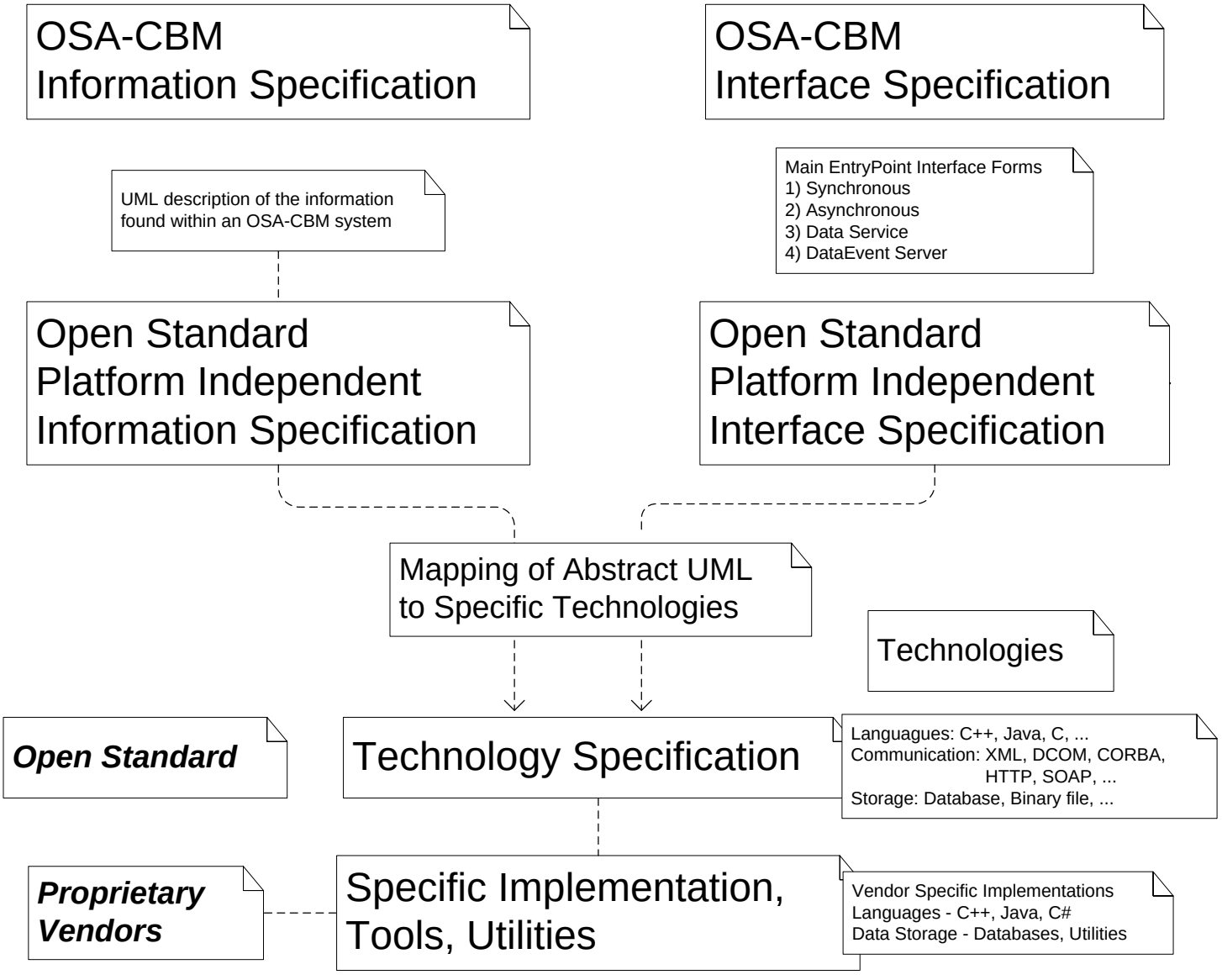
OSA-CBM stands for Open System Architecture for Condition Based Maintenance.
This specification is offered by the MIMOSA organization. Information on this organization can be found at http://www.mimosa.org.

Usage of this specification may only be done under the MIMOSA licensing agreement. It is open to the public usage only in accordance with the non-members' licensing right. It is open to MIMOSA members' usage in accordance with the members' licensing rights as held from 2002 and later. THIS WORK PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, see applicable license for complete details.

OSA-CBM version 3.2 is compatible with the OSA-EAI version 3.2.
OSA-CBM conforms to ISO 13374, a Condition Based Maintenance standard.

OSA-CBM is based on the work supported by the Office of Naval Research under Agreement No N00014-99-3-0011 OSA-CBM Boeing DUST.
This version has been modified from the original OSA-CBM 1.0 DUST program specification within the MIMOSA organizational process.



This specification is designed for multi-technological implementation.
From this point the UML needs specific mappings into programming languages, network protocols, and database storage (e.g. MIMOSA OSA-EAI CRIS).
This document provides the abstract UML description of the specification.

This architecture is divided into the information specification, which defines the information that can be moved around in a CBM system, and the interface specification, which is used to move that information. This separates the information that is moved, stored, and processed from the mechanism that accomplishes these tasks.

An implementation of this technology will select applicable interfaces and merge them with the information specification into a complete package.
Specific technological implementations may be vendor IP supplied tools and utilities. Such vendors are encouraged to become MIMOSA members.

Technology Specification

This document covers the OSA-CBM abstract UML specification.
It defines the core specification of the information found in a CBM system.
It also defines several interfaces that may be used to transport information.

A mapping effort is required to convert this specification into a technology representation that is verifiable. For example, a mapping of the UML Information Specification to XML will result in an XML schema that specifically defines the XML form of the data. The XML schema can then be used to validate the information content of OSA-CBM messages in the XML format.

Notes on Compliance

The initial implementations for the OSA-CBM 3.2 technology mapping are an XML schema for the information content and a WSDL document for the interface implementation. Programs can be verified against the XML schema and WSDL document.

Other implementations will be added as they are developed.
New technology mappings will determine their means of compliance at the time of acceptance.

The Enterprise Architect (EA) Version

There is an Enterprise Architect (.EA) version of the OSA CBM abstract UML.
The EA version is the official version and it is used for generation of the XML schema.
The visio version is used for generation of more human readable documentation.

The interface part of the specification is not in the EA version. Therefore the visio version is still used to define the set of interfaces.

Interfaces

Interface Types

1) Synchronous
2) Asynchronous
3) Data Service
4) DataEvent Server

There are several interface types to accomodate different purposes and technological capabilities.
A given implementation will likely not implement every interface.
Rather, the technology of choice will specify possible interfaces, and an implementation will select appropriate interface(s) from that subset.

Example: A Web server returning XML over HTTP would likely use the synchronous interface.

Definitions

Interface
An interface describes how information will be moved.
A request is made to get information from an object.
A notify is made to input information into an object

EntryPoint - the interface presented by an object to the outside world.
It provides direct access to the top level classes.
(For example, the DataEventSet and Configuration classes.)

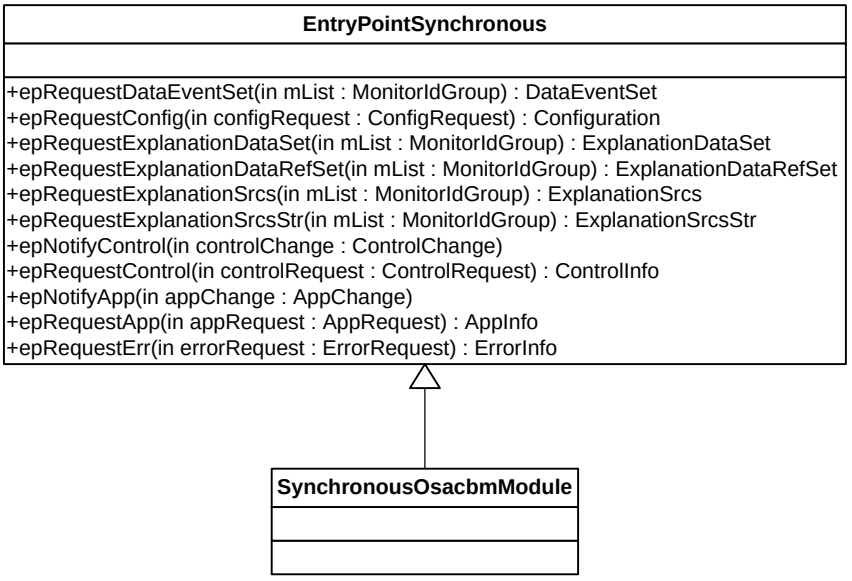
EntryPointSink - Asychronous data return path for requested information.

Synchronous Interface - Information is returned by the Request method.
Asynchronous Interface - Information is returned as available via an EntryPointSink object.

Synchronous Interface

The synchronous interface returns data with the call.
It models the Web XML over HTTP fetch methodology

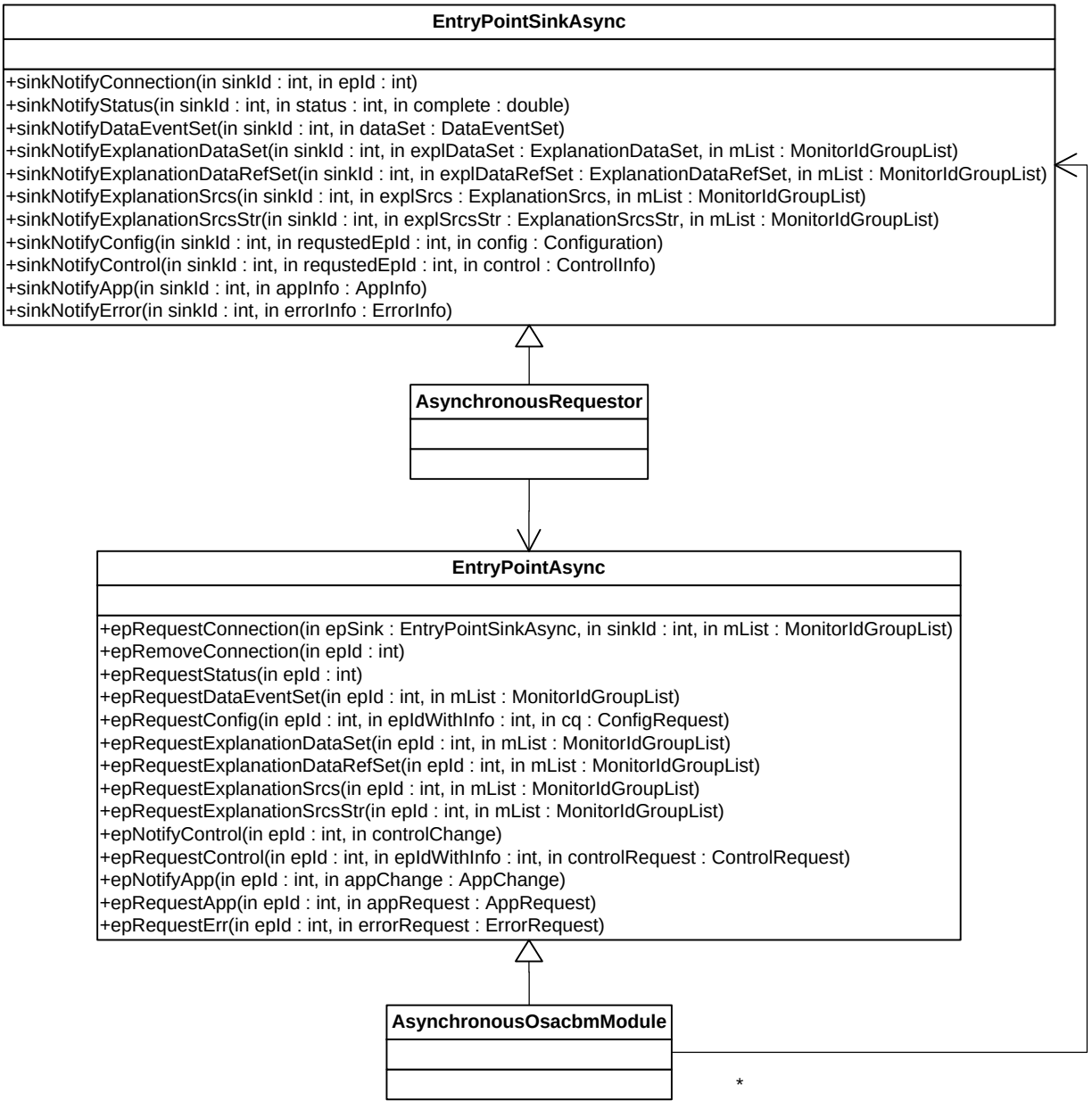
Example (C++):
newData = moduleEPptr->requestDataEventSet(...);



Asynchronous Connected Module Interface

The Asynchronous Interface allows any number of higher modules to
establish and maintain a two-way connection for duration of need.
The sinkId and epId are used for specific sink and entry point identification.
The two-way connection has two main advantages over synchronous calls:
1) It is typically faster in usage since the overhead of connection occurs only once.
2) It allows for three different modes of communication.
-- Return on request, which was the main OSA-CBM 1.0 style of communication.
-- Return on alert, such as when a threshold is exceeded. The connection can be set up for notification only on alert.
-- Push All, which pushes data to the higher connected module every time it collects data without the need for a request beforehand.

Example method call interplay with the connection oriented Asynchronous Interface (C++):
// A higher module requests data from lower module that it previously established a connection with
lpEp_lowerModuleWithData->requestDataEventSet(lpRequestingModuleEPSinkptr);
// The lower module returns data when it is ready
lpSink_higherModule->notifyDataEventSet(data);



Data Service

EntryPointService is a one-way data input device.

An EntryPointService is a well-known location service of a well-known function.

Two possible uses would be:
1) data storage utility
2) maintenance advisory receiver service

EntryPointService
+serviceNotifyDataEventSet(in dataSet : DataEventSet) : EPSStatus +serviceNotifyConfig(in config : Configuration) : EPSStatus +serviceNotifyExplanationDataRefSet(in explDataRefSet : ExplanationDataRefSrc) : EPSStatus

EPSStatus
+status : string

EPSStatus is a return indicator of how an input message was received.

