RADU POPESCU

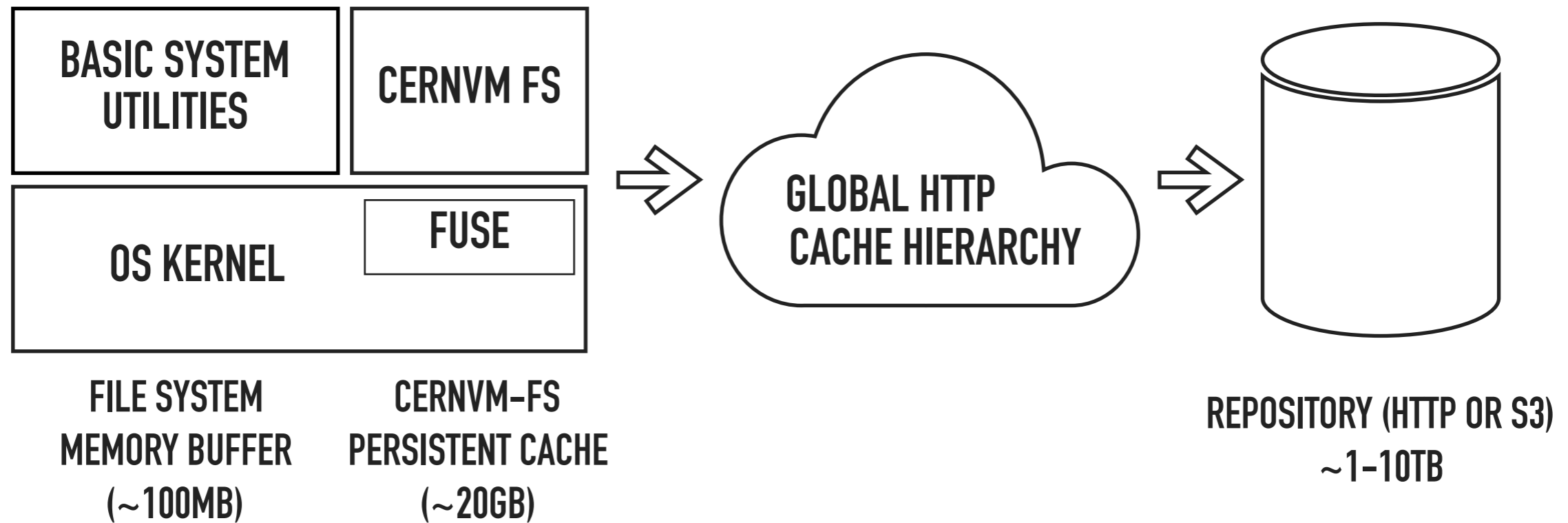## CERN EP-SFT, ON BEHALF OF THE CERNVM-FS TEAM

ADDING HTTP INGESTION SUPPORT TO XCACHE

XROOTD@IN2P3 LYON, JUNE 2019

CVMFS – A FILE SYSTEM APPROACH TO DISTRIBUTING SOFTWARE

BASIC SYSTEM UTILITIES

CERNVM FS

OS KERNEL

FUSE

FILE SYSTEM MEMORY BUFFER (~100MB)

CERNVM–FS PERSISTENT CACHE (~20GB)

GLOBAL HTTP CACHE HIERARCHY

REPOSITORY (HTTP OR S3) ~1–10TB

- FUSE based, independent mount points, e. g. /cvmfs/sft.cern.ch
- Clients have a read-only view; single writer into repository
- Immutable, content-addressed storage
- HTTP transport, access and caching on demand

CVMFS HTTP CACHING LAYER

- Essential to CVMFS scalability at global scale

- Based on Squid (http://www.squid-cache.org/)

  - Single-threaded, performance for large files?

