FDSN Web Service Specification

fdsnws-station

Version 1.1

2019-06-27

International Federation of Digital Seismograph Networks
www.fdsn.org

Purpose

To specify a web service interface for the exchange of time series metadata within the context of the International Federation of Digital Seismograph Networks (FDSN). The intention is to provide a specification that, when implemented at different FDSN data centers, can be used interchangeably by the same client software. Combined with common FDSN web service specifications, this document fully defines the request parameters and expected results.

Common service characteristics

This document must be combined with the common service characteristics defined in version 1.1, or later version 1.x, of the "FDSN-WS-Specification-Commonalities" for a full specification. The common service characteristics include versioning scheme, general calling pattern, common service methods, common error responses, and more.

Service methods

The service should support these methods:

query – to submit a data or information request

version – to request the full service version

application.wadl – to request a WADL for the interface

Purpose of the *query* method:

This method is designed to return metadata for time series data. Metadata may be requested in multiple formats and at different levels of granularity as documented in this specification.

Request parameters for the *query* method:

The service shall accept requests formulated using the parameters identified in Table 1. The **alias** values are acceptable synonyms for the given **parameter** name.

Table 1. Parameters for the *query* method:

Parameter	Alias	Support	Default	Allowed Values	Type	Unit
starttime	**start**	**required**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit results to time series samples on or after the specified start time.						
endtime	**end**	**required**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit results to time series samples on or before the specified end time.						
startbefore		**optional**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit to metadata epochs starting before specified time.						
startafter		**optional**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit to metadata epochs starting after specified time.						
endbefore		**optional**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit to metadata epochs ending before specified time.						
endafter		**optional**	**[Any]**	**Any valid time**	**time**	**UTC**
Limit to metadata epochs ending after specified time.						
network	**net**	**required**	**[Any]**	**Valid network code or wildcard**	**string**	
Select one or more network codes. Can be FDSN network codes or data center defined codes. Multiple codes are comma-separated.						
station	**sta**	**required**	**[Any]**	**Valid station code or wildcard**	**string**	
Select one or more FDSN station codes. Multiple codes are comma-separated.						
location	**loc**	**required**	**[Any]**	**Valid location code or wildcard**	**string**	
Select one or more FDSN location identifiers. Multiple identifiers are comma-separated. As a special case '--' (two dashes) will be translated to a string of two space characters to match blank location IDs.						
channel	**cha**	**required**	**[Any]**	**Valid channel code or wildcard**	**string**	
Select one or more FDSN channel codes. Multiple codes are comma-separated.						
minlatitude	**minlat**	**required**	**-90.0**	**-90.0 to 90.0**	**float**	**degrees**
Limit to stations with a latitude larger than or equal to the specified minimum.						
maxlatitude	**maxlat**	**required**	**90.0**	**-90.0 to 90.0**	**float**	**degrees**
Limit to stations with a latitude smaller than or equal to the specified maximum.						
minlongitude	**minlon**	**required**	**-180.0**	**-180.0 to 180.0**	**float**	**degrees**
Limit to stations with a longitude larger than or equal to the specified minimum.						
maxlongitude	**maxlon**	**required**	**108.0**	**-180.0 to 180.0**	**float**	**degrees**
Limit to stations with a longitude smaller than or equal to the specified maximum.						
latitude	**lat**	**optional**	**0.0**	**-90.0 to 90.0**	**float**	**degrees**
Specify the latitude to be used for a radius search.						
longitude	**lon**	**optional**	**0.0**	**-180.0 to 180.0**	**float**	**degrees**
Specify the longitude to be used for a radius search.						
minradius		**optional**	**0.0**	**0 to 180.0**	**float**	**degrees**
Limit results to stations within the specified minimum number of degrees from the geographic point defined by the latitude and longitude parameters.						
maxradius		**optional**	**180.0**	**0 to 180.0**	**float**	**degrees**
Limit results to stations within the specified maximum number of degrees from the geographic point defined by the latitude and longitude parameters.						
level		**required**	**station**	**network, station, channel, response**	**string**	
Specify the level of detail for the results.						
includerestricted		**optional**	**TRUE**	**TRUE or FALSE**	**boolean**	
Specify if results should include information for restricted stations.						
includeavailability		**optional**	**FALSE**	**TRUE or FALSE**	**boolean**	
Specify if results should include information about time series data availability.						

