

**230-WP-001-003**

# **Machine-to-Machine Search and Order Gateway Interface for the ECS Project**

**White Paper**

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# Abstract

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A Machine-to-Machine Search and Order Gateway is currently a TBD in Volume 0 of the ICD Between ECS and the Science Investigator-Led Processing Systems. This White Paper is an advance description of the operations concept and high-level design, including syntax, of that interface. After review and update to final design, the content of this paper will be migrated to the ECS-SIPS ICD to close that TBD.

**Keywords:** gateway, ICD, interface, machine-to-machine, metadata, MOJO, order, reprocessing, search SIPS

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# 1. Introduction

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## 1.1 Purpose

The ECS Project has contractual requirements to provide a machine-to-machine gateway to support external reprocessing of standard ECS products. This interface has been a TBD in Volume 0 of the ICD Between ECS and the SIPS since that document was baselined. This white paper summarizes the preliminary design of the machine-to-machine gateway interface, giving ESDIS and potential users a chance to review and understand the operations concept and high-level design.

This is the last revision of this White Paper. The content of the paper will be folded into a volume of the ICD Between ECS and the SIPS for CCB approval.

## 1.2 Organization

This paper is organized as follows: Section 1 explains the purpose and use of this White Paper. Section 2 contains references to parent and related documents. Section 3 is an overview of the Machine-to-Machine Gateway (MTMGW) interface. Section 4 describes the gateway design and operations concept, with details to the extent currently available. Section 5 is the draft specification for the MTMGW syntax that will be used for information interchange between the SIPS and the Machine-to-Machine Gateway. Appendix A is a work-off plan, listing TBDs that should be closed before a CCR is submitted to update the ICD. Appendix B is a dictionary of MTMGW syntax. Appendix C contains a list of parameters recommended for inclusion in an operations agreement between the SIPS and the DAAC. Appendix D is the XML DTD used by the MTMGW for formatting search results.

## 1.3 Review and Approval

This White Paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval; however, it is submitted with the intent that review and comments will be forthcoming.

The information and ideas expressed in this White Paper are valid only until the concepts presented have migrated into the ICD Between the ECS and the SIPS, ESDIS document 423-41-57.

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## 2. References

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The latest versions of all documents below should be used. The latest ESDIS Project documents can be obtained from URL: [http://spsosun.gsfc.nasa.gov/ESDIS\\_Pub.html](http://spsosun.gsfc.nasa.gov/ESDIS_Pub.html). ESDIS documents have a document number starting with either 423 or 505. The latest EOSDIS Core System (ECS) documents can be obtained from URL: <http://edhs1.gsfc.nasa.gov/>.

### 2.1 Parent Documents

- 423-10-01-5 Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project Level 2 Requirements, Volume 5: EOSDIS Version 0
- 423-41-01 Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
- 423-41-02 Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
- 423-42-03 Goddard Space Flight Center, Interface Responsibilities for Standard Product Generation Using Science Investigator-Led Processing Systems (SIPS)

### 2.2 Applicable Documents

- 420-TP-022 Release 6A Implementation Earth Science Data Model
- 423-41-57 Interface Control Document Between the EOSDIS Core System (ECS) and the Science Investigator-Led Processing Systems. Volume 0, Interface Mechanisms

### 2.3 Information Documents

- 420-TP-016 Backus-Naur Format (BNF) Representation of the B.0 Earth Science Data Model

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## 3. Overview

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### 3.1 Requirement

When PGEs are executed to reprocess data within the ECS, the data products needed as processing input are pulled directly from the ECS archives on demand. When reprocessing is done externally to the ECS by a SIPS, the SIPS needs a reliable high-speed interface for searching and ordering the required processing inputs in time for use. This interface must support automated orders, provide adequate criteria for the required data searches and deliver high data volumes quickly, minimizing processing delays and storage overhead at the SIPS. It must offer the SIPS flexibility and control, as the various SIPS may have a wide variety of processing needs and plans.

Also, the MTMGW should be available for recovery from any subscription delivery failures that might occur in obtaining L0 and ancillary data for standard product generation by the SIPS.

It is expected that this interface will meet the reprocessing needs of some other ECS data providers not approved as SIPS. Such providers should request approval from ESDIS to use this interface.

### 3.2 Description

ECS provides machine-to-machine gateway software and specifies a syntax for interchange between the SIPS and the gateway. The syntax is an extension of the ECS MOJO language, which was originally developed to support the ECS JEST client.

Using Secure Shell, the SIPS enters remote commands containing MTMGW syntax statements at a specified DAAC server and receives MTMGW responses via the remote connection.

Three capabilities are supported: Inventory Search, Product Order and Integrated Search and Order. Each SIPS can develop its own automated routines to submit requests and parse response messages.

Order distributions are achieved with the standard ECS data distribution system.

#### 3.2.1 Inventory Search

The MTMGW interface supports the ECS metadata model (as opposed to the V0 model). Searches can include spatial and temporal data types and the full range of searchable science metadata including LocalGranuleID and PSAs. The search response format is XML.

### **3.2.2 Product Order**

Product orders can be submitted for one or several granules, by specifying

- Granule UR,
- ESDT shortname, version and GranuleID,
- ESDT shortname, version and LocalGranuleID (if available).

Orders may be for data granules alone, for just BROWSE, QA and/or PH granules associated with specified data granules or for both.

### **3.2.3 Integrated Search and Order**

The SIPS provides search criteria and delivery information. No search results are returned to the SIPS. The product order is processed within ECS using the search results returned to the gateway; product files are placed on the specified platform or placed on media, and an e-mail distribution notice delivered.

## **3.3 Example Scenarios for Machine-to-Machine Gateway Use**

### **3.3.1 Reprocessing**

A SIPS might regularly submit a Search Request using criteria that specify inputs needed for reprocessing. It would not actually order the data until a search return showed that all needed reprocessing inputs were available to be staged.

It could then order the data needed, identifying it by UR, Granule ID, or LocalGranuleID or could break the results up into several orders to match its reprocessing plan.

### **3.3.2 Missing Data**

An Integrated Search and Order Request could be used when a program or script run by the SIPS on a regular basis discovers that inputs for a certain time range are missing. Since the script would not need to know the individual granule IDs, it could submit an Integrated Search and Order Request, telling ECS to stage the data for the missing time range if available.

Software or hardware failure can cause the occasional loss of granules needed by a SIPS as input. An automatic auditing and re-ordering capability implemented by the SIPS would reduce operator workload in such situations.

### **3.3.3 Ancillary Inputs**

Ancillary inputs often are static files, not being regenerated and reinserted in the ECS, and so unavailable by subscription. The SIPS can use a script to order these ancillary inputs for repeated reprocessing runs.

### **3.3.4 Recovery from Processing Delays**

If a SIPS temporarily falls behind in its processing, data files initially staged via subscriptions might be lost and need to be restaged.

### **3.3.5 Subscription Failure Recovery**

A Subscription delivery for initial higher-level processing inputs may fail. Most failures will be announced by an ECS Failure Distribution Notice that lists URs of files not delivered. Failure DNs can be parsed for the URs of undelivered files and a Machine-to-Machine Gateway Product Order submitted to reorder them.

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## 4. Design and Operations Concept

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### 4.1 Introduction

This section describes the design and operations concept of the ECS-SIPS Machine-to-Machine Gateway (MTMGW) interface to meet the requirements for SIPS reprocessing support.

### 4.2 Physical Interface and Communications

For the SIPS to submit search and order requests for locally archived data, the DAAC gives the SIPS remote access to a MTMGW server at the DAAC. To access the MTMGW server, the SIPS needs to install Secure Shell (ssh) Client Protocol Version 1.5 on the SIPS host that is to communicate with the MTMGW.

To submit a request to the MTMGW, the SIPS executes the remote command

```
ssh -[p port] remote-host-name ecscommand MTMGW-message
```

where

- *remote-host-name* is the designated MTMGW host at the DAAC
- *ecscommand* is one of the three commands supported by the ECS MTMGW server (mtmsearch, mtmorder or mtmsearchorder)
- *MTMGW-message* is the complete syntax for one of the three MTMGW message types (specified in Section 5)

The MTMGW program executes the command and returns the results via stdout. The local system may reroute stdout from ssh to a local file.

Note that Secure Shell imposes a length of 64 kB on the MTMGW message length.

### 4.3 Security

A SIPS must obtain authorization from the DAAC to use the machine-to-machine gateway. A SIPS user account is set up manually with ssh encryption keys on both the local SIPS host and the DAAC. Under ssh, the entire message is authenticated and encrypted. ECS provides the SIPS with scripts and guidelines to assist the SIPS in the setup and use of ssh. Following are points to be remembered.

DAAC Operations establishes a MTMGW user account for the SIPS and defines a MTMGW configuration for the SIPS.

The SIPS installs Secure Shell according to ECS-provided instructions.

The SIPS generates local and ECS private/public key pairs using a script provided by ECS.

SIPS Operations effects the key exchange using ssh via a script provided by ECS.

A valid MSS UserID is required; if it is not supplied in the command and a default ID has not been configured by DAAC Operations, the connection will fail.

#### **4.4 MTMGW Server Instances**

The MTMGW supports multiple concurrent servers. Each SIPS can be assigned a dedicated MTMGW server at a DAAC; a server may be configured to support one or more SIPS; or multiple servers may be configured to support SIPS clients, one MTMGW per SIPS client. Each MTMGW server is independently configurable by the DAAC. There are separate MTMGW servers for each science data server at a DAAC.

