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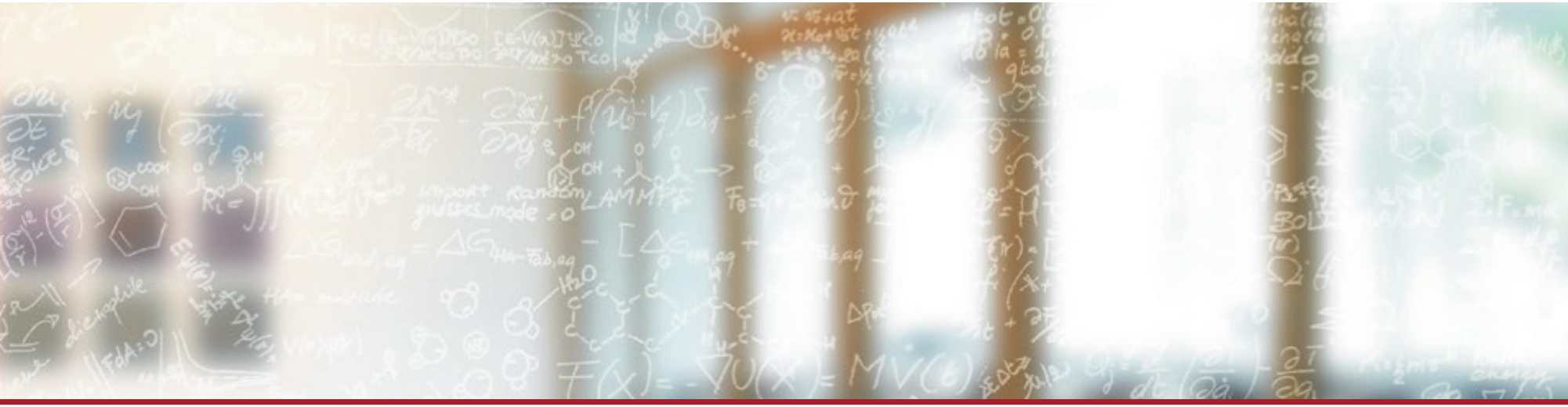


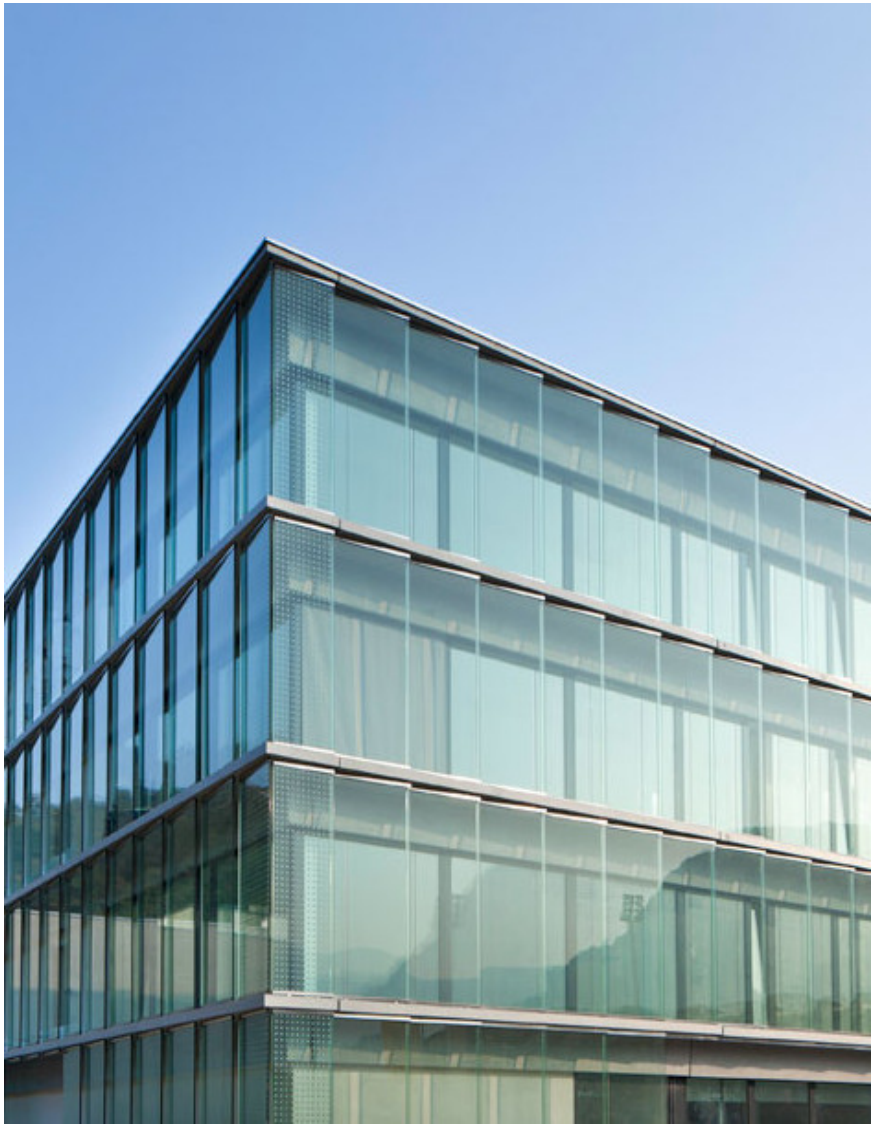
FirecREST - a Web API for HPC at CSCS

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?

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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.

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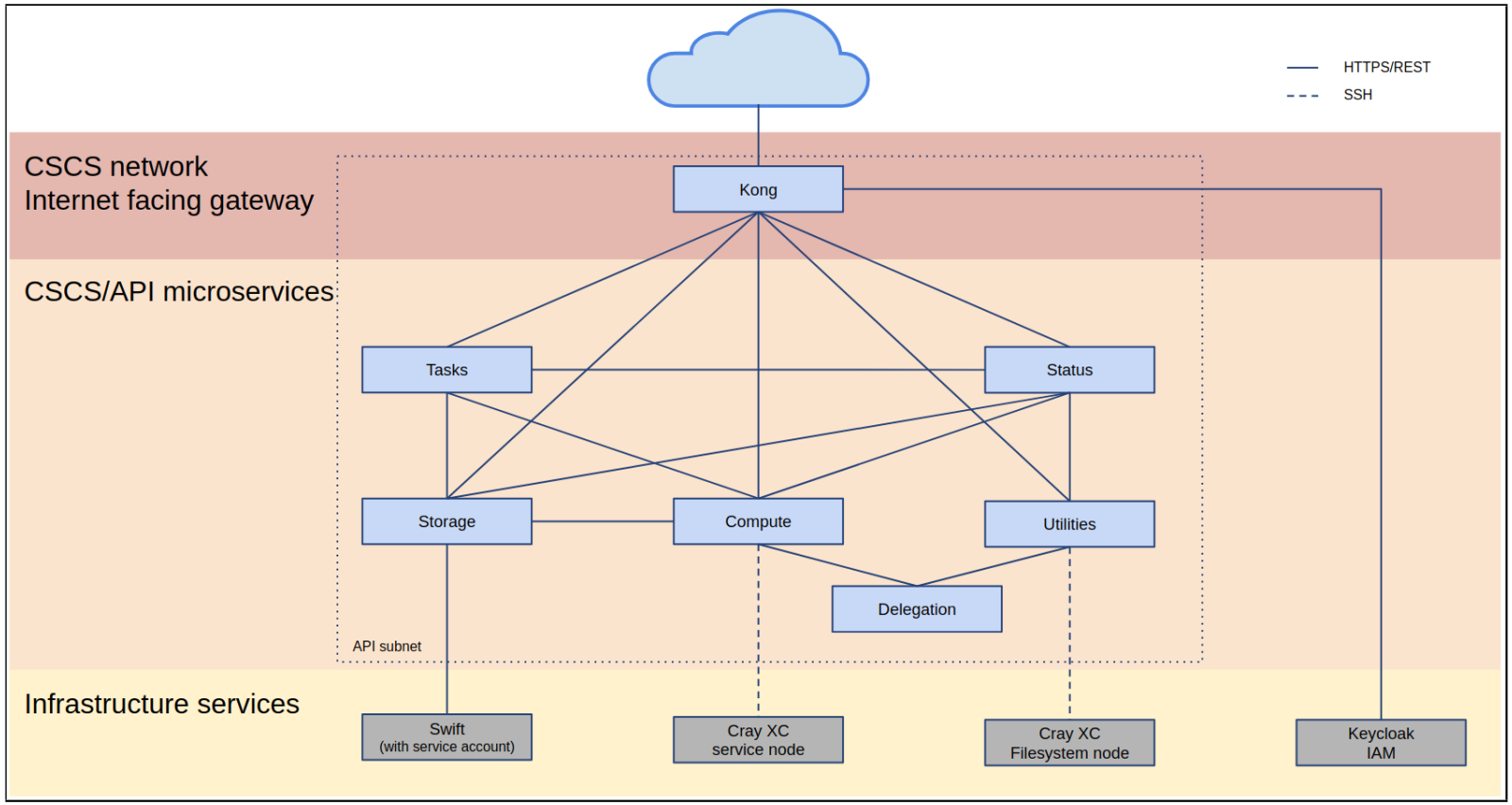
Microservice Architecture

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.

