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Developing applications using OpenStack Swift as Storage

All about the API features to power up your apps

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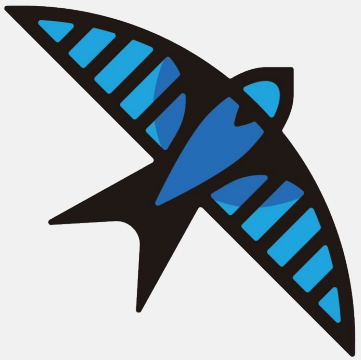
FOSDEM 2018, Brussels

What is OpenStack Swift?

- Object Storage
- Flat namespace
- Unstructured data
- Scalable, durable, reliable
- In production for ~8 years



SWIFT

an OpenStack Community Project

https://video.fosdem.org/2018/, Room H.2213

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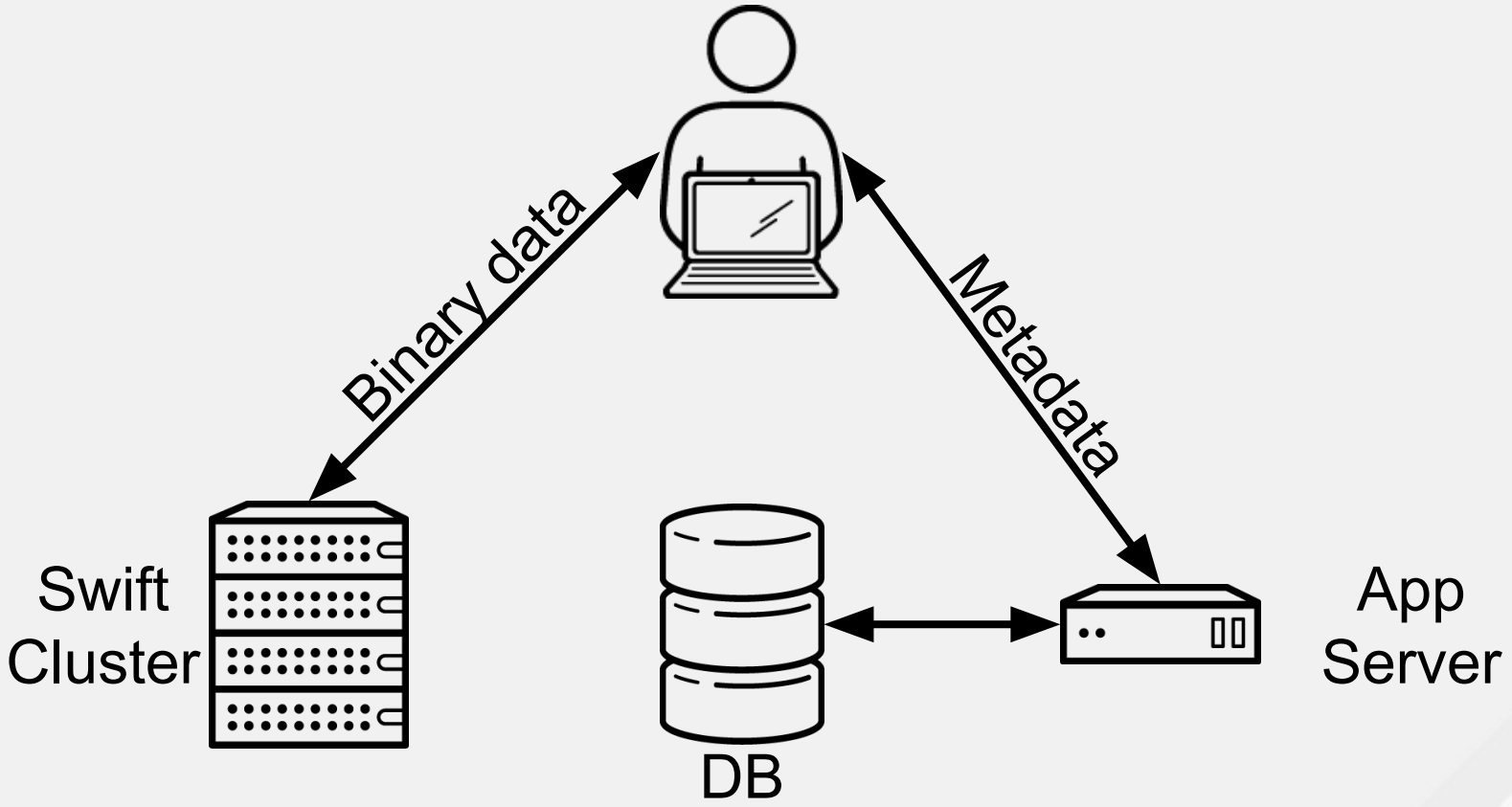
The big picture



