#18: Cloud Object Storage (AWS S3, etc)

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Cloud Object Storage

Instead of using local file storage, large data storage in the cloud-based systems are commonly stored as **"objects"**. These objects (files) are organized into _____:

Public Cloud Providers	Private Cloud Solutions

Example: AWS

Amazon AWS S3 CreateBucket REST API
https://docs.aws.amazon.com/AmazonS3/latest/API/API_CreateBucket.html

```
PUT / HTTP/1.1
Host: Bucket.s3.amazonaws.com
x-amz-acl: ACL
x-amz-grant-read: GrantRead : UserList
x-amz-grant-write: GrantWrite : UserList
x-amz-grant-full-control: GrantFullControl : UserList
x-amz-grant-read-acp: GrantReadACP : UserList
x-amz-grant-write-acp: GrantWriteACP : UserList
[...]
```

Bucket:	Name of the bucket. *[Required]*
ACL:	The canned Access Control to apply to the bucket. **private	public-read	public-read-write	authenticated-read**
UserList:	You specify each grantee (user) as a type=value pair, where the type is one of the following: **id** – if the value specified is the canonical user ID of an AWS account **uri** – if you are granting permissions to a predefined group **emailAddress** – if the value specified is the email address of an AWS account Ex: **x-amz-grant-read: id="11112222333",id="444455556666"**
ACP:	**x-amz-grant-read** grants permission for the file itself; **x-amz-grant-read-acp** grants permissions for the access control policies.

+ Lots of Language-level Libraries

Private Cloud Solutions:

MinIO: https://docs.min.io/docs/python-client-api-reference.html#make_bucket
OpenStack/Swift:
https://docs.openstack.org/api-ref/object-store/index.html?expanded=create-container-detail#create-container

Adding files to storage are also HTTP endpoints:

Amazon AWS S3 PutObject REST API
https://docs.aws.amazon.com/AmazonS3/latest/API/API_PutObject.html

```
PUT /Key HTTP/1.1
Host: Bucket.s3.amazonaws.com
x-amz-tagging: Tagging
x-amz-acl: ACL
x-amz-grant-full-control: GrantFullControl : UserList
x-amz-grant-read: GrantRead : UserList
x-amz-grant-read-acp: GrantReadACP : UserList
x-amz-grant-write-acp: GrantWriteACP : UserList
[...]
Content-Length: ContentLength

Body
```

Q: Is there a directory structure similar to traditional file systems?

Cloud Object Storage in Python

Instead of using file storage on disk, object storage in the cloud provides us access to a file-system-like interface without the need for all programs to be running on the same computer!

Reading a file in Python:

18/local.py

```python
1  f = open("settings.json", "r")
2  print(f.read())
```

Reading Data from S3:

18/s3.py

```python
1  import boto3
2  s3 = boto3.client('s3', [...])
3
4  # Reading data from S3:
5  obj = s3.get_object(Bucket="cs340", Key="session_data")
6  f = obj["Body"]
```