Welcome

To Advance through Presentation
Use Page Up and Page Down Keys

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HLTB: Carbon Events

Ed Voas

Manager, Tech Lead, Jedi
High Level Toolbox

Carbon Events

- New underlying event system
- Classic routines (WNE) are built on top
- Exposes new way of receiving events

Why a New Model?

- Greatly simplifies writing applications
- Provides default behaviors
- Unification of different messaging models
- Better support for plug-ins
- API encourages performance

Classic Model

- App calls WaitNextEvent/GetNextEvent
- Decides what to do with the event
- Receives null events to do idle processing
- You write the same code many times

Carbon Model

- App calls RunApplicationEventLoop
- Events are dispatched directly to objects
- Timers enable idle processing
- You write no boilerplate code!

Carbon Event Basics

- Events are opaque—EventRefs
- Events can be posted or sent directly to an object
- Events can be requests or notifications
- Not cross-process
- Lightweight

Mouse Events

- Multiple-click detection is free
- Mouse moved events are always sent
- Multi-button mouse support

Keyboard Events

- High-level: Text Input events
    - Supports Unicode
    - Helps unify paste and key filtering
- Low-level: KeyUp/KeyDown events
- Key Modifiers Changed event

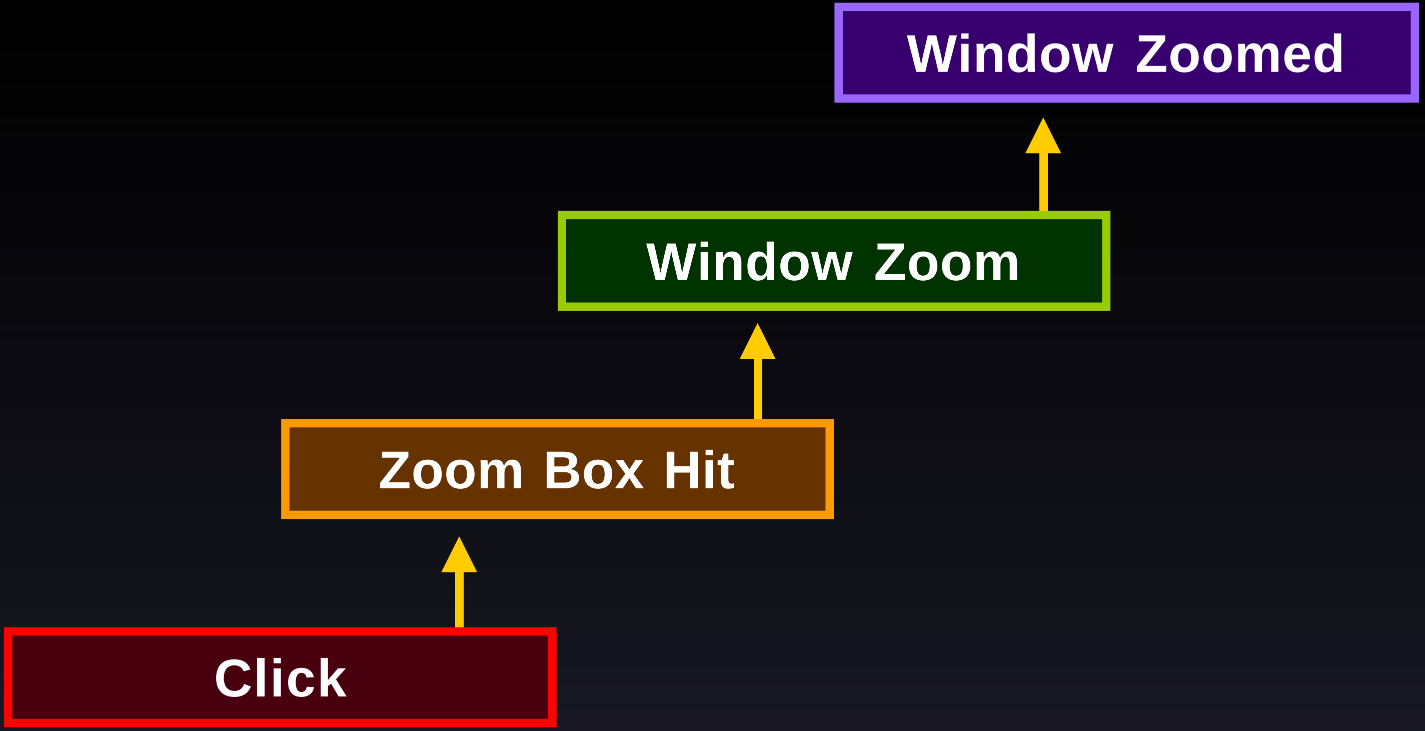
Toolbox Object Events

- Events for Window, Controls, Menus
- Many are defined now, more to come
- Examples
    - kEventWindowMoved
    - kEventControlHit

