

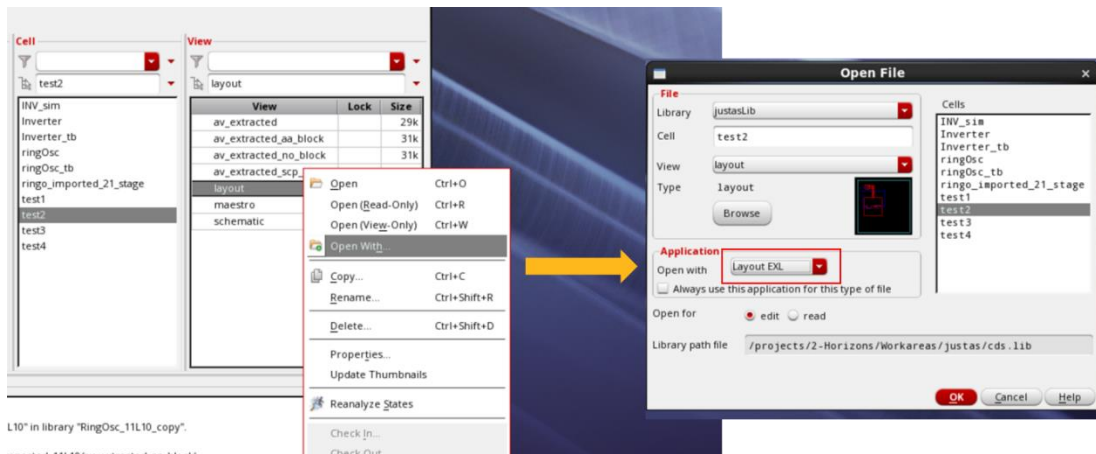
## How to use Electrically Aware Design (EAD) Browser for parasitic extraction and visualization

The EAD browser is a powerful addition to the in-design layout flow which allows to extract parasitic R's and C's without the need for a complete and LVS-clean design. While it is not intended to be of sign-off extraction quality (Quantus is used for that), EAD offers more flexibility in visualization of the parasitics, which may be useful in the earlier stages design process. EAD has been enabled in OPDKv1.9.

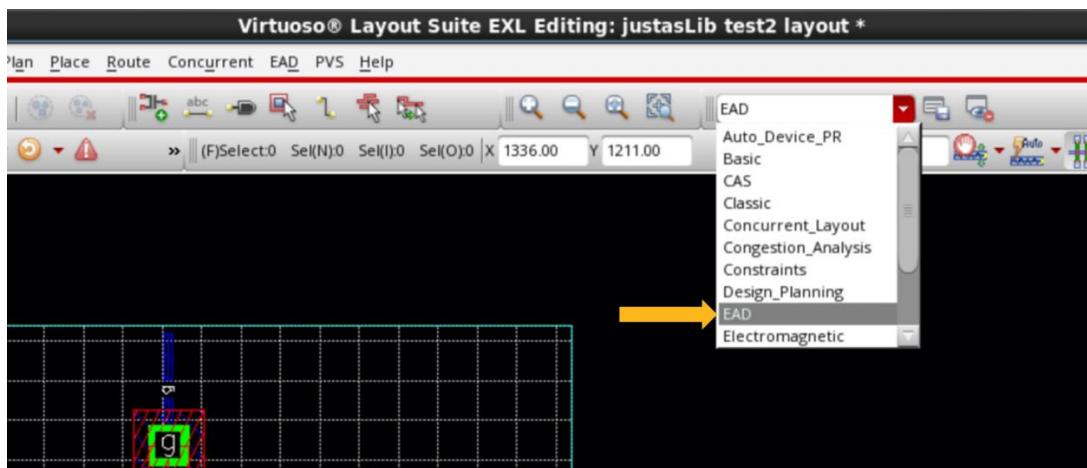
Please note, that no parasitic blocking has been implemented for the EAD tool at the moment, so in terms of comparison with Quantus, the closest match would be with the results produced using the 'rcx\_no\_SCP\_blocking' mode.

The instructions on how to invoke and make use of this functionality are outlined below.

