# **The dark side of Online Advertising**

Daniel Chechik, Rami Kogan







# **Malicious Advertising**

# Malvertising



# Types



#### Malvertising Types

- Paid ads in search engines
- Deceptive downloads
- Drive-by downloads



#### Malvertising Types

User Interaction	Drive By Downloads
Malicious paid ads in search engines	Malicious Flash
<b>Deceptive downloads</b>	Hidden iframes
	Pop unders



#### Malicious ads in search engines



Google	news	C
	All News Apps Videos Maps More - Search tools	
	About 10,750,000,000 results (0.71 seconds)	
	Latest Breaking News - Buy Nikkei Asian Review Today Ad asia.nikkei.com/ Save 44% On Your Subscription Now!	
	Ad asia.nikkei.com/ 🔻	

by Google News.

About Google News - Using Google News RSS Feeds - Languages and regions



#### Malicious ads in search engines



Google	youtube							Q
	All	Videos	Apps	News	Books	More -	Search tools	
	Abou	t 6,490,000,0	000 results	(0.68 seco	nds)			

#### YouTube

#### https://www.youtube.com/ -

Enjoy the videos and music you love, upload original content, and share it all with friends, family, and the world on **YouTube**.

Results from youtube.com

#### YouTube

Enjoy the videos and music you love, upload original content ...

#### Movies

YouTube's movies destination featuring the latest new ...

Q



#### Malicious ads in search engines



Google	yout	ube							Q
	All	Videos	Apps	News	Books	More -	Search tools		
	Abou	t 6,490,000,0	00 results	(0.68 seco	nds)				
	Ad www	<b>be Chann</b> (.youtube.co outube Telev	om/ 🔻	nel Browse	News Chan	nel on <b>Youtub</b>	be		
	Enjoy th friends,	www.youtu	nd music the world	you love, l on <b>YouT</b> t		jinal content	t, and share it all wi	ith Q	
		ouTube				Movies	•	•	<b>-</b> .
									Trust art security

#### \*\*\* STOP: 0x0000007E (0xFFFFFFFC000000047, 0xFFFFF800002EB5B48)

#### **USC** Malici

Serious security threats have been detected on your computer. Your browser may have been hacked or hijacked. You're currently using and located around

A serious malfunction has been detected with Windows 7 / Server 2008 R2 7 and your Chrome 50.0.2661.94.

Please call the toll-free number below for a Certified Technician to help you resolve the issue:

1-800-752-154

For your safety, closing the Chrome browser has been disabled without support of the Certified Technician to avoid corruption to the r egistry of your Windows 7 / Server 2008 R2 operating system

Do not shut down or restart the computer, doing that may lead to data loss and possible failure of the operating system and potential non bootable situation resulting in complete data loss. Please contact Certified Technician at the toll-free Helpline 1-800-752-154





DO NOT RESTART COMPUTER AS IT MAY CAUSE PERMANENT HARD DRIVE FAILURE

CALL CERTIFIED TECHNICIAN TOLL FREE 1-800-752-154

#### Deceptive Downloads - Fake AV



#### **Firefox security alert**

Scanning of your system is currently on, please wait until the end.

Your system affected by numerous virus attacks, Mozilla Firefox recommends you to install proper software to protect your computer

Scan complete		
Number of scanned objects: 4063 Number of infected objects: 🙀		
Name	Туре	Threat leve
🛞 W32.Nimba.J@amm	Virus	Medium
🛞 Trojan Horse IRC/Backdoor.SdBot4.FRV	Virus	Medium
🛞 W95/Elkern F-Secure	Virus	High
🚱 AdvWare.Hotbar	Virus	High
🚱 W95/Elkern F-Secure	Virus	High
🍘 Trojan Horse Generic11.0QJ	Virus	High





#### Deceptive Downloads - Fake Plugin



Update your mash mayer for windows /





Adobe Flash Player Update Install Adobe Flash Player and enjoy the largest database for:

- Music Albums with user-friendly interface
- · All Song Formats with easy access
- Videos Library leading video codec library

Decline & Continue



Smart security on demand





Drive-By Downloads - The silent killer

Pop Under







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• Iframe/Flash/JS

\Xi 🎡 🗗 offstagenews.com/?\_url=%2Fr&utm\_source=ts&utm\_medium=interstitial&utm\_campaign=cid%3D1%2Csubid%3

# NO Drive



Prince died on eve of planned meeting with addiction doctor May 5, 2016



Artist ends lawsuit over Shkreli's oneof-a-kind Wu-Tang album

🚞 May 5, 2016



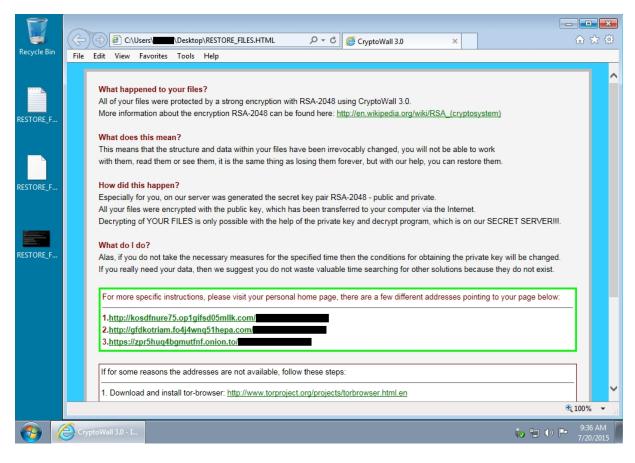
'May the Fourth Be With You': fans celebrate Star Wars Day May 5, 2016



