

# **Murano Project Documentation**

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# Murano Project Documentation

v0.1

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## Abstract

This document is intended for individuals who wish to configure and use our product or intend to contribute.

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# Table of Contents

|                                     |    |
|-------------------------------------|----|
| 1. Overview .....                   | 1  |
| Intended Audience .....             | 1  |
| Document Change History .....       | 1  |
| Additional Resources .....          | 1  |
| 2. Blueprint .....                  | 2  |
| Project Background .....            | 2  |
| Proposal .....                      | 2  |
| Architecture .....                  | 3  |
| REST API .....                      | 3  |
| Object Model .....                  | 3  |
| Orchestration Engine .....          | 4  |
| Integration with Heat .....         | 4  |
| Windows on OpenStack .....          | 4  |
| 3. Roadmap .....                    | 5  |
| 4. API Specification .....          | 6  |
| Introduction .....                  | 6  |
| Return codes and errors .....       | 7  |
| Response of POSTs and PUTs .....    | 7  |
| Authentication .....                | 7  |
| Workflow .....                      | 7  |
| Hostname assignment .....           | 7  |
| API .....                           | 8  |
| Environment API .....               | 8  |
| Environment Configuration API ..... | 12 |
| Active Directory API .....          | 15 |
| Web Server API .....                | 18 |
| ASP.NET Application API .....       | 21 |
| Web Server Farm API .....           | 24 |
| ASP.NET Application Farm API .....  | 26 |
| 5. Installation Guide .....         | 30 |
| Common Pre-Requirements .....       | 30 |
| Murano API Service .....            | 30 |
| Install .....                       | 30 |
| Configure .....                     | 31 |
| Run .....                           | 33 |
| Conductor Service .....             | 33 |
| Install .....                       | 33 |
| Configure .....                     | 33 |
| Run .....                           | 34 |
| Murano Dashboard .....              | 34 |
| Pre-Requirements .....              | 34 |
| Install .....                       | 35 |
| Configure .....                     | 35 |
| Run .....                           | 36 |
| 6. ScreenShots .....                | 37 |
| 7. How To Participate .....         | 40 |

---

## List of Figures

|                            |   |
|----------------------------|---|
| 2.1. Architecture .....    | 3 |
| 4.1. Sample Workflow ..... | 7 |

---

## List of Tables

|  |    |
|--|----|
| 4.1. Environment Object .....  | 8  |
| 4.2. GET /environments Call .....                                    | 8  |
| 4.3. Environment Object .....  | 9  |
| 4.4. POST /environments Call .....                                   | 9  |
| 4.5. Environment Object .....  | 10 |
| 4.6. PUT /environments/<id> Call .....                               | 10 |
| 4.7. Error Response Codes .....                                      | 10 |
| 4.8. GET /environments/<id> Call .....                               | 11 |
| 4.9. Error Response Codes .....                                      | 11 |
| 4.10. DELETE /environments/<id> Call .....                           | 12 |
| 4.11. Error Response Codes .....                                     | 12 |
| 4.12. Configuration Session Object .....                             | 12 |
| 4.13. POST /environments/<id>/configure Call .....                   | 13 |
| 4.14. Error Response Codes .....                                     | 13 |
| 4.15. POST /environments/<id>/sessions/<sessionId>/deploy Call ..... | 13 |
| 4.16. Error Response Codes .....                                     | 13 |
| 4.17. GET /environments/<id>/sessions/<sessionId> Call .....         | 14 |
| 4.18. Error Response Codes .....                                     | 14 |
| 4.19. DELETE /environments/<id>/sessions/<sessionId> Call .....      | 14 |
| 4.20. Error Response Codes .....                                     | 15 |
| 4.21. Active Directory Object .....                                  | 15 |
| 4.22. Active Directory Unit Object .....                             | 15 |
| 4.23. GET /environments/<id>/activeDirectories Call .....            | 15 |
| 4.24. Headers .....  | 16 |
| 4.25. Active Directory Object .....                                  | 16 |
| 4.26. Active Directory Unit Object .....                             | 17 |
| 4.27. POST /environments/<id>/activeDirectories Call .....           | 17 |
| 4.28. Headers .....  | 17 |
| 4.29. Web Server Object .....  | 18 |
| 4.30. Web Server Unit Object .....                                   | 18 |
| 4.31. GET /environments/<id>/webServers Call .....                   | 18 |
| 4.32. Headers .....  | 19 |
| 4.33. Web Server Object .....  | 20 |
| 4.34. Web Server Unit Object .....                                   | 20 |
| 4.35. POST /environments/<id>/webServers Call .....                  | 20 |
| 4.36. Headers .....  | 20 |
| 4.37. ASP.NET Application Object .....                               | 21 |
| 4.38. ASP.NET Application Unit Object .....                          | 21 |
| 4.39. GET /environments/<id>/aspNetApps Call .....                   | 21 |
| 4.40. Headers .....  | 21 |
| 4.41. ASP.NET Application Object .....                               | 22 |
| 4.42. ASP.NET Application Unit Object .....                          | 23 |
| 4.43. POST /environments/<id>/aspNetApps Call .....                  | 23 |
| 4.44. Headers .....  | 23 |
| 4.45. Web Server Farm Object .....                                   | 24 |
| 4.46. Web Server Farm Unit Object .....                              | 24 |
| 4.47. GET /environments/<id>/webServerFarms Call .....               | 24 |
| 4.48. Headers .....  | 24 |
| 4.49. Web Server Farm Object .....                                   | 25 |
| 4.50. Web Server Farm Unit Object .....                              | 25 |
| 4.51. POST /environments/<id>/webServerFarms Call .....              | 25 |

|   |    |
|---|----|
| 4.52. Headers .....                                     | 26 |
| 4.53. ASP.NET Application Farm Object .....             | 26 |
| 4.54. ASP.NET Application Farm Unit Object .....        | 27 |
| 4.55. GET /environments/<id>/aspNetAppFarms Call .....  | 27 |
| 4.56. Headers .....                                     | 27 |
| 4.57. ASP.NET Application Farm Object .....             | 28 |
| 4.58. ASP.NET Application Farm Unit Object .....        | 28 |
| 4.59. POST /environments/<id>/aspNetAppFarms Call ..... | 28 |
| 4.60. Headers .....                                     | 28 |

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# Chapter 1. Overview

Welcome to Murano Project.

## Intended Audience

This guide is intended to individuals who want to contribute to our project.

## Document Change History

This version of the Murano Manual replaces and obsoletes all previous versions. The most recent changes are described in the table below:

| Revision Date  | Summary of Changes   |
|----------------|--|
| April. 4, 2013 | <ul style="list-style-type: none"><li>Initial document creation.</li></ul> |

## Additional Resources

- Mirantis - Cloud Software [<http://www.mirantis.com>]

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# Chapter 2. Blueprint

## Project Background

Enterprise customers frequently use Windows-based environments for their internal and external products. Configuration of the Windows environment is a complex task which usually requires a lot of effort from administrators. Windows setup consists of numerous services which might be tightly coupled to each other. While the automated installation of Windows services can be fairly straightforward, service configuration can be hard to automate because it requires a well-designed Windows architecture and deep knowledge of Windows services configuration.

