

GLOBUS TOOLKIT INSTALLATION.

AIM:

To study the installation procedure for Globus Toolkit.

PROCEDURE:

STEP 1: Installation of Apache ant.

```
itadmin@PLLAB-49:~$ pwd
```

```
/home/itadmin
```

```
itadmin@PLLAB-49:~$ cd Downloads/
itadmin@PLLAB-49:~/Downloads$ ls
apache-ant-1.9.6-bin.tar.gz      Install.doc
apache-tomcat-7.0.67.tar.gz     Introduction to Linux Environment.pdf
Basic Linux Commands.pdf        Intro to BigData.ppt
End.pptx                        KVM INSTALLTION.pdf
globus_toolkit-6.0.1464122925.tar.gz  opennebula instal steps.ppt
Hadoop.ppt                       Opensatck.ppt
Hadoop Pseudo-Node v2.7_MIT.pdf   ubuntu.iso
HDFSCommands11062015MIT.pdf
```

```
itadmin@PLLAB-49:~/Downloads$ tar zxvf apache-ant-1.9.6-bin.tar.gz
```

```
apache-ant-1.9.6/bin/ant
apache-ant-1.9.6/bin/antRun
apache-ant-1.9.6/bin/antRun.pl
apache-ant-1.9.6/bin/complete-ant-cmd.pl
apache-ant-1.9.6/bin/runant.pl
apache-ant-1.9.6/bin/runant.py
apache-ant-1.9.6/
apache-ant-1.9.6/bin/
apache-ant-1.9.6/etc/
apache-ant-1.9.6/etc/checkstyle/
apache-ant-1.9.6/lib/
apache-ant-1.9.6/manual/
apache-ant-1.9.6/manual/Integration/
apache-ant-1.9.6/manual/Tasks/
apache-ant-1.9.6/manual/Types/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/image/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/j2ee/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/javacc/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/javah/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/jdepend/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/jlink/
apache-ant-1.9.6/manual/api/org/apache/tools/ant/taskdefs/optional/jsp/
```

```
itadmin@PLLAB-49:~/Downloads$ cd apache-ant-1.9.6/
```

```
itadmin@PLLAB-49:~/Downloads/apache-ant-1.9.6$ pwd
```

```
/home/itadmin/Downloads/apache-ant-1.9.6          (Copy this path you have to paste in
/etc/profile)
```

```
itadmin@PLLAB-49:~/Downloads/apache-ant-1.9.6$ sudo nano /etc/profile
```

(Add the bold lines alone)

```
# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).
```

```
if [ "$PS1" ]; then
  if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then
    # The file bash.bashrc already sets the default PS1.
    # PS1=\h:\w\$'
    if [ -f /etc/bash.bashrc ]; then
      . /etc/bash.bashrc
    fi
  else
    if[ "id -u" -eq 0 ]; then
      PS1=#'
    else
      PS1=$'
    fi
  fi
fi
```

```
JAVA_HOME=/home/itadmin/jdk1.8.0_60
```

```
HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0
```

```
ANT_HOME=/home/itadmin/Downloads/apache-ant-1.9.6
```

```
PATH=$PATH:$JAVA_HOME/bin
PATH=$PATH:$HADOOP_PREFIX/bin
PATH=$PATH:$ANT_HOME/bin
```

```
export PATH JAVA_HOME HADOOP_PREFIX ANT_HOME
```

```
# The default umask is now handled by pam_umask.
# See pam_umask(8) and /etc/login.defs.
```

```
if [ -d /etc/profile.d ]; then
  for i in /etc/profile.d/*.*; do
    if [ -r $i ]; then
      . $i
    fi
  done
  unset i
fi
```

(Save the file)

```
itadmin@PLLAB-49:~/Downloads/apache-ant-1.9.6$ cd ..
```

STEP 2: Installation of Apache Tomcat.

```
itadmin@PLLAB-49:~/Downloads$ tar zxvf apache-tomcat-7.0.67.tar.gz
```

```
apache-tomcat-7.0.67/bin/catalina.sh
apache-tomcat-7.0.67/bin/configtest.sh
apache-tomcat-7.0.67/temp/
apache-tomcat-7.0.67/webapps/
apache-tomcat-7.0.67/webapps/ROOT/
apache-tomcat-7.0.67/webapps/ROOT/WEB-INF/
apache-tomcat-7.0.67/webapps/docs/
apache-tomcat-7.0.67/webapps/docs/WEB-INF/
apache-tomcat-7.0.67/webapps/docs/api/
apache-tomcat-7.0.67/webapps/docs/appdev/
```

```
itadmin@PLLAB-49:~/Downloads$ cd apache-tomcat-7.0.67/
```

```
itadmin@PLLAB-49:~/Downloads/apache-tomcat-7.0.67$ pwd
```

/home/itadmin/Downloads/apache-tomcat-7.0.67 (Copy this path you have to paste in /etc/profile)

itadmin@PLLAB-49:~/Downloads/apache-tomcat-7.0.67\$ sudo nano /etc/profile

(Add the bold lines alone)

```
# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).
```

```
if [ "$PS1" ]; then
  if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then
    # The file bash.bashrc already sets the default PS1.
    # PS1=\h:\w\$'
    if [ -f /etc/bash.bashrc ]; then
      . /etc/bash.bashrc
    fi
  else
    if [ "id -u" -eq 0 ]; then
      PS1=#'
    else
      PS1=$'
    fi
  fi
fi
```

JAVA_HOME=/home/itadmin/jdk1.8.0_60

HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0

ANT_HOME=/home/itadmin/Downloads/apache-ant-1.9.6

CATALINA_HOME=/home/itadmin/Downloads/apache-tomcat-7.0.67

PATH=\$PATH:\$JAVA_HOME/bin

PATH=\$PATH:\$HADOOP_PREFIX/bin

PATH=\$PATH:\$ANT_HOME/bin

PATH=\$PATH:\$CATALINA_HOME/bin

export PATH JAVA_HOME HADOOP_PREFIX ANT_HOME CATALINA_HOME

```
# The default umask is now handled by pam_umask.
```

```
# See pam_umask(8) and /etc/login.defs.
```

```
if [ -d /etc/profile.d ]; then
  for i in /etc/profile.d/*.*sh; do
    if [ -r $i ]; then
      . $i
    fi
  done
  unset i
fi
```

(Save the file)

itadmin@PLLAB-49:~/Downloads/apache-tomcat-7.0.67\$ cd ..

STEP 3: Installing and unzip the junit.

itadmin@PLLAB-49:~/Downloads\$ unzip junit3.8.1.zip

```
Archive: junit3.8.1.zip
  creating: junit3.8.1/
  creating: junit3.8.1/doc/
  creating: junit3.8.1/doc/cookbook/
  creating: junit3.8.1/doc/cookstour/
```

```
inflating: junit3.8.1/doc/cookbook/cookbook.htm
inflating: junit3.8.1/doc/cookbook/IMG00001.GIF
inflating: junit3.8.1/doc/cookbook/logo.gif
inflating: junit3.8.1/doc/cookstour/cookstour.htm
inflating: junit3.8.1/doc/cookstour/Image1.gif
inflating: junit3.8.1/doc/cookstour/Image2.gif
```

```
itadmin@PLLAB-49:~/Downloads$ cd junit3.8.1/
```

```
itadmin@PLLAB-49:~/Downloads/junit3.8.1$ pwd
```

```
/home/itadmin/Downloads/junit3.8.1      (Copy this path you have to paste in /etc/profile)
```

```
itadmin@PLLAB-49:~/Downloads/junit3.8.1$ sudo nano /etc/profile
```

(Add the bold lines)

```
# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).
```

```
if [ "$PS1" ]; then
  if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then
    # The file bash.bashrc already sets the default PS1.
    # PS1=\h:\w\$'
    if [ -f /etc/bash.bashrc ]; then
      ./etc/bash.bashrc
    fi
  else
    if [ "`id -u`" -eq 0 ]; then
      PS1='# '
    else
      PS1='$ '
    fi
  fi
fi
```

```
JAVA_HOME=/home/itadmin/jdk1.8.0_60
```

```
HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0
```

```
ANT_HOME=/home/itadmin/Downloads/apache-ant-1.9.6
```

```
CATALINA_HOME=/home/itadmin/Downloads/apache-tomcat-7.0.67
```

```
JUNIT_HOME=/home/itadmin/Downloads/junit3.8.1
```

```
PATH=$PATH:$JAVA_HOME/bin
PATH=$PATH:$HADOOP_PREFIX/bin
PATH=$PATH:$ANT_HOME/bin
PATH=$PATH:$CATALINA_HOME/bin
PATH=$PATH:$JUNIT_HOME
```

```
export PATH JAVA_HOME HADOOP_PREFIX ANT_HOME CATALINA_HOME
JUNIT_HOME
```

```
# The default umask is now handled by pam_umask.
# See pam_umask(8) and /etc/login.defs.
```

```
if [ -d /etc/profile.d ]; then
  for i in /etc/profile.d/*.sh; do
    if [ -r $i ]; then
      . $i
    fi
  done
  unset i
fi
```

(Save the file)

```
itadmin@PLLAB-49:~/Downloads/junit3.8.1$ cd ..
```

```
itadmin@PLLAB-49:~/Downloads$ cd ..
```

STEP 4: Installing and update the necessary packages.

```
itadmin@PLLAB-49:~$ sudo apt-get install vim git-core
Reading package lists... Done
Building dependency tree
Reading state information... Done
vim is already the newest version.
git-core is already the newest version.
The following packages were automatically installed and are no longer required:
libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-
numpy ruby-amazon-ec2 ruby-blankslate ruby-builder
ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-
rack ruby-rack-protection ruby-sequel ruby-sequel-pg
ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

```
itadmin@PLLAB-49:~$ wget
http://toolkit.globus.org/ftppub/gt5/5.2/5.2.5/installers/repo/globus-repository-5.2-
stable-trusty_0.0.3_all.deb
--2016-05-29 14:15:05-- http://toolkit.globus.org/ftppub/gt5/5.2/5.2.5/installers/repo/globus-
repository-5.2-stable-trusty_0.0.3_all.deb
Resolving toolkit.globus.org (toolkit.globus.org)... 192.5.186.47
Connecting to toolkit.globus.org (toolkit.globus.org)|192.5.186.47|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2028 (2.0K) [application/x-debian-package]
Saving to: ‘globus-repository-5.2-stable-trusty_0.0.3_all.deb’

globus-repository-5.2-stable-trusty
100%[=====] 1.98K --.-KB/s in 0s
```

```
2016-05-29 14:15:05 (185 MB/s) - ‘globus-repository-5.2-stable-trusty_0.0.3_all.deb’ saved
[2028/2028]
```

```
itadmin@PLLAB-49:~$ sudo dpkg -i globus-repository-5.2-stable-trusty_0.0.3_all.deb
(Reading database ... 217894 files and directories currently installed.)
Preparing to unpack globus-repository-5.2-stable-trusty_0.0.3_all.deb ...
Unpacking globus-repository-5.2-stable-trusty (0.0.3) over (0.0.3) ...
Setting up globus-repository-5.2-stable-trusty (0.0.3) ...
```

```
itadmin@PLLAB-49:~$ sudo apt-get update
```

```
Hit http://archive.ubuntu.com vivid InRelease
Hit http://security.ubuntu.com vivid-security InRelease
Hit http://archive.ubuntu.com vivid-updates InRelease
Ign http://downloads.opennebula.org stable InRelease
Hit http://archive.ubuntu.com vivid-backports InRelease
Hit http://security.ubuntu.com vivid-security/main Sources
Hit http://archive.ubuntu.com vivid/main Sources
Hit http://security.ubuntu.com vivid-security/restricted Sources
Hit http://archive.ubuntu.com vivid/restricted Sources
Hit http://security.ubuntu.com vivid-security/universe Sources
Hit http://archive.ubuntu.com vivid/universe Sources
Hit http://security.ubuntu.com vivid-security/multiverse Sources
```

```
rse i386 Packages  
Hit http://security.ubuntu.com vivid-security/multiverse i386 Packages  
Hit http://downloads.opennebula.org stable/opennebula amd64 Packages  
Hit http://archive.ubuntu.com vivid/multiverse i386 Packages  
Hit http://security.ubuntu.com vivid-security/main Translation-en  
Hit http://archive.ubuntu.com vivid/main Translation-en  
Hit http://security.ubuntu.com vivid-security/multiverse Translation-en  
Hit http://archive.ubuntu.com vivid/multiverse Translation-en  
Hit http://security.ubuntu.com vivid-security/restricted Translation-en  
Hit http://archive.ubuntu.com vivid/restricted Translation-en  
Hit http://downloads.opennebula.org stable/opennebula i386 Packages  
Hit http://security.ubuntu.com vivid-security/universe Translation-en
```

itadmin@PLLAB-49:~\$ sudo apt-get install perl perl-modules libxml-parser-perl

```
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
libxml-parser-perl is already the newest version.  
perl is already the newest version.  
perl-modules is already the newest version.  
The following packages were automatically installed and are no longer required:  
  libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-  
  numpy ruby-amazon-ec2 ruby-blankslate ruby-builder  
    ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-  
    rack ruby-rack-protection ruby-sequel ruby-sequel-pg  
    ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin  
Use 'apt-get autoremove' to remove them.  
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

itadmin@PLLAB-49:~\$ sudo apt-get install make gcc sudo tar

```
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
gcc is already the newest version.  
make is already the newest version.  
sudo is already the newest version.  
tar is already the newest version.  
The following packages were automatically installed and are no longer required:  
  libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-  
  numpy ruby-amazon-ec2 ruby-blankslate ruby-builder  
    ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-  
    rack ruby-rack-protection ruby-sequel ruby-sequel-pg  
    ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin  
Use 'apt-get autoremove' to remove them.  
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

itadmin@PLLAB-49:~\$ sudo apt-get install libiodbc2 libiodbc2-dev

```
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
libiodbc2 is already the newest version.  
libiodbc2-dev is already the newest version.  
The following packages were automatically installed and are no longer required:  
  libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-
```

```
numpy ruby-amazon-ec2 ruby-blankslate ruby-builder
ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-
rack ruby-rack-protection ruby-sequel ruby-sequel-pg
ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

itadmin@PLLAB-49:~\$ sudo apt-get install libltdl3-dev

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'libltdl-dev' instead of 'libltdl3-dev'
libltdl-dev is already the newest version.
The following packages were automatically installed and are no longer required:
  libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-
numpy ruby-amazon-ec2 ruby-blankslate ruby-builder
  ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-
rack ruby-rack-protection ruby-sequel ruby-sequel-pg
  ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

itadmin@PLLAB-49:~\$ sudo apt-cache search zlib1g-dev

zlib1g-dev - compression library - development

itadmin@PLLAB-49:~\$ sudo apt-get install zlib1g-dev zlib1g

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
zlib1g is already the newest version.
The following packages were automatically installed and are no longer required:
  libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-
numpy ruby-amazon-ec2 ruby-blankslate ruby-builder
  ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-
rack ruby-rack-protection ruby-sequel ruby-sequel-pg
  ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
```

The following NEW packages will be installed:

zlib1g-dev

0 upgraded, 1 newly installed, 0 to remove and 310 not upgraded.

Need to get 169 kB of archives.

After this operation, 462 kB of additional disk space will be used.

Do you want to continue? [Y/n] y

```
Get:1 http://archive.ubuntu.com/ubuntu/ vivid/main zlib1g-dev amd64 1:1.2.8.dfsg-2ubuntu1
[169 kB]
```

Fetched 169 kB in 0s (224 kB/s)

Selecting previously unselected package zlib1g-dev:amd64.

(Reading database ... 217894 files and directories currently installed.)

Preparing to unpack .../zlib1g-dev_1%3a1.2.8.dfsg-2ubuntu1_amd64.deb ...

Unpacking zlib1g-dev:amd64 (1:1.2.8.dfsg-2ubuntu1) ...

```
Processing triggers for man-db (2.7.0.2-5) ...
Setting up zlib1g-dev:amd64 (1:1.2.8.dfsg-2ubuntu1) ...
```

```
itadmin@PLLAB-49:~$ sudo apt-get install gcc g++ tar make sed sudo
```

```
Reading package lists... Done
```

```
Building dependency tree
```

```
Reading state information... Done
```

```
g++ is already the newest version.
```

```
gcc is already the newest version.
```

```
make is already the newest version.
```

```
sed is already the newest version.
```

```
sudo is already the newest version.
```

```
tar is already the newest version.
```

```
The following packages were automatically installed and are no longer required:
```

```
libgfortran3 liblapack3 liblog4cpp5 libpq5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder
```

```
ruby-daemons ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg
```

```
ruby-sinatra ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
```

```
Use 'apt-get autoremove' to remove them.
```

```
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

```
itadmin@PLLAB-49:~$ sudo apt-get install postgresql
```

```
Reading package lists... Done
```

```
Building dependency tree
```

```
Reading state information... Done
```

```
The following packages were automatically installed and are no longer required:
```

```
libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
```

```
ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra
```

```
ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
```

```
Use 'apt-get autoremove' to remove them.
```

```
The following extra packages will be installed:
```

```
postgresql-9.4 postgresql-client-9.4 postgresql-client-common postgresql-common
```

```
Suggested packages:
```

```
postgresql-doc oidentd ident-server locales-all postgresql-doc-9.4
```

```
The following NEW packages will be installed:
```

```
postgresql postgresql-9.4 postgresql-client-9.4 postgresql-client-common postgresql-common
```

```
0 upgraded, 5 newly installed, 0 to remove and 310 not upgraded.
```

```
Need to get 3,852 kB of archives.
```

```
After this operation, 15.9 MB of additional disk space will be used.
```

```
Do you want to continue? [Y/n] y
```

```
Get:1 http://archive.ubuntu.com/ubuntu/ vivid/main postgresql-client-common all 166bzr2 [26.9 kB]
```

```
Get:2 http://archive.ubuntu.com/ubuntu/ vivid-updates/main postgresql-client-9.4 amd64 9.4.5-0ubuntu0.15.04 [819 kB]
```

```
Get:3 http://archive.ubuntu.com/ubuntu/ vivid/main postgresql-common all 166bzr2 [151 kB]
```

```
Get:4 http://archive.ubuntu.com/ubuntu/ vivid-updates/main postgresql-9.4 amd64 9.4.5-0ubuntu0.15.04 [2,850 kB]
```

```
Get:5 http://archive.ubuntu.com/ubuntu/ vivid/main postgresql all 9.4+166bzr2 [5,104 B]
```

```
Fetched 3,852 kB in 6s (640 kB/s)
```

```
Preconfiguring packages ...
```

```
Selecting previously unselected package postgresql-client-common.
```

```
(Reading database ... 217922 files and directories currently installed.)
```

```
Preparing to unpack .../postgresql-client-common_166bzr2_all.deb ...
```

```
Unpacking postgresql-client-common (166bzr2) ...
```

```

Selecting previously unselected package postgresql-client-9.4.
Preparing to unpack .../postgresql-client-9.4_9.4.5-0ubuntu0.15.04_amd64.deb ...
Unpacking postgresql-client-9.4 (9.4.5-0ubuntu0.15.04) ...
Selecting previously unselected package postgresql-common.
Preparing to unpack .../postgresql-common_166bzr2_all.deb ...
Adding 'diversion of /usr/bin/pg_config to /usr/bin/pg_config.libpq-dev by postgresql-common'
Unpacking postgresql-common (166bzr2) ...
Selecting previously unselected package postgresql-9.4.
Preparing to unpack .../postgresql-9.4_9.4.5-0ubuntu0.15.04_amd64.deb ...
Unpacking postgresql-9.4 (9.4.5-0ubuntu0.15.04) ...
Selecting previously unselected package postgresql.
Preparing to unpack .../postgresql_9.4+166bzr2_all.deb ...
Unpacking postgresql (9.4+166bzr2) ...
Processing triggers for man-db (2.7.0.2-5) ...
Processing triggers for ureadahead (0.100.0-19) ...
ureadahead will be reprofiled on next reboot
Processing triggers for systemd (219-7ubuntu3) ...
Setting up postgresql-client-common (166bzr2) ...
Setting up postgresql-client-9.4 (9.4.5-0ubuntu0.15.04) ...
update-alternatives: using /usr/share/postgresql/9.4/man/man1/psql.1.gz to provide
/usr/share/man/man1/psql.1.gz (psql.1.gz) in auto mode
Setting up postgresql-common (166bzr2) ...
Adding user postgres to group ssl-cert

Creating config file /etc/postgresql-common/createcluster.conf with new version

Creating config file /etc/logrotate.d/postgresql-common with new version
Building PostgreSQL dictionaries from installed myspell/hunspell packages...
    en_au
    en_gb
    en_us
    en_za
Removing obsolete dictionary files:
Setting up postgresql-9.4 (9.4.5-0ubuntu0.15.04) ...
Creating new cluster 9.4/main ...
    config /etc/postgresql/9.4/main
    data  /var/lib/postgresql/9.4/main
    locale en_US.UTF-8
Flags of /var/lib/postgresql/9.4/main set as -----e-C
    port 5432
update-alternatives: using /usr/share/postgresql/9.4/man/man1/postmaster.1.gz to provide
/usr/share/man/man1/postmaster.1.gz (postmaster.1.gz) in auto mode
Setting up postgresql (9.4+166bzr2) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (219-7ubuntu3) ...

```

itadmin@PLLAB-49:~\$

itadmin@PLLAB-49:~\$ sudo vim /etc/postgresql/9.4/main/postgresql.conf

(Change max_connections to '200')

```

#-----
# CONNECTIONS AND AUTHENTICATION
#-----

# - Connection Settings -

#listen_addresses = 'localhost'      # what IP address(es) to listen on;
                                    # comma-separated list of addresses;
                                    # defaults to 'localhost'; use '*' for all

```

```

# (change requires restart)
port = 5432           # (change requires restart)
max_connections = 200          # (change requires restart)
# Note: Increasing max_connections costs ~400 bytes of shared memory per
# connection slot, plus lock space (see max_locks_per_transaction).
#superuser_reserved_connections = 3    # (change requires restart)
unix_socket_directories = '/var/run/postgresql' # comma-separated list of directories
                                            # (change requires restart)
#unix_socket_group = "          # (change requires restart)
#unix_socket_permissions = 0777      # begin with 0 to use octal notation
                                            # (change requires restart)
#bonjour = off          # advertise server via Bonjour
                                            # (change requires restart)
#bonjour_name = "        # defaults to the computer name
                                            # (change requires restart)

```

(To Save and exit: ESC :wq)

```
itadmin@PLLAB-49:~$ sudo vim /etc/postgresql/9.4/main/pg_hba.conf
```

```
itadmin@PLLAB-49:~$ sudo /etc/init.d/postgresql restart
[ ok ] Restarting postgresql (via systemctl): postgresql.service.
```

```
itadmin@PLLAB-49:~$ sudo /etc/init.d/postgresql status
postgresql.service - PostgreSQL RDBMS
   Loaded: loaded (/lib/systemd/system/postgresql.service; enabled; vendor preset: enabled)
     Active: active (exited) since Sun 2016-05-29 14:37:06 IST; 8s ago
       Process: 8388 ExecStart=/bin/true (code=exited, status=0/SUCCESS)
      Main PID: 8388 (code=exited, status=0/SUCCESS)

May 29 14:37:06 PLLAB-49 systemd[1]: Starting PostgreSQL RDBMS...
May 29 14:37:06 PLLAB-49 systemd[1]: Started PostgreSQL RDBMS.
```

```
itadmin@PLLAB-49:~$ ps -ef|grep postgres
postgres  8371  1  0 14:37 ?        00:00:00 /usr/lib/postgresql/9.4/bin/postgres -D
/var/lib/postgresql/9.4/main -c config_file=/etc/postgresql/9.4/main/postgresql.conf
postgres  8373  8371  0 14:37 ?        00:00:00 postgres: checkpointer process
postgres  8374  8371  0 14:37 ?        00:00:00 postgres: writer process
postgres  8375  8371  0 14:37 ?        00:00:00 postgres: wal writer process
postgres  8376  8371  0 14:37 ?        00:00:00 postgres: autovacuum launcher process
postgres  8377  8371  0 14:37 ?        00:00:00 postgres: stats collector process
itadmin   8424  3353  0 14:39 pts/1  00:00:00 grep --color=auto postgres
```

```
itadmin@PLLAB-49:~$ sudo adduser globus
```

Adding user `globus' ...

Adding new group `globus' (1003) ...

Adding new user `globus' (1003) with group `globus' ...

Creating home directory `/home/globus' ...

Copying files from `/etc/skel' ...

Enter new UNIX password:

(Password was given as 'globus')

Retype new UNIX password:

passwd: password updated successfully

Changing the user information for globus

Enter the new value, or press ENTER for the default

Full Name []:

Room Number []:

Work Phone []:

Home Phone []:

Other []:

Is the information correct? [Y/n] Y

```
itadmin@PLLAB-49:~$ sudo mkdir /usr/local/globus
```

```
itadmin@PLLAB-49:~$ sudo chown -Rh globus:globus /usr/local/globus/
```

```
itadmin@PLLAB-49:~$ cd Downloads/
```

```
itadmin@PLLAB-49:~/Downloads$ sudo mv globus_toolkit-6.0.1464122925.tar.gz  
/usr/local/
```

```
itadmin@PLLAB-49:~/Downloads$ sudo chown -Rh globus:globus  
/usr/local/globus_toolkit-6.0.1464122925.tar.gz
```

```
itadmin@PLLAB-49:~/Downloads$ cd /usr/local/
```

```
itadmin@PLLAB-49:/usr/local$ sudo tar zxvf globus_toolkit-6.0.1464122925.tar.gz
```

```
globus_toolkit-6.0.1464122925/  
globus_toolkit-6.0.1464122925/Doxyfile.in  
globus_toolkit-6.0.1464122925/globus-vararg-enums-doxygen-filter.pl  
globus_toolkit-6.0.1464122925/Makefile.in  
globus_toolkit-6.0.1464122925/libltdl/  
globus_toolkit-6.0.1464122925/libltdl/README  
globus_toolkit-6.0.1464122925/libltdl/ltdlloader.c  
globus_toolkit-6.0.1464122925/libltdl/Makefile.in  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_glibc.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_dirent.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_private.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/slist.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_alloc.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_dlloader.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_strl.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_system.h  
globus_toolkit-6.0.1464122925/libltdl/libltdl/ltdl_error.h  
globus_toolkit-6.0.1464122925/libltdl/argz_h  
globus_toolkit-6.0.1464122925/libltdl/argz_c  
globus_toolkit-6.0.1464122925/libltdl/COPYING.LIB  
globus_toolkit-6.0.1464122925/libltdl/ltdl_error.c  
globus_toolkit-6.0.1464122925/libltdl/ltdl_strl.c  
globus_toolkit-6.0.1464122925/libltdl/ltdl_alloc.c  
globus_toolkit-6.0.1464122925/libltdl/slist.c  
globus_toolkit-6.0.1464122925/libltdl/ltdl_dirent.c  
globus_toolkit-6.0.1464122925/libltdl/Makefile.am  
globus_toolkit-6.0.1464122925/doxygen/
```

```
itadmin@PLLAB-49:/usr/local$ sudo chown -Rh globus:globus globus_toolkit-  
6.0.1464122925
```

```
itadmin@PLLAB-49:/usr/local$ sudo chown -Rh globus:globus globus_toolkit-  
6.0.1464122925
```

```
itadmin@PLLAB-49:/usr/local$ sudo apt-get install openssl
```

Reading package lists... Done

Building dependency tree

Reading state information... Done

The following packages were automatically installed and are no longer required:

```
libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
```

```
ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra
```

```
ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
```

Use 'apt-get autoremove' to remove them.

