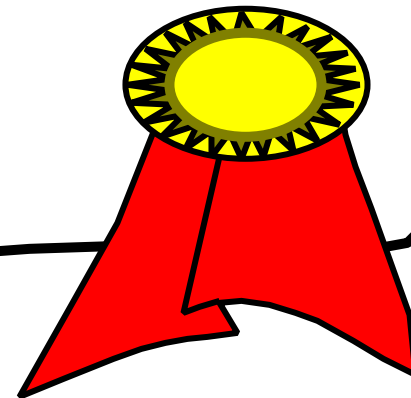
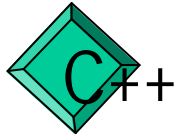


# Visual C++ Programming



[hava@shinbiro.com](mailto:hava@shinbiro.com)






 C++ 1980

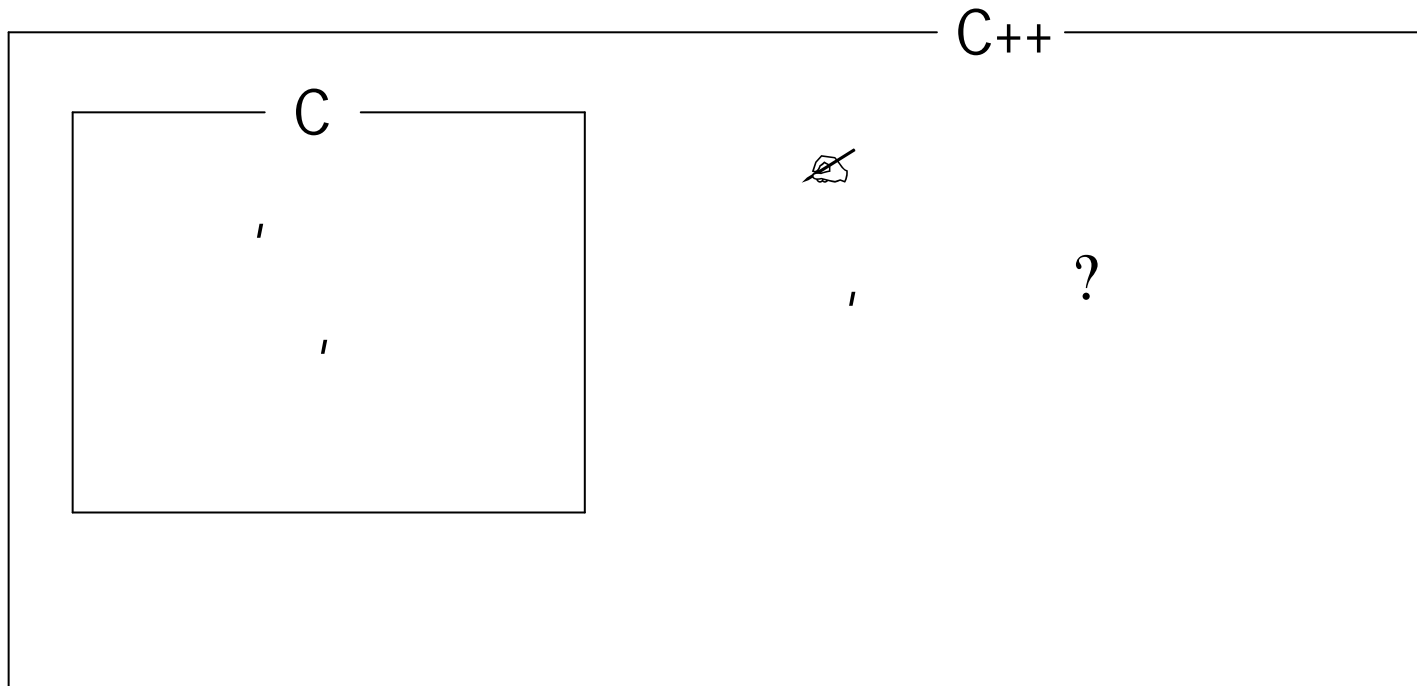
Bjarne Stroustrup

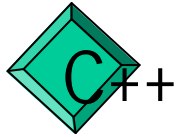
 1980

"C with class"

 "C++"

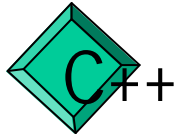
1983



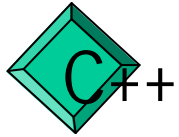


# Bjarne Stroustrup






class	가
new	
delete	
friend	가
inline	가
operator	
this	가
private	
protected	
public	
virtual	가



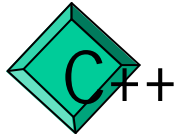
 I/O

 C stream    stdin, stdout, stderr, stdprn    C++  
cout, cin    stream    stream    inserter(<<),  
extractor(>>)    .

 Inserter(<<)

 cout stream    inserter    iostream.h  
include    .

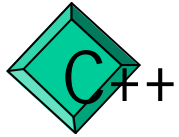
C	C++
<pre>#include &lt;stdio.h&gt; void main(void) {     printf("Hello World!\n"); }</pre>	<pre>#include &lt;iostream.h&gt; void main(void) {     cout &lt;&lt; "Hello World!\n"; }</pre>



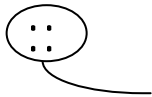
```
#include<iostream.h>
void main()
{
    int hap=0;
    for(int i=0; i<=100; i++)
        hap += i;
    cout << hap << "\n";
}
```



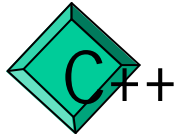
```
#include<iostream.h>
void main(void)
{
    int my_int = 5;
    float my_float = 5.333;
    cout << "The value of my_int is : " << my_int << "\n";
    cout << "The value of my_float is : " << my_float << "\n";
}
```



(::) (Global Scope Resolution Operator)



```
#include<iostream.h>
int suja=123;
void main()
{
    int suja=10;
    cout << suja << "\n";
    cout << ::suja << "\n";
}
```



✍ Extractor(>>)

✍ cin stream     extractor  
   iostream.h     include



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

```
void main(void)
```

```
{
```

```
    int my_int;
```

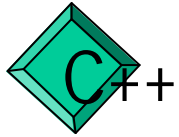
```
    float my_float;
```

```
    cin >> my_int;
```

```
    cin >> my_float;
```

```
    cout << "my_int = " << my_int << "\nmy_float = "  
          << my_float << "\n";
```

```
}
```



## new delete

C	C++
<pre>#include&lt;stdio.h&gt; void main(void) {     int *i;     i = malloc(sizeof(int));     *i = 10;     printf("%d", *i);     free(i); }</pre>	<pre>#include&lt;iostream.h&gt; void main(void) {     int *i = new int;     //int *i = new int[10];     i=10; // 10     cout &lt;&lt; i;     delete i; }</pre>

# Enumerator



: 가

.



```
enum [ ] { , , ... };
```

```
) enum color { black, blue, green, cyan, red }; ( )
```

```
enum color screen; ( )
```

```
enum color { black, blue, green, cyan, red } screen;
```

```
enum .
```

```
color tag
```

```
black, blue, green, cyan, red
```

```
screen black, blue, green, cyan, red
```

.

# Enumerator



```
, , , .
enum color rainbow; /* color 가 */
enum color rainbow[10]; /* 가 color */

enum color rainbow, *rp;
rp = &rainbow;
/* color 가 color rp */

enum color rain(); /* color */
```



# Enumerator



```
) enum color { black, blue, green, cyan, red };  
    black=0, blue=1, green=2, cyan=3, red=4
```

```
) enum color { black=5, blue, green=15, cyan, red=25 };  
    black=5, blue=6 green=15, cyan=16, red=25
```

```
) enum color { black=5, blue, green=15, cyan, red=25 } screen;  
    screen=6; /*          가 */  
    screen=25;
```

```
) enum color { black, blue, green, cyan, red };  
    black++, &blue, --green ( X ) /*      가
```

\*/



***I***

•

)



t



7

.

7

—

i

**t**



# Reference



C++

(value)

.



&

.

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

```
void load_a(char &the_char); // C : void load_a(char *the_char);
```

```
void main()
```

```
{
```

```
    char my_char='z';
```

```
    load_a(my_char);          // C : load_a(&my_char);
```

```
    cout << my_char << "\n";
```

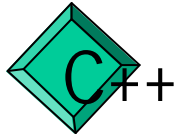
```
}
```

```
void load_a(char &the_char) // C : void load_a(char *the_char)
```

```
{
```

```
    the_char = 'a';          // C : *the_char = 'a';
```

```
}
```



```
void func(int inja1=1, inja2=100)
{
    ;
}
```

```
#include <iostream.h>
void func(int a=10, int b=20, int n=5)
{
    for(int i=a; i<=b; i+=n) // a ? b
        cout << i;
    cout << "\n";
}
void main()
{
    func();           // func(10, 20, 5)
    func(5);          // func(5, 20, 5)
    func(5, 30);      // func(5, 30, 5)
    func(30, 40, 2);
}
```



# (Object-Oriented Programming)



(OOP)

(Structured Programming)

OOP

가

(Data Abstraction),

(Inheritance)

(Polymorphism)



(Data Abstraction)



OOP

(Encapsulation)

(Function)

, OOP



가

가

(Data Structure)



가

가 가




(Information Hiding)

가



## (Object-Oriented Programming)

 (Inheritance)

 OOP  
( ) 가  
,

 Sub-Class, 가  
Super-Class .

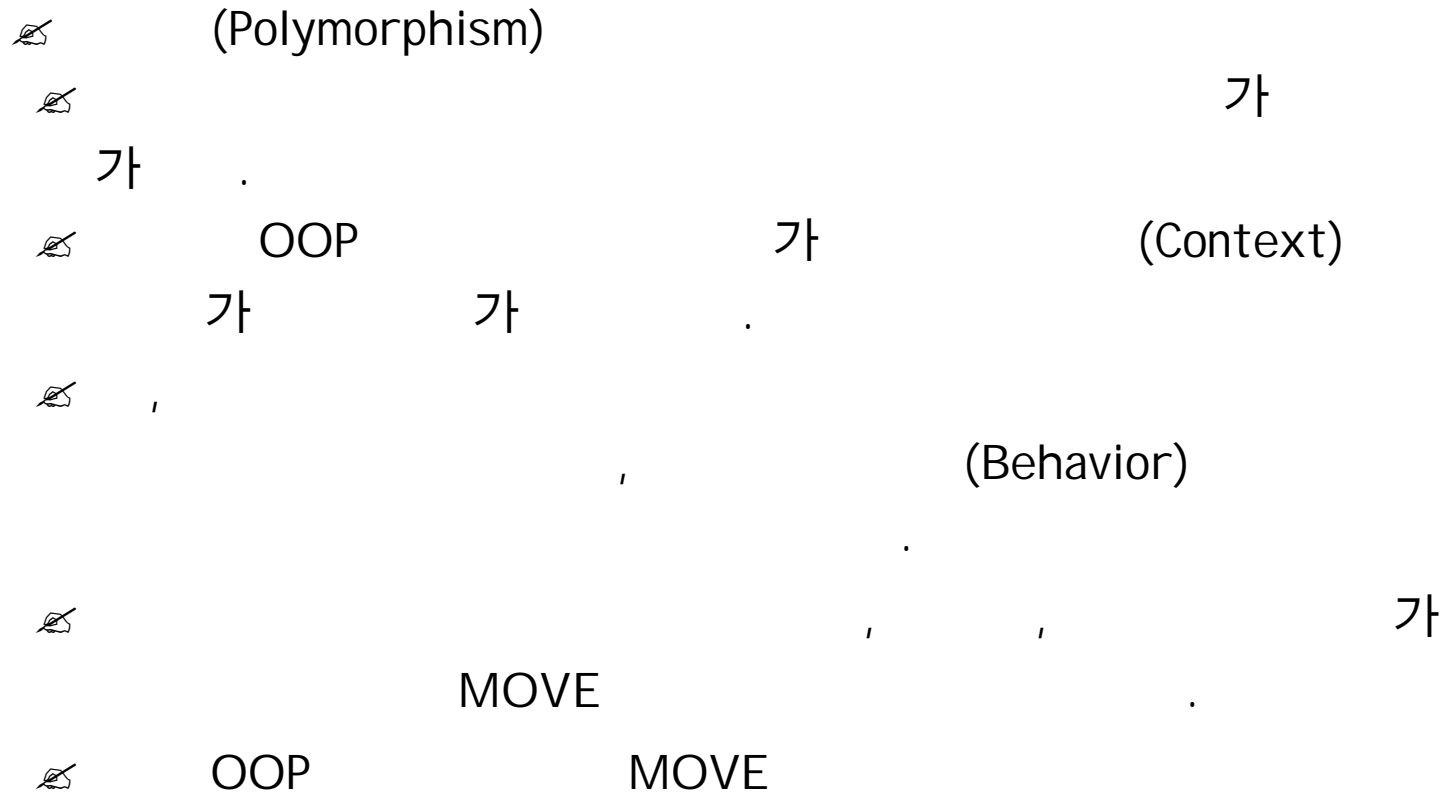
 Super-Class Sub-Class가  
.

 C C++

(Object-Oriented Analysis)



# (Object-Oriented Programming)





(Object)



+

=



+

=



가



,

,

,

,



=

(Attributes) + (Behaviors)

=

(Variables) + (Methods)



(Encapsulation)

(Information Hiding)





# (Encapsulation)



 C++

```
class Point {
```

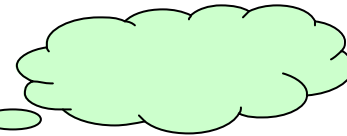
```
    int xPosition;  
    int yPosition;  
    colorType color;
```

```
public:
```

```
    void move(int x, int y);  
    void setColor(colorType c);
```



```
}
```





# (Information Hiding)



600

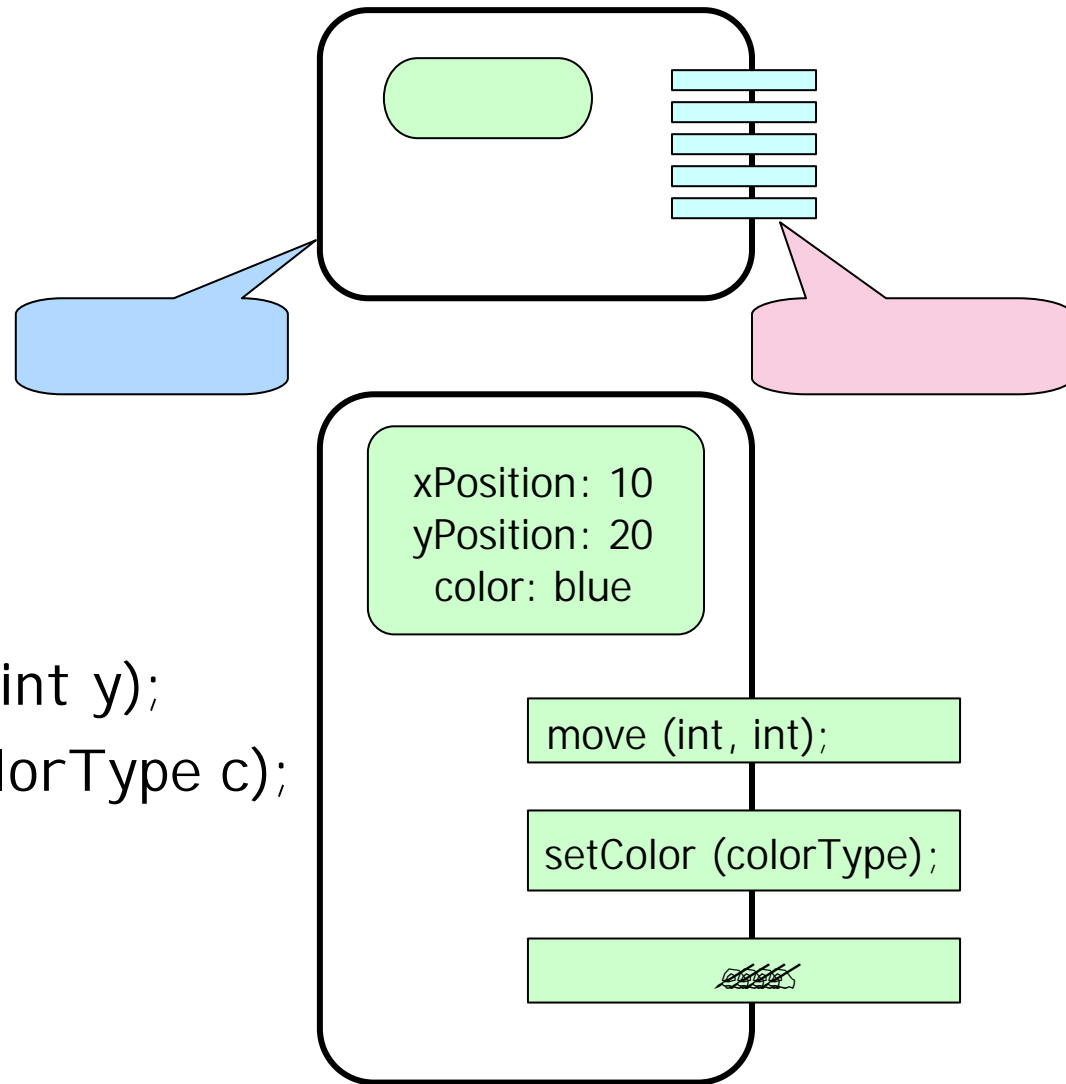
가



# (Information Hiding)

~~✍~~ C++

```
class Point {  
    int xPositon;  
    int yPositon;  
    colorType color;  
  
    public:  
    void move(int x, int y);  
    void setColor(colorType c);  
    void  
}
```





(Object)



(State) 가 .



(Behavior) 가 .



(Identity) 가 .



## (Composite Object)





가



가

 Point and Circle

```
 class Point {  
    int xPositon, yPositon;  
public:  
    void move(int x, int y);  
}  
  
 class Circle {  
    Point center;  
    int radius;  
public:  
    void move(int x, int y) {  
        center.xPositon += x;    // Error  
        center.yPositon += y;    // Error  
        center.move(x, y);       // Okay  
    }  
}}
```



(Message)



(Message Passing)



(Message Passing)



가

(Message Passing)



, , Arguments



<receiver>.<operation\_name> <arguments>

myPoint.move(10, 5);

myPoint.setcolor (blue);



(Class)



(Object Type)

(Specification)

(Instance)

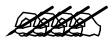
가



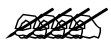
## (Class)



```
class Employee {  
    char *name;  
    positionType position;  
    int salary;  
    phoneNumberType phoneNumber;
```



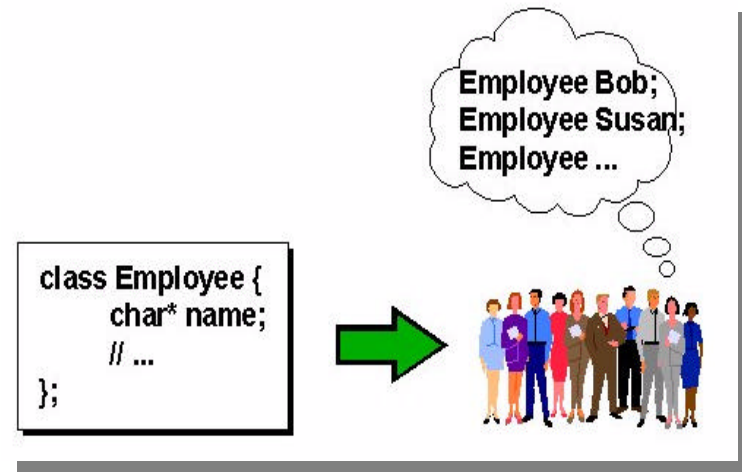
```
public:  
    void promote(positionType newPosition);  
    void changeSalary(int newSalary);
```



```
}
```

 `Employee YoungHee();`

`Employee* YoungHee = new Employee();`





## (Inheritance)



가

.

?

,

,

?



가

.

?



## (Terminology)



(Super class, Base class)



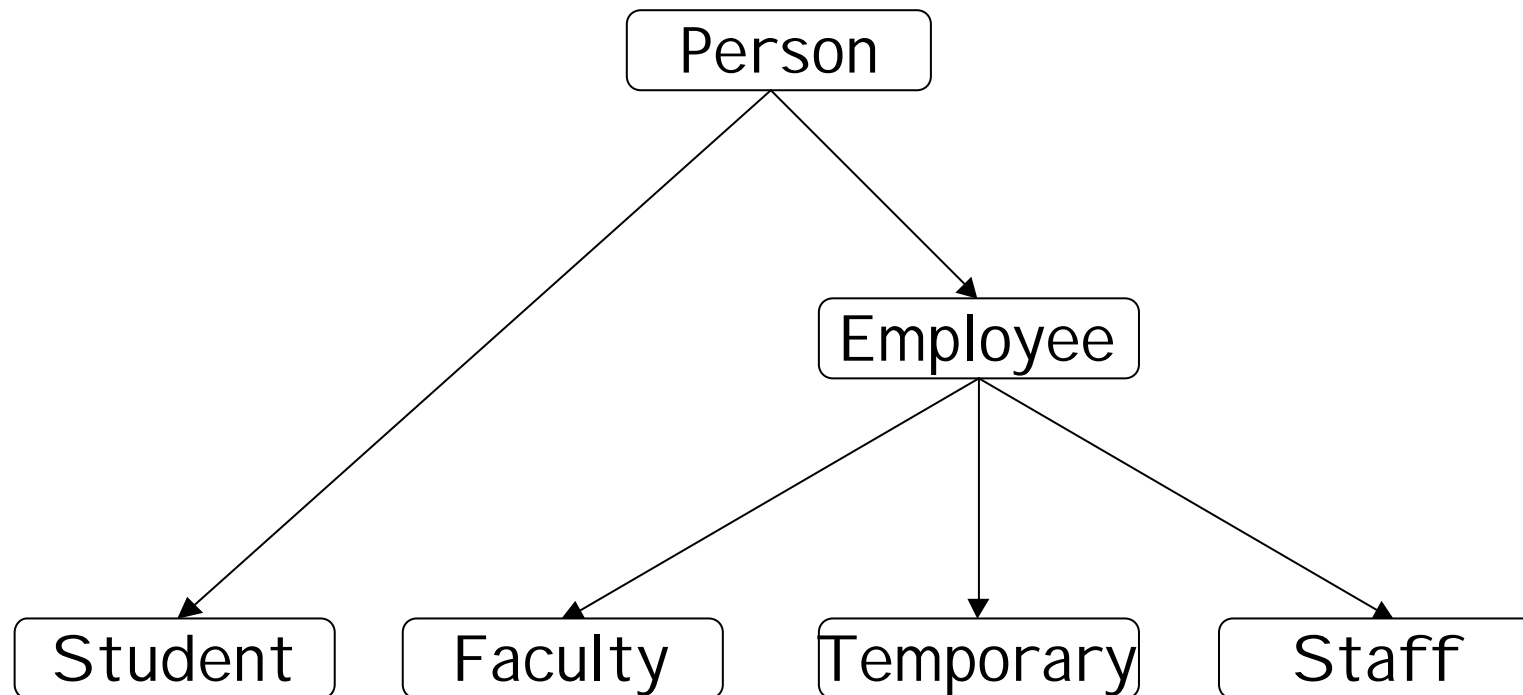
(Subclass, Derived class, Extended class)



(Class Inheritance Hierarchy)



## (Inheritance)



`class Student : public Person{... }`



# (Multiple Inheritance)

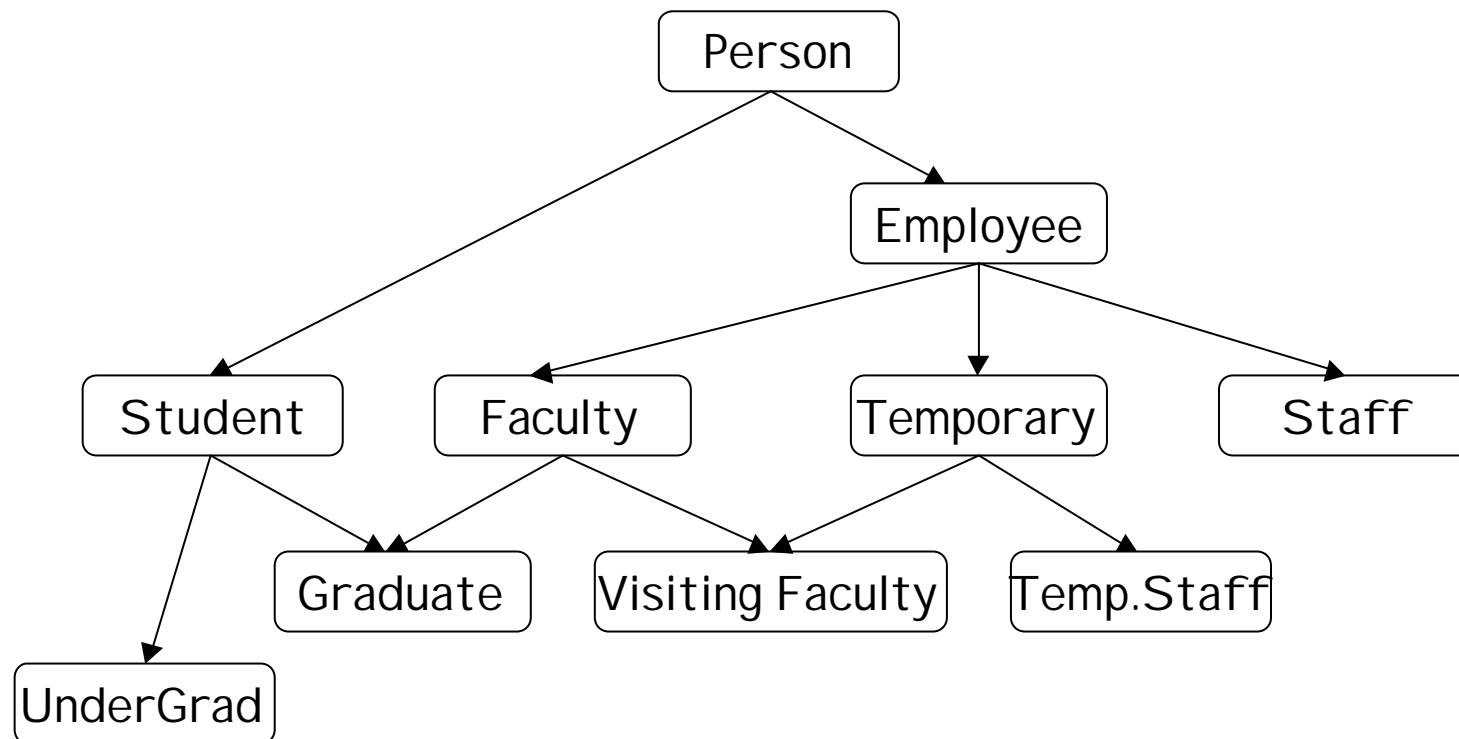


가

가



`class Graduate : public Student, public Faculty{... }`





# (Abstract Class)



 Printer Software



가

가

? : ,

? : print();



Print



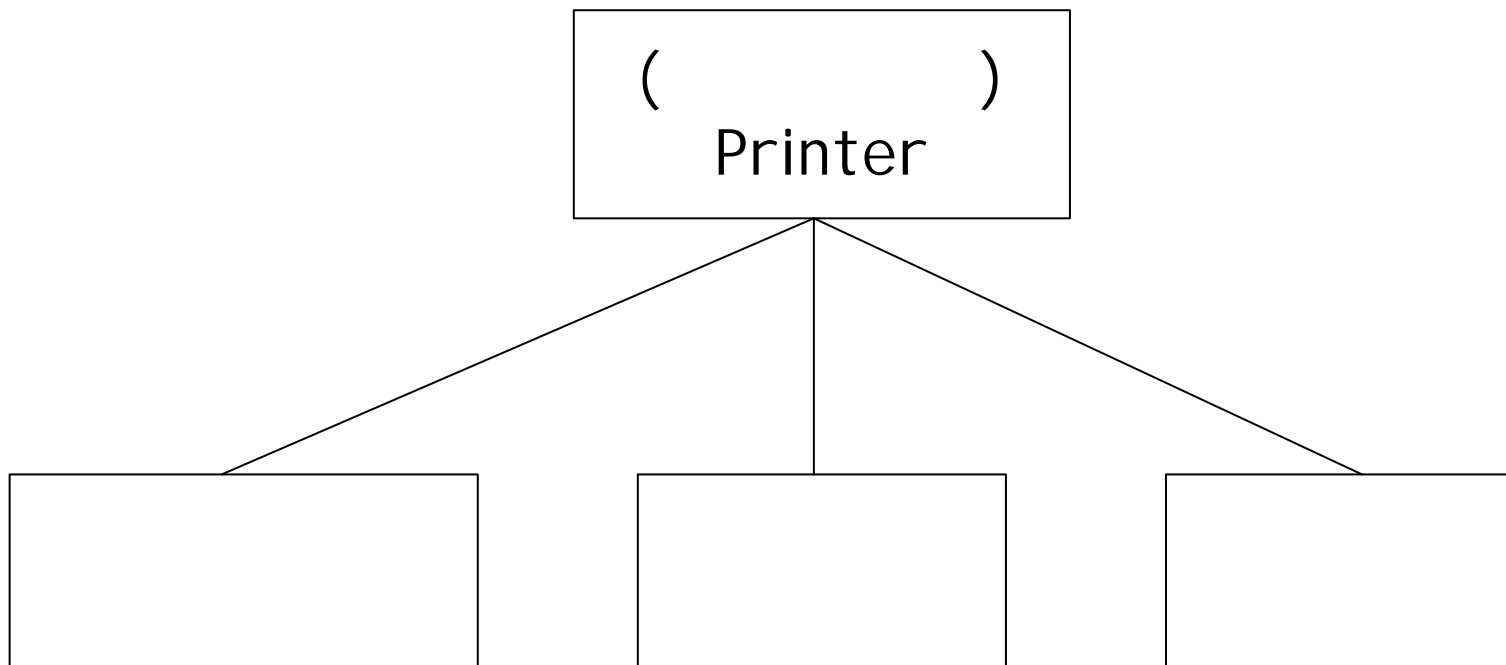
.



# (Abstract Class)



'Printer'





(Polymorphism, )



가

가

가

.



가

.



가 (Virtual Function)



Compile time Polymorphism



, Overloading



Run time Polymorphism

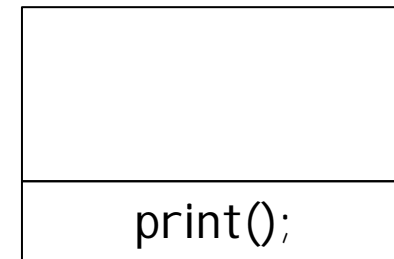
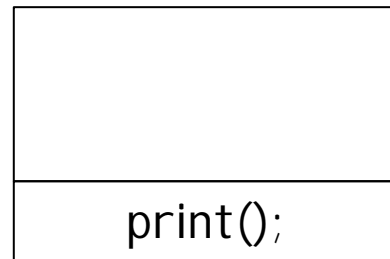
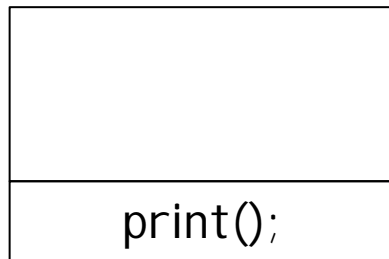


가 Overriding



# (Polymorphism)

 Printer



private	protected	public
	private private protected protected public protected	private private protected protected public public



# Class Library

✍ Template ( )



가

.



가

가

,

가

.



.

✍ STL(Standard Template Library, )



STL

가

가

.



C++

C++

가

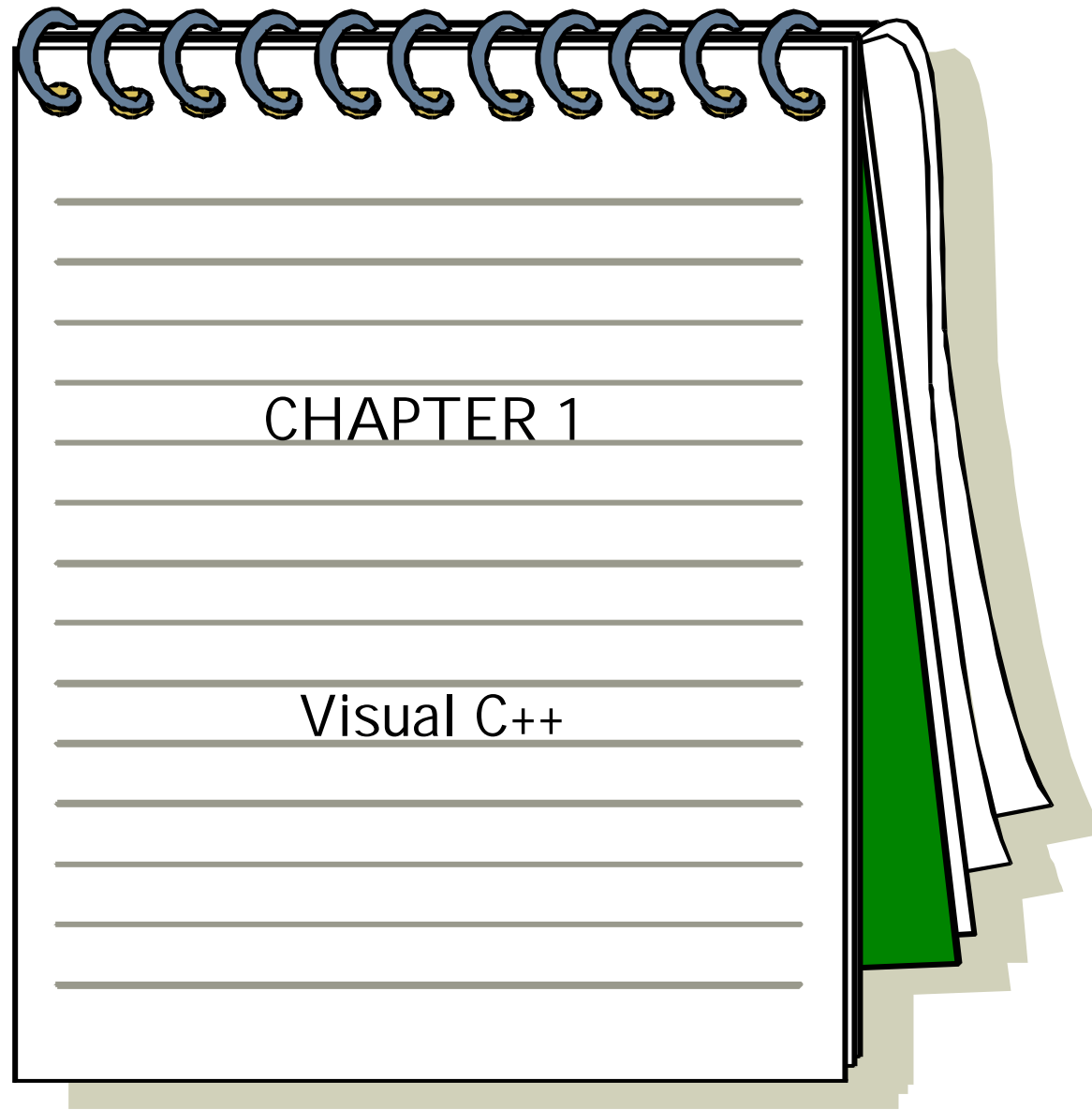
STL

.



"If you can dream it, you can do it"  
가







# CHAPTER 1



(GDI)



.



(device context)

GDI

.



,

.




Bitmap, Icon, Menu, Dialog Box, String

.

# CHAPTER 1



 Accelerator  
가

 Bitmap

 Cursor

32x32 Pixel

 Dialog Box

 Font

 Icon

 Menu

 String Table

 User-defined Resource

가

# CHAPTER 1



\*.c OR \*.cpp



\*.rc



(App Studio)



\*.rc →



Link → \*.EXE



.EXE



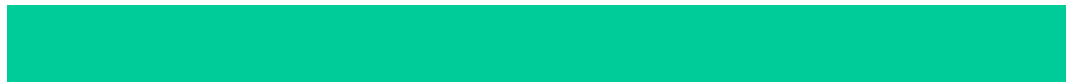
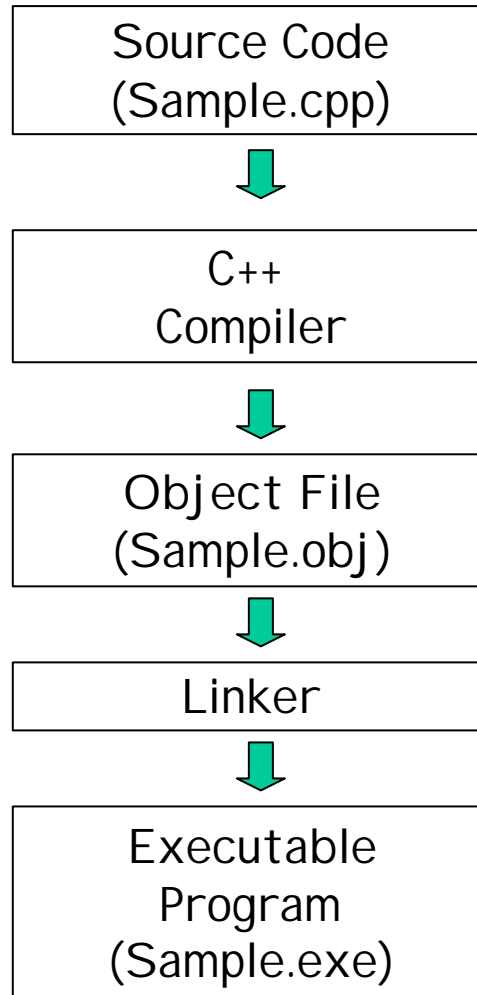
Visual C++ (Components)



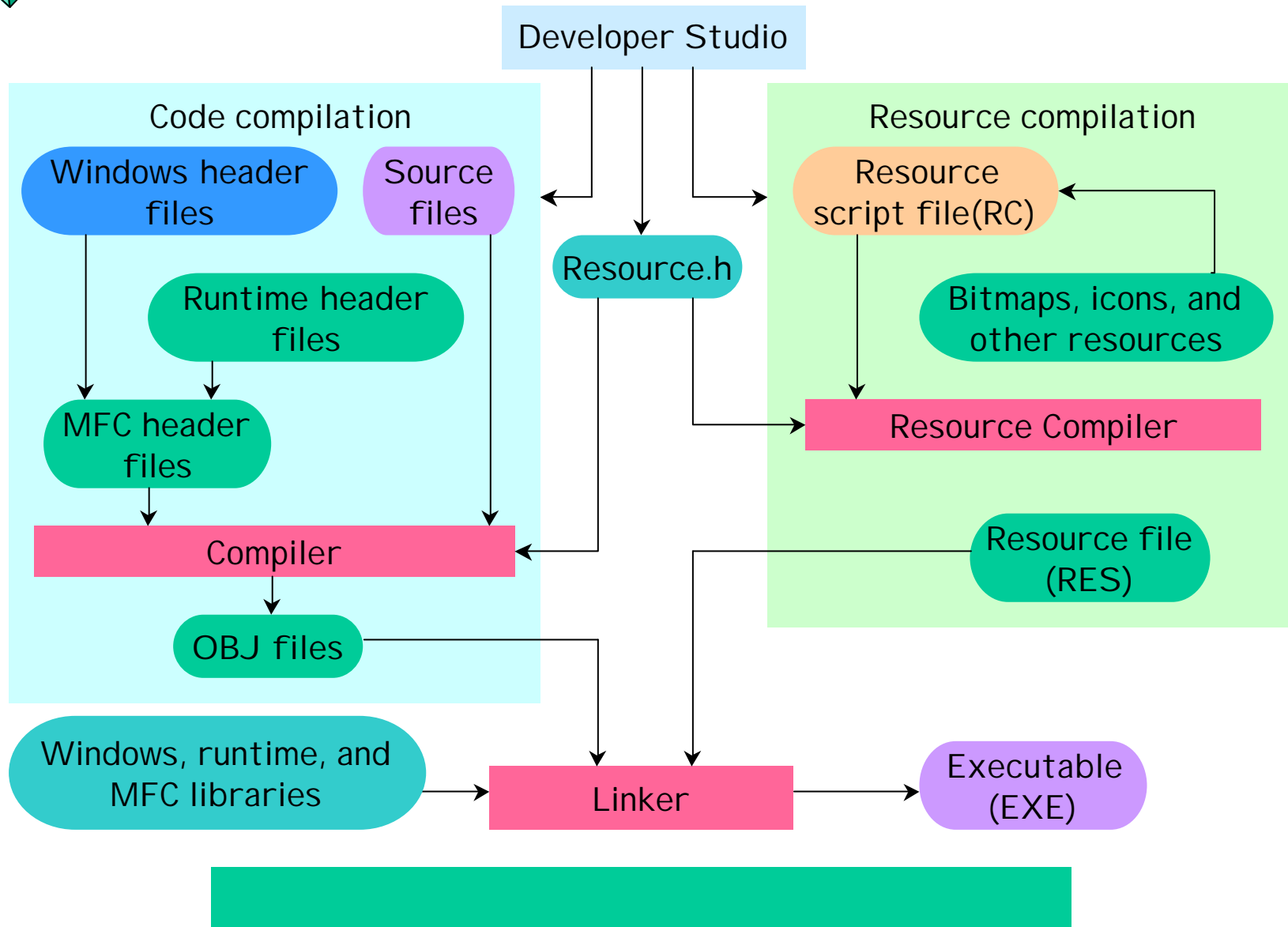
? C Win32

? C++ MFC

# CHAPTER 1



# CHAPTER 1



# CHAPTER 1

 Microsoft Developer Studio97

 Project

?

?

DLL

가

 Make file

?

?

? Visual C++ 4.0 : (.mak)

? Visual C++ 5.0 : (.dsp)



? Developer Studio

(.dsw)

# CHAPTER 1

( )	
APS	
BSC	
CLW	
DSP	*
DSW	*
MAK	
NCB	
OPT	
PLG	
CPP	
H	

# CHAPTER 1

 VC++ CASE(Computer-Aided Software Engineering)

 AppWizard ( )

?

 AppStudio (Resource Editor, )

? (Resource)

? ( , , )

.

 ClassWizard ( )


? AppStudio

.

?

.

# CHAPTER 1

 C/C++ Compiler

 Visual C++

C

C++

,

가

C

C

C++

C++

.

 Resource Compiler

 RC

.res

.

 .rc :

 .res :

 Linker



.obj

.res

,

LIB


, DLL


EXE

.



# CHAPTER 1

 Debugger

 (BreakPoint)



 Debug

Build

가

가

 Release

Debug

Release

# CHAPTER 1



(Windows Diagnostic Tools)



Spy++ :

DevStudio\Vc\bin\Spyxx.exe



MFC Tracer :

DevStudio\Vc\bin\Tracer.exe



Source Browser



Definitions and References ( )

Call Graph/Caller Graph ( )


Derived Class Graph/Base Class Graph ( )


File Outline ( )


# CHAPTER 1

 Online Help

 Developer Studio 97      HTML

 : Help - Contents  
Workspace window가 InfoView

 Topic : Help - Search

 : Help - Search - Query tab -

 F1 : , F1

# CHAPTER 1



(Component Gallery)



 ActiveX

Visual C++ 4.0 : OLE Control(OCX)

 C++

가

 Developer Studio

가



Microsoft Foundation Class Library 4.21



 ActiveX Template Library(ATL)



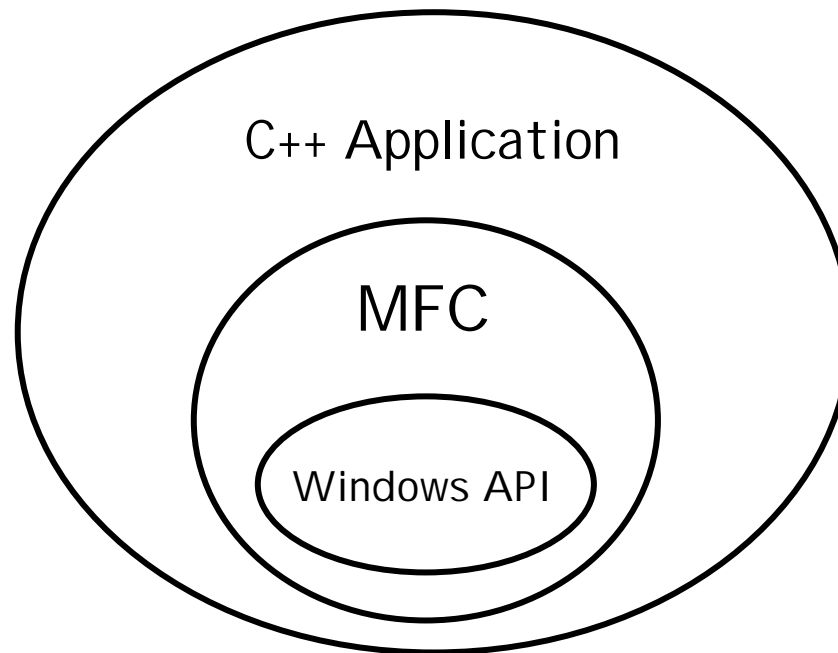
MFC

ActiveX

# MFC (Microsoft Foundation Class)

Microsoft가

C++



API

MFC



# MFC (Microsoft Foundation Class)



(Efficiency)



(Safety)



(Extensibility)

가



(Reusability)

가



(Maintainability)

가

가



(Portability)

가

가



- ? Window management :
- ? Graphic Device Interface(GDI) :
- ? Multiple Document Interface(MDI) :
- ? Menus :
- ? Dialog boxes :
- ? Windows controls :
- ? Windows common dialogs :
- ? OLE(Object Linking & Embedding) :
- ? Application services :



- ? Run-Time Type Information :
- ? Object Persistence :
- ? Collection Classes :
- ? Strings :
- ? Files :
- ? Time and Date :
- ? Exception Handling :



- ? Commands :
- ? Documents and Views :
- ? Printing and Print Preview :
- ? Dialog Data Exchange and Validation(DDX/DDV) :
- ? Context-Sensitive Help :



- ? Form View :
- ? Edit View :
- ? Scrolling View :
- ? Splitter Window :
- ? Toolbars and Status bar :
- ? Dialog Bar and other Control Bars :
  
- ? VBX Controls : VBX



- ? Database Engine classes :
- ? Record Field Exchange(RFX) :
- ? Record View :



## OLE

- ? Visual Editing servers :
- ? Visual Editing containers :
- ? Drag and Drop Structured Storage :
- ? OLE Automation servers : OLE
- ? OLE Automation clients : OLE



- ? Enhanced toolbars : 가
- ? Miniframe windows :
- ? Tabbed dialogs : ( )

## Win32

- ? New Win32 API s : Win32 API
- ? Multithreading : Thread
- ? Unicode support :
- ? Shared 32-bit DLLs : 32 DLL

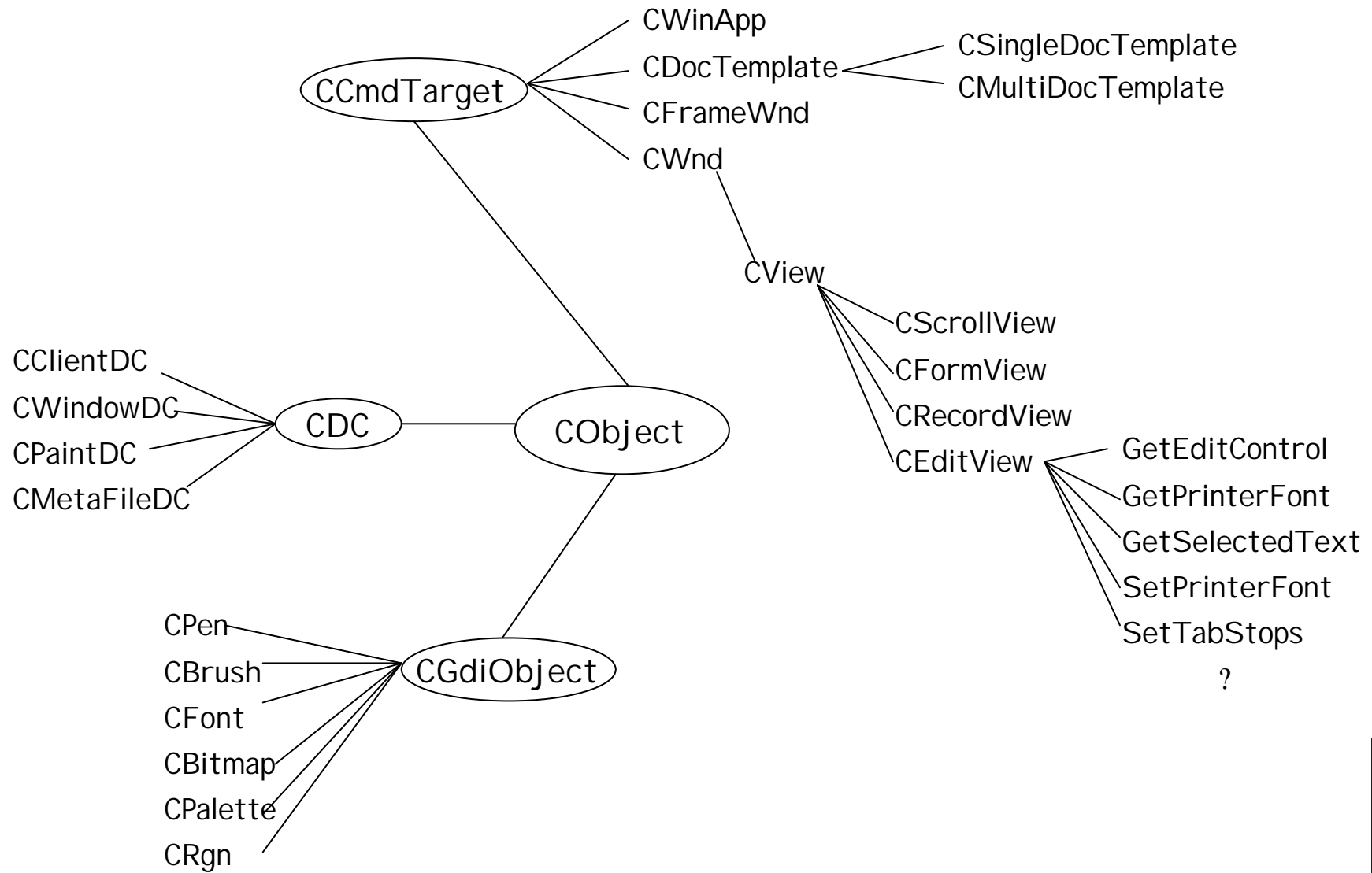


## MFC 3.1 3.2

- ? Windows 95 Common Controls : 95
- ? Simple MAPI : MAPI
- ? Windows Sockets :
- ? Swap-tuned DLL versions : DLL

## MFC 4.0

- ? Containment of OLE Controls : OLE
- ? DAO(Data Access Objects) : MFC
- ? Simplified Windows 95 Common Controls : 95
- ? Windows 95 Common Dialogs : 95
- ? Thread synchronization Objects :



MFC

(Mind Map)



(CObject)



가



(Serialize)

Run-time

Debugging



MFC



CWinApp, CWnd, CDocument, CView



1.



CWinApp :



2. (Command-Related)

 CCmdTarget :

 CCmdUI :  
(enable/disable, check/uncheck)

3.

 CDocTemplate :

 CSingleDocTemplate : SDI

 CMultiDocTemplate : MDI

 CDocument : (Base)

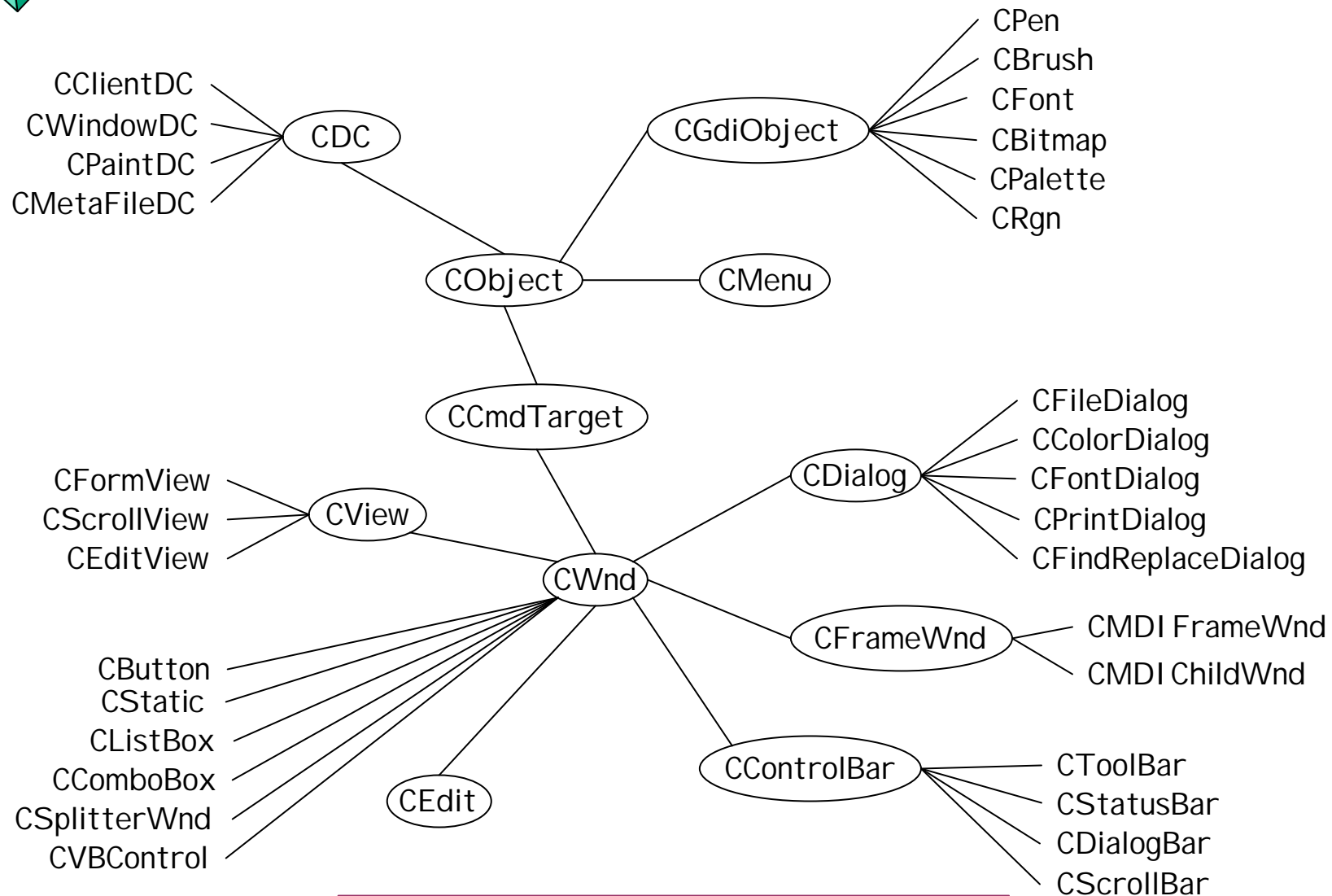
CDocument

 CView :

View CView

 CPrintInfo :

 CCreateContext : CCreateContext



Visual Object Class Mind Map



## Visual Objects

### 1. CWnd

 CWnd :

MFC

(Encapsulation)

SDK

.

 CFrameWnd :

CMDI FrameWnd : MDI

CMDI ChildWnd : MDI

(Child)

### 2. CView

 CView :

 CScrollView : CView

가

.

 CFormView :

가

.

 CEditView :

,

,

.



Visual Objects

3. (Dialog)

CDialog : (Base)

CDialog (Modal)

CDialog (Modeless)

MFC가

CDataExchange : (validation)

CFileDialog : 가

CPrintDialog :

CFontDialog :

CColorDialog :

CFindReplaceDialog :



✍ Visual Objects

4. (Control)

✍ CStatic :

✍ CButton :

✍ CEdit : 가

✍ CListBox :

, 가

✍ CComboBox :

✍ CControlBar :

✍ CStatusBar :

✍ CScrollBar :

✍ CToolBar :

✍ CDialogBar :

✍ CVBControl :

VBX

✍ CSplitterWnd :



## Visual Objects

### 5. (Menu)

 CMenu :

### 6. (Device-Context)

 CDC :

 CPaintDC :

OnPaint()

BeginPaint가

EndPaint가

 CClientDC :

 CWindowDC :

가

 CMetaFileDC :

:

GDI

BMP PCX

가



✍ Visual Objects

7. Drawing( ) Object

✍ CGdiObject : GDI

✍ CBitmap :

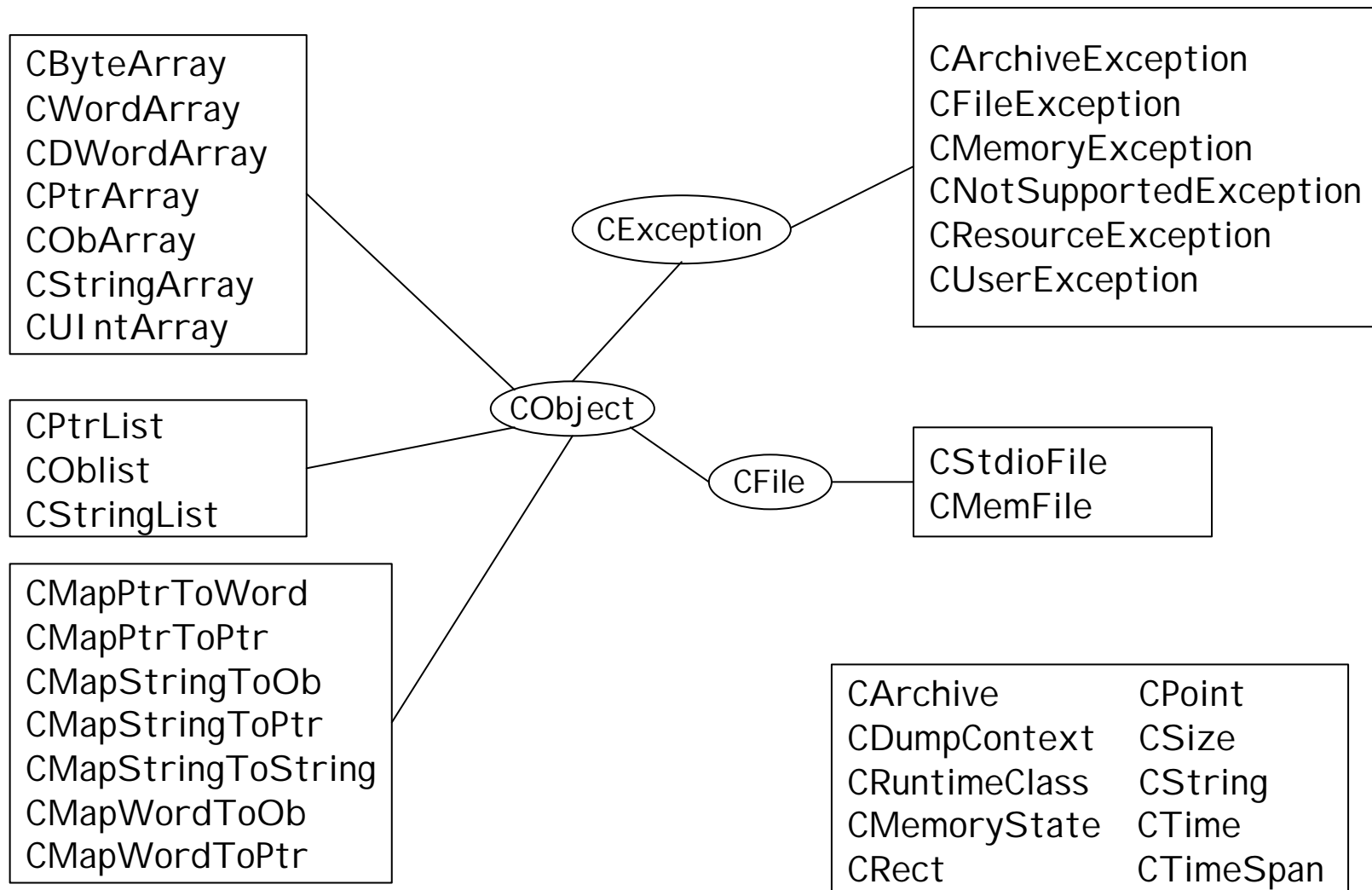
✍ CBrush :

✍ CFont :

✍ CPalette :

✍ CPen :

✍ CRgn :



(General Purpose) Class Mind Map



1.

 CFile : 2

 CMemFile :

 CStdioFile :

 CArchive : CFile

Serialization

2. (Diagnostics)

 CDumpContext :

 CMemoryState :

 CRuntimeClass :



### 3. (Exceptions)

:

가

CException : 가

CArchiveException :

CFileException :

CMemoryException :

CNotSupportedException :

CResourceException :

CUserException : 가

가

가

### 4. (Collections)



CByteArray : BYTE

CDWordArray :

CObArray : CObject

CObject

CPtrArray : (void)

CStringArray : CString


CWordArray : WORD

CUIntArray : UINT




#### 4. (Collections)



 COblist : CObject

CObject

 CPtrList : (void)

 CStringList : CString



 CMapPtrToWord : (void)

WORD

 CMapPtrToPtr : (void)

 CMapStringToOb : CString

CObject

 CMapStringToPtr : CString

CObject void

 CMapStringToString : CString

CString

 CMapWordToOb : WORD

CObject

 CMapWordToPtr : WORD



5.

: MFC

 CPoint :

 CSize :

 CRect :

 CString :

 CTime :

 CTimeSpan :



MFC

 DevStudio\Vc\mfc\include\<afx.h>

1. (Data Types)



SDK



MFC

POSITION : MFC Collection

LPCRECT : RECT

32

# Data Types

BOOL		(TRUE	FALSE)
BYTE	8	unsigned	
WORD	16	unsigned	
UINT	32	unsigned	
DWORD	32	unsigned	or :
LONG	32	signed	
LPVOID	32		
COLORREF		(color)	32
BSTR	32		
LPSTR	32		
LPCSTR	32		
WNDPROC		32	
WPARAM, LPARAM		Callback	
	32		
LRESULT		Callback	
	32		

 DevStudio\Vc\include\Windef.h

(C) 1998 Sang Il Kim

# Data Types

hIcon	가
hCursor	(                      ) 가
hBrush	가
hWnd	가
hMenu	가
hInstance	가
hFont	가
hBitmap	DIB 가
hPalette	(                      ) 가
hPen	가
hTask	가
hDlg	가
hDC	가
hRgn	(clip) 가

 MFC

MFC가



## 2. Run-Time Object Model Service



DECLARE\_DYNAMIC, DECLARE\_DYNCREATE, DECLARE\_SERIAL,  
IMPLEMENT\_DYNAMIC, IMPLEMENT\_DYNCREATE,  
IMPLEMENT\_SERIAL, RUNTIME\_CLASS

## 3. (Diagnostic Services)



MFC

가

.



\_\_\_\_\_ afx , \_\_\_\_\_ Afx .



: ASSERT, ASSERT\_VALID, DEBUG\_NEW, TRACE, VERIFY



: afxDump, afxMemDF, afxTraceEnabled, afxTraceFlags



: AfxCheckMemory, AfxDump, AfxEnabledMemoryTracking,  
AfxIsMemoryBlock, AfxIsValidAddress, AfxIsValidString,  
AfxSetAllocHook, AfxDoForAllClasses



#### 4. (Exception Processing)



(  
, ) .



TRY, CATCH, AND\_CATCH, END\_CATCH, THROW, THROW\_LAST



AfxThrowArchiveException, AfxThrowFileException,  
AfxThrowMemoryException, AfxThrowNotSupportedException,  
AfxThrowResourceException, AfxThrowUserException, AfxAbort( )

#### 5. CString



.



: AfxFormatString1, AfxFormatString2, AfxMessageBox



## 6. (Message Maps)



MFC 가

.



```
DECLARE_MESSAGE_MAP //  
BEGIN_MESSAGE_MAP, END_MESSAGE_MAP //
```



```
ON_COMMAND, ON_CONTROL, ON_MESSAGE, ON_VBXEVENT  
ON_REGISTERED_MESSAGE, ON_UPDATED_COMMAND_UI
```



7.



