



Project Acronym: **OPTIMIS**
Project Title: **Optimized Infrastructure Services**
Project Number: **257115**
Instrument: **Integrated Project**
Thematic Priority: **ICT-2009.1.2 – Internet of Services, Software and Virtualization**

Software Packages User Guide

Activity 6: Integration and Experimentation

WP 6.1: Integration

Due Date:	M36	
Submission Date:	07/06/2013	
Start Date of Project:	01/06/2010	
Duration of Project:	36 months	
Organization Responsible for the Deliverable:	ATOS	
Version:	1.0	
Status	Final	
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Project co-funded by the European Commission within the Seventh Framework Programme

Dissemination Level

PU	Public	X
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group specified by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission)	



Version History

Version	Date	Comments, Changes, Status	Authors, contributors, reviewers
0.1	01/10/2013	First version	Enric Pages (ATOS)
0.2	25/05/2013	01/10/2013	Jorge Ejarque (BSC) Josep Subirats (BSC) George Vafiadis (NTUA)
0.3	30/05/2013	Revision	Johan Tordsson (UMU) George Kousiouris (NTUA)
1	07/06/2013	Final version for submission	Ricardo Castaños (ATOS)



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1 Introduction

This document includes the user guide for each of the OPTIMIS software packages. The following sections describe how to use and configure the packages to get the expected functionality.

1.1 Glossary of Acronyms

Acronym	Definition
AC	Admission Control
CO	Cloud Optimizer
D	Deliverable
DM	Data Manager
DO	Deployment Optimizer
EE	Elasticity Engine
FTE	Fault Tolerance Engine
ICS	Image Creation Service
IDE	Integrated Development Environment
IDE	Integrated Development Environment
IP	Infrastructure Provider
MI	Monitoring Infrastructure
OVA	Open Virtual Appliance
PM	Programming Model
SD	Service Deployer
SDO	Service Deployment Optimizer
SM	Service Manager
SP	Service Provider
SSH	Secure Shell
VAPP	Virtual Appliance
VM	Virtual Machine
VMC	Virtual Machine Contextualizer
VMM	VM Manager
WP	Work Package
XML	Extensible Markup Language

Figure 1. Glossary



2 Software Packages User Guide

2.1 Release information

Package Name	Format
Service Construction	.zip
Service Provider	.zip / tar.gz
Infrastructure Provider	.zip / tar.gz
Database	.zip / tar.gz
Data Manager	.zip

Figure 2 - Release Information

2.2 Introduction

The software packages released in Y3 will help the end-users visualize how the Optimis Toolkit components can operate together. These packages contain an installation of the Y3 version of the Optimis Toolkit components.

The Service Construction package provides an integrated development environment for implementing Optimis Services.

The Service Provider (SP) package plays the role of an intermediary between end-users and the Infrastructure Providers.

The Infrastructure Provider (IP) package contains tools to simplify and automate the management of the IP's infrastructure.

The Database virtual appliance includes all the schemas to build the database where all the related OPTIMIS tools metrics are stored.

A DataManager package is also provided in order to build the Data Manager to create on-demand 'Data Analytics as a Service' clusters.



Figure 3 - OPTIMIS Tools

2.3 Software packages

Next paragraphs describe how to use the packages.

2.3.1 Service Construction

The Software package for service construction contains the installation of the Y3 version of the OPTIMIS Programming Model (PM) and the Integrated Development Environment (IDE), which provide a graphical user interface for implementing OPTIMIS services.

2.3.1.1 Requirements

Eclipse Helios (with WTP features for developers.)

Java EE

2.3.1.2 Getting Started

To install the Service construction package, you require to have and Eclipse Helios the Java EE for Web developers version (includes the WTP features). After that follow the step below:

1. Unzip the package
2. Change to the generated folder
3. Run `./install.sh <eclipse_location>`

Open your Eclipse installation and a new OPTIMIS menu should appear.

Details on how to use the IDE can be found in the Programming Model and IDE user guides. [1][2][3]

2.3.2 Service Provider Package

This package plays a Service Provider role through the following Optimis components:

- The Service Manifest offers an API that allows you to build Optimis Services in an xml manifest file following the OVF standards.
- The Service Manager that keeps track of all service runtime data.
- The SPTrustFramework provides trust from historical data and social networking.
- The Eco Efficiency Tool is in charge of assessing energy related aspects.



