



GPS SDK

for



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1 Introduction

1.1. Document Purpose

The document is designed to ensure successful interaction of ETAdirect GPS module and external SOAP applications.

1.2. Scope of the Document

The document describes the elements of SOAP technology and its usage when creating client applications for interacting with GPS module of the ETAdirect system.

1.3. Target Audience

This document is intended for software developers, implementing SOAP clients for interaction with the ETAdirect GPS module.

1.4. Glossary

Term	Explanation
Activate route	Start the work day
Activity	Entity of the ETAdirect system that represents any time-consuming activity of the resource
Client Application	see SOAP Client Application
Decimal degrees	Representation of latitude and longitude geographic coordinates as decimal fractions
Delivery	In this context, transportation of GPS data from external GPS service to ETAdirect
GPS	Global Positioning System – space-based global navigation satellite system, providing data on location of objects on the Earth in a given moment of time
ISO 8601 format	see http://en.wikipedia.org/wiki/ISO_8601
SOAP	Lightweight protocol for exchange of information in a decentralized, distributed environment
SOAP 1.1	See http://www.w3.org/TR/2000/NOTE-SOAP-20000508/
SOAP Interface	Interface used to receive requests and return responses via SOAP
SOAP Client Application	Application running at the Client's site and providing interaction with ETAdirect server via SOAP
SOAP Fault	SOAP element used to carry error and/or status information in a SOAP message
SOAP Faultcode	SOAP element intended to be used by software to provide an algorithmic mechanism for identifying the fault
SOAP Faultstring	SOAP element intended to provide a human readable explanation of the fault and not intended for algorithmic processing
User	1) Person using ETAdirect

Term	Explanation
	2) Entity used for authentication and authorization, allowing people or external software to access ETAdirect

2 GPS API Overview

The aim of the GPS module is to support integration of the ETAdirect system with external GPS-based systems, providing position tracking of GPS-enabled devices (hereinafter – the objects). This module works as a data cache and security firewall, and allows providing GPS data to ETAdirect quickly and safely.

The GPS interface provides ETAdirect with data that enables it to see the current and earlier positions of an object on the map, and shows their trace (it is shown as a sequence of blue dots).

