

Applications of Object Oriented Concepts by using C++

(Concept and Tools)

Under the guidance of Dr. Prof. Martin Thost



By:
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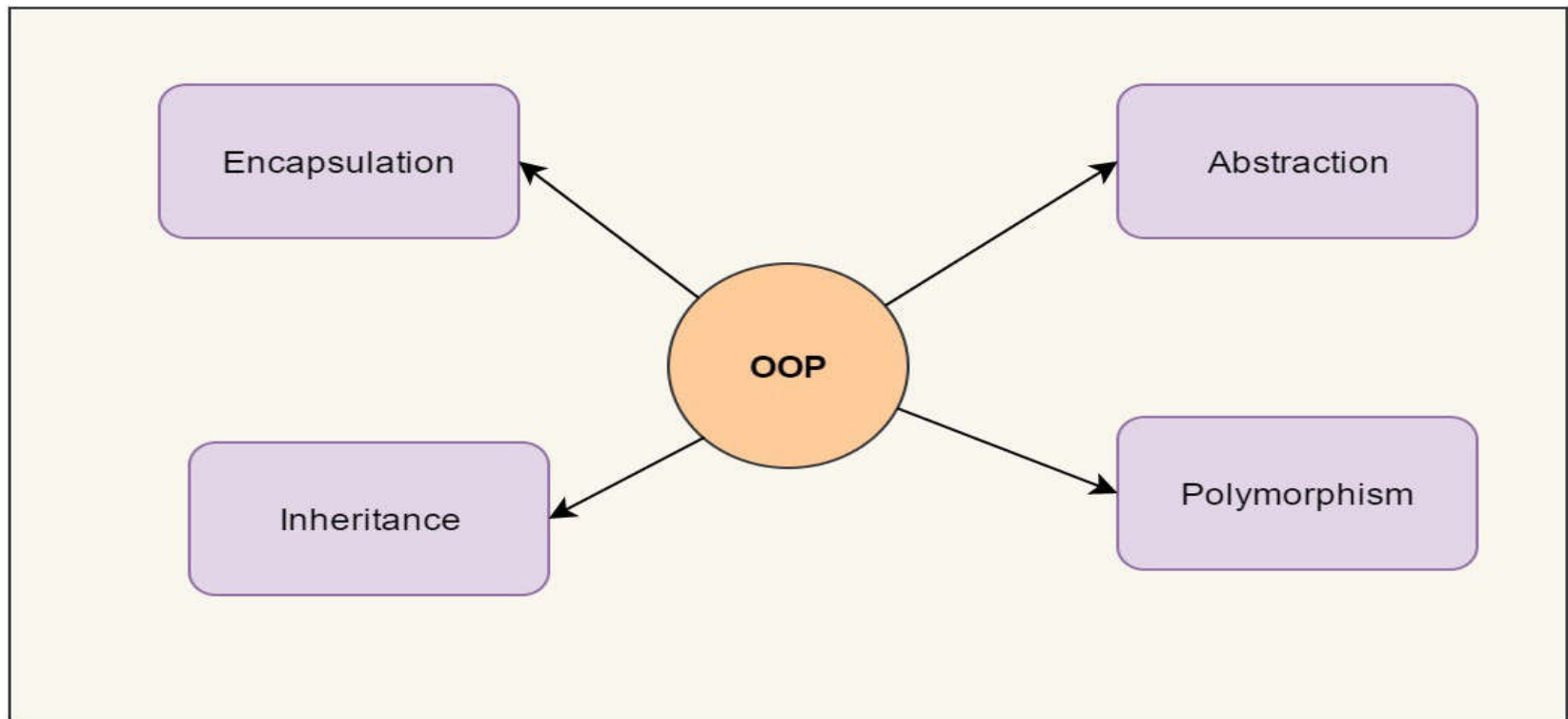
Introduction



Agenda

- ◆ Four pillars of OOP
- ◆ Characteristics of OOP
- ◆ About inventor of C++
- ◆ The root of C++
- ◆ Evolution of C++
- ◆ Features adopted from Procedural Programming in C++
- ◆ Advanced Features of C++
- ◆ IDE used for modern C++
- ◆ A popular IDE installation and execution process of C++ Program
- ◆ Why do Software Developers use C++
- ◆ A small project for Desktop Application by Using C++
- ◆ Summary
- ◆ Questionnaire

Four pillars of OOP



Four Pillars of Object Oriented Programming

Characteristics of OOP

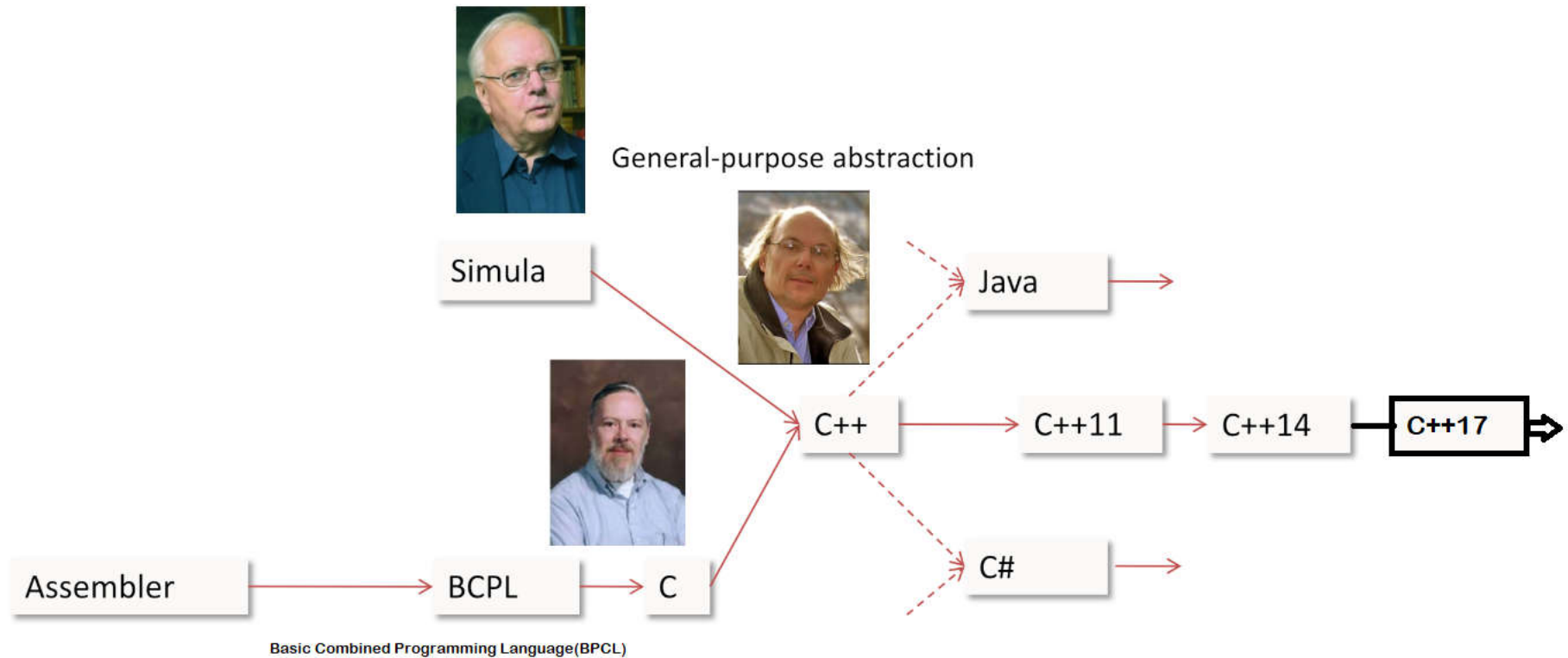
- Emphasis on data rather than procedure
- Division of programs into objects
- Data structures characterize the objects
- Separate on the data of an object by using functions
- Data hiding and cannot be accessed by external functions
- Communication of objects through functions
- Easy way to add new data and functions
- Bottom-up approach

About inventor of C++



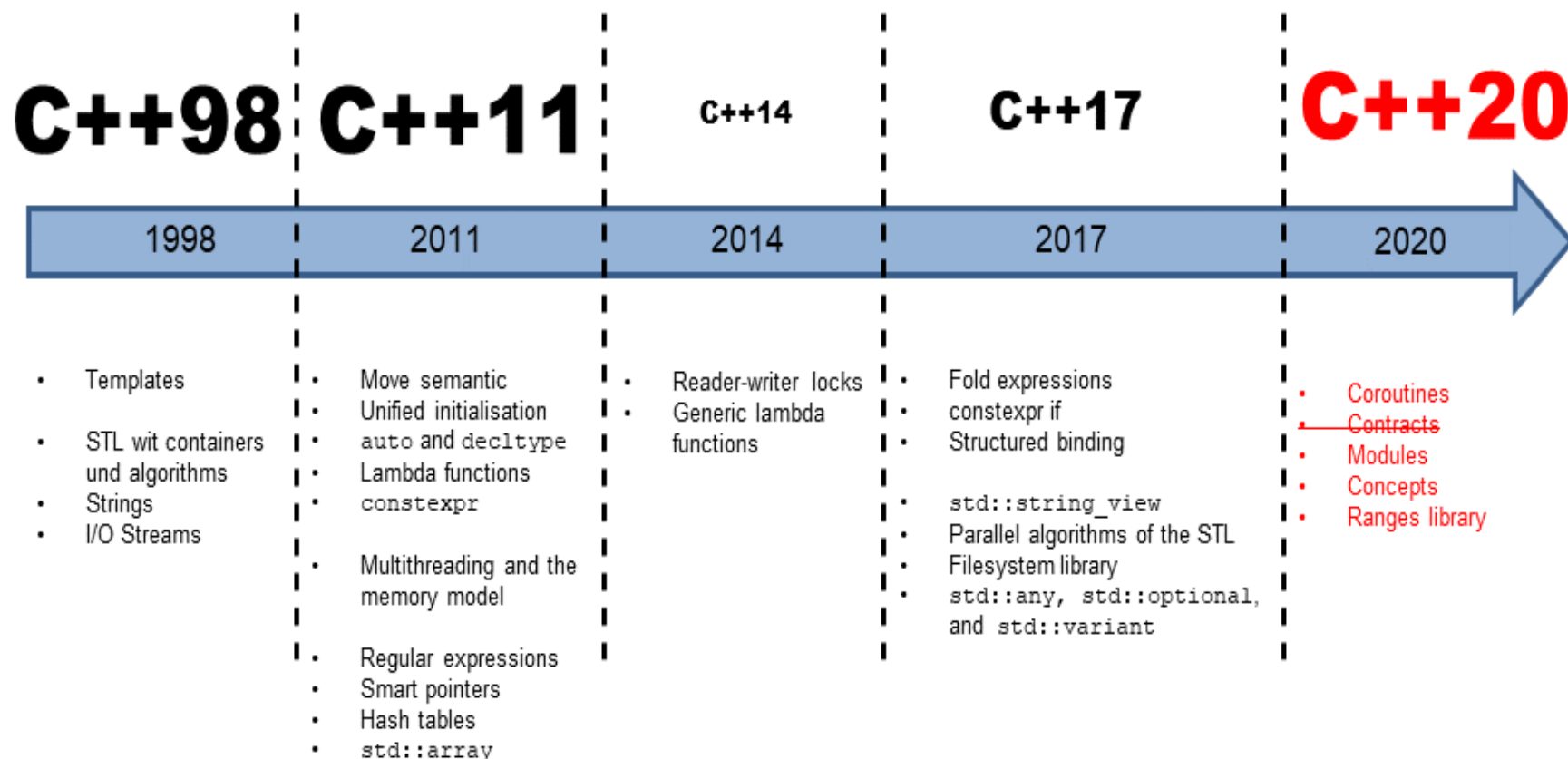
- Developed by **Bjarne Stroustrup**
- Extension of the C language
- The designer and original implementer of C++
- Member of the US National Academy of Engineering, and an IEEE, ACM, and CHM fellow.

