Revision Control – Lattice Propel Builder 2024.2

User Guide

FPGA-UG-02221-1.0

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Inclusive Language

This document was created consistent with Lattice Semiconductor’s inclusive language policy. In some cases, the language in underlying tools and other items may not yet have been updated. Please refer to Lattice’s inclusive language FAQ 6878 for a cross reference of terms. Note in some cases such as register names and state names it has been necessary to continue to utilize older terminology for compatibility.

Contents

Figures

Abbreviations in This Document

A list of abbreviations used in this document.

Abbreviation	Definition
FPGA	Field Programmable Gate Array
GIT	An open-source distributed version control system
GUI	Graphical User Interface
IP	Intellectual Property
SoC	System on Chip
SVN	Subversion software, an open source version control system
TCL	Tool Command Language

1. Introduction

This user guide introduces how to use revision control for Lattice Propel™ projects. Lattice Propel design environment supports revision control for your projects. You can access the revision control system to get all the change logs and switch to previous milestones if necessary. Using revision control for Lattice Propel projects, the compile time can be reduced. Compilation only starts when inputs are changed.

2. Recommended Revision Control Systems

The following revision control systems are recommended to be used with Lattice Propel software:

- GIT
  GIT is an open-source distributed version control system.
- SVN
  Subversion Software is an open-source version control system.
- Perforce
  Perforce is a centralized version control system.

3. Lattice Propel Revision Control Strategies

Lattice Propel design environment is friendly to revision control systems. There are many revision control systems available. You do not need to consider version compatibility. Lattice Propel design environment does not directly integrate specific revision control into it. You can select different revision control systems to work with Lattice Propel design environment.

Only the necessary files that constitute the project are managed by the revision control system. Other files, including some intermediate files and your configuration files, are only used in your own project and are not submitted to the version control system.

3.1. Lattice Propel Project Directory Structure

In Lattice Propel design environment, it is recommended that all source codes and IP designs be placed under the same disk partition instead of being used across partitions.

Lattice Propel projects use one directory to put all source and project files. After creating a project, the directory structure of the project is shown in Figure 3.1 and Figure 3.2.

All source files are stored in the folder named project name, such as the hello_world folder as shown in Figure 3.1.

```
├─── hello_world
│    ├─── application            -- Folder containing functional-ready embedded application source
│                                    codes(only exists for template SoC with legacy C design flow)
│    │    ├─── main.c
│    │    ├─── utils.c
│    │    └─── utils.h
│    ├─── hello_world.layout     -- Created after running “Generate”
│    ├─── hello_world.sbx        -- Builder Project file
│    ├─── hello_world_tmpl.v     -- Verilog instantiation template top file
│    ├─── hello_world_tmpl.vhd   -- VHDL instantiation template top file
│    ├─── hello_world.v          -- Verilog file
│    └─── lib                    -- IP instances files under the folder
│         └─── latticesemi.com
│              ├─── ip
│              └─── module
├─── hello_world.pdc             -- Radiant constraint file
├─── sge                         -- The folder created after running “Generate”
│    ├─── bsp
│    │    ├─── driver             -- Folder containing driver codes from the IP in the platform
│    │    │    ├─── gpio
│    │    │    ├─── riscv_mc
│    │    │    └─── uart
│    │    ├─── riscv_errors.h
│    │    └─── sys_platform.h
│    ├─── cpu0.yaml               -- Processor description file used at debugging time
│    ├─── soc_svd                 -- System view description file used for peripherals registers
│                                    view at debug perspective.
│    │    └─── hello_world.svd
│    └─── sys_env.xml             -- System environment file describing aspects of the platform,
│                                    such as memory spaces
├─── .socproject                 -- Propel project file, internal file
```

Figure 3.1. Source Files

If the Propel project has a verification design, all relative files are placed in a verification directory, as shown in Figure 3.2.

```
├─── verification
    ├─── hello_world_v.json      -- File describes current simulator and do file path
    ├─── hello_world_v.sbx       -- Verification project file
    └─── lib                     -- IP instances files for verification project
         └─── latticesemi.com
              └─── sim_model
```

Figure 3.2. Verification-related Files

3.2. Lattice Propel File Types

The project and constraint file types under a Lattice Propel project directory include:

- .socproject file: Propel project file, internal file
- .pdc file: Radiant constraint file
- .lpf file: Diamond constraint file

The basic source or design file types include:

- .v file: Verilog file
- .vhdl file: VHDL file
- .sv file: System Verilog file
- .sbx file: Builder Project file

3.3. Files Committed for Lattice Propel Revision Control Strategies

The following files are committed for revision control strategies of Lattice Propel design environment:

- The .socproject project file and .pdc/.lpf constraint file
- All the source files under directory named project name
- Verification directory files

For an SoC project named hello_world, the files committed are as shown in Figure 3.3.

```
├─── hello_world
     └─── *.*
├─── hello_world.pdc
├─── .socproject
└─── verification
     └─── *.*
```

Figure 3.3. Files Committed for Lattice Propel Revision Control Strategies

4. Lattice Propel Revision Control Workflows

The Lattice Propel revision control workflows are presented in the following sections.

4.1. Lattice Propel Revision Control Normal Workflow

Each developer has a working directory. You can get the latest code from the Lattice Propel version server and develop in your own development environment. Later, you can submit the modified code or new design to the Propel version server if needed.

