

Virtualization Workshop: Network Modes

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How do virtual hosts access the network ?

Virtual Machines are connected to virtual network adapters, presented to the guest OS by the Hypervisor.

But what is the virtual network adapter connected to on the host side ?

Several possibilities

Essentially:

- Bridged mode
- Other modes (host-only, NAT, internal)

Note that the above terminology is usually associated with desktop virtualization software like VirtualBox and VMWare, although other products/solutions have reused the same terms.

Bridged mode

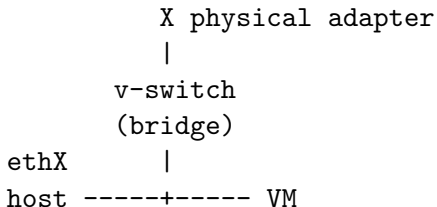
This is the most straightforward way to attach a Virtual Machine to the network.

- The VM is “bridged”, or attached, to the same network that the host OS is physically connected to, using the Host’s interface
- If DHCP is present on this network, then the VM will receive an IP from it.
- To other hosts on the network, the VM will look like just any other machine, with its own MAC address and IP address.

```
-----+-----+---:----- network N ----
      |           | : <- bridge
[other] .-----+---:---.
      |           .--+--. | VM attached to network N, like
      |           | VM | | Host, and other machines on N.
      | Host '----' |
      '-----'
```

Bridged mode (cont'd)

Inside the Host OS, a virtual switch is used to achieve this.



Multiple VMs can be attached to the network in this fashion.

Note that the host does not necessarily need to have an IP address on the network. We will discuss this in more detail later.

- Pros: VM participates in the network like any other machine
- Cons: VMs are visible to other machines (whether one wants to or not, and there has to be enough IPs available on the network)

Other modes: host-only, internal

These modes do not place the VM directly on the network where the Host is connected to the outside world.

Instead, a private, internal network is created, and the VM is placed on it. Each mode works differently:

- host-only: the Host and the Guest VM can communicate together, but the VM cannot talk to the outside world - only with the Host For example, it's possible to SSH directly to the Guest from the Host (and vice-versa)
- internal: the Guest VM is isolated and cannot talk to the Host or the outside world, but can talk to other VMs, if they are connected to the same internal network

Accessing the Guest from the Host

So what do we do if we want to access the Guest from the Host ?

3 Possibilities

- Use bridged mode - the VM is then a machine just like any other on your local network, and you can SSH to it using the IP address configured (statically or using DHCP)
- Use Host-only mode - you can then connect to the VM, and vice-versa, but the VM cannot talk to hosts “outside”
- Use Port Forwarding, which maps TCP/UDP ports on the Host to TCP/UDP ports on the VM. We will see this last solution now. ^a

^aVMware has a mode combining Host-only and NAT, which solves this problem. With VirtualBox, one can give the VM two network interfaces: one host-only, one NAT, or one can use Port Forwarding

A very good article explaining the different network modes in Virtual Box

https://blogs.oracle.com/fatbloke/entry/networking_in_virtualbox1