

# **SFpark Availability Service API Reference**

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## 1. Introduction

The San Francisco Municipal Transportation Agency (SFMTA) established SFpark to use new technologies and policies to better manage parking in San Francisco. Through demand-responsive pricing, SFpark aims to find the lowest meter rate possible so that there is always parking available. By ensuring parking availability, SFpark aims to reduce circling, double parking, and greenhouse gas emissions. The SFpark project also provides a real-time feed into an SFMTA hosted data store (part of SFpark Data warehouse) for physical parking activity as collected by sensors installed for on-street metered parking spaces (see next section describing deactivation of on-street parking sensors) and gate controlled off-street (OSP) facilities. The data from sensors focus on updates to the status for each space as “occupied” or “vacant” or occupied count for OSP facilities. Any other applicable operational schedule/closure data, taken together and applied to these individual real-time data at any point in time are used to calculate if “vacant” spaces are in fact available for general parking.

The SFpark data warehouse will process the real time data and provide the basis for the Parking Availability (or simply availability) feed. This real time SFpark availability feed is being provided as a REST service with data returned in XML or JSON format.

This document includes API information needed by SFpark API end users and partners to effectively carry out testing for retrieving and displaying the Availability data from the SFpark Data Warehouse. It is intended to be a living document, updated as required during the life of the project. Use of the data and the API is governed by the SFpark rules and limitations as applicable. For latest information on the project and other relevant information, including developer resources, please visit <http://sfpark.org>

### 1.1 Parking sensors deactivation effective Dec 30, 2013

Effective December 30, 2013, the parking sensors used to determine real-time on-street parking occupancy in the SFpark pilot areas will be deactivated. SFpark will continue to provide real-time parking availability information for SFpark garages as well as pricing information for both off-street garages and on-street spaces in SFpark areas. The format of the availability feed will not change; on-street availability data will simply no longer be sent. The SFMTA will continue to conduct demand-responsive rate changes to find the lowest rates possible to help ensure there is a minimum number of open parking spaces on each block to reduce circling and double-parking.

Respective sections in this document have been updated that describe the handling and recommended interpretation of the occupancy and operational space counts that are provided by this service.

### 1.2 Objectives

The main objective of this document is to serve as a reference that describes the SFpark availability services API, their format and associated parameters that are necessary to carry out connectivity and testing of these services.

This document also provides basic information to set up the service client along with the connection properties for successfully connecting to and passing the request parameters for obtaining the availability data from the SFpark system. It should however, not be used to determine the type, level of testing or the validity of the request parameters to be passed.

The formats of valid messages, success and error responses are also described for determining whether the service was invoked successfully or resulted in errors. It however, does not provide information on

connection errors that may be due to network or firewalls. In general once the connectivity to the SFpark system has been established, the error response from the service should provide useful information to determine the cause or reason of the error.

The guide also provides basic steps to configure a popular Web Services Testing tool, SoapUI for testing the service. Since there are variety of ways to test such a service and a number of tools that can be used, this guide does not attempt to provide how to resolve issues with setting up any particular service client.

### 1.3 Special Considerations

Key aspects of the SFpark system are discussed in this section. It provides information regarding certain characteristics and or conventions that are used by the SFpark system.

The data provided in the response is based on the actual status events as received from the various sensors and may have changed since the events were transmitted from the individual spaces and stored and processed prior to returning this data. Hence, the status provided in the response has some lag and may provide a different view than actual status. The real time status refers to state of the data as available from the SFpark data warehouse at the time of request.

#### 1.3.1 Using the XML or JSON response format

SFpark Availability service can return data in XML or JSON format (along with JSONP support) for increased flexibility to display the results as appropriate. JSON is becoming increasingly popular; however, XML is also used extensively when dealing with structured data. User thus has the choice to decide which format to use based on the merits of each format, availability of tools or developer resources for a particular format and the suitability for the target display or usage.

#### 1.3.2 Note Regarding DNS Names/ IP Addresses used in this guide

The service should be accessed by utilizing the current SFpark service DNS name/port number. This will avoid connectivity problems in case the associated IP address(es) for the DNS name change, which are subject to change by SFpark at any time.

For illustrative purposes where hostname and or port numbers are needed this document references the current DNS name for the SFpark server: `api.sfpark.org` running on default HTTP port 80. If the DNS server/port information changes in the future or if a secondary environment is provided for testing, then replace these connection parameters with the appropriate server/ port information.

#### 1.3.3 SFpark Data Conventions

Following are some of the key data conventions adopted by SFpark:

1. XML element names are specified as UPPERCASE with ' \_ ' allowed for readability. Example:  
<MESSAGE>25 records found</MESSAGE>
2. JSON response data elements are similarly also specified as UPPERCASE, e.g.,  
MESSAGE : "25 records found"
3. JSON request parameters are allowed to be case insensitive.
4. All prices returned from the service are in US Dollars.

### 1.3.4 SFpark Date-Time Conventions

In general, date-time elements returned from SFpark and the SFpark Data Warehouse follow the Pacific Time zone (PST/GMT-08:00 or PDT/GMT-07:00) in effect based on the time of the year unless otherwise noted.

Also, the response elements representing timestamp data will be formatted as per the XML dateTime convention and will provide the applicable offset from UTC/GMT, e.g., PDT offset is specified as -07:00. Hence the dateTime: "2011-04-18T12:28:41.838-07:00" represents "2011-04-18T12:28:41.838 PDT" or "2011-04-18T19:28:41.838Z" where Z indicates UTC (or GMT which is 7 hours ahead of PDT) time representation. Similarly, when SFpark follows the PST time zone, the response will be provided using the offset: -08:00 which is equivalent to PST in numerical representation and this offset represents a time being 8 hours behind UTC.

The time element itself is incomplete without the time zone (or offset) and hence the users of the data should always consider the offset (when provided) to derive the actual time it represents. Such usage will allow for correct time interpretation in cases when the offset or the time zone changes.

When not representing a timestamp value and the response refers to certain time of day the usual SFpark convention is to use 12 hour AM/PM time format. As above, these will represent the time for the SFpark time zone in effect (PST or PDT). E.g., when providing the time interval for a particular price in effect: 7:00 AM – 6:00 PM: \$2.00 Per Hour.

### 1.3.5 Acronyms and Abbreviations

Following are some of the common abbreviations and acronyms used throughout this document.

Term	Definition
API	Application Programming Interface
JSON	JavaScript Object Notation. It is a lightweight data-interchange format.
JSONP	JSONP or "JSON with padding" is a complement to the base JSON data format.
REST	Representational State Transfer. The REST protocol is a simple HTTP-based protocol.
SFMTA	San Francisco Municipal Transportation Agency.
SFpark	SFpark is a SFMTA project. It allows for new parking management approaches and technology to manage parking supply and demand more intelligently.
SOA	Service Oriented Architecture.
XML	Extensible Markup Language (XML) is a simple yet very flexible text format.
XSD	XML Schema Definition is an XML-based language used to describe and control XML document contents.

## 2. SFpark Availability REST Service API

This section provides API information for the SFpark REST based Availability Service (or simply service). This SFpark service provides the mechanism for obtaining the latest Availability data from the SFpark Data Warehouse.

### 2.1 REST based Availability Service API

It is recommended for the users of the service to implement suitable response status, error checking and recovery and handling of any planned or unscheduled maintenance of the SFpark services. Testing should also help understand the response status for various common kinds of errors that may be expected during such transmissions. e.g., network latency and or errors, incomplete or invalid format of request parameters, etc.

#### 2.1.1 Service Endpoint

Following is the information for connecting to this service and can be tested by passing appropriate Availability Request (or filter) parameters. The service allows these parameters to be case in-sensitive. The parameter names and values should conform to the rules of this service. For the specific rules governing these parameters and details on the various search parameters allowed by the service, please review the section “Availability Search Parameters”.

The REST availability service endpoint URL is:  
<http://api.sfpark.org/sfpark/rest/availabilityservice>

Note: The URL portion above is case-sensitive. Any parameters beyond the URL endpoint are case-insensitive.

#### 2.1.2 Sample request for testing

The service will validate the request parameters passed as query string beyond the above endpoint. Example below shows the query parameters which could be passed in using a browser or set up in an appropriate REST service test tool such as SoapUI that is described in this document. Note that testing tools may require specifying the parameters in a different manner.

```
http://api.sfpark.org/sfpark/rest/availabilityservice?lat=37.792275&long=-122.397089&radius=0.25&uom=mile&response=json
```

The service will return a SUCCESS with availability data or ERROR response based on the outcome of the request processing. Optional request parameters may be omitted in the request in which case the service will use its internal default values as appropriate for those parameters.

Upon successful invocation the service provides a HTTP 200 status code along with a SUCCESS message response. A sample response for successful invocation of the service is provided below:

```
HTTP/1.1 200 OK
Date: Thu, 17 Feb 2011 02:05:08 GMT
Content-Length: 7981
```

Content-Type: application/json; charset=utf-8  
X-Powered-By: Servlet/2.5 JSP/2.1

```
{
  "STATUS": "SUCCESS",
  "NUM_RECORDS": "52",
  "MESSAGE": "52 records found",
  "AVAILABILITY_UPDATED_TIMESTAMP": "2011-02-16T18:05:08.240-08:00",
  "AVAILABILITY_REQUEST_TIMESTAMP": "2011-02-16T18:05:08.180-08:00",
  "AVL": [
    {
      "TYPE": "OFF",
      "OSPID": "934",
      "NAME": "Golden Gateway Garage",
      "DESC": "250 Clay Street",
      "INTER": "Clay between Front & Davis",
      "TEL": "(415) 433-4722",
      "OPHRS": {"OPS": [
        {
          "FROM": "Monday",
          "TO": "Friday",
          "BEG": "4:00 AM",
          "END": "10:00 PM"
        },
        {
          "FROM": "Saturday",
          "BEG": "7:00 AM",
          "END": "10:00 PM"
        },
        {
          "FROM": "Sunday",
          "BEG": "9:00 AM",
          "END": "10:00 PM"
        }
      ]},
      "OCC": "1023",
      "OPER": "1100",
      "PTS": "1",
      "LOC": "-122.3986032,37.79544154"
    },
    {
      "TYPE": "ON",
      "BFID": "650011",
      "NAME": "Sacramento St (101-199)",
      "OCC": "0",
      "OPER": "0",
      "PTS": "2",
      "LOC": "-122.3967848,37.7945224,-122.397573,37.7944219"
    }
  ],
  "OCC": "1023",
  "OPER": "1100",
  "PTS": "1",
  "LOC": "-122.3986032,37.79544154"
}
##### 50 more Availability Records omitted#####
]
```

The data may be returned as XML (default format) and a sample XML response is shown below:

HTTP/1.1 200 OK

Date: Thu, 17 Feb 2011 02:06:27 GMT

Content-Length: 9570

Content-Type: text/xml; charset=utf-8

X-Powered-By: Servlet/2.5 JSP/2.1

```
<SFP_AVAILABILITY xmlns="http://www.sfmta.com/xsd/availability">
  <STATUS>SUCCESS</STATUS>
  <NUM_RECORDS>52</NUM_RECORDS>
  <MESSAGE>52 records found</MESSAGE>
  <AVAILABILITY_UPDATED_TIMESTAMP>2011-02-16T18:06:27.957-
08:00</AVAILABILITY_UPDATED_TIMESTAMP>
  <AVAILABILITY_REQUEST_TIMESTAMP>2011-02-16T18:06:27.910-
08:00</AVAILABILITY_REQUEST_TIMESTAMP>
  <AVL>
    <TYPE>OFF</TYPE>
    <OSPID>934</OSPID>
    <NAME>Golden Gateway Garage</NAME>
    <DESC>250 Clay Street</DESC>
    <INTER>Clay between Front & Davis</INTER>
    <TEL>(415) 433-4722</TEL>
    <OPHRS>
      <OPS>
        <FROM>Monday</FROM>
        <TO>Friday</TO>
        <BEG>4:00 AM</BEG>
        <END>10:00 PM</END>
      </OPS>
      <OPS>
        <FROM>Saturday</FROM>
        <BEG>7:00 AM</BEG>
        <END>10:00 PM</END>
      </OPS>
      <OPS>
        <FROM>Sunday</FROM>
        <BEG>9:00 AM</BEG>
        <END>10:00 PM</END>
      </OPS>
    </OPHRS>
    <OCC>1021</OCC>
    <OPER>1100</OPER>
    <PTS>1</PTS>
    <LOC>-122.3986032,37.79544154</LOC>
  </AVL>
  <AVL>
    <TYPE>ON</TYPE>
    <BFID>650011</BFID>
    <NAME>Sacramento St (101-199)</NAME>
    <OCC>0</OCC>
    <OPER>0</OPER>
    <PTS>2</PTS>
    <LOC>-122.3967848,37.7945224,-122.397573,37.7944219</LOC>
  </AVL>
</SFP_AVAILABILITY>
```

</AVL>

#####50 more Availability Records omitted#####  
</SFP\_AVAILABILITY>

If there are errors during request parameter validation or retrieving availability from SFpark data warehouse it returns an ERROR status and possible reason. A sample of such an error response is shown below. Note that the HTTP status code is still 200 since the request itself was successfully processed by the server and the error is merely data related.

HTTP/1.1 200 OK  
Date: Thu, 17 Feb 2011 02:07:46 GMT  
Content-Length: 256  
Content-Type: application/json; charset=utf-8  
X-Powered-By: Servlet/2.5 JSP/2.1

```
{  
  "STATUS": "ERROR",  
  "MESSAGE": "Error while retrieving availability. Both Latitude and Longitude are required if specifying  
either one of these parameters.",  
  "AVAILABILITY_UPDATED_TIMESTAMP": "2011-02-16T18:07:46.999-08:00",  
  "AVAILABILITY_REQUEST_TIMESTAMP": "2011-02-16T18:07:46.982-08:00"  
}
```

In the above error response the error details indicate that both the request parameter LAT and LONG are required when specifying either one of these. For details about the response elements, please refer to the section SFpark Availability Service Response.

### 3. SFpark Availability Service Response

This section describes the information returned by the availability service and to describe the service response elements. The SFpark servers are capable of sending compressed response when the request header (Accept-Encoding: gzip,deflate) is set that indicates the user can accept compressed data. Using compression allows reducing the amount of data needed to be transmitted back in the response.

Note: In general, the absence of an element(s) from the response indicates that no data was available and hence omitted from the response. This is used to distinguish the absence of data as opposed to passing 0 or some other arbitrary value. Also, effective Dec 30, 2013 SFpark on street parking sensors are being deactivated. The following sections explain how these are handled with the OPER and OCC elements in the availability response.

#### 3.1 XML Response

Availability service data response may be requested as XML or JSON. This section describes the format and elements when requesting the response to be XML (default). Note that XML response is sent if the query parameter contains response=xml or omits it (since the SFpark default is XML) when invoking the service. It includes the following elements (only relevant elements are sent based on the outcome of the validation and retrieval of availability data from the SFpark Database). The response XML sent back by the service is based on the SFpark Availability XML XSD and is available at: <http://api.sfpark.org/xsd/availability.xsd>

<STATUS>Response indicating Success or Error</STATUS>  
 <REQUESTID>Identifier that is returned if passed in request</REQUESTID>  
 <UDF1>User defined field identifier that is returned if passed in request</UDF1>  
 <NUM\_RECORDS>Returns the number of records being returned, if Success</NUM\_RECORDS>  
 <ERROR\_CODE>Returns an SFMTA Error code if encountered Error</ERROR\_CODE>  
 <MESSAGE>Returns additional details as appropriate</MESSAGE>  
 <VERSION>Placeholder for possible future use: To allow returning the version of the service that created this response</VERSION>  
 <AVAILABILITY\_UPDATED\_TIMESTAMP>Returns the Timestamp of when the availability data response was updated for the request</AVAILABILITY\_UPDATED\_TIMESTAMP>  
 <AVAILABILITY\_REQUEST\_TIMESTAMP>Timestamp of when the associated request was originally received by SFMTA that generated this response. </AVAILABILITY\_REQUEST\_TIMESTAMP>  
 <AVL> 0 or more availability elements are passed, if SUCCESS. Each element provides the id of the parking location along with location co-ordinates. Currently up to two location points (Lat/Long) pairs are sent. If two pairs are sent they are an approximate begin and end position of the line for the specific parking location</AVL>

The STATUS is the main XML element that returns SUCCESS or ERROR.

The AVAILABILITY Element has the following child elements

<TYPE>Specifies whether on or off street parking</TYPE>  
 <NAME>Name of parking location or street with from and to address, if available</NAME>  
 <DESC>Returned for OSP only – usually address for the parking location, if available</DESC>  
 <INTER>Returned for OSP only – usually cross street or nearby intersection from parking location, if available</INTER>  
 <TEL>Returned for OSP only – Contact telephone number for parking location, if available</TEL>

<OSPID>Unique SFMTA Identifier for the parking location for off street parking type</OSPID>  
 <BFID>Unique SFMTA Identifier for on street block face parking location</BFID>  
 <OCC>Number of spaces currently occupied. Note: Effective Dec 30, 2013 for on street parking locations, this will be sent as 0 if all spaces are currently Restricted, e.g., Tow-away or not sent at all.</OCC>  
 <OPER>Number of spaces currently operational for this location. Note: Effective Dec 30, 2013 for on street parking locations, this will be sent as 0 if all spaces are currently Restricted, e.g., Tow-away or not sent at all.</OPER>  
 <PTS>Number of location points returned for this record. Usually 1 for OSP and 2 for on-street parking location</PTS>  
 <LOC>Comma separated Longitude and Latitude values of points for this location. Currently a max of two points are specified for a parking location which are the begin and end points</LOC>  
 <OPHRS>Returned for OSP only. Returns sub elements (specified below) that indicate the operating hours schedule information for this location. It may not contain hours for special events, etc.</OPHRS>

The OPHRS Element has the following child elements.

Note: Operating hour's information is returned in 1 or more <OPS> sub-elements. If there is no schedule information in the response, it indicates that the system did not retrieve any current valid operating hour's information for this location.

<OPS>Returns an operating schedule. There may be 1 or more schedule information returned for a location.

<FROM>Start day for this schedule, e.g., Monday</FROM>

<TO>End day for this schedule, e.g., Friday</TO>

<BEG>Indicates the begin time for this schedule</BEG>

<END>Indicates the end time for this schedule</END>

</OPS>

<RATES>Returns sub elements (described below) that indicate the general pricing or rate information for this location. Note that the rate information provided for on-street location is updated daily (soon after midnight) and returns only the rates that apply for the day of the request. It may not contain rates for special event, motorcycle rates, etc.</RATES>

The RATES Element has the following child elements.

Note: Rate information is returned in 1 or more <RS> sub-elements. If there is no RATE information found for a location the response will return a RATE of 0 with a rate qualifier (RQ) message similar to "See Meter" or "See Garage" for off street garage locations.

<RS>Returns a rate schedule. There may be 1 or more rate schedules for a location.

<BEG>Indicates the begin time for this rate schedule</BEG>

<END>Indicates the end time for this rate schedule</END>

<RATE>Applicable rate for this rate schedule</RATE>

<DESC>Used for descriptive rate information when not possible to specify using BEG or END times for this rate schedule</DESC>

<RQ>Rate qualifier for this rate schedule, e.g. Per Hr</RQ>

<RR>Rate restriction for this rate schedule if any</RR>

</RS>

Note: Effective December 30, 2013 with deactivation of parking sensors the OCC and OPER values for on-street parking will be omitted from the response unless it is restricted, e.g, tow-away in which case they will both be sent as 0. These will continue to be provided for the off-street garages. In general, absence of OCC element can be used to determine that no occupancy or availability data is available and OPER and OCC being 0 indicate that particular parking location is currently restricted.

The percentage of parking spaces available for a location (if OCC and OPER values are returned and OPER is non-zero) may be calculated using the values returned. E.g., % availability for a location =  $(\text{OPER} - \text{OCC}) / \text{OPER} \times 100 \%$

It is recommended to verify that OPER is non-zero to avoid mathematical division by 0 error.

Also the format for the location is comma separated paired values in the conventional order (also SFpark standard unless otherwise noted) of Longitude, Latitude. Returned values should be paired accordingly to identify unique points. For a single pair of values returned it indicates a specific geographical point. For two points, it represents the two end points of an approximate line that indicates the parking location. Currently, max of two points (or four comma separated values) is returned for any location. However, SFpark may in future switch to returning multiple point data which may need to be handled differently.

Note that if incomplete parameters or arbitrary data is sent when invoking this service, the error response may not be available.

### 3.1.1 Successful Response Format

```
<STATUS>SUCCESS</STATUS>
<AVAILABILITY_UPDATED_TIMESTAMP>2011-02-18T13:17:13.000-
08:00</AVAILABILITY_UPDATED_TIMESTAMP>
```

Note: SUCCESS in the STATUS is sent and indicates that the input request parameters were valid. This should provide 0 or more availability records from the SFpark database based on the request parameters. Also, the field AVAILABILITY\_UPDATED\_TIMESTAMP indicates the time when the response was queried and calculated by the data warehouse. It applies to the entire set of records returned in the response. Individual availability records are a snapshot of the status in the data warehouse at the time this response is queried based on the individual events that were received by the SFpark system. The actual status may have changed since the events are transmitted from the individual spaces and stored and processed prior to returning this data.

The SFpark processing includes request search parameter validation followed by retrieval of the availability data from the SFpark Data Warehouse based on the request parameters.

Below are the response examples showing the phase which encountered the error.

### 3.1.2 Parameter Validation Error Response Format

```
<STATUS>ERROR</STATUS>
<MESSAGE>Error while retrieving availability. Search parameters are not valid. long should be
numeric
</MESSAGE>
```

ERROR message above indicates error is during the parameter validation phase of the request which contains an invalid search request element LONG (longitude). It indicates that the element must be a valid number.

### 3.1.3 Retrieving from Database Error Response Format

```
<STATUS>ERROR</STATUS>
<MESSAGE>Error while retrieving Availability</MESSAGE>
```

ERROR message above indicates error is while retrieving the data from the database.

Please review the ERROR elements in the response for information as to the cause of the error and whether it failed during request parameter validation or retrieval from SFpark database. These may include technical error details which may need to be reviewed for the specific cause. The error should provide information to identify why the invocation failed. If the cause is request parameter related, please fix the problems for avoiding similar errors in the future.

