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# Human Brain Project

## Using the HPAC supercomputers from the collaboratory

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# OUTLINE



- The HPAC supercomputers
- UNICORE middleware – motivation & brief overview
- Demos
- Hands-on
  - Jupyter notebooks in the Collab (v1)
  - <accessing some HPC machine>

# HPAC



- High-performance compute and data resources
- Services for job submission, data access, data movement, ...
- Allow integration with the Collaboratory and other Platforms
- Enable and support complex user workflows

## Visualisation Systems



**Platform services, APIs, policies, support, ...**

## HPC, Storage, Cloud VMs



## HPC, Storage



## HPC, Storage



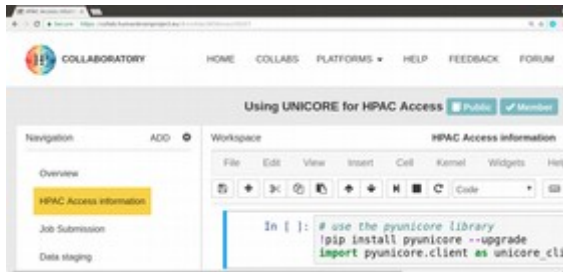
## HPC, Storage, Cloud VMs



# ENABLE MULTISITE WORKFLOWS



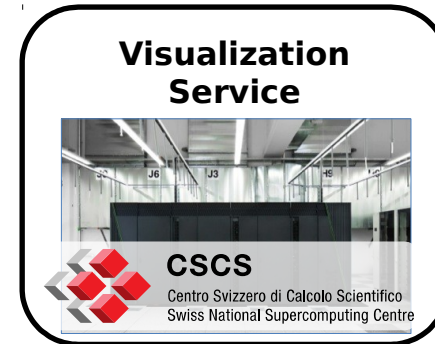
Jupyter notebook or app



HBP accounts



3. Use



1. Launch simulation

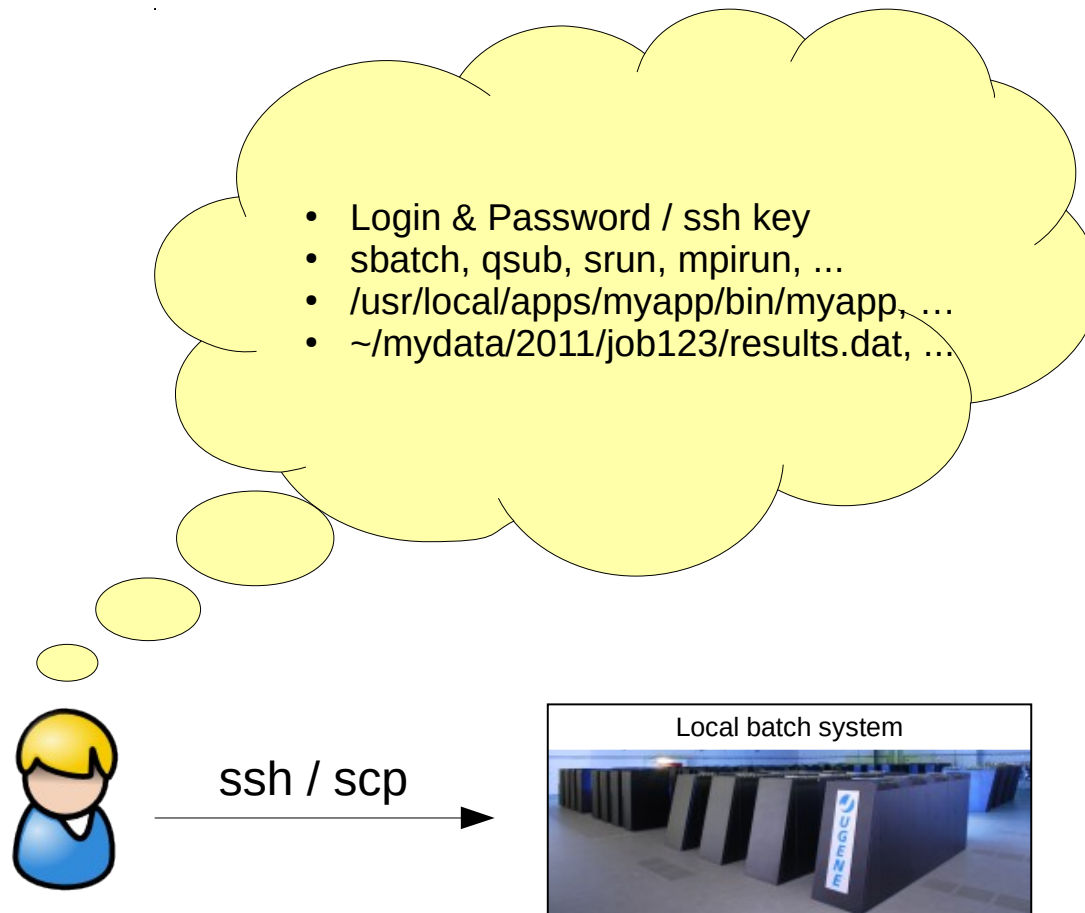


Data access

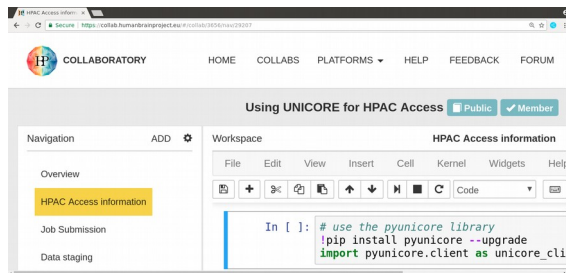


2. Results

# TRADITIONAL HPC USE

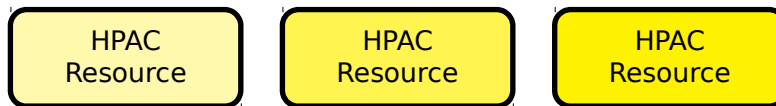


# COLLABORATORY AND HPAC



HBP accounts  
(OIDC)

- Login with HBP account
- HBP account automatically mapped to local account(s)
- Delegation – service can use other services on user's behalf

