Intel® vRAN Baseband Driver and Tools for VMware ESXi

User Guide

August 2023

Contents

1 Introduction

Intel® vRAN Baseband Driver and Tool for VMware ESXi enables virtualized Radio Access Network (vRAN) for performing the most compute-intensive task of Forward Error Correction (FEC), which resolves data transmission errors over unreliable or noisy communication channels. FEC technology detects and corrects a limited number of errors in 4G or 5G data without the need for retransmission.

This document contains user guidance information on the accompanying Intel® vRAN Baseband Driver and Tools for VMware ESXi, Release 2.0.0.

2 BIOS Configuration

Please refer to the following document (ID: 640685) for recommended BIOS Settings:

- BIOS Settings for FlexRAN™ Reference Architecture Platforms Based on Intel® Xeon® Processors Reference Guide

3 Supported VMware Software

- VMware ESXi 8.0 U1 (VMware ESXi 7.0 is not supported in Release 2.0.0)
- Photon OS 5.0 GA Real-Time (This version is recommended and validated)

4 Supported vRAN Software in guest VM

The software in this release has been validated with the following guest software (ID: 645964):

- FlexRAN™ Software Reference Solution v23.03 Release Announcement

5 Driver and Tools installation and usage

Please refer to the following documents provided with the release package:

- Intel® vRAN Baseband Driver and Tools for VMware ESXi - Release Notes.pdf (ID: 19758)
- README.txt (part of software package)

5.1 SR-IOV Driver

Intel vRAN Baseband Driver is a part of the release package. After package installation, it appears in ESXi as a vmkernel module named "**vranpf**", which supports various module parameters to change the default behavior of different features such as reset and logging. A detailed description can be found in "**README.txt**", which is part of the release package.

```
[root@localhost:~]
[root@localhost:~]
[root@localhost:~] esxcfg-module -l vranpf | grep vranpf
vranpf                  1    156
[root@localhost:~]
[root@localhost:~]
[root@localhost:~] esxcli system module parameters list -m vranpf
Name               Type  Value  Description
-----------------  ----  -----  -----------
auto_reset         uint         Auto reset (supported only by VRB1). Disabled: 0, Enabled: 1, Default: 0
device_reset_type  uint         Device reset type (supported only by VRB1). Cluster Reset: 0, Function Level Reset: 1, Default: 0
log_level          uint         Logging level of the driver. Valid Range: [1 - 4] 1: Alerts, 2: Errors, 3: Warnings, 4: Info, Defa
ult: 3
user_vfs           uint         Number of VFs to enable (0 for PF only)
[root@localhost:~]
[root@localhost:~]
[root@localhost:~]
[root@localhost:~]
[root@localhost:~]
[root@localhost:~]
[root@localhost:~]
```

