

# Telematic Services on Internet

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## 1 INTRODUCTION

IN this practice we'll accost a practical case of telematic service implementation, making them available from the internet.

## 2 OBJECTIVES AND GUIDELINES

The main objective of this practice is to approach common and useful services in order to learn how to maintain and manage a server. Simulating as much as possible real work environments and performing tasks that involve a combination of different skills that we acquired along 'TDRC' and other network related subjects such as:

- Configuration and startup of routers and other interconexion elements.
- Design, display and management of business networks.
- Installation, setup and management of key services in internet usage.
- Being able to select, design, deploy, merge and control communication infrastructure and networks.

In order to perform the practices we've divided our group of 5 members in 2 teams of 2 and designed a coordinator. Both teams have been supervised by the coordinator: Carlos de la Torre Fanin. Team 1 is composed by Mariano Palomo Villafranca and Marco Manuel Fernández Pranno and team 2 is composed by Jesús González Novez and Lorenzo Rosas Rodríguez.

Each team has been responsible of setting up a series of services and TCP/IP applications with its corresponding clients to make them accessible using a web browser. Using a public dynamic IP and a Dynamic DNS service we managed to put online the services and set up two corporate remote networks.

The installed and configured services are the following:

- **Service 1:** Apache server (Website and FTP protocol). The server hosts a simple webpage with a summary of the practices and its related documents: report and presentation document. We've also created two domains: palomofernandez and Gonzalezrosas. Furthermore, we used two FTP clients for demonstration and an additional user for them, so the professor it's able to check it's performance using this login. User: "tdrc". Password: "tdrc2015".

- **Service 2:** XMPP server. We've used Openfire

server software with the same domains that were created in service 1. Establishing server-to-server (s2s) connexion we allow users to chat between domains over the internet. In this case we've also created an additional client for the professor to check the service with the following credentials: tdrc@gonzalezrosas.dtdns.net and tdrc@palomofernandez.dtdns.net - password: "tdrc2015". As client to establish connection we've used Pidgin.

- **Service 3:** VMware WSX. It's a web module for VMware Workstation that allows us to control shared Virtual Machines remotely.

The parts that shape the project are the following

- Virtual Machine's setup and OS installation.
- DDNS configuration and installation.
- Service 1: Website service using Apache with FTP server service.
- Service 2: XMPP chat service.
- Service 3: VMware WSX virtual machine's management tool using web interface.
- Services testing.
- Conclusions.

The architecture is based on two Virtual Machines running over two hosts (our personal computers), in each case we configured our home routers (using NAT) to redirect the traffic in the designated ports for each service to the VM's hosts. Those VM have each one CentOS and all four services running - these being respectively Website (Apache) with FTP, XMPP and VMware WSX.

## 3 VM SETUP AND CONFIGURATION

Those are the specs of the Virtual Machines described above and each host.

```
processor           : 0
vendor_id          : GenuineIntel
cpu family         : 6
model              : 15
model name         : Intel(R) Core(TM)2 Quad CPU    Q6600  @ 2.40GHz
stepping           : 11
microcode          : 182
cpu MHz            : 2399.999
cache size         : 4096 KB
physical id        : 0
siblings           : 1
core id            : 0
cpu cores          : 1
apic id            : 0
initial apic id    : 0
fdiv_bug           : no
hlt_bug            : no
f00f_bug           : no
coma_bug           : no
fpu                : yes
fpu_exception      : yes
cpuid level        : 10
wp                 : yes
flags               : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
```

```

aero@lucypher:~$ cat /proc/cpuinfo
processor       : 0
vendor_id      : GenuineIntel
cpu family     : 6
model          : 42
model name     : Intel(R) Core(TM) i7-2600K CPU @ 3.40GHz
stepping       : 7
microcode      : 0x14
cpu MHz        : 1600.000
cache size     : 8192 KB
physical id    : 0
siblings       : 8
core id        : 0
cpu cores      : 4
apicid         : 0
initial apicid : 0
fpu            : yes
fpu_exception  : yes
cpuid level    : 13
flags           : yes
fpu_0           : yes
fpu_1           : yes
fpu_2           : yes
fpu_3           : yes
fpu_4           : yes
fpu_5           : yes
fpu_6           : yes
fpu_7           : yes
fpu_8           : yes
fpu_9           : yes
fpu_10          : yes
fpu_11         : yes
fpu_12         : yes
fpu_13         : yes
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fpu_391        : yes
fpu_392        : yes
fpu_393        : yes
fpu_394        : yes
fpu_395        : yes
fpu_396        : yes
fpu_397        : yes
fpu_398        : yes
fpu_399        : yes
fpu_400        : yes
fpu_401        : yes
f
```

```
processor      : 0
vendor_id     : GenuineIntel
cpu_family    : 6
model         : 15
model_name    : Intel(R) Core(TM)2 Quad CPU    Q6600   @ 2.40GHz
stepping      : 11
microcode     : 0xb6
cpu_mhz       : 1600.000
cache_size    : 4096 KB
physical_id   : 0
siblings      : 4
core_id       : 0
cpu_cores     : 4
apicid        : 0
initial_apicid : 0
fpu           : yes
fpu_exception : yes
cpuid_level    : 10
wp            : yes
bugs          :
bogomips      : 4799.95
clflush_size   : 64
cache_alignment : 64
address_sizes  : 36 bits physical, 48 bits virtual
```

