

Flexible Caching and Replication: dCaches in Data Lakes

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- WLCG trying to optimize storage cost
- R&D push into „Data Lakes“ — outcome is open
- We want to hear your perspective!

What is already known

- Very little concrete information
 - R&D project in its early stages
 - Early discussion at Joint WLCG & HSF Workshop in Napoli, March 2018 (<https://indico.cern.ch/event/658060/>)
- Concepts so far seem not very well aligned with industry's understanding of Data Lakes

What is already known

- QoS supposed to become more and more important
 - *Policies* push data to slower, cheaper, archival-grade QoS classes
 - *Usage* pushes data to faster, more expensive, throughput-focused QoS classes

What is already known

- Networking supposed to become more important
 - more distribution of data across sites
 - talk about remote reads over WAN
- Cost balance between storage and networking cost?

- Some distributed instances already running
 - NDGF Tier 1 (tape at any site, reading from location, writing distributed across sites)
 - Great Lakes Tier 2 (no tape, both reads and writes are local, remote reads trigger replication)
- Why are those not considered Data Lakes?

Distributed dCaches: Existing Features

- Support for diverse protocols
- Support HSM connectivity
- Pools may run different major versions
- Choose preferred write location depending on IP (location) or directory path (if requested)
- Prefer 'local' read access if data locally available
- Replication
 - Both on-demand and manually triggered
 - Permanent, data protection, location adjustment

Distributed dCaches: Missing Features

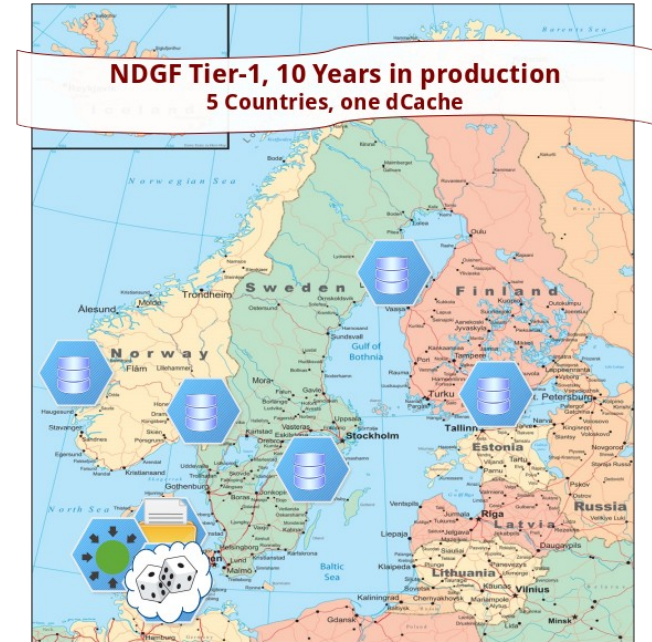
- All data servers must be dCache pools
- No locality preference / network topology awareness for internal communication
- No central/dCache way to update whole setup
- No operation if consistency can't be guaranteed (CAP theorem)

Thinking about three possible architectures:

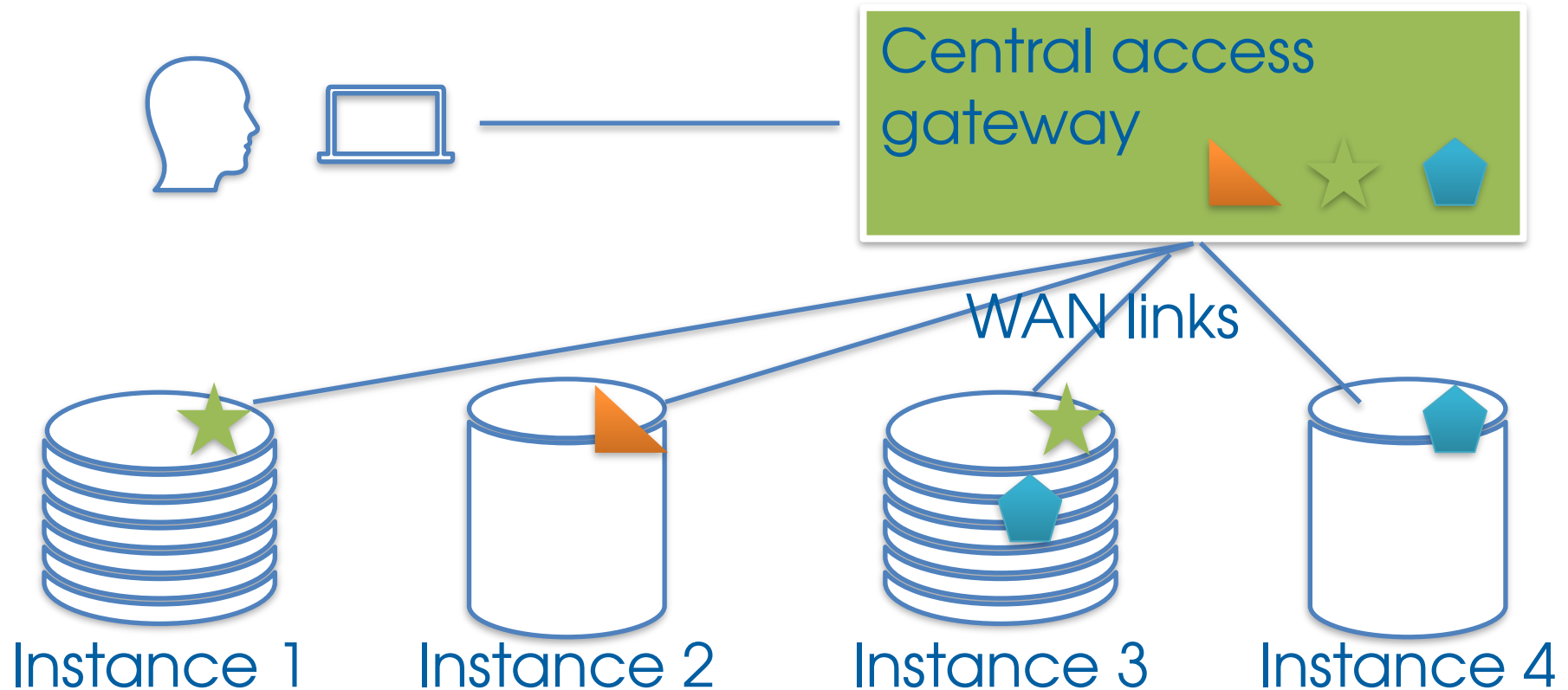
1. Distributed dCaches (already existing)
2. dCache as part of a federated storage system
3. dCache as part of a caching system