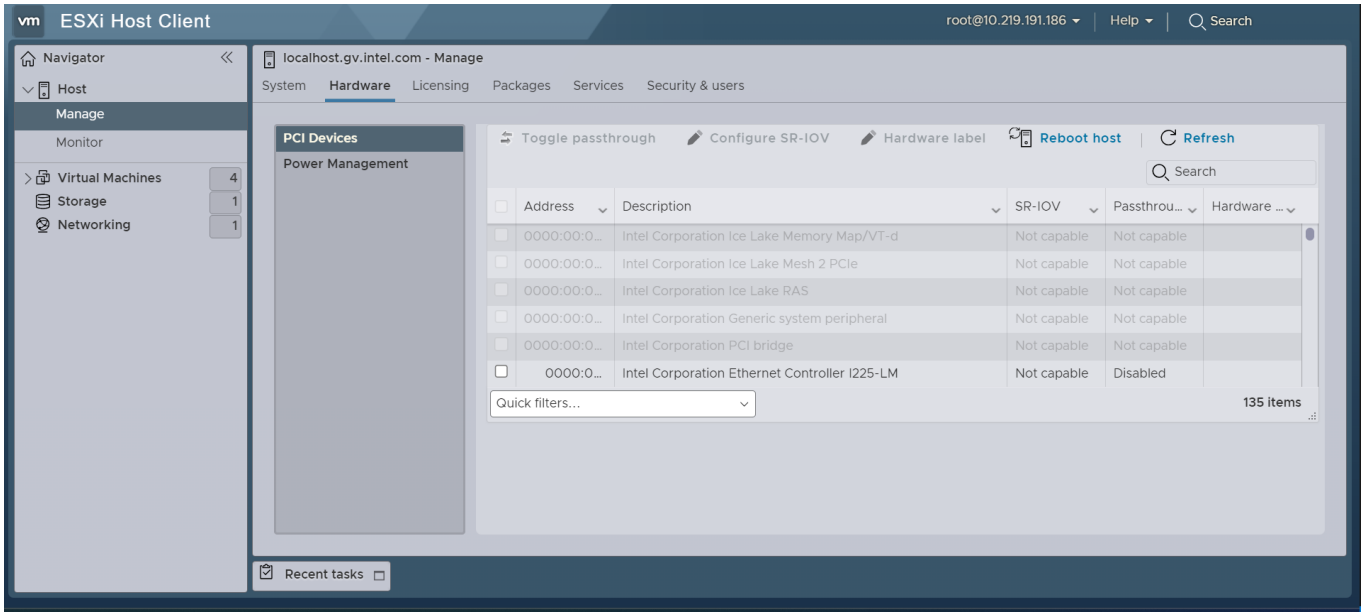
5.2 ESXCLI Tools

Intel vRAN Baseband Tools are a part of the release package. After package installation, this set of tools appears in ESXi as a namespace **"intvran"** under "**esxcli**" as shown below. It provides accelerator configuration, dumping, telemetry, and health check functionality. Details of each below command can be found in "**README.txt**", which is part of the release package.

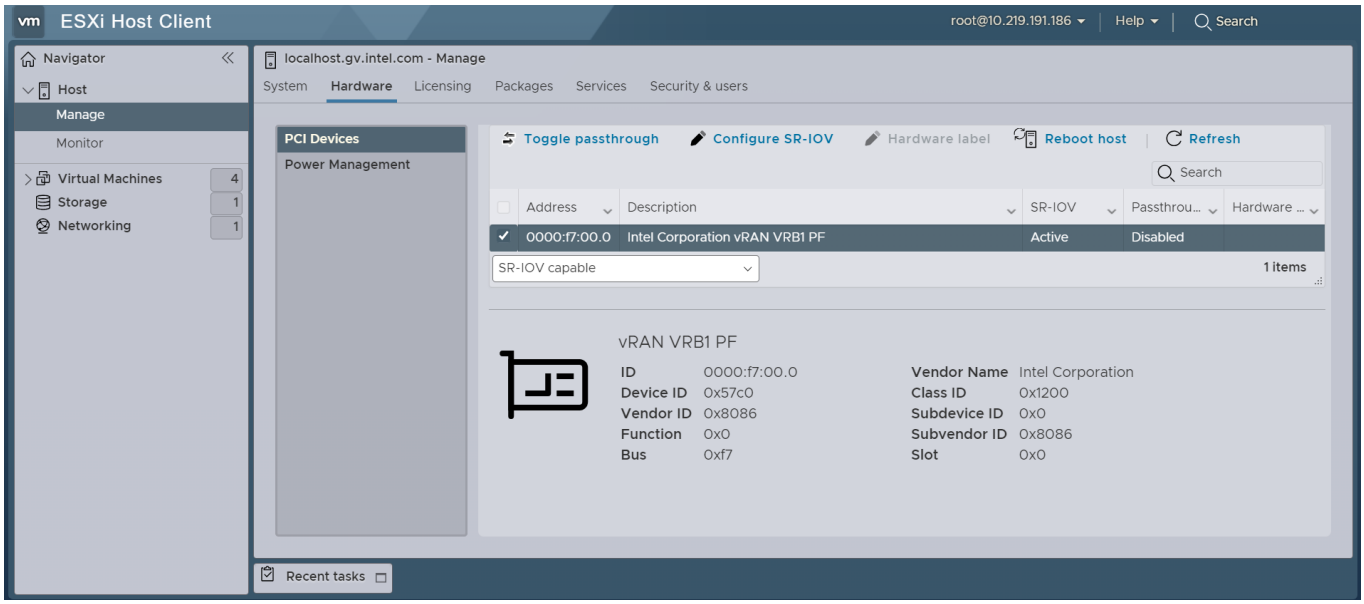
```
[root@localhost:~] esxcli intvran
Usage: esxcli intvran {cmd} [cmd options]

Available Namespaces:
  config               Intel(R) vRAN accelerator configuration
  dump                 Intel(R) vRAN accelerator register content and telemetry data
  health               Intel(R) vRAN accelerator health status and recovery

Available Commands:
  list                 List all Intel(R) vRAN accelerators detected by driver
  read                 Show content of Intel(R) vRAN register
  version              Show information about Intel(R) vRAN Software versions
[root@localhost:~]
```

