Thinking Outside of the Console (Box)



Squidly1

gameconsolez@gmail.com / haksys.schleppingsquid.net

DefCon 15 / August 04, 2007

HAXO(RED)

See G. Mark FMI see him @ Hacker Jeopardy

SaveDarfur.org

Crisis ongoing. Read up & help

Squidly1

- Computer Network Defense Team Lead (US Navy)
- Former Red Team Lead
- Independent security researcher
- **◆** GSEC
- Software engineering student
- Wireless explorer
- Heavy gamer
- ◆ Fervent g33k



Covert Testing

- ◆ Used by legitimate vulnerability assessment firms and Red Teams in order to better help companies and organizations learn how to protect themselves. The focus of these testing methods is to help said entity identify possible intrusions, faulty equipment / software, bad security practices, ineffective policies among other things. At the end of the assessment phase a report is presented to the entity in order to set into motion an informed plan for fixing the discovered deficiencies.
- Used by other companies and governments in order to serve their own gain. Corporate espionage anyone?



Corporate Espionage

"The U.S. Department of Justice (DOJ) pulled the covers off a previously-sealed case of corporate espionage by a former DuPont scientist who stole \$400-million in intellectual property from his employer."

- SC Magazine (16 Feb 2007)

"A UK-based hi-tech firm that's become the victim of "industrial espionage" is offering a reward for information leading to the arrest of those responsible for stealing its computer hardware. Thieves who stole a number of laptops from VBi Triscan Systems also lifted hard disks from the fuel management firm's servers... Executives at the ... firm fear the thefts were aimed at gathering trade secrets rather than just routine blogs."

- The Register (20 Apr 2007)



Covert Testing

... And then you have people like us ...

: P

We have no allegiance, no political motive and no fiscal gain - just looking and passing through - kthxbai



Are You High?!?

- ◆ After I modified my first XBOX and bought my first PSP I experienced the realization that the newer generation game consoles could be so much more than ... game consoles.
- Prior to 2002 there was very little going on in the console hacking arena, outside of relatively crude hardware modifications and game cheating.
- Since then the game industry has moved forward in using even more powerful main processors and GPUs, in order to both satisfy and build up gamer desires for 'the next best thing.'
- ◆ Now we have true computers with the ability to network... to share... to probe... to perform vulnerability scans... to find YOUR network... to get on YOUR network... and...?



Stimulation

- Sixth & Seventh Generation game consoles
- Hand-held game systems
- Ubiquious online connectivity (wired / wireless)
- ...but it's just a video game console...
- OMG! It's a video game console on MY network!! WTF!!!



Goals

- Cover the three key features a covert tester looks for in penetration hardware, and why game consoles can fit the bill.
- Look at the evolution of homebrew applications on various game systems, especially those that expand system usage.
- Show how a couple of game systems can be used to infiltrate your network, or collect data.
- Suggest things you can do to mitigate this threat.
- Open discussions on what the future holds...



Three Important Things

... or what is important to the covert tester?



Three Important Things

- ◆Power (Potential)
- Programmability (Flexibility)
- Concealment
 (Plausible Deniability)



POWER!!!

... or what might this baby do?



Sixth Generation Systems

Primary platforms:

- ◆ Sony Playstation2 (26 Oct 2000)
- ◆ Microsoft XBOX (15 Nov 2001)
- ◆ Nintendo GameCube (18 Nov 2001)
- ◆ Nintendo GameBoy Advace SP (Sept 2004)
- ◆ Nintendo Wii * (08 Dec 2006)



Seventh Generation Systems

Primary platforms:

- ◆ Sony Playstation3 (17 Nov 2006)
- ◆ Sony Playstation Portable (24 Mar 2005)
- ◆ Microsoft XBOX 360 (22 Nov 2005)
- ◆ Nintendo Wii (08 Dec 2006)
- ◆ Nintendo DS / DS-Lite (21 Nov 04 / 11 June 06)



Squidly1's Systems

- Playstation3 (60G)
- Playstation2 (40G)
- Playstation
- ◆ PSP (1.50, 3.400E-A)
- GameBoy

- ◆ XBOX 360 (120G)
- ◆ XBOX (300G)
- Wii
- ◆ DS Lite (M3 Movie Player Lite Pro, Passcard)
- GameBoy Advance SP





Hardware & Potential

... G33k pr0n, awww yeahhhh...