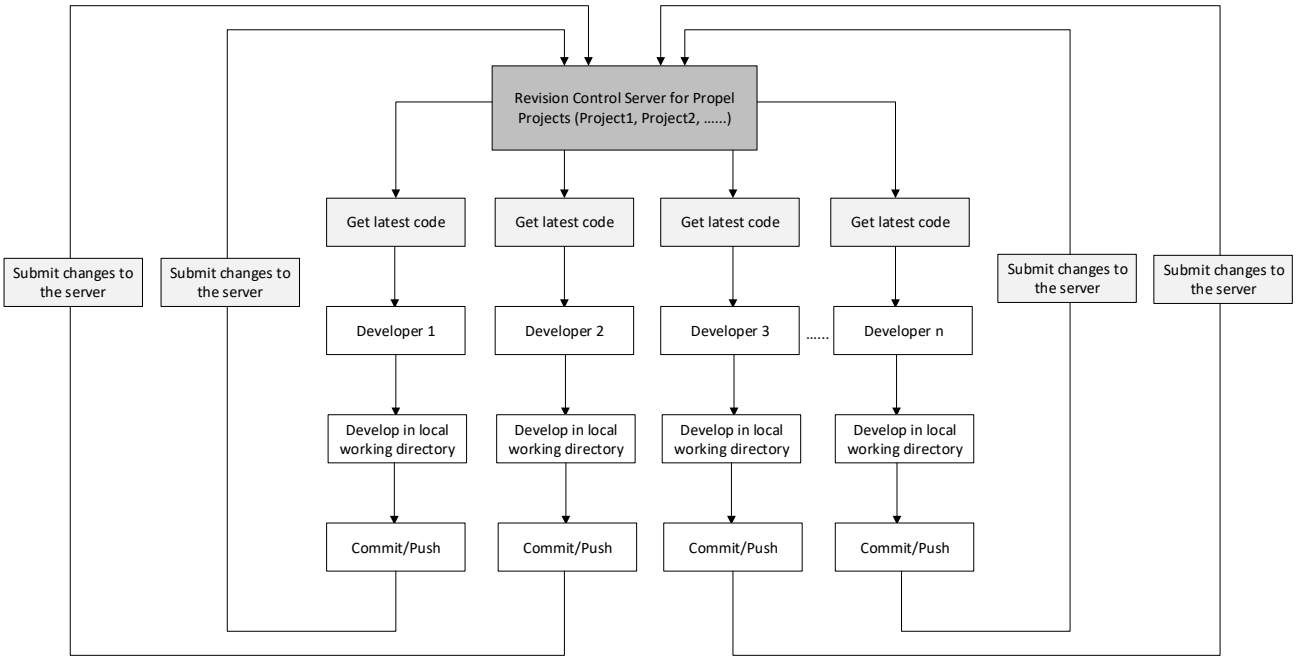

Figure 4.1. Lattice Propel Revision Control Normal Workflow

4.2. Multiple Developers Working on the Same File Workflow

Most of the time, developers have their own code changes, and may modify the same source file or design. If developer A submits a file and developer B has updated the file, then developer A gets an error. At this time, developer A needs to update the latest code locally from the server, integrate it with his own modifications, and submit it again. This is the collaborative operation of multiple developers for revision control.

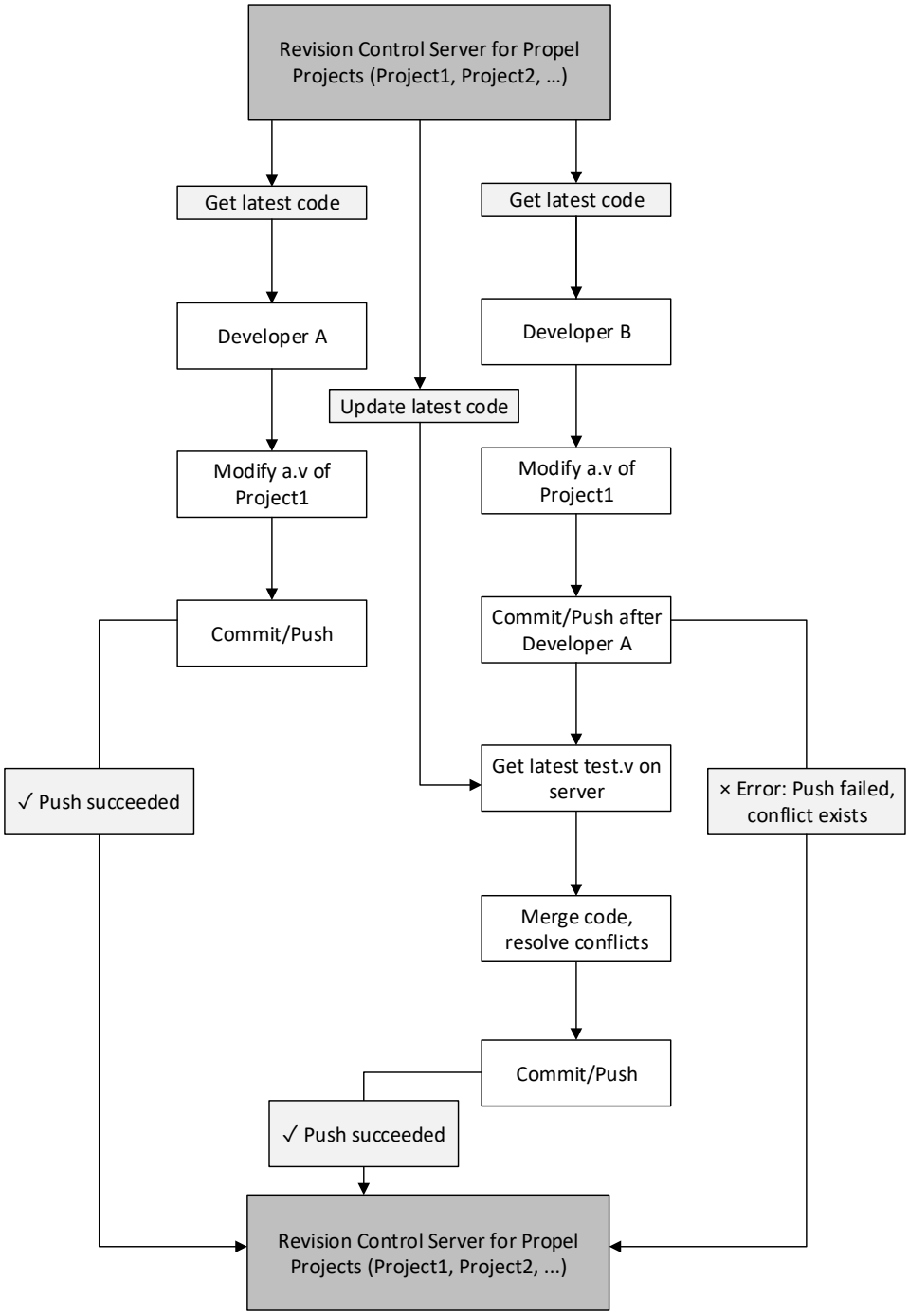

Figure 4.2. Multiple Developers Working on the Same File Workflow

4.3. Multiple Developers Adding Files Workflow

Developer A may add a new file a.v to the design, submitting this file and the Propel project file to the revision control server. After that, Developer B can get the latest code from the server, merge the local code, resolve the conflict, and continue the subsequent development.

