# Hacking from the Palm of your Hand

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DEFCON - August 01, 2003

Where Security & Business Intersect℠

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# Agenda

- **Goals**
- **Past**
  - Overview of the Palm Platform
  - Hacker Tools on the Palm
- **Present**
  - AUSTIN - A Palm OS Vulnerability Scanner
  - Architecture
  - Features
  - Demos
  - But wait, there's more!!!
- **Future**
  - New Features

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# Goals

- **Overview of Palm OS as a hacking platform**
- **Walkthrough of a Palm OS-based vulnerability scanner**
  - Architecture
  - Features & how they're implemented
  - Lessons learned
- **Release a new tool for Palm OS**
- **Have Fun!**

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# The Past

**Trivia Questions:**

What was the first Palm Pilot called? How much memory did it have?

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# The Palm Platform

- **Old**
  - Motorola 68K processor
  - Max speed 66MHz
  - RAM 2-16MB
  - Typical resolution 160^2
  - Some color, some b/w screens
  - Serial/USB port
  - IR
  - Some expansion slots
  - PalmOS 4.x and below
- **New**
  - ARM processor
  - Max speed 150? 200? 400? MHz
  - RAM 16-32MB
  - Typical resolution 320^2
  - All color
  - USB port
  - IR
  - Expansion slots
  - PalmOS 5.x and above

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# Security Tools

- **Password Generators**
  http://www.freewarepalm.com/utilities/passgen.shtml
  http://www.freewarepalm.com/utilities/passphrase.shtml
- **Encryption**
  http://cryptopad.sourceforge.net/
  http://linkesoft.com/secret/
- **Password Crackers (old)**
  http://atstake.com/research/tools/password_auditing/
- **War Dialer**
  http://atstake.com/research/tools/info_gathering/

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# Communication Tools

- **Telnet**
  http://netpage.em.com.br/mmand/ptelnet.htm
- **SSH (v1 only)**
  http://online.offshore.com.ai/~iang/TGssh/
- **Web & Mail**
  http://www.eudora.com/internetsuite/
- **Ping**
  http://www.mergic.com/vpnDownloads.php

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# Communication Tools (continued)

- **FTP**
  http://lthaler.free.fr/
- **IR Tools**
  http://pamupamu.tripod.co.jp/soft/irmenu/irm.htm
  http://www.harbaum.org/till/palm/ir_ping/
  http://www.pacificneotek.com/omniProfsw.htm

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# Dev Tools

- **RPN Calculator**
  http://nthlab.com/
- **Longtime**
  Search on http://palmgear.com/
- **Filez**
  http://nosleep.net/
- **RsrcEdit**
  http://quartus.net/products/rsrcedit/
- **OnBoard C**
  http://onboardc.sourceforge.net/

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# Useful/Interesting Hardware

- Serial/USB cable
- Keyboard
- GPS
- Modem
- Expansion slot gadgets
- Tilt switch
- IR booster
- Speedometer
- Robotics
- …

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# The Present

**Trivia Question:**

How many Palm OS handhelds are in the market today?

Compact "Slider" Design

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# Palm Vulnerability Scanner

- **Why?**
- **What?**
  - TCP & UDP scanning
  - Multiple hosts/ports
  - Banner grabbing
  - Save results in re-useable format
  - Standalone/self-contained program
- **What about other scanners?**

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# Choosing a Development Environment…

- C / C++
- Assembly
- CASL
- AppForge
- NS Basic
- Satellite Forms
- DB2 Personal App Builder
- Java (many flavors)
- Forth
- PocketStudio (Pascal)
- PocketC
- Smalltalk
- Perl
- Python

Even more tools at: http://www.palmos.com/dev/tools/

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# Technical Features

- **Must have**
  - Leverage Palm UI
  - Responsive
  - Extensible
  - Development on PC
- **Nice to have**
  - Development on Palm
- **Most important**
  - Re-use other components

