



Basic API Reference & Developer Guide

Version 1.1

November 9, 2009

Revision History

Version	Date	Changes
1.0	2008-11-18	Initial version.
1.1	2009-11-09	Added <code>estimateMarketOrder</code> method, and everything that comes with it.

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1 Overview

This document describes the services that are available via the VirWoX (Virtual World Exchange) Basic API (Application Programming Interface). This API is an easy-to-use, standards-based, programming-language-independent interface to Web Services, enabling access to the functionality of VirWoX by programs.

BASIC API VS. TRANSACTIONAL API

The Basic API is designed for applications that require simple read-only access to the exchange, whereas the more complex Transactional API also allows performing transactions on the exchange.

Typical applications of the Basic API include:

- display of current exchange rates on Web pages or in-world
- currency calculators (Web or in-world) using up-to-date exchange rates
- integration of current exchange rates into in-world items such as vendors or rental boxes
- advanced graphs of historical price and volume
- an alert service that sends an alarm message when a specified exchange rate is reached

The protocol is completely stateless, i.e. the server does not remember state information between requests (e.g. there is no “login” request).

Access to the Basic API is anonymous and does not require a VirWoX account.

2 Protocol Options

SIMPLE HTTP

Because in the Basic API we only transmit “public” information, all data is simply sent over unencrypted HTTP. In order to make access easy from a wide variety of programming language, we support two alternative protocol options: SOAP and JSON-RPC. While SOAP is the robust standard protocol for interfacing web services, supported by a variety of programming languages, JSON is more lightweight and simple.

2.1 SOAP

SOAP (Simple Object Access Protocol) is a robust standard interface to web services¹. It is based on XML and can be sent over HTTP and HTTPS, and therefore works well with firewalls. Both request and response are XML documents.

WSDL

The definition of the web service’s methods, types, and messages is typically done using the Web Services Description Language (WSDL)², so that it can be automatically

¹ <http://www.w3.org/TR/soap12-part1>

² <http://www.w3.org/TR/wsdl>

processed. Software development tools for web services based on SOAP and WSDL are available for a wide range of programming languages.

The WSDL service description of the VirWoX Basic API is at:

<http://api.virwox.com/api/basic.wsdl>

This resource contains all the necessary information you will need to access the service (see the programming examples in Chapter 5). It is recommended to directly read the resource from above URL when starting the connection, rather than from a local copy, so that you always use the most up-to-date version of the protocol.

DIRECT ACCESS

In most programming environments, the WSDL file is all you need to invoke methods. However, if you want to access the SOAP protocol directly, e.g. from a programming environment that does not support WSDL, the access point for the API is at:

<http://api.virwox.com/api/soap.php>

EXAMPLE

For example, to invoke the `getMarketDepth` method (see Section 3.3), you would POST the following XML document (whitespace added for readability) to the above URL³:

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:ns1="urn:types"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <ns1:getMarketDepth>
      <instruments SOAP-ENC:arrayType="xsd:string[2]"
        xsi:type="SOAP-ENC:Array">
        <item xsi:type="xsd:string">EUR/SLL</item>
        <item xsi:type="xsd:string">USD/SLL</item>
      </instruments>
      <buyDepth xsi:type="xsd:int">1</buyDepth>
      <sellDepth xsi:type="xsd:int">1</sellDepth>
    </ns1:getMarketDepth>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The server would respond with something like this (again, whitespace has been added for readability):

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:ns1="urn:types"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <ns1:getMarketDepthResponse>
      <result SOAP-ENC:arrayType="SOAP-ENC:Struct[2]"
        xsi:type="SOAP-ENC:Array">
        <item xsi:type="SOAP-ENC:Struct">
          <buy SOAP-ENC:arrayType="SOAP-ENC:Struct[1]"
            xsi:type="SOAP-ENC:Array">
```

³The *Content-Type* header of the posted content must not be *application/x-www-form-urlencoded* or *multipart/form-data*.

```
<item xsi:type="SOAP-ENC:Struct">
  <price xsi:type="xsd:string">371.5</price>
  <volume xsi:type="xsd:string">24</volume>
</item>
</buy>
<sell SOAP-ENC:arrayType="SOAP-ENC:Struct[1]"
  xsi:type="SOAP-ENC:Array">
  <item xsi:type="SOAP-ENC:Struct">
    <price xsi:type="xsd:string">388</price>
    <volume xsi:type="xsd:string">18</volume>
  </item>
</sell>
<symbol xsi:type="xsd:string">EUR/SLI</symbol>
<errorCode xsi:type="xsd:string">OK</errorCode>
<bestBuyPrice xsi:type="xsd:string">371.5</bestBuyPrice>
<bestSellPrice xsi:type="xsd:string">388</bestSellPrice>
</item>
<item xsi:type="SOAP-ENC:Struct">
  <buy SOAP-ENC:arrayType="SOAP-ENC:Struct[1]"
    xsi:type="SOAP-ENC:Array">
    <item xsi:type="SOAP-ENC:Struct">
      <price xsi:type="xsd:string">277</price>
      <volume xsi:type="xsd:string">448</volume>
    </item>
  </buy>
  <sell SOAP-ENC:arrayType="SOAP-ENC:Struct[1]"
    xsi:type="SOAP-ENC:Array">
    <item xsi:type="SOAP-ENC:Struct">
      <price xsi:type="xsd:string">281</price>
      <volume xsi:type="xsd:string">211</volume>
    </item>
  </sell>
  <symbol xsi:type="xsd:string">USD/SLI</symbol>
  <errorCode xsi:type="xsd:string">OK</errorCode>
  <bestBuyPrice xsi:type="xsd:string">277</bestBuyPrice>
  <bestSellPrice xsi:type="xsd:string">281</bestSellPrice>
</item>
</result>
</ns1:getMarketDepthResponse>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