- The Broker components could be used to enable a multi-cloud deployment.
- Service Deployer (SD) / Deployment Optimizer (DO) manage the deployment of new services.
- The CloudBroker contains an IPregistry that allow SPs to register as many IPs as needed.
- The ServiceManager Web is a dashboard that centralizes the management of the Service Provider.
- The TREC Manager Web is a GUI where TREC related metrics are offered.

2.3.2.1 Requirements

JDK1.6.0_24 or higher is required.

Maven-3.0.3 or higher is recommended.

It is also recommended that the server have at least 2 cores and 2 GB of memory, and a minimum of 10GB free space.

2.3.2.2 Getting Started

To configure the SP package follows the steps below:

1. Download the Service Provider package (.zip/.tar.gz)
2. Extract the packages
 - a. Zip case:
`unzip optimis-sp-distribution-3.0.zip`
 - b. .tar.gz case:
`tar xvfz optimis-sp-distribution-3.0.tar.gz`

Take into account that Optimis software packages are system-wide so the path where you extract the content will be your `$OPTIMIS_HOME`.

3. Export `$OPTIMIS_HOME` environment variable
`i.e.: export OPTIMIS_HOME=/opt/optimis/`
4. Export `$CATALINA_HOME` environment variable
`export CATALINA_HOME = $OPTIMIS_HOME/optimis-sp`

5. The SP package hierarchy looks like as follow:

```
$OPTIMIS_HOME/  
|-- bin => Generic scripts  
|-- dm => DataManager scripts to generate SP mountpoints  
|-- documentation => Documentation  
|-- etc => Config files per component  
|-- optimis-ics ==> SP storage folder  
|-- optimis-sp => SP tomcat container where components are deployed  
|-- sdo => SDO server  
|-- var => Log directory  
`-- vmc => Repository for contextualized isos
```

6. In order to make the SP works the relation between hosts should looks like as follows:
`#Localhost`



```
127.0.0.1 localhost
# Full Optimis Environment
127.0.0.1 optimis-spvm
x.x.x.x optimis-ipvm
x.x.x.x optimis-database
x.x.x.x DataManager
#Physical layer
x.x.x.x optimisl
```

7. First of all you will need to register the IPs, in this version only a provider called *'generic'* is configured. IPRegistry tool provided inside the Broker component is in charge of the IP registration. The IPRegistry information is stored in the file **IP-Store.xml** and the location of this file storage can be configured in the configuration file **BrokerServerProperties**.

(`$(CATALINA_HOME)/webapps/CloudBrokerREST/WEB-INF/classes/IP-Store.xml`)

8. Start tomcat container:

```
cd $CATALINA_HOME/bin/
./start.sh
```

9. Once the provider targets are configured you can start the Service Deployment Optimizer component.

```
cd $OPTIMIS_HOME/etc/sdo/sdo.properties
```

(Edit the configuration file: It is mandatory that the SM endpoint will be configured to be accessible from outside as it will be passed across the OPTIMIS entities inside the manifest)

```
cd $OPTIMIS_HOME/etc/sdo/DeploymentService/SDO-GUI/
./runserver.sh
```

10. After a successful start of the SDO you are ready to deploy services. Use the Service Construction virtual appliance or the SDO GUI for performing deployments. The SDO GUI may be found on the following URL:

<http://optimis-spvm:8087/>

11. Optimis provides a Service Provider Dashboard where the SP capabilities are centralized. Service Provider Dashboard may be found on the following URL:

<http://optimis-spvm:8080/ServiceManagerWeb>

Additional setup has to be made to configure the Data Manager, the required scripts to install and configure the shared mount point between the SP and the DM can be found under `$(OPTIMIS_HOME)/dm/`.

The `/conf` folder contains the credentials of each of the DM instances that you want to connect.

Install the required packages with `install-optimis-sp-datamanager.sh` and use `optimis-sp-mount/optimis-sp-umount` scripts to enable/disable the shared space.

Note that Optimis components are highly configurable; additional details about how to use a specific component can be found in the installation and user guides.[3][4][5][6][7][8]

2.3.3 Infrastructure Provider Package

The IP software package contains the tools to simplify and automate the management of the Infrastructure provider's infrastructure.



