

DiCloud Software Architecture and Administration

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1. Requirements

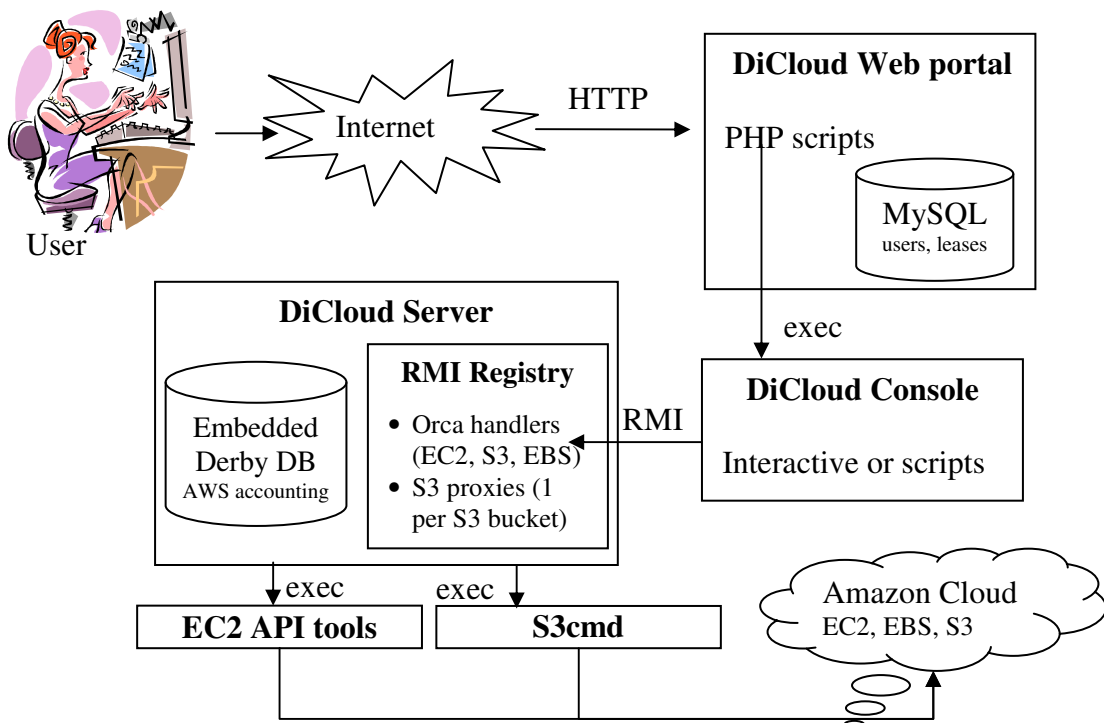
The following software is required in order to use the DiCloud software distribution:

- Java Runtime Environment v1.5 or more recent (Java 6 recommended)
- EC2 command line tools available for download from [1]
- S3 command line tools [6] configured using `s3md --configure`
- Apache/PHP/MySQL for the Web portal

2. Architecture overview

The DiCloud software is composed of 3 main components:

- The DiCloud Web portal that interfaces with users (researchers). It is written in PHP, stores information about users and leases in a MySQL database, and performs cloud operations by invoking the DiCloud console.
- The DiCloud console interacts with the DiCloud server to perform operations on the cloud. The console can be invoked interactively on the command line or can be scripted (commands stored in a text file redirected as input of the console).
- The DiCloud server integrates the Orca handlers that interact with the AWS resources. It also embeds an Apache Derby database that keeps track of AWS accounting.



3. Installing the DiCloud software

You can download the latest distribution of the DiCloud software from the DiCloud wiki page at <http://groups.geni.net/geni/wiki/DICLOUD>.

3.1. Setting up the DiCloud Server and Console

The DiCloud server and console software are packaged in source and binary distributions. The source distribution can be built using Ant and a JDK v1.5 or 1.6. Simply uncompress the distribution in a directory of your choice. The scripts to start the server and the console are located in the bin/ directory of the distribution.

Use *dicloud_server.sh* to start the DiCloud server. Note that this will also start the embedded Derby database that will store its content in the current directory.

