REQUIREMENTS FOR HSM SYSTEMS

HSM & Cluster FS Konferenz 2023

Charlotte Wehn, DLR DFD, 16.6.2023

Overview

- The DLR Earth Observation Center and the German Satellite Data Archive (D-SDA)
- Oracle HSM at the D-SDA
- Requirements for new HSM system:
  - Functional
  - Migration from Oracle HSM
  - Operational
  - Data management
  - Sizing and perfomance

Earth Observation Center (EOC)

Deutsches Fernerkundungsdatenzentrum (DFD)
German Remote Sensing Data Center

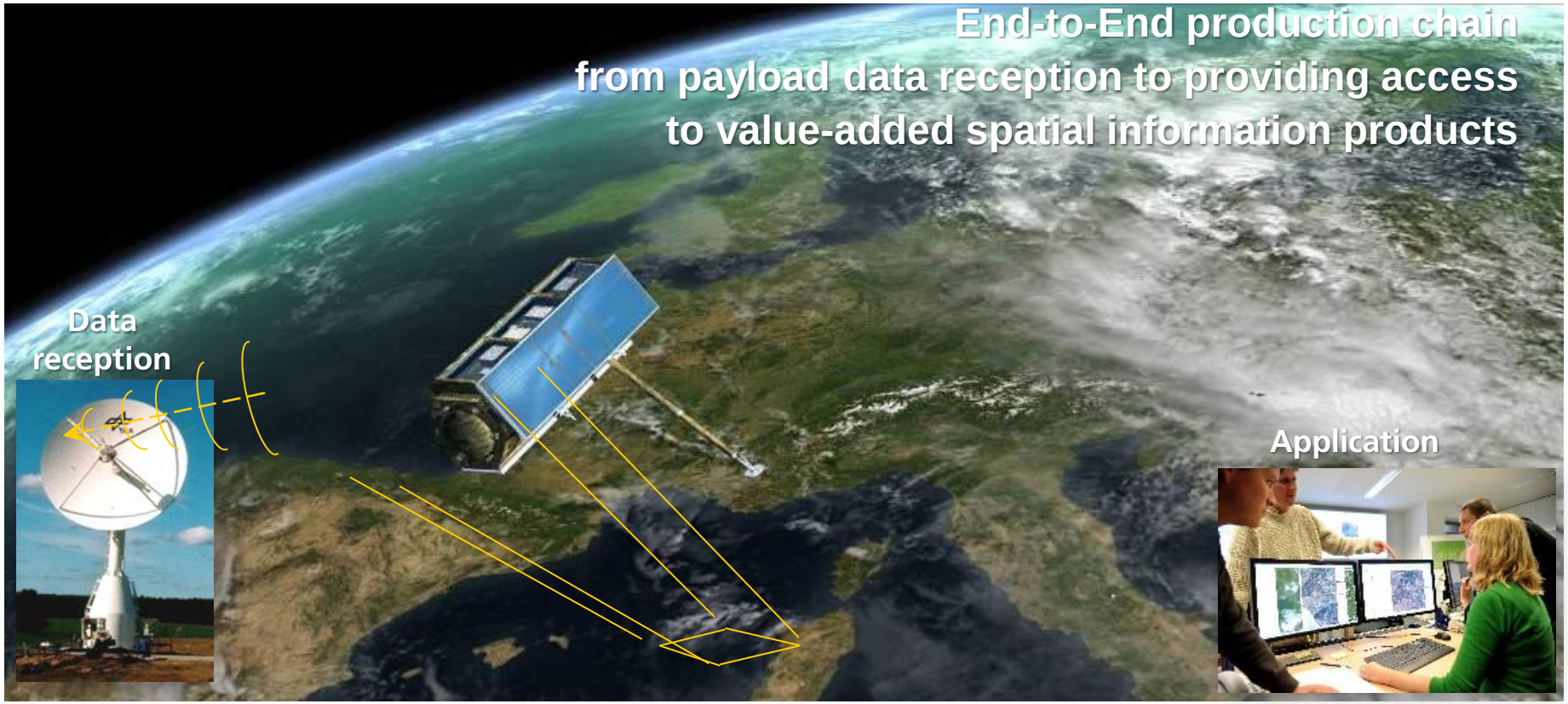
Director: Prof. Dr. Stefan Dech

Institut für Methodik der Fernerkundung (IMF)