2.2 JSON-RPC

JSON⁴ (JavaScript Object Notation) is a lightweight data interchange format whose simplicity has resulted in widespread use among web developers. JSON is easy to read and write; you can parse it using any programming language, and its structures map directly to data structures used in most programming languages. JSON-RPC⁵ is a lightweight Remote Procedure Call (RPC) protocol using JSON for object serialization.

The access point for the JSON-RPC over HTTP interface is:

<http://api.virwox.com/api/json.php>

We support two request options: via HTTP POST and via HTTP GET.

⁴ <http://www.ietf.org/rfc/rfc4627.txt>

⁵ <http://json-rpc.org/wiki/specification>

HTTP POST Using HTTP POST⁶, the client sends a JSON-encoded request object with the following properties:

- **method** - A string containing the name of the method to be invoked.
- **params** - An array of objects to pass as arguments to the method.
- **id** - The request id. This can be of any type. It is used to match the response with the request that it is replying to.

The service responds with a JSON-encoded object with the following properties:

- **result** - The object that was returned by the invoked method. This is *null* in case there was an error invoking the method.
- **error** - An error object if there was an error invoking the method. It is *null* if there was no error.
- **id** - This is the same id as the request it is responding to. This allows to send and receive requests asynchronously.

EXAMPLE For example, to invoke the `getMarketDepth` method (see Section 3.3), you would POST the following string (whitespace added for readability):

```
{
  "method": "getMarketDepth",
  "params":
  {
    "symbols": ["EUR\$/SLL", "USD\$/SLL"],
    "buyDepth": 1,
    "sellDepth": 1
  },
  "id": 1
}
```

The server would respond with something like this (again, whitespace has been added for readability):

```
{
  "result":
  [
    {
      "buy":
      [
        {
          "price": "370",
          "volume": "165"
        }
      ],
      "sell":
      [
        {
          "price": "387.9",
          "volume": "63"
        }
      ],
      "symbol": "EUR\$/SLL",
      "errorCode": "OK",
      "bestBuyPrice": "370",
      "bestSellPrice": "387.9"
    },
    {

```

⁶The *Content-Type* header of the posted content must not be *application/x-www-form-urlencoded* or *multipart/form-data*.

```

    "buy":
    [
      {
        "price": "277",
        "volume": "487"
      }
    ],
    "sell":
    [
      {
        "price": "281",
        "volume" : "149"
      }
    ],
    "symbol": "USD\SLL",
    "errorCode": "OK",
    "bestBuyPrice": "277",
    "bestSellPrice": "281"
  }
],
"error": null,
"id":1
}

```

Library functions to produce the request and parse the response into objects are available for most programming languages (see Chapter 5).

HTTP GET

To make it even easier to invoke methods from some programming environments (and in fact, even interactively from a web browser), we also support the "Google AJAX API Style" of calling JSON functions, i.e. encoding the request as url-form-encoded parameters. To issue the same call as in the example above, you can fetch

[http://api.virwox.com/api/json.php?method=getMarketDepth&symbols\[0\]=EUR/SLL&symbols\[1\]=USD/SLL&buyDepth=1&sellDepth=1&id=1](http://api.virwox.com/api/json.php?method=getMarketDepth&symbols[0]=EUR/SLL&symbols[1]=USD/SLL&buyDepth=1&sellDepth=1&id=1)

e.g. by entering it into the address bar of your browser. The service will respond as above.

Similarly, you can also POST

```
method=getMarketDepth&symbols[0]=EUR/SLL&symbols[1]=USD/SLL
&buyDepth=1&sellDepth=1&id=1
```

to the access point URL, with the *Content-Type* header of the POST request set to *application/x-www-form-urlencoded*.

3 API Services Reference

This chapter contains descriptions of each of the methods supported by the Basic API. Coding examples using these methods can be found in Chapter 5.

3.1 getInstruments

PURPOSE Use this method to retrieve a list of the tradable instruments on VirWoX. In Forex terminology, an “instrument” is a currency pair, sometimes also called ‘cross’, such as EUR/SLL.

INPUT None.

OUTPUT An array of objects of type `Instrument`; each of which has the following attributes:

Parameter	Type	Description
<code>symbol</code>	<code>string</code>	A human-readable name of the instrument, e.g. “EUR/SLL” or “VirWoX Stock”.
<code>longCurrency</code>	<code>string</code>	The name of the tradable unit that you get when you go long (i.e. buy) this instrument.
<code>shortCurrency</code>	<code>string</code>	The name of the tradable unit that you get when you go short (i.e. sell) this instrument.
<code>decimals</code>	<code>int</code>	The number of decimal digits (to the right of the decimal point) used for prices in this instrument.
<code>commissionRate</code>	<code>double</code>	The base commission rate (i.e. without any discounts) for Limit Order for this instrument.
<code>commissionRateMkt</code>	<code>double</code>	The variable commission rate for Market Orders for this instrument.
<code>commissionConstMkt</code>	<code>double</code>	The constant commission rate for Market Orders for this instrument.

