

CSMD: the Core Scientific Metadata Model

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Abstract

CSMD, the Core Scientific MetaData model, is an model of metadata to capture a description of Scientific "activities" (e.g. experiments, observations, simulations etc) which are characterised by an event where the application of resources (e.g. equipment, instruments) to a subject item (e.g. a chemical, geological or materials sample or biological specimen) causes a signal which is detected via sensors, and results in the collection of data.

The CSMD is currently used largely within the context of large-scale scientific facilities (e.g. Photon and Neutron Sources) and has some characteristics which are specialised to those contexts. However, the model is intended to have a general application and thus these features are kept to a minimum.

A metadata model for Facilities Science

The Core Scientific Metadata Model (CSMD) is a metadata model oriented towards facilities science which has been developed at STFC over the last 12 years; for earlier work see [\[Sufi and Matthews 2004\]](#) [\[Sufi and Matthews 2005\]](#) [\[Matthews, B., et. al 2009\]](#). The CSMD is being used as the core metadata model within the data management infrastructure which is being developed for the large scale scientific facilities supported by STFC including the ISIS Neutron Source and the Diamond Light Source, and now being used across the PaN-Data consortium and elsewhere. It has been the result of an analysis of science practice over a number of years and a number of projects to allow the user to manage their own data, and have access to other interesting data.

The currently version is CSMD v.4.0, and the ICAT data catalogue is based on this version, though the database schema of ICAT has a number of modifications and additions to accommodate the practical implementation of the database.

The model is intended to capture high level information about investigations undertaken at facilities and the data that they produce. However, it is designed to be generic across scientific disciplines and has application beyond facilities science, particularly in the "structural sciences" (such as chemistry, material science, earth science, and biochemistry) which are concerned with the molecular structure of substances, and within which systematic experimental analyses are undertaken on material samples.

The core metadata model

CSMD is organised around the notion of Studies, a study being a body of scientific work on a particular subject of interest. During a study, a scientist would perform a number of activities e.g. experiments, observations, measurements and simulations. Results from these activities usually run through different stages: the collection of raw data, the generation of analysed or derived data through the application of software tools, and end results. Data should be grouped accordingly, and associated with the appropriate experimental parameters. Not all information captured in specific metadata schemas would be used to search for this data or distinguish one data set from another, giving the possibility to select special parameters. The CSMD is designed to be a common general format/standard for Scientific Studies and their associated data holdings.

Thus this model:

- Forms a specification for the types of metadata which should be captured during Scientific Studies.
- Allows citation, collaboration, exploitation and integration of information on scientific studies.
- Allows easy integration of distributed heterogeneous metadata systems into a homogeneous (albeit virtual) platform.

The CSMD has been developed to be a core system which is extensible and can be specialised to particular scientific domains, so it does not make assumptions about the specific terminology of the domain.

The use of the CSMD for facilities is focused on capturing the activities associated with the facilities science lifecycle as detailed in [\[PaNData-ODI D6.1\]](#), which generically is called an Investigation. Thus the Investigation concept represents those activities and research outputs associated with one approved application for use of the facilities. In practice, this may involve a number of visits to use a number of instruments, analysing a number of samples and generating a number of resultant data sets.

The model thus defines a hierarchical model of the structure of scientific research around studies and investigations, with their associated information, and also a generic model of the organisation of data sets into collections and files. Specific data sets can be associated with the appropriate experimental parameters, and details of the files holding the actual data, including their location for linking. This provides a detailed description of the study, although not all information captured in specific metadata schemas would be used to search for this data or distinguish one data set from another.

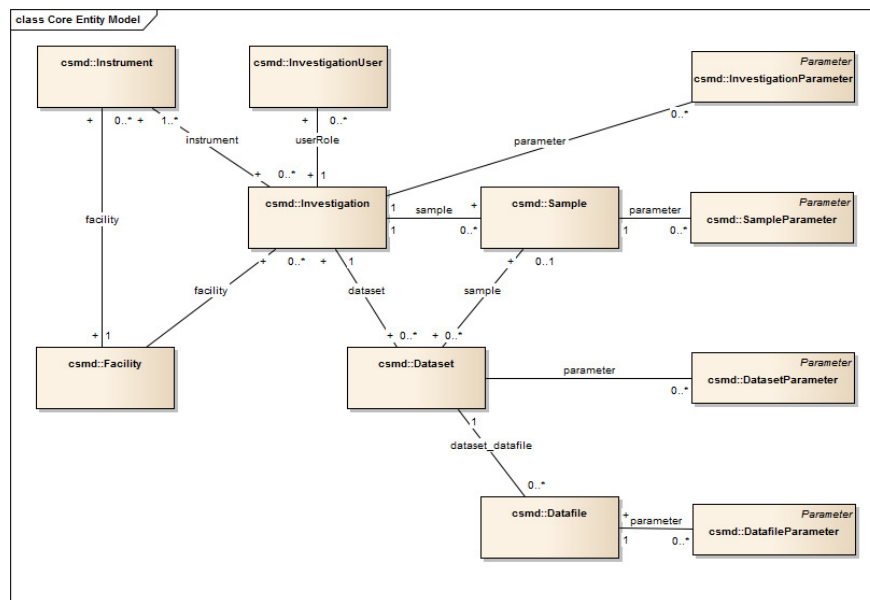


Figure 1: Main entities of the CSMD

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The metadata within the general structure is laid in a series of classes and subclasses. We do not describe the whole model in detail for reasons of space, but rather select some areas of particular interest. The core entities of the CSMD for a study are given in Figure 1, and are summarised as follows.

Study

The fundamental unit of the CSMD Model, collecting together an aggregation of associated scientific activities, data collecting events, artefacts (e.g. instruments, samples, dataset) and people.

Investigation

The fundamental unit of a *facility study*, associated with an accepted proposal for use of the facility to undertake a series of experiments. Attributes including a title, abstract, dates, and unique identifiers referencing the particular investigation.

Facility

The facility which is used within the investigation, hosting the instrument and experiments.

Instrument

The instruments the investigation uses to carry out experiments.

Sample

Information on the material sample analysed within the investigation. The model has attributes for a sample's name, chemical formula and any associated special information, such as specific safety information on a toxic material.

Dataset

One or more datasets can be associated with an investigation, representing different runs or analyses on a sample. Initially a raw data set can be attached to the investigation, but subsequently, analysed datasets can also be added.

Datafile

The CSMD takes a hierarchical view of data holdings, as data sets may contain other dataset as well as units of storage, typically datafiles. Each datafile has more detailed attributes, including its name, version, location, data format, creation and modification time, and fixity information such as a Checksum.

