

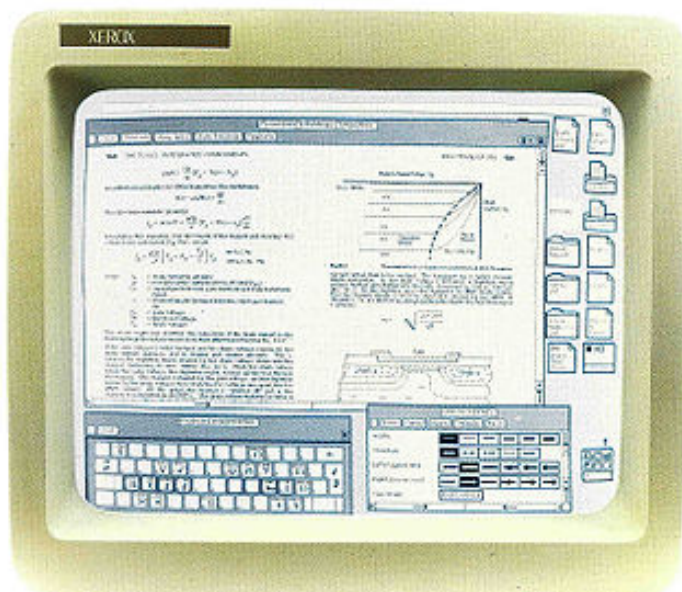
IB111

Programování a algoritmizace

Graphical User Interface (GUI)

