Document title

EURONEXT FILES SERVICES

Document type or subject

User Guide

Version number

1.2

Date

26 May 2017

Number of pages

23

Author

Euronext

PREFACE

PURPOSE

Euronext File Services is a Server providing files necessary for Euronext's customers that have either an EMDDA (market data), SPA (Service Provider) or TPA (Trading Platform) agreement to get access to the core trading chain of Euronext. This document provides general technical information about Euronext's File Services.

This document intends to provide general technical information about Euronext File Services.

TARGET AUDIENCE

The primary audience of this document is Developers, Exchange Connectivity Managers, Trading Support Teams and anybody involved in the setup and the configuration of Optiq MDG solution in End User Acceptance (EUA) and Production environments.

ASSOCIATED DOCUMENTS

The following lists the associated documents, which either should be read in conjunction with this document or which provide other relevant information for the user:

Euronext Cash and Derivatives Markets - Optiq MDG Client Specifications - v1.4.0

CONTACTS

For any questions about this document or technical support please contact the Optiq Support Desk:

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WHAT'S NEW?

The following lists only the most recent modification made to this revision/version. For the Document History table, see the Appendix.

VERSION NO.	DATE	AUTHOR	CHANGE DESCRIPTION
1.0	18 April 2017	Euronext	Initial version
1.1	26 May 2017	Euronext	Modification of Sections 3.4 & 3.5 : security and configuration. Additional information on Curl version in section 5.1.
1.2	14 November 2017	Euronext	Modification of Sections:3.4.3 Security SSL configuration and 4 Current Folders Structure

CONTENTS

1. OVERVIEW

The Euronext File Services is designed to centralize and provide access to configuration and data files for customers via SFTI network and/or Internet. This new critical service is based on a resilient and secured infrastructure.

Customers covered by this Euronext File Services are companies who have signed one of the following agreements:

■ Euronext Market Data Distribution Agreement (EMDDA)

■ Service Provider Agreement (SPA)

■ Trading Platform Agreement (TPA)

Euronext plans to leverage on the implementation of the European File Services going forward. The service will be used in the near future to host various files, generic or customized per member, thereby becoming the hub for any file transfer between Euronext and its customers.

2. WHY CONNECT TO THE EURONEXT EFS SERVICE?

Euronext EFS Services will host key configuration and data files that are to be used for OPTIQ MDG migration.

The following files will be available per environment (v-EUA, p-EUA and Production):

- TimetableFile
- CashTickSizeReferentialFile
- SBETemplate

And per Environment/Optiq Segment:

- OpenInterestFile
- PrevDayCapAndVolTradeFile
- FullTradeInformationFile
- CashStandingDataFile
- DerivativesStandingDataFile
- RepoSettlementPriceFile

3. ACCESS TO EURONEXT FILE SERVICES USER INTERFACE

3.1 GENERAL PROCEDURE

In order to connect to the EFS, customers need to submit a request for a user ID through the Euronext Member Connectivity Administrator (MCA) web portal for each environment they want to access, i. e. p-EUA and Production.

The user ID for each environment is emailed directly to the customer. With this id, the customer will be asked to connect once to the Euronext File Services to reset their password. Once this is complete, the user ID and the password can be used to login to the Service via a GUI (browser) or a RESTful API.

Requests for p-EUA access will be processed under 2 working days. Customers can start placing their requests to access Production EFS. The requests will be processed at the end of April.

During the first weeks after the launch of EFS in p-EUA and until the 6 of June, customers can use a generic user ID to access the Service. The user ID and password are available on the Home page of each customer's MCA secured section of the Euronext web portal.

3.2 DETAILED PROCEDURE

3.2.1 Pre-requisite: company agreements

As a pre-requisite, customers are required to have a company agreement signed with Euronext (EDDA, SPA or TPA).

3.2.2 Accessing the EFS User Interface

To access the EFS User Interface in both p-EUA and Production, the customers' Member Connectivity Administrator (MCA) needs to connect to the Euronext web portal and fills the EFS form:
https://connect2.euronext.com/en/form/efs-login-creation.
Only contacts registered as MCAs are allowed to access and fill the form. For more information about MCAs and their registration, please contact : cas@euronext.com.

MCA can order two types of accesses:
- For a physical person : first name, last name, email address and phone number are required
- For a software : application name, hostname must be provided

3.2.2.1 Confirmation of initial request for EFS

Each subscriber will receive, in less than 48h following the initial request, an individual EFS subscriber confirmation email (see below). Follow the link and the steps provided in the email to activate the account and get access to the EFS.

