items>
    <Item DocType="MyApp:Patient" PropName="Gender" >{*:/Patient/Gender}</Item>
    <Item DocType="MyApp:Patient" PropName="MRN" >{*:/Patient/@MRN}</Item>
  </Items>
}
```

9.3 See Also

- [Using Virtual Documents in Productions](#)
- [Introduction to XML Virtual Documents](#)

- [Defining a Search Table Class](#)
- [Overview of XML Virtual Property Paths](#)
- [Specifying Schema-dependent Paths for XML Virtual Documents](#)
- [Specifying DOM-style Paths for XML Virtual Documents](#)

10

XML-Enabled Objects Compared to XML Virtual Documents

When developing a production with XML messages, you can use either of the following structures to contain the XML document:

- [XML virtual documents](#)
- XML-enabled objects

If you need to access a small number of the elements in the input XML document, you can use XML virtual documents, but if you need to access most of the elements in the input XML document, you should choose XML-enabled objects because they are more efficient, especially when an object with many elements is processed by a transformation. The following business services and operations are provided to handle XML-enabled objects:

- `EnsLib.XML.Object.Service.FileService`
- `EnsLib.XML.Object.Service.FTPService`
- `EnsLib.XML.Object.Operation.FileOperation`
- `EnsLib.XML.Object.Operation.FTPOperation`

The XML-enabled object business services read a file containing an XML document and convert it to one or more objects. You specify a property that defines the XML element to convert to objects. If the XML root document contains a single element, then the service converts it to one object, but if the XML root document contains a series of these elements, then the service converts them to separate objects.

To use the XML-enabled object services, you do the following:

1. Define a class that matches the structure of the input XML documents that you are processing. The class can either match the entire XML document or a repeating element within the root XML document. You can use the XML Schema Wizard to define this class. You can optionally define a `NAMESPACE` parameter for this class. This parameter specifies the XML namespace.
2. Specify the class name in the business service **Class Name** field.
3. Optionally, specify the element name in the **Element Name** field. If you specify this field, the service looks for one or more XML elements with this name within the root XML object. Each occurrence of this element is converted to an instance of the specified class. If you do not specify this field, the service matches the root document to the specified class.

4. Optionally, specify the **Format** parameter and optionally select **Ignore Null**. The **Format** parameter can have a value of "literal", "encoded", or "encoded12". These parameters specify the corresponding parameters for the %XML.Adaptor class.

The XML-enabled object business operations convert an object to an XML document and write the document to a file. In addition to specifying information about the XML class and element, you can specify properties that are used when the operation invokes the %XML.Writer class.

Specify the following properties in the operations:

- **Root Element Name**—If you specify this property, it is used as the root element name. If you omit this element, the operation uses the input element name.
- **Namespace**—Specifies the XML namespace except if the class defines a NAMESPACE property. In that case, the operation always uses the XML namespace defined in the class.
- **Expected Class Name**—Class name of the XML-enabled object. If the expected name does not match the actual name, the %XML.Writer adds an xsi:type attribute to the XML element.
- **Indentation Type**—Specifies the corresponding property for %XML.Writer. Indentation Type specifies if indentation of the XML output should take place and what type of indentation.
- **Indentation Depth**—Specifies the corresponding property for %XML.Writer. Indentation Depth specifies the number of indentation characters to be used for indentation. The default for "tab" is 1. The default for "space" is 4.
- **Charset**—Specifies the corresponding property for %XML.Writer. Charset is the charset to use for encoding the XML output. The default depends upon the output destination. "UTF-8" is the default for output to files and binary streams. On a Unicode system, "UTF-16" is the default for output to character streams and strings. On an 8-bit system, the default charset for the locale is the default charset for output to character streams and strings.
- **No XML Declaration**—Specifies the corresponding property for %XML.Writer. If No XML Declaration is 1 (true), the %XML.Writer does not write the XML declaration. The default is for the %XML.Writer to write the XML declaration unless Charset is not specified and the output is directed to a string or character stream in which case it does not write an XML declaration.
- **Runtime Ignore Null**—Specifies the corresponding property for %XML.Writer.
- **Element Qualified**—Specifies the corresponding property for %XML.Writer.
- **Attribute Qualified**—Specifies the corresponding property for %XML.Writer.
- **Default Namespace**—Specifies the corresponding property for %XML.Writer.
- **Suppress xml:ns**—Specifies the corresponding property for %XML.Writer.
- **Format**—Specifies the corresponding property for %XML.Writer.
- **References inline**—Specifies the corresponding property for %XML.Writer.