If the error is during the database phase it is assumed that the request parameter validation was successful. For this error, the response will need to be reviewed for determining if the cause is due to specific request value sent (e.g., latitude or longitude values not in proper range) or other issues entirely related to SFpark system.

If such an error occurs, please try the request again later. If the problem persists, you may submit the error details to SFpark if unable to confirm the cause.

### 3.2. JSON Response

Availability service response may be requested as XML or JSON. This section describes the elements sent when requesting the response as JSON. Note that service response is sent as JSON whenever the query parameter contains response=json when invoking the service, otherwise the response will be sent as XML (default).

The JSON response sent back by the service contains elements in JSON format and are according to the SFpark Availability XML XSD. For reference, the latest version of the XSD is available at: <http://api.sfpark.org/xsd/availability.xsd>

The response includes the following elements (only relevant elements are sent based on the outcome of the validation and retrieval of availability data from the SFpark Database).

```
{
  "STATUS": "Response indicating SUCCESS or ERROR ",
  "REQUESTID": "Identifier that is returned if passed in request ",
  "UDF1": "User defined field identifier that is returned if passed in request",
  "NUM_RECORDS": "Returns the number of records being returned, if Success ",
  "ERROR_CODE ": "Returns a SFMTA internal Error code if encountered Error ",
  "MESSAGE": "Returns additional details as appropriate ",
  "VERSION": "Placeholder for possible future use: To allow returning the version of the service that
created this response",
  "AVAILABILITY_UPDATED_TIMESTAMP": "Returns the Timestamp of when the availability data
response was updated for the request",
  "AVAILABILITY_REQUEST_TIMESTAMP": "Timestamp of when the associated request was originally
received by SFMTA that generated this response.",
  "AVL": "[0 or more availability elements are passed, if SUCCESS. Availability elements are described
below.
{
  "TYPE": "Specifies whether on or off street parking",
  "NAME": "Name of parking location or street with from and to address, if available",
  "DESC": "Returned for OSP only – usually address for the parking location, if available",
  "INTER": "Returned for OSP only – usually cross street intersection parking location, if available",
  "TEL": "Returned for OSP only – Contact telephone number for parking location, if available",
  "OSPID": "Unique SFMTA Identifier for the parking location for off street parking type",
  "BFID": "Unique SFMTA Identifier for on street block face parking ",

```

"OCC": "Number of spaces currently occupied. Note: Effective Dec 30, 2013 for on street parking locations, this will be sent as 0 if all spaces are currently Restricted, e.g., Tow-away or not sent at all. ",

"OPER ": "Number of spaces currently operational for this location. Note: Effective Dec 30, 2013 for on street parking locations, this will be sent as 0 if all spaces are currently Restricted, e.g., Tow-away or not sent at all. ",

"PTS": "Number of location points returned for this record. Usually 1 for OSP and 2 for on-street parking location ",

"LOC": "Comma separated Longitude and Latitude values of points for this location. Currently a max of two points are specified for a parking location which being the start and end points",

"OPHRS": "Returned for OSP only. Returns array of sub elements (specified below) that indicate the operating hours schedule information for this location. It may not contain hours for special events, etc."

"RATES": "Returns array of sub elements (described below) that indicate the general pricing or rate information for this location. Note that the rate information provided for on-street location is updated daily (after midnight) to apply for the day of the request. It may not contain rates for special event, motorcycle rates, etc."

```
    }
  ]
}
```

The OPHRS Element indicated above has the following child elements.

Note: Operating hour's information is returned as an array of one or more OPS sub-elements. If there is no schedule information in the response, it indicates that the system did not retrieve any current valid operating hour's information for this location.

"OPHRS": {"OPS": "Returns an operating schedule. There may be 1 or more schedule information returned for a location"

```
[
  {
    "FROM": "Start day for this schedule, e.g., Monday",
    "TO": "End day for this schedule, e.g., Friday",
    "BEG": "Indicates the begin time for this schedule, e.g., 4:00 AM",
    "END": "Indicates the end time for this schedule, e.g., 10:00 PM"
  }
]
```

The RATES element indicated above has the following child elements.

Note: RATES information is returned as an array of one or more RS or rate schedule elements. If there is no RATE information found for a location the response will return a RATE of 0 with a rate qualifier (RQ) message indicating "See Meter" or "See Garage" for off street garage locations.

"RATES": {"RS": "Returns a rate schedule. There may be 1 or more rate schedules for a location"

```
[
  {
    "BEG": " Indicates the begin time for this rate schedule",
    "END": "Indicates the end time for this rate schedule ",
    "RATE": "Applicable rate for this rate schedule",
    "DESC": "Used for descriptive rate information when not possible to specify using BEG
or END times for this rate schedule",
    "RQ": "Rate qualifier for this rate schedule, e.g. Per Hr",
    "RR": "Rate restriction for this rate schedule, if any"
  },
]
```

The STATUS is the main XML element that returns SUCCESS or ERROR.

Note: Effective December 30, 2013 with deactivation of parking sensors the OCC and OPER values for on-street parking will be omitted from the response unless it is restricted, e.g, tow-away in which case they will both be sent as 0. These will continue to be provided for the off-street garages. In general, absence of OCC element can be used to determine that no occupancy or availability data is available and OPER and OCC being 0 indicate that particular parking location is currently restricted.

The percentage of parking spaces available for a location (if OCC and OPER values are returned and OPER is non-zero) may be calculated using the values returned. E.g., % availability for a location =  $(\text{OPER} - \text{OCC}) / \text{OPER} * 100 \%$   
It is recommended to verify that OPER is non-zero to avoid mathematical division by 0 error.

The format for the location is comma separated paired values in the conventional order (also SFpark standard unless otherwise noted) of Longitude, Latitude. Returned values should be paired accordingly to identify unique points. For a single pair of values returned it indicates a specific geographical point. For two points, it represents the two end points of an approximate line that indicates the parking location. Currently, max of two points (or four comma separated values) is returned for any location.

Note that if incomplete parameters or arbitrary data is sent when invoking this service, the error response may not be available.

### 3.2.1 Successful Response Format

```
"STATUS": "SUCCESS"  
"AVAILABILITY_UPDATED_TIMESTAMP": "2011-04-18T13:17:13.000-07:00"
```

Note: SUCCESS in the STATUS is sent and indicates that the input request parameters were valid. This should provide 0 or more availability records from the SFpark database based on the request parameters.

The SFpark processing includes request search parameter validation followed by retrieval of the availability data from the SFpark Data Warehouse based on the parameters specified in the request. Below are the response examples showing the phase which encountered the error.

### 3.2.2 Parameter Validation Error Response Format

```
"STATUS": "ERROR"  
"MESSAGE": "Error while retrieving availability. Both Latitude and Longitude are required if  
specifying either one of these parameters."
```

The MESSAGE element may provide further details as shown above. ERROR message above indicates error is during the parameter validation phase of the request and indicates that both Lat and Long need to be specified if any one of these passed.

### 3.2.3 Retrieving from Database Error Response Format

```
"STATUS": "ERROR"  
"MESSAGE": "ERROR while retrieving Availability"
```

ERROR message above indicates error is while retrieving the data from the database.

Please review the ERROR elements in the response for information as to the cause of the error and whether it failed during request parameter validation or retrieval from SFpark database. These may include technical error details which may need to be reviewed for the specific cause. The error should provide information to identify why the invocation failed. If the cause is request parameter related, please fix the problems for avoiding similar errors in the future.

If the error is during the database phase it is assumed that the request parameter validation was successful. For this error, the response will need to be reviewed for determining if the cause is due to specific request value sent (e.g., latitude or longitude values not in proper range) or other issues entirely related to SFpark system. If such an error occurs, please try the request again later. If the problem persists, you may submit to SFpark and provide details along with the error response if you are unable to confirm the cause.

### 3.3 Response element changes due to parking sensor deactivation

This section provides some examples of describing how the parking sensor deactivation will affect the availability response elements OPER and OCC. The examples are shown using the XML format; however, the changes described are applicable for the JSON response as well.

#### 3.3.1

##### Before parking sensor deactivation:

Here the OCC element returns the current occupied space count and OPER returns the current operational space capacity for this blockface.

```
<AVL>
  <TYPE>ON</TYPE>
  <BFID>650011</BFID>
  <NAME>Sacramento St (101-199)</NAME>
  <OCC>5</OCC>
  <OPER>8</OPER>
  <PTS>2</PTS>
  <LOC>-122.3967848,37.7945224,-122.397573,37.7944219</LOC>
</AVL>
```

#### 3.3.2

##### After parking sensor deactivation effective Dec 30, 2013:

Note: The off-street garages will continue to provide OPER and OCC data. However, interpretation of below can be used for garages as well to handle situations where the data becomes unavailable during maintenance periods.

- a) Example of on-street response indicating "Data Not Available"

Here both the OCC and OPER are absent in the availability response for this blockface. The absence of OCC element is sufficient to indicate that occupancy data is not available for the respective location.

```
<AVL>
  <TYPE>ON</TYPE>
  <BFID>650011</BFID>
```

```
<NAME>Sacramento St (101-199)</NAME>  
<PTS>2</PTS>  
<LOC>-122.3967848,37.7945224,-122.397573,37.7944219</LOC>  
</AVL>
```

b) Example of on-street response indicating it is “Restricted”

Here both the OCC and OPER are sent as “0” in the availability response for this blockface. The value of “0” for OPER element is sufficient to indicate that blockface currently has “Restricted” parking, e.g., Tow-away for the respective location.

```
<AVL>  
  <TYPE>ON</TYPE>  
  <BFID>650011</BFID>  
  <NAME>Sacramento St (101-199)</NAME>  
  <OCC>0</OCC>  
  <OPER>0</OPER>  
  <PTS>2</PTS>  
  <LOC>-122.3967848,37.7945224,-122.397573,37.7944219</LOC>  
</AVL>
```

As noted above it is important to understand that the absence of OPER and OCC elements should not be treated the same as when they return value of “0”.

## 4. Pricing Information

As discussed in earlier sections, the availability service allows for returning the pricing (or rates) information along with the availability data and is returned only if pricing has been specifically requested as a parameter to the service. This allows limiting the amount of data that is returned when pricing information is not required. The rates information for on street metered locations is usually structured differently than those for garages. On street metered locations usually have a rate associated with various time periods and may change during the day. For both metered on-street and garages or off-street locations multiple rates may apply for a location based on time, etc. Hence the returned data may contain more than one rate information for a location. If there is no RATE information found for a location the response will return a RATE of 0 with a rate qualifier (RQ) message similar to “See Meter” or “See Garage” for off street garage locations.

This section will describe the formats of data that may be returned and how it can be classified into two types for purposes of presenting the information on a display.

### 4.1 General Guidelines

The following are some guidelines when interpreting the rate information returned by the service.

