install softwares, can create groups, ... Applications to users. At client side user will get Hosted application with Linux Desktop on browser.

Module III : Open source cloud implementation and administration

Experiment 4 : To demonstrate installation and Configuration of Open stack Private cloud.

Solution :

1. Installation and Configuration of Open stack Private cloud using Ubuntu.

- Login and change to the root user by typing :

```
Sudo su -
```

Then type your password

- To download and install git type :

```
Apt-get install git
```

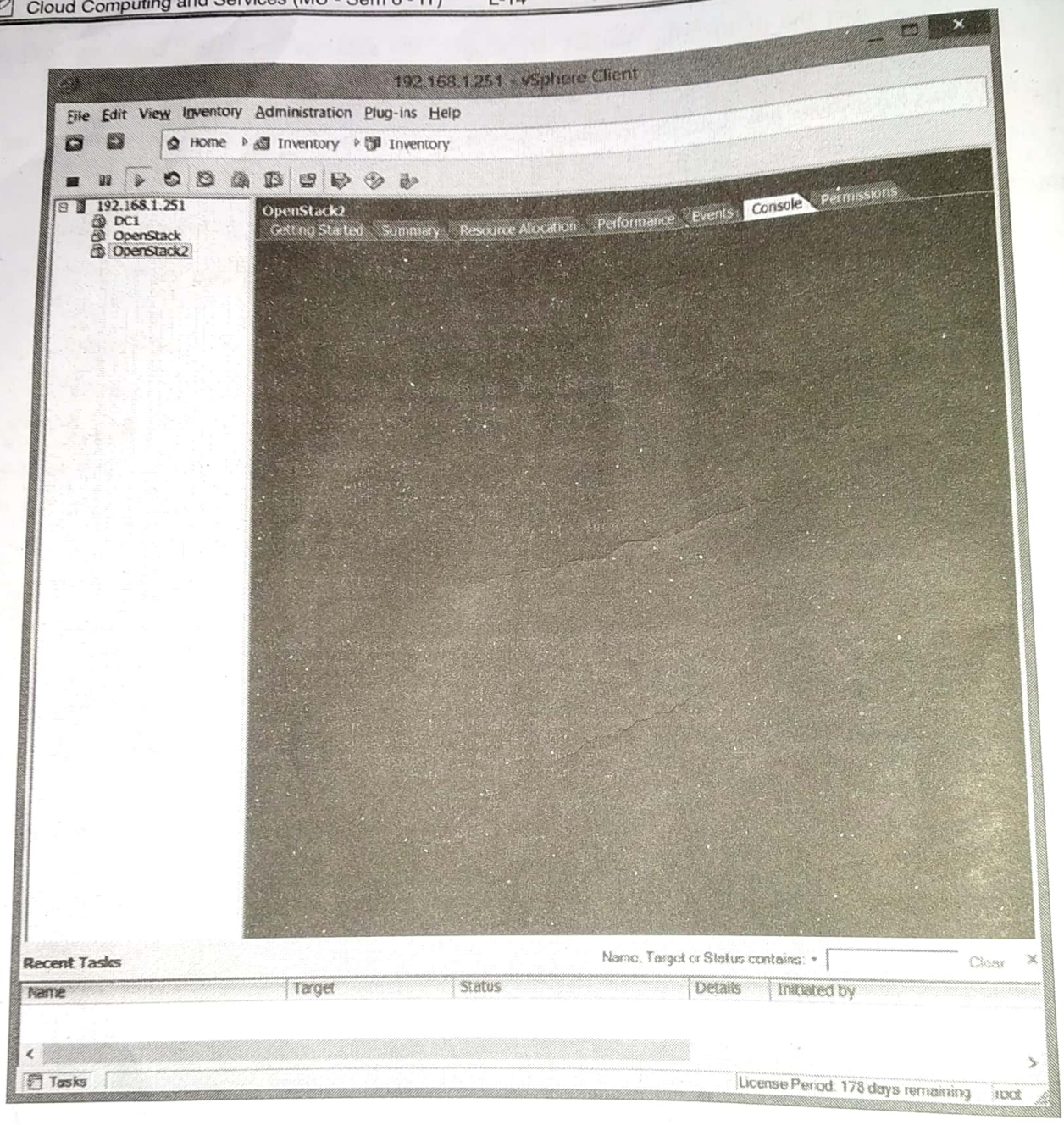
- You also need to download and install the devstack in order to get the essential components for OpenStack. To download and install the devstack type :

```
git clone git://github.com/openstack-dev/devstack.git
cd devstack; ./stack.sh
```

