

The document benefit by having UML diagrams showing the metadata organization we discussed at the specathon.

# MetOcean -WCS New Orleans Specathon

*A communiqué*

Version 0.1

**Date 19th July 2013**

**Secretary: - Peter Trevelyan**

**Discussion document for the required in extensions for a WCS2.0 profile for Meteorological and Oceanographic Data**

***A MetOc profile for “The Describe Coverage Response”,***

***“GetCapabilities” and “GetCoverage”*.**

**V.8**

**Date 12th November 2012**

**Author Peter Trevelyan**

**12*-148 for Met Ocean DWG Discussion paper on WCS2.0.***

Notes on the meeting and about this document:-

The OGC places a strong emphasis on community and the Met-Ocean community has therefore set up a domain working group within the OGC. This group organises and prioritises the requirements of the community and this workshop was a result of the need to create a WCS2.0 extension to support specific Met-Ocean use cases. The meeting was kindly hosted by the United States Navy at NASA Stennis by Dr Roy Ladner who took a lot of trouble to ensure the success of the meeting by ensuring all required facilities were available.

The attendees, listed below, represented a cross section of users, ranging from imagery, meteorology and oceanography. The inclusion of Dr Peter Baumann was a real benefit as he is chair of the OGC WCS standards working group.

This document is incomplete and after the first round of comments will be updated to include the relevant UML diagrams. There may well be errors, so apologies.

Peter Trevelyan (Secretary)

List of Attendees:-

Dr Roy Ladner, US Navy, Naval Meteorology and Oceanography Command

Peter Baumann, Jacobs University

Pete Trevelyan, UK [MetOffice](http://external.opengeospatial.org/twiki_public/bin/edit/CoveragesDWG/MetOffice?topicparent=CoveragesDWG.WcsMetocNewOrleansSpecathon)

Jeremy Tandy, UK [MetOffice](http://external.opengeospatial.org/twiki_public/bin/edit/CoveragesDWG/MetOffice?topicparent=CoveragesDWG.WcsMetocNewOrleansSpecathon)

Yann Genin, Meteo-France

Eric Wise, US Air Force Weather Agency

Chris Kuhl, US Air Force Weather Agency (Northrup Grumman)

Joe Work, US Air Force Weather Agency (Raytheon)

Bryant Obando AFLCMC (Mitre)

Jason Pyron (USN)

Henry Pugh (USN)

Chris Moreau (GD)

**Introduction:-**

This document is a distillation of discussions that were result of a Met-Ocean WCS2.0 specification meeting that took place at the Stennis Space Centre during the last week of June 2013. The attendees (see list below) represented a number of interested communities that included:- Meteorology, Oceanography, Image sensing, Aviation and Defence. The meeting was set the challenge of creating an extension/profile of the core WCS2.0 standard that would support Met/Ocean use cases.

**Background to the meeting:-**

The biggest challenge for the Met-Ocean community is one of dimensionality. Geographers really only deal with two and half dimensions as height is treated as a property of a geodetic dataset. A further complication is introduced as Met-Ocean data is often not continuous in time or in elevation. It is difficult therefore to describe the output of a numerical model as “a 4D” coverage although based on a “4D” computational grid. Some new ideas/concepts are therefore needed to extend the exiting WC2.0 core standard interface (see OGC standards documentation).

**A Short NWP (Numerical Weather Prediction) Primer:-**

The term “NWP model” refers to a specific configuration of a set of numerical algorithms used to forecast the weather. The model name is quite arbitrary, but may reflect the domain i.e. global, UK etc. Typically a model is run at a set time a number of times a day and this time is known (amongst the MetOC community), as the “model run time”, but to avoid any ambiguity this “model run time” will be referred to as the “reference time”. All forecast times for a specific model run are relative to this time. The output from the model is 4 dimensional, but often irregular in time and in the vertical. See diagram below:

A specific NWP model can be thought of as providing a “service” i.e. it provides forecasts for specific parameters over a domain, including oceans. Each model run time has a reference time, i.e. the notional starting point, but some service e.g. an icing service may not, and in this case the reference time would be the time of the last service update. Examples of both kinds of services are included.

