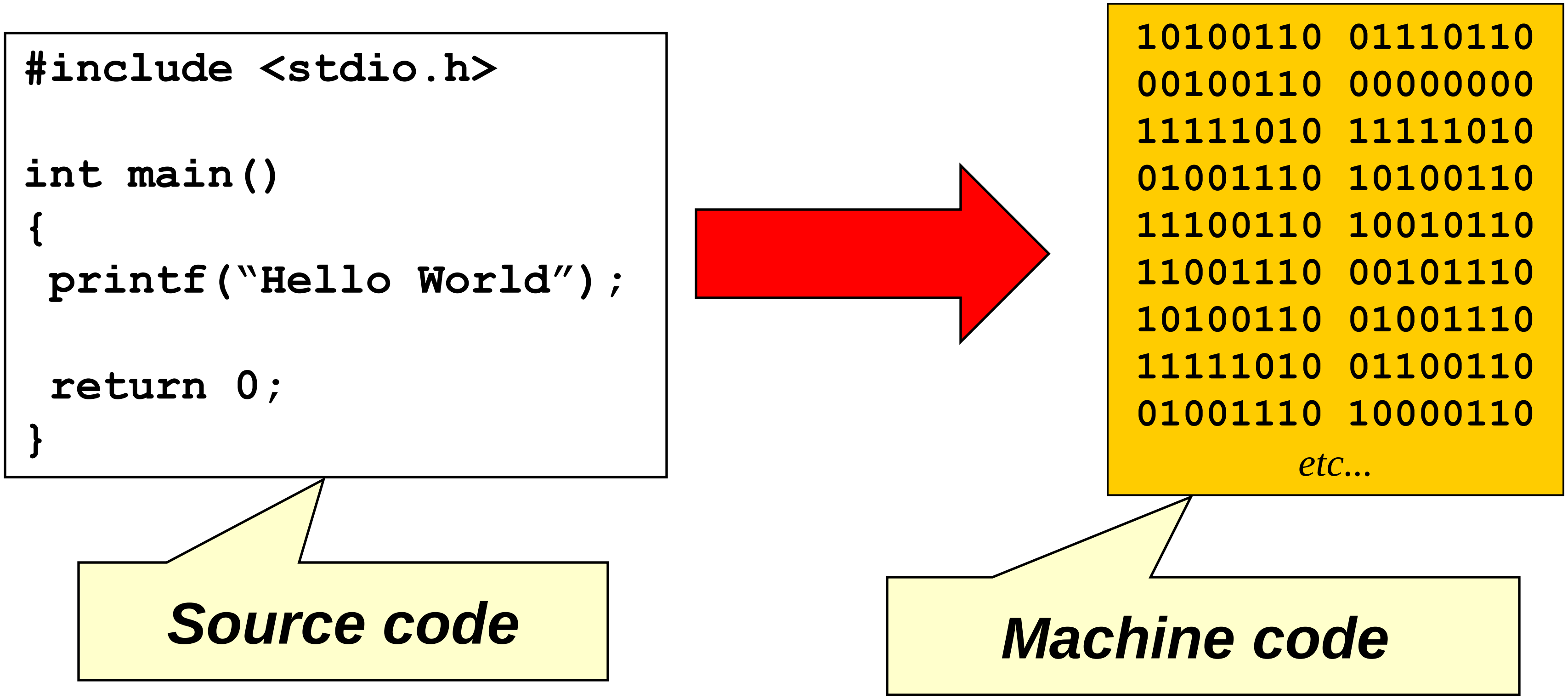
ĐẠI HỌC BÁCH KHOA HÀ NỘI
VIỆN CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

Introduction to C programming language

Department of Information System

SoICT, HUST

High level language



```
#include <stdio.h>

int main()
{
 printf(“Hello World”);

 return 0;
}
```

```
10100110 01110110
00100110 00000000
11111010 11111010
01001110 10100110
11100110 10010110
11001110 00101110
10100110 01001110
11111010 01100110
01001110 10000110
```

etc...

