

Lab2 guide

Vivado Installation Guide

Access Xilinx website to download Vivado:

(<https://www.xilinx.com/support/download/index.html/content/xilinx/en/downloadNav/vivado-design-tools/2020-2.html>)

For Windows

For Linux

The screenshot displays the Xilinx website's download page for Vivado 2020.2. The page features a dark header with navigation links: Solutions, Products, and Company. The main content area lists three download options, each with a download icon, a title, a file size, and an MD5 SUM Value. Below each download link is a 'Download Verification' section with buttons for 'Digests', 'Signature', and 'Public Key'. The first two options are highlighted with red boxes and arrows pointing to the 'For Windows' and 'For Linux' labels respectively. The third option is for the 'Single-File Download'.





Platform	Download Link	File Size	MD5 SUM Value
Windows	Xilinx Unified Installer 2020.2: Windows Self Extracting Web Installer	EXE - 248.44 MB	102bb67c6806a667dc7176be7997475
Linux	Xilinx Unified Installer 2020.2: Linux Self Extracting Web Installer	BN - 354.08 MB	0c74a74cbef649dceea34774c5bca490
Single-File	Vivado HLx 2020.2: All OS installer Single-File Download	TAR/GZIP - 43.07 GB	523e8596f114ab5e389c14df50ecb1d8

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- Fill in the personal information and click “Download”

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Phone

Job Function*

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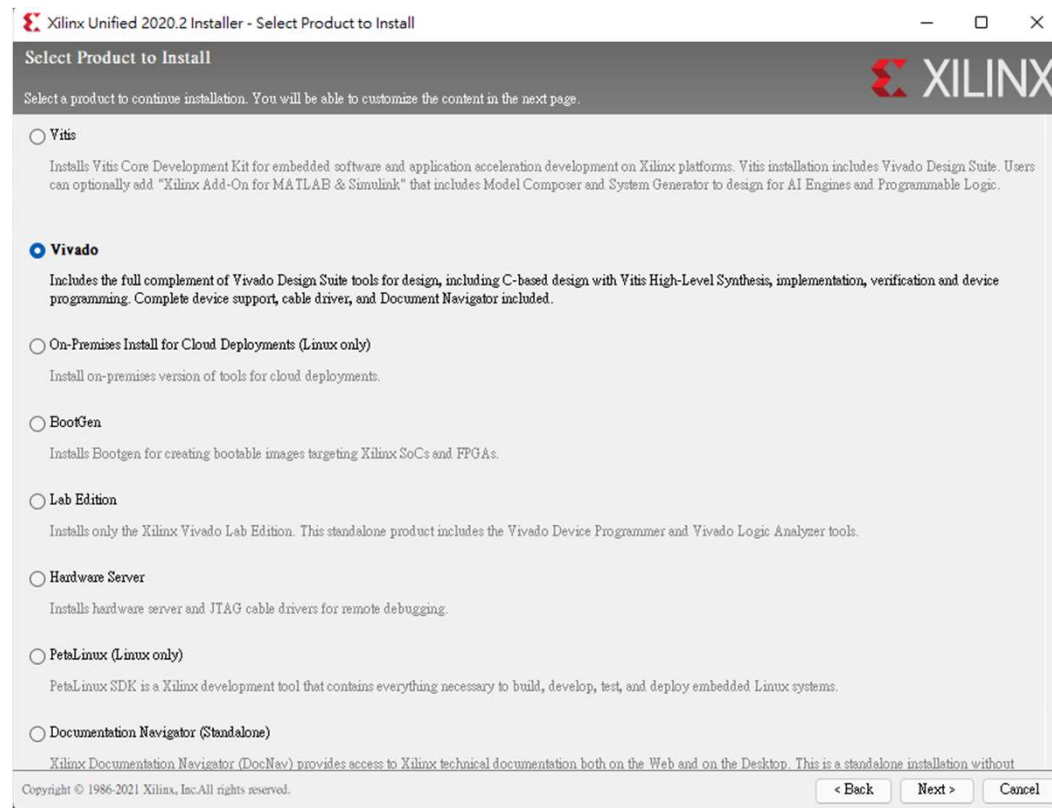
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Feedback