Currently several open source solutions exist that can help to partially solve automation of Windows environment provisioning. In the world of OpenStack there is the Heat project, which is similar to Amazon CloudFormation. Heat is an excellent tool for managing OpenStack cloud resources such as VM instances, security groups, and so on. It allows you to define all cloud resources in a single JSON template, then later maintain all of those resources by editing that template. Although the declarative template approach is well suited to OpenStack resources, it quickly becomes complex when it comes to application management.

Another option is a tool such as Chef or Puppet. These tools are flexible, but require you to have a deep knowledge of scripting and require a significant amount of effort to manually script or modify cookbooks for your specific environment configuration. This is manageable in a stable environment, but it becomes time-consuming and involves manual script coding when one needs to deploy various environments with rapidly changing configurations. Also Chef and Puppet require additional infrastructure to support them.

The biggest problem for both approaches above is in supporting multi-step configuration of services with circular dependencies required for correct configuration of Windows services. This can be solved by using external orchestration.

Another potential problem is the lack of UI functionality enabling creation and configuration of an environment without writing a script.

## Proposal

Mirantis proposes to introduce a new service which will allow a non-experienced user to deploy reliable Windows based environments in a “push-the-button” manner. The key goal is to provide a UI and API enabling the deployment and operation of Windows Environments at the Windows Services abstraction level. The service should be able to orchestrate complex circular dependent cases in order to set up a complex Windows Environment with multiple dependant services.

The service will address following use cases:

- Self-provisioning of predefined Windows services with their dependencies
- Automation of administrative tasks during data center roll-out
- Custom windows application as a windows service

The solution will provide higher level of abstraction for manipulation Windows Environments. Key concepts are:

- Windows Service - a service such as Active Directory, MSSQL, or IIS, which usually consists of multiple virtual machines and has multiple dependencies.
- Windows Environment - a logical unit for all Services and represents a classical Windows Datacenter
- Windows VM instance - a VM which hosts a Windows Service. A Windows Service might be deployed

The Key Features of the Service are the following:



1. Native to OpenStack
2. Introduces abstraction level for Windows Environments
3. Supports Availability Zones and Disaster Recovery scenarios
4. Uses native Windows features for HA solutions

## Architecture

The Murano Service communicates with the following OpenStack components:

- Horizon - provides a GUI with ability to use all Murano features;
- Keystone - authenticates users and provides the security token that is used to work with OpenStack, hence limiting the user abilities in Murano based on OpenStack privileges;
- Heat - is used to provision VMs and other OpenStack resources for Windows Environments;
- Glance - stores Windows Server VM images, with each image containing an installed OS and a set of scripts
- Quantum - provides the network configuration API
- Agent - provides agent functionality to communicate with the Orchestration Engine and executes tasks on VMs

**Figure 2.1. Architecture**



## REST API

Murano exposes a service endpoint for communication with a client. It exposes API functions to manipulate objects such as environment and service.

This component is responsible for translating API function parameters to Object Model attributes and propagating the deployment status from the Orchestration Engine.

## Object Model

An internal representation of Windows Services and Environments. All attributes and entities are described in the API specification.

## Orchestration Engine

This is the core component which evaluates Object Model changes and creates a plan for implementing these changes on the instances or in the cloud. This component will support extensions via plug-ins. Plugins can add new services and extend existing services for integration. Currently there are two services which are already implemented as plugins. They are Active Directory and IIS Service.

## Integration with Heat

Heat is a cloud resource management engine that allows you to manipulate resources that represent OpenStack entities (Security Groups, Instances, Floating IPs, Volumes, etc.) and some entities such as AutoScaling groups from a single point of control.

OpenStack resource provisioning is one of the steps required for environment deployment and Heat will be used for that purpose. Heat allows you to define all OpenStack resources in a single document that will be easy to maintain and will not require resorting to multiple OpenStack APIs while keeping the software configuration separate.

## Windows on OpenStack

Windows works on KVM pretty smoothly, and with the RedHat-created open-source VirtIO drivers for Windows, it's possible to work efficiently with KVM exposed devices.

In OpenStack's Grizzly release, Microsoft's hypervisor Hyper-V will be supported. The Hyper-V virtual switch will be also supported as a Quantum plug-in. From the performance viewpoint, Hyper-V Server 2012 compares very favorably with bare metal, processing just over 6% fewer transactions per second compared to the same workload running on a similarly configured physical server.

Also, unlike the current OpenStack, Hyper-V also natively supports Windows Clusters.

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# Chapter 3. Roadmap

## ***Phase 1. Initial Version***

(Release date: May 30th)

- Core Services: REST API, Orchestration Engine
- Horizon dashboard extension as plugin
- Integration with Heat
- Support single Data Center (no Disaster Recovery)
- Support the following Windows Services:
  - Active Directory - Single Domain with multiple domain controllers
  - IIS Server - single instance of IIS Server
  - IIS Cluster - multiple IIS instances with Load Balancing
  - ASP.NET Application Service - ASP.NET application installed on top of IIS

## ***Phase 2. Stable Release***

(3 month)

- Stabilize Core Services (bug fixing)
- Support API, UI extensibility
- UI design
- Workflow and recipes repository
- Data transfer between service instances
- Basic Service monitoring
- Additional Services:
  - MS SQL - single instance of Microsoft SQL Server or Pair of SQL Servers with DB mirroring

## ***Phase 3***

- Add more services
- Services Dependencies support
- Extended health monitoring
- Agent extensibility (allow 3rd party configuration tools)
- Basic Self-healing (actions on monitoring events)
- Additional Services

## ***Phase 4***

- Availability Zones support
- Auto-scaling for Windows services
- Security improvements

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# Chapter 4. API Specification

| Revision Date     | Summary of Changes  |
|-------------------|---|
| February 4, 2013  | • Initial document creation   |
| February 22, 2013 | • Enhance API with latest architecture changes  |
| March 06, 2013    | • Fix specification according to remarks from Dmitry Teselkin   |
| Jun 06, 2013      | • ASP.NET Application, Web Server Farm and ASP.NET Application Farm Services Added, uri/address/endpoint corrections, hostname assignment section added |

## Introduction

Murano Service API is a programmatic interface used for interaction with Murano. Other interaction mechanisms like Murano Dashboard or Murano CLI should use API as underlying protocol for interaction.