The root of C++



Evolution of C++

- In 1985, a commercial product.
- In 1998, the published the first international standard for C++ ISO/IEC 14882:1998



Features adopted from Procedural Programming in C++

- Token
- Variables
- Type casting
- Decision making statements
- Loop
- Array
- String handling
- Structure & Union
- Pointer
- File handling

Advanced Features of C++

- Vector
- Virtual functions
- Compiler generated default constructor
- Lambda functions
- Constexpr
- Regular expression
- Random number generator
- Tuple
- Threading
- Container
- Template functions
- Assert

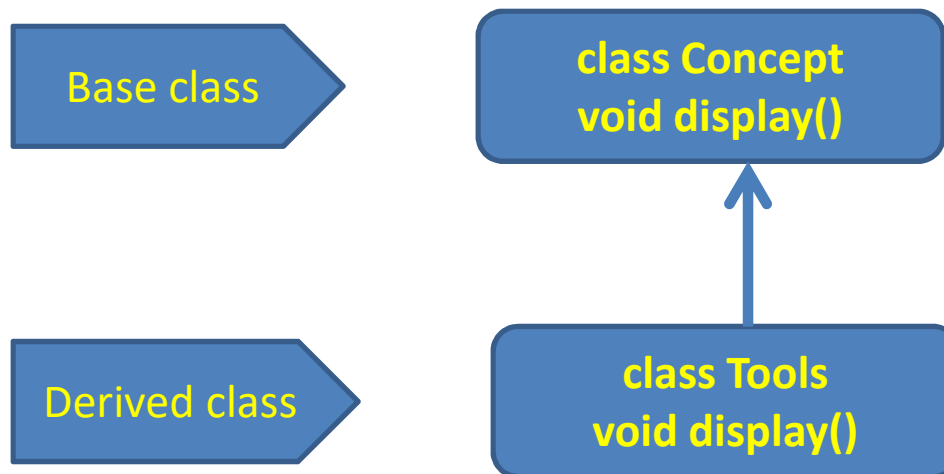
Vector

- Handle dynamic data elements
- Working as sequence containers for stored elements

```
#include <iostream>
#include <string>
#include <vector>
int main()
{
    std::vector < std::string > conceptTools;
    conceptTools.push_back("first");
    conceptTools.push_back("sec");
    conceptTools.push_back("third");
    conceptTools.pop_back();
}
```

Virtual functions

- Redefined in derived classes
- Referenced through a base class pointer
- Base class pointer invoke derived class
- Redefined functions during runtime



An Example of Virtual Functions

```
class Concept
{
public:
    virtual void display()
    {
        cout<<"Concepts";
    }
};

class Tools: public Concept
{
public:
    void display()
    {
        cout<<"Tools";
    }
};

void main()
{
    Concept C;
    Tools *T=&C;
    T->display();
}
```

Lambda Functions

```
#include<iostream.h>
#include<string.h>

using namespace std;

int main()
{
    auto add=[](auto x,auto y)(return
    x+y);
    std::string str1="Concept",
    str2="Tools;
    cout<<add(2,3); //5
    cout<<add(str1,str2);
    //ConceptTools
    return 0;
}
```

“constexpr” Expression

- Evaluate the value of a function or variable at compile time

```
#include<iostream.h>
using namespace std;

constexpr int add(int a,int b)
{
    return a+b;
}

int main()
{
    int a,b;
    cin>>a>>b;
    cout<<add(a,b)<<endl;
    cout<<add(2,3);
    return 0;
}
```

Regular expression

- Specific pattern
- Concise and flexible string to text

```
#include<iostream.h>
#include<regex.h>
using namespace std;

int main()
{
    string str;
    cin>>str;
    regex e("Concept&Tools");
    bool match=regex_match(str,e);
    //regex_constant::icase
    if(match==true)
        cout<<"Matched";
    else
        cout<<"Not matched";
    return 0;
}
```


Random Number Generator

- Generate a sequence without any pattern

```
#include<iostream.h>
#include<ctime.h>
#include<random.h>
int main()
{
    std::mt19937 generator;
    generator.seed(std::time(0));
    std::uniform_int_distribution<uint32_t>dice(1,10);
    int random=dice(generator);
    cout<<random;

    random=dice(generator);
    cout<<random;
    return 0;
}
```

Tuple

- Hold a number of elements
- Different data types for elements
- The elements initialized as arguments

An example of “tuple”

```
#include<iostream>
#include<tuple>
using namespace std;
int main()
{
    typedef tuple<int, char, float> tp;
    tp t1(1,'A',1.2);
    tp t2{2,'B',2.2};
    cout<<get<0>(t1)<<endl;
    cout<<get<1>(t1)<<endl;
    cout<<get<2>(t1)<<endl;
    cout<<tuple_size<tp>::value<<endl;

    auto[first, second,third]=t2;
    cout<<first<<endl;
    cout<<second<<endl;
    cout<<third<<endl;
    return 0;
}
```

Threading

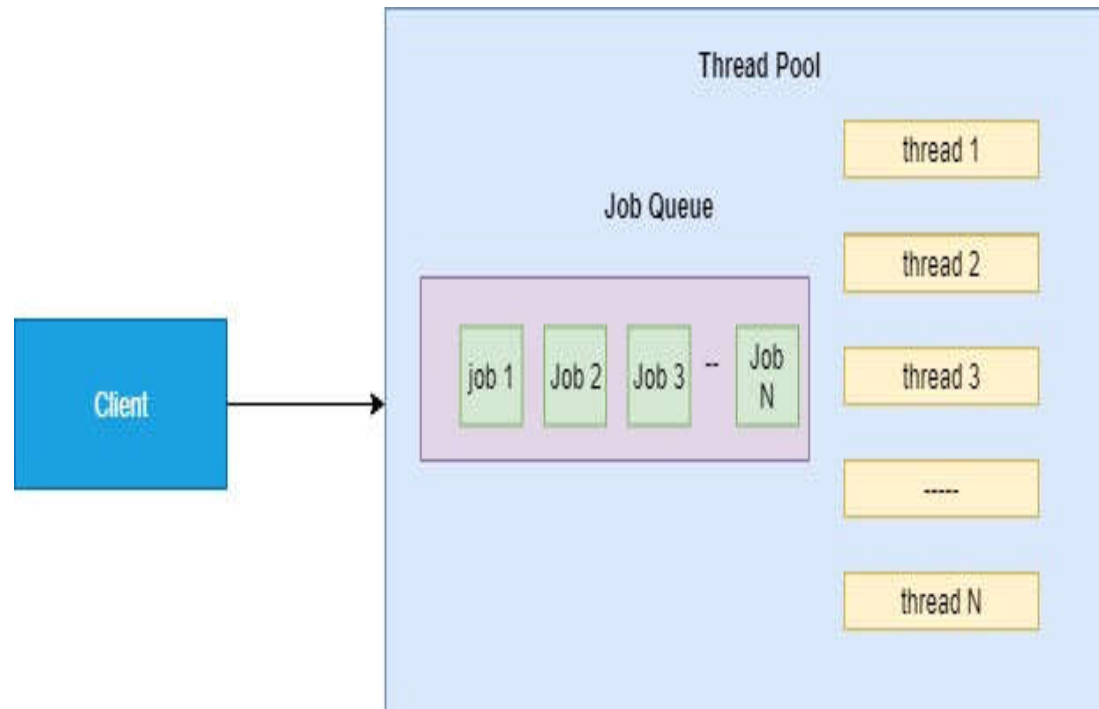
- Light weight process and idea
- Achieved parallelism by dividing a process into multiple threads

```
#include<iostream.h>
#include<thread.h>

using namespace std;

void threadFn(int value)
{
    cout<<"Concepts and Tools";
}

int main()
{
    thread t1(threadFn);
    t1.join();
    return 0;
}
```



Container

- Collection of classes
- Implemented as generic class templates
- Used to hold different kind of objects

Common Containers :-

- Vector
- Queue
- Stack
- Priority_queue
- List
- Set
- Map

An Example of Container “list”

```
#include<iostream>
#include<list>
int main()
{
    list<int> list1={1,5,3};
    list<int> list2={7,8,2,3};
    list1.push_back(10);
    list1.sort();
    list1.merge(list2);
    return 0;
}
```

Template

- Operate with generic type
- Template functions
- Template class

Example of a template function

```
#include<iostream.h>
template<class T>
void show(T a, T b)
{
    cout<<"First value  :"<<a;
    cout<<"Second value:"<<b;
}
int main()
{
    int a=5, b=10;
    show(a,b);
    //-----
    char *st1="Concept";
    char *st2="Tools";
    show(st1,st2);
    return 0;
}
```

“Assert” Functions

- Tests a program assertion at run time
- Specify expression is false or true


```
#include<iostream>
using namespace std;
void square(int *p)
{
    (*p)=(*p)*(*p);
}
int main()
{
    int a=5;
    int *p=NULL;
    square(p);
    cout<<a;
}
```

Without “assert” function

```
#include<iostream>
#include<cassert>
using namespace std;
void square(int *p)
{
    assert(p!=NULL);
    (*p)=(*p)*(*p);
}
int main()
{
    int a=5;
    int *p=NULL;
    square(p);
    cout<<a;
}
```

