PROJECT REPORT

Submitted by:

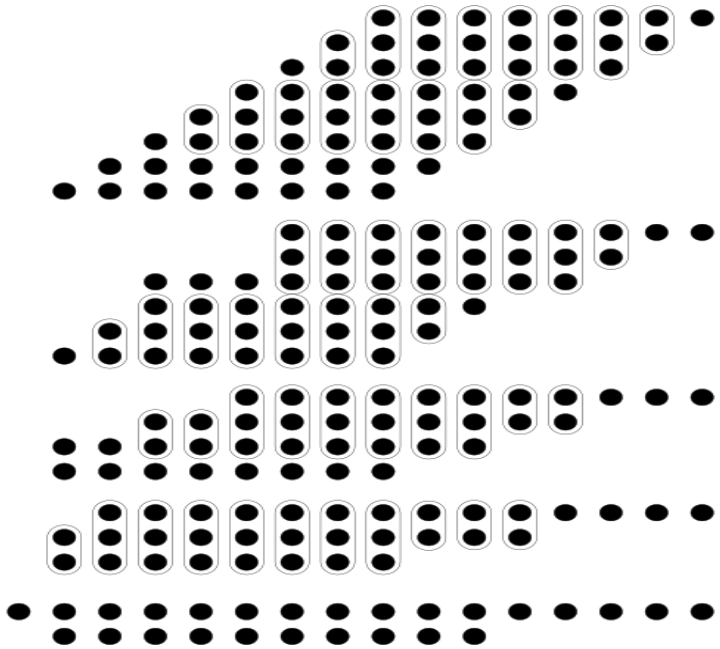
Gurseerat (2018CSB1093)
Sweety (2018CSB1122)

Submitted to:

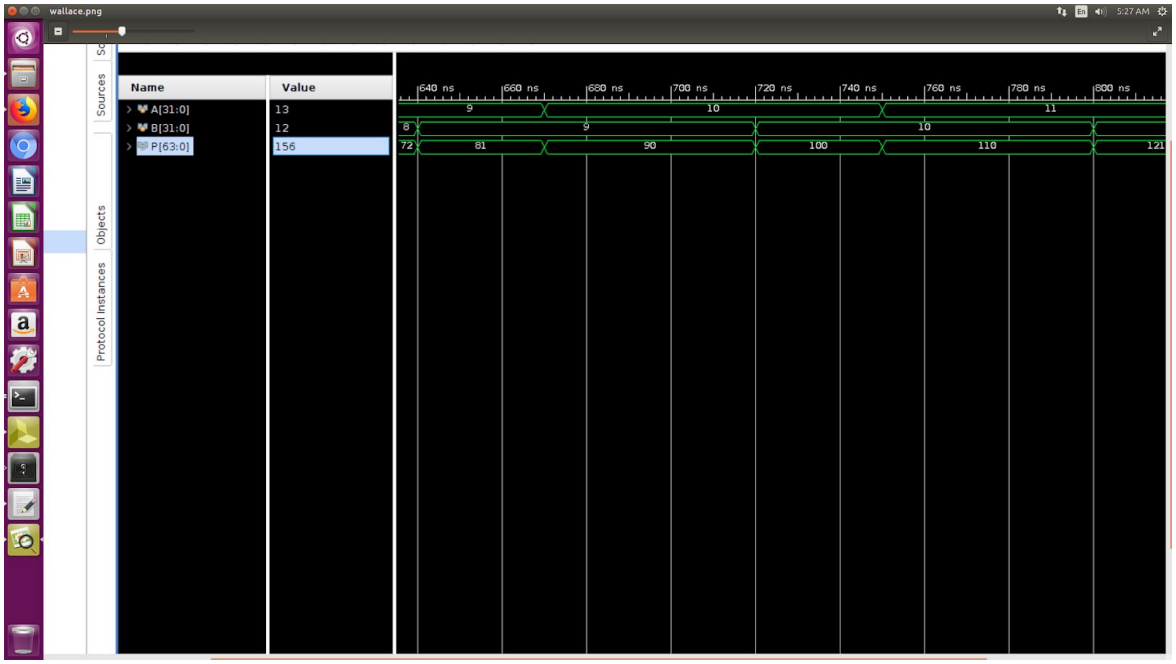
Dr. Neeraj Goel

Fast Multipliers: Wallace Multiplier and Dadda Multiplier

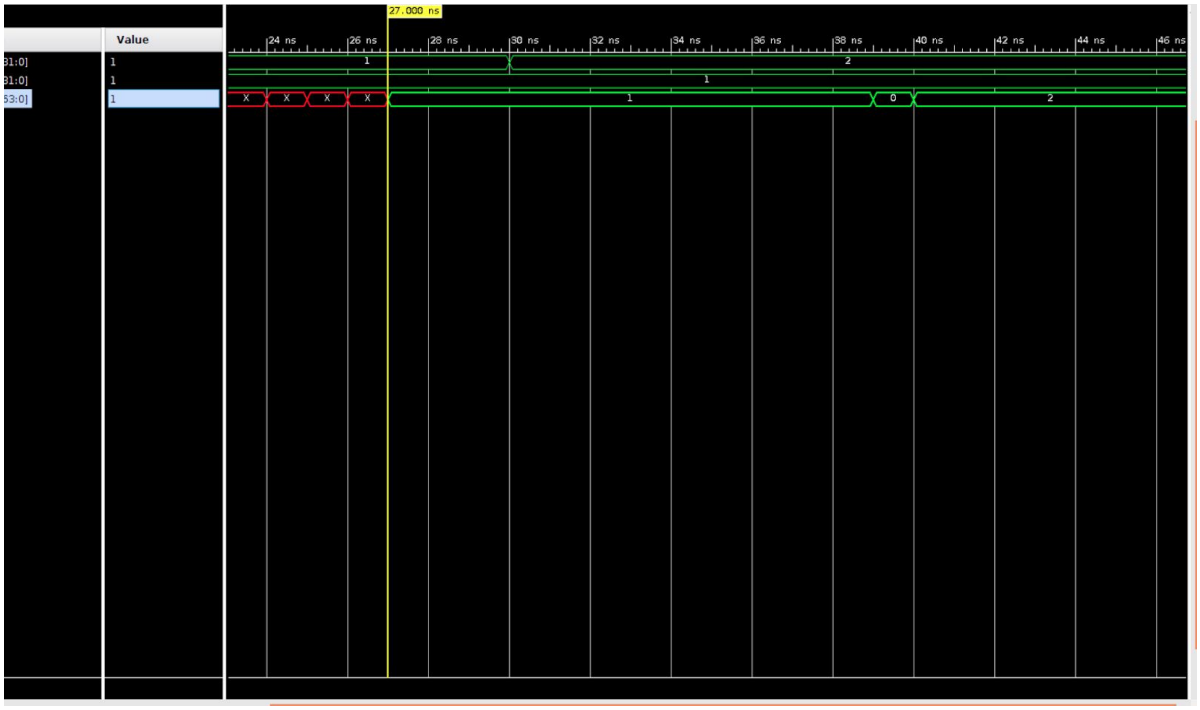
Wallace Multiplier



The benefit of the Wallace tree is that there are only O (log n) reduction layers, and each layer has O (1) propagation delay. As making the partial products is O (1) and the final addition is O (log n) the multiplication is only O (log n) , not much slower than addition (however, much more expensive in the gate count)
Output:

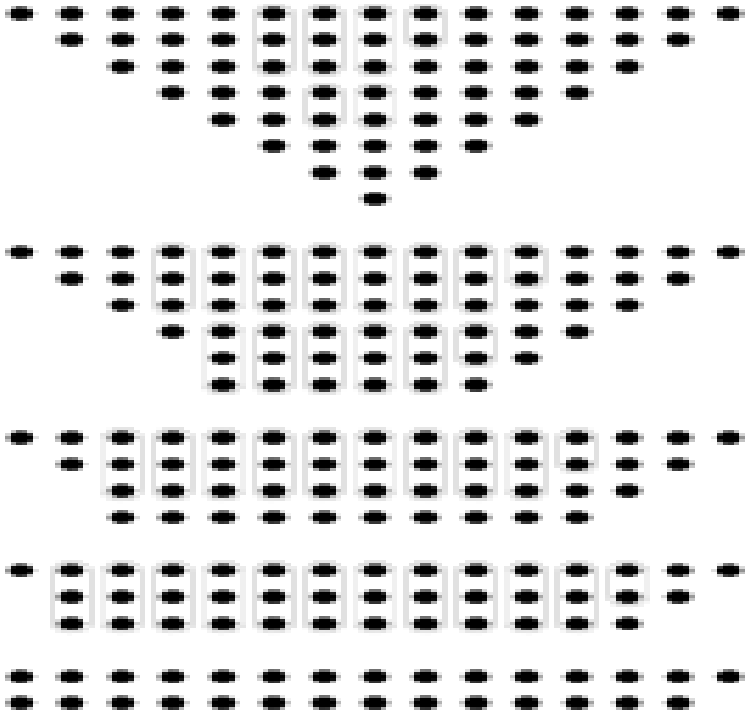


Output of Wallace tree multiplier



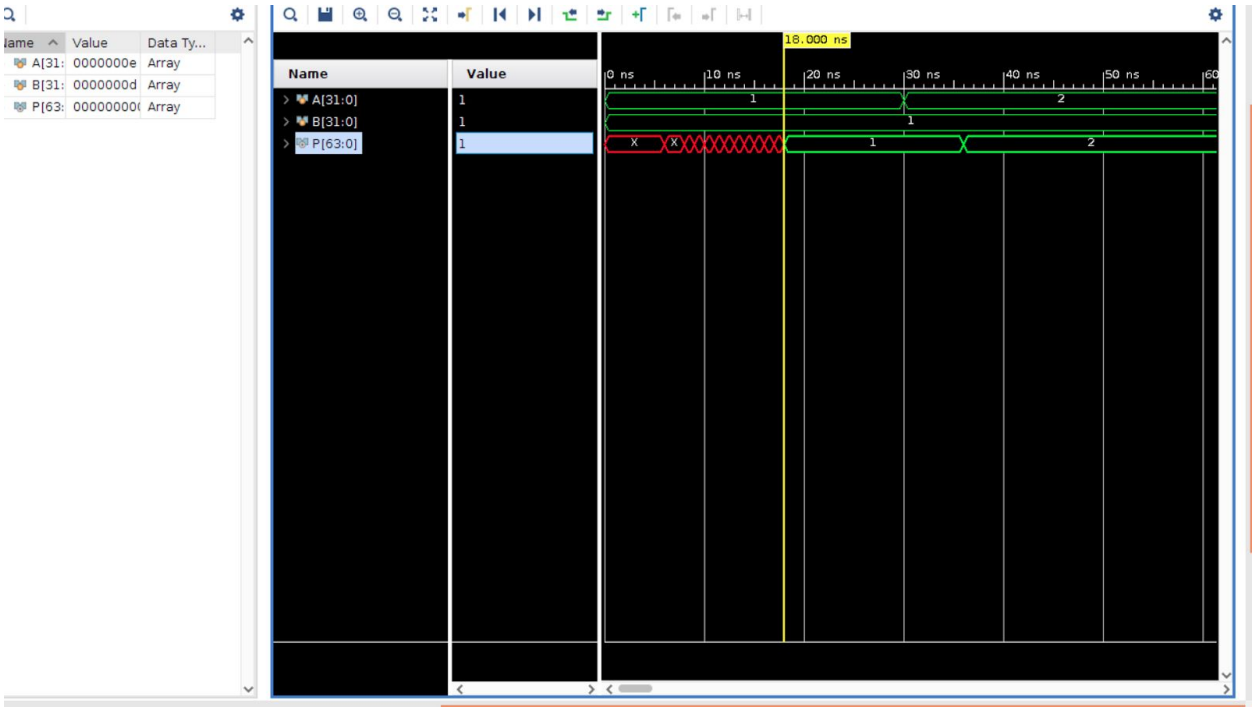
The Delay of 27,000ns is observed in Wallace tree multiplier due to the Gate delays in the multiplier and full and half adders.

