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# **Backend.AI Documentation**

*Release 24.09.0dev1*

**Lablup Inc.**

**Jun 13, 2024**



# CONTENTS

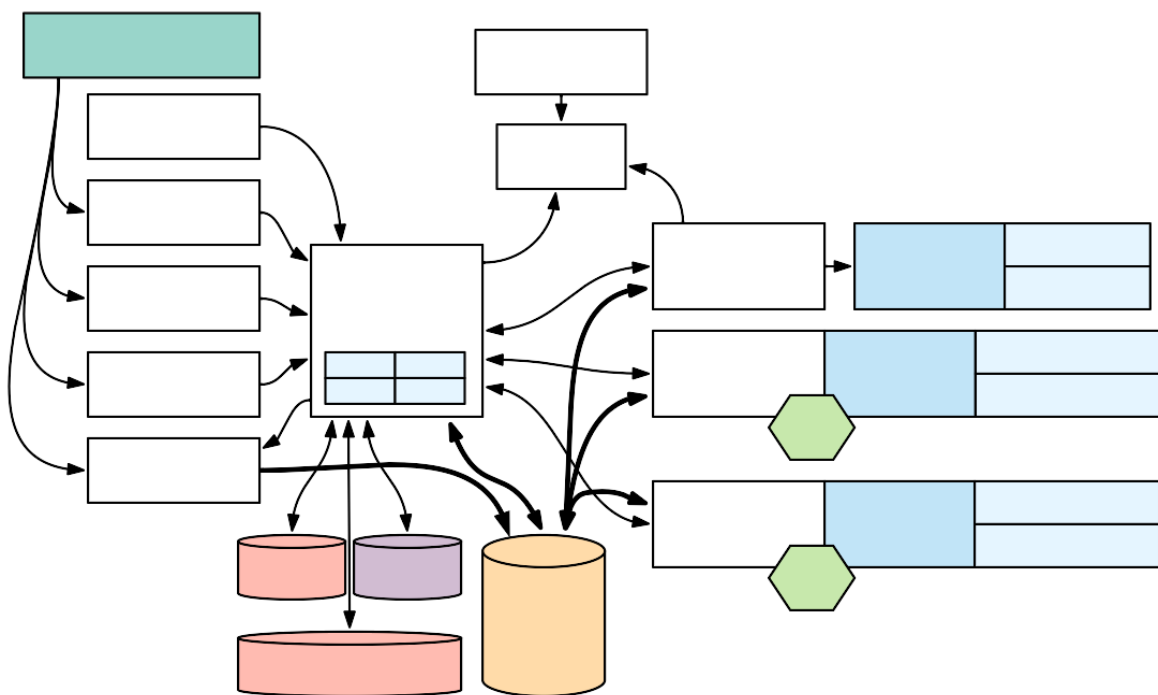


» «»

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## BACKEND.AI CONCEPTS



### 1.1 Service Components

#### 1.1.1 Public-facing services

Manager and Webserver

**App Proxy**

**Storage Proxy**

,

**FastTrack (Enterprise only)**

## **1.1.2 Resource Management**

**Sokovan Orchestrator**

**Agent**

“”

## **1.1.3 Internal services**

**Event bus**



Control Panel (Enterprise only)

Forklift (Enterprise only)

Reservoir (Enterprise only)

Container Registry

,

## 1.2 Computing

### 1.2.1 Sessions and kernels

“”.

,

**Kernel roles in a cluster session**

“” “” “”, “”, “”, ..., “” “”

“” “”

### 1.2.2 Session templates

### 1.2.3 Session types

Feature	Compute (Interactive)	Compute (Batch)	Inference	System
Code execution	✓			
Service port	✓	✓	✓	✓
Dependencies		✓		
Session result		✓		
Clustering	✓	✓	✓	✓

**Interactive compute session**

**Batch compute session**

“”

**Dependencies between compute sessions**

**Inference session**

**System session**

## 1.2.4 Scheduling

**Session selection strategy**

**Heuristic FIFO**

“”

Dominant resource fairness (DRF)

Agent selection strategy

Concentrated

Dispersed

Custom

## 1.3 Resource Management

### 1.3.1 Resource slots

“”.

Resource slot name	Device name	Slot name

Slot type	Meaning	Examples
	“”	

### 1.3.2 Compute plugins

### 1.3.3 Resource groups

## 1.4 User Management

### 1.4.1 Users

,

### 1.4.2 Projects

## 1.5 Cluster Networking

### 1.5.1 Single-node cluster session

### 1.5.2 Multi-node cluster session

### 1.5.3 Detection of clustered setups

,

Environment Variable	Meaning	Examples

## 1.6 Storage Management

### 1.6.1 Virtual folders

“” “”

User-owned vfolders

Project-owned vfolders

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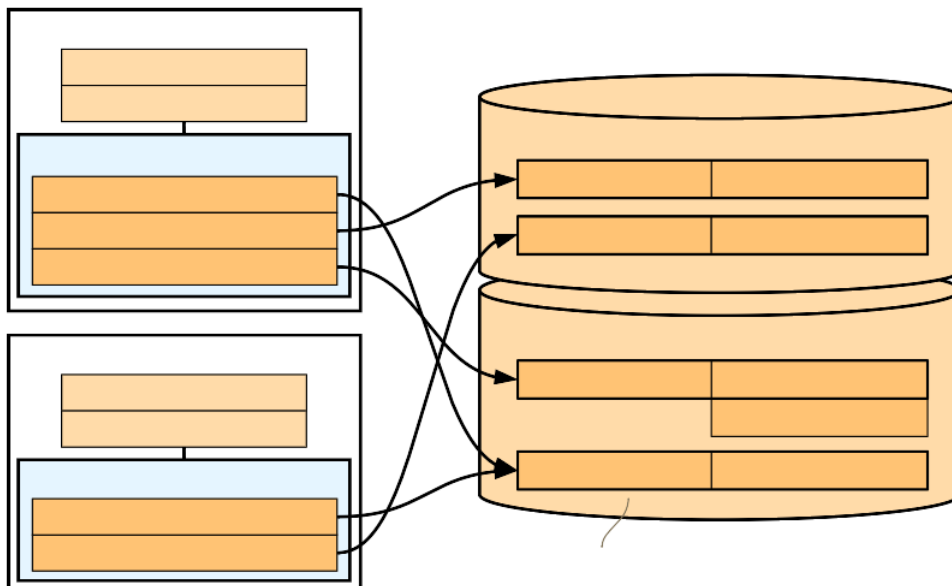
VFolder invitations and permissions

Volume-level permissions

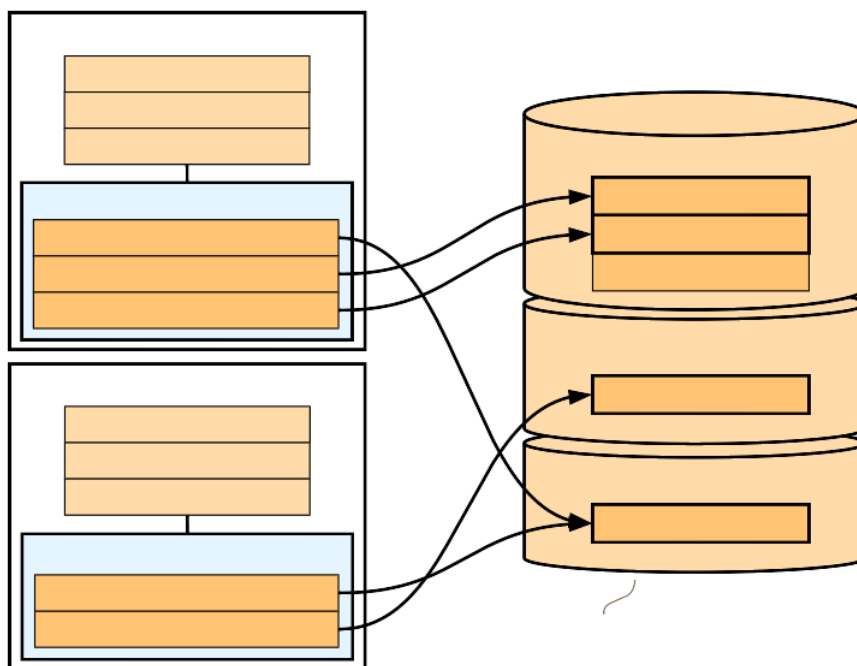
Auto-mount vfolders

## 1.6.2 Quota scopes

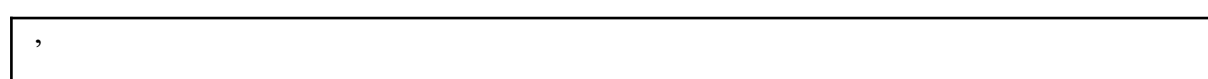
Storage with per-directory quota



## Storage with per-volume quota



,



## 1.7 Configuration

### 1.7.1 Shared config

## 1.7.2 Local config

# 1.8 Monitoring

## 1.8.1 Dashboard (Enterprise only)

## 1.8.2 Alerts (Enterprise only)

# 1.9 FAQ

### vs. Notebooks

Product	Role	Value

### vs. Orchestration Frameworks

Product	Target	Value

### vs. Big-data and AI Frameworks

Product	Role	Value





## INSTALLATION GUIDES

### 2.1 Install from Source

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#### 2.1.1 Setting Up Manager and Agent (single node, all-in-one)

#### 2.1.2 Setting Up Additional Agents (multi-node)

Updating manager configuration for multi-nodes

Installing additional agents in different nodes

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### 2.1.3 Setting Up Accelerators

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### 2.1.4 Setting Up Shared Storage

,

### 2.1.5 Configuring Overlay Networks for Multi-node Training (Optional)

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## 2.2 Install from Packages

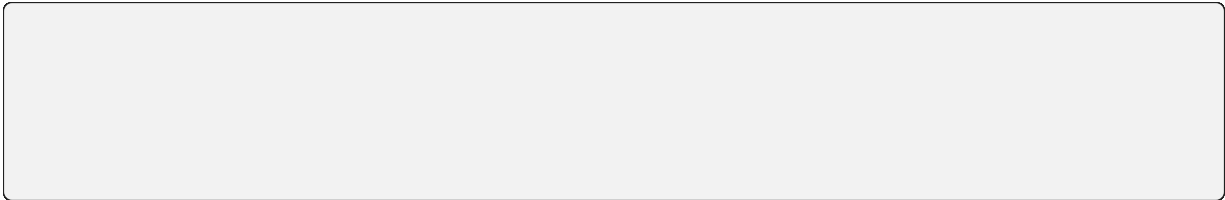
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## 2.2.1 Setup OS Environment

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Create a user account for operation



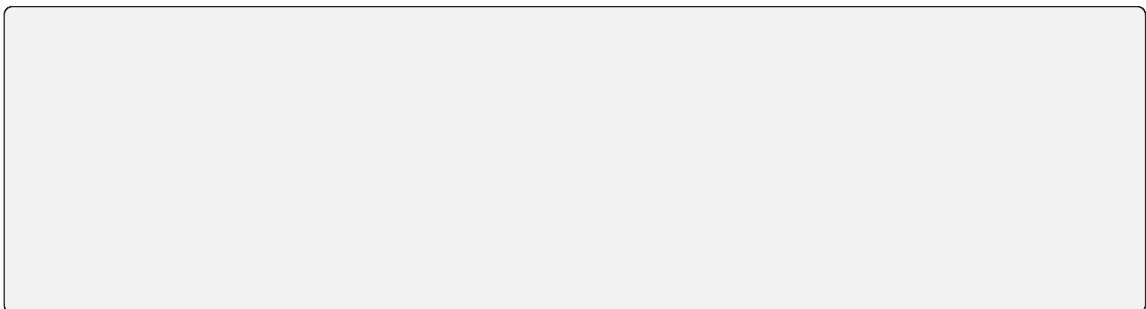
Install Docker engine

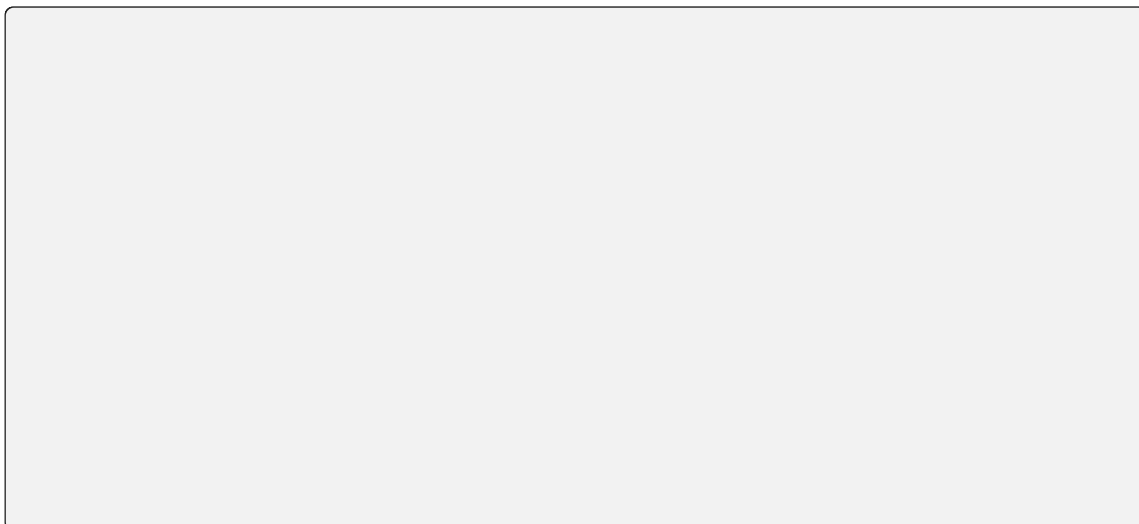


Optimize sysctl/ulimit parameters

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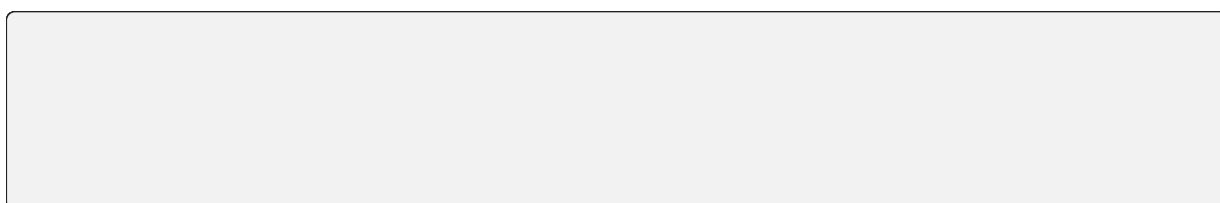
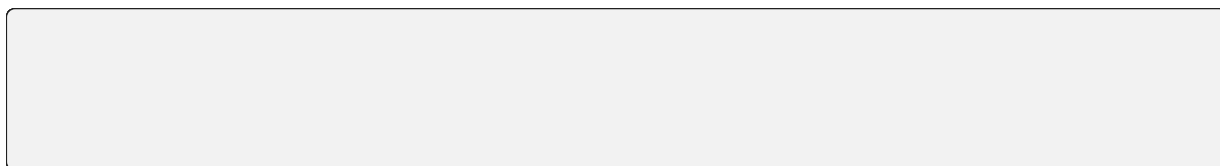
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### Prepare required Python versions and virtual environments

#### Use a standalone static built Python (Recommended)



(Alternative) Use pyenv to manually build and select a specific Python version

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**Configure network aliases**

**Mount a shared storage**

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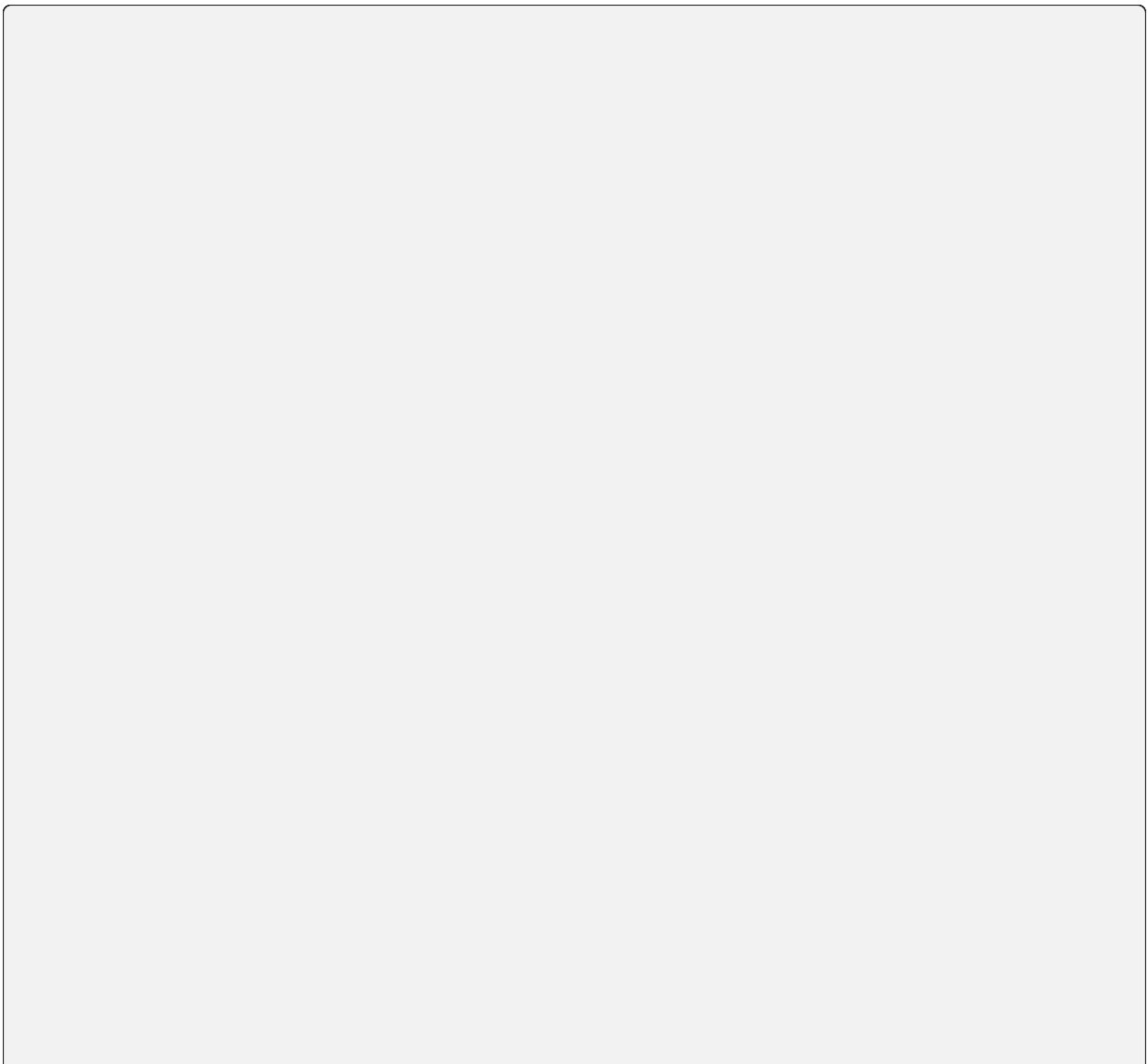
Setup accelerators

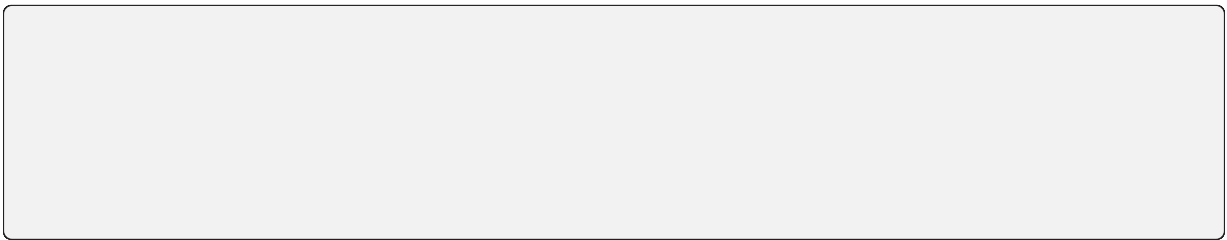
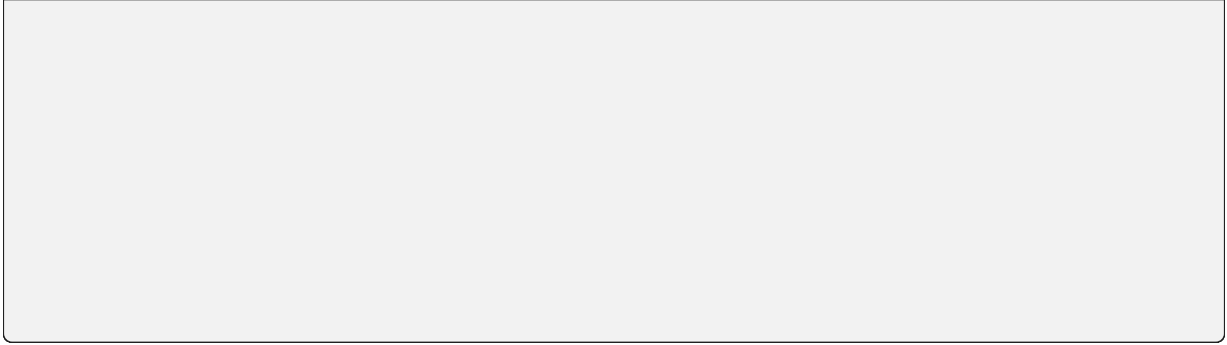
Pull container images



## 2.2.2 Prepare Database

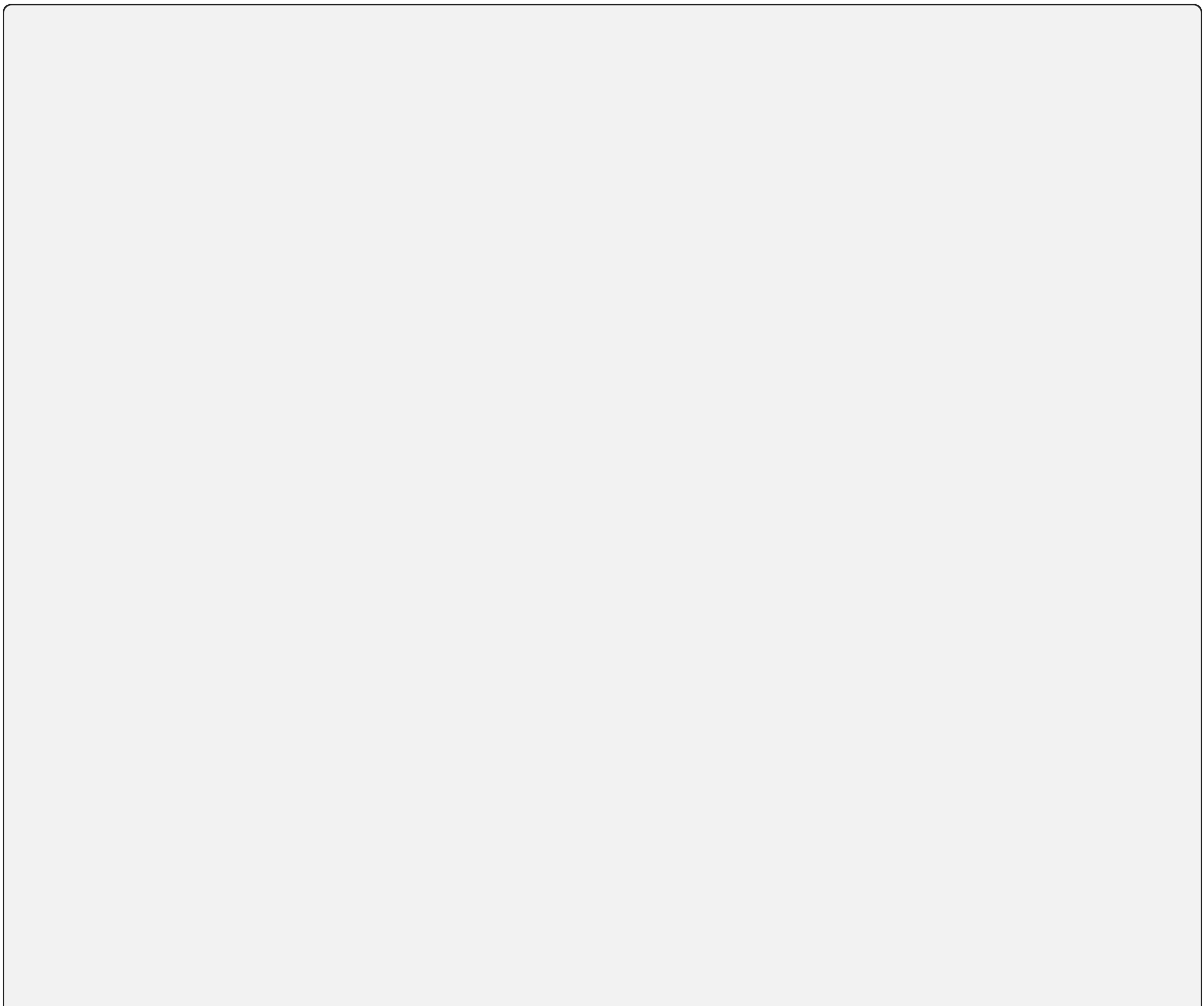
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### 2.2.3 Prepare Cache Service

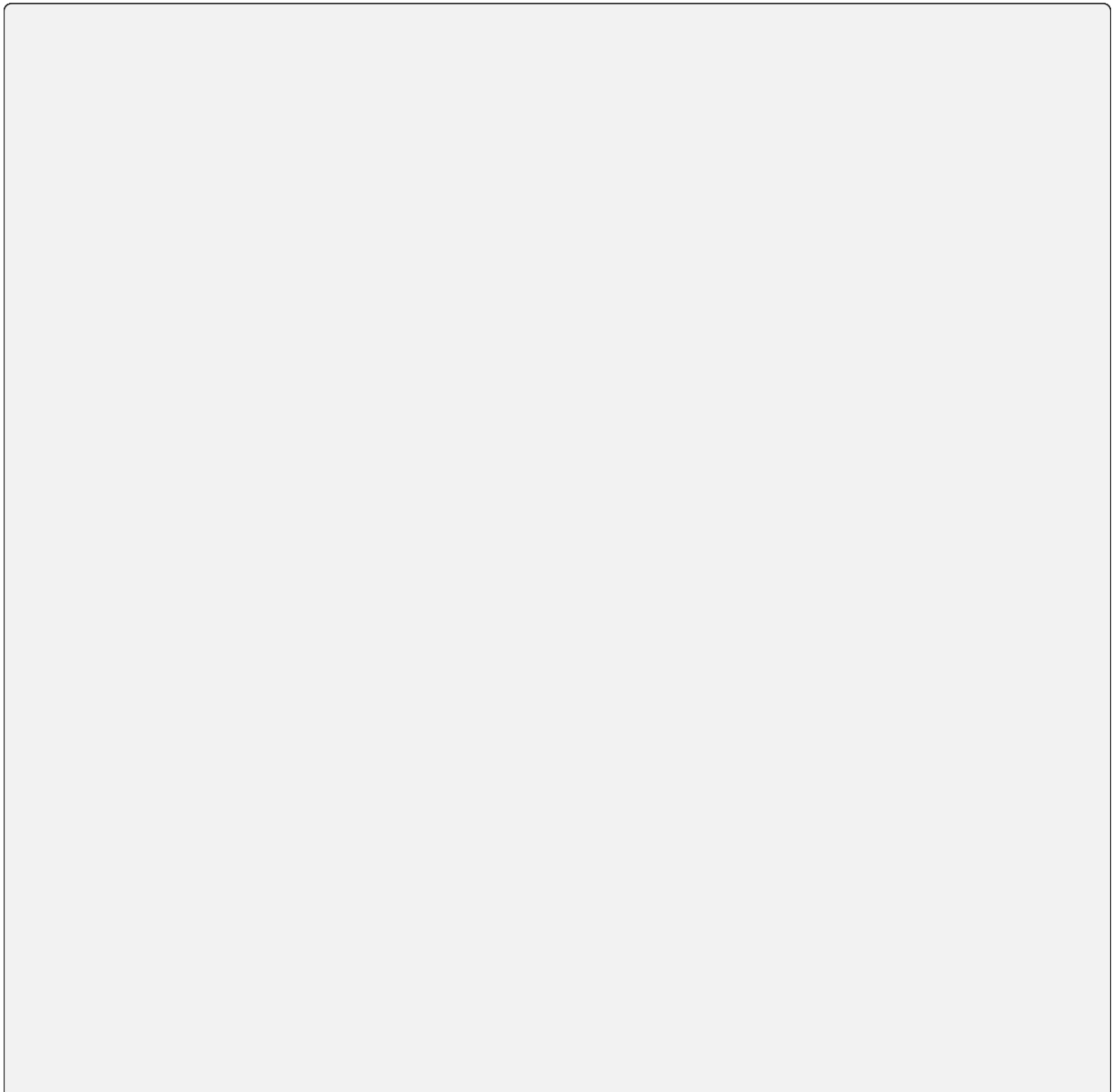
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## 2.2.4 Prepare Config Service

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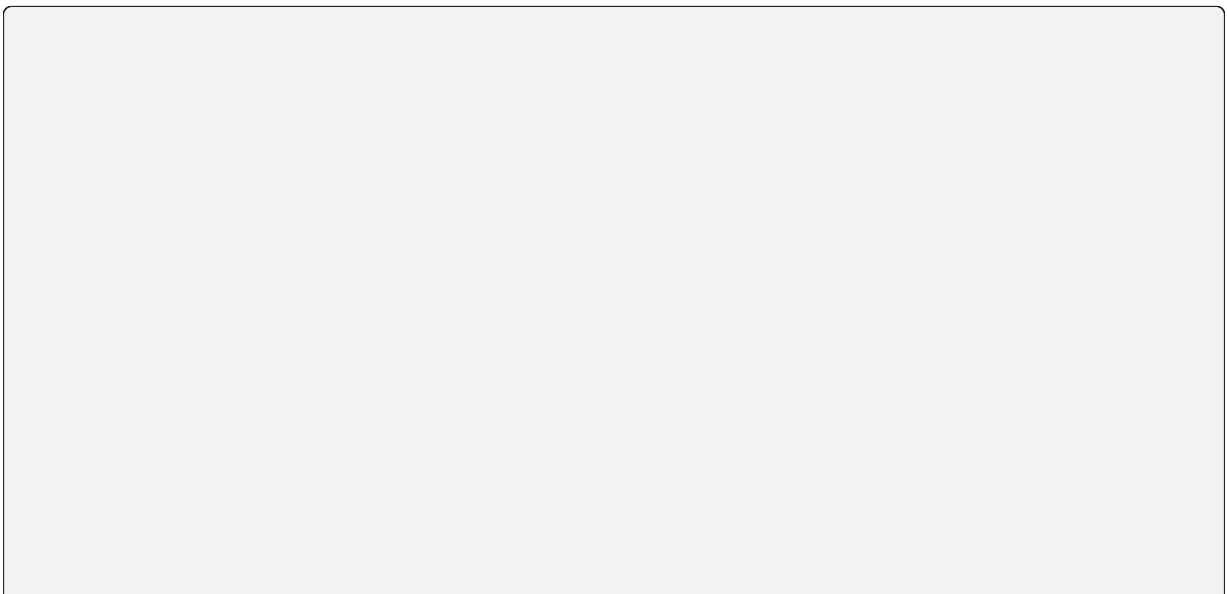


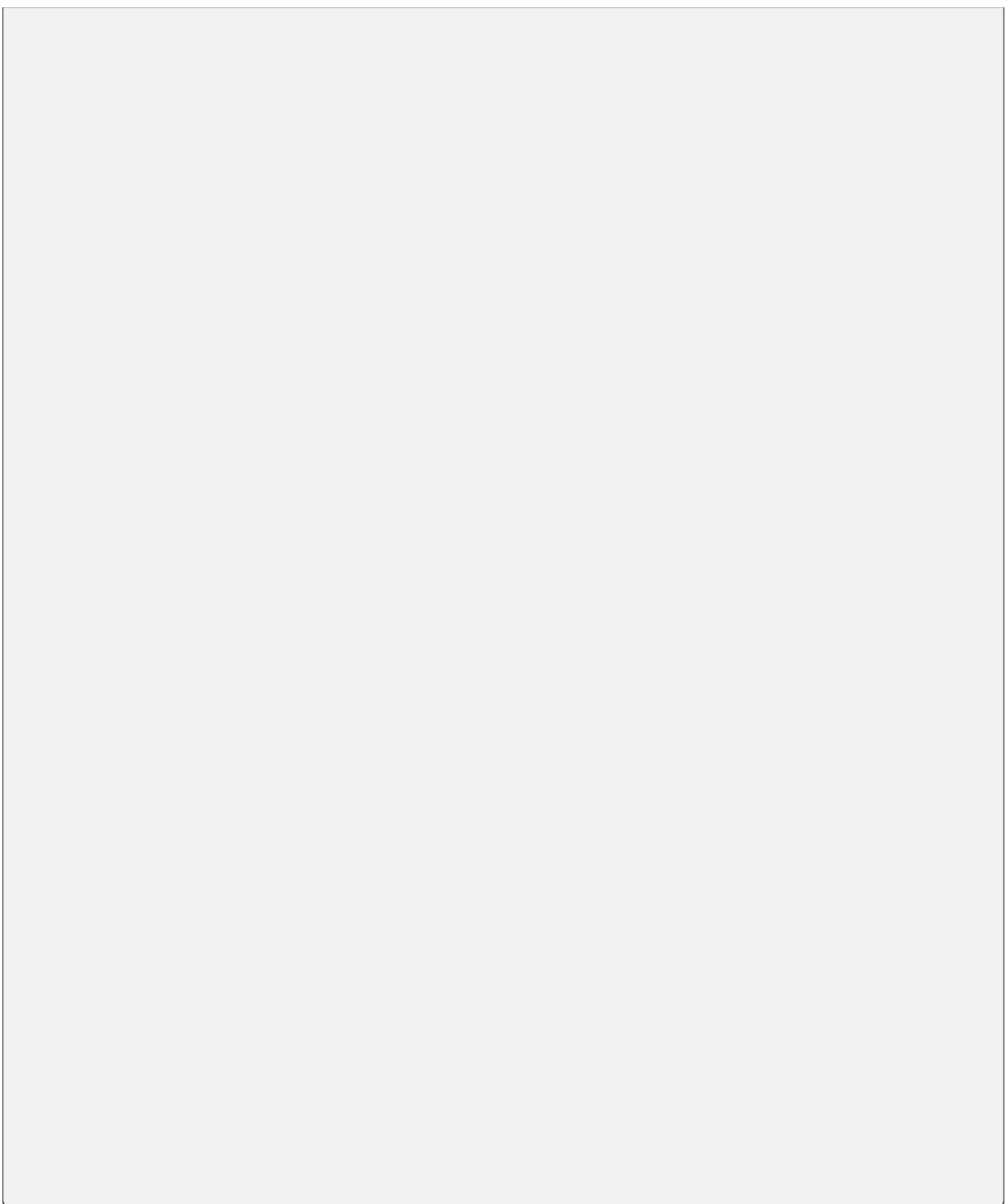


### 2.2.5 Install Backend.AI Manager



#### Local configuration





## Global configuration

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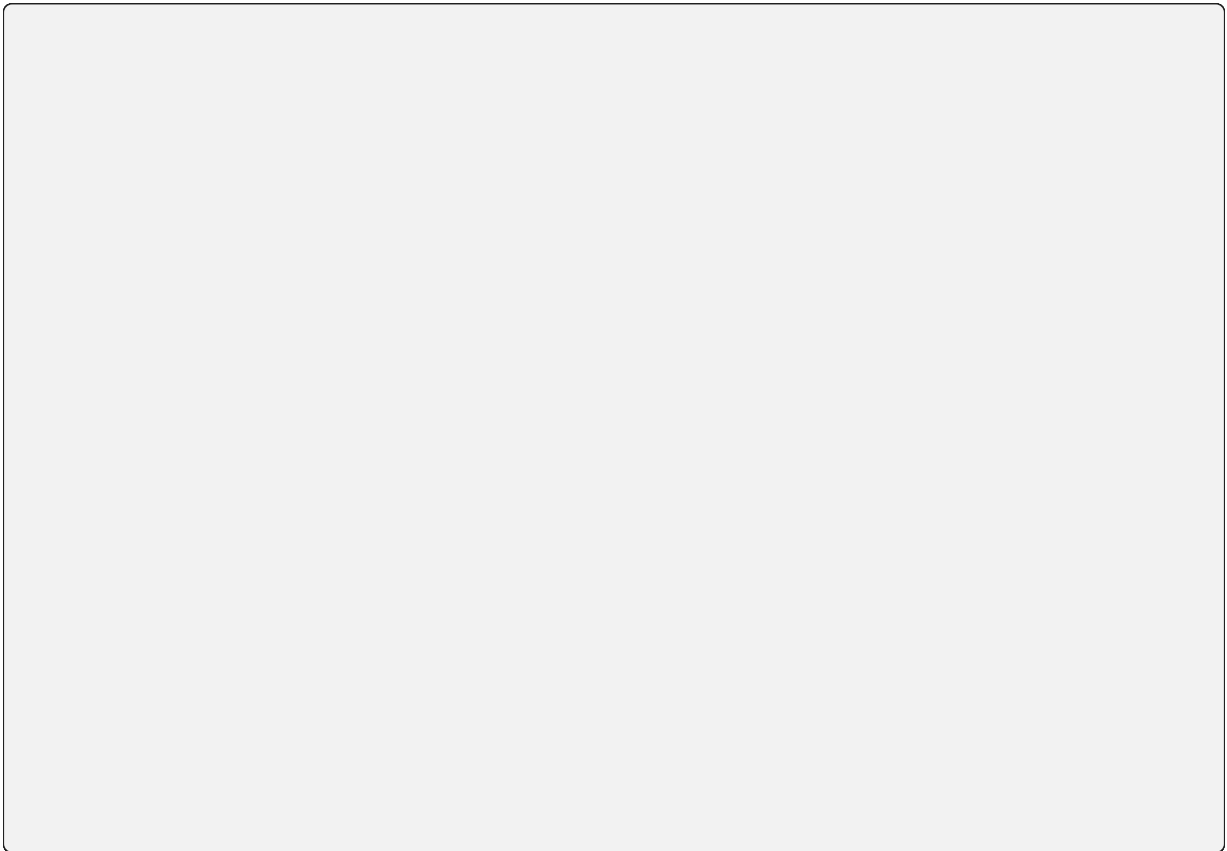
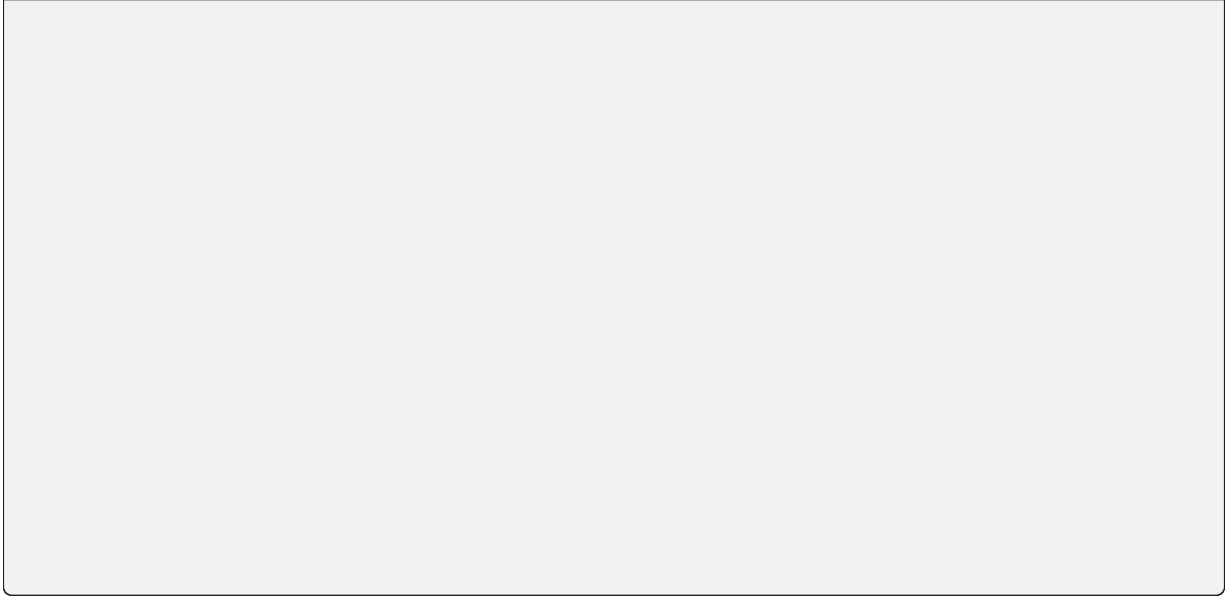
**Populate the database with initial fixtures**

