

# ARC-TS Data Services

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ARC-TS

ADVANCED RESEARCH COMPUTING  
TECHNOLOGY SERVICES  
UNIVERSITY OF MICHIGAN



## In Memory

- Small to modest data
- Interactive or batch work
- Might have many thousands of jobs
- Excel, R, SAS, Stata, SPSS

## In Server

- Small to medium data
- Interactive or batch work
- Hosted/shared and transactional data
- SQL / NoSQL
- Hosted data pipelines
- iRODS / Globus
- Document databases

## Big Data

- Medium to huge data
- Batch work
- Full table scans
- Hadoop, Spark, Flink
- Presto, HBase, Impala





# Flux & Armis - High Performance Computing

Batch and Interactive High Performance Platform supporting serial to highly parallel jobs

## Resources

20,000+ CPU Cores  
Upto 1.5TB Shared Memory  
Upto 54 Core Shared Memory  
Nvidia GPU's, Intel Xeon PHI's

## Key Features

40 or 100gbit/s InfiniBand  
1.5PB Scratch Filesystem  
HIPAA/PHI Acceptance (Armis)  
160Gig Backbone Connection  
Free to Undergrads

## Software and Development

Over 100 Titles  
MATLAB, Mathematica  
FEA/CAE Abaqus, Ansys  
SAS, STATA/MP, R  
Compilers, Debuggers, Libs

## Start a Job

Resource ?

Flux

Account ?

support\_flux

Session type

VNC

Jupyter Notebook (formerly IPython): Py

RStudio

Desktop resolution

1280x1024

Generic resource ?

(none)

Quantity: 0

Nodes

2

*Increasing the number of nodes will only increase the amount of resources utilized by the job. Utilizing multiple nodes (such as software with MPI) is required for some applications.*

<https://connect.arc-ts.umich.edu/>

Cores

6

per node

Total for job: 12 cores

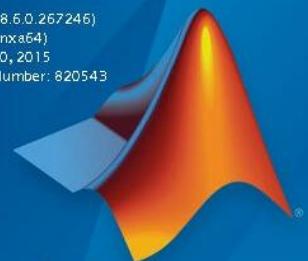
Sessions Job Desktop Help

Connected (encrypted) to: TurboVNC: nyx5788.arc-ts.umich.edu:1 (brockp)

Applications Menu MATLAB Terminal - brockp@nyx5...

Terminal - brockp@nyx5788::~

```
File Edit View Terminal Go Help
[brockp@nyx5788 ~]$ matlab
bash: matlab: command not found
[brockp@nyx5788 ~]$ module load matlab
[brockp@nyx5788 ~]$ matlab
MATLAB is selecting SOFTWARE_OPENGL rendering.
```



R2015b (8.6.0.267246)  
64-bit (glnxa64)  
August 20, 2015  
License Number: 820543

**MATLAB**<sup>®</sup>

Academic License - for use in teaching, academic research, and meeting

# Coming Soon: Bigger Big Data



- ~5000 CPUs
- ~24TB Memory
- ~ 3PB of HDFS/Storage
- 6x the network speed of the backbone

## Software

- Hadoop
- Spark
- Presto
- Etc. (Researcher Driven)