The console is started using *dicloud_console.sh*. Typing 'help' displays a list of all available commands and their syntax. Here is an example of a console session:

```
cecchet@geni:~/dicloud/bin$ ./dicloud_console.sh
dicloud - not connected>connect localhost 1099
Connecting to //localhost:1099/dicloud/server
dicloud - //localhost:1099>help
Commands available for the main menu are:
add credit amount_of_money
    Add credit to the AWS account
billing history history_size csv|html
    Get the AWS account activity history in CSV or HTML format (a history of 0 retrieves
the entire history)
connect DiCloudServerHostName RmiPortNumber
    Connects to the DiCloud server
ebs attach cert.pem pk.pem ec2_region ebs_volume_id ec2_instance_id device_name
    Attach an EBS volume (ebs_volume_id) to the running instance (ec2_instance_id) as
device device_name
ebs create cert.pem pk.pem size_in_gb ec2_region ec2_availability_zone
    Create an EBS volume
ebs delete cert.pem pk.pem volume_id ec2_region
    Delete an EBS volume
ebs detach cert.pem pk.pem ec2_region ebs_volume_id
    Detach EBS volume ebs_volume_id from its EC2 instance
ebs probe cert.pem pk.pem volume_id ec2_region ascii|html
    Probe an EBS volume and get current status information
ec2 probe cert.pem pk.pem instance_id ec2_region html|ascii
    Check the status of a running EC2 instance
ec2 start cert.pem pk.pem ami_id instance_nb instance_type ec2_region ec2_keypair_name
    Start a new EC2 instance
ec2 stop cert.pem pk.pem instance_id ec2_region ec2_keypair_name
    Stop an EC2 instance
get balance
    Get the AWS account balance
help
    Print this help message
history [<command index>]
    Display history of commands for the console.
quit
    Quit the console
s3 create bucket_name region
    Create an S3 bucket
s3 delete bucket_name region
    Delete an S3 bucket
s3 get s3_bucket_name object_name file_path
    Get the content of an object named object_name into the specified file from the S3
bucket
s3 probe bucket_name region
    Get information about an S3 bucket
```

```

s3 put s3_bucket_name object_name file_path
    Put the content of the specified file in an object named object_name in the S3 bucket
shutdown
    Shutdown the DiCloud server the console is currently connected to.
dicloud - //localhost:1099>billing history 10 csv
Timestamp,Service,Operation,Cost
2010-11-02 17:12:07.059,S3,s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/rushsprings.ok-20100510-200236.netcdf.gz
/tmp/dicloud2623012264487143179get,-0.015000999999999999
2010-11-02 17:12:07.055,S3,Network Out traffic for s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/rushsprings.ok-20100510-200236.netcdf.gz
/tmp/dicloud2623012264487143179get,-0.0011958047887310383
2010-11-02 17:11:38.885,S3,s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/chickasha.ok-20100510-200232.netcdf.gz
/tmp/dicloud1219043568055753102get,-0.015000999999999999
2010-11-02 17:11:38.88,S3,Network Out traffic for s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/chickasha.ok-20100510-200232.netcdf.gz
/tmp/dicloud1219043568055753102get,-0.0011741684563457964
2010-11-02 17:11:19.065,S3,s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/cyril.ok-20100510-200218.netcdf.gz
/tmp/dicloud6162340948333184987get,-0.015000999999999999
2010-11-02 17:11:19.037,S3,Network Out traffic for s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/cyril.ok-20100510-200218.netcdf.gz
/tmp/dicloud6162340948333184987get,-0.001451566801406443
2010-11-02 17:10:57.438,S3,s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/lawton.ok-20100510-200214.netcdf.gz
/tmp/dicloud1564631151005979217get,-0.015000999999999999
2010-11-02 17:10:57.434,S3,Network Out traffic for s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/lawton.ok-20100510-200214.netcdf.gz
/tmp/dicloud1564631151005979217get,-0.0014650322869420049
2010-11-02 17:10:37.344,S3,s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/rushsprings.ok-20100510-200211.netcdf.gz
/tmp/dicloud5495581357460960241get,-0.015000999999999999
2010-11-02 17:10:37.331,S3,Network Out traffic for s3cmd get -f --bucket-location=us
s3://geni_gec9_demo_raw/rushsprings.ok-20100510-200211.netcdf.gz
/tmp/dicloud5495581357460960241get,-0.00145439890678972
dicloud - //localhost:1099>quit

```

The console provides command completion and command history for ease of use. The console can be scripted by typing the commands in a text file and redirected the input of the console to the text file like: `./dicloud_console.sh < commands.txt`. If the script needs to run in background, you must use `dicloud_console_script.sh` instead otherwise the tty interactions are going to block in Unix environments.

