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Connect MKx via Ethernet

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Link-local IPv6 addressing

- Locate the serial number sticker, attached to MKx OBU/RSU enclosure. The serial number of the MKx is also its Ethernet MAC address, and easily converted to an ipv6 address. Use this converter, or simply memorize the prefix "`fe80::6e5:48ff:fe`", and add the last 6 digits of the SN:
  - SN 04E548014014 -> MAC 04:E5:48:01:40:14 -> ipv6 fe80::6e5:48ff:fe01:4014

- An Ethernet port must be specified and appended to the link-local ipv6 address. Query for the zone id (Windows), or network interface (Linux), and append that to the address using the '%' symbol.
  - From windows, open `cmd.exe`, type `ipconfig` and look for a string like as shown below. The Zone-ID is shown after "**%**" sign.
    `Link-local IPv6 Address.....: fe80::58a1:65fb:414e:1c80%11`
  - From Linux command line, type '`ifconfig | grep eth`', and look for a string like as shown below:
    `eth0 Link encap:Ethernet HWaddr 00:0c:29:21:7e:8a`
    or
    `eth1 Link encap:Ethernet HWaddr 00:0c:29:21:7e:94`

    Check whether eth0 or eth1 shows '`inet6 addr`' by typing '`ifconfig eth0`' and '`ifconfig eth1`'. Accordingly use eth0 or eth1.

- Finally, test connectivity using the '`ping`' command:
  - *On Windows:*
    `ping -6 fe80::6e5:48ff:fe01:4014%11`
  - *On Linux (assuming eth1 has '`inet6 addr`') :*
    `ping6 fe80::6e5:48ff:fe01:4014%eth1`

DHCP addressing

Works well when you have access to the DHCP server (router) and can query it for assigned addresses. Just type the your computer's default gateway address into a browser window to get the router login screen, and then navigate to the LAN addresses tab. DHCP addresses can be made persistent by using the 'reserve addresses' option in the router. As before, use the '`ping`' command to confirm connectivity with the desired device.

Static ipv4 addressing

The user logs into the MKx using one of the other addressing methods, and then stores a fixed ipv4 address into persistent memory on the MKx, using '`fw_setenv`', followed by a '`reboot`'.

```
sudo fw_setenv static_ip_addr "192.168.52.79"
sudo fw_setenv static_ip_mask "255.255.255.0"
sudo fw_setenv static_ip_bcast "192.168.52.255"
sudo fw_setenv static_ip_gw "192.168.52.1"
sudo fw_setenv static_ip_ns "192.168.52.2"
reboot
```

Static device addresses are cleared from persistent memory by again using the '`fw_setenv`' directive, followed by '`reboot`':

```
sudo fw_setenv static_ip_addr
sudo fw_setenv static_ip_mask
sudo fw_setenv static_ip_bcast
sudo fw_setenv static_ip_gw
sudo fw_setenv static_ip_ns
reboot
```

Link-local IPv4 addressing

Link-local IPv4 addressing is not recommended. Nevertheless some information on it is provided below.

A virtual interface / alias eth0:1 is used to provide networking support within the IPv4 Link Local address space 169.254.0.0/16 – the assigned address is of the form 169.254.ABC.DEF where ABC.DEF corresponds to the last two octets of the devices serial number in decimal format. For example as shown below: `01-04E54801325C -> 169.254.0x32.0x5c = 169.254.50.92`

```
root@MK5:~# ifconfig
.....
.....
eth0:1 Link encap:Ethernet HWaddr 04:e5:48:01:32:5c
 inet addr:169.254.50.92 Bcast:169.254.255.255 Mask:255.255.0.0
 UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
```

On Windows:

The IPv4 address on the Windows PC will be as shown below -

```
C:\Users\xyz>ipconfig
Windows IP Configuration
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . :
 Link-local IPv6 Address . . . . . : fe80::e0e8:8bdf:4f1e:5ede%11
 Autoconfiguration IPv4 Address. . : 169.254.94.222
 Subnet Mask . . . . . . . . . . . : 255.255.0.0
 Default Gateway . . . . . . . . . :
```

Ping Mk5 from Windows -

```
C:\Users\xyz>ping 169.254.50.92
Pinging 169.254.50.92 with 32 bytes of data:
Reply from 169.254.50.92: bytes=32 time=1ms TTL=64
Reply from 169.254.50.92: bytes=32 time<1ms TTL=64
...
```

To do **ssh** from windows, you can use Tera-Term or Putty as described below in the section "*SSH*

Login from Windows PC".