Remote Sensing Technology Institute
Director: Prof. Dr. Peter Reinartz &
Dr. Peter Haschberger (acting)

- ca. 350 employees
- ca. 40 at Universities
  (TU Munich, Univ. Würzburg, Augsburg)
  - ca. 250 Scientists and Engineers from
    over 30 countries
  - ca. 65 PhD Students
  - ca. 20 guest Scientists
- ca. 53 % Third party income

Earth Observation Data – Production and Usage

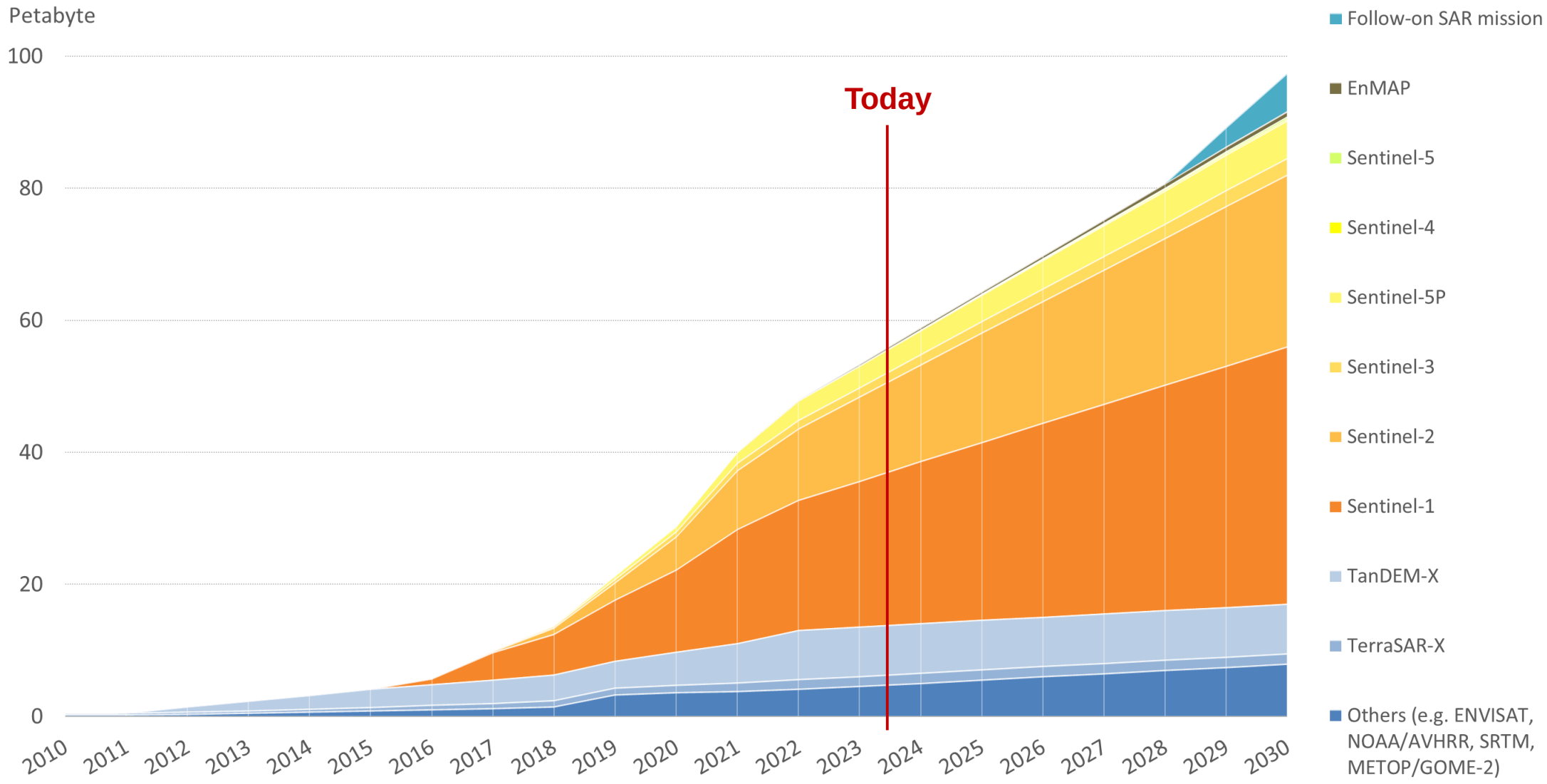


The German Satellite Data Archive D-SDA

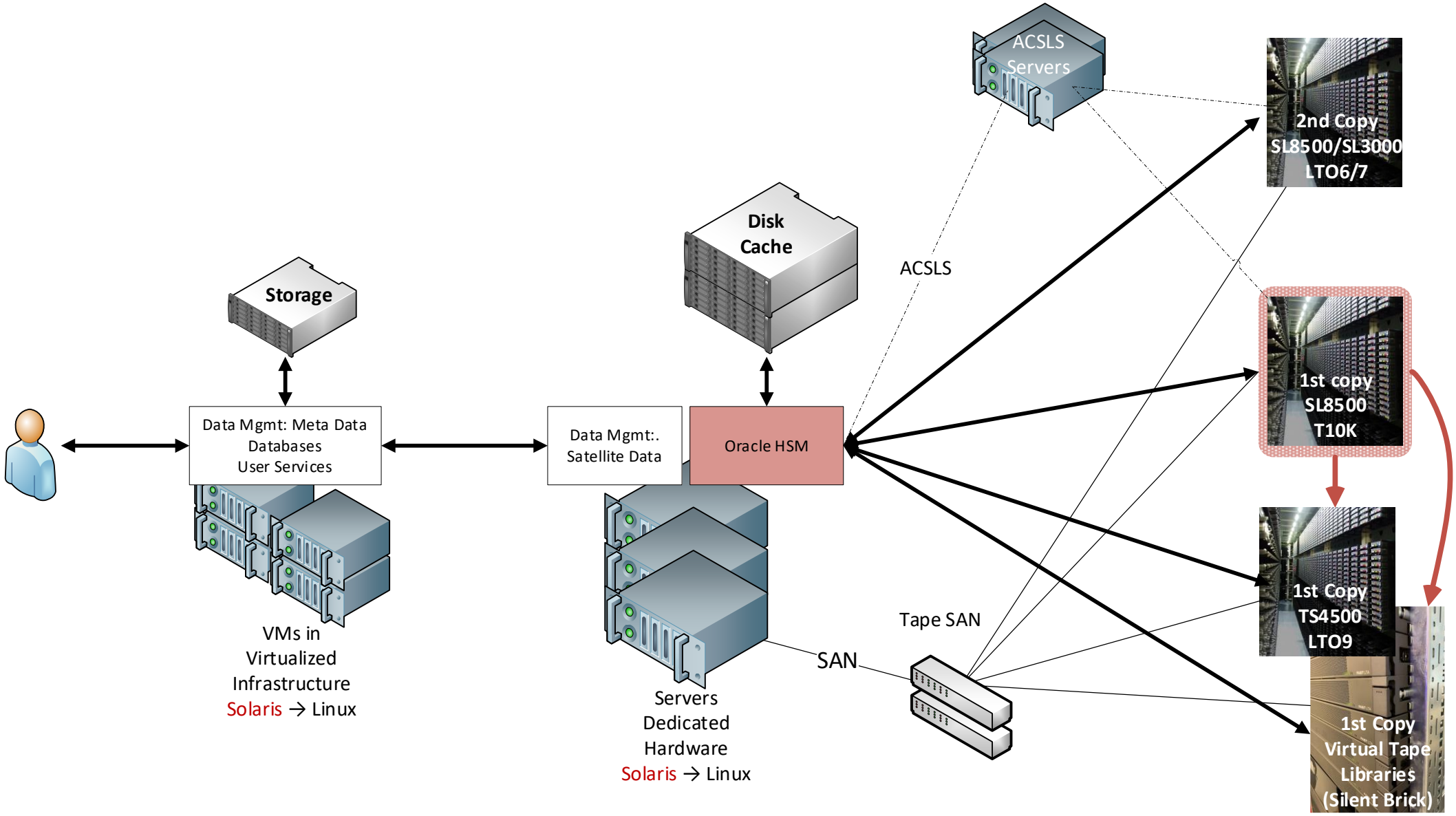
German Satellite Data Archive D-SDA

- Key component in the payload data ground segments of national and international Earth observation missions since the 1990s – SRTM X-SAR, TerraSAR-X, TanDEM-X , EnMap
- Satellite data management within the European Copernicus program under ESA contract - Sentinel-1, Sentinel-3, and Sentinel-5 Precursor
- Provide data and products to internal and external scientific users and for fulfilling national mandates
- Sustainable data preservation and curation to ensure long-term availability and usability of Earth observation data
- Embedded into national and international networks and initiatives – coordination, technological evolution, interoperability