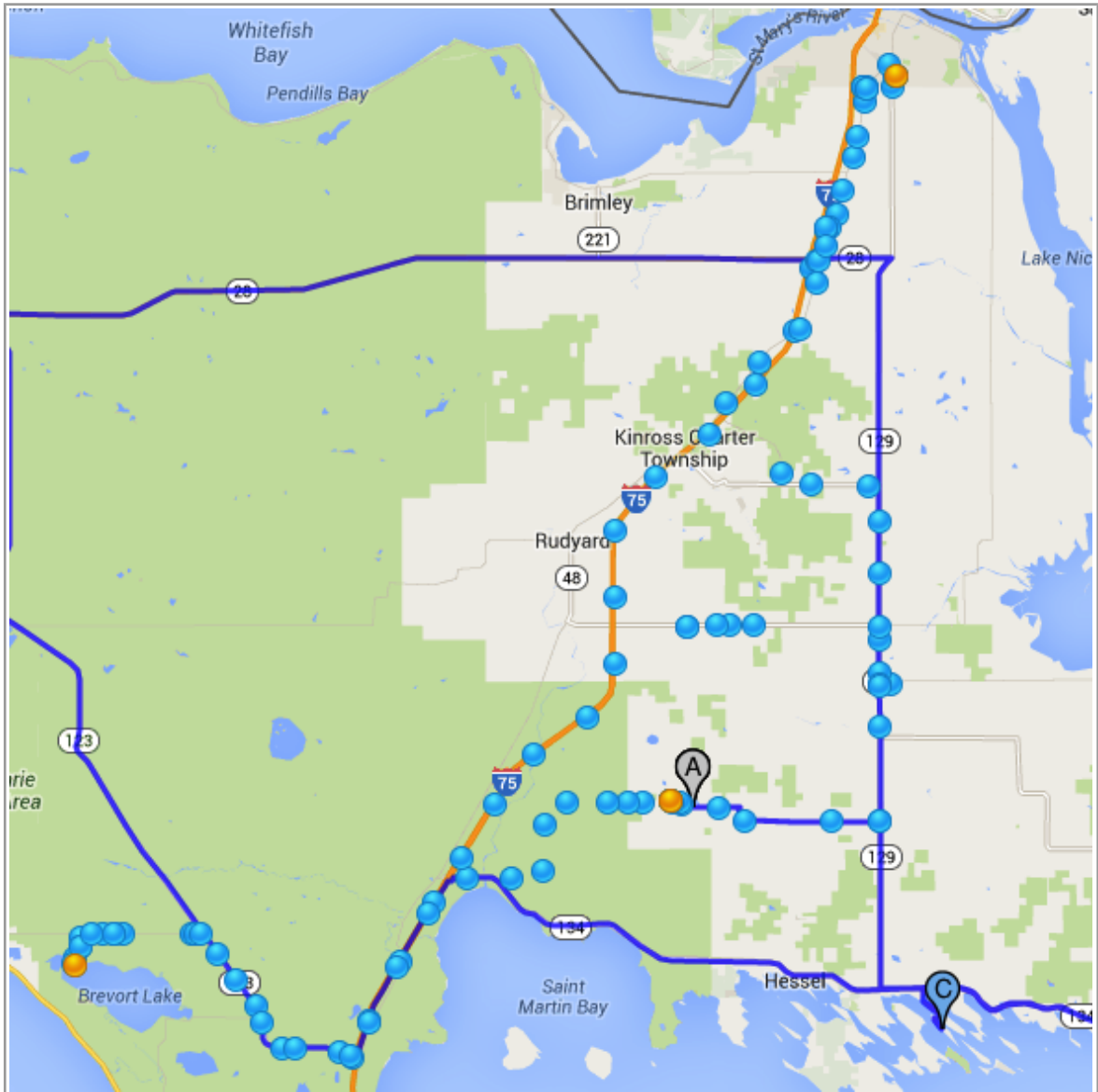


Figure 1: Displaying current resource position and trace

ETAdirect 4.5 can be used with GPS module v1.3.0.

2.1. GPS API Methods

The following operations are used to deliver GPS data by means of SOAP:

Method	Can be used to...	Details
set_position	...update the object position	Enables the external system to update information about last known position(s) of the object(s) specified by the identifier(s)
get_position	... obtain information on the object position	Enables ETAdirect to obtain information about the last known position of the object(s) specified by the identifier(s) and (optionally) history of their movement

2.2. Authentication Structure

All GPS API methods use authentication elements in order to determine the permissions of the ETAdirect client company user. The ETAdirect SOAP authentication structure has the following **mandatory** fields:

Name	Type	Description
now	string	current time in ISO 8601 format
company	string	case-insensitive identifier of the Client for which data is to be retrieved provided by TOA Technologies during integration
login	string	case-insensitive identifier of a specific user within the Company provided by TOA Technologies during integration
auth_string	string	authentication hash; auth_string = md5(now + md5(password)); where 'password' is a case-sensitive set of characters used for user authentication provided by TOA Technologies during integration

For example:

```
<now>2014-01-10T13:56:50Z</now>
<login>soap</login>
<company>in132</company>
<auth_string>ba8e6417c60e0e1748265252b4f4d601</auth_string>
```

2.2.1. Authentication

The structure is used for the request authentication. If any of the situations below occur, authentication fails and relevant error is returned.

Authentication fails if:

- 1 now is different from the current time on the server and this difference exceeds the predefined time-window (30 minutes by default)
- 2 company cannot be found in the ETAdirect
- 3 login cannot be found for this company
- 4 user with this 'login' is not authorized to use the specified method
- 5 auth_string is not equal to md5(now+md5(password))

For example:

'now' = "2005-07-07T09:25:02+00:00" and password = "Pa\$\$w0rD"

then

md5 (password) = "06395148c998f3388e87f222bfd5c84b"

concatenated string =

= "2005-0707T09:25:02+00:0006395148c998f3388e87f222bfd5c84b"

auth_string should be:

```
auth_string = "62469089f554d7a38bacd9be3f29a989"
```

Otherwise authentication is successful and the request is processed further.

3 Detailed Method Description

3.1. 'set_position' Method

The 'set_position' method is used to update the position of an object. Several objects and their GPS coordinates and timestamps can be specified in one transaction.