NOTES Currently, we trade only four real-world currencies (EUR, USD, CHF, GBP) for SLL (Second Life Lindens). Therefore, the `shortCurrency` parameter is currently always “SLL”, and the `decimals` and `commissionRate` parameters are currently set to 1 decimal digit and 0.039 (i.e. 3.9%), respectively, for all these instruments. Likewise, the `commissionRateMkt` is at 0.025 (i.e. 2.5%) and `commissionConstMkt` is 50 (i.e. 50 SLL) for all instruments. See also https://www.virwox.com/help.php#_Commissions_and_Discounts.

However, the system is designed to trade arbitrary commodities (or even stocks), for arbitrary currencies (real or virtual), or against each other. Therefore the developer should not make assumptions about the settings of these parameters, but use this method to determine them if needed.

3.2 getBestPrices

- PURPOSE** Use this method to quickly retrieve the currently best available prices for one or more instruments.
- INPUT** An array named `symbols` containing the symbols of the desired instruments.
- OUTPUT** An array of objects of type `BestPriceItem` for each symbol requested; each of which has the following attributes:

Parameter	Type	Description
<code>errorCode</code>	<code>ErrorEnum</code>	"NO_SUCH_INSTRUMENT" if this symbol does not exist, or "OK" if it does (Chapter 1).
<code>symbol</code>	<code>string</code>	The human-readable name of the instrument.
<code>bestBuyPrice</code>	<code>double</code>	The best (i.e. highest) price somebody is willing to buy this instrument for.
<code>bestSellPrice</code>	<code>double</code>	The best (i.e. lowest) price somebody is willing to sell this instrument for.

3.3 getMarketDepth

- PURPOSE** Use this method to retrieve detailed market depth information, i.e. the currently offered prices and volume, for one or more instruments. For each instruments, the method will return a list containing the specified number of price/volume pairs, starting from the currently best available buy and sell prices. For convenience, the method also returns the currently best available buy and sell prices.
- INPUT** The following parameters:

Parameter	Optional	Type	Description
<code>instruments</code>	N	<code>SymbolList</code>	An array of symbols (type <code>string</code>).
<code>buyDepth</code>	Y	<code>int</code>	The number of items to return for buy prices (starting at the best buy price). Default 0.
<code>sellDepth</code>	Y	<code>int</code>	The number of items to return for sell prices (starting at the best sell price). Default 0.

- OUTPUT** An array of objects of type `MarketDepthItem` for each symbol requested; each of which has the following attributes:

Parameter	Type	Description
-----------	------	-------------

buy	PriceVolumeList	List of the best buy prices and volumes (see below).
sell	PriceVolumeList	List of the best sell prices and volumes (see below).
errorCode	ErrorEnum	"NO_SUCH_INSTRUMENT" if this symbol does not exist, or "OK" if it does (Chapter 4).
symbol	string	The human-readable name of the instrument.
bestBuyPrice	double	The best (i.e. highest) price somebody is willing to buy this instrument for.
bestSellPrice	double	The best (i.e. lowest) price somebody is willing to sell this instrument for.

The `PriceVolumeList` is an array of items of type `PriceVolumeItem`; each of which has the following attributes:

Parameter	Type	Description
price	double	The price.
volume	int	The volume at this price, measured in <code>longCurrency</code> . Volume in <code>shortCurrency</code> can easily be calculated as <code>price * volume</code> .

NOTES

On the VirWoX website, we display only the volume of the 5 best buy and sell prices offered. With this method, you have access to the full market.

While the `getMarketDepth` method also retrieves the best prices for convenience, the `getBestPrices` method is faster and returns less data, so it should be preferred if you just need the prices and not the available volume.

3.4 estimateMarketOrder

PURPOSE Use this method estimate the results of a Market Order, taking into account the exchange fees. For a SELL order this method returns the amount of `shortCurrency` that would be gained from selling the specified amount of `longCurrency`. For a BUY order it returns the amount of `shortCurrency` that would be needed to buy the specified amount of `longCurrency`. As orders may be entered and executed any time, the real amount of a subsequently placed Market Order may be slightly different, which is why this is only an estimate.

INPUT The following parameters:

Parameter	Optional	Type	Description
<code>orderType</code>	N	<code>OrderTypeEnum</code>	"BUY" or "SELL", with reference to <code>longCurrency</code> , i.e. BUY means buying <code>longCurrency</code> and selling <code>shortCurrency</code> .
<code>Amount</code>	N	<code>int</code>	Number of units to buy or sell, measured in <code>longCurrency</code> .
<code>Instrument</code>	N	<code>string</code>	The human-readable name of the instrument.

OUTPUT The following attributes:

Parameter	Type	Description
<code>errorCode</code>	<code>ErrorEnum</code>	"OK", or one of these Error Codes (Chapter 4): "NO_SUCH_INSTRUMENT" "INVALID_ORDER_TYPE" "INVALID_AMOUNT_OR_PRICE" "INSUFFICIENT_LIQUIDITY"
<code>Amount</code>	<code>Amount</code>	Amount of <code>shortCurrency</code> necessary to BUY the specified amount of <code>longCurrency</code> , or amount of <code>shortCurrency</code> gained from a SELL of the specified amount of <code>longCurrency</code> . Already including fees.

