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How to Print Cell Hierarchy Path with Calibre DESIGNrev Scripting

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Outline

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- Directions
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Objective

This Support kit offers printing the cell hierarchy path and its bbox information, using a Calibre DESIGNrev Tcl script.

Included Files

File	Description
layout.gds	Sample GDS file
layout.gds.layerprops	Layer properties file
cell_list.txt	Text file includes a list of cell names
script.tcl	Tcl script to return the cell hierarchy path in a text file
runme	Script to Calibre DESIGNrev with Tcl code

Description

- Calibre DESIGNrev provides a convenient way to return reference cell information by using the command **$L iterator ref**. The returned information is in the following format:

  {cell_name x y mirror angle mag [{properties}]} path {bbox}}

- **$L iterator ref** takes 4 required arguments specifying the ***cell name*** that contains the objects to be returned and the ***range*** of elements to return with indices ***startRange*** through ***endRange***

- The command also has multiple optional arguments such as:
  - **-depth *startDepth endDepth***: specifying the hierarchical output of objects between startDepth and endDepth with the search beginning in the specified cell (the required cell name option).

  - **-filterCell *list_of_cells***: used to return only objects that reference the specified list_of_cells.

Description
>> Tcl Script

- The Tcl script is invoked by a Calibre DESIGNrev batch run as such:

```
calibredrv script.tcl <layout_name> <cell_list.txt>
```

- It takes two required arguments for the input:
  - **layout_name:** the first argument is the layout file name
  - **cell_list.txt:** the second argument is the text file that contains specified cell names
- The script generates an output text file “cell_list.txt_out.txt”. That file contains the following:
  - The total instance reference count for the specified cell
  - The possible hierarchical path for each reported instance
  - The origin of each reported instance
  - the bbox information for each reported instance

Note:

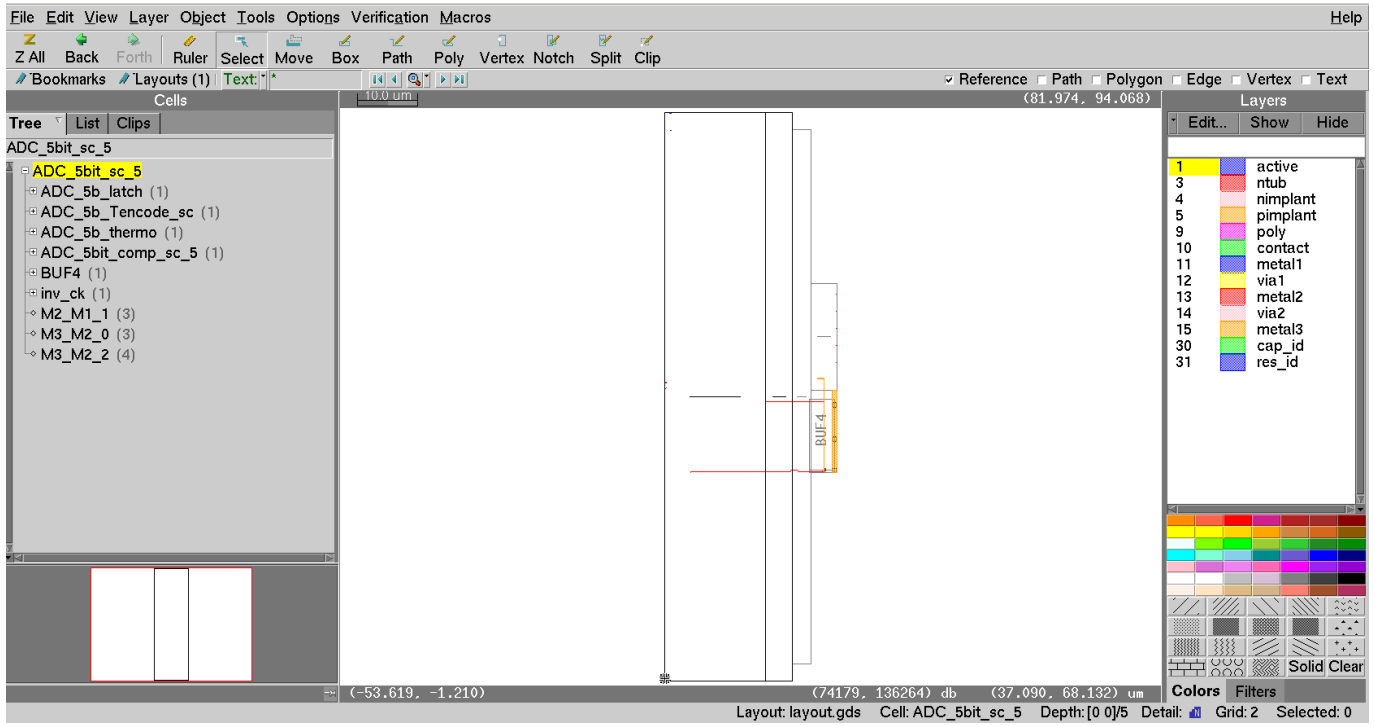
- **The bbox (bounding box)** information are as follows: The first two values are the lower left corner coordinates, and the last two values are the upper right corner coordinates of the bounding box

