

Data Avenue REST API

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What is REST?

- REST (Representational State Transfer) is an “architectural style” (Roy Fielding , 2000)
- ***client-server model***, stateless (individually interpretable requests), cacheable, layered (pipe-and-filter through network components)
- ***resources*** identified by URLs (nouns, not verbs)
- ***methods*** can be made on them using HTTP GET (query), PUT (modify), POST (create), DELETE (delete)
- different ***representations*** of resources (application/json, application/xml, text/plain, application/html, ...)
- RESTful: a system that satisfies REST

Why not Web Services?

- Client lib needed (jar), **cannot be accessed from shell** (wget, curl, javascript)
- Sensitive for **interface changes** (new operations, new parameters, new WSDL => old clients become unusable)
- Not efficient in transferring **binary content** (“HTTP aliases” required), direct download (e.g. by GET) not possible
- Likely slightly slower due to WSDL/message XML parsing (and validation), message sizes are bigger than necessary (SOAP envelope, XML mark-ups, namespaces) compared to non-XML communications
- Server-side Tomcat’s WS libraries (Sun JAX-WS/Apache CXF) are “heavy-weight” (restart causes memory leak warnings)

Goals

- Design and implement REST API for Data Avenue services
- Documentation
- Provide client jar that helps in using DA over REST from Java
- (optionally) Provide Java client jar that can replace SOAP-based jar without the need of changing other codes (gUSE)

Data Avenue Clean-up

- Do not support anymore unused, un-trusted authentication types (SSH private key, private certificates, generate VOMS extension)
- Change term “ticket” -> “access key” or simply “key”
- Re-think *copy* service (workflows don't use, only users). Separation?

Web Service -> REST mapping

- Operations(WS)->resources (REST)
 - WS dir *list()* => REST */directory* GET
 - WS file *delete()* => REST */file* DELETE
 - WS *copy()* => REST?
- SOAP parameters -> REST parameters?
- Stateless? (Sessions?)

Parameter Passing in REST

- Input/output parameter options:
 - URL **path parameters**: `/contact/{contactName}`
(query strings not supported)
 - HTTP **headers** (charset => base64)
 - HTTP entity **body** (not in GET)
 - **Representation** (Accept/Content-Type)
 - HTTP response **status**

Parameter Passing in REST DA

- What to pass?
 - Access key (ticket)
 - URI
 - Credentials (passwords, proxies)
 - Other input parameters
 - Results
- (Access) Key (ticket) → HTTP header “**X-Key**”
- URI → HTTP header “**X-URI**”
- Credentials → HTTP header extension elements, **X-Username**, **X-Password**, **X-Credentials-extension** (GET has no body)
- Other input parameters → **path parameters** in URL (e.g., aliases)/**entity body** (PUT, POST)
- Results → HTTP **status** code, **entity body** in JSON format (less verbose than XML; well supported)

Authentication – Key (ticket)

- Access *key* into HTTP header field **X-Key**

```
$ curl -v --header "X-Key: de305d54-75b4-431b-adb2-eb6b9e546014" ...  
  
* About to connect() to 127.0.0.1 port 8080 (#0)  
*   Trying 127.0.0.1...  
* connected  
* Connected to 127.0.0.1 (127.0.0.1) port 8080 (#0)  
> GET /blacktop3/rest/directory HTTP/1.1  
> User-Agent: curl/7.27.0  
> Host: 127.0.0.1:8080  
> Accept: */*  
> X-Key: de305d54-75b4-431b-adb2-eb6b9e546014
```

- Security: command history (~/.wgetrc/read from file or use curl
- --header "\$ (cat creds)" even with multiple lines X-Username, X-Password)
- Verbose: wget -d, curl -v; shorthand: curl -H
- curl --header "name: value", wget --header="name: value"
- (Standard field *Authorization* fails at redirecting to S3: InvalidArgument)

Credentials - Username/password (SFTP, S3)