- All pricing data is in US Dollars.
- On street parking locations (block-face) pricing is mostly structured by BEG and END time along with the applicable RATE for that period. A rate of 0 indicates either no-charge or in certain situations some other reason that the rate is not returned, e.g., the information is not available to the service. A rate qualifier is always passed which will usually specify whether it is no-charge. If no rate was found for a location then the rate qualifier indicates “See Meter”. Hence, when the rate is returned as 0, just use the description in the rate qualifier as that will describe the rate more appropriately.
- If there is a BEG and END time being returned then that rate schedule does not require a DESC and hence it will not be returned. The DESC allows to return special types of rates that are not simple to be returned as a BEG or END time, e.g., “Early Bird”. Hence these may be considered as mutually exclusive types. A DESC is returned along with some Rate Qualifier, e.g., “Flat Rate”. A Rate Restriction may be returned as well, e.g., “Sat: In after 7AM/Out by 4AM;Sun: In after 4AM/Out by 4AM”. The DESC and associated elements allow returning special pricing that usually apply to garages only and not metered locations.
- Certain off street locations are metered lot and in those situations the rates returned for these will be similar to those returned for on street locations.
- In certain cases, there is a need for longer text to be returned for rate restrictions. Ex: “Sat: In after 7AM/Out by 4AM;Sun: In after 4AM/Out by 4AM.” In the example the text is readable as-is, however to improve readability on a limited screen size (e.g., mobile devices) the semi-colon is used as a special char within the text to be a hint to allow replacing it with a line-break. This will allow generically replacing the ‘;’ with a line-break when appropriate for display purposes.
- Off street locations may return combination of BEG-END data and DESC type rate schedule records as appropriate. For on-street locations it is expected that only BEG-END data elements will be returned.

## 4.2 Examples of rate information

The following are some examples to help illustrate displaying the rate information returned from the service. A rates array contains one or more rate schedule elements. However, it can be assumed that a particular rate schedule element will be either BEG and END or DESC type of rate data. Hence, there are essentially only two types of display formats to be considered, either a "BEG-END" (time interval) data or "DESC" (descriptive) rate data as discussed below.

### 4.2.1 BEG and END data example

Following is an example of RATES array consisting of multiple rate schedules BEG and END data elements. To keep it simple the example does not include DESC elements.

```
<RATES>
  <RS>
    <BEG>12:00 AM</BEG>
    <END>7:00 AM</END>
    <RATE>0</RATE>
    <RQ>No Charge</RQ>
  </RS>
  <RS>
    <BEG>7:00 AM</BEG>
    <END>6:00 PM</END>
    <RATE>3.5</RATE>
    <RQ>Per Hour</RQ>
  </RS>
  <RS>
    <BEG>6:00 PM</BEG>
    <END>12:00 AM</END>
    <RATE>0</RATE>
    <RQ>No Charge</RQ>
  </RS>
</RATES>
```

Using above as an example a simple display format is shown below: For actual display, special columns or other appropriate characters may be used as appropriate to provide better readability.

Note that rate qualifier (RQ) is expected to be returned with each element as shown in above example where Rate of '0' has a rate qualifier of "No Charge". For Rate element of '3.5' it is being displayed as '\$3.50' as appropriate currency format. The BEG and END times are concatenated with a '-' char to signify the time duration the rate is applicable.

12:00 AM – 7:00 AM	No Charge
7:00 AM – 6:00 PM	\$3.50 Per Hour
6:00 PM – 12:00 AM	No Charge

### 4.2.2 DESC data example

If the rate schedule contains DESC element then presence of this is used as an indicator of descriptive type for rate display which is used when the rate cannot be classified as a time interval. Following is an

example of a RATES element array consisting of rate schedules with only DESC data elements. To keep it simple the example does not include BEG or END element data.

```

<RATES>
  <RS>
    <DESC>Incremental</DESC>
    <RATE>3.5</RATE>
    <RQ>Per 1/2-Hr</RQ>
  </RS>
  <RS>
    <DESC>24-Hour Max/Lost Tkt</DESC>
    <RATE>36</RATE>
    <RQ>Flat Rate</RQ>
  </RS>
  <RS>
    <DESC>Early Bird</DESC>
    <RATE>20</RATE>
    <RQ>Flat Rate</RQ>
    <RR>Mon-Fri: In by 10AM/Out by 7PM</RR>
  </RS>
  <RS>
    <DESC>Weekend</DESC>
    <RATE>7</RATE>
    <RQ>Per Day</RQ>
    <RR>Sat: In after 7AM/Out by 4AM;Sun: In after 4AM/Out by 4AM</RR>
  </RS>
</RATES>
  
```

Using above as an example a simple display format is shown below: For actual display, special columns or other appropriate characters may be used as appropriate to provide better readability.

Note that rate qualifier (RQ) is expected to be returned with each element. Rates are formatted with appropriate \$ symbol and decimal, e.g., rate of '36' is displayed as '\$36.00'. The rate restriction is added, if available as it may not be returned in all cases. This allows specifying any restriction to the rate as applicable.

Incremental	\$3.50 Per ½-Hr
24-Hour Max/Lost Tkt	\$36.00 Flat Rate
Early Bird Mon-Fri: In by 10AM/Out by 7PM	\$20.00 Flat Rate
Weekend Sat: In after 7AM/Out by 4AM Sun: In after 4AM/Out by 4AM	\$7.00 Per Day

#### 4.2.3 Combination data example

If the rates contain mixed rate schedule data including both BEG-END and DESC elements then the rate display should use a combination of the approaches discussed for the two individual formats. Since each rate schedule can be displayed as one row of data on a display you can mix and match as per the data that gets returned. A sample table is shown below that contains a mix of these two types of data.

6:00 AM – 7:00 PM	\$3.50 Per Hour
24-Hour Max/Lost Tkt	\$36.00 Flat Rate
Early Bird Mon-Fri: In by 10AM/Out by 7PM	\$20.00 Flat Rate
Evening/Weekend Sat: In after 7AM/Out by 4AM Sun: In after 4AM/Out by 4AM Evenings: In after 7:00 PM/Out by 6:00 AM	\$7.00 Per Day

The above examples are for illustrative purposes only and may not represent actual data that may be returned. However, it helps illustrate how to classify it into two formats for displaying actual data that will be returned. It should be noted that the rate information and presentation is subject to change so certain exceptions or alternate format may be needed in future as needed.

## 5. Sample Error Messages

This section provides a few sample error messages returned when invoking the service. It is intended as a concise supplement to the prior section “SFpark Availability Service Response” and may include information already discussed in that section. The most common errors to expect are during the validation of the search parameters passed to the service. This section is thereby focused on providing samples from such validation errors that may occur.

### 5.1 Validation Errors

The following samples illustrate the validation error responses for REST service invocations.

The status will always be ERROR as shown below. The ERROR status indicates that there was problem during validation or retrieving availability data for this request. Hence if you do receive this status then review the error message to understand the reason of the problem.

Error Status for XML Response: <STATUS>ERROR</STATUS>

Error Status for JSON Response: STATUS: "ERROR"

Following are some sample error messages that may be encountered during an invocation of the service. Only relevant MESSAGE element is shown for these sample validation error scenarios:

Scenario 1: Numeric Field contains alpha character

MESSAGE: "Error while retrieving availability. Search parameters are not valid. long should be numeric."

Scenario 2: Field contains invalid option for this type

MESSAGE: "Error while retrieving availability. Search parameters are not valid. long should be numeric. Allowed values for uom are: mile, km, foot, meter, m, yard."

Scenario 3: Request contains invalid element. Here LATITUDE is not a valid element, it should be LAT and hence the error

MESSAGE: "Error while retrieving availability. Search parameters are not valid. latitude is not a valid request parameter."

Scenario 4: General Error Response

MESSAGE: "Invalid parameters found in request. Valid parameters are requestId, lat and long (both or none), radius, uom (mile, km, foot, meter, m, yard), response (xml or json), jsoncallback (callback method name for jsonp support), type (on, off or all), version, pricing (yes, no), udf1 and method (availability).

Scenario 5: JSONP invalid method name Error Response

MESSAGE: "Error while retrieving availability. JSON callback parameter is not valid. It should be non-empty string of less than 100 char and may not start with jsonp."

Scenario 6: JSON not specified as response type when requesting JSONCALLBACK

Error while retrieving availability. Response type needs to be specified as JSON if JSON callback is requested.

Scenario 7: More than one validation error found

The error response usually tries to parse all errors and report them all in case of multiple validation errors. An example is shown below which contained two validation errors.

MESSAGE: "Error while retrieving availability. Search parameters are not valid. radius should be numeric. Allowed values for uom are: mile, km, foot, meter, m, yard."

## 5.2 Retrieving from Database Error Response Format

The general error message format for database errors is provided below. To understand the reason of the error it may be needed to review the message to understand the reason of the problem. In certain cases there may not be any further reason, in which case you may want to retry the request later. This may happen during SFpark database being unavailable, etc. These conditions may also happen during scheduled maintenance periods. If such errors are encountered frequently and no details are present in the message and they continue after repeated attempts to differing request parameters, you may submit these details to SFpark.

For failed invocations the status will always be ERROR as shown below. The ERROR status indicates that there was some problem during retrieving availability data for this request. The message will indicate that the error was during retrieving availability. This indicates that the request was valid and that the error happened during retrieving from database.

```
"STATUS": "ERROR"  
"MESSAGE": "ERROR while retrieving Availability"
```

ERROR message above indicates error is while retrieving the data from the database.

### 5.2.1 No Records Found Response Format

It is possible that a request query returns no availability records (e.g., long/lat in the search is a point outside the SFpark area) in which case the response will indicate that there are 0 records found. This is normal for such requests as there is no valid parking location found to report availability for the request and is not an ERROR. A sample response is shown below.

```
<STATUS>SUCCESS</STATUS>  
<NUM_RECORDS>0</NUM_RECORDS>  
<MESSAGE>0 records found</MESSAGE>
```

## 6. Availability Search Parameters

This section lists the availability service search parameters and their descriptions along with their default values, if any. Note that the parameters and their default values are subject to change. The SFpark Availability service returns data matching the search criteria as specified when invoking the service. The service will use default values for certain parameters when not specified. However, if specifying a value for certain parameters it may be necessary to provide a suitable value for its complementary parameter, e.g., Latitude and Longitude.

These are specified as query parameters. The parameters are not case sensitive for the REST service but they should be valid as far as their naming and values. For further information on sample request and response message please refer to the response section.

### 6.1 Availability Service Input Request Parameters

The following request parameters are currently supported by the Availability Service. Note that all parameters are currently optional. If no parameter is supplied, then the service uses internal defaults for LAT, LONG, RADIUS and UOM.

#### 6.1.1 REQUESTID – Request Identifier

This optional request parameter allows correlating a response to a particular request or may be used for tracking purposes. If passed, this identifier is returned as is in the response generated for the particular request. It has no other purpose in determining the outcome of the request.

Example: REQ1234567890

Default value (if none specified): Optional field – no default provided

Allowed values: Any alphanumeric string. Note: Certain special characters may not be supported and is restricted to less than 100 chars.

#### 6.1.2 LAT – Latitude in decimal format to be specified along with LONG

This request parameter is used in conjunction with the specified Longitude parameter and represents the geographical point from which the search results will be centered.

Note: System will use a default value if both LAT and LONG are skipped. If either parameter is passed then both LAT and LONG are required.

Example: 37.7853

Default value (if both LAT and LONG are skipped): 37.7819

#### 6.1.3 LONG – Longitude in decimal format to be specified along with LAT

This request parameter is used in conjunction with the specified Latitude parameter and represents the geographical point from which the search results will be centered.

Note: System will use a default value if both LAT and LONG are skipped. If either parameter is passed then both LAT and LONG are required.

