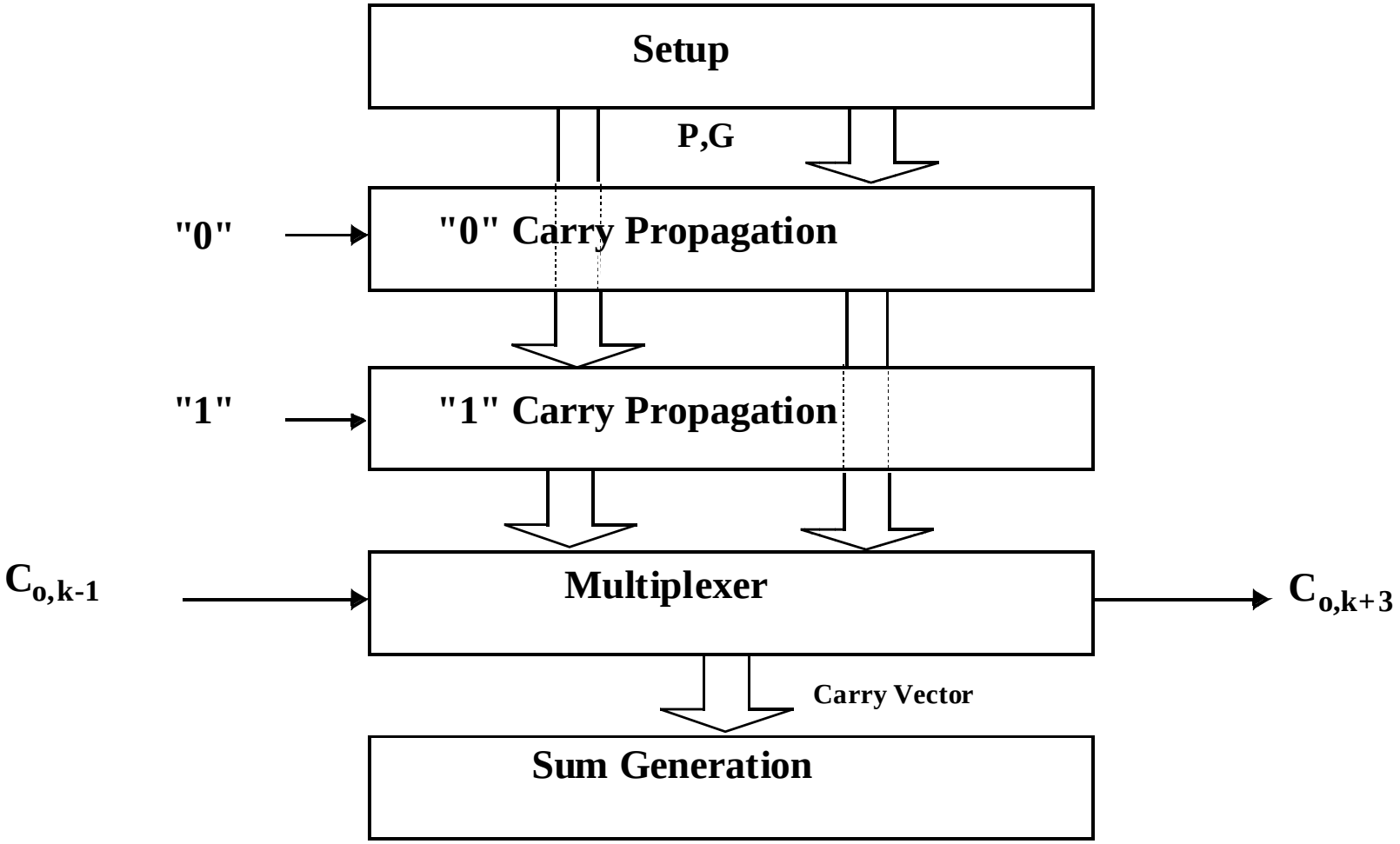
