EE8074-Fall 2023
記憶體積體電路
Final Project N16 SRAM Layout: Tutorials

Prof. E Ray Hsieh 謝易叡 副教授

Full-Custom IC Design Using Virtuoso

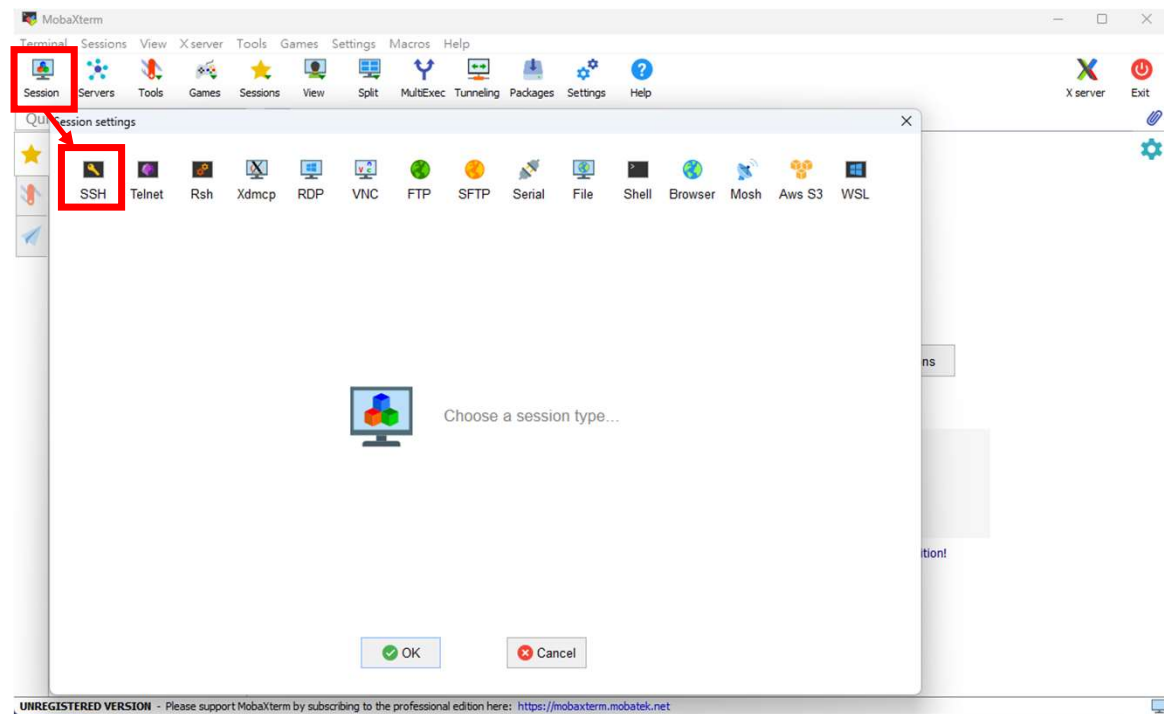Professor: E Ray Hsieh

Date: 2023/12/25

Outline

- Virtuoso Workstation Setup
- Environment Setup
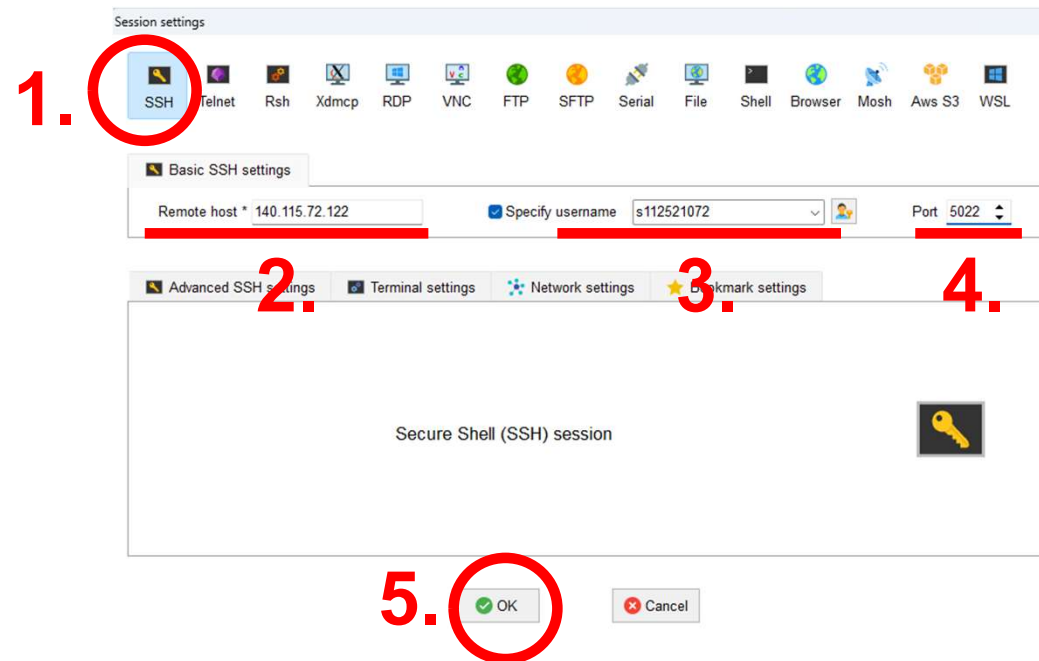- Draw Schematic using Virtuoso

Virtuoso Workstation Setup

Login Server (1/5)