Event Evolution

- Events go from low-level to high-level in meaning
- Listening to higher level events means less work

Event Evolution



Window Zoomed

Window Zoom

Zoom Box Hit

Click

Processing Events

- High-Level
  - RunApplicationEventLoop
  - QuitApplicationEventLoop
- Low-Level (no dispatching)
  - BlockUntilNextEvent
  - BlockUntilNextEventMatchingList

Idle Processing—Timers

- Replacement for null events
- Can be periodic or one-shot
- Finer granularity when running on Mac OS X
- Allows you to decentralize idle processing
- Work with WaitNextEvent
- Called even when mouse is down

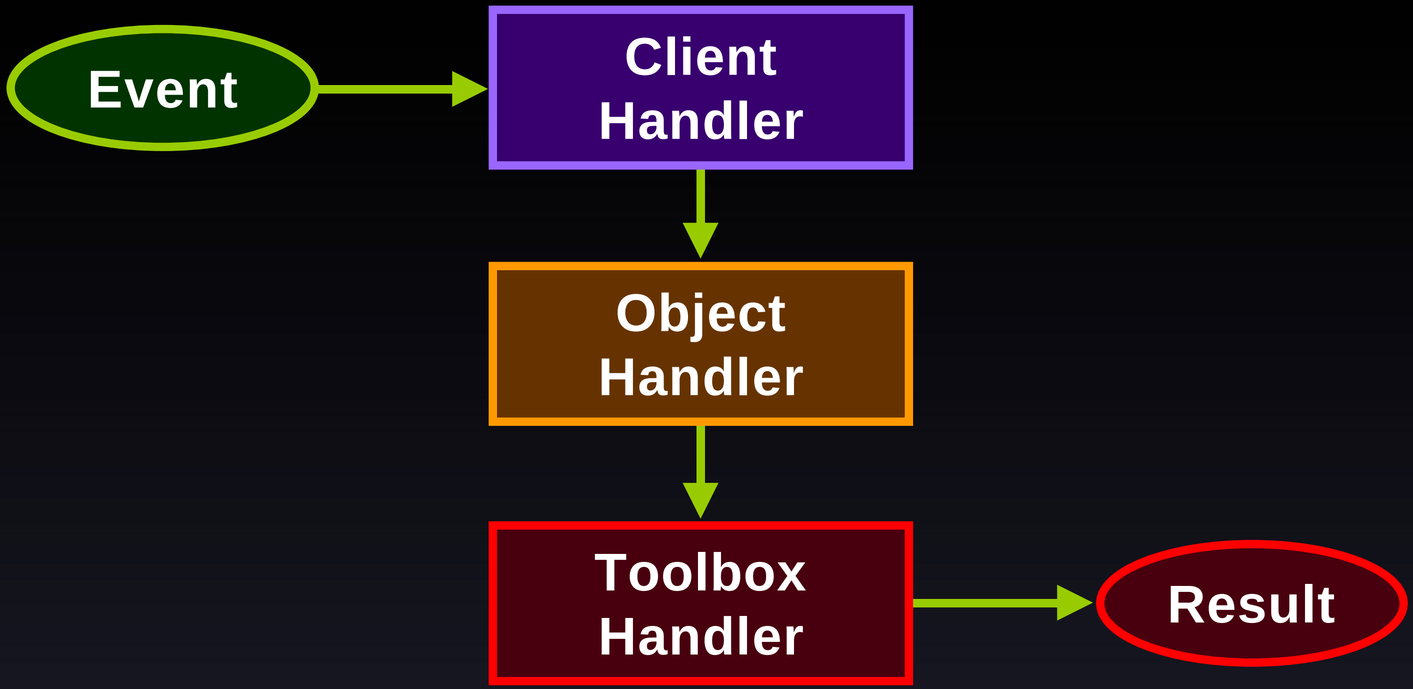
Event Loop Observers

- Watch for events outside of event loop
- Perform operations at certain times

Event Handlers

- Attached to Toolbox Objects
- Handlers are stacked
- Events propagate through stacks, then up the container hierarchy
- Allows overriding
- You can call through to the next handler