**Sync the information of container registry**

,

**Run Backend.AI Manager service**

**Register systemd service**





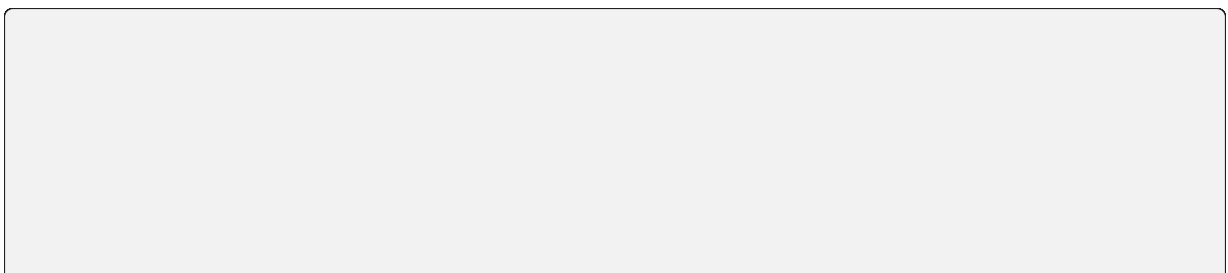
## 2.2.6 Install Backend.AI Agent

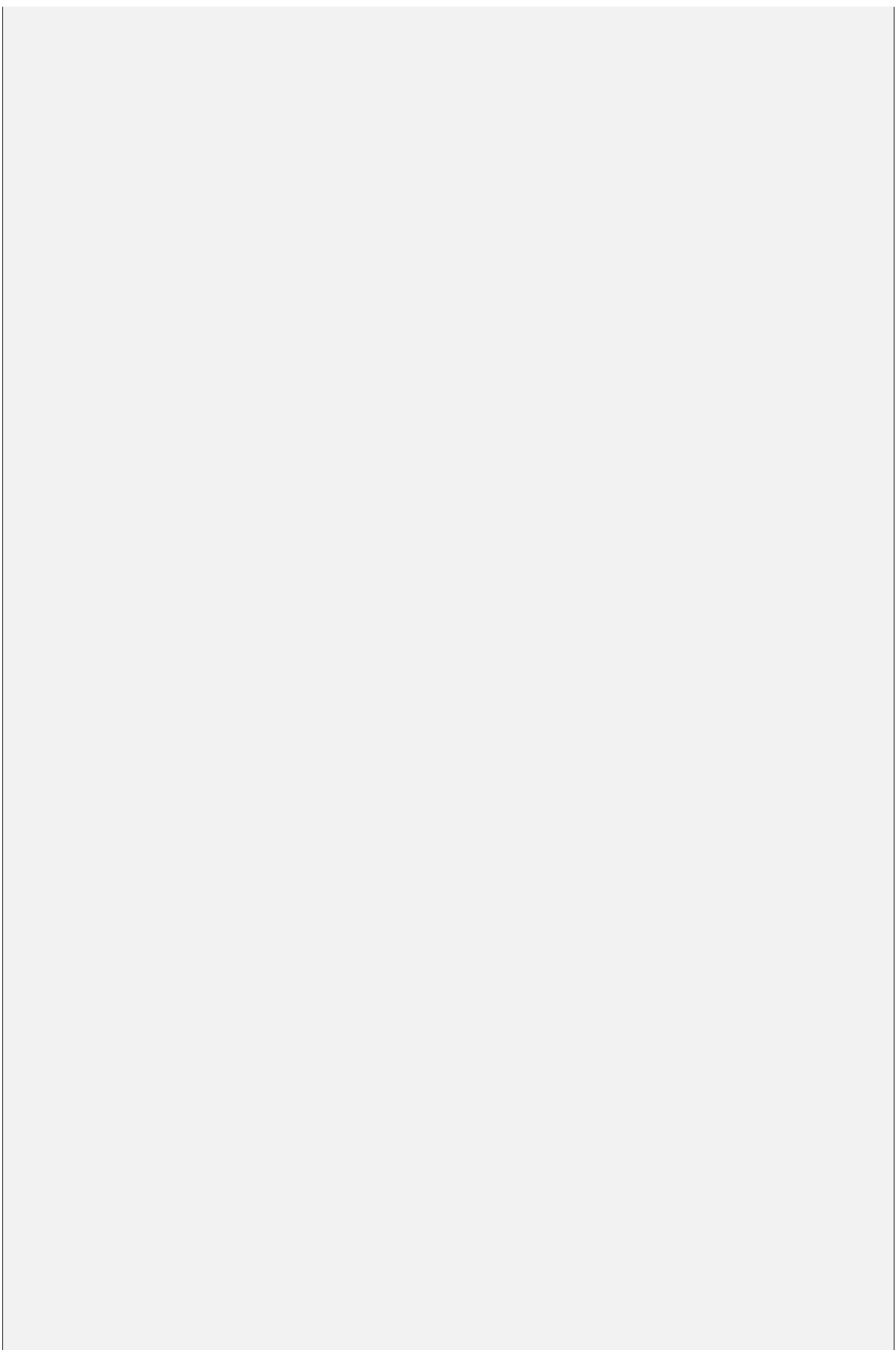


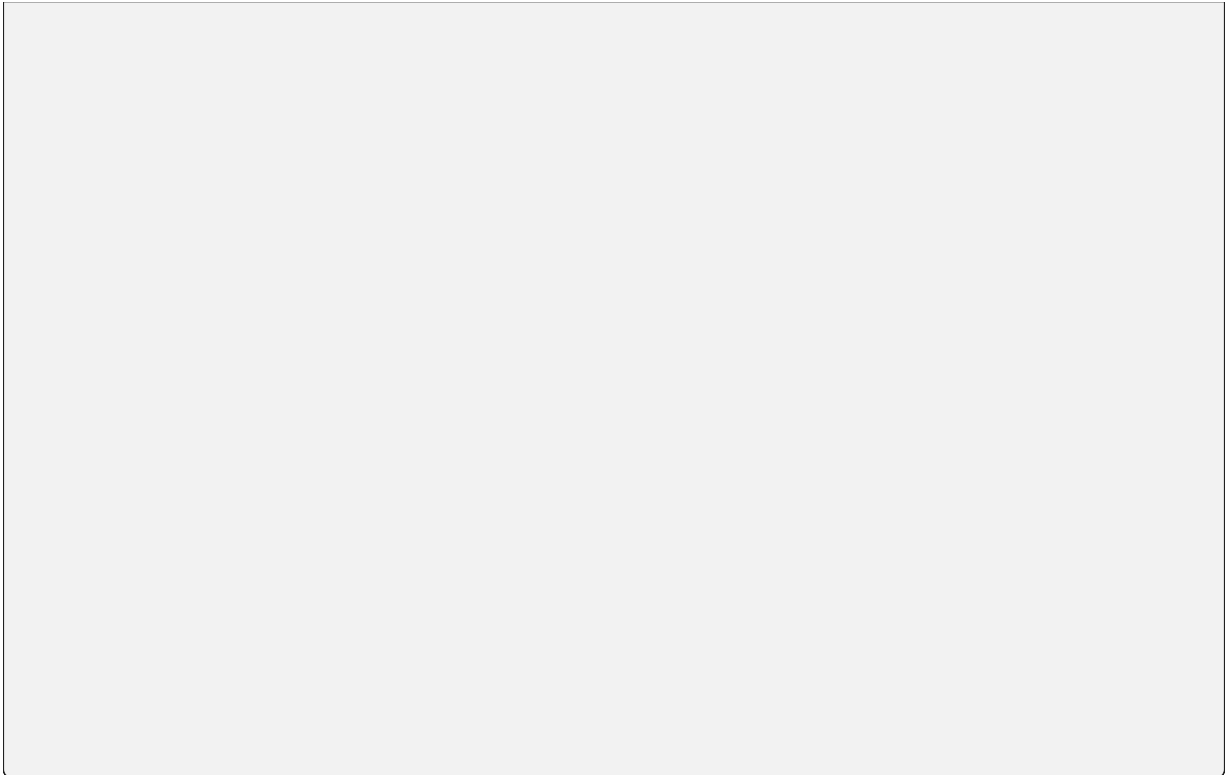
### Setting Up Accelerators



### Local configuration







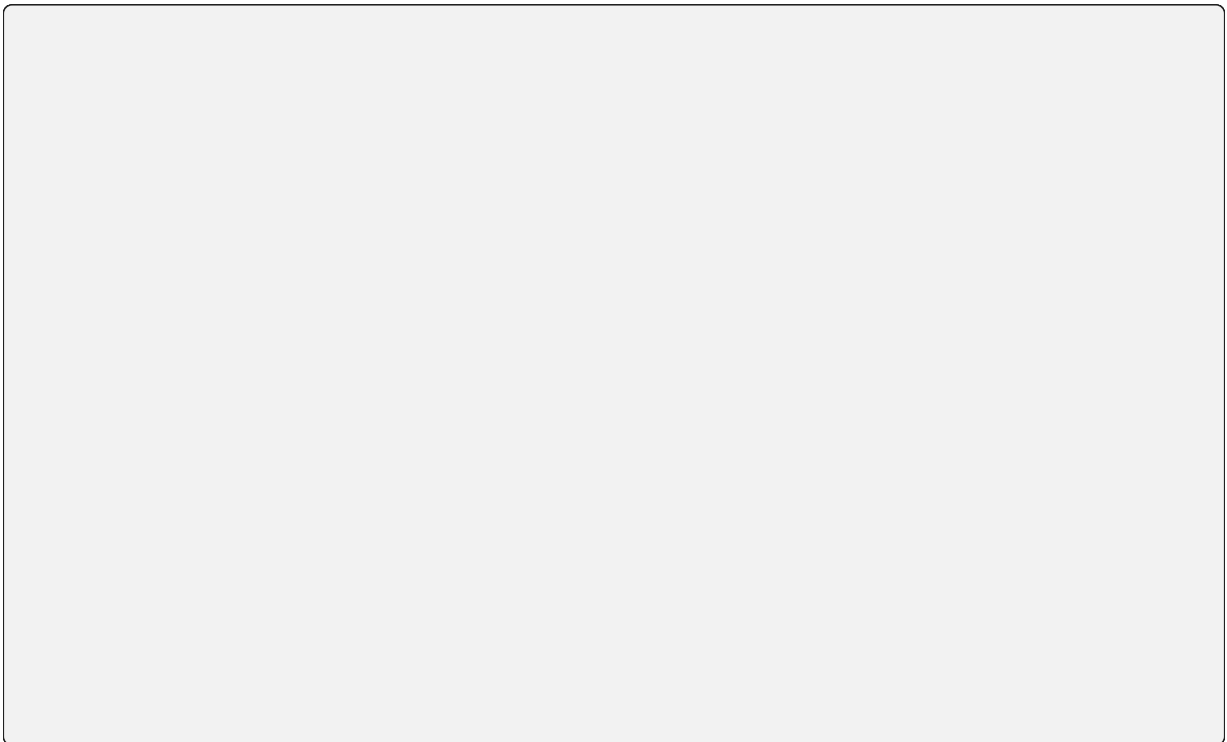
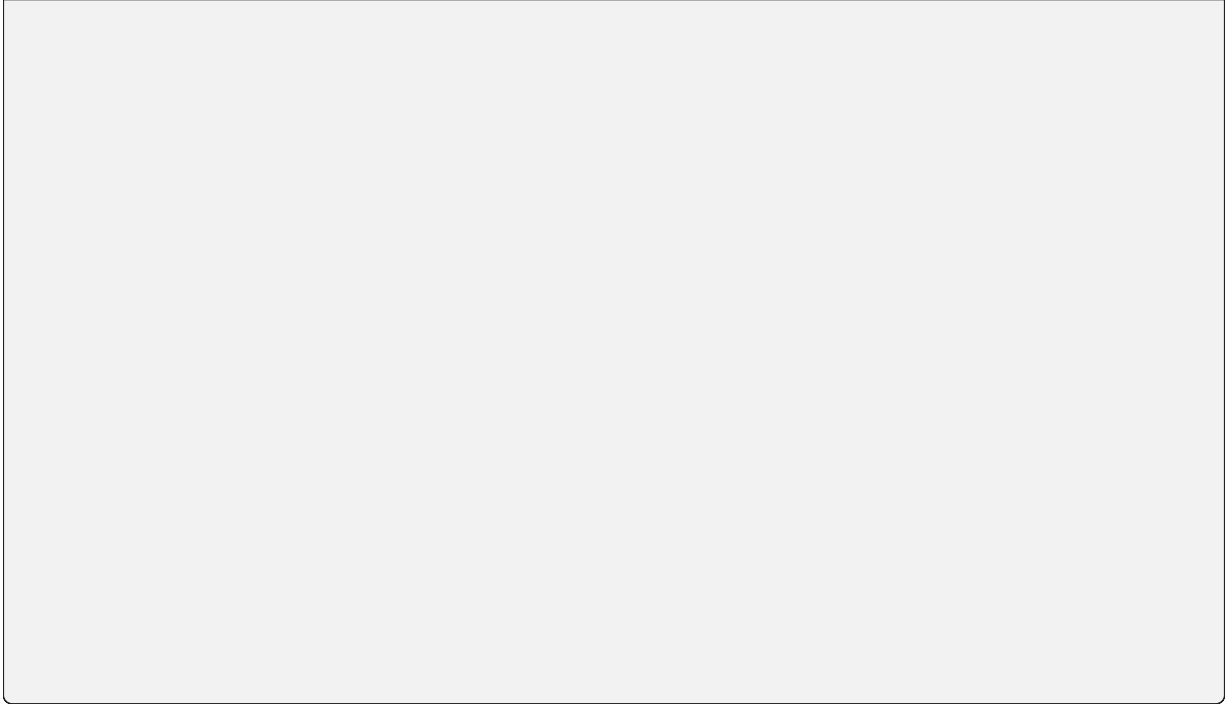
### Run Backend.AI Agent service

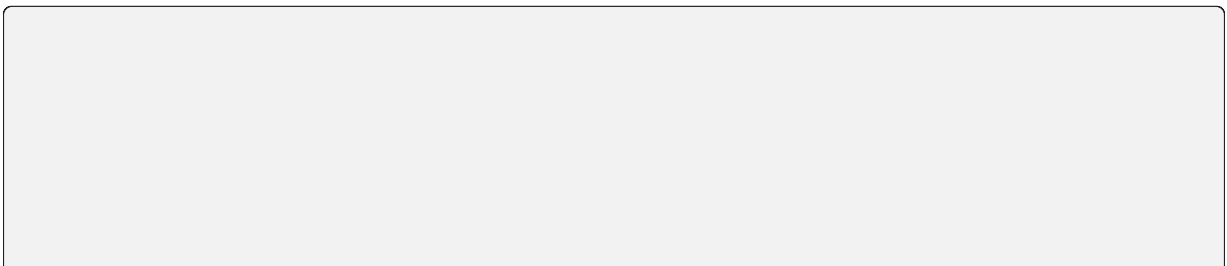
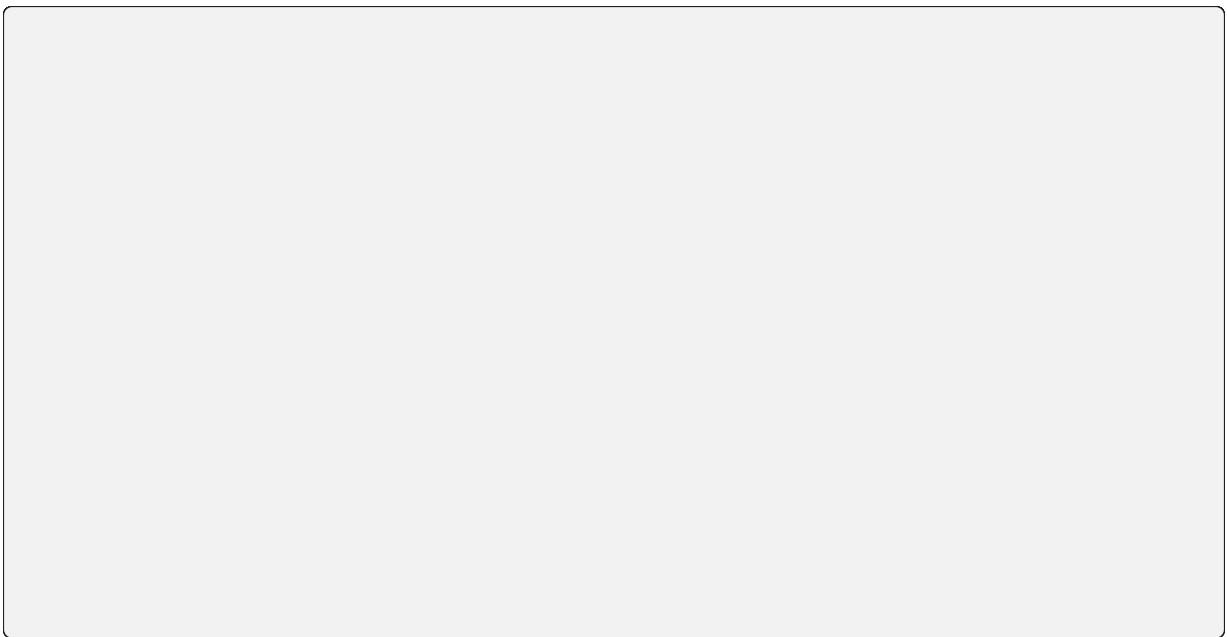
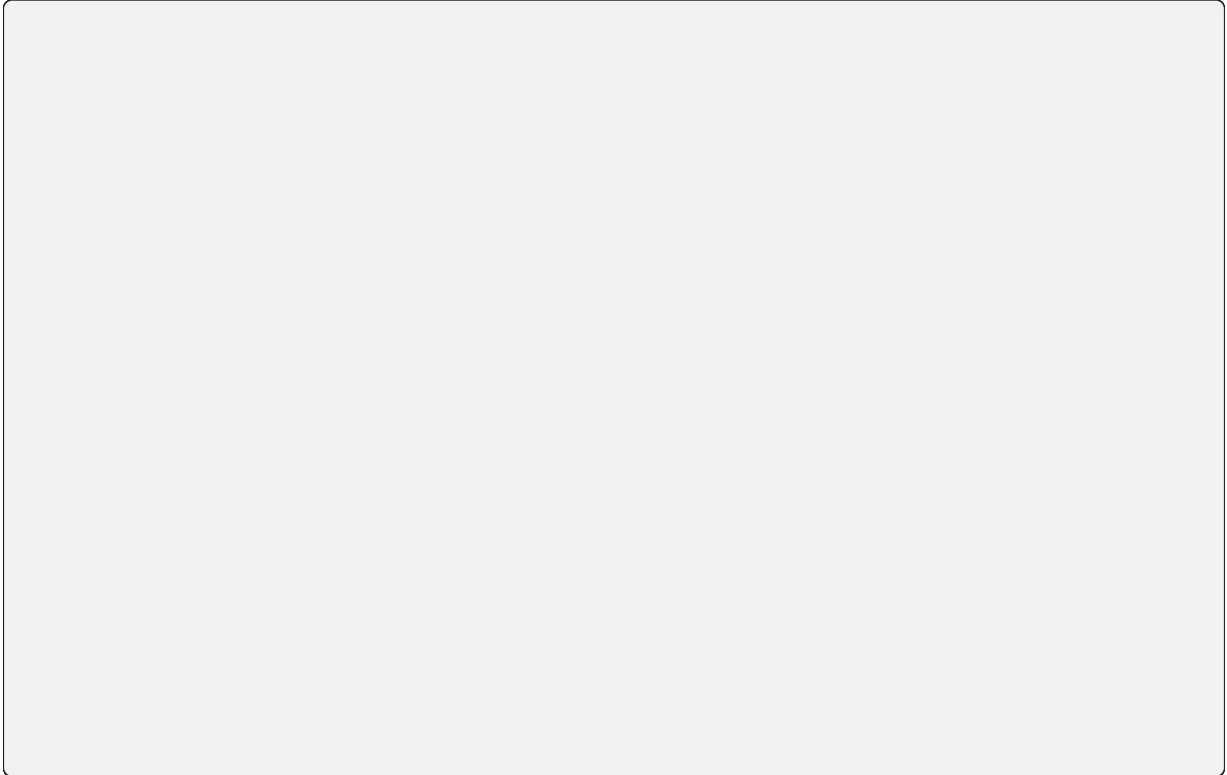


### Register systemd service



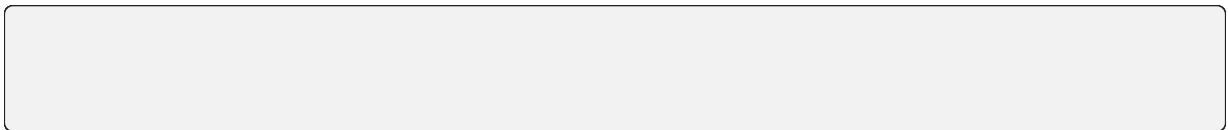




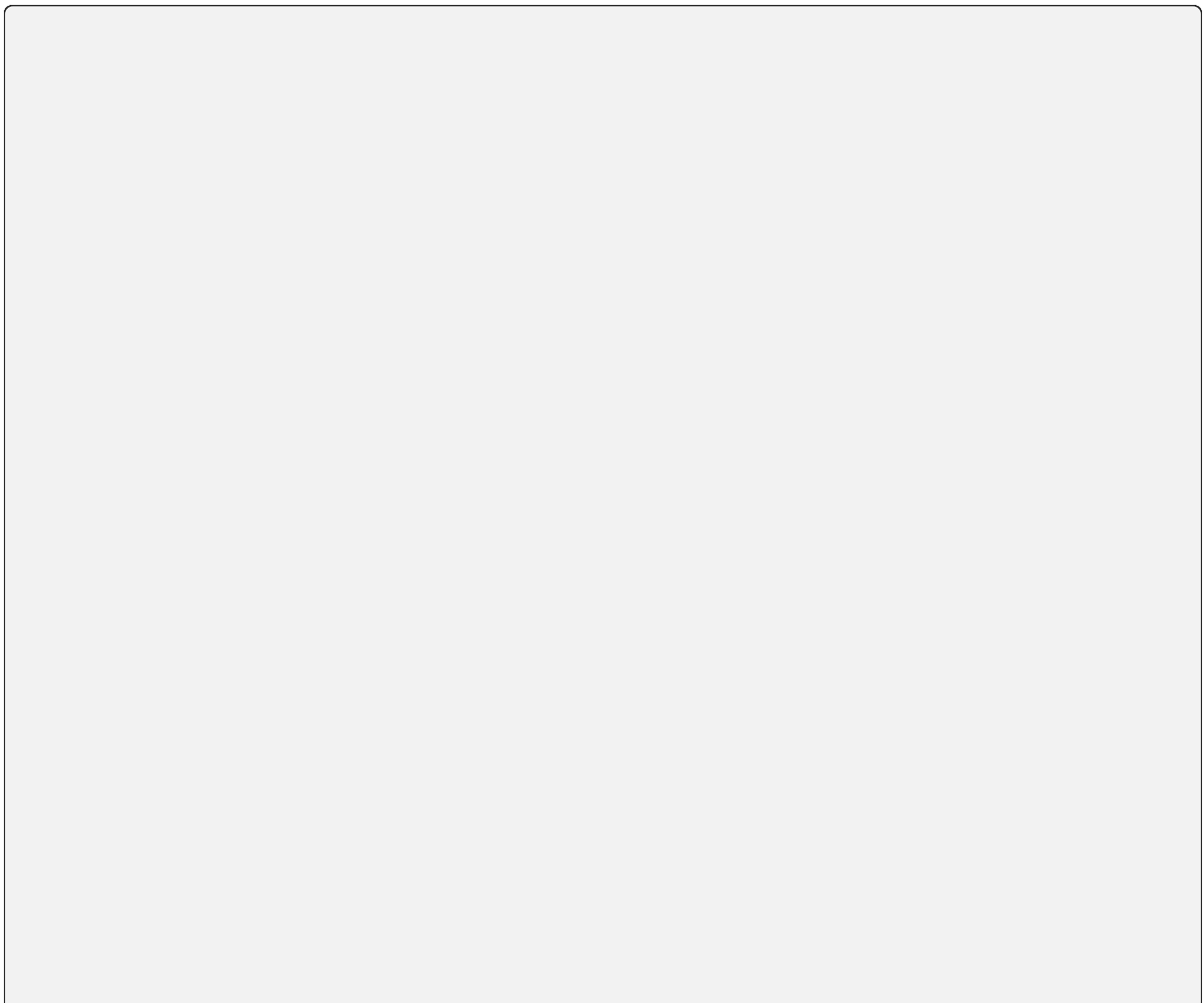


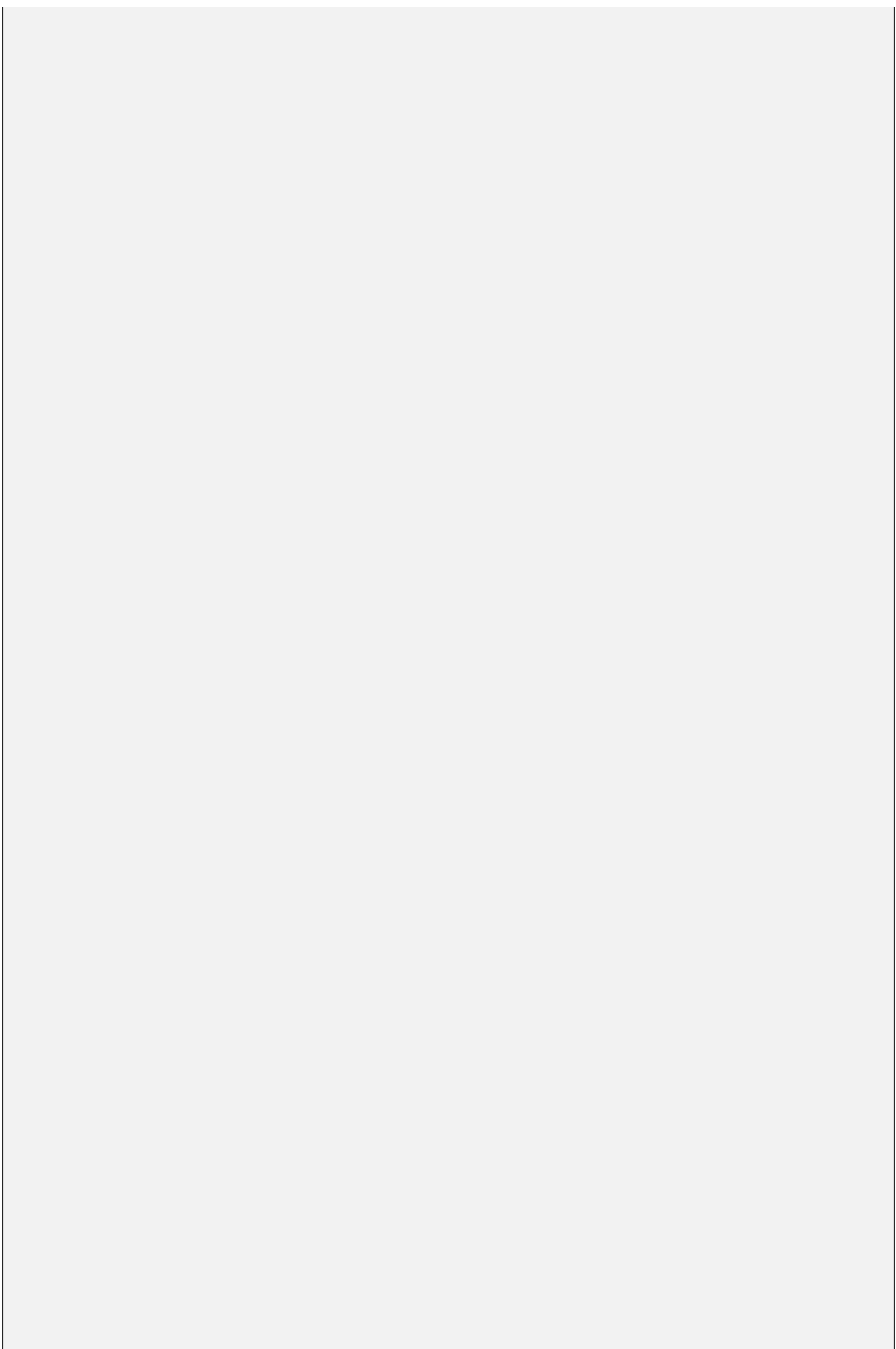


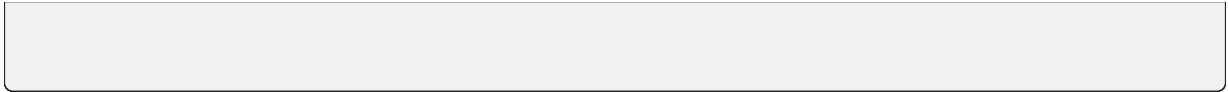
## 2.2.7 Install Backend.AI Storage Proxy



### Local configuration



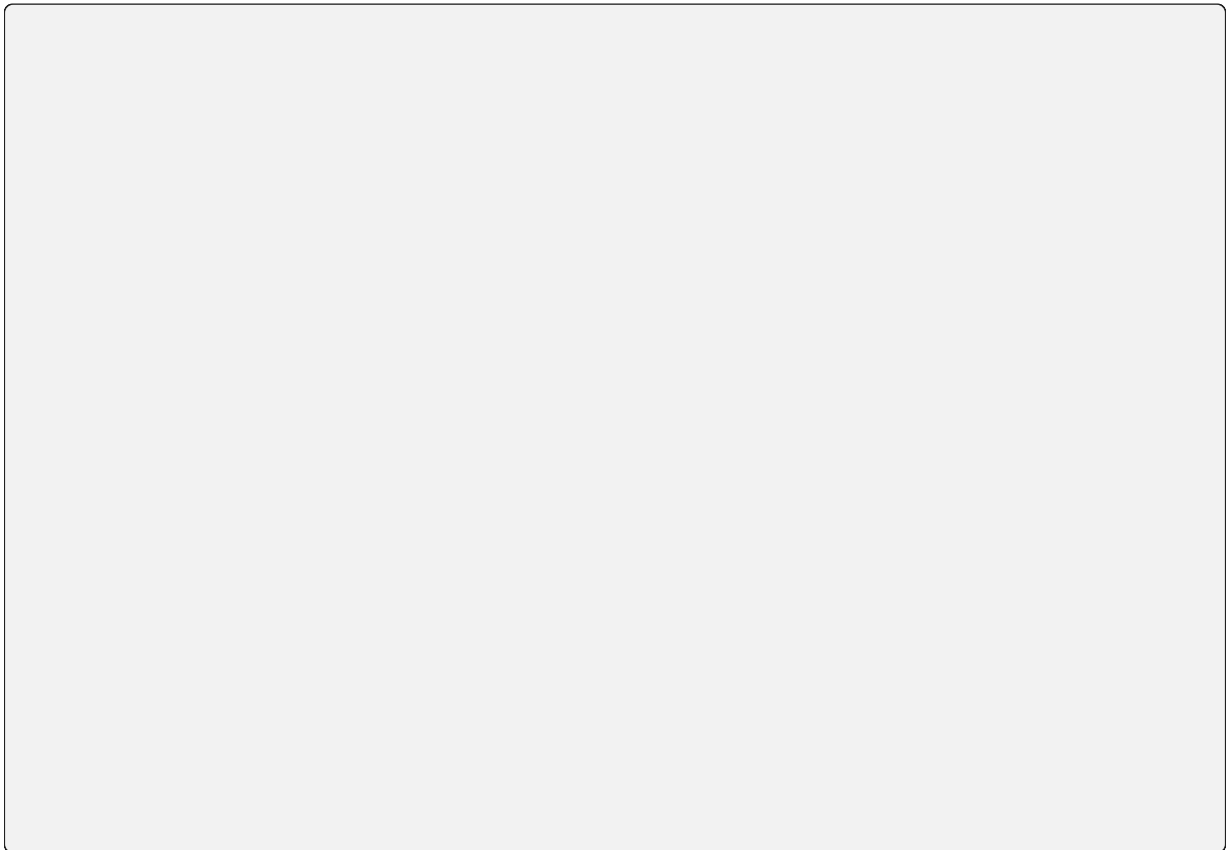


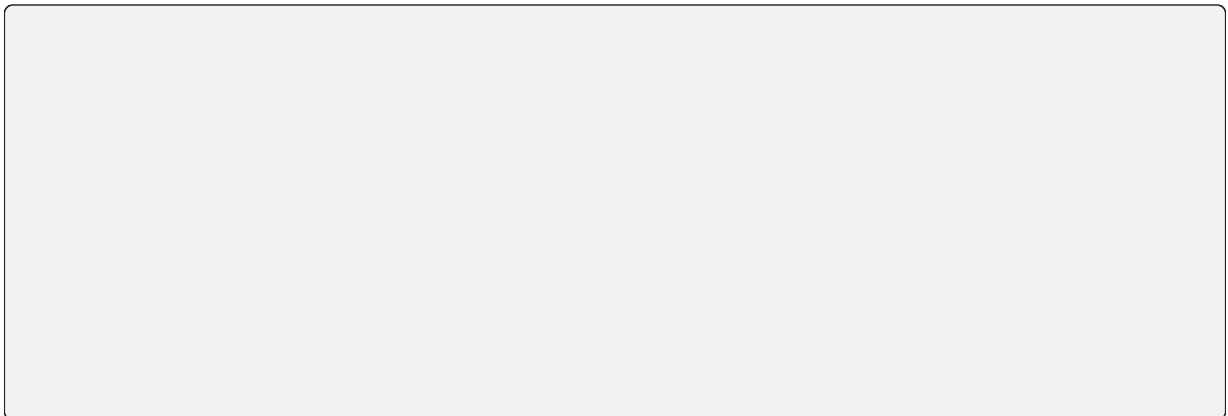
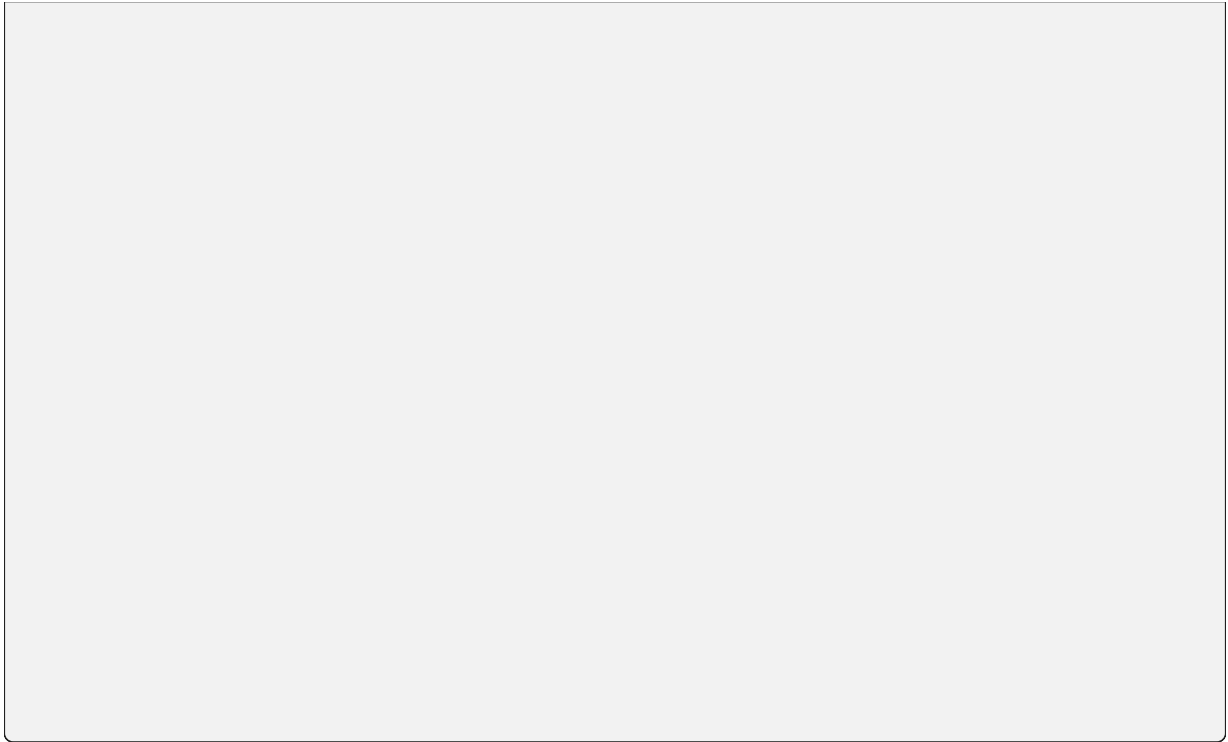


