Project Proposals

Project Proposal Details

- Due: Friday, November 2nd, 11:59pm
  - One submission *per team* (not per person)
- **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!

Project Partners FAQ

- **Yes**, you still need to work in pairs.

- **No**, it doesn't have to be the same person you did your labs with.

- **Yes**, it could be with somebody in another room or another section...

  - **BUT**...if any disagreement with your milestone marks arises, we need to verify this with the TA.

  - If you don't remember the TA who marked you or the TA doesn't know who you are, we can't guarantee a mark change.

Looking for inspiration?

- Think of electronic devices or simple games.
- Look at electronic hardware websites:
  - e.g. Creatron Inc.
- Remember, the project needs to be three labs' worth of work!
  - Project ideas that we will not allow:
    - Clocks / Stopwatches
    - Pianos
    - Tic-Tac-Toe (unless you add a smart AI)
    - Other ideas at this basic level.
  - Rejected ideas will have to be resubmitted, which results in less time to work on the first milestone.

Lab 7 Preparation

Handing in your code

- There's a modification to the pre-lab work required for this lab:
  - Before attending your lab, you need to hand in the source files that you created on Quercus.
    - Look under Assignments to find the submission for Lab 7.
  - You need to do this before the lab starts or we can't give you credit for the lab exercise!

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.
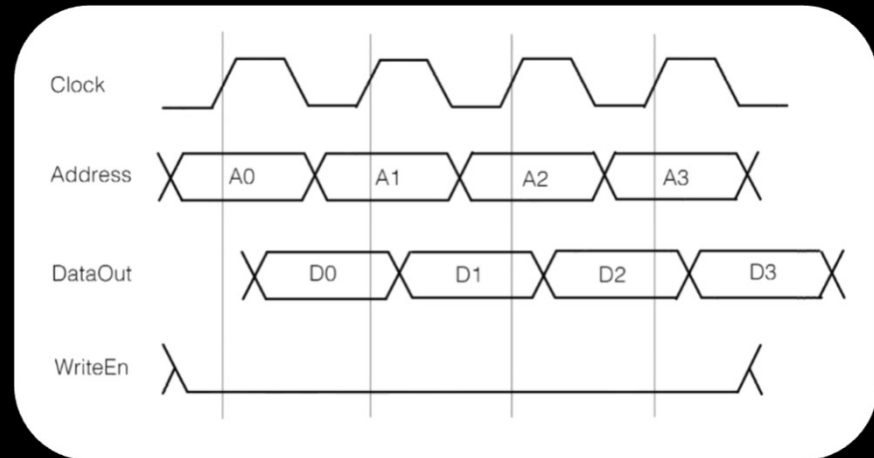- Once created, connect this RAM to the switches, keys and HEX.
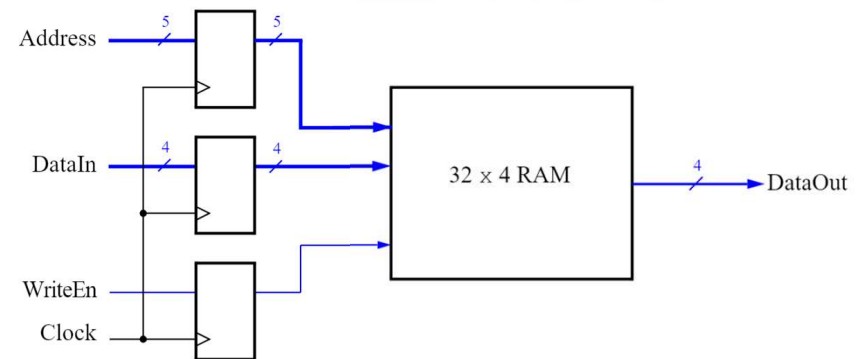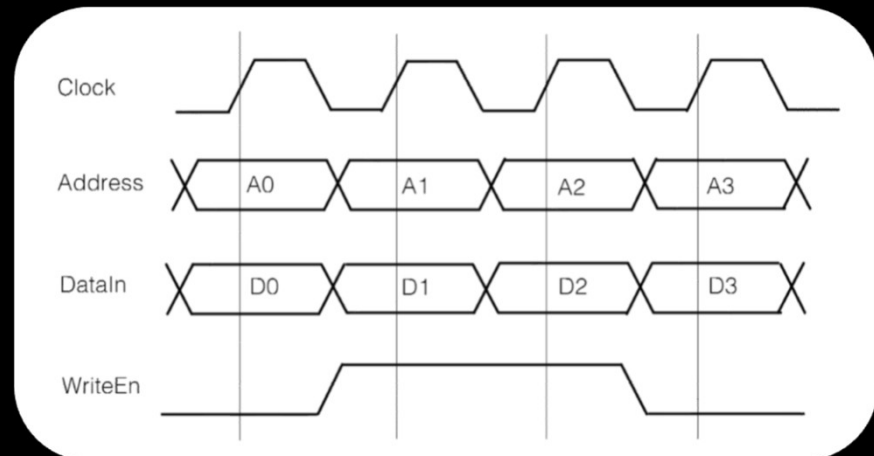
Part 1: Read & Write Timing

