MANAGEMENT MODEL FOR AVAILABILITY AND INTERCONNECTION SERVICE IN CLOUD COMPUTING

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Abstract. This paper presents a model for the management and improvement of Quality of Service (QoS) Availability of Interconnection and Access in the Cloud Computing, it's an automatic mechanism of connectivity that allows all services provided by a "Public Cloud" are most of the time available to users when they need it. This model is based on a layered architecture to allow users to access their services in the cloud no matter if there is any problem of interconnection.

Keywords: Architecture, Mobile Computing, Cloud Computing, Communications, Availability, Networking and Services.

1 Introduction

One of the emerging trends that are observed at this time and that will mark the field of Information Technology and Communications (ICT) in the coming years is what has come to be known as cloud computing or cloud computing [1].

According to the Cloud Security Alliance (CSA) Cloud computing is a demand model for the allocation and consumption of computers, which describes the use of a number of services, applications, information and infrastructure composed of resource reserves computing, networking, and storage information [2].

The cloud computing is the convergence and evolution of several concepts related to information technologies, such as virtualization, distributed application design or the design of networks [3].

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This allows the information is no longer necessarily in has to be stored on computing devices, but on the systems provided by their own "cloud" computing resources and that are shared by multiple users across different devices and can work together over the same content; achieving a greater agility and cost efficiency in the management of information.

While it is true that the availability is an advantage, currently is a concern because it is a responsibility that falls solely to the service provider as well as the quality of information management which includes operations as extraction, handling, treatment, purification, conservation, access, etc. For this we have proposed creating a model that will provide a solution to this problem.

The structure of this work consists firstly of a current panorama of the problem and subsequently showing the proposed model, its characteristics and a brief description of the layers that comprise it; in the following section describes the architecture that has been developed for model; immediately is found the design and installation of the cloud using ownCloud; subsequently are shown some preliminary tests and the results obtained; and finally presents the conclusions and future work of our model.

2 Connectivity Model

The system in "cloud" is designed to be used remotely, so any user will have access to most of the systems wherever you are. So in terms of the availability, this is negotiated with a supplier through a service level agreement that specifies a guarantee of continued access to services with a minimum quality [4].

In Fig. 1 shows the proposed model, which aims be fitted with a standard character to be implemented on different architectures of "cloud" that will optimize the services of availability, connectivity, reconnaissance and monitoring of the link status and of the users.

Fig. 1. Management model for cloud computing.

As you can see our proposed model is composed of five interconnected layers. Some of the most important features of the connectivity model for the cloud computing are:

- Must be suitable for different devices no matter what operating system platform beneath which these operate.
- Must operate with different wireless technologies permitting users access to services that are associated with it, regardless of the type of technology that uses the device.

- It should provide users freedom of movement within any environment.
- Must offer services to users in a transparent, without the user cares about the location of the service provider.
- It must be handled through a friendly interface that enables users to connect to the system to easily and simple.
- Based on your structure should be susceptible to changes or modifications to enable continuous improvement of this.
- Must be able to grow depending on the needs of the environment.

Then it describes the operation of model layers, which will manage the availability of the services offered in the cloud.

2.1 Interconnection Layer

This layer is responsible for making the user's mobile device detects the Cloud Network existing in the area and have the possibility of entering the environment or domain of the cloud, for this, there will be a point of interconnection of the domain that will be responsible for allow access to the Cloud and therefore all services, applications and other resources that in provide it.

2.2 Validation and Identification Layer

When a user performs the connection request, you will be asked to enter your name and password, this information along with the direction of the interconnection point where the user wishes to enter the network, should be sent to a server for authentication [5].

This server would be responsible for verifying that both the name and password sent coincide with those registered in its database, so you will be assigned an address to the user devices and can access the corresponding domain; while if the information provided by the user is incorrect will be asked to forward your name and password.

2.3 Layer Management of Information

The management of services is provided according to the profile that users have within the environment, which caters to each according to your servicing requirements and information [6], and through a graphical interface the user selects one of the services and applications to which you're entitled, access to these is via a client - server mode.

The user can select from their list of the services and applications you need, once you select the application establishes a connection between the user and the server, the server processes the service and sends a response to the user through a graphical interface through its mobile device.