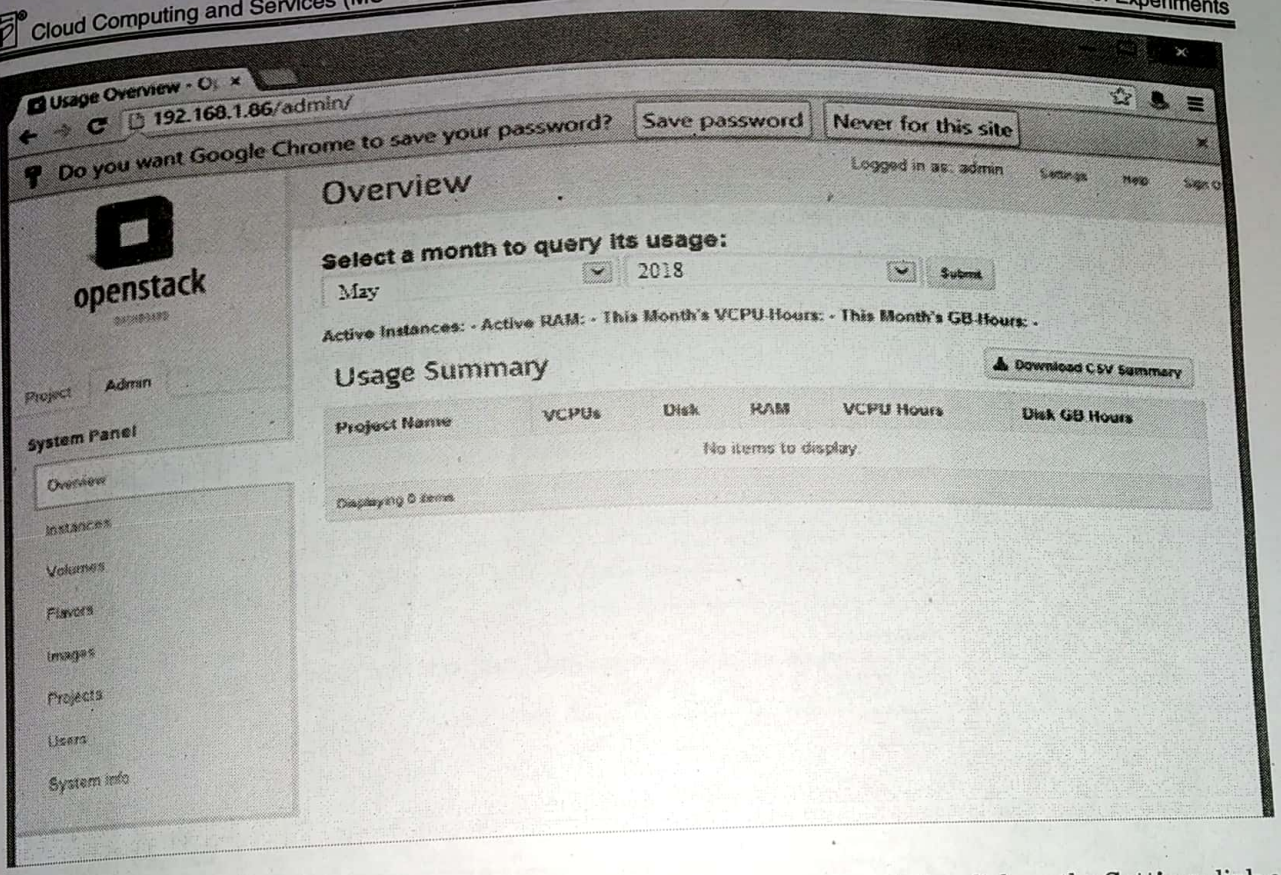
You must enter a password to use for the Database, Rabbit, Authentication, Horizon ,Service Admin Token, Service and Keystone. The script will actually run as a non-root user called stack, which it creates robotically. So you don't require to really be logged in as root if that concerns you.