On Linux VM:

Set IPv4 setting to "*Link-Local only*". How to do this is described in the section "*SSH from Linux VM through direct Ethernet connection to MK5*" given below.

```
duser@192.168.52.141:~$ ifconfig
eth0 Link encap:Ethernet HWaddr 00:0c:29:1b:55:1e
     inet addr:169.254.3.154 Bcast:169.254.255.255 Mask:255.255.0.0
     inet6 addr: fe80::20c:29ff:fe1b:551e/64 Scope:Link
```

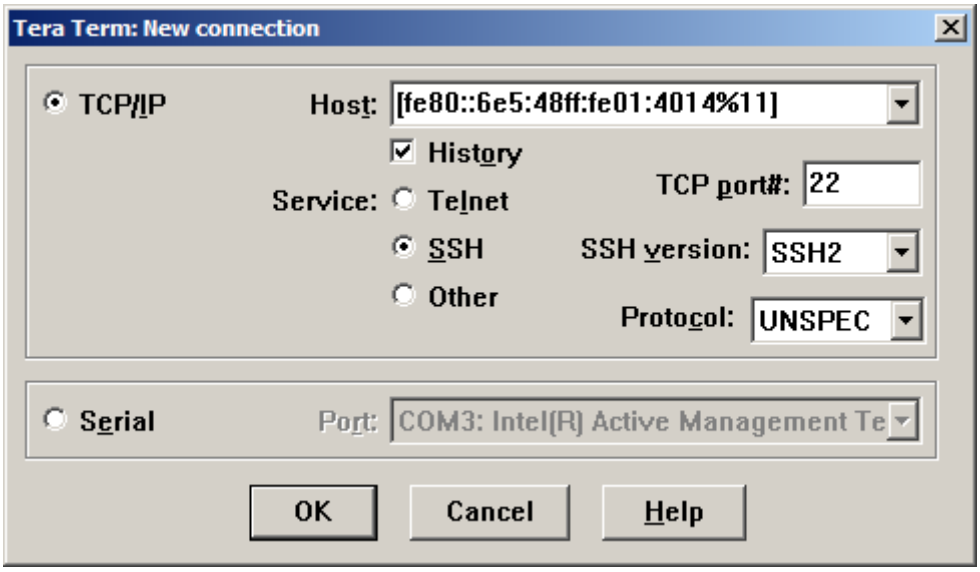
```
duser@169.254.3.154:~$ ping 169.254.50.92
PING 169.254.50.92 (169.254.50.92) 56(84) bytes of data.
64 bytes from 169.254.50.92: icmp_req=1 ttl=64 time=2.13 ms
64 bytes from 169.254.50.92: icmp_req=2 ttl=64 time=1.15 ms
...
```

