

Práctica 3

Requisitos previos:

- Haber completado las prácticas 1 y 2
- Cliente LINUXXX correctamente configurado. Para ello es necesario arrancar la máquina cliente previamente y modificar la configuración de red para que el adaptador que está en la red interna esté en DHCP en lugar de STATIC.
- Cliente WindowsXX correctamente configurado. Para ello es necesario arrancar la máquina cliente previamente y modificar la configuración de red para que el adaptador que está en la red interna esté en DHCP en lugar de STATIC.

Pasos de la práctica:

1. Modificar el archivo de configuración de la Práctica 2 (recuerda haber hecho copia de seguridad previamente) para conseguir que:
 - Se otorgue a la máquina LinuxXX (por ser cliente conocido) una dirección del pool 10.0.128+XX.150 a 10.0.128+XX.159
 - Tiempo máximo de alquiler de direcciones de 90 segundos
 - Tiempo por defecto de alquiler de direcciones de 45 segundos
 - Se otorgue a la máquina WindowsXX (por ser cliente desconocido) una dirección del pool 10.0.128+XX.160 a 10.0.128+XX.169. Cuidado, porque habrá que quitar la dirección reservada de la práctica anterior.
 - Tiempo máximo de alquiler de direcciones de 40 segundos
 - Tiempo por defecto de alquiler de direcciones de 20 segundos

IDENTIFICACIÓN DE CLIENTES CONOCIDOS Y DESCONOCIDOS POR SO

Este método utiliza la Opción 60 de DHCP, conocida como Vendor Class Identifier (VCI). El método se basa en que la mayoría de los sistemas operativos se identifican a sí mismos al solicitar una dirección IP (en el paquete **DHCP DISCOVER**).

- Clientes Windows (Desconocidos): Se identifican enviando un VCI (Opción 60) que comienza con el texto **MSFT** (por ejemplo, **MSFT 5.0**).
- Clientes Linux (Conocidos): Envían un VCI diferente (como **dhclient...**) o, en muchos casos, no envían esta opción en absoluto.

```
GNU nano 7.2 /etc/kea/kea-dhcp4.conf
}
],
"client-classes": [
  {
    "name": "windows-clientes",
    "test": "option[60].exists and substring(option[60].text, 0, 4) == 'MSFT'",
    "valid-lifetime": 20,
    "max-valid-lifetime": 40
  },
  {
    "name": "linux-clientes",
    "test": "not (option[60].exists and substring(option[60].text, 0, 4) == 'MSFT')",
    "valid-lifetime": 45,
    "max-valid-lifetime": 90
  }
],
"subnet4": [
```

```
BookWorm11A_DHCP [Corriendo] - Oracle VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda
alumno@bookworm11a: ~
Archivo Editar Pestañas Ayuda
GNU nano 7.2 /etc/kea/kea-dhcp4.conf *
"client-classes": [
  {
    "name": "windows-clientes",
    "test": "option[60].exists and substring(option[60].text, 0, 4) == 'MSFT'",
    "valid-lifetime": 20,
    "max-valid-lifetime": 40
  },
  {
    "name": "linux-clientes",
    "test": "not (option[60].exists and substring(option[60].text, 0, 4) == 'MSFT')",
    "valid-lifetime": 45,
    "max-valid-lifetime": 90
  }
],
"subnet4": [
  {
    "subnet": "10.0.139.0/24",
    "pools": [
      {
        "pool": "10.0.139.150 - 10.0.139.159",
        "client-class": "linux-clientes"
      },
      {
        "pool": "10.0.139.160 - 10.0.139.169",
        "client-class": "windows-clientes"
      }
    ]
  }
],
```

```
BookWorm11A, DHCP [Contenido] - Oracle VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda
alumno@bookworm11a: ~

alumno@bookworm11a:~$ sudo kea-dhcp4 -t /etc/kea/kea-dhcp4.conf
2025-11-01 18:37:17.717 INFO [kea-dhcp4.hosts/3020.139956236452352] HOSTS_BACKENDS_REGISTERED the following host backend types are available: mysql postgresql
2025-11-01 18:37:17.717 INFO [kea-dhcp4.dhcpsrv/3020.139956236452352] DHCP4_SRV_CFGMGR_ADD_IFACE listening on interface enp0s8
2025-11-01 18:37:17.720 INFO [kea-dhcp4.dhcpsrv/3020.139956236452352] DHCP4_SRV_CFGMGR_SOCKET_TYPE_DEFAULT "dhcp-socket-type" not specified , using default socket type raw
2025-11-01 18:37:17.720 INFO [kea-dhcp4.dhcpsrv/3020.139956236452352] DHCP4_SRV_CFGMGR_NEW_SUBNET4 a new subnet has been added to configuration: 10.0.139.0/24 with params: valid-lifetime=7200
alumno@bookworm11a:~$
```

```
BookWorm11A, DHCP [Contenido] - Oracle VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda
alumno@bookworm11a: ~

alumno@bookworm11a:~$ sudo systemctl restart kea-dhcp4-server
alumno@bookworm11a:~$ sudo systemctl status kea-dhcp4-server
● kea-dhcp4-server.service - Kea IPv4 DHCP daemon
   Loaded: loaded (/lib/systemd/system/kea-dhcp4-server.service; enabled; preset: enabled)
   Active: active (running) since Sat 2025-11-01 18:38:12 CET; 1s ago
     Docs: man:kea-dhcp4(8)
  Main PID: 3049 (kea-dhcp4)
    Tasks: 5 (limit: 7180)
  Memory: 2.6M
     CPU: 33ms
    CGroup: /system.slice/kea-dhcp4-server.service
            └─3049 /usr/sbin/kea-dhcp4 -c /etc/kea/kea-dhcp4.conf

nov 01 18:38:12 bookworm11a systemd[1]: Started kea-dhcp4-server.service - Kea IPv4 DHCP daemon.
nov 01 18:38:12 bookworm11a kea-dhcp4[3049]: 2025-11-01 18:38:12.071 INFO [kea-dhcp4.dhcp4/3049.140680555146160] DHCP4_LEASES_REGISTERED the following lease types are available: dhcp4-lease
lines 1-13/13 (END)
alumno@bookworm11a:~$
```