Description
>> Layout.gds

- View the sample layout with the command

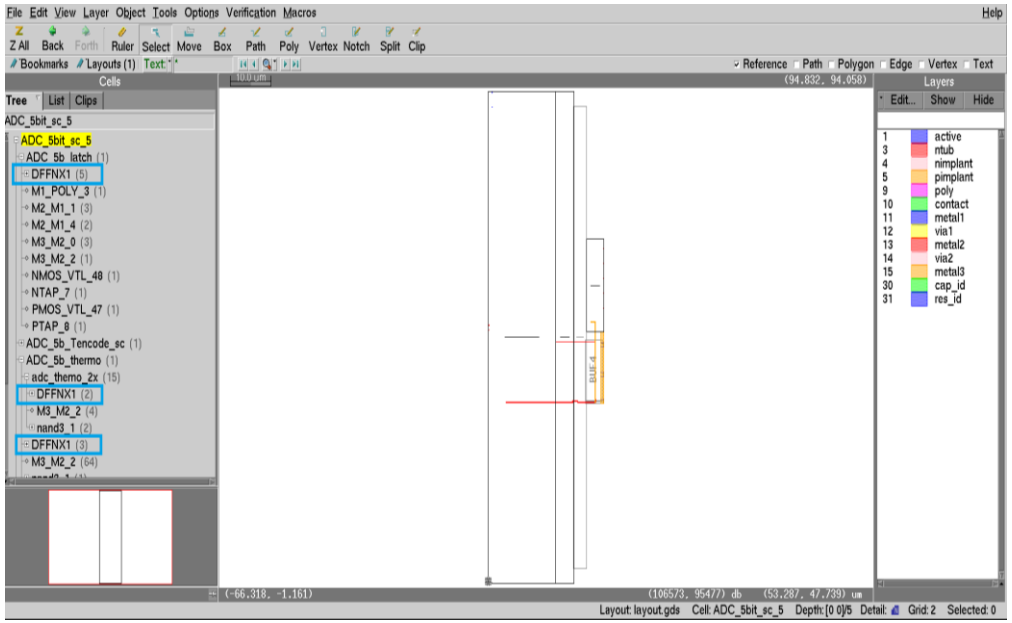
```
calibredrv layout.gds
```

- To view all the hierarchy, press 9



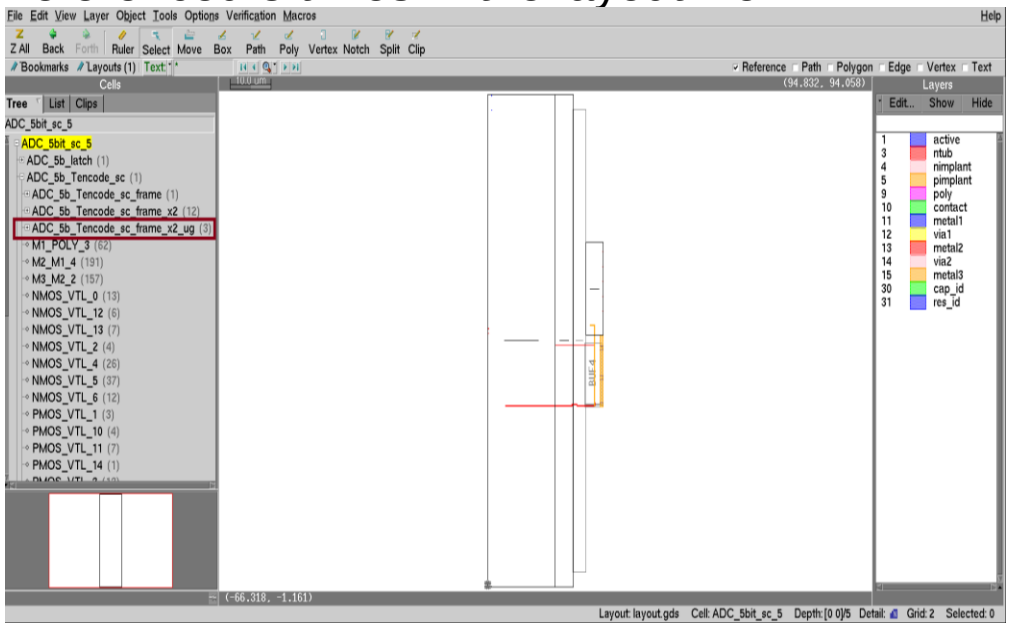
Description
>> Layout.gds

- In the cells tree, expand the following cells:
  - “ADC_5b_latch”
  - “ADC_5b_thermo”
  - “adc_themo_2x”
- You can observe that cell “DFFNX1” is referenced 38 times in the layout file.



- In the cells tree, expand the following cell:
  - ADC_5b_Tencode_sc

- You can observe that cell “ADC_5b_Tencode_sc_frame_x2_ug" is referenced 3 times in the layout file.



- Please close Calibre DESIGNrev after examining the layout file

Description
>> runme

- The **runme** file executes one Calibre DESIGNrev run followed by an execution of a Tcl script at invocation

```
#!/bin/csh
calibredrv script.tcl layout.gds cell_list.txt
```

- The **cell_list.txt** file lists the cells whose paths are required to be reported
- For this test case, the cells **DFFNX1** and **ADC_5b_Tencode_sc_frame_x2_ug** are specified

```
DFFNX1
ADC_5b_Tencode_sc_frame_x2_ug
```

Note:

- Clear any empty lines in the “cell_list.txt file” to avoid any run error

Directions

- To execute the **runme** file, write the following in the opened terminal:

```
source runme
```

- This run generates the output text file “cell_list.xt_out.txt”. it contains the cell instances information as mentioned in the transcript

```
#  Cell instance info is written to file cell_list.txt_out.txt
```

- You can open the generated text file **“cell_list.txt_out.txt”** using any text editor tool

