

## 5.1 Data Storage and 5.2 Data Representation

**Notebook:** How Computers Work [CM1030]

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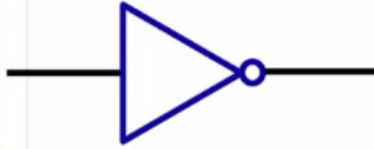
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**Tags:** AND, ASCII, Bit, Byte, Cache, NOT, OR, RGB, UNICODE

<b>Cornell Notes</b>	<b>Topic:</b>  5.1 Data Storage 5.2 Data Representation	Course: BSc Computer Science
		Class: How Computer Work [CM1030]-Lecture
		Date: October 30, 2019
<b>Essential Question:</b>		
What are different methods of data storage? Alongside this, what is a bit and/or bytes and how can we use these to represent our data?		
<b>Questions/Cues:</b>		
<ul style="list-style-type: none"><li>• What is a bit?</li><li>• What is the main difference between Main Memory and Mass Storage?</li><li>• What is the NOT operation on a bit?</li><li>• What is the AND operation on a bit?</li><li>• What is the OR operation on a bit?</li><li>• What are the different types of storage media?</li><li>• What is cache and virtual memory?</li><li>• How many bit patterns can a byte represent?</li><li>• What is a binary number and how is it represented?</li><li>• What is ASCII and Unicode?</li><li>• How can we represent colour to humans on a computer using bits and bytes?</li></ul>		
<b>Notes</b>		
<ul style="list-style-type: none"><li>• Bit = fundamental unit of digital info, can have one of 2 states at any 1 time; (1 or 0, true or false, on or off)<ul style="list-style-type: none"><li>◦ Is an abstract representation that represent any duality, binary distinction between 2 things</li><li>◦ Comp memory measured in Gigabytes (GB), byte is 8 bits, GB is a billion bytes</li><li>◦ Modern HDD measured in Terabytes(TB) or 8 trillion bytes</li></ul></li><li>• Main Memory(Temporary Storage) = where info is stored that Comp currently using, made up of RAM (Random Access Memory)<ul style="list-style-type: none"><li>◦ Everything in main memory forgotten when comp turned off</li><li>◦ Fast and easy to write to but capacity small &lt; 100GB</li></ul></li><li>• Mass Storage (Permanent Storage) = where things are stored permanently, where doc when you save it.<ul style="list-style-type: none"><li>◦ Slower, but saves data when comp turned off and capacity into TB</li></ul></li><li>• Microchips handle bits, microchips perform calculations on bits</li></ul>		

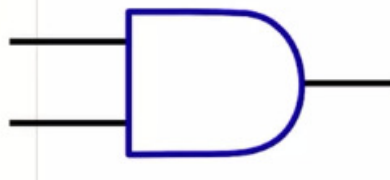
- NOT operation = taking single bit and making it its opposite. ie. One become Zero

NOT



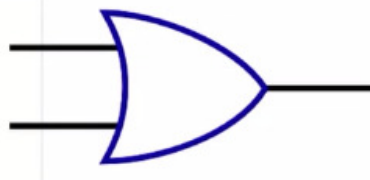
- AND operation = when dealing with two bits, has output of 1 if both inputs are 1, but 0 if either input is 0

AND



- OR operation = when dealing with two bits, if either input is 1, output is 1. Output only 0 if both inputs are 0

OR



- Hard disk stores data magnetically, DVD is optical storage and stores data that can be read with light, Flash USB stores data permanently alternative to RAM, also this Flash storage comes as alternative to HDD as flash-based storage drives called SSD (Solid State Drives).
  - SSD slower than RAM, but much faster than HDD or optical drives
  - Optical drives slow to write to, best used for permanent archiving
  - With Storage we trade off between storage capacity, power usage and speed
- Cloud storage = data not stored on own comp, but comp somewhere on Internet

- since data transmitted over Internet, storing and accessing data much slower than device on comp.
- Cache = often on same chip as main processor, used for storing data being used at very moment
- Virtual Memory = when main memory full, comp saves some of what should be in memory to HDD, area called virtual memory
  - Comp does its best to make sure what is placed in Virtual Memory isn't something to be used immediately
- On modern comp, smallest element to access is 64 bits or 8 bytes
- A byte can represent 256 different patterns of 1s and 0s called bit patterns. With single byte rep'ping #'s up to 255
- Binary number rep'ed by base 2 instead of 10, decimal number can be converted to binary rep like so

1 1 0 1

1x	1x	0x	1x
8	4	2	1
=	=	=	=
8	4	0	1

- American Standard Code for Information Interchange (ASCII) = standard for rep'ping texts, includes all Eng alphabet, numbers and special characters in seven bits
  - Gradually being replaced by UNICODE to include almost any writing system in the world
- Shades of B & W between 0 and 255
- We use RGB and optionally A to represent colour to humans with R being red, G being green, B being blue and A being alpha or opacity (transparency)

## Summary

In this week, we learned what is a bit is and bytes are. Also we looked at the different operations performed on bits. Alongside this, we looked at the binary representation of decimal numbers, letters and etc. Further, we touched on the ASCII and UNICODE standards in computing. Finally, we explored the various types of storage media