

Breakout Session 1: Track A

Hybrid- and Multi-Cloud Storage Strategies for Cost-effective Deployment of Data Resources

Dr. Robert Schuler

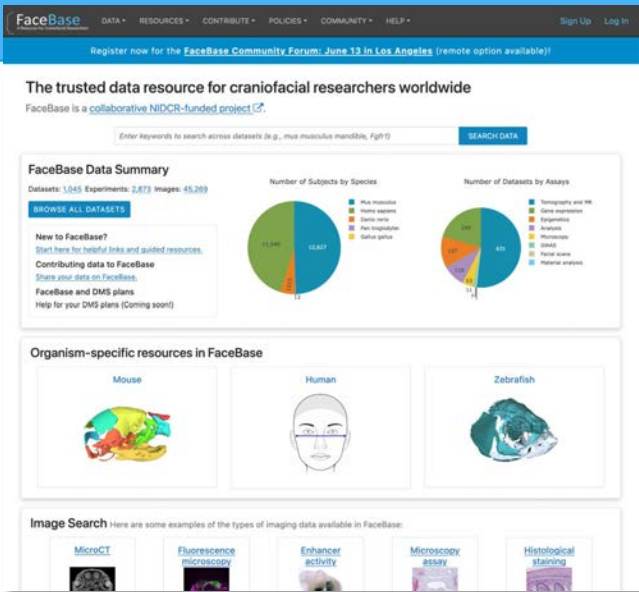
Lead Scientist, USC Information Sciences Institute

Hybrid- and Multi-Cloud Storage Strategies for Cost-effective Deployment of Data Resources

Rob Schuler, FaceBase (Co-I)
USC Information Sciences Institute

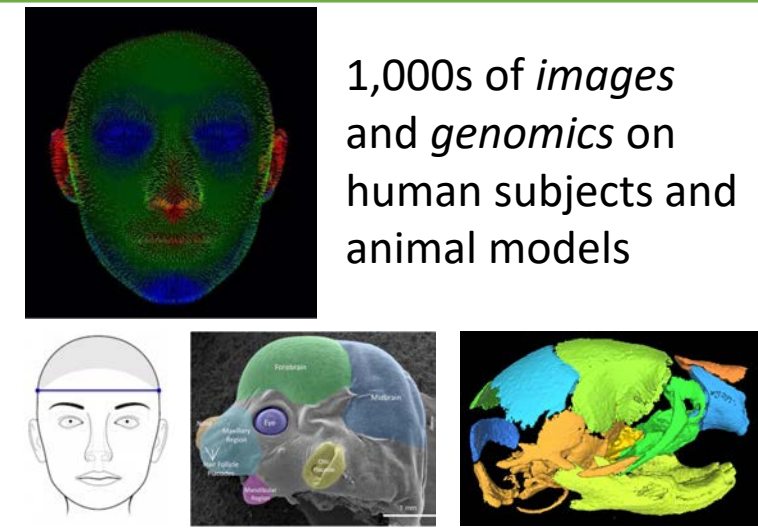
2024 NIH/ODSS Cloud Supplement Program PI Meeting

FaceBase Data Integration and Analysis Hub



Goal: To serve as the trusted online data resource for craniofacial and dental researchers worldwide

1. Provide a comprehensive data resource in support of advancing research in craniofacial development and malformations
2. Promote multidisciplinary collaboration and research in the dental and craniofacial fields
3. Integrate genomic and phenotype data from multiple species
4. Utilize diverse resources and strategies to enhance data reproducibility