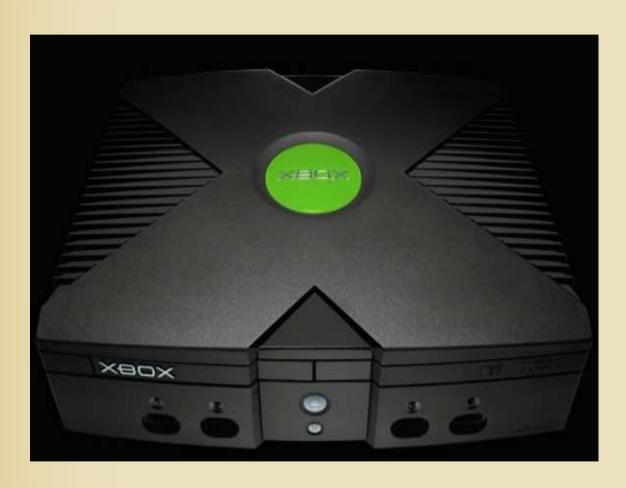
Hardware: XBOX



- An Intel 733Mhz custom PIII
- 64M DDR SDRAM
- 250 Mhz custom nVidia GPU (NV2X) + 200Mhz media processor
- ♦ 10/100 Ethernet
- Proprietary USB ports
- DVD optical drive
- ♦ 8~10G hard drive
- Proprietary memory cartidge port



Potential: XBOX

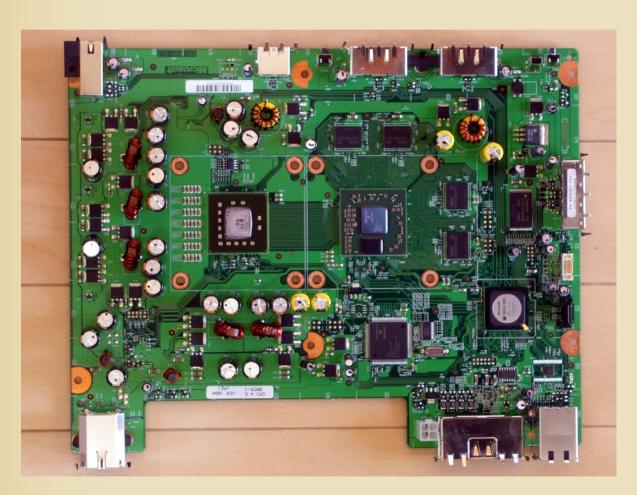


Add-ons:

- Upgrade to 1.3G Celeron
- Upgrade 128MRAM
- ♦ 802.11B/G adapter
- ◆ Dual HDs / 320G max HD
- USB Keyboard / Mouse



Hardware: XBOX 360



- An IBM PowerPC (3 symmetrical cores) 3.2G ea.
- 512M GDDR3 RAM
- ◆ 500 Mhz Xenos custom ATI GPU
- ◆ 10/100 Ethernet
- USB ports
- DVD optical drive
- ◆ 20~120G hard drive
- Proprietary memory cartidge port



Potential: XBOX 360



Add-ons / Mods:

- ◆ Upgrade HD 120G or more...
- ◆ 802.11G adapter
- XBL Vision (Web Camera)
- USB Keyboard / Mouse







Hardware: Playstation²

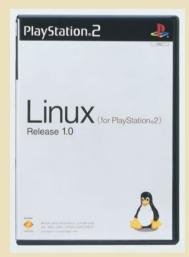


- Toshiba 300MHz R5900 MIPS IV Processor
- 32M Direct RAMBUS RAM
- 150Mhz GPU
- USB / Firewire
- DVD optical drive
- MS Pro Duo, Compact Flash (I & II) and SD (standard & mini)