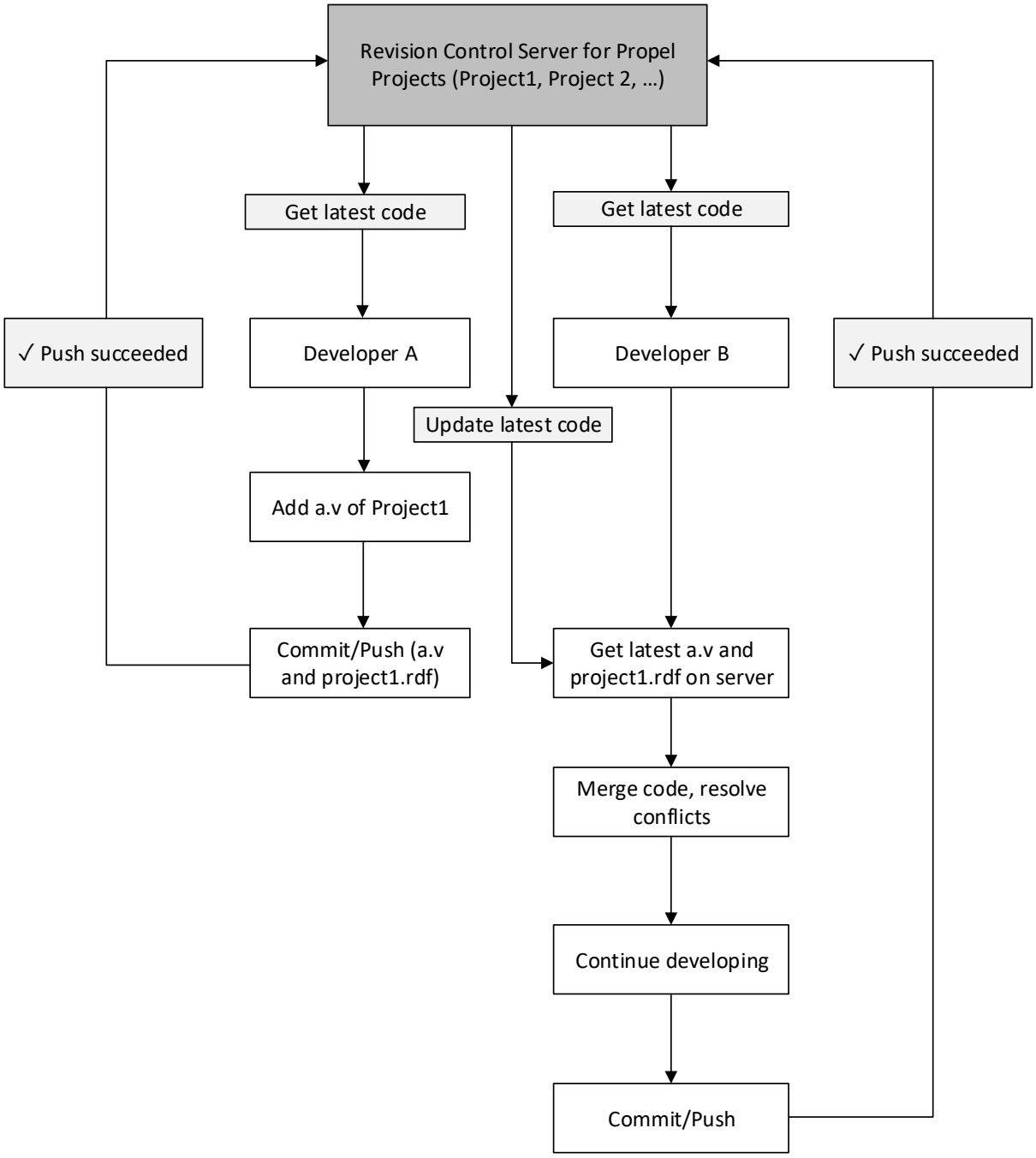

Figure 4.3. Multiple Developers Adding Files Workflow

5. Reproduce SoC Design Using TCL Script

You can generate a TCL script from the current SoC project, and then set up a new project by launching this TCL script in the new environment.

Any Propel Builder project can be exported as a TCL script. The generated TCL script can contain the required TCL commands to recreate the SoC design from scratch, generate all of its IP and make the required interface and port connections. This script can be used to create a new project from its source project entirely from scratch.

5.1. Generate TCL Script for Existing SoC Design

To generate the TCL script:

1. In Lattice Propel Builder, save the current SoC project by clicking the  icon.
2. Type the following command in the TCL console with corresponding options:

   sbp_design gen_tcl -proj_dir <*project directory*> -proj_name <*project name*> [-propel_dir <*propel directory*>] [-o <output name of the generated script>]

   An example is given below:

   sbp_design gen_tcl -proj_dir D:/lscc/my_workspace -proj_name test -o newsbx.tcl

   The output of this command shows the location of the TCL script, as shown in the following example (Figure 5.1):

   Tcl file C:/lscc/workspace/Example/Example/newsbx.tcl was generated successfully.

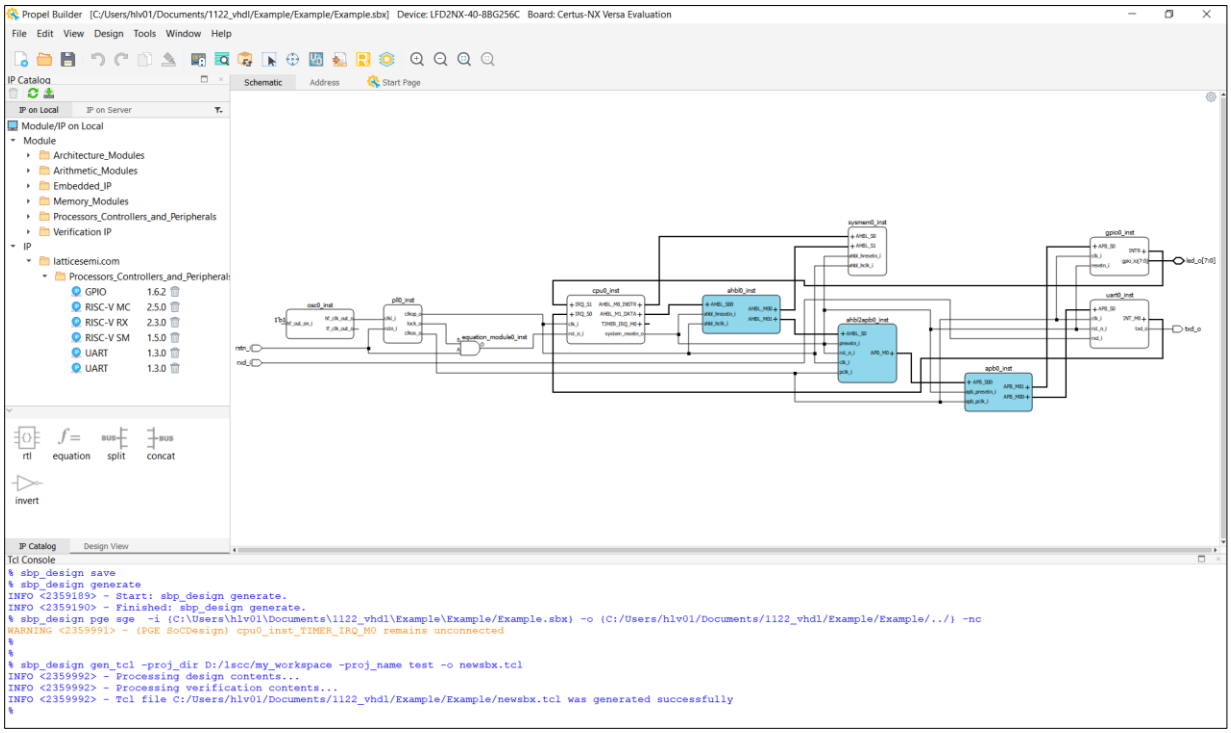

Figure 5.1. Generate TCL Script for Existing System

5.2. Reproduce SoC Design

You can use the TCL script generated for the existing SoC project to reproduce a new SoC project.

1. Before launching this TCL script in a new environment, make sure all the IPs mentioned in the script are installed in the new environment. Both name and version of the IPs should match.

You can check all IPs from the IP Catalog view (Figure 5.2).