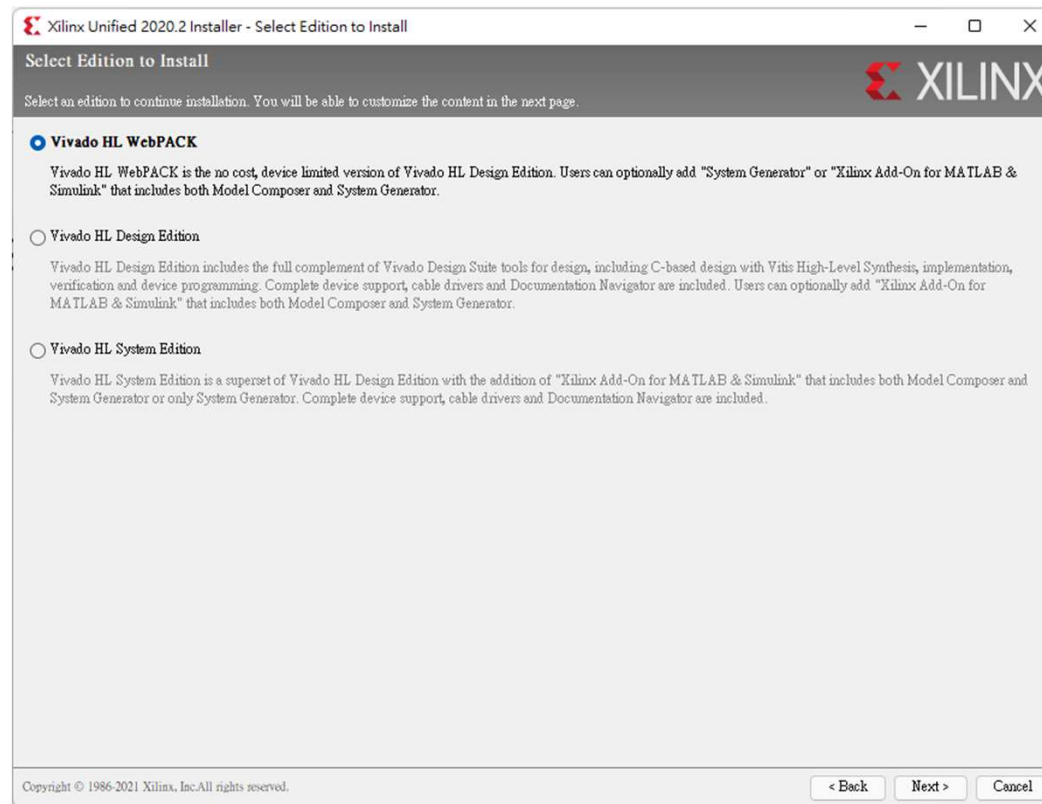
Vivado Installation Guide

- Select “Vivado”



