Leibniz Supercomputing Centre

of the Bavarian Academy of Sciences and Humanities

IBM Something Scale @ LRZ

Michael Stephan | ISS Strategy Days 2023

Leibniz Supercomputing Centre

Bavarian Academy of Sciences and Humanities

IT Service Backbone for the Advancement of Science and Research

IT support
since 1962

~ 280
employees

Computer Centre
for all Munich Universities

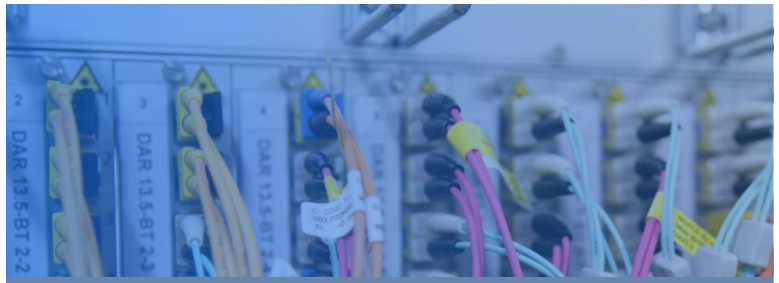
Regional Computer Centre
for all Bavarian Universities

National Supercomputing Centre
(Gauss Centre for Supercomputing)

European HPC Community

Operating Cutting-Edge IT Infrastructure

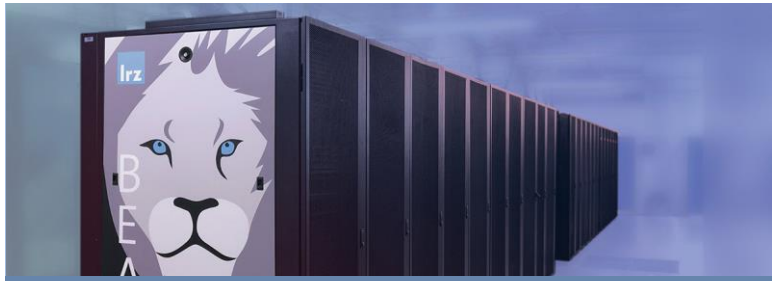
- Email
- Network
- Storage
- Cloud Computing
- Cluster
- HPC
- Training
- Consultancy



High Speed Networking
Munich Scientific Network

HPC
SuperMUC-NG, Linux Cluster, Compute Cloud, LRZ AI

Big Data
Bavarian State Library Digital Archive



Future Computing
Technology exploration, Research & Development

IBM Spectrum Scale @ LRZ

HPC Storage

SuperMUC-NG

23PF (peak) – 6.5k Nodes – 300k Cores – 715TB Memory – 3.3 MW (HPL)
9 ISS Client Clusters

