Cadence Layout Tips

Setting User Preferences

1) Set User Preferences in icfb (Cadence main window)

Options > User Preferences >

a) deselect "Infix (No Click is necessary for first point)"
This prevents the a pop-up menu from starting each time you use a hotkey.

b) deselect "Options Displayed When Commands Start"
This prevents the mouse from auto-snapping to a point when you hit a hotkey.

2) Set User Preferences in Layout Editor (Virtuoso)

Options > Display >

a) Select "Pin Names"
This allows you to see the name of the pins you have placed.

b) Change "Display Levels" so the To field is 20.
This allows you to see 20 levels of hierarchy, otherwise your instances will just look like empty red boxes and you won't know what the heck is going on.

NOTE: I know the lab says to go through this "Flatten Hierarchy" thing, but I highly recommend that you DO NOT do this. Though flattening the hierarchy will get rid of the red box problem described above, it means that you can alter the insides of the cells, which totally defeats the idea of a hierarchy in the first place. You might alter the lower cells without knowing it (this happens often) and really mess up your design. Flattening the hierarchy should be used as an absolute last resort.

c) Change the snap spacing (Optional)
You can change the snap spacing to 0.05 (assuming 0.35um process) in both x&y directions. This increases the resolution of your mouse pointer. BE VERY CAREFUL WITH THIS. If the snap spacing is too small, the DRC will give you "off-grid" errors. The only way to remedy this error is to delete EVERYTHING you've drawn using the too-small snap spacing, change your snap spacing back and start again.)

From the Layout editor you will also

Options > Layout Editor >

a) Deselect "Gravity On"
Gravity is this annoying option that snaps the mouse cursor to odd places. Every designer I've talked to hates this option.

Hotkeys for Layout

F3 - incredibly important hotkey.
If you hit a hotkey (say "p") and then hit F3 immediately afterwards, it brings a pop-up window detailing all the options associated with that particular hotkey.

F4 - toggle between partial and full select.
Say you draw a square. You want to move this square. Toggle F4 to give you full select (you will know this by the "(F)Select" in the toolbar). Click on the square and drag it to move it. Life is good. Now say you want to stretch only one edge of a square. Toggle F4 to give you partial select (now

you'll see a "(P)Select" in the toolbar). Now click on the edge you want to stretch to select it, then click again and drag. This will enlarge that edge - *extremely* useful.

Side bonus: if you select a bunch of items, a number shows up in the toolbar showing how many items you have selected. i.e. (F)Select:15 means you have 15 items selected.

ESC - cancels the current mode.

NOTE: The bottom of the layout window will tell you what mode you're in, and will tell you what to do with this mode. i.e. you hit "r" and it says "right click to draw a rectangle".

u - undo

ctrl z - zoom in
Or zoom by drawing a box around the zoom area with right mouse button.

shift z - zoom out
shift + draw box with right mouse button ----> zooms out really fast)

r – draw rectangle

s - stretch the edge of an item (have to be in Partial Select mode)

m - move (hit F3 after to see all the move options, like rotate & flip)

c - copy (hit F3 to see the move options, like copying multiple times)

p – path
Used for drawing path lines, and is much better than rectangles. Hit F3 to switch path options, like path width, or try using partial select to modify the length of the path after you've drawn it.

q - query
Gets info on the currently selected instance; great for changing properties, for example, if you've drawn a path of 0.7u width and you want 0.5u, select the path, hit "q" and then change the width property, or even the layer property.

i - instance / insert (adds a cell)

k - ruler

shift k - delete all rulers

f - fit entire layout to the screen; zooms out perfectly

g - gravity
Turn this off and never touch this key again.

shift c – chop
cuts pieces out of a selected item. Hit F3 for more options.

shift m – merges selected items – must be overlapping

ctrl r - redraw

ctrl p - insert pin (more on pins below)

l - label

Allows you to insert text to keep track of nets. Make sure you've selected the "text" layer of the LSW, otherwise you might get DRC errors or short something.

