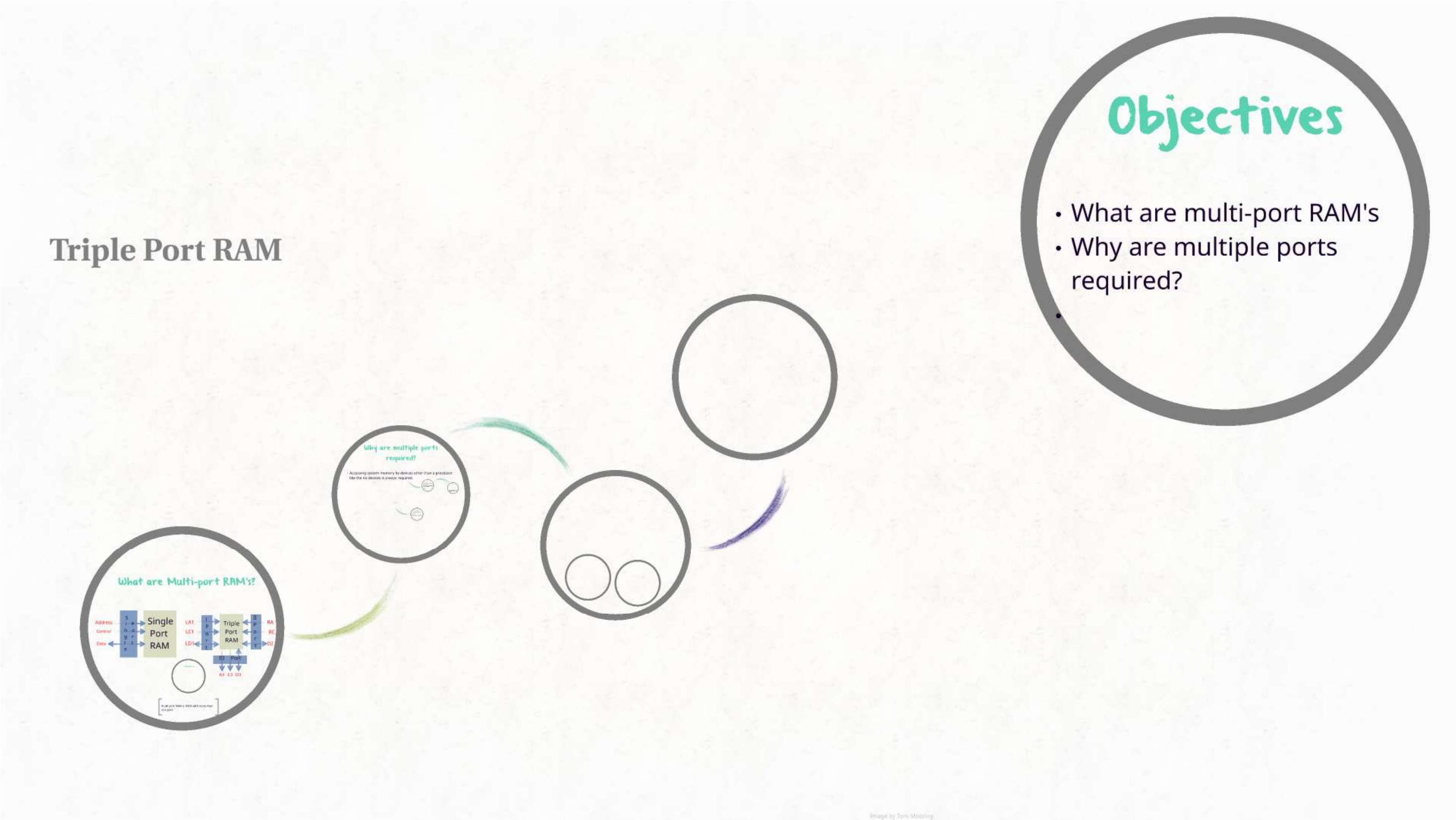


Triple Port RAM

Objectives

- What are multi-port RAM's
- Why are multiple ports required?
-

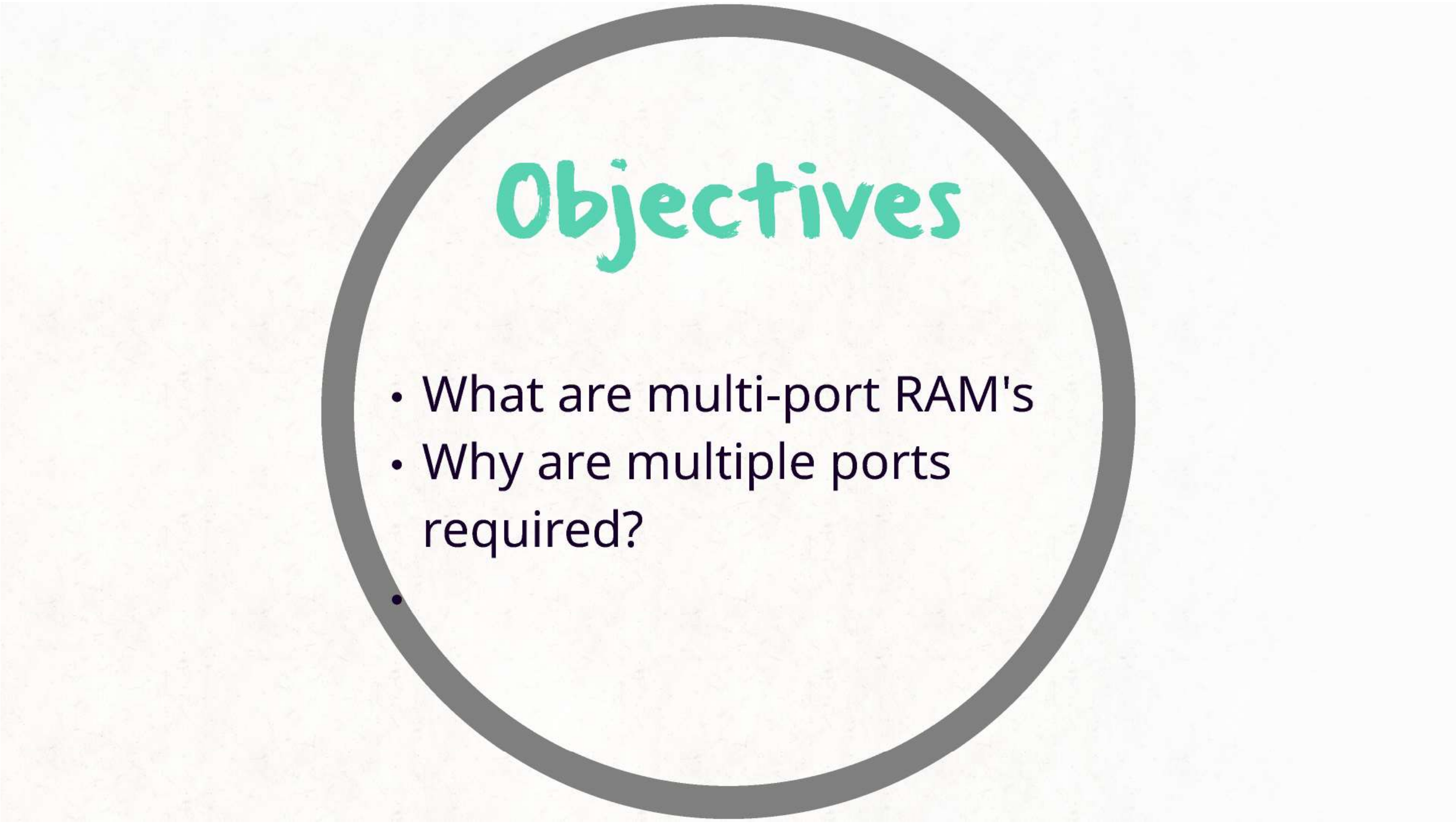
What are Multi-port RAM's?

