

Digital Logic Synthesis

Direct Implementation

Last updated 10/29/24

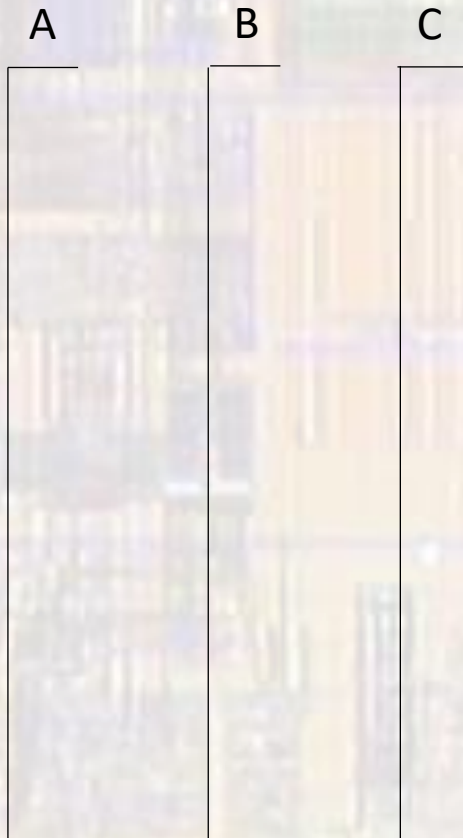
Digital Logic Synthesis – Direct Implementation

- Synthesize a gate level implementation of a logic expression
 - Process
 1. Create a vertical wire for each input
 2. Create a vertical wire for the complement of each input using an inverter
 3. Determine the precedence of the operations
 4. Working from highest to lowest precedence
 - Create a new gate and connect the appropriate inputs or intermediate signals
 - Label the new gate's output signal
 - Replace the appropriate portion of the logic expression with the new signal name
 - Repeat until complete
 5. Remove any un-used inputs

Digital Logic Synthesis – Direct Implementation

- Ex – step 1

$$\text{Out} = \overline{(AB)} + \overline{(C + B)}$$



Digital Logic Synthesis – Direct Implementation

- Ex – step 2

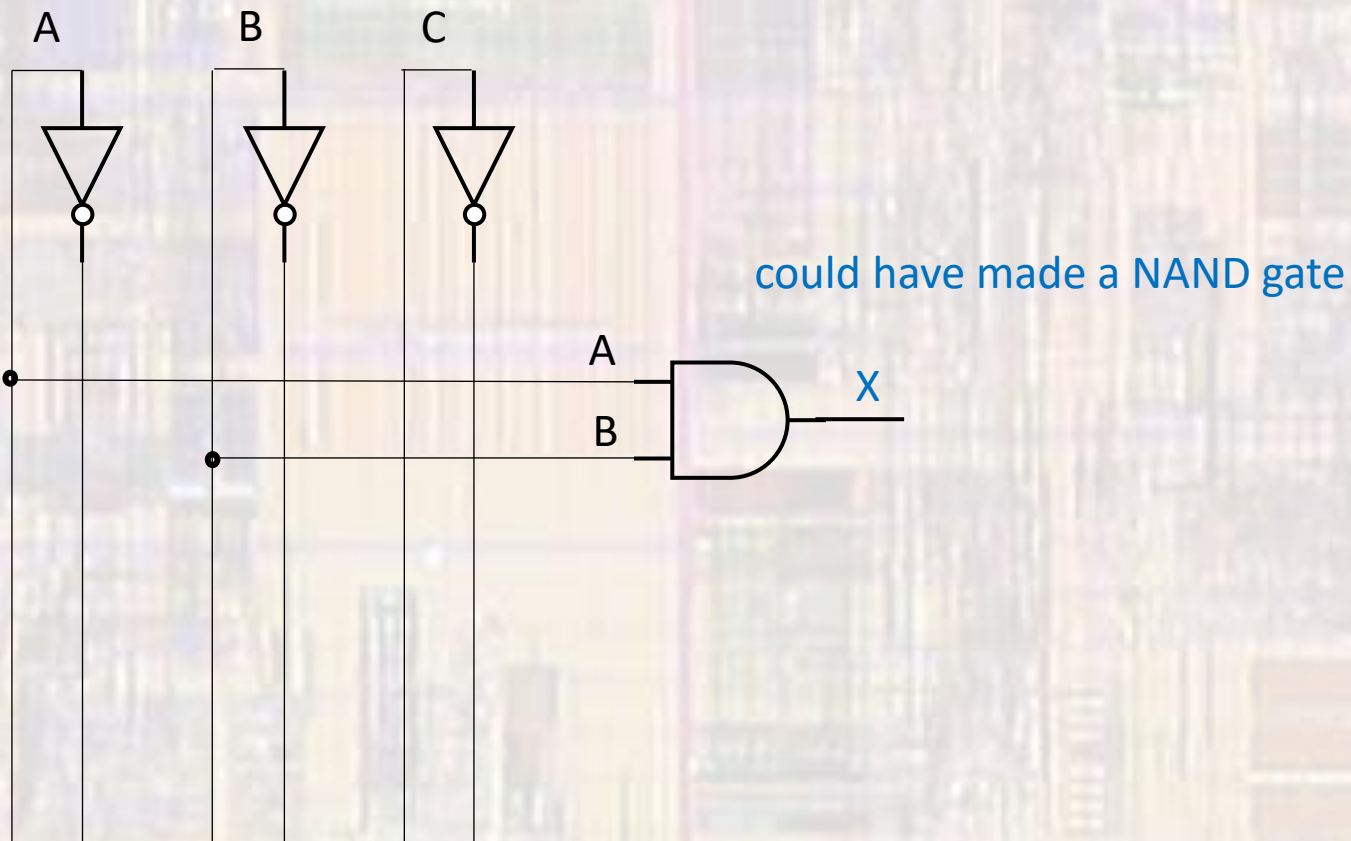
$$\text{Out} = \overline{(AB)} + \overline{(C + B)}$$



