

## Getting Started with Cadence Virtuoso on the Palmetto Cluster

### Introduction

This guide will walk through the steps to setting up Cadence's Virtuoso software for custom IC design on the Palmetto Cluster. This will not be an overview on how to use the Cadence Virtuoso software, but instead a functional setup guide specifically for the Clemson environment.

### Palmetto Cluster

Many of Cadence's software options are not Windows-compatible, so Clemson students are able to access them through the Palmetto Cluster. Cluster access in general requires a faculty sponsor, so please see the Getting Started portion of our website if you have not yet made arrangements. This is a relatively easy and straightforward process through Dr. Wei, so please do not let this be a deterrent.

To start a new session, visit the Interactive Sessions tab of the Palmetto Dashboard through the following link:

[https://ondemand.rcd.clemson.edu/pun/sys/dashboard/batch\\_connect/sessions](https://ondemand.rcd.clemson.edu/pun/sys/dashboard/batch_connect/sessions)

The current recommended specs for running Cadence software are as follows:

Partition: interact

Account: cuuser\_twei2\_cadence (may vary depending on the faculty sponsor)

CPU Cores: 4

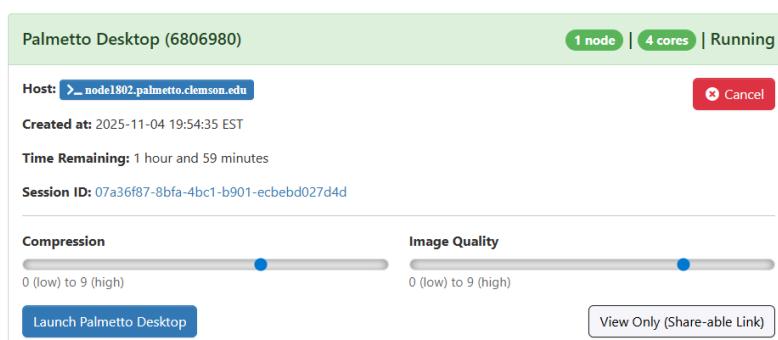
Memory (GB): 16

GPUs: 0

GPU Model: Any

Number of hours: Up to user

Leave the Feature Constraints field blank and click the "Launch" button at the bottom to submit your job request. After a few moments, your session will be ready to open. Click the "Launch Palmetto Desktop" button to open your Palmetto Desktop session.



## Adding Modules

When you enter your desktop session, choose the second icon from the left on the bottom menu to open a terminal window.



To prevent compatibility issues, commercial software on the Palmetto Cluster has been divided up into an assortment of different modules. To view all available modules, enter ‘module av’ into the terminal.

```
[discogin@node1802 ~]$ module av
```