Multi port RAM is RAM with more than one port.

Why are multiple ports required?

Accessing system memory by devices other than a processor like the I/o devices is always required.

Image by Tom Mooring



Objectives

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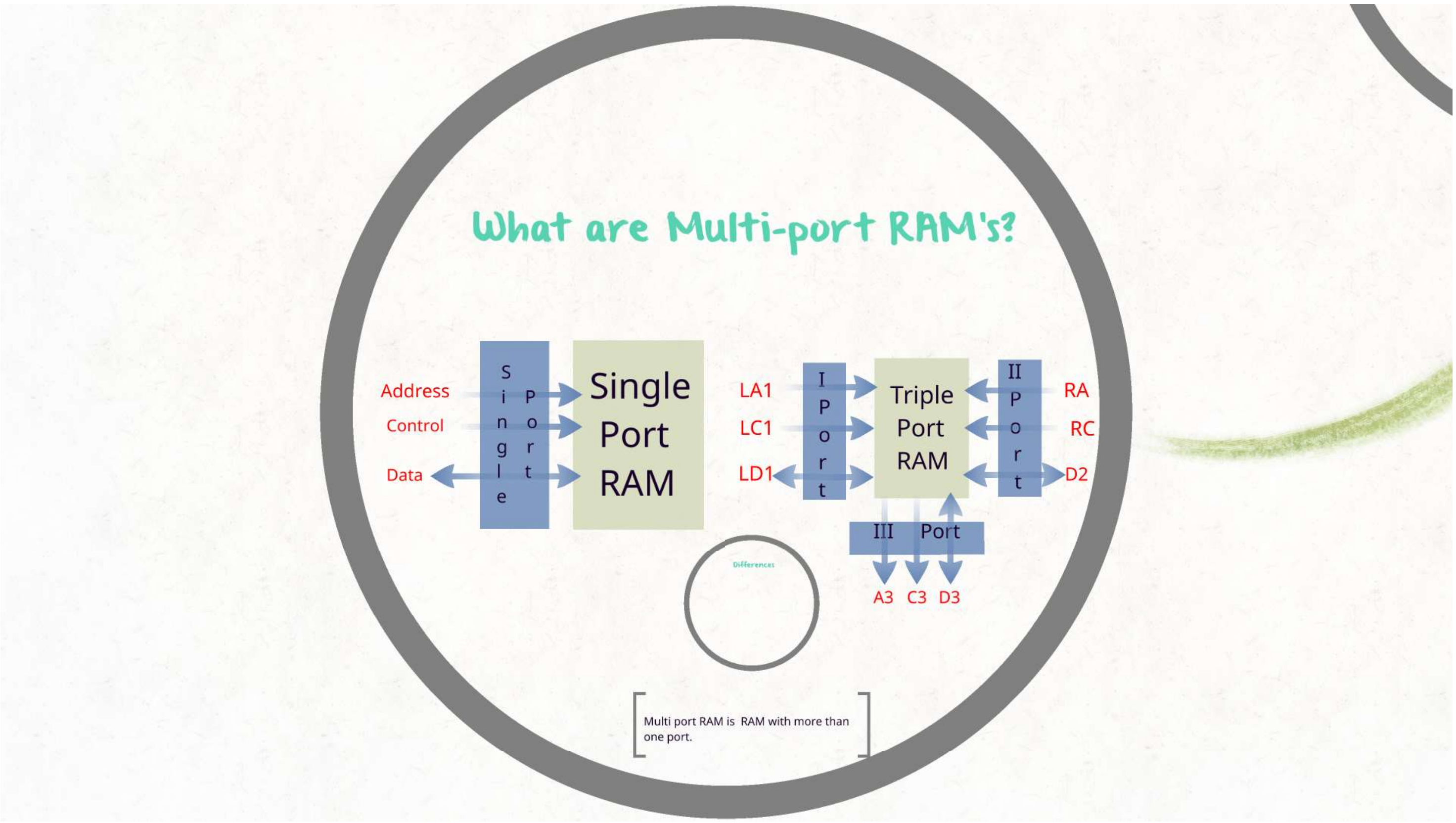
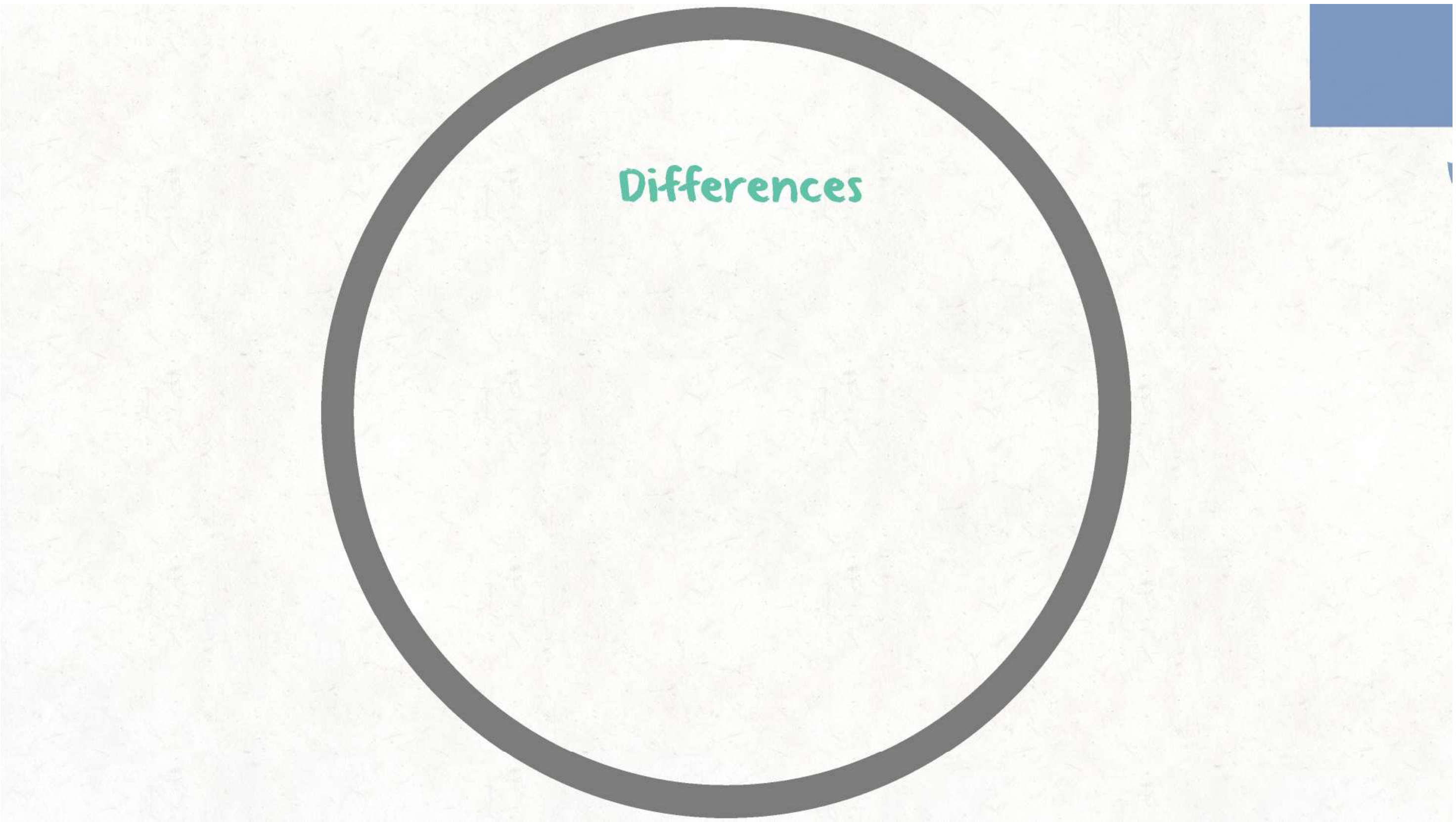
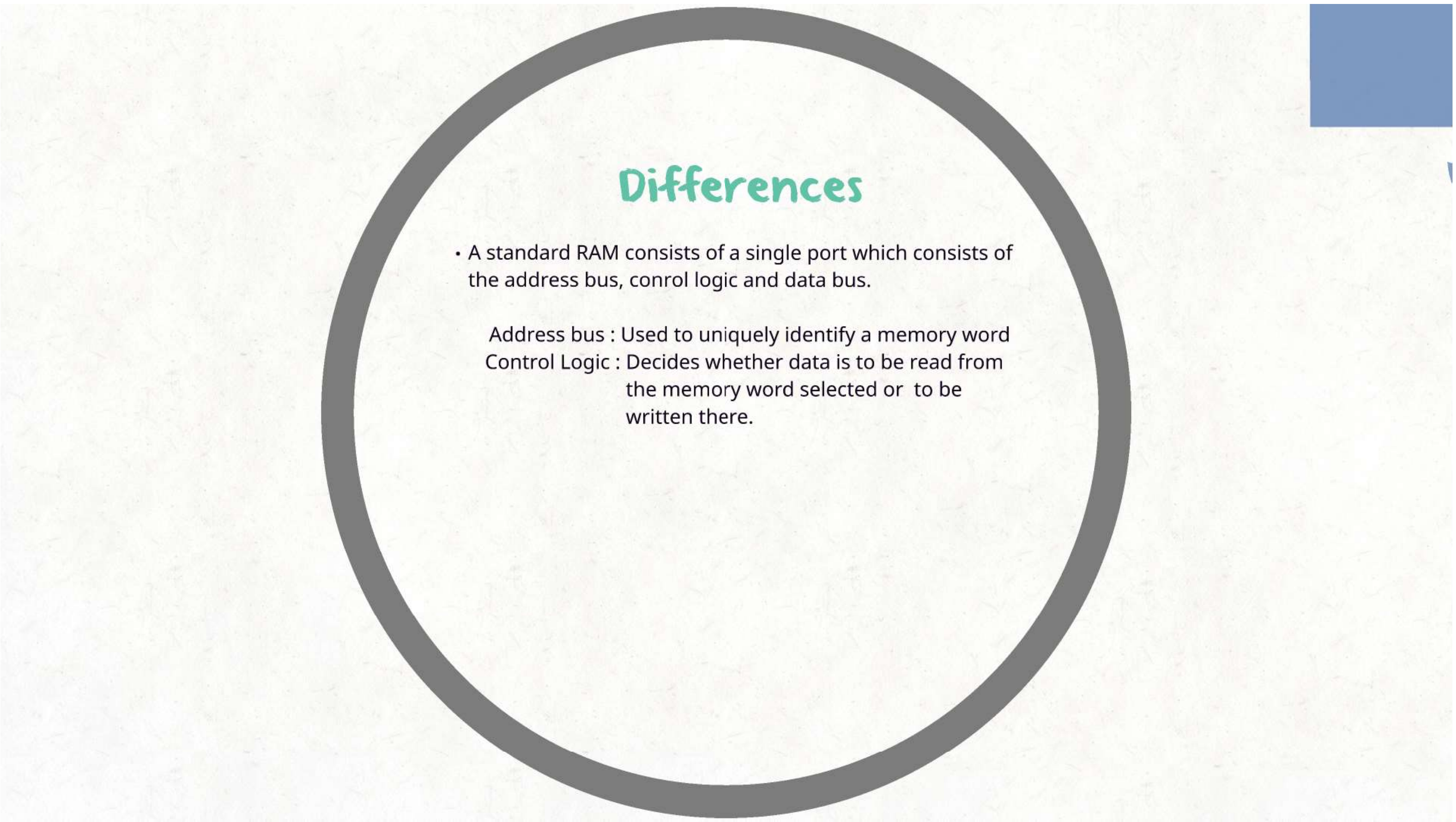