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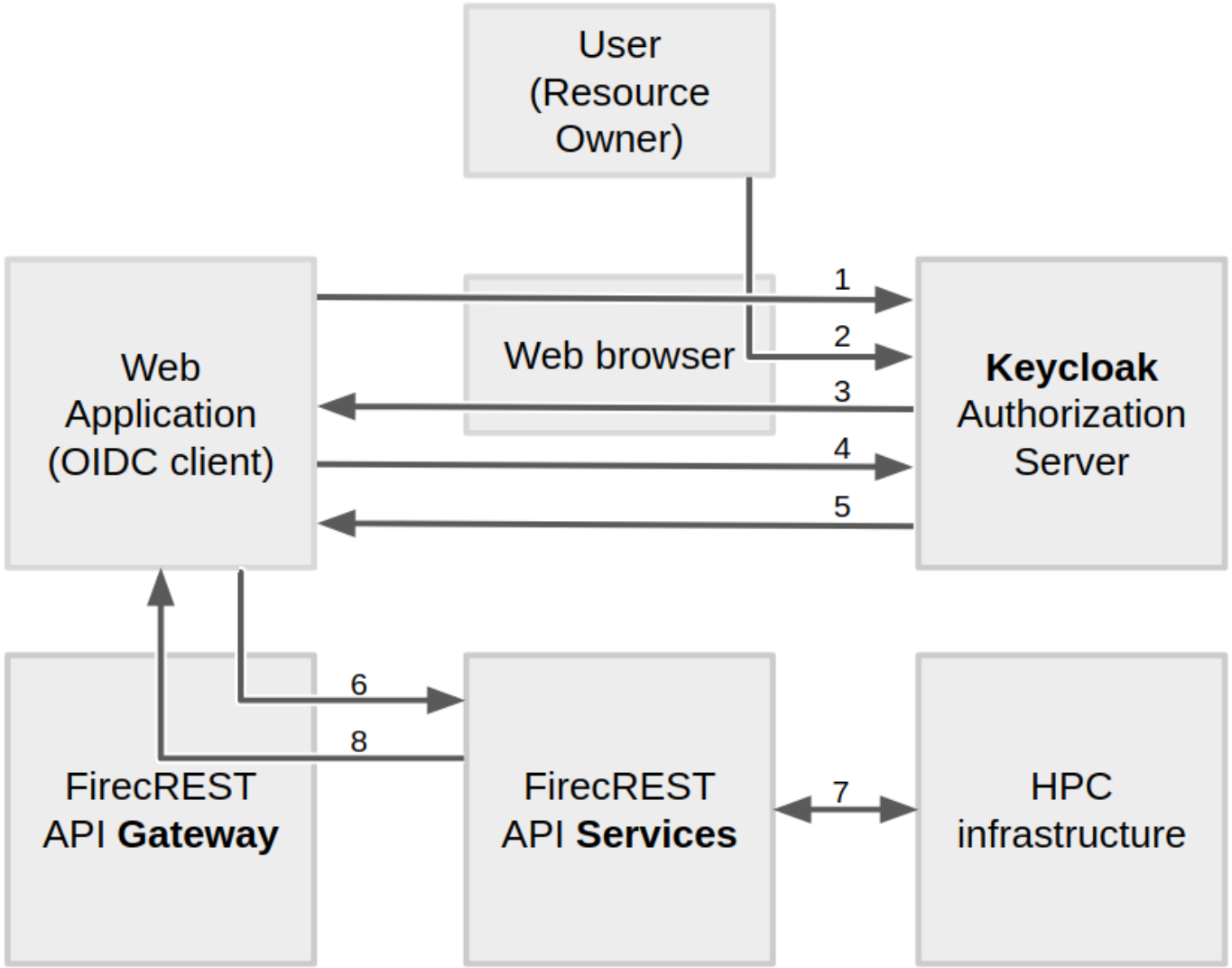
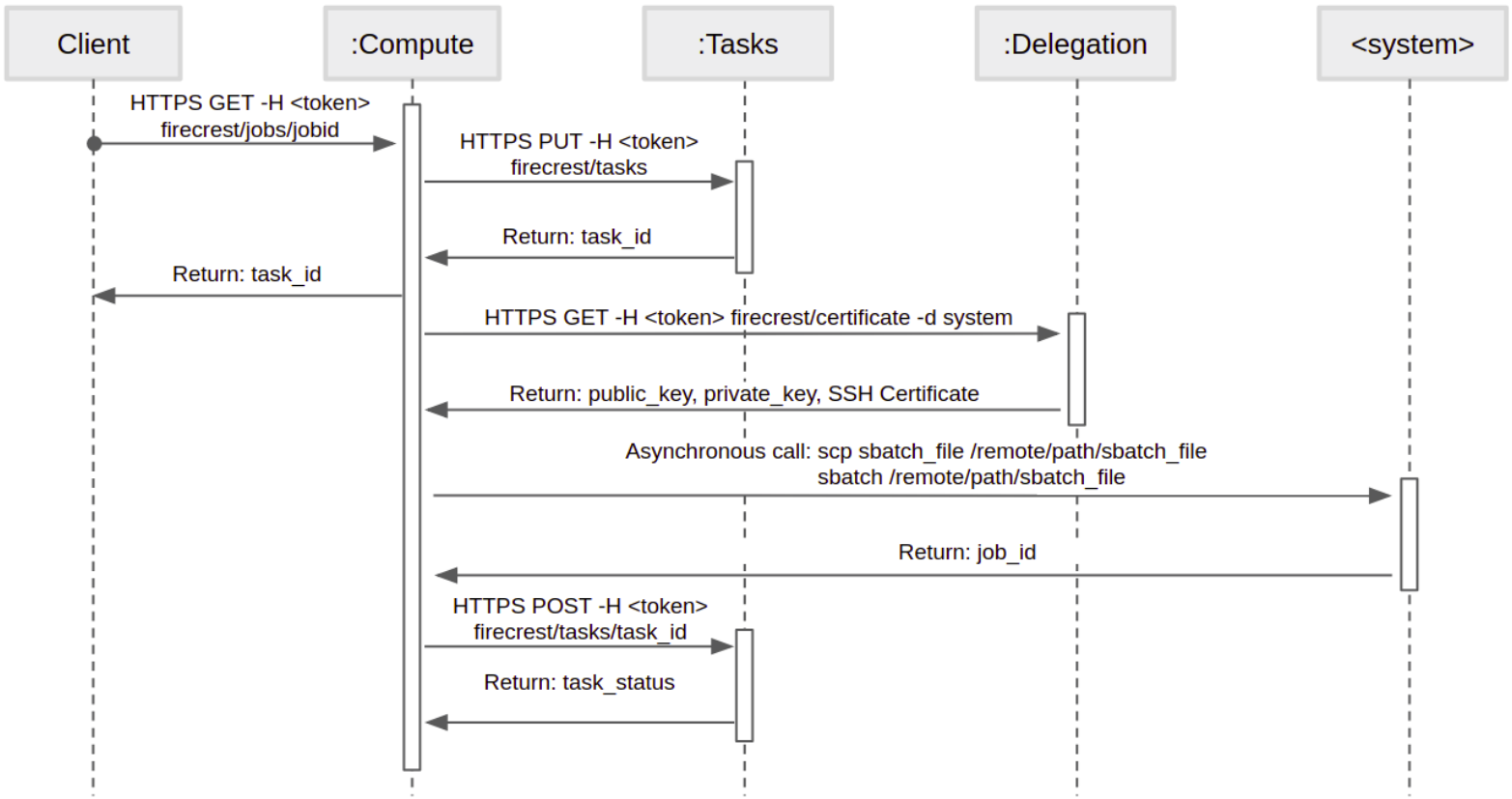
FirecREST Workflow

