



Lenovo ThinkAgile CP Create a Custom NFV Appliance (Quick Start)



Models: CP 4000, CP 6000

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at the following address:

http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html

In addition, be sure that you are familiar with the terms and conditions of the Lenovo warranty for your solution, which can be found at the following address:

<http://datacentersupport.lenovo.com/warrantylookup>

First Edition (March 2020)

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Contents

Contents	i	Configure the NFV Appliance	7
Create a Custom NFV Appliance in ThinkAgile CP	1	Link NFV Appliance to the VNET	8
Create a VNET	2	Create routes for the VNET	9
Deploy the Linux Appliance Instance	4	Validate the VNET	10

Create a Custom NFV Appliance in ThinkAgile CP

A virtual network (VNET) in ThinkAgile CP enables application instances to migrate seamlessly among compute nodes without changing networking configurations.

[Download PDF](#)

Infrastructure admin users can create a VNET through the ThinkAgile CP Cloud Controller. The VNET manages all DHCP, Routing, and DNS services via an auto-deployed application instance called the network function virtualization (NFV) instance. There is one NFV instance per VNET. This NFV instance acts like any application instance in your cloud infrastructure. It resides in a virtual datacenter, consuming migration zone and storage pool resources. The instance uses the gateway IP address for your VNET.

When requirements demand different functionality than the auto-deployed NFV appliance provides, it is possible to create a custom appliance. At a minimum the custom NFV must be able to route traffic from the VNET (inside) to the outside VLAN or VNET to which the NFV is connected.

Prerequisites

Make sure that you meet the following prerequisites before continuing:

- General familiarity with managing ThinkAgile CP.
- Familiarity with the Linux CLI.
- Login access to the interconnect switches.
- Environment prerequisites:
 - A southbound route that already exists on the customer network for the VNET subnet.
 - A virtual datacenter has already been created and provisioned for use
 - Centos 7.4 (64-bit) template that has already been downloaded from the Lenovo Cloud Marketplace
 - An external IP address is available to the NFV instance.

Note: If no external IP address is available, the NFV instance might not work as expected. After obtaining an external IP address, re-configure the NFV instance.

- A working application must exist that can be assigned to the VNET with a static IP for testing

Example Topology

Details for this example include:

- **VNET Name:** VNET-01
- **VNET Subnet:** 100.127.4.0/24
- **VNET Gateway (NFV Inside):** 100.127.4.254
- **NFV Outside Interface:** DHCP in Default (4091). (This is the hypervisor network for the example.)