Core Modules					
anaconda3/2023.09-0	fftw/3.3.10	go/1.21.6	jags/4.3.0	openblas/0.3.25	r/4.5.0
aocc/4.1.0	gcc/12.3.0	gsl/2.7.1	julia/1.9.3	openjdk/11.0.20.1_1	snakemake/7.32.4
aocc/5.0.0	(D) gcc/13.2.0	(D) hdf5/1.14.3	libxml2/2.10.3	openjdk/17.0.8.1_1	spack/0.23.1
boost/1.64.0	gcc/14.2.0	intel-oneapi-compilers/2023.2.3	miniforge3/24.3.0-0	openmpi/4.1.6	sqlite/3.43.2
cmake/3.27.9	gdal/3.8.3	intel-oneapi-compilers/2024.0.2	mpfr/4.2.0	openmpi/5.0.1	subversion/1.14.2
cmake/3.30.5	(D) geos/3.12.1	intel-oneapi-compilers/2025.1.1 (D)	mpich/4.1.3	parallel/20220522	Virtuoso/2.5.2
curl/8.0.0	git/2.35.0	intel-oneapi-mkl/2023.1.0	nextflow/23.10.0	perl/5.40.0	vmd/1.9.3
cuda/12.3.0	(D) git/2.42.0	intel-oneapi-mkl/2025.1.0	(D) nextflow/24.10.5	python/3.9.2.1	
emacs/29.2	gnuplot/5.4.3	intel-oneapi-mpi/2021.11.0	nvhpc/23.11	r/4.4.0	(D)
Commercial/External Modules					
abaqus/2023	(D) cadence/DDIEXPORT/22	cadence/QUANTUS/212	converge/4.1.2	(D) matlab/2022a	nrg/lammps/3Nov2022 (g)
abaqus/2025	(D) cadence/GENUS/211	cadence/SIGRICT/221	edem/2024.1	matlab/2023a	nrg/namd/3.0-beta2 (g)
alphaFold/2.3.2	cadence/IC/618	cadence/SPB/221	gaussian/g16-avx	matlab/2023b	nrg/namd/3.0.1 (g,D)
amber/22_gpu_mpi	cadence/ICADMV/201	cadence/SPECTRE/211	gaussian/g16-avx2	matlab/2025a	nrg/parabricks/4.1.1-1 (g)
amber/22_openmpi	cadence/IC/2212	cadence/SPECTRE/2202	gaussian/g16-ss64	modelFRONTIER/2020R2	nrg/parabricks/4.5.0-1 (g,D)
amber/24_gpu_mpi	(D) cadence/JLS/211	cadence/SPIDE/G/2209	gromacs/gromacs-2025.1-cpu	namd/2.16.0-cpu	nrg/pytorch/23.06 (g)
amber/24_openmpi	(D) cadence/LIBERATE/217	cadence/VMANAGER/2209	gromacs/gromacs-2025.1-gpu (D)	namd/2.16.0-gpu	orc/6.0.0
ansys/22.2	cadence/MODUS/221	cadence/XCELLUM/2209	gurobi/10.0.1	gurobi/12.0.3-python-3.12	neurocontainers (D)
ansys/23.2	(D) cadence/PAS/31	comsol/6.3	(D) hyperworks/2020	hyperworks/2020	orc/6.0.1
baseamount/0.43_0.3596	cadence/PAS/211	comsol/6.3	lumerical/2021.2	inf-core/2.14.1	paraview/5.12
biocontainers	cadence/PEGASUS/221	converge/3.1.5	matematica/13.3.1	inf-core/3.2.0	xcrysden/1.5.60
cadence/CONFML/222			ngc/gromacs/2022.3 (g)		