With “assert” function

IDE used for modern C++

➤ Visual Studio Code → 

➤ Eclipse → 

➤ NetBeans → 


➤ Sublime Text → 

➤ Code::Blocks → 

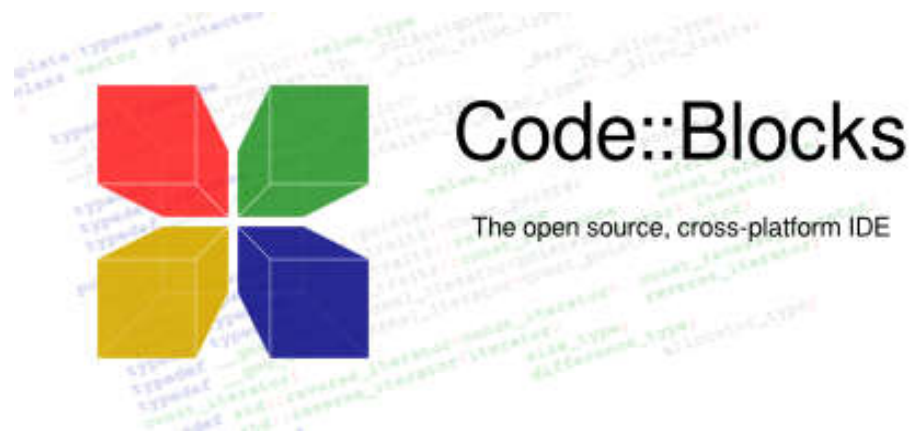
➤ CodeLite → 

➤ CodeWarrior → 

➤ Dev-C++ → 

➤ Turbo C++ compiler → 

A popular IDE installation and execution process of C++ Program

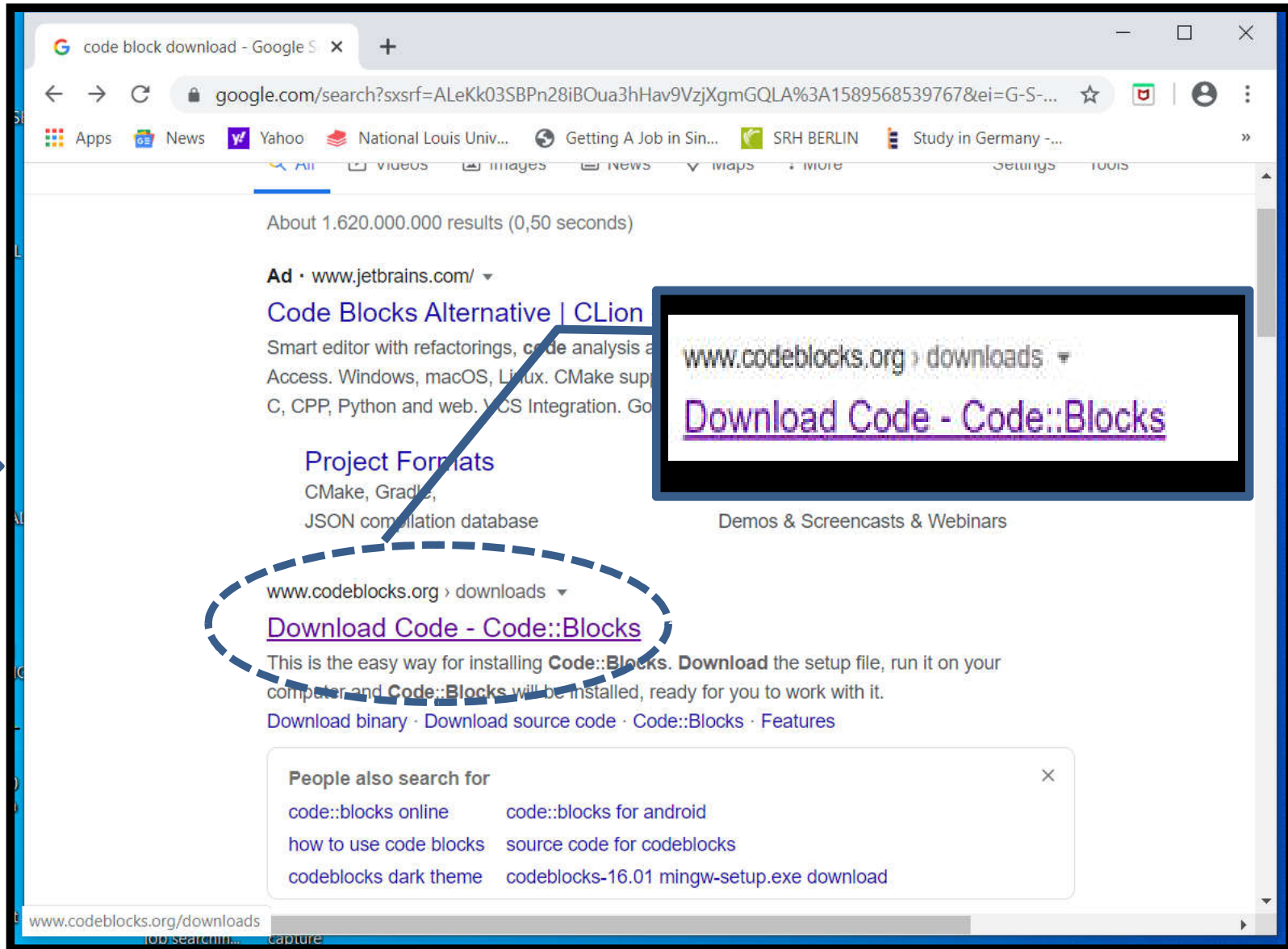


Prerequisite

- Windows 2000/XP/Vista/7)
- Browser
- Internet connection
- 64 bit system

Searching in Google browser

Step-1



Downloading the release of versions

Step-2



Downloads

Not secure | codeblocks.org/downloads

Apps News Yahoo National Louis Univ... Getting A Job in Sin... SRH BERLIN Study in Germany -...

Code::Blocks

Code::Blocks - The IDE with all the features you need, having a consistent look, feel and operation across platforms.

Home Features Downloads Forums V

Downloads

There are different ways to download and install Code::Blocks on your computer:

- **Download the binary release**

This is the easy way for installing Code::Blocks. Download the setup file, run it on your computer and Code::Blocks will be installed, ready for you to work with it. Can't get any easier than that!

- **Download a nightly build:** There are also more recent so-called *nightly builds* available in the **forums**. Please note that we consider nightly builds to be *stable*, usually, unless stated otherwise.
- Other distributions usually follow provided by the **community** (big "Thank you!" for that!). If you want to provide some, make sure to announce in the forums such that we can put it on the official C::B homepage.

Download the source code

If you feel comfortable building applications from source, then this is the recommend way to download Code::Blocks. Downloading the source code and building it yourself puts you in great control and also makes it easier for you to update to newer versions or, even better, create patches for bugs you may find and contributing them back to the community so everyone benefits.

Retrieve source code from SVN

This option is the most flexible of all but requires a little bit more work to setup. It gives you

Main

- Home
- Features
- Screenshots
- Downloads
 - Binaries
 - Source
 - SVN
- Plugins
- User manual
- Licensing
- Donations

Quick links

- FAQ
- Wiki
- Forums
- Forums (mobile)
- Nightlies
- Ticket System
- Browse SVN
- Browse SVN log

Select the operating system

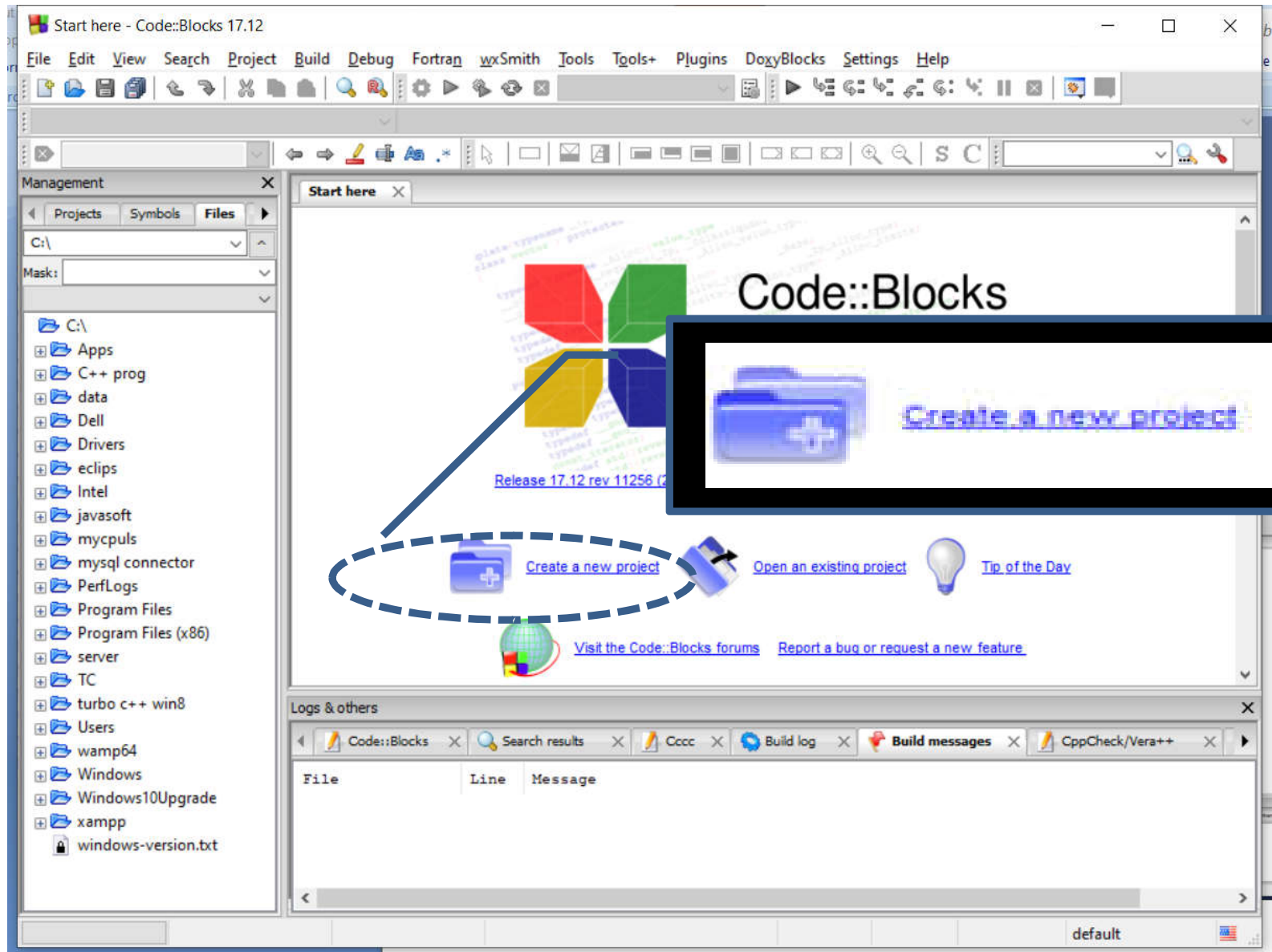
Step-3

The screenshot shows a web browser window at `codeblocks.org/downloads/26`. A blue arrow points from the 'Step-3' label to the download list. A dashed blue circle highlights the file `codeblocks-20.03mingw-setup.exe`. A black box with a blue border contains the text `codeblocks-20.03mingw-setup.exe`. The left sidebar contains logos for GPL v3, wxWidgets, W3C CSS, Get Firefox, and SourceForge. The main content area lists several download options with their dates and sources.

File Name	Date	Source
codeblocks-20.03-setup.exe	29 Mar 2020	FossHUB or Sourceforge.net
codeblocks-20.03-setup-nonadmin.exe	29 Mar 2020	FossHUB or Sourceforge.net
codeblocks-20.03-nosetup.zip	29 Mar 2020	FossHUB or Sourceforge.net
codeblocks-20.03mingw-setup.exe	29 Mar 2020	FossHUB or Sourceforge.net
codeblocks-20.03mingw-nosetup.zip	29 Mar 2020	FossHUB or Sourceforge.net
codeblocks-20.03-32bit-setup.exe	02 Apr 2020	FossHUB or Sourceforge.net
codeblocks-20.03-32bit-setup-nonadmin.exe	02 Apr 2020	FossHUB or Sourceforge.net