AfxGetApp, AfxGetAppName, AfxGetInstanceHandle, AfxGetMainWnd,  
AfxGetResourceHandle, AfxRegisterWndClass, AfxRegisterVBEvent,  
AfxSetResourceHandle

8. ID



ID

: ID

) ID\_FILE\_OPEN :

ID



ID (

ID)

: AFX\_ID



DevStudio\Vc\mfc\include\<afxres.h>



## 9. 가 (Hungarian Notation)



a	Array	lp	Long Pointer
ai	Integer Array	lpfn	Function Pointer
b	Boolean	lpsz	String Pointer
by	Unsigned Char(Byte)	m	Data member of a class
c	Char	n	Short or Int
cb	Count of bytes	np	Near Pointer
cr	Color Reference Value	p	Pointer
cx, cy	Short(count of x, y length)	psz	String Pointer
dw	Unsigned long(dword)	s	String
f	Flag(On/Off)	sz	0 terminated String(NULL)
fn	Function	tm	Text Metric
h	Handle	w	Unsigned Int(Word)
i	Integer	x, y	Short(x, y coordinate)
l	Long		



 가

hWndMain	Main	(Wnd)	가	(h)	
aDice	Dice	long	(a)		
lpzText	Text	NULL	(sz)	가	(lp)
cdwPixels		(dw)	,		
	Pixels				



MFC

 OLE









 OLE

 OLE

 OLE

 OLE

OLE

 OLE

Cole

OLE

OLE

OLE



## MFC

✍ MFC가

✍ point rect

Win32 API

CImageList	
COleCurrency	CURRENCY 4 가 15 가 ,
COleDateTime	OLE DATE
COleDateTimeSpan	COleDateTime
COleVariant	OLE
CPoint	SDK POINT (x,y)
CRect	SDK RECT
CSize	
CString	
CTime	
CTimeSpan	

(C) 1998 Sang I Kim



MFC



CcmdUI



CWaitCursor



CRectTracker



Win32

C++

MFC

가



CSemaphore



CMutex



CCriticalSection



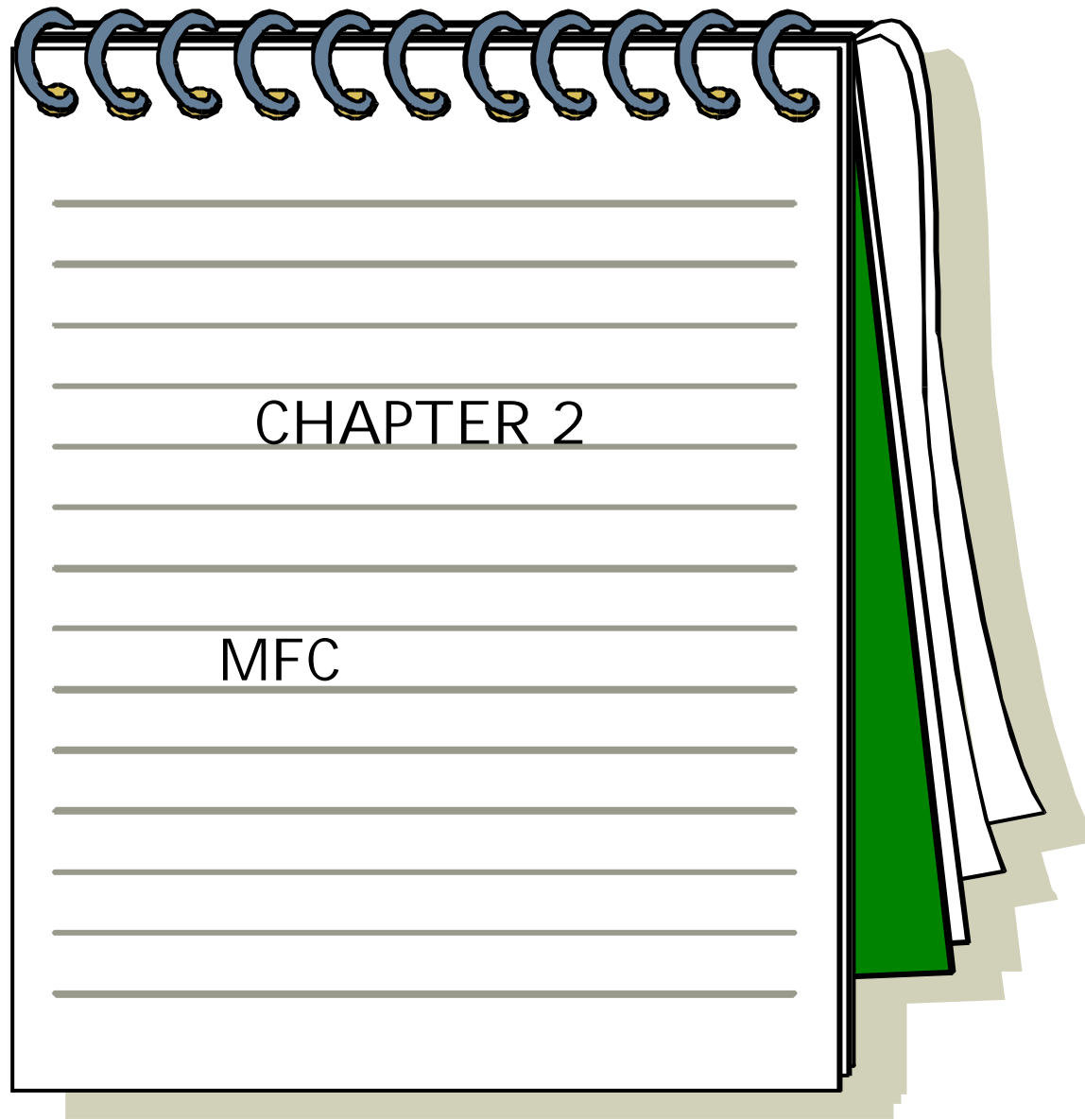
CEvent



, CObject



 MFC



# CHAPTER 2



(Application Framework)



.



C++

.



(Application Framework)



MFC

AFX



(Application Framework) AFX

.



AFX

1994

.

# CHAPTER 2

 (Message Processing)

 :

 : 가 .


 , WinMain() .

 MFC WinMain() ,

CWinApp .

 WM\_ .

 WM\_LBUTTONDOWN ( )

 가 .

# CHAPTER 2



typedef struct tagMSG

{

    HWND        hwnd;    //

    UINT        message;  //

    WPARAM     wParam;    //

    LPARAM     lParam;    //

    DWORD      time;      //     가

    POINT      pt;        //     가

};

hwnd -           가 0(NULL) ,

message -                   WINDOWS.H

```
typedef struct tagPOINT
{
    LONG x; //
    LONG y; //
} POINT;    //
```

가

가



# CHAPTER 2



BM	
CB	
DM	
EM	
LB	
SBM	
WM	

# CHAPTER 2



( 1 )	0x0000-0x03FF
	0x0400-0x7FFF
( 2 )	0x8000-0xBFFF
	0xC000-0xFFFF



## MFC

AfxGetApp	CWinApp .
AfxGetAppName	.
AfxGetInstanceHandle	AfxWinInit() .
AfxGetResourceHandle	AfxWinInit() .

# CHAPTER 2



가



Message Event

Message Driven



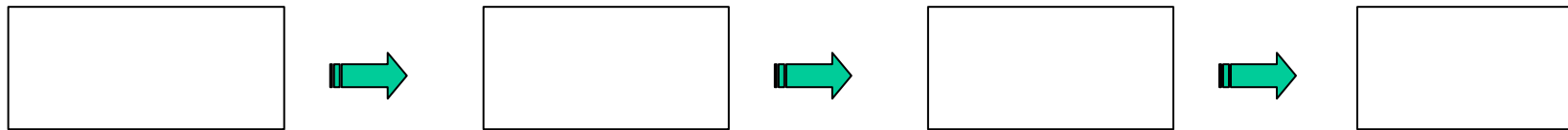
Hardware Event Queue




System Queue



# CHAPTER 2



 (Handle)



 HWND ( )

 HICON ( )

 HMENU ( )

# CHAPTER 2



(Instance)



? \_\_\_\_\_

/

.



/

/

.

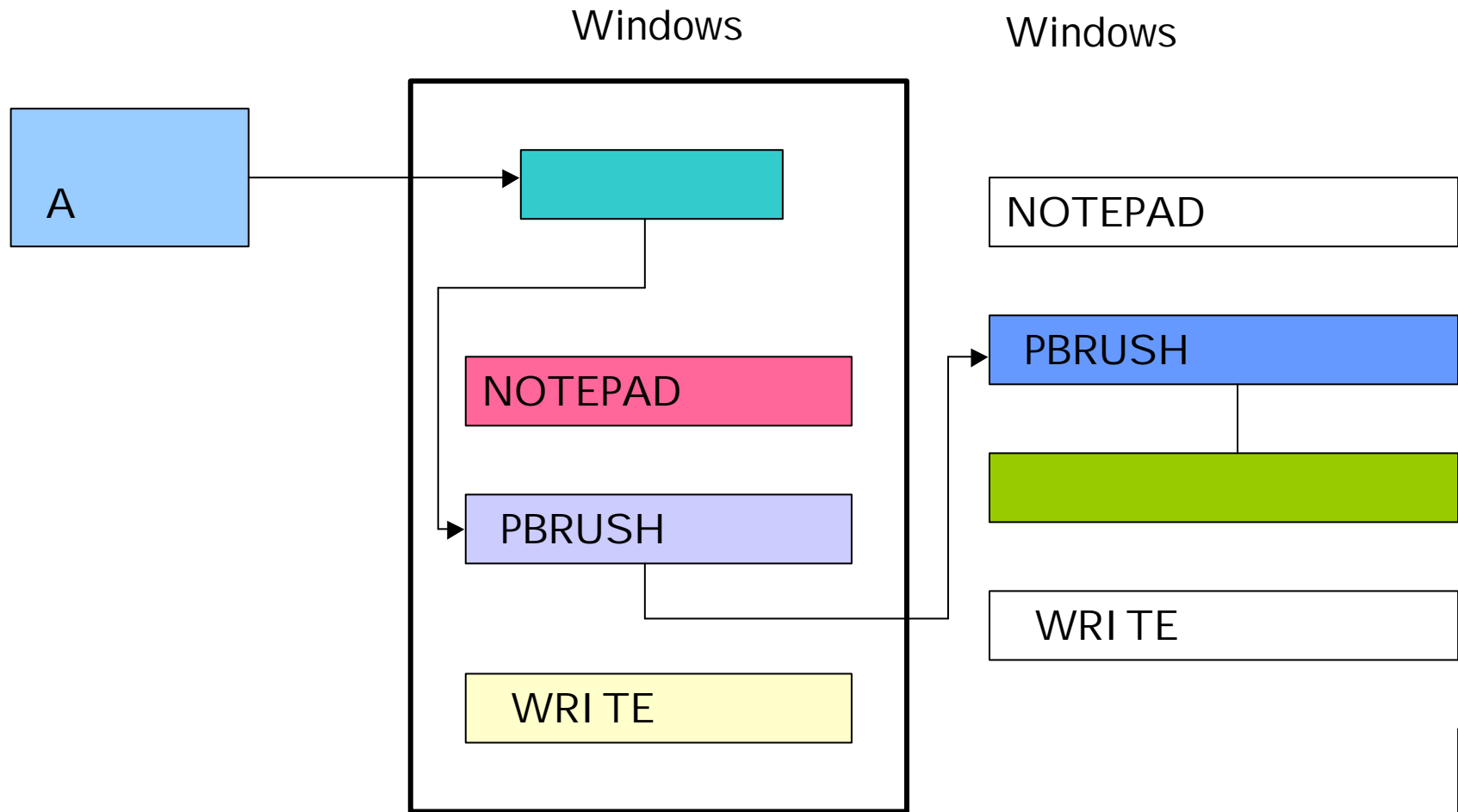


.



.

# CHAPTER 2



# CHAPTER 2



가

( )



WM\_



WM\_LBUTTONDOWN (

)



WM\_DESTROY (

)



WINDOWS.H

.



가

(notification)

.



가

,

가

.



?

?

?

# CHAPTER 2



WM\_  
, WM\_COMMAND - MFC



가

가

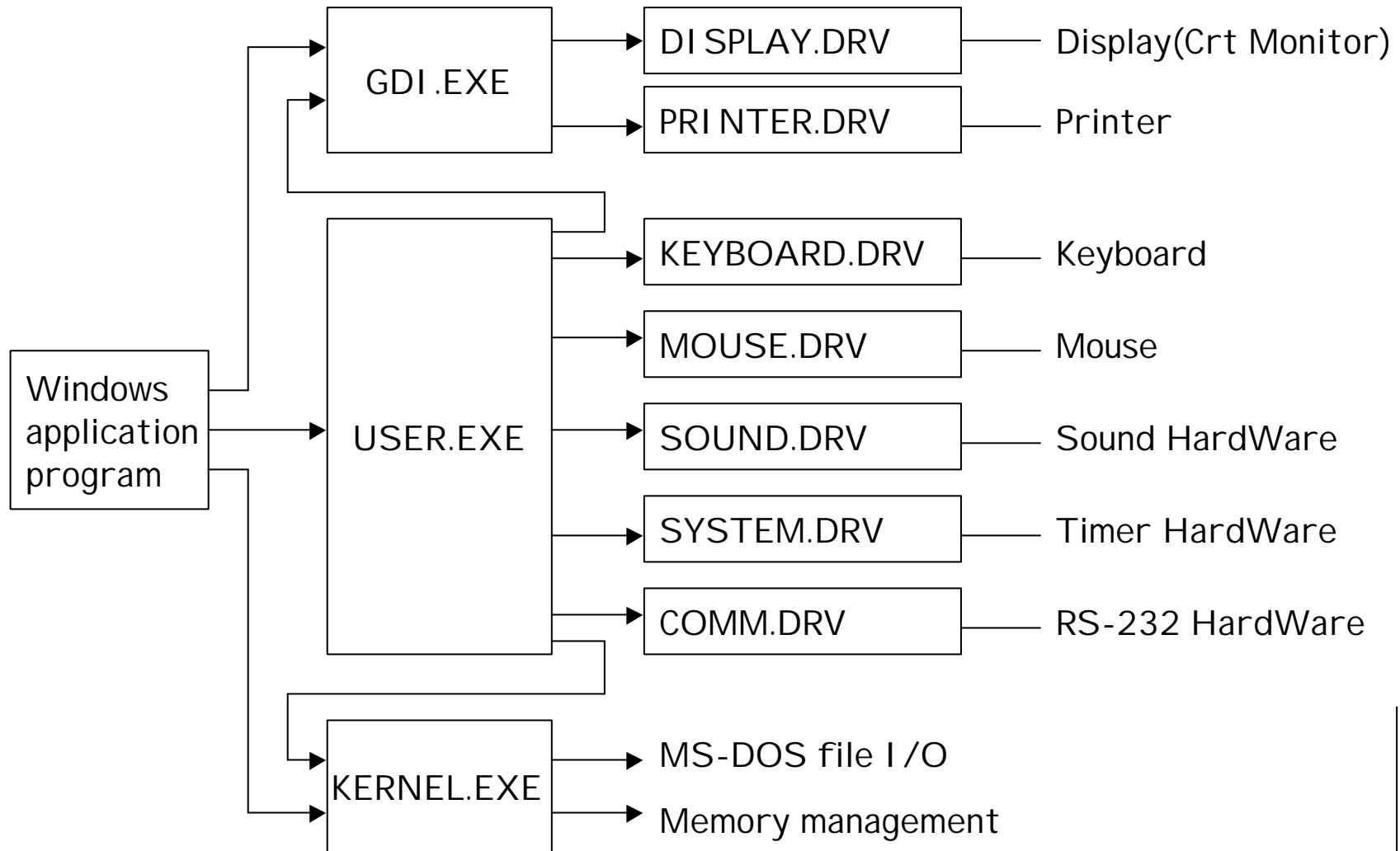
WM\_COMMAND  
WM\_COMMAND  
MFC  
가

, MFC가



WM\_COMMAND

# CHAPTER 2





## CHAPTER 2



OLE

(DLL)  
(VBX)  
(OCX)



(Run-time)



가



DLL



? DLLs



가 DLLs



USER32.DLL, GDI 32.DLL, KERNEL32.DLL

DLL



DLL Win32

(API)

# CHAPTER 2

(VBX)  
 VBX 가 DLL .  
 VBX .  
 16 .  
 OLE (OCX)  
 VBX OLE2.0 .  
 16 32  
 .  
 (API)  
 가 , (  
 )  
 가 ,

# CHAPTER 2

Win16 (API)  
 Win16 (.EXE) , DLL

Win32 (API)  
 16 32  
 Win32 API 가 .

Win16 API	Win32 API	
USER.EXE	USER32.DLL	USER , , , ,
GDI .EXE	GDI 32.DLL	GDI , ,
KRNL386.EXE	KERNEL32.DLL	KERNEL ,

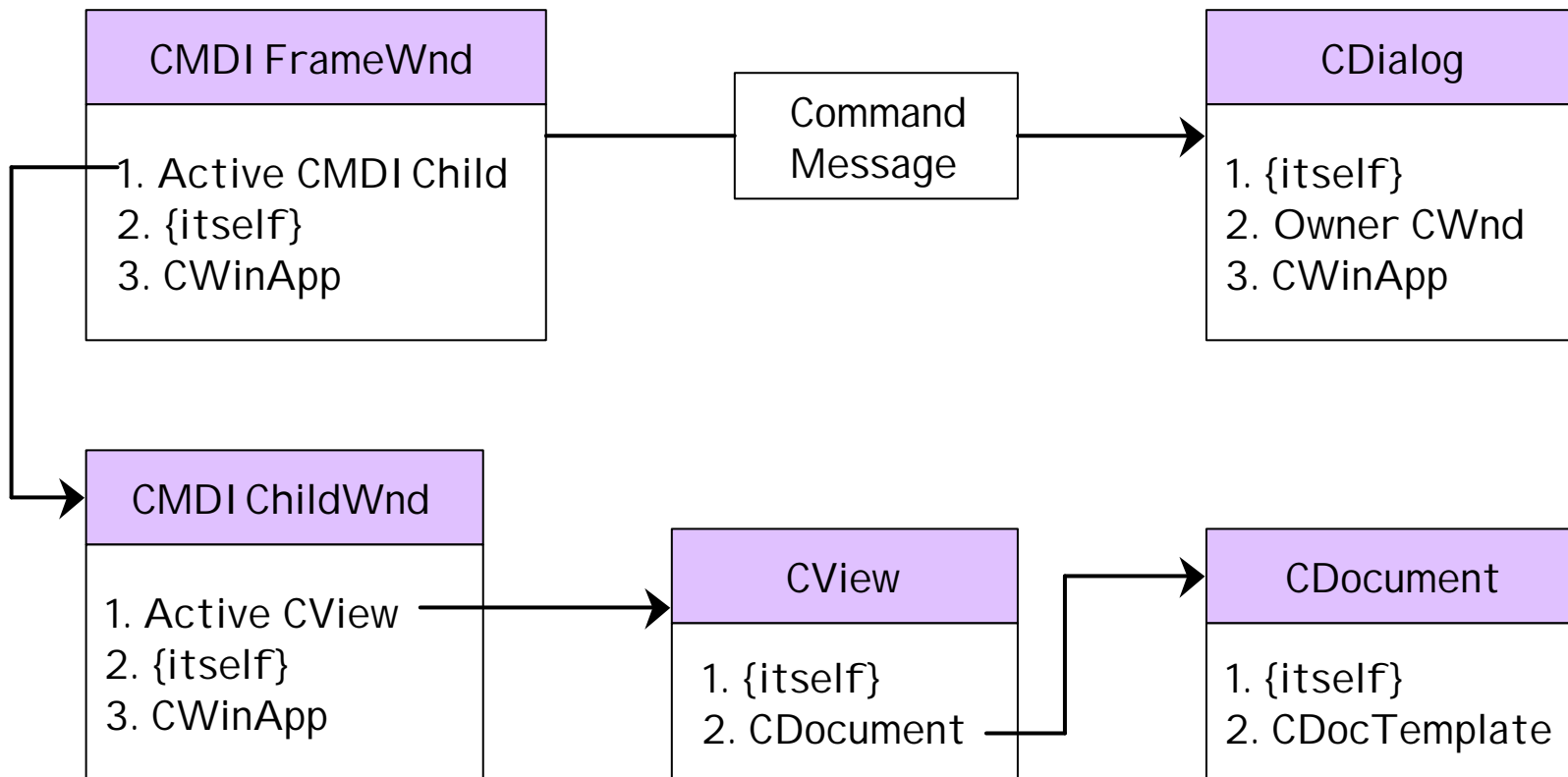
# CHAPTER 2



CCmdTarget CCmdUI	C++ (map) . ( , 가 .)

# CHAPTER 2

MFC



# CHAPTER 2

 (Message Map)

 ? C++ (map)

 , 가 vtable .

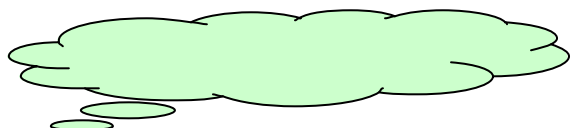
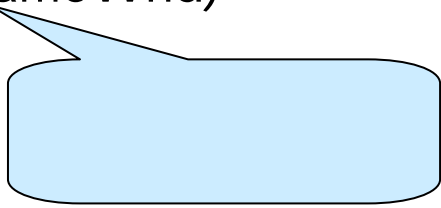
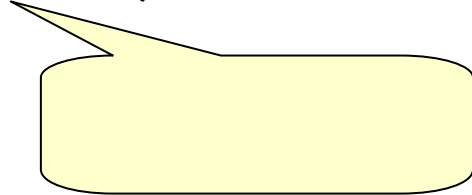
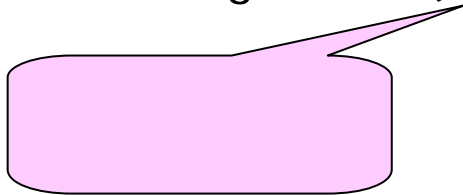
 BEGIN\_MESSAGE\_MAP(CMyFrame, CMyFrameWnd)

ON\_WM\_PAINT()

ON\_WM\_LBUTTONDOWN()

END\_MESSAGE\_MAP()

 ON\_MessageName(ID, ClassMethod)



# CHAPTER 2



가

WM\_COMMAND



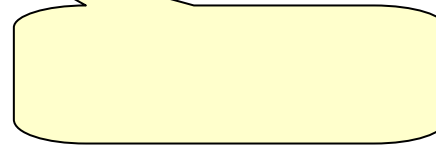
WM\_COMMAND

ON\_COMMAND

가



ON\_COMMAND(ID, ClassMethod)



afx\_msg void ClassMethod();

# CHAPTER 2



가

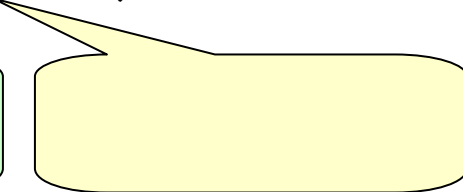
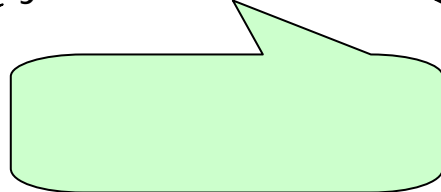
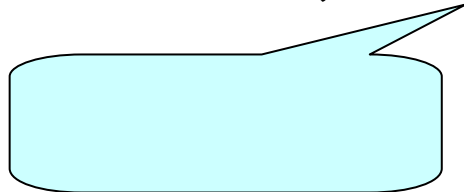
(Button)

(Combo)

(Edit)

(List)

ON\_CONTROL (wNotifyCode, I D, ClassMethod)



# CHAPTER 2



ON\_BN\_\*EVENT\* (ID, ClassMethod)



ON\_BN\_\*EVENT\*

BN\_\*( )

ON\_BN\_CLICKED

ON\_BN\_DISABLE

ON\_BN\_DOUBLECLICKED

ON\_BN\_HILITE

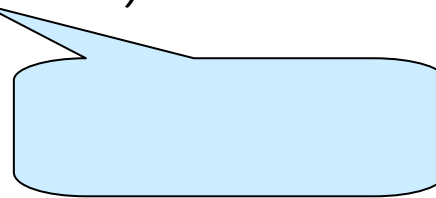
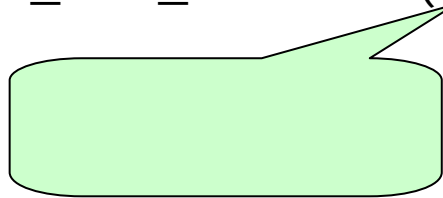
ON\_BN\_PAINT

ON\_BN\_UNHILITE

# CHAPTER 2



ON\_CBN\_\*EVENT\* (ID, ClassMethod)



 ON\_CBN\_\*EVENT\*

CBN\_\*( )

ON\_CBN\_CLOSEUP

ON\_CBN\_DBLCLK

ON\_CBN\_DROPDOWN

ON\_CBN\_EDITCHANGE

ON\_CBN\_EDITUPDATE

ON\_CBN\_ERRSPACE

ON\_CBN\_KILLFOCUS

ON\_CBN\_SELCHANGE

ON\_CBN\_SELENDCANCEL

ON\_CBN\_SELENDOK

ON\_CBN\_SETFOCUS

# CHAPTER 2



ON\_EN\_\*EVENT\* (ID, ClassMethod)



ON\_EN\_\*EVENT\*

EN\_\*( )

ON\_EN\_CHANGE

ON\_EN\_ERRSPACE

ON\_EN\_HSCROLL

ON\_EN\_KILLFOCUS

ON\_EN\_MAXTEXT

ON\_EN\_SETFOCUS

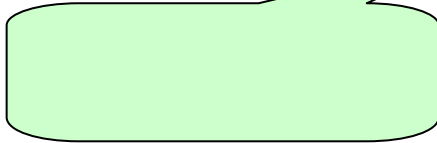
ON\_EN\_UPDATE

ON\_EN\_VSCROLL

# CHAPTER 2



ON\_LBN\_\*EVENT\* (ID, ClassMethod)



ON\_LBN\_\*EVENT\*

LBN\_\*( )

ON\_LBN\_DBLCLK

ON\_LBN\_ERRSPACE

ON\_LBN\_KILLFOCUS

ON\_LBN\_SELCANCEL

ON\_LBN\_SELCHANGE

ON\_LBN\_SETFOCUS

# CHAPTER 2

✍ MFC가

✍ Win32가

ON\_MESSAGE()

✍

, WM\_SETREDRAW

MFC

✍

, ON\_MESSAGE()

ON\_MESSAGE(WM\_SETREDRAW, OnSetReDraw)

✍

OnSetReDraw()

afx\_msg LRESULT OnSetReDraw(WPARAM wParam, LPARAM lParam);

✍

wParam lParam MSG

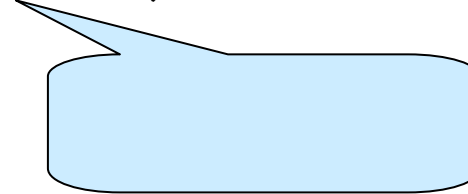
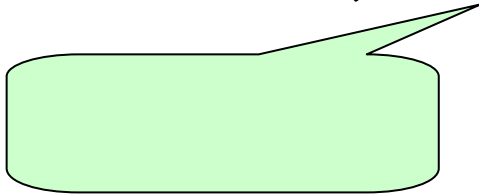
# CHAPTER 2



가



ON\_MESSAGE (MessageMacro, ClassMethod)



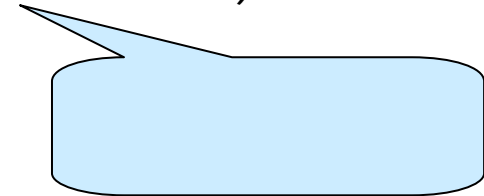
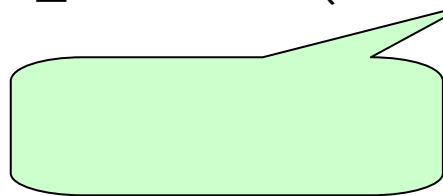
ClassMethod()

afx\_msg LONG ClassMethod (UINT, LONG);

# CHAPTER 2



ON\_REGISTERED\_MESSAGE (MessageMacro, ClassMethod)



ClassMethod()

.

afx\_msg LONG ClassMethod (UINT, LONG);



WM_PAINT WM_LBUTTONDOWN WM_CHAR	ON_WM_PAINT() ON_WM_LBUTTONDOWN() ON_WM_CHAR()	void OnPaint() void OnLButtonDown(UINT nFlags, CPoint point) void OnChar(UINT nChar, UINT nRepCnt, UINT nFlags)

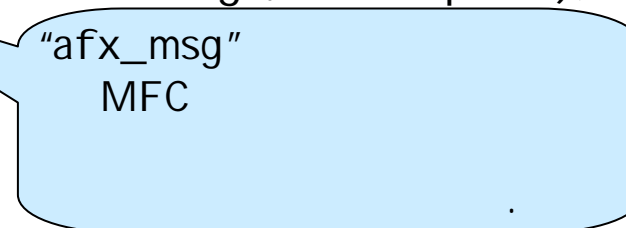
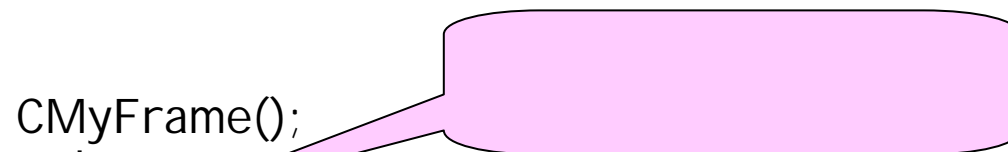
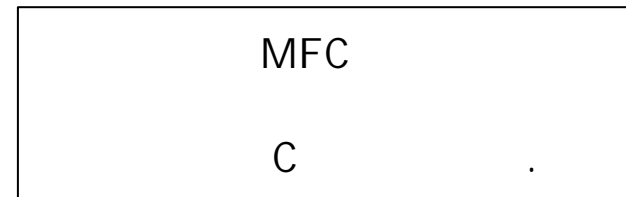
# CHAPTER 2



(.h)

```
//
class CMyApp : public CWinApp
{
public:
    virtual BOOL InitInstance();
};

//
class CMyFrame: public CMainFrame
{
public:
    CMyFrame();
protected:
    afx_msg void OnLButtonDown(UINT nFlags, CPoint point);
    afx_msg void OnPaint();
    DECLARE_MESSAGE_MAP()
};
```



## CHAPTER 2



(.cpp)

```
#include <afxwin.h> //          가          MFC
#include "myapp.h"
CMyApp theApp; //          CMyApp
BOOL CMyApp::InitInstance()
{
    m_pMainWnd = new CMyFrame();
    m_pMainWnd -> ShowWindow(m_nCmdShow);
    m_pMainWnd -> UpdateWindow();
    return TRUE;
}

BEGIN_MESSAGE_MAP (CMyFrame, CFrameWnd)
    ON_WM_PAINT()
    ON_WM_LBUTTONDOWN()
END_MESSAGE_MAP()
```

# CHAPTER 2



```
CMyFrame::CMyFrame()
{
    Create(NULL, "MYAPP Application");
}

void CMyFrame::OnPaint()
{
    CPaintDC dc(this);
    dc.TextOut(0, 0, "Hello, world!");
}

void CMyFrame::OnLButtonDown(UINT nFlags, CPoint point)
{
    TRACE("Entering CMyFrame::OnLButtonDown -
          %lx, %d, %d\n", (long)nFlags, point.x, point.y);
}
```

# CHAPTER 2

✍ WinMain()

✍

✍ CMyAPP

✍ CMyAPP

✍ CMyApp::InitInstance()

✍

✍ CWinApp::Run()

✍ CWinAPP

✍

✍ CMyFrame

✍

✍ CFrameWnd Create()

가

# CHAPTER 2

✍ CMyFrame::OnLButtonDown()

✍ WM\_LBUTTONDOWN()

✍ CMyFrame::Onpaint()

✍ WM\_PAINT()

✍

✍

➡ WinMain()

➡ CWinApp

.

➡ InitInstance()

➡ Run()

✍

(Shutdown)

✍ CMyFrame

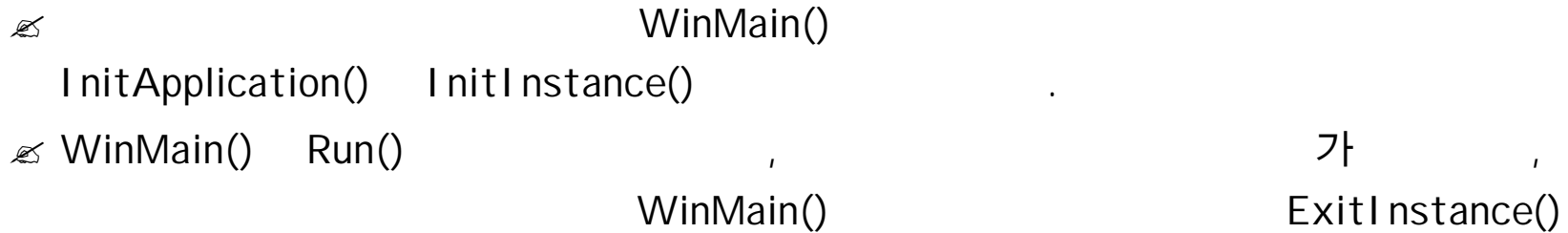
➡ Run()

➡ WinMain()

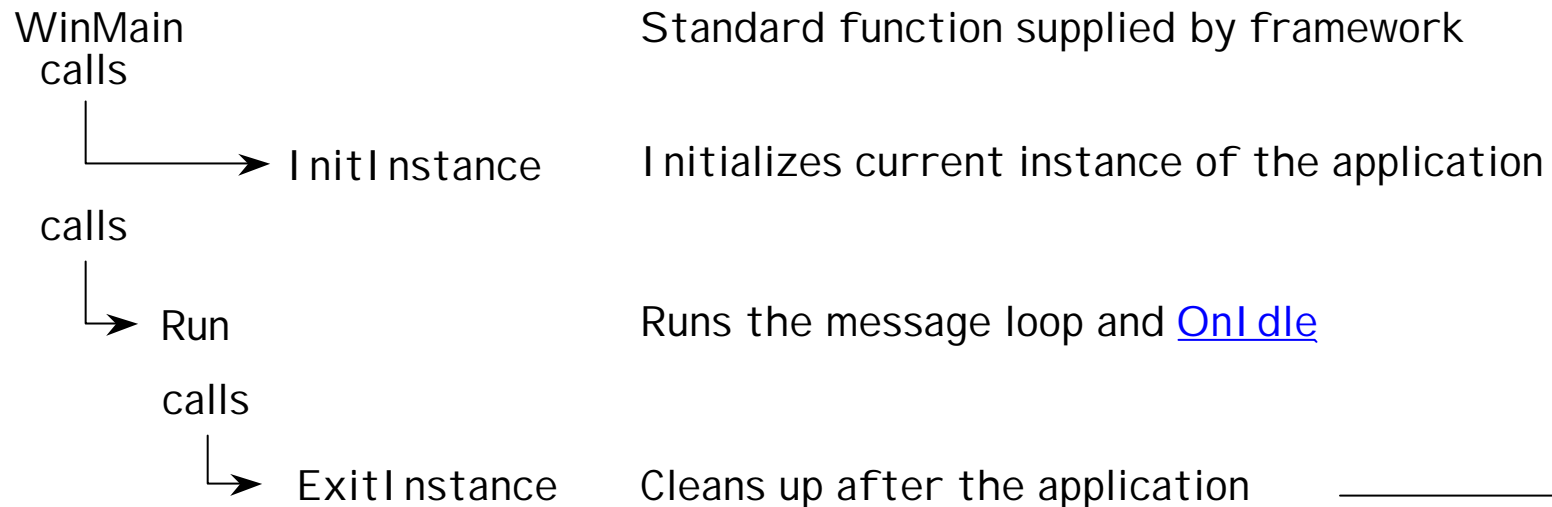
➡ CMyApp

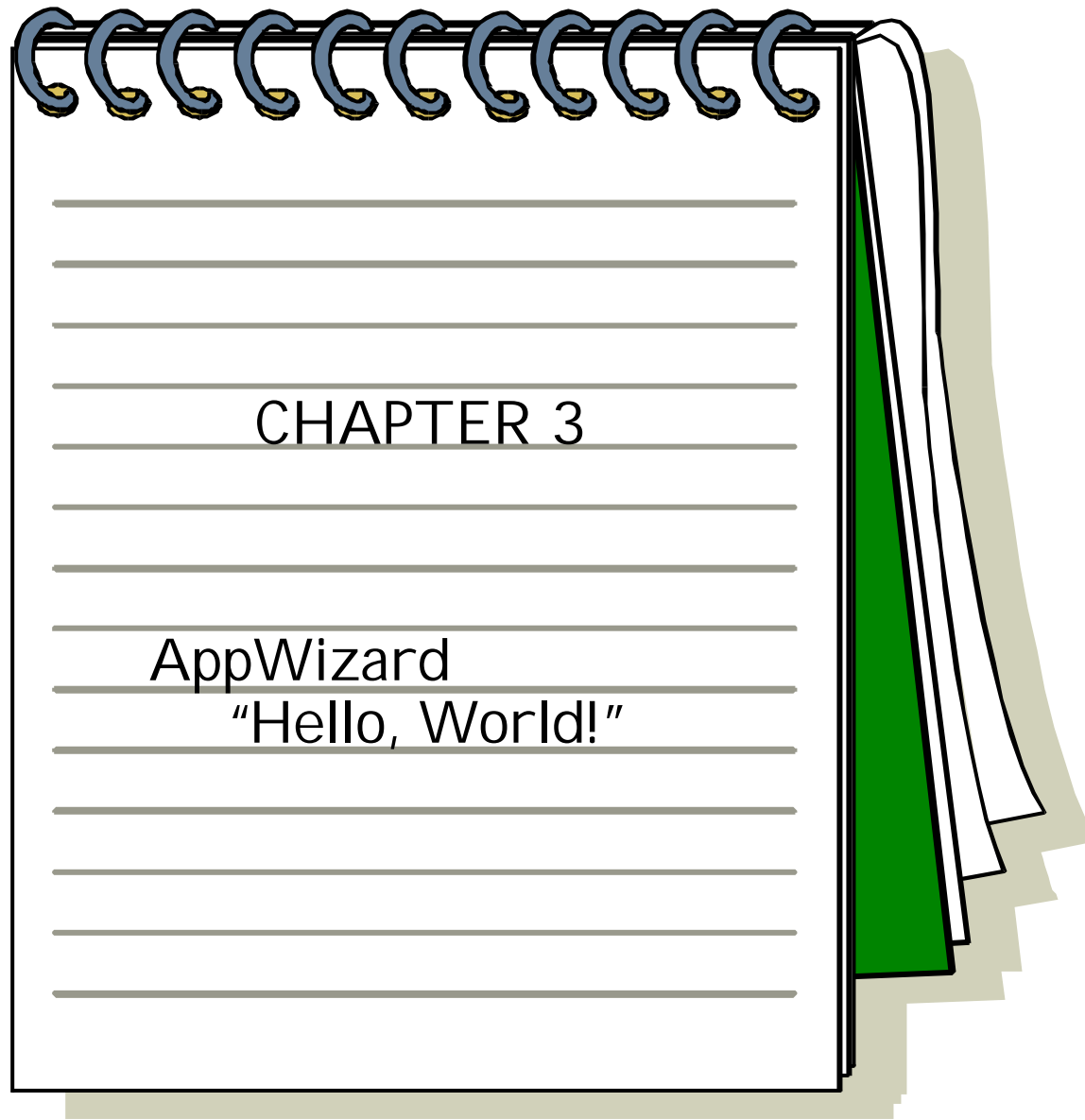
# CHAPTER 2

## Sequence of Execution



- `CWinApp` is derived from `CWinThread`.
- Represents the main thread of execution for your application.
- In recent versions of MFC, the `InitInstance`, `Run`, `ExitInstance`, and `OnIdle` member functions are actually in class `CWinThread`.







# CHAPTER 3



(Documents and Views)



File

Open

Save

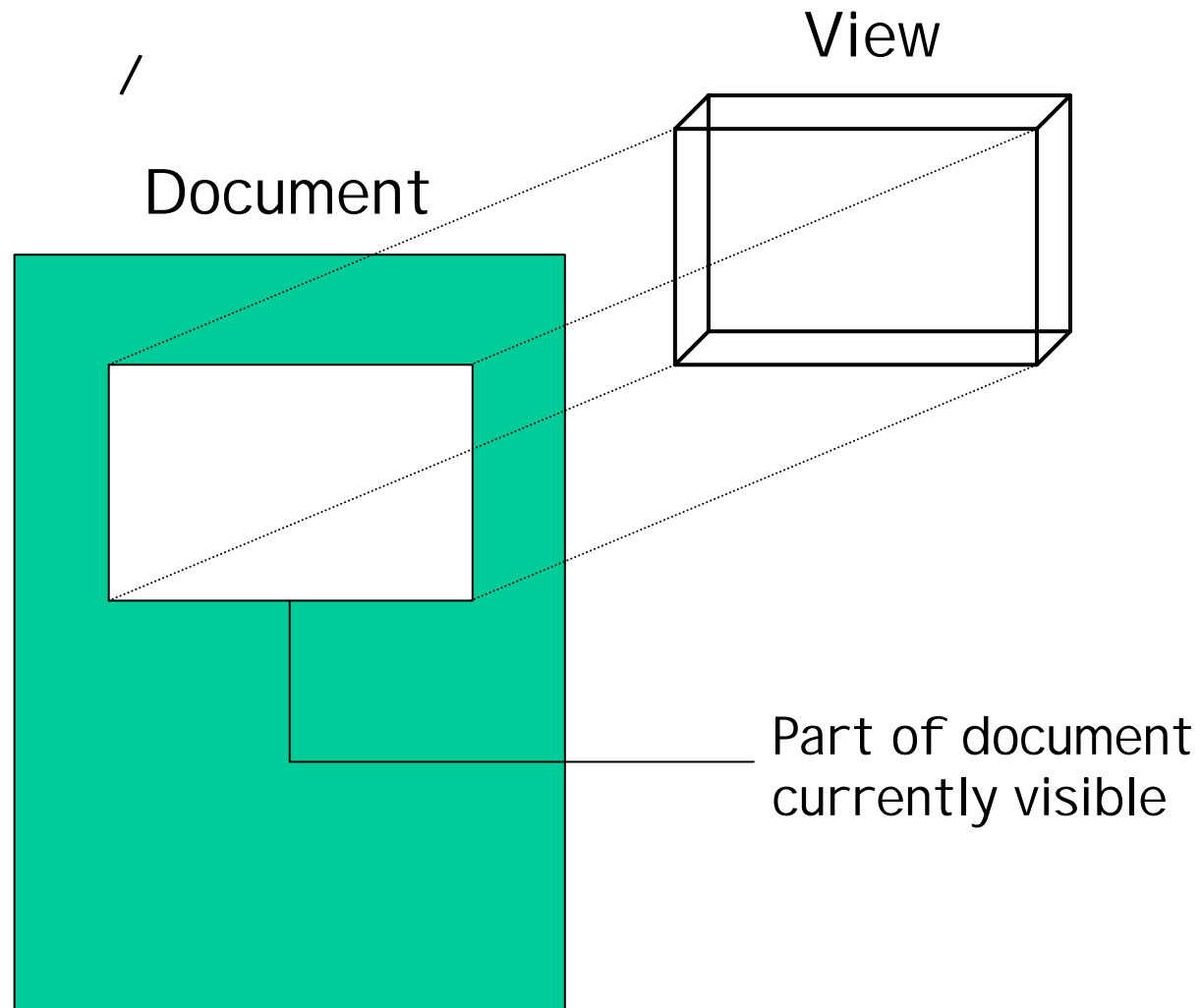


I/O


# CHAPTER 3



/



# CHAPTER 3

 (View)



? 가 .



? MFC

CView

C++

.

 MFC



(H)



(CPP)



(SDI)

(MDI)

 SDI

?

가

.

?

.

? Notepad

 MDI

?

(child)

가

.

?

.

? Word,

(Hangul)

# CHAPTER 3

✍ OnDraw()

✍ CView 가

✍ 가

✍ 가

? Invalidate() ( InvalidateRect())

? Invalidate()가 OnDraw() 가 .

✍ CView::OnDraw

✍ virtual void OnDraw( **CDC** \* *pDC* ) = 0;

✍ Parameters

? *pDC*



~~**bool**~~ *declarators*;

- ✗ This keyword is an integral type.
- ✗ A variable of this type can have values [true](#) and [false](#).
- ✗ `!false == true`  
`!true == false`
- ✗ `if (expres1) statement1;`  
If expres1 is true, statement1 is always executed; if expres1 is false, statement1 is never executed.

~~👉~~ CDC::TextOut

- ```
virtual BOOL TextOut( int x, int y, LPCTSTR lpszString, int nCount);  
BOOL TextOut( int x, int y, const CString& str);
```

## Parameters

~~가~~가 x ( ).

~~y~~ 가 y ( ).

## lpszString

~~nCount~~ IpszString 가 .

~~str~~ CString .



# SelectStockObject( )

✍ virtual CGdiObject\* SelectStockObject(**int** *nIndex*);

✍ Parameters

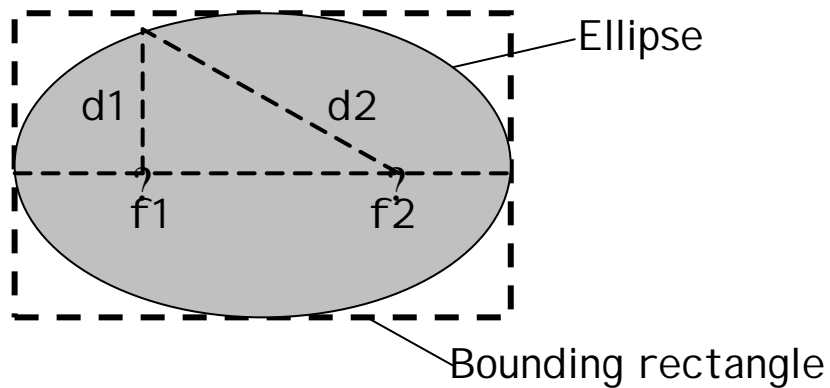
| BLACK_BRUSH         |                         |
|---------------------|-------------------------|
| DKGRAY_BRUSH        |                         |
| GRAY_BRUSH          |                         |
| HOLLOW_BRUSH        |                         |
| LTGRAY_BRUSH        |                         |
| NULL_BRUSH          |                         |
| WHITE_BRUSH         |                         |
| BLACK_PEN           |                         |
| NULL_PEN            |                         |
| WHITE_PEN           |                         |
| ANSI_FIXED_FONT     | ANSI                    |
| ANSI_VAR_FONT       | ANSI 가                  |
| DEVICE_DEFAULT_FONT | (Device-dependent)      |
| OEM_FIXED_FONT      | OEM                     |
| SYSTEM_FONT         | ( , )                   |
| SYSTEM_FIXED_FONT   | (Fixed-width) (Win3.0 ) |
| DEFAULT_PALETTE     | (Default color palette) |


(C) 1998 Sang Il Kim

# Ellipse

## About Ellipses -

An ellipse is a closed curve defined by two fixed points ( $f1$  and  $f2$ ) such that the sum of the distances ( $d1 + d2$ ) from any point on the curve to the two fixed points is constant.



 `BOOL Ellipse(int x1, int y1, int x2, int y2);`

 `BOOL Ellipse(LPCRECT lpRect);`

 Parameters

 *lpRect*

RECT

CRect









 :  $y2 - y1$

 :  $x2 - x1$ .

# CHAPTER 3

## Visual C++

- The visual design step
- The code-writing step


| <p>  <br/>  <br/>  <br/>  <br/>  (Debug)         </p> | <p>  <br/> AppWizard </p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <p>  <br/>  (Release)         </p>                                                                                                                                                                                                                                                                       | <p> ResourceView </p>                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p> ClassWizard </p>                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>가</p>                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>가</p>                                                                                                   |


# CHAPTER 3

 (Diagnostic Macros) 가

 TRACE - .

 가  
( ).

 TRACER (... \Vc\bin\Tracer.exe) Enable  
tracing .

 TraceEnabled = 1

 (Precompiled Headers)

 AppWizard



 /Yx .





 /Yc, /Yu .

# CHAPTER 3

 (Precompiled Headers)

 StdAfx.cpp

 #include "StdAfx.h" //

 #include

 #include <afxwin.h> // MFC

 #include <afxext.h> // MFC

 #include <afxole.h> // MFC OLE compound document

 #include <afxdisp.h> // Automation      ActiveX

 #include <afxtempl.h> // (p519)

 #include <afxcmn.h> // MFC

 #include <afxdlgs.h> // MFC

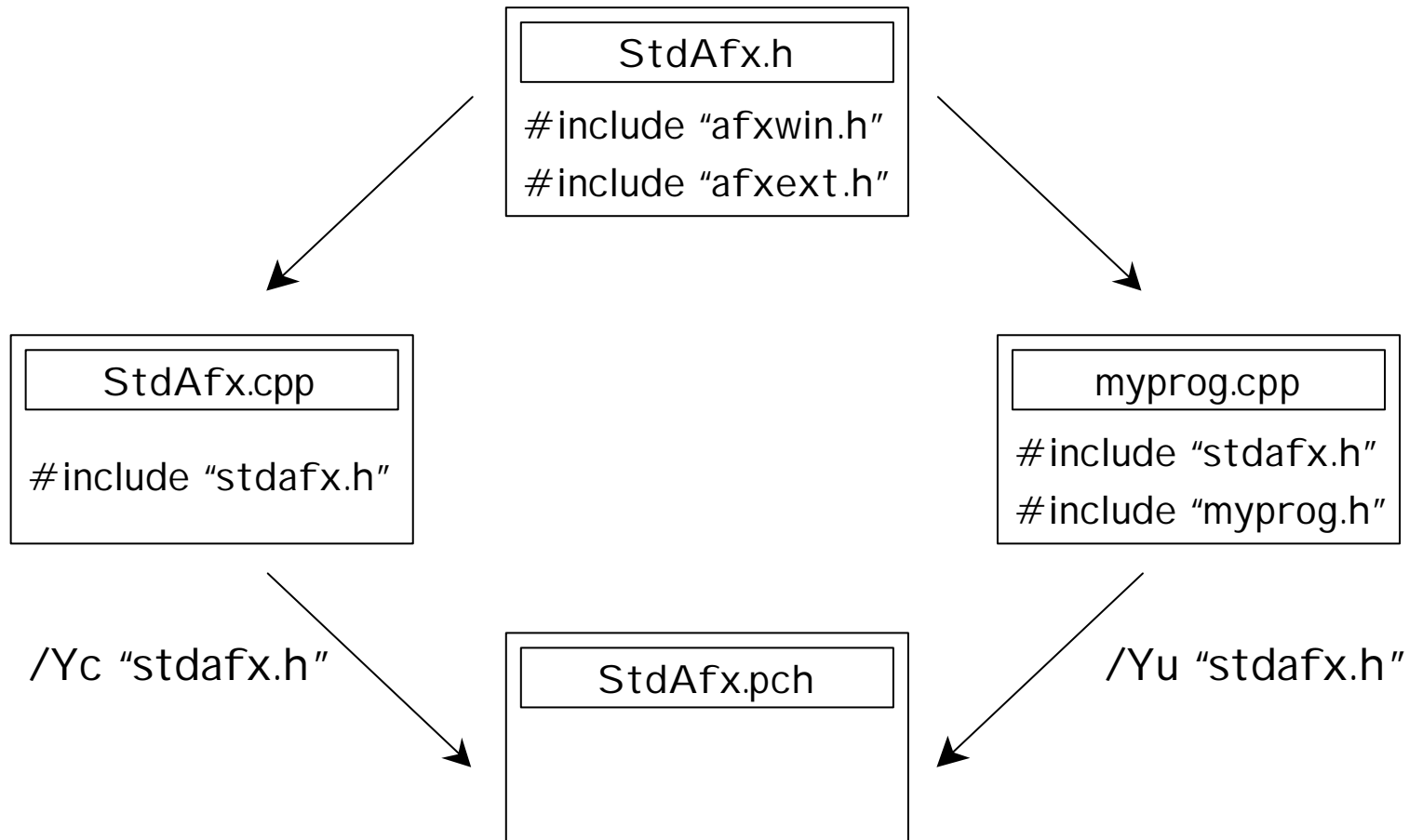
 #include <afxres.h> // MFC

 가

 Developer Studio : Ctrl + F5

 Debugger : F5

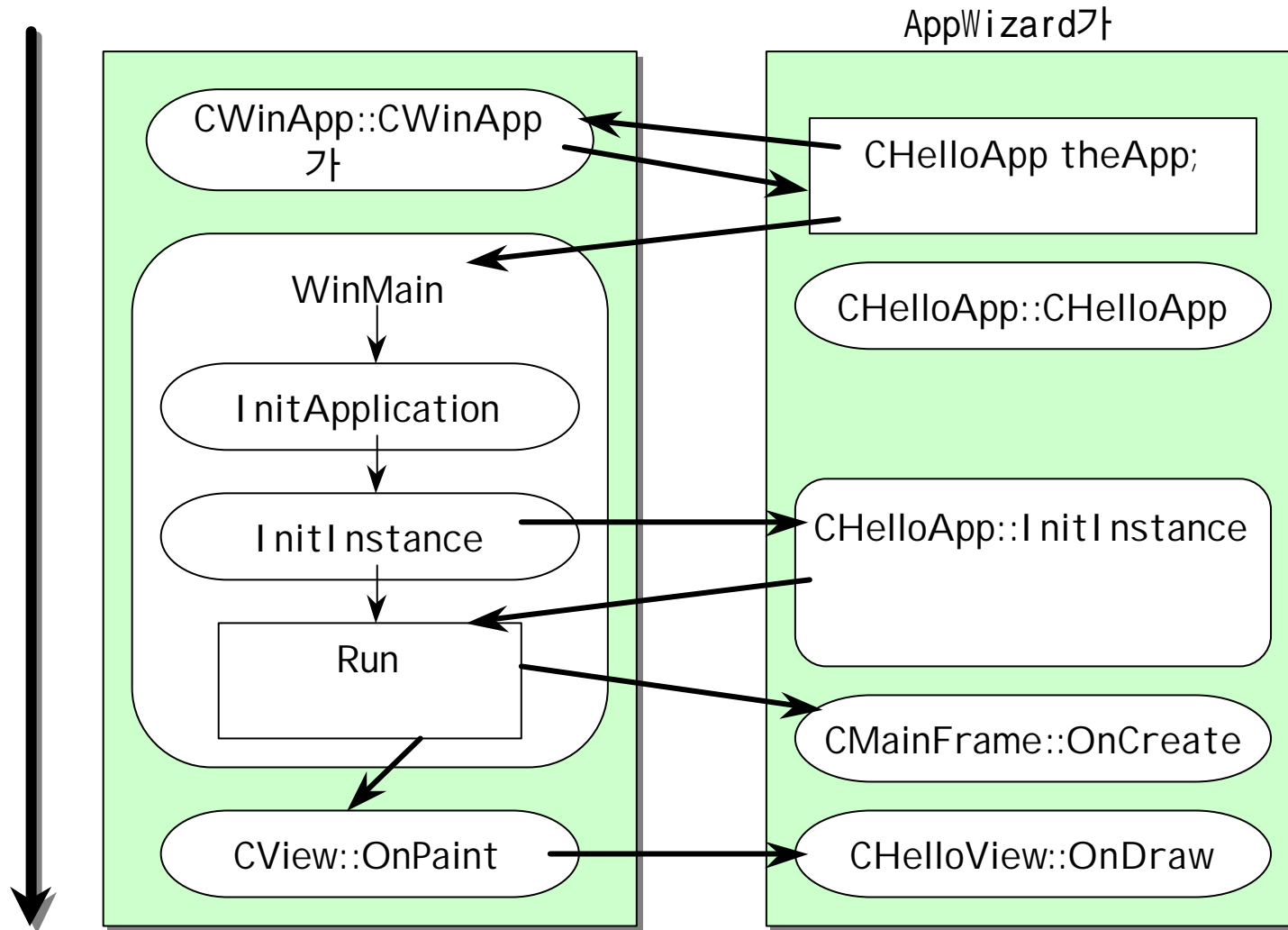
# CHAPTER 3



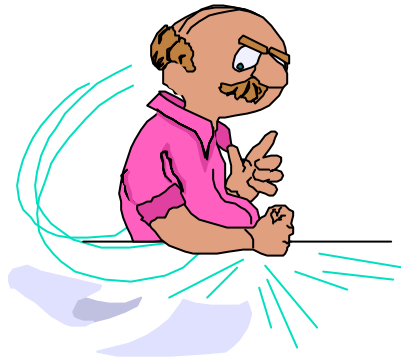
/Fp "path" sets path for this file

Visual C++

# CHAPTER 3



Hello World

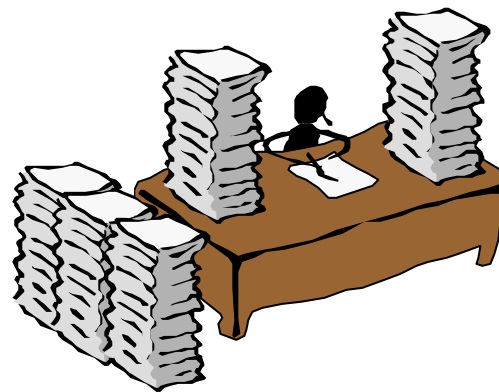


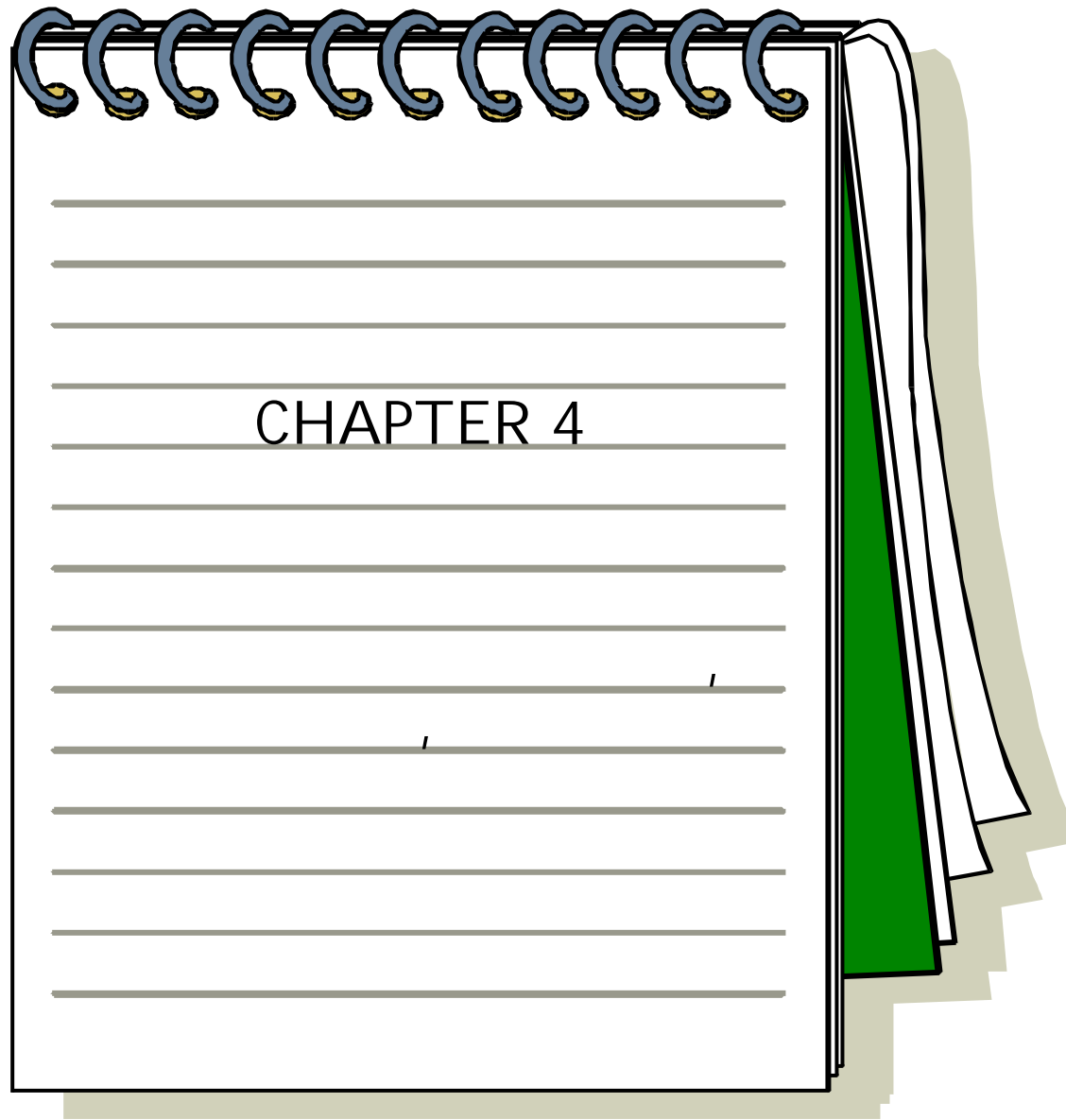
A B C

Ability(     )

Brain(     )

Challenge(     )





# CHAPTER 4

가 가

On

OnKeyDown(), OnLButtonDown()

가 가

가 .

가 .

CHAPTER 2

가 . →

WM\_LBUTTONDOWN  
WM\_LBUTTONDOWN

가

가

가

# CHAPTER 4

```
< , >
afx_msg void OnLButtonDown(UINT nFlags, CPoint point);
afx_msg 가 .

< , >
void CMyView::OnLButtonDown(UINT nFlags, CPoint point)
{
    // ...
    ( x, y )
}

OnLButtonDown()

< , >
DECLARE_MESSAGE_MAP()

< , >
BEGIN_MESSAGE_MAP(CMyView, CView)
    ON_WM_LBUTTONDOWN()
END_MESSAGE_MAP()
```

+

x, y  
( )

# CHAPTER 4

✍ WM\_XXX

MFC

| WM_CHAR        | afx_msg void OnChar(UINT, UINT, UINT)    |
|----------------|------------------------------------------|
| WM_CREATE      | afx_msg int OnCreate(LPCREATESTRUCT)     |
| WM_LBUTTONDOWN | afx_msg void OnLButtonDown(UINT, CPoint) |
| WM_DESTROY     | afx_msg void OnDestroy()                 |
| WM_LBUTTONUP   | afx_msg void OnLButtonUp(UINT, CPoint)   |
| WM_MOUSEMOVE   | afx_msg void OnMouseMove(UINT, CPoint)   |
| WM_PAINT       | afx_msg void OnPaint()                   |
| WM_SIZE        | afx_msg void OnSize(UINT, int, int)      |

# CHAPTER 4

✍ - 가 .

✍ rectEllipse

✍ CRect

✍ m\_nColor

✍ .

✍

✍ CMyView::CMyView() : m\_rectEllipse(0, 0, 200, 200) {...}

✍ MFC

m\_

✍ (Invalidate Rectangle)

✍

✍ OnLButtonDown() ➡ InvalidateRect() ➡ WM\_PAINT

➡ OnDraw() ➡ Invalidate Rectangle

# CHAPTER 4

 (Client Area)

 , , , .

 GetClientRect() :

 .


 CRect, CPoint, CSize

 DevStudio\Vc\mfc\include\<afxwin.h> (60, 137, 171, 212 line)




 CRect *left, top, right, bottom*

 CPoint *x, y*

 CSize *cx, cy*

 가

```
 if(m_rectEllipse.PtInRect(point)) {  
    // 가  
}
```

# CHAPTER 4



가



CRgn

, PtInRegion()



CRgn rgn;

rgn.CreateEllipticRgnIndirect(m\_rectEllipse);

if(rgn.PtInRegion(point)) {

// 가

}



CRect

LPRECT



CWnd::InvalidateRect()



void InvalidateRect( **LPCRECT** lpRect, **BOOL** bErase = **TRUE** );

CRect LPRECT() 가

가 CRect

가 LPRECT



CRect rectClient;

GetClientRect(rectClient); //

# CHAPTER 4

✎ CWnd::Invalidate -

✎ NULL 가

✎

✎

가 WM\_PAINT

✎

가

✎ void Invalidate( BOOL *bErase* = TRUE );

✎ CWnd::InvalidateRect -

✎ void InvalidateRect( LPCRECT *lpRect*, BOOL *bErase* = TRUE );

✎ Parameters

✎ *lpRect*

RECT

CRect

NULL

✎ *bErase*

TRUE.