NOTES The average exchange rate can be computed by dividing the returned amount of `shortCurrency` by the specified amount of `longCurrency`.

3.5 getTradedPriceVolume

PURPOSE

This method retrieves historical prices and traded volumes per time interval, for example to create charts.

INPUT The following parameters:

Parameter	Optional	Type	Description
instrument	N	string	The human-readable name of the instrument.
startDate	N	string	The beginning of the interval, in the format "YYYY-MM-DD hh:mm:ss".
endDate	N	string	The end of the interval, in the format "YYYY-MM-DD hh:mm:ss".
precision	Y	int	The output is grouped by this many digits of the date & time in format "YYYY-MM-DD hh:mm:ss". Meaningful values are: 4 : year 7 : month 10 : day 13 : hour 15 : 10-minutes 16 : minute Default is 10 (day).
HLOC	Y	int	When set to 1 (true), the method returns High/Low/Open/Close data. Default is 0 (false). See Notes.

OUTPUT The following attributes:

Parameter	Type	Description
errorCode	ErrorEnum	"NO_SUCH_INSTRUMENT" if this symbol does not exist, or "OK" if it does (Chapter 4).
priceVolumeList	HLOCPriceVolumeList	Map (associative array) of price & volume data (see below).

The HLOCPriceVolumeList is a map (associative array) of items of type HLOCPriceVolumeItem. The keys are strings containing the date and time of the interval (**precision** digits long). The HLOCPriceVolumeItem contains the following data:

Parameter	Type	Description
longVolume	int	The volume traded in this interval, specified in the instrument's longCurrency.

shortVolume	int	The volume traded in this interval, specified in the instrument's shortCurrency.
high	double	The highest actually traded price in this interval. Only present if HLOC is set to true.
low	double	The lowest actually traded price in this interval. Only present if HLOC is set to true.
open	double	The first actually traded price in this interval. Only present if HLOC is set to true.
close	double	The last actually traded price in this interval. Only present if HLOC is set to true. See Notes.

NOTES Calculating `shortVolume / longVolume` yields the average price for the interval.

Depending on the chosen parameters, this method may return a lot of data. Don't select HLOC if you do not need it.

For performance reasons, the `close` price per interval is simply set to the open price of the next interval. The last `close` price, however, is set to the last actually traded price before the specified `endDate`.

3.6 getStatistics

PURPOSE This method returns general performance statistics about the VirWoX exchange.

INPUT None.

OUTPUT The following attributes:

Parameter	Type	Description
registeredUsers	int	The number of registered users.
volumeTotal	string	The all-time volume (in shortCurrency) traded by VirWoX.
volume24hours	string	The total volume (in shortCurrency) traded in the last 24 hours.
volume30days	string	The total volume (in shortCurrency) traded in the last 30 days.

NOTES Currently, the only supported `shortCurrency` is SLL. Therefore, all volumes are SLL amounts.

The trading volumes returned by this method are compensated for trading activity by certain exchange system users. Therefore, this method may return volume figures slightly smaller than `getTradedPriceVolume`.

3.7 getTerminalList

PURPOSE This method returns a list of our in-world terminals.

INPUT None.

OUTPUT An array of items of type `Terminal`:

Parameter	Type	Description
atmID	int	An internal unique ID of the terminal.
Public	BoolEnum	'Y' if this terminal should be shown to the user, 'N' if not (e.g. if it is offline).
Busy	BoolEnum	'Y' if this terminal is busy, i.e. the last request was due to an interaction with an agent.
Region	string	The region name of the terminal's location.
X	int	The x coordinate of the terminal's location.
Y	int	The y coordinate of the terminal's location.
Z	int	The z coordinate of the terminal's location.
Language	string	The terminal's default language ⁷ .
lastRequest	string	Date and time of the last request we received from the terminal.
nextRequest	string	Date and time of the next request we expect to receive from the terminal.
Delta	int	Difference (in seconds) between the current time and <code>nextRequest</code> . If negative, the request is overdue for this many seconds, and the terminal probably offline.

⁷ An ISO 639-1 language code, optionally followed by a country code; e.g. en_US

4 Error Codes

ERRORENUM The following error codes are defined in the SOAP data type **ErrorEnum**:

Value	Meaning
OK	No error.
INVALID_USERNAME_OR_PASSWORD	The specified username and/or password is invalid ⁸ .
NO_TARGET_CUSTOMER	The recipient does not exist.
NO_SOURCE_ACCOUNT_FOR_THIS_CURRENCY	The sender has no account for this currency.
NO_TARGET_ACCOUNT_FOR_THIS_CURRENCY	The recipient has no account for this currency.
INVALID_AMOUNT_OR_PRICE	Invalid amount or price.
INSUFFICIENT_FUNDS	The account has not enough funds in the necessary currency for the requested operation.
NO_SUCH_INSTRUMENT	The requested instrument cannot be traded.
NO_SUCH_ORDER	The specified order does not exist, is not of the specified user, or has been filled or cancelled in the meantime.
INVALID_ORDER_TYPE	Invalid order type.
DATABASE_TIMEOUT	The request for a lock in the database has timed out. This is a temporary problem, and the operation should be retried.
NOT_UNIQUE	The username or SL-username is not unique.
ILLEGAL_PARAMETER	An illegal parameter has been sent to the server.
MANUAL_INTERVENTION_REQUIRED	The payout request could not be fulfilled instantly. A manual check is required.
ACCOUNT_DISABLED	The account has been disabled.
LIMIT_EXCEEDED	The deposit or withdrawal amount exceeds the current limit of the user.

