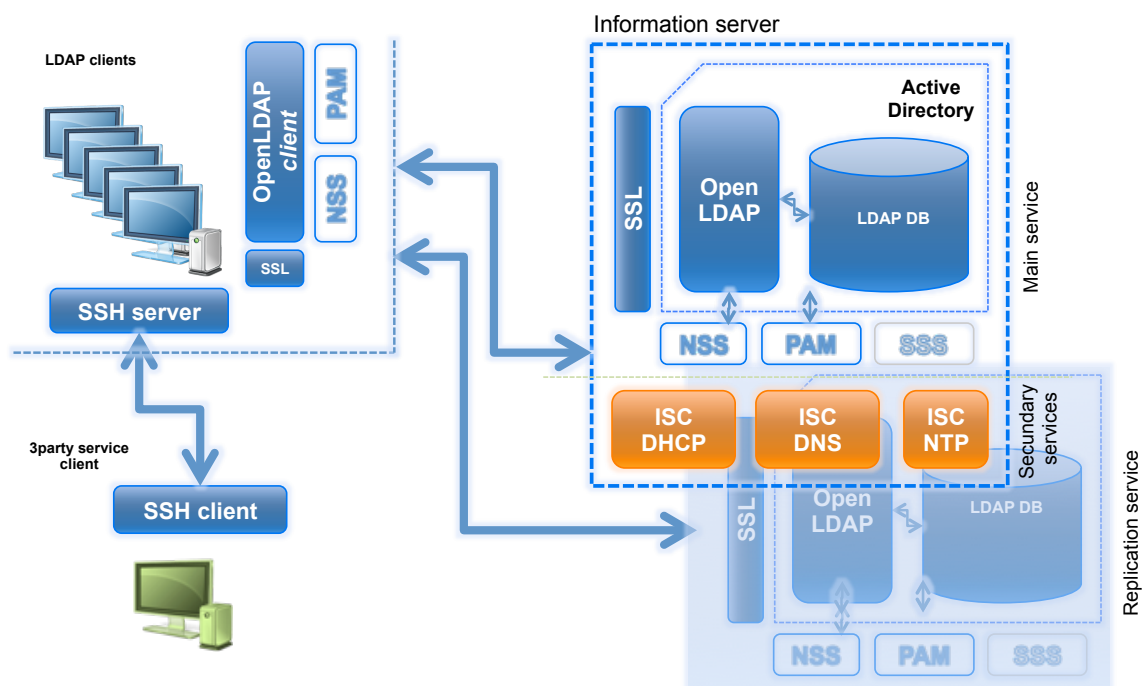


## Integration of global services in enterprise environments I:

### The INTRANET

#### Deployment of a secure information server II

Computer systems for deploying (third-party) networking services



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## Main goals

- To learn to deploy some of the most critical (and necessary) services for the INTRANET:
  - **Dynamic Host Configuration service (ISC DHCP)** to serve network parameters to hosts in the local network (LAN).
  - **Domain Name service (Bind9 DNS)** to manage host name resolution in the local network (LAN)
  - **Network Time service (ISC NTP)** to sync the host time (and date) in the local network (LAN)
- Adaptation, integration and client configuration for each one of these services.
- To become familiar with, practice using and gain experience with tools for managing these services.

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## Getting started: Creating the clone for lab2

1. In this lab class, we will use the same VM (*clone\_P1*) as that used before.
2. Create a new snapshot before starting this lab class;
  - a. Create it from the last state of *clone\_P1* after ending lab1.
  - b. Remember to keep the VM off.
  - c. Call it **snapshot\_P2**.

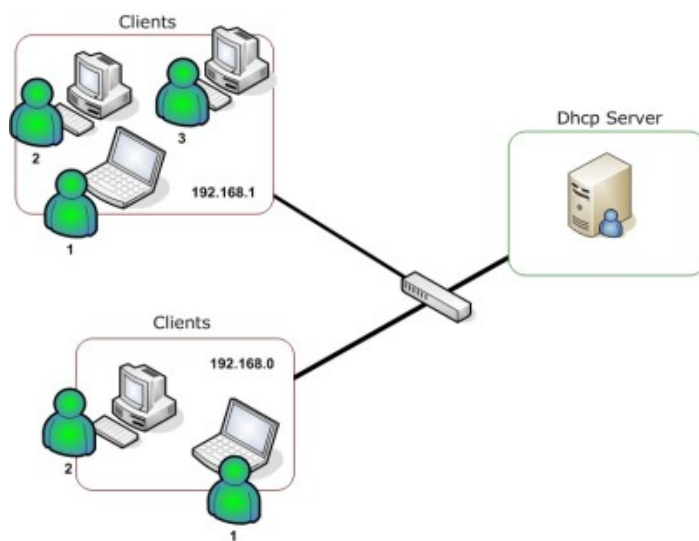
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## Assignment 1: Installation and configuration of additional services: DHCP service

To complete our secure information server, we will also install some *third-party* network services, consolidating our computing environment into an autonomous system. In addition, these services will enable us to manage in a secure and centralized way, basic services such as local name resolution and time network service.

**DHCP server:** Install and configure the **DHCP** service on `server-01`. This allows us to keep the network configuration parameters of every client host on only one host; the DHCP server.

1. *Installation*<sup>1</sup>:
  - a. `isc-dhcp-server`.
2. *Configuration*: After that, configure it. The master configuration file for DHCP is `/etc/dhcp/dhcpd.conf`.
  - a. This file is divided into sections which establish the config parameters for each network managed. Also, you can establish global parameters for every network.