Source code

Machine code

- Compiler translates a program in high level programming language into machine language

Why C?

- Flexible language
  - Structured language
  - Low level activities possible
- Standard library exists, allowing portability
- It can produce lean and efficient code
- Wide availability on a variety of computers and widely used
- It is the foundation for other languages (C++, Java, Perl, awk)

History of C

- CPL Combined Programming Language (Barron et al., 1963)
- BCPL Basic CPL (Richards, 1969)
- B (Thompson, 1970)
- C K&R C (Ritchie, 1972)
- ANSI C American National Standards Institute C (X3J11, 1989)
- C99 (JTC1/SC22/WG14, ISO/IEC 9899, 1999)

The first C program

Hello World

Algorithm

output “Hello World!”

C program

```
#include <stdio.h>

int main()
{
  printf(“Hello World!”);

  return 0;
}
```

C Language Structure

- #include <stdio.h>
  - To declare using the standard I/O library. Other libraries: string, time, math…
- int main()
  - To declare the main() function. An C program must declare only one main() function. The first line in the main() will implement when the program starts.
- { … }
  - The syntax to open and close a block of codes.
- printf
  - the printf() function sends the output to standard output (monitor). This function will be taught in the next week.
- return 0;
  - Stop the program.

Syntax of C programs

- A C program is written using:
  - Keywords: reserved words for specific meaning in a program, e.g., main, if, do, while, …
  - User’s names: names defined by user to specify a variable, a function, etc. in a program.
  - Specific characters: to represent expressions in a program and make the program have structure, for example:
    - Create a block of instructions {}
    - Create a string “ “

Keywords of C

- Flow control (6) – `if, else, return, switch, case, default`
- Loops (5) – `for, do, while, break, continue`
- Common types (5) – `int, float, double, char, void`
- structures (3) – `struct, typedef, union`
- Counting and sizing things (2) – `enum, sizeof`
- Rare but still useful types (7) – `extern, signed, unsigned, long, short, static, const`
- Evil keywords which we avoid (1) – `goto`
- Weirdies (3) – `auto, register, volatile`

Common characters used in a program

- {…} create a block of instructions
- “…” create a string to display
- /* … */ create a block of comment in the program
- ; End of an instruction
- other characters for formulas such as +, -, *, /, (), …

Identifiers

- When declare a variable or a procedure, we need to identify it
- Principles:
  - Only use alphabetic letters, numbers, underscore _ character to name an identify
  - Identify must begin with an alphabetic letter
  - Upper case and lower case are different
- Which identities are illegal:
  - tong, 2k, trung binh, %totnghiep

Example of writing a program

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

Create the main fuction for the program

```
int main()
{



   return 0;
}
```

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```
#include <stdio.h>


int main()
{






   return 0;
}
```

Declare the standard input/output library

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{



  return 0;
}
```

Comment

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{
   int dem;




   return 0;
}
```

Declare a variable

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```c
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{
   int dem;
   dem = 0;



   return 0;
}
```

Assign a value to dem

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```c
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{
   int dem;
   dem = 0;
   while ( dem < 10 )
   {


   }
   return 0;
}
```

Creare a loop

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```c
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{
   int dem;
   dem = 0;
   while ( dem < 10 )
   {
    printf(“%d\n”, dem);

   }
   return 0;
}
```

Example …

print number from 0 to 9

```
dem = 0
while (dem < 10)
do
{
   output dem
   dem = dem + 1
}
```

```c
#include <stdio.h>

/* In tu 0 toi 9 */
int main()
{
   int dem;
   dem = 0;
   while ( dem < 10 )
   {
    printf(“%d\n”, dem);
    dem = dem + 1;
   }
   return 0;
}
```