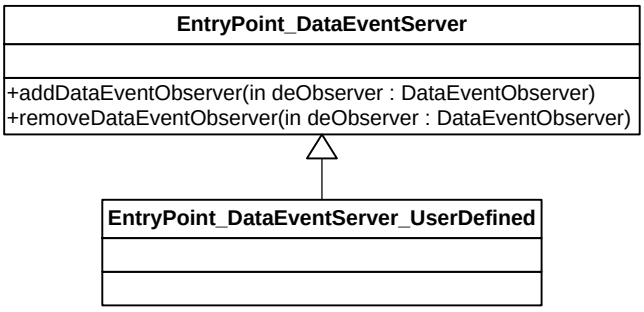
DataEvent Server

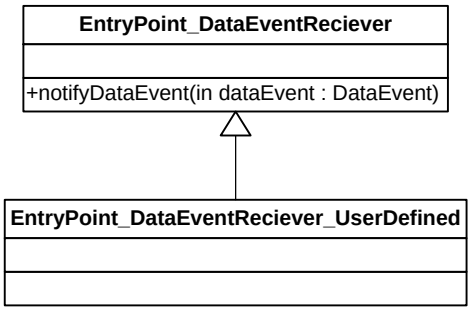
In many systems, signals are moved individually.
This page describes an interface mechanism for handling an individual DataEvent in a simplified interface.

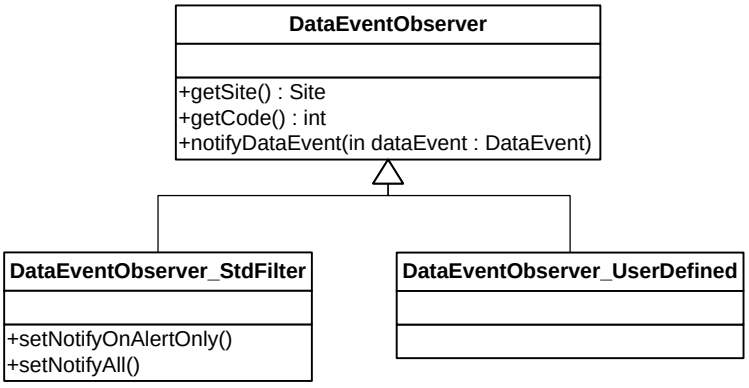
All classes marked with "_UserDefined" are abstract representations of some class that is written with any desired class name with specifically desired functionality for special handling of signals.

Serving module interface

Receiving module interface







A module that provides DataEvents will inherit from the EntryPoint_DataEventServer.

A module that is to recieve DataEvents will inherit from EntryPoint_DataEventReciever.

The DataEventObserver will contain a reference to the EntryPoint_DataEventReciever and have the notification called by the EntryPoint_DataEventServer when a new DataEvent is ready.

It is possible to put filtering of events into the DataEventObserver class via a child class. DataEventObserver_StdFilter is designed for filtering of DataEvents with alerts only.

Information Specification

The Information Specification describes in UML the information found in a CBM system. This specification was developed in conjunction with OSA-EAI CRIS.

There are six main categories of information:

Dynamic Data (on platform)
Configuration Data (not typical for on platform)
Explanation Data (on platform optional)
Control Data (simple user option)
App Data (simple user option)
Error Data (simple user option)

Each of these is individually addressable in the interfaces.

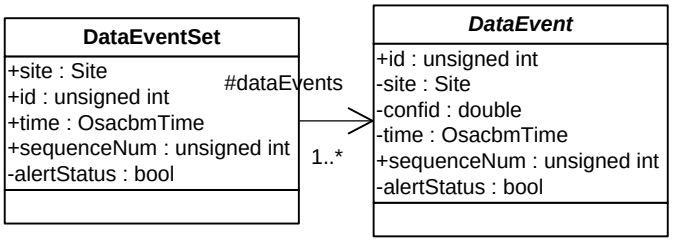
It is suggested that only Dynamic Data is required to be used in embedded systems such as a small platform IVHM system where configuration is known and engineering units are built in. The addition of configuration data especially forces users to put into these systems information not typically found there. That adds development time for something of very limited or no use within its present realm.

For such systems, MIMOSA servers which contain the configuration information may exist at servicing locations.

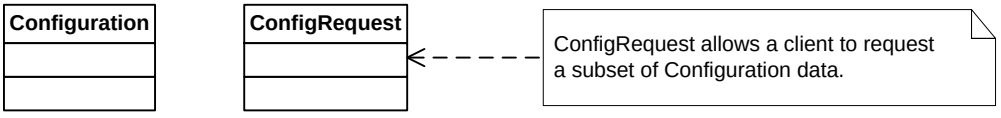
Information Specification - EntryPoint Classes

The EntryPoint interface provides direct access to the following classes.
The remaining thrust of this document describes their details in UML form.

Data



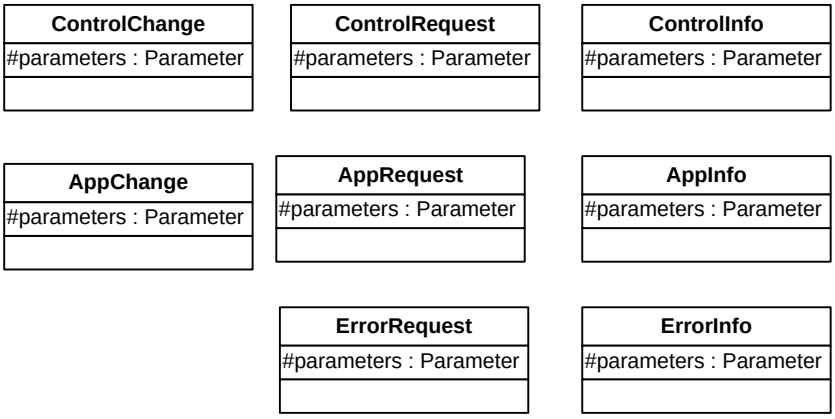
Configuration



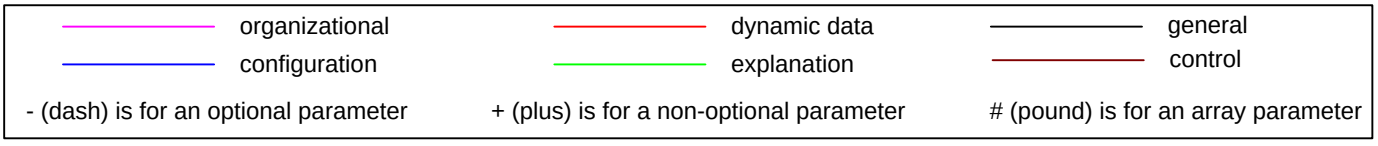
Explanation

Extensible

Extensible types are for application-specific purposes. Certain applications may require these specific categories of information for setup, control, and error reporting.



Legend



The legend explains some of the OSA-CBM specific nomenclature.
Note especially the '-', '+', and '#' used to indicate parameter optionality and count.
These symbols have different meanings from those in the standard UML specification.

MonitorIDGroupList contains a list of MonitorIDGroups.
It is used directly by the Asynchronous interface.

MonitorIdGroup corresponds to the DataEventSet level.
It is used directly by the Synchronous interface.
If the monitorIdGroup list is empty then the module should send all DataEvents with no filtering.

MonitorIdGroupList
MonitorIdGroup
MonitorId

MonitorIdGroupList

1
0..* #monitorIdGroup

MonitorIdGroup
+site : Site
-dataEventSetId : unsigned int
-alertFilter : ALERT_FILTER_SETTING

0..1 -sequenceSelect
1

SequenceSelect
-sequenceNumStart : unsigned int
-sequenceNumEnd : unsigned int

MonitorGroup is used as follows:
(1) If a module has a common set of data to provide, it can be requested using DataEventSetId. DataEventSetIds correspond to OutPortSets' id fields in Configuration. No MonitorIds need be added when requesting data using a DataEventSetId.

(2) When not using a DataEventSetId, desired data channels can be requested using an array of MonitorIds.

1
0..* #monitorId

0..1 -timeSelect

MonitorId
-site : Site
+id : unsigned int
+type : DataIdType
-itemId : ItemId

TimeSelect
-timeStart : OsacbmTime
-timeEnd : OsacbmTime
-snapshotStart : int
-snapshotEnd : int
-decimate : unsigned int

MonitorId is a reference to a monitored measurement location, agent, or agent / item.
Its main change from version 3.1 was to add the selection filter

1
0..* #selectionFilter

SelectionFilter

Optionality Constrain: Use either, SequenceSelect, TimeSelect, or Neither.

If nothing is used then then assume present time.

SequenceSelect refers to the sequenceNum in DataEventSet or DataEvent.

It timeSelect is used then:
Snapshot indicates the number of DataEventSets before or after the time specified. snapshotStart must be <= 0; snapshotEnd must be >= 0.
Snapshot 0 is at timeStart or present time.
Decimate means to send only one out of every <decmiate value> DataEvents, e.g.<3> => 1-in-3
EntryPoints may (1) not support this
or may support one or more of the following
(2) TimeRange only, or (3) TimeRange with decimate
(4) timeStart, (5) timeStart with decimate
(6) timeStart with snapshot
(7) timeStart with snapshot and decimate

Some additional notes:
1) The Site value in MonitorId is used as an override to the site used in MonitorIdGroup when the two are not the same.

2) SelectionFilter contains a list of attributes for specific purposes. The usage type must be applicable to the type indicated by the MonitorId.
MeasLocAlertFilter is applicable to DA,DM,SD layers
AgentAlertFilter is applicable to HA,PA,AG layers

MeasLocAlertFilter
-alertTypeSite : Site
-alertTypeId : unsigned int
-alertTypeCode : unsigned int
-alertSeverity : MIMExtType
-regionRef : AlertRegionRef
-regionEnum : EnumValue

AgentAlertFilter
-itemId : ItemId
-eventType : MIMExtType
-severityType : MIMExtType

«enumeration»
ALERT_FILTER_SETTING
-ALL_EVENTS = 0
-ALERT_EVENTS_ONLY = 1
-NO_EVENTS = 2
-CHANGED_VALUE_EVENTS = 3

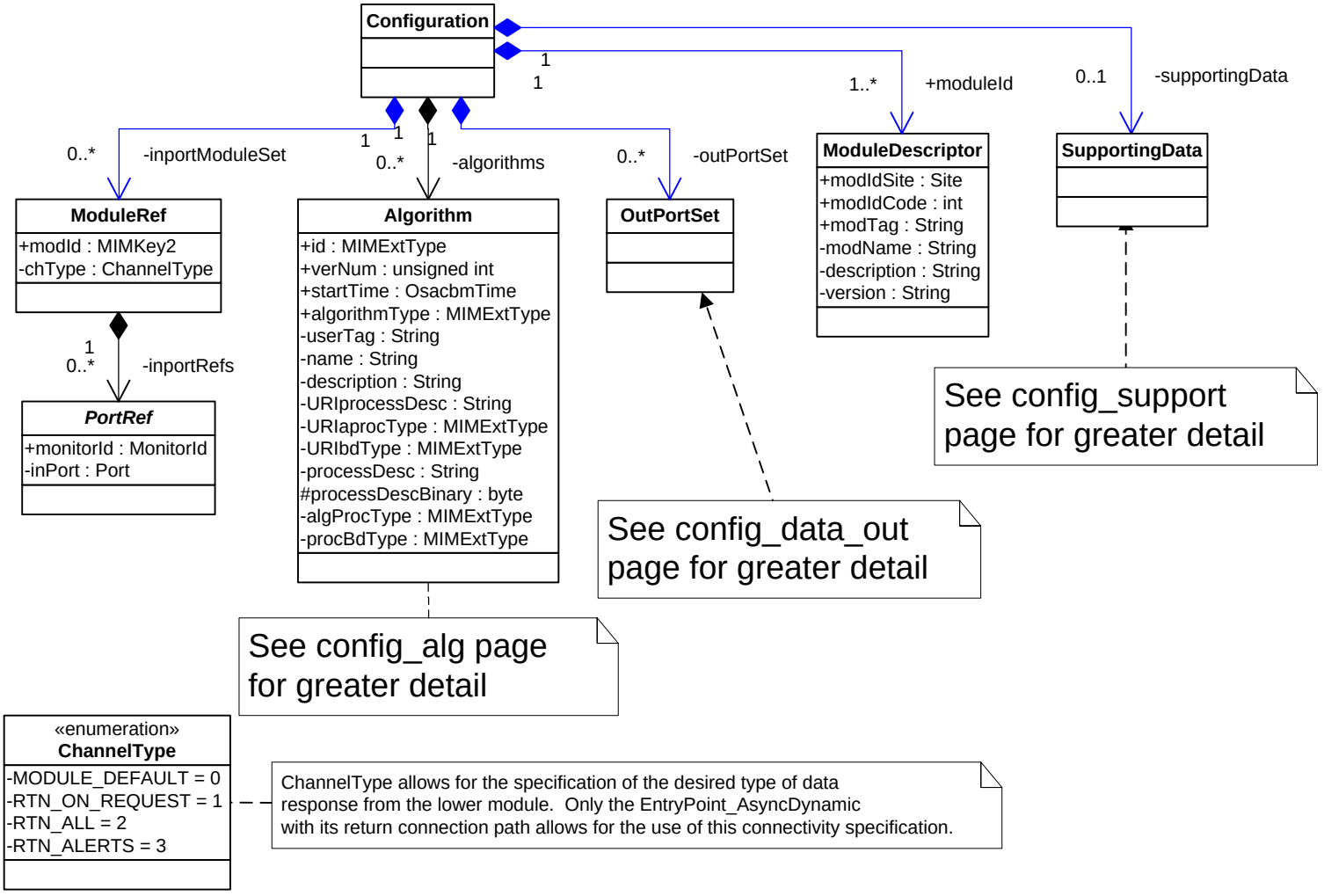
Synchronous versus Asynchronous Usages

The Synchronous Interface must return all data in one call. Therefore epRequestDataEventSet will return all applicable dataEvents in the one DataEventSet. Additionally, the Synchronous Interface will mainly be for historical data.

The Asynchronous Interface provides an unlimited number of unsolicited DataEventSets to the supplied entry point. It can therefore support a large variety of applications. This interface will return all applicable DataEventSets to the EntryPointSink.

Configuration

Configuration gives information about an OSA-CBM module's input sources, a description of algorithms used for processing input data, a list of outputs, and various output specifics such as engineering units, thresholds for alerts, etc.



ModuleRef gives information about where a module gets data from.

Algorithm describes the process used to generate a DataEvent.

OutPortSet lists each Port provided by the module. A Port is a 'data channel' and the Port class gives specific configuration data for that data channel.

