

# GNUstep for Embedded Devices

## The QuantumSTEP project

Dr. H. Nikolaus Schaller  
Golden Delicious Computers GmbH&Co. KG  
Oberhaching, Germany  
hns@computer.org



# Why base a Handheld on GNUstep?

- Users (Application Developer)
  - GNUstep it's a very powerful GUI toolkit
  - it's very easy to write Applications
  - nice GNU/Linux capable devices are and will be available
  - it's MacOS X Cocoa compatible
  - it's an open platform! (you still hear the cry that iPhone is probably closed)
- GNUstep Developers
  - it's fun
  - it's challenging to develop the GUI Toolkit for constrained resources (memory, CPU, no FPU, pen-only operation)



# What is different to Desktop GNUstep?

- Processor: ARM (different flavors)
- Clock: 200-600MHz
- FPU: usually NO
- GPU: sometimes, but usually proprietary
- Memory: RAM 64MB (some with 128MB are coming)
- Flash: 64MB, but usually SD/CF expansion to GBytes
- Kernel: Linux 2.4.x or 2.6.x
- X11: most modern designs are X11 based (Maemo, OpenMoko)
- Input: pen = single button mouse; probably no keyboard

# What do you need to start?

- A Linux Device: Sharp Zaurus, FIC Neo1973, Nokia N770, Acer n30, HTC, ...
- A Host: optimally a Mac with Xcode
- A Cross-Compiler: gcc 2.95.3 (!)
- Core Libraries: libobjc.so, libX11, libpng, ...
  
- and ...

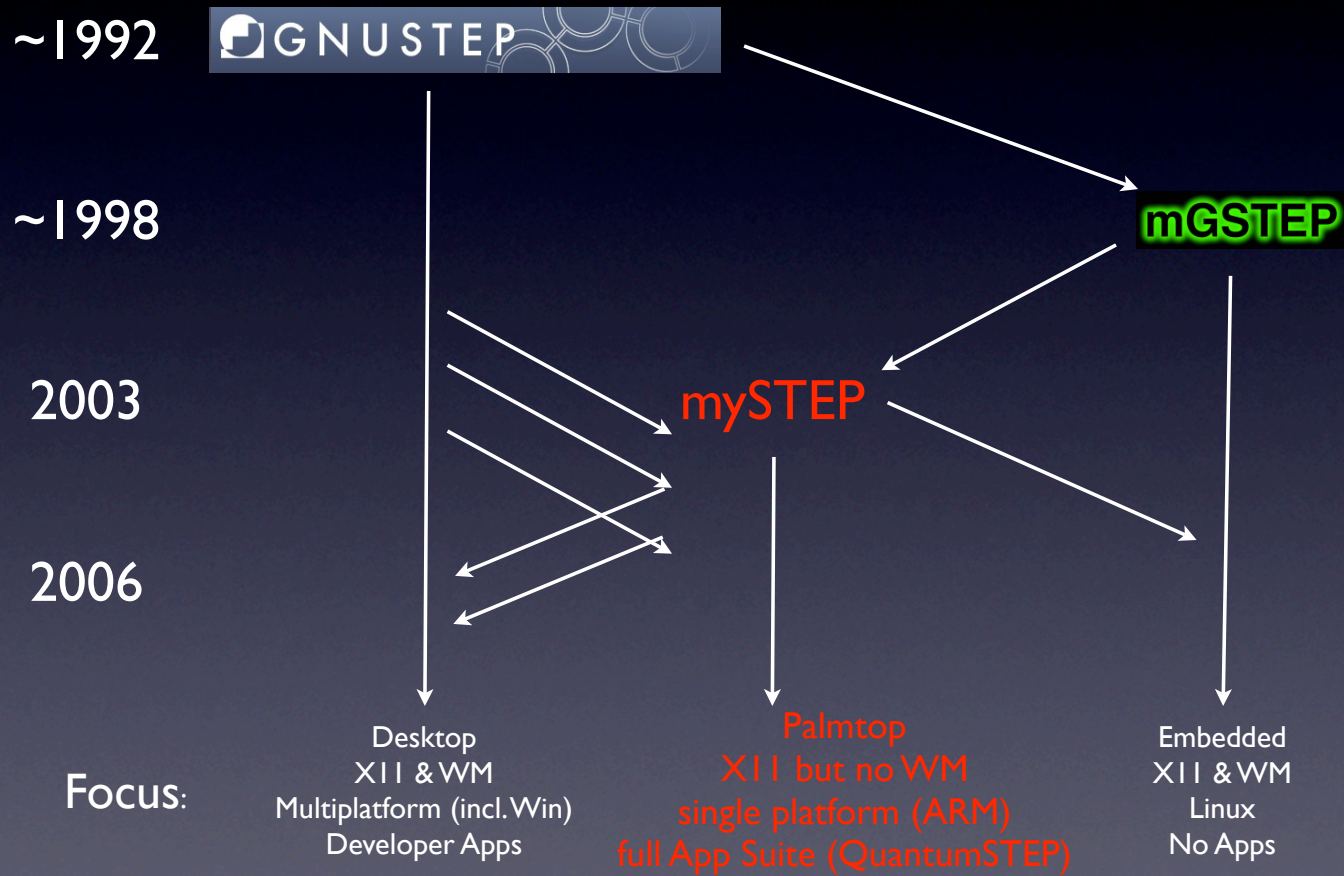
... embedded GNUstep

= mySTEP

+

QuantumSTEP (Runtime system)