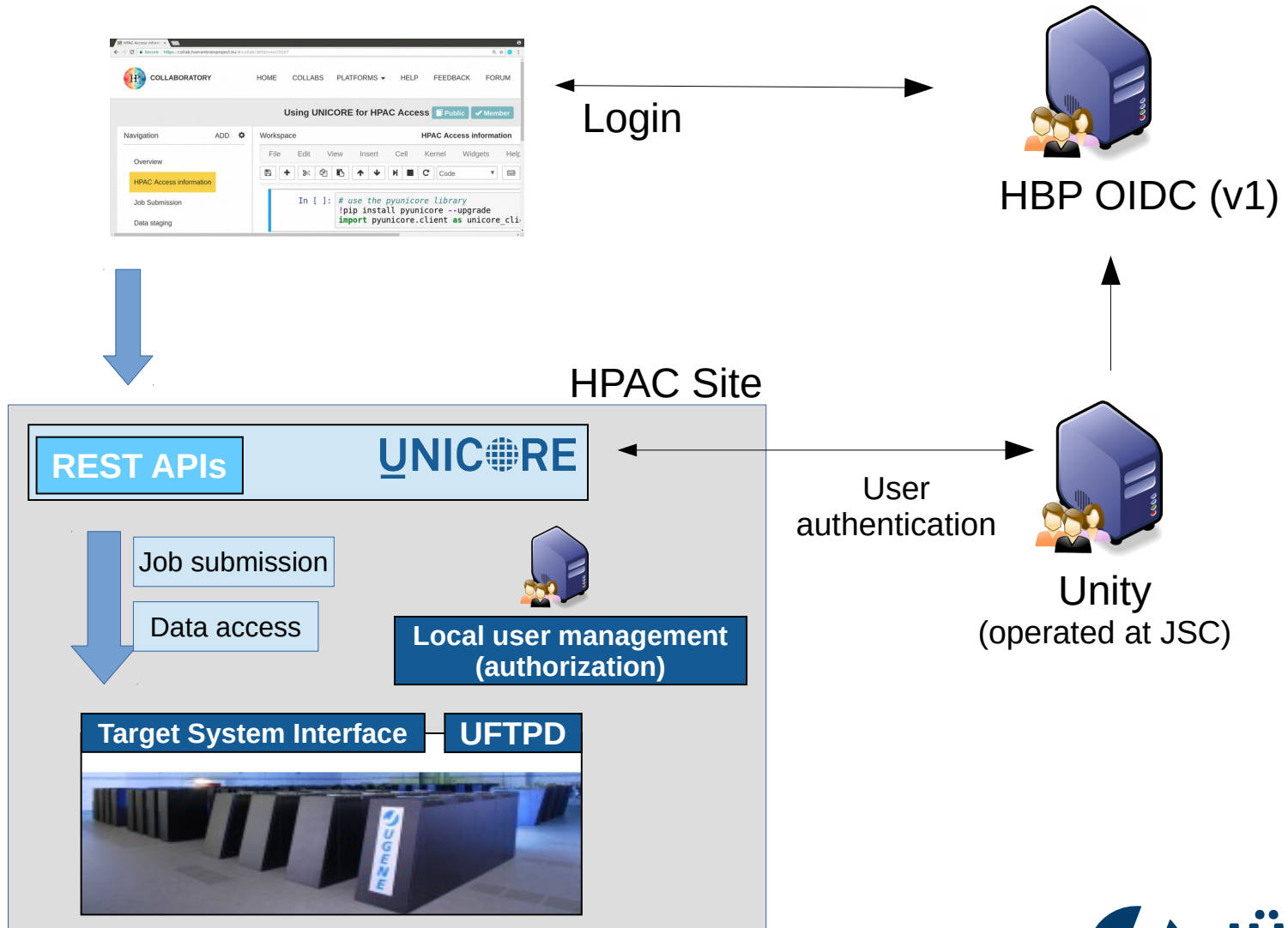


- Run simulations
- Access and move data
- ...



Site local accounts  
Projects  
Groups  
Compute quotas

# ACCESSING A HPAC SITE



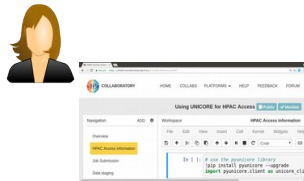
# KEY FEATURES



- UNiform Interface to COmputing and data REsources (established 1997, <https://www.unicore.eu/about-unicore/history>)
- Middleware components for integration of HPC into federated environments
  - Federated authentication, site-local authorization, account mapping (UNIX login & groups)
  - Batch system abstraction
  - File system access
  - High-performance data transfer (UFTP)
- REST APIs for jobs, data, workflows



# BUILDING FEDERATED SYSTEMS



HBP OIDC (v1)

Service Registry

UNITY  
Federated identity

Workflow enactment  
service

Client tier

Shared  
services  
(defining the  
federation)