Potential: Playstation²







Add-ons:

- Ethernet / Modem / HD assembly
- ~500G HD maximum**
- USB keyboard / mouse

Tricks:

- 70 node Beowulf cluster
 * Customized code blocks to the GPU allowed for processing speeds up to 1 Gflop – per machine.
- Oh, yeah, it runs Linux



Hardware: Playstation³



- Cell Broadband Engine processor (heterogeneous, 1 control CPU, 8 computational SPEs)
 ~3.2Ghz ea
- 256M XDR RAM (3.2Ghz) / 256M GDDR3 RAM (700Mhz)
- ◆ 550 Mhz custom GeForce 5900 nVidia GPU
- 10M~1G Ethernet / 802.11B/G
- USB ports
- DVD/BluRay optical drive
- ◆ 20~60G hard drive **
- MS Pro Duo, Compact Flash (I & II) and SD (standard & mini)



Hardware: Playstation³

Interaction with the PS3 Hypervisor

Game / Application

Game OS / Other OS (Linux)

Hypervisor

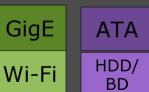
Hypervisor

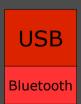


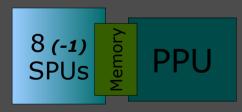








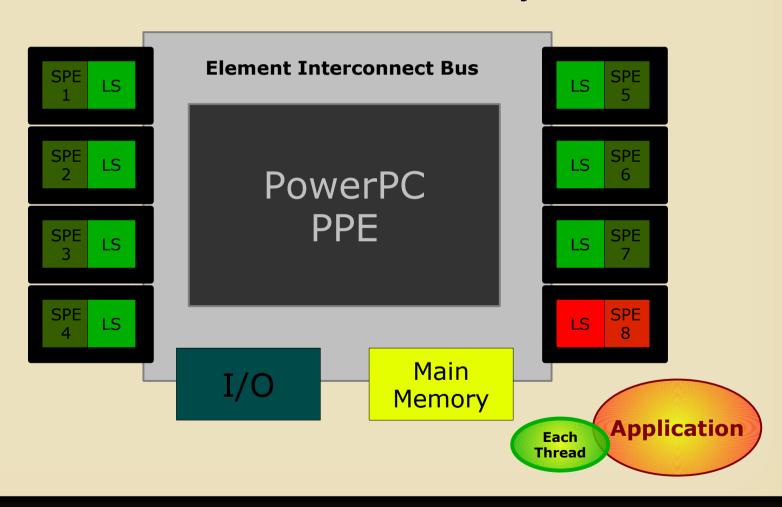






Hardware: Playstation³

PS3 Cell Processor Security





Potential: Playstation³





Add-ons:

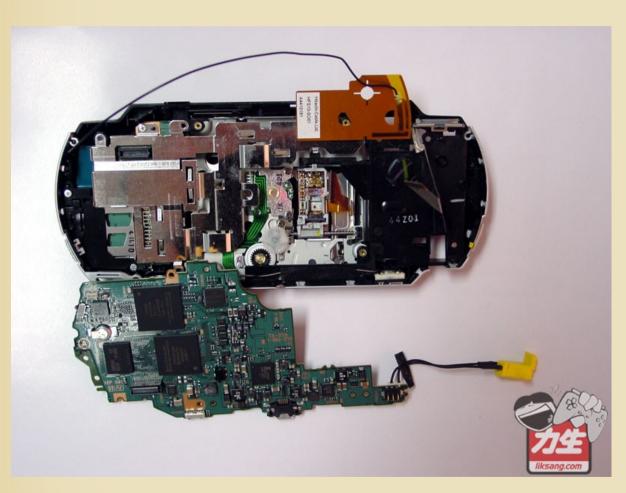
- 250G+ hard drive (2.5" Serial ATA) **
- MS Pro Duo, Compact Flash (I & II) and SD (standard & mini) – max size?
- InFeCtuS firmware (hardware) downgrader **
- BlueTooth or USB keyboard / mouse

Tricks:

- Runs Linux, many flavors
- And there are a few clusters...
- Crack crypto Single Precision is best... See Folding@Home zoom!