Euronext File Services new access

24-05-2017

Dear Customer,

Thank you for subscribing to an Euronext data product.

To gain access to the Euronext data that you have subscribed to, please set up your credentials
and/or email distribution preferences on the Euronext File Services.

To log in go to [INTERNET] https://efs-eua.euronext.com or [SFTI] https://efs-eua.sfti.euronext.com/ and enter the following information:

* Username: XXXXX
* To obtain your password, please use the "Forgot Password?" functionality available on the Euronext Files Services

If you need any assistance, please contact us at ctsg@euronext.com or cas@euronext.com

We appreciate your business.
Sincerely,
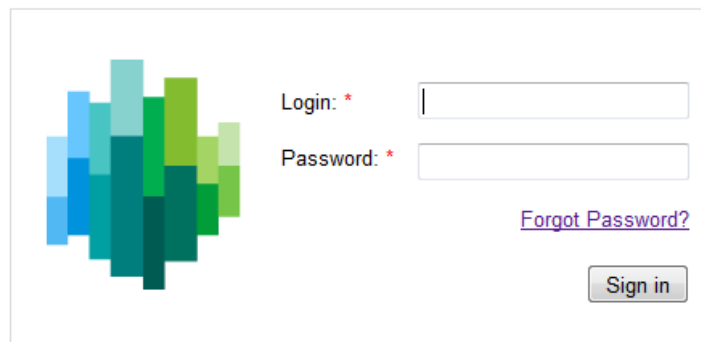
European Market Services **Euronext**

3.2.2.2   Logging In via the user interface

To log in to the Euronext File Services application, do the following:

1. Start your web browser
2. Enter the appropriate test or production URL address

The Euronext File Services Login box is displayed:

3. Type your Euronext File Services username and password as provided by the Customer Access Service (CAS) team and click on the Login button.

4. You are now logged on to the Euronext File Services home page.

Please note:
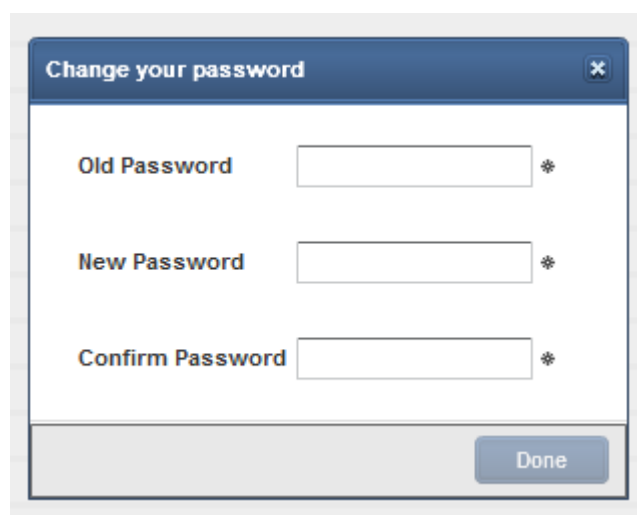
- If you have lost your password, you can use the "Forgot Password" link or contact cas@euronext.com.

- Subscribers must pay attention to the number of failed logons. After five (5) failed logon attempts (for incorrect username and/or password), their account will be locked. Participants need to contact the CAS team to reset their credentials.

3.2.2.3   Logging Out

To log out from the Euronext File Services User Interface, click Log Out (Sign-out) at the top right of the title bar, or simply close your browser.

3.2.2.4   Changing Your Password

To change your password, enter the old password, the new password and then confirm the new password. Click 'done'.

Passwords must be a minimum of eight (8) characters and contain the four character types listed below:
- At least 1 upper case character – A-Z
- At least 1 lower case character – a-z
- At least 1 westernised Arabic numeral – 0-9
- At least 1 special (non-alphanumeric) character [@#$%^&-+=_{}]

Please note :
- When logging in for the first time, you need to change your password.
- Enter your user ID, then click on "Forgot Password" and follow the directions. You will be asked to enter your username, your email and a verification field to confirm you are not a robot.

You can change your password at any time by clicking on "Change Password" at the top left of the window.
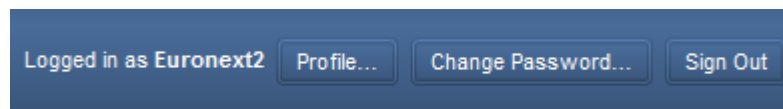
3.3   SUPPORTED BROWSERS

The Euronext File Service User Interface is compatible with the following browsers with Adobe Flash Player installed (at least Flash Player version 13):
- Google Chrome
- Safari
- Internet Explorer 11

3.4   PROTOCOL AND SECURITY

3.4.1   HTTPS

The EFS protocol is: **HTTPS - Hypertext Transfer Protocol Secure**

The HTTPS protocol can be used manually through a User Interface such as an Internet browser. Automatic transfer of files are also possible using the EFS API with a RESTful API client such as the Curl command line tool. Details about these methods to download files can be found in section 5.