⁸ If this error code is generated, the response is delayed for 3 seconds.

	The user should specify a smaller amount.
INSUFFICIENT_LIQUIDITY	There is not enough liquidity available for a market order and the specified amount. The user should specify a smaller amount.
PRICE_CHANGED	The estimated price of a market order has changed against the user's favor. The market order has not been placed. The user can repeat the request with the new estimate.
COULD_NOT_SEND_EMAIL	An email could not be sent.
PAYPAL_API_ERROR	An error in the PayPal API has occurred.
NETELLER_API_ERROR	An error in the NETELLER API has occurred.
PSC_API_ERROR	An error in the paysafecard API has occurred.

NOTES

Most error codes are not used in the Basic API, but are listed here for consistency and completeness.

5 Programming Examples

This chapter contains a few (small) examples on how to access the VirWoX API in a number of programming languages.

5.1 PHP5

SOAP The following is a minimalistic example showing how simple it is to retrieve the current best prices in PHP5 using the SOAP interface:

```
<?php
// open the SOAP client in WSDL mode:
$virwox = new SoapClient('http://api.virwox.com/api/basic.wsdl');

// retrieve the best prices for EUR/SLL and USD/SLL:
$result = $virwox->getBestPrices(array('EUR/SLL', 'USD/SLL'));

// output the result for demonstration:
print_r($result);
?>
```

This will produce an output similar to this:

```
Array
(
    [0] => stdClass Object
        (
            [symbol] => EUR/SLL
            [errorCode] => OK
            [bestBuyPrice] => 340.1
            [bestSellPrice] => 344
        )

    [1] => stdClass Object
        (
            [symbol] => USD/SLL
            [errorCode] => OK
            [bestBuyPrice] => 276.1
            [bestSellPrice] => 280
        )
)
```

JSON-RPC Now, the same example using JSON-RPC and curl:

```
<?php
// prepare request object
$request->method = 'getBestPrices';
$request->params = array('symbols' => array('EUR/SLL', 'USD/SLL'));
$request->id = 1;
$request_string = json_encode($request);

//set the curl parameters:
$ch = curl_init();
curl_setopt($ch, CURLOPT_URL, 'http://api.virwox.com/api/json.php');
curl_setopt($ch, CURLOPT_RETURNTRANSFER, 1);
```

```

curl_setopt($ch, CURLOPT_POST, 1);
curl_setopt($ch, CURLOPT_POSTFIELDS, $request_string);

//get response from server:
$response = curl_exec($ch);
curl_close($ch);

//parse response:
$result = json_decode($response);

// print debug output:
print "Request:\n$request_string\n";
print "\nResponse:\n";
print_r($result);
?>

```

This will produce an output similar to this:

```

Request:
{"method":"getBestPrices","params":{"symbols":["EUR/SLL","USD/SLL"]},"id":1}

Response:
stdClass Object
(
    [result] => Array
        (
            [0] => stdClass Object
                (
                    [symbol] => EUR/SLL
                    [errorCode] => OK
                    [bestBuyPrice] => 340.1
                    [bestSellPrice] => 344
                )

            [1] => stdClass Object
                (
                    [symbol] => USD/SLL
                    [errorCode] => OK
                    [bestBuyPrice] => 276.1
                    [bestSellPrice] => 280
                )
        )
    [error] => null
    [id] => 1
)

```

5.2 JavaScript

AJAX AND JSON

This is an example on how to asynchronously retrieve data from VirWoX using JavaScript's `XMLHttpRequest` object. For simplicity, we use the JSON interface so we can directly `eval` the result into a JavaScript object.

The following is a simple but complete HTML page⁹ that displays a table with the current best prices for EUR/SLL and USD/SLL. Pressing the “refresh prices” button will update the table.

```
<html>
<head>
<title>Current VirWoX exchange rates</title>

<script LANGUAGE=javascript>
// requires Mozilla, Opera, Safari or Internet Explorer >= 7:
var xmlhttp = new XMLHttpRequest();

// send request:
function getBestPrices() {
  var method = 'getBestPrices';
  var params = '{"symbols":["EUR/SLL","USD/SLL"]}';

  xmlhttp.open('POST', 'http://api.virwox.com/api/json.php', true);
  xmlhttp.onreadystatechange = displayPrices;
  xmlhttp.send({'method':"'+method+'","params":"+params+", "id":"1"}');
}

// handle response:
function displayPrices() {
  if (xmlhttp.readyState == 4 && xmlhttp.status == 200) {
    // alert(xmlhttp.responseText);
    // parse JSON response to a JavaScript object:
    var result = eval('(' + xmlhttp.responseText + ')').result;

    // modify output table:
    var p1 = document.getElementById('prices').rows[1].cells;
    var p2 = document.getElementById('prices').rows[2].cells;
    p1[0].innerHTML = result[0].symbol;
    p1[1].innerHTML = result[0].bestBuyPrice;
    p1[2].innerHTML = result[0].bestSellPrice;
    p2[0].innerHTML = result[1].symbol;
    p2[1].innerHTML = result[1].bestBuyPrice;
    p2[2].innerHTML = result[1].bestSellPrice;
  }
};
</script>
</head>

<body>
<input type="button" onclick="getBestPrices()" value="refresh prices"/>

<table id='prices' border='1'>
  <tr><th>Symbol</th><th>Bid</th><th>Ask</th></tr>
  <tr><td>-</td><td>-</td><td>-</td></tr>
  <tr><td>-</td><td>-</td><td>-</td></tr>
</table>
</body>
</html>
```

