Firebird and REST (PDF)

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Today, you often need to handle REST requests. If you haven't come across this yet:

"Representational state transfer (REST) is a software architectural style that was created to guide the design and development of the architecture for the World Wide Web. REST defines a set of constraints for how the architecture of an Internet-scale distributed hypermedia system, such as the Web, should behave. The REST architectural style emphasizes the scalability of interactions between components, uniform interfaces, independent deployment of components, and the creation of a layered architecture to facilitate caching components to reduce user-perceived latency, enforce security, and encapsulate legacy systems."

IBEBlock can handle REST requests and the data received, just by using functions provided by IBEScript. The following example illustrates that any REST API can be used based on IBExpert scripting without any real development knowledge.

The following is an example of how to use a REST API to get the exact GPS location of, for example, train stations in Germany.

Example 1

- Create an IBEBlock script that monitors a table somewhere in the database using ibec_waitforevent.
- When a table gets a new entry (for example a city name for the train station), it should stop waiting because the event is posted by a trigger, gets the data from the REST API, puts the results into the database in native format, the trigger will then convert the native format to a readable text format or individual records and stores all this in the database.

For this example, I am using https://data.deutschebahn.com/dataset/api-fahrplan.html and will use the free version of their REST API, for sample locations: https://developer.deutschebahn.com/store/apis/info?name=Fahrplan-Free&version=v1&provider=DBOpenData#/

This is a RESTful webservice to request a railway journey - free plan with restricted access (max. 10 requests per minute). However, you can register to use a less restricted version which requires an access token.

As a first step, you can use an already existing database and extend it with the following, or create your own sample from scratch:

1. Create a sample table which contains data and which we will monitor:

```
CREATE TABLE PLZ (
    PLZ  VARCHAR(255) NOT NULL,
    ORT  VARCHAR(255)
);
```

2. Create a table trigger to post an event so that data is inserted, and set the necessary context variables to pass to the user session:

```
CREATE OR ALTER TRIGGER PLZ_AI0 FOR PLZ
ACTIVE AFTER INSERT POSITION 0
AS
begin
  RDB$SET_CONTEXT('USER_SESSION', 'LAST_ORT', new.ORT);
  RDB$SET_CONTEXT('USER_SESSION', 'LAST_PLZ', new.PLZ);
 POST_EVENT 'new_ort';
END
```

3. Create additional tables to store raw data received from the REST API, and to store single records parsed from the REST API request:

```
CREATE TABLE DEUTSCHEBAHN (
    ID    INTEGER GENERATED BY DEFAULT AS IDENTITY,
    JSON  BLOB SUB_TYPE 1 SEGMENT SIZE 80,
    PLZ   VARCHAR(255)
);

CREATE TABLE DEUTSCHEBAHN_GPS (
    ID    VARCHAR(255),
    NAME  VARCHAR(255),
    LON   FLOAT,
    LAT   FLOAT
);
```

Now create an IBEBlock script to handle the job: If you want to connect to your database and start the script in the current connection, you can use ibec_GetDefaultConnection(). Alternatively use something like the following, adjusting the database path and authentication data:

```
ibec_CreateConnection(__ctFirebird,'DBName="localhost:c:\DB\REST.FDB";
                      ClientLib=fbclient.dll;
                      user=SYSDBA; password=masterkey; names=UTF8;
    sqldialect=3');
```

The next step should be to wait for a posted event:

```
Res = ibec_WaitForEvent(FBSrc, 'new_ort', 0);
```

If an event is received, fetch the data from the context variables, and execute the REST call to the REST API:

```
if (Res is not null) then begin
      ort = RDB$GET_CONTEXT('USER_SESSION', 'LAST_ORT');
      plz = RDB$GET_CONTEXT('USER_SESSION', 'LAST_PLZ');

      url   = 'URL=https://api.deutschebahn.com/freeplan/v1/location/' ||
```

```
ort;
```

Now execute the function to get data from the REST API, and, if successful, insert into a table as raw data:

```
      ibec_http_Get(:sess);

      scode = ibec_http_StatusCode(:sess);
      sdesc = ibec_http_Data(:sess);
      if (scode = 200) then begin
        INSERT INTO DEUTSCHEBAHN (PLZ, JSON) VALUES (:plz, :sdesc);
```

It will always return an array of data, but not exactly as standard JSON, so that needs to be modified prior to parsing, using our JSON functions:

```
      sdesc = '{"Res" : {   "Items" :' + sdesc + '}}';
```