Parameter

Parameters describe measurable quantities associated with the investigation, such as temperature, pressure, or scattering angle, describing either the parameters of the sample, the environment the data was collected in, or the parameters being measured. Parameters can be associated at different levels: the investigation, the sample, dataset or the datafile, and have attributes for names, units, values, and allowable data ranges. These different type of parameter are all represented as subclasses of the general Parameter class. Parameters in CSMD are thus a very general data holding component (essentially a key-value pair table). Parameters thus provides a highly flexible and tailorable mechanisms for representing information about many type of study.

InvestigationUser

A user (represented as a separate entity, omitted for clarity) associated with a role in the investigation.

Additionally, a number of other entities are defined to capture for example, associated publications, data format used, sample types (representing the class of material under analysis, of which the sample is a particular instance), parameter types (representing the classes of parameters of which the parameters are particular instances).

Further entities capture specialist facility concepts, such as "shifts" (representing a daily time period within which the experiment was undertaken) and "cycles" (representing a period of weeks or months where the facility is in active operation between "shutdown" periods of maintenance).

A full UML class diagram of the model is given in Figure 2.

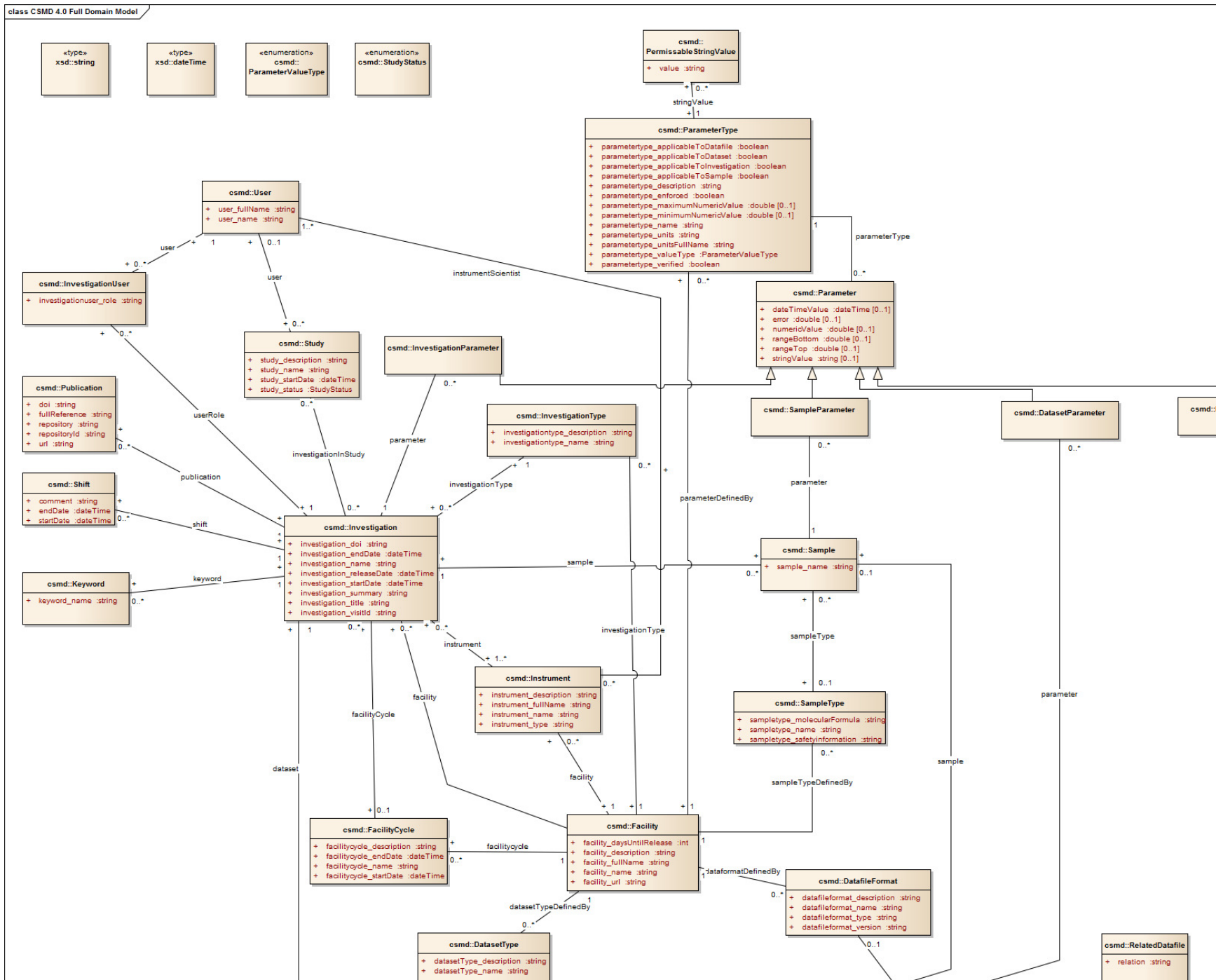


Figure 2: UML Class Diagram for the full CSMD

OWL representation

We support this metadata model by providing a representation as an OWL ontology. This allows us to represent metadata as RDF triples within triple stores (or provide a triple based front end onto metadata databases such as ICAT via for example a SPARQL endpoint. We can also publish data about experiments into Linked Open Data, furthering the publication, exchange and sharing of metadata about facilities experiments, as well as its combination with other metadata items. We give a sample of the OWL representation, for reasons of brevity. The full model can be found on the ICAT Google Code site.

The OWL representation has a base URI: <http://www.purl.org/net/CSMD/4.0#>

The OWL representation reflects the UML model closely. Thus for each UML there is a corresponding OWL Class, as below (using RDF/XML notation):

```
<!-- csmd:Investigation -->

<owl:Class rdf:about="csmd:Investigation">
  <rdfs:label>Investigation</rdfs:label>
  <rdfs:comment>An investigation or experiment</rdfs:comment>
</owl:Class>

<!-- csmd:Facility -->

<owl:Class rdf:about="csmd:Facility">
  <rdfs:label>Facility</rdfs:label>
  <rdfs:comment>An experimental facility</rdfs:comment>
</owl:Class>

<!-- csmd:Dataset -->

<owl:Class rdf:about="csmd:Dataset">
  <rdfs:label>Dataset</rdfs:label>
  <rdfs:comment>A collection of data files and part of an investigation</rdfs:comment>
</owl:Class>

<!-- csmd:Datafile -->

<owl:Class rdf:about="csmd:Datafile">
  <rdfs:label>Datafile</rdfs:label>
  <rdfs:comment>A data file</rdfs:comment>
</owl:Class>
```