WM\_ERASEBKGND

# CHAPTER 4

✍ Size

✍ CSize Size() const;

✍ CSize .  
 ✍ (width) x .  
 ✍ (height) y .  
 ✍ 가 .  
 ✍

✍ CRect rect(1,1,5,7);

CSize size;

size = rect.Size(); // size 4,6 .

# CHAPTER 4

## ✍ Rectangle

✍ BOOL Rectangle(int x1, int y1, int x2, int y2);

✍ BOOL Rectangle(LPCRECT lpRect);

## ✍ Parameters

|         |   |   |      |
|---------|---|---|------|
| ✍x1     | x | ( | )    |
| ✍y1     | y | ( | )    |
| ✍x2     | x | ( | )    |
| ✍y2     | y | ( | )    |
| ✍lpRect | ( | ) | RECT |

CRect

# CHAPTER 4

WM\_PAINT 가

가 , .

가 .

SendMessage() WM\_PAINT

ScrollWindow() , ScrollDC() .

WM\_PAINT  
InvalidateRect() , InvalidateRgn() .

가

가 가 .

가 .

(Drag) .

# CHAPTER 4



가



MFC가

| ON_WM_MOUSEMOVE()      | 가   |
|------------------------|-----|
| ON_WM_LBUTTONDOWNCLK() | 가   |
| ON_WM_LBUTTONDOWN()    | 가   |
| ON_WM_LBUTTONUP()      | 가   |
| ON_WM_MBUTTONDOWNCLK() | 가 가 |
| ON_WM_MBUTTONDOWN()    | 가 가 |
| ON_WM_MBUTTONUP()      | 가 가 |
| ON_WM_RBUTTONDOWNCLK() | 가   |
| ON_WM_RBUTTONDOWN()    | 가   |
| ON_WM_RBUTTONUP()      | 가   |

# CHAPTER 4



가

(Pointing Device)

가



WM\_MOUSEMOVE

가

가

(

가

)

가

```
class CWnd : public CCmdTarget
{
protected:
    afx_msg void OnMouseMove(UINT nFlags, CPoint point);
    :
}
```



CWnd

protected

# CHAPTER 4

✍ OnMouseMove()

nFlags

| nFlags     |         |
|------------|---------|
| MK_CONTROL | Ctrl    |
| MK_LBUTTON | .       |
| MK_MBUTTON | 가 .     |
| MK_RBUTTON | .       |
| MK_SHIFT   | Shift . |

✍ windows.h #define

✍ void CMainFrame::OnMouseMove(UINT nFlags, CPoint point)

```
{
    if(nFlags & MK_SHIFT) // Shift
    else if(nFlags & MK_LBUTTON) //
}
```

# CHAPTER 4



| Button | Button Down                                        | Button Up                                    | Button DoubleClick                                                |
|--------|----------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------|
| 가      | WM_LBUTTONDOWN<br>WM_MBUTTONDOWN<br>WM_RBUTTONDOWN | WM_LBUTTONUP<br>WM_MBUTTONUP<br>WM_RBUTTONUP | WM_LBUTTONDOWNBLCLK<br>WM_MBUTTONDOWNBLCLK<br>WM_RBUTTONDOWNBLCLK |

```
class CWnd : public CCmdTarget
{
    protected: //
        afx_msg void OnLButtonDown(UI NT nFlags, CPoint point);
        afx_msg void OnLButtonUp(UI NT nFlags, CPoint point);
        afx_msg void OnLButtonDbIClk(UI NT nFlags, CPoint point);
        afx_msg void OnMButtonDown(UI NT nFlags, CPoint point);
        afx_msg void OnMButtonUp(UI NT nFlags, CPoint point);
        afx_msg void OnMButtonDbIClk(UI NT nFlags, CPoint point);
        afx_msg void OnRButtonDown(UI NT nFlags, CPoint point);
        afx_msg void OnRButtonUp(UI NT nFlags, CPoint point);
        afx_msg void OnRButtonDbIClk(UI NT nFlags, CPoint point);
}
```

CWnd                      protected

# CHAPTER 4



가

WM\_\*BUTTONDOWN



가

가



WM\_\*BUTTONDOWN

가

WM\_\*BUTTONUP



가

# CHAPTER 4





 CMainFrame CFrameWnd  
가 ,


```
BEGIN_MESSAGE_MAP (CMainFrame, CFrameWnd)
    ON_WM_LBUTTONDOWN()
    ON_WM_RBUTTONDOWN()
    ON_WM_LBUTTONUP()
    ON_WM_RBUTTONUP()
    ON_WM_MOUSEMOVE()
END_MESSAGE_MAP()
```

# CHAPTER 4




 CMainFrame::OnLButtonDown() 가  
BOOL (m\_bLMouseDown),  
가 .


 void CMainWnd::OnLButtonDown (UI NT nFlags, CPoint point)  
{  
    m\_bLMouseDown = TRUE; //  
    CFrameWnd::OnLButtonDown (nFlags, point); //  
}


 void CMainWnd::OnLButtonUp (UI NT nFlags, CPoint point)  
{  
    m\_bLMouseDown = FALSE; //  
    CFrameWnd::OnLButtonUp (nFlags, point); //  
}

# CHAPTER 4



 CMainFrame::OnLButtonDown() 가  
BOOL (m\_bLMouseDown),  
가 .

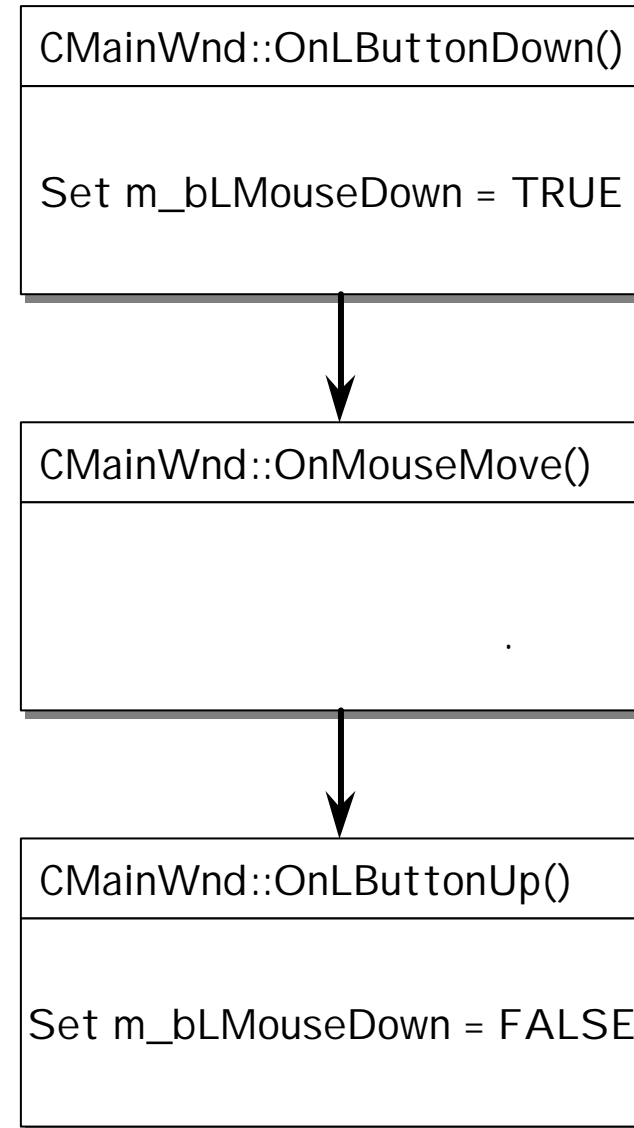
 void CMainWnd::OnLButtonDown (UI NT nFlags, CPoint point)  
{  
    m\_bLMouseDown = TRUE; //  
    CFrameWnd::OnLButtonDown (nFlags, point); //  
}

 void CMainWnd::OnLButtonUp (UI NT nFlags, CPoint point)  
{  
    m\_bLMouseDown = FALSE; //  
    CFrameWnd::OnLButtonUp (nFlags, point); //  
}

# CHAPTER 4



가



# CHAPTER 4



가

SetCapture()

SetCapture()

CWnd

void CMainWnd::OnLButtonDown (UI NT nFlags, CPoint point)

{

m\_bLMouseButton = TRUE; //

SetCapture(); //

CFrameWnd::OnLButtonDown(nFlags, point); //

}

void CMainWnd::OnLButtonUp (UI NT nFlags, CPoint point)

{

m\_bLMouseButton = FALSE; //

ReleaseCapture(); //

CFrameWnd::OnLButtonUp(nFlags, point); //

}

# CHAPTER 4



가



MFC가

| ON_WM_NCMOUSEMOVE()     | 가   |
|-------------------------|-----|
| ON_WM_NCLBUTTONDBLCLK() | "   |
| ON_WM_NCLBUTTONDOWN()   | "   |
| ON_WM_NCLBUTTONUP()     | "   |
| ON_WM_NCMBUTTONDBLCLK() | " 가 |
| ON_WM_NCMBUTTONDOWN()   | " 가 |
| ON_WM_NCMBUTTONUP()     | " 가 |
| ON_WM_NCRBUTTONDBLCLK() | "   |
| ON_WM_NCRBUTTONDOWN()   | "   |
| ON_WM_NCRBUTTONUP()     | "   |

(C) 1998 Sang I Kim

# CHAPTER 4



```
afx_msg UINT OnNcHitTest (CPoint point);
afx_msg void OnNcLButtonDown (UINT nHitTest, CPoint point);
afx_msg void OnNcLButtonUp (UINT nHitTest, CPoint point);
afx_msg void OnNcLButtonDbcClick (UINT nHitTest, CPoint point);
afx_msg void OnNcMButtonDown (UINT nHitTest, CPoint point);
afx_msg void OnNcMButtonUp (UINT nHitTest, CPoint point);
afx_msg void OnNcMButtonDbcClick (UINT nHitTest, CPoint point);
afx_msg void OnNcRButtonDown (UINT nHitTest, CPoint point);
afx_msg void OnNcRButtonUp (UINT nHitTest, CPoint point);
afx_msg void OnNcRButtonDbcClick (UINT nHitTest, CPoint point);
afx_msg void OnNcMouseMove (UINT nHitTest, CPoint point);
```

nHitTest

가

가

-

.



가 nHitTest

OnNcHitTest()

# CHAPTER 4

 GDI













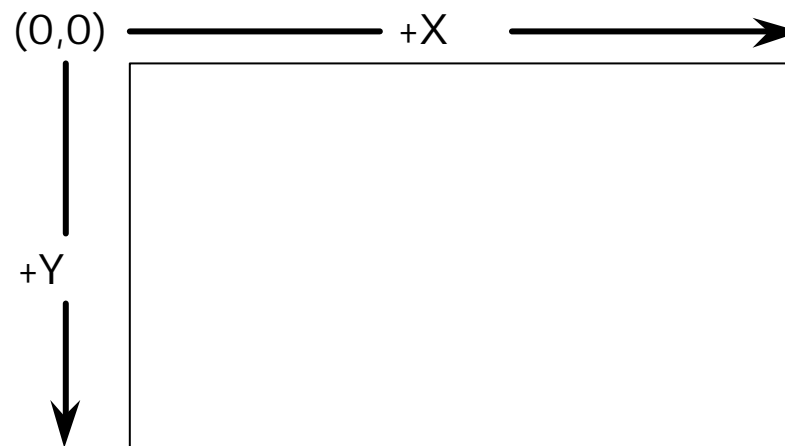


(            ),            (            )

(0,0)            ,            y            가            .

x            ,            y            가            .

(640, 480), (800, 600), (1024, 768)



# CHAPTER 4

 GDI



 GDI



GDI

GDI

( )



GetSystemMetrics()




GetSystemMetrics(SM\_CXSCREEN)




GetSystemMetrics(SM\_CYSCREEN)

# CHAPTER 4

 (Mapping Mode)


 MM\_TEXT

 Fixed-Scale( )

 Variable-Scale (가 )

 MM\_TEXT ( )

 : Pixel

 CDC

SetViewportOrg SetWindowOrg

void CMyView::OnDraw(CDC\* pDC)

{

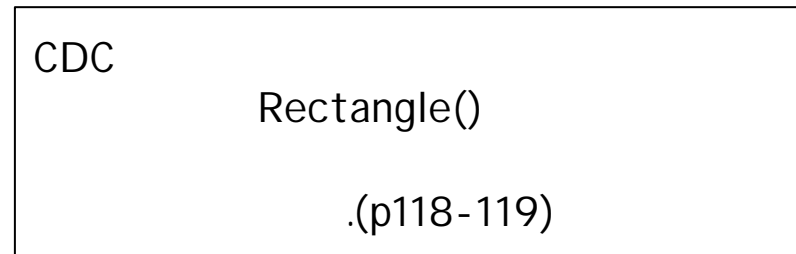
pDC -> SetMapMode(MM\_TEXT);

pDC -> SetWindowOrg(CPoint(100, 100));

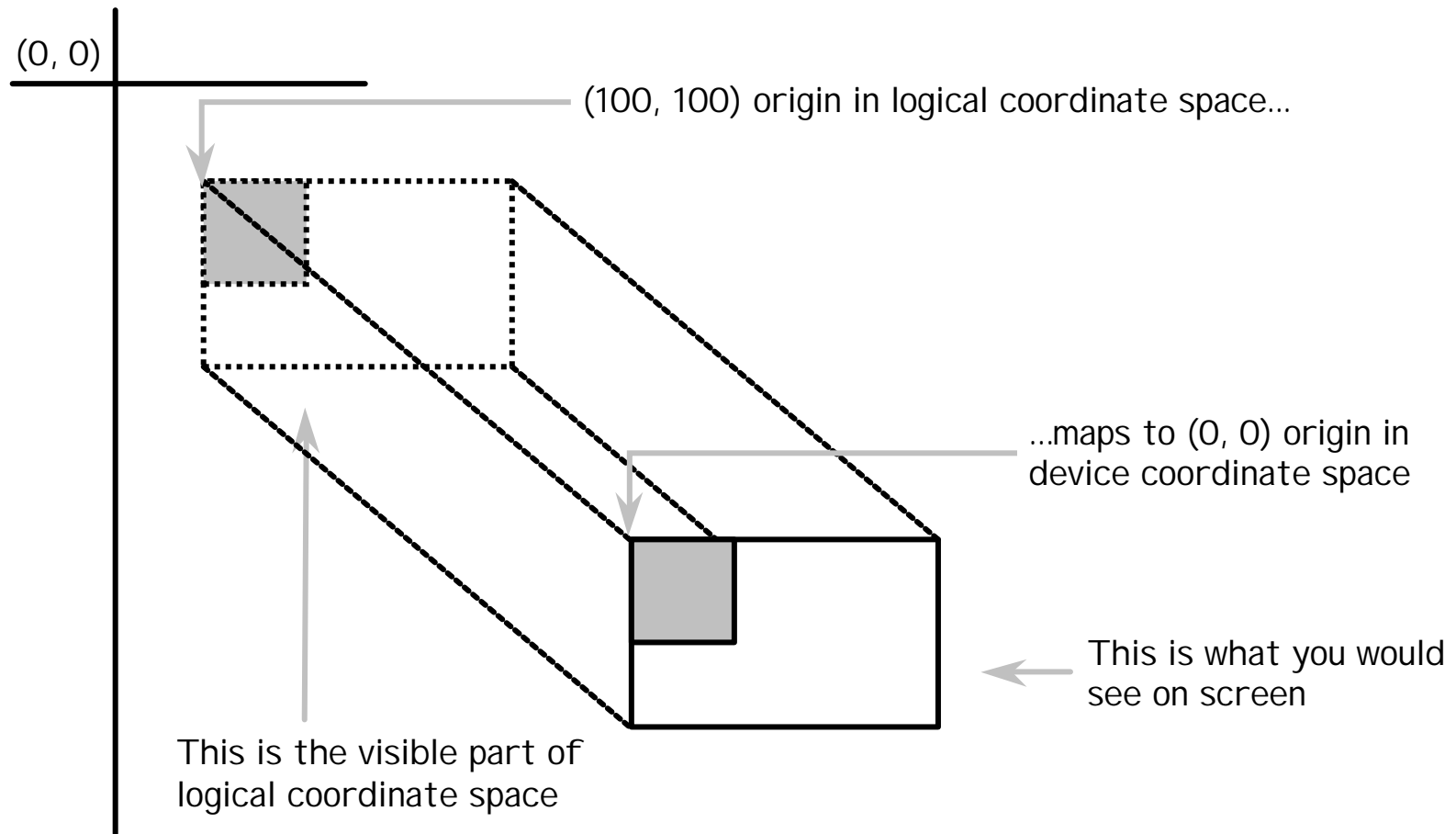
pDC -> Rectangle(CRect(100, 100, 300, 300));

}

 (100, 100) (0, 0)



# CHAPTER 4



# CHAPTER 4

✍ (Fixed-Scale)

✍ CDC::SetMapMode

✍ virtual int SetMapMode(**int** nMapMode);

| Mapping Mode         | Logical Unit                                                 |
|----------------------|--------------------------------------------------------------|
| <i>MM_HI ENGLISH</i> | 0.001 inch                                                   |
| <i>MM_LO ENGLISH</i> | 0.01 inch                                                    |
| <i>MM_HI METRIC</i>  | 0.01 mm                                                      |
| <i>MM_LO METRIC</i>  | 0.1 mm                                                       |
| <i>MM_TEXT</i> ( )   | 1 device pixel(+X: , +Y: )                                   |
| <i>MM_TWIPS</i>      | a twip is 1/1440 inch, 1/20 of a point(a point is 1/72 inch) |

✍ Positive x is to the right; positive y is up.(p119)

✍ 가 (Variable-Scale)

| <i>MM_I SOTROPIC</i>   | xy 1:1 .            |
|------------------------|---------------------|
| <i>MM_ANI SOTROPIC</i> | xy scale factor 가 . |

✍ MM\_I SOTROPIC, MM\_ANI SOTROPIC

CDC:: **SetViewportExt()**

CDC::**SetWindowExt()**

# CHAPTER 4



CDC

| GetViewportExt()   | . |
|--------------------|---|
| GetViewportOrg()   | . |
| GetWindowExt()     | . |
| GetWindowOrg()     | . |
| ScaleWindowExt()   | . |
| ScaleViewportExt() | . |
| SetViewportExt()   | . |
| SetViewportOrg()   | . |
| SetWindowExt()     | . |
| SetWindowOrg()     | . |

(C) 1998 Sang I Kim

# CHAPTER 4



OnDraw

```
void CMyView::OnDraw(CDC* pDC)
{
    CRect rectClient;

    GetClientRect(rectClient);
    pDC -> SetMapMode(MM_ANISOTROPIC);
    pDC -> SetWindowExt(1000, 1000);
    pDC -> SetViewportExt(rectClient.right, -rectClient.bottom);
    pDC -> SetViewportOrg(rectClient.right / 2, rectClient.bottom / 2);

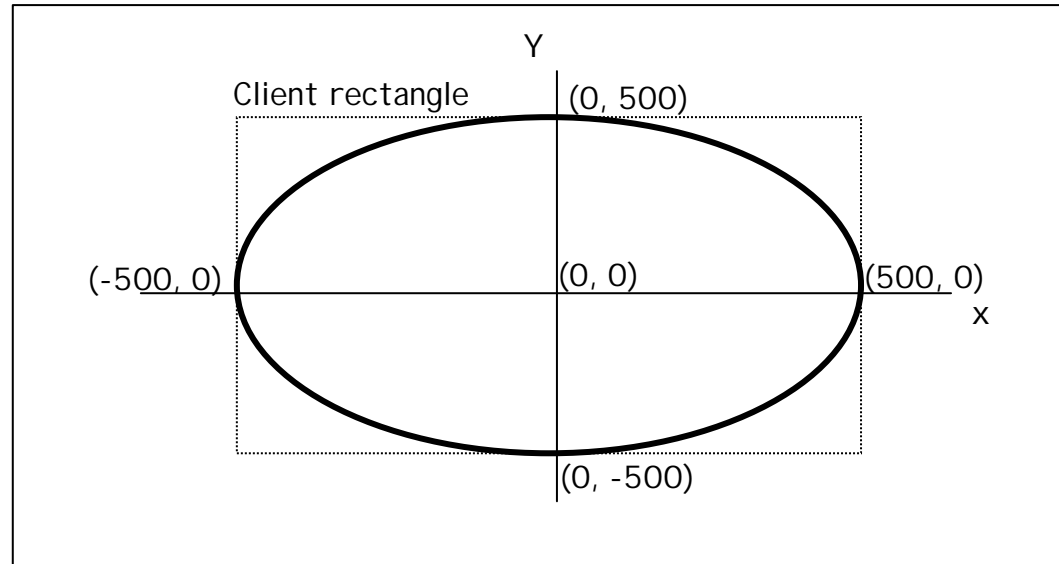
    pDC -> Ellipse(CRect(-500, -500, 500, 500));
}
```

SetWindowExt, SetViewportExt  
MM\_ISOTROPIC

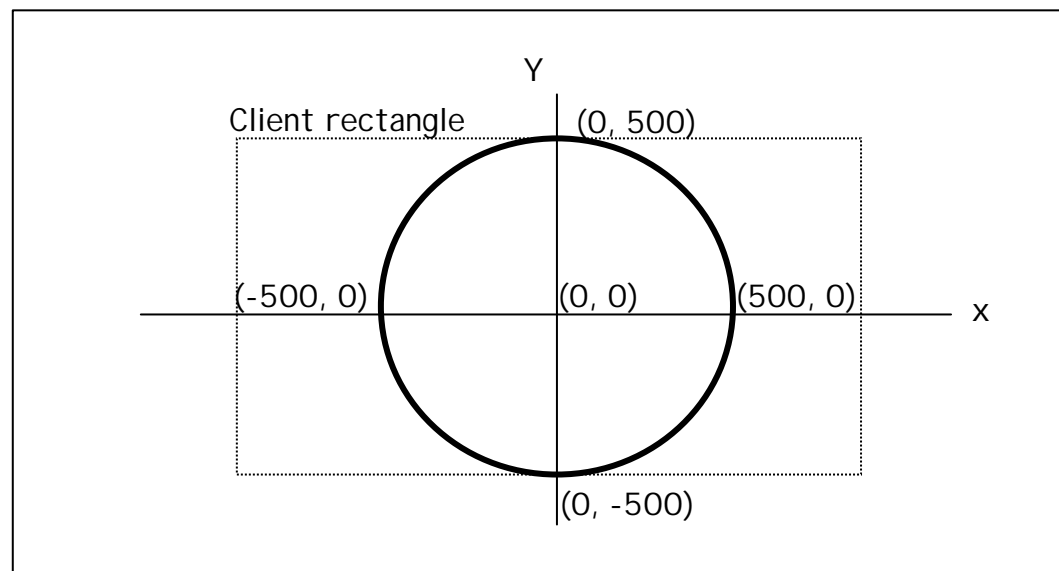
OnDraw() CView 가  
OnPrepareDC()

# CHAPTER 4

✍ MM\_ANISOTROPIC



✍ MM\_ISOTROPIC



# CHAPTER 4

✍ CDC::SetWindowExt -

✍ virtual CSize SetWindowExt(**int** cx, **int** cy);  
virtual CSize SetWindowExt(**SIZE** size);

✍ Parameters

✍ *cx* (logical units)  
✍ *cy* (logical units)  
✍ *size* (logical units)

CSize

SIZE

✍ CDC::SetViewportExt -

✍ virtual CSize SetViewportExt(**int** cx, **int** cy);  
virtual CSize SetViewportExt(**SIZE** size);

✍ Parameters

✍ *cx* (device units)  
✍ *cy* (device units)  
✍ *size* (device units)

CSize

SIZE

# CHAPTER 4

✍ CDC::SetWindowOrg - .

✍ CPoint SetWindowOrg(**int** x, **int** y);  
CPoint SetWindowOrg(**POINT** point);

✍ Parameters

|                |        |   |   |       |
|----------------|--------|---|---|-------|
| ✍ <b>x</b>     | x      | ( | ) |       |
| ✍ <b>y</b>     | y      | ( | ) |       |
| ✍ <b>point</b> | (      | ) |   | POINT |
|                | CPoint |   |   |       |


✍ CDC::SetViewportOrg - .

✍ virtual CPoint SetViewportOrg(**int** x, **int** y);  
virtual CPoint SetViewportOrg(**POINT** point);

✍ Parameters

|                |        |   |   |       |
|----------------|--------|---|---|-------|
| ✍ <b>x</b>     | x      | ( | ) |       |
| ✍ <b>y</b>     | y      | ( | ) |       |
| ✍ <b>point</b> | (      | ) |   | POINT |
|                | CPoint |   |   |       |


# CHAPTER 4


 (Coordinate)

 가

 CDC \_\_\_\_\_ .

 CWnd \_\_\_\_\_ .

 Hit-Test .

 (Region) .

 CRect::PtInRect()

 .



void LPtoDP(**LPPOINT** *lpPoints*, **int** *nCount* = 1) const;

void LPtoDP(**LPRECT** *lpRect*) const;

void LPtoDP(**LPSIZE** *lpSize*) const;

void DPtoLP(**LPPOINT** *lpPoints*, **int** *nCount* = 1) const;

void DPtoLP(**LPRECT** *lpRect*) const;

void DPtoLP(**LPSIZE** *lpSize*) const;

# CHAPTER 4

 LPtoDP -

 Parameters

 lpPoints -

POINT

CPoint

 nCount -

 lpRect -

RECT


CRect


 lpSize -

SIZE

CSize



 x = x / x

 y = y / y

 x = x \* x + x

 y = y \* y + y

 DPtoLP -

# CHAPTER 4



CScrollView

CView

가



(Viewport)



CScrollView

WM\_HSCROLL, WM\_VSCROLL



가

가 CView

# CHAPTER 4

✍ CWnd::OnVScroll -

가

✍ afx\_msg void OnVScroll(**UINT** *nSBCode*, **UINT** *nPos*, **CScrollBar\*** *pScrollBar*);

✍ Parameters

*nSBCode* -

✍ **SB\_BOTTOM**

✍ **SB\_TOP**

✍ **SB\_ENDSCROLL**

✍ **SB\_LINEDOWN**

✍ **SB\_LINEUP**

✍ **SB\_PAGEDOWN**

✍ **SB\_PAGEUP**

✍ **SB\_THUMBPOSITION**

✍ **SB\_THUMBTRACK**

*nPos*

✍ **SB\_THUMBPOSITION** or **SB\_THUMBTRACK**

*pScrollBar*

✍

NULL

가

# CHAPTER 4

✍ CWnd::OnHScroll -

가

✍ afx\_msg void OnHScroll(**UINT** *nSBCode*, **UINT** *nPos*, **CScrollBar\*** *pScrollBar*);

✍ Parameters

*nSBCode* -

✍ **SB\_LEFT**

✍ **SB\_RIGHT**

✍ **SB\_ENDSCROLL**

✍ **SB\_LINELEFT**

✍ **SB\_LINERIGHT**

✍ **SB\_PAGELEFT**

✍ **SB\_PAGERIGHT**

✍ **SB\_THUMBPOSITION**

✍ **SB\_THUMBTRACK**

*nPos*

✍ **SB\_THUMBPOSITION** or **SB\_THUMBTRACK**

*pScrollBar*

✍

NULL

가

# CHAPTER 4

✍ CScrollView::SetScrollSizes

✍ void SetScrollSizes

( int *nMapMode*, SI ZE *sizeTotal*, const SI ZE& *sizePage* = sizeDefault,  
const SI ZE& *sizeLine* = sizeDefault );

✍ Parameters

✍ *nMapMode*

✍ *sizeTotal*

✍ *sizePage*

✍ *sizeLine*

가

가

# CHAPTER 4

✍ OnInitialUpdate()

✍ 가 , OnDraw()

✍

✍

WM\_KEYUP , 가 WM\_KEYDOWN

가 , ANSI 가 ,  
Shift 가 WM\_CHAR .

WM\_KEYDOWN WM\_KEYUP .

✍ WM\_CREATE

✍

가 가 Create()  
 , OnCreate()

OnInitialUpdate() (Override)

# CHAPTER 4

WM\_CLOSE

가 [ ], , 가  
WM\_CLOSE . OnClose()

. (OnClose())  
CDocument::SaveModified() .)

WM\_QUERYENDSESSION

95  
WM\_QUERYENDSESSION . WM\_CLOSE  
, WM\_QUERYENDSESSION 가 .

WM\_DESTROY

WM\_CLOSE , OnDestroy() 가  
. OnDestroy()  
Base class OnDestroy()

WM\_NCDESTROY

가  
OnNcDestroy() 가 . Base class  
OnNcDestroy() .

# CHAPTER 4



WM\_KILLFOCUS WM\_SETFOCUS



MFC

CWnd::OnSetFocus(),

CWnd::OnKillFocus()



가

CWnd::GetFocus()

Win32 API

GetFocus()

# CHAPTER 4



가

WM\_KEYDOWN

WM\_KEYUP , CWnd::OnKeyDown() CWnd::OnKeyUp()



Alt

가 WM\_KEYDOWN WM\_KEYUP



Alt

WM\_SYSKEYDOWN WM\_SYSKEYUP

MFC

CWnd::OnSysKeyDown() CWnd::OnSysKeyUp()



가 Alt

MFC CWnd::SysKeyDown()

MFC가

afx\_msg void OnMessageHandler (UINT nChar, UINT nRepCnt, UINT nFlags)



nChar -



nRepCnt -

(

),

-

1

-

0



nFlags -

,

,

# CHAPTER 4

✍ MFC

nFlags

| 0-7   | : 8 OEM                 |
|-------|-------------------------|
| 8     | 1 : , 0 .               |
| 9-10  | :                       |
| 11-12 | :                       |
| 13    | Alt : Alt .<br>Alt 1, 0 |
| 14    | : 1, . 0                |
| 15    | : 0, . 1                |

# CHAPTER 4

 MFC

nFlags

| Alt                 |       |
|---------------------|-------|
|                     |       |
| Ctrl                |       |
| Delete              |       |
| End                 |       |
| Enter               | Enter |
| Home,<br>Insert     |       |
| PageDown,<br>PageUp |       |
| (/)                 | /     |

# CHAPTER 4

가

,

가

.

가

가

가

가

| 가           |              |
|-------------|--------------|
| VK_0 ~ VK_9 | 0~9          |
| VK_A ~ VK_Z | A~Z          |
| VK_ADD      | +            |
| VK_BACK     |              |
| VK_CANCEL   | Ctrl + Break |

# CHAPTER 4



가

가

| 가            |                    |
|--------------|--------------------|
| VK_CAPITAL   | CapsLock           |
| VK_CLEAR     | Clear (NumLock 5 ) |
| VK_CONTROL   | Ctrl               |
| VK_DECIMAL   | .                  |
| VK_DELETE    | Delete             |
| VK_DIVIDE    | /                  |
| VK_DOWN      |                    |
| VK_END       | End                |
| VK_ESCAPE    | Esc                |
| VK_F1~VK_F12 | F1 ~ F12           |

# CHAPTER 4



가

가

| 가                          |                   |
|----------------------------|-------------------|
| VK_HOME                    | Home              |
| VK_INSERT                  | Insert            |
| VK_LEFT                    |                   |
| VK_MENU                    | Alt               |
| VK_MULTIPLY                | *                 |
| VK_NEXT                    | Page Down    PgDn |
| VK_NUMLOCK                 | NumLock           |
| VK_NUMPAD0<br>~ VK_NUMPAD9 | 0 ~ 9             |
| VK_PAUSE                   | Pause             |

# CHAPTER 4



가

가

| 가           |              |
|-------------|--------------|
| VK_PRIOR    | Page Up PgUp |
| VK_RETURN   |              |
| VK_RIGHT    |              |
| VK_SCROLL   | Scroll Lock  |
| VK_SHIFT    | Shift        |
| VK_SNAPSHOT | Print Screen |
| VK_SPACE    |              |
| VK_SUBTRACT | -            |
| VK_TAB      |              |
| VK_UP       |              |

# CHAPTER 4



- Alt, Ctrl, Shift

- CapsLock, Num Lock

Win32 API      GetKeyState()      -  
BOOL

가      가      Win32 API  
GetKeyboardState()

BOOL bAltPressed = ::GetKeyState(VK\_MENU);  
Alt

BOOL bCapsLockOn = ::GetKeyState(VK\_CAPITAL) & 0x01;  
16      0x01      AND      (&)

# CHAPTER 4



가

WM\_KEYDOWN, WM\_KEYUP, WM\_SYSKEYDOWN, WM\_SYSKEYUP  
가



Win32 API TranslateMessage()  
WM\_CHAR WM\_SYSCHAR

WM\_CHAR

ON\_WM\_CHAR()

OnChar() OnKeyDown() OnKeyUp()

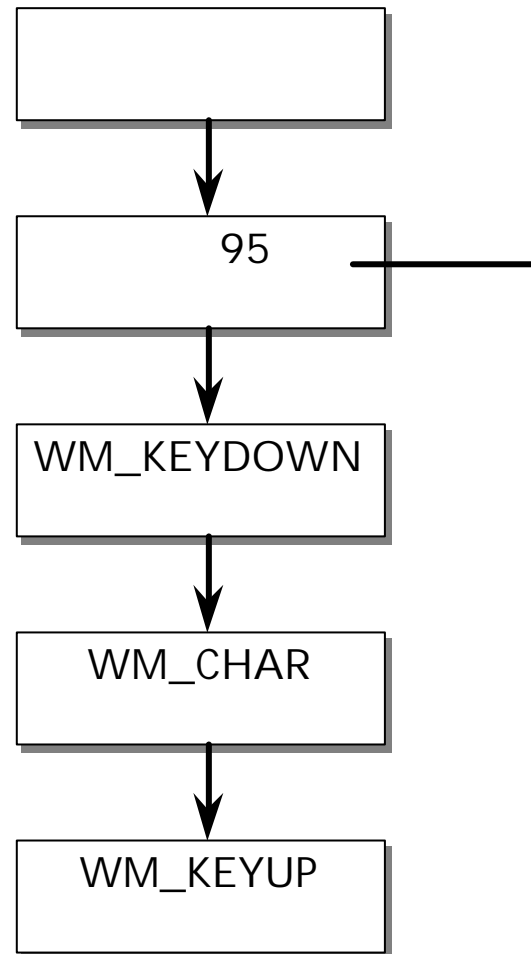
nChar OEM ANSI

afx\_msg void OnChar (UINT nChar, UINT nRepCnt, UINT nFlags);



WM\_CHAR WM\_KEYDOWN  
WM\_KEYUP

# CHAPTER 4



# CHAPTER 4



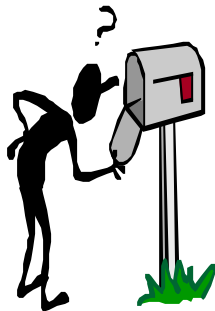
```
void CMainWnd::OnChar (UI NT nChar, UI NT nRepCnt, UI NT nFlags)
{
    CString msg = "WM_CHAR"; //
    ShowKeyInfo(msg, nChar, nRepCnt, nFlags);
    CFrameWnd::OnChar(nChar, nRepCnt, nFlags); //
}
```



가

가

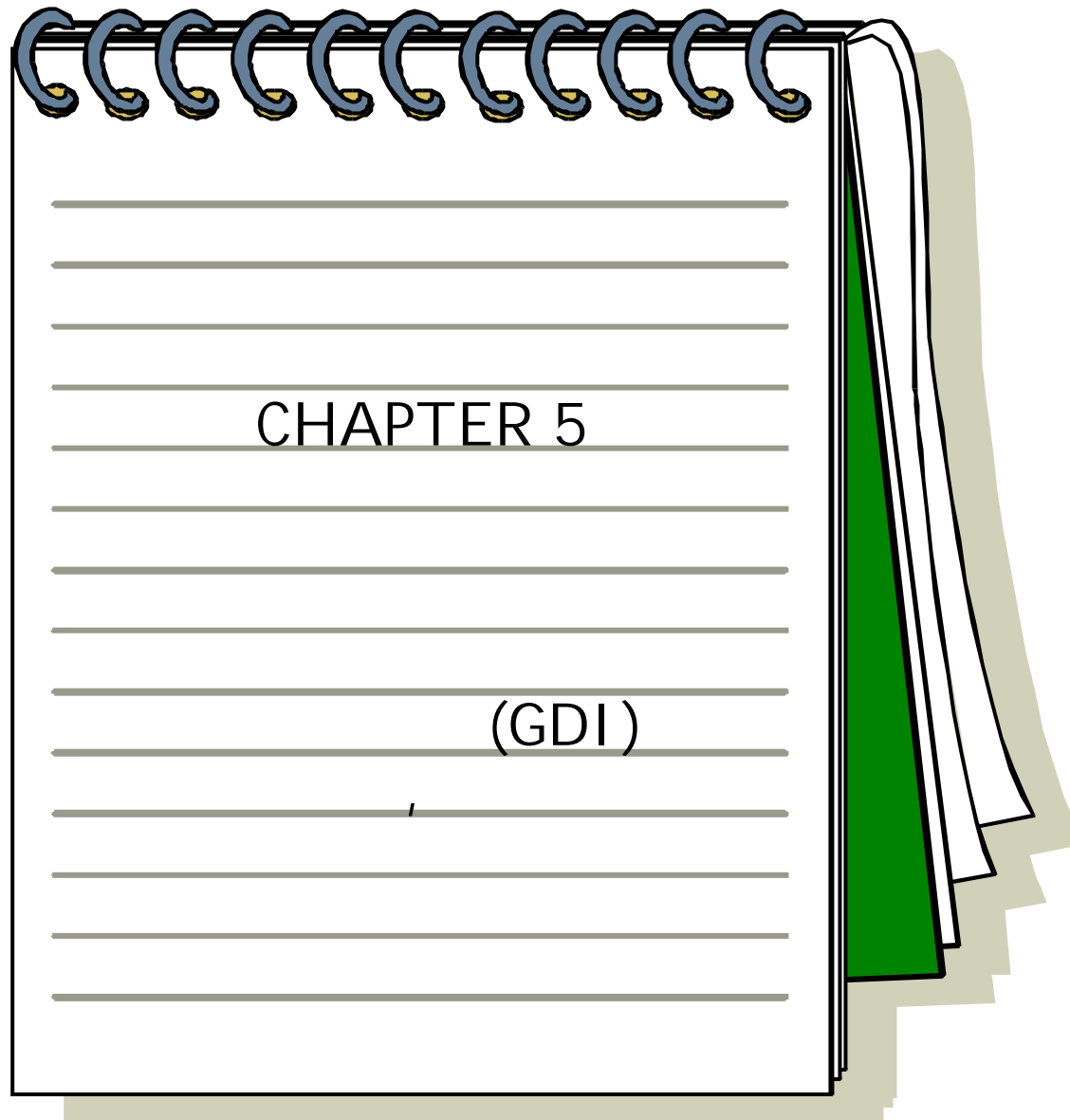
- 
- 
- 
- 
- 



-

-





# CHAPTER 5



(Device Context)



?



( , ... )

가

. - ( )



- ( )



Win32 API

Device Context



- .



- .



- .



- .

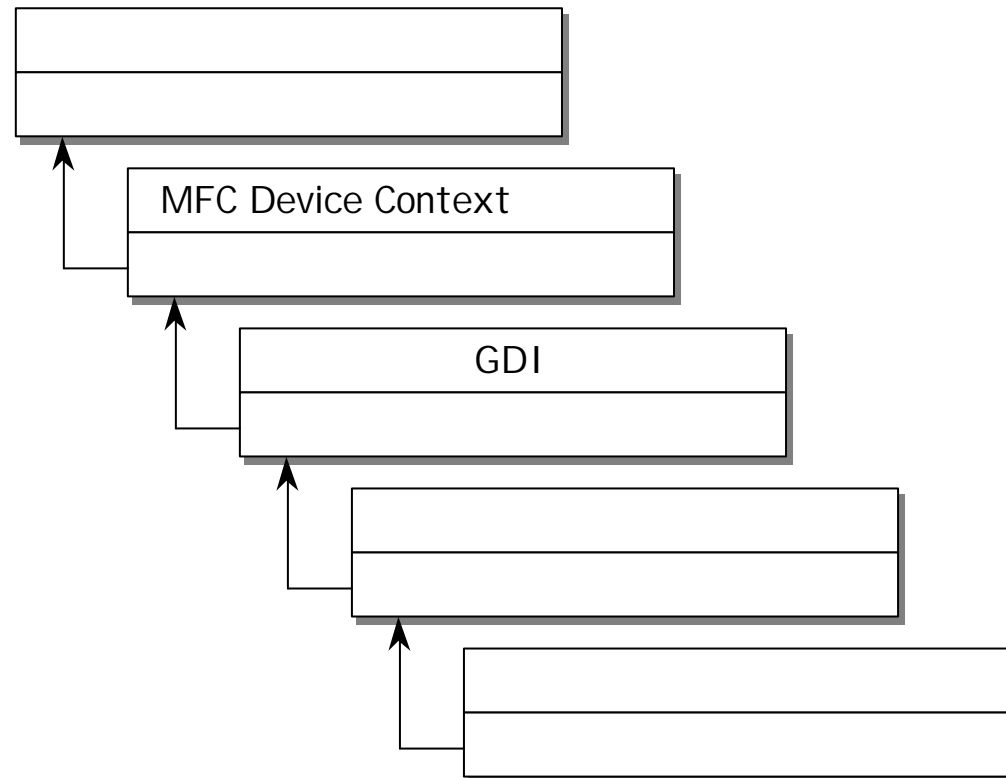
# CHAPTER 5

✍ GDI (Graphic Device Interface)

✍ DC

✍ GDI

MFC



# CHAPTER 5

 (Device Context)

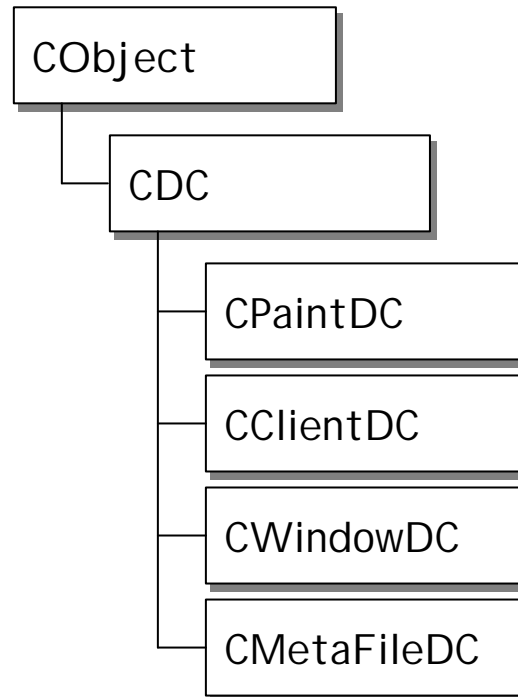


 C++ GDI HDC  
가 .



MFC

CDC



# CHAPTER 5

(Device Context)

DevStudio\Vc\mfc\include\<Afxwin.h>

|                              |                                                  |
|------------------------------|--------------------------------------------------|
|                              |                                                  |
| CDC<br>CClientDC<br>CPaintDC | WM_PAINT<br>BeginPaint EndPaint<br>CDC . (1069 ) |
| CWindowDC<br>CMetaFileDC     | . (1053 )                                        |

- CClientDC CWindowDC

CClientDC (0, 0)

CWindowDC (0, 0) 가

# CHAPTER 5

 - CDC








CDC가

CDC

| m_hDC       | CDC<br>CDC GDI<br>DC        |
|-------------|-----------------------------|
| m_hAttribDC | CDC<br>CDC<br>DC<br>CDC GDI |

 DC

 CDC::SetAttribDC() - m\_hAttribDC( )

 CDC::SetOutputDC() - m\_hDC( )

 DC

 CDC::ReleaseAttribDC() - m\_hAttribDC

 CDC::ReleaseOutputDC() - m\_hDC

# CHAPTER 5

✍ CDC

✍ CDC::CDC()

✍ 가

CDC

| CreateDC()           | . |
|----------------------|---|
| CreateIC()           | . |
| CreateCompatibleDC() | . |

# CHAPTER 5

✍ CDC::CreateDC()



✍ DC가 TRUE , FALSE

✍ virtual BOOL CreateDC( LPCTSTR *lpszDriverName*,  
LPCTSTR *lpszDeviceName*,  
LPCTSTR *lpszOutput*, const void \* *lpInitData* );

✍ CDC::CreateIC()



✍ IC가 TRUE , FALSE

✍ virtual BOOL CreateIC( LPCTSTR *lpszDriverName*,  
LPCTSTR *lpszDeviceName*,  
LPCTSTR *lpszOutput*, const void \* *lpInitData* );

✍ CDC::CreateCompatibleDC()

✍ virtual BOOL CreateCompatibleDC( CDC \* *pDC* );

✍ pDC DC DC .

✍ 가 NULL

DC가 .

# CHAPTER 5

✎ CreateDC() CreateI C()

|                 |                                          |
|-----------------|------------------------------------------|
|                 |                                          |
| lp szDriverName | NULL<br>) "EPSON" CString                |
| lp szDeviceName | NULL<br>) "EPSON FX-80" ( ) CString<br>가 |
| lp szOutput     | CString NULL                             |
| lp l nitData    | DEVMODE                                  |

✎ DEVMODE

PRINT.H

(C) 1998 Sang I Kim

# CHAPTER 5

✍ CDC

✍

가

, CDC

✍

```
Void CMyView::OnLButtonDown(UINT nFlags, CPoint point)
{
    CRect rect;
    CClientDC dc(this);    // dc
    dc.GetClipBox(rect);    //
}                          // dc가
```

✍ CDC::GetDC

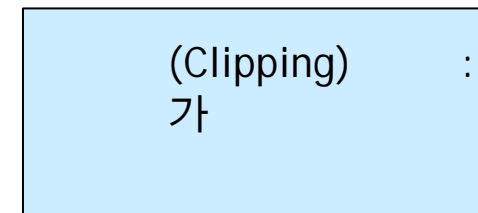
. GetDC

ReleaseDC

```
Void CMyView::OnLButtonDown(UINT nFlags, CPoint point)
{
    CRect rect;
    CDC* pDC = GetDC();    // dc
    pDC -> GetClipBox(rect); //
    ReleaseDC(pDC);        //
}
```

✍ CDC

가



# CHAPTER 5

✍ CPaintDC

✍ CPaintDC

✍ BeginPaint()

✍

, PAINTSTRUCT

✍

✍ EndPaint() -

✍ CPaintDC

1. CPaintDC

2. CPaintDC

3. CPaintDC

✍ CPaintDC

BeginPaint()

✍ CPaintDC

EndPaint()

✍

EndPaint()

✍ View

CView::OnDraw()

CPaintDC

# CHAPTER 5

✍ CPaintDC

✍

C

```
switch (msg)
{
    case WM_PAINT:
        HDC          hDC;
        PAINTSTRUCT paintstruct;

        hDC = BeginPaint (hWnd, &paintstruct);
        // hDC
        EndPaint (hWnd, &paintstruct);

        return 0;
}
```

✍

OnPaint

```
void CMyView::OnPaint()
{
    CPaintDC dc(this);
    OnPrepareDC(&dc);
    dc.TextOut(0, 0, "for the display. Not the printer");
    OnDraw(&dc);    //
}
```

✍ CPaintDC

✍ OnPaint()

WM\_PAINT

```
void CMainWnd::OnPaint()
{
    //      DC
    CPaintDC dc(this);

    // DC
    CRect rc;
    GetClientRect(&rc);
    dc.Ellipse(rc);
}
```

가

OnDraw

OnPaint

PaintDC

가

.

# CHAPTER 5

✍ CClientDC

✍

✍ Win32 API GetDC()

✍ CClientDC

✍ Win32 API ReleaseDC()

✍ CClientDC

✍ CClientDC DC가  
m\_hWnd

✍ CClientDC CWnd

✍ CClientDC::CClientDC // #include <afxwin.h>

✍ CClientDC ( CWnd\* *pWnd* );

✍ Parameters

✍ *pWnd* 가 CWnd

# CHAPTER 5

✍ CClientDC

✍ OnLButtonDown()

WM\_LBUTTONDOWN

CClientDC

```
void MainWnd::OnLButtonDown(UINT nFlags, CPoint point)
{
    CClientDC dc(this); // ClientDC
    // DC
    CRect rc;
    GetClientRect(&rc);
    dc.MoveTo (0, (rc.bottom + rc.top) / 2);
    dc.LineTo ((rc.right + rc.left) / 2, 0);
    dc.LineTo (rc.right, (rc.bottom + rc.top) / 2);
    dc.LineTo ((rc.right + rc.left) / 2, rc.bottom);
    dc.LineTo (0, (rc.bottom + rc.top) / 2);
}
```

# CHAPTER 5

✍ CWindowDC

✍

✍ Win32 API      GetDC()

✍ CWindowDC

✍ Win32 API      ReleaseDC()

✍ CWindowDC

✍ CWindowDC      DC가

m\_hWnd

✍ CWindowDC      CWnd

✍ CWindowDC::CWindowDC      // #include <afxwin.h>

✍ CWindowDC ( CWnd\* *pWnd* );

✍ Parameters

✍ *pWnd*      가      CWnd

# CHAPTER 5

✍ CWindowDC

✍ OnRButtonDown()  
CWindowDC

WM\_RBUTTONDOWN

```
void MainWnd::OnRButtonDown(UINT nFlags, CPoint point)
{
    CWindowDC dc(this); // WindowDC
    CRect rc; // , DC
    GetWindowRect(&rc);

    //
    int cyCaption = GetSystemMetrics(SM_CYCAPTION);

    //
    CRect rcEllipse(0, 0, cyCaption, cyCaption);

    while (rcEllipse.right < rc.right); //
    {
        dc.Ellipse(rcEllipse);
        rcEllipse.left += cyCaption;
        rcEllipse.right += cyCaption;
    }
}
```

# CHAPTER 5

✍ CMetaFileDC

✍ GDI

✍

1. CMetaFileDC

2. CMetaFileDC::Create()

3. CMetaFileDC

✍ CMetaFileDC::Create

✍ BOOL Create( LPCTSTR *lpstrFilename* = NULL );

✍ Parameters

✍ *lpstrFilename* NULL

NULL

가

(C) 1998 Sang I Kim

# CHAPTER 5

 (GDI) (DevStudio\Vc\mfc\include\<Afxwin.h>

 CBitmap 481

 CBrush . (418 )

 CFont 451

 CPalette (522 )

 CPen (382 )

 CRgn (Region) (556 )

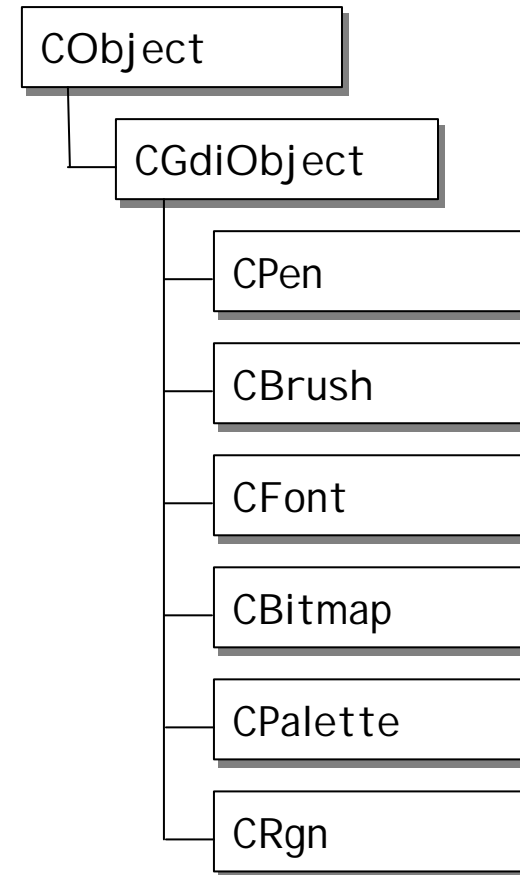
 SDK

MFC

| SDK     | MFC      |          |
|---------|----------|----------|
| Bitmap  | CBitmap  | hBitmap  |
| Brush   | CBrush   | hBrush   |
| Font    | CFont    | hFont    |
| Palette | CPalette | hPalette |
| Pen     | CPen     | hPen     |
| Rgn     | CRgn     | hRgn     |

# CHAPTER 5

MFC



가

DC

# CHAPTER 5

✍ GDI

✍ 1 : ,  
(CPen CBrush )

✍ 2 : , .  
(CFont CRgn )

✍ void CMyView::OnDraw(CDC\* pDC)  
{  
    CPen myPen1(PS\_DOT, 5, RGB(0, 0, 0)); // 1  
    CPen myPen2; // 2  
    if(myPen2.CreatePen(PS\_DOT, 5, RGB(0, 0, 0)))  
        //  
}

✍ GDI (Tracking)

✍

✍ GDI , GDI ,


# CHAPTER 5

 GDI (Tracking)

```
void CMyView::OnDraw(CDC* pDC)
{
    CPen newPen (PS_DASHDOTDOT, 2, (COLORREF) 0); // 2

    CPen* pOldPen = pDC -> SelectObject(&newPen); //
    pDC -> MoveTo(10, 10); //
    pDC -> LineTo(110, 10);
    pDC -> SelectObject(pOldpen); // newPen .( )
} // newPen .
```

 (stock) GDI

 stock GDI 가 .  
가 .  
Stock GDI 가 GDI

# CHAPTER 5

GDI

GDI 가

(Color Mapping)

VGA 4 , 16가

8 RGB

GDI 32bit COLORREF

(RGB COLORREF )

(dithering)

CBrush brush (RGB(128, 128, 192));

SetBkColor SetTextColor (dithering)

.( .)

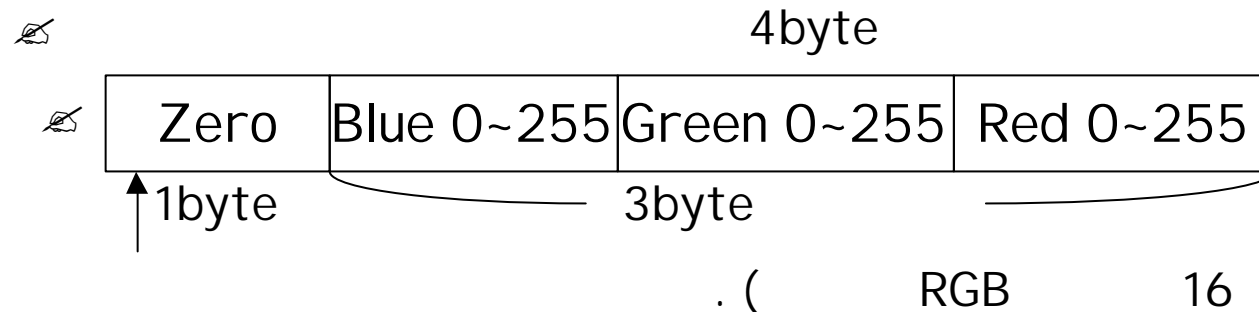


✍ windows.h

```
✍ COLORREF RGB(    // COLORREF :      type
    BYTE bRed,      // red component of color
    BYTE bGreen,    // green component of color
    BYTE bBlue      // blue component of color
);
```

✍ RGB

```
✍ #define RGB(r, g, b) ((DWORD) (((BYTE) (r) | \
    ((WORD) (g) << 8)) | (((DWORD) (BYTE) (b)) << 16)))
```



✍ RGB

✍  $256 * 256 * 256 = 16,777,216$  color



| Red | Green | Blue | Color        |
|-----|-------|------|--------------|
| 0   | 0     | 0    | Black        |
| 0   | 0     | 255  | Blue         |
| 0   | 255   | 0    | Green        |
| 0   | 255   | 255  | Cyan         |
| 255 | 0     | 0    | Red          |
| 255 | 0     | 255  | Magenta      |
| 255 | 255   | 0    | Yellow       |
| 255 | 255   | 255  | White        |
| 0   | 0     | 128  | Dark blue    |
| 0   | 128   | 0    | Dark green   |
| 0   | 128   | 128  | Dark cyan    |
| 128 | 0     | 0    | Dark red     |
| 128 | 0     | 128  | Dark magenta |
| 128 | 128   | 0    | Dark yellow  |
| 128 | 128   | 128  | Dark gray    |
| 192 | 192   | 192  | Light gray   |

# CHAPTER 5

 CPen

 CPen
















GDI

| CreatePen()         | CPen           |
|---------------------|----------------|
| CreatePenIndirect() | LOGPEN<br>CPen |
| FromHandle()        | HPEN<br>CPen   |
| GetExtLogPen()      | EXTLOGPEN      |
| GetLogPen()         | LOGPEN         |
| HPEN                | CPen           |

(C) 1998 Sang I Kim



# CHAPTER 5

|                                                                                                    |                                         |   |   |                                                                                     |
|----------------------------------------------------------------------------------------------------|-----------------------------------------|---|---|-------------------------------------------------------------------------------------|
|                   | (DevStudio\Vc\include\<Wingdi.h> 1389 ) |   |   |                                                                                     |
|  PS_SOLID         |                                         |   |   |  |
|  PS_DASH          |                                         | 1 |   |  |
|  PS_DOT           |                                         | 1 |   |  |
|  PS_DASHDOT       | 1                                       |   | 1 |  |
|  PS_DASHDOTDOT    | 2                                       |   | 1 |  |
|  PS_NULL          |                                         |   |   |                                                                                     |
|  PS_INSIDEFRAME |                                         |   |   | (Rectangle, Ellipse)                                                                |
|  PS_USERSTYLE   |                                         |   |   |                                                                                     |
|  PS_ALTERNATE   |                                         |   |   |                                                                                     |

# CHAPTER 5



OnLButtonDown()

 void CMainWnd::OnLButtonDown(UINT nFlags, CPoint point)

```
{
    CClientDC dc(this); // CClientDC
    CPen penRed; //
    penRed.CreatePen(PS_DASH, 1, RGB(255, 0, 0));

    //
    CPen* ppenOld;
    ppenOld = dc.SelectObject(&penRed);

    // DC
    CRect rc;
    GetClientRect(&rc);
    dc.MoveTo (0, (rc.bottom + rc.top) / 2);
    dc.LineTo ((rc.right + rc.left) / 2, 0);
    dc.LineTo (rc.right, (rc.bottom + rc.top) / 2);
    dc.LineTo ((rc.right + rc.left) / 2, rc.bottom);
    dc.LineTo (0, (rc.bottom + rc.top) / 2);
    dc.SelectObject(ppenOld); //
}
```

( )

# CHAPTER 5

✍ CBrush

✍ CBrush

GDI

| CreateBrushIndirect()   | LOGBRUSH<br>CBrush |
|-------------------------|--------------------|
| CreateDIBPatternBrush() | CBrush             |
| CreateHatchBrush()      | 가 CBrush           |
| CreatePatternBrush()    | 가 CBrush           |
| CreateSolidBrush()      | 가 CBrush           |
| CreateSysColorBrush()   | CBrush             |
| FromHandle()            | HBRUSH CBrush      |
| GetLogBrush()           | CBrush LOGBRUSH    |
| HBRUSH                  | CBrush             |

(C) 1998 Sang I Kim

# CHAPTER 5

✎ CBrush Constructor

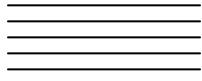
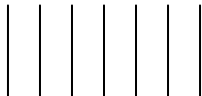
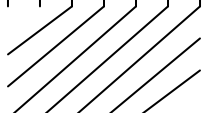


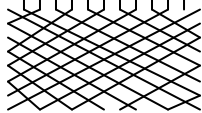
✎ CBrush();

✎ CBrush(COLORREF crColor); // crColor -

✎ CBrush(int nIndex, COLORREF crColor); // nIndex - ( )

✎ CBrush(CBitmap\* pBitmap);  
// pBitmap - CBrush

✎ (Hatching) (DevStudio\Vc\include\<Wingdi.h> 1380 )

| HS_HORIZONTAL |            |    |
|---------------|------------|---------------------------------------------------------------------------------------|
| HS_VERTICAL   |            |   |
| HS_BDIAGONAL  | 45'<br>( ) |  |
| HS_FDIAGONAL  | 45'<br>( ) |  |
| HS_CROSS      | 가          |  |
| HS_DIAGCROSS  | 45' 가      |  |

# CHAPTER 5



 void CMainWnd::OnPaint()

{

CPaintDC dc(this); // DC

//

CBrush br (HS\_BFDIAGONAL, RGB(0, 0, 255));

//

//

CBrush\* pbrOld;

pbrOld = dc.SelectObject(&br);

// DC

CRect rc;

GetClientRect(&rc);

dc.Ellipse(rc);

dc.SelectObject(pbrOld); //

}

OnPaint()

( )

# CHAPTER 5

✍ CFont

✍ CFont

GDI

|                           |                       |
|---------------------------|-----------------------|
|                           |                       |
| CreateFontIndirect()      | LOGPEN 가 CFont        |
| CreateFont()              | 가 CFont               |
| CreatePointFont()         | ( 10 ) 가<br>CFont     |
| CreatePointFontIndirect() | LOGFONT 가 CFont<br>10 |
| FromHandle()              | HFONT CFont           |
| operator HFONT()          | CFont GDI             |
| GetLogFont()              | CFont LOGFONT         |

(C) 1998 Sang I Kim

# CHAPTER 5

 CBitmap



 CBitmap

 CPalette



 MFC

CPalette

GDI

 CRgn



GDI

 CRgn GDI

# CHAPTER 5

✍ CRgn

✍

CRgn

| CombineRgn()                | .                  |
|-----------------------------|--------------------|
| CopyRgn()                   | CRgn .             |
| CreateEllipticRgn()         | 가 CRgn .           |
| CreateEllipticRgnIndirect() | 가 CRgn ,<br>RECT . |
| CreateFromData()            | .                  |
| CreateFromPath()            | .                  |
| CreatePolygonRgn()          | 가 CRgn .           |
| CreatePolyPolygonRgn()      | 가 CRgn .           |
| CreateRectRgn()             | 가 CRgn .           |

(C) 1998 Sang I Kim

# CHAPTER 5

✍ CRgn

✍

CRgn

| CreateRectRgnIndirect() | RECT 가 CRgn . |
|-------------------------|---------------|
| CreateRoundRectRgn()    | 가 CRgn .      |
| EqualRgn()              | CRgn .        |
| FromHandle()            | CRgn .        |
| GetRegionData()         | .             |
| GetRgnBox()             | CRgn .        |
| OffsetRgn()             | CRgn .        |
| PtInRegion()            | .             |
| RectInRegion()          | .             |
| SetRectRgn()            | CRgn .        |
| HRGN                    | CRgn .        |

(C) 1998 Sang Il Kim

# CHAPTER 5



TTF(TrueType Font) :

가



(typeface) :

.



:



:

1 - 1/72



( ) :

.



가

:

.