### Run Backend.AI Storage Proxy service



### Register systemd service

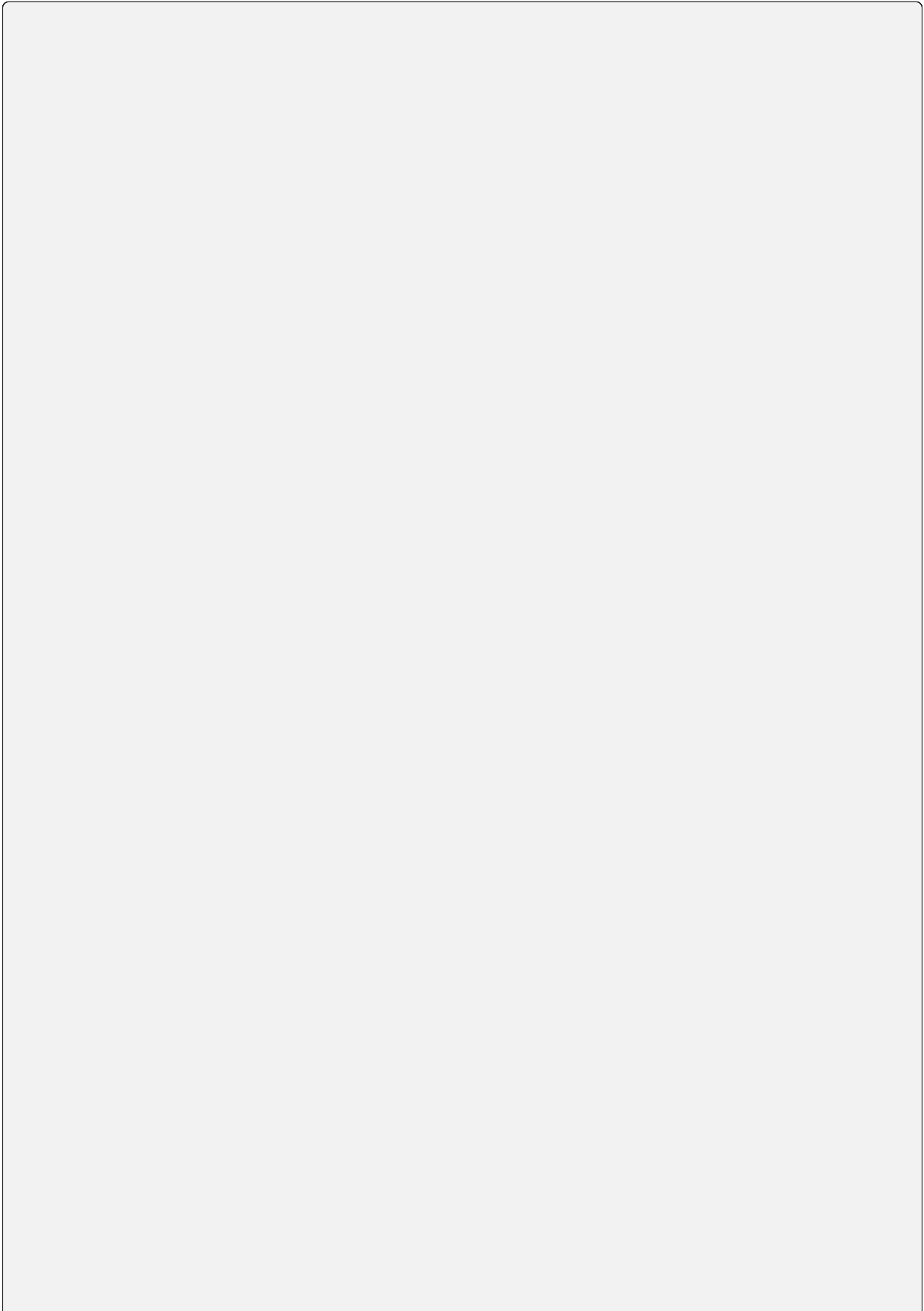


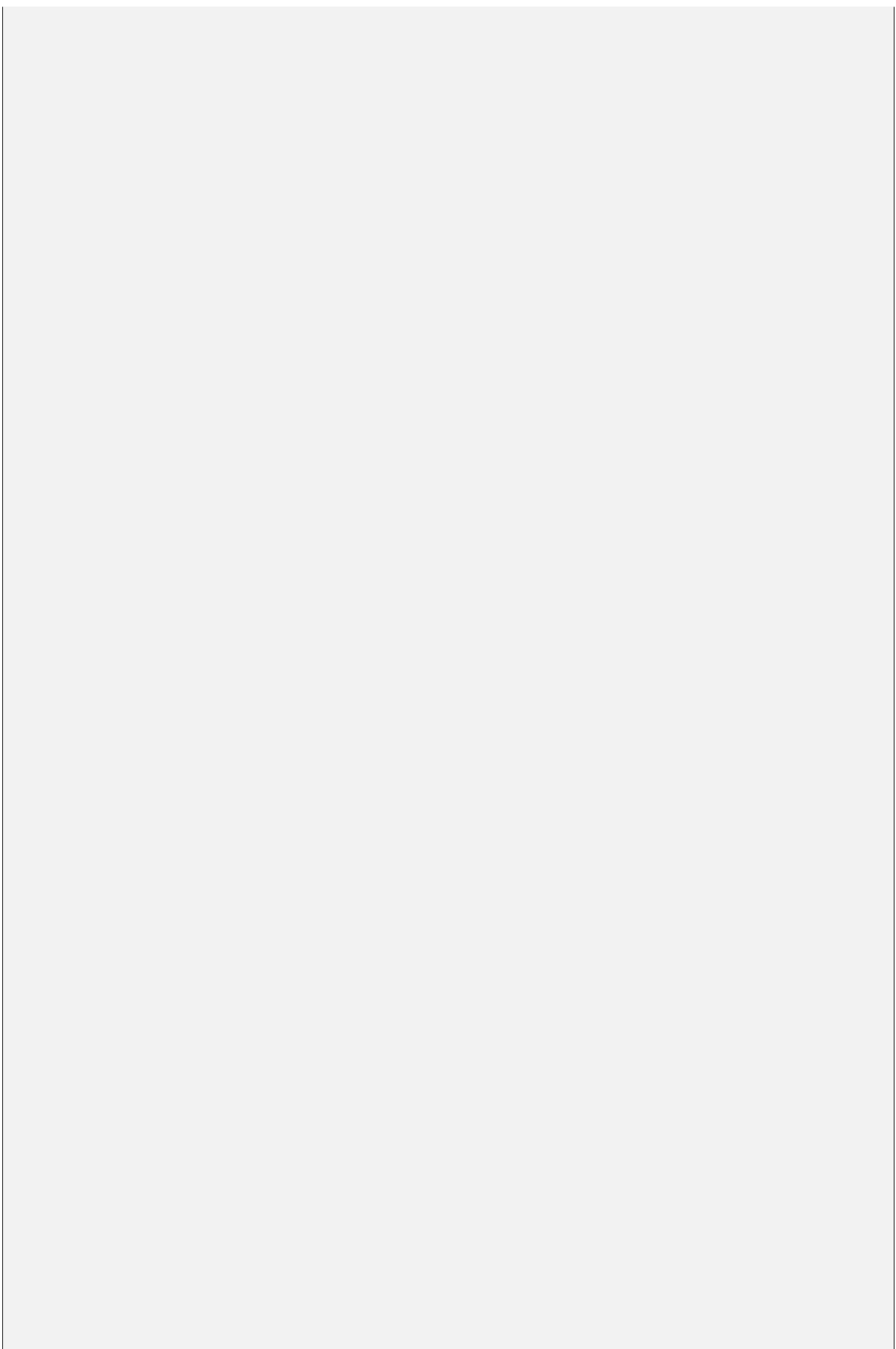


### 2.2.8 Install Backend.AI Webserver

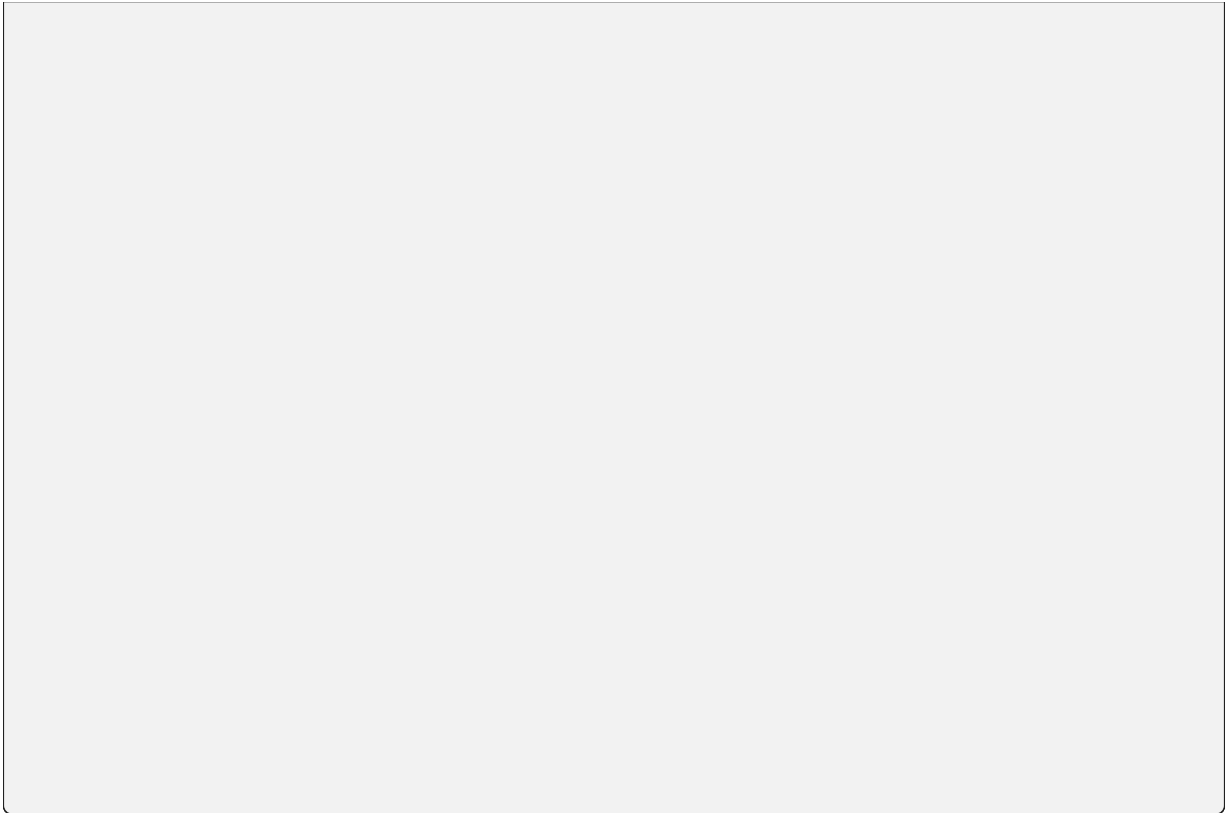


## Local configuration





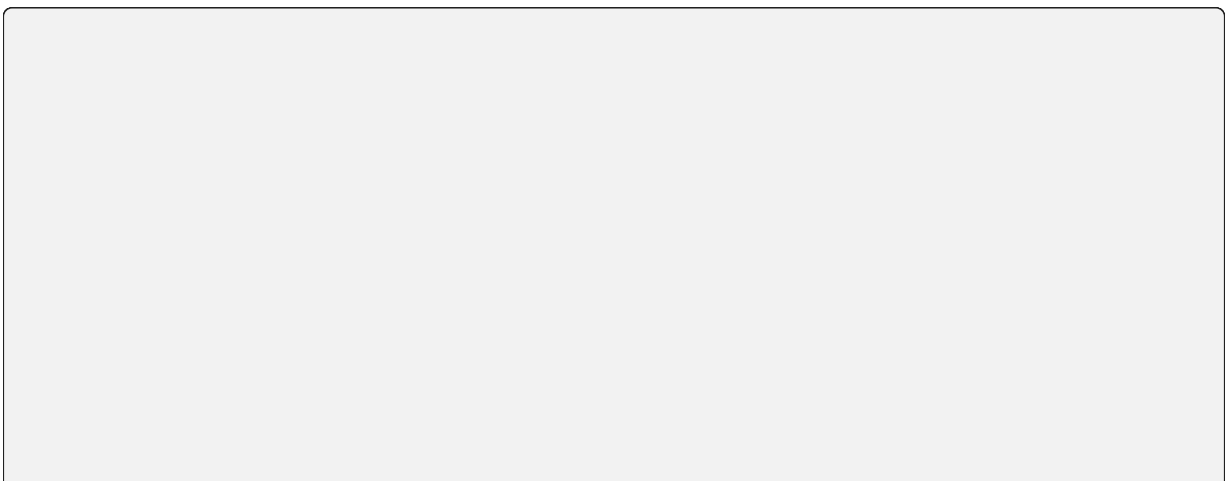


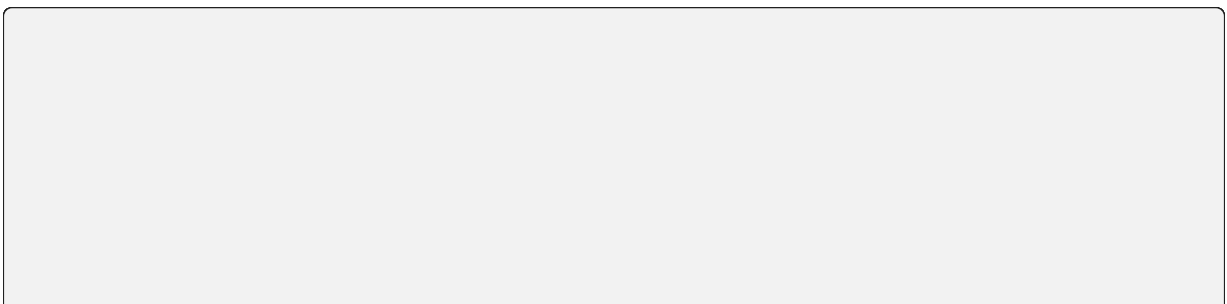
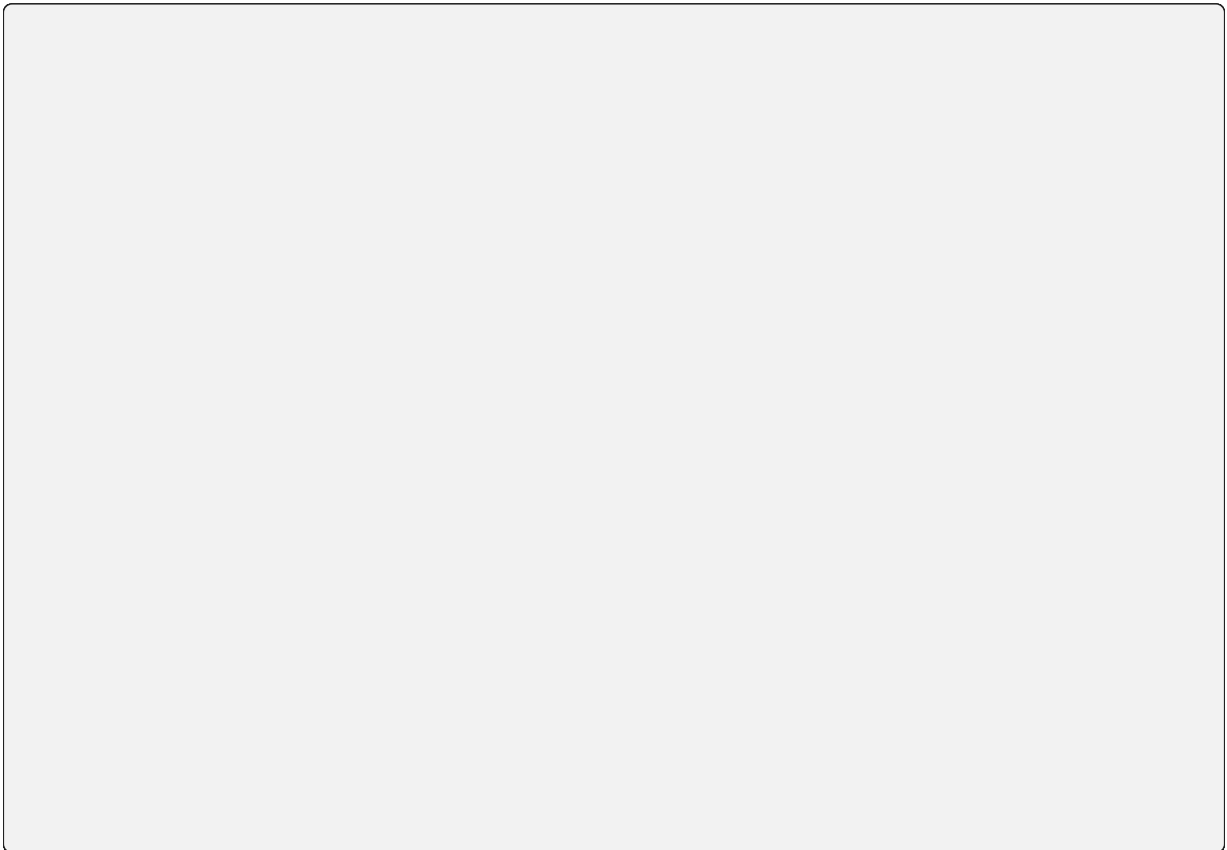


### Run Backend.AI Webserver service

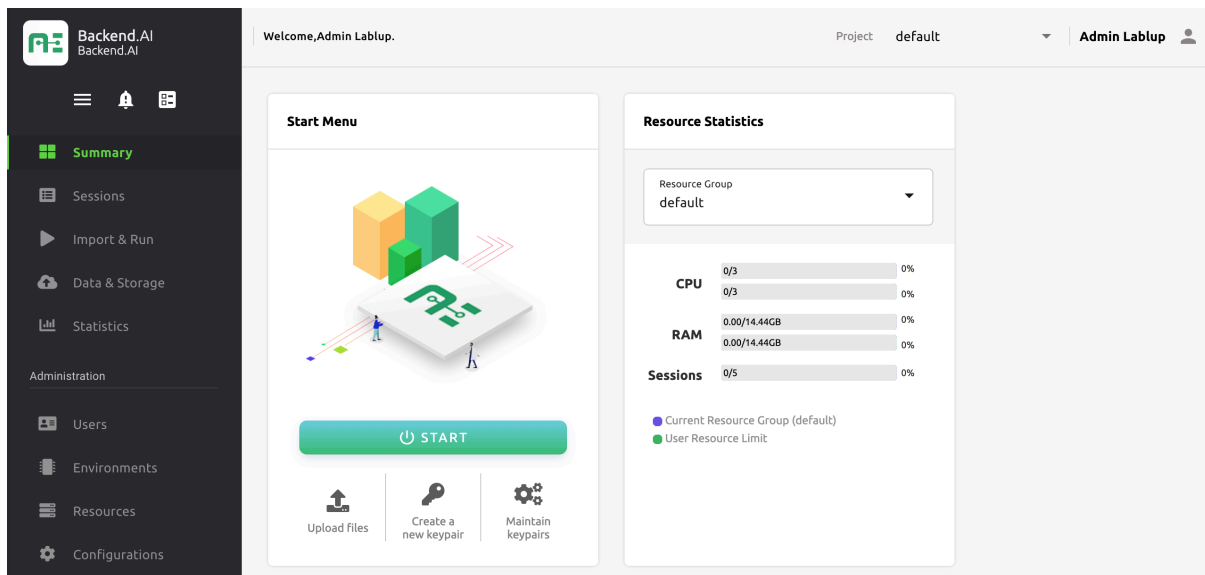
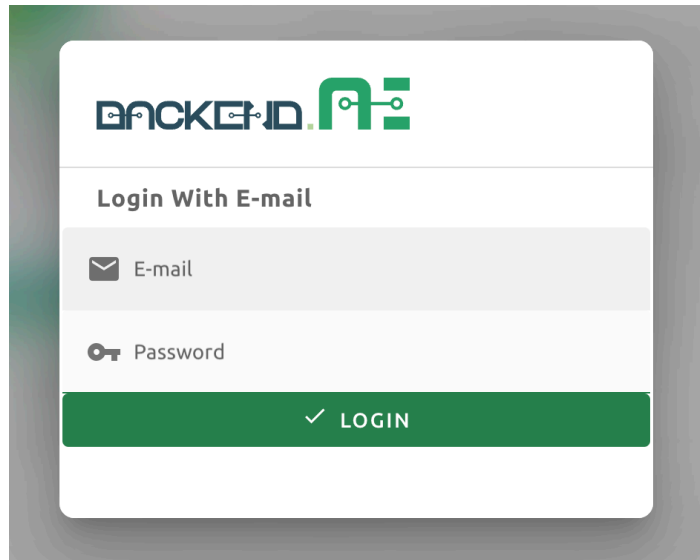


### Register systemd service

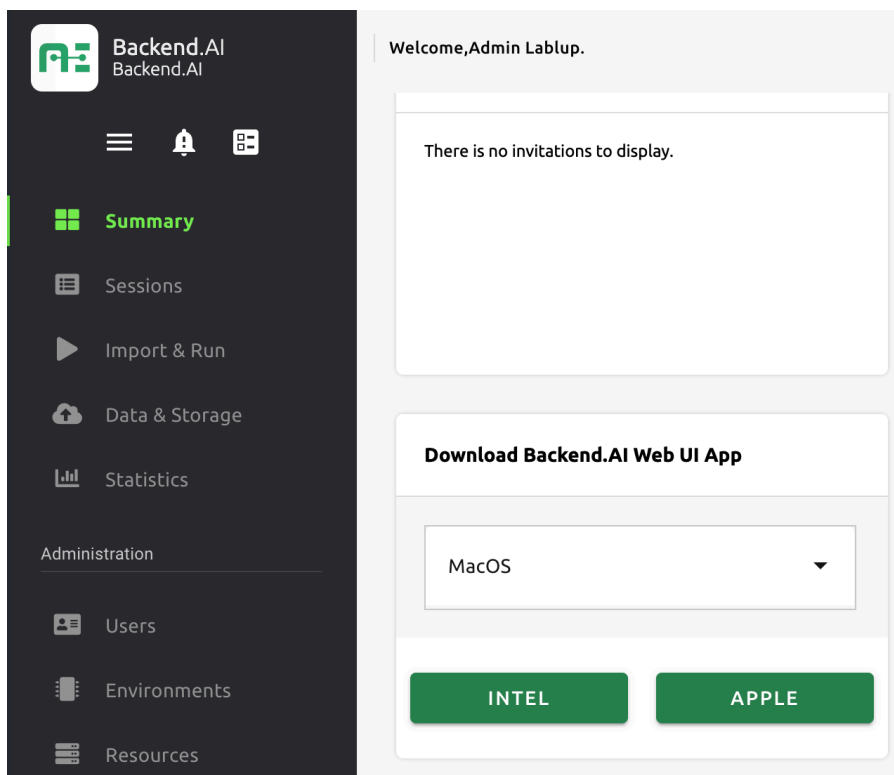




Check user GUI access via web



“”



## 2.3 Install on Clouds

## 2.4 Install on Premise

## 2.5 Install monitoring and logging tools

### 2.5.1 Guide variables

Name	Description

### 2.5.2 Install Datadog agent

### 2.5.3 Install Raven (Sentry client)

## 2.6 Upgrade existing Backend.AI cluster

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### 2.6.1 Performing minor upgrade

,

Upgrading Backend.AI Manager

Upgrading other Backend.AI components

Others

### 2.6.2 Performing major upgrade

### Example of allowed upgrade paths

...

...

### Example of forbidden upgrade paths

...

### Upgrading Backend.AI Manager

### Upgrading other Backend.AI components

### Others

## 2.7 Environment specifics: WSL v2

### 2.7.1 Configuration of Docker Desktop for Windows

→ →

## 2.7.2 Configuration of WSL



## 2.7.3 Installation of Backend.AI



## 3.1 Install User Programs in Session Containers

### 3.1.1 Install packages with linuxbrew

Creating a user linuxbrew directory

,

Installing linuxbrew

,

## Testing linuxbrew

### Setting linuxbrew environment variables automatically

#### Example: Installing and testing htop

```
,
```

```
,
```

## 3.1.2 Install packages with miniconda

### Creating a user miniconda-required directory

```
,
```

miniconda test

**Example: Installing and testing htop**

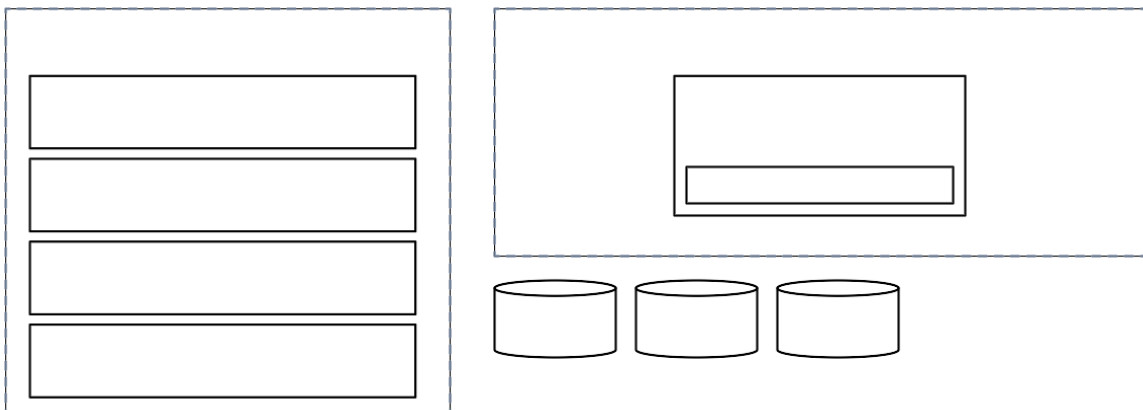
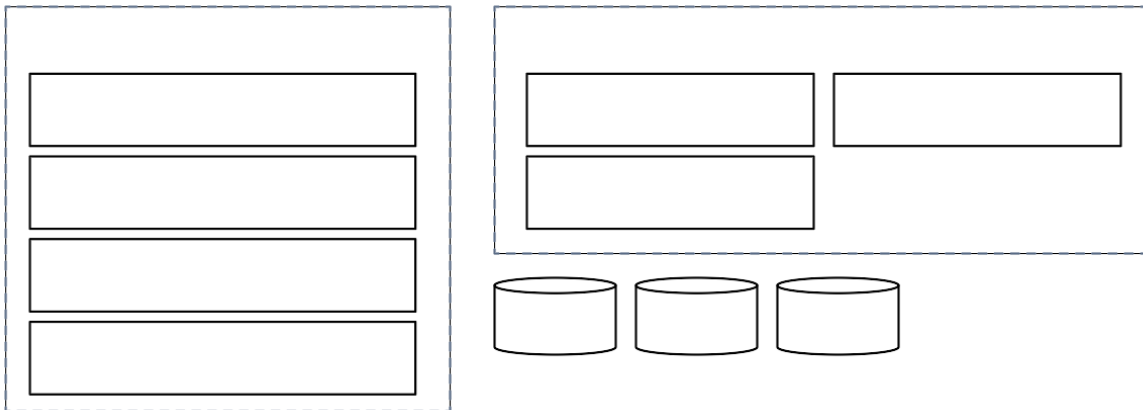
```
,
```

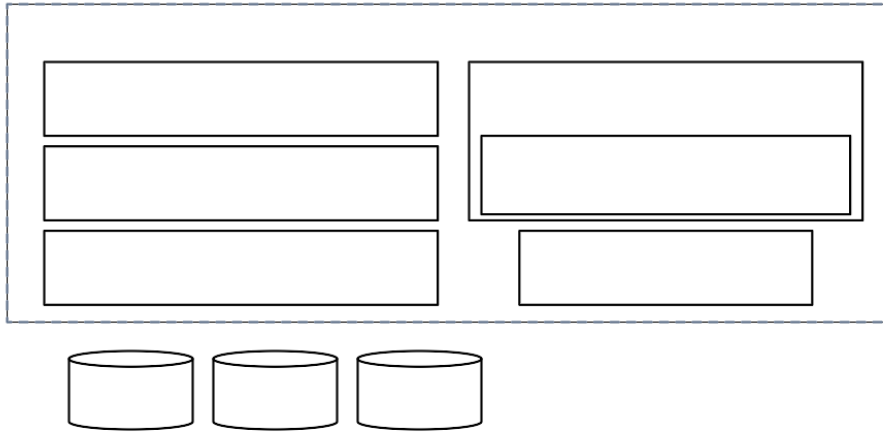
```
,
```



## DEVELOPER GUIDES

### 4.1 Development Setup





## 4.1.1 Installation from Source

### Prerequisites

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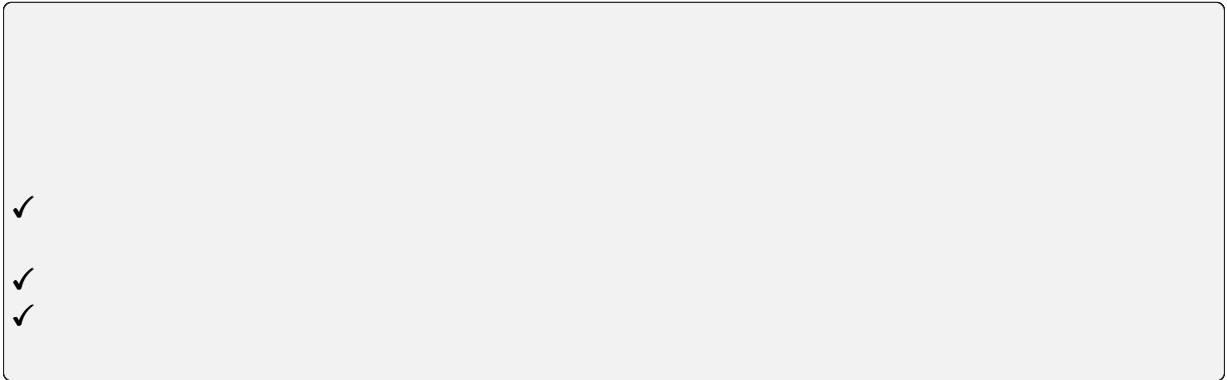
### Running the install-dev script

```
,
```

---

### Verifying Installation

```
,
```



Resetting the environment

,

Daily Workflows

## 4.2 Daily Development Workflows

### 4.2.1 About Pants

Key concepts





### Inspecting build configurations

[Redacted]

[Redacted]

[Redacted]

---

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### 4.2.2 Running lint and check

[Redacted]

[Redacted]

### 4.2.3 Running formatters

[Redacted]

[Redacted]

### 4.2.4 Running unit tests

[Redacted]

#### 4.2.5 Running integration tests

#### 4.2.6 Building wheel packages

#### 4.2.7 Using IDEs and editors



,

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## VSCode

,

Setting ID	Recommended value

Setting ID	Example value

---

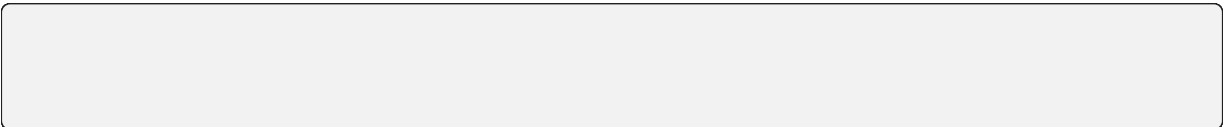
---

## Vim/NeoVim

## Switching between branches

“”

### 4.2.8 Running entrypoints



### 4.2.9 Working with plugins



### 4.2.10 Writing test cases



```
“”  
,
```

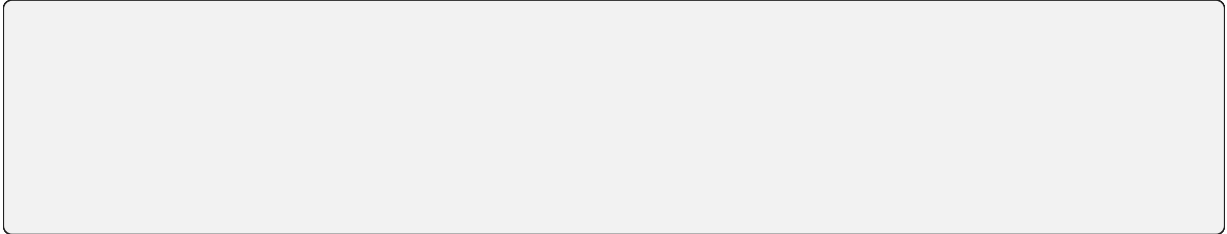
### 4.2.11 Writing documentation

```
,
```

### 4.2.12 Advanced Topics

#### Adding new external dependencies

## Merging lockfile conflicts



## Resetting Pants

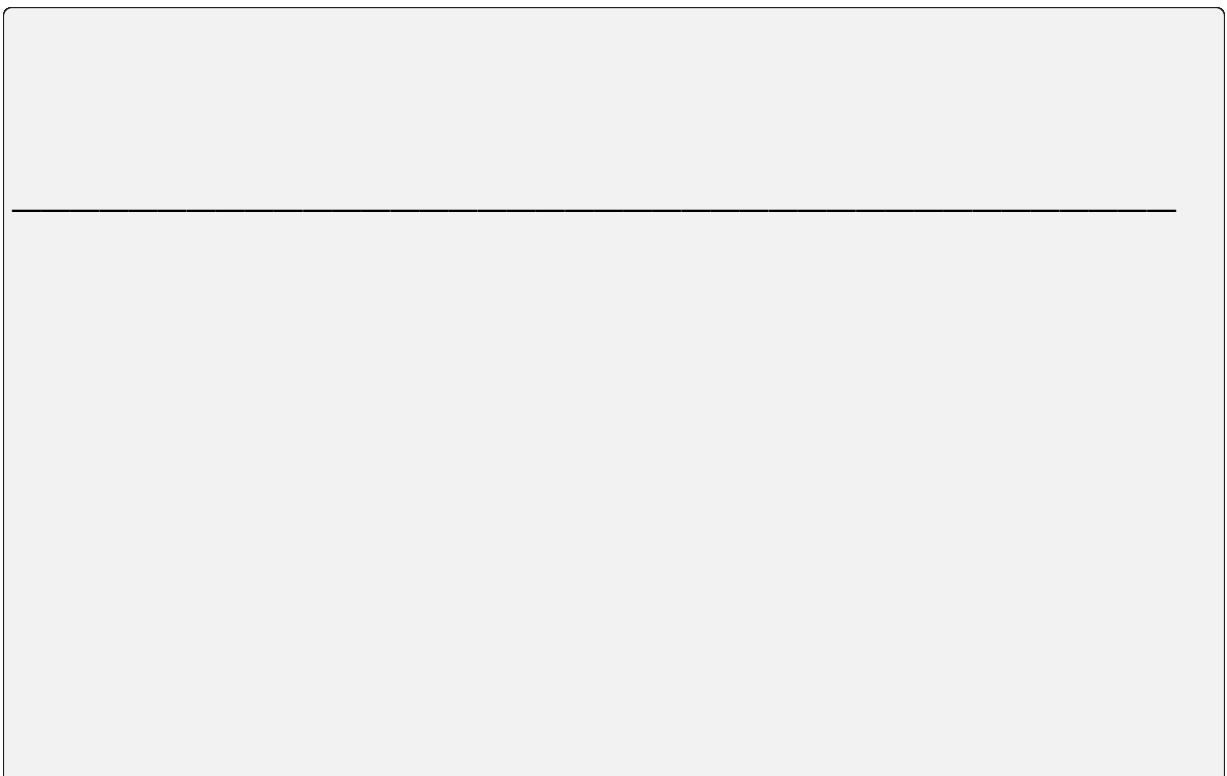


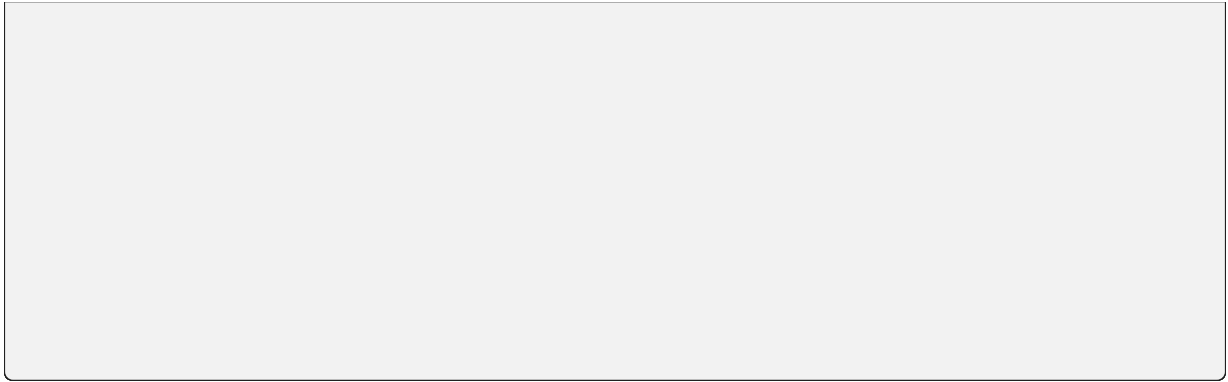
,



## Resolve the error message ‘Pants is not available for your platform’, When installing Backend.AI with pants

‘





### Resolving missing directories error when running Pants



### Changing or updating the Python runtime for Pants

### Debugging test cases (or interactively running test cases)



### Installing a subset of mono-repo packages in the editable mode for other projects

,







,

### Boosting the performance of Pants commands



### Making a new release

“”

“” “”

,



Backporting to legacy per-pkg repositories

## 4.3 Adding New Kernel Images

### 4.3.1 Overview

### 4.3.2 Kernel Runner

```
“”
```

```
”“
```

#### Image Prerequisites

```
,
```

### 4.3.3 Metadata Labels

```
“” “” “”
```

,

### 4.3.4 Service Ports

```
“”
```

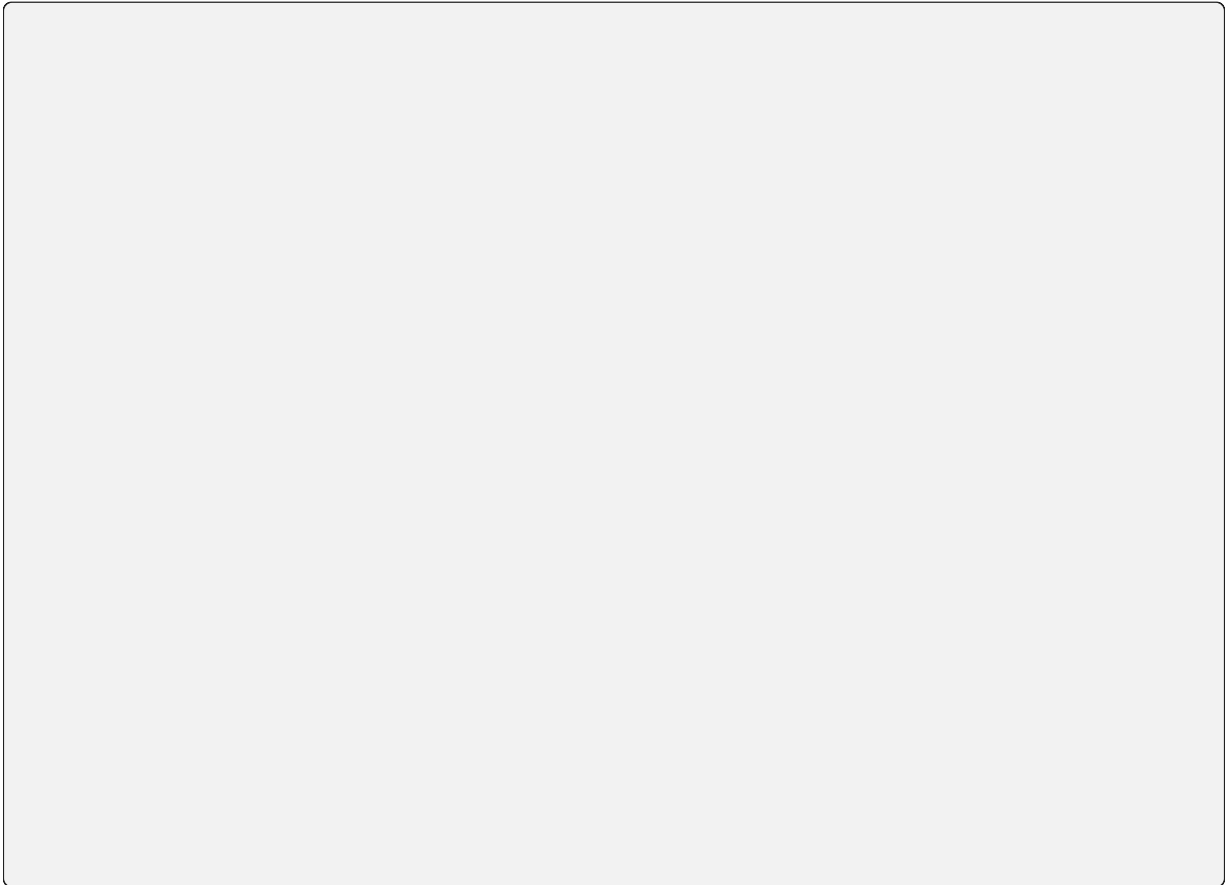
#### Port Mapping Declaration



## Service Definition DSL

,

“”



“”

## Available predefined variables

### Available prestart actions

“”.

