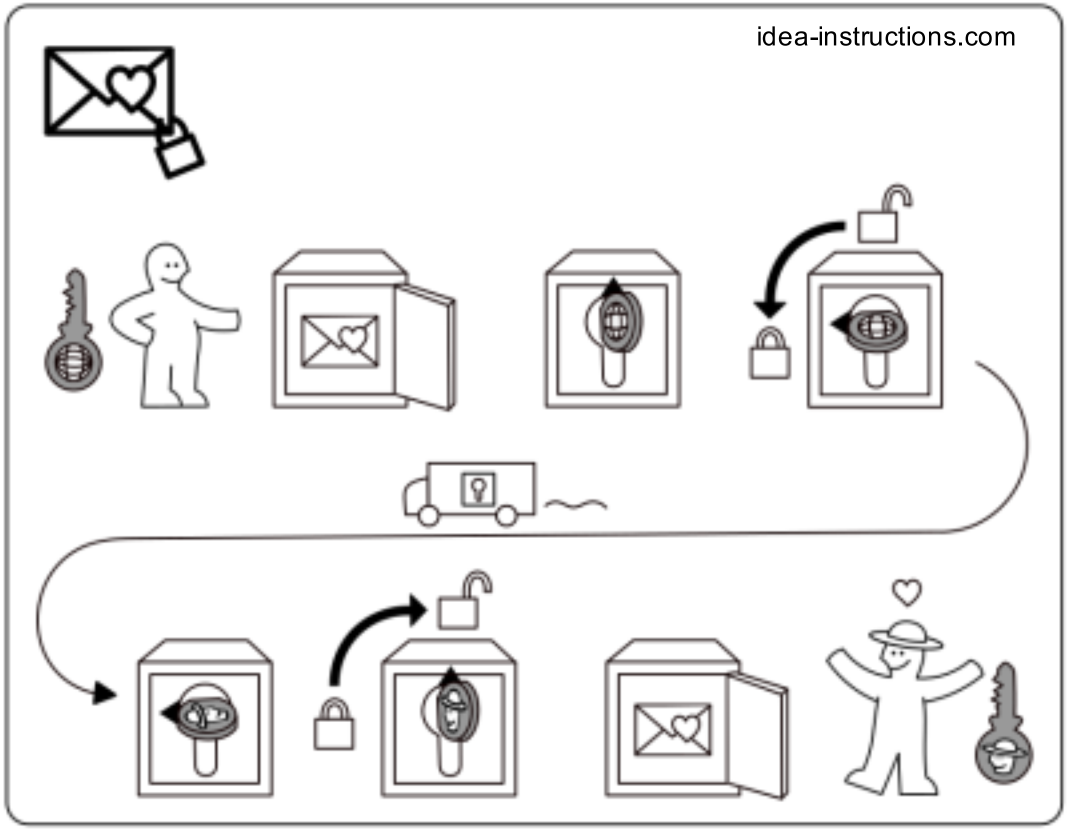
dCache & WebDAV

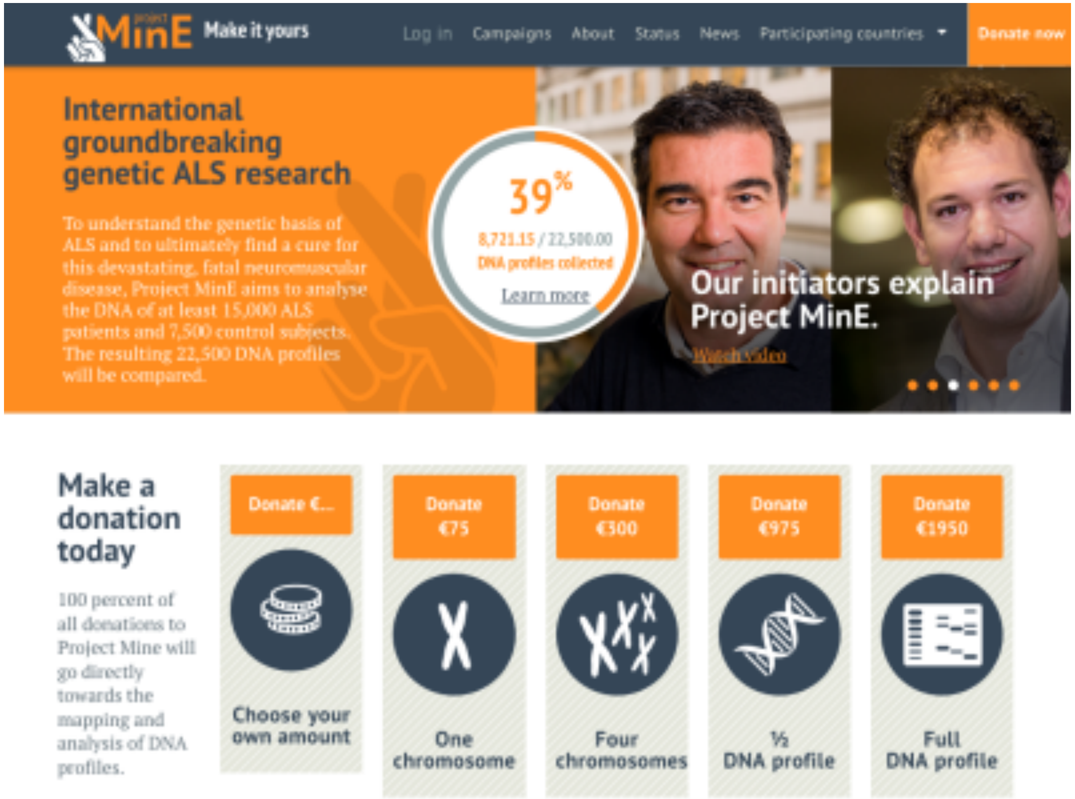


Onno Zweers (with input from Paul & Tigran)
dCache workshop Hamburg 2018-05-28..29 - v1.1

ALS Project MinE

project MinE
Make it yours

Searching for the genes
that cause ALS
(motor neurone disease)



International groundbreaking genetic ALS research

To understand the genetic basis of ALS and to ultimately find a cure for this devastating, fatal neuromuscular disease, Project MinE aims to analyse the DNA of at least 15,000 ALS patients and 7,500 control subjects. The resulting 22,500 DNA profiles will be compared.

39%
8,721.15 / 22,500.00
DNA profiles collected
Learn more

Our initiators explain Project MinE.
Watch video

Make a donation today

100 percent of all donations to Project Mine will go directly towards the mapping and analysis of DNA profiles.

https://www.projectmine.com/

Project MinE

- Collects DNA scans from 19 countries
- Each country has different Grid certificate procedure
  - Some countries don't (Australia)
  - Huge threshold
- Medical data transfers need encryption
  - dCache GridFTP does not support data channel encryption (yet)
  - \`globus-url-copy -dcpriv\` to dCache *appears* to encrypt data while in fact it doesn't! https://github.com/globus/globus-toolkit/issues/121