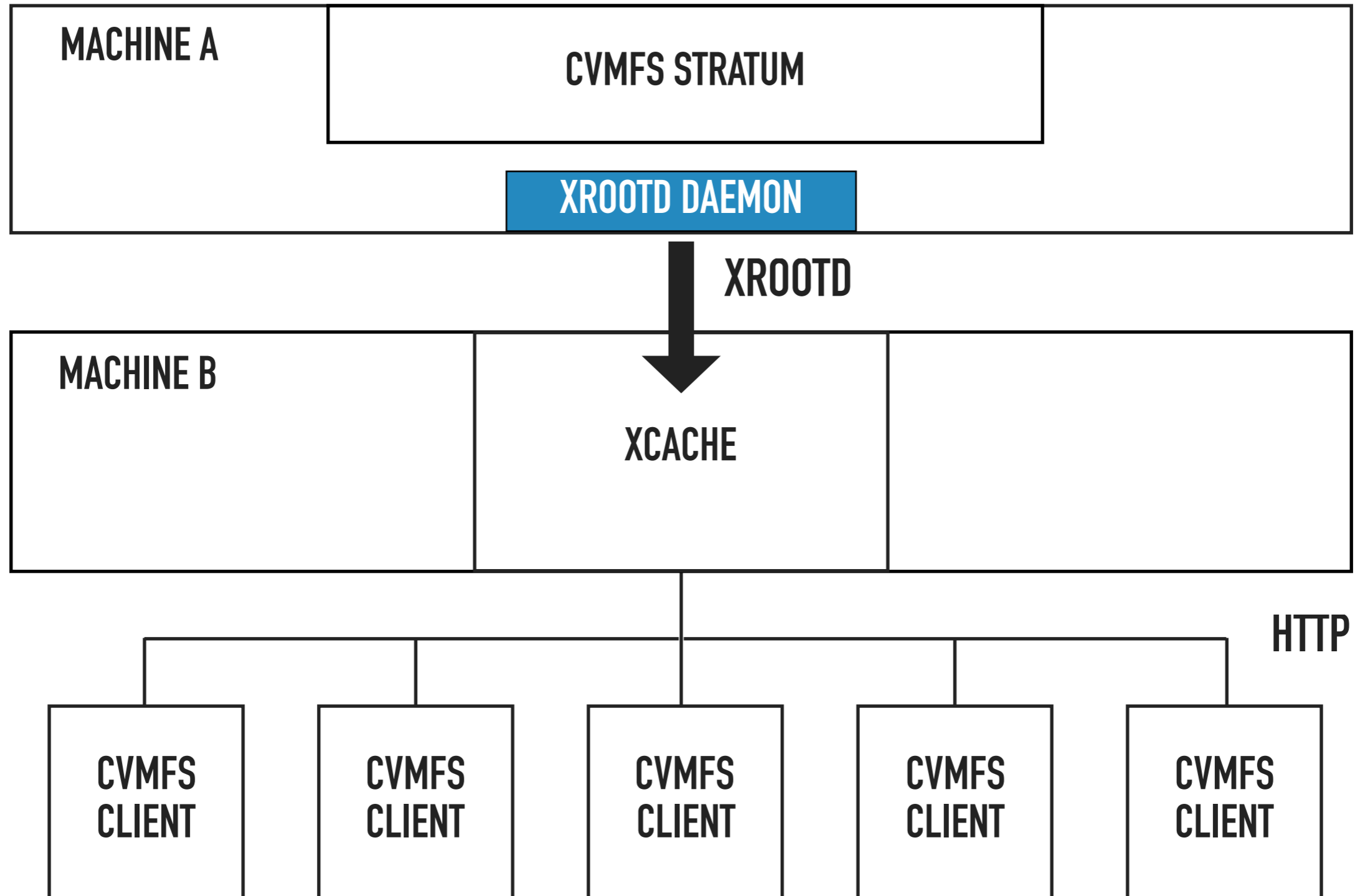- Separate from existing caching infrastructures / CDNs

PREMISE

- Can XRootD be used as an alternative transport for CVMFS?