2. Revisa los logs del servidor y recoge evidencias (registros) sobre el funcionamiento del servidor: concesión de direcciones, renovación, identificación del cliente y tiempo de concesión
3. Recoge evidencias en que se muestre el tiempo por el que se ha concedido la IP a cada uno de los clientes

LINUX11 :

The screenshot displays a Linux terminal window on the left and a Wireshark network capture on the right. The terminal shows logs for the kea-dhcp4-server, including lease evaluations and allocations. The Wireshark capture, titled 'Capturando desde enp0s8', shows a series of DHCP messages (REQUEST, ACK, and RELEASE) between the server and clients. The packet list on the right shows the following details:

No.	Time	Source	Destination	Protocol	Length	Info
4	0.066318084	0.0.0.0	255.255.255.255	DHCP	356	DHCP Request - Transaction ID 0xebcd2395
5	0.066739907	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395
81	23.467525943	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0xebcd2395
82	23.468193866	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395
129	45.364278856	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0xebcd2395
130	45.364885893	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395
181	68.777019649	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0xebcd2395
182	68.777531785	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395
225	91.656155328	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0xebcd2395
226	91.656628531	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395
263	114.384260719	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0xebcd2395
264	114.384881760	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0xebcd2395

The terminal logs show the following sequence of events:

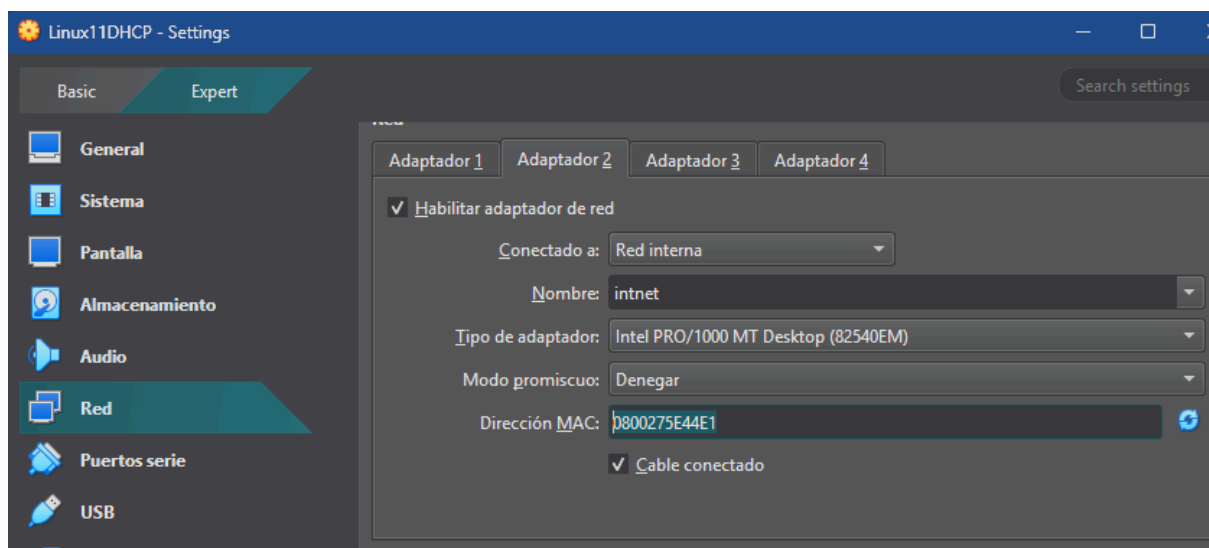
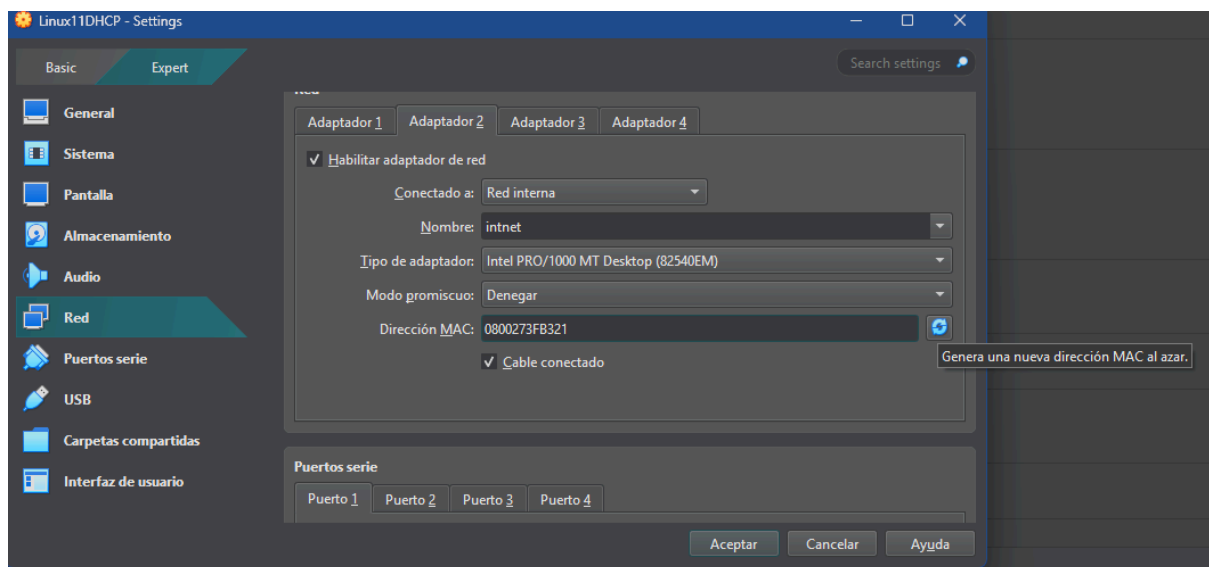
- 2025-11-01 18:41:29.599 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RESULT Expression linux-clientes evaluated to 1
- 2025-11-01 18:41:29.600 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LEASE_ALLOC [hwtype=1 08:00:27:3f:b3:21], cid=[ff:af:81:8f:7d:00:02:00:00:ab:11:94:2f:0e:f1:84:f0:d9:a0], tid=0xebcd2395: lease 10.0.139.150 has been allocated for 45 seconds
- 2025-11-01 18:41:53.012 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RESULT Expression linux-clientes evaluated to 1
- 2025-11-01 18:41:53.012 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LEASE_ALLOC [hwtype=1 08:00:27:3f:b3:21], cid=[ff:af:81:8f:7d:00:02:00:00:ab:11:94:2f:0e:f1:84:f0:d9:a0], tid=0xebcd2395: lease 10.0.139.150 has been allocated for 45 seconds
- 2025-11-01 18:42:15.891 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RESULT Expression linux-clientes evaluated to 1
- 2025-11-01 18:42:15.891 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LEASE_ALLOC [hwtype=1 08:00:27:3f:b3:21], cid=[ff:af:81:8f:7d:00:02:00:00:ab:11:94:2f:0e:f1:84:f0:d9:a0], tid=0xebcd2395: lease 10.0.139.150 has been allocated for 45 seconds
- 2025-11-01 18:42:38.619 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RESULT Expression linux-clientes evaluated to 1
- 2025-11-01 18:42:38.620 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LEASE_ALLOC [hwtype=1 08:00:27:3f:b3:21], cid=[ff:af:81:8f:7d:00:02:00:00:ab:11:94:2f:0e:f1:84:f0:d9:a0], tid=0xebcd2395: lease 10.0.139.150 has been allocated for 45 seconds

```
Linux1DHCP [Corriendo] - Oracle VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

linux11@linux11-virtualbox: ~

linux11@linux11-virtualbox: ~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:3f:b3:21 brd ff:ff:ff:ff:ff:ff
    inet 10.0.139.150/24 metric 1024 brd 10.0.139.255 scope global dynamic enp0s8
        valid_lft 33sec preferred_lft 33sec
    inet6 fe80::a00:27ff:fe3f:b321/64 scope link
        valid_lft forever preferred_lft forever
linux11@linux11-virtualbox: ~$
```