Despite sanctions and isolation, Pyongyang skyline grows May 5, 2016



#### Drive-By Downloads - The silent killer



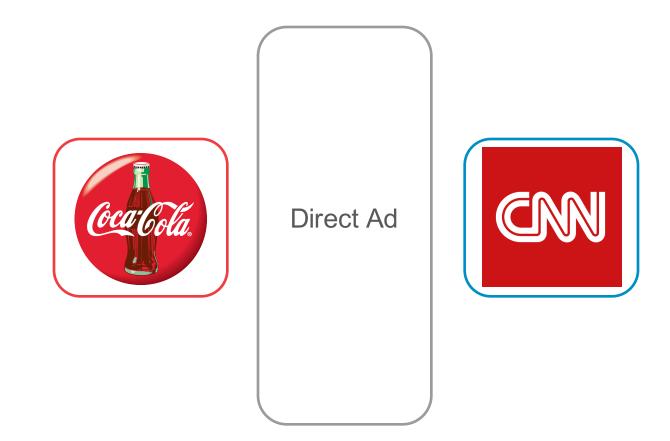


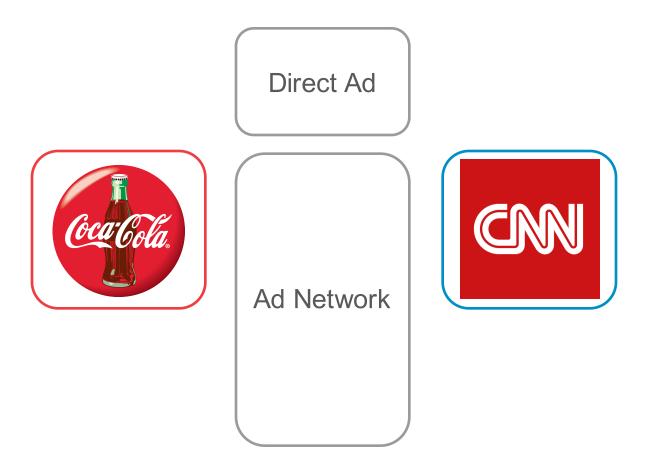


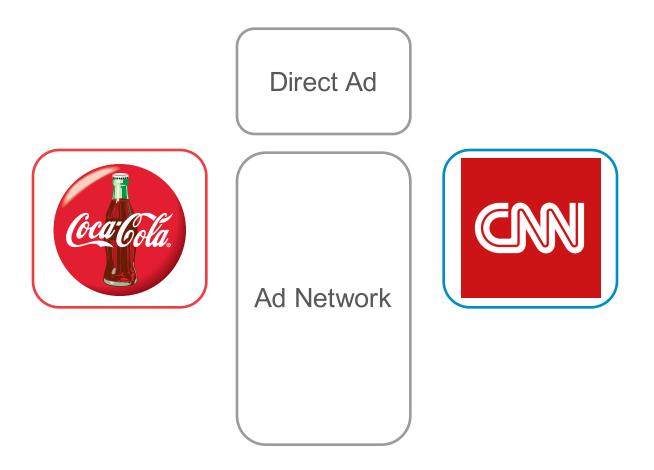
# Howp

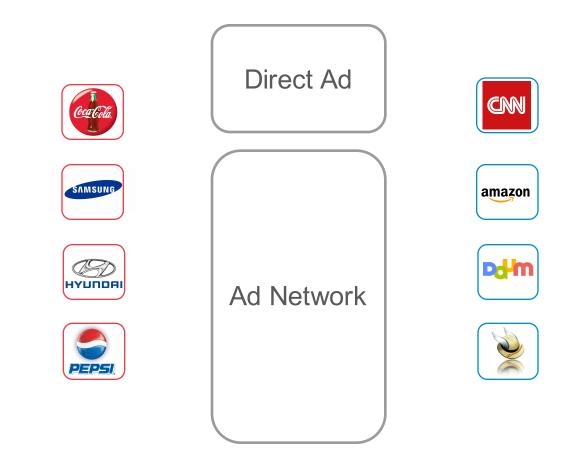


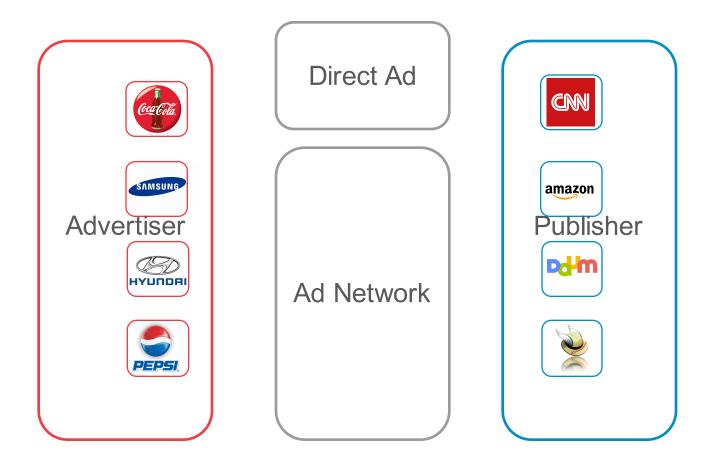
**Direct Advertising** 

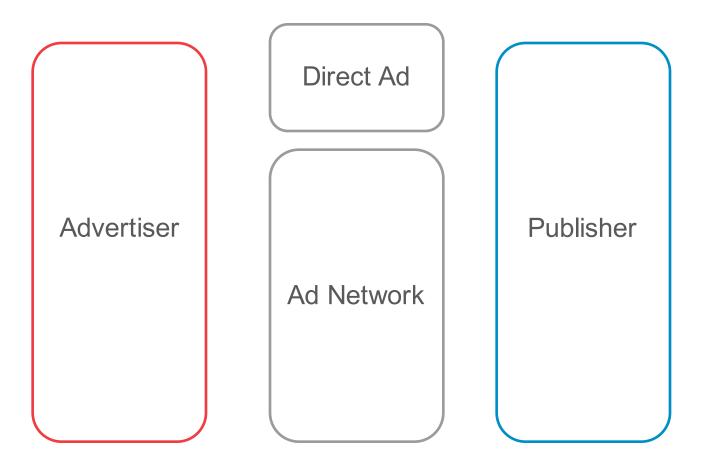




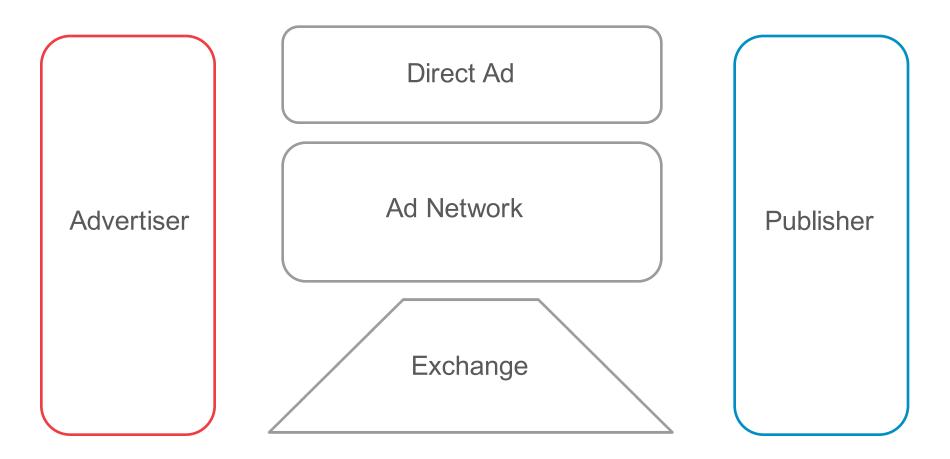




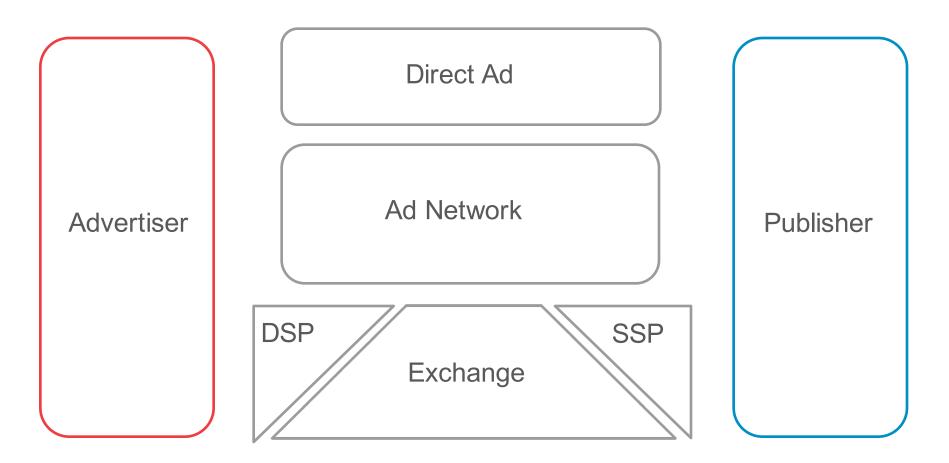




Exchange Services

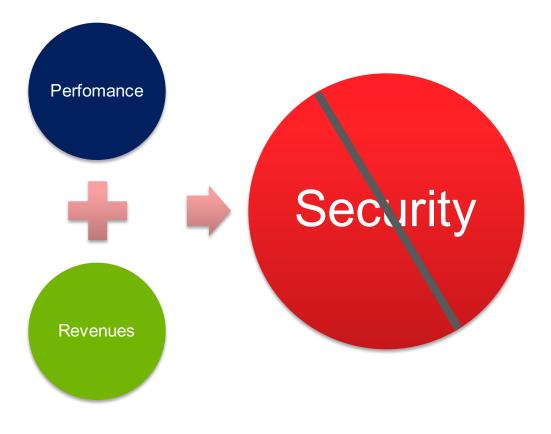


DSP and SSP



## **Malvertising**

#### Online advertisement ecosystem - The Problem





## **Malvertising**

Online advertisement ecosystem - The Problem

- RTB takes less than 100 milliseconds
- DSPs "fight" to respond faster
- Too fast to validate ads



\Xi 🎲 🗗 offstagenews.com/?\_url=%2Fr&utm\_source=ts&utm\_medium=interstitial&utm\_campaign=cid%3D1%2Csubid%3

Ma Sam



Prince died on eve of planned meeting with addiction doctor May 5, 2016



Artist ends lawsuit over Shkreli's oneof-a-kind Wu-Tang album

🛗 May 5, 2016



'May the Fourth Be With You': fans celebrate Star Wars Day May 5, 2016



Despite sanctions and isolation, Pyongyang skyline grows May 5, 2016



#### **Malvertising** Malvertising Infection Chain

≪≫2	offstagenews.com	/?_url=%2Fr&utm_source=ts&utm_medium=interstitial&utm_campaign=cid%3D1%2Csubid
S 25	ads.contextweb.com	/TagPublish/getjs.static.js?v=27
<u>5</u> 4	ads.contextweb.com	/TagPublish/GetAd.aspx?tagver=1&ca=VIEWAD&cp=558496&ct=416228&cwod=&epid=&e
5 5	as.eu.angsrvr.com	/select?type=js&plc=1031744&cache=6207360&padsrvcurl=
<u>5</u> 6	x.fidelity-media.com	/delivery/ajs.php?zoneid=16765&cb=31517148700&ab=145742126031517148700&charset
235 7 235 8	data.rtbfy.com	/rtb2?id=20104&publisher_id=4518&rtb=1&product_id=9&campaign_id=10047&bid=MC4w
