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Forewords

OPC UA is a machine to machine communication technology to transmit characteristics of products (e.g. manufacturer name, device type or components) and process data (e.g. temperatures, pressures or feed rates). To enable vendor unspecific interoperability the description of product characteristics and process data has to be standardized utilizing technical specifications, the OPC UA companion specifications.

This specification was created by a joint working group of the OPC Foundation and VDMA Mining, AMT Institute of RWTH Aachen University and IREDES

OPC Foundation

OPC is the interoperability standard for the secure and reliable exchange of data and information in the industrial automation space and in other industries. It is platform independent and ensures the seamless flow of information among devices from multiple vendors. The OPC Foundation is responsible for the development and maintenance of this standard.

OPC UA is a platform independent service-oriented architecture that integrates all the functionality of the individual OPC Classic specifications into one extensible framework. This multi-layered approach accomplishes the original design specification goals of:

* Platform independence: from an embedded microcontroller to cloud-based infrastructure
* Secure: encryption, authentication, authorization and auditing
* Extensible: ability to add new features including transports without affecting existing applications
* Comprehensive information modelling capabilities: for defining any model from simple to complex

# Scope

This document provides a comprehensive overview of the model information structure of the International Rock Excavation Data Exchange Standard (IREDES) standard which in this case uses OPC UA as carrier and is therefore part of the companion specification mining. Version 1.0 of this document covers most of the IREDES type definitions, most of the IREDES ApplicationBaseClasses as well as the LHD truck equipment profile.

# Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments and errata) applies.

OPC 10000-1, *OPC Unified Architecture - Part 1: Overview and Concepts*

<http://www.opcfoundation.org/documents/10000-1/>

OPC 10000-2, *OPC Unified Architecture - Part 2: Security Model*

<http://www.opcfoundation.org/documents/10000-2/>

OPC 10000-3, *OPC Unified Architecture - Part 3: Address Space Model*

<http://www.opcfoundation.org/documents/10000-3/>

OPC 10000-5, *OPC Unified Architecture - Part 5: Information Model*

<http://www.opcfoundation.org/documents/10000-5/>

OPC 10000-6, *OPC Unified Architecture - Part 6: Mappings*

<http://www.opcfoundation.org/documents/10000-6/>

OPC 10000-7, *OPC Unified Architecture - Part 7: Profiles*

<http://www.opcfoundation.org/documents/10000-7/>

OPC 40560, *OPC Unified Architecture for Mining - General*

<http://opcfoundation.org/UA/Mining/General/>

International Rock Excavation Data Exchange Standard (IREDES) – General Definitions and Standard Architecture

<https://iredes.org>

International Rock Excavation Data Exchange Standard (IREDES) – IREDES Drill Rigs Profile Documentation version 1.3 IREDES Initiative 20Terms, definitions and conventions

# Terms, definitions and conventions

## Overview

It is assumed that basic concepts of OPC UA information modelling from OPC 10000-1, OPC 10000-2, OPC 10000-3, OPC 10000-5, OPC 10000-6 and OPC 10000-7 are understood in this document. This document will use these concepts to describe the OPC 40568-1 Information Model. For the purposes of this document, the terms and definitions given in the documents referenced in the OPC Core documents and OPC 40160 apply.

## Conventions used in this document

The conventions and definitions described in the OPC Core documents and OPC 40160 apply.

# General Information to 40568-1: IREDES

## introduction to the OPC UA Companion Specification Mining

For general information on the OPC UA Companion Specification Mining and OPC UA in general, please refer to OPC 40160.

As part of the External Standards section of the OPC UA Companion Specification Mining, the IREDES standard uses OPC UA as carrier.

## Introduction to the IREDES standard

IREDES is a flexible standard architecture for convenient worksite information exchange in the mining industry. It is used for information exchange between mainly mobile equipment and devices on one side and central computer systems on the other side. Also, Machine-to-Machine (“M2M”) communication is covered to a certain extend. Excluded from the standard is any direct communication related to machine remote control as this is inside the product responsibility of the respective suppliers. The standard covers definitions of how to exchange information and what kind of content is exchanged. The flexibility of the standard is achieved by separation between the purpose of information exchange (Application Profile) and the dedicated type equipment using and extending the generic Application Profile information by specific entries for dedicated types of equipment (Equipment Profile).

This principle leads to a matrix structure of the information exchange interface:

1. Application Purpose in the Application Profile (vertical structure)
2. Equipment specific purposes in the respective Equipment Profile (horizontal structure).

The structure of the IREDES standard is shown in Figure 1. The structure is mirrored as far as possible in the IREDES OPC UA information model.

Ein Bild, das Tisch enthält.

Automatisch generierte Beschreibung

Figure 1 – Structure of the IREDES standard

# Information Model Overview

The following Figure 2 contains an overview about all ObjectTypes specified in this document and their corresponding relationships.

Ein Bild, das Screenshot, Design enthält.

Automatisch generierte Beschreibung

Figure 2 – Information Model Overview

# Data Types

This section contains the definitions of data types used in the IREDES information model.

## IRLengthDataType

This structure contains data describing lengths. It is formally defined in Table 1

Table 1 – IRLengthDataType Structure

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| IRLengthDataType | structure | Subtype of structure defined in OPC 10000-3. | |
| Value | 0:Double | Data Type for length specification. |
| Unit | 0:EUInformation | Datatype for engineering unit description. Valid values: mm, cm, m, ft. |

Note: In <http://www.opcfoundation.org/UA/units/un/cefact> the relevant unitIds are:

UnitId[mm] = 5066068  
UnitId[cm] = 4410708  
UnitId[m]=5067858  
UnitId[ft]= 4607828

Its representation in the *AddressSpace* is defined in Table 2.

Table 2 – IRLengthDataType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | IRLengthDataType | | | | |
| IsAbstract | | False | | | | |
| **References** | **Node Class** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the Structure defined in OPC 10000-3 | | | | | | |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## JobAssignmentTimeDataType

The JobAssignmentTimeDataType union is used for JobAssignment times. It is formally described in Table 3.

Table 3 – JobAssignmentTimeDatatype Union

|  |  |  |
| --- | --- | --- |
| **Name** | **Type** | **Description** |
| JobAssignmentTimeDataType | union |  |
| ExpectedFinishTime | 0:DateTime | Time Machine is expected to finish the job. |
| ExpectedDuration | 0:Duration | Time the job is going to take to finish. |

Its representation in the *AddressSpace* is defined in Table 4.

Table 4 – JobAssignmentTimeDataType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attributes** | | **Value** | | | | |
| BrowseName | | JobAssignmentTimeDataType | | | | |
| IsAbstract | | False | | | | |
| **References** | **Node Class** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of 0:Union defined in OPC 10000-5 | | | | | | |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## Mapping for simple IREDES Data Types

Simple IREDES data types will be mapped as described in Table 5.