# embedded GNUstep History and Forks



# What is new since presenting mySTEP at FOSDEM 2006?

- Foundation
- Backend
- NSViews
- other Frameworks
- new Applications

# Foundation

- header files reviewed to be 99.9% compatible to MacOS X API
- quite complete: 135 NIMPs for 211 @implementations
- now compatible for binary property lists
  - mySTEP had introduced a better but incompatible binary format long ago
- NSKeyedArchiver added
- NSPredicate, NSIndexSet added
- NSSStreams added (in preparation for NS(Socket)Stream to be used in NSURLConnection for https)
- full rewrite of the DO system to be API compatible
  - NSSocketPort and NSPortMessage are even Network compatible with MacOS X!
  - no effort so far to make NSPortCoder/NSConnection compatible



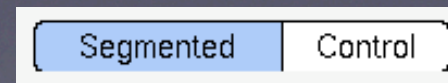
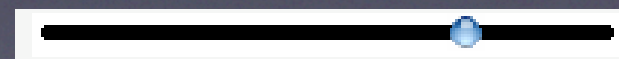
# Backend (X11)

- Backend and backend interface completely rewritten to use a quite small set of powerful primitives that can be easily rendered on X11 or into PDF e.g. :
  - - (void) \_setCTM:(NSAffineTransform \*) atm; 1.0 2.0 3.0 4.0 5.0 6.0 cm
  - - (void) \_draw:(NSImageRep \*) rep; /Im17 Do
  - - (void) \_fill:(NSBezierPath \*) path; 10.0 10.0 m 20.0 20.0 l f
- NSAffineTransform optimized for speed (lower number of float ops)
  - non-rotated identity transforms
  - flip-Y transforms
- fully handle NSBezierPaths
  - -stroke
  - -fill
  - -setClip, -addClip
  - only some X11 limitations remain with winding rule and complex paths
- set the window shape by a NSBezierPath
- prepared to wrap libfreetype into NSFont (not completed)



# NSViews

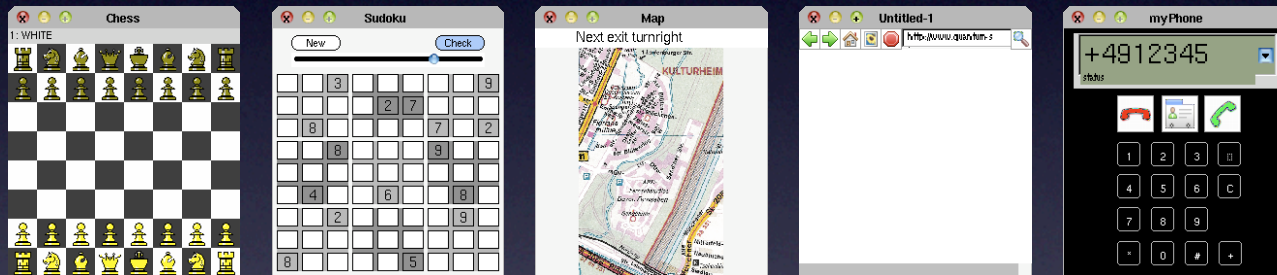
- drawing system reworked to support
  - - getRectsBeingDrawn:count:
- header files reviewed to be mostly compatible to MacOS X API
- Keyed NIB loading fully implemented (nib2mib deprecated)
- new and improved View classes e.g.
  - NSLevelIndicator added
  - NSSlider adapted
  - NSSegmentedControl added



# Other Frameworks\*

- SimpleWebKit.framework
  - WebView handles first HTML
  - WebFrame
  - ... full WebKit is Open Source but needs Objective-C++ (gcc 2.95.3?)
- PDFKit.framework mostly complete
  - PDFView
- QTKit.framework started (to replace NSMovie, NSMovieView)
  - QTVView
  - QTMovie
- IOBluetooth.framework started
  - to allow compatible management of Bluetooth in Handhelds