2. Sign in, Dashboard & User Setup

When the script is done you end up with this :

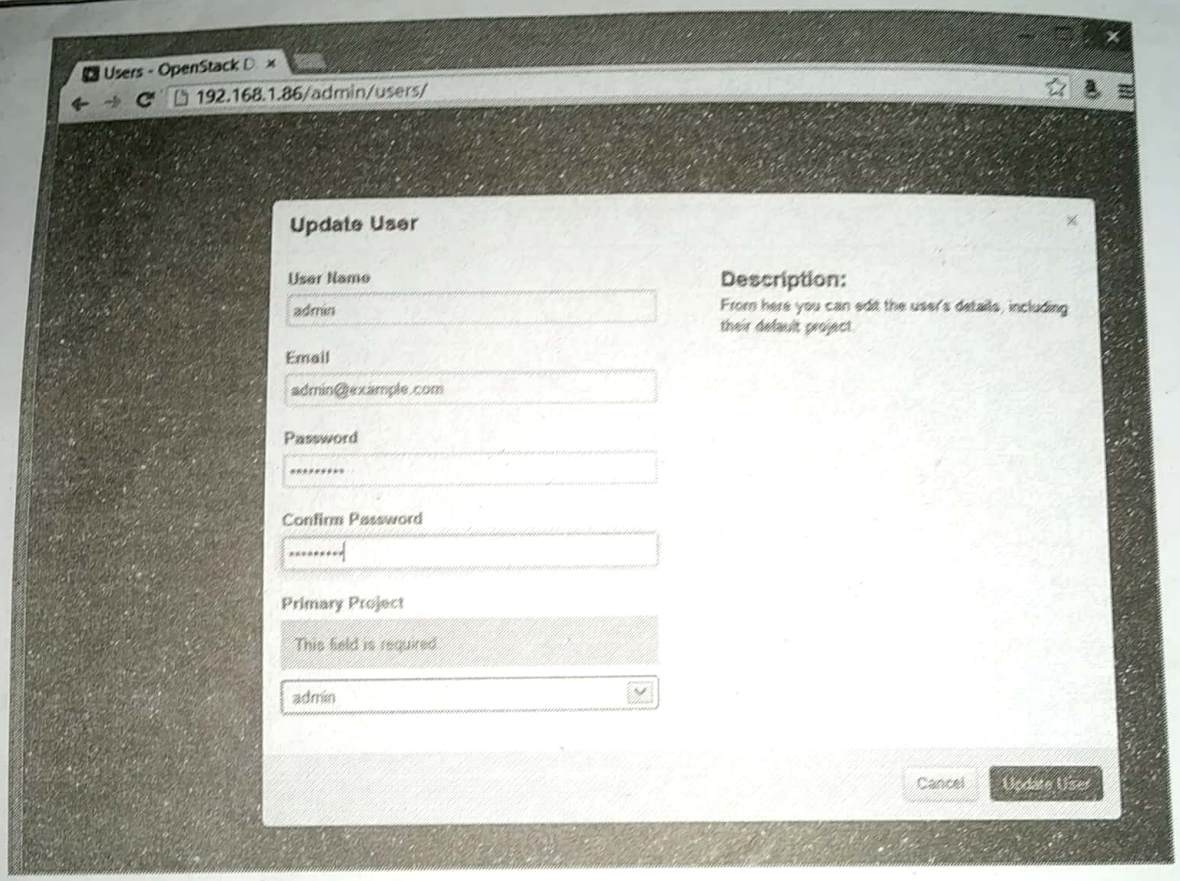


As you can see, it tells you where you can sign on to the dashboard as well as how to sign in and get to the rest of the components. You can see in the following dashboard :



When you want to change your password, while logged in as admin, click on the **Settings** link at the top right. Click on **Change Password**. Enter your old password and then enter your new password and confirm it.

