

LUMI

A white wolf is the central focus, standing in a futuristic, blue-toned digital environment. The background is filled with vertical lines, data streams, and server racks, creating a high-tech, data-centric atmosphere. The wolf is looking slightly to the right of the camera.

Files on LUMI 2: LUMI-O object storage

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Why do I need to know this?

- LUMI-O is the primary option on LUMI to transfer large amounts of data to LUMI
- LUMI-O is the only local option if you want to backup some data
- Some datasets come in a format optimised for object storage rather than a parallel file system

- What we will discuss:
 - Properties of object storage
 - Getting started
 - But not a reference manual of the tools that can be used on LUMI-O

What is LUMI-O?

- Object storage system, based on Ceph
 - Finnish users: similar to Allas, but less functionality at the moment
 - Specific tools to access data, not mounted as a regular file system
- Organisation: 3 levels:
 - Projects: LUMI projects
 - Buckets: “Containers” used to store objects.
 - Flat structure: Buckets cannot contain other buckets
 - Objects: Any type of data, stored in a bucket
 - Atomic access to objects: Put, get, copy, delete, ..., but no partial write
 - Flat space, though slashes in the name can create a pseudo-folder view in some tools
 - Metadata for buckets and objects
 - Bucket: e.g., access rights
 - Custom metadata possible

What is LUMI-O? (2)

- Objects can be served on the web also
 - This is how recordings of some LUST courses are served
 - But not meant as a data publishing service (e.g., no EUDAT alternative)
- Can be reached easily from outside LUMI
 - So also a mechanism for data exchange
 - Tools for accessing object storage are more performant and more robust than sftp on high latency connections
- Specs:
 - Capacity: 30 PB
 - Quota: 150 TB capacity, 1K buckets and 500K objects per bucket
 - Billed at 0.25 TB·hour per TB per hour (0.5 before 2025)
 - Persistent for the duration of the project

Lustre vs LUMI-O (1)

Lustre	LUMI-O object storage
Closely integrated with compute nodes	Separate system
Upgrades with the system	Separate upgrade cycle and on-the-fly
Organisation: Hierarchical directory structure and files	Organisation: Triple flat space of projects, buckets and objects
Files can be read, written, modified, appended, ...	Simple atomic operations on objects: put, get, copy, delete
Optimised for bandwidth to the compute nodes	Optimised for reliability, resilience, global access
Simpler schemes for redundancy	Very complex internal redundancy setup

Lustre vs LUMI-O (2)

Lustre	LUMI-O object storage
Integrated in the authentication of the supercomputer	Separate key-based authentication mechanism
Seen as any other POSIX file system	Separate range of access tools/APIs, some tools can provide a filesystem view
No external access	External access integrated, includes web
Structure with MDS and ODS	Structure with MDS and ODS, but very different technologies
Parallelism for performance: Access a file in parallel from multiple processes	Parallelism for performance: Different processes access different objects
Fairly expensive to very expensive hardware	Cheaper hardware

LUSTRE vs LUMI-O (3)

- The optimal way/technology of storing data is very different depending on whether you work from a parallel file system or from object storage. E.g., in earth and climate science:
 - netCDF is a popular data storage format for storing simulation data on a parallel filesystem
 - Not suited for object storage though as it would be a single object
 - Zarr is a format to store similar data on object storage (cloud storage)
 - It is not a single object, but a structured collection of objects
 - Putting it on a parallel filesystem where each object would become a file in a directory tree is a very bad idea!
 - But with the right libraries, you can access Zarr data on object storage directly from your application

Accessing LUMI-O

- Access is based on authentication keys
 - Generated via a web interface: Separate steps to generate the credentials and to get them on LUMI.
 - Or generated via Open OnDemand: Can put credentials on LUMI for `rc1one` and `s3cmd`.
- Tools:
 - `rc1one`: Easiest tool if you want public and private data
 - `s3cmd`
 - `restic`: More a backup tool
 - `boto3`: Python API from the AWS SDK for programmatic access
 - Needs a more recent Python version than the system Python
 - Additional GUI-based tools exist for clients
 - Open OnDemand web interface is not a substitute!
 - Speed limited by browser protocols

