CVMFS

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Background

The CernVM-File System (CernVM-FS) provides a scalable, reliable and low- maintenance software distribution service

- But not just software distribution!
- Galaxy Project uses it for worldwide distribution of 6TB of reference data.

Overview

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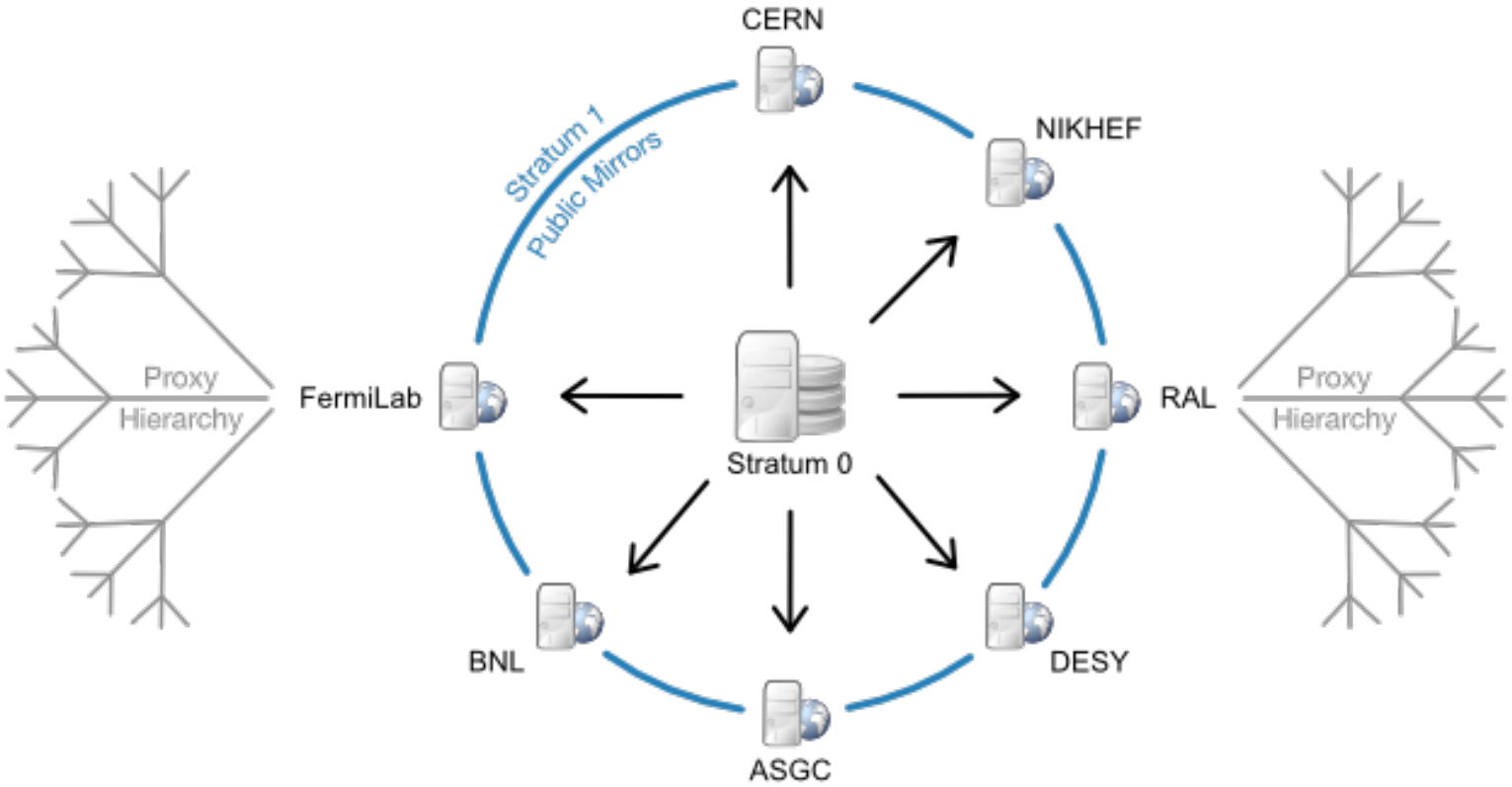
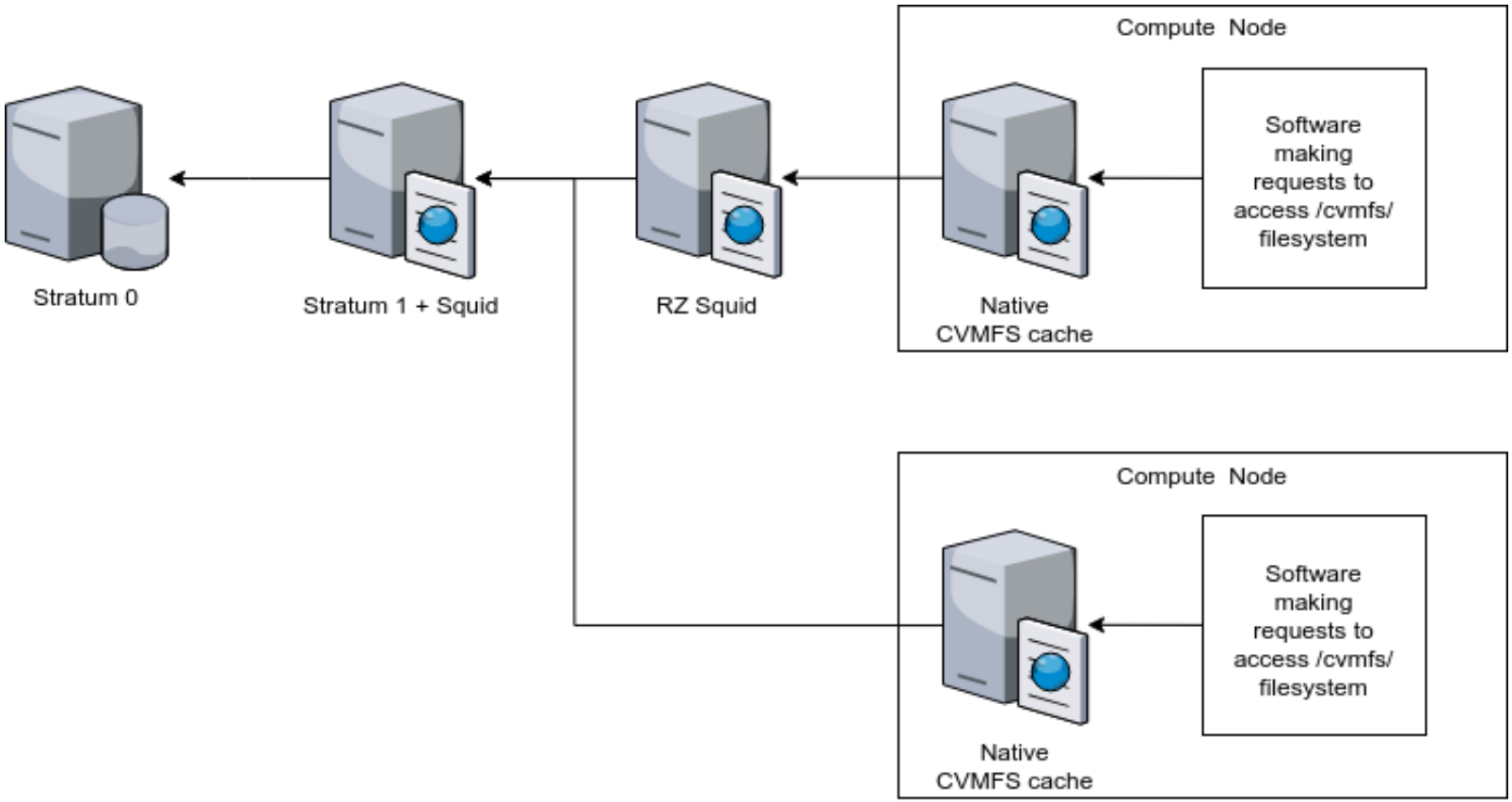
Overview