# Storage

Storage Options across data types

## Turbo

High speed storage with solid state memory cache

Optional Replication and Snapshots

## Locker

Cost Optimized Large File Storage

Early Phase 200TB+

Late Phase Winter 2017

## Data Den

Extreme low cost  
Onetime costs for data protection and archive



# Network Connection Improvement Program

Provide uninterrupted data flow to meet needs of researchers across campus

## Key Features

Upgrade connections to support laboratory instruments and data flows

Network need not be in University building or on campus

## Features Ctd

1, 10, and 40gbit/s network speeds possible

ARC-TS representative will help design workflows to achieve lab goals

## Partners

Unit IT

ITS

MSIS/MCIT





# Yottabyte Research Cloud - Databases and Services

SQL, NoSQL, Columnar, Data Ingest - ARC-TS can consume your datasource

## Key Features

Database/Service on demand  
Hardware scales as needed

Faculty feedback determines  
the services we offer

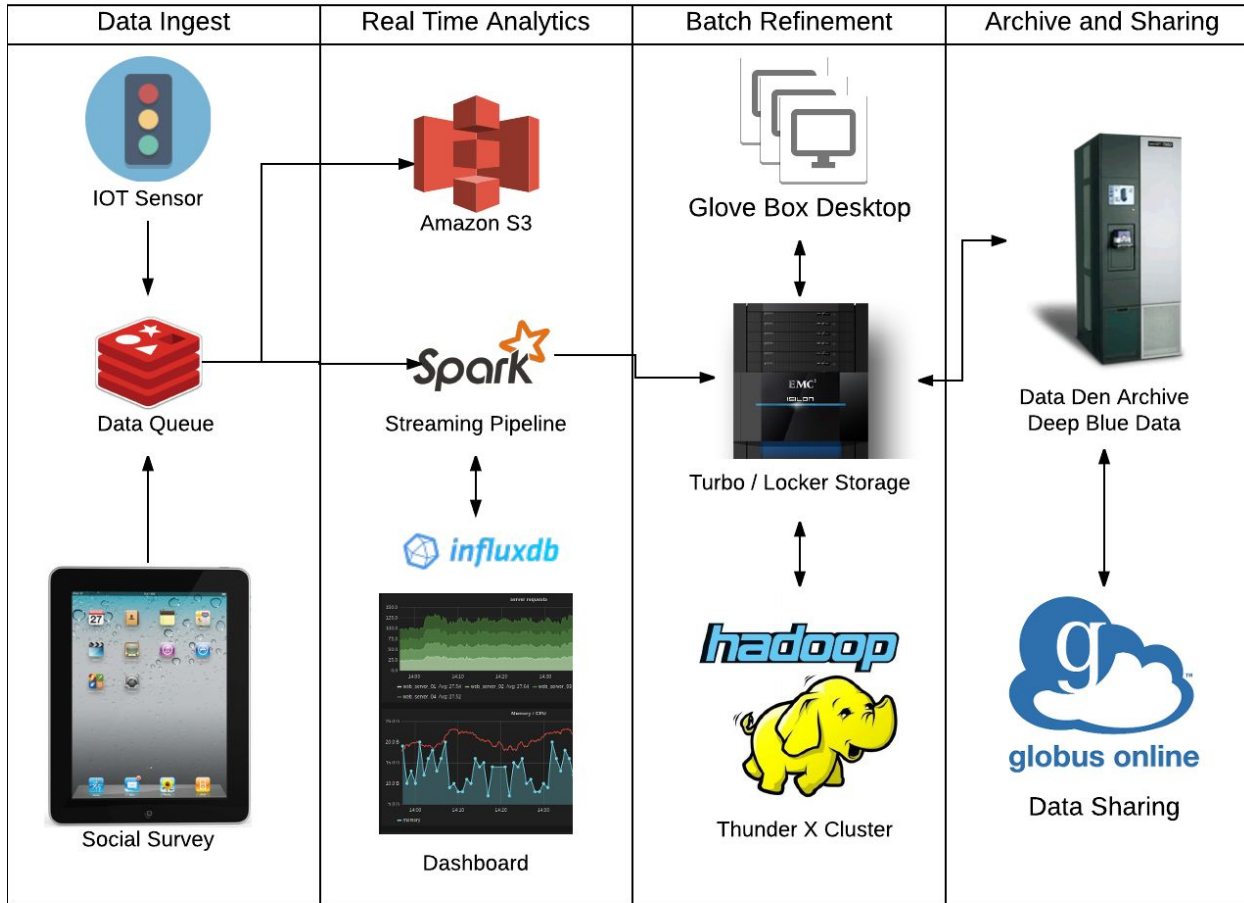
## Services Offered

MariaDB / PostgreSQL  
Redis / Kafka  
Elasticsearch  
InfluxDB / Grafana  
Apache Storm  
MongoDB

## Services Ctd.

Impala  
Hbase  
Cassandra  
iRods

# Example Workflow - Analytics



- Transportation
- Social Surveys
- Remote Sensor Nets (IOT)
- Bedside Monitors
- Remote Imaging
- Telescope Networks
- Finance and Marketing
- Social Media Mining
- Machine Learning Prediction
- Network Security Prediction

# Thank You - Contact

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