The following packages will be upgraded:

```
openssl
1 upgraded, 0 newly installed, 0 to remove and 309 not upgraded.
Need to get 492 kB of archives.
After this operation, 0 B of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu/ vivid-updates/main openssl amd64 1.0.1f-1ubuntu11.5 [492 kB]
Fetched 492 kB in 2s (170 kB/s)
(Reading database ... 218359 files and directories currently installed.)
Preparing to unpack .../openssl_1.0.1f-1ubuntu11.5_amd64.deb ...
Unpacking openssl (1.0.1f-1ubuntu11.5) over (1.0.1f-1ubuntu11) ...
Processing triggers for man-db (2.7.0.2-5) ...
Setting up openssl (1.0.1f-1ubuntu11.5) ...
```

**itadmin@PLLAB-49:/usr/local\$ sudo apt-get install vim ant build-essential libpod-*
postgresql**

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'libpod-strip-perl' for regex 'libpod-*'
Note, selecting 'libpod-tests-perl' for regex 'libpod-*'
Note, selecting 'libpod-simple-wiki-perl' for regex 'libpod-*'
Note, selecting 'libpodofo0-utils' for regex 'libpod-*'
Note, selecting 'libpodofo-dev' for regex 'libpod-*'
Note, selecting 'libpod-sax-perl' for regex 'libpod-*'
Note, selecting 'libpod-elemental-perl' for regex 'libpod-*'
Note, selecting 'libpod-wsdl-perl' for regex 'libpod-*'
Note, selecting 'libpod2pdf-perl' for regex 'libpod-*'
Note, selecting 'libpod-tree-perl' for regex 'libpod-*'
Note, selecting 'libpod-parser-perl' for regex 'libpod-*'
Note, selecting 'libpodofo0-dev' for regex 'libpod-*'
Note, selecting 'libpod-eventual-perl' for regex 'libpod-*'
Note, selecting 'libpod-plainer-perl' for regex 'libpod-*'
Note, selecting 'libpod-wordlist-hanekomu-perl' for regex 'libpod-*'
Note, selecting 'libpod-elemental-perlmunger-perl' for regex 'libpod-*'
Note, selecting 'libpod-abstract-perl' for regex 'libpod-*'
Note, selecting 'libpod-webserver-perl' for regex 'libpod-*'
Note, selecting 'libpod-weaver-perl' for regex 'libpod-*'
Note, selecting 'libpodofo-utils' for regex 'libpod-*'
Note, selecting 'perl-modules' instead of 'libpod-escapes-perl'
```

**itadmin@PLLAB-49:/usr/local\$ sudo apt-get install xinetd zlib1g-dev libiodbc2
libiodbc2-dev libxml-parser-perl libxml2-dev**

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
libiodbc2 is already the newest version.
libiodbc2-dev is already the newest version.
libxml-parser-perl is already the newest version.
zlib1g-dev is already the newest version.
The following packages were automatically installed and are no longer required:
Processing triggers for man-db (2.7.0.2-5) ...
Processing triggers for doc-base (0.10.6) ...
Processing 1 added doc-base file...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (219-7ubuntu3) ...
Setting up libicu52:amd64 (52.1-8ubuntu0.2) ...
Setting up libxml2:amd64 (2.9.2+dfsg1-3ubuntu0.3) ...
Setting up icu-devtools (52.1-8ubuntu0.2) ...
Setting up libicu-dev:amd64 (52.1-8ubuntu0.2) ...
Setting up libxml2-dev:amd64 (2.9.2+dfsg1-3ubuntu0.3) ...
Setting up xinetd (1:2.3.15-3ubuntu1) ...
Processing triggers for libc-bin (2.21-0ubuntu4) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (219-7ubuntu3) ...
```

**itadmin@PLLAB-49:/usr/local\$ sudo apt-get install xinetd zlib1g-dev libiodbc2
libiodbc2-dev libxml-parser-perl libxml2-dev libssl1.0.0**

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
libiodbc2 is already the newest version.
libiodbc2-dev is already the newest version.
libxml-parser-perl is already the newest version.
```

```
xinetd is already the newest version.  
zlib1g-dev is already the newest version.  
libxml2-dev is already the newest version.  
The following packages were automatically installed and are no longer required:  
 libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons  
 ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra  
 ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin  
Use 'apt-get autoremove' to remove them.  
The following packages will be upgraded:  
 libssl1.0.0  
1 upgraded, 0 newly installed, 0 to remove and 306 not upgraded.  
Need to get 850 kB of archives.  
After this operation, 5,120 B of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Get:1 http://archive.ubuntu.com/ubuntu/ vivid-updates/main libssl1.0.0 amd64 1.0.1f-1ubuntu11.5 [850 kB]  
Fetched 850 kB in 3s (215 kB/s)  
Preconfiguring packages ...  
(Reading database ... 223479 files and directories currently installed.)  
Preparing to unpack .../libssl1.0.0_1.0.1f-1ubuntu11.5_amd64.deb ...  
Unpacking libssl1.0.0:amd64 (1.0.1f-1ubuntu11.5) over (1.0.1f-1ubuntu11) ...  
Setting up libssl1.0.0:amd64 (1.0.1f-1ubuntu11.5) ...  
Processing triggers for libc-bin (2.21-0ubuntu4) ...
```

itadmin@PLLAB-49:/usr/local\$ sudo apt-cache search libwrap

```
libwrap0 - Wietse Venema's TCP wrappers library  
libwrap0-dev - Wietse Venema's TCP wrappers library, development files  
openbsd-inetd - OpenBSD Internet Superserver  
python-tcpwrap - python interface for libwrap0 (TCP wrappers)
```

itadmin@PLLAB-49:/usr/local\$ sudo apt-get install libwrap0 libwrap0-dev

```
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
libwrap0 is already the newest version.  
libwrap0-dev is already the newest version.  
The following packages were automatically installed and are no longer required:  
 libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons  
 ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra  
 ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin  
Use 'apt-get autoremove' to remove them.  
0 upgraded, 0 newly installed, 0 to remove and 306 not upgraded.
```

itadmin@PLLAB-49:/usr/local\$ sudo apt-cache search pam-devel

itadmin@PLLAB-49:/usr/local\$ sudo apt-cache search pam-dev

```
libpam0g-dev - Development files for PAM
```

itadmin@PLLAB-49:/usr/local\$ sudo apt-get install libpam0g-dev

```
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
 libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons  
 ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra  
 ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin  
Use 'apt-get autoremove' to remove them.  
The following NEW packages will be installed:  
 libpam0g-dev  
0 upgraded, 1 newly installed, 0 to remove and 306 not upgraded.  
Need to get 110 kB of archives.  
After this operation, 393 kB of additional disk space will be used.  
Get:1 http://archive.ubuntu.com/ubuntu/ vivid/main libpam0g-dev amd64 1.1.8-3.1ubuntu3 [110 kB]  
Fetched 110 kB in 0s (141 kB/s)  
Selecting previously unselected package libpam0g-dev:amd64.  
(Reading database ... 223479 files and directories currently installed.)  
Preparing to unpack .../libpam0g-dev_1.1.8-3.1ubuntu3_amd64.deb ...  
Unpacking libpam0g-dev:amd64 (1.1.8-3.1ubuntu3) ...
```

```
Processing triggers for man-db (2.7.0.2-5) ...
Setting up libpam0g-dev:amd64 (1.1.8-3.1ubuntu3) ...
```

itadmin@PLLAB-49:/usr/local\$ date

Sun May 29 15:12:35 IST 2016

itadmin@PLLAB-49:/usr/local\$ sudo apt-get install libiodbc2 libiodbc2-dev

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
libiodbc2 is already the newest version.
libiodbc2-dev is already the newest version.
The following packages were automatically installed and are no longer required:
  libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
    ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra
    ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 306 not upgraded.
```

itadmin@PLLAB-49:/usr/local\$ sudo apt-get install zlib1g

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
zlib1g is already the newest version.
The following packages were automatically installed and are no longer required:
  libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
    ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra
    ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
Use 'apt-get autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 306 not upgraded.
```

itadmin@PLLAB-49:/usr/local\$ pwd

/usr/local

itadmin@PLLAB-49:/usr/local\$ cd globus_toolkit-6.0.1464122925/

itadmin@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925\$ pwd

/usr/local/globus_toolkit-6.0.1464122925

itadmin@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925\$ sudo nano /etc/profile

```
# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).
```

```
if [ "$PS1" ]; then
  if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then
    # The file bash.bashrc already sets the default PS1.
    # PS1=\h:\w\$ '
    if [ -f /etc/bash.bashrc ]; then
      . /etc/bash.bashrc
    fi
  else
    if [ "id -u" -eq 0 ]; then
      PS1='# '
    else
      PS1='$ '
    fi
  fi
fi
```

JAVA_HOME=/home/itadmin/jdk1.8.0_60

HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0

ANT_HOME=/home/itadmin/Downloads/apache-ant-1.9.6

CATALINA_HOME=/home/itadmin/Downloads/apache-tomcat-7.0.67

```
JUNIT_HOME=/home/itadmin/Downloads/junit3.8.1  
GLOBUS_LOCATION=/usr/local/globus_toolkit-6.0.1464122925
```

```
PATH=$PATH:$JAVA_HOME/bin  
PATH=$PATH:$HADOOP_PREFIX/bin  
PATH=$PATH:$ANT_HOME/bin  
PATH=$PATH:$CATALINA_HOME/bin  
PATH=$PATH:$JUNIT_HOME  
PATH=$PATH:$GLOBUS_LOCATION/bin
```

```
export PATH JAVA_HOME HADOOP_PREFIX ANT_HOME CATALINA_HOME  
JUNIT_HOME GLOBUS_LOCATION
```

```
# The default umask is now handled by pam_umask.  
# See pam_umask(8) and /etc/login.defs.
```

```
if [ -d /etc/profile.d ]; then  
    for i in /etc/profile.d/*_sh; do  
        if [ -r $i ]; then  
            . $i  
        fi  
    done  
    unset i  
fi
```

Save and Exit

Simultaneously open a new terminal and do the following

```
itadmin@PLLAB-49:~$ su globus  
Password:  
globus@PLLAB-49:/home/itadmin$ pwd  
/home/itadmin
```

```
globus@PLLAB-49:/home/itadmin$ cd /usr/local/globus_toolkit-6.0.1464122925/  
globus@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$ pwd  
/usr/local/globus_toolkit-6.0.1464122925
```

```
globus@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$ ./configure --  
prefix=/usr/local/globus --enable-prewsmds --enable-wsgram-pbs --enable-i18n --enable-  
drs --with-gsiopensshargs="--with-pam --with-md5-passwords --with-tcp-wrappers" --  
with-flavor=gcc64dbg --with-iodbc=/usr/lib --with-flavour=gcc64dbgpthr  
checking for a BSD-compatible install... /usr/bin/install -c  
checking whether build environment is sane... yes  
checking for a thread-safe mkdir -p... /bin/mkdir -p  
checking for gawk... gawk  
checking whether make sets $(MAKE)... yes  
checking whether make supports nested variables... yes  
checking how to create a pax tar archive... gnutar  
checking build system type... x86_64-unknown-linux-gnu  
checking host system type... x86_64-unknown-linux-gnu  
checking for /usr/bin/ld option to reload object files... -r  
checking for objdump... objdump  
checking how to recognize dependent libraries... pass_all  
checking for dlltool... no  
checking how to associate runtime and link libraries... printf %s\n  
checking for ar... ar  
checking for archiver @FILE support... @  
checking for strip... strip  
checking for ranlib... ranlib  
checking command to parse /usr/bin/nm -B output from gcc object... ok  
checking for sysroot... no
```

```
checking for mt... mt
checking if mt is a manifest tool... no
checking how to run the C preprocessor... gcc -E
checking for ANSI C header files... yes
checking for sys/types.h... yes
checking for sys/stat.h... yes
checking for stdlib.h... yes
No package 'openssl' found
```

Consider adjusting the PKG_CONFIG_PATH environment variable if you
installed software in a non-standard prefix.

Alternatively, you may set the environment variables PACKAGE_DEP_CFLAGS
and PACKAGE_DEP_LIBS to avoid the need to call pkg-config.
See the pkg-config man page for more details.

configure: error: ./configure failed for gsi/openssl_error/source

(Execute the following command in first terminal)

```
itadmin@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$ sudo apt-get install libssl0.9.8
```

Reading package lists... Done

Building dependency tree

Reading state information... Done

The following packages were automatically installed and are no longer required:

```
libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3 python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
```

```
ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra
```

```
ruby-sqlite3 ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
```

Use 'apt-get autoremove' to remove them.

The following NEW packages will be installed:

```
libssl0.9.8
```

0 upgraded, 1 newly installed, 0 to remove and 306 not upgraded.

Need to get 694 kB of archives.

After this operation, 2,445 kB of additional disk space will be used.

```
Get:1 http://archive.ubuntu.com/ubuntu/ vivid/universe libssl0.9.8 amd64 0.9.8o-7ubuntu4 [694 kB]
```

Fetched 694 kB in 2s (260 kB/s)

Preconfiguring packages ...

Selecting previously unselected package libssl0.9.8:amd64.

(Reading database ... 223557 files and directories currently installed.)

Preparing to unpack .../libssl0.9.8_0.9.8o-7ubuntu4_amd64.deb ...

Unpacking libssl0.9.8:amd64 (0.9.8o-7ubuntu4) ...

Setting up libssl0.9.8:amd64 (0.9.8o-7ubuntu4) ...

Processing triggers for libc-bin (2.21-0ubuntu4) ...

```
itadmin@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$ sudo apt-get install libssl-dev
```

Reading package lists... Done

Building dependency tree

Reading state information... Done

The following packages were automatically installed and are no longer required:

```
libgfortran3 liblapack3 liblog4cpp5 libxmlrpc-c++8 libxmlrpc-core-c3
```

```
python-numpy ruby-amazon-ec2 ruby-blankslate ruby-builder ruby-daemons
```

```
ruby-eventmachine ruby-json ruby-nokogiri ruby-password ruby-pg ruby-rack
```

```
ruby-rack-protection ruby-sequel ruby-sequel-pg ruby-sinatra ruby-sqlite3  
ruby-termios ruby-tilt ruby-uuidtools ruby-xml-simple thin
```

Use 'apt-get autoremove' to remove them.

The following extra packages will be installed:

```
libssl-doc
```

The following NEW packages will be installed:

```
libssl-dev libssl-doc
```

0 upgraded, 2 newly installed, 0 to remove and 306 not upgraded.

Need to get 2,052 kB of archives.

After this operation, 7,946 kB of additional disk space will be used.

Do you want to continue? [Y/n] y

```
Get:1 http://archive.ubuntu.com/ubuntu/ vivid-updates/main libssl-dev amd64 1.0.1f-1ubuntu11.5 [1,089 kB]
```

```
Get:2 http://archive.ubuntu.com/ubuntu/ vivid-updates/main libssl-doc all 1.0.1f-1ubuntu11.5 [963 kB]
```

Fetched 2,052 kB in 3s (624 kB/s)

Selecting previously unselected package libssl-dev:amd64.

(Reading database ... 223581 files and directories currently installed.)

Preparing to unpack .../libssl-dev_1.0.1f-1ubuntu11.5_amd64.deb ...

Unpacking libssl-dev:amd64 (1.0.1f-1ubuntu11.5) ...

Selecting previously unselected package libssl-doc.

Preparing to unpack .../libssl-doc_1.0.1f-1ubuntu11.5_all.deb ...

Unpacking libssl-doc (1.0.1f-1ubuntu11.5) ...

Processing triggers for man-db (2.7.0.2-5) ...

Setting up libssl-dev:amd64 (1.0.1f-1ubuntu11.5) ...

Setting up libssl-doc (1.0.1f-1ubuntu11.5) ...

```
itadmin@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$
```

(Execute the following command in Globus terminal)

```
globus@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925$ ./configure --  
prefix=/usr/local/globus --enable-prewsmds --enable-wsgram-pbs --enable-i18n --enable-  
drs --with-gsiopensshargs="--with-pam --with-md5-passwords --with-tcp-wrappers" --  
with-flavor=gcc64dbg --with-iodbc=/usr/lib --with-flavour=gcc64dbgpthr
```

(This command will execute for long time)

.

.

.

OpenSSH has been configured with the following options:

User binaries: /usr/local/globus/bin

System binaries: /usr/local/globus/sbin

Configuration files: /usr/local/globus/etc

Askpass program: /usr/local/globus/libexec/ssh-askpass

Manual pages: /usr/local/globus/share/man/manX

PID file: /var/run

Privilege separation chroot path: /var/empty

sshd default user PATH: /usr/bin:/bin:/usr/sbin:/sbin:/usr/local/globus/bin

MD5 password support: no

libedit support: no

Solaris process contract support: no

Solaris project support: no

IP address in \$DISPLAY hack: no

Translate v4 in v6 hack: yes

BSD Auth support: no

```
Random number source: OpenSSL internal ONLY
NERSC Mods      : no
Privsep sandbox style: seccomp_filter

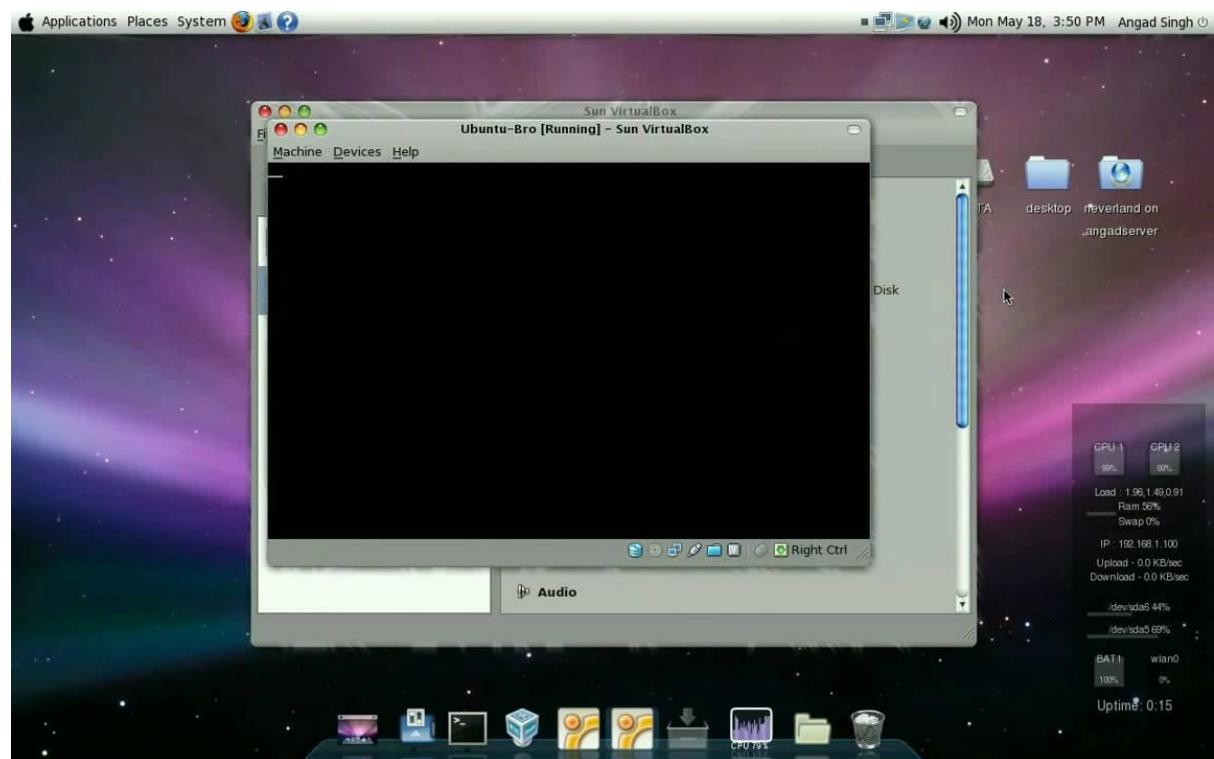
Host: x86_64-unknown-linux-gnu
Compiler: gcc
Compiler flags: -g -O2 -Wall -Wpointer-arith -Wsign-compare -Wformat-security -Wsizeof-pointer-memaccess -Wno-pointer-sign -Wno-unused-result -fno-strict-aliasing -D_FORTIFY_SOURCE=2 -ftrapv -fno-builtin-memset -fstack-protector-strong -fPIE
Preprocessor flags:
Linker flags: -lssl -lcrypto -Wl,-z,relro -Wl,-z,now -Wl,-z,noexecstack -fstack-protector-strong -pie
Libraries: -lcrypto -ldl -util -lz -lssl -lcrypt -lresolv
```

globus@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925\$ make

(It will be executed for long time)

globus@PLLAB-49:/usr/local/globus_toolkit-6.0.1464122925\$ make install

OUTPUT:



RESULT:

Thus the procedure for installation of Globus Toolkit was executed successfully.

EX. NO:1

GRID COMPUTING EXPERIMENTS
DATE: DEVELOP A NEW WEB SERVICE FOR
CALCULATOR.

AIM:

To develop a new Web Service for Calculator using Globus toolkit.

PROCEDURE:

Step1: Create new project.

Step2: Select java Empty Web Application.

Step3: Give a name to your project and click ok button.

Step4: Go to Solution Explorer and right click at your project.

Step5: Select Add New Item and select Web Service application.

Step6: Give it name and click ok button.

PROGRAM:

```
package gt3tutorial.core.first.impl;  
import org.globus.ogsa.impl.ogsi.GridServiceImpl; import  
gt3tutorial.core.first.Math.MathPortType; import java.rmi.RemoteException;  
public class MathImpl extends GridServiceImpl implements MathPortType  
{  
    public MathImpl()  
    {  
        super("Simple Math Service");  
    }  
    public int add(int a, int b) throws  
        RemoteException  
    {  
        return a + b;  
    }  
    public int subtract(int a, int b) throws  
        RemoteException  
    {
```

```

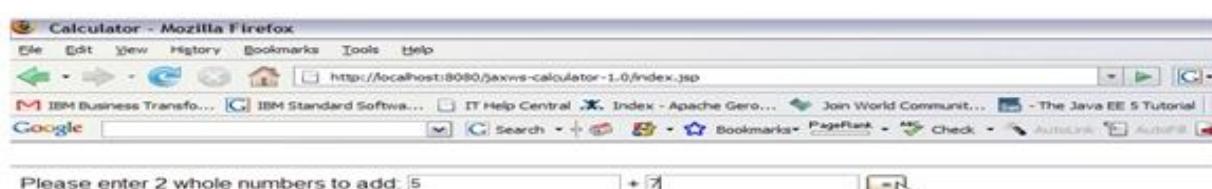
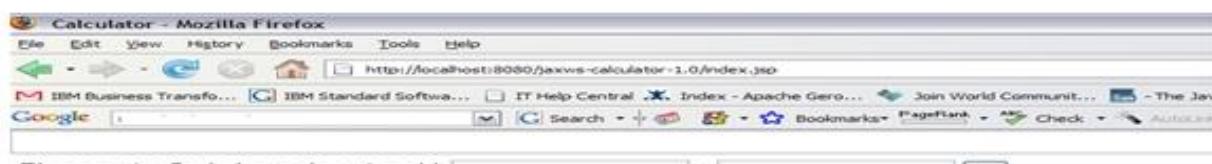
return a - b;
}

