

Research Computing Training Series

Introduction to Tiger Den

Le Yan | Assistant Director, Research Computing Services



Centrally managed, on-premises research storage at LSU

Meet the Research Enabling Technology team

Research Computing Training Series — today: Tiger Den and Globus, storing and sharing.

RESEARCH ENABLING TECHNOLOGY

lsu.edu/researchit



Leadership

Ric Simmons
Sam White
Le Yan



Research Technology Consultants

Greg Guillotte
Alexander Perlis
Michael Stewart
Sherrie Liang
AI consultant, AI research solutions



HPC support team

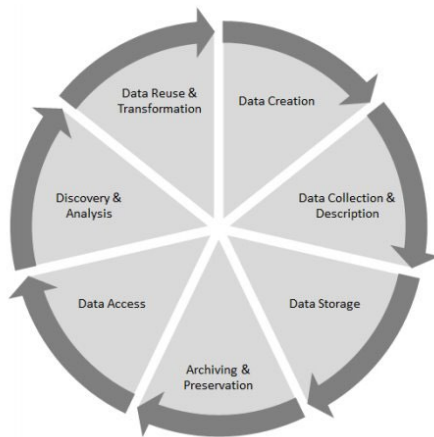
Led by Feng Chen

Today's agenda: motivation, features, benefits, access, demonstrations, and future plans.

Research data lifecycle is much broader than storage

To sustain research at all levels, support must attend to the entire research data cycle.

RESEARCH DATA LIFECYCLE



Where data come from

Sensors, microscopes, genome sequencers, instruments, HPC simulations



What sustains it

Hardware, software, services, policies, and people



Where Tiger Den fits

The storage component of the lifecycle

Storage is one piece of the puzzle.

Tiger Den is one option in LSU's storage ecosystem

Live demo

Compare options, then let the Data Storage Finder narrow them down.

ONLINE TOOLS

lib.lsu.edu/researchdatastorage

DATA STORAGE OPTIONS

DATA STORAGE OPTIONS

	Scholarly Repository	Tiger Den	Wasabi	OneDrive	Box	Network Attached (SaaS) Storage	Block (Performance) Storage
Sharing/Collaboration - LSU faculty and staff	Yes, read-only global access	Yes	No	Yes	Yes	Yes	Yes
Sharing/Collaboration - LSU students	Yes, read-only global access	Yes	No	Yes	Yes	Yes	Yes
Sharing/Collaboration - non-LSU affiliates	Yes, read-only global access	Yes, via Citrus	No	Yes	Yes	No	No
Cost	Free	\$50 per TB per year, first TB is free, paid priority	\$60 per TB per year, paid priority	Free	Free	\$400 per TB per year, paid monthly	\$500 per TB per year, paid monthly
Web-based access	Yes	Yes, via Citrus	Yes, WebDav interface	No, OneDrive SharePoint web interface	Yes, Box web file interface	No	No
File-level access	Yes	Yes, NFS & SMB	No	Yes, OneDrive Desktop Sync	Yes, Box drive and Box tools	Yes, NFS & SMB	Yes, attached in compute mode
POSIX compliance	No	Partial	No	Partial	No	Yes	Yes
Performance	Low	Moderate	Low	Low	Low	Moderate	High
Meets Common National Data Preservation and Security Requirements	No	No	No	No	No	No	No
Capacity	Unlimited	100 TB, can request an increase	Unlimited	5TB	Unlimited	50TB, can request an increase	50TB, can request an increase
Maximum Indicated File Size Limitation	1GB	4TB	1TB	250GB	150GB	50TB, can request for larger files	50TB, can request for larger files

Compare sharing, cost, web access, and file-level access.

DATA STORAGE FINDER

DATA STORAGE FINDER

All services presented on this finder tool are vetted and supported by Louisiana State University.

Narrow choices by answering questions.

Select data storage services you would like to compare.

What type(s) of file access will you need for your data?

What type(s) of file sharing permissions will you require?

What is your estimated total storage requirement (including growth needs)?

What is your file size requirement?

What level of file access performance do you require?

What functional requirements for file system and data management do you need?

What is your acceptable cost range for storage?

What security compliance requirements must your storage meet?

What type(s) of data will be stored?