SupportingData gives additional information about MIMOSA primary key references which may be used elsewhere in this architecture.

ModuleDescriptor gives a top level description of the module/entryPoint. modIdCodes should correspond to OutPortSet ids and DataEventSet ids

DataEventSet

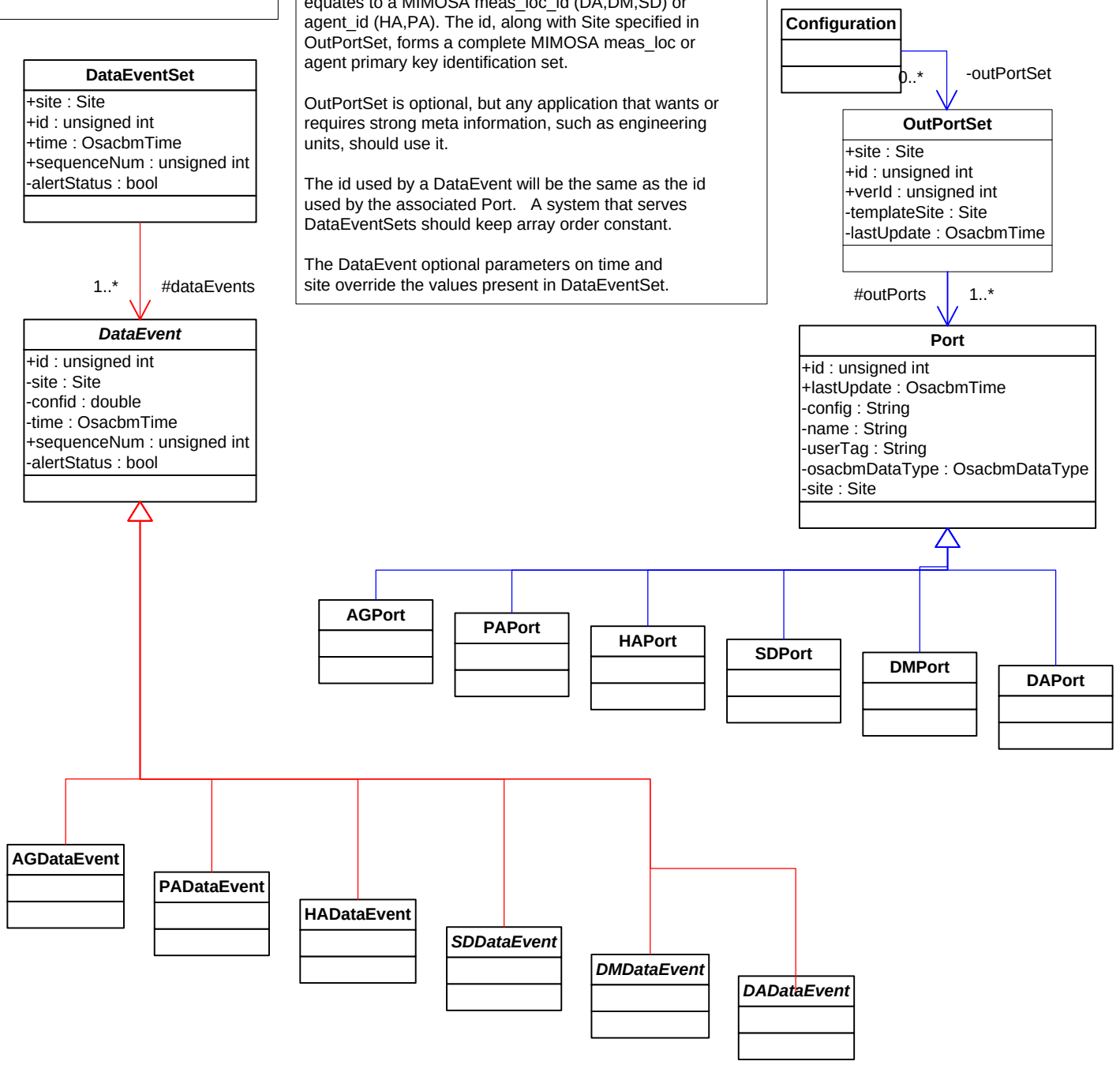
Port contains configuration/metadata about a specific DataEvent 'channel'. The attribute id equates to a MIMOSA meas_loc_id (DA,DM,SD) or agent_id (HA,PA). The id, along with Site specified in OutPortSet, forms a complete MIMOSA meas_loc or agent primary key identification set.

OutPortSet is optional, but any application that wants or requires strong meta information, such as engineering units, should use it.

The id used by a DataEvent will be the same as the id used by the associated Port. A system that serves DataEventSets should keep array order constant.

The DataEvent optional parameters on time and site override the values present in DataEventSet.

OutPortSet

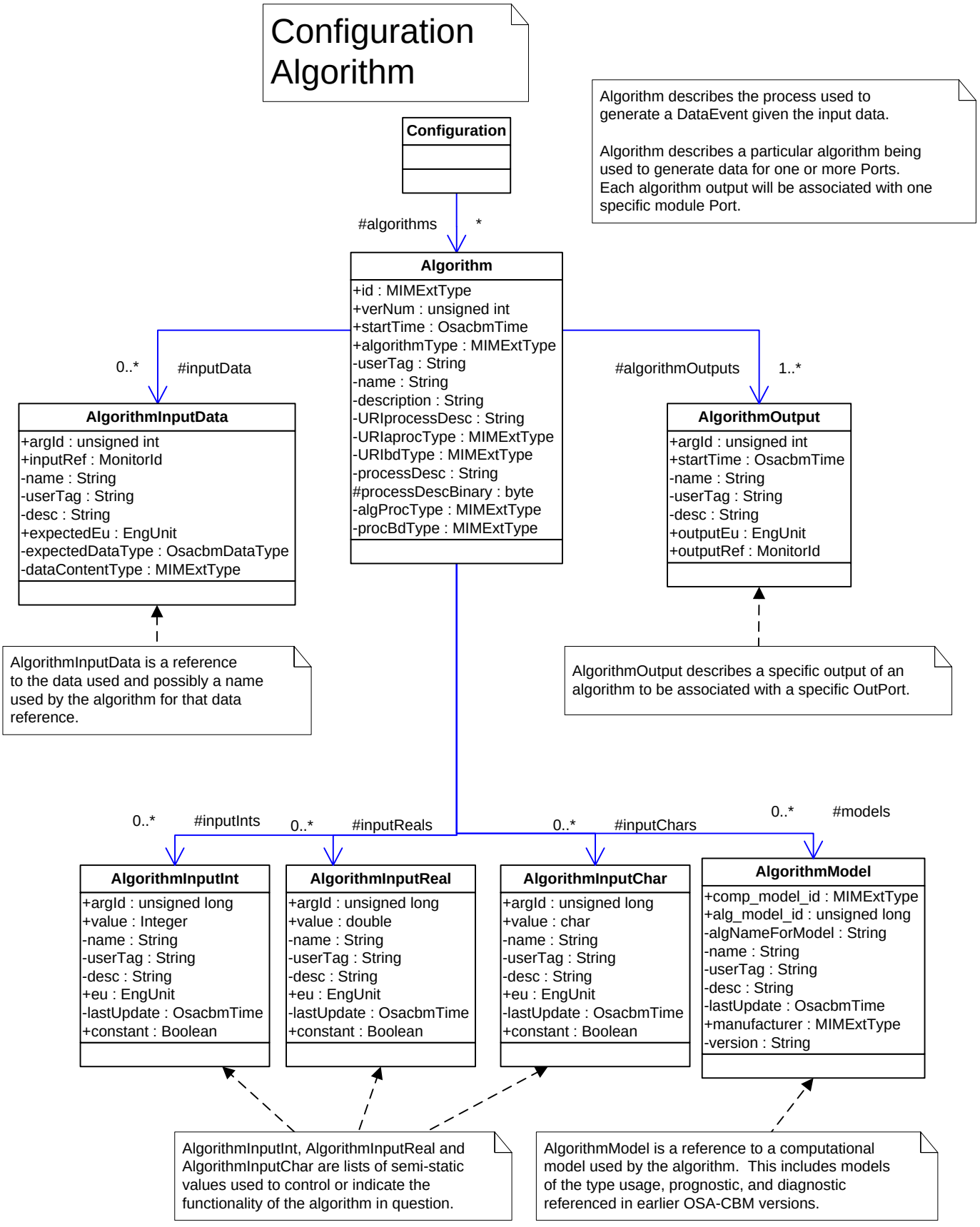


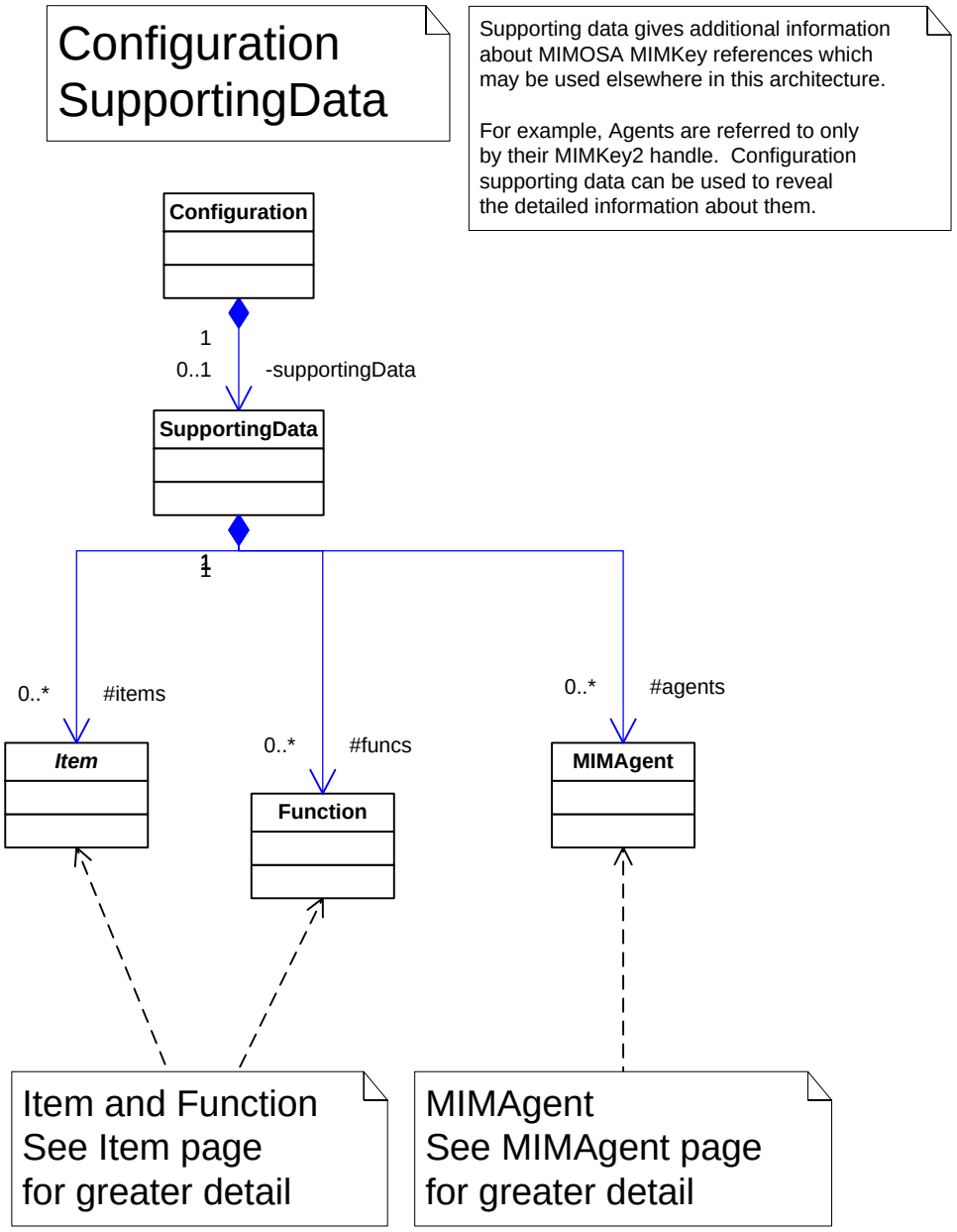
DataEvent contains the data generated by one event of one Port.

The DataEvent child hierarchy below it is associated with particular layers in the OSA-CBM architecture. Those classes have child classes below them describing particular data types.

Port contains the configuration information specific to one output channel of a module. The Port child heirarchy associates to a particular layer in the OSA-CBM architecture.

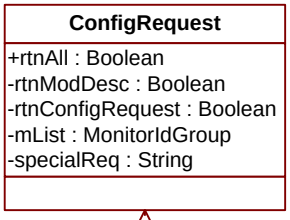
Time on DataEvent is optional. If it is used, it is meant to override the time from DataEventSet. It is also used when fetching single DataEvents from a DataEvent Server.





ConfigRequest

ConfigurationRequest is used in the entry point interface method to select possible subsets of the Configuration data to reduce the size of the returned request.



An OSA-CBM module, especially at the HA or PA level, may have a large list of supported components, like Items (i.e. Assets and Segments), Ports, Algorithms, Agents, etc.

The ConfigRequest is for future capability to be able to request a subset of that data.

Parameters:

rtnAll - overriding parameter to state all configuration information is desired.

rtnModDesc - indicates whether the module description is desired as part of the return.

rtnConfigRequest - indicates if the ConfigRequest is desired as part of the return.
This is used as confirmation that the request was properly received.

monitorIdList - list of data channels or agent/monitored components in the configuration subset.

specialReq - is for future extensible detailed subset request.

Explanation

Explanation is the data or a reference to the data used by a module to produce an output.