Historie GUI

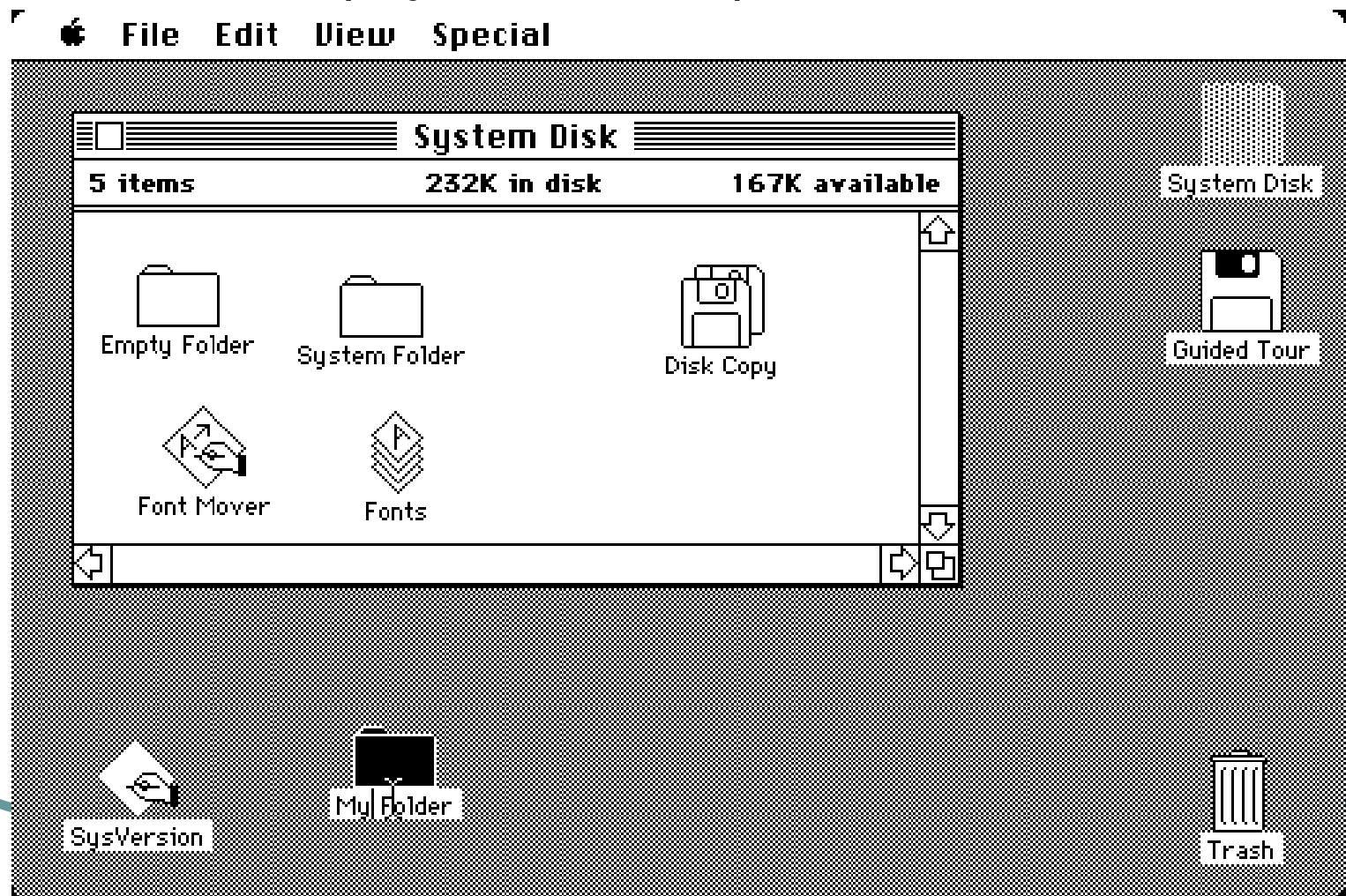
- První OS s GUI: Xerox PARC



- Apple, Microsoft, Sun následovali

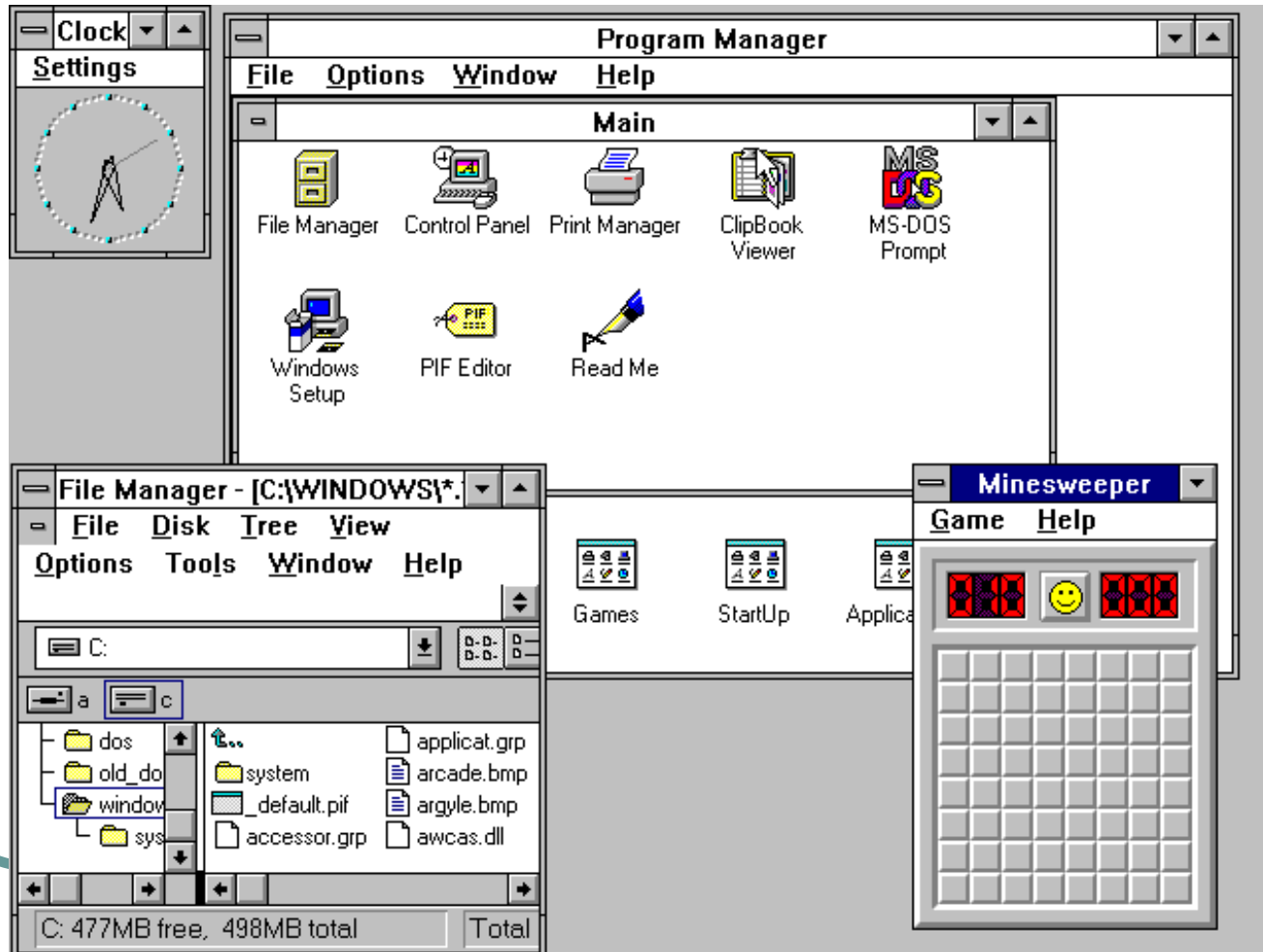
Historie GUI

- MAC OS (System 1.1) - 1984



Historie GUI

- Microsoft Windows 3.1 (1992)



Historie GUI

- Unixový X Window System (od roku 1983)

The screenshot displays a classic X Window System desktop. At the top, several window titles are visible: 'xconsole', 'xbiff', 'xman', 'oclock', and 'xlogo'. The 'xman' window is a 'Manual Browser' with 'Help', 'Quit', and 'Manual Page' buttons. The 'oclock' window shows a simple analog clock. The 'xlogo' window features a large, stylized 'X' logo. A 'Manual Page' window is open, displaying the manual for 'XSET(1)'. The terminal window at the bottom right shows a list of system boot logs, including entries for 'octave-bug-2.1.72', 'mkcoctfile-2.1.72', 'ncgen', 'ncdump', 'blas-config', 'oneko', 'unrar', 'xdaliclock', 'xsetroot', 'oclock', 'xconsole', 'xcalc', 'xbiff', 'xset', 'xman', 'xeyes', and 'xterm'.

Manual Page
Options Sections The current manual page is: xset(x).

XSET(1) XSET(1)

NAME
xset - user preference utility for X

SYNOPSIS
xset [-display *display*] [-b] [b on/off] [b [volume [pitch [duration]]] [[-]bc] [-c] [c on/off] [c [volume]] [[+|-]dpms] [dpms standby [suspend [off]]] [dpms force standby/suspend/off/on] [[-+]fp[+|=] path[,path[...]]] [fp default] [fp rehash] [[-]led [integer]]] [led on/off] [m[mouse] [accel_mult[/accel_div] [threshold]]] [m[mouse] default] [p [pixel color] [[-]r [keycode]] [r on/off] [r rate delay [rate]]] [s [length [period]]] [s blank/noblink] [s expose/noexpose] [s on/off] [s default] [s activate] [s reset] [q]

DESCRIPTION
This program is used to set various user preference options of the display.