Those are the major hotkeys you'll need. Feel free to root around in the pull down menus for the rest.

LSW – Layer Select Window

This window tells you all the layers (metal, poly, n-plus etc) available to you in the process. It's the long rectangular window that pops up when you open a layout.

AV - all view

you see all the layers

NV - no view

You see *only* the selected layer. You may have to hit ctrl-r (redraw) to see the new view. You can select more than one layer to view.

AS - all select

When you select, you select every layer.

NS - no select

When you select, it's everything *but* that layer.

inst – instance

Deselect this to only select the current hierarchy, but no blocks. Great way for deleting lots of wire traces without deleting the actual transistors you've placed.

pin – pin

deselect this and you can't select the pins. BE VERY CAREFUL WITH THIS ONE. I've left it deselected many times and when I've gone to move chunks of layout, the pins stay behind, causing major LVS headaches later.

Pins

Check with the 565 prof for any particulars on pin placements / pin options.

When you hit "ctrl p" a pin pop-up menu appears. Make sure you select the proper type (input or output or input/output). You'll get DRC errors if your pin types don't match those of your schematic. Also select "Keep Pin Name" otherwise you'll place the name and it will disappear.

NOTE: If you want your pin to be on metal1, then select me1 - pn from the LSW. Now hit ctrl p. Your pin type must match the layer type otherwise you might get DRC errors.

DRC Options

You run a DRC and get a million errors. Don't panic.

1) Check the icfb window (main Cadence window). It will give you a summary of all the errors found.

2) From the layout editor

verify > markers > ...

a) find

cycles through the errors (make sure to select "zoom to error"

b) explain
point to a specific error and get the explanation

c) delete all
delete that bothersome flashing layer

DRC Hints: It looks like this process doesn't like floating poly, so at the very least put a poly to metal contact. Make sure your nwells are all tied to Vdd and that you have a pin declaring that particular net to be Vdd. Ditto for your substrate contacts; they should all be to ground. (Keep in mind the design may call for something different, I've had to do layout where a certain nwell was NOT tied to Vdd and so I had to keep that separate.)

Extraction Options

Deselect "echo commands" it just makes the extractions slower.

If you want Cadence to calculate parasitic capacitances, hit the "set switches" button and select "parasitics". It makes the extraction longer (more calculations) but you can then probe the extracted file to see how much capacitance your traces have.

LVS Options

You go to run an LVS and sometimes a little pop up window appears (not the LVS form). In this form, I usually go for "form contents" myself, that way you can use the LVS form to see exactly what you are LVSing.

Now you run an LVS and get a million errors.

1) open the extracted view.

2) go to the LVS window and hit "error display".

Another pop-up menu appears: I check "auto-zoom" so it goes right to the error and then hit "next".

You can now cycle through them like DRC errors.

Bonus: You can also cycle through the errors on the schematic as well - it all depends on the last window you selected (extracted or schematic window) before hitting "error display". Potential Problem: if you change the layout/schematic AFTER you run the LVS, it might give you an error saying "Window does not match LVS run" i.e. the file in the LVS and the file you're trying to look at are not the same. Close the LVS, close the extracted, save the schematic and the layout, then re-run your extractions and try again. Or talk to a TA.

Bonus: With the extracted view you can also do the parasitic probe I was talking about. Hit "parasitic probe" from the LVS window, then go to the extracted view and click on the net you want to probe. Some capacitances will be on the order of "aF" -> atto Farads. Yikes! If you hit a net and a pop-up window appears with different net names, then two or more layers overlap and Cadence doesn't know which one you want to probe. Select one, hit ok and the capacitance value will display.

This parasitic probe ONLY works if you extracted the layout with the "parasitics" switch on.

When All Else Fails

Go googling for cadence tutorials - there are quite a few on the net. Try either "cadence tutorial" or "cadence hotkeys" and you'll find some good ones with nice pictures.