## 4 NETWORK ARCHITECTURE

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Emergency Support  
1-477-432-4367

## Hostname Manager

**Note:** Your account is limited to five free hostnames. Please consider paying the one-time \$5.00 fee to upgrade your account if you need more hostnames. [Tell me more.](#)

To add a hostname, enter the name you would like in the box below, select a domain name to place it on, then click the "add" button. Valid hostnames may contain letters, numbers and the hyphen (-) character. A hyphen may appear at the beginning or end of a hostname. Typically hostnames shouldn't contain numerical.

To manage existing hostnames, simply click the entry in the list below.

Hostname	Domain	IP Address	Type
<a href="#">gonzalezrosas</a>	dt dns.net	217.216.45.201	Active Dynamic
<a href="#">palomofernandez</a>	dt dns.net	217.216.41.16	Active Dynamic
<input type="text"/>	<input type="text" value=".chatnook.com"/> <input type="button" value="v"/>	<input type="button" value="Add Hostname &gt;&gt;"/>	

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You are currently logged in as jeusgn00

```
usuario@bash - Koneksi
Archivo Editar Ver Marcadores Preferencias Ayuda
[usuario@fedora20 ~]$ nslookup gonzalezrosas.dtdns.net
Server:      8.8.4.4
Address:     8.8.4.4#53

Non-authoritative answer:
Name:   gonzalezrosas.dtdns.net
Address: 217.216.45.201

[usuario@fedora20 ~]$ nslookup palomofernandez.dtdns.net
Server:      8.8.4.4
Address:     8.8.4.4#53

Non-authoritative answer:
Name:   palomofernandez.dtdns.net
Address: 217.216.41.16

[usuario@fedora20 ~]$
```

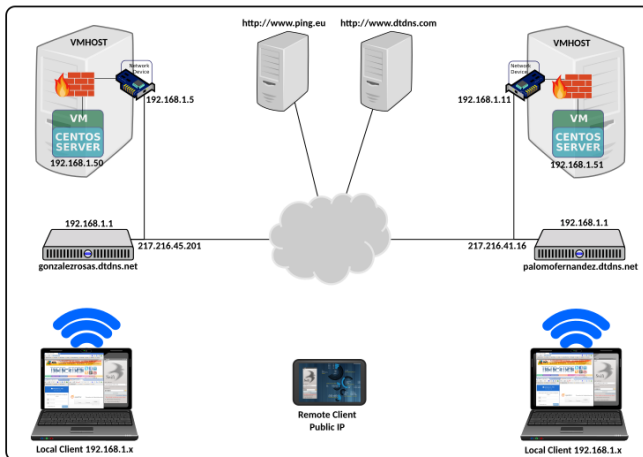
```
## Dtdns (www.dtdns.com)
##
protocol=dtdns,
server=www.dtdns.com,
client=ddclient,
password=secret1,
gonzalezrosas.dtdns.net
ysuario@fedora20:~$dnswallis

## Dtdns (www.dtdns.com)
##
protocol=dtdns,
server=www.dtdns.com,
client=ddclient,
password=secret1,
palo@fernandez.dtdns.net
ysuario@fedora20:~$dnswallis
```

Dirección IP del servidor		Dirección IP del servidor			
Número del servidor		192	168	1	Añadir
#	Nombre del servicio	Puerto de acceso externo	Puerto de destino externo	Puerto de acceso interno	Puerto de destino interno
0					
1					
2					
3	HTTPS	443	443	443	192.168.1.5
4	tomcat8.5	8080	8080	8080	192.168.1.5
5	GestorcionWare	902	902	902	192.168.1.5
6					
7					
8	FTP	20	21	20	192.168.1.50
9	HTTP	80	80	80	192.168.1.50
10	SMP	5222	5223	5222	192.168.1.50
11	esqnet	9090	9091	9090	192.168.1.50
12	atquepodador	5269	5269	5269	192.168.1.50
13	webmin	10000	10000	10000	192.168.1.50