Each MTMGW server supports multiple concurrent requests. DAAC operations can configure the maximum number of concurrent requests for each server. If the maximum is exceeded, an error message is returned to the SIPS.

#### **4.5 Inventory Search**

Searches can include spatial and temporal data types and the full range of searchable science metadata (including LocalGranuleID and PSAs). The names of metadata groups may be used as well as individual attributes.

The names of the attributes are as specified in the ECS Science Data Model (i.e., as opposed to the attribute names used by V0 and the EDG clients).

The SIPS may specify the spatial type used by the ESDT for the desired granule. On the other hand, generic attribute names may be used to request spatial coverage information regardless of the spatial data type used for the ESDT. The MTMGW returns the specific spatial type in the search result, even if the SIPS provided the generic name in its request.

Searches can include lists of values, which will be interpreted as OR lists.

Multiple search terms are assumed to be ANDed.

For each granule returned, the search result always includes

- ESDT shortname,
- ESDT version,
- granuleID,
- LocalGranuleID (if available).
- core attributes specified in the search request
- PSA inventory attributes specified in the search request.

When the Search Request specifies it, the ECS granule UR for each granule found is returned in the Search Result.

The search result format is XML (Extensible Markup Language).

The SIPS can specify a maximum number of granules to be returned in the search result. DAAC Operations can also specify a maximum. If the SIPS-specified maximum exceeds the DAAC maximum or if it is not specified at all, the DAAC maximum will be returned.

The science data server may set a truncation limit for search results. If results are truncated, the MTMGW result includes a truncation indicator. Since it will not be clear which results have been truncated, the SIPS may wish to submit a new search request or requests using more restrictive criteria.

## **4.6 Product Availability Limitations**

The Machine-to-Machine Gateway supports search and order of locally archived data only; it cannot be used for cross-DAAC searches or orders. If the SIPS requires reprocessing data from multiple DAACs, it must request a separate machine-to-machine interface from each DAAC.

Each DAAC operations staff has the capability to determine what Earth Science Data Types (ESDTs) in its archives are made available for search and order via the MTMGW, and to configure the system to automatically limit the scope of searches and orders for each MTMGW. Requests for ESDTs not within the configured scope are rejected.

Some ECS search criteria that are currently not supported by the EOS Data Gateway (EDG) can be used in searches through the MTMGW, so the MTMGW may allow some searches and orders that cannot be done through the EDG. Landsat 7 products are not available to search or order through the MTMGW.

It is recommended that the SIPS reach agreement with the DAAC in advance of reprocessing concerning the ESDTs needed for reprocessing via the MTMGW. The SIPS can then plan its search and order activity to avoid rejected orders.

## **4.7 Order Request**

Product orders can be submitted by specifying one of the following:

- Granule UR,
- ESDT shortname, version and GranuleID,
- ESDT shortname, version and LocalGranuleID.

Orders may be for data granules alone, for just the BROWSE, QA and/or PH granules associated with the specified data granules or for both.

The order can specify any DAAC-allowed media distribution type, including CD ROM and Digital Linear Tape (DLT), and a data compression option can be selected. The order specifies contact and shipping information. If this information is not supplied the MTMGW obtains default information from the ECS user profile setup for the SIPS based on the MSS UserID in the order or on the default MSS UserID configured for the gateway by DAAC Operations.

The MTMGW issues a response message, indicating whether an order has been submitted to the system successfully or unsuccessfully

The ECS tracks status of MTMGW orders just as for orders from the EOS Data Gateway client (see also Section 4.9). Order status queries should be directed to DAAC User Services.

## **4.8 Integrated Search and Order Requests**

The MTMGW permits integrated search and order requests. Each integrated request specifies all search information needed to find the granules and all information needed for delivery of the granules found. No search results are returned to the SIPS. The order is simply processed on the basis of the search results obtained by the MTMGW.

The SIPS should specify in its integrated search and order request a maximum number of granules and a maximum total file volume in uncompressed megabytes. The DAAC operators can configure the maximum number of granules and the total size of uncompressed megabytes for the result set. The Operations maximums take effect if lower than the SIPS maximums or if the SIPS has not specified maximums.

The MTMGW submits the order for the search results obtained if the results set does not exceed the maximum number of granules and does not exceed the maximum total size of uncompressed megabytes. The order fails and an error is returned to the SIPS if the results set exceeds the maximum number of granules or exceeds the maximum total size of uncompressed megabytes. The order will also fail, with an error message, if the search result set has been truncated by the ECS Science Data Server. (The data server truncation limit is not visible to the MTMGW.)

## **4.9 External Request Identifier**

The SIPS can supply its own request identifier (External Request ID) in a Product Request or an Integrated Search and Order Request. ECS records the External Request ID with the order tracking data. It is recommended that the SIPS supply an External Request ID with every order.

The External Request ID has several uses:

- DAAC User Services can retrieve order tracking information on the basis of the External Request ID and thus respond to SIPS questions regarding orders based on the SIPS own order identifier.
- For MTMGW orders only, the External Request ID is shown on the ECS Distribution Notice, making it easier for the SIPS to correlate data receipt with previously submitted orders.

- If the SIPS receives no response to an order request or integrated search and order request, it should resubmit the request under the same External Request ID. If the MTMGW has successfully submitted an order to the system and receives a second order with the same External Request ID, it simply returns order status to the second request. However, if no order with the same External Request ID has been successfully submitted to the system (i.e., is not yet tracked by ECS), the MTMGW attempts to process the resubmitted order.

The External Request ID for each request must be unique: once the MTMGW has returned a response to a request, whether successful or failed, that External Request ID cannot be re-used.

Actual delivery of an order that has been successfully submitted by the MTMGW may conceivably fail. In that case, a new External Request ID must be supplied when the order is resubmitted.

#### **4.10 Product Delivery**

The products ordered are delivered on media or ftp pushed to the destination specified in the product order. An ECS Distribution Notice is sent via e-mail to the address specified by the SIPS in the Product Request or Integrated Search and Order Request. Distribution Notice formats (for successful and failed orders) are specified in Section 4.3 of the ECS-SIPS ICD, Volume 0. Note, however, that for Machine-to-Machine Gateway orders, the Distribution Notice will also include the External Request ID if it has been furnished by the SIPS.

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## 5. MTMGW Message Syntax

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ECS provides an ASCII text standard syntax to support the MTMGW-SIPS search and order interface. The MTMGW syntax includes three types of request messages to be submitted by the SIPS and three MTMGW response messages. These messages are Inventory Search Request, Inventory Search Result, Product Order Request, Product Order Result, Integrated Search and Order Request and Integrated Search and Order Result. The MTMGW also returns Error messages.

The MTMGW validates the syntax of received messages and returns an error message to the SIPS without processing the message if the syntax is invalid.

Appendix B is a dictionary of MTMGW syntax definitions.

### 5.1 Notation

*Note: The following explanation applies to all messages except for Inventory Search Result. The Inventory Search Result is provided in XML format in accordance with the DTD given in Appendix D.*

MTMGW message formats are specified with literals and variables distinguished as follows: Literals are in bold face, for example, **MSSUserID**, and variables are in italic, for example, *value*.

Each MTMGW syntax element consists of a keyword and a value. It begins with a hyphen and each keyword is separated from its value by a space. For example:

**-MSSUserID** *value*

An element is either a name-value pair separated by a space, where the value is a simple tag containing no spaces as in the above example, or a more complex construction that must be delimited by double quotation marks. Each double quotation mark must be preceded by an escape backslash character (\). For example:

**-QualificationList** \"ShortName Match MOD\_AMO6 AM1\_MODIS\"

If the syntax element has more than one clause, then each clause is delimited with escape-quotation marks. To make the message file more human-readable, a syntax element may be broken into multiple lines ending with a backslash continuation character (\), to indicate that the element is continued on the next line. For example:

### **-QualificationList\**

```
"ShortNameVersionID Match MOD02QKM.001 MOD02HKM.001\"  
"OrbitNumber Match 12 39"
```

Note that no special character is needed at the end of the element, as the start of the next element is defined by a hyphen.

## **5.2 Remote Command Line**

The SIPS uses three remote commands. These are the only commands that will be accepted by the MTMGW server.

```
ssh [-port#] remote-host-name mtmsearch search-message
```

```
ssh [-port#] remote-host-name mtmorder order-message
```

```
ssh [-port#] remote-host-name mtmsearchorder searchorder-message
```

The last term in the command (search-message, order-message, searchorder-message) is the MTMGW message syntax. Each message syntax as well as the MTMGW response is described in the remainder of Section 5.

## **5.3 Message Elements**

The usual MTMGW data request message consists of the MSSUserID, MessageID and the data payload. However, the MSS UserID in requests is optional depending on agreement with DAAC Operations and the MessageID may be omitted at the SIPS's discretion. There are also special Error messages.

### **5.3.1 MSSUserID**

The MSSUserID is assigned by DAAC Operations. Whether the SIPS includes the MSSUserID in each request or a default is provided by the DAAC should be agreed on and documented in an operations agreement or other document between the SIPS and the DAAC. If no default MSSUserID has been configured for the specific SIPS by DAAC operations, messages without MSSUserID are rejected. The format of this message element is as follows:

```
-MSSUserID value
```

### **5.3.2 MessageID**

The SIPS may specify an optional numeric message identifier in each request message. The MTMGW will return the SIPS's message identifier in its response.

```
-MessageID value
```

### 5.3.3 Payload

The data payloads consist of keyword syntax elements which are specified for each Request message type in Sections 5.4, 5.6 and 5.8.