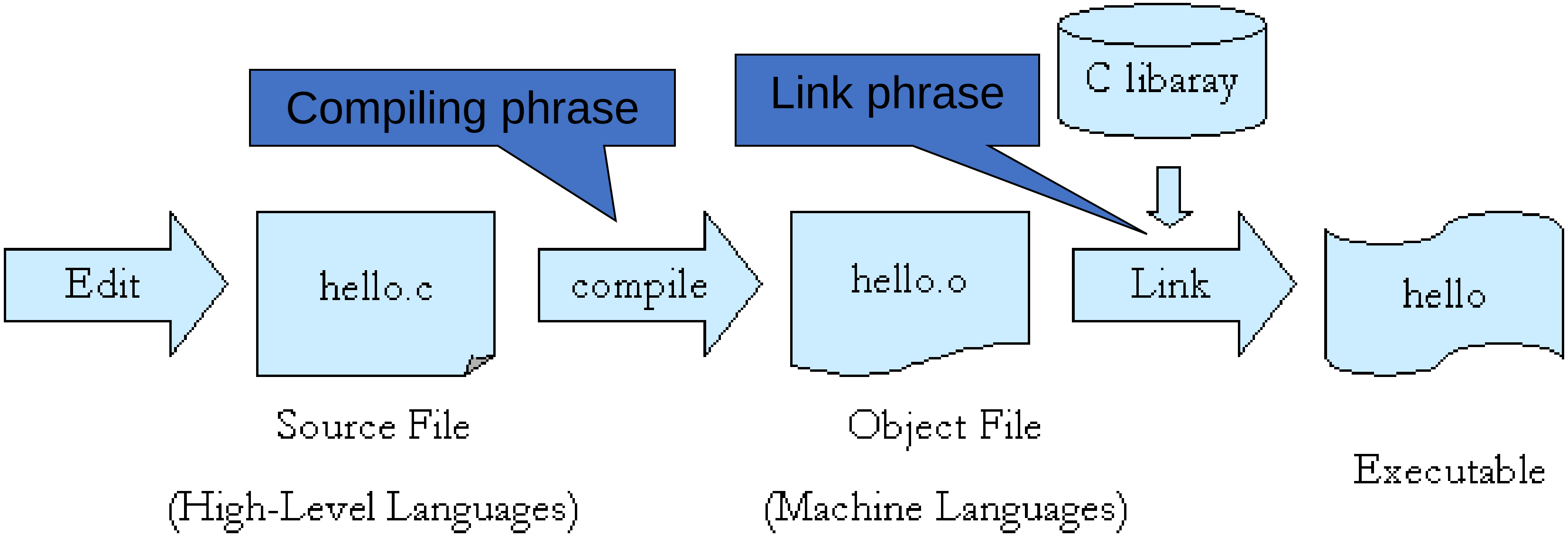
What does this program do?

```
#include <stdio.h>

int main(){
  float num;

  printf(“Enter a number: “);
  scanf(“%f”, &num);

  if ( num < 0 )  {
     printf(“%f is negative”, num);
  }   else  {
     printf(“%f is positive”, num);
  }

  return 0;
}
```

Algorithm of the program

```
/* Find the sign of a number */
input num
if (num < 0) then
{
   output “negative number”
}
else
{
   output “positive number”
}
```

Compile a C program



Error can appear at compiling phrase or link phrase

Compiler

- To translate a program, we need a compiler, for example: gcc
- The compiler of C always supports parameter to perform two phrases of the compiling process. For example, gcc – c to do the compiling phrase, gcc –o to do the link phrase.
- If your program is written in only one file, a single Unix command can help to make an executable program from the source code.
  - $ gcc -o *program-name filename*
  - Ex: $gcc -o hello hello.c