Action Name	Arguments	Return
	:	
	“”	
	:	
	“”	
	:	
	:	
	:	

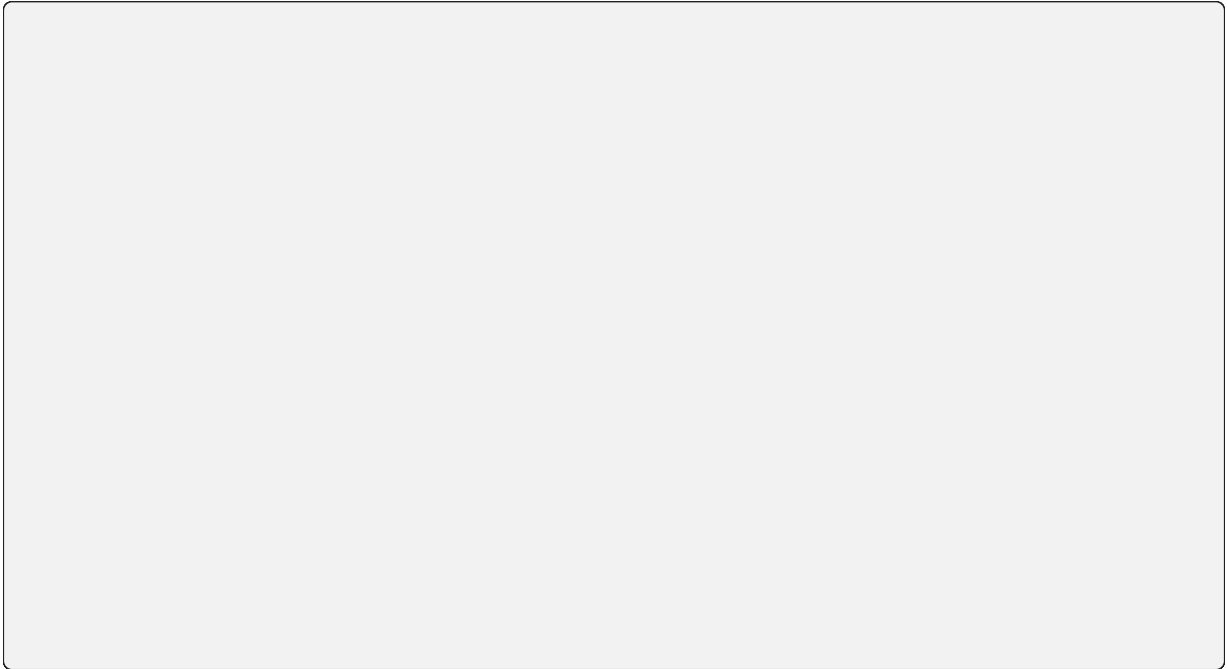
### Interpretation of URL template

,

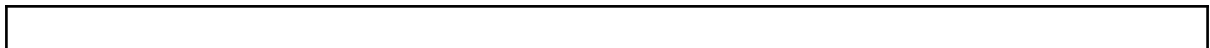
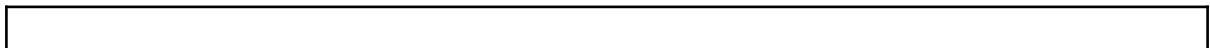
## 4.3.5 Jail Policy

Adding Custom Jail Policy

## 4.3.6 Example: An Ubuntu-based Kernel



## 4.3.7 Custom startup scripts (aka custom entrypoint)

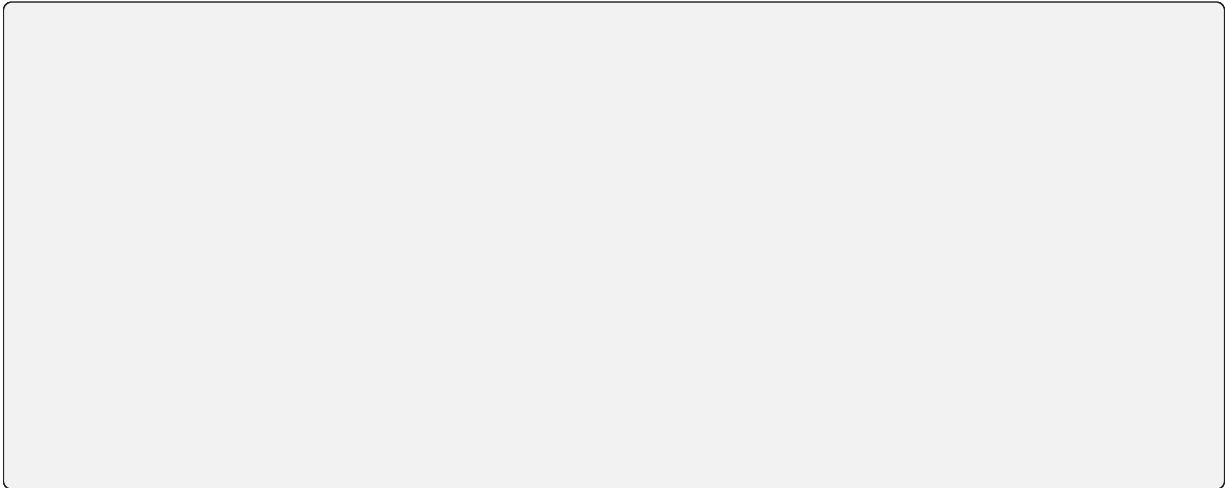


### 4.3.8 Implementation details

#### The query mode I/O protocol

,

,



#### The pseudo-terminal mode protocol

“”

“” “”

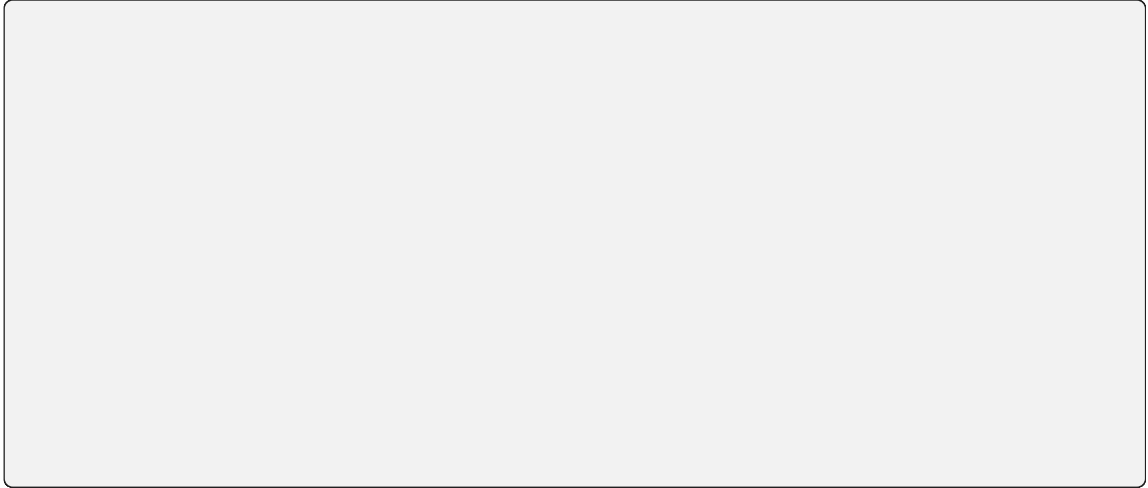
,

“”

## 4.4 Using Mocked Accelerators

### 4.4.1 Configuring the mock-accelerator plugin

”





#### 4.4.2 Activating the mock-accelerator plugin

,

### 4.5 Version Numbering

,

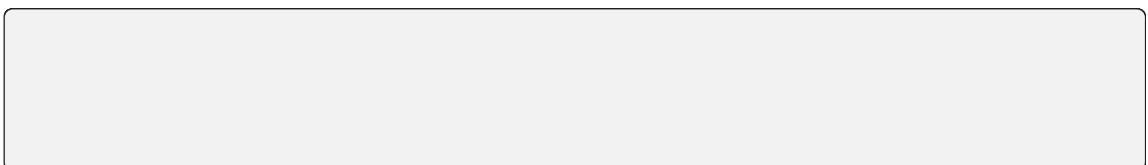
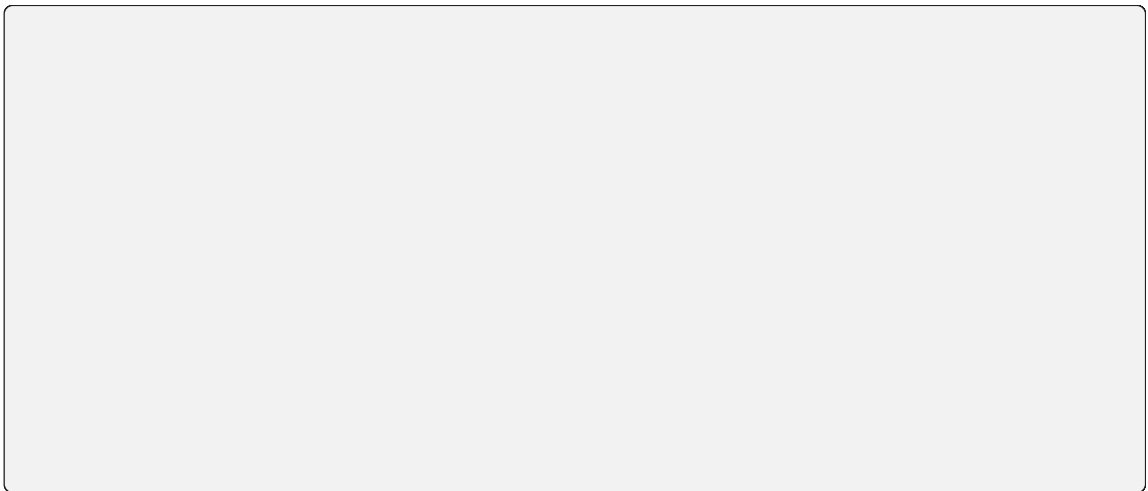
### 4.6 Upgrading



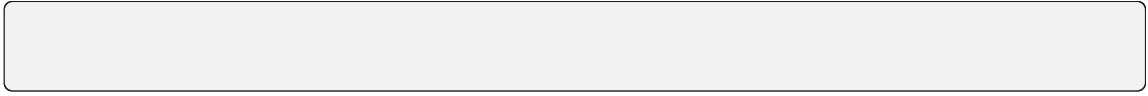
## MIGRATION GUIDES

### 5.1 Upgrading from 20.03 to 20.09

### 5.2 Migrating from the Docker Hub to cr.backend.ai



“” “...””



## BACKEND.AI MANAGER REFERENCE

### 6.1 Manager API Common Concepts

#### 6.1.1 API and Document Conventions

##### HTTP Methods

##### Parameters in URI and JSON Request Body

##### HTTP Status Codes and JSON Response Body

##### JSON Field Notation

Example	Meaning

## JSON Value Types

,

Type	Description

## API Versioning



### 6.1.2 JSON Object References

#### Paging Query Object

Key	Type	Description

#### Paging Info Object

Key	Type	Description

### KeyPair Item Object

Key	Type	Description

### KeyPair Properties Object

Key	Type	Description

Key	Type	Description

### Service Port Object

Key	Type	Description

### Batch Execution Query Object

Key	Type	Description





### Execution Result File Object

Key	Type	Description

### Container Stats Object

Key	Type	Description

### Creation Config Object

Key	Type	Description

### Resource Slot Object

Key	Type	Description
		<code>“” , “” , “” , “” , “” , “” ,</code>
		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <math>2^{53} - 1</math> </div>
		<code>“” “” .</code> <code>“”</code> <code>“”</code>

### Resource Preset Object

Key	Type	Description
		<code>“” , “” , “” ,</code>

### Virtual Folder Creation Result Object

Key	Type	Description

### Virtual Folder List Item Object

Key	Type	Description
		<code>“” “” , “” “” “”</code>
		<code>“” “” .</code>



## 6.1.3 Authentication

### Access Tokens and Secret Key

#### Common Structure of API Requests

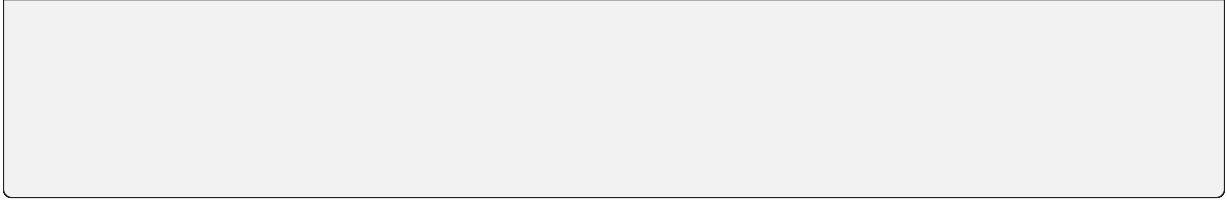
HTTP Headers	Values
	,

#### Common Structure of API Responses

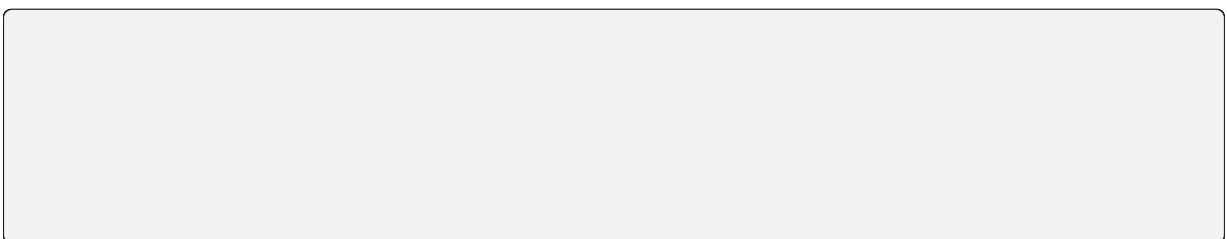
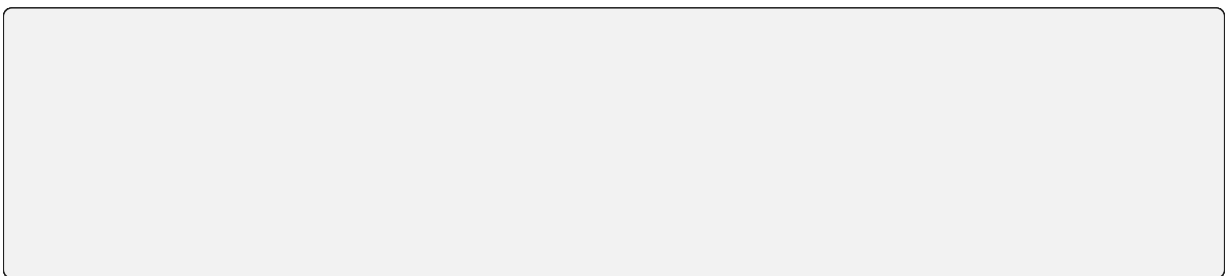
HTTP Headers	Values

#### Signing API Requests

#### Generating a signing key



**Generating a string to sign**



### Attaching the signature

### Example Requests and Responses

#### Success example for checking the latest API version

#### Failure example with a missing authorization header

## 6.1.4 Rate Limiting

,

HTTP Headers	Values

“”.

## 6.2 Manager REST API

### 6.2.1 Session Management

#### Creating Session

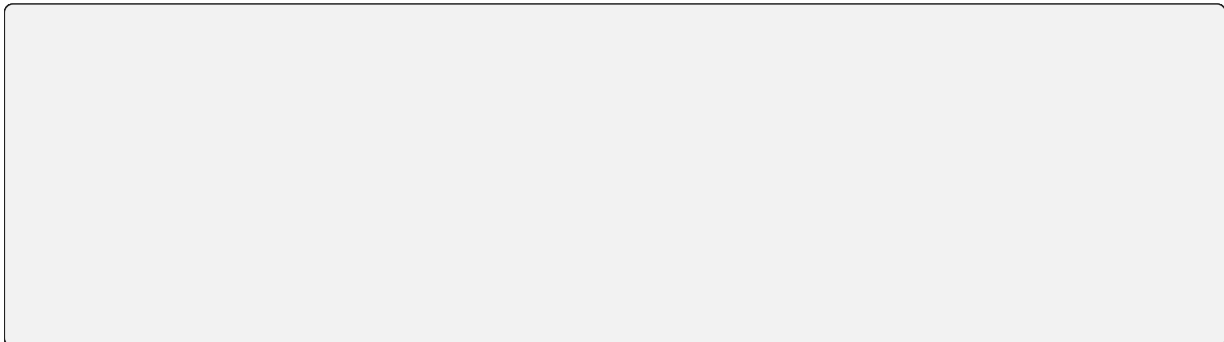




## Response

HTTP Status Code	Description

Fields	Type	Values



## Getting Session Information

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Key	Type	Description

### Destroying Session

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Key	Type	Description

### Restarting Session

### Parameters

Parameter	Type	Description
-----------	------	-------------

### Response

HTTP Status Code	Description
------------------	-------------

## 6.2.2 Code Execution (Query Mode)

### Executing Snippet

### Parameters

Parameter	Type	Description
-----------	------	-------------

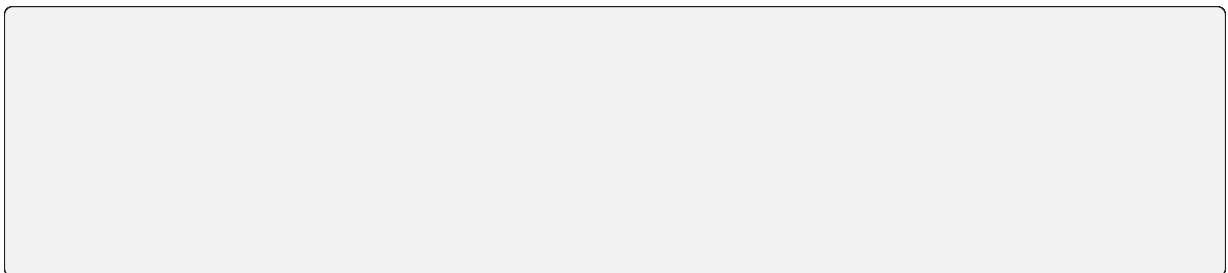
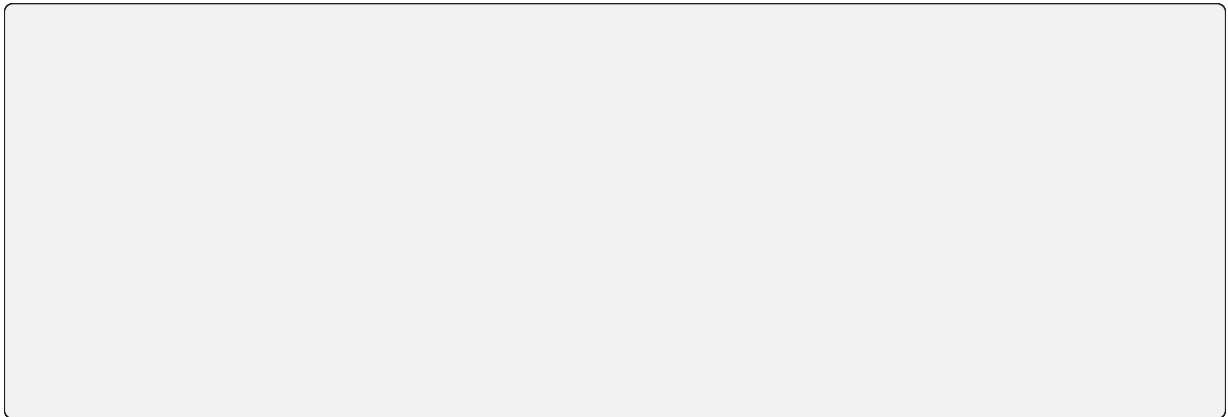
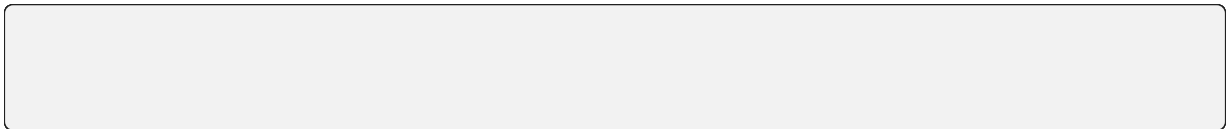
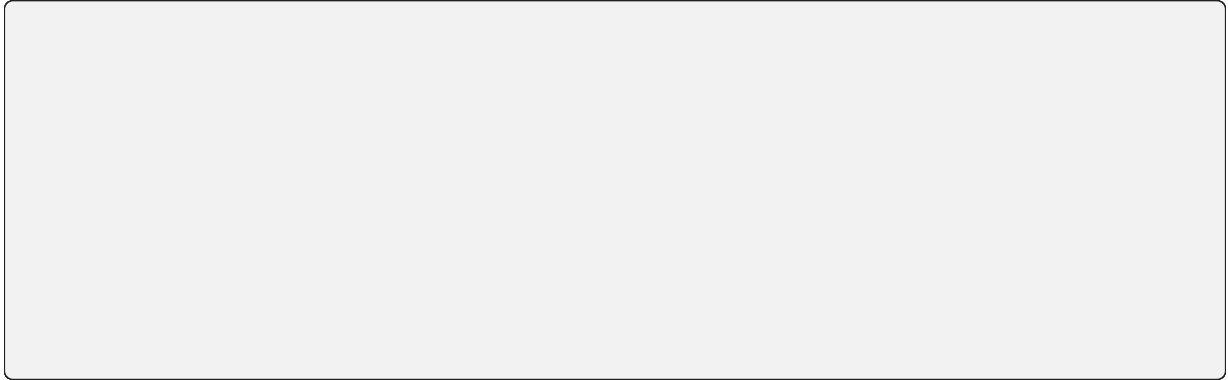
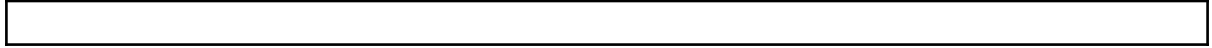
### Response

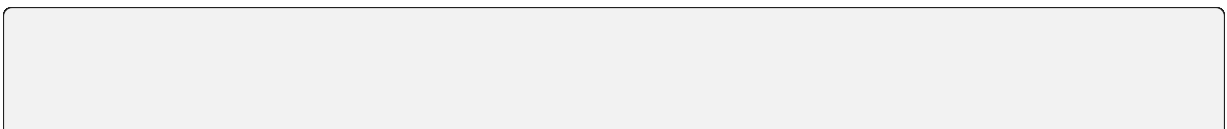
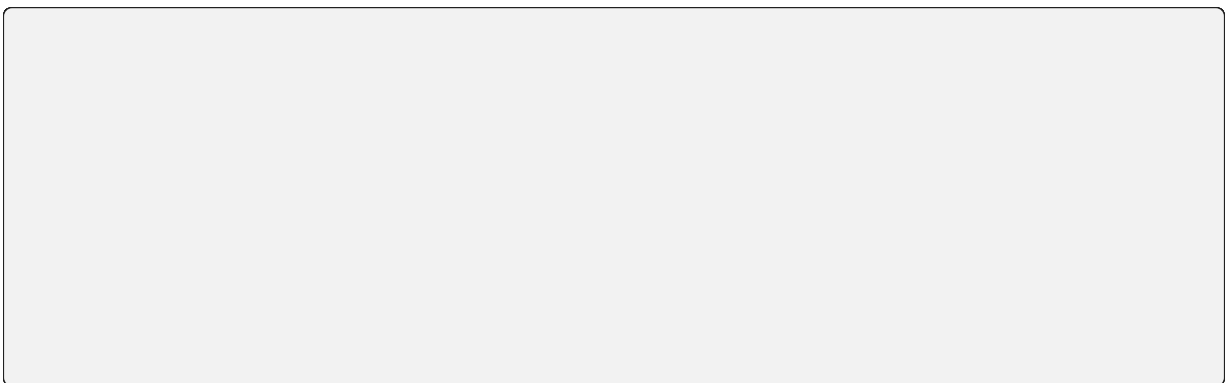
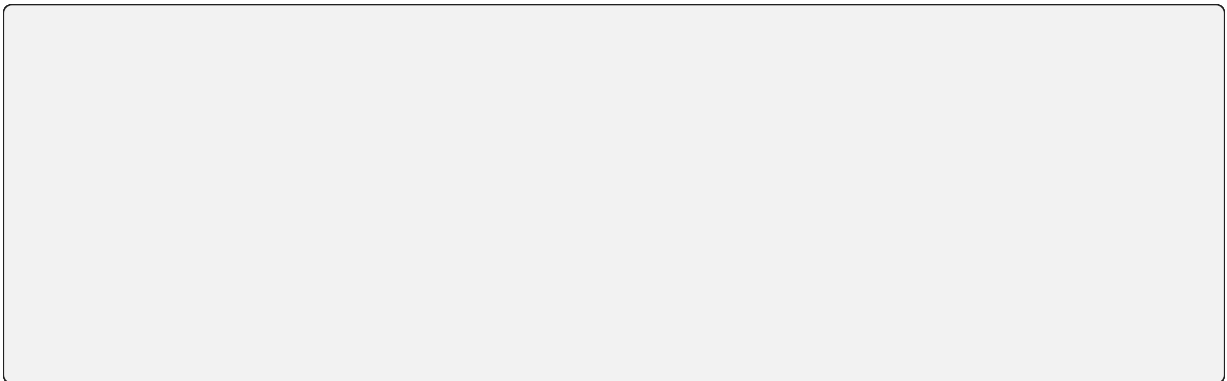
HTTP Status Code	Description
------------------	-------------

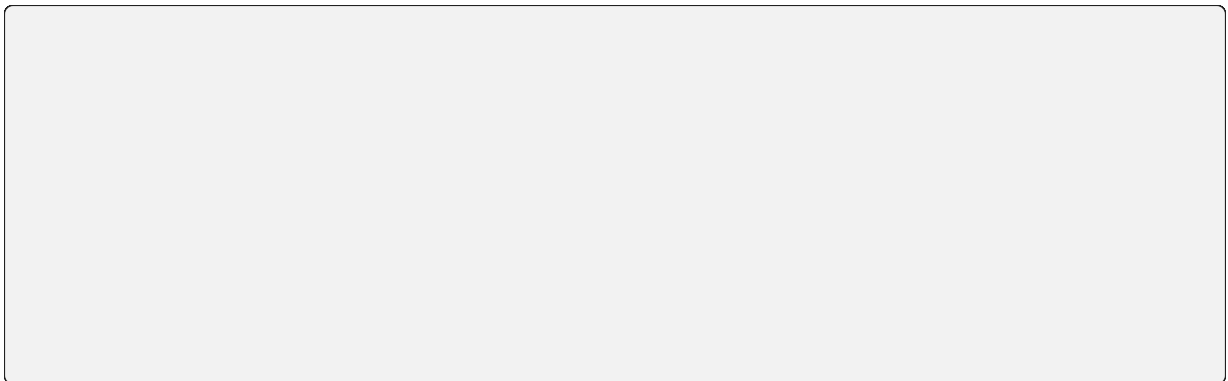
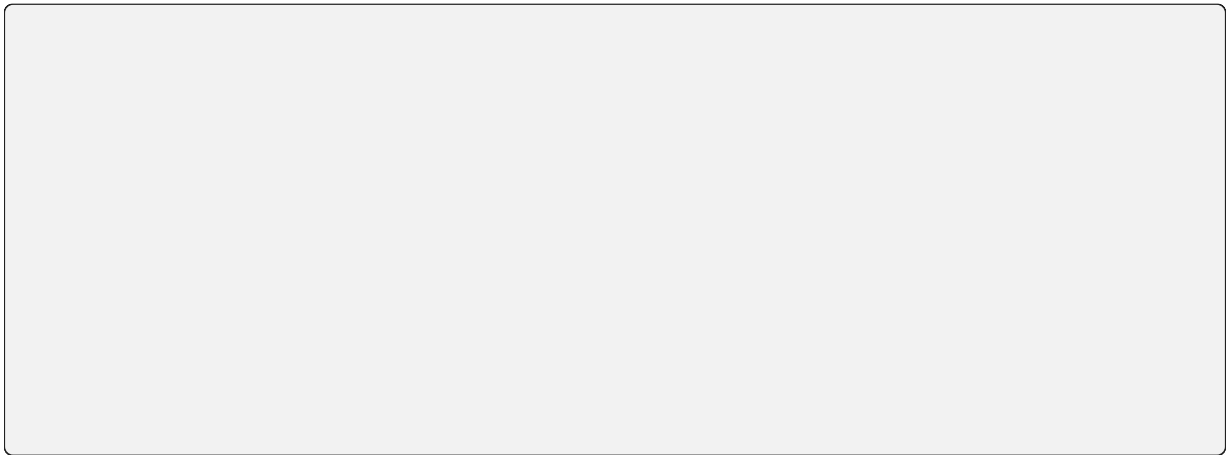
Fields	Type	Values
--------	------	--------

---

---







## Auto-completion

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Interrupt

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

## 6.2.3 Code Execution (Batch Mode)

### Uploading files

### Parameters

---

---

--


### Response

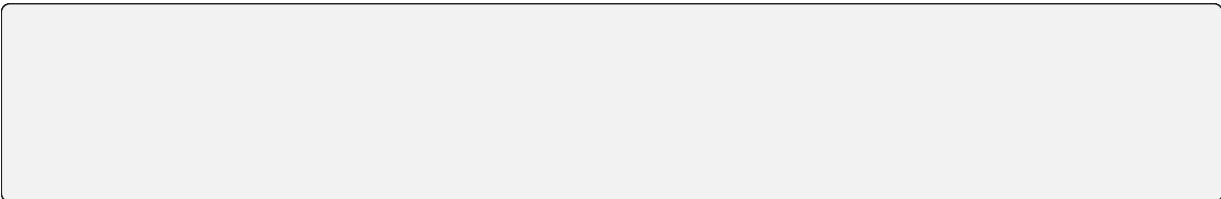
HTTP Status Code	Description



## Executing with Build Step

### Parameters

Parameter	Type	Description



### Response

HTTP Status Code	Description

Fields	Type	Values

## Listing Files

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

### Downloading Files

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

## 6.2.4 Code Execution (Streaming)

### Code Execution

## Terminal Emulation

---

---

### Parameters

Parameter	Type	Description

### Client-to-Server Protocol

#### Standard input stream

#### Terminal resize

### Ping

### Restart

### Server-to-Client Protocol

#### Standard output/error stream

### Server-side errors

## 6.2.5 Event Monitoring

### Session Lifecycle Events

## Parameters

Parameter	Type	Description
		,
		,

## Responses

Event Name	Description

---

---

Field Name	Description

## Background Task Progress Events

### Parameters

Parameter	Type	Description

### Responses

Event Name	Description

Field Name	Type	Description

“”

### 6.2.6 Service Ports (aka Service Proxies)

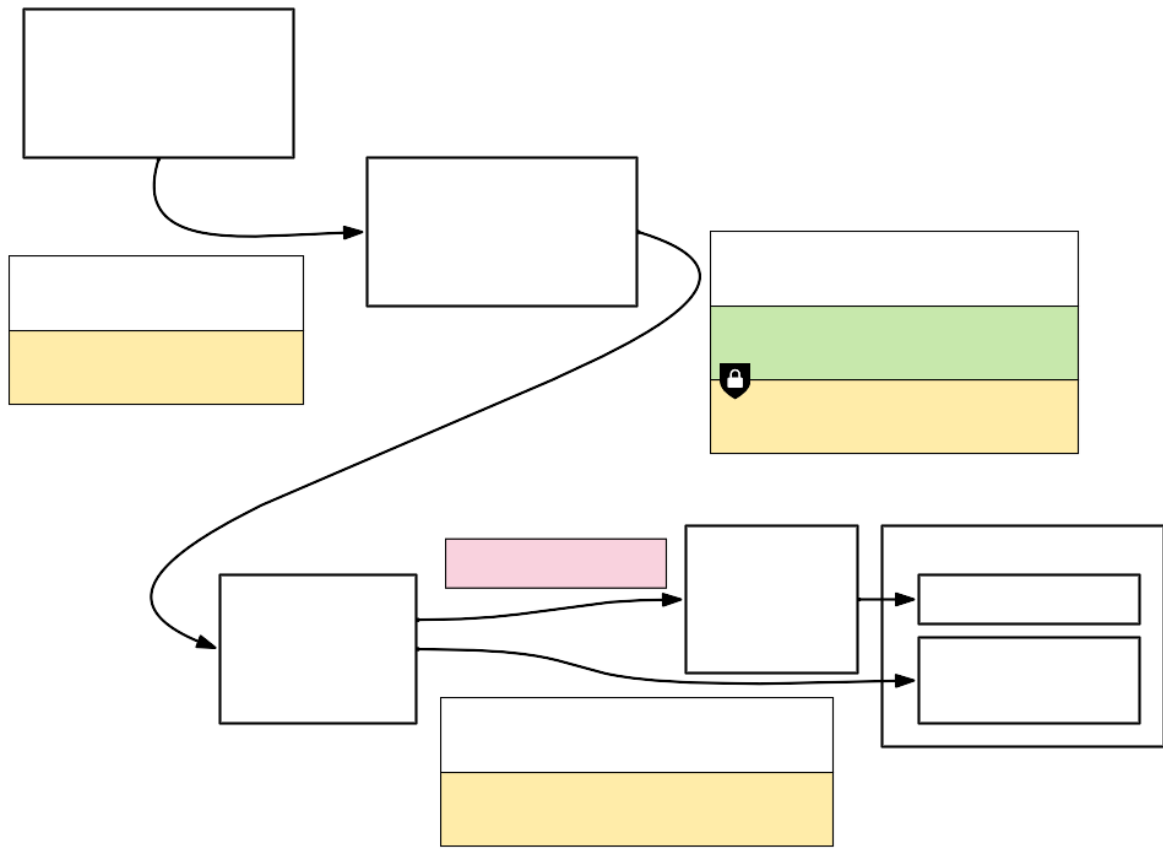
“”