Table 1 continued.

Parameter	Alias	Support	Default	Allowed Values	Type	Unit
updatedafter		optional*	**[Any]**	**Any valid time**	**time**	**UTC**
Limit to metadata updated after specified time; updates are data center specific. * While this option is not required it is highly recommended due to usefulness.						
matchtimeseries		optional	**FALSE**	**TRUE or FALSE**	**boolean**	
Limit to metadata where selection criteria matches time series data availability.						
format		optional	**text**	**xml, text**	**string**	
Specify format of result, either *xml* (default) or *text* (defined below). If this parameter is not specified the service must return StationXML.						
nodata		optional	**204**	**204 or 404**	**string**	
Select status code for "no data", either *204* (default) or *404*.						

Requests using the *query* method

The parameters may be submitted using either of the HTTP GET or POST methods. The POST method is useful to allow a large number of core request parameters to be submitted.

For the GET method, the parameters should be submitted as key=value pairs and may not be specified more than once; if a parameter is submitted multiple times the result is undefined.

For the POST method, all parameters must be submitted as part of the POST body. The parameters for *network*, *station*, *location*, *channel*, *starttime* and *endtime* may be repeated as many times as necessary, all other parameters should be specified as key=value pairs on separate lines following this pattern:

```
parameter1=value
parameter2=value
NET STA LOC CHA STARTTIME ENDTIME
NET STA LOC CHA STARTTIME ENDTIME
NET STA LOC CHA STARTTIME ENDTIME
```

This would be POSTed to the URI "<site>/fdsnws/station/1/query".

All rules for parameters apply equally whether specified using the GET or POST methods with the exception of blank location IDs, which must be specified as "--" in the POST body due to spaces being used as the field separator.

Controlling the level of detail

The *level* parameter controls the amount of detail included in the returned FDSN StationXML results with the following hierarchy: network, station, channel and response. For example, if the station level is requested the Station elements will be included in the results but not Channel or Response related information.

Responses for the *query* method:

The results of a successful request shall be returned as FDSN StationXML using MIME type **application/xml** by default or when the *format* parameter value is 'xml'. If the *format* parameter value is 'text' the results shall be returned in a simple ASCII format for *level* = network, station or channel using MIME type **text/plain** as defined below. Requests for text output at the response level should generate an error.

Behavior for the *version* method

The service shall return the return the implementation version as a simple text string using the MIME type **text/plain**. Any parameters submitted with the method will be ignored.

Behavior for the ***application.wadl*** method

The service shall return a WADL conformant description of the interface using the MIME type **application/xml**. Any parameters submitted with the method will be ignored. The WADL shall describe all parameters supported by the interface and is primarily used to document which optional parameters are supported.

Behavior for the **error** conditions

All errors returned to the client shall use the type and pattern described in the common service characteristics specification.

Behavior for the ***matchtimeseries*** parameter

When *matchtimeseries* is TRUE: in addition to matching metadata based on selection criteria, the results will be further limited to metadata for which the selection criteria (e.g. *starttime, endtime, network, station, location, channel*) also match the existence of available time series data.

Text output formats for network, station and channel levels

These simple text output formats contain one entry per line with common fields separated by vertical bar characters ("|": ASCII decimal 124). Field entries cannot contain vertical bar characters. Lines beginning with a hash character ("#": ASCII decimal 35) should be considered comment lines.

level=network

```
Network|Description|StartTime|EndTime|TotalStations
Network|Description|StartTime|EndTime|TotalStations
…
```

level=station

```
Network|Station|Latitude|Longitude|Elevation|SiteName|StartTime|EndTime
Network|Station|Latitude|Longitude|Elevation|SiteName|StartTime|EndTime
…
```

level=channel

```
Network|Station|Location|Channel|Latitude|Longitude|Elevation|Depth|Azimuth|Dip|Sensor
Description|Scale|ScaleFrequency|ScaleUnits|SampleRate|StartTime|EndTime
Network|Station|Location|Channel|Latitude|Longitude|Elevation|Depth|Azimuth|Dip|Sensor
Description|Scale|ScaleFrequency|ScaleUnits|SampleRate|StartTime|EndTime
…
```

The description for each column is, in most cases, directly equivalent to the like named element or attribute in StationXML and SEED, column values should follow the conventions used in those formats.