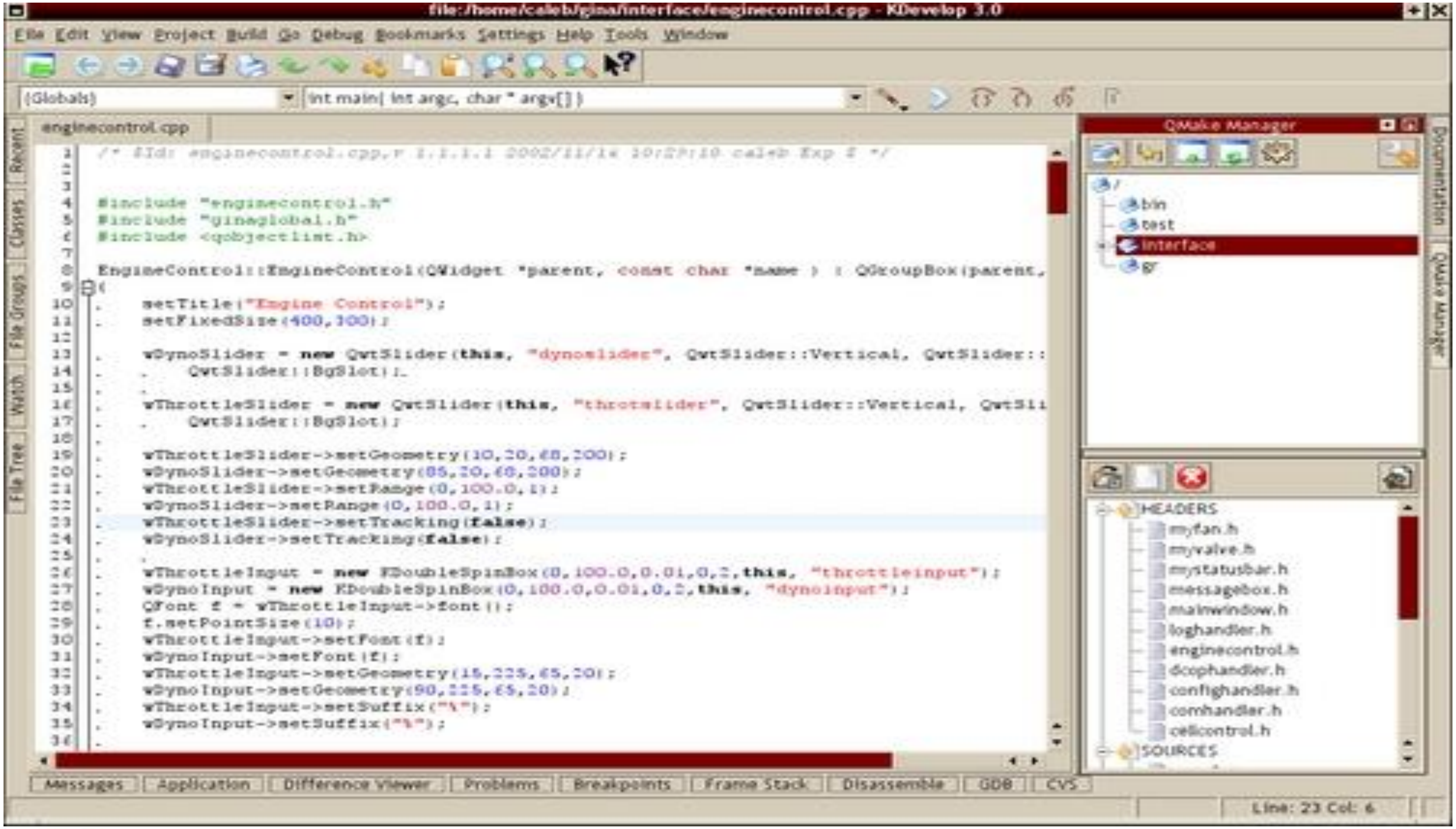
IDE: Integrated Development Environment

- Programming is a process that repeatly carries out operations: source code editing, compiling, debugging.
- These operations can carry out independently by different tools. For example, edit by emacs, compile by gcc.
- However, a more convenient way is to integrate all programming tools to an unique environment to support the programming. This environment is called IDE.
- IDE - an environment of 3 in 1: editor, compiler, debugger