The components deployed on the virtual appliance covers different roles:

- The Admission Control decides when to admit services, the SLA Manager negotiates, create and monitor SLAs between SPs and IPs.
- The Monitoring Manager collects runtime metrics and propagates this information to the TREC framework analysis.
- The Fault Tolerance Engine recovers the service from failures restarting failing VMs.
- The Elasticity Engine proactively allocates and de-allocates resources based on the SLA metrics defined for the service.
- The VM Manager provides a mechanism to operate and allocate VMs across the infrastructure.
- The Cloud Optimizer component is a management entity that combines monitoring and assessment tools in the toolkit.
- The Virtual Machines Contextualizer enables the dynamic changing environment of an IP to be abstracted away from the application deployed.
- The IP Trust framework calculates the trust rating based on historical information and social networking offering this information at deployment and operation time.
- The Eco Efficiency Tool is in charge of assessing energy related aspects.
- The Economic Framework is responsible of cost and economic factors.
- The TREC Manager Web is a GUI where TREC related metrics are offered.
- The IPManagerWeb is a dashboard that centralizes the management of the Infrastructure Provider.

2.3.3.1 Requirements

JDK1.6.0_24 or higher is required.

Maven-3.0.3 or higher is recommended.

It is recommended that the server have at least 2 cores and 3 GB of memory, and a minimum of 15GB free space.

2.3.3.2 Getting Started

To configure the IP package follows the steps below:

1. Download the Infrastructure Provider package (.zip/.tar.gz)
2. Extract the packages
 - a. Zip case:
`unzip optimis-ip-distribution-3.0.zip`
 - b. .tar.gz case:
`tar xvfz optimis-ip-distribution-3.0.tar.gz`

Take into account that Optimis software packages are system-wide so the path where you extract the content will be your \$OPTIMIS_HOME.

3. Export \$OPTIMIS_HOME environment variable
`i.e.: export OPTIMIS_HOME=/opt/optimis/`
4. Export \$CATALINA_HOME environment variable



```
export CATALINA_HOME = $OPTIMIS_HOME/optimis-ip
```

5. The IP package hierarchy looks like as follow:

```
$OPTIMIS_HOME/  
|-- ElasticityServer => EE server  
|-- bin => Generic scripts  
|-- dm => DataManager scripts to generate storage mountpoints  
|-- documentation => Documentation  
|-- etc => Configurations per component  
|-- optimis-ics => SDO mount-point  
|-- optimis-ip => IP tomcat container where components are deployed  
|-- sdo => SDO server  
|-- servicemonitoring => ServiceMonitor service  
|-- var => Log directory  
|-- vmc => Repository for contextualized isos  
`-- vmstorage => IP side DM mount-point
```

6. In order to make the IP works the relation between hosts should looks like as follows:

```
#Localhost  
127.0.0.1 localhost  
# Optimis Environment  
x.x.x.x optimis-spm  
127.0.0.1 optimis-ipvm  
x.x.x.x optimis-database  
x.x.x.x DataManager  
#Phisycal layer  
x.x.x.x optimis1
```

7. First of all you will need to start the container where the toolkit components are deployed.

The IP components can be found under `$OPTIMIS_HOME/optimis-ip/webapps/`
It is recommended to use specific ruby script located under `$OPTIMIS_HOME/bin`
to restart the container in order to enforce the correct deployment order of the components.

```
cd $OPTIMIS_HOME/bin  
./restartiptomcat.rb
```

8. After a successful start the core of the IP is ready.
9. Optimis provides an Infrastructure Provider Dashboard where the IP capabilities are centralized. IP Dashboard may be found on the following URL:

<http://optimis-ip:8080/IPManagerWeb>

Despite this other component are needed in order to fully support the operations offered by OPTIMIS:

The Elasticity Engine server offers bursting recommendations to the IP based on the threshold metrics defined by the users. Virtual, physical and service level metrics are supported.

```
cd $OPTIMIS_HOME/ElasticityServer/ElasticityEngineServer/  
nohup mvn jetty:run
```

The Service Monitoring tool allows us to capture server level metrics specifics to the application.



```
cd $OPTIMIS_HOME/servicemonitoring  
nohup ./run.sh
```

The SDO allows IPs to burst or federate among other providers if they cannot fulfill the service requirements.

```
cd $OPTIMIS_HOME/etc/sdo/sdo.properties  
(Edit the configuration file: It is mandatory that the SM endpoint will be configured to be  
accessible from outside as it will be passed across the OPTIMIS entities inside the manifest)
```

```
cd $OPTIMIS_HOME/etc/sdo/DeploymentService/SDO-GUI/  
./runserver.sh
```

Additional setup has to be made to configure the Data Manager, the required scripts to install and configure the shared mount point between the IP and the DM can be found under `$OPTIMIS_HOME/dm/`.