2.4 Layer Management of Information

It aims to track the consumption of cloud resources for users through a database of services and user profiles in the type of service that is provided, when he began to use it and when finished, in addition to collecting and analyzing traffic. [7].

Instantly of arrive at this layer, take place a detailed analysis of: The number of users accessing and the services they need, knowing whether they are taking advantage of resources such as the bandwidth, know whether each service consumes the bandwidth you need, user or service that generates more traffic than they may require, if the power levels, of noise and interference are tolerable, etc.

It aims to track the consumption of cloud resources by users, through a database with the services and users profiles in the type of service that is provided, when he began to use it and when finished, in addition to collecting and analyzing traffic.

2.5 Layer of Correction Techniques

Here is carry out the procedures and protocols to reverse the errors detected by the previous layer during transmission of the information, services and applications. It should establish a set of rules that allow adjustment of the signal power, tolerable levels of noise and interference, the bandwidth consumed by an application, the proper management of synchronization and data frames, and define procedures to determine when an error has occurred and how they should be corrected [7].

For the treatment of errors during data transmission can be followed two different strategies, such as including redundant information so that the user device requested by the retransmission of the information or allow you to deduct that was wrong and correct it, without asking for retransmission the information sent [8].

3 Architecture of the Model

The Architecture of the Model, it is very important as it defines as interacting the elements that make up the model and they are supported by some standards, norms, protocols, processes, rules, etc., in order to make the model fully functional has been proposed [9].

The interaction you have with the end user is central to the objectives of the model, because here is where it the user feels comfortable and fully familiar with the management of services in addition to offer them in the time and manner in which the requested, the architecture proposed model shown in Fig. 2.

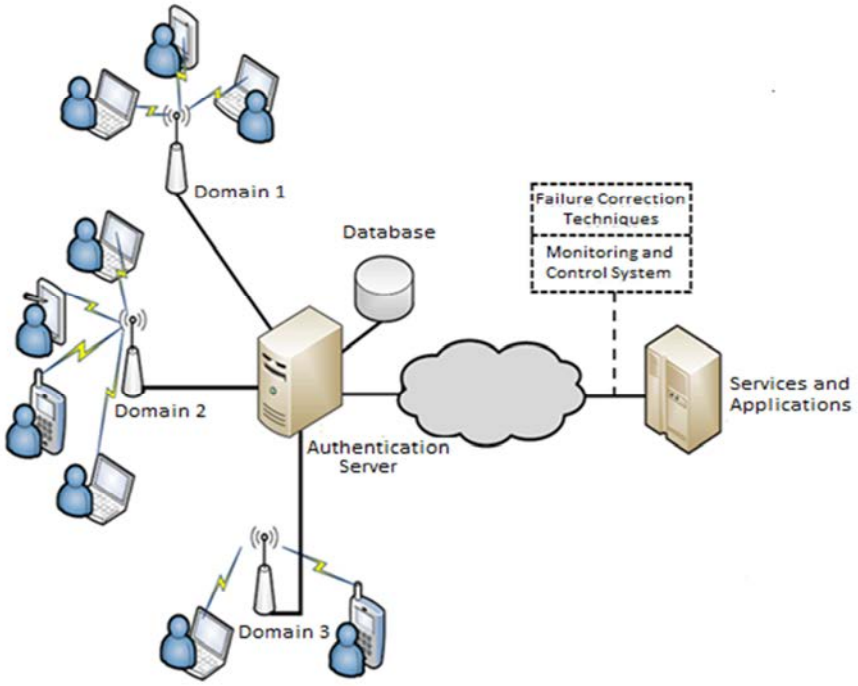

Fig. 2. Architecture of the model of connectivity.

In general the architecture of the model of connectivity operates as shown in the sequence diagram of the model of Fig. 3, and then explains the process to be followed by a service request in order to make the allocation of services and applications in the cloud to end users.