Table 5 – Mapping for simple IREDES data types

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Notation** | **Data-Type** | **Value Rank** | **ArrayDimensions** | **Description** |
| IRtextShort | String | -1 | NULL | Text data type element for short text information provided in the IREDES standard. Limited to 24 characters in its original. |
| IRtext | String | -1 | NULL | Text data type for comments or text information provided in the IREDES standard. Originally limited to 64 characters. |
| IRtextLong | String | -1 | NULL | Text data type element for long text information. Limited to 256 characters in the IREDES standard. |
| IRangle | Float | -1 | NULL | Data Type for angle specification. This data type is limited to values from -360.000 to +360.000. |
| IRVersion | String | -1 | NULL | REDES Version Numbering. |
| AnyURI | String | -1 | NULL | XMLSimpleType |

## IRtextShort

This DataType specifies a String for short text information provided in the IREDES standard. It is originally limited to 24 characters. Its representation in the AddressSpace is defined in Table 6.

Table 6 – IRtextShort Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRtextShort | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the String DataType defined in OPC 10000-5 | | | | | |

|  |
| --- |
| **Conformance Units** |
| IREDES Component |

### IRtext

This DataType specifies a String for comments or text information provided in the IREDES standard. It is originally limited to 64 characters. Its representation in the AddressSpace is defined in Table 7.

Table 7 – IRtext Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRtext | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the String DataType defined in OPC 10000-5 | | | | | |
| **Conformance Units** | | | | | |
| IREDES Component | | | | | |

### IRtextLong

This DataType specifies a String for long text information. It is limited to 256 characters in the IREDES standard. Its representation in the AddressSpace is defined in Table 8.

Table 8 – IRtextLong Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRtextLong | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the String DataType defined in OPC 10000-5 | | | | | |
| **Conformance Units** | | | | | |
| IREDES Component | | | | | |

### IRangle

This DataType specifies a Float for angle specification. It is limited to values from -360.000 to +360.000. Its representation in the AddressSpace is defined in Table 9.

Table 9 – IRangle Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRangle | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the Float DataType defined in OPC 10000-5 | | | | | |
| **Conformance Units** | | | | | |
| IREDES Component | | | | | |

### IRVersion

This DataType specifies a String for for IREDES Version Numbering. Its representation in the AddressSpace is defined in Table 10.

Table 10 – IRVersion Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRVersion | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the String DataType defined in OPC 10000-5 | | | | | |

|  |
| --- |
| **Conformance Units** |
| IREDES Component |

### AnyURI

This DataType specifies a String as a XMLSimpleType. Its representation in the AddressSpace is defined in Table 11.

Table – AnyURI Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | AnyURI | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the String DataType defined in OPC 10000-5 | | | | | |
| **Conformance Units** | | | | | |
| IREDES Component | | | | | |

## DispFlag

The enumeration DispFlag is used to determine when to display messages to the machine operator. It is formally defined in Table 12.

Table 12 – DispFlag Items

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Description** |
| MachStart | 0 | To be displayed when the machine is started. Machine start is defined as switching on the main power supply or power generation. |
| FileLoad | 1 | To be displayed as soon as the file is loaded (activated) in the machine’s automation system (applicable especially to plan files originating from the mine!). |

Its representation in the *AddressSpace* is defined in Table 13.

Table 13 – DispFlag Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | DispFlag | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the 0:Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumValues | 0:EnumValueType[] | 0:PropertyType |  |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## Answer

The following enumeration Answer is used to classify answers to work orders. It is formally defined in Table 14

Table 14 – Answer Items

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Description** |
| Accepted | 0 | Order is accepted. |
| Delayed | 1 | Order can only be executed with delay. |
| AcceptedWithCondition | 2 | Order is accepted under a condition. |
| Denied | 3 | Orders denied. |

Its representation in the *AddressSpace* is defined in Table 13.

Table 15 – Answer Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | Answer | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the 0:Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumValues | 0:EnumValueType[] | 0:PropertyType |  |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## LTPPMptFromType

The enumeration LTPPMptFromType is used to classify mission start points for LHDs. It is formally described in Table 16.

Table 16 – LTPPMptFromType Items

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Description** |
| LoadPt | 0 | Load point |
| DumpPt | 1 | Dump point |
| Parking | 2 | Parking |
| Workshop | 3 | Workshop |
| Others | 4 | Others |

Its representation in the *AddressSpace* is defined in Table 17.

Table 17 – LTPPMptFromType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | LTPPMptFromType | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the 0:Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumValues | 0:EnumValueType[] | 0:PropertyType |  |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## LTPPMptToType

The enumeration LTPPMptToType is used to classify mission end points for LHDs. It is formally described in Table 18.

Table 18 – LTPPMptToType Items

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Description** |
| LoadPt | 0 | Load point |
| DumpPt | 1 | Dump point |
| Parking | 2 | Parking |
| Boulder | 3 | Boulder |
| Workshop | 4 | Workshop |
| Others | 5 | Others |

Its representation in the *AddressSpace* is defined in Table 17.

Table 19 – LTPPMptToType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | LTPPMptToType | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the 0:Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumValues | 0:EnumValueType[] | 0:PropertyType |  |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

## LTPPMaction

The LTPPMaction enumeration is used classify actions carried out at the destination point specified in LTPPMptToN (Table 70). It is formally described in Table 20.

Table 20 – LTPPMaction Items

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Description** |
| Load | 0 | Load |
| Dump | 1 | Dump |
| Parking | 2 | Parking |
| Workshop | 3 | Workshop |
| Other | 4 | Other |

Its representation in the *AddressSpace* is defined in Table 17.

Table 21 – LTPPMaction Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | LTPPMaction | | | | |
| IsAbstract | | False | | | | |
| **References** | **NodeClass** | | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of the 0:Enumeration type defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:EnumValues | 0:EnumValueType[] | 0:PropertyType |  |
| **Conformance Units** | | | | | | |
| IREDES Component | | | | | | |

# OPC UA ObjectTypes

## ProjectInfoType ObjectType

### Overview

The ProjectInfoType is an ObjectType which contains additional project information. It is based on the ObjectType and intended to be used as AddIn. Its formal definition can be found in Table 22.

### ObjectType Definition

Table 22 – ProjectInfoType ObjectType

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | ProjectInfoType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | Signature | String | 0:BaseDataVariableType | O,RW |
| 0:HasComponent | Variable | Comment | String | 0:BaseDataVariableType | O,RW |
| **Conformance Units** | | | | | |
| IREDES ProjectInfoType | | | | | |

The component Variables of the ProjectInfoType have additional Attributes defined in Table 23.

Table 23 – ProjectInfoType Attribute values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | ProjectInfo | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 24.

Table 24 – ProjectInfoType Attribute values for child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| Signature | Project signature. |
| Comment | Comments concerning the project can be added here. |

## EquipmentInfoType ObjectType

### Overview

The EquipmentInfoType is an ObjectType which contains equipment specific information concerning the main aggregate the information comes from. ATTENTION: the information shall not be required to interpret the standard conformant data set! It’s just provided to identify a machine. The ObjectType is based on the BaseObjectType and is intended to be used as AddIn. Its definition is given in Table 25.