CAMBIANDO DE MAC EN EL LINUX PARA SIMULAR OTRA MAQUINA:



```
Linux1DHCP [Corriendo] - Oracle VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda

linux11@linux11-virtualbox: ~
Archivo Acciones Editar Vista Ayuda

linux11@linux11-virtualbox:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:5e:44:e1 brd ff:ff:ff:ff:ff:ff
    inet 10.0.139.150/24 metric 1024 brd 10.0.139.255 scope global dynamic enp0s8
        valid_lft 29sec preferred_lft 29sec
    inet6 fe80::a00:27ff:fe5e:44e1/64 scope link
        valid_lft forever preferred_lft forever
linux11@linux11-virtualbox:~$
```

BookWorm11A.DHCP [Comando] - Oracle VirtualBox

alumno@bookworm11a: ~

alumno@boo... *alumno@...

2025-11-01 18:48:33.944 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression linux-clientes evaluated to 1
2025-11-01 18:48:33.944 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ADVERT [hwtype=1 08:00:27:5e:44:e1], cid=[ff:af:81:8f:7d:00:02:00:ab:11:
94:2f:0e:f1:84:f0:d9:a0], tid=0x292344bc: lease 10.0.139.150 will be advertis
ed
2025-11-01 18:48:33.948 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression linux-clientes evaluated to 1
2025-11-01 18:48:33.948 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:5e:44:e1], cid=[ff:af:81:8f:7d:00:02:00:ab:11:
94:2f:0e:f1:84:f0:d9:a0], tid=0x292344bc: lease 10.0.139.150 has been allocat
ed for 45 seconds
2025-11-01 18:48:57.079 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression linux-clientes evaluated to 1
2025-11-01 18:48:57.079 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:5e:44:e1], cid=[ff:af:81:8f:7d:00:02:00:ab:11:
94:2f:0e:f1:84:f0:d9:a0], tid=0x292344bc: lease 10.0.139.150 has been allocat
ed for 45 seconds
2025-11-01 18:49:19.081 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression linux-clientes evaluated to 1
2025-11-01 18:49:19.081 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:5e:44:e1], cid=[ff:af:81:8f:7d:00:02:00:ab:11:
94:2f:0e:f1:84:f0:d9:a0], tid=0x292344bc: lease 10.0.139.150 has been allocat
ed for 45 seconds