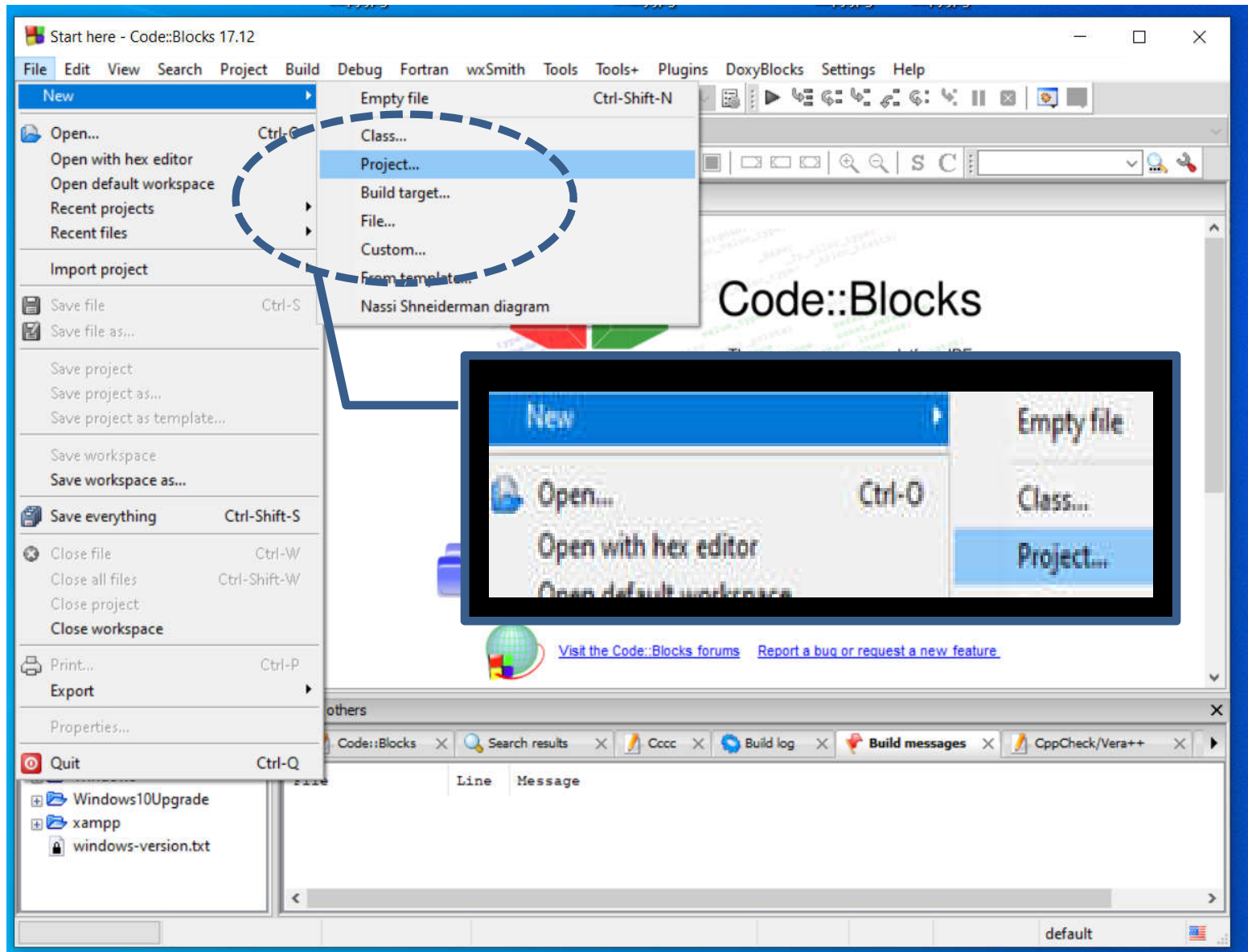
Create your first Project

Step-4



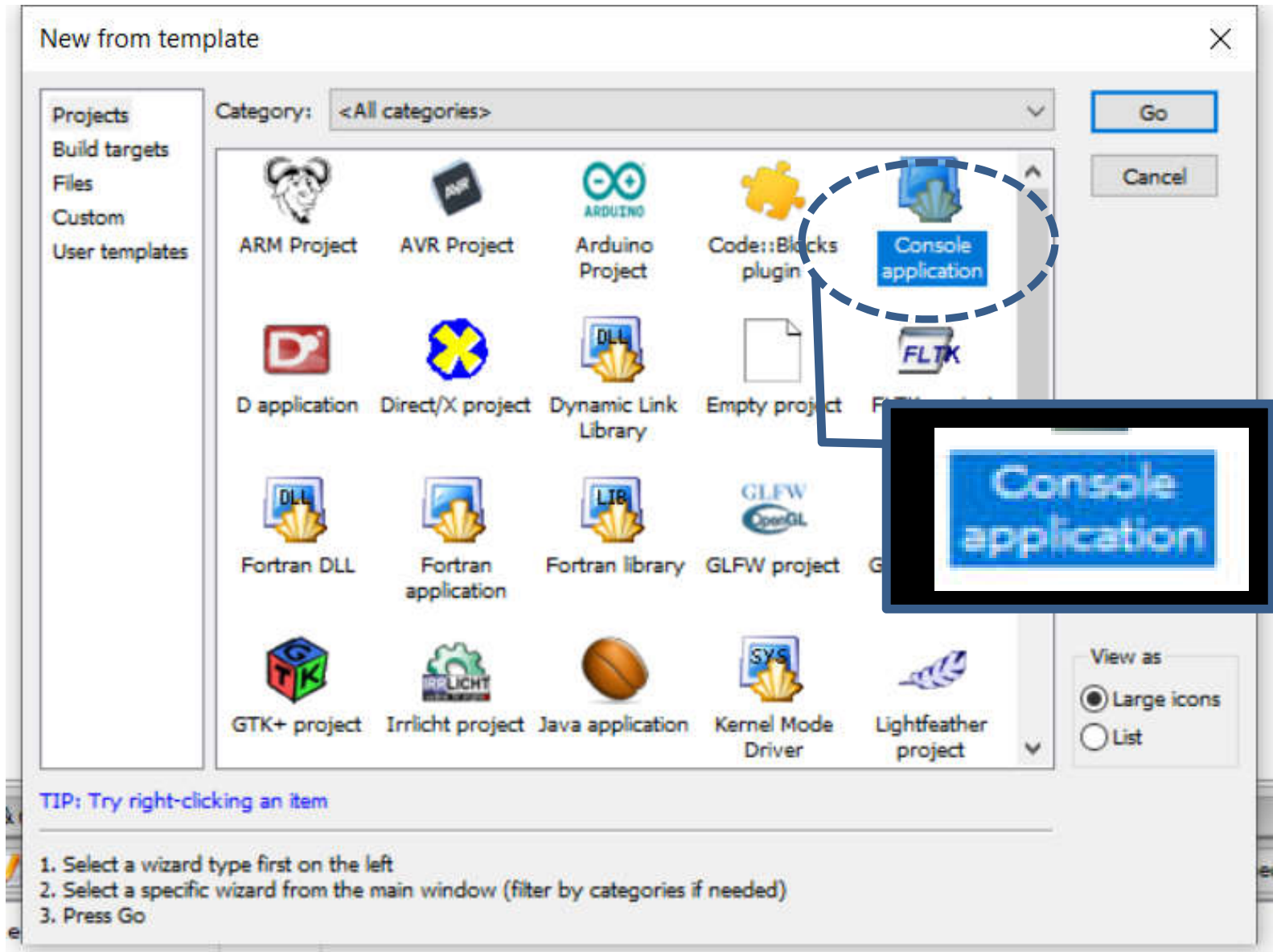
Select the menu options

Step-5



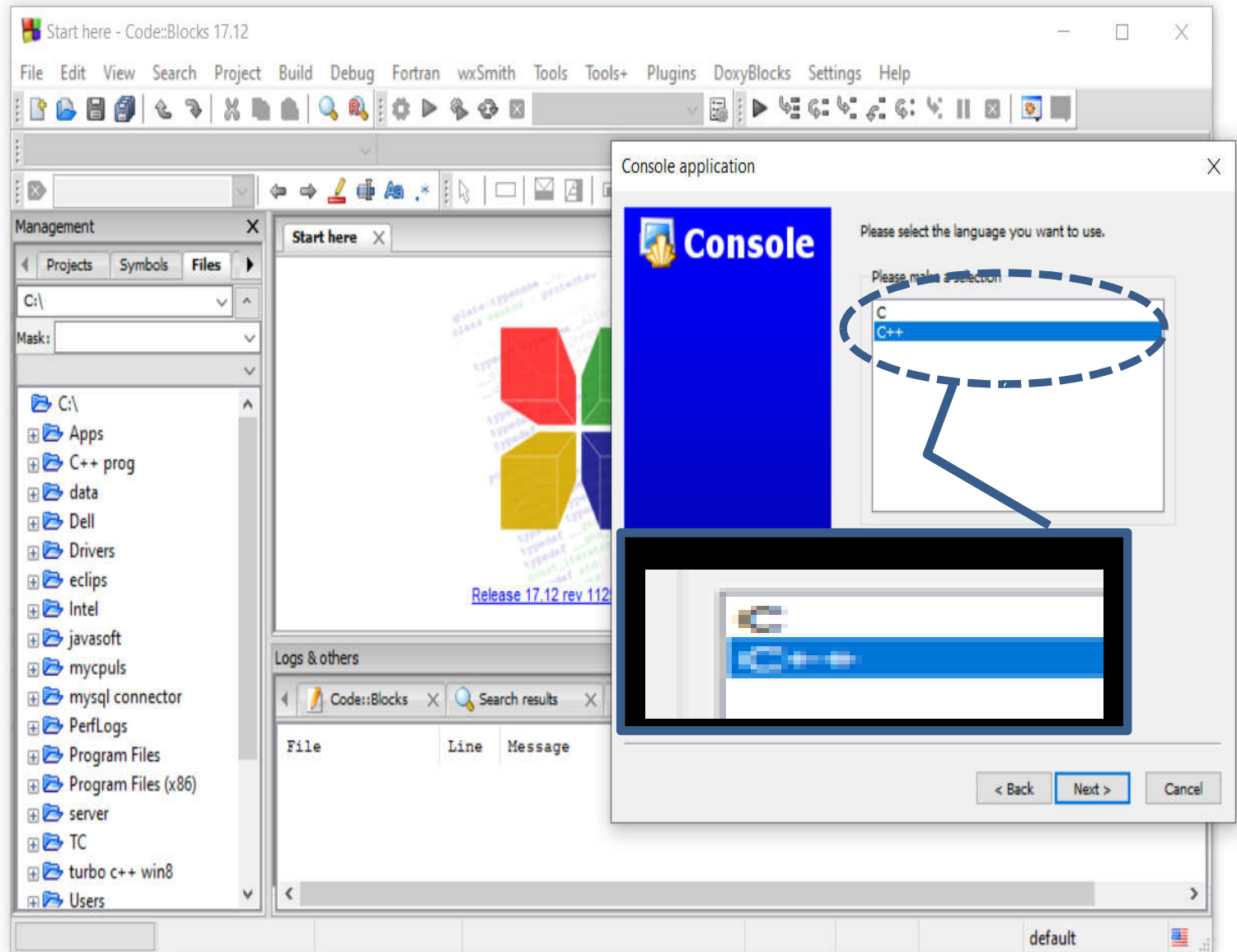
Select the type of applications

Step-6



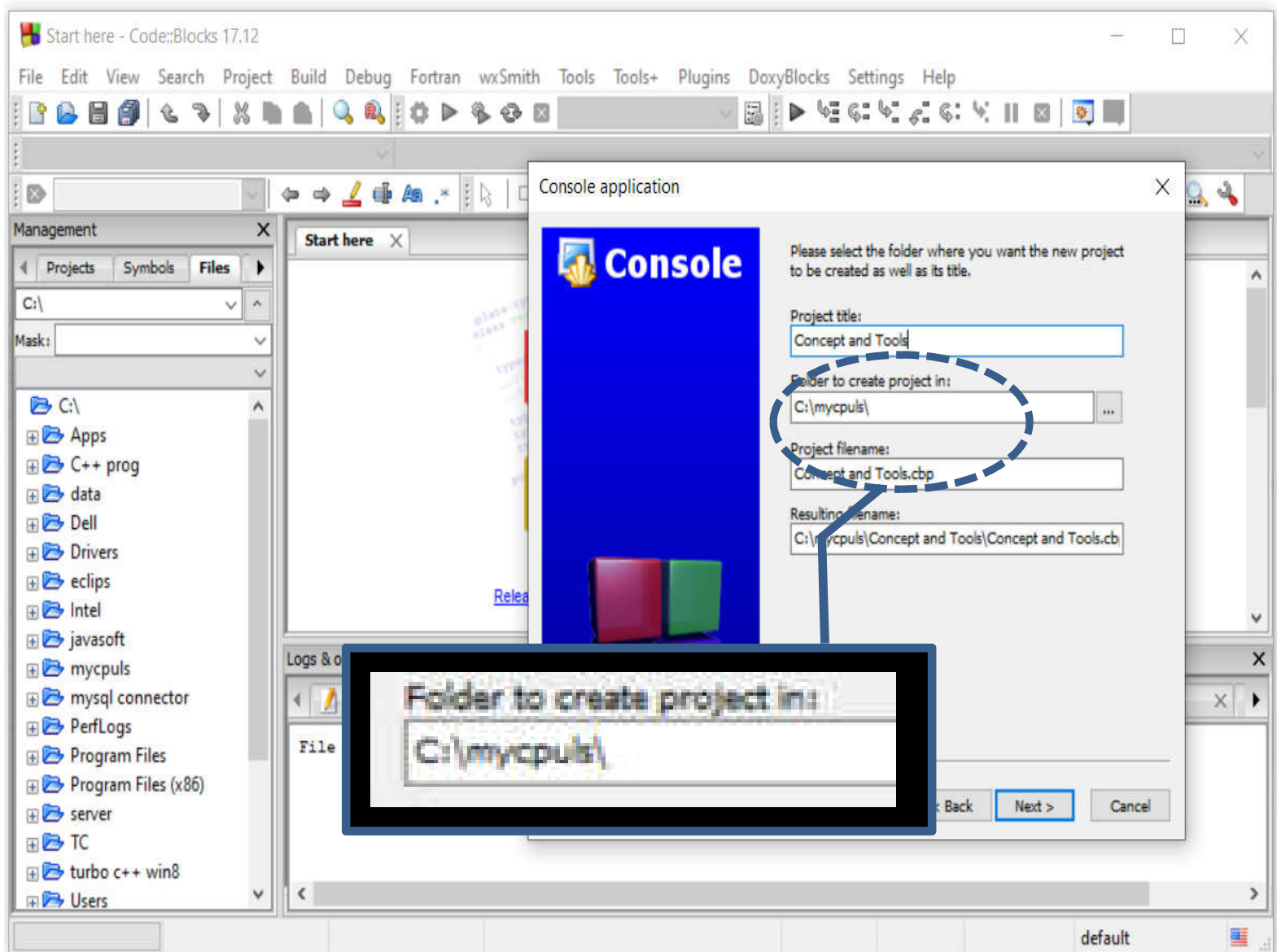
Select the language

Step-7

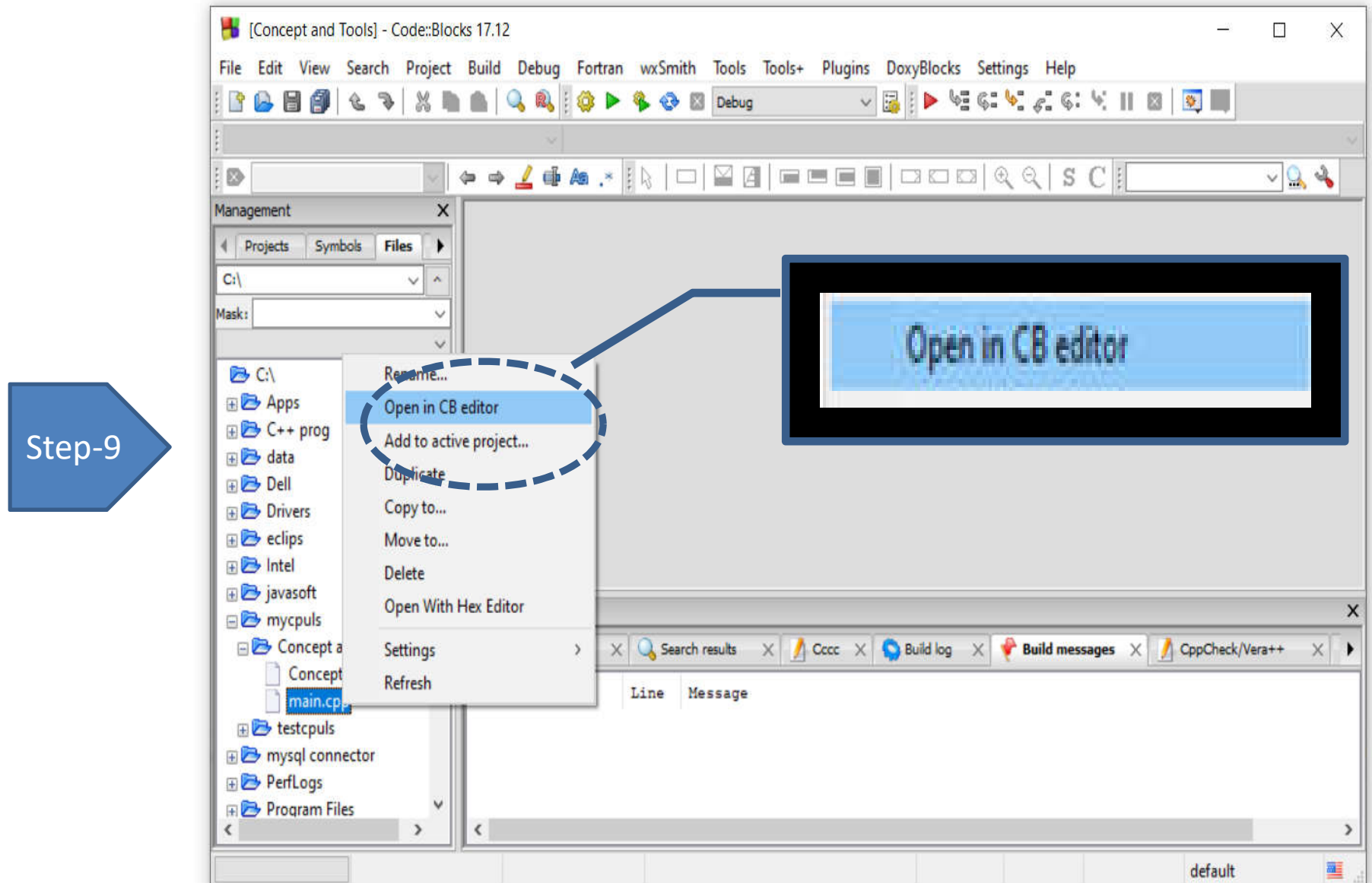


Specify the name of Project

Step-8

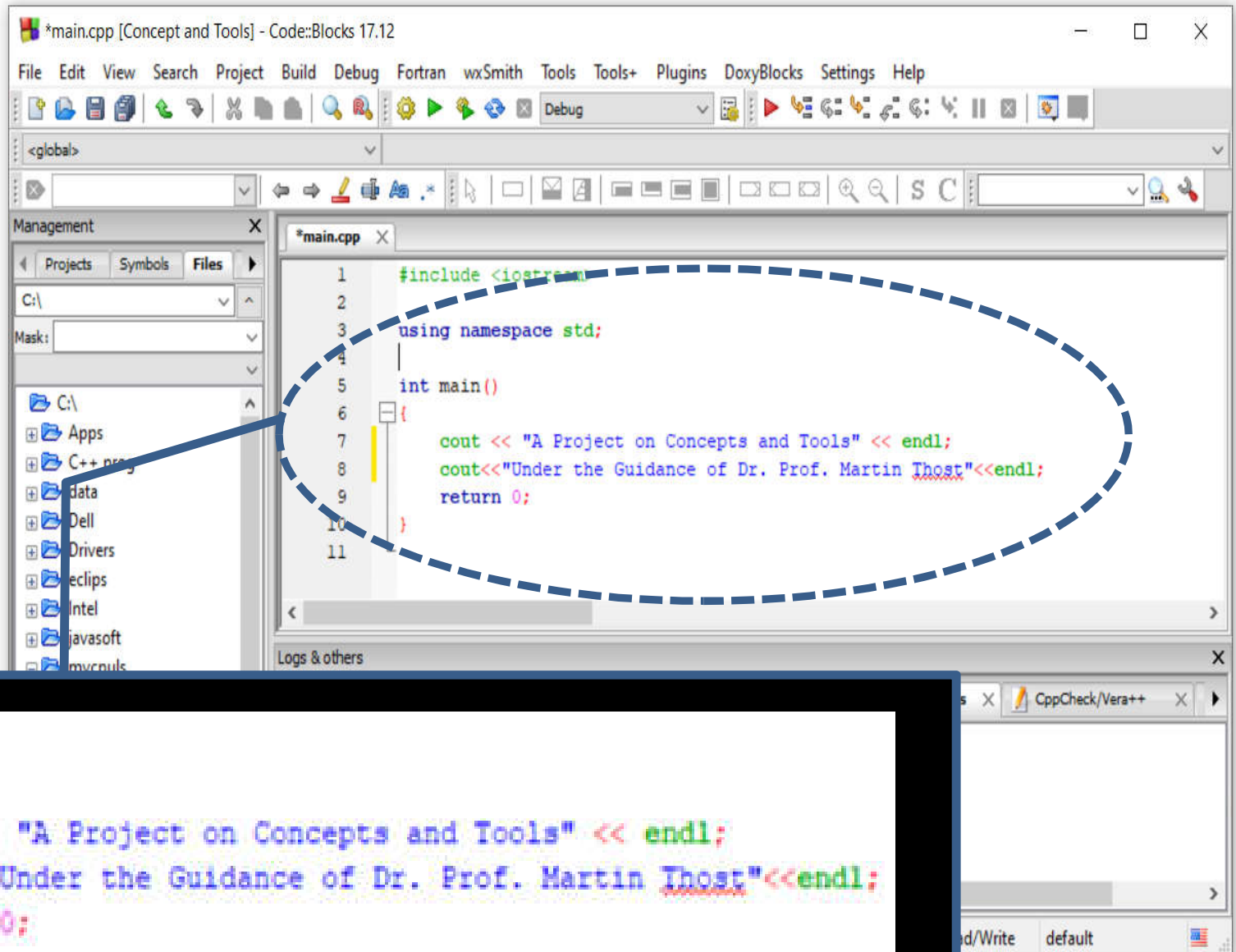


Open the Editor



Write your code in C++

Step-10



Output after execution in Console Window

Step-
11

The screenshot shows the Code::Blocks IDE with a C++ project named 'Concept and Tools'. The main.cpp file is open, showing the following code:

```
1  #include <iostream>
2
3  using namespace std;
4
5  int main()
6  {