Requirements for uploading data

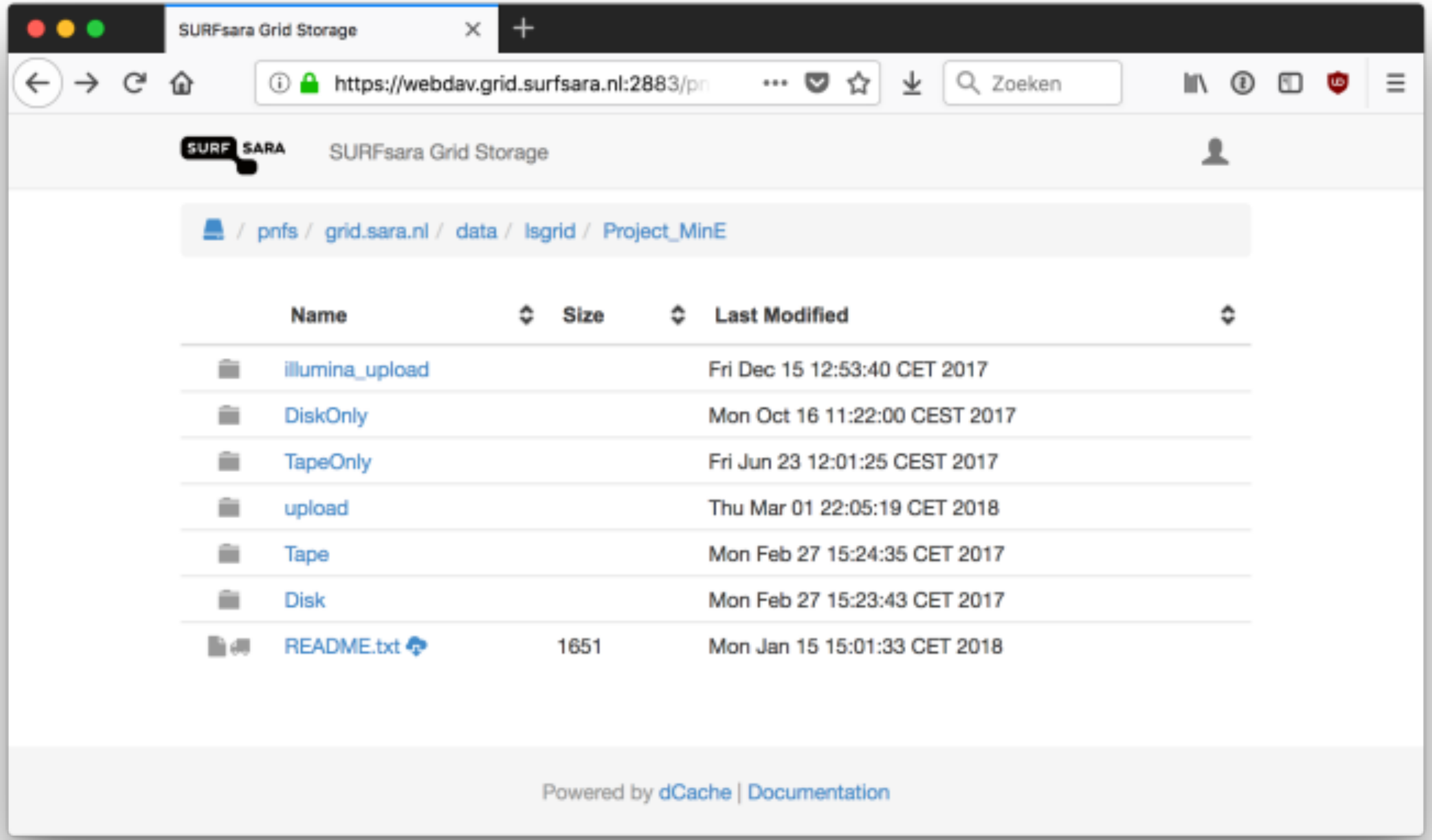
- Simple authentication
  - No X509
- Easy client installation
  - No root CA certs, fetch-crl
- Encrypted data transfers
  - No dCache GridFTP

WebDAV

- Authentications
  - X509
  - Username/password
- Can use port 443, bypassing firewall misery
- Redirects (to HTTP)
  - On: load balancing, but unencrypted
  - Off: TLS data encryption
- webdav.grid.surfsara.nl DNS round robin

Clients

- web browsers (read only)
- wget (read only)
- curl
- Cyberduck
- Rclone (no x509 auth)
- FTS (third party file transfers)
- gfal* CLI and Python lib
- WebDAV Nav+ app for iPhone
- … many more



https://webdav.grid.surfsara.nl:2883/pn

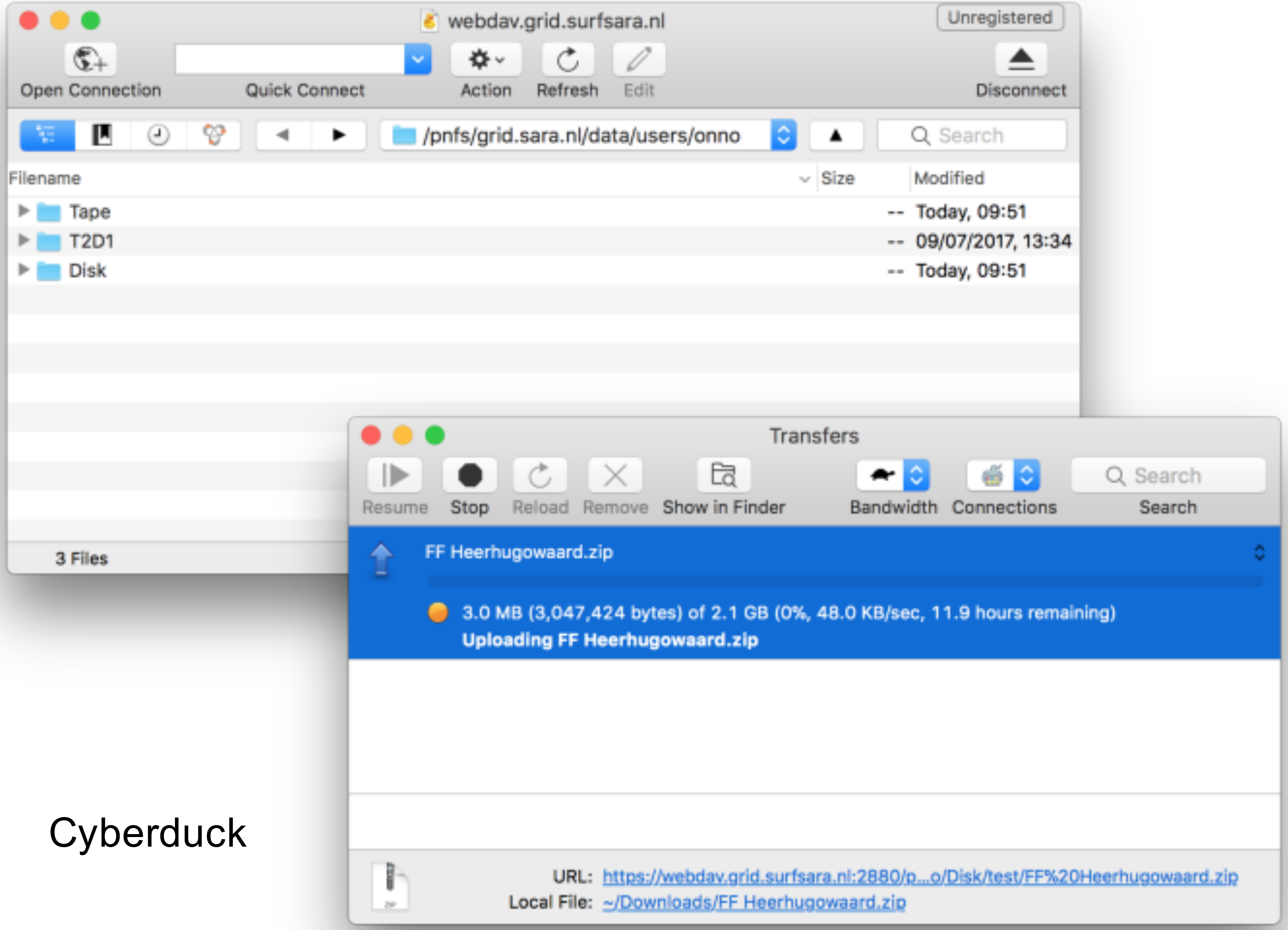
SURFsara Grid Storage

/ pnfs / grid.sara.nl / data / lsgrid / Project_MinE

Name	Size	Last Modified
illumina_upload		Fri Dec 15 12:53:40 CET 2017
DiskOnly		Mon Oct 16 11:22:00 CEST 2017
TapeOnly		Fri Jun 23 12:01:25 CEST 2017
upload		Thu Mar 01 22:05:19 CET 2018
Tape		Mon Feb 27 15:24:35 CET 2017
Disk		Mon Feb 27 15:23:43 CET 2017
README.txt	1651	Mon Jan 15 15:01:33 CET 2018

Powered by dCache | Documentation

Firefox



/pnfs/grid.sara.nl/data/users/onno

Filename	Size	Modified
Tape	--	Today, 09:51
T2D1	--	09/07/2017, 13:34
Disk	--	Today, 09:51

3 Files

FF Heerhugowaard.zip

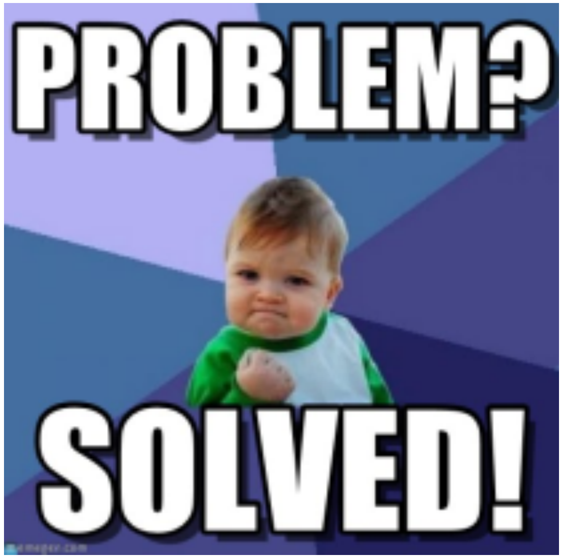
3.0 MB (3,047,424 bytes) of 2.1 GB (0%, 48.0 KB/sec, 11.9 hours remaining)
Uploading FF Heerhugowaard.zip

URL: https://webdav.grid.surfsara.nl:2880/p...o/Disk/test/FF%20Heerhugowaard.zip
Local File: ~/Downloads/FF Heerhugowaard.zip

Cyberduck

It works!