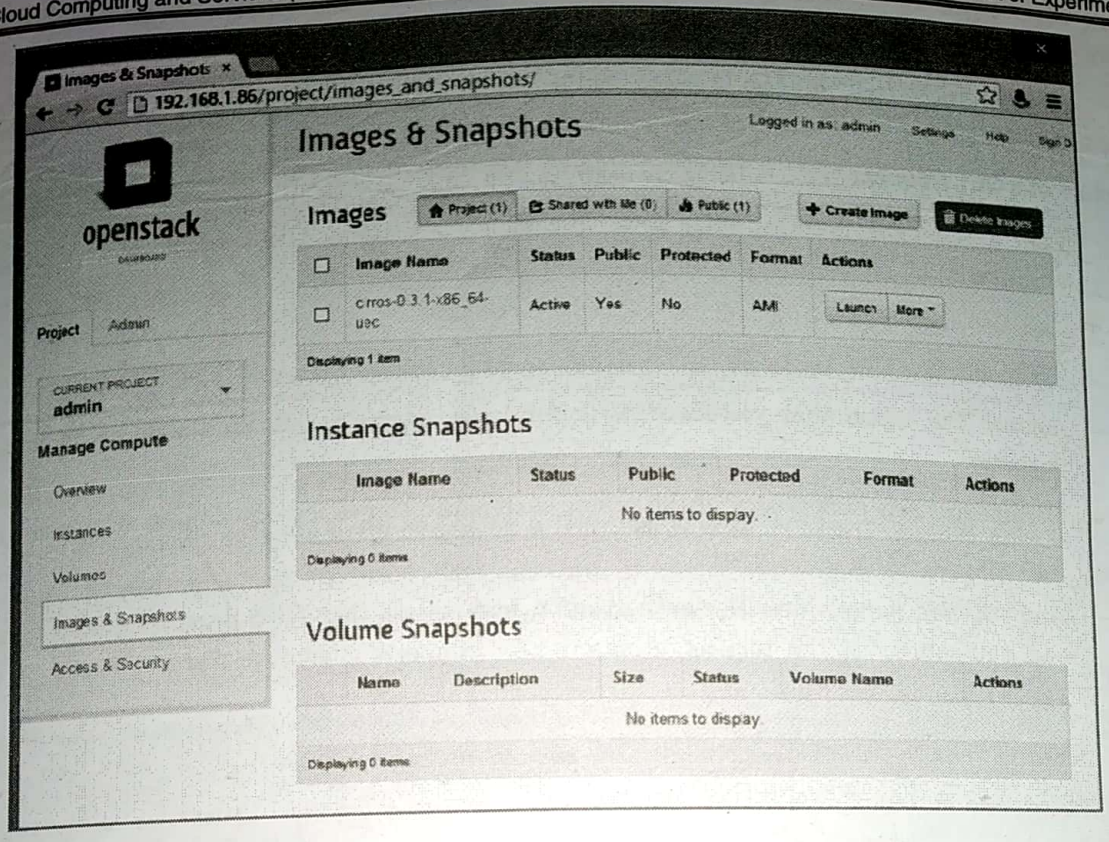
When you want to change the passwords for other built-in users or just edit users in general, go to the **Admin tab** and click on **Users**. Click **Edit** which is next to the Admin user, change the password and enter a primary project. Then click **Update User**. You can edit your current password while logged in here, but you'll need to logout and log back in using the new password.



3. Configuration

When installation of OpenStack is completed, you can start configuring your cloud by going to the **Project tab** and clicking on the Overview, Instances, Volumes, Images & Snapshots, and Access & Security tabs.

Under the instances tab you'll see an image already in there. You can add other images from other operating systems in here as well.



Module IV : Amazon Web Services

Experiment 5 : Like auto scaling, elastic load balancing, virtual private computing & Networking. Security service provided by Amazon web services. Accessing AWS using web services API provided by Amazon.

Solution :

Making API Requests

Amazon provides the Query API for Amazon EC2, as well as software development kits (SDK) for Amazon Web Services (AWS) that enable to access Amazon EC2 from preferred programming language.

To monitor the calls made to the Amazon EC2 API for your account, including calls made by the AWS Management Console, command line tools, and other services, use AWS CloudTrail.