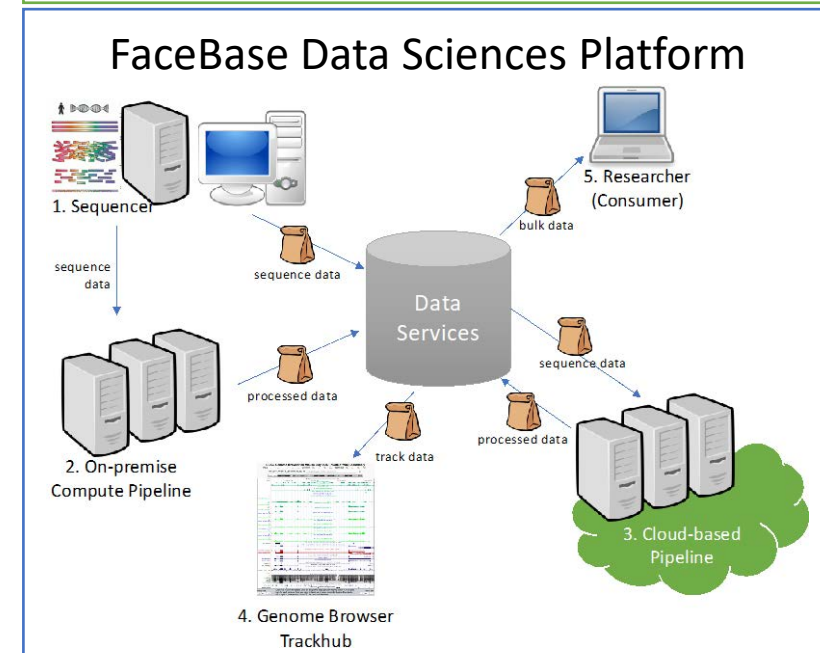
1,000s of *images* and *genomics* on human subjects and animal models

The trusted data resource for craniofacial researchers worldwide

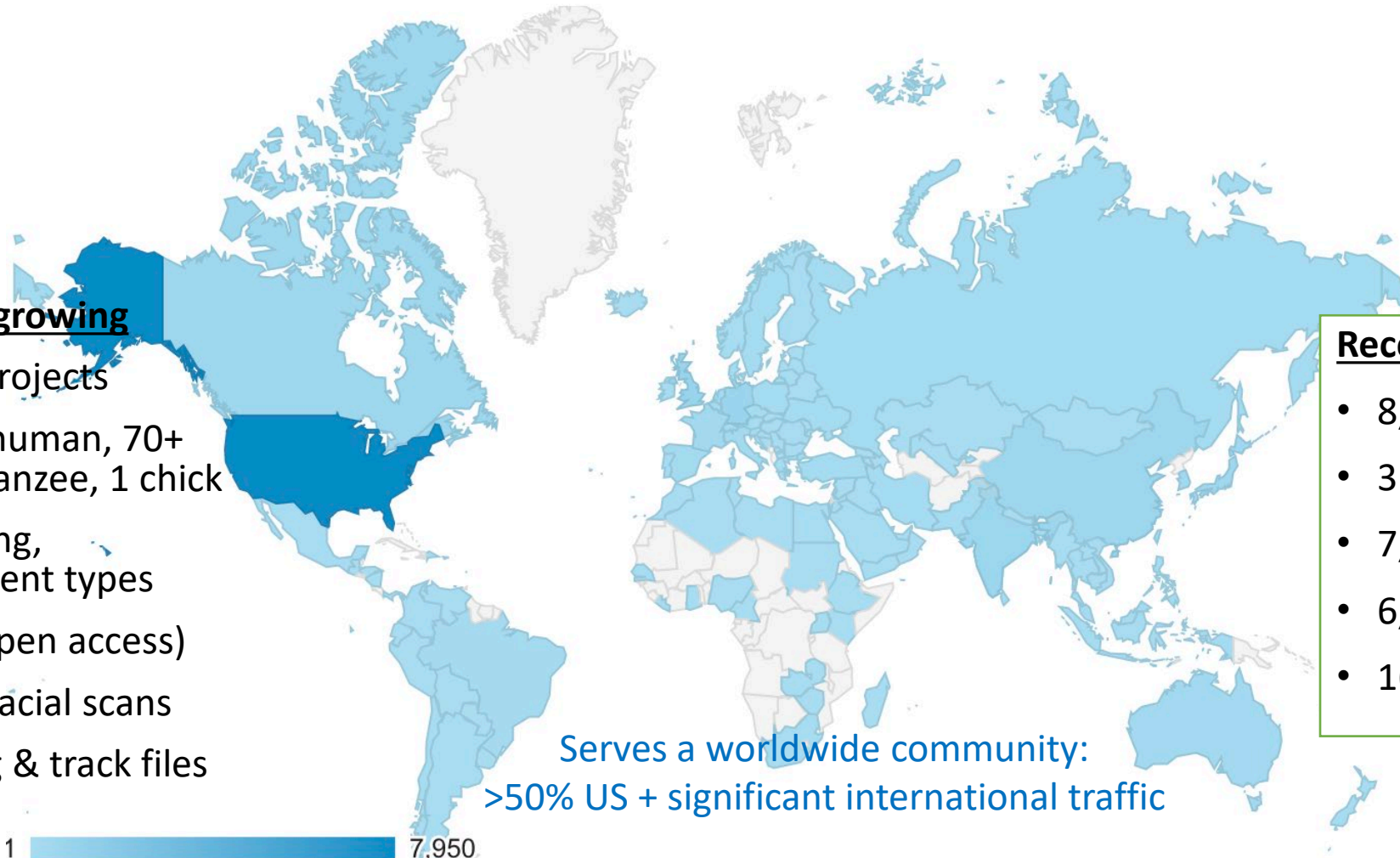
Resources spanning dental, oral, and craniofacial (DOC) research

