Installing and Running MOVES on Linux

MOVES Workgroup
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Outline

- Why MOVES on Linux?
- MOVES components & tools for Linux
- Install Java Development Kit (JDK)
- Install MySQL & GUI tools
- Install MOVES application (code, databases, etc.)
- Configuration specific for Linux-MOVES
- Run MOVES & view/process results

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Why MOVES on Linux?

- **Popularity**

  Make MOVES available to large population of Linux-users (in addition to Windows users)

- **Performance**

  Look for performance improvement on systems other than Windows

- **Prerequisite for cloud computing**

  Cloud technologies are the solution to the challenge/demand of running MOVES hundreds of thousand times with satisfactory turn-around time. Today leading cloud environments are Linux based.

- **Portability**

  MOVES has been designed with a goal of being portable and platform-independent, and can be installed on Linux

MOVES Components & Tools for Linux

- **Java JDK (v 1.6.0_12) (required)**
- **MySQL (v 5.1.32; community version) (required)**
- **MOVES application (required)**
  - Java code, database(s), support files, Java doc, etc.
- **Query Browser (optional but recommended)**
- **Microsoft Open DataBase Connectivity (ODBC) connector (optional)**

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Tips Before Installation (1/2)

- Log in as root user, or a user with administrative rights (sufficient user rights to install software)
- Stop firewall
- Disable SELinux (Security-Enhanced Linux)
- dos2unix - converts DOS files to Linux format

  unix2dos - converts Linux files to DOS format
- Allow MySQL to write to the MOVES directory
- Disable AppArmor (Ubuntu) (see Appendix C)

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Tips Before Installation (2/2)

- **Red-hat, Ubuntu, CentOS and other Linux systems**
  - Materials and examples shown in this presentation are based on our experience on Linux machines such as Ubuntu, CentOS and Oracle Red Hat Linux. For other Linux systems, the installations may vary but the principles and basics are similar.
  - The support of Linux-MOVES by EPA MOVES team is limited at this time due to lack of resources.

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Install Java

Install Java Development Kit (JDK)

Two methods:

- **Method 1: Use Linux-OS system provided feature**

  (Java version ?)
- **Method 2: Use manual installation (recommended)**

  (Java version provided by MOVES team)

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Install Java Development Kit (JDK) (Method 1)

Method 1: Use Linux-OS system provided feature

- Step 1: Go to Applications -> System -> Add/Remove Software. (you'll need to login as root user)
- Step 2: Select the appropriate Java application and install.

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Install Java Development Kit (JDK) (Method 2) (1/2)

Method 2: Manual installation (recommended)

1. Get Java JDK

- From Sun Microsystems/Oracle web site (https://cds.sun.com/is-bin/INTERSHOP.enfinity/WFS/CDS-CDS_Developer-Site/en_US/-/USD/ViewProductDetail-Start?ProductRef=jdk-6u12-oth-JPR@CDS-CDS_Developer)

- Select "Linux" from the pull-down menu. Download "jdk-6u12-linux-i586.bin" to the Desktop

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Install Java Development Kit (JDK) (Method 2) (2/2)

2. Open a terminal (window/screen) and enter the following commands to install:

- Sudo mkdir /opt/java
- Cd /opt/java
- Sudo mv ~/Desktop/jdk-6u12-linux-i586.bin
- Sudo chmod +x jdk-6u12-linux-i586.bin
- Sudo ./jdk-6u12-linux-i586.bin

Follow instructions to complete the installation.

Install MySQL

Install MySQL on Linux

Two methods:

- **Method 1: Use Linux-OS system provided feature**

  (MySQL version ?)

- **Method 2: Use manual installation (recommended)**

  (MySQL version provided by MOVES team)

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Install MySQL on Linux (Method 1)

Method 1: Use Linux-OS system provided feature

- Step 1: Go to Applications -> System -> Add/Remove Software. (you'll need to login as root user)
- Step 2: Select the appropriate MySQL application and install.