**Thoughts from the meeting:-**

Some key proposals to extend the WCS data model:

* The typical output of a NWP model run will have thousands of fields, each of which can be considered to be “a coverage”, this number is unmanageable and a method of grouping them is needed.
* A new concept was therefore introduced that treats the contents of NWP (a numerical weather prediction model) as a collection of coverages grouped by vertical level type. This will reduce the number of coverages to a manageable level. These coverage collections have unique identifiers.
* The grouping of coverages by vertical level type enables the description of a “4D” coverage.
* A new service called “Describe Model Run” is needed to describe these coverages and list their identifiers (aka CoverageIds’) given a coverageCollection identifier.
* A NWP model will have a “reference” time indicating a start time. The forecast time is always relative to this time.
* It will be useful to use the GetCapabilities response to list the reference times for each listed model.
* Models may be grouped together to indicate a common characteristic e.g. Atmospheric models”, “Aviation services” etc.
* A simple service e.g. “latest convection forecast” may be considered as a forecast run with only one available reference time.
* In order to overcome the problem of NWP output often being irregular in time and in the vertical a mask will be used in the “Describe Coverage response” to mask out missing data.

**Document Outline:-**

This document sets out to describe draft proposals for the response and request documents used within a Web Coverage Service (WCS) i.e. operations GetCapabilites, DescribeCoverage and GetCoverage and the proposal for a new operation DescribeModeRun. The Wiki page is located at <http://external.opengeospatial.org/twiki_public/CoveragesDWG/WcsMetocNewOrleansSpecathon>

**GetCapabilities:-**

A *GetCapabilities* operation allows a WCS client to retrieve service metadata and coverages metadata offered by a WCS server. The scope of the first version of this document covers numerical model output, derived from a computation based on a well defined grid. At a later stage other data types will be included e.g. observations.

**GetCapabilities and service end points:-**

The GetCapabilities response advertises the offered operations i.e. the Get Capabilities, GetCoverage and DescribeCoverage. These services can be extended to provide an extension point to the core WCS2.0 standard and this is particularly important for “GetCoverage.” A possible future extension to the service model could be service called “DescribeMetOCCoverageSet.” This new service will be able to take extra parameters, but for the purpose of this document this extension has not been included in the examples.

This approach means that, even though the GetCapabilites “end point” stays the same, services can be added/deleted without changes to the client software as long as the client reads the GetCapabilites response. This is possible because the service end points are referred to via an “href” reference that is encoded in the XML capabilities document. This approach is somewhat different to the WCS1.0 specification where the WCS service end point is embedded in the URL.

*If* *required, all coverage’s can be requested by using the “vanilla” DescribeCoverage request, but this may result in a very large coverage description document which is why a filter option is employed (see examples). (This option is not included in this version of the document)*

**GetCapabilities Request:-**

This diagram shows the relationship between the classes for GetCapabilities request. The example below only requests two sections i.e. OperationMetadata and DataSeriesSummary. The example response implies that the sections CoverageSummary, ServiceIdentification and ServiceProvider have been included in the request.



A typical GetCapabilites request is straightforward and simple. This example is requesting both operations and a data series request. The XML would be posted to a given service end point i.e. server.

An example of a GetCapabilities Request:-

<?xml version="1.0" encoding="UTF-8"?>

<wcs:GetCapabilities

 xmlns:ows='http://www.opengis.net/ows/2.0'

 xmlns:wcs='http://www.opengis.net/wcs/2.0'

 xmlns:wcsmo="http://www.metoffice.gov.uk/wcsmo/1.0"

 xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'

 xsi:schemaLocation=http://schemas.opengis.net/wcs/2.0/wcsAll.xsd'service="WCS">

 <ows:AcceptVersions>

 <ows:Version>2.0.0</ows:Version>

 </ows:AcceptVersions>

 <ows:Sections>

 <ows:Section>OperationsMetadata</ows:Section>

 <ows:Section>ModelrunSummary</ows:Section>

 </ows:Sections>

</wcs:GetCapabilities>

GetCapabilities Response:-

The GetCapabilities response document consists of a service metadata section and an optional contents section. Service metadata are those defined in the s­er­vice­Metadata component of the server’s coverage offering. The contents section delivers information about the coverage offering of the server. This figure shows this structure.