Established in 2009 in collaboration with the NIDCR

FaceBase
A Resource For Craniofacial Researchers



FaceBase Serves Global Research Community



1050+ Datasets and growing

- 50+ contributing projects
- 890+ mouse, 80+ human, 70+ zebrafish, 2 chimpanzee, 1 chick
- Imaging, sequencing, and other experiment types
- 45,000+ images (open access)
- 10,000+ (human) facial scans
- 7,300+ sequencing & track files

Recent 6 mo. Usage

- 8,500+ visitors
- 31,000+ page views
- 7,200+ downloads
- 6,500+ image views
- 165,000+ track views

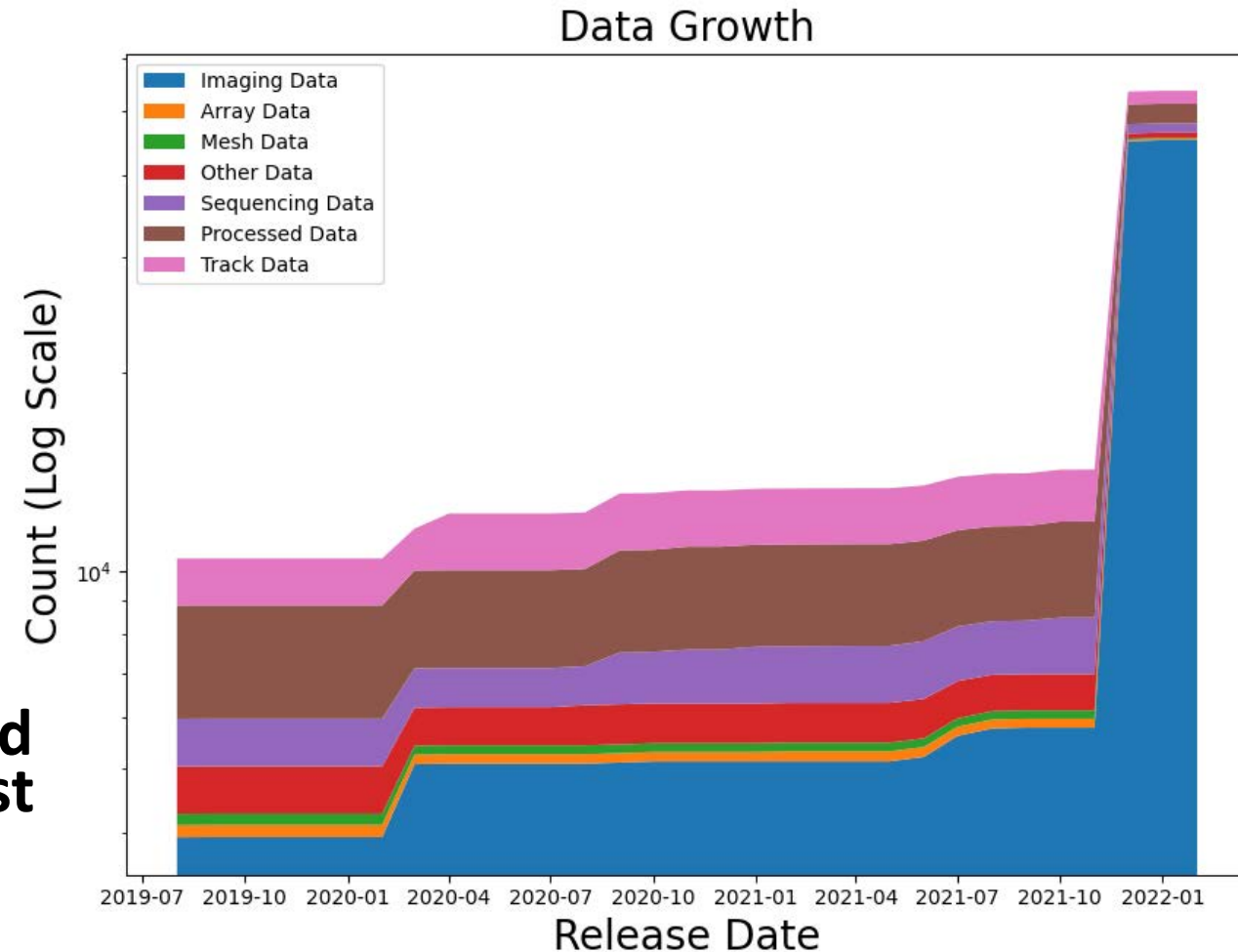
Serves a worldwide community:
>50% US + significant international traffic