6 Enabling SR-IOV and VFs

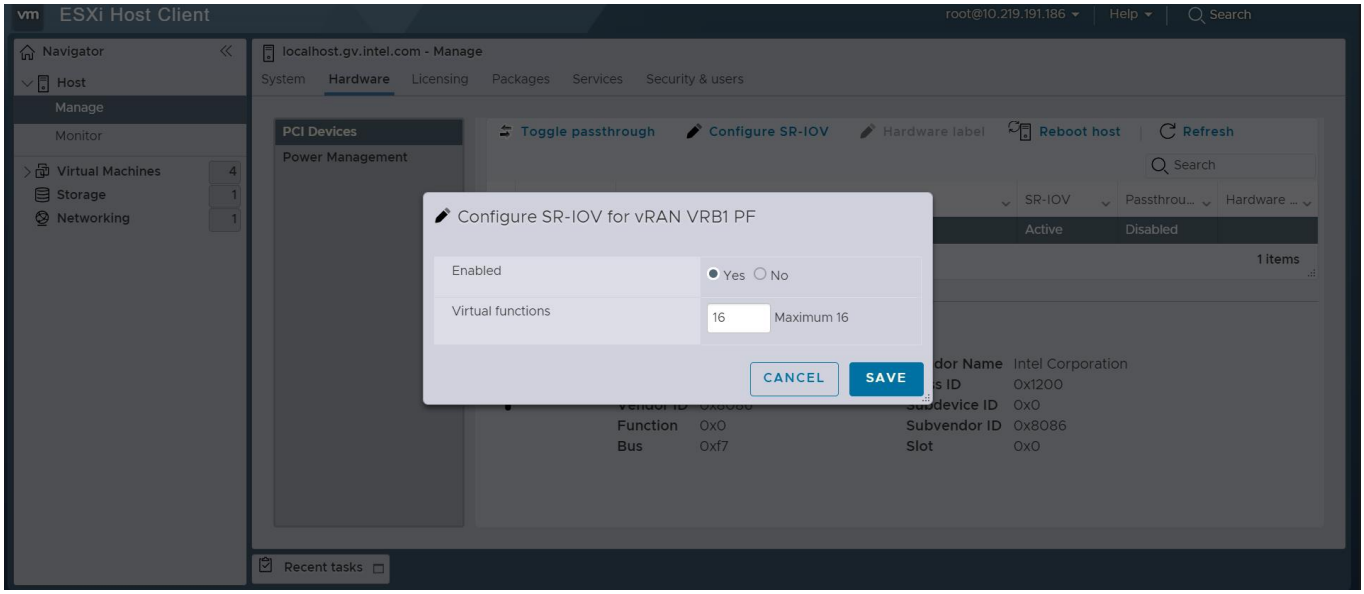
Log in to your vSphere. Go to Manage -> Hardware -> PCI Devices.



Click on the filter, select **SR-IOV Capable,** and then select **vRAN PF** device.



Press **Toggle passthrough** to enable SR-IOV and then use **Configure SR-IOV** to enable desired number of VFs (which is recommended to match to **num_vf_bundles** provided in hardware configs).