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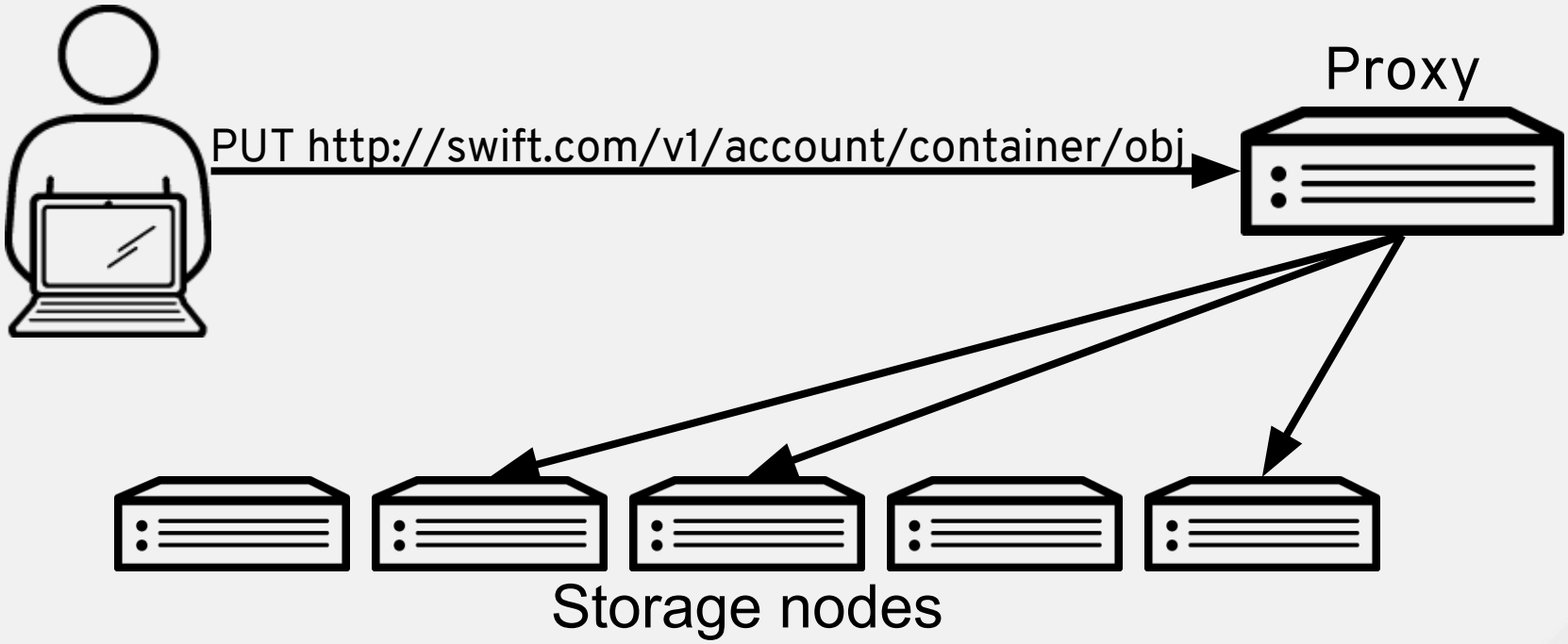
REST API

Swift uses a simple REST API based on GET, PUT, HEAD, POST requests



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REST API

Swift uses a simple REST API based on GET, PUT, HEAD, POST requests

```
# List objects in a (public readable) container
curl http://192.168.2.1:8080/v1/AUTH_test/public

# Download a (public readable) object
curl http://192.168.2.1:8080/v1/AUTH_test/public/obj

# Upload an object
curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X PUT -H "Content-Length: 36816" \
-H "X-Auth-Token: AUTH_tk5917..."
```

https://developer.openstack.org/api-ref/object-store/index.html

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Headers, metadata & swift CLI

System metadata & custom metadata

```
# Generally: try “--debug” with the swift CLI
swift --debug list container

curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X POST
-H "X-Delete-After: 5" \
-H “X-Object-Meta-Some: value”

swift post -H “X-Delete-After: 5” -m “Some: value”
```

https://developer.openstack.org/api-ref/object-store/index.html

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Authentication

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tempauth

Built-in auth for development & testing. Don’t use in production

```
curl -I \
-H "X-Auth-User: test:tester" \
-H "X-Auth-Key: testing"
http://192.168.2.1:8080/auth/v1.0

< X-Storage-Url: http://192.168.2.1:8080/v1/AUTH_test
< X-Auth-Token: AUTH_tk5917…

curl -I -H "X-Auth-Token: AUTH_tk59…
http://192.168.2.1:8080/v1/AUTH_test

< X-Account-Object-Count: 9
```