- An XCache instance can be introduced without changes to the CVMFS clients' source

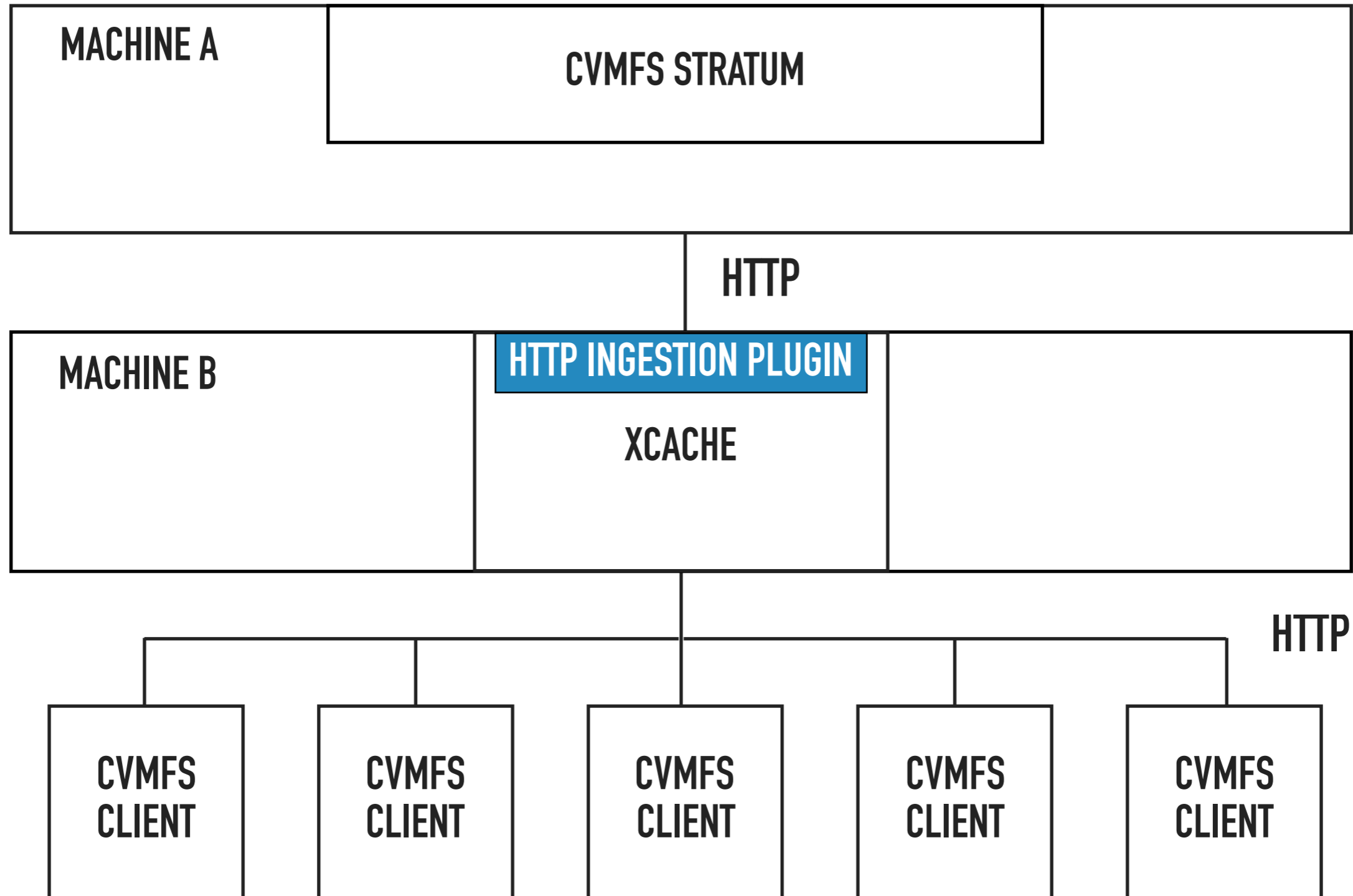Not the first time we look at XRootD: XRootD-based cache plugin for CVMFS (2017): https://github.com/cvmfs/xrootd-plugin

