SNS COLLEGE OF TECHNOLOGY

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An Autonomous Institution

COURSE NAME : 23CST101 PROBLEM SOLVING & C PROGRAMMING

I YEAR/ I SEMESTER

UNIT-II C PROGRAMMING BASICS

Topic: Introduction to 'C' Programming

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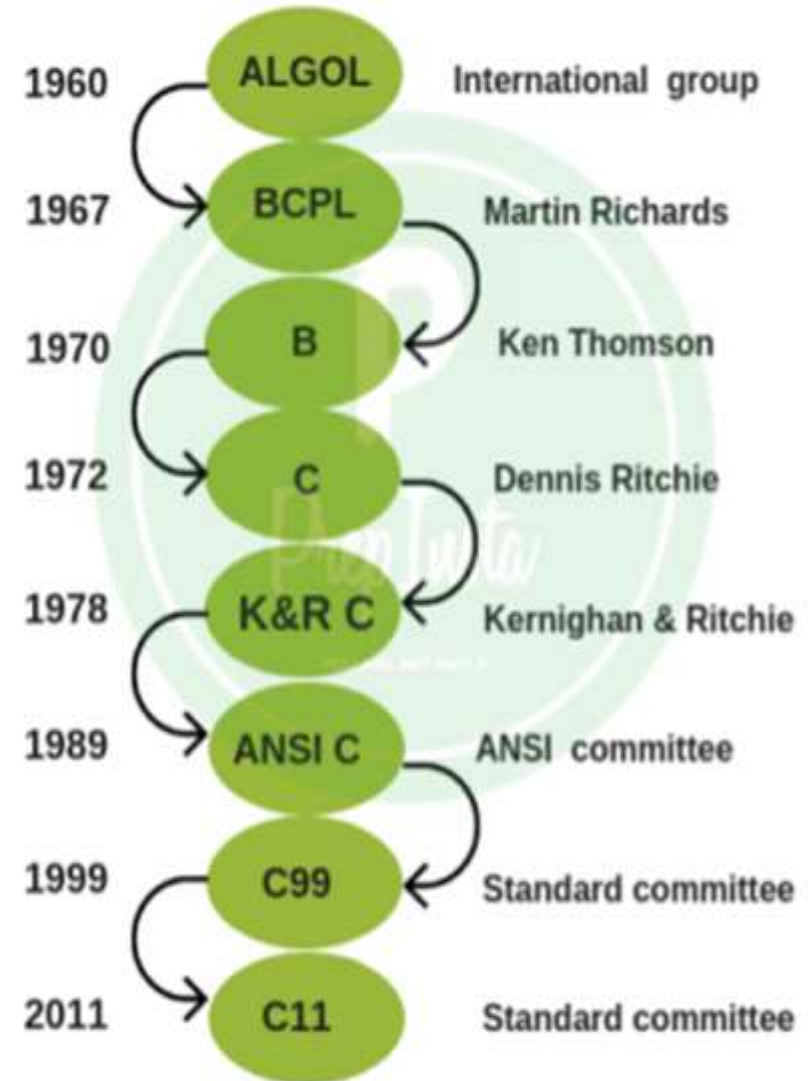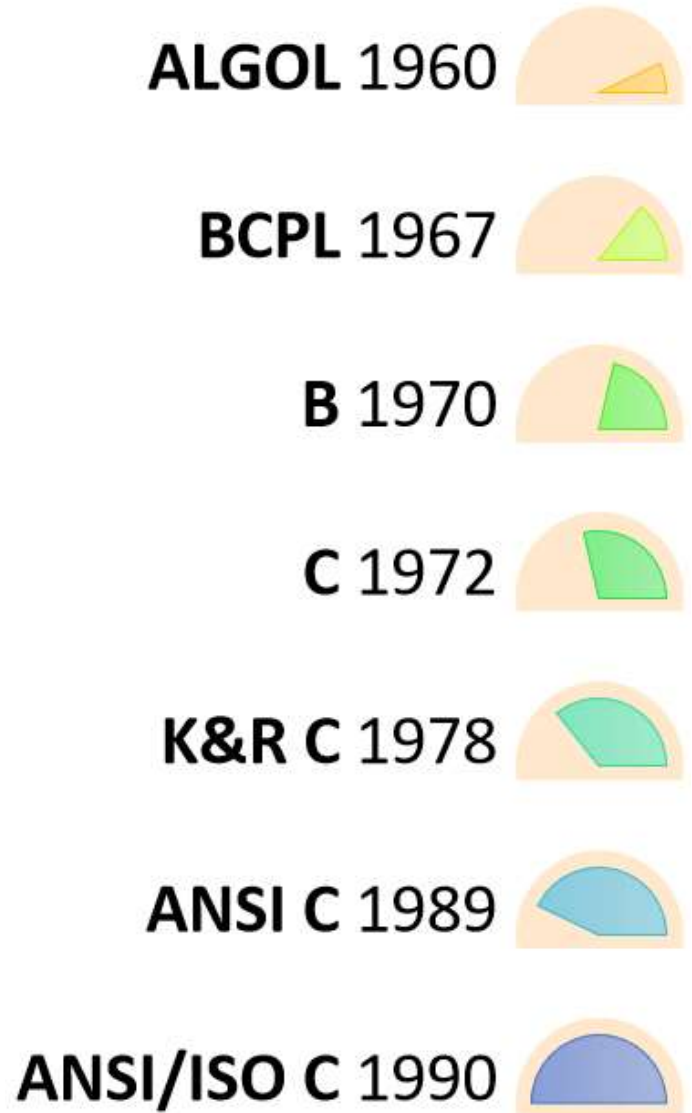Department of Computer Science and Engineering

What is C programming?