Hardware: PSP



- a MIPS R4000-based CPU (1~333Mhz)
- ◆ 32M RAM + 4M DRAM
- 166 Mhz GPU has 2 MiB embedded memory
- ♦ 802.11B Ad-Hoc / Infra Modes
- IrDA transmit / receive
- Mini-USB and custom serial
- UMD optical drive
- MemoryStick Pro Duo drive



Potential: PSP







Add-ons:

- ◆ PSP PS-290 GPS Unit
- ◆ PSP PS-260 Microphone
- ◆ PSPj-15003 Camera
- ◆ 8 GB MS Pro Duo (need firmware 2.81 or higher)





Potential: PSP



Mods:

 Hirose connector for expansion of antenna





Hardware: GameCube



- 485Mhz Gekko (custom) IBM PowerPC CPU
- ◆ 40M RAM (total)
- 162Mhz ATI / Nintendo Flipper GPU
- Proprietary optical disc
- Proprietary memory cards



Potential: GameCube



Add-ons:

- Mod chips
- Keyboard / Analog stick

Trick:

Linux - again...







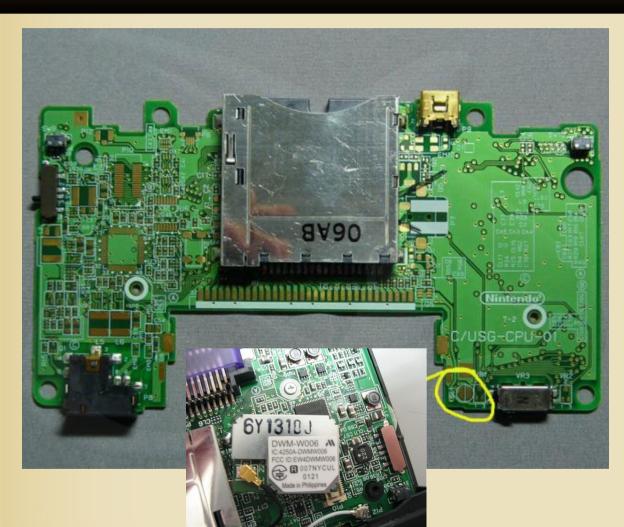
Hardware: Wii



- 729Mhz Boardway IBM PowerPC CPU
- 88M RAM (total)
- 243Mhz Hollywood ATI GPU
- ♦ 802.11B/G
- ◆ 512M Flash memory
- SD memory
- USB 2.0 ports
- Optical drive (No DVD support)



Hardware: DS-Lite



- Two 32-bit processors:
 [main] ARM 946E-S (67 MHz)
 [co] ARM 7 TDMI (33MHz)
- ◆ 4M main RAM / 656K VRAM
- 802.11B / Ni-Fi protocol (Mitsumi MM3205B module)
- SD removable memory storage
- Microphone
- Touch sensitive display
- GBA (Slot 2) and NDS (Slot 1) ports



Potential: DS-Lite





Add-ons:

- Removable memory storage
 SD, CompactFlash, MicroSD **
- Flash ROMs / Mod cards

Trick:

Linux...? Limited, but it's here, too!



Programmability & Flexibility

... or what can I make this thing do??



Native Vulnerabilties





- Sony Playstation Portable (PSP)
 - Firmwares 1.00 & 1.50
 - Custom Firmwares
 - Gateway Firmwares: 2.71, 3.02, 3.50
 - Vulnerable games:LuminesGrand Theft Auto: Liberty Cities
- Nintendo DS
- Nintendo DS-Lite

Both units are open enough that one only needs to plug in some custom hardware... Done.



Native Vulnerabilties





Microsoft XBOX

- Font handler / no mod checks
- XBOX Dashboard
- A20# memory handling flaw
- Games run in Kernel Mode
- Vulnerable games
 007 Agent Under Fire
 MechAssault
 Splinter Cell (and many more)
- Playstation3
 - Internet browser flaw?!?!
 - 'Controlled' PS2 game 'crash'?!?