### ObjectType Definition

Table 25 – EquipmentInfoType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | EquipmentInfoType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-5 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasProperty | Variable | EqpManufact | String | 0:PropertyType | M,RO |
| 0:HasProperty | Variable | EqpType | String | 0:PropertyType | M,RO |
| 0:HasProperty | Variable | EqpModel | String | 0:PropertyType | O,RW |
| 0: HasProperty | Variable | EqpSerNo | String | 0:PropertyType | O,RW |
| 0:HasComponent | Variable | EqpSysVer | String | 0:BaseDataVariableType | O,RW |
| 0:HasComponent | Variable | EqpInfo | String | 0:BaseDataVariableType | O,RW |
| 0:HasComponent | Variable | EqpName | String | 0:BaseDataVariableType | O,RW |
| **Conformance Units** | | | | | |
| IREDES EquipmentInfoType | | | | | |

The component Variables of the EquipmentInfoType have additional Attributes defined inTable 26.

Table 26 – EquipmentInfoType Attribute values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | EquipmentInfo | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 27.

Table 27 – EquipmentInfoType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| EqpManufact | Name of the manufacturer. |
| EqpType | Manufacturer internal type name of the machine. |
| EqpModel | Equipment model describing the model in the specified EqpType. To be stated if required for unequivocal machine type identification. |
| EqpSerNo | Serial number of the machine. |
| EqpSysVer | Version Info Automation System / Software |
| EqpInfo | Other equipment specific information. Free tex. |
| EqpName | Used for designation of the machine |

## GenHeadType ObjectType

### Overview

The GenHeadType ObjectType contains the IREDES General header. It is based on the BaseObjectType and intended to be used as AddIn. It is formally defined in Table 28.

### ObjectType definition

Table 28 – GenHeadType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | GenHeadType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasProperty | Variable | FileCreateDate | DateTime | 0:PropertyType | M,RW |
| 0:HasProperty | Variable | IRVersion | String | 0:PropertyType | M,RW |
| 0:HasProperty | Variable | DownCompat | String | 0:PropertyType | M,RW |
| 0:HasAddIn | Object | ProjectInfo |  | ProjectInfoType | O |
| 0:HasAddIn | Object | EquipmentInfo |  | EquipmentInfoType | O |
| **Conformance Units** | | | | | |
| IREDES GenHeadType | | | | | |

The component Variables of the GenHeadType have additional Attributes defined in Table 29.

Table 29 – GenHeadType Attribute values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | GenHead | The default BrowseName for instances of this type. |

### ObjectType Desciption

The description can be found in Table 30.

Table 30 – GenHeadType ObjectType Description

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| FileCreateDate | Date of file creation. This is the date/time stamp for initializatioin of the Data Set. |
| IRVersion | Version of the IREDES main components of the standard. this version number changes any time IREDES top level schemas are modified. Please note to state downward compatibility in the separate Attribute. Type definition see below. Fixed 2.0 |
| DownCompat | Downward compatibility of the profile version stated in “version” can be guaranteed down to the version number stated in this attribute. Fixed 2.0 |
| ProjectInfo | Project specific information. Type definition see below. |
| EquipmentInfo | Equipment specific information concerning the main aggregate the information comes from. ATTENTION: This information shall not be required to interpret a standard conformant data set. |

## DisplayToOperatorType ObjectType

### Overview

The DisplayToOperatorType ObjectType is used to display messages to the operator of a machine. It is based on the BaseObjectType and is intended to be used as AddIn. Its formal definition is given in Table 31.

### ObjectType definition

Table 31 – DisplayToOperatorType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | DisplayToOperatorType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | DispFlag | DispFlag | 0:BaseDataVariableType | O,RW |
| 0:HasComponent | Variable | AckFlag | String | 0:BaseDataVariableType | O,RW |
| 0:HasComponent | Variable | DispText | String | 0:BaseDataVariableType | O,RW |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES DisplayToOperatorType | | | | | |

The component Variables of the DisplayToOperatorType have additional Attributes defined in Table 32.

Table 32 – DisplayToOperatorType Attribute values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | DisplayToOperator | The default BrowseName for instances of this type. |

### ObjectType description

The description can be found in Table 33.

Table 33 – DisplayToOperatorType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| DispFlag | States under which circumstances the line (message) has to be displayed to the operator |
| AckFlag | Acknowledgement by the operator that he has read the message. (Will be transferred back as soon as the SiteHead is returned to the mine’s computer system with the next protocol exchange. Contains the name of the operator (user name in the Automation system) or simply ACK if automation system does not work with user logins. |
| DispText | Text to be displayed. |

## IROptionType ObjectType

### Overview

The IROptionType is based on the BaseObjectType and is intended to be used as AddIn. Its purpose is to allow individual IREDES standard extensions. These extensions will not be processed. The formal definition is given in Table 34.

### ObjectType definition

Table 34 – IROptionType definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IROptionType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | OptionSchema | String | 0:BaseDataVariableType | O, RW |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES IROptionType | | | | | |

The component Variables of the IROptionType have additional Attributes defined in Table 35.

Table 35 – IROptionType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | IROption | The default BrowseName for instances of this type. |

### ObjectType description

The description can be found in Table 36.

Table 36 – IROptionType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| OptionSchema | URI for the schema that will extend the IREDES standard. This schema won’t be processed. |

## SiteHeadType ObjectType

### Overview

The SiteHeadType is based on the BaseObjectType and is intended to be used as AddIn. It represents an optional site header. Its formal definition is given in Table 37.

### ObjectType definition

Table 37 – SiteHeadType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | SiteHeadType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | DisplayToOperator |  | DisplayToOperatorType | M |
| 0:HasAddIn | Object | SiteOption |  | IROptionType | M |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES SiteHeadType | | | | | |

The component Variables of the SiteHeadType have additional Attributes defined in Table 38.

Table 38 – SiteHeadType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | SiteHead | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 39.

Table 39 – SiteHeadType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| DisplayToOperator | Object used to display messages to the operator of a machine. |
| SiteOption | Object that holds/references information that will not be processed. |

## GenTrailerType ObjectType

### Overview

The GenTrailerType is based on the BaseObjectType and is intended to be used as AddIn. It contains a CRC 32 checksum which is calculated over the entire IREDES file. This is used for data integrity. The formal definition of the ObjectType is given in Table 40.

### ObjectType definition

Table 40 – GenTrailerType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | GenTrailerType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasProperty | Variable | FileCloseDate | DateTime | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | ChkSum | ByteString | 0:PropertyType | M, RW |
| **Conformance Units** | | | | | |
| IREDES GenTrailerType | | | | | |

The component Variables of the GenTrailerType have additional Attributes defined in Table 41.