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,

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---



## Service Proxy (HTTP)

### Parameters

Parameter	Type	Description

## Service Proxy (TCP)

### Parameters

Parameter	Type	Description

## 6.2.7 Resource Presets

### Listing Resource Presets



## Parameters

## Response

HTTP Status Code	Description

Fields	Type	Values

## Checking Allocatability of Resource Presets

,

## Parameters

## Response

HTTP Status Code	Description

Fields	Type	Values
		“”.
		“”.
		“”
		”

## 6.2.8 Virtual Folders

## Listing Virtual Folders

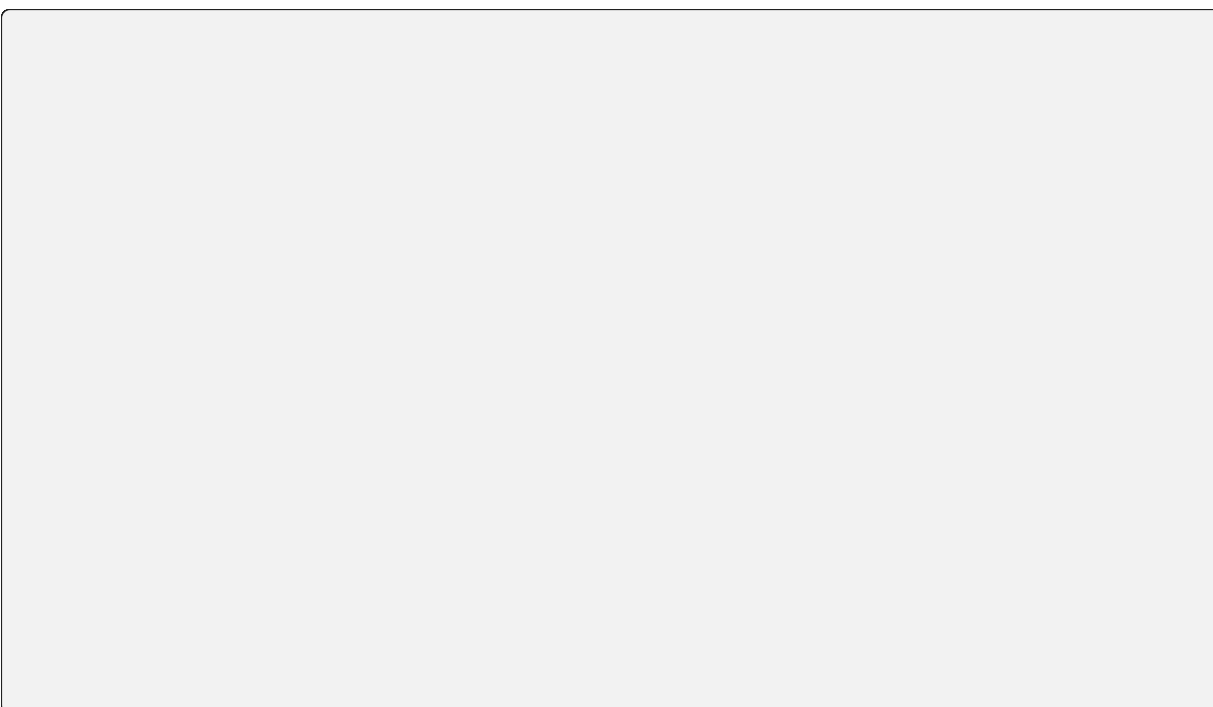
### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values



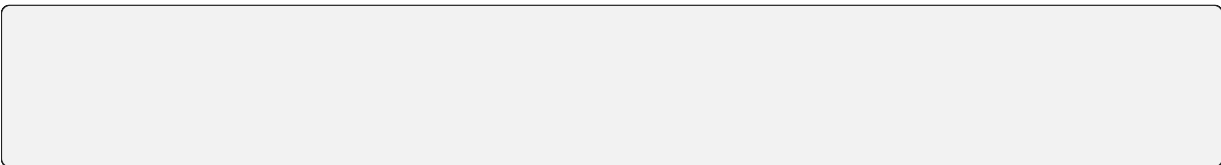
## Listing Virtual Folder Hosts

### Parameters

### Response

HTTP Status Code	Description

Fields	Type	Values

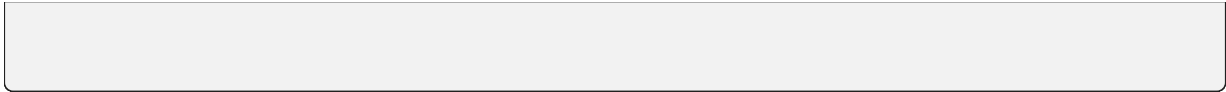


## Creating a Virtual Folder

### Parameters

Parameter	Type	Description

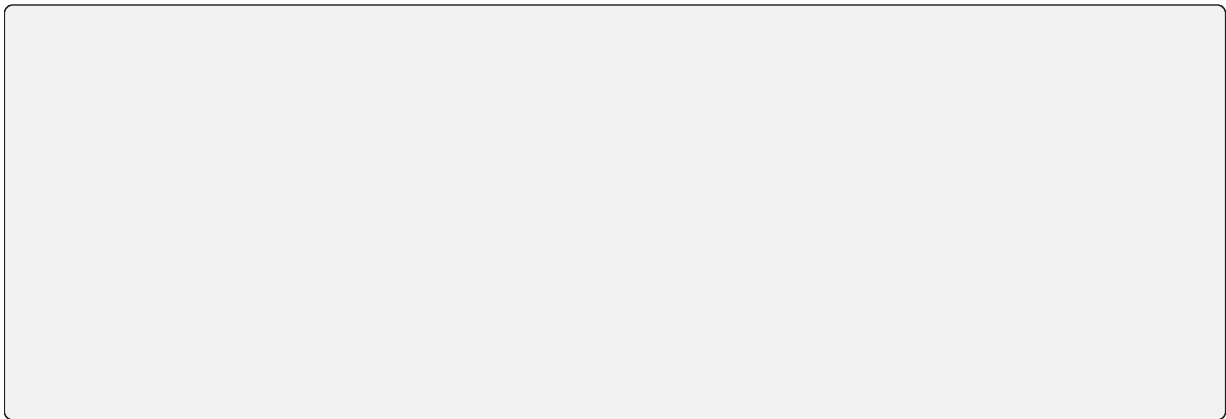




### Response

HTTP Status Code	Description

Fields	Type	Values



### Getting Virtual Folder Information

### Parameters

Parameter	Type	Description
-----------	------	-------------

### Response

HTTP Status Code	Description
------------------	-------------

Fields	Type	Values
--------	------	--------

### Deleting Virtual Folder

### Parameters

Parameter	Description
-----------	-------------

### Response

HTTP Status Code	Description
------------------	-------------

### Rename a Virtual Folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

### Listing Files in Virtual Folder

#### Parameters

Parameter	Type	Description

#### Response

HTTP Status Code	Description

Fields	Type	Values

### Uploading a File to Virtual Folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

### Creating New Directory in Virtual Folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

## Downloading a File or a Directory from a Virtual Folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Deleting Files in Virtual Folder

### Parameters

Parameter	Type	Description



### Response

HTTP Status Code	Description

### Rename a File in Virtual Folder

#### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

### Listing Invitations for Virtual Folder

#### Parameters

### Response

HTTP Status Code	Description

Fields	Type	Values

## Creating an Invitation

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Accepting an Invitation

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

## Rejecting an Invitation

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Listing Sent Invitations

### Parameters

### Response

HTTP Status Code	Description

Fields	Type	Values

## Updating an Invitation

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Leave an Shared Virtual Folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Listing Users Share Virtual Folders

,

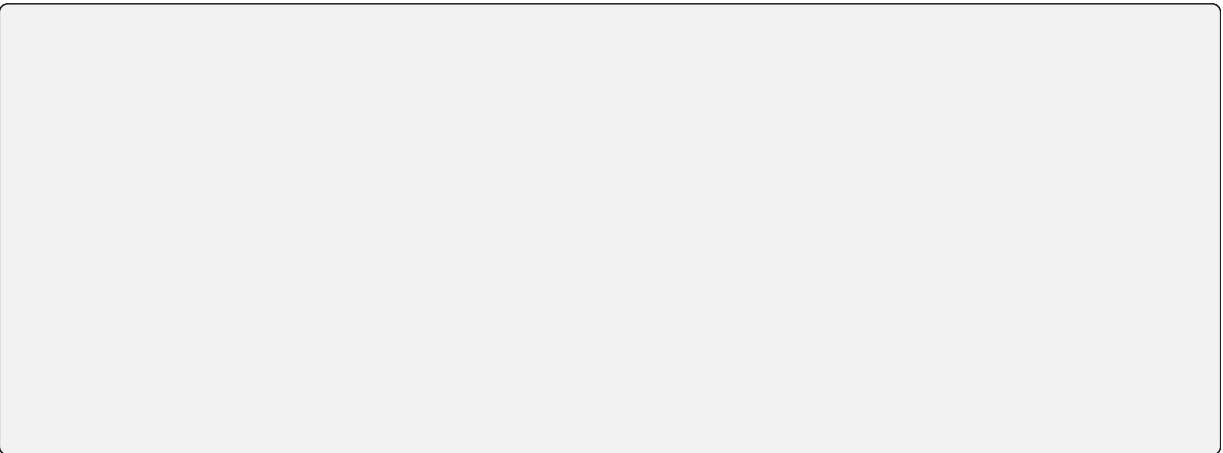
### Parameters

Parameter	Type	Description
-----------	------	-------------

### Response

HTTP Status Code	Description
------------------	-------------

Fields	Type	Values
--------	------	--------



### Updating the permission of a shared virtual folder

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

### Share a Group Virtual Folder to an Individual Users

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Unshare a Group Virtual Folder from Users

### Parameters

Parameter	Type	Description

### Response

HTTP Status Code	Description

Fields	Type	Values

## Clone a Virtual Folder

### Parameters

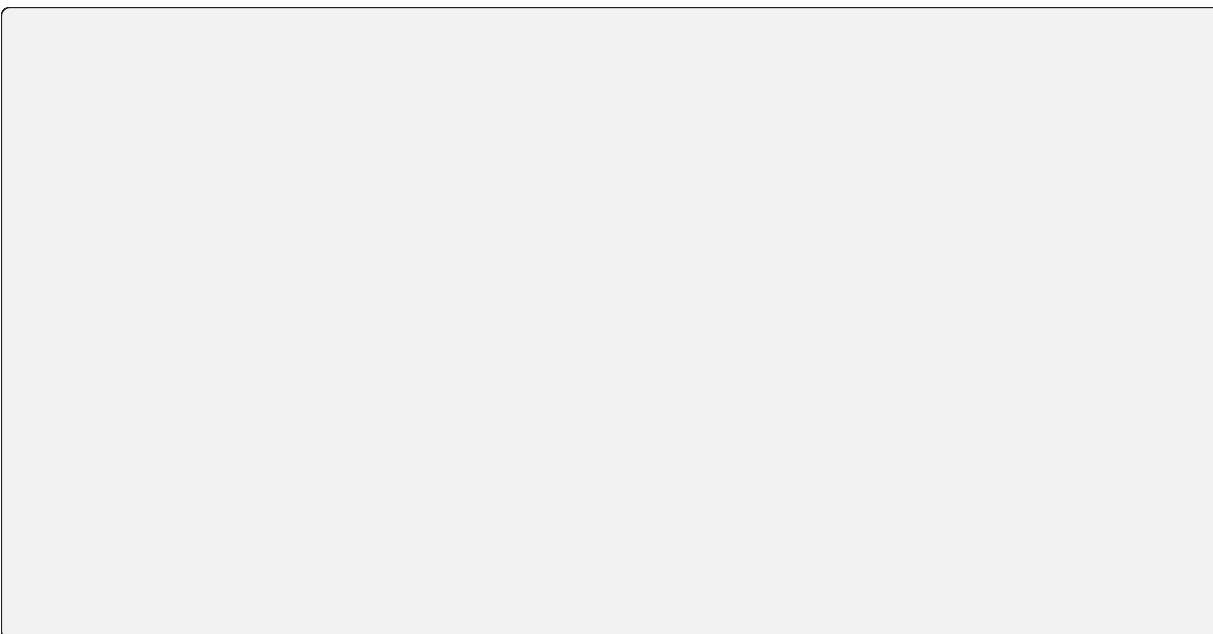
Parameter	Type	Description

## Response

HTTP Status Code	Description

Fields	Type	Values

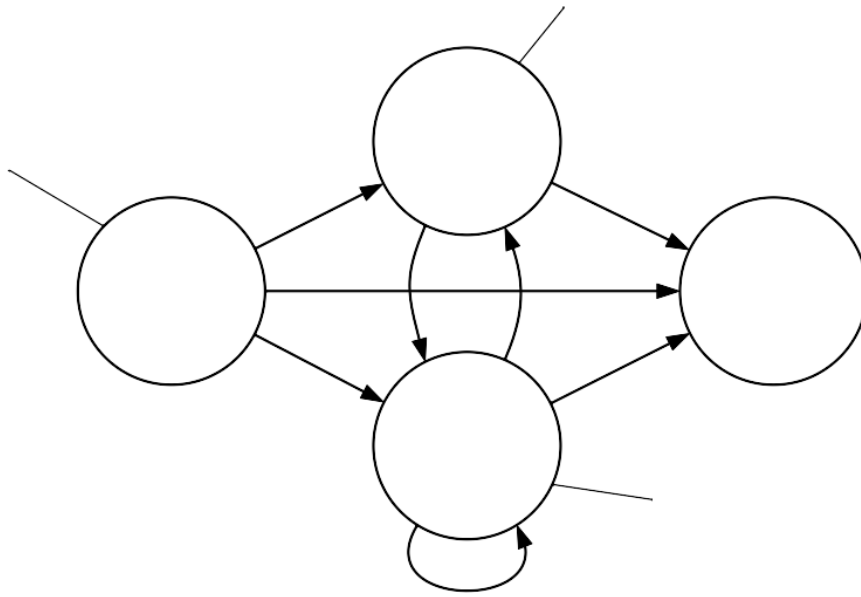
Fields	Type	Values



### 6.2.9 Code Execution Model

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“”

,

### 6.2.10 Handling Console Output

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,

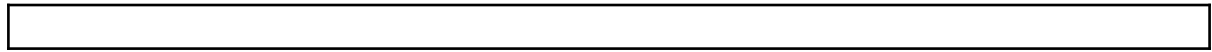
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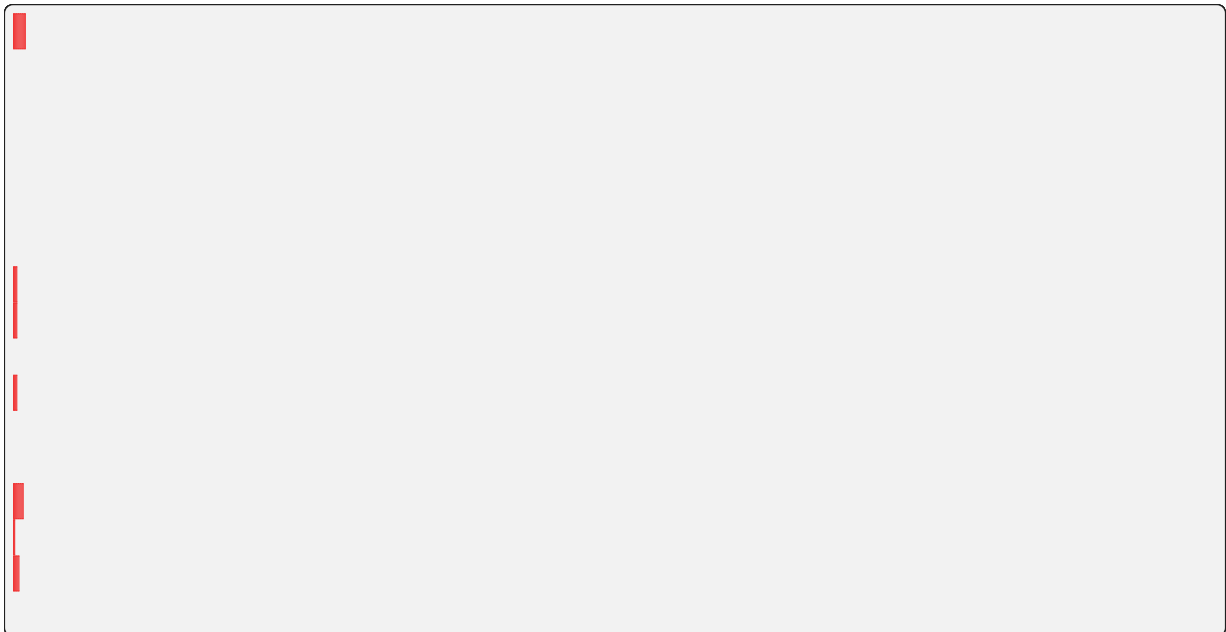
---