Digital Logic Synthesis – Direct Implementation

- Ex – step 3/4

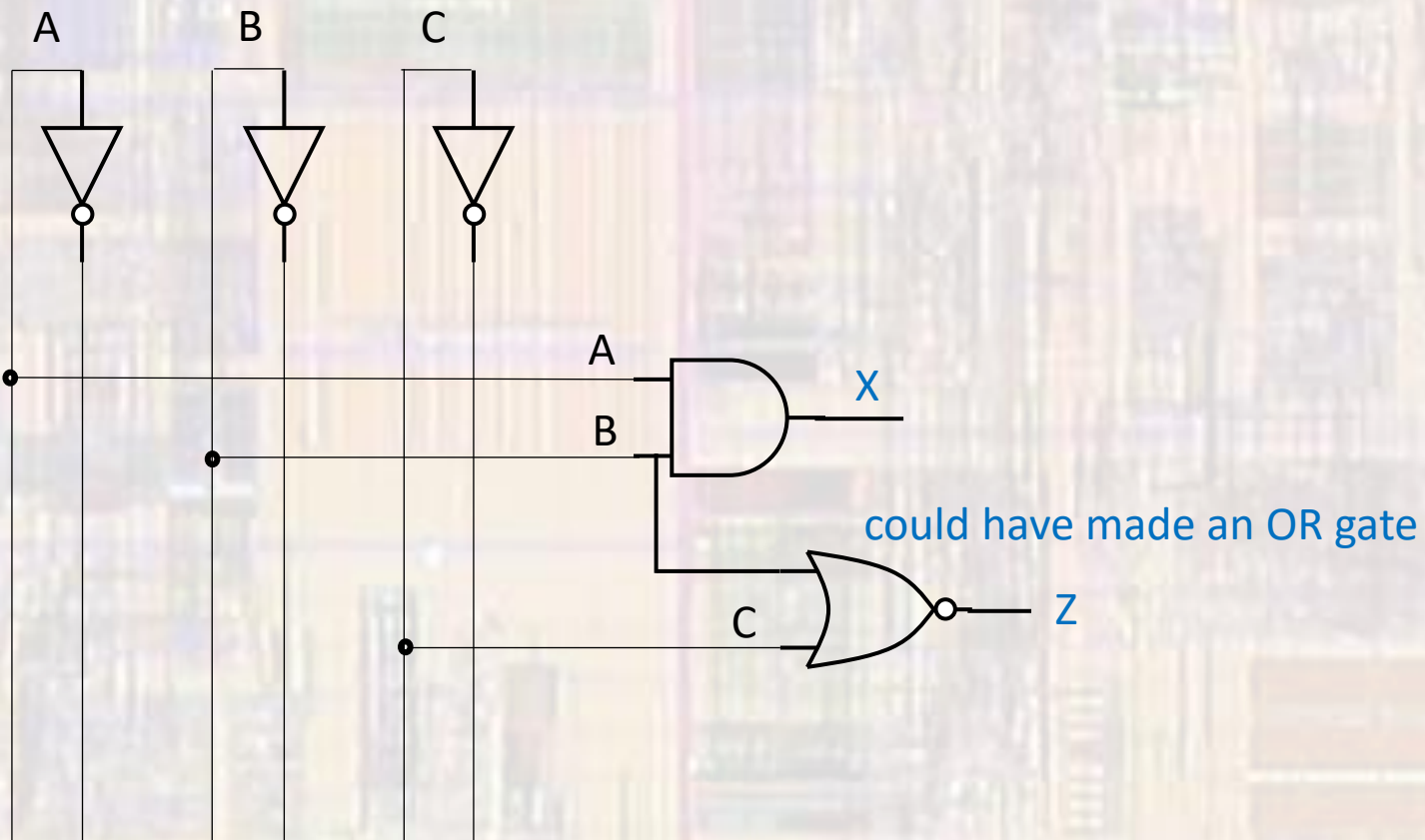
$$\text{Out} = \overline{(\overline{A}B)} + \overline{(C + B)}$$
$$\text{Out} = \overline{X} + (C + B)$$