- HTTP header fields: X-Username, X-Password

```
$ curl -v --header "X-Username: username" --header "X-Password:  
password" ...
```

```
$ curl -v --header "$(cat creds)" ...
```

```
* About to connect() to 127.0.0.1 port 8080 (#0)  
*   Trying 127.0.0.1...  
* connected  
* Connected to 127.0.0.1 (127.0.0.1) port 8080 (#0)  
> GET /blacktop3/rest/directory HTTP/1.1  
> User-Agent: curl/7.27.0  
> Host: 127.0.0.1:8080  
> Accept: */*  
> X-Username: username  
> X-Password: password
```

Credentials - Proxy (GridFTP)

- Proxy into HTTP header X-Proxy (base64 + no line wrap):

```
$ curl --header "X-Proxy: $(base64 --wrap=0 x509up)" ...
```

- VOMS proxy: X-Proxy-Type:

```
$ curl --header "X-Proxy: $(base64 --wrap=0 x509up)" --  
header "X-Credential-Proxy-Type: VOMS" ...
```

- Change tomcat header size if needed (server.xml, Connector *maxHttpHeaderSize* attribute)

Credentials - Proxy (GridFTP)

Client (base64encode):

```
$ curl -v -H "X-Proxy: $(base64 --wrap=0 x509up)"  
  "http://127.0.0.1:8080/blacktop3/rest/directory/"  
* About to connect() to 127.0.0.1 port 8080 (#0)  
*   Trying 127.0.0.1...  
* connected  
* Connected to 127.0.0.1 (127.0.0.1) port 8080 (#0)  
> GET /blacktop3/rest/directory HTTP/1.1  
> User-Agent: curl/7.27.0  
> Host: 127.0.0.1:8080  
> Accept: */*  
> X-Proxy:  
  LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSURDVENDQWZH0F3SUJBZ0lFYzBHbHRq  
  ...
```

Server-side (base64decode):

```
X-Proxy:  
-----BEGIN CERTIFICATE-----  
MIIDCTCCAfGgAwIBAgIEc0G1tjANBgkqhkiG9w0BAQsFADBVMQswCQYDVQQGEwJI  
...
```

Credentials - Extensibility

- Headers with **X-Credential-** prefix will be added to credentials
- For example, iRODS can be used as **X-Credential-Type: *UserPassIRODS*** (custom authentication type), **X-Credential-Resource: *dsets***, **X-Credential-Zone: *IPGP05Zone***
- Header values starting with “Base64 ...” will be decoded on server-side

DA REST Resources

- /rest/directory
- /rest/file
- /rest/attributes
- /rest/aliases
- /rest/transfers
- /rest/protocols
- /rest/authentication
- /rest/operations
- /rest/version

/rest/directory - API

- **GET:** **list** directory entries (without attributes)
 - in: directory URI (X-URI header)
 - out: entry names in JSON array (entity body)
- **POST:** **create** new directory
 - in: directory URI (X-URI header)
- **PUT:** rename the directory (not supported)
- **DELETE:** **delete** directory (recursively)
 - in: directory URI (X-URI header)

/rest/directory - Examples

```
$ curl --request GET \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
http://127.0.0.1:8080/blacktop3/rest/directory
```

```
[".java_pid23968/", "hsperfdata_databridge/", ".java_pid1720/", "mc-databridge/","  
.java_pid5104/", "mydir/", ".java_pid28751/", ".java_pid24262/", ".java_pid19597/", ".ICE-  
unix/", ".java_pid1751/", "file2alias.dat", "x509up_u505"]
```

```
$ curl --request GET --header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" --header "X-URI:  
gsiftp://grid143.kfki.hu/dpm/kfki.hu/home/hungrid/akostest/" --header "X-Proxy: $(base64 --  
wrap=0 x509up)" http://127.0.0.1:8080/blacktop3/rest/directory
```

```
["100MB.dat", "10MB.dat", "1GB.dat", "1MB.dat"]
```

```
$ curl --request POST \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/dir2create/" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
http://127.0.0.1:8080/blacktop3/rest/directory
```

```
$ curl --request DELETE \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/dir2delete/" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
http://127.0.0.1:8080/blacktop3/rest/directory
```