- At be within wireless coverage area of a station is necessary to use the Network recognition, where the user through their device and interconnect device from the domain of "Cloud" exchange information to establish a connection.
- Then proceed to the validation, identification and authentication, the user identifies itself to a server that authenticates against a database of users to be able to begin the Request for Services that offered by the environment.
- The Authentication Server shall be responsible for verifying that both the username and password match recorded in its database.
- If the information provided by the user is incorrect, it does not will have access to cloud, while if the authentication is successful, and will be assigned an IP address to the user device and you can access the domain.
- Once the user has connected and is know the location of this in the network, a Web server is responsible for providing a whole list of services associated with a database of the user profile.
- The submission of the applications and services is carried at the time the user opens the Web browser on your device.

- Returning to the provision of services, the user must select one of the services and applications that are available, for this establishes the connection with the services server where these are found so as to process it and deliver it to the user.
- Finally, the two upper layers are responsible for monitoring and control of the state of the network and users by the use of the corresponding Technical Testing and Performance Monitoring Techniques, and so then that should be required to implement the respective Technical Correction Fault.

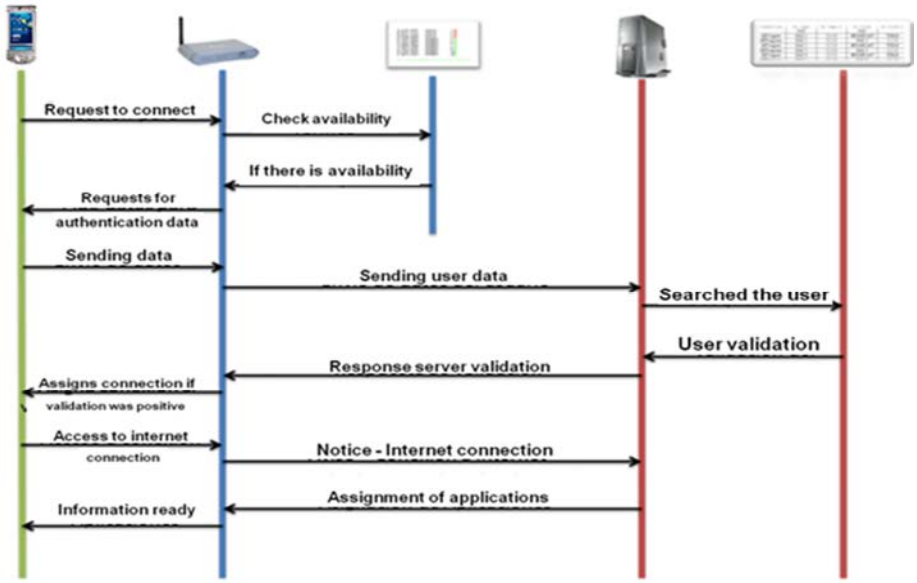

Fig. 3. Sequence diagram of the model.

Mastering the Cloud is open to anyone who is within their reach and should be sent periodically throughout the Interconnection Point a package Domain Identifier (SSID) that users can be detected through their personal devices. So then, the model is designed so that various Wireless Technologies can interoperate with each other, so this is not a barrier in communication [10].

4 Design of the Cloud

The proposed connectivity model is developed within the Mobile Computing Lab of the School of Computing of the IPN, because in this exist the means and facilities to develop and conduct the necessary tests to define its operation and functionality.

So far we have installed a Server Cloud Computing using ownCloud, eliminating the limitations in terms of capacity and we will have all the free space we have on your hard disk to storing information and as the cloud administrators we can also assign disk quotas to other users.

4.1 Cloud Server Installation with ownCloud

First you must start by starting our server under Ubuntu Server operating system, which uses a Linux kernel and based on Debian, to proceed to install Ubuntu Server, first you must download the ISO from the Ubuntu website.

```
http://www.ubuntu.com/download
```

After the computer boots from our CD, USB or ISO image as the case, select the language in which the program will be installed, a window appears immediately of welcome to installation wizard (Fig. 4), and then must complete all the steps indicated by the installation wizard.

Fig. 4. Menu ubuntu server installation.

During the installation of Ubuntu Server defines a user account and password for the system, the disk partitioning, configuration of updates, programs that accompany the base system, the GRUB boot loader and finally reboot.

Upon completion of the installation into the system, this will enter the login and password you chose during installation, if the data is correct must be displayed one home screen like Fig. 5.