( )



-



-

# CHAPTER 5



DevStudio\VC\include\<wingdi.h> 1073

|               |                               |
|---------------|-------------------------------|
|               |                               |
| FF_DECORATIVE | . ) Viking Runes              |
| FF_DONTCARE   | 가                             |
| FF_MODERN     | 가<br>Pica, Elite, Courier New |
| FF_ROMAN      | 가 . ) Times New Roman         |
| FF_SCRIPT     | . ) Script, Cursive           |
| FF_SWISS      | 가 . ) Arial                   |



## CHAPTER 5

```
LOGFONT Structure(
    (
    ...
    )
    )

typedef struct tagLOGFONT {
    LONG lfHeight;        //
    LONG lfWidth;         //
    LONG lfEscapement;     // ( 1/10 )
    LONG lfOrientation;   // ( 1/10 )
    LONG lfWeight;        // (0-1000 )
    BYTE lfItalic;        // TRUE
    BYTE lfUnderline;     // TRUE
    BYTE lfStrikeOut;     // TRUE
    BYTE lfCharSet;       //
    BYTE lfOutPrecision;  //
    BYTE lfClipPrecision; //
    BYTE lfQuality;       //
    BYTE lfPitchAndFamily; //
    CHAR lfFaceName[LF_FACESIZE]; // 32
} LOGFONT;
```

# CHAPTER 5



|                           |                      |
|---------------------------|----------------------|
|                           |                      |
| CreateFontIndirect()      | LOGFONT CFont .      |
| CreateFont()              | 가 CFont .            |
| CreatePointFont()         | CFont .              |
| CreatePointFontIndirect() | LOGFONT CFont 1/10 . |

# CHAPTER 5



| <i>HORZSIZE</i>   | (mm)     | 320 |
|-------------------|----------|-----|
| <i>VERTSIZE</i>   | (mm)     | 240 |
| <i>HORZRES</i>    |          | 640 |
| <i>VERTRES</i>    | (raster) | 480 |
| <i>LOGPIXELSX</i> |          | 96  |
| <i>LOGPIXELSY</i> |          | 96  |



MM\_HIMETRIC

MM\_TWIPS

# CHAPTER 5



(p155)

```
pDC->SetMapMode(MM_ANGISOTROPIC);  
pDC->SetWindowExt(1440, 1440);  
pDC->SetViewportExt(pDC->GetDeviceCaps(LOGPIXELSX),  
                    pDC->GetDeviceCaps(LOGPIXELSY));
```

MM\_TWIPS

12

tmheight - 295

tmInternalLeading - 55

Netheight( ) - 240

# CHAPTER 5



(p154)



CDC

GetTextMetrics()



tmHeight

descender

diacritic



tmExternalLeading

diacritic

descender



Diacritic



tminternalLeading



Netheight



Descender



Character



tmHeight + tmExternalLeading



(=Netheight, )



tmHeight - tmInternalLeading



ascending letter : ascender ( x  
ex) b, d, f, h

, 上行 )



descending letter : descender ( x  
ex) g, j, p, q, y

, 下行 )



## CHAPTER 5

The TEXTMETRIC structure contains basic information about a physical font. All sizes are given in logical units.

✎ CDC::GetTextMetrics

✎ BOOL GetTextMetrics(**LPTEXTMETRIC** lpMetrics) **const**;

```
typedef struct tagTEXTMETRIC { /* tm */
    int tmHeight;                //          (ascent + descent)
    int tmAscent;                //
    int tmDescent;               //
    int tmInternalLeading;        // tmHeight
    int tmExternalLeading;        //
    int tmAveCharWidth;          //
    int tmMaxCharWidth;          //      가
    int tmWeight;                //
    BYTE tmItalic;               // 0
    BYTE tmUnderlined;           // 0
    BYTE tmStruckOut;            // 0
    BYTE tmFirstChar;            //
    BYTE tmLastChar;             //
    BYTE tmDefaultChar;          //
    BYTE tmBreakChar;            //
    BYTE tmPitchAndFamily;       //
    BYTE tmCharSet;              //
    int tmOverhang;              //
    int tmDigitizedAspectX;      //
    int tmDigitizedAspectY;      //
} TEXTMETRIC;
```

# CHAPTER 5

✍ CFont::CreateFont - CFont .

✍ BOOL CreateFont( **int** *nHeight*, **int** *nWidth*, **int** *nEscapement*,  
**int** *nOrientation*, **int** *nWeight*, **BYTE** *bItalic*, **BYTE** *bUnderline*,  
**BYTE** *cStrikeOut*, **BYTE** *nCharSet*, **BYTE** *nOutPrecision*,  
**BYTE** *nClipPrecision*, **BYTE** *nQuality*, **BYTE** *nPitchAndFamily*,  
**LPCTSTR** *lpszFacename* );

✍ CDC::GetTextExtent

✍ ( ) .

✍ CSize GetTextExtent( **LPCTSTR** *lpszString*, **int** *nCount* ) const;

✍ CSize GetTextExtent( **const CString&** *str* ) const;

✍ Return Value

( ) CSize object.

✍ Parameters

✍ *lpszString*

✍ *nCount* *lpszString* 가 ( )

✍ *str* CString

# CHAPTER 5

✎ CDC::GetDeviceCaps() -

✎ int GetDeviceCaps( **int** nIndex ) const;

✎ Parameters

✎ DRIVERVERSION

✎ TECHNOLOGY

✎ HORZSIZE

✎ VERTSIZE

✎ HORZRES

✎ VERTRES

✎ LOGPIXELSX

✎ LOGPIXELSY

✎ BITSPIXEL

✎ PLANES

✎ NUMBRUSHES

✎ NUMPENS

✎ NUMFONTS

✎ NUMCOLORS

✎ ASPECTX

✎ ASPECTY

✎ ASPECTXY

✎ PDEVICESIZE

PDEVICE

✎ CLIPCAPS

✎ SIZEPALETTE

✎ NUMRESERVED

✎ COLORRES

✎ RASTERCAPS

✎ CURVECAPS

✎ LINECAPS

✎ POLYGONALCAPS

✎ TEXTCAPS

; for example, 0x100 for 1.0.  
(technology).

( ).  
( ).  
(in raster lines).

가  
가  
가

# CHAPTER 5

✍ CDC::GetTextFace

✍

✍ int GetTextFace( **int** *nCount*, **LPTSTR** *lpszFacename* ) const;

✍ int GetTextFace( **CString&** *rString* ) const;

✍ Parameters

✍ *nCount*                      *lpszFacename*                      가

✍ *lpszFacename*

✍ *rString*                      CString

# CHAPTER 5

✍ CDC::SetBrushOrg



.



0, 0

.



8 x 8

,

x y

0

7

.

✍ CPoint SetBrushOrg( **int** x, **int** y );

✍ CPoint SetBrushOrg( **POINT** point );

✍ Parameters

✍ *x*

x

(

, 0 - 7 )

✍ *y*

y

(

, 0 - 7 )

✍ *point*

(

)

POINT

CPoint

# CHAPTER 5

✍ EX05A

✍ OnPrepareDC

✍ ShowFont Private

✍ CFont::CreateFont

✍

:

✍

:

0

,

가

.

✍

:

✍

가

:

(tmHeight - tmInternalLeading)

:

(tmHeight)가 .

# CHAPTER 5

✍ OnDraw()

✍ fontTest1 : Arial

✍ fontTest2 : Courier

✍ fontTest3 : (generic) Roman

✍ fontTest4 : LinePrinter 가 ,

가 FF\_MODERN

가 Courier New .

# CHAPTER 5

✍ EX05C

✍ OnPrepareDC

✍ ShowFont Private

✍ CFont::CreateFont

✍ :

✍ :

0 , 가 .

✍ :

✍ 가 : (tmHeight - tmInternalLeading)

: (tmHeight)가 .

# CHAPTER 5

✍ Win32

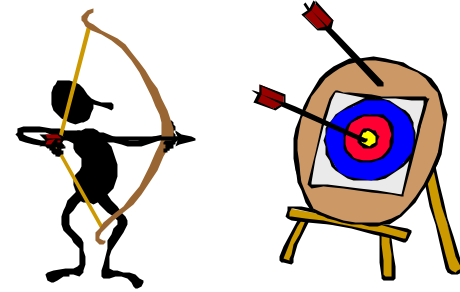
| Value           | Description                                       |
|-----------------|---------------------------------------------------|
| IDC_APPSTARTING | Standard arrow and small hourglass                |
| IDC_ARROW       | Standard arrow                                    |
| IDC_CROSS       | Crosshair                                         |
| IDC_IBEAM       | Text I-beam                                       |
| IDC_ICON        | Windows NT only:Empty icon                        |
| IDC_NO          | Slashed circle                                    |
| IDC_SIZE        | Windows NT only:Four-pointed arrow                |
| IDC_SIZEALL     | Same as IDC_SIZE                                  |
| IDC_SIZENESW    | Double-pointed arrow pointing northeast and south |
| IDC_SIZENS      | Double-pointed arrow pointing north and south     |
| IDC_SIZENWSE    | Double-pointed arrow pointing northwest and south |
| IDC_SIZEWE      | Double-pointed arrow pointing west and east       |
| IDC_UPARROW     | Vertical arrow                                    |
| IDC_WAIT        | Hourglass                                         |

(C) 1998 Sang Il Kim

3

가

.



‘

,

.

.

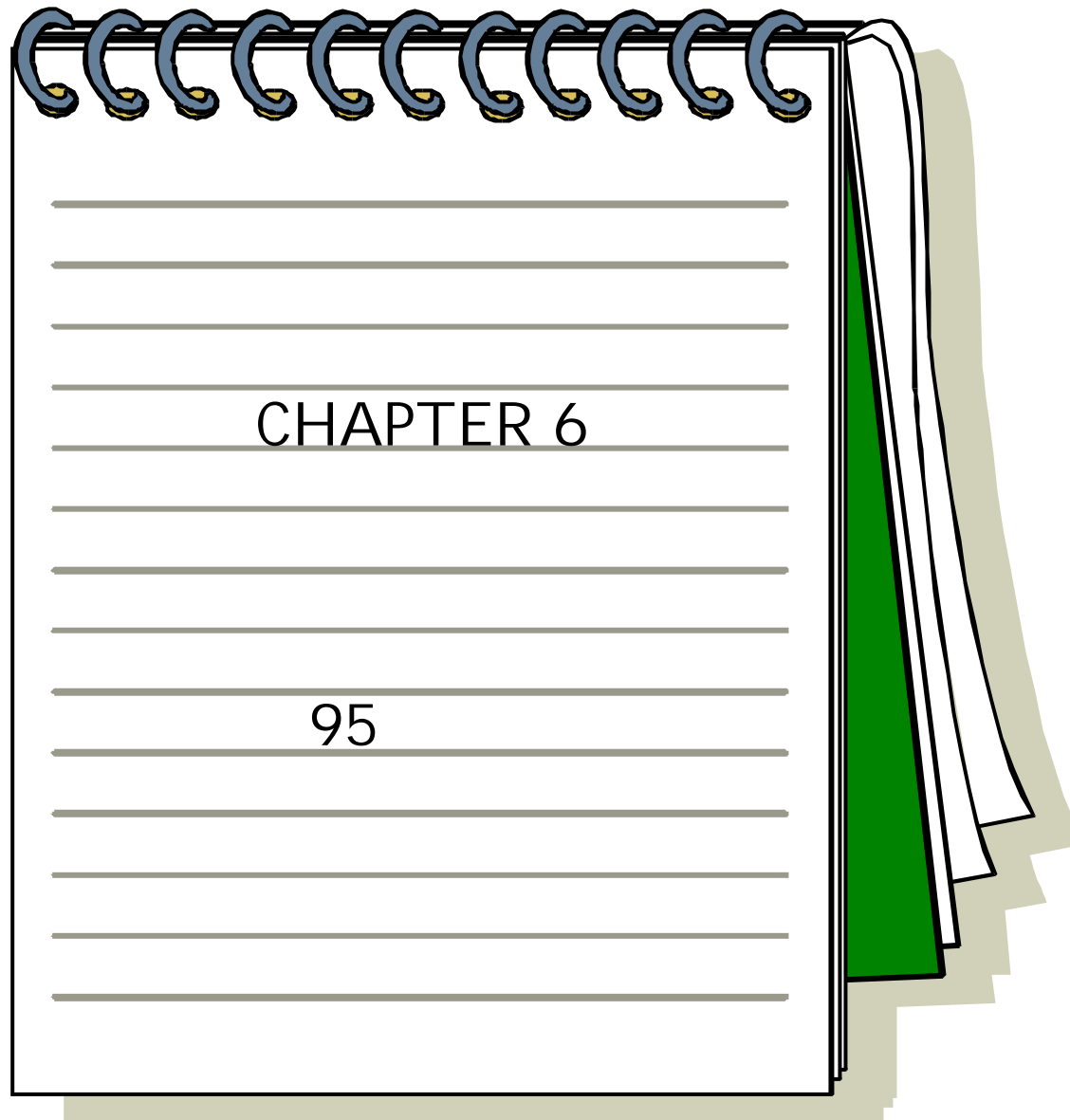
가

‘

,


.

.




# CHAPTER 6

 (Modal) (Modeless)


 (Modal)

가

 (Modeless)

가

 (DevStudio\Vc\mfc\include\<Afxcmn.h>)

 CAnimateCtrl, CHotKeyCtrl, CImageList, CListCtrl, CProgressCtrl,

CRichEditCtrl, CSliderCtrl, CSpinButtonCtrl, CStatusBarCtrl

CTabCtrl, CToolBarCtrl, CToolTipCtrl, CTreeCtrl

 COMMCTRL.DLL

Ctrl 가 Win32


# CHAPTER 6

 (CAnimateCtrl)

 AVI (Audio Video Interleaved)

 AVI



 (CHotKeyCtrl)



가

가



가












 (CImageList)

 0

 Win32

, 가 , , , , ,

# CHAPTER 6

|                                                                                     |                   |   |
|-------------------------------------------------------------------------------------|-------------------|---|
|    | (CListCtrl)       |   |
|    |                   | . |
|    | (CProgressCtrl)   |   |
|    |                   | . |
|    | (CRichEditCtrl)   |   |
|    | 가                 | 가 |
|    | OLE               | . |
|  | (CSliderCtrl)     |   |
|  |                   | . |
|  | (CSpinButtonCtrl) |   |
|  |                   | 가 |

# CHAPTER 6



(CStatusBarCtrl)



가

가

.



(CTabCtrl)



.



(CToolBarCtrl)



.



.



가

(Tooltip)

.



(CTreeCtrl)



.



.



# CHAPTER 6



(CToolTipCtrl)



(CCheckListBox)



가



(CDragListBox)



(drag)



CHeaderCtrl



# CHAPTER 6



CView



✎ Edit Control(Text Box), Button, List Box, Combo Box,  
Static Text(Label), Tree View, Progress Indicator, Slider



CWnd



(Parent Dialog)

# CHAPTER 6



(Modal)



가

1.

2. ClassWizard

CDialog

3. ClassWizard

(Exchange Function

ClassWizard가

.)

4. ClassWizard

5. OnInitDialog

( 가

CDialog 가

OnOK() 가

.)

6.

DoModal()

DoModal()

가

# CHAPTER 6

✍ Progress Indicator (CProgressCtrl)

✍ Progress Indicator OnInitDialog

SetRange SetPos

SetPos  
( 0 - 100 )

| void SetRange(int <i>nLower</i> , int <i>nUpper</i> ); | .               |
|--------------------------------------------------------|-----------------|
| int SetPos( int <i>nPos</i> );                         | .               |
| int OffsetPos( int <i>nPos</i> );                      | <i>nPos</i> 가 . |
| int SetStep( int <i>nStep</i> );                       | 가<br>( 10 )     |
| int StepIt();                                          | Step<br>가 .     |

(C) 1998 Sang I Kim


# CHAPTER 6

 Progress Indicator (CProgressCtrl)

| dwStyle    | 가 . |
|------------|-----|
| rect       |     |
| nParentWnd |     |
| nID        | ID  |

# CHAPTER 6

 (CSliderCtrl)

 , 가

· ,  
· ,  
WM\_HSCROLL WM\_VSCROLL 가  
· , 가

 CSliderCtrl

| ON_WM_HSCROLL | TBS_HORZ<br>·    |
|---------------|------------------|
| ON_WM_VSCROLL | TBS_VERT( )<br>· |

(C) 1998 Sang I Kim

# CHAPTER 6



( ,Track Bar Styles-TBS)

| TBS_AUTOTICKS      | 가<br>SetRange() |
|--------------------|-----------------|
| TBS_NOTICKS        | 가 가 .           |
| TBS_BOTH           | ( , ) .         |
| TBS_ENABLESELRANGE | 가 .             |
| TBS_LEFT           | .               |
| TBS_RIGHT          | .               |
| TBS_HORZ           | .( )            |
| TBS_VERT           | .               |
| TBS_TOP            | .               |
| TBS_BOTTOM         | .               |

(C) 1998 Sang I Kim

# CHAPTER 6

OnHScroll() OnVScroll()

| TB_PAGEUP        | 가<br>PageUp                                        |
|------------------|----------------------------------------------------|
| TB_PAGEDOWN      | 가<br>PageDown                                      |
| TB_LINEUP        | 가                                                  |
| TB_LINEDOWN      | 가                                                  |
| TB_ENDTRACK      | 가                      가 (WM_KEYUP)<br>(scrolling) |
| TB_THUMBTRACK    | 가                                                  |
| TB_THUMBPOSITION | 가                      가(TB_THUMBTRACK)<br>nPos    |
| TB_TOP           | 가                      Home                        |
| TB_BOTTOM        | 가                      End                         |

(C) 1998 Sang I Kim



# CHAPTER 6



## CSliderCtrl

| void GetChannelRect( LPRECT <i>lprc</i> ) const;              | . |
|---------------------------------------------------------------|---|
| int GetLineSize( ) const;                                     | . |
| UI NT GetNumTics( ) const;                                    | . |
| int GetPageSize( ) const;                                     | . |
| int GetPos( ) const;                                          | . |
| void GetRange(int& <i>nMin</i> ,int& <i>nMax</i> ) const;     | . |
| int GetRangeMax( ) const;                                     | . |
| int GetRangeMin( ) const;                                     | . |
| void GetSelection(int& <i>nMin</i> ,int& <i>nMax</i> ) const; | . |
| void GetThumbRect(LPRECT <i>lprc</i> ) const;                 | . |
| int GetTic( int <i>nTic</i> ) const;                          | . |

# CHAPTER 6



## CSliderCtrl

| DWORD* GetTicArray( ) const;                                                         | .   |
|--------------------------------------------------------------------------------------|-----|
| int GetTicPos( int <i>nTic</i> ) const;                                              | .   |
| int SetLineSize( int <i>nSize</i> );                                                 | .   |
| int SetPageSize( int <i>nSize</i> );                                                 | .   |
| void SetPos( int <i>nPos</i> );                                                      | .   |
| void SetRange( int <i>nMin</i> , int <i>nMax</i> ,<br>BOOL <i>bRedraw</i> = FALSE ); | .   |
| void SetRangeMax( int <i>nMax</i> ,<br>BOOL <i>bRedraw</i> = FALSE );                | .   |
| void SetRangeMin( int <i>nMin</i> ,<br>BOOL <i>bRedraw</i> = FALSE );                | .   |
| void SetSelection( int <i>nMin</i> , int <i>nMax</i> );                              | .   |
| BOOL SetTic( int <i>nTic</i> );                                                      | .   |
| void SetTicFreq( int <i>nFreq</i> );                                                 | 가 . |

# CHAPTER 6



CSliderCtrl

| void ClearSel(BOOL <i>bRedraw</i> = FALSE);  | .     |
|----------------------------------------------|-------|
| void ClearTics(BOOL <i>bRedraw</i> = FALSE); | .     |
| void VerifyPos( );                           | 가 0 . |







```
m_pSlider1->SetTicFreq(8);
m_pSlider2->SetTicFreq(8);
```

```
m_pSlider1->SetPageSize(8);
m_pSlider2->SetPageSize(8);
```

```
m_pSlider1->SetLineSize(1);
m_pSlider2->SetLineSize(1);
```

# CHAPTER 6

 (CSpinButtonCtrl)  
 (buddy)  
 integer , ClassWizard  
 Auto Buddy Set Buddy Integer  
 OnInitDialog() SetRange() SetAccel()  
 WM\_VSCROLL WM\_HSCROLL , GetPos() GetBuddy()

 (CSpinButtonCtrl)  


|               |            |
|---------------|------------|
|               |            |
| ON_WM_HSCROLL | UDS_HORZ 가 |
| ON_WM_VSCROLL | UDS_VERT 가 |
| ON_EN_UPDATE  | 가          |

# CHAPTER 6



(CSpinButtonCtrl)

| void SetRange(int <i>nLower</i> , int <i>nUpper</i> );                  | .   |
|-------------------------------------------------------------------------|-----|
| int SetPos( int <i>nPos</i> );                                          | .   |
| BOOL SetAccel( int <i>nAccel</i> ,<br>UDACCEL* <i>pAccel</i> );         | 가 . |
| int SetBase( int <i>nBase</i> );                                        | .   |
| CWnd* SetBuddy(CWnd* <i>pWndBuddy</i> );                                | .   |
| void GetRange( int & <i>lower</i> , int & <i>upper</i> )<br>const;      | .   |
| int GetPos() const;                                                     | .   |
| UI NT GetAccel( int <i>nAccel</i> ,<br>UDACCEL * <i>pAccel</i> ) const; | 가 . |
| UI NT GetBase( ) const;                                                 | .   |
| CWnd* GetBuddy() const;                                                 | .   |

# CHAPTER 6



(CSpinButtonCtrl)

| UDS_ALIGNLEFT   | .                   |
|-----------------|---------------------|
| UDS_ALIGNRIGHT  | .                   |
| UDS_ARROWKEYS   | 가 ,                 |
| UDS_AUTOBUDDY   | z .                 |
| UDS_HORZ        | .                   |
| UDS_NOTHOUSANDS | .                   |
| UDS_SETBUDDYINT | 가<br>가 10 16 .      |
| UDS_WRAP        | 가 . (scroll)<br>가 . |

# CHAPTER 6



(CListBox)



-

.



-

.

# CHAPTER 6

✍ CListBox

(DevStudio\Vc\include\winuser.h)

| LBS_DISABLENOSCROLL  | 가 가                  |
|----------------------|----------------------|
| LBS_EXTENDEDSEL      |                      |
| LBS_HASSTRINGS       | GetText()            |
| LBS_MULTICOLUMN      | SetColumnWidth() ( ) |
| LBS_MULTIPLESEL      | 가 ,                  |
| LBS_NOINTEGRALHEIGHT | 가 ,                  |
| LBS_NOREDRAW         | WM_SETREDRAW         |

(C) 1998 Sang I Kim

# CHAPTER 6

## ✍ CListBox

| LBS_NOSEL             | 가 ,<br>가 .                                               |
|-----------------------|----------------------------------------------------------|
| LBS_NOTIFY            | 가 .                                                      |
| LBS_OWNERDRAWFIXED    | 가 ,                                                      |
| LBS_OWNERDRAWVARIABLE | 가 ,                                                      |
| LBS_SORT              | .                                                        |
| LBS_STANDARD          | LBS_NOTIFY   LBS_SORT   WS_VSCROLL   WS_BORDER.<br>, 가 . |
| LBS_USETABSTOPS       | 32 .                                                     |
| LBS_WANTKEYBOARDINPUT | 가 WM_VKEYTOITEM WM_CHARTOITEM .                          |

# CHAPTER 6

## CListBox

| ON_LBN_DBLCLK    | 가<br>가<br>가<br>LBS_NOTIFY                          |
|------------------|----------------------------------------------------|
| ON_LBN_ERRSPACE  | 가                                                  |
| ON_LBN_KILLFOCUS | 가                                                  |
| ON_LBN_SELCANCEL | 가<br>가<br>LBS_NOTIFY                               |
| ON_LBN_SELCHANGE | 가<br>가<br>CListBox::SetCurSel()<br>LBS_NOTIFY<br>가 |
| ON_LBN_SETFOCUS  | 가                                                  |

# CHAPTER 6

 CListBox





 int GetCurSel( ) const;

(0) .


 int SetCurSel( int *nSelect*);


.






 가 가

 LB\_ERRSPACE(-2) : 가 가

 LB\_ERR(-1) : 가

 LB\_OKAY(0) :

 가

# CHAPTER 6



## CListBox

|                                                                                                            |                             |
|------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                                                                            |                             |
| int GetCount( ) const;                                                                                     | .                           |
| int GetHorizontalExtent( ) const;                                                                          | ( ) .                       |
| DWORD GetItemData<br>( int nIndex ) const;                                                                 | 32 .                        |
| void* GetItemDataPtr<br>( int nIndex ) const;                                                              | .                           |
| int GetItemHeight<br>( int nIndex ) const;                                                                 | .                           |
| int GetItemRect( int nIndex,<br>LPRECT lpRect ) const;                                                     | .                           |
| LCID GetLocale( ) const;                                                                                   | (LCID, Locale identifier) . |
| int GetSel( int nIndex ) const;                                                                            | .                           |
| int GetText( int nIndex, LPTSTR lpszBuffer ) const;<br>void GetText( int nIndex, CString& rString ) const; | .                           |
| int GetTextLen<br>( int nIndex ) const;                                                                    | ( ) .                       |

# CHAPTER 6



## CListBox

| int GetTopIndex( ) const;                                                                                                  | (0 ) .   |
|----------------------------------------------------------------------------------------------------------------------------|----------|
| UINT ItemFromPoint (CPoint pt,<br>BOOL& bOutside ) const;                                                                  | 가 가 .    |
| void SetColumnWidth<br>( int cxWidth );                                                                                    | 가 .      |
| void SetHorizontalExtent<br>( int cxExtent );                                                                              | ( ) .    |
| int SetItemData( int nIndex,<br>DWORD dwItemData );                                                                        | 32 .     |
| int SetItemDataPtr<br>( int nIndex, void * pData );                                                                        | . .      |
| int SetItemHeight<br>( int nIndex, UINT cyItemHeight );                                                                    | . .      |
| LCID SetLocale<br>( LCID nNewLocale );                                                                                     | (LCID) . |
| void SetTabStops( );<br>BOOL SetTabStops( const int& cxEachStop );<br>BOOL SetTabStops( int nTabStops, LPINT rgTabStops ); | . .      |
| int SetTopIndex<br>( int nIndex );                                                                                         | (0 ) .   |

# CHAPTER 6



## Listbox

| int GetAnchorIndex( ) const;                                              | anchor item |
|---------------------------------------------------------------------------|-------------|
| int GetCaretIndex( ) const;                                               |             |
| int GetSelCount( ) const;                                                 |             |
| int GetSelItems( int <i>nMaxItems</i> ,<br>LPI NT <i>rgIndex</i> ) const; |             |
| SelectedItemRange()                                                       |             |
| void SetAnchorIndex<br>( int <i>nIndex</i> );                             |             |
| int SetCaretIndex( int <i>nIndex</i> ,<br>BOOL <i>bScroll</i> = TRUE );   |             |
| int SetSel( int <i>nIndex</i> ,<br>BOOL <i>bSelect</i> = TRUE );          |             |

# CHAPTER 6



| int AddString( LPCTSTR <i>lpszItem</i> );                                         | 가 .                        |
|-----------------------------------------------------------------------------------|----------------------------|
| int DeleteString( UINT <i>nIndex</i> );                                           | .                          |
| int Dir( UINT <i>attr</i> ,<br>LPCTSTR <i>lpszWildcard</i> );                     | 가 .                        |
| int FindString( int <i>nStartAfter</i> ,<br>LPCTSTR <i>lpszItem</i> ) const;      | .                          |
| int FindStringExact( int <i>nIndexStart</i> ,<br>LPCTSTR <i>lpszFind</i> ) const; | .                          |
| int InsertString<br>( int <i>nIndex</i> , LPCTSTR <i>lpszItem</i> );              | ( <i>nIndex</i> : -1, 가) . |
| void ResetContent( );                                                             | .                          |
| int SelectString( int <i>nStartAfter</i> ,<br>LPCTSTR <i>lpszItem</i> );          | .                          |

# CHAPTER 6

가 ( 가 )

| virtual int CharToItem<br>( UINT nKey, UINT nIndex );                       | 가<br>WM_CHAR                             |
|-----------------------------------------------------------------------------|------------------------------------------|
| virtual int CompareItem<br>( LPCOMPAREITEMSTRUCT<br>lpCompareItemStruct );  | MFC                                      |
| virtual void DeleteItem<br>( LPDELETEITEMSTRUCT<br>lpDeleteItemStruct );    | 가<br>MFC                                 |
| virtual void DrawItem<br>( LPDRAWITEMSTRUCT<br>lpDrawItemStruct );          | MFC<br>가                                 |
| virtual void MeasureItem<br>( LPMEASUREITEMSTRUCT<br>lpMeasureItemStruct ); | 가<br>MFC                                 |
| virtual int VKeyToItem<br>( UINT nKey, UINT nIndex );                       | 가<br>LBS_WANTKEYBOARDINPUT<br>WM_KEYDOWN |

(C) 1998 Sang I Kim

# CHAPTER 6



(CListCtrl, )



,

.



0

.



(CImageList)

.



.

# CHAPTER 6

## CListCtrl

|  | LVS_ICON<br>가 . 가                                       |
|--|---------------------------------------------------------|
|  | LVS_SMALLICON<br>가 . 가                                  |
|  | LVS_LIST<br>가 .                                         |
|  | LVS_REPORT<br>가 .<br>가 .<br>LVS_NOCOLUMNHEADER<br>Win32 |

# CHAPTER 6

## ✍ CListCtrl

| LVS_ALIGNLEFT      | .   |
|--------------------|-----|
| LVS_ALIGNTOP       | .   |
| LVS_AUTOARRANGE    | .   |
| LVS_EDITLABELS     | 가 . |
| LVS_ICON           |     |
| LVS_LIST           | ( ) |
| LVS_NOCOLUMNHEADER | .   |
| LVS_NOLABELWRAP    | 가 . |
| LVS_NOSCROLL       | .   |

# CHAPTER 6

## CListCtrl

| LVS_NOSORTHEADER    | . |
|---------------------|---|
| LVS_OWNERDRAWFIXED  | . |
| LVS_REPORT          |   |
| LVS_SHAREIMAGELISTS | . |
| LVS_SINGLESEL       | . |
| LVS_SMALLICON       |   |
| LVS_SORTASCENDING   | . |
| LVS_SORTDESCENDING  | . |

# CHAPTER 6

## ✍ CListCtrl

| CCS_BOTTOM        | .         |
|-------------------|-----------|
| CCS_NODIVIDER     | 가 .       |
| CCS_NOHILITE      | 가 .       |
| CCS_NOMOVEV       | WM_SIZE . |
| CCS_NOPARENTALIGN | .         |
| CCS_NORESIZE      | .         |
| CCS_TOP           | , .       |

(C) 1998 Sang Il Kim

# CHAPTER 6



LVS\_ICON



LVS\_ICON



# CHAPTER 6

✍

✍

가 .

✍

✍

✍

✍

✍

(CListCtrl)

✍ LV\_ITEM

```
typedef struct _LV_ITEM {
```

```
    UINT    mask;        //
```

가 가

```
    int     item;        // 0
```

가

```
    int     subitem;     // 1
```

가

```
    UINT    state;       //
```

```
    UINT    stateMask;   //
```

.

```
    LPSTR    pszText;    // 가
```

```
    int      cchTextMax; // pszText가 가
```

```
    int      image;      //
```

```
    LPARAM   lParam;     //
```

32

```
} LV_ITEM;
```

# CHAPTER 6

LV\_ITEM mask

| LVIF_TEXT       | pszText 가 . |
|-----------------|-------------|
| LVIF_IMAGE      | image 가 .   |
| LVIF_PARAM      | lParam 가 .  |
| LVIF_STATE      | state 가 .   |
| LVIF_DI_SETITEM | .           |



가

WM\_NOTIFY

( DevStudio\Vc\include\Commctrl.h )



## CHAPTER 6



| LVN_BEGINDRAG      | .       |
|--------------------|---------|
| LVN_BEGINLBEEDIT   | .       |
| LVN_BEGINRDRAG     | .       |
| LVN_COLUMNCLICK    | .       |
| LVN_DELETEALLITEMS | 가 .     |
| LVN_DELETEITEM     | 가 .     |
| LVN_ENDLBEEDIT     | .       |
| LVN_GETDISPINFO    |         |
| LVN_INSERTITEM     | .       |
| LVN_ITEMCHANGED    | .       |
| LVN_ITEMCHANGING   | .       |
| LVN_KEYDOWN        | .       |
| LVN_PEN            | ( 가 ) . |
| LVN_SETDISPINFO    | .       |

# CHAPTER 6



- 1.
- 2.
3. CListCtrl
4. WM\_NOTIFY

가  
가

OnChildNotify()



LVS\_ICON

,

.



CImageList

.

CListCtrl::SetImageList()



.

# CHAPTER 6



가



(CHeaderCtrl)

.

1. LV\_COLUMN

2. InsertColumn()



LV\_COLUMN

```
typedef struct _LV_COLUMN {
```

```
    UINT    mask;           //
```

.

```
    int      fmt;           // (LVCFMT_CENTER, LVCFMT_LEFT, LVCFMT_RIGHT)
```

```
    int      cx;            // ( : )
```

```
    LPTSTR   pszText;       //
```

```
    int      cchTextMax;    // pszText가 가
```

```
    int      iSubItem;      //
```

```
} LV_COLUMN;
```

# CHAPTER 6

✍ LV\_COLUMN mask 가

| LVCF_FMT     | fmt 가 .      |
|--------------|--------------|
| LVCF_SUBITEM | iSubItem 가 . |
| LVCF_TEXT    | pszText 가 .  |
| LVCF_WIDTH   | cx 가 .       |

# CHAPTER 6



| <pre> CImageList* SetImageList ( <b>CImageList*</b> <i>pImageList</i>, int <i>nImageList</i>); </pre>                                                                                                |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre> CImageList* GetImageList           ( int <i>nImageList</i> ) const; </pre>                                                                                                                     |  |
| <pre> int GetItemCount(); </pre>                                                                                                                                                                     |  |
| <pre> BOOL SetColumn ( int <i>nCol</i>, <b>const LV_COLUMN*</b> <i>pColumn</i>); </pre>                                                                                                              |  |
| <pre> BOOL SetColumnWidth( int <i>nCol</i>, int <i>cx</i>); </pre>                                                                                                                                   |  |
| <pre> int GetItemText( int <i>nItem</i>, int <i>nSubItem</i>, LPTSTR <i>lpszText</i>, int <i>nLen</i> ) const; CString GetItemText           ( int <i>nItem</i>, int <i>nSubItem</i> ) const; </pre> |  |

# CHAPTER 6



## Operation

| Operation     |     |
|---------------|-----|
| InsertItem    | 가 . |
| DeleteItem    | .   |
| DeleteAllItem | .   |
| FindItem      | .   |
| SortItems     | .   |
| Scroll        | .   |
| RedrawItems   | .   |
| Update        | .   |
| Arrange       | .   |
| InsertColumn  | 가 . |

# CHAPTER 6



(CTreeCtrl)



HTREEITEM

가 InsertItem()

TV\_INSERTSTRUCT

TV\_INSERTSTRUCT

```
typedef struct _TV_INSERTSTRUCT {
```

```
    HTREEITEM hParent;
```

```
    HTREEITEM hInsertAfter;
```

```
    TV_ITEM item;
```

```
} TV_INSERTSTRUCT;
```

# CHAPTER 6



(CTreeCtrl)



TV\_ITEM

```
typedef struct _TV_ITEM {  
    UINT          mask;  
    HTREEITEM     hItem;  
    UINT          state;  
    UINT          stateMask;  
    LPSTR          pszText;  
    int            cchTextMax;  
    int            image;  
    int            iSelectedImage;  
    int            cChildren;  
    LPARAM         lParam;  
} TV_ITEM;
```

# CHAPTER 6



(CTreeCtrl)

( DevStudio\Vc\include\Commctrl.h )

| TVS_HASLINES        | 가 .           |
|---------------------|---------------|
| TVS_LINESATROOT     | 가 .           |
| TVS_HASBUTTONS      | 가 .           |
| TVS_EDITLABELS      | .             |
| TVS_SHOWSELALWAYS   | .             |
| TVS_DISABLEDRAHDROP | TVN_BEGINDRAG |

# CHAPTER 6



( DevStudio\Vc\include\Commctrl.h )

| TVN_BEGINDRAG     | . |
|-------------------|---|
| TVN_BEGINLBELEDIT | . |
| TVN_BEGINRDRAG    | . |
| TVN_DELETEITEM    | . |
| TVN_ENDLBELEDIT   | . |
| TVN_GETDISPINFO   | . |
| TVN_ITEMEXPANDED  | . |
| TVN_ITEMEXPANDING | . |
| TVN_KEYDOWN       | . |
| TVN_SELCHANGED    | . |
| TVN_SELCHANGING   | . |
| TVN_SETDISPINFO   | . |

(C) 1998 Sang Il Kim

# CHAPTER 6



(CTreeCtrl)

| CI mageList* SetI mageList( <b>CI mageList*</b><br><i>pl mageList</i> , <b>int</b> <i>nI mageListType</i> );                                                                                                                                                                                                                                 | . |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| CI mageList* GetI mageList<br>( <b>UINT</b> <i>nI mage</i> );                                                                                                                                                                                                                                                                                | . |
| HTREEI TEM GetSelectedI tem();                                                                                                                                                                                                                                                                                                               | . |
| BOOL SetI tem( <b>TV_I TEM*</b> <i>pl tem</i> );<br><br>BOOL SetI tem( <b>HTREEI TEM</b> <i>hl tem</i> ,<br><b>UINT</b> <i>nMask</i> , <b>LPCTSTR</b> <i>lpszI tem</i> ,<br><b>int</b> <i>nI mage</i> , <b>int</b> <i>nSelectedI mage</i> ,<br><b>UINT</b> <i>nState</i> , <b>UINT</b> <i>nStateMask</i> ,<br><b>LPARAM</b> <i>lParam</i> ); | . |
| <b>UINT</b> GetI temState( <b>HTREEI TEM</b> <i>hl tem</i> ,<br><b>UINT</b> <i>nStateMask</i> ) const;                                                                                                                                                                                                                                       | . |
| CString GetI temText<br>( <b>HTREEI TEM</b> <i>hl tem</i> ) const;                                                                                                                                                                                                                                                                           | . |

# CHAPTER 6

## CTreeCtrl

| dwStyle    | 가 . |
|------------|-----|
| rect       |     |
| nParentWnd |     |
| nID        | ID  |

# CHAPTER 6



(I con)



Small I con : 16 x 16



Large I con : 32 x 32



(mask)



0(FALSE) :



1(TRUE) :

:

4

:

1

(opaque)

:

(0) -

:

(0xF) -

# CHAPTER 6

✍ CWnd::GetDlgItem

✍

✍

✍ CWnd\* GetDlgItem(**int** *nID*) const;

void CWnd::GetDlgItem(**int** *nID*, **HWND\*** *phWnd*) const;

✍ Return value

✍

가 NULL

✍ Parameters

✍ *nID*

ID

✍ *phWnd*

HWND

# CHAPTER 6

✍ CComboBox::InsertString

✍

✍

CBS\_SORT

✍ int InsertString( **int** *nIndex*, **LPCTSTR** *lpszString* );

✍ Parameters

✍ *nIndex*

-1 :

가 .

✍ *lpszString*

null

✍ CListBox::InsertString

✍

✍

LBS\_SORT

✍ int InsertString( **int** *nIndex*, **LPCTSTR** *lpszItem* );

✍ Return Value

, LB\_ERR

LB\_ERRSPACE

✍ Parameters

✍ *nIndex*

-1 :

가 .

✍ *lpszItem*

null

# CHAPTER 6

## ✎ CWnd::SetScrollRange



✎ void SetScrollRange( **int** *nBar*, **int** *nMinPos*, **int** *nMaxPos*, **BOOL** *bRedraw* = **TRUE** );

✎ Parameters

✎ *nBar*

SB\_HORZ

SB\_VERT

✎ *nMinPos*           가

✎ *nMaxPos*           가

✎ *bRedraw*                           TRUE,                           FALSE

## ✎ CScrollBar::SetScrollRange

✎ void SetScrollRange( **int** *nMinPos*, **int** *nMaxPos*, **BOOL** *bRedraw* = **TRUE** );

✎ Parameters

✎ *nMinPos*

✎ *nMaxPos*

✎ *bRedraw*                           TRUE,                           FALSE

# CHAPTER 6

✍ CDialog::DoModal



DoModal

✍ virtual int DoModal( );

✍ Return vlaue

가  
가 IDABORT

-1,

EndDialog

.

✍ EndDialog

: IDCANCEL,

: IDOK

✍ CDialog::OnOK



(OK)

.



IDOK

EndDialog

.

✍ OnOK

.




,


DestroyWindow

.

✍ virtual void OnOK( );

# CHAPTER 6

 CDialog::OnCancel

 (I DCANCEL)



I DCANCEL

EndDialog

 OnCancel



DestroyWindow

 virtual void OnCancel();

 CDialog::EndDialog



 EndDialog

가

 EndDialog CDialog

 virtual EndDialog( **int** *nResult* );

 Parameters

 *nResult*

DoModal

# CHAPTER 6

✍ CWnd::DoDataExchange

✍

✍ virtual void DoDataExchange( **CDataExchange\*** *pDX*);

✍ Parameters

✍ *pDX* CDataExchange

✍ CWnd::GetScrollPos

✍

✍

✍ int GetScrollPos( **int** *nBar* ) const;

✍ Parameters

✍ *nBar*

**SB\_HORZ**

**SB\_VERT**

✍ CScrollBar::GetScrollPos

✍

✍ int GetScrollPos( ) const;

# CHAPTER 6

✎ CScrollBar::SetScrollPos

✎

✎ int SetScrollPos( **int** *nPos*, **BOOL** *bRedraw* = **TRUE** );

✎ Parameters

✎ *nPos*

✎ *bRedraw* TRUE

FALSE

✎ CScrollBar::GetScrollRange

✎

✎ void GetScrollRange( **LPINT** *lpMinPos*, **LPINT** *lpMaxPos* ) const;

✎ Parameters

✎ *lpMinPos*

✎ *lpMaxPos*

# CHAPTER 6

✍ CDC::SetBkColor

✍

RGB

✍ virtual COLORREF SetBkColor( **COLORREF** *crColor* );

✍ Parameters

✍ *crColor*

RGB

✍ CImageList::SetBkColor

✍

✍ COLORREF SetBkColor( **COLORREF** *cr* );

✍ Parameters

✍ *cr*

✍ CListCtrl::SetBkColor

✍

✍ BOOL SetBkColor( **COLORREF** *cr* );

✍ Parameters

✍ *cr*

# CHAPTER 6

 CDC::GetBkColor




RGB

 COLORREF GetBkColor( ) const;

 CImageList::GetBkColor



 COLORREF GetBkColor( ) const;

 CListCtrl::GetBkColor




 COLORREF GetBkColor( ) const;

# CHAPTER 6

 CWnd::OnCtlColor

 WM\_CTLCOLOR



 afx\_msg HBRUSH OnCtlColor( **CDC\*** *pDC*, **CWnd\*** *pWnd*, **UINT** *nCtlColor* );

 Parameters

 *pDC*

 *pWnd*

 *nCtlColor*

CTLCOLOR\_BTN

CTLCOLOR\_DLG

CTLCOLOR\_EDIT

CTLCOLOR\_LISTBOX

CTLCOLOR\_MSGBOX

CTLCOLOR\_SCROLLBAR

CTLCOLOR\_STATIC

# CHAPTER 6

✍ CWnd::SetDlgItemText

✍

✍ void SetDlgItemText( **int** *nID*, **LPCTSTR** *lpszString* );

✍ Parameters

✍ *nID*

가

ID

✍ *lpszString*

null

✍ CWnd::SetWindowText

✍

✍

( )

✍ void SetWindowText( **LPCTSTR** *lpszString* );

✍ Parameters

✍ *lpszString*

null

# CHAPTER 6

✍ CWnd::GetWindowText

✍ ( ) .

✍ int GetWindowText( **LPCTSTR** *lpszStringBuf*, **int** *nMaxCount* ) const;

✍ void GetWindowText( **CString&** *rString* ) const;

✍ Parameters

✍ *lpszStringBuf* null

✍ *nMaxCount* *lpszStringBuf* 가

✍ *rString* CString

✍ CWinApp::LoadIcon

✍ .

✍ HICON LoadIcon( **LPCTSTR** *lpszResourceName* ) const;

✍ HICON LoadIcon( **UINT** *nIDResource* ) const;

✍ Parameters

✍ *lpszResourceName* MAKEINTRESOURCE

✍ *nIDResource* ID

# CHAPTER 6

✎ CListCtrl::SetImageList

✎

✎ CImageList\* SetImageList( **CImageList\*** *plImageList*, **int** *nImageList* );

✎ Parameters

✎ *plImageList*

✎ *nImageList*

**LVSIL\_NORMAL**

**LVSIL\_SMALL**

**LVSIL\_STATE**

✎ CListCtrl::GetItemText

✎

✎ **int** GetItemText( **int** *nItem*, **int** *nSubItem*, **LPTSTR** *lpszText*,  
**int** *nLen* ) const;

✎ **CString** GetItemText( **int** *nItem*, **int** *nSubItem* ) const;

✎ Parameters

✎ *nItem*

✎ *nSubItem*

✎ *lpszText*

✎ *nLen*            *lpszText*

# CHAPTER 6

✍ CListCtrl::InsertItem -

✍ int InsertItem( **const LV\_ITEM\*** pItem );

✍ int InsertItem( **int** nItem, **LPCTSTR** lpszItem );

✍ int InsertItem( **int** nItem, **LPCTSTR** lpszItem, **int** nImage );

✍ int InsertItem( **UINT** nMask, **int** nItem, **LPCTSTR** lpszItem, **UINT** nState, **UINT** nStateMask, **int** nImage, **LPARAM** lParam );

✍ Parameters

✍ pItem

LV\_ITEM

✍ nItem

✍ lpszItem

✍ nImage

I\_IMAGECALLBACK

✍ nMask

가

✍ nState

✍ nStateMask

nState

가

가

✍ nImage

✍ lParam

가

32



## CHAPTER 6

EX06B

| Object   | Property    | Setting                        |
|----------|-------------|--------------------------------|
| Dialog   | ID          | IDD_DIALOG1                    |
|          | Caption     | Windows Common Controls Dialog |
| Static   | ID          | IDC_STATIC                     |
|          | Caption     | Progress                       |
| Static   | ID          | IDC_STATIC                     |
|          | Caption     | Trackbar 1                     |
| Trackbar | Style/Point | Bottom/Right                   |
| Static   | ID          | IDC_STATIC_TRACK1              |
|          | Caption     | Static                         |
| Static   | ID          | IDC_STATIC                     |
|          | Caption     | Trackbar 2                     |
| Trackbar | Style/Point | Bottom/Right                   |
|          |             | Tick marks, Auto ticks         |
| Static   | ID          | IDC_STATIC_TRACK2              |
|          | Caption     | Static                         |
| Static   | ID          | IDC_STATIC                     |
|          | Caption     | Buddy                          |
| Edit     | ID          | IDC_BUDDY_SPIN1                |
|          | Style       | Read-only                      |

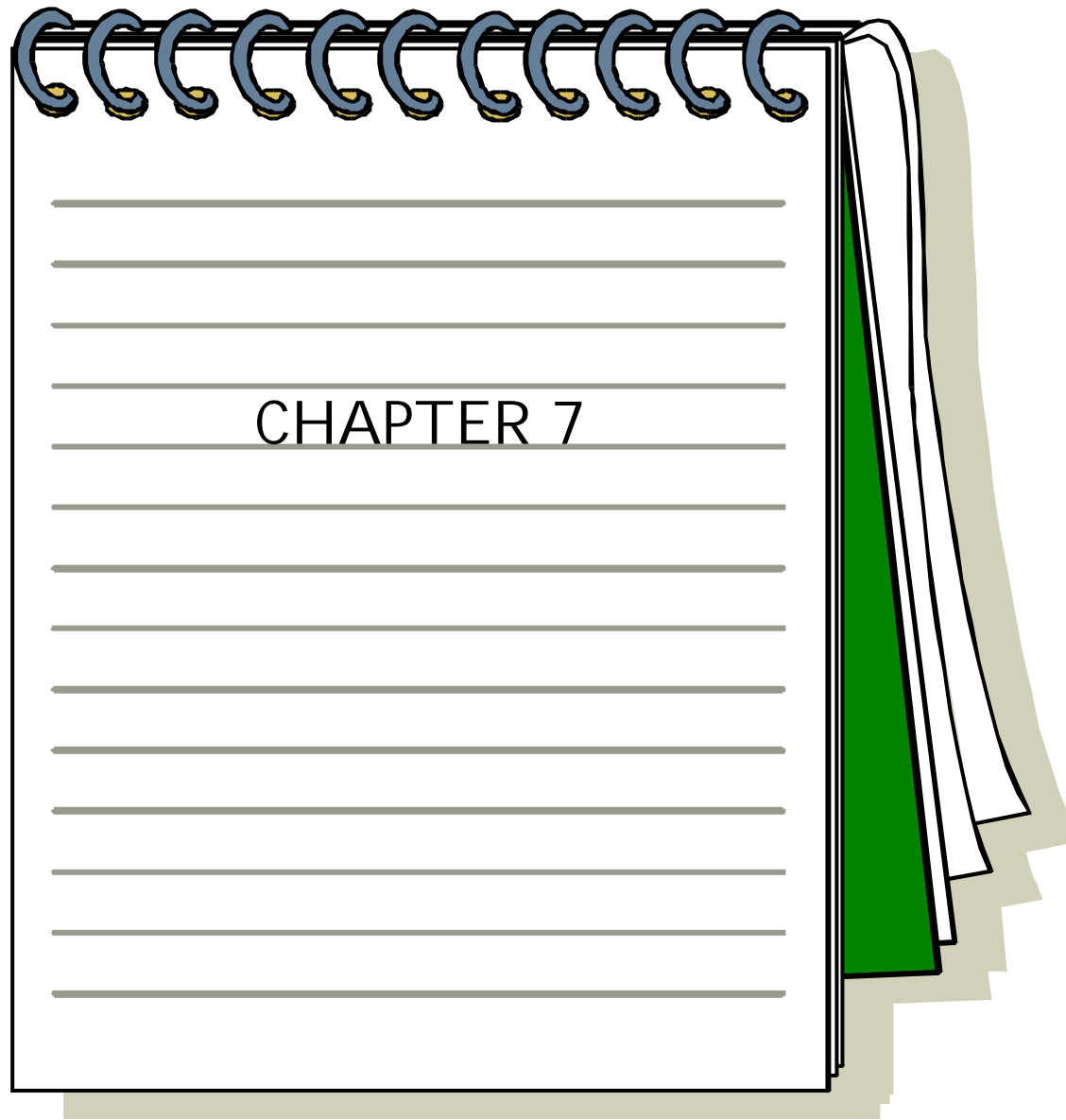
(C) 1998 Sang I Kim



## CHAPTER 6

EX06B

| Object       | Property    | Setting                                         |
|--------------|-------------|-------------------------------------------------|
| Spin         | Style       | Auto buddy                                      |
| Static       | ID          | IDC_STATIC                                      |
|              | Caption     | Spin                                            |
| Static       | ID          | IDC_STATIC                                      |
|              | Caption     | List Control                                    |
| List Control | ID          | IDC_LISTVIEW1                                   |
|              | Style       | Single selection<br>Show selection always       |
|              | Style/View  | List                                            |
|              | More Styles | Border                                          |
| Static       | ID          | IDC_STATIC_LISTVIEW1                            |
|              | Caption     | Current Selection                               |
| Static       | ID          | IDC_STATIC                                      |
|              | Caption     | Tree Control                                    |
| Tree Control | ID          | IDC_TREEVIEW1                                   |
|              | Style       | Has buttons, Has lines<br>Lines at root, Border |
| Static       | ID          | IDC_STATIC_TREEVIEW1                            |
|              | Caption     | Current Selection                               |



# CHAPTER 7



CFileDialog, CFontDialog, CColorDialog, CPrintDialog



COMDLG32.DLL



CDialog



|  | ID                 | ( )                         |
|--|--------------------|-----------------------------|
|  | CDialog::DoModal() | CDialog::Create()<br>( ID ) |

# CHAPTER 7



가

|                     |   |
|---------------------|---|
| CWnd::SendMessage() | 가 |
| CWnd::PostMessage() | 가 |



(Ownership)



(Pop-up)



(Owner)

가

# CHAPTER 7

SendMessage() PostMessage()

A ( )

pW->SendMessage(WM\_MYMSG, 0, 0);

AfxMessageBox(" 1");

pW->PostMessage(WM\_MYMSG, 0, 0);

AfxMessageBox(" 2");

B ( )

LONG CMyView::OnMyMsg(WPARAM wParam, LPARAM lParam)

return 0L;

B 가

B

가

AfxMessageBox(" 2")

# CHAPTER 7

## SendMessage

.

.

SendMessage 가

LRESULT SendMessage(UINT *message*, WPARAM *wParam*=0, LPARAM *lParam*=0);

### Parameters

*message*

*wParam* 가

*lParam* 가

## PostMessage

.

가 ,

PostMessage 가

BOOL PostMessage(UINT *message*, WPARAM *wParam* = 0, LPARAM *lParam* = 0);

### Parameters

*message*

*wParam* 가

*lParam* 가

# CHAPTER 7



CDialog::DoModal()

CDialog::OnCancel()

가

가

.

CDialog::Create()

DestroyWindow()

.

DestroyWindow()



Enter

ESC

EndDialog()

.

CDialog::OnOK()

CDialog::EndDialog()

EndDialog()

# CHAPTER 7



| CColorDialog       | 가 .   |
|--------------------|-------|
| CFileDialog        | 가 .   |
| CFindReplaceDialog | 가 .   |
| CPageSetupDialog   | 가 .   |
| CFontDialog        | 가 가 . |
| CPrintDialog       | 가 .   |

# CHAPTER 7

 CFileDialog

 CFileDialog dlg(TRUE, "bmp", "\*.bmp");


if(dlg.DoModal() == IDOK) {

CFile file;

VERIFY(file.Open(dlg.GetPathName(), CFile::modeRead));

}

 : TRUE(File Open ), FALSE(File Save )

 : "bmp" ( )


 : "\*.bmp" ( )

 CFileDialog::GetPathName() :

CString

.

# CHAPTER 7

 (nested)

 Win32

" "

.



( ID : stc32=0x045f)

, (CFileDialog)

.



ClassWizard

.

# CHAPTER 7



가

 BOOL CSpecialFileDialog::OnInitDialog()

{

CFileDialog::OnInitDialog();

HICON hIcon = AfxGetApp() -> LoadIcon(IDI\_ICON1);

GetParent() -> SetIcon(hIcon, TRUE); // Large Icon

GetParent() -> SetIcon(hIcon, FALSE); // Small Icon

return TRUE;

}



## CHAPTER 7

EX07A

| Object      | Property | Setting         |
|-------------|----------|-----------------|
| Dialog      | ID       | IDD_DIALOG1     |
|             | Caption  | Modeless Dialog |
|             | Style    | Popup           |
|             | Border   | Dialog Frame    |
| Static Text | ID       | IDC_STATIC      |
|             | Caption  | Edit1           |

EX07B

| Object   | Property | Setting                   |
|----------|----------|---------------------------|
| Dialog   | ID       | IDD_FILESPECIAL           |
|          | Style    | Child                     |
|          | Border   | None                      |
| GroupBox | ID       | Stc32=0x045f              |
| Button   | ID       | IDC_DELETE                |
|          | Caption  | Delete all matching files |

(C) 1998 Sang Il Kim

가가

가  
가

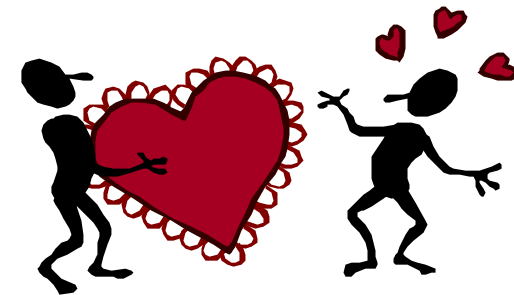
가  
가

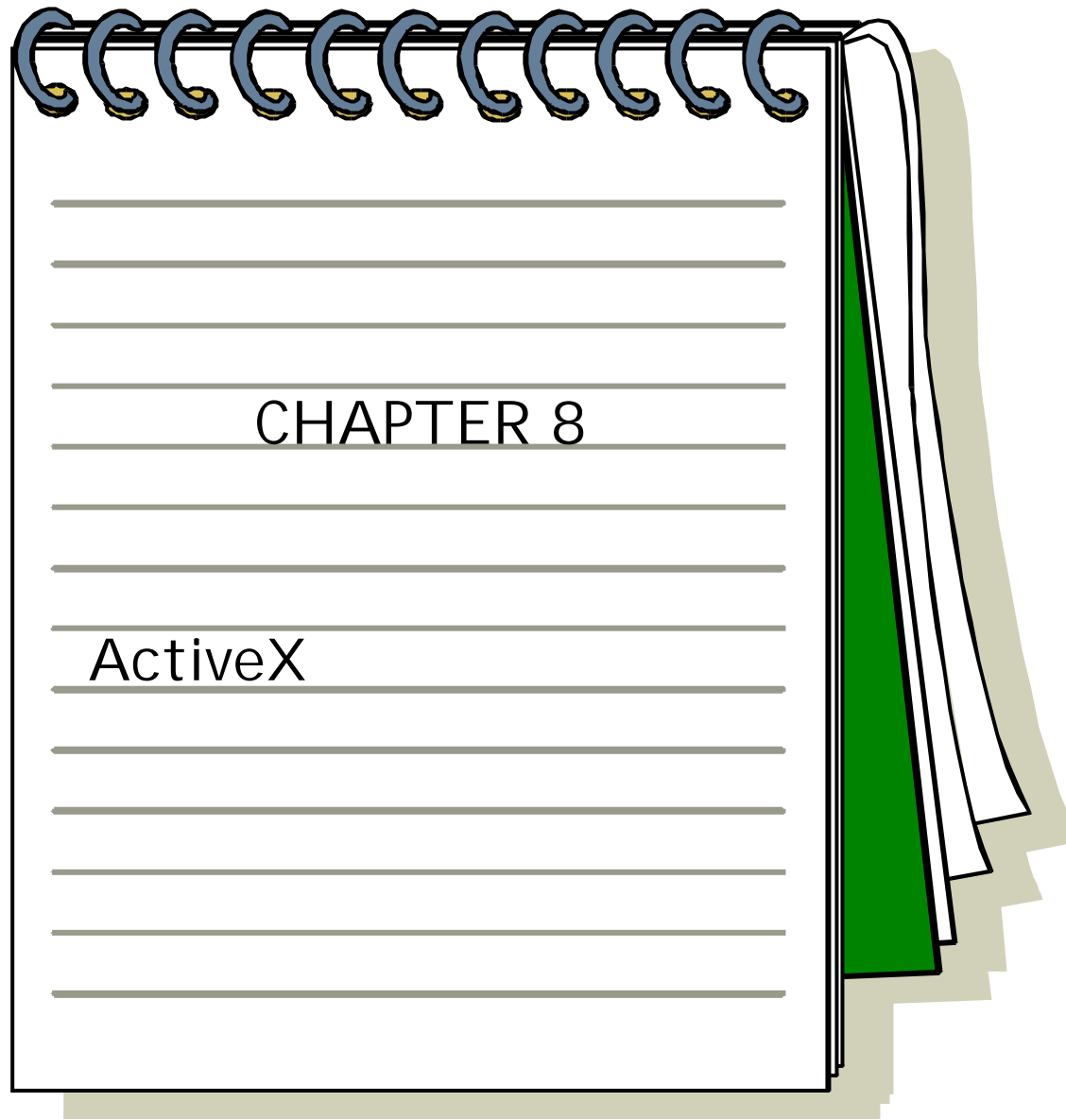
가

가

?

?





# CHAPTER 8

✍ ActiveX

✍ ActiveX

✍

C++

가

✍

✍

95

.

✍

MFC

CEdit

CTreeCtrl

.

✍

.

✍

BN\_CLICKED

(Notification

Command Message)

.

✍

가

CWnd::GetWindowText()

.

# CHAPTER 8

 ActiveX





DLL



 "CUSTOM Control" - 가



WM\_COMMAND

.

# CHAPTER 8

✍ ActiveX



ActiveX



ActiveX

가



가



WM\_CREATE

ActiveX

Create()



ActiveX

(container)

✍ ActiveX



(Properties) -



Dialog Data Exchange(DDX)

ActiveX



# CHAPTER 8


 ActiveX

 (Methods) -


 - WM\_

 *ActiveX* - " "

 " " *ActiveX*

 " " ActiveX

 ActiveX

 Project - Add To Project

- Registered ActiveX Controls

 ActiveX

- Component And Controls

- Calendar Control 8.0 - Insert

(exported)

# CHAPTER 8

✍ ActiveX                      ClassWizard C++                      (wrapper)

✍                      ActiveX                      ClassWizard

                                 C++ wrapper                      .

✍                      CWnd                      ,

                                 .

✍                      ActiveX

                                 .

```
✍ unsigned long CCalendar::GetBackColor()
{
    unsigned long result;
    InvokeHelper(DISPID_BACKCOLOR, DISPATCH_PROPERTYGET,
                VT_I4, (void*)&result, NULL);
    return result;
}
```

# CHAPTER 8

✍ ActiveX AppWizard

✍ AppWizard Step3 - ActiveX Control AppWizard  
InitInstance() 가 .

✍ AfxEnableControlContainer(); // Ex08a.cpp

✍ #include <afxdisp.h> // MFC OLE automation classes, StdAfx.h

✍ ActiveX 가 가 .

✍ (wrapper)

✍ CDialog::OnInitDialog()  
CWnd::UpdateData(FALSE) .

✍ CDialog::OnOK()  
CWnd::UpdateData(TRUE) .

✍ ActiveX 가 , Value  
UpdateData(FALSE) .

✍ , (wrapper) Get

# CHAPTER 8

✍ ClassWizard



ActiveX

ClassWizard

가

.



✍ ActiveX

(wrapper)

가

.

✍ Calendar

(wrapper)

CCalendar

가

,

m\_calendar

가

Value

COleVariant var = m\_calendar.GetValue();



```
CMyDialog dlg;  
dlg.m_sCalDay = 5;  
dlg.DoModal();
```

Day

( I D)



| Calendar | Value | VARIANT   |
|----------|-------|-----------|
| DDX      | 가     | (wrapper) |

# CHAPTER 8

✍ CWnd::GetSafeHwnd

✍ CWnd

✍ NULL CWnd (safe)

✍ HWND GetSafeHwnd( ) const;

✍ Return Value

✍ CWnd

✍ CWnd가 NULL

.  
GetSafeHwnd .

NULL

# CHAPTER 8

✍ DDX\_Text :

- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **BYTE&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **short&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **int&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **UINT&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **long&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **DWORD&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **CString&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **float&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **double&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **COleCurrency&** *value* );
- ✍ void AFXAPI DDX\_Text( **CDataExchange\*** *pDX*, **int** *nIDC*, **COleDateTime&** *value* );

✍ Parameters

✍ *pDX* CDataExchange( )

✍ *nIDC* ID

✍ *value* (dialog box, form view, or control view)



# CHAPTER 8

DDX

| DDX_CBI ndex()      | INT INT                                                    |
|---------------------|------------------------------------------------------------|
| DDX_CBString()      | CString CString                                            |
| DDX_Check()         | INT INT                                                    |
| DDX_Control()       | CWnd                                                       |
| DDX_LBI ndex()      | INT INT                                                    |
| DDX_LBString()      | CString CString                                            |
| DDX_LBStringExact() | CString , View, Control View<br>CString                    |
| DDX_Radio()         | INT INT                                                    |
| DDX_Scroll()        | INT INT                                                    |
| DDX_Text()          | CString INT, UINT, LONG,<br>DWORD, CString , FLOAT, DOUBLE |

# CHAPTER 8

DDV ( , Dialog Data Validation)



가



가

가



DDV

DDX

| DDV_MaxChars()       | 가        |
|----------------------|----------|
| DDV_MinMaxByte()     | BYTE ,   |
| DDV_MinMaxDouble()   | DOUBLE , |
| DDV_MinMaxDWord()    | DWORD ,  |
| DDV_MinMaxFloat()    | FLOAT ,  |
| DDV_MinMaxInt()      | INT ,    |
| DDV_MinMaxLong()     | LONG ,   |
| DDV_MinMaxUnsigned() | UINT ,   |

(C) 1998 Sang I Kim

# CHAPTER 8

✎ CDataExchange

✎ CDataExchange ( CDataExchange\* pDX )가 DDX DDV

✎ CDataExchange

|                   |               |
|-------------------|---------------|
|                   |               |
| Fail()            | DDV 가 가 .     |
| PrepareCtrl()     | DDX DDV ( ) . |
| PrepareEditCtrl() | DDX DDV .     |

✎ CDataExchange가

✎ m\_bSaveAndValidate : DDX DDV BOOL Flag

Flag - FALSE : DDX

TRUE : DDV

✎ m\_pDlgWnd :

# CHAPTER 8

## ✍ DDX\_OCColor

✍ void AFXAPI DDX\_OCColor( **CDataExchange\*** *pDX*, **int** *nIDC*,  
**DISPID** *dispid*, **OLE\_COLOR&** *value* );

### ✍ Parameters

✍ *pDX*

✍ *nIDC*

ID

✍ *dispid*

(dispatch) ID

✍ *value*

가

## ✍ DDX\_Control

✍ MFC (CStatic, CEdit, CComboBox)

✍

✍ void AFXAPI DDX\_Control( **CDataExchange\*** *pDX*, **int** *nIDC*,  
**CWnd&** *rControl* );

### ✍ Parameters

✍ *pDX*

✍ *nIDC*

ID

✍ *rControl*

MFC

# CHAPTER 8

✍ COleDateTime::Format

✍ `printf`

✍ CString Format( **DWORD** *dwFlags* = 0, **LCID** *lcid* = **LANG\_USER\_DEFAULT** );

✍ CString Format( **LPCTSTR** *lpszFormat* ) const;

✍ CString Format( **UINT** *nFormatID* ) const;

✍ Parameters

✍ *dwFlags*

**LOCALE\_NOUSEROVERRIDE** Use the system default locale settings, rather than custom user settings.

**VAR\_TIMEVALUEONLY** Ignore the date portion during parsing.

**VAR\_DATEVALUEONLY** Ignore the time portion during parsing.

✍ *lcid* Indicates locale ID to use for the conversion.