/rest/file - API

- GET: **download** file contents
 - in: file URI (X-URI header)
 - out: application/octet-stream (entity body)
- POST: **upload** file contents (create)
 - in: file URI (X-URI header), application/octet-stream (entity body)
- PUT: **upload** file contents (create, for S3 redirect support)
 - in: file URI (X-URI header), application/octet-stream (entity body)
- PUT: rename the file (not supported, Content-Type JSON)
- DELETE: **delete** file
 - in: file URI (X-URI header)

/rest/file - Examples

```
$ curl --request GET \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file2download.dat" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
-o file2download.dat \  
http://127.0.0.1:8080/blacktop3/rest/file
```

```
$ curl --request POST \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file2upload.dat" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
--header "Content-Type: application/octet-stream" \  
--data-binary @file2upload.dat \  
http://127.0.0.1:8080/blacktop3/rest/file
```

```
$ curl --request PUT \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file2upload.dat" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
--upload-file file2upload.dat \  
http://127.0.0.1:8080/blacktop3/rest/file
```

```
$ curl --request DELETE \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file2delete.dat" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
http://127.0.0.1:8080/blacktop3/rest/file
```

/rest/file – Redirection API

- Use header: "**X-Accept-Redirects**"
- If applicable (in the case of S3 storages), Data Avenue redirects HTTP requests to direct storage URLs
- `curl --location (-L)` option allows redirection (`wget --max-redirect=1`)
- `curl --insecure (-k)` option trusts any CA certificates (`wget --no-check-certificate`)

/rest/file - Redirection example

```
$ curl -v --request GET \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: s3://s3.lpds.sztaki.hu/s3bucket/1MB.dat" \  
--header "X-Username: ahajnal" \  
--header "X-Password: 2cafa126809f4faad1a569620aa7d1a26659259b" \  
--header "X-Accept-Redirects: yes" \  
--location \  
-o downloaded \  
http://127.0.0.1:8080/blacktop3/rest/file
```

```
> GET /blacktop3/rest/file HTTP/1.1  
> User-Agent: curl/7.37.0  
> Host: 127.0.0.1:8080  
> X-Accept-Redirects: yes  
...  
< HTTP/1.1 307 Temporary Redirect  
< Location: https://s3.lpds.sztaki.hu/s3bucket/1MB.dat?Expires...  
...  
> GET /s3bucket/1MB.dat?Expires...  
> User-Agent: curl/7.37.0  
> Host: s3.lpds.sztaki.hu  
...  
< HTTP/1.1 200 OK  
< Content-Length: 1048576  
< Content-Type: binary/octet-stream
```

/rest/file - Redirection example

```
$ curl -v --request PUT \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: s3://s3.lpbs.sztaki.hu/s3bucket/1MB.dat" \  
--header "X-Username: ahajnal" \  
--header "X-Password: 2cafa126809f4faad1a569620aa7d1a26659259b" \  
--header "X-Accept-Redirects: yes" \  
--location \  
--upload-file file2upload \  
http://127.0.0.1:8080/blacktop3/rest/file
```

```
$ curl -v --request PUT \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: s3://s3.lpbs.sztaki.hu/s3bucket/1MB.dat" \  
--header "X-Username: ahajnal" \  
--header "X-Password: 2cafa126809f4faad1a569620aa7d1a26659259b" \  
--header "X-Accept-Redirects: yes" \  
--location \  
--data-binary file2upload \  
--header "Content-Type: " \  
http://127.0.0.1:8080/blacktop3/rest/file
```

NOTE:

- For S3 redirect **PUT** must be used (POST causes MethodNotAllowed)
- Use curl **--upload-file** option (not to send Content-Type header)
- In the case of **--data-binary** **clear** Content-Type header (application/x-www-form-urlencoded): -H "Content-Type: " -H "Expect: 100-continue" (otherwise you get AccessDenied)

/rest/attributes - API

- **GET:** **get** attributes of a **single** file or directory
 - in: directory or file URI (X-URI header)
 - out: attributes in JSON array of JSON objects (entiry body)
 - entry name
 - size in bytes (file)
 - date of last modification (epoch in millis)
 - permissions (-rw-rw-rw: owner/group/all users, Canonical/Group grantee, NOTE: not all permissions are available for all protocols)
 - comment (e.g. owner in the case of S3)
- **POST:** **get** attributes of a **set** of files or subdirectories
 - in: directory URI (X-URI header), list of sub-entry names in JSON array (entity body)
 - out: list of attributes in JSON array of JSON objects (entity body)
- **PUT:** change attributes (not implemented)

/rest/attributes - Examples

```
$ curl --request GET \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
http://127.0.0.1:8080/blacktop3/rest/attributes
```

```
{"lastModified":1444641344000,"name":"file","permissions":"rwx---r--","sizeUnit":"B","size":3649}
```

```
$ curl --request GET \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: s3://s3.lpbs.sztaki.hu/s3bucket/10MB.dat" \  
--header "X-Username: ahajnal" --header "X-Password: 2cafa126809f4faad1a569620aa7d1a26659259b" \  
http://127.0.0.1:8080/blacktop3/rest/attributes
```

```
$ curl --request POST --header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: gsiftp://grid143.kfki.hu/dpm/kfki.hu/home/hungrid/akostest/" \  
--header "X-Proxy: $(base64 --wrap=0 x509up)" \  
--header "Content-Type: application/json" \  
--data "[100MB.dat, 10MB.dat, 1GB.dat]" \  
http://127.0.0.1:8080/blacktop3/rest/attributes
```

```
[{"lastModified":1403481750000,"name":"100MB.dat","permissions":"rw----r--  
","sizeUnit":"B","size":104857600},  
{"lastModified":1403481914000,"name":"10MB.dat","permissions":"rw----r--  
","sizeUnit":"B","size":10485760},  
{"lastModified":1403481660000,"name":"1GB.dat","permissions":"rw----r--  
","sizeUnit":"B","size":1073741824}]
```

/rest/aliases - API

- **POST:** **create** alias
 - in: alias creation properties in JSON object (entity body)
 - *alias lifetime* (in seconds, optional, default: 1 hour)
 - *read* (boolean, optional, default: true)
 - *redirect allowed*(boolean, optional, default: true)
 - *archive* (boolean, optional, default: false)
 - out: alias properties in JSON object (entity body)
 - *id* (alias id)
 - *URL* (alias HTTP URL on Data Avenue host)
 - *directURL* (direct URL to the storage, if available)
- **DELETE:** **delete** alias (before expiration)
 - in: alias id (path param), e.g. /rest/aliases/2cafa...

/rest/aliases - Examples

```
$ curl --request POST \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: sftp://192.168.152.46/tmp/file2alias.dat" \  
--header "X-Username: databridge" --header "X-Password: databridge" \  
--header "Content-Type: application/json" \  
--data "{lifetime: 3600, read: true, redirect: false}" \  
http://127.0.0.1:8080/blacktop3/rest/aliases  
  
{  
  "id": "0a6921bf-4599-4548-8595-497ed9cd01e9",  
  "URL": "http://127.0.0.1:8080/blacktop3/aliases/0a6921bf-4599-4548-8595-497ed9cd01e9"  
}
```

```
$ curl --request POST \  
--header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
--header "X-URI: s3://s3.lpds.sztaki.hu/s3bucket/10MB.dat" \  
--header "X-Username: ahajnal" --header "X-Password:  
  2cafa126809f4faad1a569620aa7d1a26659259b" \  
--header "Content-Type: application/json" \  
--data "{redirect: true}" \  
http://127.0.0.1:8080/blacktop3/rest/aliases  
  
{  
  "id": "16a5db84-db48-4747-9a6f-7df0fe515103",  
  "URL": "http://127.0.0.1:8080/blacktop3/aliases/16a5db84-db48-4747-9a6f-7df0fe515103",  
  "directURL": "https://s3.lpds.sztaki.hu/s3bucket/10MB.dat?Expires=1445645656&AWSAccessKey  
  Id=ahajnal..."  
}
```

