

## 13.3.3 Virtual Networking Facts

A hypervisor presents a virtual hardware environment that's used by a virtual machine. Part of that environment is a virtual network.

This lesson covers the following topics:

- Virtual switches
- Linux bridge modes
- Multi-homed considerations
- Overlay networks

### Virtual Switches

Linux-based hypervisors, such as Xen, KVM, and QEMU, provide a software-based virtual network switch.

- A virtual network switch works just like a physical network switch.
  - A software connection is made between the virtual switch and the host's physical NIC.
  - A software connection is made between the virtual switch and the virtual machine's virtual NIC
- A Linux bridge is a virtual switch
  - It behaves like a network switch.
  - It offers additional features, such as NAT.
  - To implement Linux bridging, install the bridge-utils software package.

### Linux Bridge Modes

A Linux bridge can operate in several modes

Mode	Description
NAT	<p>NAT mode is the default mode.</p> <ul style="list-style-type: none"><li>▪ Use this mode when there's no need for the external network to be aware of your VMs, but the VMs need access to the external network.</li><li>▪ Guest VMs use the host's IP address to communicate with the external network.</li><li>▪ Computers on the external network can't initiate communications to guest VMs because they only know the host's IP address.</li><li>▪ When your VM sends a network packet to an address on external network, your host substitutes its own IP address for the VM's IP address and sends the packet.</li><li>▪ When it receives a packet from the external network that's a response to a guest VM's message, it forwards it back to the initiating VM.</li></ul>
Bridged	<p>In bridged mode, all VMs are configured with IP addresses on the same subnet as the host computer.</p> <ul style="list-style-type: none"><li>▪ The virtual switch acts like a physical switch and forwards network frames accordingly.</li><li>▪ All physical machines on the same subnet will be aware of the virtual machines.</li></ul>
Routed	<p>In routed mode, the host acts as a gateway.</p> <ul style="list-style-type: none"><li>▪ Use this mode if the virtual machines are located in a firewall's DMZ.</li><li>▪ Configure the VMs with IP addresses in a different subnet than the external network.</li></ul>
Isolated	<p>In isolated mode, the VMs only communicate with each other.</p> <ul style="list-style-type: none"><li>▪ The VMs are disconnected from both the external network and from the host computer.</li><li>▪ The VMs can only be accessed using the hypervisor's VM console.</li><li>▪ Use this mode when testing the performance of a new system with no external distractions.</li></ul>

### Multi-Homed Considerations

Physical computers can have multiple NICs connected to multiple subnets to increase performance, use the computer as a network gateway, or use the computer as a network firewall. Virtual machines can also be configured as a multi-homed system with multiple virtual NICs. Depending on your requirements, you can connect each NIC to a separate virtual switch or connect multiple NICs to a single virtual switch. You can link each physical NIC on the host machine to a different virtual switch, or you could link several physical NICs to one virtual switch.

### Overlay Networks

Overlay networks can be used to connect VMs on different host machines in a way that doesn't expose them to the external network.

- Overlay networks are virtual networks that are built on top of an existing network.
  - Network packets are encapsulated within other packets that are assembled and dissected as they're moved over physical networks.
  - A virtual network can be overlayed on another virtual network, which can be overlayed on top of a physical network.
  - Overlay networking is especially important in scalable cloud technologies, where virtual resources like VMs and containers dedicated to one customer reside in the same datacenter as VMs and containers dedicated to other customers.
  - Overlay networking makes a network more complex and decreases network performance.
  - Overlay networks are flexible. Adding, moving, and removing virtual assets at different physical locations makes overlay networking very appealing and worth the drawbacks.
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