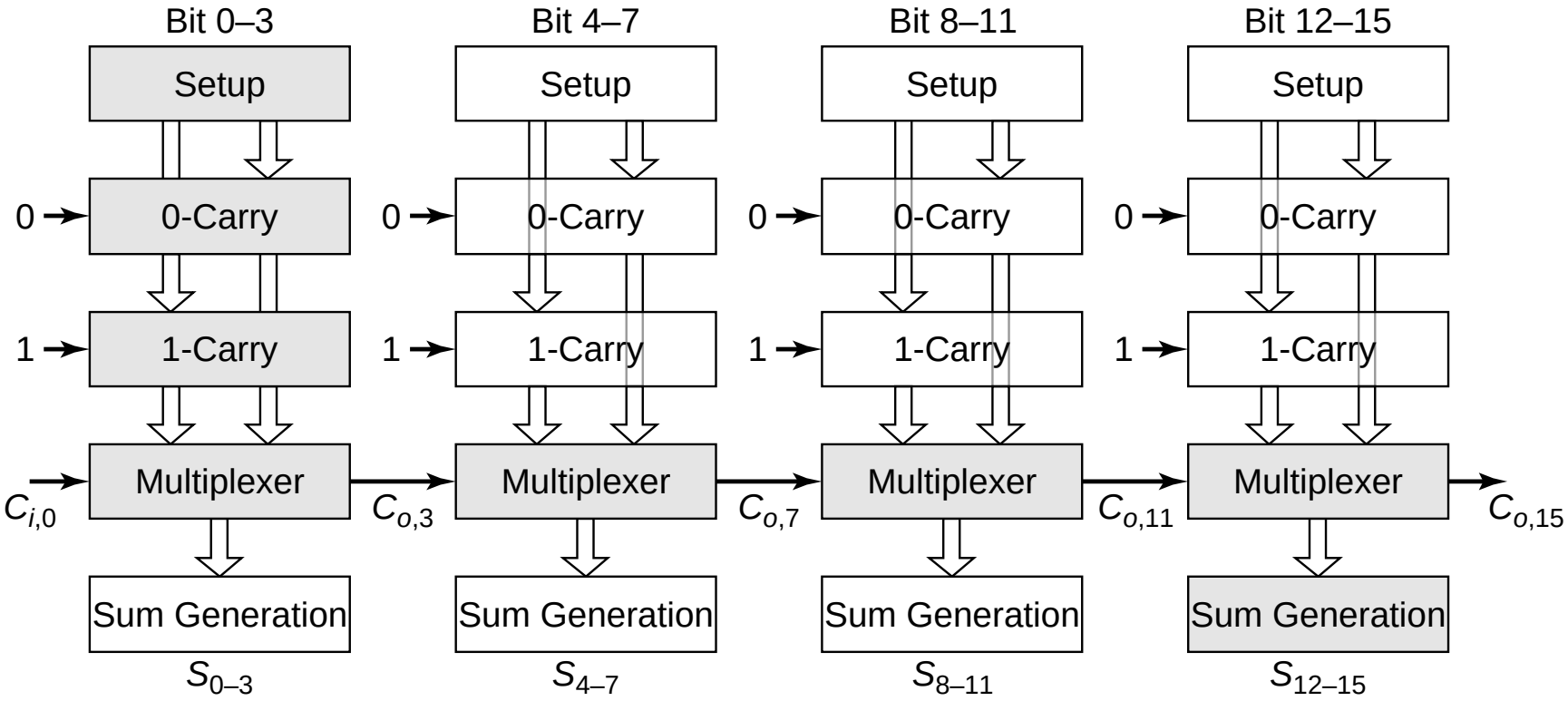
Adder & Multplier