Stack 'Em Up


Event

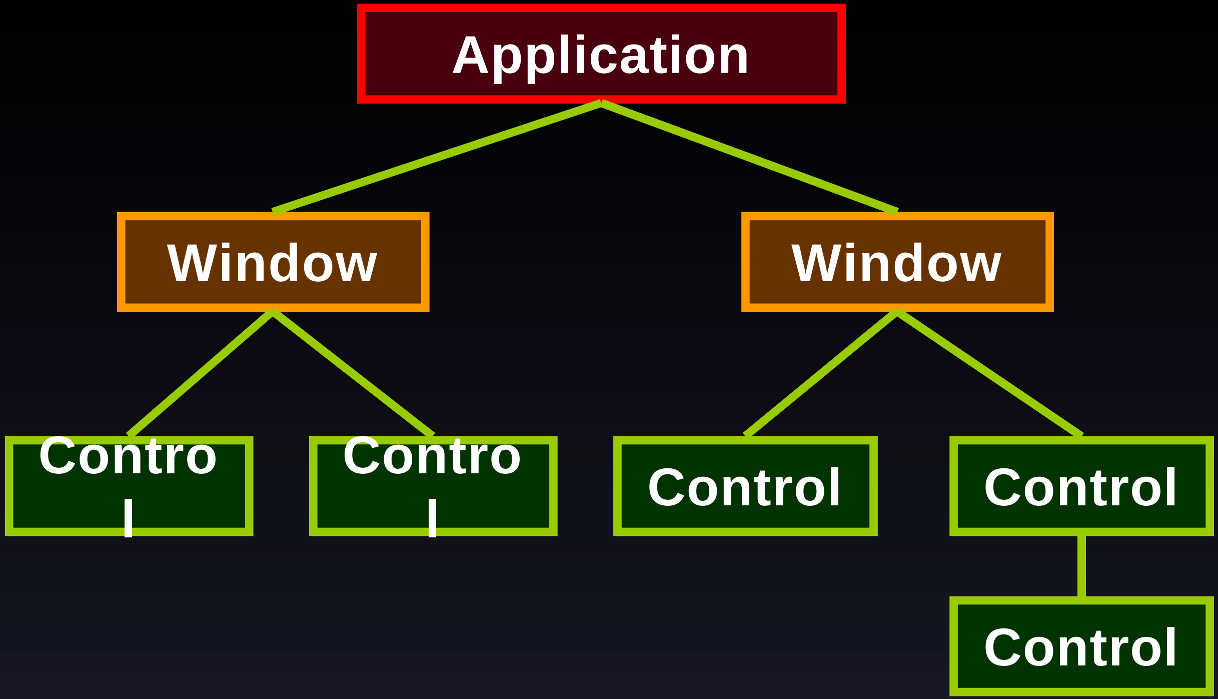
Client Handler

Object Handler

Toolbox Handler

Result

Container Hierarchy



Handle With Care

- If you don’t understand an event, propagate it
- Don’t assume the Toolbox will never use an event
- Make sure your handlers are reentrant

User Focus

- Can be a window and/or a control
- Keyboard input is automatically sent to the current user focus
- Normally managed by the toolbox
- Supports Validation

HICommands

- Expanded version of Menu Command IDs
- Predefined commands, such as quit
- Always sent to command chain
- Normally sent via command events

A Minimal Application

```
main ()
{
    InstallStandardMenuBar();

    CreateNewWindow( … );

    RunApplicationEventLoop();
}
```

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Demo

Guy Fullerton

Resident of Tatooine
Rebel Scum

What Dialog Manager?

- Obsolete with new event functionality
- Can specify Default/Cancel for a window
- Control IDs
- Control persistence
- Window modality without ModalDialog

Performance Tips

- Avoid Button, StillDown, and WaitMouseUp
  - Use TrackMouseLocation or TrackMouseRegion
- Avoid GetKeys/EventAvail in tight loops
  - Use ModifiersChanged event

Why Adopt?

- Maximum Functionality
- Minimum Code
- New Event Model = the Future
- Get new Toolbox features for free
- Gradual adoption path

Things You Can Do

- Check out CarbonEvents.h on the Mac OS X Developer Preview CD
- Start moving null event processing to use timers
- Give us lots of feedback!
  - toolbox@apple.com
  - Feedback session later today

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Q&A

Think different.™

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