Extract `optimis-dm-mount-vmimages.zip` zip. Install the required packages with `install-optimis-datamanager.sh` and use `optimis-sp-mount/optimis-sp-umount` scripts to enable/disable the shared space.

GAMS version 23.6 or higher is required for solving the optimization problem that is formulated by the Admission Control component. Information about downloading and installing it can be found at the GAMS [28] site: <http://www.gams.com>. Please see the AC user guide for more information. [10]

Note that the components deployed on those virtual appliances are highly configurable; additional details about how to use a specific component can be found in the installation and user guides. [9][10][11][12][13][14][15][17][18][19][20][21]

2.3.4 Database Package

Database package includes the database schemas used by the Monitoring infrastructure, among other schemas that are used to store the TREC related information.

The Monitoring Infrastructure (MI) software component provides its functionalities via two sub-components: Aggregator and Monitoring Manager. The MI is in charge of collecting all the service related metrics divided in virtual, physical and service level metrics.

Those metrics are stored in a database, they are used by the other decision making components such as Cloud Optimizer, VMM, when determining which actions to perform on the cloud.

2.3.4.1 Requirements

MySQL_server.

It is recommended that the server have at least 2 core and 2 GB of memory, and a minimum of 15GB free space.

2.3.4.2 Getting Started

In order to configure the Database virtual appliance follows the steps below:

1. Download the Database package (`.zip/.tar.gz`)
2. Extract the package



- a. Zip case:
`unzip optimis-DBschemas.zip`
 - b. .tar.gz case:
`tar xvfz optimis-DBschemas.tar.gz`
3. Import the Optimis schemas into your MySQL installation.

2.3.5 Data Manager Package

Data Manager Package is the blue print for instantiating the OPTIMIS distributed file system.

2.3.5.1 Requirements

If it is configured in a virtual system such as Xen, Xen 3.3.2 or higher is required. The hypervisor have to support hardware-assisted virtualization.

2.3.5.2 Getting Started

The steps for package installation are given below:

- Download `optimis-datamanager-v3-release.zip`
- `wget optimis-datamanager-v3-release.zip`
- `apt-get install zip`
- `unzip optimis-datamanager-v3-release.zip`
- `chmod +x *.sh`
- `./install.sh`

Additional details about how to use Data Manager component can be found in the installation and user guide document. [9]

2.3.6 Physical Layer

Emotive Cloud 2.0

EMOTIVE Cloud 2.0 is a middleware to manage infrastructure resources in order to create private and public clouds. It consists of 4 components, each of them shipped as an independent war file. They are:

- The Virtualization Manager that allows managing the virtual resources of the host where it is installed.
- The Dynamic Resource Provisioning optimizes through a scheduler the placement of VM, and a Network Manager that allows the creation of virtual networks.
- The Resource Manager is in charge of monitoring the status of the infrastructure resources.
- A Graphical User Interface to use Emotive functionalities from a web based dashboard.

Information about downloading and installing Emotive Cloud 2.0 can be found at the Emotive Cloud 2.0: Quick installation Guide and Startup [30].

Interoperability with other VM Managers

DRP OpenNebula:

We have implemented a plugin for OpenNebula (so-called DRP4ONE) that offers VMM the possibility of creating, removing and moving VM's around the OpenNebula cluster.



DRP4ONE is a web application, running on an application server, which provides its web services through a REST interface that follows the OCCl specification. DRP4ONE interacts with the XML-RPC API exposed by OpenNebula through the “Java OpenNebula Cloud API 3.8”, a Java wrapper for the XML-RPC methods offered by OpenNebula. The main functionality of DRP4ONE is mapping the REST requests against its corresponding OpenNebula requests. DRP4ONE methods handle the client requests, extract from the requests all the necessary data and after that, generate the corresponding OpenNebula requests.