For each network, you can define main parameters such as:

- `default-lease-time`: number of seconds the lease remains valid if the client requesting the lease does not specify the duration.
- `routers`: gateways (IP).
- `subnet-mask`: network mask.
- `domain-name`: domain name.
- `domain-name-servers`: DNS servers (IP).
- `ntp-servers`: NTP servers (IP).

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<sup>1</sup> Use the official debian software repositories

- `broadcast-address`: Broadcast IP.
- `range`: Clients are assigned an IP address within the **range**.

Now, define for your DHCP service only one network (*subnet*) which can serve network configurations to clients belonging to the network **192.168.0.0**.

Main parameters:

- Gateway: **192.168.0.1**
- Network mask: **255.255.255.0**
- *broadcast*: **192.168.0.255**
- Domain: **localdomain**
- DNS servers: **8.8.8.8 8.8.4.4 (192.168.0.11)**<sup>2</sup>
- NTP servers: **192.168.0.1 (192.168.0.11)**
- *range*: from **192.168.0.20** to **192.168.0.30** (both included)

And now, for each client of our subnet, add its DHCP configuration to the file `/etc/dhcp/dhcpd.conf` (according to their `@ 'mac'`) **statically**.

- `client.localdomain: 192.168.0.20`

3. *Post-installation*: Restart the service and make sure that:
  - a. Service is started on *run levels* 2, 3, 4 and 5.
  - b. Remember, DHCP service in VirtualBox networks is disabled.

**DHCP client**: Check that the `client` *links* correctly with the DHCP server on `server-01`:

1. Configure the main network interface of `client` VM (`bond0`) dynamically. That is, when client boots (or networking is restarted), its network interface must be automatically configured by the DHCP service on `server-01`.
2. Use the `dhclient` command from `client` to renew the "lease".
3. Change the `dhclient` configuration on `client` so that the DNS search domain and server are configured by themselves and not by the server.

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<sup>2</sup> Following the installation and configuration of local DNS and NTP services on `server-01`, you can reconfigure the DHCP service to use them as services by default.

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## Assignment 2: Installation and configuration of additional services: DNS service

**DNS server (CACHE/Local mode):** You should deploy a local name resolution service (DNS) on `server-01` using the **bind9** software. You will have to configure it as a “*primary local*” DNS using a “*cache*” operation mode.

1. *Installation*<sup>3</sup>:
  - a. `bind9`
2. *Configuration*:
  - a. Make sure that the service is started on default *run levels*: 2,3,4, and 5.
  - b. Bind9 daemon must be run under “no root” user privileges: `bind`
  - c. The external DNS (*forwarders*):
    1. **8.8.8.8**
    2. **8.8.4.4**
  - a. Also, your DNS service should be configured as a “*local primary*” DNS server to carry out the direct and reverse name resolution for **localdomain** domain. So, you should add the DNS information about local hosts (`server-01`, `server-02` and `client`, for the moment). Include a network *alias* for `server-01`, called “`is`”.
  - b. Implement on your DNS server a **load balancing** mechanism for the LDAP service. For this, you will need to create an FQDN associated with the service: `ldap.localdomain`. To that domain name, the DNS will associate the IPs of the 2 LDAP servers implemented (N-way Multi-Master). Then, the DNS must manage the name resolution for `ldap.localdomain` in such a way that it returns a different IP each time (Round Robin algorithm).

*More details in [3]*

**DNS client:** `client` should manage the name resolution using `server-01`, as a main DNS. Keep IP 192.168.0.1 (VirtualBox) as a secondary DNS.

1. Configure the client host according to it.
2. Check from `client` that the DNS service running on `server-01` is ok.
  - a. `$ nslookup server-01`
  - b. `$ nslookup www.unican.es/www.google.es`
  - c. `$ nslookup 192.168.0.11`

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<sup>3</sup> Use the official debian software repositories.

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## Assignment 3: Installation and configuration of additional services: NTP service

**NTP server:** Finally, install and configure a local system clock synchronization service or network time service (time).

1. *Installation*<sup>4</sup>:
  - a. `ntpd`
2. *Configuration*:
  - a. NTP “peers” servers:
    1. **`ntp.redimadrid.es`**
    2. **`minuto.roa.es`**
    3. **`0.europe.pool.ntp.org`**
  - b. Besides:
    1. Your NTP service should generate stats in `/var/log/ntpstat`
      - a. `loopstats peerstats clockstats`
    2. Your NTP service should provide “time” in *broadcast* to 192.168.0.0.
    3. Check that when the service starts, the host time and date (software) are updated.

**NTP client:** Check that the client VM *links* correctly with NTP service on `server-01`:

1. The `client` VM should also synchronize its software clock automatically in relation to `server-01` every so often (you decide this interval). Use the `ntpdate-debian` as NTP client and `cron` service.

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<sup>4</sup> Use the official debian software repositories



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## References and resources

1. man
2. Google
3. **Slides:**
  - <https://gitlab.com/herreroja/G679>
4. More:
  - ISC DHCP
    - [1] <https://www.isc.org/downloads/dhcp>
  - ISC DNS (Bind9)
    - [2] <http://www.bind9.net/>
    - [3] <https://www.isc.org/downloads/bind/>
    - [3] <http://www.zytrax.com/books/dns/ch9/rr.html>
  - ISC NTP
    - [4] <http://www.eecis.udel.edu/~mills/ntp/html/index.html>
5. More docs and web links are available in the GIT repository.