## Glossary

For detailed information about entities and terms used in this document, please refer first to the section called “Architecture”.

|                  |  |
|------------------|--|
| Environment      | <p>Environment is a set of logically related Services managed by a single tenant. Environment defines Windows environment boundaries.</p> <p>Services within single Environment may comprise some complex configuration while Services in different Environments are always independent from one another. Each Environment is associated with single OpenStack project (tenant).</p> |
| Service          | <p>Service is building block of Windows environment. Service is a set of one or more Virtual Machines sharing a common purpose and configured together. Each service belongs to a single Environment and single Service Type.</p> <p>Services are comprised from one or more Service Units.</p>  |
| Service Type     | <p>Service type is definition for describing set of features exposed by service.</p>   |
| Service Unit     | <p>Service Units are the actual Windows Server VMs instantiated by OpenStack and then configured according to its Service Type (this may also correspond to one of predefined Windows Server roles).</p>   |
| Service Metadata | <p>Service Metadata is a JSON-encoded definition of Environment, its Services and their Service Units along with all their attributes. Service Metadata may describe both current and the intended state of the Environment.</p>   |
| Session          | <p>All changes to environment done in scope of Session. After all changes to Environment state are accumulated, changes actually are applied only after session is deployed.</p>   |

## Return codes and errors

All REST API calls return the natural HTTP response codes for the operations, e.g. a successful GET returns a HTTP 200, a successful PUT returns a HTTP 201, a GET for a non-existent entity returns HTTP 404, unauthorized operations return HTTP 401 or HTTP 403, internal errors return HTTP 500.

## Response of POSTs and PUTs

All POST and PUT requests by convention should return the created object (in the case of POST, with a generated ID) as if it was requested by GET.

## Authentication

All requests include a Keystone authentication token header (X-Auth-Token). Clients must authenticate with Keystone before interacting with the Murano service.

## Workflow

**Figure 4.1. Sample Workflow**



Let's review a sample workflow (series of API calls) for creating new Environment with Active Directory Service deployment:

1. POST /environments/ - Creating new Environment
2. POST /environments/id/configure – Creating new configuration session for Environment
3. POST /environments/id/activeDirectory – Creating new ActiveDirectory service
4. POST /environments/id/sessions/session\_id/deploy – Saving and deploying changes

## Hostname assignment

Each Service Object definition may have an attribute "unitNamingPattern" that is used to control hostnames that will be assigned to spawned VM instances of the service.

Hostname pattern has the form of "name#" where "#" character is replaced with sequential number of unit within the service (starting with 1) and all other characters remain intact. For example Service with unitNamingPatter equal to "ad#-loc" will have units with hostnames "ad1-loc", "ad2-loc" etc.

"unitNamingPattern" attribute is optional. If it is omitted then a unique random hostname would be assigned.

# API

## Environment API

This section describes API calls for Environment management.

### Get a List of existing Environments

**Table 4.1. Environment Object**

| Attribute | Type     | Description                                  |
|-----------|----------|--|
| id        | string   | Unique ID                                    |
| name      | string   | User-friendly name                           |
| created   | datetime | Creation date and time in ISO format         |
| updated   | datetime | Modification date and time in ISO format     |
| tenant_id | string   | OpenStack tenant ID                          |
| version   | int      | Current version                              |
| status    | string   | Deployment status: ready, pending, deploying |

### Call

**Table 4.2. GET /environments Call**

| Method | URI           | Description                         |
|--------|---------------|-------------------------------------|
| GET    | /environments | Get a list of existing Environments |

### Payload

None

### Returns

This call returns list of environments. Only the basic properties are returned. For details see "Get Environment Detailed Information":

```
{
  "environments": [
    {
      "id": "0ce373a477f211e187a55404a662f968",
      "name": "dc1",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "tenant_id": "0849006f7ce94961b3aab4e46d6f229a",
```

```
        "version": 1,
        "status": "ready"
      },
      {
        "id": "c697bd2429304820a928d145aa42af59",
        "name": "dc2",
        "created": "2010-11-30T03:23:42Z",
        "updated": "2010-11-30T03:23:44Z",
        "tenant_id": "0849006f7ce94961b3aab4e46d6f229a",
        "version": 2,
        "status": "deploying"
      }
    ]
  }
}
```

## Create Environment instance

**Table 4.3. Environment Object**

| Attribute | Type   | Required | Description        |
|-----------|--------|----------|--------------------|
| name      | string | yes      | User-friendly name |

## Call

**Table 4.4. POST /environments Call**

| Method | URI           | Description            |  |
|--------|---------------|------------------------|--|
| POST   | /environments | Create new Environment |  |

## Payload

```
{
  "name": "env1"
}
```

## Returns

This call returns created environment:

```
{
  "id": "ce373a477f211e187a55404a662f968",
  "name": "env1",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:44Z",
}
```

```
    "tenant_id": "0849006f7ce94961b3aab4e46d6f229a",
    "version": 0
}
```

## Update Environment Instance

**Table 4.5. Environment Object**

| Attribute | Type   | Required | Description        |
|-----------|--------|----------|--------------------|
| name      | string | yes      | User-friendly name |

### Call

**Table 4.6. PUT /environments/<id> Call**

| Method | URI                | Description                               |
|--------|--------------------|---|
| PUT    | /environments/<id> | Update properties of Environment instance |

**Table 4.7. Error Response Codes**

| Code | Description  |
|------|--|
| 401  | User is not authorized to access this tenant resources |

### Payload

```
{
  "name": "env1-changed"
}
```

### Returns

This call returns modified environment object:

```
{
  "id": "ce373a477f211e187a55404a662f968",
  "name": "env1-changed",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:44Z",
  "tenant_id": "0849006f7ce94961b3aab4e46d6f229a",
  "version": 0
}
```



## Get Environment Instance Detailed Information

### Call

**Table 4.8. GET /environments/<id> Call**

| Method | URI                | Description   |
|--------|--------------------|---|
| GET    | /environments/<id> | Returns detailed information about Environment including child entities |

**Table 4.9. Error Response Codes**

| Code | Description  |
|------|--|
| 401  | User is not authorized to access this tenant resources |

### Payload

None

### Returns

This call returns environment object with underlying services:

```
{
  "environments": [{
    "id": "0ce373a477f211e187a55404a662f968",
    "name": "dc1",
    "created": "2010-11-30T03:23:42Z",
    "updated": "2010-11-30T03:23:44Z",
    "tenant_id": "0849006f7ce94961b3aab4e46d6f229a",
    "version": 1,
    "status": "deploying",
    "services": [
      "activeDirectories": [{
        "id": "96365940588b479294fe8e6dc073db04",
        "name": "acme.dc",
        "created": "2010-11-30T03:23:42Z",
        "updated": "2010-11-30T03:23:44Z",
        "status": "deploying",
        "units": [{
          "id": "d08887df15b94178b244904b506fe85b",
          "isMaster": true,
          "location": "west-dc"
        }, {
          "id": "dcf0de317e7046bea555539f19b8ea84",
          "isMaster": false,
          "location": "west-dc"
        }
      ]
    }
  ]
}
```

```
} ]  
}
```

## Remove Environment

### Call

**Table 4.10. DELETE /environments/<id> Call**

| Method | URI                | Description                   |
|--------|--------------------|-------------------------------|
| DELETE | /environments/<id> | Remove specified Environment. |

**Table 4.11. Error Response Codes**

| Code | Description  |
|------|--|
| 401  | User is not authorized to access this tenant resources |

### Payload

None

### Returns

None

## Environment Configuration API

Multiple sessions could be opened for one environment simultaneously, but only one session going to be deployed. First session that starts deploying is going to be deployed; other ones become invalid and could not be deployed at all. User could not open new session for environment that in `deploying` state (that's why we call it "almost lock free" model).