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Install MySQL on Linux (Method 2) (1/2)

Method 2: Manual installation (recommended)

1. **Download MySQL** from MySQL web site (http://www.mysql.com/downloads/mysql/) . Get the MySQL server by selecting
   - "Linux-Generic" (or other type of Linux that fits your system) from the pull-down menu.
   - Download
     - MySQL-server-5.1.xx-x.glibc23.x86_64.rpm"(for 64-bit), or
     - MySQL-server-5.1.xx-x.glibc23.i386.rpm (for 32-bit)

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Install MySQL on Linux (Method 2) (2/2)

2. **Open a terminal** and enter the following commands:
   - sudo mkdir /usr/bin/mysql
   - cd /usr/bin/mysql
   - sudo mv ~/Desktop/MySQL-server-5.1.xx-x.glibc23.i386.rpm /usr/bin/mysql
   - sudo chmod +x MySQL-server-5.1.xx-x.glibc23.i386.rpm
   - **sudo rpm –i MySQL-server-5.1.xx-x.glibc23.i386.rpm**

   Follow instructions. A successful message appears if MySQL has been installed.
3. **Change MySQL** to meet your need: modify my.cnf

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An Example of Installing MySQL on Ubuntu Linux

- Appendix A: an example of installing MySQL on Ubuntu. (attached in this presentation)

Install MOVES Application

Install MOVES Application (1/3)

1. Download the MOVES Installation Suite and the instruction file from EPA web site to your computer. http://www.epa.gov/otaq/models/moves/index.htm
2. Following instructions to unzip the Installation Suite, then run the MOVES installation program via using the following command:

   java -jar MOVESInstallationPackage.jar

- The install wizard will guide you to complete the MOVES installation.

Install MOVES Application (2/3)

Some Tips for Installing MOVES

- **Enter MySQL data folder**: When prompted for the directory of the MySQL data folder, browse for or type the directory path specified during the MySQL installation. E.g., /var/lib/mysql
- **Enter a desired MOVES install folder**: When prompted, select an installation directory for MOVES. MOVES can be installed to any director y.
- **Skip creating shortcuts**: When the "Setup Shortcuts" window appears, uncheck "Create shortcuts in the Start Menu" and continue with the installation.

Install MOVES Application (3/3)

