dCache.org

Federated File System

(let's learn from the others' ~~mistakes~~ expirience)

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Déjà vu

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Requirements for Federated File Systems

Abstract

This document describes and lists the functional requirements of a federated file system and defines related terms.

What this presentation about

- Show industry attempt to solve similar issue
- Show ideas and implementation details
- Show weak points and problems
- Help to detect and avoid “well know” mistakes

Requirements (join effort SUN + NetApp)

- Provide a set of protocols to turn a collection of fileservers into a federation
- Provided namespace hosted on different fileservers
- Fileservers can belong and managed by different administrative entities

What is FedFS

- A way to build a uniform namespace
  - Do you still remember AFS?
  - Make use of existing (unmodified) servers
  - Make use of existing (unmodified) clients
- Keep POSIX semantics
- Migrate files to new locations
- Replica list, geo/load balancing

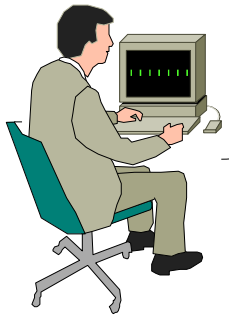
Junction/Referral

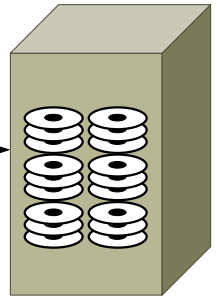
- **Junction:** A filesystem object used to link a directory name in the current filesystem with a directory on a different filesystem.
  - A special ***SYMLINK***-like object with only one attribute – filesystem location information
  - Querying for any other attr will return ERR_MOVED
- **Referral:** response with location information returned to the client.

