



Project Proposals

Project Proposal Details

- Due: Friday, March 9th, 11:59pm
- **Personal details:** Your name, your partner's name, email addresses, etc.
- **Your project:** Project name, what you're making, why it connects to the course.
- **Milestones:** What will you do in Week #1, Week #2 & Week #3 (final demo)
 - Make sure each week is a lab's worth of work!



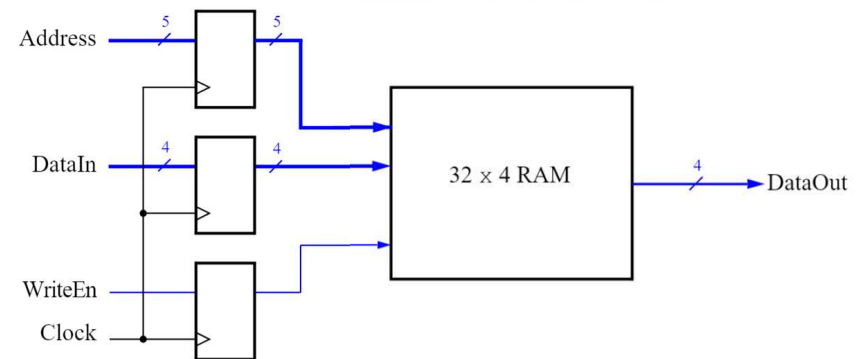
Lab 7 Preparation

Lab 7 Components

- **Part I:** Create a memory unit
- **Part II:** Interface with the VGA display
- **Part III:** VGA animation (bonus)

Part I: Memory Unit

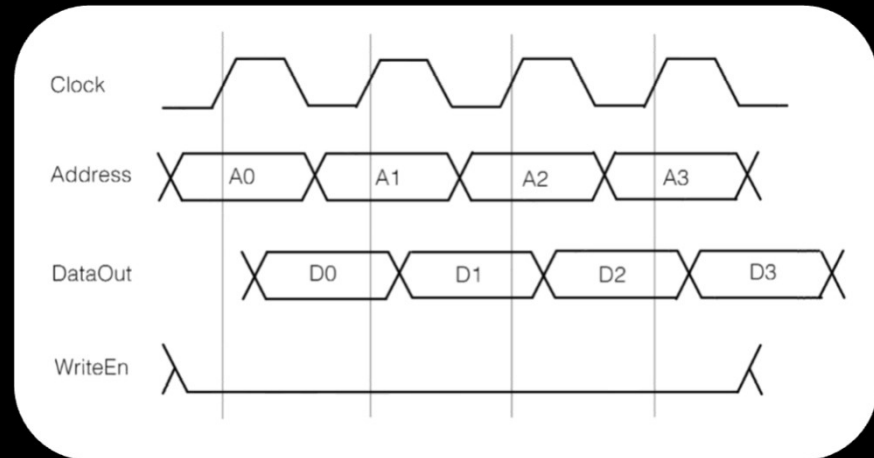
- Creating a mini-RAM unit.
- Make use of the **IP Catalog** built into Quartus.
 - Follow lab instructions to create a 4-bit RAM unit with 32 words.
- Once created, connect this RAM to the switches, keys and HEX.



Part 1: Read & Write Timing

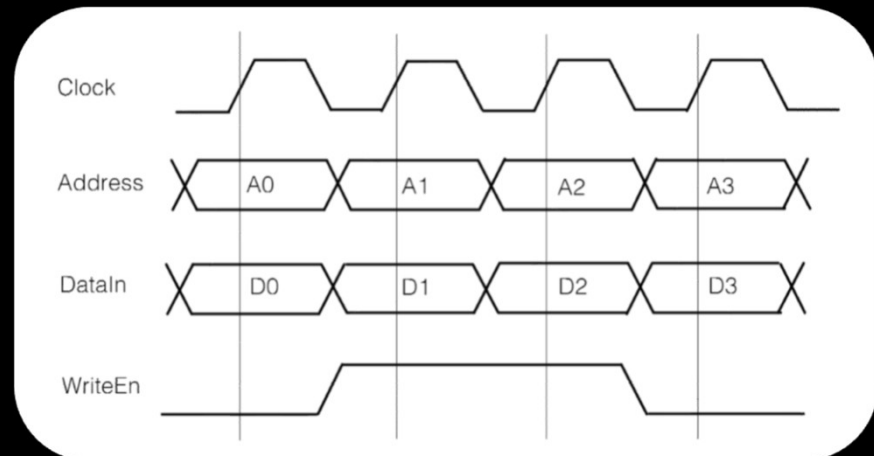
- **Read:**

- Note slight delay after clock signal, before data appears.