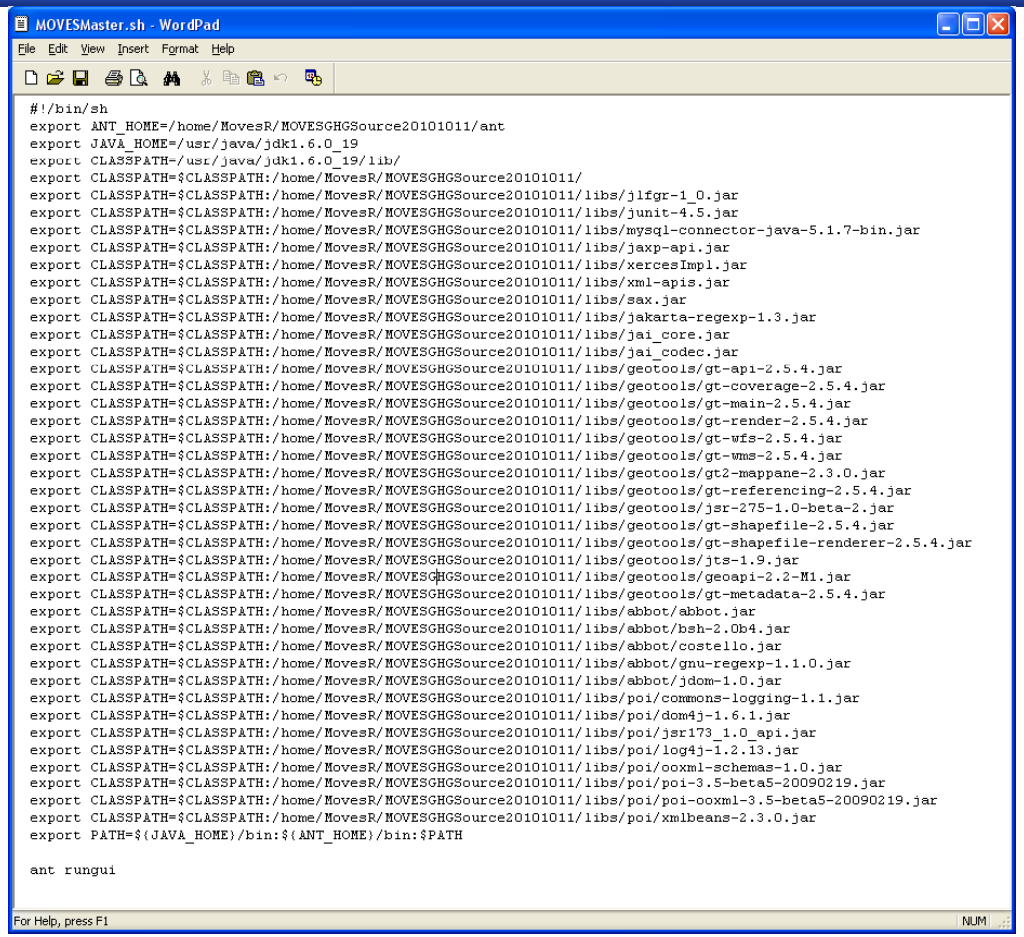
A Few Changes to Wrap up Installation

Edit MOVESConfiguration.txt and WorkerConfiguration.txt

- Replace all backslashes ("\") with slashes ("/").
- **Change MOVES directory and subdirectories**: default home directory is "C:\EPA\MOVES\MOVESGHGSource"; replace it with the actually directory specified during MOVES installation. Do the same for subdirectories.
- **Change database names** such as defaultDatabaseName, outputDatabaseName, and workerDatabaseName to lowercase, and remove the directory paths.

Create the shell scripts for running MOVES (See Appendix B for details)

Example Shell Script (MOVESMaster.sh)



Configuration Specific for Linux-MOVES

Configuration Specific for Linux-MOVES (1/3)

Case Sensitive in Linux

1. **Change the database name to lowercase**, e.g., from "MOVESDB20100830" to "movesdb20100830"
2. **Change all filenames in the MOVES database to lowercase, except for the extensions**: (Note MYD & MYI in upper case)
   - cd movesdbyyyymmdd
   - sudo rename 'y/A-Z/a-z/' *
   - sudo rename 's/.myd$/.MYD/' *.myd
   - sudo rename 's/.myi$/.MYI/' * myi

Configuration Specific for Linux-MOVES (2/3)

File Permissions on Linux

3. Set ownership and permissions on the database files:

- sudo chown -R mysql movesdbyyyymmdd/
- sudo chmod -R a=rwx movesdbyyyymmdd/

Configuration Specific for Linux-MOVES (3/3)

Permissions within MySQL on Linux

4. Start the MySQL client (log in as root user), and grant all database privileges to the anonymous user:

   mysql –root or **mysql –root -p**

   mysql> **use movesdbyyyymmdd**

   mysql> **grant all privileges on movesdbyyyymmdd to ''@'localhost';**

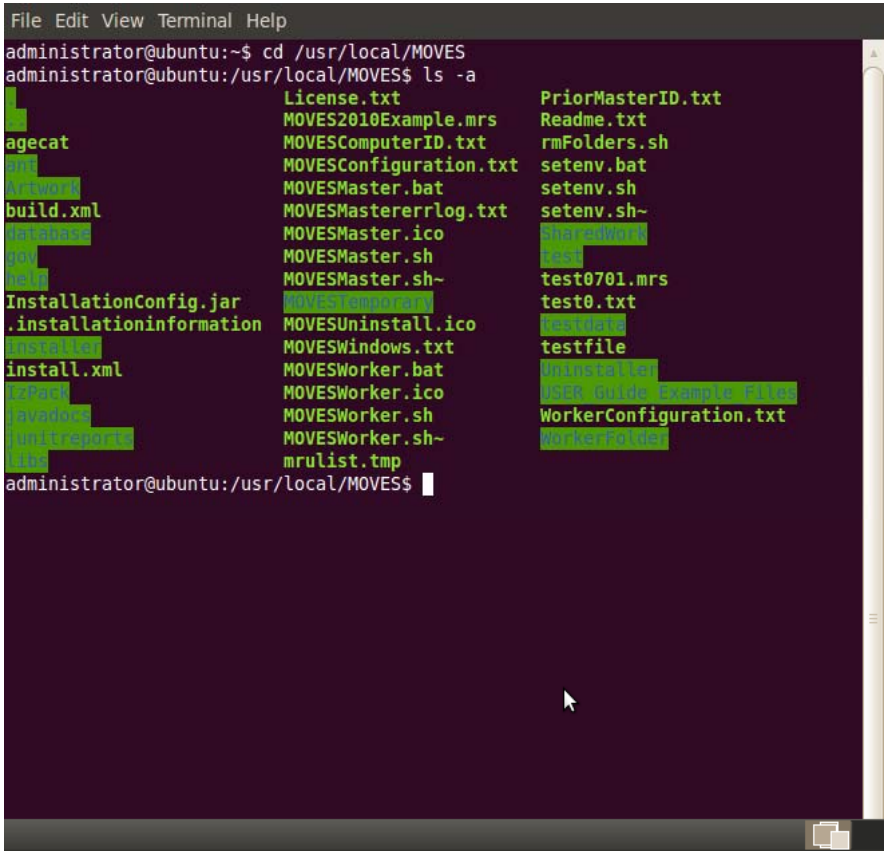
   Alternatively, you can use MySQL Administrator (a GUI tool) to do the above granting privileges).