The server automatically assigns IP address dynamically, so it is must configure the network card to assign a fixed IP. For this opens and edits the file "interfaces" using the following statement:

```
sudo nano /etc/network/interfaces
```

Is written fixed IP address, the subnet mask, the gateway address and the DNS (see Fig. 6), then save the changes and exit the editor.

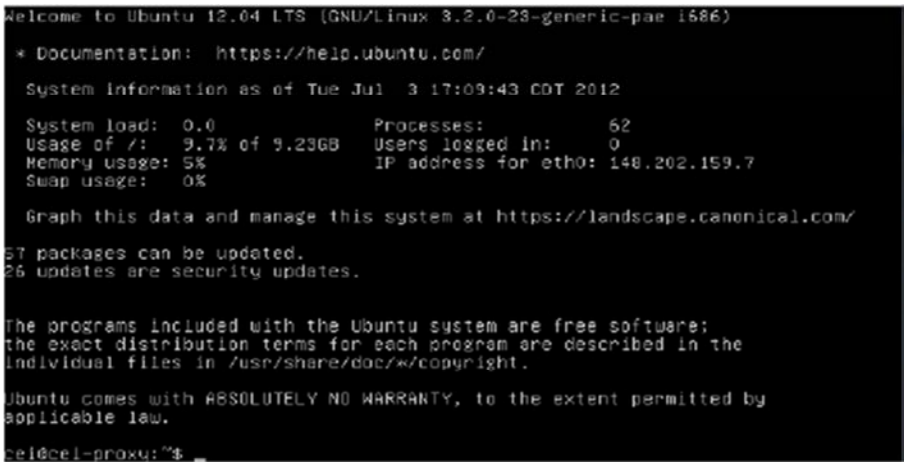

Fig. 5. Home screen of ubuntu server.

Finally, you must restart the card and using the command "ifconfig" will verify that the changes have been made.

```
sudo /etc/init.d/networking restart
ifconfig
```

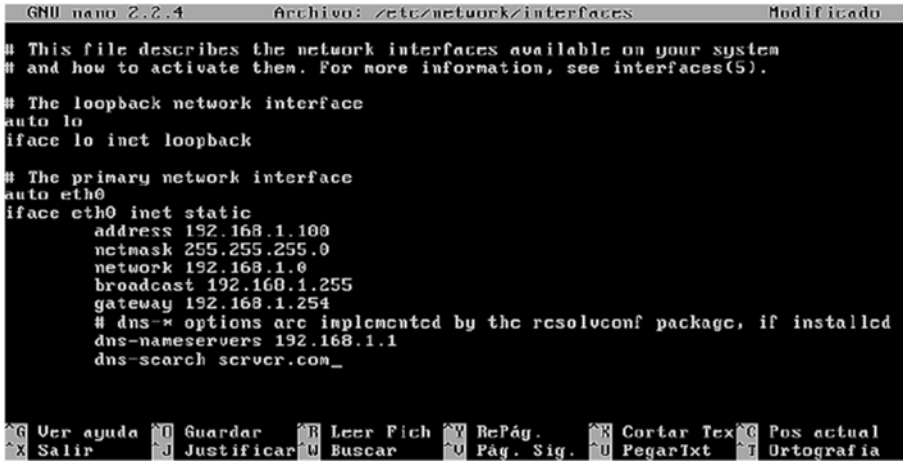

Fig. 6. Configuring the network card.

Once installed Ubuntu Server, proceed to the installation of ownCloud, but first you must be install the following programs: apache2, php5, php5-mysql, libcurl3, php5-curl, php-pear, php-xml-parser, php5-sqlite, php5-json, sqlite, mp3info, curl, libcurl3-dev and zip; using the following statement:

```
sudo apt-get install [program name]
```

Once installed in the server root directory ownCloud downloaded, then unzip the package, once permission is given the server web directory ownCloud and finally apache restarts, using the following code:

```
sudo wget http://owncloud.org/releases/owncloud-2.tar.bz2
sudo tar –xvf owncloud-2.tar.bz2
sudo chown –R www-data:www-data owncloud
sudo /etc/init.d/apache2 restart
```

Now the browser from another computer on the network is keyed the command below.

```
http://IP.SERVER/owncloud or http://DOMAIN/owncloud
```

Fig. 7. Screen owncloud.