Authentication and Authorization

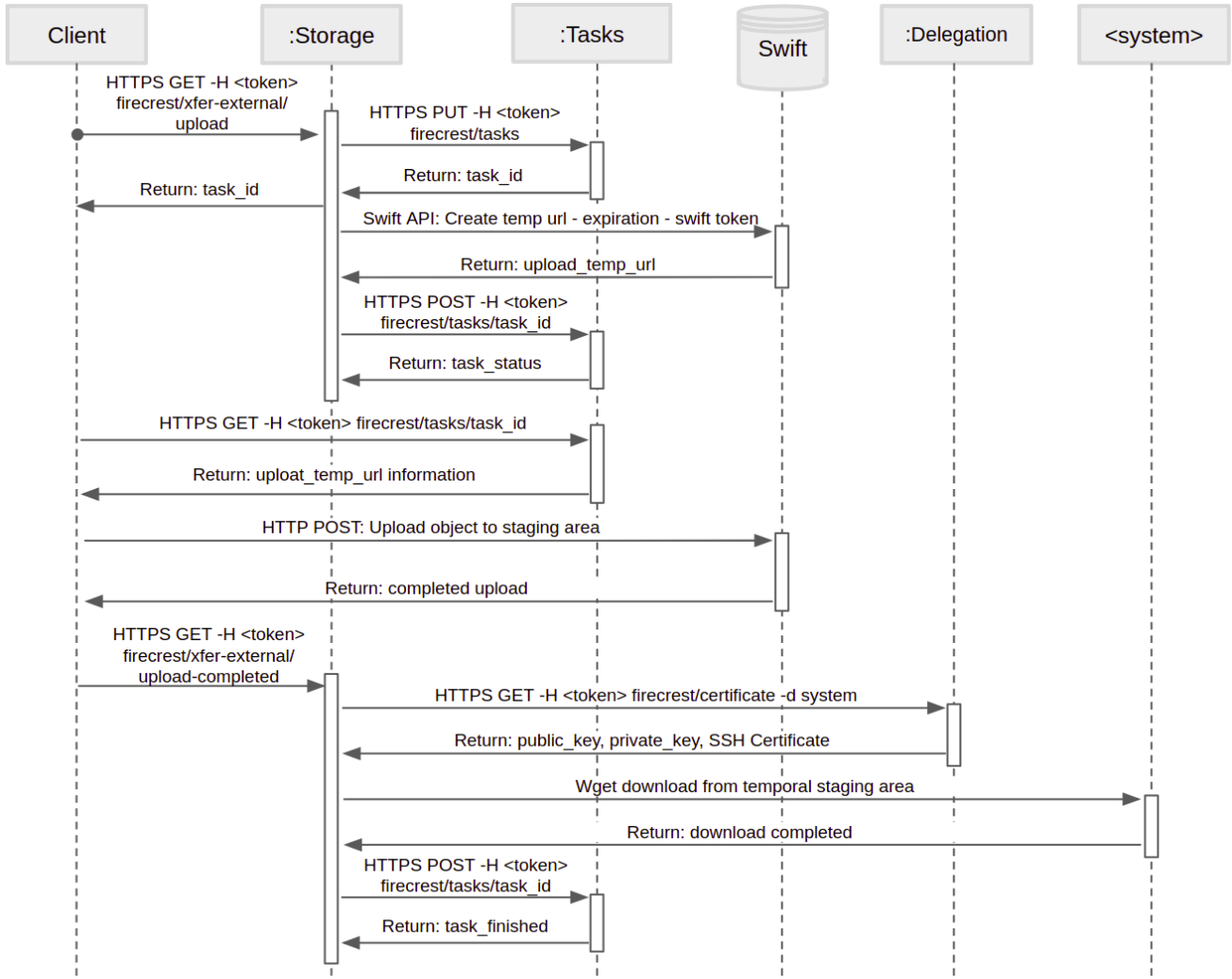


OIDC-based Authentication/Authorization

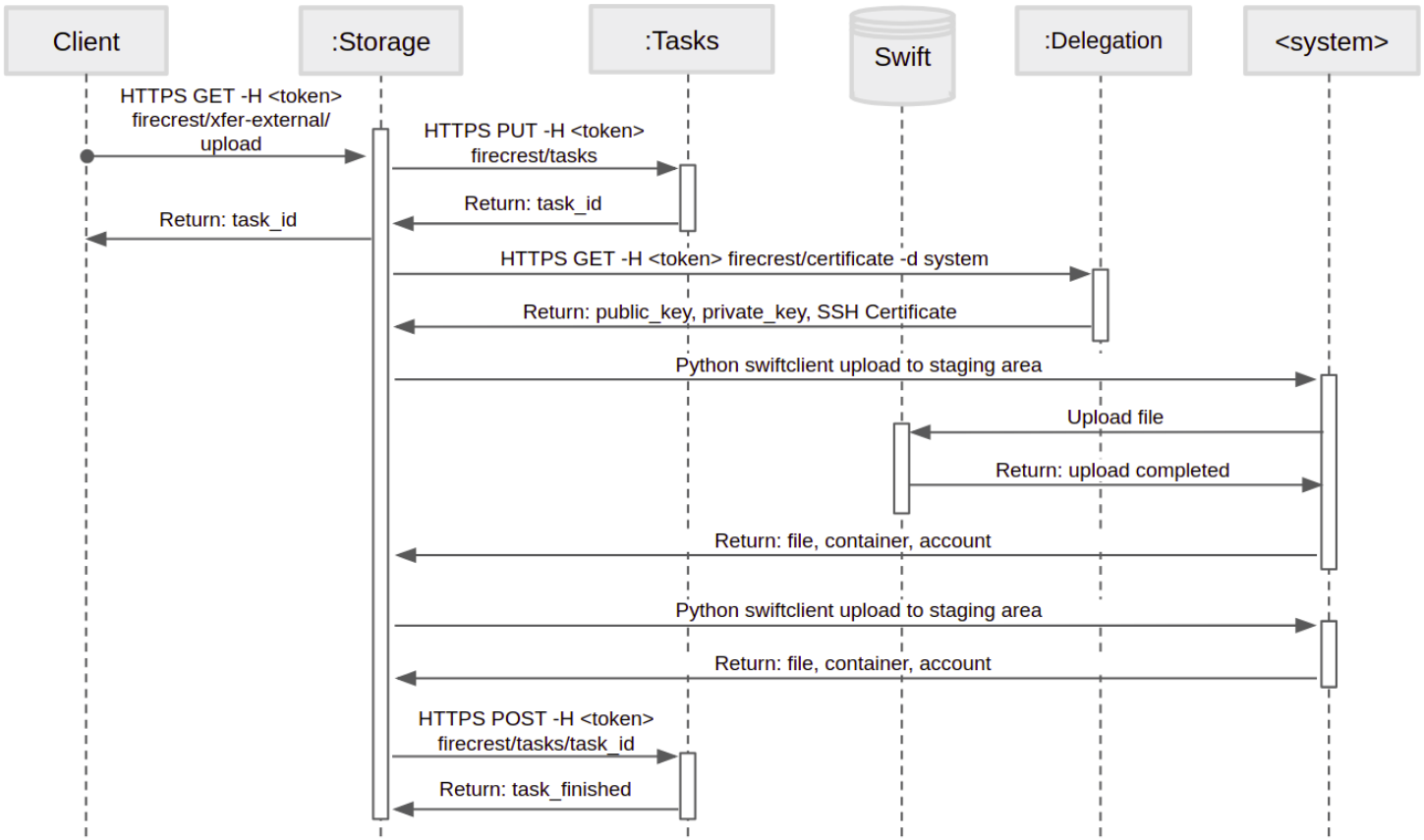
Job Submission Workflow



Data Upload Workflow

