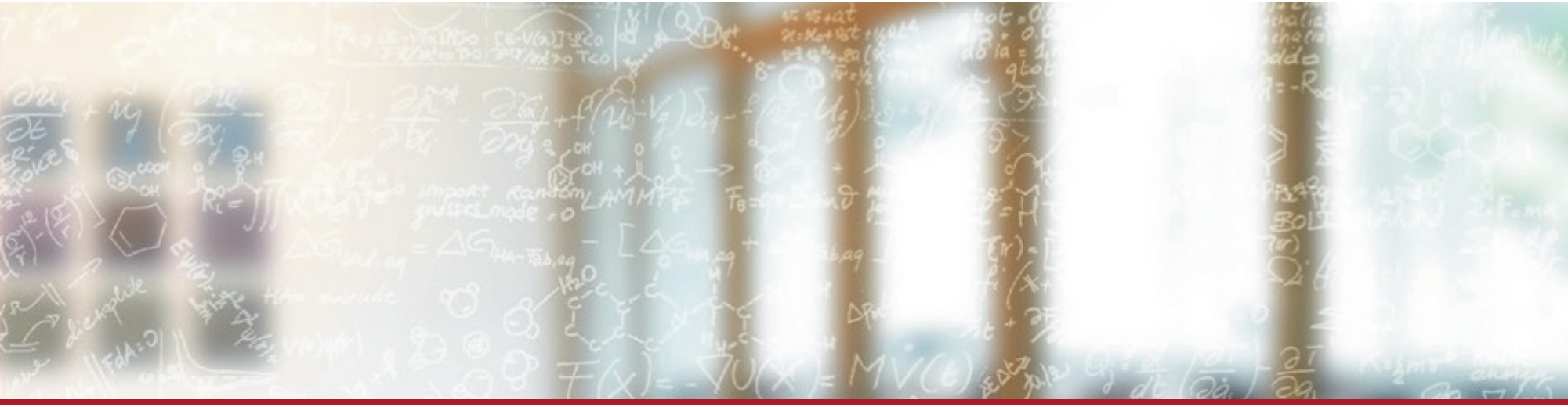
CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich



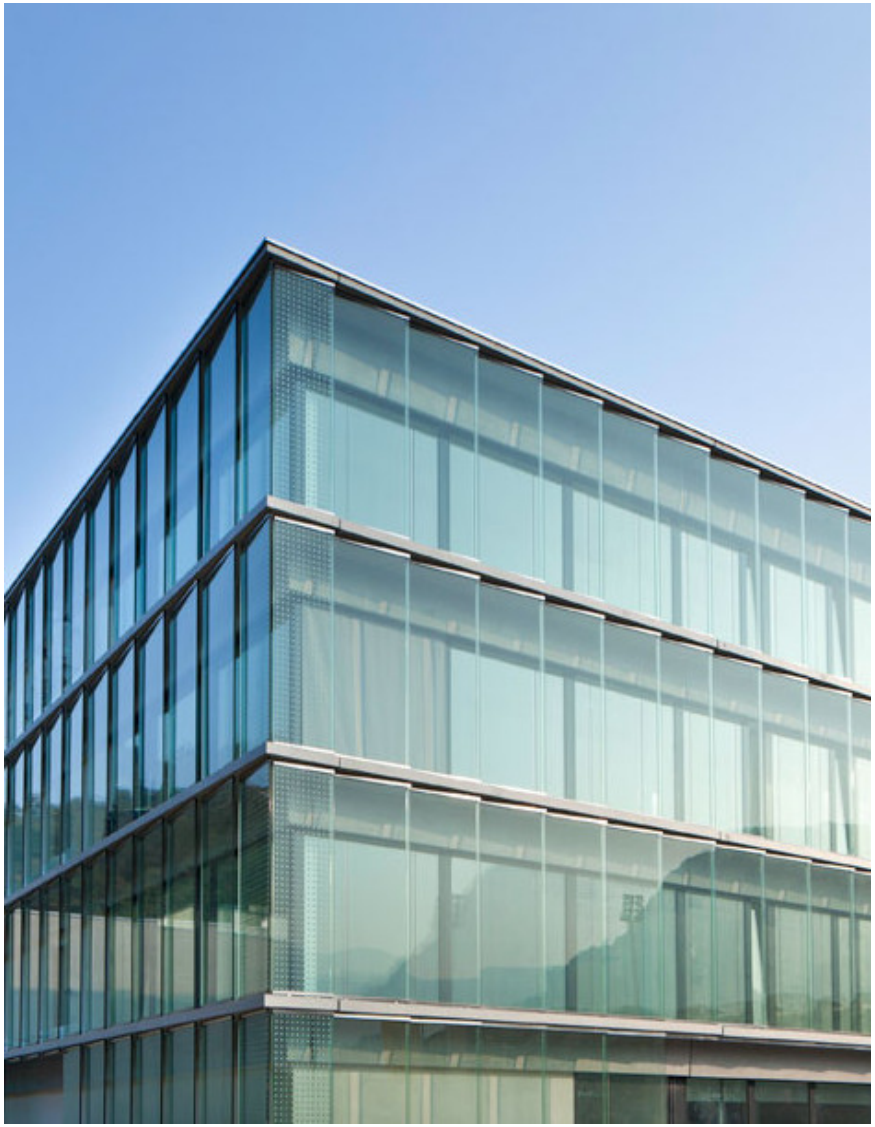
FirecREST - a Web API for HPC at CSCS

CSCS User Lab Day - Meet the Swiss National Supercomputing Centre

Theofilos Manitaras - ETH Zurich/CSCS

September 9, 2019

FirecREST a Web API for HPC at CSCS



- FirecREST in a Nutshell
- Microservice Architecture
- FirecREST Workflow
- API Endpoints & Demo client
- Why FirecREST?

CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich

FirecREST in a Nutshell

FirecREST Trivia

Firecrest in nature

What is FirecREST?

FirecREST is a RESTful Services Gateway to HPC resources built with a microservices architecture.

- **Gateway to HPC:**
  - Identity Access Management (IAM)
  - HPC Workload Management
  - Data Mover
- **RESTful interfaces:** Architecture abstraction allowing for simple, lightweight and fast applications.
- **Microservices:** Decouple funcionalities found in monolithic server architecture.

FirecREST Motivation

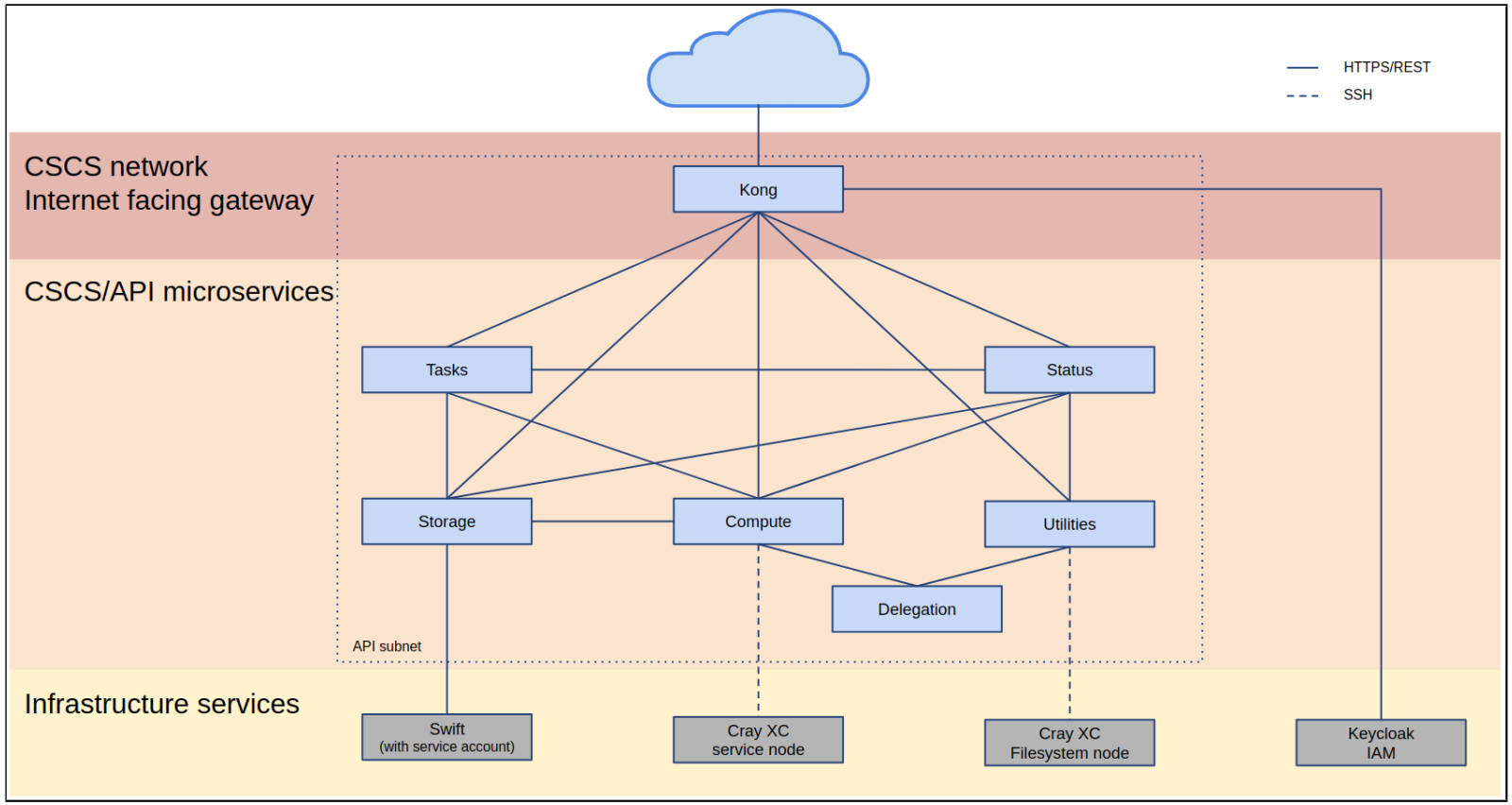
- Improve accessibility of HPC resources to scientific communities.
- Create an interface for the development of domain specific platforms.
- Develop a standard interface to Cray system resources.
- Take advantage of the CSCS Identity and Access Management so that users can use their credentials.

CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich

Microservice Architecture

FirecREST Microservices Overview



FirecREST microservice architecture

FirecREST Components

Services

- Kong API gateway
- Compute
- Storage
- Utilities
- Support
  - Tasks
  - Status
  - Delegation

Core CSCS Service Dependencies

- Workload Manager node
  - Compute
  - Xfer
- Utility node, filesystem utilities
- SWIFT, data transfer staging area
- Keycloak, authentication & authorization

FirecREST Microservices

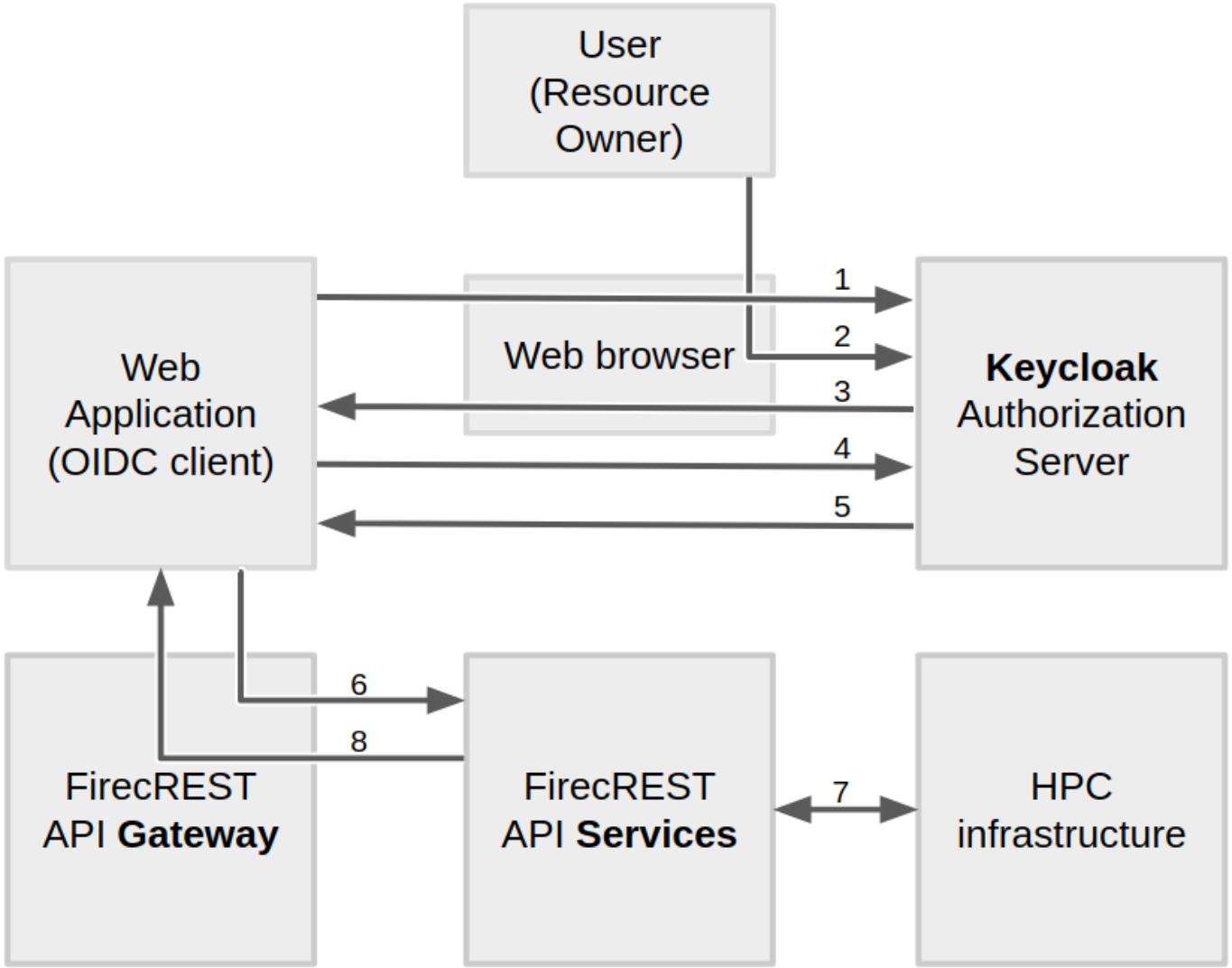
- **Kong:** Open-Source microservice API Gateway. Implements and enforces authentication, authorization, traffic control, analytics, logging.
- **Compute:** Non-blocking calls to workload manager for submitting/querying jobs. The service responds with a reference to a temporary task resource tracking the request state.
- **Storage:** Non-blocking calls to high-performance storage services. The service responds with a task reference as above.
- **Utilities:** Fundamental filesystem utilities. All calls are blocking with a timeout.
- **Support:**
  - Tasks: state of tasks
  - Delegation: OIDC token $\rightarrow$ SSH user-certificate
  - Status: information on services and infrastructure.

CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich

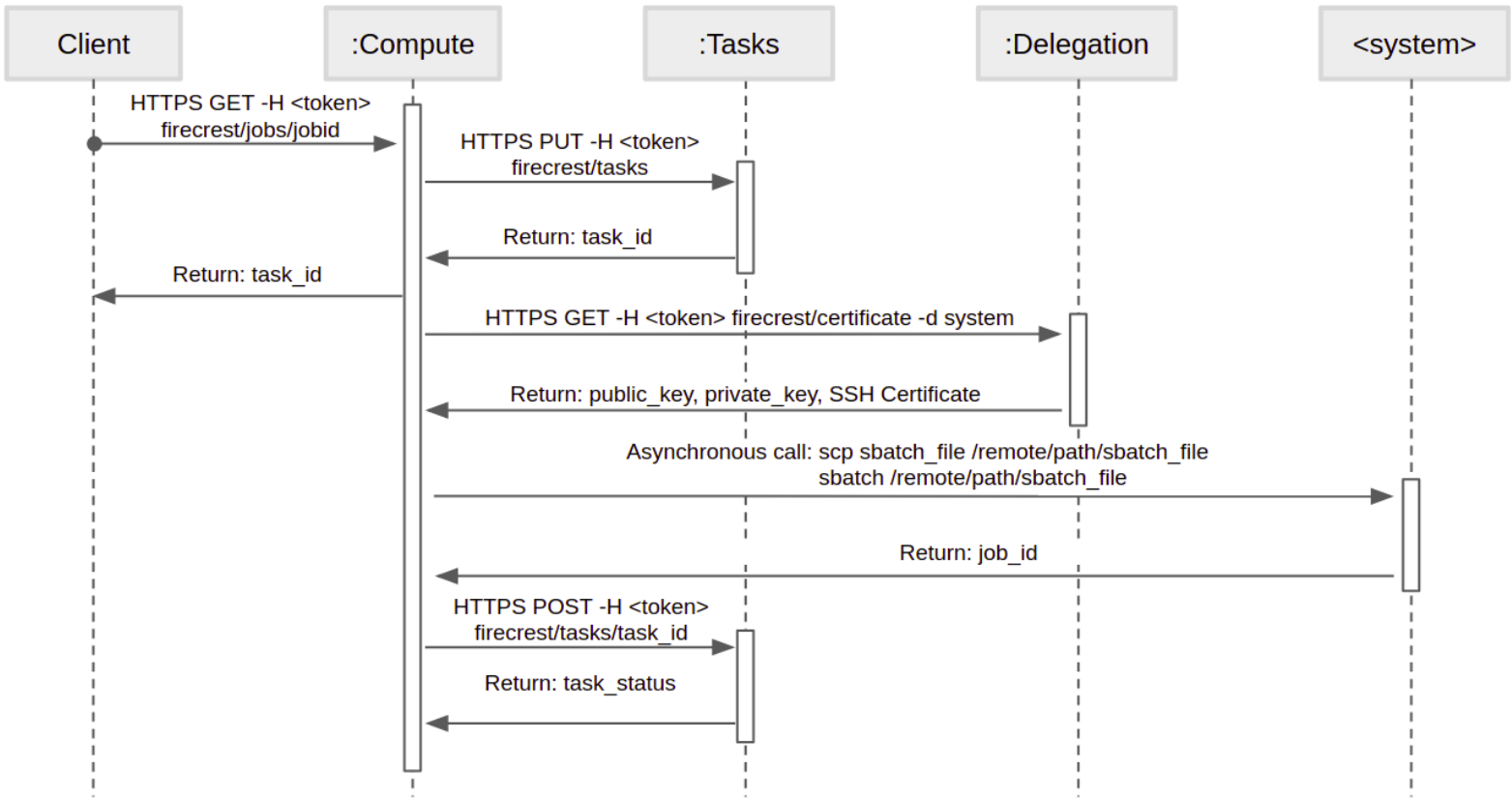
FirecREST Worfklow

Authentication and Authorization

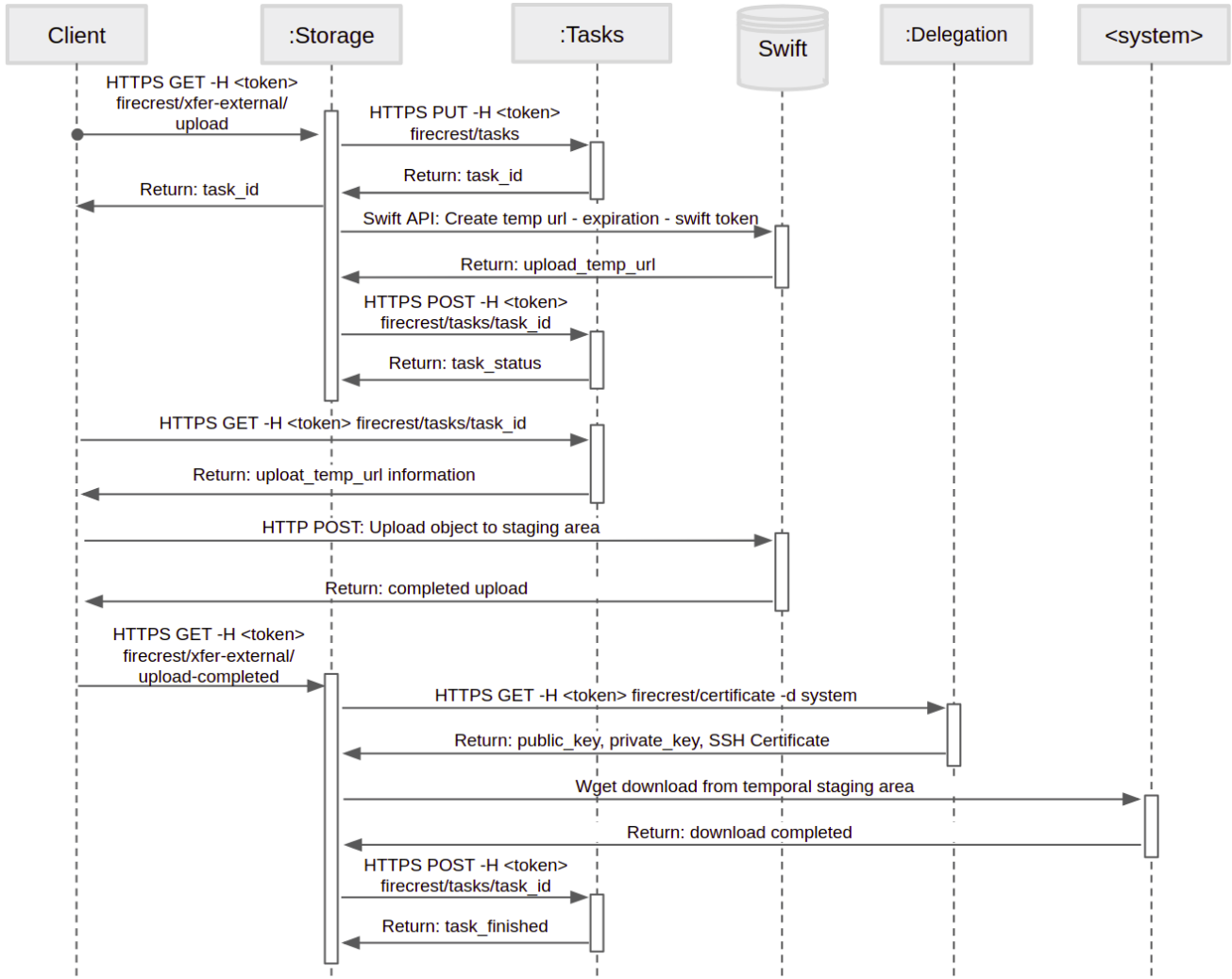


OIDC-based Authentication/Authorization