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Keystone

The default auth in OpenStack

```
curl -i -H "Content-Type: application/json" \
  -d '{"auth": {
    "identity": {
      "methods": ["password"],
      "password": {
        "user": {
          "name": "admin",
          "domain": { "id": "default" },
          "password": "adminpwd"
        }
      }
    }
  }
}' "http://192.168.2.1:5000/v3/auth/tokens"
```


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tempurl

Pre-computed URLs for one specific object action

```
swift post -m “temp-url-key: secret” containername
```

```
import hmac
from hashlib import sha1
from time import time
method = 'GET'
expires = int(time() + 60)
path = '/v1/AUTH_test/cont/obj'
key = 'secret'

hmac_body = '%s\n%s\n%s' % (method, expires, path)
sig = hmac.new(key, hmac_body, sha1).hexdigest()
```

http://swift.com/v1/AUTH_test/cont/obj?temp_url_sig=5d4aa...&temp_url_expires=1517568481

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formpost

Similar to tempurl, but for HTML forms

```
# Like tempauth, plus:

redirect = 'https://srv.com/some-page'
max_file_size = 104857600
max_file_cnt = 10

hmac_body = '%s\n%s\n%s\n%s\n%s' % (
path, redirect, max_file_size, max_file_cnt, expires)

signature = hmac.new(key, hmac_body, sha1).hexdigest()
```

https://docs.openstack.org/swift/latest/middleware.html#formpost

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ACLs

```
# Make container listing and objects public readable
swift post -r ".r:*,.rlistings" public


# Allow “user2” to write to container
swift post -w "tenant:user2" public


swift stat container
> Read ACL: .r:*,.rlistings
> Write ACL: tenant:user
```


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Authentication summary

	Account	Container	Object
anonymous	X	✔	✔
w/ Token	✔	✔	✔
tempurl	X	X	✔
formpost	X	X	✔

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API Features

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Container listings

Listings can be modified using querystring parameters

limit=2	Returns only 2 entries
marker=1000	Starts List with object names larger than marker
end_marker=2000	List ends with object names smaller than end_marker
prefix=sub/	Only returns objects whose name start with the prefix “sub/”
reverse=on	Reverse order listing
format=json	Returns list as JSON (can be XML as well)

http://192.168.2.1:8080/v1/AUTH_test/public?limit=2

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Expiring objects

Blocks request after given time and deletes objects shortly after

```
curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X PUT -H "X-Auth-Token: AUTH_tk591…" \
-H "X-Delete-After: 5"


curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X PUT -H "X-Auth-Token: AUTH_tk591…" \
-H "X-Delete-At: 1517210485"
```


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Static large objects

- Objects are limited to 5GB by default
- Split larger objects into chunks
- Upload them, and finally a manifest

```
[{"path": "/cont/chunk_00001",
  "etag": "etagoftheobjectsegment",
  "size_bytes": 10485760,
  "range": "1048576-2097151"},
…]


$ curl -X PUT http://…/cont/obj?multipart-manifest=put
```


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Range requests

Sounds simple, but especially wanted for video (seeking, preview)

```
# obj content: "Hello World from Fosdem!"

# Returns only “Hello”
curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X PUT -H "X-Auth-Token: AUTH_tk5917…" \
-H "Range: bytes=0-5"

# Returns multipart/byteranges + “Hello Fosdem!”
curl http://192.168.2.1:8080/v1/AUTH_test/cont/obj \
-X PUT -H "X-Auth-Token: AUTH_tk5917…" \
-H "Range: bytes=0-5,16-"
```