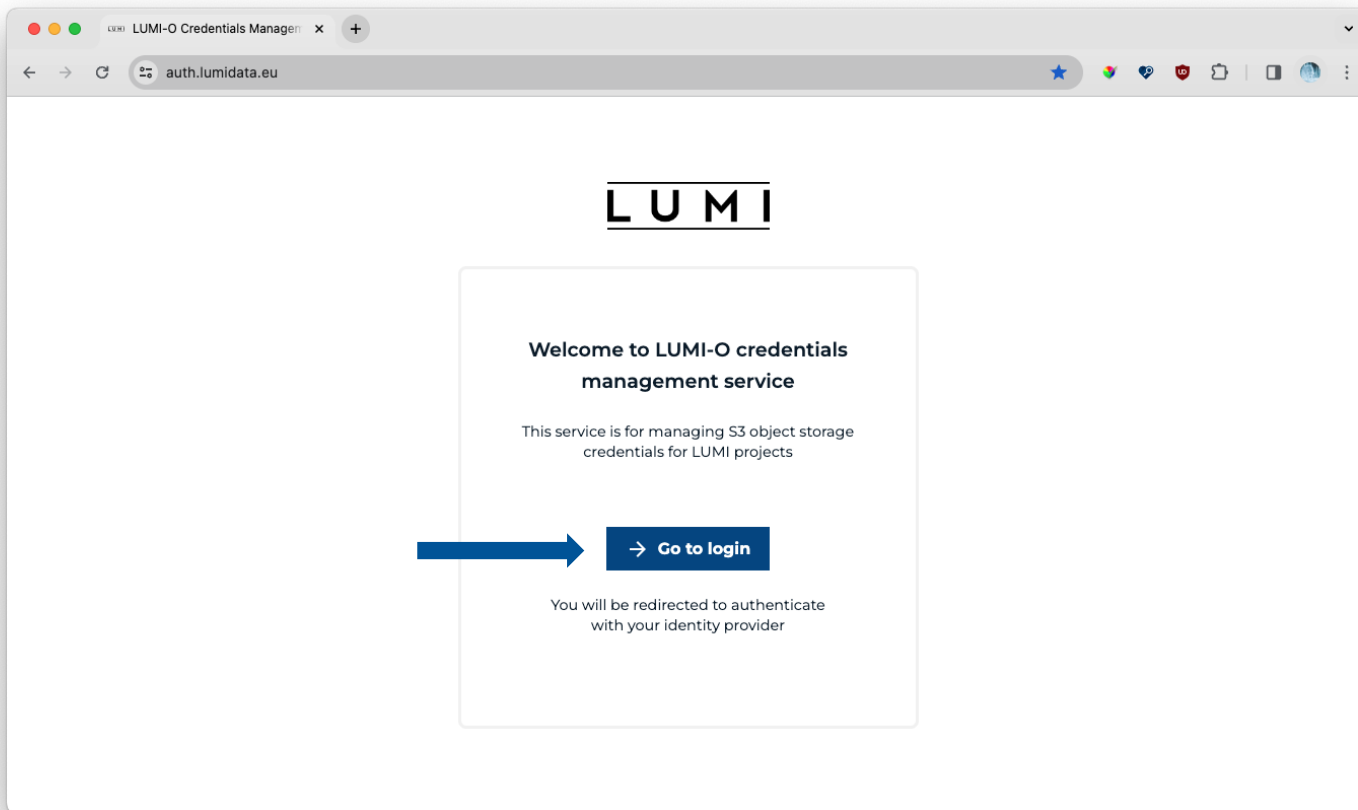
module `lumio`

The credential management web interface

- Credential management web interface at auth.lumidata.eu
 - Create keys
 - Extend lifetime of a key (not needed that frequently anymore)
 - Create configure scripts for various tools

Credential management web interface: Create credentials (1)

LUMI

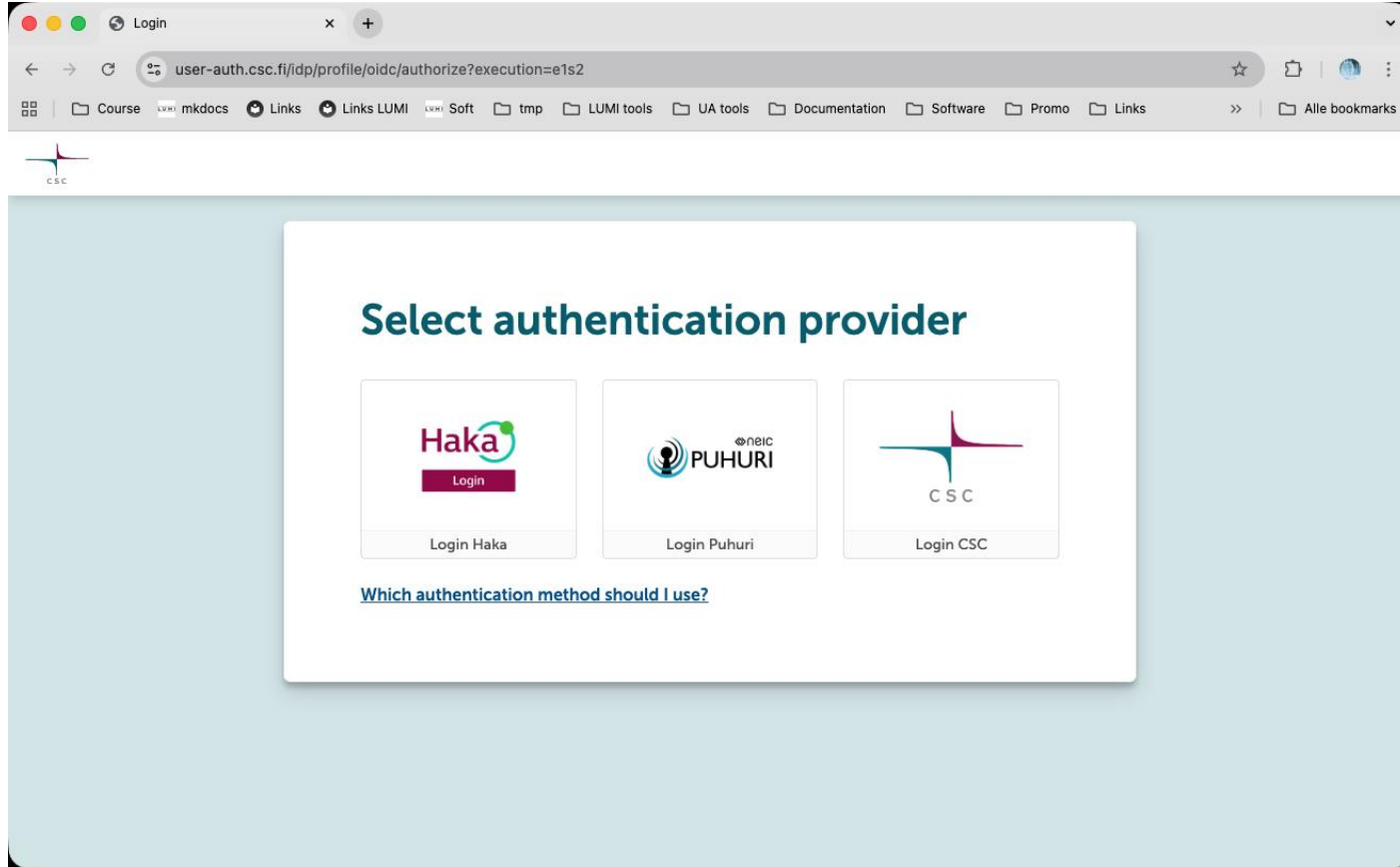


The credential management web interface

- Credential management web interface at auth.lumidata.eu
 - Create keys
 - Extend lifetime of a key (not needed that frequently anymore)
 - Create configure scripts for various tools
- You'll have to select your login method in the same way as for Open OnDemand

Credential management web interface: Create credentials (2)

LUMI



The screenshot shows a web browser window with the address bar containing the URL `user-auth.csc.fi/oidc/profile/authorize?execution=e1s2`. The browser's bookmark bar includes folders for 'Course', 'mkdocs', 'Links', 'Links LUMI', 'Soft', 'tmp', 'LUMI tools', 'UA tools', 'Documentation', 'Software', 'Promo', and 'Links'. The main content area features the CSC logo in the top left and a central white card with the heading 'Select authentication provider'. This card contains three selectable options: 'Login Haka' with the Haka logo, 'Login Puhuri' with the Puhuri logo, and 'Login CSC' with the CSC logo. Below these options is a blue link that reads 'Which authentication method should I use?'.