At current, neither of these approaches is all that promising. Besides, who wants to brick a \$600 system to find out??



Linux Is Everywhere

- ◆ The only sustained exceptions to this rule are:
 - 1. Nintendo Wii
 - 2. Microsoft Xbox360 ** (only "works" on X360 kernels 4532 & 4548)
- But is it "Game Over" when Linux is installed??







Game Console Coding

While In Linux:

◆ Take your pick – C, Python, Perl, etc.

After Modification:

- Python (PSP, XBOX and DS)
- Lua (PSP and DS)
- Assembler (PSP**)
- ◆ C (PSP**)
- ◆ BASIC (DS)



Homebrew

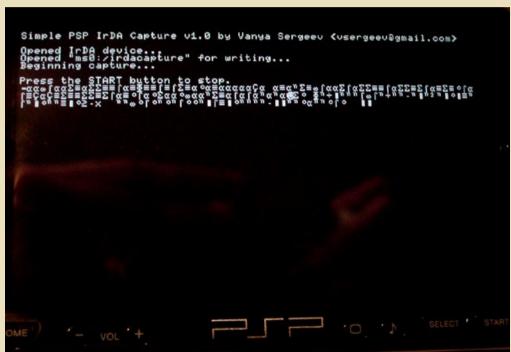
Homebrew is a term frequently applied only to video games that are produced by consumers on proprietary game platforms; in other words, game platforms that are not typically user-programmable, or use proprietary hardware for storage.

Sometimes games developed on official development kits, such as Net Yaroze or PS2 Linux are included in the definition. Some, however, also refer to all non-commercial, "home-developed" games for open architectures as homebrew games, though these typically go under more frequently used labels, such as freeware.



[PSP] IrDA Capture





Shows "IrDA Sample" by Vanya Sergeev snagging raw IR signals from two universal remotes. The same trick can be done with any other IR device – like your PDA.



[PSP] iR Commander

```
Panasonic Camcorder G5250
Panasonic TU
Pentax Optio
Sony Projector H510
Xbox DVD Remote
Yamaha DSP-A1

If to browse, O or X to select Remote Unit
```

The newest version supports 2,000 controllable infrared devices – for 1.50 users. Check Major Malfunction's "Old Skewl Hacking Infrared" for why this interesting.



[PSP] iR Shell

```
PSP IF FIE V3.1
                        By AhMan
                                     RDF View
                                                     222
                        iR Remotes
Canon-WL-DC100
 anasonic Camcorder 65250
Pentax Optio
To shiba TW
MBMC Remote
MBMC-MUSIC
MBMC-Qideo
MboxRemote
Vamaha DSP-A1
                                                 14 81 1
 Click (SUC) for Menu
```

AhMan returns with another homebrew of interest. This one allows for *more* IR devices, performs ad-hoc WiFi transfers, throttles CPU speed, DevHook support, nethost redirection, and works on all homebrew-friendly firmwares.



[PSP] Portable VNC Viewer





AhMan's VNC controller for the PSP. Allows you to control computers, even password protected ones, with your PSP. Can be also used with iR a keyboard.

