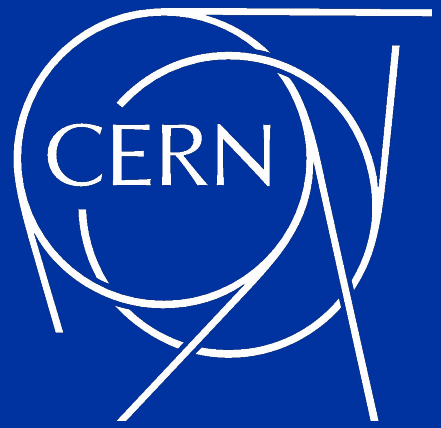

XrdHttp and XrdHttpTPC
The 12-Month Diff

Presented by Cedric Caffy

XRootD workshop 2026 - 2026-09-18

Outline

- A new use-case from LHCb: web-browser friendly access to EOS
  - CORS plugin
  - XRootD HTTP Proxy setup
- WLCG HTTP Third Party Copy data integrity check
- Out-Of-Memory kill on XRootD EOS+CTA clusters after the end of Run 3

Use-case

Web-browser based physics analysis interactive view (JSROOT)

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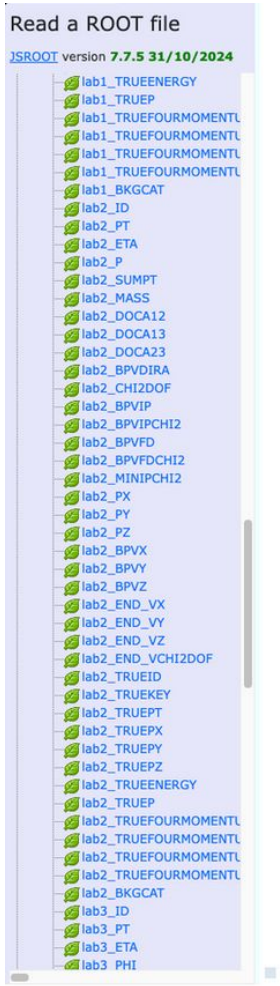
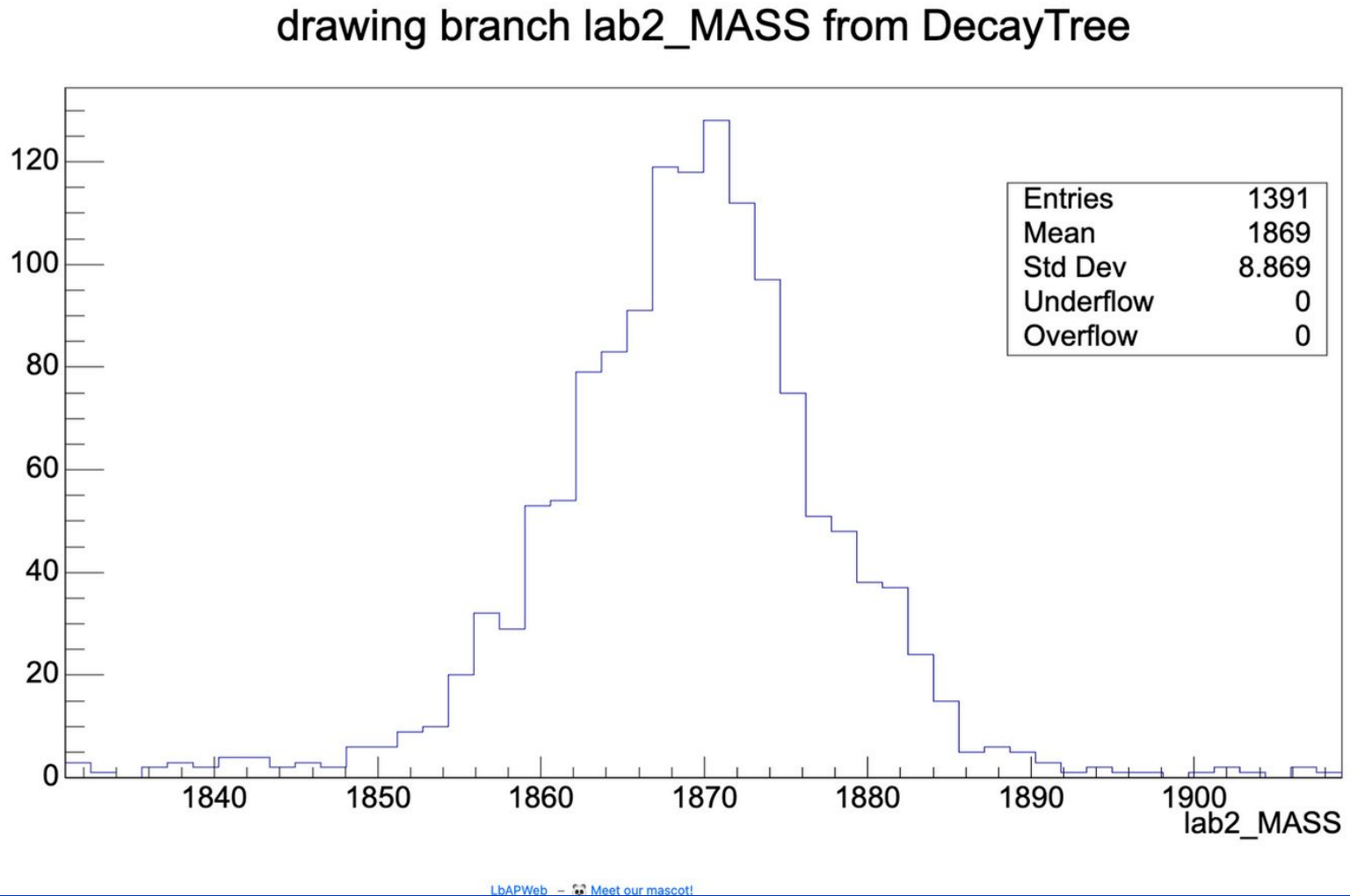




Use-case

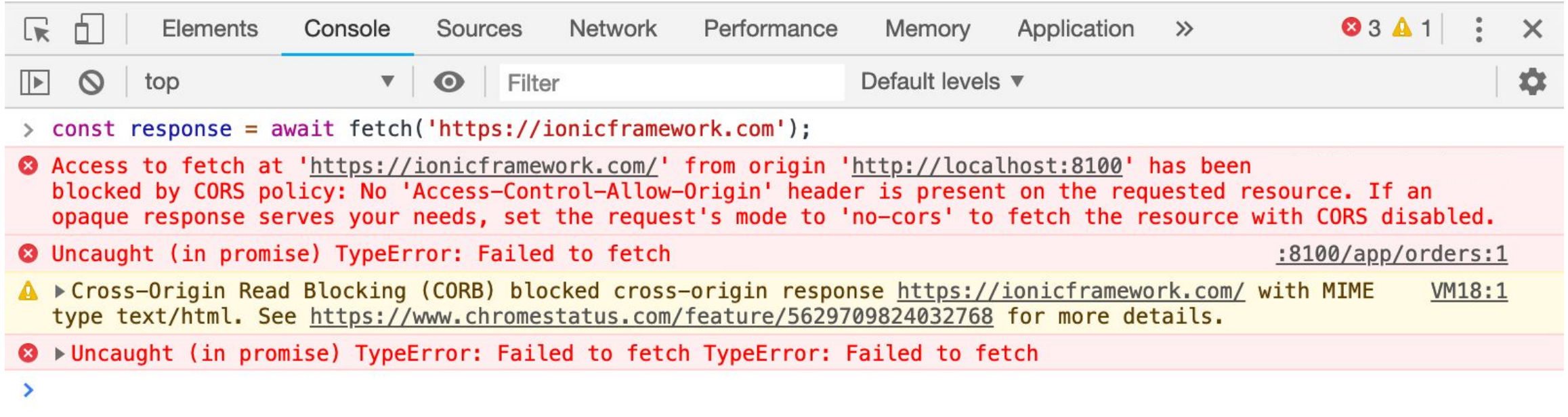
Web-browser based physics analysis interactive view (JSROOT)

- Publicly-trusted access
  - Users should not need to install CERN CA files on web browsers

Web-browser security features

Web-browser security features

CORS - Cross Origin Resource Sharing



Web-browser security features

HTTPS to HTTP redirection: Forbidden

Web-browser security features

Summary

- CORS
- Redirection to HTTP

XRootD HTTP CORS plugin
Cross Origin Resource Sharing

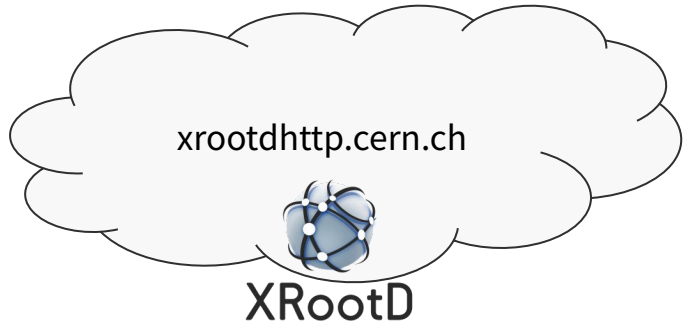
CORS Plugin

Use case

- CORS allows controlled access to resources from a different origin

CORS Plugin

Example



Web browser

CORS Plugin

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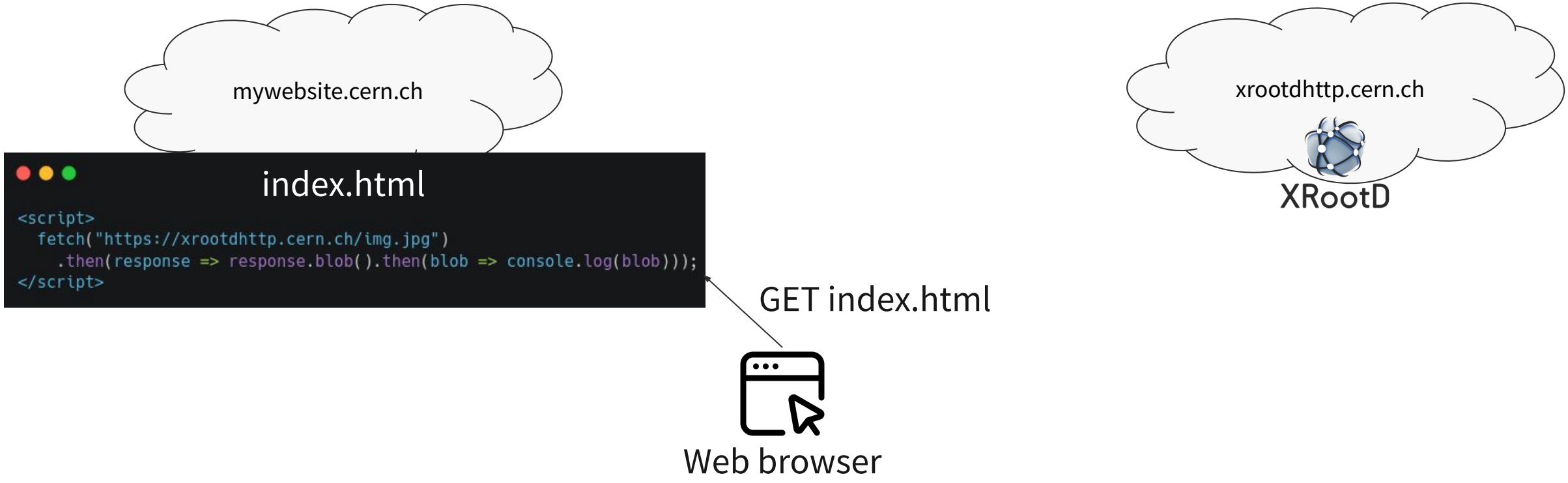

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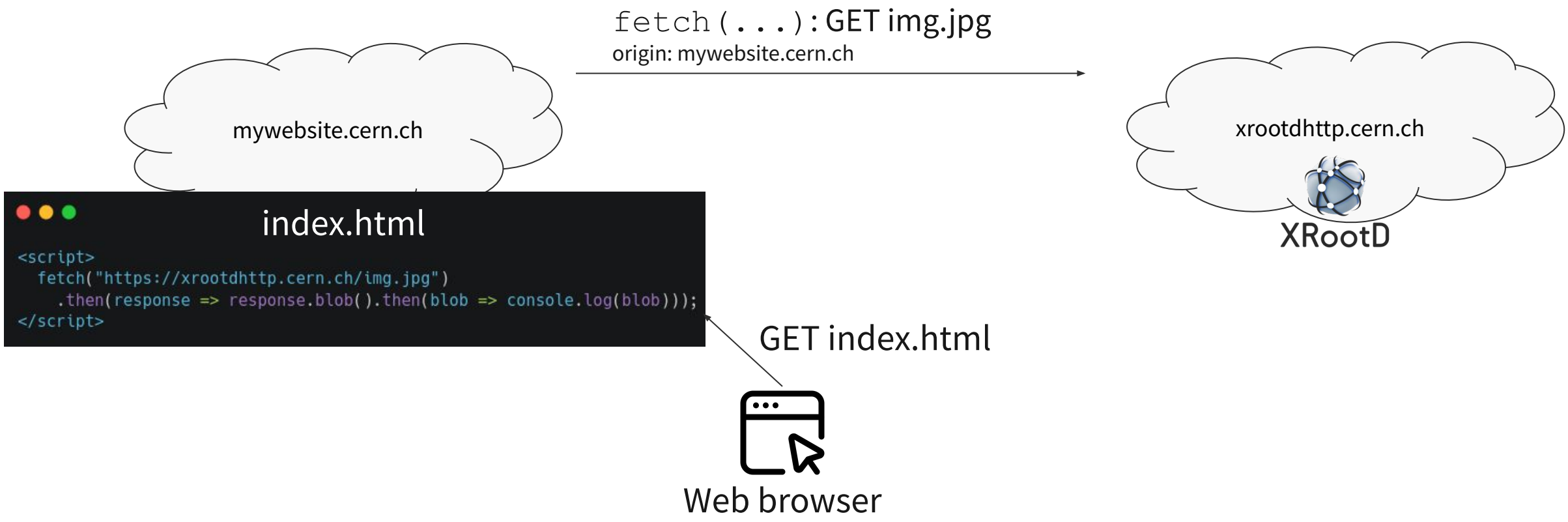