The credential management web interface

- Credential management web interface at auth.lumidata.eu
 - Create keys
 - Extend lifetime of a key (not needed that frequently anymore)
 - Create configure scripts for various tools
- You'll have to select your login method in the same way as for Open OnDemand
- After a while you should see a list of projects, select the one for which you want to generate a key
 - The right column will also show active keys for the project, and expired ones

Credential management web interface: Create credentials (3)

The screenshot shows a web browser window with the URL `auth.lumidata.eu/projects/465002175`. The browser's address bar and tabs are visible. The main content area is divided into two sections: a table of projects on the left and a form for generating a new authentication key pair on the right.

Project number	Project description
465000095	VLAAMS SUPERCOMPUTER CENT SUPPORT
465001965	LUST Training / 2025-06-23 LUMI (CSC)
465001999	Technical University of Ostrava / U Access for EPICURE AST: Enabling Support for AST Teams (EHPC-DE
465002178	LUST Training / 2025-10-08 Moving training jobs to LUMI: A Hands-On
465002174	LUST Training / 2025-10-20 LUMI Ir (Tallinn)
465002175	LUST Training / 2025-10-22 LUMI A Course (Tallinn)

Project number: 465002175
Project description: LUST Training / 2025-10-22 LUMI Advanced Course (Tallinn)
Quota: 150 TiB
Usage: 0 B

Generate a new authentication key pair
Key duration may not exceed 1 year from now.

Select expiration date*
10/31/2025, 09:59
Selected expiration in 3 weeks and 4 days from now

Key description*
Course demo

Generate key

Available keys
There are no keys to show.
The keys you generate will appear in this list.

Credential management web interface: Create credentials (4)

The screenshot shows a web browser window with the URL `auth.lumidata.eu/projects/465002175`. The browser's address bar and bookmarks are visible. The main content area is divided into two panels. The left panel displays a table of existing credentials, with the entry for ID `465002175` highlighted in blue. The right panel is titled "Generate a new authentication key pair" and contains several form fields: "Key duration" (with a note that it cannot exceed 1 year), "Select expiration date*" (set to `10/31/2025, 09:59`), "Key description*" (with the placeholder text "E.g. Work laptop,..."), and a blue "Generate key" button. Below the form, the "Available keys" section shows a single key with a key icon, ID `WZBTMOECYF23NRX98HVS`, description "Course demo", and expiration time "Expires on: Oct 31 2025 10:04:41 GMT+0100". The "Expired keys" section below it is empty, with the text "There are no expired keys to show." A blue arrow points from the highlighted credential in the table to the "Available keys" section.

ID	Description
465001999	Access for EPICURE AST: Enabling Support for AST Teams (EHPC-DE
465002178	LUST Training / 2025-10-08 Moving training jobs to LUMI: A Hands-On
465002174	LUST Training / 2025-10-20 LUMI Ir (Tallinn)
465002175	LUST Training / 2025-10-22 LUMI A Course (Tallinn)

Generate a new authentication key pair

Key duration may not exceed 1 year from now.

Select expiration date*

10/31/2025, 09:59

Selected expiration in 3 weeks and 4 days from now

Key description*

E.g. Work laptop,...

Generate key

Available keys

Access key

WZBTMOECYF23NRX98HVS
Course demo
Expires on: Oct 31 2025 10:04:41 GMT+0100

Expired keys

The are no expired keys to show.

The credential management web interface

- Credential management web interface at auth.lumidata.eu
 - Create keys
 - Extend lifetime of a key (not needed that frequently anymore)
 - Create configure scripts for various tools
 - Often available during system maintenance also
- You'll have to select your login method in the same way as for Open OnDemand
- After a while you should see a list of projects, select the one for which you want to generate a key
 - The right column will also show active keys for the project, and expired ones
- Selecting an active access key changes the right column to one where you get information about the key, can extend the key duration and can generate templates to configure various tools

Credential management web interface: Check credentials

LUMI

The screenshot shows a web browser window with the URL `auth.lumidata.eu/projects/465002175/keys/WZBTMOECYF23NRX98HVS`. The page has a navigation bar with 'Help & Support', 'Documentation', and 'Logout'. The main content area is titled 'Your projects' and contains a table with the following data:

Project number	Project description
465000095	VLAAMS SUPERCOMPUTER SUPPORT
465001965	LUST Training / 2025-06-27 LUMI (CSC)
465001999	Technical University of Ostrava Access for EPJ Support for A
465002178	LUST Training / 2025-10-08 Mov
465002174	
465002175	Course (Tallinn)

An 'Authentication keys' modal window is open, showing 'Access key details' for the selected project. The details include:

- Access key: WZBTMOECYF23NRX98HVS
- Secret key: xV1HutsijhfeC4qwJO9Jjr4zRCrftPaWxlzEdTSA
- Key description: Course demo
- Project number: 465002175
- Project description: LUST Training / 2025-10-22 LUMI Advanced Course
- Creation time: Oct.06.2025.10:05:12 GMT+0200

Two blue callout boxes provide additional information:

- Endpoint URL: `https://lumidata.eu/`
- Path-style addressing: `https://project.lumidata.eu/bucket` Instead of virtual-hosted `https://bucket.project.lumidata.eu`

At the bottom of the modal, there is an 'Extend key duration' button and a note: 'Key duration may not exceed 1 year from now.'