What are Multi-port RAM's?

Multi port RAM is RAM with more than one port.



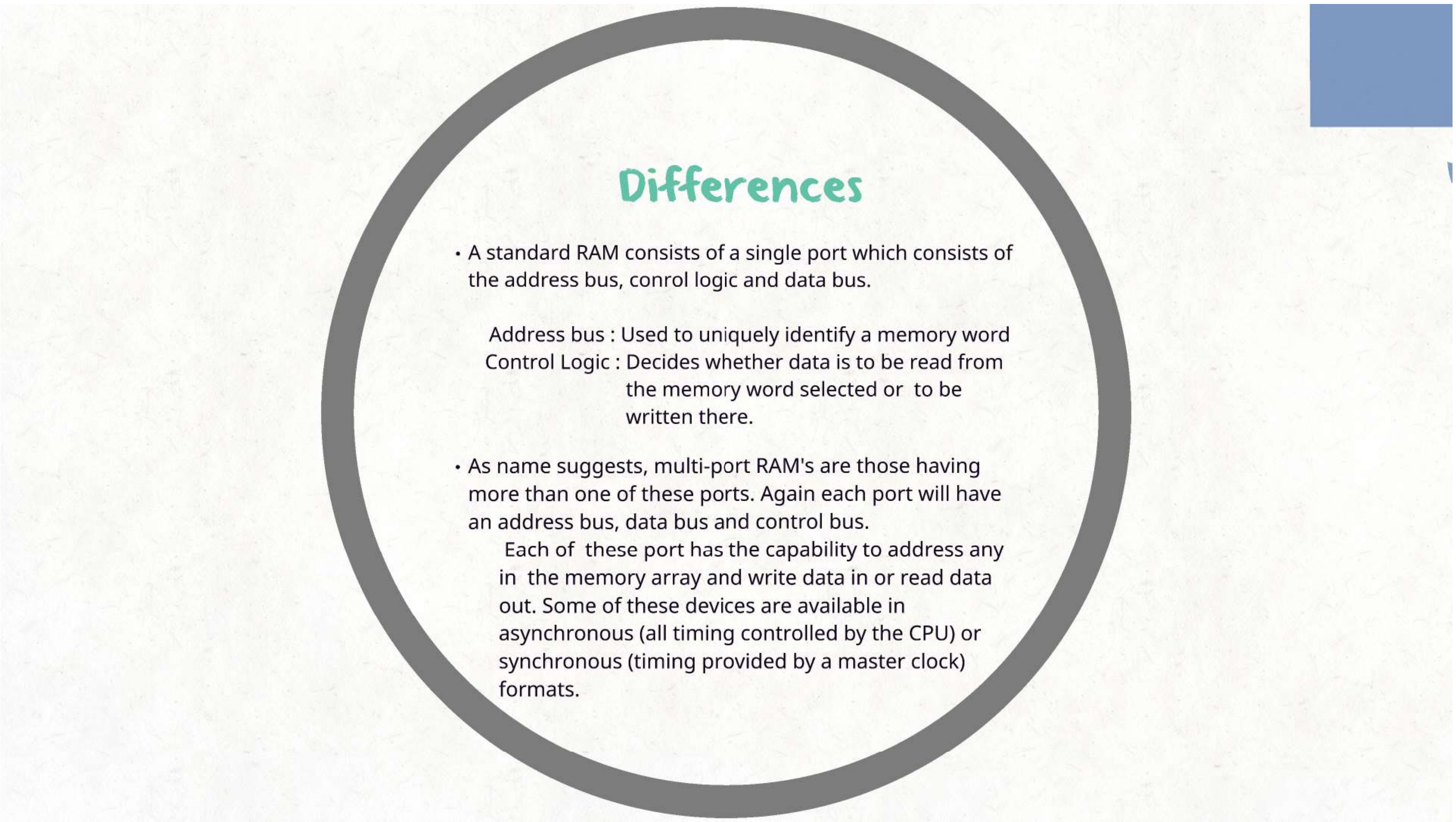
Differences



Differences

- A standard RAM consists of a single port which consists of the address bus, conrol logic and data bus.

Address bus : Used to uniquely identify a memory word
Control Logic : Decides whether data is to be read from the memory word selected or to be written there.



