<AutomationML/>

The Glue for Seamless Automation Engineering

Best Practice Recommendations:
Modelling of List Attributes in
AutomationML

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Table of contents

List of figures

Preface

AutomationML provides the basis for an efficient data exchange within the engineering process of production systems. The AutomationML standard series IEC 62714 "Engineering data exchange format for use in industrial automation systems engineering" already contains many use cases and guidelines of how system engineering information is modelled.

In order to specify these definitions with examples, to apply them to specific use cases, and to facilitate the first steps with AutomationML, specific issues for the modelling of data in AutomationML are illustrated in Best Practise Recommendations (BPR).

In addition, the BPR shall provide a consistent realisation for specific use cases and shall thus, complement the AutomationML standard documents.

1   Motivation for list attributes

Until now, there is no recommendation about how to model data types of lists in AutomationML when using attributes.

Since in practice there is a need to transfer strongly typed lists of values, e.g. a list of supported frequencies, this BPR proposes how to model these in AutomationML using attributes.

2   Modelling of list attributes

A list is a sequence of homogenous items, i.e. all items must be of the same data type. In AML the list data type is represented by a parent attribute and the list items are created as child attributes of the parent attribute. To make the parent attribute identifiable as a list data type, the CAEX element 'RefSemantic' is added to the parent attribute named: 'ListType' for an unordered list or 'OrderedListType' for an ordered list. Therefore, the 'DataType' and the 'Value' of the parent attribute are irrelevant and should be kept empty. Is this not the case, the importing software tool shall ignore the 'DataType', 'Value', and 'DefaultValue'.

In case of an ordered list, the name of the child attributes shall be an integer number "1, 2, …". The aforementioned numbers are to be interpreted as the index of the item in the ordered list.

In case of an unordered list, all child attributes shall have unique names.

The data type of all child attributes within the parent attribute must be either of the same XML built-in basis data type, or serve as new parent attributes for further lists allowing the modelling of nested lists.

In the latter case, the 'DataType' shall be empty and the CAEX element 'RefSemantic' shall be 'ListType' for an unordered list or 'OrderedListType' for an ordered list.

3   Example

The following example shows the attribute "scanFrequencies" that models different frequencies with data type "xs:double".

Figure 1 and Figure 2 shows the implementation of an unordered list in the AML Editor and as the XML-text.
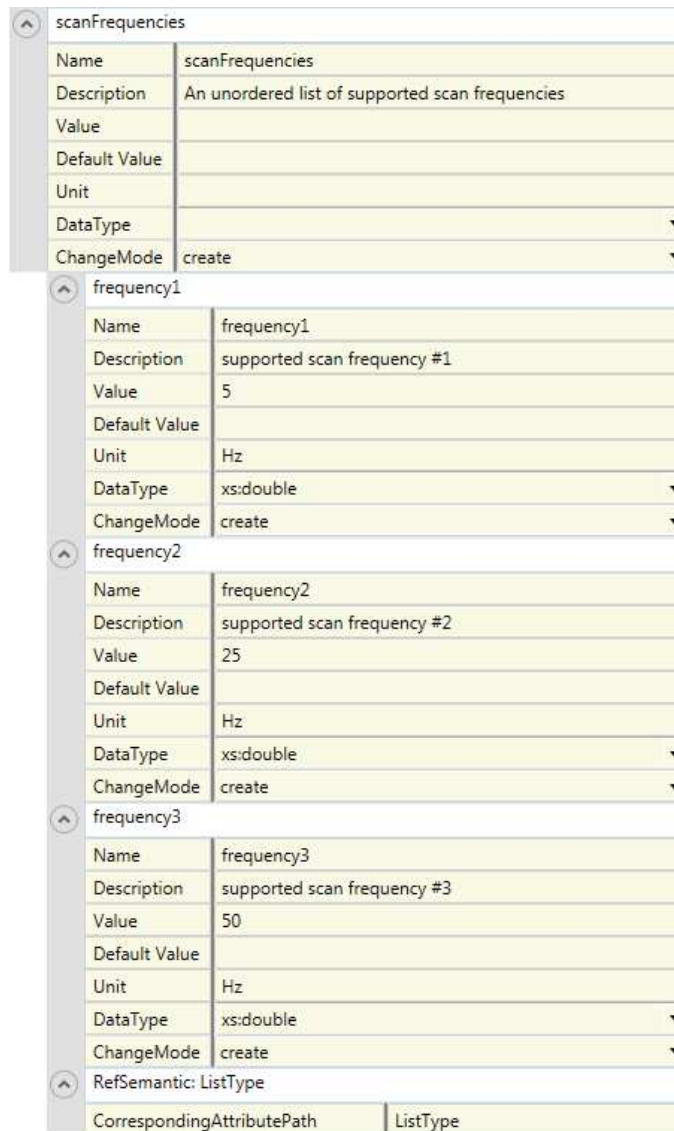

Figure 1 – Unordered list "scanFrequencies" with the AML Editor

```xml
<Attribute Name="scanFrequencies" Unit="" AttributeDataType="" ChangeMode="create">
    <Description>An unordered list of supported scan frequencies</Description>
    <RefSemantic CorrespondingAttributePath="ListType" />
    <Attribute Name="frequency1" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #1</Description>
        <Value>5</Value>
    </Attribute>
    <Attribute Name="frequency2" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #2</Description>
        <Value>25</Value>
    </Attribute>
    <Attribute Name="frequency3" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #3</Description>
        <Value>50</Value>
    </Attribute>
</Attribute>
```

Figure 2 – XML text of the unordered list attribute "scanFrequencies"

Figure 3 and *Figure 4* shows the implementation of an ordered list in the AML Editor and as the XML-text.

Figure 3 – Ordered list "scanFrequencies" with the AML Editor

```xml
<Attribute Name="scanFrequencies" Unit="" AttributeDataType="" ChangeMode="create">
    <Description>An ordered list of supported scan frequencies</Description>
    <RefSemantic CorrespondingAttributePath="OrderedListType" />
    <Attribute Name="1" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #1</Description>
        <Value>5</Value>
    </Attribute>
    <Attribute Name="2" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #2</Description>
        <Value>25</Value>
    </Attribute>
    <Attribute Name="3" Unit="Hz" AttributeDataType="xs:double" ChangeMode="create">
        <Description>supported scan frequency #3</Description>
        <Value>50</Value>
    </Attribute>
</Attribute>
```

Figure 4 – XML text of the ordered list attribute "scanFrequencies"

4   References

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