For each Class attribute in the UML model, there is a corresponding OWL DatatypeProperty, conventionally named by prefixing the domain Class name with the attribute name as in the below:

```
<!-- csmd:investigation_startDate -->

<owl:DatatypeProperty rdf:about="csmd:investigation_startDate">
  <rdf:type rdf:resource="<owl:FunctionalProperty"/>
  <rdfs:label>investigation_startDate</rdfs:label>
  <rdfs:comment>The time at which the investigation was initiated</rdfs:comment>
  <rdfs:domain rdf:resource="csmd:Investigation"/>
```

```

    <rdfs:range rdf:resource="xsd:dateTime"/>
</owl:DatatypeProperty>

<!-- csmd:investigation_summary -->

<owl:DatatypeProperty rdf:about="csmd:investigation_summary">
  <rdfs:label>investigation_summary</rdfs:label>
  <rdfs:comment>Summary or abstract</rdfs:comment>
  <rdfs:domain rdf:resource="csmd:Investigation"/>
  <rdfs:range rdf:resource="xsd:string"/>
</owl:DatatypeProperty>

<!-- csmd:investigation_title -->

<owl:DatatypeProperty rdf:about="csmd:investigation_title">
  <rdfs:label>investigation_title</rdfs:label>
  <rdfs:comment>Full title of the investigation</rdfs:comment>
  <rdfs:domain rdf:resource="csmd:Investigation"/>
  <rdfs:range rdf:resource="xsd:string"/>
</owl:DatatypeProperty>

```

Similarly, for each association in the UML model, there are two corresponding OWL ObjectProperties which form a pair of inverse Properties , conventionally named by prefixing the domain Class name with the range Class name. This is because whilst the associations in UML are not directed, properties in OWL are. This results for example in the below:

```

<!-- csmd:facility_instrument -->

<owl:ObjectProperty rdf:about="csmd:facility_instrument">
  <rdfs:label>facility_instrument</rdfs:label>
  <rdfs:comment>An Instrument supported by a facility.</rdfs:comment>
  <rdfs:domain rdf:resource="csmd:Facility"/>
  <rdfs:range rdf:resource="csmd:Instrument"/>
  <owl:inverseOf rdf:resource="csmd:instrument_facility"/>
</owl:ObjectProperty>

<!-- csmd:instrument_facility -->

<owl:ObjectProperty rdf:about="csmd:instrument_facility">
  <rdfs:type rdf:resource="owl:FunctionalProperty"/>
  <rdfs:label>instrument_facility</rdfs:label>
  <rdfs:comment>The facility which has this instrument.</rdfs:comment>
  <rdfs:range rdf:resource="csmd:Facility"/>
  <rdfs:domain rdf:resource="csmd:Instrument"/>
</owl:ObjectProperty>

```

```

<!-- csmd:investigation_dataset -->

<owl:ObjectProperty rdf:about="csmd:investigation_dataset">
  <rdf:type rdf:resource="%owl;InverseFunctionalProperty"/>
  <rdfs:label>investigation_dataset</rdfs:label>
  <rdfs:comment>A data set which is the result of an investiga-tion</rdfs:comment>
  <rdfs:range rdf:resource="csmd:Dataset"/>
  <rdfs:domain rdf:resource="csmd:Investigation"/>
</owl:ObjectProperty>

<!-- csmd:dataset_investigation -->

<owl:ObjectProperty rdf:about="csmd:dataset_investigation">
  <rdf:type rdf:resource="%owl;FunctionalProperty"/>
  <rdfs:label>dataset_investigation</rdfs:label>
  <rdfs:comment></rdfs:comment>
  <rdfs:comment>The investigation associated with an da-taset</rdfs:comment>
  <rdfs:domain rdf:resource="csmd:Dataset"/>
  <rdfs:range rdf:resource="csmd:Investigation"/>
  <owl:inverseOf rdf:resource="csmd:investigation_dataset"/>
</owl:ObjectProperty>

```

Note also that some object properties are declared as OWL Functional (or inverseFunctional) properties; this reflects the cardinality constraints of the UML model into the OWL model.

Supporting Provenance

In order to support provenance, we need to relate the model of facility experiments encapsulated in the "data-centric" view expressed in the CSMD with a notion of scientific activity, so that we can provide a notion of the further processes and outputs involved with managing the data. We relate the model with the general notion of a process given in the W3C Prov model [\[PROV-O\]](#), which gives a high level view of a process step as in Figure 3

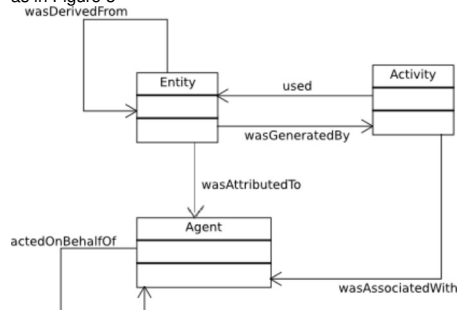


Figure 3: High level view of the structure of Prov records

Thus the Prov model defines three general classes :

- **Entities** are "physical, digital, conceptual, or other kinds of thing. ... Provenance records can describe the provenance of entities, and an entity's provenance may refer to many other entities".
- **Activities** are "how entities come into existence and how their attributes change to become new entities. ... They are dynamic aspects of the world, such as actions, processes, etc".
- **Agent** which take "a role in an activity such that the agent can be assigned some degree of responsibility for the activity taking place. An agent can be a person, a piece of software, an inanimate object, an organization, or other entities that may be ascribed responsibility".

Then the general properties relate these class instances together to represent the relationships between entities and how they were processed by whom to form a record of provenance. Note that, in common with

many approaches to representing provenance, these relationships take the point of view of an historical record of the origins of entities, asking the question "where does this entity come from", so the arrows point from the future to the past.

In the CSMD model, Entities include datasets, datafiles, samples, and indeed, investigations themselves as a conceptual object representing the entirety of the experiment while the InvestigationUser and instruments are Agents. We can add these relationships into the OWL model by making the appropriate CSMD OWL classes subclasses of the PROV-O classes.

The provenance step for which we have the most immediate need is the use of an analytic software package on datasets or specific data files, to generate new datasets and datafiles. Consequently, a new class Job has been added to CSMD to represent the Activity (in the PROV sense) of running a software package on a set of input data to derive a set of output data. We represent this in UML as in Figure 4.

