



SKILLSEA

Module 6 Computer Science

6.1 Introduction and understanding computer terms

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Introduction

- Why is a study of computer science needed
- How a computers utilised in a shipboard context
- Introduction to key terms and architecture

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Learning Outcomes

6.1. Understanding computer terminology . Introduction to Bit, Byte, RAM ROM

At the completion of the session, students will be able to

- 1. Explain the key concepts, principles and techniques associated with computing and information technology systems
- 2. Recognise major trends in computer and processor development and use in a shipboard setting.
- 3. Explain or define key terms used in computer science

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What is a computer



- The term "computer" is derived from a Latin term "compute," which means 'to calculate.'
- Initially, the computer system had been designed to calculate; it was intended to be a computing device.
- However, over a period of time, this device technically advanced; at present, it can perform a wide range of desirable works apart from simply calculation.
- The main function is in some form of data processing.

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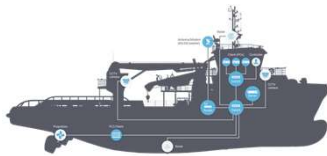


Shipboard applications



Wide and varied use

- Navigation and position fixing
- Engine control and monitoring
- Communications (internal and external)
- Crew entertainment
- Security
- Safety requirements
- Stability calculations
- General administration



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Key Functions of a computer



Following are the core functions of a computer system –

- A computer accepts the **command** and/or data as an **input** given by the user.
- A computer follows the **instructions** and **stores** the **data** given by the user.
- A computer processes the **data** as per the **instructions** given by the user.
- A computer gives the desirable results in the form of **output**.

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Requirement for a computer system



- Input of data
- Manipulation/processing of data
- Giving output (i.e. management of an output result)
- In computer system, data needs to be arranged in an orderly and systematic form.

Main features of a computer system (1)



The Following are the salient features of a Computer System –

- **Automation** – The operating system of a computer system is automatic, as no human intervention is required; simply when given a command and it will do the work automatically
- **Speed** – Depending upon the power of the computer, it can perform, it can take Millions of instructions per second.
- **Storage** – A computer system can store enormous quantity of data in different format.
- **Accuracy** – The accuracy of a computer system is very high.

Main features of a computer system (2)



- **Versatility** – A computer system is capable of performing a wide range of tasks.
- **Diligence** – A computer neither get tired nor lose concentration.
- **Reliability** – As a computer system always gives an accurate result; therefore, its reliability is very high.
- **Vast memory** – A computer system can have a wide range of memory which can **recall** the desired data at any point of time.



Key components of a computer system

Basic components of a computer system.

- **Hardware** - The physical components collectively form the hardware of a computer system
- Software -
- Humanware
- Firmware
- Bridgeware
- Firmware

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Hardware

■ Hardware comprises of the equipment that helps in the working system of the computer.

■ Following are some of the different types of hardware components (which have specific functions and are commonly found on board ship)

- **Monitor** – It displays (visual) the result.
- **CPU** – It is the Central Processing Unit that controls the computer's functions and transmits data.
- **Motherboard** – It is mainly accountable to establish communication between components and transmission of information.
- **RAM** – It is the Random Access Memory and responsible for the storage of programs that are currently running and also stores data temporarily.
- **Hard Disk Drive (HDD) or Solid State Drive (SSD)** – It is a permanent memory storage device.
- **Floppy Disk Drive** – Although rarely used, is still found on systems such as older data loggers, Sat-C installations etc.
- **Optical disks** – It is a device that also store data. For example, CD, DVD, etc.
- **USB Storage** – A form of solid state device

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How would these be classified?

■ What other examples can you think of?

■ The hardware components can only function when software components are added to the computer system. Software is a program that performs different commands given by a user.

Input Device	Marine Example	Output device	Marine Example
Keyboard	ECE/Bridge PCU	Monitor	Navigation
Mouse/Trackball	Radar	LED/LCD Display	Various Bridge and Engine systems
Touch Screen	OSC Controller	Speaker	VHF/UHF Transceivers
Microphone	VEP	Headset/Handset	
Printer	Data logger	Sensor Output	Engine control
JoyStick	ECCDS /Radar	Alarm actuator	Engine and Bridge systems e.g. Fire Alarm
Camera	Internal CCTV		

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Software

- Software is an intangible part of hardware and controls the sequence of operations.
- Types of Software
- Depending on the basic features and functionality, software can be categorized as –
 - Operating Systems (OS)
 - Application Software (AS)
 - E-accessibility Software



Operating System and Application software

- The Operating system is software that helps to load the basic program automatically as soon as the computer is started. There are numerous operating systems, some bespoke.
- Operating Software Examples
 - Microsoft Windows 11, 10, Vista, XP, NT etc.
 - Mac OS X Panther, Cheetah, Snow leopard, etc.
 - Linux Debian, Ubuntu, Fedora, Knoppix, etc.
- E-accessibility Software
 - The E-accessibility software components additional facilities to users such as –
 - Voice recognition software
 - Screen reader
 - Magnifying tool
 - On-screen keyboard
 - Simulation – developed from Video games
 - Learning software etc.



Application Software

- The software, which can be used on an installed operating system, is known as application software. (APPS) The following are the significant examples of application software –
 - Office programs Microsoft Office (Word, Excel, PowerPoint), OpenOffice, LibreOffice, etc.
 - Web browser Internet Edge/Explorer, Mozilla Firefox, Google Chrome, Opera, Safari, etc.
 - Antivirus Program e.g. Norton, McAfee, Quick Heal, Avira, Kaspersky, etc.
- Your examples ?