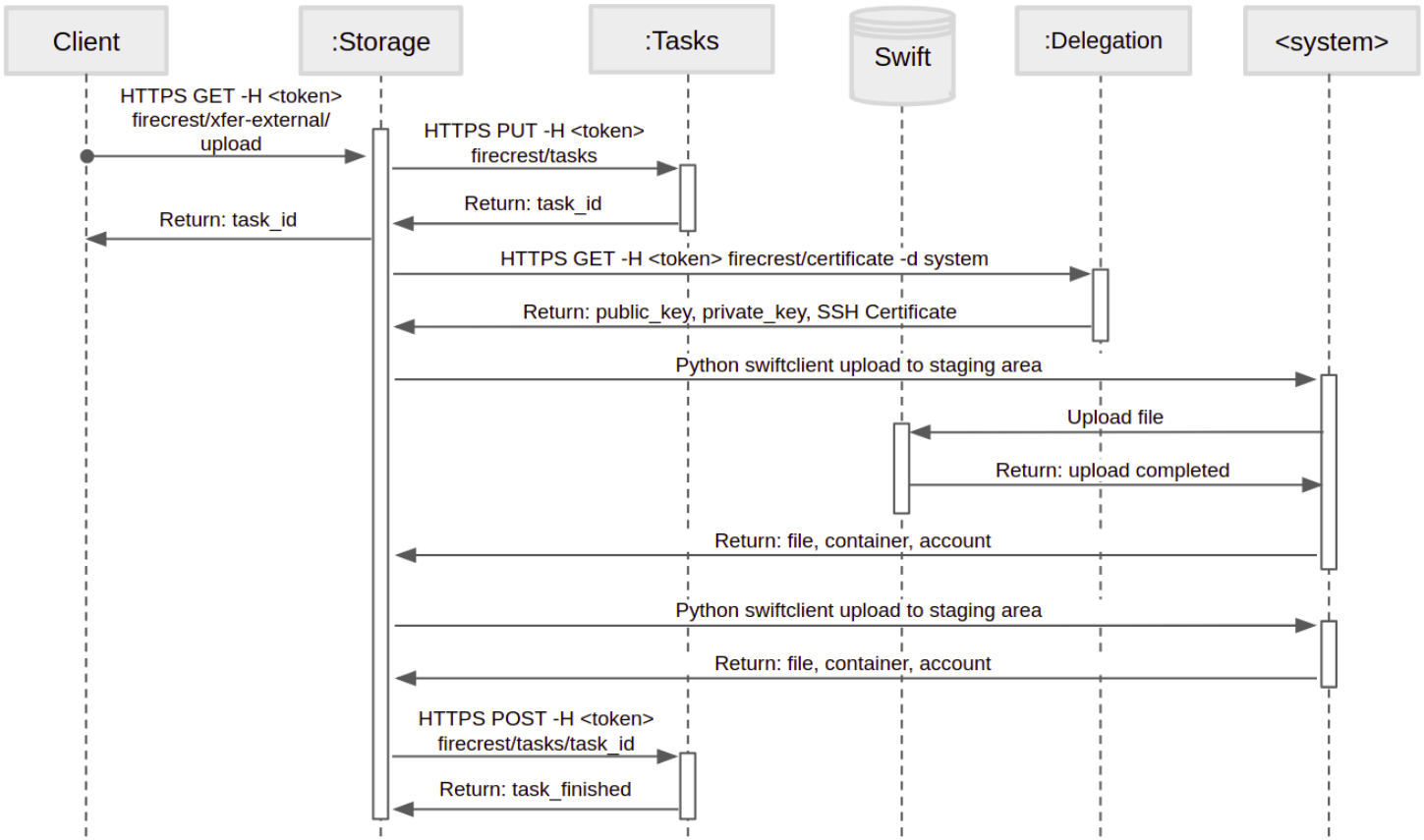
Job Submission Wordkflow



Data Upload Workflow

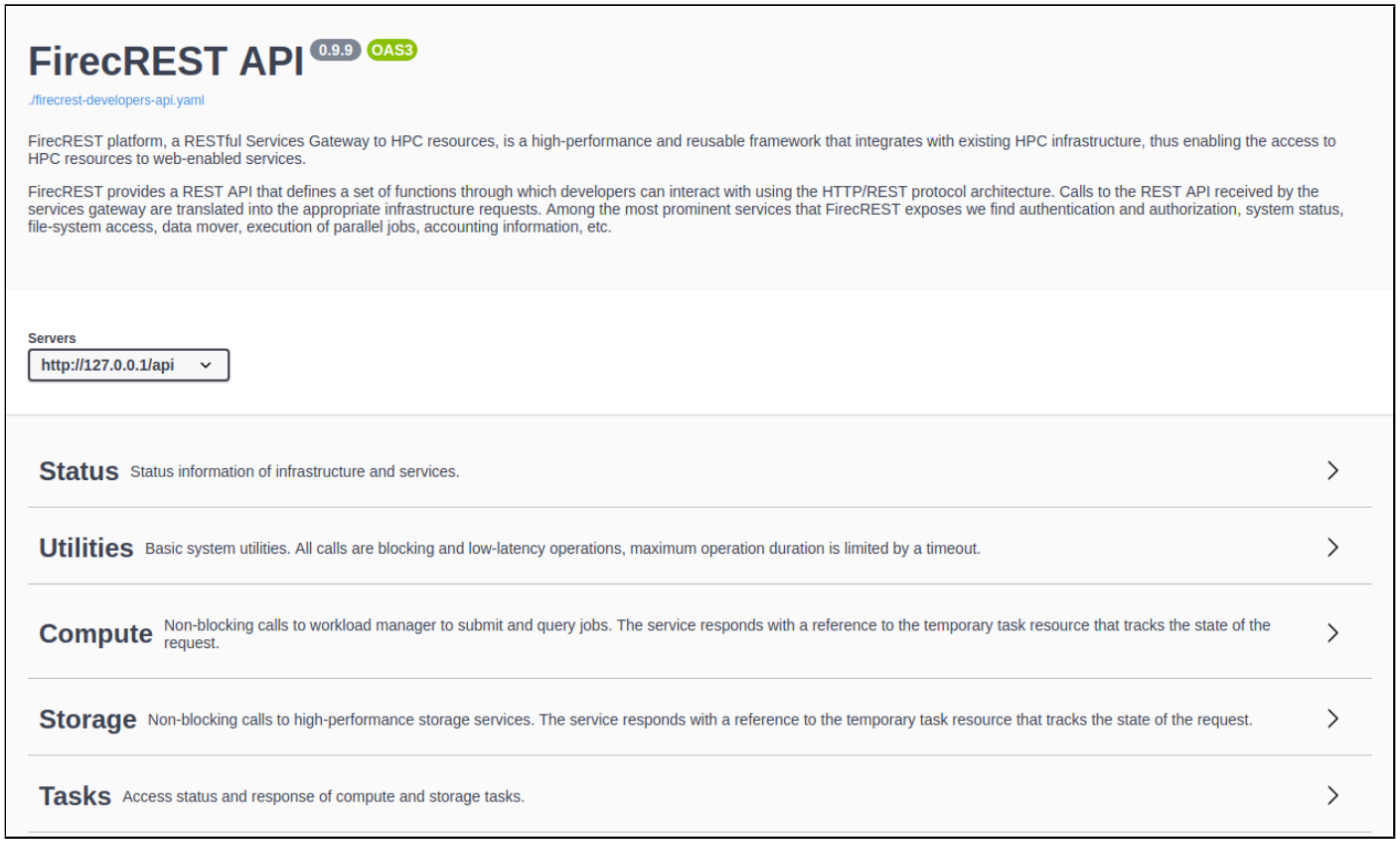


Data Download Workflow



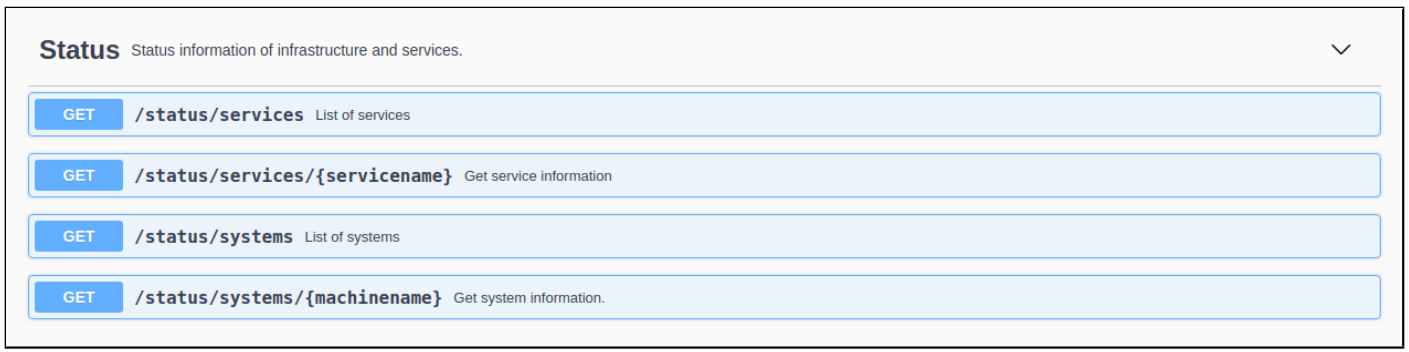
API Endpoints

The FirecREST API



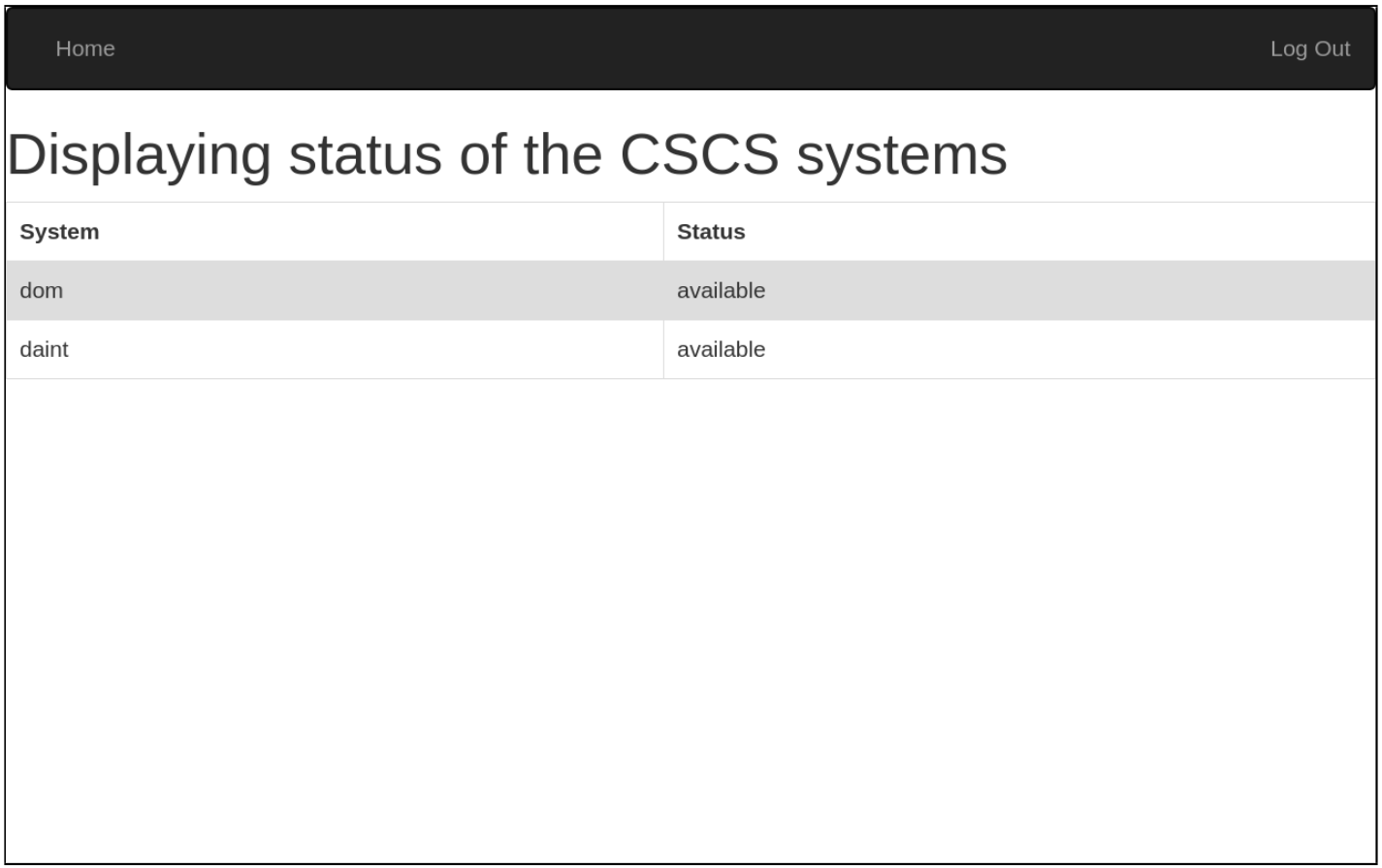