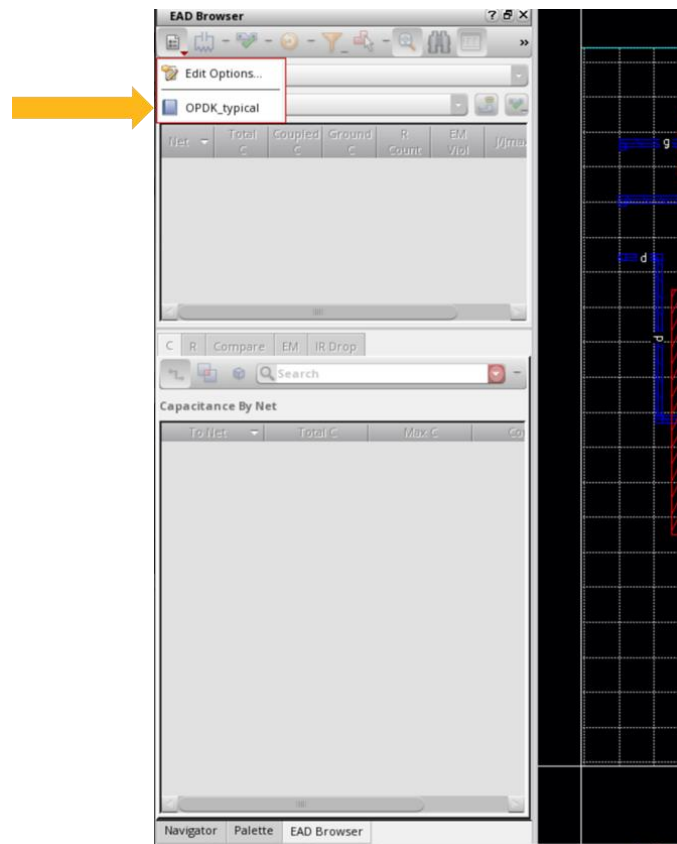
**Step 1.** Open the layout view that needs to be examined in Layout EXL mode, by right-clicking on the layout view in the Library Manager and selecting 'Open With...', then choosing Layout EXL from the Application drop-down menu.



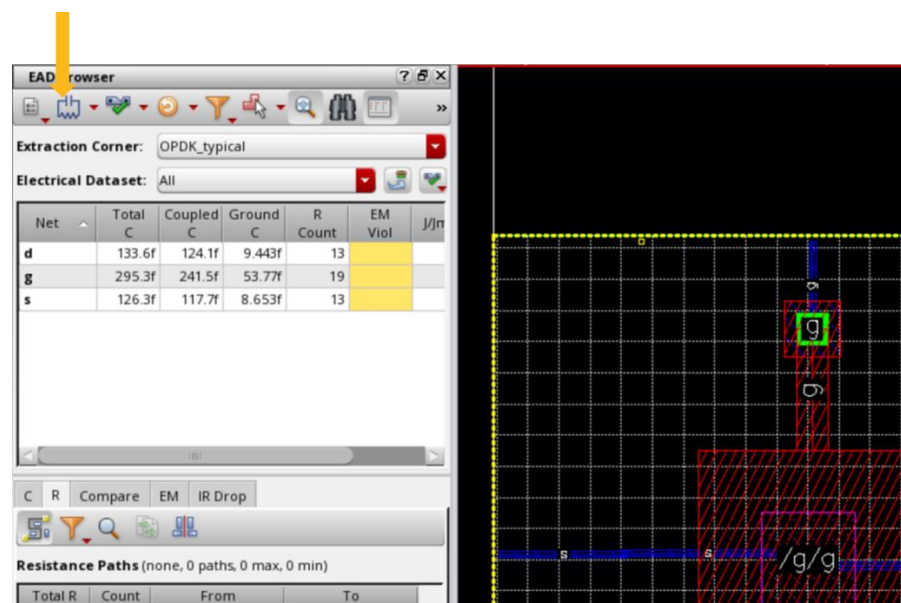
**Step 2.** In the Layout EXL window, switch to the EAD workspace in the workspace configuration toolbar.



**Step 3.** Load the OPDK\_typical process settings on the EAD browser.



**Step 4.** This also populates the top window with a column for each net present in the design. Now click on the second icon from the left of the EAD browser toolbar. This will trigger extraction of parasitics for all nets.