UNICORE Site



UNICORE Site

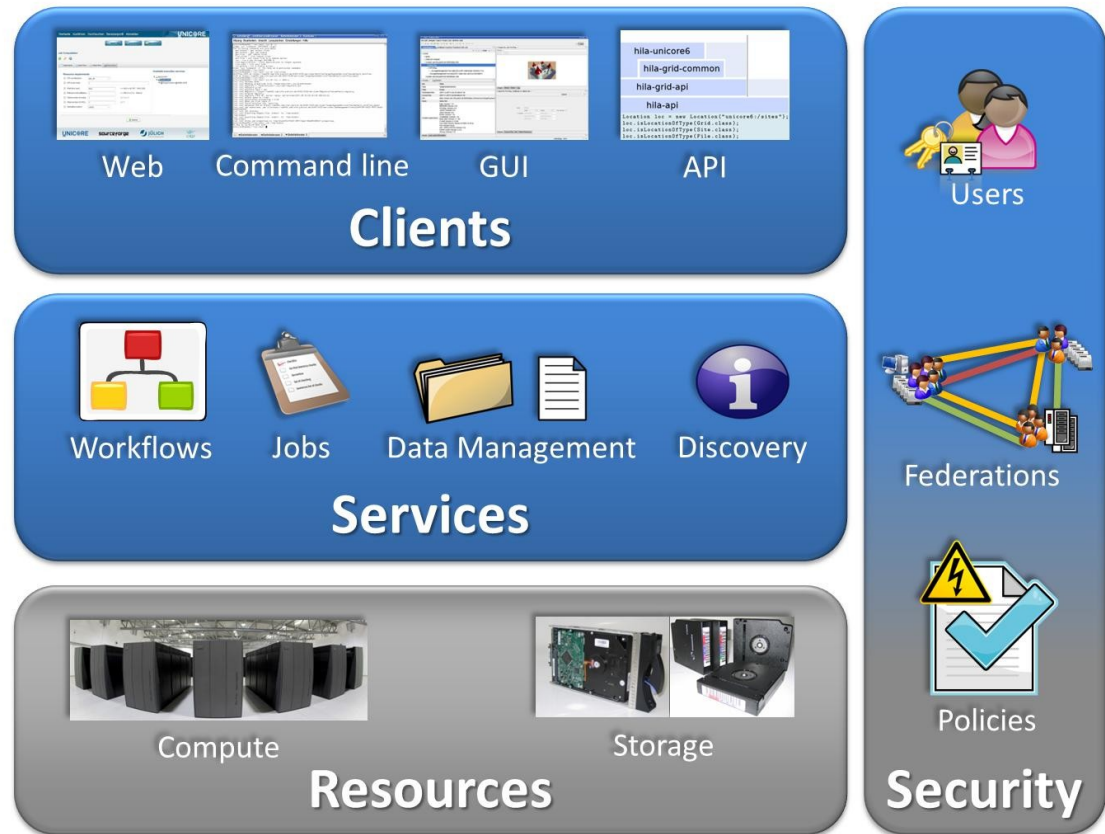


UNICORE Site



UNICORE  
HPC site(s)