Vivado Installation Guide

- Select “Vivado HL WebPACK” for free license version

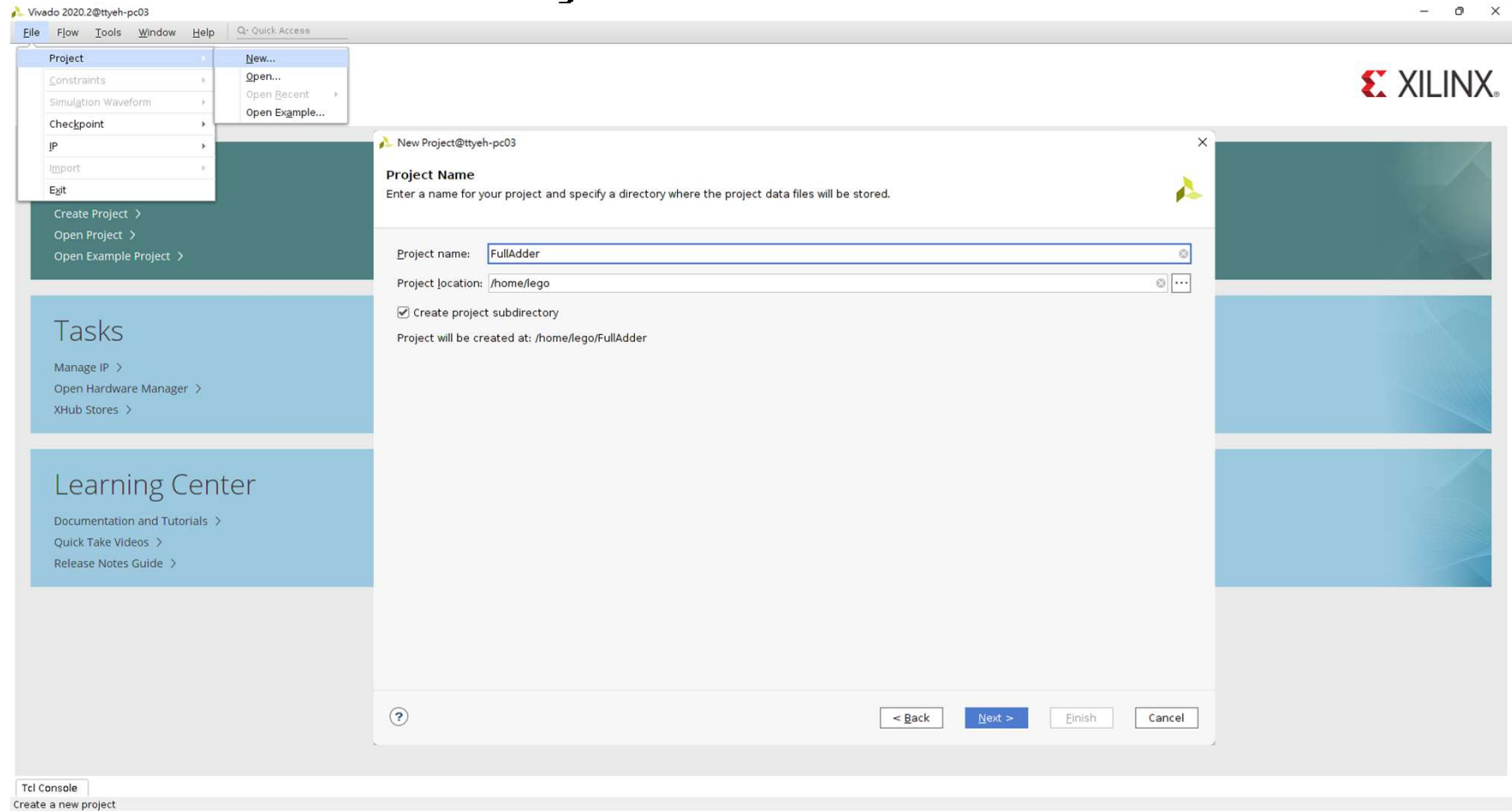


Vivado Installation Guide

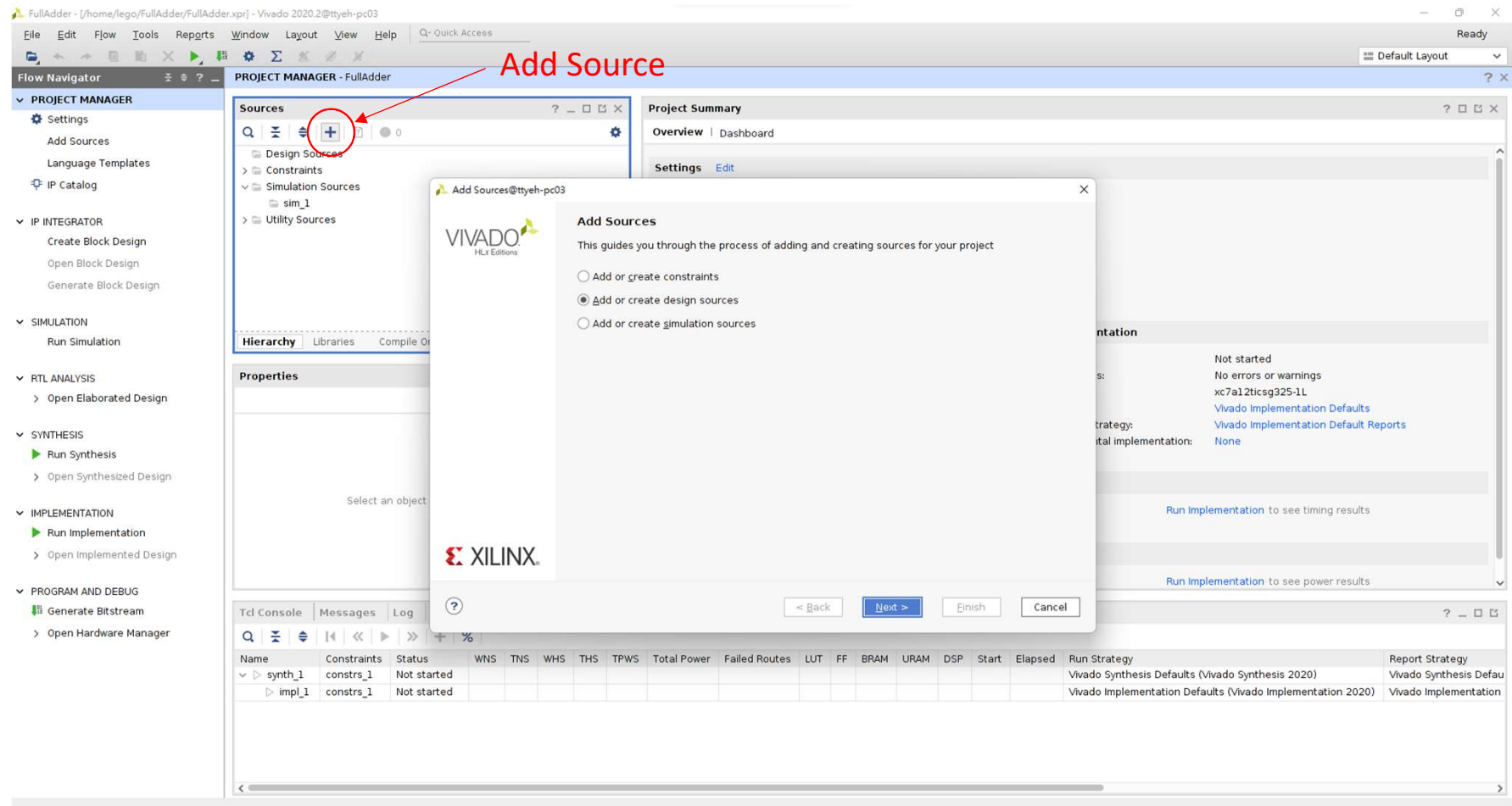
- Uncheck features we don't need.