XROOTD/XCACHE ADVANTAGES

- Scalable via horizontal clustering

- Multi-threaded

- Flexible

- Self managing in terms of disk utilization

- Architected for local or regional use
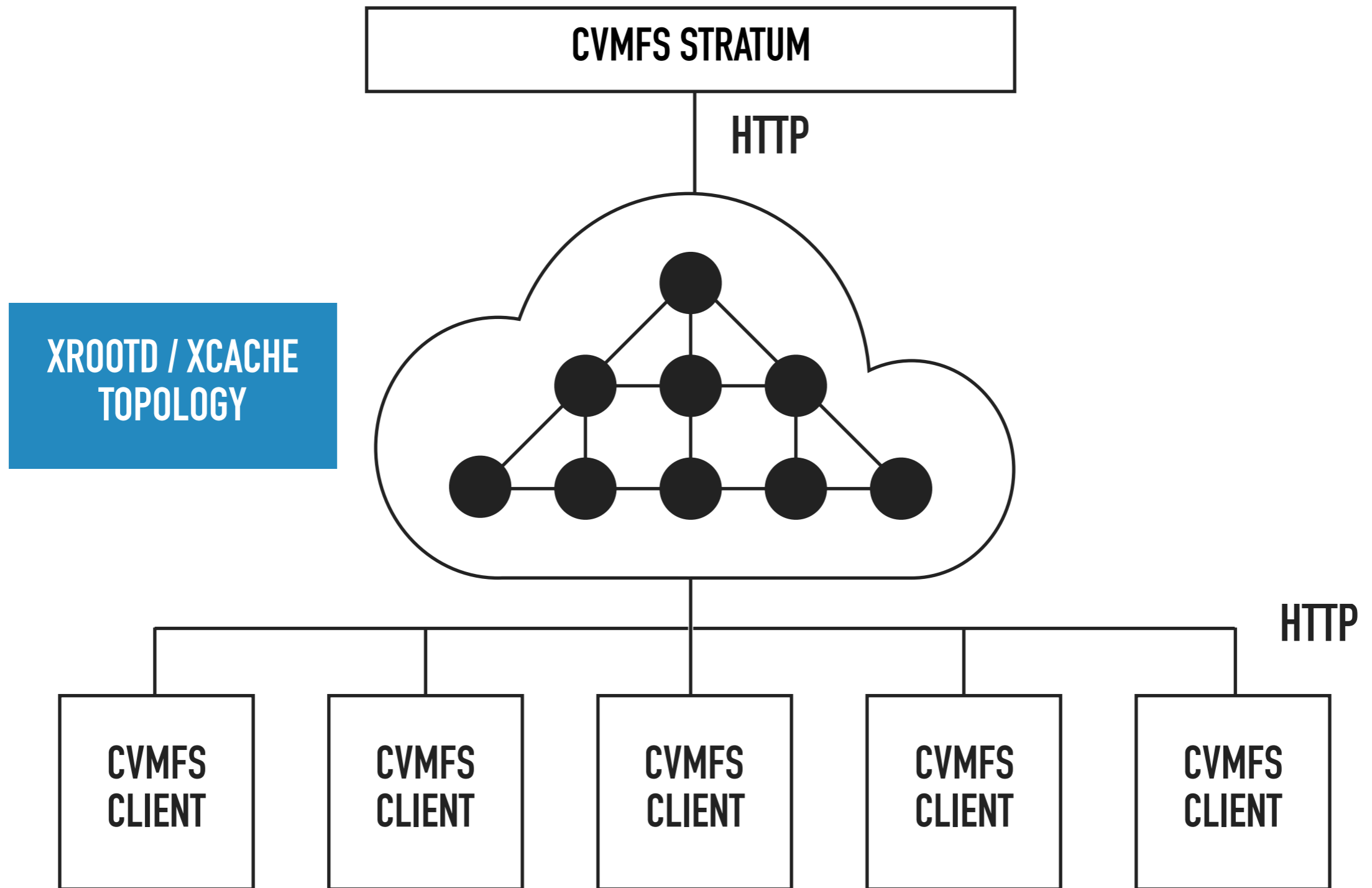
- Accessible via HTTP[S] or XRoot protocols