Block Storage
High speed departmental storage in 1 TB, 5TB, 10TB, 20TB, 40TB, 80TB, 160TB, 320TB, 640TB, 1.2TB, 2.4TB, 4.8TB, 9.6TB, 19.2TB, 38.4TB, 76.8TB, 153.6TB, 307.2TB, 614.4TB, 1228.8TB, 2457.6TB, 4915.2TB, 9830.4TB, 19660.8TB, 39321.6TB, 78643.2TB, 157286.4TB, 314572.8TB, 629145.6TB, 1258291.2TB, 2516582.4TB, 5033164.8TB, 10066329.6TB, 20132659.2TB, 40265318.4TB, 80530636.8TB, 161061273.6TB, 322122547.2TB, 644245094.4TB, 1288490188.8TB, 2576980377.6TB, 5153960755.2TB, 10307921510.4TB, 20615843020.8TB, 41231686041.6TB, 82463372083.2TB, 164926744166.4TB, 329853488332.8TB, 659706976665.6TB, 1319413953331.2TB, 2638827906662.4TB, 5277655813324.8TB, 10555311626649.6TB, 21110623253299.2TB, 42221246506598.4TB, 84442493013196.8TB, 168884986026393.6TB, 337769972052787.2TB, 675539944105574.4TB, 1351079888211148.8TB, 2702159776422297.6TB, 5404319552844595.2TB, 10808639105689190.4TB, 21617278211378380.8TB, 43234556422756761.6TB, 86469112845513523.2TB, 172938225691027046.4TB, 345876451382054092.8TB, 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Tiger Den is LSU's central, on-premises research storage

Hardware and software are securely managed by professional IT staff.

KEY FEATURES

tigerden.lsu.edu



On premises

- Dell PowerScale in the Frey Computing Services Center
- Managed by Research Computing



3 PB capacity

- 2.4 PB for LSU use
- 600 TB supports the Open Science Data Federation



Access options

- Mount/map on your computer
- On and off campus (via VPN)
- HPC clusters via designated head nodes

FUNDED BY

NSF CC* Campus Cyberinfrastructure (PI: Le Yan; co-PI: Michael Stewart)

Globus will add off-campus access and sharing with collaborators.

Many LSU researchers have unmet research data needs

Very limited institutional infrastructure and services meant sub-optimal practices.

UNMET NEEDS



Secure, resilient storage

Dependable power, backup power, and redundancy



Bulky data transfer

Move large datasets and collaborate



Sharing and publication

Preserve and publish, with rich metadata



Data Management Plans

Support for data-management plans

As a result, researchers have had to settle for sub-optimal practices.

Some of the drivers that led LSU to build Tiger Den

Many drivers exist; these five were selected to illustrate the need.

SELECTED DRIVERS



Data protection and continuity

GOAL

Protect research data from loss and preserve continuity when project personnel leave.



Research productivity

GOAL

Free researchers from storage administration so they can focus on research.



Data-intensive workflows

GOAL

Support large, data-intensive workflows across instruments, HPC, collaborators, and publication.



Funding expectations

GOAL

Help meet funder expectations for data management, access, and retention.