OPTIONS

-display *display*
This option specifies the server to use; see *X(7)*.

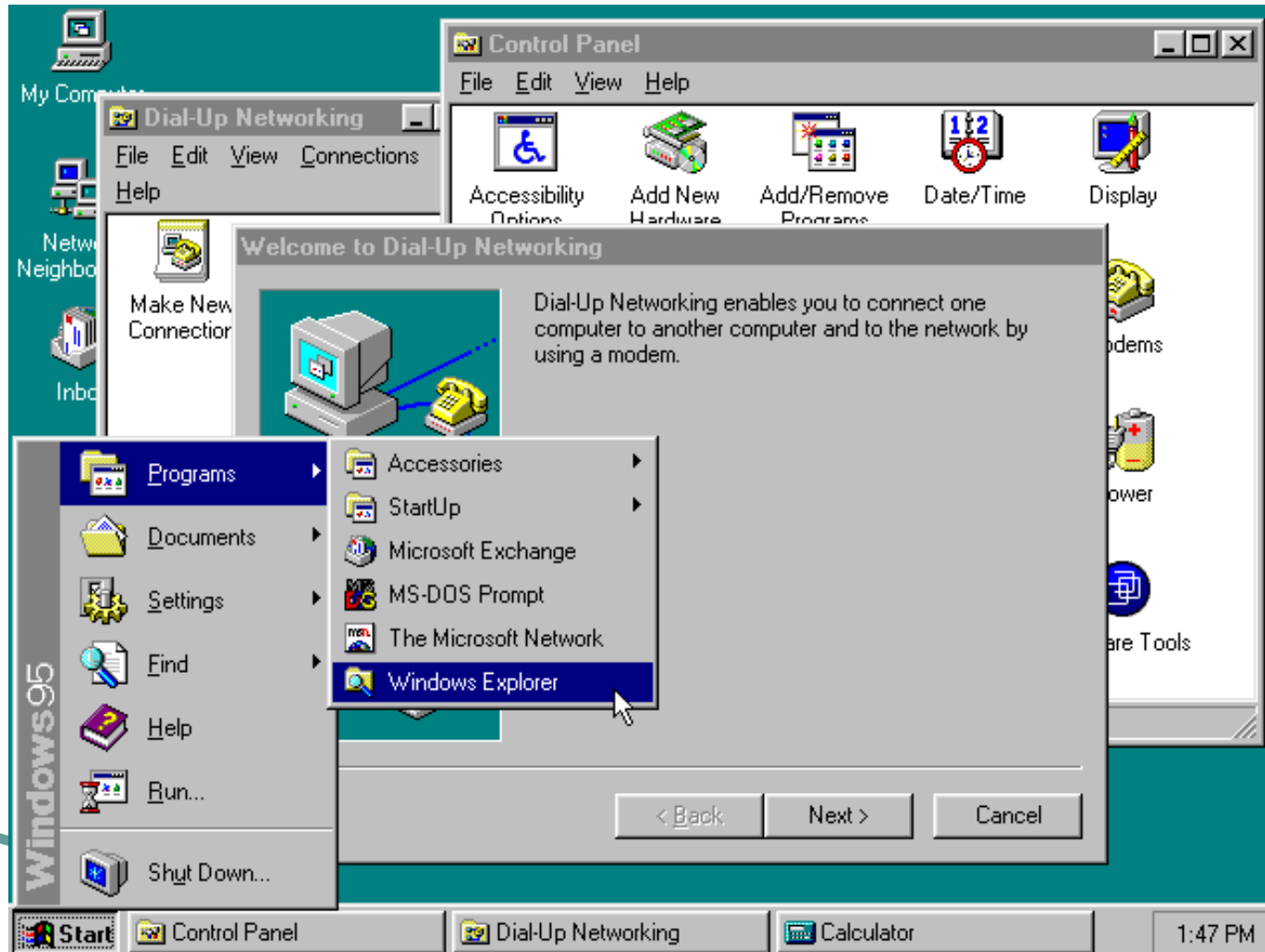
b
The **b** option controls bell volume, pitch and duration. This option accepts up to three numerical parameters, a preceding dash(-), or a 'on/off' flag. If no parameters are given, or the 'on' flag is used, the system defaults will be used. If the dash or 'off' are given, the bell will be turned off. If only one numerical parameter is given, the bell volume will be set to that value, as a percentage of its maximum. Likewise, the second numerical parameter specifies the bell pitch, in hertz, and the third numerical parameter specifies the duration in milliseconds. Note that not all hardware can vary the bell characteristics. The X server will set the characteristics of the bell as closely as it can to the user's specifications.

bc
The **bc** option controls *bug compatibility* mode in the server, if

```
Dec 5 23:55 octave-bug-2.1.72
Dec 5 23:55 octave-bug -> octave-bug-2.1.72
Dec 5 23:55 octave-2.1.72
Dec 5 23:55 octave -> octave-2.1.72
Dec 5 23:55 mkcoctfile-2.1.72
Dec 5 23:55 mkcoctfile -> mkcoctfile-2.1.72
Dec 5 23:55 ncgen
Dec 5 23:55 ncdump
Dec 5 23:55 blas-config
Dec 9 12:31 oneko
Dec 9 13:56 neko -> oneko
Dec 13 21:54 unrar
Jan 29 20:23 xdaliclock
Feb 15 23:08 xsetroot
Feb 15 23:11 oclock
Feb 15 23:11 xconsole
Feb 15 23:19 xcalc
Feb 15 23:19 xbiff
Feb 15 23:20 xset
Feb 15 23:20 xman
Feb 15 23:20 xeyes
Feb 15 23:20 .
xterm
xconsole
root@:-
xbiff
xman
oclock
xlogo
nacbook
```