3.2. *Setting up the DiCloud Web Portal*

The DiCloud web portal is currently implemented as an extension of the Vise portal.

Though it is possible to use the DiCloud portal autonomously.

The Web portal is written in PHP and works well with a standard LAMP stack with Apache v2 and PHP 5.

Just uncompress the DiCloud web portal distribution in a directory and configure your HTTP server to point to that directory. The home page is the `dicloud.php` script in the main directory.

Edit the `secure/dicloud_console.php` script to adjust the `$console_path` variable and eventually the DiCloud host name and port if it is not running on the local machine.

The MySQL database access configuration setup can be tuned in the `secure/dicloud_db.php` script.

The database schema is described in appendix 6.1 and can be used to create the DiCloud database. You can create an initial admin user using an SQL statement like:

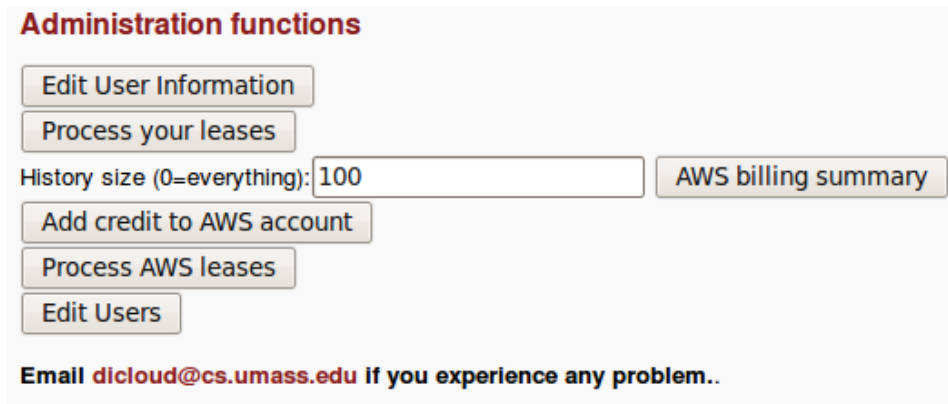
```
INSERT INTO users(id, username, password) VALUES (1, 'admin', SHA1('geni'));
```

To give all the access rights to this admin user (id=1), use a statement like:
INSERT INTO admin_rights VALUES (1, true, true, true, true);

You can then log into the DiCloud portal as user *admin* with password *geni* and create new users as needed (see next section for administration functions).

4. DiCloud administration functions

All the regular user functions are described in the DiCloud User Guide. When a user have all the administrator rights, the following options are available:



Administration functions

Edit User Information

Process your leases

History size (0=everything): 100

AWS billing summary

Add credit to AWS account

Process AWS leases

Edit Users

Email dicloud@cs.umass.edu if you experience any problem..

- Edit User Information: Edit the current user information to change his/her password and download the keypair
- Process Your Leases: Process the leases of the current user (start/stop EC2 instances, allocate/free S3 buckets, ...)
- AWS billing summary: Shows the current billing summary stored in the Derby database (shows as many entries as specified in the history size field, or all entries if 0 is specified)
- Add credit to AWS account: Adjusts the AWS account balance
- Process AWS leases: Process leases of all users (needed after a system restart)
- Edit Users: Manage DiCloud Web portal users

4.1. AWS billing information

The AWS pricing is set in `ec2pricing.properties` (found in the main directory of the DiCloud software distribution). The activities are stored in the Derby database on a real-time basis. The next figure shows an example of the AWS billing history.

Each activity has a timestamp, the type of service (EC2, S3 or EBS), the description of the activity (operation) and the price deducted from the account for that activity. A negative price is a debit and a positive price is a credit to the account.

