FICO Application Studio/Optimization Executor Integration Package

9.7

REFERENCE MANUAL

FICO® Xpress Optimization

FICO

FICO® Xpress Optimization 9.7

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Contents

CHAPTER 1

Introduction

The helper package *fssappstudio* provides a set of routines to transform input and result data of a Mosel model into the XML record format of FICO Application Studio. This package is imported by adding the following line to the top of your model:

```
uses "fssappstudio"
```

1.1 XML record format

The XML record format used by FICO Application Studio has the following structure: The top-level element is `InputRecordList` (for inputs) or `ResultRecordList` (for results), which always contains a single `InputRecord` or `ResultRecord`. Data comes in the form of scalars or arrays.

- Scalars are represented as values enclosed in a named element, as shown in the example below.
- Arrays are represented as a 'table' comprised of a named element which contains multiple 'rec' (`_rec`) elements that represent rows of the table. Each table row contains multiple elements representing individual cells. The following example has a table named 'Channels' with three columns: 'Channel', 'Cost', and 'Capacity'.

```
<?xml version="1.0"?>
<InputRecordList xmlns="http://www.fico.com/input"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <InputRecord>
    <MyScalarValue>7.5</MyScalarValue>
    <AnotherScalar>a string value</AnotherScalar>
    <Channels>
      <Channels_rec>
        <Channel>1</Channel>
        <Cost>0.5</Cost>
        <Capacity>100</Capacity>
      </Channels_rec>
      <Channels_rec>
        <Channel>2</Channel>
        <Cost>1.2</Cost>
        <Capacity>50</Capacity>
      </Channels_rec>
      <Channels_rec>
        <Channel>3</Channel>
        <Cost>3</Cost>
        <Capacity>40</Capacity>
      </Channels_rec>
    </Channels>
  </InputRecord>
</InputRecordList>
```

In a Mosel model, data input from such XML files needs to be preceeded by a call to `appsxmlimport` to register the inputs:

```
declarations
  myScalar: real
  ChannelCost,ChannelCapacity: array(CHANNELS: range) of real
end-declarations

appsxmlimport
initialisations from appsxmlin("MyScalarValue")
  myScalar as "[](MyScalarValue)"
end-initialisations
initialisations from appsxmlin("Channels")
  [ChannelCost,ChannelCapacity] as "[](Channel,Cost,Capacity)
end-initialisations
```

Inversely, data output from a Mosel model needs to be terminated with a call to `appsxmlexport` to generate the XML format data and the corresponding XSD schema definition from the output data:

```
declarations
  ResultCost,ResultCapacity: array(CHANNELS: range) of real
end-declarations

initialisations appsxmlout("ResultChannels")
  [ChannelCost,ChannelCapacity] as "[](ResultChannel,ResultCost,ResultCapacity)"
end-initialisations
appsxmlexport
```

Please note that array data needs to be specified in *sparse format*, that is, all indices are specified along with the value columns.

CHAPTER 2

Package functionality

2.1 Constants

The following publicly declared objects can be employed by Mosel models that load the package *fssappstudio*:

APPSXML_FMT_TYPED_RECORDLIST = 1

Normal XML format, use `InputRecordList/InputRecord` or `ResultRecordList/ResultRecord` elements

APPSXML_FMT_UNTYPED_RECORDLIST = 2

Untyped XML format, use `RecordList/Record` elements

2.2 Subroutines

appsxmlexport

Purpose

Build XML from CVS files.

Synopsis

```
procedure appsxmlexport(fname:string, type:integer)
procedure appsxmlexport(fname:string)
procedure appsxmlexport
```

Arguments

`fname` name of the XML output file, defaults to ”result”

`type` entity label

`APPSXML_FMT_TYPED_RECORDLIST` use `ResultRecordList`/ `ResultRecord` elements (default)

`APPSXML_FMT_UNTYPED_RECORDLIST` use `RecordList`/ `Record` elements

Example

See function `appsxmlout`.

Further information

1. This function transforms result data that has been generated by a Mosel model using `initializations to` with `appsxmlout` to the XML result data format of *fssappstudio*.
2. `appsxmlexport` also generates the XSD schema that corresponds to the resulting XML file.
3. FICO Application studio expects the fixed filename `result` for XML output data, using a single file per model.
4. The reverse operation, transforming XML format input data to CSV files is performed by `appsxmlimport`.

Related topics

`appsxmlout`, `appsxmlimport`

appsxmlfnin

Purpose

Generate a file name for an input file.

