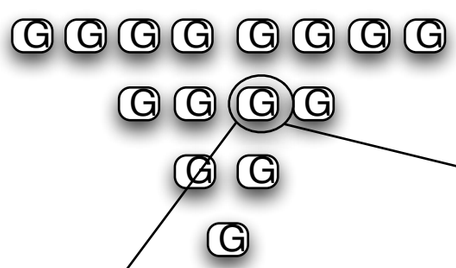
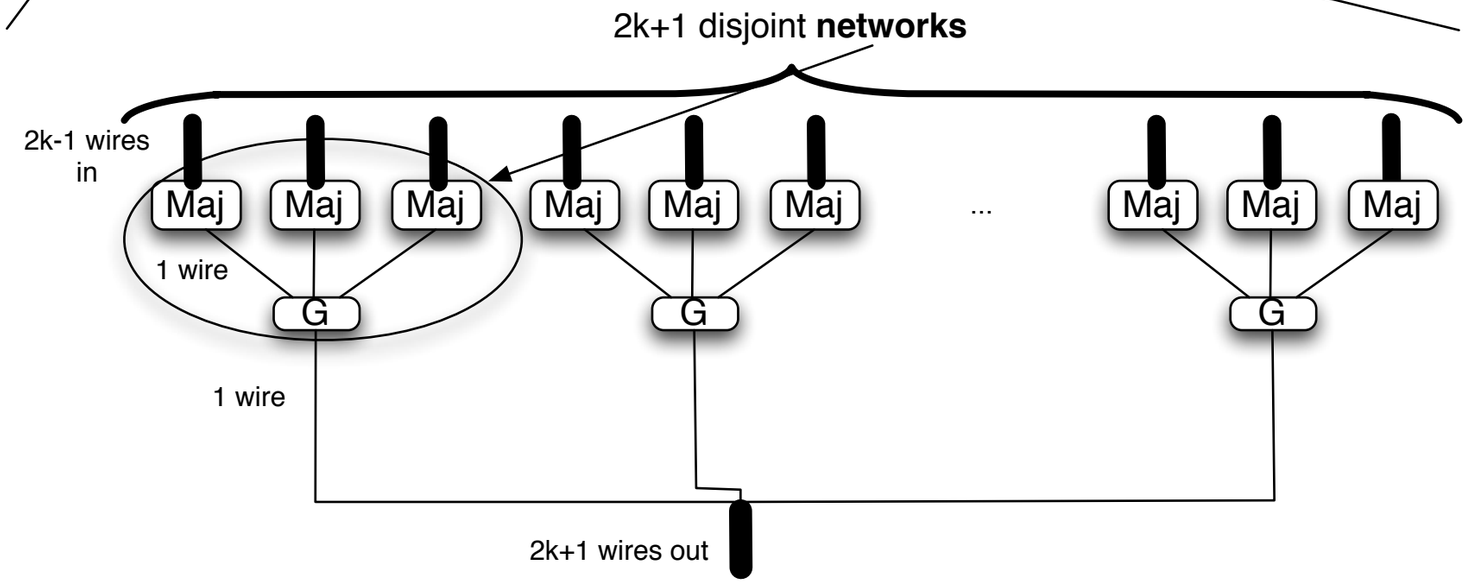


This is the **module** replacing each gate G at each level k:



We say a **network** errs if the wire leaving it has a different value than the wire leaving the corresponding gate, G, in the noiseless circuit. Say the entire **module** errs if a majority of the wires leaving it differ from wire leaving the corresponding G in the noiseless circuit

Each network has error probability no more than 2ϵ.

So entire module has error prob. $\leq 2^{2k+1}(2\epsilon)^{k+1} = 4\epsilon(8\epsilon)^k$

Maj is a subcircuit that outputs the majority of its inputs. Each **network** requires O(k) noiseless gates, so it can be built with O(k log k) noisy gates to ensure error probability less than 2 \epsilon. (See Part 1 in series)

$$\text{Total gates in module} = O(k^2 \log k)$$

$$\text{Total gates in entire MUX} = \sum_{k=0}^{r} 2^{r-k} O(k^2 \log k) = O(2^r)$$

So failure prob along any path is:

$$\leq \sum_{k=0}^{r} 4\epsilon(8\epsilon)^k \leq 4\epsilon/(1-8\epsilon) \leq 6\epsilon < 1/2$$