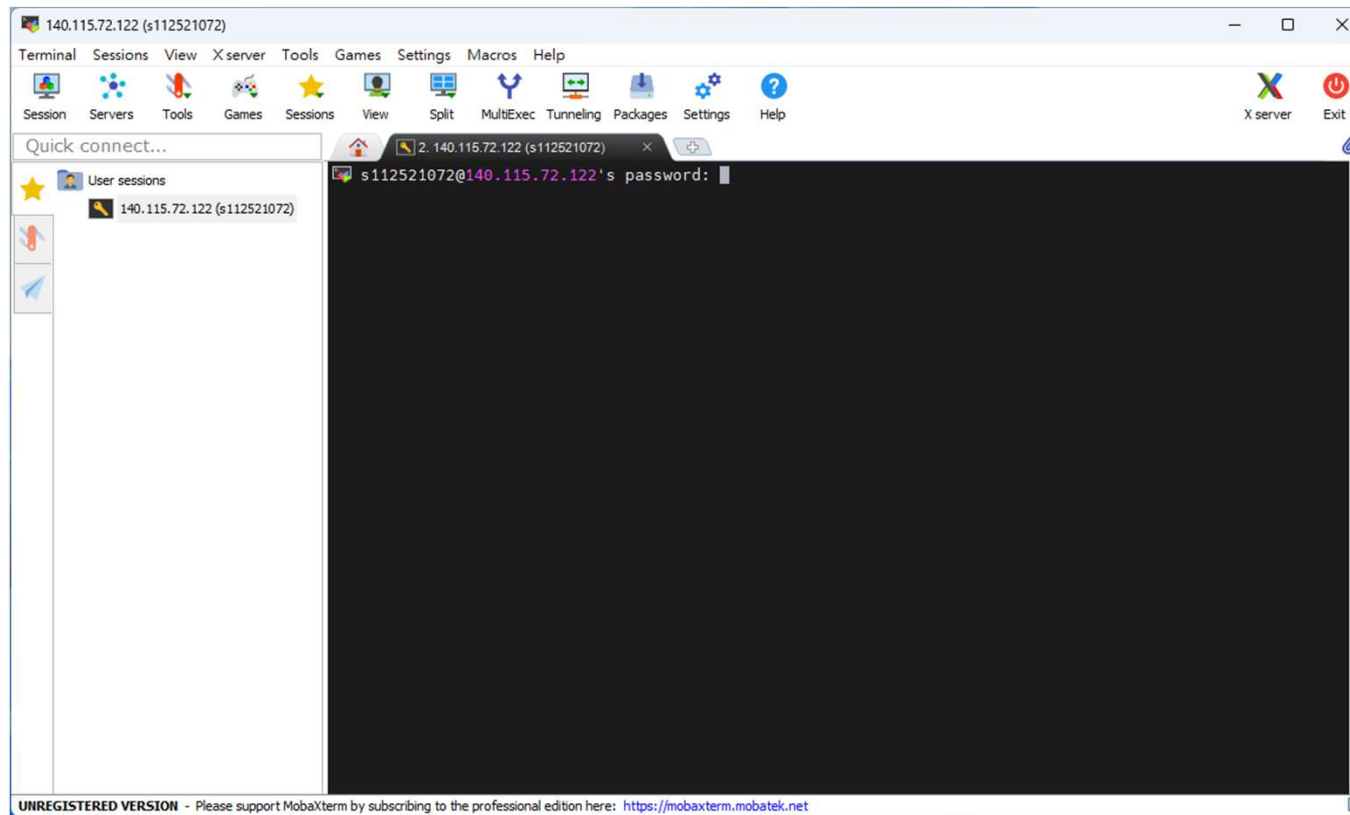- Download MobaXterm
- Choose "Session" -> "SSH"term

Login Server (2/5)

- Host : 140.115.72.122
- Username : s + your student ID no. (Ex: s112521072)
- Port : 5022

Login Server (3/5)

- Password(default) : ncuee

Login Server (4/5)

- Enter "passwd" for changing password in first time login.
- Or you can just use the default password, and you can press "ctrl + C" to terminate the command.

Login Server (5/5)

- "exit" when you finishing your work

Environment Setup

Environment

- TSMC N16 ADFP (Academic Design Foster Package)
- Cadence (including Virtuoso)
- Mentor Graphics Calibre