Overview of the FirecREST API

Status



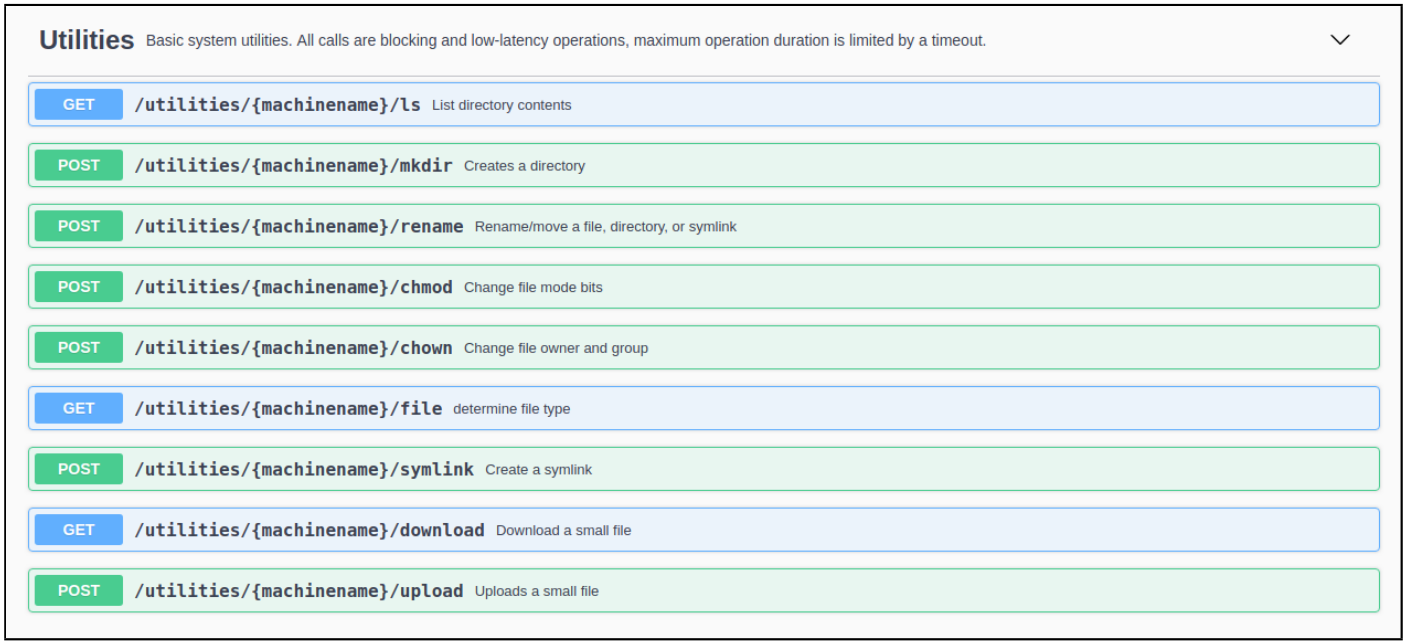
The **Status** endpoints

Displaying the status of the systems



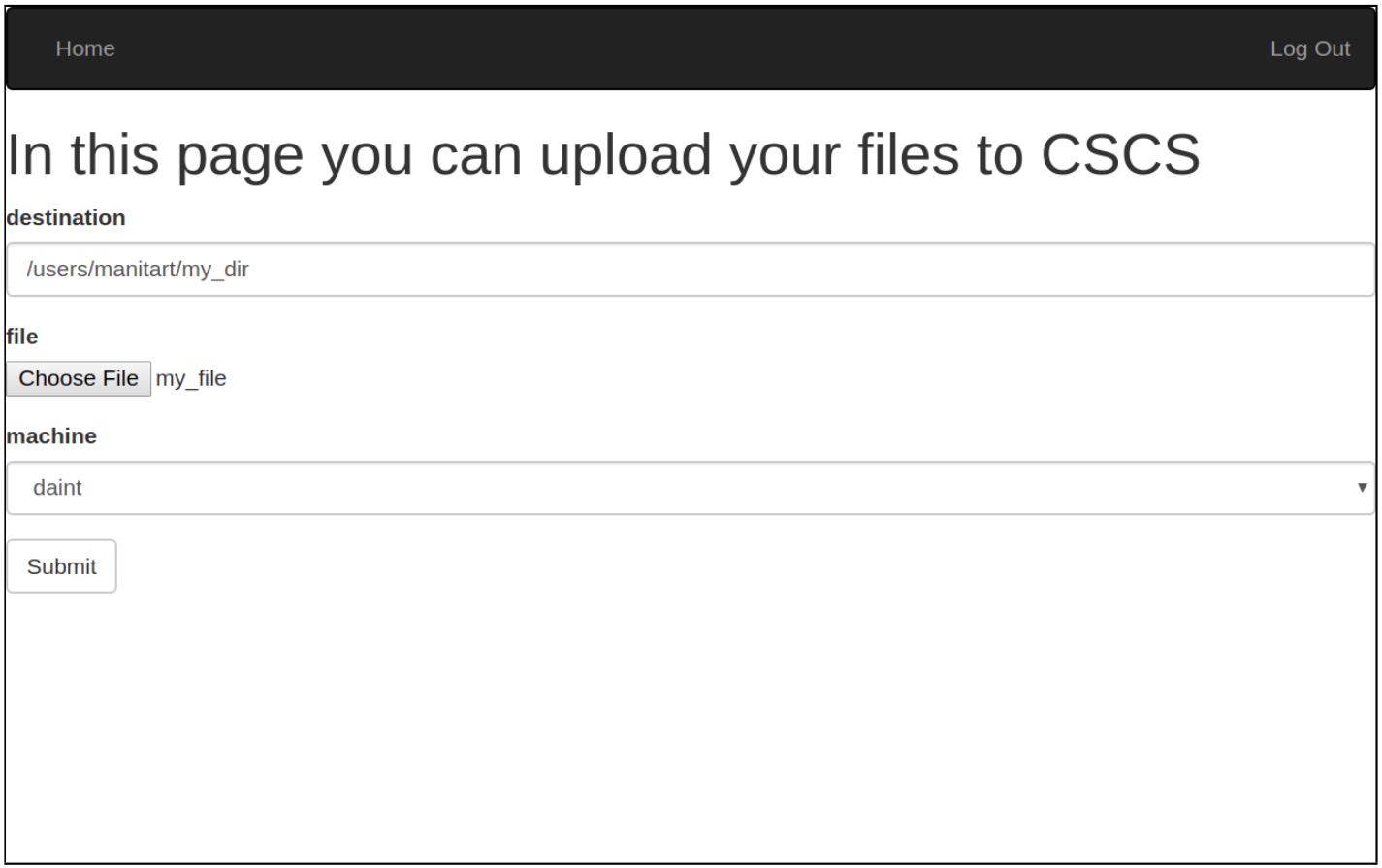
System status using endpoint: /status/system/{machinename}