Capturando desde enp0s8

dhcpc

No.	Time	Source	Destination	Protocol	Length	Info
2	0.00103319	0.0.0.0	255.255.255.255	DHCP	316	DHCP Discover - Transaction ID 0x292344bc
3	0.000910900	10.0.139.1	10.0.139.150	DHCP	310	DHCP Offer - Transaction ID 0x292344bc
4	0.003552892	0.0.0.0	255.255.255.255	DHCP	356	DHCP Request - Transaction ID 0x292344bc
5	0.004187127	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0x292344bc
81	23.194022822	10.0.139.150	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0x292344bc
82	23.195382890	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0x292344bc
129	45.196480021	10.0.139.1	10.0.139.1	DHCP	344	DHCP Request - Transaction ID 0x292344bc
130	45.196959559	10.0.139.1	10.0.139.150	DHCP	389	DHCP ACK - Transaction ID 0x292344bc

Frame 2: 346 bytes on wire (2768 bits), 346 bytes captured (2768 bits) on
Ethernet II, Src: PcsCompu_5e:44:e1 (08:00:27:5e:44:e1), Dst: Broadcast
Destination: Broadcast (ff:ff:ff:ff:ff:ff)
Source: PcsCompu_5e:44:e1 (08:00:27:5e:44:e1)
Address: PcsCompu_5e:44:e1 (08:00:27:5e:44:e1)
...0... = IG bit: Globally unique address (rf
...0... = IG bit: Individual address (unicast
Type: IPv4 (0x800)
Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
User Datagram Protocol, Src Port: 67, Dst Port: 67
Dynamic Host Configuration Protocol (Discover)

WINDOWS11 CLIENTE:

BookWorm11A.DHCP [Comando] - Oracle VirtualBox

alumno@bookworm11a: ~

alumno@boo... *alumno@...

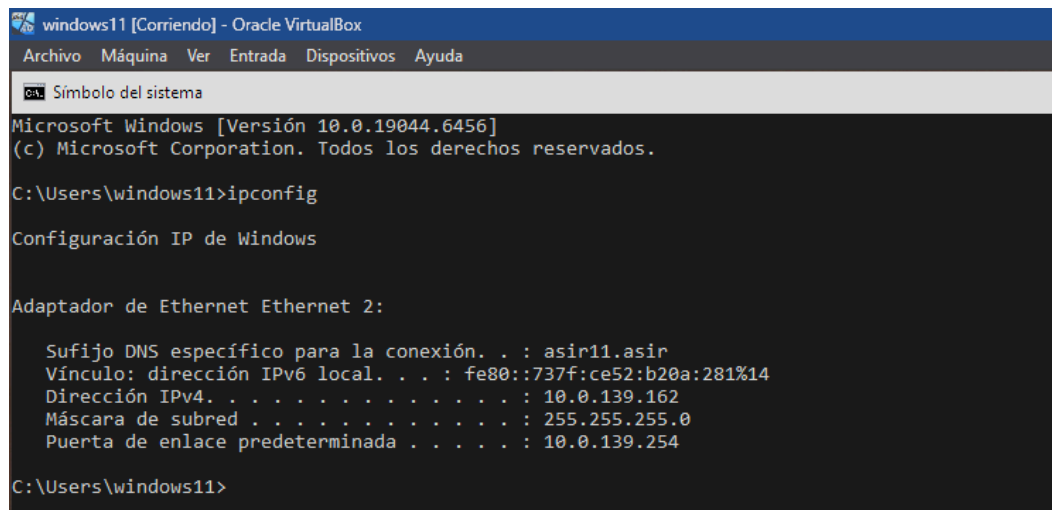
SULT Expression windows-clientes evaluated to 1
2025-11-01 18:52:14.774 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:09:b1:b9], cid=[01:08:00:27:09:b1:b9], tid=0xb785
c7f0: lease 10.0.139.162 has been allocated for 20 seconds
2025-11-01 18:52:24.042 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression windows-clientes evaluated to 1
2025-11-01 18:52:24.042 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:09:b1:b9], cid=[01:08:00:27:09:b1:b9], tid=0xc194
6520: lease 10.0.139.162 has been allocated for 20 seconds
2025-11-01 18:52:34.376 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression windows-clientes evaluated to 1
2025-11-01 18:52:34.376 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:09:b1:b9], cid=[01:08:00:27:09:b1:b9], tid=0x9590
601e: lease 10.0.139.162 has been allocated for 20 seconds
2025-11-01 18:52:44.661 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression windows-clientes evaluated to 1
2025-11-01 18:52:44.662 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:09:b1:b9], cid=[01:08:00:27:09:b1:b9], tid=0x967a
24cd: lease 10.0.139.162 has been allocated for 20 seconds
2025-11-01 18:52:54.223 INFO [kea-dhcp4.options/3049.140680555164160] EVAL_RE
SULT Expression windows-clientes evaluated to 1
2025-11-01 18:52:54.223 INFO [kea-dhcp4.leases/3049.140680555164160] DHCP4_LE
ASE_ALLOC [hwtype=1 08:00:27:09:b1:b9], cid=[01:08:00:27:09:b1:b9], tid=0xc9f9
cd3d: lease 10.0.139.162 has been allocated for 20 seconds