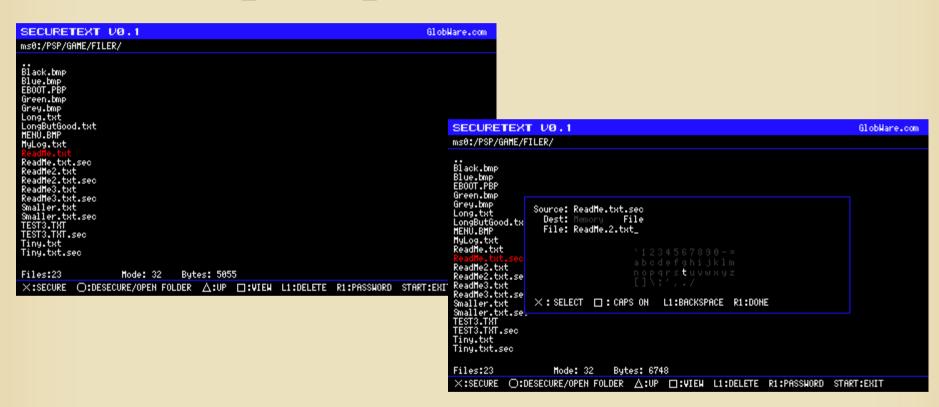


| PortableVNC Video | |





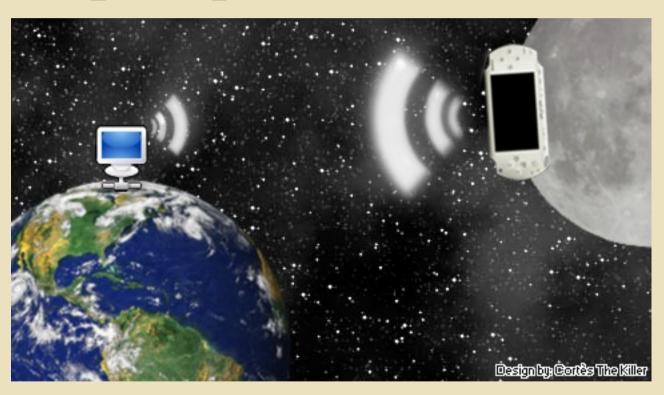
[PSP] SecureText



Allows the user to encrypt and decrypt – with RC4.



[PSP] HTTPd / FTPd



Need to set up a quickie web (by Elxx) or FTP (by ZX-81/PSPKrazy) server? Works really well, too.



[PSP] AFKIM

```
Resolving
Resolved, Connecting
Connected, Identifying
&bitlbee
Welcome to the BitlBee gateway!
If you've never used BitlBee before, please do read the help information using the [help] command. Lots of FAQ's are
answered there.
&bitlbee
Configuration saved
     Add an Account
                          = `true'
    AIM
                              `60'
  ICQ
d O MSN
                         d, press [select] to add one.
  ■ GTalk
Yahoo
```

IRC, AIM, ICQ, MSN, GTalk, Yahoo! on your PSP. 14 iR keyboards are supported. Thanks Danzel!



[PSP] PSPSSH

```
Last login: Wed Aug 1 14:48:22 2007 from part of the provided of the property of the provided of the provided
```



Zx-81's port of the DropBear (Matt Johnston) SSH2 client / server application.



(((PSPSSH Video)))

PSPSSH Video





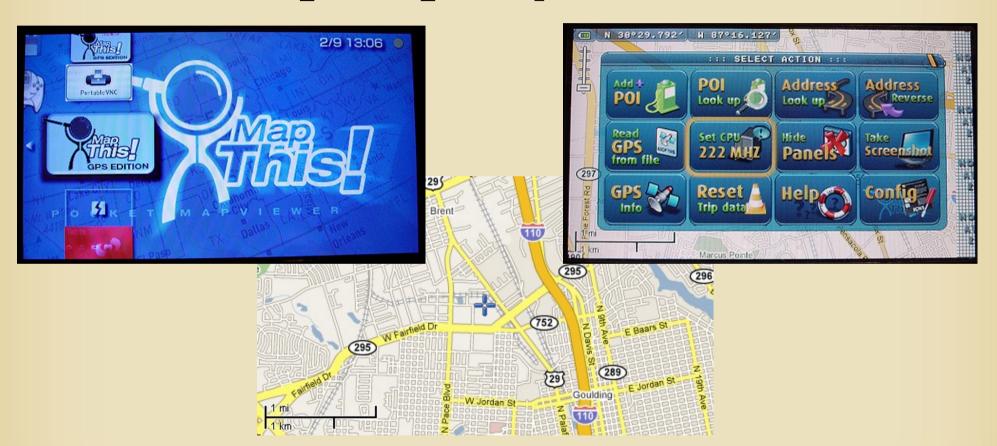
[PSP] WiFi Sniffer



Jean Yves Lamoureux's basic WiFi Sniffer.



[PSP] MapThis!