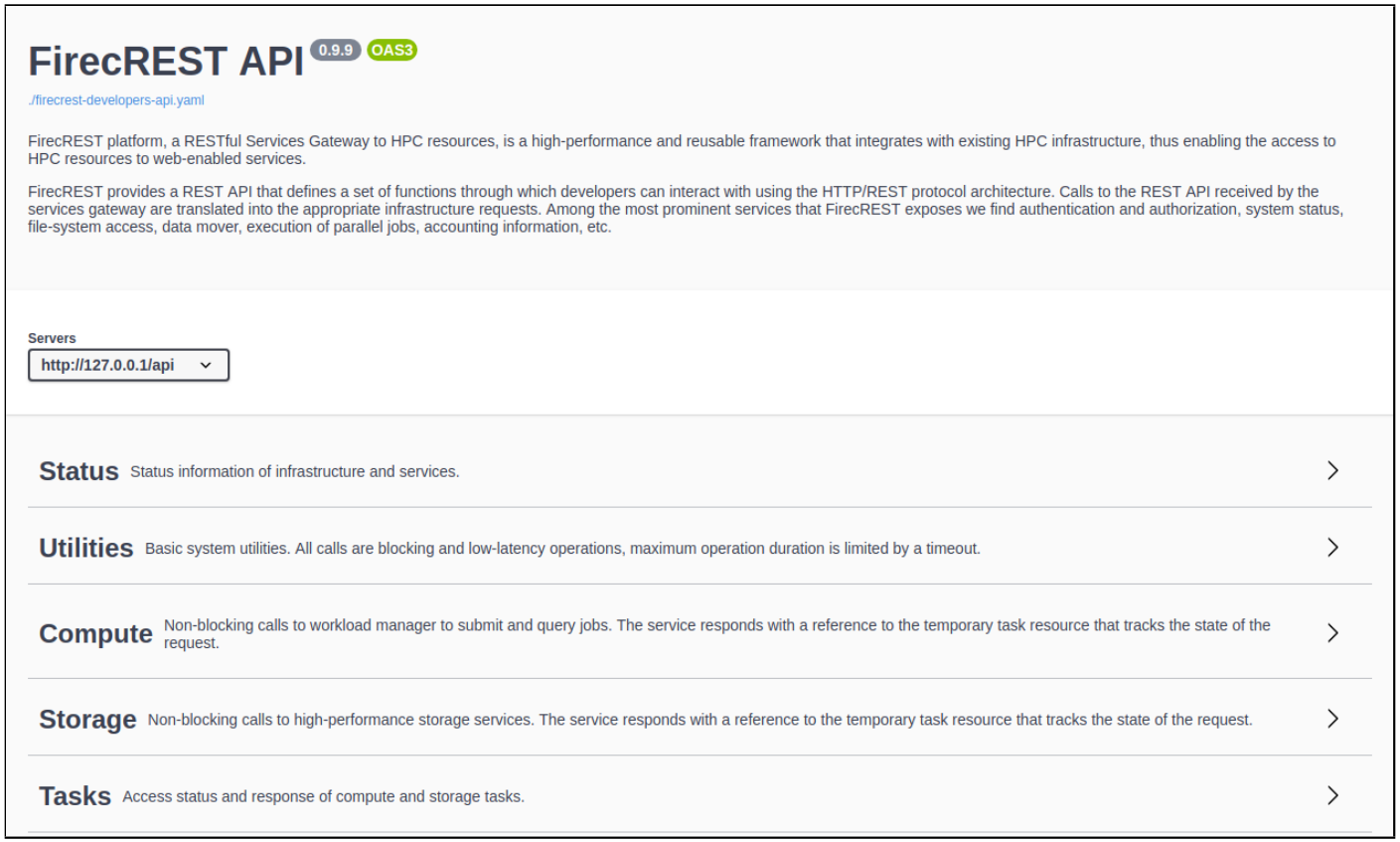


Data Download Workflow



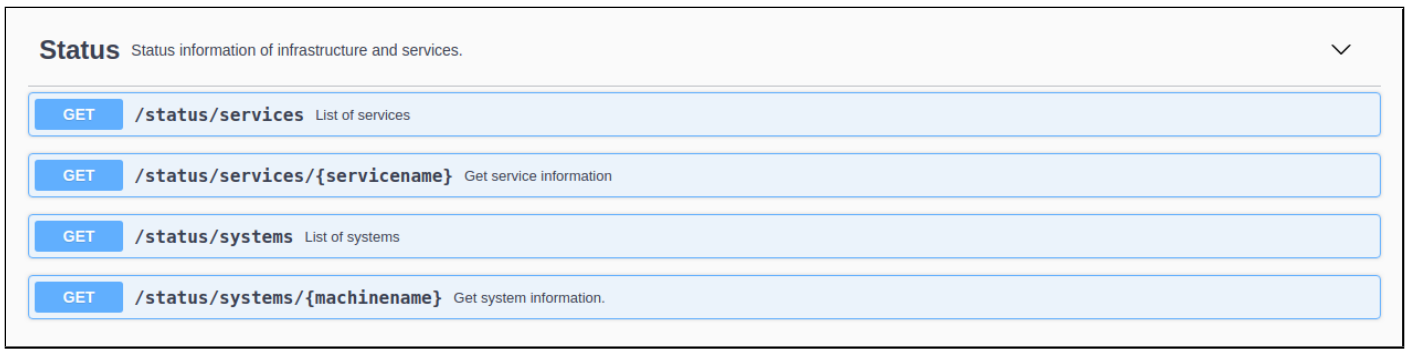
API Endpoints

The FirecREST API



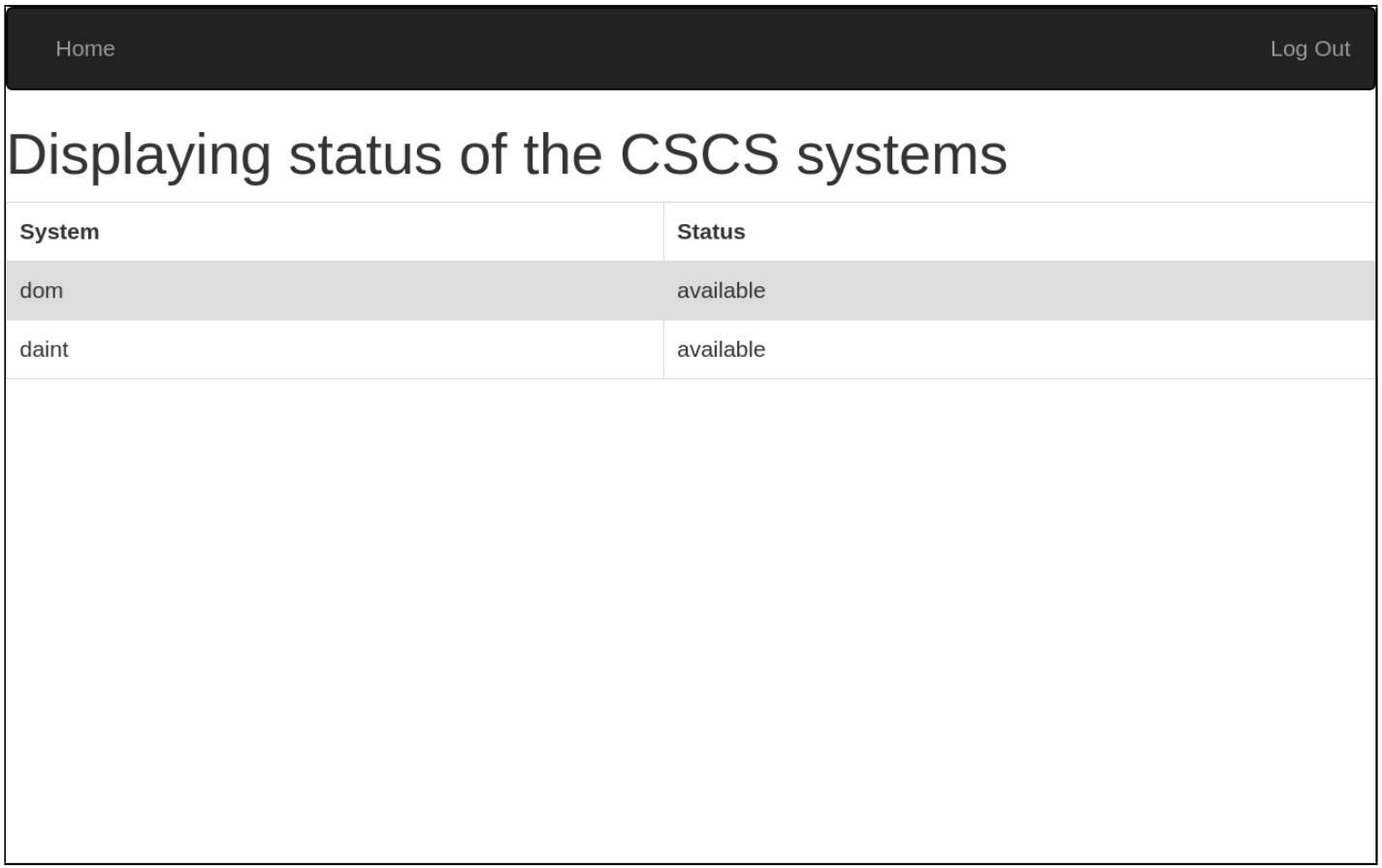
Overview of the FirecREST API