If you plan to access Amazon EC2 through an API, you should be familiar with the following :

- XML
- Web services
- HTTP requests
- One or more programming languages, such as Java, PHP, Perl, Python, Ruby, C#, or C++.

Query Requests

Query requests are HTTP or HTTPS requests that use the HTTP verb GET or POST and a Query parameter named `Action`.

Structure of a GET Request

The Amazon EC2 documentation presents the GET requests as URLs, which can be used directly in a browser.

The request consists of the following :

- Endpoint: The URL that serves as the entry point for the web service.
- Action: The action that you want to perform; for example, use RunInstances to launch an instance.
- Parameters: Any parameters for the action; each parameter is separated by an ampersand (&).
- Version: The API version to use.
- Authorization parameters: The authorization parameters that AWS uses to ensure the validity and authenticity of the request. Amazon EC2 supports Signature Version 2 and Signature Version 4;

he following is an example request that launches instances:

https://ec2.amazonaws.com/?Action=RunInstances&ImageId=ami-2bb65342&MaxCount=3&MinCount=1&Placement.AvailabilityZone=us-east-1a&Monitoring.Enabled=true&Version=2016-11-15&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIDEXAMPLE%2F20130813%2Fus-east-1%2Fec2%2Faws4_request&X-Amz-Date=20130813T150206Z&X-Amz-SignedHeaders=content-type%3Bhost%3Bx-amz-date&X-Amz-Signature=525d1a96c69b5549dd78dbbec8efe264102288b83ba87b7d58d4b76b71f59fd2

Content-type: application/json

host:ec2.amazonaws.com

Module V : Platform as a Service

Experiment 6 : To Demonstrate Platform as a Service using Googleapp Engine/IBM BlueMix/tSuru.

Solution :

Platform as a Service (PaaS)

In Platform as a Service, we would get the Platforms such as the Application Servers, Databases Server, Mobile Backend as a Service. Which means (IaaS + Required Software) both.

In sort Platform as a Service, we would have the Platform to deploy our application, and we need not to worry about the OS version, the security fix packs, download and install the Software, or any type of Software configuration. We only focus on application development and Infrastructure and Software will be taken care by Platform as a Service provider.

IBM Bluemix

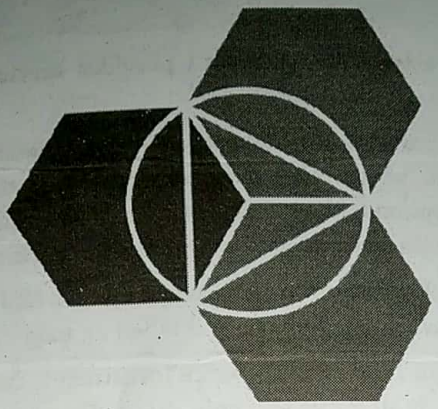


Fig. 7 : IBM Bluemix

IBM Bluemix is a cloud **Platform as a Service (PaaS)** developed by IBM. Bluemix supports multiple platforms and services. IBM Bluemix provides end-to-end solution for an enterprise application Development, Testing, and Deployment in Production.

Bluemix is founded on Cloud Foundry open technology and runs on SoftLayer infrastructure. Bluemix maintains several programming languages including **Java, Swift, Python, Node.js, Go, PHP, Ruby Sinatra and Ruby on Rails** and can be extended to support other languages such as **Scala** through the use of buildpacks.

Bluemix provides a wide range of cloud services. we can create and deploy our app in the cloud using the runtime of our choice and choosing from 130+ services, across **IBM Watson, Blockchain, IoT, Mobile, Data and Analytics** and many more.

Bluemix gives solution to build, migrate, and extend our app. In subsequent blogs and articles, we see how Bluemix helps to build, migrate, and extend our app. On Bluemix, we can deploy a demo app of our choice in less than 2 minutes.

1. **Apps**

The Bluemix Apps dashboard provides everything we need to get your apps up and running, and to manage those apps while they are running. Bluemix provides various boilerplates and runtimes.

- A boilerplate is a template for an application and its associated runtime environment and predefined services for a specific domain.
- A runtime is the set of resources that is used to run an app.