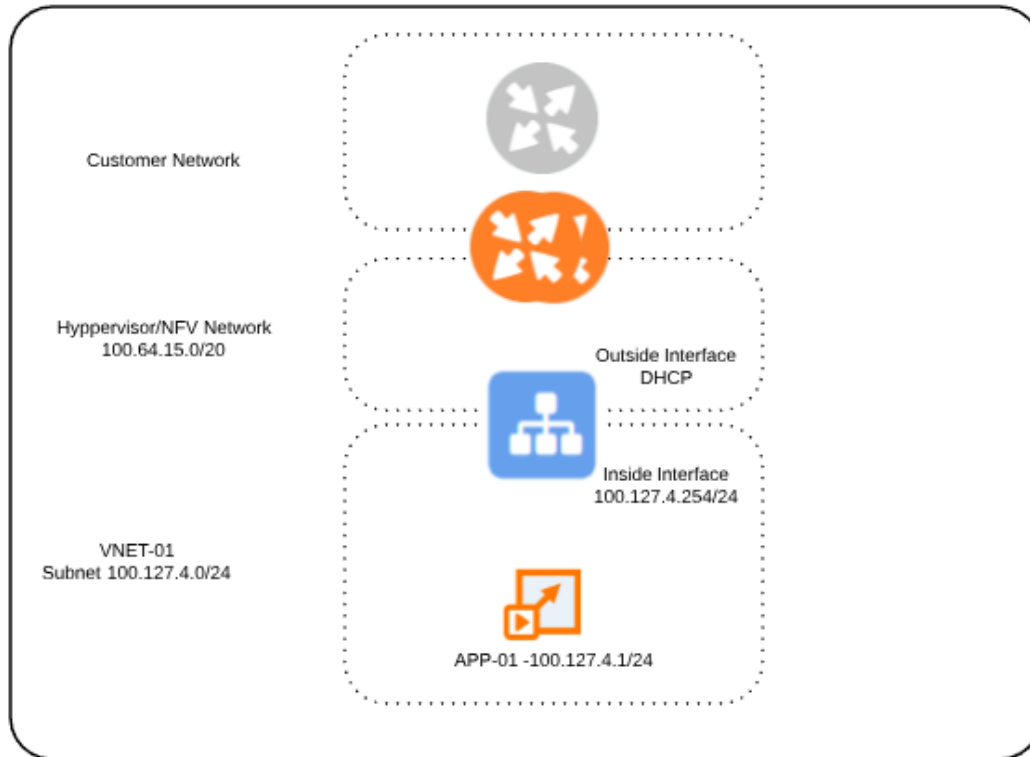


Figure 1. Example network settings for an NFV appliance

- [“Create a VNET” on page 2](#)
- [“Deploy the Linux Appliance Instance” on page 4](#)
- [“Configure the NFV Appliance” on page 7](#)
- [“Link NFV Appliance to the VNET” on page 8](#)
- [“Create routes for the VNET” on page 9](#)
- [“Validate the VNET” on page 10](#)

Create a VNET

Create a VNET before configuring a custom NFV instance.

Complete the following steps to create a VNET:

- Step 1. Log in to the ThinkAgile CP Cloud Controller as an **infrastructure manager** user.
- Step 2. In the left navigation, click **+ Create New → New VNET**.

Alternatively, in the left navigation, you can expand **Networks** and click **Networks → New Network → New VNET**.

- Step 3. Enter the following values (based on [Figure 1 “Example network settings for an NFV appliance” on page 2](#)):

- **VNET Name:** VNET-ID-01
- **Network Address:** 100.127.4.0
- **Netmask:** 255.255.255.0
- **Default Gateway:** 100.127.4.254

Step 4. For Network Services, select **Manual**.

Step 5. Click **Create VNET**.

New VNET

Properties

VNET Name: VNET-ID-01

Network Address: 100.127.4.0

Netmask: 255.255.255.0

Usable IP Range: 100.127.4.1 — 100.127.4.254

Default Gateway: 100.127.4.254

Default gateway should be within the specified usable IP range.

Network Services

Network Services Deployment

Automatic
ThinkAgile CP will auto-deploy the NFV instance to provide network services.

Manual
You should manually configure an application instance for NFV to provide network services. See [Instructions](#).

NOTE: Ensure the network properties entered above match those of the services in this NFV instance.

Network Function Virtualization (NFV) Instance

This virtual network will not work until it is linked to an NFV instance with necessary network services.
To manually create an NFV instance, See [Instructions](#)

Cancel Create VNET

Figure 2. Create a VNET Example

Step 6. On the Networks page, click the newly created VNET, *VNET-ID-01*.

Step 7. Click the **Assigned Virtual Datacenters** tab.

Step 8. Click **Assign Virtual Datacenters**. The Assign Virtual Datacenters dialog box opens.

Step 9. Select a virtual datacenter and click **Assign** (*VDC-test* is used for this example).