Directions

The output text file **“cell_list.txt_out.txt”**

```
############################################################
Output Format:
Cellname        Instance Count
Hierarchy path  cell origin     bbox { X1, Y1, X2, Y2 }
(Note : Coordinates are in um)
############################################################

Cell =DFFNX1    Count =38
Path 1 = ADC_5bit_sc_5/ADC_5b_latch      (X,Y) = (24.25,56.4)    bbox = { 24.25  56.025  27.725  59.595 }
Path 2 = ADC_5bit_sc_5/ADC_5b_latch      (X,Y) = (24.25,50.76)   bbox = { 24.25  50.385  27.725  53.955 }
Path 3 = ADC_5bit_sc_5/ADC_5b_latch      (X,Y) = (24.25,62.04)   bbox = { 24.25  61.665  27.725  65.235 }
Path 4 = ADC_5bit_sc_5/ADC_5b_latch      (X,Y) = (24.25,56.4)    bbox = { 24.25  53.205  27.725  56.775 }
Path 5 = ADC_5bit_sc_5/ADC_5b_latch      (X,Y) = (24.25,62.04)   bbox = { 24.25  58.845  27.725  62.415 }
Path 6 = ADC_5bit_sc_5/ADC_5b_thermo     (X,Y) = (16.705000000000002,0.0)        bbox = { 16.705000000000002  -0.375  20.18  3.1950000000000003 }
Path 7 = ADC_5bit_sc_5/ADC_5b_thermo     (X,Y) = (16.705000000000002,90.24)      bbox = { 16.705000000000002  89.865  20.18  93.435 }
Path 8 = ADC_5bit_sc_5/ADC_5b_thermo     (X,Y) = (16.705000000000002,90.24)      bbox = { 16.705000000000002  87.045  20.18  90.615 }
Path 9 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x        (X,Y) = (16.705000000000002,73.32000000000001)  bbox = { 16.705000000000002  72.94500000000001  20.18  76.515 }
Path 10 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,73.32000000000001)  bbox = { 16.705000000000002  70.125  20.18  73.69500000000001 }
Path 11 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,78.96000000000001)  bbox = { 16.705000000000002  78.58500000000001  20.18  82.155 }
Path 12 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,78.96000000000001)  bbox = { 16.705000000000002  75.765  20.18  79.33500000000001 }
Path 13 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,62.04)      bbox = { 16.705000000000002  61.665  20.18  65.235 }
Path 14 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,62.04)      bbox = { 16.705000000000002  58.845  20.18  62.415 }
Path 15 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,67.68)      bbox = { 16.705000000000002  67.305  20.18  70.875 }
Path 16 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,67.68)      bbox = { 16.705000000000002  64.485  20.18  68.055 }
Path 17 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,50.76)      bbox = { 16.705000000000002  50.385  20.18  53.955 }
Path 18 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,50.76)      bbox = { 16.705000000000002  47.565  20.18  51.135 }
Path 19 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,56.4)       bbox = { 16.705000000000002  56.025  20.18  59.595 }
Path 20 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,56.4)       bbox = { 16.705000000000002  53.205  20.18  56.775 }
Path 21 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,45.12)      bbox = { 16.705000000000002  44.745  20.18  48.315 }
Path 22 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,45.12)      bbox = { 16.705000000000002  41.925000000000004  20.18  45.495 }
Path 23 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,39.480000000000004)         bbox = { 16.705000000000002  39.105000000000004  20.18