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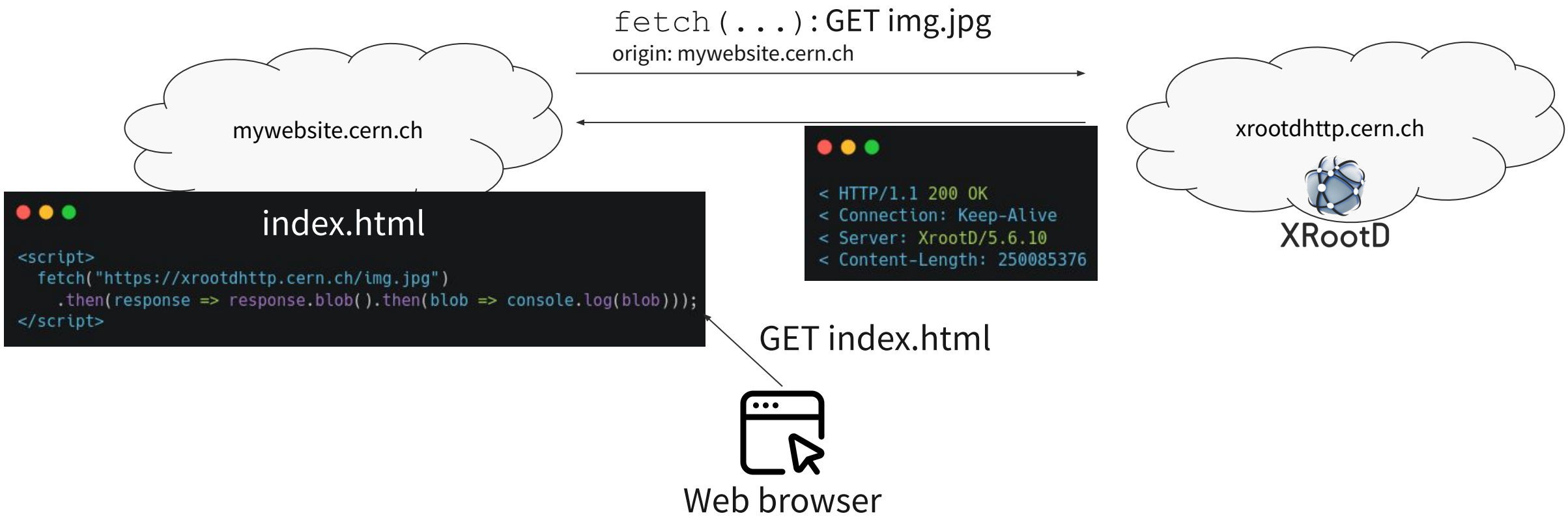

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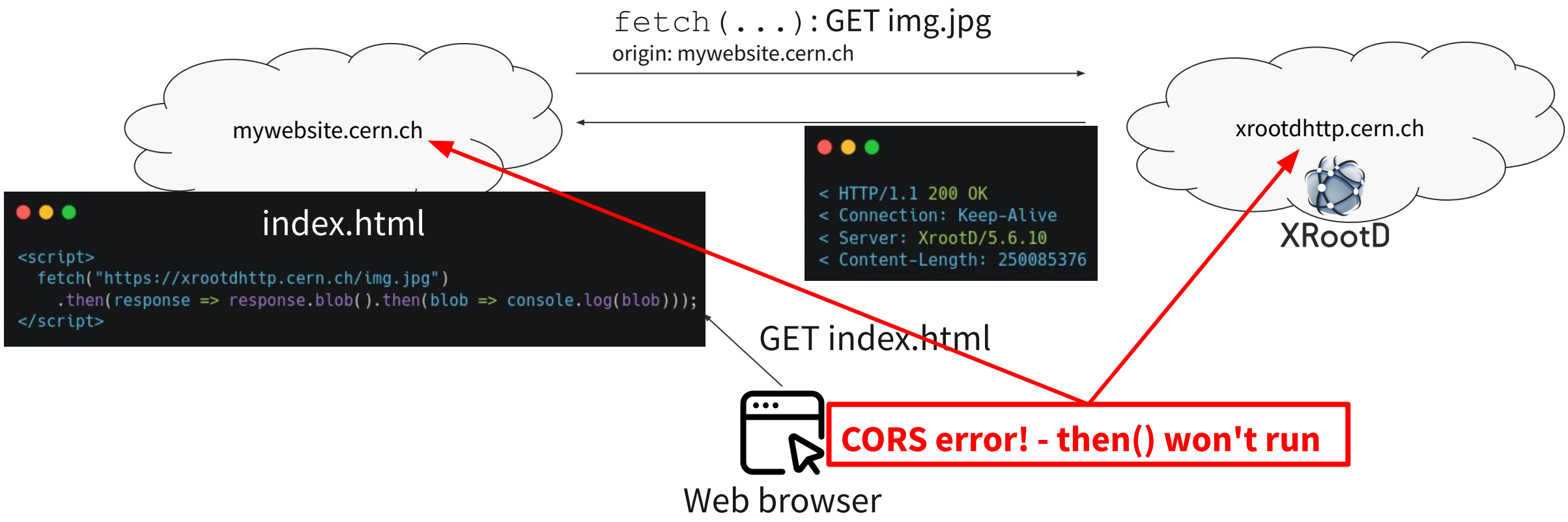

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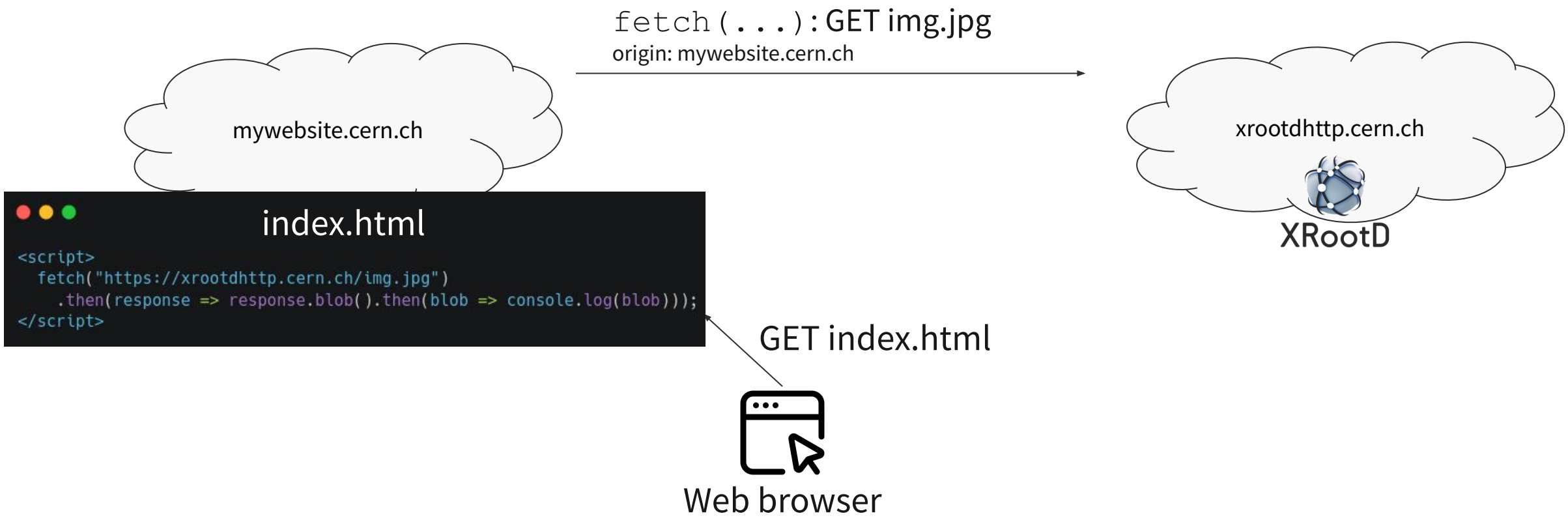

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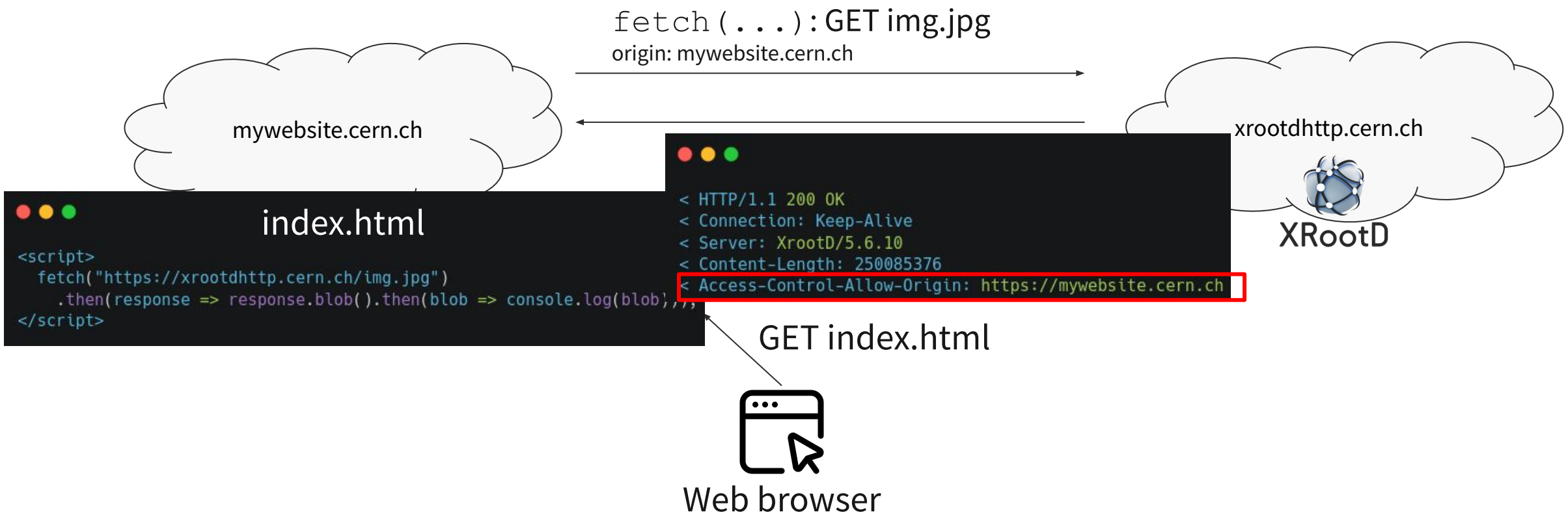

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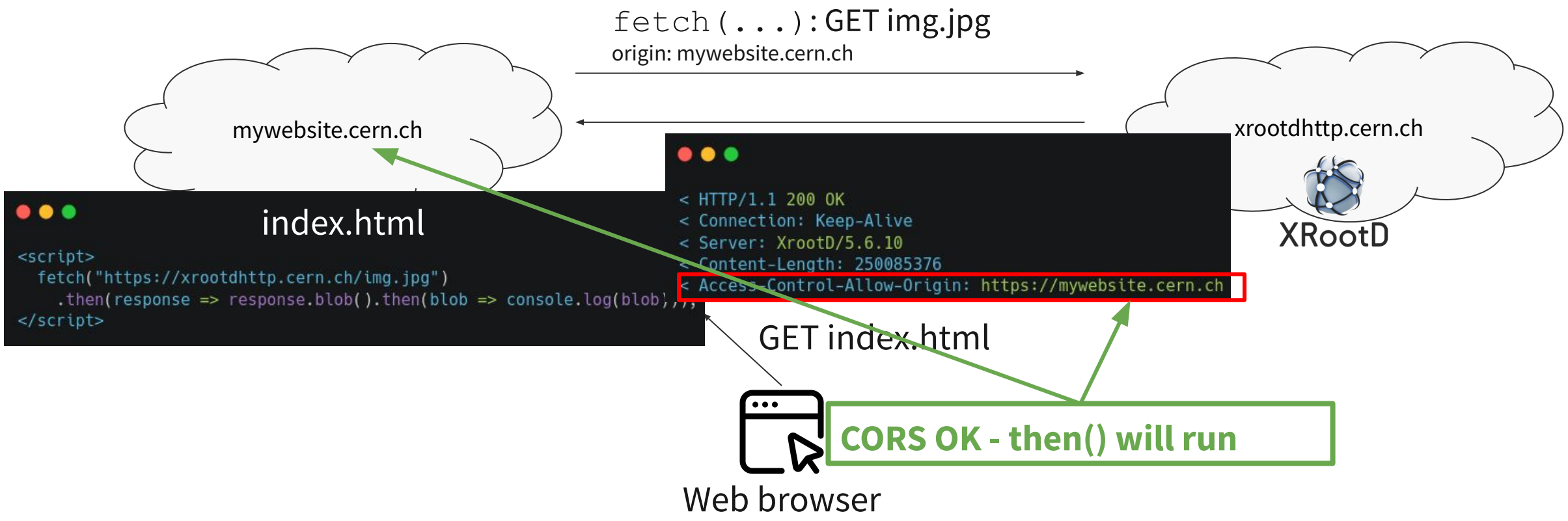
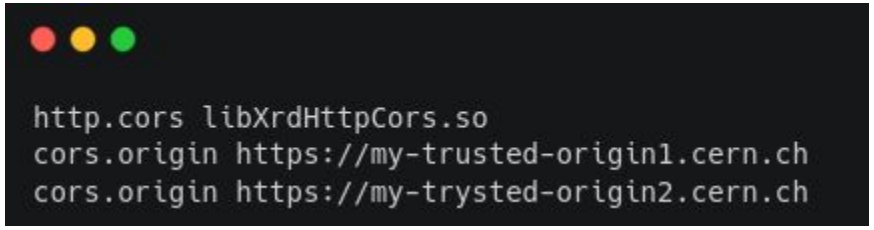