✍ *lpszFormat* `printf`

**%D** Total days in this COleDateTime

**%H** Hours in the current day

**%M** Minutes in the current hour

**%S** Seconds in the current minute

**%%** Percent sign

✍ *nFormatID* `printf`

ID

# CHAPTER 8

✍ Form at a time string

%a Abbreviated weekday name

%A Full weekday name

%b Abbreviated month name

%B Full month name

%c Date and time representation appropriate for locale

%d Day of month as decimal number (01 - 31)

%H Hour in 24-hour format (00 - 23)

%I Hour in 12-hour format (01 - 12)

%j Day of year as decimal number (001 - 366)

%m Month as decimal number (01 - 12)

%M Minute as decimal number (00 - 59)

%p Current locale's A.M./P.M. indicator for 12-hour clock

%S Second as decimal number (00 - 59)

%U Week of year as decimal number, with Sunday as first day of week (00 - 51)

%w Weekday as decimal number (0 - 6; Sunday is 0)

%W Week of year as decimal number, with Monday as first day of week (00 - 51)

%x Date representation for current locale

%X Time representation for current locale

%y Year without century, as decimal number (00 - 99)

%Y Year with century, as decimal number

%z, %Z Time-zone name or abbreviation; no characters if time zone is unknown

%% Percent sign










# CHAPTER 8

## Event Sink Maps

When an embedded OLE control fires an event, the control's container receives the event using a mechanism, called an "event sink map," supplied by MFC.

This event sink map designates handler functions for each specific event, as well as parameters of those events. For more information on event sink maps, see the article *ActiveX Control Containers in Visual C++ Programmer's Guide*.

### **Event Sink Maps**

- |                                                                                                                  |                                                                                                         |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|  <b>BEGIN_EVENTSINK_MAP</b>     | Starts the definition of an event sink map.                                                             |
|  <b>DECLARE_EVENTSINK_MAP</b>   | Declares an event sink map.                                                                             |
|  <b>END_EVENTSINK_MAP</b>       | Ends the definition of an event sink map.                                                               |
|  <b>ON_EVENT</b>                | Defines an event handler for a specific event.                                                          |
|  <b>ON_EVENT_RANGE</b>          | Defines an event handler for a specific event fired from a set of OLE controls.                         |
|  <b>ON_EVENT_REFLECT</b>        | Receives events fired by the control before they are handled by the control's container.                |
|  <b>ON_PROPNOTIFY</b>           | Defines a handler for handling property notifications from an OLE control.                              |
|  <b>ON_PROPNOTIFY_RANGE</b>    | Defines a handler for handling property notifications from a set of OLE controls.                       |
|  <b>ON_PROPNOTIFY_REFLECT</b> | Receives property notifications sent by the control before they are handled by the control's container. |

# CHAPTER 8

## ✎ ON\_EVENT

✎ ON\_EVENT( *theClass*, *id*, *dispid*, *pfnHandler*, *vtParams* )

### Parameters

- ✎ *theClass*      The class to which this event sink map belongs.
- ✎ *id*              The control ID of the OLE control.
- ✎ *dispid*          The dispatch ID of the event fired by the control.
- ✎ *pfnHandler*      Pointer to a member function that handles the event.  
This function should have a **BOOL** return type, and parameter types that match the event's parameters (see *vtParams*). The function should return **TRUE** to indicate the event was handled; otherwise **FALSE**.
- ✎ *vtParams*        A sequence of **VTS\_** constants that specifies the types of the parameters for the event. These are the same constants that are used in dispatch map entries such as **DISP\_FUNCTION**.

### Remarks

- ✎ Use the **ON\_EVENT** macro to define an event handler function for an event fired by an OLE control.
- ✎ The *vtParams* argument is a space-separated list of values from the **VTS\_** constants.
- ✎ One or more of these values separated by spaces (not commas) specifies the function's parameter list.
- ✎ specifies a list containing a short integer followed by a **BOOL**.

# CHAPTER 8

✎ EVENT\_CUSTOM

✎ EVENT\_CUSTOM( *pszName*, *pfnFire*, *vtsParams* )

## Parameters

✎ *pszName*      The name of the event.

✎ *pfnFire*      The name of the event firing function.

✎ *vtsParams*    A space-separated list of one or more constants specifying the function's parameter list.

## Remarks

✎ Use the **EVENT\_CUSTOM** macro to define an event-map entry for a custom event.

✎ The *vtsParams* parameter is a space-separated list of values from the **VTS\_** constants.

✎ One or more of these values separated by spaces (not commas) specifies the function's parameter list.

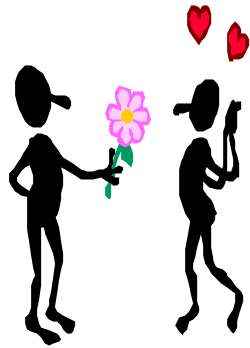
✎ specifies a list containing a short integer followed by a **BOOL**.

# CHAPTER 8

## EVENT\_CUSTOM

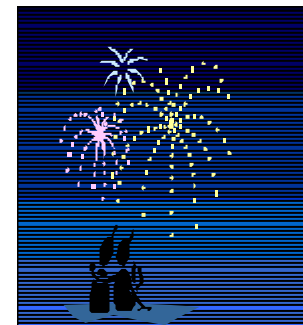
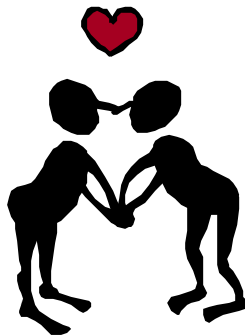
The **VTS\_** contains and their meanings are as follows:

| Symbol       | Parameter Type | Symbol             | Parameter Type     |
|--------------|----------------|--------------------|--------------------|
| VTS_I2       | short          | VTS_VARIANT        | const VARIANT*     |
| VTS_I4       | long           | VTS_PVARIANT       | VARIANT*           |
| VTS_R4       | float          | VTS_UNKNOWN        | LPUNKNOWN          |
| VTS_R8       | double         | VTS_OPTEXCLUSIVE   | OLE_OPTEXCLUSIVE   |
| VTS_COLOR    | OLE_COLOR      | VTS_PICTURE        | IPictureDisp*      |
| VTS_CY       | CURRENCY       | VTS_TRISTATE       | OLE_TRISTATE       |
| VTS_DATE     | DATE           | VTS_XPOS_PIXELS    | OLE_XPOS_PIXELS    |
| VTS_BSTR     | const char*    | VTS_YPOS_PIXELS    | OLE_YPOS_PIXELS    |
| VTS_DISPATCH | LPDISPATCH     | VTS_XSIZE_PIXELS   | OLE_XSIZE_PIXELS   |
| VTS_FONT     | IFontDispatch* | VTS_YSIZE_PIXELS   | OLE_YSIZE_PIXELS   |
| VTS_HANDLE   | HANDLE         | VTS_XPOS_HIMETRIC  | OLE_XPOS_HIMETRIC  |
| VTS_SCOPE    | SCOPE          | VTS_YPOS_HIMETRIC  | OLE_YPOS_HIMETRIC  |
| VTS_BOOL     | BOOL           | VTS_XSIZE_HIMETRIC | OLE_XSIZE_HIMETRIC |
|              |                | VTS_YSIZE_HIMETRIC | OLE_YSIZE_HIMETRIC |

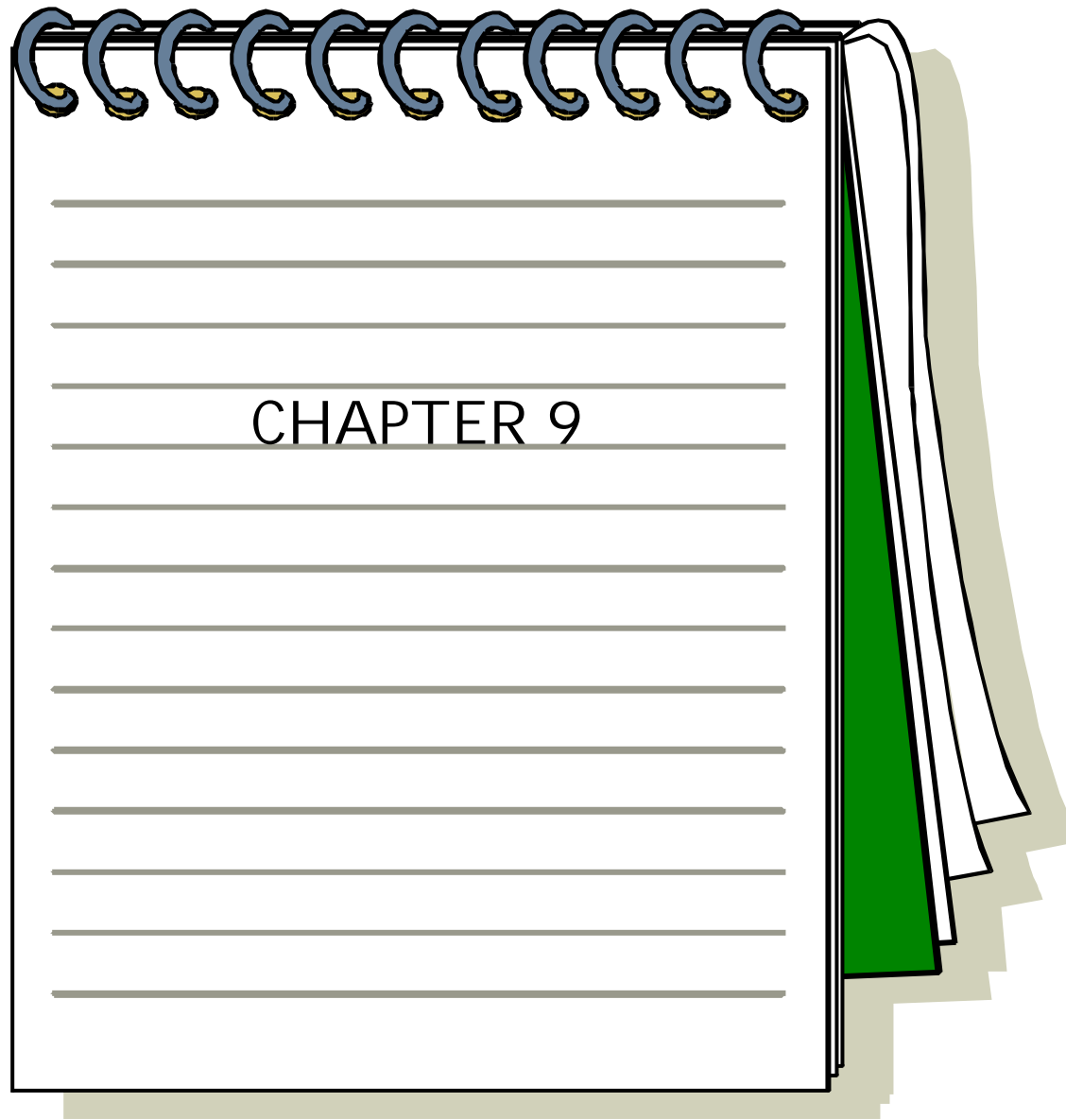


가  
가

가  
가



(C) 1998 Sang Il Kim



# CHAPTER 9

MFC

( , ) 가 .

(Stack)

.

.

가 , 가

.

가

.

.

(Heap)

가 .

.

C C++ ,

malloc(), free() new delete ,

MFC .

가

# CHAPTER 9

✍

✍

✍

가

.

.

✍

,

(

)

(

)

.

✍

.

✍

\_\_\_\_\_.

✍

(

,

,

가

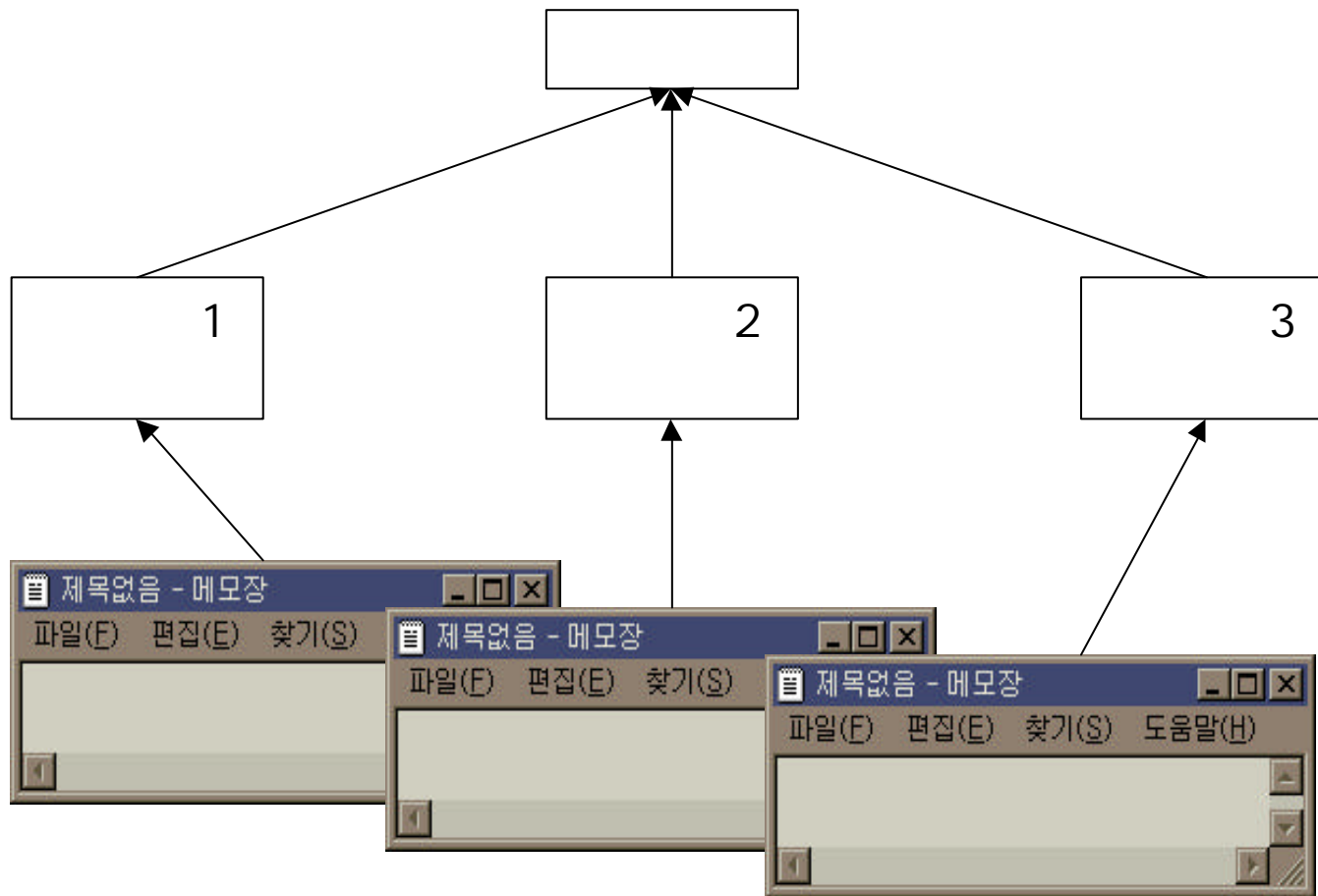
)

가,

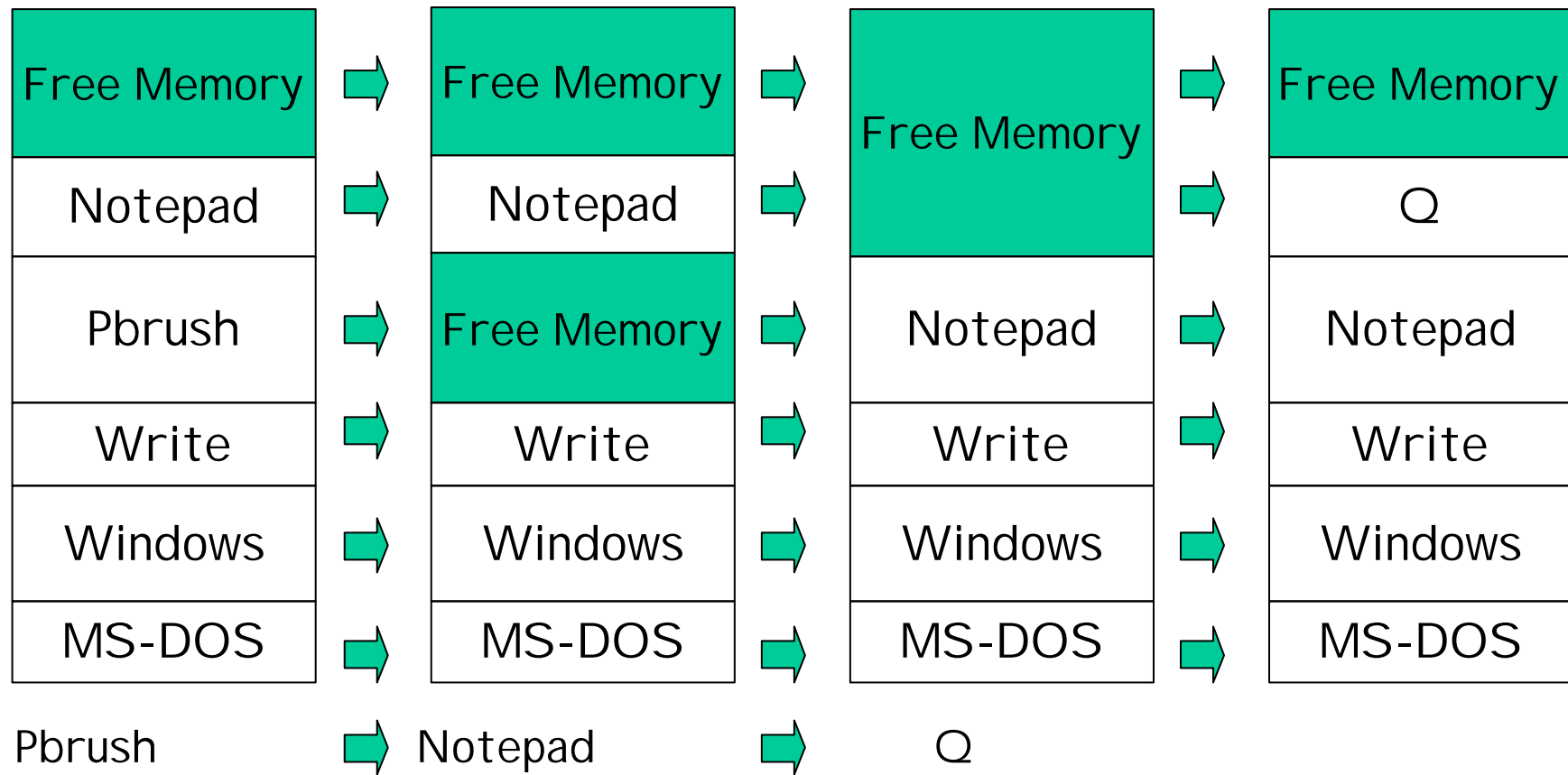
✍

.

# CHAPTER 9



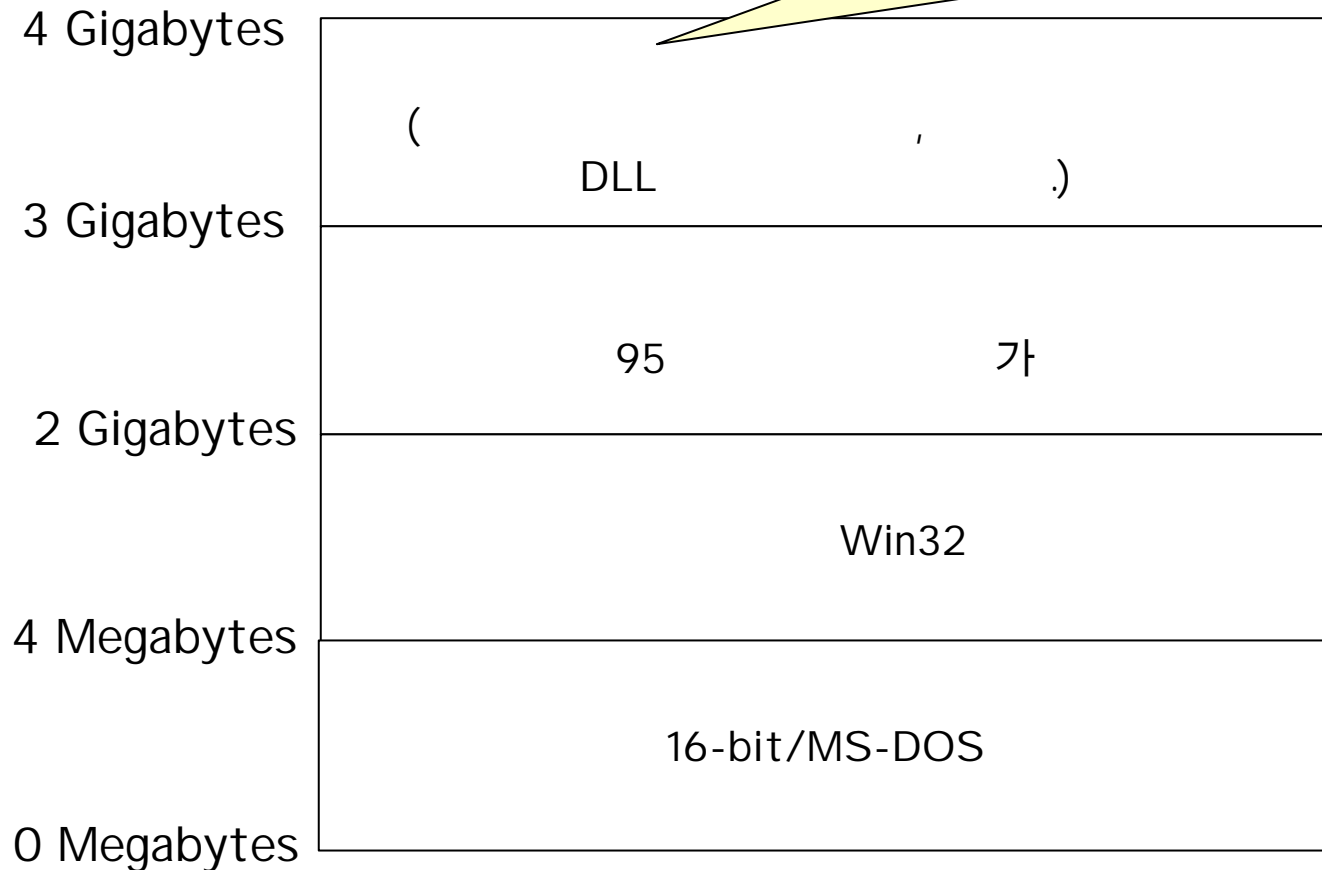
# CHAPTER 9



# CHAPTER 9

32

가 (VMM) 가



Win95 가

# CHAPTER 9

32 95

16 /MS

TSR( ) MS

Win32 16 /MS

Win32

가

가

95

NT

Win32가

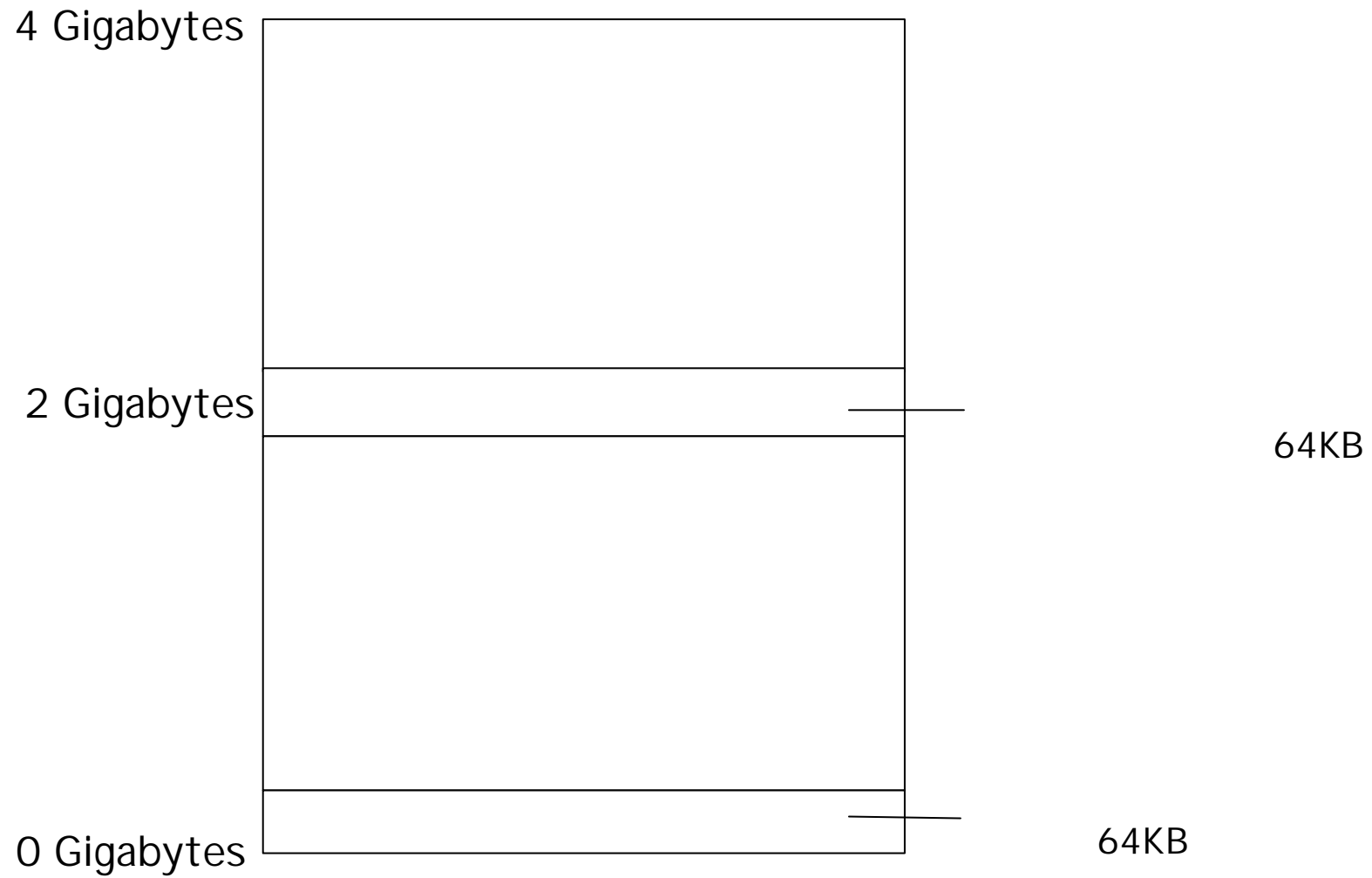
DLL

Win32

(C) 1998 Sang I Kim



## CHAPTER 9



Windows NT 가

# CHAPTER 9

95 2GB 2GB

,

NT 4GB

95 NT 가 32

, 4GB

,

,

Win32 API

[VirtualAlloc\(\)](#) [MapViewOfFile\(\)](#)

# CHAPTER 9

✍ VirtualAlloc()

✍ 가  
VirtualAlloc()

✍ LPVOID VirtualAlloc(  
LPVOID *lpAddress*, //  
DWORD *dwSize*, //  
DWORD *flAllocationType*, //  
DWORD *flProtect* //  
);

✍ Parameters

✍ *lpAddress* 가 NULL

✍ *dwSize* ( )

✍ *flAllocationType*

✍ *flProtect* 가 가

# CHAPTER 9

## VirtualAlloc()

| MEM_COMMIT<br>MEM_RESERVE | 가 , . |
|---------------------------|-------|
| MEM_TOP_DOWN              | 가 가 . |

## VirtualAlloc()

| PAGE_READONLY<br>PAGE_READWRITE<br>PAGE_EXECUTE<br>PAGE_EXECUTE_READ<br>PAGE_EXECUTE_READWRITE<br>PAGE_GUARD<br>PAGE_NOACCESS<br>PAGE_NOCACHE | 가 가 . |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------|

# CHAPTER 9

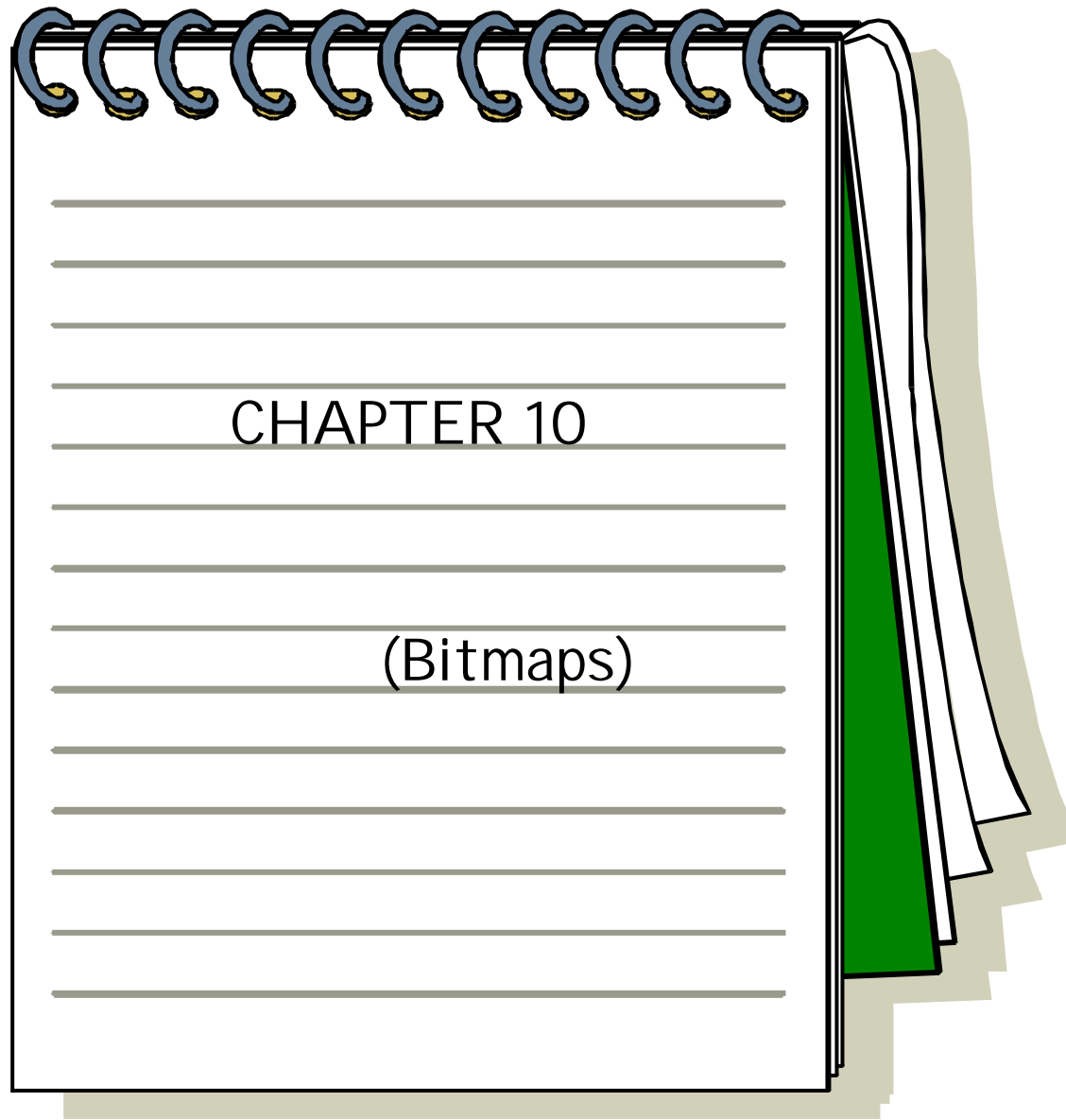
가

가

가

STATUS\_GUARD\_PAGE  
PAGE\_GUARD

, 가



# CHAPTER 10

 GDI - (DIB, device-independent bitmap)

 GDI - GDI -


 DIB - 가

 Win32 API DIB .

 (Color Bitmap) (Monochrome Bitmap)





 4 (color plane) .

 1 .

 16 .

 (dithering) .





 off(0, ) on(1, )

# CHAPTER 10

GDI

" "

가

CDC::CreateCompatibleDC()

"

"

GDI

-

DIB

RES

- DIB

EXE

CDC::LoadBitmap() - DIB

BMP

GDI

# CHAPTER 10



## GDI



### Red Blocks

### OnDraw()

```
void CMyView::OnDraw(CDC* pDC)
{
    CBitmap bitmap;
    CDC dcMemory;
    bitmap.LoadBitmap(IDB_REDBLOCKS);
    dcMemory.CreateCompatibleDC(pDC);
    dcMemory.SelectObject(&bitmap);
    pDC->BitBlt(100, 100, 54, 96, &dcMemory, 0, 0, SRCCOPY);
    // CDC          dcMemory
    // CBitmap
}
```

# CHAPTER 10



MM\_LOENGLISH

COLORONCOLOR

CDC::SetStretchBltMode()

가 MM\_TEXT가

54x96

Red Blocks  
BitBlt()

StretchBlt()

CSize size(54, 96);

pDC -> DPtoLP(&size);

pDC -> StretchBlt(0, 0, size.cx, -size.cy,

&dcDisplayMemory, 0, 0, 54, 96, SRCCOPY);

BitBlt() SetStretchBlt()

GDI가



# CHAPTER 10



(BBT : Bit Block Transfer, BitBlt)



DC



CDC::BitBlt ( )



CDC

, BitBlt()

StretchBlt()

(StretchBlt .)



BOOL BitBlt(

int x, //

x ( )

int y, //

y ( )

int nWidth, //

( )

int nHeight, //

( )

CDC\* pSrcDC, //

int xSrc, //

x ( )

int ySrc, //

y ( )

DWORD dwRop //

);



## CHAPTER 10

```
✎ CDC::StretchBlt (
    ✎ BOOL StretchBlt(
        int x          // x ( )
        int y          // y ( )
        int nWidth      // ( )
        int nHeight     // ( )
        CDC* pSrcDC      //
        int xSrc         // x ( )
        int ySrc         // y ( )
        int nSrcWidth    // ( )
        int nSrcHeight   // ( )
        DWORD dwRop      //
    );
```

# CHAPTER 10

 (raster-operation, *dwRop*)

 BLACKNESS

 DSTINVERT

 MERGECOPY      AND

 MERGEPAINT      OR

 NOTSRCCOPY

 NOTSRCERASE      OR

 PATCOPY

 PATINVERT      XOR

 PATPAINT      OR

OR

 SRCAND      AND

 SRCCOPY

 SRCERASE

AND

 SRCINVERT      XOR

 SRCPAINT      OR

 WHITENESS



DC

 $\{$ 

//

}

else

$$\{$$

//

}

# CHAPTER 10

✂ CDC::SetStretchBltMode -

✂ int SetStretchBltMode( **int** *nStretchMode* );

✂ Parameters

✂ *nStretchMode*

| Value                                                                          | Description                                                                                                                                                                                            |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BLACKONWHITE 1                                                                 | Performs a Boolean AND operation using the color values for the eliminated and existing pixels. If the bitmap is a monochrome bitmap, this mode preserves black pixels at the expense of white pixels. |
| COLORONCOLOR 3                                                                 | Deletes the pixels. This mode deletes all eliminated lines of pixels without trying to preserve their information.                                                                                     |
| HALFTONE 4                                                                     | Maps pixels from the source rectangle into blocks of pixels in the destination rectangle. The average color over the destination block of pixels approximates the color of the source pixels.          |
|                                                                                | After setting the HALFTONE stretching mode, an application must call the Win32 function ::SetBrushOrgEx to set the brush origin. If it fails to do so, brush misalignment occurs.                      |
| WHITEONBLACK 2                                                                 | Performs a Boolean OR operation using the color values for the eliminated and existing pixels. If the bitmap is a monochrome bitmap, this mode preserves white pixels at the expense of black pixels.  |
| STRETCH_ANDSCANS<br>STRETCH_DELETESCANS<br>STRETCH_HALFTONE<br>STRETCH_ORSCANS | windows 95: Same as BLACKONWHITE<br>windows 95: Same as COLORONCOLOR<br>windows 95: Same as HALFTONE<br>windows 95: Same as WHITEONBLACK                                                               |

# CHAPTER 10

✎ CGdiObject::GetObject

✎ CGdiObject GDI

✎ int GetObject( **int** *nCount*, **LPVOID** *lpObject* ) const;

✎ Parameters

✎ *nCount*

가

sizeof()

✎ *lpObject*

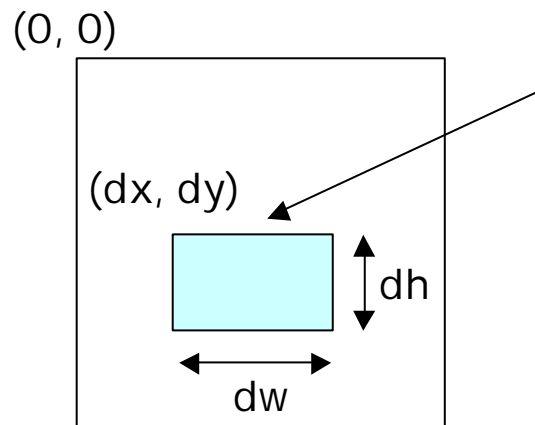
가

| Object   | Buffer type                          |
|----------|--------------------------------------|
| CPen     | LOGPEN. EXLOGPEN                     |
| CBrush   | LOGBRUSH                             |
| CFont    | LOGFONT                              |
| CBitmap  | BI TMAP                              |
| CPalette | WORD.<br>CPalette::GetPaletteEntries |
| CRgn     | Not supported                        |

# CHAPTER 10

✍ BitBlt

BitBlt(dx, dy, dw, dh, pSrcDC, sx, sy, rop);

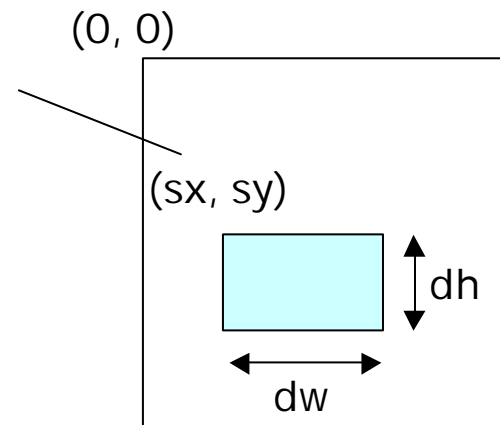


(dx, dy) :

dw :

dh :

(sx, sy) :



가

가

# CHAPTER 10



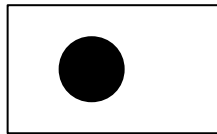
(Raster Operation) (DevStudio\Vc\include\wingdi.h)

| SRCCOPY    | $\text{dst} = \text{src}$                    | .     |
|------------|----------------------------------------------|-------|
| NOTSRCCOPY | $\text{dst} = \sim \text{src}$               | .     |
| SRCPAINT   | $\text{dst} = \text{dst} \mid \text{src}$    | OR .  |
| SRCAND     | $\text{dst} = \text{dst} \& \text{src}$      | AND . |
| SRCINVERT  | $\text{dst} = \text{dst} \wedge \text{src}$  | XOR . |
| SRCERASE   | $\text{dst} = \sim \text{dst} \& \text{src}$ | .     |

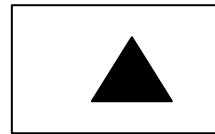
# CHAPTER 10



(Raster Operation)



(SRC)

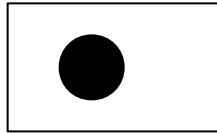


(DST)

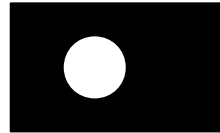


DST

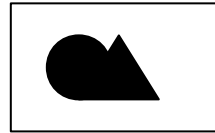
SRCCOPY



NOTSRCCOPY



SRCPAINT



SRCAND



SRCINVERT



SRCERASE



# CHAPTER 10



EX10A



가 MM\_LOENGLISH



CGdiObject

GetObject()



# CHAPTER 10



EX10B



WM\_MOUSEMOVE

가

GDI



OnInitialUpdate()



dc



OnPaint()



OnDraw()



# CHAPTER 10



```
InvalidateRect(rectOld, TRUE);  
InvalidateRect(rectNew, TRUE);
```



가 True( )

.

.



```
InvalidateRect(rectOld, FALSE);  
InvalidateRect(rectNew, FALSE);
```



가 False

가

.

# CHAPTER 10

 DIB CDib

 MFC GDI

(CBitmap)

DIB





DIB

(DIB

GDI )

( 가

256 )

. - realize





가

- 236



- 20







# CHAPTER 10



WM\_PALETTECHANGED



가



Win32 RealizePalette()

SelectPalette()

SelectPalette()

True -

False -

(realize)

?

WM\_QUERYNEWPALETTE

DIB

# CHAPTER 10



( Hardware Palette ) -

( System Palette ) -

( Logical Palette ) -

( CPalette )

(Realize)

(foreground)/ (background) /

-

-

WM\_PALETTECHANGED -

가

WM\_QUERYNEWPALETTE -

가

# CHAPTER 10



|   | RGB                |  |     | RGB                |  |
|---|--------------------|--|-----|--------------------|--|
| 0 | RGB(0, 0, 0)       |  | 246 | RGB(255, 251, 240) |  |
| 1 | RGB(128, 0, 0)     |  | 247 | RGB(160, 160, 164) |  |
| 2 | RGB(0, 128, 0)     |  | 248 | RGB(128, 128, 128) |  |
| 3 | RGB(128, 128, 0)   |  | 249 | RGB(255, 0, 0)     |  |
| 4 | RGB(0, 0, 128)     |  | 250 | RGB(0, 255, 0)     |  |
| 5 | RGB(128, 0, 128)   |  | 251 | RGB(255, 255, 0)   |  |
| 6 | RGB(0, 128, 128)   |  | 252 | RGB(0, 0, 255)     |  |
| 7 | RGB(192, 192, 192) |  | 253 | RGB(255, 0, 255)   |  |
| 8 | RGB(192, 220, 192) |  | 254 | RGB(0, 255, 255)   |  |
| 9 | RGB(166, 202, 240) |  | 255 | RGB(255, 255, 255) |  |

# CHAPTER 10



 LOGPALETTE

```
typedef struct tagLOGPALETTE {  
    WORD            palVersion;          //          . 0x300  
    WORD            palNumEntries; //  
    PALETTEENTRY    palPalEntry[1];  
    //          PALETTEENTRY  
} LOGPALETTE;
```

```
typedef struct tagPALETTEENTRY {  
    BYTE peRed;  
    BYTE peGreen;  
    BYTE peBlue;  
    BYTE peFlags; //  
} PALETTEENTRY;
```

# CHAPTER 10



| PC_EXPLICIT   | 가 |
|---------------|---|
| PC_NOCOLLAPSE | . |
| PC_RESERVED   | , |

# CHAPTER 10

## ✍ CPalette

| AnimatePalette()         | .                   |
|--------------------------|---------------------|
| CreateHalftonePalette()  | CPalette .          |
| CreatePalette()          | , CPalette .        |
| FromHandle()             | HPALETTE CPalette . |
| GetEntryCount()          | .                   |
| GetNearestPaletteIndex() | 가 가 .               |
| GetPaletteEntries()      | .                   |
| ResizePalette()          | CPalette .          |
| SetPaletteEntries()      | CPalette<br>RGB .   |

# CHAPTER 10

✍ DIBs, ,

✍ DIB 2 .

✍ DIB 1, 4, 8, 16, 24, 32

✍ 1bpp( ) - Mono ✍ 4bpp - 16

✍ 8bpp - 256 ✍ 16bpp ( ) - 65,536

✍ 24bpp ( ) - 1,680

✍ bpp (bit per pixel)

✍ DIB가 가 Win32

CreateHalftonePalette()가 .

# CHAPTER 10



(DDB : Device Dependent Bitmap)



BI TMAP ( DevStudio\Vc\include\<Wingdi.h> 374 )

```
typedef struct tagBI TMAP
```

```
{
```

```
    LONG    bmType;        //
```

```
    LONG    bmWidth;       //          (          )
```

```
    LONG    bmHeight;      //          (          )
```

```
    LONG    bmWidthBytes;  //
```

```
    WORD    bmPlanes;      //
```

```
    WORD    bmBitsPixel;   //
```

```
    LPVOID  bmBits;        //
```

```
} BI TMAP;
```

# CHAPTER 10



(DIB : Device Independent Bitmap)



DIB

가

\_\_\_\_\_

.



DIB

가

\_\_\_\_\_

.



DIB

가

\_\_\_\_\_

.



RGB

DIB

\_\_\_\_\_

.



\_\_\_\_\_

.

# CHAPTER 10

BMP

DIB

( DevStudio\Vc\include\<Wingdi.h> 500 )

*BITMAPFILEHEADER*  
(BMP file only)

bfType = "BM"  
bfOffBits

*BITMAPFILEHEADER*

biSize ( <Byte> )  
biWidth ( )  
biPlanes ( )  
biPlanes=1 ( , 1)  
biBitCount ( 1,4,8,16,24,32 )  
biCompression ( )  
biSizeImage ( )  
biClrUsed ( )

Color Table  
( )

DIB 2 32  
4bpp DIB 16 32  
8bpp DIB 256 32

DIB Bit Image

( (row) (column) .  
(row) 4 .

# CHAPTER 10

✍ BMP

DIB

✍

DIB

DIB BITMAPFILEHEADER가

. BITMAPINFOHEADER

✍ BITMAPINFOHEADER

BITMAPINFO

✍ DevStudio\Vc\include\<Wingdi.h> 546

```
typedef struct tagBITMAPINFO{
```

```
    BITMAPINFOHEADER bmiHeader;
```

```
    RGBQUAD           bmiColors[1];
```

```
} BITMAPINFO;
```

# CHAPTER 10

✍ DIB

✍ SetDIBitsToDevice

✍

DIB

✍

1

1

✍ StretchDIBits

✍ StretchBlt()

DIB

✍ GetDIBits

✍

GDI

DIB

✍

DIB

✍

GetDIBits()

DIB

✍ CreateDIBitmap

✍

DIB

GDI

✍

DIB

✍ CreateDIBSection

✍

Win32

DIB

DIB

GDI

✍

DIB

GDI

DIB

가

# CHAPTER 10

✍ DIB

✍

DIB

✍

DIB

가

✍

DIB

DIB

✍

16bpp/24bpp

✍

8bpp GDI

StretchBlt()

✍

(drawing)

(Realize)

✍

BMP

CDib

(Loading)

```
m_pDib -> UsePalette(&dc);
```

```
m_hBitmap = m_pDib -> CreateBitmap(&dc);
```

```
::SelectObject(m_dcMem.GetSafeHdc(), m_hBitmap);
```

✍

OnDraw() CDib::Draw()

```
m_pDib -> UsePalette(&dc);
```

```
CSize sizeDib = m_pDib -> GetDimensions();
```


```
pDC -> StretchBlt( 0, 0, sizeDib.cx, sizeDib.cy, &m_dcMem,
                  0, 0, sizeToDraw.cx, sizeToDraw.cy, SRCCOPY);
```

# CHAPTER 10

## CBitmap

|                           |                        |
|---------------------------|------------------------|
|                           |                        |
| CreateBitmap()            | ,                      |
| CreateBitmapIndirect()    | BI TMAP ,              |
| CreateCompatibleBitmap()  | .                      |
| CreateDiscardableBitmap() | .                      |
| FromHandle()              | CBitmap .              |
| GetBitmap()               | CBitmap .              |
| GetBitmapBits()           | .                      |
| GetBitmapDimension()      | SetBitmapDimension() . |
| LoadBitmap()              | CBitmap .              |
| LoadMappedBitmap()        | .                      |
| LoadOEMBitmap()           | CBitmap .              |
| SetBitmapBits()           | .                      |
| SetBitmapDimension()      | 0.1mm .                |


# CHAPTER 10

 CBitmap::LoadBitmap



CBitmap

 BOOL LoadBitmap( **LPCTSTR** *lpszResourceName* );

 BOOL LoadBitmap( **UINT** *nIDResource* );

 Parameters

 *lpszResourceName*

 *nIDResource*

 CDC::CreateCompatibleDC



 virtual BOOL CreateCompatibleDC( **CDC\*** *pDC* );

 Parameters

 *pDC*

가

# CHAPTER 10

✍ CDC::GetSafeHdc

✍ CDC

✍ HDC GetSafeHdc() const;

✍ Return Value  
CDC

✍ CPoint::Offset

✍ x, y 가 .

✍ void Offset( **int** xOffset, **int** yOffset );

✍ void Offset( **POINT** point );

✍ void Offset( **SIZE** size );

✍ Parameters

✍ xOffset x (offset)

✍ yOffset y (offset)

✍ point CPoint x, y  
(POINT or CPoint)

✍ size CPoint cx, cy  
(SIZE or CSize)

✍ ) CPoint point(5,5); // x=5, y=5  
point.Offset(4,3); // x 4, y 3 가 .

# CHAPTER 10

✍ CDC::SelectClipRgn

✍

✍ virtual int SelectClipRgn( **CRgn\*** *pRgn* );

✍ int SelectClipRgn( **CRgn\*** *pRgn*, **int** *nMode* );

✍ The region's type

✍ **COMPLEXREGION**

✍ **ERROR**

✍ **NULLREGION**

✍ **SIMPLEREGION**

✍ Parameters

✍ *pRgn*

✍ *nMode*

**RGN\_AND**

**RGN\_COPY**

**RGN\_DIFF**

**RGN\_OR**

**RGN\_XOR**

1

2

.( )

.( )

가

# CHAPTER 10

✍ CDC::IntersectClipRect

✍

✍

✍ virtual int IntersectClipRect( **int** x1, **int** y1, **int** x2, **int** y2 );

✍ virtual int IntersectClipRect( **LPCRECT** lpRect );

✍ The new clipping region's type.

✍ **COMPLEXREGION**

✍ **ERROR**

✍ **NULLREGION**

✍ **SIMPLEREGION**

✍ Parameters

✍ x1

✍ y1

✍ x2

✍ y2

✍ lpRect

CRect

x ( )  
y ( )  
x ( )  
y ( )  
RECT

# CHAPTER 10

✍ CBitmap::CreateCompatibleBitmap

✍

✍ BOOL CreateCompatibleBitmap( **CDC\*** *pDC*, **int** *nWidth*, **int** *nHeight* );

✍ Parameters

✍ *pDC*

✍ *nWidth* ( )

✍ *nHeight* ( )

✍ *nWidth*, *nHeight* 가 0 , CreateCompatibleBitmap 1x1

✍ CDC::GetClipBox

✍

✍

✍ virtual int GetClipBox( **LPRECT** *lpRect* ) const;

✍ The clipping region's type.

✍ **COMPLEXREGION**

✍ **ERROR**

✍ **NULLREGION**

✍ **SIMPLEREGION**

✍ Parameters

✍ *lpRect*

RECT

CRect

# CHAPTER 10

✍ CDC::PatBlt

✍

✍

✍ **BOOL** PatBlt( **int** x, **int** y, **int** nWidth, **int** nHeight, **DWORD** dwRop );

✍ Parameters

✍ x

x ( )

✍ y

y ( )

✍ nWidth

( )

✍ nHeight

( )

✍ dwRop

가

**PATCOPY**

**PATINVERT** XOR

**DSTINVERT**

**BLACKNESS**

**WHITENESS**

# CHAPTER 10

✎ CDC::GetDeviceCaps

✎

가

✎ int GetDeviceCaps( **int** nIndex ) const;

✎ Parameters

✎ nIndex

**DRIVERVERSION  
TECHNOLOGY**

(technology)

Value

Meaning

DT\_PLOTTER

Vector plotter

DT\_RASDISPLAY

Raster display

DT\_RASPRINTER

Raster printer

DT\_RASCAMERA

Raster camera

DT\_CHARSTREAM

Character stream

DT\_METAFILE

Metafile

DT\_DISPLAYFILE

Display file

**HORZSIZE**

( )

**VERTSIZE**

( )

**HORZRES**

( )

**VERTRES**

( )

# CHAPTER 10

 Parameters

 *Index*

**LOGPIXELSX**

**LOGPIXELSY**

**BITSPIXEL**

**PLANES**

**NUMBRUSHES**

**NUMPENS**

**NUMFONTS**

**NUMCOLORS**

**ASPECTX**

**ASPECTY**

**ASPECTXY**

**PDEVICESIZE**      PDEVICE

# CHAPTER 10

✎ CCmdTarget::BeginWaitCursor

✎ 가

✎ void BeginWaitCursor( );

✎ CCmdTarget::EndWaitCursor

✎ BeginWaitCursor , 가

✎ void EndWaitCursor( );

✎ void CMyView::OnSomeCommand()

{

BeginWaitCursor(); // display the hourglass cursor

// do some lengthy processing

EndWaitCursor(); // remove the hourglass cursor

}

# CHAPTER 10

✍ CPoint::Cpoint

✍ CPoint POINT

✍ CPoint

✍ CPoint( );

✍ CPoint( **int** *initX*, **int** *initY* );

✍ CPoint( **POINT** *initPt* );

✍ CPoint( **SIZE** *initSize* );

✍ CPoint( **DWORD** *dwPoint* );

✍ Parameters

✍ *initX* x

✍ *initY* y

✍ *initPt* POINT CPoint

x initPoint cx ,

y initPoint cy .

✍ *initSize* SIZE CSize

x initSize cx ,

y initSize cy .

✍ *dwPoint* x LOWORD(low-order word of dwPoint) ,

y HIWORD(high-order word of dwPoint)

# CHAPTER 10



#ifdef

1

|        |   |   |   |
|--------|---|---|---|
| #ifdef | 가 | 1 | . |
|        | 가 | 1 |   |
|        | . |   |   |

#endif

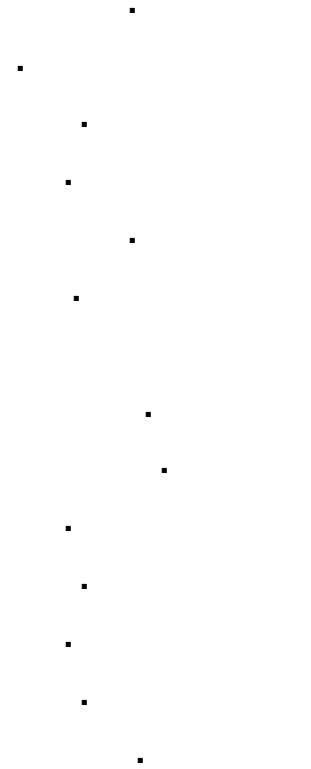
#ifndef

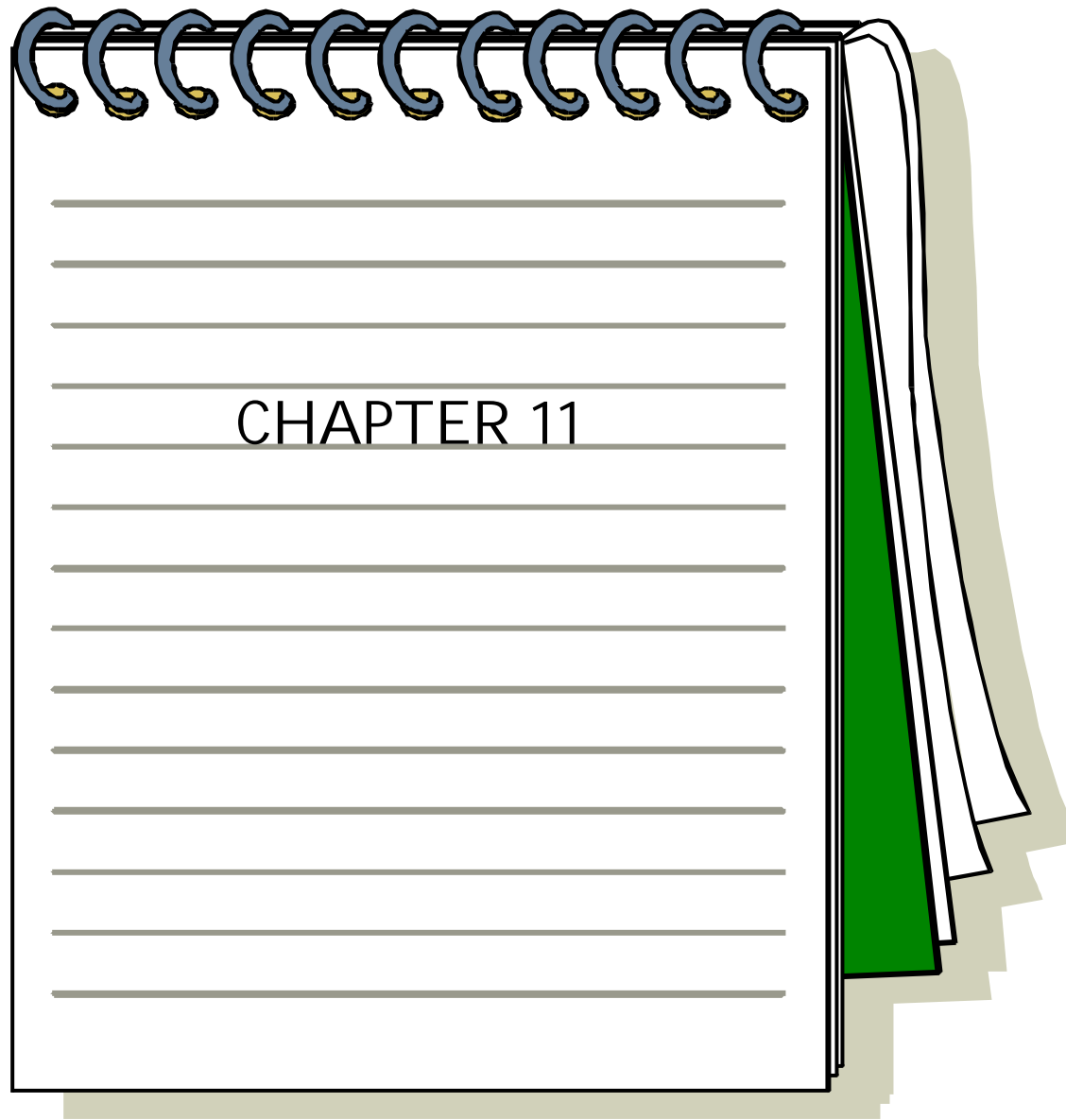
1

|         |   |   |   |
|---------|---|---|---|
| #ifndef | 가 | 1 | . |
|         | 가 | 1 |   |
|         | . |   |   |

#endif

가





# CHAPTER 11



가?

MSG message;

```
while (::GetMessage(&message, NULL, 0, 0)) {
    ::TranslateMessage(&message);
    ::DispatchMessage(&message);
}
```



GetMessage()

가



가



가

TranslateMessage()

WM\_KEYDOWN

가

ASCII

WM\_CHAR

DispatchMessage()

MFC

# CHAPTER 11



Win16, Win32 가 DispatchMessage()  
가 .



가 .

MSG message;

```
if (::PeekMessage(&message, NULL, 0, 0, PM_REMOVE)) {
    ::TranslateMessage(&message);
    ::DispatchMessage(&message);
}
```

PeekMessage() 가 .

(PeekMessage() ) CPU  
가 가 (PeekMessage() )

가 (PeekMessage()  
) 가 .

# CHAPTER 11

## ✍ GetMessage



```
✍ BOOL GetMessage(  
    LPMMSG lpMsg,          //  
    HWND hWnd,             //  
    UINT wMsgFilterMin,    //  
    UINT wMsgFilterMax     //  
);
```

## ✍ Parameters

✍ *lpMsg*

MSG

✍ *hWnd*

| <u>Value</u> | <u>Meaning</u> |
|--------------|----------------|
|--------------|----------------|

|      |                                                                                                                                                         |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| NULL | GetMessage retrieves messages for any window that belongs to the calling thread and thread messages posted to the calling thread via PostThreadMessage. |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

✍ *wMsgFilterMin*

가

✍ *wMsgFilterMax*

가

# CHAPTER 11

✍ PeekMessage

✍

✍ 가

✍ BOOL PeekMessage(

**LPMMSG** lpMsg, //

가

**HWND** hWnd, //

**UINT** wParamFilterMin, //

**UINT** wParamFilterMax //

**UINT** wRemoveMsg //

);

✍ Parameters

✍ lpMsg

MSG 가

✍ hWnd

✍ wParamFilterMin

✍ wParamFilterMax

✍ wRemoveMsg

Value

Meaning

PM\_NOREMOVE

가 PeekMessage

PM\_REMOVE

가 PeekMessage

# CHAPTER 11

✍ TranslateMessage

✍ 가 (virtual-key)

✍ BOOL TranslateMessage(  
    **CONST MSG** \*lpMsg     //  
);

✍ Parameters

✍ lpMsg    GetMessage    PeekMessage  
MSG    가 .

✍ DispatchMessage

✍


✍ LONG DispatchMessage(  
    **CONST MSG** \*lpmsg     //  
);

✍ Parameters

✍ lpmsg     MSG    가 .

# CHAPTER 11

## WM\_CHAR


-  The WM\_CHAR message is posted to the window with the keyboard focus when a WM\_KEYDOWN message is translated by the TranslateMessage function. WM\_CHAR contains the character code of the key that was pressed.

## WM\_CHAR

```
chCharCode = (TCHAR) wParam; // character code
lKeyData = lParam;           // key data
```

## Parameters

 *chCharCode* Value of *wParam*. Specifies the character code of the key.

 *lKeyData* Value of *lParam*. Specifies the repeat count, scan code, extended-key flag, context code, previous key-state flag, and transition-state flag,

| <u>Value</u> | <u>Description</u>                                                                                                                                                                                       |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-15         | Specifies the repeat count. The value is the number of times the keystroke is repeated as a result of the user holding down the key.                                                                     |
| 16-23        | Specifies the scan code. The value depends on the original equipment manufacturer (OEM).                                                                                                                 |
| 24           | Specifies whether the key is an extended key, such as the right-hand ALT and CTRL keys that appear on an enhanced 101- or 102-key keyboard. The value is 1 if it is an extended key; otherwise, it is 0. |
| 25-28        | Reserved; do not use.                                                                                                                                                                                    |
| 29           | Specifies the context code. The value is 1 if the ALT key is held down while the key is pressed; otherwise, the value is 0.                                                                              |
| 30           | Specifies the previous key state. The value is 1 if the key is down before the message is sent, or it is 0 if the key is up.                                                                             |
| 31           | Specifies the transition state. The value is 1 if the key is being released, or it is 0 if the key is being pressed.                                                                                     |

# CHAPTER 11



WM\_TIMER

CWnd

SetTimer()  
ClassWizard



가



EX11A



가

Progress Control



WM\_TIMER

# CHAPTER 11

✍ CWnd::SetTimer

✍

WM\_TIMER

✍ `UINT SetTimer( UINT nIDEvent, UINT nElapsed,  
void (CALLBACK EXPORT* lpfnTimer)(HWND, UINT, UINT, DWORD) );`

✍ Parameters

✍ *nIDEvent* (Timer ID)

✍ *nElapsed* (1/1000 , 1000millisecond=1 )

✍ *lpfnTimer*

가 NULL , WM\_TIMER

, CWnd

✍ ASSERT

✍ `ASSERT( booleanExpression )`

✍ Parameters

✍ *booleanExpression* Specifies an expression (including pointer values) that evaluates to nonzero or 0.