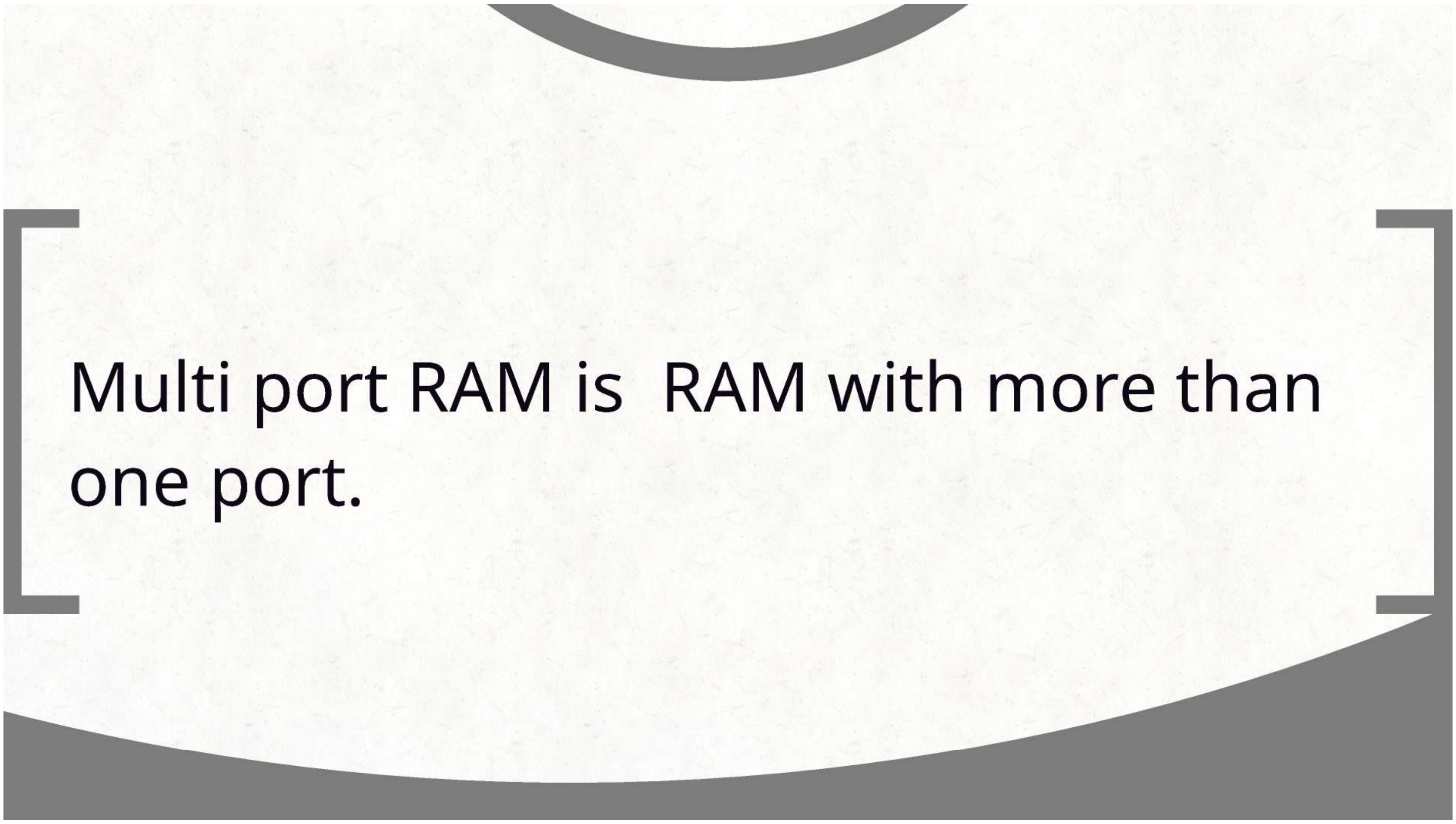
Differences

- A standard RAM consists of a single port which consists of the address bus, conrol logic and data bus.

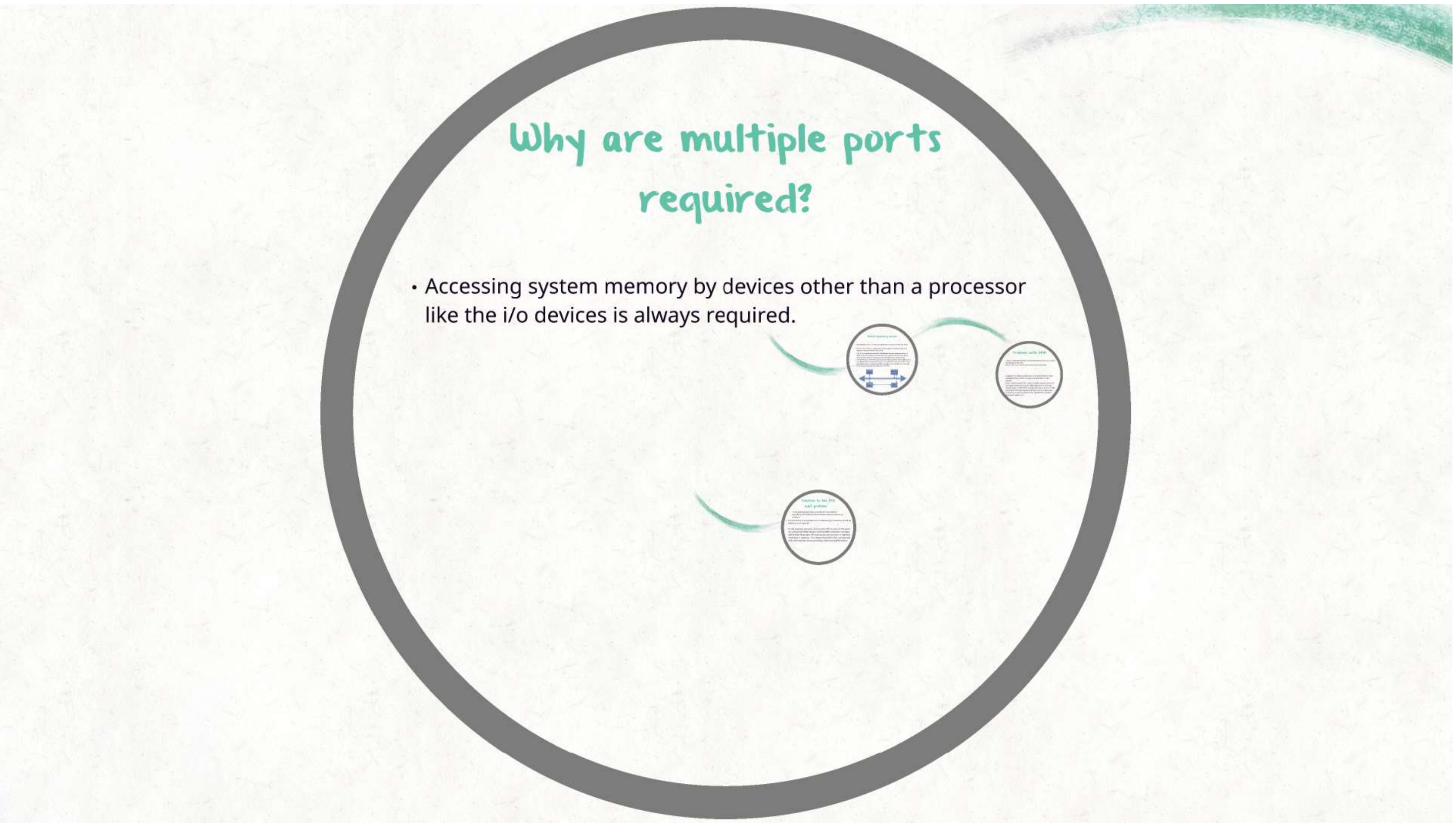
  Address bus : Used to uniquely identify a memory word
  Control Logic : Decides whether data is to be read from the memory word selected or to be written there.