11

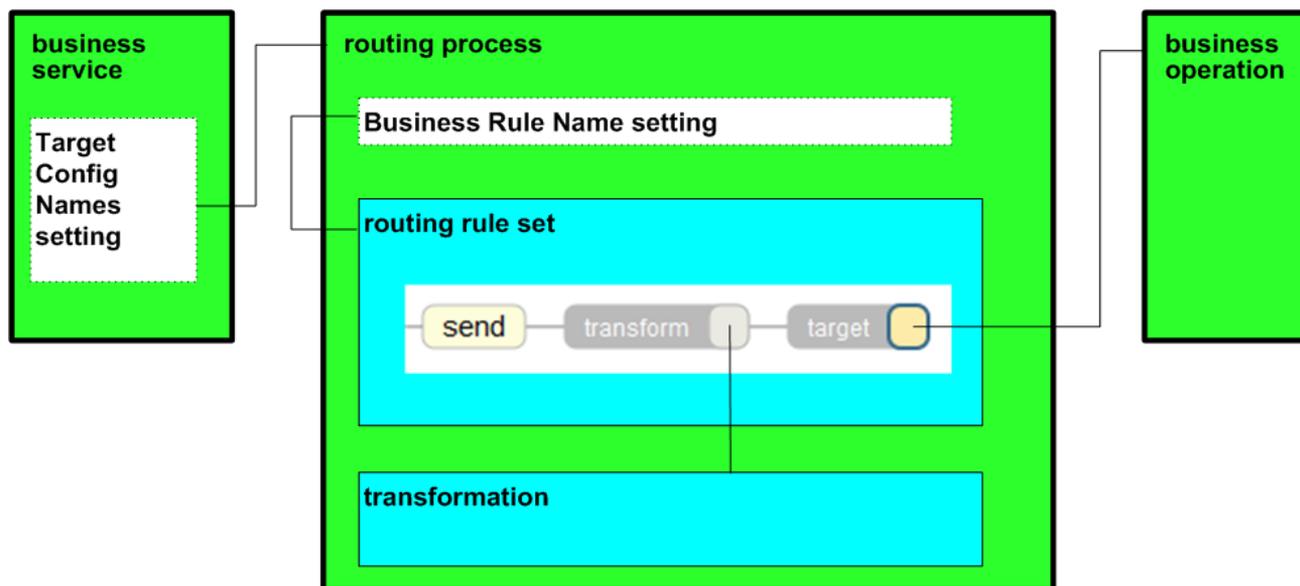
Classes for Use with XML Virtual Documents

For reference, this topic lists the classes you can use within an interoperability production, when you want to work with XML documents as [virtual documents](#).

Item	Classes	Notes
XML business services	<ul style="list-style-type: none">EnsLib.EDI.XML.Service.FileServiceEnsLib.EDI.XML.Service.FTPService	Each of these business service classes uses a different adapter, as indicated by the class name.
XML routing process	EnsLib.MsgRouter.VDocRoutingEngine	This class is the standard virtual document routing process.
XML business operations	<ul style="list-style-type: none">EnsLib.EDI.XML.Operation.FileOperationEnsLib.EDI.XML.Operation.FTPOperation	Each of these business operation classes uses a different adapter, as indicated by the class name.
Messages	EnsLib.EDI.XML.Document (automatically used by the business host classes)	This is a specialized message class to carry XML documents as virtual documents.
Search table	EnsLib.EDI.XML.SearchTable	This is a specialized search table class for XML documents.

You can also create and use subclasses of these classes.

The business host classes include configurable targets. The following diagram shows some of them:



For information on other configurable targets, see [Reference for Settings](#).

11.1 See Also

- [Using Virtual Documents in Productions](#)
- [Configuring a Production to Use XML Virtual Documents](#)

XML Virtual Document Business Service and Business Operation Settings

This section provides reference information for business hosts to process [XML virtual documents](#).

For information on settings for the routing process (EnsLib.MsgRouter.VDocRoutingEngine), see [Settings of a Virtual Document Routing Process](#).

Settings for XML Business Services

Provides reference information for settings of [XML virtual documents](#) business services.

Summary

XML virtual document business services provide the following settings:

Group	Settings	See
Basic Settings	Target Config Names , Doc Schema Category	Settings for Business Services
Additional Settings	Search Table Class , Validation	<i>section in this topic</i>
Additional Settings	Reply Target Config Names	<i>section in this topic</i>

The remaining settings are either common to all business services or are determined by the file adapter. For information, see:

- [Settings for All Business Services](#)
- [Settings for the File Inbound Adapter](#)

Reply Target Config Names

(File and FTP only) Comma-separated list of configuration items within the production to which the business service should relay any XML virtual documents *reply* messages. Usually the list contains one item, but it can be longer. The list can include both business processes and business operations.

Compare to [Target Config Names](#).

Validation

By default, validation of XML virtual documents is limited to testing whether the DocType is defined. To provide additional validation for XML virtual documents, you should subclass the `EnsLib.MsgRouter.VDocRoutingEngine` class and override the **OnValidate** method, adding custom code to validate the XML document.

If you are validating the document, return a nonzero value, which suppresses any default validation. If the document passes validation, return 1 (\$\$\$OK) in `pStatus` to indicate success. If the document fails validation, return an error code in `pStatus`.

Settings for XML Business Operations

Provides reference information for settings of [XML virtual documents](#) business operations.

Summary

XML virtual document business operations provide the following settings:

Group	Settings	
Basic Settings	Format	<i>section in this topic</i>
Additional Settings	Search Table Class	Settings for Business Operations

The remaining settings are either common to all business operations or are determined by the file adapter. For information, see:

- [Settings for All Business Operations](#)
- [Settings for the File Outbound Adapter](#)

Format

Specifies how to form the outbound document. You can leave this empty, in which case defaults are used. Or you can specify a string that contains a suitable combination of the characters listed in [The pFormat Argument](#).

For example, if you use the value `C(UTF-8)q`, the outbound document is in the UTF-8 character set and attributes are set off with double quotes. For another example, if you use the value `C(UTF-16)a`, the outbound document is in the UTF-16 character set and attributes are alphabetized.