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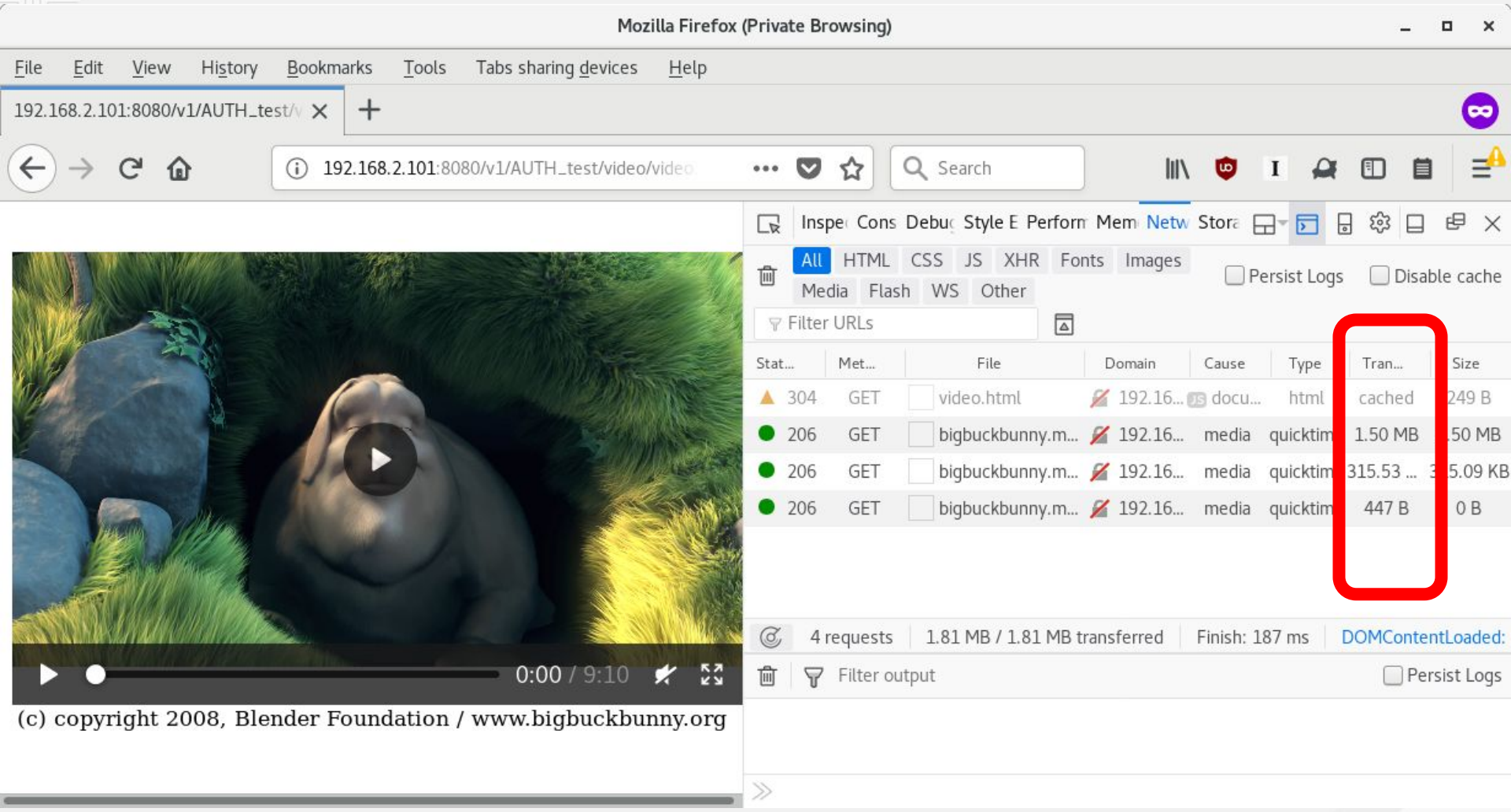
Mozilla Firefox (Private Browsing)
File Edit View History Bookmarks Tools Tabs sharing devices Help
192.168.2.101:8080/v1/AUTH_test/v
192.168.2.101:8080/v1/AUTH_test/video/video
Search
Inspe Cons Debu Style E Perform Mem Netw Stora
All HTML CSS JS XHR Fonts Images
Media Flash WS Other
Persist Logs
Disable cache
Filter URLs
Stat... Met... File Domain Cause Type Tran... Size
304 GET video.html 192.16... docu... html cached 249 B
206 GET bigbuckbunny.m... 192.16... media quicktim 1.50 MB 50 MB
206 GET bigbuckbunny.m... 192.16... media quicktim 315.53 ... 5.09 KB
206 GET bigbuckbunny.m... 192.16... media quicktim 447 B 0 B
0:00 / 9:10
(c) copyright 2008, Blender Foundation / www.bigbuckbunny.org
4 requests
1.81 MB / 1.81 MB transferred
Finish: 187 ms
DOMContentLoaded:
Filter output
Persist Logs