Externo			Interno			Protocolo	Activar
Puerto inicial	Puerto final	Dirección IP	Puerto inicial	Puerto final			
22	a	22	192.168.1.15	22	a	TCP	<input type="checkbox"/>
80	a	80	192.168.1.15	80	a	Ambos	<input type="checkbox"/>
8888	a	8888	192.168.1.11	8888	a	8888	Ambos <input checked="" type="checkbox"/>
443	a	443	192.168.1.11	443	a	443	Ambos <input type="checkbox"/>
902	a	902	192.168.1.11	902	a	Ambos	<input checked="" type="checkbox"/>
20	a	21	192.168.1.50	20	a	21	Ambos <input type="checkbox"/>
80	a	80	192.168.1.50	80	a	80	Ambos <input checked="" type="checkbox"/>
5222	a	5223	192.168.1.50	5222	a	5223	Ambos <input checked="" type="checkbox"/>
10000	a	10000	192.168.1.50	10000	a	10000	Ambos <input checked="" type="checkbox"/>
9090	a	9091	192.168.1.50	9090	a	9091	Ambos <input checked="" type="checkbox"/>

In this way, we would obtain the following network configuration:



## 5 TOOLS AND UTILITIES

- Open fire: Server software for messaging using XMPP protocol. It provides and administration panel using a web interface.
- Webmin: Web-based system configuration tool for unix-like systems, we used it to configure and manage, modify and control the Apache server and other features.
- PhpPgAdmin: Web interface for managing PostgreSQL databases.
- DDNS: Method for updating automatically server's IP and relate it to the domain name. Used to solve the issue that will cause the servers to be unreachable if the ISP changes our dynamic IPs.

## 6 SERVICE 1: APACHE + FTP (VSFTPD) SERVER

Over them we got running CentOS 6.6 (32bit) using the console interface to speed them up and save resources.

**Apache's** the most widely used HTTP server platform. It has got a key role in the growth of the WWW since the beginning, it has remained the most popular server software since 1996 until today.

It is developed and maintained by the Apache Software Foundation. Besides it is most commonly used on Unix-based systems, it's a multiplatform software and it's available for a wide range of OS (Windows, OS X, Solaris, Linux, etc). In this case, our web server will host an static page with the practice summary, as well as the documents related to it (report and presentation display).

In order to install it in the hosts we used:

```
[usuario@fedora20 ~]$ sudo yum install httpd
```

**vsFTPD** stands for very secure FTP daemon: an FTP server for Unix-based operating system that's strongly focused on security and efficiency. It has support for IPv6 and

SSL protocol. It's licenced under GNU General Public Licence.

It has an optional validation of client certificates that can be setup to add security. The user access can be monitored and controlled by using deny and enable lists. Furthermore, vsFTPD can be configured to show and store detailed logs of activity in various formats. Last to mention, it is the default FTP daemon in Ubuntu, CentOS and Fedora.

Installation process is the following:

```
[usuario@fedora20 ~]$ sudo yum install vsftpd
```

## 7 SERVICE 2: XMPP SERVER

**XMPP** stands for Extensible Messaging and Presence Protocol. It is a communications protocol for message-oriented software based on XML (Extensible Markup Language).

It enables an almost real time communication by exchanging an structured and extensible data between two or more network entities. It has been used and extended to signal VoIP, videoconference, file transfer, gaming and social networking services (Google Talk, etc).

Since it's an open protocol defined in an open standard and uses an open systems approach of development and application, it can be used and developed by anyone using any software licence.

It's main features, besides the open standards, it's decentralization using an architecture similar to email, security by isolating servers from the public XMPP network or by using technologies such as SASL ( Simple Authentication and Security Layer ) or TLS ( Transport Layer Security ) that have been built in the core of XMPP.

It's also remarkably flexible in the sense of maintaining interoperability when implemented custom functionalities over it. Some examples of this are the common extensions that allow groupchat, network management, file sharing, remote systems control and monitoring, VoIP or gaming.