- Installing rclone, configuring it, uploading test files: all in 7 minutes
- 6 TB uploaded from McGill university, Canada (cross Atlantic over public internet)



But wait...

Challenges

- Certificates & DNS round robin
- Certificate chain
- Cipher hardening
- Abandon 1 project -> 1 account mapping
- View locality
- View checksums
- Stage files through webdav?

Certificate & DNS round robin

- webdav.grid.surfsara.nl is DNS round robin to 64 hosts
    - Simple load balancing
    - Why?
        - dCache WebDAV redirects to HTTP, not HTTPS!
          So we use non-redirecting doors.
          No load balancing there.
- Host guppy1.grid.surfsara.nl != DNS name webdav.grid.surfsara.nl
- Each host cert has webdav.grid.surfsara.nl in subjectAltNames
    - DNS name always matches certificate

Certificate chain

- Installing CA root certs & fetch-crl difficult for users
- Our host certs chain:
  - DigiCert Assured ID Root CA
  - ↳ Terena eScience SSL CA 3
  - ↳ webdav.grid.surfsara.nl
- Terena is not in browsers & distros.
- But DigiCert is!
- We provide host cert + intermediate cert.
- All clients trust our webdav!
- How set up? See next slide...

Build certificate chain

```
echo "Composing chain file /etc/grid-security/chain.pem..."
cd /etc/grid-security
issuer_dn=$(openssl x509 -in hostcert.pem -noout -issuer | sed -e 's/issuer= //')
issuer_infofile=$(grep -l "subjectdn = .$issuer_dn" certificates/*.info)
issuer_pem=$(sed -e 's/\.info$/.pem/' <<< "$issuer_infofile")
cat $issuer_pem  hostcert.pem > chain.pem
```

dCache config

```
webdav.authn.hostcert.cert=/etc/grid-security/chain.pem
```

Cipher hardening

- java.security
- dcache.conf
- layout file

java.security

- Java version 8
- Disable 3DES (= DESede in Java)

```
[root@door1  ~]# grep  -A 1 '^jdk.tls.disabledAlgorithms'   /usr/lib/jvm/jre/lib/security/java.security
jdk.tls.disabledAlgorithms=SSLv3,  DES, DESede, RC4, MD5withRSA,  DH keySize < 768, \
              EC keySize < 224
```

dcache.conf

dcache.authn.ciphers

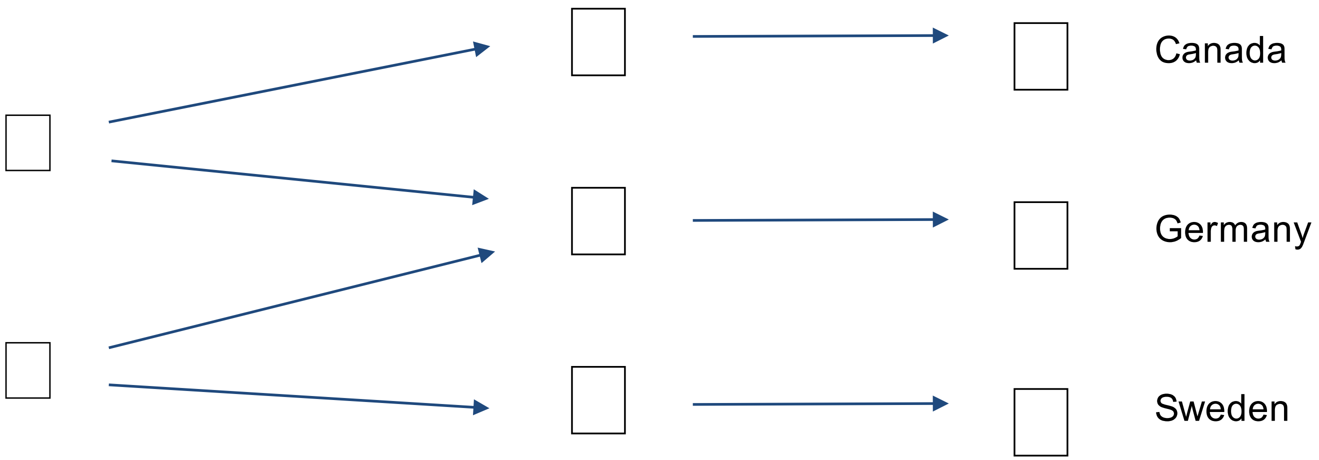
- DISABLE_EC
  - Remove this to have Perfect Forward Secrecy, but test it first!
- DISABLE_RC4
  - RC4 unsafe, so you want this.

layout file

```
[webdav2880-${host.name}Domain]
[webdav2880-${host.name}Domain/webdav]
webdav.cell.name=webdav2880-${host.name}
# Disable redirects because they send client to HTTP, not HTTPS!
webdav.redirect.on-read=false
webdav.redirect.on-write=false
# Username/password auth
webdav.authn.basic=true
webdav.authn.protocol=https
webdav.net.port=2880

# Also interesting:
webdav.authn.accept-client-cert = true
```

Abandon 1 project -> 1 account mapping

- Most projects have FQAN to UID mapping: /vo/group/Role=*/Capability=* -> one single username
- WebDAV & username/password auth
  - each user must have his own username!
- Project MinE needed that anyway
  - Any user can be in a unique combination of multiple groups
  - Each group provides access to one country's data
    - Needed ACLs for permission inheritance
  - 18 countries -> 18 groups
    - NFS has a limit of 16 groups



Locality & checksums

With CURL, you can get both the locality and the checksum of a file through WebDAV.

Examples:
http://doc.grid.surfsara.nl/en/latest/Pages/Advanced/storage_clients/webdav.html#querying-file-properties

Thanks Paul!

Pre-staging with WebDAV

Theoretically possible with a dirty trick:
Use `curl --range` to read only 1 byte.

Alternatives:

- NFS https://github.com/dCache/dcache/wiki/NFS-Dot-Commands
- srm-bring-online, gfal

Security testing

Testing with nmap

```
onno$ ~/nmap/bin/nmap --script ssl-enum-ciphers -p 2880 -P0 webdav.grid.surfsara.nl
...
PORT     STATE SERVICE
2880/tcp open  https
| ssl-enum-ciphers:
|   TLSv1.0:
|     ciphers:
|       TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (secp256r1) - A
|       TLS_RSA_WITH_AES_256_CBC_SHA (rsa 2048) - A
|       TLS_DHE_RSA_WITH_AES_256_CBC_SHA (dh 2048) - A
|       TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA (secp256r1) - A
|       TLS_RSA_WITH_AES_128_CBC_SHA (rsa 2048) - A
|       TLS_DHE_RSA_WITH_AES_128_CBC_SHA (dh 2048) - A
|     compressors:
|       NULL
|     cipher preference: server
|   TLSv1.1:
|     ciphers:
|       TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (secp256r1) - A
….
```

Testing with Wireshark

- yum install wireshark wireshark-gnome
- If you don't use port 443, tell Wireshark it's an SSL connection (Analysis -> Decode as); you'll get full TLS analysis.
- In my rclone test, I found that TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA was used. That's good: it provides Forward Secrecy. Still trying to improve it though.
- Search for "client hello" to see which ciphers the client supports.