7      cout << "A Project on Concepts and Tools" << endl;
8      cout<<"Under the Guidance of Dr. Prof. Martin Thost"<<endl;
9      return 0;
10 }
11
```

The console window, titled '"C:\mycpuls\Concept and Tools\bin\Debug\Concept a...", displays the output of the program:

```
A Project on Concepts and Tools
Under the Guidance of Dr. Prof. Martin Thost
Process returned 0 (0x0)   execution time : 2.232 s
Press any key to continue.
```

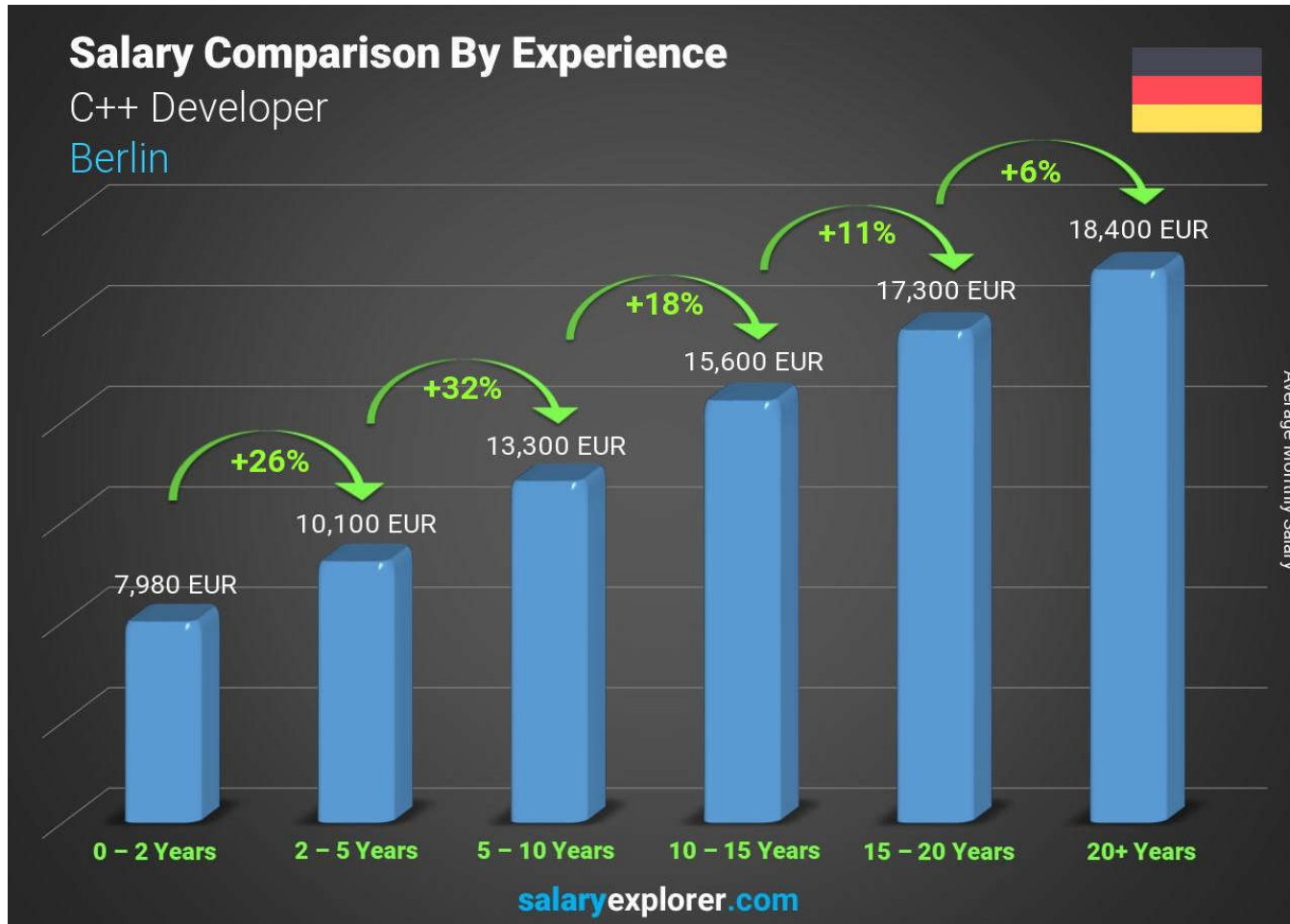
A dashed blue circle highlights the console window. A blue arrow points from the console window to a larger, magnified view of the output text at the bottom of the slide.

A Project on Concepts and Tools
Under the Guidance of Dr. Prof. Martin Thost

Why do Software Developers use C++?