⁹ Available at <http://api.virwox.com/api/ajaxdemo.html>

5.3 LSL

ACCESSING VIRWOX DIRECTLY FROM SECOND LIFE INTERFACE SCRIPT

The following is an example on how to access the VirWoX server from the Linden Scripting Language (LSL), i.e. directly from an object in the virtual world "Second Life". We use the JSON interface as JSON can be efficiently converted to an LSL list.

An LSL script has only 16 KB of data available, including the byte-code of the script itself. Therefore, it is good practice to encapsulate functions in scripts of their own, which are attached to linked prims and accept commands via link messages. The following script is designed to be put into a linked prim. It accepts link messages with commands (below we implement only the GET_RATE command) and parameters, calls the corresponding VirWoX API method, and asynchronously returns a formatted response to the caller:

```
// Interface to VirWoX Basic API
// -----
//
// - waits for link message with currency pair passed as the string
//   parameter
// - sends VirWoX Basic API request to retrieve current price
// - sends average price back to sender of link message as a formatted
//   number (f.2)
//
// constants:
string SERVER = "http://api.virwox.com/api/json.php";
list HTTP_OPTS = [HTTP_METHOD, "POST",
                  HTTP_MIMETYPE, "application/x-www-form-urlencoded" ];

// commands:
integer GET_RATE = 1;      // get current rate

// we use the simple url-encoded API, simulating a form
string REQUEST_RATE      = "&method=getBestPrices&symbols[0]=";

// remove these separators in parsing the JSON response:
list JSON_SEPARATORS = [",", ":", "{", "}", "[", "]", "\""];

// global variables:
integer return_to;        // link number to return data to

default
{
    link_message(integer sender, integer cmd, string s, key k)
    {
        return_to = sender;    // remember where to send the answer to

        if (cmd == GET_RATE)
            llHTTPRequest(SERVER, HTTP_OPTS, "id=" + (string)cmd +
                          REQUEST_RATE + s);
    }

    // process response from server.
    // Parse returned JSON string into a flat list of strings
    http_response(key id, integer status, list meta, string response)
    {
        // parse JSON response into a flat list, removing all unnecessary
        // characters
        list l = llParseString2List(response, JSON_SEPARATORS, []);

        integer id = llList2Integer(l, -1);    // last element is always ID
    }
}
```

```

string json_error = llList2String(l, -3); // JSON error code

if (json_error == "null") // OK
{
    if (id == GET_RATE)
    {
        if (llList2String(l, 4) == "OK")
        {
            // calculate average rate in a way that eliminates these LSL
            // rounding errors:
            integer ratex100 = (integer)((llList2Float(l, 6) +
                llList2Float(l, 8)) * 50);
            string rate = (string)(ratex100/100) + "." +
                llGetSubString((string)ratex100,-2,-1);

            llMessageLinked(return_to, id, rate, NULL_KEY); // return
        }
        else // unsupported instrument or the like; return error
            llMessageLinked(return_to, 0, llList2String(l, 4), NULL_KEY);
    }
    else
        llMessageLinked(return_to, 0, "unknown command", NULL_KEY);
}
else // JSON error
    llMessageLinked(return_to, 0, json_error, NULL_KEY);
}
}

```

USING THE API

The following LSL code snippet shows how to call the method from another script:

```

integer GET_RATE = 1; // get current rate
integer API_PRIM = 2; // linked prim #2 has our API code

// this function sends a request to the API prim
// it returns nothing; a link_message will return the answer
// from the API prim
getCurrentPrice()
{
    llMessageLinked(API_PRIM, GET_RATE, "EUR/SLL", NULL_KEY);
}

...

default
{
    ...
    link_message(integer sender, integer cmd, string response, key k)
    {
        if (sender == API_PRIM) // answer for our request
            if (cmd == GET_RATE) // data received OK from GET_RATE
            {
                rate = (float)response;
                ... // do something with it
            }
    }
    ...
}

