|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| |  | | --- | |  | |  |  | OPC UA |
|  | | |
| Title | | |

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# OPC UA ObjectTypes

{#objectTypes}

## {browsename}

The {*browsename*} provides information about {description}

The {*browsename*} is formally defined in …

Table 13 – {*browsename*} Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| Browsename | {*browsename*} | | | | |
| IsAbstract | {*isAbstract*} | | | | |
| **References** | **Node Class** | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the {superType} defined in {superTypeSrc} i.e. inheriting the InstanceDeclarations of that Node. | | | | | |
| {#childrows}{referenceType} | {nodeClass} | {*browsename*} | {#datatype}{datatype}{/datatype} | {typedefinition} | {modelingrule}{/childrows} |

{#childrows}

{*browsename*} is defined as {description}

{/childrows}

{/objectTypes}

# OPC UA EventTypes

## <some>EventType

This *EventType* is ….. Its representation in the *AddressSpace* is formally defined in Table 15.

Table 15 – <some>EventType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| Browsename | | <some>EventType | | | | |
| IsAbstract | | True | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the *BaseEventType* defined in …, which means it inherits the InstanceDeclarations of that Node. | | | | | | |
| 0:HasSubtype | ObjectType | | <someother>EventType | Defined in | | |
| 0:HasProperty | Variable | | <some>Eventfield | 0:String | 0:PropertyType | 0:Mandatory |

This *EventType* inherits all *Properties* of the *BaseEventType*. ….

# OPC UA VariableTypes

## <some>VariableType

The <some>*VariableType* is a subtype of the *BaseVariableType*. It is used ….

It is formally defined in Table 23.

Table 23 – <some>Type Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| Browsename | | <some>Type | | | | |
| IsAbstract | | False | | | | |
| ValueRank | | −1 (−1 = Scalar) | | | | |
| DataType | | String | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the BaseDataVariableType defined in … | | | | | | |
| 0:HasComponent | Variable | | <var1> | 0:UtcTime | 0:BaseDataVariableType | 0:Mandatory |
| 0:HasComponent | Variable | | <var2> | 0:UtcTime | 0:BaseDataVariableType | 0:Mandatory |

# OPC UA DataTypes

## <someStructure>

This structure contains …. The structure is defined in Table 24.

Table 24 – <someStructure> Structure

|  |  |  |
| --- | --- | --- |
| Name | Type | Description |
| <someStructure> | structure | Subtype of <someParentStructure> defined in … |
| SP1 | 0:Byte[] | Setpoint 1 |
| SP2 | 0:Byte[] | Setpoint 2 |

Its representation in the *AddressSpace* is defined in Table 25.

The *AddressSpace* definition can be omitted if isAbstract=False and there are no *Properties*.

Table 25 – <someStructure> Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| Browsename | | <someStructure> | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the <someParentStructure> defined in … | | | | | | |

## <someUnion>

This union contains …. The union is defined in Table 26.

Table 26 – <someUnion> Union

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| <someUnion> | union |  |
| Var\_1 | 0:String | First set |
| Var\_2 | <someStructure> | Second set |
| Var\_3 | <someEnumeration> | Third set |

Its representation in the *AddressSpace* is defined in Table 27.

Table 27 – <someUnion> Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attributes** | | **Value** | | | | |
| Browsename | | <someUnion> | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of Union defined in OPC 10000-5. | | | | | | |

## <someEnumeration>

This enumeration …. The enumeration is defined in Table 28.

Table 28 – <someEnumeration> Items

|  |  |  |
| --- | --- | --- |
| Name | Value | Description |
| <Enum1\_Name> | 0 | <Enum1Description> |
| <Enum2\_Name> | 1 | <Enum2Description> |
| <Enum3\_Name> | 2 | <Enum4Description> |

Each *Enumeration* item is represented by a "Name" - the human readable representation and a "Value" - the numeric representation. If the *Enumeration* is zero-based and sequential, the *EnumStrings Property* is used for the names. In all other cases the *EnumValues Property* has to be used.

Its representation in the AddressSpace is defined in Table 29.

The *AddressSpace* definition can be omitted if isAbstract=False and there are no *Properties* other than *EnumStrings*.

Table 29 – <someEnumeration> Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| Browsename | | <someEnumeration> | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumStrings | 0:LocalizedText [] | 0:PropertyType |  |

## <someOptionSet>

This *DataType* defines flags for … *<*someOptionSet*>* is formally defined in Table 30.