Digital Logic Synthesis – Direct Implementation

- Ex – step 3/4

$$\text{Out} = \overline{(AB)} + \overline{(C + B)}$$
$$\text{Out} = \overline{X} + Z$$

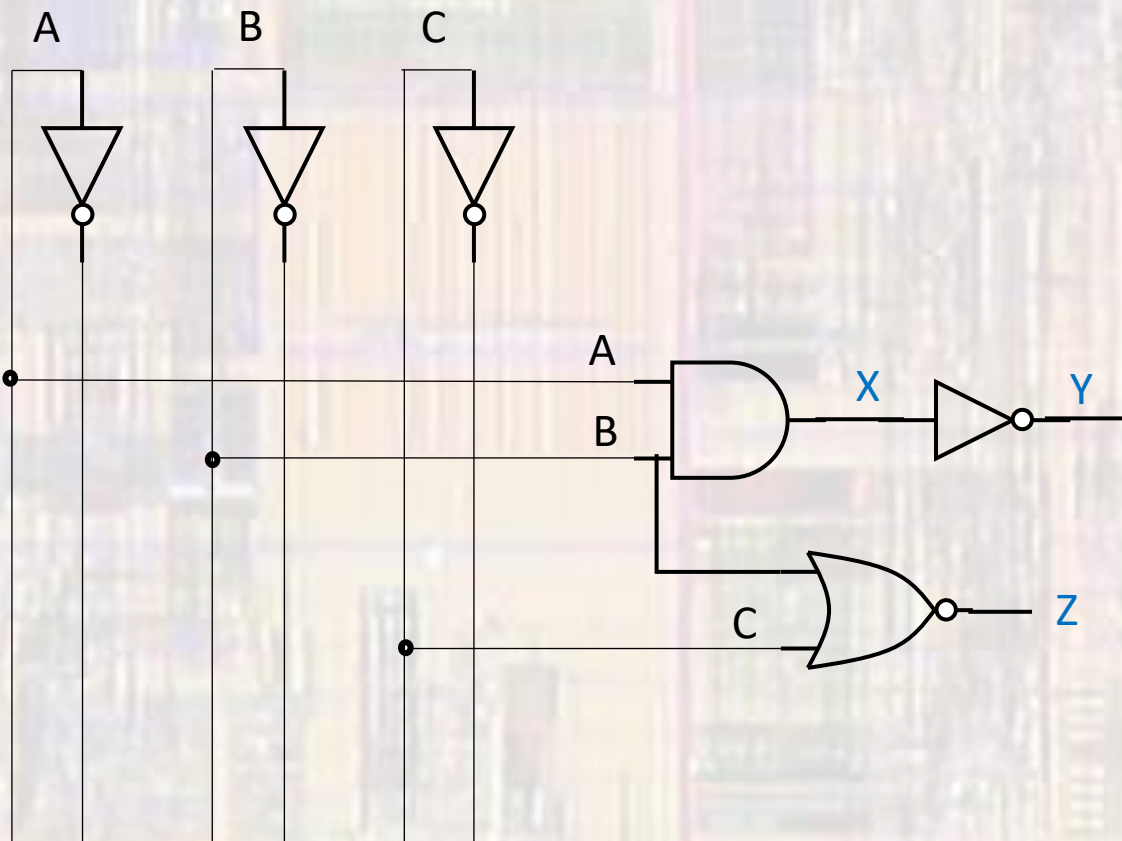


Digital Logic Synthesis – Direct Implementation

- Ex – step 3/4

$$\text{Out} = (\overline{AB}) + (\overline{C + B})$$