Products of IDE

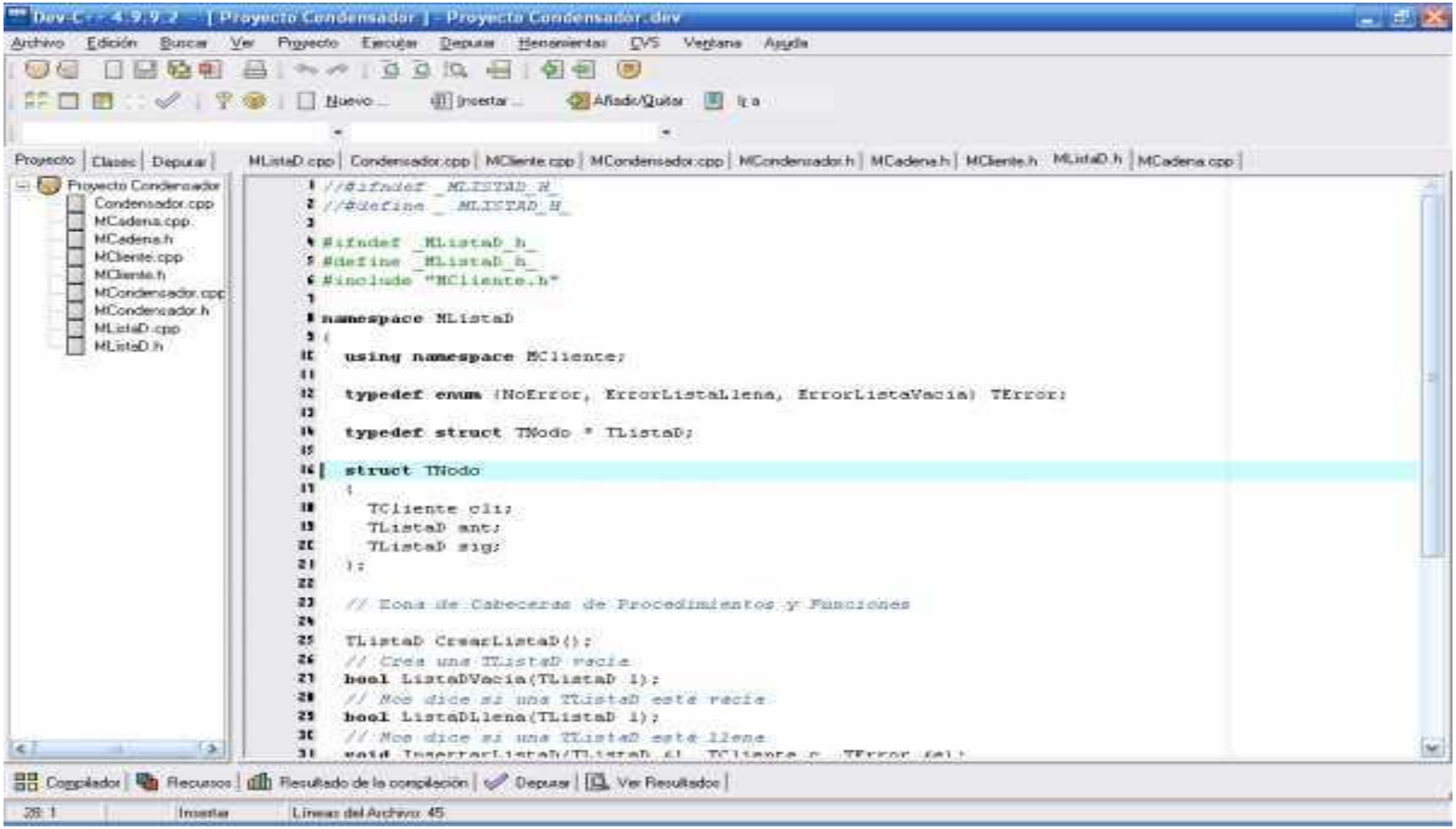
- On Linux:
  - KDevelop
- On Window:
  - Dev-C++,
  - Turbo C++,
  - Visual C++,
  - etc.