Table 30 – <someOptionSet> Values

|  |  |  |
| --- | --- | --- |
| **Value** | **Bit No.** | **Description** |
| <Value1> | 0 | This flag…. |
| <Value2> | 1 | This flag…. |
| <Value3> | 2 | This flag…. |

The *<*someOptionSet*>* representation in the *AddressSpace* is defined in Table 31.

Table 31 – <someOptionSet> Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| Browsename | | <someOptionSet> | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **Browsename** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the OptionSet DataType defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:OptionSetValues | 0:LocalizedText [] | 0:PropertyType |  |

# OPC UA ReferenceTypes

## <someReferenceType>

The <someReferenceType> is a concrete *ReferenceType* and can be used directly. It is a subtype of <someParentReferenceType>.

The semantic of this *ReferenceType* is to link …...

The *SourceNode* of *References* of this type shall be an…...

The *TargetNode* of this *ReferenceType* shall be an …..

The *<*someReferenceType*>* is formally defined in Table 32.

Table 32 – <someReferenceType> Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Attributes** | **Value** | | |
| Browsename | <someReferenceType> | | |
| InverseName | <someinverseName> | | |
| Symmetric | <True/False> | | |
| IsAbstract | <True/False> | | |
| **References** | **NodeClass** | **Browsename** | **Comment** |
| Subtype <someParentReferenceType> | | | |

# Instances

## <someInstance>

The *<*someInstance*>* is formally defined in Table 33.

Table 33 – <someInstance> Definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | |
| Browsename | *<*someInstance*>* | | | |
| **References** | **NodeClass** | **Browsename** | **DataType** | **TypeDefinition** |
| OrganizedBy by the <TheLocationInAddressSpace> defined in <Where It is Defined> | | | | |
| 0:HasTypeDefinition | <class of SomeInstance> | *<Type of someInstance>* | Defined in <Where Type of SomeInstance isdefined> | |

Provide some description of the instance, what it is used for, constraints on it etc

# Profiles and Conformance Units

*Profiles* and *ConformanceUnits* break functionality into testable groups. All companion specification shall include at least one *Profile*/*Facet*. If there are any groupings of functionality that not all *Servers*/*Client* would implement then multiple *Profile*/*Facet* are encouraged. A *ConformanceUnit* should describe a testable unit. A single *ConformanceUnit* is tested as a unit so all items covered by it must be support or the *ConformanceUnit* will fail. *ConformanceUnits* can be included in multiple *Profiles*, thus they are declared in their own table.

The name of the *Profile* should end with *Facet* or *Profile*. A *Facet* is a grouping of functionality that must also be paired with other *Facets* to create a running *Server* or *Client*. A *Profile* is all inclusive, in that is the *Profile* is implemented no additional functionality would be required to have a running application.

**<short name>**

A <short name> is required for each companion specification to assure uniqueness of string identifiers. It precedes the names of Profiles and ConformanceUnits and is included in URIs and URLs defined in a companion specification.

A <short name> is all caps if an acronym, otherwise camel case.

Exception if the short name is a trademark. Use trademark casing.

## Conformance Units

Table 34 defines the corresponding *ConformanceUnits* for the OPC UA Information Model for <title>.

Table 34 – Conformance Units for <Title>

| **Category** | **Title** | **Description** |
| --- | --- | --- |
| {#obejctTypes}Server | <short name> {browsename} | The {browsename} node is available in the AddressSpace. Supports nodes that conform to the (subtypes of) {browsename}.This node has to include all mandatory components of the {browsename} and may include the optional components. The instance(s) of the (subtypes of) {browsename} is/are available in the AddressSpace [Location] in Model. {/obejctTypes} |
| Server | <short name> <Function2> | Supports the …... |
| Server | <short name> <Function3> | Supports the …... |
| Client | <short name> Client <Function1> | The client can make use of the …... |

Typically, *Client* *ConformanceUnits* describe the use of a function, but they do not need to match 1 to 1 with *Server* *ConformanceUnits*. They might also reference to other categories defined in Part 7 (Pub, Sub, GDS…). For larger companion specifications, there might be separate tables for *Client* *ConformanceUnits*, *Server* *ConformanceUnits*, etc.

## Profiles

### Profile list

Table 35 lists all Profiles defined in this document and defines their URIs.