Parsing is then done by also using our JSON functions:

```
JsonRoot = ibec_json_Parse(sdesc);

      try
        ArrayNode = @Json.SelectNode(JsonRoot, 'res\items',
@Json.SEARCH_IGNORE_CASE); -- case insensitive search
        begin
       iCount = ibec_json_ChildCount(ArrayNode);
       for i = 0 to (iCount - 1) do
       begin

         ChildNode = ibec_json_SelectNode(ArrayNode, i,
__jsonSearchByIndex);
         NType = ibec_json_NodeType(ChildNode);
         if (NType = __jsonObject) then begin

           N = ibec_json_SelectNode(ChildNode, 'name', 0);
           vName = ibec_json_GetNodeValue(N, TRUE);
           id = ibec_json_SelectNode(ChildNode, 'id', 0);
           vID = ibec_json_GetNodeValue(id, TRUE);
           lon = ibec_json_SelectNode(ChildNode, 'lon', 0);
           vLon = ibec_json_GetNodeValue(lon, TRUE);
           lat = ibec_json_SelectNode(ChildNode, 'lat', 0);
           vLat = ibec_json_GetNodeValue(lat, TRUE);

           try
             INSERT INTO DEUTSCHEBAHN_GPS (id, name, lat, lon) VALUES (:vID,
:vName, :vLat, :vLon);
           except
           end;
```

At the end, don’t forget to free objects and close the session, as well as close the database

connection:

```
      finally
        ibec_json_Free(JsonRoot);
      end

      ibec_http_CloseSession(:sess);
    end
  end;
finally
    ibec_CloseConnection(FBSrc);
  end;
```

So, in this context, the complete script will look as follows when ready to execute:

```
execute ibeblock
  as
  begin
    try
      FBSrc  = ibec_GetDefaultConnection();
     /*
ibec_CreateConnection(__ctFirebird,'DBName="localhost:c:\DB\REST.FDB";
                           ClientLib=fbclient.dll;
                           user=SYSDBA; password=masterkey; names=UTF8;
sqldialect=3'); */

      Res = ibec_WaitForEvent(FBSrc, 'new_ort', 0);
      if (Res is not null) then begin
        ort = RDB$GET_CONTEXT('USER_SESSION', 'LAST_ORT');

        plz = RDB$GET_CONTEXT('USER_SESSION', 'LAST_PLZ');


        url   = 'URL=https://api.deutschebahn.com/freeplan/v1/location/' ||
ort;
        sess  = ibec_http_OpenSession(:url);

        ibec_http_Get(:sess);

        scode = ibec_http_StatusCode(:sess);
        sdesc = ibec_http_Data(:sess);
        if (scode = 200) then begin
          INSERT INTO DEUTSCHEBAHN (PLZ, JSON) VALUES (:plz, :sdesc);

          sdesc = '{"Res" : {   "Items" :' + sdesc + '}}';
          JsonRoot = ibec_json_Parse(sdesc);
          try
            ArrayNode = @Json.SelectNode(JsonRoot, 'res\items',
@Json.SEARCH_IGNORE_CASE); -- case insensitive search
```

```
            iCount = ibec_json_ChildCount(ArrayNode);
            for i = 0 to (iCount - 1) do
            begin
              ChildNode = ibec_json_SelectNode(ArrayNode, i,
__jsonSearchByIndex);
              NType = ibec_json_NodeType(ChildNode);
              if (NType = __jsonObject) then begin
                N = ibec_json_SelectNode(ChildNode, 'name', 0);
                vName = ibec_json_GetNodeValue(N, TRUE);
                id = ibec_json_SelectNode(ChildNode, 'id', 0);
                vID = ibec_json_GetNodeValue(id, TRUE);
                lon = ibec_json_SelectNode(ChildNode, 'lon', 0);
                vLon = ibec_json_GetNodeValue(lon, TRUE);
                lat = ibec_json_SelectNode(ChildNode, 'lat', 0);
                vLat = ibec_json_GetNodeValue(lat, TRUE);
                try
                  INSERT INTO DEUTSCHEBAHN_GPS (id, name, lat, lon) VALUES
(:vID, :vName, :vLat, :vLon);
                except
                end;
              end;
            end;
          finally
            ibec_json_Free(JsonRoot);
          end
        end;
        ibec_http_CloseSession(:sess);
      end

    finally
      commit;
      ibec_CloseConnection(FBSrc);
    end;
  end
```

To test the example posted above, you can insert some data in the PLZ table, or alternatively execute a query to insert a record:

```
INSERT INTO PLZ (PLZ, ORT) VALUES ('01067', 'Dresden');
```