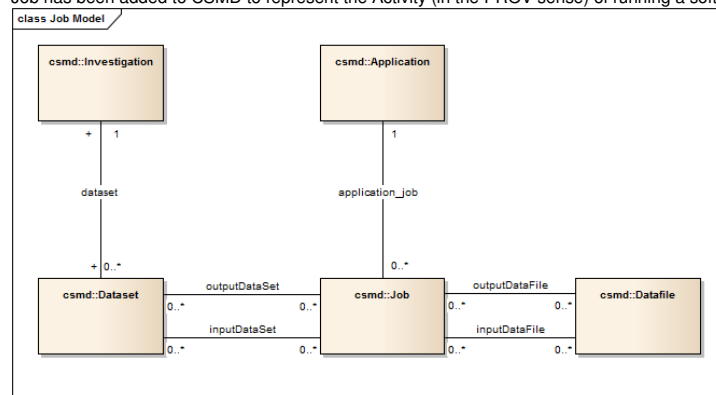


Figure 4: Modelling jobs in CSMD

Thus a Job is an Activity which is associated with a software application as an Agent (again in the PROV-O sense) and takes a number of input data sets and data files within those data sets as inputs, and outputs data files and dataset as output. These data set are themselves linked into the Investigation. Thus inputDataSet and inputDataFile are associations which are specialisations of the PROV-O uses property, and outputDataSet and outputDataFile are associations which are specialisations of the PROV-O wasGeneratedBy property (with appropriate directionality).

Generalising the Activity Model -

We can generalize this notion of Scientific Activity in the CSMD model to add a general class of activities, and add other types of activity. Thus we can add a "Run" activity to the CSMD representing the particular activity of generating a dataset from a sample using an instrument (an agent), as in Figure 5.

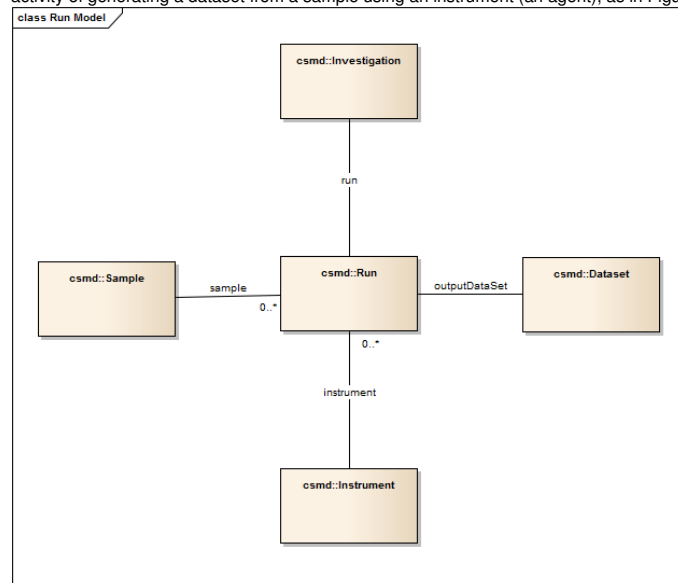


Figure 5: A Run model for CSMD

We would also relate the Investigation to the Run. Adding a Run entity to the CSMD is not included within CSMD 4.0, and is still under discussion as it not as yet accepted that this adds to the current use of ICAT; however, it would make the model more consistent in the representation of provenance.

Description of classes and properties

We give a complete description of the classes and properties in the CSMD model.

Ontology Classes -

Class Id	csmd:Application
Class Name:	Application
Description:	Some piece of software
Class Id	csmd:Datafile
Class Name:	Datafile
Description:	A data file
Class Id	csmd:DatafileFormat
Class Name:	DatafileFormat
Description:	A data file format
Class Id	csmd:DatafileParameter
Class Name:	DatafileParameter
Description:	A parameter associated with a data file
Class Id	csmd:Dataset
Class Name:	Dataset
Description:	A collection of data files and part of an investigation
Class Id	csmd:DatasetParameter
Class Name:	DatasetParameter
Description:	A parameter associated with a data set
Class Id	csmd:DatasetType
Class Name:	DatasetType
Description:	A type of data set
Class Id	csmd:Facility
Class Name:	Facility
Description:	An experimental facility
Class Id	csmd:FacilityCycle
Class Name:	FacilityCycle
Description:	An operating cycle within a facility
Class Id	csmd:Instrument
Class Name:	Instrument
Description:	Used by a user within an investigation
Class Id	csmd:Investigation
Class Name:	Investigation
Description:	An investigation or experiment
Class Id	csmd:InvestigationParameter

Class Name:	InvestigationParameter
Description:	A parameter associated with an investigation
Class Id	csmd:InvestigationType
Class Name:	InvestigationType
Description:	A type of investigation
Class Id	csmd:InvestigationUser
Class Name:	InvestigationUser
Description:	Many to many relationship between investigation and user
Class Id	csmd:Job
Class Name:	Job
Description:	A run of an application with its related inputs and outputs
Class Id	csmd:Keyword
Class Name:	Keyword
Description:	Must be related to an investigation
Class Id	csmd:Parameter
Class Name:	Parameter
Description:	A parameter associated with an entity
Class Id	csmd:ParameterType
Class Name:	ParameterType
Description:	A parameter type with unique name and units
Class Id	csmd:PermissibleStringValue
Class Name:	PermissibleStringValue
Description:	Permissible value for string parameter types
Class Id	csmd:Publication
Class Name:	Publication
Description:	A publication
Class Id	csmd:RelatedDatafile
Class Name:	RelatedDatafile
Description:	Used to represent an arbitrary relationship between data files
Class Id	csmd:Sample
Class Name:	Sample
Description:	A sample to be used in an investigation
Class Id	csmd:SampleParameter
Class Name:	SampleParameter
Description:	A parameter associated with a sample
Class Id	csmd:SampleType
Class Name:	SampleType
Description:	A sample to be used in an investigation

Class Id	csmd:Shift
Class Name:	Shift
Description:	A period of time related to an investigation

Class Id	csmd:Study
Class Name:	Study
Description:	A study which may be related to an investigation

Class Id	csmd:User
Class Name:	User
Description:	A user of the facility

Data Properties -

Property Id	csmd:application_name
Property Name:	application_name
Domain:	csmd:Application
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name for the software - e.g. mantid

Property Id	csmd:application_version
Property Name:	application_version
Domain:	csmd:Application
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	

Property Id	csmd:datafile_checksum
Property Name:	datafile_checksum
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Checksum of file represented as a string

Property Id	csmd:datafile_datafileCreateTime
Property Name:	datafile_datafileCreateTime
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	Date of creation of the actual file rather than storing the metadata