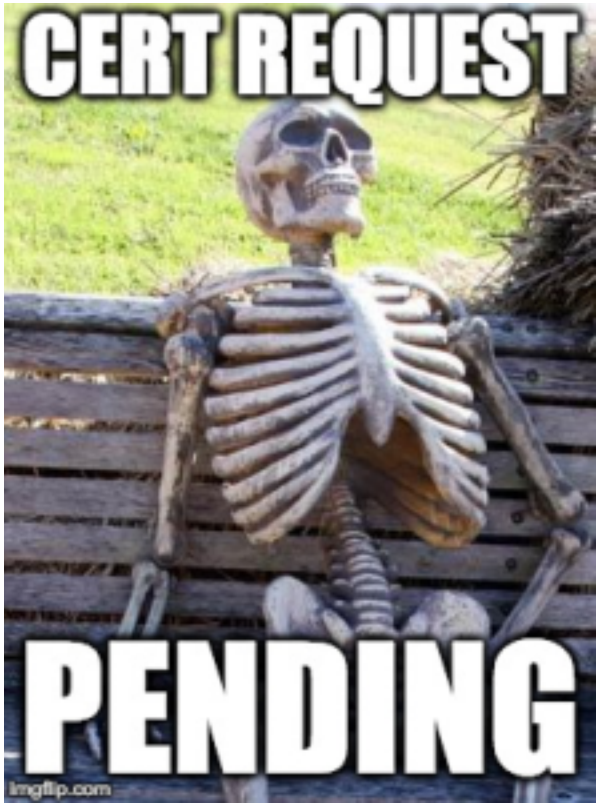
Testing with Greenbone/OpenVAS

- http://www.openvas.org/
- Score 2.6 (Low), good

Testing with Qualys SSLtest

- https://www.ssllabs.com/ssltest/analyze.html?d=guppy1.grid.surfsara.nl&s=145.100.33.67&latest
- Grade B
  - Because unable to enforce Forward Secrecy
    - Java 8 thingy

RCauth - proxies without certificates



Onno Zweers
dCache workshop Hamburg 2018-05-28..29 - v1

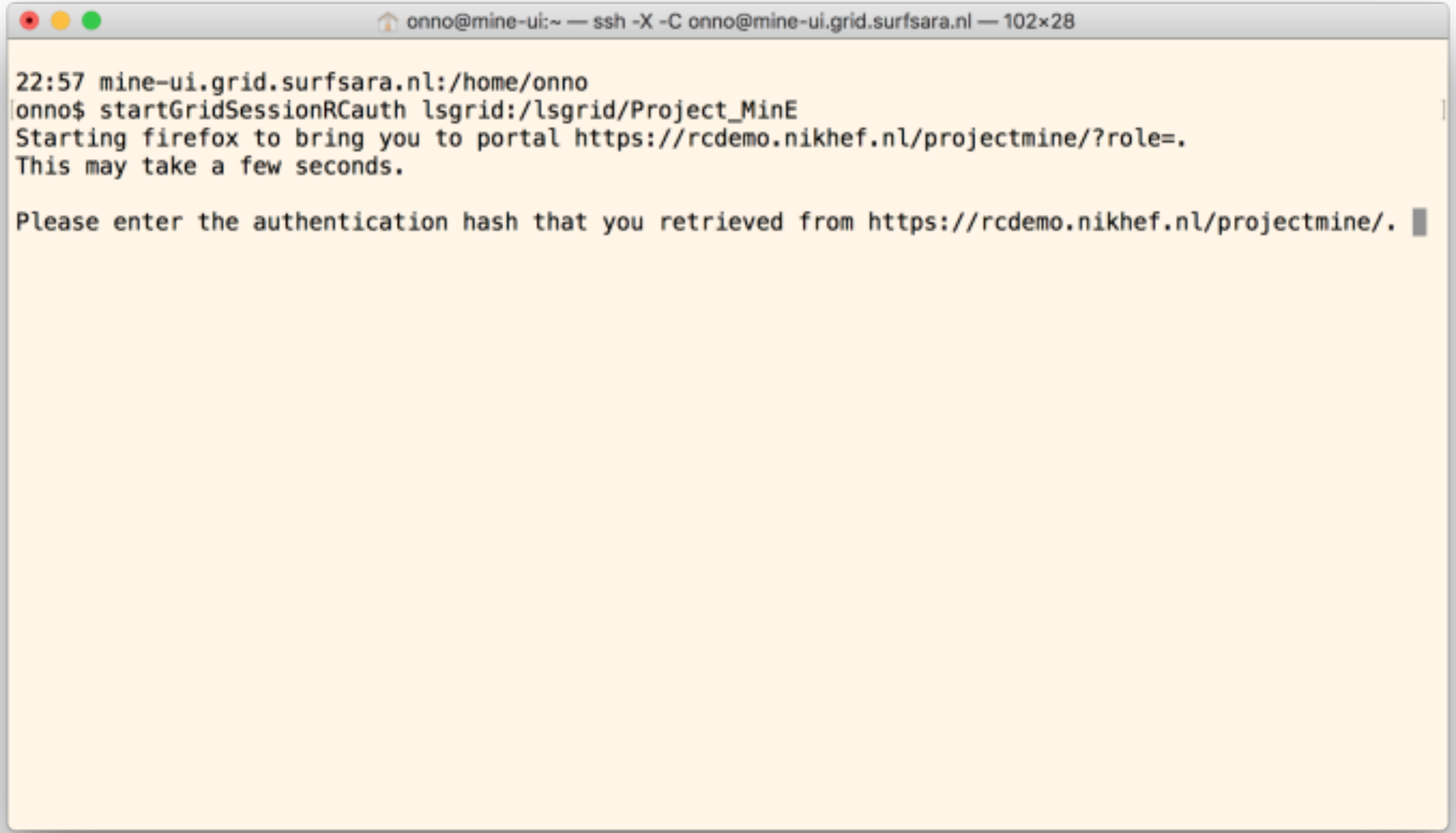
Project MinE

- 19 countries, 19 procedures to get certificate
- Uploading/downloading => WebDAV
- Processing => ?

RCauth

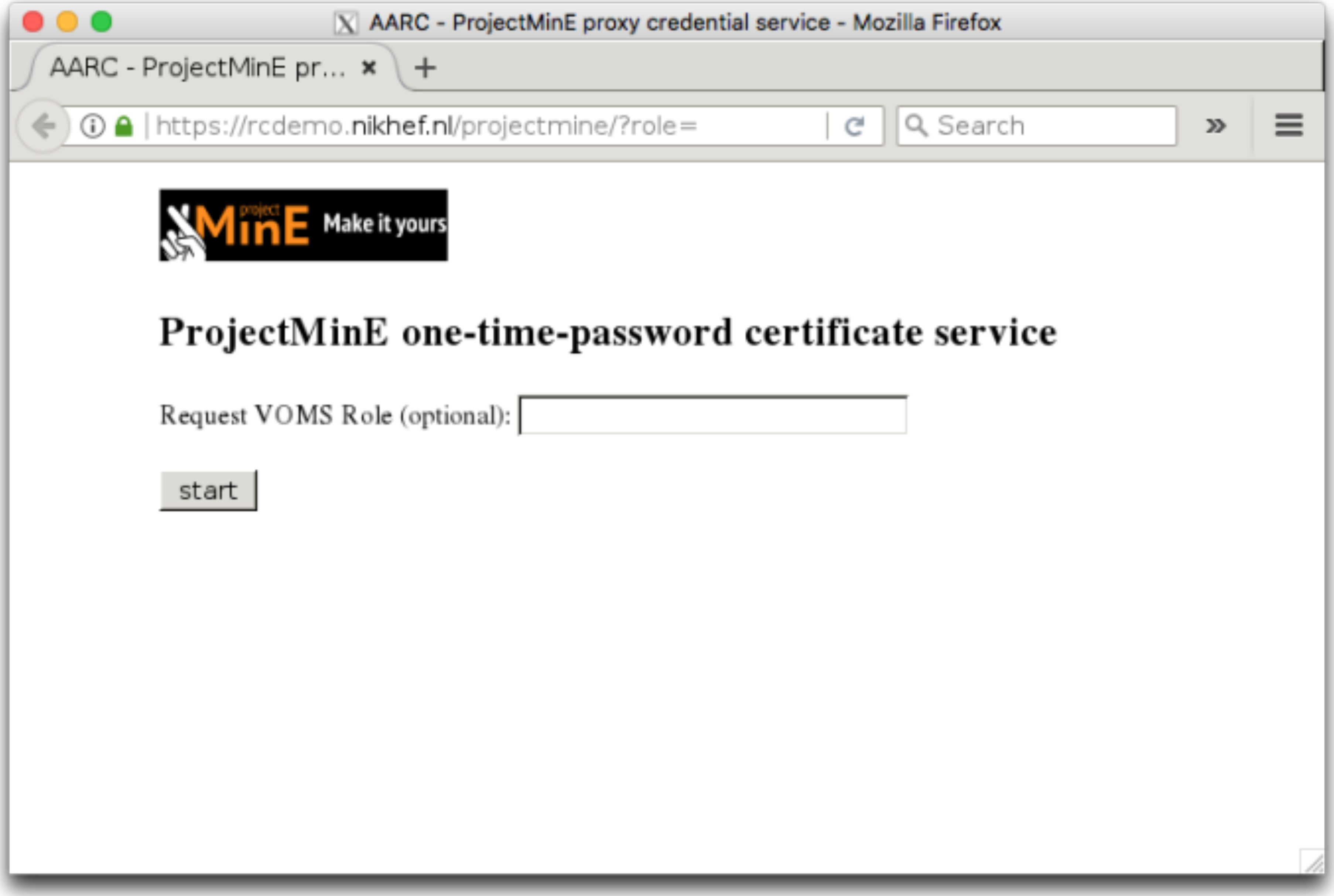
- Provides a grid proxy based on username & password instead of grid certificate
- AARC (Authentication and Authorisation for Research and Collaboration) project
- https://rcauth.eu/
- Operated by Nikhef, our neighbours at Amsterdam Science Park & Tier 1 partners