## 5.4 Inventory Search Request

Each inventory search request message consists of the following elements:

<b>MSSUserID</b>	(May be required by DAAC)
<b>MessageID</b>	(Optional)
<i>Payload</i>	
<b>ReturnGranuleUR</b>	(Optional)
<b>MaximumNumberOfGranules</b>	(Optional)
<b>QualificationList</b>	(Required)
<b>AttributeList</b>	(Required)

### 5.4.1 ReturnGranuleUR

The SIPS can specify that ECS granule URs be returned for each granule in the search result.

**-ReturnGranuleUR [Y,N]**

Here “Y” specifies that ECS granule URs be returned; “N” that no URs be returned. The default is “N”. Example:

-ReturnGranuleUR N

## 5.4.2 Maximum Number Of Granules

The SIPS may specify the maximum number of granules to be returned in the Search Result.

**-MaximumNumberOfGranules** *value*

DAAC Operations also has the capability to configure maximum number of granules. The DAAC maximum overrides the SIPS maximum if smaller than the SIPS maximum.

The Science Data Server has a limit, which, if smaller, overrides the DAAC and SIPS limits.

## 5.4.3 Qualification List

The Qualification List contains the criteria for the Inventory Search. The list may consist of multiple lines of attributes in the following format:

**-QualificationList**\

*"AttributeName RelationalOperator AttributeValue"*\

### 5.4.3.1 Relational Operators

A RelationalOperator can be one of the following three types.

1. Match – the operator is followed by a list of values to be matched. Values are separated by spaces and each clause is delimited by quotation marks.
2. Range -- followed by one or two pairs, each specifying a relational operation and a value. The allowed relational operators are

<

<=

=

>=

>

3. Overlap -- the search condition specifies a rectangle or a polygon or a circle or a point as the search area. A rectangle is defined by two pairs of latitude and longitude. A polygon is defined by multiple pairs of latitude and longitude separated by spaces. A circle is defined by a pair of latitude and longitude and a radius, separated by a comma (.). A point is defined by a pair of latitude and longitude. The latitude and longitude are separated by a comma (.). All granules whose spatial extent intersects the specified spatial region will be selected and returned. For more details, see Section 5.4.3.2.

### 5.4.3.2 Attribute Specification

The AttributeName values are generally the attributes associated with the specific data types (ESDTs) as defined in the ECS Data Model. However, as is described below, special attribute names can be used for temporal or spatial searching that simplify the attribute specification.

Notes:

1. Attribute names in the qualification list do not require paths.
2. To specify version ID for an ESDT, use ShortNameVersionID as the attribute name. VersionID is optional, so ShortName is also a valid attribute name.

An attributename, with the exception of spatial and temporal attributes, must be one of the attributes defined in "Release 6A Implementation Earth Science Data Model ", 420-TP-022-001." This information can also be found online with information on PSAs (not defined in the data model), domain values or valids for the attributes and the full group specification of the attributes at:

[http://ecsinfo.gsfc.nasa.gov/applied\\_tech/metadata/meta\\_psatables.html](http://ecsinfo.gsfc.nasa.gov/applied_tech/metadata/meta_psatables.html)

The MTMGW contains features to facilitate the specification of spatial or temporal coverage selection.

#### 5.4.3.2.1 Spatial

For spatial selection, specification of the search criteria might be accomplished using the Range and relational operator procedures with the attributes from the data model appropriate to the specific data type (ESDT).

However, using the protocol of the MTMGW interface the search criteria can be specified without knowledge of the ESDT-specific implementation of spatial attributes by using one of four generic spatial search area specifications. The MTMGW then translates these spatial criteria into the appropriate structure for application to the Science Data Server. These spatial attributes then specify the desired search region independent of the spatial structure of the ESDT. The four generic spatial structures are:

##### *1. BoundingRectangle*

```
"BoundingRectangle Overlap LLSBC, LLWBC, URNBC, UREBC"
```

where

LLSBC = Lower Left South Bounding Coordinate

LLWBC = Lower Left West Bounding Coordinate

URNBC = Upper Right North Bounding Coordinate

UREBC = Upper Right East Bounding Coordinate

These pairs of points define the lower left and upper right vertices of a bounding rectangle. All values are float in the format  $\pm$ NNN.NNN, North-South coordinate in the range (+90, -90), East-West Coordinates in the range (-180, +180). No edge may subtend an angle greater than 180 degrees.

## 2. *Gpolygon*

"GPolygonContainer Overlap LAT1, LONG1, ..., LATn, LONGn"

where:

LATn = Latitude of the nth polygon vertex

LONGn = Longitude of the nth polygon vertex

The sequence of paired values are the vertices that define the polygon. The sequence of points are provided in sequence (i.e., no intersecting edges), no enclosed exclusion areas, progression from one point to the next taken in clockwise sense around the polygon perimeter. Polygons are limited to 700 (TBD) points per polygon. Again, all values are float in the format  $\pm$ NNN.NNN, latitude values in the range (+90, -90), longitude values in the range (-180, +180). No edge may subtend an angle greater than 180 degrees. MTMGW will close the polygon from the last point to the first.

## 3. *BoundingCircle*

"BoundingCircle Overlap LAT, LONG, RADIUS"

where

LAT = Latitude of the circle center

LONG = Longitude of the circle center

RADIUS = Radius of the circle in meters

These values define a circular region centered on LAT/LONG on the Earth's surface. Lat/Long values are float in the format  $\pm$ NNN.NNN, latitude values in the range (+90, -90), longitude values in the range (-180, +180). The radius is float in the format +NNNNNNNN.NN. The diameter must subtend an angle less than 180 degrees.

## 4. *Point*

"PointLocation Overlap LAT, LONG"

where

LAT = Latitude of the point

LONG = Longitude of the point

This defines a point object at LAT/LONG on the Earth's surface. Lat/Long values are float in the format  $\pm$ NNN.NNN, latitude values in the range (+90, -90), longitude values in the range (-180, +180).

### 5.4.3.2 Temporal

Similarly, for temporal selection, the temporal attributes appropriate to the specific ESDT might be used directly. However, generic temporal attributes can be used that will then be translated by MTMGW into the proper structure for searching the Science Data Server. These generic temporal attributes are:

BeginningDateTime Range range-operator date-time-spec

EndingDateTime Range range-operator date-time-spec

where

date-time-spec is of the form "mm/dd/yyyy hh:mm:ss".

Specification of a single date-time is accomplished by using the same date-time-spec value for both of the generic temporal attributes. If "hh:mm:ss" are omitted, the value defaults to 00:00:00.

### 5.4.3.3 Qualification List Example

**-QualificationList\**

\ShortNameVersionID Match MOD02QKM.001 MOD02QKM.003 \

MOD02HKM.001 MOD02HKM.003 \\"

\OrbitNumber Match 12 39\\"

\CloudPercent Range >= 0 <= 100\\"

\CloudCover Range >= 40\\"

\BeginningDateTime Range >= 01/01/2000\\"

\EndingDateTime Range <= 06/30/2000\\"

\BoundingRectangle Overlap 41.63,-97.25,54.49,-85.97\\"

This Qualification List would find granules in either MOD02QKM or MOD02HKM collections which have version ID equal to either 1 or 3, OrbitNumber equal to either 12 or 39, and CloudPercent in the interval [0, 100] inclusively, and CloudCover is greater than or equal to 40, and are recorded in the first six months of year 2000, and include granules that intersect the spatial region defined by latitude/longitude box [41.63N, 97.25W], [54.49N, 85.97W].

### 5.4.4 AttributeList

The default attributes ShortName, VersionID, GranuleID and LocalGranuleID, if available, are always included in the search result.

The SIPS may use AttributeList to specify which granule-level metadata it wants to have returned in the Search Result. Following is the format:

**-AttributeList** Attr1 Attr2 Attr3 ... Attrn

The **AttributeList** keyword is required in the Search message. If no additional granule level attributes are wanted, the keyword must still be included, as follows:

**-AttributeList**

*Attr1* etc are the names of the attributes to be returned from the search and all attributes to be returned are in the same space-separated list. These attribute names are defined in the reference given above for the Science Data Model, including the PSAs for the specific data types. As in the qualification list, special generic attributes can be used to request return of temporal or spatial attributes for the selected granules. These generic attributes are:

SpatialCoverage

TemporalCoverage

The MTMGW will return the spatial and/or temporal attributes appropriate for the data type in the format described in Section 5.5.

Following is an example:

**-AttributeList** ProductionDateTime\  
SizeMBECSDataGranule QAFlags.ScienceQualityFlag\  
SpatialCoverage\  
TemporalCoverage

The MTMGW returns values for these attributes for each granule returned in the Search Result.

## 5.5 Inventory Search Result

The entire Search Result is returned in XML format. ECS references a DTD (Document Type Definition) to define the XML format for MTMGW search results. The MTMGW DTD is given in Appendix D.

The elements of a search result message are as follows:

**MessageID** (Returned if present in Request)  
**NumberOfGranules** *value*  
**Truncated** [Y,N]  
**Trigger**  
**TruncatedLimit**  
*Granule Metadata*

### 5.5.1 NumberOfGranules

This is the total number of granules actually returned in this search result. If the number of granules found exceeds the configured truncation limit, NumberOfGranules will equal the truncation limit.