**Table 4.12. Configuration Session Object**

| Attribute      | Type     | Description   |
|----------------|----------|---|
| id             | string   | Session unique ID   |
| environment_id | string   | Environment that going to be modified during this session     |
| created        | datetime | Creation date and time in ISO format                          |
| updated        | datetime | Modification date and time in ISO format                      |
| user_id        | string   | Session owner ID  |
| version        | int      | Environment version for which configuration session is opened |
| state          | string   | Session state. Could be: open, deploying, deployed            |

## Configure Environment / Open session

During this call new working session is created, and session ID should be sent in header (X-Configuration-Session) to all next API calls.

## Call

**Table 4.13. POST /environments/<id>/configure Call**

| Method | URI                          | Description                        |
|--------|------------------------------|------------------------------------|
| POST   | /environments/<id>/configure | Creating new configuration session |

**Table 4.14. Error Response Codes**

| Code | Description  |
|------|--|
| 403  | Could not open session for environment, environment has deploying status |

## Payload

None

## Returns

This call returns created session:

```
{
  "id": "4aecdc2178b9430cbbb8db44fb7ac384",
  "environment_id": "4dc8a2e8986fa8fa5bf24dc8a2e8986fa8",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:54Z",
  "user_id": "d7b501094caf4daab08469663a9e1a2b",
  "version": 12,
  "state": "open"
}
```

## Deploy changes from Session

## Call

**Table 4.15. POST /environments/<id>/sessions/<sessionId>/deploy Call**

| Method | URI  | Description  |
|--------|--|--|
| POST   | /environments/<id>/sessions/<sessionId>/deploy | Deploying changes made in session with specified <sessionId> |

**Table 4.16. Error Response Codes**

| Code | Description  |
|------|--|
| 403  | Session is invalid                                       |
| 403  | Session is already deployed or deployment is in progress |

## Payload

None

## Returns

None

## Get session information

### Call

**Table 4.17. GET /environments/<id>/sessions/<sessionId> Call**

| Method | URI                                     | Description  |
|--------|---|--|
| GET    | /environments/<id>/sessions/<sessionId> | Getting details about session with specified <sessionId> |

**Table 4.18. Error Response Codes**

| Code | Description                                   |
|------|---|
| 401  | User is not authorized to access this session |
| 403  | Session is invalid                            |

## Payload

None

## Returns

This call returns session information:

```
{
  "id": "4aecdc2178b9430cbbb8db44fb7ac384",
  "environment_id": "4dc8a2e8986fa8fa5bf24dc8a2e8986fa8",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:54Z",
  "user_id": "d7b501094caf4daab08469663a9e1a2b",
  "version": 0,
  "state": "deploying"
}
```

## Delete Session

### Call

**Table 4.19. DELETE /environments/<id>/sessions/<sessionId> Call**

| Method | URI                                     | Description                               |
|--------|---|---|
| DELETE | /environments/<id>/sessions/<sessionId> | Delete session with specified <sessionId> |

**Table 4.20. Error Response Codes**

| Code | Description  |
|------|--|
| 401  | User is not authorized to access this session          |
| 403  | Session is in deploying state and could not be deleted |

**Payload**

None

**Returns**

None

## Active Directory API

This section describes API calls for Active Directory service management.

### Get a List of existing Active Directory instances

**Table 4.21. Active Directory Object**

| Attribute | Type     | Description                              |
|-----------|----------|--|
| id        | string   | Unique ID                                |
| name      | string   | Domain name                              |
| created   | datetime | Creation date and time in ISO format     |
| updated   | datetime | Modification date and time in ISO format |
| domain    | string   | Domain name                              |
| uri       | string   | URI of the Service                       |
| units     | object   | Active Directory Unit object             |

**Table 4.22. Active Directory Unit Object**

| Attribute | Type    | Description   |
|-----------|---------|---|
| id        | string  | Unique ID   |
| isMaster  | boolean | true for primary domain controller, false otherwise |
| address   | string  | Unit address  |
| location  | string  | AvailabilityZone or specific physical datacenter.   |

**Call****Table 4.23. GET /environments/<id>/activeDirectories Call**

| Method | URI                                  | Description                              |
|--------|--------------------------------------|--|
| GET    | /environments/<id>/activeDirectories | Get a list of Active Directory instances |

**Table 4.24. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | no       | ID of valid configuration session |

**Payload**

None

**Returns**

This call returns list of Active Directory instances:

```
{
  "activeDirectories": [{
    "id": "96365940588b479294fe8e6dc073db04",
    "name": "acme.dc",
    "created": "2010-11-30T03:23:42Z",
    "updated": "2010-11-30T03:23:44Z",
    "uri": "10.0.0.2",
    "units": [{
      "id": "d08887df15b94178b244904b506fe85b",
      "isMaster": true,
      "address": "10.0.0.2",
      "location": "west-dc"
    },
    {
      "id": "dcf0de317e7046bea555539f19b8ea84",
      "isMaster": false,
      "address": "10.0.0.3",
      "location": "west-dc"
    }
  ]
}]
}
```

**Create Active Directory instance****Table 4.25. Active Directory Object**

| Attribute     | Type   | Required | Description                                |
|---------------|--------|----------|--|
| name          | string | yes      | Domain name                                |
| adminPassword | string | yes      | Password from domain administrator account |
| domain        | string | yes      | Domain name                                |
| units         | object | yes      | Active Directory Unit object               |

**Table 4.26. Active Directory Unit Object**

| Attribute        | Type    | Required | Description   |
|------------------|---------|----------|---|
| isMaster         | boolean | yes      | true for primary domain controller, false otherwise |
| recoveryPassword | string  | yes      | Recovery password                                   |
| location         | string  | yes      | AvailabilityZone or specific physical datacenter.   |

**Call****Table 4.27. POST /environments/<id>/activeDirectories Call**

| Method | URI                                  | Description                 |
|--------|--------------------------------------|-----------------------------|
| POST   | /environments/<id>/activeDirectories | Create new Active Directory |

**Table 4.28. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | yes      | ID of valid configuration session |

**Payload**

```
{
  "name": "acme.dc",
  "adminPassword": "password",
  "domain": "acme.dc",
  "units": [
    {
      "isMaster": true,
      "recoveryPassword": "password",
      "location": "west-dc"
    },
    {
      "isMaster": false,
      "recoveryPassword": "password",
      "location": "west-dc"
    }
  ]
}
```

**Returns**

This call returns created active directory domain:

```
{
  "id": "96365940588b479294fe8e6dc073db04",
```

```
"name": "acme.dc",
"created": "2010-11-30T03:23:42Z",
"updated": "2010-11-30T03:23:44Z",
"domain": "acme.dc",
"units": [{
  "id": "d08887df15b94178b244904b506fe85b",
  "isMaster": true,
  "location": "west-dc"
}, {
  "id": "dcf0de317e7046bea555539f19b8ea84",
  "isMaster": false,
  "location": "west-dc"
}]
}
```

## Web Server API

This section describes API calls for managing Windows web-server software – IIS.