The previous example shows you how to use Firebird events, and it can be modified to traverse existing records in the PLZ table, returning data and inserting it into the database. So instead of using an event to inform us to trigger data retrieval, we can use a loop, in this case for 30 rows in our table:

```
execute IBEBlock
as
begin
  try
    Stmt = 'select plz, ort from plz rows 30';
    for execute statement :Stmt into :plz, :ort do
    begin
```

```
      ibec_Progress('data ' + plz + ' - ' + ort);

      url   = 'URL=https://api.deutschebahn.com/freeplan/v1/location/' ||
ort;
        sess  = ibec_http_OpenSession(:url);

        ibec_http_Get(:sess);

        scode = ibec_http_StatusCode(:sess);
        sdesc = ibec_http_Data(:sess);
        if (scode = 200) then begin
          INSERT INTO DEUTSCHEBAHN (PLZ, JSON) VALUES (:plz, :sdesc);

          sdesc = '{"Res" : {   "Items" :' + sdesc + '}}';
          JsonRoot = ibec_json_Parse(sdesc);
          try
            ArrayNode = @Json.SelectNode(JsonRoot, 'res\items',
@Json.SEARCH_IGNORE_CASE); -- case insensitive search

            iCount = ibec_json_ChildCount(ArrayNode);
            for i = 0 to (iCount - 1) do
            begin
              ChildNode = ibec_json_SelectNode(ArrayNode, i,
__jsonSearchByIndex);
              NType = ibec_json_NodeType(ChildNode);
              if (NType = __jsonObject) then begin
                N = ibec_json_SelectNode(ChildNode, 'name', 0);
                vName = ibec_json_GetNodeValue(N, TRUE);
                id = ibec_json_SelectNode(ChildNode, 'id', 0);
                vID = ibec_json_GetNodeValue(id, TRUE);
                lon = ibec_json_SelectNode(ChildNode, 'lon', 0);
                vLon = ibec_json_GetNodeValue(lon, TRUE);
                lat = ibec_json_SelectNode(ChildNode, 'lat', 0);
                vLat = ibec_json_GetNodeValue(lat, TRUE);
                try
                  INSERT INTO DEUTSCHEBAHN_GPS (id, name, lat, lon) VALUES
(:vID, :vName, :vLat, :vLon);
                except
                end;
              end;
            end;
          finally
            ibec_json_Free(JsonRoot);
          end
        end;
        ibec_http_CloseSession(:sess);
      end

  finally
    commit;
```

```
  end;
end
```

If you would like some more simple examples, there are some Fake Online REST API for Testing and Prototyping available here http://www.dummy.restapiexample.com/, so you can play with those like:

Example 2

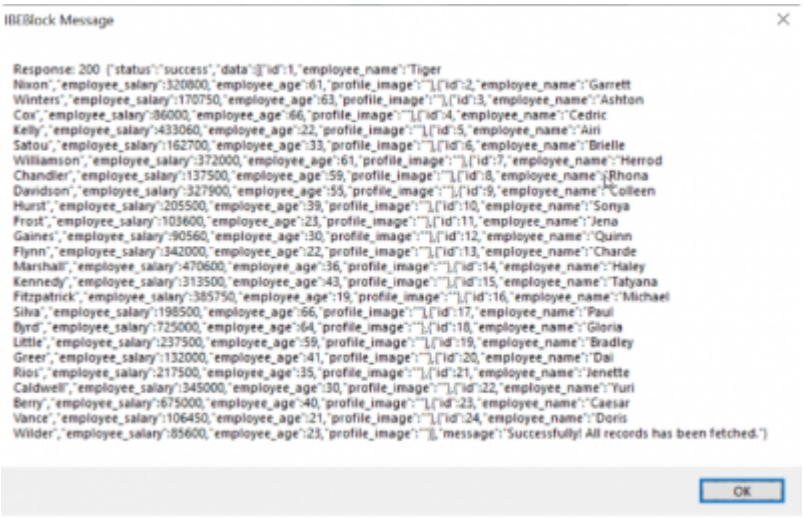
```
execute IBEBlock
as
begin
  url   = 'URL=http://dummy.restapiexample.com/api/v1/employees';
  sess  = ibec_http_OpenSession(:url);

  ibec_http_Get(:sess);
  scode = ibec_http_StatusCode(:sess);
  sdesc = ibec_http_Data(:sess);
  if (scode = 200) then
    ibec_ShowMessage('Response: '||:scode||'
'||ibec_UTF8ToAnsiString(:sdesc));
  else if (scode = 429) then
    ibec_ShowMessage('Too many requests');

  ibec_http_CloseSession(:sess);

end
```

This will return the following:



Or execute similar for a single record:

```
execute IBEBlock
as
begin
  url   = 'URL=http://dummy.restapiexample.com/api/v1/employee/1';
  sess  = ibec_http_OpenSession(:url);
```

```
  ibec_http_Get(:sess);

  scode = ibec_http_StatusCode(:sess);
  sdesc = ibec_http_Data(:sess);
  if (scode = 200) then
    ibec_ShowMessage('Response: '||:scode||'
'||ibec_UTF8ToAnsiString(:sdesc));
  else if (scode = 429) then
    ibec_ShowMessage('Too many requests');
  ibec_http_CloseSession(:sess);

end
```

will return the employee with id=1, for example:

Please note that this REST testing service can be under a heavy load, and if the status code is 429 there will be an error message saying “Too many requests”.

This is a minimal working example that can be extended further, with some ideas posted in the more complex examples above. We have shown that any REST API can be used based on IBExpert scripting, without any in-depth knowledge in development and the results are simply accessible in the database.