1 7,950

Total number of publications: 200+ (regarding FaceBase data and resources)

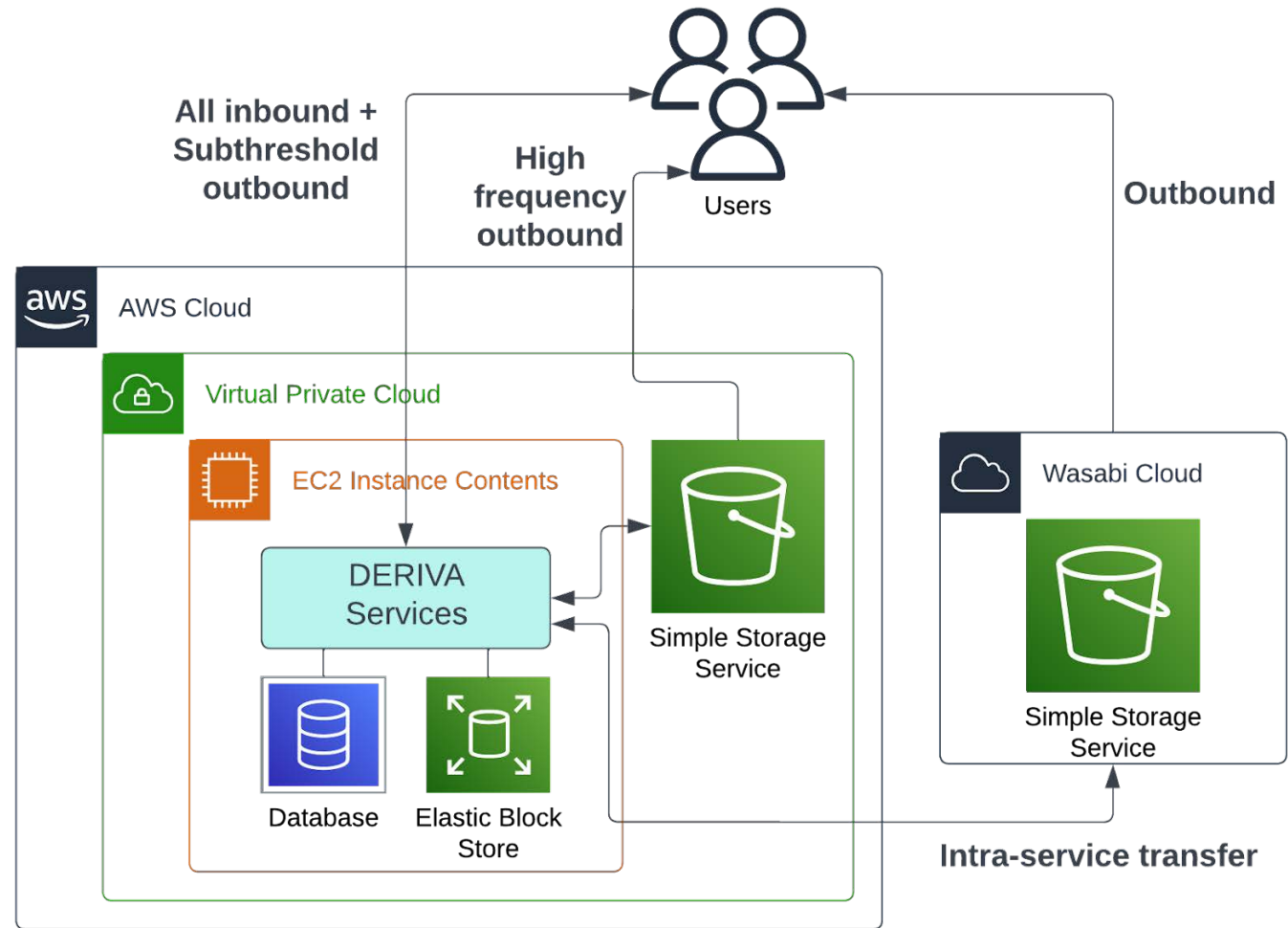
Challenged to Scale with Data Volume Growth