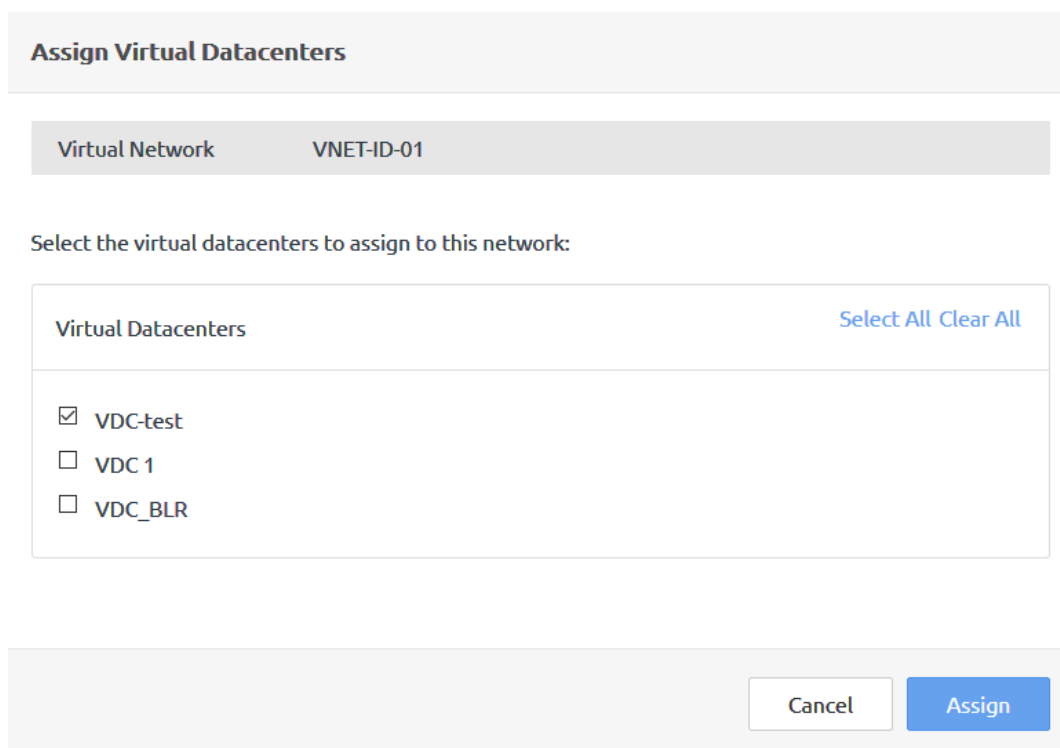


Figure 3. The Assign Virtual Datacenters dialog box

Deploy the Linux Appliance Instance

Create an application instance from a template that will be used as the NFV.

- Step 1. In the left navigation menu of the ThinkAgile CP Cloud Controller, click **Organization Templates**.
- Step 2. Click **New Instance** next to the CentOS 7.5 (64-bit) - Lenovo Template.

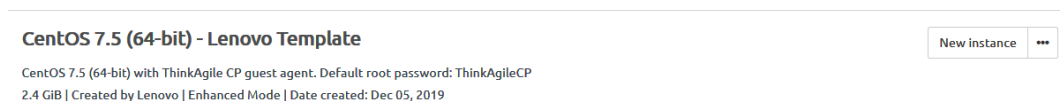


Figure 4. CentOS 7.5 (64-bit) Template

Note: If the template is not displayed in Organization Templates, you can download it from the Lenovo Cloud Marketplace. For more information, see the following topic:

https://thinkagile.lenovofiles.com/help/topic/thinkagile_cp/create-a-new-instance-from-a-template.html

- Step 3. Enter a name in the Instance Name field under the **Properties** section (for example, *VNET-01-NFV*).

New instance from Template

Properties

Instance Name

Description (Optional)

Source Template Linux CentOS 7.5 (64-bit) - Lenovo Template (created by Lenovo)

Templates created by ThinkAgile CP come with default passwords (see template description). Please change this password as soon as the instance is created.

Template Type Organization Template

Figure 5. New Instance Name

- Step 4. In the Virtual Datacenter section, select the virtual datacenter where the application instance will run. This selection determines the migration zone and storage pool resources available for the application instance. Use the virtual datacenter (*VDC-test*) that was assigned to the VNET *VNET-ID-01* when it was created.

Virtual Datacenter

Select a virtual datacenter for the application instance, then complete the resource profile for networking, storage, and compute.

Virtual Datacenter

Application Group

Number of Instances

Figure 6. Virtual Datacenter assignment

- Step 5. In the Storage section, select the storage pool for this application instance.
- Step 6. In the Compute section, select the migration zone for this application instance.
- Step 7. Configure the network as follows:
- Assign *vNIC 0* to the Hypervisor VLAN (for example: *Default 4091*).
 - Add a second vNIC by clicking **Add vNIC**.
 - Assign *vNIC 1* to *VNET-ID-01*.

Network

Configure at least one virtual network interface controller (vNIC) to specify the instance's network settings.

[Add vNIC](#)

vNIC	Networking Mode	Network	Firewall Profile	Firewall Override	Mac Address	
vNIC 0	VLAN	Default 4091	—	—	Automatic	...
vNIC 1	VNET	VNET-ID-01	NONE	None	Automatic	...


Boot Order Disk 0 > Network (vNIC 0) > Network (vNIC 1) [✎](#)

Figure 7. Modify Network Settings

Step 8. Click **Create Instance**.

Once the instance starts you will be taken back to the Application Instances page.

Step 9. In the list of instances, click the application instance that was just created (VNET-01-NFV).

Step 10. Click the **Profile** tab and navigate to the Networking section. Click the Actions menu () next to each vNIC and click **Edit Name**.

Networking

At least one virtual network interface controller must be present.