Property Id	csmd:datafile_datafileModTime
Property Name:	datafile_datafileModTime
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	Date of modification of the actual file rather than of the metadata

Property Id	csmd:datafile_description
Property Name:	datafile_description
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A full description of the file contents

Property Id	csmd:datafile_doi
Property Name:	datafile_doi
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The Digital Object Identifier associated with this data file

Property Id	csmd:datafile_fileSize
Property Name:	datafile_fileSize
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#long
Description:	File size expressed in bytes

Property Id	csmd:datafile_location
Property Name:	datafile_location
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The logical location of the file - which may also be the physical location

Property Id	csmd:datafile_name
Property Name:	datafile_name
Domain:	csmd:Datafile
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A name given to the file

Property Id	csmd:datafileformat_description
Property Name:	datafileformat_description
Domain:	csmd:DatafileFormat
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	An informal description of the format

Property Id	csmd:datafileformat_name
Property Name:	datafileformat_name
Domain:	csmd:DatafileFormat
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying the format -e.g. "mp3" within the facility

Property Id	csmd:datafileformat_type
Property Name:	datafileformat_type
Domain:	csmd:DatafileFormat
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Holds the underlying format - such as binary or text

Property Id	csmd:datafileformat_version
Property Name:	datafileformat_version
Domain:	csmd:DatafileFormat
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The version if needed. The version code may be part of the basic name

Property Id	csmd:dataset_complete
--------------------	-----------------------

Property Name:	dataset_complete
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	May be set to true when all data files and parameters have been added to the data set. The precise meaning is facility dependent.

Property Id	csmd:dataset_description
Property Name:	dataset_description
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	An informal description of the data set

Property Id	csmd:dataset_doi
Property Name:	dataset_doi
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The Digital Object Identifier associated with this data set

Property Id	csmd:dataset_endDate
Property Name:	dataset_endDate
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	Time that the data set was last updated.

Property Id	csmd:dataset_location
Property Name:	dataset_location
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Identifies a location from which all the files of the data set might be accessed. It might be a directory

Property Id	csmd:dataset_name
Property Name:	dataset_name
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name for the data set

Property Id	csmd:dataset_startDate
Property Name:	dataset_startDate
Domain:	csmd:Dataset
Range:	http://www.w3.org/2001/XMLSchema#date
Description:	The time that a dataset is created.

Property Id	csmd:datasettype_description
Property Name:	datasettype_description
Domain:	csmd:DatasetType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of this data set type

Property Id	csmd:datasettype_name
Property Name:	datasettype_name
Domain:	csmd:DatasetType

Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying this data set type within the facility

Property Id	csm�:facility_daysUntilRelease
Property Name:	facility_daysUntilRelease
Domain:	csm�:Facility
Range:	http://www.w3.org/2001/XMLSchema#integer
Description:	The number of days before data is made freely available after collecting it.

Property Id	csm�:facility_description
Property Name:	facility_description
Domain:	csm�:Facility
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of this facility

Property Id	csm�:facility_fullName
Property Name:	facility_fullName
Domain:	csm�:Facility
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The full name of the facility

Property Id	csm�:facility_name
Property Name:	facility_name
Domain:	csm�:Facility
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying this facility

Property Id	csm�:facility_url
Property Name:	facility_url
Domain:	csm�:Facility
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A URL associated with this facility

Property Id	csm�:facilitycycle_description
Property Name:	facilitycycle_description
Domain:	csm�:FacilityCycle
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of this facility cycle

Property Id	csm�:facilitycycle_endDate
Property Name:	facilitycycle_endDate
Domain:	csm�:FacilityCycle
Range:	http://www.w3.org/2001/XMLSchema#date
Description:	End of cycle

Property Id	csm�:facilitycycle_name
Property Name:	facilitycycle_name
Domain:	csm�:FacilityCycle
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying this facility cycle within the facility

Property Id	csmd:facilitycycle_startDate
Property Name:	facilitycycle_startDate
Domain:	csmd:FacilityCycle
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	Start of cycle

Property Id	csmd:instrument_description
Property Name:	instrument_description
Domain:	csmd:Instrument
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of this instrument

Property Id	csmd:instrument_fullName
Property Name:	instrument_fullName
Domain:	csmd:Instrument
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The formal name of this instrument

Property Id	csmd:instrument_name
Property Name:	instrument_name
Domain:	csmd:Instrument
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying this instrument within the facility

Property Id	csmd:instrument_type
Property Name:	instrument_type
Domain:	csmd:Instrument
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The type of the instrument - e.g. spectrometer etc. Also should refer to the technique (?)

Property Id	csmd:investigation_doi
Property Name:	investigation_doi
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The Digital Object Identifier associated with this investigation

Property Id	csmd:investigation_endDate
Property Name:	investigation_endDate
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	The latest date of change to the investigation

Property Id	csmd:investigation_name
Property Name:	investigation_name
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name for the investigation

Property Id	csmd:investigation_releaseDate
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Property Name:	investigation_releaseDate
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#date
Description:	A date when the data will be made freely available after an embargo period

Property Id	csmd:investigation_startDate
Property Name:	investigation_startDate
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	The time at which the investigation was initiated

Property Id	csmd:investigation_summary
Property Name:	investigation_summary
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Summary or abstract

Property Id	csmd:investigation_title
Property Name:	investigation_title
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Full title of the investigation

Property Id	csmd:investigation_visitId
Property Name:	investigation_visitId
Domain:	csmd:Investigation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Identifier for the visit to which this investigation is related

Property Id	csmd:investigationtype_description
Property Name:	investigationtype_description
Domain:	csmd:InvestigationType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of this type of investigation

Property Id	csmd:investigationtype_name
Property Name:	investigationtype_name
Domain:	csmd:InvestigationType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A short name identifying this type of investigation

Property Id	csmd:investigationuser_role
Property Name:	investigationuser_role
Domain:	csmd:InvestigationUser
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	

Property Id	csmd:keyword_name
Property Name:	keyword_name
Domain:	csmd:Keyword

Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of the keyword

Property Id	csmd:parameter_dateTimeValue
Property Name:	parameter_dateTimeValue
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	The value if the parameter is a date

Property Id	csmd:parameter_error
Property Name:	parameter_error
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	The error of the numeric parameter

Property Id	csmd:parameter_numericValue
Property Name:	parameter_numericValue
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	The value if the parameter is numeric

Property Id	csmd:parameter_rangeBottom
Property Name:	parameter_rangeBottom
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	The minimum value of the numeric parameter that was observed during the measurement period