- On the Cloud...
 - Increased data volume = +\$
 - Increased data access = +\$
 - Difficult to predict too
- AWS Simple Storage Service (S3)
 - AWS = Amazon Cloud Storage Provider (CSP)
 - \$0.023/GB-month (ex. 1TB = \$23/mo)
 - “Intelligent Tiering” to drop cost with caveats based on frequency of access, cost to move between tiers, latency to access from tiers
- **Objective: explore hybrid- and multi-cloud storage strategies to optimize for the most cost-effective storage providers and schemes available**



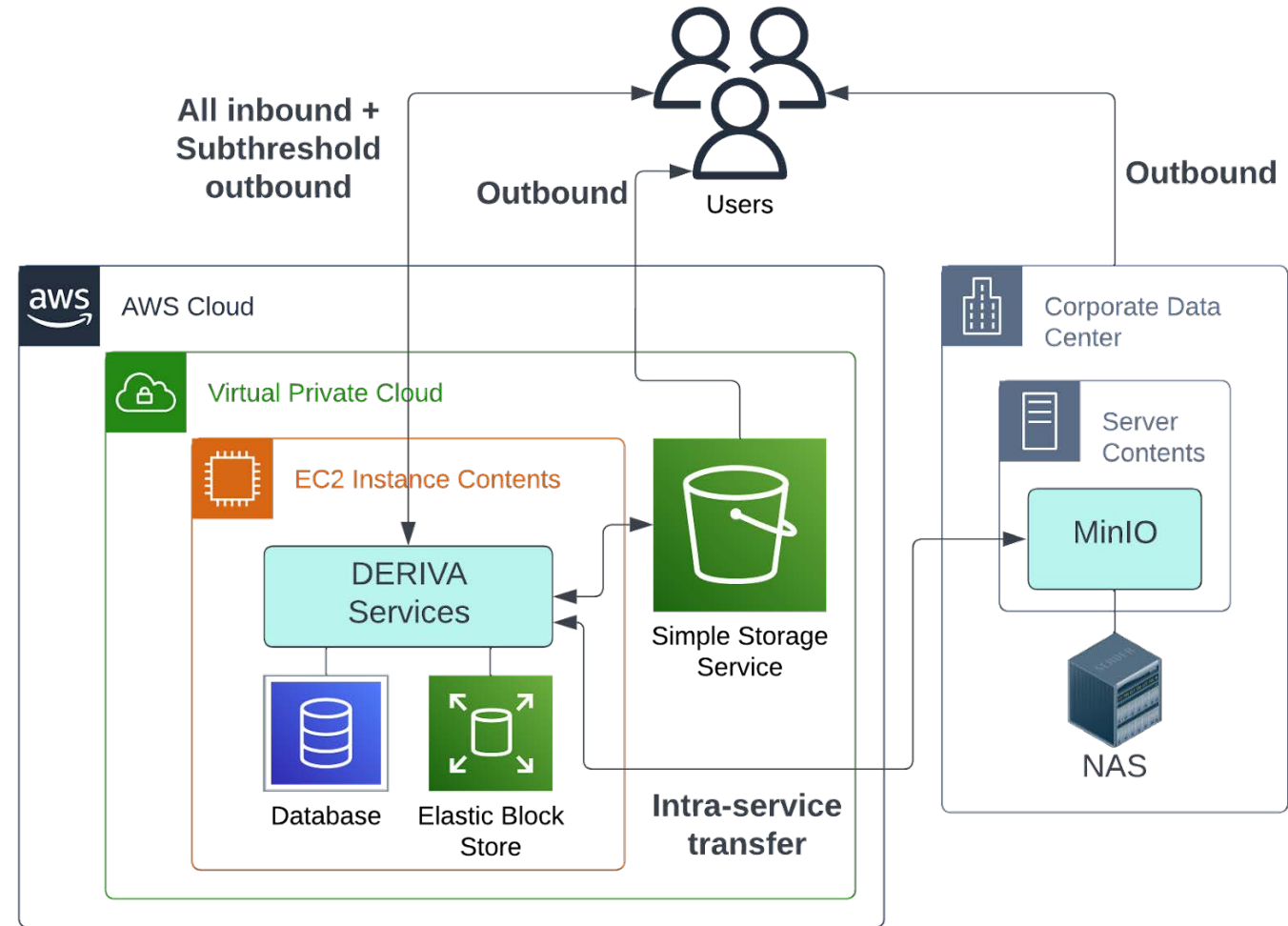
Leverage competitive storage cloud service pricing through a *multi-cloud storage strategy* (Aim 1)