50 PB – 500GB/s
WORK + SCRATCH

44x Lenovo DSS-G220
1x Lenovo DSS-G202

HPC Storage

Linux Cluster / LRZ-AI / MCML / Attended Housing

1500 Nodes (x86) – 15 DGX A100
16 ISS Client Clusters

3 PB – 80GB/s SCRATCH	430 TB (all flash) AI filesystems
2x IBM ESS 5000 SL4	2x IBM ESS 3200 3x IBM ESS 3000

Spectrum Protect Disk Cache + B2D

LRZ Backup and Archive System

136PB – 38bn Files – 9,000 ISP Nodes

18 TSM Server
2 x 40/100GE – 2 x EDR IB – 4 x 32G FC

2x ESS 5000 SL5
9PB – 80GB/s
2x 40 Port HDR Switches

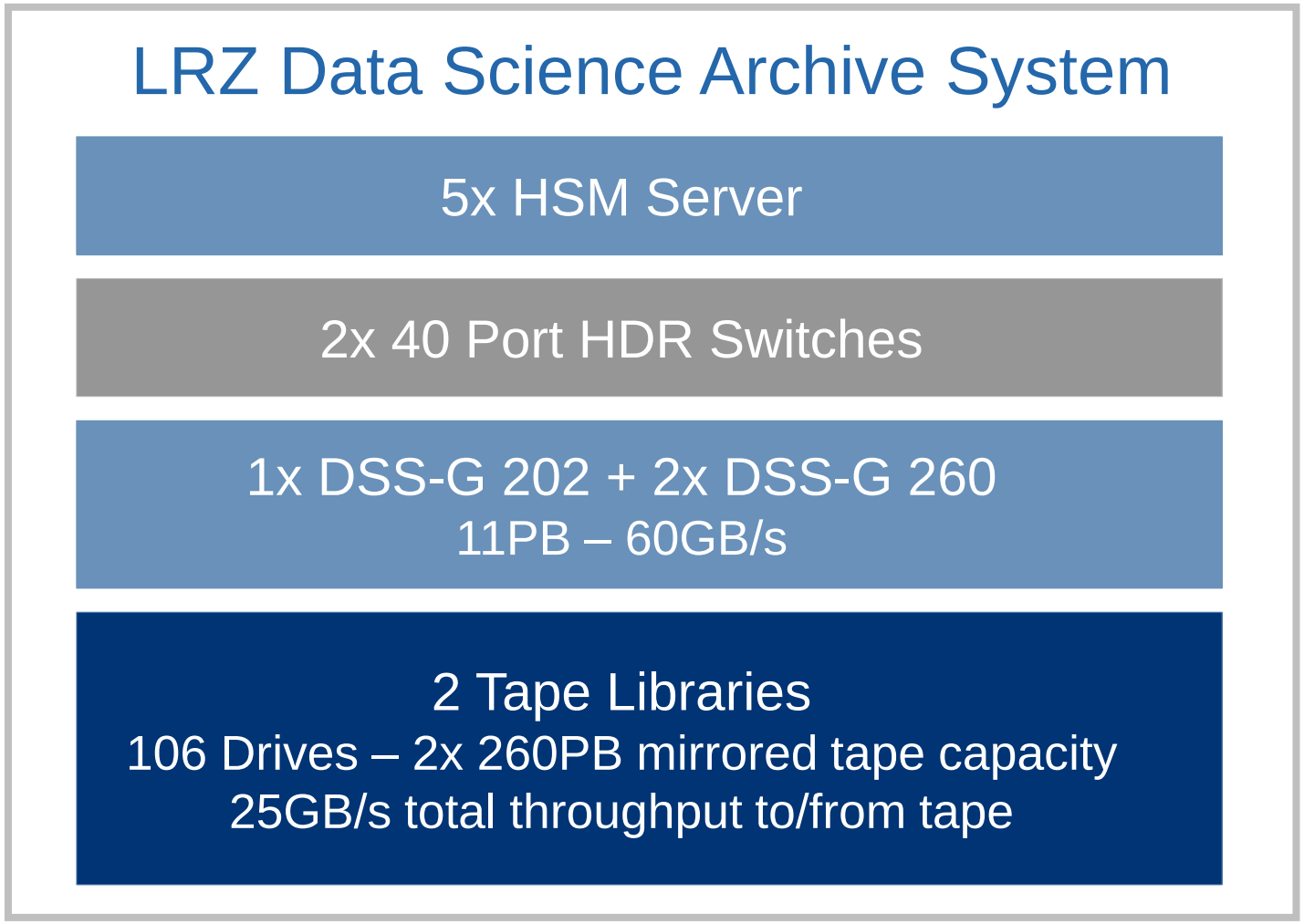
2 x NetAPP EF560
1 x NetAPP E2800
96 SSDs – 48 Disks

3 Tape Libraries

114 Tape Drives

17,500 Tape Cartridges

Long Term Storage / Data Science Archive (DSA)



Design / Configuration:

- Retain scientific data for at least 10 years
  - Files made immutable after 24h
  - No auto-recall on file access
- Filesystem only mounted on Login Nodes + DSA Recall Director
- Allow data sharing and publication
  - World wide access via Globus Online
- Based on:
  - Spectrum Scale File System
  - Spectrum Protect for Space Management
  - Scale Out Backup and Restore (SOBAR)
- Management via DSSWeb

Data Science Storage

Unified Storage for Data Intensive Science

I need to share a 400TB dataset with someone in Canada!

Why should I pay you that amount for storage. A 20TB disk from *** costs only 300 Euro!

My experiment will generate multiple PBs, that have to be analysed and backed up! How?

I need to share some data on SuperMUC-NG between multiple projects!

I want to analyse a large dataset, generated on SuperMUC-NG, using some special OS image on the LRZ Cloud!

I want to build a WebApp that allows users to interactively analyse my 500TB SuperMUC-NG simulation data!

Unified Storage for Data Intensive Science

High throughput batch processing
on LRZs Linux-Cluster or SuperMUC-NG

External access and sharing
via Globus Online/GridFTP

Interactive processing
on LRZs Compute Cloud

High performance backup and
archive of data on LRZs Backup-
and Archive System

Remote visualization
on LRZs visualization systems

Batch and interactive processing
on dedicated, hosted HPC Cluster at LRZ

Hardware Overview

Data Science Storage

4 Storage Cluster – 27 Client Cluster – ~8200 Mounting Nodes

DSSHOME (600TB) 2x DSS-G 202 1x DSS-G 220	InHPC-DE (11PB) 1x DSS-G 202 4x DSS-G 240	LRZ DSS (11PB) 1x DSS-G 202 4x DSS-G 240
LMU Bio (2PB) 1x DSS-G 221	terrabyte (32PB) 1x DSS-G 202 10x DSS-G 240	KCS DSS (1.4PB) 1x DDN SFA7990