Status



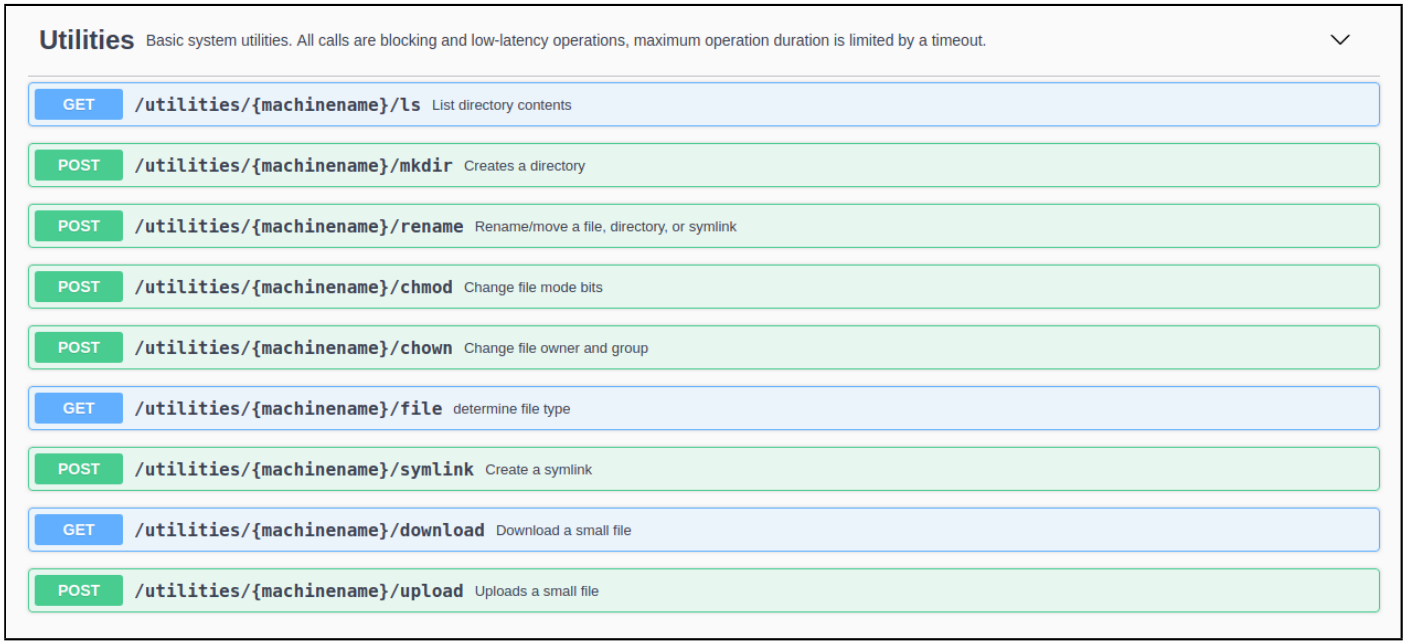
The **Status** endpoints

Displaying the status of the systems



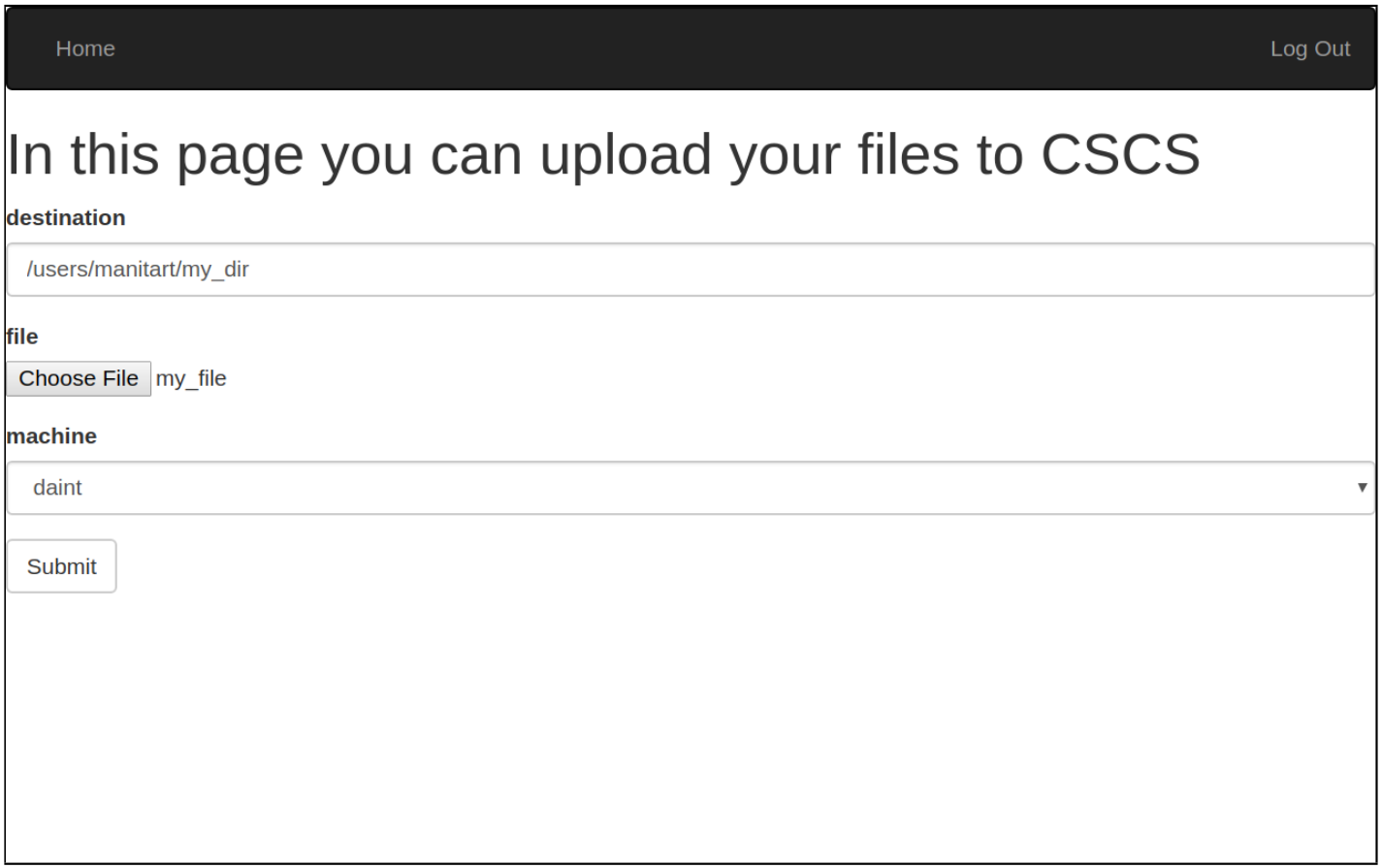
System status using endpoint: /status/system/{machinename}