Property Id	csmd:parameter_rangeTop
Property Name:	parameter_rangeTop
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	The maximum value of the numeric parameter that was observed during the measurement period

Property Id	csmd:parameter_stringValue
Property Name:	parameter_stringValue
Domain:	csmd:Parameter
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The value if the parameter is a string

Property Id	csmd:parameterType_applicableToDatafile
Property Name:	parameterType_applicableToDatafile
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	If a parameter of this type may be applied to a data file

Property Id	csmd:parameterType_applicableToDataset
Property Name:	parameterType_applicableToDataset
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	If a parameter of this type may be applied to a data set

Property Id	csmd:parameter_type_applicableToInvestigation
Property Name:	parameter_type_applicableToInvestigation
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	If a parameter of this type may be applied to an investigation

Property Id	csmd:parameter_type_applicableToSample
Property Name:	parameter_type_applicableToSample
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	If a parameter of this type may be applied to a sample

Property Id	csmd:parameter_type_description
Property Name:	parameter_type_description
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Description of the parameter type

Property Id	csmd:parameter_type_enforced
Property Name:	parameter_type_enforced
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	True if constraints are enforced

Property Id	csmd:parameter_type_maximumNumericValue
Property Name:	parameter_type_maximumNumericValue
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	

Property Id	csmd:parameter_type_minimumNumericValue
Property Name:	parameter_type_minimumNumericValue
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#double
Description:	

Property Id	csmd:parameter_type_name
Property Name:	parameter_type_name
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of the parameter type

Property Id	csmd:parameter_type_units
Property Name:	parameter_type_units
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of the parameter type units

Property Id	csmd:parameter_type_unitsFullName
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Property Name:	parametertype_unitsFullName
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The formal name of the parameter type units

Property Id	csmd:parametertype_valueType
Property Name:	parametertype_valueType
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	enum with possible values: NUMERIC, STRING, DATE_AND_TIME

Property Id	csmd:parametertype_verified
Property Name:	parametertype_verified
Domain:	csmd:ParameterType
Range:	http://www.w3.org/2001/XMLSchema#boolean
Description:	If ordinary users are allowed to create their own parameter types this indicates that this one has been approved

Property Id	csmd:permissiblestringvalue_value
Property Name:	permissiblestringvalue_value
Domain:	csmd:PermissibleStringValue
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The value of the string

Property Id	csmd:publication_doi
Property Name:	publication_doi
Domain:	csmd:Publication
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The Digital Object Identifier associated with this publication

Property Id	csmd:publication_fullReference
Property Name:	publication_fullReference
Domain:	csmd:Publication
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A reference in the form to be used for citation

Property Id	csmd:publication_repository
Property Name:	publication_repository
Domain:	csmd:Publication
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of a repository where the publication is held

Property Id	csmd:publication_repositoryId
Property Name:	publication_repositoryId
Domain:	csmd:Publication
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The id of the publication within the repository

Property Id	csmd:publication_url
Property Name:	publication_url
Domain:	csmd:Publication

Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A URL from which the publication may be downloaded

Property Id	csmd:relateddatafile_relation
Property Name:	relateddatafile_relation
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Identifies the type of relationship between the two datafiles - e.g. "COPY"

Property Id	csmd:sample_name
Property Name:	sample_name
Domain:	csmd:Sample
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	

Property Id	csmd:samplotype_molecularFormula
Property Name:	samplotype_molecularFormula
Domain:	csmd:SampleType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The formula written as a string -e.g. C2H6O2 for ethylene glycol

Property Id	csmd:samplotype_name
Property Name:	samplotype_name
Domain:	csmd:SampleType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Name of a type of sample

Property Id	csmd:samplotype_safetyInformation
Property Name:	samplotype_safetyInformation
Domain:	csmd:SampleType
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Any safety information related to this sample

Property Id	csmd:shift_comment
Property Name:	shift_comment
Domain:	csmd:Shift
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	

Property Id	csmd:shift_endDate
Property Name:	shift_endDate
Domain:	csmd:Shift
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	

Property Id	csmd:shift_startDate
Property Name:	shift_startDate
Domain:	csmd:Shift
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	

Property Id	csmd:study_description
Property Name:	study_description
Domain:	csmd:Study
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	A description of the study and its purpose

Property Id	csmd:study_endDate
Property Name:	study_endDate
Domain:	csmd:Study
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	The end date of this study

Property Id	csmd:study_name
Property Name:	study_name
Domain:	csmd:Study
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of the study

Property Id	csmd:study_startDate
Property Name:	study_startDate
Domain:	csmd:Study
Range:	http://www.w3.org/2001/XMLSchema#dateTime
Description:	The start date of this study

Property Id	csmd:study_status
Property Name:	study_status
Domain:	csmd:Study
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The status of the study. Possible values are: NEW, IN_PROGRESS, COMPLETE, CANCELLED

Property Id	csmd:user_fullName
Property Name:	user_fullName
Domain:	csmd:User
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	Full name of a user - may include title

Property Id	csmd:user_name
Property Name:	user_name
Domain:	csmd:User
Range:	http://www.w3.org/2001/XMLSchema#string
Description:	The name of the user to match that provided by the authentication mechanism

Object Properties -

Property Id	csmd:application_job
Property Name	application_job
Domain	csmd:Application
Range	csmd:Job
Inverse of	csmd:job_application
Description:	

Property Id	csmd:datafile_datafileFormat
Property Name	datafile_datafileFormat
Domain	csmd:Datafile
Range	csmd:DatafileFormat
Inverse of	csmd:datafileformat_datafile
Description:	

Property Id	csmd:datafile_dataset
Property Name	datafile_dataset
Domain	csmd:Datafile
Range	csmd:Dataset
Inverse of	csmd:dataset_datafile
Description:	The dataset which holds this file

Property Id	csmd:datafile_destDatafile
Property Name	datafile_destDatafile
Domain	csmd:Datafile
Range	csmd:RelatedDatafile
Description:	the destination data file in a datafile-datafile relation

Property Id	csmd:datafile_parameter
Property Name	datafile_parameter
Domain	csmd:Datafile
Range	csmd:DatafileParameter
Description:	Association of a datafile and a parameter associated with that datafile

Property Id	csmd:datafile_sourceDatafile
Property Name	datafile_sourceDatafile
Domain	csmd:Datafile
Range	csmd:RelatedDatafile
Description:	the destination data file in a datafile-datafile relation

Property Id	csmd:datafileformat_datafile
Property Name	datafileformat_datafile
Domain	csmd:DatafileFormat
Range	csmd:Datafile
Description:	Files with this format