### Get a List of existing Web Servers

**Table 4.29. Web Server Object**

| Attribute | Type     | Description   |
|-----------|----------|---|
| id        | string   | Unique ID   |
| name      | string   | User-friendly name  |
| created   | datetime | Creation date and time in ISO format  |
| updated   | datetime | Modification date and time in ISO format  |
| uri       | string   | URI of the Service  |
| domain    | string   | Domain name. This attribute may be empty/null/omitted if machine is not a domain member |
| units     | object   | Web Server Unit object  |

**Table 4.30. Web Server Unit Object**

| Attribute | Type   | Description                                       |
|-----------|--------|---|
| id        | string | Unique ID   |
| address   | string | Unit address                                      |
| location  | string | AvailabilityZone or specific physical datacenter. |

### Call

**Table 4.31. GET /environments/<id>/webServers Call**

| Method | URI                           | Description                        |
|--------|-------------------------------|------------------------------------|
| GET    | /environments/<id>/webServers | Get a list of existing Web Servers |



**Table 4.32. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | no       | ID of valid configuration session |

**Payload**

None

**Returns**

This call returns list of web servers:

```
{
  "webServers":
  [
    {
      "id": "0ce373a477f211e187a55404a662f968",
      "name": "frontend",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "domain": "ACME",
      "uri": "http://10.0.0.2",
      "units": [{
        "id": "1bf3491c409b4541b6f18ea5988a6437",
        "address": "10.0.0.2",
        "location": "west-dc"
      }]
    },
    {
      "id": "c697bd2429304820a928d145aa42af59",
      "name": "backend",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "domain": "ACME",
      "uri": "http://10.0.0.3",
      "units": [{
        "id": "eb32f97866d24001baa430cb34e4049f",
        "address": "10.0.0.3",
        "location": "west-dc"
      }]
    }
  ]
}
```

## Create Web Server instance

**Table 4.33. Web Server Object**

| Attribute | Type   | Required | Description            |
|-----------|--------|----------|------------------------|
| name      | string | yes      | User-friendly name     |
| domain    | string | no       | Domain name            |
| units     | object | yes      | Web Server Unit object |

**Table 4.34. Web Server Unit Object**

| Attribute | Type   | Required | Description                                       |
|-----------|--------|----------|---|
| location  | string | yes      | AvailabilityZone or specific physical datacenter. |

## Call

**Table 4.35. POST /environments/<id>/webServers Call**

| Method | URI                           | Description           |
|--------|-------------------------------|-----------------------|
| POST   | /environments/<id>/webServers | Create new Web Server |

**Table 4.36. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | yes      | ID of valid configuration session |

## Payload

```
{
  "name": "frontend",
  "adminPassword": "password",
  "domain": "acme.dc",
  "units": [{
    "location": "west-dc"
  }]
}
```

## Returns

This call returns created web server:

```
{
  "id": "ce373a477f211e187a55404a662f968",
  "name": "frontend",
  "created": "2010-11-30T03:23:42Z",
```

```

    "updated": "2010-11-30T03:23:44Z",
    "domain": "ACME",
    "units": [{
      "id": "1bf3491c409b4541b6f18ea5988a6437",
      "location": "west-dc"
    }]
  }

```

## ASP.NET Application API

This section describes API calls for managing ASP.NET Applications

### Get a List of existing ASP.NET Applications

**Table 4.37. ASP.NET Application Object**

| Attribute  | Type     | Description   |
|------------|----------|---|
| id         | string   | Unique ID   |
| name       | string   | User-friendly name  |
| created    | datetime | Creation date and time in ISO format  |
| updated    | datetime | Modification date and time in ISO format  |
| repository | string   | URL of git repository containing the application source files                           |
| uri        | string   | URI of the Service  |
| domain     | string   | Domain name. This attribute may be empty/null/omitted if machine is not a domain member |
| units      | object   | ASP.NET Application Unit object   |

**Table 4.38. ASP.NET Application Unit Object**

| Attribute | Type   | Description                                       |
|-----------|--------|---|
| id        | string | Unique ID   |
| address   | string | Unit address                                      |
| location  | string | AvailabilityZone or specific physical datacenter. |

### Call

**Table 4.39. GET /environments/<id>/aspNetApps Call**

| Method | URI                           | Description                                 |
|--------|-------------------------------|---|
| GET    | /environments/<id>/aspNetApps | Get a list of existing ASP.NET Applications |

**Table 4.40. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | no       | ID of valid configuration session |

## Payload

None

## Returns

This call returns list of ASP.NET Applications:

```
{
  "aspNetApps":
  [
    {
      "id": "88f6ed99ff3645bcb84ele37ab9ece3d",
      "name": "frontend",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "domain": "ACME",
      "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
      "uri": "http://10.0.0.2",
      "units": [{
        "id": "59255829f0574297acclcd3a18ff6fd7",
        "address": "10.0.0.2",
        "location": "west-dc"
      }]
    },
    {
      "id": "aa49dcaff9914b8abb26855f0799b0e0",
      "name": "backend",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
      "uri": "http://10.0.0.3",
      "domain": "ACME2",
      "units": [{
        "id": "274b54f6bbe6493690e7107aa947e112",
        "address": "10.0.0.3",
        "location": "west-dc"
      }]
    }
  ]
}
```

## Create ASP.NET Application instance

**Table 4.41. ASP.NET Application Object**

| Attribute  | Type   | Required | Description   |
|------------|--------|----------|---|
| name       | string | yes      | User-friendly name  |
| repository | string | yes      | URL of git repository containing the application source files |

| Attribute | Type   | Required | Description                     |
|-----------|--------|----------|---------------------------------|
| domain    | string | no       | Domain name                     |
| units     | object | yes      | ASP.NET Application Unit object |

**Table 4.42. ASP.NET Application Unit Object**

| Attribute | Type   | Required | Description                                       |
|-----------|--------|----------|---|
| location  | string | yes      | AvailabilityZone or specific physical datacenter. |

## Call

**Table 4.43. POST /environments/<id>/aspNetApps Call**

| Method | URI                           | Description                    |
|--------|-------------------------------|--------------------------------|
| POST   | /environments/<id>/aspNetApps | Create new ASP.NET Application |

**Table 4.44. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | yes      | ID of valid configuration session |

## Payload

```
{
  "name": "frontend",
  "adminPassword": "password",
  "domain": "acme.dc",
  "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
  "units": [{
    "location": "west-dc"
  }]
}
```

## Returns

This call returns created ASP.NET Application:

```
{
  "id": "5374bd535e26452e8acb6ae3ee87c596",
  "name": "frontend",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:44Z",
  "domain": "ACME",
  "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
  "units": [{
    "id": "7bb3f29bcc9449f7b91f7a4d4668499a",
```

```
        "location": "west-dc"
    } ]
}
```