Utilities



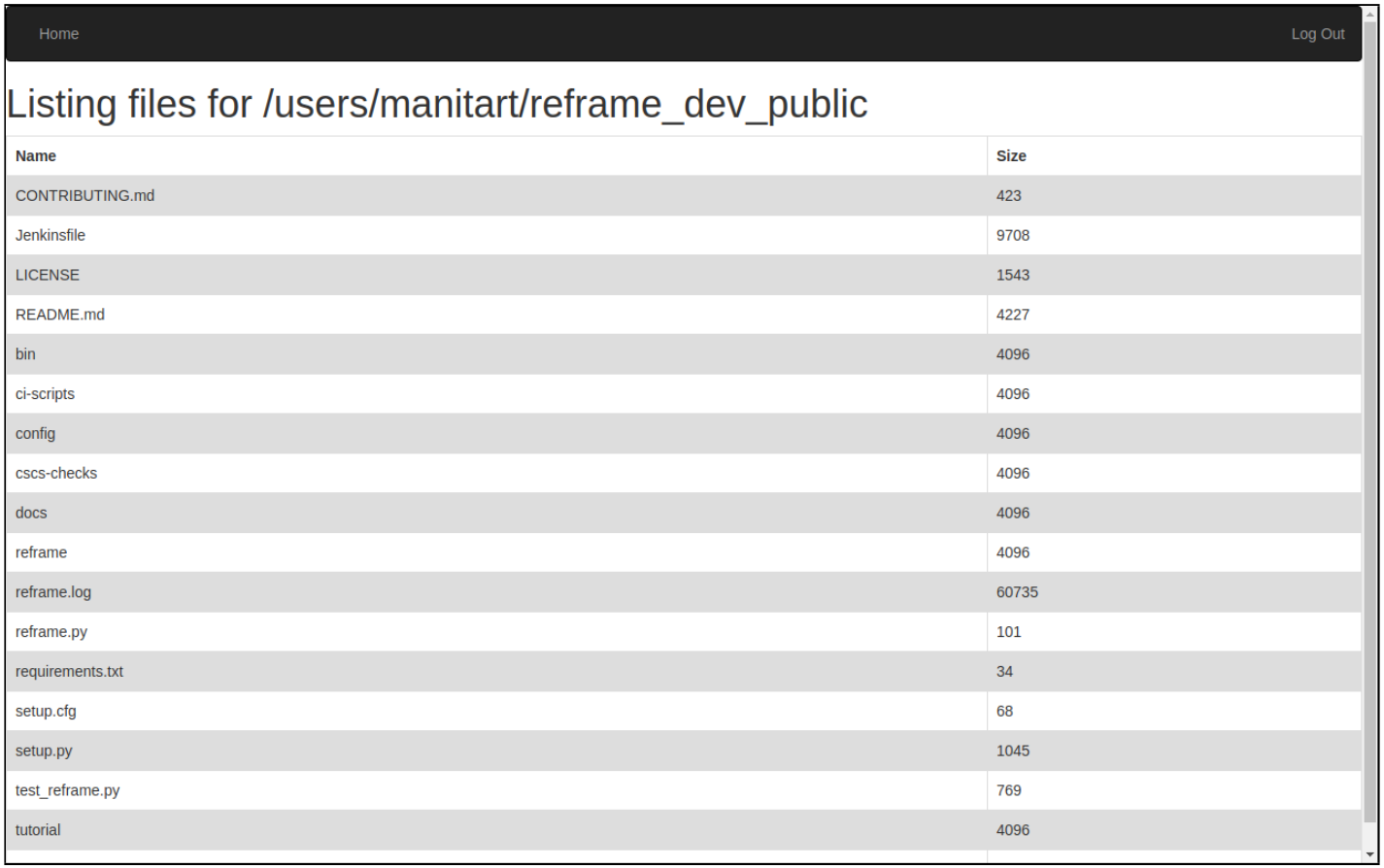
The **Utilities** endpoints

Upload small file



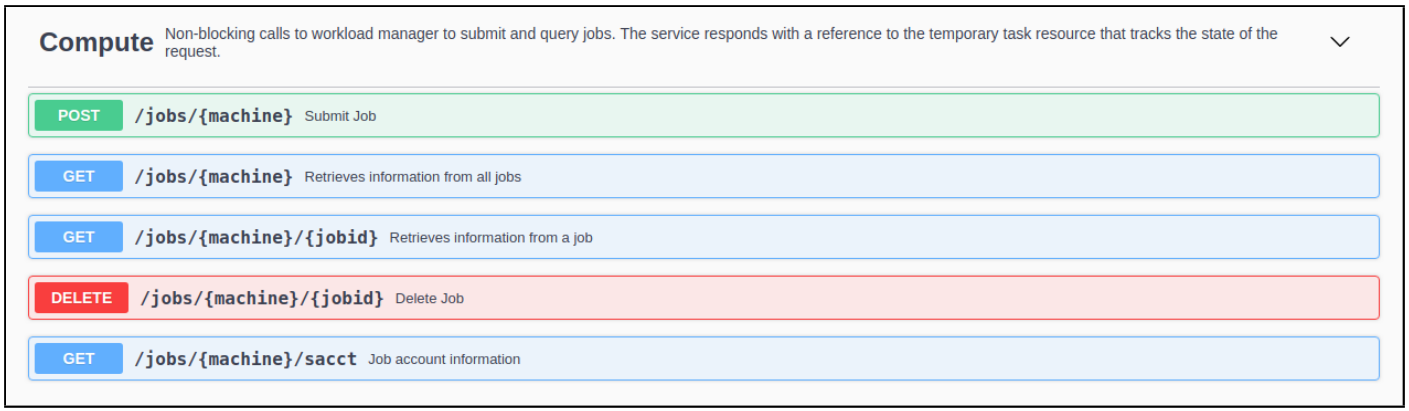
Upload a small file using: /utilities/{machinename}/upload

List User Files



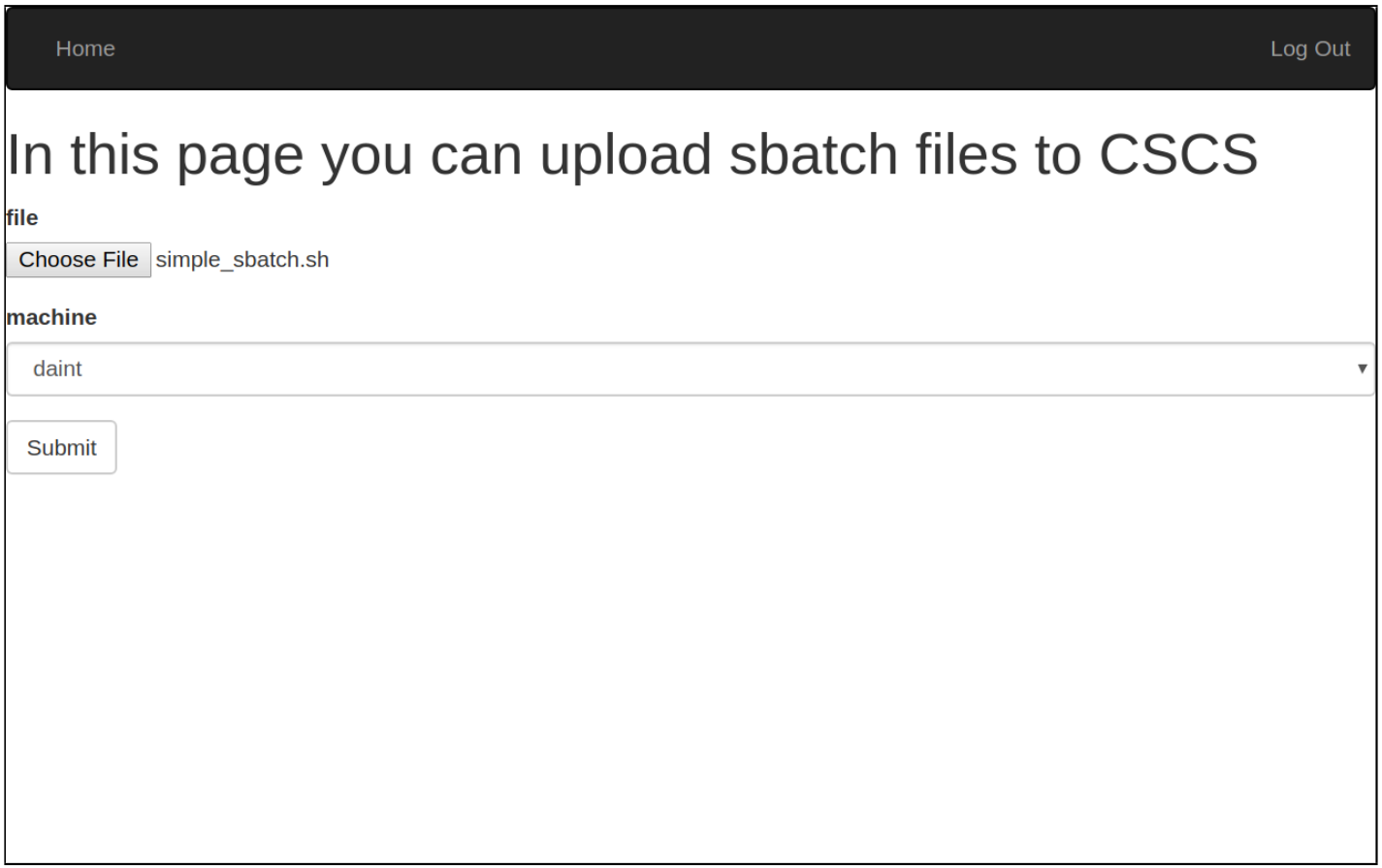
List user directory using: /utilities/{machinename}/ls

