

Quick start guide:

FederatedCloudSim

This quick start guide provides a short introduction to the simulation framework **FederatedCloudSim** (FCS). FCS is based on the modular cloud simulation framework CloudSim¹.

Main features:

1. simulation of different federation scenarios (one to many cloud service provider (CSPs) having each one to many data centers (DCs) and vCSP (virtual CSPs) which act as service brokers without resources (DCs) of their own) (cf. Figure 1)
2. fully automatized SLA management (including SLA and service request management)
3. three tier VM scheduling (Inter-DC-Level, Intra-DC-Level (same CSP) and Inter-CSP-Level (federation)) (including different schedulers on each level) (cf. Figure 2)
4. resource overprovisioning (RAM and CPU)
5. processing of real world cloud workload traces
6. cloud auctioning platform
7. versatile finance model (CloudAccount)
8. very comprehensive monitoring and logging (including graphical analysis of VM migrations using Gephi²)
9. XML-configuration

FCS is built as an extension to CloudSim. This way FCS does not interfere with the base framework and can easily be ported to newer versions of CloudSim as long as no core-functionality is altered. FCS is built in a modular way so that it can be easily extended. For example the schedulers on all three levels, the SLA manager and the financial model are implemented using abstract base-classes. If you want to implement your own strategies you can inherit from these classes and add your functionality (see figure 2).

To help you understand the way the framework works we provide a set of schedulers for all levels, a financial model and a SLA manager. These classes can be used to conduct your own research or as a basis to build upon. Further we provide some example configurations for the same purpose.