Run MOVES & View/Process Results

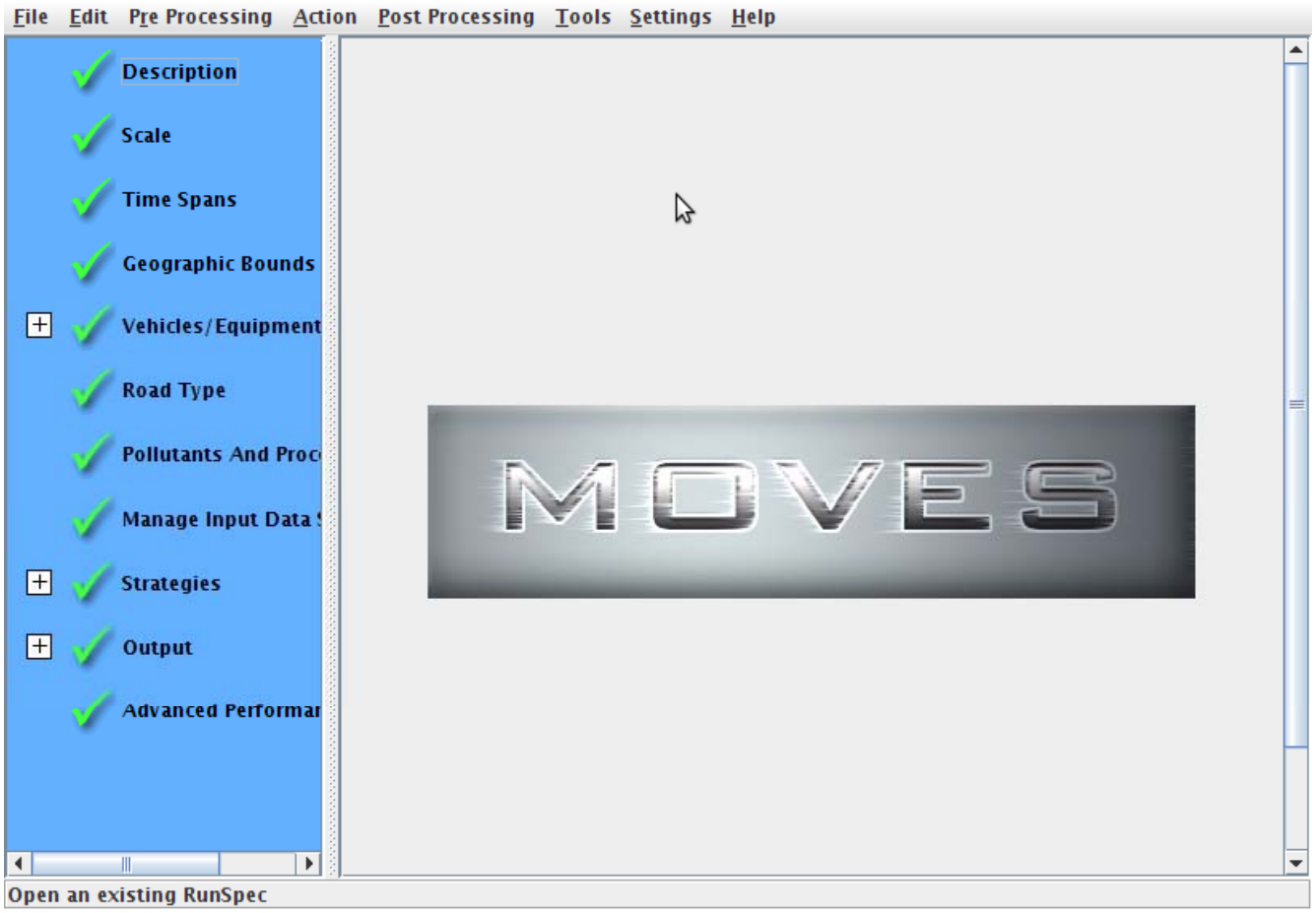
Run MOVES

- Open a terminal (screen)
- Change directory to MOVES home directory
- Enter “ /MOVESMaster.sh” (to start MOVES master)
- Load a runspec, and
- Click Action -> Execute to run.

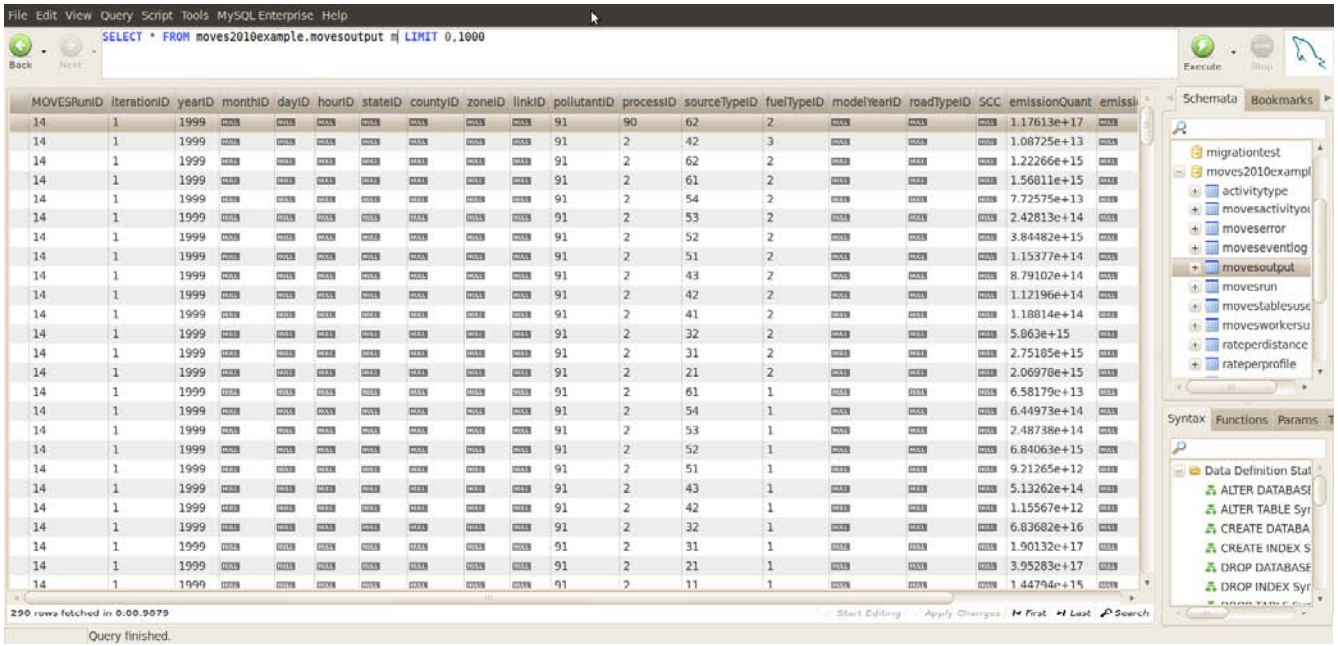
Linux Terminal Screen



MOVES Main Screen



Using MySQL Query Browser to View and Work with MOVES Output



Thank You!

Appendix A:

An Example of Installing MySQL on Ubuntu System

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Install MySQL on Ubuntu Linux (1/6)

1. Go to Applications -> System -> Administration -> Synaptic Package Manager (or you may see System -> Administration -> Synaptic Package Manager.)
2. Enter your password, and open Edit -> Search.
3. In the "Look in:" drop-down box, select "Description and Name“.
4. In the "Search:" box, type "mysql," then click "Search".
5. Find "mysql-server-5.1," right-click it, and select "Mark for Installation". In the "Mark additional changes?" window select "Mark". Make sure "mysql-client-5.1" is selected. Select "mysql-admin" and "mysql-query-browser", and click "Apply".