Implementation Details

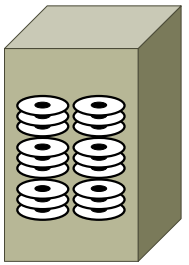
/wlcg/atlas/dataset1/file1

cd /wlcg; cd atlas

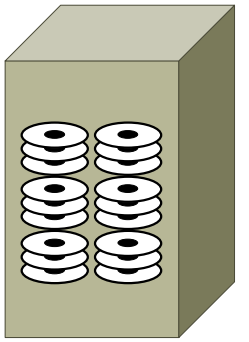




Server A



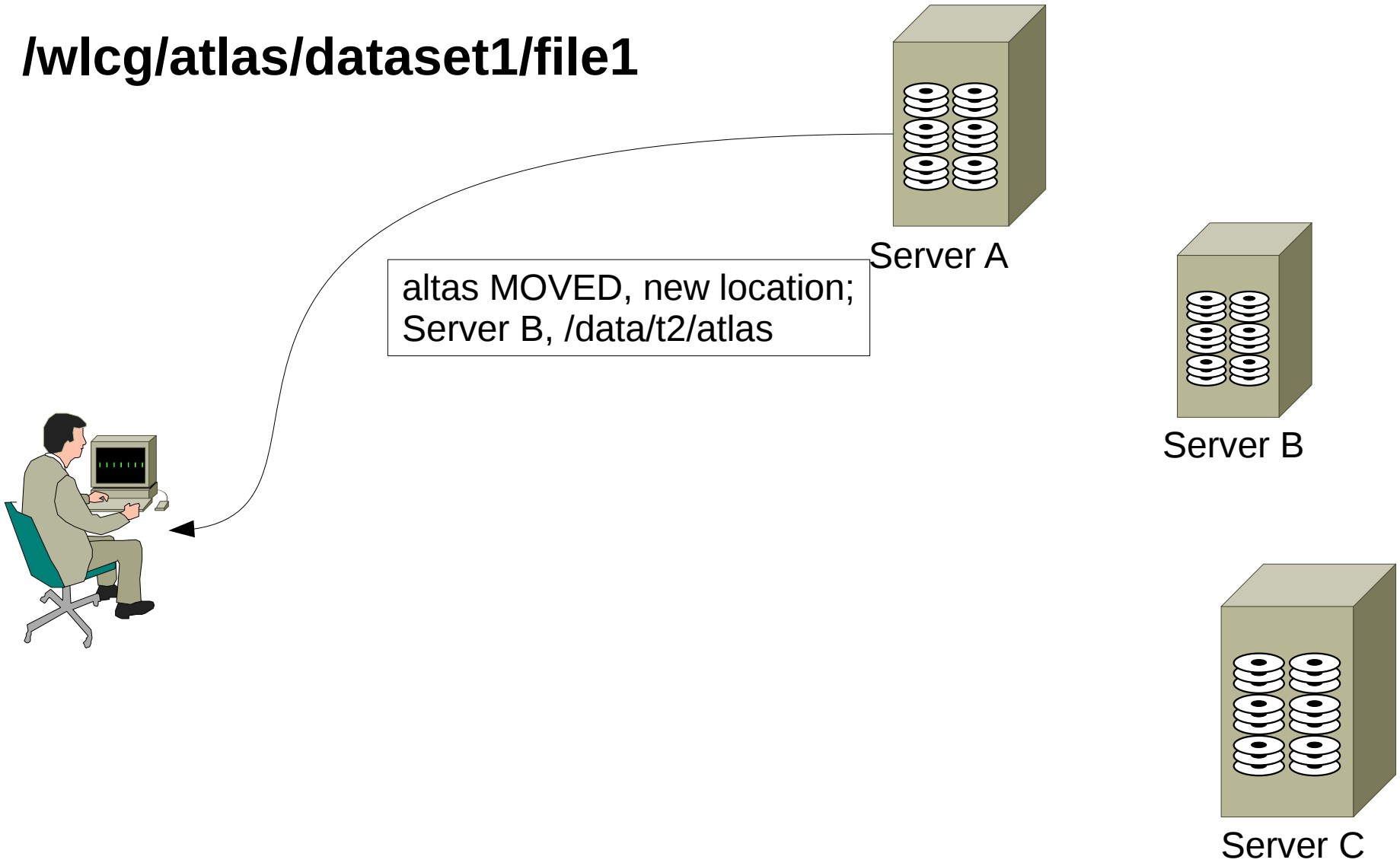
Server B



Server C

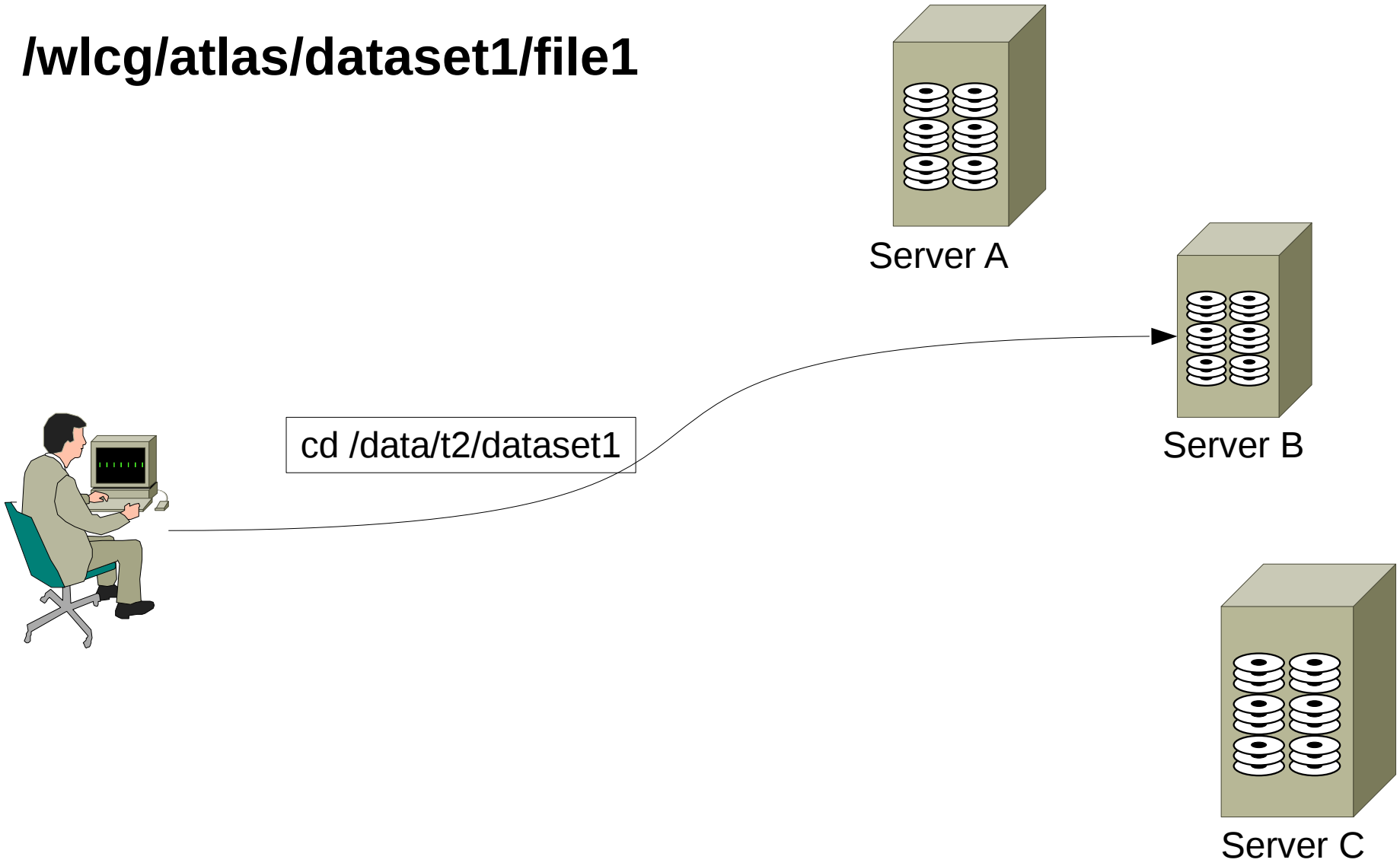