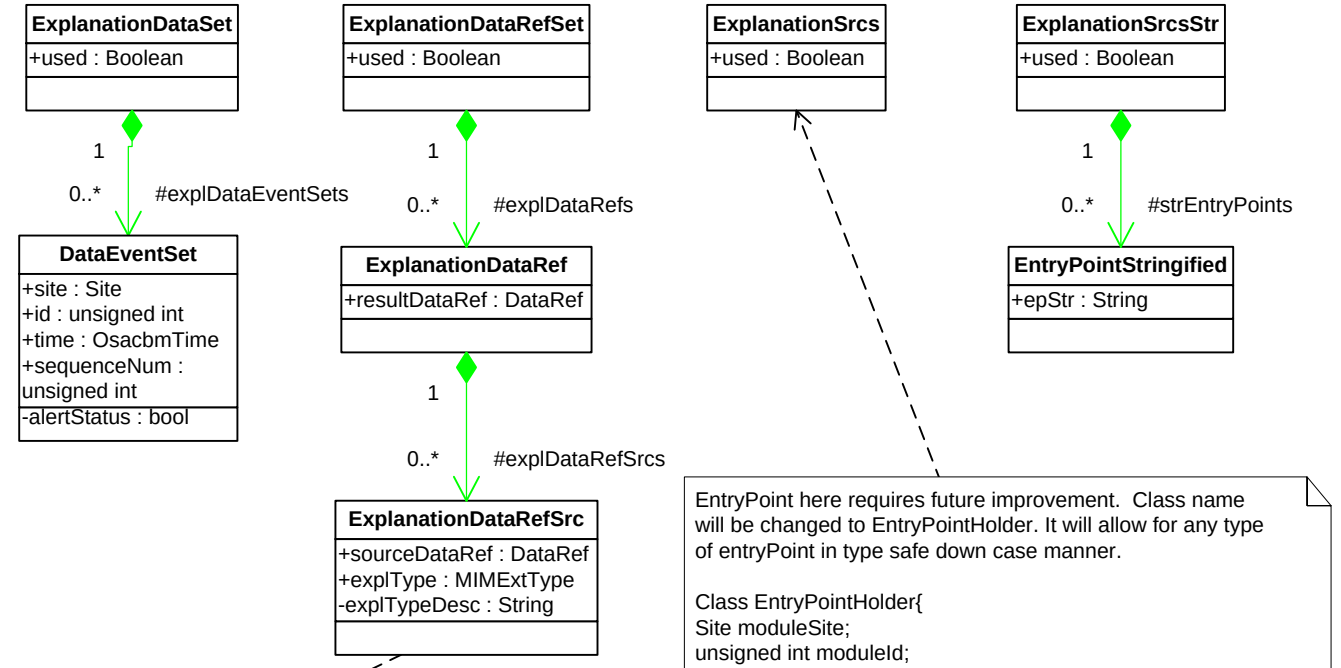
Explanation consists of four possible forms depending upon the application.

The ExplanationDataSet is simply the data used for a calculation.

ExplanationDataRefSet is a handle / timestamp type of reference to the data used. This is used when the data comes from a well-known location or it is known to be stored somewhere. The main example is using data stored in a database.

ExplanationSrcs and ExplanationSrcsStr are two different ways of giving direct access to the modules supplying the data. The former is a set of direct pointers to modules. The other latter a "stringified" form of a pointer that will allow a user to construct a pointer to the module.

Explanation Forms



There will be many types of standard MIMOSA OSA-CBM explanation types.

EntryPoint here requires future improvement. Class name will be changed to EntryPointHolder. It will allow for any type of entryPoint in type safe down case manner.

```
Class EntryPointHolder{
Site moduleSite;
unsigned int moduleId;
EntryPointType epType; // MIMNonExt
};

Class EntryPointHolder_Type1:public EntryPointHolder{
EntryPointHolder_Type1& ep;
};
```

Note on "used" boolean

Note, if a form is not used, set the boolean 'used' to false and return an empty set.

Extensible Components

These are called the extensible components because they are application specific and meant to hold any kind of data. The parameter class can be extended as necessary to provide ways to read and write parameters on a module.

GeneralParameter is recommended to provide application-specific parameters in a standard, human-readable format.

Because these classes are application-specific, they are optional. It is acceptable if a small embedded system does not want to use them or wants to use them in a very narrowly defined way.

Control Specific

Control is the concept of being able to change module parameters on the fly.

One major use would be to be able to change a threshold alert monitor's threshold settings on the fly to adjust to present operating conditions.

Application Specific

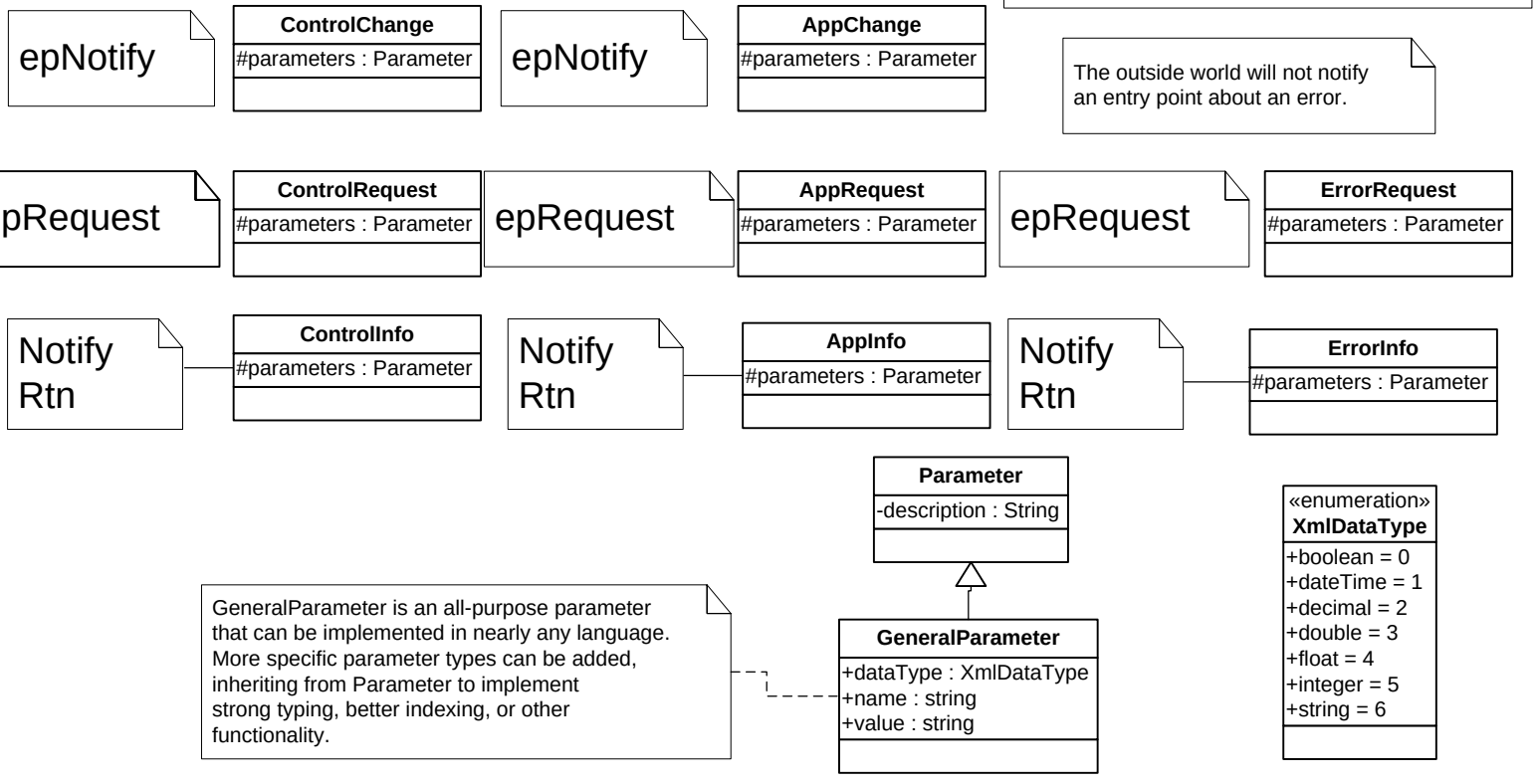
Application specific is the concept of being able to interact with a module in an application specific way.

One possible use might be to request extra non-standard information about a module.

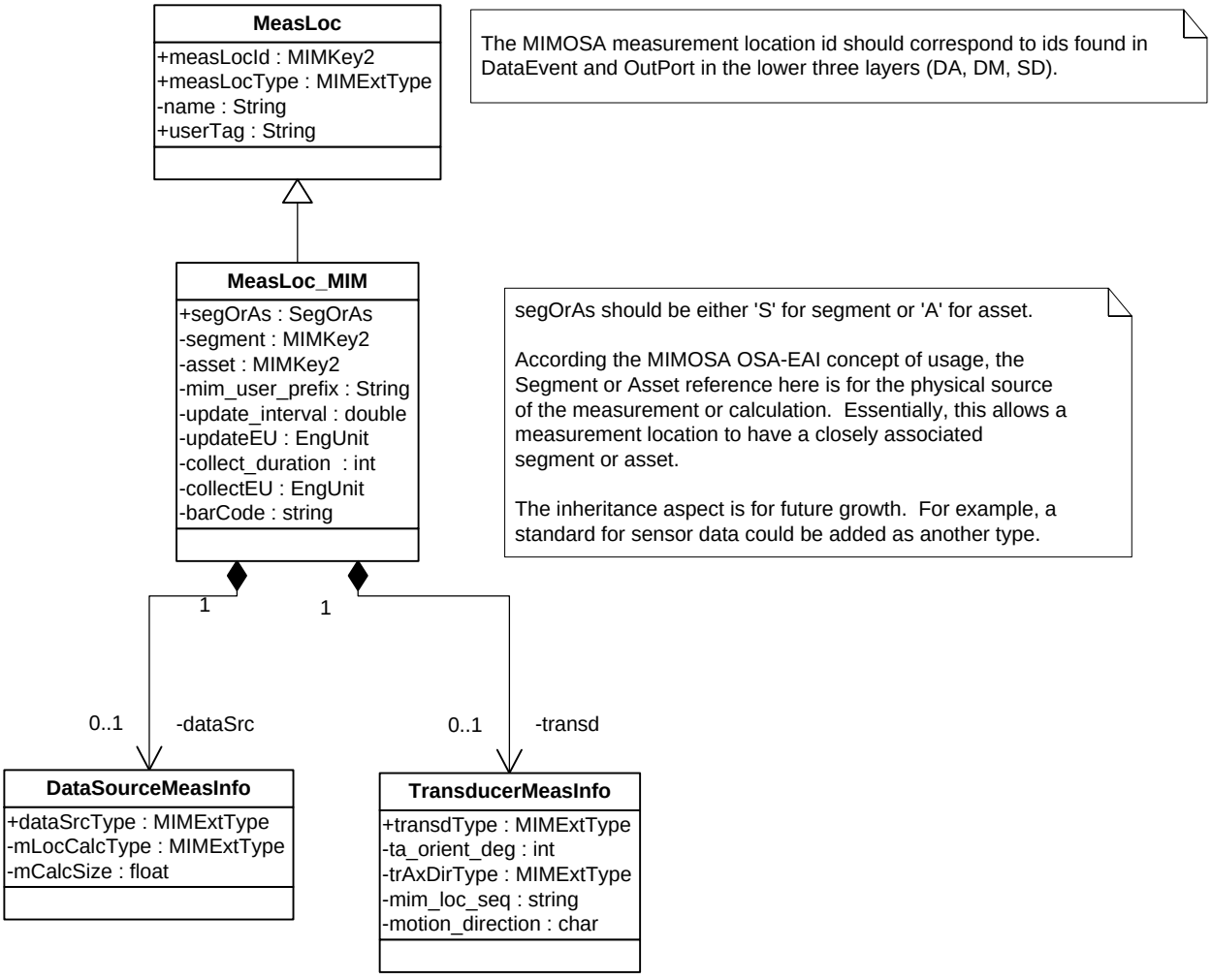
Error Specific

Error specific is the concept of indicating an error condition. Errors are application specific. However as the standard progresses, specific activities may start to standardize errors.
For example, invalid web requests using XML over HTTP will have a standard return response.

Note: Connected state configuration will allow for unsolicited error notification.



Measurement Location (DA, DM, SD)

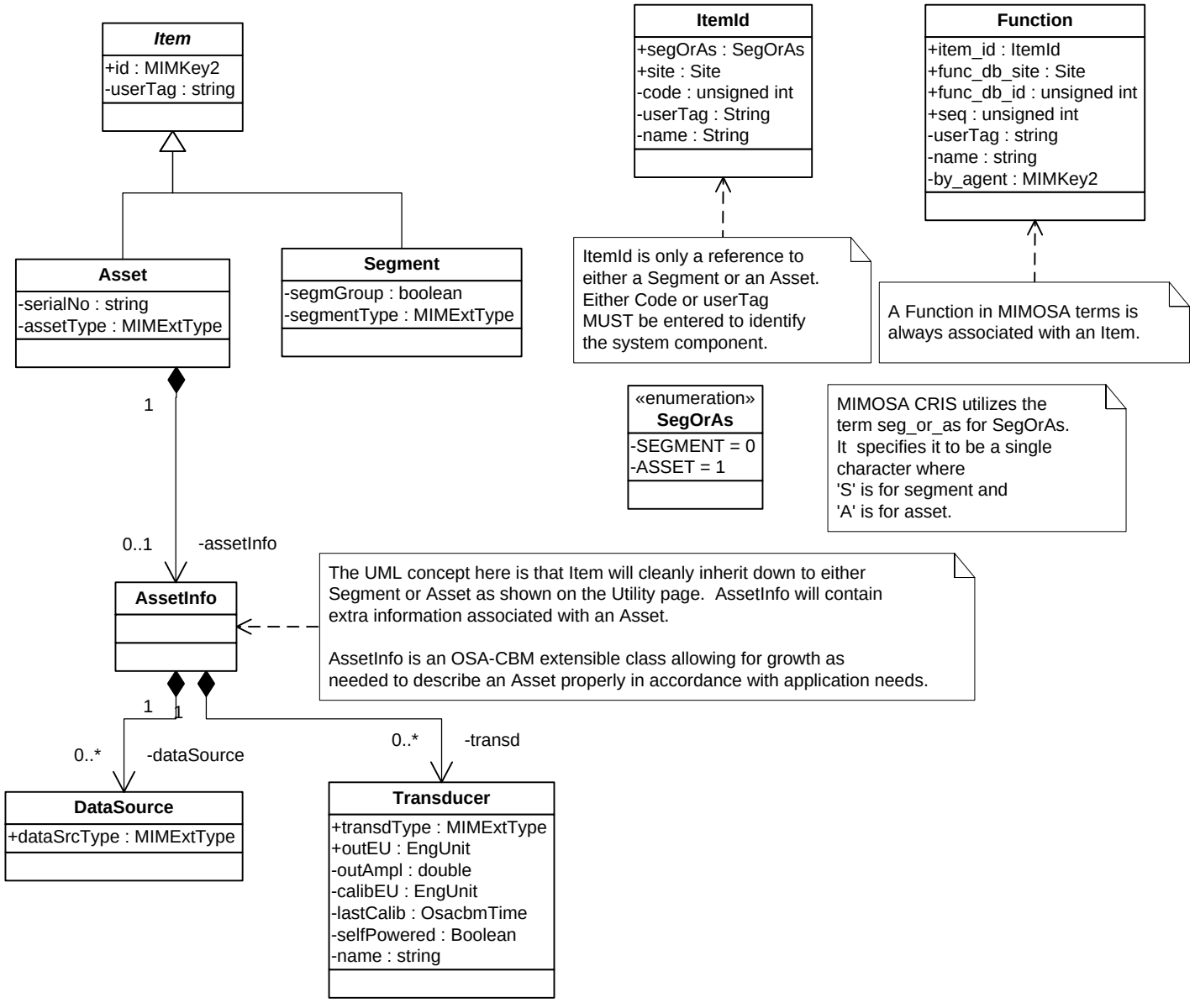


The Item page details the Item and Function classes that may be used or referenced elsewhere in this document.