Start virtuoso

- At your home directory :

```
[s112521009@centos7-rram ~]$ cd_sh
```
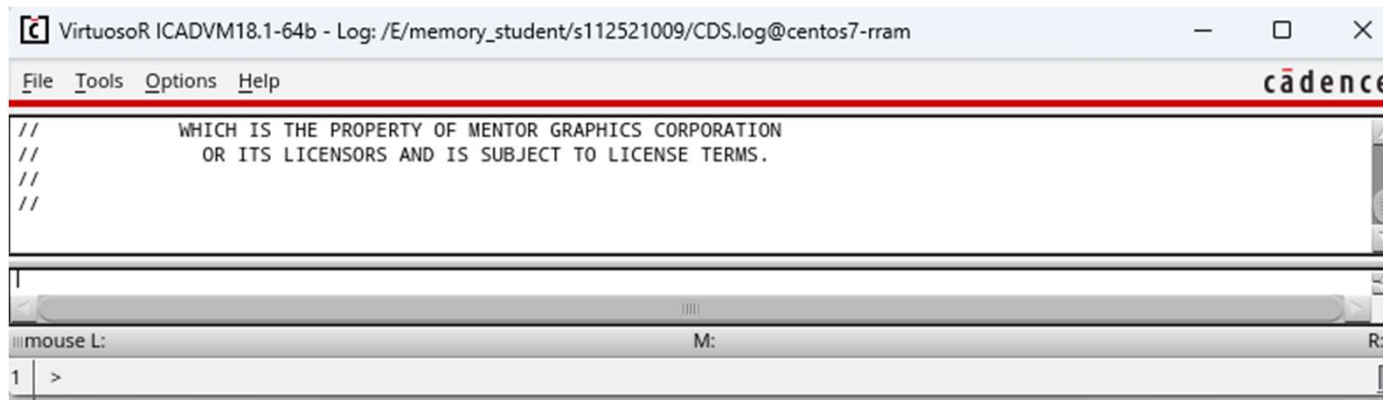
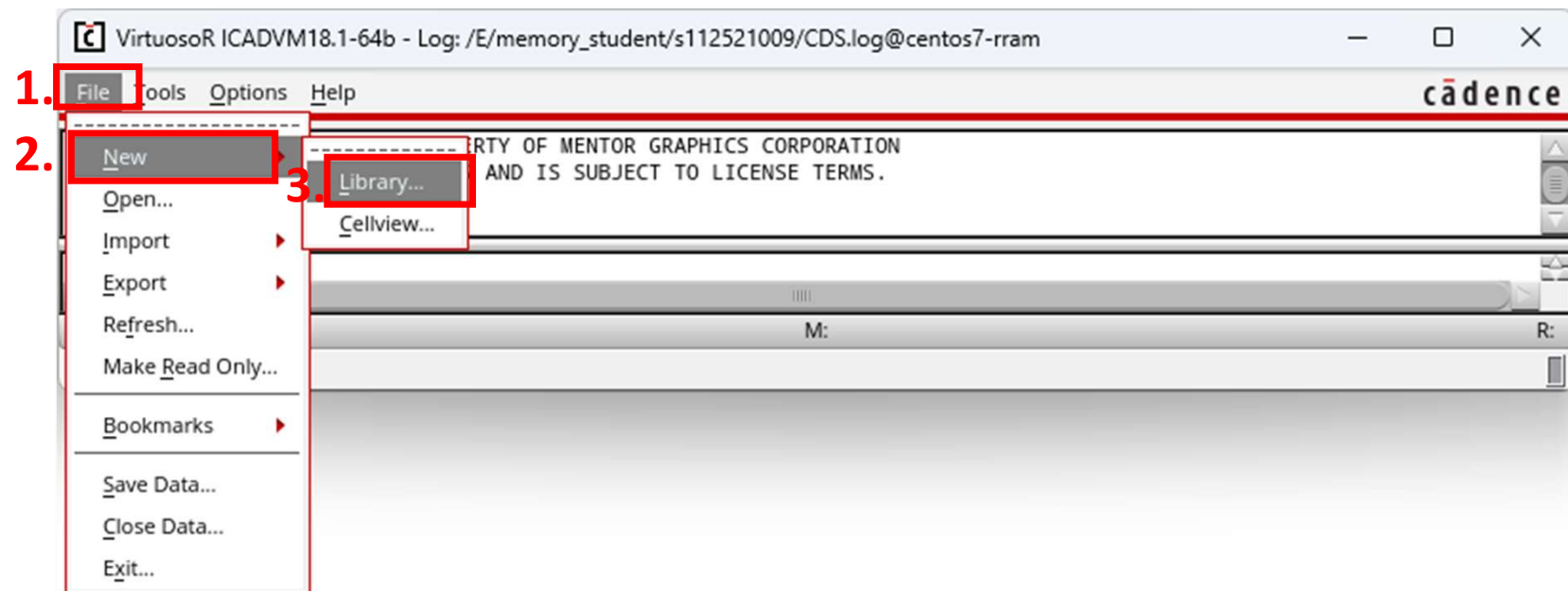- Go into the 'sh' folder

```
[s112521009@centos7-rram sh]$ /bin/csh
[s112521009@centos7-rram ~/sh]$ source memory.sh
[s112521009@centos7-rram ~/sh]$ virtuoso &
```

- ICADVM window :

VirtuosoR ICADVM18.1-64b - Log: /E/memory_student/s112521009/CDS.log@centos7-rram

File Tools Options Help   cadence

```
//          WHICH IS THE PROPERTY OF MENTOR GRAPHICS CORPORATION
//               OR ITS LICENSORS AND IS SUBJECT TO LICENSE TERMS.
//
//
```

mouse L: M: R:
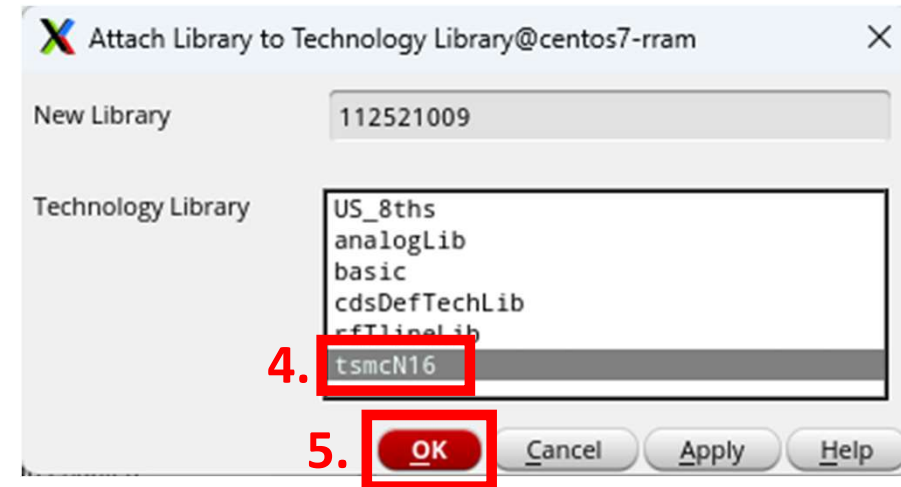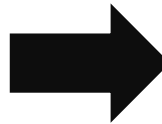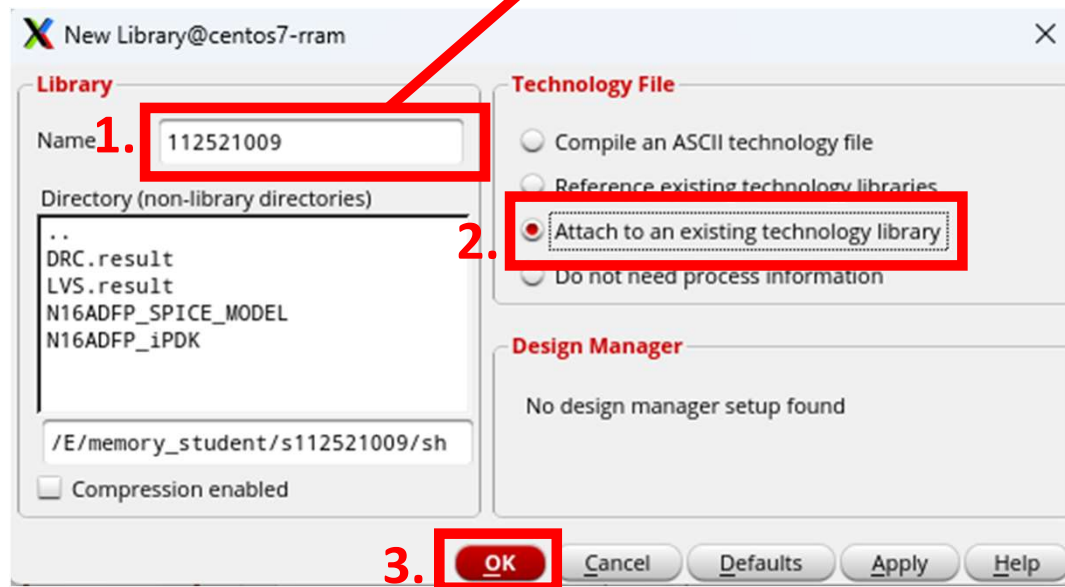
1 >