Overview: Path to Data



Internals

- Content-addressable storage and Merkle trees for data storage
- Outgoing HTTP connections only
- On demand transfer of data
- Cryptographic hash verification of transfers

Standard Tooling

- Plain HTTP
- Standard debugging tools (e.g. tcpdump, mitmproxy)
- Standard HTTP Squid Cache as proxy
- Standard caching configuration options (e.g. size, lifetime, max object size)
- Could use CDN services to cache (e.g. cloudflare, etc.)

Client Viewpoint

- Read-only filesystem, do not have to care about access control
- (Optionally) public distribution network, no secret keys needed (Galaxy Project's is public)
- Only up-to-date data
- POSIX filesystem via FUSE
- Other options if fuse is not available.
- CVMFS-FUSE will not block IO on the node indefinitely if it has connection problems

Galaxy Project Use

- $\tilde{6}$TB of reference data
- Host multiple stratum1s, one per datacenter
- Multiple community hosted stratum1s
- Jobs running in VMs leverage ephemeral storage for cvmfs cache
- Used in production for the largest known Galaxy server

Rsync

- "By the aid of the CernVM-FS file catalogs, the `cvmfs_server` utility knows beforehand (without remote listing) which files to transfer."
- Easily host only the data your users use
- Do not have to know what that is ahead of time
- "Requires fragile manual tooling to keep up to date" – the Galaxy Project sysadmin (they originally used rsync)

Torrents

- Does not experience firewall issues, university admins often block torrent protocols
- Built-in catalog updating, stratum0 pushes a new catalog and everyone automatically updates
- (again) Easily host only the data your users use
- (again) Do not have to know what that is ahead of time
- Requires us to build tooling to support this

CVMFS Overview

- Existing example in production with genomics data
- Plain HTTP, tons of existing tools
- Low client storage requirements, host only want you use
- Easy to deploy (ansible roles)