Table 35 – Profile URIs for <Title>

| **Profile** | **URI** |
| --- | --- |
| <short name> <Prf1name> Server Profile | [http://opcfoundation.org/UA-Profile/<short](http://opcfoundation.org/UA-Profile/%3cshort) name>/Server/<Prf1name> |
| <short name> <Prf2name> Server Facet | [http://opcfoundation.org/UA-Profile/<short](http://opcfoundation.org/UA-Profile/%3cshort) name>/Server/<Prf2name> |
| <short name> <Prf3name> Client Facet | [http://opcfoundation.org/UA-Profile/<short](http://opcfoundation.org/UA-Profile/%3cshort) name>/Client/<Prf3name> |

### Server Facets

#### Overview

The following sections specify the *Facets* available for *Servers* that implement the <title> companion specification. Each section defines and describes a *Facet* or *Profile*.

A specification can define multiple *Facets* if not all features are to be implemented by all *Servers* and *Clients*. The name of the *Facet* shall give a hint of the subset. An overall description shall be provided that explains the subset and it potential use.

#### <short name> <Prf1name> Server Profile

Table 36 defines a *Profile* that describes the …….

Table 36 - <short name> <Prf1name> Server Profile

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | 0:Core 2017 Server Facet http://opcfoundation.org/UA-Profile/Server/Core2017Facet |  |
| Profile | 0:UA-TCP UA-SC UA Binary http://opcfoundation.org/UA-Profile/Transport/uatcp-uasc-uabinary |  |
| Profile | 0:Data Access Server Facet http://opcfoundation.org/UA-Profile/Server/DataAccess |  |
| Profile | 2:BaseDevice\_Server\_Facet |  |
| Profile | <short name> <Prf2name> Server Facet |  |
| Subscription Services | 0:Subscription Durable | M |
| <short name> | <short name> <Function1> | M |

This table lists a *Profile*, in which it includes other base *Profiles* that would be needed to make a working *Server*. It also includes other *Facets* defined in this companion specification and *ConformanceUnits* defined in this companion standard.

A namespace shall be included if Profiles or ConformanceUnits of another specification are included. In the example above '0' represents the OPC UA core specification and '2' UA for Devices (see Table 41).

The column with title "Mandatory / Optional" defines whether support of included *ConformanceUnits* is optional or mandatory. Optional means that an application has the option to not support the *ConformanceUnit*. However, if supported, the application shall pass all tests associated with the *ConformanceUnit*.

The "Group" for all ConformanceUnits defined in this document shall be the <short name>. If ConformanceUnits of OPC 10000-7 are referenced, the corresponding Groups shall be used. See the example with group "Subscription Services".

#### <short name><Prf2name> Server Facet

Table 37 defines a *Facet* that describes the …….

Table 37 - <short name> <Prf2name> Server Facet

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| <short name> | <short name> <Function1> | M |
| <short name> | <short name> <Function3> | O |

This table lists a *Facet*, in that it must be include with other *Facets* to create a running application. It defines the *ConformanceUnits* and other facets that are required

### Client Facets

#### Overview

The following tables specify the *Facets* available for *Clients* that implement the <title> companion specification.

A specification can define multiple facets if not all features are to be implemented by all *Servers* and *Clients*. The name of the facet shall give a hint of the subset. An overall description shall be provided that explains the subset and it potential use.

#### <short name> < Prf3name> Client Facet

Table 38 defines a *Facet* that describes the base characteristics for all OPC UA *Clients* that make use of this companion specification. Additional *Profiles* will define support for various information models that are part of this document.

Table 38 - <short name> < Prf3name> Client Facet

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | 0:AddressSpace Lookup Client Facet http://opcfoundation.org/UA-Profile/Client/AddressSpaceLookup |  |
| Profile | 0:DataAccess Client Facet http://opcfoundation.org/UA-Profile/Client/DataAccess |  |
| Profile | 0:DataChange Subscriber Client Facet http://opcfoundation.org/UA-Profile/Client/DataChangeSubscriber |  |
| Session Services | 0:Session Client Detect Shutdown | M |
| <short name> | <short name> Client <Function1> | M |

This table lists a *Facet*, in that it must be include with other *Facets* to create a running application. It defines the *ConformanceUnits* and other facets that are required as an example it include other base Facets and a Base system *ConformanceUnit*

# Namespaces

## Namespace Metadata

Namespace Metadata are required for any companion standard that specifies an information model (e.g. *Objects* and *ObjectTypes*). The metadata provide standardized information about the elements of this namespace. This information is particularly important for aggregating *Servers*.