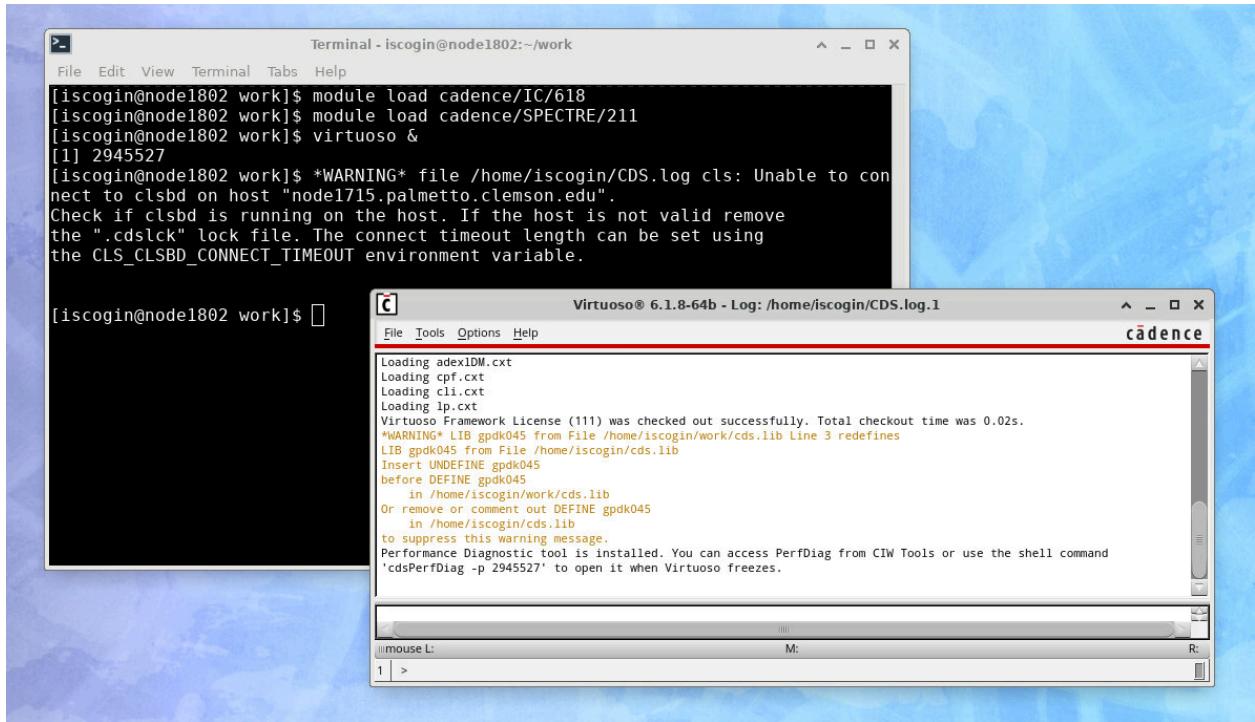
For general use, we will load the primary Virtuoso module and the Spectre simulation module. Enter the following commands into the terminal:

```
module load cadence/IC/618  
module load cadence/SPECTRE/211
```

Using ‘module list’ will list all of your loaded modules. You should see IC618 and SPECTRE211 loaded.

## Starting Virtuoso

With all necessary modules loaded, enter ‘virtuoso &’ into the terminal. The extra & is a Unix feature which allows for applications to be run in the background, allowing for the terminal to be used while processes are active. This will open Virtuoso’s Command Interpreter Window (CIW), which serves as the primary command interface for interacting with the rest of the software. For instance, placing a component into a schematic view will actually pass a tailored placement command into the CIW to update the information in the schematic cell. For beginner use, this serves more as a menu & settings hub.



## Library Management

Virtuoso has found much of its success from having an incredibly versatile and scalable design library system. The Cadence environment uses a specific file titled ‘cds.lib’ to keep track of all library paths so that they are automatically available through any relevant design application. These files are typically located in either the home or working directories, and multiple cds.lib files can be used as long as they reference one another.

When starting Virtuoso for the first time in the Palmetto Cluster, there will not be a proper library setup. With no libraries, you will not have access to any of the process components or analog models needed to make a functional design.

Open the Library Path Editor from the CIW by choosing the Tools > Library Path Editor... option. In this window you will define your library names and paths for use later on. The core libraries needed for general use are as follows:

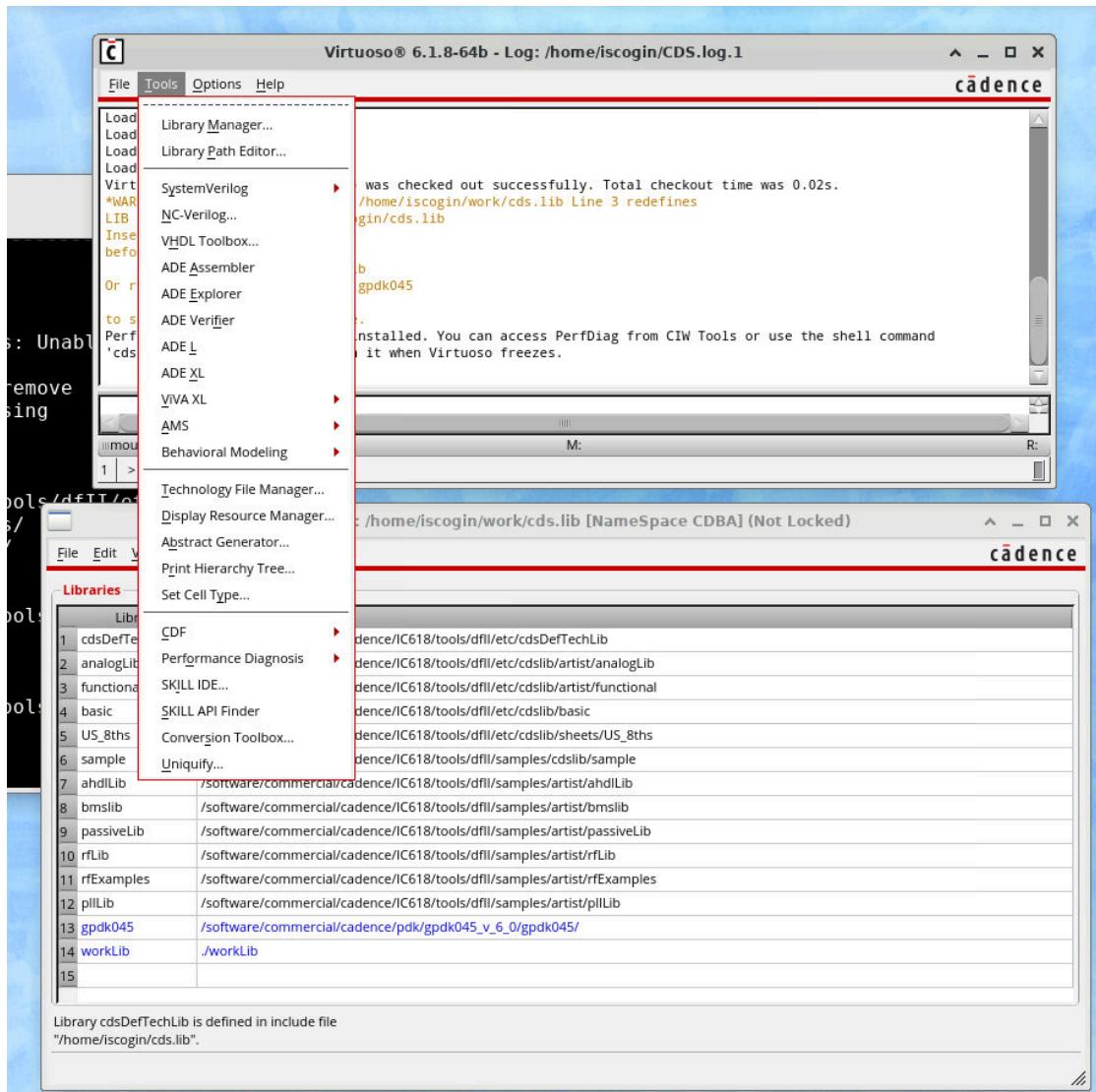
```

cdsDefTechLib - /software/commercial/cadence/IC618/tools/dfl/etc/cdsDefTechLib
analogLib - /software/commercial/cadence/IC618/tools/dfl/etc/cdslib/artist/analogLib
basic - /software/commercial/cadence/IC618/tools/dfl/etc/cdslib/basic

```

You will also need to choose a [technology](#) to use. Most educational materials choose gpdk045 as their pdk, but there are also 90nm and 180nm processes. Add the following library:

```
gpdk045 - /software/commercial/cadence/pdk/gpdk045_v_6_0/gpdk045/
```