E-accessibility Software

- The E-accessibility software components additional facilities to users such as –
- Voice recognition software
 - Screen reader
 - Magnifying tool
 - On-screen keyboard
 - Video games
 - Learning software, etc.

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The computer hardware – Bits

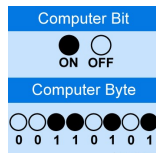
- Storage – The storage capacity of a computer system is normally expressed in terms of Kilobytes (KB), Megabytes (MB), Gigabytes (GB), or Terabytes (TB).
What does this mean?
- The **BIT** is the fundamental building block of computers and ALL digital devices.
- A bit is a binary digit, the smallest increment of data on a computer. A bit can hold **only one of two values**: 0 or 1, corresponding to the electrical values of off or on, respectively.
- This can also be True/False

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The computer hardware – Bits and Bytes

- Because bits are so small, they are rarely work with information one bit at a time.
- Bits are usually assembled into a **group of eight** to form a **byte**.
- A kilobyte (KB) is **1,024 bytes**,
 - not one thousand bytes as might be expected, because computers **use binary (base two)**, instead of a decimal (base ten) system.
- 1 MB is 1,024 kilobytes, or 1,048,576 (1024x1024) bytes, **not one million bytes**.



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Task



How can 1 GB be written as

- Megabytes
- Kilobytes,
- Bytes
- Bits

Clue, A terabyte (TB) is 1,024 GB;



Answer



- 1 GB is 1,024 MB, or
- 1048576 KB (1024 x 1024)
- 1,073,741,824 bytes (1024x1024x1024).
- 8589934592 bits
- Many hard drive manufacturers use a decimal number system to define amounts of storage space. As a result, 1 MB is defined as one million bytes, 1 GB is defined as one billion bytes, etc.
- Since a computer uses a binary system there is a discrepancy between a hard drive's published capacity and the capacity recognised by the computer.



Other number bases HEX and OCTAL



- The large numbers make it difficult for humans to use and describe.
- Conveniently we can express these numbers to different bases
- In day to day life we use denary, to the base of 10.
- This is not very convenient when expressing binary sequence.
- It is usual to CONVERT to
- Base 16 – Hexadecimal
- Base 8 - Octal





ASCII

- For meaningful OUTPUT, binary codes are used.
- One of the most common encoding formats is ASCII (American Standard Code for Information Interchange).
- Character for text data in computers and on the internet use this.
- In standard ASCII-encoded data, there are **unique values for 128 alphabetic, numeric or special additional characters and control codes.**

Dec	Hex	Name	Char	Ctrl Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0		Null			32	20	Space	64	40	@	96	60	0
1		Start of heading			33	21	!	65	41	A	97	61	a
2		Start of line			34	22	"	66	42	B	98	62	b
3		End of line			35	23	#	67	43	C	99	63	c
4		End of message			36	24	\$	68	44	D	100	64	d
5		Enquiry			37	25	%	69	45	E	101	65	e
6		Attention			38	26	&	70	46	F	102	66	f
7		Bell			39	27	'	71	47	G	103	67	g
8		Backspace			40	28	(	72	48	H	104	68	h
9		Horizontal tab			41	29	)	73	49	I	105	69	i
10		Line feed			42	2A	*	74	4A	J	106	6A	j
11		Vertical tab			43	2B	+	75	4B	K	107	6B	k
12		Form feed			44	2C	,	76	4C	L	108	6C	l
13		Carriage feed			45	2D	-	77	4D	M	109	6D	m
14		Shift out			46	2E	.	78	4E	N	110	6E	n
15		Shift in			47	2F	/	79	4F	O	111	6F	o
16		Data line escape			48	30	:	80	50	P	112	70	p
17		Device control 1			49	31	;	81	51	Q	113	71	q
18		Device control 2			50	32	<	82	52	R	114	72	r
19		Device control 3			51	33	=	83	53	S	115	73	s
20		Device control 4			52	34	>	84	54	T	116	74	t
21		Msg acknowledge			53	35	?	85	55	U	117	75	u
22		Synchrous data			54	36	@	86	56	V	118	76	v
23		End of message			55	37	A	87	57	W	119	77	w
24		End of transmit			56	38	B	88	58	X	120	78	x
25		Escape			57	39	C	89	59	Y	121	79	y
26		File separator			58	3A	[	90	5A	Z	122	7A	z
27		Group separator			59	3B	\	91	5B	[	123	7B	{
28		Record separator			60	3C	]	92	5C	]	124	7C	}
29		Unit separator			61	3D	^	93	5D	^	125	7D	~
30		Cancel			62	3E	_	94	5E	_	126	7E	
31		End of transmission			63	3F	`	95	5F	~	127	7F	

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ASCII

- A byte contains enough information to store a single ASCII character, Example "h".
- 104 base 10
- 68 base 16
- 150 base 8
- 01101000 base 2

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Summary

- Reviewed the main terms used in computer systems
- Considered the hardware, software and firmware
- Considered the electrical binary signal
- Reviewed number bases of 2,8,10 and 16
- Introduced ASCII
- Lesson 6.2 develops an understanding of number bases and the use of coding.

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Self assessment quiz



Note – develop an online interactive quiz or multiple choice selection.

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