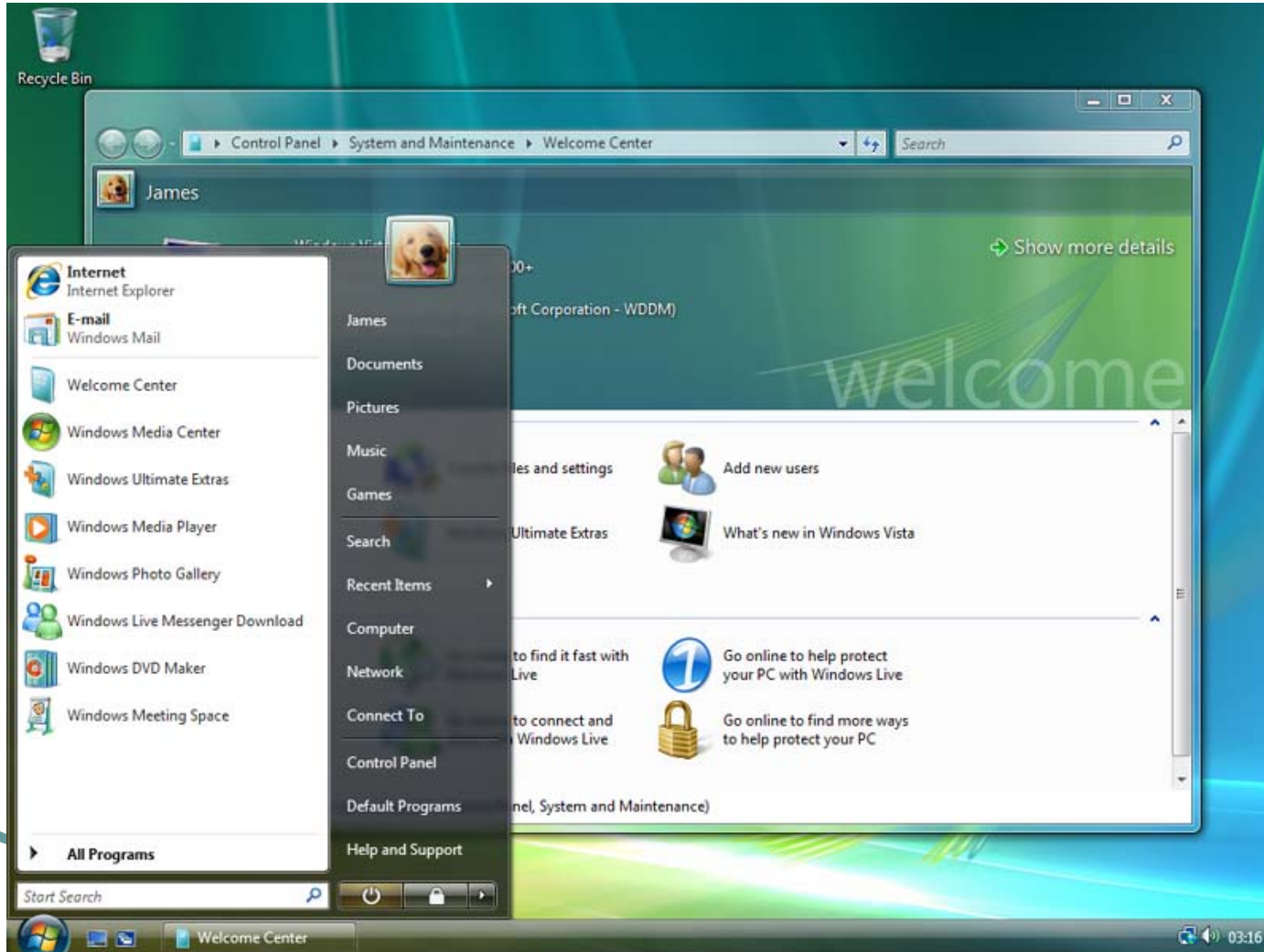
Historie GUI

- Windows 95



Historie GUI

- Windows Aero (3D prvky)



Programování GUI

- Microsoft Windows
 - Programátorské rozhraní Win32
 - Dnes nazývané **Windows API**
 - Několik tisíc funkcí
 - Podpora pro vytváření menu, ikon, bitmap, dialogů apod.
 - Založeno na událostmi řízené architektuře programu
 - Event driven programming

Programování GUI

- Program pro MS Windows pracuje v následujících krocích
 - registrace třídy okna
 - vytvoření hlavního okna aplikace
 - provádění cyklu, který očekává příchod události
 - jakmile událost přijmeme následuje její předání obslužné funkci okna a zpracování události
 - cyklus končí s příchodem zprávy pro ukončení celé aplikace

