OPC UA Information Modeling

Unified Object Model

OPC DA and HDA
Variable Services
OPC Commands
Method Services

OPC A&E
Event Services
OPC Subscriptions

OPC UA Object
Variables
Methods
Events
Object Classes and Instances

- Relationship
  - Instance
  - Subclassing
  - Data Type Reference
  - Other relationship such as "contained", "operated by", "controls", etc.

Nodes and References

- Everything in the UA Address Space is a Node
- UA defines a none extensible list of 8 Node Classes
- Each Node Class has a defined set of Attributes
- Nodes are connected by References
Modeling in Specifications

### Part 12 - Discovery
Base Concepts For Modeling
Entry Points Address Space OPC defined Types

### Part 13 - Aggregates

### OPC UA
- Modeling of Data

Vendor Specific Extensions
Specifications of Information Models of other Organizations
- DA
- AC
- EA
- Prog

OPC UA Base Services
OPC UA Data Model
OPC UA Information Model
Base Services
OPC UA Basic
DE, ISA, SBDC, ...
Node Classes

- Object
- Object type
- Variable
- Variable type
- Data Type
- Method
- Reference
- View

Object Type Node Class

- Types folder provides main entry point for the types
- **ObjectTypes**
  - Allow definition of custom types
  - Can be nested
- **ObjectTypes folder** organizes object types
Object Node Class

- Typical items in Address space
- Folders are used to organize the address space
- Root folder provides the main entry point into the address space
- The Boiler object and its contained objects represent the hardware system components

Variable Type Node Class

- VariableTypes folder organizes variable types
- VariableTypes can contain variables and properties
- A property is just a variable that can not contain additional variables (leaf)
Variable Node Class

- **Variables**
  - Are components of objects representing the data of objects
  - Can be complex and can have Properties
  - Can be typed (VariableType)

- **Properties are providing metadata for nodes**
  - Properties are always the leaf of a hierarchy

ReferenceType Node Class
Method Node Class

- Methods are components of objects
- Provide interface to execute an action
- Arguments of Methods are described with properties of the Method
- Arguments of Methods can be complex

DataType NodeClass and Complex Data

Type System with Type Dictionary
- Description of Data Types
- A Data Type can have Different Encodings
VariableType vs. DataType

**VariableType**
- Defines a structure describing the Properties or Variables an instance of a Variable would provide

**DataType**
- Defines the Data Type of the Value Attribute of a Variable
- Can be scalar (e.g. Float) or complex type (e.g. Structure)
- Data Type ID of a Variable is the NodeId of the DataType Nodes

Sub Typing

Standard Faceplate works with components of Base Type

Derived Type adds Components
- Specialized Faceplate can work with additional information
UA Node Example

Type Definitions: Summary

• General to all Types in UA
  – Types are represented in the Address Space
  – Type Hierarchies
• Object Types
  – Instance Declarations with Modeling Rules
  – Event Types
• Variable Types
  – Data Variables (Typed)
  – Properties (identified by BrowseName)
• Reference Types
  – Hierarchical References – Nonhierarchical References
  – Used in Browsing and Querying as Filter
• Data Types
  – Important for Value Attribute of Variable
    (all other Attributes have fixed, build-in Data Types)
  – Extensible -> complex data build-in UA
Questions?

• Paul Hunkar
• Paul.Hunkar@DSInteroperability.com