## 6.3 Manager GraphQL API

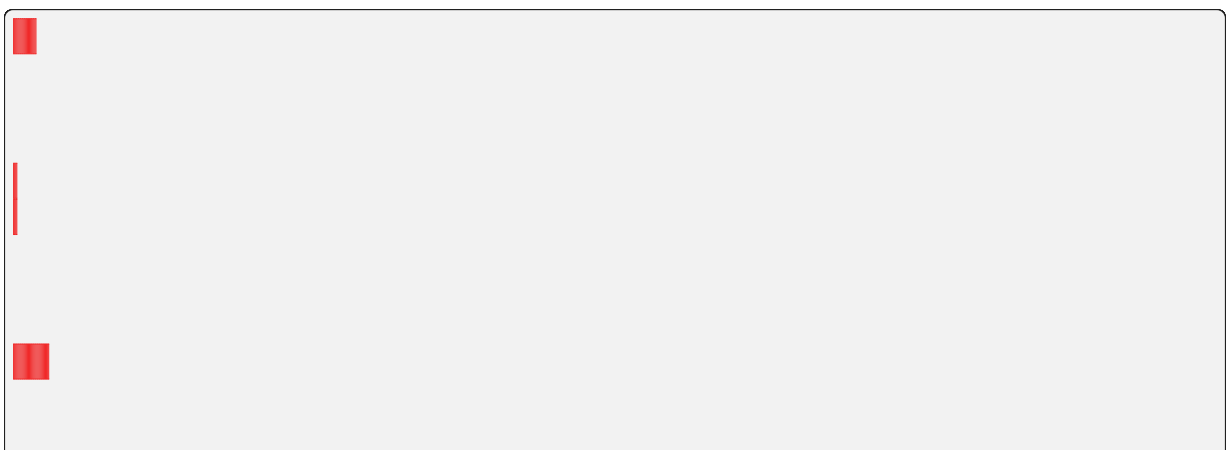


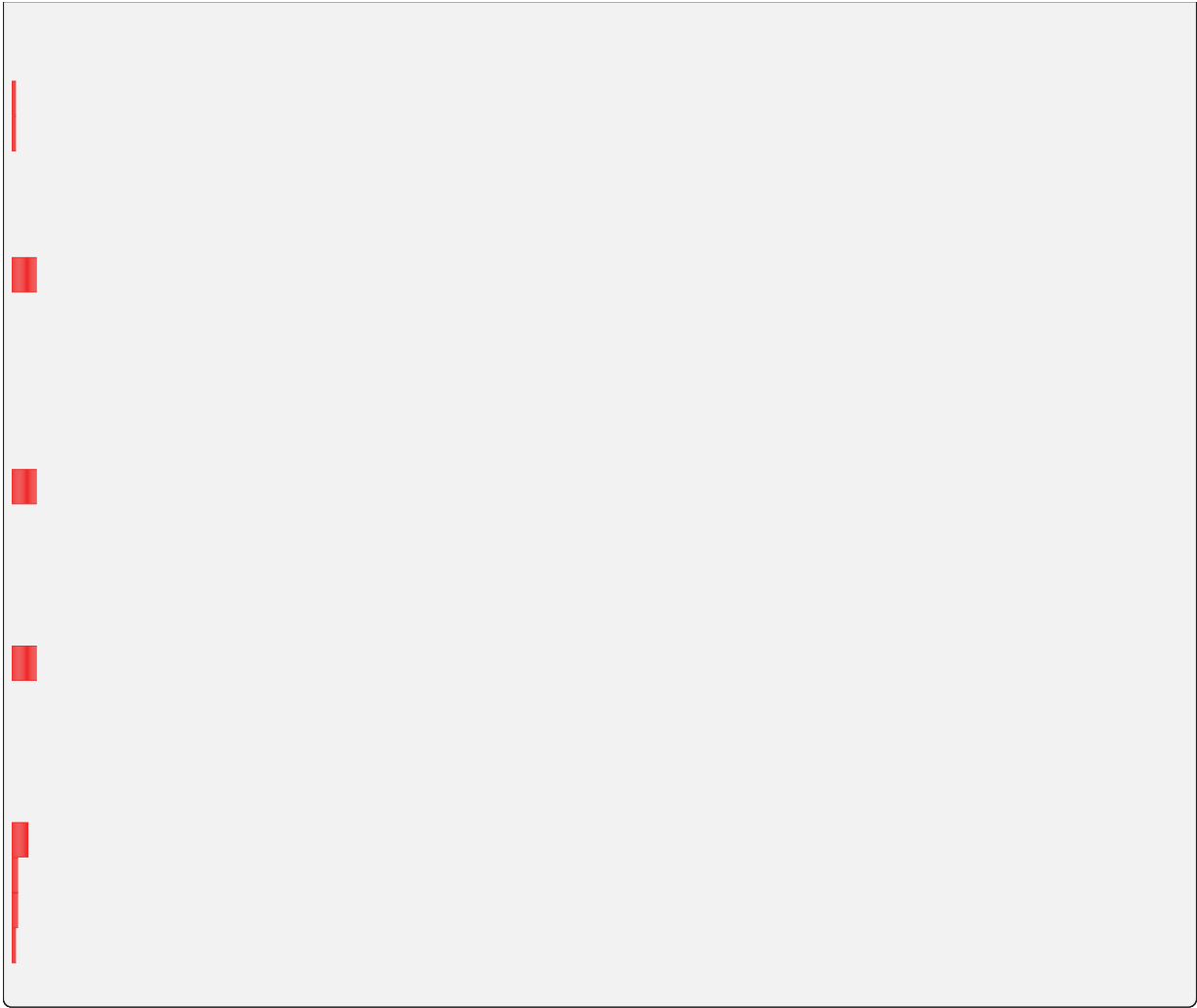
### 6.3.1 Domain Management

#### Query Schema



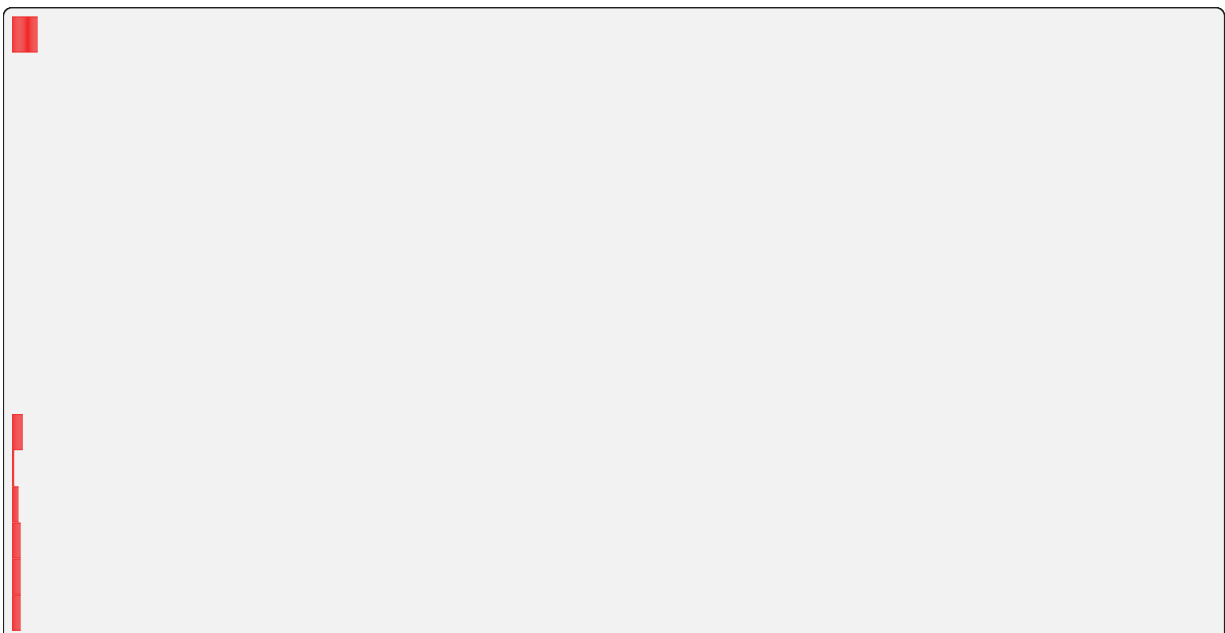
#### Mutation Schema



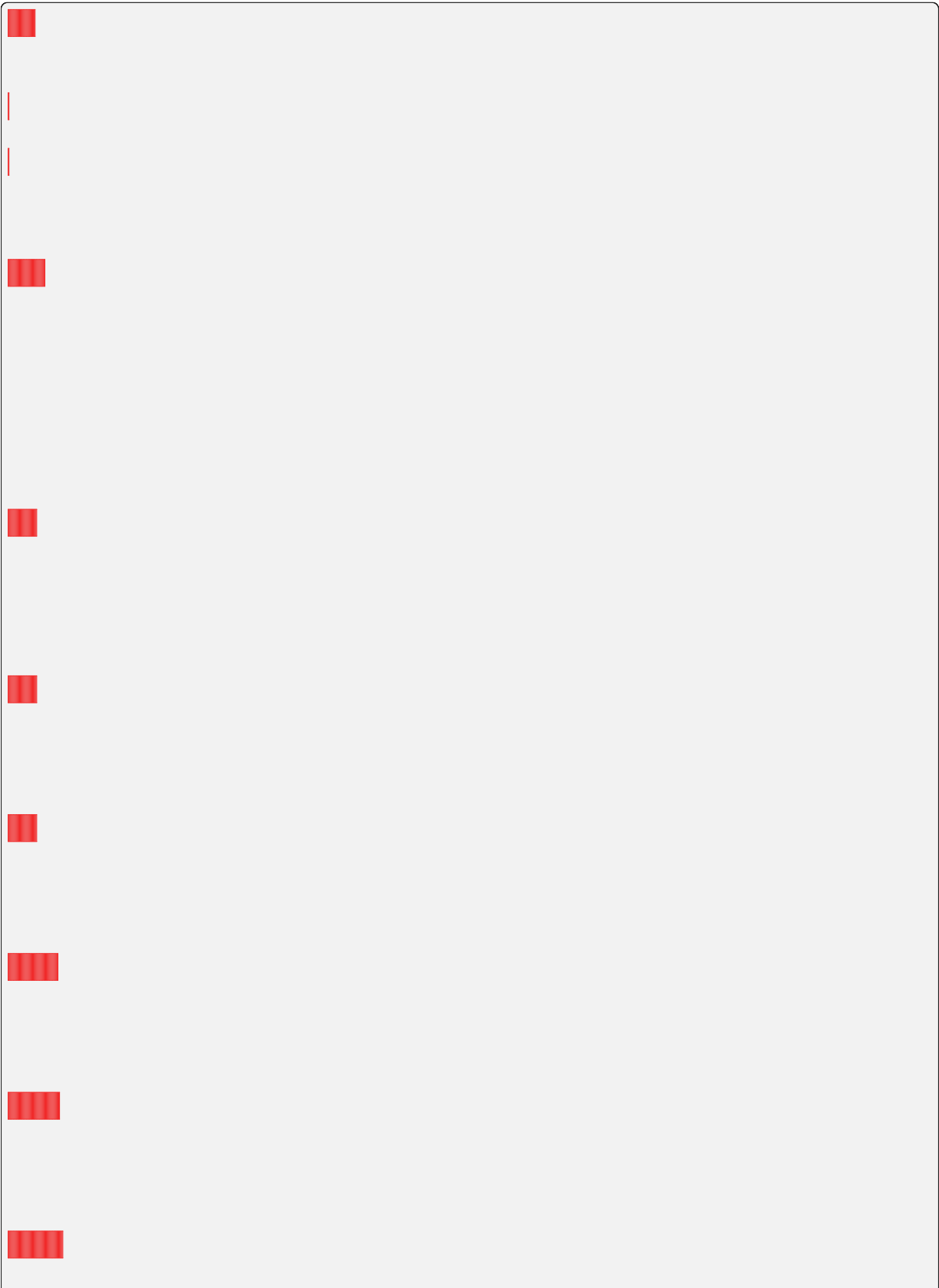


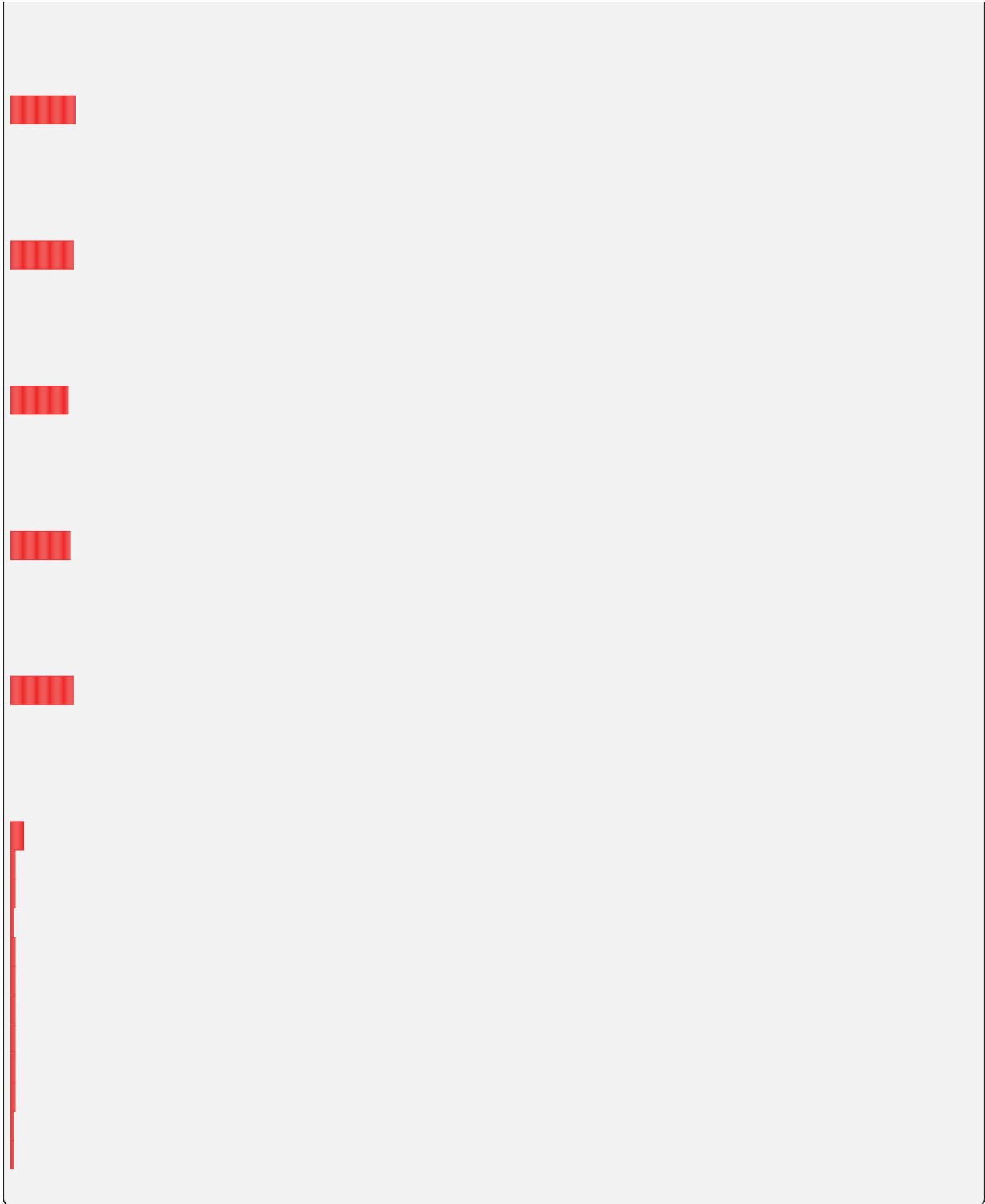
### 6.3.2 Scaling Group Management

#### Query Schema



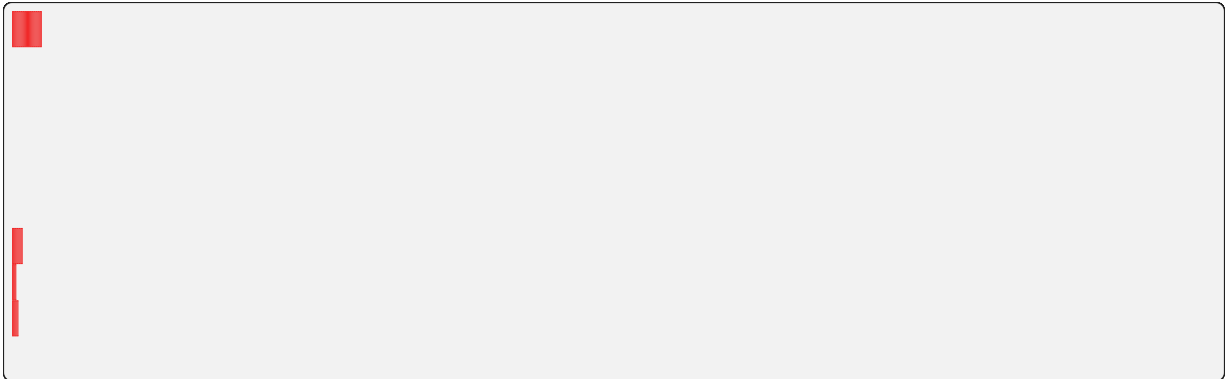
## Mutation Schema



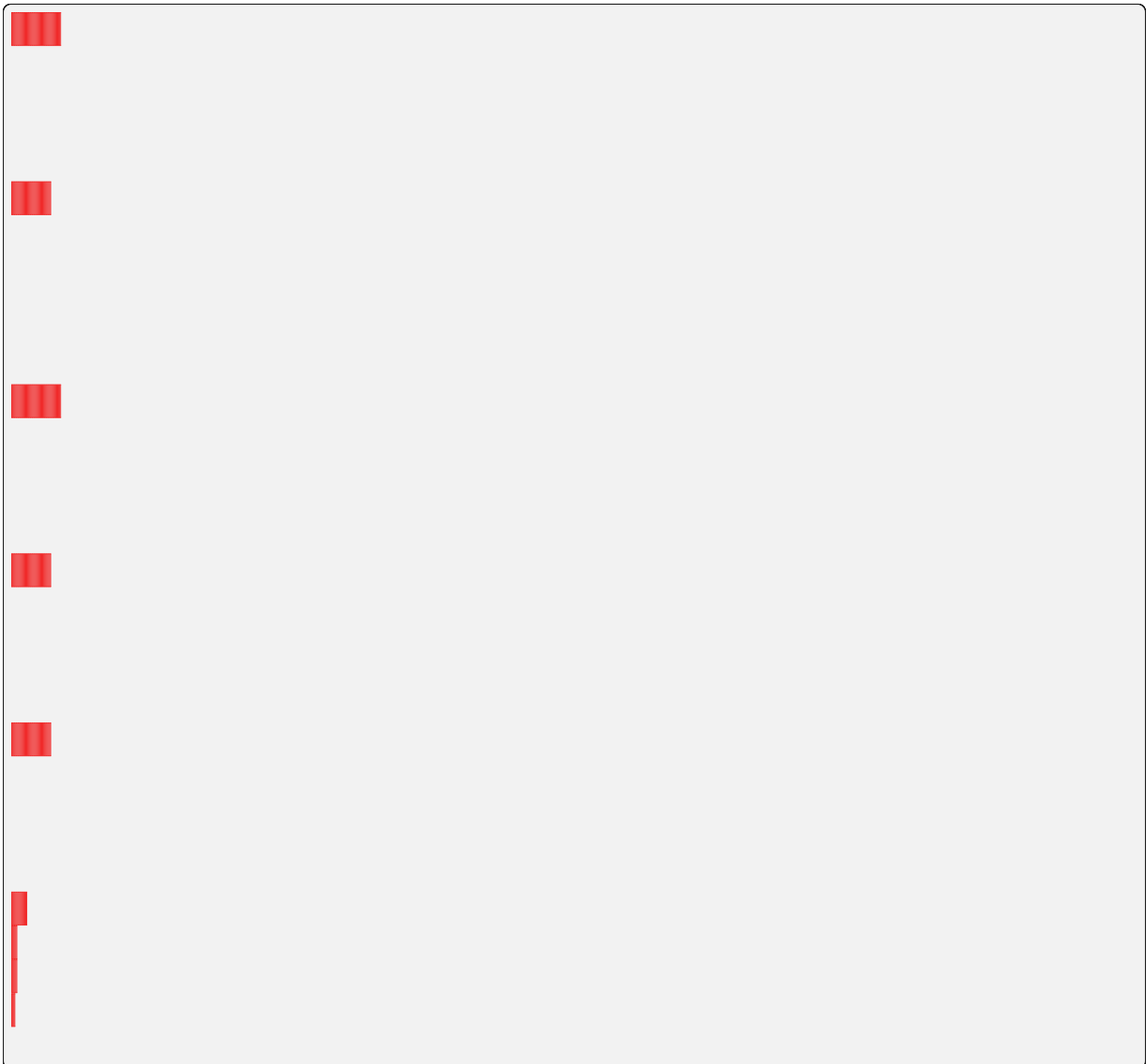


### 6.3.3 Resource Preset Management

#### Query Schema

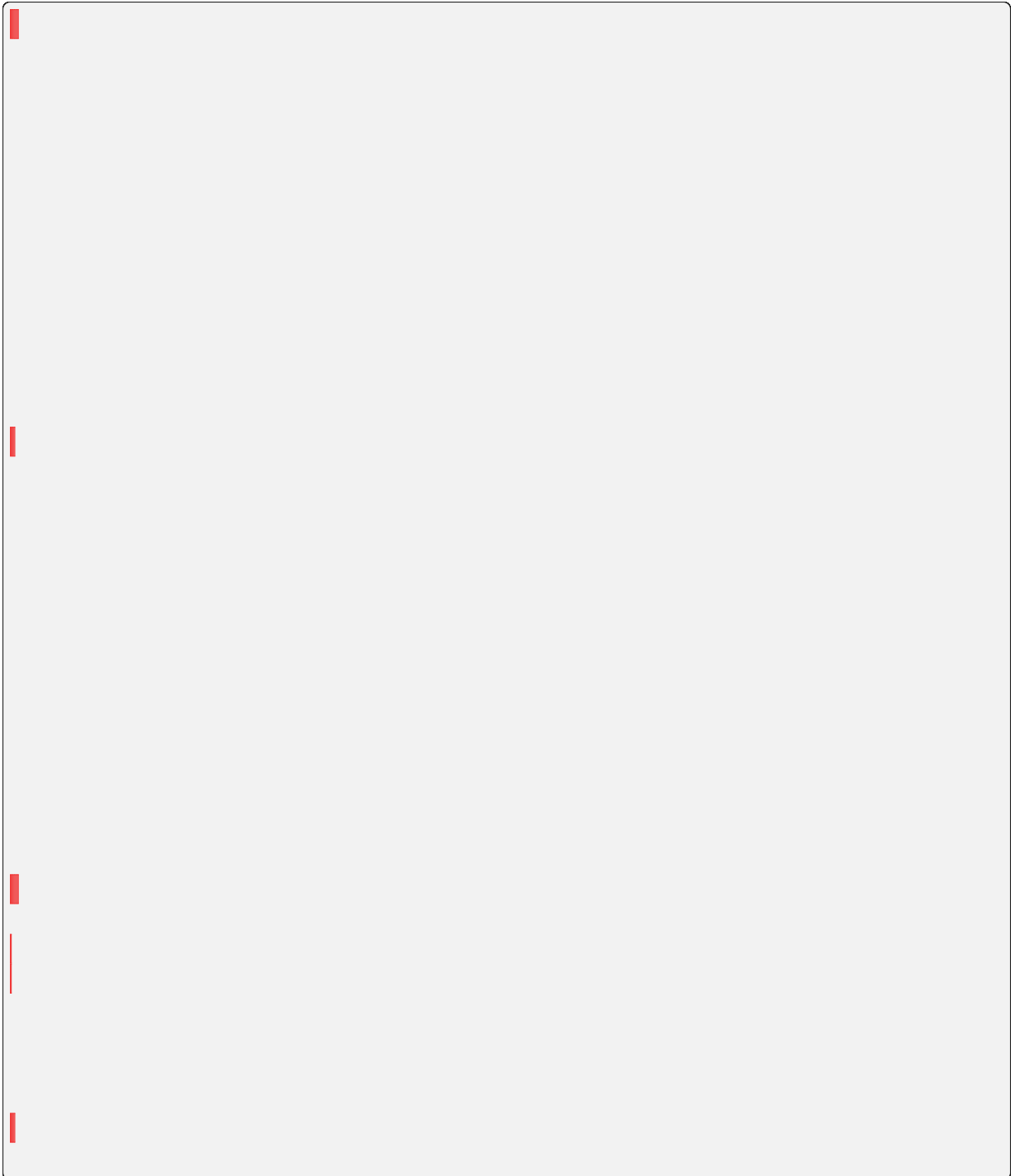


#### Mutation Schema



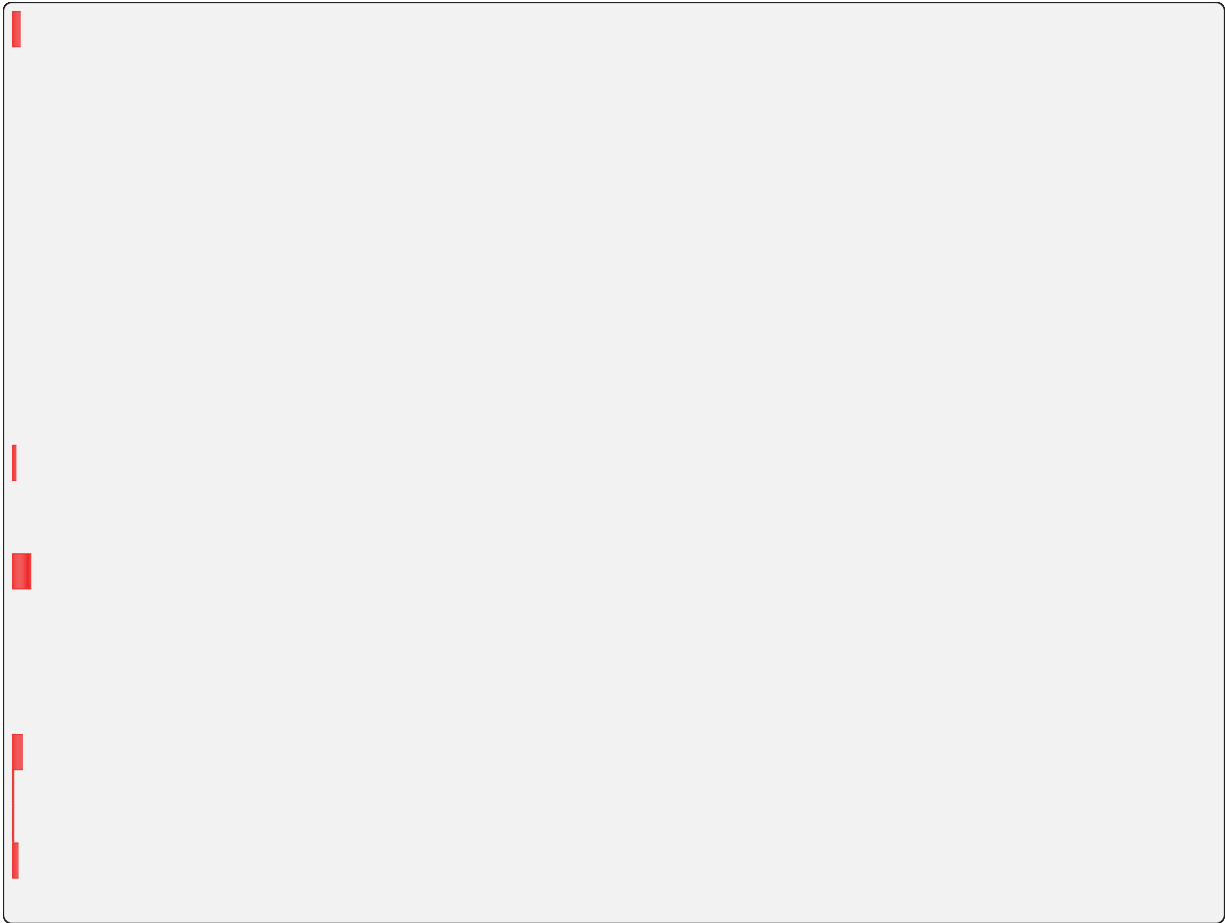
## 6.3.4 Agent Monitoring

### Query Schema

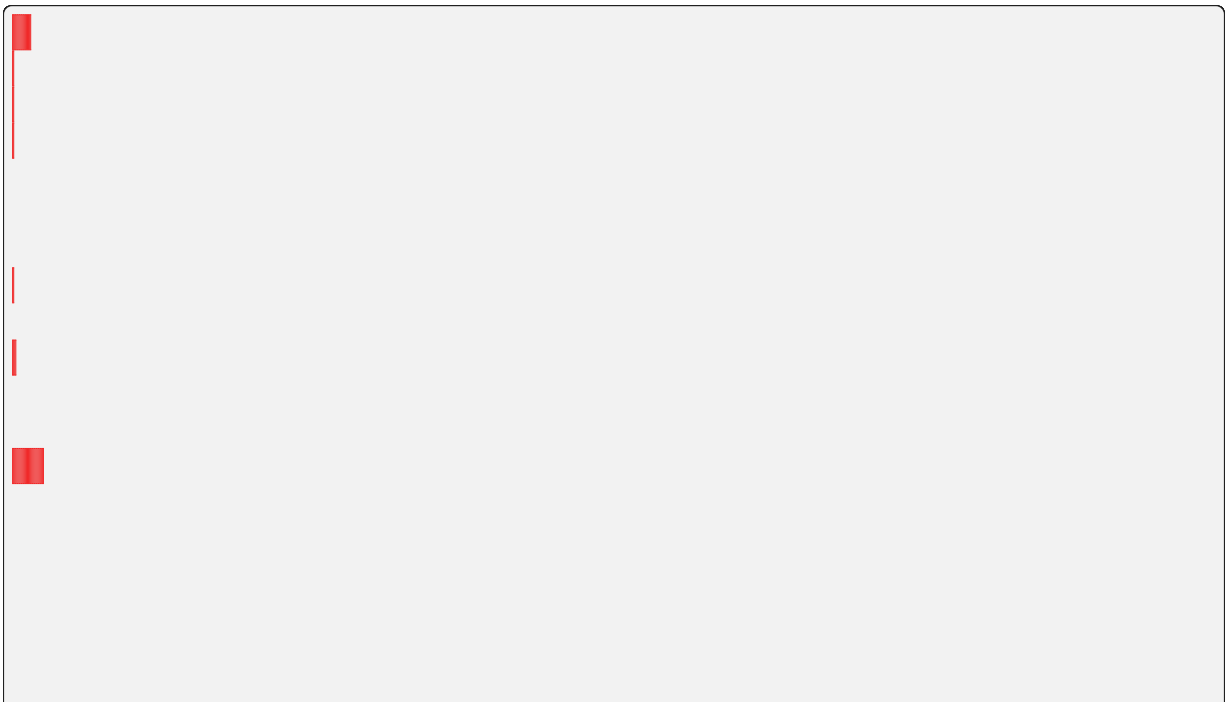


## 6.3.5 User Management

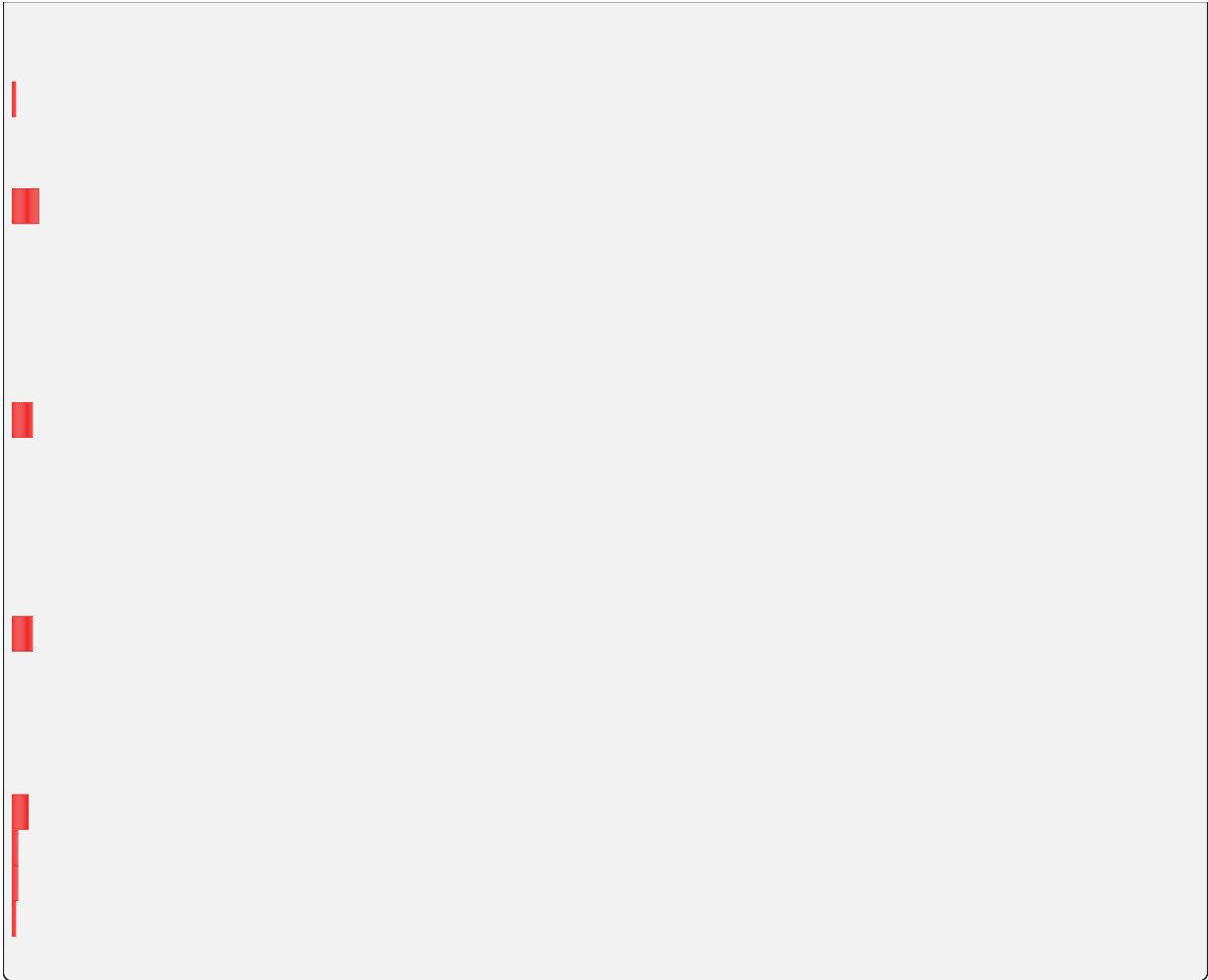
### Query Schema



### Mutation Schema

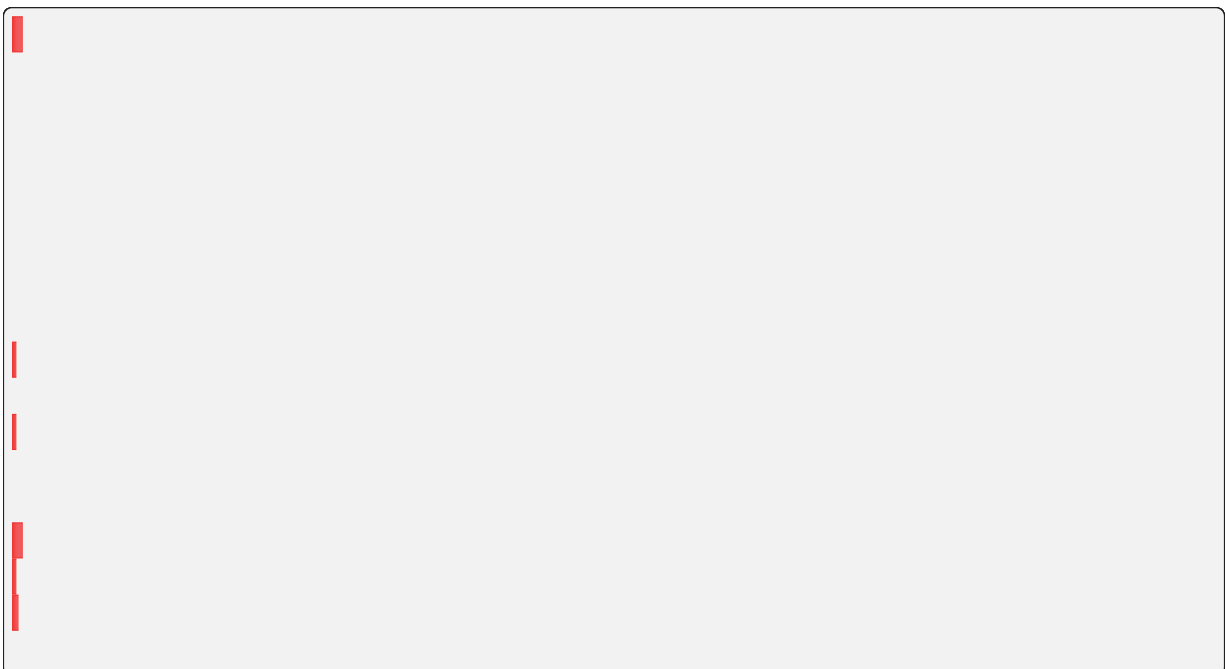






### 6.3.6 Group Management

#### Query Schema

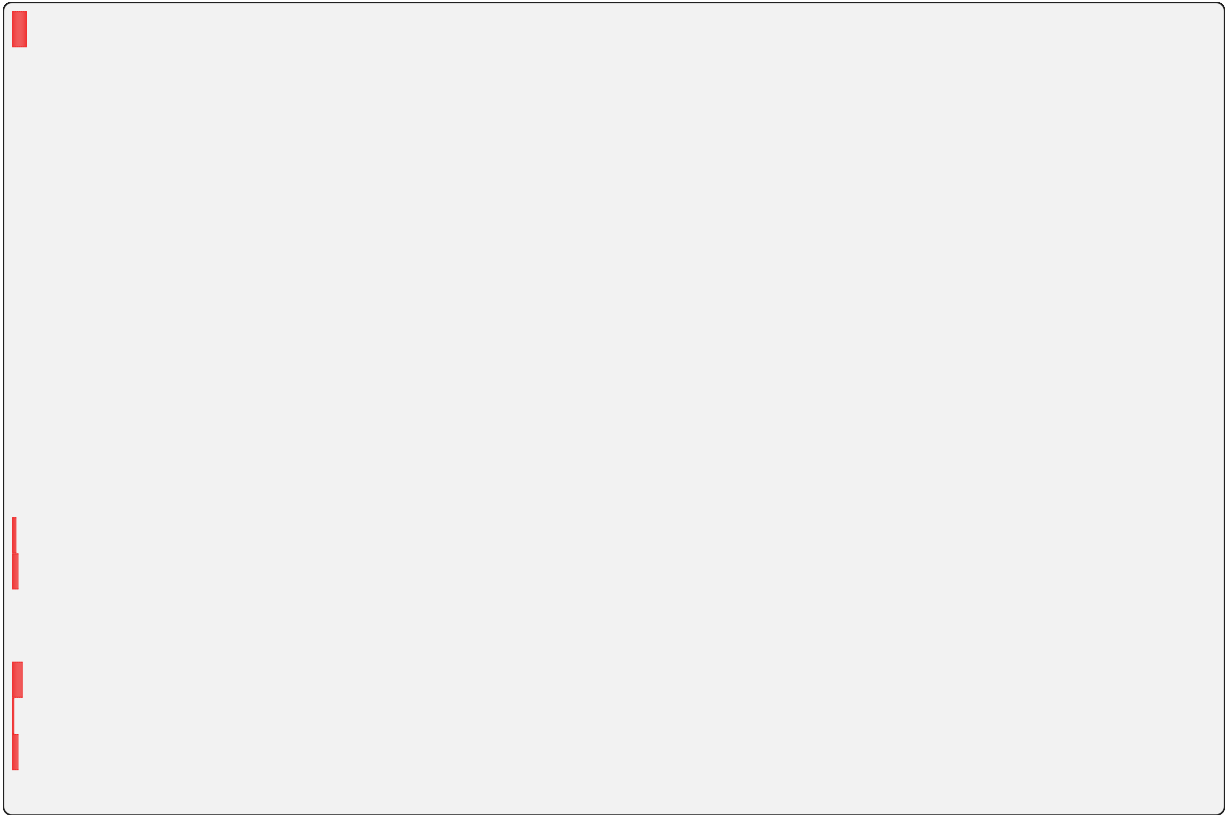


## Mutation Schema

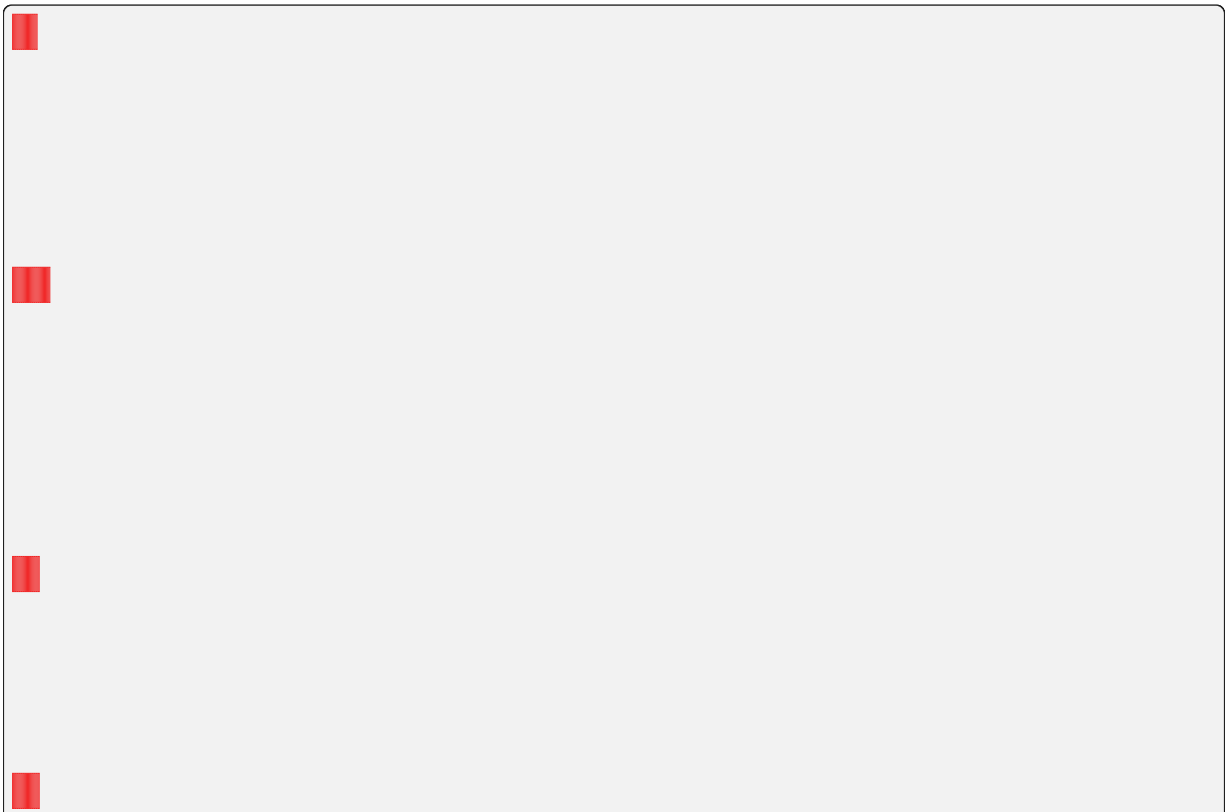


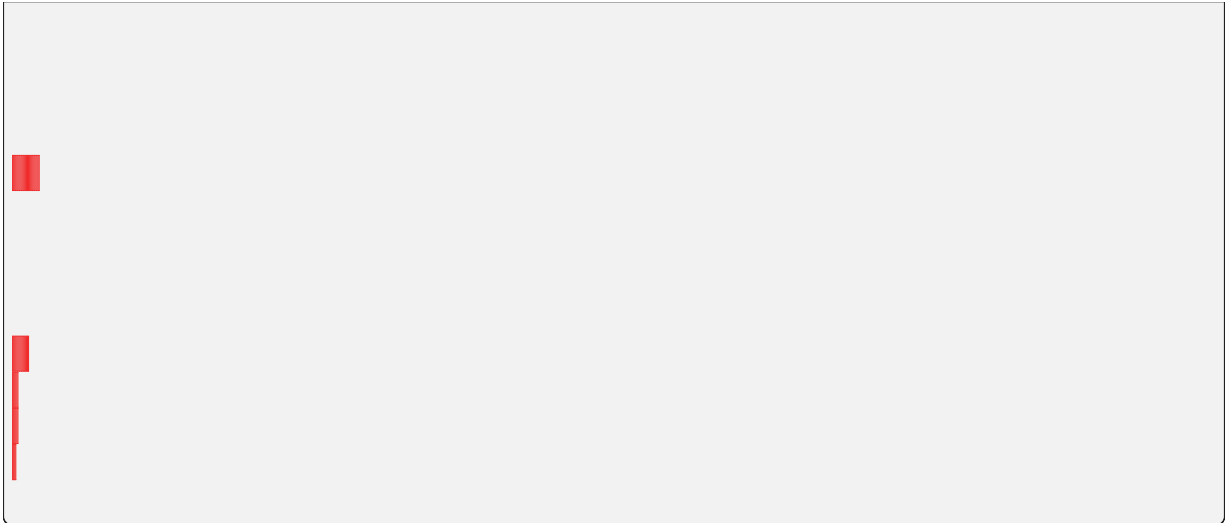
## 6.3.7 KeyPair Management

### Query Schema



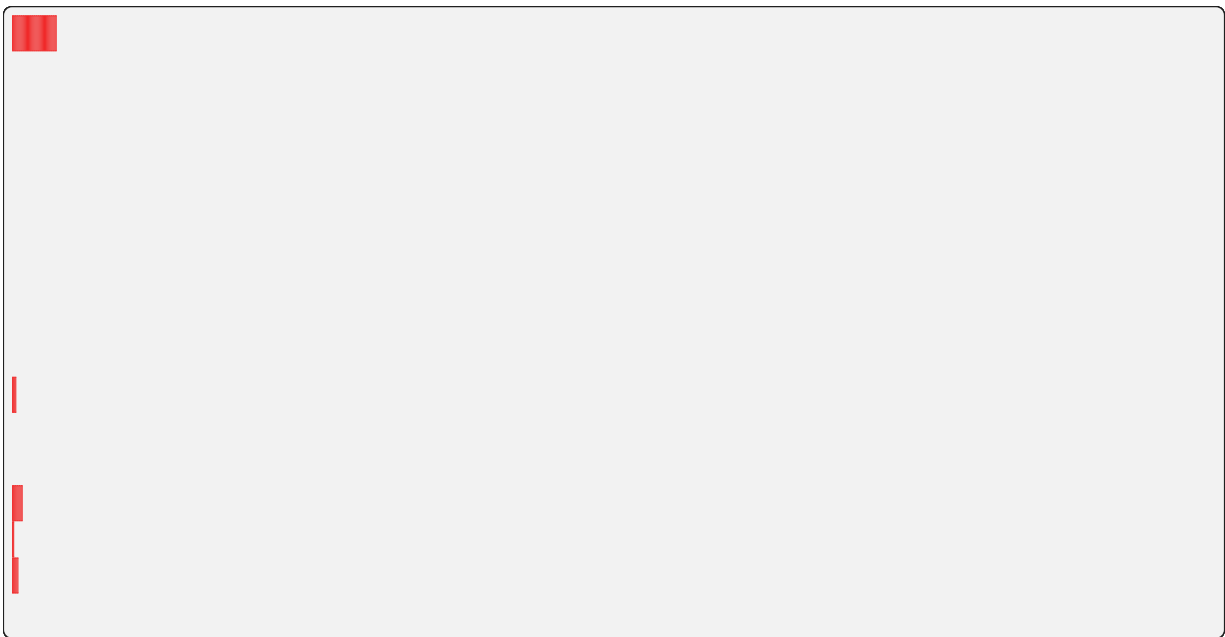
### Mutation Schema



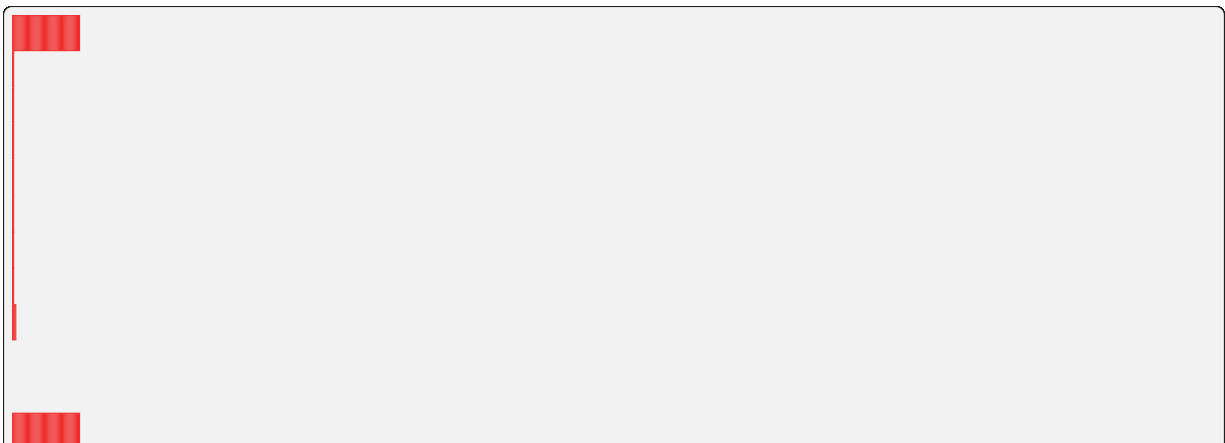


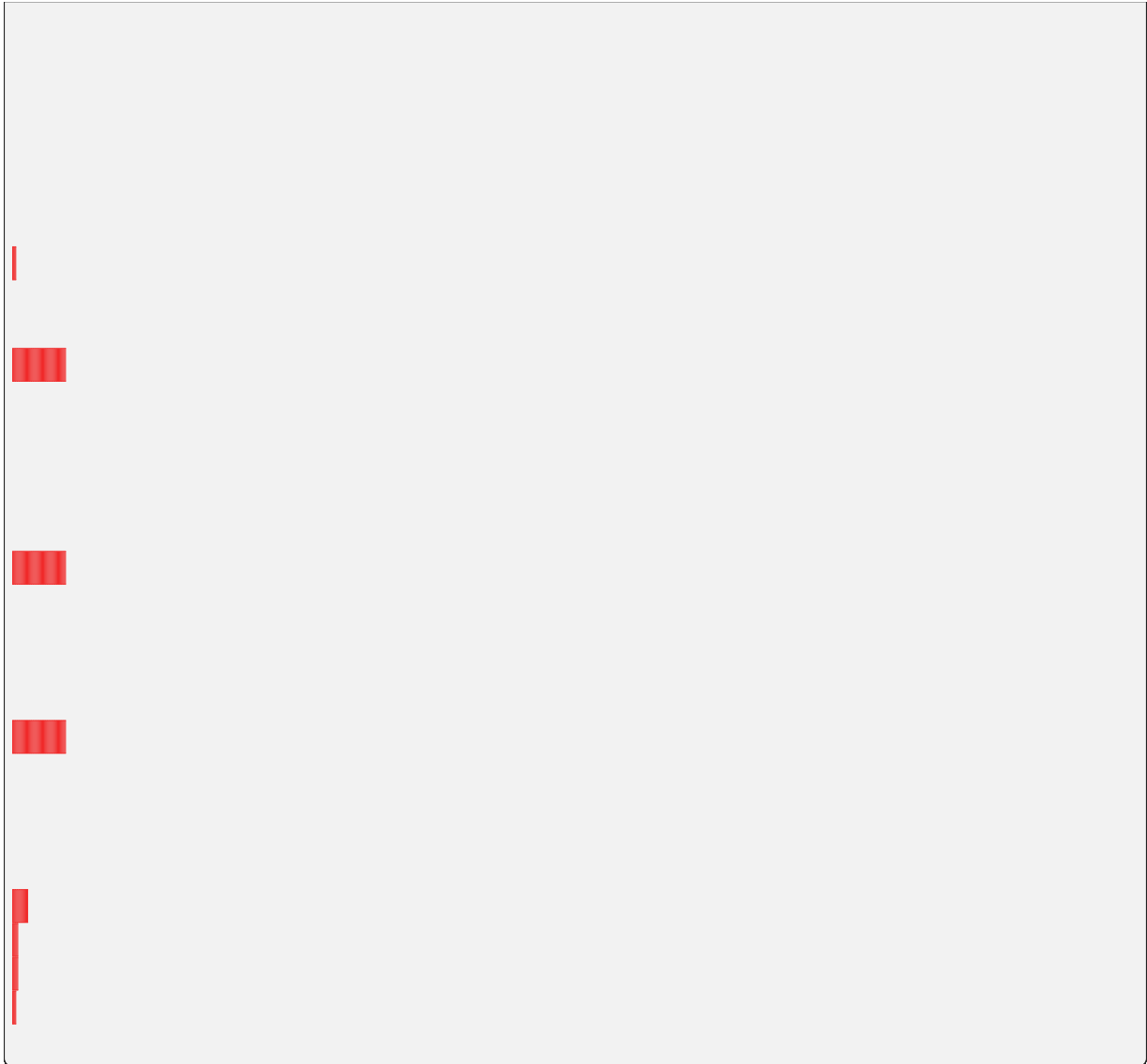
### 6.3.8 KeyPair Resource Policy Management

#### Query Schema



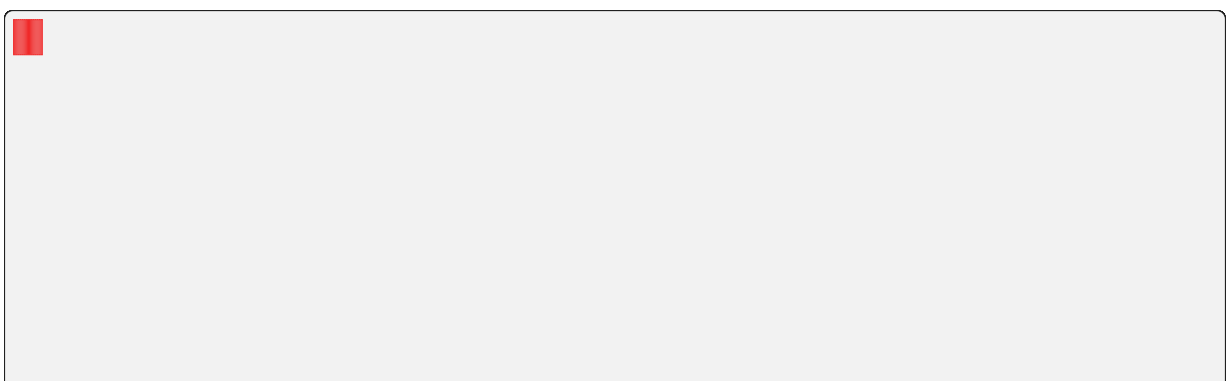
#### Mutation Schema

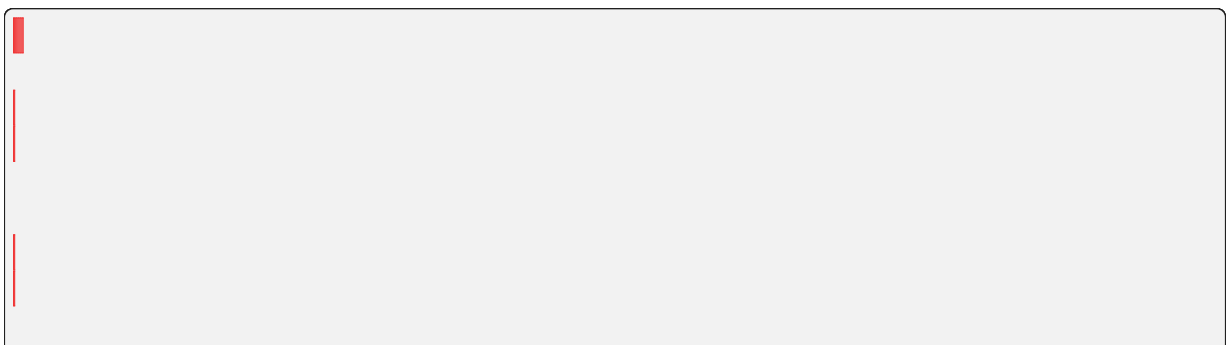
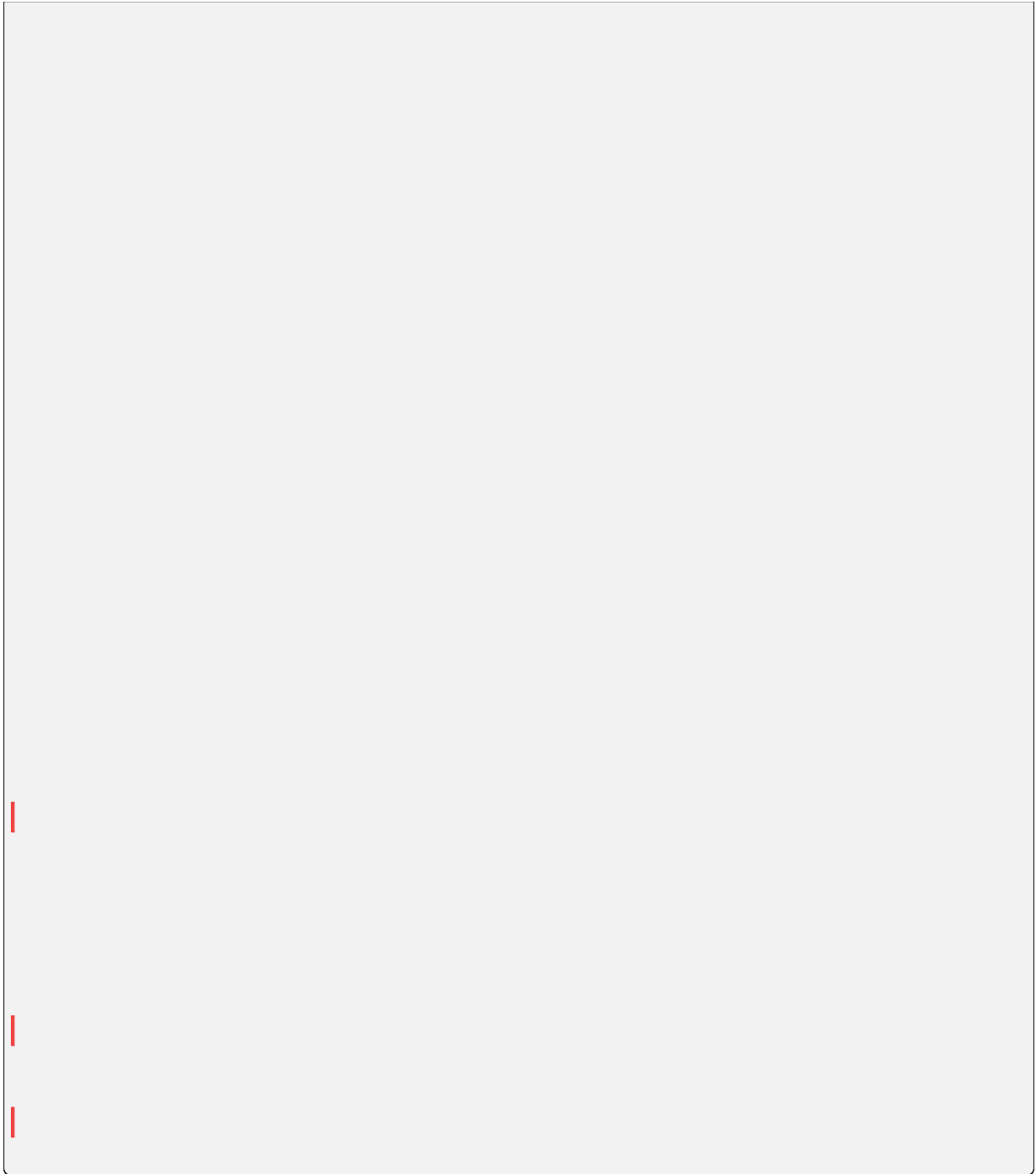