Příklad v C/C++ pro MS Windows

● Registrace třídy okna

```
ATOM MyRegisterClass(HINSTANCE hInstance)
{
    WNDCLASSEX wcex;

    wcex.cbSize = sizeof(WNDCLASSEX);

    wcex.style          = CS_HREDRAW | CS_VREDRAW;
    wcex.lpfnWndProc    = (WNDPROC) WndProc;
    wcex.cbClsExtra     = 0;
    wcex.cbWndExtra     = 0;
    wcex.hInstance     = hInstance;
    wcex.hIcon          = LoadIcon(hInstance, (LPCTSTR)IDI_AAA);
    wcex.hCursor        = LoadCursor(NULL, IDC_ARROW);
    wcex.hbrBackground  = (HBRUSH) (COLOR_WINDOW+1);
    wcex.lpszMenuName   = (LPCTSTR)IDC_AAA;
    wcex.lpszClassName  = szWindowClass;
    wcex.hIconSm        = LoadIcon(wcex.hInstance, (LPCTSTR)IDI_SMALL);

    return RegisterClassEx(&wcex);
}
```

Programování GUI

- Vytvoření hlavního okna aplikace

```
☐ BOOL InitInstance(HINSTANCE hInstance, int nCmdShow)
{
    HWND hWnd;

    hInst = hInstance; // Store instance handle in our global variable

    hWnd = CreateWindow(szWindowClass, szTitle, WS_OVERLAPPEDWINDOW,
        CW_USEDEFAULT, 0, CW_USEDEFAULT, 0, NULL, NULL, hInstance, NULL);

☐ if (!hWnd)
    {
        return FALSE;
    }

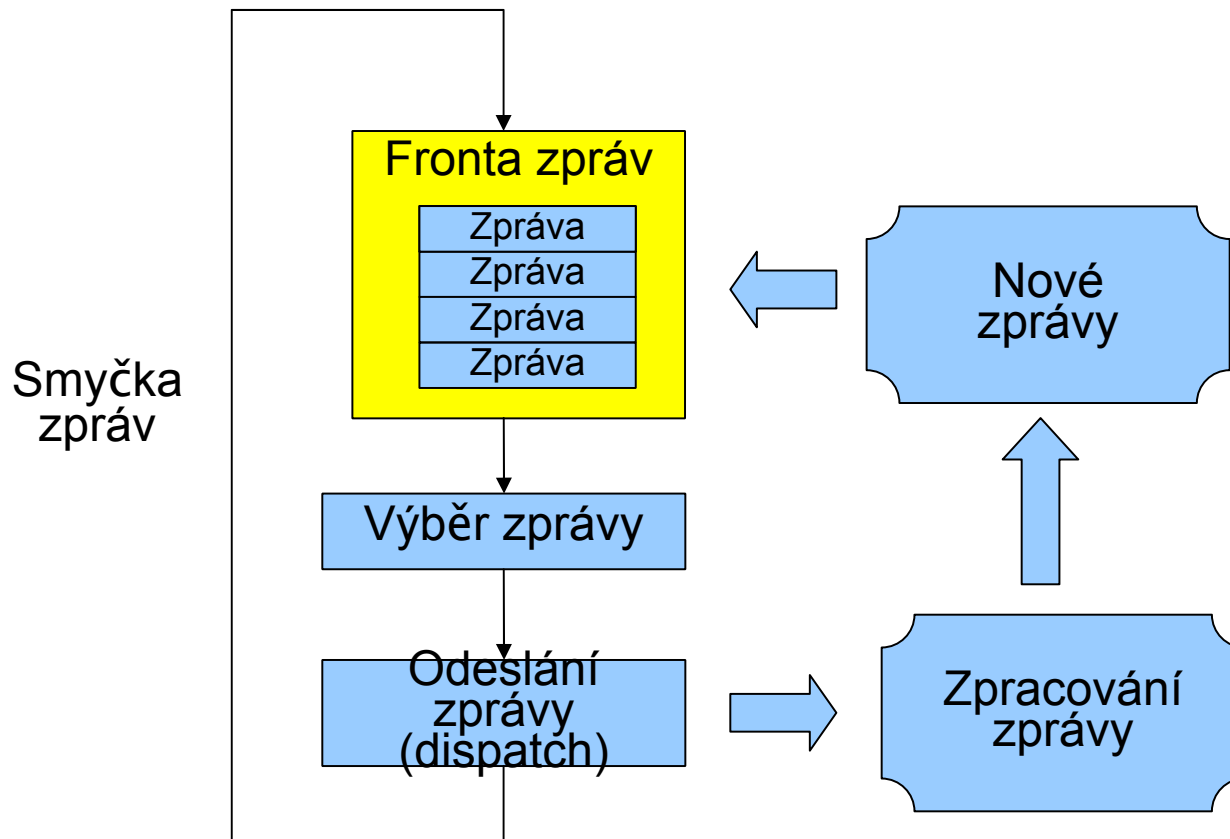
    ShowWindow(hWnd, nCmdShow);
    UpdateWindow(hWnd);

    return TRUE;
}
```

Programování GUI

- Událostmi řízené programování
 - Vstup od uživatele znamená vytvoření události
 - Stisky kláves
 - Přesun/kliknutí myši
 - Program reaguje na jednotlivé události a zpracovává (ošetřuje) je.