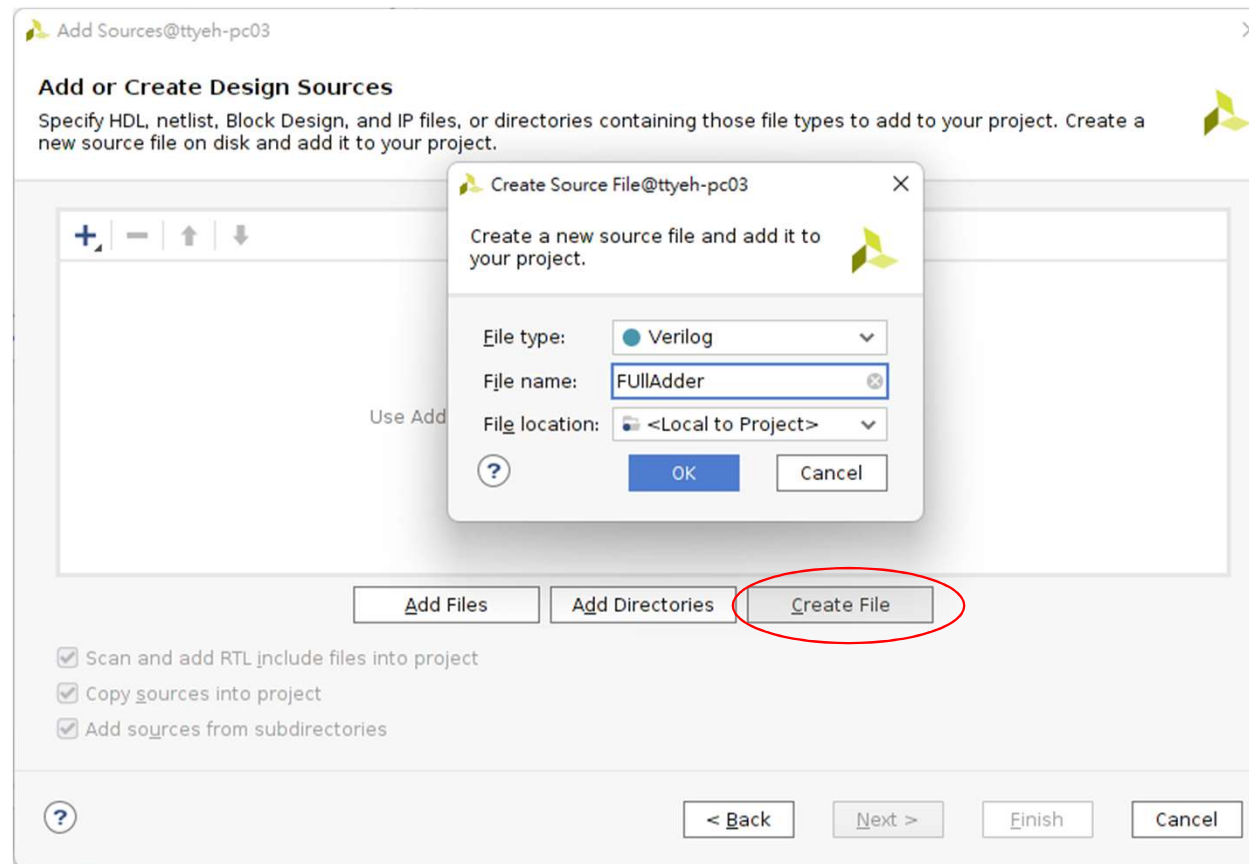
Create a New Project in Vivado



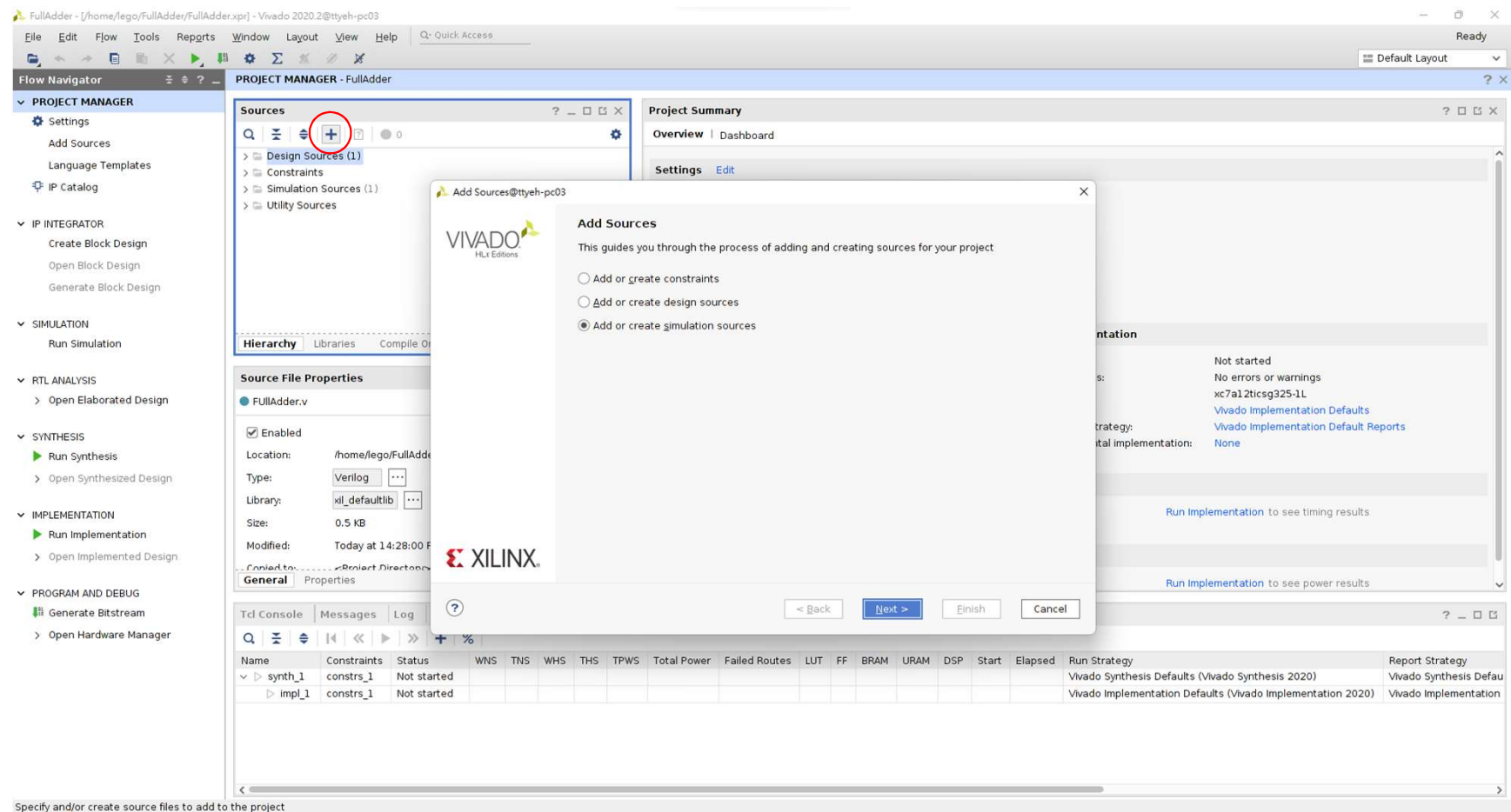
Create a Design



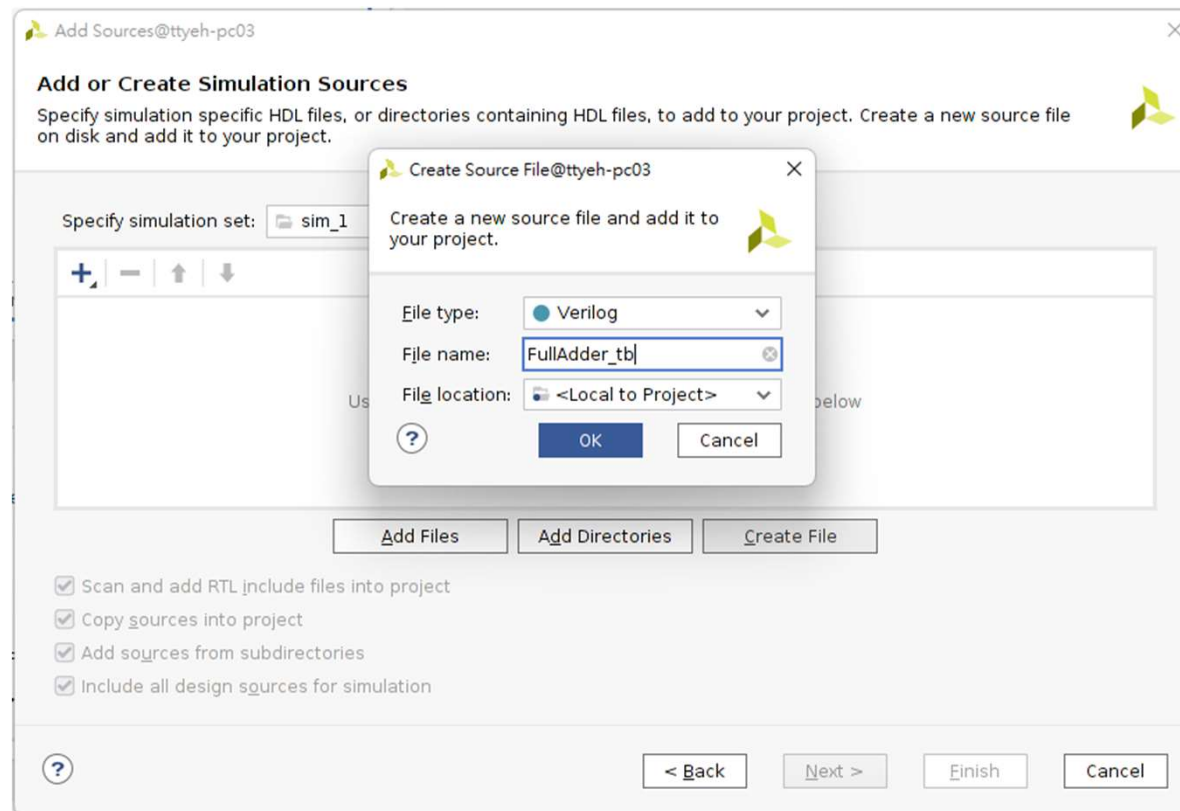
Create a Design