public int multiply(int a, int b) throws
RemoteException
{
return a * b;
}

public float divide(int a, int b) throws
RemoteException
{
return a / b;
}
}

```

OUTPUT:



RESULT:

Thus the "**develop a new web service for calculator**" using Globus toolkit has been successfully developed.

EX. NO:2

DEVELOP NEW OGSA-COMPLIANT WEB SERVICES.

AIM:

To develop a OGSA-compliant Web Service using Globus Toolkit

PROCEDURE:

The Global Grid Forum (GGF)'s Open Grid Services Architecture working group (OGSA-WG) has recently completed two major work products. The OGSA Use Cases document describes a set of use cases from a range of enterprise and scientific settings, intended as a source of requirements for OGSA services. The OGSA Version 1 document collates requirements for an Open Grid Services Architecture and identifies a large number of service interfaces that may be required to meet those requirements.

The completion of these two documents leads to the question: what is the path by which OGSA should now be further developed and defined? An answer to this question is important to a variety of people.

- Many GGF participants have bought into the notion that OGSA can serve as an overarching architectural framework for different GGF activities. They now want to understand what this framework implies for their work.
- Developers and users want to know “what they can expect when” in terms of standards, so that they can make plans for product developments and technology acquisitions.
- Arguably the credibility of OGSA, GGF, and Grid as a whole depends in part on a coherent answer to this question.

These and other pressures encourage the view that we must move quickly to fill out the OGSA definition and produce a set of normative specifications that define in great detail what it means to be OGSA compliant.

However, before rushing into this task, we must also be aware of a number of other factors:

- The broad importance of Grid and the tight alignment of OGSA with Web services means that further work on OGSA cannot proceed as a purely GGF activity, but must rather be viewed as one (hopefully important) input to a larger process aimed at defining service-oriented solutions to distributed computing problems.
- As in any standardization process, we need to be acutely sensitive to the dangers of

premature standardization, i.e., standardization without adequate experience and/or buy in from its eventual users. These issues are particularly important in the case of OGSA, due to the particularly large gap between our ambition and experience.

- While the OGSA design team has worked hard and considered a variety of use cases, the team remains relatively small. It would seem likely that there are important perspectives that have not yet been considered.
- The human resources available to work on OGSA activities are small, certainly far fewer than are needed to do justice to the full spectrum of issues described in OGSA Version 1.

These considerations motivate this document, which seeks to clarify the role of OGSA and the steps required to refine its definition by addressing the following three issues.

- With a view to identifying external constraints on OGSA, we review major relevant standardization activities external to GGF. We discuss both past activities that have produced specifications on which OGSA can build, and current and planned future activities that may contribute to, and/or constrain, OGSA's evolution.
- With a view to identifying factors that might help prioritize work on OGSA, we identify dependencies among different OGSA interfaces and the interfaces that appear needed within different deployment and application profiles.
- With a view to clarifying the process by which OGSA definition may proceed, we recommend a process by which technical specifications developed within or outside GGF can be identified as meeting OGSA requirements.

Open Grid Services Architecture: Goals and Status

A few brief words on goals and status, referring to other documents for details of course.

- Overarching goals.
- Documents produced.

The Standards Landscape:

The roles of GGF, OASIS, W3C, DMTF, WS-I, IETF. Products that may be expected from each of these groups in the coming 1-2 years, and their relevance to OGSA. Approaches that may be taken to facilitate coordination.

The following are a few rough notes that may be relevant.

There are many places where bilateral coordination has worked, e.g. WSDM/CMM, but there is still a lot of potential for conflict, e.g. Notification and Eventing.

Several low hanging pieces of fruit were identified: Notification, WMX, CML, Naming, Reliable Messaging, Workflow (CAF/BEPL), Code footprint vs. minimal functionality, common data model, policy models/languages (constraints and capabilities), provisioning and deployment (Solution Installation Schema, CDDLM).

OGSA Definition Process:

The process by which we see OGSA being further refined. Figure 1 may be relevant here.

A key point that Foster wants to see expressed here is that the “top down” and “bottom up” worlds are to be coordinated as follows:

- OGSA-WG is concerned with defining requirements and overall architecture: the lighthouse towards which others may steer.
- WGs within GGF or other bodies may (hopefully will!) be formed to develop specifications that speak to requirements identified by OGSA-WG. However, OGSA-WG is **not** in the business of endorsing such activities ahead of time.
- The steps by which a technical specification may become identified as “OGSA compliant” remains to be clearly defined. I’d suggest that a key requirement should be identification as a “recommendation” in the sense that there are two or more interoperable implementations.

RESULT:

Thus the “**OGSA-compliant Web Service**” using Globus Toolkit is developed successfully.

EX. NO:3

DEVELOP A GRID SERVICE USING APACHE AXIS.

AIM:

To develop a web Service using Apache Axis Webserver.

PROCEDURE:

Step1: Create a new project

Start by creating a new Java Project called ProvisionDirService. Select File > New > Project... and select Java > Java Project from the selection wizard. Click Next and enter ProvisionDirService in the Project Name textbox. Accept the remaining project creation defaults by clicking Finish.

Step2: Make the project a Tomcat project

The first thing we need to do is to make this project a "Tomcat Project." Doing so enables Tomcat to run from .class files inside our project as soon as they are compiled by Eclipse (which happens every time they are saved). Hence, minor changes to the service logic will be reflected in the running service without having to regenerate or redeploy any GARS. Open the project properties page shown in Figure 8 (select Properties from the project's pop-up menu), select the Tomcat page, and check the "Is a Tomcat Project" checkbox.

Step3: Add project source to Tomcat source path

Now we need to add the project's source to the Tomcat source path. The last step allows Tomcat to reload any updates to the implementation. This step allows the live debugger to pull up the fresh source when debugging. Go to Window > Preferences and select the Tomcat > Source Path page (shown in Figure 9). Select the checkbox next to our ProvisionDirService project.

Step4: Now we need to add the project's source to the Tomcat source path. The last step allows Tomcat to reload any updates to the implementation. This step allows the live debugger to pull up the fresh source when debugging.

Step5: Go to Window>Preferences and select the Tomcat > Source Path

Step6: Select the checkbox next to our ProvisionDirService project

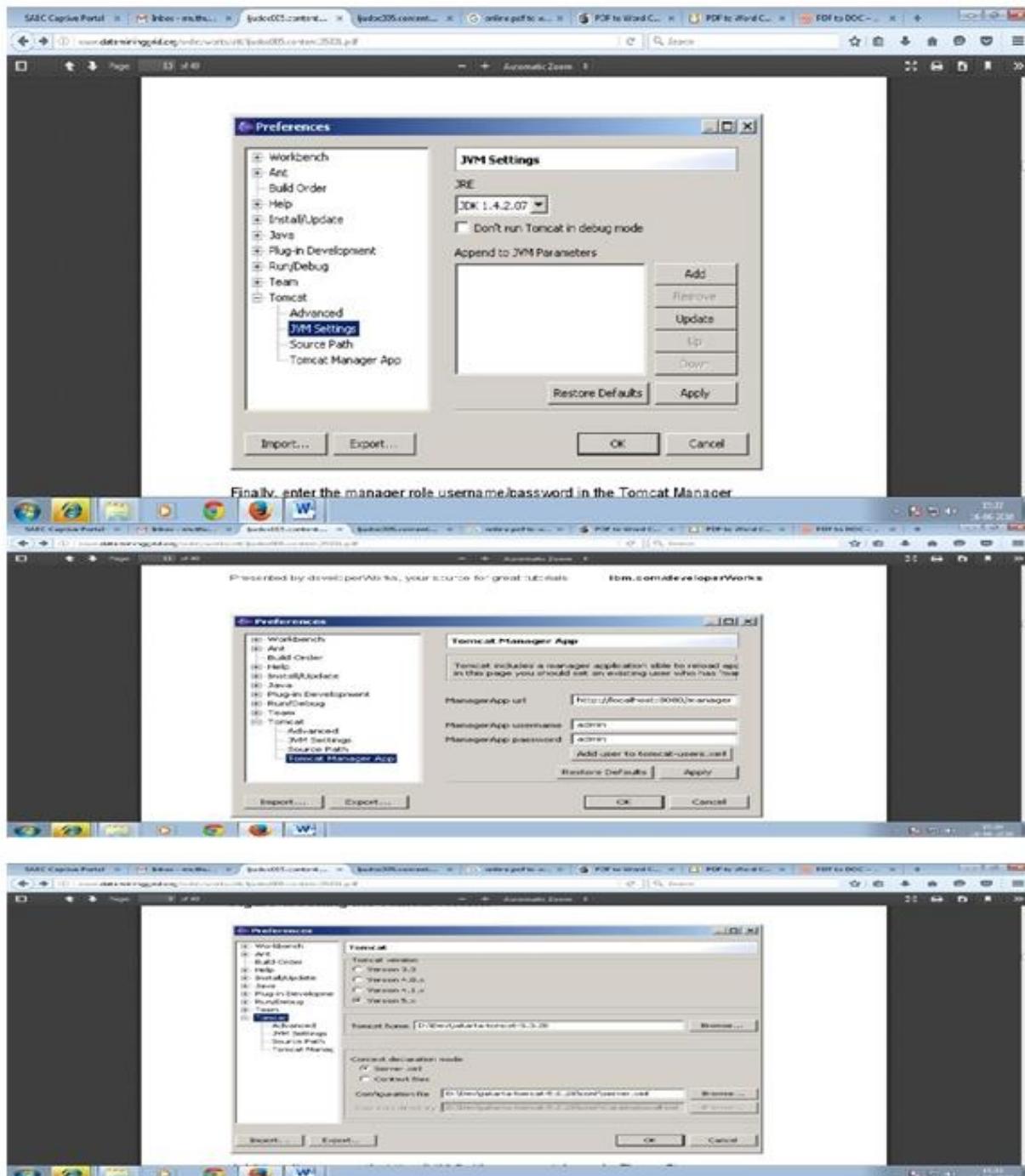
Step7: Create the GT4 library

Step8: To create a user library from the GT4 library directory, use the User Libraries... button. Click New... in the User Libraries dialog (see Figure 11) and create a Library called

GT4Library.

Step9: Finish the configuration

OUTPUT:



RESULT:

Thus the “develop a grid service using apache axis” using Globus Toolkit has been developed successfully.

EX. NO:4

DEVELOP APPLICATION USING C++ GRID

DATE:

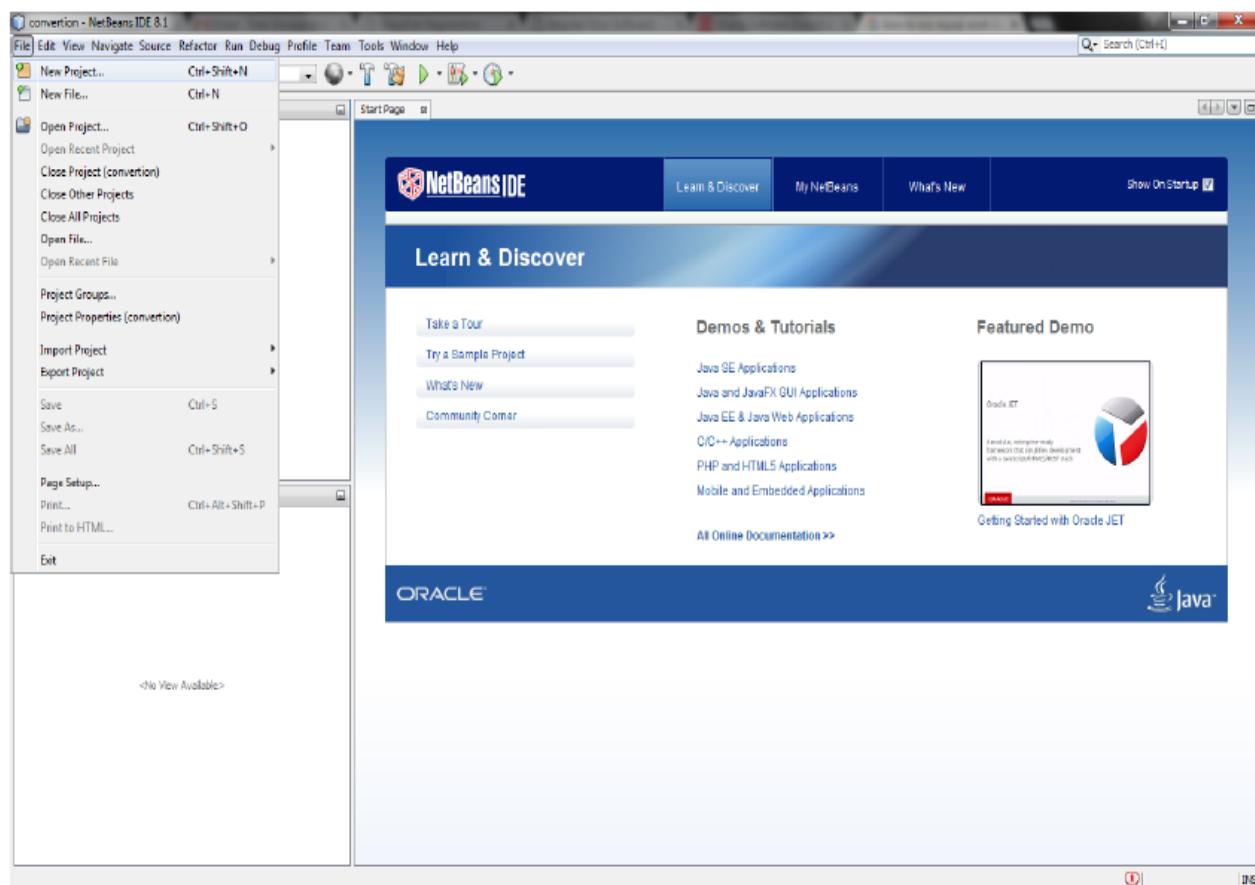
APIs.

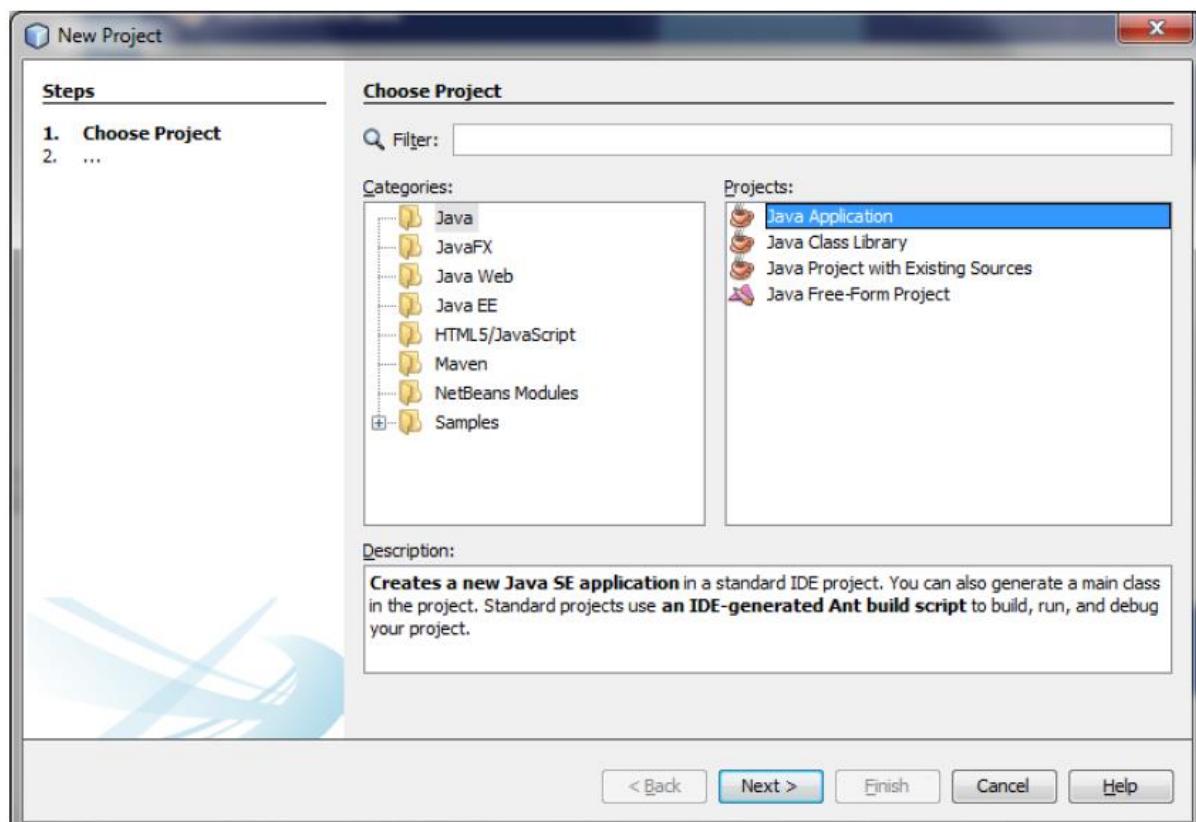
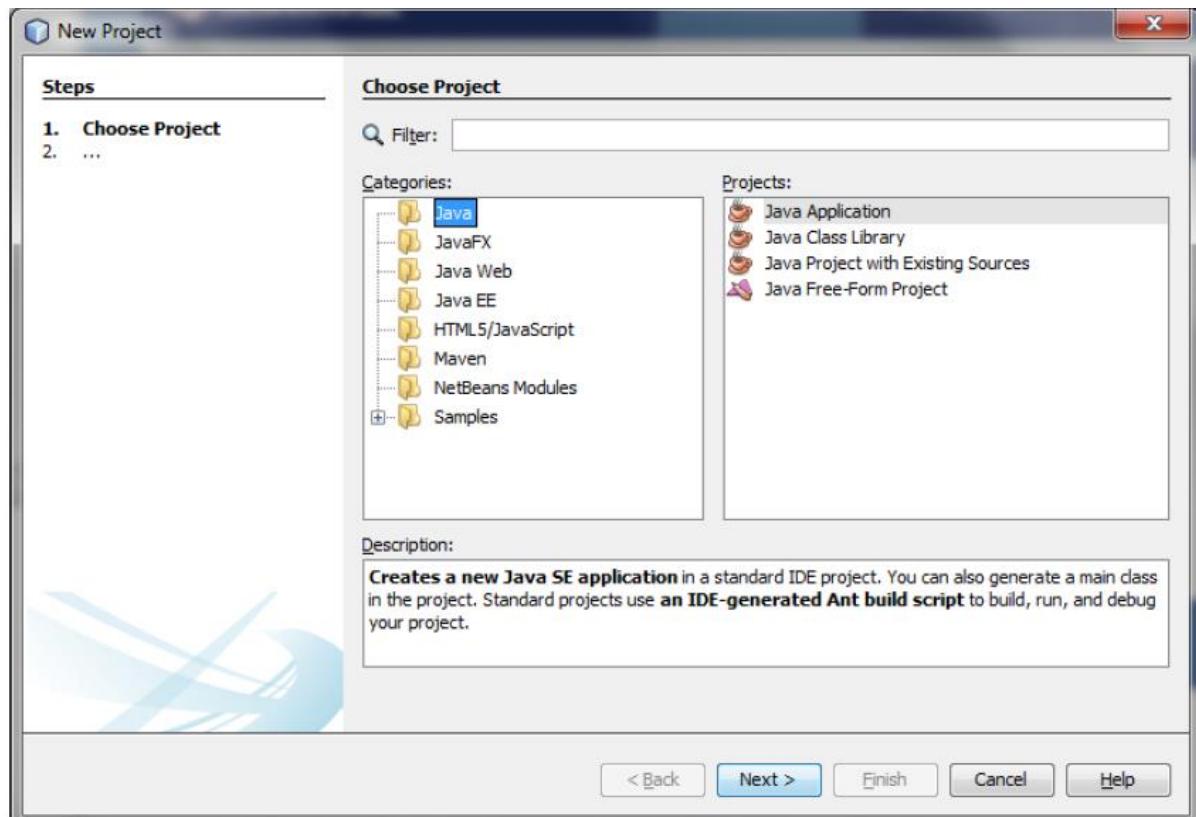
AIM:

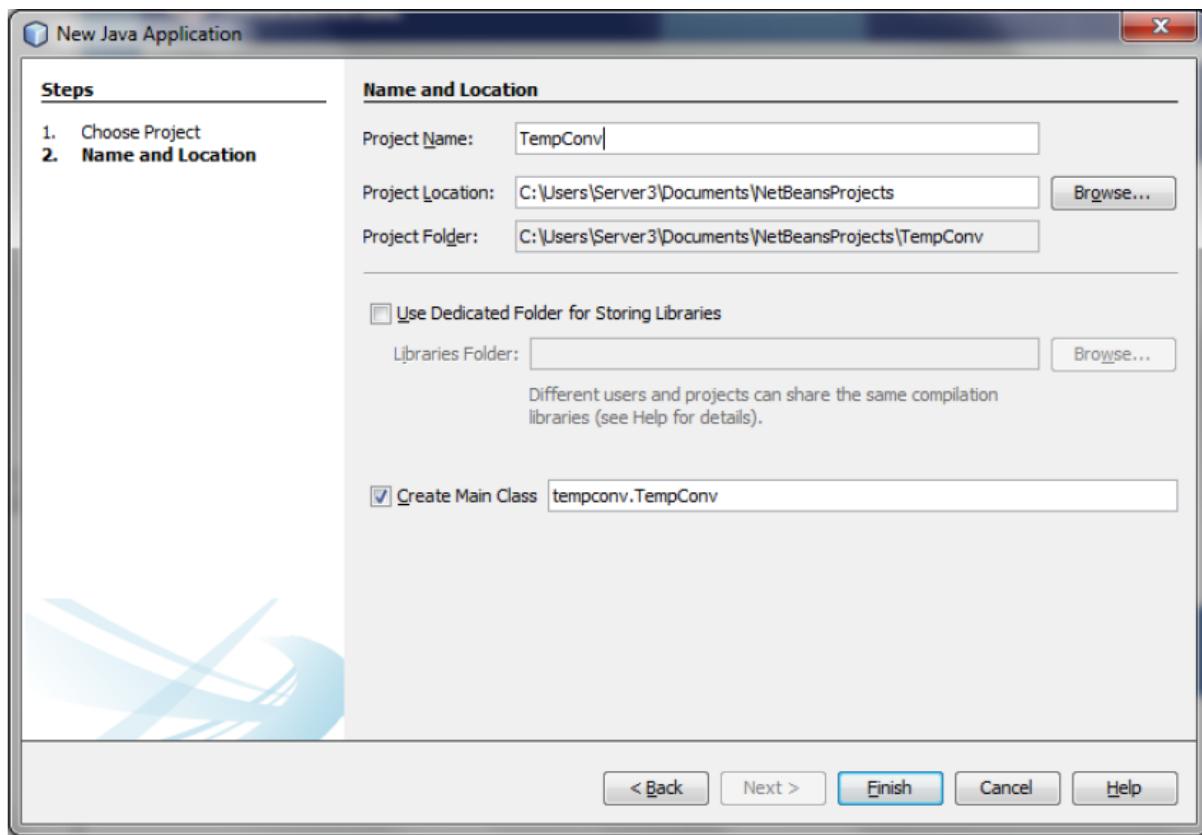
To write a program for developing Grid API's using C++.

PROCEDURE:

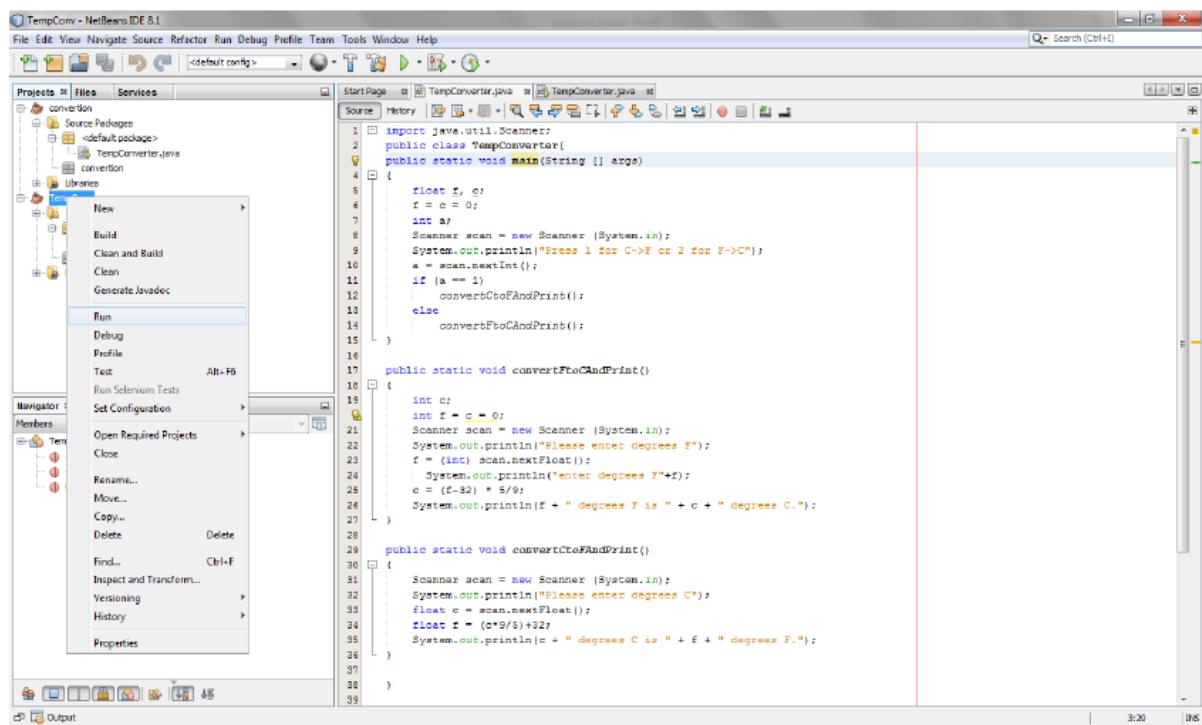
Step 1 : Create a new Project







Step 2 : TemperatureConversion.java



Step 3: Then the output will be shown down
Press 1 for Celsius to Fahrenheit conversion
Press 2 for to Fahrenheit to Celsius conversion

```
TempConv - NetBeans IDE 8.1
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
Projects Files Services Start Page TempConverter.java TempConverter.java
Source History <default config> Search (Ctrl+F)
Projects
  conversion
    Source Packages
      <default package>
        TempConverter.java
      conversion
        Libraries
    TempConv
      Source Packages
        <default package>
          TempConverter.java
          tempconv
        Libraries
  Libraries
  TempConv
  Libraries
  Navigator Members
  TempConverter
    convertCtoFAndPrint()
    convertFtoCAndPrint()
    main(String[] args)
Output - TempConv (run)
  run:
  Press 1 for C->F or 2 for F->C
  Output Building TempConv (run)...
  TempConv [run] 3:20 75%
```

```
1 import java.util.Scanner;
2 public class TempConverter{
3     public static void main(String [] args)
4     {
5         float f, c;
6         f = c = 0;
7         int a;
8         Scanner scan = new Scanner (System.in);
9         System.out.println("Press 1 for C->F or 2 for F->C");
10        a = scan.nextInt();
11        if (a == 1)
12            convertCtoFAndPrint();
13        else
14            convertFtoCAndPrint();
15    }
16
17    public static void convertFtoCAndPrint()
18    {
19        int a;
20        int f = c = 0;
21        Scanner scan = new Scanner (System.in);
22        System.out.println("Please enter degrees F");
23        f = (int) scan.nextFloat();
24        System.out.println("enter degrees F"+f);
25        c = (f-32) * 5/9;
26        System.out.println(f + " degrees F is " + c + " degrees C.");
27    }
}
```

RESULT:

Thus the program for “developing Grid API using C++ “ has been executed successfully.

EX. NO:5

**DEVELOP SECURED APPLICATION USING
BASIC SECURITY IN GLOBUS.**

AIM:

To develop a Develop secured applications using basic security in Globus .

PROCEDURE:

Authenticating Users Programmatically:

Servlet 3.0 specifies the following methods of the HttpServletRequest interface that enable you to authenticate users for a web application programmatically:

- Authenticate :

The authenticate method allows an application to instigate authentication of the request caller by the container from within an unconstrained request context. A login dialog box displays and collects the user's name and password for authentication purposes.

- Login :

The login method allows an application to collect username and password information as an alternative to specifying form-based authentication in an application deployment descriptor.

- Logout :

The logout method is provided to allow an application to reset the caller identity of a request. The following example code shows how to use the login and logout methods:

Package test;

```
import java.io.IOException;  
import java.io.PrintWriter;  
import java.math.BigDecimal;  
import javax.ejb.EJB;  
import javax.servlet.ServletException;  
import javax.servlet.annotation.WebServlet;  
import javax.servlet.http.HttpServlet;  
import javax.servlet.http.HttpServletRequest;  
import javax.servlet.http.HttpServletResponse;
```

```

@WebServlet(name="TutorialServlet", urlPatterns={"/TutorialServlet"}) public class
TutorialServlet extends HttpServlet {
    @EJB
    private ConverterBean converterBean;
    protected void processRequest(HttpServletRequest request,
        HttpServletResponse response) throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8"); PrintWriter out = response.getWriter();
        try {
            out.println("<html>");
            out.println("<head>");
            out.println("<title>Servlet TutorialServlet</title>"); out.println("</head>");
            out.println("<body>");
            request.login("TutorialUser", "TutorialUser");
            BigDecimal result = converterBean.dollarToYen(new BigDecimal("1.0"));
            out.println("<h1>Servlet TutorialServlet result of dollarToYen= " + result + "</h1>");
            out.println("</body>");
            out.println("</html>");
        } catch (Exception e) {
            throw new ServletException(e);
        } finally {
            request.logout();
            out.close();
        }
    }
}

```

This code sample shows how to use the

```

authenticate method: package com.sam.test;
import java.io.*;
import javax.servlet.*;
import javax.servlet.http.*;
public class TestServlet extends HttpServlet {
    protected void processRequest(HttpServletRequest request,
        HttpServletResponse response)

```