The only way to add credit to the account is to use the 'Add credit to AWS account' described in the next section.

Recent AWS Activity

Current balance is: \$81.64779067651027

Timestamp	Service	Operation	Cost
2010-11-02 18:09:43.055	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/lawton.ok-20100510-202157.netcdf.gz /tmp/dicloud1126315683334902284get	-0.015000999999999999
2010-11-02 18:09:43.05	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/lawton.ok-20100510-202157.netcdf.gz /tmp/dicloud1126315683334902284get	-0.0012323873536661265
2010-11-02 18:09:23.926	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/rushsprings.ok-20100510-202153.netcdf.gz /tmp/dicloud3064095591944944185get	-0.015000999999999999
2010-11-02 18:09:23.922	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/rushsprings.ok-20100510-202153.netcdf.gz /tmp/dicloud3064095591944944185get	-0.0012165097380056975
2010-11-02 18:08:53.781	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/chickasha.ok-20100510-202150.netcdf.gz /tmp/dicloud2956081261529759194get	-0.015000999999999999
2010-11-02 18:08:53.777	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/chickasha.ok-20100510-202150.netcdf.gz /tmp/dicloud2956081261529759194get	-0.0011946287658065556
2010-11-02 18:08:31.349	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/cyril.ok-20100510-202136.netcdf.gz /tmp/dicloud3705765695752428708get	-0.015000999999999999
2010-11-02 18:08:31.342	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/cyril.ok-20100510-202136.netcdf.gz /tmp/dicloud3705765695752428708get	-0.001449752287007868
2010-11-02 18:08:11.015	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/lawton.ok-20100510-202132.netcdf.gz /tmp/dicloud4264716144661256501get	-0.015000999999999999
2010-11-02 18:08:11.01	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/lawton.ok-20100510-202132.netcdf.gz /tmp/dicloud4264716144661256501get	-0.0014723172364756463
2010-11-02 18:07:49.403	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/rushsprings.ok-20100510-202129.netcdf.gz /tmp/dicloud3398105549670510813get	-0.015000999999999999
2010-11-02 18:07:49.399	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/rushsprings.ok-20100510-202129.netcdf.gz /tmp/dicloud3398105549670510813get	-0.0014535546535626052
2010-11-02 18:06:49.13	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/chickasha.ok-20100510-202126.netcdf.gz /tmp/dicloud8112158939967458460get	-0.015000999999999999
2010-11-02 18:06:49.126	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/chickasha.ok-20100510-202126.netcdf.gz /tmp/dicloud8112158939967458460get	-0.0014399024611338972
2010-11-02 18:06:30.257	S3	s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/cyril.ok-20100510-202043.netcdf.gz /tmp/dicloud2542968683244470280get	-0.015000999999999999
2010-11-02 18:06:30.253	S3	Network Out traffic for s3cmd get -f --bucket-location=us s3://geni_gec9_demo_raw/cyril.ok-20100510-202043.netcdf.gz /tmp/dicloud2542968683244470280get	-0.001196535788476467

4.2. Adjusting the AWS account balance

The AWS account balance defines how much credit is left on the AWS account (as shown on top of the AWS billing history). When the balance reaches 0, all leases are revoked and resources are relinquished.

It is possible to adjust the balance at any time by using the ‘Add credit to AWS account’. A positive value adds credit to the account and a negative value debits money from the account. Note that this feature can be used to re-adjust the DiCloud account balance with the real AWS account balance at each billing cycle or more often if some drifting is observed under intense utilization.

The DiCloud Testbed

[Logout cecchet](#)

Credit to add: \$

Email dicloud@cs.umass.edu if you experience any problem.

4.3. Managing users

The 'Edit Users' option from the main menu allows to manage users of the DiCloud Web portal and its resources. The administrator can directly change the password of any user, update the user's X509 certificate and keypair and grant various administrator rights to other users.

A new user is created by entering a new username and password and clicking the 'Create new user account' button.

User accounts can also be deleted by selecting the 'Remove account' option.