42.675000000000004 }
Path 24 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,39.480000000000004)         bbox = { 16.705000000000002  36.285000000000004  20.18
39.855000000000004 }
Path 25 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,28.2)       bbox = { 16.705000000000002  27.825  20.18  31.395 }
Path 26 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,28.2)       bbox = { 16.705000000000002  25.005  20.18  28.575 }
Path 27 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,33.84)      bbox = { 16.705000000000002  33.465  20.18  37.035000000000004 }
Path 28 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,33.84)      bbox = { 16.705000000000002  30.645  20.18  34.215 }
Path 29 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,16.92)      bbox = { 16.705000000000002  16.545  20.18  20.115000000000002 }
Path 30 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,16.92)      bbox = { 16.705000000000002  13.725  20.18  17.295 }
Path 31 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,22.56)      bbox = { 16.705000000000002  22.185  20.18  25.755 }
Path 32 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,22.56)      bbox = { 16.705000000000002  19.365000000000002  20.18  22.935 }
Path 33 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,11.28)      bbox = { 16.705000000000002  10.905  20.18  14.475 }
Path 34 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,11.28)      bbox = { 16.705000000000002  8.085  20.18  11.655 }
Path 35 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,5.64)       bbox = { 16.705000000000002  5.265  20.18  8.835 }
Path 36 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,5.64)       bbox = { 16.705000000000002  2.445  20.18  6.015000000000001 }
Path 37 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,84.60000000000001)  bbox = { 16.705000000000002  84.22500000000001  20.18  87.795 }
Path 38 = ADC_5bit_sc_5/ADC_5b_thermo/adc_themo_2x       (X,Y) = (16.705000000000002,84.60000000000001)  bbox = { 16.705000000000002  81.405  20.18  84.97500000000001 }

Cell =ADC_5b_Tencode_sc_frame_x2_ug     Count =3
Path 1 = ADC_5bit_sc_5/ADC_5b_Tencode_sc         (X,Y) = (21.0425,36.660000000000004)    bbox = { 21.0425  36.28  24.25  42.68 }
Path 2 = ADC_5bit_sc_5/ADC_5b_Tencode_sc         (X,Y) = (21.0425,31.02)         bbox = { 21.0425  30.64  24.25  37.04 }
Path 3 = ADC_5bit_sc_5/ADC_5b_Tencode_sc         (X,Y) = (21.0425,42.300000000000004)    bbox = { 21.0425  41.92  24.25  48.32 }
```

38 instances of cell “DFFNX1”

3 instances of cell “ADC_5b_Tencode_sc_frame_x2_ug”

Note:

- All dimensions are in microns

Conclusion

- Dealing with full-chip layouts requires a quick access to cell instances information such as the instance path or the bounding box information

- **$L iterator ref** is a very powerful Calibre DESIGNrev command, with vast optional arguments, that returns a list of the specified type of references with several information about each reference such as instance path, coordinates of the cell origin, angle of rotation, mirroring information, geometrical properties and bbox information

- Please refer to the **Calibre® DESIGNrev™ Reference Manual** for additional information