Credential management web interface: Extend credential lifetime

The screenshot shows a web browser window with the URL `auth.lumidata.eu/projects/465002175/keys/WZBTMOECYF23NRX98HVS`. The page has a navigation bar with **Help & Support**, **Documentation**, and **Logout**. On the left, under **Your projects**, there is a table with the following data:

Project number	Project description
465000095	VLAAMS SUPERCOMPUTER CE SUPPORT
465001965	LUST Training / 2025-06-23 LU (CSC)
465001999	Technical University of Ostrava Access for EPICURE AST: Enabl Support for AST Teams (EHPC-
465002178	LUST Training / 2025-10-08 Mov training jobs to LUMI: A Hands-
465002174	LUST Training / 2025-10-20 LUM (Tallinn)
465002175	LUST Training / 2025-10-22 LUM Course (Tallinn)

A blue arrow points from the project description of the last row to the right-hand panel. This panel is titled **Extend key duration** and contains the following text: **Extend key duration**,

Key duration may not exceed 1 year from now.

Select expiration date*

Set expiration

Configuration templates

Select configuration format to generate (opens in a new tab)

Select format

Generate

shell
boto3
rclone
s3cmd

manently disable all connections where this key has been he connection

Credential management web interface: Tool configuration (1)

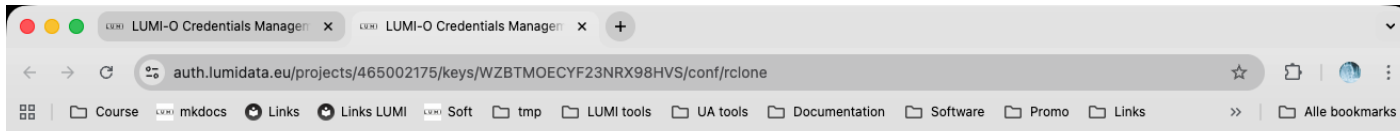
The screenshot shows a web browser window with the URL `auth.lumidata.eu/projects/465002175/keys/WZBTMOECYF23NRX98HVS`. The page has a navigation bar with **Help & Support**, **Documentation**, and **Logout**. The main content is divided into two columns. The left column, titled **Your projects**, contains a table with the following data:

Project number	Project description
465000095	VLAAMS SUPERCOMPUTER CE SUPPORT
465001965	LUST Training / 2025-06-23 LU (CSC)
465001999	Technical University of Ostrava Access for EPICURE AST: Enabl Support for AST Teams (EHPC-
465002178	LUST Training / 2025-10-08 Mo training job
465002174	LUST Training / 2025-10-20 LUM (Tallinn)
465002175	LUST Training / 2025-10-22 LUM Course (Tallinn)

Blue arrows point from the project descriptions for 465002178 and 465002175 to the right column. The right column is titled **Extend key duration** and contains the text: "Key duration may not exceed 1 year from now." Below this is a **Select expiration date*** section with a date picker and a **Set expiration** button. Further down is the **Configuration templates** section, which says "Select configuration format to generate (opens in a new tab)". It features a **Generate** button and a list of templates: `shell`, `boto3`, `rclone`, and `s3cmd`. A note at the bottom right states: "manently disable all connections where this key has been he connection".

Credential mangement web interface: Tool configuration (2)

LUMI



```
# rclone configuration template for project
# Generated for kulust
# Valid until 2025-10-31T11:04:41+02:00
# DO NOT SHARE!

# ~/.config/rclone/rclone.conf
# Objects will inherit defaults from bucket, acl can be controlled by object level if needed finer granularity.
# Add your favorite encryption to objects for increased security.
# see https://rclone.org/encrypt/ for rclone specific methods

[lumi-465002175-private]
# Buckets created with this endpoint configuration are private by default.
type = s3
acl = private
env_auth = false
provider = Ceph
endpoint = https://lumidata.eu
access_key_id = WZBTMOECYF23NRX98HVS
secret_access_key = xV1HutsijhfeC4qwJ09Ijr4zRGrftPaWxlzEdTSA
max_upload_parts = 1000

[lumi-465002175-public]
# Buckets created with this endpoint configuration are visible for all.
type = s3
acl = public-read
env_auth = false
provider = Ceph
endpoint = https://lumidata.eu
access_key_id = WZBTMOECYF23NRX98HVS
secret_access_key = xV1HutsijhfeC4qwJ09Ijr4zRGrftPaWxlzEdTSA
max_upload_parts = 1000
```

Access through Open OnDemand

- Open OnDemand provides 2 apps:
 - An app for simple **credential management**, including generation of config files for `rclone` and `s3cmd` on LUMI.
 - The **“Home Directory” app** can be used to browse, download and upload objects and to create buckets.
Structure resembles view of a typical rclone-based browser.
- Note that Open OnDemand is not a replacement for proper tools for access to LUMI-O!
 - Uploading and downloading is through web protocols that are not as performant as proper object storage tools.
- Open OnDemand is down during LUMI system maintenance!

Credential management via OOD (1)