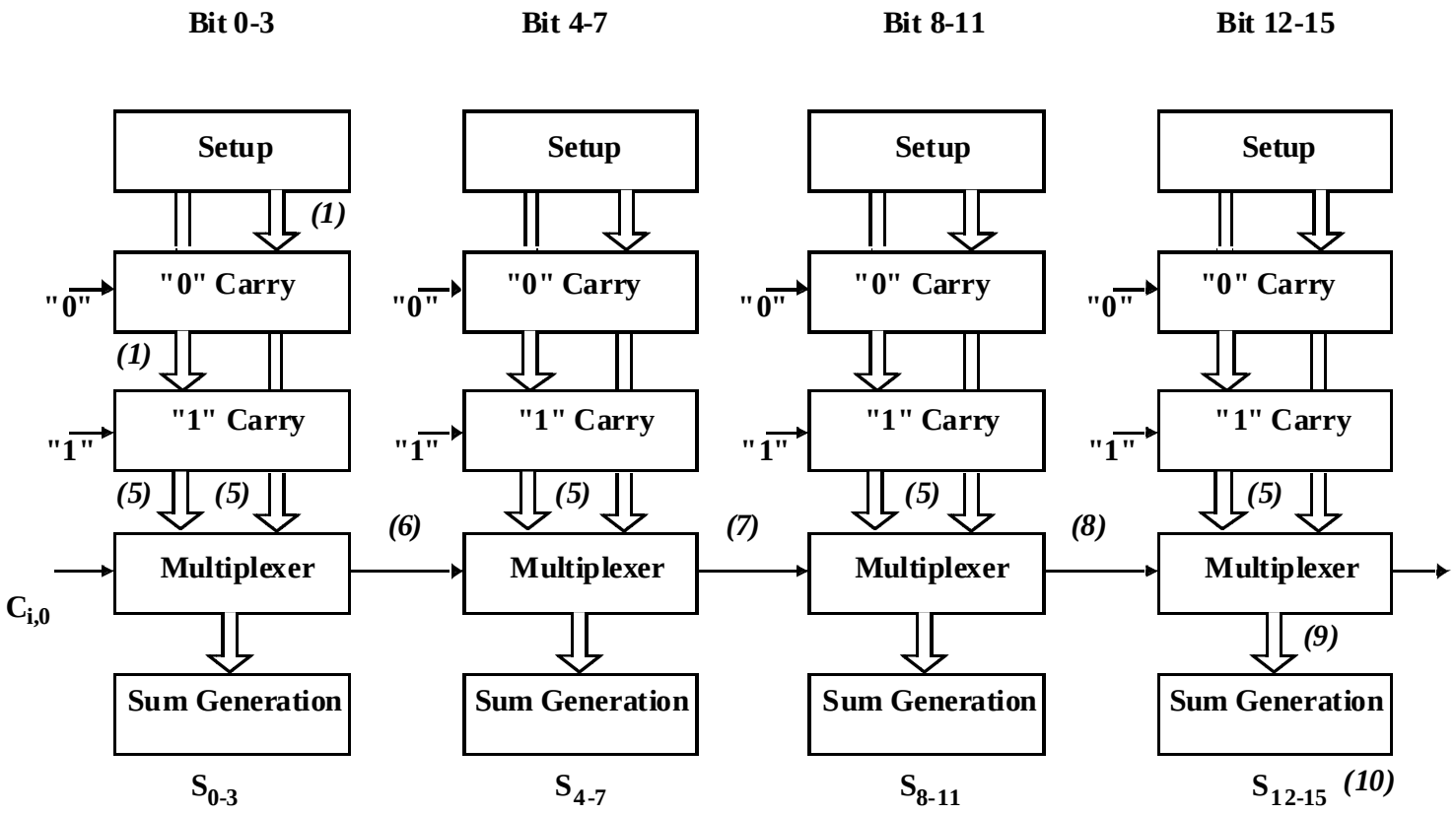
Carry-Select Adder



Carry Select Adder: Critical Path