	partner.brentsmedia.com	/type/suggestion.js
<u> 9</u>	partner.brentsmedia.com	/may/citizen/pole/sound/club/society.js?wrapper=false
{js}} 10	partner.brentsmedia.com	/broad/duty/offer/house.json?lang=en-US&screen=1011x758&time=1457421348&offset=
<>> 20	ah.gordonfreasjr.com	/topic/11856-resubmits-triggering-schoolroom-tessellation-protestors-adjustments-subdivide
📝 22	ah.gordonfreasjr.com	/?r=VgFS&d=VtiDHMdQ1Q&w=KZp&p=qcHVI&j=NC6NqeDAFB&s=1jczkVHoF&i=4Rrb_m1
<b>\$</b> 23	ah.gordonfreasjr.com	/?s=BSBhG&l=&r=PF0LkzsQV&w=&f=wg-e9c61wh&p=qN0nzk2K1G&o=64EEnQ&j=&g=6pv



# Malvertising

#### **Infection Chain in**

&≥2	offstagenews.com	/?_url=%2Fr&utm_source=ts&utm_medium=interstitial&utm_campaign=cid%3D1%2Csubid	Publisher
3 4 5 5 6	ads.contextweb.com ads.contextweb.com as.eu.angsrvr.com x.fidelity-media.com	/TagPublish/getjs.static.js?v=27 /TagPublish/GetAd.aspx?tagver=1&ca=VIEWAD&cp=558496&ct=416228&cwod=&epid=&e /select?type=js&plc=1031744&cache=6207360&padsrvcurl= /delivery/ajs.php?zoneid=16765&cb=31517148700&ab=145742126031517148700&charset	SSP
<b>5</b> 7	data.rtbfy.com	/rtb2?id=20104&publisher_id=4518&rtb=1&product_id=9&campaign_id=10047&bid=MC4w	Exchange
ງງງ 8 ງງງ 9 { <sup>js</sup> } 10	partner.brentsmedia.com partner.brentsmedia.com partner.brentsmedia.com	/type/suggestion.js /may/citizen/pole/sound/club/society.js?wrapper=false /broad/duty/offer/house.json?lang=en-US&screen=1011x758&time=1457421348&offset=	Malvertising
<ul> <li>20</li> <li>22</li> <li>23</li> </ul>	ah.gordonfreasjr.com ah.gordonfreasjr.com ah.gordonfreasjr.com	/topic/11856-resubmits-triggering-schoolroom-tessellation-protestors-adjustments-subdivide /?r=VgFS&d=VtiDHMdQ1Q&w=KZp&p=qcHVI&j=NC6NqeDAFB&s=1jczkVHoF&i=4Rrb_m1 /?s=BSBhG&l=&r=PF0LkzsQV&w=&f=wg-e9c61wh&p=qN0nzk2K1G&o=64EEnQ&j=&g=6pv	Angler EK