### 5.5.2 Truncated

The ECS Science Data Server maintains a search result ceiling in a configuration file. If the configured limit is not exceeded, the MTMGW returns

Truncated N

If the result set has been truncated and only a portion of the granules is sent back,

Truncated Y

is returned.

### 5.5.3 Trigger

If Truncated is Y, then a Trigger element will be present. It identifies the limit causing the truncation as originating from one of the following: SDSRV, MTMGW, SIPS

### 5.5.4 TruncatedLimit

This element gives the value of the limit that caused the truncation.

## 5.5.5 Search Result Examples

### 5.5.5.1 Example 1

#### Search Request

```
-QualificationList \"ShortNameVersionID Match MOD11_L2\"\  
  \"RangeBeginningDate Range = 1997-08-12\"\  
  \"RangeBeginningTime Range >= 19:00:00\"\  
  \"RangeEndingDate Range = 1997-08-12\"\  
  \"RangeEndingTime Range <= 24:00:00\"\  
-ReturnGranuleUR Y  
-MaximumNumberOfGranules 4  
-AttributeList RangeDateTime \  
  SpatialCoverage \  
  SizeMBECSDataGranule \  
  QAPercentCloudCover \  
  DayNightFlag \  
  GranuleNumber \  
  QAPercentGoodQuality \  
  
```

QAPercentNotProducedCloud \  
QAPercentNotProducedOther \  
QAPercentOtherQuality

## Search Result

<SearchResult>  
<NumberOfGranules>4</NumberOfGranules>  
<Truncated>N</Truncated>  
<GranuleURMetaData>  
<GranuleUR>SC:MOD11\_L2.001:7969</GranuleUR>  
<DbID>7969</DbID>  
<CollectionDescriptionClass>  
<ShortName>MOD11\_L2</ShortName>  
<VersionID>001</VersionID>  
</CollectionDescriptionClass>  
<ECSDDataGranule>  
<SizeMBECSDDataGranule>25.8820</SizeMBECSDDataGranule>  
<LocalGranuleID>MOD11\_L2.A1997224.1917.002.1999099152630.hdf</LocalGranuleID>  
<DayNightFlag>Day</DayNightFlag>  
</ECSDDataGranule>  
<RangeDateTime>  
<RangeEndingTime>19:22:09.000000</RangeEndingTime>  
<RangeEndingDate>1997-08-12</RangeEndingDate>  
<RangeBeginningTime>19:17:09.000000</RangeBeginningTime>  
<RangeBeginningDate>1997-08-12</RangeBeginningDate>  
</RangeDateTime>  
<SpatialDomainContainer>  
<HorizontalSpatialDomainContainer>  
<GPolygon>  
<Boundary>  
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<PointLatitude>60.3845</PointLatitude>  
</Point>  
<Point>  
<PointLongitude>-99.6413</PointLongitude>  
<PointLatitude>54.8214</PointLatitude>  
</Point>  
<Point>  
<PointLongitude>-111.9949</PointLongitude>  
<PointLatitude>38.6962</PointLatitude>  
</Point>  
<Point>  
<PointLongitude>-139.5342</PointLongitude>  
<PointLatitude>42.6290</PointLatitude>

```

</Point>
</Boundary>
</GPolygon>
</HorizontalSpatialDomainContainer>
</SpatialDomainContainer>
<MeasuredParameter>
<MeasuredParameterContainer>
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<QAPercentCloudCover>53</QAPercentCloudCover>
</QAStats>
</MeasuredParameterContainer>
</MeasuredParameter>
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</PSA>
<PSA>
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</PSA>
<PSA>
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<PSAValue>34</PSAValue>
</PSA>
<PSA>
<PSAName>QAPERCENTNOTPRODUCEDOTHER</PSAName>
<PSAValue>4</PSAValue>
</PSA>
<PSA>
<PSAName>QAPERCENTOTHERQUALITY</PSAName>
<PSAValue>0</PSAValue>
</PSA>
</PSAs>
</GranuleURMetaData>
<GranuleURMetaData>
<GranuleUR>SC:MOD11_L2.001:7959</GranuleUR>
<DbID>7959</DbID>
<CollectionDescriptionClass>
<ShortName>MOD11_L2</ShortName>
<VersionID>001</VersionID>
</CollectionDescriptionClass>
<ECSDDataGranule>
<SizeMBECSDDataGranule>25.8820</SizeMBECSDDataGranule>
<LocalGranuleID>MOD11_L2.A1997224.1917.002.1999099152630.hdf</LocalGranuleID>

```

```

<DayNightFlag>Day</DayNightFlag>
</ECSDDataGranule>
<RangeDateTime>
<RangeEndingTime>19:22:09.000000</RangeEndingTime>
<RangeEndingDate>1997-08-12</RangeEndingDate>
<RangeBeginningTime>19:17:09.000000</RangeBeginningTime>
<RangeBeginningDate>1997-08-12</RangeBeginningDate>
</RangeDateTime>
<SpatialDomainContainer>
<HorizontalSpatialDomainContainer>
<GPolygon>
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<PointLatitude>54.8214</PointLatitude>
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<Point>
<PointLongitude>-139.5342</PointLongitude>
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</Boundary>
</GPolygon>
</HorizontalSpatialDomainContainer>
</SpatialDomainContainer>
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<QAStats>
<QAPercentCloudCover>53</QAPercentCloudCover>
</QAStats>
</MeasuredParameterContainer>
</MeasuredParameter>
<PSAs>
<PSA>
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<PSAValue>6</PSAValue>
</PSA>
<PSA>

```

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 </PSA>  
 <PSA>  
 <PSAName>QAPERCENTNOTPRODUCEDOTHER</PSAName>  
 <PSAValue>8</PSAValue>  
 </PSA>  
 <PSA>  
 <PSAName>QAPERCENTOTHERQUALITY</PSAName>  
 <PSAValue>5</PSAValue>  
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 </PSAs>  
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 <GranuleURMetaData>  
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 <DbID>7958</DbID>  
 <CollectionDescriptionClass>  
 <ShortName>MOD11\_L2</ShortName>  
 <VersionID>001</VersionID>  
 </CollectionDescriptionClass>  
 <ECSDDataGranule>  
 <SizeMBECSDDataGranule>25.8784</SizeMBECSDDataGranule>  
 <LocalGranuleID>MOD11\_L2.A1997224.2057.002.1999099183757.hdf</LocalGranuleID>  
 <DayNightFlag>Day</DayNightFlag>  
 </ECSDDataGranule>  
 <RangeDateTime>  
 <RangeEndingTime>21:02:05.000000</RangeEndingTime>  
 <RangeEndingDate>1997-08-12</RangeEndingDate>  
 <RangeBeginningTime>20:57:05.000000</RangeBeginningTime>  
 <RangeBeginningDate>1997-08-12</RangeBeginningDate>  
 </RangeDateTime>  
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```

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<PSA>
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<GranuleURMetaData>
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```

```

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<VersionID>001</VersionID>
</CollectionDescriptionClass>
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<SizeMBECSDDataGranule>25.8748</SizeMBECSDDataGranule>
<LocalGranuleID>MOD11_L2.A1997224.1942.002.1999099183848.hdf</LocalGranuleID>
<DayNightFlag>Day</DayNightFlag>
</ECSDDataGranule>
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</RangeDateTime>
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</GPolygon>
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</SpatialDomainContainer>
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<QAStats>
<QAPercentCloudCover>33</QAPercentCloudCover>
</QAStats>

```

```

</MeasuredParameterContainer>
</MeasuredParameter>
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<PSAName>QAPERCENTOTHERQUALITY</PSAName>
<PSAValue>6</PSAValue>
</PSA>
</PSAs>
</GranuleURMetaData>
</SearchResult>

```

### 5.5.5.2 Example 2

#### Search Request

```

-QualificationList \"ShortNameVersionID Match AST_L1BT.001\" \
 \"DAR_ID Range = 12345678\"
-ReturnGranuleUR Y
-MaximumNumberOfGranules 10
-AttributeList RangeDateTime \
 SizeMBECSDataGranule \
 SpatialCoverage \
 DAR_ID \
 ASTERGRANULEID \
 Band10_Available \
 Band11_Available \
 Band12_Available \
 Band13_Available \

```

Band14\_Available \  
Band1\_Available \  
Band2\_Available \  
Band3B\_Available \  
Band3N\_Available \  
Band4\_Available \  
Band5\_Available \  
Band6\_Available \  
Band7\_Available \  
Band8\_Available \  
Band9\_Available \  
GenerationDateandTime \  
SWIR\_observationMode \  
TIR\_ObservationMode \  
VNIR1\_ObservationMode \  
VNIR2\_ObservationMode \  
Solar\_Azimuth\_Angle \  
Solar\_Elevation\_Angle

## Search Result

<SearchResult>  
<NumberOfGranules>1</NumberOfGranules>  
<Truncated>N</Truncated>  
<GranuleURMetaData>  
<GranuleUR>SC:AST\_L1BT.001:59706</GranuleUR>  
<DbID>59706</DbID>  
<CollectionDescriptionClass>  
<ShortName>AST\_L1BT</ShortName>  
<VersionID>001</VersionID>  
</CollectionDescriptionClass>  
<ECSDDataGranule>  
<SizeMBECSDDataGranule>4.9100</SizeMBECSDDataGranule>  
<LocalGranuleID>tahoe-north-middle.hdf</LocalGranuleID>  
</ECSDDataGranule>  
<SingleDateTime>  
<TimeofDay>13:01:23.345670</TimeofDay>  
<CalendarDate>1997-07-04</CalendarDate>  
</SingleDateTime>  
<SpatialDomainContainer>  
<HorizontalSpatialDomainContainer>  
<BoundingRectangle>  
<WestBoundingCoordinate>-120.2017</WestBoundingCoordinate>  
<NorthBoundingCoordinate>39.2136</NorthBoundingCoordinate>  
<EastBoundingCoordinate>-120.0364</EastBoundingCoordinate>