LUMI

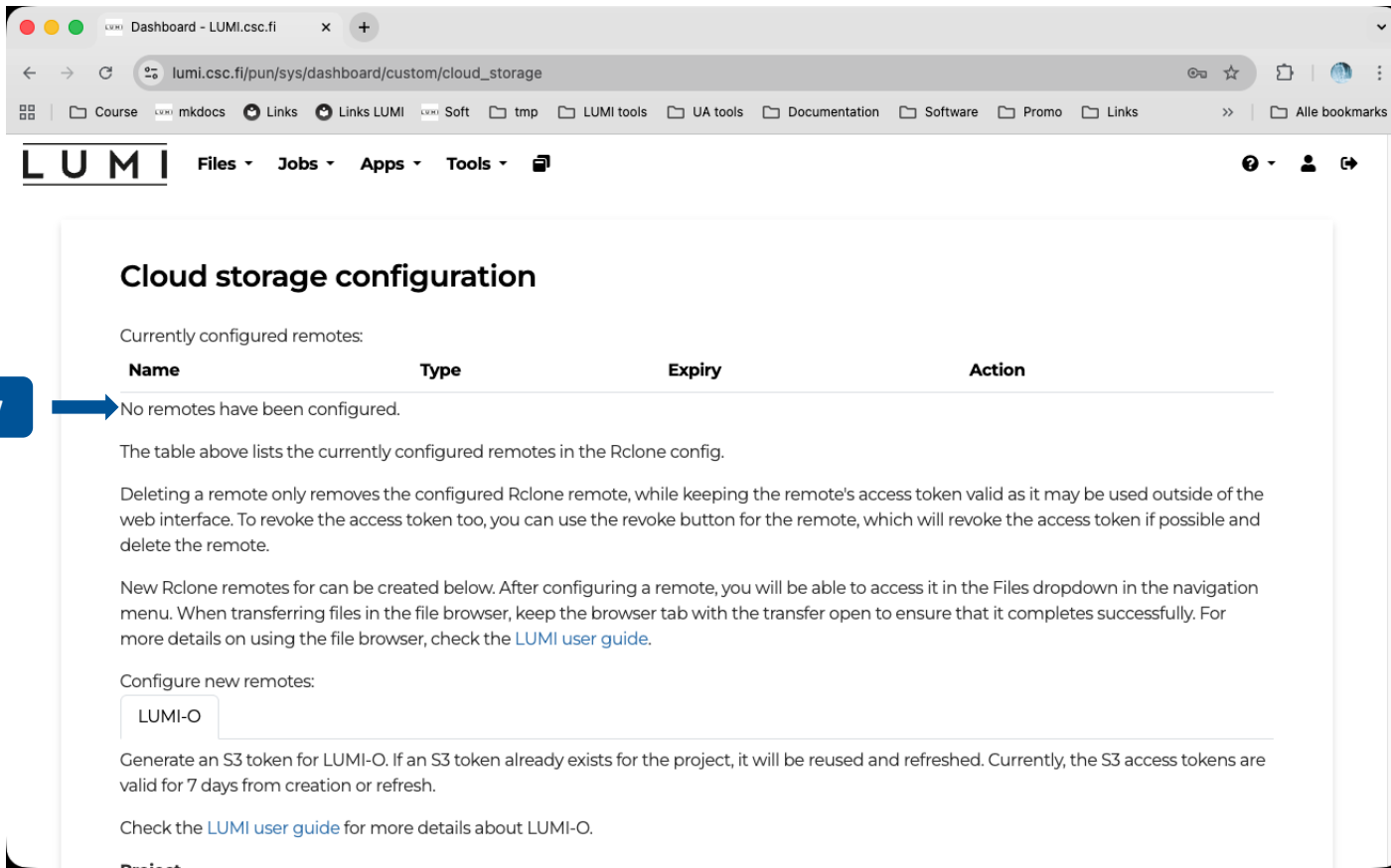
The screenshot shows a web browser window with the URL `lumi.csc.fi/pun/sys/dashboard/`. The dashboard features a navigation bar with the LUMI logo and menu items: Files, Jobs, Apps, and Tools. Below the navigation bar is a section titled "Pinned Apps" containing a 3x5 grid of application tiles. A blue arrow points from the "Desktop" tile to the "Cloud storage configuration" tile.

Home Directory	Compute node shell	Login node shell	Desktop	Cloud storage configuration
Disk quotas	Project view	Active Jobs	Jupyter	Jupyter for courses
Julia-Jupyter	MATLAB	MLflow	TensorBoard	Visual Studio Code

Below the "Pinned Apps" section is a "Notifications" section with the text "You have no notifications".

Credential management via OOD (2)

LUMI



Dashboard - LUMI.csc.fi

lumi.csc.fi/pun/sys/dashboard/custom/cloud_storage

LUMI Files Jobs Apps Tools

Cloud storage configuration

Currently configured remotes:

Name	Type	Expiry	Action
No remotes have been configured.			

The table above lists the currently configured remotes in the Rclone config.

Deleting a remote only removes the configured Rclone remote, while keeping the remote's access token valid as it may be used outside of the web interface. To revoke the access token too, you can use the revoke button for the remote, which will revoke the access token if possible and delete the remote.

New Rclone remotes can be created below. After configuring a remote, you will be able to access it in the Files dropdown in the navigation menu. When transferring files in the file browser, keep the browser tab with the transfer open to ensure that it completes successfully. For more details on using the file browser, check the [LUMI user guide](#).

Configure new remotes:

LUMI-O

Generate an S3 token for LUMI-O. If an S3 token already exists for the project, it will be reused and refreshed. Currently, the S3 access tokens are valid for 7 days from creation or refresh.

Check the [LUMI user guide](#) for more details about LUMI-O.

Overview

Credential management via OOD (3)

LUMI

web interface. To revoke the access token too, you can use the revoke button for the remote, which will revoke the access token if possible and delete the remote.

New Rclone remotes can be created below. After configuring a remote, you will be able to access it in the Files dropdown in the navigation menu. When transferring files in the file browser, keep the browser tab with the transfer open to ensure that it completes successfully. For more details on using the file browser, check the [LUMI user guide](#).

Configure new remotes:

LUMI-O

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Check the [LUMI user guide](#) for more details about LUMI-O.