```

throws ServletException, IOException {
response.setContentType("text/html;charset=UTF-8");
PrintWriterout=response.getWriter();
try {
request.authenticate(response);
out.println("Authenticate Successful");
} finally {
    out.close();
}
}

```

Writing GSI enabled Web Services :

Install Tomcat according to the instructions and check that it works.

Installing the software :

Install Tomcat :

- Install Tomcat according to the instructions and
check that it works. **Deploy Axis on Tomcat**
- Install Axis according to the instructions and check that it works.
Note that a bug in Tomcat means that any jars containing java.* or
javax.* classes will not be executed if there are in the webapps/ tree. Instead,
copy the jars to Tomcat's common/lib directory. In Axis alpha 3 this applies to
axis.jar and wsdl4j.jar; in Axis beta 1 this applies to jaxrpc.jar and
wsdl4j.jar.

Install libraries to provide GSI support for Tomcat:

- Copy cog.jar, cryptix.jar, iaik_ssl.jar, iaik_jce_full.jar, iaik_javax_crypto.jar
to Tomcat's common/lib directory.
- Check that log4j-core.jar and xerces.jar (or other XML parser) are in
Tomcat's common/lib directory.
- Copy gsicatalina.jar to Tomcat's server/lib directory.

Deploy GSI support in Tomcat:

- Edit Tomcat's conf/server.xml
- Add GSI Connector in <service> section:
- <!-- Define a GSI HTTP/1.1 Connector on port 8443
- Supported parameters include:
- Proxy // proxy file for server to use
or

- cert // server certificate file in PEM format
- key // server key file in PEM format
- cacertdir // directory location containing trusted CA certs
- gridMap // grid map file used for authorization of users
- debug // "0" is off and "1" and greater for more info
- <Connector className="org.apache.catalina.connector.http.HttpConnector"
- port="8443" minProcessors="5" maxProcessors="75"
- enableLookups="true" authenticate="true"
- acceptCount="10" debug="1" scheme="httpg" secure="true">
- <Factory
- className="org.globus.tomcat.catalina.net.GSIServerSocketFactory"
- cert="/etc/grid-security/hostcert.pem"
- okey="/etc/grid-security/hostkey.pem"
- cacertdir="/etc/grid-security/certificates"
- gridmap="/etc/grid-security/gridmap-file"
- debug="1"/>
- </Connector>

If you are testing under a user account, make sure that the proxy or certificates and keys are readable by Tomcat. For testing purposes you can use user proxies or certificates instead of host certificates e.g.:

```
<Connector className="org.apache.catalina.connector.http.HttpConnector"
port="8443" minProcessors="5" maxProcessors="75"
enableLookups="true" authenticate="true"
acceptCount="10" debug="1" scheme="httpg" secure="true">
<Factory className="org.globus.tomcat.catalina.net.GSIServerSocketFactory"
proxy="/tmp/x509u_up_neilc" debug="1"/>
</Connector>
```

If you do test using user proxies, make sure the proxy has not expired!

- Add a GSI Valve in the <engine> section:
- <Valve className="org.globus.tomcat.catalina.valves.CertificatesValve"
- debug="1" />

Install libraries to provide GSI support for Axis

- Copy gsiaxis.jar to the WEB-INF/lib directory of your Axis installation under Tomcat. **Set your CLASSPATH correctly**
- You should ensure that the following jars from the axis/lib directory are in your classpath:
 - axis.jar
 - clutil.jar
 - commons-logging.jar
 - jaxrpc.jar
 - log4j-core.jar
 - tt-bytecode.jar
 - wsdl4j.jar
- You should also have these jars in

- your classpath:
- gsaxis.jar
 - cog.jar
 - xerces.jar (or other XML parser)

Start the GSI enabled Tomcat/Axis server :

- Start up Tomcat as normal ,Check the logs in Tomcat's logs/ directory to ensure the server started correctly. In particular check that:
 - apache_log.YYYY-MM-DD.txt does not contain any GSI related error messages
 - catalina.out contains messages saying "Welcome to the IAIK ... Library"
 - catalina_log.YYYY-MM-DD.txt contains messages saying "HttpConnector[8443] Starting background thread" and "HttpProcessor[8443][N] Starting background thread"
 - localhost_log.YYYY-MM-DD.txt contains a message saying "WebappLoader[/axis]: Deploy JAR /WEB-INF/lib/gsaxis.jar"

Writing a GSI enabled Web Service :

Implementing the service :

The extensions made to Tomcat allow us to receive credentials through a transport-level security mechanism. Tomcat exposes these credentials, and Axis makes them available as part of the MessageContext.

Alpha 3 version :

Let's assume we already have a web service called MyService with a single method, myMethod. When a SOAP message request comes in over the GSI httpg transport, the Axis RPC despatcher will look for the same method, but with an additional parameter: the MessageContext. So we can write a new myMethod which takes an additional argument, the MessageContext.

This can be illustrated in the following example:
package org.globus.example;

```
import org.apache.axis.MessageContext;
import org.globus.axis.util.Util;
public class MyService {
    // The "normal" method
    public String myMethod(String arg) {
        System.out.println("MyService: http request\n");
        System.out.println("MyService: you sent " +
```

```

arg); return "Hello Web Services World!";

}

// Add a MessageContext argument to the normal method public String
myMethod(MessageContext ctx, String arg) { System.out.println("MyService: httpg request\n");
    System.out.println("MyService: you sent " + arg);
    System.out.println("GOT PROXY: " + Util.getCredentials(ctx));
return "Hello Web Services World!";
}
}

```

Beta 1 version :

In the Beta 1 version, you don't even need to write a different method. Instead the Message Context is put on thread local store. This can be retrieved by calling MessageCOntext.getCurrentContext():

```

package org.globus.example;
import org.apache.axis.MessageContext;
import org.globus.axis.util.Util;
public class MyService {
// Beta 1 version
public String myMethod(String arg) {
System.out.println("MyService: httpg request\n");
System.out.println("MyService: you sent " + arg);
// Retrieve the context from thread local
MessageContext ctx = MessageContext.getCurrentContext();
System.out.println("GOT PROXY: " + Util.getCredentials(ctx)); return "Hello Web Services
World!";
}
}

```

Part of the code provided by ANL in gsaxis.jar is a utility package which includes
getCredentials() method. This allows the service to extract the proxy credentials from
MessageContext.

Deploying the service:

Before the service can be used it must be made available. This is done by deploying the service. This can be done in a number of ways:

1. Use the Axis AdminClient to deploy the MyService classes.
2. Add the following entry to the server-config.wsdd file in WEB-INF directory of axis on

Tomcat:

```
3.<service name="MyService" provider="java:RPC">
4.<parameter name="methodName" value="*"/>
5.<parameter name="className" value="org.globus.example.MyService"/>
6.</service>
```

Writing a GSI enabled Web Service client

As in the previous example, this is very similar to writing a normal web services client. There are some additions required to use the new GSI over SSL transport:

- Deploy a httpg transport chain
- Use the Java CoG kit to load a Globus proxy
- Use setProperty() to set GSI specifics in the Axis "Property Bag":
- globus credentials (the proxy certificate)
- authorisation type
- GSI mode (SSL, no delegation, full delegation, limited delegation) Continue with the normal Axis SOAP service invocation:
- Set the target address for the service
- Provide the name of the method to be invoked Pass on any parameters required
- Set the type of the returned value
- Invoke the service
- Here's an example which can be used to call the service you wrote in the last section:

```
package org.globus.example;

import org.apache.axis.client.Call;
import org.apache.axis.client.Service;
import org.apache.axis.encoding.XMLType;
import org.apache.axis.configuration.SimpleProvider; import org.apache.axis.utils.Options;
import org.apache.axis.AxisFault;
import org.apache.axis.SimpleTargetedChain;
import org.apache.axis.transport.http.HTTPSender;
import org.globus.axis.transport.GSISender;
import org.globus.axis.transport.GSISHTTPTransport; import org.globus.axis.util.Util;
import org.globus.security.auth.SelfAuthorization; import org.globus.security.GlobusProxy;
import javax.xml.rpc.namespace.QName;
import javax.xml.rpc.ParameterMode;
public class Client
```

```
{  
public static void main(String [] args)  
{  
    Util.registerTransport();  
    try {  
        Options options = new Options(args);  
        String endpointURL = options.getURL();  
        String textToSend;  
        // Parse the arguments for text to send  
        args = options.getRemainingArgs();  
        if ((args == null) || (args.length < 1)) {  
            textToSend = "";  
        } else {  
            textToSend = args[0];  
        }  
        // Set up transport handler chains and deploy  
        SimpleProvider provider = new SimpleProvider();  
        SimpleTargetedChain c = null;  
        c = new SimpleTargetedChain(new GSIHTTPSender()); provider.deployTransport("httpg", c);  
        c = new SimpleTargetedChain(new HTTPSender()); provider.deployTransport("http", c);  
        // Load globus proxy  
        GlobusProxy proxy = GlobusProxy.getDefaultUserProxy();  
        // Create a new service call  
        Service service = new Service(provider);  
        Call call = (Call) service.createCall();  
        // Set globus credentials call.setProperty(GSIHTTPTransport.GSI_CREDENTIALS,  
        proxy);  
        // Set authorization type  
        call.setProperty(GSIHTTPTransport.GSI_AUTHORIZATION,  
        new SelfAuthorization(proxy));  
        // Set gsi mode  
        call.setProperty(GSIHTTPTransport.GSI_MODE,  
        GSIHTTPTransport.GSI_MODE_LIMITED_DELEG);  
        // Set the address of the service (from cmd line arguments)
```

```

call.setTargetEndpointAddress( new java.net.URL(endpointURL) );
// Set the name of the method we're invoking
call.setOperationName(new QName("MyService", "myMethod"));
// Setup a target parameter
call.addParameter( "arg1", XMLType.XSD_STRING,
ParameterMode.PARAM_MODE_IN);
// Set the return type
call.setReturnType( XMLType.XSD_STRING );
// Invoke the method, passing in the value of "arg1"
String ret = (String) call.invoke( new Object[] { textToSend } );
// Print out the returned value
System.out.println("MyService returned: " + ret);
} catch (Exception e) {
if ( e instanceof AxisFault ) {
((AxisFault)e).dump();
} else
e.printStackTrace();
}
}
}
}
}

```

You can invoke this client by running:

```

java org.globus.example.Client-I
http://127.0.0.1:8443/axis/servlet/AxisServlet
assuming that you are running the client on the same machine
(localhost) as the Axis/Tomcat server, and that you've installed Axis
in the webapps/axis directory of Tomcat.

```

If you examine logs/catalina.out you should see the messages from the Client received by the service, as well as the proxy credentials.

Descriptions of the GSI extensions to Tomcat and Axis

1. Build a server-side SOAP service using Tomcat and Axis
2. Create connection stubs to support client-side use of the SOAP service
3. Build a custom client-side ClassLoader
4. Build the main client application
5. Build a trivial compute task designed to exercise the client ClassLoader

Build the SOAP service

The SOAP service I build in this article is the closest thing to a management layer that this framework will have. The SOAP service provides a way for our grid computing application to pull the classes it needs from the SOAP server. While my example service simply delivers a single specific jar file, this service's actual production version would likely have access to multiple jar files (each containing a different computing task), and it would contain additional logic to control which JAR was delivered to whom.

The first step in providing the SOAP service is to set up the SOAP infrastructure. I chose Tomcat as the servlet container/HTTP server because it is an open source project and proves to be extremely reliable and easy to use. I chose Axis as the SOAP services provider because it too is open source, supports an easy-to-use drag-and-drop service installer, and comes with a tool that creates SOAP client-side stubs from WSDL (Web Services Description Language) files (a feature I exploit later).

After downloading and installing Tomcat 4.0.6 and Axis 1.0, I wrote the SOAP service class GridConnection. This service fetches a known jar file, loads the file into a byte array, and returns the byte array to the caller. The following code is the entire file GridConnection.java:

```
/// GridConnection.java
//
import java.util.*;
import java.io.* ;
public class GridConnection {
    public byte[] getJarBytes () {
        byte[] jarBytes = null ;

        try {
            FileInputStream fi = new
FileInputStream("/Users/tkarre/MySquare/build/MySquare.jar");
            jarBytes = new byte[fi.available()];
            fi.read(jarBytes);
            fi.close() ;
        }
        catch(Exception e) { }

        return jarBytes ;
    }
}
```

RESULT:

Thus the above application basic security in Globus executed successfully.

EX. NO:6

DEVELOPMENT OF GRID PORTAL WITH AND WITHOUT GRAM CONCEPT.

AIM:

To develop a grid portal, where user can submit a job and get the result and to implement it with and without GRAM concept.

ALGORITHM:

The Grid Portal Development Kit leverages off existing Globus/Grid middleware infrastructure as well as commodity web technology including Java Server Pages and servlets. Present the design and architecture of GPDK as well as a discussion on the portal building capabilities of GPDK allowing application developers to build customized portals more effectively by reusing common core services provided by GPDK.

The Grid Portal Development Kit:

The Grid Portal Development Kit is based on the standard n-tier architecture adopted by most web application servers as shown in Figure 1. Tiers represent physical and administrative boundaries between the end user and the web application server. The client tier is represented as tier 1 and consists of the end-user's workstation running a web browser. The only requirements placed upon the client tier is a secure (SSL-capable) web browser that supports DHTML/Javascript for improved interactivity, and cookies to allow session data to be transferred between the client and the web application server.

Job Submission Both interactive and batch queue job submissions are enabled using either the GSI enhance SSH client [] or using the Globus GRAM protocol to submit jobs to Globus gatekeepers deployed on Grid resources. The major GPDK components used to submit jobs are the JobBean, the JobSubmissionBean and the JobInfoBean. The JobBean provides a description of the job to be submitted.

It includes methods for setting and returning values for the executable, additional arguments passed to the executable, number of processors for parallel jobs, batch queue if submitting a batch mode and more. The JobSubmissionBean is actually an abstract class that is subclassed by the GramSubmissionBean in the case of submitting a job to a Globus gatekeeper or a GSISSHSubmissionBean idf using the GSI enhanced SSH client. The GramSubmissionBean capabilities are provided once again by the Java CoG

library. Once a job has been successfully submitted, a JobInfoBean is created which contains a time stamp of when the job was submitted and other useful information about the job, including a GRAM URL that can be used to query on the status of the job

File Transfer:

Data access capabilities are provided by the GridFTP [] API implemented as part of the CoG toolkit and encapsulated into core GPDK service beans. Capabilities include file transfer, including third-party file transfer between GSI enabled FTP servers, as well as file browsing capabilities. The FileTransferBean provides a generic file transfer API that is extended by the GSIFTPTransferBean and the GSISCPTransferBean, an encapsulation of file transfer via the GSI enhanced scp command tool. The GSIFTPServiceBean provides a session scoped bean that manages multiple FTP connections to GSI enabled FTP servers. The GSIFTPServiceBean allows users to browse multiple GSI FTP servers simultaneously and a separate thread monitors server timeouts. The GSIFTPViewBean is an example view bean used by a JSP to display the results of browsing a remote GSI FTP server.

Information Services:

The Grid Forum Information Services working group has proposed the Grid Information Services (GIS) architecture for deploying information services on the Grid and supported the Lightweight Directory Access Protocol (LDAP) as the communication protocol used to query information services. Information services on the Grid are useful for obtaining both static and dynamic information on software and hardware resources. The Globus toolkit provides a Metacomputing Directory Service (MDS), which is an implementation of a Grid Information Service using OpenLDAP, an open source LDAP server. Although, the Java CoG toolkit provides support for LDAP using the Java Naming and Directory Interface (JNDI), GPDK uses the open source Netscape/Mozilla Directory SDK [] as it proved easier to use in practice and also provides support for developing a connection pool for maintaining multiple connections to several Grid Information service providers, thus eliminating the need for clients to reconnect during each query. However, this model will need to be re-evaluated with the widespread deployment of the MDS-2 architecture which includes GSI enhancements making it necessary for clients to reauthenticate to the MDS for each query. GPDK provides an MDSQueryBean and MDSResultsBean for querying and formatting results obtained from the MDS. Currently GDK supports querying the MDS for hardware information such as CPU type, number of processors and other details as

well as cpu load and queue information that can be used by the user to make more effective job scheduling decisions.

OUTPUT:

The GridSphere portal framework was an open-source portlet-based web portal developed from 2002 to 2010. Converted from SVN and hosted here because the official site is no longer accessible.

6,025 commits 19 branches 55 releases 0 contributors

Branch: master New pull request Find file Clone or download

Latest commit de4e772 on Jun 9, 2010

File	Description	Date
config	Added support for GridSphere install on Tomcat 6.X	6 years ago
lib	Rolled back Castor error Caused by: org.exolab.castor.xml.MarshalExce...	6 years ago
src	Fixed a miss spelling of Exception.	6 years ago
webapps	Added px to the width attributes.	6 years ago
.cvsignore	Added build directory to .cvsignore	13 years ago
ChangeLog.txt	Updated changelog	8 years ago
INSTALL.txt	corrected INSTALL.txt, need java 5 and tomcat 6.5.x	9 years ago
LICENSE.txt	apache 2 license	10 years ago
README.txt	change mail lists	10 years ago
RELEASE_NOTES.txt	Updated readme	8 years ago
build.properties	updated again :)	8 years ago

RESULT:

Thus the “develop a grid portal with and without GRAM concept” has been developed and verified successfully.

EX.NO:1

CLOUD COMPUTING EXPERIMENTS

DATE:

INSTALLATION OF VIRTUAL MACHINE.

AIM:

To find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.

KVM:

In computing, virtualization refers to the act of creating a virtual (rather than actual) version of something, including virtual computer hardware platforms, operating systems, storage devices, and computer network resources. Kernel-based Virtual Machine (KVM) is a virtualization infrastructure for the Linux kernel that turns it into a hypervisor.

PROCEDURE:

itadmin@PLLAB-49:~\$ pwd

/home/itadmin

itadmin@PLLAB-49:~\$ egrep -c '(vmx|svm)' /proc/cpuinfo

(If output is '0', then virtualization wouldn't be supported)

itadmin@PLLAB-49:~\$ egrep -c 'lm' /proc/cpuinfo

Install necessary packages:

qemu-kvm

libvirt-bin

bridge-utils

virt-manager

qemu-system

itadmin@PLLAB-49:~\$ sudo apt-get install qemu-kvm

[sudo] password for itadmin:

Reading package lists... Done

Building dependency tree

Reading state information... Done

qemu-kvm is already the newest version.

qemu-kvm set to manually installed.

0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.

itadmin@PLLAB-49:~\$ sudo apt-get install libvirt-bin

Reading package lists... Done

Building dependency tree

Reading state information... Done

```
libvirt-bin is already the newest version.  
libvirt-bin set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

```
itadmin@PLLAB-49:~$ sudo apt-get install bridge-utils  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
bridge-utils is already the newest version.  
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

```
itadmin@PLLAB-49:~$ sudo apt-get install virt-manager  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Setting up libgvnc-1.0-0 (0.5.3-1.3) ...  
Setting up libgtk-vnc-2.0-0 (0.5.3-1.3) ...  
Setting up gir1.2-gtk-vnc-2.0 (0.5.3-1.3) ...  
Setting up gir1.2-spice-client-glib-2.0 (0.25-1build1) ...  
Setting up gir1.2-spice-client-gtk-3.0 (0.25-1build1) ...  
Setting up gnome-icon-theme (3.12.0-1ubuntu1) ...  
Setting up python-ipaddr (2.1.11-2) ...  
Setting up python-libvirt (1.2.12-0ubuntu1) ...  
Setting up python-libxml2 (2.9.2+dfsg1-3ubuntu0.3) ...  
Setting up python-pycurl (7.19.5-3ubuntu1) ...  
Setting up python-urlgrabber (3.9.1-4ubuntu5) ...  
Setting up libvirt-glib-1.0-0 (0.1.9-4) ...  
Setting up gir1.2-libvirt-glib-1.0 (0.1.9-4) ...  
Setting up virtinst (1:1.0.1-5ubuntu1) ...  
Setting up virt-manager (1:1.0.1-5ubuntu1) ...  
Setting up virt-viewer (1.0-1) ...  
update-alternatives: using /usr/bin/spice-xpi-client-remote-viewer to provide /usr/bin/spice-xpi-client (spice-xpi-client) in auto mode  
Processing triggers for libc-bin (2.21-0ubuntu4) ...
```

```
itadmin@PLLAB-49:~$ sudo apt-get install qemu-system  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Setting up qemu-system-arm (1:2.2+dfsg-5expubuntu9.7) ...  
Setting up qemu-system-mips (1:2.2+dfsg-5expubuntu9.7) ...  
Setting up qemu-slof (20140630+dfsg-1ubuntu1) ...  
Setting up qemu-system-ppc (1:2.2+dfsg-5expubuntu9.7) ...  
Setting up qemu-system-sparc (1:2.2+dfsg-5expubuntu9.7) ...
```

```
Setting up qemu-system-misc (1:2.2+dfsg-5expubuntu9.7) ..
```

To check whether a package is installed or not:

```
itadmin@PLLAB-49:~$ dpkg -l|grep qemu-kvm
ii  qemu-kvm                         1:2.2+dfsg-5expubuntu9.7      amd64
QEMU Full virtualization
itadmin@PLLAB-49:~$
```

```
itadmin@PLLAB-49:~$ virsh
```

```
Welcome to virsh, the virtualization interactive terminal.
```

```
Type: 'help' for help with commands
'quit' to quit
```

```
virsh # exit
```

```
itadmin@PLLAB-49:~$ sudo virsh -c qemu:///system list
```

```
[sudo] password for itadmin:
```

Id	Name	State

```
itadmin@PLLAB-49:~$
```

```
itadmin@PLLAB-49:~$ sudo virsh -c qemu:///system
```

```
Welcome to virsh, the virtualization interactive terminal.
```

```
Type: 'help' for help with commands
'quit' to quit
```

```
virsh # version
```

```
Compiled against library: libvirt 1.2.12
```

```
Using library: libvirt 1.2.12
```

```
Using API: QEMU 1.2.12
```

```
Running hypervisor: QEMU 2.2.0
```

```
virsh # nodeinfo
```

```
CPU model:          x86_64
```

```
CPU(s):            8
```

```
CPU frequency:     2573 MHz
```

```
CPU socket(s):     1
```

```
Core(s) per socket: 4
```

```
Thread(s) per core: 2
NUMA cell(s):      1
Memory size:       8059520 KiB
```

```
virsh # exit
```

```
itadmin@PLLAB-49:~$ sudo virt-install --connect qemu:///system -n hardy -r 512 -f hardy1.qcow2 -s 12 -c /home/itadmin/Desktop/ubuntu.iso --vnc --noautoconsole --os-type linux --os-variant ubuntuHardy --accelerate --network=network:default
```

Command description:

```
virt-install --connect qemu:///system
-n hardy                         → Name of the VM
-r 512                           → RAM Size
-f hardy1.qcow2                   → File Size
-s 12                            → Hard Disk Size
-c /home/itadmin/Desktop/ubuntu.iso → .iso file location
--vnc                            → Virtualization software
--noautoconsole
--os-type linux
--os-variant ubuntuHardy
--accelerate
--network=network:default
```

```
itadmin@PLLAB-49:~$ sudo virt-install --connect qemu:///system -n hardy -r 512 -f hardy.qcow2 -s 12 -c /home/itadmin/Downloads/ubuntu.iso --vnc --noautoconsole --os-type linux --os-variant ubuntuHardy
```

Starting install...