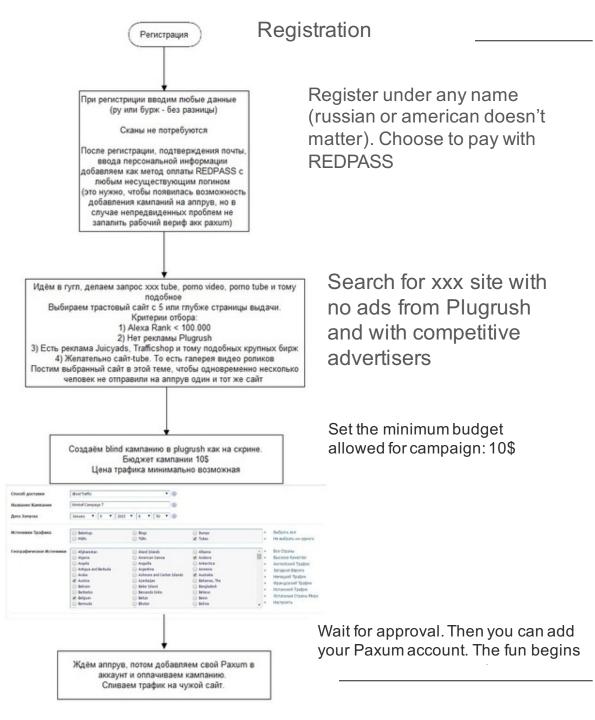


# **Malvertising Laundry**

#### The standard flow

- A hacker signs up to an Ad network impersonates as a legit advertiser
- Spreading harmless ads for a while
- Choosing the right timing to enable the malicious code
- Every fixed number of views the malicious code is served
- Redirect to exploit kit







# Whop



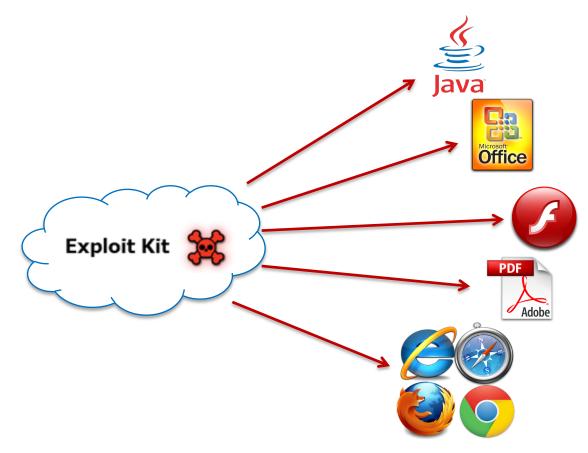
## **Exploit Kits**

#### Exploit kits without traffic are like...





# **Exploit Kits**





# **Exploit Kits**

**Sources of traffic** 

Compromised Web Sites



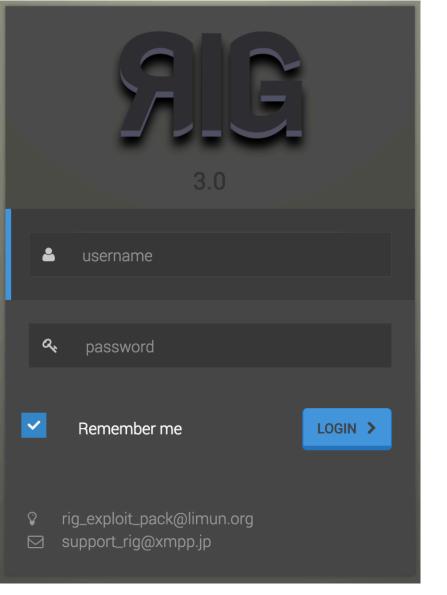




Malvertising





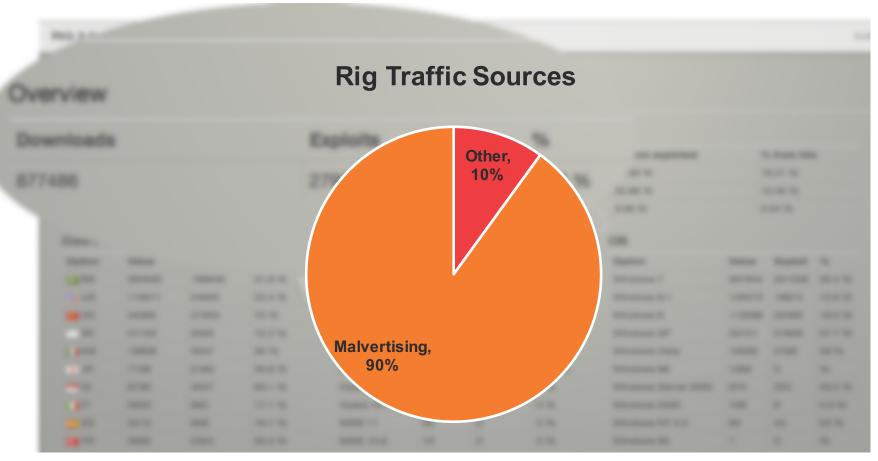


# Exploit Kits

#### **Rig Exploit Kit Dashboard**

RIG 3 A											
Overview											
Download	s			Exploits			%				
								om exploited		% from hit	8
877486			279070			31.8 %	.56 %		18.31 %		
							32.88 % 9.56 %		10.46 % 3.04 %		
Cours Option	Value					Exploits	%	OS	Value	Exploit	%
BR	592830	188646	31.8 %	MSIE 11.0	357421	67467	18.9 %	Windows 7	567834	201038	35.4 %
US	110011	24600	22.4 %	MSIE 8.0	175540	104620	59.6 %	Windows 8.1	126473	19674	15.6 %
VN	44365	31950	72 %	MSIE 7.0	146980	61647	41.9 %	Windows 8	113098	22490	19.9 %
××	41140	5002	12.2 %	MSIE 10.0	100473	19258	19.2 %	Windows XP	55121	31828	57.7 %
∎•∎ MX	16808	5037	30 %	MSIE 9.0	89498	23828	26.6 %	Windows Vista	13008	3766	29 %
• JP	7138	2183	30.6 %	MSIE 6.0	5967	2248	37.7 %	Windows 98	1085	0	%
ID 🗖	6736	4047	60.1 %	Opera 10.00	1053	0	0 %	Windows Server 2003	675	224	33.2 %
E 🛙 IT	5633	965	17.1 %	Opera 12.17	95	0	0 %	Windows 2000	108	6	5.6 %
ES	5315	858	16.1 %	MSIE 11	92	0	0 %	Windows NT 4.0	83	44	53 %
💽 TR	4693	2354	50.2 %	MSIE 10.6	73	0	0 %	Windows 95	1	0	%