Once the extraction is completed, for each net, new parasitic values will be populated. The meanings of the reported values:

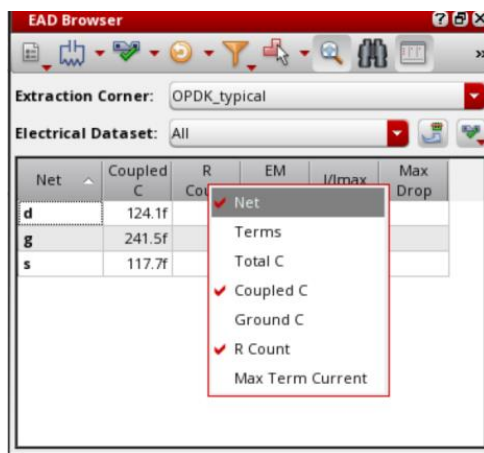
**Total C** – sum of Coupled C and Ground C

**Coupled C** – total coupled capacitance to this net

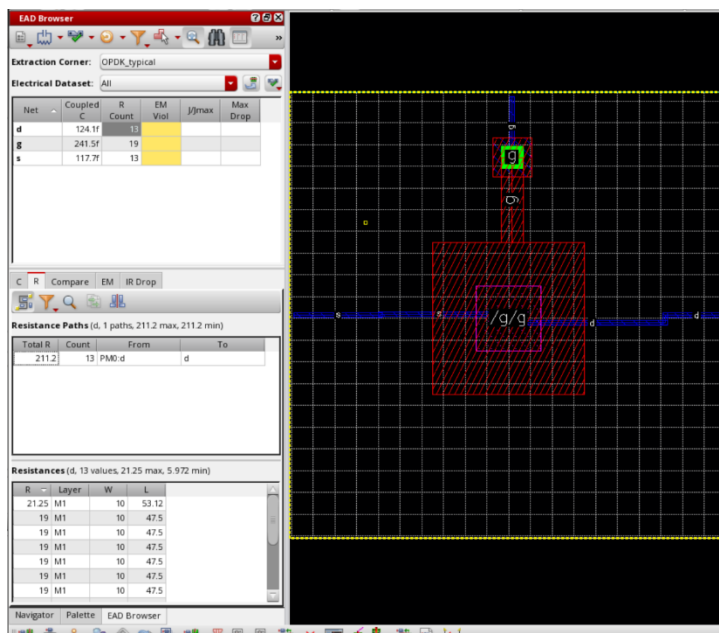
**Ground C** – total capacitance to ground, assuming the substrate is placed on a conductive plate.

**R count** – total number of parasitic resistance components present on the net.

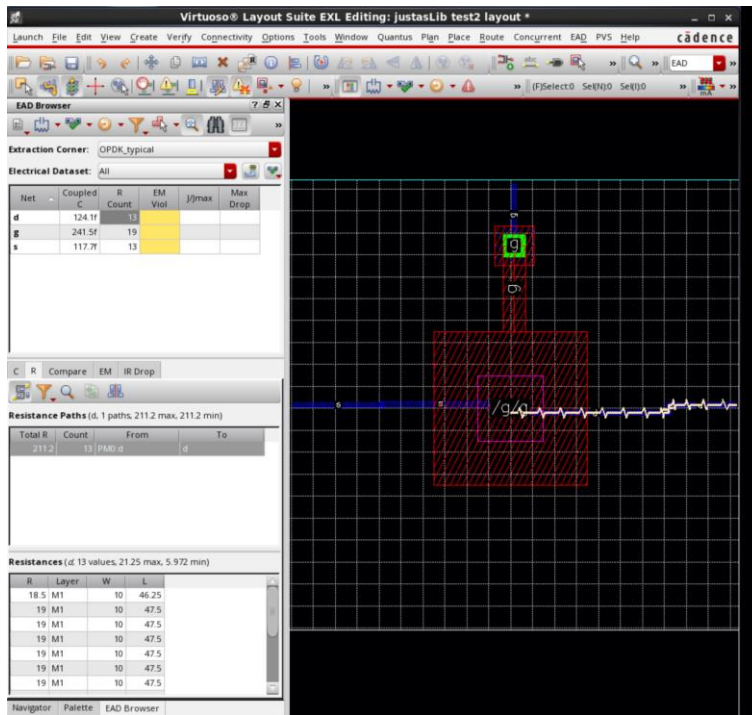
At this point, the key metrics are Coupled C and R count. The Ground C and Total C columns can be disabled to avoid confusion. This can be done by right clicking on the column headers and unselecting the two categories:



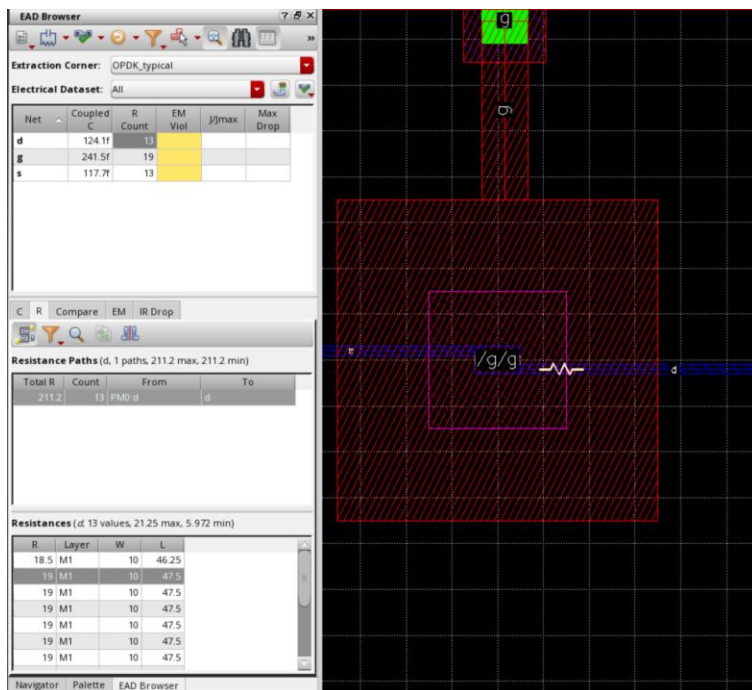
**Step 5.** To explore the parasitic elements in more detail, select the metric of interest, for one of the nets in the top table and refer to the lower sections of the EAD browser. ‘Resistance paths’ and ‘Resistances’ sections are now populated.



**Step 6.** 'Resistance paths' list the total resistance in the path between two terminals on the same net. When clicked, it will highlight the path on the layout.



**Step 7.** For an even more detailed analysis, the 'Resistances' section on the bottom lists every parasitic resistor in the resistance path. Selecting an individual R component in this table will highlight its location in the layout.



**Step 8.** Now let's take a look at the parasitic capacitances. Select the Coupled C value for one of the nets and notice that the bottom sections 'Capacitance by Net' and 'Coupling Caps' are now populated.

The screenshot shows the EAD Browser interface with the 'Electrical Dataset' set to 'All'. The 'Coupled C' column for net 'd' is selected, and the 'Capacitance by Net' and 'Coupling Caps' sections are populated.

Net	Coupled C	R Count	EM Viol	J/Jmax	Max Drop
d	124.1f	13			
g	241.5f	19			
s	117.7f	13			

To Net	Total C	Count
g	124f	13
s	0.1694f	5

C	Layer	To Net	To Layer
29.33f	M1	g	M2
27.79f	M1	g	M2
26.24f	M1	g	M2
24.7f	M1	g	M2
6.175f	M1	g	M2
4.631f	M1	g	M2
3.087f	M1	g	M2
1.544f	M1	g	M2
0.142f	M1	g	M2

**Step 9.** 'Capacitance by Net' table shows a list of the total coupling capacitance from the selected net to all other nets, where parasitics have been identified. Click one of the entries in this table and observe that the two layout nets are now highlighted.

The screenshot shows the EAD Browser interface with the 'Capacitance by Net' table selected. The entry for net 'g' is highlighted, and the layout view on the right shows nets 'd' and 'g' highlighted in purple.

Net	Coupled C	R Count	EM Viol	J/Jmax	Max Drop
d	124.1f	13			
g	241.5f	19			
s	117.7f	13			