- As name suggests, multi-port RAM's are those having more than one of these ports. Again each port will have an address bus, data bus and control bus.

  Each of these port has the capability to address any in the memory array and write data in or read data out. Some of these devices are available in asynchronous (all timing controlled by the CPU) or synchronous (timing provided by a master clock) formats.

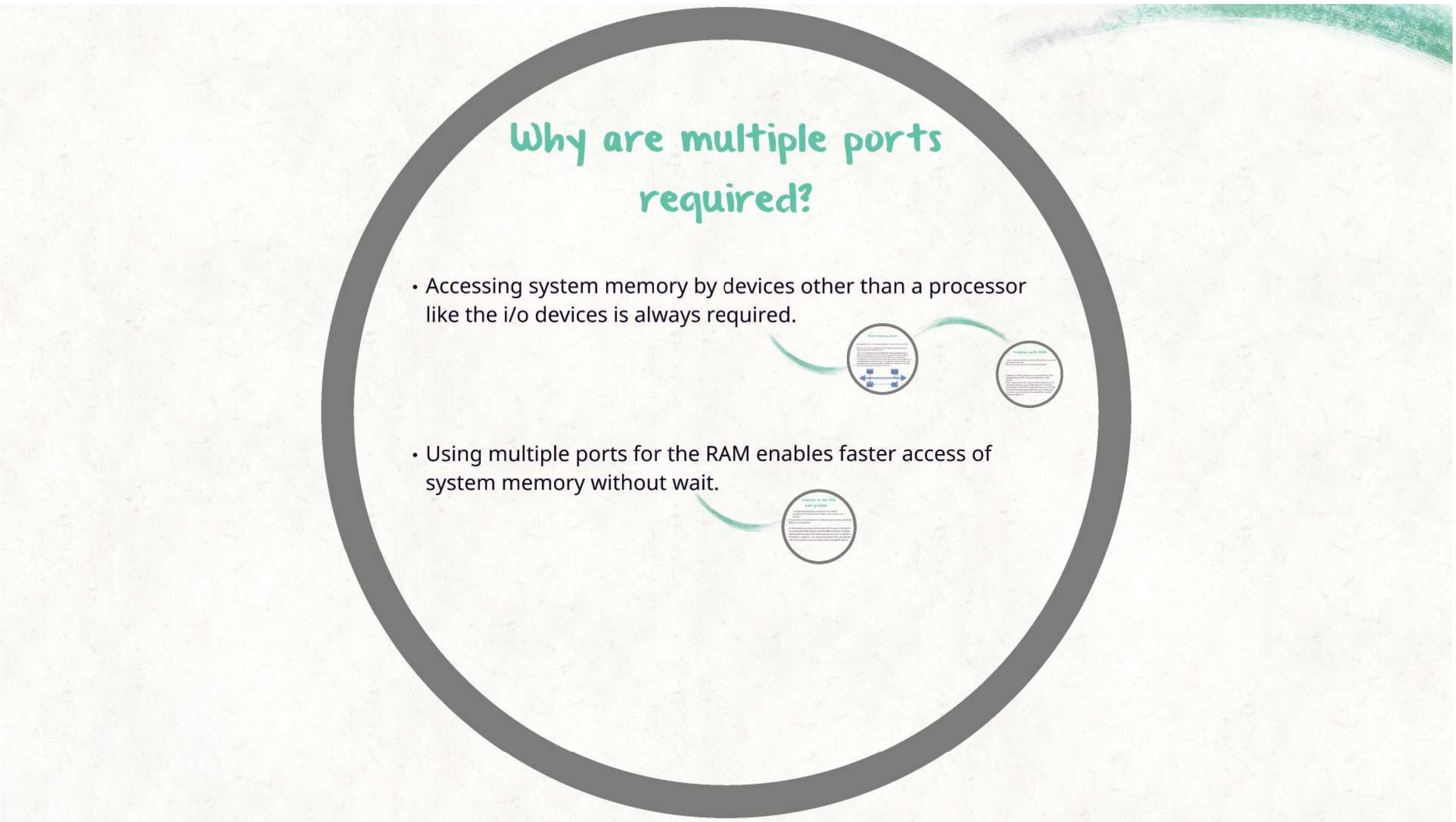


Multi port RAM is RAM with more than one port.