CORS Plugin

Configuration



Requirements

Web-browser security features - Summary

- CORS → OK
- Redirection to HTTP → NOK

Extra requirement

"No need to install Site-specific-CA on client web-browsers" → NOK

How to do it

A new XRootD server

How to do it

XRootD

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- HTTP(S) enabled

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How to do it

A new XRootD server

- HTTP(S) enabled
- CORS plugin configured → JS fetch(...) can work
- Sectigo certificate → no need to install site-specific CA on browser
- Behave as a proxy in front of the storage cluster (EOS)
  - No client redirection to read files from the storage cluster
  - Authenticates with SSS (Simple Shared Secrets)
  - Forwards users credentials to EOS

How to do it

A new XRootD server

```
all.role  proxy server
all.export  /eos/ readonly
xrd.protocol  XrdHttp:8443 libXrdHttp.so
ofs.osslib  libXrdPss.so
pss.origin  eoslhcb.cern.ch:1094
pss.persona  client noverify
xrd.tls  /etc/grid-security/daemon/proxycert.pem /etc/grid-security/daemon/proxykey.pem
xrd.tlsca  certdir /etc/grid-security/certificates
http.secxtractor  libXrdVoms.so
http.gridmap  /etc/grid-security/grid-mapfile
http.header2cgi  Authorization authz
http.tlsclientauth  off
http.cors  libXrdHttpCors.so
cors.origin  https://lhcb-productions.web.cern.ch https://lhcbdiracx.app.cern.ch
https://lhcbdiracx-cert.app.cern.ch
```

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pss.persona  client noverify
xrd.tls  /etc/grid-security/daemon/proxycert.pem /etc/grid-security/daemon/proxykey.pem
xrd.tlsca  certdir /etc/grid-security/certificates
http.secxtractor  libXrdVoms.so
http.gridmap  /etc/grid-security/grid-mapfile
http.header2cgi  Authorization authz
http.tlsclientauth  off
http.cors  libXrdHttpCors.so
cors.origin  https://lhcb-productions.web.cern.ch https://lhcbdiracx.app.cern.ch
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xrd.tlsca  certdir /etc/grid-security/certificates
http.secxtractor  libXrdVoms.so
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```

Enable HTTP

How to do it

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pss.persona  client noverify
xrd.tls  /etc/grid-security/daemon/proxycert.pem /etc/grid-security/daemon/proxykey.pem
xrd.tlsca  certdir /etc/grid-security/certificates
http.secxtractor  libXrdVoms.so
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Enable HTTP

Proxy library

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SECTIGO®

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Avoid annoying web-browser popup for certificate authentication

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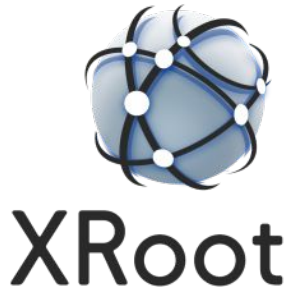
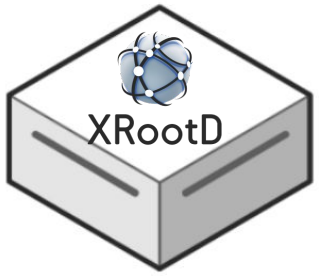
CORS

WLCG HTTP-TPC data integrity check

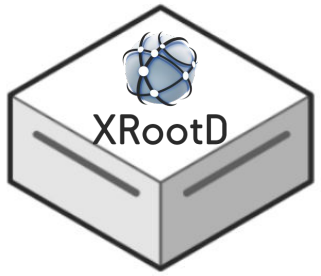
Reminder: HTTP - Third Party Copy



PULL



eoslhcb.cern.ch



eospublic.cern.ch

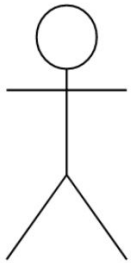


image: Flaticon.com

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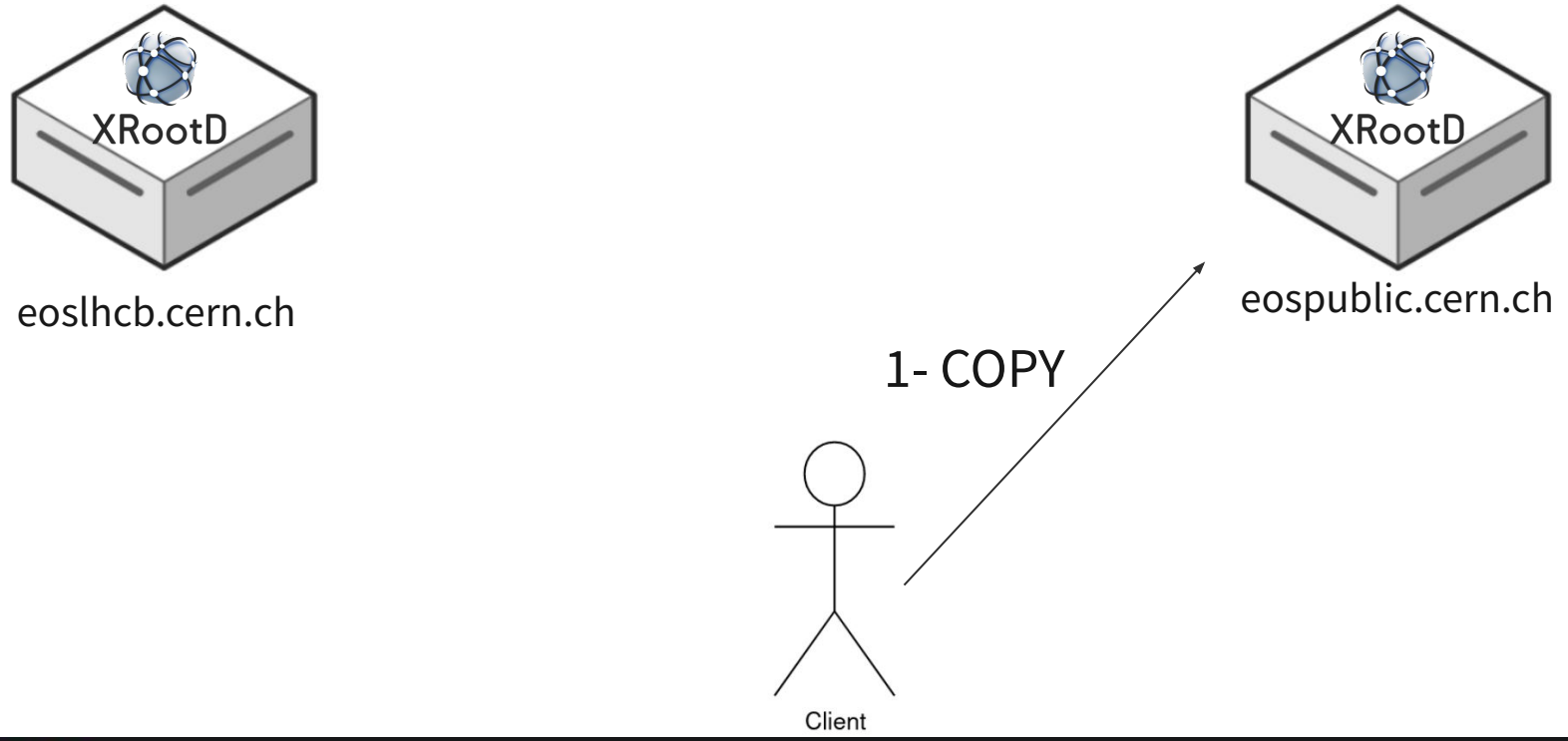


```
curl -X COPY -H 'Source: https://eoslhcb.cern.ch/source/file.txt' https://eospublic.cern.ch/dest/file.txt
```

image: Flaticon.com

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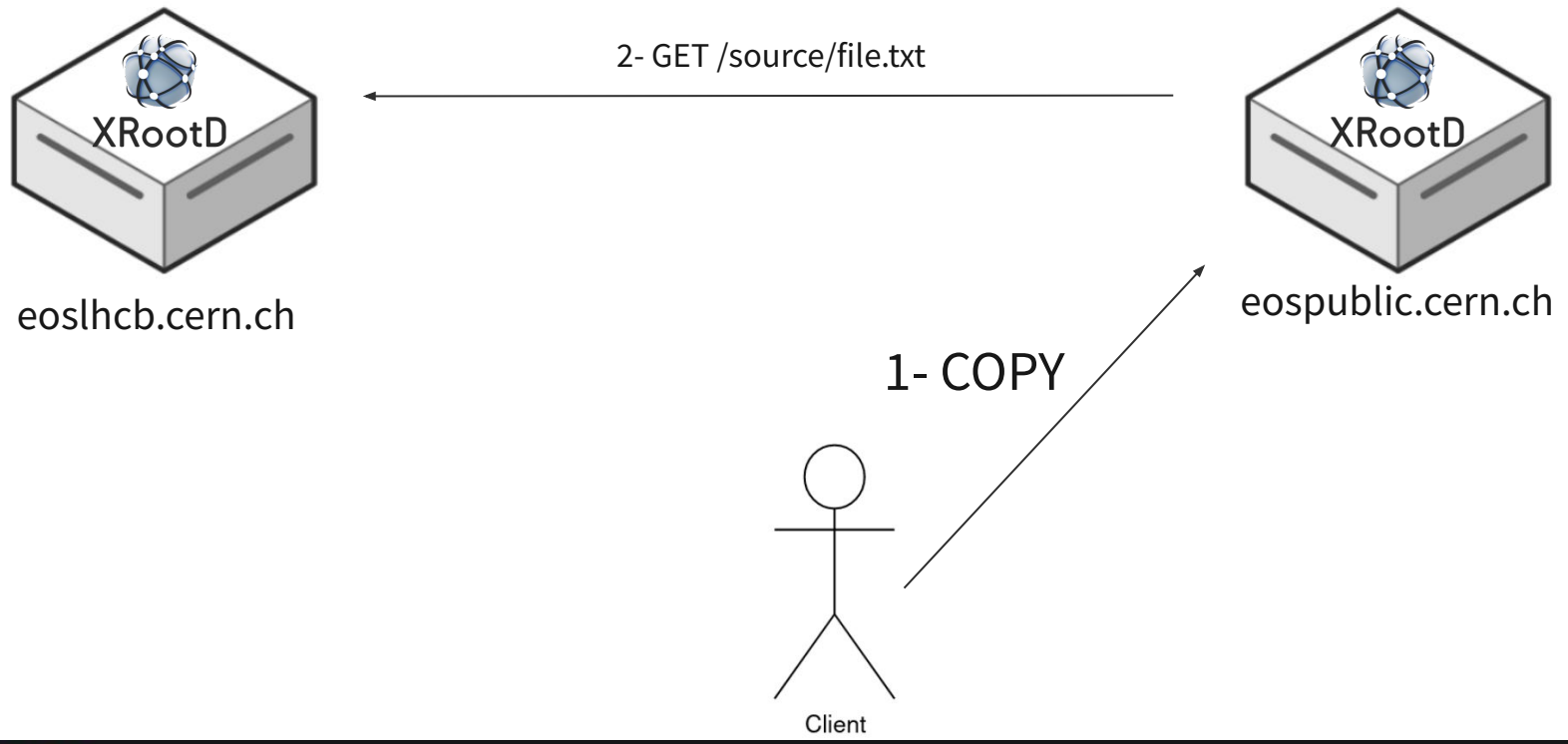


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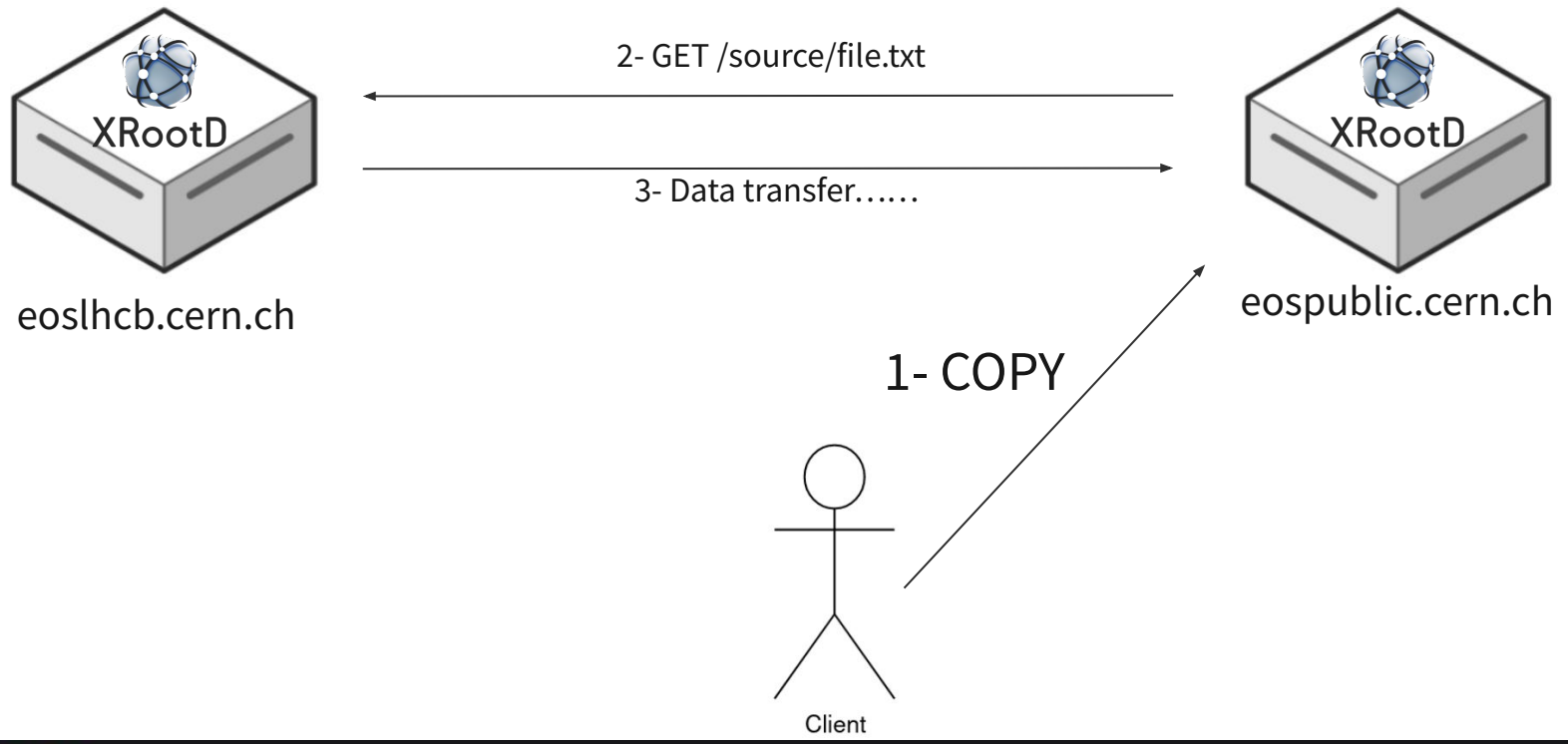