Property Id	csmd:datafileformat_facility
Property Name	datafileformat_facility
Domain	csmd:DatafileFormat
Range	csmd:Facility
Inverse of	csmd:facility_datafileFormat
Description:	The facility which has defined this format

Property Id	csmd:datafileparameter_datafile
Property Name	datafileparameter_datafile
Domain	csmd:DatafileParameter
Range	csmd:Datafile

Inverse of	csmd:datafile_parameter
Description:	The associated data file
Property Id	csmd:dataset_datafile
Property Name	dataset_datafile
Domain	csmd:Dataset
Range	csmd:Datafile
Description:	A data file within the dataset
Property Id	csmd:dataset_investigation
Property Name	dataset_investigation
Domain	csmd:Dataset
Range	csmd:Investigation
Inverse of	csmd:investigation_dataset
Description:	The investigation associated with an dataset
Property Id	csmd:dataset_parameter
Property Name	dataset_parameter
Domain	csmd:Dataset
Range	csmd:DatasetParameter
Description:	A Parameter associated with a Dataset
Property Id	csmd:dataset_sample
Property Name	dataset_sample
Domain	csmd:Dataset
Range	csmd:Sample
Inverse of	csmd:sample_dataset
Description:	A Sample associated with a dataset
Property Id	csmd:dataset_type
Property Name	dataset_type
Domain	csmd:Dataset
Range	csmd:DatasetType
Inverse of	csmd:datasettype_dataset
Description:	The type of a dataset
Property Id	csmd:datasetparameter_dataset
Property Name	datasetparameter_dataset
Domain	csmd:DatasetParameter
Range	csmd:Dataset
Inverse of	csmd:dataset_parameter
Description:	The associated data set
Property Id	csmd:datasettype_dataset
Property Name	datasettype_dataset
Domain	csmd:DatasetType
Range	csmd:Dataset
Description:	A dataset which is of a given type.
Property Id	csmd:datasettype_facility

Property Name	datasettype_facility
Domain	csmd:DatasetType
Range	csmd:Facility
Inverse of	csmd:facility_datasetType
Description:	The facility which has defined this data set type

Property Id	csmd:facility_datafileFormat
Property Name	facility_datafileFormat
Domain	csmd:Facility
Range	csmd:DatafileFormat
Description:	A datafile format supported by a facility

Property Id	csmd:facility_datasetType
Property Name	facility_datasetType
Domain	csmd:Facility
Range	csmd:DatasetType
Description:	The types of datasets supported by a facility

Property Id	csmd:facility_facilityCycle
Property Name	facility_facilityCycle
Domain	csmd:Facility
Range	csmd:FacilityCycle
Inverse of	csmd:facilitycycle_facility
Description:	A Facility cycle (period of facility availability) offered by a facility.

Property Id	csmd:facility_instrument
Property Name	facility_instrument
Domain	csmd:Facility
Range	csmd:Instrument
Inverse of	csmd:instrument_facility
Description:	An Instrument supported by a facility.

Property Id	csmd:facility_investigation
Property Name	facility_investigation
Domain	csmd:Facility
Range	csmd:Investigation
Inverse of	csmd:investigation_facility
Description:	An Investigation undertaken within a facility

Property Id	csmd:facility_investigationType
Property Name	facility_investigationType
Domain	csmd:Facility
Range	csmd:InvestigationType
Inverse of	csmd:investigationtype_facility
Description:	An Investigation Type supported by a facility

Property Id	csmd:facility_parameterType
Property Name	facility_parameterType
Domain	csmd:Facility
Range	csmd:ParameterType

Inverse of	csmd:parameter_type_facility
Description:	A parameter type supported by a facility

Property Id	csmd:facility_sampleType
Property Name	facility_sampleType
Domain	csmd:Facility
Range	csmd:SampleType
Inverse of	csmd:samplertype_facility
Description:	A Sample type supported by a facility

Property Id	csmd:facilitycycle_facility
Property Name	facilitycycle_facility
Domain	csmd:FacilityCycle
Range	csmd:Facility
Description:	The facility which has this cycle

Property Id	csmd:facilitycycle_investigation
Property Name	facilitycycle_investigation
Domain	csmd:FacilityCycle
Range	csmd:Investigation
Inverse of	csmd:investigation_facilityCycle
Description:	an investigation within a particular facility cycle

Property Id	csmd:inputdatafile
Property Name	inputdatafile
Domain	csmd:Job
Range	csmd:Datafile
Description:	an input datafile of a job

Property Id	csmd:inputdataset
Property Name	user_studiesinputdataset
Domain	csmd:Job
Range	csmd:Dataset
Description:	an input dataset of a job

Property Id	csmd:instrument_facility
Property Name	instrument_facility
Domain	csmd:Instrument
Range	csmd:Facility
Description:	The facility which has this instrument

Property Id	csmd:instrument_instrumentScientist
Property Name	instrument_instrumentScientist
Domain	csmd:Instrument
Range	csmd:User
Inverse of	csmd:instrumentscientist_instrument
Description:	An instrument scientist is a particular user with expertise on the instrument

Property Id	csmd:instrument_investigation
Property Name	instrument_investigation

Domain	csmd:Instrument
Range	csmd:Investigation
Inverse of	csmd:investigation_instrument
Description:	an investigation which has be undertaken on an instrument

Property Id	csmd:instrumentscientist_instrument
Property Name	instrumentscientist_instrument
Domain	csmd:User
Range	csmd:Instrument
Description:	

Property Id	csmd:investigation_dataset
Property Name	investigation_dataset
Domain	csmd:Investigation
Range	csmd:Dataset
Description:	

Property Id	csmd:investigation_facility
Property Name	investigation_facility
Domain	csmd:Investigation
Range	csmd:Facility
Description:	The facility an investigation takes place within

Property Id	csmd:investigation_facilityCycle
Property Name	investigation_facilityCycle
Domain	csmd:Investigation
Range	csmd:FacilityCycle
Description:	The facility cycle an investigation takes place in

Property Id	csmd:investigation_instrument
Property Name	investigation_instrument
Domain	csmd:Investigation
Range	csmd:Instrument
Description:	The instrument used in an investigation

Property Id	csmd:investigation_investigationUser
Property Name	investigation_investigationUser
Domain	csmd:Investigation
Range	csmd:InvestigationUser
Inverse of	csmd:investigationuser_investigation
Description:	The user which contributes to an investigation

Property Id	csmd:investigation_keyword
Property Name	investigation_keyword
Domain	csmd:Investigation
Range	csmd:Keyword
Inverse of	csmd:keyword_investigation
Description:	A keyword associated with an investigation

Property Id	csmd:investigation_parameter
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Property Name	investigation_parameter
Domain	csmd:Investigation
Range	csmd:InvestigationParameter
Inverse of	csmd:investigationparameter_investigation
Description:	A parameter associated with an investigation

Property Id	csmd:investigation_publication
Property Name	investigation_publication
Domain	csmd:Investigation
Range	csmd:Publication
Inverse of	csmd:publication_investigation
Description:	A publication associated with an investigation

Property Id	csmd:investigation_sample
Property Name	investigation_sample
Domain	csmd:Investigation
Range	csmd:Sample
Inverse of	csmd:sample_investigation
Description:	A sample used within an investigation

Property Id	csmd:investigation_shift
Property Name	investigation_shift
Domain	csmd:Investigation
Range	csmd:Shift
Inverse of	csmd:shift_investigation
Description:	A shift in which the investigation took place.