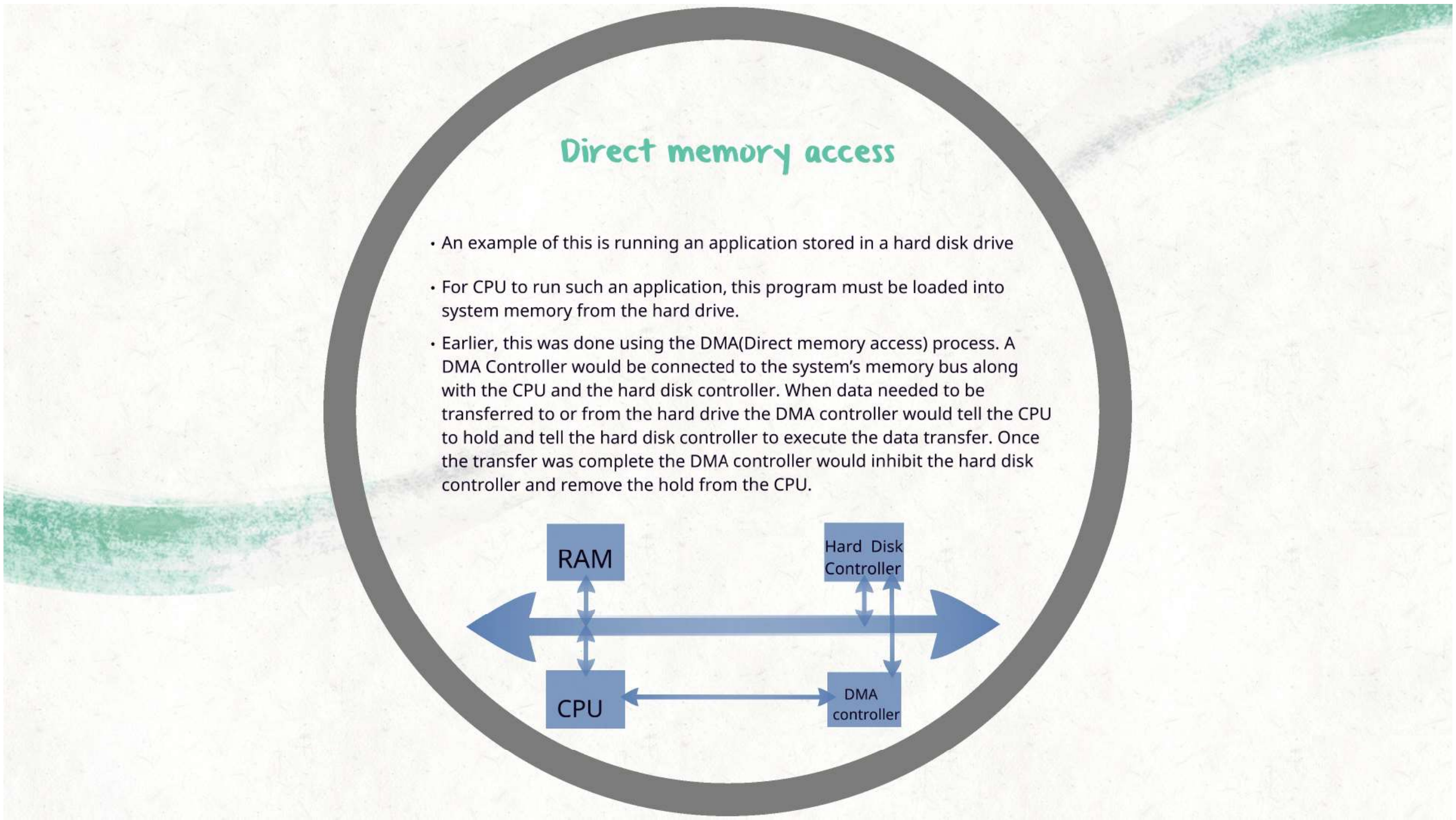
Why are multiple ports required?

- Accessing system memory by devices other than a processor like the i/o devices is always required.



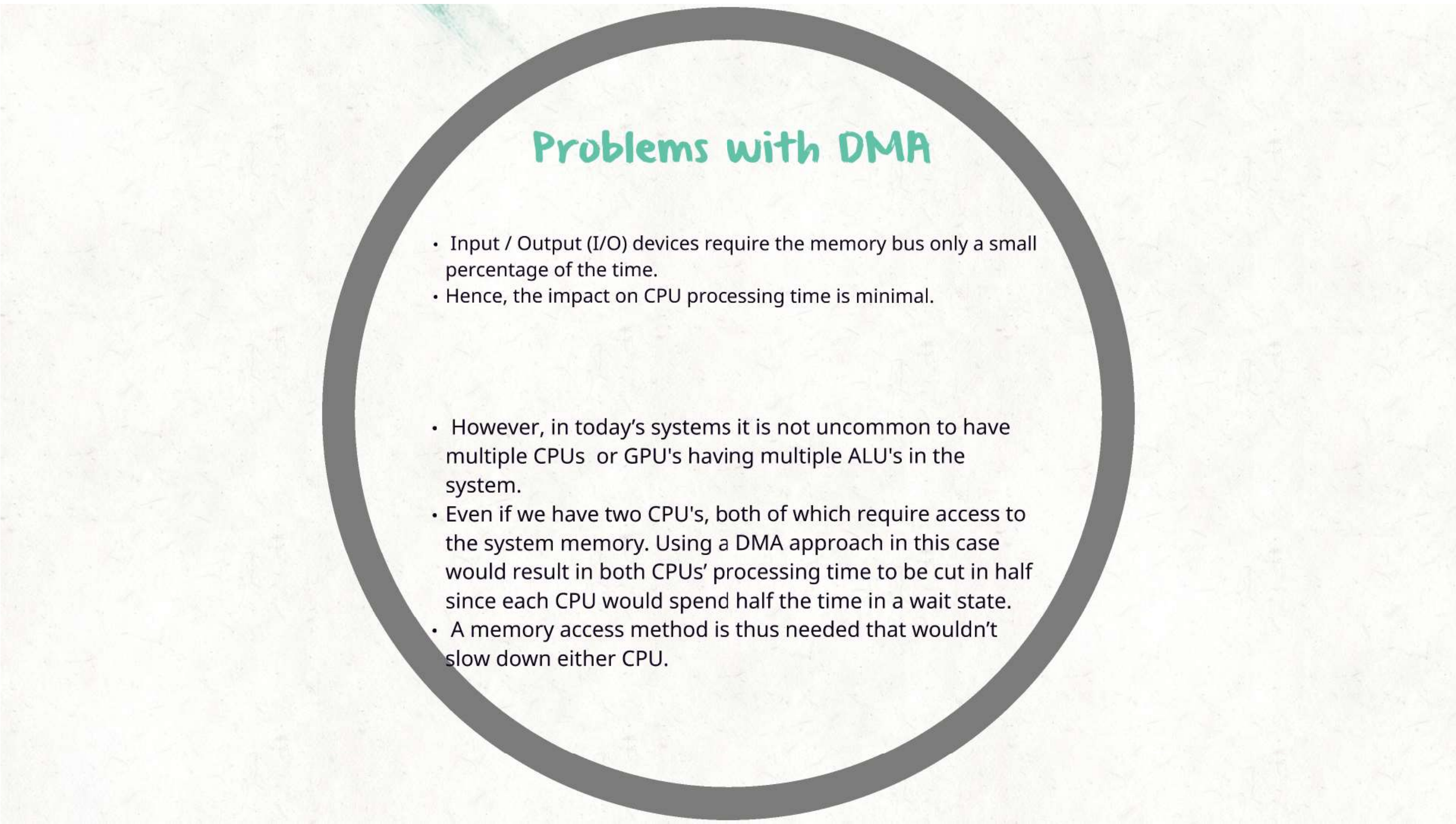
Why are multiple ports required?