DSS Container Implementation

Maier

TUM User: tumuser1

LinuxCluster

Project:	lxpr1
User:	lx11xc

SuperMUC-NG

Project:	smpr1
User:	sm11bb

Huber

LMU User: lmuuser2

LinuxCluster

Project:	lxpr2
User:	lx22bp

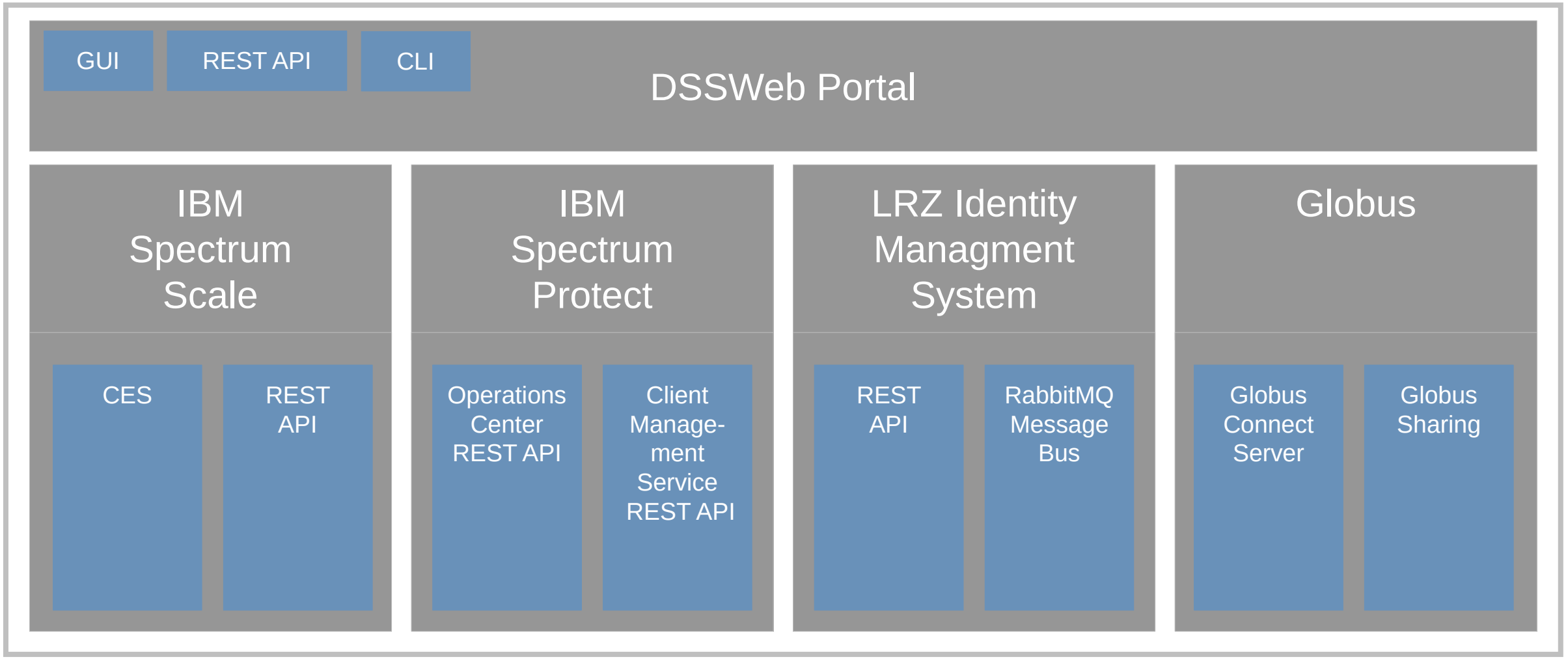
SuperMUC-NG

Project:	smpr2
User:	sm33sx

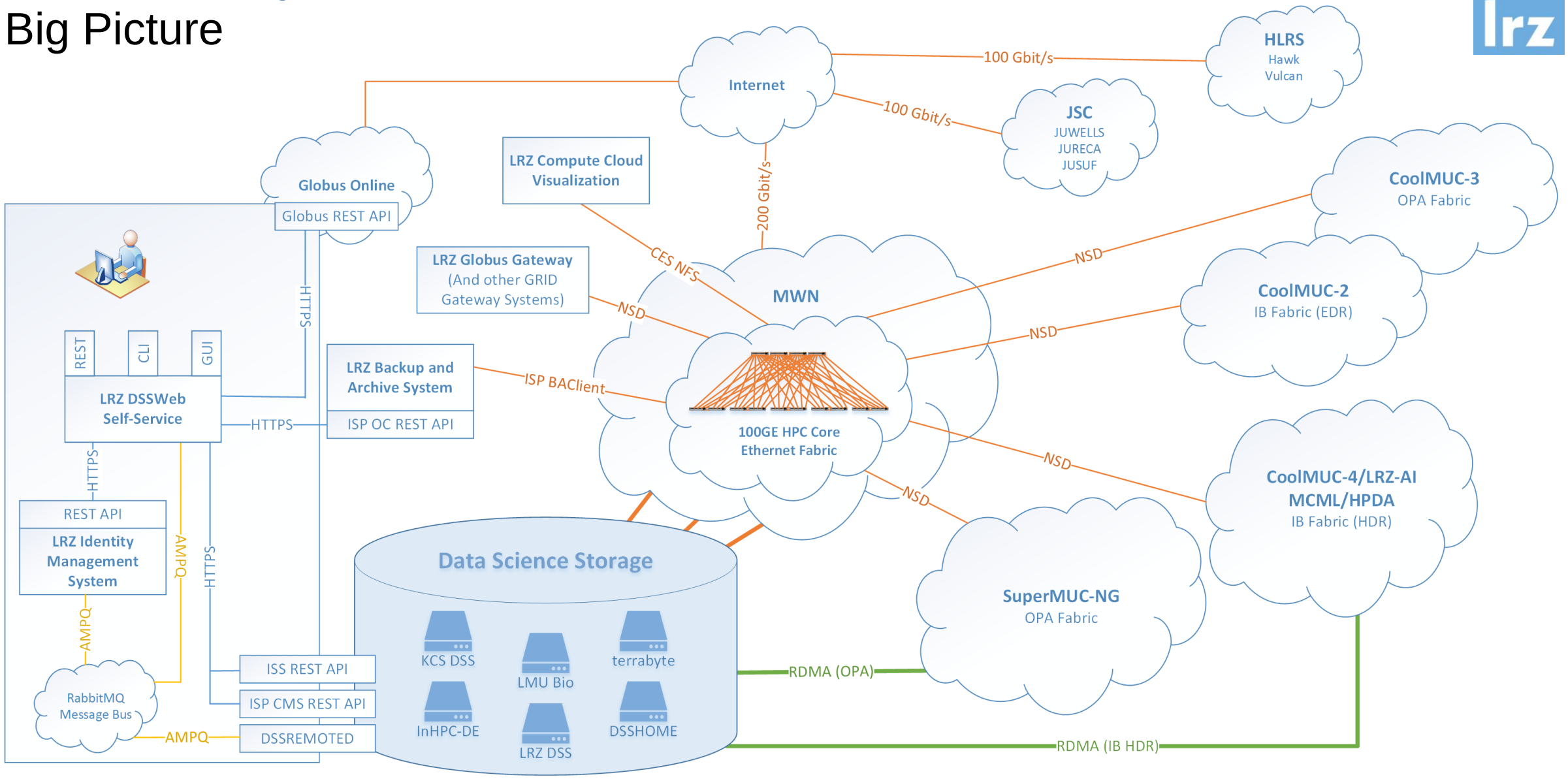
DSS POSIX Group in IDM/LDAP
pr45xa-dss-0000