DRP OpenStack:

We have implemented a plugin for OpenStack (so-called DRP4OST) that offers VMM the possibility of creating, removing and moving VM's around the OpenStack cluster.

DRP4OST is a web application, running on an application server, which provides its web services through a REST interface that follows the OCCl specification. DRP4OST interacts with the OpenStack through its REST interface. DRP4OST generates the HTTP requests and analyze responses helped by HTTPComponents.

The main functionality of the web service is mapping the REST requests against its corresponding OpenStack requests. The methods that handle the client requests, extracts from the request received all the necessary data and after that, it generates the corresponding OpenStack requests. In the cases where nova client and glance client are used, the web application generates and executes command instead of generating a HTTP request.

Use the link bellow to find the most updated version of the DRP plugins:

https://emotivecloud.svn.sourceforge.net/svnroot/emotivecloud/branches/smendoz_a/Scheduler/

Image Creation Service (ICS)

The ICS need to be installed in the physical layer. More information about how to install and configure ICS component can be found in the Image Creation Service user and installation guides [16].

MI Physical Collectors

MI can collect monitoring parameters and store them in a monitoring database for TREC purpose. It uses pull and push process to collect parameter. By executing pull or push process MI works only specific defined xml format, in which the collected monitoring data are wrapped.

MI uses Nagios [24] to collect physical level monitoring parameter. Because the monitoring parameter from Nagios should be wrapped in a specific XML format, we have developed script files, which are seen as collector scripts, to achieve this.

The following steps are needed to enable collect (physical) monitoring parameters

1. Install optimis_db database (section 2.3.4.2)
2. Install Nagios.
3. Add new records into the table `monitoring_information_collector` in Optimis database. (Currently the collector scripts could be found under `/opt/optimis/MonitoringInfrastructure/scripts` on `optimis-ipvm` host)



4. Start monitoring by calling the command:

```
curl -d "" http://{HOST:PORT}/Aggregator/Aggregator/startmonitoring
```

Mounting Distributed Virtual Image Repository

Data Manager provides a distributed image repository. There are two image repositories which are used for storing virtual images. The first image repository is used for storing VM images for each service. These images can be in XEN or HVM (qcow2) or VDI format. SDO uses the DM client API in order to perform the actual uploading. Emotive can have access to this repository using a mounting point. The mounting point is created using the `optimis-mount` and `optimis-umount` scripts. These scripts are called by `optimis-datamanager` `init.d` service script and their operation is automatic.

These scripts have to be installed to all machines where the `emotive` is installed and where VM images are instantiated. The installation is straightforward:

- Download `optimis-dm-mount-vmimages-current.zip`
- `unzip optimis-dm-mount-vmimages-current.zip`
- `chmod +x install-optimis-datamanager.sh`
- `./install-optimis-datamanager.sh <ip-provider>`

The `ip-provider` has the same file name as configuration file located inside the `conf` folder of `optimis-dm-mount-vmimages-current.zip`. The '`conf`' folder has for each IP a configuration file. This configuration file has the IP address and an `ssh` key for accessing the repository.

The second image repository provided by DM is the Service Provider Image Repository. This repository is used by the Contextualization as a temporary storage facility while generating images. The functionality is provided through mounting scripts the same way we mount the storage for the IP.

The installation script is `optimis-dm-mount-spimages-current.zip`. The procedure is given below:

- `yum -i zip wget zip`
- Download `optimis-dm-mount-spimages-current.zip`
- `unzip optimis-dm-mount-spimages-current.zip`
- `chmod +x install-optimis-sp-datamanager.sh`
- `./install-optimis-sp-datamanager.sh`

The mounting point is located at `/opt/optimis-ics`.

Additional details about how to use Data Manager component can be found in the installation and user guide document. [9]

2.4 Other information

2.4.1 Repository Information

User and Installation Guides Repository

<http://ww.optimis-project.eu/>

Artifactory Repository

<http://optimis-artifactory.atosorigin.es/artifactory/>



2.4.2 Contributors

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- [30] Emotive Cloud 2.0: Quick installation Guide and Startup
[<http://surfnet.dl.sourceforge.net/project/emotivecloud/EMOTIVEManual.pdf>]