The areas of real interest are the “OperationsMetadata” and the “ServiceMetadata” sections. The “OperationsMetadata” advertises the various operations that are supported and are really service endpoints. There are three mandatory operations i.e. GetCapabilities, GetCoverage and DescribeCoverage. The other operations are specific to the particular provider and support the tailoring of services. Note that these operations have been extended beyond those already defined in the WCS namespace. So for example DescribeModelRun is a service that has been set up on the server and can be invoked.

**Example GetCapabilities Response:-**

The following listing is an example of a typical response to a GetCapabilities request. The only extension to the core standard is the inclusion of some extra metadata after the “extension” element. This extra metadata could, and probably will be extended in the future. Note that there is a unique relationship with the CollectionId and DescribeModelRun. The following diagram shows the structure of the contents section.



**Example GetCapabilities Response:**

<?xml version="1.0" encoding="ISO-8859-1"?>
<wcs:Capabilities updateSequence="20120504T160000Z" version="2.0.0"
 xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:gmlcov="http://www.opengis.net/gmlcov/1.0"
 xmlns:ogc="http://www.opengis.net/ogc"
 xmlns:ows="http://www.opengis.net/ows/2.0"
 xmlns:swe="http://www.opengis.net/swe/2.0"
 xmlns:wcs="http://www.opengis.net/wcs/2.0"
 xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:metocean="http://def.wmo.int/metocean/2013"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
 <ows:ServiceIdentification>
 <ows:Title>Test configuration of Met data server</ows:Title>
 <ows:Abstract> Copyright (C) The Met Office - UK </ows:Abstract>
 <ows:Keywords>
 <ows:Keyword>MO-WCS</ows:Keyword>
 <ows:Keyword>WCS MO-AP</ows:Keyword>
 <ows:Keyword>WCS 2.0</ows:Keyword>
 <ows:Keyword>WCS</ows:Keyword>
 <ows:Keyword>WMS</ows:Keyword>
 <ows:Keyword>MO-WMS</ows:Keyword>
 <ows:Keyword>UKPP</ows:Keyword>
 <ows:Keyword>UKGLOBAL</ows:Keyword>
 <ows:Keyword>UKNAE</ows:Keyword>
 <ows:Keyword>UKMESO</ows:Keyword>
 <ows:Keyword>ICING</ows:Keyword>
 </ows:Keywords>
 <ows:ServiceType codeSpace="OGC">OGC WCS</ows:ServiceType>
 <ows:ServiceTypeVersion>2.0.0</ows:ServiceTypeVersion>
 <ows:Profile>http://www.opengis.net/spec/WCS\_application-profile\_metoc/1.0/conf/mowcs</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_application-profile\_metoc/1.0/conf/mowcs\_get-kvp</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS/2.0/conf/core</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_protocol-binding\_get-kvp/1.0/conf/get-kvp</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_protocol-binding\_post-xml/1.0/conf/post-xml</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_service-model\_crs-predefined/1.0/conf/crs-
 predefined</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_encoding\_geotiff/1.0/conf/geotiff</ows:Profile>
 <ows:Profile>http://www.placeholder.com/GML\_and\_GeoTIFF</ows:Profile>
 <ows:Profile>http://www.opengis.net/spec/WCS\_service-
 model\_scaling+interpolation/1.0/conf/scaling+interpolation</ows:Profile>
 <ows:Fees>None</ows:Fees>
 <ows:AccessConstraints>None</ows:AccessConstraints>
 </ows:ServiceIdentification>
 <ows:ServiceProvider>
 <ows:ProviderName>The Met Office Fitzroy Road Exeter UK EX13PB</ows:ProviderName>
 <ows:ProviderSite xlink:href="http://metocserver.metoffice.gov.uk" xlink:type="simple"/>
 <ows:ServiceContact>
 <ows:IndividualName>A Another</ows:IndividualName>
 <ows:PositionName>Programme Tech Lead</ows:PositionName>
 <ows:ContactInfo>
 <ows:Phone>
 <ows:Voice>Provided on request</ows:Voice>
 <ows:Facsimile>None</ows:Facsimile>
 </ows:Phone>
 <ows:Address>
 <ows:DeliveryPoint>Fitzroy Road</ows:DeliveryPoint>
 <ows:City>Exeter</ows:City>
 <ows:AdministrativeArea>Exeter</ows:AdministrativeArea>
 <ows:PostalCode>EX13PB</ows:PostalCode>
 <ows:Country>UK</ows:Country>
 <ows:ElectronicMailAddress>office@metoffice.gov.uk</ows:ElectronicMailAddress>
 </ows:Address>
 <ows:OnlineResource xlink:href="http://metocserver.metoffice.gov.uk" xlink:type="simple"/>
 <ows:HoursOfService>Mon - Fri 08:30 - 17:00 UT and CEST+1</ows:HoursOfService>