Implementation Details

/wlcg/atlas/dataset1/file1



Implementation Details

/wlcg/atlas/dataset1/file1



Implementation Details

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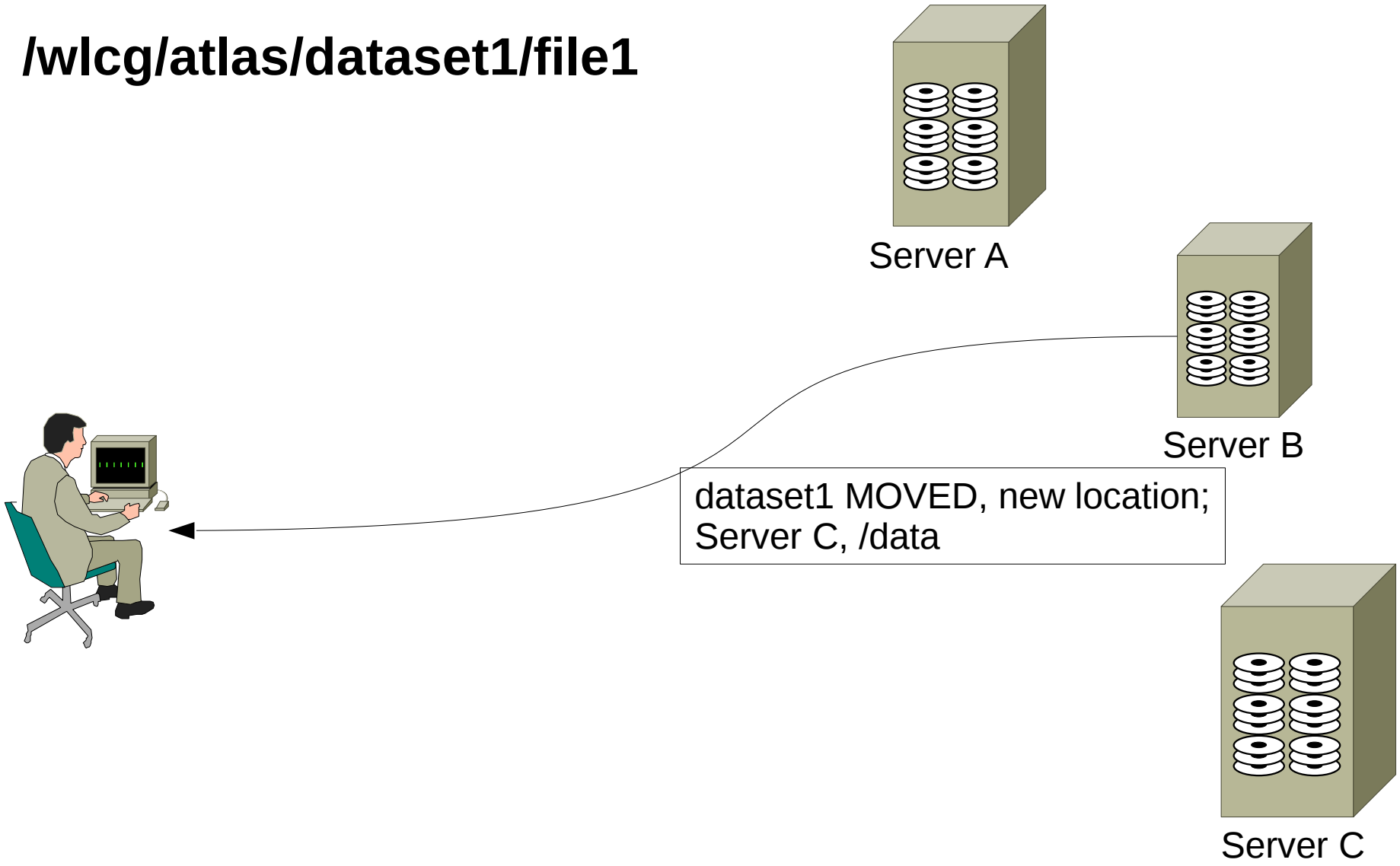
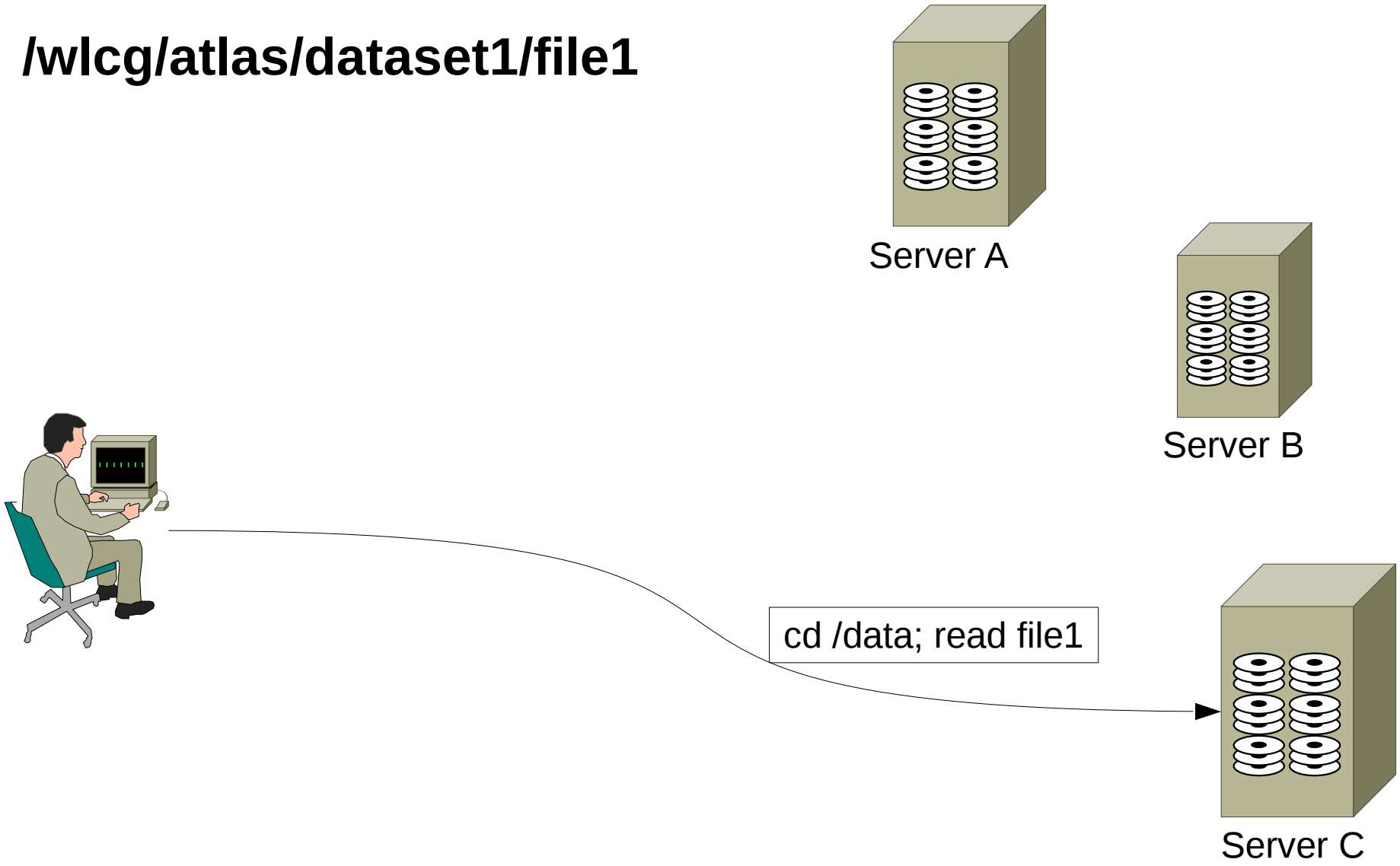