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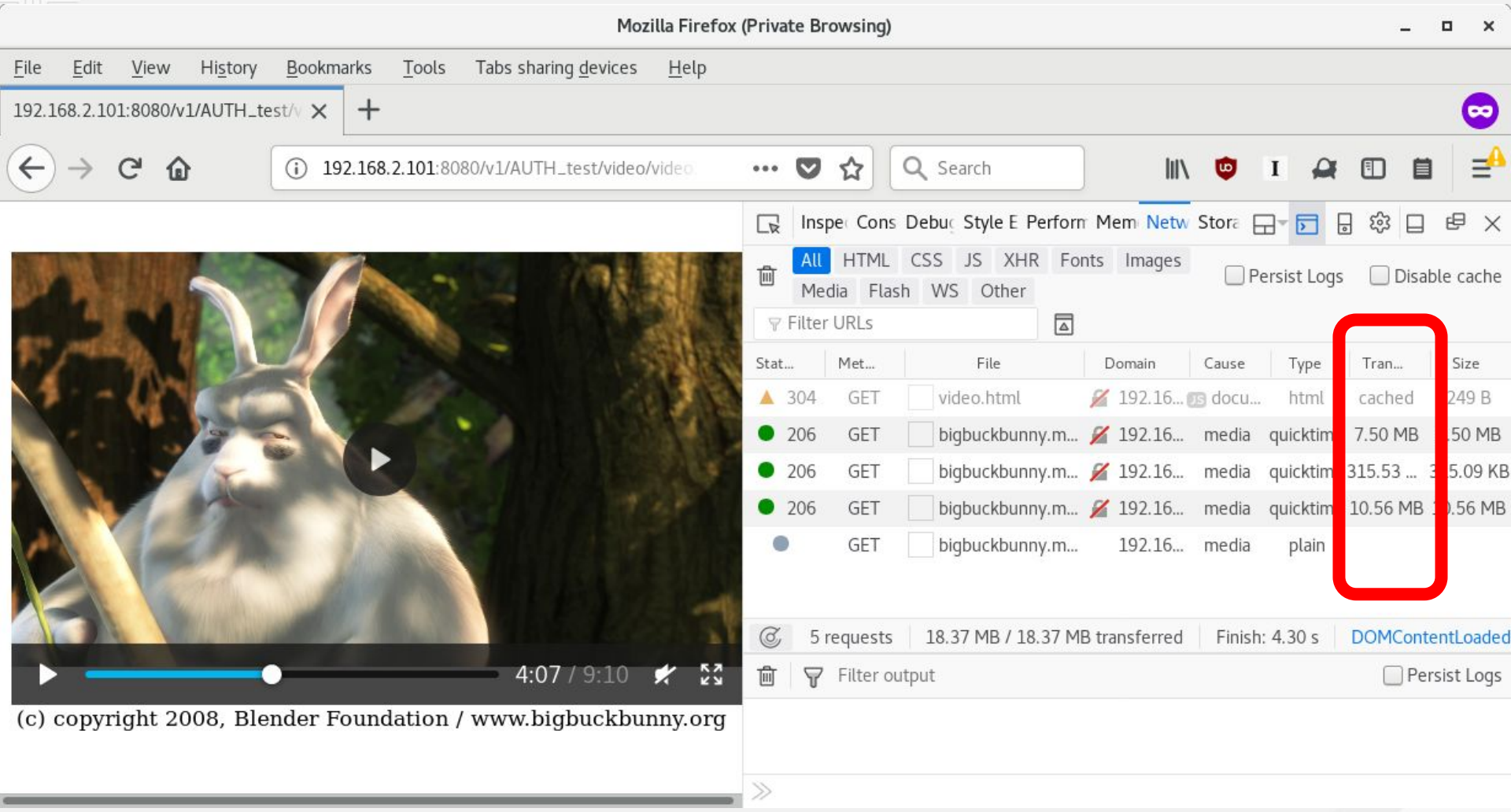
Mozilla Firefox (Private Browsing)
File Edit View History Bookmarks Tools Tabs sharing devices Help
192.168.2.101:8080/v1/AUTH_test/v
192.168.2.101:8080/v1/AUTH_test/video/video
Search
Inspe Cons Debu Style E Perform Mem Netw Stora
All HTML CSS JS XHR Fonts Images
Media Flash WS Other
Persist Logs
Disable cache
Filter URLs
Stat... Met... File Domain Cause Type Tran... Size
304 GET video.html 192.16... docu... html cached 249 B
206 GET bigbuckbunny.m... 192.16... media quicktim 7.50 MB 50 MB
206 GET bigbuckbunny.m... 192.16... media quicktim 315.53 ... 5.09 KB
206 GET bigbuckbunny.m... 192.16... media quicktim 10.56 MB 0.56 MB
GET bigbuckbunny.m... 192.16... media plain
4:07 / 9:10
(c) copyright 2008, Blender Foundation / www.bigbuckbunny.org
5 requests 18.37 MB / 18.37 MB transferred Finish: 4.30 s DOMContentLoaded
Filter output
Persist Logs