Construct New Library (1/2)

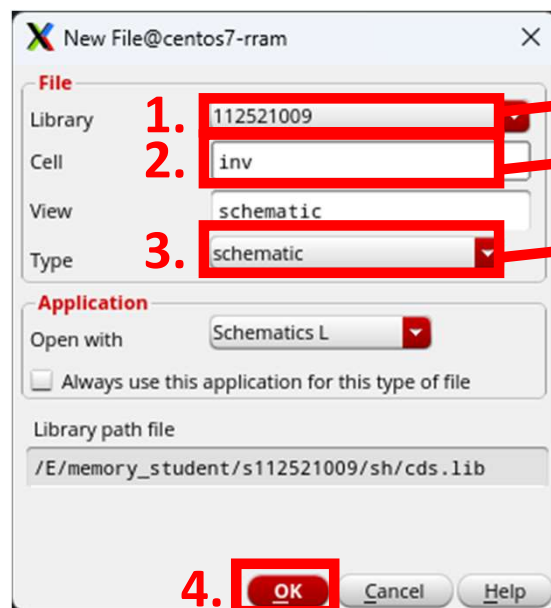# Construct New Library (2/2)

Please name it using your student ID

Draw Schematic using Virtuoso
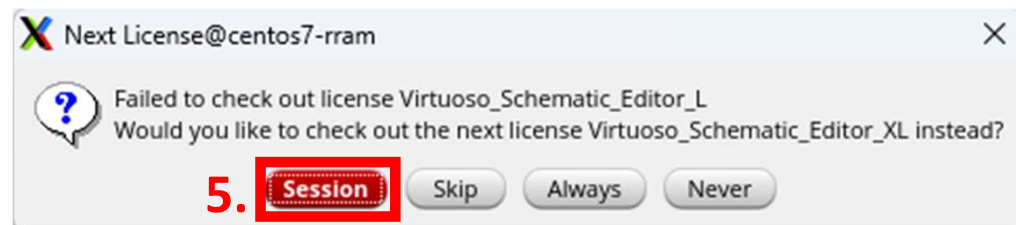
Create Schematic View

- ICADVM window : Tools -> Library Manager

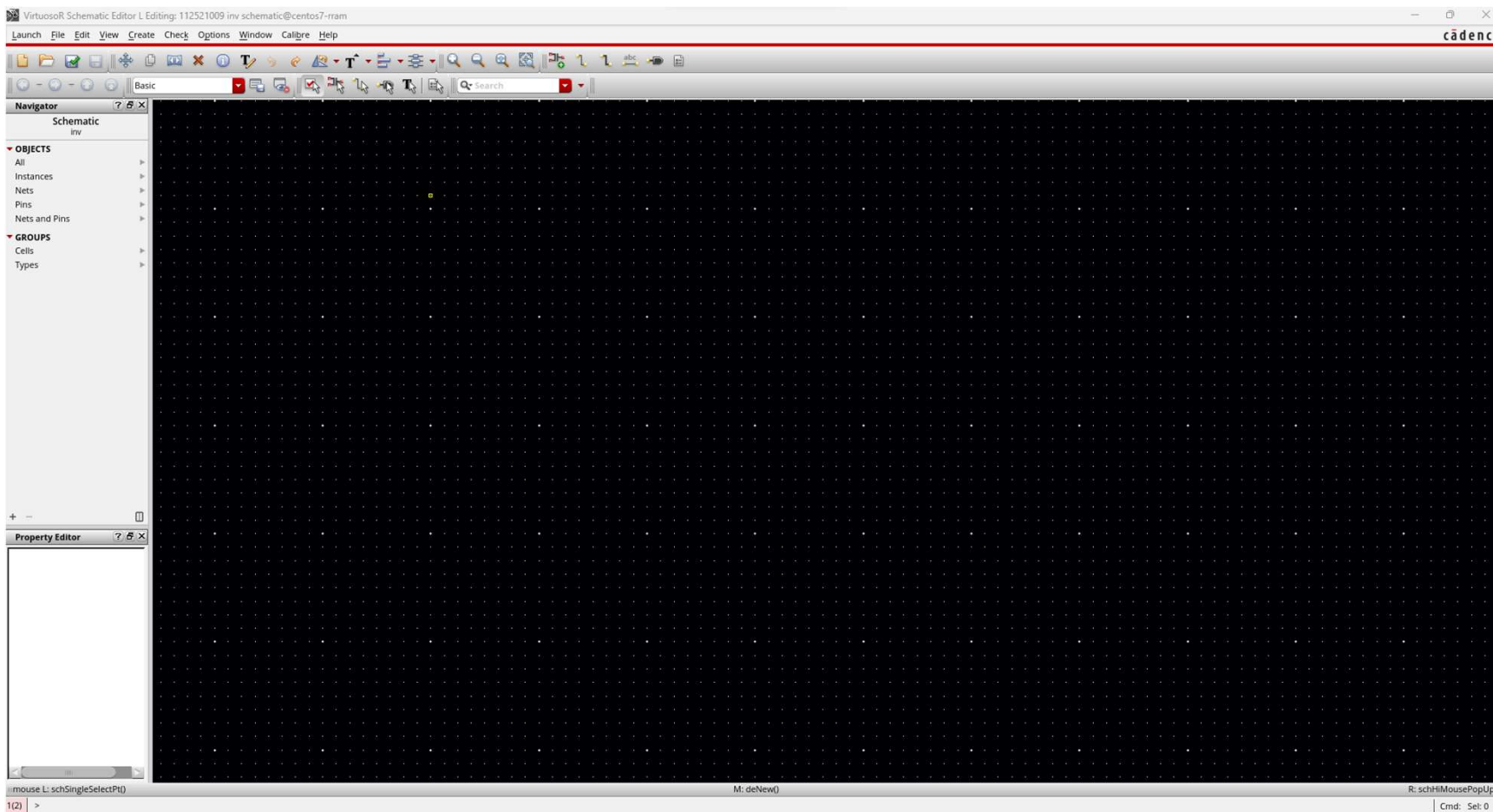- Library Manager : Click your new library -> File -> New -> Cell View...