Item

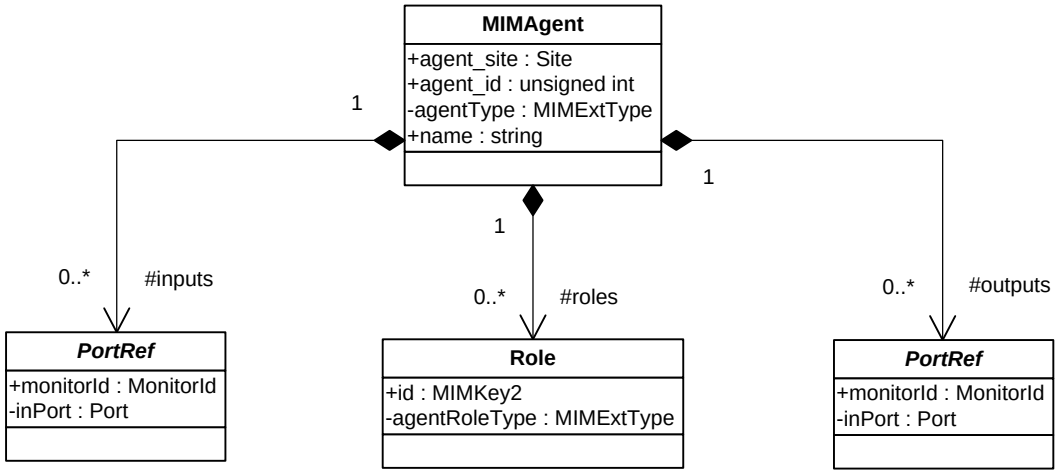
ItemId

Function



This page details the MIMAgent class
that is referenced elsewhere in this document.

MIMAgent and Roles

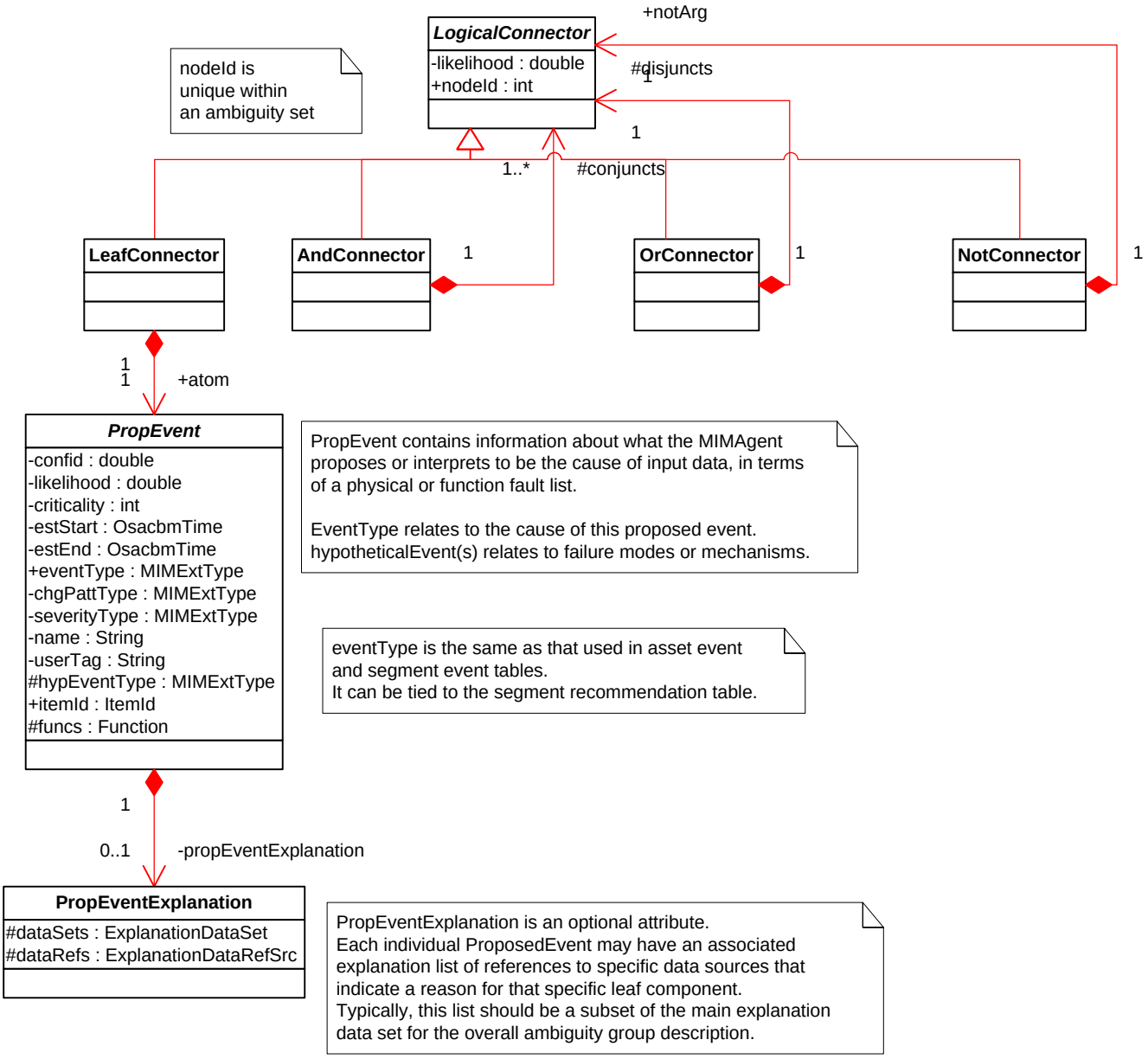


Proposed Event for Failure Descriptions (HA,PA)

The LogicalConnector provides for any style of ambiguity group by using combinations of the AndConnector, OrConnector, and NotConnector classes.

The LeafConnector class gives information about the proposed event fault.

A single LeafConnector without using the And, Or, and Not Connectors is the simplest form used to describe a single determined fault.



Site

Site is globally uniquely identified by one of two methods. Either the MIMOSA assigned 16 hex character siteId or the (regId, userTag) string combination where regId is assigned by MIMOSA for a specific registered user and the userTag is uniquely assigned by the registered user for each of the registered user's mobile platforms.

More specifics on these strings is described in the MIMOSA CRIS documentation.

SITE_CATEGORY indicates specific site types.

SITE_ZERO is MIMOSA (0, db_id=0).
SITE_ENT_ZERO is for platform enterprise site zero entry.
SITE_PLAT is for site platform.
SITE_TEMPLATE is for platform template.
SITE_SPECIFIC is for all other sites and needs to be added into the system directly or indirectly.
SITE_ZERO_ONE is MIMOSA (0,db_id=1).
SITE_ZERO_TWO is MIMOSA (0,db_id=2).
SITE_PLAT_TRNG_DATA is for simulated platforms.

«enumeration»
SITE_CATEGORY
-SITE_ZERO = 0
-SITE_ENT_ZERO = 1
-SITE_PLAT = 2
-SITE_TEMPLATE = 3
-SITE_SPECIFIC = 4
-SITE_ZERO_ONE = 5
-SITE_ZERO_TWO = 6
-SITE_PLAT_TRNG_DATA = 7

Site
+category : SITE_CATEGORY
-siteId : String
-regId : String
-userTag : String
-systemUserTag : String

«enumeration»
OsacbmDataType
-InvalidUnsetType = 0
-DAWaveform = 1
-DABLOBData = 2
-DAVector = 3
-DADataSeq = 4
-DAReal = 5
-DAInt = 6
-DABool = 7
-DMAmpl = 8
-DMVector = 9
-DMRealFrqSpect = 10
-DMCmplxFrqSpect = 11
-DMCPB = 12
-DMReal = 13
-DMInt = 14
-DMBool = 15
-DMRealWaveform = 16
-DMCmplxWaveform = 17
-DMDataSeq = 18
-DMUserDef = 19
-SDReal = 20
-SDInt = 21
-SDBool = 22
-SDEnum = 23
-HADataEvent = 24
-PADataEvent = 25
-PARUL = 26
-PARULDist = 27
-PAFutureHlth = 28
-PAFutureHlthTrend = 29
-AGDataEvent = 30
-DAUnknown = 31
-DMUnknown = 32
-SDUnknown = 33
-HAUnknown = 34
-PAUnknown = 35
-AGUnknown = 36
-DAInvalid = 37
-DMInvalid = 38
-SDInvalid = 39
-HAInvalid = 40
-PAInvalid = 41
-AGInvalid = 42
-DEUser = 43
-SDEnumSet = 44
-SDTestReal = 45
-SDTestInt = 46
-DMBLOBData = 47
-DAString = 48
-SDEvent = 49

DataReference

MIMKeys: MIMOSA Table Keys

MIMKey1
+code : unsigned int
-name : String

MIMKey2
+site : Site
+id : unsigned int
-name : String

MIMKey3
+site : Site
+dbId : unsigned int
+code : unsigned int
-name : String

DataRef
+site : Site
+id : unsigned int
+dataIdType : DataIdType
+time : OsacbmTime
-dataType : OsacbmDataType
-itemId : ItemId

MIMKey Type Defs

typedef MIMKey1 MIMNonExtType
typedef MIMKey2 Handle
typedef MIMKey3 MIMExtType

DataRef is a reference to one data item.
It is essentially a descriptor to one DataEvent value. Explanation uses this as a type of data pointer.

«type»
MIMNonExtType

«type»
Handle

«type»
MIMExtType

MIMNonExtType is a MIMOSA non-extensible type. It is therefore a single integer.
Handle is used to indicate a specific MIMOSA measurement location (DA, DM,SD) or agent id (HA,PA,AG).
MIMExtType is a MIMOSA extensible type. It has three keys: site, dbId, and code. (Handle, code) may be put into a MIMExtType number to form its value. In this case, it would typically refer to a MIMOSA database id.

DataIdType

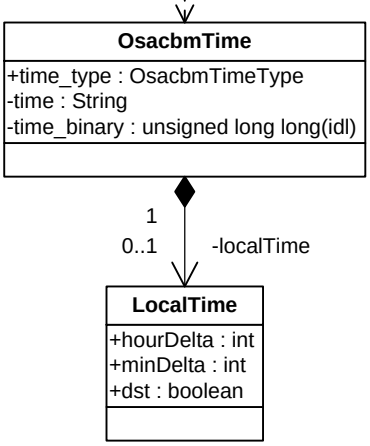
«enumeration»
DataIdType
-meas_location = 0
-agent_id = 1

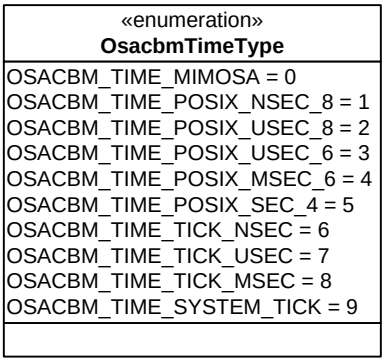
DataIdType descibes what kind of id a DataEvent id references. OSA-CBM DataEvents from the lower three layers DA, DM, and SD are MIMOSA measurement locations. OSA-CBM DataEvents from the higher three layers, HA PA, and AG, are MIMOSA agents. The DataEvent ids from these different data types therefore correspond to these two types of sources: agents and measurement locations.

Time

The Utility page details some classes that are used or referenced elsewhere in this document.

OSA-CBM uses the name OsacbmTime to eliminate clashing of class names. Either 'time' (as a string) or time_binary should be used.





Time has been expanded to have a few different internal content form types. This is to allow the simplest most direct method of handling time to be incorporated for a specific embedded system.

'time' as string should be set to the MIMOSA format which is a string conforming to ISO 8601. See description to the right.

'time_binary' is defined for a binary format indicator of time. There are two main types: POSIX and tick.

Posix is a Unix type time, which is also fetched in terms of the data type long long.

Methods to access specific time portions is highly desirable for any implementation.
Any language implementation should have methods:
uint getYear()
uint getMonth()
...
ushort getHour()
...
ushort getMicrosec()
ushort getNanosec()

methods should interpret Tick or Posix accordingly.

All rtn types are integer EXCEPT getTick which is an unsigned long long
64 bit int.

Date/time in ISO 8601 variable length character form:
YYYY-MM-DDThh:mm:ss.fffffffff
example 2006-05-31T14:30:33.123

where:

YYYY	= four-digit year
MM	= two-digit month (01=January, etc.)
DD	= two-digit day of month (01 through 31)
hh	= two digits of hour (00 through 23) (am/pm NOT allowed)
T	= literal "T" character
mm	= two digits of minute (00 through 59)
ss	= two digits of second (00 through 59)
fffffffff	= represents a decimal fraction of a second to the billionth of a second

Year, month, and day must be specified. Additional timestamp content should be provided, if known. Zeros will be assumed for the omitted values. Negative DATETIME is not supported. All suffixes after the 29th character provided in the ISO 8601 specification, such as "Z" (representing Coordinated Universal Time (UTC), are not necessary since the CRIS specification explicitly manages local offset hours and minutes as distinct columns associated with the UTC (referred to in the CRIS specification prefixed with "GMT") column.