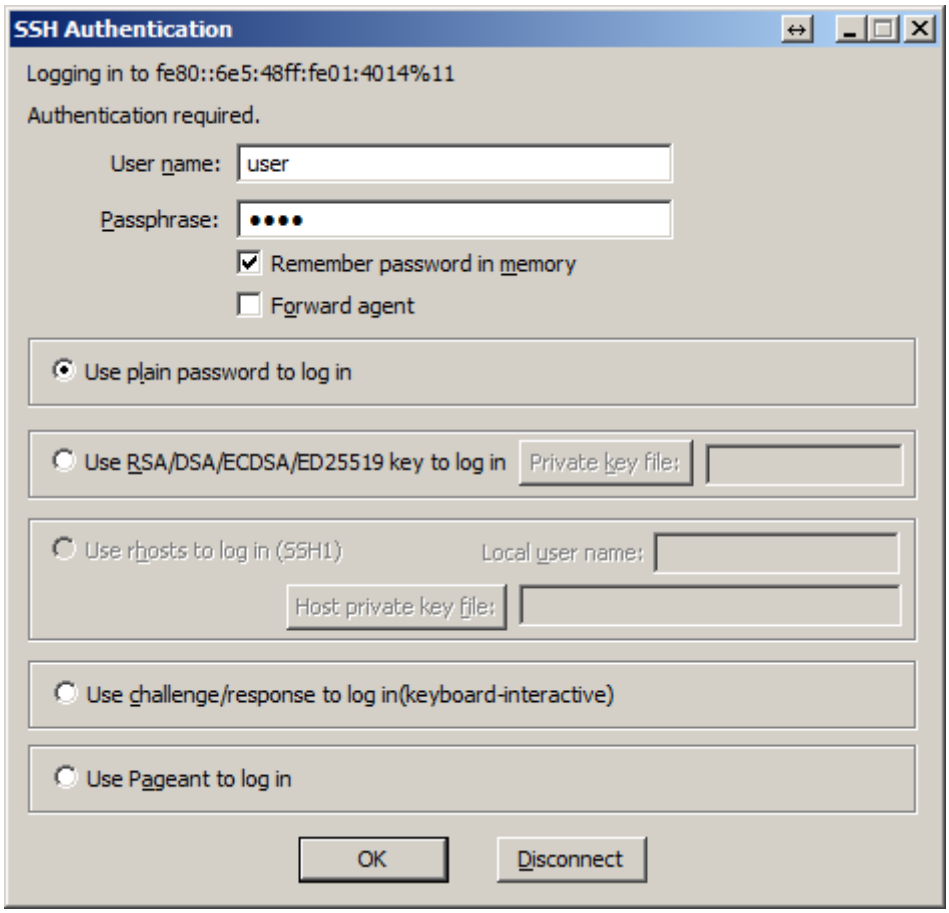
```
duser@169.254.3.154:~$ ssh user@169.254.50.92
user@169.254.50.92's password:
Welcome to Cohda Wireless MK5 Radio (MK5)
* Documentation: http://mk2wiki.cohdawireless.com
Last login: Tue Feb 17 01:09:12 2015 from 169.254.94.222
root@MK5:~#
```

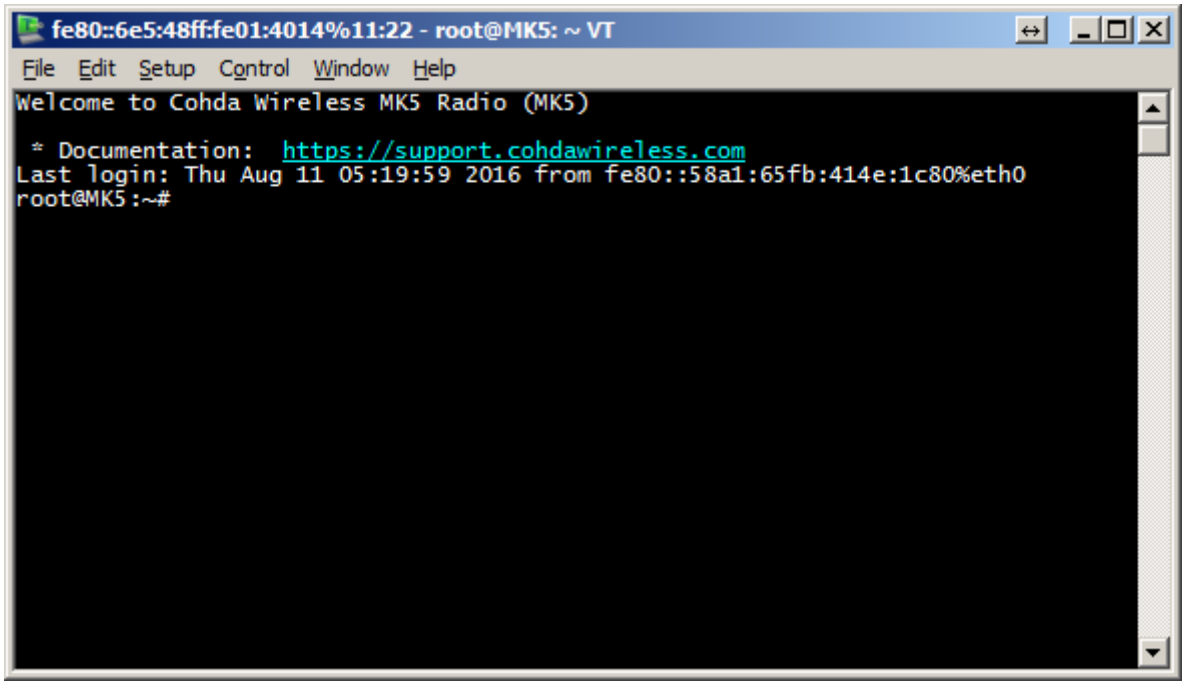
SSH Login from Windows PC

Logging into the MK5 from Windows PC can done using Tera-Term (https://tera-term.en.lo4d.com/windows) or Putty (https://www.putty.org/). The following illustrates using Tera-Term.