3.4.2   CA Certificate

Customers must ensure their Entrust CA Certificate is up-to-date.

To prevent any connectivity issue linked to an outdated root certificate, customers must download the latest version of the CA Certificate. Otherwise an error message such as " curl: (60) Peer certificate cannot be authenticated with known CA certificates " will appear during the connection phase.

3.4.3 SSL configuration

The supported TLS/SSL protocols to secure the connectivity are

- TLSv1.1
- TLSv1.2 (Recommended)

The SSL Cipher Suite encryption options are :

- Must use:
    o RSA Cipher Suites,
    o AES Cipher Suites,
    o SHA1 hashing Cipher suites.
- Not allowed:
    o Null Ciphers,
    o Export grade ciphers,
    o Anonymous Ciphers (ADH),
    o 3DES,
    o MD5/RC4 hashing-based Ciphers.

3.5 CONFIGURATION

The following table provides the links to connect to Euronext File Services User Interface in the EUA and Productions environments.

	EUA (Test Environment)	Production	Disaster Recovery
Internet access	https://efs-eua.euronext.com/	https://efs.euronext.com/	https://efs-dr.euronext.com/
SFTI access	https://efs-eua.sfti.euronext.com/	https://efs.sfti.euronext.com/	https://efs-dr.sfti.euronext.com/

Please note:

To connect to EFS, the certificate needs the URL name. Connection to EFS must be done using the URL name.

- On Internet, URL are provided and can be resolved by using the public DNS service.

- On SFTI, if customers have access to Internet public DNS services, then the name can be resolved the same way. However if customers' servers are not connected to Internet, then customers have two options:

    o Add the following mapping in the local DNS
    o Add the following mapping in the local host file of the server

> 212.197.223.241   efs-eua.sfti.euronext.com

> 212.197.195.1   efs.sfti.euronext.com

> 212.197.225.1   efs-dr.sfti.euronext.com

Here is the command to use to activate the session using curl :

> curl https://efs-eua.sfti.euronext.com:443

4. CURRENT FOLDERS STRUCTURE

For all details on folder structure and naming convention please refer to the last Optiq file specification available here:

https://www.euronext.com/fr/optiq/documentation?quicktabs_188=1#quicktabs-188

Today target for Optiq Step2 version of the document is version 2.0.0 (available on the following direct link):

https://www.euronext.com/sites/www.euronext.com/files/euronext_cash_and_derivatives_markets_-_optiq_files_specifications_-_v2.0.0.pdf

5. ACCESS TO EURONEXT FILE SERVICES USING RESTFUL API

5.1 INTRODUCTION

Euronext provides a RESTful API to help customers develop applications to connect to EFS Services regardless of the development language used (see appendix for more information).

The following sections describe how to connect to EFS, check for the availability of files and download them using the RESTful API. Equivalent commands and examples in Curl are also available. Curl is a command-line tool that uses URL syntax with a MIT/X derivative license to transfer data. More information is available at https://curl.haxx.se/).

Please note:

Euronext recommends to use **Curl version 7.29 (Feb 2013) or later.**

Features

There are three different ways to interact with EFS Services:

- Check if a file or folder exists
- Browse the content of the folder
- Download a file

Access

The RESTful API is accessible through Internet and SFTI. The selection of the EFS Services to access can be done in the *Request Headers* section by replacing the URL with the correct one.

For example:

- Internet
  ```
  GET https://efs-eua.euronext.com/api/files/OptiqMDG/v-EUA/Current HTTP/1.1
  ```
- SFTI
  ```
  GET    https://  efs-eua.sfti.euronext.com:443/api/files/OptiqMDG/v-EUA/Current
  HTTP/1.1
  ```

5.2 STEPS FOR ACCESSING EFS

Pre-required step :

1) Authentication (step 1)

Possible scenarios and steps to follow:

1) File name already known but never downloaded => Check if the file exists (step 2) and download it directly (step 4)
2) File name already known and already downloaded at least once => Download the file directly with If-Modified-Since condition (step 4)
3) Unknown file name => Browse the content (step 3) and download the file (step 4)