Install MySQL on Ubuntu Linux (2/6)

6. If the MySQL server is running, stop it:

   $ sudo service mysql stop

   or

   $ sudo /etc/init.d/mysql stop

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Install MySQL on Ubuntu Linux (3/6)

7. Copy a configuration file into the /etc directory:

```
$ sudo cp /usr/local/mysql/share/mysql/my-large.cnf
/etc/my.cnf
```

There are a number of sample configuration files in /usr/local/mysql/share/mysql/ which are suited for different purposes. Any one should work, but here we have used my-large.cnf.

Install MySQL on Ubuntu Linux (4/6)

- 8. Edit the file /etc/my.cnf:

  a) Add the line lower_case_table_names = 1 under the [mysqld] group if it does not already exist, or set it to 1 otherwise.

  b) Add user = root under the [mysqld] group.

Install MySQL on Ubuntu Linux (5/6)

9. Restart the computer, and run the MySQL Administrator from the Applications => Programming menu.
    a) Enter localhost for the Server Hostname, and root for the username, and click "Connect". It's required to set the hostname to "localhost" in MySQL, not "localhost.localdomain".
    b) Make sure the port 3306 was opened up already for MOVES connections.
    c) Select the "User Administration" menu, and select the "root" user.

Install MySQL on Ubuntu Linux (6/6)

d) Clear the "New Password" and "Confirm Password" boxes, and click "Apply Changes".

e) Click "New User", clear the "MySQL User", "New Password", and "Confirm Password" boxes, and click "Apply Changes". This sets up an anonymous user account that MOVES uses to connect to MySQL server.

f) Start the MySQL client in the terminal:

$ /usr/local/mysql/bin/mysql

Find the data directory, where the MOVES database files will be installed later:

mysql> SHOW VARIABLES LIKE 'datadir';

The result should be something like /var/lib/mysql.

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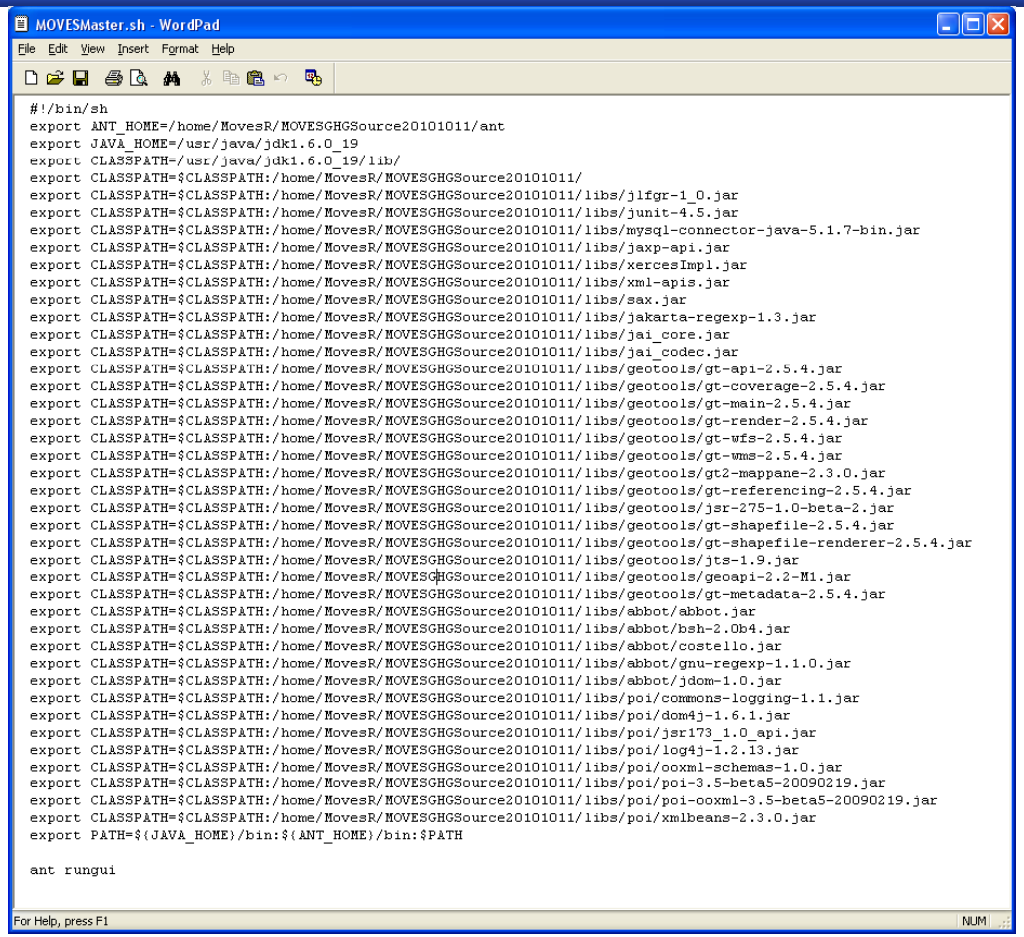
Appendix B:
Create Shell Scripts