<SouthBoundingCoordinate>39.0483</SouthBoundingCoordinate>  
</BoundingRectangle>  
</HorizontalSpatialDomainContainer>  
</SpatialDomainContainer>  
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</PSA>  
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</PSA>  
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<PSAValue>NO</PSAValue>  
</PSA>  
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<PSA>  
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<PSA>  
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<PSAValue>OFF</PSAValue>  
</PSA>  
<PSA>  
<PSAName>VNIR2\_ObservationMode</PSAName>  
<PSAValue>OFF</PSAValue>

```

</PSA>
<PSA>
<PSAName>Solar_Azimuth_Angle</PSAName>
<PSAValue>35.0</PSAValue>
</PSA>
<PSA>
<PSAName>Solar_Elevation_Angle</PSAName>
<PSAValue>180.0</PSAValue>
</PSA>
</PSAs>
</GranuleURMetaData>
</SearchResult>

```

## 5.6 Product Order Request

**MSSUserID** (Per agreement with DAAC)

**MessageID** (Optional)

*Payload*

**MaximumTotalSizeInMegabytes** (Optional)

**ExternalRequestID** (Optional)

**ContactInformation** (Optional)

**ShippingInformation** (Optional)

**GranuleInformation** (Required)

**TransferAttribute** (Required)

If ContactInformation and/or ShippingInformation are present, they override the User Profile referenced by MssUserID.

### 5.6.1 MaximumTotalSizeInMegabytes

The SIPS can specify a maximum size for the order; if that size is exceeded, the order fails. DAAC Operations can also set a total size maximum, which, if lower than the SIPS maximum, overrides the SIPS value.

The MTMGW obtains science granule sizes from the metadata, but uses estimates for sizes of non-science granules (Browse, Production History, QA).

### 5.6.2 ExternalRequestID

If the SIPS supplies an ExternalRequestID, the MTMGW records it with other order tracking data. For example,

-ExternalRequestID 20000001

### 5.6.3 ContactInformation

ContactInformation is optional. If present, it overrides the contact information in the ECS User Profile referenced by the MSS UserID. If Contact Information is present, it consists of the following required and optional attributes:

#### **-ContactInformation\**

<b>\ContactInformationCount</b> <i>value</i> \	(Required)
<b>\Title</b> <i>value</i> \	(Optional)
<b>\FirstName</b> <i>value</i> \	(Required)
<b>\MiddleInit</b> <i>value</i> \	(Optional)
<b>\LastName</b> <i>value</i> \	(Required)
<b>\EmailAddress</b> <i>value</i> \	(defaults to this e-mail address if no e-mail address is given in Transfer Attribute)
<b>\Street1</b> <i>value</i> \	(Optional)
<b>\Street2</b> <i>value</i> \	(Optional)
<b>\Street3</b> <i>value</i> \	(Optional)
<b>\City</b> <i>value</i> \	(Optional)
<b>\State</b> <i>value</i> \	(Optional)
<b>\Zip</b> <i>value</i> \	(Optional)
<b>\Country</b> <i>value</i> \	(Optional)
<b>\Phone</b> <i>value</i> \	(Required)
<b>\Fax</b> <i>value</i> \	(Optional)

An error message is sent if the ContactInformationCount does not match the number of attributes listed. If neither Shipping Information nor Contact Information is provided and there is no ECS User Profile an error message is sent.

#### 5.6.4 ShippingInformation

ShippingInformation is optional. When present, it overrides the shipping information in the ECS User Profile referenced by the MSSUserID. If ShippingInformation is present, it consists of the following required and optional attributes.

<b>-ShippingInformation\</b>	
\"ShippingInformationCount value\"	(Required)
\"Title value \"	(Optional)
\"FirstName value\"	(Required)
\"MiddleInit value\"	(Optional)
\"LastName value\"	(Required)
\"Street1 value\"	(Required)
\"Street2 value\"	(Optional)
\"Street3 value\"	(Optional)
\"City value\"	(Required)
\"State value\"	(Required)
\"Zip value\"	(Required)
\"Country value\"	(Required)
\"Phone value\"	(Required)
\"Fax value\"	(Optional)

An error message is sent if ShippingInformationCount does not match the number of attributes listed. If neither ShippingInformation nor ContactInformation is provided and there is no ECS User Profile an error message is sent.

#### 5.6.5 GranuleInformation

The next element of the payload, GranuleInformation, is required. It identifies the granules to be acquired.

For each granule in the request, the SIPS can specify whether and how Browse, QA and/or PH are ordered. BROWSE, QA and/or PH granules can be ordered alone or with their associated data granules. The default is 'N', which means the MTMGW will Not acquire QA, PH, and/or BROWSE granules. 'G' means that BROWSE, QA and/or PH granules will be acquired along with the specified data Granules. 'A' means that BROWSE, QA and/or PH granules will be acquired Alone.

Then the SIPS specifies

granule UR

or

ShortName, VersionID, granule ID

or

ShortName, VersionID, LocalGranuleID (if present)

For each granule requested the SIPS sends a BEGIN\_GRANULE/END\_GRANULE block. The structure is as follows:

**-GranuleInformation\**

**\GranuleCount** *value***\**

**\BEGIN\_GRANULE\**

**BrowseIncluded** [G|A|N]**\** (Optional)

**QAIncluded** [G|A|N]**\** (Optional)

**PHIncluded** [G|A|N]**\** (Optional)

And/or

**GranuleUR** *value***\**

Or

**ShortName** *value***\**

**VersionID** *value***\**

**GranuleID** *value***\**

Or

**ShortName** *value***\**

**VersionID** *value***\**

**LocalGranuleID** *value***\**

**END\_GRANULE\**

The GranuleCount value must match the number of BEGIN\_GRANULE/END\_GRANULE blocks requested.

### 5.6.6 TransferAttribute

The TransferAttribute element is required. It consists of a list of keyword/value pairs specifying parameters controlling distribution of data to the SIPS. These keywords are listed in Table 5-1. Each order type requires a different selection of attributes. The following example is for an ftp Push order.

```

-TransferAttribute\
  \TransferAttributeCount value\
  \DDISTMEDIATYPE FtpPush\
  \DDISTMEDIAFMT FILEFORMAT\
  \FTPUSER user_login\
  \FTPPASSWORD user_password\
  \FTPHOST hostname.abc.com\
  \FTPPUSHDEST /data1/upload/ftp\
  \DDISTNOTIFYTYPE MAIL\
  \NOTIFY myuser@abc.com\

```

The attribute list is always preceded by a count. An error message is sent if the count does not match the number of attributes or if transfer attributes are not provided.

**Table 5-1. TransferAttribute Valid Values  
(Data Distribution Options)(1 of 2)**

Transfer Attributes (case sensitive)	Valid Values (case sensitive)	Notes
DDISTMEDIATYPE	CDROM, D3, DLT, 8MM, FtpPush	Required. Note that DAACs can configure the allowable valid media values
COMPRESSION	gzip, Unix	Optional
DDISTMEDIAFMT	TARFORMAT, FILEFORMAT, RockRidge	Optional. If present, must be FILEFORMAT for ftp, RockRidge for CDROM, TARFORMAT for other media.
DDISTNOTIFYTYPE	MAIL (email)	Defaults to MAIL if not supplied
NOTIFY	e-mail address to which data distribution notices should be sent.	If no e-mail address given, defaults to Contact Information e-mail address

**Table 5-1. TransferAttribute Valid Values  
(Data Distribution Options) (2 of 2)**

<b>Transfer Attributes (case sensitive)</b>	<b>Valid Values (case sensitive)</b>	<b>Notes</b>
FTPUSER	SIPS-supplied user name required for ECS to ftp files to SIPS host/directory	ftp Push orders will fail if this is not supplied.
FTPPASSWORD	SIPS-supplied password required for ECS to ftp files to SIPS host/directory	ftp Push orders will fail if this is not supplied.
FTPHOST	Host to which ECS should push data ordered.	ftp Push orders will fail if this is not supplied.
FTPPUSHDEST	Directory to which ECS should push data ordered.	ftp Push orders will fail if this is not supplied.

## 5.7 Product Order Result

The MTMGW sends an Order Result in two cases: (1) To provide information about granules successfully ordered or failed by the MTMGW. (2) To respond with status information to a duplicate Order Request message.

### 5.7.1 Response to Initial Order Request

In the first case, the message provides the number of granules successfully submitted by the MTMGW and identifies granules that could not be submitted. The Order Result elements are the following:

**MessageID** (Returned if provided in the Request)

**OrderID** *value*

**ExternalRequestID** *value*

**SuccessfulGranuleCount** *value*

**FailedGranuleCount** *value*

**BEGIN\_GRANULE\**

**GranuleUR** (BR or PH or QA) *value\*

Or

**GranuleUR** *value\*

Or

**ShortName** *value*\

**VersionID** *value*\

**GranuleID** *value*\

Or

**ShortName** *value*\

**VersionID** *value*\

**LocalGranuleID** *value*\

**GranuleOrderFailure** *FailureCode Description*\

**END\_GRANULE**

Note that for non-science granules the UR is always reported.