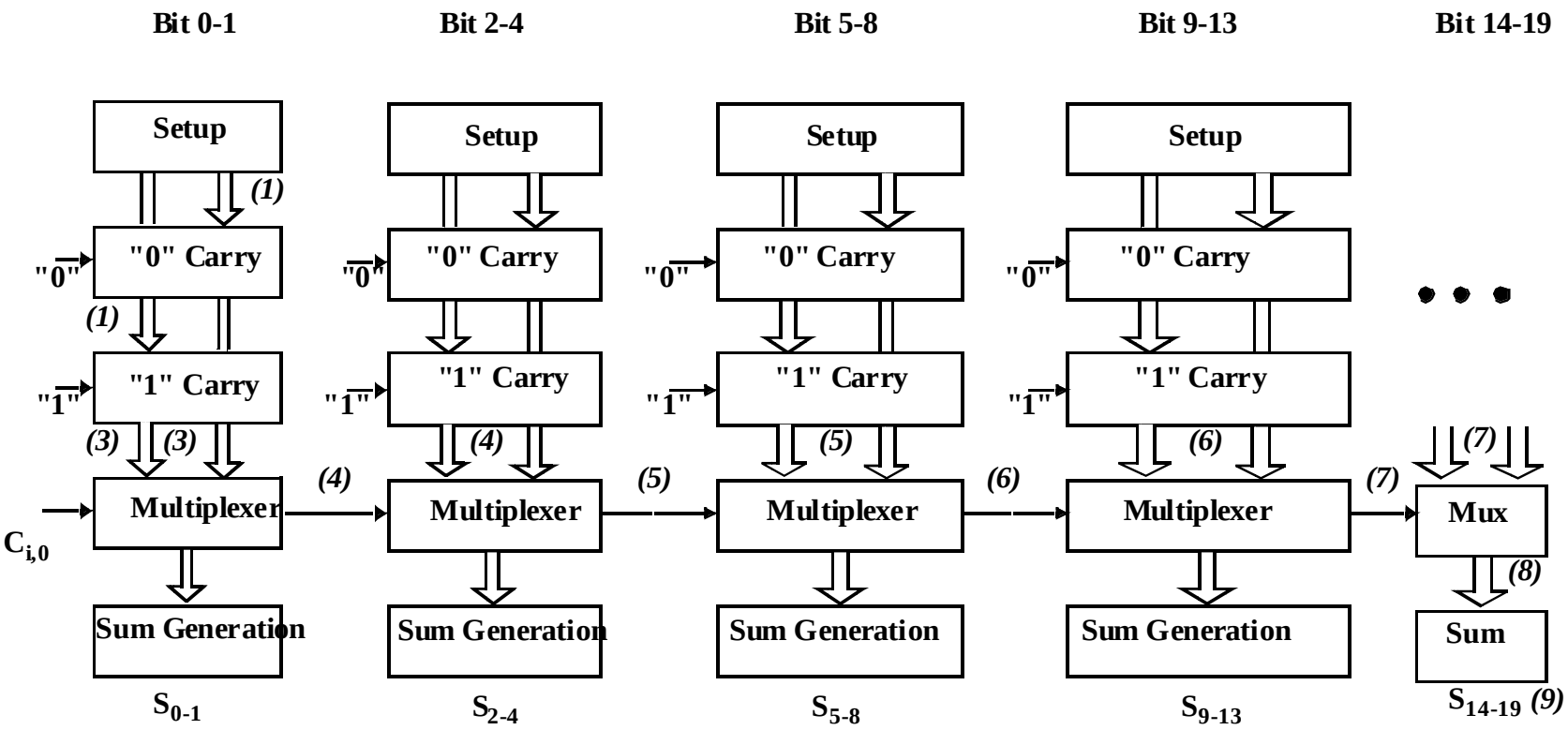


Linear Carry Select



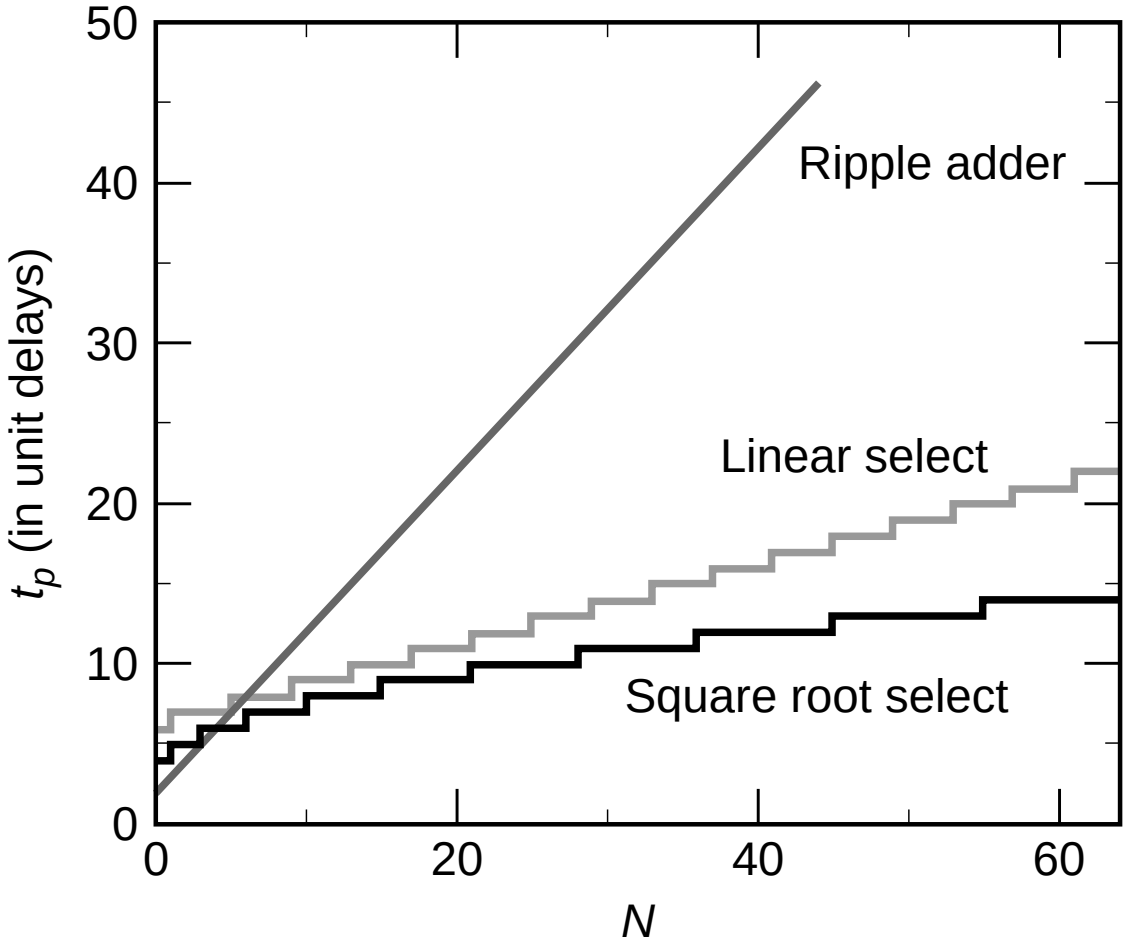
$$t_{add} = t_{setup} + Mt_{carry} + \left(\frac{N}{M}\right)t_{mux} + t_{sum}$$