 <ows:ContactInstructions>E-mails are usually answered within 3 working
 days.</ows:ContactInstructions>
 </ows:ContactInfo>
 <ows:Role>Service provider</ows:Role>
 </ows:ServiceContact>
 </ows:ServiceProvider>
 <ows:OperationsMetadata>
 <ows:Operation name="GetCapabilities">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/ows?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="DescribeCoverage">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/demo /ows?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/demo/ows?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="GetCoverage">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="GetCorridorCoverage">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="GetCrossSection">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="GetTimeCrossSectionCoverage">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="GetPolygonCoverage">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk/test?" xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Operation name="DescribeModelRun">
 <ows:DCP>
 <ows:HTTP>
 <ows:Get xlink:href="http://emetocserver.metoffice.gov.uk/test?"
 xlink:type="simple"/>
 <ows:Post xlink:href="http://metocserver.metoffice.gov.uk.org/test?"
 xlink:type="simple">
 <ows:Constraint name="PostEncoding">
 <ows:AllowedValues>
 <ows:Value>XML</ows:Value>
 </ows:AllowedValues>
 </ows:Constraint>
 </ows:Post>
 </ows:HTTP>
 </ows:DCP>
 </ows:Operation>
 <ows:Constraint name="CountDefault">
 <ows:NoValues/>
 <ows:DefaultValue>100</ows:DefaultValue>
 </ows:Constraint>
 </ows:OperationsMetadata>
 <wcs:ServiceMetadata/>
 <wcs:Contents>
 <wcs:CoverageSummary>
 <wcs:CoverageId>Atmospheric\_NWP\_Models</wcs:CoverageId>
 <wcs:CoverageSubtype>ReferenceableDataset</wcs:CoverageSubtype>
 </wcs:CoverageSummary>
 <wcs:extension>
 <metocean:ModelrunSummary>
 <metocean:memberList>
 <metocean:ModelRunCollectionSummary>
 <metocean:CollectionId>UK-Global\_model</metocean:CollectionId>
 <gml:name>The UK operational Global Model</gml:name>
 <ows:WGS84BoundingBox>
 <ows:LowerCorner>-180 -90</ows:LowerCorner>
 <ows:UpperCorner>180 90</ows:UpperCorner>
 </ows:WGS84BoundingBox>
 <metocean:ReferenceTime>
 <metocean:referenceTimeList>
 <metocean:ReferenceTimeList>
 <metocean:referenceTime>2012-12-15T00:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-15T12:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T00:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T12:00:00Z</metocean:referenceTime>
 </metocean:ReferenceTimeList>
 </metocean:referenceTimeList>
 </metocean:ReferenceTime>
 </metocean:ModelRunCollectionSummary>
 <metocean:ModelRunCollectionSummary>
 <metocean:CollectionId>COAMPS\_EPAC</metocean:CollectionId>
 <gml:name>USN\_East\_Pacifice\_Mesoscale\_Model</gml:name>
 <ows:WGS84BoundingBox>
 <ows:LowerCorner>-170 30</ows:LowerCorner>
 <ows:UpperCorner>-130 60</ows:UpperCorner>
 </ows:WGS84BoundingBox>
 <metocean:ReferenceTime>
 <metocean:referenceTimeList>
 <metocean:ReferenceTimeList>
 <metocean:referenceTime>2012-12-15T00:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-15T12:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T00:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T12:00:00Z</metocean:referenceTime>
 </metocean:ReferenceTimeList>
 </metocean:referenceTimeList>
 </metocean:ReferenceTime>
 </metocean:ModelRunCollectionSummary>
 <metocean:ModelRunCollectionSummary>
 <metocean:CollectionId>Arpege</metocean:CollectionId>
 <gml:name>ARPEGE is a global spectral model</gml:name>
 <ows:WGS84BoundingBox>
 <ows:LowerCorner>-180 -90</ows:LowerCorner>
 <ows:UpperCorner>180 90</ows:UpperCorner>
 </ows:WGS84BoundingBox>
 <metocean:ReferenceTime>
 <metocean:referenceTimeList>
 <metocean:ReferenceTimeList>
 <metocean:referenceTime>2012-12-15T00:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-15T06:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T12:00:00Z</metocean:referenceTime>
 <metocean:referenceTime>2012-12-16T18:00:00Z</metocean:referenceTime>
 </metocean:ReferenceTimeList>
 </metocean:referenceTimeList>
 </metocean:ReferenceTime>
 </metocean:ModelRunCollectionSummary>
 </metocean:memberList>
 </metocean:ModelrunSummary>
 </wcs:extension>
 </wcs:Contents>
</wcs:Capabilities>