Table 41 – GenTrailerType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | GenTrailer | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 42.

Table 42 – GenTrailerType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| FileCloseDate | Date the file was created |
| ChkSum | CRC 32 checksum |

## IREDESType ObjectType

### Overview

The IREDESType is part of a complete IREDES data set. It is intended to be used as AddIn and based on the BaseObjectType. Its formal definition is given in Table 43.

### ObjectType definition

Table 43 – IREDESType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IREDESType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | GenHead |  | GenHeadType | M |
| 0:HasAddIn | Object | SiteHead |  | SiteHeadType | O |
| 0:HasProperty | Variable | IRVersion | String | 0:PropertyType | M, RW |
| HasProperty | Variable | IRDownwCompat | String | 0:PropertyType | M, RW |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES IREDESType | | | | | |

The component Variables of the IREDESType have additional Attributes defined in Table 44.

Table 44 – IREDESType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | IREDES | The default BrowseName for instances of this type. |

### ObjectType description

The description can be found in Table 45.

Table 45 – IREDESType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| GenHead | IREDES general header. |
| SiteHead | Optional site header. |
| IRVersion | IREDES Base version needed to process this scheme. |
| IRDownwCompat | Earliest version the IREDES Base system version stated in IRVersion is downward compatible to. Since this version, only extensions have been made but no changes affecting compatibility issues (data type changes etc). |

## OpPerfLogType Object Type

### Overview

The OpPerfLogType ObjectType is based on the BaseObjectType and is intended to be used as AddIn. Its purpose is to accumulate the time of each operation mode during the reporting period. Its formal definition is given in Table 46.

### OpPerfLogType Object Type Definition

Table 46 – OpPerfLogType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | OpPerfLogType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | Mworking | Duration | 0:BaseDataVariableType | M, RW |
| 0:HasComponent | Variable | WaitProcess | Duration | 0:BaseDataVariableType | M, RW |
| 0:HasComponent | Variable | WaitOperator | Duration | 0:BaseDataVariableType | M, RW |
| 0:HasComponent | Variable | WaitRepair | Duration | 0:BaseDataVariableType | M, RW |
| 0:HasComponent | Variable | WaitSamples | Duration | 0:BaseDataVariableType | M, RW |
| 0:HasComponent | Variable | TurnedOff | Duration | 0:BaseDataVariableType | M, RW |
| **Conformance Units** | | | | | |
| IREDES OpPerfLogType | | | | | |

The component Variables of the OpPerfLogType have additional Attributes defined in Table 47.

Table 47 – OpPerfLogType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | OpPerfLog | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 48.

Table 48 – OpPerfLogType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| Mworking | Machine working. |
| WaitProcess | Machine waiting for other partners in the process or for process reasons not caused by the machine itself. This may be an (autonomous) machine waiting for access to a shared tramming zone or waiting for access to a dump shaft, a truck to become available etc. See “IREDES Drill Rig profile description” document. |
| WaitOperator | Time the machine waits for operator assistance during the reporting period. See “IREDES Drill Rig profile description” document. |
| WaitRepair | Waiting time for repair until the repair is finished and the machine manually is switched on again. See “IREDES Drill Rig profile description” document. |
| WaitSamples | Waiting time for external supplies like electric power, network connection for remote control (if not in local operation mode), water, material etc. See “IREDES Drill Rig profile description” document. |
| TurnedOff | Machine intentionally put in “OFF” state. This state is only counted if the machine is intentionally deactivated by an operator. Observe that a “switch off” while the machine is in “Wait Repair” mode will be counted as “wait repair” until the machine is switched on again. |

## IRpPerfGenType ObjectType

### Overview

The IRpPerfGenType ObjectType is a generic type used report production performance. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 49.

### ObjectType Definition

Table 49 – IRpPerfGenType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRpPerfGenType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IREDES |  | IREDESType | M |
| 0:HasProperty | Variable | ReportId | String | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | StartLogTime | DateTime | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | EndLogTine | DateTime | 0:PropertyType | M, RW |
| 0:HasComponent | Variable | Comment | String | 0:BaseData  VariableType | O, RW |
| 0:HasAddIn | Object | OpPerfLog |  | OpPerfLogType | O |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES IRpPerfGenType | | | | | |

The component Variables of the IRpPerfGenType have additional Attributes defined inTable 50.

Table 50 – IRpPerfGenType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | IRpPerfGen | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 51.

Table 51 – IRpPerfGenType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IREDES | Basic IREDES data type. Part of every complete IREDES data set. |
| ReportId | Report id code, to uniquely identify this log report. |
| StartLogTime | Start of the reporting period. Date and time when the first entry to this xml-set was made. |
| EndLogTine | End of the reporting period. Date and time when the last entry to this xml-set was made. |
| Comment | Project information concerning this log. |
| OpPerfLog | Object Type which accumulates the time of each operation mode during the reporting period. |

## IRplanGenType ObjectType

### Overview

The IRplanGenType ObjectType is based on the BaseObjectType and intended to be used as AddIn. Its purpose is to provide a generic datatype for production planning. Its formal definition can be found inTable 52.

### ObjectType Definition

Table 52 – IRplanGenType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRplanGenType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **Browse**  **Name** | **DataType** | **TypeDefinition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IREDES |  | IREDESType | M |
| 0:HasProperty | Variable | PlanName | String | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | PlanId | String | 0:PropertyType | M, RW |
| 0:HasComponent | Variable | Comment | String [8] | 0:BaseDataVariableType | O, RW |
| 0:HasComponent | Variable | Project | String | 0:BaseDataVariableType | O, RW |
| 0:HasComponent | Variable | WorkOrder | String | 0:BaseDataVariableType | O, RW |
| **Conformance Units** | | | | | |
| IREDES IRplanGenType | | | | | |

The component Variables of the IRplanGenType have additional Attributes defined in Table 53.

Table 53 – IRplanGenType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | IRplanGen | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 54.

Table 54 – IRplanGenType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IREDES | Basic IREDES data type. Part of every complete IREDES data set. |
| PlanId | IREDES internal production plan ID used for reference e.g. by Production Quality data sets basing on a particular production plan. |
| PlanName | Plan logical name to identify this specific plan to the human user. Useful to help the operator of a machine to logical identify a specific plan. |
| Comment | Comments to the plan for example type of plan, purpose, tools to use. |
| Project | Project id code. To identify the target project for this plan. |
| WorkOrder | Work order id code. To identify the work order associated with this plan. |

## IRStatusGenType

### Overview

The IRStatusGenType is based on the BaseObjectType and intended to be used as AddIn. The IRStatusGenType is a generic datatype for status reporting. Its formal definition can be found in Table 55.