1. Distributed dCache

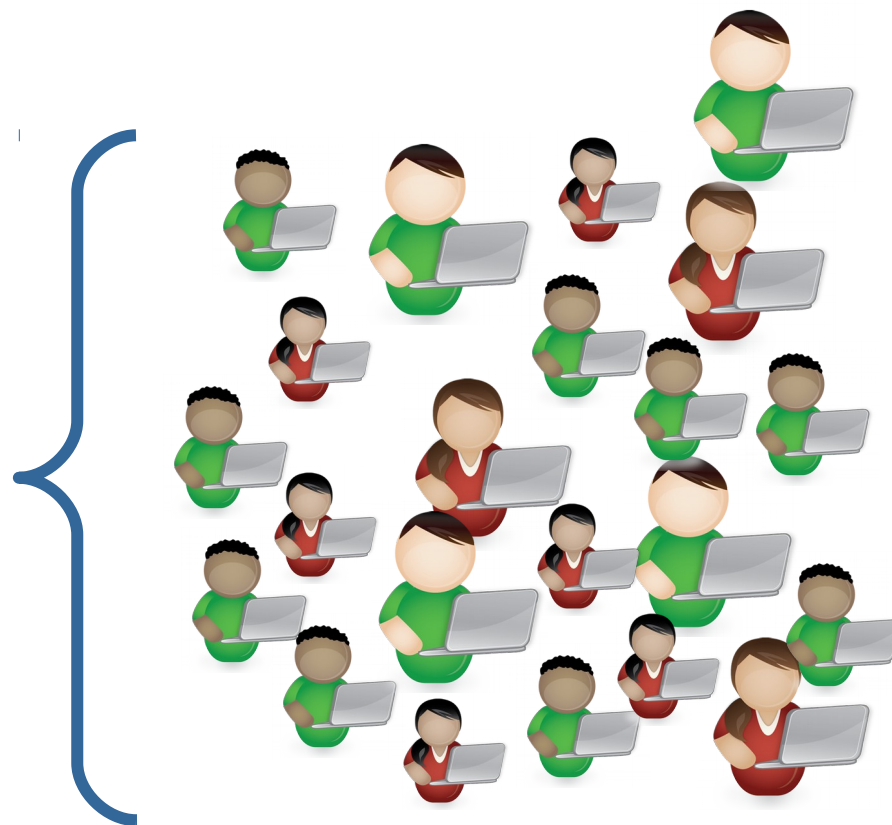
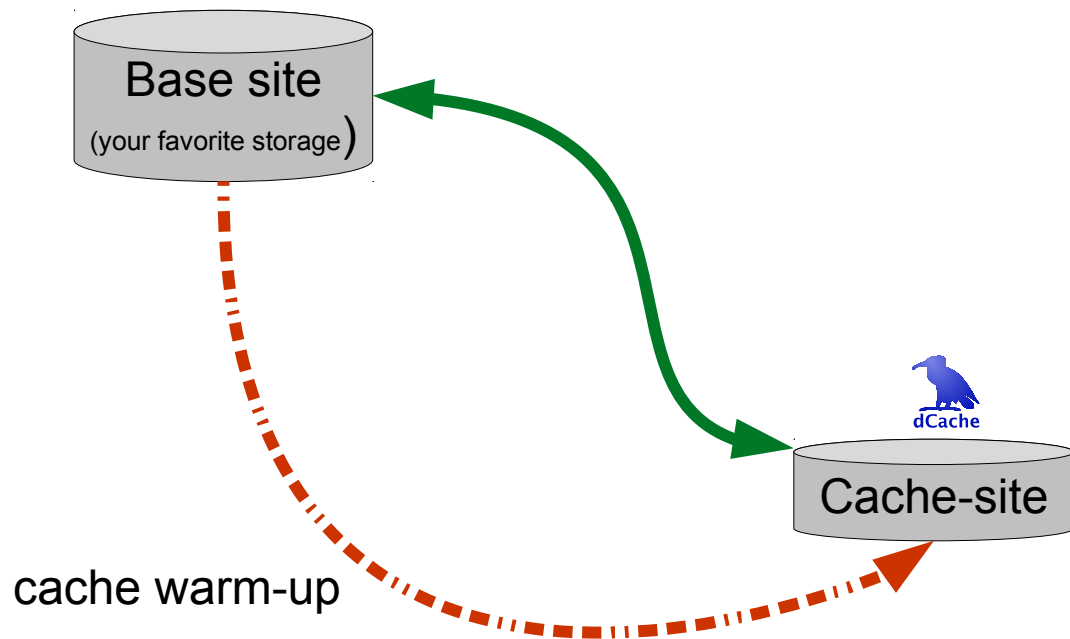
- dCache servers (and services) connected by WAN instead of LAN
- Share admin workload
- May use less resources



2. dCache as part of a Federation



3. dCache in a cache hierarchy



Architecture

- Which one will be chosen for WLCG?

Security

- Responsibilities
- Methods

Transfer

- Protocols
- Management

Management

- What remains for local sites?
- What's needed for local sites?

Next steps

- Big question:
How will the R&D effort turn out?
- We'll support what admins in WLCG need
- CERN representatives from several levels will come to Hamburg for discussions right after this workshop

Data Lake concepts: Discussion