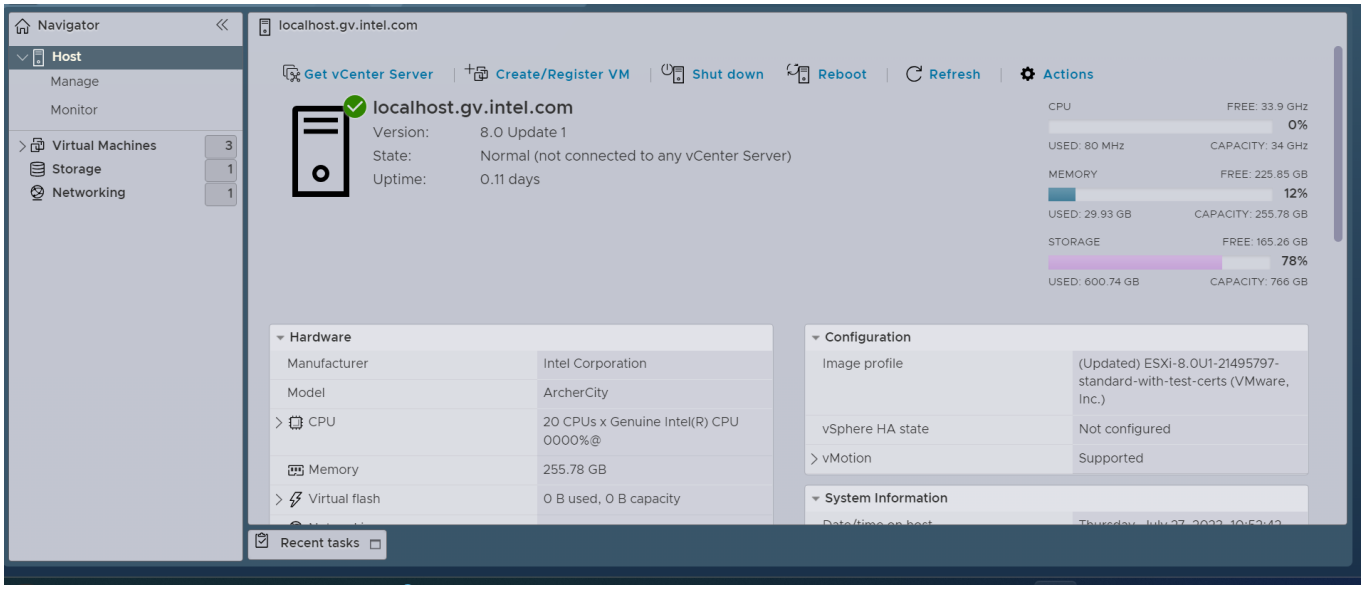
Refresh vSphere Host UI to verify the VFs are enabled. VFs also can be checked via ESXi command line.

```
[root@localhost:~] uname -a
VMkernel localhost.gv.intel.com 8.0.1 #1 SMP Release build-21495797 Mar 24 2023 18:45:16 x86_64 x86_64 x86_64 ESXi
[root@localhost:~]
[root@localhost:~] lspci | grep VRB1
0000:f7:00.0 Processing accelerators: Intel Corporation vRAN VRB1 PF
0000:f7:00.1 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.2 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.3 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.4 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.5 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.6 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:00.7 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.0 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.1 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.2 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.3 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.4 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.5 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.6 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:01.7 Processing accelerators: Intel Corporation vRAN VRB1 VF
0000:f7:02.0 Processing accelerators: Intel Corporation vRAN VRB1 VF
[root@localhost:~]
```