### ObjectType Definition

Table 55 – IRStatusGenType ObjectType Definition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Attribute** | | **Value** | | | | |
| BrowseName | | IRStatusGenType | | | | |
| IsAbstract | | False | | | | |
| **References** | **Node Class** | | **BrowseName** | **DataType** | **Type-Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-5 | | | | | | |
| 0:HasProperty | Variable | | 0:DefaultInstanceBrowseName | QualifiedName | 0: PropertyType |  |
| 0:HasAddIn | Object | | IREDES |  | IREDESType | M |
| 0:HasProperty | Variable | | ReportId | String | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | | StartLogTime | DateTime | 0:PropertyType | M, RW |
| 0:HasProperty | Variable | | EndLogTime | DateTime | 0:PropertyType | M, RW |
| 0:HasComponent | Variable | | Comment | String | 0:BaseDataVariableType | O, RW |
| 0:HasComponent | Variable | | OperatorId | String | 0:BaseDataVariableType | O, RW |
| **Conformance Units** | | | | | | |
| IREDES IRStatusGenType | | | | | | |

The component Variables of the IRStatusGenType have additional Attributes defined in Table 56.

Table 56 – IRStatusGenType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | IRStatusGen | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 57.

Table 57 – IRStatusGenType Attribute values for child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IREDES | Basic IREDES data type. Part of every complete IREDES data set. |
| ReportId | Report id code, to uniquely identify this log report. |
| StartLogTime | Start of the reporting period. Date and time when the first entry to this xml-set was made. |
| EndLogTime | End of the reporting period. Date and time when the last entry to this xml-set was made. |
| Comment | Project information concerning this log. |
| OperatorId | Identify the operator of the machine for reference. |

## IRLTMMonType

### Overview

The IRLTMMonType ObjectType is based on the BaseObjectType and is intended to be used as AddIn. The IRLTMMonType is used for LHD machine monitoring reporting. Its formal definition can be found in Table 58.

### ObjectType Definition

Table 58 – IRLTMMonType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRLTMMonType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IREDES |  | IREDESType | M |
| 0:HasAddIn | Object | GenTrailer |  | GenTrailerType | M |
| 0:HasProperty | Variable | LTMMonVersion | String | 0:PropertyType | M |
| 0:HasProperty | Variable | LTMMonDownwCompat | String | 0:PropertyType | M |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES IRLTMMonType | | | | | |

The component Variables of the IRLTMMonType have additional Attributes defined in Table 59.

Table 59 – IRLTMMonType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | IRLTMMon | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 60.

Table 60 – IRLTMMonType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IREDES | Basic IREDES data type. Part of every complete IREDES data set. |
| GenTrailer | Datatype that is used to guarantee the integrity of the data set. |
| LTMMonVersion | Fixed V 1.0 |
| LTMMonDownwCompat | Fixed V 1.0 |

## IRLTPlanType ObjectType

### Overview

The IRLTPlanType is used for LHD production planning. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 61.

### ObjectType Definition

Table 61 – IRLTPlanType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRLTPlanType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **Data-Type** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IRplanGen |  | IRplanGenType | M |
| 0:HasAddIn | Object | GenTrailer |  | GenTrailerType | M |
| 0:HasProperty | Variable | LTPlanVersion | String | 0:PropertyType | M |
| 0:HasProperty | Variable | LTPlanDownwCompat | String | 0:PropertyType | M |
| **Conformance Units** | | | | | |
| IREDES IRLTPlanType | | | | | |

The component Variables of the IRLTPlanType have additional Attributes defined inTable 62.

Table 62 – IRLTPlanType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | IRLTPlan | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 63.

Table 63 – IRLTPlanType ObjectType Description

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IRplanGen | Generic datatype for production planning. |
| GenTrailer | Datatype that is used to ensure the integrity of the data set. |
| LTPlanVersion | Fixed V 1.0 |
| LTPlanDownwCompat | Fixed V 1.0 |

## LTPPwaitProcType

### Overview

The LTPPwaitProcType ObjectType is used to document process caused waiting time. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 64.

### ObjectType Definition

Table 64 – LTPPwaitProcType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | LTPPwaitProcType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **Data-Type** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | BlastDelay | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | CantDump | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | Traffic | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | NoRock | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | MineUtils | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | RoadMaint | DateTime | 0:BaseDataVariableType | O |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES LTPPwaitProcType | | | | | |

The component Variables of the LTPPwaitProcType have additional Attributes defined inTable 65.

Table 65 – LTPPwaitProcType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | LTPPwaitProc | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 66.

Table 66 – LTPPwaitProcType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| BlastDelay | Any Delay caused by blasting operations. |
| CantDump | Dump point blocked by another machine, boulders or dump shaft filled / truck missing. |
| Traffic | Traffic caused delays: roadway blocked by another machine / cars / other traffic. |
| NoRock | Wait for material to handle - No access to material to load. |
| MineUtils | Waiting for mine utilities. |
| RoadMaint | Waiting for roadway maintenance. |

## LTPPTimeRepType

### Overview

The LTPPTimeRepType is used for time reporting concerning a particular load/dump point pair. It is based on the BaseObjectType and intended to be used as an AddIn. Its formal definition can be found in Table 67.

### ObjectType Definition

Table 67 – LTPPTimeRepType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | LTPPTimeRepType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasProperty | Variable | LTPPStartTime | UtcTime | 0:PropertyType | M |
| 0:HasProperty | Variable | LTPPEndTime | UtcTime | 0:PropertyType | M |
| **Conformance Units** | | | | | |
| IREDES LTPPTimeRepType | | | | | |

The component Variables of the LTPPTimeRepType have additional Attributes defined inTable 68.

Table 68 – LTPPTimeRepType Attribute values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | LTPPTimeRep | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 69.

Table 69 – LTPPTimeRepType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| LTPPStartTime | Mission start time |
| LTPPEndTime | Mission end time |

## LTPPMissionType

### Overview

The LTPPMissionType is used to generate a report for each tramming order ("mission") run during the reporting period. One object per mission! One "mission" is defined as tramming from A to B. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 70.

### ObjectType Definition

Table 70 – LTPPMissionType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | LTPPMissionType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | LTPPMisSeq | UInt64 | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPMptFromN | String | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPMptFromID | String | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMptFromType | LTPPMptFromType | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMptToN | String | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPMptToID | String | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMptToType | LTPPMptToType | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMarea | String | 0:BaseDataVariableType | O |
| 0:HasProperty | Variable | LTPPMisstart | DateTime | 0:PropertyType | M |
| 0:HasProperty | Variable | LTPPMissEnd | DateTime | 0:PropertyType | M |
| 0:HasComponent | Variable | LTPPMwaitPoint | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMaction | LTPPMaction | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPMwaitgen | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMtimeAct | DateTime | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPMpayld | Float | 0:BaseDataVariableType | M |
| 0:HasProperty | Variable | LTPPMtramEnd | DateTime | 0:PropertyType | M |
| 0:HasComponent | Variable | LTPPMtramDist | Float | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPMopID | String | 0:BaseDataVariableType | O |
| **Conformance Units** | | | | | |
| IREDES LTPPMissionType | | | | | |

The component Variables of the LTPPMissionType have additional Attributes defined inTable 71.