2. **Services**

The Bluemix Services dashboard provides access to the Bluemix Services including IBM and third-party providers. For example Watson, Internet of Things, Analytics, Mobile, and DevOps services etc.

IBM enables us to do more with rich, integrated cloud databases and Data & Analytics services.

IBM Bluemix provides a wide range of services.

3. Infrastructure

The IBM Bluemix Infrastructure dashboard provides services to fit our cloud infrastructure needs.

Bluemix infrastructure provides the highest performing cloud infrastructure available. Bluemix infrastructure is one platform, which takes data centers around the world that are full of the widest range of cloud computing options, then integrates and automates everything. IBM Cloud Data Centers are filled with first class computing, storage, and networking gear.

Bluemix infrastructure offers powerful bare metal servers and flexible virtual servers in a single seamless platform. All are provided on demand and billed on monthly or hourly terms.

With Bluemix, we no longer have to make large investments in hardware to test out or run a new app. Instead, Bluemix manage it all for us and only charge for what we use.

4. Bluemix offers 3 types of integrated deployment models.

1. IBM Bluemix Public

Bluemix Public is an environment for us to develop apps and use services that provide ready-to-use functions. In this environment, the app can use pre-built services to make app assembly easy. IBM manages all service instances.

2. IBM Bluemix Dedicated

Bluemix Dedicated is a private cloud with physically isolated hardware in an IBM SoftLayer data center. Bluemix Dedicated is securely connected to both the Bluemix Public environment and your own network. Single-tenant, and provisioned on a combination of bare metal and virtual servers.

3. IBM Bluemix Local

Bluemix Local is a private cloud that you host within your data center. With Bluemix Local, we get the benefits of a cloud, but we can use our existing mainframes, service-oriented architecture, processes, permissions, and data.

Bluemix Local allows you to protect your most sensitive workloads behind your company firewall, while staying securely connected and in sync with Bluemix Public. IBM uses cloud operations as a service to monitor and maintain your environment and also handles platform updates, so that we can focus on building apps and services that run on top of the environment.

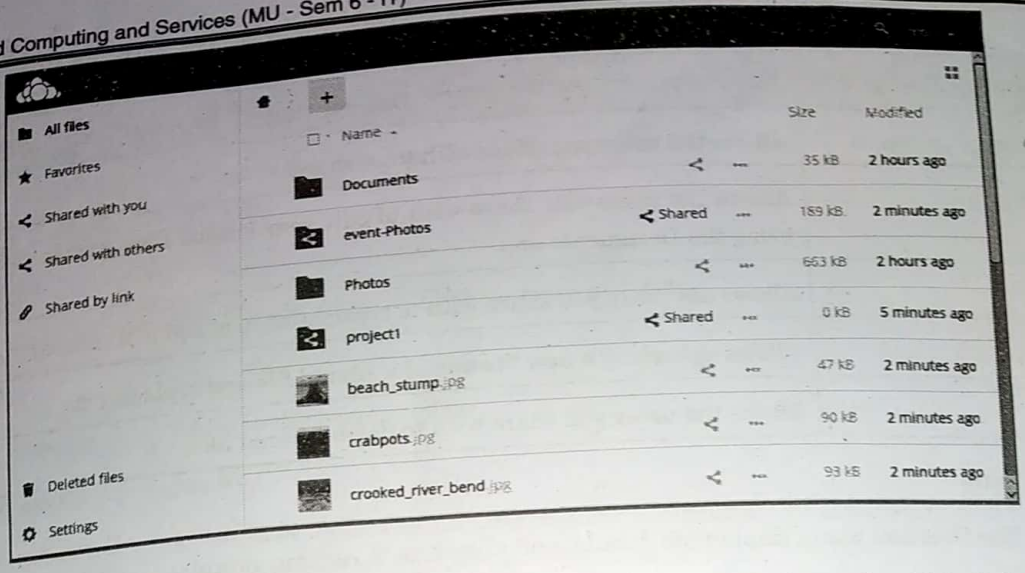
Module VI : Storage as a Services

Experiment 7 : Explore Storage as a service using own Cloud for remote file access using web interfaces. S3 storage and glacier storage and understand the storage LC management provided by AWS.