**DescribeModelRun:-**

The “DescribeModelRun” request, using a collection identifier (CollectionId), submits returns, for reference time, a list of coverage identifiers (CoverageId).

**Example DescribeModelRun Request:-**

In these examples of the DescribeModelRun request the “ReferenceTime” is used to denote a specific/range of “model run time(s)”. For services where the reference denotes the time the service was last updated the “ReferenceTime” then the use of this filter has no real purpose.

Obtain the coverage description for a coverage with a CoverageId “UKMOGLOBAL” for the model reference time 2012-05-15T00:00:00Z.

*http://metofficeserver.gov.uk/demo/ows?*

 *service=wcs&*

 *version=2.0.0&*

 *request=DescribeModelRun&*

 *ReferenceTime ="2012-05-15T00:00:00Z"&*

 *CollectionId=UKMOGLOBAL*

Obtain the coverage descriptions for “UKBESTDATA” for all= model run times between 2012-05-01T00:00:00Z and 2012-05-02T00:00:00Z

*http://metofficeserver.gov.uk/demo/ows?*

 *service=wcs&*

 *version=2.0.0&*

 *request= DescribeModelRun&*

 *ReferenceTime="2012-05-01T00:00:00Z","2012-05-02T00:00:00Z"&*

 *CollectionId =UKBESTDATA*

Obtain the coverage description for “AIRCRAFT\_ICING\_SERVICE”. There is no need to specify a time as there is only one dataset (or service). The forecast times contained within the dataset will be enumerated in the DescribeCoverage Response.

http://metofficeserver.gov.uk/demo/ows?