Project

46500095

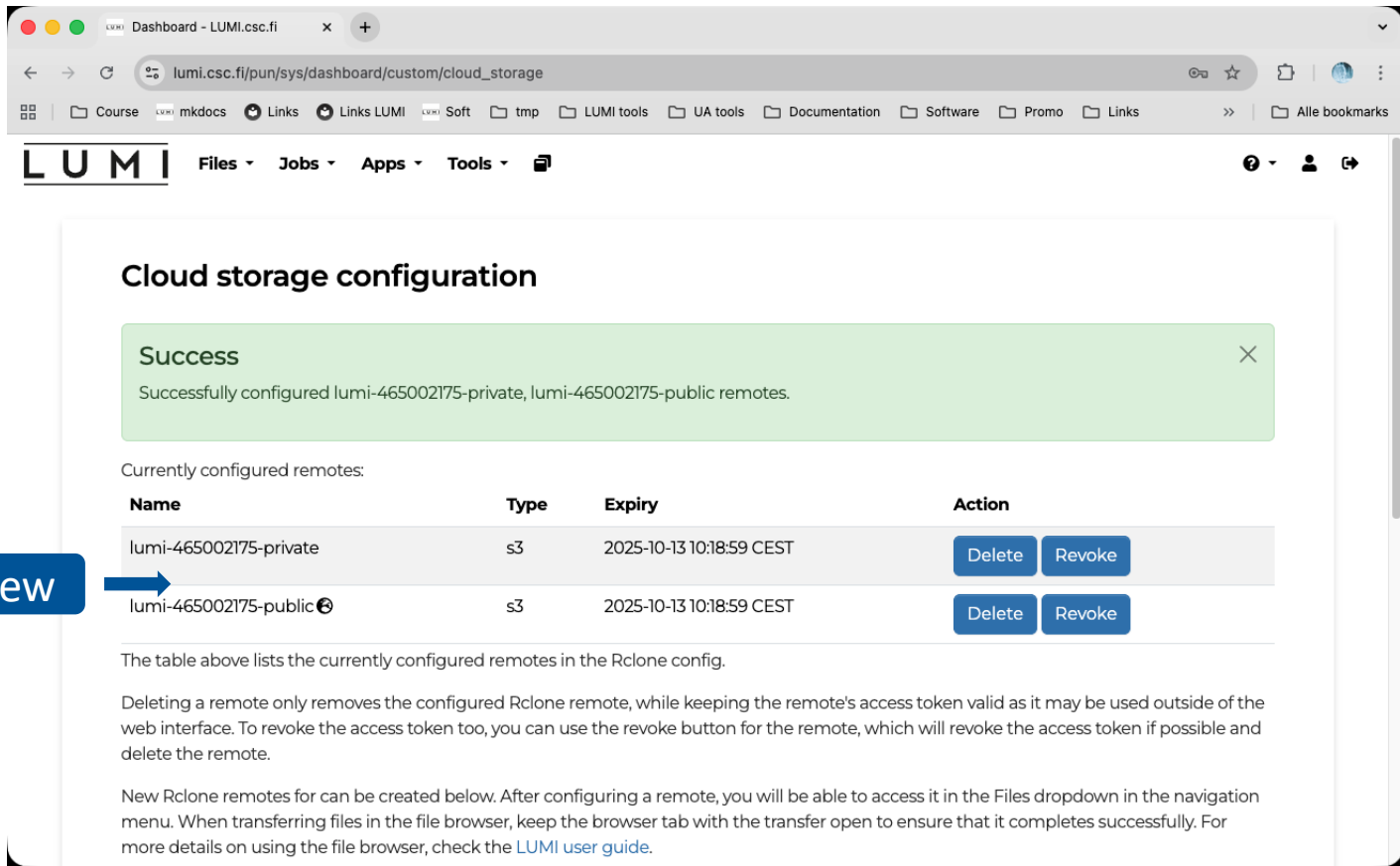
Generate s3cmd configuration ?

Configure public remote ?

Submit Add remotes for all projects

Select project
Configure for s3cmd
Configure public endpoint also

Credential management via OOD (4)



The screenshot shows a web browser window with the URL `lumi.csc.fi/pun/sys/dashboard/custom/cloud_storage`. The page title is "Dashboard - LUMI.csc.fi". The browser's address bar and bookmarks are visible. The LUMI logo is in the top left, and navigation menus for "Files", "Jobs", "Apps", and "Tools" are in the top center. A green success message box at the top of the content area reads: "Success Successfully configured lumi-465002175-private, lumi-465002175-public remotes." Below this is a table titled "Currently configured remotes:" with columns for "Name", "Type", "Expiry", and "Action". The table contains two rows of data. The first row is for "lumi-465002175-private" and the second for "lumi-465002175-public". Each row has "Delete" and "Revoke" buttons. Below the table, there is explanatory text about the remotes and instructions on how to use them.

Cloud storage configuration

Success ✕

Successfully configured lumi-465002175-private, lumi-465002175-public remotes.

Currently configured remotes:

Name	Type	Expiry	Action
lumi-465002175-private	s3	2025-10-13 10:18:59 CEST	<button>Delete</button> <button>Revoke</button>
lumi-465002175-public	s3	2025-10-13 10:18:59 CEST	<button>Delete</button> <button>Revoke</button>

The table above lists the currently configured remotes in the Rclone config.

Deleting a remote only removes the configured Rclone remote, while keeping the remote's access token valid as it may be used outside of the web interface. To revoke the access token too, you can use the revoke button for the remote, which will revoke the access token if possible and delete the remote.

New Rclone remotes for can be created below. After configuring a remote, you will be able to access it in the Files dropdown in the navigation menu. When transferring files in the file browser, keep the browser tab with the transfer open to ensure that it completes successfully. For more details on using the file browser, check the [LUMI user guide](#).

Overview

Credential management via OOD (5)

LUMI

The screenshot shows a web browser window with two tabs: 'Dashboard - LUMI.csc.fi' and 'LUMI-O Credentials Manager'. The address bar shows 'auth.lumidata.eu/projects/465002175'. The browser's bookmark bar contains various folders like 'Course', 'mkdocs', 'Links', 'LUMI', 'Soft', 'tmp', 'LUMI tools', 'UA tools', 'Documentation', 'Software', 'Promo', and 'Links'. The main content area is divided into two columns. The left column is a table with three rows:

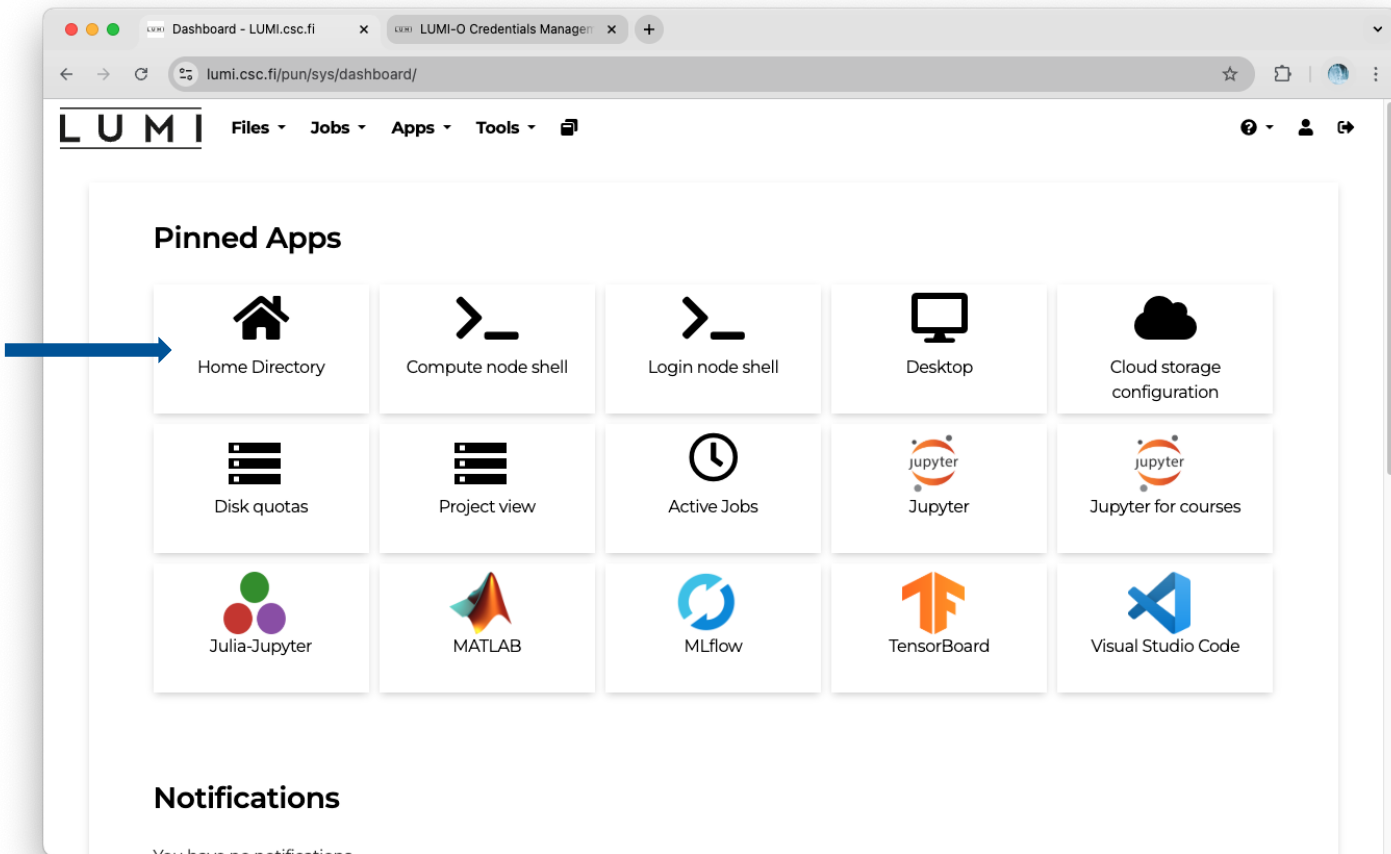
ID	Description
465002178	LUST Training / 2025-10-08 Moving training jobs to LUMI: A Hands-On
465002174	LUST Training / 2025-10-20 LUMI In (Tallinn)
465002175	LUST Training / 2025-10-22 LUMI A Course (Tallinn)

The right column contains a form for generating a key. It has a 'Select expiration date*' field with a calendar icon, a 'Key description*' field with the placeholder text 'E.g. Work laptop,...', and a blue 'Generate key' button. Below the form is a section titled 'Available keys' containing two key entries:

- Access key**
NQBHLZOAX8TM47YF0K3P
lumi web interface
Expires on: Oct 13 2025 10:18:59 GMT+0200
- Access key**
WZBTMOECYF23NRX98HVS
Course demo
Expires on: Oct 31 2025 10:04:41 GMT+0100

A blue arrow points to the first key entry. Below this is an 'Expired keys' section with the text 'There are no expired keys to show.'

Browsing via OOD (1)



Browsing via OOD (2)

Dashboard - LUMI.csc.fi | LUMI-O Credentials Manager

lumi.csc.fi/pun/sys/dashboard/files/lumi-465000095-public/

Open in Terminal | Refresh | New File | New Directory | Upload | Download | Copy/Move | Delete

Home Directory

- /projappl/project_465001362
- /projappl/project_465000095
- /projappl/project_465000844
- /projappl/project_465001361
- /scratch/project_465001362
- /scratch/project_465000095
- /scratch/project_465000844
- /scratch/project_465001361
- /flash/project_465001362
- /flash/project_465000095
- /flash/project_465000844
- /flash/project_465001361
- lumi-465000095-private
- lumi-465000095-public

lumi-465000095-public: / | Change directory | Copy path

Show Owner/Mode Show Dotfiles Filter:

Showing 4 rows - 0 rows selected

<input type="checkbox"/>	Type	Name	Size	Modified at
<input type="checkbox"/>	Folder	hpe	-	2-10-2024 13:50:31
<input type="checkbox"/>	Folder	mytest	-	24-5-2023 13:09:08
<input type="checkbox"/>	Folder	mytest2	-	24-5-2023 13:11:13
<input type="checkbox"/>	Folder	training-materials-web	-	31-10-2023 16:40:48

↑

Buckets

Browsing via OOD (3)

End point

Bucket

lumi-465000095-public:/ training-materials-web/

Type	Name	Size	Modified at
Folder	intro-evolving	-	22-11-2024 10:56:35

Pseudo-folder, not an object or bucket

Browsing via OOD (4)

The screenshot shows the LUMI OOD interface with the following annotations:

- End point**: Points to the URL `lumi.csc.fi/pun/sys/dashboard/` in the browser address bar.
- Bucket**: Points to the path `lumi-465000095-public/` in the breadcrumb navigation.
- intro-evolving/files/**: Points to the current directory path in the breadcrumb navigation.
- intro-evolving/files/exercises-evolving.tar**: Points to the selected file in the table.
- Not the object name**: Points to the file `exercises-evolving.tar` in the table, indicating that the full path is used for the object name.