Utilities



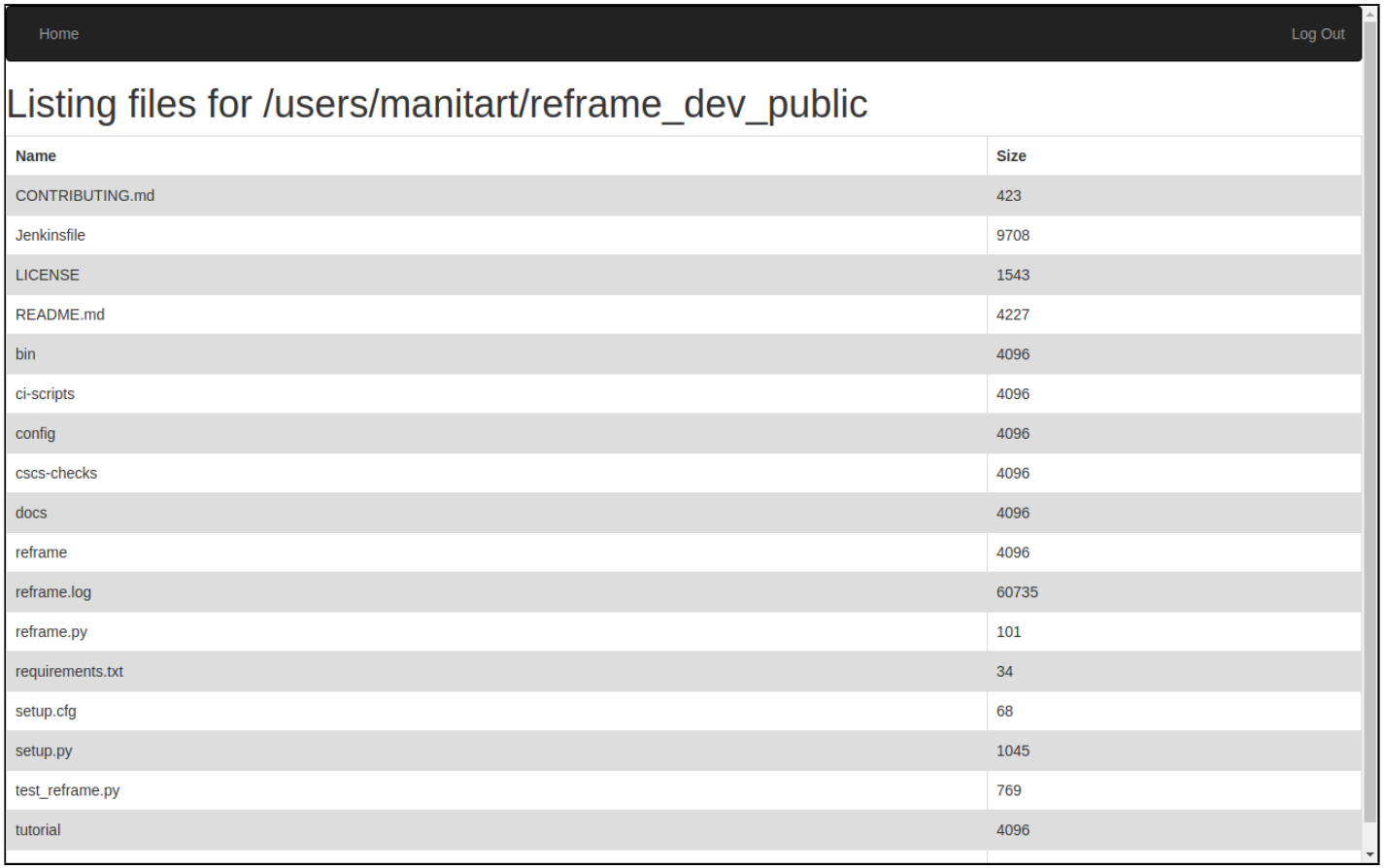
The **Utilities** endpoints

Upload small file



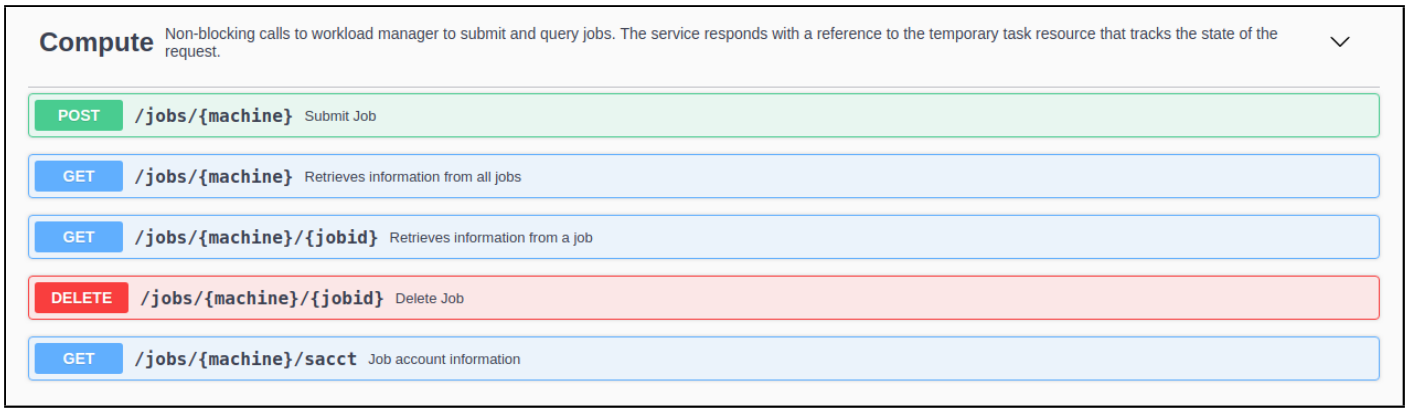
Upload a small file using: /utilities/{machinename}/upload

List User Files



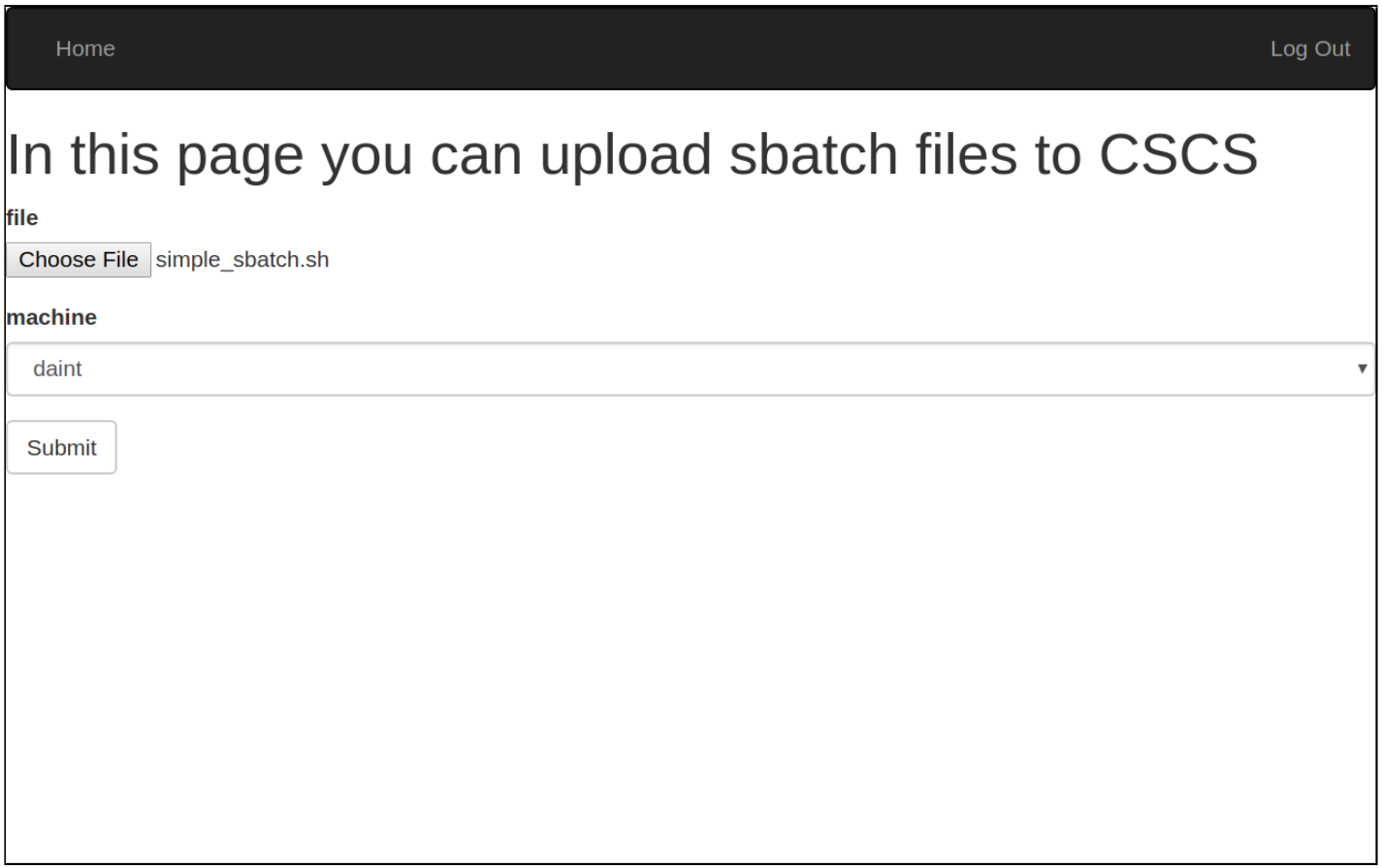
List user directory using: /utilities/{machinename}/ls