Choose your new library

Naming your new cell

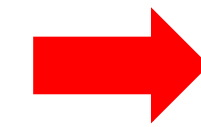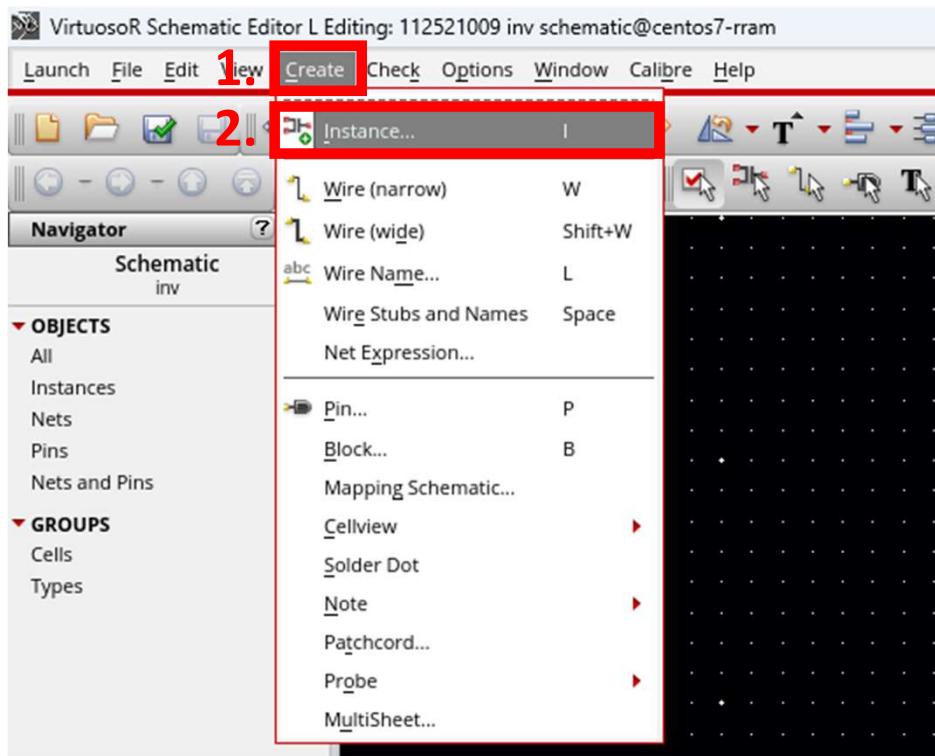Choose schematic

Cadence Virtuoso Schematic Editor

Can use keyboard's "↑↓←→" to move window

Cadence Virtuoso Schematic Editor

Function	Command	Function	Command
Zoom in	Ctrl + z	Properties	q
Zoom out	Shift + z	Instance	i
Zoom overall circuit	Ctrl + x	Path	p
Zoom in specific location	mouse right button	Polygon	Shift + p
Stretch	s	Label	l
Copy	c	Rectangle	r
Move	m	Ruler/Clear Ruler	k/Shift + k
Delete	del	Save	F2
Undo	u	Erase current command	esc