Virtual Network Interface Controllers (vNICs)

[Add vNIC](#)

vNIC	IP Address	MAC Address	Networking Mode	Network	Firewall Profile	Firewall Override	
vNIC 0	—	b4:d1:35:00:00:82 (automatic)	VLAN	SDI_VM_VLAN	—	—	...
vNIC 1	—	b4:d1:35:00:00:83 (automatic)	VNET	VNET-ID-01	—	—	...

Edit name...

Edit networking mode...

Edit MAC address...

Delete vNIC...

Figure 8. vNIC Edit Name

- Rename vNIC 0 to be **outside**.
- Rename vNIC 1 to be **inside**.

Networking

At least one virtual network interface controller must be present.

Virtual Network Interface Controllers (vNICs)

[Add vNIC](#)

vNIC	IP Address	MAC Address	Networking Mode	Network	Firewall Profile	Firewall Override	
outside	—	b4:d1:35:00:00:82 (automatic)	VLAN	SDI_VM_VLAN	—	—	...
inside	—	b4:d1:35:00:00:83 (automatic)	VNET	VNET-ID-01	—	—	...

Figure 9. vNIC after renaming

Step 11. Record the MAC addresses for both vNICs for later use, as well as the IP address that was allocated to the outside vNIC.

Networking

At least one virtual network interface controller must be present.

Virtual Network Interface Controllers (vNICs)

[Add vNIC](#)

vNIC	IP Address	MAC Address	Networking Mode	Network	Firewall Profile	Firewall Override
outside	100.65.0.29	b4:d1:35:00:00:82 (automatic)	VLAN	SDL_VM_VLAN	—	—
inside	—	b4:d1:35:00:00:83 (automatic)	VNET	VNET-ID-01	—	—


Figure 10. IP and MAC Addresses

Configure the NFV Appliance

Configure the NFV appliance.

Complete the following steps to configure the NFV appliance:

Step 1. From the Applications instances page, click *VNET-01-NFV* to display the details for the application instance.

Step 2. Click on the Actions menu (). Then click **Connect to console**.

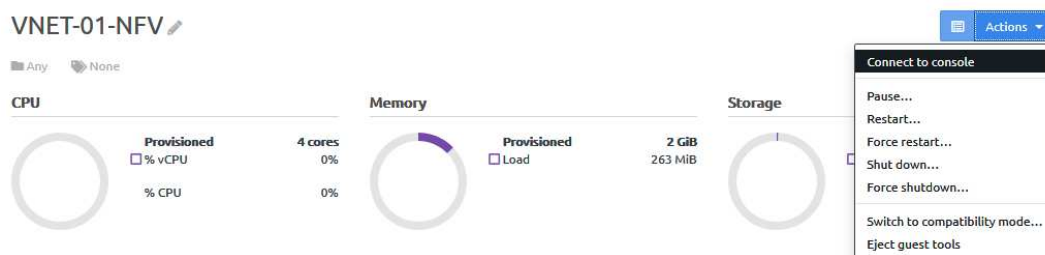


Figure 11. Actions menu

This opens the VNC console.

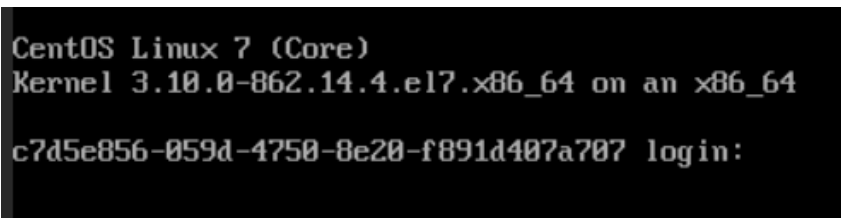


Figure 12. VNC console

Step 3. Log in with the following credentials:

- User: root
- Password: ThinkAgileCP

Step 4. Set the base configuration as follows:

```
# Set hostname
ctl set-hostname VNET-01-NFV

# Disable unused network services
systemctl stop firewalld
systemctl disable firewalld
systemctl stop NetworkManager
```

```
systemctl disable NetworkManager

# Enable IP forwarding
echo net.ipv4.ip_forward = 1 >> /etc/sysctl.conf
sysctl -p /etc/sysctl.conf

# Remove default network interface
rm -r /etc/sysconfig/network-scripts/ifcfg-eth0
```

Step 5. Configure the Outside interface as follows:

```
vi /etc/sysconfig/network-scripts/ifcfg-outside
TYPE="Ethernet"
BOOTPROTO="dhcp"
ONBOOT="yes"
HWADDR="b4:d1:35:00:23:57"
DEVICE="outside"
NAME="outside"
USERCTL="no"
```