Compute



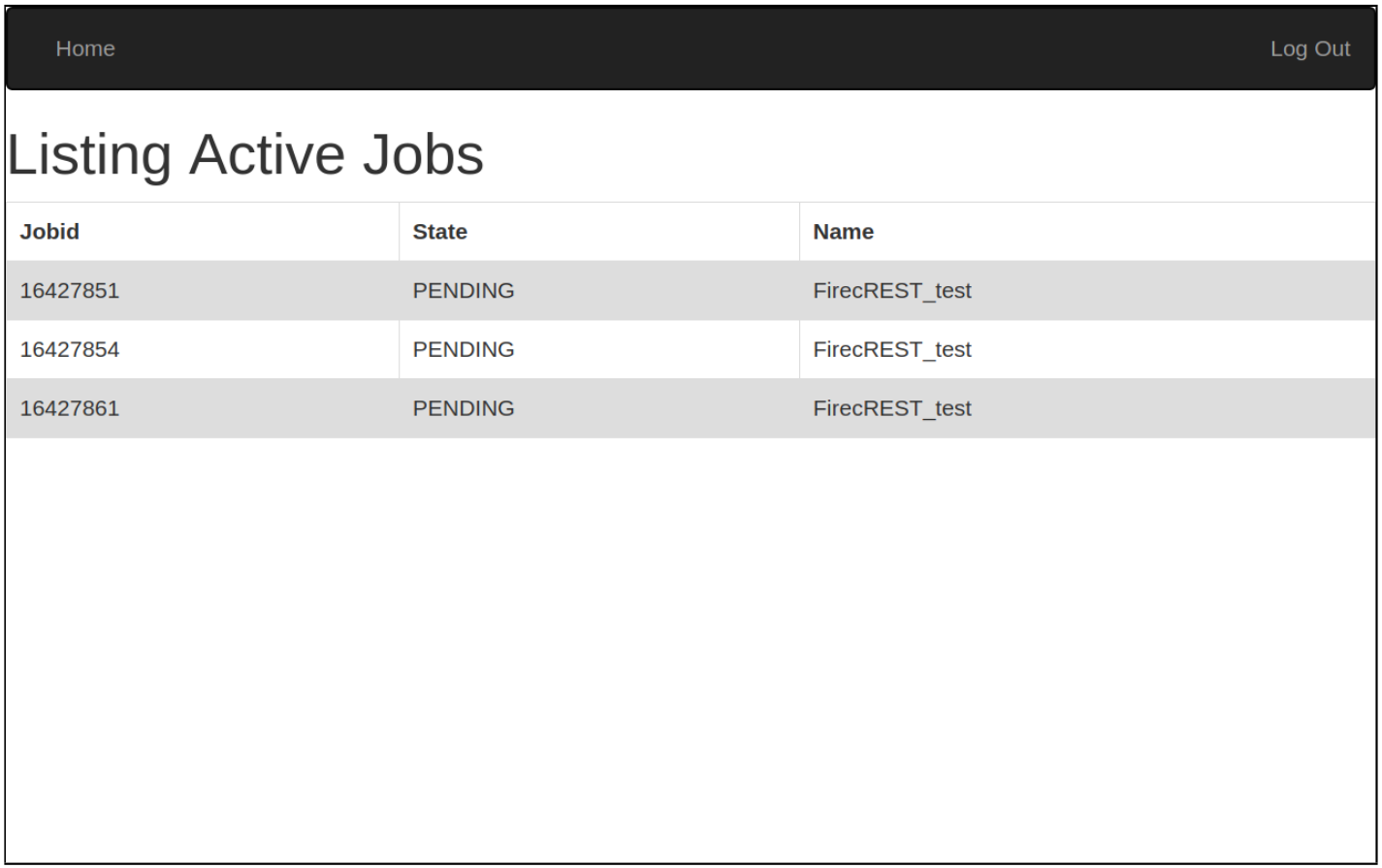
The **Compute** endpoints

Submitting a Job



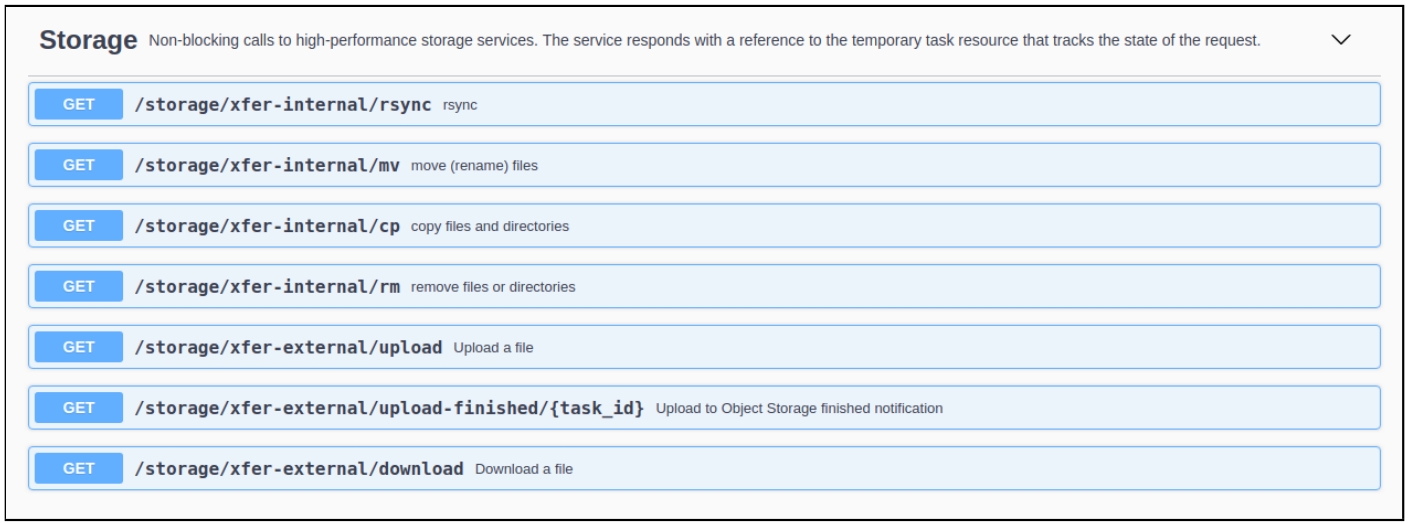
Submit an sbatch script using: /jobs/{machine}