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# PocketC Overview

- Interpreted C-like language
- Variable types: int, float, char, string, pointer
- Multi-dimensional arrays
- Structs possible through a (minor) hack
- Reasonably fast
- Allows development on Palm + PC platforms
- Extensible

**Example:**

```
//helloworld.pc

main()

{

    puts("Hello world!\n");

}
```

http://www.orbworks.com/pcpalm/index.html

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# Extending PocketC

- **Can be done in two ways**
  - PocketC include files
  - Native (C/C++) libraries
- **Must-have PocketC library**
  - Pocket Toolbox by Joe Stadolnik
    http://www.geocities.com/retro_01775/PToolboxLib.htm
  - Features:
    - Full access to Palm OS GUI functions
    - Database functions
    - Graphic functions
    - Much more...

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# Presenting… AUSTIN

- AUSTIN stands for
  - At Stake
  - Ultralight
  - Scanning
  - Tool (for the)
  - Inter-
  - Net

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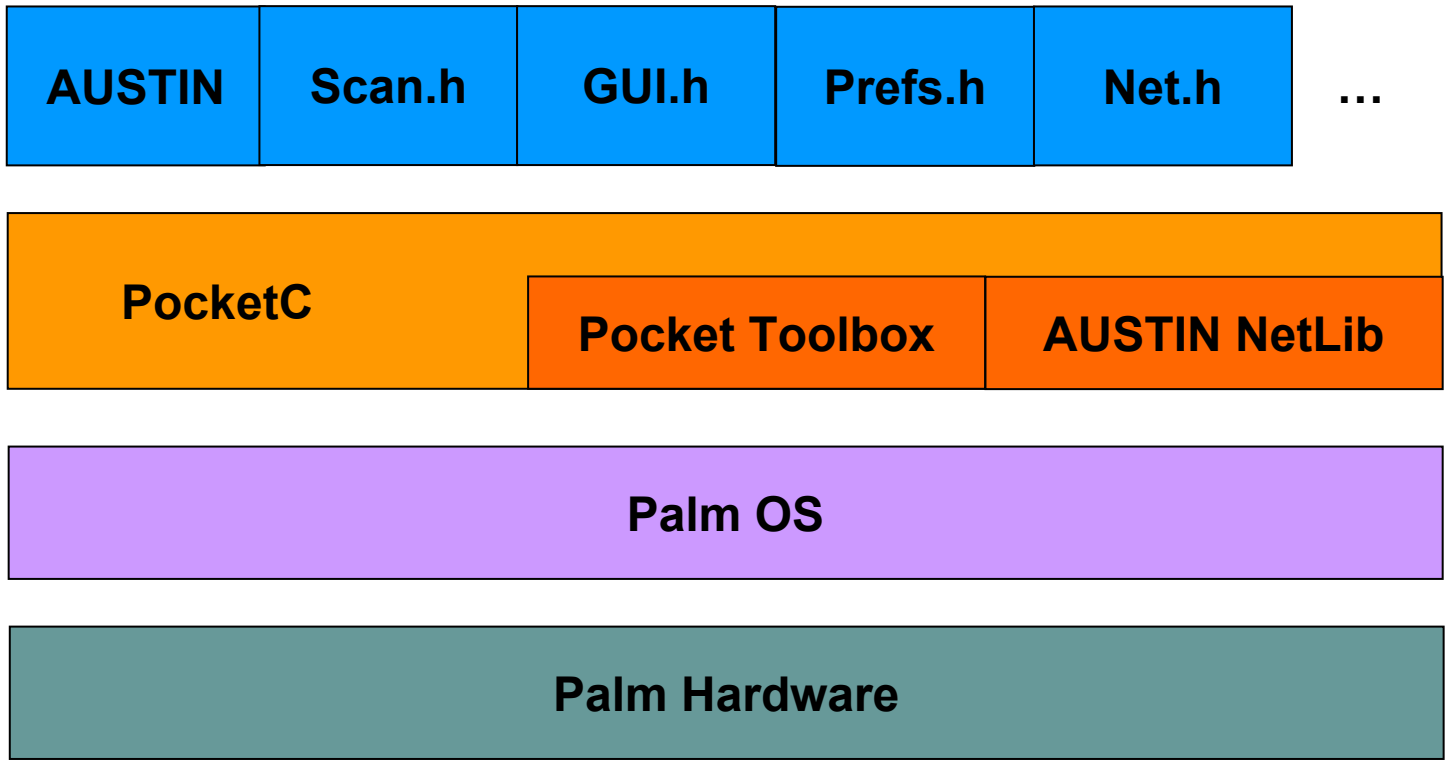
# AUSTIN Architecture