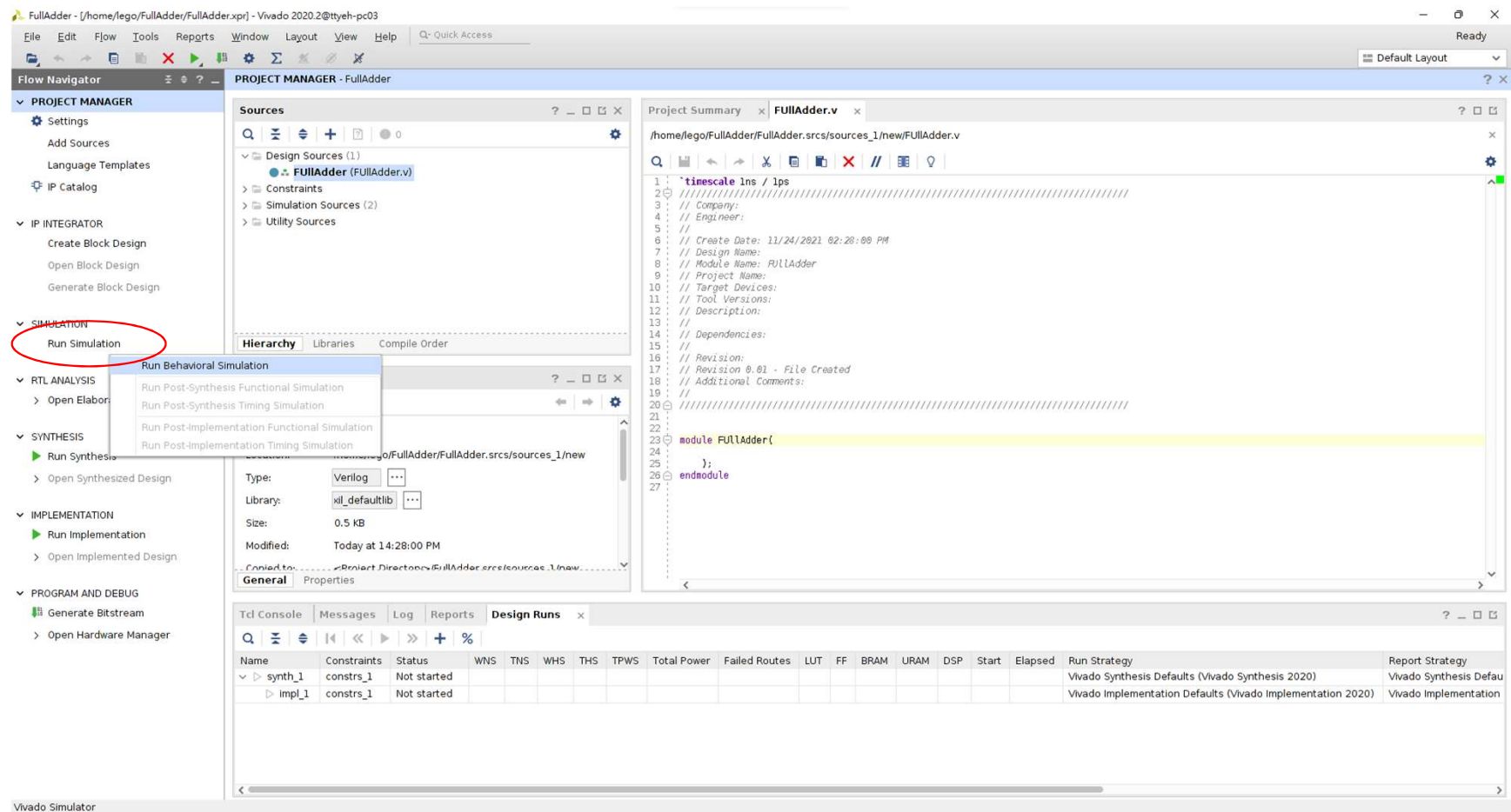
Creating Testbench Source Code



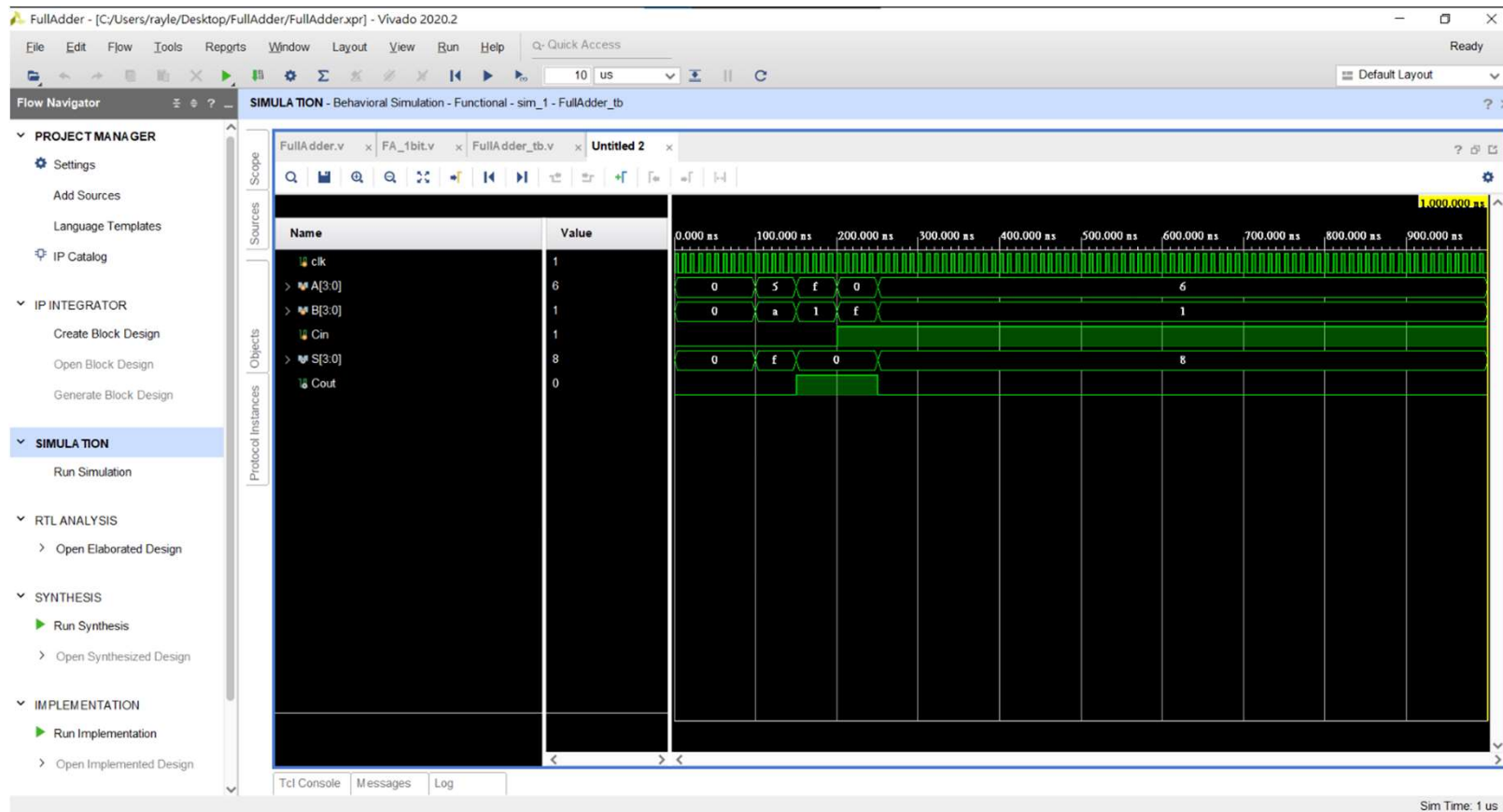
Creating Testbench Source Code



Run the Simulation

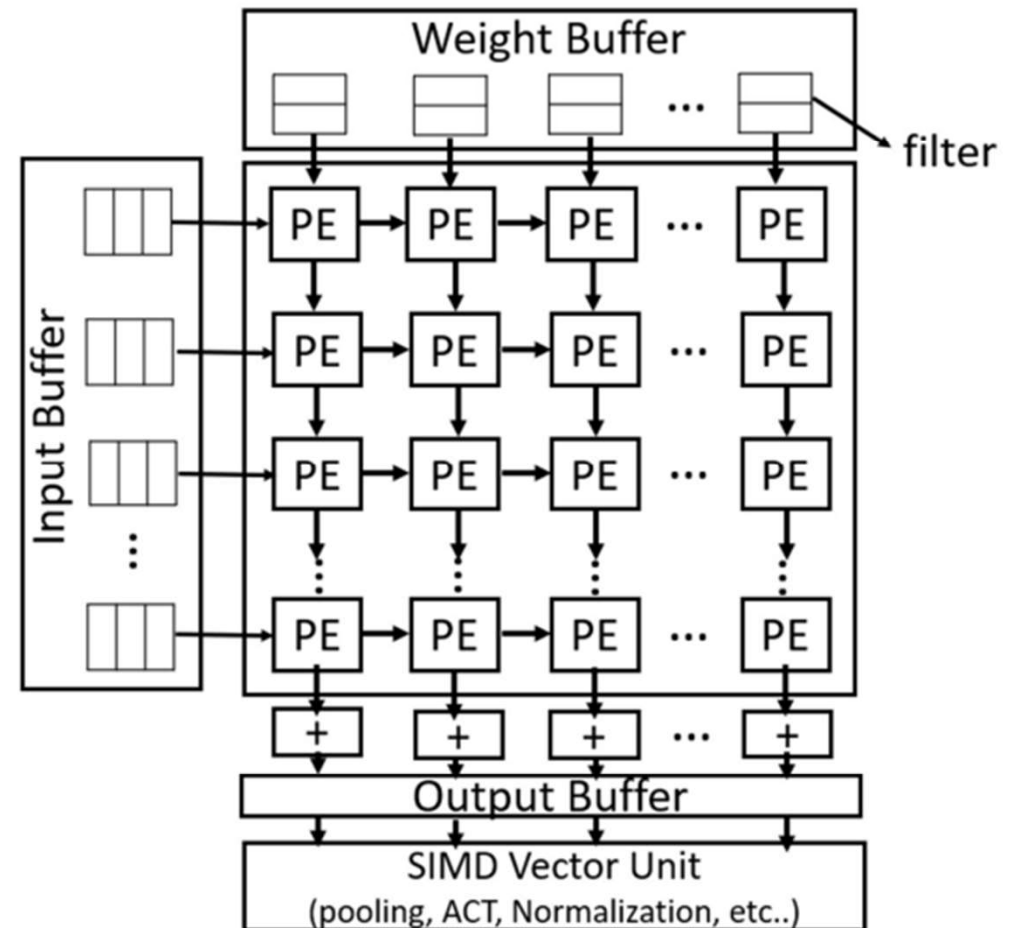