#### **Exploit Kits** Rig Exploit Kit Dashboard





# Why P

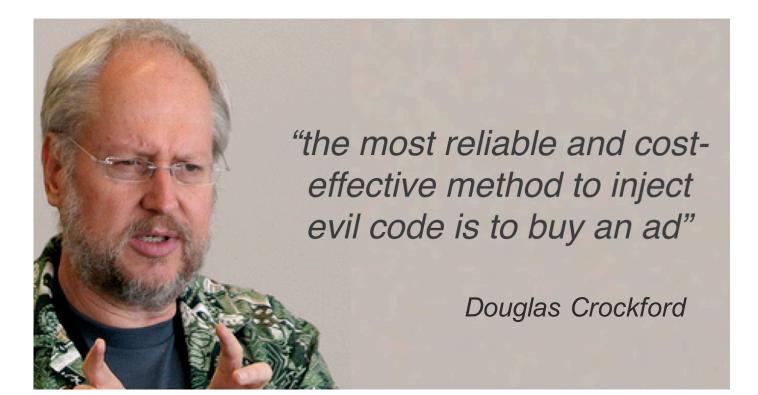


### **OR IN OTHER WORDS...**

#### IF THE BAD GUYS CAN DO IT SO CAN WE



### **Reaching Vulnerable Machines**





#### **Reaching Vulnerable Machines** Task List

- Building a landing page
- Choosing Ad companies
- Bypassing "Security" checks of the Ad companies
- Running a campaign and analyzing the results
- Finding the best ROI taken by cybercriminals



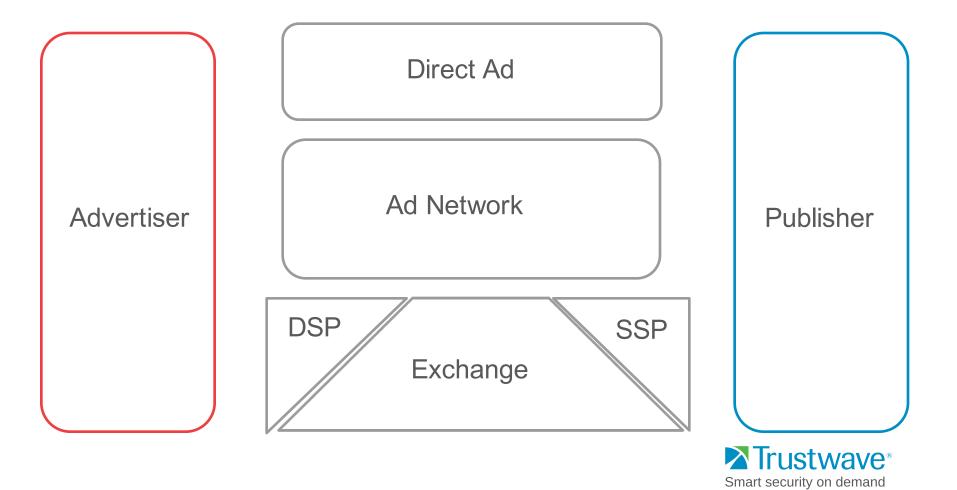
# **Building a Landing Page**

#### Looking for vulnerable Flash Player

```
<script>
```

```
var xmlhttp;
    if (window.XMLHttpRequest)
    {// code for IE7+, Firefox, Chrome, Opera, Safari
        xmlhttp=new XMLHttpRequest();
    3
    else
   {// code for IE6, IE5
        xmlhttp=new ActiveXObject("Microsoft.XMLHTTP");
    xmlhttp.onreadystatechange=function()
    Ł
        if (xmlhttp.readyState=4 && xmlhttp.status=200)
                document.getElementById("myDiv").innerHTML=xmlhttp.responseText;
            3
    xmlhttp.open("POST", "update3.php", true);
    xmlhttp.setRequestHeader("Content-type", "application/x-www-form-urlencoded");
   xmlhttp.send("flash="+PluginDetect.getVersion('Flash')+"&IE="+getBrowserVerion());
</script>
```

### **Picking the right Ad company**



### **Picking the right Ad company**



# **Bypassing Security Checks**

**Identity Verification** 

- Domain of the proposed banner vs domain of the company
  - Use hacked domain accounts (or buy already hacked) in some domain registrars
  - Generate subdomain in one of the accounts
  - Create a banner with a copied logo and a text from the original site
  - Host the banner on the subdomain
  - Approach an ad network and pretend to represent abused company



# **Bypassing Security checks**

#### **Request for identifying documents**

We Appreciate Your Interest with

Your Application is currently under review.

We are having a few problems validating some of your information.

To Expedite the review process of your Application.

1. Please send to Us a copy of Your photo ID showing the same First and Last Name as are entered in the Application fields.

Acceptable examples are: Drives license , Passport, etc.

 Please send to Us 2 facsimiles from official documents, forms, etc. showing the same name and physical Address as you provided in your Application.

Acceptable examples such as Utility Bills: Water, Phone Electrical bill, etc.

Such as: 1 copy of an Electrical Bill and 1 copy of a Water Bill, etc. showing the same name and physical Address as you provided in the Application fields.

We look forward to hearing from You.

We regret any inconvenience this may have caused you.

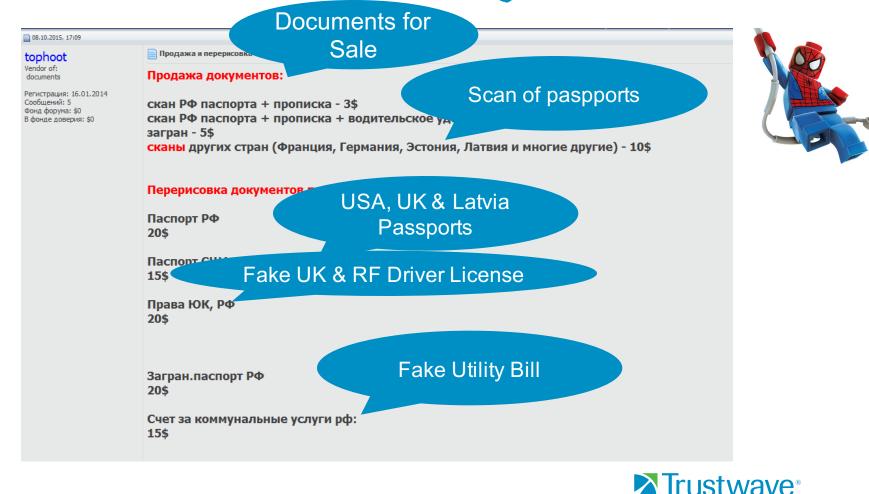
Best Regards,

© 2016 Trustwave Holdings, Inc.