```
ERROR internal error: process exited while connecting to monitor: 2016-05-28T10:20:10.495449Z qemu-system-x86_64: -drive
file=/home/itadmin/hardy.qcow2,if=none,id=drive-ide0-0-0,format=raw: could not open disk
image /home/itadmin/hardy.qcow2: Could not open '/home/itadmin/hardy.qcow2': Permission
denied
```

Domain installation does not appear to have been successful.

If it was, you can restart your domain by running:

```
virsh --connect qemu:///system start hardy
```

otherwise, please restart your installation.

If suppose you get an error try this:

```
itadmin@PLLAB-49:~$ sudo chmod 777 hardy.qcow2
```

```
itadmin@PLLAB-49:~$ sudo virt-install --connect qemu:///system -n hardy -r 512 -f  
hardy.qcow2 -s 12 -c /home/itadmin/Downloads/ubuntu.iso --vnc --noautoconsole --os-type  
linux --os-variant ubuntuHardy
```

Starting install...

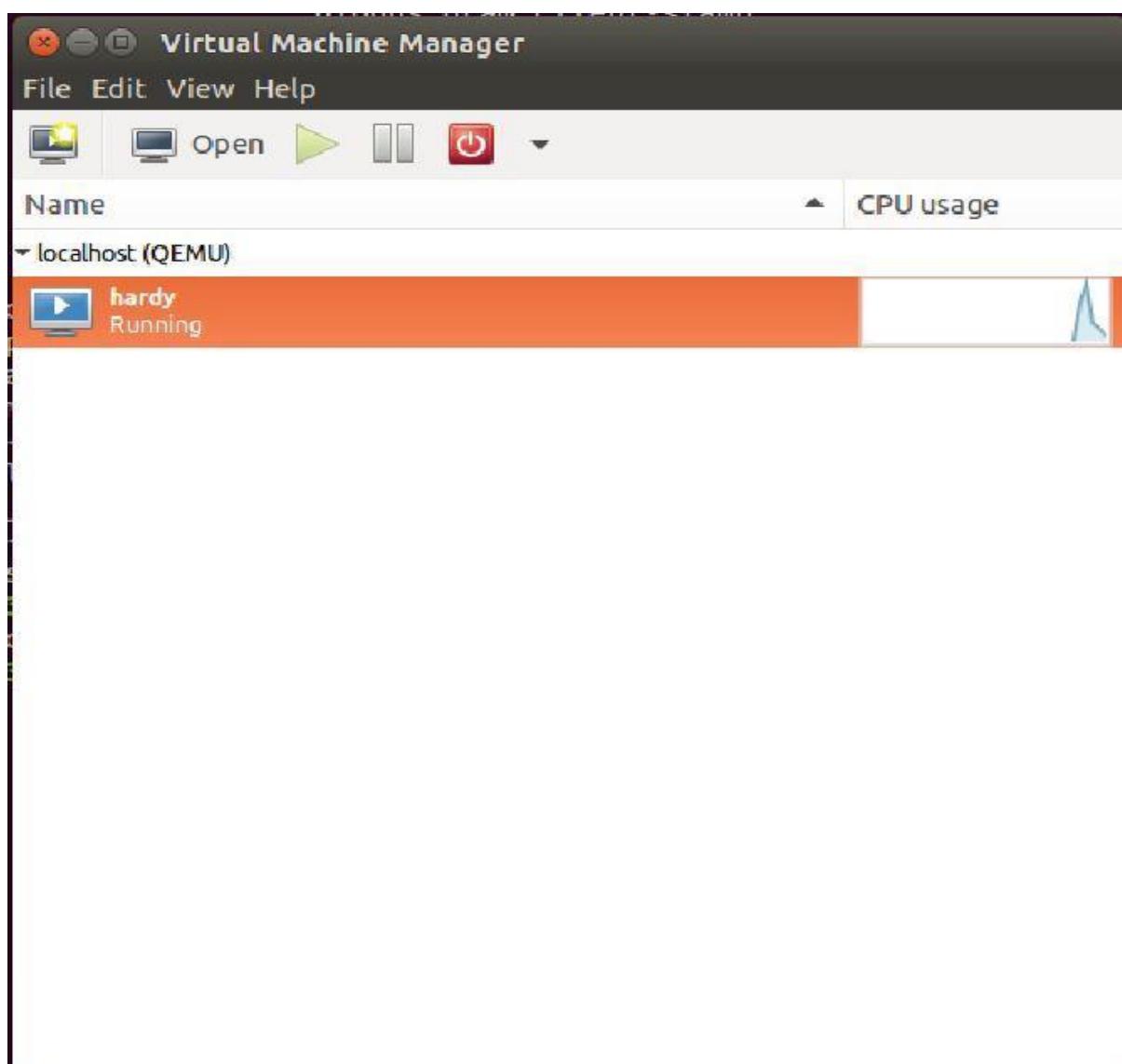
Creating domain... | 0 B 00:00

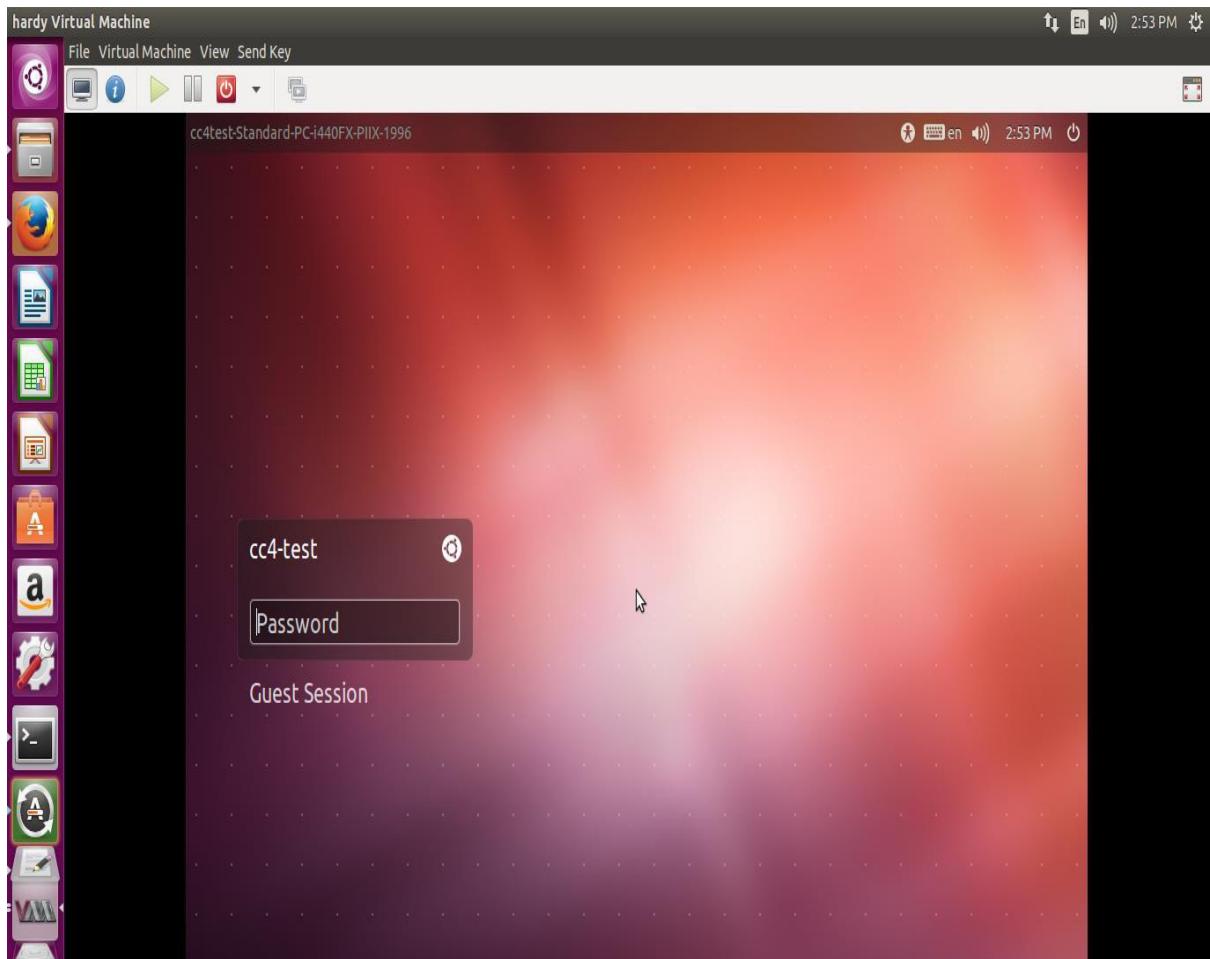
Domain installation still in progress. You can reconnect to
the console to complete the installation process.

```
itadmin@PLLAB-49:~$
```

```
itadmin@PLLAB-49:~$ sudo virt-manager
```

OUTPUT:





OPEN STACK INSTALLATION:

Step 1: sudo adduser stack

Note: give the password as stack.

For other details, just give some name and numbers.

Step 2: sudo apt-get install sudo -y

Step 3: (a) Switch to the root user:

```
sudo -i
```

(b) Execute the following command:

```
echo "stack ALL=(ALL) NOPASSWD: ALL" >> /etc/sudoers
```

Note: cat /etc/sudoers will display the line added now.

Step 4: Switch to the stack user using the following command:

```
su stack
```

Step 5: sudo apt-get install git -y

Step 6: git clone <https://git.openstack.org/openstack-dev/devstack> -b stable/kilo

Step 7: cd devstack

Step 8: ls -a

We can see the list of files in the directory devstack.

One of the notable files is “stackrc”

Step 9: (a) Edit stackrc as follows;

sudo nano stackrc

The file will be opened.

(b) You will see the following 2 lines inside the file somewhere :

```
# Another option is https://git.openstack.org
```

```
GIT_BASE=${GIT_BASE:-git://git.openstack.org}
```

(c) Edit the second line as follows:

```
GIT_BASE=${GIT_BASE:-https://git.openstack.org}
```

Step 10: Edit the local.conf file in the /devstack/samples folder.

(a) **cd samples**

Now you will be like this: git://git.openstack.org}stack@milton-Veriton-M200-H81:/devstack/samples\$

(b) **ls -a**

we can see the local.conf file.

(c) Do the following changes in it. The change is done to bypass the firewall for

downloading the packages for the openstack installation.

(i) Sudo nano local.conf

(ii) Paste the following contents after the line “[local|localrc]”.

```
FLOATING_RANGE=192.168.0.0/24
```

```
FIXED_RANGE=117.239.243.178/24
```

```
FIXED_NETWORK_SIZE=256
```

```
FLAT_INTERFACE=eth0
```

```
ADMIN_PASSWORD=rgr
```

```
DATABASE_PASSWORD=rgr
```

```
RABBIT_PASSWORD=rgr
```

```
SERVICE_PASSWORD=rgr
```

```
SERVICE_TOKEN=root
```

```
#Enable/Disable Services
```

```
disable_service n-net
```

```
enable_service q-svc
```

```
enable_service q-agt
```

```
enable_service q-dhcp
```

```
enable_service q-l3
```

```
enable_service q-meta
```

```
enable_service neutron
```

```
enable_service tempest
```

```
GIT_BASE=${GIT_BASE:-https://git.openstack.org}
```

(d) To quit from the local.conf

(i) **ctrl+x**

(ii) press 'y' and press enter

Step 11: (i) **sudo nano stack.sh**

(ii) Find the line “umask 022”.

(iii) After that line, type “Force=yes”

(iv) Press Ctrl+x

(v) press y and press enter

Step 12: ./stack.sh

This will install all the openstack packages and you will be given the ipaddress at which openstack is available, its username and password.

Note: If any error occurs during the operation of openstack and it is not able to be cleared, then uninstall the openstack installation. Then, reinstall it.

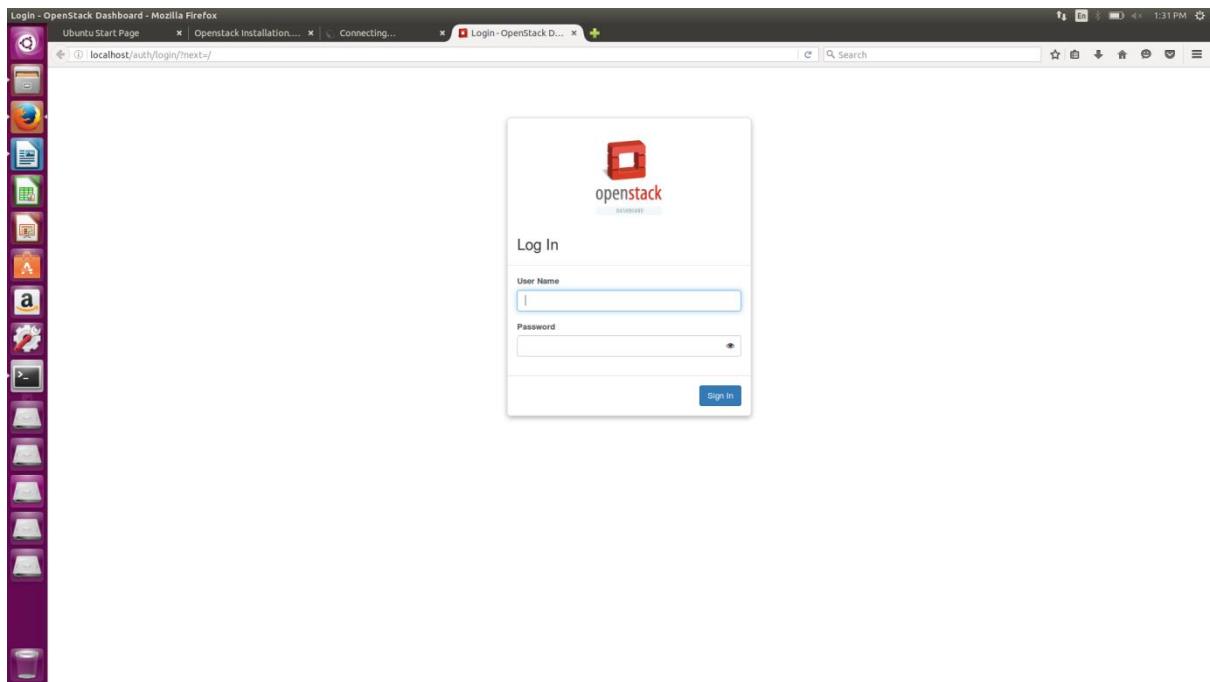
Step 1: ./unstack.sh

Step 2: ./clean.sh

Step 3: ./stack.sh

```
stack@BLAZEEY:~/devstack
from devstack' /etc/lvm/lvm.conf
+ echo_summary 'set lvm.conf device global_filter to: global_filter = [ "a|loop0|", "a|loop1|", "r|.*"
|" ]' # from devstack'
+ [[ -t 3 ]]
+ [[ True != \T\r\u\e ]]
+ echo -e set lvm.conf device global_filter to: global_filter = '[' '\"a|loop0|", "a|loop1|", "r|.
*'|"' ']' '#' from devstack
2016-05-29 06:44:28.465 | set lvm.conf device global_filter to: global_filter = [ "a|loop0|", "a|loop
1|", "r|.*" ] # from devstack
+ set +o xtrace

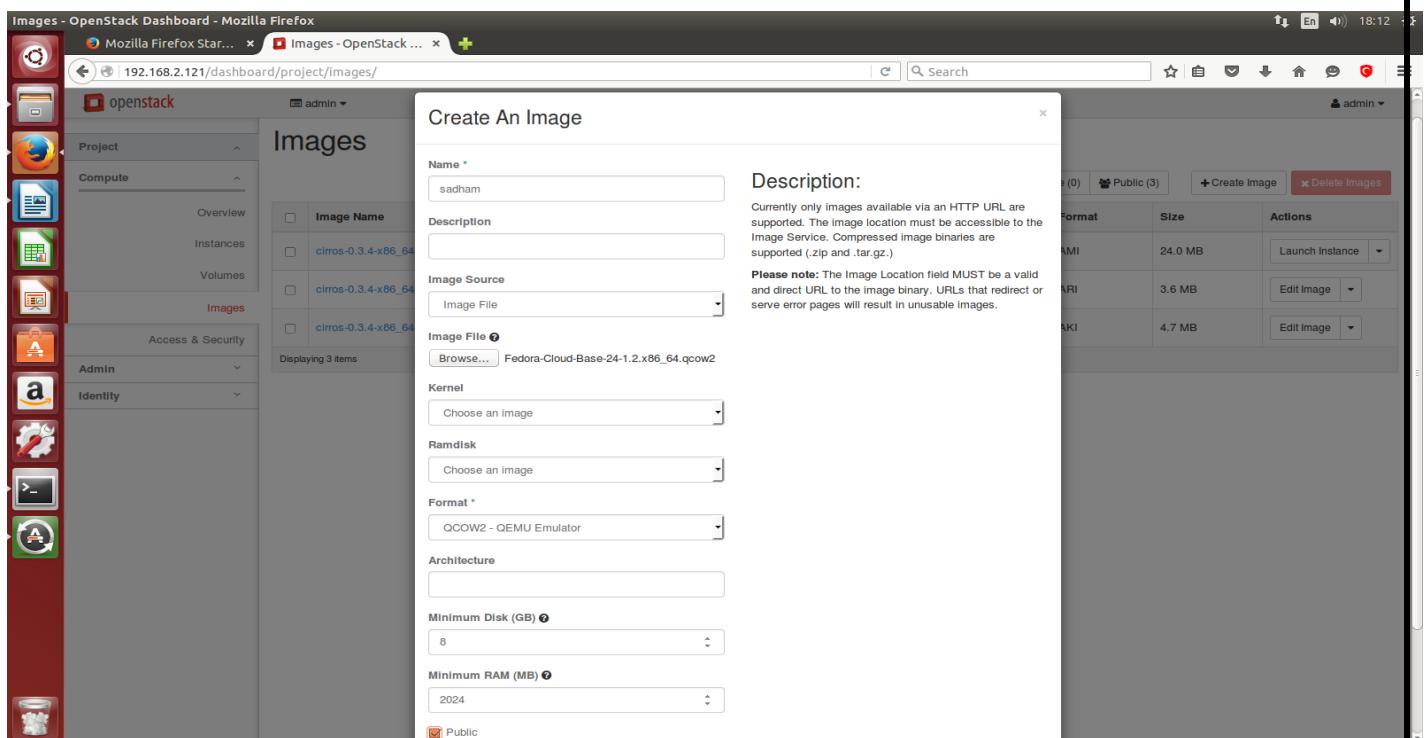
This is your host ip: 192.168.43.172
Horizon is now available at http://192.168.43.172/
Keystone is serving at http://192.168.43.172:5000/
The default users are: admin and demo
The password: root
2016-05-29 06:44:28.480 | stack.sh completed in 1710 seconds.
stack@BLAZEEY:~/devstack$ free -m
              total        used        free      shared      buffers      cached
Mem:       7897        7598        298        385        676       3085
-/+ buffers/cache:    3836        4060
Swap:      8105         20       8085
stack@BLAZEEY:~/devstack$ vi local.conf
stack@BLAZEEY:~/devstack$
```



Step 13:Open the open stack login with user name and password.

Step 14:Project-->images-->Create Images

Step 15:create an image text box will appear and fill as follows:



Step 16: After create an image launch the instance.

The screenshot shows the OpenStack Dashboard in Mozilla Firefox. The left sidebar has 'Compute' selected under 'Project'. The main area is titled 'Images' and shows a list of images: 'sadham' (selected), 'cirros-0.3.4-x86_64', and 'cirros-0.3.4-x86_64'. A modal window titled 'Launch Instance' is open. In the 'Image Name' dropdown, 'sadham' is selected. The 'Instance Name' field contains 'sadham1'. The 'Flavor' dropdown shows 'm1.small' is selected. The 'Instance Count' dropdown shows '1'. The 'Instance Boot Source' dropdown shows 'Boot from image'. The 'Image Name' dropdown at the bottom also shows 'sadham (195.1 MB)'. On the right, there's a table of images with columns 'Format', 'Size', and 'Actions'. The first image is 'qcow2' (195.1 MB). The 'Actions' column for this image has a 'Launch Instance' button. Below the table, project limits are shown: 'Number of Instances' (0 of 10 Used), 'Number of VCPUs' (0 of 20 Used), and 'Total RAM' (0 of 51,200 MB Used). At the bottom of the modal are 'Cancel' and 'Launch' buttons.

Step 17: Goto the Access and Security Tab.

Step 18: Generate a key pair and then Import the public key.

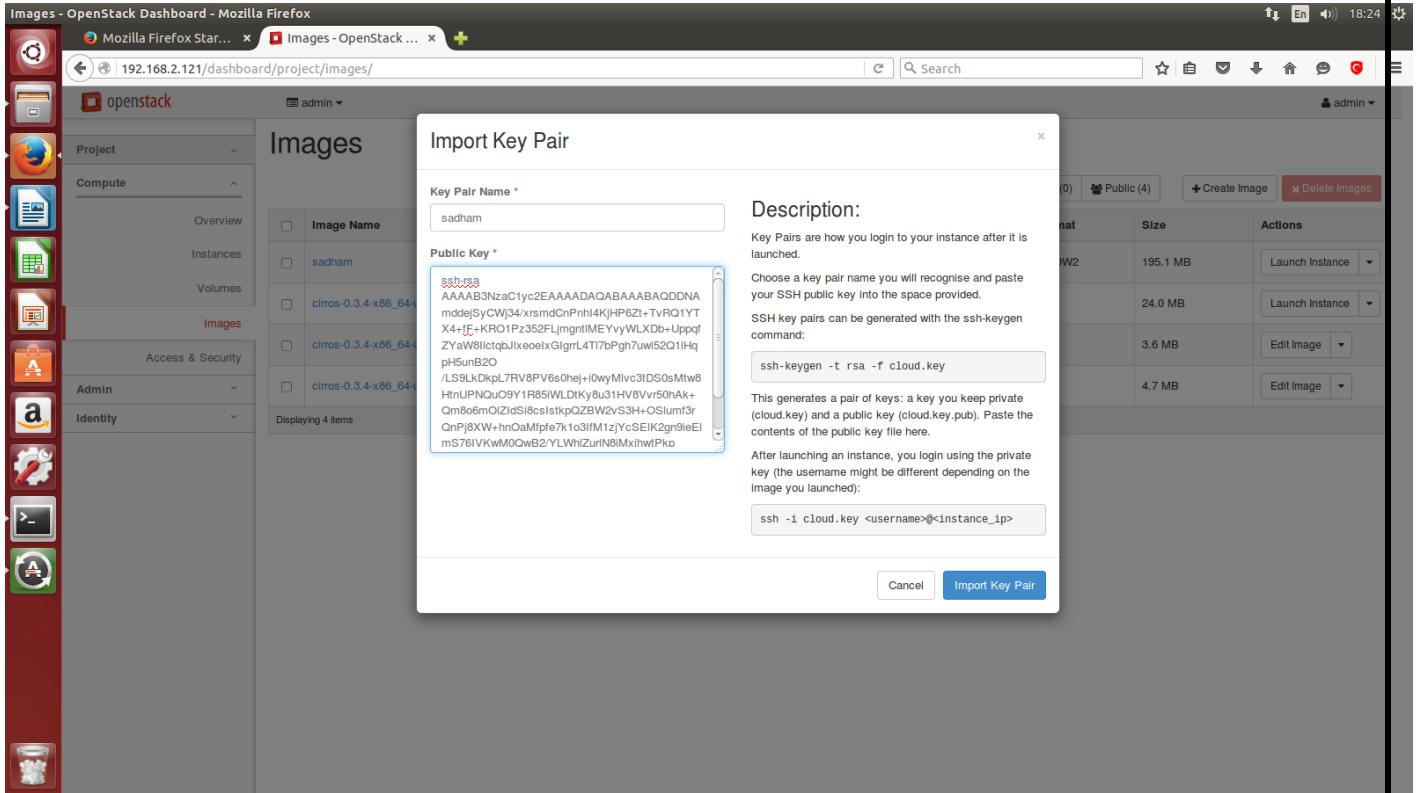
Step 19: Enter the following in Terminal Window:

```
ssh-keygen -t rsa -f cloud.key
```

Step 20: To view the public key and enter the following command:

```
vi cloud.key.pub
```

Step 21: Copy the public key and paste in the public key text box present in the import keypair:



Step 22: Launch the instance.

RESULT:

Thus the virtual machine of different configuration is created successfully.

EX. NO:2

VIRTUAL BLOCK ATTACHMENT

DATE:

AIM:

To find the procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.

PROCEDURE:

Step1: Make sure that you have shut down your virtual machine.

Step2: Select your VM and then click Edit settings.

Step3: Select the Hardware tab and then click Add.

Step4: Select Hard Disk from the list of device types and then click Next.

Step5: Choose Create a new virtual disk.

Step6: Specify the disk size.

Step7: Choose Thick Provision Lazy Zeroed.

Step8: Choose Specify a datastore or datastore cluster: and then click Browse

Step9: Click Next to accept the default advanced options. (By default, the new disk will be included in full VM snapshots. To keep them consistent, we recommend that you leave the Independent option unselected.)

Step10: Click Finish to proceed with adding the disk.

Step11: Click OK once the new hard disk has been added. This may take some time, depending on how much storage you're adding.

RESULT:

Thus the new virtual block is successfully added to existing virtual machine.

EX. NO:3

INSTALLATION OF C COMPILER

DATE:

AIM:

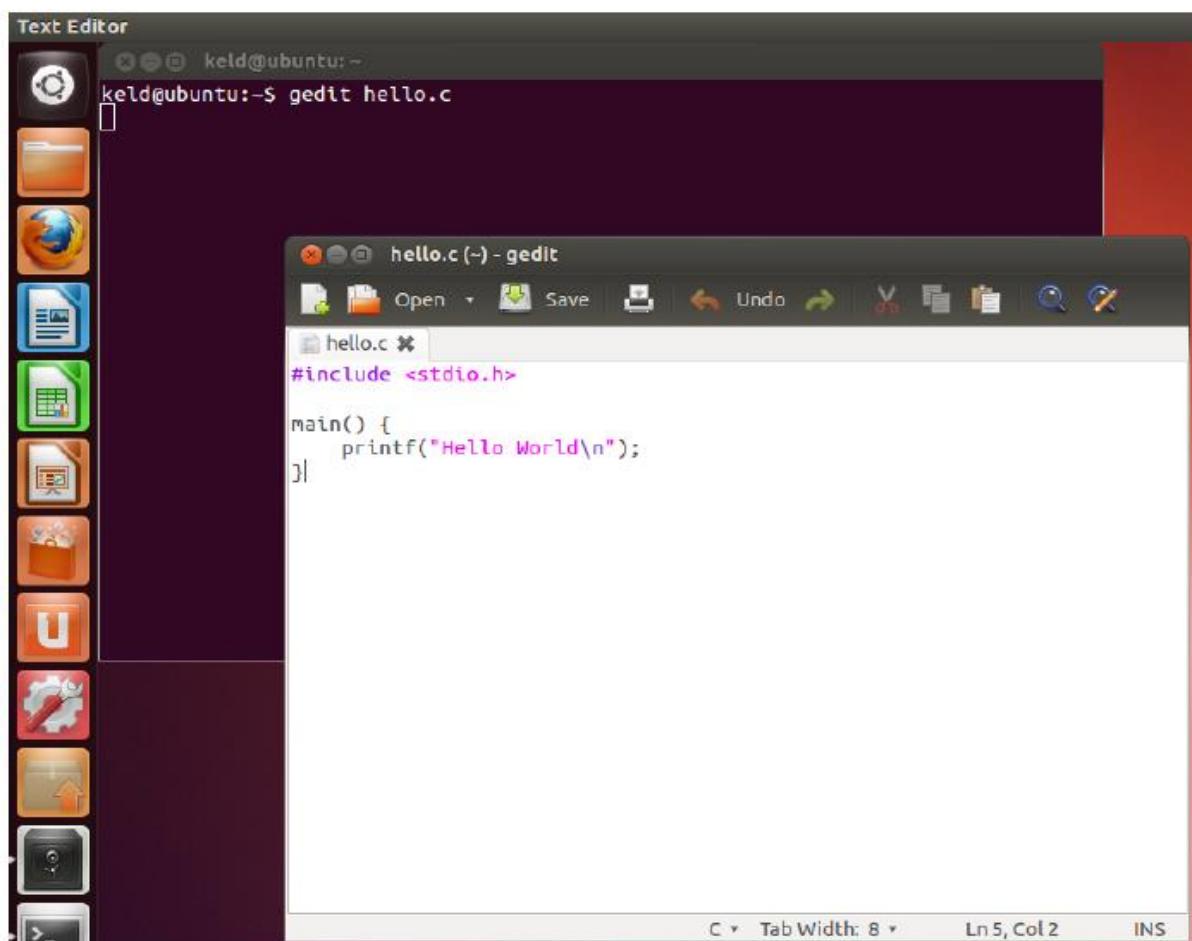
To find the procedure to install a C Compiler in the Virtual Machine and execute a C program.

PROCEDURE:

Step1: To install the C Compiler in the guest os, install the following package

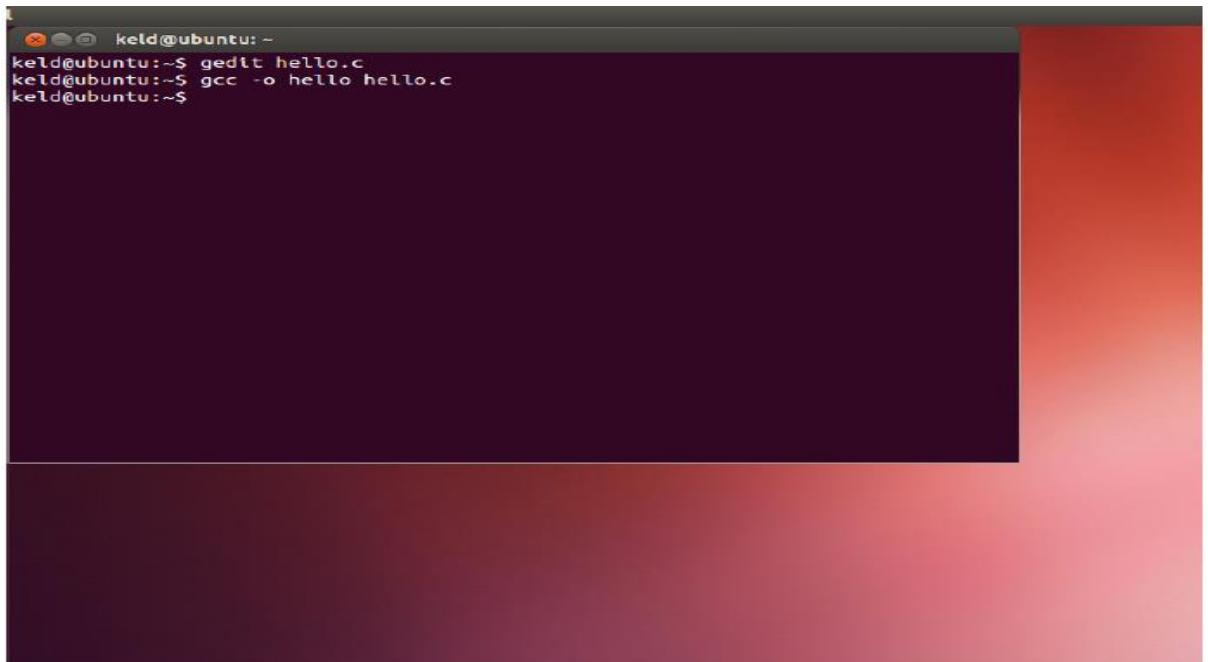
gcc

Step2: Write a sample program using gedit/vim editor.



Step3: Compile the C program using the compiler installed.

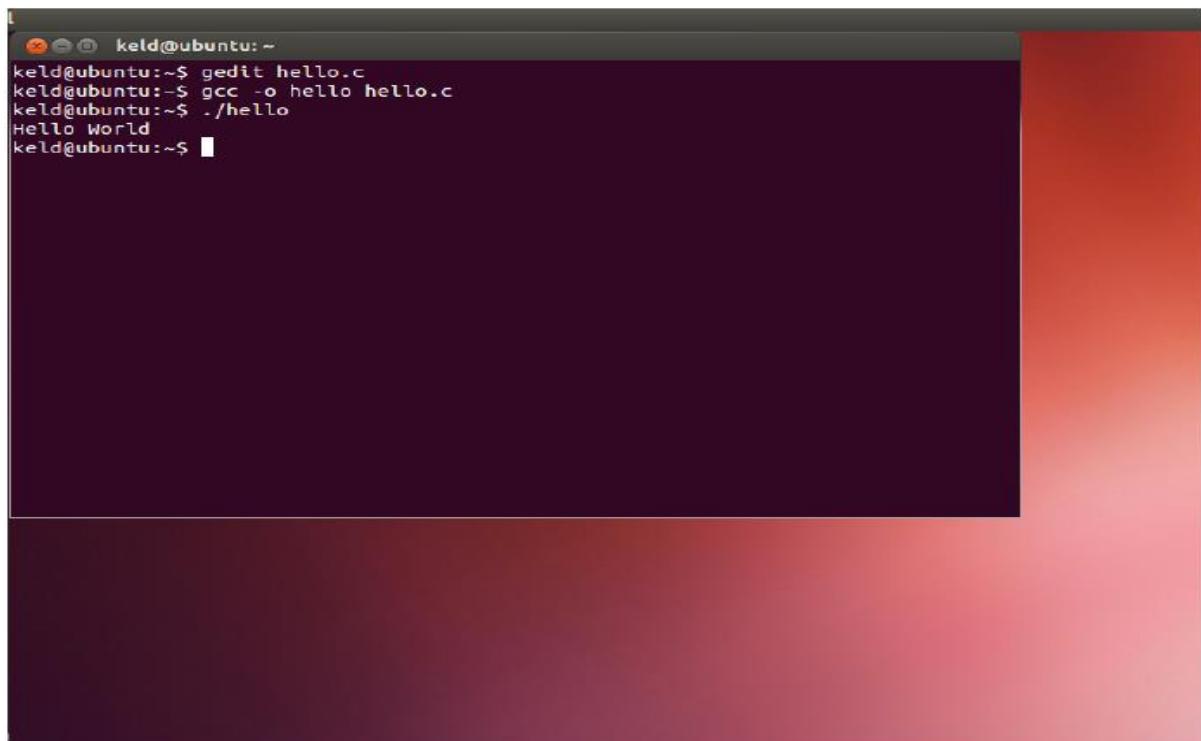
gcc sample_c_program.c -o output