```

6 WSDL

This is the formal, machine-readable definition of the VirWoX Basic API in WSDL¹⁰:

```
<?xml version = '1.0' encoding = 'UTF-8' ?>
<definitions name = 'VirWoX'
  targetNamespace = 'http://virwox.com/VirWoX'
  xmlns:tns = 'http://virwox.com/VirWoX'
  xmlns:types = 'http://virwox.com/types/VirWoX'
  xmlns:soap = 'http://schemas.xmlsoap.org/wsdl/soap/'
  xmlns:xsd = 'http://www.w3.org/2001/XMLSchema.xsd'
  xmlns:soapenc = 'http://schemas.xmlsoap.org/soap/encoding/'
  xmlns:wsdl = 'http://schemas.xmlsoap.org/wsdl/'
  xmlns = 'http://schemas.xmlsoap.org/wsdl/'>
<types>
  <xsd:schema targetNamespace = 'http://virwox.com/types/VirWoX'>
    <xsd:simpleType name = 'Amount'>
      <xsd:restriction base = 'xsd:decimal'>
        <xsd:totalDigits value = '11' />
        <xsd:fractionDigits value = '2' />
      </xsd:restriction>
    </xsd:simpleType>
    <xsd:simpleType name = 'ErrorEnum'>
      <xsd:restriction base = 'xsd:string'>
        <xsd:enumeration value = 'OK' />
        <xsd:enumeration value = 'INVALID_USERNAME_OR_PASSWORD' />
        <xsd:enumeration value = 'NO_TARGET_CUSTOMER' />
        <xsd:enumeration value = 'NO_SOURCE_ACCOUNT_FOR_THIS_CURRENCY' />
        <xsd:enumeration value = 'NO_TARGET_ACCOUNT_FOR_THIS_CURRENCY' />
        <xsd:enumeration value = 'INVALID_AMOUNT_OR_PRICE' />
        <xsd:enumeration value = 'INSUFFICIENT_FUNDS' />
        <xsd:enumeration value = 'NO_SUCH_INSTRUMENT' />
        <xsd:enumeration value = 'NO_SUCH_ORDER' />
        <xsd:enumeration value = 'INVALID_ORDER_TYPE' />
        <xsd:enumeration value = 'DATABASE_TIMEOUT' />
        <xsd:enumeration value = 'NOT_UNIQUE' />
        <xsd:enumeration value = 'ILLEGAL_PARAMETER' />
        <xsd:enumeration value = 'MANUAL_INTERVENTION_REQUIRED' />
        <xsd:enumeration value = 'ACCOUNT_DISABLED' />
        <xsd:enumeration value = 'LIMIT_EXCEEDED' />
        <xsd:enumeration value = 'INSUFFICIENT_LIQUIDITY' />
        <xsd:enumeration value = 'PRICE_CHANGED' />
        <xsd:enumeration value = 'COULD_NOT_SEND_EMAIL' />
        <xsd:enumeration value = 'PAYPAL_API_ERROR' />
        <xsd:enumeration value = 'NETELLER_API_ERROR' />
        <xsd:enumeration value = 'PSC_API_ERROR' />
      </xsd:restriction>
    </xsd:simpleType>
    <xsd:simpleType name = 'BoolEnum'>
      <xsd:restriction base = 'xsd:string'>
        <xsd:enumeration value = 'N' />
        <xsd:enumeration value = 'Y' />
      </xsd:restriction>
    </xsd:simpleType>
    <xsd:complexType name = 'InstrumentList'>
      <xsd:complexContent>
```

¹⁰ <http://www.w3.org/TR/wsdl>

```

        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='types:Instrument[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='SymbolList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='xsd:string[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='BestPriceList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='types:BestPriceItem[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='BestPriceItem'>
    <xsd:sequence>
        <xsd:element name='errorCode' type='types:ErrorEnum' />
        <xsd:element name='symbol' type='xsd:string' />
        <xsd:element name='bestBuyPrice' type='xsd:double' />
        <xsd:element name='bestSellPrice' type='xsd:double' />
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name='Instrument'>
    <xsd:sequence>
        <xsd:element name='symbol' type='xsd:string' />
        <xsd:element name='longCurrency' type='xsd:string' />
        <xsd:element name='shortCurrency' type='xsd:string' />
        <xsd:element name='decimals' type='xsd:int' />
        <xsd:element name='commissionRate' type='xsd:double' />
        <xsd:element name='commissionRateMkt' type='xsd:double' />
        <xsd:element name='commissionConstMkt' type='xsd:double' />
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name='MarketDepthList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='types:MarketDepthItem[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='MarketDepthItem'>
    <xsd:complexContent>
        <xsd:extension base='types:BestPriceItem'>
            <xsd:sequence>
                <xsd:element name='buy' nillable='true'
                    type='PriceVolumeList' />
                <xsd:element name='sell' nillable='true'
                    type='PriceVolumeList' />
            </xsd:sequence>
        </xsd:extension>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='PriceVolumeList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>

```

```

        <attribute ref='soapenc:arrayType'
            wsdl:arrayType='types:PriceVolumeItem[]' />
    </restriction>
</xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='PriceVolumeItem'>
    <xsd:sequence>
        <xsd:element name='price' type='xsd:double' />
        <xsd:element name='volume' type='xsd:int' />
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name='HLOCPriceVolumeList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='types:HLOCPriceVolumeItem[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='HLOCPriceVolumeItem'>
    <xsd:sequence>
        <xsd:element name='longVolume' type='xsd:int' />
        <xsd:element name='shortVolume' type='xsd:int' />
        <xsd:element name='high' nillable='true' type='xsd:double' />
        <xsd:element name='low' nillable='true' type='xsd:double' />
        <xsd:element name='open' nillable='true' type='xsd:double' />
        <xsd:element name='close' nillable='true' type='xsd:double' />
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name='TerminalList'>
    <xsd:complexContent>
        <restriction base='soapenc:Array'>
            <attribute ref='soapenc:arrayType'
                wsdl:arrayType='types:Terminal[]' />
        </restriction>
    </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name='Terminal'>
    <xsd:sequence>
        <xsd:element name='atmID' type='xsd:int' />
        <xsd:element name='public' type='types:BoolEnum' />
        <xsd:element name='busy' type='types:BoolEnum' />
        <xsd:element name='region' type='xsd:string' />
        <xsd:element name='x' type='xsd:int' />
        <xsd:element name='y' type='xsd:int' />
        <xsd:element name='z' type='xsd:int' />
        <xsd:element name='language' nillable='true'
            type='xsd:string' />
        <xsd:element name='lastRequest' nillable='true'
            type='xsd:string' />
        <xsd:element name='nextRequest' nillable='true'
            type='xsd:string' />
        <xsd:element name='delta' type='xsd:int' />
    </xsd:sequence>
</xsd:complexType>
</xsd:schema>
</types>

<message name='getInstrumentsOut'>
    <part name='instruments' type='types:InstrumentList' />
</message>
<message name='getBestPricesIn'>
    <part name='instruments' type='types:SymbolList' />
</message>