The DiCloud Testbed Logout **cecchet**

User list

User id	Name	Password	Certificates	Admin rights	Remove account
1	bbn	Change password	0 certificates Change	Edit	Delete
2	bdonlan	Change password	0 certificates Change	Edit	Delete
3	cecchet	Change password	3 certificates Change	Edit	Delete
4	irwin	Change password	0 certificates Change	Edit	Delete
5	ryan	Change password	0 certificates Change	Edit	Delete
6	zink	Change password	0 certificates Change	Edit	Delete
9	aruna	Change password	3 certificates Change	Edit	Delete
14	mcorner	Change password	3 certificates Change	Edit	Delete

User name: Password:

[Go back to your user page](#)

Email dicloud@cs.umass.edu if you experience any problem..

After creating a new user account, the user will not have any certificate which will prevent him/her from using any AWS resources.

4.4. Updating user certificates

The X509 certificates will only be used by the DiCloud portal and NEVER sent to the user. The user will only have access to its SSH keypair to log into EC2 instances that are started by the portal on his/her behalf.

The procedure to create the user certificates is as follow. First check your openssl version:

```
cecchet@geni:~$ openssl version
OpenSSL 0.9.8g 19 Oct 2007
```

Generate the private key:

```
cecchet@geni:~$ openssl genrsa 1024 > ec2/keys/user_pk.pem
Generating RSA private key, 1024 bit long modulus
```

```
.....+++++
.....+++++
e is 65537 (0x10001)
```

Generate the X509 certificate:

```
cecchet@geni:~$ openssl req -new -x509 -nodes -sha1 -key
ec2/keys/user_pk.pem > ec2/keys/user_cert.pem
You are about to be asked to enter information that will be
incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a
DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:MA
Locality Name (eg, city) []:Amherst
Organization Name (eg, company) [Internet Widgits Pty Ltd]:UMass
Organizational Unit Name (eg, section) []:CS
Common Name (eg, YOUR name) []:User name
Email Address []:user@cs.umass.edu
```

Add the user to your AWS group (this generates the AccessKeyId on the first line and the Secret Key on the second line):

```
cecchet@geni:~/ec2/IAMcli$ ./iam-usercreate -u user -g group -k -v
AKIAI6YEKCS7UQLHEXJA
JvUNt6aXXgGwoJw/2ZJK7TuyP8ZUdhdufZGarQB4
arn:aws:iam::101840822718:user/cecchet
AIDAI6QY3DPOSCJ2CWXEI
```

Add the X509 certificate to the user account:

```
cecchet@geni:~/ec2$ IAMcli/iam-useraddcert -u user -f
keys/user_cert.pem
GNXXM6OXT2WQPNTVCOD2WUGOSQZCTCGV
```

Generate the SSH keypair for the user:

```
cecchet@geni:~/ec2$ ec2-add-keypair user > user_pair.pem
cecchet@geni:~/ec2$ chmod 600 user_pair.pem
```

The script to automatically generate user certificates and register them is below:

```
#Usage: create_new_user.sh user_name user_id

echo Creating private key for user $2
/usr/bin/openssl genrsa 1024 > $2_pk.pem
echo Creating X509 certificate for user $2
/usr/bin/openssl req -new -x509 -nodes -sha1 -key $2_pk.pem
>$2_cert.pem
```

```
echo Adding user $1 to EC2 account
/home/cecchet/ec2/IAMCli/iam-usercreate -u $1 -g LASS -k -v > $2_ids
echo Registering user $1 X509 certificate
/home/cecchet/ec2/IAMCli/iam-useraddcert -u $1 -f $2_cert.pem
echo Creating new keypair for user $1
ec2-add-keypair $1 > $2_pair.pem

echo Copy the keys using:
echo sudo cp $2*.pem /var/www/ec2/keys/
echo Give ownership to web server:
echo sudo chown www-data.www-data /var/www/ec2/keys/$2*.pem
echo Set permission to owner only:
echo sudo chmod 600 /var/www/ec2/keys/$2_pair.pem
echo Update user certificate information as follows:
echo PK: /var/www/ec2/keys/$2_pk.pem
echo CERT: /var/www/ec2/keys/$2_cert.pem
echo PAIR: $1
```

The DiCloud Testbed

Logout **cecchet**

User certificates change

cert.pem file path (on server machine):

pk.pem file path (on server machine):