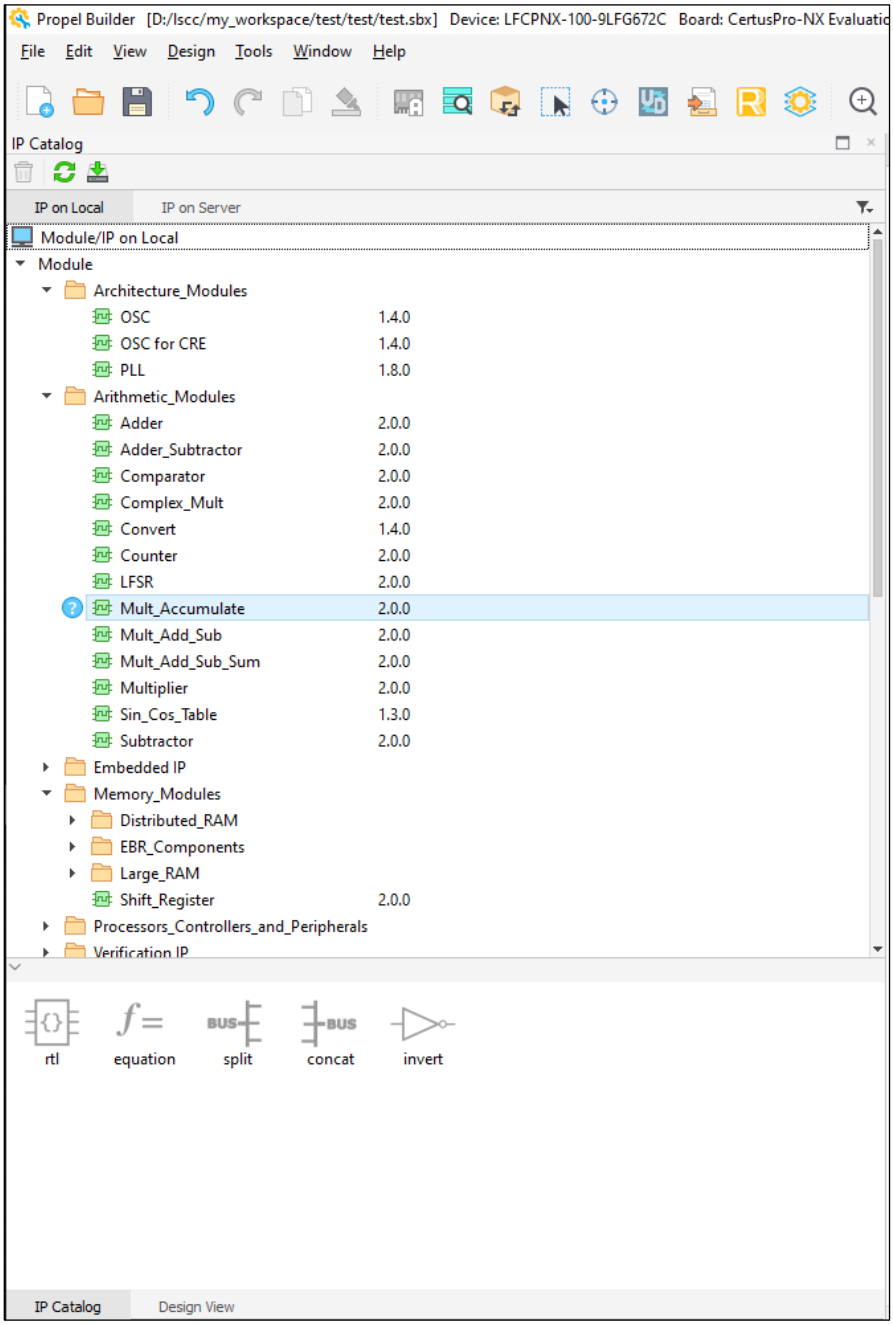

Figure 5.2. IP Catalog View

2. Or, you can check all IPs by typing the following command in TCL console (Figure 5.3):
   ip_catalog_list

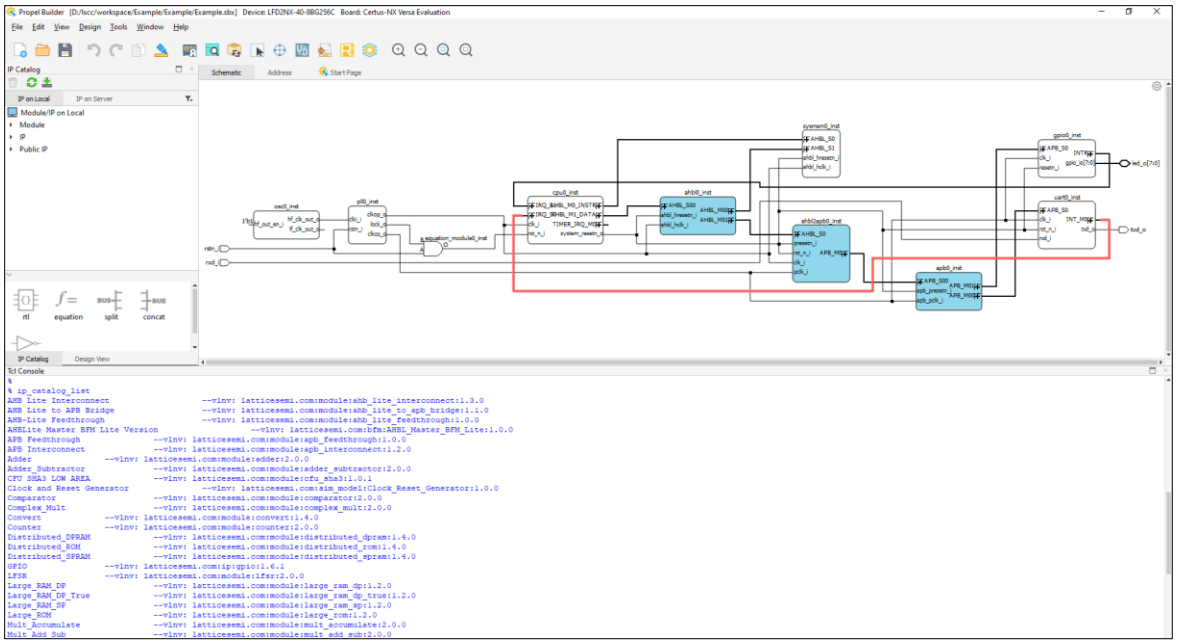

Figure 5.3. IP Catalog List Command

3. Fetch the TCL script and if needed, change corresponding settings in the script to use in the new environment:
   - targetDir: The new project directory. Make sure this directory already exists before launching TCL.
   - projectName: Project name.
   - propelRegenLsccBase: The Propel installation path. Make sure this directory exists.