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Versioning

Keeps objects in given container when they are DELETED

```
curl -i http://192.168.2.1:8080/v1/AUTH_test/fosdem \
-X PUT -H "X-Auth-Token: AUTH_tk187…" \
-H "X-History-Location: archive"

# After object delete archive container looks like:
006fosdem/1517212630.62613
006fosdem/1517212640.36957
```

https://docs.openstack.org/swift/latest/overview_object_versioning.html

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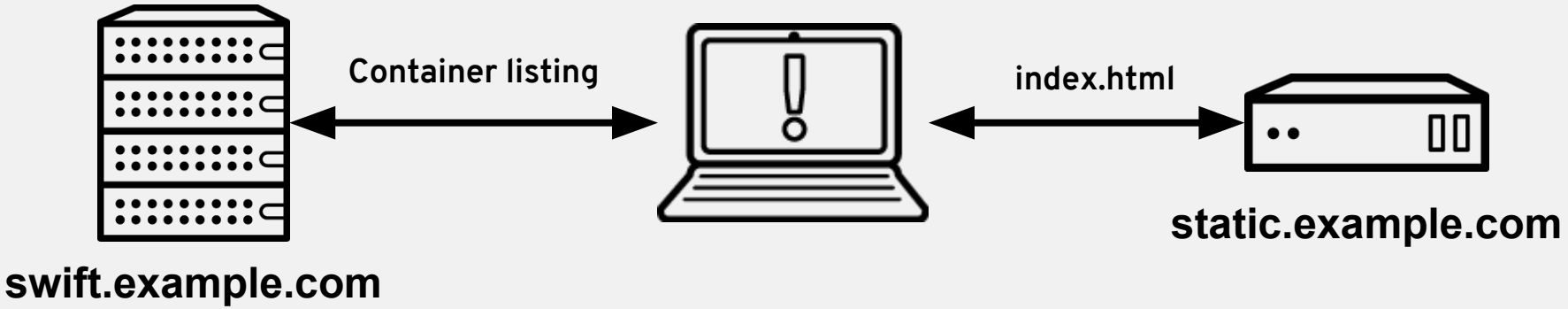
CORS

Cross-origin resource sharing



Enable CORS by setting header
X-Container-Meta-Access-Control-Allow-Origin on container to
http://static.example.com

https://docs.openstack.org/swift/latest/cors.html

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Examples

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AngularJS + public container

```
$http.get(base_url + "?prefix=img").then(
    function(response) {
        imgs = response.data;
        showImage(index);
    }
);

var showImage = function() {
    $scope.img = base_url + "/" + imgs[index].name;
    $http.head($scope.img).then(
        function(response) {
            $scope.headers = response.headers();
        }
    );
}
```

github.com/cschwede/snippets/tree/master/fosdem2018

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Two weeks hiking the Kungsleden, Sweden

Creating tempurls in Lua

```
local function tempurl(url, key, method)
  local expires = tostring(os.time() + 900)
  local path = url:match(".*(/v1/.*)$")

  local hmac_body = string.format(
    "%s\n%s\n%s", method, expires, path)

  local sig = LrDigest.HMAC.digest(
    hmac_body, 'SHA1', key)

  return string.format(
    "%s?temp_url_sig=%s&temp_url_expires=%s",
    url, signature, expires)
end
```