Table 71 – LTPPMissionType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | LTPPMission | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 72.

Table 72 – LTPPMissionType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| LTPPMisSeq | Sequence number of the mission. Starting at 1 with the first mission in the reporting period. |
| LTPPMptFromN | Name of the point where the mission originated (tramming started). |
| LTPPMptFromID | Electronic (Tag) ID of the point where the mission originated (Tramming started). Electronic ID of the point stated in LTPPMptFromN. |
| LTPPMptFromType | Type of the point where the mission started. |
| LTPPMptToN | Name of the destination point, where the tramming finished and the mission ended. |
| LTPPMptToID | Electronic (tag) ID of the point where the mission ended (destination point). |
| LTPPMptToType | Type of the point where the mission ended. |
| LTPPMarea | ID for the mine area the machine is operating in. Usually both departure and destination points should be located in this area. |
| LTPPMisstart | Time tag when the mission started. |
| LTPPMissEnd | End time of the mission. Counting ends when the machine is ready to start the next mission, including all waiting before the next mission can be started. |
| LTPPMwaitPoint | Waiting time for destination point availability. |
| LTPPMaction | Action to be carried out at destination point specified in LTPPMptTo. |
| LTPPMwaitgen | Accumulated waiting time during the mission, excluding the time reported in LTPPMwaitPoint. |
| LTPPMtimeAct | Duration of the action carried out at the destination point in LTPPMaction. |
| LTPPMpayld | Tonnage of payload carried between start and destination points. |
| LTPPMtramEnd | Tramming end time: Time stamp when the tramming ended at destination point. |
| LTPPMtramDist | Tramming distance between start and destination point. Unit: km; Resolution: 0.0001km (10cm). |
| LTPPMopID | Operator ID |

## LTPPaccPtsType

### Overview

The LTPPaccPtsType is used to document data for each pair of load point / dump point. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 73.

### ObjectType Definition

Table 73 – LTPPaccPtsType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | LTPPaccPtsType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **DataType** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasProperty | Variable | LTPPLdrawPtN | String | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPLdrawPtID | String | 0:BaseDataVariableType | O |
| 0:HasProperty | Variable | LTPPLdumpPtN | String | 0:PropertyType | M |
| 0:HasComponent | Variable | LTPPLdumpPtID | String | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPLmass | Float | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPLcycl | UInt16 | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPLdist | Float | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPLopObserv | String | 0:BaseDataVariableType | O |
| 0:HasAddIn | Object | LTPPTimeRep |  | LTPPTimeRepType | O |
|  |  |  |  |  |  |
| **Conformance Units** | | | | | |
| IREDES LTPPaccPtsType | | | | | |

The component Variables of the LTPPaccPtsType have additional Attributes defined inTable 74**.**

Table 74 – LTPPaccPtsType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | LTPPaccPts | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 75.

Table 75 – LTPPaccPtsType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| LTPPLdrawPtN | Name of the draw (load point) accessed in the reported job. |
| LTPPLdrawPtID | Electronic (tag) ID of the draw (load point) in this combination (Name in 1.1.1.1). |
| LTPPLdumpPtN | Name of the dump point in this combination. |
| LTPPLdumpPtID | Electronic (tag) ID of the draw (load point) in this combination (Name in 1.1.1.1). |
| LTPPLmass | Mass transported between this point pair during reporting period in t. Min accuracy: 0.01t. |
| LTPPLcycl | Number of cycles travelled between this point pair during reporting period. |
| LTPPLdist | Distance travelled between those two points during reporting period. Accumulated distance of al rounds travelled. Both routes are counted! Accuracy: 0,01 km |
| LTPPLopObserv | Operator observations regarding the travel way, load or dump points during reporting period (e.g. loose rock, bad roadway,...). Preliminarily a string, later we can add preselect-lists for easier operator input! |
| LTPPTimeRep | Time reporting for access to the particular load / Dump point pair. Multiple elements may be required as work can be interrupted and restarted again at a later time during reporting period. |

## LTPPLoadRepType

### Overview

The LTPPLoadRepType is a special type used for LHD load reporting. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition can be found in Table 76.

### ObjectType Definition

Table 76 – LTPPLoadRepType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | LTPPLoadRepType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **Data**  **Type** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasComponent | Variable | LTPPCyclTot | UInt64 | 0:BaseDataVariableType | M |
| 0:HasComponent | Variable | LTPPdistTot | Float | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPwrkDist | Float | 0:BaseDataVariableType | O |
| 0:HasComponent | Variable | LTPPloadTot | Float | 0:BaseDataVariableType | M |
| 0:HasAddIn | Object | LTPPwaitProc |  | LTPPwaitProcType | O |
| 0:HasAddIn | Object | LTPPaccPts |  | LTPPaccPtsType | O |
| 0:HasAddIn | Object | LTPPMission |  | LTPPMissionType | O |
| **Conformance Units** | | | | | |
| IREDES LTPPLoadRepType | | | | | |

The component Variables of the LTPPLoadRepType have additional Attributes defined in Table 77**.**

Table 77 – LTPPLoadRepType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | LTPPLoadRep | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 78.

Table 78 – LTPPLoadRepType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
|  |  |
| LTPPCyclTot | Total number of working cycles (rounds) completed during the reporting period |
| LTPPdistTot | Overall distance travelled in during the reporting period. This includes also non-performance related tramming e.g. to workshop,... Minimum accuracy required by the standard: 0,1 km |
| LTPPwrkDist | Total distance travelled in a working mode (as reported by MWorking) during the reporting period. |
| LTPPloadTot | Total load carried under all completed working cycles during reporting period. Minimum accuracy required by the standard: 0,01 |
| LTPPwaitProc | Process caused waiting time - LHD specific! Specifies details of the WaitProc timing in the Application Profile! |
| LTPPaccPts | Report data for each pair of load point / dump point. |
| LTPPMission | See LTPPMissionType. |

## IRLTPPerfType

### Overview

The IRLTPPerfType ObjectType is used for LHD production performance reporting. It is based on the BaseObjectType and intended to be used as AddIn. Its formal definition is given in Table 79.

### ObjectType Definition

Table 79 – IRLTPPerfType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRLTPPerfType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | Data  Type | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IRpPerfGen |  | IRpPerfGenType | M |
| 0:HasAddIn | Object | LTPPLoadRep |  | LTPPLoadRepType | M |
| 0:HasProperty | Variable | LTPPerfVersion | String | 0:PropertyType | M |
| 0:HasProperty | Variable | LTPPerfDownwCompat | String | 0:PropertyType | M |
| **Conformance Units** | | | | | |
| IREDES IRLTPPerfType | | | | | |

The component Variables of the IRLTPPerfType have additional Attributes defined in Table 80**.**

Table 80 – IRLTPPerfType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| 0:DefaultInstanceBrowseName | IRLTPPerf | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 81.