   Note: If there is any file configuration in the sbp_config_ip command, update the file path to the correct path on local setup. For example, update INIT_FILE in the System Memory IP.
4. To launch this TCL script to create a new project, make sure no design is currently open in Propel Builder. Type 'source <*tcl_path*>' in the TCL console, as shown in the example below (Figure 5.4):

   source D:/lscc/workspace/Example/Example/newsbx.tcl

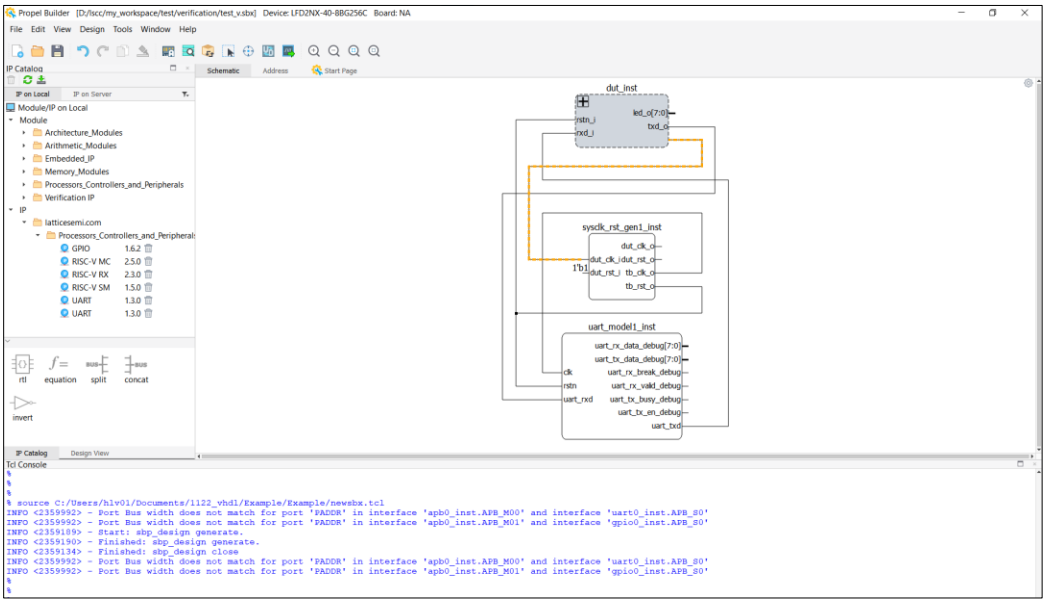

Figure 5.4. Launch TCL Script to Create New Project

5. Now you can click the  icon from Propel Builder toolbar to switch back to SoC Design project.

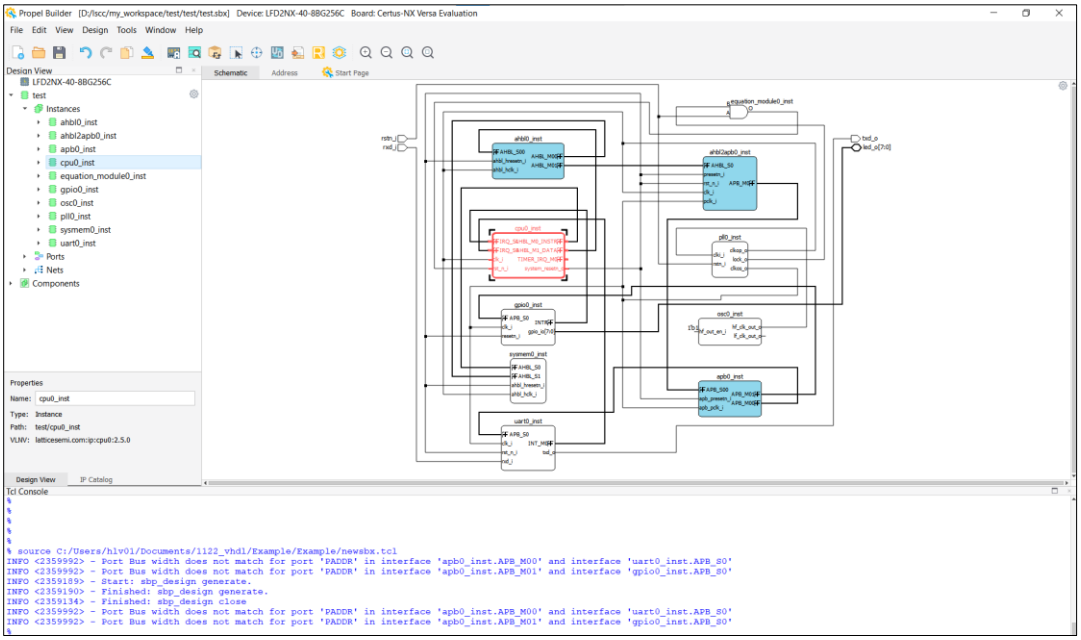

Figure 5.5. SoC Design View

6. (Optional) Right-click on the **Schematic** view and select **Relayout**, if the new design is out of proportion (Figure 5.6).

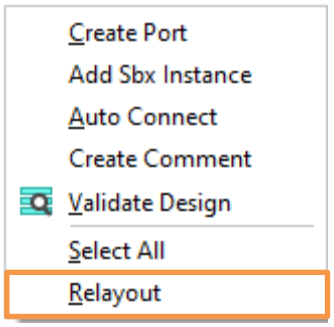

Figure 5.6. Relayout Option

7. Some files need to be added/modified to fully reproducing the original SoC design.
   - **For devices supported in Lattice Radiant software**:
     a. If the SoC is on board level, copy the Radiant constraint file from the source project (Figure 5.7). The path is <*workspace*>/<*project_dir*>/<*project_name*>.pdc.

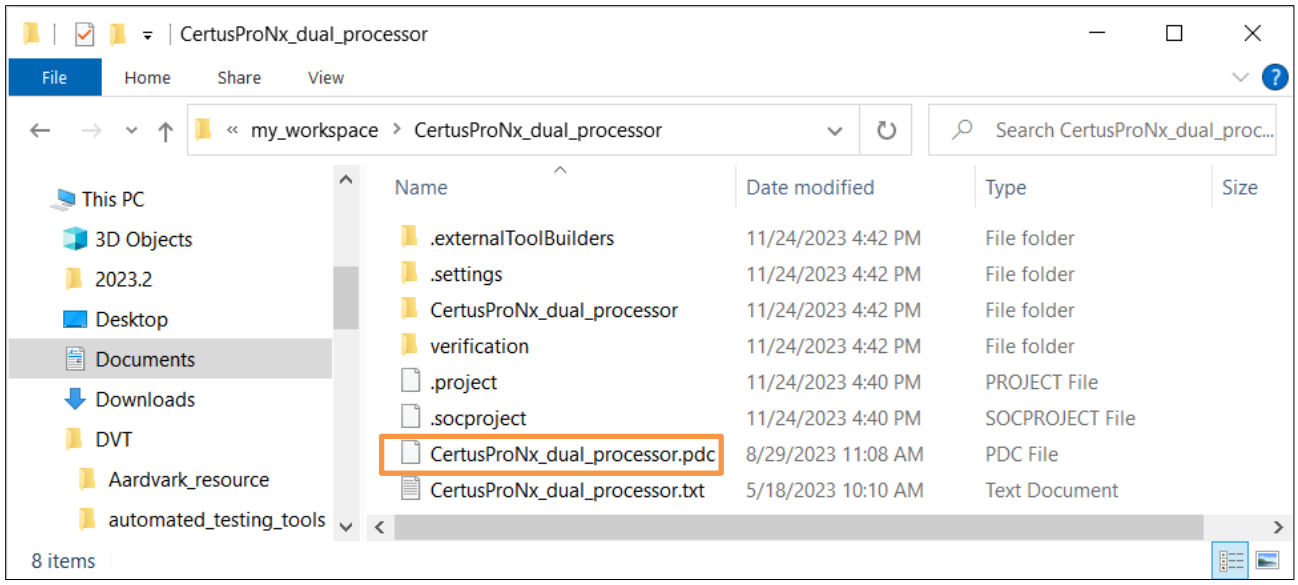

Figure 5.7. Constraint File in Source Project

b. Rename the copied constraint file with the new project name, as shown in Figure 5.8.