Vivado Simulator Window

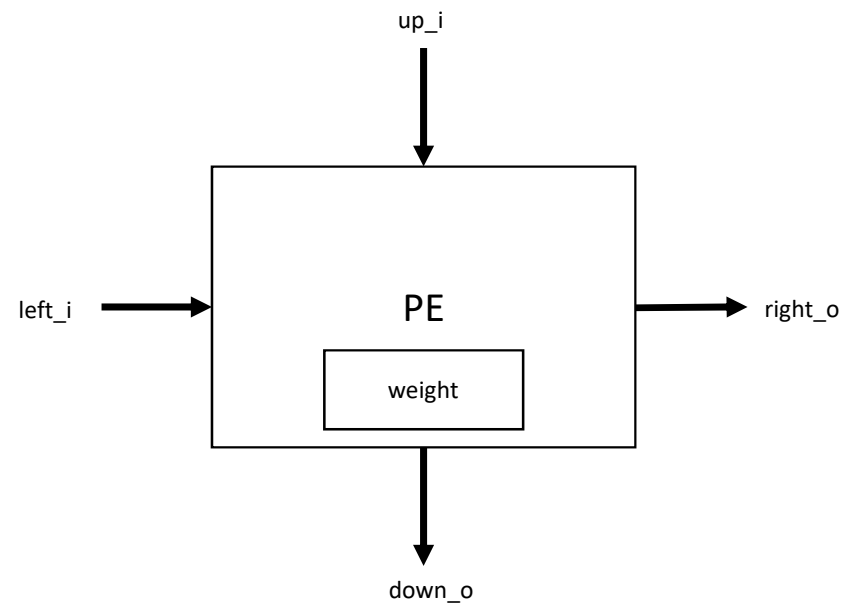


TPU Micro-architecture

- Each PE performs Multiply-and Accumulate (MAC) operation
- The unified memory buffer is decomposed into input, weight, and output buffer
- Each weight buffer stores weights of a filter
- At each cycle, inputs are pushed in the PE horizontally
- Partial sums flow vertically