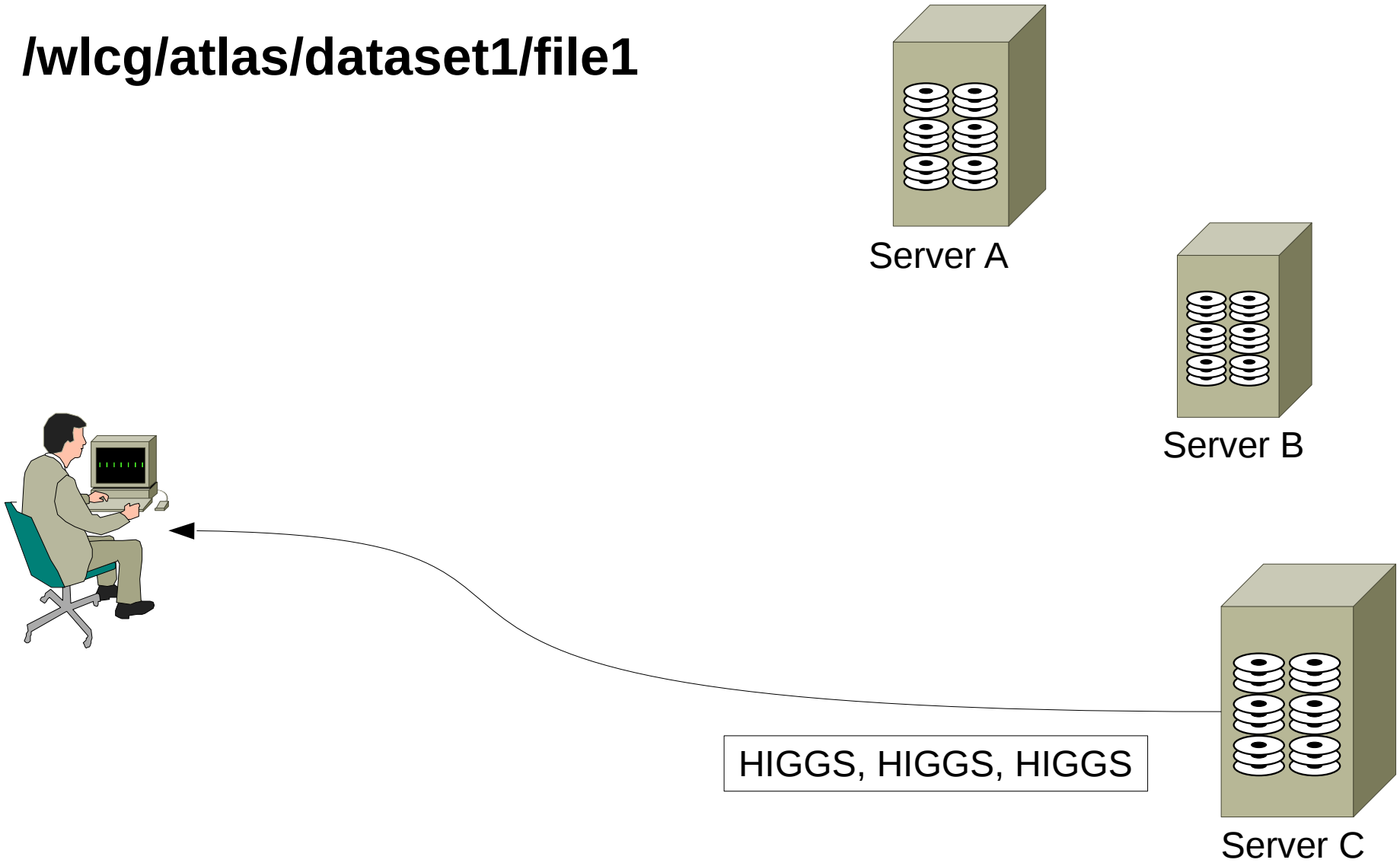
Implementation Details

/wlcg/atlas/dataset1/file1



Implementation Details

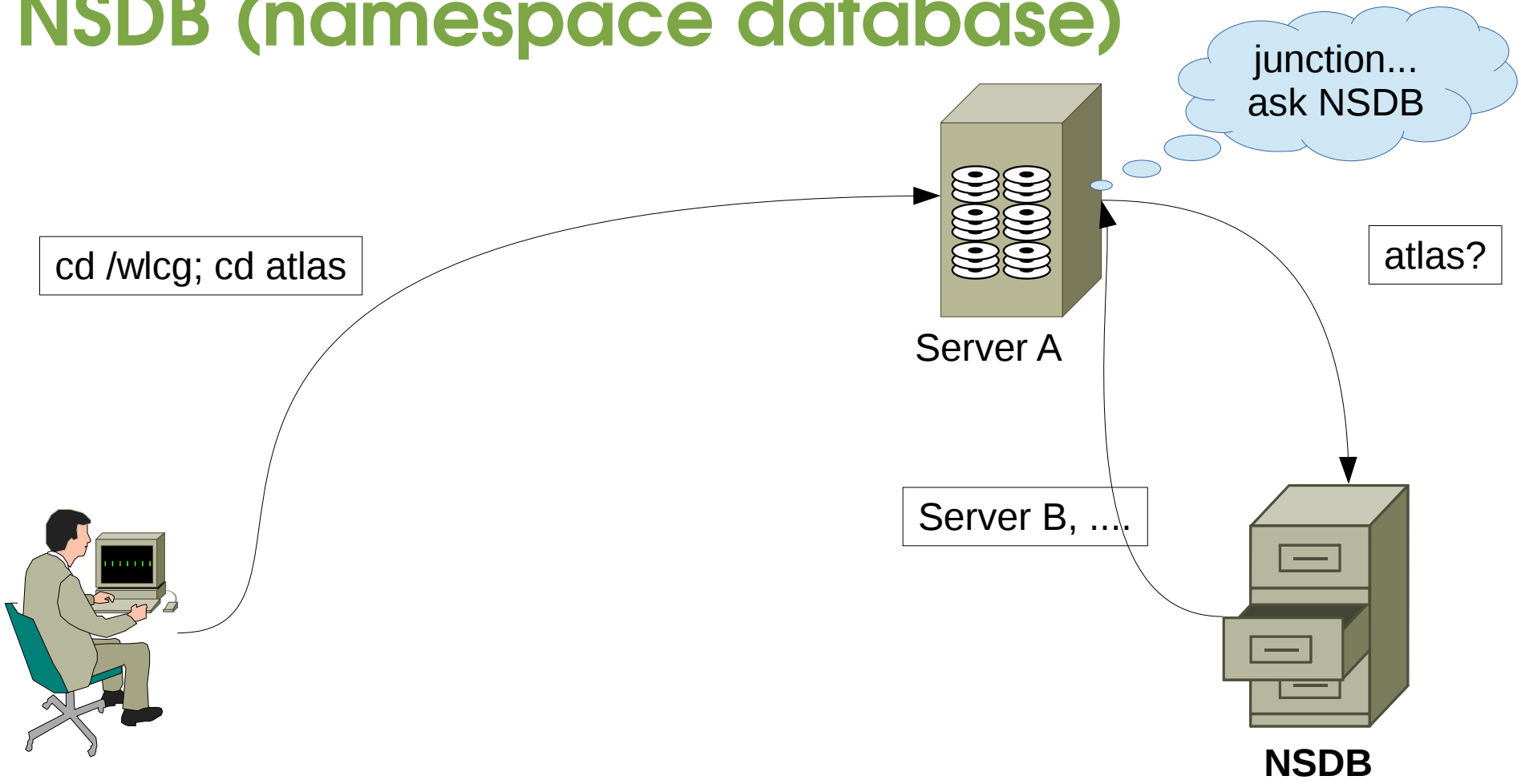
/wlcg/atlas/dataset1/file1



Transparent

- Transparent for end-user
- **Server-C** an aware of re-directions
  - Only Servers **A** ans **B** must provide referrals

NSDB (namespace database)



NSDB

- slowly changing information
  - easy to replicate
- small set of information
  - easy to manage / replicate
- can be managed locally
  - each server/site may have it own NSDB
- RFC7533: Admin Protocol for Federated File Systems
  - protocol to inject junctions points into FS
  - Solaris and Linux implementations
  - NFS only :(

Good sides (linux)

- Available in EPEL repo
- Implemented as automounter + LDAP
- Uses DNS service record
  - no mount required
  - /nfs4/domain.com (do you remember AFS?)
- NFSv4 compliant client is sufficient
  - linux, solaris, OSX 10.10 (?)
- 'last server' can be any valid V4 server

Down sides of FedFS

- Protocol (semantics) specific
  - All server MUST talk the same protocol
- LDAP specific
- Assumes user can access any server
  - Federated identity required
- Management protocol does not define access controls
- No production installations

More info

- https://tools.ietf.org/rfc/rfc5716.txt
  - Requirements for Federated File Systems
- https://tools.ietf.org/rfc/rfc7533.txt
  - Administration Protocol for Federated File Systems
- https://tools.ietf.org/id/draft-adamson-nfsv4-multi-domain-federated-fs-reqs-02.txt

Implementation Details