Compute



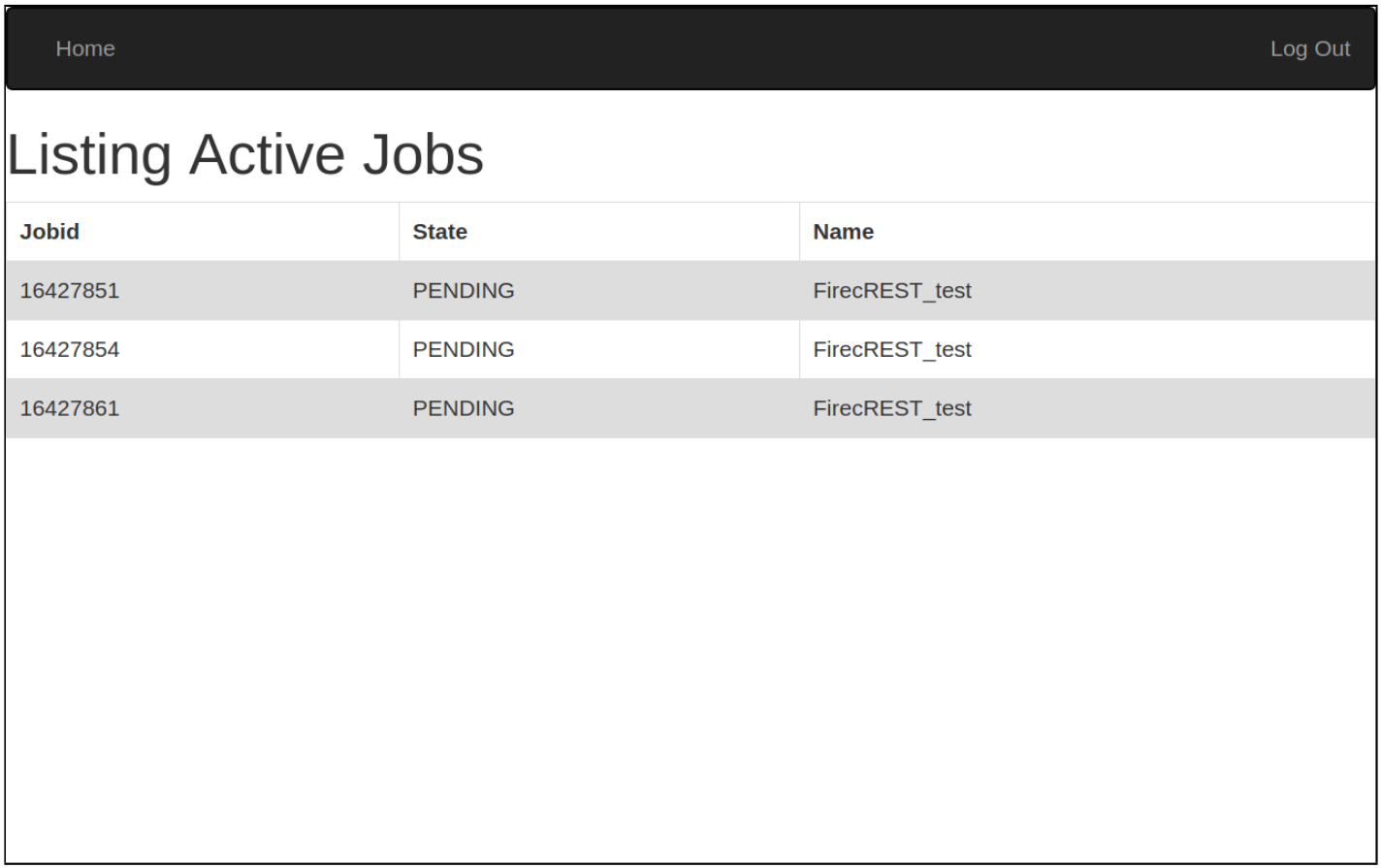
The **Compute** endpoints

Submitting a Job



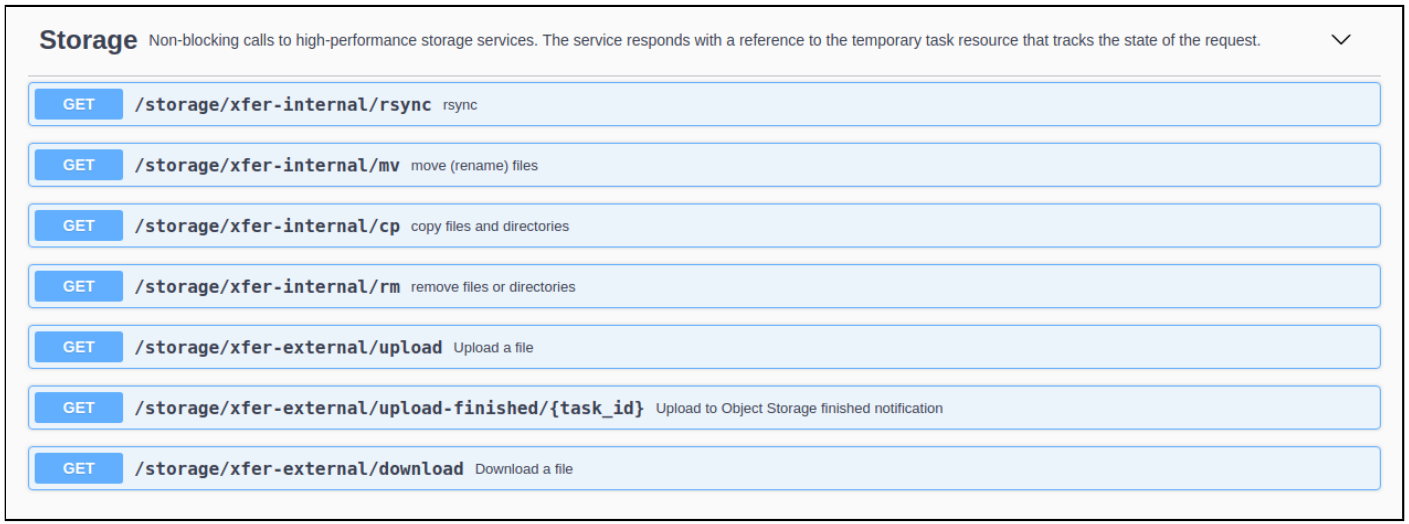
Submit an sbatch script using: /jobs/{machine}

