Quick guide for using the lab machines

R.S. Ashwin Kumar

July 1, 2017

Please go through the document carefully. The document contains detailed instructions on how to setup and invoke cadence, MATLAB and other details on using the lab machines.

1 Servers in the lab

There are basically 4 servers in our labs.

1. LDAP server (Network IP address : **10.21.17.104**; "Physical address" : DSDL lab): When you login to a system by entering the username and password, the authentication comes from a LDAP server which stores the login details for all the users. If you are still using the password created by default, change your password by typing `passwd` in the terminal and type the old and new passwords.
2. Home server (Network IP address : **10.21.17.1**; "Physical address" : TI lab
   (a) Once you login to your machine, you will find a folder `/home/<username>`. This is not physically preent in the hard-disk of your PC but it is located in a central server which we refer to as the home server. In the terminal, typing

   >> cd ∼

   will take you to your home directory.
   Any path written as ∼`/dir1/dir2` means it is actually `/home/<username>/dir1/dir2`.
   (b) Each user has a quota of 10GB, implying the the size of the all the files `/home/<username>` should not exceed beyond 10GB. Hence it is adviced to store only important data here like your projects in this directory.
   (c) Some more info about the PC :
      i. Apart from /home, there are two more partitions which are locally present in the hard-disk.
      - /cad : contains all the related software tools and the PDK kits
      - /data : Each user will have access only to the folder `/data/<username>`. Here is where you can store all other data.
3. Backup server (Network IP address : **10.21.17.2**; "Physical address" : TI lab) :
   (a) The contents of `/home/<username>/cadence_project` will be backed up every day at 2:45AM, and the backup server will have the backup of the last three days.
   (b) To access the backup data, login to 10.21.17.2 with username as "`guest`" and password as "`guest`". The backup data is in `/backup/home`. To see the data from the previous day go to `/backup/home/current/<username>`, to access the data from the day before, go to `/backup/home/day-1/<username>` and so on till day-3.
4. License servers : We have three license servers from which contain the license for cadence.
   (a) ams 91 - IP :10.21.17.91 (TI lab),
   (b) ams 98 & ams101 - IP : 10.21.17.98 & 10.21.17.101 (both in DSDL lab)

2 Starting cadence :

Cadence binary files are already copied to all the machines. Confirm it by checking if these folders exist `/cad/tools/cadencetools` & `/cad/tools/cadencetools/MMSIM151` (If not contact Ashwin or Janaki madam). Then follow the instructions given below.

Step 1:

Create a file with the name `.cshrc` in your home `(/home/<username>)`. Copy and paste the following contents but replace <username> with your name in Calibre section. (Find & replace "<username>" with your actual username in gedit).

```
#!/bin/sh
##############################################
# CAD Tools Environment
#setting the environment variables for cadence
##############################################
setenv CDS_INST_DIR /cad/tools/cadencetools/IC617
setenv CDSHOME $CDS_INST_DIR
setenv MMSIMHOME /cad/tools/cadencetools/MMSIM151

set prompt = "[%n@%m %c]"$ # PROMPT remainder for the shell
umask 002 # Create new files with rwxrwxr--
limit coredumpsize 0

setenv EDITOR gvim # Default text editor is gvim
setenv LANG C # set language to english to make Zoom working
setenv XTAPPPEEKEVENT_SKIPTIMER 1 #for latest X11 code Cadence needs
setenv CLS_CDSD_COMPATIBILITY_LOCKING NO #for Linux, Cadence needs
setenv DD_DONT_DO_OS_LOCKS set
unset OA_BIT
unset OA_MODE
set path = ( $CDSHOME/tools/bin $CDSHOME/tools/dfII/bin $path )
set path = ( $MMSIMHOME/tools/bin $MMSIMHOME/tools/dfII/bin $path)
setenv CDS_Netlisting_Mode Analog # required for analog/microwave tools
setenv CDS_NUM_USER_COLORS 63 # in 8bit graphics mode: leave some free colors for other apps
setenv CDS_AUTO_64BIT ALL
setenv XKEYSYMDB /usr/share/X11/XKeysymDB
setenv CDS_CMI_COMPLEVEL 0
setenv ASSURA_UI_NONMEMDATA
setenv CDS_AHDLCMI_ENABLE NO

###################################
# License Environment Variables
###################################
setenv CDS_LIC_FILE 5280@ams91:5280@ams101:5280@ams98
setenv MGLS_LICENSE_FILE 1717@ams91:1717@ams98:1717@ams101

#########Calibre############
setenv MGC_HOME /cad/tools/mentor/calibre_2016 #2016 Mentor graphics calibre
setenv MGC_TMPDIR /data/<username>/tmp

###################################
# MODELSIM
alias vsim "/cad/tools/mentor/AMS162/questasim/v10.5b/bin/vsim"

######INCISIVE151######
```

```
    set path=($path /cad/tools/cadencetools/INCISIVE151/lnx86/bin /cad/tools/cadencetools \
/INCISIVE151/lnx86/tools.lnx86/bin )
    set LD_LIBRARY_PATH = /cad/tools/cadencetools/INCISIVE151/lnx86/tools.lnx86/lib

    ######INNOVUS######
    alias innovus '/cad/tools/cadencetools/INNOVUS152/bin/innovus'
    set path = ($path /cad/tools/cadencetools/INNOVUS152/bin)
    set LD_LIBRARY_PATH = ( $LD_LIBRARY_PATH /cad/tools/cadencetools \
/INNOVUS152/tools.lnx86/lib/ )

    ######GENUS######
    alias genus '/cad/tools/cadencetools/GENUS152/bin/genus'
    set path = ($path /cad/tools/cadencetools/GENUS152/bin)
    set LD_LIBRARY_PATH = ($LD_LIBRARY_PATH /cad/tools/cadencetools \
/GENUS152/tools.lnx86/lib/)

    #####CONFRML######
    set path = ( $path /cad/tools/cadencetools/CONFRML161/bin )
    set LD_LIBRARY_PATH = ( $LD_LIBRARY_PATH /cad/tools/cadencetools \
/CONFRML161/tools.lnx86/lib/ )

    ######QRC######
    setenv QRC_HOME /cad/tools/cadencetools/EXT152
    set path = ($path /cad/tools/cadencetools/EXT152/bin $QRC_HOME \
/tools.lnx86/dfII/bin $QRC_HOME/tools.lnx86/bin $QRC_HOME/oa_v22.50.034/bin)
    set LD_LIBRARY_PATH = ($LD_LIBRARY_PATH /cad/tools/cadencetools \
/EXT152/tools.lnx86/lib /cad/tools/cadencetools/EXT152/tools.lnx86/lib/64bit)
```

The above cshrc file sets the environment variables required for cadence, Calibre, Modelsim, Genus & Innovus which are the most commonly used tools.

Terminal commands to do the above steps :

```
>>  cd ~
>>  gedit .cshrc
```

This will create the .cshrc file and open in gedit (a text editor) to which you can copy-paste the contents.

Step 2 :

- Create a file named `.cdsinit` in your home directory and copy the following contents to it but replace "<username>" with your username in line 7.

```
editor = "gedit"
load("~/bindkeys/bindkeys_sch")
load("~/bindkeys/bindkeys_layout")
load("~/bindkeys/bindkeys_awv")
load("~/bindkeys/bindkeys_sym")
load("~/bindkeys/bindkeys_ciw")
envSetVal("asimenv.startup" "projectDir" 'string "/data/<username>/simulation")
envSetVal("asimenv.misc" "numberOfSavedRuns" 'int 5)
envSetVal("layout" "xSnapSpacing" 'float 0.01)
```

envSetVal("layout" "ySnapSpacing" 'float 0.01)

envSetVal("ui" "undoLevel" 'int 10)

load(strcat(getShellEnvVar("MGC_HOME") "/shared/pkgs/icv/tools/queryskl/calibre.OA.skl"))

ddsOpenLibManager()

mgc_eview_globals~>importSchematicProperties=nil

envSetVal("asimenv.startup" "remoteTimeOut" 'int 100)

- Copy the folder `bindkeys` to your home from the following path :
  `/home/ee13d058/bindkeys`

Terminal commands to do the above :

```
>>  cd ~
>>  gedit .cdsinit
```

Copy-paste the contents; save and close the file.

```
>>  cp -rf /home/ee13d058/bindkeys ~/
```

The last command copies the folder from the source location `/home/ee13d058/bindkeys` to the destination location `~/` (your home directory).