# UNICORE



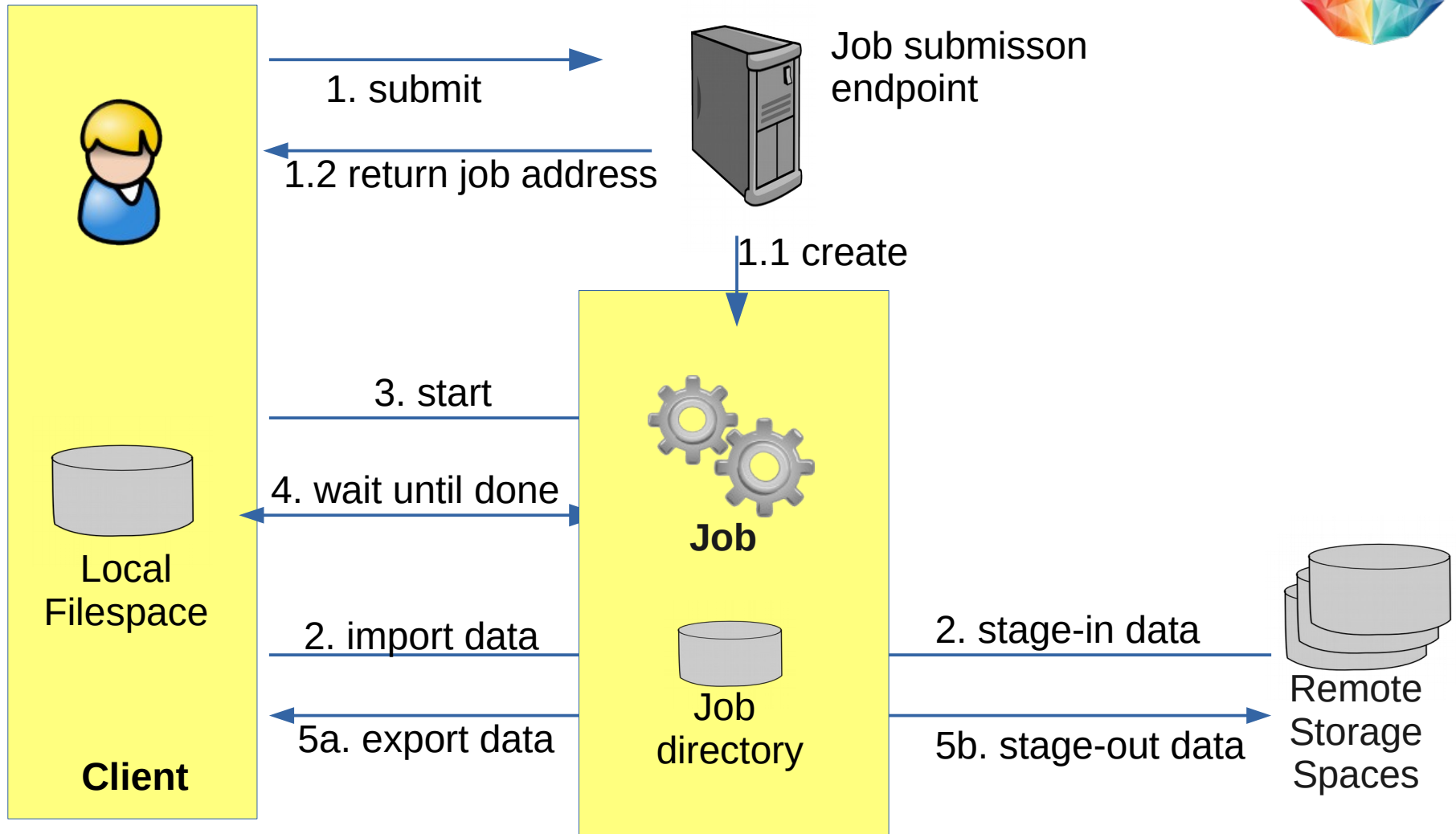
- Open source (BSD license)  
<https://www.unicore.eu>

# RESOURCE MODEL



- UNICORE is resource / object oriented
  - E.g. a batch job or a storage
  - HTTPS endpoints / URLs with operations to manipulate them
  - Per-user, access-controlled
- APIs
  - REST / JSON
  - SOAP / XML