Solution :

Accessing our Files using the ownCloud Web Interface

We can access our ownCloud files with the ownCloud web interface and create, preview, edit, delete, share, and re-share files. Our ownCloud administrator has the option to disable these features, so if any of them are missing on our system ask your server administrator.

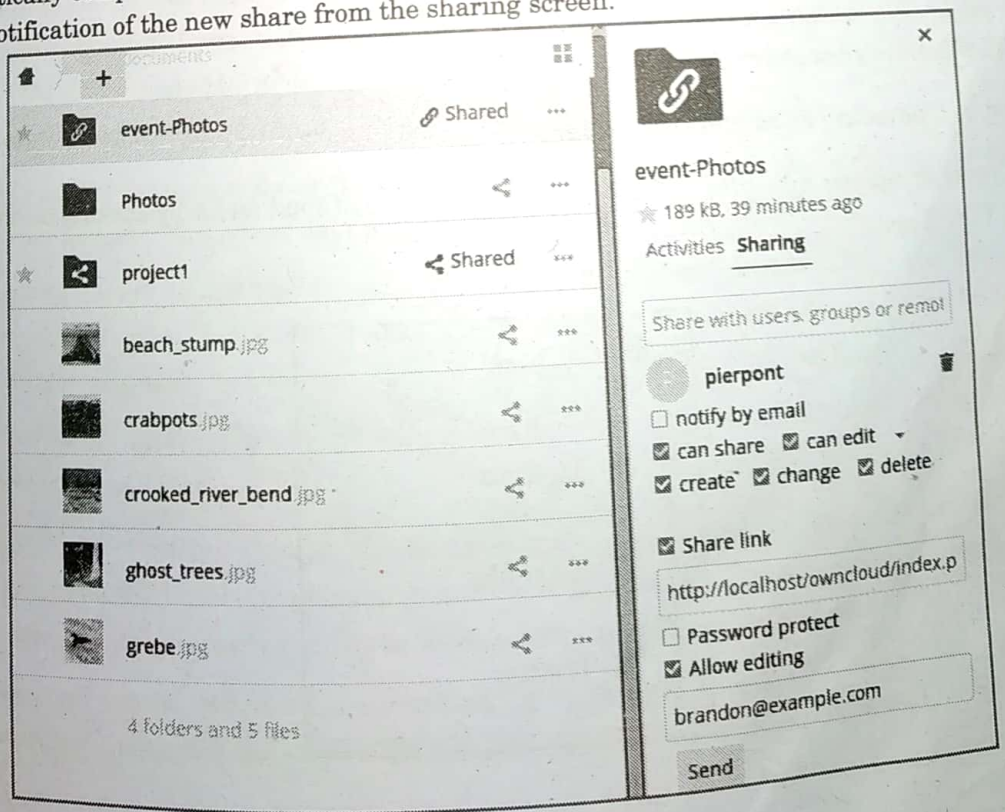


Favorites

Click the star which is the left of the file icon to mark it as a favorite, and quickly find all of your favorites with the Favorites filter on the left sidebar.

Share

With a group or other users share the file or folder, and create public shares with hyperlinks. We can also see who we have shared with already, and revoke shares by clicking the trash can icon. If username auto-completion is enabled, when you start typing the user or group name ownCloud will automatically complete it for us. If our administrator has enabled email notifications, we can send an email notification of the new share from the sharing screen.

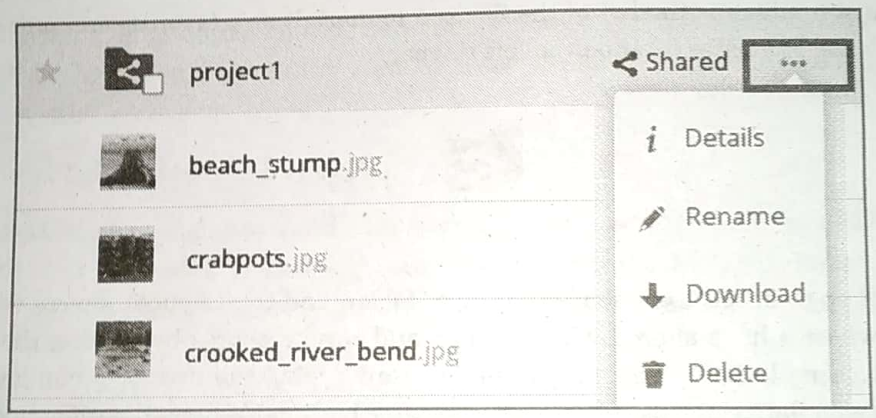


We have five share permissions :