IMPORTANT CHECK :

Line 7 : ‘‘`envSetVal("asimenv.startup" "projectDir" 'string "/data/<username>/simulation")`”

defines the path where the simulation data is stored.

Please ensure that this is set to `/data/<username>/simulation`. If this is not set, the default location will be `~/simulation`. And if the simulation is a bit long, the data dumped in this folder will be huge and it will easily fill up your quota.

But most importantly it will load the network heavily and will slow the access to /home for everyone, since /home is accessed from a separate home server and not present locally in the hard-disk.

This has happened quite a number of times and so it is always safe to check in ADE : Setup->Simulator directory and confirm it is `/data/<username>/simulation` before starting the simulation.

Step 3 :

- As already mentioned contents in `~/cadence_project` will be backed up daily. So if you want your cadence project to be backed up, run cadence from `cadence_project` folder.
- After navigating to the path where you want to run cadence, create a file “`cds.lib`”. This will contain the list of all the libraries you want to include. The following lines will include the libraries which will be needed.

DEFINE analogLib /cad/tools/cadencetools/IC617/tools/dfII/etc/cdslib/artist/analogLib

DEFINE basic /cad/tools/cadencetools/IC617/tools/dfII/etc/cdslib/basic

DEFINE cdsDefTechLib /cad/tools/cadencetools/IC617/tools/dfII/etc/cdsDefTechLib

DEFINE ahdlLib /cad/tools/cadencetools/IC617/tools.lnx86/dfII/samples/artist/ahdlLib

DEFINE rfLib /cad/tools/cadencetools/IC617/tools.lnx86/dfII/samples/artist/rfLib

DEFINE US_8ths /cad/tools/cadencetools/IC617/tools.lnx86/dfII/etc/cdslib/sheets/US_8ths

###PDK###

#DEFINE UMC_18_CMOS /cad/library/UMC_180_AUG_15 \
/G-9FD-MIXED_MODE_RFCMOS18-1.8V_3.3V-1P6M-MMC_ \
UM180FDKMFC00000OA-FDK-Ver.A02_PB \
/UM180FDKMFC00000OA_A02_DESIGNKIT \
/UM180FDKMFC00000OA_A02_PB/UMC_18_CMOS

#DEFINE tsmcN65 /cad/library/TSMC/65/lp/tsmcN65

- Ideal resistors, capacitors, voltage sources and similar components are available in analogLib.
- ahdlLib contains veriloga/ahdl models for various blocks.
- The last section commented as "pdk" contain the definitions for the common pdks used in our group. Uncomment the one which you will use.

Terminal commands to do the above :

```
>>   mkdir ~/cadence_project
>>  cd ~/cadence_project
>>  gedit cds.lib &
```

Copy paste the contents. (the "&" at the end of the last line will execute the command before "&" and will return back to the command prompt immediately or after pressing Enter key; try executing the same command without "&" to see the difference)

Step 4 :

- Type `tcsh`. This will execute the commands in `~/.cshrc` file by default and all the necessary environment variables will be set. This is commonly called as sourcing the cshrc
  - You can have the same contents stored in a different file say `.cshrc_abc` and in a different location say `~/dir1/dir2/.cshrc_abc`. In that case after typing `tcsh`, explicitly source the file by
    ```
    >>  tcsh
    >>  source ~/dir1/dir2/.cshrc_abc
    ```
- Go to the location where you want to run cadence from (say `cadence_project` folder). Type `cd ~/cadence_project`
- Type `virtuoso &`

3 Simulations using Cadence

For starters, the following link will be useful http://www-classes.usc.edu/engr/ee-s/477p/cadencetutorial.pdf. You can also learn from other videos/tutorials available online.

4 Starting MATLAB

- MATLAB should be installed in all the machines. Confirm it by checking if either of these paths exist : `/cad/tools/MATLAB/R2012b` or `/cad/tools/MATLAB/MATLAB2016a`. (If not contact Janaki Mam or Ashwin)
- You can then invoke MATLAB (say 2012b version) from the terminal by
  >> `/cad/tools/MATLAB/R2012B/bin/./matlab` &
- If you do not want to type this full path everytime, you can add what is called an "alias" statement in your .cshrc file. At the end of your .cshrc file add the below line

  ```
  alias matlab12 /cad/tools/MATLAB/R2102b/bin/matlab
  ```