- Stability and evolution
- Tool chains
- Teaching and learning
- Technical community
- Concise expression odd ideas
- Coherence
- Competences
- Compact data structure
- Performance
- Lots of libraries

An Example of growth rate of C++



A small project

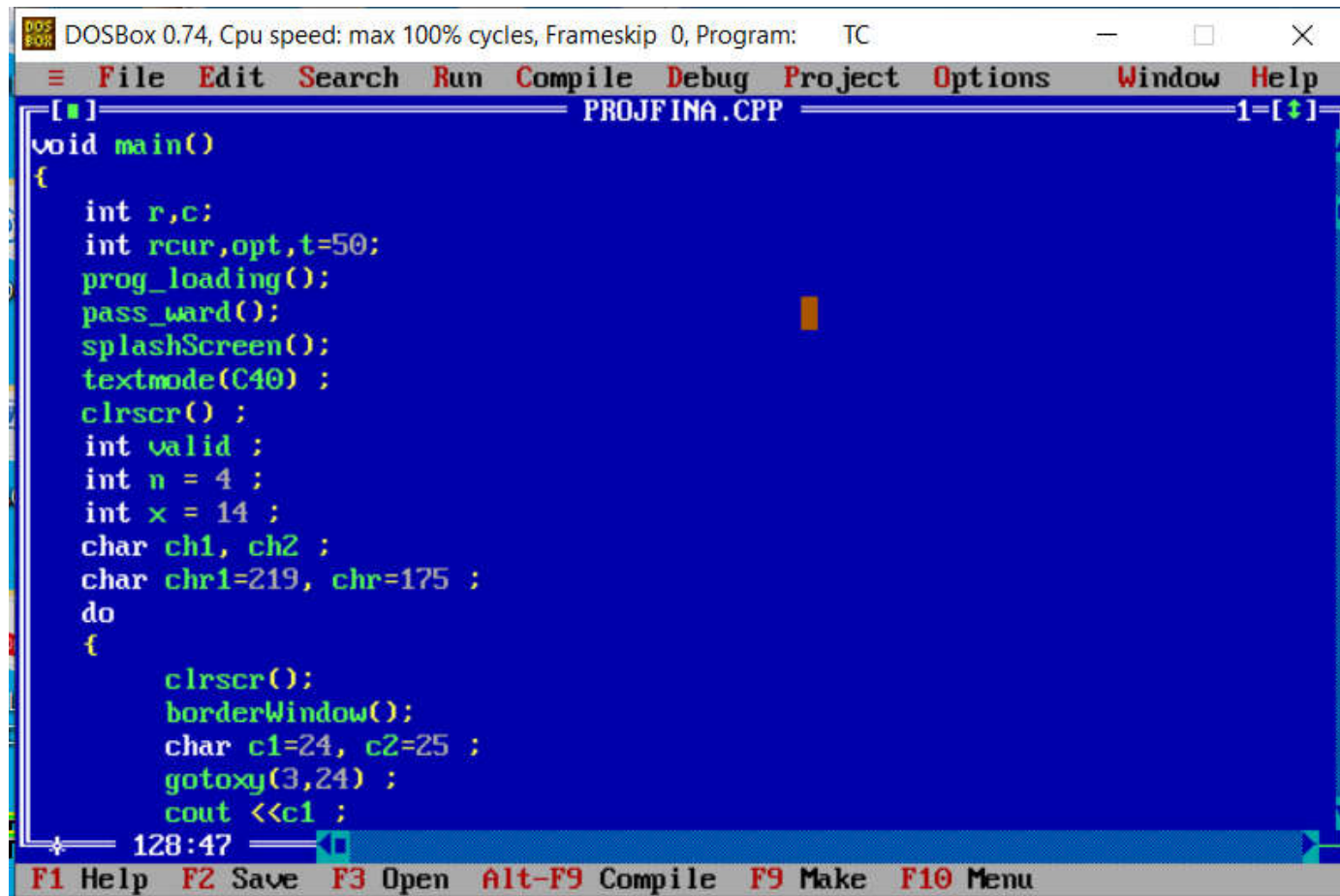
“STUDENT MANAGEMENT SYSTEM “ for German School



A Desktop Application by Using C++

Demonstration of Coding and Program run

A screenshot of Programming with IDE

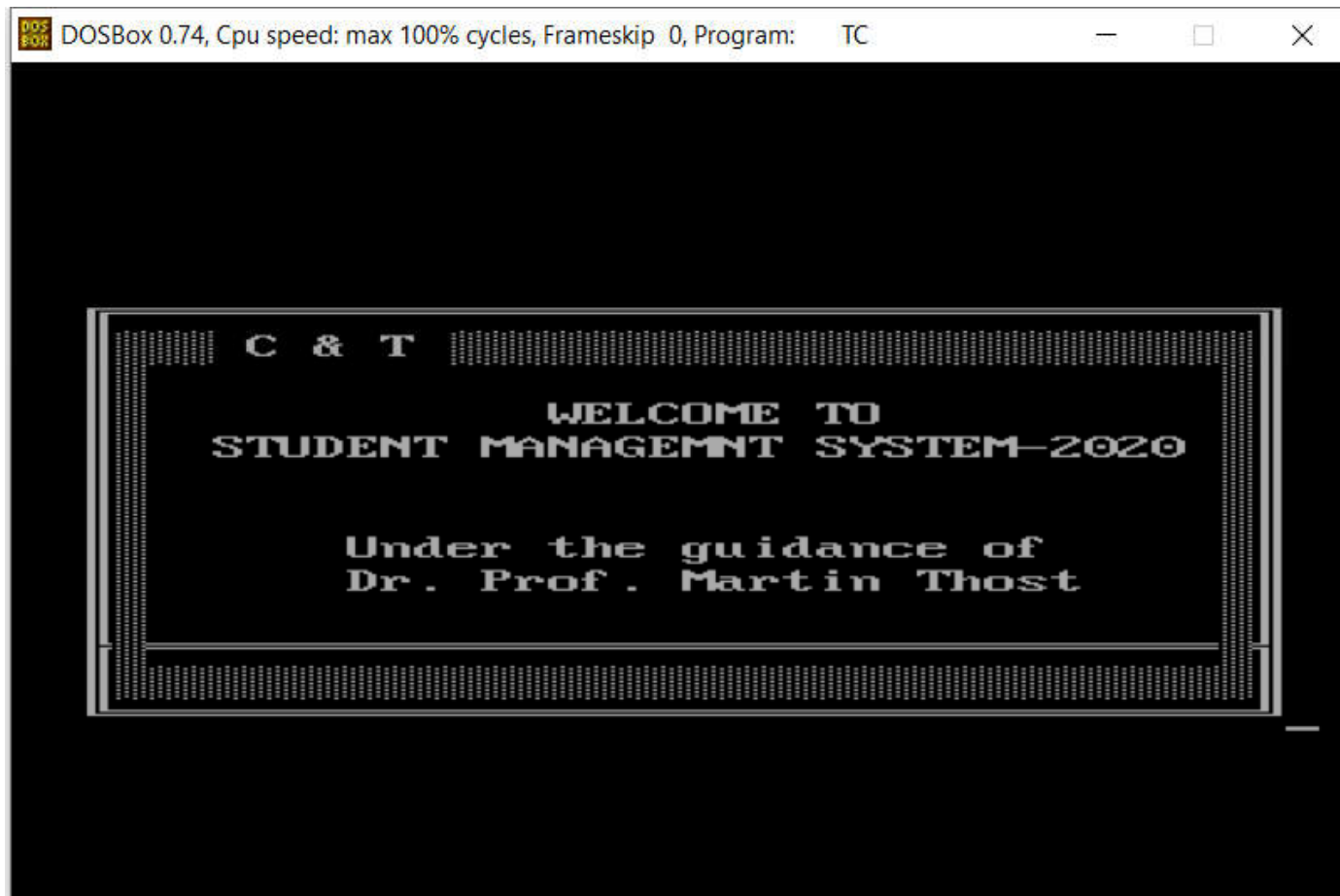


The screenshot shows a DOSBox 0.74 window with a Turbo C++ IDE. The title bar reads "DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC". The menu bar includes File, Edit, Search, Run, Compile, Debug, Project, Options, Window, and Help. The file name "PROJFINA.CPP" is displayed in the title bar. The code editor shows a C++ program with the following content:

```
void main()
{
    int r,c;
    int rcur,opt,t=50;
    prog_loading();
    pass_ward();
    splashScreen();
    textmode(C40) ;
    clrscr() ;
    int valid ;
    int n = 4 ;
    int x = 14 ;
    char ch1, ch2 ;
    char chr1=219, chr=175 ;
    do
    {
        clrscr();
        borderWindow();
        char c1=24, c2=25 ;
        gotoxy(3,24) ;
        cout <<c1 ;
```

The status bar at the bottom shows the time "128:47" and function key shortcuts: F1 Help, F2 Save, F3 Open, Alt-F9 Compile, F9 Make, and F10 Menu.

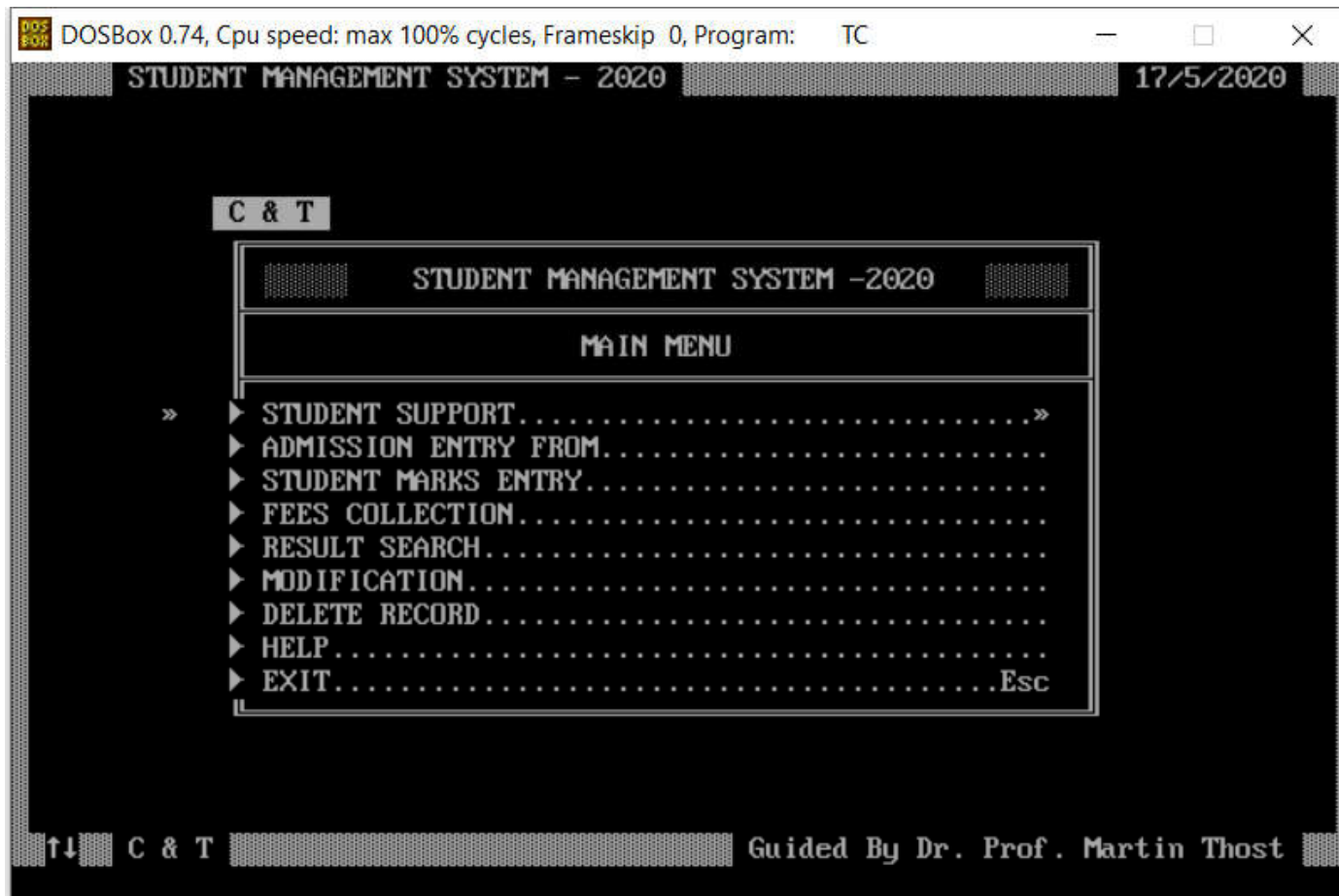
Screenshot of Splash screen (Screenshot-1)