The SuccessfulGranuleCount value represents the number of granules successfully identified and submitted by the MTMGW. It does not necessarily represent the number successfully processed and distributed by the Science Data Server and Data Distribution.

The FailedGranuleCount is the number of granules that could not be successfully identified and submitted by the MTMGW. It must match the number of BEGIN\_GRANULE/END\_GRANULE blocks. The Product Order Result is returned even if the MTMGW fails to submit all granules ordered. The failed granule identifiers will be presented in the same format as given in the Product Order Request; for example, if the order specified granule UR , the failure notification will be in granule UR format.

The OrderID is the ECS internal order identification, while the ExternalRequestID is present if provided by the SIPS in the Order Request.

The following is an example of an Order Result message.

```
MessageID 0000591
OrderID 0300000390
ExternalRequestID AB00001
SuccessfulGranuleCount 39
FailedGranuleCount 5
BEGIN_GRANULE
GranuleUR SC:AST_AWC.001:18023
GranuleOrderFailure 203 Acquire failed
```

```

END_GRANULE
BEGIN_GRANULE
GranuleUR    SC:MISLOBF.001:18069
GranuleOrderFailure  203  Acquire failed
END_GRANULE
BEGIN_GRANULE
GranuleUR    PH:PH.001:18042
GranuleOrderFailure  201  Garbled Granule
END_GRANULE
BEGIN_GRANULE
GranuleUR    BR:Browse.001:18154
GranuleOrderFailure  203  Acquire failed
END_GRANULE
BEGIN_GRANULE
GranuleUR    SC:MOD000.001:18045
GranuleOrderFailure  203  Acquire failed
END_GRANULE

```

Note: For this example, it is assumed that the order specified Granule URs. Failure codes used in the example are preliminary.

### 5.7.2 Response to Duplicate Order Request

If the MTMGW receives an Order Request with the same ExternalRequestID and same MSSUserID as an existing order, it interprets the duplicate request as a status request. If the duplicate Product Order Request is intended only as a status request, then only ExternalRequestID and MSSUserID are needed in the request message. The format of the Product Order Result status message is as follows:

```

MessageID value                (Returned if present in Request)
OrderID value
ExternalRequestID value
OrderStatus value
ReceiveDateTime value
StartDateTime value

```

**FinishDateTime** *value*

**ShippingDateTime** *value*

The following is an example duplicate Product Order Result:

OrderID 0300000390

ExternalRequestID 0000001

OrderStatus Shipped

ReceiveDateTime 06/02/00 15:46:00.000

StartDateTime 06/02/00 15:46:00.000

FinishDateTime 06/02/00 15:48:00.000

ShippingDateTime 06/02/00 15:49:00.000

ECS Order Status codes are listed in Table B-2.

## 5.8 Integrated Search and Order Request

The search criteria for the Integrated Search and Order request are exactly the same as for a Search Request (refer to Section 5.4).

The MTMGW handles the order portion of an integrated search and order request in the same way as it does Product Requests (refer to Section 5.6). It returns a response message indicating whether an order has been submitted to the system successfully or unsuccessfully and giving the number of granules ordered.

The order will be rejected if the search returns any ESDTs not configured as permissible for the MTMGW server or if **MaximumTotalSizeInMegabytes** is exceeded

**MSSUserID** (As agreed with DAAC)

**MessageID** (Optional)

*Payload*

**QualificationList** (Required; See Section 5.4.3)

**BrowseIncluded** [G|A|N] (Optional)

**QAIncluded** [G|A|N] (Optional)

**PHIncluded** [G|A|N] (Optional)

**MaximumNumberOfGranules** (Optional)

**MaximumTotalSizeInMegaBytes** (Optional)

**ExternalRequestID** (Optional; see Section 4.9)

<b>ContactInformation</b>	(Optional; see Section 5.6.2)
<b>Shipping Information</b>	(Optional; see Section 5.6.3)
<b>TransferAttribute</b>	(Required; see Section 5.6.5)

The BrowseIncluded, QAIncluded, and PHIncluded selections are applied to all granules found in the search. To constrain delivery of Browse, QA and/or PH files to specific granules, use the Search Request and Order Request to specify the granules for which these files are required.

## 5.9 Integrated Search and Order Result

The MTMGW returns an Integrated Search and Order Result message in two cases: (1) To return the lists of granules successfully ordered and of granules failed as a result of the integrated search. (2) To respond with status information to a duplicate Integrated Search and Order Request.

### 5.9.1 Response to Initial Search and Order Request Message

In the first case, where the request executed as an order, the following message is sent:

<b>MessageID</b>	(Returned if present in the Request)
<b>OrderID</b> <i>value</i>	
<b>ExternalRequestID</b> <i>value</i>	
<b>SuccessfulGranuleCount</b> <i>value</i>	
<b>GranuleUR</b> <i>value</i> or <b>GranuleUR</b> (BR or PH or QA) <i>value</i>	(Repeated for each successful granule)
<b>FailedGranuleCount</b> <i>value</i>	
<b>GranuleOrderFailure</b> <i>GranuleUR FailureCode Description</i>	(Repeated for each failed granule)

SuccessfulGranuleCount is the number of granules successfully submitted to the data server by the MTMGW.

FailedGranuleCount is the number of granules that the MTMGW could not successfully submit to the data server.

If the number of granules in the search returns exceeds the setting in effect for MaximumNumberOfGranules (see Section 5.4.2), the MTMGW terminates request processing and returns an error message to the SIPS. If the search result does not exceed the maximum number of granules but MaximumTotalSizeInMegaBytes exceeds the settings in effect (see Section 5.6.1), the MTMGW cancels the order and returns an error message to the SIPS.

Following is an example of an Integrated Search and Order Result.

OrderID 0300000390

ExternalRequestID 0000001

SuccessfulGranuleCount 4

GranuleUR SC:AST\_AWC.001:18023

GranuleUR SC:MISLOBF.001:18069

GranuleUR PH:PH.001:18042

GranuleUR BR:Browse.001:18154

FailedGranuleCount 2

GranuleOrderFailure SC:MOD28ED1.001:17964 203 Acquire failed

GranuleOrderFailure SC:MOD000.001:18045 203 Acquire failed

### 5.9.2 Response to Duplicate Search and Order Request Message

In the case of a duplicate Integrated Search and Order request, the MTMGW returns the following status message:

**MessageID** (Returned if present in Request)

**OrderID** *value*

**ExternalRequestID** *value*

**OrderStatus** *value*

**ReceiveDateTime** *value*

**StartDateTime** *value*

**FinishDateTime** *value*

**ShippingDateTime** *value*

For an example message, see Section 5.7.2. See Table B-2 for a list of ECS Order Status Codes.

### 5.10 Error Messages

In case of error, the MTMGW stops processing and returns an error message in the following format:

**ERROR** *ErrorCode Error Description*

See Appendix B, Table B-3 for a list of error codes that may be returned by the MTMGW.

# Appendix A. Work-Off Plan for Incomplete Topics

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Item No.	Location	Topic	Comments	Schedule
1	Appendix B	Error Codes	ECS to supply list of error codes with descriptions	Will be added in when white paper is converted to SIPS ICD

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## Appendix B. Dictionary of Message Syntax€

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**Table B-1. MTMGW Keyword Dictionary (1 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
AttributeList	Search Request	The list of attributes that the SIPS wishes to be returned in the Search Result	N/A
BEGIN_GRANULE	Order Request, Order Result	BEGIN_GRANULE and END_GRANULE frame identifying information for a single granule	N/A
BrowseIncluded[G A N]	Order Request, Integrated Search and Order Request	A Browse file may be ordered with its associated Granule(s) (G), ordered Alone (A) without associated granule(s), or Not ordered (N)	1 char
City	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	35-char string
COMPRESSION	Order Request, Integrated Search and Order Request	Optional. SIPS-specified data compression type for distribution of the order. Compression type values are listed in Table 5-1.	4

**Table B-1. MTMGW Keyword Dictionary (2 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
ContactInformation	Order Request, Integrated Search and Order Request	Optional. Consists of a list of optional attributes. If no ContactInformation attributes are given, contact information defaults to the User Profile database.	N/A
ContactInformationCount	Order Request, Integrated Search and Order Request	The total number of attributes actually included in ContactInformation	Decimal number
Country	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	30
DDISTMEDIATYPE	Order Request, Integrated Search and Order Request	SIPS-specified media type for distribution of the order. Valid media type values are listed in Table 5-1.  Note: A DAAC may not support all ECS media types.	50 char
DDISTMEDIAFMT	Order Request, Integrated Search and Order Request	SIPS-specified media format for distribution of the order: Valid media formats are listed in Table 5-1.	50 char

**Table B-1. MTMGW Keyword Dictionary (3 of 10)**

Keyword/Command	Message	Description	Field Size
DDISTNOTIFYTYPE	Order Request, Integrated Search and Order Request	SIPS-specified method for sending data distribution notices. The only valid type is MAIL (see Table 5-1).	4 char
EmailAddress	Order Request, Integrated Search and Order Request	An attribute of ContactInformation. If no value is provided for NOTIFY in TransferAttribute, defaults to the value in ContactInformation. If not included in Contact Information, defaults to User Profile.	255
END_GRANULE	Order Request, Order Result	BEGIN_GRANULE and END_GRANULE frame identifying information for a single granule	N/A
ExternalRequestID	Order Request, Integrated Search and Order Request	SIPS-supplied identifier for an order. MTMGW forwards to order status database. SIPS may use this identifier or OrderID when contacting DAAC operator for order status.	50-character string