Monitor active jobs



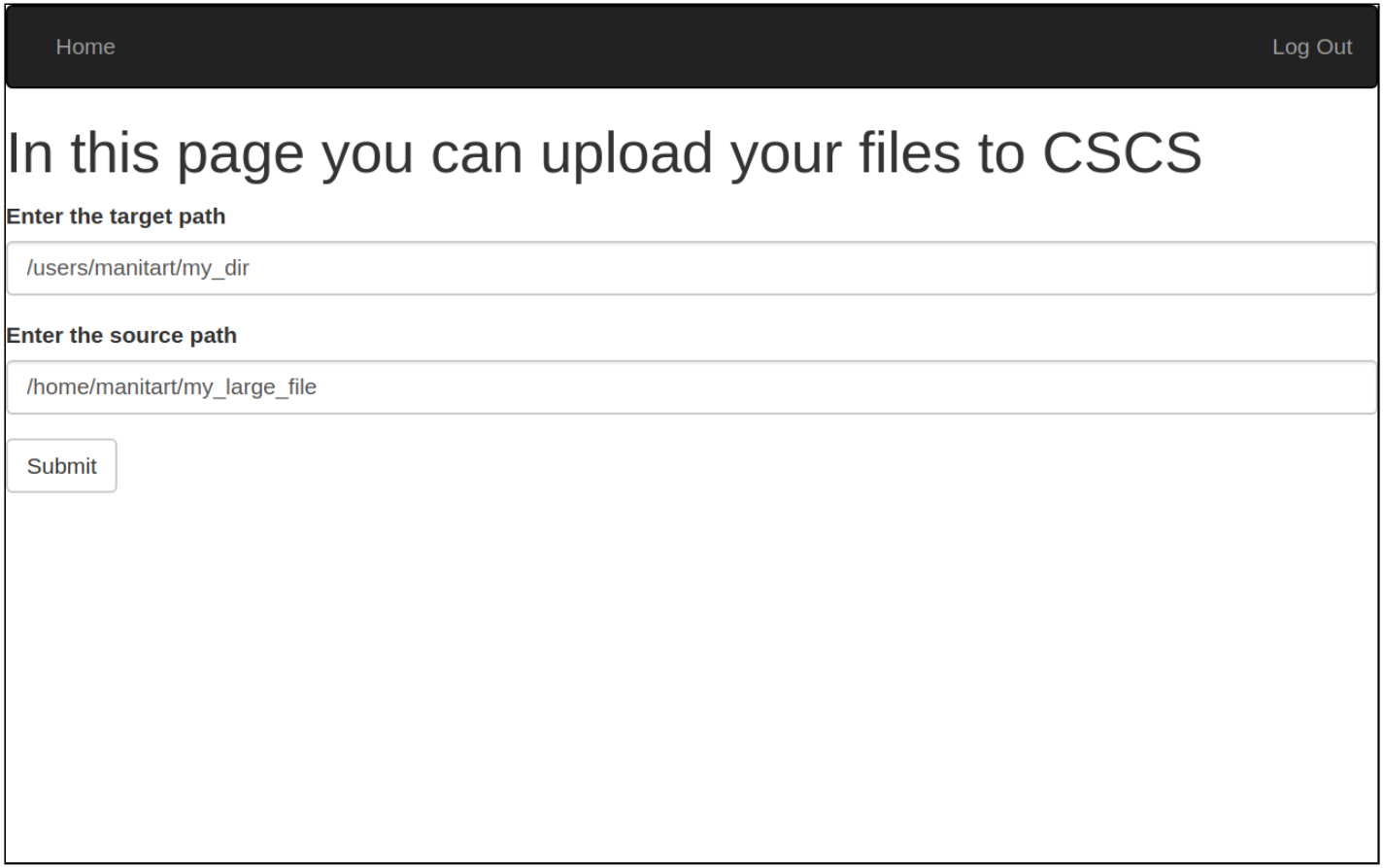
Monitor status of active jobs using: /jobs/{machine}

Storage



The **Storage** endpoints

Upload a large file

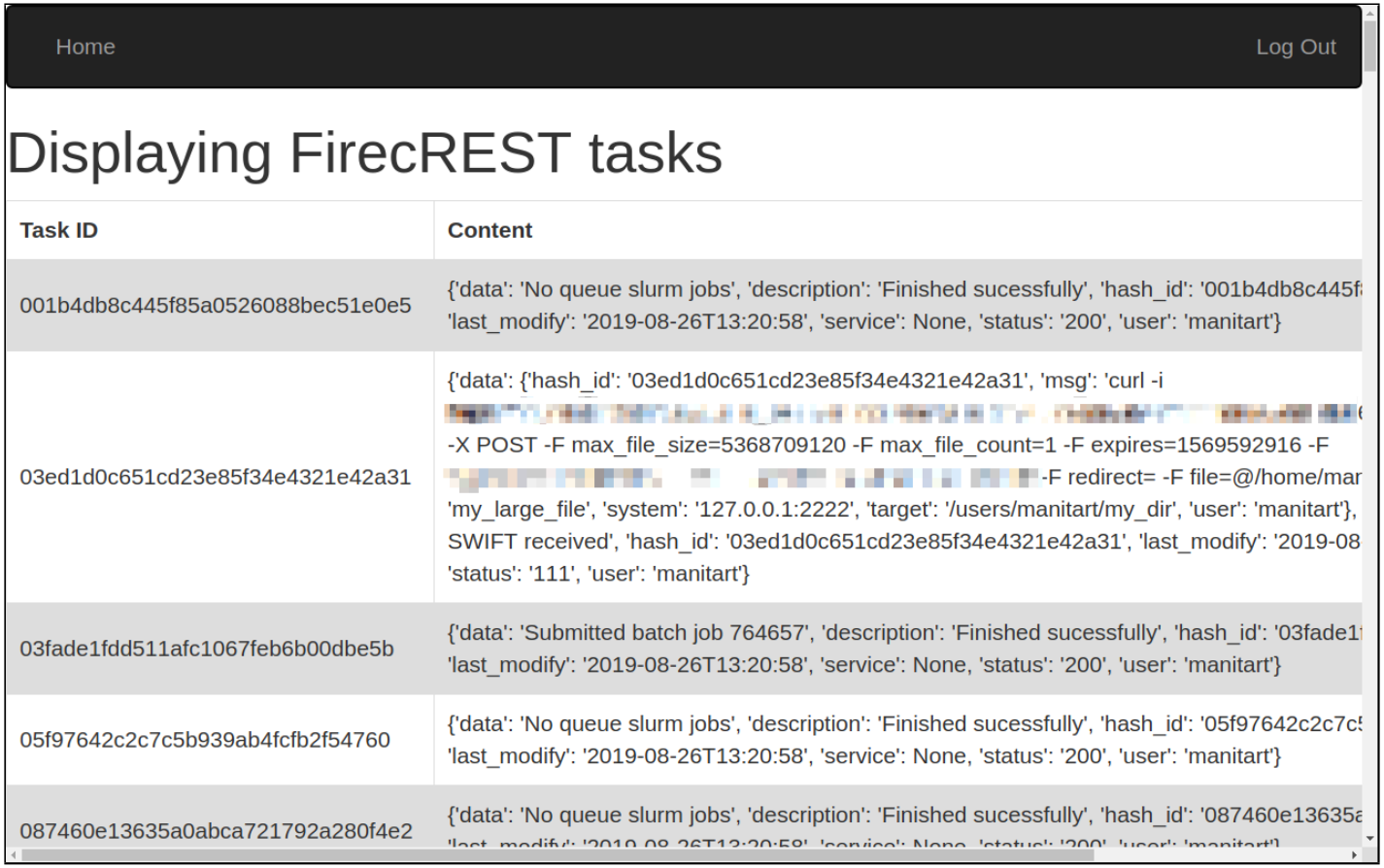


Upload file using: /storage/xfer-external/upload

Tasks

The **Tasks** endpoints

Displaying FirecREST tasks



Display all tasks using: /tasks/tasks

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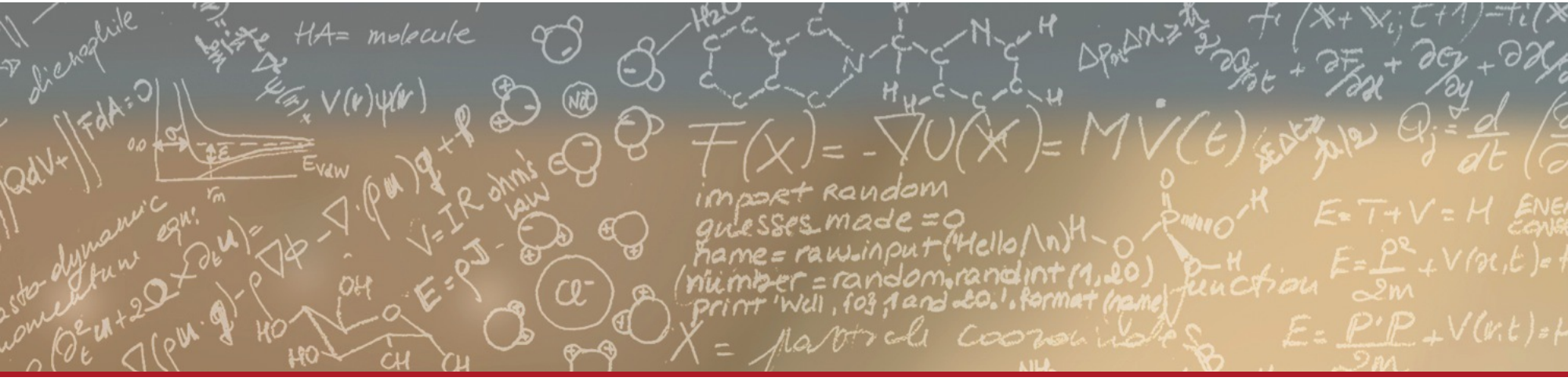
Why use FirecREST?

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.