5.2.1   Step 1 - Authentication

Request Header

All API requests require authentication via a session cookie and an authorization token.

```
POST https://efs-eua.euronext.com/api/authenticate HTTP/1.1

Host: efs-eua.euronext.com

Content-type: application/json

Accept: application/json
```

Request Body

```
{

   "username": "demo",

   "password": "d3m0"

}
```

Here the equivalent command using Curl:

Command

```
curl -c cookies.txt -X POST --data '{"username":"demo","password":"d3m0"}'
-H "Accept: application/json" -H "Content-Type: application/json"
https://efs-eua.euronext.com/api/authenticate -v
```

1) If authentication information is invalid or omitted, the status code 401 will be returned:

   Response Header

```
HTTP/1.1 401 Unauthorized

Host: efs-eua.euronext.com
```

2) If authentication information is valid, an access token and its validity in minutes will be returned with status code 200:

Response Header

```
HTTP/1.1 200 OK

Host: efs-eua.euronext.com

Content-Type: application/json

Content-Length: <variable content length>

Set-Cookie:
JSESSIONID=F1C6710ADE3DE6026F93237B426575F4;path=/;HttpOnly;ROUTEID=route_1
```

Response Body

```
{

  "access_token": "XJbJ3tF9x5EBVJPYzyUFaz6Ahbw7raYRIBV_WxFvgmsG",

  "validity": "5"

}
```

5.2.2 Step 2 - Check if resource exists

To prevent unnecessary download, customers have the possibility to check if a file exists before attempting to download it.

Request Header

All API requests require to transport the session cookie and the authorization token.

```
HEAD https://efs-eua.euronext.com/api/files/folder/file.extension HTTP/1.1

Host: efs-eua.euronext.com

content-type: application/x-www-form-urlencoded

Authorization: Bearer your_access_token

Cookie:
JSESSIONID=F1C6710ADE3DE6026F93237B426575F4;path=/;HttpOnly;ROUTEID=route_1
```

Here the equivalent command using Curl:

Command

```
curl -b cookies.txt -H "Authorization: Bearer your_access_token" -X HEAD
https://efs-eua.euronext.com/api/files/folder/file.extension
```

1) If the resource doesn't exist or if the session has expired, the status code **404** will be returned:

Response Header

```
HTTP/1.1 404 Not Found

Host: efs-eua.euronext.com
```

2) If the resource exists, the status code 200 will be returned:

Response Header

```
HTTP/1.1 200 OK

Host: efs-eua.euronext.com
```

5.2.3   Step 3 - Browse the content of a folder

Request Header

All API requests require to transport the session cookie and the authorization token.

```
GET https://efs-eua.euronext.com/api/files/folder HTTP/1.1

Host: efs-eua.euronext.com

content-type: application/x-www-form-urlencoded

Authorization: Bearer your_auth_token

Cookie:
JSESSIONID=F1C6710ADE3DE6026F93237B426575F4;path=/;HttpOnly;ROUTEID=route_1
```

Here the equivalent command using Curl:

Command

```
curl -b cookies.txt -H "Authorization: Bearer your_auth_token"

-X GET https://efs-eua.euronext.com/api/files/folder
```

1) If the resource doesn't exist or if the session has expired, the status code 404 will be returned:

   Response Header

```
HTTP/1.1 404 Not Found
Host: efs-eua.euronext.com
```

2) If the resource exists, the folder content will be returned with status code 200:

   Response Header

```
HTTP/1.1 200 OK
Host: efs-eua.euronext.com
Accept-Ranges: bytes
Content-Type: application/json;charset=encoding_type
Cache-control: no-cache
Content-Length: number_of_bytes_in_response
Last-Modified: last_modified_date
```

   Response Body Example

```
{
  "folder": {
      "name": "p-EUA",
      "relativePath": "OptiqMDG/p-EUA",
      "folders": [
        {
           "name": "BdL"
        },
        {
           "name": "Commodities"
        }
      ],
```

```
      "files": [
        {
            "name":
"OptiqMDG_vEUA_PrevDayCapAndVolTradeFile_Equities_ALL_20170124.xml",

            "contentLength": "10485760",

            "lastModified": "2017-01-24 14:32:45",

            "contentType":"application/xml"

        },
        {
            "name":
"OptiqMDG_vEUA_FullTradeInformationFile_Equities_ALL_20170124_011201.xml",

            "contentLength": "18485760",

            "lastModified": "2017-01-24 14:32:45",

            "contentType":"application/xml"

        }

    ]

  }
}
```