KDevelop



```
/* $Id: enginecontrol.cpp,v 1.1.1.1 2002/11/14 10:29:10 caleb Exp $ */


#include "enginecontrol.h"
#include "ginaglobal.h"
#include <qobjectlist.h>

EngineControl::EngineControl(QWidget *parent, const char *name ) : QGroupBox(parent,
{
    setTitle("Engine Control");
    setFixedSize(400,300);

    wDynoSlider = new QwtSlider(this, "dynoslider", QwtSlider::Vertical, QwtSlider::
        QwtSlider::BgSlot);

    wThrottleSlider = new QwtSlider(this, "throtslider", QwtSlider::Vertical, QwtSli
        QwtSlider::BgSlot);

    wThrottleSlider->setGeometry(10,20,68,200);
    wDynoSlider->setGeometry(85,20,68,200);
    wThrottleSlider->setRange(0,100.0,1);
    wDynoSlider->setRange(0,100.0,1);
    wThrottleSlider->setTracking(false);
    wDynoSlider->setTracking(false);

    wThrottleInput = new KDoubleSpinBox(0,100.0,0.01,0,2,this, "throttleinput");
    wDynoInput = new KDoubleSpinBox(0,100.0,0.01,0,2,this, "dynoinput");
    QFont f = wThrottleInput->font();
    f.setPointSize(10);
    wThrottleInput->setFont(f);
    wDynoInput->setFont(f);
    wThrottleInput->setGeometry(15,225,65,20);
    wDynoInput->setGeometry(90,225,65,20);
    wThrottleInput->setSuffix("%");
    wDynoInput->setSuffix("%");
```