/rest/transfers/{transferID} - API

- **GET:** get **status** of transfer
 - in: id (path param), /rest/transfers/{id}
 - out: transfer status in JSON object (entity body)
 - source, target (URIs)
 - state (CREATED, TRANSFERRING, COMPLETED, FAILED)
 - bytes transferred (bytes)
 - size (file size in bytes)
 - started, ended, server time (epoch)
 - failure (cause)
- **POST:** **start** a new transfer
 - in: alias properties in JSON object (entity body)
 - *target* (URI , required, file or directory URI)
 - *credentials* (for target URI, JSON object: credentials: {type:UserPass, username:...})
 - *move* (boolean, optional, default: false)
 - *overwrite* (boolean, optional, default: false)
 - out: transfer id (transfer ID, JSON object)
- **DELETE:** **abort** (cancel) a transfer
 - in: id (path param), /rest/transfers/{id}

/rest/transfers/{transferID} - Examples

```
$ curl --request POST \  
-H "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
-H "X-URI: s3://s3.lpds.sztaki.hu/s3bucket/100MB.dat" \  
-H "$(cat creds_s3)" \  
-H "Content-Type: application/json" \  
--data "{target:'sftp://192.168.152.46/tmp/',credentials:  
  {Type:UserPass,UserID:databridge,UserPass:databridge}}" \  
http://127.0.0.1:8080/blacktop3/rest/transfers  
{"id":"4f85d931-40fb-4836-8fdb-b0c28b556225"}
```

```
$ curl --request -H "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" \  
http://127.0.0.1:8080/blacktop3/rest/transfers/4f85d931-40fb-4836-8fdb-  
b0c28b556225  
{"bytesTransferred":104857600,"source":"s3://s3.lpds.sztaki.hu/s3bucket/100MB.dat  
","status":"DONE","serverTime":1446719043792,"target":"sftp://192.168.152.46/t  
mp/100MB.dat","ended":1446718355963,"started":1446718343133,"size":104857600}
```

```
$ curl --request DELETE -H "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73"  
http://127.0.0.1:8080/blacktop3/rest/transfers/4f85d931-40fb-4836-8fdb-  
b0c28b556225
```

Transfer cannot be cancelled (already done/failed)!

or

< HTTP/1.1 200 OK

/rest/protocols - API, example

- **GET:** **list** supported protocols
 - out: list of protocols in JSON array (entire body)

```
$ curl http://127.0.0.1:8080/blacktop3/rest/protocols
```

```
["http","https","sftp","gsiftp","srm","irods","cassandra","jcloud  
s-aws-s3","jclouds-atmos","jclouds-swift","jclouds-s3","jclouds-  
cloudfiles-us","jclouds-cloudfiles-uk","jclouds-swift-  
keystone","jclouds-azureblob","jclouds-cloudfiles","jclouds-  
openstack-swift","s3","jclouds-hpcloud-objectstorage"]
```

/rest/authentication - API, example

- **GET:** **list** supported authentication types for a given protocol
 - in: protocol name (path param)
 - out: list of authentication types in JSON array (entity body)

```
$ curl http://127.0.0.1:8080/blacktop3/rest/authentication/sftp
```

```
["UserPass", "SSH"]
```