Permissions	Description
Can share;	Allows the users you share with to re-share.
Can edit;	Allows the users you share with to edit your shared files, and to collaborate using the Documents app.
Create;	Allows the users you share with to create new files and add them to the share.
Change;	Allows uploading a new version of a shared file and replacing it.
Delete;	Allows the users you share with to delete shared files.

Overflow Menu

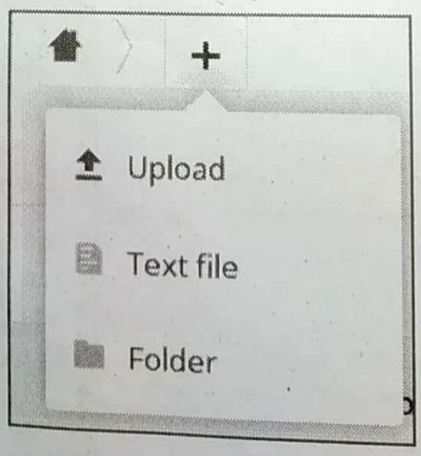
The Overflow menu display file details, and allows us to rename, download, or delete files.



The Details view shows Activities, Sharing, and Versions information.

1. Creating or Uploading Files and Directories

Create or upload new files or folders directly in an ownCloud folder by clicking on the *New* button in the Files app.



The *New* button provides the following options :

(i) Up arrow

Upload files from computer into ownCloud. We can also upload files by dragging and dropping them from our file manager.

(ii) Text file

Creates a new text file and adds the file to our current folder.

(iii) Folder

Creates a new folder in the current folder.

2. Selecting Files or Folders

Select one or more files or folders by clicking on their checkboxes. To select all files in the current directory, click on the checkbox located at the top of the files listing.

When we select multiple files, we can delete all of them, or download them as a ZIP file by using the Delete or Download buttons that appear at the top.

Amazon S3 Storage

- Amazon S3 stands for Amazon Simple Storage Service. It is a Infrastructure as a Service (IaaS) solution which is developed by AWS. Amazon S3 provides highly-scalable, secured and low-latency data storage from the cloud.
- The most important functionality of Amazon S3 interface is of data storage and it's retrieval from anywhere and at any time.
- The Amazon S2 has flexible back-end infrastructure which avoids the requirement of in house storage and also provides unlimited or add-as-you-grow form of storage which is billed depending upon the usage.

Amazon S3 features and benefits include

- Huge capacity for data and object storage is provided by Amazon S3 for maximum of data types in different formats. The size of data may vary in the range of 1B - 5 TB.
- To reduce latency Amazon S3 provides Reduced Redundancy Storage (RRS). The data is stored in regionally segregated buckets. Hence the number of resources are saved and increases the application efficiency for the subscribers which may be at different locations.
- It provides strong security of regionally stored data through authentication.

S3 API and competing services

- Competing services have got an effective rise because of the Amazon S3 and tooling based on the S3 API. The standard programming interface is used by these services; however underlying technologies and supporting business models helps to differentiate them.
- Competing service providers are enabled by the cloud storage standard (like electrical and networking standards) to design their services and provide following benefits :

- A set of rules are provided to increase competition. It encourages market entry of smaller companies.
- The innovations of developers, cloud storage & tool vendors, are encouraged which helps them to concentrate on improvement of quality of product and services rather than focusing on compatibility.
- The economies of scale in implementation are allowed. (i.e., if a service provider finds an outage or as tools of client outgrow and require faster OS or tools, the swapping the solutions can be done.
- In response to demands of the market place, timely solutions for delivering functionality are provided.

❑❑❑