Událostmi řízené programování



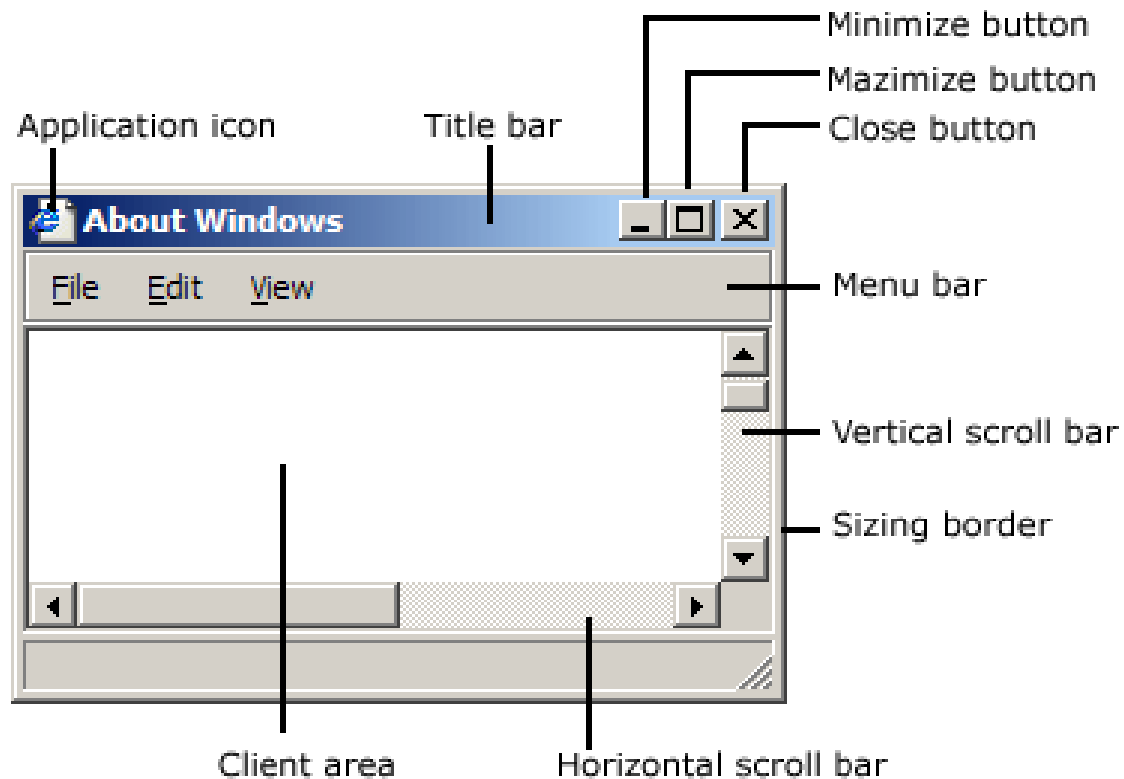
Příklad v C/C++ pro MS Windows

```
▣ LRESULT CALLBACK WndProc(HWND hWnd, UINT message, WPARAM wParam, LPARAM lParam)
{
    int wmId, wmEvent;
    PAINTSTRUCT ps;
    HDC hdc;

    ▣ switch (message)
    {
        ▣ case WM_COMMAND:
            wmId    = LOWORD(wParam);
            wmEvent = HIWORD(wParam);
            // Parse the menu selections:
            switch (wmId)
            {
                case IDM_ABOUT:
                    DialogBox(hInst, (LPCTSTR)IDD_ABOUTBOX, hWnd, (DLGPROC)About);
                    break;
                case IDM_EXIT:
                    DestroyWindow(hWnd);
                    break;
                default:
                    return DefWindowProc(hWnd, message, wParam, lParam);
            }
            break;
        case WM_PAINT:
            hdc = BeginPaint(hWnd, &ps);
            // TODO: Add any drawing code here...
            EndPaint(hWnd, &ps);
            break;
        case WM_DESTROY:
            PostQuitMessage(0);
            break;
        default:
            return DefWindowProc(hWnd, message, wParam, lParam);
    }
    return 0;
}
```

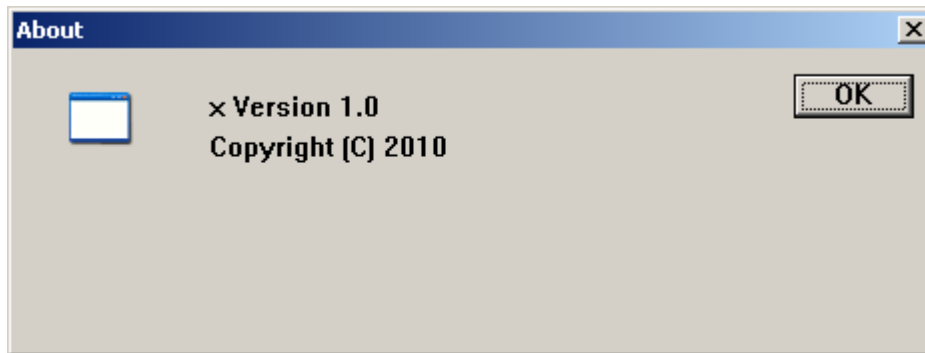
Okno

- Základní prvky okna



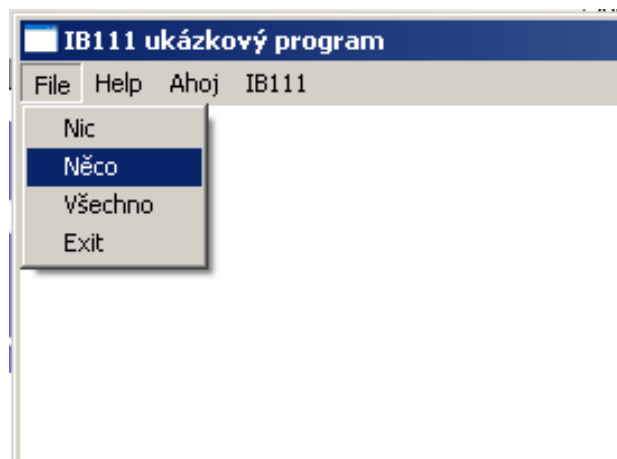
Okna

- Okno rodičovské a dětské
- Okno rodičovské se často skládá z několika oken dětských
 - Widget – grafické objekt s určitou funkcí
 - Např. tlačítko