¹ CloudSim: <http://www.cloudbus.org/cloudsim/>

² Gephi: <https://gephi.org/>

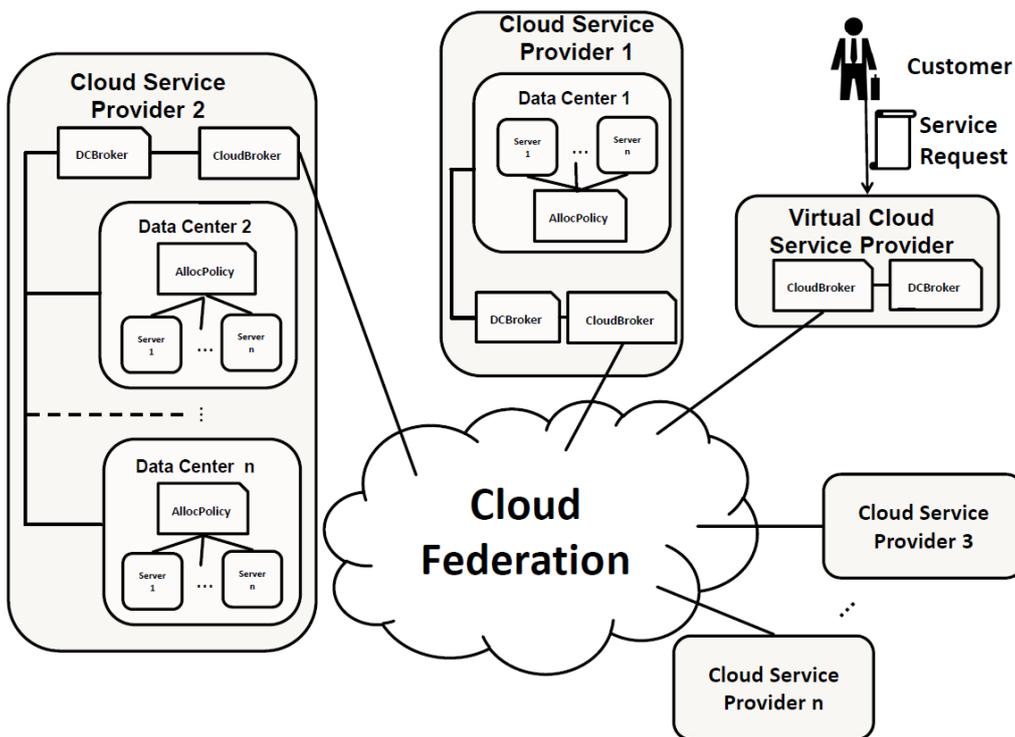


Figure 1: Example of a cloud federation scenario with CSPs and a vCSP

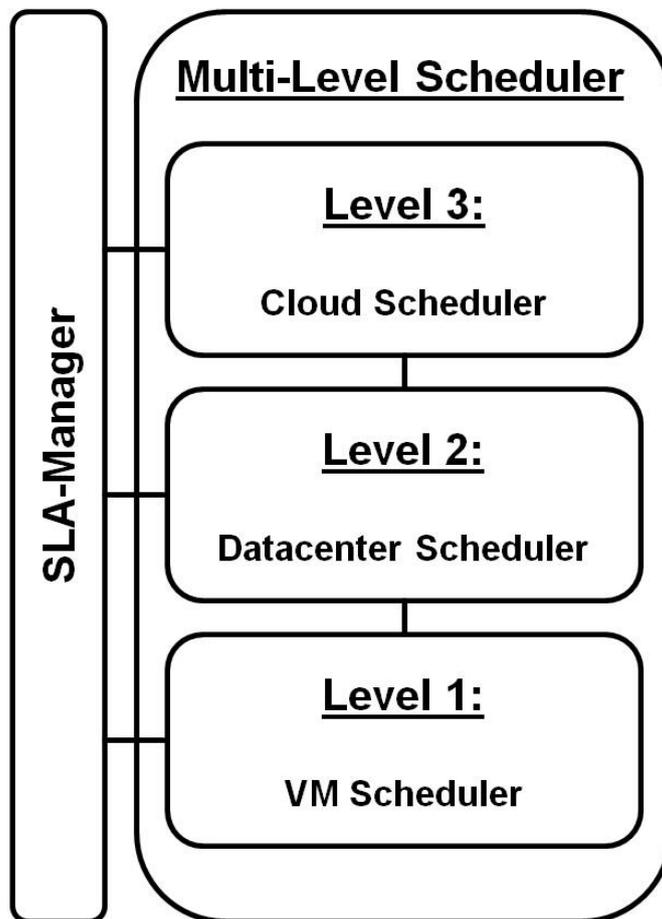


Figure 2: Multi-level scheduling in FCS with SLA-Manager

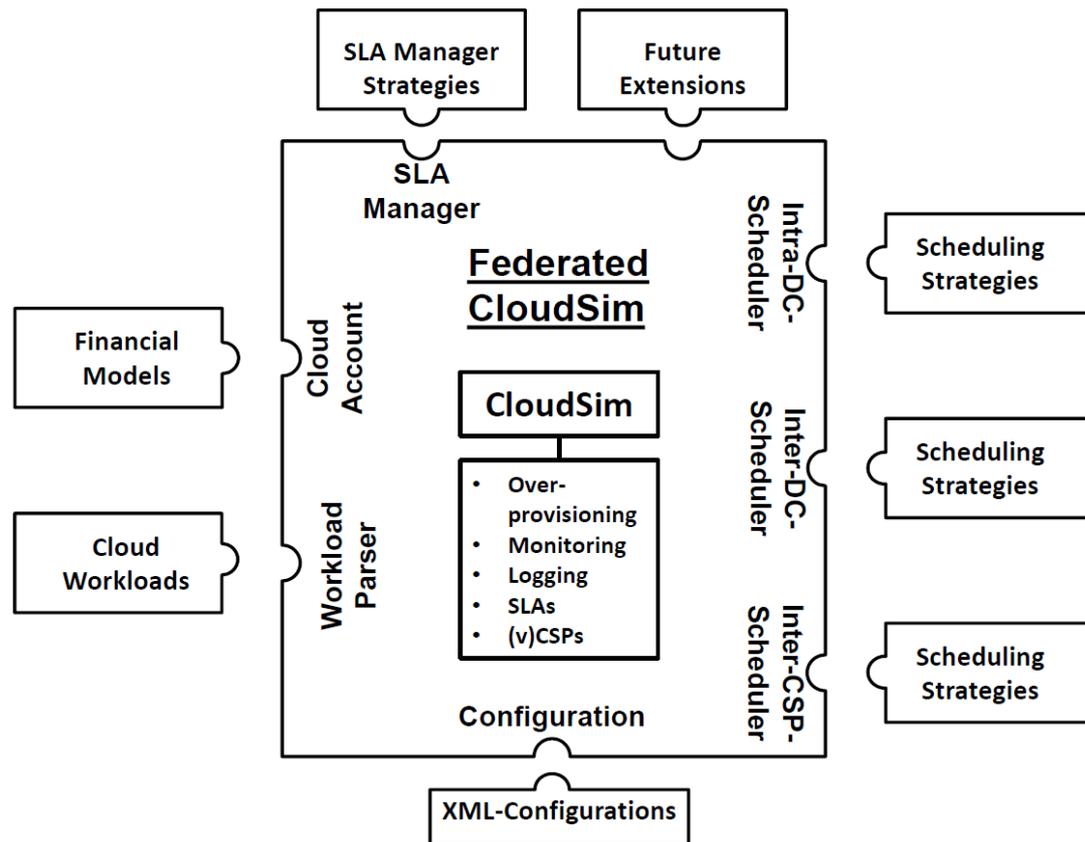


Figure 3: Schematic structure of FederatedCloudSim

Simulations in FCS:

To conduct simulations using FCS you have to integrate the workload traces and configure your cloud scenario. Please follow these steps:

1. Download FederatedCloudSim from our project site:

<http://ess.cs.uni-dortmund.de/EN/Research/Projects/FederatedCloudSim/index.html>

2. Download the workload traces from:

<http://gwa.ewi.tudelft.nl/datasets/gwa-t-13-materna>

and

<http://gwa.ewi.tudelft.nl/datasets/gwa-t-12-bitbrains>

3. Extract FCS on your PC and open it in your IDE (e.g. Eclipse)
4. Integrate the following libraries in you build path:

- a. jdom: (tested with v. 2.0.6) <http://www.jdom.org/downloads/>

- b. opencsv: (tested with v 3.8) <https://sourceforge.net/projects/opencsv/>

- c. CloudSim: (tested with v 4.0)<https://github.com/Cloudslab/cloudsim/releases>
5. Use the TraceShortener in the utils package to create workload files that can be read by FCS. For creating the trace files you have to configure the tool accordingly (local folder paths etc.).
6. Convert your workloads with: "utils.TraceShortener
7. Formatt your workloads with: utils.WorkloadFormatter
 - a. copies and renames all workloads into the correct format
 - b. if you have different workload folders, for each csp --> use copyRenameOn=true to copy and rename all workloads into the correct format, also use generateSwfOn=true, to to create the swf file for this setup.
 - c. If you have one workload folder for one csp only, just use generateSwfOn=true and set all necessary values (e.g. vmCountList.add([NUMBER_OF_VMS]))