Example: -122.4077

Default value (if both LAT and LONG are skipped): -122.4200

#### **6.1.4 RADIUS – Search Radius**

This request parameter is used in conjunction with the specified UOM parameter and represents the search radius the result will return from the requested location point. If UOM is not passed, then the service will use the default value for UOM.

Note: If no UOM is specified but RADIUS is specified, then UOM is still defaulted to mile. So be aware of these default values and their behavior and hence it is recommended to specify both RADIUS and UOM or leave them out to use the SFpark default, currently 0.25 mile radius.

Example: 0.5

Default value (if none specified): 0.25

#### **6.1.5 UOM – Unit of Measurement for the search radius**

This request parameter is used in conjunction with the specified RADIUS parameter and represents the unit of measurement for the radius parameter. The result will return available data points based on the requested radius in this unit of measurement from the requested location point. If RADIUS is not passed, then the service will use the default value for RADIUS.

Note: If no RADIUS is specified but UOM is specified as other than mile, then radius is still defaulted to 0.25. So be aware of these default values and their behavior and hence it is recommended to specify both RADIUS and UOM or leave them out to use the SFpark default, currently 0.25 mile radius.

Example: mile

Default value (if none specified): mile

Allowed values: mile, km, foot, meter, m, yard

#### **6.1.6 RESPONSE – Format of Response Data**

This request parameter is used to specify the format of the data to be returned. Default value is XML format. However, JSON format may be specified if prefer to have data in JSON format. Note that if using the JSON callback option then the response needs to be specified as JSON.

Example: json

Default value (if none specified): xml

Allowed values: xml, json

#### **6.1.7 JSONCALLBACK – Request Identifier**

This request parameter allows support for JSONP or JSON with padding. JSONP is script tag injection, passing the response from the server to a user specified function. The JSONCALLBACK parameter

allows specifying the function name to use in the response. If specified, the JSON response is wrapped in the requested call back, e.g., "mycallback( <JSON AVAILABILITY REPNSE>)". It requires that the response be specified to be returned as JSON and is not supported for XML response data. It has no other purpose in determining the outcome of the request.

Example: mycallback

Default value (if none specified): Optional field – no default provided

Allowed values: Any alphanumeric string. Note: Certain special characters may not be supported.

Special Rules: Response type needs to be json. The method name may not be empty string. It also cannot start with jsonp and is restricted to less than 100 chars.

### **6.1.8 TYPE – Limit data to specified parking type**

This request parameter is used to specify the data returned be limited to the requested parking type. There are currently following two parking types supported, on-street (on) and off-street (off). Use the parameter to allow restricting data to following parking types; on-street (on), off-street (off) or all (returns both on and off-street or all results).

Example: all

Default value (if none specified): all

Allowed values: all, on, off

### **6.1.9 METHOD – Method to invoke**

This request parameter is used invoke available methods for the availability service. Currently only the availability method is provided. In future other methods may be supported.

Example: availability

Default value (if none specified): availability

Allowed values: availability

### **6.1.10 PRICING – Include rate information in response**

This request parameter is used to specify whether the data returned should include the pricing information for the parking locations included in the response. The rate information does not change frequently but involves extra information to be added to the response. Hence, requests to retrieve pricing data should be made specifically by setting the pricing option. The rate information returned by the service is discussed in an earlier section.

Example: yes

Default value (if none specified): no

Allowed values: no, yes

### 6.1.11 UDF1 – User Defined Field # 1

This optional request parameter allows user to pass in a text string to be used as a field that they may define for their internal use, e.g., specifying an organization name or may be used for tracking purposes. If passed, this identifier is returned as is in the response generated for the particular request. It has no other purpose in determining the outcome of the request.

Example: "SFMTA"

Default value (if none specified): Optional field – no default provided

Allowed values: Any alphanumeric string. Note: Certain special characters may not be supported and is restricted to less than 100 chars.

### 6.1.12 VERSION – Placeholder for possible future use

Note that this is currently a placeholder for possible future use and is ignored at this time. However, if specifying this request parameter it should be set to no more than 100 chars. It currently has no other purpose in determining the outcome of the request.

Example: "1.0"

Default value (if none specified): Optional field – no default provided

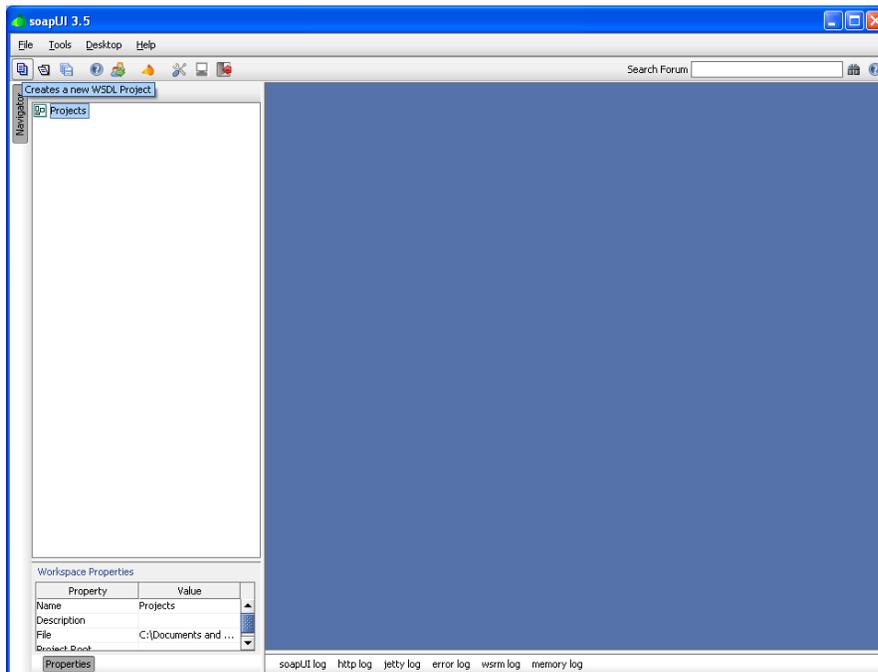
Allowed values: Any alphanumeric string less than 100 chars. Note: In future it may be restricted to specific valid version strings as appropriate.

## 7. Using soapUI for testing the REST based Service

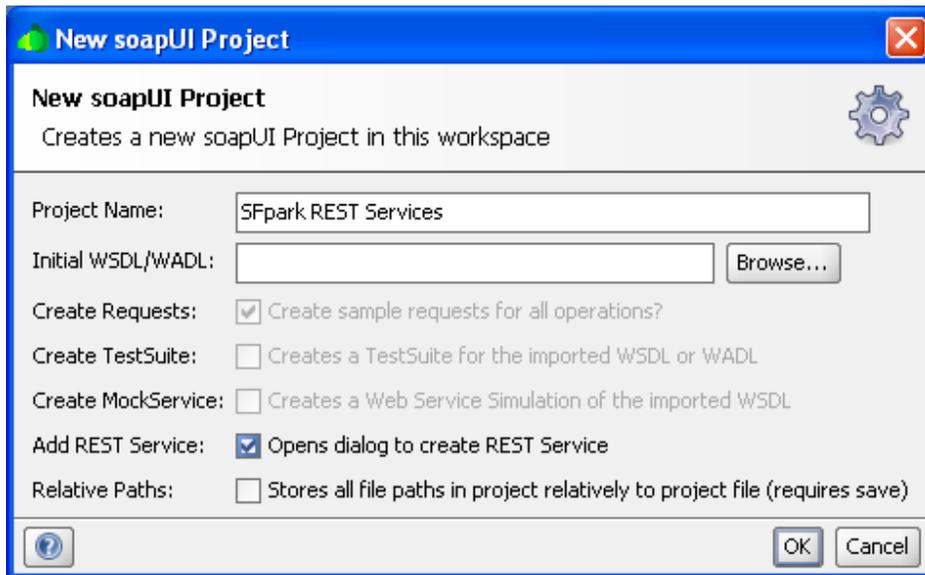
SoapUI is a powerful open source web service testing tool and is available from <http://www.soapui.org>. SFpark doesn't make any recommendations on testing strategy or tools and this section is provided merely as an aid in setting up testing for the availability service.

SoapUI has capability to test REST Services which can optionally be tested using a regular browser; however, they have limited capability so testing using SoapUI is shown below that will provide a good test environment. This section provides basic steps to assist with setting up the test tool and how to invoke the REST based service for testing. The samples provided below are based on SoapUI version 3.5. Newer versions may look slightly different but main steps should be similar. Alternate testing tools or means may also be used as suitable for your environment as appropriate.

Launch the soapUI console and click on the icon to create a new project (or select from File option menu to create a new project)



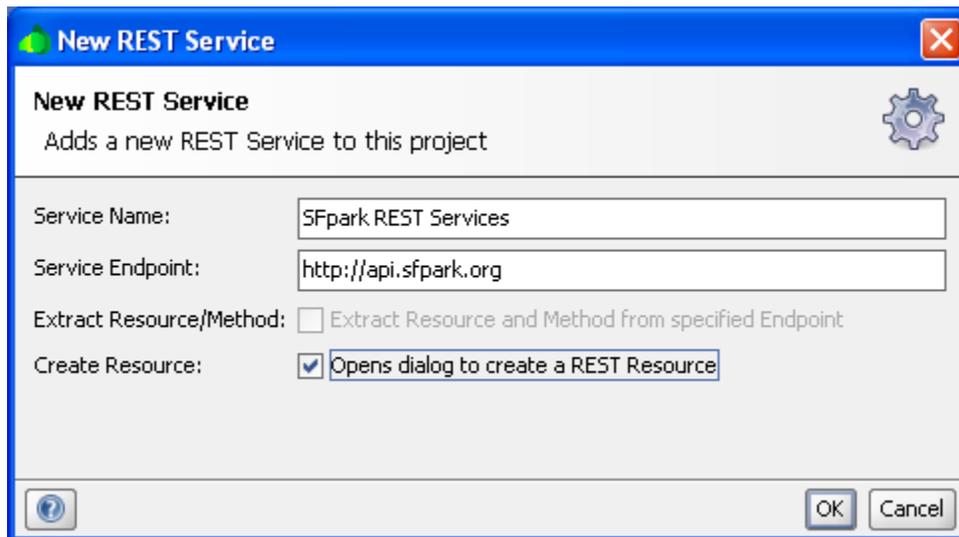
Next Enter a project name and select the option “Opens dialog to create REST service”  
 Project Name: SFpark REST Services  
 Check Option: Opens dialog to create REST service



This will pop up a new window to enter a new REST Service. Provide a suitable Service Name and the Service Endpoint (need to enter only the server IP/name and port number).

NOTE: The screen below shows the current SFpark API service DNS name (port number is not required as the service uses the HTTP default port 80).