EC2 keypair name (as registered on EC2, not file name):

Notes on adding a new user and validating its certificates:

Add the user to the group (this generates the AccessKeyId on the first line and the Secret Key on the second line):

```
cecchet@geni:~/ec2/IAMCli$ ./iam-usercreate -u cecchet -g LASS -k -v
AKIAI6YEKCS7UQLHEXJA
JvUNt6aXXgGwoJw/2ZJK7TuyP8ZUdhdufZGarQB4
arn:aws:iam::101840822718:user/cecchet
AIDAI6QY3DPOSCJ2CWXEI
```

Add the X509 certificate to the user account:

```
cecchet@geni:~/ec2$ IAMCli/iam-useraddcert -u cecchet -f keys/cecchet_cert.pem
GNXXM6OXT2WQPNTVCOD2WUGOSQZCTCGV
```

Generate an SSH keypair for the user and send it to him:

```
ec2-add-keypair username > /var/www/ec2/keys/userid_pair.pem
chmod 600 /var/www/ec2/keys/userid_pair.pem
```

Update EC2 keypair name if needed in this page.

[Go back to the user management page](#)

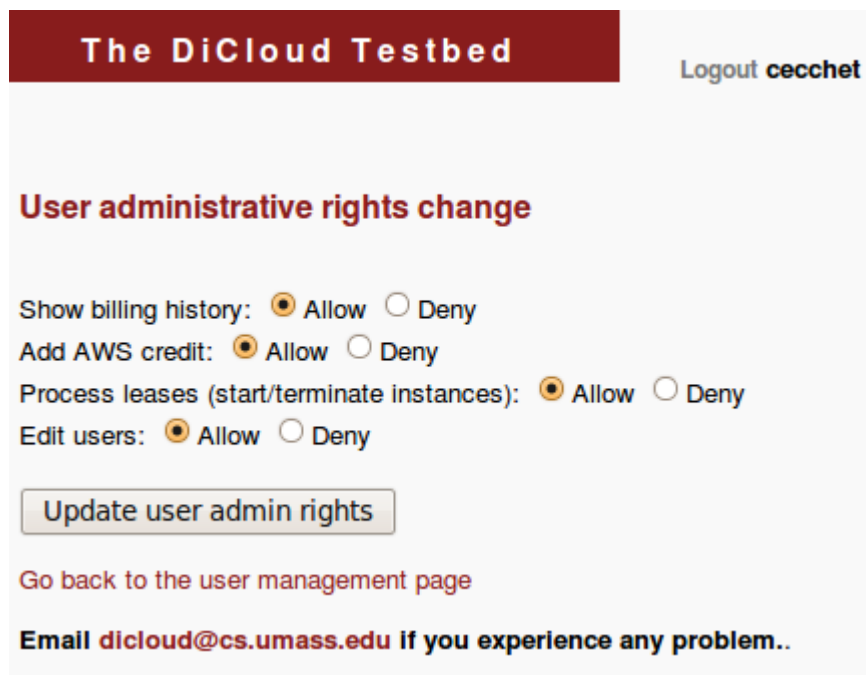
Email dicloud@cs.umass.edu if you experience any problem..

The path to the files must then be entered in the web page. Note that the files can be anywhere on the machine where the DiCloud portal is running but for security reason, they should not be stored in any directory that is under the DocumentRoot of the HTTP server to prevent those files to be directly retrieved by the web server. However, the user under which the DiCloud server execute must be able to access the files to pass them to the AWS API tools.

4.5. User rights

The user can give administrator privileges to users. These privileges control whether the user has access to the 4 administrator function buttons described previously:

- AWS billing summary: Shows the current billing summary stored in the Derby database (shows as many entries as specified in the history size field, or all entries if 0 is specified)
- Add credit to AWS account: Adjusts the AWS account balance
- Process AWS leases: Process leases of all users (needed after a system restart)
- Edit Users: Manage DiCloud Web portal users



The screenshot shows a web interface for 'The DiCloud Testbed'. At the top right, there is a 'Logout cecchet' link. The main heading is 'User administrative rights change'. Below this, there are four rows of radio button controls for permissions: 'Show billing history' (Allow selected), 'Add AWS credit' (Allow selected), 'Process leases (start/terminate instances):' (Allow selected), and 'Edit users' (Allow selected). A 'Update user admin rights' button is located below these controls. At the bottom, there is a link 'Go back to the user management page' and a note: 'Email dycloud@cs.umass.edu if you experience any problem..'