**Table B-1. MTMGW Keyword Dictionary (4 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
FailedGranuleCount	Order Result, Integrated Search and Order Result	Number of granules that MTMGW could not successfully order from the data server.	Decimal number
Fax	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	22-char string
FinishDateTime	Order Result, Integrated Search and Order Result	Time at which an order has been completed by ECS Data Distribution	MM/DD/YY hh:mm:ss:lll where Y=year, M=month, D=day, h=hours, m=minutes, s=seconds, l=milliseconds
FirstName	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	20-char string
FTPUSER	Order Request, Integrated Search and Order Request	User ID provided by SIPS to be used by ECS for ftp Push deliveries	50 char
FTPPASSWORD	Order Request, Integrated Search and Order Request	Password provided by SIPS to be used by ECS for ftp Push deliveries	50 char
FTPHOST	Order Request, Integrated Search and Order Request	For DDISTMEDIATYPE = FtpPush, the host to which ECS should push a data distribution.	255 char

**Table B-1. MTMGW Keyword Dictionary (5 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
FTPPUSHDEST	Order Request, Integrated Search and Order Request	For DDISTMEDIATYPE = FtpPush, the directory path to which ECS should push a data distribution.	255 char
GranuleCount	Order Request	Total number of granules in the order	Decimal number
GranuleID	Order Request, Order Result	ECS attribute used with short name and version ID to uniquely identify a granule.	TBS
GranuleInformation	Order Request,	Identifies granules to be acquired.	N/A
GranuleOrderFailure	Order Result, Integrated Search and Order Result	For each granule failed, gives failure code and description	N/A
GranuleUR	Order Request, Order Result, Integrated Search and Order Result	ECS label used internally to uniquely identify a granule.	TBS
LastName	Order Request, Integrated Search and Order	An attribute of ContactInformation and ShippingInformation	20
LocalGranuleID	Order Request, Order Result	Metadata attribute provided by the data provider that uniquely identifies a granule in combination with short name and version ID.	80 char string

**Table B-1. MTMGW Keyword Dictionary (6 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
MaximumNumberOfGranules	Search Request, Integrated Search and Order Request	Maximum number of granules to be delivered	Decimal number
MaximumTotalSizeInMegabytes	Order Request, Integrated Search and Order Request	Maximum total size of uncompressed data to be delivered (Megabytes)	Decimal number
MessageID	All	Optional message number provided by SIPS in a request message. Returned by MTMGW in corresponding response	Decimal number Maximum: 25 characters
MiddleInit	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	1 char string
MSSUserID	Search Request, Order Request, Integrated Search and Order Request	Assigned by DAAC Operations. May be included in the SIPS requests or obtained from default configured by DAAC Operations	12-char string
NOTIFY	Order Request, Integrated Search and Order Request	e-mail address to use for data distribution notices.	50-char string

**Table B-1. MTMGW Keyword Dictionary (7 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
NumberOfGranules	Search Result	The total number of granules in all chunks in the search result.	Decimal number
OrderID	Order Result, Integrated Search and Order Result	OrderID is assigned by ECS for tracking order status. SIPS may use this identifier or ExternalRequestID when contacting DAAC operator for order status.	10-char string
OrderStatus	Order Result	Order status code; see list in Table B-3.	22-char string
PHIncluded[G A N]	Order Request, Integrated Search and Order Request	A Production History File may be ordered with its associated <b>Granule(s) (G)</b> , ordered <b>Alone (A)</b> without associated granule(s), or <b>Not ordered (N)</b>	1 char
Phone	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	22-char string
QAIncluded[G A N]	Order Request, Integrated Search and Order Request	A Quality Assessment (QA) File may be ordered with its associated <b>Granule(s) (G)</b> , ordered <b>Alone (A)</b> without associated granule(s), or <b>Not ordered (N)</b>	1 char

**Table B-1. MTMGW Keyword Dictionary (8 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
QualificationList	Search Request	List of Search Criteria submitted by the SIPS	N/A
ReceiveDateTime	Order Result, Integrated Search and Order Result	Time at which order was submitted to science data server	MM/DD/YY hh:mm:ss:lll where Y=year, M=month, D=day, h=hours, m=minutes, s=seconds, l=milliseconds
ReturnGranuleUR	Search Request	Specifies whether SIPS wants ECS URs returned in the Search Result. Defaults to N (no).	1 char
ShippingDateTime	Order Result, Integrated Search and Order Result	Time at which last request on the order was shipped	MM/DD/YY hh:mm:ss:lll where Y=year, M=month, D=day, h=hours, m=minutes, s=seconds, l=milliseconds
ShippingInformation	Order Request, Integrated Search and Order Request	Optional. Consists of a list of optional attributes. If ShippingInformation is not present, system defaults to ContactInformation.	N/A
ShippingInformationCount	Order Request, Integrated Search and Order Request	Total number of attributes actually included in the ShippingInformation	decimal number

**Table B-1. MTMGW Keyword Dictionary (9 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
ShortName	Search Result, Order Request, Order Result	ECS-registered short name for Earth Science Data Type (ESDT)	8-char string
StartDateTime	Order Result, Integrated Search and Order Result	Time that Data Distribution began to process the distribution request	MM/DD/YY hh:mm:ss:lll where Y=year, M=month, D=day, h=hours, m=minutes, s=seconds, l=milliseconds
State	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	20-char string
Street1	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	35-char string
Street2	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	35-char string
Street3	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	35-char string
SuccessfulGranuleCount	Order Result, Integrated Search and Order Result	Number of granules successfully identified and submitted to the Science Data Server. Does not represent number of granules for which orders were successfully processed.	Decimal Number

**Table B-1. MTMGW Keyword Dictionary (10 of 10)**

<b>Keyword/Command</b>	<b>Message</b>	<b>Description</b>	<b>Field Size</b>
Title	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	5-char string
TransferAttribute	Order Request, Integrated Search and Order Request	Specifies a list of data distribution parameters	N/A
TransferAttributeCount	Order Request	Number of TransferAttributes (data distribution attributes) included in message.	Decimal number
Truncated	Search Result, Integrated Search and Order Request	Results are truncated when ECS Science Data Server's configurable ceiling is exceeded. If Truncated is Y, the Search Result has been truncated and only a portion of the granules found has been returned.	1 char
UserID	Search Request, OrderRequest, Integrated Search and Order Request		12-char string
VersionID	Search Result, Order Request, Order Result	Version of Earth Science Data Type (ESDT)	4 chars
Zip	Order Request, Integrated Search and Order Request	An attribute of ContactInformation and ShippingInformation	15-char string

**Table B-2. ECS Order Status Codes**

Pending
Canceled
Aborted
Shipped
Terminated
Expired
Operator Intervention
Staging
Transferring
Waiting for shipment
Subsetting
Subsetting Staging
Prep for Distribution
SDSRV Staging
Queued
Waiting for Data
Waiting for Processing
Being Processed
Completed Processing

**Table B-3. Error Codes - TBS**

## Appendix C. Configurable Parameters

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The following list of MTMGW interface procedures and configurable parameters may not be complete but is intended to help SIPS and DAAC operations to work together. Values for the configurable MTMGW parameters should be defined in operations agreements or equivalent documents between each SIPS and the DAAC.

MTMGW remote\_host\_name

MSSUserID

Will DAAC use default MSSUserID or will MSSUserID be included in MTMGW messages?

Maximum number of concurrent requests for the MTMGW server

ESDTs available to MTMGW server for search and order by the SIPS

Will ExternalRequestID be used?

DAAC maximum for number of granules in Search Result and in Integrated Search and Order Result

DAAC maximum for total file volume in uncompressed megabytes in Order Result and in Integrated Search and Order result set.

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# Appendix D. Document Text Definition (DTD)

---

## D.1 Introduction

Section D.2 is the DTD on which the MTMGW Search Result format is based. Following are some reserved characters and entities used in the XML DTD.