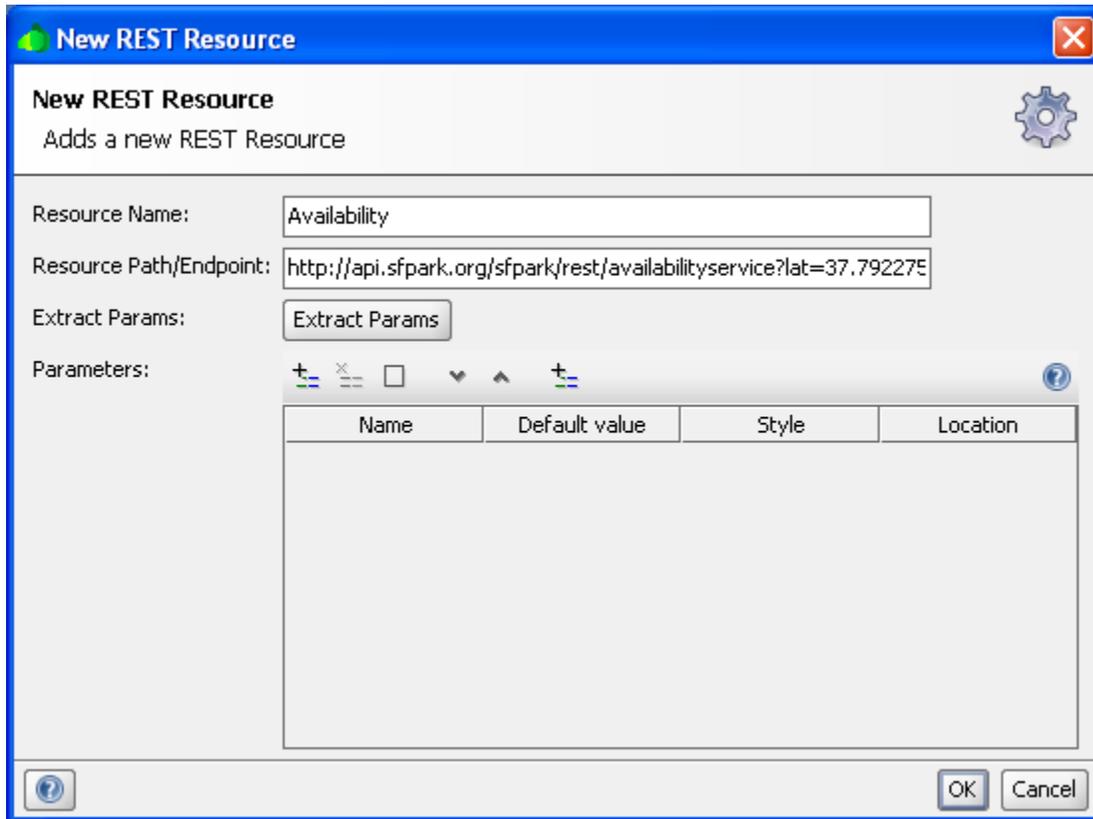
Service Name: SFpark REST Services  
 Service Endpoint: http://api.sfpark.org



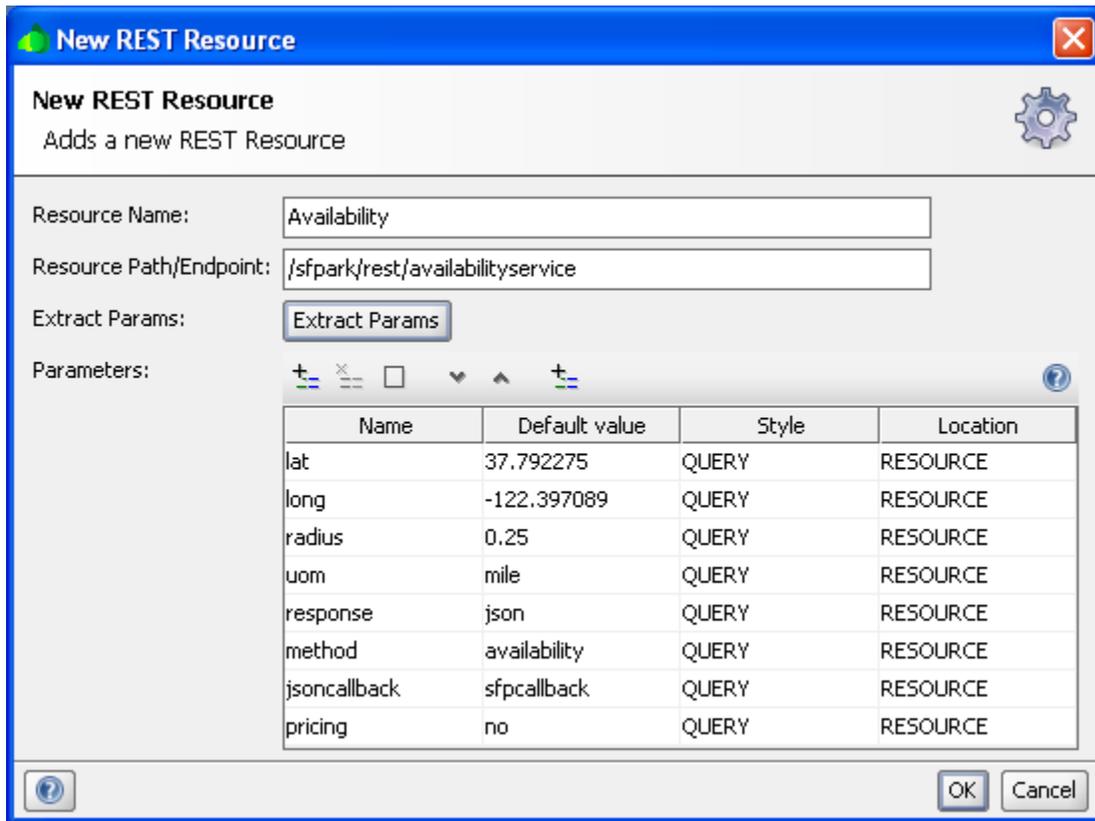
Clicking OK should pop up a new window to enter a new REST Resource. Provide a suitable Resource Name and the Resource Path/ Endpoint as shown below.

For the Resource Path type in similar to below: This includes some of the important parameters for the service along with some sample values. Update it as appropriate for your tests.

<http://api.sfpark.org/sfpark/rest/availabilityservice?lat=37.792275&long=-122.397089&radius=0.25&uom=mile&response=json&method=availability&jsoncallback=sfpccallback&pricing=no>



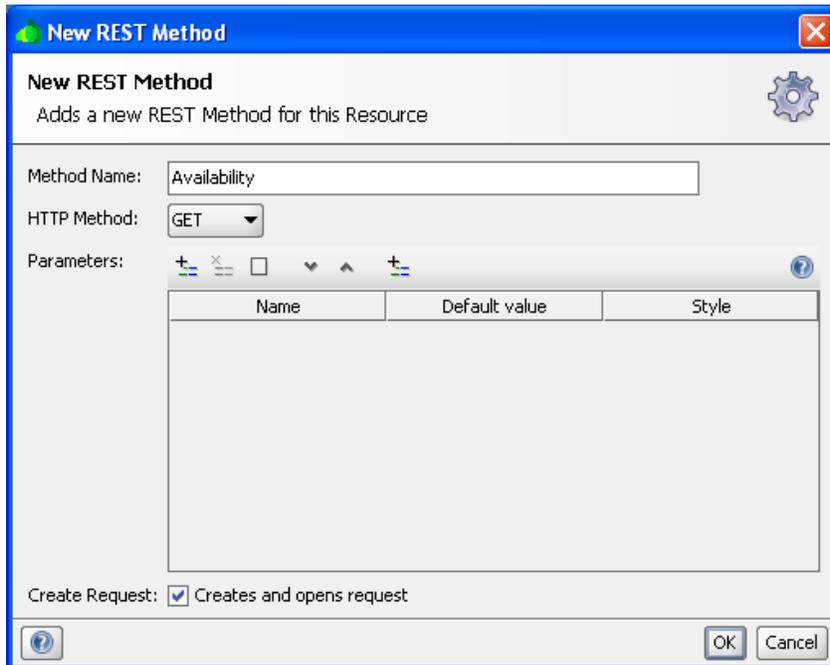
Next: In the above screen you can then simply click on the “Extract Params” button and the tool will review the URL and set up all the parameters for this service as shown below:



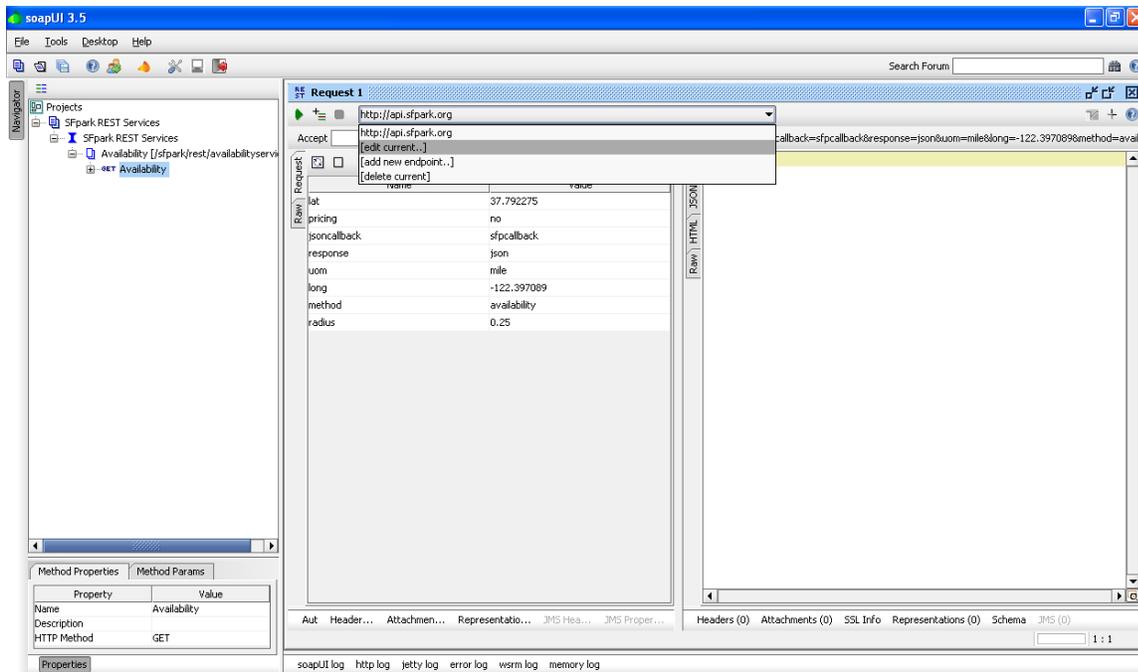
NOTE: The Resource Path gets truncated after the Parameters have been extracted. You can also update the default value for each parameter shown in the above screen by left clicking in the value for a particular parameter. Leave Style selection and Location to default of QUERY and RESOURCE.

Optionally you could enter the parameters manually by clicking the “+” icon in the Parameters section to add the parameters allowed for this service.

Next click “OK” button. This will launch the New REST Method dialog screen as shown. Enter a suitable Method Name, e.g., Availability.



Leave the other selections to default and click OK to launch the Test window. The test window is shown below (shown maximized).