So, how does it work?



onno@mine-ui:~ — ssh -X -C onno@mine-ui.grid.surfsara.nl — 102×28

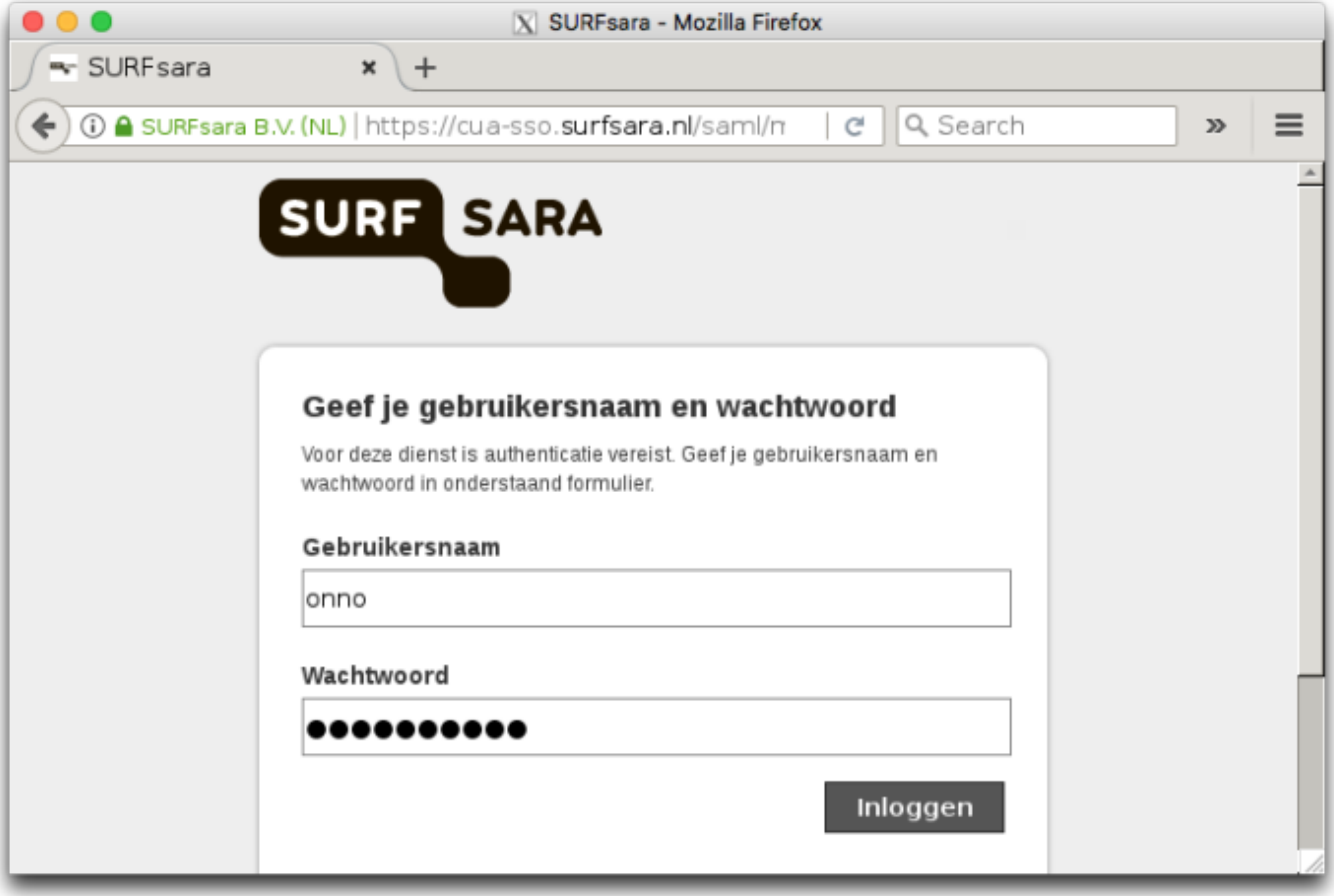
```
22:57 mine-ui.grid.surfsara.nl:/home/onno
onno$ startGridSessionRCauth lsgrid:/lsgrid/Project_MinE
Starting firefox to bring you to portal https://rcdemo.nikhef.nl/projectmine/?role=.
This may take a few seconds.

Please enter the authentication hash that you retrieved from https://rcdemo.nikhef.nl/projectmine/.
```



AARC - ProjectMinE proxy credential service - Mozilla Firefox
AARC - ProjectMinE pr…
https://rcdemo.nikhef.nl/projectmine/?role=
Search
project MinE Make it yours

ProjectMinE one-time-password certificate service

Request VOMS Role (optional):



SURFsara - Mozilla Firefox
SURFsara
SURFsara B.V. (NL) | https://cua-sso.surfsara.nl/saml/n
Search
SURF SARA

Geef je gebruikersnaam en wachtwoord

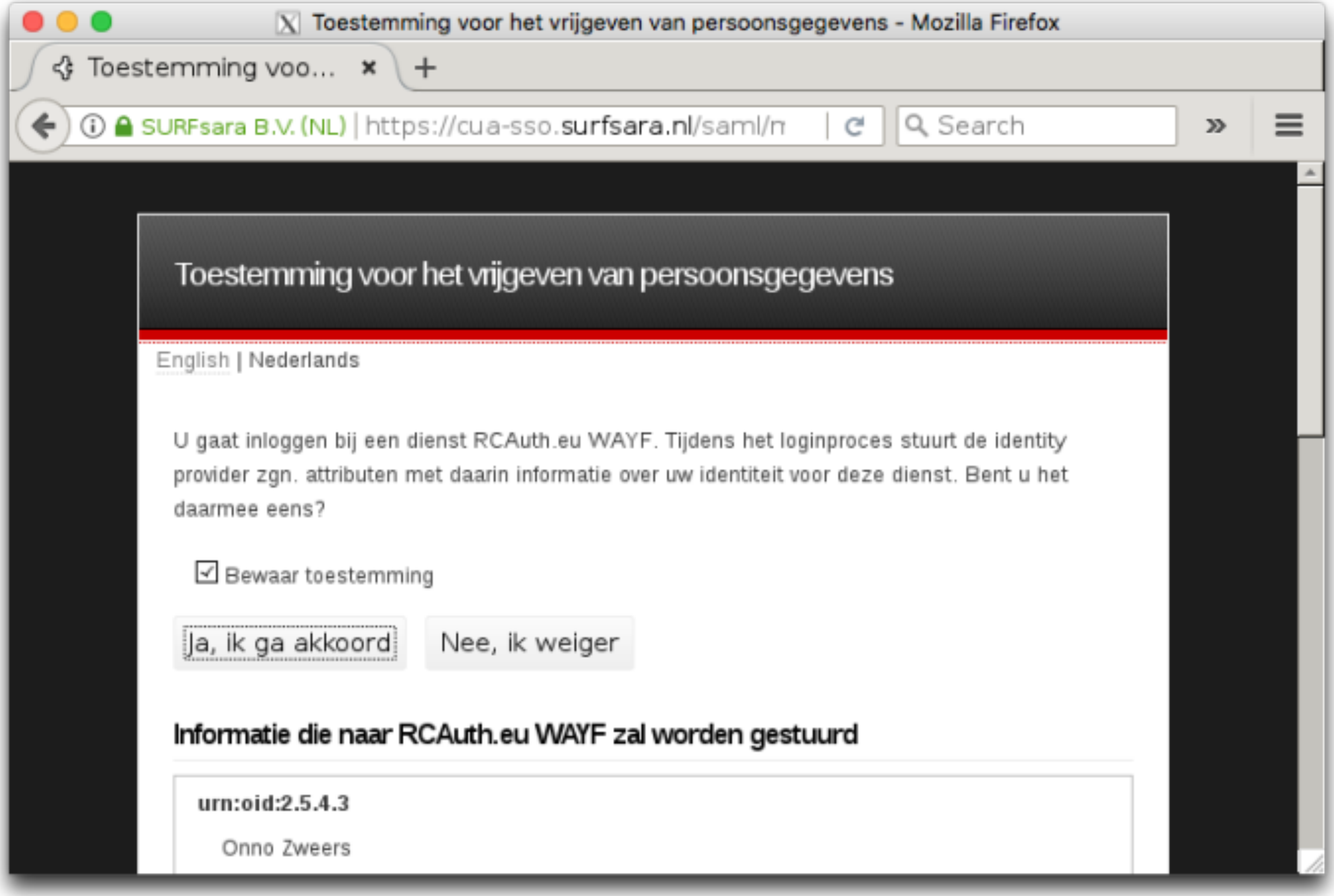
Voor deze dienst is authenticatie vereist. Geef je gebruikersnaam en wachtwoord in onderstaand formulier.