Another way to add instance
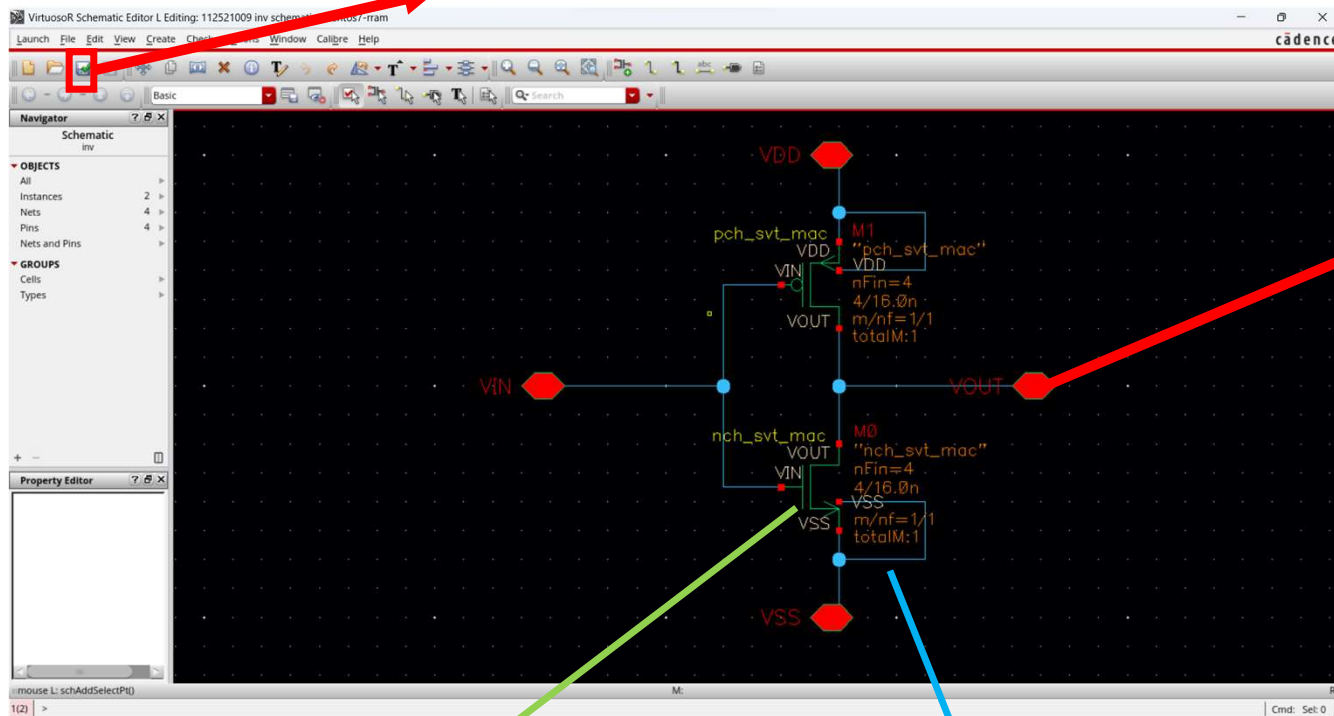

Choosing
nch_svt_mac 、
pch_svt_mac

Please set the
number of fins to
be 4 or more,
and it must be
the same as the
layout quantity.
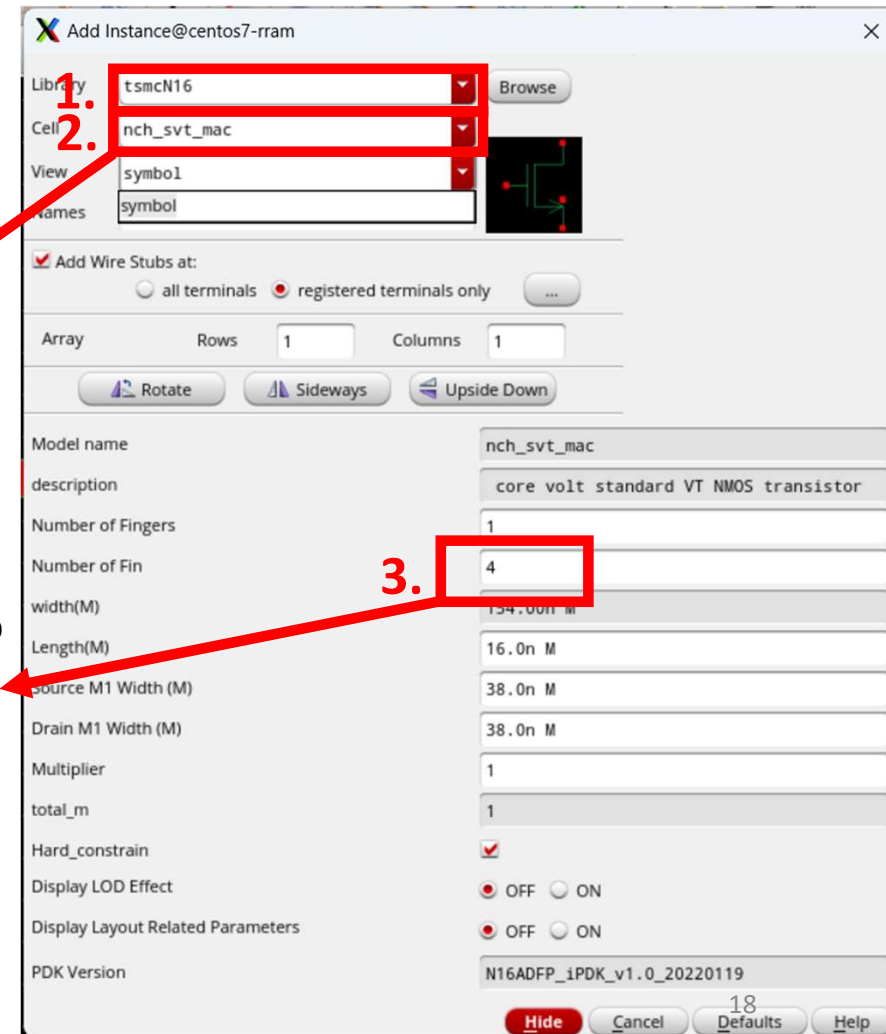
Schematic

4. After finishing the schematic, remember to click on "check and save"

3. Command "p"

1. Command "i"

2. Command "w"

19

Export the .sp file (1/2)

1.
2.
3.
4.
5. Please name it as "your_schematic_name.sp"
6.
7.