#### the company

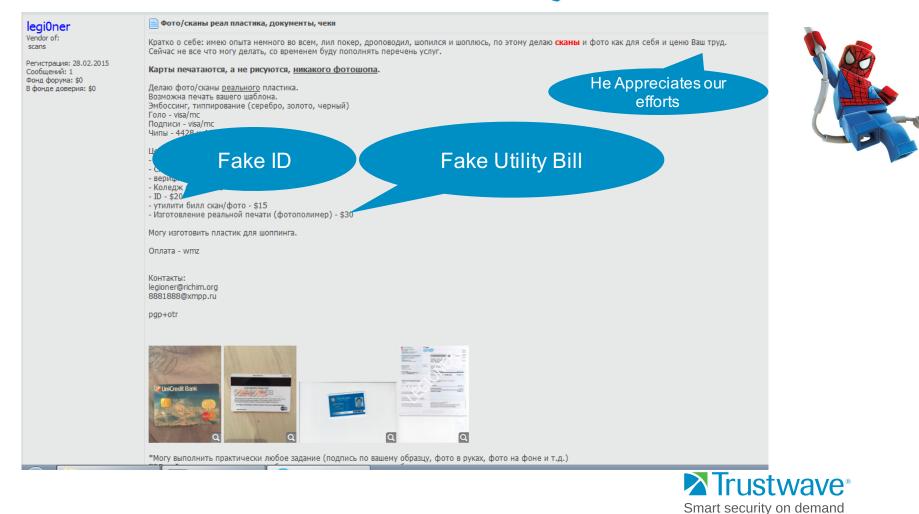
### **Bypassing Security checks**

Request for identifying documents - The underground to the rescue!!



### **Bypassing Security checks**

#### Request for identifying documents - The underground to the rescue!!



# **First Experience as Advertisers**

**Campaign Results** 

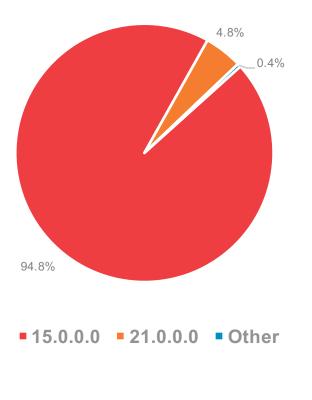
- Budget: \$4.00
- Campaign Time: 8 hours
- Total Clicks (according to the Ad company): 20,000
- Total Click (according to our records): 25,831



# First Experience as Advertisers

#### Campaign Results

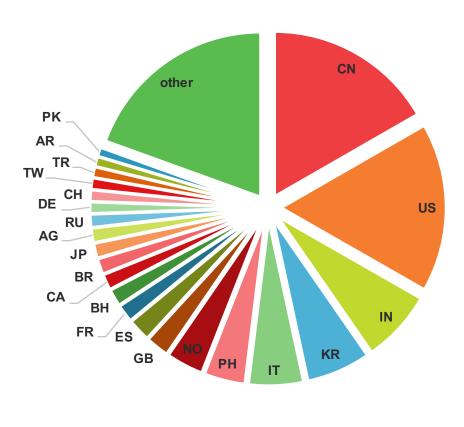
Flash version breakdown of 25,829 users





### **First Experience as Advertisers**

#### **Campaign Results**



**Users by Countries** 

© 2016 Trustwave Holdings, Inc.

# **Ad-Clicker & Malvertising**

**Bedep Malware in Action** 

• <LIVE DEMO>



# **Ad-Clicker & Malvertising**

Bedep Malware over 1 month period

- Approximately 300,000 advertising impressions
- The machine was attacked 2500 by exploits delivered by malvertising
- 0.83 % of the advertising were malware



# **Second Experience as Advertisers**

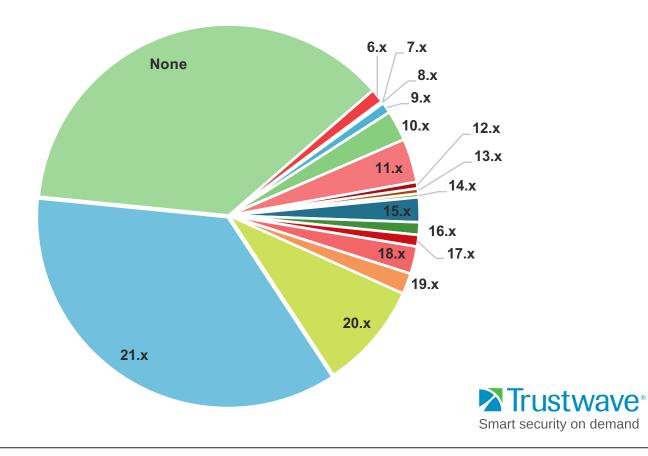
A different Ad network

- Budget: \$5.00
- Campaign Time: 10 hours
- Total Clicks (according to the Ad company): 9,999
- Total Click (according to our records): 9,265



### **Second Experience as Advertisers**

Flash version breakdown of 9257 users



### What we've learned so far

- Every campaign inserted automatically into pending status
- Changing the campaign parameters enforce system approval
- Mostly cosmetic checks, such as URL validity and visually
- After approval, no validation upon changing the landing page itself



### **Flash Based Landing Page**

```
private function init(param1:Event = null) : void
{
    var e:Event = param1;
    var urlLoader:URLLoader = null;
    var req:URLRequest = null;
    var requestVars:URLVariables = null;
    removeEventListener(Event.ADDED_TO_STAGE,this.init);
    Mouse.cursor = MouseCursor.BUTTON;
    this.image.width = 463;
    this.image.height = 270;
    stage.addEventListener(MouseEvent.CLICK,this.clickHandler);
    addChild(this.image);
    var versionNumber:String = Capabilities.version;
    trace("versionNumber: " + versionNumber);
    try
    var
```

```
urlLoader = new URLLoader();
req = new URLRequest("stat.php");
requestVars = new URLVariables();
requestVars.flash = versionNumber;
requestVars.IE = "n/a";
req.data = requestVars;
req.method = URLRequestMethod.POST;
urlLoader.load(req);
```

# **Third Experience as Advertiser**

#### **Campaign Results**

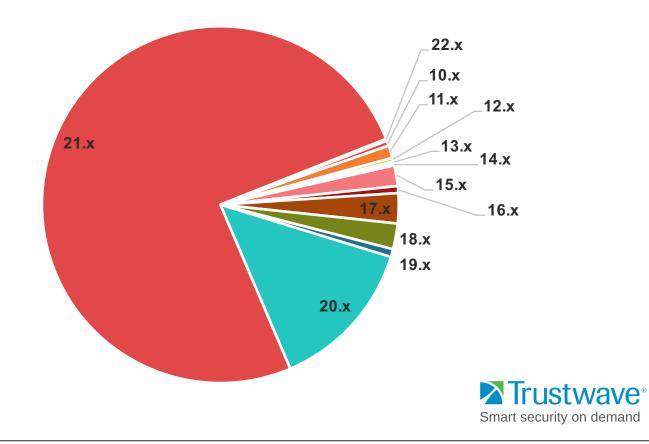
- Budget: \$5.00
- IE Filter
- Campaign Time: 6 hours
- Total Clicks (according to the Ad company): 6250
- Total Click (according to our records): 4,818