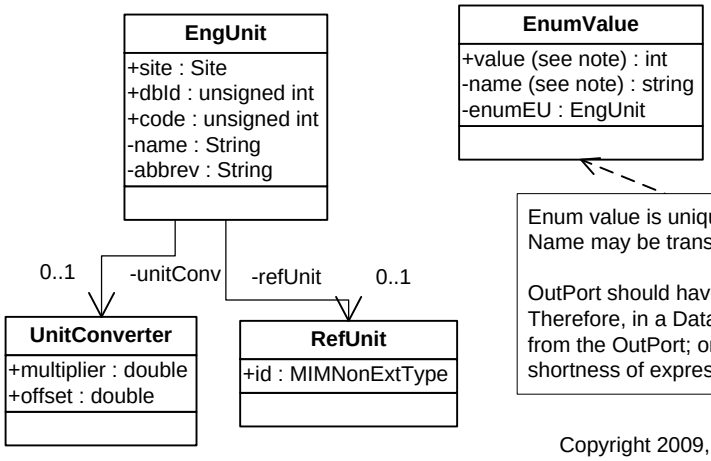
Note that the actual difference between the new DATETIME(10:29) data type and the CRIS V2.1 fixed-length STRING(29) form is the separator between date and time information is now a literal “T” instead of a blank space, the separator for the billionths of seconds is now a dot (“.”) instead of a dash (“-“), and trailing items after the year-month-day fields may be omitted.

POSIX time is a signed integer indicating a time since the Unix epoch time 00:00:00 UTC on January 1, 1970. LSB value is a multiplier to give time distance from the epoch time. Bytes used can vary and determines how wide the time range around the epoch time can be. The OsacbmTimeType for POSIX indicates the LSB value and number of bytes used. The following indicates some of the possible time ranges

# Bytes	LSB	Delta Time to 1970
4 Signed	1 sec	+/- 68 years 1901 to 2038
6 Signed	1 mSec	+/- 4459 years
8 Signed	1 nSec	+/- 292years
8 Signed	1 uSec	+/- 74 million years

Time Tick is for an embedded system that uses a counter as a timer, typically since power up. Three specified versions are for nano, micro, and milliseconds. Other variations from this should use _SYSTEM_TICK. It is a systemic problem to convert tick time into a UTC time. This should be done for any stored or transmitted data.

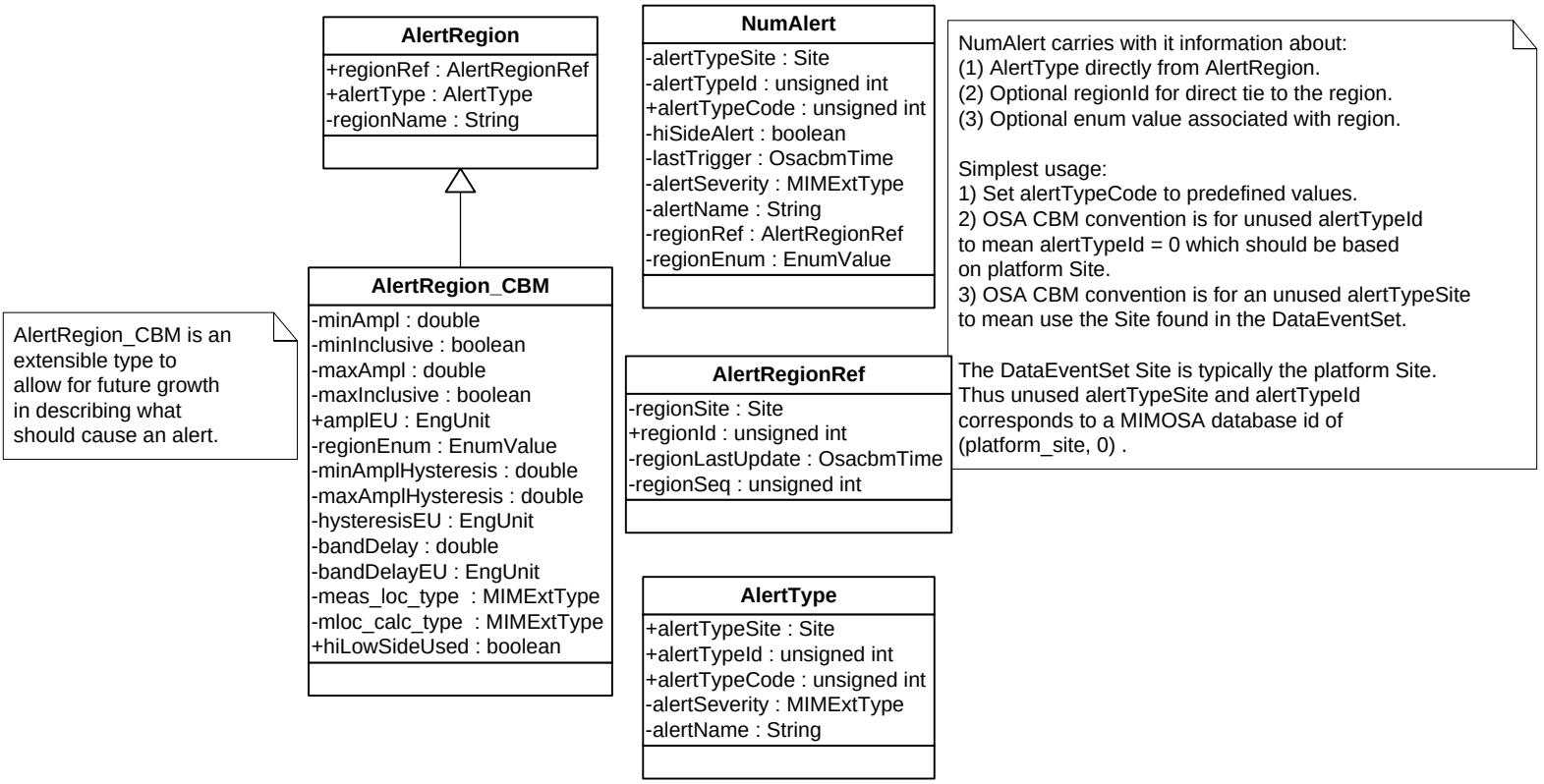
EngUnit and Enum Type



Enum value is uniquely identified by EngUnit plus value.
Name may be transmitted optionally.

OutPort should have a corresponding EngUnit for transmitted values. Therefore, in a DataEvent transmission the DataEvent id can link to EngUnit from the OutPort; only a value may be needed in the actual DataEvent if shortness of expression is desired.

Alerts and Regions



Usage Concept

A set of AlertRegions will be associated with a specific OutPort. The value associated with the AlertRegion set is contained in the DataEvent with the same id as the OutPort.

When the value contained in a DataEvent activates an AlertRegion, the DataEvent will contain a NumAlert associated to the AlertRegion along with the time of occurance stored in the lastTrigger. In a condition-based monitoring system, the following DataEvents from that OutPort will have new values and new times. However, the NumAlert will remain the same while in that region. This includes the lastTrigger time which may be used as an indicator of how long a particular region has been in effect.

When a Region is first entered it gives the specific DataEvent an "Alert Status". For CBM modules supporting "Alert Status" functionality, the output can be suppressed to output only when an alert trigger occurs. This mechanism requires one of the connected-type interfaces.

(RegionId, OutPort handle) can be the identifier used by a higher module to control threshold levels via a user defined ControlVector. Future versions of the standard will begin to create a standard UML/XML form for this control.

Hysteresis BandDelay

Hyterisis and BandDelay are used to reduce threshold nuisance crossings.
A region is activated when:
1) Threshold amplitude is crossed when no BandDelay and no Hysteresis.
2) Threshold amplitude is crossed for more than BandDelay time.
3) Threshold amplitude is crossed by more than Hysteresis value.
3) Threshold amplitude is crossed by more than Hysteresis value for BandDelay time.

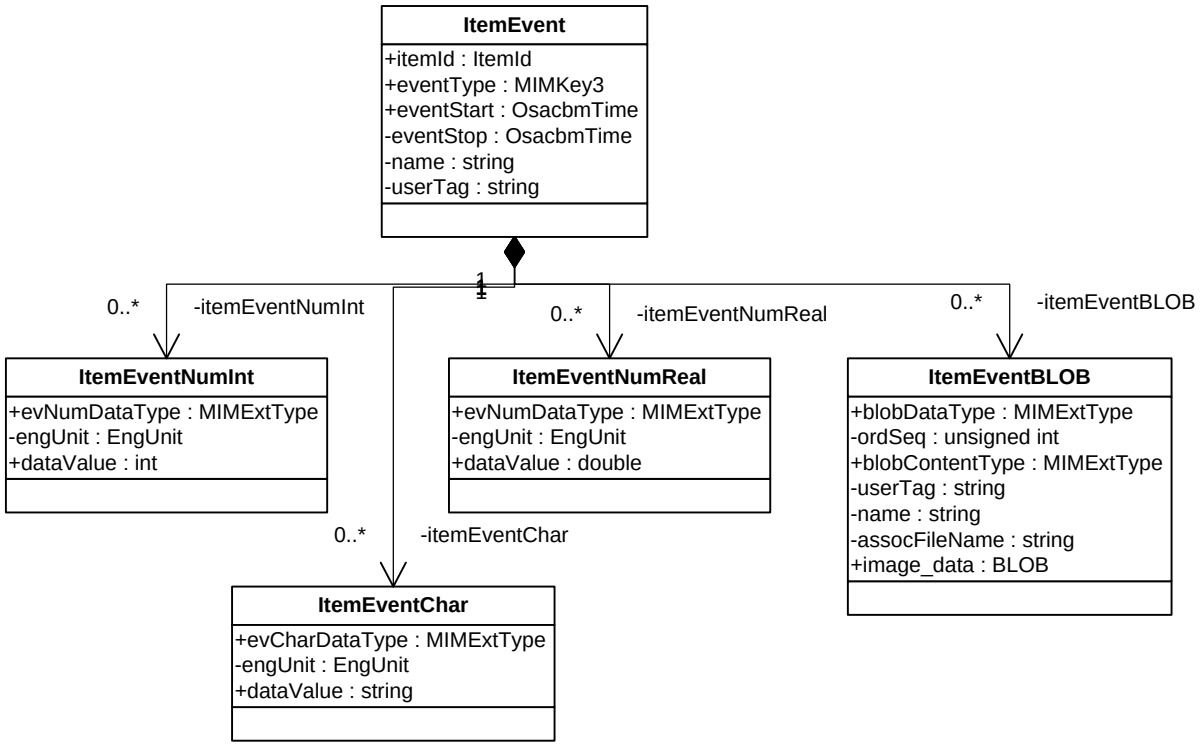
Hi-Low

hiLowSideUsed default is false. MIMOSA OSA-EAI does not presently support this functionality.

The simplest method of use is to have a single set of alertRegions for an output and a direct set of alert types for those regions. The system should be set up so that AlertTypes and AlertRegions are all unique within the system. Then only a single int is needed to identify the code, the RegionId, and the AlertTypeCode respectively.
The Alert classes are based on the MIMOSA OSA-EAI CRIS. Substitute the term Alert for Alarm. The OSA-CBM version has a few extra parameters like those for hysterisis and hiLowSideAlert indicator.
The main principles for optional arguments are:
For those terms that are primary keys in CRIS: if they are not used, then they should be elsewhere in the information schema, i.e. if Site is not specified, use the site found in DataEventSet. For those terms that are not primary keys, like name, they may simply be expected to be found in a database. In short, assume that they are not needed for an operational monitoring system and would only make the system less efficient.

ItemEvent

ItemEvent supports events in the State Detection layer that might correspond to the MIMOSA OSA-EAI tables segment_event and asset_event



ItemEvent can be an OSA EAI asset_event or segment_event. For those ItemEvents which do not have a specialized measurement location, a single measurement location should be assigned to a top level machine segment or asset. Usage is mainly aimed at legacy OSA-EAI applications which used segment_events and asset_events without measurement locations.

The OSA-CBM best practice is to use enumerated types rather than ItemEvents wherever possible because enumerations tie together events of a particular type.

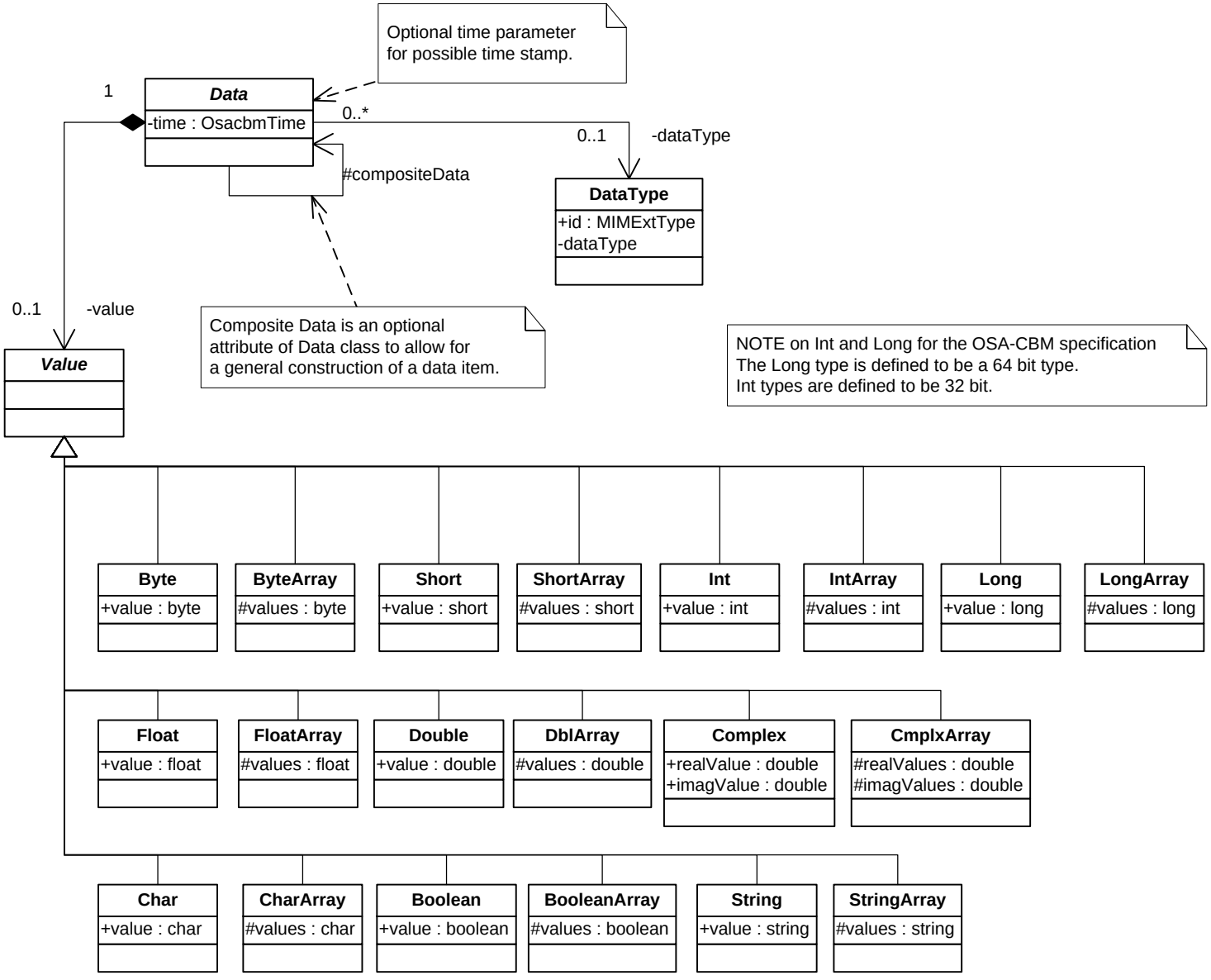
Data class for-user definable types. Read note below on usage.