Choosing your schematic

Export the .sp file (2/2)

The .sp file will appear in the "sh" folder under your own student ID.
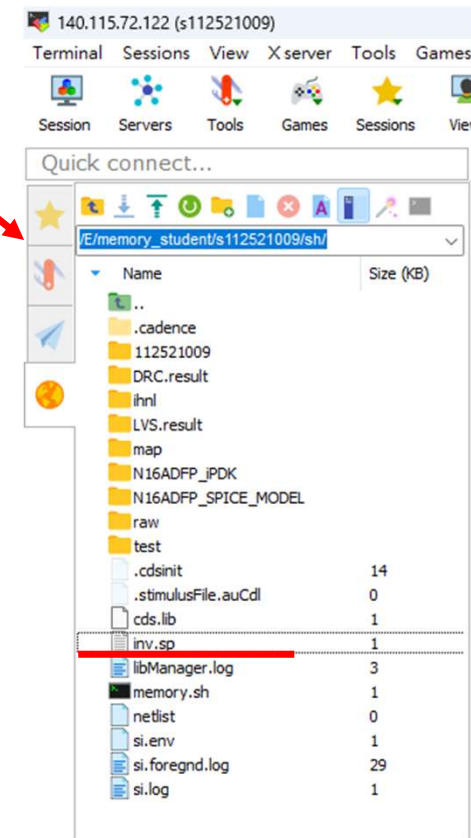
Edit the .sp file