- Accessing system memory by devices other than a processor like the i/o devices is always required.
- Using multiple ports for the RAM enables faster access of system memory without wait.



Direct memory access

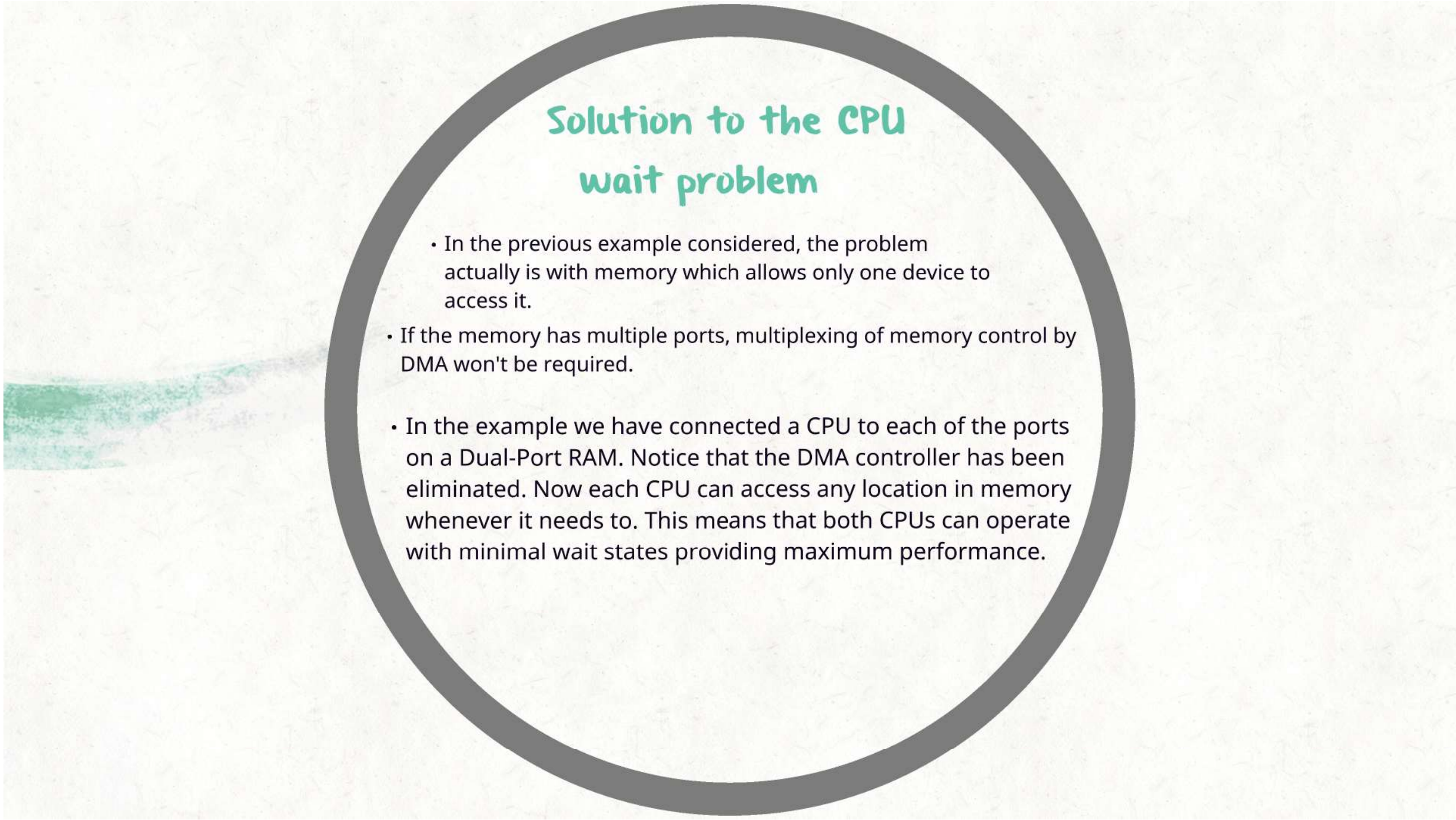
- An example of this is running an application stored in a hard disk drive
- For CPU to run such an application, this program must be loaded into system memory from the hard drive.
- Earlier, this was done using the DMA(Direct memory access) process. A DMA Controller would be connected to the system's memory bus along with the CPU and the hard disk controller. When data needed to be transferred to or from the hard drive the DMA controller would tell the CPU to hold and tell the hard disk controller to execute the data transfer. Once the transfer was complete the DMA controller would inhibit the hard disk controller and remove the hold from the CPU.



Problems with DMA

- Input / Output (I/O) devices require the memory bus only a small percentage of the time.
- Hence, the impact on CPU processing time is minimal.

- However, in today’s systems it is not uncommon to have multiple CPUs or GPU's having multiple ALU's in the system.
- Even if we have two CPU's, both of which require access to the system memory. Using a DMA approach in this case would result in both CPUs’ processing time to be cut in half since each CPU would spend half the time in a wait state.
- A memory access method is thus needed that wouldn’t slow down either CPU.



Solution to the CPU wait problem

- In the previous example considered, the problem actually is with memory which allows only one device to access it.
- If the memory has multiple ports, multiplexing of memory control by DMA won't be required.

- In the example we have connected a CPU to each of the ports on a Dual-Port RAM. Notice that the DMA controller has been eliminated. Now each CPU can access any location in memory whenever it needs to. This means that both CPUs can operate with minimal wait states providing maximum performance.