5.2.4 Step 4 - Download a file

Request Header

All API requests require to transport the session cookie and the authorization token.
The date when the file was downloaded for the last time must also be provided in order to prevent another download of the same file. This date is returned in the response header when the file is downloaded for the first time (see the third response case below).

```
GET https://efs-eua.euronext.com/api/files/folder/file.extension HTTP/1.1

Host: efs-eua.euronext.com

content-type: application/x-www-form-urlencoded

Authorization: Bearer your_auth_token

If-Modified-Since: last_file_downloaded_modified_date

Cookie:
JSESSIONID=F1C6710ADE3DE6026F93237B426575F4;path=/;HttpOnly;ROUTEID=route_1
```

Command

```
curl -b cookies.txt -H "Authorization: Bearer your_auth_token"
-H "If-Modified-Since: last_file_download_date
" -X GET https://efs-eua.euronext.com/api/files/folder/file.extension
```

1) If the resource doesn't exist or the session has expired, the status code 404 will be returned:

   Response Header

```
HTTP/1.1 404 Not Found
Host: efs-eua.euronext.com
```

2) If the resource exists but was not modified since the last download, the status code 304 will be returned:

   Response Header

```
HTTP/1.1 304 Not Modified
Host: efs-eua.euronext.com
```

3) If the resource exists, the file content will be returned with status code 200:

Response Header

```
HTTP/1.1 200 OK
Host: efs-eua.euronext.com
Accept-Ranges: bytes
Content-Type: application/file_type;charset=encoding_type
Cache-control: no-cache
Content-Length: number_of_bytes_in_file
Last-Modified: last_modified_date
```

Response Body

```
{The files content}
```

6.   APPENDIX

6.1   RESTFUL API

REST (REpresentational State Transfer) is an architectural style for designing a web service, making maximum use of HTTP capabilities. Its main characteristics are as follows:

1) **Client / server application:** transport over the network is provided by HTTP. Notice that EFS is based on the HTTP secured protocol (HTTPS).

2) **Uniform interface:** Any element offered by the application to handle is called a resource and is uniquely identified by the Uniform Resource Identifiers (URI below) according to the schema:

   https_URL = "https:" "//" host [":" port]

   Two types of URI schemes are distinguished:

   -**URI member** that designates a single resource.

   -**URI collection** that designates a list of resources of the same type.

3) **The semantic** of messages from the client to the server is that of HTTP:

   -**GET URI**: retrieve the representation of a resource (URI member), or a list of resources (URI collection)

   -**POST URI** (collection): add a resource to a list of existing resources, thus creating a resource.

   -**PUT URI** (member): modify an existing resource or create a new resource.

   -**DELETE URI**: Destruction of one (URI member) or multiple (URI collection) resources.

4) **Server responses** to clients also use HTTP messages, especially the following codes:

   -200 Ok

   -404 Resource Not Found on Server

5) **Representation of resources**: the format with which a resource is represented is obtained by negotiation using HTTP headers. The client specifies what it wants as the representation format with the header "Accept", the client and the server use the "Content-type" header to describe the representation format of the resource included in the message. The format used by EFS is JSON.

Status code

Request type	CRUD	Description
POST	Create	Return **201 Created** if the resource is successfully created.
		404 (Not Found), **409** (Conflict) if resource already exists.

GET	Read	Access one or more resources and return the result as JSON or file content. Return **200 OK**
PUT	Update/Replace	Return **200 OK** if the resource is accessed, modified or deleted successfully.
DELETE	Delete	Designed to be idempotent, meaning a request to a resource still returns **200 OK** even it was deleted before or is not available. The reasoning behind this, is that the user is not really interested if the resource existed before or not.
HEAD		Return **200 OK** if the resource is available, **404** (Not Found) if the resource is not available.

The following table shows the possible return codes for API requests.

Return values	Description
200 OK	The **GET**, **PUT** or **DELETE** request was successful, the resource(s) itself is returned as JSON or file content.
201 Created	The **POST** request was successful and the resource is returned as JSON.
204 No Content	The **POST** request was successful and nothing is returned in the body.
304 Not Modified	Indicates that the resource has not been modified since the last request.
400 Bad Request	A required attribute of the API request is missing, e.g., the title of an issue is not given.
401 Unauthorized	The user is not authenticated, a valid user token is necessary.
403 Forbidden	The request is not allowed, e.g., the user is not allowed to download a file.
404 Not Found	A resource could not be accessed, e.g., a file could not be found.
405 Method Not Allowed	The request is not supported.
409 Conflict	A conflicting resource already exists, e.g., uploading a file with a name that already exists.
422 Unprocessable	The entity could not be processed.
500 Server Error	While handling the request something went wrong server-side.