Cost and effort

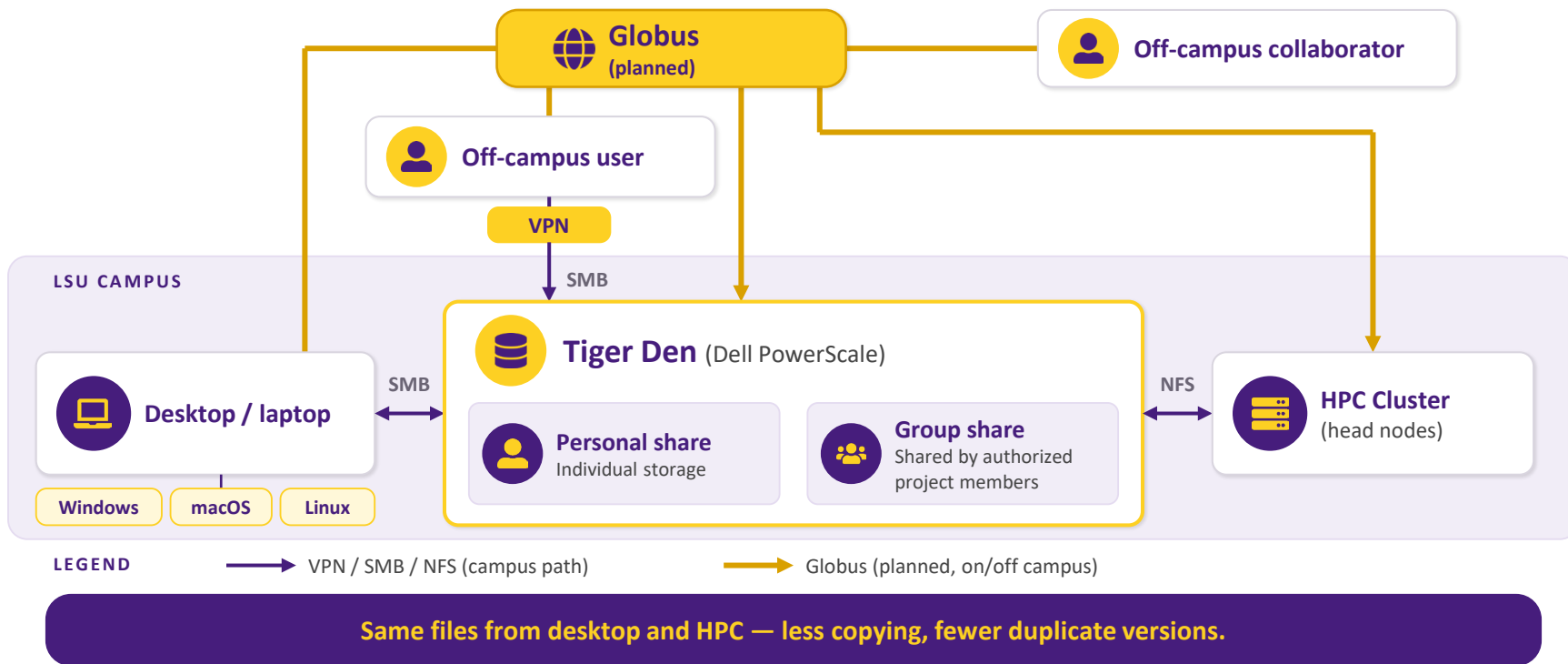
GOAL

Reduce duplicated cost and effort through shared, professionally managed storage.

Tiger Den answers these with shared, professionally managed storage.

One storage system, reachable from desktops and HPC

Two kinds of shares: personal (individual) and group (shared by authorized project members).



Reading 10,000 files of 10 MB: local drive vs. Tiger Den

Estimated speed to read 100 GB as 10,000 separate 10 MB files, one at a time (MB/s — higher is faster)

	Effective speed (MB/s)	Rate limited by	Time (100 GB)
DATA ON THE MACHINE'S LOCAL DRIVE			
NVMe SSD	 ~3,000 MB/s	NVMe / PCIe interface	about 35 sec
SATA SSD	 ~500 MB/s	SATA interface (6 Gb/s)	about 3 min
Spinning disk (HDD)	 ~130–200 MB/s	Disk spin and seek speed	about 8–13 min
DATA ON A MAPPED TIGER DEN DRIVE (SPINNING DISKS + SSD CACHE), BY NETWORK SPEED			
10 GbE connection	 ~180–440 MB/s	Per-file delay + disks	about 4–9 min
2.5 GbE connection	 ~115–215 MB/s	Network + per-file delay	about 8–14 min
1 GbE connection	 ~65–100 MB/s	Network link (1 Gb/s)	about 17–26 min

bars drawn to scale; ranges use midpoint

Planning estimates, not measured LSU results: files read one at a time, uncached, ~10–30 ms per-file delay on Tiger Den. Parallel reads are faster; files under ~1 MB are much slower. Warm storage (active archive): not mounted on HPC compute nodes or meant for many compute jobs.

10 MB files add per-file delay: small on 1 GbE, but up to ~2× longer on 10 GbE.

Tiger Den is not for private or restricted data

General-purpose research storage: not high-throughput and not encrypted at rest.

BEFORE YOU STORE



Not encrypted at rest

Do not store private, confidential, sensitive, regulated, or otherwise restricted data



Classify first

Decide data classification before choosing a storage service



Follow policy

Comply with LSU data management and acceptable use policies

PS-124 · PS-121

When in doubt about sensitivity, ask before you store.