- This example utilises an ipv6 address, but all of the above addressing schemes are supported.
- Use credentials 'user', 'user', to sign in as root.
  Note: login duser/duser was removed in Rel15


Tera Term: New connection
TCP/IP
Host: [fe80::6e5:48ff:fe01:4014%11]
History
Service: Telnet
TCP port#: 22
SSH
SSH version: SSH2
Other
Protocol: UNSPEC
Serial
Port: COM3: Intel(R) Active Management Te
OK
Cancel
Help


SSH Authentication
Logging in to fe80::6e5:48ff:fe01:4014%11
Authentication required.
User name: user
Passphrase: ••••
Remember password in memory
Forward agent
Use plain password to log in
Use RSA/DSA/ECDSA/ED25519 key to log in
Private key file:
Use rhosts to log in (SSH1)
Local user name:
Host private key file:
Use challenge/response to log in(keyboard-interactive)
Use Pageant to log in
OK
Disconnect



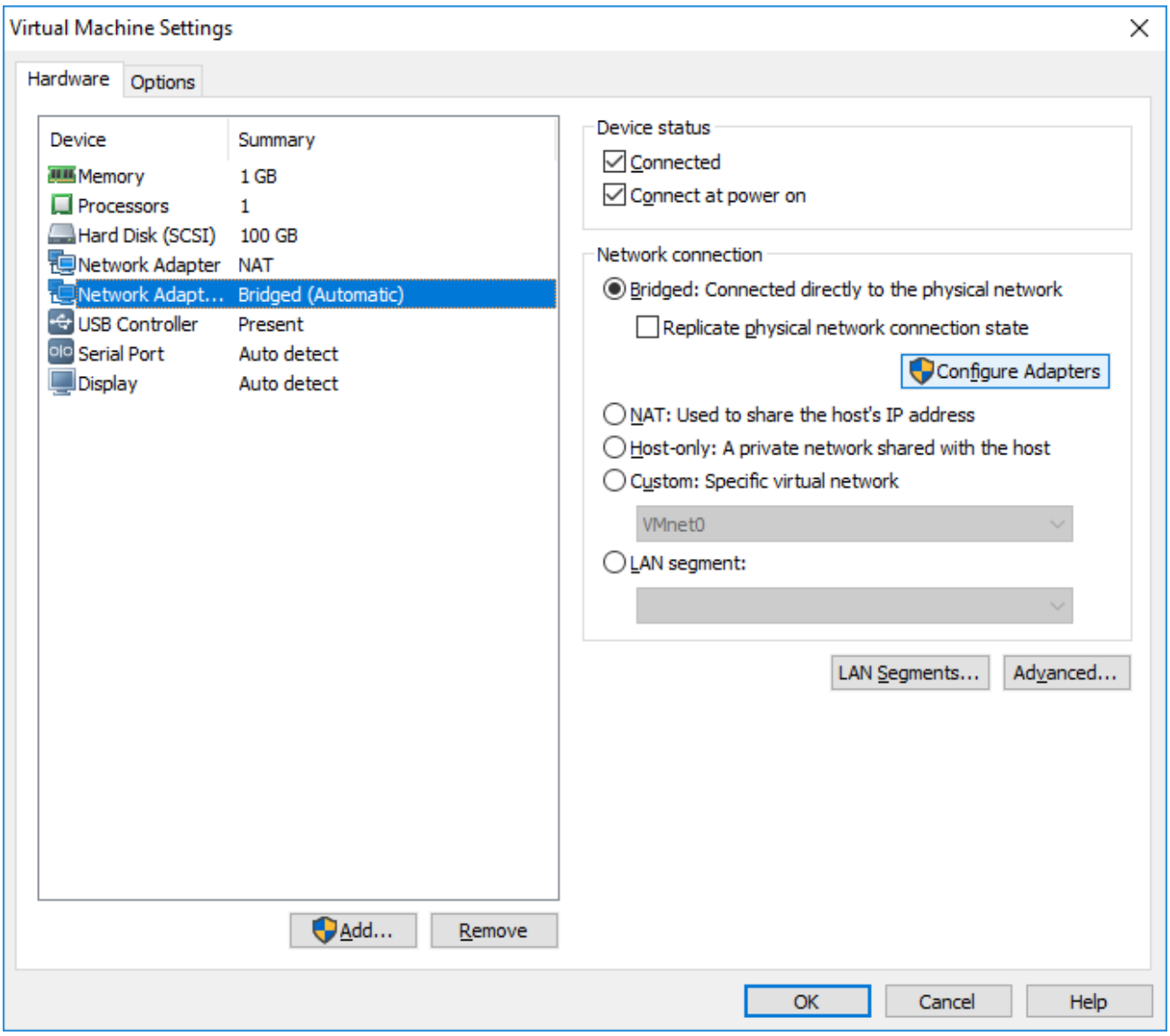
SSH Login from Linux

- Open a terminal window, and enter SSH command, specifying the appropriate Ethernet adapter after the '%' symbol.
  - `ssh user@fe80::6e5:48ff:fe01:4014%eth0`
  - Use credentials 'user', 'user', to sign in as root.

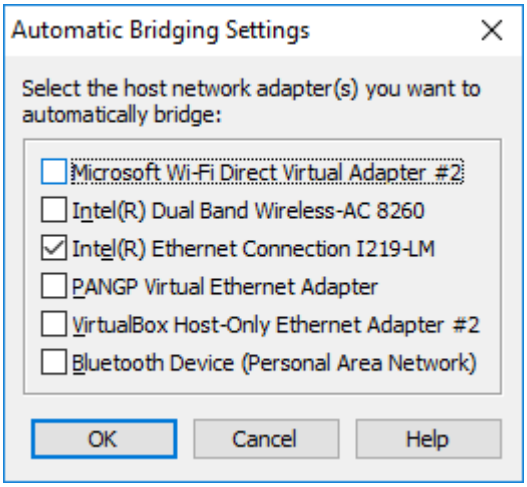
SSH from Linux VM through direct Ethernet connection to MK5

If your VM is on a laptop PC in which the Ethernet cable is connected directly to MK5 OBU (or RSU through a PoE injector), and if the laptop has WiFi, then **you should disable WiFi in the VM**,

In the VM, go into the Network adaptor settings, then click on "**Configure Adapters**"



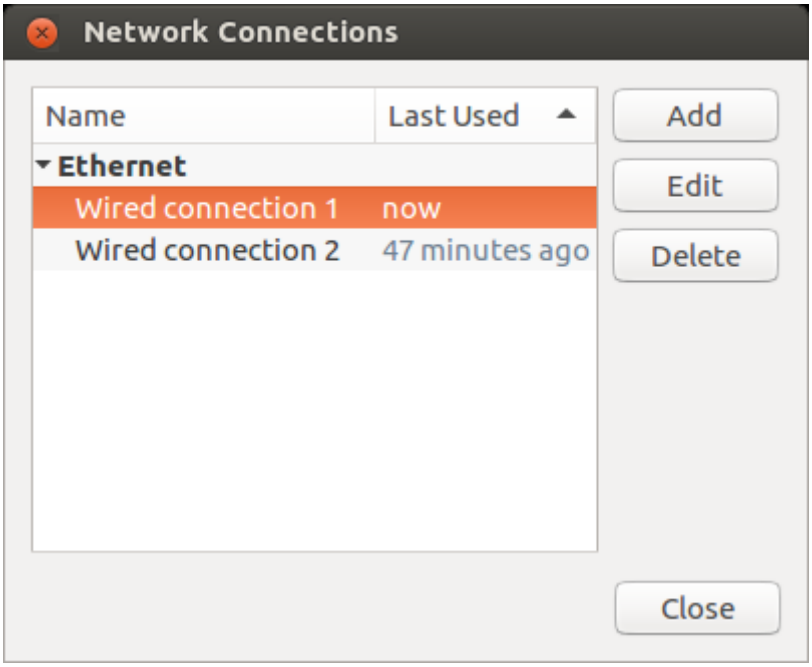
Untick "WiFi" and then "OK".



