How to run the code?

- Run the following commands to generate the N-bit CLA circuit in Verilog from the C++ code.
- The code will ask the user to input the value of N when the user runs ./a.out. Enter any value in the power of 2.

unzip CS19S018.zip ; cd CS19S018

g++ CLA_gen.cpp

./a.out

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- After running the above commands, the CLA.v file will be generated in the current directory, which is the Verilog file for N-bit CLA adder (N is 16 in this case)

- Run the following commands to generate the N-bit CRA circuit in Verilog from the C++ code.
- Again, code will ask the user to input N's value when the user will run ./a.out. Enter any value in the power of 2.

unzip CS19S018.zip ; cd CS19S018

g++ RCA_gen.cpp

./a.out

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- After running the above commands, the RCA.v file will be generated in the current directory, the Verilog file for N-bit CRA adder (N is 16 in this case).

- In order to run the generated Verilog files using the test benches, use the following commands.

iverilog CLA.v

iverilog CLA_tb.v

./a.out

iverilog RCA.v

iverilog RCA_tb.v

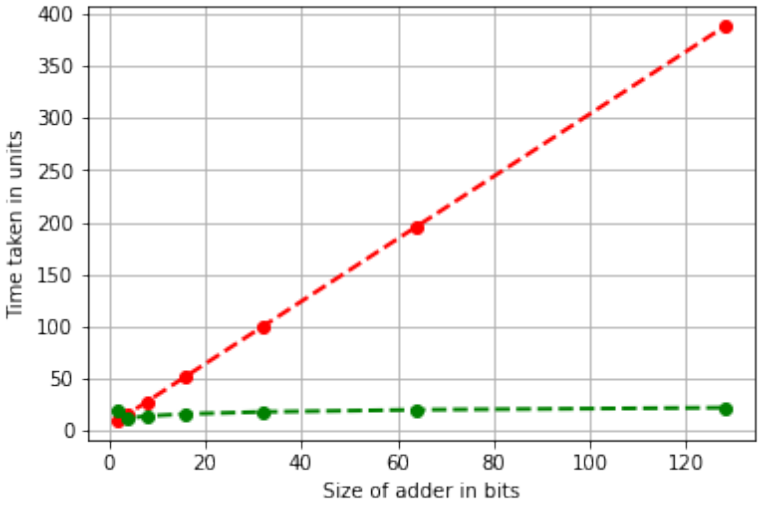
./a.out

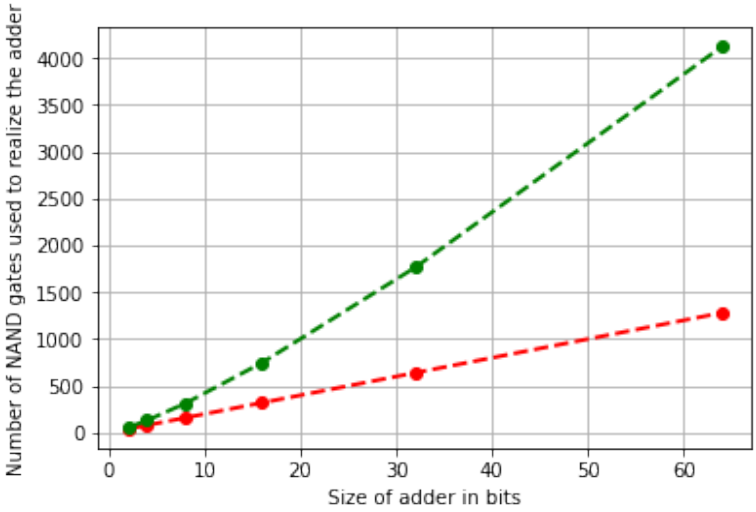
Results

Value of N	Time taken by CRA in units	Time taken by CLA in units
N=2	10	10
N=4	16	12
N=8	28	14
N=16	52	16
N=32	100	18
N=64	196	20
N=128	388	22

Value of N	Number of NAND gates needed to realize the N-bit CRA circuit	Number of NAND gates needed to realize the N-bit CLA circuit
N=2	40	56
N=4	80	132
N=8	160	314
N=16	320	748
N=32	640	1766
N=64	1280	4112

Comparative Analysis





- **The green line shows the result of CLA**, and **Red line shows the result of CRA**.
- We can see that time taken for CLA is much lesser than CRA as the value of N increases. The curve for CLA is almost flat, which shows that CLA is much faster than CRA.
- The number of NAND gates required to realize CLA is more than that for CRA. This shows that CLA is much costlier as compared to CRA.
- For this experiment, we can conclude that if we consider cost, then CRA is better than CLA, and if we consider the execution time, then CLA (O(log_2 n)) is better then CRA (O(n)). Hence we need to look for trade-of between both of them.