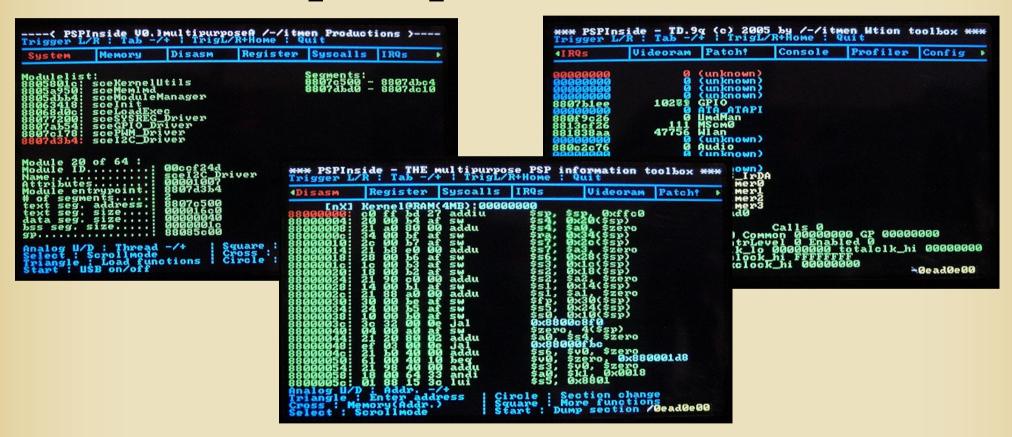


MapThis! Video





[PSP] PSPInside

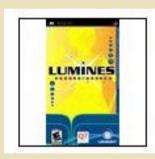


/-/itmen Console's PSPInside – the tool for determining what your PSP is thinking... Can you say buffer overflow??



Lumines Downgrader

- Less than a week after discovery, game sellers on Amazon and eBay began gouging PSP gamers with prices far over what they were selling at prior to the announcement. On eBay people were actively bidding for \$60-\$45 copies.
- The median prices the week before were \$12 \$15...



Used - Like New

Lumines (PlayStation Portable)

Platform: Sony PSP

Genre: Action, Adventure

Release Date: 2005

4.5/5 from 23 reviews

\$0.01 - \$144.99

175 items for purchase

\$125.00 + \$3.99 shipping



Seller: DAROGA28

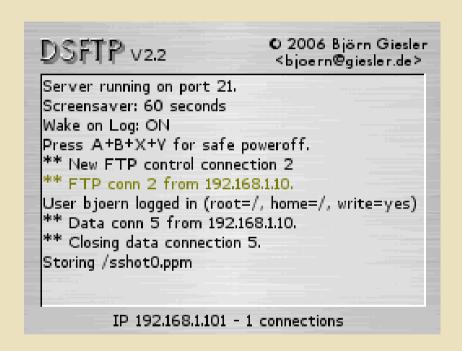
Rating: ***** 92% positive over the past 12 months (24 ratings.) 30 lifetime ratings.

Shipping: In Stock. Ships from MI, United States Expedited shipping available See shipping rates





[DS] DSFTP



Björn Gieslers Webseiten's FTP server application.



[DS] Wifi Lib Test



Stephen Stair's bare-bones AP finder and packet capture application.



[DS] AirCrackDS

```
** AircrackDS **
no /ptw.cap
Recovering MEP KEY...
```



Retrohead's simple WEP cracking application.



[DS] AirePlayDS

JSR's packet injection code. At the Alpha stage at the moment.



[DS] DSOrganize



DragonMinded's general purpose organizer, IRC client and web viewer.



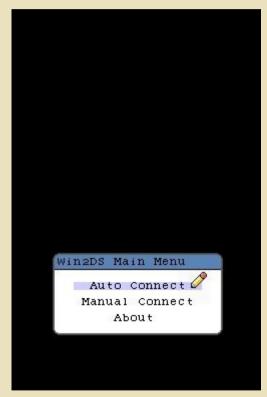
[DS] PointyRemote



Pointless' custom protocol driven remote PC controller.



