Keysight EEsuf EDA
Getting Started with Advanced Design System (ADS)

Demo Guide
Getting Started with ADS

This tutorial will introduce the basic structure of ADS workspaces, libraries and cells. This includes design capture, simulation, and displaying simulation results.

Note: Workspaces in ADS 2011 and later replace projects from earlier ADS versions.

Figure below shows how ADS organizes each workspace.

![Workspace-Library Hierarchy](image)

Note: Understanding these concepts is the key to using ADS 2011 and later effectively:

- **Workspaces**: Different than a project, a workspace give you access to libraries that contain cells, where the cells contain designs.
- **Libraries**: In a workspace, libraries are a collection of cells. But libraries can also be Process Design Kit (PDKs) or separate folders outside of the workspace.
- **Cells**: Cells are folders that replace design files in the old networks directory. Cells are in libraries and usually contain different views of a design- this means layouts, schematics and a symbol.
- **Symbols**: The symbol represents all views in the cell. Usually one symbol is all you need for a cell.
Step 1 - Create a New Workspace

1. Launch ADS and from the ADS main window select File > New > Workspace. Or click on this icon.

Enter workspace name as desired, please note that the workspace name and path to the workspace location should not contain any spaces. Click Next.

Figure 1.
2. Select the libraries to be included in the workspace. ADS natively provides the Analog/RF and DSP components libraries and it can be selected as needed in actual design work under the workspace.

![New Workspace Wizard](image)

**Figure 2.**

Note: ADS Process Design Kits (PDKs) come directly from the foundry and configure the ADS environment for a given manufacturing process. Multiple PDKs can be associated to a single workspace. The PDK can be easily associated to a library and cell using easy-to-use interface.

Note: Component libraries provided in ADS can be added by clicking the link Add User Favorite Library/PDK.

Note: All vendor component libraries are provided in zipped format under:

```
/hpeesof/oalibs/componentLib/folder
```

Note: `<ADS_install_directory>` is called `/hpeesof`.

Note: All vendor component libraries are provided in zipped format.
3. Provide the library name under which you would like to organize the work. Default library name will be the same as the Workspace, unless you change the name. This library is not to be confused with component vendor or the third party libraries. This is a new way in which ADS organizes the design schematics/ layouts in a workspace and every workspace can contain multiple libraries in which we can organize our work consisting of multiple technologies e.g. GaAs, GaN, InP, SiGe etc. While we keep one library for each technology ADS provides the capability to use these designs under a single main design to perform Multi-Technology designs. It may be noted that in ADS, schematic and layout units are also considered in different technologies and it is recommended not to mix the units which we use in design. i.e. mil, mm, um etc. Click Next.

Figure 3.
4. Select the preferred units to be used during the design. In the present example, select 0.0001 mil layout resolution.

5. Click Next and see the summary of the workspace and click Finish and a blank workspace as shown below will appear. We are ready to create our schematic or layout designs in the newly created workspace.
Step 2 - Creating Schematic Design

Usually circuit design will start from schematic entry. To start the schematic design we can begin from File > New > Schematic or by clicking on the Schematic icon on the main window toolbar.

1. Enter the desired cell name (e.g. Discrete LPF) and select the Schematic Design Template as ads_templates: S_Params (for S-Parameter simulation). Selecting a template is an optional step but it is good feature to have because it saves the effort of setting up the design for simulation. Click OK.

Figure 6.
2. A new schematic page with two 50-ohm terminations and an S-parameter controller placed on it with default frequency settings should be visible. If a template was not selected during new schematic creation then we can place required components for SP simulations by going to the appropriate Simulation category e.g. Simulation-S_Param, Simulation-HB etc.

![S-Parameters schematic](image)

**Figure 7.**

3. Now let’s start creating a circuit, go to Palette menu as shown here and select Lumped-With-Artwork, place L_Pad and C_Pad components on the schematic to form a Low Pass Filter Topology as shown in the Figure 9. L_Pad and C_Pad are normal inductor and capacitors but they also include footprint information and designers can enter desired width, spacing and length of the component as per the component that might be used for actual PCB design.

![Circuit schematic](image)

**Figure 8.**

Note: Ground icon is located in the ADS schematic main menu toolbar as it is shown in the figure.
4. Double-click the S-Parameter controller and set the parameter as follows:
   - Start = 0.01 GHz
   - Stop = 1 GHz
   - Num. of points = 101 (step size will be automatically calculated) Click OK.
5. Click the **Simulate** icon (or press F7) to start the simulation.
6. Once done, a data display shows the simulation results, as shown below.

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**S-Parameters vs. Frequency**

![S-Parameters vs. Frequency](image)

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Figure 11.
7. Save the design to save all the work and inspect the main window to notice the schematic cell and data display (\texttt{<filename>.dds}).

Figure 12.

Congratulations! You have completed Getting Started with Keysight Advanced Design System (ADS). Check out more examples.

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