 service=wcs&

 version=2.0.0&

 request=DescribeCoverageSet&

 CoverageId=AIRCRAFT\_ICING\_SERVICE

**Example DescribeModelRun Response:-**

<?xml version="1.0" encoding="UTF-8"?>
<metocean:ModelRunDescriptions
 xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:ows="http://www.opengis.net/ows/2.0"
 xmlns:wcs="http://www.opengis.net/wcs/1.0"
 xmlns:gmlcov="http://www.opengis.net/gmlcov/1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:om="http://www.opengis.net/om/2.0"
 xmlns:metocean="http://www.wmo.int/metocean"
 xsi:schemaLocation="http://www.wmo.int/metocean fwcsMetOCall2.xsd">
 <metocean:ModelRunDescription>
 <metocean:CollectionId>UK\_Global\_model</metocean:CollectionId>
 <gml:name>The UK operational Global Model</gml:name>
 <ows:WGS84BoundingBox>
 <ows:LowerCorner>-180 -90</ows:LowerCorner>
 <ows:UpperCorner>180 90</ows:UpperCorner>
 </ows:WGS84BoundingBox>
 <metocean:referenceTime>
 <gml:TimeInstant>2013-05-15T00:00:00Z</gml:TimeInstant>
 </metocean:referenceTime>
 <metocean:sourceObservation>
 <om:OM\_Observation>
 <om:type xlink:href=

 "http://codes.wmo.int/common/observation-type/METCE/2013/SamplingCoverageMeasurement"/>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="TimeRange">
 <gml:beginPosition>2013-05-15T00:00:00Z</gml:beginPosition>
 <gml:endPosition>2013-10-15T00:00:00Z</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="arrival\_time\_on\_system">
 <gml:timePosition>2013-05-15T03:30:00Z</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:parameter>
 <om:NamedValue>
 <om:name xlink:href=

 "http://codes.wmo.int/common/observation-type/METCE/2013/ReferenceTime"/>
 <om:value>
 <gml:TimeInstant>2013-05-15T00:00:00Z</gml:TimeInstant>
 </om:value>
 </om:NamedValue>
 </om:parameter>
 <om:procedure>
 <metce:Process>
 <gml:description>UKMO Unified Model</gml:description>
 </metce:Process>
 </om:procedure>
 <om:observedProperty xlink:href=

 "http://codes.wmo.int/common/observation-type/METCE/2013/NWP\_Model"/>
 <om:featureOfInterest>
 <sams:SF\_SpatialSamplingFeature gml:id="ss-SHANWICK\_OCA">
 <sam:type xlink:href=

 "http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF\_SamplingSurface"/>
 <sam:sampledFeature>
 <metocean:ModelDomain gml:id="uuid.37a7f1d0-b731-11e2-9e96-0800200c9a66">
 <gml:identifier codeSpace=

 "urn:uuid:">37a7f1d0-b731-11e2-9e96-0800200c9a66</gml:identifier>
 <metocean:type>model\_grid\_definition</metocean:type>
 <metocean:originatingcentre>EGRR</metocean:originatingcentre>
 <metocean:modelidentifier>UKMetOfficeGlobalModel</metocean:modelidentifier>
 <metocean:geometryComponent>
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 90.0 -180.0
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 -90.0 -180.0
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 UK\_GLOBAL\_2013-05-15T00:00:00Z\_Specific\_Altitude\_Above\_Mean\_Sea\_Level

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 <sam:sampledFeature>
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 srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
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 </gml:Polygon>
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 </wcs:CoverageSummary>
 <wcs:CoverageSummary>
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 <gml:name>Ground</gml:name>
 </wcs:CoverageSummary>
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 <gml:name>Ground</gml:name>
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 UK\_GLOBAL\_2013-05-15T12:00:00Z\_Specific\_Altitude\_Above\_Mean\_Sea\_Level

 </wcs:CoverageId>
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 </wcs:CoverageSummary>
 </metocean:memberList>
 <wcs:ServiceParameters/>
 </metocean:ModelRunDescription>
</metocean:ModelRunDescriptions>

**======================================**

**DescribeCoverage:-**

The “DescribeCoverage” request returns, for a given coverage identifier, a description of that coverage.

**Example Describe Coverage Request:-**

In these examples of the DescribeCoverage request the “ReferenceTime” is used to denote a specific “model run time”. For a coverage that is continuously updated and for which only the latest update is provided, e.g. convection forecasts, the reference denotes the time the coverage was last updated and would not be used.