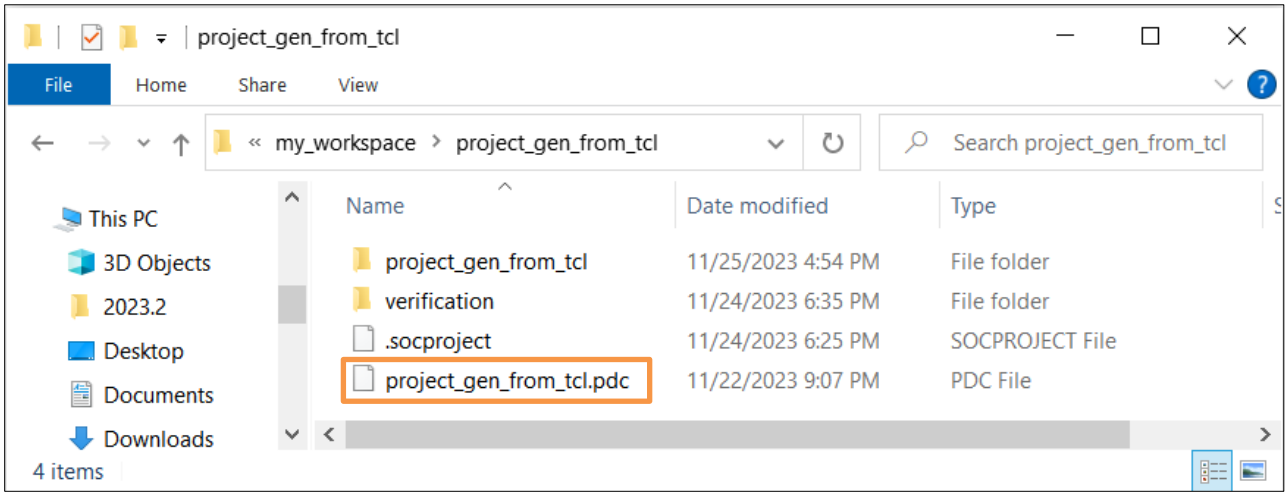

Figure 5.8. Rename Constraint File Copied from Source Project

c. Open Lattice Radiant software by clicking on the icon on Propel Builder GUI toolbar.

d. Type the following commands in the Radiant TCL console (Figure 5.9).

```
prj_set_strategy_value -strategy Strategy1 par_place_iterator=10
prj_set_strategy_value -strategy Strategy1 par_stop_zero=True
prj_save
```

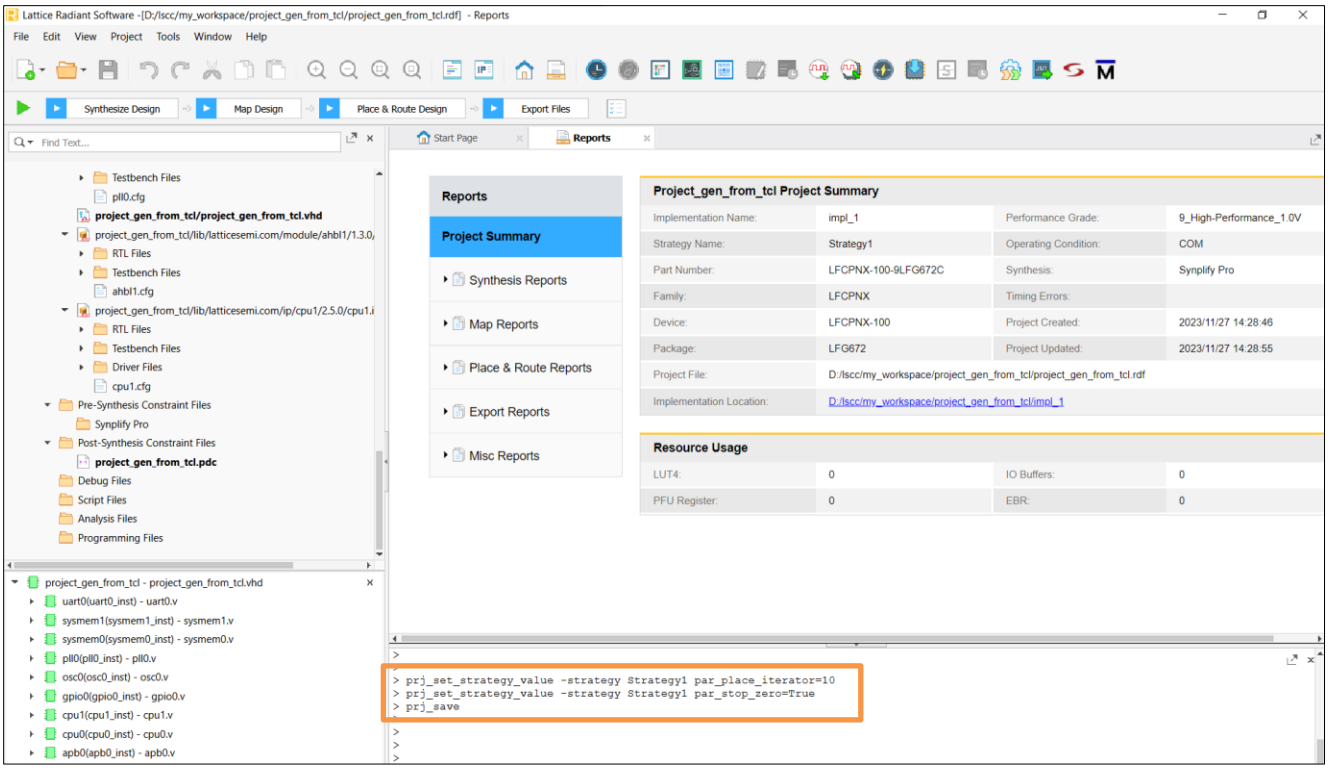

Figure 5.9. Radiant TCL Console

e. For some templates, there is an application folder inside the project directory (Figure 5.10). This folder is used for creating C project in Propel SDK. Copy it from the source project.

The path is <*workspace*>/<*project_dir*>/<*project_name*>/application.