D-SDA Predicted Data Volume Evolution



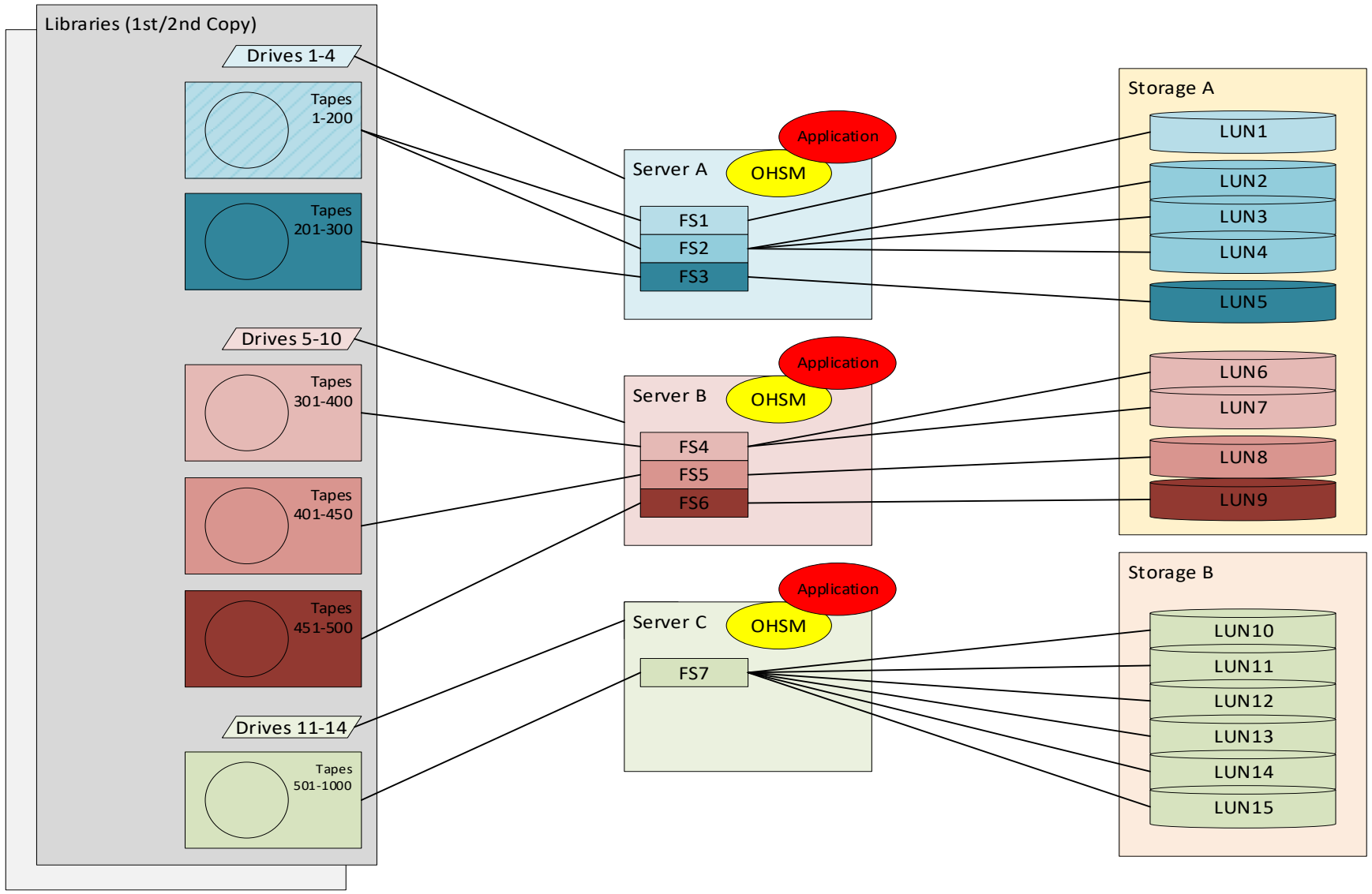
Archive Overview



Oracle HSM Characteristics

- Traditional POSIX file systems
- Decentralized approach:
  Typically data is moved to tape where stored to disk
  Shared filesystems possible via QFS
- Typical problems with large number of files per file system (search, metadata backup + restore)
- Fairly simple configuration, file based
- Multiple options for data steering (disk and tape)
- Straightforward logging (syslog, separate logs for archiving/staging)
- Open file format on tape, can be extracted using tar

Oracle HSM Setup at D-SDA



HSM Requirements
Functional

- Standard HSM functionality: rule based data movement from/to (virtual) tape, no specific user actions required
- Runs on RedHat Enterprise Linux supported versions
- POSIX compatible file system – expected by application, no NFS/CIFS!
- S3 capability - future use
- Compatibility with SAN attached block storage
- Compatibility with existing (virtual) tape libraries including FastLTA Silent Brick System (→ no LTFS!)
- Library control via ACSLS
- Fast file system access for multiple application instances on multiple servers
  For centralized architecture: application can run on (RHEL) shared FS clients **with fast file system access**
- Redundancy for HW outages: servers, storage, (virtual) libraries
  High Availability or simple predefined manual procedures

Requirements
Migration from Oracle HSM

- Fast metadata migration
- Must be able to read OHSM tape format for staging/recalls
  We cannot wait for all data to be copied!
- Metadata migration of existing OHSM file systems separately one by one
  Application instances have to be moved with data!
- Data migration in the background, if necessary

Requirements
Operational

- CLI for operations, including file operations such as staging/recall
  GUI is optional
- Bonus: REST interface for operations/file operations
- Monitoring/Logging:
  - Reasonable logging for errors and file operations
  - Integration in monitoring system possible (e.g. by CLI commands / monitoring logs)
  - Bonus: interfaces to Telegraf/InfluxDB/Grafana
- Maintenance:
  - Take single resources offline for maintenance (library, drive …)
  - Don‘t require complete downtime of all application instances for partial maintenance
  - If complete downtime is necessary for anything: short downtimes!
  - Good error recovery – we don‘t want to restart everything if a drive hangs!