[DS] Win2DS



A small VNC-type program by Bill Blaiklock (Sintax).



[DS] Lilou FTP Server

fat en cours d'initialisation fat initialis0 Uifi_lib_test - Alain Version 0.3a Build Date:Jun 23 2007 19:54:30	
Waiting for ARM7 to init ARM7 Init Confirmed. Rename file failed %d Wait Confirmed. Picked: Launch Quick ftp server Connection failed - Returning to main menu Returned from ftp server	•
Quick ftp server	
Quick ftp client	
ftp client bookmark	
Connect to an AP	
Configure wifi	
Tools	
[UP/DN]Move[A/Touch]Sel	

Lilou's FTP server / client application.



[DS] MoonShell



General interface replacement by Infantile Paralysiser.



... you put that console WHERE?? (No Goatses were hurt in this section)





Who in this picture does *NOT* have a pocket video game on them?

Hint: Probably not the young geisha.



Do you know if game systems are allowed in your work spaces? What about the customers? Is there a policy covering you??





Altoids tins ain't just for holding those curiously strong gum pieces anymore...





Are they playing a game, or not?



Other Tidbits

... last minute goodies ...



The following ports were detected, on a v1.50 PSP:

- 25 [SMTP] Simple Mail Transfer Protocol is a protocol for sending electronic mail messages between computers. (TCP) Open
- 110 [POP3] Post Office Protocol 3. Mail server protocol commonly used on the internet. (TCP) Open
- 123 [NTP] Network Time Protocol (UDP). Listening

Research on www.netbsd.org shows that the network architecture on the PSP is based on NetBSD, giving it a robust communications capability.

IDS Goodies: PSP MAC addresses begin with 00:01:4A, and they will generally look for fj00.psp.update.playstation.org (130.94.58.55) if an update is requested.



The following ports were detected, on an Xbox360:

- 25 [SMTP] An unknown service is running on this port.. (TCP) Open
- 110 [POP3] An unknown service is running on this port. (TCP) Open
- 1030 [IAD1] A communications service, acting as webserver is on this port. (TCP) Open

"It was possible to crash the remote host by sending a specially malformed TCP/IP packet with invalid TCP options. *Only the version 2.6 of the Linux Kernel* is known to be affected by this problem" (hmmm)...

IDS Goodies: X360 MAC addresses begin with 00:12:5A.



The following ports were detected, on a Playstation³:

- 25 [SMTP] Simple Mail Transfer Protocol is a protocol for sending electronic mail messages between computers. (TCP) Open
- 110 [POP3] Post Office Protocol 3. Mail server protocol commonly used on the internet. (TCP) Open

"The remote host accepts loose source routed IP packets."

"The remote host is vulnerable to an 'Etherleak' - the remote ethernet driver seems to leak bits of the content of the memory of the remote operating system"

IDS Goodies: PS3 MAC addresses begin with 00:15:C1, and they will generally look for fj00.ps3.update.playstation.org (129.250.162.55) if an update is requested.



The following ports were detected, on the Wii and DS Lite:

Nothing... Seems that both units shut down all wireless when not expecting to use it. Still checking for 802.11x radiation signature fluctuation. Could be part of their power-saving functionality...



Really Alternative



I believe that I am the first person to actually use my PSP (or any wireless device) to assist in a pub crawl... Found the **Sidebar** in San Diego.



Sources

- Chaos Computer Congress 22nd & 23rd
 - Nintendo DS: Mario Manno, Tobias Gruetzmacher, Marcel Klein
 - Console Hacking 2006: Felix Domke
 - "Xbox" and "Xbox 360" Hacking: Michael Steil and Felix Domke
- PSPUpdates.net
- MaxConsole
- DCEmu.co.uk
- NeoFlash.com
- PS2Dev
- dev-scene.com/NDS
- Sony's Playstation Forums

- XboxHacker Forums
- Xbox-Scene
- Anathema (PS3 browser exploit)
- PSP Vault
- IBM / Sony CBE Engineers & their programming support sites
- Individual developer websites
 THANKS for all the hard work guys!!!