- General-purpose programming language - extremely popular, simple and flexible.

- Machine-independent, structured programming language - used extensively in various applications.

- 'C' is a god's programming language.

- C is a base for the programming.

- If you know 'C,' - can easily grasp the knowledge of the other programming languages that uses the concept of 'C'

History of C language

ALGOL 1960

BCPL 1967

B 1970

C 1972

K&R C 1978

ANSI C 1989

ANSI/ISO C 1990

Year	Language	Author
1960	ALGOL	International group
1967	BCPL	Martin Richards
1970	B	Ken Thomson
1972	C	Dennis Ritchie
1978	K&R C	Kernighan & Ritchie
1989	ANSI C	ANSI committee
1999	C99	Standard committee
2011	C11	Standard committee

History of C language

Dennis Ritchie
1941-2011

- In 1972, a great computer scientist Dennis Ritchie created a new programming language called 'C' at the Bell Laboratories.

- It was created from 'ALGOL', 'BCPL' and 'B' programming languages.

- 'C' programming language contains all the features of these languages and many more additional concepts that make it unique from other languages.

- 'C' is a powerful programming language which is strongly associated with the UNIX operating system.

- Today 'C' runs under a variety of operating systems and hardware platforms.

- To assure that 'C' language will remain standard, American National Standards Institute (ANSI) defined a commercial standard for 'C' language in 1989.

- Later, it was approved by the International Standards Organization (ISO) in 1990. 'C' programming language is also called as 'ANSI C'.

- Languages such as C++/Java are developed from 'C'.

- These languages are widely used in various technologies.

- Thus, 'C' forms a base for many other languages that are currently in use.

Key Applications

Where is C used?

- Widely used in embedded systems.

- Used for developing system applications.

- Widely used for developing desktop applications.

- Most of the applications by Adobe.

- Used for developing browsers and their extensions.

- Google's Chromium.

- Used to develop databases – MySQL

- Used in developing an operating system - Apple's OS X, Microsoft's Windows, and Symbian

- Used for compiler production.

- Widely used in IOT applications.

Real-World Applications

Real-World Applications

1. Operating Systems
  - The first operating system to be developed using a high-level programming language was UNIX. Later on, Microsoft Windows and various Android applications were scripted in C.

2. Embedded Systems
  - The C programming language is considered an optimum choice when it comes to scripting applications and drivers of embedded systems, as it is closely related to machine hardware.

3. GUI
  - GUI stands for Graphical User Interface. Adobe Photoshop, Adobe Premiere and Illustrator were created using C.

4. New Programming Platforms
  - C++, the concept of object-oriented programming, various other programming languages like MATLAB and Mathematica.
  - It facilitates the faster computation of programs.

5. Google
  - Google file system and Google chromium browser were developed using C/C++.
  - The Google Open Source community has a large number of projects being handled using C/C++.

6. Mozilla Firefox and Thunderbird
  - Mozilla Firefox and Thunderbird were open-source email client projects, they were written in C/C++.

Real-World Applications

7. MySQL

- MySQL, again being an open-source project, used in Database Management Systems was written in C/C++.

8. Compiler Design

- One of the most popular uses of the C language was the creation of compilers.
- The association of C with low-level languages, making it easier to be comprehensible by the machine.
- Several popular compilers were Bloodshed Dev-C, Clang C, MINGW, and Apple C.