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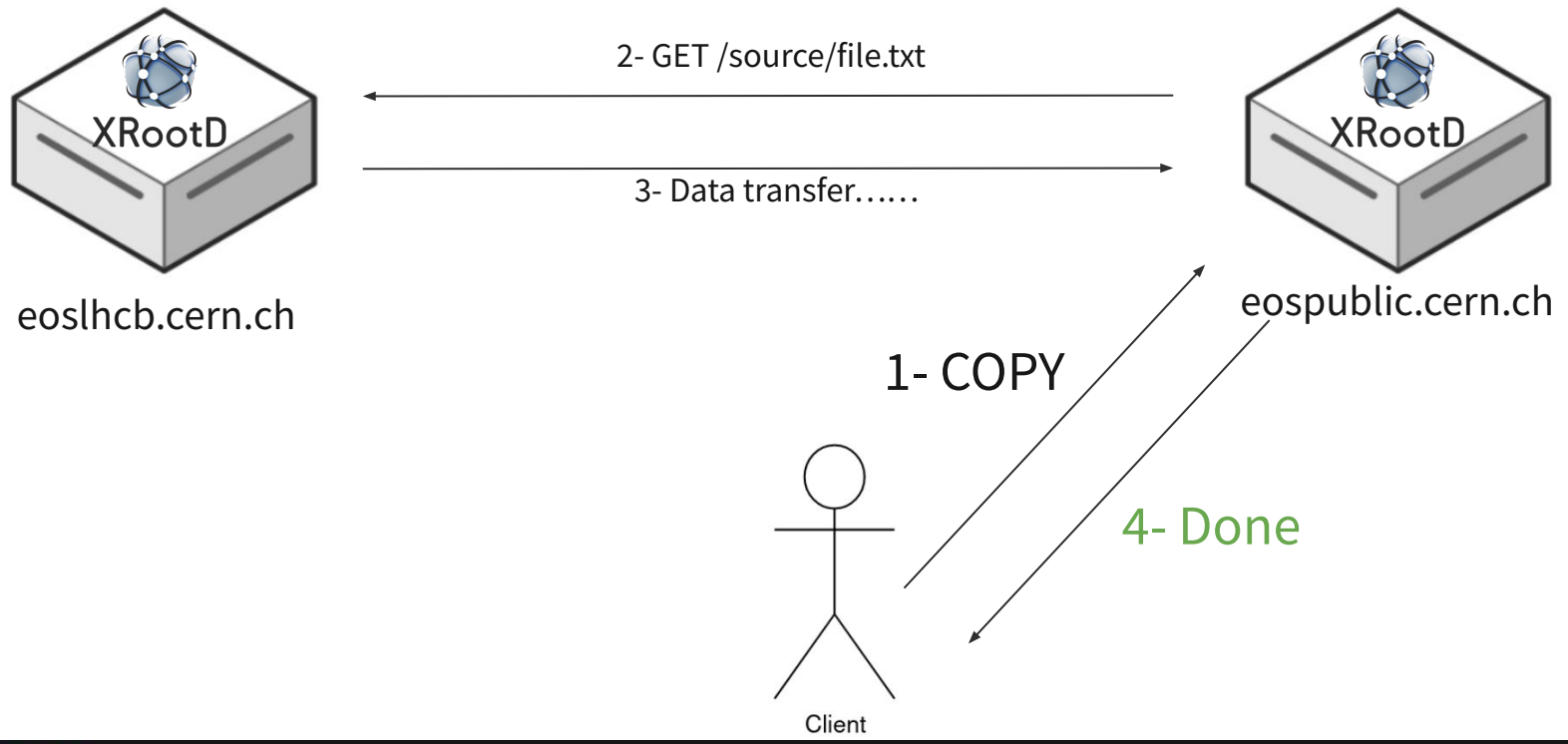


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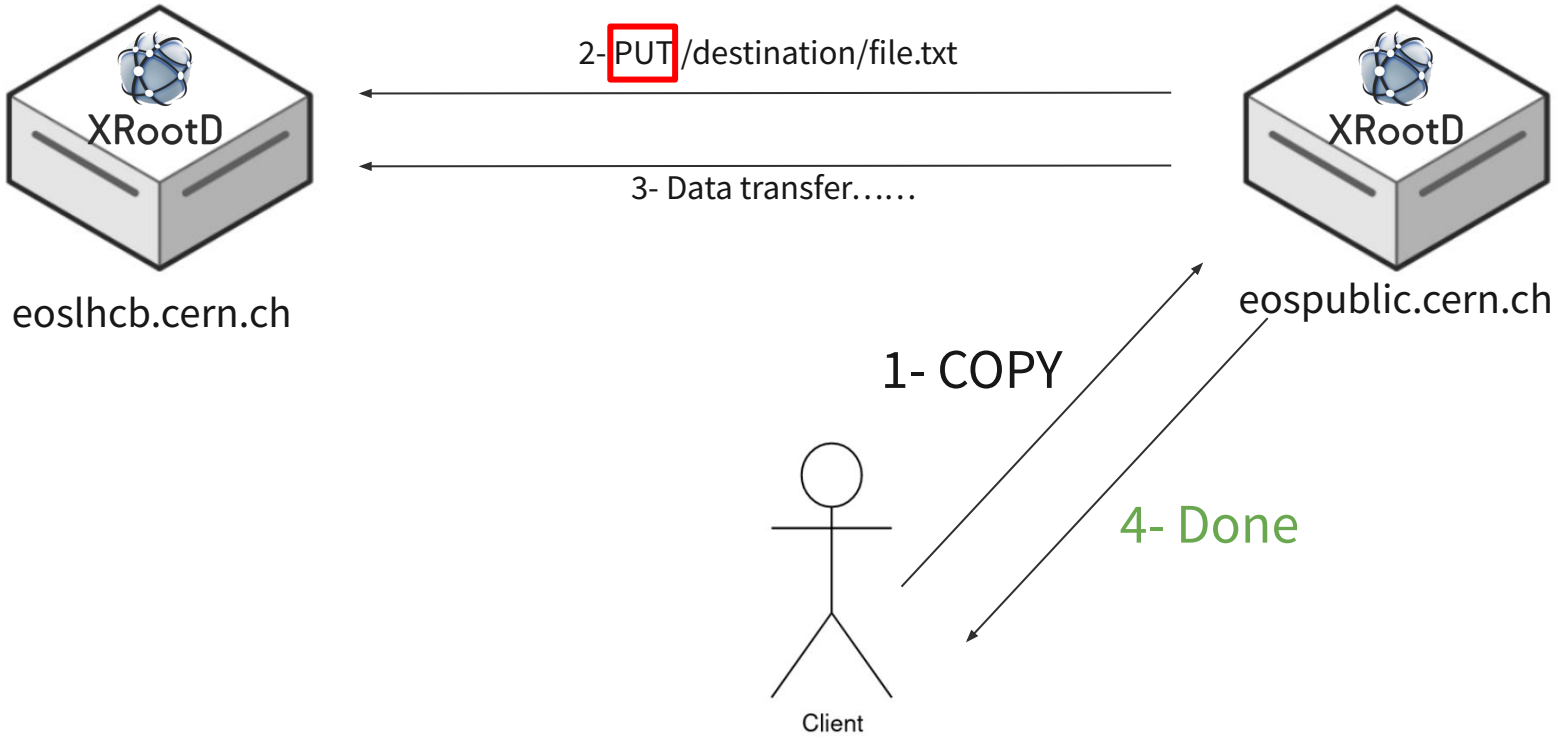
Reminder: HTTP - Third Party Copy