# Third Experience as Advertiser

#### Campaign Results

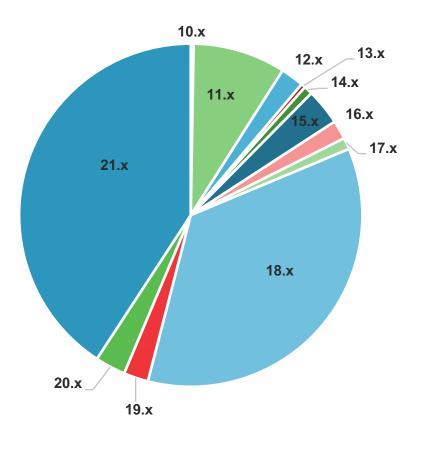
Flash version breakdown of 3,419 users



# **Third Experience as Advertiser**

#### **Campaign Results**

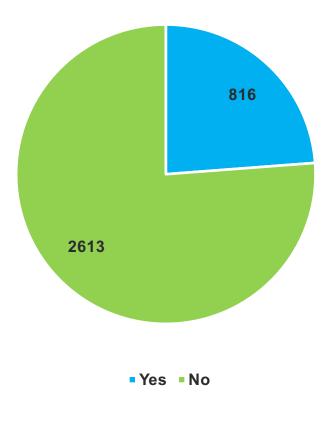
Flash Versions Breakdown of 4,818 Users



Trustwave<sup>®</sup>

# **Arm Landing Page With Exploit**

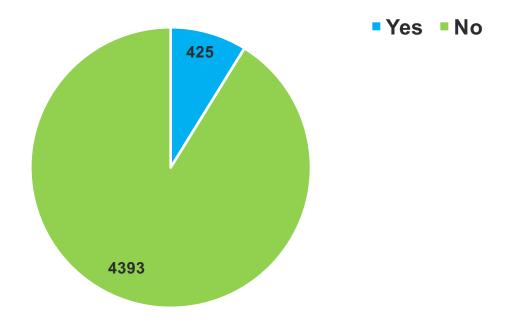
#### **Machines Running Vulnerable Flash**





### **Arm Landing Page With Exploit**

#### Machines Running Vulnerable Flash





### **LIVE DEMO**





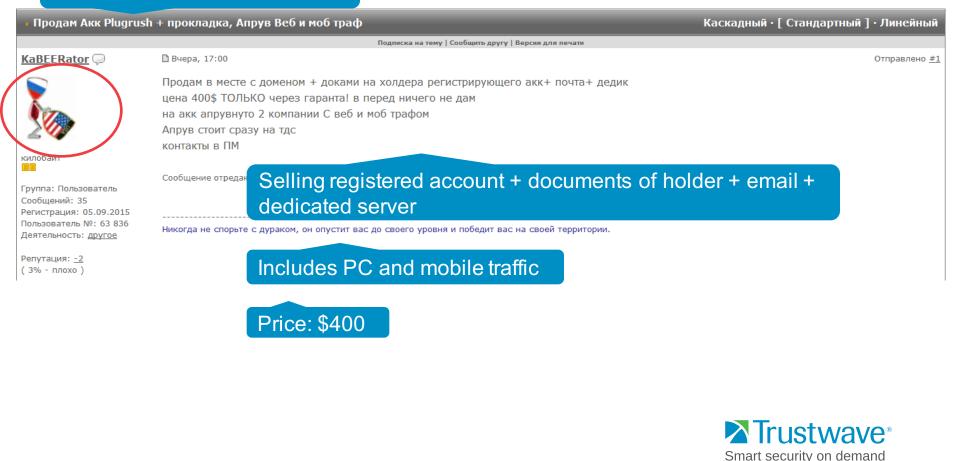
# Underground



# **Underground Gives its Alternatives**

#### **Ad Networks Accounts For Sale**

#### PlugRush account for sale



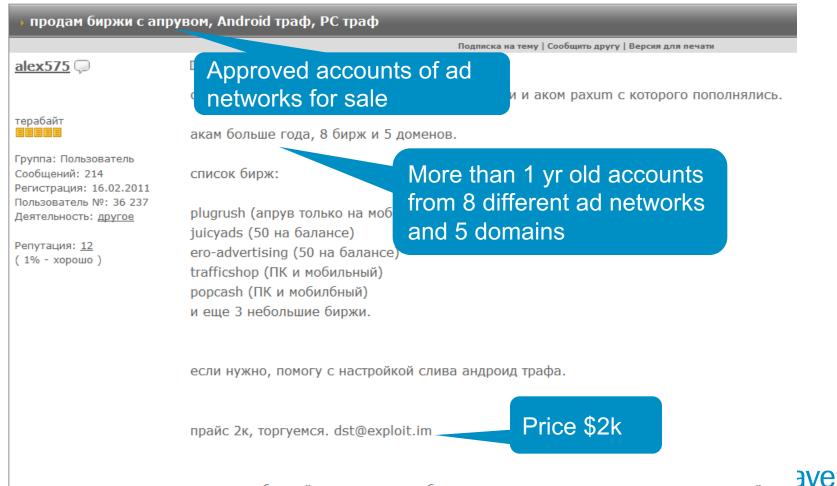
### **Underground Gives its Alternatives**

#### 2 PlugRush accounts for sale Sale

Продам 2 трастед ан	ка ниgrush	Каскадный - [ Стандартный ;
	Подписк	ка на тему   Сообщить другу   Версия для печати
<u>zlazuzla</u> 💭	□ 19.04.2016, 12:25	
гигабайт Группа: Пользователь Сообщений: 125 Регистрация: 23.02.2010 Пользователь №: 29 403 Деятельность: <u>другое</u>	Продам 2 трастед акка Plugrush Акки с отлежкой, обоми в районе года. Комплект: акк мыло доки холдера акк Рахит с фулл инфо.	nail, documents account
Репутация: <u>11</u> (1% - хорошо )	на акках было проаппрувлено 2 компании - моб и веб. Работа только через гарант, стоимость 400 за единицу. связь ПМ	
профиль) пм)	MARDBA BBEPX	+шх
<u>rlazuzla</u> 🤤	21.04.2016, 12:57	
гигабайт Группа: Пользователь Сообщений: 125 Регистрация: 23.02.2010 Пользователь №: 29 403 Деятельность: <u>другое</u>	1 акк продан. остался еще 1. 1st ac	ccount SOLD
Репутация: <u>11</u> ( 1% - хорошо )	2nd acc	ount SOLD
<u>zlazuzla</u> Ģ	D 25.04.2016, 16:25	
гигабайт	последний акк в продаже. нашелся еще акк adcash.com с балансом. акку тоже год.	For sale: 1 year old adcash account with money in balance
		Smart security on demand

# **The Underground Gives its Alternatives**

#### Ad Networks Accounts For Sale



продаю тк ближайшие пол года не будет времени, скоро сезон в юсе, кто в теме поймет.