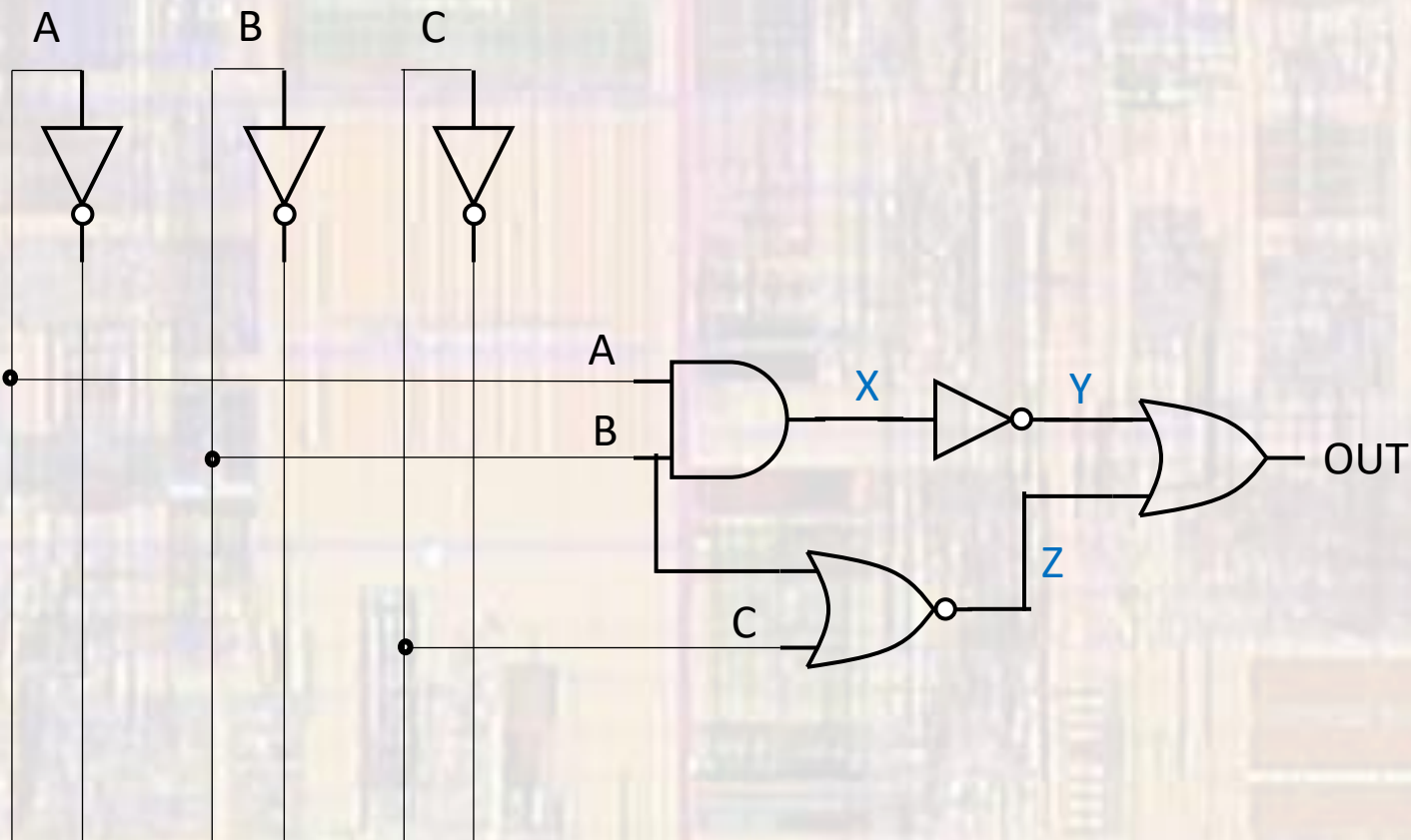
$$\text{Out} = X + Z$$



Digital Logic Synthesis – Direct Implementation

- Ex – step 3/4

$$\text{Out} = (\overline{AB}) + (\overline{C + B})$$



Digital Logic Synthesis – Direct Implementation

- Ex – step 5

$$\text{Out} = (\overline{AB}) + (\overline{C + B})$$