```

```

<message name='getBestPricesOut'>
  <part name='result' type='types:BestPriceList' />
</message>
<message name='getMarketDepthIn'>
  <part name='instruments' type='types:SymbolList' />
  <part name='buyDepth' nillable='true' type='xsd:int' />
  <part name='sellDepth' nillable='true' type='xsd:int' />
</message>
<message name='getMarketDepthOut'>
  <part name='result' type='types:MarketDepthList' />
</message>
<message name='estimateMarketOrderIn'>
  <part name='orderType' type='types:OrderTypeEnum' />
  <part name='amount' type='xsd:int' />
  <part name='instrument' type='xsd:string' />
</message>
<message name='estimateMarketOrderOut'>
  <part name='errorCode' type='types:ErrorEnum' />
  <part name='amount' type='types:Amount' />
</message>
<message name='getTradedPriceVolumeIn'>
  <part name='instrument' type='xsd:string' />
  <part name='startDate' nillable='false' type='xsd:string' />
  <part name='endDate' nillable='false' type='xsd:string' />
  <part name='precision' nillable='true' type='xsd:int' />
  <part name='HLOC' nillable='true' type='xsd:int' />
</message>
<message name='getTradedPriceVolumeOut'>
  <part name='errorCode' type='types:ErrorEnum' />
  <part name='priceVolumeList' type='types:HLOCPriceVolumeList' />
</message>
<message name='getTerminalListOut'>
  <part name='terminals' nillable='true' type='types:TerminalList' />
</message>
<message name='getStatisticsOut'>
  <part name='registeredUsers' type='xsd:int' />
  <part name='volumeTotal' type='xsd:string' />
  <part name='volume24hours' type='xsd:string' />
  <part name='volume30days' type='xsd:string' />
</message>
<portType name='VirWoXPortType'>
  <operation name='getInstruments'>
    <output message='tns:getInstrumentsOut' />
  </operation>
  <operation name='getBestPrices'>
    <input message='tns:getBestPricesIn' />
    <output message='tns:getBestPricesOut' />
  </operation>
  <operation name='getMarketDepth'>
    <input message='tns:getMarketDepthIn' />
    <output message='tns:getMarketDepthOut' />
  </operation>
  <operation name='estimateMarketOrder'>
    <input message='tns:estimateMarketOrderIn' />
    <output message='tns:estimateMarketOrderOut' />
  </operation>
  <operation name='getTradedPriceVolume'>
    <input message='tns:getTradedPriceVolumeIn' />
    <output message='tns:getTradedPriceVolumeOut' />
  </operation>
  <operation name='getTerminalList'>
    <output message='tns:getTerminalListOut' />
  </operation>
  <operation name='getStatistics'>

```

```
<output message='tns:getStatisticsOut' />
</operation>
</portType>

<binding name='VirWoXBinding' type='tns:VirWoXPortType'>
  <soap:binding style='rpc'
    transport='http://schemas.xmlsoap.org/soap/http' />
  <operation name='getInstruments'>
    <soap:operation soapAction='getInstruments' />
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
  <operation name='getBestPrices'>
    <soap:operation soapAction='getBestPrices' />
    <input>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </input>
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
  <operation name='getMarketDepth'>
    <soap:operation soapAction='getMarketDepth' />
    <input>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </input>
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
  <operation name='estimateMarketOrder'>
    <soap:operation soapAction='estimateMarketOrder' />
    <input>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </input>
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
  <operation name='getTradedPriceVolume'>
    <soap:operation soapAction='getTradedPriceVolume' />
    <input>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </input>
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
  <operation name='getTerminalList'>
    <soap:operation soapAction='getTerminalList' />
    <output>
      <soap:body use='encoded' namespace='urn:types'
        encodingStyle='http://schemas.xmlsoap.org/soap/encoding' />
    </output>
  </operation>
</binding>
```

```
<operation name='getStatistics'>
  <soap:operation soapAction='getStatistics' />
  <output>
    <soap:body use='encoded' namespace='urn:types'
      encodingStyle='http://schemas.xmlsoap.org/soap/encoding/' />
  </output>
</operation>
</binding>

<service name='VirWoX'>
  <documentation>API documentation at
    http://api.virwox.com/api/documentation</documentation>
  <port name='VirWoXPortType' binding='tns:VirWoXBinding'>
    <soap:address location='http://api.virwox.com/api/soap.php' />
  </port>
</service>
</definitions>
```