Data is mainly for user-definable types not in the OSA-CBM specification.
This class set should be used as a last resort. Please report any
required types not in the specification to the OSA-CBM technical subcommittee.

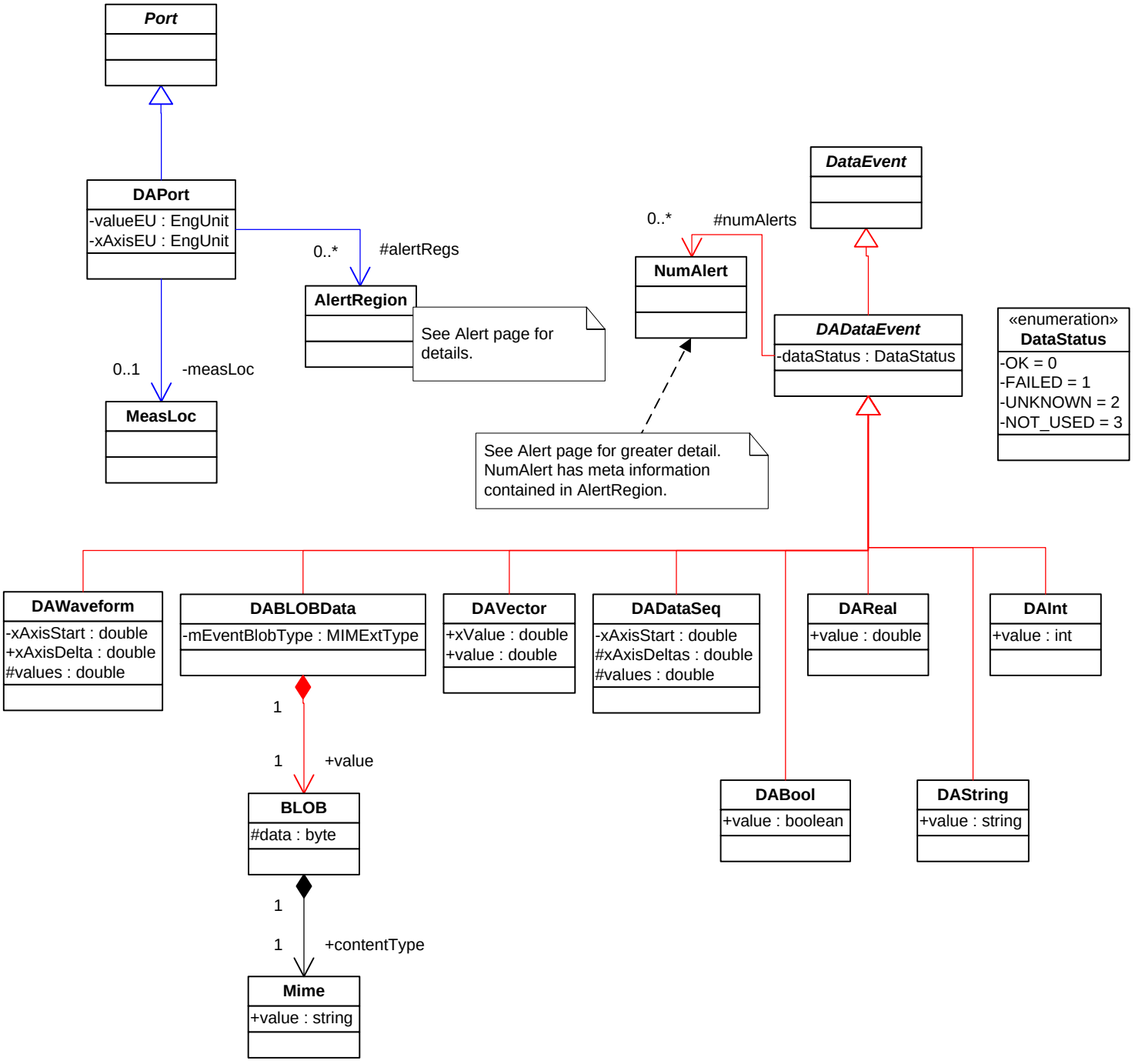
It is preferred that if there exists an information class that can contain
your data in OSA-CBM then that should be used.

The BLOB class is a more standardized for many complext types of data and
a supported approach to sending many data types that are not directly in
the OSA-CBM specification.

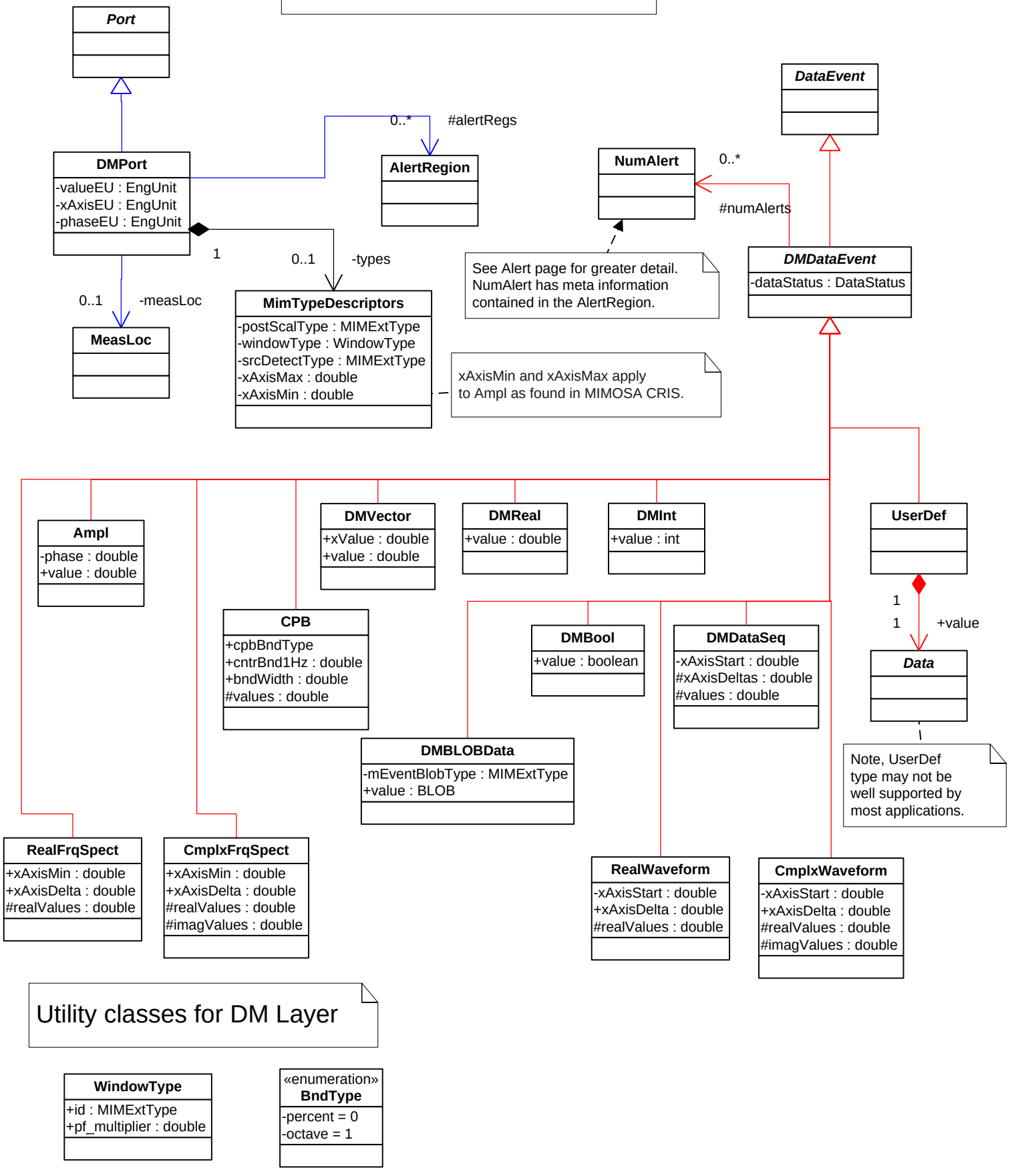
Additionally new types, such as multidimensional arrays,
can be added as a new class to the OSA-CBM specification is required.



