

Mantis 0009449: Attribute NodeId Discussion paper

Adding a relative path to every InternalElement that does not have a NodeId will add a lot of redundant data and should be avoided.

When a relative path is added to elements in a UAFX context the starting point of the relative path will be most likely FxRoot, because it is the last well-known node.

In the following example the FunctionalEntity myFe contains 9 variables and the browse path relative to FxRoot is the same for all variables, except the last element.

```
OfflineDescriptor
├── Root (Class: [FolderType] Role: UaBaseRole)
│   ├── Organizes (Class: [Organizes])
│   └── Objects (Class: [FolderType] Role: UaBaseRole)
│       ├── Organizes (Class: [Organizes])
│       ├── OrganizedBy (Class: [OrganizedBy])
│       ├── Server (Class: [ServerType] Role: UaBaseRole)
│       └── FxRoot (Class: [FolderType] Role: UaBaseRole)
│           ├── Organizes (Class: [Organizes])
│           └── OrganizedBy (Class: [OrganizedBy])
├── IOPTestProject (Class: [AutomationComponentType] Role: UaBaseRole)
│   ├── HasComponent (Class: [HasComponent])
│   ├── HasProperty (Class: [HasProperty])
│   └── OrganizedBy (Class: [OrganizedBy])
├── Assets (Class: [FolderType] Role: UaBaseRole)
├── ComponentCapabilities (Class: [AutomationComponentCapabilitiesType] Role: UaBaseRole)
├── ConformanceName (Class: [PropertyType] Role: UaBaseRole)
├── FunctionalEntities (Class: [FolderType] Role: UaBaseRole)
│   ├── ComponentOf (Class: [ComponentOf])
│   └── Organizes (Class: [Organizes])
└── myFe (Class: [FunctionalEntityType] Role: [IFunctionalEntityType])
    ├── HasProperty (Class: [HasProperty])
    ├── HasComponent (Class: [HasComponent])
    ├── OrganizedBy (Class: [OrganizedBy])
    └── IsHostedBy (Class: [IsHostedBy])
        ├── ApplicationIdentifier (Class: [PropertyType] Role: UaBaseRole)
        ├── AuthorAssignedIdentifier (Class: [PropertyType] Role: UaBaseRole)
        ├── AuthorAssignedVersion (Class: [PropertyType] Role: UaBaseRole)
        ├── AuthorUri (Class: [PropertyType] Role: UaBaseRole)
        └── InputData (Class: [InputsFolderType] Role: UaBaseRole)
            ├── HasComponent (Class: [HasComponent])
            ├── ComponentOf (Class: [ComponentOf])
            └── Organizes (Class: [Organizes])
                ├── SubscriberCapabilities (Class: [SubscriberCapabilitiesType] Role: UaBaseRole)
                │   ├── Boolean (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── WordIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── DWordIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── IntIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── DIntIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── FloatIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── DoubleIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   ├── StringIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                │   └── WStringIn (Class: [BaseDataVariableType] Role: UaBaseRole)
                ├── OutputData (Class: [OutputsFolderType] Role: UaBaseRole)
                ├── PublisherCapabilities (Class: [PublisherCapabilitiesType] Role: UaBaseRole)
                └── SubscriberCapabilities (Class: [SubscriberCapabilitiesType] Role: UaBaseRole)
                    ├── myFeArray (Class: [FunctionalEntityType] Role: [IFunctionalEntityType])
                    ├── myFeArray2Dim (Class: [FunctionalEntityType] Role: [IFunctionalEntityType])
                    ├── PublisherCapabilities (Class: [PublisherCapabilitiesType] Role: UaBaseRole)
                    └── SubscriberCapabilities (Class: [SubscriberCapabilitiesType] Role: UaBaseRole)
```