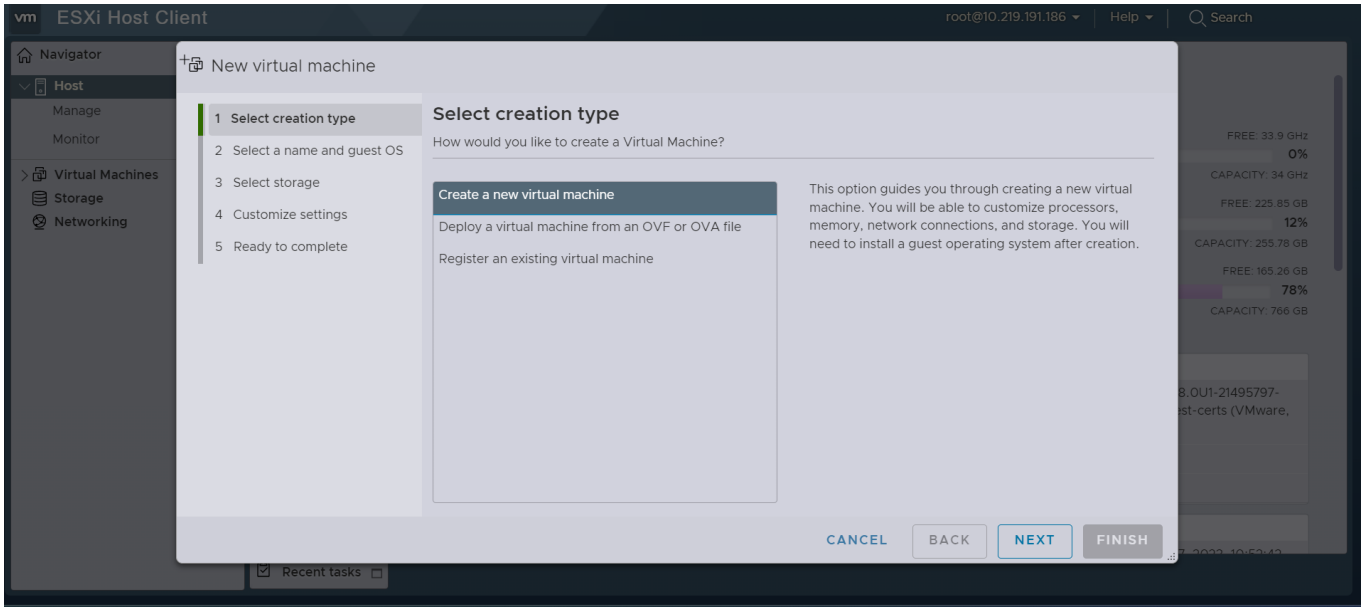
7 Guest VM creation and configuration

7.1 VM Setup

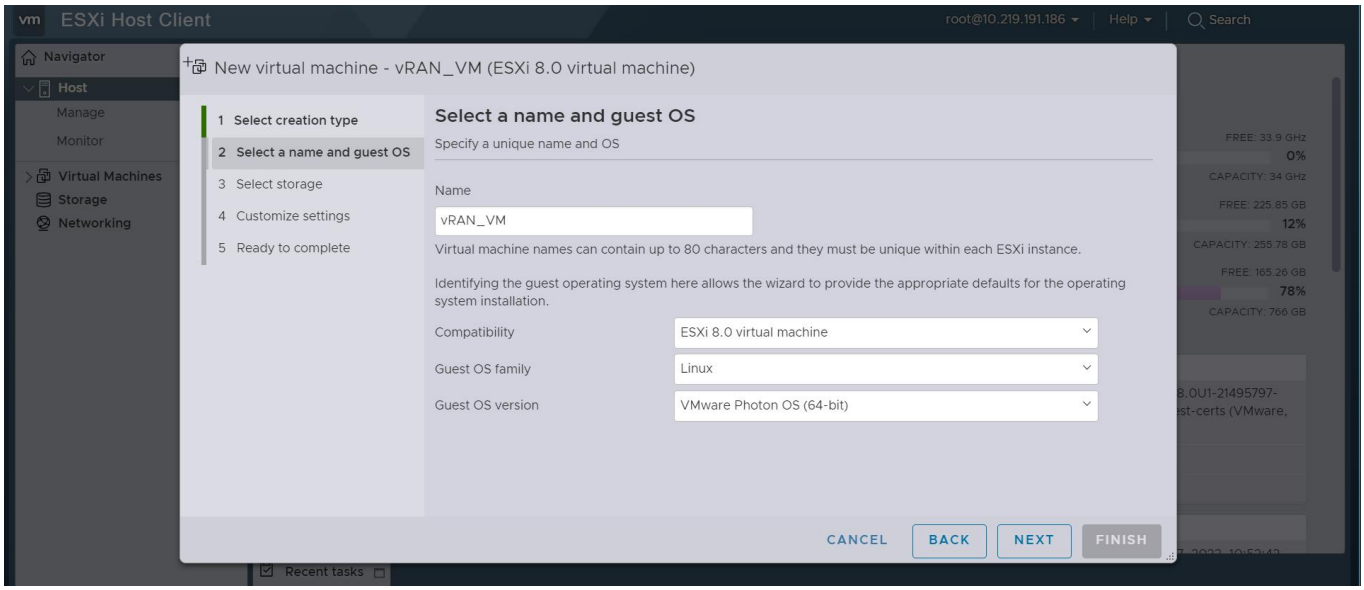
Log in to your vSphere. In the Virtual Machines window, choose **Create/Register VM.**