  The above statement defines "matlab12" as an alias for the entire path and so after you source the `.cshrc`

file (which happens automatically when you type `tcsh`), typing `matlab12` will launch MATLAB.

```
>>  tcsh
>>  matlab12 &
```

(You can add alias statement for any application like this)

- If you get a licensing error, you need to get access from the computer center and so drop a mail to hpce@iitm.ac.in, requesting access to MATLAB. Send them the error message you get and also mention your IP address and MAC address. IP&MAC addresses can be found using the command `ifconfig;` In the first section of the output, the address shown under `inet` is your IP address (should be `10.21.17.X`) and the one shown as `ether` is your MAC address

5 VNC sessions

It's very useful to always work by logging into a VNC (Virtual Network Computing) session. Working in a VNC session enables one to access the lab machines from the hostel or any other machine on campus. Even when one is working in the lab, it is always useful to work through a VNC session since the session is kept alive and you can login to any machine and invoke the session.

Starting a VNC server

Let's say that the IP of your lab machine is 10.21.17.X. In order to use a VNC session, first you need to create a VNC server on the machine for which you want a virtual access. The command for creating the server is given below

```
>> vncserver -depth 24 :N
```

where N is the session number. You could also specify the screen resolution you want by adding an extra option `-geometry` but the TigerVNC server/viewer which is what is being used in our machines can auto-adjust the resolution automatically. If you are creating VNC server for the first time it will ask for a password and after confirming the password your session will be created. You can also create multiple VNC sessions.

To open a VNC session which was created as above,

```
>>  vncviewer 10.21.17.X:N
```

The password entered while creating the session needs to be given for authentication.

Accessing VNC sessions from Windows machines/laptops

To open VNC sessions from your windows laptops, first download and install TigerVNC from
http://www.softpedia.com/get/Internet/Remote-Utils/TigerVNC.shtml or http://tigervnc.en.lo4d.com/
Then open TigerVNC viewer and enter the session name and password.

Remote Desktop access to the machines

You can also enable a remote desktop access to the lab machines. The difference between a VNC session and a remote desktop is that, using remote desktop you can access the desktop which is displayed on the monitor by default from other machines, whereas a VNC session creates a separate desktop so that you can use it independently.
To enable remote desktop access, goto `Applications->Internet->X11VNCserver`
There select the `port name as 5900` and click `Enable SSL` option and press OK. In the next window, check the `Accept connections` option and set the password and click OK.

Now to open this remote desktop session, open TigerVNC viewer and give the session name as 10.21.17.X:0

```
>>  vncviewer 10.21.17.X:0
```

6 Common problems & solutions :

6.1 "ADEL license not found" message :

Always check the CIW window (command interpreter window which is the small main window that opens when you start cadence) for any errors/warnings. If something is not working or simulation is not starting, first check the CIW for the displayed errors/warnings. If you get any error regarding license, go to the terminal from where you launched cadence from (or open a new terminal and source the .cshrc file) and type

```
>>  lmstat -a -c $CDS_LIC_FILE -f
```

This will display the available licenses, how many are in use and the no. of licenses used by each user. You can request the user using too many licenses to relase one.

In case you find that there are enough licenses and still you get this error when you click `Launch->ADE L`, then try to launch ADEXL first (`Launch->ADE XL`) and create a new ADEXL view and then go back to the schematic and launch ADEL.

6.2 After typing username and password the screen locks or comes back to login screen again :

This is mostly because the home server is not mounted. Contact Ashwin or Janaki Madam.

6.3 "Disk quota exceeded" message :

This is because you have exceeded the alloted quota of 10 GB per user. You can delete the folder with the maximum size from home or move it to /data. To check which folder/file occupies the most space, do the following from terminal

```
>>  cd ~
>>  du -ahd1 |sort -h
```

The above command will list out the size of all the folders in your home directory in ascending order. The command `du` stands for "disk usage" and finds the space occupied by each folder in the current directory. The option `-a` will check all the files in the directory; `-h` will give the result in human-readable format (in MB or GB) and `-d1` specifies the depth as 1 i.e., it looks for all the folders one hierearchy behlow the current directory. (`-d2` will make the depth 2 and it will also list the sub-folder with the maximum size in each folder). Finally the output is passed on to the sort command which sorts the result and the option `-h` for the sort will make it look for human-readable numbers (in this case it is the size) and sort accordingly.