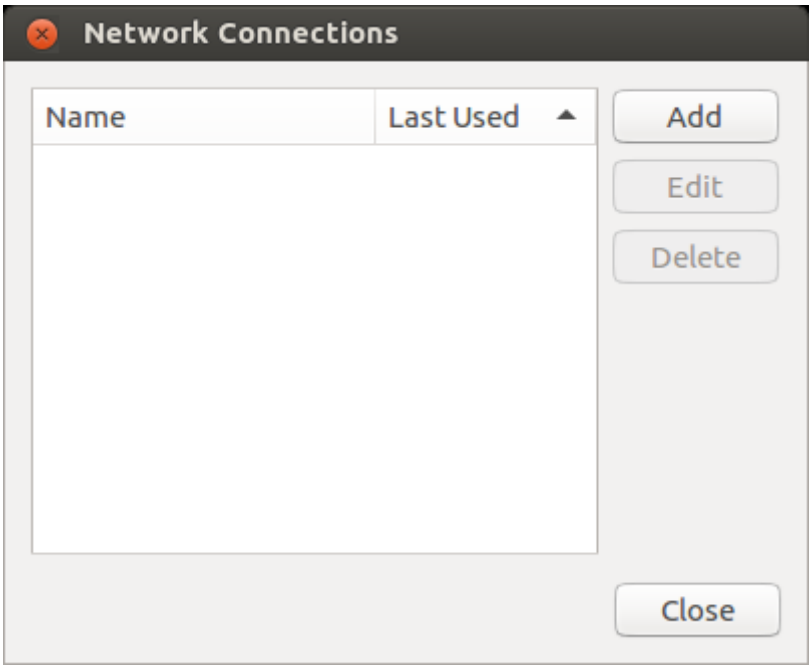
You will then have to edit the Network connections.

Initially select "Disable Networking", after you click on the networking icon show on the top of the VM.

Then select "Edit connections"



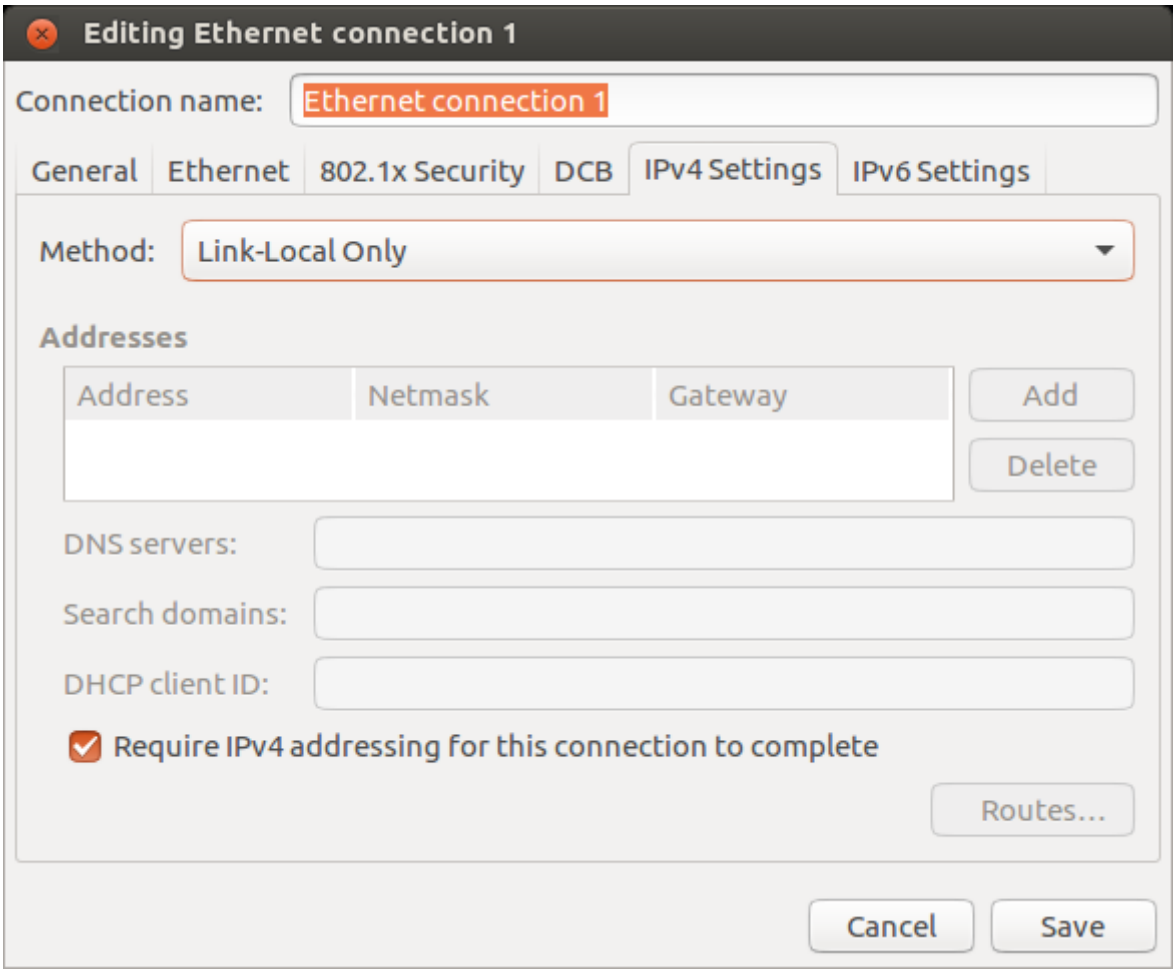
Delete both "Wired connection 1" & "Wired connection 2"