Gebruikersnaam

onno

Wachtwoord

●●●●●●●●●●



Toestemming voor het vrijgeven van persoonsgegevens - Mozilla Firefox
Toestemming voo...
SURFsara B.V. (NL) | https://cua-sso.surfsara.nl/saml/m
Search

Toestemming voor het vrijgeven van persoonsgegevens

English | Nederlands

U gaat inloggen bij een dienst RCAuth.eu WAYF. Tijdens het loginproces stuurt de identity provider zgn. attributen met daarin informatie over uw identiteit voor deze dienst. Bent u het daarmee eens?

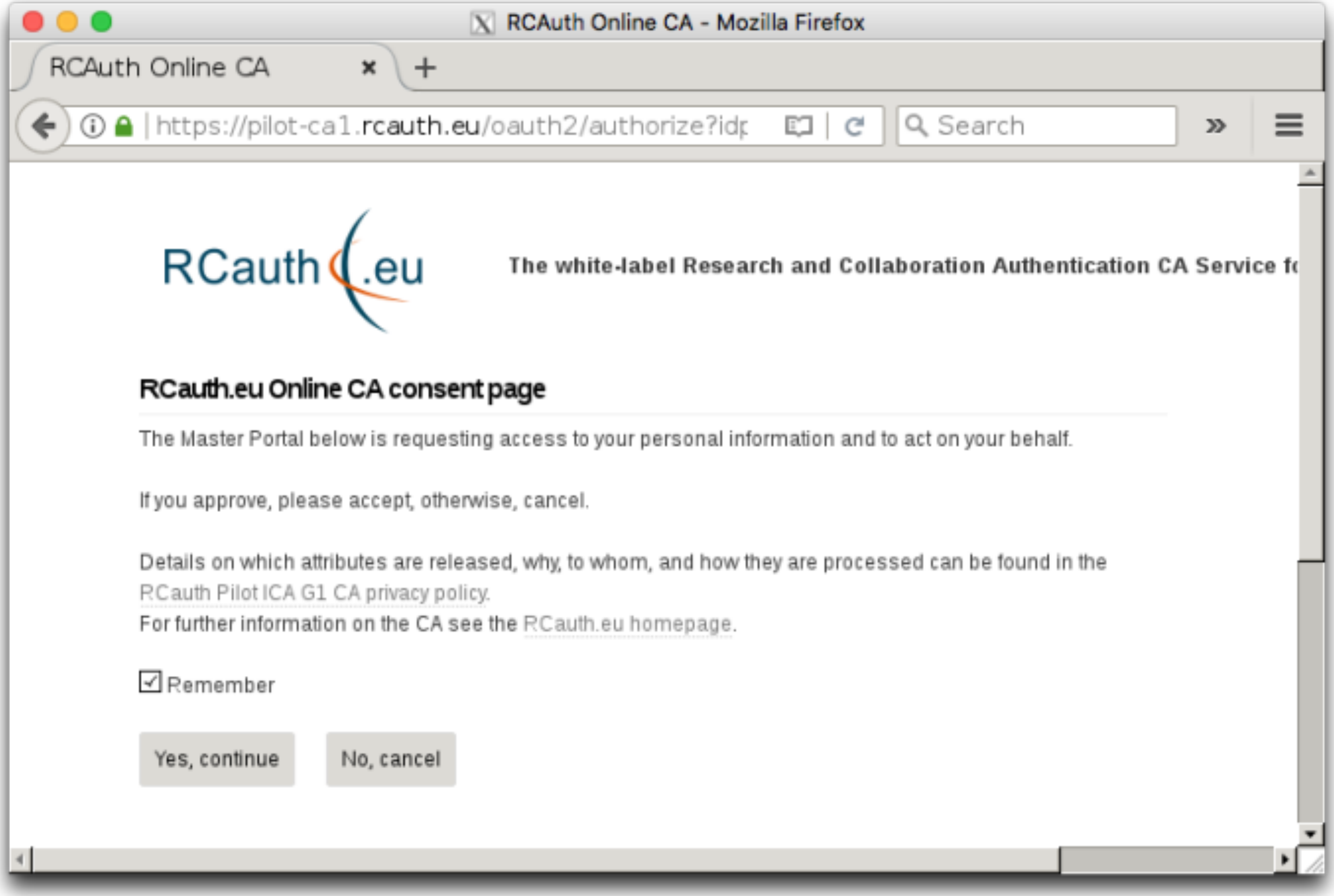
☑ Bewaar toestemming

Ja, ik ga akkoord
Nee, ik weiger

Informatie die naar RCAuth.eu WAYF zal worden gestuurd

urn:oid:2.5.4.3

Onno Zweers


RCAuth Online CA - Mozilla Firefox
RCAuth Online CA
https://pilot-ca1.rcauth.eu/oauth2/authorize?idp
Search
RCauth.eu

The white-label Research and Collaboration Authentication CA Service fo

RCauth.eu Online CA consent page

The Master Portal below is requesting access to your personal information and to act on your behalf.

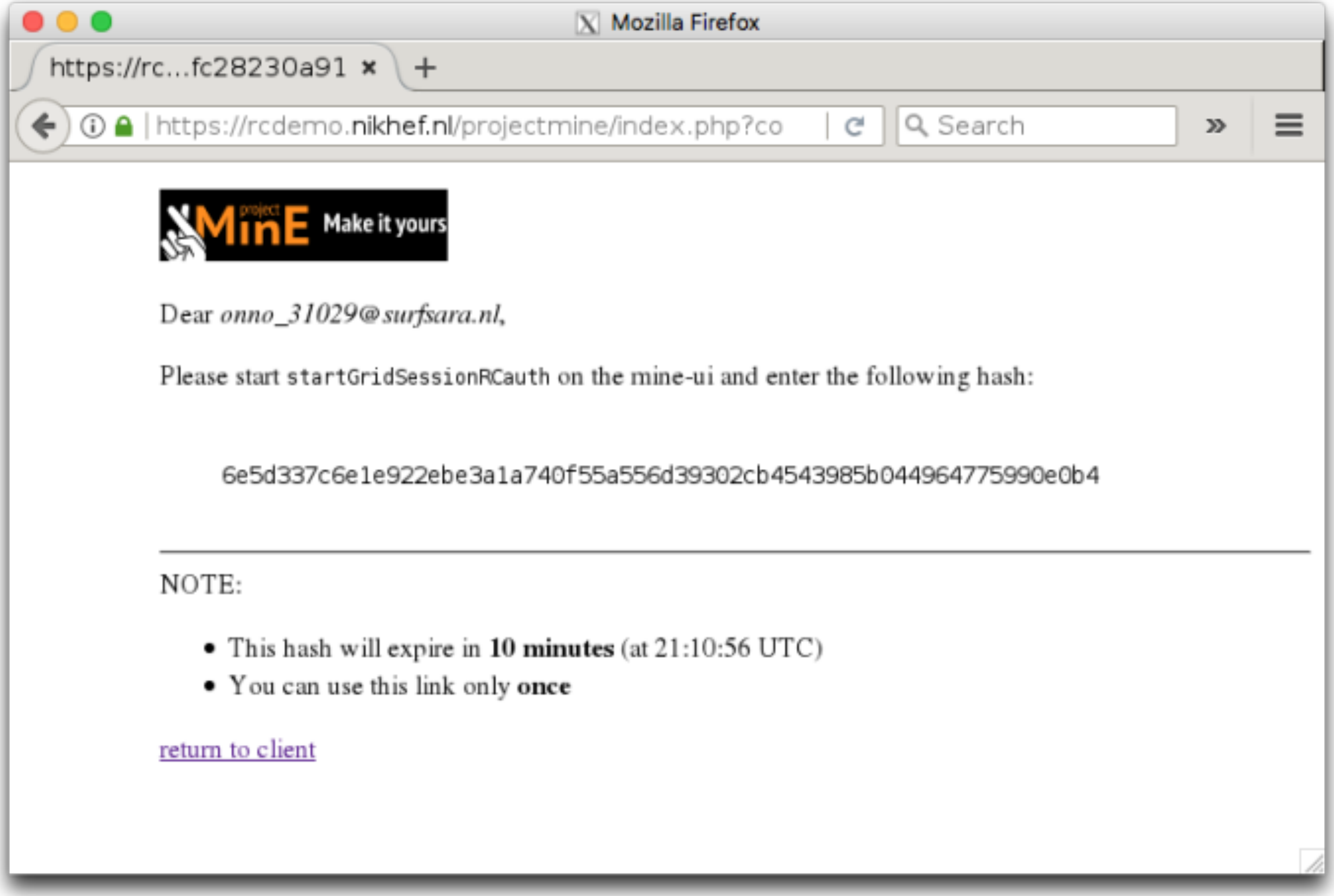
If you approve, please accept, otherwise, cancel.