Property Id	csmd:investigation_study
Property Name	investigation_study
Domain	csmd:Investigation
Range	csmd:Study
Inverse of	csmd:study_investigation
Description:	Association of a Study to an investigation

Property Id	csmd:investigation_type
Property Name	investigation_type
Domain	csmd:Investigation
Range	csmd:InvestigationType
Inverse of	csmd:investigationtype_investigation
Description:	The type of an investigation

Property Id	csmd:investigationparameter_investigation
Property Name	investigationparameter_investigation
Domain	csmd:InvestigationParameter
Range	csmd:Investigation
Description:	The associated investigationThe associated investigation of a parameter

Property Id	csmd:investigationtype_facility
Property Name	investigationtype_facility
Domain	csmd:InvestigationType

Range	csmd:Facility
Description:	The facility which has defined this investigation type

Property Id	csmd:investigationtype_investigation
Property Name	investigationtype_investigation
Domain	csmd:InvestigationType
Range	csmd:Investigation
Description:	An investigation with a particular type

Property Id	csmd:investigationuser_investigation
Property Name	investigationuser_investigation
Domain	csmd:InvestigationUser
Range	csmd:Investigation
Description:	The investigation a user contributes to in a particular role

Property Id	csmd:investigationuser_user
Property Name	investigationuser_user
Domain	csmd:InvestigationUser
Range	csmd:User
Inverse of	csmd:user_investigationUser
Description:	

Property Id	csmd:job_application
Property Name	job_application
Domain	csmd:Job
Range	csmd:Application
Description:	A Software Application used to run a job

Property Id	csmd:keyword_investigation
Property Name	keyword_investigation
Domain	csmd:Keyword
Range	csmd:Investigation
Description:	The investigation to which this keyword applies

Property Id	csmd:outputdatafile
Property Name	outputdatafile
Domain	csmd:Job
Range	csmd:Datafile
Description:	an output datafile of a job

Property Id	csmd:outputdataset
Property Name	outputdataset
Domain	csmd:Job
Range	csmd:Dataset
Description:	the output dataset of a job

Property Id	csmd:parameter_type
Property Name	parameter_type
Domain	csmd:Parameter
Range	csmd:ParameterType

Description:	The type of the parameter
Property Id	csmd:parameter_type_facility
Property Name	parameter_type_facility
Domain	csmd:ParameterType
Range	csmd:Facility
Description:	The facility which has defined this data set type
Property Id	csmd:parameter_type_permmissiblestringvalue
Property Name	parameter_type_permmissiblestringvalue
Domain	csmd:ParameterType
Range	csmd:PermissibleStringValue
Inverse of	csmd:permissiblestringvalue_type
Description:	
Property Id	csmd:permissiblestringvalue_type
Property Name	permissiblestringvalue_type
Domain	csmd:PermissibleStringValue
Range	csmd:ParameterType
Description:	The parameter type to which this permissible string value applies
Property Id	csmd:publication_investigation
Property Name	publication_investigation
Domain	csmd:Publication
Range	csmd:Investigation
Description:	
Property Id	csmd:relateddatafile_destDatafile
Property Name	relateddatafile_destDatafile
Domain	csmd:RelatedDatafile
Range	csmd:Datafile
Description:	
Property Id	csmd:relateddatafile_sourceDatafile
Property Name	relateddatafile_sourceDatafile
Domain	csmd:RelatedDatafile
Range	csmd:Datafile
Description:	
Property Id	csmd:sample_dataset
Property Name	sample_dataset
Domain	csmd:Sample
Range	csmd:Dataset
Description:	A dataset related to a sample
Property Id	csmd:sample_investigation
Property Name	sample_investigation
Domain	csmd:Sample
Range	csmd:Investigation
Description:	

Property Id	csmd:sample_parameter
Property Name	sample_parameter
Domain	csmd:Sample
Range	csmd:SampleParameter
Inverse of	csmd:sampleparameter_sample
Description:	A Parameter associated with a sample

Property Id	csmd:sample_type
Property Name	sample_type
Domain	csmd:Sample
Range	csmd:SampleType
Inverse of	csmd:samplotype_sample
Description:	

Property Id	csmd:sampleparameter_sample
Property Name	sampleparameter_sample
Domain	csmd:SampleParameter
Range	csmd:Sample
Description:	The associated sample

Property Id	csmd:samplotype_facility
Property Name	samplotype_facility
Domain	csmd:SampleType
Range	csmd:Facility
Description:	The facility which has defined this sample type

Property Id	csmd:samplotype_sample
Property Name	samplotype_sample
Domain	csmd:SampleType
Range	csmd:Sample
Description:	

Property Id	csmd:shift_investigation
Property Name	shift_investigation
Domain	csmd:Shift
Range	csmd:Investigation
Description:	

Property Id	csmd:study_investigation
Property Name	study_investigation
Domain	csmd:Study
Range	csmd:Investigation
Description:	An investigation in a study

Property Id	csmd:study_user
Property Name	study_user
Domain	csmd:Study
Range	csmd:User
Description:	The user responsible for the study

Property Id	csmd:user_investigationUser
Property Name	user_investigationUser
Domain	csmd:User
Range	csmd:InvestigationUser
Description:	

Property Id	csmd:user_study
Property Name	user_study
Domain	csmd:User
Range	csmd:Study
Inverse of	csmd:study_user
Description:	The relationship between a user and a study they contribute to.

Property Id	http://www.purl.org/net/CSMD/4.0#parameter_type_parameter
Property Name	
Domain	csmd:ParameterType
Range	csmd:Parameter
Inverse of	csmd:parameter_type
Description:	

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