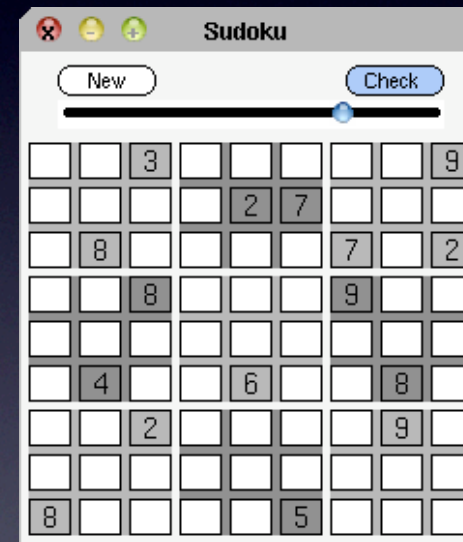
# Some New Applications of QuantumSTEP



# Games

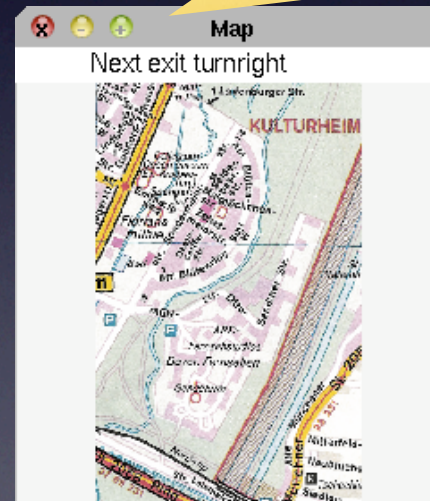
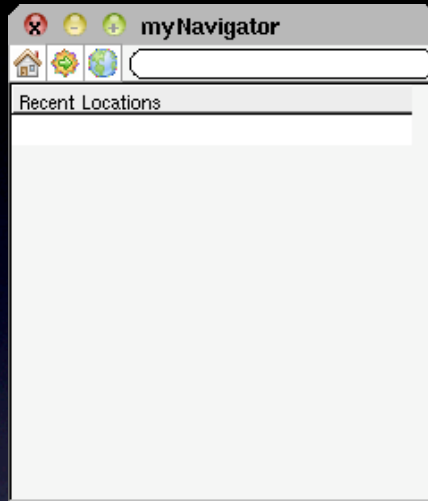


GNUchess frontend  
~1000 LOC + IB



just 200 LOC + IB

# myNavigator



[NSSpeechSynthesizer  
startSpeakingString:@"Next exit turn right"]

libflite wrapper?

- Well, it is just a Frontend
- no Location Database  
-> OpenGeoDB?
- no Maps
- but GPS interface works

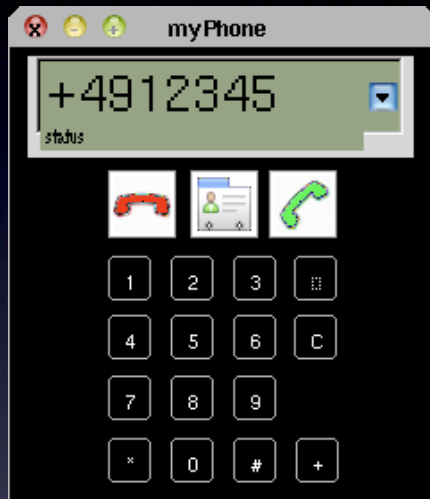


# myAfrica



- uses SimpleWebKit.framework
  - WebView
  - WebFrame
  - WebFrameView
  - WebDataSource
  - NSXMLParser
  - NSURLConnection
  - NSURLRequest, NSURLResponse
  - and some others
- Completely written in Objective-C (no C++, KHTML wrappers)
- Will handle more and more HTML

# myPhone



- Phone dialler
- GUI complete
- interface through the kernel to a GSM module (AT commands) is missing





# Next Steps

- Bug fixing & bug fixing & bug fixing...
- Memory capacity...
- optimize for missing FPU - even NSLog() and NSRunLoop use a lot of float&double operations
- support of X11 render extension
- use of libfreetype
- X11 double buffering is currently broken
- better Handwriting recognition
- Killer-Apps: myTunes, myPhoto...
- ASR and OCR
- Add 10.5 extensions as they become public

# QuantumSTEP and Devices

- Zaurus - working\*
- Letux / Acer n30 - working\*
- OpenMoko / Neo1973 - coming
- Xanadux / HTC Omni - in discussion
  
- Which one would you prefer with embedded GNUstep over an iPhone (if any)?
- Some aspects to consider:
  - GNUstep = Open Platform but still Mac compatible
  - QWERTY keyboard
  - VGA display and beyond
  - UMTS, ...



# And now to the Demo...

More Info: <http://www.quantum-step.com>

# Project Status

- Demo 1: Running QuantumSTEP on a Sharp Zaurus C860
- Demo 2: Creating and Cross-Compiling an Apple Sample Project
  - 1) download Apple <http://developer.apple.com/samplecode/NSFontAttributeExplorer/index.html>
  - 2) add shell script build phase and configure
  - 3) compile
  - 4) run on network connected Zaurus with X11-Server on Mac