You create an administrator account by entering a username, a password and select "Completing the installation". For access to the data is a little safer creates a user with fewer privileges than the administrator, this user will be the one used to connect remotely to the Cloud.

To create users open the settings menu located on the bottom left of the user manager, select the "Users", you enter a new username and password, select the "Groups", select the option "add Group" must be entered a group and finally pressed "Create".

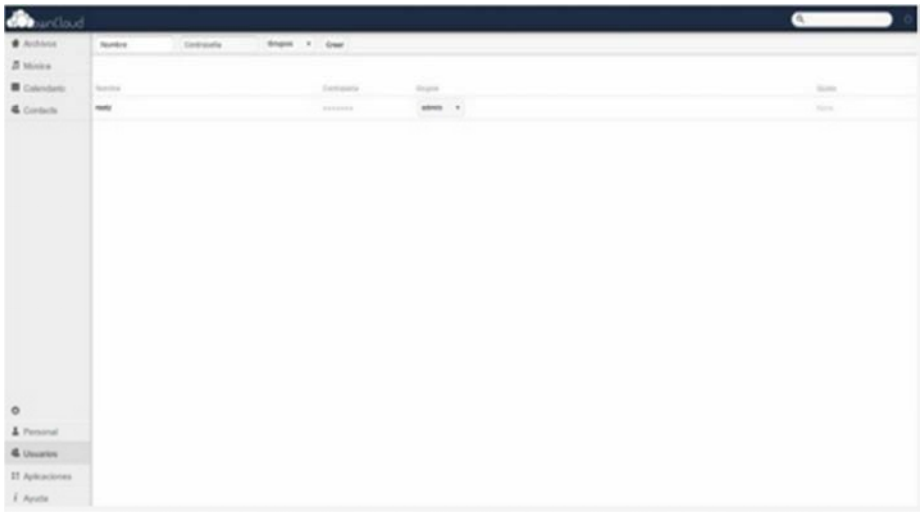

Fig. 8. Window management owncloud users.

4.2 Support for WebDAV

To use WebDAV support the user created in the web environment is also created in the system using the command "adduser user" done you can proceed with the installation.

It installs and configures davfs2, select "Yes" and are given permissions to users so they can use the cloud:

```
sudo apt-get install davfs2
sudo dpkg-reconfigure davfs2
sudo usermod –aG davfr2 USER
```

Then edit the file "fstab" to include the user's mount point and cloud, web path is inserted if they have a domain pointing to our server or if the local IP, insert the mount point within the / home user and permissions, then save the changes and exit the editor.

```
sudo nano /etc/fstab
http://[IP or domain]/owncloud/files/webdav.php home/USER
/ownCloud davfs user,rw,noauto 0 0
```

Then create two directories, at one is edited and saved the key file, we left editor and assign permissions.

```
mkdir /var/www/.davfs2
mkdir /var/www/owncloud
sudo nano /var/www/.davfs2/secrets
http://[IP or domain]/files/webdav.php USER PASSWORD
chmod 600 var/www/.davfs2/secrets
```

With this has finally installed a Server Cloud Computing with ownCloud ready to be used, thus eliminating the limitations in terms of capacity because it has all the free space you have on your hard drive where everything is staying only under the administrator's control; managing their security, privacy and ensuring the confidentiality of data.

5 Tests and Results

Tests have been made file storage in the cloud with registered users to date via web connecting through the above address or also using the Nautilus file browser that comes installed by default in almost all GNU/Linux and default in Ubuntu. In the Nautilus file browser, select the File menu and choose the "Connect to Server", and a window appears like Fig. 8.

Fig. 8. Connection window.

We press the tab "Public FTP" and select "WebDAV (HTTP)" in the "Server" enter the server IP, port is left like this and "Folder" you enter the path /ownCloud/files/webdav. php (see Fig 9).

Fig. 9. Connecting to the cloud server.

Finally insert the username and password of the user who will be using the Cloud, press the button "Connect" and see that the Cloud is mounted as a network drive, as shown in Fig. 10.