# CHAPTER 11

✍ CWnd::EnableWindow

✍

✍

WM\_ENABLE

✍ BOOL EnableWindow( **BOOL** *bEnable* = **TRUE** );

✍ Parameters

✍ *bEnable* TRUE, 가  
FALSE, 가

✍ volatile

✍ volatile

✍ **volatile** declarator

✍ int volatile nVint;

✍ CWnd::OnTimer

✍ WM\_TIMER

✍ afx\_msg void OnTimer( **UINT** *nIDEvent* );

✍ Parameters

✍ *nIDEvent*

# CHAPTER 11

## ✎ WM\_TIMER

- ✎ The WM\_TIMER message is posted to the installing thread's message queue when a timer expires.

## ✎ WM\_TIMER

```
wTimerID = wParam; //
tmprc = (TIMERPROC *) lParam; // (callback)
```

## ✎ Parameters

✎ *wTimerID* Value of wParam.  
 ✎ *tmprc* Value of lParam.

## ✎ CWnd::KillTimer

## ✎ SetTimer

✎ BOOL KillTimer( **int** *nIDEvent* );

## ✎ Parameters

✎ *nIDEvent* ID.

ID

SetTimer

ID.

# CHAPTER 11

On-I dle

On-I dle

가

가

가

On-I dle 가

OnI dle() override

가

가

stream

가

OnI dle() override


OnI dle()

OnI dle()

가

OnI dle()

# CHAPTER 11

 (Thread)





Win32가 CPU



time slice











 Process -



Thread



가

# CHAPTER 11



Worker thread



User interface thread



MFC (CWinThread)



MFC CWinThread CWinApp가  
( .)

가 .

.

.

가 .

.

.

( )

.

# CHAPTER 11



\_\_\_\_\_;

UINT

LPVOID

가

.

가

가

가

.

CWinThread\* pThread =

AfxBeginThread( ComputeThreadProc, GetSafeHwnd(),  
THREAD\_PRIORITY\_NORMAL);

32

UINT ComputeThreadProc( LPVOID pParam)

{

//

return 0;

}

# CHAPTER 11

## CWinThread

| m_bAutoDelete | CWinThread 가 CWinThread<br>BOOL Flag |
|---------------|--------------------------------------|
| m_hThread     |                                      |
| m_nThreadId   | ID                                   |
| m_pMainWnd    | 가                                    |
| m_pActiveWnd  | OLE 가 (in-place) (가                  |

# CHAPTER 11

## CWinThread

| GetMainWnd()        | 가 .                 |
|---------------------|---------------------|
| GetThreadPriority() | .                   |
| ResumeThread()      | (suspend count) .   |
| SetThreadPriority() | .                   |
| SuspendThread()     | (suspend count) 가 . |

# CHAPTER 11

## 가 CWinThread

| ExitInstance()            | 가                                                             |
|---------------------------|---------------------------------------------------------------|
| InitInstance()            |                                                               |
| OnIdle()                  |                                                               |
| PreTranslateMessage()     | Win32 API      TranslateMessage()      DiapatchMessage()<br>. |
| IsIdleMessage()           | .                                                             |
| ProcessWndProcException() | 가 .                                                           |
| ProcessMessageFilter()    | 가 .      가                                                    |
| Run()                     | .                                                             |

(C) 1998 Sang Il Kim

# CHAPTER 11



| AfxBeginThread() | .                   |
|------------------|---------------------|
| AfxGetThread()   | 가 CWinThread<br>가 . |
| AfxEndThread()   | .                   |

# CHAPTER 11

✍ AfxBeginThread()

✍ CWinThread

✍ Worker thread

✍ CWinThread\* AfxBeginThread( **AFX\_THREADPROC** *pfnThreadProc*,  
**LPVOID** *pParam*, **int** *nPriority* = **THREAD\_PRIORITY\_NORMAL**,  
**UINT** *nStackSize* = **0**, **DWORD** *dwCreateFlags* = **0**,  
**LPSECURITY\_ATTRIBUTES** *lpSecurityAttrs* = **NULL** );

✍ User interface thread

✍ CWinThread\* AfxBeginThread( [\*\*CRuntimeClass\\*\*\* \*pThreadClass\*](#),  
**int** *nPriority* = **THREAD\_PRIORITY\_NORMAL**,  
**UINT** *nStackSize* = **0**, **DWORD** *dwCreateFlags* = **0**,  
**LPSECURITY\_ATTRIBUTES** *lpSecurityAttrs* = **NULL** );



|                 |                                                                                       |
|-----------------|---------------------------------------------------------------------------------------|
|                 |                                                                                       |
| pfnThreadProc   | Worker<br>가<br>. NULL<br>. UI NT MyControllingFunction( LPVOID pParam );              |
| pThreadClass    | CWinThread<br>RUNTIME_CLASS                                                           |
| pParam          | Worker                                                                                |
| nPriority       | .<br>0'(NULL)<br>가 , .<br>.                                                           |
| nStackSize      | ( :byte)<br>. 0'(NULL)<br>,<br>가 .                                                    |
| dwCreateFlags   | 가<br>가<br>가<br>. CREATE_SUSPENDED (<br>ResumeThread()가<br>.)<br>가 1<br>0'(NULL,<br>.) |
| lpSecurityAttrs | Win32 SECURITY_ATTRIBUTES<br>가<br>. 0'(NULL)<br>,<br>가 .                              |

# CHAPTER 11

## SetThreadPriority



 BOOL SetThreadPriority( **int** *nPriority* );


 Parameters

 *nPriority*

## CWinThread::ResumeThread



가 0

 DWORD ResumeThread( );

 Return Value


0xFFFFFFFF

# CHAPTER 11




| THREAD_PRIORITY_ABOVE_NORMAL  | 1<br>가 .                                                                                                       |
|-------------------------------|----------------------------------------------------------------------------------------------------------------|
| THREAD_PRIORITY_BELOW_NORMAL  | 1<br>가 .                                                                                                       |
| THREAD_PRIORITY_HIGHEST       | 2<br>가 .                                                                                                       |
| THREAD_PRIORITY_LOWEST        | 2<br>가 .                                                                                                       |
| THREAD_PRIORITY_IDLE          | IDLE_PRIORITY_CLASS, NORMAL_PRIORITY_CLASS,<br>HIGH_PRIORITY_CLASS<br>1 가 , REALTIME_PRIORITY_CLASS<br>16 가 .  |
| THREAD_PRIORITY_NORMAL        | 가 .                                                                                                            |
| THREAD_PRIORITY_TIME_CRITICAL | IDLE_PRIORITY_CLASS, NORMAL_PRIORITY_CLASS,<br>HIGH_PRIORITY_CLASS<br>15 가 , REALTIME_PRIORITY_CLASS<br>31 가 . |

# CHAPTER 11

 (User interface thread) 가?

 \_\_\_\_\_ . ( .)

```
 UI NT ComputeThreadProc( LPVOID pParam )
{
    g_nCount = 0;
    while( g_nCount < 100 ) {
        //
        ::InterlockedIncrement((long*) &g_nCount);
    }
    return 0;
}
```

 InterlockedIncrement() 가 가

# CHAPTER 11



(User interface thread)

가?



.



\_\_\_\_\_.



가



AfxBeginThread() 32 \_\_\_\_\_.



PostMessage()

.

# CHAPTER 11



EX11B



g\_nCount

Cancel



가

(PostMessage())

DoModal()



g\_nCount가

( )가



EX11C





# CHAPTER 11



(Scheduling)



dead lock



(wait function)



가

가 .

가

Win32

(C) 1998 Sang Il Kim

# CHAPTER 11



(Synchronization)



?

가

,



(sleeping)

.



.



가

.



가

가

.



가

, Win32

,

.



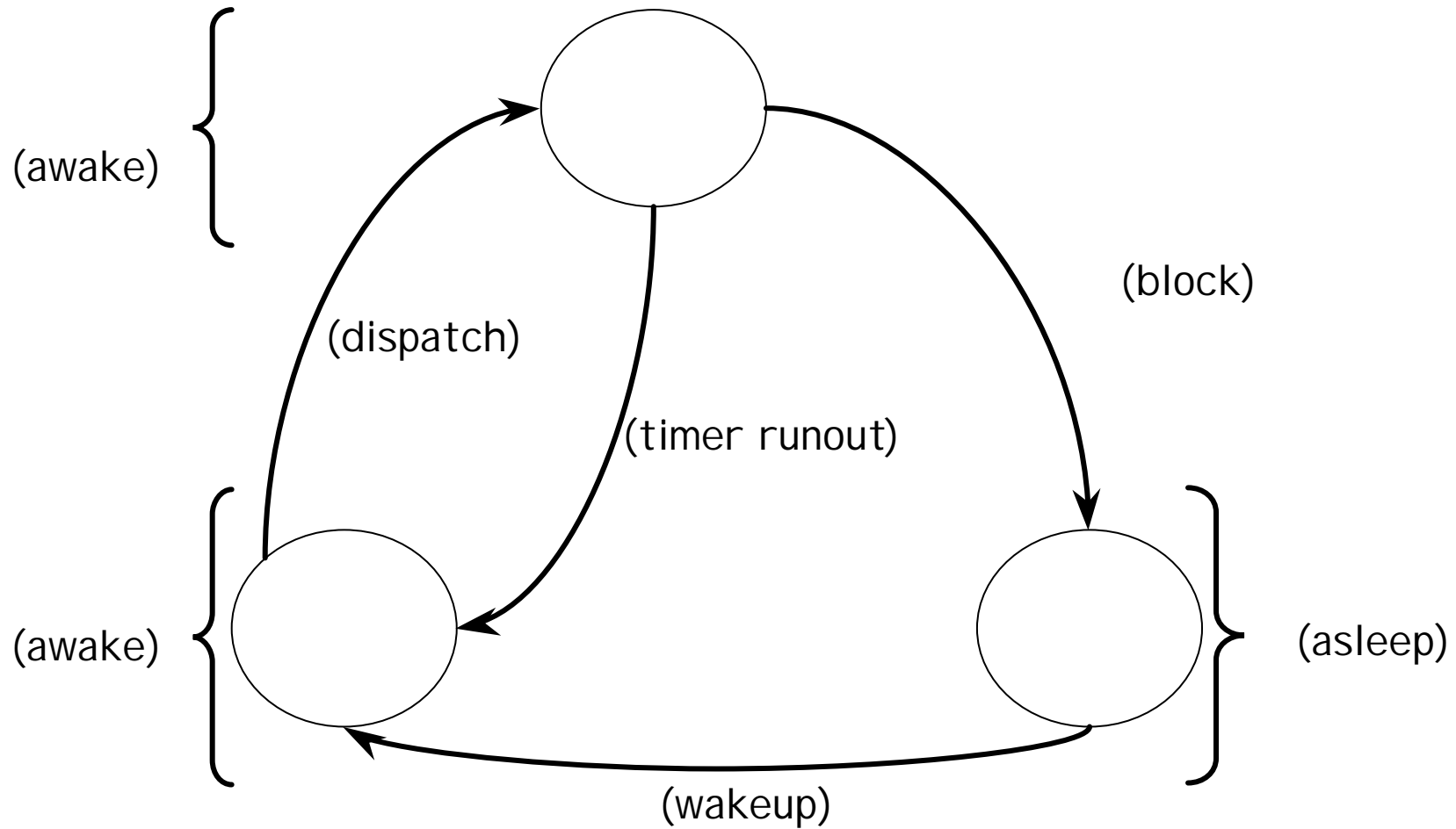
가

.



.

# CHAPTER 11



(State Transition)

# CHAPTER 11



(Synchronization Object)



.



가

가

.



Signaled :

가

.



Nonsignaled :

가

.



가

가

,

가 가

.



MFC "lock"

CObject


.



CSingleLock, CMultiLock

# CHAPTER 11

 (Synchronization Object)

 (Mutex, Mutual exclusion)



가





가

가



가



(Semaphore)



가



Win32

가



(Critical Section)







(Event)



가

가

# CHAPTER 11



가



32



(manual)



(signaled)

(TRUE)



(automatic)



(nonsignaled)

(FALSE)



가



가 "Signal"

/

"start"

"kill"

가



CEvent::SetEvent()

/

"signal"

# CHAPTER 11

## ✍ CEvent

| SetEvent()   | 가 ( ) ,<br>release .          |
|--------------|-------------------------------|
| PulseEvent() | 가 ( )<br>release ,<br>가 ( ) . |
| ResetEvent() | 가 ( ) .                       |



✍ (manual)

CEvent

가

SetEvent()

ResetEvent()

.



✍ (automatic)

CEvent

가 release ,

가

( ) .

.

# CHAPTER 11



가

가

(user interface thread)

가

(Critical section)

가

가

가

.( )

\_\_\_\_\_;

MFC

(wrap)

CCriticalSection

가

InitializeCriticalSection()

DeleteCriticalSection()

Lock()

Unlock()


EnterCriticalSection()

LeaveCriticalSection()

# CHAPTER 11



## CCriticalSection

```
 CCriticalSection g_cs;  
int g_nCount;  
void func()  
{  
    g_cs.Lock();  
    g_nCount++;  
    g_cs.Unlock();  
}
```

# CHAPTER 11

✍ CMutex

✍ CMutex( BOOL *bInitiallyOwn* = FALSE, LPCTSTR *lpszName* = NULL,  
LPSECURITY\_ATTRIBUTES *lpsaAttribute* = NULL );

| <i>bInitiallyOwn</i> | CMutex<br>가 .             |
|----------------------|---------------------------|
| <i>lpszName</i>      | CMutex<br>가 ,             |
| <i>lpsaAttribute</i> | Win32 SECURITY_ATTRIBUTES |

✍ CMutex, CSemaphore

CSyncObject Lock() Unlock()

# CHAPTER 11

## ✎ CSemaphore

✎ CSemaphore( LONG *InitialCount* = 1, LONG *IMaxCount* = 1,  
LPCTSTR *pstrName* = NULL,  
LPSECURITY\_ATTRIBUTES *lpSaAttributes* = NULL );

| InitialCount  | IMaxCount                 |
|---------------|---------------------------|
| IMaxCount     | pstrName                  |
| pstrName      | lpSaAttribute             |
| lpSaAttribute | Win32 SECURITY_ATTRIBUTES |

# CHAPTER 11

## Win32 (Wait Function)

| WaitForSingleObject()       | 가                               |
|-----------------------------|---------------------------------|
| WaitForStringObjectEx()     | WaitForSingleObject()<br>I/O    |
| WaitForMultipleObjects()    | 가                               |
| WaitForMultipleObjectsEx()  | WaitForMultipleObjects()<br>I/O |
| MsgWaitForMultipleObjects() | 가                               |

# CHAPTER 11

✍ CSingleLock

✍ CSingleLock

✍ CSingleLock

CMultiLock

CSyncObject

release

✍ CSingleLock

✍ CSingleLock

| IsLocked() | 가 .       |
|------------|-----------|
| Lock()     | .         |
| Unlock()   | release . |

# CHAPTER 11

## CSingleLock

1. CSingleLock .
2. 가 ( )  
Lock() .
3. 가 , ,  
release  
.
4. 가 , Unlock()  
(CSingleLock ) CSingleLock 가  
.

# CHAPTER 11

✍ CMultiLock

✍ CMultiLock

✍ CSingleLock

CMultiLock  
release

CSyncObject

✍ CMultiLock

✍ CMultiLock

| IsLocked() | 가 .       |
|------------|-----------|
| Lock()     | .         |
| Unlock()   | release . |



## CHAPTER 11

### CMultiLock

1. .
2. CMultiLock() .
3. 가 ( )  
Lock() .
4. 가 , ,  
release  
.
5. 가 , Unlock()  
(CMultiLock ) CMultiLock 가  
.

# CHAPTER 11

 CSyncObject

 CSingleLock    CMultiLock

CSyncObject

 MFC

| CCriticalSection | Win32 |
|------------------|-------|
| CEvent           | Win32 |
| CMutex           | Win32 |
| CSemaphore       | Win32 |

# CHAPTER 11

✍ WaitForSingleObject()

✍ 가

✍ DWORD WaitForSingleObject(  
**HANDLE** hHandle, // handle of object to wait for  
**DWORD** dwMilliseconds // time-out interval in milliseconds  
);

✍ Parameters

✍ hHandle

✍ dwMilliseconds (1/1000 , 1000millisecond=1 ).

가

dwMilliseconds가 0 ,  
dwMilliseconds가 INFINITE , time-out

| <u>Value</u>   | <u>Meaning</u>                                                                                                                                                                                                                                   |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WAIT_ABANDONED | The specified object is a mutex object that was not released by the thread that owned the mutex object before the owning thread terminated. Ownership of the mutex object is granted to the calling thread, and the mutex is set to nonsignaled. |
| WAIT_OBJECT_0  | 0 (signaled)                                                                                                                                                                                                                                     |
| WAIT_TIMEOUT   | time-out , (nonsignaled)                                                                                                                                                                                                                         |

# CHAPTER 11

 CComMultiThreadModel::Increment

 static ULONG Increment( **LPLONG** *p* );

 Return Value

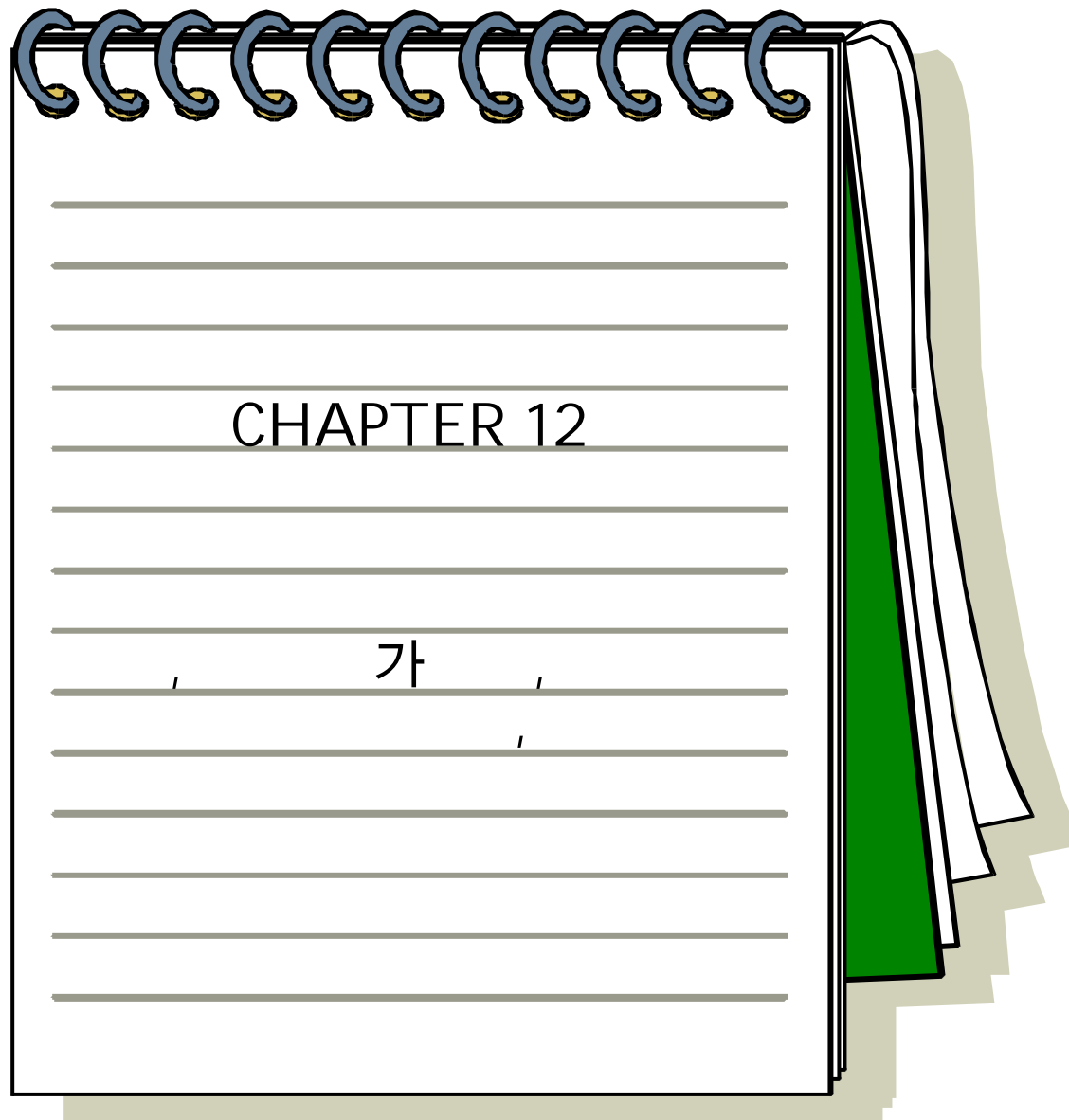
If the result of the increment is 0, then Increment returns 0.

If the result of the increment is nonzero, the return value is also nonzero but may not equal the result of the increment.

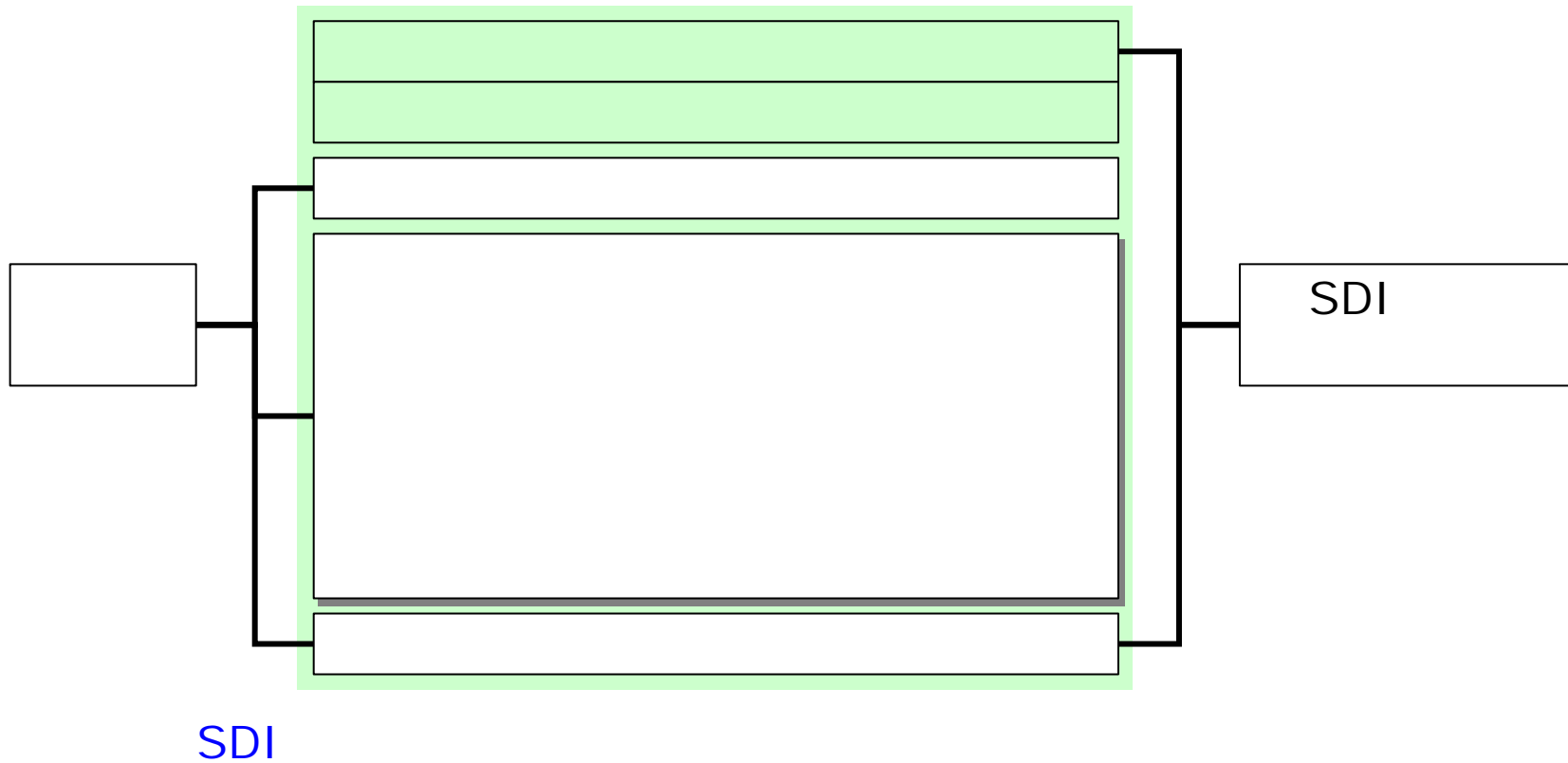
 Parameters

 *p* [in] Pointer to the variable to be incremented.

가 “ ! . ,  
가 .  
가 .  
, 가 .  
,  
.”



# CHAPTER 12



# CHAPTER 12



✎ MainFrm.h, MainFrm.cpp - CFrameWnd  
(CMainFrame) 가 .

✎ ex12aDoc.h, ex12aDoc.cpp - CDocument  
(CEx12aDoc) 가 .



✎ 가 .

✎ CView GetDocument()



( DevStudio\Vc\mfc\include\afxres.h )



가

가 .



(RC) .



resource.h

ID\_FILE\_OPEN

ID



-

ID

.

# CHAPTER 12

가  
가 ID  
Edit Copy ( ID ID\_EDIT\_COPY 가 ) 가  
?Ctrl+C?

, 가 ,  
CWnd::SendMessage() PostMessage()

#define  
resource.h ID  
가

| SDI | MDI        |
|-----|------------|
| SDI | MDI<br>MDI |

# CHAPTER 12



```
BEGIN_MESSAGE_MAP( CMyView, CView )
    ON_COMMAND( IDM_ZOOM, OnZoom )
END_MESSAGE_MAP()
```



```
void CMyView::OnZoom()
{
    //
}
```



```
    ( CMyView ) // DECLARE_MESSAGE_MAP
afx_msg void OnZoom();
```



가  
(Override)  
가

# CHAPTER 12



Edit

Clear All

가

가



MFC

가

UI



\_\_\_\_\_

CCmdUI



UI



- (top-level)



ID

# CHAPTER 12



```
BEGIN_MESSAGE_MAP( CMyView, CView )
    ON_UPDATE_COMMAND_UI( IDM_ZOOM, OnUpdateZoom )
END_MESSAGE_MAP()
```



```
void CMyView::OnUpdateZoom( CCmdUI * pCmdUI )
{
    pCmdUI -> SetCheck( m_bZoomed ); // m_bZoomed -
}
```



```
( CMyView )
```

```
DECLARE_MESSAGE_MAP 가 .
```

```
afx_msg void OnUpdateZoom( CCmdUI * pCmdUI );
```

# CHAPTER 12

( )  
 가  
 ID : 0-8000 0-DFFF  
 ID  
 가 가  
 ID가 0-8000 0-DFFF  
 Developer Studio ID  
 ID  
 가 CView CView

ON\_COMMAND ( ID\_FILE\_PRINT, CView::OnFilePrint )  
 ON\_COMMAND ( ID\_FILE\_PRINT\_PREVIEW, CView::OnFilePrintPreview )

# CHAPTER 12

가 / 가



가 .

CFrameWnd m\_bAutoMenuEnable False

. (the default)



가

IDM\_ZOOM 가 Zoom

가 가 가 .

MFC



가 .



# CHAPTER 12

 MFC


 CEditView

 64KB

 .

 (subclassing)

 Edit Cut, Copy, Paste

 CRichEditView

 .

 CRichEditDoc, CRichEditCtrl tem

ActiveX

# CHAPTER 12

✍ CRichEditCtrl( ) (EX12A)

✍ CView

가

가

✍ CRichEditCtrl

✍ MFC CRichEditCtrl 가

✍ CRichEditCtrl

(DevStudio\Vc\mfc\include\afxcmn.h 812 .)

✍ CRichEditCtrl

✍

✍

✍

✍

✍

✍

# CHAPTER 12

## ✍ CRichEditCtrl

| GetLineCount()        | CRichEditCtrl . |
|-----------------------|-----------------|
| GetLine()             | CRichEditCtrl . |
| GetFirstVisibleLine() | CRichEditCtrl . |
| LineIndex()           | CRichEditCtrl . |
| LineFromChar()        | 가 .             |
| LineLength()          | CRichEditCtrl . |
| LineScroll()          | CRichEditCtrl . |

# CHAPTER 12

## CRichEditCtrl

| Clear()            | . |
|--------------------|---|
| GetSel()           | . |
| GetSelectionType() | . |
| GetSelText()       | . |
| HideSelection()    | . |
| ReplaceSel()       | . |
| SetSel()           | . |

# CHAPTER 12

## CRichEditCtrl

| GetDefaultCharFormat()   | . |
|--------------------------|---|
| GetParaFormat()          | . |
| GetSelectionCharFormat() | . |
| SetDefaultCharFormat()   | . |
| SetParaFormat()          | . |
| SetSelectionCharFormat() | . |
| SetWordCharFormat()      | . |

# CHAPTER 12

## CRichEditCtrl

| CanUndo()         | .               |
|-------------------|-----------------|
| EmptyUndoBuffer() | CRichEditCtrl . |
| StreamIn()        | .               |
| StreamOut()       | CRichEditCtrl . |
| Undo()            | .               |

# CHAPTER 12

## CRichEditCtrl

| CanPaste()     | . |
|----------------|---|
| Copy()         | . |
| Cut()          | . |
| Paste()        | . |
| PasteSpecial() | . |

# CHAPTER 12

✍ CRichEditCtrl

| DisplayBand()   | CRichEditCtrl .   |
|-----------------|-------------------|
| FindText()      | CRichEditCtrl .   |
| FormatRange()   | .                 |
| GetCharPos()    | CRichEditCtrl .   |
| GetEventMask()  | CRichEditCtrl .   |
| GetLimitText()  | 가 CRichEditCtrl . |
| GetModify()     | CRichEditCtrl .   |
| GetRect()       | CRichEditCtrl .   |
| GetTextLength() | CRichEditCtrl .   |

(C) 1998 Sang I Kim

# CHAPTER 12

## ✍ CRichEditCtrl


| LimitText()          | 가 CRichEditCtrl    |
|----------------------|--------------------|
| RequestResize()      | CRichEditCtrl<br>가 |
| SetBackgroundColor() | CRichEditCtrl      |
| SetEventMask()       | CRichEditCtrl      |
| SetModify()          | CRichEditCtrl      |
| SetOptions()         | CRichEditCtrl      |
| SetReadOnly()        | CRichEditCtrl      |
| SetRect()            | CRichEditCtrl      |
| SetTargetDevice()    | CRichEditCtrl      |

# CHAPTER 12

## CRichEditCtrl

1. CRichEditCtrl::CRichEditCtrl()
2. CRichEditCtrl::Create() CRichEditCtrl

## CRichEditCtrl::Create()

 BOOL Create(DWORD *dwStyle*, const RECT& *rect*,  
CWnd \* *pParentWnd*, UI NT *nID*);

## Parameter

 *dwStyle* :

 *rect* :

 *nParentWnd* :

 *nID* :

# CHAPTER 12

✍ CRichEditCtrl

1. `PARAFORMAT` `CHARFORMAT`
2. `CRichEditCtrl`

✍ CRichEditCtrl

```
void CMainWnd::SetStyleHeading1(CHARFORMAT& cf)
{
    cf.cbSize      = sizeof(CHARFORMAT);
    cf.dwMask      = CFM_COLOR | CFM_FACE | CFM_SIZE |
                    CFM_ITALIC | CFM_BOLD;
    cf.dwEffects    = CFE_BOLD | CFE_ITALIC;
    cf.yHeight     = 500;
    cf.crTextColor  = crRed;
    cf.bCharSet     = ANSI_CHARSET;
    cf.bPitchAndFamily = FF_ROMAN;
}
```

# CHAPTER 12



(CHARFORMAT)



GetDefaultCharFormat(), GetSelectionCharFormat(),  
SetDefaultCharFormat(), SetSelectionCharFormat(),  
SetWordCharFormat() CHARFORMAT

가 .



Win32 .

# CHAPTER 12

## ✍ CHARFORMAT

```
typedef struct _charformat
```

```
{
```

```
    UINT        cbSize;           //
```

```
    _WPAD        _wPad1;
```

```
    DWORD        dwMask;          //
```

가

```
    DWORD        dwEffects;       //
```

```
    LONG         yHeight;         //
```

```
    LONG         yOffset;         //
```

. +: , -:

```
    COLORREF     crTextColor;     //
```

```
    BYTE         bCharSet;        //
```

```
    BYTE         bPitchAndFamily; //
```

```
    TCHAR        szFaceName[LF_FACESIZE]; //
```

가

```
    _WPAD        _wPad2;
```

```
} CHARFORMAT;
```

# CHAPTER 12

## ✎ CHARFORMAT dwMask

| CFM_BOLD      | dwEffects      CFE_BOLD .                       |
|---------------|-------------------------------------------------|
| CFM_COLOR     | dwEffects      crTextColor      CFE_AUTOCOLOR . |
| CFM_FACE      | szFaceName      가 .                             |
| CFM_ITALIC    | dwEffects      CFE_ITALIC .                     |
| CFM_OFFSET    | yOffset      가 .                                |
| CFM_PROTECTED | dwEffects      CFE_PROTECTED .                  |
| CFM_SIZE      | yHeight      가 .                                |
| CFM_STRIKEOUT | dwEffects      CFE_STRIKEOUT .                  |
| CFM_UNDERLINE | dwEffects      CFE_UNDERLINE .                  |

# CHAPTER 12



가 /

| CFE_AUTOCOLOR | GetSysColor(COLOR_WINDOWTEXT) |
|---------------|-------------------------------|
| CFE_BOLD      |                               |
| CFE_ITALIC    |                               |
| CFE_STRIKEOUT |                               |
| CFE_UNDERLINE |                               |
| CFE_PROTECTED | , EN_PROTECTED                |



# CHAPTER 12



(Property Sheet)



95



MFC



1.

2. ClassWizard

CPropertyPage

가

3. ClassWizard

CPropertySheet

4.

가

5.

AddPage()

6.

CPropertySheet

DoModal()

CPropertySheet::SetTitle()

7. Apply

# CHAPTER 12



가

DDX



WM\_NOTIFY



OK, Cancel, Apply

DDX

가

OnApply()

Apply

가



가

Cancel

가



Apply( )



가



가

가

CPropertyPage::OnApply()

Override

Apply



가

가

SetModified(TRUE)



Override

# CHAPTER 12

✍ CMenu

✍ CMenu -

✍ CWnd::GetMenu() CMenu .

✍

✍ GetSubMenu() CMenu  
(CMenu ) .

✍ (Pop-up)

✍ CMenu::TrackPopupMenu() .

1. .

2. - , 가 .

3. ClassWizard

WM\_CONTEXTMENU 가 .

# CHAPTER 12

✍ CPage1 (Pop-up)

```
void CPage1::OnContextMenu(CWnd* pWnd, CPoint point)
{
    CMenu menu;
    menu.LoadMenu(IDR_MAINFRAME);
    menu.GetSubMenu(1) -> TrackPopupMenu(
        TPM_LEFTALIGN | TPM_RIGHTBUTTON, //
        point.x, point.y, //
        this); //
}
```

# CHAPTER 12



(Pop-up)

```
void CMyView::OnContextMenu(CWnd* pWnd, CPoint point)
{
    CMenu menu;
    menu.LoadMenu(IDR_MYFLOATMENU);
    menu.GetSubMenu(0) -> TrackPopupMenu(
        TPM_LEFTALIGN | TPM_RIGHTBUTTON, //
        point.x, point.y,                //
        this);                           //
}
```

# CHAPTER 12

| Win32 API        | MFC                                            |
|------------------|------------------------------------------------|
| Win32 API        | MFC                                            |
| WM_COMMAND       | WM_COMMAND .                                   |
| WM_INITMENU      | ; MFC .                                        |
| WM_INITPOPUPMENU | UPDATE_COMMAND_UI . MFC<br>가 ,<br>WM_COMMAND . |
| WM_MENUSELECT    | ; CFrameWnd .                                  |

✍ CMenu

✍

✍

✍

✍ 가

# CHAPTER 12

## ✍ CMenu

| Attach()           | CMenu .              |
|--------------------|----------------------|
| CreateMenu()       | , CMenu .            |
| CreatePopupMenu()  | , CMenu .            |
| DeleteTempMap()    | FromHandle() CMenu . |
| DestroyMenu()      | CMenu , 가 .          |
| Detach()           | CMenu , .            |
| FromHandle()       | , CMenu .            |
| GetSafeMenu()      | CMenu (m_hMenu) .    |
| LoadMenu()         | , CMenu .            |
| LoadMenuIndirect() | , CMenu .            |

# CHAPTER 12



DeleteMenu()



가 ,

TrackPopupMenu()

POINT

가

DrawItem()



가

MFC가 .

MeasureItem()



가

가

MFC가 .

# CHAPTER 12



## CMenu

| AppendMenu()           | 가 .       |
|------------------------|-----------|
| CheckMenuItem()        | .         |
| CheckMenuRadioItem()   | .         |
| EnableMenuItem()       | 가 , 가 , . |
| GetMenuContextHelpID() | ID 가 .    |
| GetMenuItemCount()     | 가 .       |
| GetMenuItemID()        | ID 가 .    |
| GetMenuState()         | 가 가 .     |

# CHAPTER 12



## CMenu

| GetMenuString()        | 가 .  |
|------------------------|------|
| GetSubMenu()           | 가 .  |
| InsertMenu()           | .    |
| ModifyMenu()           | .    |
| RemoveMenu()           | .    |
| SetMenuContextHelpId() | ID . |
| SetMenuItemsBitmaps()  | .    |

# CHAPTER 12

## CPropertyPage

 CPropertyPage();

 CPropertyPage( UI NT *nIDTemplate*, UI NT *nIDCaption* = 0);

 CPropertyPage(LPCTSTR *lpszTemplateName*, UI NT *nIDCaption* = 0);

### Parameters

 *nIDTemplate* ID

 *lpszTemplateName*


 *nIDCaption* ID.

0


,


.

## CWnd::OnContextMenu

 afx\_msg void OnContextMenu( CWnd \* *pWnd*, CPoint *pos* );

### Parameters

 *pWnd* Handle to the window in which the user right clicked the mouse.  
This can be a child window of the window receiving the message.  
For more information about processing this message, see the  
Remarks section.

 *pos* Position of the cursor, in screen coordinates, at the time of the  
mouse click.

# CHAPTER 12

✍ CWnd::SetMenu

✍

✍ SetMenu

✍ SetMenu

✍ CWnd::GetMenu

, CMenu::DestroyMenu

✍ BOOL SetMenu( CMenu \* *pMenu* );

✍ Parameters

✍ *pMenu*

가 NULL , 가

✍ CMenu::GetSubMenu

✍

CMenu

✍

✍ CMenu\* GetSubMenu( int *nPos* ) const;

✍ Return Value

CMenu

✍ Parameters

✍ *nPos*

Position values start at 0 for the first menu item.

# CHAPTER 12

✍ CMenu::TrackPopupMenu

```
✍ BOOL TrackPopupMenu( UI NT nFlags,           //  
                        int x, int y,           //  
                        CWnd * pWnd,           //  
                        LPCRECT lpRect = NULL ); //
```

✍ Screen-position flag

✍ TPM\_CENTERALIGN

✍ TPM\_LEFTALIGN

✍ TPM\_RIGHTALIGN

✍ Mouse-button flag

✍ TPM\_LEFTBUTTON

✍ TPM\_RIGHTBUTTON

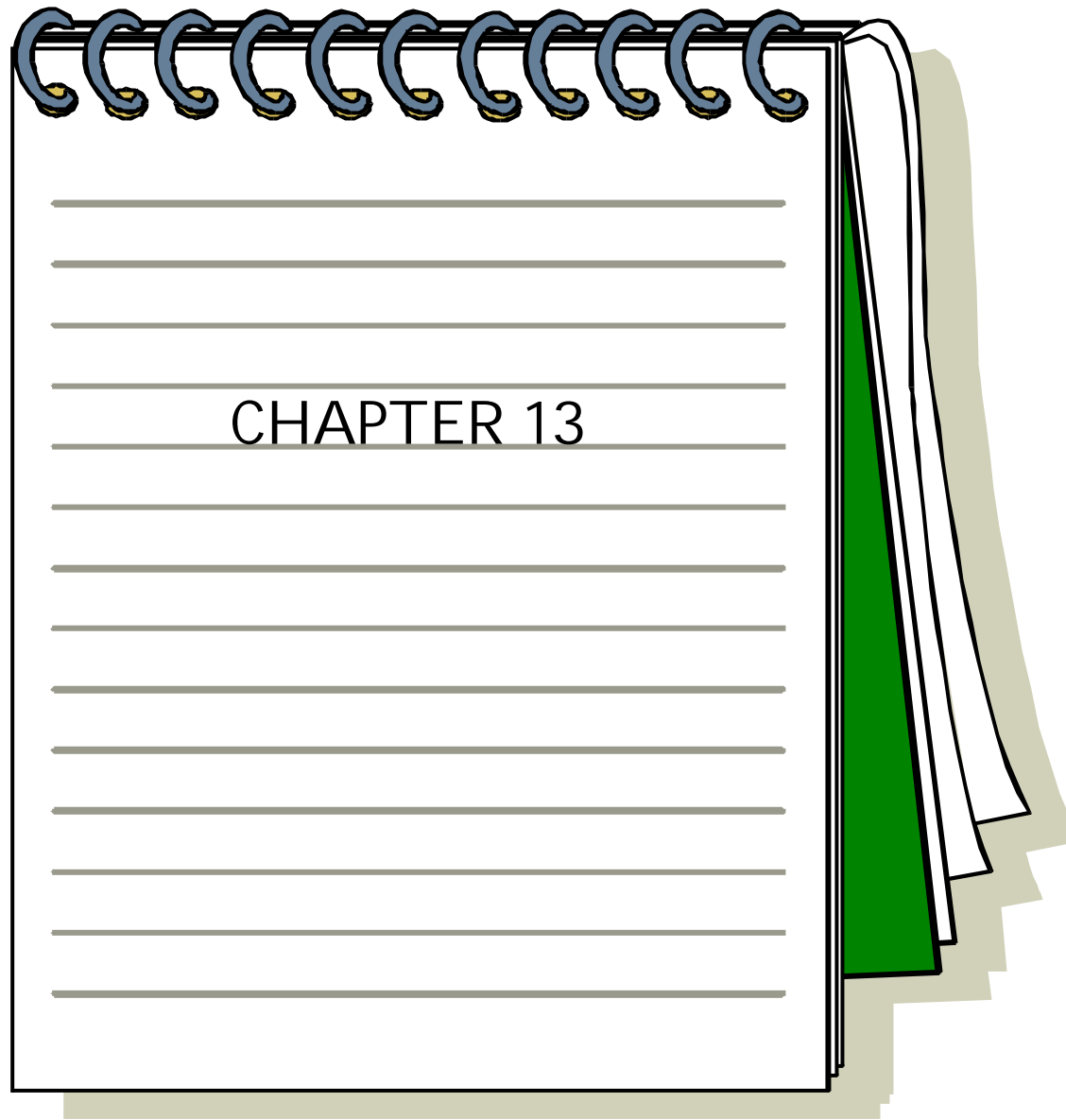
✍ *x*

✍ *y*

✍ *pWnd*

.

" 가 "Can do" .  
 " 가 " .  
 " 가 " .  
 ( )



# CHAPTER 13



AppWizard Step4      Docking toolbar      Initial status bar  
AppWizard



- CToolBar  
- CStatusBar  
CControlBar -  
가



AppWizard -      MainFrm.cpp,  
MainFrm.h



SDI  
CToolBar - CMainFrame  
CStatusBar - CMainFrame  
- ( )

# CHAPTER 13



가



UI

가



16( )x15( ) (tile) 가



( )



\res Toolbar.bmp



(.rc) IDC\_MAINFRAME

# CHAPTER 13



| 0                            | (up)        |
|------------------------------|-------------|
| TBBS_PRESSED                 | ( )         |
| TBBS_CHECKED                 | (down)      |
| TBBS_DISABLED                | 가           |
| TBBS_INDETERMINATE           | 가 , up down |
| TBBS_CHECKED   TBBS_DISABLED | (down) , 가  |



ClassWizard

UI



TOOLBAR



TOOLBAR

ID(ID\_MAINFRAME)

# CHAPTER 13

AppWizard가

IDR\_MAINFRAME TOOLBAR DISCARDABLE 16, 15

BEGIN

BUTTON ID\_FILE\_NEW

BUTTON ID\_FILE\_OPEN

BUTTON ID\_FILE\_SAVE

SEPARATOR

BUTTON ID\_EDIT\_CUT

BUTTON ID\_EDIT\_COPY

BUTTON ID\_EDIT\_PASTE

SEPARATOR

BUTTON ID\_FILE\_PRINT

BUTTON ID\_APP\_ABOUT

END

(pane) 가

.

double click

가 .

ID

# CHAPTER 13

UI  
 UI 가 False 가 CCmdUI::Enable()  
 ( )

CCmdUI::SetCheck()

-

-

CCmdUI::SetCheck -

virtual void SetCheck( **int** nCheck = 1 );

Parameters

nCheck : 0, : 1, : 2

CButton::SetCheck -

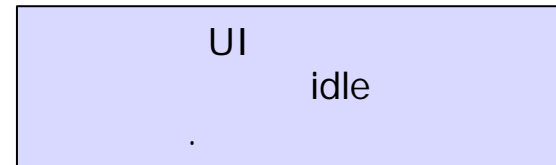
( , )

void SetCheck( int nCheck );

Parameters

nCheck

| Value | Meaning |
|-------|---------|
| 0     | ( )     |
| 1     | ( )     |
| 2     | 가       |





## CHAPTER 13

✍ ( )

✍ (p439)

✍ (\n) 가 .

✍

✍

✍ SDI MDI

✍ AfxGetApp() -

✍ CWinApp m\_pMainWnd -

✍ CMainFrame\* pFrame = ( CMainFrame\*)AfxGetApp()->m\_pMainWnd;

CToolBar\* pToolBar = &pFrame->m\_wndToolBar;

✍ m\_wndToolBar CFrameWnd\* CMainFrame\*

m\_pMainWnd

✍ SDI - m\_pMainWnd OnCreate()

GetParentFrame()

# CHAPTER 13

## ✍ CToolBar

| CommandToIndex()   | ID             |
|--------------------|----------------|
| Create()           | CStatusBar     |
| GetItemID()        | ID             |
| GetItemRect()      |                |
| GetPanelInfo()     | ID,            |
| GetPaneStyle()     |                |
| GetPaneText()      |                |
| GetStatusBarCtrl() | CStatusBarCtrl |
| SetIndicators()    | ID             |
| SetPanelInfo()     | ID,            |
| SetPaneStyle()     |                |
| SetPaneText()      |                |

# CHAPTER 13



EX13A -

| Circle<br>Square<br>Pattern | . |
|-----------------------------|---|



가

Circle

가

,

Square

가

.



Draw

Pattern

가

,

(down)

(up)

.

# CHAPTER 13

✍

✍

✍

✍

(pane)

가

indicators[]

(pane)

```
static UI NT BASED_CODE indicators[] =
{
    ID_SEPARATOR,          // status line indicator
    ID_INDICATOR_CAPS,
    ID_INDICATOR_NUM,
    ID_INDICATOR_SCRL,
    ID_INDICATOR_PAGE,
};
```

✍ CStatusBar::SetIndicators -

✍ BOOL SetIndicators( const UI NT\* *lpIDArray*, int *nIDCount* );

✍ Return Value

✍ TRUE, FALSE

✍ Parameters

✍ *lpIDArray*

ID

UI NT

✍ *nIDCount*

. *lpIDArray*

# CHAPTER 13

✍ (pane)

✍

✍ - 0 : , 1 : (CAP)

✍ CMainFrame\* pFrame = (CMainFrame\*)AfxGetApp()->m\_pMainWnd;  
 CStatusBar\* pStatus = &pFrame->m\_wndStatusBar;  
 pStatus->SetPaneText( 0, "message line for first pane" );

✍ 1/4 .

✍ ( 0 )  
 1/4 .

✍ CStatusBar::SetPaneText -

✍ BOOL SetPaneText( **int** *nIndex*, **LPCTSTR** *lpszNewText*, **BOOL** *bUpdate* = **TRUE** );

✍ Return Value

✍ TRUE, FALSE

✍ Parameters

✍ *nIndex* 0

✍ *lpszNewText*

✍ *bUpdate* 가 TRUE, FALSE

# CHAPTER 13

 (Status Indicator)





UI



ID

 CapsLock

 ON\_UPDATE\_COMMAND\_UI ( ID\_INDICATOR\_CAPS, OnUpdateKeyCapsLock )

void CMainFrame::OnUpdateKeyCapsLock ( CCmdUI \* pCmdUI )

{

pCmdUI->Enable(::GetKeyState(VK\_CAPITAL) & 1);

}



UI

idle

가

# CHAPTER 13



ID(AFX\_IDW\_STATUS\_BAR)

ID

ID

✎ CFrameWnd::OnUpdateKeyIndicator(CCmdUI \* pCmdUI)

가 (..\vc\mfc\src\Winfrm.cpp - 1733 )



ID

가 0



ID

m\_wndStatusBar.Create(this);

➡ m\_wndStatusBar.Create(this, WS\_CHILD | WS\_VISIBLE | CBRs\_BOTTOM,

ID\_MY\_STATUS\_BAR);



View

가

show/hide



## CHAPTER 13

✍ CStatusBar::Create -

✍ AFX\_IDW\_STATUS\_BAR ID .  
MFC 가 가 가

✍ BOOL Create( CWnd \* *pParentWnd*, DWORD *dwStyle* =  
WS\_CHILD | WS\_VISIBLE | CBRs\_BOTTOM,  
UINT *nID* = AFX\_IDW\_STATUS\_BAR );

✍ Return Value

✍ : TRUE, : FALSE

✍ Parameters

✍ *pParentWnd*

✍ *dwStyle*

**CBRS\_TOP**

Control bar is at top of frame window.

**CBRS\_BOTTOM**

Control bar is at bottom of frame window.


**CBRS\_NOALIGN**

Control bar is not repositioned when the parent is resized.

✍ *nID*

ID.

# CHAPTER 13


 RecalcLayout




가

가

Customize

 virtual void RecalcLayout( BOOL *bNotify* = TRUE );

 Parameters

 *bNotify* TRUE ,

# CHAPTER 13



EX13B -

|   | ID                 | Type |   |
|---|--------------------|------|---|
| 0 | ID_SEPARATOR(0)    |      | x |
| 1 | ID_SEPARATOR(0)    |      | y |
| 2 | ID_INDICATOR_LEFT  |      |   |
| 3 | ID_INDICATOR_RIGHT |      |   |



CStatusBar::SetPanel nfo -



void SetPanel nfo( **int** nIndex, **UINT** nID, **UINT** nStyle, **int** cxWidth);



Parameters



nIndex

0



nID

ID



nStyle

SBPS\_NOBORDERS

가

SBPS\_POPOUT

Popout

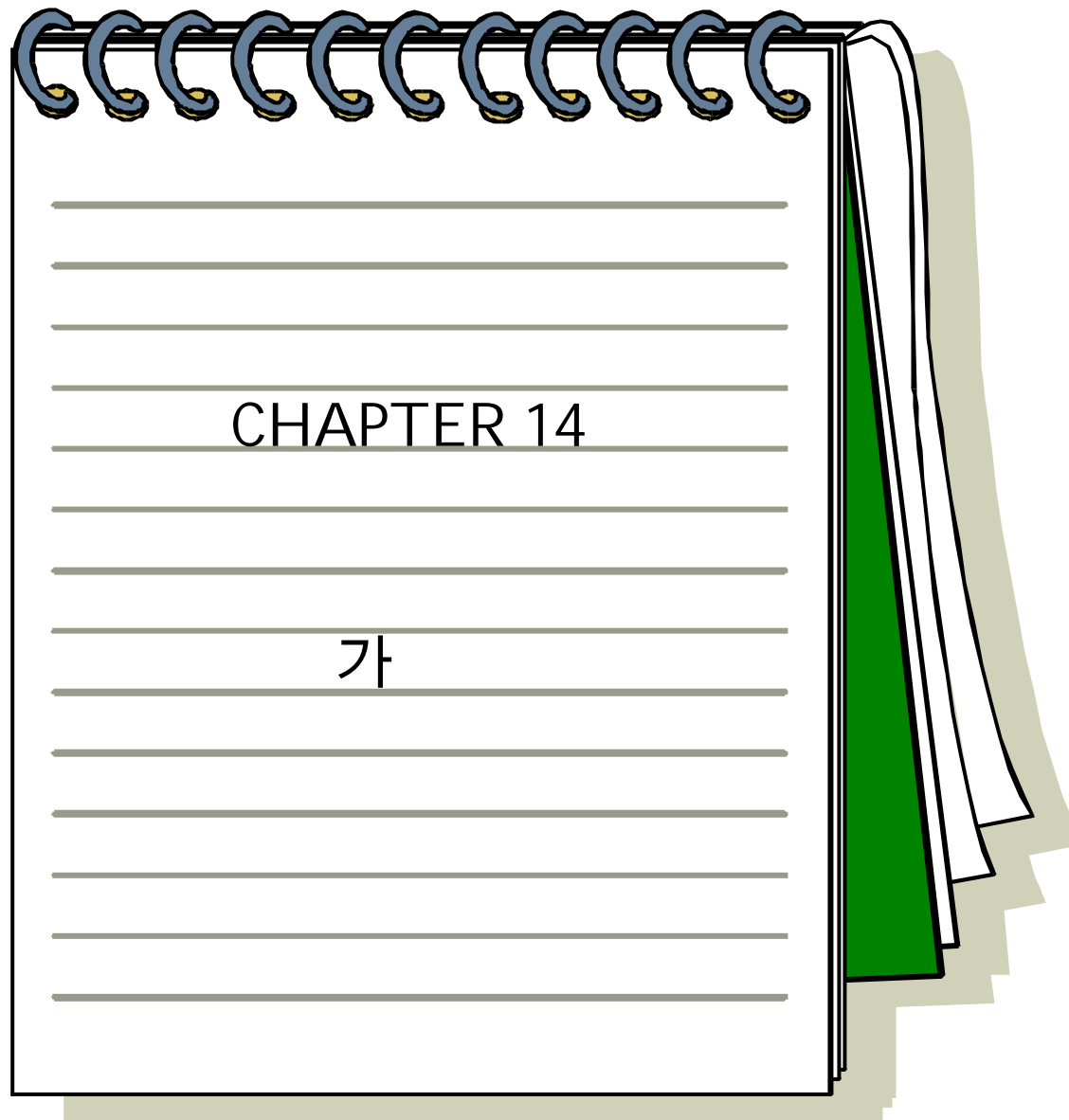
SBPS\_DISABLED

SBPS\_STRETCH

SBPS\_NORMAL



cxWidth



# CHAPTER 14



MFC가  
API



| CFrameWnd<br>CMDI FrameWnd<br>CMDI ChildWnd<br>CMiniFrameWnd |  |
|--------------------------------------------------------------|--|

# CHAPTER 14

 CPersistentFrame

 CPersistentFrame

SDI

.









( Iconized status )



가

 CFrameWnd

ActivateFrame()

 MFC SDI

가

.




가

,

.



 CFrameWnd::ActivateFrame()

# CHAPTER 14

 CFrameWnd::ActivateFrame

 ( )  
Z .



Customize .

 virtual void ActivateFrame( **int** *nCmdShow* = -1 );

 Parameters

 *nCmdShow* .

-1 , 가  
(SW\_RESTORE),  
SW\_SHOWNORMAL .  
-1 , nCmdShow  
CWnd::ShowWindow


# CHAPTER 14

 CFrameWnd      ActivateFrame()

      SDI

 가      ActivateFrame()      .



 nCmdShow      CWnd::ShowWindow()

 ShowWindow()

 .

 nCmdShow

 ,

      ActivateFrame()      Override      nCmdShow      가

CFrameWnd::ActivateFrame()

 CWnd::SetWindowPlacement()

 ,

# CHAPTER 14

✍ CWnd::ShowWindow -

✍ BOOL ShowWindow(**int** *nCmdShow*);

✍ Return Value

Nonzero if the window was previously visible; 0 if the CWnd was previously hidden.

✍ Parameters

✍ *nCmdShow*

SW\_HIDE

SW\_MINIMIZE

SW\_RESTORE

가

SW\_SHOW

SW\_SHOWMAXIMIZED

SW\_SHOWMINIMIZED

SW\_SHOWMINNOACTIVE

가

SW\_SHOWNA

가

SW\_SHOWNOACTIVATE

가

가

SW\_SHOWNORMAL

가

# CHAPTER 14

✍ CWnd::SetWindowPlacement

✍

✍

✍ BOOL SetWindowPlacement( const **WINDOWPLACEMENT**\* *lpwndpl* );

✍ Parameters

✍ *lpwndpl*

**WINDOWPLACEMENT**

✍ CWnd::GetWindowPlacement

✍

**WINDOWPLACEMENT**

✍ BOOL GetWindowPlacement( **WINDOWPLACEMENT**\* *lpwndpl* ) **const**;

✍ Parameters

✍ *lpwndpl*


( , , , )


**WINDOWPLACEMENT**

0

# CHAPTER 14

## WINDOWPLACEMENT Structure

-  The WINDOWPLACEMENT structure contains information about the placement of a window on the screen


```
 typedef struct tagWINDOWPLACEMENT {    /* wndpl */
    UINT    length;
    UINT    flags;
    UINT    showCmd;
    POINT    ptMinPosition;
    POINT    ptMaxPosition;
    RECT     rcNormalPosition;
} WINDOWPLACEMENT;
```

# CHAPTER 14

## WINDOWPLACEMENT Structure

### Members

 **length** Specifies the length, in bytes, of the structure.

 **flags** Specifies flags that control the position of the minimized window and the method by which the window is restored.

This member can be one or both of the following flags:

**WPF\_SETMINPOSITION** Specifies that the x- and y-positions of the minimized window can be specified. This flag must be specified if the coordinates are set in the ptMinPosition member.

**WPF\_RESTORETOMAXIMIZED** Specifies that the restored window will be maximized, regardless of whether it was maximized before it was minimized. This setting is valid only the next time the window is restored. It does not change the default restoration behavior.

This flag is valid only when the SW\_SHOWMINIMIZED value is specified for the showCmd member.

 **showCmd** Specifies the current show state of the window.

# CHAPTER 14

✍ PreCreateWindow()

✍ 가

override .

✍ ActivateFrame() PreCreateWindow()

✍ CREATESTRUCT .

✍ style , ,

✍ dwExStyle

✍ lpszClass , ,

✍ CWnd::PreCreateWindow

✍ virtual BOOL PreCreateWindow( **CREATESTRUCT&** cs );

✍ Parameters

✍ CS CREATESTRUCT .

# CHAPTER 14



Registry

Registry



- USER.DAT



- SYSTEM.DAT



(heading name)

(entry name)



TEXTPROC // , Root Key

Text formatting // Heading name,

Font = Times Roman // Entry name, Value

Points = 10 // Entry name, Value



MFC INI 4 CWinApp

SetRegistryKey(\_T("Local AppWizard-Generated Applications"));

(c:\Windows) INI

# CHAPTER 14



 GetProfileInt

 GetProfileString

 WriteProfileInt

 WriteProfileString



가

AfxGetApp() .

 AfxGetApp()->WriteProfileString("Text formatting", "Font",  
"Times Roman");

 AfxGetApp()->WriteProfileString("Text formatting", "Point", 10);

# CHAPTER 14

✍ CWinApp::SetRegistryKey



GetProfileString)가

(WriteProfileInt,

MFC



가

✍ void SetRegistryKey( **LPCTSTR** *lpzRegistryKey* );

✍ void SetRegistryKey( **UINT** *nIDRegistryKey* );

✍ Parameters

✍ *lpzRegistryKey*

✍ *nIDRegistryKey*

ID.

# CHAPTER 14

✍ CWinApp::GetProfileInt



.INI

✍ GetProfileInt

가

SetRegistryKey()

✍ UINT GetProfileInt( **LPCTSTR** lpszSection, **LPCTSTR** lpszEntry, **int** nDefault );

✍ Parameters

✍ lpszSection

✍ lpszEntry

✍ nDefault

가

unsigned value : 0 - 65,535, signed value : -32,768 - 32,767

✍ CWinApp::GetProfileString



.INI

✍ GetProfileString

가

SetRegistryKey()

✍ CString GetProfileString( **LPCTSTR** lpszSection, **LPCTSTR** lpszEntry,  
**LPCTSTR** lpszDefault = **NULL**);

✍ Parameters

✍ lpszSection

✍ lpszEntry

✍ lpszDefault

가

NULL

# CHAPTER 14

✍ CWinApp::WriteProfileInt

✍ .INI

✍ WriteProfileInt 가 SetRegistryKey()

✍ BOOL WriteProfileInt( **LPCTSTR** *lpszSection*, **LPCTSTR** *lpszEntry*, **int** *nValue* );

✍ Parameters

✍ *lpszSection*

✍ *lpszEntry*

✍ *nValue*

✍ CWinApp::WriteProfileString

✍ .INI

✍ WriteProfileString 가 SetRegistryKey()

✍ BOOL WriteProfileString( **LPCTSTR** *lpszSection*, **LPCTSTR** *lpszEntry*,  
**LPCTSTR** *lpszValue* );

✍ Parameters

✍ *lpszSection*

✍ *lpszEntry*

✍ *lpszValue* . NULL

# CHAPTER 14

 Example

```
CString strSection      = "My Section";
CString strStringItem   = "My String Item";
CString strIntItem      = "My Int Item";

CWinApp* pApp = AfxGetApp();

pApp->WriteProfileString(strSection, strStringItem, "test");

CString strValue;
strValue = pApp->GetProfileString(strSection, strStringItem);
ASSERT(strValue == "test");

pApp->WriteProfileInt(strSection, strIntItem, 1234);
int nValue;
nValue = pApp->GetProfileInt(strSection, strIntItem, 0);
ASSERT(nValue == 1234);
```

# CHAPTER 14

✍ CString

✍ CString 가

✍

✍ CString

```
CString strFirstName("Elvis");
```

```
CString strLastName("Presley");
```

```
CString strTruth = strFirstName + " " + strLastName; //
```

```
strTruth += " is alive";
```

```
ASSERT( strTruth == "Elvis Presley is alive" );
```

```
ASSERT( strTruth.Left(5) == strFirstName );
```

```
ASSERT( strTruth[2] == ' '); //
```

✍ ASSERT

✍

(MFC

),

가 FALSE ,

```
char *buf;  
buf = (char *) calloc( 20, sizeof(char) );  
ASSERT( buf != NULL );  
strcpy( buf, "Hello, World" );  
free( buf );
```

# CHAPTER 14

✍ CString

✍

✍ CString      가 CString      const char\*

✍ LPCTSTR    CString      가      const char\*

✍ AfxMessageBox

✍ CWinApp      DoMessageBox      Helper

✍ int AfxMessageBox( **LPCTSTR** *lpszText*, **UINT** *nType* = **MB\_OK**, **UINT** *nIDHelp* = **0** );

✍ int AFXAPI AfxMessageBox( **UINT** *nIDPrompt*, **UINT** *nType* = **MB\_OK**,  
**UINT** *nIDHelp* = (**UINT**) -1 );

✍ Parameters

✍ *lpszText*

✍ *nType*

SDK

✍ *nIDHelp*    *nIDHelp*

0,

ID

-1.