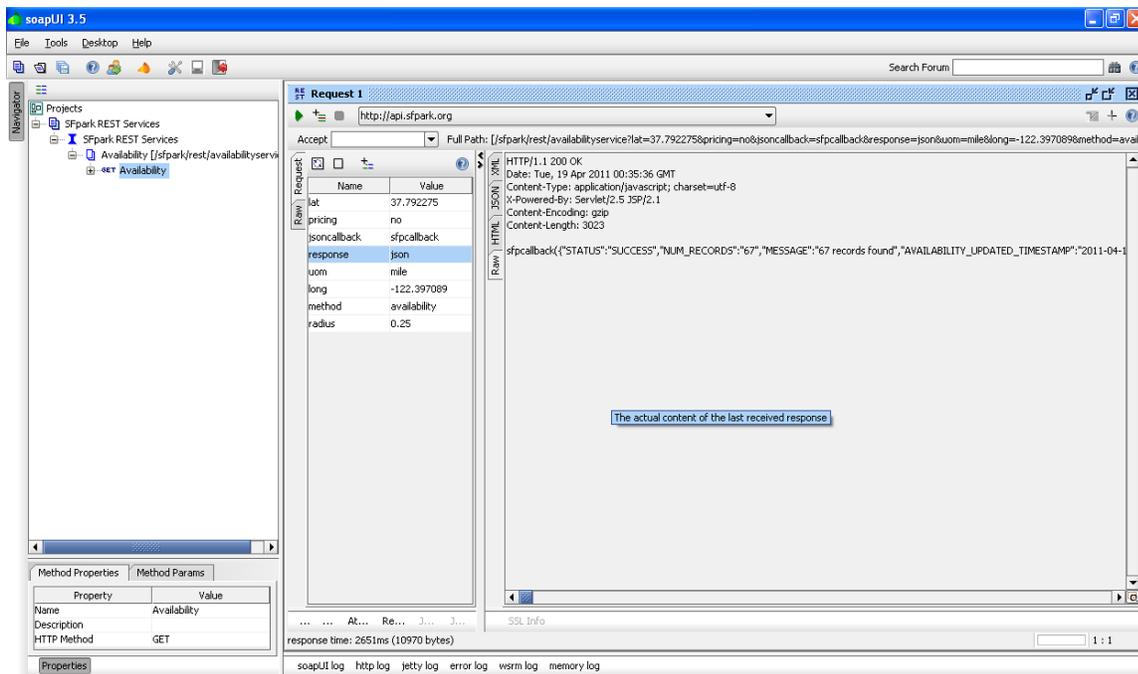
You can now start testing the service by clicking the green Play Icon.

NOTE: If you need to change the SFpark server endpoint you can simply edit the URL at the top as shown in the above screen. Left click on the URL as highlighted and select the option “edit current”. Then replace the server IP address to the desired server name or IP address.

Once you submit the request (by clicking the green play icon) the server should respond with a response message along with relevant information. To view the raw response that includes the HTTP headers, click the Raw Tab to the rightmost pane.

If the response is taking too long (> 30seconds) there could be connectivity problems as the server may be down or not reachable. Also, if you are testing from a corporate network ensure the firewall rules allow connecting to the SFpark server.

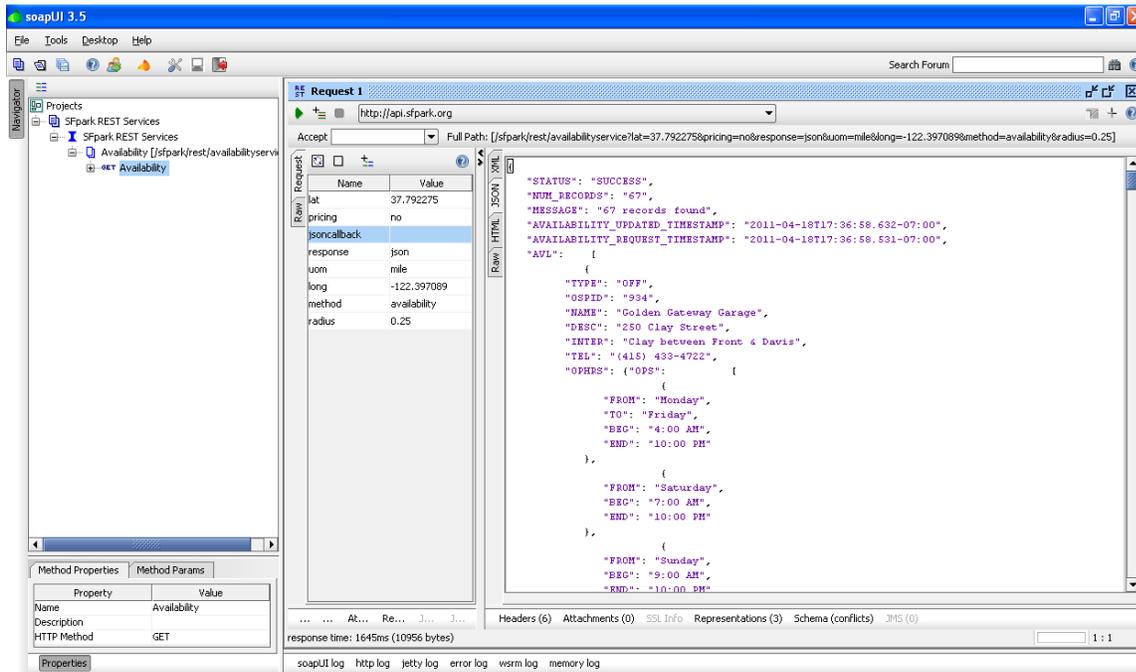
If you receive a SUCCESS response similar to below it has successfully returned the availability information for the requested search parameters. Note: since we requested jsoncallback in the above request select the "Raw" tab in the right pane to view the response as the Content-Type is set to application/javascript for JSON callback (JSONP) option.



Looking at the data returned the STATUS for the request resulted in SUCCESS and NUM\_RECORDS field indicates the actual number of results found matching the request criteria.

If the JSON callback is not needed for the response, clear out the value for the jsoncallback parameter and re-submit the request to receive response in JSON format as shown below.

NOTE: If requesting jsoncallback option then the response type needs to be specified as json. This option is not valid when response type of XML is specified.



In this case the response Content-Type is now set to application-json and HTTP status code: 200. Tip: This is seen by clicking the “Raw” tab of the results section of the screen.

```

HTTP/1.1 200 OK
Date: Tue, 19 Apr 2011 00:36:58 GMT
Content-Type: application/json; charset=utf-8
X-Powered-By: Servlet/2.5 JSP/2.1
Content-Encoding: gzip
Content-Length: 3003
    
```

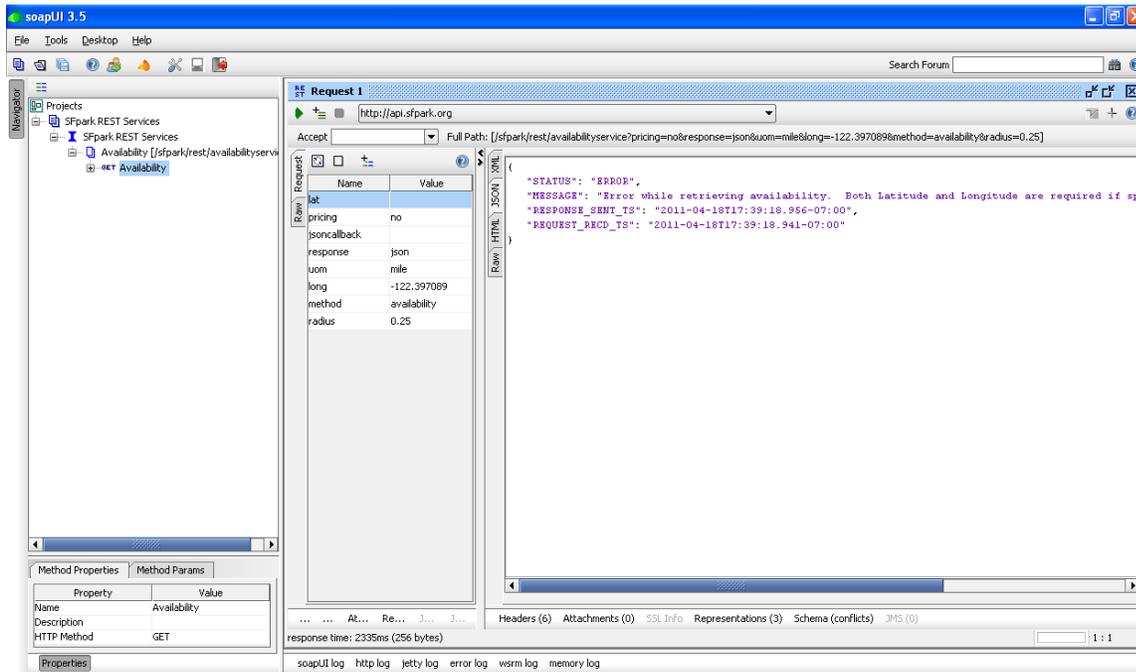
The JSON response data for the above request is provided below for reference:

```

{
  "STATUS": "SUCCESS",
  "NUM_RECORDS": "67",
  "MESSAGE": "67 records found",
  "AVAILABILITY_UPDATED_TIMESTAMP": "2011-04-18T17:36:58.632-07:00",
  "AVAILABILITY_REQUEST_TIMESTAMP": "2011-04-18T17:36:58.531-07:00",
  "AVL": [
    {
      "TYPE": "OFF",
      "OSPID": "934",
      "NAME": "Golden Gateway Garage",
      "DESC": "250 Clay Street",
      "INTER": "Clay between Front & Davis",
      "TEL": "(415) 433-4722",
      "OPHRS": { "OPS": [
        {
          "FROM": "Monday",
          "TO": "Friday",
          "BEG": "4:00 AM",
          "END": "10:00 PM"
        },
        {
          "FROM": "Saturday",
          "BEG": "7:00 AM",
          "END": "10:00 PM"
        },
        {
          "FROM": "Sunday",
          "BEG": "9:00 AM",
          "END": "10:00 PM"
        }
      ]}
    }
  ]
}
    
```

```
    "END": "10:00 PM"
  },
  {
    "FROM": "Saturday",
    "BEG": "7:00 AM",
    "END": "10:00 PM"
  },
  {
    "FROM": "Sunday",
    "BEG": "9:00 AM",
    "END": "10:00 PM"
  }
}],
"OCC": "543",
"OPER": "1100",
"PTS": "1",
"LOC": "-122.3986032,37.79544154"
},
{
  "TYPE": "ON",
  "BFID": "651001",
  "NAME": "Sansome St (1-99)",
  "OCC": "0",
  "OPER": "0",
  "PTS": "2",
  "LOC": "-122.4007030779,37.790581372,-122.4007936029,37.7910219272"
},
##### 65 more Availability Records omitted#####
]
```

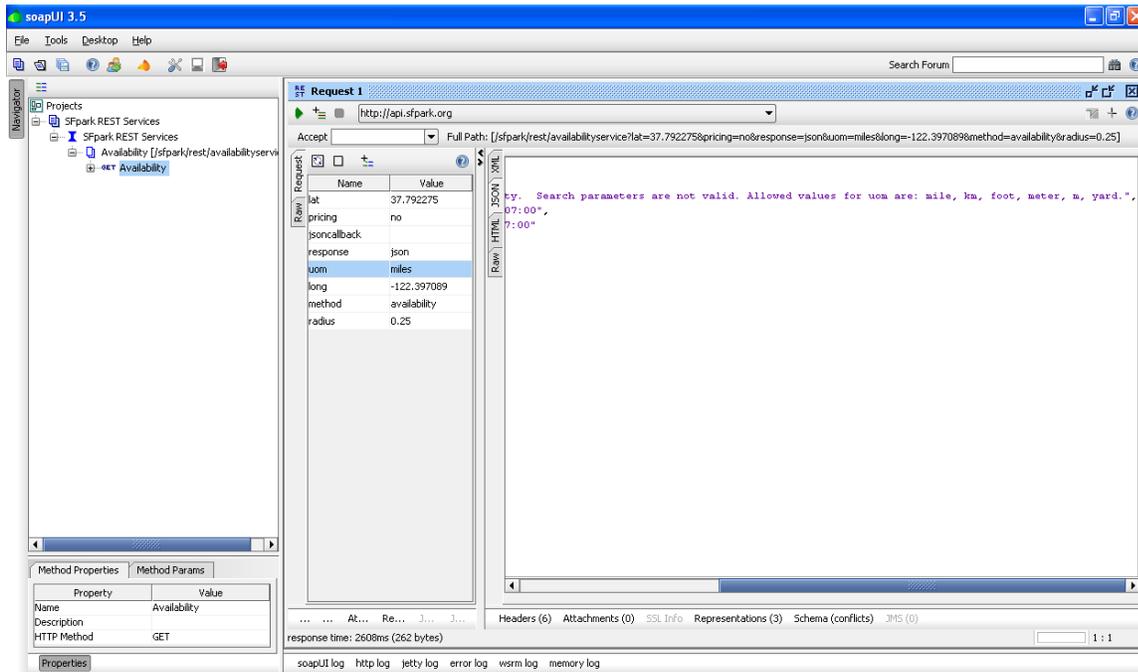
However, if incorrect parameters or values are passed the service will return an ERROR status as shown below where longitude is omitted even though the latitude is specified.