5. References

- [1] Amazon Elastic Compute Cloud Getting Started Guide (API Version 2009-11-30) - <http://docs.amazonwebservices.com/AWSEC2/latest/GettingStartedGuide/index.html?setting-up-your-tools.html>.
- [2] Amazon CloudWatch - <http://aws.amazon.com/cloudwatch/>.
- [3] Amazon EC2 - <http://aws.amazon.com/ec2/>.
- [4] Amazon S3 - <http://aws.amazon.com/s3/>.
- [5] Amazon EBS - <http://aws.amazon.com/ebs/>.
- [6] s3cmd: command line S3 client - <http://s3tools.org/s3cmd>.

6. Appendix

6.1. DiCloud portal database schema

```
-- MySQL dump 10.11
--
-- Host: localhost      Database: dicloud
-----
-- Server version      5.0.75-0ubuntu10.5

/*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
/*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
/*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
/*!40101 SET NAMES utf8 */;
/*!40103 SET @OLD_TIME_ZONE=@@TIME_ZONE */;
/*!40103 SET TIME_ZONE='+00:00' */;
/*!40014 SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0 */;
/*!40014 SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0 */;
/*!40101 SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='NO_AUTO_VALUE_ON_ZERO' */;
/*!40111 SET @OLD_SQL_NOTES=@@SQL_NOTES, SQL_NOTES=0 */;

--
-- Table structure for table `admin_rights`
--

DROP TABLE IF EXISTS `admin_rights`;
SET @saved_cs_client      = @@character_set_client;
SET character_set_client  = utf8;
CREATE TABLE `admin_rights` (
  `user_id` int(11) NOT NULL,
  `aws_account_read` tinyint(1) NOT NULL,
  `aws_account_write` tinyint(1) NOT NULL,
  `execute_leases` tinyint(1) default NULL,
  `edit_users` tinyint(1) default NULL,
  KEY `user_id` (`user_id`),
  CONSTRAINT `admin_rights_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON
DELETE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
SET character_set_client  = @saved_cs_client;

--
-- Table structure for table `budget`
--

DROP TABLE IF EXISTS `budget`;
SET @saved_cs_client      = @@character_set_client;
SET character_set_client  = utf8;
CREATE TABLE `budget` (
  `user_id` int(11) NOT NULL,
  `ec2_budget` double default NULL,
  `s3_budget` double default NULL,
  `ebs_budget` double default NULL,
  KEY `user_id` (`user_id`),
  CONSTRAINT `budget_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON DELETE
CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
SET character_set_client  = @saved_cs_client;

--
-- Table structure for table `ebs_leases`
--

DROP TABLE IF EXISTS `ebs_leases`;
SET @saved_cs_client      = @@character_set_client;
SET character_set_client  = utf8;
CREATE TABLE `ebs_leases` (
  `lease_id` int(11) NOT NULL auto_increment,
```

```

`leased_time` bigint(20) unsigned default '0',
`duration` int(11) default '0',
`outstanding` int(11) default '1',
`state` int(11) default '0',
`ebs_size_in_gb` int(11) NOT NULL,
`ebs_region` text NOT NULL,
`ebs_avail_zone` text NOT NULL,
`user_id` int(11) NOT NULL,
`ebs_volume_id` text,
PRIMARY KEY (`lease_id`),
KEY `user_id` (`user_id`),
CONSTRAINT `ebs_leases_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON
DELETE CASCADE
) ENGINE=InnoDB AUTO_INCREMENT=16 DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;