Capturando desde enp0s8

dhcpc

No.	Time	Source	Destination	Protocol	Length	Info
24	36.366758152	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5400a514
25	36.367207360	10.0.139.1	10.0.139.160	DHCP	374	DHCP Offer - Transaction ID 0x5400a514
32	40.682193530	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5400a514
33	40.682736565	10.0.139.1	10.0.139.161	DHCP	374	DHCP Offer - Transaction ID 0x5400a514
65	40.910516855	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5400a514
66	48.911007513	10.0.139.1	10.0.139.162	DHCP	374	DHCP Offer - Transaction ID 0x5400a514
67	48.955018101	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x5400a514
68	48.955060805	10.0.139.1	10.0.139.162	DHCP	375	DHCP ACK - Transaction ID 0x5400a514
144	57.605168302	10.0.139.162	10.0.139.1	DHCP	358	DHCP Request - Transaction ID 0xc7c756027
145	57.605616663	10.0.139.1	10.0.139.162	DHCP	378	DHCP ACK - Transaction ID 0xc7c756027
183	67.921110741	10.0.139.162	10.0.139.1	DHCP	358	DHCP Request - Transaction ID 0x1a9717ce
184	67.921178976	10.0.139.1	10.0.139.162	DHCP	378	DHCP ACK - Transaction ID 0x1a9717ce
217	78.178600884	10.0.139.162	10.0.139.1	DHCP	358	DHCP Request - Transaction ID 0x1a9717ce

Frame 144: 358 bytes on wire (2864 bits), 358 bytes captured (2864 bits) on
Ethernet II, Src: PcsCompu_09:b1:b9 (08:00:27:09:b1:b9), Dst: PcsCompu_1
Destination: PcsCompu_b7:ae:6e (08:00:27:b7:ae:6e)
Address: PcsCompu_b7:ae:6e (08:00:27:b7:ae:6e)
...0... = IG bit: Globally unique address (rf
...0... = IG bit: Individual address (unicast
Source: PcsCompu_09:b1:b9 (08:00:27:09:b1:b9)
Address: PcsCompu_09:b1:b9 (08:00:27:09:b1:b9)
...0... = IG bit: Globally unique address (rf
...0... = IG bit: Individual address (unicast
Type: IPv4 (0x800)
Internet Protocol Version 4, Src: 10.0.139.162, Dst: 10.0.139.1
User Datagram Protocol, Src Port: 68, Dst Port: 67
Dynamic Host Configuration Protocol (Request)



```
Microsoft Windows [Versión 10.0.19044.6456]
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C:\Users\windows11>ipconfig

Configuración IP de Windows

Adaptador de Ethernet Ethernet 2:

    Sufixo DNS específico para la conexión. . . : asir11.asir
    Vínculo: dirección IPv6 local. . . : fe80::737f:ce52:b20a:281%14
    Dirección IPv4. . . . . : 10.0.139.162
    Máscara de subred. . . . . : 255.255.255.0
    Puerta de enlace predeterminada. . . . . : 10.0.139.254

C:\Users\windows11>
```

NOTA: Durante todo el proceso de la práctica deberán hacerse capturas de imagen de cada uno de los pasos dados así como capturas y almacenaje de los paquetes de wireshark. Algunos de ellos serán solicitados por el profesor una vez concluida la práctica. Para poder realizar esta práctica es necesario haber realizado las prácticas 1 y 2