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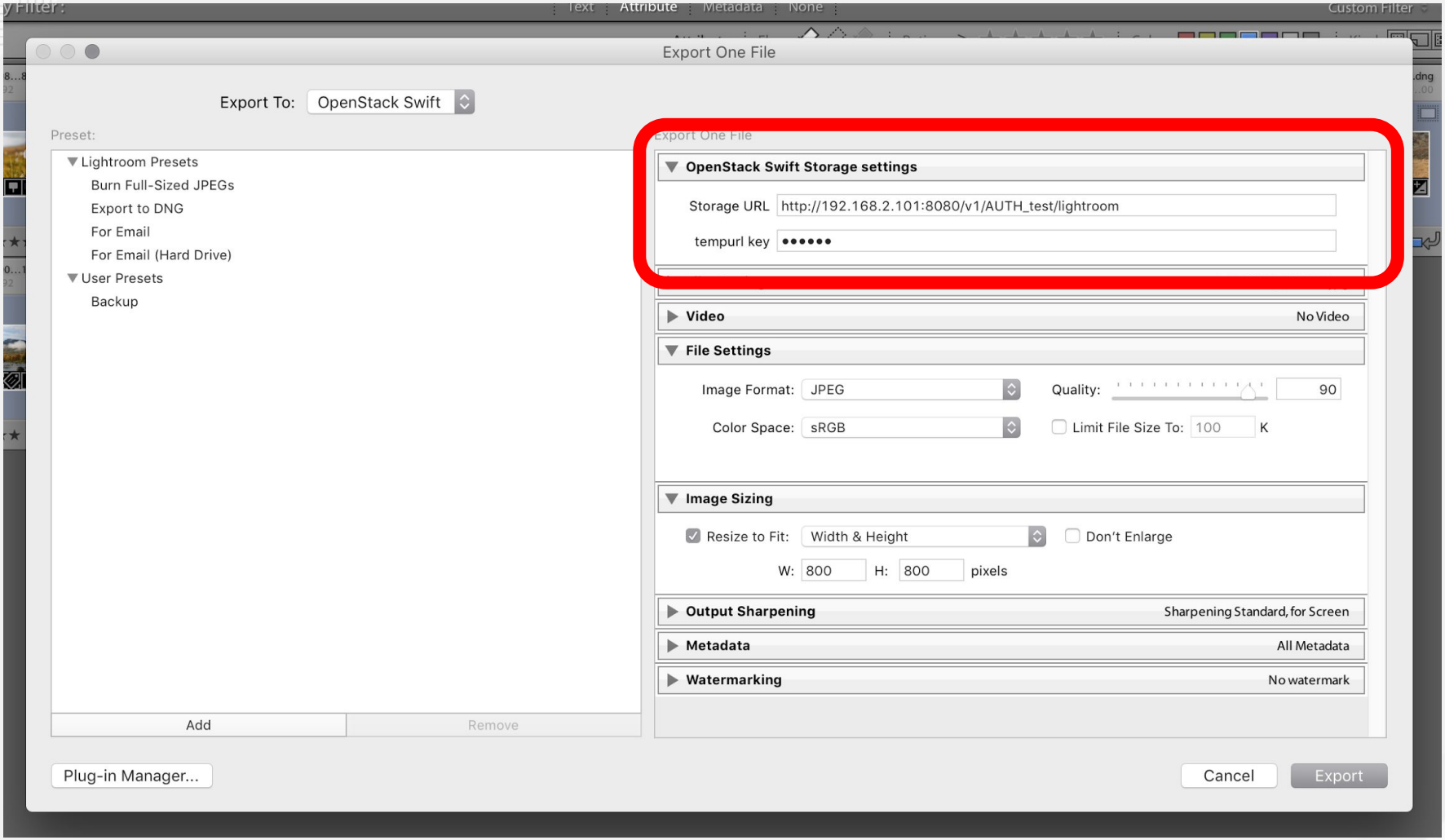

https://github.com/cschwede/OpenStackSwift.lrplugin/

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Python

Simplest way: use python-swiftclient

```
from swiftclient import client
try:
  (storage_url, auth_token) = client.get_auth(
    auth_url, username, password, auth_version)
except client.ClientException:
  # log error here


client.get_account(storage_url, auth_token)

client.put_container(storage_url, auth_token,
container)
```


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Creating secret for tempurl/formpost

```
account = client.get_account(
    storage_url, auth_token)
key = account[0].get('x-account-meta-temp-url-key')

if not key:
  chars = string.ascii_lowercase + string.digits
  key = ''.join(
    random.choice(chars) for x in range(32))

  headers = {'x-account-meta-temp-url-key': key}

  client.post_account(
    storage_url, auth_token, headers)
```