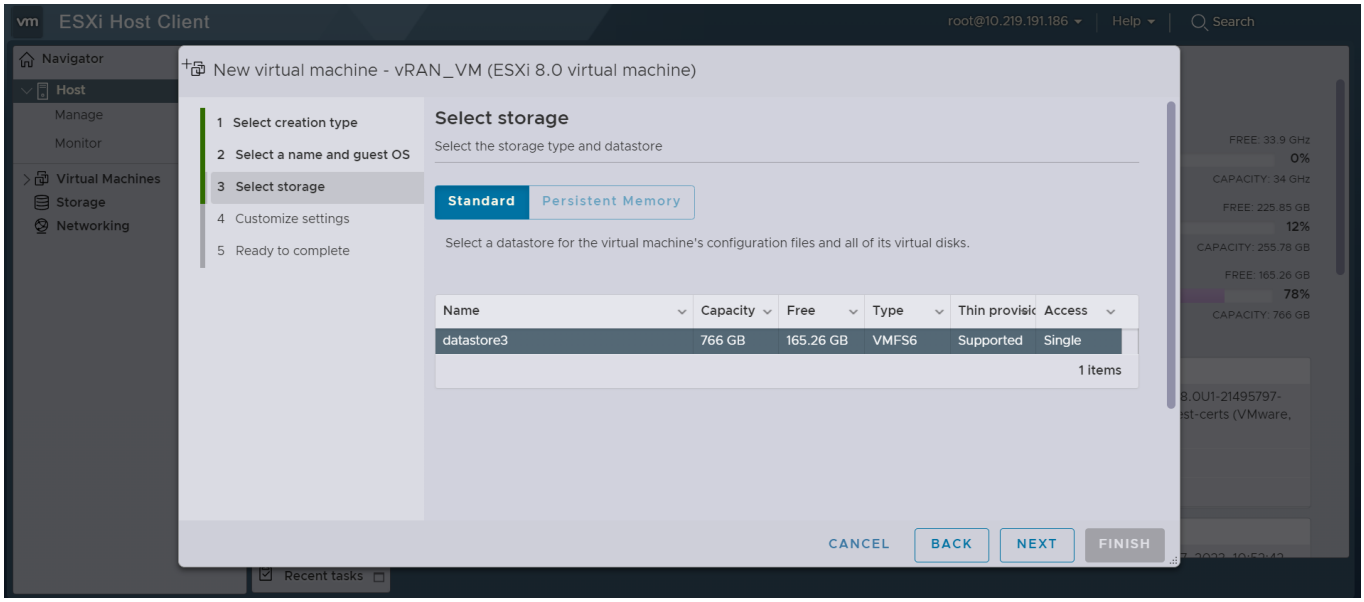
On the **Select creation type** screen, select **Create a new virtual machine** and click "**NEXT**".