Details on which attributes are released, why, to whom, and how they are processed can be found in the RCauth Pilot ICA G1 CA privacy policy.
For further information on the CA see the RCauth.eu homepage.

☑ Remember

Yes, continue

No, cancel



Mozilla Firefox
https://rc...fc28230a91
https://rcdemo.nikhef.nl/projectmine/index.php?co
Search
project MinE Make it yours

Dear *onno_31029@surfsara.nl*,

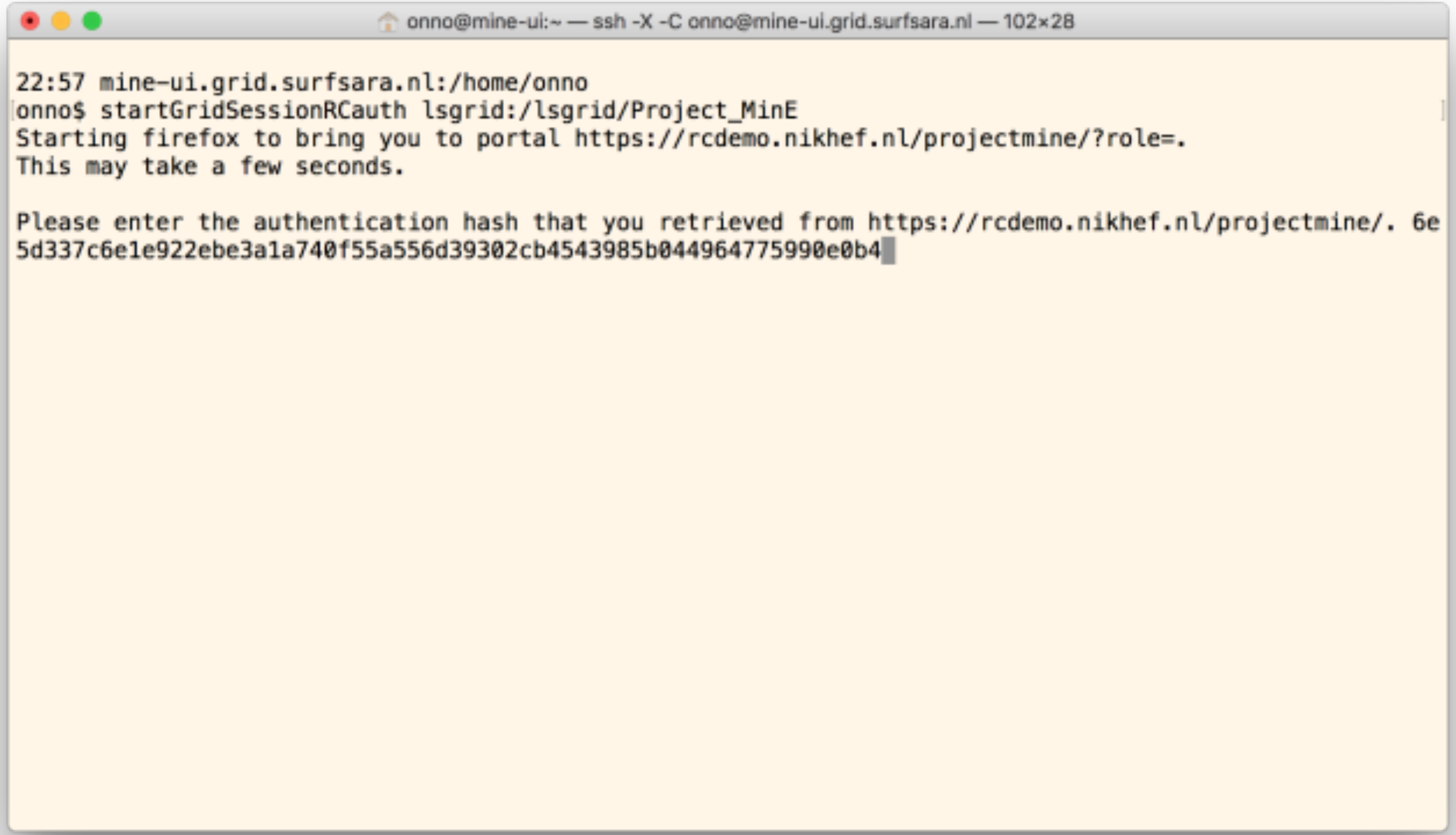
Please start `startGridSessionRCauth` on the mine-ui and enter the following hash:

```
6e5d337c6e1e922ebe3a1a740f55a556d39302cb4543985b044964775990e0b4
```

NOTE:

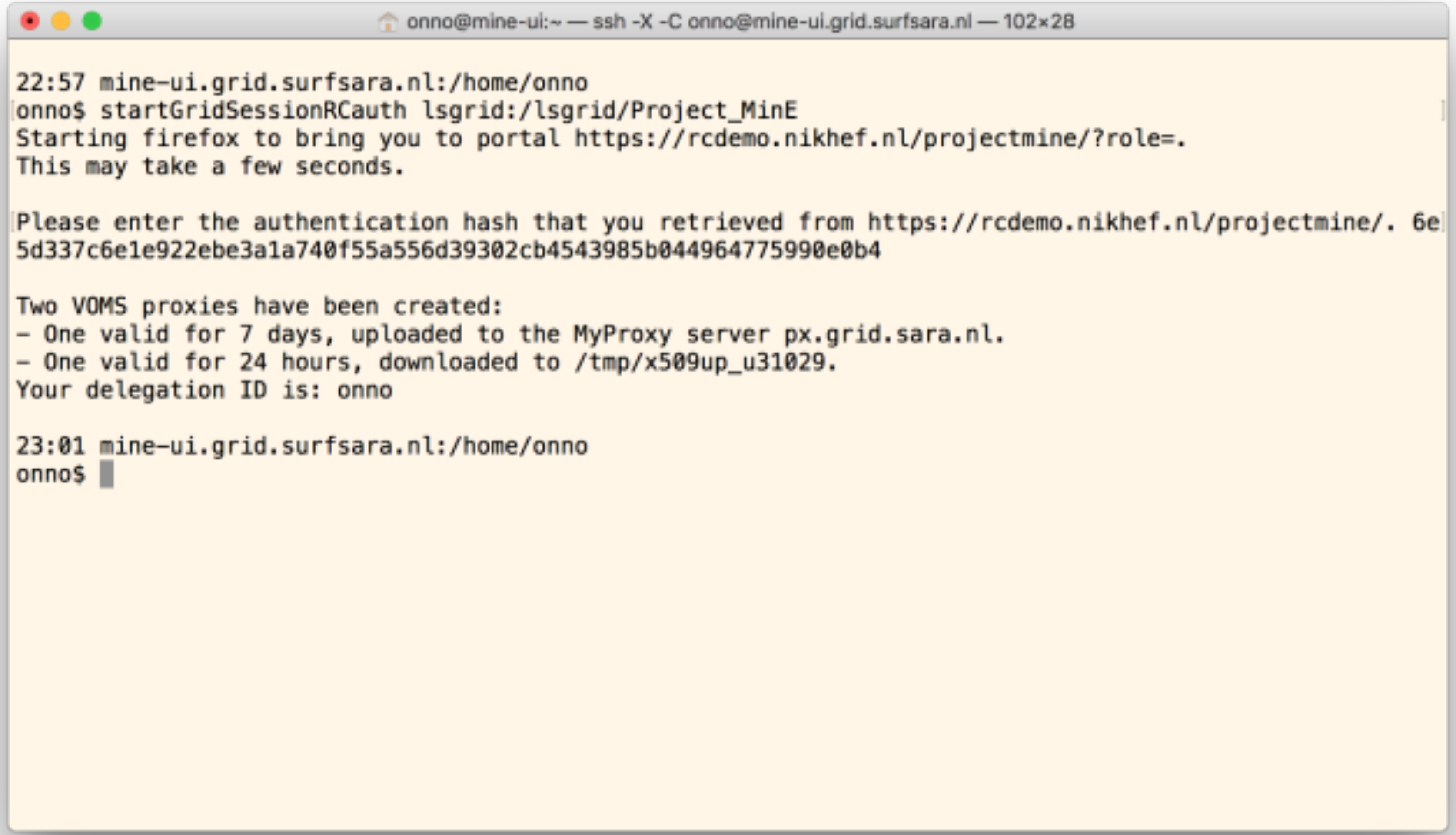
- This hash will expire in **10 minutes** (at 21:10:56 UTC)
- You can use this link only **once**