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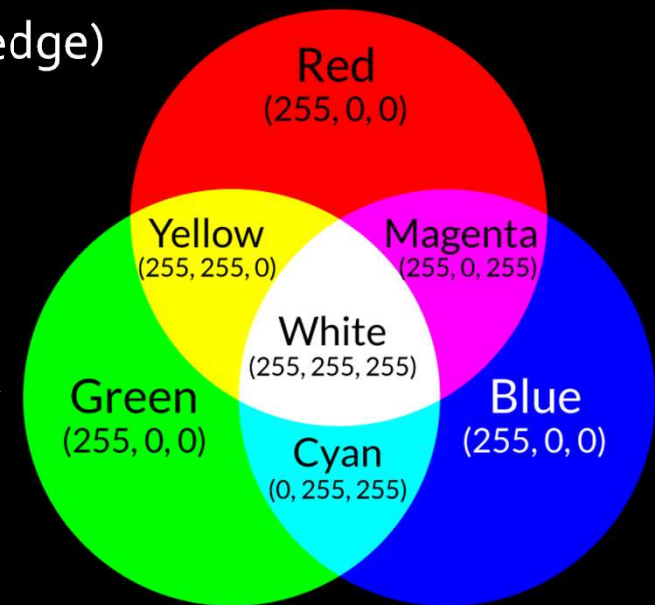 - Note slight delay after clock signal, before data appears.

- Write:
  - Note that only `D1` and `D2` are written (because of the `WriteEn` signal).
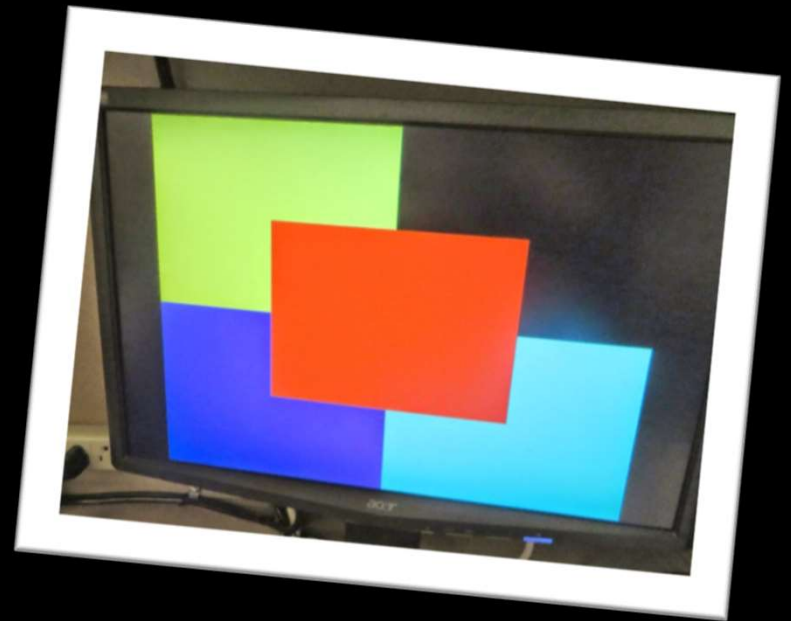
Part II: VGA Display

- 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)

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

  - `colour` (three values: **R**, **G**, **B**)
  - `plot` (signals to write at next clock edge)
  - `clock`, `resetn`
- Colours are additive!

Red (255, 0, 0)

Yellow (255, 255, 0)

Magenta (255, 0, 255)

White (255, 255, 255)

Green (255, 0, 0)

Cyan (0, 255, 255)

Blue (255, 0, 0)

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 $4x4$ 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)

- <u>Note:</u> 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! ☺