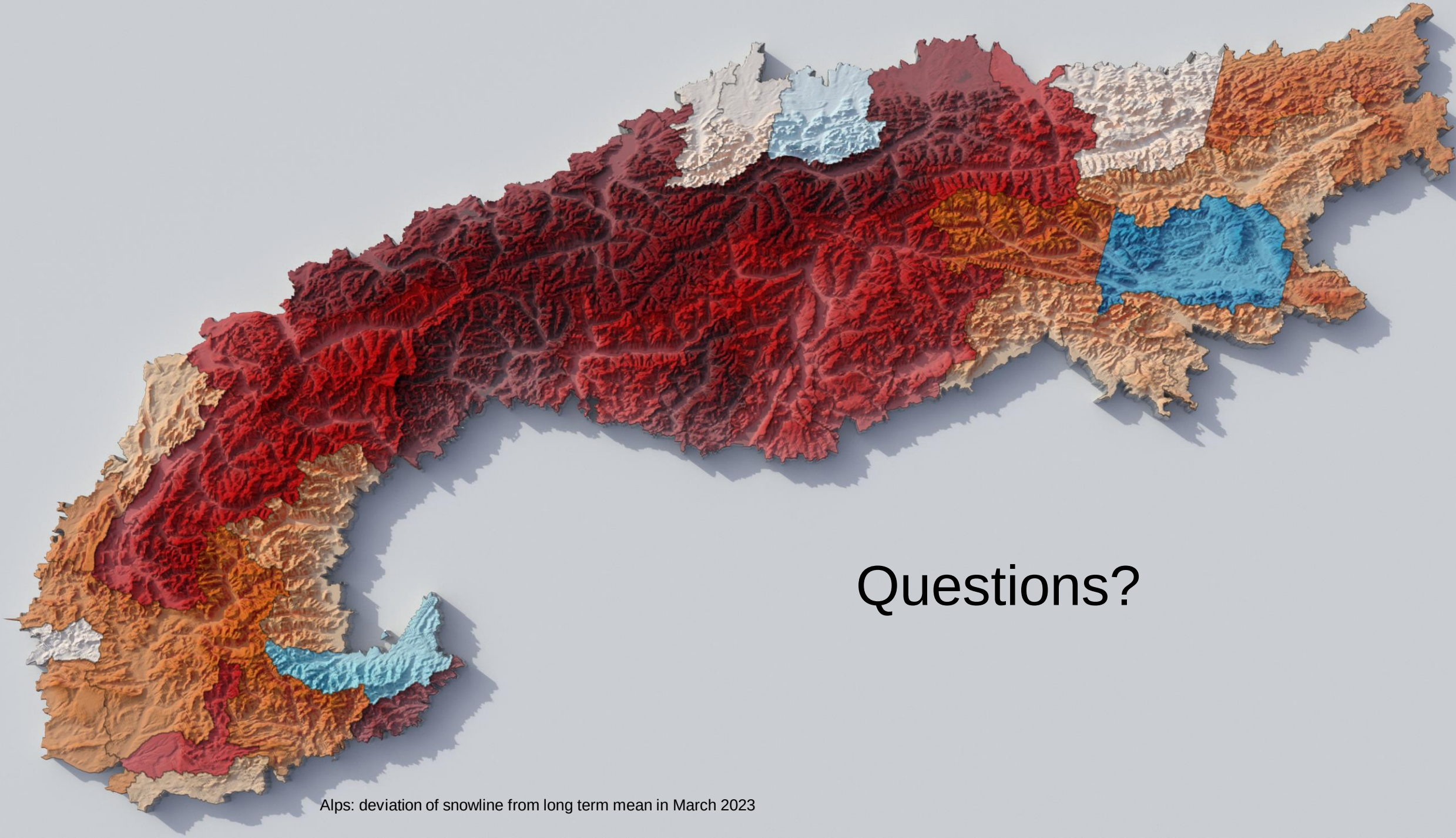
Requirements
Data Management

- Control which tapes are considered for use by HSM
  Libraries are used by different applications and from different environments!
- Control and separate (virtual) tape usage by dataset (e.g. directory/file name)
  For efficient staging/recall for known use cases, we need to control placement on tape.
- Control and separate disk cache usage by dataset
  Needed for performance and space separation of datasets / projects.
  We don‘t want one active system overrun all others.

Requirements
Sizing and Performance

The new HSM must support:

- 4 Copies – 2 are used by default
- Total data volume of 100PB, with margin for growth
- I/O 100TB/day (~10Gbits/s), with margin for growth
- Disk cache in the petabyte scale, with margin for growth
- Distribution of disk and tape I/O to several servers, number of servers can be expanded later



Questions?

Alps: deviation of snowline from long term mean in March 2023

Imprint

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