Square Root Carry Select

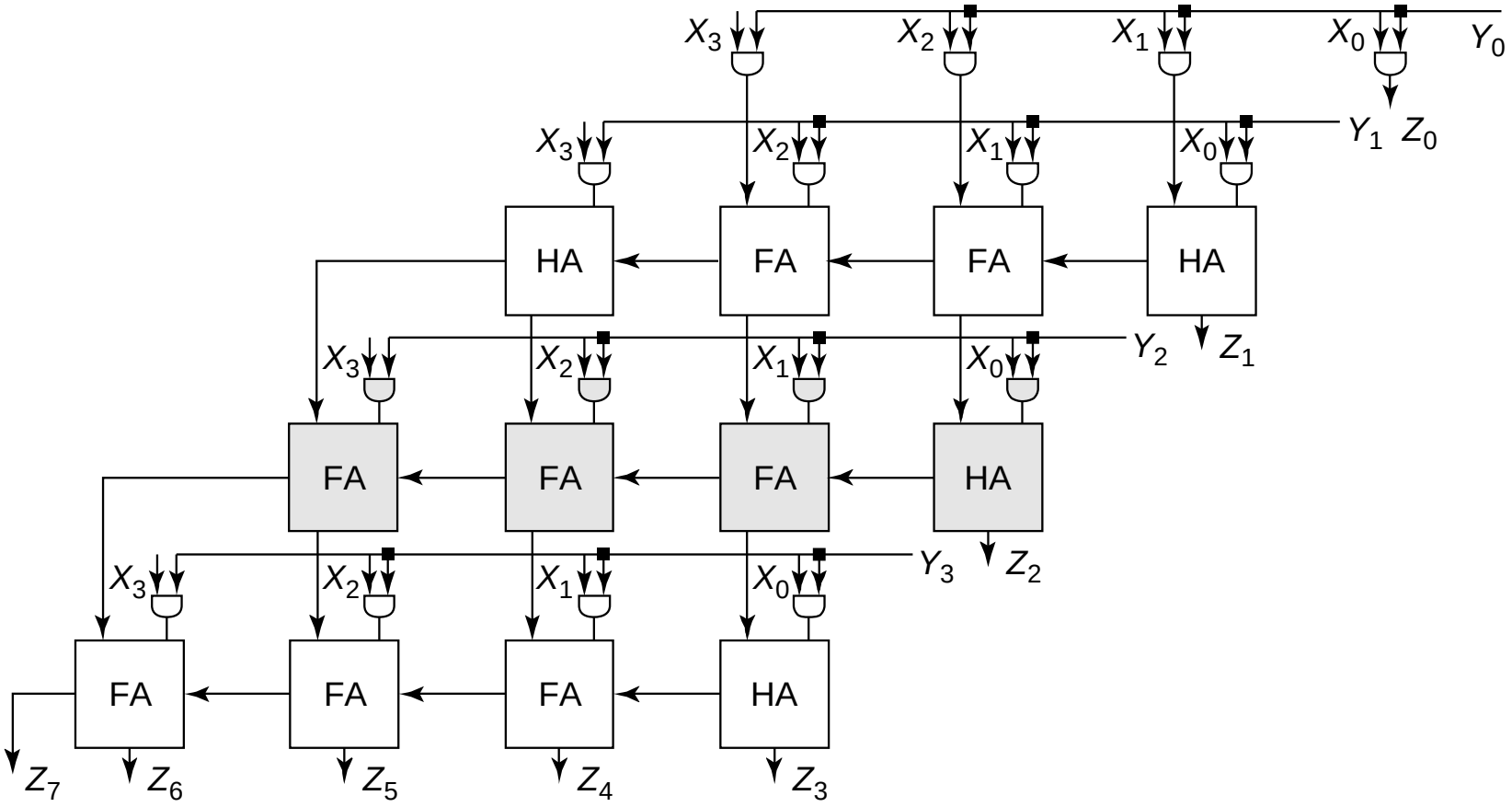


$$t_{add} = t_{setup} + P \cdot t_{carry} + (\sqrt{2N})t_{mux} + t_{sum}$$

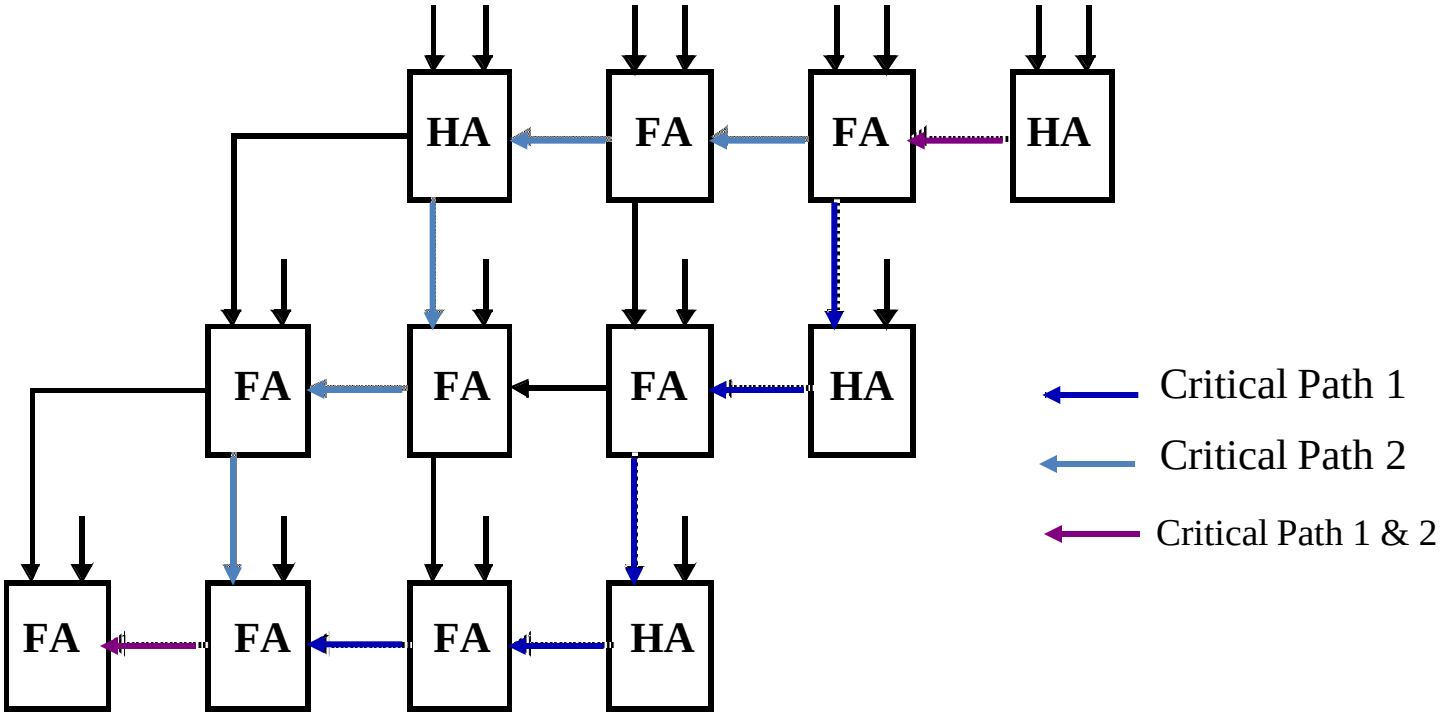
Adder Delays - Comparison



The Array Multiplier



The MxN Array Multiplier — Critical Path

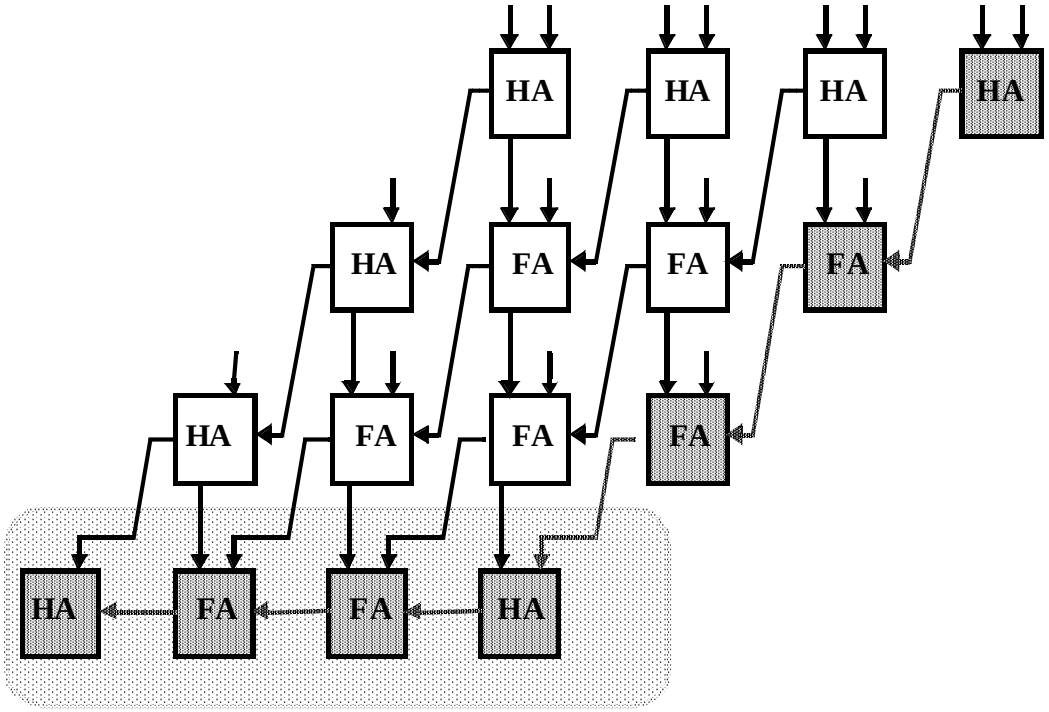


$$t_{mult} = [(M-1) + (N-2)]t_{carry} + (N-1)t_{sum} + t_{add}$$

Carry-Save Multiplier

- Multiplication result does not change when the output carry bits are passed diagonally downwards instead of only to the right.
- Include an extra adder called a vector-merging adder to generate the final results

Carry-Save Multiplier



Vector Merging Adder

$$t_{mult} = (N-1)t_{carry} + t_{merge} + t_{add}$$