In these text formats the meaning of the StartTime and EndTime values change depending on the level of the output. For channel-level output the time values refer to channel operating times, for station-level output the time values refer to station operating times and for network-level output the time values refer to network operating times. Similarly, the meaning of the Latitude and Longitude values change depending on the level, they are either station coordinates or channel coordinates.

In the network level output, the TotalStations value is the number of stations associated with the given network entry.

In the channel level output, the Scale value is the total sensitivity, the ScaleFrequency is the frequency at which the Scale is valid and the ScaleUnits are the units of data after the Scale value has been applied. These values are equivalent to the values in the StationXML <InstrumentSensitivity> structure or stage 0 of SEED headers.

In the channel level output, the SensorDescription field is equivalent to the StationXML element Network::Station::Channel::Sensor::Type, which is commonly mapped to description identified in field 6 of SEED Blockette 52.

Examples

Requesting metadata for all channels from IU station COLA with no time limitations:

http://service.iris.edu/fdsnws/station/1/query?network=IU&station=COLA&level=channel

Requesting metadata for all BH* channels between latitude -10 and -45 and longitude between 112 and 155 (e.g. Australia):

http://service.iris.edu/fdsnws/station/1/query?channel=BH&maxlatitude=-10&minlatitude=-45&minlongitude=122&maxlongitude=155&level=channel*

Requesting metadata in simple text format at the network level:

http://service.iris.edu/fdsnws/station/1/query?network=II,IU&format=text&level=network

```
#Network | Description | StartTime | EndTime | TotalStations
II|Global Seismograph Network (GSN - IRIS/IDA)|1986-01-01T00:00:00|2500-12-12T23:59:59|50
IU|Global Seismograph Network (GSN - IRIS/USGS)|1988-01-01T00:00:00|2500-12-12T23:59:59|255
```

Requesting metadata in simple text format at the station level:

http://service.iris.edu/fdsnws/station/1/query?network=IU&format=text&level=station

```
#Network | Station | Latitude | Longitude | Elevation | SiteName | StartTime | EndTime
IU|ANMO|34.9459|-106.4572|1850.0|Albuquerque, New Mexico, USA|1989-08-29T00:00:00|1995-07-14T00:00:00
IU|ANMO|34.9459|-106.4572|1850.0|Albuquerque, New Mexico, USA|1995-07-14T00:00:00|2000-10-19T16:00:00
IU|ANMO|34.9502|-106.4602|1839.0|Albuquerque, New Mexico, USA|2000-10-19T16:00:00|2002-11-19T21:07:00
…
```

Requesting metadata in simple text format at the channel level:

http://service.iris.edu/fdsnws/station/1/query?station=COLA&format=text&level=channel

```
#Network | Station | Location | Channel | Latitude | Longitude | Elevation | Depth | Azimuth
| Dip | SensorDescription | Scale | ScaleFreq | ScaleUnits | SampleRate | StartTime | EndTime
IU|COLA|20|HNE|64.873599|-147.8616|200.0|0.0|90.0|0.0|Kinemetrics FBA-23 Low-Gain
Sensor|53687.1|1.0|M/S**2|80.0|2005-09-28T22:00:00|2009-07-08T22:00:00
IU|COLA|20|HNN|64.873599|-147.8616|200.0|0.0|0.0|0.0|Kinemetrics FBA-23 Low-Gain
Sensor|53687.1|1.0|M/S**2|80.0|2005-09-28T22:00:00|2009-07-08T22:00:00
IU|COLA|20|HNZ|64.873599|-147.8616|200.0|0.0|0.0|-90.0|Kinemetrics FBA-23 Low-Gain
Sensor|53687.1|1.0|M/S**2|80.0|2005-09-28T22:00:00|2009-07-08T22:00:00
IU|COLA|00|BH1|64.873599|-147.8616|80.0|120.0|111.0|0.0|Geotech KS-54000 Borehole
Seismometer|8.04479E8|0.02|M/S|20.0|2005-09-27T00:00:00|2009-07-08T22:00:00
IU|COLA|00|BH2|64.873599|-147.8616|80.0|120.0|201.0|0.0|Geotech KS-54000 Borehole
Seismometer|8.1814E8|0.02|M/S|20.0|2005-09-27T00:00:00|2009-07-08T22:00:00
IU|COLA|00|BHZ|64.873599|-147.8616|80.0|120.0|0.0|-90.0|Geotech KS-54000 Borehole
Seismometer|8.44329E8|0.02|M/S|20.0|2005-09-27T00:00:00|2009-07-08T22:00:00
…
```