Some examples:-

http://metofficeserver.gov.uk/demo/ows?

 service=wcs&

 version=2.0.0&

 request= DescribeCoverage &

 subset=ReferenceTime("2013-05-01T00:00:00Z")&

 CoverageId= UK\_GLOBAL\_2013-05-15T00:00:00Z\_ISBL

Obtain the coverage description for “AIRCRAFT\_ICING\_SERVICE”.There is no need to specify a time as there is only one dataset (or service).

http://metofficeserver.gov.uk/demo/ows?

 service=wcs&

 version=2.0.0&

 request= DescribeCoverage&

 CoverageId=Aircraft\_Icing\_Service\_ISBL

**Example Describe Coverage Response:-**

This diagram shows the relationship between the classes for a describe coverage response. Note that metadata is shown as an attribute in Coverage Description that provides an extension point for community specific metadata.

This diagram is the UML diagram for the DescribeCoverage response.



**DescribeCoverage Response:-**

By referring to the UML diagrams above it can be seen that the DescribeCoverage response document is divided up into sections i.e.

* <boundedBy>
* <CoverageId>
* <metadata>
* <domainSet>
* <rangeType>
* <ServiceParameters>

The Met-Ocean extension will be part of the metadata section that is itself an extension of the O&M Observation class. The O&M observation provides frame work for time, feature of interest as well as the observation procedure, in this case a numerical weather prediction model. Additional metadata is required as not all forecast times are offered for all levels. This problem is addressed by providing a mask that will indicate, for each parameter, what is omitted and what is included.

**Example of a DescribeCoverage Response:-**

<?xml version="1.0" encoding="UTF-8"?>
<wcs:CoverageDescriptions
 xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:ows="http://www.opengis.net/ows/2.0"
 xmlns:wcs="http://www.opengis.net/wcs/1.0"
 xmlns:gmlcov="http://www.opengis.net/gmlcov/1.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:om="http://www.opengis.net/om/2.0"
 xmlns:metocean="http://www.wmo.int/metocean"
 xsi:schemaLocation="http://metoffice.gov.uk/metocean file:/U:/Architect/WCS/MOWCS2/wcsMetOCall2.xsd">
 <wcs:CoverageDescription>
 <gml:boundedBy>
 <gml:Envelope axisLabels="lat long" srsDimension="2"
 srsName="http://www.opengis.net/def/crs/EPSG/0/4326" uomLabels="deg deg">
 <gml:lowerCorner>-90.0 0.0</gml:lowerCorner>
 <gml:upperCorner>90.0 360.0</gml:upperCorner>
 </gml:Envelope>
 </gml:boundedBy>
 <wcs:CoverageId>UK\_GLOBAL\_2013-05-15T00:00:00Z\_ISBL</wcs:CoverageId>
 <gmlcov:metadata>
 <metocean:MetOceanCoverageMetadata>
 <metocean:sourceObservation>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="TimeRange">
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 <gml:endPosition>2013-10-15T12:00:00Z</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="arrival\_time\_on\_system">
 <gml:timePosition>2013-05-15T15:30:00Z</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:parameter>
 <om:NamedValue>
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 <om:value>
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 </om:value>
 </om:NamedValue>
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 </metce:Process>
 </om:procedure>
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 <om:featureOfInterest>
 <sams:SF\_SpatialSamplingFeature gml:id="ss-SHANWICK\_OCA">
 <sam:type xlink:href="http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF\_SamplingSurface"/>
 <sam:sampledFeature>
 <metocean:ModelDomain gml:id="uuid.37a7f1d0-b731-11e2-9e96-0800200c9a66">
 <gml:identifier codeSpace="urn:uuid:">37a7f1d0-b731-11e2-9e96-0800200c9a66</gml:identifier>
 <metocean:type>model\_grid\_definition</metocean:type>
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 axisLabels="Lat Lon"
 srsDimension="2"
 srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
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 90.0 -180.0
 90.0 180.0
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 </gml:boundedBy>
 <gml:domainSet>
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 1=http://www.codes.wmo.int/GRIB2/table4.5/IsobaricSurface&amp;
 2=http://www.opengis.net/def/temporal/ISO8601"
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 </gml:limits>
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 1000 0 850 0 700 0 500 0 300 0 250 0
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 1000 12 850 12 700 12 500 12 300 12 250 12
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 2=http://www.opengis.net/def/temporal/ISO8601"
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