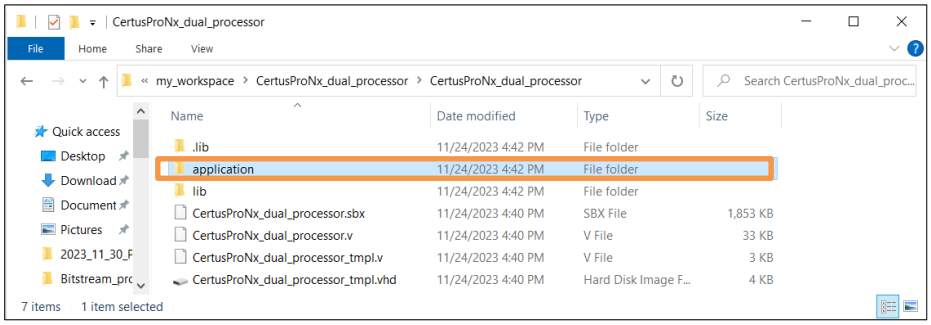

Figure 5.10. Application Folder in Source Project

f. Edit the .socproject file to add the ConstraintFile and AddResources entries if there is an application folder in the step above, as shown in the example below.

The file path is <*workspace*>/<*project_dir*>/.socproject.

```
<?xml version="1.0" encoding="UTF-8" ?>
<propelProject>
    <builder-resource>
        <socProject sbxfile="./project_gen_from_tcl/project_gen_from_tcl.sbx" />
        <verifyProject sbxfile="./verification/project_gen_from_tcl_v.sbx" />
        <ConstraintFile>./project_gen_from_tcl.pdc</ConstraintFile>
        <AddResources>
            <AddResource SoC="False">./project_gen_from_tcl/application</AddResource>
        </AddResources>
    </builder-resource>
    <builderInfo version="2023.2" />
</propelProject>
```

- **For devices supported in Lattice Diamond software:**
  a. Copy top.v from the source project, which is used for the Diamond flow (Figure 5.11).
  The file path is <*workspace*>/<*project_dir*>/<*project_name*>/<*project_name*>_Top.v.

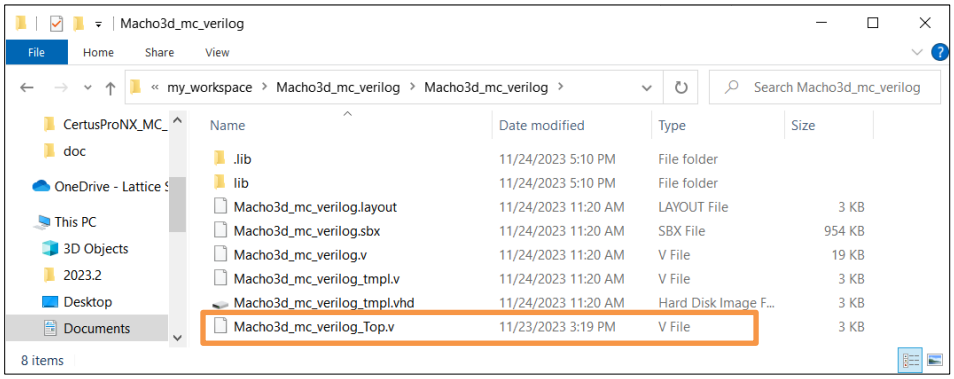

Figure 5.11. Top.v File in Source Project

  b. Rename the file to <*new_project_name*>_Top.v (Figure 5.12).

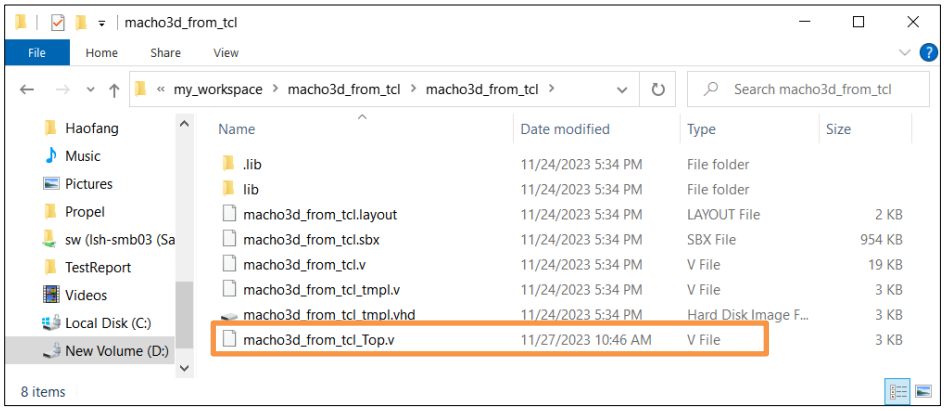

Figure 5.12. Rename Top File Copied from Source Project

  c. Edit contents of the file, replacing the project name with the new one (Figure 5.13).

```
module HelloWorld_Top (
    input  rstn_i,
    input  rxd_i,
    output txd_o,
    inout [7:0] led_o
);

GSR GSR_INST(.GSR(rstn_i));
wire sys_clk /*synthesis syn_keep = 1*/;
wire esb_oscclk;
OSCJ #(.NOM_FREQ("38.0")) OSCJ (.STDBY(1'b0), .OSC(sys_clk), .SEDSTDBY(),.OSCESB(esb_oscclk));

test_macho3d_mc_tcl HelloWorld_inst (
    .clk_i(sys_clk),
    .rstn_i(rstn_i),
    .rxd_i(rxd_i),
    .txd_o(txd_o),
    .gpio_io(led_o)
);

endmodule
```

Figure 5.13. Updated Top File in New Project

d. For board level SoC project, copy the Diamond constraint .lpf file from the source project (Figure 5.14). The path is <*workspace*>/<*project_dir*>/<*project_name*>.lpf.

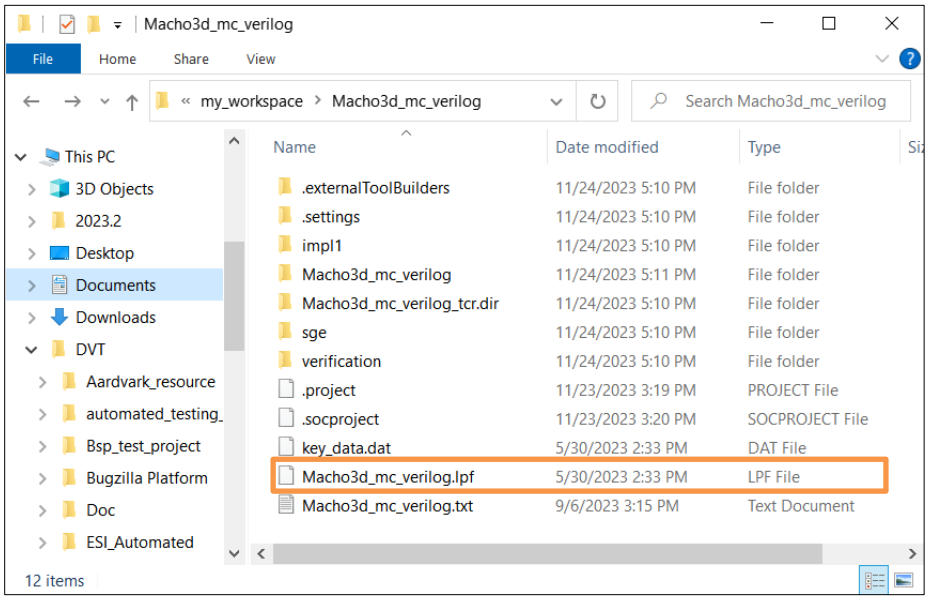

Figure 5.14. Constraint File in Source Project

e. Rename the file with new project name (Figure 5.15).