### **Buying Traffic**

[5/15/2016 3:20:38 PM] me: i want to buy traffic [5/15/2016 3:21:11 PM] sell\_digi opt: how much traffic your needs ? [5/15/2016 3:21:36 PM] me: 100k [5/15/2016 3:21:57 PM] sell\_digi opt: from what countries need traffic? [5/15/2016 3:22:11 PM] me: mix, but i need to do test before of 1k (i will pay for 1k) [5/15/2016 3:23:02 PM] sell\_digi opt: куда пойдет трафик? [5/15/2016 3:26:38 PM] sell\_digi opt: on a link to send the traffic? Which countries ? Europe, Russia ? [5/15/2016 3:27:10 PM] me: europe [5/15/2016 3:29:15 PM] sell\_digi opt: I do not have a banner traffic to Europe only popup [5/15/2016 3:31:22 PM] me: so you can use this one http://\_\_\_\_\_\_.html



# **Buying Traffic**



# **Buying Traffic**

[5/15/2016 4:06:36 PM] sell\_digi opt: I will send traffic to the first link after payment to you. where you feel comfortable to make the payment ? [5/15/2016 4:08:30 PM] me: what are the options for payment? [5/15/2016 4:08:49 PM] sell\_digi opt: tell me what to do , where to direct the traffic as you want to pay for traffic [5/15/2016 4:09:51 PM] sell\_digi opt: Now only Webmoney and qiwi



# **Experience With Underground Traffic**

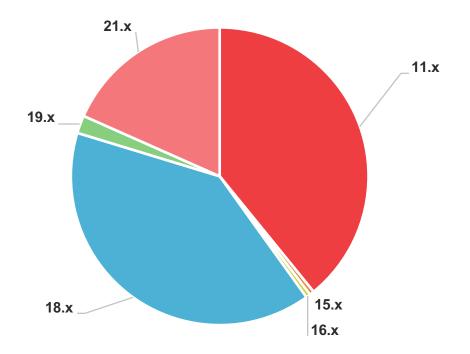
Campaign Results (A different Ad network)

- Budget: \$6.00
- Campaign Time: 3 hours
- Total clicks according to agreement: 3,000
- Total clicks actual number: 2,742



## **Underground Traffic**

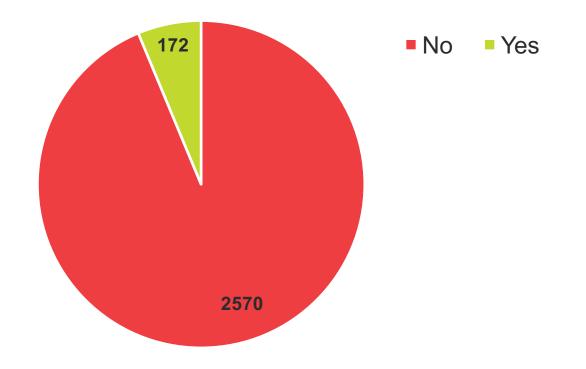
#### Flash Versions Breakdown of 206 IE Users





## **Underground Traffic**

#### **Amount of Vulnerable Machines**

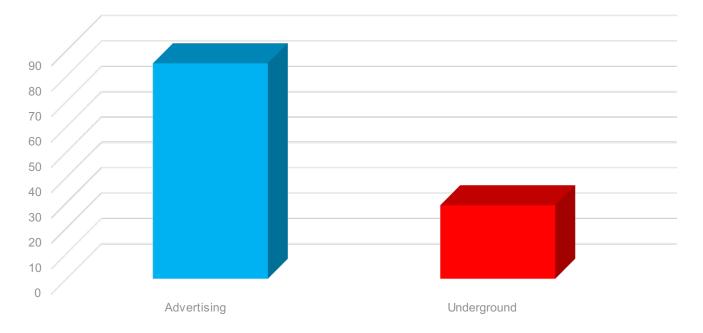




# **Campaigns Summary**

## **Advertising VS. Underground**

Vulnerable Machines for \$1







# Perspectives



## The Online Advertising Market Perspective A wake up call

- IAB: Malvertising is costing the American marketing and media industry: \$1.1 billion
- IAB: Out of \$1.1 b, \$780m is lost because of ad blocking
- IAB: a "call to action" asking industry leaders to step in and contribute to fight corruption in the digital advertising supply chain ecosystem
- AdWords & DoubleClick will block Flash by June 30<sup>th</sup>



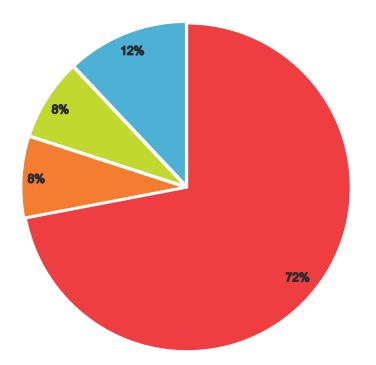
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## **The Online Advertising Market Perspective**

**Publishers losses because of ad blockers** 



- Under \$200,000
- **\$200,000-\$499,000**
- Over \$1,000,000
- **\$500,000 to \$999,000**



## Web Users' Perspective

### Ad blocking is the name of the game

- According to KPMG's survey in UK:
  - 60% of 16-24 year-olds in UK plan to make use of ad blocking in the next six months
  - 55% of people earning more than £55,000 are using or are planning to use ad blocking in the next six months
- According to IAB UK:
  - 22% of British adults online are currently using ad blocking
- Mobile operator Three to introduce adblocking across its UK
   and Italian networks



# **Publishers' Perspective**

**Bad reputation** 

- Less visitors
- Bad reputation within search engine = down the result list
- Income disaster



## **Browsers' Perspectives**

- Image: None for you!
- Google Chrome: "HTML5 by Default" by 4<sup>th</sup> Q of 2016
- Microsoft's Edge will pause Flash ads on the upcoming updates
- Opera featured last March a native ad blocker
- "Brave" is a new browser which automatically blocks ads



## Web Criminal's Perspective





# **Reduction of Attack Surface**

Staying safe is in your hands

• Plugins – Click to Play



- Use the most advanced browsers like Chrome and Edge
- Keep your browser and its plugins constantly updated