## Web Server Farm API

This section describes API calls for managing Web Server (IIS) Web Farm services

### Get a List of existing Web Server Farms

**Table 4.45. Web Server Farm Object**

| Attribute        | Type     | Description   |
|------------------|----------|---|
| id               | string   | Unique ID   |
| name             | string   | User-friendly name  |
| created          | datetime | Creation date and time in ISO format  |
| updated          | datetime | Modification date and time in ISO format  |
| uri              | string   | URI of the Service  |
| loadBalancerPort | integer  | Port number of the Farm   |
| domain           | string   | Domain name. This attribute may be empty/null/omitted if machine is not a domain member |
| units            | object   | Web Server Farm Unit object   |

**Table 4.46. Web Server Farm Unit Object**

| Attribute | Type   | Description                                       |
|-----------|--------|---|
| id        | string | Unique ID   |
| location  | string | AvailabilityZone or specific physical datacenter. |

### Call

**Table 4.47. GET /environments/<id>/webServerFarms Call**

| Method | URI                               | Description                             |
|--------|-----------------------------------|---|
| GET    | /environments/<id>/webServerFarms | Get a list of existing Web Server Farms |

**Table 4.48. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | no       | ID of valid configuration session |

### Payload

None

### Returns

This call returns list of Web Server Farms:

```

{
  "webServerFarms":
  [
    {
      "id": "01fa4412ab4849acb27394aaf307ca88",
      "name": "frontend",
      "created": "2010-11-30T03:23:42Z",
      "updated": "2010-11-30T03:23:44Z",
      "domain": "ACME",
      "loadBalancerPort": 80,
      "uri": "http://192.168.1.1:80",
      "units": [
        {
          "id": "a34992c8634b482798187d3c0e1c999a",
          "address": "10.0.0.2",
          "location": "west-dc"
        },
        {
          "id": "fcd60488bb6f4acf97ccdb8f8fc6bc9a",
          "address": "10.0.0.3",
          "location": "west-dc"
        }
      ]
    }
  ]
}

```

## Create Web Server Farm instance

**Table 4.49. Web Server Farm Object**

| Attribute        | Type    | Required | Description                 |
|------------------|---------|----------|-----------------------------|
| name             | string  | yes      | User-friendly name          |
| loadBalancerPort | integer | yes      | Port number for the Farm    |
| domain           | string  | no       | Domain name                 |
| units            | object  | yes      | Web Server Farm Unit object |

**Table 4.50. Web Server Farm Unit Object**

| Attribute | Type   | Required | Description                                       |
|-----------|--------|----------|---|
| location  | string | yes      | AvailabilityZone or specific physical datacenter. |

## Call

**Table 4.51. POST /environments/<id>/webServerFarms Call**

| Method | URI                               | Description                |  |
|--------|-----------------------------------|----------------------------|--|
| POST   | /environments/<id>/webServerFarms | Create new Web Server Farm |  |

**Table 4.52. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | yes      | ID of valid configuration session |

**Payload**

```
{
  "name": "frontend",
  "adminPassword": "password",
  "domain": "acme.dc",
  "loadBalancerPort": 80,
  "units": [{
    "location": "west-dc"
  }]
}
```

**Returns**

This call returns created Web Server Farm:

```
{
  "id": "fa723794e1b7454f967deb65b30d2c22",
  "name": "frontend",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:44Z",
  "domain": "ACME",
  "loadBalancerPort": 80,
  "units": [{
    "id": "54213d8fb87d41f7a1be2f81dbba0d69",
    "location": "west-dc"
  }]
}
```

## ASP.NET Application Farm API

This section describes API calls for managing ASP.NET Web Farm Application Services

### Get a List of existing ASP.NET Application Farms

**Table 4.53. ASP.NET Application Farm Object**

| Attribute | Type   | Description |
|-----------|--------|-------------|
| id        | string | Unique ID   |



| Attribute        | Type     | Description   |
|------------------|----------|---|
| name             | string   | User-friendly name  |
| created          | datetime | Creation date and time in ISO format  |
| updated          | datetime | Modification date and time in ISO format  |
| uri              | string   | URI of the Service  |
| repository       | string   | URL of git repository containing the application source files                           |
| loadBalancerPort | integer  | Port number of the Farm   |
| domain           | string   | Domain name. This attribute may be empty/null/omitted if machine is not a domain member |
| units            | object   | ASP.NET Application Farm Unit object  |

**Table 4.54. ASP.NET Application Farm Unit Object**

| Attribute | Type   | Description                                       |
|-----------|--------|---|
| id        | string | Unique ID   |
| address   | string | Unit address                                      |
| location  | string | AvailabilityZone or specific physical datacenter. |

**Call****Table 4.55. GET /environments/<id>/aspNetAppFarms Call**

| Method | URI                               | Description                                      |
|--------|-----------------------------------|--|
| GET    | /environments/<id>/aspNetAppFarms | Get a list of existing ASP.NET Application Farms |

**Table 4.56. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | no       | ID of valid configuration session |

**Payload**

None

**Returns**

This call returns list of ASP.NET Application Farms:

```
{
  "aspNetAppFarms":
  [
    {
      "id": "01fa4412ab4849acb27394aaf307ca88",
      "name": "frontend",
      "created": "2010-11-30T03:23:42Z",
```

```

    "updated": "2010-11-30T03:23:44Z",
    "domain": "ACME",
    "loadBalancerPort": 80,
    "uri": "http://192.168.1.1:80",
    "units": [
      {
        "id": "3374f4eb850e4b27bf734649d7004cc0",
        "address": "10.0.0.2",
        "location": "west-dc"
      },
      {
        "id": "fcd60488bb6f4acf97ccdb8f8fc6bc9a",
        "address": "10.0.0.3",
        "location": "west-dc"
      }
    ]
  }
}

```

## Create ASP.NET Application Farm instance

**Table 4.57. ASP.NET Application Farm Object**

| Attribute        | Type    | Required | Description   |
|------------------|---------|----------|---|
| name             | string  | yes      | User-friendly name  |
| repository       | string  | yes      | URL of git repository containing the application source files |
| loadBalancerPort | integer | yes      | Port number for the Farm                                      |
| domain           | string  | no       | Domain name   |
| units            | object  | yes      | ASP.NET Application Farm Unit object                          |

**Table 4.58. ASP.NET Application Farm Unit Object**

| Attribute | Type   | Required | Description                                       |
|-----------|--------|----------|---|
| location  | string | yes      | AvailabilityZone or specific physical datacenter. |

## Call

**Table 4.59. POST /environments/<id>/aspNetAppFarms Call**

| Method | URI                               | Description                         |
|--------|-----------------------------------|-------------------------------------|
| POST   | /environments/<id>/aspNetAppFarms | Create new ASP.NET Application Farm |

**Table 4.60. Headers**

| Name                    | Type   | Required | Description                       |
|-------------------------|--------|----------|-----------------------------------|
| X-Configuration-Session | string | yes      | ID of valid configuration session |

## Payload

```
{
  "name": "frontend",
  "adminPassword": "password",
  "domain": "acme.dc",
  "loadBalancerPort": 80,
  "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
  "units": [{
    "location": "west-dc"
  }]
}
```

## Returns

This call returns created ASP.NET Application Farm:

```
{
  "id": "1eb6cd5fc3f24d60a9a4c431512d3708",
  "name": "frontend",
  "created": "2010-11-30T03:23:42Z",
  "updated": "2010-11-30T03:23:44Z",
  "domain": "ACME",
  "loadBalancerPort": 80,
  "repository": "https://github.com/Mirantis/murano-mvc-demo.git",
  "units": [{
    "id": "54213d8fb87d41f7a1be2f81dbba0d69",
    "location": "west-dc"
  }]
}
```

---

# Chapter 5. Installation Guide

This chapter is about installation and configuration Murano services.