INITIAL TEST DEPLOYMENT

IMPROVED DEPLOYMENT

POTENTIAL SETUP

CVMFS STRATUM

HTTP

XROOTD / XCACHE
TOPOLOGY

HTTP

CVMFS
CLIENT

CVMFS
CLIENT

CVMFS
CLIENT

CVMFS
CLIENT

CVMFS
CLIENT

INTRODUCING: XRDCL-HTTP

- Allows the XRootD client to read from HTTP sources

- Some support for writing to HTTP locations

- Based on XrdClPlugInInterface (FilePlugin, FileSystemPlugin)

- Uses Davix

- Prototype, not production-quality

XROOTD CLIENT PLUGIN INTERFACE

- Almost all operations with meaning in the context of HTTP are implemented

- Not implemented: Sync (NoOp), Fcntl, Visa, Locate, Truncate, Chmod, Ping, DirList, StatVFS, Protocol, SendInfo, Prepare

- Based on XrdCl plugin interface: can be used with XCache and xrdcp!

XCACHE CONFIGURATION

- libXrdClHttp-4.so should be available in client plugin search path (set XRD_PLUGINROOT if needed)

- XrdCl plugin configuration:

```
url = http://*
lib = <<XROOTD_PREFIX>>/lib/libXrdClHttp.so
enable = true
```

- Set the XCache origin to the HTTP URL:

```
pss.origin http://cvmfs-stratum-zero-hpc.cern.ch:80
```

XRDCP CONFIGURATION

- libXrdClHttp-4.so should be available in client plugin search path (set XRD_PLUGINROOT if needed)

- Client plugin configuration

- New flag (-A) enables HTTP sources and destinations:

```
xrdcp -A \

  http://some.host.com:8080/file.txt \

  xroot://localhost:1095///destdir/file.txt
```

XRDCP CONFIGURATION

- libXrdClHttp-4.so should be available in client plugin search path (set XRD_PLUGINROOT if needed)

- Client plugin configuration

- New flag (-A) enables HTTP sources and destinations:

```
xrdcp -A \

  xroot://localhost:1095///srcdir/file.txt \

  http://some.host.com:8080/file.txt
```

XRDCP CONFIGURATION

- libXrdClHttp-4.so should be available in client plugin search path (set XRD_PLUGINROOT if needed)

- Client plugin configuration

- New flag (-A) enables HTTP sources and destinations:

```
xrdcp -A \

  http://some.host.com/file.txt \

  http://another.host.com///file.txt
```

DAVIX

- Library for file management over HTTP protocol

- Using the POSIX interface of Davix

- Single-threaded (delegate parallelism to XRootD)

- Straightforward use for most operations

- Varying levels of support for certain operations (nested directories?) depending on HTTP or WebDAV

TESTING XRDCL-HTTP

- Basic functional tests:

  - Create random files and dirs

  - Caddy serves the files over HTTP

  - xrdcp with xrdcl-http accesses and modifies the HTTP source

- It would be nice to have a more structured approach: QuickCheck, Hypothesis?

- Check WebDAV, HTTP, etc…

BENCHMARK SETUP

- Randomly generate 100MB worth of files: 10 x 10MB, 100 x 1MB, 1000 x 100kB

- Served locally with Caddy HTTP server and XRootD

- Download all files with xrdcp, in turn, from HTTP and XRootD sources

BENCHMARK RESULTS

Average throughput (MB/s)

Configuration	HTTP	XRootD
10MB x 10	178.8	183.1
1MB x 100	33.2	33.1
100kB x 1000	3.6	3.5

SUMMARY

- A new plugin for XCache and xrdcp allows ingesting from HTTP sources

- Distributed with XRootD 4.9

- Needs advanced test suite (QuickCheck, Hypothesis?)

- Use cases beyond CVMFS?

- Available at: https://github.com/xrootd/xrdcl-http

THANK YOU!