PUSH

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curl -X COPY -H 'Destination: https://eoslhcb.cern.ch/destination/file.txt' https://eospublic.cern.ch/source/file.txt
```

image: Flaticon.com

Context

WLCG HTTP-TPC

- Files copied directly between source storage and destination storage

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Solution

XRootD

Let data storages deal with corrupted files

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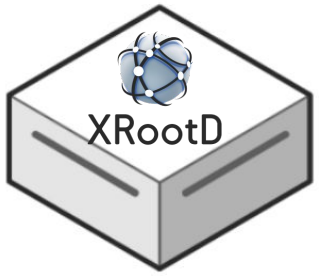
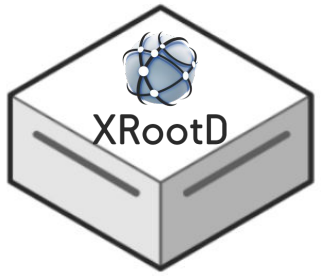
More infos: https://indico.cern.ch/event/1484669/contributions/6464759/attachments/3063730/5418458/WLCG_HSF_Workshop2025_DOMA_BDT_Plans.pdf and https://github.com/labkode/wlcg-tpc

WLCG data integrity check - HTTP TPC

PULL



eoslhcb.cern.ch



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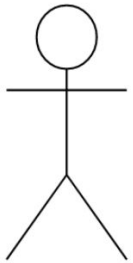
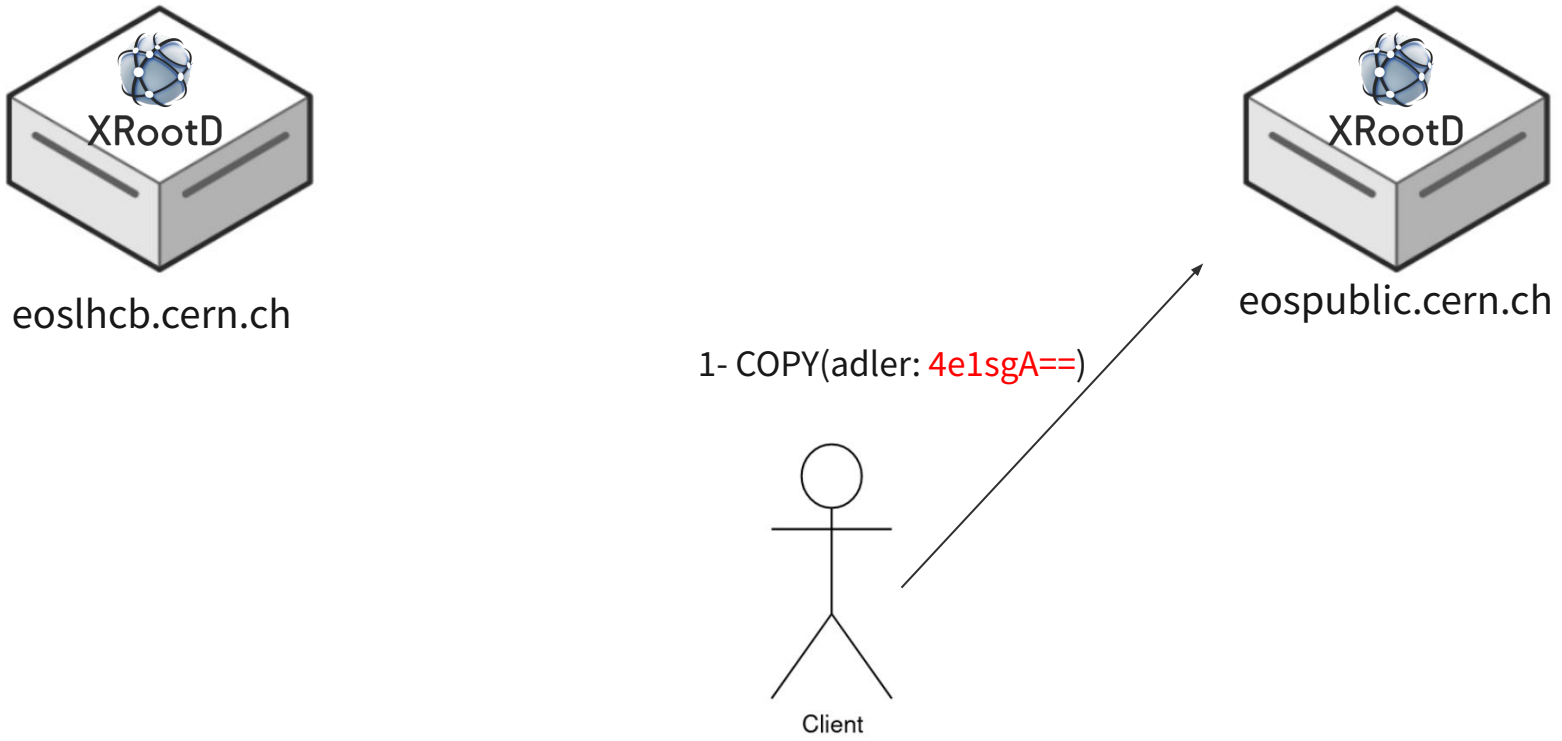


image: Flaticon.com

WLCG data integrity check - HTTP TPC

PULL

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curl -X COPY -H 'Source: https://eoslhcb.cern.ch/source/file.txt' -H 'Repr-Digest: adler32=:4e1sgA==:' https://eospublic.cern.ch/
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ge: Flaticon.com

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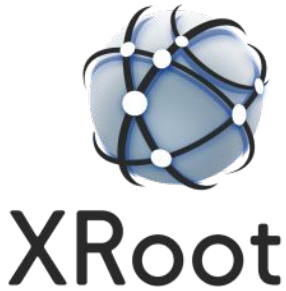

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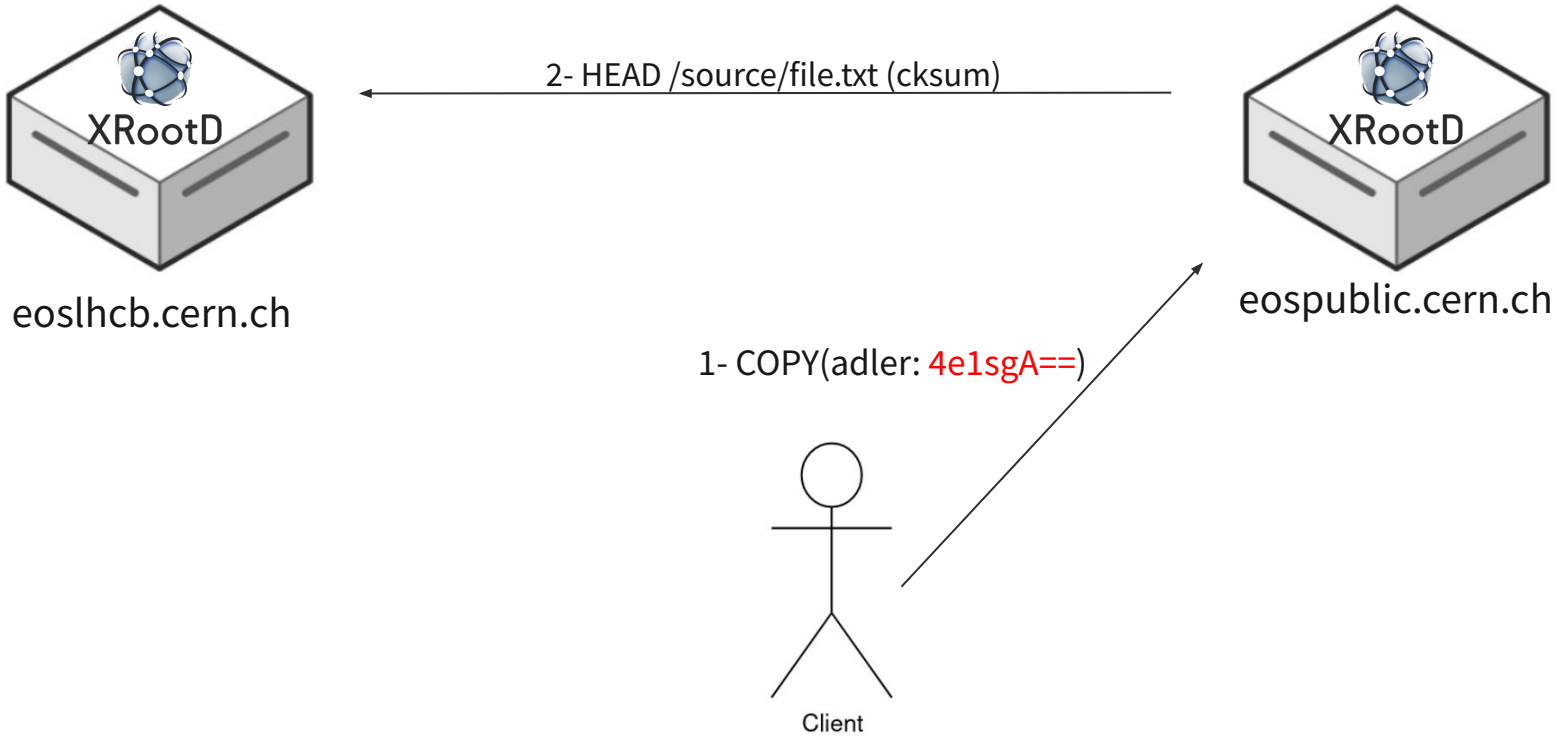