DSS Container → GPFS (In)dependent Fileset
/dss/dssfs01/pr45xa-dss-0000
drwxrws--- root pr45xa-dss-0000

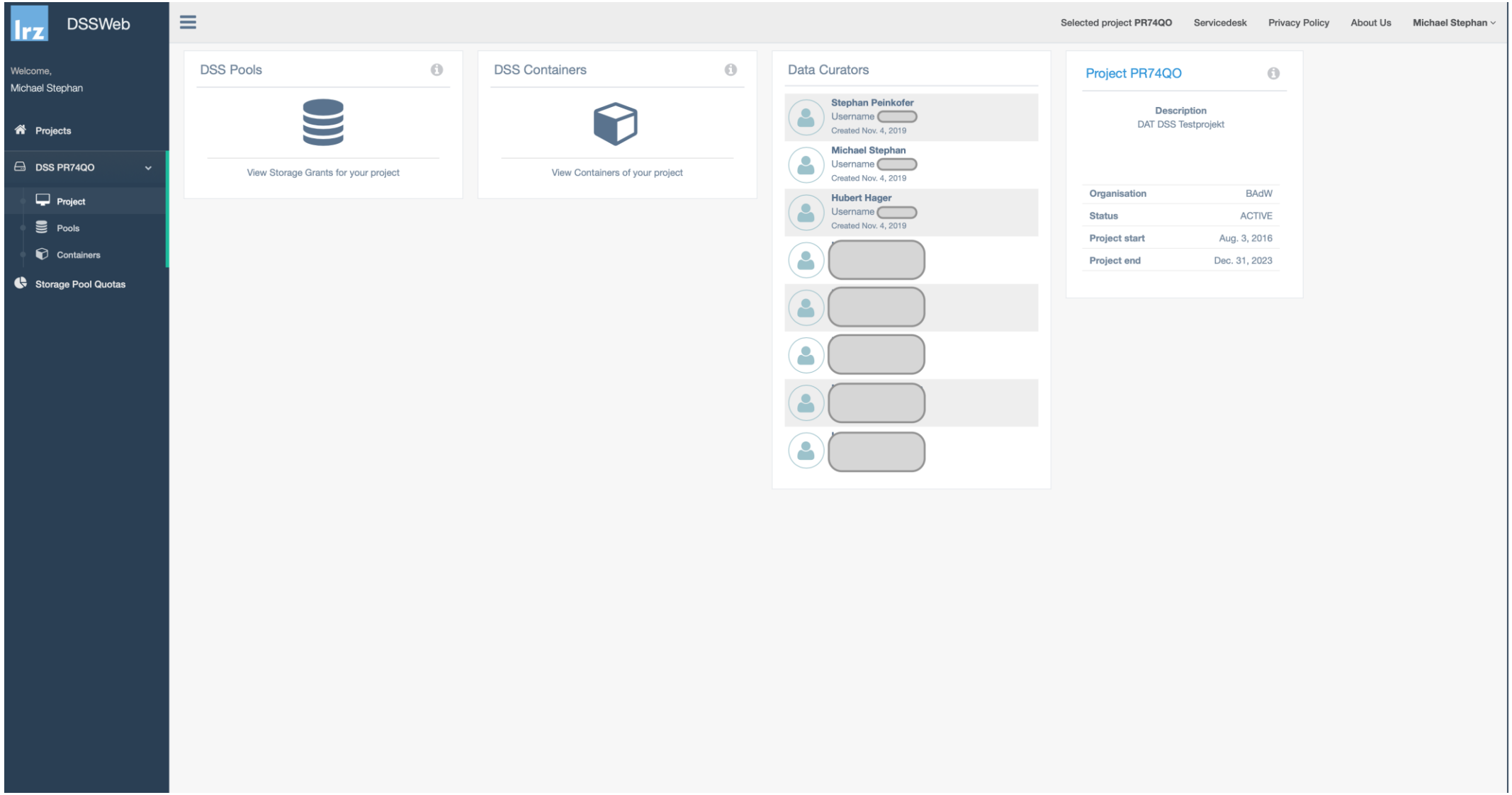
DSSWeb Self Service Management Portal



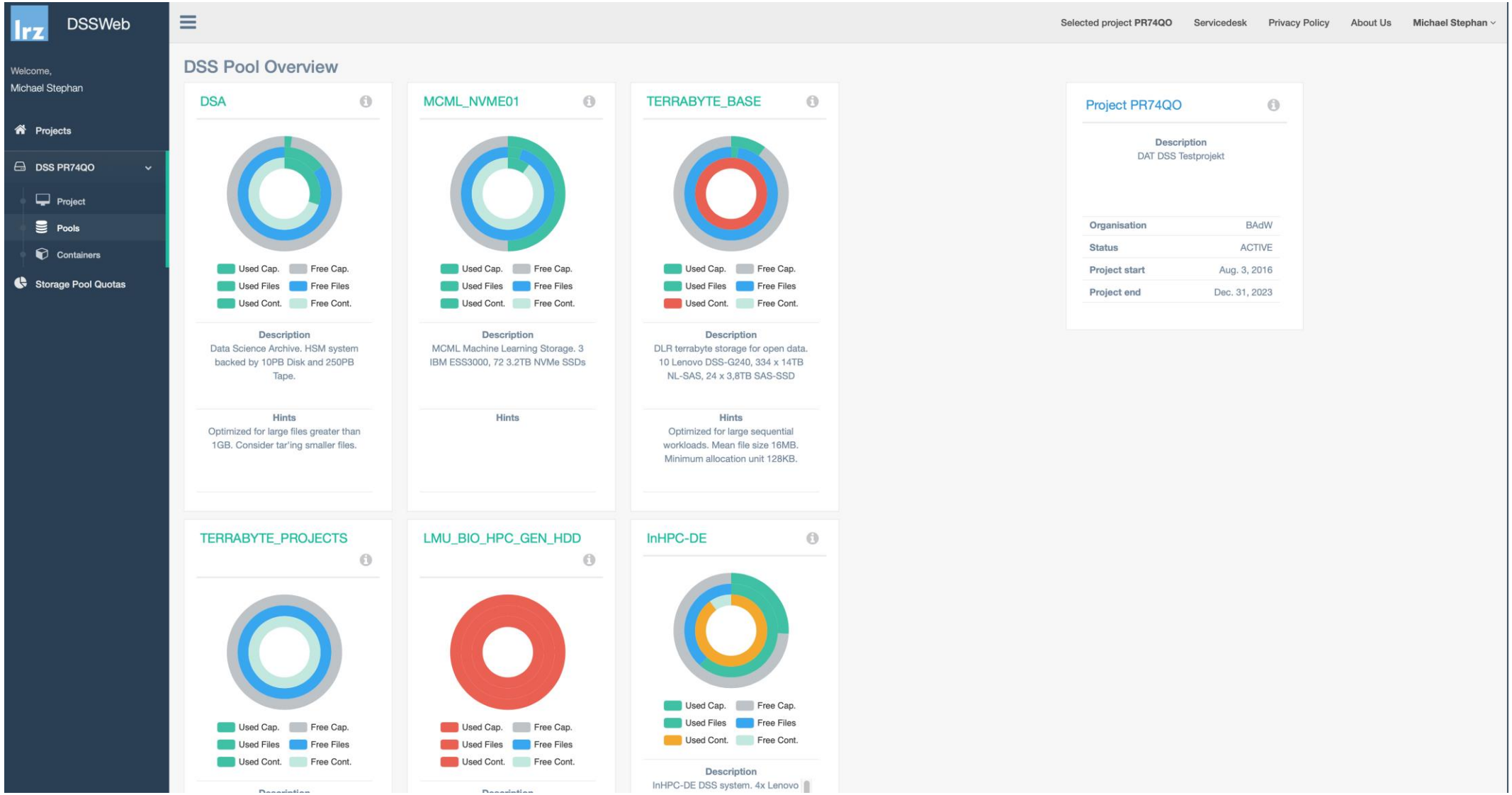
Data Science Storage
Big Picture



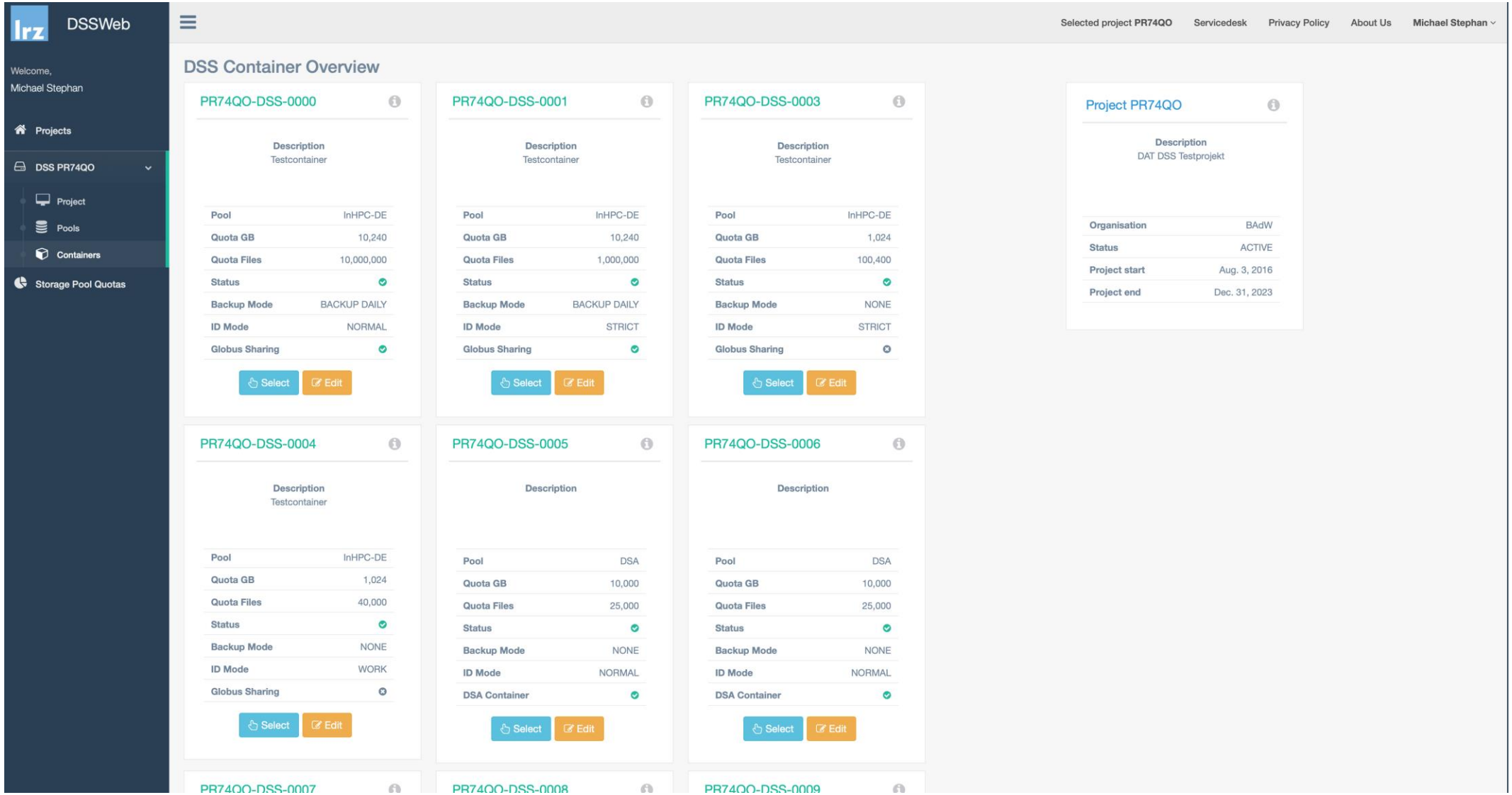
DSSWeb GUI


DSSWeb
Welcome,
Michael Stephan
Projects
DSS PR74QO
Project
Pools
Containers
Storage Pool Quotas
Selected project PR74QO
Servicedesk
Privacy Policy
About Us
Michael Stephan
DSS Pools
View Storage Grants for your project
DSS Containers
View Containers of your project
Data Curators
Stephan Peinkofer
Username
Created Nov. 4, 2019
Michael Stephan
Username
Created Nov. 4, 2019
Hubert Hager
Username
Created Nov. 4, 2019
Project PR74QO
Description
DAT DSS Testprojekt
Organisation BAdW
Status ACTIVE
Project start Aug. 3, 2016
Project end Dec. 31, 2023

