



IBM Research GmbH

Säumerstrasse 4
CH - 8803 Rüschlikon
Switzerland

Subject: EcoGrid Task 4.4 Shared-Services – FBS Servlets documentation

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Authors: Florian Schmidt

1. Scope and Content

This document describes the software interface between the EcoGrid EU consortium Task 4.4 Shared Services data warehouse and the Feedback System (FBS) user interface. This interface is implemented by IBM in the FBS Servlets version 3.9, as currently available to and used in our partners' FBS web application implementation, version 3.9 and upward.

Due to security constraints, access to the service is typically restricted to localhost. Conceptually, the service is available from:

<http://portal.ecogridbornholm.dk/feedback/ecogrideu/sharedservices>

The service consists of several servlets, handling user authentication and providing various data retrievals. The following table lists the available servlets with their corresponding invocation parameters.

servlet	parameters
auth.php	username, password
change_password.php	username, old_password, new_password
live_data.php	username
analysis.php	username, mode, period, datePeriodFrom, dateBenchmarkTo, dateBenchmarkFrom, datePeriodFrom, referencePrice
monthly_virtual_bill.php	username, yearFrom, monthFrom, yearTo, monthTo

The next sections give more details on the HTTP GET requests and XML responses, along with some sample invocations.

2. Authentication Servlet (auth.php)

The authentication servlet distinguishes three different scenarios. In addition to a successful or failed authentication (unknown user or wrong password), a correct but expired password is recognized. In this case, the status value is 2, the user is not logged in. Hence the application-side HTTP session should not be considered as established. A password is expired if the user has never logged in before and hence has to change his or her initial password.

Parameters GET

name	type	interpretation
username	number	At the moment, the username is the installation number.
password	String	The user's password.

Response XML

node	visible	values	interpretation
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status	always	0,1,2	0: failed 1: success 2: expired
tariff	on success	0,1,2,3,4,7	0: unknown 1: statistical reference group 2: manual control group 3: IBM heat pump 4: IBM electric heating 7: Siemens electric heating
pricestream	on success	string	String describing the installation number's current pricestream.
ecohome_link	on success	url	Url to the portal the installation number is affiliated with.
server_time	always	dateTime	The server time in CET/CEST

Note: Oestkraft has directly provided the mapping from the tariff numbers to their description strings to Alcedo-Media.

Example: Successful login

Request:

<http://portal.ecogridbornholm.dk/feedback/ecogrideu/sharedservices/auth.php?username=3709&password=smartname>

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<authentication xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="ecogrid-shared-services.xsd">
  <user>
    <status>1</status>
    <tariff>3</tariff>
    <pricestream>Ecogrid real-time market price</pricestream>
    <ecohome_link>https://gwr1.ecogridbornholm.dk/ui/GWRMain.php#</ecohome_link>
    <server_time>2013-04-30T08:51:50</server_time>
  </user>
</authentication>
```

3. Change Password Servlet (change_password.php)

Given the current and a new password, this servlet changes the user's password in the user database. There are no restrictions on the length of the password and the characters used.

Parameters GET

name	type	interpretation
username	integer	At the moment, the username is the installation number.
old_password	string	The current password

new_password	string	The desired new password
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Response XML

node	values	interpretation
status	0,1	1 on success and 0 on any error
server_time	time string	The local time at the server.

Example: Change password with success

Request:

https://portal.ecogridbornholm.dk/feedback/ecogrideu/sharedservices/change_password.php?userame=3709&old_password=somepw&new_password=anotherpw

Response:

```
<password_change>
  <status>1</status>
  <server_time>2013-06-24 13:49:33</server_time>
</password_change>
```

4. Prices Servlet (live_data.php)

The live data servlet provides the current price and outlooks using the forecasts stored in the warehouse.

Parameters GET

name	type	interpretation
username	Integer	At the moment, the username is the installation number.

Response XML

node	values	interpretation
rt_price -> current	double	Current realtime price
rt_price -> min	double	Minimum realtime price during the last 24h.
rt_price -> max	double	Maximum realtime price during the last 24h.
price_trend->current_hour	0,1,2	Trend 1h ahead
price_trend->next_5_hours	0,1,2	Trend 5h ahead
price_trend->next_10_houts	0,1,2	Trend 10h ahead

The price trend node contains three different values for three different outlooks: 1 hour ahead, 5 hours ahead, and 10 hours ahead. Firstly, the servlet computes the current real time price as well as the three predicted prices. The predictions are computed as follows:

Price	Computation
1 hour ahead	Average of the available 5-min price predictions of the next 60 minutes.
5 hours ahead	Spot market price of the fifth full hour from now.
10 hours ahead	Spot market price of the tenth full hour from now.

Secondly, the servlet computes the trend value as follows: If the predicted price is 15% lower compared to the current price, the response is 0. If the predicted price is more than 15% higher than the current price, the response is 2. Otherwise it is 1. The threshold of 15% can be adjusted in the configuration file etc/sharedservices.conf.php.

Example: Get current electricity price and trend data

Request:

http://portal.ecogridbornholm.dk/feedback/ecogrideu/sharedservices/live_data.php?username=3709

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<live_data xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="ecogrid-shared-services.xsd">
  <time_sent>2013-04-30T09:34:08</time_sent>
  <rt_price>
    <current>
      <value>2.4774</value>
      <time>2013-04-30T09:35:00</time>
    </current>
    <min>
      <value>1.766</value>
      <time>2013-04-29T23:55:00</time>
    </min>
    <max>
      <value>2.8174</value>
      <time>2013-04-29T21:05:00</time>
    </max>
  </rt_price>
  <price_trend>
    <current_hour>
      <direction>1</direction>
    </current_hour>
    <next_5_hours>
      <direction>0</direction>
    </next_5_hours>
    <next_10_hours>
      <direction>2</direction>
    </next_10_hours>
  </price_trend>
```