DA: Data Acquisition

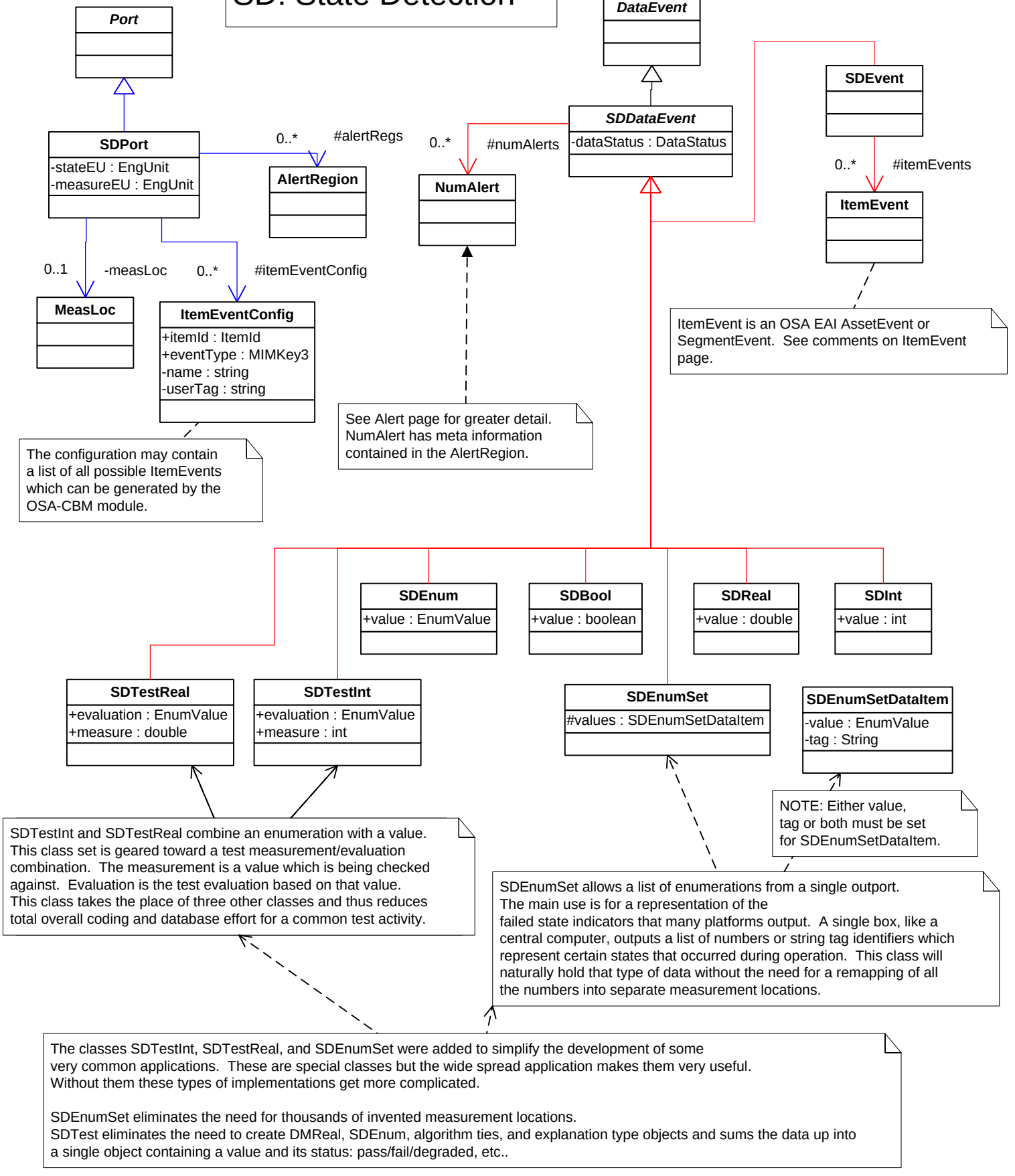


DM: Data Manipulation

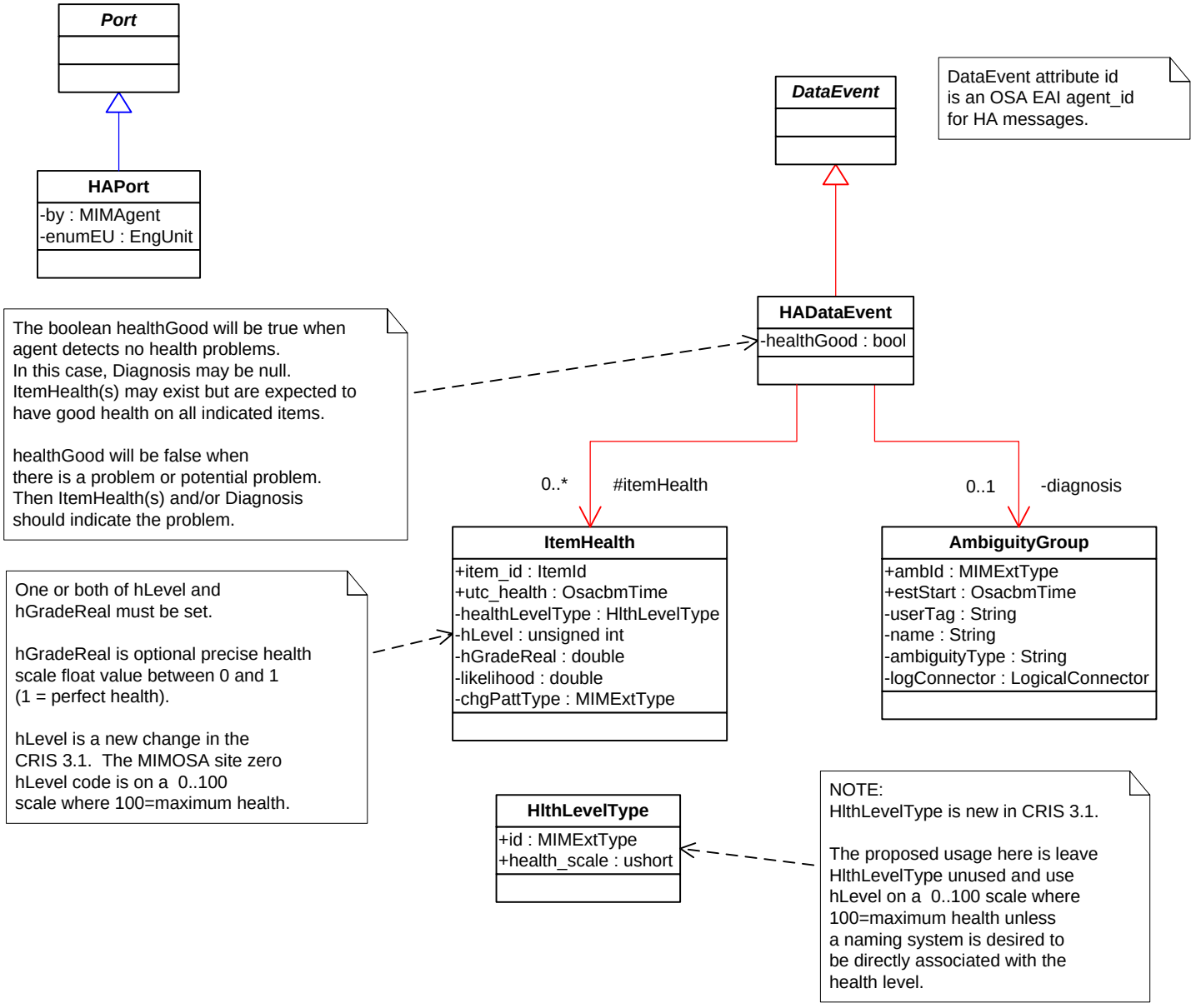


Utility classes for DM Layer

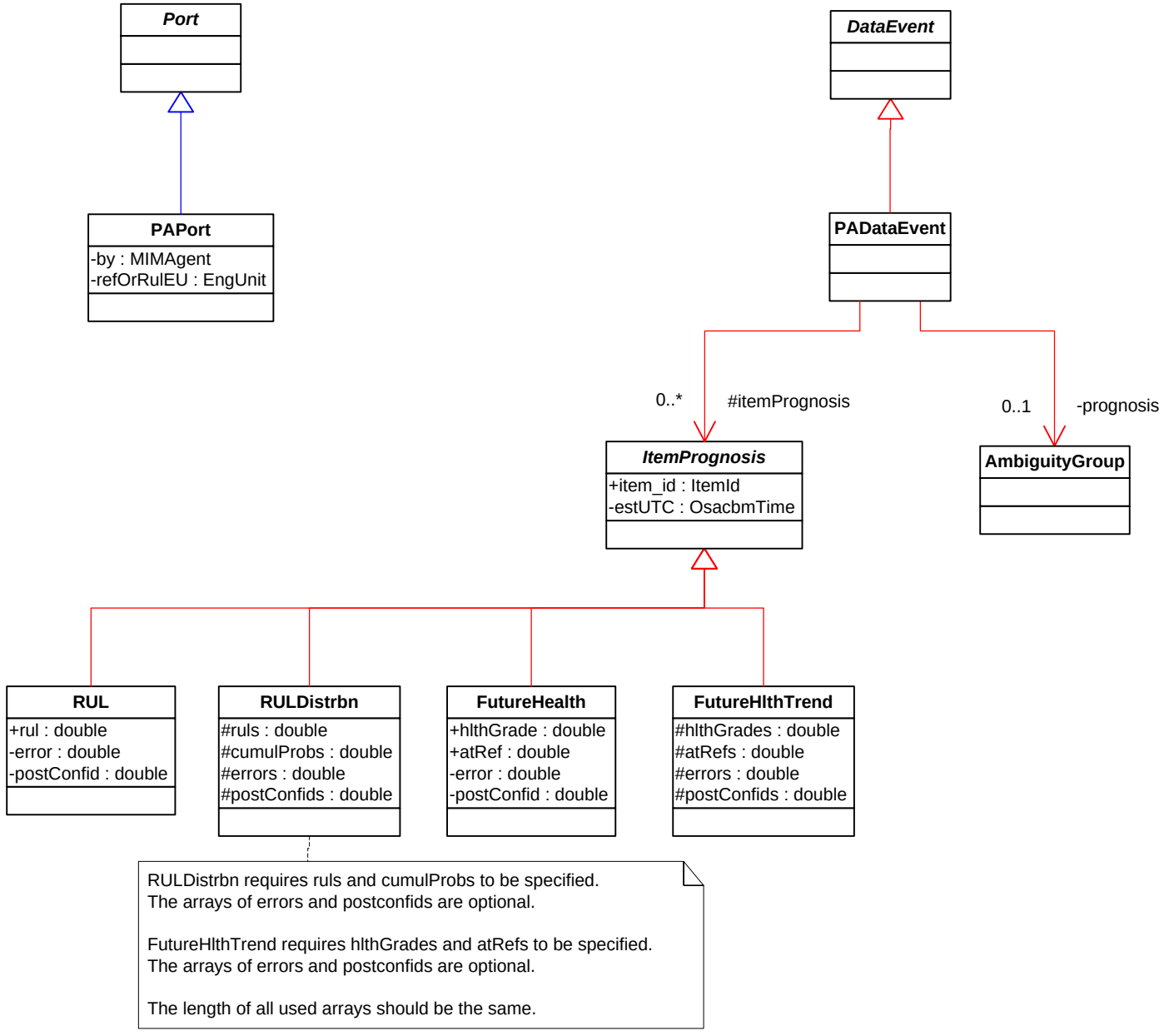
SD: State Detection



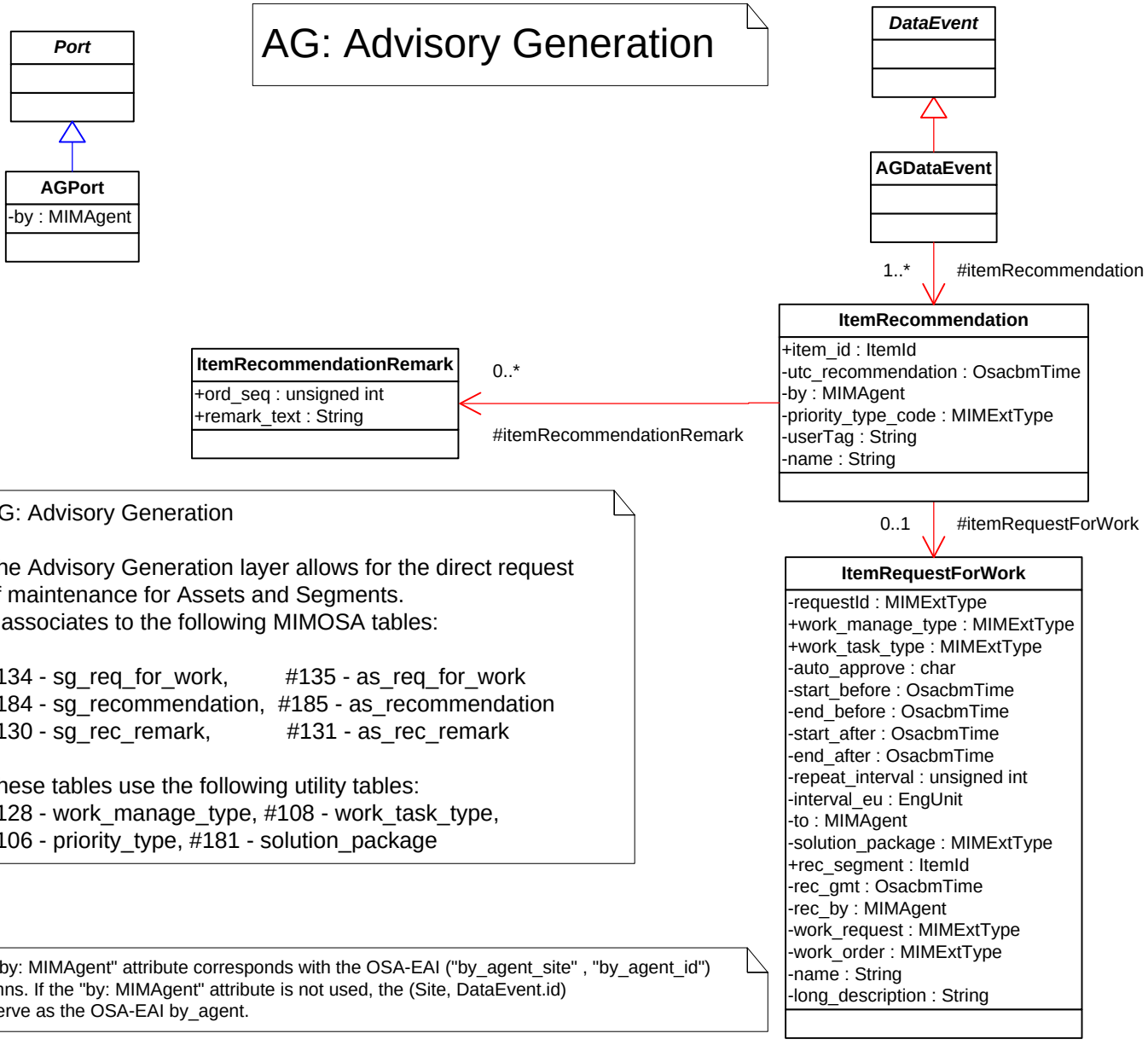
HA: Health Assessment



PA: Prognostics Assessment



AG: Advisory Generation



AG: Advisory Generation

The Advisory Generation layer allows for the direct request of maintenance for Assets and Segments.
It associates to the following MIMOSA tables:

#134 - sg_req_for_work, #135 - as_req_for_work
#184 - sg_recommendation, #185 - as_recommendation
#130 - sg_rec_remark, #131 - as_rec_remark

These tables use the following utility tables:
#128 - work_manage_type, #108 - work_task_type,
#106 - priority_type, #181 - solution_package

The "by: MIMAgent" attribute corresponds with the OSA-EAI ("by_agent_site" , "by_agent_id") columns. If the "by: MIMAgent" attribute is not used, the (Site, DataEvent.id) will serve as the OSA-EAI by_agent.

gtm_recomendation was renamed to utc_recommendation and made optional in 3.2.2. It is now an override on the DataEvent timestamp which is an override on the DataEventSet timestamp

Request for Work for Segment
NOTE: start_before_gmt - Request for action to begin before this time
NOTE: end_before_gmt - Request for action to end before this time
NOTE: start_after_gmt - Request for action to start after this time
NOTE: end_after_gmt - Request for action to end after this time
NOTE: from_sy_agent_site - System the request generated from
NOTE: repeat_interval - Time interval to automatically have work re-submitted for time-based actions
NOTE: int_eu_db_site, int_eu_db_id, int_eu_type_code - Time interval eng unit reference (hours, days, months, etc.)
NOTE: to_agent_site, to_agent_id - Agent to recieve the request work
NOTE: sol_pack_db_site, sol_pack_db_id, sol_pack_id - Associated solution package
NOTE: rec_segment_site, rec_segment_id, rec_gmt_recomm, rec_by_agent_site, ec_by_agent_id
- Associated segment recommendation
NOTE: work_req_db_site, work_req_db_id, work_req_id - Associated Work Request in local or remote database
NOTE: abbrev - User-generated short work description
NOTE: name - User-generated full work description

Start of Note Pages

This page ends the UML specification

and starts the notes pages for OSA-CBM.

Mapping Methodologies

Mapping Methodologies

The goal is to have OSA-CBM map seamlessly into OSA-EAI.
The OSA-CBM to OSA-EAI mapping will have the following components:

1. A simple 1-to-1 information component mapping.
2. OSA-CBM extensions to CRIS that have extra information that OSA-EAI does not need.
3. A mapping document where difficult mappings or mappings that have many potential solutions are specified to be done in only one way.

The following provides a quick overview.

Perhaps 90% or more of OSA-CBM will map directly into OSA-EAI with ease.
There also will be some changes and additions in OSA-EAI to facilitate the mapping.
However there are certain differences and some OSA-CBM needs which
are to be handled by OSA-CBM extensions in the MIMOSA specification.
The main requirement for the extensions deals with the ability to get data out of database
storage in the original OSA-CBM format with all class structure intact and easily retrievable
by a generic mechanism rather than having to hard code an expected form for a
particular known configuration.

Main areas for the extensions include:
1) The OSA-CBM class-type definition specifics.
The ability to know which OSA-CBM class was used to transmit the data.
2) OSACBM time stamp-based message identification scheme.

In OSA-CBM, all messages such as measurement events, health assessments, and proposed events
are identified by agent or meas_location, time stamp,
and, in the HA and PA layers, item id. OSA-CBM small signature vehicles are not expected
to generate new integer primary key signatures. The ability to do that would require
non-volatile memory storage of some form to remember last number used.
Instead, OSA-CBM offers a slightly different primary key basis (agent, time, item).
All the same important information components as those found in OSA-EAI are there.
When such a message reaches a the OSA-EAI database location the OSA-EAI proposed
event primary key signature may be generated.

3) Ambiguity Groups
OSA-EAI has been enhanced to accommodate ambiguity groups.

4) Explanation
Explanation is the ability to show a connection between data used as input and resultant data.
The OSA-CBM explanation classes use references within the OSA-CBM context. An OSA-CBM
extensions Explantion table will be used by those desiring this information to be retrievable.
OSA-EAI has many data tie tables for those desiring this information in the OSA-EAI context.