Password Window (Screenshot-2)



Main menu (Screenshot-3)



Admission Form (Screenshot-4)

DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

STUDENT MANAGEMENT SYSTEM - 2020 18/5/2020

STUDENT MANAGEMENT SYSTEM -2020

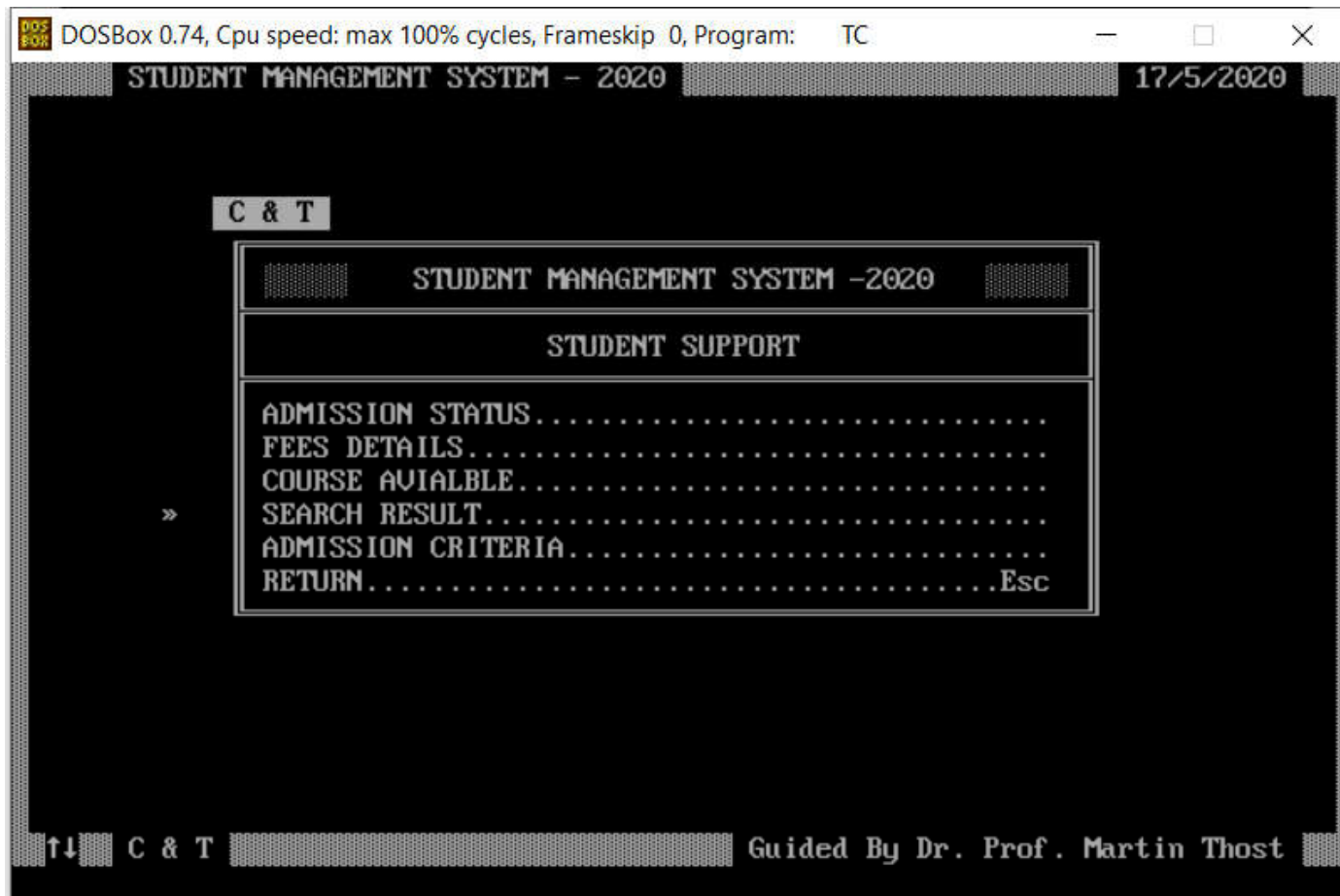
ADMISSION ENTRY FORM

AUTO ID	: SMS1
NAME	: STEPHEN SMITH
FATHER'S NAME	: JOHN SMITH
DATE OF BIRTH	: 07/07/2006
CLASS X,XI..	: XI
PERCENTAGE	: 95
ADDRESS	: UORSTADT-1
MOBILE/PHONE	: 1763562284
CITY	: HOF
PIN	: 95028
GENDER [M/F]	: M
EMAIL ID	: iim.sukanta@gmail.com
STREAM [S/C/H]	: S
YEAR OF PASSING	: 2005
BLOOD GROUP	: B+

Confirmed [Y/N]:Y

C & T st

Student support Window (Screenshot-5)



Student Details (Screenshot-6)

STUDENT MANAGEMENT SYSTEM - 2020 18/5/2020

STUDENT MANAGEMENT SYSTEM -2020

ADMISSION DETAILS

ID	: SMS1
NAME	: STEPHEN SMITH
FATHER'S NAME	: JOHN SMITH
DATE OF BIRTH	: 07/07/2006
CLASS X,XI..	: XI
PERCENTAGE	: 95
ADDRESS	: UORSTADT-1
MOBILE/PHONE	: 1763562284
CITY	: HOF
PIN	: 95028
GENDER [M/F]	: M
EMAIL ID	: iim.sukanta@gmail.coB+
STREAM [S/C/H]	: S
YEAR OF PASSING	: 2005
BLOOD GROUP	: B+

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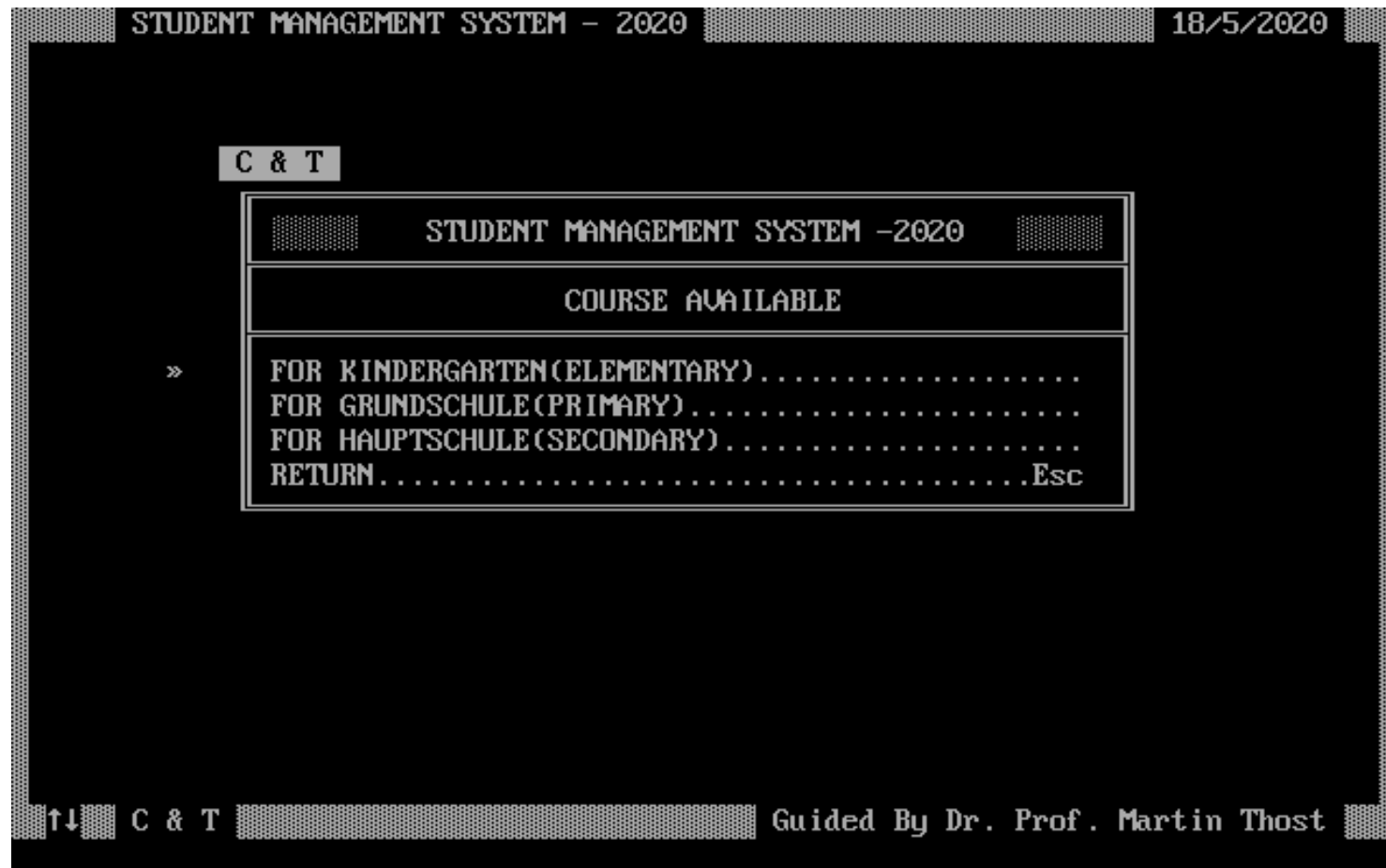
Fees Details (Screenshot-7)

STUDENT MANAGEMENT SYSTEM - 2020 18/5/2020

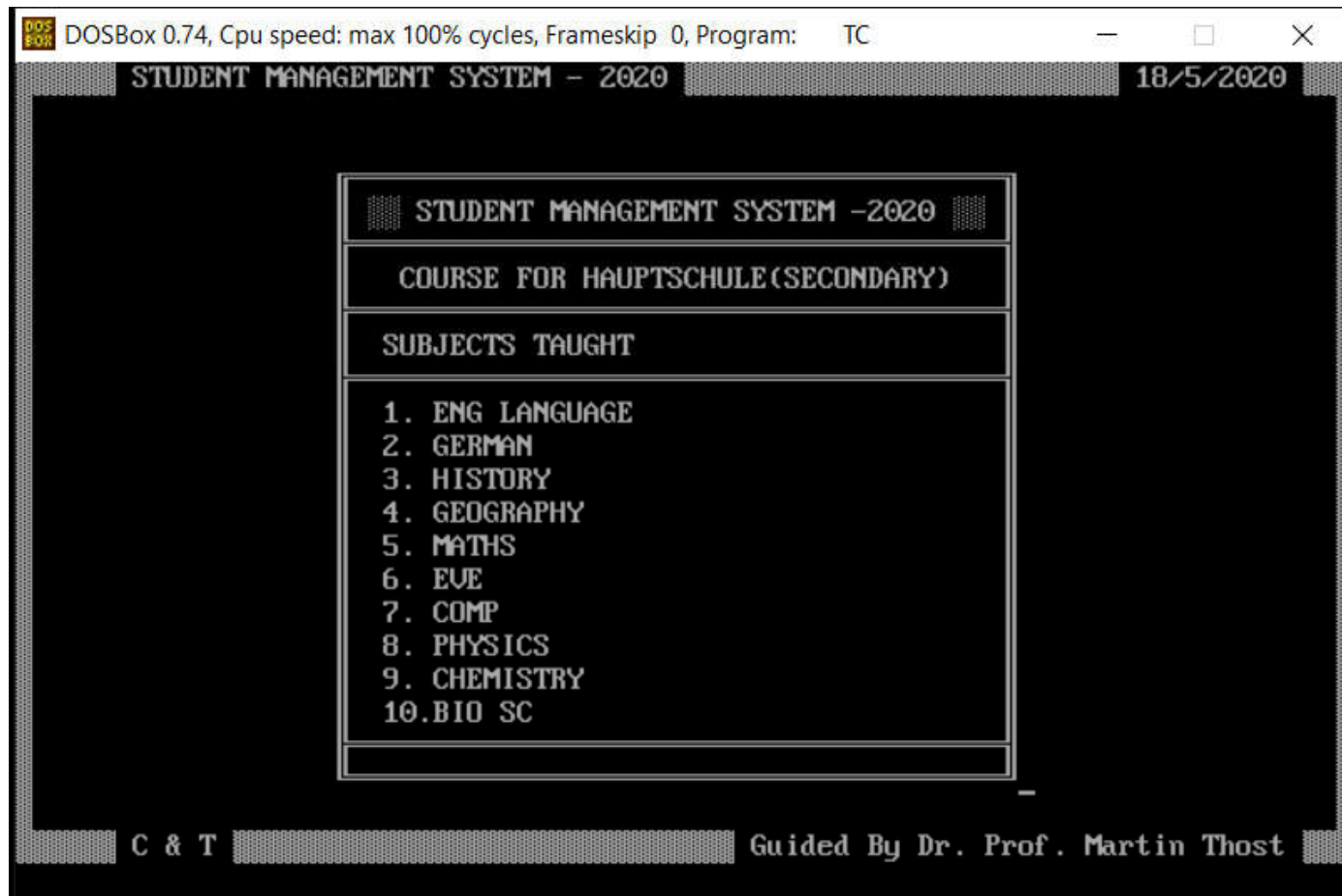
STUDENT MANAGEMENT SYSTEM -2020	
ID	: SMS1
NAME	: STEPHEN SMITH
CLASS	: XI
STREAM	: S
SESSION	: 2020
FEES DETAILS	
SESSION CHARGE	: 2625
LAB FEES	: 350
LIBRARY FEES	: 350
DEVELOPEMENT FEES	: 175
TOTAL	: 3500_