# JOB EXECUTION



# JOB EXECUTION



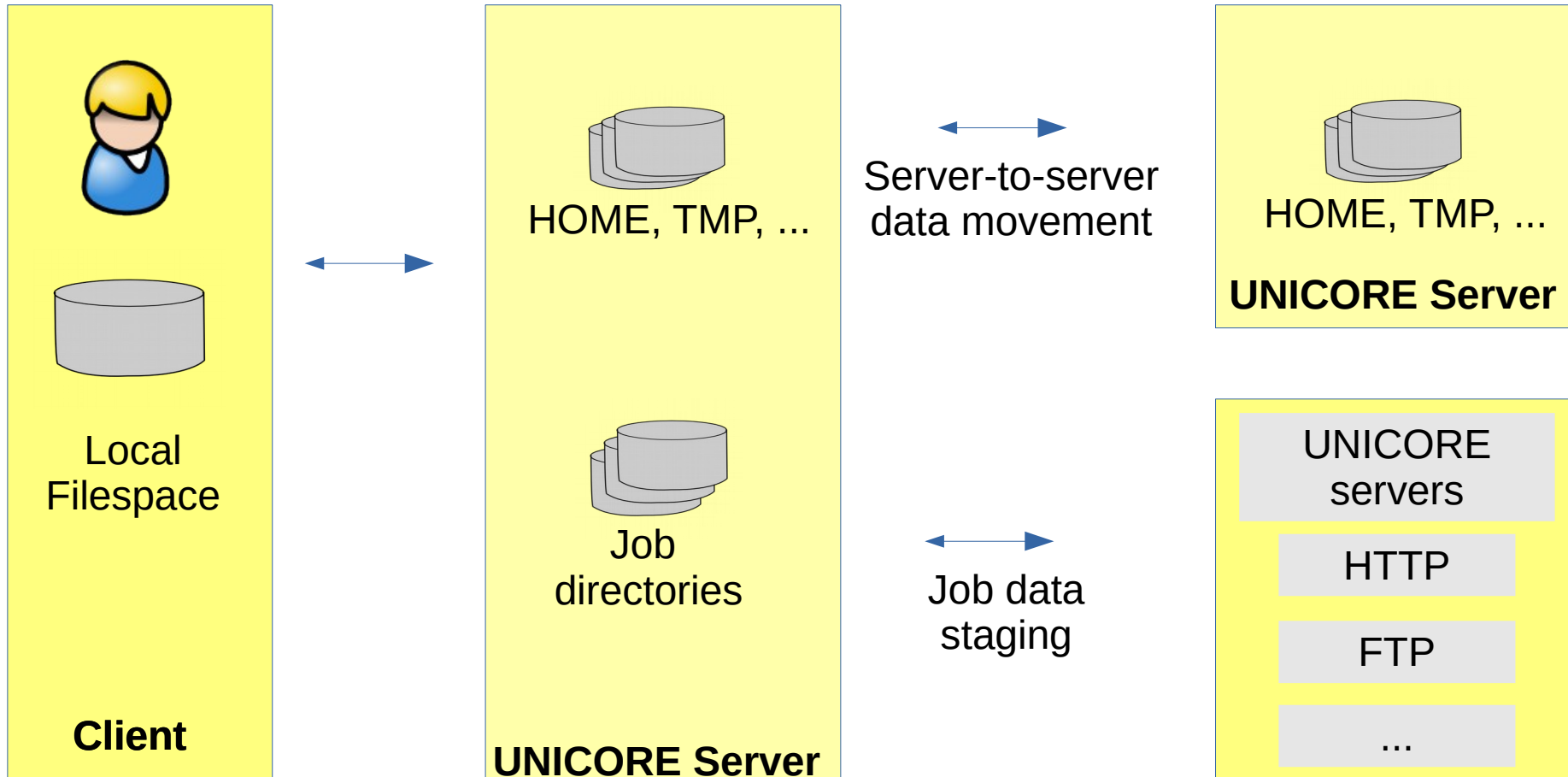
- A UNICORE job includes:
  - Data stage-in from remote servers
  - Pre-command(s)
  - Main execution / submission to batch system
  - Post command(s)
  - Data stage-out to remote servers

# JOB MANAGEMENT



- A UNICORE job has:
  - Properties (status, log, ...)
  - Working directory (sandbox) that can be accessed at any time
  - Control operations (abort, restart, delete)

# DATA AND STORAGE SERVICES



# STORAGE MANAGEMENT



- “Abstract” storage instances like HOME, SCRATCH, ...
- List, create directories, remove files, ...
- Upload/download files
- Send/receive files from other UNICORE servers
- Data movement via https (default) or UFTP
- Properties
  - Free space, ...



# CLIENTS



- REST APIs
  - curl, Python Requests, PyUNICORE client library, ...
- Command line (supporting OIDC via oidc-agent)
  - UNICORE Commandline Client (UCC)
  - UFTP client for high-performance data access

# SUMMARY



- HPAC platform
  - Federated infrastructure for HPC, data and VM-based services
  - Consists of heterogeneous, distributed resources
  - Co-design approach: scientists and infrastructure need to work together to realise complex use cases

# SUMMARY



- UNICORE
  - Access to HPC compute and data via REST APIs
  - Handles authentication and authorization
  - Job submission/management, data access, data movement
- Enables HPC for
  - Web-based environments like the Collaboratory
  - Commandline environments
  - Applications requiring access to HPC

# HANDS ON



- Requires Collab (v1) account  
<https://collab.humanbrainproject.eu>
- Training collab: “HPAC Training: Using UNICORE”  
<https://collab.humanbrainproject.eu/#/collab/34731/nav/240789>
- Low level API documentation  
[https://sourceforge.net/p/unicore/wiki/REST\\_API](https://sourceforge.net/p/unicore/wiki/REST_API)