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# Tools Used To Develop AUSTIN

**Lesson Learned:**

When adding PRCs to POSE always do so when the Palm is displaying Applications.

- **POSE - Palm OS Emulator**
  http://www.palmos.com/dev/tools/emulator/
- **PDE - PocketC Desktop Environment**
  http://www.orbworks.com/pcpalm/index.html
- **PRC-Tools - Includes gcc and other tools used to create Palm executables**
  http://prc-tools.sourceforge.net/
- **Palm SDK**
  http://www.palmos.com/dev/tools/sdk/
- **PilRC**
  http://www.ardiri.com/index.php?redir=palm&cat=pilrc

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# Palm OS NetLib

- **Provides network services to Palm OS applications**
  - Stream-based communications using TCP
  - Datagram-based communications using UDP
  - Raw IP available too
- **In addition to native Palm OS function calls, NetLib also supports the Berkeley Socket API**

**Lesson Learned:**

Using the native NetLib calls gives you much better control over network communications, such as the ability to set timeouts.

**Lesson Learned:**

Close sockets as soon as you no longer need them, you only have half a dozen to play with!

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# Native Network Library

- **AUSTIN Net Lib implemented in C as a PocketC native library**
- **Implements the following calls**
  - `netLibInit(…)`
  - `netLibVersion(…)`
  - `netSetTimeout(…)`
  - `netGetError(…)`
  - `netLibClose(…)`
  - `netTCPConnect(…)`
  - `netSocketConnect(…)`
  - `netSocketOpen(…)`
  - `netSocketReceive(…)`
  - `netSocketSend(…)`
  - `netSocketClose(…)`

**Lesson Learned:**

Default timeout is 5 seconds, you may need to increase this if you're on a slow connection, see the Preferences database.

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# Example: netSocketSend()

```
// sends data via socket
// int netSocketSend(int socket, string data, int length,
                        int flags, pointer error)
// returns number of bytes sent

void netSocketSend(PocketCLibGlobalsPtr gP) {
   Value vSocket, vString, vLength, vFlags, vErrorPtr, *errP;
   char *buf;
   Int16 bytes;

   // get parameters
   gP->pop(vErrorPtr);
   gP->pop(vFlags);
   gP->pop(vLength);
   gP->pop(vString);
   gP->pop(vSocket);
```

# Example: netSocketSend() (continued)

```
    // dereference the error ptr
    errP = gP->deref(vErrorPtr.iVal);

    // lock string before modification
    buf = (char *) MemHandleLock(vString.sVal);

    // send data, capture number of bytes sent
    bytes = NetLibSend(AppNetRefnum, vSocket.iVal, buf, vLength.iVal,
                       vFlags.iVal, 0, 0, gP->timeout, &(gP->error));

    // cleanup
    MemHandleUnlock(vString.sVal);
    gP->cleanup(vString);

    // return number of bytes sent, set error ptr
    gP->retVal->iVal = bytes;
    errP->iVal = gP->error;
}
```