Table 81 – IRLTPPerfType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IRpPerfGen | Generic type used report production performance. |
| LTPPLoadRep | Reports on how much material has been transported between load and dump points during the reporting period. |
| LTPPerfVersion | Fixed V 1.0 |
| LTPPerfDownwCompat | Fixed V 1.0 |

## IRLHDTruckType ObjectType

### Overview

The IREDES IRLHDTruckType ObjectType is intended to be used as AddIn or for instantiation. It constitutes a complete IREDES IRLHDTruck equipment profile. It is based on the BaseObjectType. Its formal definition can be found in Table 82.

### ObjectType Definition

Table 82 – IRLHDTruckType ObjectType Definition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute** | **Value** | | | | |
| BrowseName | IRLHDTruckType | | | | |
| IsAbstract | False | | | | |
| **References** | **Node Class** | **BrowseName** | **Data**  **Type** | **Type**  **Definition** | **Other** |
| Subtype of BaseObjectType as defined in OPC 10000-3 | | | | | |
| 0:HasProperty | Variable | 0:DefaultInstanceBrowseName | 0:QualifiedName | 0:PropertyType |  |
| 0:HasAddIn | Object | IRLTPPerf |  | IRLTPPerfType | M |
| 0:HasAddIn | Object | IRLTPlan |  | IRLTPlanType | M |
| 0:HasAddIn | Object | IRLTMMon |  | IRLTMMonType | M |
| **Conformance Units** | | | | | |
| IREDES IRLHDTruckType | | | | | |

The component Variables of the IRLHDTruckType have additional Attributes defined in Table 83**.**

Table 83 – IRLHDTruckType Attribute Values for child Nodes

|  |  |  |
| --- | --- | --- |
| **BrowsePath** | **Value Attribute** | **Description Attribute** |
| DefaultInstanceBrowseName | IRLHDTruck | The default BrowseName for instances of this type. |

### ObjectType Description

The description can be found in Table 84Table 81.

Table 84 – IRLHDTruckType Attribute Values for Child Nodes

|  |  |
| --- | --- |
| **BrowsePath** | **Description Attribute** |
| IRLTPPerf | IRLHD production performance reporting. |
| IRLTPlan | IRLHD production planning. |
| IRLTMMon | IRLHD machine monitoring reporting. |

# Profiles and Conformance Units

This chapter defines the corresponding profiles and conformance units for the OPC UA Information Model for OPC 40568-1. Profiles are named groupings of conformance units. Facets are Profiles that will be combined with other Profiles to define the complete functionality of an OPC UA Server or Client. The following tables specify the facets available for servers that implement the OPC 40568-1 Information Model companion specification.

## Conformance Units

Table 85 defines the corresponding *ConformanceUnits* for the OPC UA Information Model for OPC 40568- IREDES

Table 85 – Conformance Units for OPC 40568 IREDES

| **Category** | **Title** | **Description** |
| --- | --- | --- |
| Server | IREDES Component | Supports the IREDESType type definition. |
| Server | IREDES ProjectInfoType | Supports the ProjectInfoType and has at least one instance of it in the address space |
| Server | IREDES EquipmentInfoType | Supports the EquipmentInfoType and has at least one instance of it in the address space |
| Server | IREDES GenHeadType | Supports the GenHeadType and has at least one instance of it in the address space |
| Server | IREDES DisplayToOperatorType | Supports the DisplayToOperatorType and has at least one instance of it in the address space |
| Server | IREDES IROptionType | Supports the IROptionType and has at least one instance of it in the address space |
| Server | IREDES SiteHeadType | Supports the SiteHeadType and has at least one instance of it in the address space |
| Server | IREDES GenTrailerType | Supports the GenTrailerType and has at least one instance of it in the address space |
| Server | IREDES IREDESType | Supports the IREDESType and has at least one instance of it in the address space |
| Server | IREDES OpPerfLogType | Supports the OpPerfLogType and has at least one instance of it in the address space |
| Server | IREDES IRplanGenType | Supports the IRplanGenType and has at least one instance of it in the address space |
| Server | IREDES IRStatusGenType | Supports the StatusGenType and has at least one instance of it in the address space |
| Server | IREDES IRLTMMonType | Supports the IRLTMMonType and has at least one instance of it in the address space |
| Server | IREDES IRLTPlanType | Supports the IRLTPlanType and has at least one instance of it in the address space |
| Server | IREDES LTPPwaitProcType | Supports the LTPPwaitProcType and has at least one instance of it in the address space |
| Server | IREDES LTPPTimeRepType | Supports the LTPPTimeRepType and has at least one instance of it in the address space |
| Server | IREDES LTPPMissionType | Supports the LTPPMissionType and has at least one instance of it in the address space |
| Server | IREDES LTPPaccPtsType | Supports the LTPPaccPtsType and has at least one instance of it in the address space |
| Server | IREDES LTPPLoadRepType | Supports the LTPPLoadRepType and has at least one instance of it in the address space |
| Server | IREDES IRLTPPerfType | Supports the IRLTPPerfType and has at least one instance of it in the address space |
| Server | IREDES IRLHDTruckTyoe | Supports the IRLHDTruckTyoe and has at least one instance of it in the address space |
| Client | IREDES component client query | Supports querying variable instance declarations of the IREDESType |

## Profiles

### Profile list

Table 86 lists all Profiles defined in this document and defines their URIs.

Table 86 – Profile URIs for OPC 40568-1

| **Profile** | URI |
| --- | --- |
| IREDES Core Server Facet | [http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Server/Core](http://opcfoundation.org/UA-Profile/MiningExternalStandards/IREDES/Server/Core) |
| IREDES Server Facet | <http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Server/IREDES> |
| IREDES Base Server Profile | <http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Server/Base> |
| IREDES Core Client Facet | <http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Client/Core> |
| IREDES Client Facet | <http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Client/IREDES> |
| IREDES Base Client Profile | <http://opcfoundation.org/UA-Profile/Mining/ExternalStandards/IREDES/Client/Base> |

### Server Facets

#### Overview

The following sections specify the *Facets* available for *Servers* that implement the OPC 40568- OPC UA for Mining – External Standards – IREDES companion specification. Each section defines and describes a *Facet* or *Profile***.**

#### IREDES Core Server Facet

Table 87 defines aFacet that describes the fundamental base functionalities an OPC UA server is expected to process for serving OPC UA CS Mining IREDES Information Model. However, this will not allow to serve meaningful OPC UA CS Mining IREDES information models and purely serves to describe the fundamental Profiles and Facets required for basic server operation.