- Go into the 'sh' folder

```
[s112521009@centos7-rram ~/sh]$ hspice -i inv.sp -o inv.lis
```

```
1  ********************************************************
2  * auCdl Netlist:
3  *
4  * Library Name:  112521009
5  * Top Cell Name: inv
6  * View Name:     schematic
7  * Netlisted on:  Dec 26 13:31:31 2023
8  ********************************************************
9  .TEMP 25
10 .OPTION POST=2
11 .LIB '/E/memory_student/s112521009/sh/N16ADFP_SPICE_MODEL/n16adfp_spice_model_v1d0_usage.l' TTMacro_MOS_MOSCAP
12 ********************************************************
13 *.INCLUDE  /E/cad_install/sh/N16ADFP_iPDK/tsmcN16/../Calibre/lvs/source.added
14 *.BIPOLAR
15 *.RESI = 2000
16 *.RESVAL
17 *.CAPVAL
18 *.DIOPERI
19 *.DIOAREA
20 *.EQUATION
21 *.SCALE METER
22 *.MEGA
23 .PARAM
24
25
26
27 ********************************************************
28 * Library Name: 112521009
29 * Cell Name:    inv
30 * View Name:    schematic
31 ********************************************************
32
33 .SUBCKT inv VDD VIN VOUT VSS
34 *.PININFO VDD:B VIN:B VOUT:B VSS:B
35 MM0 VOUT VIN VSS VSS nch_svt_mac l=16.0n nfin=4 m=1
36 MM1 VOUT VIN VDD VDD pch_svt_mac l=16.0n nfin=4 m=1
37 .ENDS
38
39 X1 VDD VIN VOUT VSS inv
40 VDD VDD 0 DC 1.8V
41 VIN VIN 0 PULSE(0 1.8 0.1n 0.1n 0.1n 0.5u 1u)
42 VSS VSS 0 DC 0V
43 .tran 0.1n 5u
44 .end
```
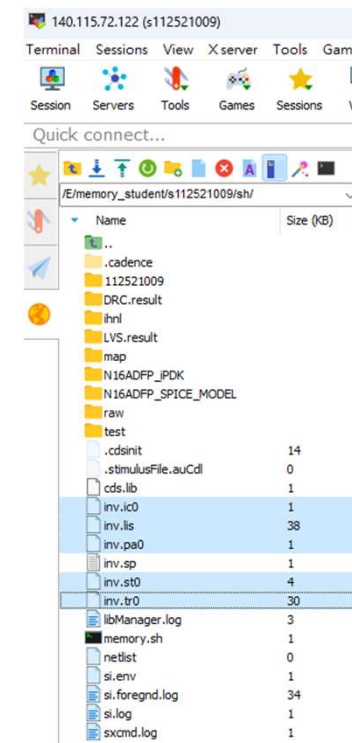
Add these three lines above INCLUDE, remember to change the LIB path to your student ID, and comment out the INCLUDE line.
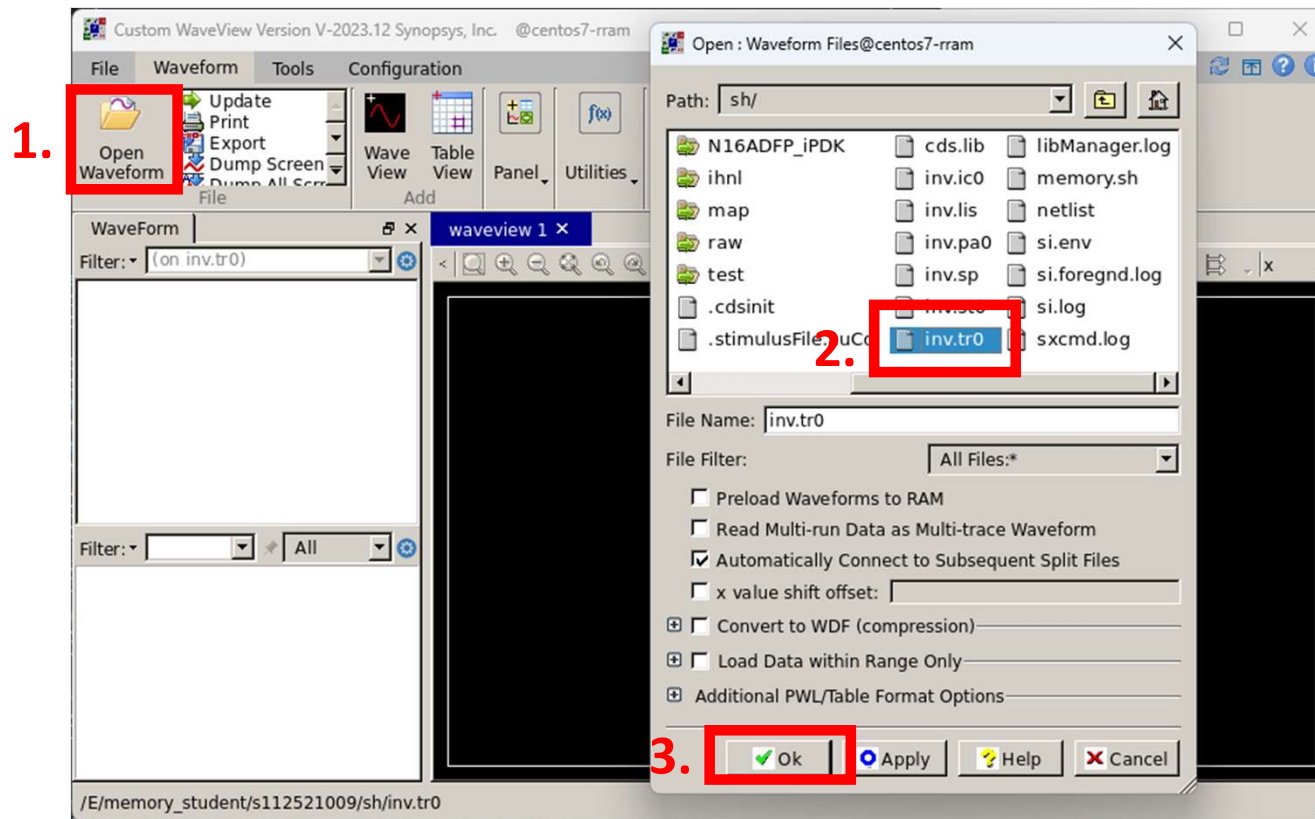
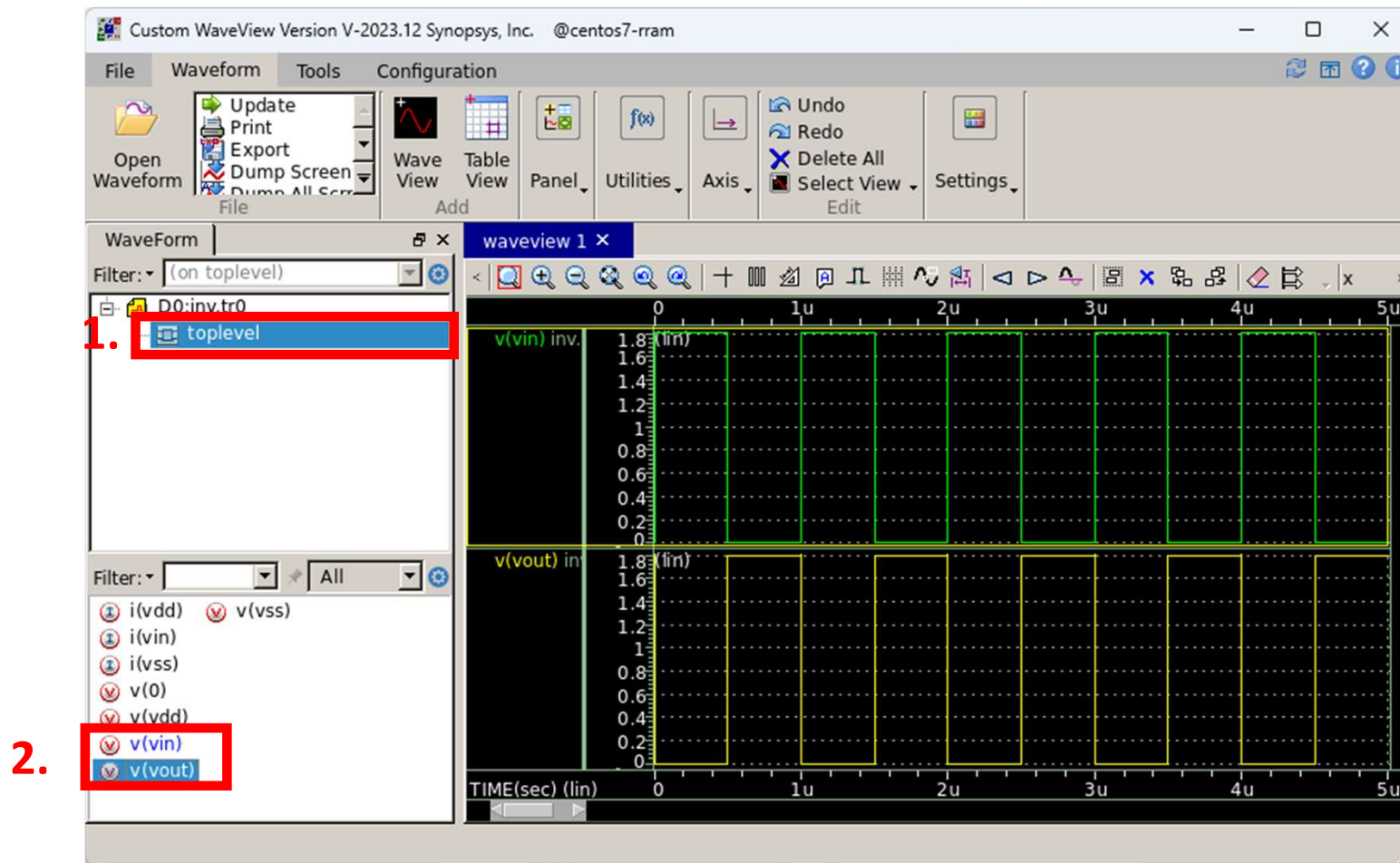Make sure the order and names here match those in SUBCKT.

22

Output waveform (1/2)

- Go into the 'sh' folder

Output waveform (2/2)

Presim completed

THANK YOU FOR YOUR ATTENTION!