```
keld@ubuntu:~$ gedit hello.c
keld@ubuntu:~$ gcc -o hello hello.c
keld@ubuntu:~$
```

Step4: Run and execute the program by using the command,

./hello



```
keld@ubuntu:~$ gedit hello.c
keld@ubuntu:~$ gcc -o hello hello.c
keld@ubuntu:~$ ./hello
Hello World
keld@ubuntu:~$
```

RESULT:

Thus the C Compiler is installed successfully and executed a sample C program.

EX. NO:4

VIRTUAL MACHINE MIGRATION

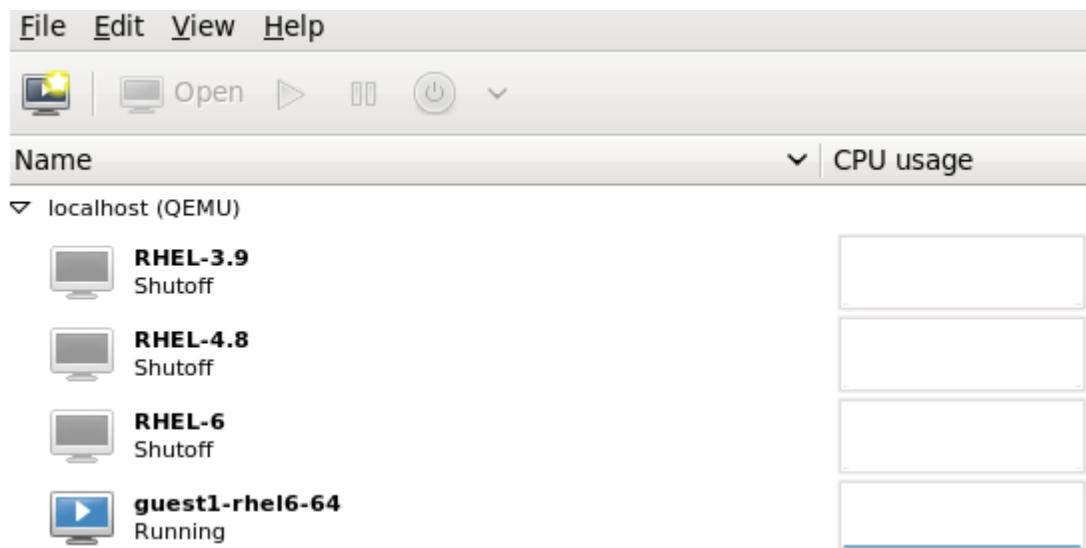
DATE:

AIM:

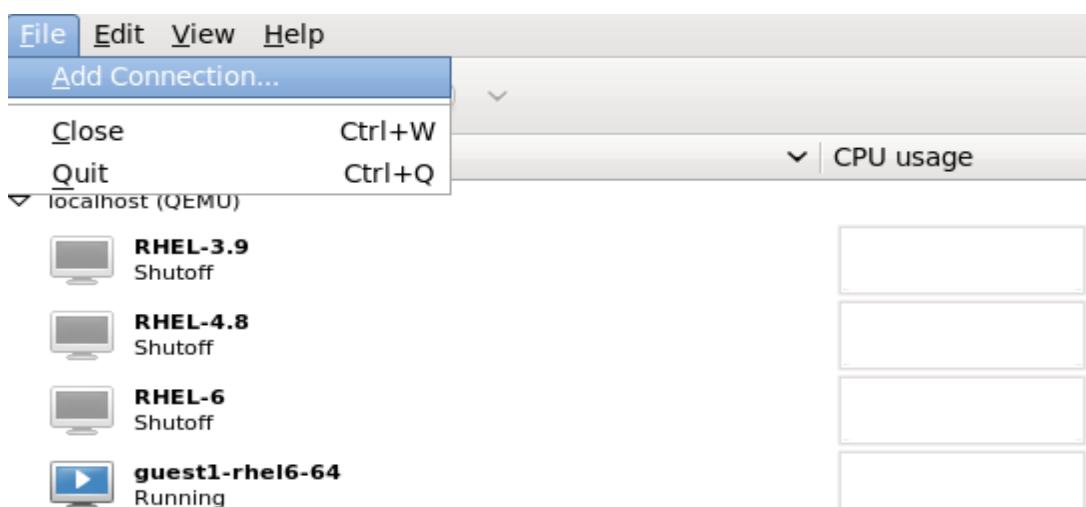
To show the virtual machine migration based on the certain condition from one node to the other.

PROCEDURE:

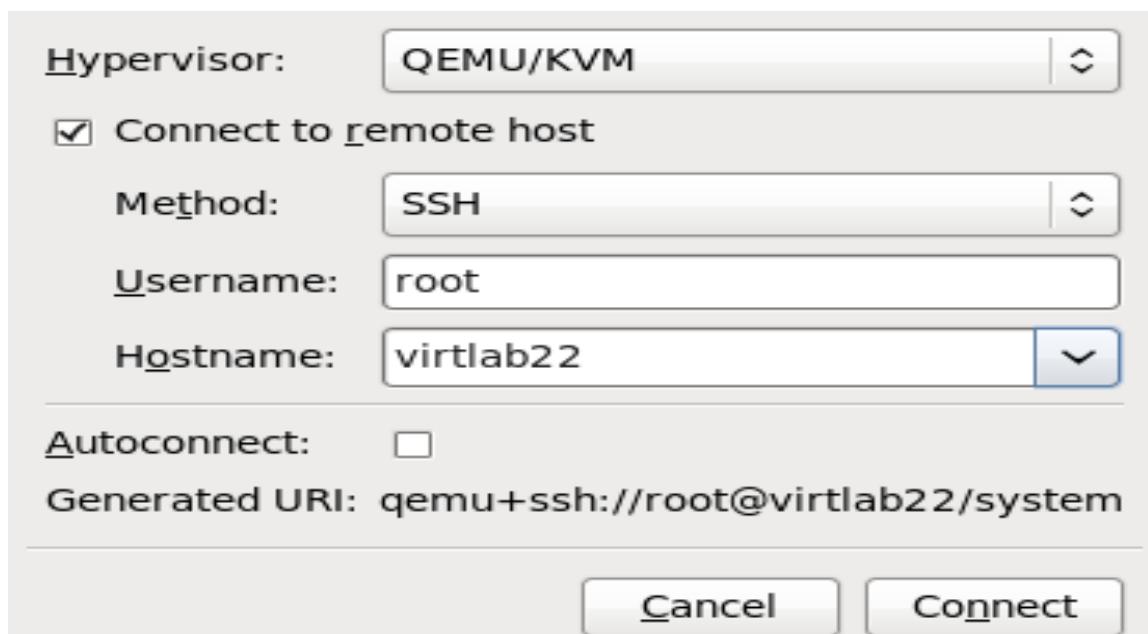
Step1: Open virt-manager.



Step2: Connect to the target host physical machine. Connect to the target host physical machine by clicking on the File menu, then click Add Connection.



Step3: The Add Connection window appears.



Enter the following details:

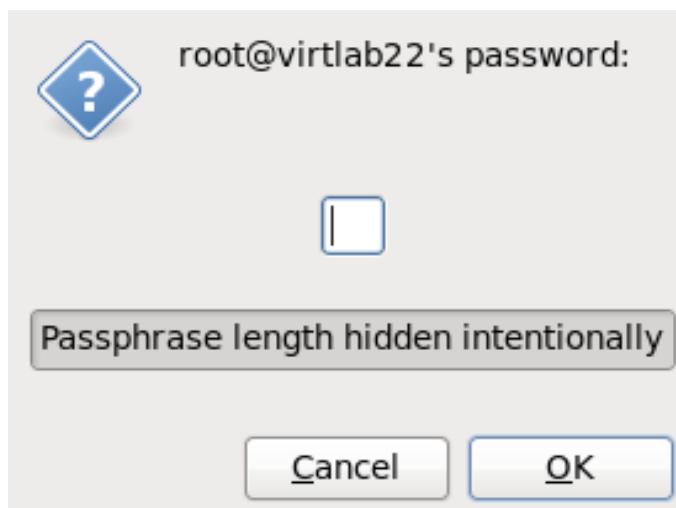
Hypervisor: Select QEMU/KVM.

Method: Select the connection method.

Username: Enter the username for the remote host physical machine.

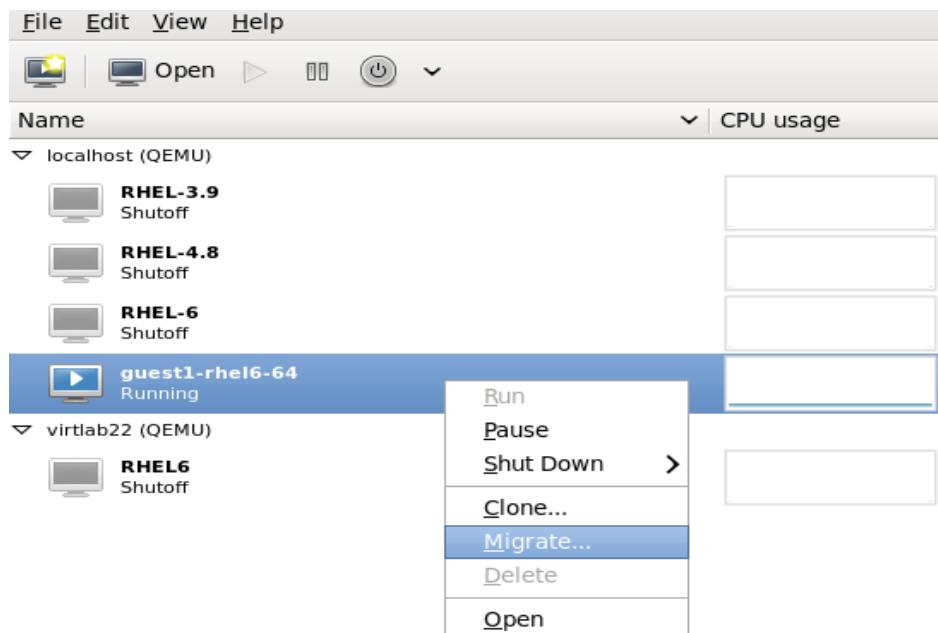
Hostname: Enter the hostname/IP address for the remote host physical machine.

Click the Connect button. An SSH connection is used in this example, so the specified user's password must be entered in the next step.

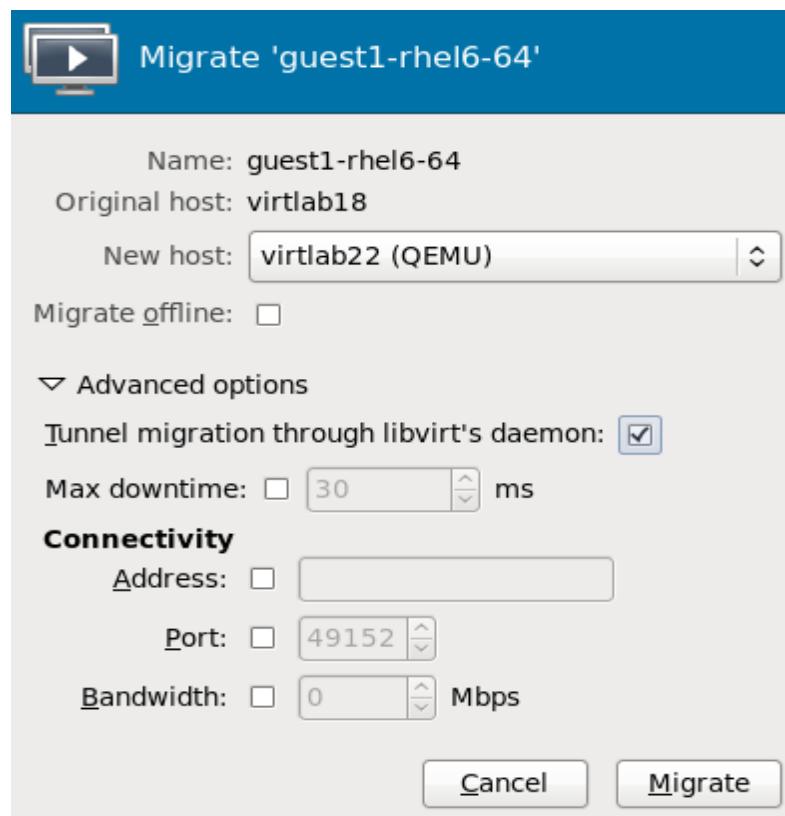


Step4: Migrate guest virtual machines

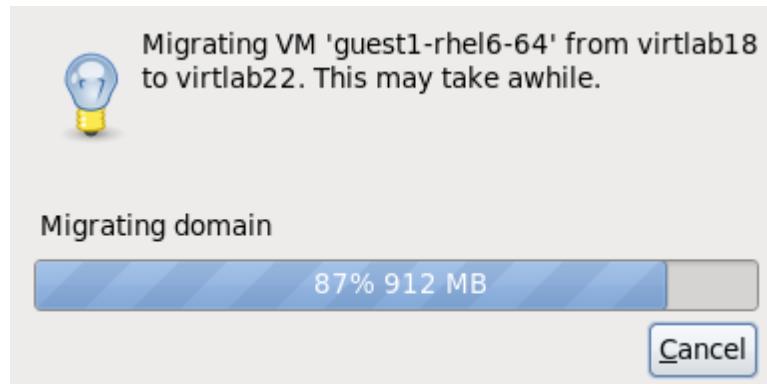
Open the list of guests inside the source host physical machine (click the small triangle on the left of the host name) and right click on the guest that is to be migrated (**guest1-rhel6-64** in this example) and click Migrate.



Step5: In the New Host field, use the drop-down list to select the host physical machine you wish to migrate the guest virtual machine to and click Migrate.



Step6: A progress window will appear.



virt-manager now displays the newly migrated guest virtual machine running in the destination host. The guest virtual machine that was running in the source host physical machine is now listed in the Shutoff state

RESULT:

Thus the virtual machine is migrated from one node to another node successfully.

EX. NO:5

INSTALLATION OF VIRTUAL MACHINE

DATE:

AIM:

To find procedure to install storage controller and interact with it.

KVM:

In computing, virtualization refers to the act of creating a virtual (rather than actual) version of something, including virtual computer hardware platforms, operating systems, storage devices, and computer network resources. Kernel-based Virtual Machine (KVM) is a virtualization infrastructure for the Linux kernel that turns it into a hypervisor.

PROCEDURE:

itadmin@PLLAB-49:~\$ pwd

/home/itadmin

itadmin@PLLAB-49:~\$ egrep -c '(vmx|svm)' /proc/cpuinfo

(If output is '0', then virtualization wouldn't be supported)

itadmin@PLLAB-49:~\$ egrep -c 'lm' /proc/cpuinfo

Install necessary packages:

qemu-kvm

libvirt-bin

bridge-utils

virt-manager

qemu-system

itadmin@PLLAB-49:~\$ sudo apt-get install qemu-kvm

[sudo] password for itadmin:

Reading package lists... Done

Building dependency tree

Reading state information... Done

qemu-kvm is already the newest version.

qemu-kvm set to manually installed.

0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.

itadmin@PLLAB-49:~\$ sudo apt-get install libvirt-bin

Reading package lists... Done

Building dependency tree

Reading state information... Done

libvirt-bin is already the newest version.

libvirt-bin set to manually installed.

0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.

itadmin@PLLAB-49:~\$ sudo apt-get install bridge-utils

Reading package lists... Done

```
Building dependency tree
Reading state information... Done
bridge-utils is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 310 not upgraded.
```

```
itadmin@PLLAB-49:~$ sudo apt-get install virt-manager
Reading package lists... Done
Building dependency tree
Reading state information... Done
Setting up libgvcnc-1.0-0 (0.5.3-1.3) ...
Setting up libgtk-vnc-2.0-0 (0.5.3-1.3) ...
Setting up gir1.2-gtk-vnc-2.0 (0.5.3-1.3) ...
Setting up gir1.2-spice-client-glib-2.0 (0.25-1build1) ...
Setting up gir1.2-spice-client-gtk-3.0 (0.25-1build1) ...
Setting up gnome-icon-theme (3.12.0-1ubuntu1) ...
Setting up python-ipaddr (2.1.11-2) ...
Setting up python-libvirt (1.2.12-0ubuntu1) ...
Setting up python-libxml2 (2.9.2+dfsg1-3ubuntu0.3) ...
Setting up python-pycurl (7.19.5-3ubuntu1) ...
Setting up python-urlgrabber (3.9.1-4ubuntu5) ...
Setting up libvirt-glib-1.0-0 (0.1.9-4) ...
Setting up gir1.2-libvirt-glib-1.0 (0.1.9-4) ...
Setting up virtinst (1:1.0.1-5ubuntu1) ...
Setting up virt-manager (1:1.0.1-5ubuntu1) ...
Setting up virt-viewer (1.0-1) ...
update-alternatives: using /usr/bin/spice-xpi-client-remote-viewer to provide /usr/bin/spice-xpi-client (spice-xpi-client) in auto mode
Processing triggers for libc-bin (2.21-0ubuntu4) ...
```

```
itadmin@PLLAB-49:~$ sudo apt-get install qemu-system
Reading package lists... Done
Building dependency tree
Reading state information... Done
Setting up qemu-system-arm (1:2.2+dfsg-5expubuntu9.7) ...
Setting up qemu-system-mips (1:2.2+dfsg-5expubuntu9.7) ...
Setting up qemu-slof (20140630+dfsg-1ubuntu1) ...
Setting up qemu-system-ppc (1:2.2+dfsg-5expubuntu9.7) ...
Setting up qemu-system-sparc (1:2.2+dfsg-5expubuntu9.7) ...
Setting up qemu-system-misc (1:2.2+dfsg-5expubuntu9.7) ..
```

To check whether a package is installed or not:

```
itadmin@PLLAB-49:~$ dpkg -l|grep qemu-kvm
ii  qemu-kvm                         1:2.2+dfsg-5expubuntu9.7          amd64
QEMU Full virtualization
itadmin@PLLAB-49:~$
```

```
itadmin@PLLAB-49:~$ virsh
Welcome to virsh, the virtualization interactive terminal.
```

Type: 'help' for help with commands
'quit' to quit

virsh # exit

itadmin@PLLAB-49:~\$ **sudo virsh -c qemu:///system list**

[sudo] password for itadmin:

Id	Name	State
----	------	-------

itadmin@PLLAB-49:~\$

itadmin@PLLAB-49:~\$ sudo virsh -c qemu:///system

Welcome to virsh, the virtualization interactive terminal.

Type: 'help' for help with commands
'quit' to quit

virsh # version

Compiled against library: libvirt 1.2.12

Using library: libvirt 1.2.12

Using API: QEMU 1.2.12

Running hypervisor: QEMU 2.2.0

virsh # nodeinfo

CPU model: x86_64

CPU(s): 8

CPU frequency: 2573 MHz

CPU socket(s): 1

Core(s) per socket: 4

Thread(s) per core: 2

NUMA cell(s): 1

Memory size: 8059520 KiB

virsh # exit

itadmin@PLLAB-49:~\$ **sudo virt-install --connect qemu:///system -n hardy -r 512 -f hardy1.qcow2 -s 12 -c /home/itadmin/Desktop/ubuntu.iso --vnc --noautoconsole --os-type linux --os-variant ubuntuHardy --accelerate --network=network:default**

Command description:

virt-install --connect qemu:///system

-n hardy → Name of the VM

-r 512 → RAM Size

-f hardy1.qcow2 → File Size

-s 12 → Hard Disk Size

-c /home/itadmin/Desktop/ubuntu.iso → .iso file location

--vnc → Virtualization software

```
--noautoconsole  
--os-type linux  
--os-variant ubuntuHardy  
--accelerate  
--network=network:default
```

```
itadmin@PLLAB-49:~$ sudo virt-install --connect qemu:///system -n hardy -r 512 -f  
hardy.qcow2 -s 12 -c /home/itadmin/Downloads/ubuntu.iso --vnc --noautoconsole --os-  
type linux --os-variant ubuntuHardy
```

Starting install...