Dev-C++


Dev-C++ 4.9.9.2 - [Proyecto Condensador] - Proyecto Condensador.dev
Archivo Edición Buscar Ver Proyecto Ejecutar Depurar Herramientas CVS Ventana Ayuda
Nuevo ... Insertar ... Añadir/Quitar Ir a
Proyecto Clases Depurar
MListaD.cpp Condensador.cpp MCliente.cpp MCondensador.cpp MCondensador.h MCadena.h MCliente.h MListaD.h MCadena.cpp
Proyecto Condensador
Condensador.cpp
MCadena.cpp
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MListaD.cpp
MListaD.h
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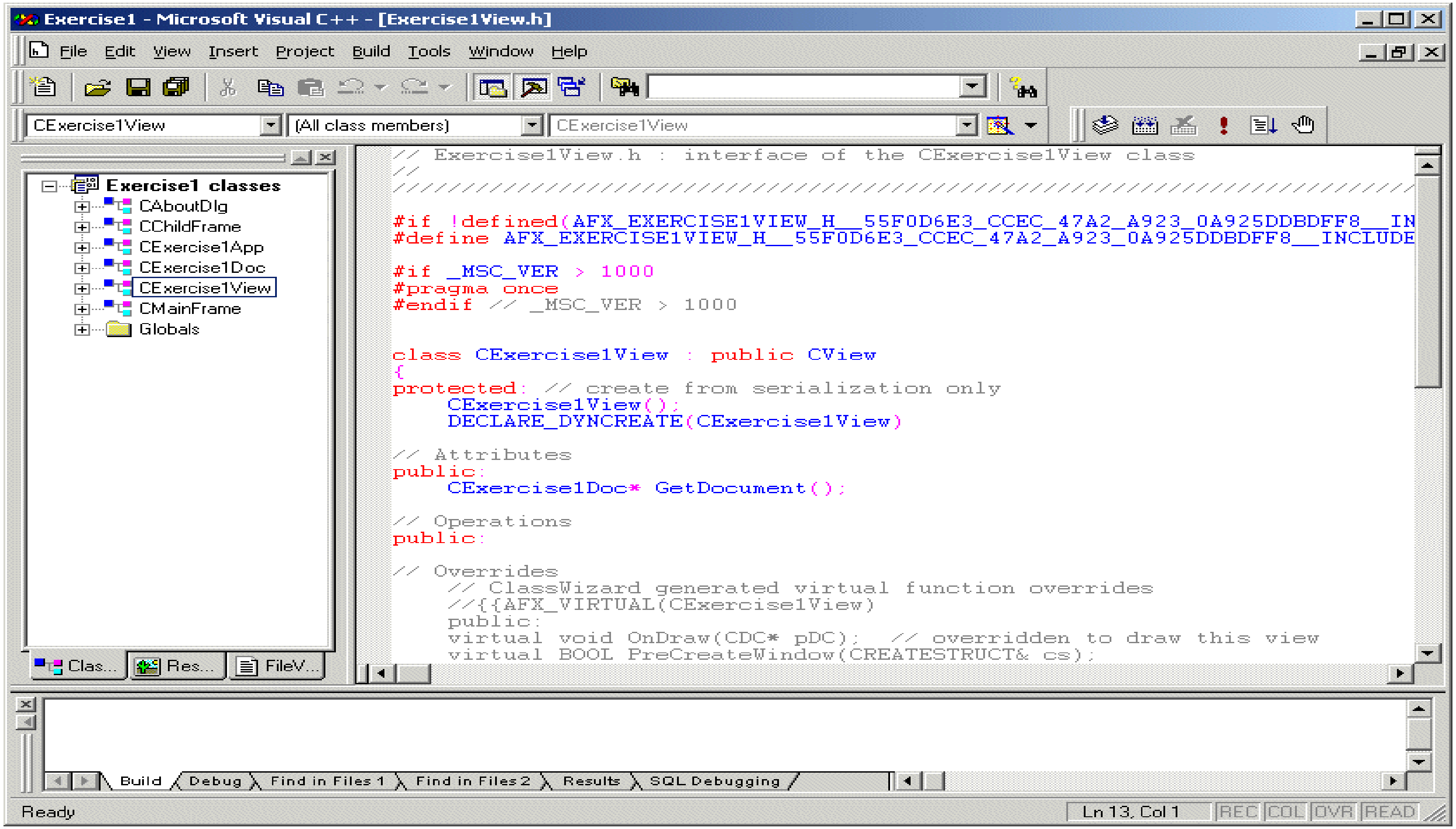
28: 1 Insertar Lineas del Archivo: 45

```
//#ifndef __MLISTAD_H_
//#define __MLISTAD_H_

#ifndef _MListaD_h_
#define _MListaD_h_
#include "MCliente.h"

namespace MListaD
{
  using namespace MCliente;

  typedef enum {NoError, ErrorListaLlena, ErrorListaVacia} TError;

  typedef struct TNodo * TListaD;

  struct TNodo
  {
    TCliente cli;
    TListaD ant;
    TListaD sig;
  };

  // Zona de Cabeceras de Procedimientos y Funciones

  TListaD CrearListaD();
  // Crea una TListaD vacia
  bool ListaDVacia(TListaD l);
  // Nos dice si una TListaD esta vacia
  bool ListaDLlena(TListaD l);
  // Nos dice si una TListaD esta llena
  void InsertarListaD(TListaD &l, TCliente c, TError &e);
```

Visual C++



```
// Exercise1View.h : interface of the CExercise1View class
//
/////////////////////////////////////////////////////////////////////////////

#if !defined(AFX_EXERCISE1VIEW_H__55F0D6E3_CCEC_47A2_A923_0A925DDBDFF8__IN
#define AFX_EXERCISE1VIEW_H__55F0D6E3_CCEC_47A2_A923_0A925DDBDFF8__INCLUDE

#if _MSC_VER > 1000
#pragma once
#endif // _MSC_VER > 1000


class CExercise1View : public CView
{
protected: // create from serialization only
	CExercise1View();
	DECLARE_DYNCREATE(CExercise1View)

// Attributes
public:
	CExercise1Doc* GetDocument();

// Operations
public:

// Overrides
	// ClassWizard generated virtual function overrides
	//{{AFX_VIRTUAL(CExercise1View)
	public:
	virtual void OnDraw(CDC* pDC);  // overridden to draw this view
	virtual BOOL PreCreateWindow(CREATESTRUCT& cs);
```

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Thank you for your attentions!