/rest/operations - API, example

- **GET:** **list** supported operation types for a given protocol
 - in: protocol name (path param)
 - out: list of operations (JSON array)

```
$ curl http://127.0.0.1:8080/blacktop3/rest/operations/sftp
```

```
["LIST", "MKDIR", "RMDIR", "DELETE", "RENAME", "INPUT_STREAM",  
"OUTPUT_STREAM"]
```

/rest/version - API, example

- **GET:** returns Data Avenue **version** (no ticket or credentials needed, ping)

```
$ curl http://127.0.0.1:8080/blacktop3/rest/version
```

```
$ wget -qO- http://127.0.0.1:8080/blacktop3/rest/version
```

```
3.0.0 (build: 04/11/2015-15:17)
```

Data Avenue Sessions


- **Store credentials, other resources created for that storage available throughout an entire user session – if requested so (ports, clients, etc.)**

```
$ curl -v --request GET --header "X-Use-Session: yes" --header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" --header "X-URI: sftp://192.168.152.46/tmp/" --header "$(cat creds)" http://127.0.0.1:8080/blacktop3/rest/directory
```

```
> GET /blacktop3/rest/directory HTTP/1.1
> X-Use-Session: yes
> X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73
> X-URI: sftp://192.168.152.46/tmp/
```

```
< HTTP/1.1 200 OK
< Server: Apache-Coyote/1.1
< Set-Cookie: JSESSIONID=7FEABC207914A21CDF3BBC54AF3F73F2; Path=/blacktop3/; HttpOnly
```

```
$ curl -v --request GET --header "Cookie: JSESSIONID=7FEABC207914A21CDF3BBC54AF3F73F2" --header "X-Key: 1a7e159a-ffd8-49c8-8b40-549870c70e73" --header "X-URI: sftp://192.168.152.46/tmp/" http://127.0.0.1:8080/blacktop3/rest/directory
(no credentials!)
```



Blacktop-dev - Tests

// list SFTP (file *sftp* contains X-Key, X-Username, X-Password lines)

```
curl -k -H "$(cat sftp)" -H "X-URI: sftp://192.168.152.46/tmp/" https://data-avenue.eu/blacktop-dev/rest/directory
```

// list S3 (file *s3* contains X-Key, X-Username, X-Password lines)

```
curl -k -H "$(cat s3)" -H "X-URI: s3://s3.lpds.sztaki.hu/" https://data-avenue.eu/blacktop-dev/rest/directory
```

// download

```
curl -k -H "$(cat sftp)" -H "X-URI: sftp://192.168.152.46/tmp/blacktop3.war" -o blacktop3.war https://data-avenue.eu/blacktop-dev/rest/file
```

// upload

```
curl -k --request POST -H "$(cat sftp)" -H "X-URI: sftp://192.168.152.46/tmp/blacktop3.war" --header "Content-Type: application/octet-stream" --data-binary @blacktop3.war https://data-avenue.eu/blacktop-dev/rest/file
```

// attributes

```
curl -k -H "$(cat sftp)" -H "X-URI: sftp://192.168.152.46/tmp/blacktop3.war" https://data-avenue.eu/blacktop-dev/rest/attributes
```

// delete

```
curl -k --request DELETE -H "$(cat sftp)" -H "X-URI: sftp://192.168.152.46/tmp/blacktop3.war" https://data-avenue.eu/blacktop-dev/rest/file
```

// copy

```
curl -k --request POST -H "$(cat s3)" -H "X-URI: s3://s3.lpds.sztaki.hu/s3bucket/100MB.dat" -H "Content-Type: application/json" --data "{target: 'sftp://192.168.152.46/tmp/', credentials: {Type: UserPass, UserID: databridge, UserPass: databridge}}" https://data-avenue.eu/blacktop-dev/rest/transfers
```

Future Works

- Make it open source?
- Create image deployable by communities?