```
ERROR internal error: process exited while connecting to monitor: 2016-05-  
28T10:20:10.495449Z qemu-system-x86_64: -drive  
file=/home/itadmin/hardy.qcow2,if=none,id=drive-ide0-0-0,format=raw: could not open  
disk image /home/itadmin/hardy.qcow2: Could not open '/home/itadmin/hardy.qcow2':  
Permission denied
```

Domain installation does not appear to have been successful.

If it was, you can restart your domain by running:

```
virsh --connect qemu:///system start hardy  
otherwise, please restart your installation.
```

If suppose you get an error try this:

```
itadmin@PLLAB-49:~$ sudo chmod 777 hardy.qcow2  
itadmin@PLLAB-49:~$ sudo virt-install --connect qemu:///system -n hardy -r 512 -f  
hardy.qcow2 -s 12 -c /home/itadmin/Downloads/ubuntu.iso --vnc --noautoconsole --os-  
type linux --os-variant ubuntuHardy
```

Starting install...

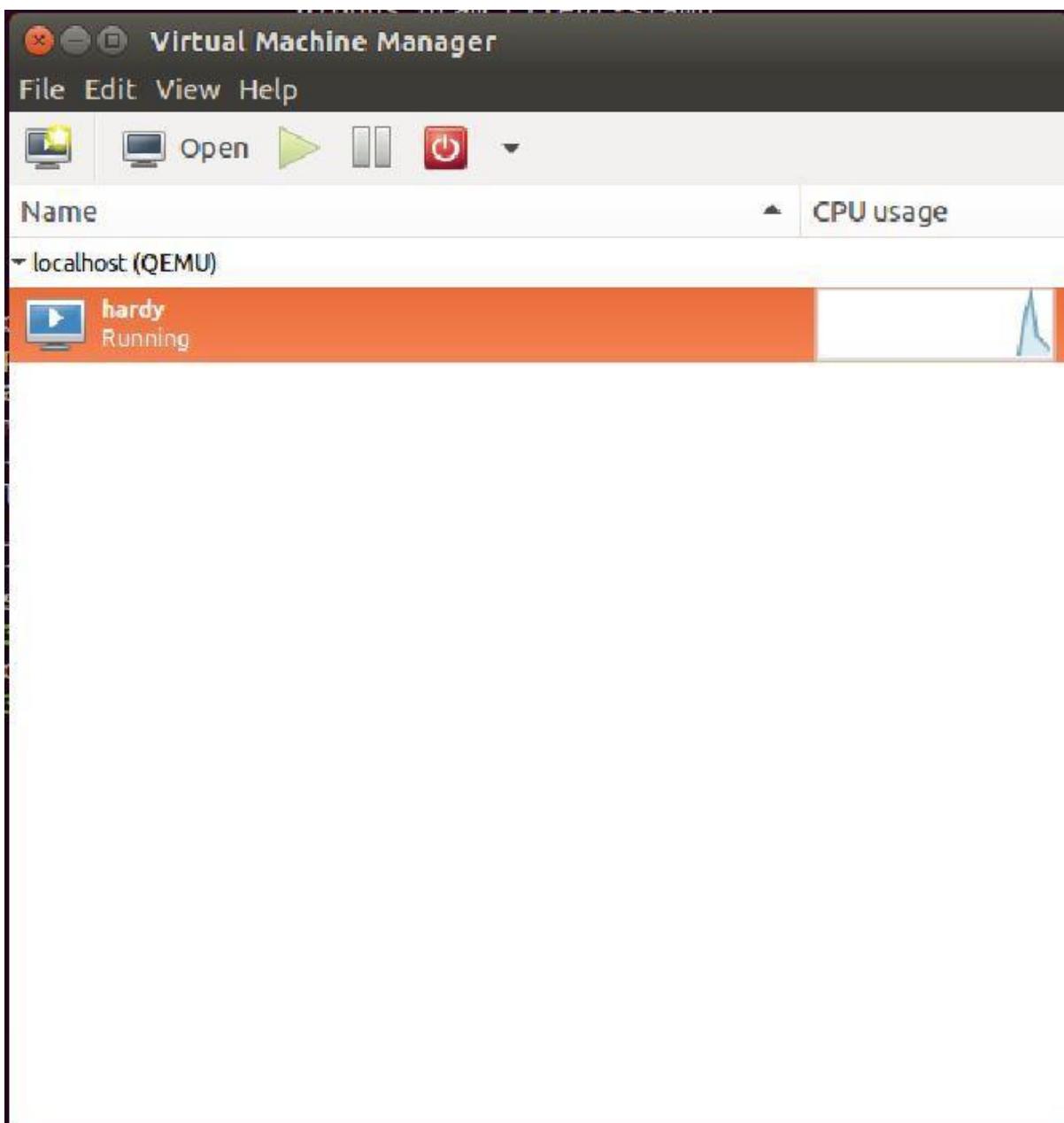
```
Creating domain... | 0 B 00:00
```

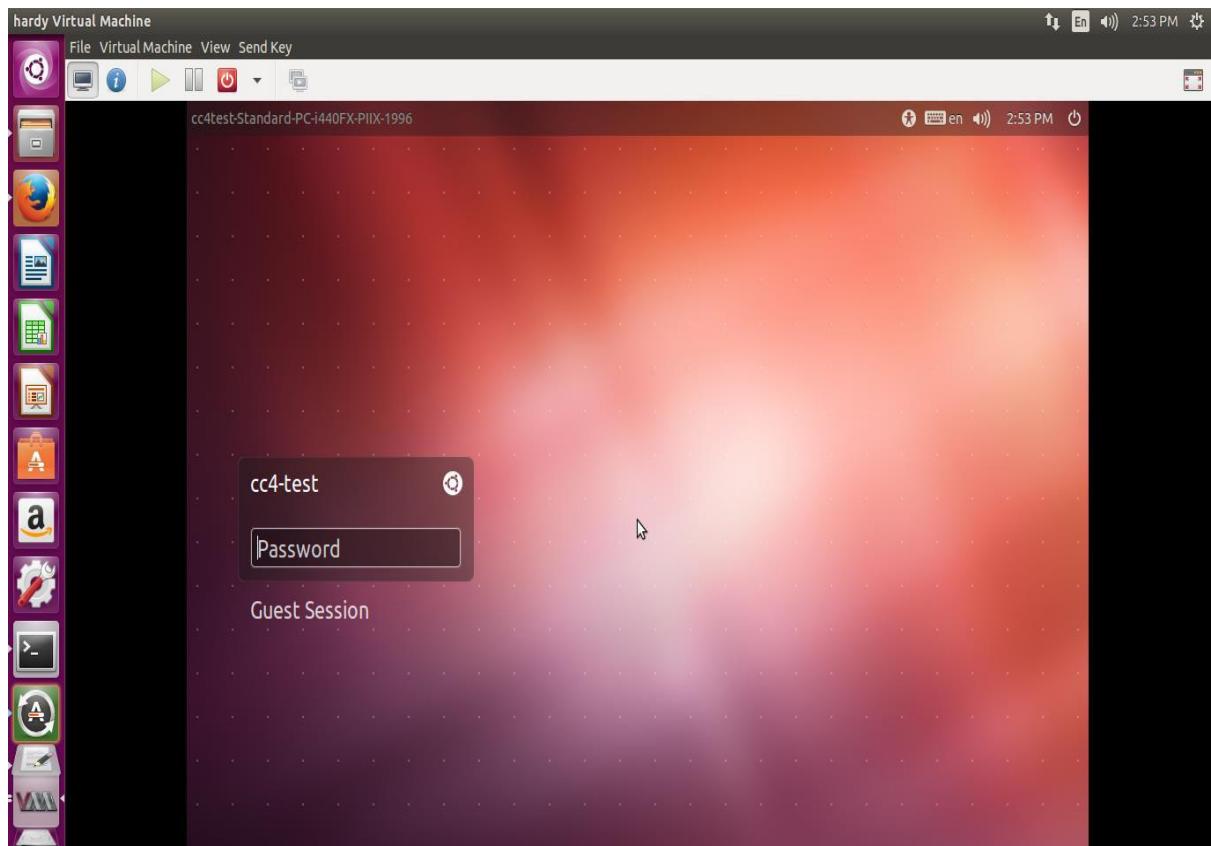
Domain installation still in progress. You can reconnect to
the console to complete the installation process.

```
itadmin@PLLAB-49:~$
```

```
itadmin@PLLAB-49:~$ sudo virt-manager
```

OUTPUT:





RESULT:

Thus the storage controller is installed successfully in virtual machine.

INSTALLATION OF HADOOP

AIM:

To study the procedure for installation of hadoop.

PROCEDURE:

Step1: itadmin@PLLAB-49:~\$ ifconfig

```
br0    Link encap:Ethernet HWaddr b8:ca:3a:8a:12:e7
      inet addr:192.168.100.61 Bcast:192.168.100.255 Mask:255.255.255.0
      inet6 addr: fe80::baca:3aff:fe8a:12e7/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
            RX packets:2650 errors:0 dropped:0 overruns:0 frame:0
            TX packets:711 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:0
            RX bytes:889484 (889.4 KB) TX bytes:75186 (75.1 KB)

eth0    Link encap:Ethernet HWaddr b8:ca:3a:8a:12:e7
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:2718 errors:0 dropped:0 overruns:0 frame:0
      TX packets:715 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:942876 (942.8 KB) TX bytes:78761 (78.7 KB)
      Interrupt:20 Memory:f7c00000-f7c20000

lo     Link encap:Local Loopback
      inet addr:127.0.0.1 Mask:255.0.0.0
      inet6 addr: ::1/128 Scope:Host
            UP LOOPBACK RUNNING MTU:65536 Metric:1
            RX packets:682 errors:0 dropped:0 overruns:0 frame:0
            TX packets:682 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:0
            RX bytes:76660 (76.6 KB) TX bytes:76660 (76.6 KB)

virbr0   Link encap:Ethernet HWaddr 52:54:00:3a:fe:ce
      inet addr:192.168.122.1 Bcast:192.168.122.255 Mask:255.255.255.0
            UP BROADCAST MULTICAST MTU:1500 Metric:1
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0
            TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:0
            RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
```

uname -a

uname (short for unix name) is a software program in Unix and Unix-like computer operating systems that prints the name, version and other details about the current machine and the operating system running on it.

```
root@PLLAB-49:~# uname -a
Linux PLLAB-49 3.19.0-59-generic #66-Ubuntu SMP Thu May 12 22:35:27 UTC 2016
x86_64 x86_64 x86_64 GNU/Linux
```

Step2: itadmin@PLLAB-49:~\$ sudo apt-get update
[sudo] password for itadmin:
Hit http://security.ubuntu.com vivid-security InRelease
Hit http://archive.ubuntu.com vivid InRelease
Hit http://archive.ubuntu.com vivid-updates InRelease
Ign http://downloads.opennebula.org stable InRelease
Hit http://security.ubuntu.com vivid-security/restricted Sources
Ign http://downloads.opennebula.org stable/opennebula Translation-en_US
Ign http://downloads.opennebula.org stable/opennebula Translation-en
Reading package lists... Done

Step3: itadmin@PLLAB-49:~\$ sudo apt-cache search apache2
apache2 - Apache HTTP Server
apache2-bin - Apache HTTP Server (modules and other binary files)
apache2-data - Apache HTTP Server (common files)
apache2-dbg - Apache debugging symbols
apache2-dev - Apache HTTP Server (development headers)
radicale - simple calendar server - daemon
rt4-apache2 - Apache 2 specific files for request-tracker4
ruby-passenger-doc - Rails and Rack support for Apache2 - Documentation
shibboleth-sp2-utils - Federated web single sign-on system (daemon and utilities)
torrus-common - Universal front-end for Round-Robin Databases (common files)
web2ldap - Full-featured web-based LDAPv3 client

Step4: itadmin@PLLAB-49:~\$ sudo apt-cache search apache2|grep apache2
apache2 - Apache HTTP Server
apache2-bin - Apache HTTP Server (modules and other binary files)
apache2-data - Apache HTTP Server (common files)
apache2-dbg - Apache debugging symbols
apache2-dev - Apache HTTP Server (development headers)
apache2-doc - Apache HTTP Server (on-site documentation)
apache2-mpm-event - transitional event MPM package for apache2
libapache2-request-perl - generic Apache request library - Perl modules
libapache2-sitecontrol-perl - perl web site authentication/authorization system
libapache2-svn - Apache Subversion server modules for Apache httpd (dummy package)
libapache2-webauth - Transitional package for WebAuth Apache modules
libapache2-webkdc - Transitional package for WebAuth authentication KDC
rt4-apache2 - Apache 2 specific files for request-tracker4

Step5: libapache2-request-perl - generic Apache request library - Perl modules
libapache2-sitecontrol-perl - perl web site authentication/authorization system
libapache2-svn - Apache Subversion server modules for Apache httpd (dummy package)
libapache2-webauth - Transitional package for WebAuth Apache modules
libapache2-webkdc - Transitional package for WebAuth authentication KDC
rt4-apache2 - Apache 2 specific files for request-tracker4

Step6: itadmin@PLLAB-49:~\$ wget http://192.168.100.93/hadoop/jdk-8u60-linux-

x64.gz

```
--2016-05-28 10:59:38-- http://192.168.100.93/hadoop/jdk-8u60-linux-x64.gz
Connecting to 192.168.100.93:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 181238643 (173M) [application/x-gzip]
Saving to: 'jdk-8u60-linux-x64.gz.1'
```

jdk-8u60-linux-x64. 100%[=====] 172.84M 811KB/s in 5m 27s

2016-05-28 11:05:05 (541 KB/s) - 'jdk-8u60-linux-x64.gz.1' saved
[181238643/181238643]

Step7: itadmin@PLLAB-49:~\$ ls -lh

```
total 346M
drwxrwxr-x 3 itadmin itadmin 4.0K May 28 10:48 Ann
drwrxr-xr-x 2 itadmin itadmin 4.0K May 28 10:51 Desktop
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Documents
drwxr-xr-x 2 itadmin itadmin 4.0K May 28 10:48 Downloads
-rw-r--r-- 1 itadmin itadmin 8.8K May 21 12:53 examples.desktop
-rw-rw-r-- 1 itadmin itadmin 173M May 7 10:24 jdk-8u60-linux-x64.gz
-rw-rw-r-- 1 itadmin itadmin 173M Sep 14 2015 jdk-8u60-linux-x64.gz.1
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Music
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Pictures
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Public
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Templates
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Videos
```

Step8: itadmin@PLLAB-49:~\$ wget http://192.168.100.93/hadoop/hadoop-2.7.0.tar.gz

```
--2016-05-28 11:09:34-- http://192.168.100.93/hadoop/hadoop-2.7.0.tar.gz
Connecting to 192.168.100.93:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 210343364 (201M) [application/x-gzip]
Saving to: 'hadoop-2.7.0.tar.gz'
hadoop-2.7.0.tar.gz 100%[=====] 200.60M 11.2MB/s in 2m 11s
```

2016-05-28 11:11:44 (1.54 MB/s) - 'hadoop-2.7.0.tar.gz' saved [210343364/210343364]

Step9: itadmin@PLLAB-49:~\$ ls -lh

```
total 547M
drwxrwxr-x 3 itadmin itadmin 4.0K May 28 10:48 Ann
drwrxr-xr-x 2 itadmin itadmin 4.0K May 28 10:51 Desktop
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Documents
drwxr-xr-x 2 itadmin itadmin 4.0K May 28 11:10 Downloads
-rw-r--r-- 1 itadmin itadmin 8.8K May 21 12:53 examples.desktop
-rw-rw-r-- 1 itadmin itadmin 201M Jul 9 2015 hadoop-2.7.0.tar.gz
-rw-rw-r-- 1 itadmin itadmin 173M May 7 10:24 jdk-8u60-linux-x64.gz
-rw-rw-r-- 1 itadmin itadmin 173M Sep 14 2015 jdk-8u60-linux-x64.gz.1
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Music
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Pictures
```

```
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Public
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Templates
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Videos
```

Step10: itadmin@PLLAB-49:~\$ wget

```
http://192.168.100.93/hadoop/mrsampleddata.tar.gz
--2016-05-28 11:13:47-- http://192.168.100.93/hadoop/mrsampleddata.tar.gz
Connecting to 192.168.100.93:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 402723 (393K) [application/x-gzip]
Saving to: 'mrsampleddata.tar.gz'
```

```
mrsampleddata.tar.gz 100%[=====] 393.28K --.KB/s in 0.04s
```

```
2016-05-28 11:13:47 (9.95 MB/s) - 'mrsampleddata.tar.gz' saved [402723/402723]
```

Step11: itadmin@PLLAB-49:~\$ ls -lh

```
total 547M
drwxrwxr-x 3 itadmin itadmin 4.0K May 28 11:13 Ann
drwxr-xr-x 2 itadmin itadmin 4.0K May 28 10:51 Desktop
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Documents
drwxr-xr-x 2 itadmin itadmin 4.0K May 28 11:10 Downloads
-rw-r--r-- 1 itadmin itadmin 8.8K May 21 12:53 examples.desktop
-rw-rw-r-- 1 itadmin itadmin 201M Jul 9 2015 hadoop-2.7.0.tar.gz
-rw-rw-r-- 1 itadmin itadmin 173M May 7 10:24 jdk-8u60-linux-x64.gz
-rw-rw-r-- 1 itadmin itadmin 173M Sep 14 2015 jdk-8u60-linux-x64.gz.1
-rw-rw-r-- 1 itadmin itadmin 394K May 28 10:40 mrsampleddata.tar.gz
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Music
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Pictures
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Public
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Templates
drwxr-xr-x 2 itadmin itadmin 4.0K May 21 07:49 Videos
```

Step12: To unzip a zipped file:

```
itadmin@PLLAB-49:~$ tar zxvf jdk-8u60-linux-x64.gz
```

```
jdk1.8.0_60/
jdk1.8.0_60/README.html
jdk1.8.0_60/LICENSE
jdk1.8.0_60/include/
jdk1.8.0_60/include/jawt.h
jdk1.8.0_60/include/linux/
jdk1.8.0_60/include/linux/jawt_md.h
jdk1.8.0_60/include/linux/jni_md.h
jdk1.8.0_60/include/classfile_constants.h
jdk1.8.0_60/include/jvmticmlr.h
jdk1.8.0_60/include/jni.h
.
.
.
.
```

```
jdk1.8.0_60/bin/tnameserv  
jdk1.8.0_60/bin/jmc.ini  
jdk1.8.0_60/bin/jmap  
jdk1.8.0_60/bin/serialver  
jdk1.8.0_60/bin/wsgen  
jdk1.8.0_60/bin/jrunscript  
jdk1.8.0_60/bin/javah  
jdk1.8.0_60/bin/javac  
jdk1.8.0_60/bin/jvisualvm  
jdk1.8.0_60/bin/jcontrol  
jdk1.8.0_60/release
```

Step13: To change directory:

```
itadmin@PLLAB-49:~$ cd jdk1.8.0_60/
```

Step14: To check present working directory:

```
itadmin@PLLAB-49:~/jdk1.8.0_60$ pwd  
/home/itadmin/jdk1.8.0_60
```

```
itadmin@PLLAB-49:~/jdk1.8.0_60$ sudo nano /etc/profile
```

Add the bold lines:

```
# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))  
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).
```

```
if [ "$PS1" ]; then  
    if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then  
        # The file bash.bashrc already sets the default PS1.  
        # PS1='h:w\$'  
        if [ -f /etc/bash.bashrc ]; then  
            ./etc/bash.bashrc  
        fi  
    else  
        if [ `id -u` -eq 0 ]; then  
            PS1='#'  
        else  
            PS1='$'  
        fi  
    fi  
fi
```

```
JAVA_HOME=/home/itadmin/jdk1.8.0_60
```

```
PATH=$PATH:$JAVA_HOME/bin
```

```
export PATH JAVA_HOME
```

```
# The default umask is now handled by pam_umask.
```

```
# See pam_umask(8) and /etc/login.defs.

if [ -d /etc/profile.d ]; then
    for i in /etc/profile.d/*.sh; do
        if [ -r $i ]; then
            . $i
        fi
    done
    unset i
fi
```

To save this file: Click Ctrl + X
Do want to Save: Y or N (Click 'Y')

Step15: itadmin@PLLAB-49:~/jdk1.8.0_60\$ java -version

```
Picked up JAVA_TOOL_OPTIONS: -javaagent:/usr/share/java/jayatanaag.jar
openjdk version "1.8.0_45-internal"
OpenJDK Runtime Environment (build 1.8.0_45-internal-b14)
OpenJDK 64-Bit Server VM (build 25.45-b02, mixed mode)
```

Step16: itadmin@PLLAB-49:~/jdk1.8.0_60\$ sudo update-alternatives --install "/usr/bin/java" java "/home/itadmin/jdk1.8.0_60/bin/java" 1

Step17: itadmin@PLLAB-49:~/jdk1.8.0_60\$ sudo update-alternatives --config java
There are 3 choices for the alternative java (providing /usr/bin/java).

Selection	Path	Priority	Status
* 0	/usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java	1081	auto mode
1	/home/itadmin/jdk1.8.0_60/bin/java	1	manual mode
2	/usr/lib/jvm/java-7-openjdk-amd64/jre/bin/java	1071	manual mode
3	/usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java	1081	manual mode

Press enter to keep the current choice[*], or type selection number: **1**
update-alternatives: using /home/itadmin/jdk1.8.0_60/bin/java to provide /usr/bin/java
(java) in manual mode

Step18: itadmin@PLLAB-49:~/jdk1.8.0_60\$ java -version

```
Picked up JAVA_TOOL_OPTIONS: -javaagent:/usr/share/java/jayatanaag.jar
java version "1.8.0_60"
Java(TM) SE Runtime Environment (build 1.8.0_60-b27)
Java HotSpot(TM) 64-Bit Server VM (build 25.60-b23, mixed mode)
```

Step19: TO CONFIGURE SSH:

itadmin@PLLAB-49:~/jdk1.8.0_60\$ ssh-keygen

Generating public/private rsa key pair.

Enter file in which to save the key (/home/itadmin/.ssh/id_rsa): *(Just press ENTER button)*

Created directory '/home/itadmin/.ssh'.

Enter passphrase (empty for no passphrase): **(Just press ENTER button)**
Enter same passphrase again: **(Just press ENTER button)**
Your identification has been saved in /home/itadmin/.ssh/id_rsa.
Your public key has been saved in /home/itadmin/.ssh/id_rsa.pub.
The key fingerprint is: **(Just press ENTER button)**
a8:d4:2b:2e:9c:40:d2:5e:61:d2:94:ba:c4:91:2f:1f itadmin@PLLAB-49
The key's randomart image is: **(Just press ENTER button)**
+---[RSA 2048]----+
| +.. |
| += |
| o * . |
|..* E. . |
|oo =..o S |
|. o... . |
| o.o . |
| +.. |
| .. |
+-----+

Step20: itadmin@PLLAB-49:~/jdk1.8.0_60\$ ssh localhost

The authenticity of host 'localhost (127.0.0.1)' can't be established.
ECDSA key fingerprint is aa:39:e1:c4:a0:3d:34:f5:07:c9:24:69:f3:9e:69:5a.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
itadmin@localhost's password:
Welcome to Ubuntu 15.04 (GNU/Linux 3.19.0-59-generic x86_64)

* Documentation: <https://help.ubuntu.com/>

297 packages can be updated.
170 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

itadmin@PLLAB-49:~\$

Step21: itadmin@PLLAB-49:~\$ ssh-copy-id -i localhost
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that
are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is

to install the new keys
itadmin@localhost's password:

Number of key(s) added: 1

Now try logging into the machine, with: "ssh 'localhost'"
and check to make sure that only the key(s) you wanted were added.

itadmin@PLLAB-49:~\$

Step22: itadmin@PLLAB-49:~\$ ssh localhost

Welcome to Ubuntu 15.04 (GNU/Linux 3.19.0-59-generic x86_64)

* Documentation: <https://help.ubuntu.com/>

297 packages can be updated.
170 updates are security updates.

Your Ubuntu release is not supported anymore.
For upgrade information, please visit:
<http://www.ubuntu.com/releaseendoflife>

New release '15.10' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Sat May 28 11:39:37 2016 from localhost
itadmin@PLLAB-49:~\$

Step23: itadmin@PLLAB-49:~\$ tar zxvf hadoop-2.7.0.tar.gz

.

.

.

hadoop-2.7.0/README.txt

hadoop-2.7.0/NOTICE.txt

hadoop-2.7.0/lib/

hadoop-2.7.0/lib/native/

hadoop-2.7.0/lib/native/libhadoop.a

hadoop-2.7.0/lib/native/libhadoop.so

hadoop-2.7.0/lib/native/libhadooppipes.a

hadoop-2.7.0/lib/native/libhdfs.so.0.0.0

hadoop-2.7.0/lib/native/libhadooputils.a

hadoop-2.7.0/lib/native/libhdfs.a

hadoop-2.7.0/lib/native/libhdfs.so

hadoop-2.7.0/lib/native/libhadoop.so.1.0.0

hadoop-2.7.0/LICENSE.txt

Step24: itadmin@PLLAB-49:~\$ cd hadoop-2.7.0/

itadmin@PLLAB-49:~/hadoop-2.7.0\$ sudo nano /etc/profile
ADD THE BOLD LINES ALONE

```

# /etc/profile: system-wide .profile file for the Bourne shell (sh(1))
# and Bourne compatible shells (bash(1), ksh(1), ash(1), ...).

if [ "$PS1" ]; then
    if [ "$BASH" ] && [ "$BASH" != "/bin/sh" ]; then
        # The file bash.bashrc already sets the default PS1.
        # PS1='h:w\$'
        if [ -f /etc/bash.bashrc ]; then
            . /etc/bash.bashrc
        fi
    else
        if [ "`id -u`" -eq 0 ]; then
            PS1='# '
        else
            PS1='$ '
        fi
    fi
fi

```

JAVA_HOME=/home/itadmin/jdk1.8.0_60

Step25: HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0

```

PATH=$PATH:$JAVA_HOME/bin
PATH=$PATH:$HADOOP_PREFIX/bin

export PATH JAVA_HOME HADOOP_PREFIX

# The default umask is now handled by pam_umask.
# See pam_umask(8) and /etc/login.defs.

if [ -d /etc/profile.d ]; then
    for i in /etc/profile.d/*.sh; do
        if [ -r $i ]; then
            . $i
        fi
    done
    unset i
fi

```

itadmin@PLLAB-49:~/hadoop-2.7.0\$ source /etc/profile

itadmin@PLLAB-49:~/hadoop-2.7.0\$ cd \$HADOOP_PREFIX

itadmin@PLLAB-49:~/hadoop-2.7.0\$ bin/hadoop version

Hadoop 2.7.0
Subversion https://git-wip-us.apache.org/repos/asf/hadoop.git -r

```
d4c8d4d4d203c934e8074b31289a28724c0842cf  
Compiled by jenkins on 2015-04-10T18:40Z  
Compiled with protoc 2.5.0  
From source with checksum a9e90912c37a35c3195d23951fd18f  
This command was run using /home/itadmin/hadoop-2.7.0/share/hadoop/common/hadoop-common-2.7.0.jar
```

Step26: HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0

```
PATH=$PATH:$JAVA_HOME/bin  
PATH=$PATH:$HADOOP_PREFIX/bin  
  
export PATH JAVA_HOME HADOOP_PREFIX  
  
# The default umask is now handled by pam_umask.  
# See pam_umask(8) and /etc/login.defs.
```

```
if [ -d /etc/profile.d ]; then  
    for i in /etc/profile.d/*.sh; do  
        if [ -r $i ]; then  
            . $i  
        fi  
    done  
    unset i  
fi
```

```
itadmin@PLLAB-49:~/hadoop-2.7.0$ source /etc/profile
```

```
itadmin@PLLAB-49:~/hadoop-2.7.0$ cd $HADOOP_PREFIX
```

```
itadmin@PLLAB-49:~/hadoop-2.7.0$ bin/hadoop version
```

```
Hadoop 2.7.0  
Subversion https://git-wip-us.apache.org/repos/asf/hadoop.git -r  
d4c8d4d4d203c934e8074b31289a28724c0842cf  
Compiled by jenkins on 2015-04-10T18:40Z  
Compiled with protoc 2.5.0  
From source with checksum a9e90912c37a35c3195d23951fd18f  
This command was run using /home/itadmin/hadoop-2.7.0/share/hadoop/common/hadoop-common-2.7.0.jar
```

```
Step27: itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop$ nano hadoop-env.sh
```

ADD THESE LINES AT THE END, Dont MAKE ANY OTHER CHANGES

```
JAVA_HOME=/home/itadmin/jdk1.8.0_60  
HADOOP_PREFIX=/home/itadmin/hadoop-2.7.0
```

Save and come out

```
itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop$ nano core-site.xml
```

```
<configuration>
<property>
<name>fs.defaultFS</name>
<value>hdfs://localhost:9000</value>
</property>
</configuration>
```

Step28: itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop\$ nano hdfs-site.xml

```
<configuration>
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
</configuration>
```

Step29: itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop\$ cp mapred-site.xml.template mapred-site.xml

```
itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop$ nano mapred-site.xml
```

```
<configuration>
<property>
<name>mapreduce.framework.name</name>
<value>yarn</value>
</property>
</configuration>
```

Step30: itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop\$ nano yarn-site.xml

```
<configuration>
<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>
</configuration>
```

Step31: itadmin@PLLAB-49:~/hadoop-2.7.0/etc/hadoop\$ cd \$HADOOP_PREFIX
itadmin@PLLAB-49:~/hadoop-2.7.0\$ pwd

```
/home/itadmin/hadoop-2.7.0
```

itadmin@PLLAB-49:~/hadoop-2.7.0\$ bin/hadoop namenode -format

DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

```
16/05/28 12:18:57 INFO namenode.NameNode: STARTUP_MSG:
/*****STARTUP_MSG: Starting NameNode*****
```

```
STARTUP_MSG: host = PLLAB-49/127.0.1.1
STARTUP_MSG: args = [-format]
STARTUP_MSG: version = 2.7.0
STARTUP_MSG: classpath = /home/itadmin/hadoop-
2.7.0/etc/hadoop:/home/itadmin/hadoop-2.7.0/share/hadoop/common/lib/curator-
framework-2.7.1.jar:/home/itadmin/hadoop-2.7.0/share/hadoop/common/lib/java-
xmlbuilder-0.4.jar:/home/itadmin/hadoop-2.7.0/share/hadoop/common/lib/activation-
1.1.jar:/home/itadmin/hadoop-2.7.0/share/hadoop/common/lib/commons-httpclient-
3.1.jar:/home/itadmin/hadoop-
16/05/28 12:18:58 INFO common.Storage: Storage directory /tmp/hadoop-
itadmin/dfs/name has been successfully formatted.
16/05/28 12:18:58 INFO namenode.NNStorageRetentionManager: Going to retain 1
images with txid >= 0
16/05/28 12:18:58 INFO util.ExitUtil: Exiting with status 0
16/05/28 12:18:58 INFO namenode.NameNode: SHUTDOWN_MSG:
/*****
SHUTDOWN_MSG: Shutting down NameNode at PLLAB-49/127.0.1.1
*****
```

Step32: itadmin@PLLAB-49:~/hadoop-2.7.0\$ sbin/start-dfs.sh