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# HTTP HEAD with AUSTIN Net Lib & Net.h

```
//http_head.pc
library "AUSTIN_NetLib"
#include "Net.h"

main() {
   int err, port, socket, bytes;
   string result, host, toSend = "HEAD / HTTP/1.0\r\n\r\n";

   err = initNet();
   host = getsd("Connect to?", "192.168.199.129");
   port = getsd("Port?", "80");

   socket = tcpConnect(host, 80);
   if (socket >= 0) {
         bytes = tcpWrite(socket, toSend);
         bytes = tcpRead(socket, &result, 200);
         puts("Received " + result);
         tcpClose(socket);
   }
   clearNet();
}
```

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# More Lessons Learned about Native Libraries

- Read all the PocketC documentation on native libs (i.e. that one file in the docs/ folder :-)
- Make sure you have your dev environment set up correctly, i.e. all the include files and all the lib files
- Go to the PocketC forums and read the discussions that have mentioned native libs (some have code samples)
- Use AUSTIN Net Lib as a basis for your own libs (and re-use the makefile too!)

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# Database Access

- **Pocket Toolbox manipulates two DB formats**
  - Pilot-DB (GPL)
  - HanDBase (Commercial)
- **Databases are used throughout AUSTIN**
  - Preferences
  - Web vulnerabilities
  - Results

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# Graphical User Interfaces

- **Two ways to create GUIs on Palm OS**
  - Dynamically (i.e. programmatically)
  - Resource files (i.e. using PilRC to create a resource file)
- **Part of AUSTIN's resource file**

```
FORM ID 4000 AT (0 0 160 160)
NOFRAME
MENUID 8000
BEGIN
  TITLE "AUSTIN"
  BUTTON "Scan!" ID 4201 AT (121 2 AUTO 9) FONT 1
  LABEL "Options:" AUTOID AT (0 78) FONT 0
  CHECKBOX "TCP Scan" ID 4301 AT (48 62 AUTO AUTO) FONT 0
```

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# Scheduled Scanning

- **AUSTIN can scan at regular intervals**
- **Users can specify**
  - Number of scans
  - Minutes between scans
  - Whether to scan or sleep first