Dadda Multiplier

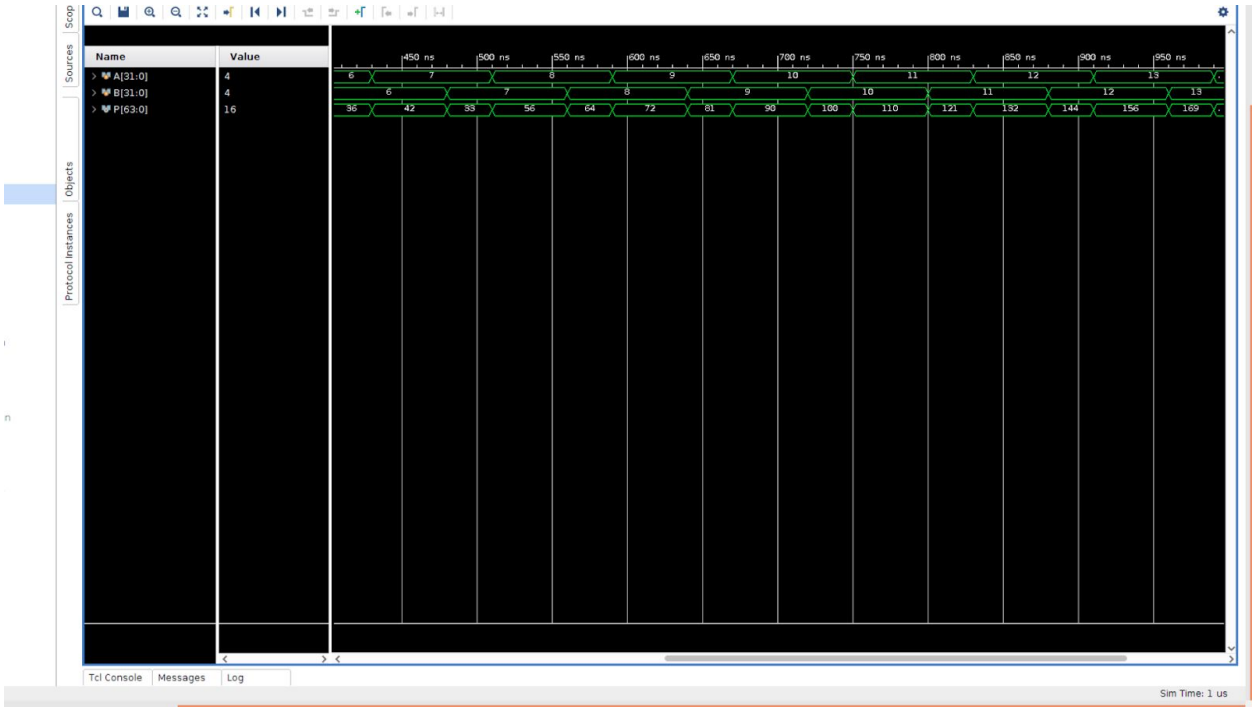


The Daddu multiplier is a hardware multiplier design .It is similar to the wallace multiplier, but it is slightly faster (for all operand sizes) and requires fewer gates (for all but the smallest operand sizes).

Unlike Wallace multipliers that reduce as much as possible on each layer, Dadda multipliers attempt to minimize the number of gates used, as well as input/output delay. Because of this, Dadda multipliers have a less expensive reduction phase, but the final numbers may be a few bits longer, thus requiring slightly bigger adders.



The output observed is as shown in the pictures. A delay of 18,000 ns is observed because of the gate delays in the dadda multiplier and the half and full adders.



Classical multiplier:

The 32 bit input is broken into 4 eight bit inputs which are further divided into 4 two bit multipliers and their partial products are combined at the end to get the final answer by their addition.

Comparison:

For the same input (Example 2 and 1), the classical multiplier takes time longer than the Dadda and Wallace Multiplier and thus fast multipliers are prefered.

The delay in classical multiplier is coming out as 35,000ns which is much greater than the Dadda and Wallace multipliers.