Installation process is the following:

```
[usuario@fedora20 Downloads]$ wget http://www.igniterealtime.org/downloadServlet?filename=openfire/openfire-3.10.0-1.i386.rpm
[usuario@fedora20 Downloads]$ mv downloadServlet?filename=openfire%2Fopenfire-3.10.0-1.i386.rpm openfire.rpm
[usuario@fedora20 Downloads]$ sudo yum install openfire.rpm
```

## 8 SERVICE 3: VMWARE WSX

For the optional service we choose to work with a virtual machine sharing service. The configuration is the following: over a high spec host we virtualize machines using VMware Workstation, and using **VMware WSX** module we get to share them using a web interface.

VMware Workstation is a hypervisor that runs over x86-64 processor architecture computers. It allows to set up and run one or more virtual machines on a single physical machine and use them simultaneously.

It supports a wide range of configurations for network sharing with the host, network virtualization, virtual hard disk drives and others.

As said before, WSX module allows us to access virtual machines remotely and manage them using an internet browser.

The installation process consists in downloading from the [official website of VMWare](#) both Workstation and WSX module, then giving the bundle files execution permissions and then running them on the host.

Those are the orders that need to be written:

```
chmod +x VMware-Workstation-Full-8.0.0-2305329.x86_64.bundle
./VMware-Workstation-Full-8.0.0-2305329.x86_64.bundle
```

## 9 TESTS AND SERVICES USAGE

Once installed and configured the services, we check it's correct performance. First of all, we check the ports on our server with "netstat -a" order:

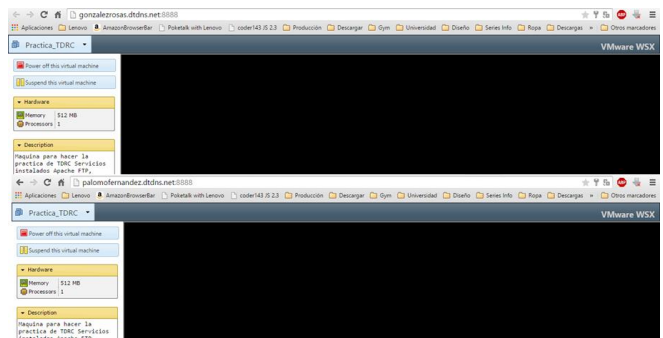
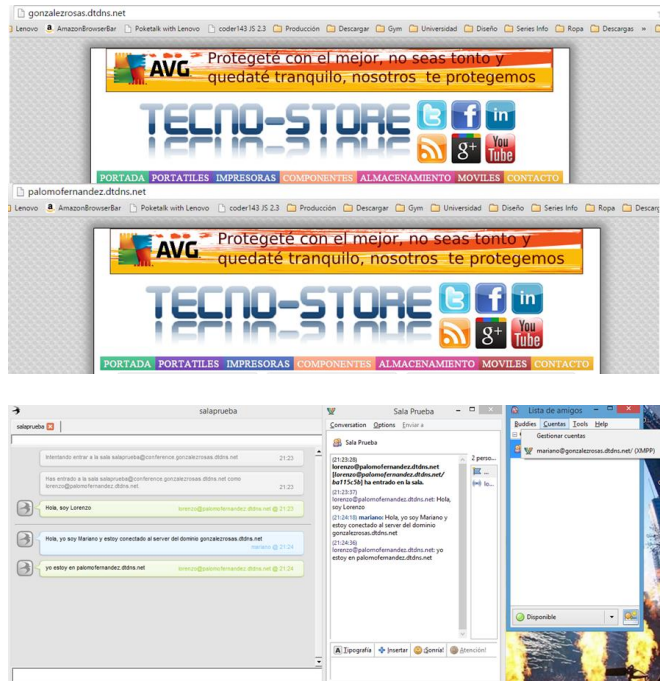
```
[root@server ~]# netstat -tulpn
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:38846          0.0.0.0:*                LISTEN      973/rpc.statd
tcp        0      0 0.0.0.0:111            0.0.0.0:*                LISTEN      953/rpcbind
tcp        0      0 0.0.0.0:10000          0.0.0.0:*                LISTEN      1570/perl
tcp        0      0 192.168.1.50:21        0.0.0.0:*                LISTEN      1173/vsftpd
tcp        0      0 0.0.0.0:0:22          0.0.0.0:*                LISTEN      1161/sshd
tcp        0      0 127.0.0.1:631          0.0.0.0:*                LISTEN      1034/cupsd
tcp        0      0 127.0.0.1:5432        0.0.0.0:*                LISTEN      1204/postmaster
tcp        0      0 0.0.0.0:443           0.0.0.0:*                LISTEN      1245/httpd
tcp        0      0 0.0.0.0:7777           0.0.0.0:*                LISTEN      1338/java
tcp        0      0 0.0.0.0:9090           0.0.0.0:*                LISTEN      1338/java
tcp        0      0 0.0.0.0:9091           0.0.0.0:*                LISTEN      1338/java
tcp        0      0 0.0.0.0:5222           0.0.0.0:*                LISTEN      973/rpc.statd
tcp        0      0 0.0.0.0:39878          0.0.0.0:*                LISTEN      1338/java
tcp        0      0 0.0.0.0:5229           0.0.0.0:*                LISTEN      953/rpcbind
tcp        0      0 0.0.0.0:111            0.0.0.0:*                LISTEN      1245/httpd
tcp        0      0 0.0.0.0:5269           0.0.0.0:*                LISTEN      1338/java
tcp        0      0 0.0.0.0:122            0.0.0.0:*                LISTEN      1161/sshd
tcp        0      0 0.0.0.0:11631          0.0.0.0:*                LISTEN      1034/cupsd
tcp        0      0 0.0.0.0:5432           0.0.0.0:*                LISTEN      1204/postmaster
udp        0      0 0.0.0.0:636           0.0.0.0:*                LISTEN      900/portreserve
udp        0      0 0.0.0.0:34179          0.0.0.0:*                LISTEN      973/rpc.statd
udp        0      0 0.0.0.0:10000          0.0.0.0:*                LISTEN      1570/perl
udp        0      0 0.0.0.0:704           0.0.0.0:*                LISTEN      953/rpcbind
udp        0      0 127.0.0.1:725         0.0.0.0:*                LISTEN      973/rpc.statd
udp        0      0 0.0.0.0:111            0.0.0.0:*                LISTEN      1034/cupsd
udp        0      0 0.0.0.0:631           0.0.0.0:*                LISTEN      953/rpcbind
udp        0      0 0.0.0.0:704           0.0.0.0:*                LISTEN      973/rpc.statd
udp        0      0 0.0.0.0:57673         0.0.0.0:*                LISTEN      953/rpcbind
udp        0      0 0.0.0.0:111            0.0.0.0:*                LISTEN      953/rpcbind
```