```

```

--
-- Table structure for table `ec2_leases`
--

```

```

DROP TABLE IF EXISTS `ec2_leases`;
SET @saved_cs_client = @@character_set_client;
SET character_set_client = utf8;
CREATE TABLE `ec2_leases` (
  `lease_id` int(11) NOT NULL auto_increment,
  `leased_time` bigint(20) unsigned default '0',
  `duration` int(11) default '0',
  `outstanding` int(11) default '1',
  `state` int(11) default '0',
  `ec2_ami_id` text NOT NULL,
  `ec2_instance_type` text NOT NULL,
  `ec2_instance_nb` int(11) NOT NULL,
  `ec2_region` text NOT NULL,
  `ec2_avail_zone` text,
  `user_id` int(11) NOT NULL,
  `ec2_instance_id` text,
PRIMARY KEY (`lease_id`),
KEY `user_id` (`user_id`),
CONSTRAINT `ec2_leases_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON
DELETE CASCADE
) ENGINE=InnoDB AUTO_INCREMENT=23 DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;

```

```

--
-- Table structure for table `quotas`
--

```

```

DROP TABLE IF EXISTS `quotas`;
SET @saved_cs_client = @@character_set_client;
SET character_set_client = utf8;
CREATE TABLE `quotas` (
  `user_id` int(11) NOT NULL,
  `max_ec2_instance` int(11) default NULL,
  `max_s3_buckets` int(11) default NULL,
  `max_ebs_gb` double default NULL,
  KEY `user_id` (`user_id`),
  CONSTRAINT `quotas_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON DELETE
  CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;

```

```

--
-- Table structure for table `s3_leases`
--

```

```

DROP TABLE IF EXISTS `s3_leases`;
SET @saved_cs_client = @@character_set_client;
SET character_set_client = utf8;
CREATE TABLE `s3_leases` (
  `lease_id` int(11) NOT NULL auto_increment,
  `leased_time` bigint(20) unsigned default '0',

```

```

`duration` int(11) default '0',
`outstanding` int(11) default '1',
`state` int(11) default '0',
`s3_bucket` text NOT NULL,
`s3_region` text NOT NULL,
`user_id` int(11) NOT NULL,
PRIMARY KEY (`lease_id`),
KEY `user_id` (`user_id`),
CONSTRAINT `s3_leases_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON
DELETE CASCADE
) ENGINE=InnoDB AUTO_INCREMENT=10 DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;

```

```

--
-- Table structure for table `user_keys`
--

```

```

DROP TABLE IF EXISTS `user_keys`;
SET @saved_cs_client = @@character_set_client;
SET character_set_client = utf8;
CREATE TABLE `user_keys` (
  `user_id` int(11) NOT NULL,
  `key_type` varchar(5) default NULL,
  `user_key` text,
  KEY `user_id` (`user_id`),
  CONSTRAINT `user_keys_ibfk_1` FOREIGN KEY (`user_id`) REFERENCES `users` (`id`) ON
DELETE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;

```

```

--
-- Table structure for table `users`
--

```

```

DROP TABLE IF EXISTS `users`;
SET @saved_cs_client = @@character_set_client;
SET character_set_client = utf8;
CREATE TABLE `users` (
  `id` int(11) NOT NULL auto_increment,
  `username` varchar(100) NOT NULL,
  `password` varchar(100) NOT NULL,
  UNIQUE KEY `id` (`id`),
  UNIQUE KEY `username` (`username`)
) ENGINE=InnoDB AUTO_INCREMENT=14 DEFAULT CHARSET=latin1;
SET character_set_client = @saved_cs_client;
/*!40103 SET TIME_ZONE=@OLD_TIME_ZONE */;

/*!40101 SET SQL_MODE=@OLD_SQL_MODE */;
/*!40014 SET FOREIGN_KEY_CHECKS=@OLD_FOREIGN_KEY_CHECKS */;
/*!40014 SET UNIQUE_CHECKS=@OLD_UNIQUE_CHECKS */;
/*!40101 SET CHARACTER_SET_CLIENT=@OLD_CHARACTER_SET_CLIENT */;
/*!40101 SET CHARACTER_SET_RESULTS=@OLD_CHARACTER_SET_RESULTS */;
/*!40101 SET COLLATION_CONNECTION=@OLD_COLLATION_CONNECTION */;
/*!40111 SET SQL_NOTES=@OLD_SQL_NOTES */;

```

```

-- Dump completed on 2010-10-27 5:58:32

```