Note that all Murano modules can be downloaded from our page [<https://launchpad.net/murano/>] on launchpad.

## Common Pre-Requirements

Operation system:

1. Ubuntu
2. RHEL/CentOS

Packages:

1. python-dev
2. libxml2-dev
3. libxslt-dev

## Murano API Service

Murano API provides access to the Murano orchestration engine via API.

This chapter describes Murano API for contributors of the project, and assumes that you are already familiar with Murano API from an end-user perspective.

## Install

- Project source can be checked out as git repository (see below) or downloaded from here [<http://tarballs.openstack.org/murano-api/>]

```
user@work:~/$ git clone https://github.com/stackforge/murano-api.git
```

- Switch to just created directory

```
user@work:~/$ cd murano-api
```

- And then perform installation:

```
user@work:~/murano-api$ chmod +x setup.sh ; sudo ./setup.sh install
```

## Configure

- First configure rabbitMQ by adding vhost and user with administrator rights:

```
sudo rabbitmqctl add_user murano murano
sudo rabbitmqctl set_user_tags murano administrator
sudo rabbitmqctl add_vhost murano
sudo rabbitmqctl set_permissions -p murano murano ".*" ".*" ".*"
```

- Edit configuration file:

```
user@work:~/murano-api$ nano ./etc/murano-api.conf
```

- Configure it according to your environment:

*[DEFAULT]* section sets up logging.

In *[reports]* section you can set names for new rabbitMQ queues.

*[rabbitmq]* section sets up host configuration where rabbitMQ with just created user and vhost is running.

```
[DEFAULT]
# Show more verbose log output (sets INFO log level output)
verbose = True
# Show debugging output in logs (sets DEBUG log level output)
debug = True
# Address to bind the server to
bind_host = 0.0.0.0
# Port the bind the server to
bind_port = 8082
# Log to this file. Make sure the user running skeleton-api has
# permissions to write to this file!
log_file = /tmp/murano-api.log
#A valid SQLAlchemy connection string for the metadata database
sql_connection = sqlite:///murano.sqlite

[reports]
results_exchange = task-results
results_queue = task-results
reports_exchange = task-reports
reports_queue = task-reports
```

```
[rabbitmq]
host = localhost
port = 5672
virtual_host = murano
login = murano
password = murano
```

- Edit one more configuration file:

```
user@work:~/murano-api$ nano ./etc/murano-api-paste.ini
```

- Configure keystone auth\_token in `[filter:authtoken]` section. For more information see [Auth-Token Middleware with Username and Password \[http://docs.openstack.org/developer/keystone/configuringservices.html\]](http://docs.openstack.org/developer/keystone/configuringservices.html)

```
[pipeline:murano-api]
pipeline = authtoken context apivlapp
[app:apivlapp]
paste.app_factory = muranoapi.api.v1.router:API.factory
[filter:context]
paste.filter_factory = muranoapi.api.middleware.context:ContextMiddleware.factory

[filter:authtoken]
paste.filter_factory = keystoneclient.middleware.auth_token:filter_factory
auth_host = localhost
auth_port = 35357
auth_protocol = http
admin_tenant_name = admin
admin_user = admin
admin_password = password
signing_dir = /tmp/keystone-signing-muranoapi
```

- Register murano-api service in Openstack (note: you need to be authorized in Openstack to run this commands)

```
user@work:~/$ keystone service-create --name muranoapi --type murano --description
```

```
user@work:~/$ keystone endpoint-create
```

```
--region RegionOne
--service-id The ID field returned by the keystone service-create
```

```
--publicurl http://x.x.x.x:8082 (where x.x.x.x - host ip where murano-api is installed)
--internalurl the same as publicurl
--adminurl the same as publicurl
```

## Run

Run Murano API and supply valid configuration file:

```
user@work:~/$ murano-api --config-file=./murano/api/etc/murano-api.conf
```

## Conductor Service

Conductor is a Murano orchestration engine that transforms object model sent by REST API service into a series of Heat and Murano-Agent commands.

This document describes Conductor for contributors of the project.

## Install

- Project source code can be checked out from git repository (see below) or downloaded from [here](http://tarballs.openstack.org/murano-conductor/).  
[<http://tarballs.openstack.org/murano-conductor/>]

```
user@work:~/$ git clone https://github.com/stackforge/murano-conductor.git
```

- Switch to just created directory

```
user@work:~/$ cd murano-conductor
```

- And install Conductor Service to the system:

```
user@work:~/murano-conductor$ chmod +x setup.sh ; sudo ./setup.sh install
```

## Configure

- Edit configuration file:

```
user@work:~/murano-conductor$ nano ./etc/conductor.conf
```

- Change it according to your environment.

*[DEFAULT]* section is responsible for logging.

*[heat]* points where heat is running.

*[rabbitmq]* section points where your rabbitMQ installed and configured.

```
[DEFAULT]
log_file = logs/conductor.log
debug=True
verbose=True

[heat]
auth_url = http://localhost:5000/v2.0

[rabbitmq]
host = localhost
port = 5672
virtual_host = murano
login = murano
password = murano
```

## Run

Run Conductor and supply valid configuration file:

```
user@work:~/murano-conductor$ conductor --config-file=./etc/conductor.conf
```

## Murano Dashboard

Murano Dashboard provides Web UI for Murano Project.

## Pre-Requirements

- To setup Murano Dashboard on a host with Openstack Dashbord already installed you just need to install *the python-muranoclient*. You can download it from [here](http://tarballs.openstack.org/python-muranoclient/). [http://tarballs.openstack.org/python-muranoclient/] And then perform installation with pip:



```
user@work:~/ $ sudo pip install just_downloaded.tar.gz
```

- If there is no OpenStack Dashboard (horizon) you'll need to install it. See [here](http://docs.openstack.org/trunk/openstack-compute/install/yum/content/ch_install-dashboard.html) [http://docs.openstack.org/trunk/openstack-compute/install/yum/content/ch\_install-dashboard.html] how to do that.