Typically, all Nodes of a companion specification are static and therefore the metadata shall describe them as static. This is done by setting all Numeric NodeIds to static (StaticNodeIdTypes). If you use different NodeIds (e.g. Strings), this needs to be adapted. If not all Nodes are static, it needs to be adapted as well. Static NodeIds mean, that the same Node is used in all servers, e.g. for TypeDefinitions or entry points like the “Root” Object of the base specification. Not static Nodes would be Nodes providing server-specific information (e.g. typically all the instances based on the TypeDefinitions of a companion specification) or other dynamic behaviour (e.g. a standardized Method that adds or removes something from a server).

Table 39 defines the namespace metadata for this document. The *Object* is used to provide version information for the namespace and an indication about static *Nodes*. Static *Nodes* are identical for all *Attributes* in all *Servers*, including the *Value Attribute*. See OPC 10000-5 for more details.

The information is provided as *Object* of type *NamespaceMetadataType*. This *Object* is a component of the *Namespaces* *Object* that is part of the *Server Object*. The *NamespaceMetadataType ObjectType* and its *Properties* are defined in OPC 10000-5.

The version information is also provided as part of the ModelTableEntry in the UANodeSet XML file. The UANodeSet XML schema is defined in OPC 10000-6.

Table 39 – NamespaceMetadata Object for this Document

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Value** | | |
| Browsename | [http://opcfoundation.org/UA/<short](http://opcfoundation.org/UA/%3cshort) name>/ | | |
| **Property** | | **DataType** | **Value** |
| NamespaceUri | | String | [http://opcfoundation.org/UA/<short](http://opcfoundation.org/UA/%3cshort) name> |
| NamespaceVersion | | String | X.YY |
| NamespacePublicationDate | | DateTime | YYYY-MM-DD |
| IsNamespaceSubset | | Boolean | False |
| StaticNodeIdTypes | | IdType [] | {Numeric} |
| StaticNumericNodeIdRange | | NumericRange [] | Null |
| StaticStringNodeIdPattern | | String | Null |

Note: The *IsNamespaceSubset* *Property* is set to False as the UaNodeSet XML file contains the complete Namespace. *Servers* only exposing a subset of the Namespace need to change the value to True.

## Handling of OPC UA Namespaces

Namespaces are used by OPC UA to create unique identifiers across different naming authorities. The *Attributes* *NodeId* and *Browsename* are identifiers. A *Node* in the UA *AddressSpace* is unambiguously identified using a *NodeId*. Unlike *NodeIds*, the *Browsename* cannot be used to unambiguously identify a *Node*. Different *Nodes* may have the same *Browsename*. They are used to build a browse path between two *Nodes* or to define a standard *Property*.

*Servers* may often choose to use the same namespace for the *NodeId* and the *Browsename*. However, if they want to provide a standard *Property*, its *Browsename* shall have the namespace of the standards body although the namespace of the *NodeId* reflects something else, for example the *EngineeringUnits* *Property*. All *NodeIds* of *Nodes* not defined in this document shall not use the standard namespaces.

Table 40 provides a list of mandatory and optional namespaces used in an <title> OPC UA *Server*.

Table 40 – Namespaces used in a <title> Server

| **NamespaceURI** | **Description** | **Use** |
| --- | --- | --- |
| http://opcfoundation.org/UA/ | Namespace for *NodeIds* and *Browsenames* defined in the OPC UA specification. This namespace shall have namespace index 0. | Mandatory |
| Local Server URI | Namespace for nodes defined in the local server. This namespace shall have namespace index 1. | Mandatory |
| http://opcfoundation.org/UA/DI/ | Namespace for *NodeIds* and *Browsenames* defined in OPC 10000-100. The namespace index is *Server* specific. | Mandatory |
| http://opcfoundation.org/UA/<title>/ | Namespace for *NodeIds* and *Browsenames* defined in this document. The namespace index is *Server* specific. | Mandatory |
| Vendor specific types | A *Server* may provide vendor-specific types like types derived from *ObjectTypes* defined in this document in a vendor-specific namespace. | Optional |
| Vendor specific instances | A *Server* provides vendor-specific instances of the standard types or vendor-specific instances of vendor-specific types in a vendor-specific namespace.  It is recommended to separate vendor specific types and vendor specific instances into two or more namespaces. | Mandatory |

Table 41 provides a list of namespaces and their indices used for *Browsenames* in this document. The default namespace of this document is not listed since all *Browsenames* without prefix use this default namespace.