Synopsis

```
function appsxmlfnin(label:string):string
```

Argument

`label` entity label

Return value

Filename or `null`: if the file has not been generated.

Example

The following line of Mosel code outputs the full path to a file called `myScalar` in a temporary directory created by this package.

```
writeln(appsxmlfnin("myScalar"))
```

Further information

This function returns the name of a temporary input file as is used by `appsxmlin`. It needs to be preceeded by a call to `appsxmlimport`.

Related topics

`appsxmlin`, `appsxmlimport`

appsxmlfnout

Purpose

Generate a file name for an output file.

Synopsis

```
function appsxmlfnout(label:string):string
```

Argument

`label` entity label

Return value

Filename.

Example

The following line of Mosel code outputs the full path to a file called `myScalar` in a temporary directory created by this package.

```
writeln(appsxmlfnout("myScalar"))
```

Further information

This function generates and records the name of a temporary output file as is used by `appsxmlout`. If the file already exists it is deleted.

Related topics

`appsxmlout`

appsxmlimport

Purpose

Extract all data files included in provided XML.

Synopsis

```
procedure appsxmlimport(fname:string, type:integer)
procedure appsxmlimport(fname:string)
procedure appsxmlimport
```

Arguments

`fname` name of an XML input file, defaults to ”input”

`type` data structure type

`APPSXML_FMT_TYPED_RECORDLIST` use `InputRecordList`/ `InputRecord` elements (default)

`APPSXML_FMT_UNTYPED_RECORDLIST` use `RecordList`/ `Record` elements

Example

See function `appsxmlin`.

Further information

1. This function prepares input data provided in *fssappstudio* XML format for reading them via `initializations from` using `appsxmlin` by transforming the XML data into a set of temporary CSV format files (one per entity).
2. `appsxmlimport` also generates the XSD schema that corresponds to the provided XML file.
3. FICO Application studio expects the fixed filename `input` for XML input data, using a single file per model.
4. The reverse operation, transforming CSV format data into the XML result data format expected by *fssappstudio* is performed by `appsxmlexport`.

Related topics

`appsxmlin`, `appsxmlexport`

appsxmlin

Purpose

Generate the extended filename for 'initialisations from' from a label.

Synopsis

```
function appsxmlin(label:string):string
```

Argument

`label` entity label

Return value

An extended CSV filename

Example

The following lines of Mosel code

```
declarations
  myStr: string
end-declarations

appsxmlimport("input")
initialisations from appsxmlin("AnotherScalar")
  myStr as "[](AnotherScalar)"
end-initialisations
```

read the value of the scalar from an input file of this form:

```
<InputRecordList>
  <InputRecord>
    <MyScalarValue>7.5</MyScalarValue>
    <AnotherScalar>a string value</AnotherScalar>
  </InputRecord>
</InputRecordList>
```

Further information

1. This function generates the extended file name to be used by `initializations from` for the specified label.
2. Data input from the resulting file needs to be preceeded by a call to `appsxmlimport`.

Related topics

`appsxmlimport`

appsxmlout

Purpose

Generate the extended filename for 'initialisations to' from a label.

Synopsis

```
function appsxmlout(label:string):string
```

Argument

`label` entity label

Return value

An extended CSV filename

Example

The following lines of Mosel code

```
declarations
  myArr: array(range) of real
end-declarations

myArr::[1..3][1.2, 3.5, 6.7]
initialisations to appsxmlout("AnArray")
  myArr as "[](ArIndex,ArValue)"
end-initialisations
appsxmlexport("result")
```

output the array `myArr` to a result file of this form:

```
<ResultRecordList>
  <ResultRecord>
    <AnArray>
      <AnArray_rec>
        <ArIndex>1</ArIndex>
        <ArValue>1.2</ArValue>
      </AnArray_rec>
      <AnArray_rec>
        <ArIndex>2</ArIndex>
        <ArValue>3.5</ArValue>
      </AnArray_rec>
      <AnArray_rec>
        <ArIndex>3</ArIndex>
        <ArValue>6.7</ArValue>
      </AnArray_rec>
    </AnArray>
  </ResultRecord>
</ResultRecordList>
```

Further information

1. This function generates the extended file name to be used by `initializations to` for the specified label.
2. Data output to the resulting file needs to be terminated by a call to `appsxmlexport` in order to generate the XML file.

Related topics

`appsxmlexport`

Appendix A

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- Phone: +1 (408) 535-1500 or +44 207 940 8718
- Web: www.fico.com/optimization and use the available contact forms

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