Data Science Storage
DSSWeb GUI



DSSWeb GUI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Welcome,
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Selected project PR74QO
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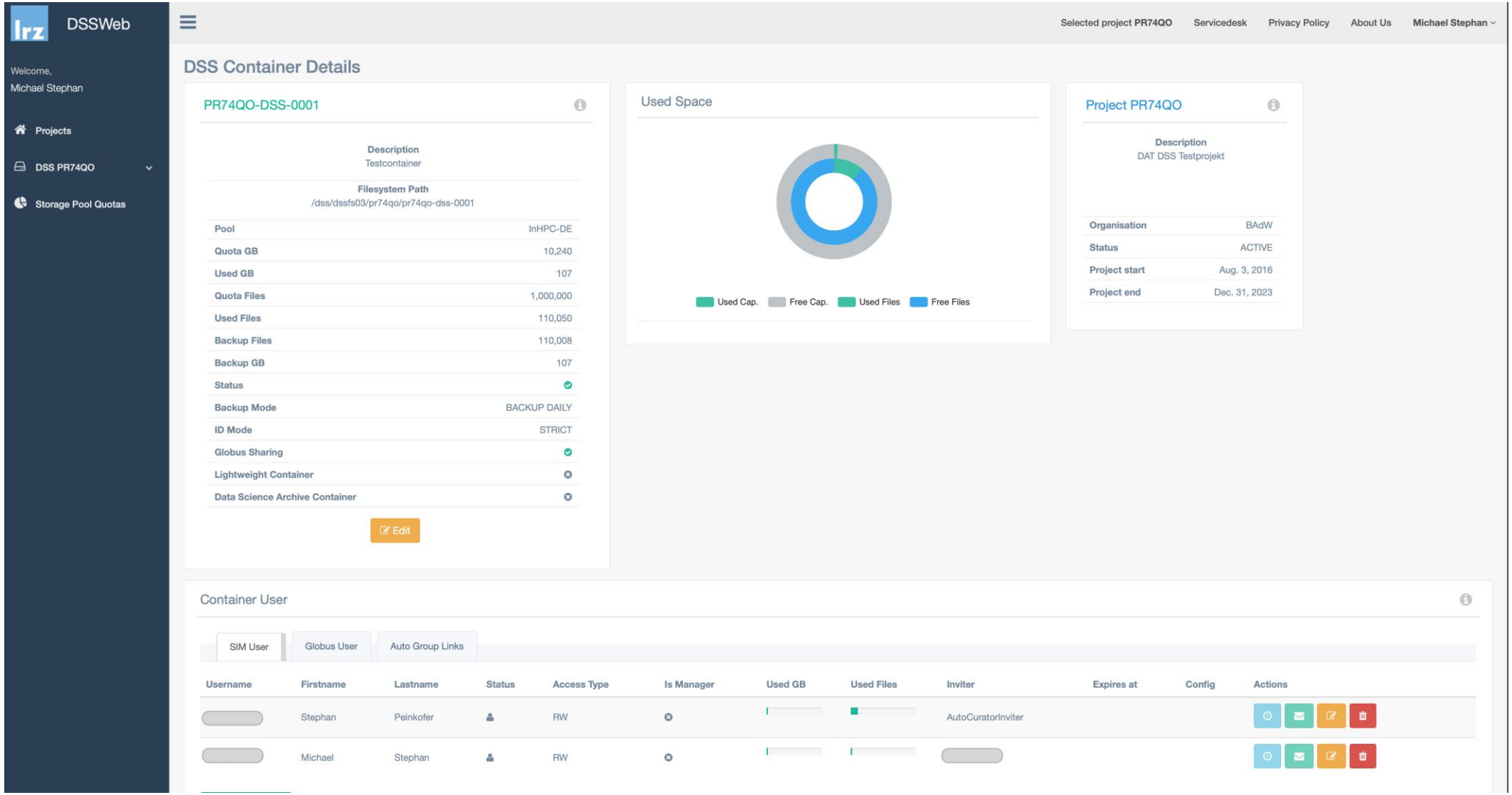
Privacy Policy
About Us
Michael Stephan
DSS Container Overview
PR74QO-DSS-0000
Description
Testcontainer
Pool InHPC-DE
Quota GB 10,240
Quota Files 10,000,000
Status
Backup Mode BACKUP DAILY
ID Mode NORMAL
Globus Sharing
Select
Edit
PR74QO-DSS-0001
Description
Testcontainer
Pool InHPC-DE
Quota GB 10,240
Quota Files 1,000,000
Status
Backup Mode BACKUP DAILY
ID Mode STRICT
Globus Sharing
Select
Edit
PR74QO-DSS-0003
Description
Testcontainer
Pool InHPC-DE
Quota GB 1,024
Quota Files 100,400
Status
Backup Mode NONE
ID Mode STRICT
Globus Sharing
Select
Edit
Project PR74QO
Description
DAT DSS Testprojekt
Organisation BAdW
Status ACTIVE
Project start Aug. 3, 2016
Project end Dec. 31, 2023
PR74QO-DSS-0004
Description
Testcontainer
Pool InHPC-DE
Quota GB 1,024
Quota Files 40,000
Status
Backup Mode NONE
ID Mode WORK
Globus Sharing
Select
Edit
PR74QO-DSS-0005
Description
Pool DSA
Quota GB 10,000
Quota Files 25,000
Status
Backup Mode NONE
ID Mode NORMAL
DSA Container
Select
Edit
PR74QO-DSS-0006
Description
Pool DSA
Quota GB 10,000
Quota Files 25,000
Status
Backup Mode NONE
ID Mode NORMAL
DSA Container
Select
Edit
PR74QO-DSS-0007
PR74QO-DSS-0008
PR74QO-DSS-0009