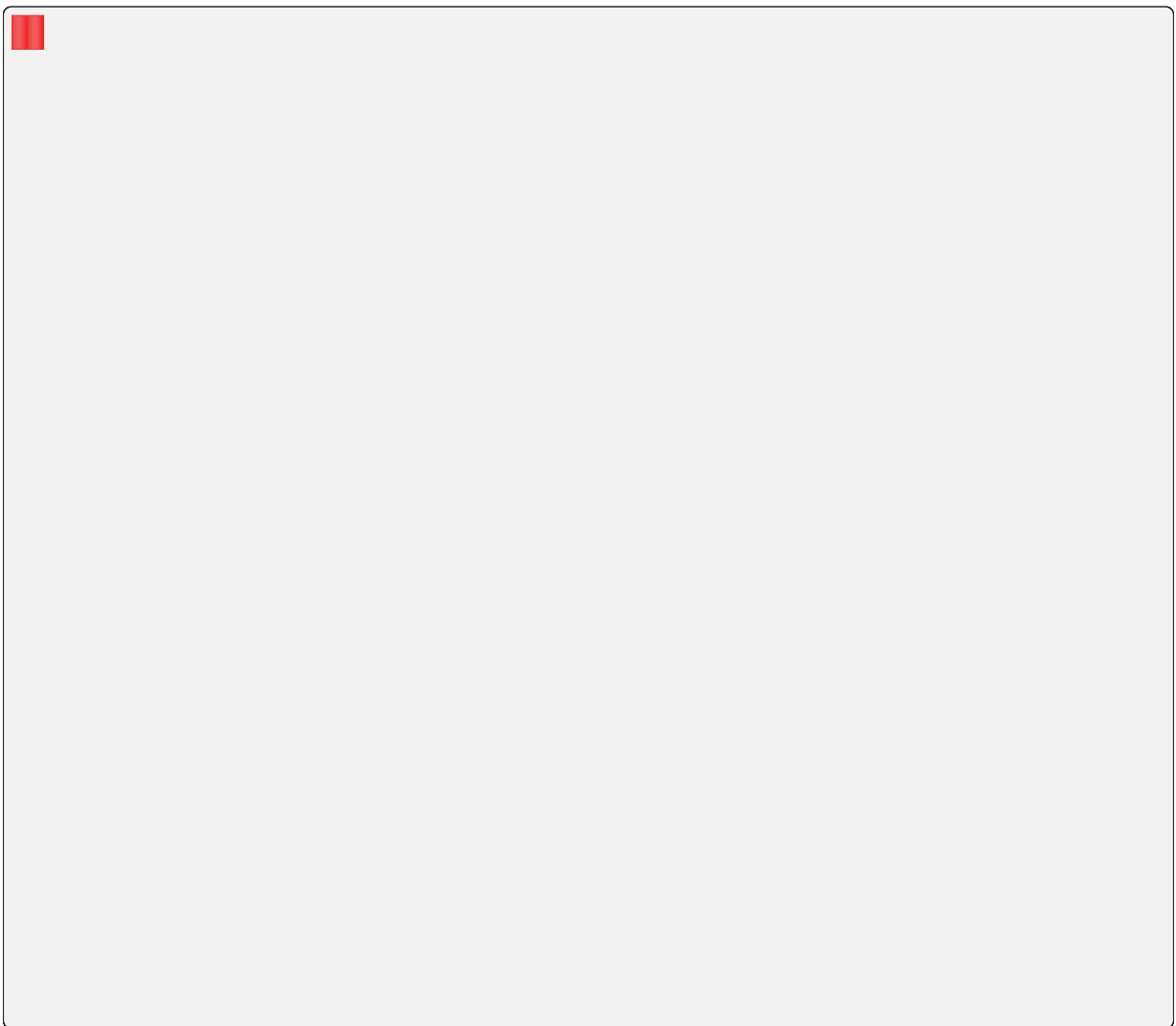
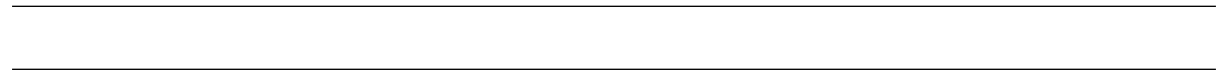


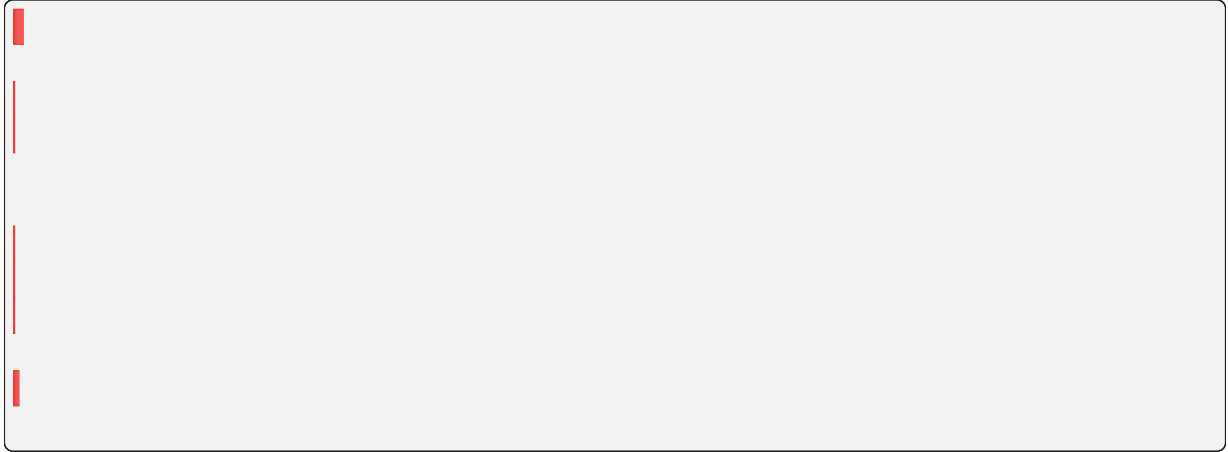
### 6.3.9 Compute Session Monitoring

#### Query Schema

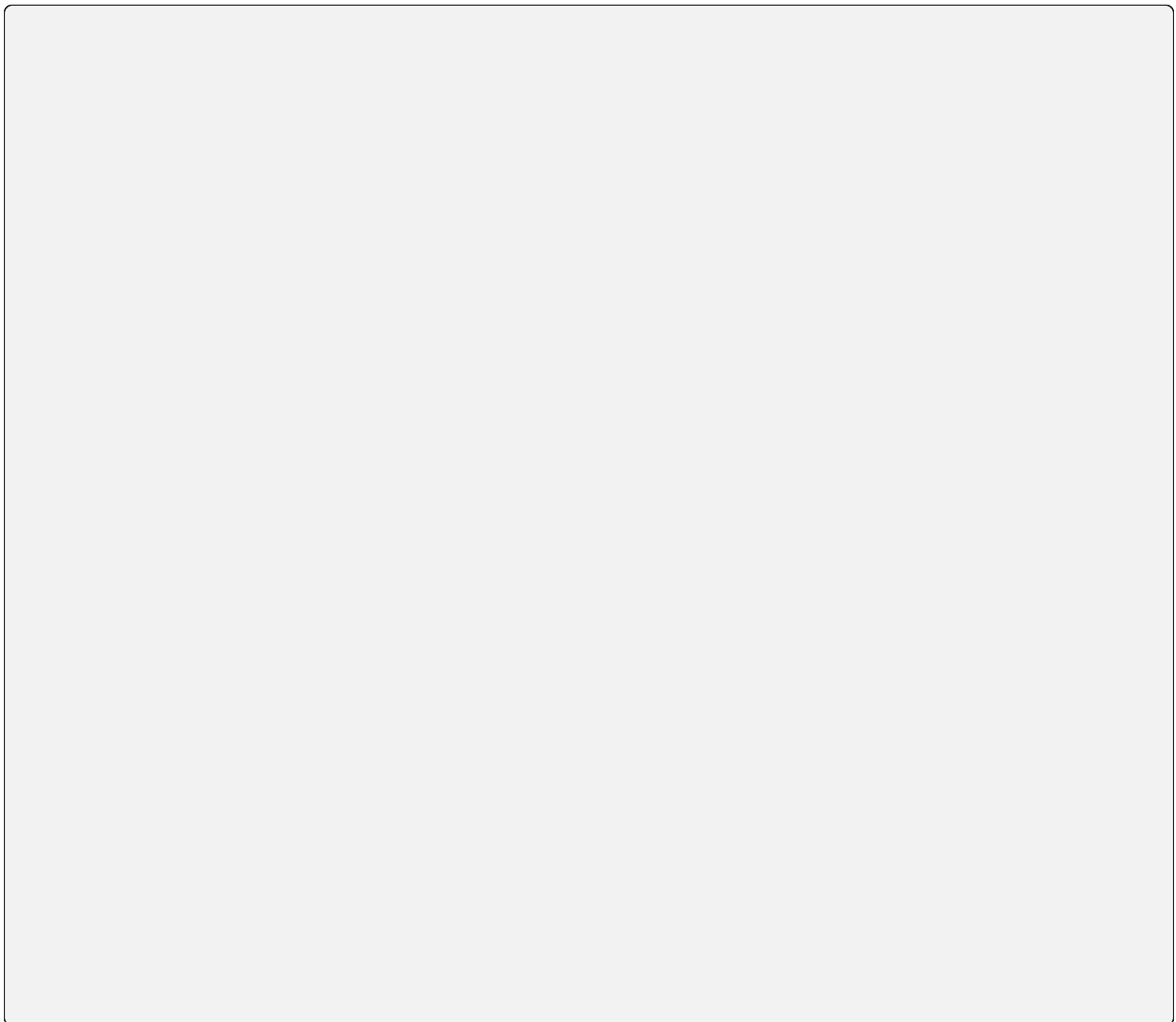






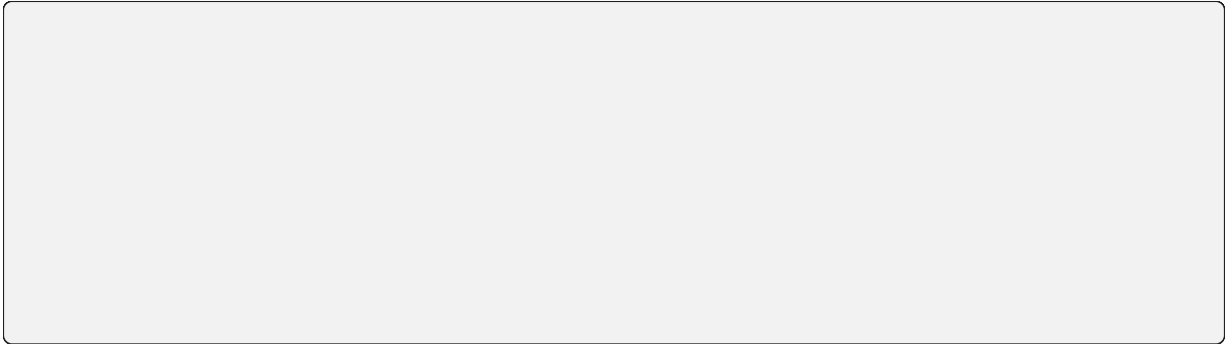


### Query Example

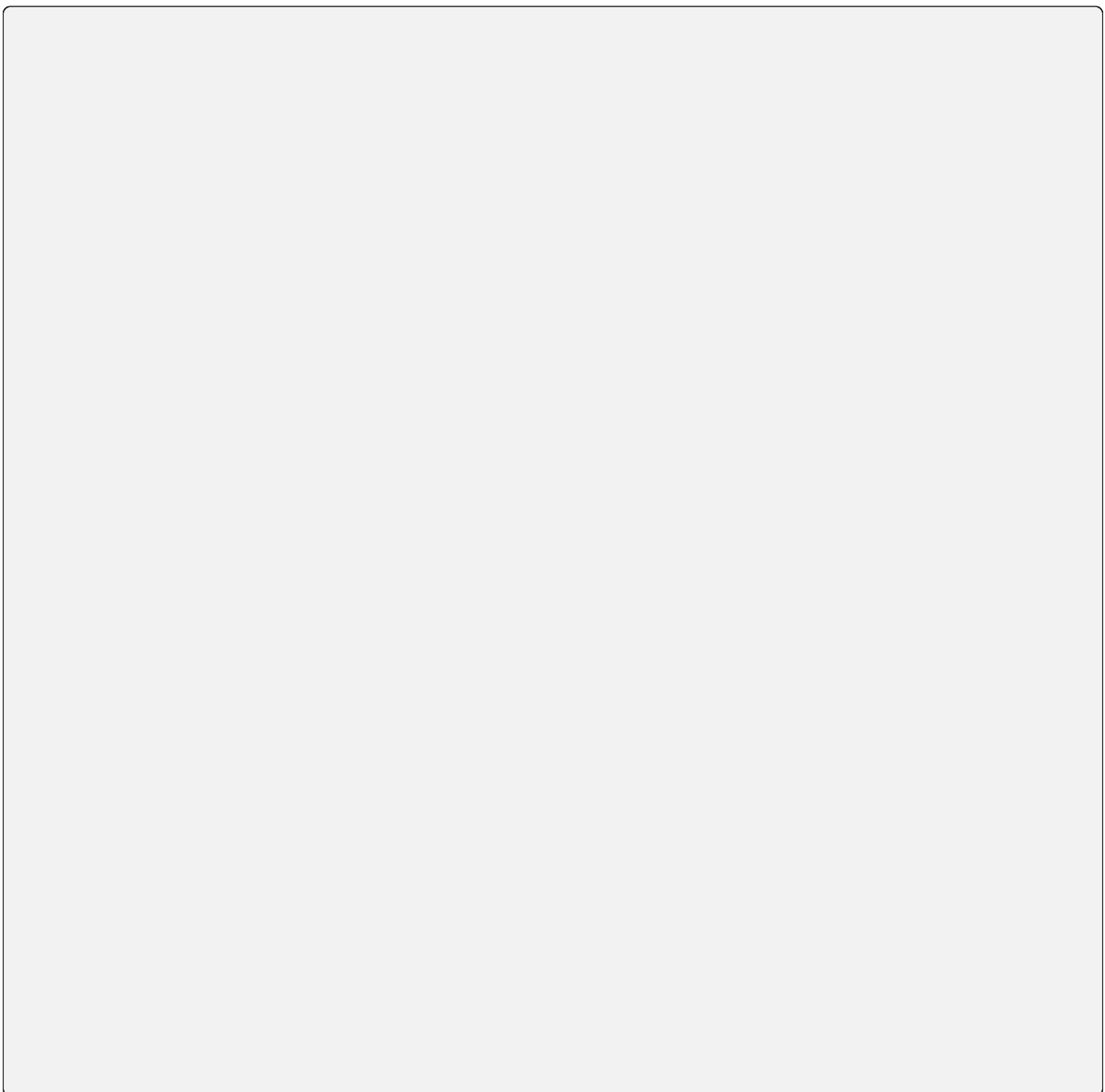




### API Parameters

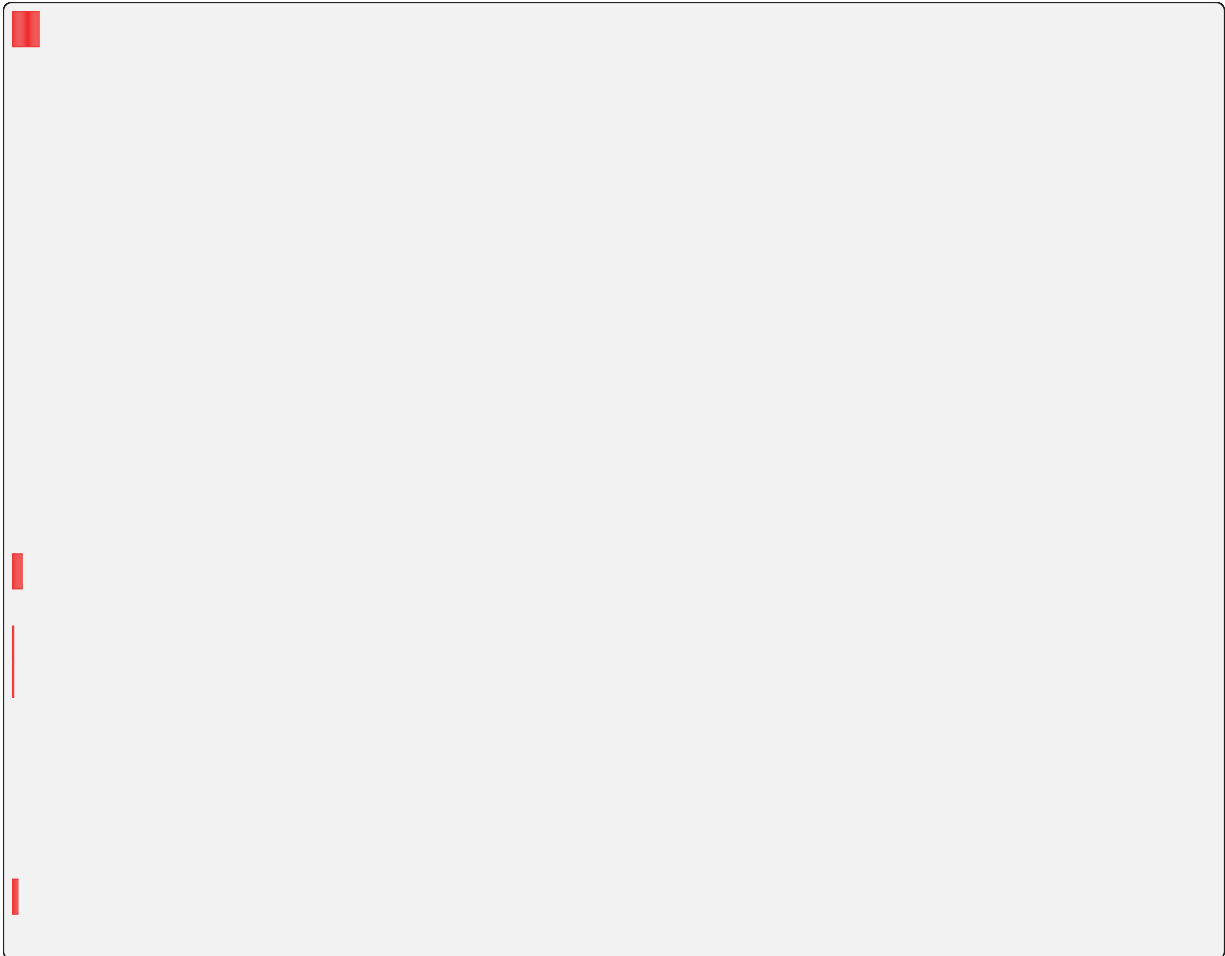


### API Response



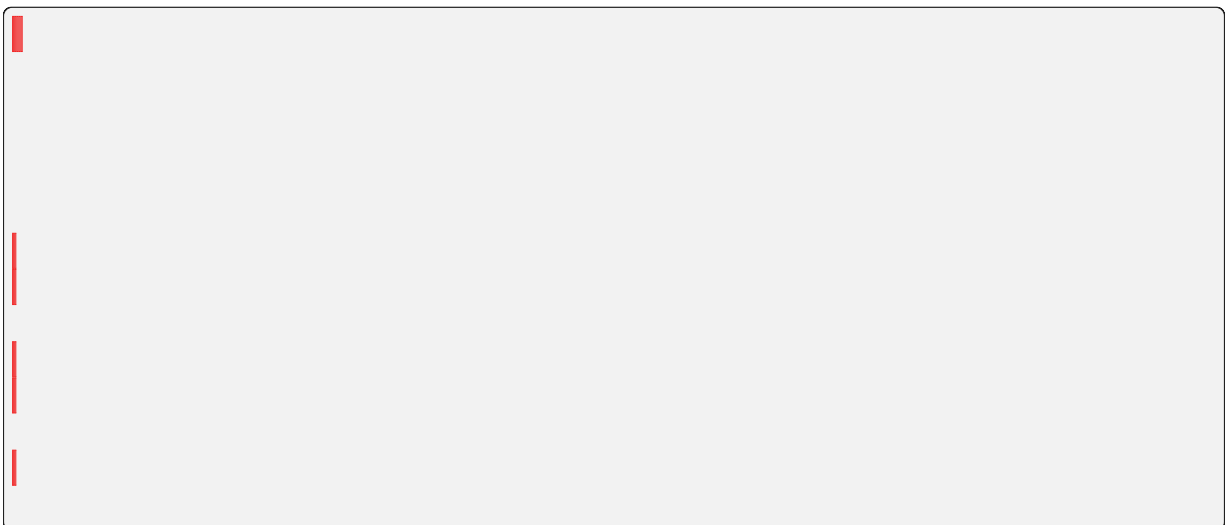
## 6.3.10 Virtual Folder Management

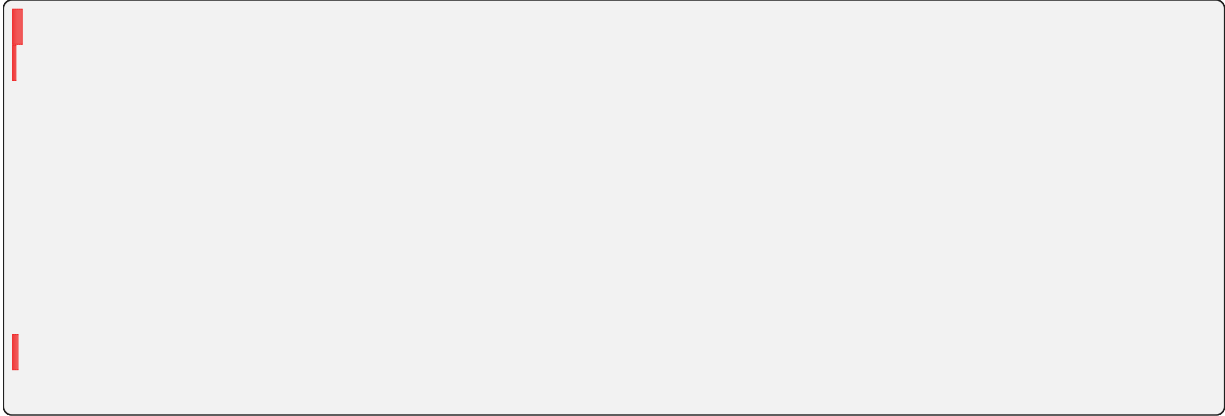
### Query Schema



## 6.3.11 Image Management

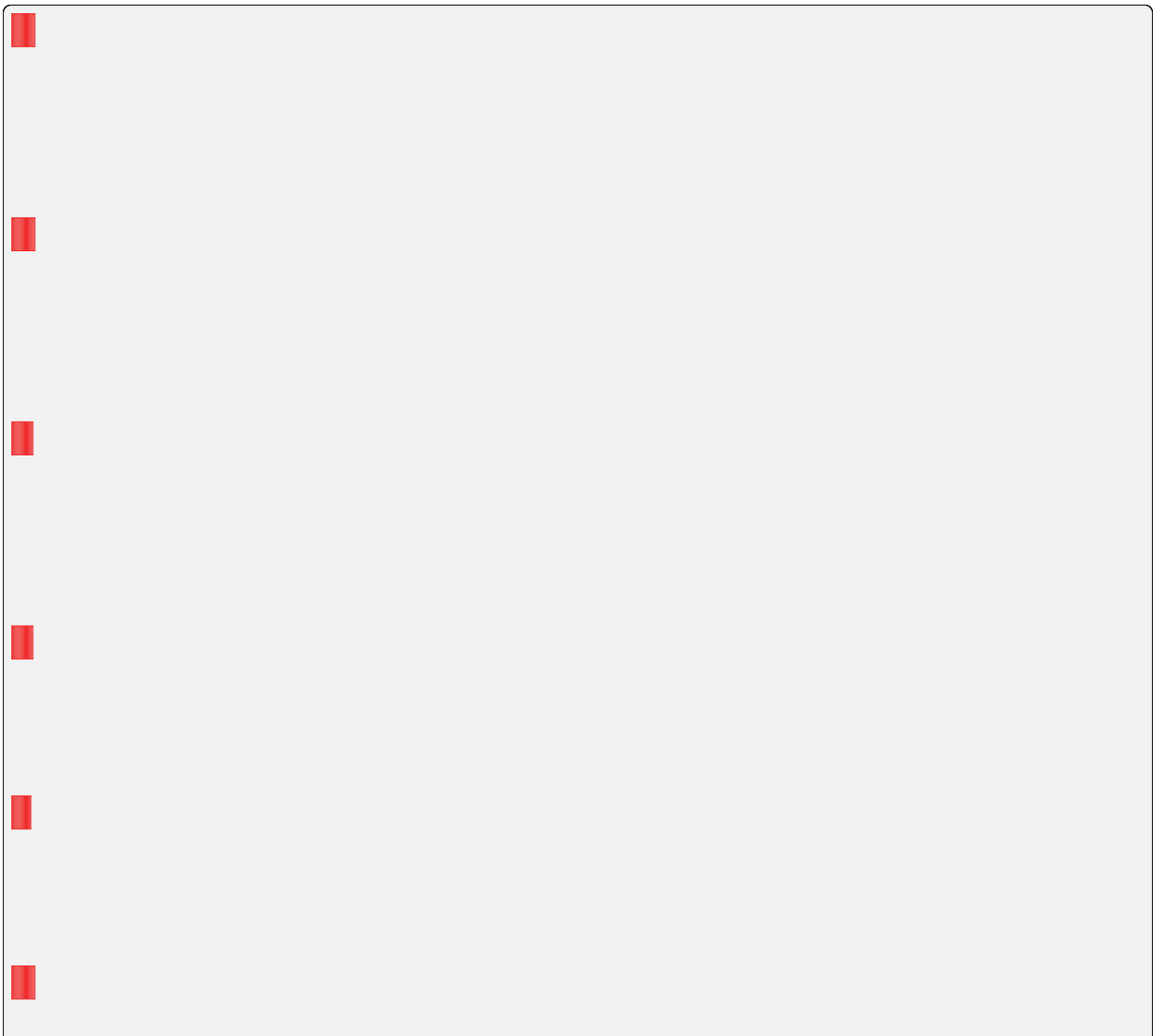
### Query Schema

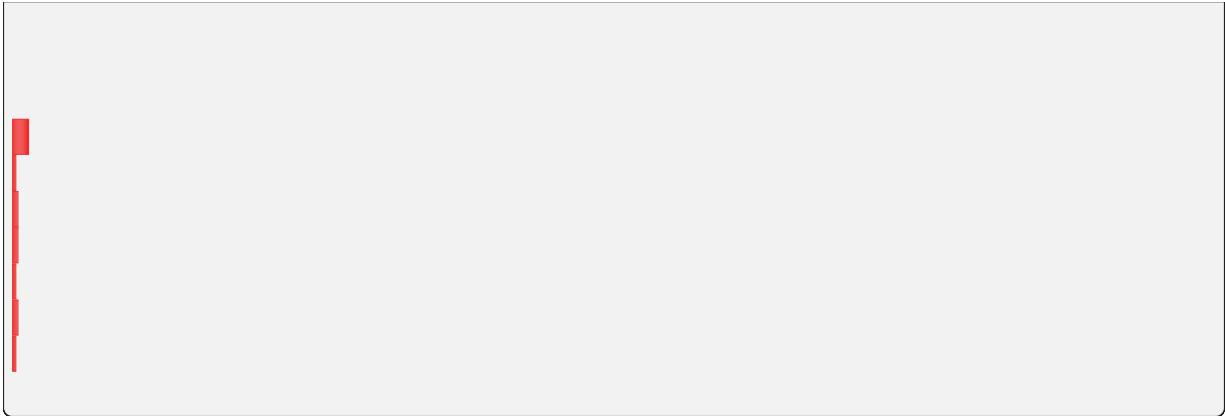




»

### Mutation Schema

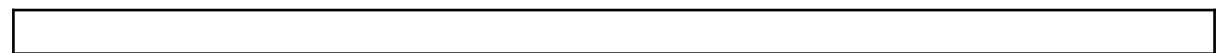




### 6.3.12 Basics of GraphQL



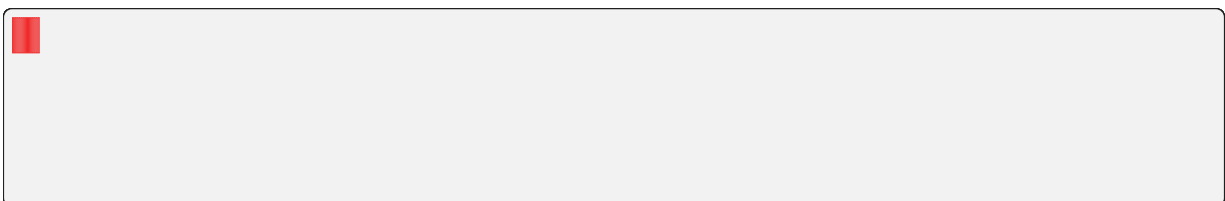
#### HTTP Request Convention



#### Field Naming Convention

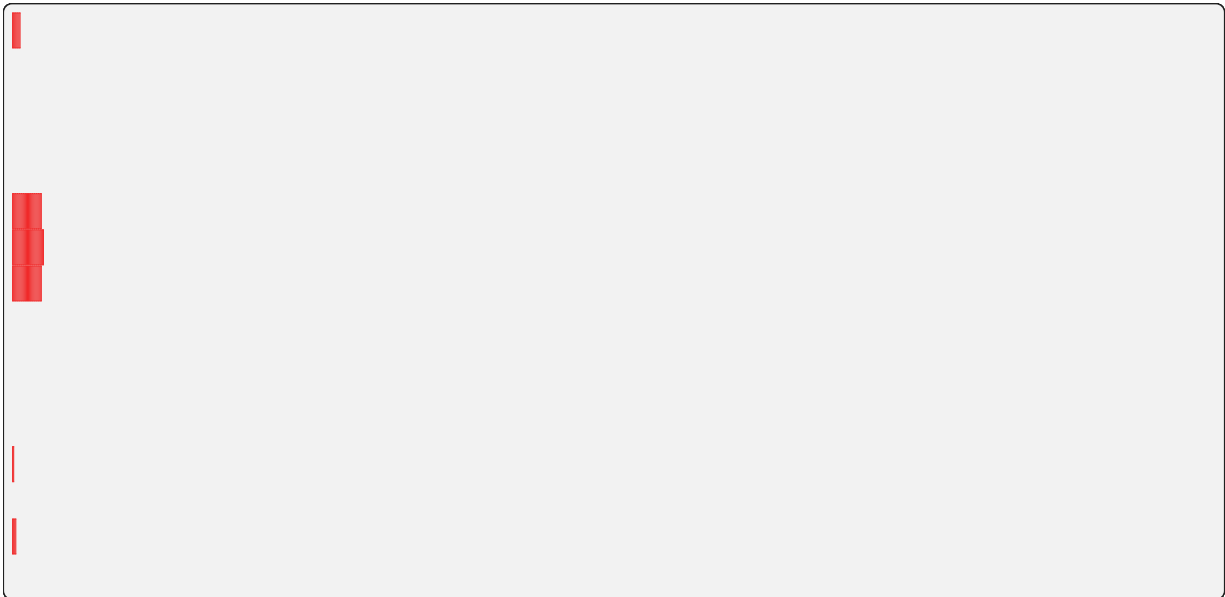
#### Common Object Types

“”





## Pagination Convention



,

## Custom Scalar Types

” “

## Authentication

## Versioning

## 6.4 Backend.AI REST API Reference

## BACKEND.AI AGENT REFERENCE

### 7.1 RPC Interface for Kernel Management

### 7.2 Docker Backend

### 7.3 Kubernetes Backend

### 7.4 Accelerators (aka Compute Plugins)





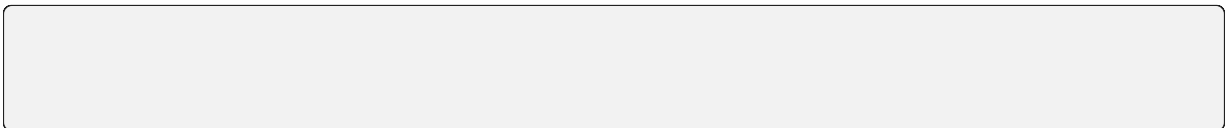
## **BACKEND.AI STORAGE PROXY REFERENCE**

### **8.1 Storage Proxy Manager-facing API**

### **8.2 Storage Proxy Client-facing API**

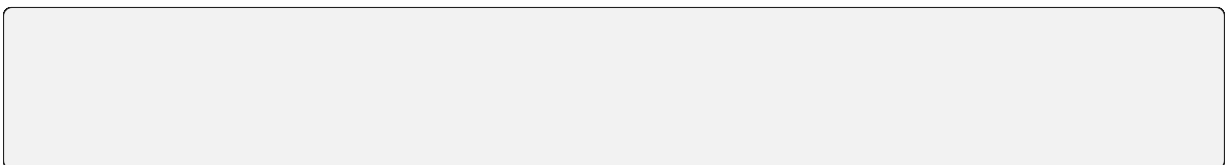


## BACKEND.AI CLIENT SDK FOR PYTHON



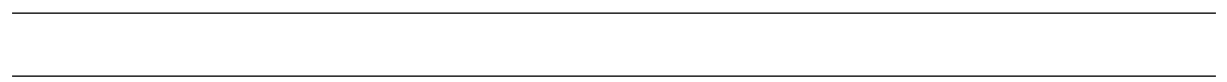
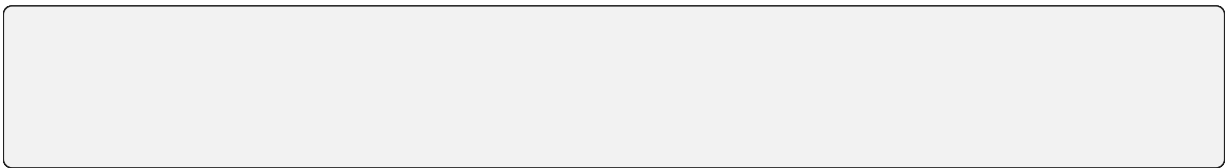
---

”

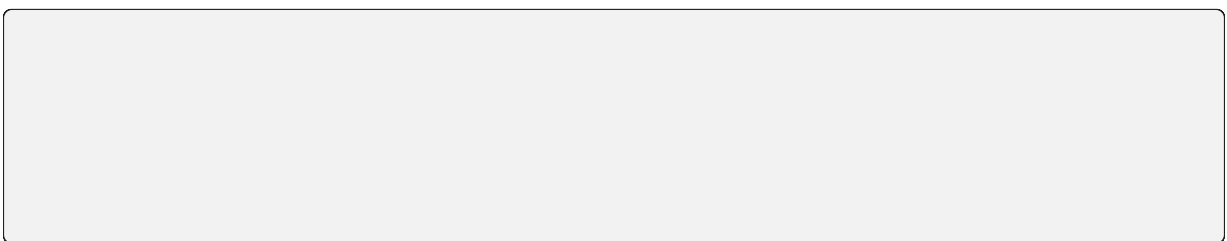


## 9.1 Installation

### 9.1.1 Linux/macOS



### 9.1.2 Windows



### 9.1.3 Verification

“”

“” ,

## 9.2 Client Configuration

,

## 9.3 Command Line Interface

### 9.3.1 Configuration

---

---

#### Session Mode

✓

✓

## API Mode

Checking out the current configuration

## 9.3.2 Compute Sessions

---

---

Listing sessions

Option	Included Session Status

Option	Included Session Fields

[Redacted]

---

### Running simple sessions

[Redacted]

---

,

---

[Redacted]

---

---

### Running sessions with accelerators

[Redacted]

### Terminating or cancelling sessions

[Redacted]

### 9.3.3 Container Applications

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---

#### Starting a session and connecting to its Jupyter Notebook

“” “”

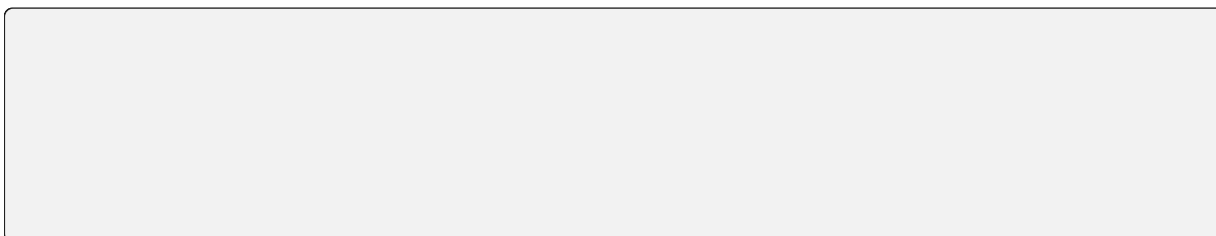


#### Accessing sessions via a web terminal



#### Accessing sessions via native SSH/SFTP

“”



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[Redacted]

[Redacted]

[Redacted]

[Redacted]

### 9.3.4 Storage Management

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“”“”

#### Creating vfolders and managing them

[Redacted]

“”:

[Redacted]

[Redacted]

[Redacted]

## File transfers and management

```
,
```

## Running sessions with storages

```
""" ""
```

```
“
```

## Creating default files for kernels

```
“, ’
```

## 9.3.5 Advanced Code Execution

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## Running concurrent experiment sessions



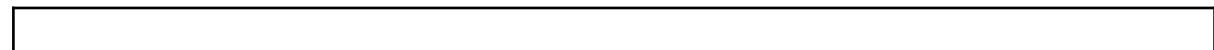
“”.