PE module

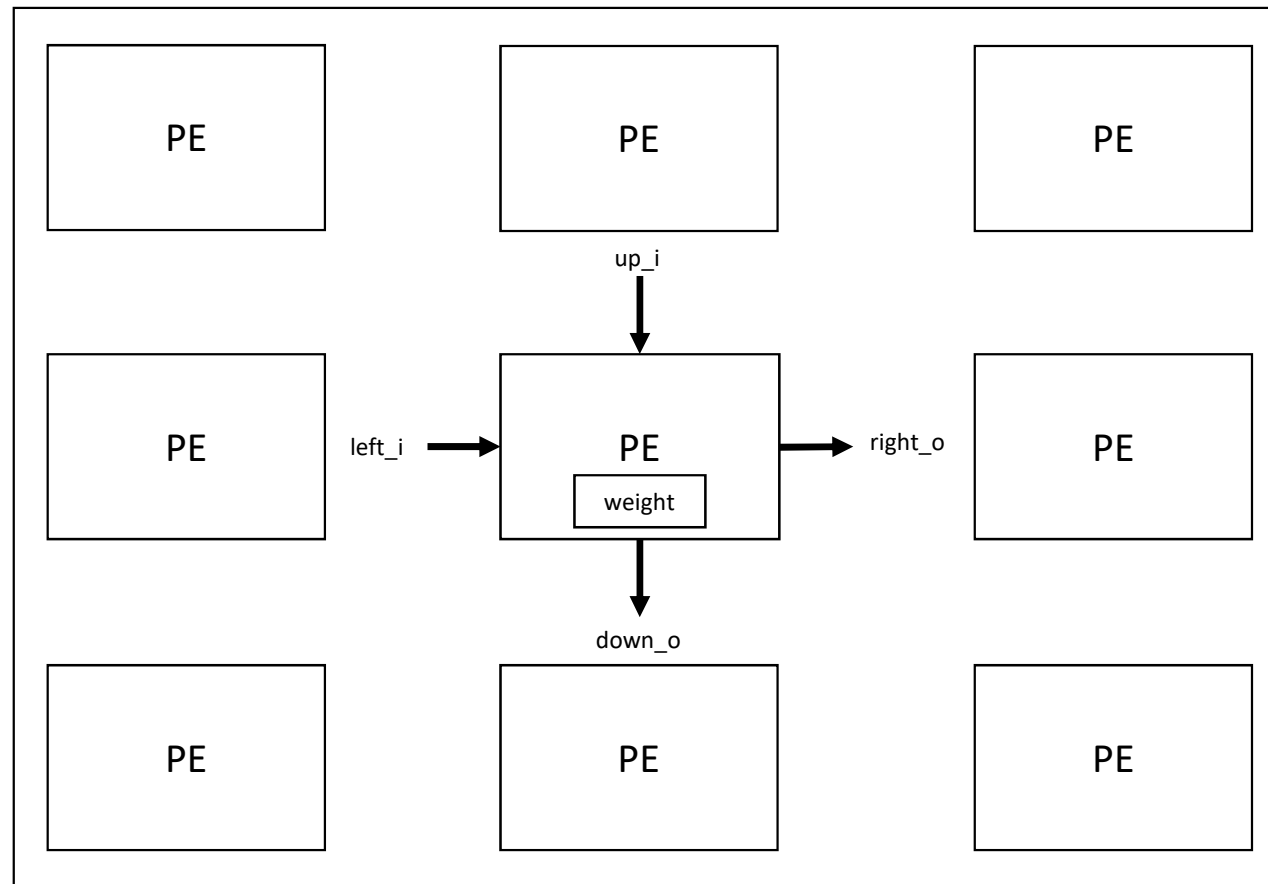


MAC:

$$\text{down_o} = \text{left_i} * \text{weight} + \text{up_i}$$

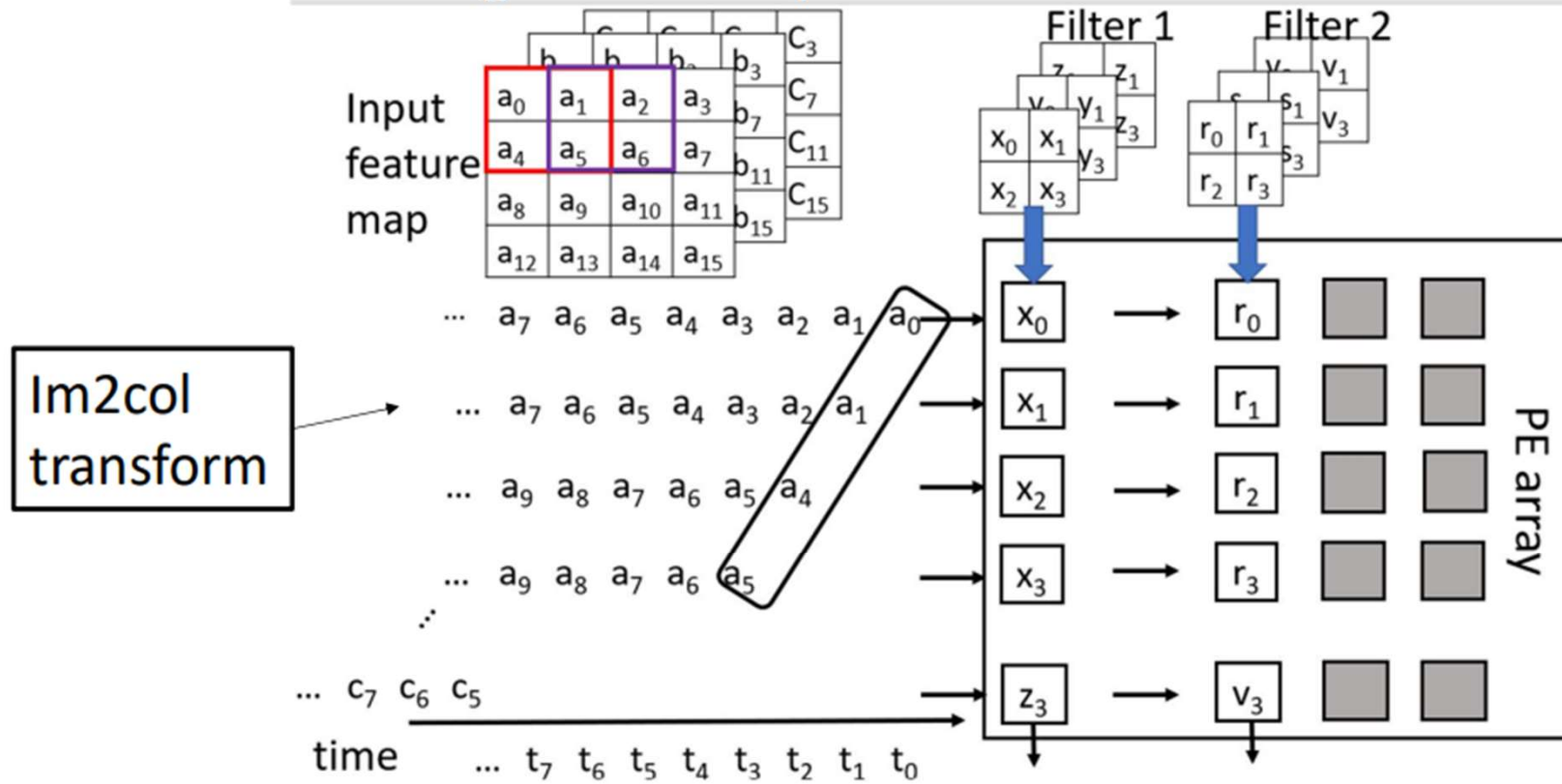
$$\text{right_o} = \text{left_i}$$

Systolic Array Module



Case Study

- The CONV weight stationary data flow



Name	Value
clk	1
reset_n	1
en	1
> weight_i[2047:0]	0101010101010101
> input_i[127:0]	0000000000000000
> result_o[255:0]	0000000000000000
> weight_data[0:255][7:0]	01,01,01,01,01,01,01,01
> input_data[0:3839][7:0]	01,00,00,00,00,00,00,00
> count[31:0]	0000012c
result_en	0
> i[31:0]	00000100
> handle[31:0]	ffffb1e0