Requesting two time windows of data for two IU stations with different channel selections using a POST request:

http://service.iris.edu/fdsnws/station/1/query

POST message body:

```
level=channel
includerestricted=FALSE
IU COLA 00 LH? 2012-01-01T00:00:00 2012-01-01T12:00:00
IU ANMO 10 BH? 2013-07-01T00:00:00 2013-02-07T12:00:00
```

References

FDSN Web Service Commonalities - http://www.fdsn.org/webservices/

SEED data format - http://www.iris.edu/manuals/SEEDManual_V2.4.pdf

FDSN StationXML - http://www.fdsn.org/xml/station/

Web Application Description Language (WADL) - http://www.w3.org/Submission/wadl/

Credits

This document was designed and is maintained by the Incorporated Research Institutions for Seismology (IRIS), Data Services on behalf of the FDSN.

Changes

Note: Through 2019-06-27 the changes relevant for this service are extracted from the original, monolithic specification document.

2012-07-12 · Initial specification, release candidate 1

2012-07-18

1. Designate the specification as provisional until the FDSN StationXML schema is defined.

2012-11-20

1. Include examples request URI's for each service.
2. Remove provisional status.

2013-04-24 · Version 1.0 final

1. Add link to FDSN StationXML specification in references and remove provisional language.
2. Remove the DRAFT designation.

2013-09-18 · Integrate proposed version 1.1 changes

1. Add designation of required versus optional parameters for each service interface.
2. Allow service interface to accept arbitrary selections via the POST method. Support for this method is required for all 1.1 implementations.
3. Add optional *format* parameter to each service definition. The default format of StationXML remains the same. Document an alternate, simple text format to return when *format=text* including examples.
4. Add optional *nodata* parameter to each service definition that accepts values of '204' (default) and '404'. This parameter controls the HTTP status code to return when the request was successful but matched no data.
5. Add optional *matchtimeseries* parameter. This parameter is used to limit results to selections that match time series data availability.

6. Clarify definition of *starttime* and *endtime* parameters to explicitly include metadata epochs intersection with the specified time range.
7. Clarify definition of minimum and maximum latitude and longitude to be inclusive by adding "or equal to" to their description.

2013-10-04 · 1.1 release candidate

1. Add description and clarification for the columns of the text format.
2. Avoid ambiguity of required parameters by re-naming the appropriate column "Support" and changing the values to "Required" and "Optional".

2013-10-15 · 1.1 release candidate 2

1. Add section describing WADL conventions.
2. Clarify that when the *format* parameter is not specified the default format must be returned.
3. Clarify that an HTTP 413 status shall be returned when either the request entity itself is too large or the resulting data set would be too large, the latter being an extension of the standard meaning.

2013-10-25 · Version 1.1 final

1. Clarify limitations of text output format: vertical bars cannot be included in fields, multiple origins & magnitudes cannot be included, phase arrivals cannot be included.
2. Document intended behavior for the *matchtimeseries* parameter.

2015-06-19 · Version 1.1b (clarifying edit, internal version change only)

1. Add *SiteName* column to station-level text template (page 12) as was the original intention and to match the example and predominant implementations.

2019-06-27 · Version 1.1 of fdsnws-station only

1. Reformat document to contain only the specification for **fdsnws-station** service. Common service characteristics are maintained in a separate document.