</live_data>

5. Analysis Servlet (analysis.php)

The purpose of the analysis servlet is to report measurements over a given time interval according to a fixed time granularity. This granularity is called period and can be one of *day*, *week*, *month*, *quarter* or *year* as well as *min5*, *min10*, *min15* and *min20*. The three measurements available are *price*, *consumption* and *cost*. For benchmarking purposes the servlet can report additional measurements for a second time interval. Furthermore, if the parameter *reference_price* is set to 'true', the servlet uses the installation number's reference price to compute prices and costs. This does not have any effect when the mode is 'consumption'.

For a given start and end timestamp (parameters *datePeriodFrom*, *datePeriodEnd*), the servlet returns the measurements of all periods that lie between start and end timestamp or include one of them. However, only data between the two timestamps is considered. The structure of the reported measurements is sketched in the following picture:

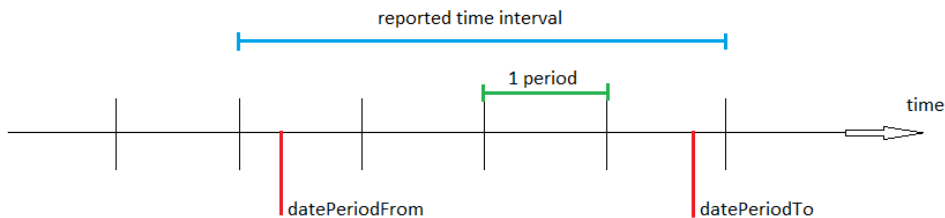


Figure 1: Four measurements are reported, one for each period

For the benchmark (parameters *dateBenchmarkFrom*, *dateBenchmarkTo*) the same principle applies.

Parameters GET

name	type	interpretation
username	integer	At the moment, the username is the installation number.
mode	price, cost, consumption	Indicates the mode
period	hour, day, week, month, quarter, year, min5, min10, min15, min20, min30	Granularity
referencePrice	true, false	If true, the reference price is used for the benchmark.
datePeriodFrom	timestamp (local time)	start section one
datePeriodTo	timestamp (local time)	end section one
dateBenchmarkFrom	timestamp (local time)	start section two
dateBenchmarkTo	timestamp (local time)	end section two

The measurements belonging to the normal time interval are located in the `<first_source></first_source>` element while those of the benchmark interval are located in `<second_source></second_source>`.

Each measurement contains a value and a timestamp that indicates the beginning of the corresponding period.

Response XML

node	values	interpretation
data_type -> mode_price data_type -> mode_consumption data_type -> mode_cost	none	Presence of exactly one the nodes indicates the mode.
data_type -> min5 data_type -> min10 ... data_type -> year	none	Indicates the period.
price (or consumption)	value & time node	The actual measurement for one period together with the time at which that period started.
min/max/average	double	The minimum/maximum/average measurement over all periods.
time_sent	dateTime	The server time in CET/CEST

Example: Analysis invocation comparing daily prices of Monday and Tuesday with daily prices from Wednesday to Friday

Request:

<http://localhost:1200/ecogrideu/sharedservices/analysis.php?username=3709&mode=price&referencePrice=false&period=day&datePeriodFrom=1366581600&datePeriodTo=1366754399&dateBenchmarkFrom=1366754400&dateBenchmarkTo=1367013599>

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<analysis xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="ecogrid-shared-services.xsd">
  <data_type>
    <mode_price />
    <day />
  </data_type>
  <first_source>
    <price>
      <value>2.0669</value>
      <time>2013-04-22T00:00:00</time>
    </price>
    <price>
      <value>2.114</value>
      <time>2013-04-23T00:00:00</time>
    </price>
    <min>
      <value>2.0669</value>
      <time>2013-04-22T00:00:00</time>
    </min>
  </first_source>
</analysis>
```