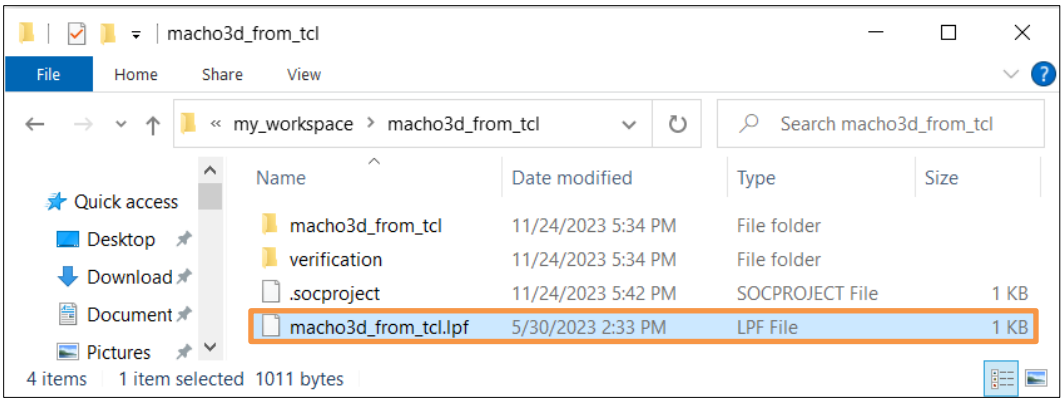

Figure 5.15. Rename Constraint File Copied from Source Project

f. Open Lattice Diamond software by clicking on the  icon in Propel Builder GUI toolbar. Type the following command in the Diamond TCL console (Figure 5.16):

```
prj_strgy set_value -strategy Strategy1 {par_place_iterator=10} {par_stop_zero=True}
prj_project save
```

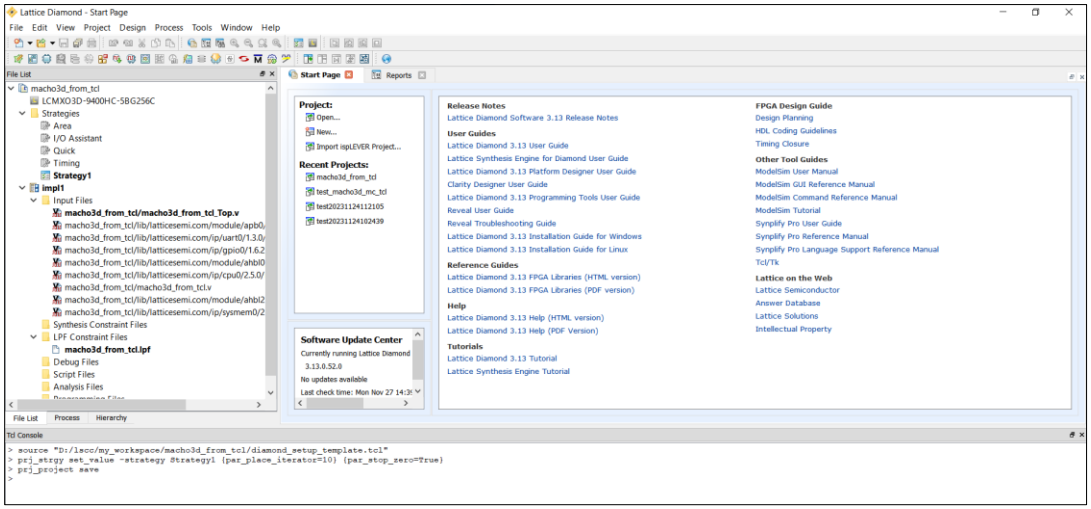

Figure 5.16. Diamond TCL Console

g. Check <*workspace*>/<*project_dir*>/<*project_name*> directory. If there are any other resource, copy them into the same directory under the new project without modification (Figure 5.17).

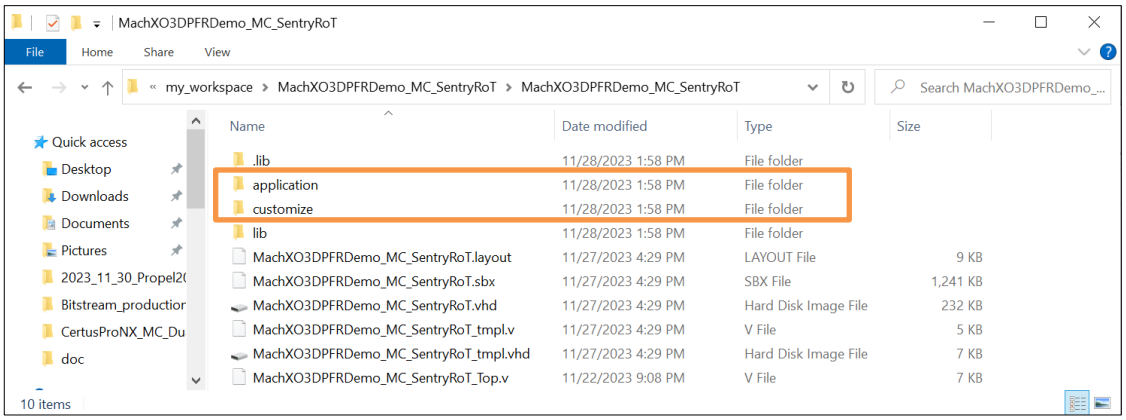

Figure 5.17. Other Resources in Source Project

h. Edit the .socproject file to add the ConstraintFile entry. If there are other resources in step above, add them to the AddResources entry, as shown in the example below.

The file path is <*workspace*>/<*project_dir*>/.socproject.

```
<?xml version="1.0" encoding="UTF-8" ?>
<propelProject>
    <builder-resource>
        <socProject sbxfile="./macho3d_from_tcl/macho3d_from_tcl.sbx" />
        <verifyProject sbxfile="./verification/macho3d_from_tcl_v.sbx" />
        <ConstraintFile>./macho3d_from_tcl.lpf</ConstraintFile>
        <AddResources>
            <AddResource SoC="False">./macho3d_from_tcl/application</AddResource>
            <AddResource SoC="False">./macho3d_from_tcl/customize</AddResource>
        </AddResources>
    </builder-resource>
    <builderInfo version="2023.2" />
</propelProject>
```

6. References

- Lattice Propel 2024.2 SDK User Guide (FPGA-UG-02218)
- Lattice Propel 2024.2 Builder User Guide (FPGA-UG-02219)
- Lattice IP Packager 2024.2 User Guide (FPGA-UG-02220)
- Lattice Propel 2024.2 Installation for Windows User Guide (FPGA-AN-02093)
- Lattice Propel 2024.2 Installation for Linux User Guide (FPGA-AN-02094)

For more information, refer to:

- Lattice Propel software web page
- Lattice Insights for training series and learning plans

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

For frequently asked questions, refer to the Lattice Answer Database at www.latticesemi.com/Support/AnswerDatabase.

Revision History

Revision 1.0, November 2024

Section	Change Summary
All	Production release.

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