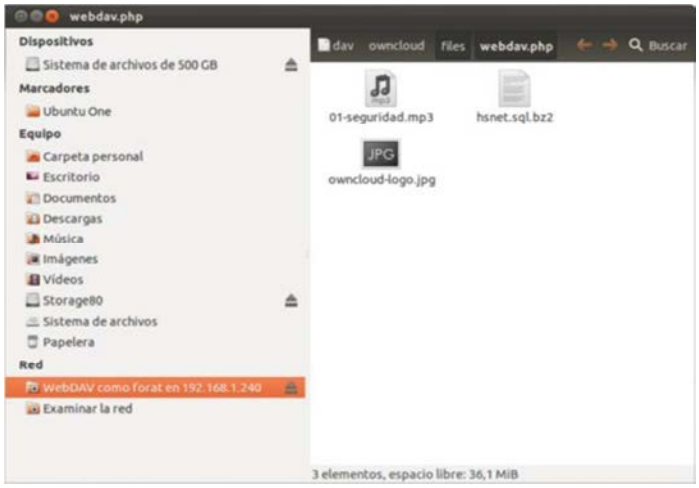

Fig. 10. Using cloud owncloud with nautilus in ubuntu.

At the same time we are working on developing an application for mobile devices with the purpose of provide the user through a graphical interface that provides a service the possibility to save, download and view certain types of digital files using the cloud which has been mounted thus will be more simple, flexible and dynamic access to information.

For the moment in Fig. 11 shows the GUI for Android application with file management locally and server, as well as uploading and downloading of files that you have so far.

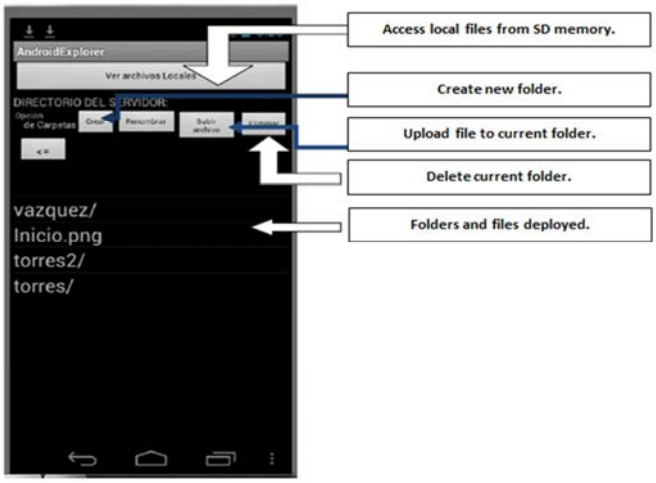

Fig. 11. Application for mobiles.

In Fig. 12, displays all functional tests conducted on the implementation of Android, which has been obtained so far is the ability to create and delete folders, also browse and select files from a folder, and upload, download and delete files in the cloud, in the same way you can delete the contents of an entire folder generally within Cloud Sever that has been mounted.