```

        </min>
        <max>
            <value>2.114</value>
            <time>2013-04-23T00:00:00</time>
        </max>
        <average>
            <value>2.0905</value>
            <time>not applicable</time>
        </average>
    </first_source>
    <second_source>
        <price>
            <value>1.9878</value>
            <time>2013-04-24T00:00:00</time>
        </price>
        <price>
            <value>2.108</value>
            <time>2013-04-25T00:00:00</time>
        </price>
        <price>
            <value>2.0299</value>
            <time>2013-04-26T00:00:00</time>
        </price>
        <min>
            <value>1.9878</value>
            <time>2013-04-24T00:00:00</time>
        </min>
        <max>
            <value>2.108</value>
            <time>2013-04-25T00:00:00</time>
        </max>
        <average>
            <value>2.0419</value>
            <time>not applicable</time>
        </average>
    </second_source>
    <time_sent>2013-04-30T11:49:28</time_sent>
</analysis>

```

6. Report Servlet (monthly_virtual_bill.php)

The monthly virtual bill servlet computes per-month bills that take into account all tax adders as well as all monthly base fees. For the purpose of comparing real time prices with fixed reference prices, two values are compute per month: The EcoGrid costs reflect the pricing according to the 5-minutes real time prices a household has subscribed to. The computation of the Reference cost is based on the quarterly fixed kWh prices that the DSOs provide. Adders and base fees are the same for both.

In addition, the consumption of every month is split into three price segments: low, average and high relative to the average price in each month. The deviation threshold to classify a price as low or high is set to 20% and can be adjusted in the configuration file etc/sharedservices.conf.php.

Parameters GET

The servlet computes a bill for all month between and including the tupels (yearFrom, monthFrom) and (yearTo, monthTo) .

name	type	interpretation
username	integer	At the moment, the username is the installation number.
yearFrom	integer	Year of first month
monthFrom	1-12	Number of first month
yearTo	integer	Year of last month
monthTo	1-12	Number of last month

Response XML

Every month node consists of:

node	values	interpretation
ecogrid_cost	double	See text above
Reference_cost	double	"
periods_with_average_consumption	double	"
periods_with_low_consumption	double	"
periods_with_high_consumption	double	"

Example: Report invocation listing bills from January 2013 to April 2013

Request:

https://portal.ecogridbornholm.dk/feedback/ecogrideu/sharedservices/monthly_virtual_bill.php?username=3709&yearFrom=2013&monthFrom=1&yearTo=2013&monthTo=4

Response:

```
<?xml version="1.0" encoding="UTF-8"?>
<virtual_bill>
  <month year="2013" month="1">
    <ecogrid_costs>3353.9452</ecogrid_costs>
    <reference_costs>3556.0359</reference_costs>
    <periods_with_average_consumption>731.558
    </periods_with_average_consumption>

    <periods_with_low_consumption>553.813</periods_with_low_consumption>

    <periods_with_high_consumption>326.113</periods_with_high_consumption>
  </month>
  <month year="2013" month="2">
    <ecogrid_costs>2916.5694</ecogrid_costs>
    <reference_costs>3077.1101</reference_costs>
    <periods_with_average_consumption>682.465
    </periods_with_average_consumption>

    <periods_with_low_consumption>384.605</periods_with_low_consumption>

    <periods_with_high_consumption>323.035</periods_with_high_consumption>
  </month>
  <month year="2013" month="3">
    <ecogrid_costs>3000.0000</ecogrid_costs>
    <reference_costs>3000.0000</reference_costs>
    <periods_with_average_consumption>682.465
    </periods_with_average_consumption>

    <periods_with_low_consumption>384.605</periods_with_low_consumption>

    <periods_with_high_consumption>323.035</periods_with_high_consumption>
  </month>
  <month year="2013" month="4">
    <ecogrid_costs>3000.0000</ecogrid_costs>
    <reference_costs>3000.0000</reference_costs>
    <periods_with_average_consumption>682.465
    </periods_with_average_consumption>

    <periods_with_low_consumption>384.605</periods_with_low_consumption>

    <periods_with_high_consumption>323.035</periods_with_high_consumption>
  </month>
</virtual_bill>
```

```
</month>
<month year="2013" month="3">
  <ecogrid_costs>2506.8468</ecogrid_costs>
  <reference_costs>2660.9317</reference_costs>
  <periods_with_average_consumption>592.329
  </periods_with_average_consumption>

  <periods_with_low_consumption>355.199</periods_with_low_consumption>

  <periods_with_high_consumption>249.163</periods_with_high_consumption>
</month>
<month year="2013" month="4">
  <ecogrid_costs>1429.0519</ecogrid_costs>
  <reference_costs>1482.9896</reference_costs>
  <periods_with_average_consumption>304.382
  </periods_with_average_consumption>

  <periods_with_low_consumption>228.823</periods_with_low_consumption>

  <periods_with_high_consumption>133.005</periods_with_high_consumption>
</month>
  <time_sent>2013-04-30T12:46:20</time_sent>
</virtual_bill>
```