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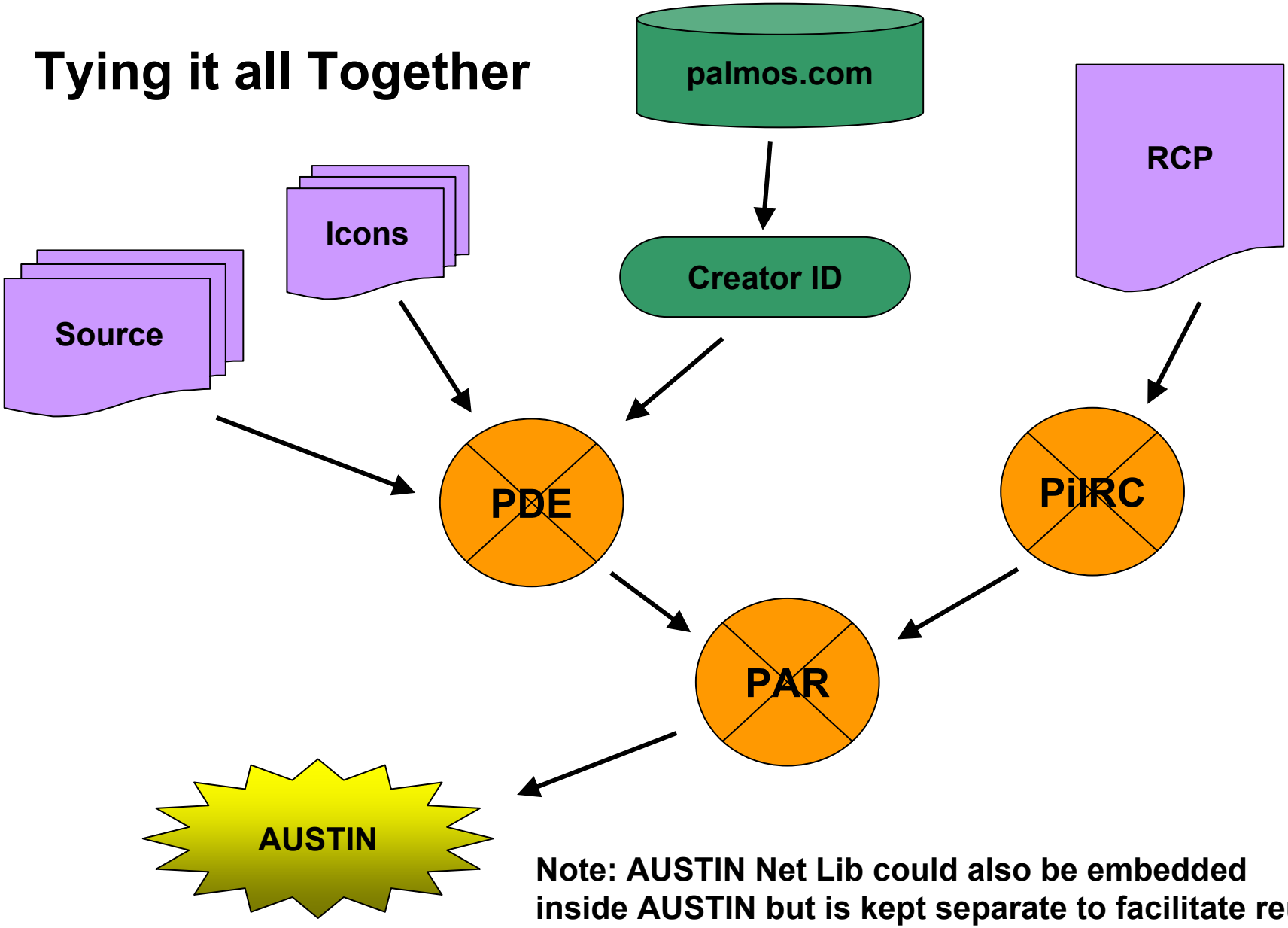
# Tying it all Together




**Note: AUSTIN Net Lib could also be embedded inside AUSTIN but is kept separate to facilitate reuse**

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# But wait! There's more!!!

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# @stake SonyEricsson P800 Development

- What is the P800?
- @stake NetScan
- @stake MobilePenTester
- @stake PDAZap
- Where can we get them?
- Advert for CCC / Thanks

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# What is the P800?

- **Cell-phone**
  - GSM
  - GPRS
  - HSCD
  - Tri-band
- **PDA**
  - Symbian OS Based
  - 12mb Internal Flash
  - Memory Stick Duo ™ Support
- **Other**
  - Bluetooth Support
  - Camera

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# @stake NetScan

- **What is it?**
  - TCP/UDP port scanner
- **Why did you develop it?**
  - Cutting our teeth on Symbian development
- **Features?**
  - TCP/UDP
  - Ports 1 to 65535
  - Timeout configuration
  - Basic error checking

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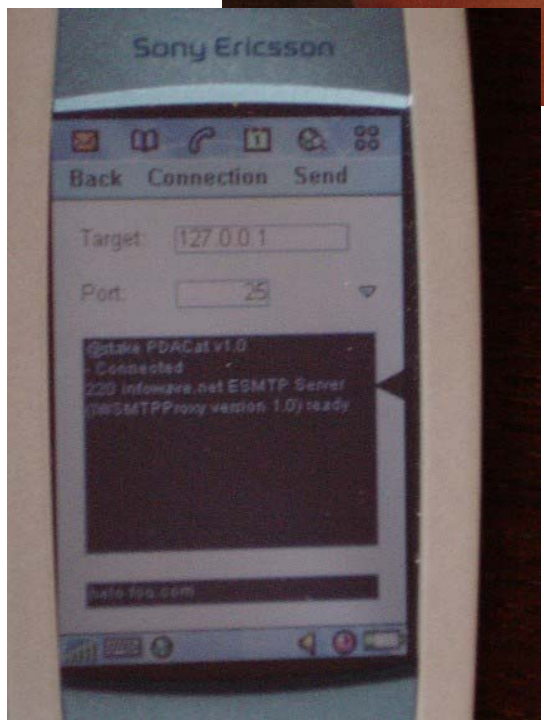
# @stake MobilePenTester