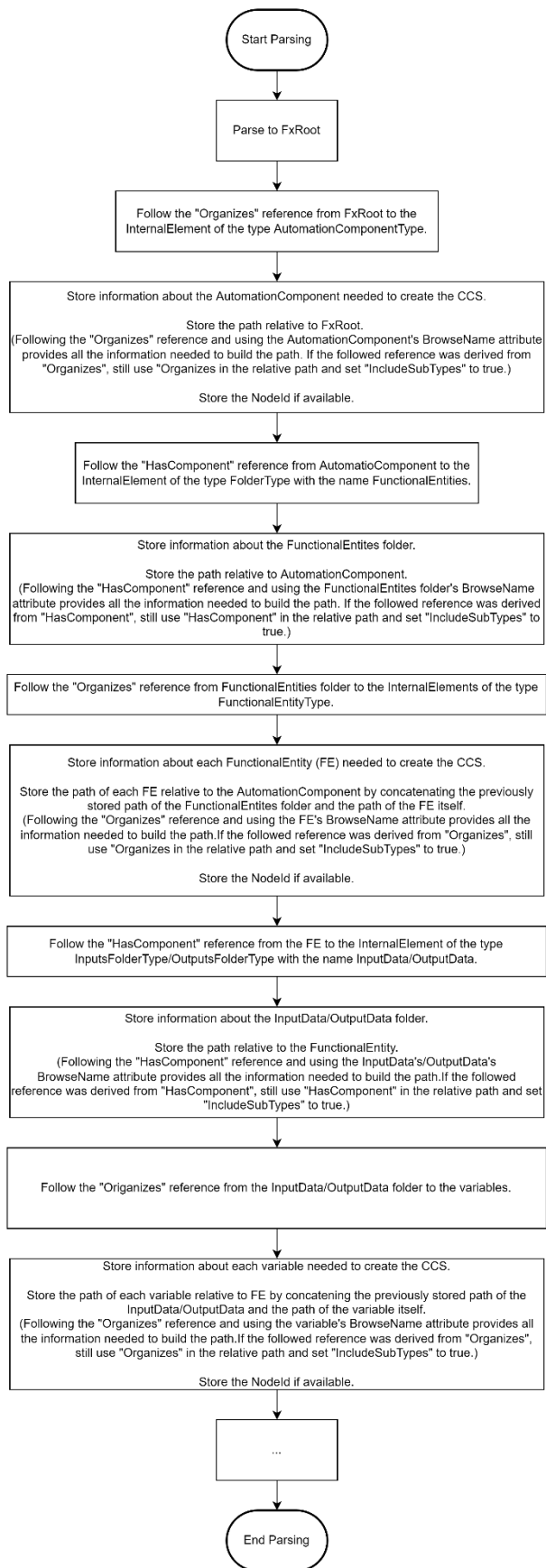
The following table visualizes the relative browse path starting from FxRoot for some variables of the FE myFE:

			BoolIn	WordIn	DWordIn
Path Element1	Reference Typeld	NamespaceUri	http://opcfoundation.org/UA/		
		Numerical	35		
	IncludeSubTypes	False			
	IsInverse	False			
	TargetName	NamespaceUri	https://www.mitsubishielectric.com/fa/FX/IOPTestProject/		
Name		IOPTestProject			
Path Element2	Reference Typeld	NamespaceUri	http://opcfoundation.org/UA/		
		Numerical	47		
	IncludeSubTypes	False			
	IsInverse	False			
	TargetName	NamespaceUri	http://opcfoundation.org/UA/FX/AC/		
Name		FunctionalEntities			
Path Element3	Reference Typeld	NamespaceUri	http://opcfoundation.org/UA/		
		Numerical	35		
	IncludeSubTypes	False			
	IsInverse	False			
	TargetName	NamespaceUri	https://www.mitsubishielectric.com/fa/FX/IOPTestProject/		
Name		myFe			
Path Element4	Reference Typeld	NamespaceUri	http://opcfoundation.org/UA/		
		Numerical	47		
	IncludeSubTypes	False			
	IsInverse	False			
	TargetName	NamespaceUri	http://opcfoundation.org/UA/		
Name		InputData			
Path Element5	Reference Typeld	NamespaceUri	http://opcfoundation.org/UA/	http://opcfoundation.org/UA/	http://opcfoundation.org/UA/
		Numerical	35	35	35
	IncludeSubTypes	False	False	False	
	IsInverse	False	False	False	
	TargetName	NamespaceUri	https://www.mitsubishielectric.com/fa/plc	https://www.mitsubishielectric.com/fa/plc	https://www.mitsubishielectric.com/fa/plc
Name		BoolIn	WordIn	DWordIn	

The yellow marked path elements are the same for each variable and would be repeated for each. This means a lot of redundant data is generated. Only the last element (green color) is different.

In addition, the path would be repeated not only for elements on the same level, but also on the previous/next level minus/plus 1 path element.

It must be possible to derive the needed path information from the given structure of the descriptor. By parsing the descriptor anyway the references/links need to be followed and based on it the relative path can be created on the fly. The following diagram shows a possible workflow:



If any data is missing to create the needed information on the fly by parsing the descriptor, it should be added, but repeating path information on each element must be avoided.

By prototyping the above workflow the following issues has been detected:

- Following the InternalLinks is slow when using AMLEngine (A descriptor uses more InternalLinks than a typical AML file.)
- 0009322: References using ExplicitNodeId (e.g., NodeId, BrowsePath) are not according to AutomationML concepts