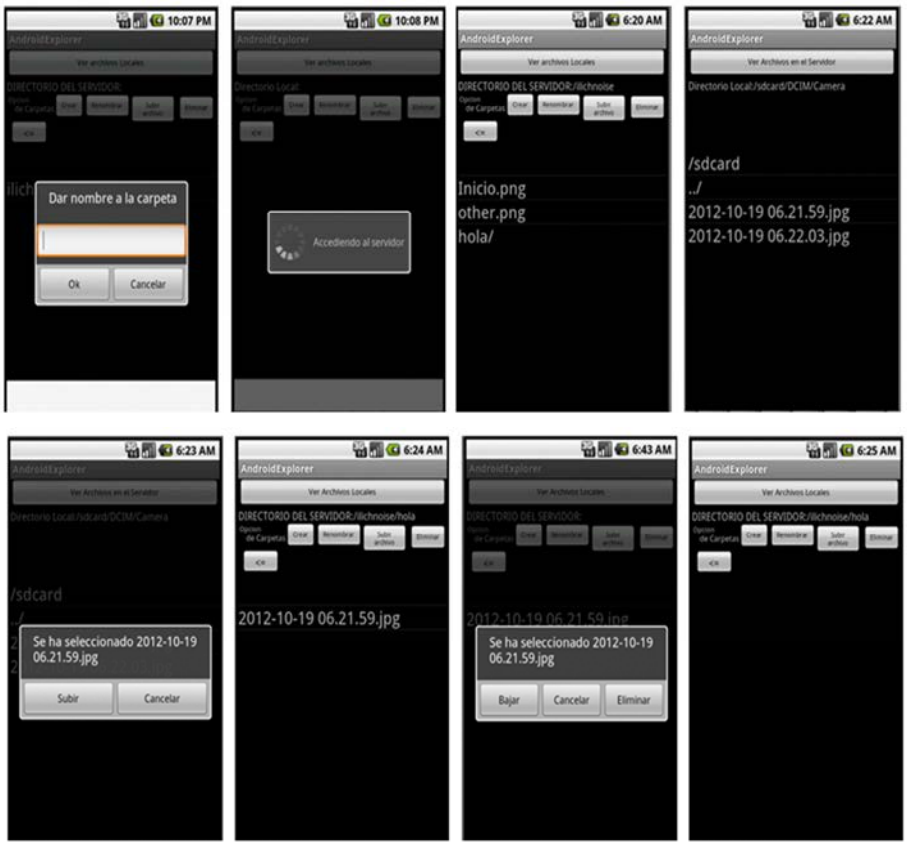

Fig. 12. Screens android application.

As seen before to consult or requesting the services, users must firstly contact the administrator of the cloud to register in the Cloud Server with ownCloud to give access to the related information according to their profile or they are can be provided a user name and password.

To this end one of the main concepts proposed model is accompanied on the prioritization, is to say that will have to give more importance to some connections than others.

Also, the model is not designed to work with a specific access technology, however for ease and comfort has chosen to work with a single wireless access technology that is WiFi.

6 Conclusions and Future Work

We can conclude that the results obtained so far are satisfactory since through ownCloud package we have create a storage area in the cloud, and thus get manage our own server and dispose of it in the cloud very easily.

Currently work is still in the stage of design improvements of the Cloud and preliminary tests of model we have proposed, while continuing with the proper documentation.

It also seeks to use some software or package with the functions of monitoring, detection and solution, to be in charge of analyzing the correct behavior of the communication between the cloud and users in various aspects, as well as the relevant decisions.

The next work that has obviously considered the implementation of the model will be run within some case study, which finally throw an idea of the functionality of the model and thus will issue the final conclusions.

In summary, the main reason for proposing and implementing this model, the purpose of which is convertible into a flexible and robust, which instantly intone be implemented within a public cloud can allow users to have a "Access "quality to the corresponding information at the place and time they need, in a more efficient, easy and fast, through their personal mobile devices and thus may be present in both labor and business environments.

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References

1. L.J. Aguilar.: “La computación en Nube: El Nuevo Paradigma Tecnológico para Empresas”, Revista cuatrimestral de las Facultades de Derecho y Ciencias Económicas y Empresariales. Mayo (2009).
2. Cloud Security Alliance, http://www.cloudsecurityalliance.org/
3. Oracle Corporation. “Architectural Strategies for Cloud Computing”, Oracle White Paper in Enterprise Architecture. Agosto 2009. [Online]. Disponible en: http://www.oracle.com/
4. Cloud Expo, http://cloudcomputingexpo.com/
5. Xipeng Xiao.: Technical Commercial and Regulatory Challenges of QoS an Internet Service Model Perspective. Morgan Kauffman, Burlington (2008).

6. Farrell Adrián.: Network QoS: Know It All. Morgan Kauffman, Burlington (2009).
7. Wang, Henry H.: Telecommunications Network Management. McGraw-Hill, University of Michigan (1999).
8. Hegering, Heinz-Gerd.: Integrated Network and System Management Network Management. Addison -Wesley, University of Michigan (1994).
9. Oracle Corporation Architectural Strategies for Cloud Computing, http://www.oracle.com/
10. The National Institute of Standards and Technology, Information Technology Laboratory, Definition of Cloud Computing, http://csrc.nist.go/