Select VMware ESXi for the compatibility version and Photon OS for the guest VM and click "**NEXT.**"

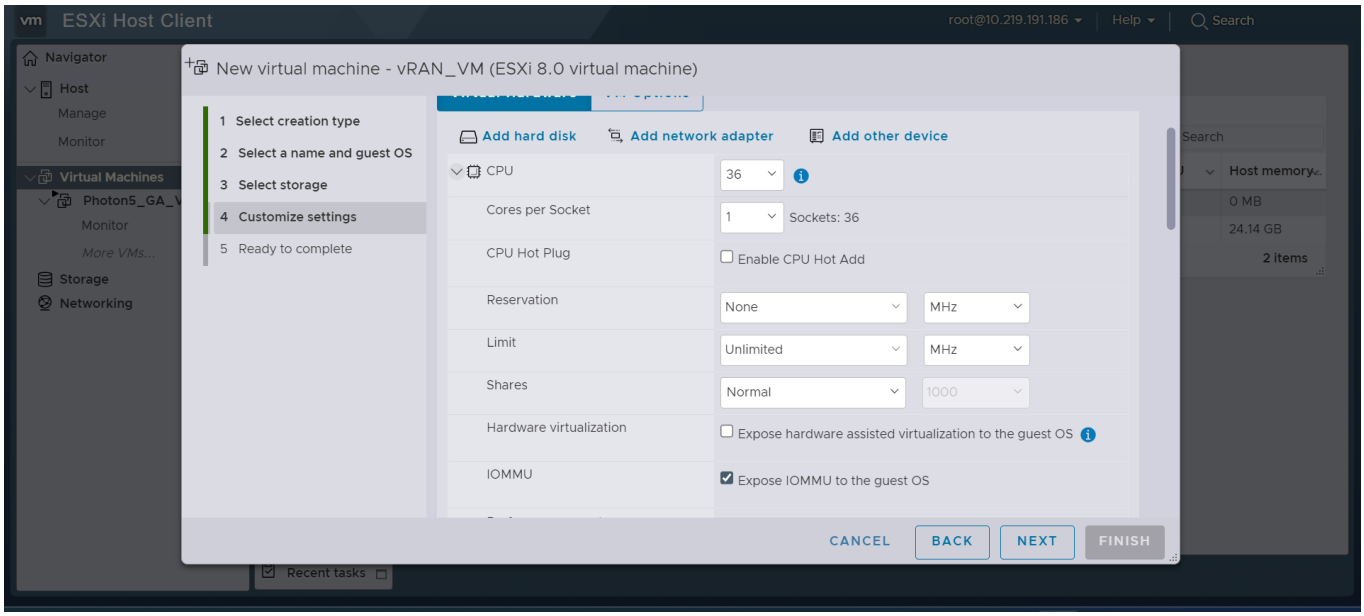


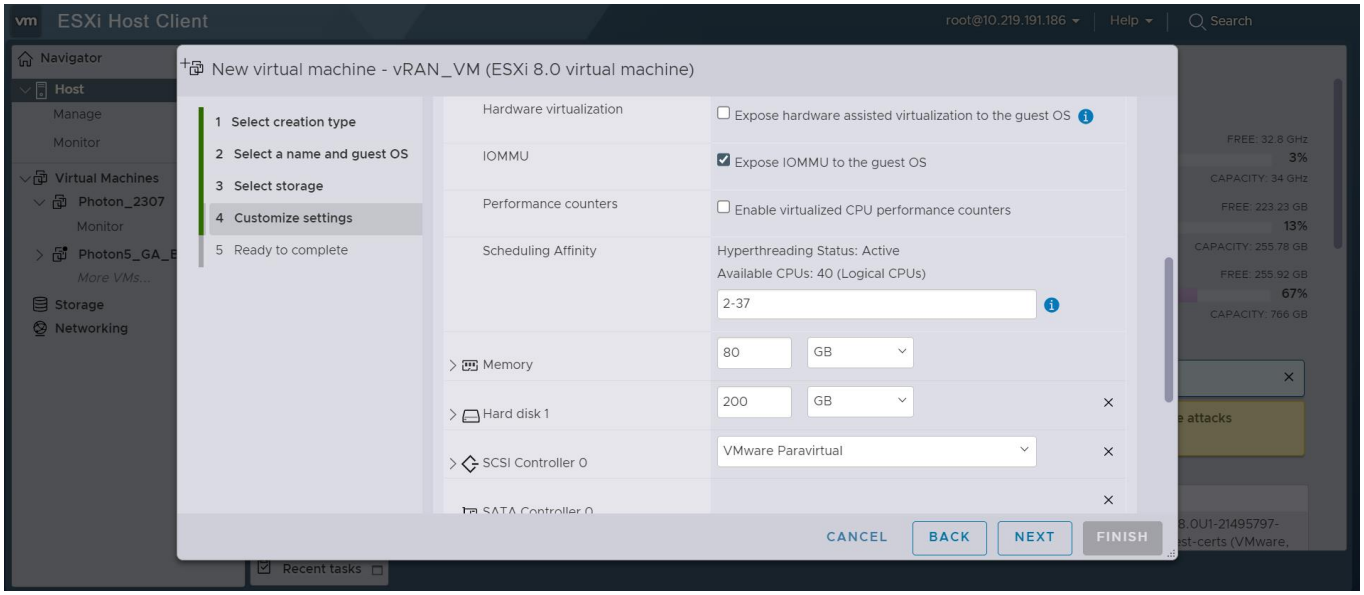
Select the storage type in which to place the VM and click **NEXT.**