Monitor active jobs



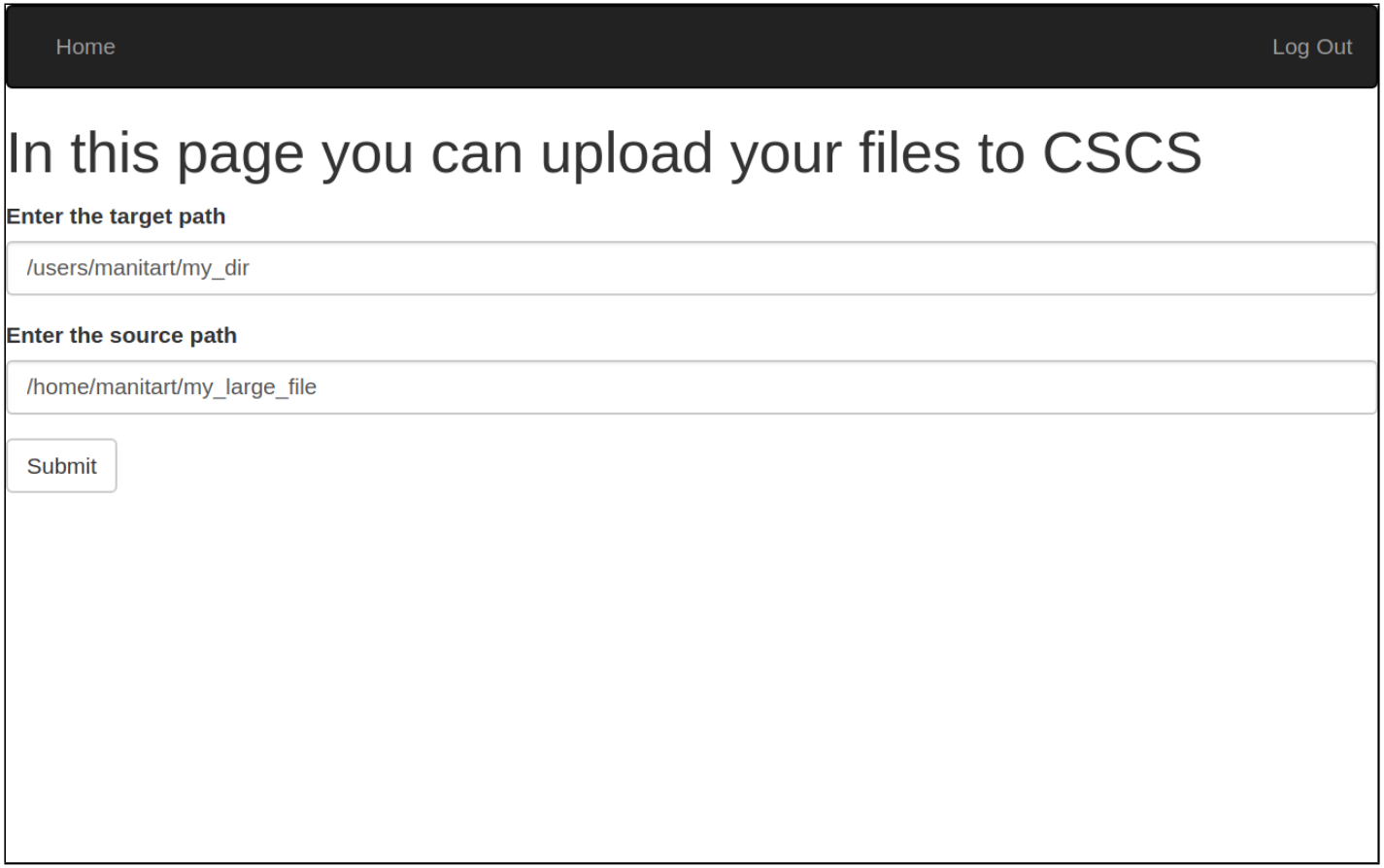
Monitor status of active jobs using: /jobs/{machine}

Storage



The **Storage** endpoints

Upload a large file

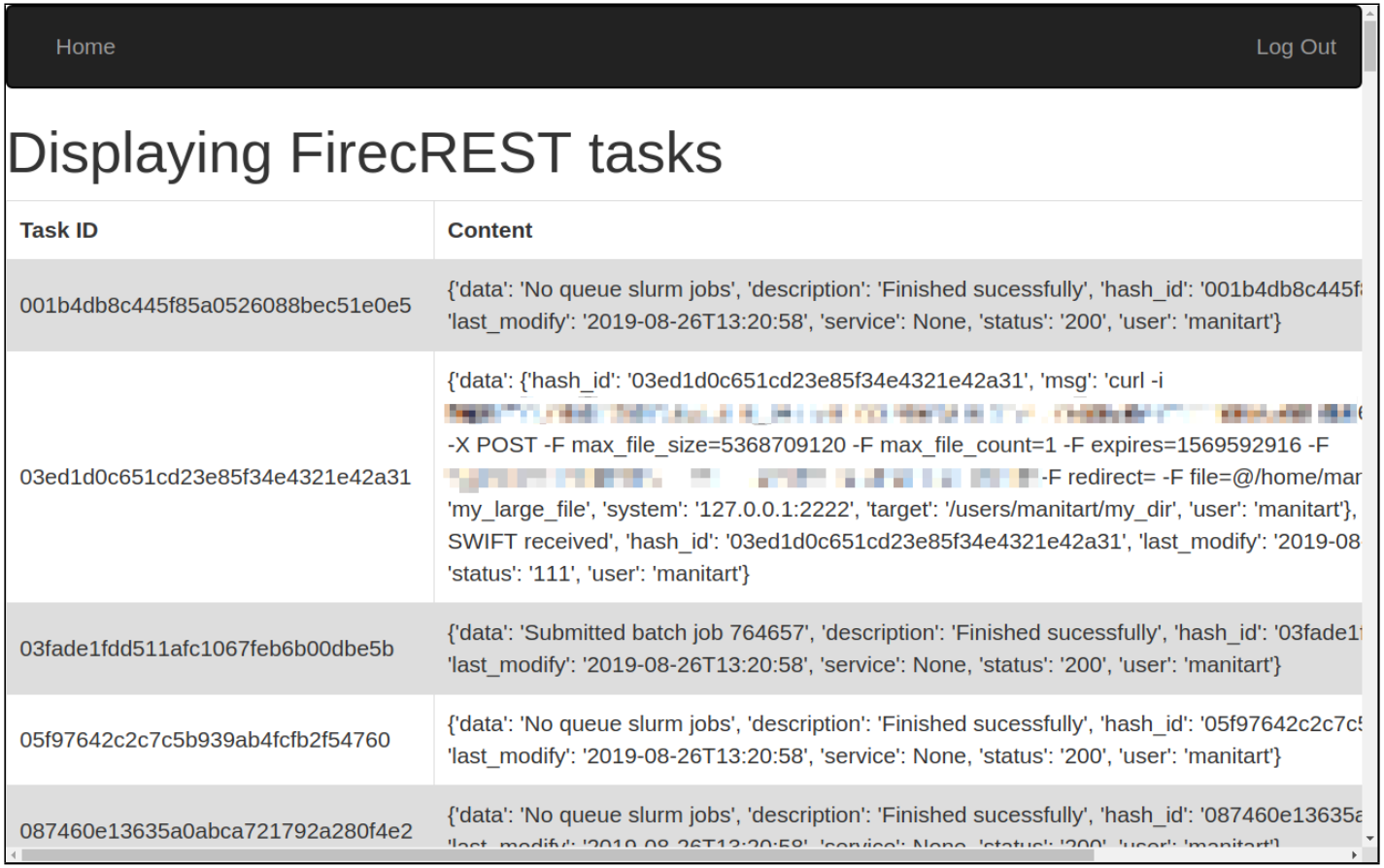


Upload file using: /storage/xfer-external/upload

Tasks

The **Tasks** endpoints

Displaying FirecREST tasks



Display all tasks using: /tasks/tasks

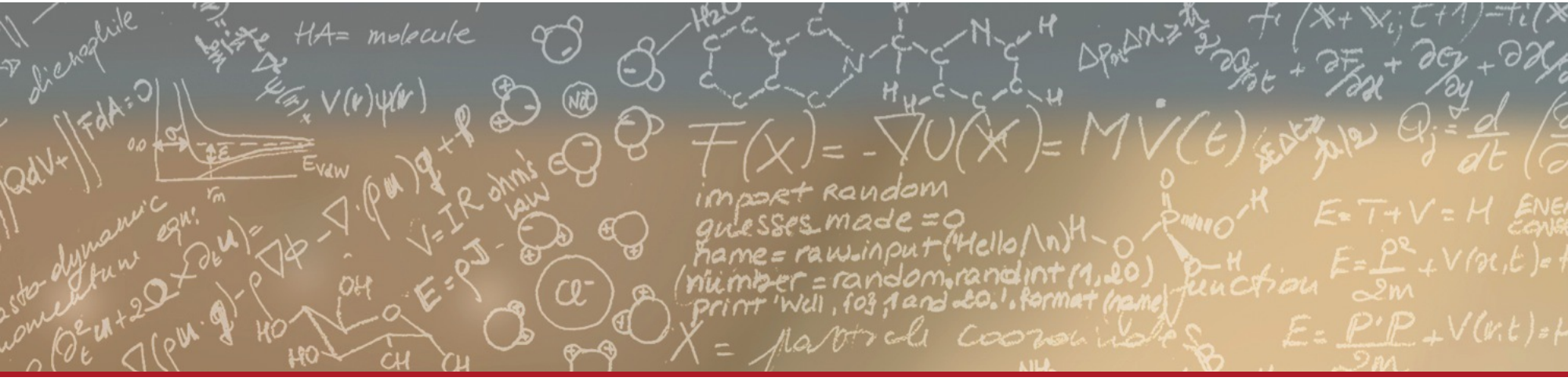
CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

ETH zürich

Why use FirecREST?

FirecREST Advantages

- Common, stable, maintainable API
- Enforce that all API requests are authenticated
- Applications never manipulate user credentials
- Only allow requests from registered applications
- User-managed access permissions per application
- Stateless security module by use of tokens (OIDC)
- Enables managing of execution workloads
- Enables external data transfer from/to HPC filesystems
- Soon to be open-sourced



Thank you for your attention.