## Install

- Project source code can be checked out from git repository (see below) or downloaded from [here](http://tarballs.openstack.org/murano-dashboard/). [http://tarballs.openstack.org/murano-dashboard/]

```
user@work:~/ $ git clone https://github.com/stackforge/murano-dashboard.git
```

- Switch to just created directory

```
user@work:~/ $ cd murano-dashboard
```

- And perform installation

```
user@work:~/murano-dashboard$ sudo python setup.py install
```

## Configure

- Open Django configuration file:

```
user@work:~/ $ cd <Horizon Installation Dir> && nano settings.py
```

Please, make sure that no local/local\_settings.py file exists.

- Add to import section

```
from muranoclient.common import exceptions as muranoclient
```

- And this so muranoclient exceptions can be safely handle by horizon:

```
RECOVERABLE_EXC = (muranoclient.HTTPException,
                   muranoclient.CommunicationError,
                   muranoclient.Forbidden)
EXTENDED_RECOVERABLE_EXCEPTIONS = tuple(
    exceptions.RECOVERABLE + RECOVERABLE_EXC)

NOT_FOUND_EXC = (muranoclient.HTTPNotFound, muranoclient.EndpointNotFound)
EXTENDED_NOT_FOUND_EXCEPTIONS = tuple(exceptions.NOT_FOUND + NOT_FOUND_EXC)

UNAUTHORIZED_EXC = (muranoclient.HTTPUnauthorized, )
EXTENDED_UNAUTHORIZED_EXCEPTIONS = tuple(
    exceptions.UNAUTHORIZED + UNAUTHORIZED_EXC)
```

- And finally edit HORIZON\_CONFIG and INSTALLED\_APPS sections

```
HORIZON_CONFIG = {
    ...
    'exceptions': {'recoverable': EXTENDED_RECOVERABLE_EXCEPTIONS,
                   'not_found': EXTENDED_NOT_FOUND_EXCEPTIONS,
                   'unauthorized': EXTENDED_UNAUTHORIZED_EXCEPTIONS},
    'customization_module': 'muranodashboard.panel.overrides'
}
...
INSTALLED_APPS = (
    ...
    'muranodashboard',
    ...
)
```

## Run

Horizon usually running on apache2 server, and can be restarted to apply changes by:

```
user@work:~/ $ sudo service apache2 restart
```

# Chapter 6. ScreenShots





**openstack**  
DASHBOARD

Project Admin

CURRENT PROJECT  
**admin**

Manage Compute

- Overview
- Instances
- Volumes
- Images & Snapshots
- Access & Security

Other

- Environments

Environment demo

Logged in as: admin [Settings](#) [Help](#) [Sign Out](#)

Services [+ Create Service](#)

| <input type="checkbox"/> | Name        | Type             | Status          | Operation |
|--------------------------|-------------|------------------|-----------------|-----------|
| <input type="checkbox"/> | ad.local    | Active Directory | Ready to deploy | -         |
| <input type="checkbox"/> | iis_server1 | IIS              | Ready to deploy | -         |
| <input type="checkbox"/> | iis_server2 | IIS              | Ready to deploy | -         |
| <input type="checkbox"/> | iis_server3 | IIS              | Ready to deploy | -         |

Displaying 4 items



**openstack**  
DASHBOARD

Project Admin

CURRENT PROJECT  
**admin**

Manage Compute

- Overview
- Instances
- Volumes
- Images & Snapshots
- Access & Security

Other

- Environments

Environment demo

Logged in as: admin [Settings](#) [Help](#) [Sign Out](#)

Services [+ Create Service](#)

| <input type="checkbox"/> | Name        | Type             | Status   | Operation  |
|--------------------------|-------------|------------------|--|--|
| <input type="checkbox"/> | ad.local    | Active Directory |  Deploy in progress | Creating Secondary Domain Controller on unit dc2       |
| <input type="checkbox"/> | iis_server1 | IIS              |  Deploy in progress | Unit iis_server1_instance_1 has joined domain ad.local |
| <input type="checkbox"/> | iis_server2 | IIS              |  Deploy in progress | Unit iis_server2_instance_1 has joined domain ad.local |
| <input type="checkbox"/> | iis_server3 | IIS              |  Deploy in progress | Unit iis_server3_instance_1 has joined domain ad.local |

Displaying 4 items



**openstack**  
DASHBOARD

Project Admin

CURRENT PROJECT  
**admin**

Manage Compute

- Overview
- Instances
- Volumes
- Images & Snapshots
- Access & Security

Other

- Environments

Environment demo

Logged in as: admin [Settings](#) [Help](#) [Sign Out](#)

Services [+ Create Service](#)

| <input type="checkbox"/> | Name        | Type             | Status | Operation  |
|--------------------------|-------------|------------------|--------|--|
| <input type="checkbox"/> | ad.local    | Active Directory | Active | Domain ad.local created                                |
| <input type="checkbox"/> | iis_server1 | IIS              | Active | Unit iis_server1_instance_1 has joined domain ad.local |
| <input type="checkbox"/> | iis_server2 | IIS              | Active | Unit iis_server2_instance_1 has joined domain ad.local |
| <input type="checkbox"/> | iis_server3 | IIS              | Active | Unit iis_server3_instance_1 has joined domain ad.local |

Displaying 4 items

  
openstack  
DASHBOARD

Project Admin

CURRENT PROJECT  
admin

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Other

Environments

Service Detail: ad.local

Logged in as: admin Settings Help Sign Out

Service Logs

Initialization....  
Creating instance dc1  
Creating instance dc2  
Instance dc1 created  
Instance dc2 created  
Creating Primary Domain Controller on unit dc1  
Primary Domain Controller created  
Unit dc2 has joined domain ad.local  
Creating Secondary Domain Controller on unit dc2  
Secondary Domain Controller created  
Domain ad.local created

  
openstack  
DASHBOARD

Project Admin

CURRENT PROJECT  
admin

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Other

Environments

Environments

Logged in as: admin Settings Help Sign Out

+ Create Environment

| <input type="checkbox"/> | Name | Status   | Actions         |
|--------------------------|------|--|-----------------|
| <input type="checkbox"/> | test | Ready to deploy  | Services More ▾ |
| <input type="checkbox"/> | demo |  Deploy in progress | Services More ▾ |

Displaying 2 items

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# Chapter 7. How To Participate

If you would like to ask some questions or make proposals, feel free to reach us on #murano irc channel at FreeNode. Typically somebody from our team will be online at irc from 6:00 to 20:00 UTC. You can also contact Murano community directly by [murano-all@lists.launchpad.net](mailto:murano-all@lists.launchpad.net) [mailto:murano-all@lists.launchpad.net] (please, note that your email address should be registered in launchpad, otherwise your mail will be ignored by mailing system).

We're going to hold public weekly meetings on Mondays at 17:00 UTC on #openstack-meeting-alt irc channel.

If you want to contribute either to docs or to code, simply send us change request via [review.openstack.org](http://review.openstack.org) [http://review.openstack.org] (gerrit). You can file bugs and register blueprints at Muranolaunchpad page [https://launchpad.net/murano].