Example Shell Script (MOVESMaster.sh)



a) Create a file named MOVESMaster.sh (or MOVESWorker.sh), and paste the contents of MOVESMaster.bat (MOVESWorker.bat) into it.

b) Delete the line "@echo off", and replace it with "\#!/bin/sh".

c) Delete the lines that look like this:

if exist directoryname*.* erase /Q /S /F directoryname\ *.*

and replace them with:

if [-d DirectoryName/]

then

rm -r DirectoryName/*

fi

There should be two such lines: one for SharedWork, and one for WorkerFolder. Because Ubuntu's file system is case sensitive, be sure to use the same case as the directory name in the replacement lines above.

d) Delete the line "call setenv.bat", and replace it with the contents of setenv.bat.

e) Replace all occurrences of environment variables enclosed in % symbols (such as %CLASSPATH%) with a $ followed by the variable name (such as $CLASSPATH). Replace semicolons after variable names with colons. If your text editor supports regular expression search-and-replace, you can do this easily by replacing %(\w+)%; with $\1: If you are using Emacs, use instead the expression %\(\w+\)%: for the first expression.

f) Replace any remaining semicolons with colons, replace all backslashes with slashes, and replace all occurrences of the word set with export.

g) Change the JAVA_HOME variable to point to /opt/java/jdk1.6.0_12, and make sure that all directory paths are using the correct case.

h) Change the ANT_HOME variable to point to /usr/local/MOVES/ant.

i) Change to the ant/bin directory and fix the ant script so that it works in Unix:

$ cat -v ant/bin/ant

If each line of the text that is output to the terminal ends with ^M, then ant needs to be fixed. If not, the following steps are unnecessary, but not harmful. Enter the following:

$ cd ant/bin

$ mv ant ant.bak

$ tr -d '\r' < ant.bak > ant

The above command should work in most cases, but if not try:

- $ perl -pe 's/\r\n|\r|\n/\n/g' ant.bak > ant
- Use dos2unix

j) Repeat step i for MOVESMaster.sh and MOVESWorker.sh if necessary.

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Appendix C: Troubleshooting

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Troubleshooting (1/4)

- **ERROR 1 (HY000): Can't create/write to file 'filename' (Errcode: 13). This may be caused by the AppArmor security suite (https://help.ubuntu.com/community/AppArmor).**
- **Fixes**
  - Allow MySQL to write to the MOVES directory.
  - Disable AppArmor.

Troubleshooting (2/4)

- **Allow MySQL to write to the MOVES directory**
  - $ sudo gedit /etc/apparmor.d/usr.sbin.mysqld
  - Add the following to the last line above the closing }:

  - /usr/local/MOVES/** rw
  - Or (if MOVES was install at ../MOVES2010a)
  - /usr/local/MOVES2010a/** rw

Troubleshooting (3/4)

- **Disable AppArmor**
  - $ sudo invoke-rc.d$_{\text{apparmor s}}$ top
  - $ sudo update-rc.d -f apparmor remove
  - Then restart your computer.
  - $ mysql
  - mysql> USE movesdb20100830;
  - mysql> SELECT * FROM agecategory INTO OUTFILE '/usr/local/MOVES/agecategory‘

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Troubleshooting (4/4)

- **Permission error is most common on Linux system. Use the following commands to fix.**
  - chmod
  - umask 000
  - …