Expression	Interpretation

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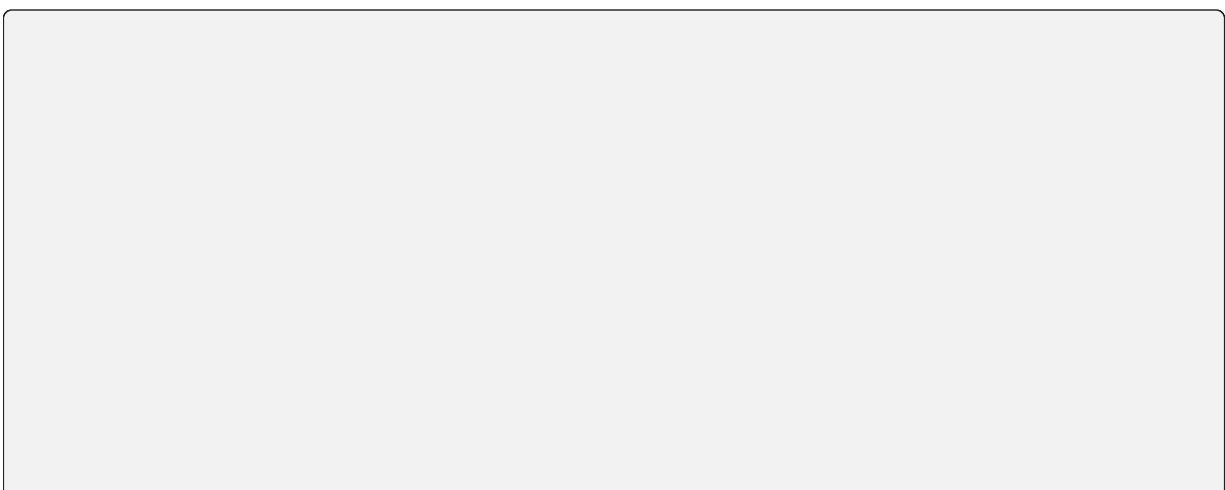
,

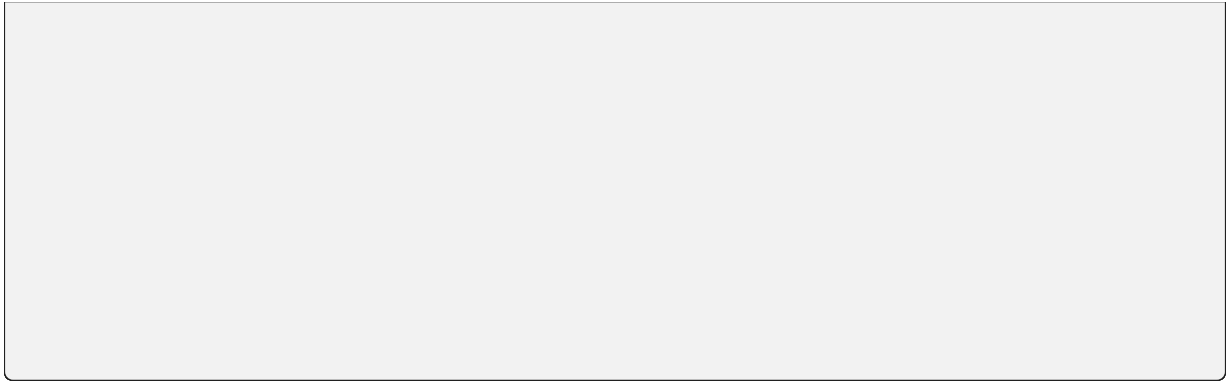
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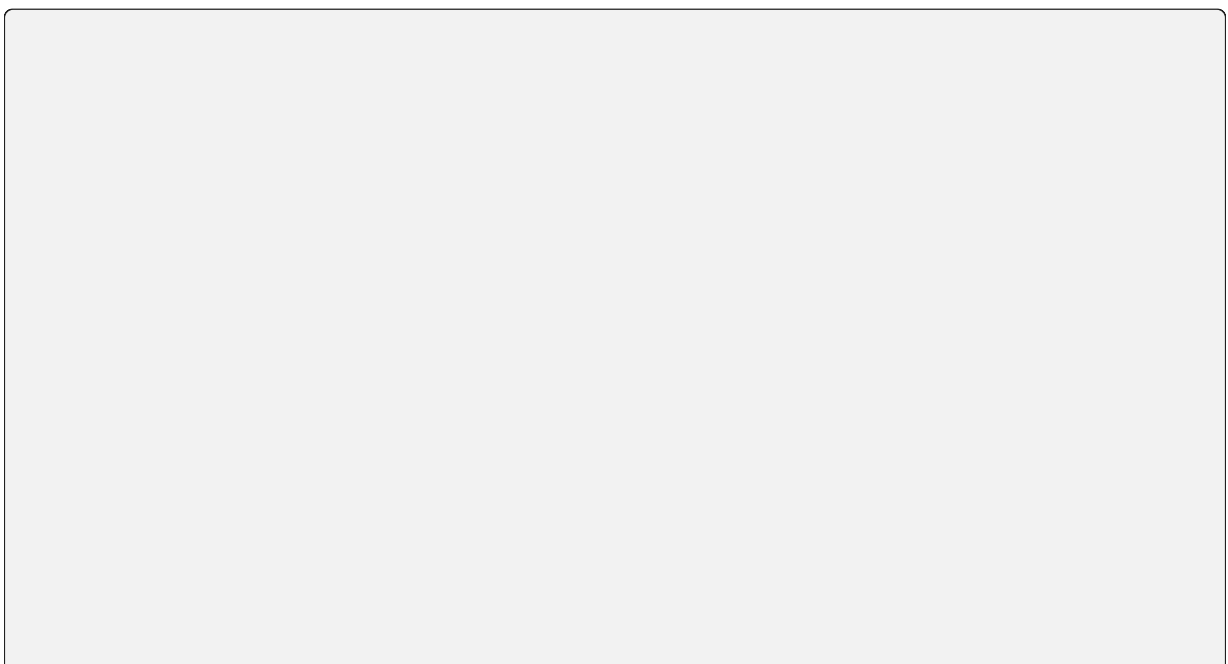
### 9.3.6 Session Templates

#### Creating and starting session template





**Full syntax for task template**





## 9.4 Developer Guides

### 9.4.1 Client Session

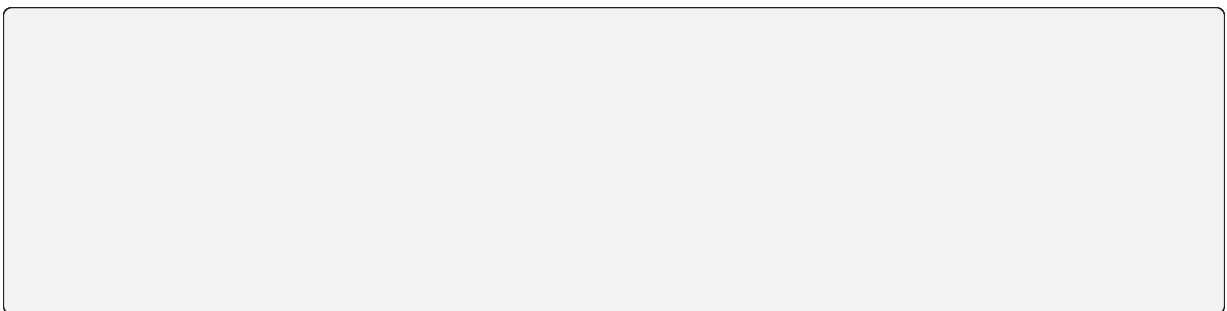
#### Client Session Objects

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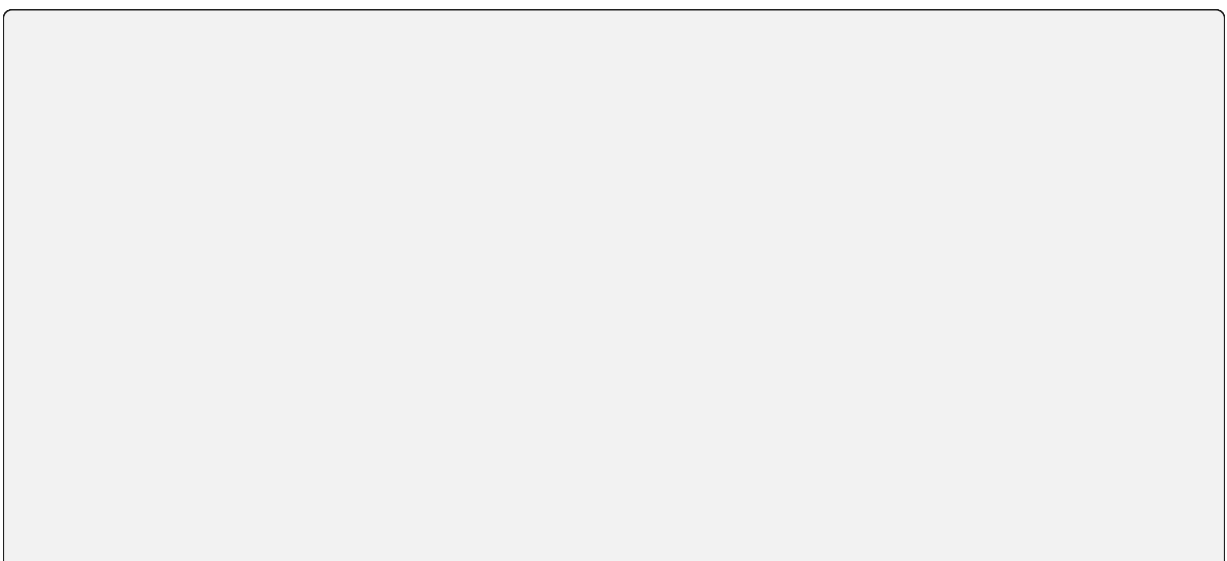
## 9.4.2 Examples

### Initialization of the API Client

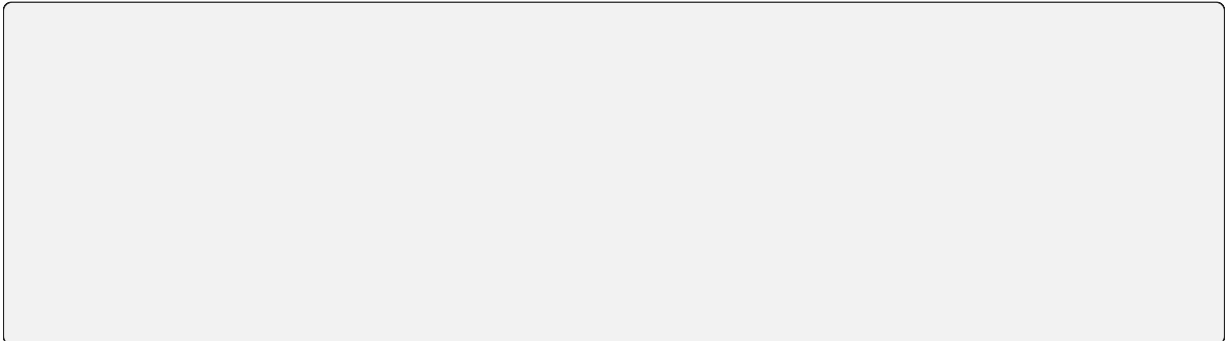
#### Implicit configuration from environment variables



#### Explicit configuration



### Asyncio-native API session

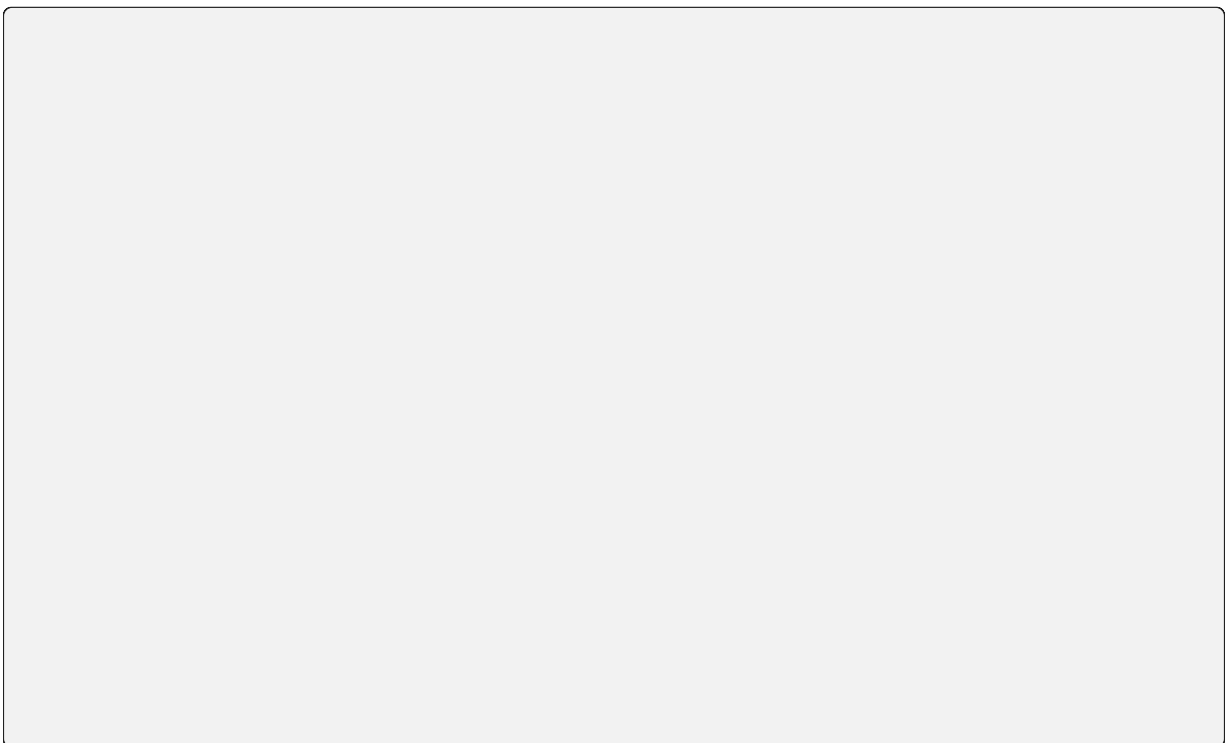


### Working with Compute Sessions

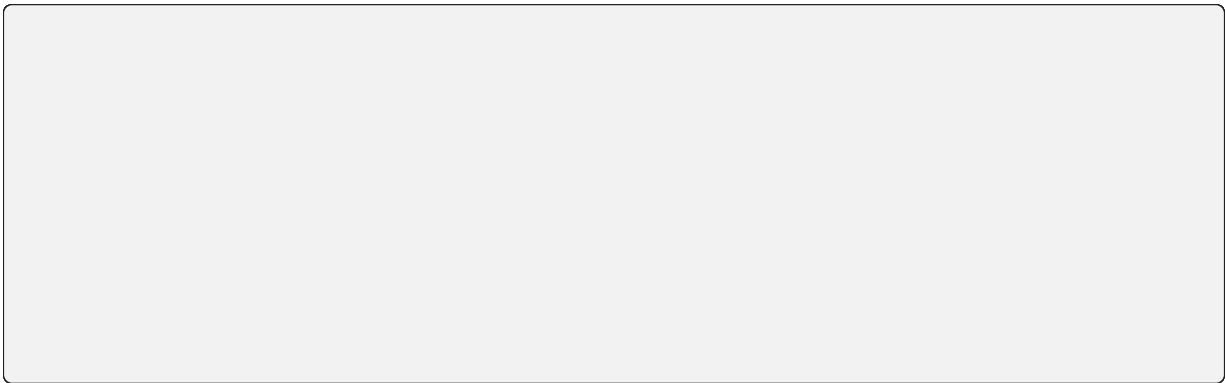
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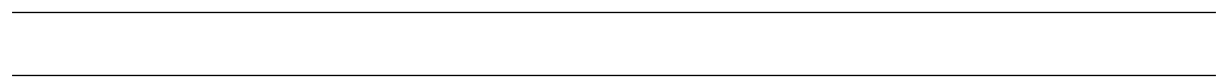
#### Listing currently running compute sessions



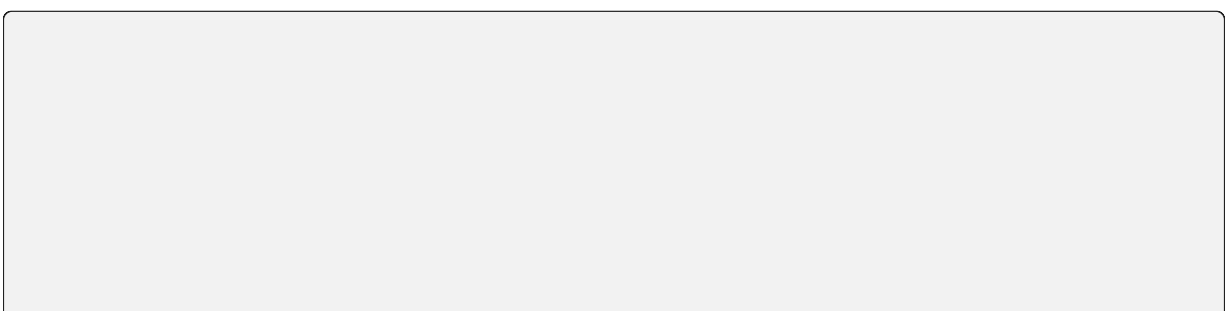
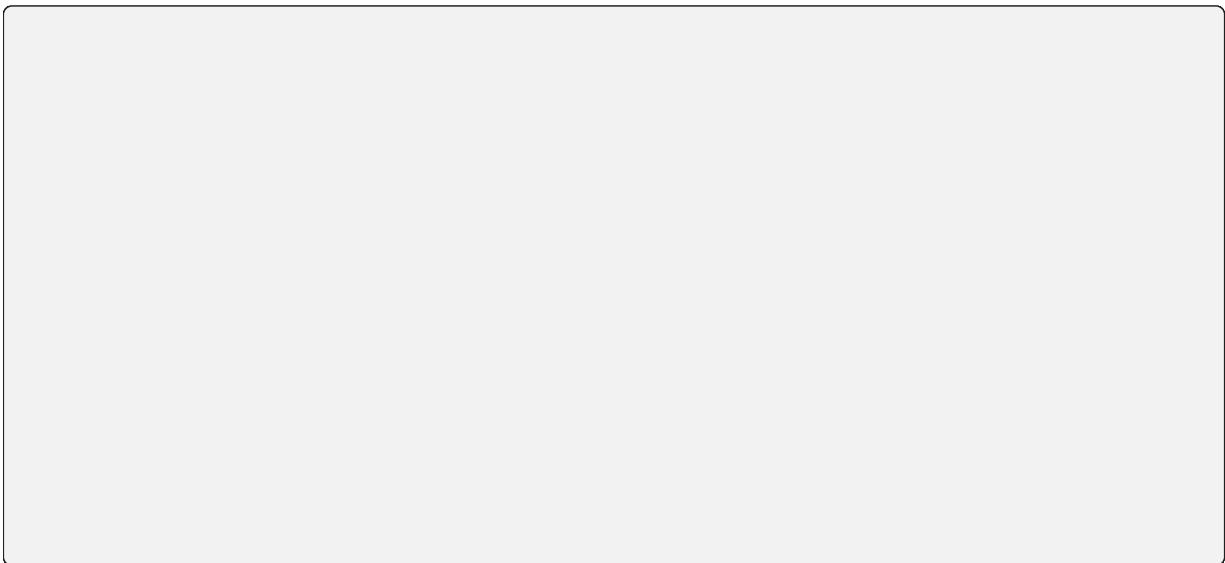
### Creating and destroying a compute session



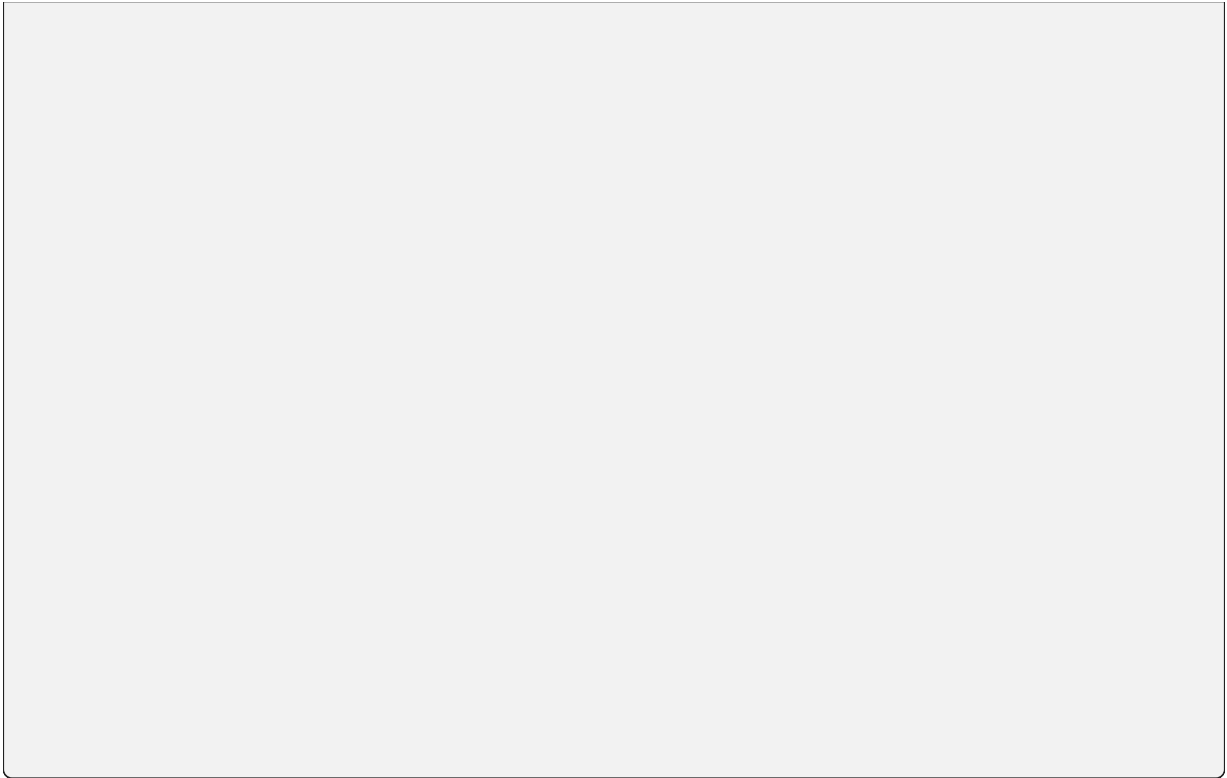
### Accessing Container Applications



### The API



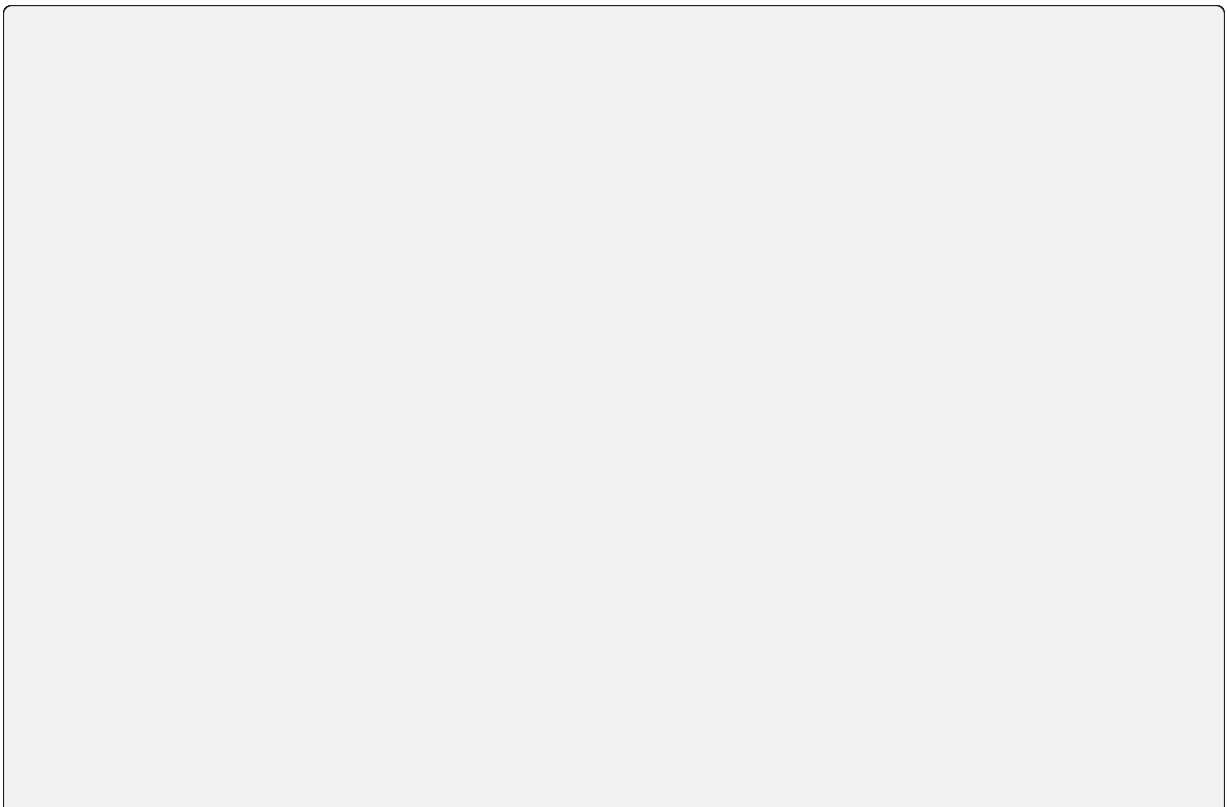




### **Code Execution via API**

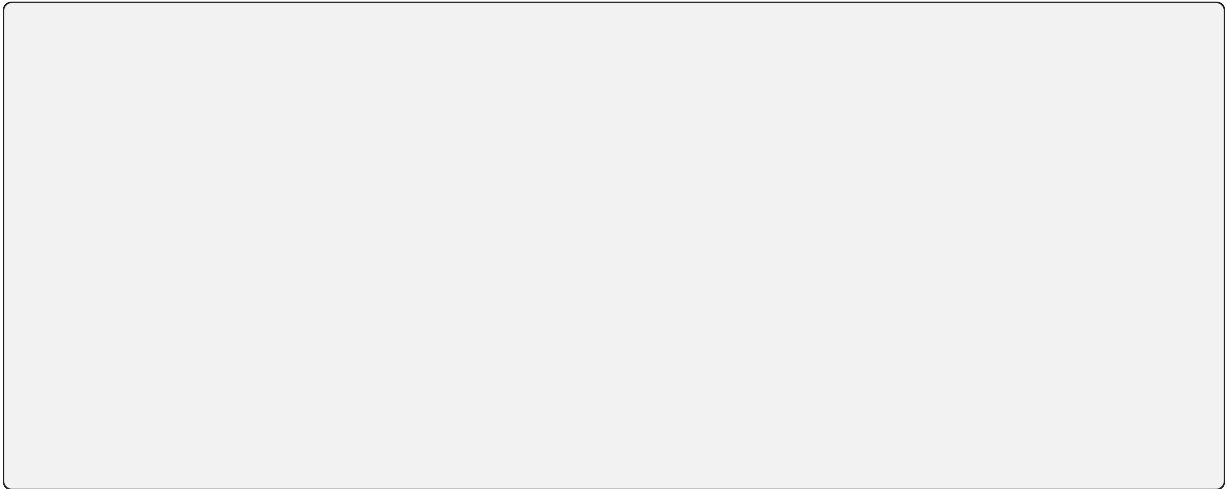
**Synchronous mode**

**Snippet execution (query mode)**



### Script execution (batch mode)

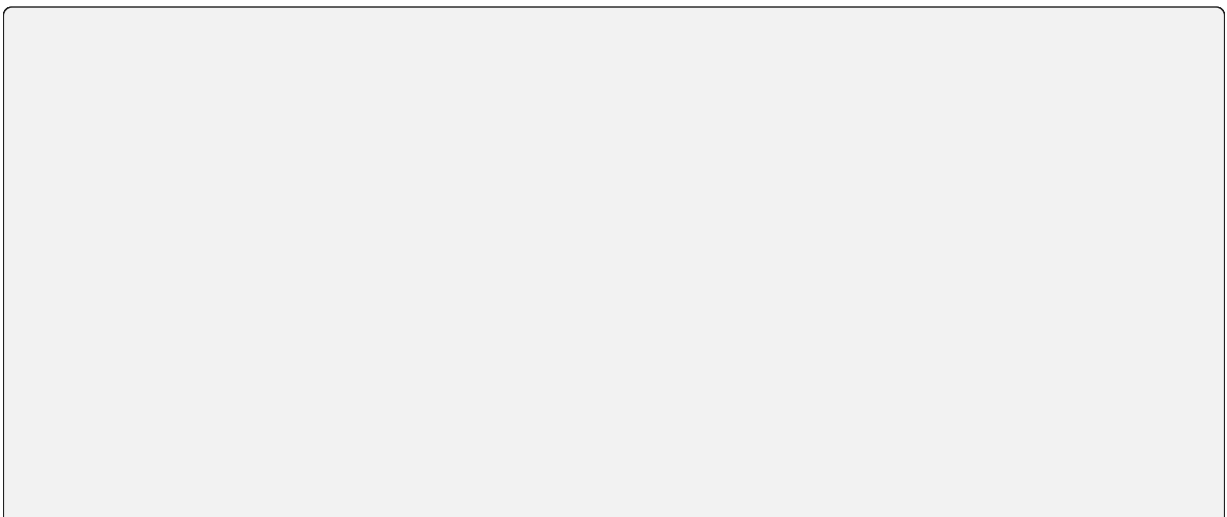
## Handling user inputs

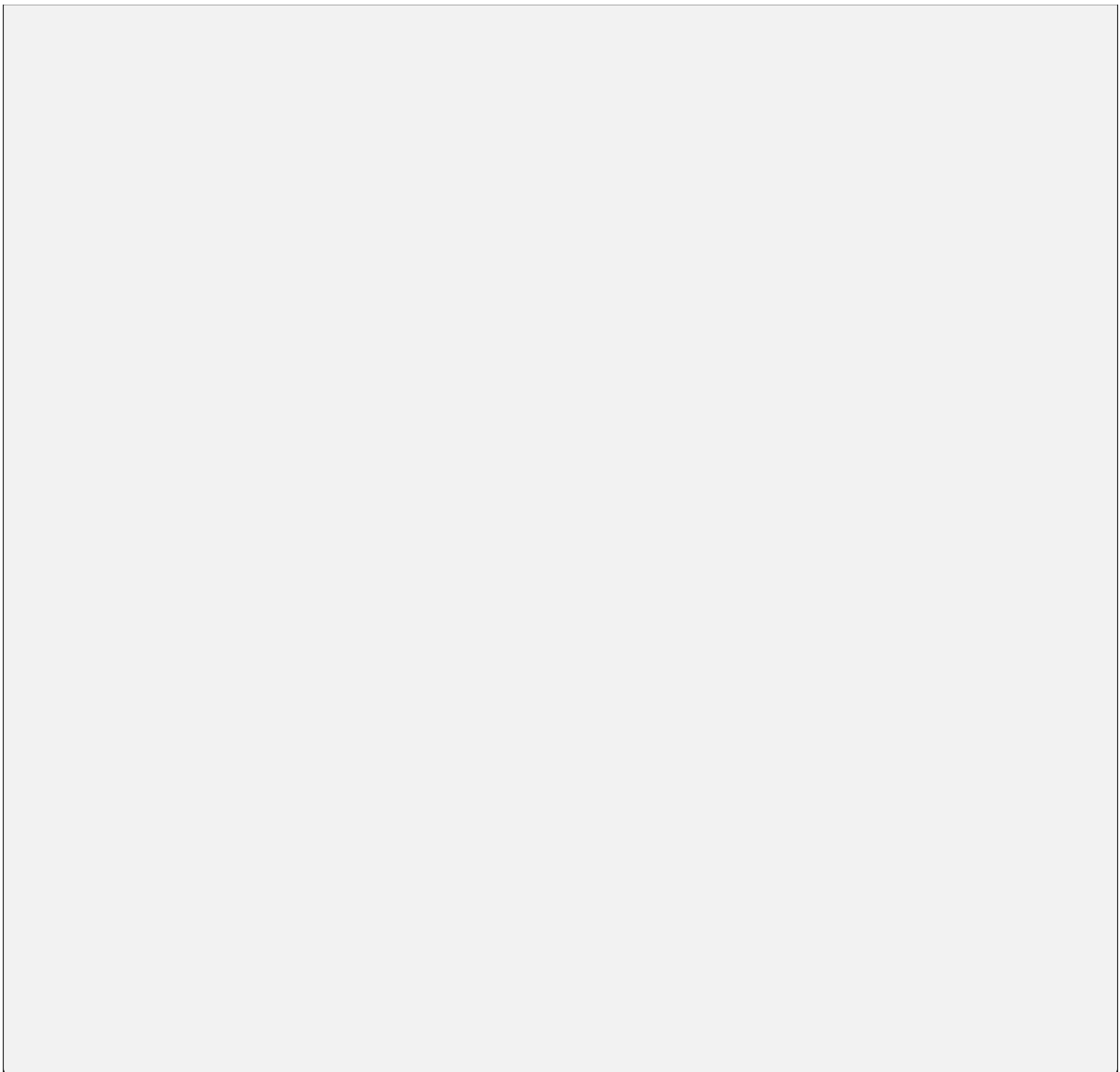


## Handling multi-media outputs



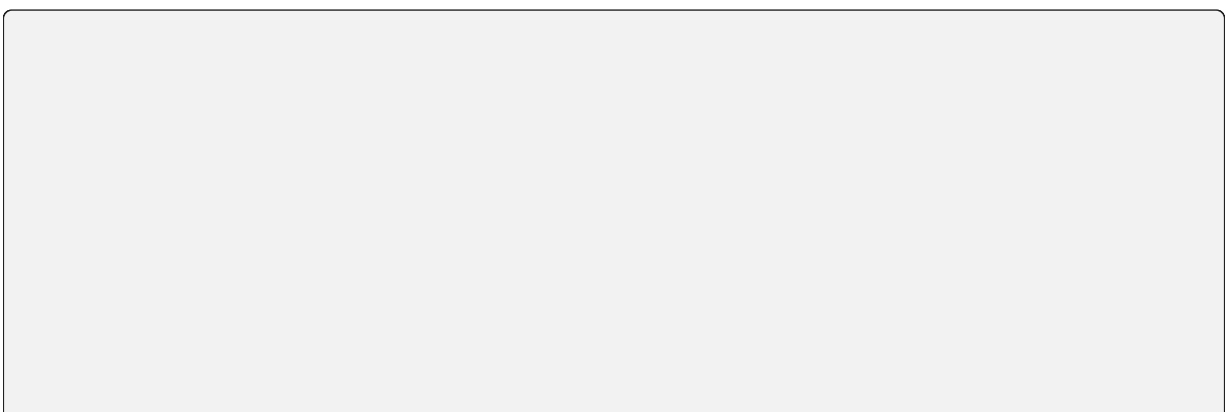
## Asynchronous mode





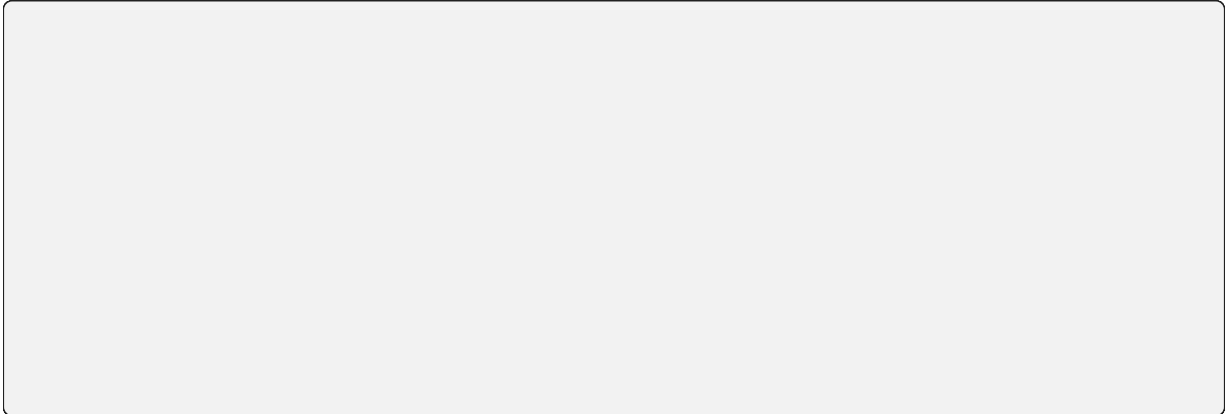
## Working with model service

### Starting model service



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### Making request to model service endpoint



## 9.4.3 Testing

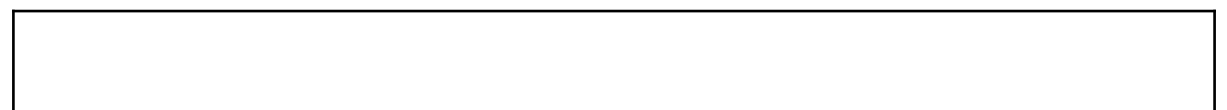
### Unit Tests

#### How to run



### Integration Tests

“”

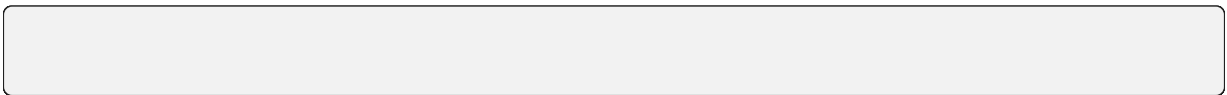


### Prerequisite

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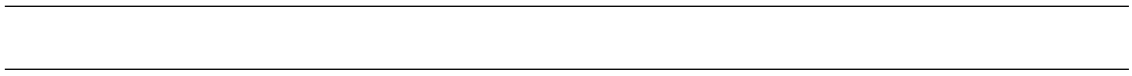
How to run



## 9.5 High-level Function Reference

### 9.5.1 Admin Functions

## 9.5.2 Agent Functions



## 9.5.3 Auth Functions

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## 9.5.4 Configuration