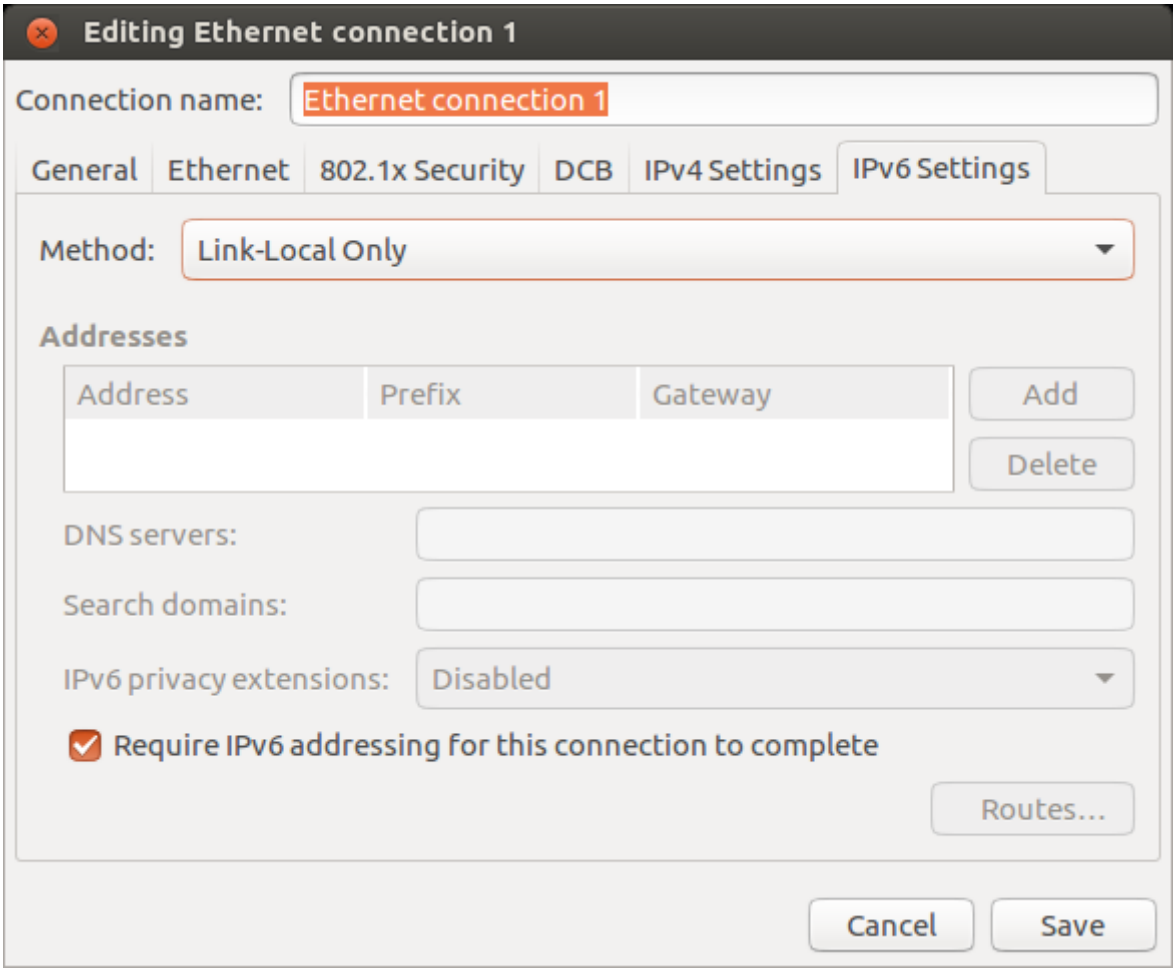
Click on "Add"

Choose "Ethernet" & "Create"

Select IPv4 setting as "link local only" and tick "Require Ipv4 addressing.."