The HTTP status code returned is still 200 since the request processed successfully, since it is data that is not correctly passed. Status code of 500 or 503 will be sent if there is some system error or connectivity issue and the request could not be processed.

The client code should focus mainly on the STATUS element returned in the response as a means of determining if there is a successful return and whether the query passed was correctly processed. The NUM\_RECORDS can be used as an easy way to determine number of records returned. This is returned only if the STATUS is SUCCESS. The MESSAGE field may also include number of records returned, however, the NUM\_RECORDS field is used primarily for this purpose so it is better suited to use for verifying if any valid records are also returned when STATUS is SUCCESS.

Below is a screen where uom parameter is not correct. Server expects value of mile but miles was sent. It returned in an ERROR status as seen below.

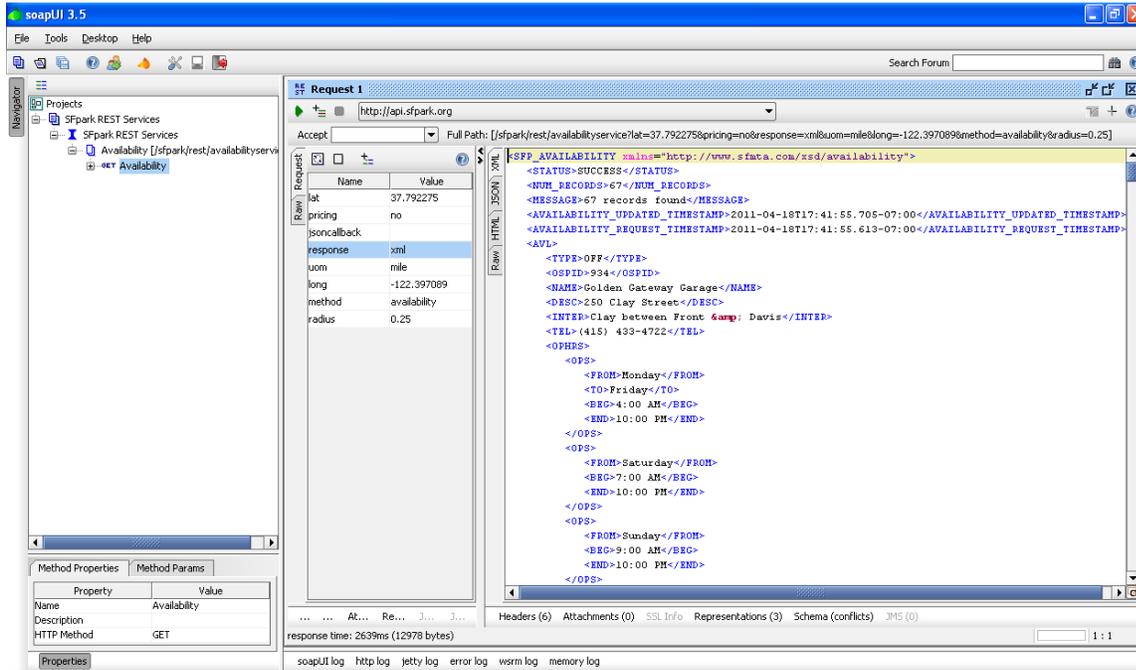


Note that you can clear out all parameter values so that you set only certain ones by clicking the “Rectangle” icon as shown in the screen below. Only the parameters with values typed in will then be passed to the server. You can test with combination of various parameters as appropriate to verify the response.

The service also provides an option to return the data in XML format. This is done by specifying xml (default value) for the response search parameter as shown below. You can then click the XML tab on the search result panel to see the XML formatted response.

If you receive a SUCCESS response similar to below it has successfully returned the availability information for the requested search parameters.

Note: Be sure to review the response in the appropriate result tab, i.e., XML data vs. JSON format as these may look odd when viewed in the other format panel.



The data returned has been formatted as XML as requested in the search parameter for response format. SUCCESS indicates the search was successfully processed and NUM\_RECORDS field indicates the actual number of results found matching the request criteria.

```

<SFP_AVAILABILITY xmlns="http://www.sfmta.com/xsd/availability">
  <STATUS>SUCCESS</STATUS>
  <NUM_RECORDS>67</NUM_RECORDS>
  <MESSAGE>67 records found</MESSAGE>
  <AVAILABILITY_UPDATED_TIMESTAMP>2011-04-18T17:41:55.705-07:00</AVAILABILITY_UPDATED_TIMESTAMP>
  <AVAILABILITY_REQUEST_TIMESTAMP>2011-04-18T17:41:55.613-07:00</AVAILABILITY_REQUEST_TIMESTAMP>
  <AVL>
    <TYPE>OFF</TYPE>
    <OSPID>934</OSPID>
    <NAME>Golden Gateway Garage</NAME>
    <DESC>250 Clay Street</DESC>
    <INTER>Clay between Front & Davis</INTER>
    <TEL>(415) 433-4722</TEL>
    <OPHRS>
      <OPS>
        <FROM>Monday</FROM>
        <TO>Friday</TO>
        <BEG>4:00 AM</BEG>
        <END>10:00 PM</END>
      </OPS>
      <OPS>
        <FROM>Saturday</FROM>
        <BEG>7:00 AM</BEG>
        <END>10:00 PM</END>
      </OPS>
    </OPHRS>
  </AVL>
</SFP_AVAILABILITY>
    
```

```

    <OPS>
      <FROM>Sunday</FROM>
      <BEG>9:00 AM</BEG>
      <END>10:00 PM</END>
    </OPS>
  </OPHRS>
  <OCC>518</OCC>
  <OPER>1100</OPER>
  <PTS>1</PTS>
  <LOC>-122.3986032,37.79544154</LOC>
</AVL>
<AVL>
  <TYPE>ON</TYPE>
  <BFID>651001</BFID>
  <NAME>Sansome St (1-99)</NAME>
  <OCC>0</OCC>
  <OPER>0</OPER>
  <PTS>2</PTS>
  <LOC>-122.4007030779,37.790581372,-122.4007936029,37.7910219272</LOC>
</AVL>
##### 65 more Availability Records omitted#####
</SFP_AVAILABILITY>

```

Also the HTTP status code of 200 is returned indicated the request processed successfully. This is seen by clicking the “Raw” tab of the results section of the screen.

```

HTTP/1.1 200 OK
Date: Tue, 19 Apr 2011 00:43:08 GMT
Content-Type: application/json; charset=utf-8
X-Powered-By: Servlet/2.5 JSP/2.1
Content-Encoding: gzip
Content-Length: 3846

```

Following is an example of JSON response that includes pricing information (pricing =yes)

```

{
  "STATUS": "SUCCESS",
  "NUM_RECORDS": "67",
  "MESSAGE": "67 records found",
  "AVAILABILITY_UPDATED_TIMESTAMP": "2011-04-18T17:43:08.426-07:00",
  "AVAILABILITY_REQUEST_TIMESTAMP": "2011-04-18T17:43:08.142-07:00",
  "AVL": [
    {
      "TYPE": "OFF",
      "OSPID": "934",
      "NAME": "Golden Gateway Garage",
      "DESC": "250 Clay Street",
      "INTER": "Clay between Front & Davis",
      "TEL": "(415) 433-4722",
      "OPHRS": {"OPS": [
        {
          "FROM": "Monday",
          "TO": "Friday",
          "BEG": "4:00 AM",
          "END": "10:00 PM"
        }
      ]}
    }
  ]
}

```

```

    },
    {
      "FROM": "Saturday",
      "BEG": "7:00 AM",
      "END": "10:00 PM"
    },
    {
      "FROM": "Sunday",
      "BEG": "9:00 AM",
      "END": "10:00 PM"
    }
  ]},
  "RATES": {"RS": [
    {
      "DESC": "Incremental",
      "RATE": "3.5",
      "RQ": "Per 1/2-hr"
    },
    {
      "DESC": "24-Hour Max/Lost Tkt",
      "RATE": "36",
      "RQ": "Flat rate"
    },
    {
      "DESC": "Early Bird",
      "RATE": "20",
      "RQ": "Flat rate",
      "RR": "Mon-Fri: In by 10AM/Out by 7PM"
    },
    {
      "DESC": "Motorcycle",
      "RATE": "7",
      "RQ": "Flat rate"
    },
    {
      "DESC": "Park & Ride Validation",
      "RATE": "3",
      "RQ": "Per day",
      "RR": "Weekend only until 10PM"
    },
    {
      "DESC": "Evening",
      "RATE": "7",
      "RQ": "Flat rate",
      "RR": "Mon-Fri: In after 5PM Out by 8AM"
    },
    {
      "DESC": "Weekend",
      "RATE": "7",
      "RQ": "Per day",
      "RR": "Sat: In after 7AM/Out by 4AM;Sun: In after 4AM/Out by 4AM"
    }
  ]},
  "OCC": "514",

```

```
"OPER": "1100",
"PTS": "1",
"LOC": "-122.3986032,37.79544154"
},
{
  "TYPE": "ON",
  "BFID": "651001",
  "NAME": "Sansome St (1-99)",
  "RATES": {"RS": [
    {
      "BEG": "12:00 AM",
      "END": "7:00 AM",
      "RATE": "0",
      "RQ": "No charge"
    },
    {
      "BEG": "7:00 AM",
      "END": "6:00 PM",
      "RATE": "0",
      "RQ": "Restricted"
    },
    {
      "BEG": "6:00 PM",
      "END": "12:00 AM",
      "RATE": "0",
      "RQ": "No charge"
    }
  ]},
  "OCC": "0",
  "OPER": "0",
  "PTS": "2",
  "LOC": "-122.4007030779,37.790581372,-122.4007936029,37.7910219272"
},
##### 65 more Availability Records omitted#####
]
}
```