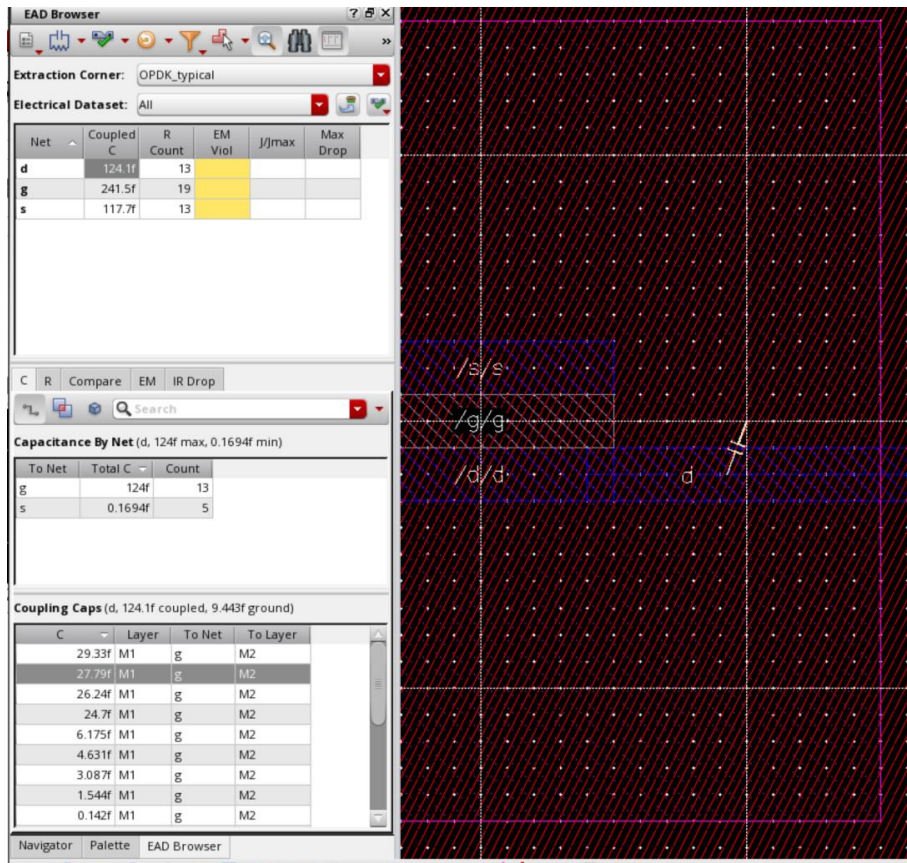
To Net	Total C	Count
g	124f	13
s	0.1694f	5

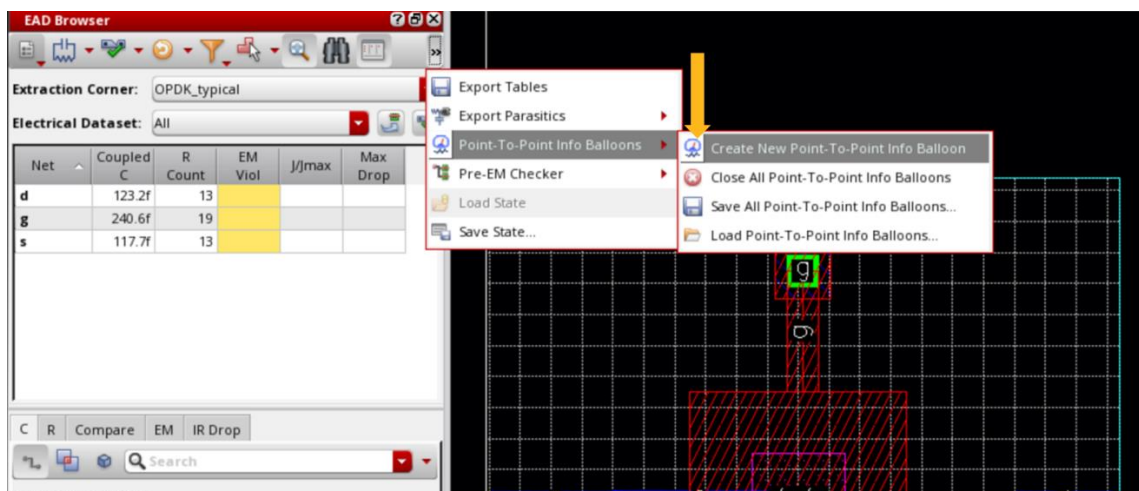
C	Layer	To Net	To Layer
29.33f	M1	g	M2
27.79f	M1	g	M2
26.24f	M1	g	M2
24.7f	M1	g	M2
6.175f	M1	g	M2
4.631f	M1	g	M2
3.087f	M1	g	M2
1.544f	M1	g	M2
0.142f	M1	g	M2



**Step 9.** 'Coupling Caps' table shows a list of all the smaller coupling capacitance elements found in the design for the selected net. Click on one of the entries and the visual representation of such capacitive element will be shown on the layout.



**Additional tip.** Another useful utility is the Point-to-Point info balloon. It provides a way to check point-to-point resistance on a single net. To invoke this, click on the arrows on the right side of the EAD Browser tool bar and select Point-To-Point Info Balloons -> Create New Point-To-Point Info Balloon.



This will allow you to place two selection points. Place the two points on separate locations of the same net. The info balloon will then report resistance between those two points.