return to client



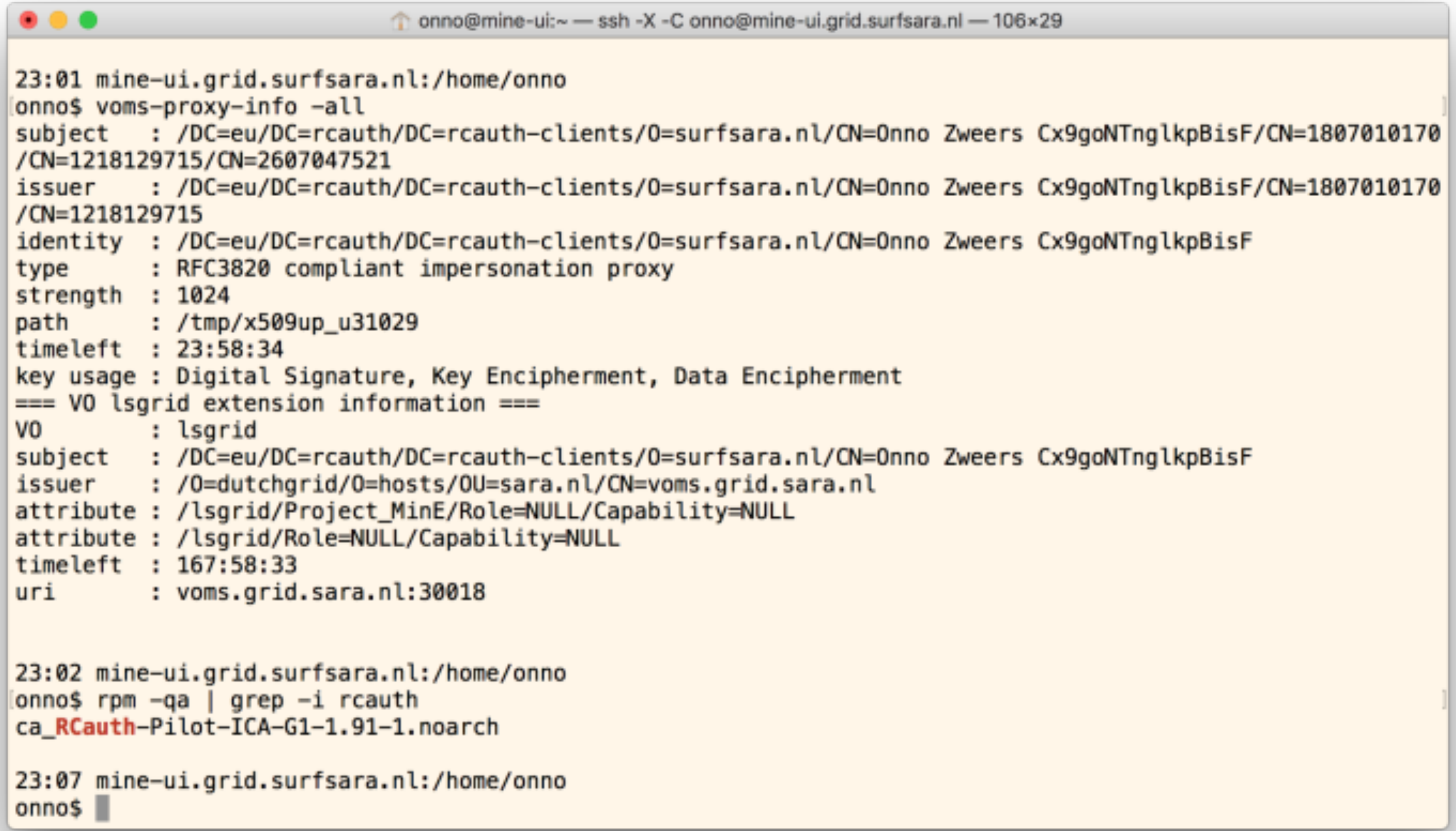
onno@mine-ui:~ — ssh -X -C onno@mine-ui.grid.surfsara.nl — 102×28

```
22:57 mine-ui.grid.surfsara.nl:/home/onno
onno$ startGridSessionRCauth lsgrid:/lsgrid/Project_MinE
Starting firefox to bring you to portal https://rcdemo.nikhef.nl/projectmine/?role=.
This may take a few seconds.

Please enter the authentication hash that you retrieved from https://rcdemo.nikhef.nl/projectmine/. 6e
5d337c6e1e922ebe3a1a740f55a556d39302cb4543985b044964775990e0b4
```



onno@mine-ui:~ — ssh -X -C onno@mine-ui.grid.surfsara.nl — 102×28

```
22:57 mine-ui.grid.surfsara.nl:/home/onno
onno$ startGridSessionRCauth lsgrid:/lsgrid/Project_MinE
Starting firefox to bring you to portal https://rcdemo.nikhef.nl/projectmine/?role=.
This may take a few seconds.

Please enter the authentication hash that you retrieved from https://rcdemo.nikhef.nl/projectmine/. 6e
5d337c6e1e922ebe3a1a740f55a556d39302cb4543985b044964775990e0b4

Two VOMS proxies have been created:
- One valid for 7 days, uploaded to the MyProxy server px.grid.sara.nl.
- One valid for 24 hours, downloaded to /tmp/x509up_u31029.
Your delegation ID is: onno

23:01 mine-ui.grid.surfsara.nl:/home/onno
onno$ 
```


onno@mine-ui:~ — ssh -X -C onno@mine-ui.grid.surfsara.nl — 106×29

```
23:01 mine-ui.grid.surfsara.nl:/home/onno
onno$ voms-proxy-info -all
subject   : /DC=eu/DC=rcauth/DC=rcauth-clients/O=surfsara.nl/CN=Onno Zweers Cx9goNTnglkpBisF/CN=1807010170
/CN=1218129715/CN=2607047521
issuer    : /DC=eu/DC=rcauth/DC=rcauth-clients/O=surfsara.nl/CN=Onno Zweers Cx9goNTnglkpBisF/CN=1807010170
/CN=1218129715
identity  : /DC=eu/DC=rcauth/DC=rcauth-clients/O=surfsara.nl/CN=Onno Zweers Cx9goNTnglkpBisF
type      : RFC3820 compliant impersonation proxy
strength  : 1024
path      : /tmp/x509up_u31029
timeleft  : 23:58:34
key usage : Digital Signature, Key Encipherment, Data Encipherment
=== VO lsgrid extension information ===
VO        : lsgrid
subject   : /DC=eu/DC=rcauth/DC=rcauth-clients/O=surfsara.nl/CN=Onno Zweers Cx9goNTnglkpBisF
issuer    : /O=dutchgrid/O=hosts/OU=sara.nl/CN=voms.grid.sara.nl
attribute : /lsgrid/Project_MinE/Role=NULL/Capability=NULL
attribute : /lsgrid/Role=NULL/Capability=NULL
timeleft  : 167:58:33
uri       : voms.grid.sara.nl:30018


23:02 mine-ui.grid.surfsara.nl:/home/onno
onno$ rpm -qa | grep -i rcauth
ca_RCauth-Pilot-ICA-G1-1.91-1.noarch

23:07 mine-ui.grid.surfsara.nl:/home/onno
onno$ 
```

More info:

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Questions?