✍ *nIDPrompt*

ID

# CHAPTER 14

✍ CWnd::MessageBox

✍ int MessageBox( LPCTSTR lpszText, LPCTSTR lpszCaption = NULL,  
UINT nType = MB\_OK );

✍ Parameters

✍ lpszText

✍ lpszCaption

✍ nType

✍ Message\_Box Types

✍ MB\_ABORTRETRYIGNORE Abort, Retry, and Ignore.

✍ MB\_OK OK.

✍ MB\_OKCANCEL OK and Cancel.

✍ MB\_RETRYCANCEL Retry and Cancel.

✍ MB\_YESNO Yes and No.

✍ MB\_YESNOCANCEL Yes, No, and Cancel.

✍

✍ MB\_ICONSTOP



✍ MB\_ICONEXCLAMATION



✍ MB\_ICONQUESTION



✍ MB\_ICONINFORMATION



# CHAPTER 14

✍ CString

✍ const char\* CString .

✍ CString ?

✍ CString CDC::TextOut()

CString .

✍ pDC->TextOut( 0, 0, "Hello, World!", 13 );

✍

✍ 가 , strcpy()

C const char\* .

✍ 가 , CString

const CString& .

✍ 가 CString& .

# CHAPTER 14



*lpRect*

( )

가

.

GetWindowRect -

.

GetWindowPlacement -

가

/

가

.

SetWindowPlacement -

/

,

/

.

CWnd::GetWindowRect -

.

void GetWindowRect( **LPRECT** *lpRect* ) **const**;

Parameters

RECT

CRect

# CHAPTER 14



SaveBarState(), LoadBarStatw()



CPersistentFrame

static const char



Encapsulation



\_\_\_\_\_.



\_\_\_\_\_



CRect rect( CW\_USEDEFAULT, CW\_USEDEFAULT, 0, 0 );


CPersistentFrame

rectDefault

# CHAPTER 14





## RECT Structure

 The RECT data structure has the following form:

```
 typedef struct tagRECT {  
    LONG left;  
    LONG top;  
    LONG right;  
    LONG bottom;  
} RECT;
```

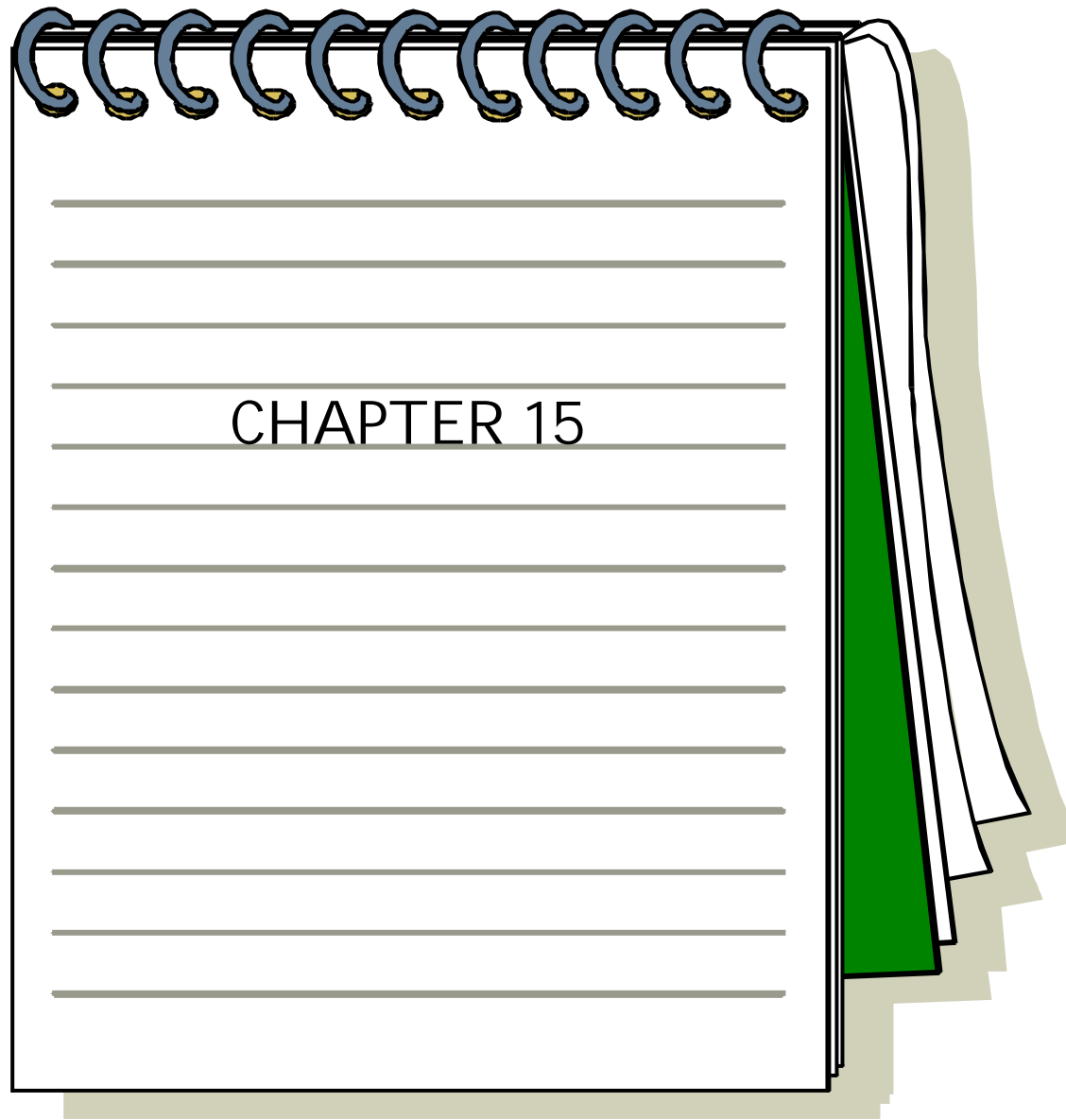
The RECT structure defines the coordinates of the upper-left and lower-right corners of a rectangle.

## Members

-  **left** Specifies the x-coordinate of the upper-left corner of a rectangle.
-  **Top** Specifies the y-coordinate of the upper-left corner of a rectangle.
-  **Right** Specifies the x-coordinate of the lower-right corner of a rectangle.
-  **Bottom** Specifies the y-coordinate of the lower-right corner of a rectangle.

## *FISHING TIPS*

*Go where the “fish” are.  
Use the right “bait”.  
Be patient!*



# CHAPTER 15



/



-



.



가

.



SDI



CDocument

.



CView::GetDocument()



public



가

가

가

.

.

(C) 1998 Sang Il Kim

# CHAPTER 15

✍ CView::GetDocument()

✍ CView CDocument 가

```
✍ CMyDoc* GetDocument()
{
    return (CMyDoc*) m_pDocument;
}
```

✍ GetDocument()  
CDocument 가

가 .

✍ CView::GetDocument

✍ CDocument\* GetDocument() const;

# CHAPTER 15

✍ CDocument::UpdateAllViews()

✍ 가 가

✍ UpdateAllViews() 가 OnUpdate()가 .

✍ CDocument::UpdateAllViews

✍

✍

CView::OnUpdate

✍ void UpdateAllViews( **CView\*** pSender, **LPARAM** lHint = **0L**,  
**CObject\*** pHint = **NULL** );

✍ Parameters

✍ pSender

CView

NULL 가 (update) .

✍ lHint

✍ pHint lHint

CObject

# CHAPTER 15

✎ CView::OnUpdate()

✎ OnUpdate()

✎ OnDraw()

✎ OnUpdate()

✎ CView::OnUpdate

✎ 가 ,

✎ 가 .

✎ virtual void OnUpdate( **CView\*** pSender, **LPARAM** lHint, **CObject\*** pHint );

✎ Parameters

✎ pSender . NULL 가 (update) .

✎ lHint 가 가 가

✎ pHint (Hint) 가

# CHAPTER 15

✍ CView::OnInitialUpdate()

✍ , 가

✍ OnInitialUpdate() OnUpdate() .

✍ OnInitialUpdate() override

OnInitialUpdate() OnUpdate()

.

✍ OnCreate()

OnInitialUpdate() .

✍ CView::OnInitialUpdate

✍ virtual void OnInitialUpdate( );



## CHAPTER 15

✍ CDocument::OnNewDocument()

✍ 가 , 가  
OnNewDocument()

✍ Override OnNewDocument() CDocument::OnNewDocument()

✍ CDocument::OnNewDocument

✍ virtual BOOL OnNewDocument( );

✍ -

✍ 가  
UpdateAllViews() OnUpdate()

✍

1. .
2. 가 OnInitialUpdate() override .
3. , OnDraw()  
GetDocument()

# CHAPTER 15



-

|  |                                                                                                                                                                               |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | CMyDocument 가 .<br>CMyView 가 .<br>가 .<br>CMyView::OnCreate() 가 .<br>CMyDocument::OnNewDocument() 가 .<br>CMyView::OnInitialUpdate() 가 .<br>가 .<br>가 .<br>CMyView::OnDraw() 가 . |
|  | CMyView CMyDocument<br>.                                                                                                                                                      |
|  | CMyView 가 .<br>CMyDocument 가 .                                                                                                                                                |

# CHAPTER 15

CFormView : public CScrollView

CFormView

가

가

DDX, DDV

AppWizard Step6

CFormView

CFormView

-

-

UpdateData()

CScrollView

CDialog

GotoDlgCtrl()

NextDlgCtrl()

CDialog

((CDialog\*) this) -> GotoDlgCtrl(GetDlgItem(IDC\_NAME));

CFormView

CDialog

# CHAPTER 15

 TRACE

 Debug

afxTraceEnabled가 True

 TRACE

```
int nCount = 9;
```

```
CString strDesc("total");
```

```
TRACE("Count = %d, Description = %s\n", nCount, strDesc);
```

 TRACE


Output

MFC Trace Options

Enable tracing

 afxTraceEnabled

 BOOL afxTraceEnabled;

 By default, output from the TRACE macro is disabled.




# CHAPTER 15

 afxDump

 afxDump cout

 Overload

 TRACE

 afxDump

int nCount = 9;

CString strDesc("total");

#ifdef \_DEBUG

afxDump << "Count = " << nCount << " , Description = " << strDesc << "\n";

#endif // \_DEBUG

 #ifdef

1

#endif

 #ifndef

1

#endif

 afxDump

 CDumpContext afxDump;

Output

|         |   |   |   |
|---------|---|---|---|
| #ifdef  | 가 | 1 | . |
|         | 가 | 1 | . |
| #ifndef | 가 | 1 | . |
|         | 가 | 1 | . |

# CHAPTER 15



Debug



가



가

CRT(C )

Debug



CPP

가

#define new DEBUG\_NEW

CRT



AppWizard

CPP

#define new DEBUG\_NEW

# CHAPTER 15



-



1.

2. ClassWizard

가 OnUpdate() Override  
OnUpdate()

가

3.

가



- Edit

Clear All

4.

CDocument::UpdateAllViews()

5.

CDocument::UpdateAllViews()

# CHAPTER 15



-

|   |                                                                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | CMyDocument 가 .<br>CMyView 가 .<br>.<br>가 .<br>CMyView::OnCreate() 가 .<br>CMyDocument::OnNewDocument() 가 .<br>CMyView::OnInitialUpdate() 가 .<br>CMyView::OnUpdate() . |
| 가 | CMyView 가 CMyDocument .<br>CDocument::UpdateAllViews() .<br>OnUpdate() 가 .                                                                                           |
|   | CMyDocument 가 .<br>CDocument::UpdateAllViews() .<br>CMyView::OnUpdate() 가 .<br>OnUpdate() 가 .                                                                        |
|   | 가 .<br>CMyDocument 가 .                                                                                                                                               |




# CHAPTER 15

 CObList

 CObList

 CObject



 CObject



 CPtrList

 CObject

void



 First-In, First-Out(FI FO)

CObList

 CObList



(tail)

가

(head)



# CHAPTER 15

✍ CObList - POSITION

✍ CObList " "

✍ GetNext()

✍ GetNext() 32 POSITION 가 .

✍ GetNext() POSITION& .

✍ POSITION

✍ GetNext()

1. POSITION " "

2. POSITION 가 .

✍ CObList::GetNext

✍

✍

GetNext 2

가

✍ CObject\*& GetNext( **POSITION&** *rPosition* );

✍ CObject\* GetNext( **POSITION&** *rPosition* ) const;

✍ Parameters

✍ *rPosition*



# CHAPTER 15



```
m_actionList - CObList          CMyView
m_position -                      POSITION
void CMyView::OnCommandNext()
{
    POSITION pos;
    CAction* pAction;
    if((pos = m_position) != NULL) {
        m_actionList.GetNext(pos);    // 가
        if(pos != NULL) {             // pos NULL
            pAction = (CAction*) m_actionList.GetAt(pos); //
            pAction -> PrintTime();
            m_position = pos;
        }
        else {
            AfxMessageBox("End of list reached");
        }
    }
}
```

# CHAPTER 15

✍ CObList::GetAt

✍

✍

GetAt 2

가

✍ CObject\*& GetAt( **POSITION** *position* );

✍ CObject\* GetAt( **POSITION** *position* ) const;

✍ Parameters

✍ *position*

✍ CTypedPtrList

✍

✍ CObList

✍

가

type-safe

✍ MFC

CTypedPtrList

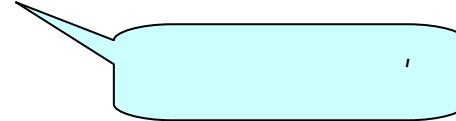
✍ CTypedPtrList -

# CHAPTER 15

✎ CTypedPtrList

✎ CAction

✎ CTypedPtrList<CObList, CAction\*> m\_actionList;



✎ CPtrList, CObList 가 .  
( MFC .)



✎ CObject CObList ,  
CPtrList .

✎ pAction = m\_actionList.GetAt(pos); //


✎ typedef CTypedPtrList<CObList, CAction\*> CActionList; //


✎ CActionList m\_actionList;





# CHAPTER 15

 (Dump Context)  
 가 가 DECLARE\_DYNAMIC  
 IMPLEMENT\_DYNAMIC Dump()

 Dump() 가 \_\_\_\_\_

 #ifdef \_DEBUG  
 afxDump.SetDepth(1); // Specifies deep dump  
 #endif

 #ifdef \_DEBUG  
 afxDump << actionList;  
 #endif

 CDumpContext::SetDepth  
 void SetDepth( **int** *nNewDepth* );  
 Parameters  
 *nNewDepth* The new depth value.

 a CObList at \$411832  
 with 4 elements

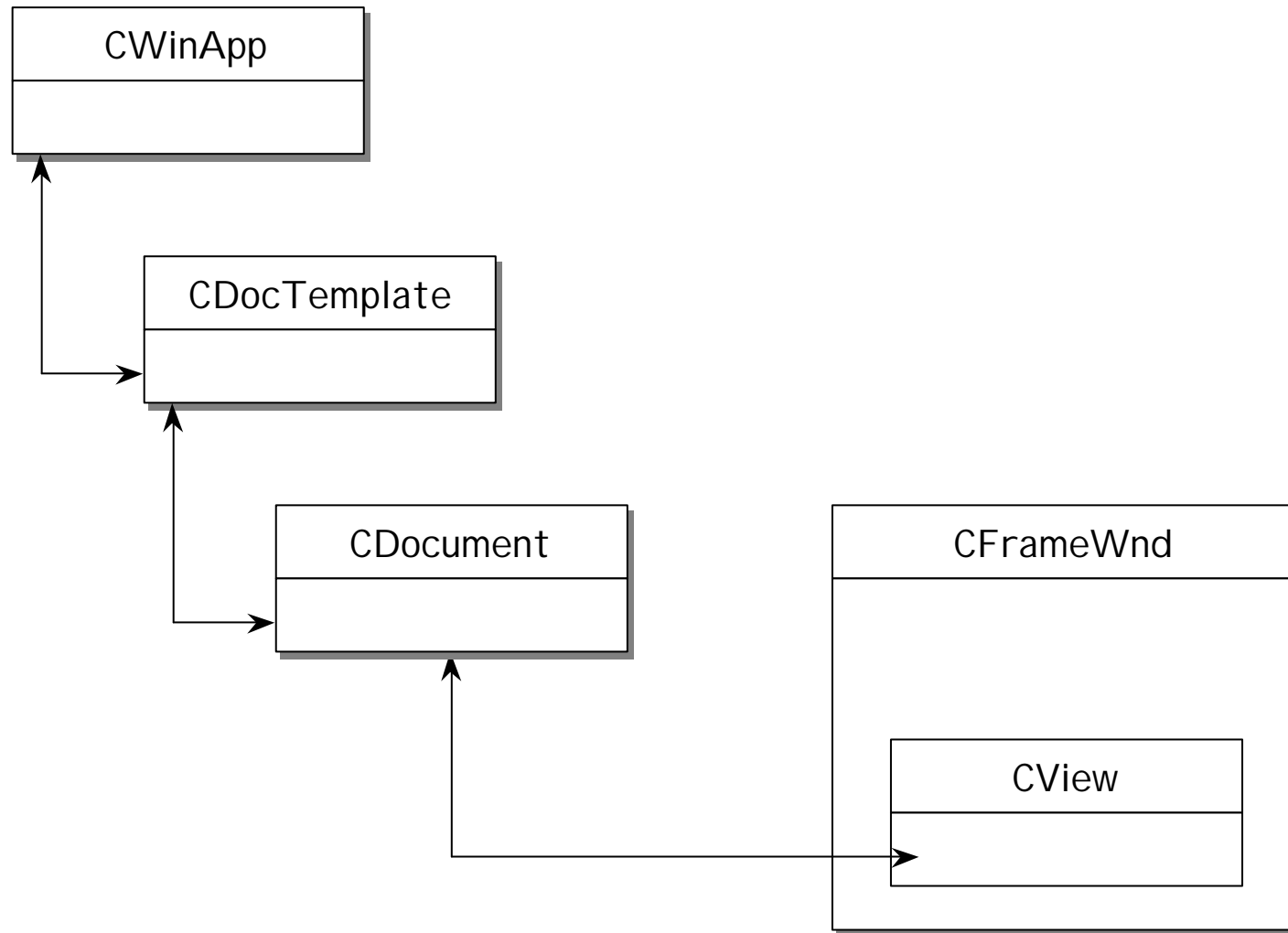
a CAction at \$412CD6  
 time = 0

a CAction at \$412632  
 time = 1

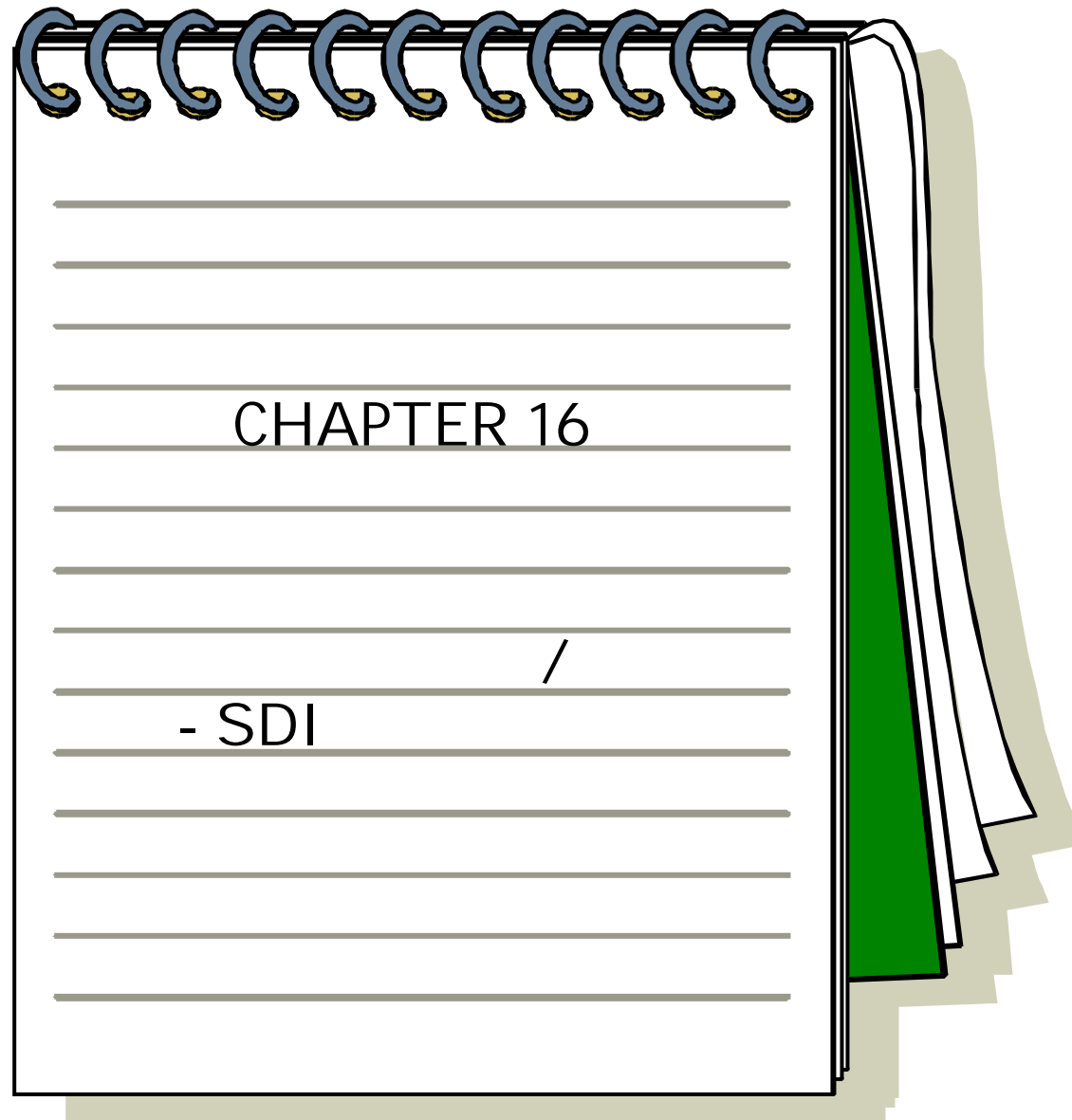
a CAction at \$41268E  
 time = 2

a CAction at \$4126EA  
 time = 3

# CHAPTER 15




/



# CHAPTER 16

 (Serialization) ?

 \_\_\_\_\_ (save)  
\_\_\_\_\_ (restore)  
\_\_\_\_\_ (serialization) .

 Serialize()      가 File      Open      Save







 OLE      (Structured Storage)

가 .

# CHAPTER 16



- CFile



CFile



Win32 CreateFile()



ReadFile(), WriteFile(), SetFilePointer()

Win32



CArchive



CFile



가



Archive



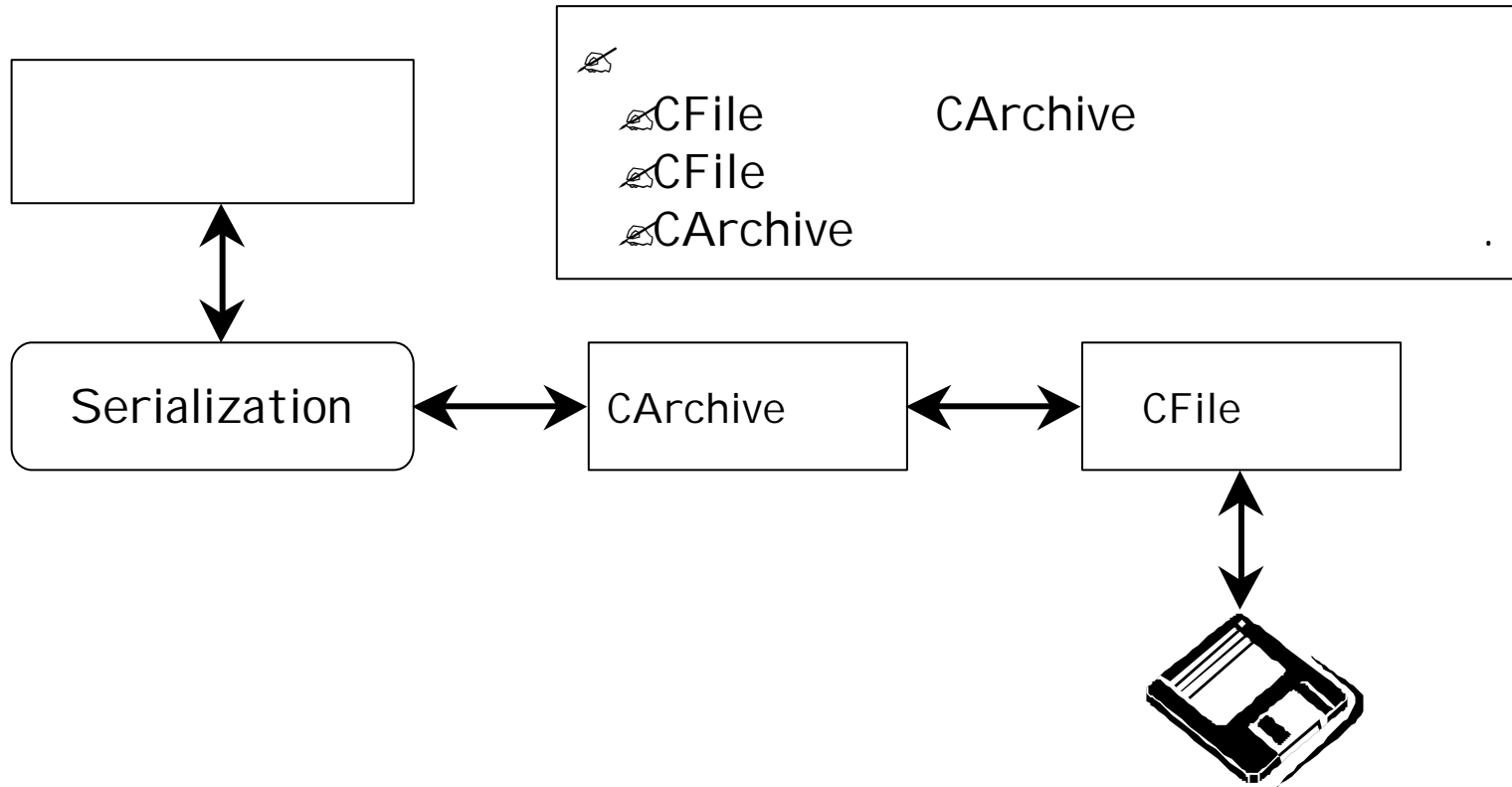
Serialize()



CArchive

CArchive

# CHAPTER 16




~~Archive -~~

( , )

가

# CHAPTER 16

 CObject

 CObject

Serialize 가  
(IMPLEMENT\_ )

CObject  
(DECLARE\_ )

 CObject

| DECLARE_DYNAMIC<br>IMPLEMENT_DYNAMIC<br>DECLARE_DYNCREATE<br>IMPLEMENT_DYNCREATE<br>DECLARE_SERIAL<br>IMPLEMENT_SERIAL | ,<br>Serialize<br>Serialize |  |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------|--|





- DECLARE\_SERIAL



- IMPLEMENT\_SERIAL

# CHAPTER 16

## ✍ DECLARE\_DYNAMIC

```

✍          CObject
✍          ,          CRuntimeClass          가
✍
✍          static
✍          static CRuntimeClass          GetRuntimeClass()

```

## ✍ DECLARE\_DYNAMIC( *class\_name* )

### ✍ Parameters

```

✍ class_name          (          ).

```

## ✍ IMPLEMENT\_DYNAMIC

```

✍          CObject
✍          ,          static CRuntimeClass
✍          GetRuntimeClass()
✍ IMPLEMENT_DYNAMIC( class_name, base_class_name )
✍ Parameters
✍ class_name          (          ).
✍ base_class_name          (          ).

```

# CHAPTER 16

✍ DECLARE\_DYNCREATE

✍ CObject

✍ DECLARE\_DYNAMIC , 가  
MFC static CreateObject()  
가 .

✍ DECLARE\_DYNCREATE( *class\_name* )

✍ Parameters

✍ *class\_name* ( ).

✍ IMPLEMENT\_DYNCREATE

✍ CObject

✍ IMPLEMENT\_DYNAMIC , 가  
MFC static CreateObject()  
.

✍ IMPLEMENT\_DYNCREATE( *class\_name*, *base\_class\_name* )

✍ Parameters

✍ *class\_name* ( ).

✍ *base\_class\_name* ( ).



## CHAPTER 16

✍ DECLARE\_SERIAL

✍ COObject

✍ DECLARE\_DYNAMIC

MFC >> 가 .

✍ DECLARE\_SERIAL( *class\_name* )

✍ Parameters

✍ *class\_name* ( ).

✍ IMPLEMENT\_SERIAL

✍ COObject

✍ IMPLEMENT\_DYNAMIC ,

MFC >> .

✍ (schema) .

✍ 가 ,

Serialize() .

✍ IMPLEMENT\_SERIAL( *class\_name*, *base\_class\_name*, *wSchema* )

✍ Parameters

✍ *class\_name* ( ).

✍ *base\_class\_name* ( ).

✍ *wSchema* "version number" , UINT

# CHAPTER 16

✍ DECLARE\_DYNAMIC, IMPLEMENT\_DYNAMIC  
✍ , MFC

---

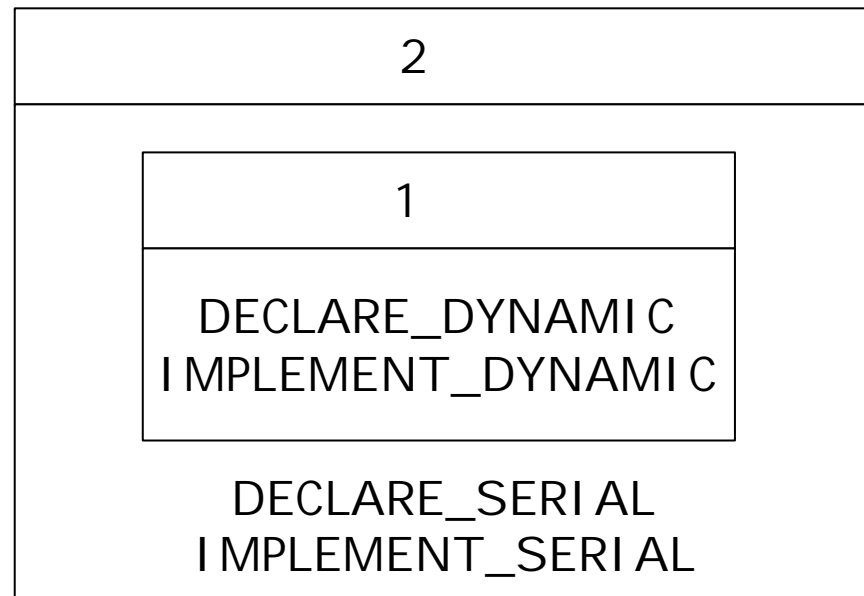
✍ DECLARE\_SERIAL, IMPLEMENT\_SERIAL

✍

✍

Archive

- (serialization)



# CHAPTER 16

Serialize()

void CStudent::Serialize(CArchive& ar)

{

TRACE ("Entering CStudent::Serialize\n");

if( ar.IsStoring() ) {

ar << m\_strName << m\_nGrade;

}

else {

ar >> m\_strName >> m\_nGrade;

}

}

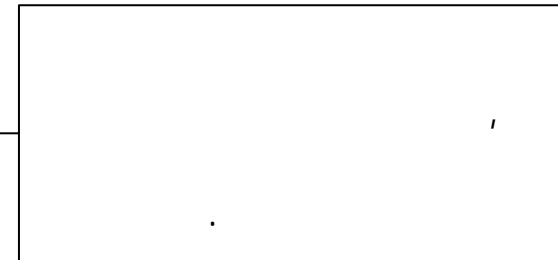
Serialize()

CObject

CObject

가

CArchive  
CArchive



# CHAPTER 16

Serialize()

(<<), (>>)

(<<) - ar

(>>) - ar

m\_nType

ar << (int) m\_nType;

ar >> (int&) m\_nType;

-

void CStudent::Serialize(CArchive& ar)

{

if(ar.IsStoring()) {

ar << m\_strName << m\_nGrade;

}

else {

ar >> m\_strName >> m\_nGrade;

}

m\_transcript.Serialize(ar); // CTranscript

}

public:  
CTranscript m\_transcript;

CObject  
Serialize()

가

# CHAPTER 16



void CStudent::Serialize(CArchive& ar)

{

if(ar.IsStoring()) {

ar << m\_strName << m\_nGrade;

}

else {

m\_Transcript = new CTranscript;

ar >> m\_strName >> m\_nGrade;

}

m\_Transcript.Serialize(ar); // CTranscript

}

public:  
CTranscript\* m\_Transcript;

# CHAPTER 16



```
void CStudent::Serialize(CArchive& ar)
{
    if(ar.IsStoring())
        ar << m_strName << m_nGrade << m_pTranscript;
    else
        ar >> m_strName >> m_nGrade >> m_pTranscript;
}
```

CArchive (<<), (>>)  
CObject

&m\_Transcript;

CTranscript

CTranscript

DECLARE\_SERIAL, IMPLEMENT\_SERIAL

CTranscript

가 CArchive

가



CStudent

가

CArchive

가

NULL

# CHAPTER 16



CObject , DECLARE\_SERIAL



(Loading)



CArchive 가



가 가  
가 .



가 DeleteContents() .



CObject

CArchive



가 .



.



가

.



가 .

# CHAPTER 16

Serialize()



가 CArchive

,

DECLARE\_SERIAL, IMPLEMENT\_SERIAL 가

.( 가 Serialize() .)

SDI



CMyApp theApp; //

548

# CHAPTER 16

 (Empty Document) - CWinApp::OnFileNew()

 InitInstance()

 AddDocTemplate()  $\Rightarrow$  OnFileNew()

 OnFileNew() -



1.

2. CMainFrame

3.

4.

5.

CDocument::OnNewDocument



DeleteContents()

6. CView::OnInitialUpdate()

7. 가 CFrameWnd::ActivateFrame()

 OnFileNew()

DeleteContents()

# CHAPTER 16

✍ OnNewDocument()

✍ 가 File New, Open

OnNewDocument() Override .

✍ SDI .

✍ OnNewDocument() False .

✍ CDocument::GetFile

✍ CFile .

✍ CFile . Helper .

✍ virtual CFile\* GetFile( **LPCTSTR** *lpszFileName*, **UINT** *nOpenFlags*,  
**CFileException**\* *pError* );

✍ Parameters




✍ *lpszFileName*






✍ *nOpenFlags*

✍ *pError*

CFileException

# CHAPTER 16

 DeleteContents()  
 가 , DeleteContents()  
 SDI DeleteContents()

 File Save File Save As  
 File New, Open  
 CWinApp::OnFileNew(), CWinApp::OnFileOpen()  
 File Save, Save As  
 CDocument::OnFileSave(), CDocument::OnFileSaveAs()

# CObject

|  |                                                                         |
|--|-------------------------------------------------------------------------|
|  | DevStudio\Vc\mfc\include\<afx.h>                                        |
|  | (Serialization), , .                                                    |
|  | CObject MFC<br>( MFC CObject .)                                         |
|  | IsSerializable(), Serialize(), GetRuntimeClass(), AssertValid(), Dump() |

 (Serialization)

 BOOL IsSerializable() const;

: . TRUE, FALSE .

 CAge a(21);

ASSERT(a.IsSerializable());

# Object

 (Serialization)

 virtual void Serialize(CArchive& ar);

: CArchive( )

 void CAge::Serialize(CArchive& ar)

{

    CObject::Serialize(Ar);

    if(ar.IsStoring())           // CArchive

        ar << m\_years;           // m\_years   ar


    else                         //

        ar >> m\_years;           // m\_years   ar

}

# Object

 (Run-time class information)

 virtual CRuntimeClass\* GetRuntimeClass() const;  
(CRuntimeClass ) .

) CAge a(21);

CRuntimeClass\* prt = a.GetRuntimeClass();

ASSERT (strcmp (prt->m\_lpszClassName, "CAge")==0);

 BOOL IsKindOf(const CRuntimeClass\* *pClass*) const;

가 가, CObject 가 .

 Parameter


*pClass* CRuntimeClass

) CAge a(21);

ASSERT (a.IsKindOf(RUNTIME\_CLASS(CAge)));

ASSERT (a.IsKindOf(RUNTIME\_CLASS(CObject)));

# CObject

 (Object Diagnostic output)

: 가

 virtual void AssertValid() const;

: 가

, const

 void CAge::AssertValid() const

{

COject::AssertValid();

ASSERT(m\_years > 0);

ASSERT(m\_years > 105);

}

 void CAge:Dump(CDumpContext &dc) const

{

COject::Dump(dc);

dc << "Age = " << m\_years;

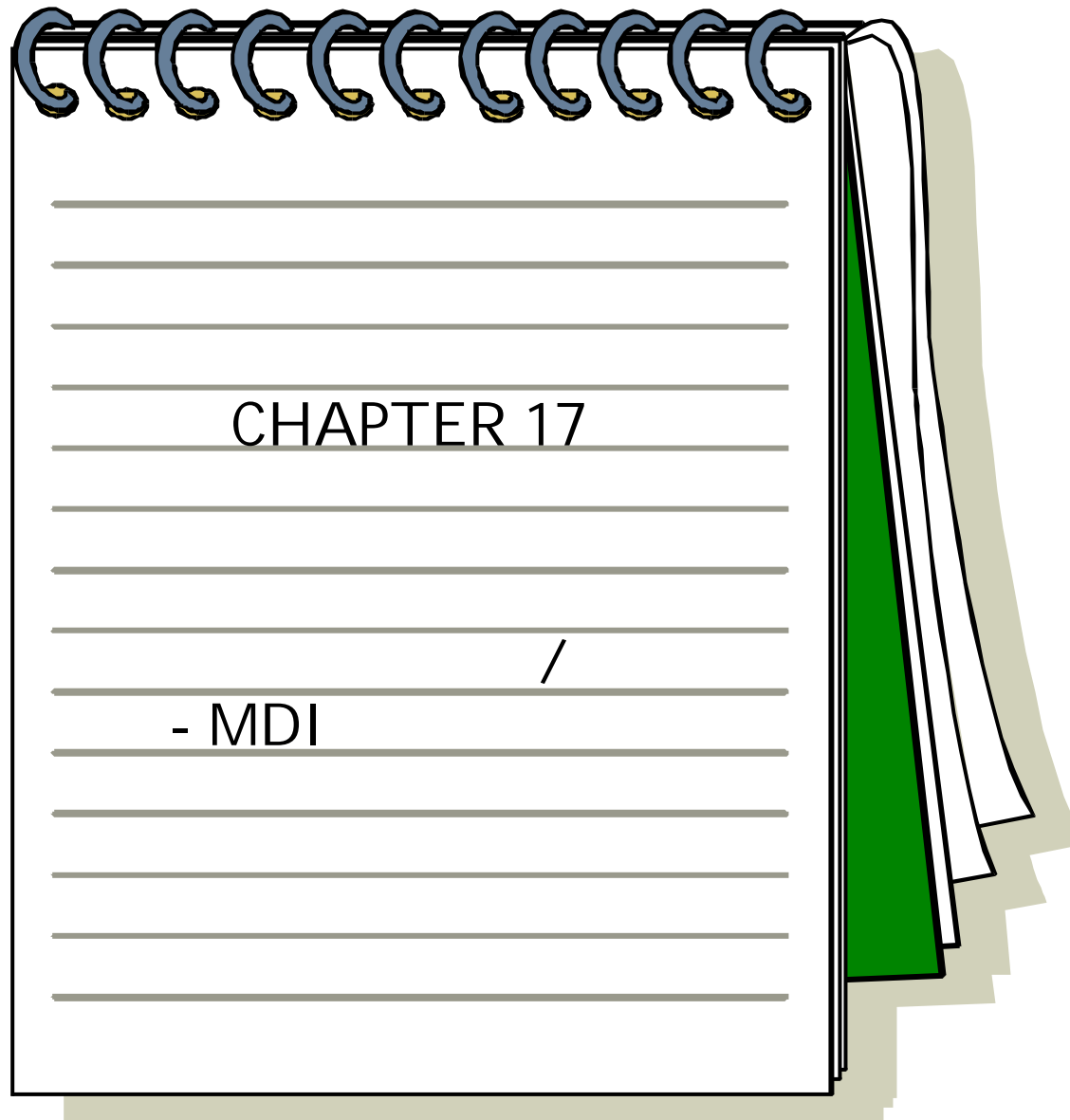
}

 virtual void Dump(CDumpContext &dc) const;

 CWinApp



CDumpContext



# CHAPTER 17

✍ MDI

✍ Developer Studio

MDI

MDI

✍ MDI

, MFC

✍

가

✍

✍

가

ProcessShellCommand()

# CHAPTER 17

✍ MDI

✍ MDI SDI CWinAPP  
override InitInstance() 가 .

✍ InitInstance() AddDocTemplate() MDI  
SDI 가 .

✍ MDI

✍ InitInstance() MDI  
CMultiDocTemplate\* pDocTemplate;  
pDocTemplate = new CMultiDocTemplate(  
IDR\_EX17ATYPE, // nIDResource  
RUNTIME\_CLASS(CStudentDoc), // Doc Class  
RUNTIME\_CLASS(CChildFrame), // MDI  
RUNTIME\_CLASS(CStudentView)); // View class  
AddDocTemplate(pDocTemplate);

# CHAPTER 17

## RUNTIME\_CLASS

 RUNTIME\_CLASS( *class\_name* )

 Parameters

 *class\_name* ( ).

 Example

// example for RUNTIME\_CLASS

CRuntimeClass\* prt = RUNTIME\_CLASS( CAge );

ASSERT( lstrcmp( prt->m\_lpszClassName, "CAge" ) == 0 );

## CObject::GetRuntimeClass

 CRuntimeClass .

 virtual CRuntimeClass\* GetRuntimeClass( ) const;

 Example

// example for CObject::GetRuntimeClass

CAge a(21);

CRuntimeClass\* prt = a.GetRuntimeClass();

ASSERT( strcmp( prt->m\_lpszClassName, "CAge" ) == 0 );

# CHAPTER 17

MDI

MDI

가

AddDocTemplate()

가

MDI

CMultiDocTemplate::GetFirstDocPosition()    GetNextDoc()

CDocument::GetDocTemplate()

# CHAPTER 17

✍ CDocTemplate::GetFirstDocPosition

✍

POSITION .

✍

GetNextDoc

✍ virtual POSITION GetFirstDocPosition( ) const = 0;

✍ CDocTemplate::GetNextDoc

✍

✍ GetFirstDocPosition .

✍ virtual CDocument\* GetNextDoc( **POSITION&** *rPos* ) const = 0;

✍ Parameters

✍ *rPos*

# CHAPTER 17

MDI

MDI

SDI

가

MDI

가

|               | AppWizard   |   |     |     |              |
|---------------|-------------|---|-----|-----|--------------|
| CMDI FrameWnd | CMainFrame  | 1 | Yes | No  | InitInstance |
| CMDI ChildWnd | CChildFrame | 1 | No  | Yes | 가            |

(C) 1998 Sang Il Kim

# CHAPTER 17



SDI



CFrameWnd



Document/View

View

Document



MDI



CMDI FrameWnd



CMDI FrameWnd

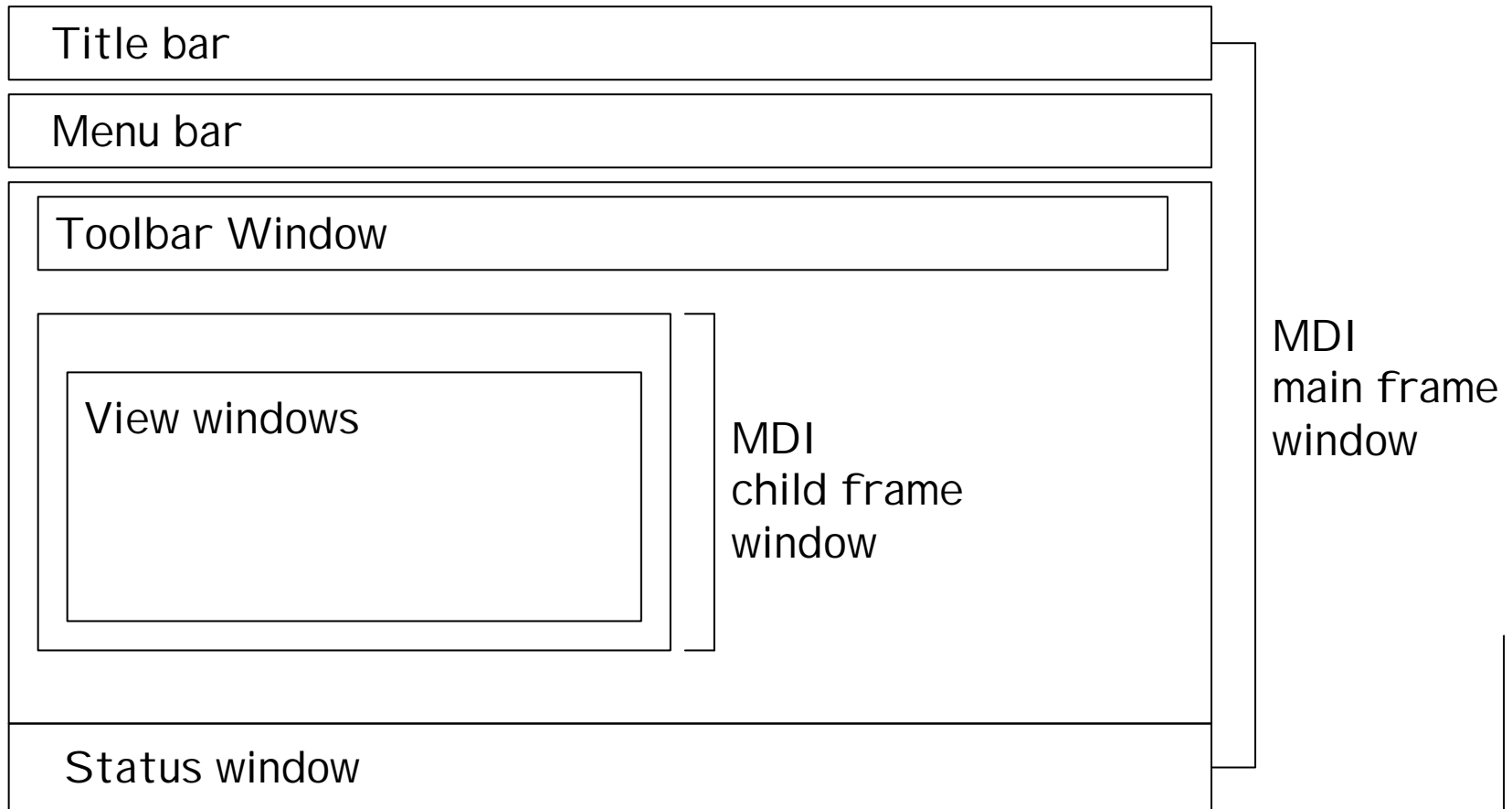
CMDI ChildWnd



Document View

# CHAPTER 17

✍ MDI



# CHAPTER 17

## MDI

```
✎ CMainFrame* pMainFrame = new CMainFrame;
    if( !pMainFrame -> LoadFrame(IDR_MAINFRAME))
        return FALSE;

    // ProcessShellCommand()

    m_pMainWnd = pMainFrame;
    pMainFrame -> ShowWindow(m_nCmdShow);
    pMainFrame -> UpdateWindow();
```

## MDI InitInstance()

```
CWinApp                                m_pMainWnd
```



```
AfxGetApp()                                m_pMainWnd
```

# CHAPTER 17



MDI

IDR\_MAINFRAME IDR\_EX17ATYPE  
가 .

IDR\_MAINFRAME

"ex17a" //

IDR\_MYDOCTYPE

"\n" // ( ).

"Ex17a\n" //

"Ex17a\n" //

"Ex17a File (\*.17a)\n" //

( )

".17a\n" //

( )

"Ex17a.Document\n" //

ID

"Ex17a Document" //



## CHAPTER 17

✍ OnFileNew (p590)

✍ ID\_FILE\_NEW

✍ ID\_FILE\_NEW File New

AppWizard가

✍ OnFileNew()

OpenDocumentFile

NULL

✍

가

✍

가

✍

가

가

✍ ON\_COMMAND(ID\_FILE\_NEW, CWinApp::OnFileNew)

✍

✍ public afx\_msg void OnFileNew();

# CHAPTER 17

✍ OnFileOpen (p590)

✍ ID\_FILE\_OPEN

✍ ID\_FILE\_OPEN File Open

AppWizard가

✍ OnFileOpen() DoPromptFileName()

, OpenDocumentFile()

✍ ON\_COMMAND(ID\_FILE\_OPEN, CWinApp::OnFileOpen)

✍

✍ public afx\_msg void OnFileOpen();

***bA***

가

TRUE,

FALSE



D



# CHAPTER 17

✍ RegisterShellFileTypes

✍ OS  
 ✍ CWinApp InitInstance  
 ✍ 가

✍ protected void RegisterShellFileTypes (BOOL *bWin95* = FALSE);

✍ Parameter

*bWin95* 95 TRUE, FALSE

✍ ProcessShellCommand

✍ Shell Command( / )

✍ public BOOL ProcessShellCommand (CCommandLineInfo & *rCmdInfo*);

✍ Parameter

*rCmdInfo* CCommandLineInfo

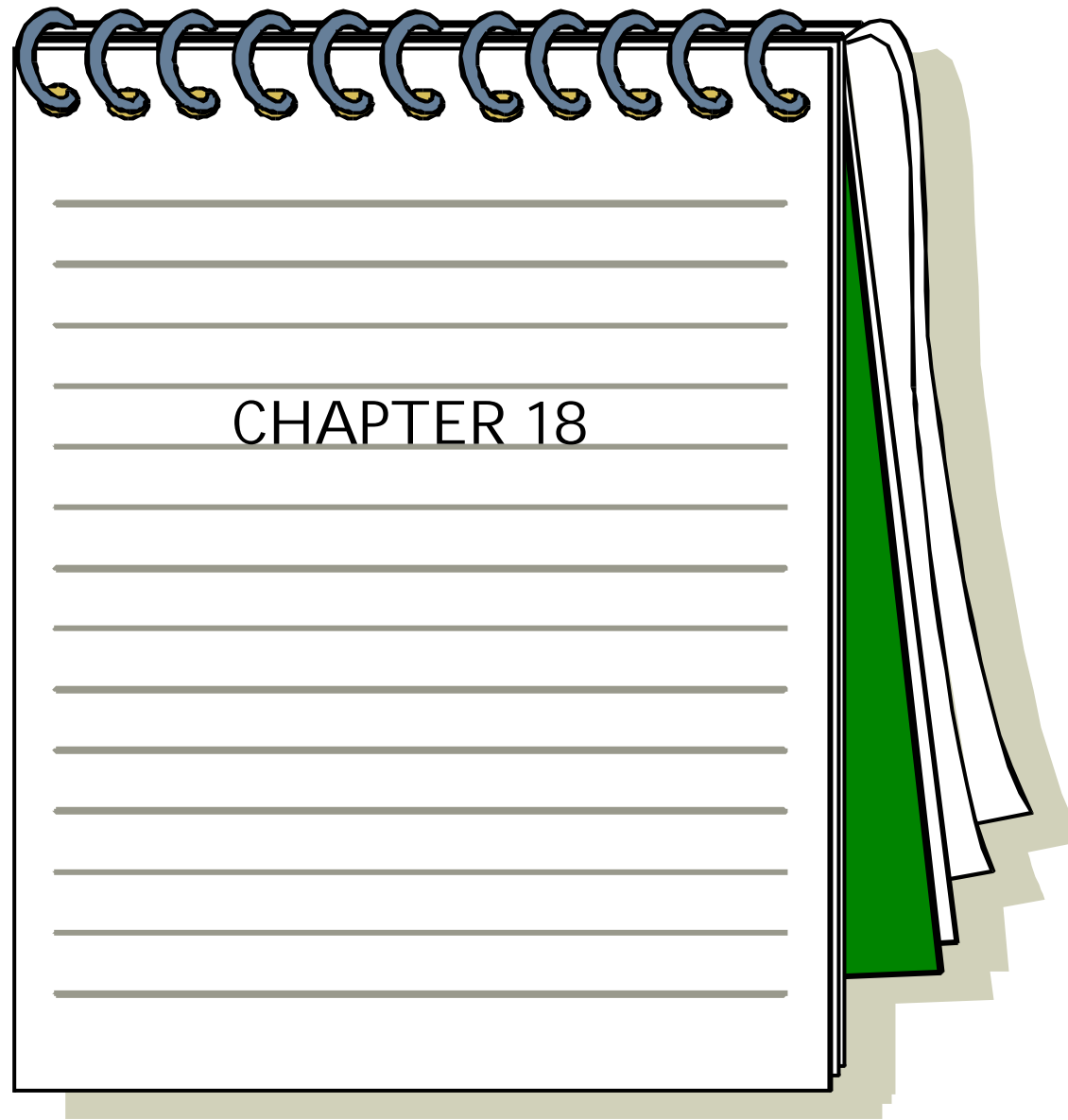
# CHAPTER 17

✎ CCommandLineInfo::CCommandLineInfo

✎ CCommandLineInfo( );

✎ Remarks

This constructor creates a CCommandLineInfo object with default values. The default is to show the splash screen (m\_bShowSplash = TRUE) and to execute the New command on the File menu (m\_nShellCommand = NewFile). The application framework calls ParseParam to fill data members of this object.



# CHAPTER 18



Print Page



1000

5

?



가 50

5

201

250

가

.



MFC

201

200



CObArray

201

.



가



(page break)

# CHAPTER 18



full-size

가 .



CScrollView

가 .













MFC .



가 .

(C) 1998 Sang Il Kim

# CHAPTER 18

 CView::OnDraw()  
 CDC  
 .  
 OnDraw()  
 OnPaint() ( CDC)  
 OnDraw() .  
 CView 가 OnPaint() ( DC)  
 OnDraw() .  
 OnPaint() .  
 OnDraw() CPreviewDC 가  
OnDraw() OnPrint()



# CHAPTER 18

✍ CView::OnPrint()

✍ Base class OnPrint() OnDraw()

✍ OnPrint()가

✍ , , OnPrint() Override .

✍ OnPrint()

✍

✍ , ,

(CPrintInfo)

✍

CPrintInfo

OnPrint() .

# CHAPTER 18

✍ CView::OnPrepareDC()

✍ 가 CView

OnPrepareDC() Override

✍ 가 CScrollView

Override

가

✍

✍

CPrintInfo

✍

OnPrepareDC() 가

✍ CDC

IsPrinting()

✍ CView::OnPrepareDC

✍

OnDraw OnPrint

✍

pl nfo

m\_nCurPage

✍ OnPrint가

OnPrepareDC

✍ virtual void OnPrepareDC( **CDC** \* *pDC*, **CPrintInfo** \* *pl nfo* = **NULL** );

✍ Parameters

✍ *pDC*

✍ *pl nfo*

# CHAPTER 18

✍ CView::OnDraw

✍ 가 가 ,  
✍ virtual void OnDraw( **CDC**\* *pDC* ) = 0;

✍ Parameters

✍ *pDC*

✍ CView::OnPrint

✍ .  
✍ *pInfo* m\_nCurPage .

✍ OnPrint()가 , OnPrepareDC

✍ virtual void OnPrint( **CDC**\* *pDC*, **CPrintInfo**\* *pInfo* );

✍ Parameters

✍ *pDC*

✍ *pInfo*

CPrintInfo

# CHAPTER 18



CView

OnPreparePrinting()    OnBeginPrinting()

OnPreparePrinting()

가

OnBeginPrinting()

가

OnEndPrinting()

가

| OnPreparePrinting | /        |
|-------------------|----------|
| OnBeginPrinting   | GDI      |
| OnPrepareDC( )    | / 가      |
| OnPrint ( )       | OnDraw() |
| OnEndPrinting     | GDI      |

# CHAPTER 18

✍ CArray

✍ template <class TYPE, class ARG\_TYPE> class CArray : public CObject

✍ Parameters

✍ TYPE

( CArray . )

✍ ARG\_TYPE

( CArray )

✍ #include <afxtempl.h>

✍ CArray::RemoveAll

✍

.

✍

FreeExtra()

가

.

✍ void RemoveAll( );

# CHAPTER 18

- ✎ CArray::GetUpperBound
- ✎ CObArray::GetUpperBound
- ✎ GetSize

1

✎ int GetUpperBound( ) const;

✎ Return value

(m\_bSize - 1)

- ✎ The following table shows other member functions that are similar to CObArray::GetUpperBound.

| <u>Class</u> | <u>Member Function</u>      |
|--------------|-----------------------------|
| CByteArray   | int GetUpperBound( ) const; |
| CDWordArray  | int GetUpperBound( ) const; |
| CPtrArray    | int GetUpperBound( ) const; |
| CStringArray | int GetUpperBound( ) const; |
| CUIIntArray  | int GetUpperBound( ) const; |
| CWordArray   | int GetUpperBound( ) const; |

# CHAPTER 18

✎ CArray::GetSize

✎ CObArray::GetSize

✎

✎ 가 1 .

✎ int GetSize( ) const;

✎ CArray::SetSize

✎ CObArray::SetSize

✎

✎ nGrowBy 가 가

✎ void SetSize( **int** *nNewSize*, **int** *nGrowBy* = -1 );  
throw( **CMemoryException** );

✎ Parameters

✎ *nNewSize* (number of elements).

✎ *nGrowBy* (minimum number of element)

# CHAPTER 18

## Example

-  See CObList::CObList for a listing of the CAge class used in all collection examples.

```
// example for CObArray::GetUpperBound  
CObArray array;
```

```
array.Add( new CAge( 21 ) ); // Element 0
```

```
array.Add( new CAge( 40 ) ); // Element 1
```

```
ASSERT( array.GetUpperBound() == 1 ); // Largest index
```

# CHAPTER 18

✍ CPrintInfo::SetMaxPage

✍ void SetMaxPage( **UINT** *nMaxPage* );

✍ Parameters

✍ *nMaxPage* Number of the last page of the document.

✍ CPrintInfo::SetMinPage

✍ void SetMinPage( **UINT** *nMinPage* );

✍ Parameters

✍ *nMinPage* Number of the first page of the document.

✍ CPrintInfo::GetMaxPage

✍ **UINT** GetMaxPage( ) const;

✍ Return Value

✍ The number of the last page of the document.

✍ CPrintInfo::GetMinPage

✍ **UINT** GetMinPage( ) const;

✍ Return Value

✍ The number of the first page of the document.



## CHAPTER 18



- CArray



SerializeElements()



SerializeElements() CArchive

bitwise



가 가

SerializeElements()

가



SerializeElements()



가

SerializeElements()



void AFXAPI SerializeElements( CArchive& ar, CRect\* pNewRects, int nCount)


```
{
    for(int i=0; i < nCount; i++, pNewRects++){
        if(ar.IsStoring()){
            ar << *pNewRects;
        }
        else{
            ar >> *pNewRects;
        }
    }
}
```

# CHAPTER 18

## RAND\_MAX

 #include <stdlib.h>

### Remarks

 The constant RAND\_MAX is the maximum value that can be returned by the rand function. RAND\_MAX is defined as the value 0x7fff.


## rand

 Generates a pseudorandom number.


 int rand( **void** );

| <u>Routine</u> | <u>Required Header</u> | <u>Compatibility</u>  |
|----------------|------------------------|-----------------------|
| rand           | <stdlib.h>             | ANSI , Win 95, Win NT |

### Return Value

 rand returns a pseudorandom number, as described above.  
There is no error return.

### Remarks

 The rand function returns a pseudorandom integer in the range 0 to RAND\_MAX. Use the srand function to seed the pseudorandom-number generator before calling rand.

# CHAPTER 18

## srand

 Set a random starting point.

 void srand( **unsigned int** seed );

Routine

Required Header

Compatibility

srand

<stdlib.h>

ANSI , Win 95, Win NT


 Return Value

 None

 Parameters

 *seed* Seed for random-number generation.

 Remarks

 The srand function sets the starting point for generating a series of pseudorandom integers. To reinitialize the generator, use 1 as the seed argument. Any other value for seed sets the generator to a random starting point. rand retrieves the pseudorandom numbers that are generated. Calling rand before any call to srand generates the same sequence as calling srand with seed passed as 1.

# CHAPTER 18

## Example

```
/* RAND.C: This program seeds the random-number generator
 * with the time, then displays 10 random integers. */
#include <stdlib.h>
#include <stdio.h>
#include <time.h>

void main( void )
{
    int i;
    /* Seed the random-number generator with current time so that
     * the numbers will be different every time we run. */
    srand( (unsigned)time( NULL ) );

    /* Display 10 numbers. */
    for( i = 0; i < 10; i++ )
        printf( " %6d\n", rand() );
}
```

Output

```
6929
 8026
21987
30734
20587
 6699
22034
25051
 7988
10104
```

(C) 1998 Sang I Kim

# CHAPTER 18

✍ CDC::GetTextExtent

✍ ( ) .

✍ CSize GetTextExtent( **LPCTSTR** *lpszString*, **int** *nCount* ) const;

✍ CSize GetTextExtent( **const CString&** *str* ) const;

✍ Return Value

( ) CSize object.

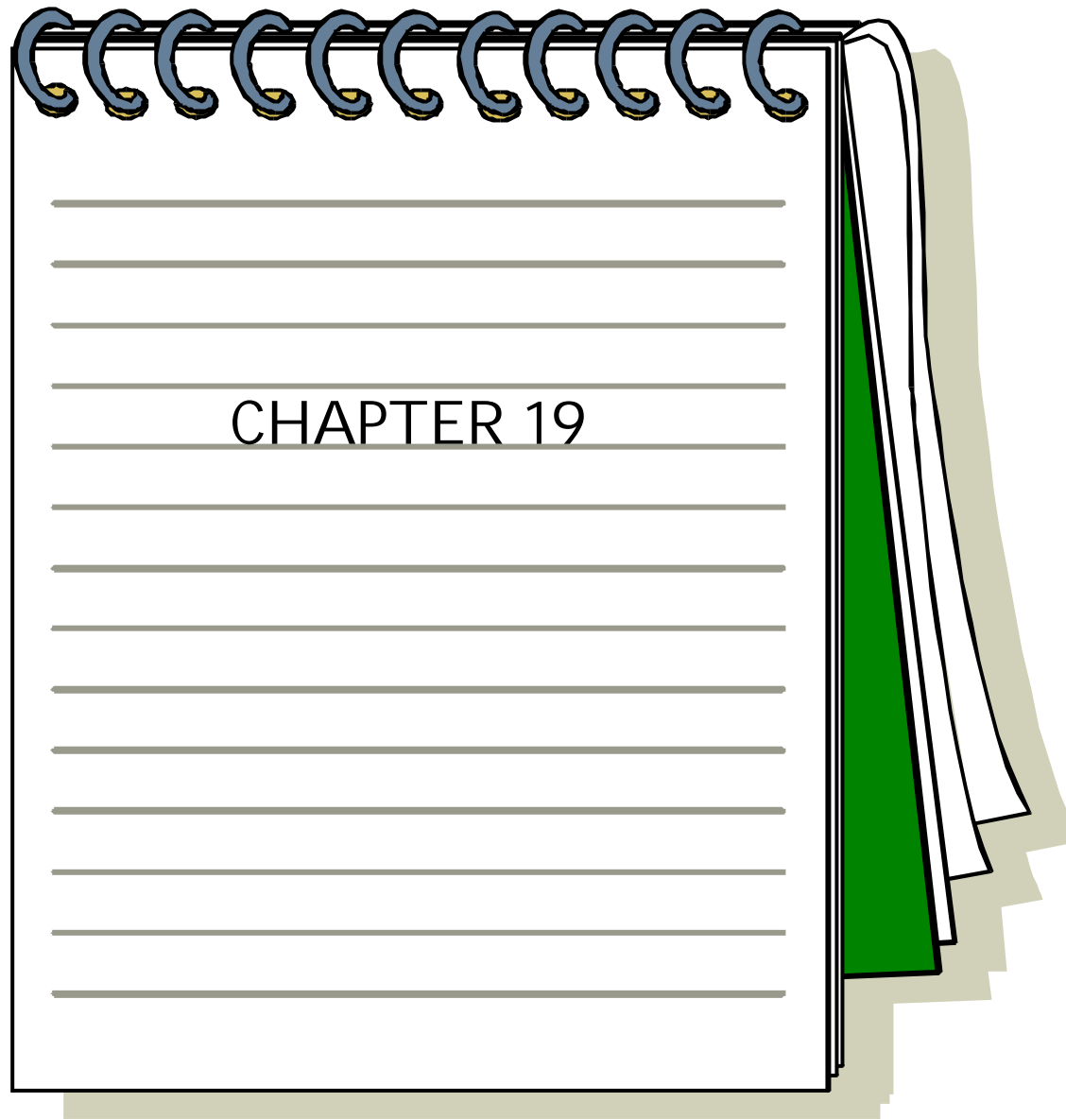
✍ Parameters

✍ *lpszString*

✍ *nCount* *lpszString* 가 ( )

✍ *str*

CString



# CHAPTER 19



(Splitter Windows and Multiple Views)



가  
가



(splitter window)

MDI



(pane)



CSplitterWnd



CSplitterWnd

(CFrameWnd

CMDI ChildWnd)

가



# CHAPTER 19



SDI

,



.

