

Adders

Electrical Engineering

From half adder to carry look-ahead, and the delay each one costs.

Carry propagation is what limits the speed of every one of these.

Circuit	Built from	Trade-off
Half adder	XOR and AND	No carry input
Full adder	Two half adders, one OR	Carry in and out
Ripple carry	n full adders in a chain	Small but slow
Carry look-ahead	Generate and propagate logic	Fast, more gates
Carry select	Two adders and a mux	Area bought for speed

Ripple delay grows with word length; look-ahead delay grows with its logarithm. That is what the extra gates are buying.