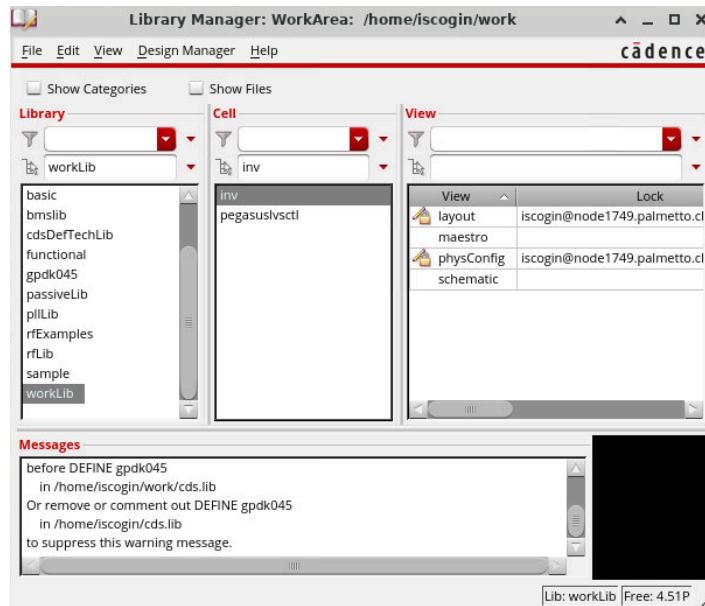


Make sure to save your changes by choosing File > Save within the Library Path Editor. This will create a copy of the cds.lib file in the directory you save it in (recommended to use the working or home directory). At this point, you should be able to start working on your own projects from the Library Manager (accessed from the CIW).

Feel free to open the cds.lib file to see the library inclusion structure for yourself. Below is a picture of my own cds.lib file, where you can see that I have defined two libraries within my working directory and included a link to another cds.lib file in my home directory.

## Lock Management

Due to the way remote sessions on the Palmetto Cluster are set up, there is a possibility that your session may run out of time before you are finished working. Virtuoso is intended to be a collaborative environment, so lock files are placed on files which are being actively edited. If the session ends prematurely and Virtuoso is not shut down properly, these locks will persist and your projects may not be editable.



If this happens, navigate back to your working directory in the terminal and enter the command 'clsAdminTool'. This will open the lock file manager, from which you can enter 'are .' to remove all locks from the working directory. If this does not work, repeat the process from your home directory. The 'exit' command will exit the lock manager.

```
[iscogin@node1689 6580]$ module load cadence/IC/618
[iscogin@node1689 6580]$ module load cadence/SPECTRE/211
[iscogin@node1689 6580]$ clsAdminTool
> ale .
BEGIN: Edit Locks List
./tmp_iscogin/.unique_number_0_file node1689.palmetto.clemson.edu iscogin 3038481 1758939225
./6580/nmos_iv/maestro/maestro.sdb node1689.palmetto.clemson.edu iscogin 3038481 1758939225
./6580/nmos_iv/schematic/sch.oa node1689.palmetto.clemson.edu iscogin 3038481 1758939232
./libManager.log node1689.palmetto.clemson.edu iscogin 3038693 1758939237
./logs_iscogin/logs0/Job31.log node1689.palmetto.clemson.edu iscogin 3052381 1758940939
END: Edit Locks List

SUMMARY: A total of 5 Edit Locks were found in the directory hierarchy: .
> are .
BEGIN: Release Edit Locks.
./tmp_iscogin/.unique_number_0_file node1689.palmetto.clemson.edu iscogin 3038481 1758939225
./6580/nmos_iv/maestro/maestro.sdb node1689.palmetto.clemson.edu iscogin 3038481 1758939225
./6580/nmos_iv/schematic/sch.oa node1689.palmetto.clemson.edu iscogin 3038481 1758939232
./libManager.log node1689.palmetto.clemson.edu iscogin 3038693 1758939237
./logs_iscogin/logs0/Job31.log node1689.palmetto.clemson.edu iscogin 3052381 1758940939
END: Release Edit Locks.
SUMMARY: A total of 5 Edit Locks were released in the directory hierarchy: .
> quit
[iscogin@node1689 6580]$ virtuoso &
```