 - d. If you have one workloadfolder for more then one csp, just use generateSwfOn=true and set all necessary parameters --> add number of vms for each csp to vmCountList.add([NUMBER_OF_VMS]); the sum of all vms must be equal to the numver of csv-files in your workload folder
8. Configure your simulation scenario. See ConfigXML.txt file.
9. Configure the framework: See Properties.txt file.
10. Provide a path to the properties file of your simulation as a parameter in your IDE or in your console. The properties file contains all other paths (config.xml, swf file and trace folder).
11. Start the simulation by executing FederatedCloudSim in the com.materna.federatedcloudsim.core package
12. Find all configured logs in your log-folder.

If you need further information on who CloudSim works please consult the CloudSim project page: <http://www.cloudbus.org/cloudsim/>

For a good (video) introduction to CloudSim please see: <http://www.superwits.com/library/cloudsim-simulation-framework>

FederatedCloudSim project site:

<http://ess.cs.uni-dortmund.de/EN/Research/Projects/FederatedCloudSim/index.html>

If you use FCS for your work please cite at least one of the following papers (preferably No. 2):

1. Andreas Kohne and Olaf Spinczyk. Model for SLA-Based VM Scheduling in Federated Cloud Environments. J. Integrated Design & Process Science, 18(1):39 - 52, 2014.
2. Andreas Kohne, Marc Spohr, Lars Nagel, and Olaf Spinczyk. FederatedCloudSim: A SLA-aware Federated Cloud Simulation Framework. In Proceedings of the 2Nd International Workshop on CrossCloud Systems, CCB '14, pages 3:1 - 3:5, New York, USA, 2014. ACM.
3. Andreas Kohne, Damian Pasternak, Lars Nagel, and Olaf Spinczyk. Evaluation of SLA-based Decision Strategies for VM Scheduling in Cloud Data Centers. In Proceedings of the 3rd Workshop on CrossCloud Infrastructures & Platforms, CrossCloud 2016, London, April 2016.