DSSWeb GUI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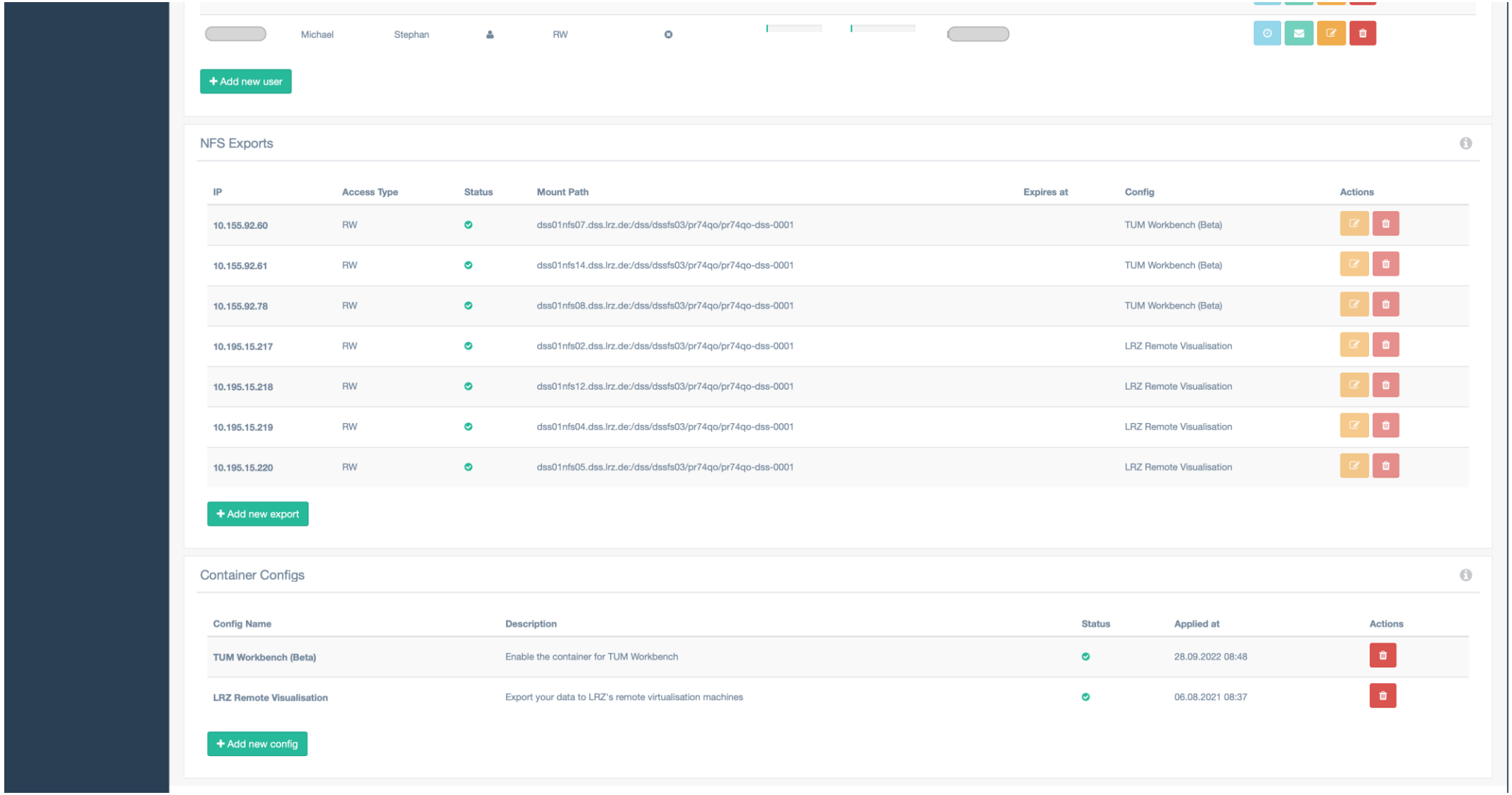
Michael Stephan
DSS Container Details
PR74QO-DSS-0001
Description
Testcontainer
Filesystem Path
/dss/dssfs03/pr74qo/pr74qo-dss-0001
Pool InHPC-DE
Quota GB 10,240
Used GB 107
Quota Files 1,000,000
Used Files 110,050
Backup Files 110,008
Backup GB 107
Status
Backup Mode BACKUP DAILY
ID Mode STRICT
Globus Sharing
Lightweight Container
Data Science Archive Container
Edit
Used Space
Used Cap.
Free Cap.
Used Files
Free Files
Project PR74QO
Description
DAT DSS Testprojekt
Organisation BAdW
Status ACTIVE
Project start Aug. 3, 2016
Project end Dec. 31, 2023
Container User
SIM User
Globus User
Auto Group Links
Username
Firstname
Lastname
Status
Access Type
Is Manager
Used GB
Used Files
Inviter
Expires at
Config
Actions
Stephan
Peinkofer
RW
AutoCuratorInviter
Michael
Stephan
RW

DSSWeb GUI


Michael
Stephan
RW
+ Add new user
NFS Exports
IP
Access Type
Status
Mount Path
Expires at
Config
Actions
10.155.92.60 RW dss01nfs07.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 TUM Workbench (Beta)
10.155.92.61 RW dss01nfs14.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 TUM Workbench (Beta)
10.155.92.78 RW dss01nfs08.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 TUM Workbench (Beta)
10.195.15.217 RW dss01nfs02.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 LRZ Remote Visualisation
10.195.15.218 RW dss01nfs12.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 LRZ Remote Visualisation
10.195.15.219 RW dss01nfs04.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 LRZ Remote Visualisation
10.195.15.220 RW dss01nfs05.dss.lrz.de:/dss/dssfs03/pr74qo/pr74qo-dss-0001 LRZ Remote Visualisation
+ Add new export
Container Configs
Config Name
Description
Status
Applied at
Actions
TUM Workbench (Beta) Enable the container for TUM Workbench 28.09.2022 08:48
LRZ Remote Visualisation Export your data to LRZ's remote virtualisation machines 06.08.2021 08:37
+ Add new config