- Route some data from AWS to Wasabi (low \$) storage resources
- Wasabi offers low fixed monthly fee for storage based only on data volume (i.e., no egress charges) *but* egress expected to match storage volume
- Lower frequency accessed objects are better suited to Wasabi
- PoC: enhancement to DERIVA Object Storage Server to integrate multiple public/private CSPs



Utilize on-premise resources with fixed, low or no-cost through a *hybrid-cloud storage strategy* (Aim 2)

- Identify and “offload” some data from public CSPs to institute storage resources (<<\$)
- Institutional resources provide “Cloud-like” storage but are unlikely to match the level of performance and availability of major CSPs
- May be suitable for any retrieval frequency but where lower availability and performance okay



Current Progress

- PoC developed: enhancements to the DERIVA object storage micro-service (“hatrac”) to integrate with multiple S3-compatible back-end storage CSPs
- Test bed configuration in-progress
 - case 0 (control): all AWS
 - case 1 (multi-cloud): Wasabi storage
 - case 2 (hybrid-cloud): MinIO + institutional storage
- Experimental evaluation planned over the next months

Ability to mix-and-match storage CSPs and even on-premise resources may provide scalability characteristics to support high growth and unpredictable data retrieval patterns

Thank You

FaceBase Hub Team

- Alejandro Bugacov
- Yang Chai (co-PI)
- Jifan Feng
- Joe Hacia
- Thach Vu Ho
- Carl Kesselman (co-PI)
- VyVy Nguyen
- Laura Pearlman
- Rob Schuler
- Cris Williams

Website: www.facebase.org

Twitter: @FaceBaseDataHub

Email: help@facebase.org

Sponsor: NIH / NIDCR (U01DE028729)

FaceBase
A Resource For Craniofacial Researchers

DATA ▾ RESOURCES ▾ CONTRIBUTE ▾ POLICIES ▾ COMMUNITY ▾ HELP ▾

Sign Up Log In

Register now for the [FaceBase Community Forum: June 13 in Los Angeles](#) (remote option available)!

The trusted data resource for craniofacial researchers worldwide

FaceBase is a [collaborative NIDCR-funded project](#).

Enter keywords to search across datasets (e.g., *mus musculus mandible, Fgfr1*) SEARCH DATA

FaceBase Data Summary

Datasets: [1,045](#) Experiments: [2,873](#) Images: [45,269](#)

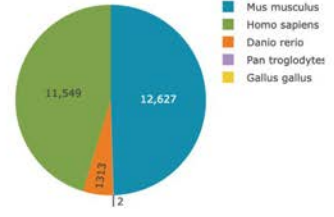
[BROWSE ALL DATASETS](#)

New to FaceBase?
[Start here for helpful links and guided resources.](#)

Contributing data to FaceBase
[Share your data on FaceBase.](#)

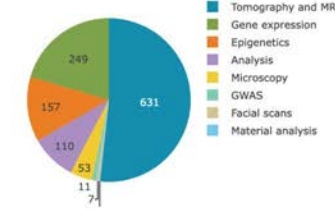
FaceBase and DMS plans
Help for your DMS plans (Coming soon!)

Number of Subjects by Species




Species	Number of Subjects
Mus musculus	12,627
Homo sapiens	11,549
Danio rerio	1,213
Pan troglodytes	12
Gallus gallus	11

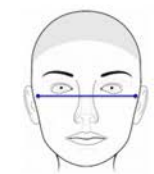
Number of Datasets by Assays



Assay Type	Number of Datasets
Tomography and MR	631
Gene expression	249
Epigenetics	157
Analysis	110
Microscopy	53
GWAS	11
Facial scans	7
Material analysis	1

Organism-specific resources in FaceBase

Mouse 

Human 

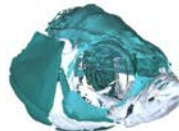



Zebrafish 


Image Search

Here are some examples of the types of imaging data available in FaceBase:

[MicroCT](#) 

[Fluorescence microscopy](#) 

[Enhancer activity](#) 

[Microscopy assay](#) 

[Histological staining](#) 