EX19A



SDI

,



. EX19B



SDI

,



. EX19C



MDI

,



가

New Window

.



MDI

,



MDI

.

EX19D



MDI

.



# CHAPTER 19



(Dynamic Splitter Windows)



가

.



-

,

.



.



가

가

가

.



(Static Splitter Windows)



-

가

.



.



.

# CHAPTER 19

- ✍ EX19A - SDI
- ✍ 4 SDI .
- ✍ 4 .
- ✍ AppWizard Step4 Advanced... ,
- Windows Styles Use split window .
- ✍ CMainFrame
- 가 .
- ✍
- ✍ Use split window가 AppWizard View Split
- 가 .
- ✍ ID\_WINDOW\_SPLIT CView::OnSplitCmd() .

# CHAPTER 19

 EX19A - SDI

 CMainFrame

 MainFrm.h

protected:

CSplitterWnd m\_wndSplitter;

//Overrides

public:


virtual BOOL OnCreateClient(LPCREATESTRUCT lpcs, CCreateContext\* pContext);



가

CFrameWnd::OnCreateClient()

.

 MainFrm.cpp

BOOL CMainFrame::OnCreateClient( LPCREATESTRUCT /\*lpcs\*/, CCreateContext\* pContext)

{

return m\_wndSplitter.Create( this,


2, 2, //

CSize(10, 10), //

pContext);


}

# CHAPTER 19

 CFrameWnd::OnCreateClient



 MDI Customize

 virtual BOOL OnCreateClient( LPCREATESTRUCT *lpcs*,  
CCreateContext\* *pContext*);

 Return Value

TRUE, FALSE

 Parameters

 *lpcs* CREATESTRUCT

 *pContext* CCreateContext

# CHAPTER 19

✍ EX19B - SDI

✍ 가

✍

✍

✍ CSplitterWnd::CreateStatic()

✍

✍ ex19bDoc.cpp, ex19bDoc.h, ex19bView.cpp, ex19bView.h

✍ 가 (Project - Add To Project - Files)

PoemDoc.cpp, PoemDoc.h, StringView.cpp, StringView.h

LogScrollView.cpp, LogScrollView.h, HexView.cpp, HexView.h

✍ ex19b.cpp

#include "ex19bDoc.h", #include "ex19bView.h"

#include "PoemDoc.h", #include "StringView.h" 가

RUNTIME\_CLASS(CEx19bDoc), RUNTIME\_CLASS(CEx19bView)

RUNTIME\_CLASS(**C**PoemDoc), RUNTIME\_CLASS(**C**StringView)

# CHAPTER 19

✎ CSplitterWnd::CreateView

✎ virtual BOOL CreateView( **int** *row*, **int** *col*, **CRuntimeClass**\* *pViewClass*,  
**SIZE** *sizeInit*, **CCreateContext**\* *pContext* );

✎ Parameters

✎ *row*

✎ *col*

✎ *pViewClass*

CRuntimeClass

✎ *sizeInit*

✎ *pContext*

(usually the *pContext* passed into the parent frame's overridden CFrameWnd::OnCreateClient member function in which the splitter window is being created).

# CHAPTER 19

✎ CSplitterWnd::CreateStatic

✎ BOOL CreateStatic( **CWnd\*** *pParentWnd*, **int** *nRows*, **int** *nCols*,  
                    **DWORD** *dwStyle* = **WS\_CHILD** | **WS\_VISIBLE**,  
                    **UINT** *nID* = **AFX\_IDW\_PANE\_FIRST** );

✎ Parameters

✎ *pParentWnd*

✎ *nRows* . 16 .

✎ *nCols* . 16 .

✎ *dwStyle*

✎ *nID* ID

The ID can be AFX\_IDW\_PANE\_FIRST unless the splitter window is nested inside another splitter window.

# CHAPTER 19



EX19C -



CStringView

CHexView

SDI

.



View

Split

,

View

가

.

|             | ID                 | CMainFrame                                                                      |
|-------------|--------------------|---------------------------------------------------------------------------------|
| String View | ID_VIEW_STRINGVIEW | COMMAND : OnViewStringView()<br>UPDATE_COMMAND_UI :<br>OnUpdateViewStringView() |
| Hex View    | ID_VIEW_HEXVIEW    | COMMAND : OnViewHexView()<br>UPDATE_COMMAND_UI :<br>OnUpdateViewHexView()       |

# CHAPTER 19

✍ EX19C -

✍ HexView.h StringView.h

✍ HexView.h

public:

CHexView();

DECLARE\_DYNCREATE(CHexView)

DECLARE\_DYNCREATE(CStringView)

StringView.h

public:

CStringView();

✍ CFrameWnd::GetActiveView

✍ . ( )

✍ CView\* GetActiveView( ) const;

✍ Return Value

✍ . NULL

# CHAPTER 19

✍ CWnd::GetDlgItem

✍

✍

✍ CWnd\* GetDlgItem( int nID ) const;

✍ void CWnd::GetDlgItem( int nID, HWND\* phWnd ) const;

✍ Parameters

✍ nID

ID

ID

✍ phWnd

HWND

✍ Return value

가

NULL

✍ CView::GetDocument

✍

✍ CDocument\* GetDocument() const;

✍ Return Value

CDocument

NULL



## CHAPTER 19

 CWnd::SetDlgCtrlID

 ID ID .


 ID .

 int SetDlgCtrlID( **int** *nID* );


 Parameters

 *nID* ID

 RecalcLayout

 가 가

 customize .

 virtual void RecalcLayout( BOOL *bNotify* = TRUE );

 Parameter

 *bNotify* TRUE -

# CHAPTER 19

✍ CObject::IsKindOf

✍ 가 가 CObject 가 .

✍ BOOL IsKindOf( **const CRuntimeClass\* pClass** ) **const**;

✍ Parameters

✍ *pClass* CRuntimeClass

✍ CView::OnInitialUpdate

✍ 가 가 가

✍ virtual void OnInitialUpdate( );

# CHAPTER 19

- ✍ EX19D - MDI
- ✍ 가 MDI
- ✍ AppWizard MDI , AppWizard Step4 Context-Sensitive Help
- ✍
  - ✍ ex19dDoc.cpp, ex19dDoc.h, ex19dView.cpp, ex19dView.h
  - ✍ 가 .(Project - Add To Project - Files)
  - PoemDoc.cpp, PoemDoc.h, StringView.cpp, StringView.h
  - LogScrollView.cpp, LogScrollView.h, HexView.cpp, HexView.h
  - ✍ ex19d.cpp
    - #include "ex19dDoc.h", #include "ex19dView.h"
    - #include "PoemDoc.h", #include "StringView.h", #include "HexView.h" 가
    - RUNTIME\_CLASS(CEx19dDoc), RUNTIME\_CLASS(CEx19dView)
    - RUNTIME\_CLASS(**CPoemDoc**), RUNTIME\_CLASS(**CStringView**) .
  - ✍ HexView.cpp, PoemDoc.cpp, StringView.cpp
  - ✍ #include "ex18a.h" #include "ex19d.h" .



## CHAPTER 19


### CWinApp::ExitInstance



 가 , MFC

 virtual int ExitInstance();

 Return Value

 The application's exit code; 0 indicates no errors, and values greater than 0 indicate an error. This value is used as the return value from WinMain.

### CMDI FrameWnd::MDI GetActive



MDI

 CMDI ChildWnd\* MDI GetActive( **BOOL** \* *pbMaximized* = **NULL** ) **const**;

 Return Value



MDI

NULL

 Parameters

 *pbMaximized* **BOOL**

가

TRUE,

FALSE.

# CHAPTER 19

✍ OnFilePrintPreview

✍

✍

CPrintPreviewState

DoPrintPreview

✍ void CView::OnFilePrintPreview()

{

// In derived classes, implement special window handling here

// Be sure to Unhook Frame Window close if hooked.

// must not create this on the frame. Must outlive this function

CPrintPreviewState\* pState = new CPrintPreviewState;

if (!DoPrintPreview(AFX\_IDD\_PREVIEW\_TOOLBAR, this,  
RUNTIME\_CLASS(CPreviewView), pState))

{

// In derived classes, reverse special window handling

// here for Preview failure case

TRACE0("Error: DoPrintPreview failed");

AfxMessageBox(AFX\_IDP\_COMMAND\_FAILURE);

delete pState; // preview failed to initialize, delete State now

}

}

# CHAPTER 19

✍ AfxGetApp

✍ CWinApp

✍ CWinApp\* AfxGetApp( );

✍ Return Value

✍ CWinApp

✍ AssertValid(), ASSERT\_VALID

✍

✍ CObject

✍

✍ ASSERT\_VALID

✍ Debug : ASSERT\_VALID CObject

AssertValid()

✍ Release : ASSERT\_VALID

✍ virtual void AssertValid() const;


✍ ASSERT\_VALID( *pObject* )

✍ Parameters

✍ *pObject* CObject

가

# CHAPTER 19

 CDocTemplate::CreateNewFrame




가 .



, 가 .



.

 virtual CFrameWnd\* CreateNewFrame( CDocument\* *pDoc*,  
CFrameWnd\* *pOther* );

 Return Value

CFrameWnd . NULL.

 Parameters

 *pDoc*

.

NULL.

 *pOther*

.

NULL.



## CDocTemplate::InitialUpdateFrame

가 OnInitialUpdate

## CFrameWnd::InitialUpdateFrame

[illegible]

## Parameters

~~pFrame~~

 pDoc . NULL

~~*bMakeVisible*~~ TRUE - . FALSE -

 VERIFY

 ASSERT

 Debug    Release

~~VERIFY~~( *booleanExpression* )

## Parameters

~~*booleanExpression*~~ Specifies an expression (including pointer values) that evaluates to nonzero or 0. \_\_\_\_\_

# CHAPTER 19

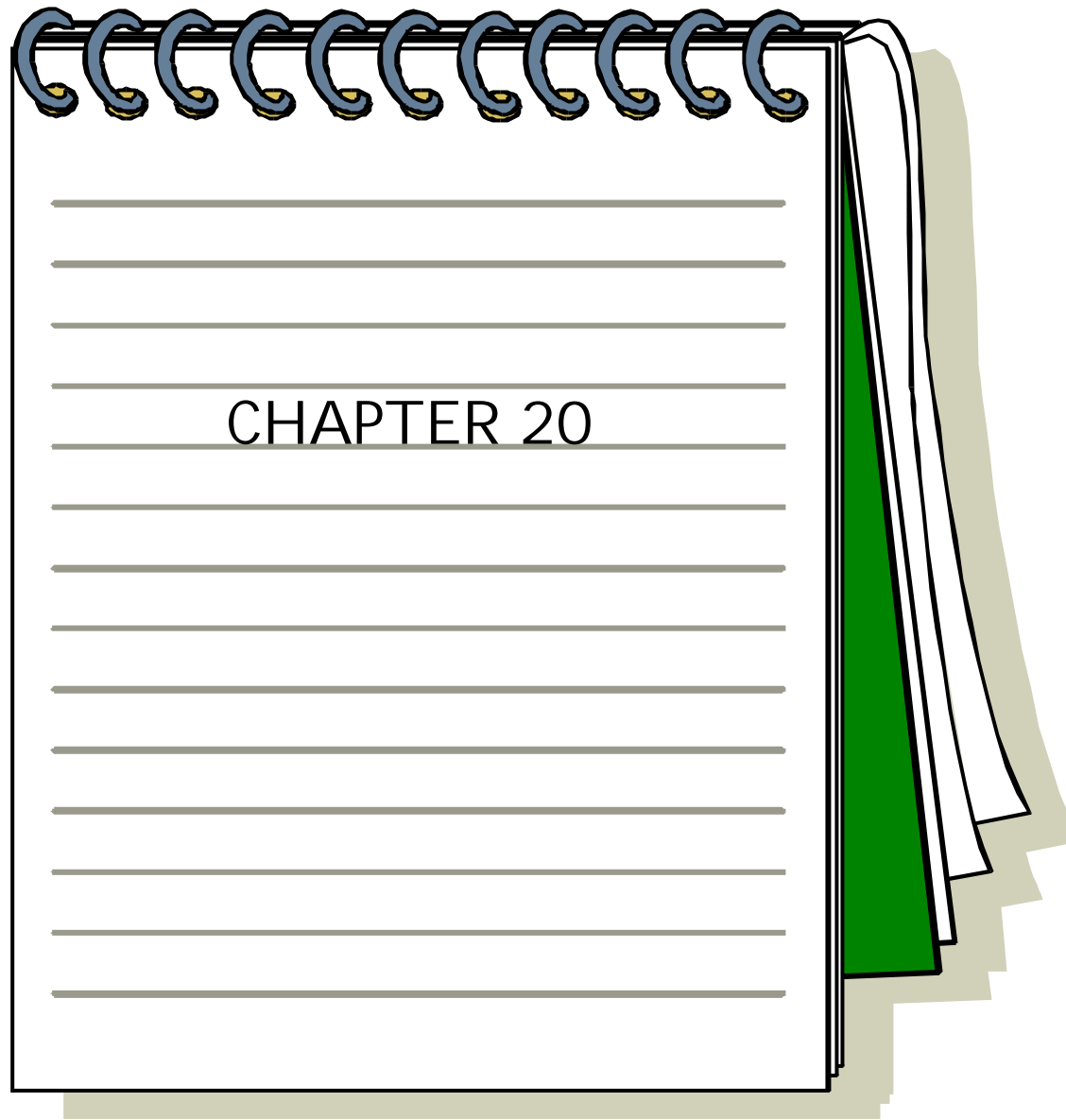
✍ CFrameWnd::GetActiveDocument

✍ CFrameWnd

✍ virtual CDocument\* GetActiveDocument( );

✍ Return Value

. 가 NULL.



# CHAPTER 20

 (Context-Sensitive Help)

 MFC 4.21

WinHelp help

 WinHelp

 RTF(Rich Text Format)

 SDK

rich text format

ASCII

 RTF





\*.Hpj

\*.Rtf



(\*Rtf)

RTF

가

# CHAPTER 20



|                                  |                              |
|----------------------------------|------------------------------|
|                                  |                              |
| #<br>K<br>+<br>@<br>\$<br>!<br>* | (Keyword)<br>Browse sequence |

# CHAPTER 20



[OPTIONS]

CONTENTS=HID\_CONTENTS

TITLES=SIMPLE Application Help //

COMPRESS=true // , true -

WARNING=2 //

[FILES]

simple.rtf // - rtf

simple.rtf

# CHAPTER 20



Microsoft Help Workshop(HCRTF)  
(DevStudio\Vc\bin\Hcrtf.exe)

|      |           |                  |
|------|-----------|------------------|
| 4.02 | HCRTF     | MS-WORD97        |
| RTF  | HwDll.dll | DevStudio\Vc\bin |



|  |               |        |
|--|---------------|--------|
|  | (.rtf)        |        |
|  | (.hpj) - Help | (.hlp) |
|  | (.cnt)        |        |
|  | /             |        |

# CHAPTER 20



WinHelp



WinHelp

.(F1, Shift-F1)

1. AppWizard Step4 Context-Sensitive Help .

2. AppWizard Help Help Topics

(.hlp),

(.rtf) .

3. AppWizard 가 F1 F1 Help Topics

ON\_COMMAND(ID\_HELP, CFrameWnd::OnHelp)

4. 가 F1 Help Topics

[Help context ID](#)가 [WinHelp](#)

# CHAPTER 20

✍ WinHelp

✍ CWinApp

WinHelp()

WinHelp

✍ WinHelp()

Help context I D

, Simple Help

AfxGetApp()->WinHelp(HI D\_TOPI C1);

✍ WinHelp

가?

✍

: Simple.exe,

: Simple.hlp

✍

HI D\_TOPI C1(WinHelp()

)

Help context I D

가?

✍

(.hjp) MAP

# CHAPTER 20

✍ WinHelp

✍ resource.h      HI D\_TOPI C1    101  
(Simple.hpj)      MAP      가      .

✍ [MAP]

HI D\_TOPI C1    101

✍ resource.h      #define HI D\_TOPI C1 101  
(HI D\_TOPI C1)      MAP      가

Help context I D(HI D\_TOPI C1)      .

✍ 101(      )      .

# CHAPTER 20



Help context I D

WinHelp()

HELP\_KEY

HELP\_PARTIALKEY

.

CString string("find this string");

AfxGetApp()->WinHelp((DWORD)(LPCSTR)string, HELP\_KEY);



WinHelp

AfxGetApp() -> WinHelp(OL, HELP\_FINDER);



가

.

AfxGetApp() -> WinHelp(OL, HELP\_INDEX);



.

# CHAPTER 20

✍ Help context I D Aliases

✍ (.hbj) Alias Help context I D

.

✍ [ALI AS]

H I D \_ T O P I C 1 = H I D \_ G E T T I N G \_ S T A R T E D

[MAP]

H I D \_ T O P I C 1 101

✍ (.rtf) H I D \_ T O P I C 1 H I D \_ G E T T I N G \_ S T A R T E D

가 101( ) .

# CHAPTER 20

✍ Help context



ID

Help context ID

.



,

,

,

,

.



ID

,

ID

ID

#define

.



HID\_EDIT\_CLEAR\_ALL(0x1E121) ID\_EDIT\_CLEAR\_ALL(0xE121)

,

IDR\_MAINFRAME(0x20080) IDR\_MAINFRAME(0x80)

.

# CHAPTER 20

✍ Help context

|   | ID         | Help context ID | (16 ) |
|---|------------|-----------------|-------|
|   | ID_        | HI D_           | 10000 |
| , | IDR_, IDD_ | HI DR_, HI DD_  | 20000 |
|   | IDP_       | HI DP_          | 30000 |
|   |            | H...            | 40000 |
|   | DW_        | HI DW_          | 50000 |
|   |            |                 | 60000 |

✍ Help ( - EX20B)

✍ [F1](#) - OnCommandHelp()

✍ [Shift+F1](#) - OnHelpHitTest() 

✍



## CHAPTER 20

✍ ON\_MESSAGE

✍ ON\_MESSAGE( *message*, *memberFxn* )

✍ Parameters

✍ *message* ID.

✍ *memberFxn*

✍ CWinApp::WinHelp

✍ WinHelp

✍ virtual void WinHelp( **DWORD** *dwData*, **UINT** *nCmd* = **HELP\_CONTEXT** );

✍ Parameters

✍ *dwData* 가

*nCmd*

✍ *nCmd*

가

# CHAPTER 20

✍ OnCommandHelp (F1 )

✍

✍ afx\_msg LRESULT OnCommandHelp( WPARAM *wParam*, LPARAM *lParam* );

✍ Parameters

✍ *wParam*

✍ *lParam* ID

✍ OnHelpHitTest (Shift + F1 )

✍

가

ID

✍

HID\_BASE\_RESOURCE

ID

✍ afx\_msg LRESULT OnHelpHitTest( WPARAM *wParam*, LPARAM *lParam* );

✍ Return value

ID



✍ Parameters

✍ *wParam* x













✍ *lParam* y

# CHAPTER 20

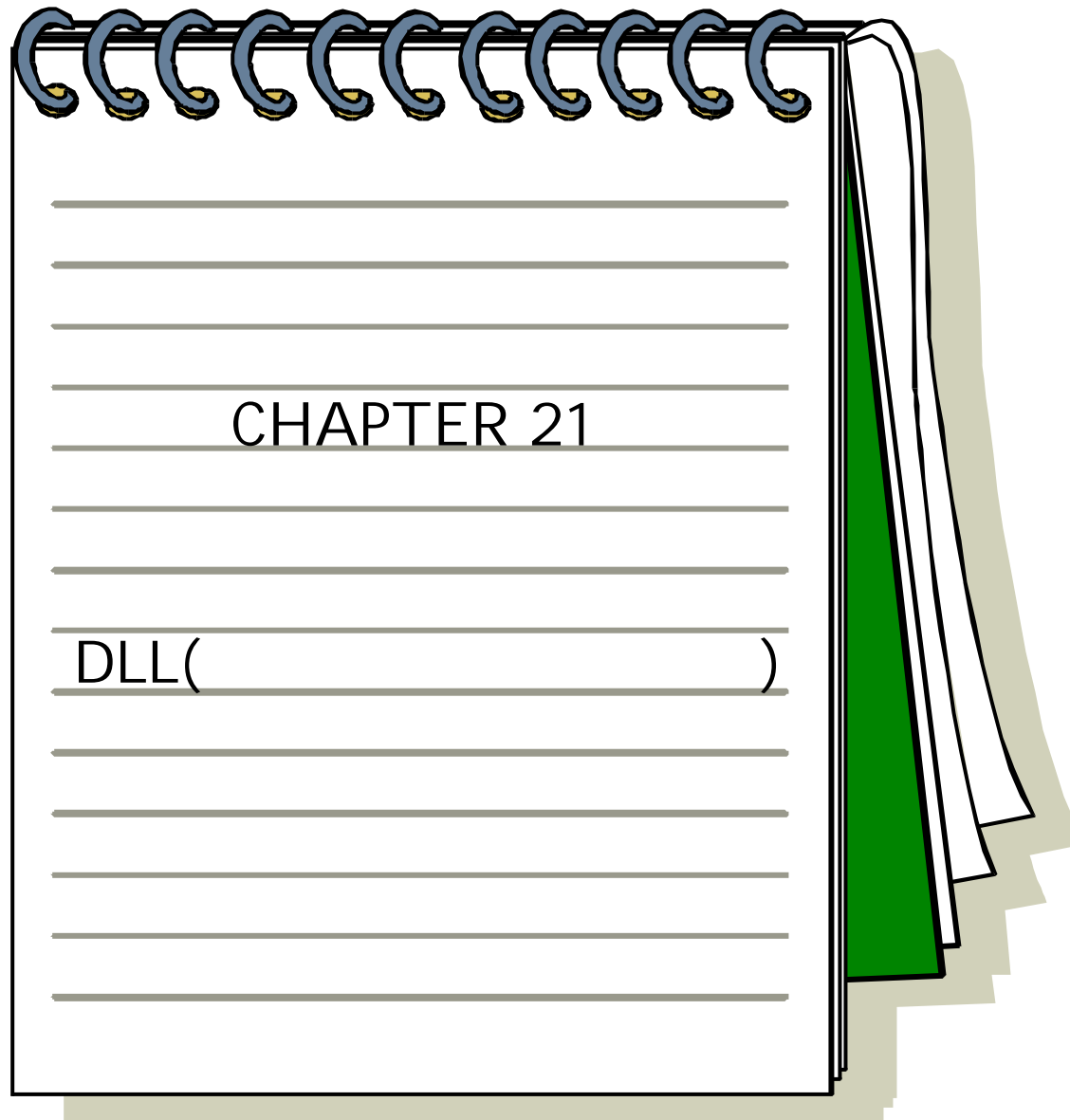
## Help Files

-  The Microsoft Foundation classes assume a single Help file. That Help file must have the same name and path as the application (.EXE -> .HLP).
-  This is a public CWinApp member variable named `m_pszHelpFilePath` that the user can change if desired.

## Help Context Ranges

-  `0x00000000 - 0x0000FFFF` : user defined
-  `0x00010000 - 0x0001FFFF` : commands (menus/command buttons)
-  `0x00010000 + ID_`  
(note: `0x18000`-> `0x1FFFF` is practical range since command IDs are  $\geq 0x8000$ )
-  `0x00020000 - 0x0002FFFF` : windows and dialogs
-  `0x00020000 + IDR_`  
(note: `0x20000`-> `0x27FFF` is practical range since IDRs are  $\leq 0x7FFF$ )
-  `0x00030000 - 0x0003FFFF` : error messages (based on error string ID)
-  `0x00030000 + IDP_`
-  `0x00040000 - 0x0004FFFF` : special purpose (non-client areas)
-  `0x00040000 + HitTest area`
-  `0x00050000 - 0x0005FFFF` : controls (those that are not commands)
-  `0x00040000 + IDW_`
-  These rules are hard-coded into the default implementation of the Microsoft Foundation classes. They can be overridden by providing different implementations of the various Help-related member functions.

(C) 1998 Sang Il Kim





# CHAPTER 21

✍ DLLs(Dynamic Link Libraries)

✍ - build\_time

✍ DLL - run\_time

✍

, DLL

EXE  
가 가 .

✍ DLL

✍ DLL (.dll)

, ,

✍ DLL

DLL

가

.

✍ DLL

가

.

✍ Win32

DLL

/

✍

(shared data section)

.

# CHAPTER 21

|  | (Imports) | (Exports)                                     |
|--|-----------|-----------------------------------------------|
|  |           | symbolic name    ordinal number               |
|  |           |                                               |
|  | DLL       | symbolic name    ordinal number               |
|  | ,         | 가                    가                    DLL |

✍ DLL -

✍ `__declspec(dllexport) int MyFunction( int n );`

✍ -

✍ `__declspec(dllimport) int MyFunction( int n );`

✍ C++    MyFunction()    C

`extern "C" __declspec(dllexport) int MyFunction( int n );`

`extern "C" __declspec(dllimport) int MyFunction( int n );`

# CHAPTER 21



(Implicit Linkage vs. Explicit Linkage)



(Implicit linking)



DLL

DLL

(symbolic name, ordinal

number)

(.lib)

.



(.lib)

( )

symbolic name, ordinal number

symbolic name, ordinal number

.



DLL.



symbolic name, ordinal number                     .



(Explicit linking)



(.lib)

.



LoadLibrary() DLL.

# CHAPTER 21



(Implicit Linkage vs. Explicit Linkage)



```
extern "C" __declspec(dllexport) double SquareRoot( double d );  
  
typedef double (SQRTPROC) (double);  
  
HINSTANCE hInstance;  
  
SQRTPROC* pFunction;  
  
VERIFY(hInstance = ::LoadLibrary("c:\\windows\\system\\mydll.dll"));  
  
VERIFY(pFunction = (SQRTPROC*)::GetProcAddress(hInstance, "SquareRoot"));  
  
double d = (*pFunction)(81.0); // DLL SquareRoot()
```

# CHAPTER 21

✍ symbolic name      ordinal number

✍ MFC                      DLL      ordinal number

✍ ordinal number                      symbolic name                      가  
EXE                      .

✍ ordinal number                      DLL                      (.def)  
ordinal number                      .

✍                      가 C++                      (.def)      decorated  
. (      extern "C"                      )

✍ MFC                      DEF(DevStudio\VC\mfc\src\intel\MFC42.DEF)

?ReadList@CRecentFileList@@UAEXXZ @ 5458 NONAME

?ReadNameDictFromStream@CPropertySection@@QAEHPAUI Stream@@@Z @ 5459 NONAME

?ReadObject@CArchive@@QAEPAVCObject@@PBUCLRuntimeClass@@@Z @ 5460 NONAME

?ReadString@CArchive@@QAEHAAVCString@@@Z @ 5461 NONAME

?ReadString@CArchive@@QAEPADPADI @Z @ 5462 NONAME

?ReadString@CI nternetFile@@UAEHAAVCString@@@Z @ 5463 NONAME

?ReadString@CI nternetFile@@UAEPADPADI @Z @ 5464 NONAME

symbol

ordinal number

# CHAPTER 21



\*.def



가

( )

(.OBJ)

(Link)



가

가



32

|             |                                |
|-------------|--------------------------------|
| NAME        | SAMPLE                         |
| DESCRIPTION | 'The Windows Program SAMPLE.C' |
| EXETYPE     | WINDOWS                        |
| STUB        | 'WINSTUB.EXE'                  |
| CODE        | PRELOAD MOVEABLE DISCARDABLE   |
| DATA        | PRELOAD MOVEABLE MULTIPLE      |
| HEAPSIZE    | 1024                           |
| STACKSIZE   | 5120                           |

(.DEF)

# CHAPTER 21



|      |         |          |             |
|------|---------|----------|-------------|
| CODE | PRELOAD | MOVEABLE | DISCARDABLE |
|------|---------|----------|-------------|

|      |         |          |          |
|------|---------|----------|----------|
| DATA | PRELOAD | MOVEABLE | MULTIPLE |
|------|---------|----------|----------|

가

|          |      |
|----------|------|
| HEAPSIZE | 1024 |
|----------|------|

(Local Heap)  
256BYTE ~ 65536BYTE

|           |      |
|-----------|------|
| STACKSIZE | 5120 |
|-----------|------|

(Stack)  
5BYTE ~ 65536BYTE

# CHAPTER 21



| PRELOAD     | 가 |
|-------------|---|
| LOADONCALL  | . |
| FIXED       | 가 |
| MOVEABLE    | 가 |
| MULTIPLE    | . |
| SINGLE      | . |
| DISCARDABLE | 가 |

# CHAPTER 21

✍ DLL Entry Point-DllMain

✍ DLL \_\_DllMainCRTStartup .

✍ \_\_DllMainCRTStartup ,  
DllMain() .

✍ DllMain() DLL , 가  
dwReason .

✍ DLL DllMain() 가 .

✍ EXE - \_WinMainCRTStartup

# CHAPTER 21

✍ DLL Entry Point-DllMain

✍ DllMain()

```
HINSTANCE g_hInstance;
```

```
extern "C" int APIENTRY
```

```
    DllMain(HINSTANCE hInstance, DWORD dwReason, LPVOID lpReserved)
```

```
{
```

```
    if(dwReason == DLL_PROCESS_ATTACH)
```

```
    {
```

```
        TRACE0("EX21A.DLL Initializing!\n");
```

```
        //
```

```
    }
```

```
    else if(dwReason == DLL_PROCESS_DETACH)
```

```
    {
```

```
        TRACE0("EX21A.DLL Terminating!\n");
```

```
        //
```

```
    }
```

```
    return 1;
```

```
}
```

# CHAPTER 21



-



, DLL EXE가

가

.



(EXE)

- 0x400000



DLL

- 0x10000000



FindResource() -

.



DLL

가

HINSTANCE

DLL

.



EXE

가

EXE

.



GetModuleHandle() -

.



EXE

NULL

.



DLL

DLL

GetModuleHandle()

.

# CHAPTER 21



DLL



/

1. EXE

/ LoadLibrary()

2.

3.

4.

5. Path



DLL

\windows\system



MFC DLLs -

DLL

DLL



DLL

C++

MFC

MFC



DLL

C

MFC



MFC

가 DLL

DLL

가



MFC DLL

# CHAPTER 21

✍ MFC DLLs - DLL DLL

|                   | MFC                                             | MFC                |
|-------------------|-------------------------------------------------|--------------------|
| DLL<br>DLL<br>EXE | _AFXDLL, _USRDLL<br>_AFXEXT, _AFXDLL<br>_AFXDLL | _USRDLL<br>#define |

✍ MFC DLL DLL

✍ Debug MFC DLL

✍ mfc42d.dll MFC

mfc042d.dll ActiveX(OLE)

mfc42d.dll (ODBC DAO)

mfc42d.dll Winsock, WinI net

✍ Release mfc42.dll

# CHAPTER 21

✍ MFC DLL -

✍ DLL 가 AFX\_EXT\_CLASS 가

✍ class **AFX\_EXT\_CLASS** CStudent::public Cobject //p694

✍ MFC DLL

✍ DLL, MFC DLL, EXE .

✍

```
HINSTANCE hInstResourceClient = AfxGetResourceHandle();
```

```
// DLL ( DLL .)
```

```
AfxSetResourceHandle(::GetModuleHandle("mydllname.dll"));
```

```
CString strRes;
```

```
strRes.LoadString(IDS_MYSTRING);
```

```
// ( .)
```

```
AfxSetResourceHandle(hInstResourceClient);
```


✍ DLL AfxGetInstanceHandle() DLL EXE .


# CHAPTER 21


|     | MFC DLL |                                                                                            |
|-----|---------|--------------------------------------------------------------------------------------------|
| DLL |         | <p>✍ C<br/>✍ DLL 가<br/>DLL</p> <p>✍ C<br/>✍ DLL 가<br/>MFC DLL</p> <p>✍ C++<br/>✍ , MFC</p> |
| DLL |         |                                                                                            |


# CHAPTER 21


## The TRACE Macro


 This topic explains how to use the TRACE macro during development to print or display debugging messages from a program. TRACE prints a string argument to your debugger.

 **Note** With 32-bit MFC, the only way to get debug output is via the debugger.

 The TRACE macro can handle a variable number of arguments, similar to the way `printf` operates. Following are examples of different ways to use TRACE macros:

```
 int x = 1;
    int y = 16;
    float z = 32.0;
    TRACE( "This is a TRACE statement\n" );
    TRACE( "The value of x is %d\n", x );
    TRACE( "x = %d and y = %d\n", x, y );
    TRACE( "x = %d and y = %x and z = %f\n", x, y, z );
```

 The TRACE macro is active only in the debug version of the class library. After a program has been debugged, you can build a release version to deactivate all TRACE calls in the program.


 **Tip** When debugging Unicode, the TRACE0, TRACE1, TRACE2, and TRACE3 macros are easier to use because the `_T` macro is not needed.


# CHAPTER 21


## TRACE

 TRACE( *exp* )

 Parameters

 *exp* Specifies a variable number of arguments that are used in exactly the same way that a variable number of arguments are used in the run-time function printf.

 TRACE is limited to sending a total of 512 characters at a time. If you call TRACE with formatting commands, the total string length after the formatting commands have been expanded cannot be more than 512 characters, including the terminating NULL. Exceeding this limit causes an ASSERT.

 Example

```
// example for TRACE
```

```
int i = 1;
```

```
char sz[] = "one";
```

```
TRACE( "Integer = %d, String = %s\n", i, sz );
```


```
// Output: 'Integer = 1, String = one'
```

# CHAPTER 21

## TRACE0


 TRACE0( *exp* )


 Parameters

 *exp* A format string as used in the run-time function printf.


 Remarks


TRACE0 is similar to TRACE, and is one variant of a group of trace macros that you can use for debug output. The group includes:


 TRACE0 - Takes a format string (Only) and can be used for simple text messages which are dumped to afxDump


 TRACE1 - Takes a format string plus one argument (one variable which is dumped to afxDump)

 TRACE2 - Takes a format string plus two arguments (two variables which are dumped to afxDump)

 TRACE3 - Takes a format string plus three arguments (three variables which are dumped to afxDump)

 TRACE0 does nothing if you have compiled a release version of your application. As with TRACE, it only dumps data to afxDump if you have compiled a debug version of your application.

 **Note** This macro is available only in the debug version of MFC.

 Example

```
// example for TRACE0
```

```
TRACE0( "Start Dump of MyClass members:" );
```


# CHAPTER 21


## TRACE1

 TRACE1( *exp*, *param1* )

 Parameters


 *exp*        A format string as used in the run-time function printf.

 *param1*    The name of the variable whose value should be dumped.

 Example


```
int i = 1;
TRACE1( "Integer = %d\n", i );
// Output: 'Integer = 1'
```


## TRACE2


 TRACE2( *exp*, *param1*, *param2* )

 Parameters

 *exp*        A format string as used in the run-time function printf.

 *param1*    The name of the variable whose value should be dumped.

 *param2*    The name of the variable whose value should be dumped.

 Example

```
int i = 1;
char sz[] = "one";
TRACE2( "Integer = %d, String = %s\n", i, sz );
// Output: 'Integer = 1, String = one'
```

# CHAPTER 21


## TRACE3


 TRACE3( *exp*, *param1*, *param2*, *param3* )

### Parameters

 *exp*      A format string as used in the run-time function printf.

 *param1*    The name of the variable whose value should be dumped.

 *param2*    The name of the variable whose value should be dumped.

 *param3*    The name of the variable whose value should be dumped.

## AfxGetResourceHandle




 HINSTANCE AfxGetResourceHandle( );

### Return Value



## AfxSetResourceHandle



 void AfxSetResourceHandle( **HINSTANCE** *hInstResource* );

### Parameters

 *hInstResource*

# CHAPTER 21

 AfxGetInstanceHandle





MFC    USRDLL

DLL

 HINSTANCE AfxGetInstanceHandle( );

 Return Value



# CHAPTER 21

✍ MFC      DLL - CWinApp

✍ AppWizard가      DLL      DllMain()

✍ EXE      CWinApp

✍      C      \_declspec(dllexport)  
(.def)      )

✍      DLL      AppWizard가      DllMain()      가

✍ AFX\_MANAGE\_STATE

✍ mfc42.dll

✍      DLL      mfc42.dll

✍      -      DLL

✍ AFX\_MANAGE\_STATE(AfxGetStaticModuleState()); // p700

✍ DLL      MFC      DLL  
가

# CHAPTER 21

✍ AFX\_MANAGE\_STATE

✍ AFX\_MANAGE\_STATE( **AFX\_MODULE\_STATE** \* *pModuleState* )

✍ Parameters

✍ *pModuleState*                      AFX\_MODULE\_STATE

✍ AfxGetStaticModuleState

✍ AFX\_MODULE\_STATE\* AFXAPI AfxGetStaticModuleState( );

✍ Return Value

✍ AFX\_MODULE\_STATE

✍ MFC                      DLL

✍                      DLL

,                      DLL

EXE  
DLL

✍                      DLL

AfxSetResourceHandle()

. // PowerPoint 333

# CHAPTER 21



DLL (A Custom Control DLL)



C

DLL



(regular) DLL C++

custom control



가?



WM\_COMMAND



ClassWizard



WndProc

가

# CHAPTER 21



(WNDCLASS)



가



OOP

```
typedef struct _WNDCLASS {
```

```
    UINT style;                //
```

```
    WNDPROC lpfnWndProc;      //
```

```
    int cbClsExtra;           //
```

```
    int cbWndExtra;           //
```

```
    HANDLE hInstance;        //
```

```
    HICON hIcon;              //
```

```
    HCURSOR hCursor;          //
```

```
    HBRUSH hbrBackground;     // (    )
```

```
    LPCTSTR lpszMenuName;     //
```

```
    LPCTSTR lpszClassName;    //
```

```
} WNDCLASS;
```



# CHAPTER 21



## WNDCLASS

| style         | .       |
|---------------|---------|
| lpfnWndProc   | 가 .     |
| cbClsExtra    | .       |
| cbWndExtra    | 가 '0' . |
| hInstance     | 가 '0' . |
| hIcon         | .       |
| hCursor       | .       |
| hbrBackground | 가 .     |
| lpszMenuName  | 가 .     |
| lpszClassName | NULL .  |



DevStudio\vc\include\winuser.h(1067 , - 5914 )



## CHAPTER 21



WNDCLASS



hbrBackground

,

(HBRUSH)

.

```
wndclass.hbrBackground = (HBRUSH) (COLOR_WINDOW + 1);
```



'0'

1

.



( Window style )



.

# CHAPTER 21

MFC

WinProc

.

WinProc()

.

C++

ClassWizard

CWnd

(CRygWnd)

.

WinProc()

```
LONG MyControlWndProc(HWND hWnd, UINT message, WPARAM wParam,
                        LPARAM lParam)
```

```
{
```

```
    if(this is the first message for this window){
```

```
        CWnd* pWnd = new CMyControlWindowClass();
```

```
        attach pWnd to hWnd
```

```
    }
```

```
    return AfxCallWndProc(pWnd, hWnd, message, wParam, lParam);
```

```
}
```

MFC

AfxCallWndProc()

CMyControlWindowClass

# CHAPTER 21



(Custom Control Notification Messages)



WM\_COMMAND

, 가

가 .

| (HI WORD)wParam<br>(LOWORD)wParam<br>lParam | ID |
|---------------------------------------------|----|



,



, 77

가

```
GetParent()->SendMessage(WM_COMMAND,
    GetDlgCtrlID() | ID_NOTIFYCODE << 16, (LONG) GetSafeHwnd());
```



- MFC ON\_CONTROL

```
ON_CONTROL(ID_NOTIFYCODE, IDC_MYCONTROL, OnClickedControl)
```



```
afx_msg void OnClickedMyControl();
```

(C) 1998 Sang I Kim

# CHAPTER 21



가 32

PostMessage()

SendMessage()

가



EX21D -

(Custom Control)



off, red, yellow, green

MFC

DLL



DLL

RYG\_SETSTATE, RYG\_GETSTATE

가

,

m\_nState

가

.



ON\_CONTROL



ON\_CONTROL( *wNotifyCode*, *id*, *memberFxn* )



Parameters

*wNotifyCode*

*id*

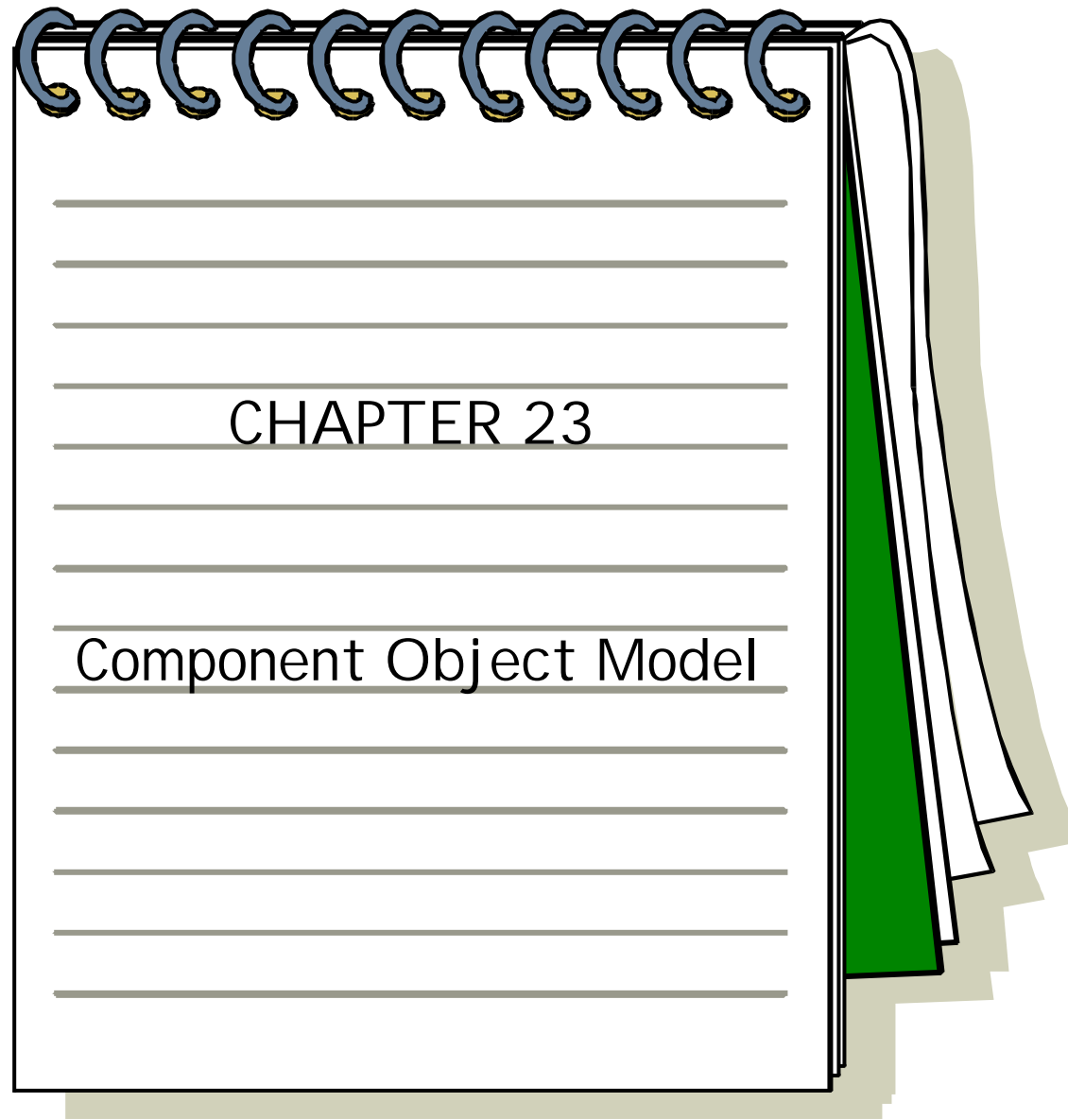
command I D.

*memberFxn*

## Seven Deadly Sins ( 가 )

- 1) Pleasure without conscience ( )
- 2) Politics without principle ( )
- 3) Commerce without ethics ( )
- 4) Knowledge without character ( )
- 5) Science without humanity ( )
- 6) Wealth without work ( )
- 7) Worship without sacrifice ( )

- -



# CHAPTER 23

✍ ( Component Object Model )

✍ Component Object Model(COM)      ActiveX

✍ ActiveX

✍ OLE - Object Linking and Embedding      , drag and drop  
ActiveX

✍ IIS - Microsoft Internet Information Server

✍ "server" -

✍ "Component" - OLE

✍ COM

✍

✍ COM

✍ API - 350

✍ VBX - 32

✍ DDE -

# CHAPTER 23

COM

가 .

Win32 EXE가 Win32 DLL

EXE가 EXE 가  
(DDE )

VBX ActiveX Control

.

OLE DB

COM(DCOM) EXE가 ( 가

microprocessor-chip ) EXE

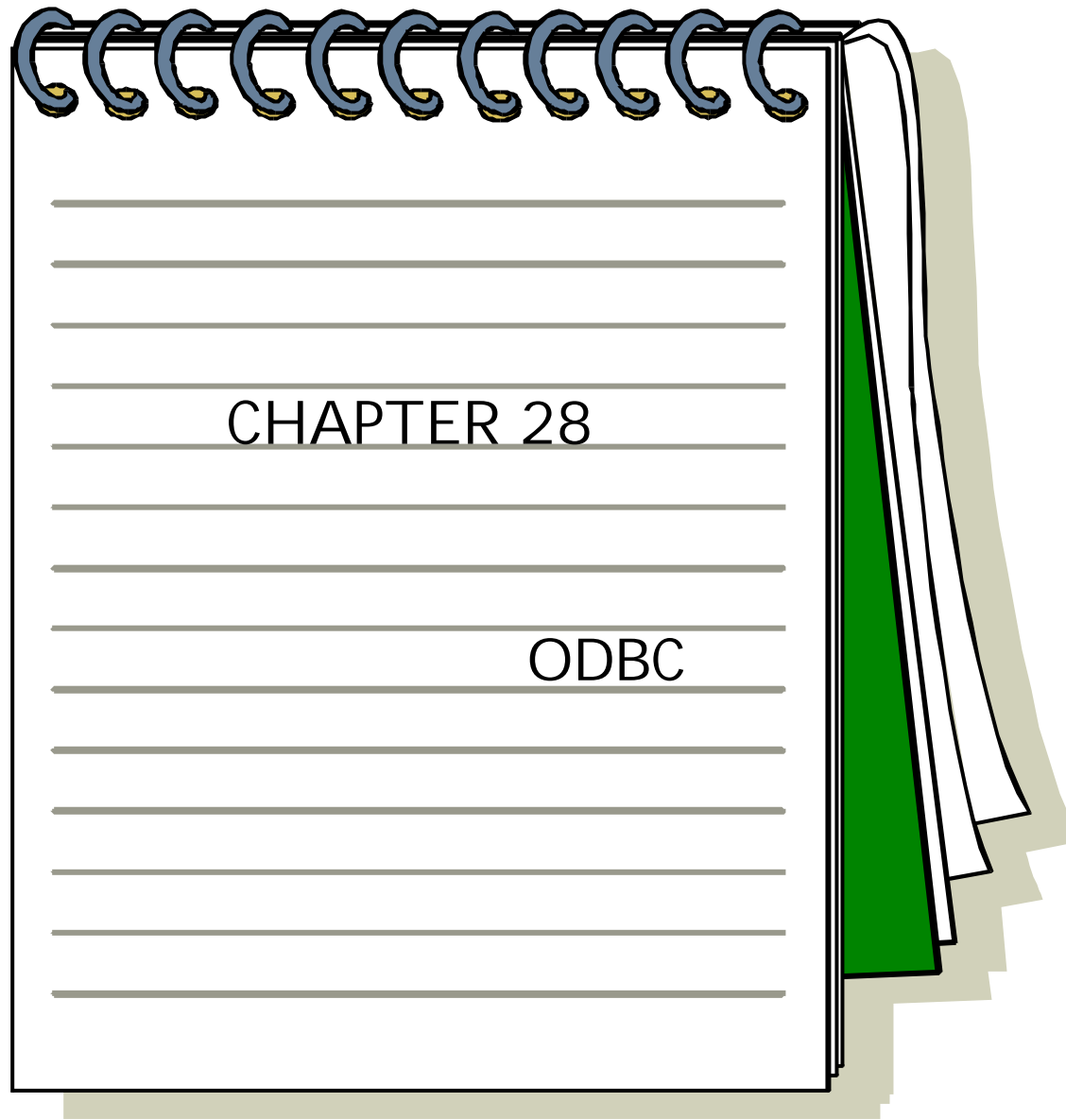
COM - COM

( )

.

가

COM -



# CHAPTER 28

✍ ODBC(Open DataBase Connectivity)

✍ ODBC SQL(Structured Query Language)

✍ ODBC SQL , ( )

✍

✍ - MDB ,

✍

- ,

가 .

✍

- DBMS

가 .( , )

✍

, 가

rollback ,

가

✍

✍ DBMS

# CHAPTER 28

SQL( )

가 .

(row: ) (column: ) .

ODBC

SQL , SQL C .

Visual C++ ODBC SDK , DBF , MDB ,

XLS , ASCII , SQL

32 가 .

C++ SQL ,

ODBC .

ODBC .

ODBC API



DL



가



가



```
SELECT FNAME, LNAME, CI TY FROM AUTHORS
```

WHERE STATE = 'UT' ORDER BY LNAME

DBMS

DLL

(connection),

(statement)

# CHAPTER 28

✍ ODBC SDK

✍ (Dynaset) -

✍ 가

✍ (Snapshots) -

✍ 가

✍

✍ MFC ODBC - CRecordset( ) CDatabase

✍ CRecordset

✍ CDatabase ODBC

✍ CRecordset

(column)

✍ CRecordset::Open() -

CDatabase

✍ CRecordset ODBC

Dynaset Snapshots

# CHAPTER 28

## ✍ CRecordset

| Open()      | .                 |
|-------------|-------------------|
| AddNew()    | 가 .               |
| Update()    |                   |
|             | AddNew() Edit() . |
| Delete()    | .                 |
| Edit()      | .                 |
| IsBOF()     | 가 .               |
| IsEOF()     | 가 .               |
| MoveNext()  | .                 |
| MoveFirst() | .                 |
| MoveLast()  | .                 |
| MovePrev()  | .                 |

# CHAPTER 28

## ✍ CRecordset

| GetDefaultConnect() | 가   |
|---------------------|-----|
| GetDefaultSQL()     | SQL |
| DoFieldExchange()   |     |
| GetStatus()         |     |
| GetRecordCount()    |     |
| GetODBCFieldCount() |     |
| GetODBCFieldInfo()  |     |

# CHAPTER 28



(row) count



MoveNext()



가/

,

가

가/

.

high-water mark

# CHAPTER 28

✍ ODBC

✍ MFC ODBC

ODBCException

✍ CRecordset::Delete() , MFC

ODBC

가

)

A B

:

A

B

✍

CRecordset::MoveNext()

✍

(Referential Integrity)

✍

가,

✍



## CHAPTER 28

✍ ODBC

```
✍ try {  
    m_pSet->Delete();  
}  
catch(CDBException* e) {  
    AfxMessageBox(e->m_strError);  
    e->Delete();  
    m_pSet->MoveFirst();  
    UpdateData(FALSE);  
    return;  
}  
m_pSet->MoveNext();
```

# MessageBeep

✍ MessageBeep()

✍ `BOOL MessageBeep( UINT uType );`

✍ Parameters

✍ *uType* Specifies the sound type, as identified by an entry in the [sounds] section of the registry.

✍ MessageBeep()

| 0xFFFFFFFF         | PC                |
|--------------------|-------------------|
| MB_ICONASTERISK    | SystemAsterisk    |
| MB_ICONEXCLAMATION | SystemExclamation |
| MB_ICONHAND        | SystemHand        |
| MB_ICONQUESTION    | SystemQuestion    |
| MB_OK              | SystemDefault     |

✍ MessageBeep()

WindowsAsterisk

✍ MB\_ICONASTERISK

✍ PC, MessageBeep()

PC



## MFC가

|               |                                |
|---------------|--------------------------------|
|               |                                |
| ASSERT        | 가 FALSE ,<br>(MFC ) , .        |
| ASSERT_KINDOF | 가 가 ( )<br>.                   |
| ASSERT_VALID  | AssertValid() CObject ( )<br>) |
| DEBUG_NEW     | 가<br>new , . ( )<br>.          |
| TRACE         | MFC C printf()                 |
| TRACE0        | 가 .                            |
| TRACE1        | 가 .                            |
| TRACE2        | .                              |
| TRACE3        | .                              |
| VERIFY        | ASSERT MFC .                   |

 MFC42.DLL : Release , MFC42D.DLL : Debug



## MFC

|                           |                  |
|---------------------------|------------------|
|                           |                  |
| AfxCheckMemory()          | .                |
| afxDump                   | CDumpContext ( ) |
| AfxEnableMemoryTracking() | .                |
| AfxIsMemoryBlock()        | new              |
| AfxIsValidAddress()       | 가 .              |
| AfxIsValidString()        | 가 .              |
| afxMemDF                  | 가 .              |
| AfxSetAllocHook()         | .                |
| afxTraceEnabled           | TRACE 가 .        |
| afxTraceFlags             | MFC .            |



✍ MFC

✍ AfxDoForAllClasses()

DECLARE\_DYNAMIC, DECLARE\_DYNCREATE,  
DECLARE\_SERIAL CObject

✍ AfxDoForAllObjects()

new CObject



✍ CString


String

|             |               |
|-------------|---------------|
|             |               |
| Empty()     | 가 0 CString . |
| GetAt()     | .             |
| GetLength() | CString .     |
| IsEmpty()   | CString 가 .   |
| SetAt()     | ( \0 .) .     |
| [ ]         | GetAt() .     |
| LPCTSTR     | CString .     |



 CString , , ,


|    |           |
|----|-----------|
|    |           |
| =  | CString . |
| +  | .         |
| += | .         |

 CString str1 = "This is an easy way to perform";  
CString str2 = "string concatenation";  
CString str3 = str1 + " " + str2;  
AfxMessageBox(str3, MB\_OK | MB\_ICONINFORMATION);



## CString

|                 |       |
|-----------------|-------|
|                 |       |
| Compare()       | . ( ) |
| CompareNoCase() | . ( ) |
| ==              | . ( ) |
| !=              | . ( ) |
| <               | . ( ) |
| >               | . ( ) |
| <=              | . ( ) |
| >=              | . ( ) |

 A string < a string  
A string > A String  
A string = A string



## CString

|                 |   |
|-----------------|---|
|                 |   |
| Left()          | . |
| Mid()           | . |
| Right()         | . |
| SpanExcluding() | . |
| SpanIncluding() | . |



```
CString str1 = "This is the way to perform string extraction!";  
CString str2 = str1.Left(8) + str1.Right(18);  
AfxMessageBox(str2, MB_OK | MB_INFORMATION);
```



## CString

|                 |              |
|-----------------|--------------|
|                 |              |
| Format()        | C sprintf()가 |
| FormatMessage() | .(Format() ) |
| MakeLower()     | .            |
| MakeUpper()     | .            |
| MakeReverse()   | .            |
| TrimLeft()      | .            |
| TrimRight()     | .            |

## CString

|               |   |
|---------------|---|
| Find()        | 0 |
| ReverseFind() | 0 |
| FindOneOf()   | 0 |



## CString

|                      |                 |
|----------------------|-----------------|
|                      |                 |
| FreeExtra()          | CString .       |
| GetBuffer()          | CString .       |
| GetBufferSetLength() | CString .       |
| LockBuffer()         | CString .       |
| ReleaseBuffer()      | GetBuffer() 가 . |
| UnlockBuffer()       | LockBuffer() .  |





 `int strcmp( const char *string1, const char *string2 );`


 `string.h`


 `int wcscmp( const wchar_t *string1, const wchar_t *string2 );`


 wide-character, `string.h, wchar.h`


 `int _mbscmp( const unsigned char *string1, const unsigned char *string2 );`


 multibyte-character, `mbstring.h`


 `int strncmp( const char *string1, const char *string2, size_t count );`

 `int wcsncmp( const wchar_t *string1, const wchar_t *string2, size_t count );`


 `int _mbsnicmp( const unsigned char *string1,  
const unsigned char *string2, size_t count );`

 `int _strnicmp( const char *string1, const char *string2, size_t count );`

 `int _wcsnicmp( const wchar_t *string1, const wchar_t *string2, size_t count );`

 `int _mbsnicmp( const unsigned char *string1,  
const unsigned char *string2, size_t count );`

 Parameters


 `string1, string2` Strings to compare

 `count` Number of characters to compare





 `char *strcpy( char *strDest, const char *strSource );`

 `string.h`


 `wchar_t *wcscpy( wchar_t *strDest, const wchar_t *strSource );`


 wide-character, `string.h, wchar.h`

 `unsigned char *_mbscopy( unsigned char *strDest,  
const unsigned char *strSource );`

 multibyte-character, `mbstring.h`

 `char *strncpy( char *strDest, const char *strSource, size_t count );`


 `wchar_t *wcsncpy( wchar_t *strDest, const wchar_t *strSource, size_t count );`

 `unsigned char *_mbsncpy( unsigned char *strDest,  
const unsigned char *strSource, size_t count );`

 Parameters

 *strDest* Destination string

 *strSource* Source string

 *count* Number of characters to be copied





 `char *strcat( char *strDest, const char *strSource );`

 `string.h`


 `wchar_t *wcscat( wchar_t *strDest, const wchar_t *strSource );`


 `wide-character, string.h, wchar.h`

 `unsigned char *_mbscat( unsigned char *strDest,  
const unsigned char *strSource );`

 `multibyte-character, mbstring.h`

 `char *strncat( char *strDest, const char *strSource, size_t count );`


 `wchar_t *wcsncat( wchar_t *strDest, const wchar_t *strSource, size_t count );`

 `unsigned char *_mbsncat( unsigned char *strDest,  
const unsigned char *strSource, size_t count );`



 Parameters



 `strDest` Null-terminated destination string



 `strSource` Null-terminated source string



 `count` Number of characters to append




 `size_t strlen( const char *string );`  
 `string.h`

 `size_t wcslen( const wchar_t *string );`  
 wide-character, `string.h, wchar.h`

 `size_t _mbslen( const unsigned char *string );`  
 multibyte-character, `mbstring.h`

 `size_t _mbstrlen( const char *string );`  
 `stdlib.h`

 Parameter

 *string* Null-terminated string



, 가 .

.

.

.



 AFXCOLL.H



MFC

|                |         |            |
|----------------|---------|------------|
|                |         |            |
| CByteArray()   |         | .(BYTE )   |
| CDWordArray()  | 32      | .(DWORD )  |
| CObArray()     | CObject | .          |
| CPtrArray()    | void    | .(void * ) |
| CStringArray() | CString | .          |
| CUI ntArray()  |         | .          |
| CWordArray()   | 16      | .(WORD )   |

(C) 1998 Sang I Kim



|               |             |
|---------------|-------------|
|               |             |
| CObList()     | CObject 가 . |
| CPtrList()    | void 가 .    |
| CStringList() | CString 가 . |



|                      |                       |
|----------------------|-----------------------|
|                      |                       |
| CMapPtrToPtr()       | void void             |
| CMapPtrToWord()      | void 16               |
| CMapStringToOb()     | CString CObject       |
| CMapStringToPtr()    | CString void (void *) |
| CMapStringToString() | CString CString       |
| CMapWordToOb()       | 16 CObject            |
| CMapWordToPtr()      | 16 void (void *)      |



가

|                |                      |
|----------------|----------------------|
|                |                      |
| CArray         | .                    |
| CList          | .                    |
| CMap           | .                    |
| CTypedPtrArray | CObArray CPtrArray . |
| CTypedPtrList  | CObList CPtrList .   |
| CTypedPtrMap   | CObMap CPtrMap .     |



## ✍ CTime

|                |                                                                     |
|----------------|---------------------------------------------------------------------|
|                |                                                                     |
| Format()       | CTime .                                                             |
| FormatGmt()    | GMT(Greenwich Mean Time) UTC(Universal Time Coordinates)<br>CTime . |
| GetDay()       | CTime (1-31) .                                                      |
| GetDayOfWeek() | CTime (1-7) .                                                       |
| GetGmtTm()     | CTime UTC<br>(Time.h tm) .                                          |
| GetHour()      | CTime (0-23) .                                                      |
| GetLocalTm()   | CTime<br>(Time.h tm) .                                              |
| GetMinute()    | CTime (0-59) .                                                      |
| GetMonth()     | CTime (1-12) .                                                      |
| GetSecond()    | CTime (0-59) .                                                      |
| GetTime()      | CTime time_t .                                                      |
| GetYear()      | CTime .                                                             |



## CTime

|    |                   |
|----|-------------------|
|    |                   |
| =  | .                 |
| +  | CTimeSpan CTime . |
| -  | CTimeSpan CTime . |
| += | CTimeSpan CTime . |
| -- | CTimeSpan CTime . |
| == | .                 |
| != | .                 |
| <  | 가 .               |
| >  | 가 .               |
| <= | 가 .               |
| >= | 가 .               |



## CTimeSpan

|                   |              |
|-------------------|--------------|
|                   |              |
| Format()          | CTimeSpan .  |
| GetDays()         | CTimeSpan .  |
| GetHours()        | (-23 ~ 23) . |
| GetMinutes()      | (-59 ~ 59) . |
| GetSeconds()      | (-59 ~ 59) . |
| GetTotalHours()   | CTimeSpan .  |
| GetTotalMinutes() | CTimeSpan .  |
| GetTotalSeconds() | CTimeSpan .  |



## CTimeSpan

|    |                       |
|----|-----------------------|
|    |                       |
| =  | .                     |
| +  | CTimeSpan .           |
| -  | CTimeSpan .           |
| += | CTimeSpan CTimeSpan . |
| -- | CTimeSpan CTimeSpan . |
| == | .                     |
| != | .                     |
| <  | 가 .                   |
| >  | 가 .                   |
| <= | 가 .                   |
| >= | 가 .                   |

# CDialog

## CDialog

|                 |       |
|-----------------|-------|
|                 |       |
| DoModal()       | , 가 . |
| EndDialog()     | .     |
| GetDefID()      | ID .  |
| GotoDlgCtrl()   | .     |
| MapDialogRect() | .     |
| NextDlgCtrl()   | .     |
| PrevDlgCtrl()   | .     |
| SetDefID()      | .     |
| SetHelpID()     | ID .  |



# DDV(Dialog Data Validation)

DDV ( )



, 가  
가 가



DDV

DDX

| DDV_MaxChars()       | 가          |
|----------------------|------------|
| DDV_MinMaxByte()     | BYTE , .   |
| DDV_MinMaxDouble()   | DOUBLE , . |
| DDV_MinMaxDWord()    | DWORD , .  |
| DDV_MinMaxFloat()    | FLOAT , .  |
| DDV_MinMaxInt()      | INT , .    |
| DDV_MinMaxLong()     | LONG , .   |
| DDV_MinMaxUnsigned() | UINT , .   |

(C) 1998 Sang I Kim