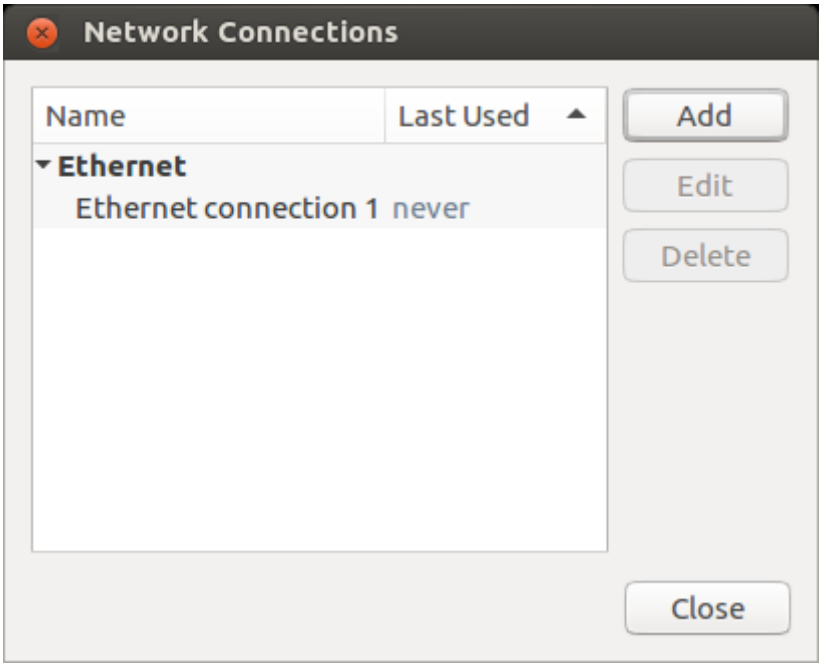


Select IPv6 setting also as "link local only" and tick "Require IPv6 addressing.."



Click on "Save".

Then "Close"



Now on the networking icon on top of the VM, select "Enable Networking"

Run `ifconfig` on the VM and check the Ethernet addresses.

```
duser@169.254.91.154:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0c:29:f0:20:63
```

```
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

eth1      Link encap:Ethernet  HWaddr 00:0c:29:f0:20:6d
          inet addr:169.254.91.154  Bcast:169.254.255.255 Mask:255.255
          inet6 addr: fe80::c3d3:ce85:c83e:f1b9/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:45250 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1217 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:5124926 (5.1 MB)  TX bytes:123492 (123.4 KB)
          Interrupt:16 Base address:0x2000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:676 errors:0 dropped:0 overruns:0 frame:0
          TX packets:676 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:54906 (54.9 KB)  TX bytes:54906 (54.9 KB)

duser@169.254.91.154:~$
```

Check pinging the MK5 on its link local IPv6 address, which is `fe80::6e5:48ff:fe10:9574` (**109574** is the last 6 numbers of its serial number)

```
duser@169.254.91.154:~$ ping6 fe80::6e5:48ff:fe10:9574%eth1
PING fe80::6e5:48ff:fe10:9574%eth1(fe80::6e5:48ff:fe10:9574) 56 data b
64 bytes from fe80::6e5:48ff:fe10:9574: icmp_seq=1 ttl=64 time=2.93 ms
64 bytes from fe80::6e5:48ff:fe10:9574: icmp_seq=2 ttl=64 time=1.49 ms
64 bytes from fe80::6e5:48ff:fe10:9574: icmp_seq=3 ttl=64 time=1.47 ms
64 bytes from fe80::6e5:48ff:fe10:9574: icmp_seq=4 ttl=64 time=1.73 ms
^C
--- fe80::6e5:48ff:fe10:9574%eth1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3007ms
```

SSH into it using its link-local IPv6 address

```
duser@169.254.91.154:~$ ssh user@fe80::6e5:48ff:fe10:9574%eth1
user@fe80::6e5:48ff:fe10:9574%eth1's password:
Welcome to Cohda Wireless MK5 Radio (MK5)

 * Documentation:  https://support.cohdawireless.com
Last login: Wed Sep  4 01:32:18 2019 from fe80::e35a:3c50:d702:bdc6%et
root@MK5:~#
```

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