Graphical Device Interface
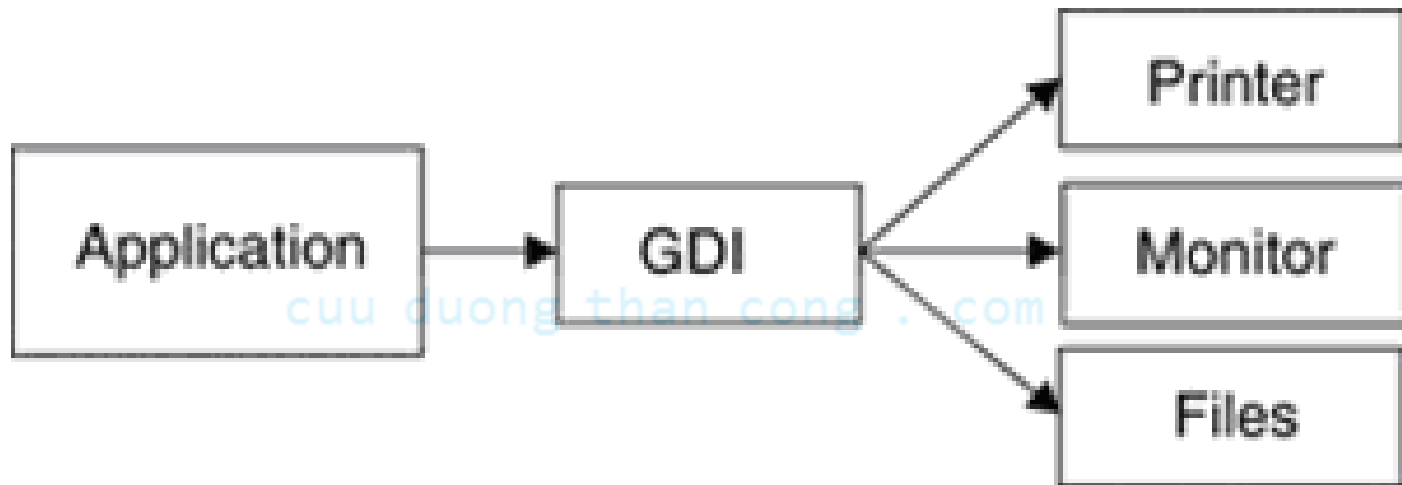
Windows programming

Graphics hardware

- ❑ Applications do not have direct access
- ❑ Instead, GDI interacts with device drivers on behalf of applications

Device context

❑ A structure storing parameters of graphical device

- Current object: Pen, Brush, Font..

- Drawing mode

- Pen position

- …

❑ An application performs drawing operations through the device's DC

Device examples

- ❑ Monitor
- ❑ Printer
- ❑ File (PDF / Bitmap)
- ❑ Projector
- ❑ ...

❑ Display DC

- BeginPaint, GetDC
- EndPaint, ReleaseDC

❑ Printer DC

- CreateDC
- DeleteDC

❑ Memory DC

- Compatiable with logic device, use for preparation
- CreateCompatibleDC, BitBlt
- DeleteDC

WM_PAINT

- ❑ Receive when something needs to be repaint
- ❑ UpdateWindow, RedrawWindow, InvalidateRect cause window to repaint too
- ❑ Get device context in WM_PAINT: BeginPaint

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Example

```
case WM_PAINT:
        hdc = BeginPaint(hWnd, &ps);
        // TODO: Add any drawing code here...
        EndPaint(hWnd, &ps);


case WM_MOUSEMOVE:
    if (wParam & MK_LBUTTON) {
        int x = LOWORD(lParam);
        int y = HIWORD(lParam);
        HDC hdc=GetDC(hWnd);
        SetPixel(hdc, x, y, RGB(0,0,0));
        ReleaseDC(hWnd, hdc);
    }
```

Basic drawing objects

Pen

❑ Line type, color, weight

❑ Use to draw line, arc

❑ CreatePen

  ▪ HPEN hpen = **CreatePen**(PS_SOLID, 10, RGB(0, 255, 0));

Brush

❑ How to fill closed boundary: circle, polylines

❑ Solid Brush

   ▪ HBRUSH hbrush = **CreateSolidBrush**(RGB(255, 0, 0));

❑ Stock Brush (21)

   ▪ HBRUSH hbrush = **GetStockObject**(GRAY_BRUSH);

❑ Hatch Brush (6)

   ▪ HBRUSH hbrush = **CreateHatchBrush**(HS_CROSS, RGB(0,0,0));

❑ Pattern Brush

   ▪ HBRUSH hbrush = **CreatePatternBrush**(hBitmap);

Font

- ❑ Typeface: Times, Courier, Arial,…
- ❑ Style: normal, thin, bold,…
- ❑ Size: in point, 1 point = 1/72 inch = 0.013837 inch

- ❑ CreateFont

Drawing functions

- ❑ SetPixel
- ❑ LineTo
- ❑ MoveToEx
- ❑ Rectangle
- ❑ RoundRect
- ❑ Ellipse
- ❑ Arc
- ❑ DrawIcon
- ❑ DrawText
- ❑ FillRect
- ❑ FillRgn
- ❑ Polygon

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Example

```
hdc = BeginPaint(hWnd, &ps);
HPEN hPen=CreatePen(PS_DASHDOT, 3, RGB(255,0,255));
SelectObject(hdc,hPen);

MoveToEx(hdc,100,100,NULL);
LineTo(hdc,200,200);

Rectangle(hdc,100, 200, 300, 300);
HRGN hRegion = CreateEllipticRgn(100, 200, 300, 300);
HBRUSH hbrush = CreateSolidBrush(RGB(23,100, 40));
FillRgn(hdc, hRegion, hbrush);

DeleteObject(hPen);
EndPaint(hWnd, &ps);
```

Extra reading

❑ Guide on Win Memory DC

- ▪ http://www.codeproject.com/Articles/224754/Guide-to-Win-Memory-DC