Then from the outside, we check that ports are actually open using [www.ping.eu](#). Simultaneously capturing the received packets as a result of the ping petitions to the servers.

The screenshots show network traffic for different ports using Wireshark. Each screenshot displays the IP address or host name, port number, and a 'Go' button. Below the button, it states 'gonzalezrosas.dtdns.net: [port] port is open'. The main table shows packet details for 'IPTraf' (TCP Connections) with columns for Packets, Bytes, Flags, and Interface. The source and destination IP addresses and ports are listed in the first row of the table.

Port	Source Host (Port)	Packets	Bytes	Flags	Interface
21	192.168.1.50:21	14	1191	--PA--	eth0
80	192.168.1.50:80	2	112	--A--	eth0
5222	192.168.1.50:5222	1	52	--A--	eth0
9091	192.168.1.50:9091	3	154	--A--	eth0

Last, we display the services running with a screen capture that shows the clients connecting to them:



## 10 CONCLUSION

Some steps turned out to be a little more complex than expected, especially in terms of configuring VM's and hosts to share resources on the web interface WSX. Mainly it was a permission and user's configuration issue that we luckily ended up solving.

The overall result has been an extensive from scratch experience in configuring a possible real scene. We had to unify several concepts learnt during the year. Such as NAT configuration, network management or DDNS (concept of it and client configuration).

We have also got in touch with a few useful tools, such as Webmin for server administration, Openfire for the XMPP servers or PhpPgAdmin to manage the database.

But most of all, it's relevant to mention the importance of hosting our own messaging server, secured with SSL technology. In this way we could manage to keep sensible data out of reach of other third parties that may be involved in the communication (such as a hosting or communication company) and eavesdrop information, with it's consequent danger to our possible business environment.

## REFERENCES

- [1] <http://httpd.apache.org/>
- [2] <https://security.appspot.com/vsftpd.html>
- [3] <https://xmpp.org/>
- [4] [www.igniterealtime.org/projects/openfire/](http://www.igniterealtime.org/projects/openfire/)
- [5] <https://pidgin.im/>
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- [7] <http://www.webmin.com/>
- [8] <http://phppgadmin.sourceforge.net/doku.php>
- [9] <https://my.vmware.com/web/vmware/details?productId=293&downloadGroup=WKST-901-WSX>