- **What is it?**
  - The first generation of cellular Swiss army knives
- **Why did you develop it?**
  - To allow us to enhance our cellular network assessments and also empower our operator clients to DIT (Do It Themselves)
- **Features?**
  - NetScan
  - PDACat
  - WAPScan port
  - HTTP vulnerability scanner

Ollie's Hand (oh and the main menu)




PDACat in action

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# @stake PDAZap

- **What is it?**
  - The first generation forensics tool for P800
- **Why did you develop it?**
  - Help us research the device, help people involved in IR (incident response)
- **Features?**
  - Mirror devices flash to Memory Stick Duo ™
  - Mini file browser

# Where can we get them?

- **@stake dot com**
  - NetScan / MobilePenTester:
    - http://www.atstake.com/research/tools/vulnerability_scanning/
  - PDAZap
    - http://www.atstake.com/research/tools/forensic/
- **Who developed them?**
  - Ollie Whitehouse (ollie at atstake.com)
- **Anything else cool?**
  - RedFang (The Bluetooth Hunter)
    - http://www.atstake.com/research/tools/info_gathering/

P800

Ollie

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# Advert for CCC / Thanks

- **So?**
  - Ollie is speaking at CCC between 7th and 10th of August 2003
- **On what?**
  - Cellular Network Security: The New Frontier
    - GSM/GPRS/UMTS Introduction
    - GSM/GPRS/UMTS Security
    - Pragmatic GSM/GPRS/UMTS Assessments
    - Other areas of assessment/research
- **Other info?**
  - Chaos Communication Camp 2003,
    The International Hacker Open Air Gathering
    7/8/9/10th August 2003
    near Berlin, Germany (Old Europe),
    http://www.ccc.de/camp/

Ollie's current cutting edge development platform!

**Thanks for listening, sorry I can't be here!**

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# The Future

**Trivia Question:**

Who makes this Palm OS watch?

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# NASL Scanning

- **Idea**
  - How to leverage the work that the Nessus team has done?
- **Issues**
  - (Nearly) All tests written in NASL
  - Nessus/NASL not made to run on a Palm
  - Complexity is higher

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# Comparing NASL and PocketC

- **Similarities**
  - Basic C syntax
    - for and while loops
    - Control flow
    - Blocks
  - No memory management
  - Ints, chars, strings, and arrays should cover most (all?) NASL var types
- **Differences in NASL**
  - Comments (# vs. //)
  - No need to declare variables
  - Named function parameters
  - Varargs
  - The “x” operator
  - The “><“ operator
  - Specific functions

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# More Ideas for Features

- **Creation of custom IP packets**
  - Enable SYN, FIN, XMAS scans
  - Useful for NASL functions too
- **Network tools (e.g. IP<->Hostname lookups, ping, traceroute, etc.)**
- **SSL scanning (probably wait for Palm OS 5 device)**
- **VulnXML support for URL scanning**
- **Download updates to URL vuln database**
- **Other suggestions?**

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# Let's Review Those Goals

- **Overview of Palm OS as a hacking platform**
- **Walkthrough of a Palm OS-based vulnerability scanner**
  - Architecture
  - Features & how they're implemented
  - Lessons learned
- **Release a new tool for Palm OS**
- **Have Fun!**

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# Thanks for listening!

## Any questions?

**You can download AUSTIN here:**
**http://atstake.com/research/tools/vulnerability_scanning/**