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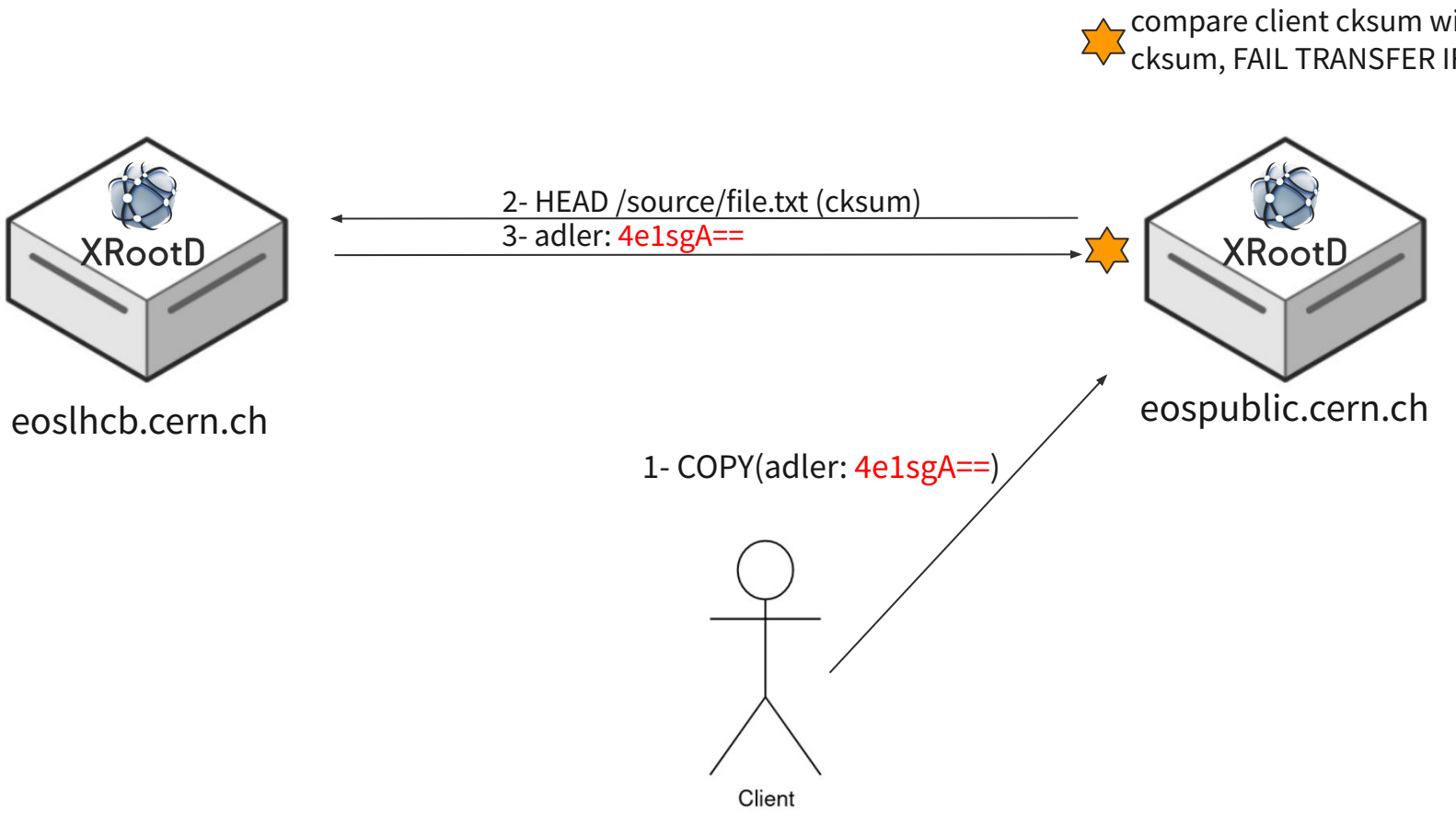


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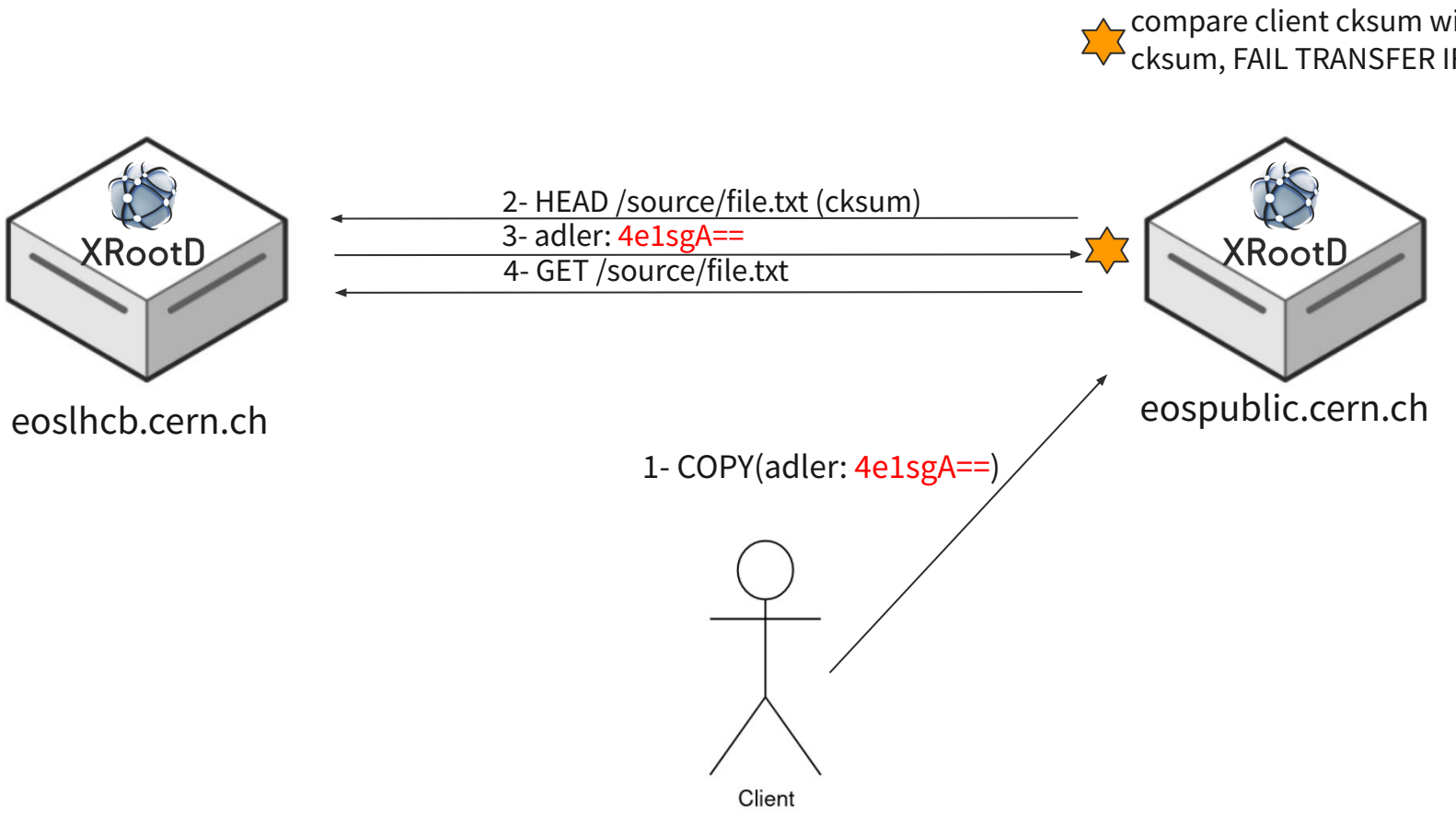


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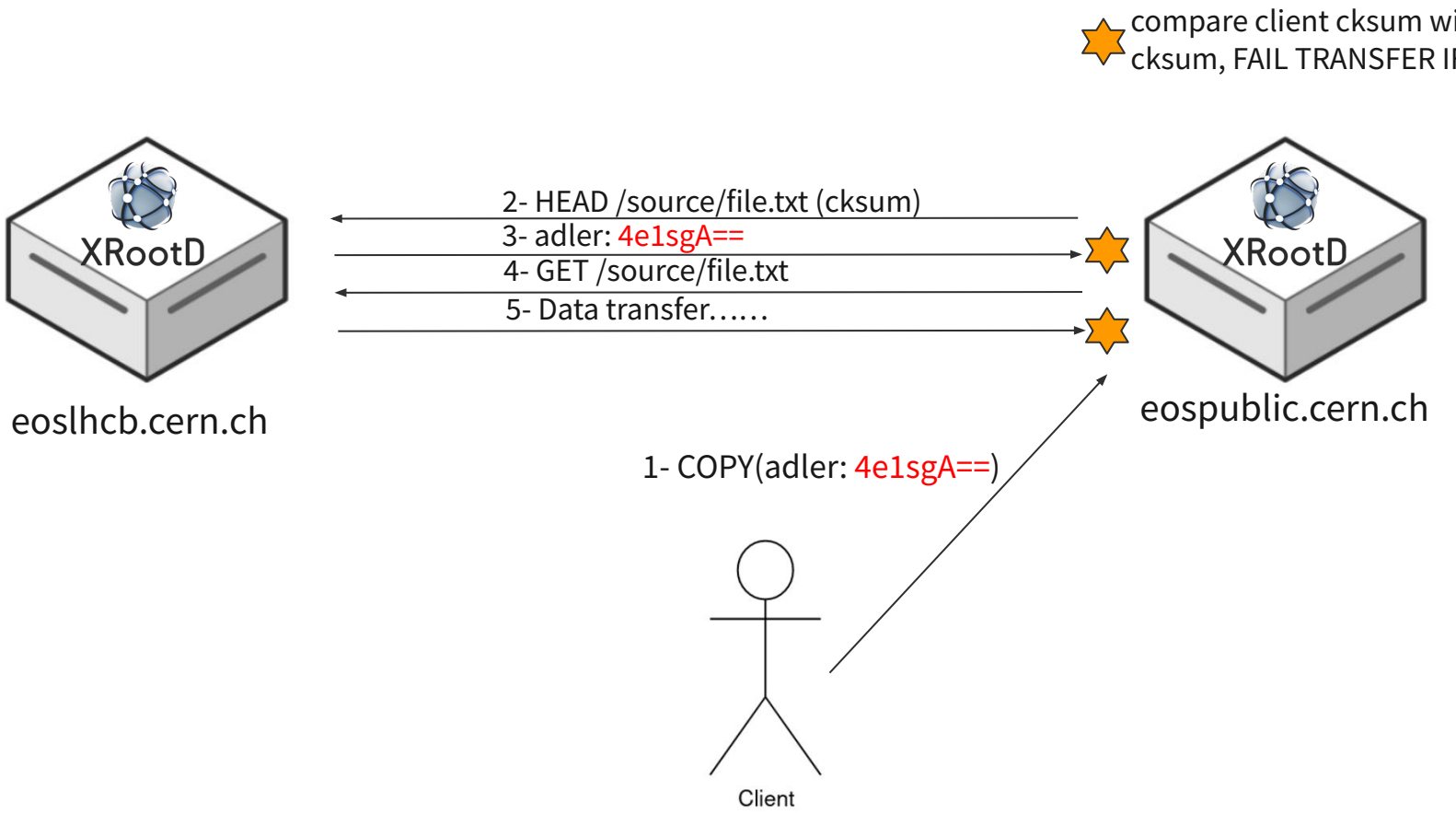


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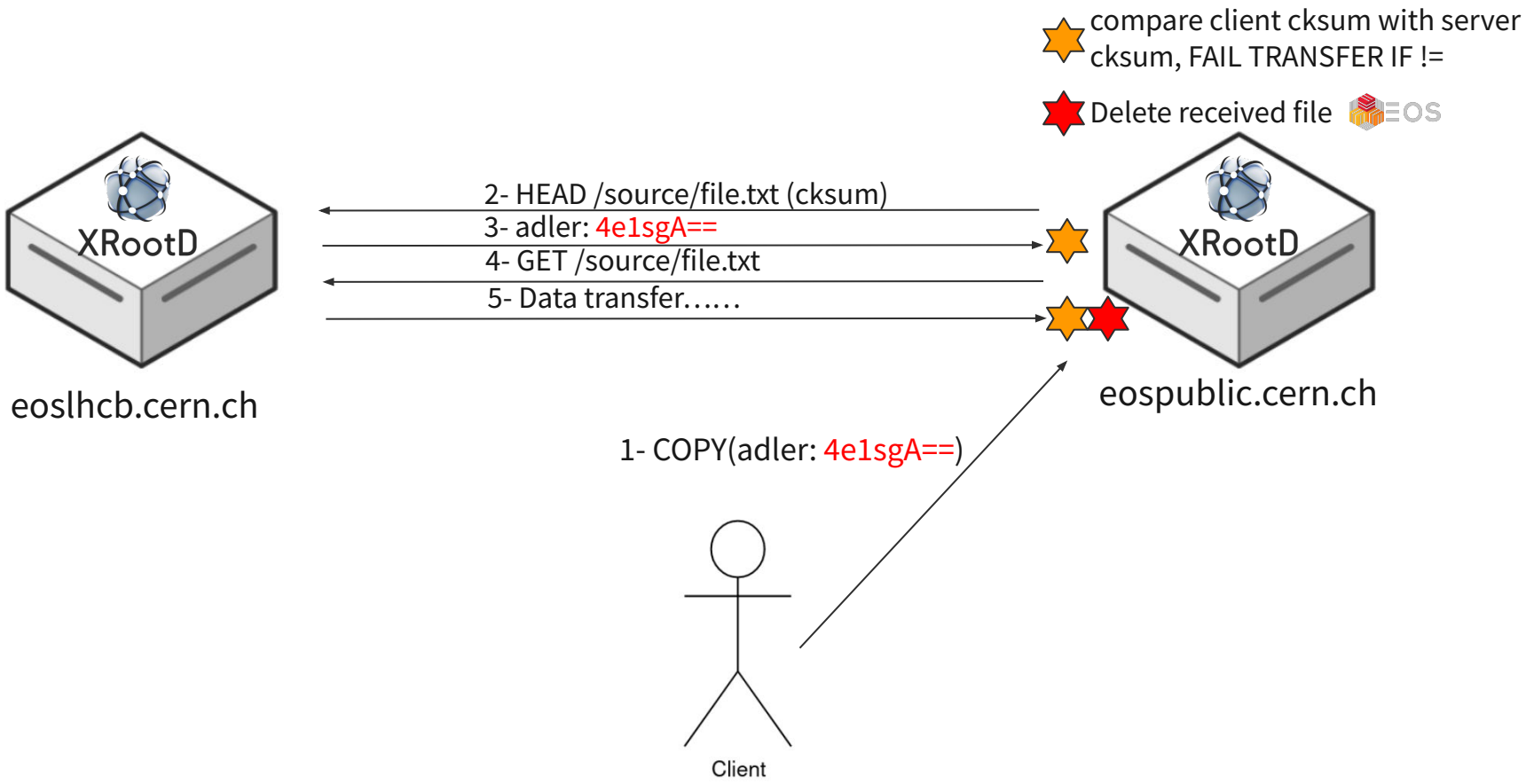


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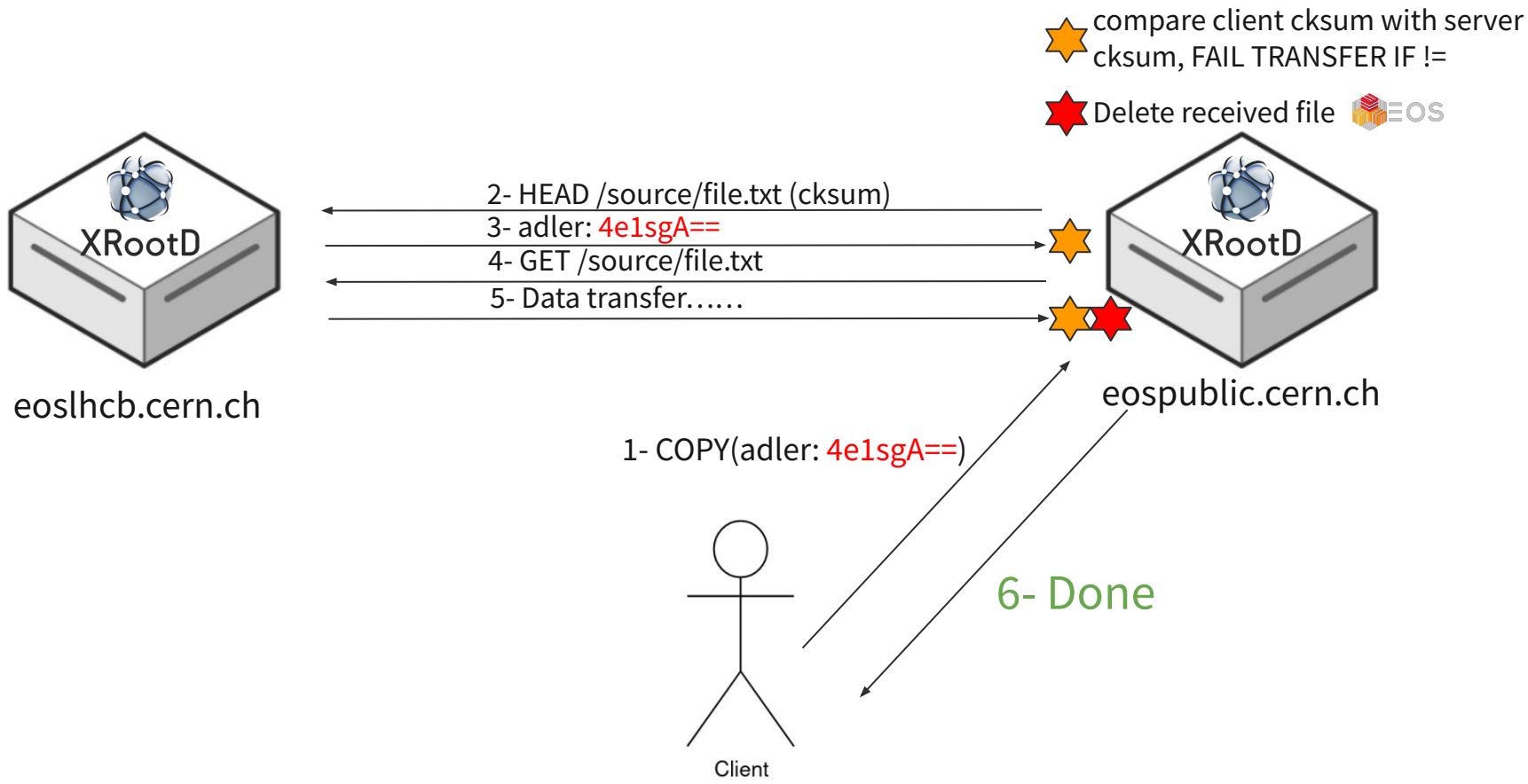


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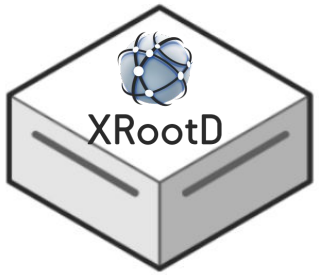
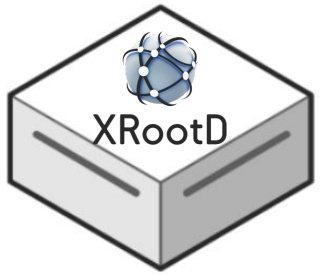


eoslhcb.cern.ch



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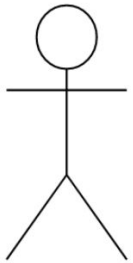

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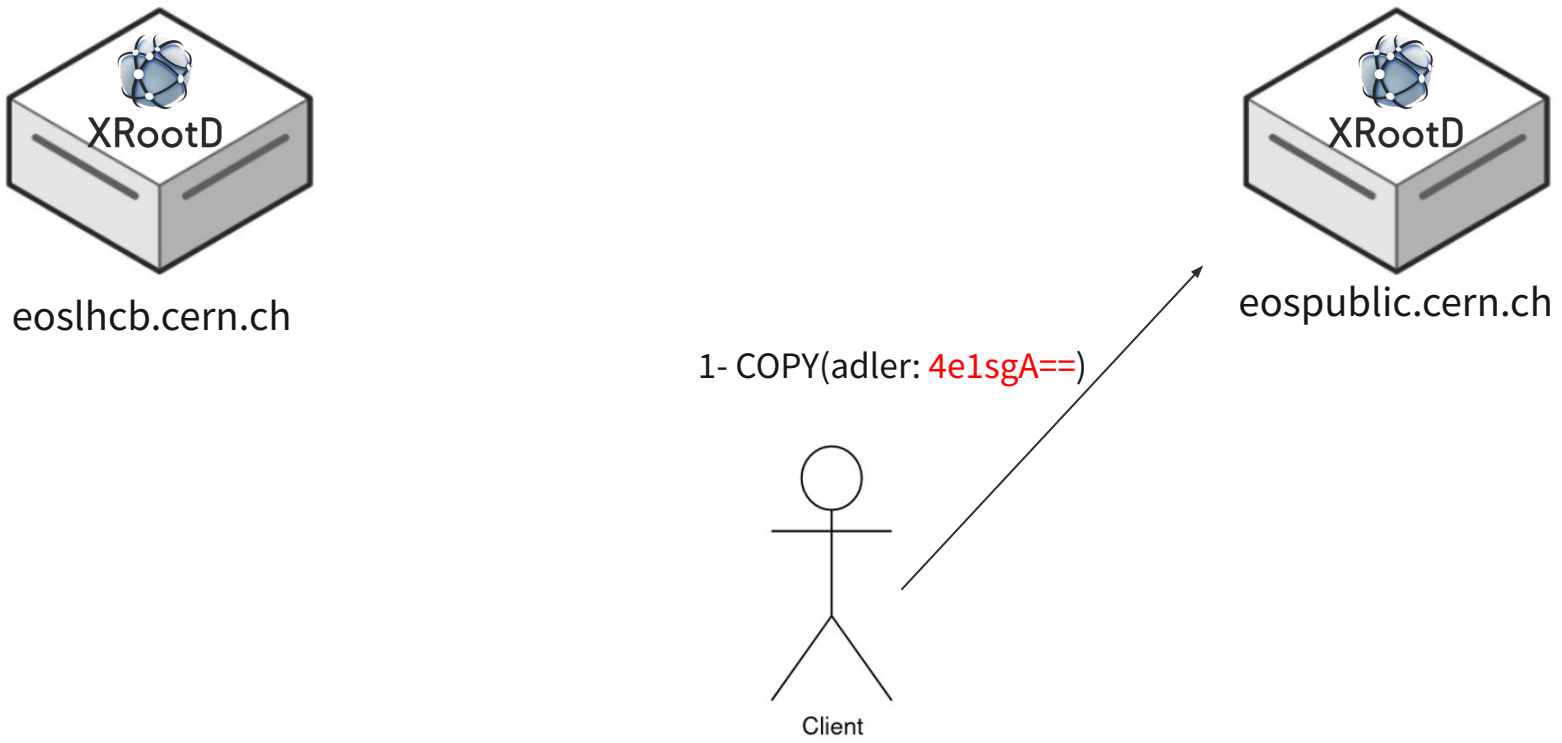


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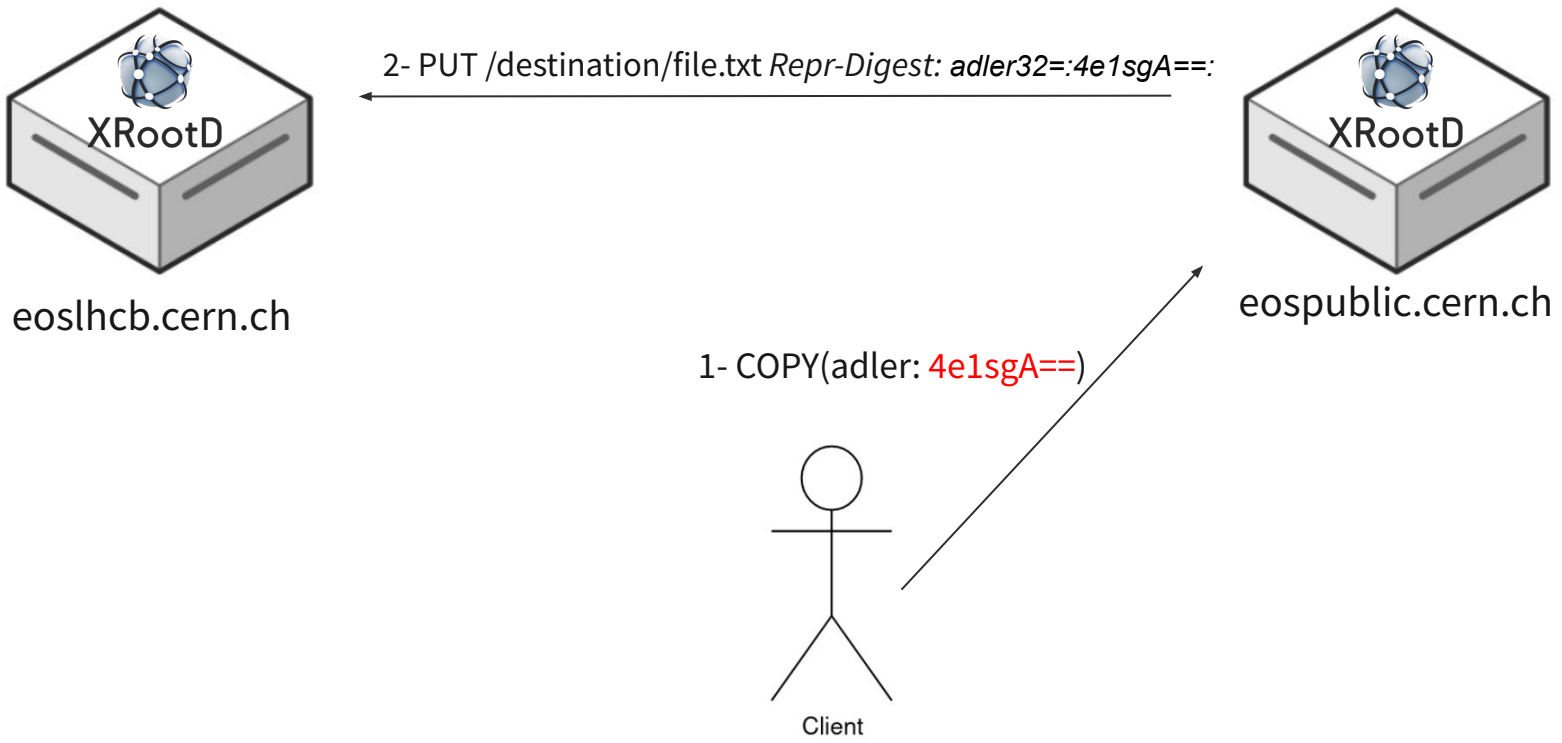


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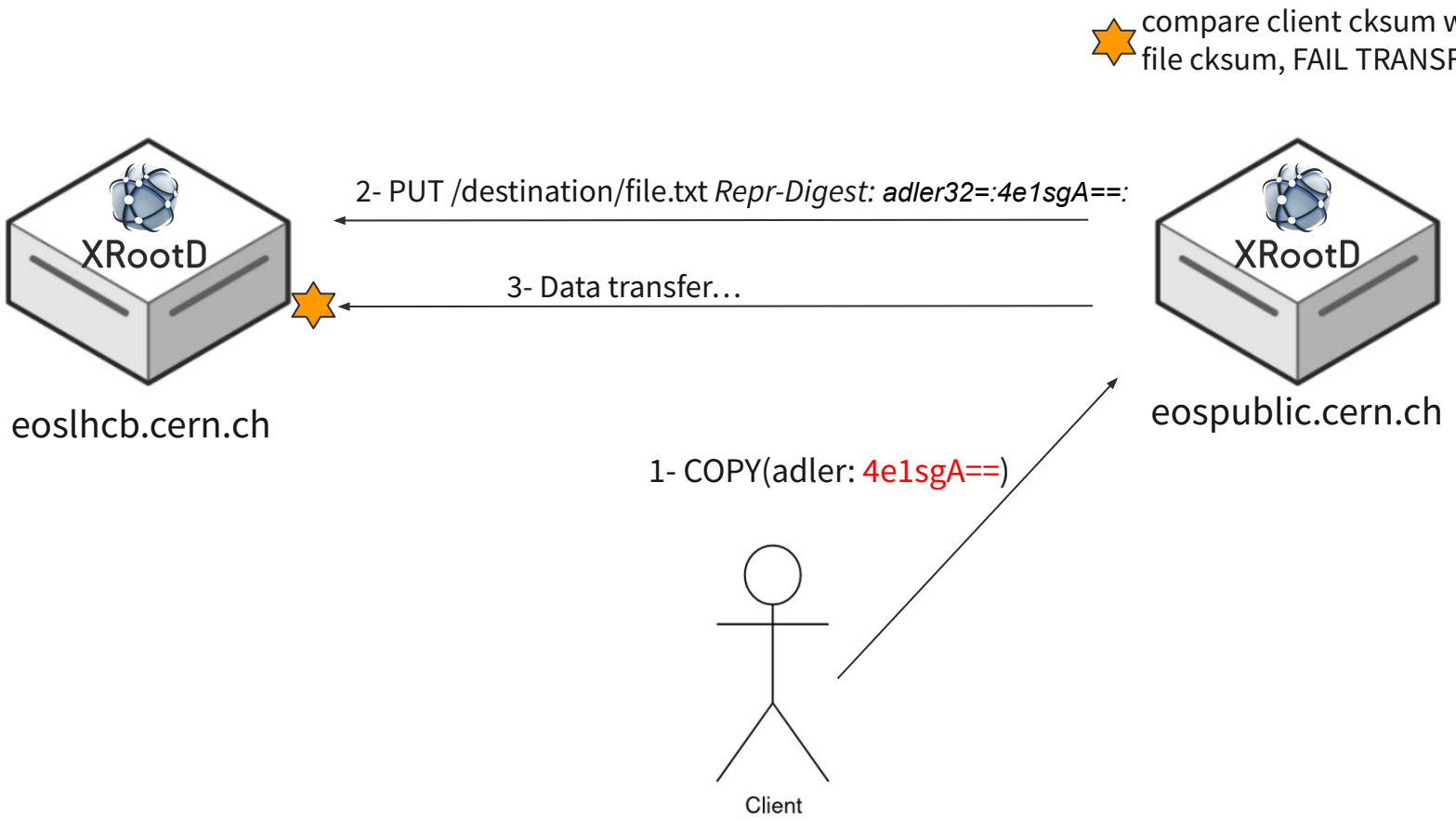


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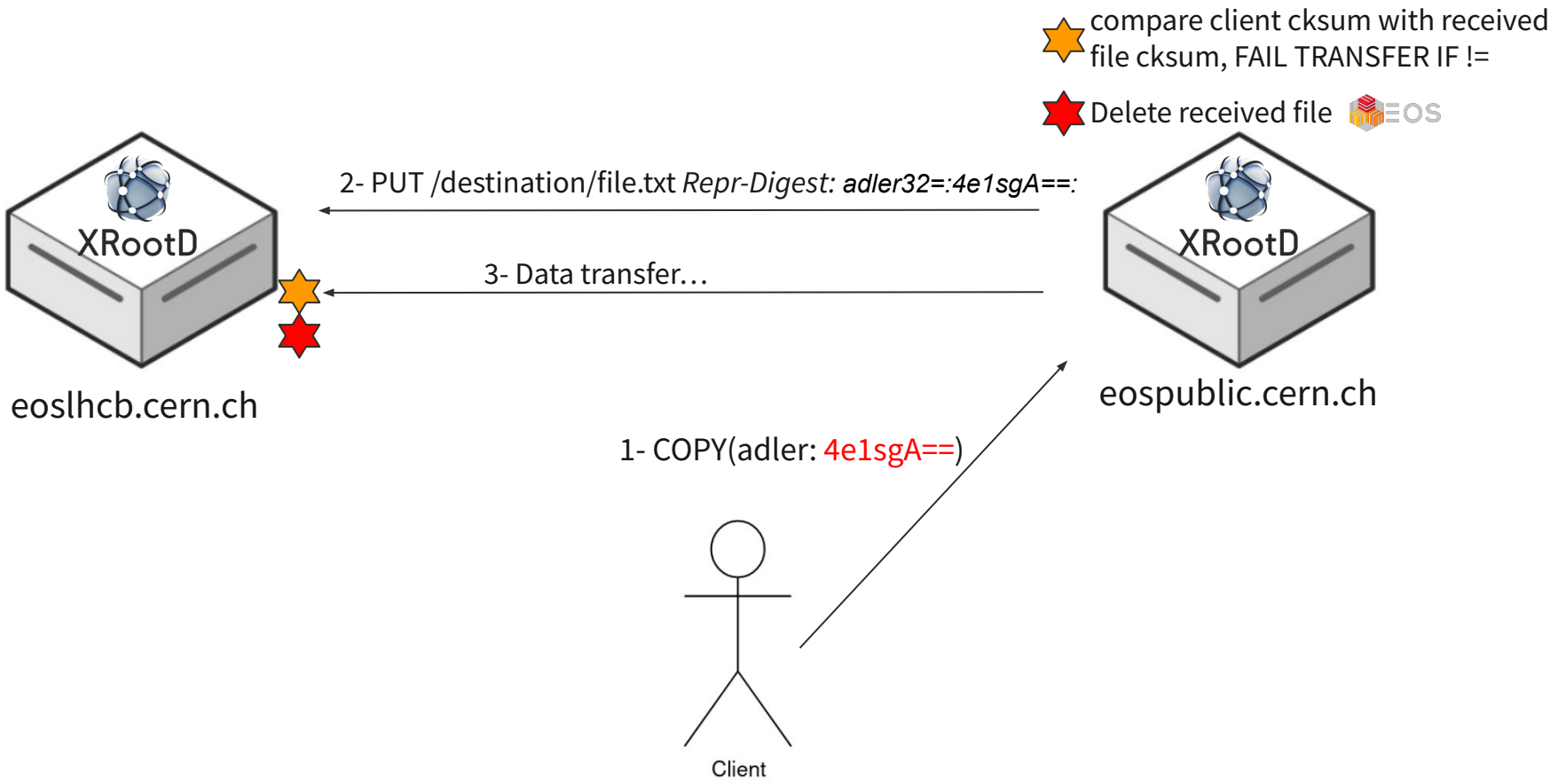


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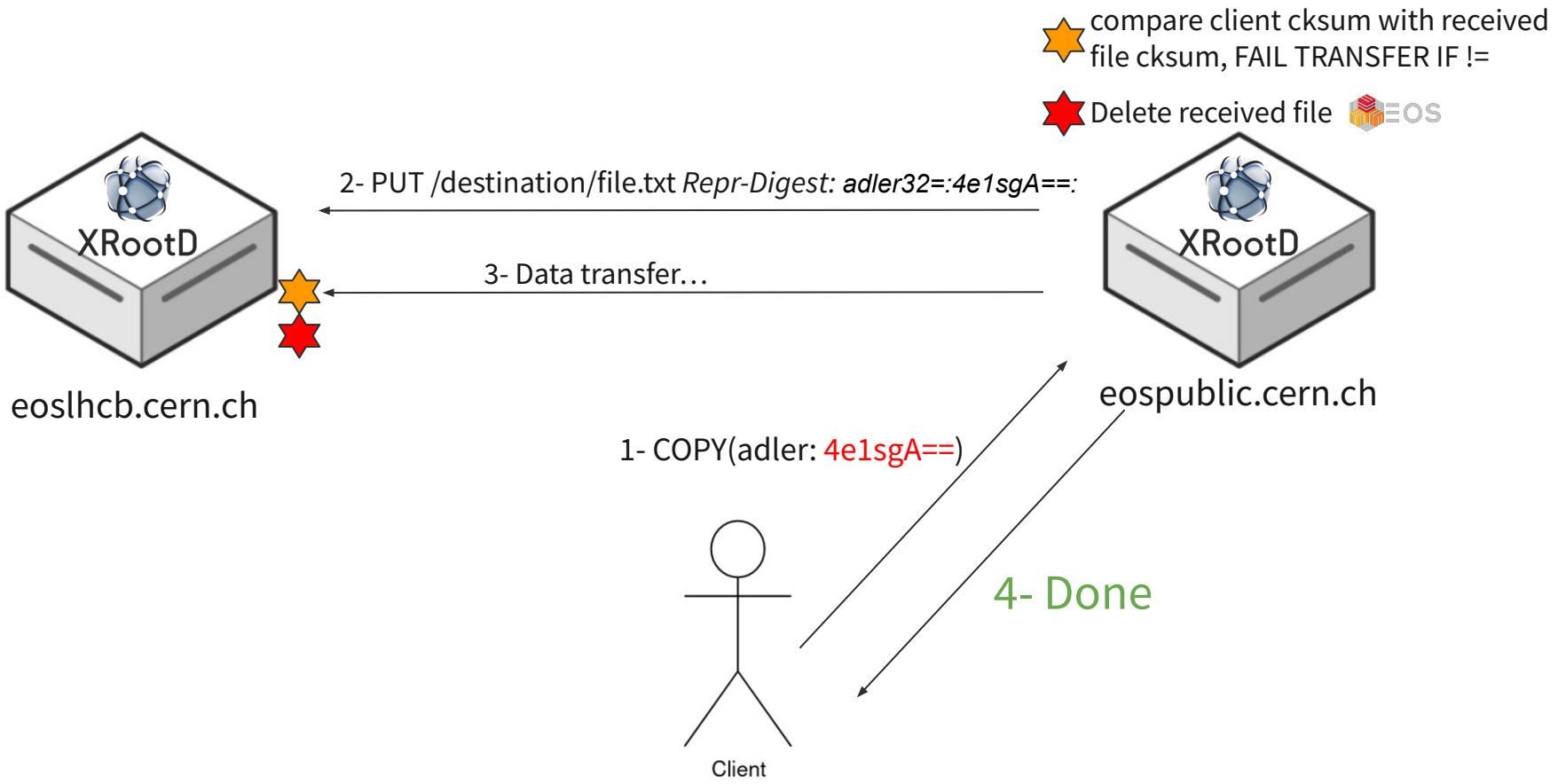


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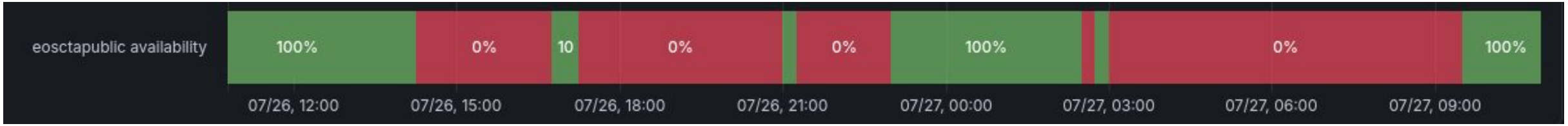
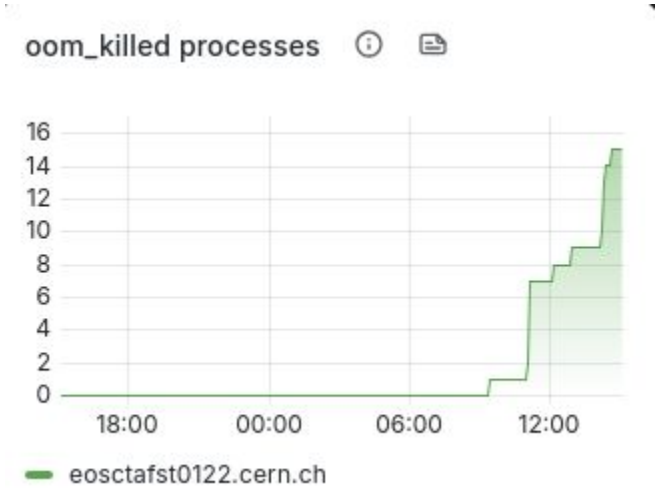
After RUN 3 was over…

Production EOSCTA instance degradation





Production EOSCTA instance degradation

Jemalloc profiling from an affected server