Step 6. Configure the Inside interface as follows:

```
vi /etc/sysconfig/network-scripts/ifcfg-inside
TYPE="Ethernet"
BOOTPROTO="none"
ONBOOT="yes"
HWADDR="b4:d1:35:00:23:58"
DEVICE="inside"
NAME="inside"
USERCTL="no"
IPADDR="100.127.4.254"
NETMASK="255.255.255.0"
```


Step 7. Reboot the instance by entering the following command: `shutdown -r now`

Link NFV Appliance to the VNET

Link the NFV appliance to the VNET.

Complete the following steps to link the NFV appliance to the VNET:

Step 1. In the left navigation menu of the ThinkAgile CP Cloud Controller, expand **Networks** and then click **Networks**.

Step 2. Click the Actions menu () for the VNET *VNET-ID-01*.

Step 3. Click **Link NFV Instance**.

Step 4. In the Link NFV Instance dialog, choose the virtual datacenter *VDC-test*.

Step 5. Choose *VNET-01-NFV* as the NFV instance and click **Save**.

Link NFV Instance

Virtual Network VNET-ID-01

Network Function Virtualization (NFV) Instance

Virtual Datacenter

NFV Instance

Firewall Profile

Figure 13. Link NFV Instance

Create routes for the VNET

For the interconnect switch to route the newly created subnet for the VNET, the route must be created on the interconnect switch.

Complete the following steps to create a route on the interconnect switch:

- Step 1. Establish an SSH session with the the interconnect switch.
- Step 2. Run the following command:

```
sudo /usr/share/tacp/export_bgp_route.sh add 100.127.4.0 24 100.65.0.29
```

```
Command: export_bgp_route.sh {add|del} {VNET Network} {VNET CIDR} {Outside NFV IP}
manager@Interconnect-Primary:~$ sudo /usr/share/tacp/export_bgp_route.sh add 100.127.4.0 24 100.65.0.29
Synchronizing configuration...OK.
Pica8 PicOS Version 2.11.5.tacp.1
Welcome to PicOS on Interconnect-Primary
root@Interconnect-Primary>Execute command: configure.
Entering configuration mode.
There are no other users in configuration mode.
Execute command: set protocols static route 100.127.4.0/24 next-hop 100.65.0.29.
Execute command: commit
.
Commit OK.
Save done.
Synchronizing configuration...OK.
Pica8 PicOS Version 2.11.5.tacp.1
Execute command: configure.
Entering configuration mode.
There are no other users in configuration mode.
Execute command: set protocols bgp network4 100.127.4.0/24.
Execute command: commit
.
```

```
Commit OK.  
Save done.
```

Note: For a dual interconnect configuration, the command needs to be run on both interconnect switches.

Step 3. Exit.

Validate the VNET

At this point you should have a fully working VNET with a custom NFV appliance providing routing.

Validate the VNET by verifying the application assigned to *VNET-ID-01*:

```
# Guest has static IP in VNET subnet  
[root@app-01 ~]# ip addr show dev eth0  
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000  
    link/ether b4:d1:35:00:23:4e brd ff:ff:ff:ff:ff:ff  
    inet 100.127.4.1/24 brd 100.127.4.255 scope global eth0  
        valid_lft forever preferred_lft forever  
    inet6 fe80::b6d1:35ff:fe00:234e/64 scope link  
        valid_lft forever preferred_lft forever  
  
# Default route is pointed at Inside interface of NFV  
[root@app-01 ~]# ip route  
default via 100.127.4.254 dev eth0  
100.127.4.0/24 dev eth0 proto kernel scope link src 100.127.4.1  
169.254.0.0/16 dev eth0 scope link metric 1002  
  
# NFV is routing traffic for guest traffic  
[root@app-01 ~]# ping www.google.com  
PING www.google.com (172.217.10.100) 56(84) bytes of data.  
64 bytes from lga34s15-in-f4.1e100.net (172.217.10.100): icmp_seq=1 ttl=53 time=12.6 ms  
64 bytes from lga34s15-in-f4.1e100.net (172.217.10.100): icmp_seq=2 ttl=53 time=9.49 ms  
--- www.google.com ping statistics ---  
2 packets transmitted, 2 received, 0% packet loss, time 1002ms  
rtt min/avg/max/mdev = 9.498/11.090/12.683/1.595 ms
```


Lenovo