'?' means optional

'\*' means repeat 0 to  $n$  times

'+' means repeat 1 to  $n$  times

'#PCDATA' means the value of the element

## D.2 DTD

```
<!ELEMENT SearchResult (NumberOfGranules, Truncated,  
(Trigger,TruncateLimits)?,(GranuleURMetaData)*)>
```

```
<!-- The total number of returned granules -->
```

```
<!ELEMENT NumberOfGranules (#PCDATA)>
```

```
<!-- the truncation flag which value is [Y/N]-->
```

```
<!ELEMENT Truncated (#PCDATA)>
```

```
<!-- Who triggers the truncation, [SDSRV/MTMGW/SIPS] -->
```

```
<!ELEMENT Trigger (#PCDATA)>
```

```
<!-- The number of granules after the truncation which is equal to the value of  
NumberOfGranules -->
```

```
<!ELEMENT TruncateLimits (#PCDATA)>
```

```

<!ELEMENT GranuleURMetaData
(GranuleUR?,(DbID|CollectionDescriptionClass|ECSDDataGranule|PGEVersionClass|RangeDate
Time|SingleDateTime|SpatialDomainContainer|OrbitCalculatedSpatialDomain|MeasuredParamet
er|ProcessingQA|StorageMediumClass|Review|SensorCharacteristic|AssociatedPlatformInstrume
ntSensor|AnalysisSource|Campaign|PSAs|InputGranule)+)>

<!ELEMENT GranuleUR (#PCDATA)>
<!ELEMENT DbID (#PCDATA)>

<!ELEMENT CollectionDescriptionClass ((ShortName|VersionID)+)>
<!ELEMENT ShortName (#PCDATA)>
<!ELEMENT VersionID (#PCDATA)>

<!ELEMENT ECSDDataGranule
(SizeMBECSDDataGranule|ReprocessingPlanned|ReprocessingActual|LocalGranuleID|DayNightF
lag|ProductionDateTime|LocalVersionID)+>
<!ELEMENT SizeMBECSDDataGranule (#PCDATA)>
<!ELEMENT ReprocessingPlanned (#PCDATA)>
<!ELEMENT ReprocessingActual (#PCDATA)>
<!ELEMENT LocalGranuleID (#PCDATA)>
<!ELEMENT DayNightFlag (#PCDATA)>
<!ELEMENT ProductionDateTime (#PCDATA)>
<!ELEMENT LocalVersionID (#PCDATA)>

<!ELEMENT PGEVersionClass (PGEVersion)>
<!ELEMENT PGEVersion (#PCDATA)>

```

```
<!ELEMENT RangeDateTime
(RangeEndingTime|RangeEndingDate|RangeBeginningTime|RangeBeginningDate)+>
<!ELEMENT RangeEndingTime (#PCDATA)>
<!ELEMENT RangeEndingDate (#PCDATA)>
<!ELEMENT RangeBeginningTime (#PCDATA)>
<!ELEMENT RangeBeginningDate (#PCDATA)>

<!ELEMENT SingleDateTime (TimeOfDay|CalendarDate)+>
<!ELEMENT TimeOfDay (#PCDATA)>
<!ELEMENT CalendarDate (#PCDATA)>

<!ELEMENT SpatialDomainContainer
(GranuleLocality|VerticalSpatialDomain|HorizontalSpatialDomainContainer)+>

<!ELEMENT GranuleLocality (LocalityValue)+>
<!ELEMENT LocalityValue (#PCDATA)>

<!ELEMENT VerticalSpatialDomain (VerticalSpatialDomainContainer)+>
<!ELEMENT VerticalSpatialDomainContainer
(VerticalSpatialDomainType|VerticalSpatialDomainValue)+>
<!ELEMENT VerticalSpatialDomainType (#PCDATA)>
<!ELEMENT VerticalSpatialDomainValue (#PCDATA)>

<!ELEMENT HorizontalSpatialDomainContainer
(ZoneIdentifierClass|Point|Circle|BoundingRectangle|GPolygon)+>
```

<!ELEMENT ZoneIdentifierClass (ZoneIdentifier)>

<!ELEMENT ZoneIdentifier (#PCDATA)>

<!ELEMENT Circle (CenterLatitude,CenterLongitude,Radius)>

<!ELEMENT CenterLatitude (#PCDATA)>

<!ELEMENT CenterLongitude (#PCDATA)>

<!ELEMENT Radius (#PCDATA)>

<!ELEMENT BoundingRectangle

(WestBoundingCoordinate,NorthBoundingCoordinate,EastBoundingCoordinate,SouthBounding  
Coordinate)>

<!ELEMENT WestBoundingCoordinate (#PCDATA)>

<!ELEMENT NorthBoundingCoordinate (#PCDATA)>

<!ELEMENT EastBoundingCoordinate (#PCDATA)>

<!ELEMENT SouthBoundingCoordinate (#PCDATA)>

<!ELEMENT GPolygon (Boundary,ExclusiveZone?)>

<!ELEMENT ExclusiveZone (Boundary)+>

<!ELEMENT Boundary (Point,Point,Point,Point\*)>

<!ELEMENT Point (PointLongitude,PointLatitude)>

<!ELEMENT PointLongitude (#PCDATA)>

<!ELEMENT PointLatitude (#PCDATA)>

```
<!ELEMENT OrbitCalculatedSpatialDomain (OrbitCalculatedSpatialDomainContainer)+>
<!ELEMENT OrbitCalculatedSpatialDomainContainer
(OrbitalModelName|OrbitNumber|StartOrbitNumber|StopOrbitNumber|EquatorCrossingLongitude|EquatorCrossingDate|EquatorCrossingTime)|>
```

```
<!ELEMENT OrbitalModelName (#PCDATA)>
<!ELEMENT OrbitNumber (#PCDATA)>
<!ELEMENT StartOrbitNumber (#PCDATA)>
<!ELEMENT StopOrbitNumber (#PCDATA)>
<!ELEMENT EquatorCrossingLongitude (#PCDATA)>
<!ELEMENT EquatorCrossingDate (#PCDATA)>
<!ELEMENT EquatorCrossingTime (#PCDATA)>
```

```
<!ELEMENT MeasuredParameter (MeasuredParameterContainer)+>
<!ELEMENT MeasuredParameterContainer (ParameterName|QAStats|QAFlags)|>

<!ELEMENT ParameterName (#PCDATA)>
```

```
<!ELEMENT QAStats
(QAPercentMissingData|QAPercentOutOfBoundsData|QAPercentInterpolatedData|QAPercentCloudCover)>
<!ELEMENT QAPercentMissingData (#PCDATA)>
<!ELEMENT QAPercentOutOfBoundsData (#PCDATA)>
<!ELEMENT QAPercentInterpolatedData (#PCDATA)>
<!ELEMENT QAPercentCloudCover (#PCDATA)>
```

<!ELEMENT QAFlags  
(AutomaticQualityFlag|AutomaticQualityFlagExplanation|OperationalQualityFlag|OperationalQualityFlagExplanation|ScienceQualityFlag|ScienceQualityFlagExplanation)|>  
<!ELEMENT AutomaticQualityFlag (#PCDATA)>  
<!ELEMENT AutomaticQualityFlagExplanation (#PCDATA)>  
<!ELEMENT OperationalQualityFlag (#PCDATA)>  
<!ELEMENT OperationalQualityFlagExplanation (#PCDATA)>  
<!ELEMENT ScienceQualityFlag (#PCDATA)>  
<!ELEMENT ScienceQualityFlagExplanation (#PCDATA)>

<!ELEMENT ProcessingQA (ProcessingQAContainer)+>  
<!ELEMENT ProcessingQAContainer (ProcessingQADescription|ProcessingQAAttribute)|>  
<!ELEMENT ProcessingQADescription (#PCDATA)>  
<!ELEMENT ProcessingQAAttribute (#PCDATA)>

<!ELEMENT StorageMediumClass (StorageMedium)+>  
<!ELEMENT StorageMedium (#PCDATA)>

<!ELEMENT Review (ReviewContainer)+>  
<!ELEMENT ReviewContainer (ScienceReviewStatus|ScienceReviewDate|FutureReviewDate)|>  
<!ELEMENT ScienceReviewStatus (#PCDATA)>  
<!ELEMENT ScienceReviewDate (#PCDATA)>  
<!ELEMENT FutureReviewDate (#PCDATA)>

```

<!ELEMENT SensorCharacteristic (SensorCharacteristicContainer)+>
<!ELEMENT SensorCharacteristicContainer
(PlatformShortName|InstrumentShortName|SensorShortName|SensorCharacteristicName|Sensor
CharacteristicValue)|>
<!ELEMENT PlatformShortName (#PCDATA)>
<!ELEMENT InstrumentShortName (#PCDATA)>
<!ELEMENT SensorShortName (#PCDATA)>
<!ELEMENT SensorCharacteristicName (#PCDATA)>
<!ELEMENT SensorCharacteristicValue (#PCDATA)>

<!ELEMENT AssociatedPlatformInstrumentSensor
(AssociatedPlatformInstrumentSensorContainer)+>
<!ELEMENT AssociatedPlatformInstrumentSensorContainer
(AssociatedPlatformShortName|AssociatedInstrumentShortName|OperationMode|AssociatedSen
sorShortName)|>
<!ELEMENT AssociatedPlatformShortName (#PCDATA)>
<!ELEMENT AssociatedInstrumentShortName (#PCDATA)>
<!ELEMENT OperationMode (#PCDATA)>
<!ELEMENT AssociatedSensorShortName (#PCDATA)>

<!ELEMENT AnalysisSource (AnalysisShortName)>
<!ELEMENT AnalysisShortName (AnalysisSourceShortName)+>
<!ELEMENT AnalysisSourceShortName (#PCDATA)>

<!ELEMENT Campaign (CampaignShortName)+>
<!ELEMENT CampaignShortName (#PCDATA)>

```

<!ELEMENT PSAs (PSA)+>

<!ELEMENT PSA (PSAName?, (PSAValue+)?)>

<!ELEMENT PSAName (#PCDATA)>

<!ELEMENT PSAValue (#PCDATA)>

<!ELEMENT InputGranule (InputPointer)+>

<!ELEMENT InputPointer (#PCDATA)>

# Abbreviations and Acronyms

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CCR	Configuration Change Request
DTD	Document Text Definition
EDG	EOS Data Gateway
ESDT	Earth Science Data Type
ICD	Interface Control Document
MOJO	Message Oriented JEST Objects
MTMGW	Machine-to-Machine Gateway
PH	Production History
PSA	Product-Specific Attribute
QA	Quality Assessment
TBD	To Be Determined
TBS	To Be Supplied
UR	(ECS) Universal Reference
XML	Extensible Markup Language

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