```
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  3465.3   1.7%  98.3%   3465.3   1.7% XrdBuffManager::Obtain
  2761.8   1.3%  99.7%   2761.8   1.3% std::vector::_M_default_append
  ...
    67.3   0.0%  99.9% 205102.6  98.2% curl_getdate           <- symbol artifact, static libcurl fn
     2.0   0.0% 100.0% 205379.2  98.3% TPC::TPCHandler::ProcessReq
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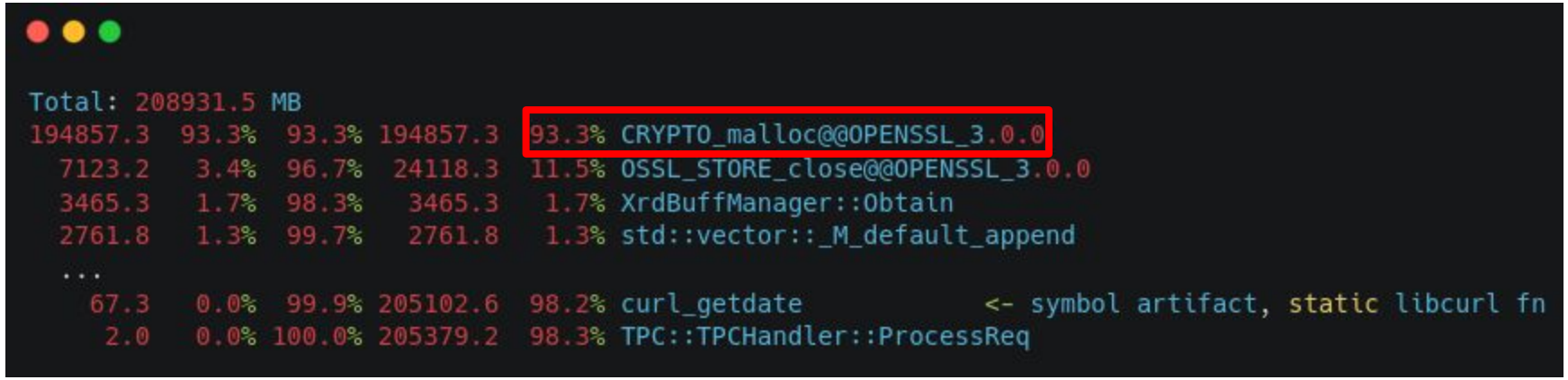