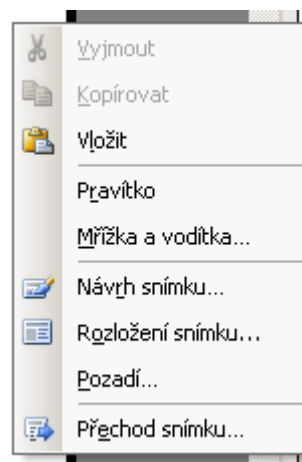


Prvky GUI

- Hlavní menu



- Kontextové menu



Prvky GUI

- Button



- Edit Box

A screenshot of a GUI form with two text input fields. The first field is labeled "Jméno:" and the second is labeled "Příjmení:". Both fields are empty and have a light gray background.

Prvky GUI

- Check Box

Souhlasím se vším ...

- Radio Buttons

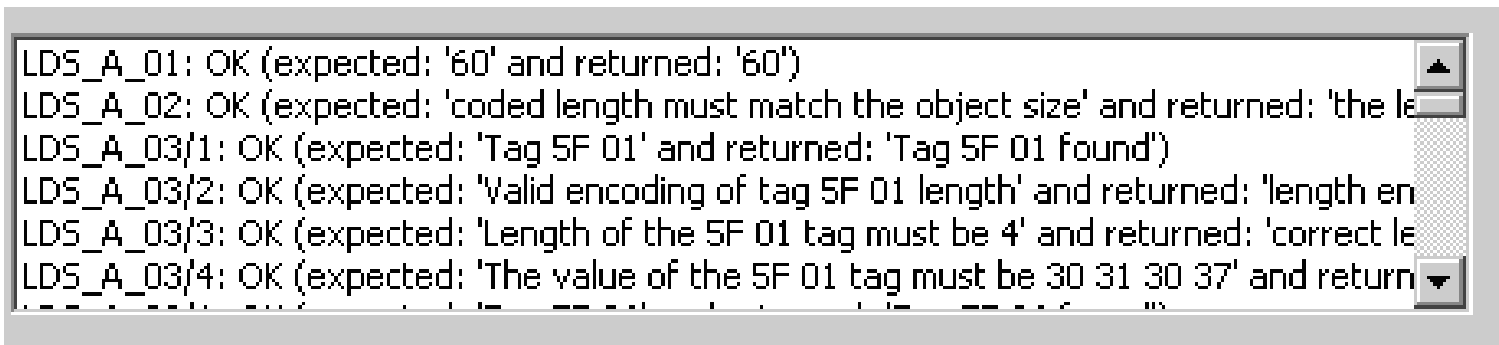
Nechci nic

Chci jen něco

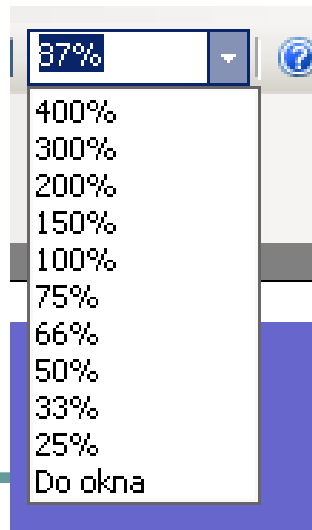
Chci všechno

Prvky GUI

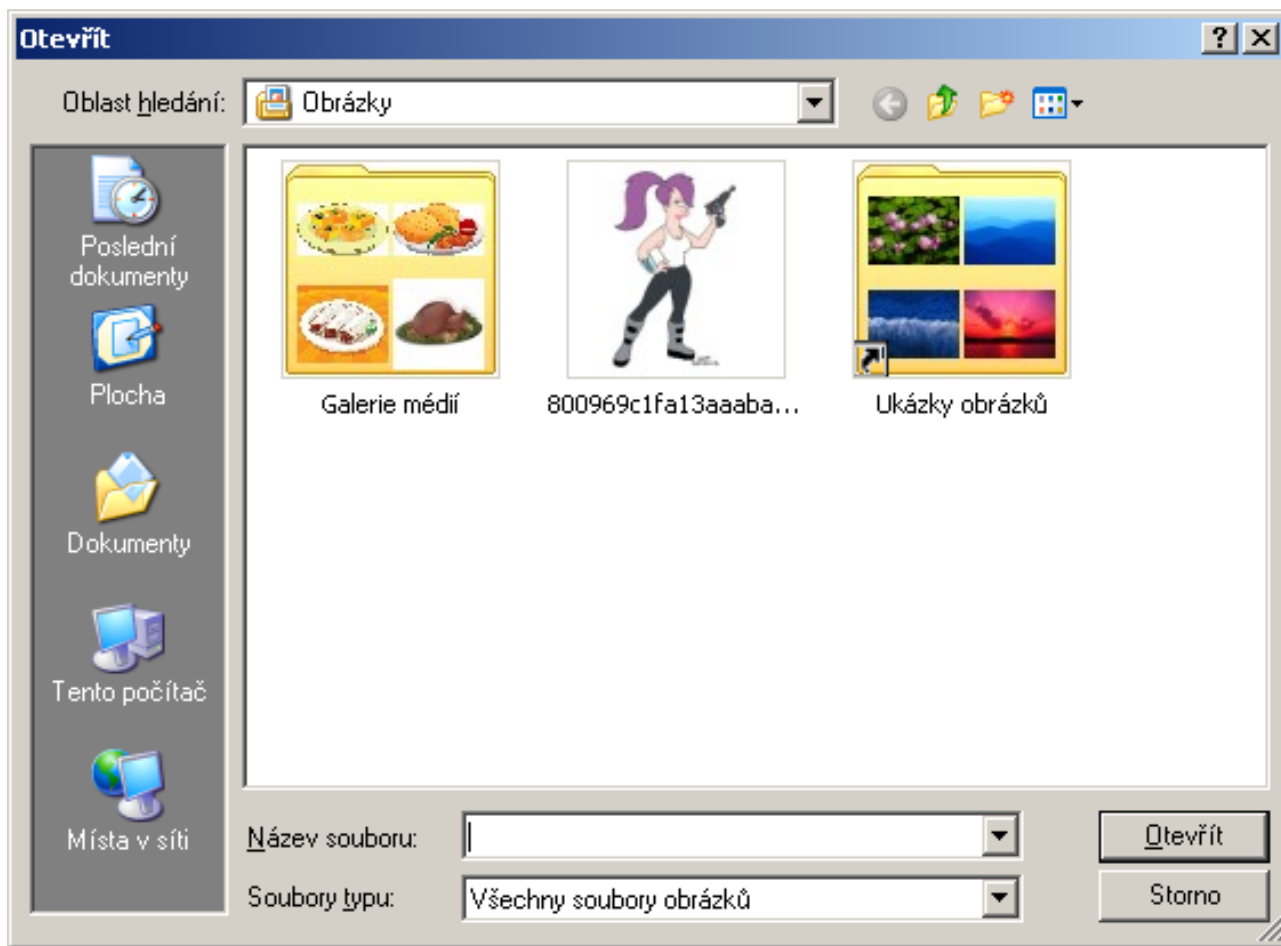
- List Box



- Combo Box



Společné dialogové boxy



Historický příklad MacOS

Ovládací prvky Apple (Finder)

textové políčko

roletové menu ▼

šoupátko

tlačítka spouštějící akci

zaškrtnutá políčka

- | | |
|------------------------------------|------------------------------------|
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |

oblast ovládaná posuvníky

Historický příklad Windows 3.x

Ovládací prvky MS Windows 3.x

textové políčko

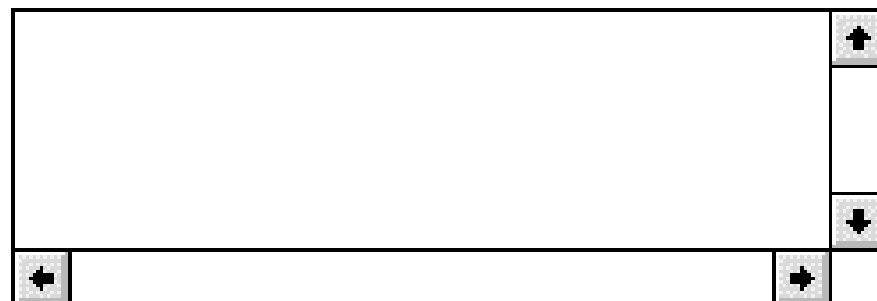
šoupátko

tlačítko spouštějící akci

zaškrťovací políčka

- | | |
|------------------------------------|------------------------------------|
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |
| <input type="radio"/> Radio Button | <input type="checkbox"/> Check Box |

oblast ovládaná posuvníky



GUI v pythonu

- Python má i nemá GUI (jak se to vezme)
- K dispozici na řadě platforem (OS)
 - Tkinter
 - wxWidgets
 - Qt
 - Gtk+
 - FLTK
 - FOX
 - OpenGL
- Plus několik specifických
 - Mac: The Mac port
 - Windows: Pythonwin (používá MFC)

Tkinter

- Na cvičení si ukážeme několik příkladů v Tkinter
- Začneme importem
 - `import Tkinter`