Type	Name	Size	Modified at
<input type="checkbox"/>	exercises-evolving.tar	61.44 kB	18-11-2024 18:20:49
<input type="checkbox"/>	LUMI-BE-Intro-evolving-01-Architecture.pdf	6.44 MB	14-5-2024 10:27:55
<input type="checkbox"/>	LUMI-BE-Intro-evolving-02-CPE.pdf	1.91 MB	14-5-2024 10:27:44
<input type="checkbox"/>	LUMI-BE-Intro-evolving-03-Access.pdf	4.92 MB	14-5-2024 12:59:06
<input type="checkbox"/>	LUMI-BE-Intro-evolving-04-Modules.pdf	3.98 MB	25-10-2024 17:31:53
<input type="checkbox"/>	LUMI-BE-Intro-evolving-05-SoftwareStacks.pdf	2.59 MB	25-10-2024 17:33:19
<input type="checkbox"/>	LUMI-BE-Intro-evolving-06-Slurm.pdf	2.08 MB	10-7-2024 16:47:15
<input type="checkbox"/>	LUMI-BE-Intro-evolving-06-Support.pdf	2.29 MB	14-5-2024 10:26:17

CLI tool configuration on LUMI: lumio-conf

- On LUMI, you can use `lumio-conf` to configure `rclone`, `s3cmd`, `aws` and `boto3`
 - Need to load the `lumio` module which also provides `rclone`, `s3cmd` and `restic`
 - Will ask for data from the “Access key details” screen
 - Default is to create configurations for `rclone` and `s3cmd` .
Try `lumio-conf -h` to see other options.
- Generate the configuration snippets via the web interface
 - E.g., for `rclone`: copy manually to `~/.config/rclone/rclone.conf`
 - Can be used to configure tools on your computer also.

CLI tool configuration on LUMI: lumio-conf, rclone and s3cmd

- The `rclone` configuration contains two endpoints
 - `lumi-46YXXXXXX-private`: Private buckets and objects
 - `lumi-46YXXXXXX-public`: Public buckets and objects

Note that this was different with an earlier version of the tool

- The `s3cmd` config file can only contain data for one project.
Solution implemented by `lumio-conf`:
 - Store information for project `46YXXXXXX` in `~/.s3cfg-lumi-46YXXXXXX`
 - Also overwrite `~/.s3cfg` with the same data
 - So `s3cmd` will by default use the project from `~/.s3cfg` but if a user has active configurations for multiple projects, the `-c` flag can be used to point `s3cmd` to the right configuration file.

Bucket and object names

- Bucket name
 - Unique name within a project
 - Must be between 3 and 63 characters long, lowercase letters, numbers, hyphens and dots, must not contain uppercase characters or underscores
 - Must start with a lowercase letter or number
 - When dots are used, each part of the name that is separated by the dots, is also called a label (but there is also a different concept of label in Ceph).
- Object name
 - Unique within a bucket
 - Technically, any UTF-8 string between 1 and 1024 bytes, but client software might add more restrictions
 - Common practice is to implement a folder-like structure using slashes in the name.
 - But creating the folder view is expensive: List all objects in a bucket and sort

Policies and ACLs

- Access control is managed through bucket policies and bucket and object access control lists (ACLs)
- Policies is a very powerful but also hard to use mechanism
 - Some information in [the “Advanced usage of LUMI-O” section of the docs](#)
 - And there is also [information in the Ceph manual](#)
 - Can be managed through `s3cmd`
- ACLs apply to individual buckets and objects
 - Can only add rights
 - Useful to make a bucket or object public, or give access to another project, but this is done to individual objects (unless applied recursively)
 - This is what rclone uses when uploading to the public or private end points in the configurations created with the various tools for LUMI-O

Policies and ACLs

Examples

- Make a bucket and all objects in it public or private

```
s3cmd setacl --recursive --acl-public s3://bucket/
s3cmd setacl --recursive --acl-private s3://bucket/
```
- Grant or revoke read rights to a bucket, e.g., 46YXXXXXX giving rights to 46BAAAAAA:

```
s3cmd -c ~/.s3cfg-lumi-46YXXXXXX \
    setacl --acl-grant='read:46BAAAAAA$46BAAAAAA' s3://bucket
s3cmd -c ~/.s3cfg-lumi-46YXXXXXX \
    setacl --acl-revoke='read:46BAAAAAA$46BAAAAAA' s3://bucket
```

 - Note the use of single quotes to make sure that `$46BAAAAAA` is not interpreted as a variable name!
 - And similarly to objects
- Check the ACL and other information of a bucket or object

```
s3cmd info s3://2day-20251020
s3cmd info s3://2day-20251020/img/LUMI-2day-20251020-204-ObjectStorage/Title.png
```

Sharing data

- Public buckets and objects can be read by anyone in the world, even simply via a web browser.
- It is possible to grant specific projects access to buckets and objects.
 - See the previous slide for setting ACLs
 - Access: e.g., project "46BAAAAAA" can list a bucket from project "46YXXXXXX" (assuming the latter has given sufficient rights to the former) with:

```
s3cmd -c ~/.s3cfg-lumi-46BAAAAAA ls s3://46YXXXXXX:bucket/  
s3cmd -c ~/.s3cfg-lumi-46BAAAAAA ls --recursive s3://46YXXXXXX:bucket/  
rclone ls lumi-46BAAAAAA-private:"46YXXXXXX:bucket"
```
- Presigned URLs: Next slide
- Invite the other to the project
 - But it is not possible to add a user who came in via puhuri to a 462-project

Sharing data: Presigned URLs

- Can be generated using `rclone`
- Access to anyone who gets the link without further authentication, for the validity period of the link
- Presigned URLs depend on the authentication key that was used to create them.
 - Link expires when the key expires or is revoked, even if the validity period of the link has not expired.
 - Maximum lifespan of a link is limited to 7 days on LUMI-O.
- Create: with `rclone link`:
`rclone link lumi-46YXXXXXX-private:bucket/object`
`rclone link --expire 2d lumi-46YXXXXXX-private:bucket/object`

Some tips & tricks

- When using the `rclone` command line tool, it is possible to throttle the speed for many commands with the `--bwlimit` command line option
 - May be needed if you upload from home over a very bandwidth-limited connection
- Sharing data from project A with project B does not protect the data from being deleted when project A ends, even if project B is still valid.
 - End of project: 90-days grace period, ~~data read-only~~
 - End of grace period: Data queued for deletion

Questions?

