

Drawing Attributes

- All drawn objects have attributes

 - Line widths
 - Fill
- These are often specified in a structure
 - Qt: QPainter Object
 - X: Graphics Context (GC)
 - Windows: Device Context (CDC)



Color

[see http://doc.trolltech.com/qcolor.html]

- Specified by electron gun settings
 - Red, Green, and Blue
 - Great for hardware, poor for the user?
- Predefined X color names (known by Qt)
 - Predefined names for standard colors
 - Look for rgb.txt
 - dpkg --search rgb.txt
 find /usr -name rgb.txt
 - Mapped to RGB values
- QColor (Qt color class)
- Other color models are available



Palettes

- Systems allow lots of colors
- Images use many fewer
 - Why store so many bits/pixel?
 - When most colors are not used
- Solution
 - Only allow a subset of the colors
 - At any one time

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Palette Example

- Typical modern system
 - 24 bits/pixel → 16 M colors
- Limited palette
 - 16 colors at a time → 4 bits/color ID



Often implemented in hardware



Palettes and Qt

- A QPalette is not a true palette
- It describes a group of related colors
 - Provide for a consistent look
- Based on a few colors
 - e.g., Foreground and Background
- Similar to the Windows appearance schemes

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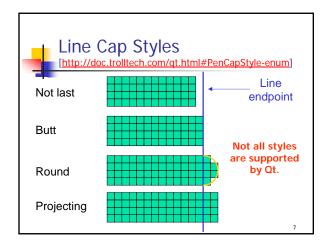
Line Attributes

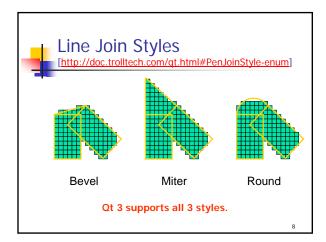
[see http://doc.trolltech.com/qpen.html]

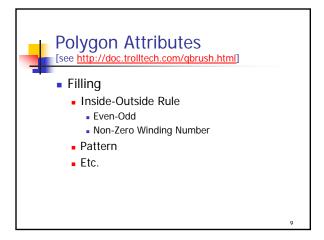
- Width
 - How many pixels wide is a line
 - Draw rectangle or lines parallel to ideal line
- Style
 - Solid, Dashed, etc.
 - Skip pixels while drawing

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Modern Windowing Systems

- Program flow is NOT sequential
- Order of execution is up to the user
 - When...
 - Buttons pressed
 - Keys typed
 - Mouse moved over a window
 - Etc.

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Events and Callbacks

- GUI and mouse activity is registered
 - Actions are associated with functions
 - Events user actions
 - Callbacks registered functions
- Each action can trigger a callback
 - Similar to interrupt service routines

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Callback Features

- Should return in a reasonable period of time
 - Don't wait for additional user input
 - Stalls application
- How do we keep track? (e.g., press-drag-release)
 - View as state machine
 - State information in member variables
 - Messages (callbacks from the windowing system to your objects) trigger response and change of state

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X Window System

- Network aware windowing system
 - Distributed processes
- Client-Server model
 - E.g., Defiant code is the client
 - Laptop is the server
 - Multiple servers can be used
 - More than one "terminal"
- Qt Runs on top of X

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Server Software: XFree86

- XFree86 is X Server software for *nix
 - xterm a terminal window that runs under X
 - ssh secure login to and forwarding of X traffic between local machine and defiant
 - TCP/IP session (address, port, ...) between client and server
 - Client trades messages with server
- Efficient use of network
 - Data structures stored by client and server
 Pens, colors, etc.
- Device independent graphics!

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