nebo
 - `from Tkinter import *`

Tkinter „Hello world“

```
from Tkinter import *  
root = Tk()  
w = Label(root, text="Hello, world!")  
w.pack()  
root.mainloop()
```



Základní „widgets“ v Tkinter

Widget	Description
Button	A simple button, used to execute a command or other operation.
Canvas	Structured graphics. This widget can be used to draw graphs and plots, create graphics editors, and to implement custom widgets.
Checkbutton	Represents a variable that can have two distinct values. Clicking the button toggles between the values.
Entry	A text entry field.
Frame	A container widget. The frame can have a border and a background, and is used to group other widgets when creating an application or dialog layout.
Label	Displays a text or an image.
Listbox	Displays a list of alternatives. The listbox can be configured to get radiobutton or checklist behavior.
Menu	A menu pane. Used to implement pulldown and popup menus.
Menubutton	A menubutton. Used to implement pulldown menus.
Message	Display a text. Similar to the label widget, but can automatically wrap text to a given width or aspect ratio.
Radiobutton	Represents one value of a variable that can have one of many values. Clicking the button sets the variable to that value, and clears all other radiobuttons associated with the same variable.
Scale	Allows you to set a numerical value by dragging a “slider”.
Scrollbar	Standard scrollbars for use with canvas, entry, listbox, and text widgets.
Text	Formatted text display. Allows you to display and edit text with various styles and attributes. Also supports embedded images and windows.
Toplevel	A container widget displayed as a separate, top-level window.