- **Write:**

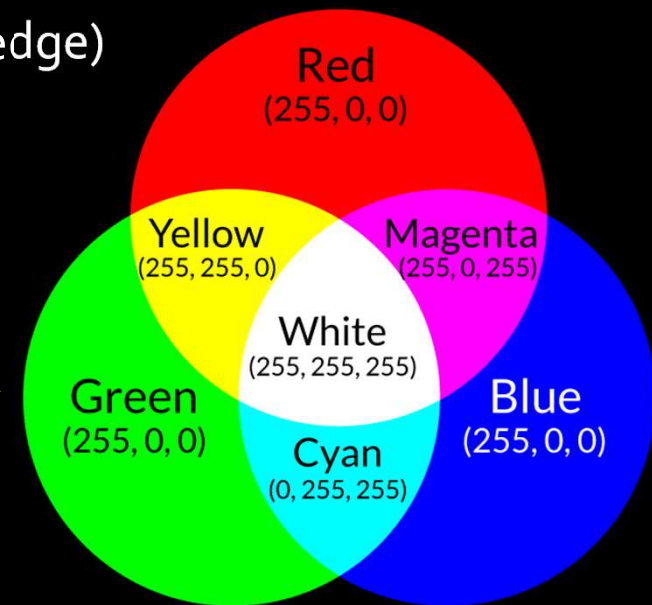
- Note that only D1 and D2 are written (because of the WriteEn signal).



Part II: VGA Display

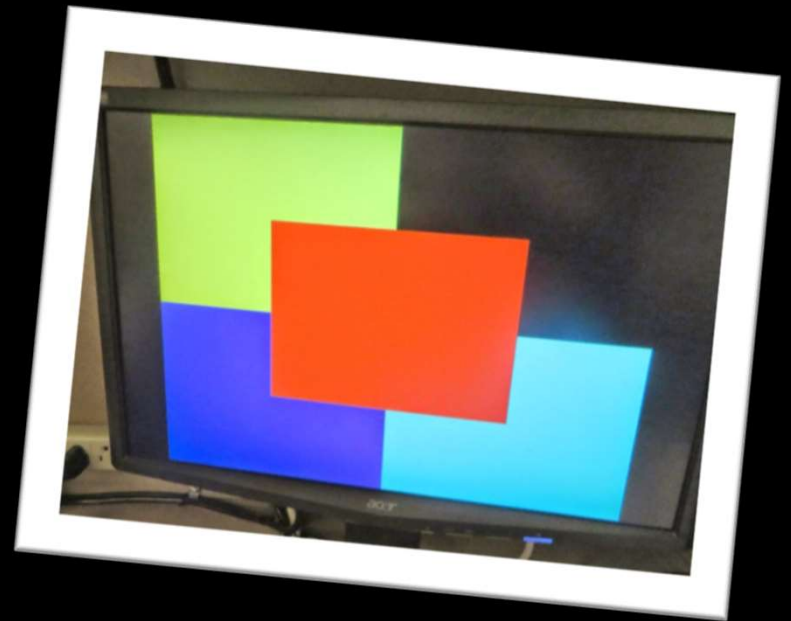
- Draw pixels on the screen, given a VGA adaptor that takes in the following values:
 - X (horizontal position of pixel)
 - Y (vertical position of pixel)
 - $colour$ (three values: R , G , B)
 - $plot$ (signals to write at next clock edge)
 - $clock, resetn$
- Colours are additive!

} Where (0, 0) is top left corner of screen



Part II: VGA Display

- Specifying the inputs to the VGA adaptor will set a single pixel to a single colour.
 - How would you make a box on the screen?
- Given input coordinates X and Y , make a 4×4 box of coloured pixels, using X and Y as the top left corner of the box.



Part II: VGA Display

- Components needed:
 - **VGA adaptor** (provided by us)
 - **Datapath** that takes in:
 - X and Y (through switches)
 - control signals (from KEYS, clock and FSM)
 - **FSM**:
 - Controls datapath to load X and Y values, and iterate through the pixel locations that need to be updated (relative to X and Y).

Part II: VGA Display

- Hints:

- Have tests to verify that each component works on its own.
 - Try using the VGA adaptor to draw a single pixel, make sure the datapath works on its own, verify that the FSM is moving from state to state as expected.
- Consider using counters to store the offsets from X and Y that need to be displayed.
- Background is black by default, so test with pixel colour values other than $(0,0,0)$

Part III: Animation (bonus)

- Note: This part is optional, but can be done for bonus marks in the course.
- Animate a box by drawing it, then waiting, then drawing another at a different location, then waiting...
- Many projects will use animation in some form, so you should try this part out!
 - Also...bonus marks! 😊