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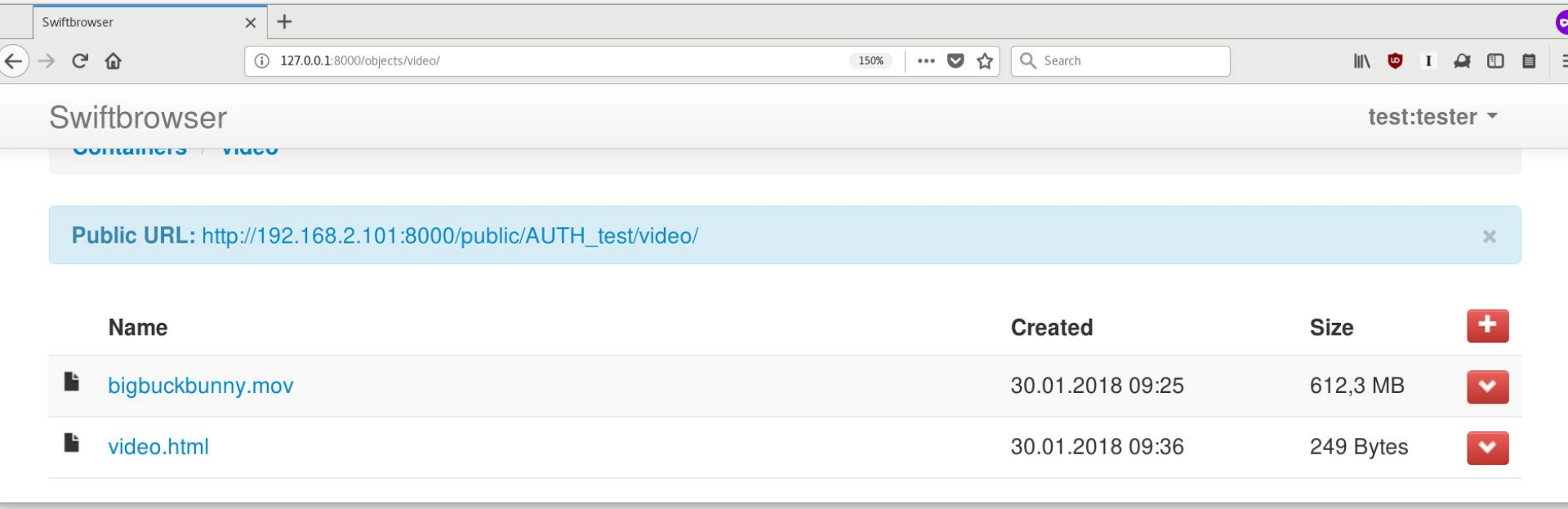

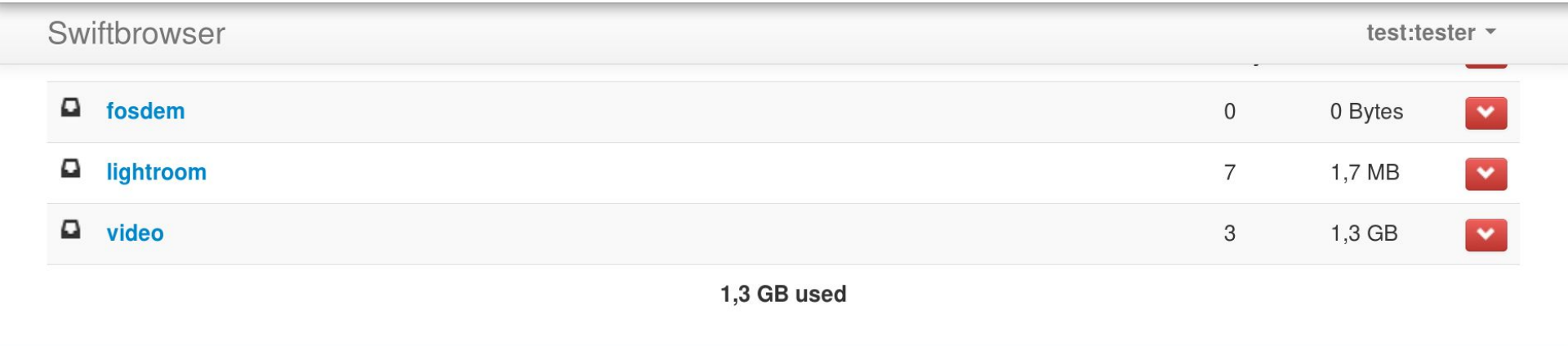

https://github.com/cschwede/django-swiftbrowser

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How do I get started?

```
git clone https://github.com/cschwede/dockerswift/
cd dockerswift
docker build -t swift .
docker run -p 8080:8080 -v node:/srv/node swift

virtualenv swift-venv
source swift-env/bin/activate
pip install python-swiftclient
export ST_USER=test:tester
export ST_KEY=testing
export ST_AUTH=http://192.168.2.101:8080/auth/v1.0

swift --debug [list|stat]
```


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THANK YOU!

Christian Schwede
cschwede@redhat.com

Slides: fosdem.org/2018/schedule/event/app_development_w_swift_storage/