```
Starting namenodes on [localhost]
localhost: starting namenode, logging to /home/itadmin/hadoop-2.7.0/logs/hadoop-itadmin-
namenode-PLLAB-49.out
localhost: starting datanode, logging to /home/itadmin/hadoop-2.7.0/logs/hadoop-itadmin-
datanode-PLLAB-49.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ECDSA key fingerprint is aa:39:e1:c4:a0:3d:34:f5:07:c9:24:69:f3:9e:69:5a.
Are you sure you want to continue connecting (yes/no)? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ECDSA) to the list of known hosts.
0.0.0.0: starting secondarynamenode, logging to /home/itadmin/hadoop-2.7.0/logs/hadoop-
itadmin-secondarynamenode-PLLAB-49.out
itadmin@PLLAB-49:~/hadoop-2.7.0$
```

jps - Java Virtual Machine Process Status Tool

Step33: itadmin@PLLAB-49:~/hadoop-2.7.0\$ sbin/start-yarn.sh

```
starting yarn daemons
starting resourcemanager, logging to /home/itadmin/hadoop-2.7.0/logs/yarn-itadmin-
resourcemanager-PLLAB-49.out
localhost: starting nodemanager, logging to /home/itadmin/hadoop-2.7.0/logs/yarn-itadmin-
nodemanager-PLLAB-49.out
```

itadmin@PLLAB-49:~/hadoop-2.7.0\$ jps

```
13601 SecondaryNameNode
13395 DataNode
19268 ResourceManager
19609 NodeManager
19742 Jps
13231 NameNode
```

```
itadmin@PLLAB-49:~/hadoop-2.7.0$ bin/hdfs dfs -mkdir /Annie
```

```
itadmin@PLLAB-49:~/hadoop-2.7.0$ cd ..
```

```
itadmin@PLLAB-49:~$ pwd
```

```
/home/itadmin
```

To make a directory

```
itadmin@PLLAB-49:~$ mkdir mr
```

To move a document:

```
itadmin@PLLAB-49:~$ mv mrsampledataltar.gz mr/
```

To change a directory

```
itadmin@PLLAB-49:~$ cd mr
```

```
itadmin@PLLAB-49:~/mr$ ls
```

```
mrsampledataltar.gz
```

Step34: itadmin@PLLAB-49:~/mr\$ tar zxvf mrsampledataltar.gz

```
file2.txt
```

```
file5.txt
```

```
file1.txt
```

```
file4.txt
```

```
file3.txt
```

Step35: itadmin@PLLAB-49:~/hadoop-2.7.0\$ bin/hdfs dfs -put /home/itadmin/mr/* /Annie

OUTPUT:

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
drwxr-xr-x	itadmin	supergroup	0 B	5/28/2016, 1:49:58 PM	0	0 B	Annie

Hadoop, 2014.

Step36: itadmin@PLLAB-49:~/hadoop-2.7.0\$ bin/hadoop jar share/hadoop/mapreduce/hadoop-mapreduce-examples-2.7.0.jar grep /Annie/file1.txt /op '(CSE)'

16/05/28 13:59:26 INFO client.RMProxy: Connecting to ResourceManager at /0.0.0.0:8032

16/05/28 13:59:27 INFO input.FileInputFormat: Total input paths to process : 1

16/05/28 13:59:27 INFO mapreduce.JobSubmitter: number of splits:1

16/05/28 13:59:27 INFO mapreduce.JobSubmitter: Submitting tokens for job:

job_1464422714543_0001

16/05/28 13:59:27 INFO impl.YarnClientImpl: Submitted application application_1464422714543_0001

16/05/28 13:59:27 INFO mapreduce.Job: The url to track the job: http://PLLAB-49:8088/proxy/application_1464422714543_0001/

16/05/28 13:59:27 INFO mapreduce.Job: Running job: job_1464422714543_0001

16/05/28 13:59:32 INFO mapreduce.Job: Job job_1464422714543_0001 running in uber mode : false

16/05/28 13:59:32 INFO mapreduce.Job: map 0% reduce 0%

16/05/28 13:59:37 INFO mapreduce.Job: map 100% reduce 0%

16/05/28 13:59:41 INFO mapreduce.Job: map 100% reduce 100%

16/05/28 13:59:41 INFO mapreduce.Job: Job job_1464422714543_0001 completed successfully

16/05/28 13:59:41 INFO mapreduce.Job: Counters: 49

File System Counters

FILE: Number of bytes read=20

FILE: Number of bytes written=230023

FILE: Number of read operations=0

FILE: Number of large read operations=0

FILE: Number of write operations=0

HDFS: Number of bytes read=884837
HDFS: Number of bytes written=106
HDFS: Number of read operations=6
Physical memory (bytes) snapshot=452300800
Virtual memory (bytes) snapshot=3885039616
Total committed heap usage (bytes)=320864256

Shuffle Errors

BAD_ID=0
CONNECTION=0
IO_ERROR=0
WRONG_LENGTH=0
WRONG_MAP=0
WRONG_REDUCE=0

File Input Format Counters

Bytes Read=106

File Output Format Counters

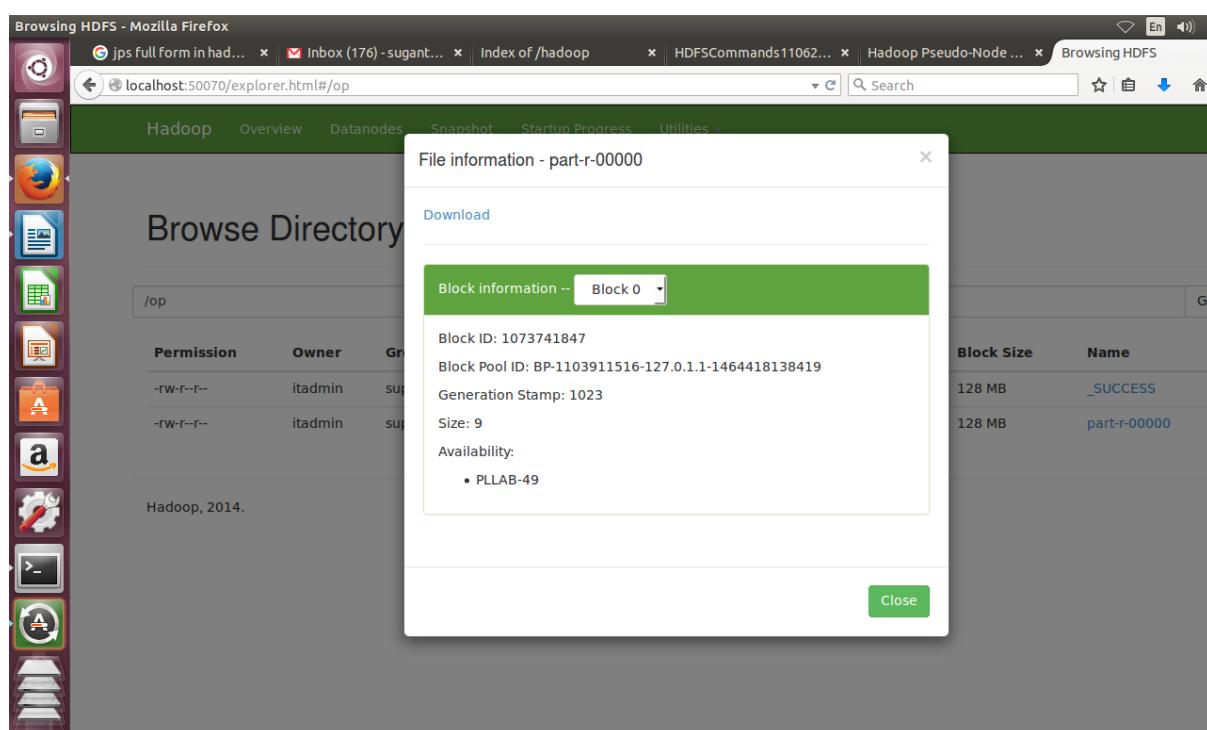
Bytes Written=9

In browser type “<http://localhost:50070/>”

Utilities → Browse the file system

Click on 'op'

Click on 'part-r-00000' → Download the file.



RESULT:

Thus the installation of hadoop procedure has been studied.

HADOOP SETUP AND INSTALLATION

EX. NO:6

DATE:

AIM:

To find the procedure to set up the one node Hadoop cluster.

HADOOP:

Apache Hadoop is an open-source software framework for storage and large-scale processing of data-sets on clusters of commodity hardware. Hadoop is an Apache top-level project being built and used by a global community of contributors and users. It is licensed under the Apache License 2.0.

The Apache Hadoop framework is composed of the following modules:

- **Hadoop Common** - contains libraries and utilities needed by other Hadoop modules
- **Hadoop Distributed File System (HDFS)** - a distributed file-system that stores data on commodity machines, providing very high aggregate bandwidth across the cluster.
- **Hadoop YARN** - a resource-management platform responsible for managing compute resources in clusters and using them for scheduling of users' applications.
- **Hadoop MapReduce** - a programming model for large scale data processing.

PROCEDURE:

Step1: Install Java

Check the Java version in the system.

“java -version”

Step2 Open the “/etc/profile” file and Add the following line as per the version to set a environment for Java

\$sudo vi /etc/profile

#--insert JAVA_HOME

JAVA_HOME=/opt/jdk1.8.0_05

#--in PATH variable just append at the end of the line

```
PATH=$PATH:$JAVA_HOME/bin
#--Append JAVA_HOME at end of the export statement
export PATH JAVA_HOME
$ source /etc/profile
```

Step3: Install SSH using the command

```
$ sudo apt-get install openssh-server openssh-client
```

Step4: Generate an SSH key for the user. Then Enable password-less SSH access

```
$ ssh localhost
$ ssh-keygen
$ exit
```

Step5: Hadoop installation:

- Download the tar.gz file of latest version Hadoop (hadoop-2.7.x) from the official site .
- Extract(untar) the downloaded file from commands

```
$ sudo tar zxvf hadoop-2.7.0.tar.gz
$ cd hadoop-2.7.0/
```

Step6: Update Hadoop environment variable in /etc/profile

```
$ sudo vi /etc/profile
#--insert HADOOP_PREFIX
HADOOP_PREFIX=/opt/hadoop-2.7.0
#--in PATH variable just append at the end of the line
PATH=$PATH:$HADOOP_PREFIX/bin
#--Append HADOOP_PREFIX at end of the export statement
export PATH JAVA_HOME HADOOP_PREFIX
Source the /etc/profile
$ source /etc/profile
Verify Hadoop installation
$ cd $HADOOP_PREFIX
$ bin/hadoop version
```

Step7: Update Java, hadoop path to the Hadoop environment file

```
$HADOOP_PREFIX/etcHado
p
$ vi core-site.xml
Paste following between <configuration> tags in core-site.xml
<property>
<name>fs.defaultFS</name>
<value>hdfs://localhost:9000</value>
</property>
```

```
$ vi hdfs-site.xml
```

Paste following between <configuration> tags in hdfs-site.xml

```
<property>
```

```
<name>dfs.replication</name> <value>1</value>
```

```
</property>
```

```
$ cp mapred-site.xml.template
```

```
mapredsite.xml $ vi mapred-site.xml
```

Paste following between <configuration> tags in mapred-site.xml

```
<property>
```

```
<name>mapreduce.framework.name</name>
```

```
<value>yarn</value>
```

```
</property>
```

```
$vi yarn-site.xml
```

Paste following between <configuration> tags in yarn-site.xml

```
<property>
```

```
<name>yarn.nodemanager.aux-services</name>
```

```
<value>mapreduce_shuffle</value>
```

```
</property>
```

Step8: Formatting the HDFS file-system via the NameNode

```
$bin/hadoop namenode -format
```

Step9: Start NameNode daemon and DataNode daemon: (port 50070)

```
$ sbin/start-dfs.sh
```

Step10: . Start ResourceManager daemon and NodeManager daemon: (port 8088)

```
$ sbin/start-yarn.sh
```

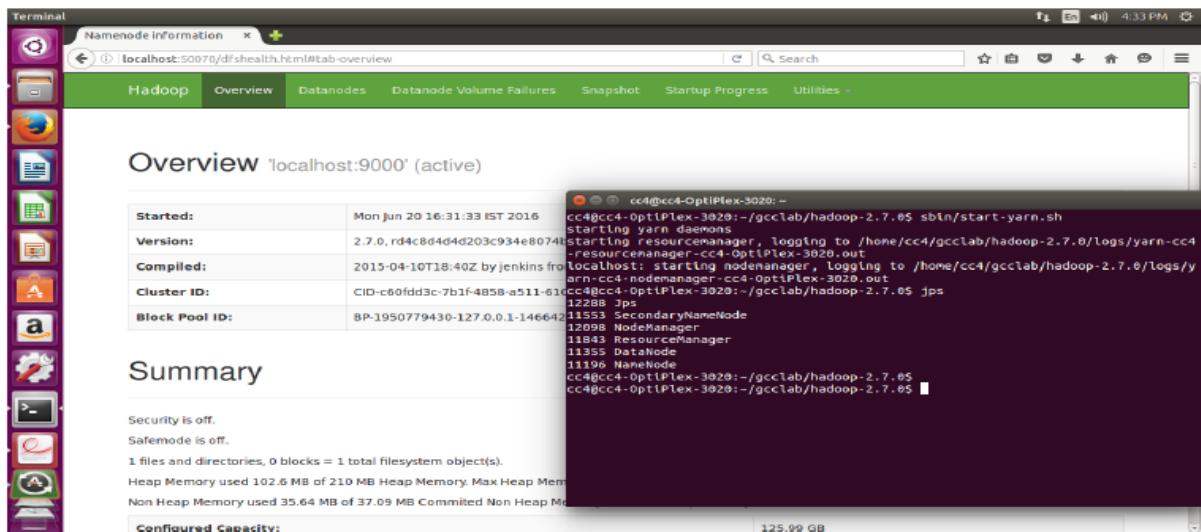
Step11: To stop the running process

```
$ sbin/stop-dfs.sh
```

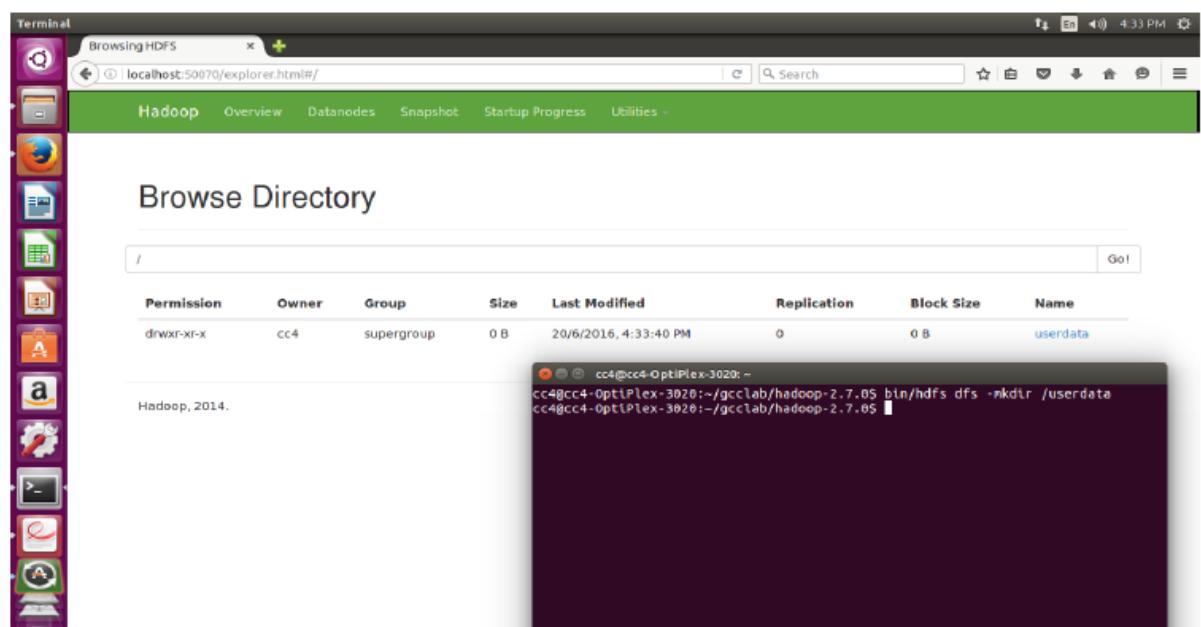
```
$ sbin/stop-yarn.sh
```

OUTPUT:

Hadoop installation:



Create the HDFS directories:



RESULT:

Thus the one node Hadoop cluster is installed successfully.

EX.NO:7

HADOOP CLUSTER USING FUSE

DATE:

AIM:

To mount the one node Hadoop cluster using FUSE.

PROCEDURE:

Step1: Download the cdh3 repository from the internet.

```
$ wget http://archive.cloudera.com/one-click-install/maverick/cdh3-
repository_1.0_all.deb
```

Step2: Add the cdh3 repository to default system repository.

```
$ sudo dpkg -i cdh3-repository_1.0_all.deb
```

Step3: Update the package information using the following command.

```
$ sudo apt-get update
```

Step4: Install the hadoop-fuse.

```
$ sudo apt-get install hadoop-0.20-fuse
```

Step5: Once fuse-dfs is installed, go ahead and mount HDFS using FUSE as follows:

```
$ sudo hadoop-fuse-dfs dfs://<name_node_hostname>:<namenode_port>
<mount_point>
```

RESULT:

Thus the one node Hadoop cluster is mounted using FUSE successfully.

EX.NO:8

API'S OF HADOOP

DATE:

AIM:

To write a program to use the API's of Hadoop to interact with it.

ALGORITHM:

Step1: Start NameNode daemon and DataNode daemon: (port 50070)

\$ sbin/start-dfs.sh

Step2: Start ResourceManager daemon and NodeManager daemon: (port 8088)

\$ sbin/start-yarn.sh

Step3: Make the HDFS directories required to execute MapReduce jobs:

\$ bin/hdfs dfs -mkdir /user

Step4: Copy the input files into the distributed filesystem:

\$ bin/hdfs dfs -put <input-path>/* /input

Step5: Run some of the examples provided:

\$ bin/hadoop jar share/hadoop/mapreduce/hadoop-mapreduce-examples-

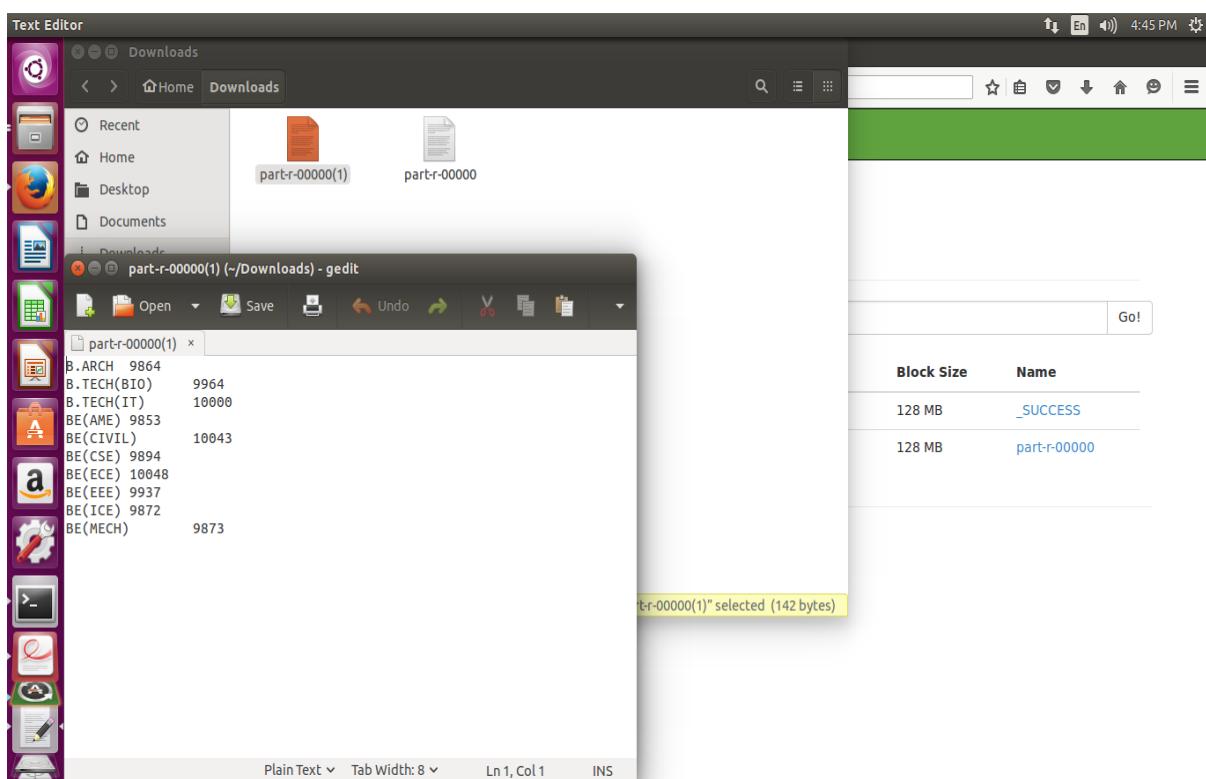
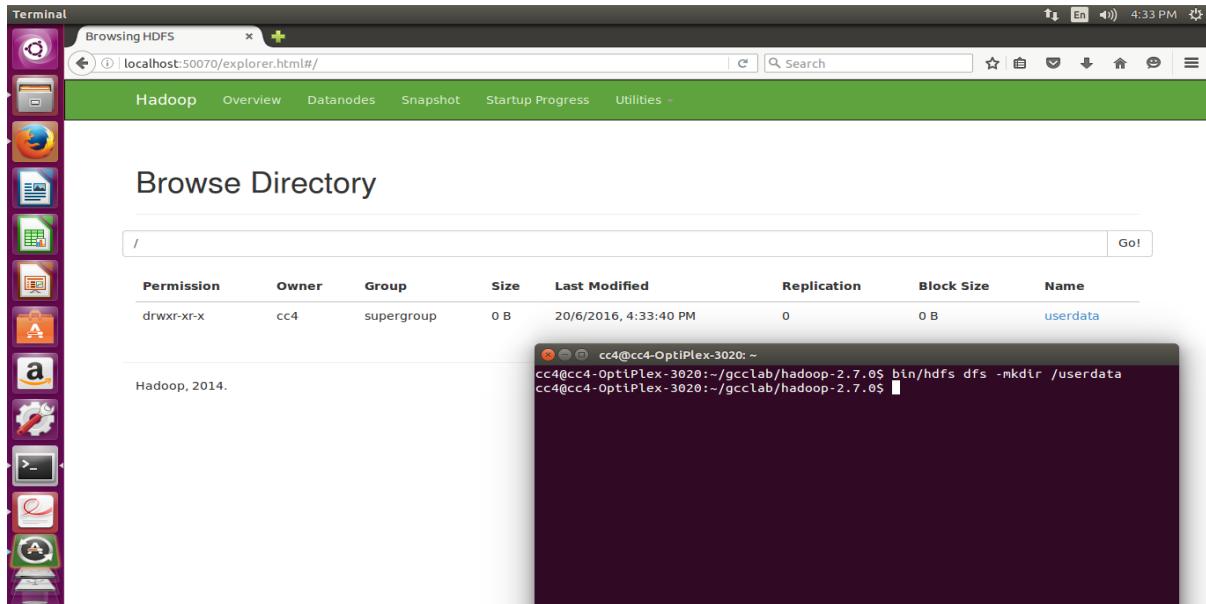
2.5.1.jar wordcount/input /output1

Step6: Examine the output files:

View the output files on the distributed filesystem:

\$ bin/hdfs dfs -cat /output/*

OUTPUT:



RESULT:

Thus the program to use the API of Hadoop is implemented successfully.

EXNO:9

MAP AND REDUCE - WORD COUNT

DATE:

AIM:

To write a word count program to demonstrate the use of Map and Reduce tasks.

MAP REDUCE:

MapReduce is a programming model and an associated implementation for processing and generating large data sets with a parallel, distributed algorithm on a cluster. A MapReduce program is composed of a **Map()** procedure that performs filtering and sorting and a **Reduce()** method that performs a summary operation.

- **"Map" step:** Each worker node applies the "map()" function to the local data, and writes the output to a temporary storage. A master node ensures that only one copy of redundant input data is processed.
- **"Shuffle" step:** Worker nodes redistribute data based on the output keys (produced by the "map()" function), such that all data belonging to one key is located on the same worker node.
- **"Reduce" step:** Worker nodes now process each group of output data, per key, in parallel.

PROGRAM:

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class WordCount {
    public static class TokenizerMapper extends Mapper<Object, Text, Text, IntWritable>{
        private final static IntWritable one = new
        IntWritable(1); private Text word = new
        Text();
        public void map(Object key, Text value, Context context ) throws IOException,
        InterruptedException

```

```

{
StringTokenizeritr=newStringTokenizer(value.to
String());
while(itr.hasMoreTokens()) {
word.set(itr.nextToken());
context.write(word, one);
}
}
}

public static class IntSumReducer extends Reducer<Text,IntWritable,Text,IntWritable> {
private IntWritable result = new IntWritable();
public void reduce(Text key, Iterable<IntWritable> values, Context context ) throws
IOException, InterruptedException { int sum = 0;
for (IntWritable val : values) {
sum += val.get();
}
result.set(sum);
context.write(key, result);
}
}

public static void main(String[] args) throws Exception {
Configuration conf = new Configuration();
Job job = Job.getInstance(conf, "word count");
job.setJarByClass(WordCount.class);
job.setMapperClass(TokenizerMapper.class);
job.setCombinerClass(IntSumReducer.class);
job.setReducerClass(IntSumReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
}
}

```

1. Set Environmental Variables:

```

export JAVA_HOME=/usr/java/default
export PATH=${JAVA_HOME}/bin:${PATH}
export HADOOP_CLASSPATH=${JAVA_HOME}/lib/tools.jar

```

2. Compile the source file to jar file,

```

$ bin/hadoop com.sun.tools.javac.Main
WordCount.java

```

```
$ jar cf wc.jar WordCount*.class
```

3. Run the Application

```
$ bin/hadoop jar wc.jar WordCount /user/joe/wordcount/input /user/joe/wordcount/output
```

OUTPUT:

```
$ bin/hadoop fs -cat /user/joe/wordcount/output/part-r-00000`
```

Bye 1

Goodbye 1

Hadoop 2

Hello 2

World 2`

RESULT:

Thus the word count program to demonstrate the Map and Reduce task is done successfully.