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Course Details Option Window (Screenshot-8)



Subjects in Hauptschule (Screenshot-9)



Fees Details for Hauptschule (Screenshot-10)

STUDENT MANAGEMENT SYSTEM - 2020		18/5/2020
STUDENT MANAGEMENT SYSTEM -2020		
COURSE FOR HAUPTSCHULE(SECONDARY)		
PERCENTAGE OF MARKS	MIN 85%	
FEE DETAILS	€ 3500,00	
LAST DATE OF ADMISSION	31st Mar	
C & T		Guided By Dr. Prof. Martin Thost

Marks Entry Form (Screenshot-11)

STUDENT MANAGEMENT SYSTEM - 2020 18/5/2020

STUDENT MANAGEMENT SYSTEM -2020			
MARKS ENTRY FORM			
GERMAN	[TO SKIP PRESS 0]	:	89
ENGLISH	[TO SKIP PRESS 0]	:	76
HISTORY	[TO SKIP PRESS 0]	:	87
GEOGRAPHY	[TO SKIP PRESS 0]	:	91
MATHS	[TO SKIP PRESS 0]	:	93
PHYSICS	[TO SKIP PRESS 0]	:	85
CHEMISTRY	[TO SKIP PRESS 0]	:	76
BIOLOGY	[TO SKIP PRESS 0]	:	83
COMPUTER	[TO SKIP PRESS 0]	:	96
EVE SC.	[TO SKIP PRESS 0]	:	76

Confirmed [Y/N]:Y

Marks sucessfully Added
Add More...[Y/N]:

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Fees Collections (Screenshot-12)

STUDENT MANAGEMENT SYSTEM - 2020 18/5/2020

STUDENT MANAGEMENT SYSTEM -2020	
ID	: SMS1
NAME	: STEPHEN SMITH
CLASS	: XI
STREAM	: S
SESSION	: 2020
FEES DETAILS	
SESSION CHARGE	: 2625
LAB FEES	: 350
LIBRARY FEES	: 350
DEVELOPEMENT FEES	: 175
TOTAL	: 3500

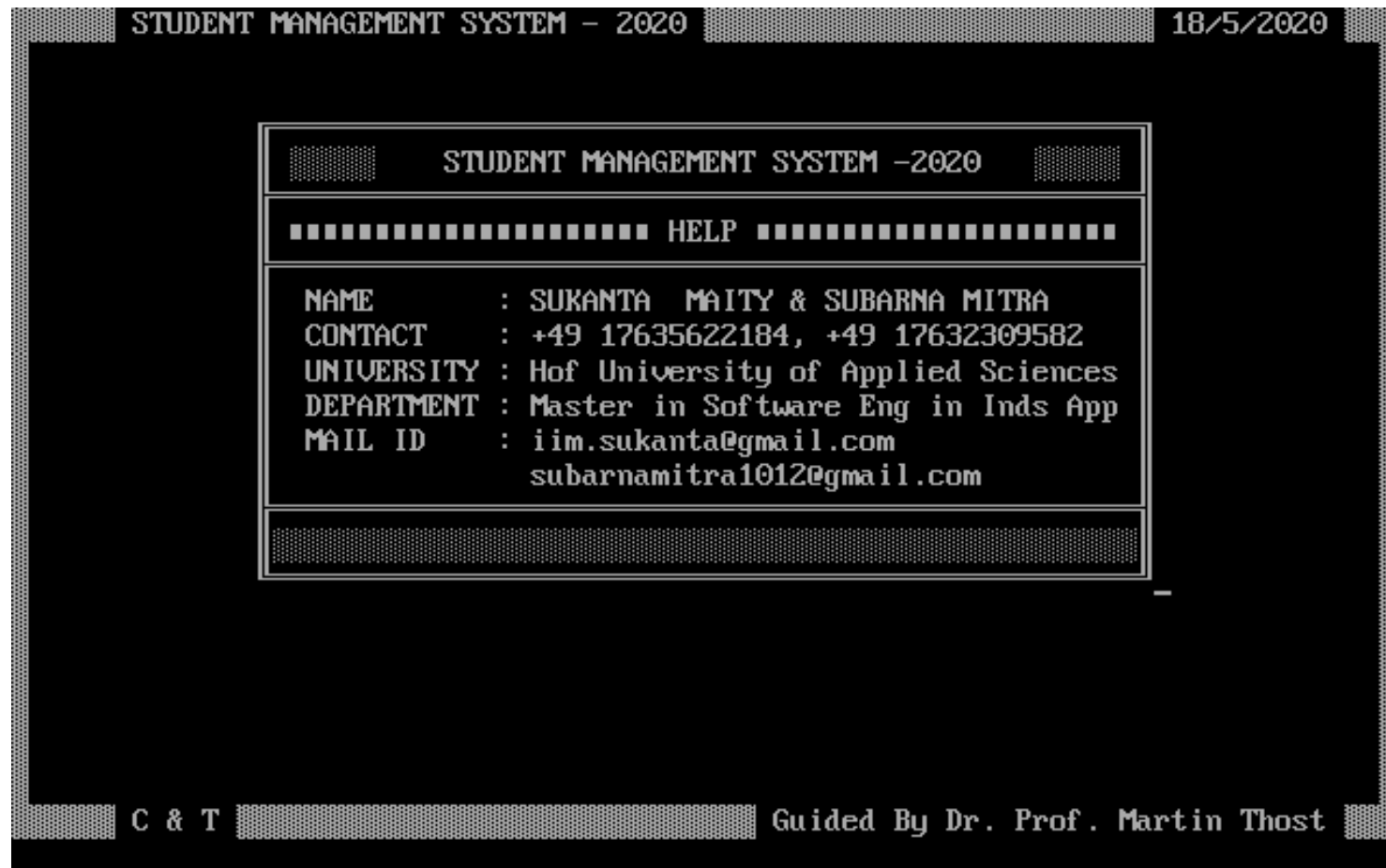
Confirm [Y/N]:Y

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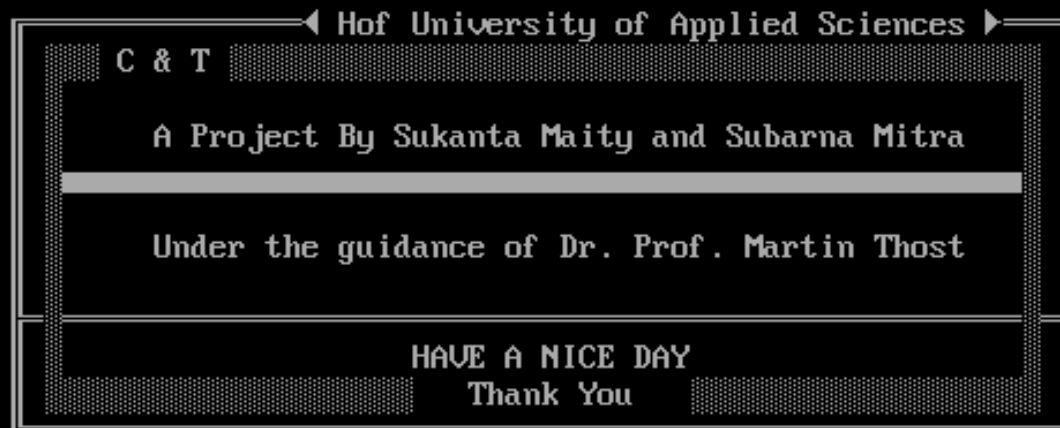
Marks Details (Screenshot-13)

STUDENT MANAGEMENT SYSTEM - 2020		18/5/2020
STUDENT MANAGEMENT SYSTEM -2020		
ID	: SMS1	
NAME	: STEPHEN SMITH	
CLASS	: XI	
MARKS DETAILS		
GERMAN	: 89	
ENGLISH	: 76	
HISTORY	: 87	
GEOGRAPHY	: 91	
MATHS	: 93	
PHYSICS	: 85	
CHEMISTRY	: 76	
BIOLOGY	: 83	
COMPUTER	: 96	
EVE SC.	: 76	
TOTAL	: 852	
PERCENTAGE	: 85.199997	GRADE: A_

Help Window (Screenshot-14)



Exit Window (Screenshot-15)



Summary



Successful on a large scale



Success must be sustained



Focus on significant changes



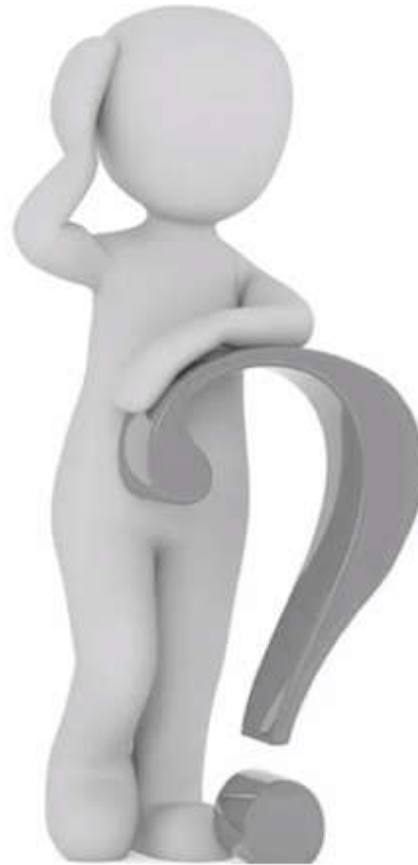
Usage of the recent features

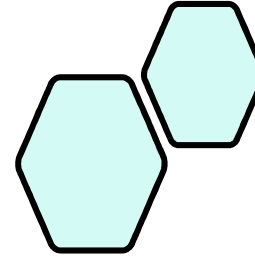


Follow Core guideline

References

- <https://medium.com/@cancerian0684/what-are-four-basic-principles-of-object-oriented-programming-645af8b43727>
- <https://www.chu.cam.ac.uk/people/view/bjarne-stroustrup/>
- <https://www.modernescpp.com/index.php/c-20-an-overview>
- Source of image:<https://cppcodetips.wordpress.com/2019/08/31/blocking-queue-implementation-in-c/>
- <https://cppcodetips.wordpress.com/2019/08/31/blocking-queue-implementation-in-c/>
- https://www.google.com/search?q=logo+of+codeblock&sxsrf=ALeKk03uEzd_CVFubYgkJrs-hgTPSNu2EA:1590965381831&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjB-Lvzl9_pAhVKiYsKHd_hC_YQ_AUoAXoECBAQAw&biw=1536&bih=674#imgsrc=5mUcmw1WYKuSM
- <http://www.codeblocks.org/downloads/binaries>
- <http://www.salaryexplorer.com/>





Thank You