Free starter storage, low-cost growth, and professional support

Four benefit areas: cost, scalability, ease of use, and support.

FOUR BENEFIT AREAS

Support services in the ITS service catalog



Cost efficiency

- Complimentary storage for faculty up to 1 TB
- \$49.03/TB/year, billed on reserved capacity
- No ingress or egress charges
- Not backed up by default; Wasabi backup: extra charge



Scalability

- Reserve large amounts of storage
- 25 TB or more needs consultation with Research Computing



Ease of use

- Account management via Tiger Den Management Portal
- Accessible on personal computers or HPC clusters
- Shared group space



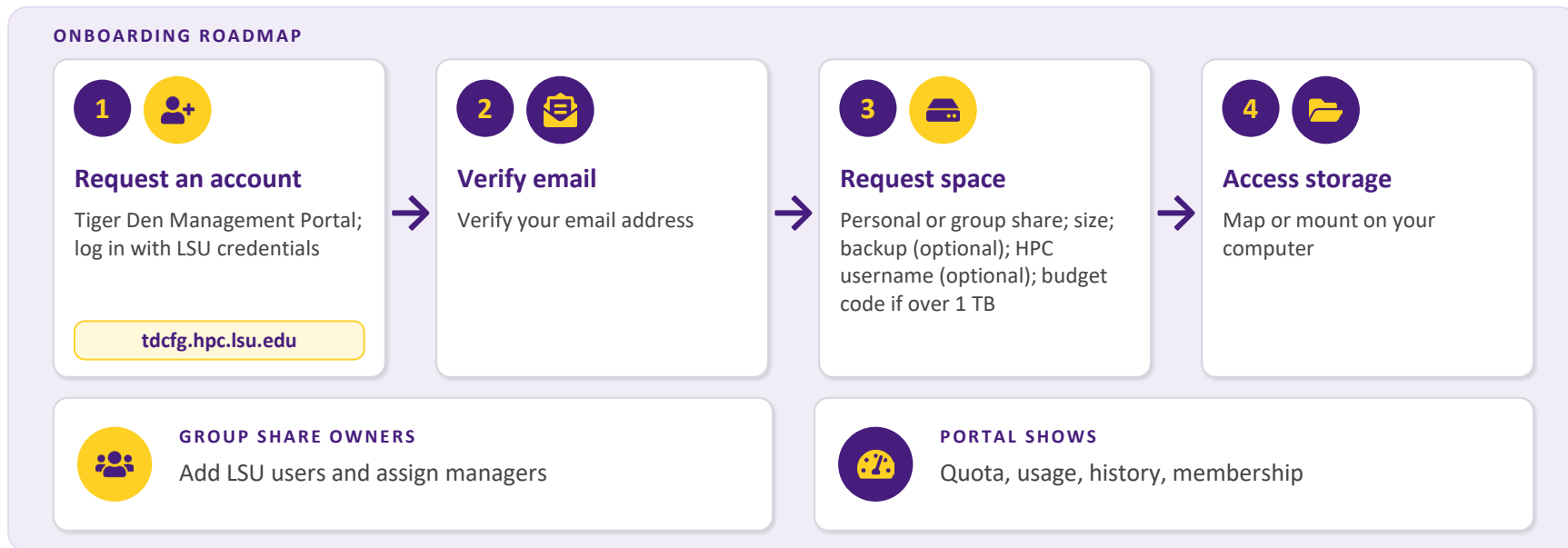
Professional support

- Operated and supported by LSU ITS and LSU Libraries

Example: reserve 5 TB and pay for the 4 TB above the free 1 TB.

Request an account, verify, request space, then mount

Only faculty and permanent research staff can apply; others join a group share.



Each group member uses their own LSU account.

Globus is next: sharing and access beyond LSU accounts

Group shares are currently limited to users with LSU accounts.

PLANNED ENHANCEMENTS



Globus

- Data sharing with external collaborators
- Off-campus access
- Large transfers

Permissions and access controls being validated before wider release



Institutional data repository

Datasets with DOIs, backed by Tiger Den storage



Additional backup options

Less expensive or bring-your-own



Broader HPC availability

Release announcements and training will follow validation.