Table 87 –IREDES Core Server Facet

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | 0:Core 2022 Server Facet http://opcfoundation.org/UA-Profile/Server/Core2022Facet | M |
| Profile | 0: Base Server Behaviour Facet  http://opcfoundation.org/UA-Profile/Server/Behaviour | M |
| Profile | 0:Data Access Server Facet http://opcfoundation.org/UA-Profile/Server/DataAccess | M |

#### IREDES Server Facet

Table 88 defines a facet that describes the functionalities of an OPC UA External Standards – IREDES server is expected to process in regard to being able to serve a component recursion of Object instances. Specifically, this is referring to the Components Instance – Declaration of the IREDESType definition provided in chapter 7.8.

Table 88 – IREDES IREDES Server Facet

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| IREDES | IREDES Component | M |
| IREDES | IREDES ProjectInfoType | O |
| IREDES | IREDES EquipmentInfoType | O |
| IREDES | IREDES GenHeadType | O |
| IREDES | IREDES DisplayToOperatorType | O |
| IREDES | IREDES IROptionType | O |
| IREDES | IREDES SiteHeadType | O |
| IREDES | IREDES GenTrailerType | O |
| IREDES | IREDES IREDESType | O |
| IREDES | IREDES OpPerfLogType | O |
| IREDES | IREDES IRpPerfGenType | O |
| IREDES | IREDES IRplanGenType | O |
| IREDES | IREDES IRStatusGenType | O |
| IREDES | IREDES IRLTMMonType | O |
| IREDES | IREDES IRLTPlanType | O |
| IREDES | IREDES LTPPwaitProcType | O |
| IREDES | IREDES LTPPTimeRepType | O |
| IREDES | IREDES LTPPMissionType | O |
| IREDES | IREDES LTPPaccPtsType | O |
| IREDES | IREDES LTPPLoadRepType | O |
| IREDES | IREDES IRLTPPerfType | O |
| IREDES | IREDES IRLHDTruckType | O |

#### IREDES Base Server Profile

Table 89defines a Profile that describes the functionalities of an OPC UA server that is used serve OPC UA CS Mining External Standards IREDES Information Models. Servers complying to this profile can be used to serve IREDES OPC UA Information Models.

Table 89 – IREDES Base Server Profile

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | IREDES Core Server Facet | M |
| Profile | IREDES IREDES Server Facet | M |

### Client Facets

#### Overview

The following tables specify the *Facets* available for *Clients* that implement the OPC 40568 - 1 External Standards – IREDES companion specification.

#### IREDES Core Client Facet

Table 90 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 90 –IREDES Core Client Facet

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | 0:Core 2022 Client Facet  https://profiles.opcfoundation.org/UA-Profile/Client/Core2022Facet | M |
| Profile | 0: Base Client Behaviour Facet  <http://opcfoundation.org/UA-Profile/Client/Behaviour> | M |
| Profile | 0:AddressSpace Lookup Client Facet http://opcfoundation.org/UA-Profile/Client/AddressSpaceLookup | M |
| Profile | 0: Diagnostic Client Facet  http://opcfoundation.org/UA-Profile/Client/Diagnostic | M |
| Profile | 0: Attribute Read Client Facet  <http://opcfoundation.org/UA-Profile/Client/AttributeRead> | M |
| Profile | 0: Attribute Write Client Facet  <http://opcfoundation.org/UA-Profile/Client/AttributeWrite> | M |
| Profile | 0: DataChange Subscriber Client Facet  http://opcfoundation.org/UA-Profile/Client/DataChangeSubscriber2021 | M |
| Profile | 0: Durable Subscription Client Facet  <http://opcfoundation.org/UA-Profile/Client/DurableSubscription> | M |
| Profile | 0:DataAccess Client Facet http://opcfoundation.org/UA-Profile/Client/DataAccess | M |
| Profile | 0: Aggregate Subscriber Client Facet  <http://opcfoundation.org/UA-Profile/Client/AggregateSubscriber> | M |

#### IREDES Client Facet

Defines a profile that describes the functionalities of an OPC UA CS Mining External Standards – IREDES Client to query information provided by an OPC UA CS Mining External Standards – IREDES server serving a component recursion of object instances. Specifically, this is referring to the Components Instance – Declaration of the IREDESType defined in chapter 7.8.

Table 91 – IREDES Client Profile

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| IREDES | IREDES Component Client Query | M |

#### IREDES Base Client Profile

IREDES Base Client Profile defines a Facet that describes the functionalities of an OPC UA client that is used to query an OPC UA server that implements the IREDES Server Profile.

Table 92 – IREDES Base Client Profile

| **Group** | **Conformance Unit / Profile Title** | **Mandatory / Optional** |
| --- | --- | --- |
| Profile | IREDES Core Client Facet | M |
| Profile | IREDES Client Facet | M |

# Namespaces

## Namespace Metadata

Table 93 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 93 – NamespaceMetadata Object for this Document

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Value** | | |
| BrowseName | http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES | | |
| **Property** | | **DataType** | **Value** |
| NamespaceUri | | String | <http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES> |
| NamespaceVersion | | String | 1.0.0 |
| NamespacePublicationDate | | DateTime | 2023-09-01 |
| IsNamespaceSubset | | Boolean | False |
| StaticNodeIdTypes | | IdType [] | 0 |
| StaticNumericNodeIdRange | | NumericRange [] |  |
| StaticStringNodeIdPattern | | String |  |

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 94 provides a list of mandatory and optional namespaces used in an OPC 40568-1 OPC UA *Server*.

Table 94 – Namespaces used in a OPC 40568 - 1 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/Mining/ExternalStandards/IREDES | 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 95 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 95 – Namespaces used in this document

| **NamespaceURI** | **Namespace Index** | **Example** |
| --- | --- | --- |
| http://opcfoundation.org/UA/ | 0 | 0:EngineeringUnits |

1. (normative)  
     
   OPC 40568-1 Namespace and mappings
   1. NodeSet and supplementary files for OPC 40568-1 Information Model

The OPC 40568-1 *Information Model* is identified by the following URI:

<http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES>

Documentation for the NamespaceUri can be found [here](https://reference.opcfoundation.org/nodesets?u=http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES).

The *NodeSet* associated with this version of specification can be found here:

<https://reference.opcfoundation.org/nodesets/?u=http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&v=1.0.0&i=1>

The *NodeSet* associated with the latest version of the specification can be found here:

[https://reference.opcfoundation.org/nodesets/?u= http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&i=1](https://reference.opcfoundation.org/nodesets/?u=%20http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&i=1)

Supplementary files for the OPC 40568-1 *Information Model* can be found here:

[https://reference.opcfoundation.org/nodesets/?u= http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&v=1.0.0&i=2](https://reference.opcfoundation.org/nodesets/?u=%20http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&v=1.0.0&i=2)

The files associated with the latest version of the specification can be found here:

[https://reference.opcfoundation.org/nodesets/?u= http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&i=2](https://reference.opcfoundation.org/nodesets/?u=%20http://opcfoundation.org/UA/Mining/ExternalStandards/IREDES&i=2)

* 1. Capability Identifier

The capability identifier for this document shall be:

IREDES

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