Hacking from the Palm of your Hand

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Where Security & Business Intersect™
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
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!
The Past

Trivia Questions:
What was the first Palm Pilot called? How much memory did it have?
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
Security Tools

- **Password Generators**

- **Encryption**

- **Password Crackers (old)**

- **War Dialer**
Communication Tools

- **Telnet**

- **SSH (v1 only)**

- **Web & Mail**

- **Ping**
Communication Tools (continued)

- FTP

- IR Tools
  [http://pamupamu.tripod.co.jp/soft/irmenu/irm.htm](http://pamupamu.tripod.co.jp/soft/irmenu/irm.htm)
  [http://www.pacificneotek.com/omniProfsw.htm](http://www.pacificneotek.com/omniProfsw.htm)
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/
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?
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?
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/](http://www.palmos.com/dev/tools/)
Technical Features

- **Must have**
  - Leverage Palm UI
  - Responsive
  - Extensible
  - Development on PC

- **Nice to have**
  - Development on Palm

- **Most important**
  - Re-use other components
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:

```c
//helloworld.pc

main()
{
    puts("Hello world!\n");
}
```

http://www.orbworks.com/pcpalm/index.html
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...
Presenting… AUSTIN

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

```
<table>
<thead>
<tr>
<th>AUSTIN</th>
<th>Scan.h</th>
<th>GUI.h</th>
<th>Prefs.h</th>
<th>Net.h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
PocketC

Pocket Toolbox  AUSTIN NetLib
```

```
Palm OS

Palm Hardware
```

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Tools Used To Develop AUSTIN

- 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/

- PiIRC

Lesson Learned:
When adding PRCs to POSE always do so when the Palm is displaying Applications.
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!
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.
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;
    }
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();
}
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!)
Database Access

- Pocket Toolbox manipulates two DB formats
  - Pilot-DB (GPL)
  - HanDBase (Commercial)

- Databases are used throughout AUSTIN
  - Preferences
  - Web vulnerabilities
  - Results
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

```plaintext
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
```
Scheduled Scanning

- AUSTIN can scan at regular intervals
- Users can specify
  - Number of scans
  - Minutes between scans
  - Whether to scan or sleep first
Tying it all Together

Note: AUSTIN Net Lib could also be embedded inside AUSTIN but is kept separate to facilitate reuse
But wait! There’s more!!!
@stake SonyEricsson P800 Development

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

- **Who developed them?**
  - Ollie Whitehouse (ollie at atstake.com)

- **Anything else cool?**
  - RedFang (The Bluetooth Hunter)
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/

Thanks for listening, sorry I can’t be here!
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
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
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?
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!
Thanks for listening!

Any questions?

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