3.1.1. 'set_position' Request

The 'set_position' method request specifies:

- the identifier of the object whose position is to be updated
- the geographic coordinates to be set for the specified object
- the time when the object was at the position defined by the coordinates

All method parameters are mandatory (if any mandatory parameter is missing, the corresponding error is returned).

The request contains the following elements:

Name	Required	Type	Description
authentication elements	Yes	struct	authentication structure
data	Yes	struct	array of 'item' elements each corresponding to a single object whose position is to be defined

- **'item' Element of 'set_position' Request**

Each 'item' element represents an object whose position is to be defined and contains the following mandatory elements:

Name	Required	Type	Description
id	Yes	string	case-sensitive object identifier; can be an object login, name, external ID, etc.
latitude	Yes	float	geographical latitude (Greenwich Geographical Coordinates in decimal degrees)
longitude	Yes	float	geographical longitude (Greenwich Geographical Coordinates in decimal degrees)
timestamp	Yes	DateTime	timestamp in the YYYY-MM-DD HH:MM:SS format

- **'set_position' Request Example**

```
<SOAP-ENV:Envelope xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:ns1="urn:toatech:Positioning:1.0">
  <SOAP-ENV:Body>
    <ns1:set_position>
```

```

<now>2014-05-15T17:10:51+00:00</now>
<login>soap</login>
<company>in132</company>
<auth_string>238165d8d5603c670cecfb6b4faeb698</auth_string>
<data>
  <item>
    <id>22</id>
    <latitude>23.99</latitude>
    <longitude>32.5</longitude>
    <timestamp>2014-05-15T14:22:54</timestamp>
  </item>
  <item>
    <id>HARTWIG, Luis</id>
    <latitude>20.00</latitude>
    <longitude>32.5</longitude>
    <timestamp>2014-05-15T12:10:15</timestamp>
  </item>
</data>
</ns1:set_position>
</SOAP-ENV:'data' ArrayBody>
</SOAP-ENV:Envelope>

```

3.1.2. 'set_position' Response

If the transaction fails, a [fault response](#) is returned. Upon a successful transaction, the 'set_position' method returns the number of successfully updated objects. The response contains the following element:

Name	Type	Description
return	int	number of updated objects

- 'set_position' Response Example

```

<SOAP-ENV:Envelope xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:ns1="urn:toatech:Positioning:1.0">
  <SOAP-ENV:Body>
    <ns1:set_positionResponse>
      <return>2</return>
    </ns1:set_positionResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

3.2. 'get_position' Method

The 'get_position' method is used to retrieve GPS coordinates of the object(s) on the basis of object identifiers and timeframe specified.

3.2.1. 'get_position' Request

A 'get_position' request contains the following elements:

Name	Required	Type	Description
authentication elements	Yes	struct	authentication structure
ids	Yes	struct	array of 'item' elements each containing a case-sensitive object identifier; can be an object login, name, external ID, etc. At least one 'item' element is mandatory.
timefrom	Yes	DateTime	beginning of the search interval in the YYYY-MM-DD HH:MM:SS format
timeto	Yes	DateTime	end of the search interval in the YYYY-MM-DD HH:MM:SS format
history	No	bool	option defining whether the request should return the history of the object(s) movement (the list of coordinates with the corresponding timestamps) within the interval defined with the 'timefrom' and 'timeto' parameters default value: false

- 'get_position' Request Example

```
<SOAP-ENV:Envelope xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:ns1="urn:toatech:Positioning:1.0">
  <SOAP-ENV:Body>
    <ns1:get_position>
      <now>2014-08-14T16:51:53Z</now>
      <login>soap</login>
      <company>in132</company>
      <auth_string>ef8c4c522657e55f928b128b8d259b97</auth_string>
      <ids>
        <item>1022</item>
        <item>1023</item>
        <item>1024</item>
      </ids>
      <timefrom>2012-02-14T00:00:01</timefrom>
      <timeto>2012-02-14T23:59:59</timeto>
      <history>true</history>
    </ns1:get_position>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

3.2.2. 'get_position' Response

If the transaction fails, a [fault response](#) is returned. Upon a successful transaction, the 'get_position' response consists of a 'return' element containing the GPS data of the objects specified in the request. The 'return' element is an array of 'item' elements each corresponding to a single object specified in the request. The 'item' element consists of the following:

Name	Type	Description
id	string	object identifier
status	int	transaction status code for the object identified with the 'id' parameter. possible values: 0 - 'id' found, coordinates returned 1 - 'id' not found, no coordinates returned 2 - 'id' found, but no GPS coordinates correspond to the specified time frame. No coordinates returned
coordinates	struct	array of 0 or more 'item' elements each containing data on the GPS position of a single object

- **'item' Element of 'get_position' Response**

The 'item' element of the 'get_position' response contains the following:

Name	Type	Description
latitude	float	geographical latitude (Greenwich Geographical Coordinates in decimal degrees)
longitude	float	geographical longitude (Greenwich Geographical Coordinates in decimal degrees)
timestamp	DateTime	timestamp in the YYYY-MM-DD HH:MM:SS format

The 'item' elements in the 'coordinates' array are sorted by the 'timestamp', so that later (newer) records are located higher.

- **'get_position' Response Examples**

- **'get_position' Response Containing No Coordinates**

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" xmlns:ns1="urn:toatech:Positioning:1.0">
  <SOAP-ENV:Body>
    <ns1:get_positionResponse>
      <return>
        <item>
          <id>12345</id>
          <status>1</status>
        </item>
      </return>
    </ns1:get_positionResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

```

    <coordinates/>
  </item>
  <item>
    <id>12346</id>
    <status>1</status>
    <coordinates/>
  </item>
</return>
</ns1:get_positionResponse>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

- **'get_position' Response Containing Objects Coordinates**

```

<SOAP-ENV:Envelope xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:ns1="urn:toatech:Positioning:1.0">
  <SOAP-ENV:Body>
    <ns1:get_positionResponse>
      <return>
        <item>
          <id>1022</id>
          <status>0</status>
          <coordinates>
            <item>
              <latitude>38.99</latitude>
              <longitude>31.2</longitude>
              <timestamp>2012-05-31T19:29:54Z</timestamp>
            </item>
          </coordinates>
        </item>
        <item>
          <id>1023</id>
          <status>0</status>
          <coordinates>
            <item>
              <latitude>23.99</latitude>
              <longitude>32.2</longitude>
              <timestamp>2012-05-31T19:29:54Z</timestamp>
            </item>
          </coordinates>
        </item>
        <item>
          <id>1024</id>
          <status>0</status>
          <coordinates>

```

```
<item>
  <latitude>40.94</latitude>
  <longitude>33.2</longitude>
  <timestamp>2012-05-31T19:29:54Z</timestamp>
</item>
</coordinates>
</item>
</return>
</ns1:get_positionResponse>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

4 Fault Responses

Upon transaction error Fault Responses are returned. Fault response contains a faultcode and faultstring of an error message.

4.1. Error Messages

Each error message is either a SOAP Fault message, or an HTTP error, or a ResourceElement error. GPS Interface responses can contain the following error messages:

Type	Code	Message	Occurs when
HTTP error	404	Not Found	Request method is not POST (except when getting WSDL)
SOAP Fault	Server	Procedure 'X' not present	Method name is not 'get_position' or 'set_position'
	Server	SOAP-ERROR: Encoding: Violation of encoding rules	in the 'set_position' method, the value of latitude or longitude is specified incorrectly
	Client	Authentication failed	Invalid credentials are passed in request
	Client	Wrong parameter format	Request format is invalid
	Client	Invalid interval of time was specified	In the 'get_position' method, the value of 'timeto' is less than 'timefrom'
	Server	Database error	Server cannot connect to database or execute query
	Client	Invalid value of geographic coordinate(s)	In the 'set_position' method, $\text{abs}(\text{latitude}) > 90^\circ$ or $\text{abs}(\text{longitude}) > 180^\circ$
Client	Bad Request	Request is not valid XML	
ResourceElement status	1		In the 'get_position' method, no data found for the specified interval

- **Fault Response Example**

```
<SOAP-ENV:Envelope xmlns:SOAP-
ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Body>
    <SOAP-ENV:Fault>
      <faultcode>SOAP-ENV:Client</faultcode>
      <faultstring>Bad Request</faultstring>
    </SOAP-ENV:Fault>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

5 Changes Compared to Previous Versions

The API has not been changed as of ETAdirect version 4.2, except the following:

- the 'get_info' method has been removed