9. Gaming and Animation

- Since the C programming language is relatively faster than Java or Python, as it is compiler-based, it finds several applications in the gaming sector.
- Some of the most simple games are coded in C such as Tic-Tac-Toe, The Dino game, The Snake game and many more.
- Increasing advanced versions of graphics and functions, Doom3 a first-person horror shooter game was designed by id Software for Microsoft Windows using C in 2004.
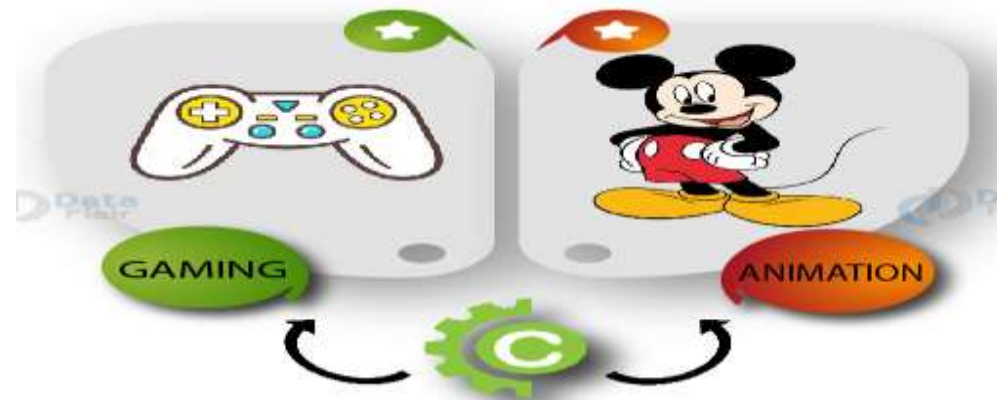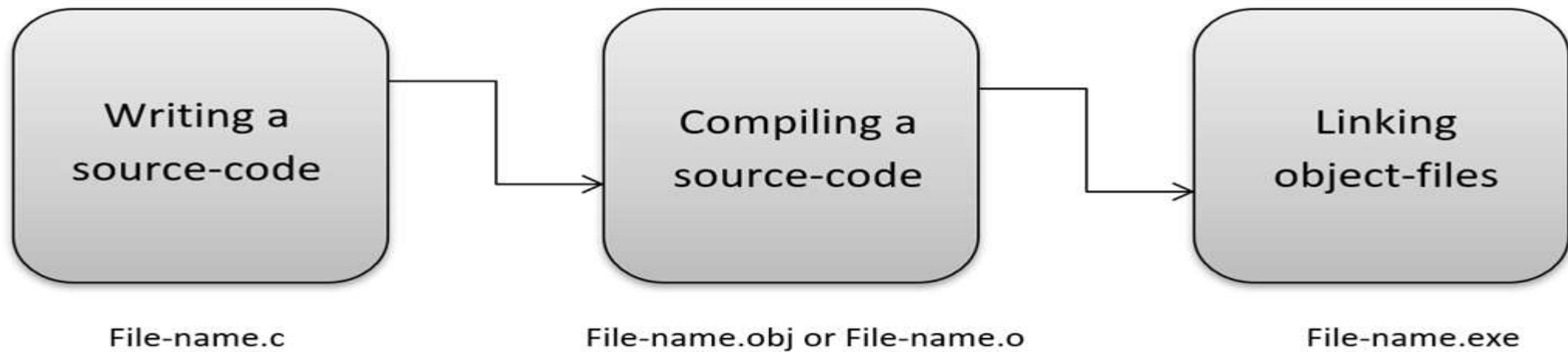
Why learn 'C'?

- Base language for many programming languages.

- It shares the same concepts such as data types, operators, control statements and many more.

- Used widely in various applications.

- Simple language and provides faster execution.

- Structured programming language in which program is divided into various modules - easy for testing, maintaining and debugging processes.

- 32 keywords, various data types and a set of powerful built-in functions - make programming very efficient.

- Can extend itself.

- Contains various functions which are part of a library - can add our features and functions to the library.

- Can access and use functions anytime we want in our program - makes it simple while working with complex programming.

- Highly portable language which means programs written in 'C' language can run on other machines.

How 'C' Works?

- C is a compiled language.

- A compiler is a special tool that compiles the program and converts it into the object file which is machine readable.

- After the compilation process, the linker will combine different object files and creates a single executable file to run the program.

- The following diagram shows the execution of a 'C' program

Writing a source-code   →   Compiling a source-code   →   Linking object-files

File-name.c   File-name.obj or File-name.o   File-name.exe

How 'C' Works?

- Nowadays, various compilers are available online, and you can use any of those compilers.

- The functionality will never differ and most of the compilers will provide the features required to execute both 'C' and 'C++' programs.

- Following is the list of popular compilers available online:
    - Clang compiler
    - MinGW compiler (Minimalist GNU for Windows)
    - Portable 'C' compiler
    - Turbo C

Summary

- 'C' was developed by Dennis Ritchie in 1972.

- It is a robust language.

- It is a low programming level language close to machine language.

- It is widely used in the software development field.

- It is a procedure and structure oriented language.

- It has the full support of various operating systems and hardware platforms.

- Many compilers are available for executing programs written in 'C'.

- A compiler compiles the source file and generates an object file.

- A linker links all the object files together and creates one executable file.

- It is highly portable.

Fundamental rules

- C is a case sensitive language so all C instructions must be written in lower case letter. (printf vs. PRINTF)

- All C statement must end with a semicolon. (;)

- Whitespace is used in C to describe blanks and tabs and improve the readability

- Whitespace is required between keywords and identifiers.

- All C statements can be written in one line or it can split into multiple lines

- Braces must always match upon pairs i.e., every opening brace must have a matching closing brace ({…})

- Every C program must contain a Main() function

- Comments cant be nested.

- The variables must be declared in the declaration section before they are used

Fundamental rules

- The rule specify how the character sequence will be grouped together, to form **tokens**.

- A smallest individual unit in C program is known as **C Token**.

- Tokens are either keywords, identifiers, constants, variables or any symbol which has some meaning in C language.

- A C program can also be called as a collection of various tokens.

- In the following program,

- if we take any one statement:

```c
#include
int main()
{
    printf("Hello,World");
    return 0;
}
```

```c
printf("Hello,World");
```