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What is going on?

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Especially, why now?

- No such issue during Run3…

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Claude to the rescue…

What is going on?

Especially, why now?

- No such issue during Run3…

Claude to the rescue…

- "Have a look at the XRootD HTTP TPC code and that jemalloc trace, tell me what makes this memory increase."

What is going on?

The cause identified by Claude

XRootD

What is going on?

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- For each HTTP TPC transfer
  - OpenSSL parses and loads the CRLs into a new X509_Store

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- For each HTTP TPC transfer
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BUT, why now?

- Claude to the rescue
  - "Write a Python program using libcrypto and load the CA and CRL bundle used by XRootD to perform TLS. Measure the memory footprint of that X509_Store object and project the memory usage of 1000 parallel HTTP TPC transfer"

What is going on?

The cause

```
$ python measure_ca_store.py ./ca_file.pem ./crl_file.pem
input ./ca_file.pem: 0.14 MiB PEM, 82 certs, 0 CRLs
input ./crl_file.pem: 6.61 MiB PEM, 0 certs, 84 CRLs

  store   1: RSS +    38.7 MiB (  38.7 MiB/store)
  store   2: RSS +    77.5 MiB (  38.7 MiB/store)
  store   3: RSS +   116.2 MiB (  38.7 MiB/store)
  store   4: RSS +   154.9 MiB (  38.7 MiB/store)
  store   5: RSS +   193.7 MiB (  38.7 MiB/store)
  store   6: RSS +   232.4 MiB (  38.7 MiB/store)
  store   7: RSS +   271.1 MiB (  38.7 MiB/store)
  store   8: RSS +   309.9 MiB (  38.7 MiB/store)
  store   9: RSS +   348.6 MiB (  38.7 MiB/store)
  store  10: RSS +   387.4 MiB (  38.7 MiB/store)

38.7 MiB per parsed X509_STORE (387.4 MiB for 10)
parsed/PEM ratio: 5.7x

projection: 1000 concurrent single-stream TPC transfers => ~37.8 GiB
```

What is going on?

The cause

- Harica certificate revocation from March 2026 resulted in huge IGTF CRL size (~330k revoked certs)

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- More information in
  - https://twiki.cern.ch/twiki/bin/view/LCG/WLCGOpsMeetingWeek260803#Monday

How to fix it?

Claude to the rescue…

- "Fix it, make no mistake"
  - Share one parsed CA/CRL store (X09_Store) across all HTTP-TPC transfers the XRootD server performs

How to fix it?

Confirmation the fix worked

- 100 transfers in parallel on my development VM

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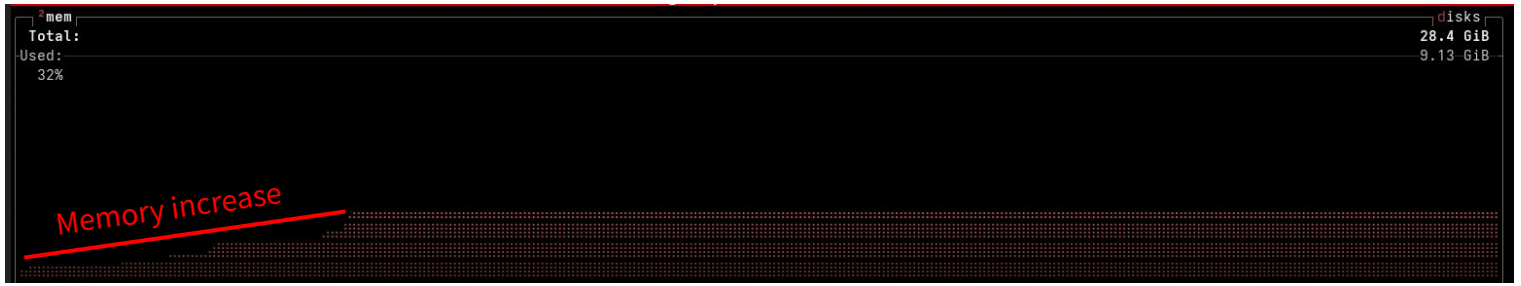

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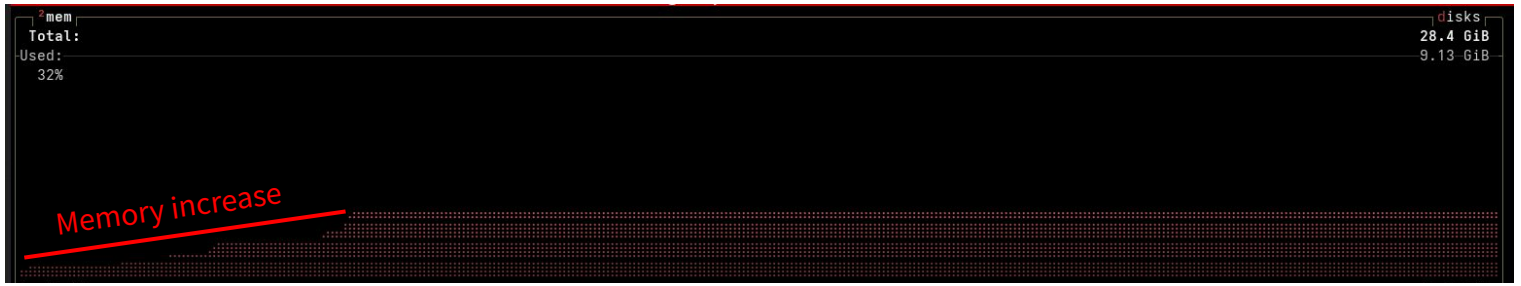

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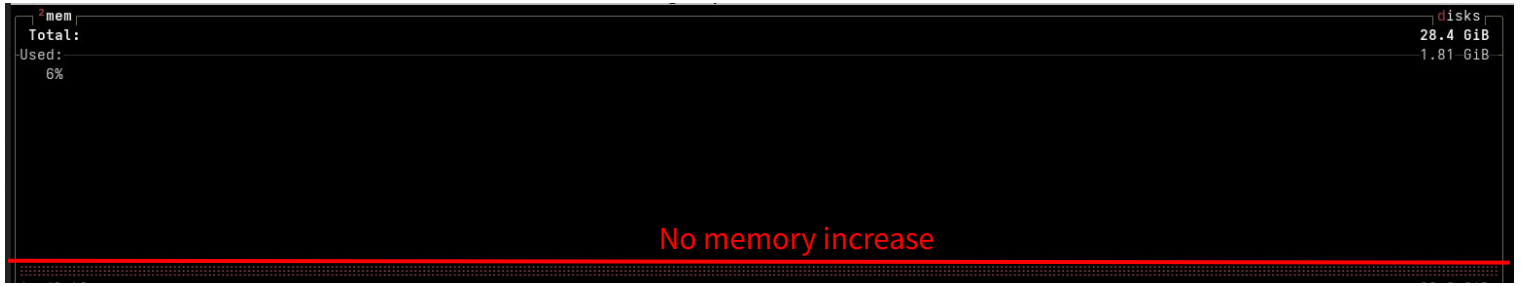


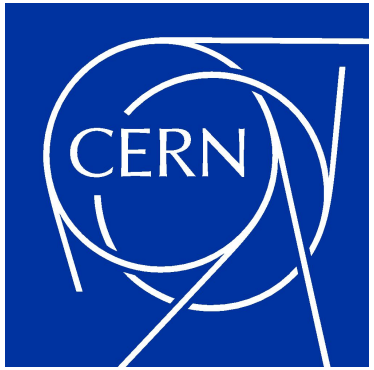
How to fix it?

XRootD version containing the fix

- XRootD >= 5.9.7, XRootD >= 6.1.1

Conclusion

- Publicly-trusted HTTPS gateway
  - New CORS plugin available for XRootD >= 5.9.1
- WLCG data integrity check
  - Repr-Digest and Want-Repr-Digest header support
  - File deletion only supported by EOS
- End-of-RUN 3 EOSCTA issue
  - Fixed in XRootD >= 5.9.7, XRootD >= 6.1.1
- **Any wish for future HTTP and HTTP-TPC improvements?**



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Backup slides