Table 41 – Namespaces used in this document

| **NamespaceURI** | **Namespace Index** | **Example** |
| --- | --- | --- |
| http://opcfoundation.org/UA/ | 0 | 0:EngineeringUnits |
| http://opcfoundation.org/UA/DI/ | 2 | 2:DeviceRevision |
| http://opcfoundation.org/UA/Dictionary/IRDI/ | 3 | 3:0112/2///61987#xzx608 |

1. (normative)   
     
   <Title> Namespace and mappings
   1. Namespace and identifiers for <Title> Information Model

This appendix defines the numeric identifiers for all of the numeric *NodeIds* defined in this document. The identifiers are specified in a CSV file with the following syntax:

<SymbolName>, <Identifier>, <NodeClass>

Where the *SymbolName* is either the *Browsename* of a *Type Node* or the *BrowsePath* for an *Instance Node* that appears in the specification and the *Identifier* is the numeric value for the *NodeId*.

The *BrowsePath* for an *Instance Node* is constructed by appending the *Browsename* of the instance *Node* to the *Browsename* for the containing instance or type. An underscore character is used to separate each *Browsename* in the path. Let’s take for example, the *<type>* *ObjectType* *Node* which has the *<property> Property*. The **Name** for the *<property>* *InstanceDeclaration* within the *<type>* declaration is: *<type>\_<property>*.

A NamespaceURI follows the convention: [http://opcfoundation.org/UA/<short name>/](http://opcfoundation.org/UA/POWERLINK/).

<short name> is described in 14.

.

Note that NamespaceURIs are NOT live URLs. Text in the specification should not suggest that they are.

The *NamespaceUri* for all *NodeIds* defined here is [http://opcfoundation.org/UA/<short name>/](http://opcfoundation.org/UA/%3cshort%20name%3e/)

**File Locations**

The location of any version dependent files follow this convention:

[http://opcfoundation.org/UA/schemas/<short name>/<version>/<file name>](http://opcfoundation.org/UA/schemas/%3cshort%20name%3e/%3cversion%3e/%3cfile%20name%3e)

The <short name> is the same as specified in the NamespaceURI;

The <version> is a number with the form #.# or #.##;

The location of the version independent files are the same but with the <version> omitted.

e.g. [http://opcfoundation.org/UA/schemas/<short name>/<file name>](http://opcfoundation.org/UA/schemas/%3cshort%20name%3e/%3cfile%20name%3e)

**File Names**

**NodeIds**: Opc.Ua.<short name>.NodeIds.csv or <short name>.NodeIds.csv

**NodeSet**: Opc.Ua.<short name>.NodeSet.xml or <short name>.NodeSet.xml;

Any other files should have a prefix that provides context when the file is downloaded in a browser.

All published files must be added to GitHub <https://github.com/OPCFoundation/UA-Nodeset>

This can be done by creating a mantis issue in the “NodeSets, XSDs and Generated Code” project:

<https://opcfoundation-onlineapplications.org/mantis/main_page.php>

The files should be attached to the mantis issue.

If the NodeSet was generated with the Opc.Ua.ModelCompiler the design file should be attached as well.

The CSV released with this version of the specification can be found here:

[http://www.opcfoundation.org/UA/schemas/<short name>/1.0/NodeIds.csv](http://www.opcfoundation.org/UA/schemas/%3cshort%20name%3e/1.0/NodeIds.csv)

NOTE    The latest CSV that is compatible with this version of the specification can be found here:

[http://www.opcfoundation.org/UA/schemas/<short name>/NodeIds.csv](http://www.opcfoundation.org/UA/schemas/%3cshort%20name%3e/NodeIds.csv)

A NodeIds.csv file is not mandated but recommended.

It contains a flat list of NodeIds with unique names and can be used instead of a full NodeSet if only such NodeId constants for a programming environment are needed.

A computer processible version of the complete Information Model defined in this document is also provided. It follows the XML Information Model schema syntax defined in OPC 10000-6.

The Information Model Schema for this version of the document (including any revisions, amendments or errata) can be found here:

[http://www.opcfoundation.org/UA/schemas/<short name>/1.0/Opc.Ua.<short name>.NodeSet2.xml](http://www.opcfoundation.org/UA/schemas/%3cshort%20name%3e/1.0/Opc.Ua.%3cshort%20name%3e.NodeSet2.xml)

NOTE    The latest Information Model schema that is compatible with this version of the document can be found here:

[http://www.opcfoundation.org/UA/schemas/<short name>/Opc.Ua.<short name>.NodeSet2.xml](http://www.opcfoundation.org/UA/schemas/%3cshort%20name%3e/Opc.Ua.%3cshort%20name%3e.NodeSet2.xml)

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