Apply the following recommended CPU settings under the “Virtual Hardware” tab:

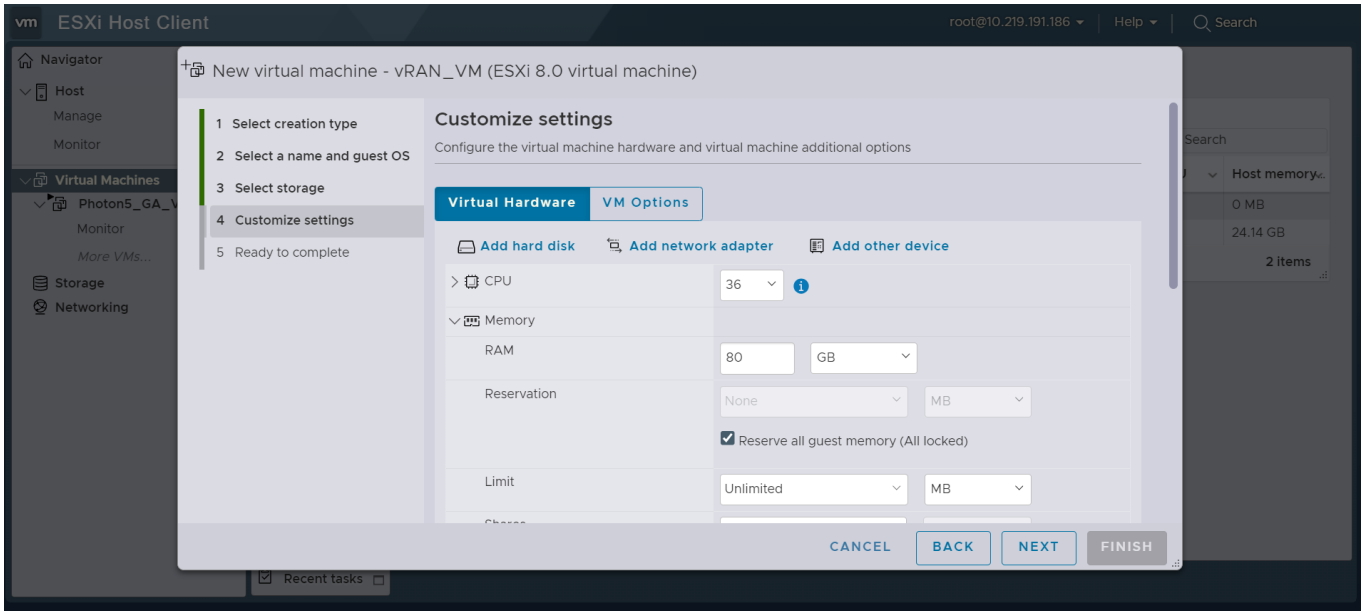
- Assign **36 Logical CPU** cores
- Set logical processor affinity by selecting the range “**2-37**”
- Enable “**Expose IOMMU to the Guest OS**”

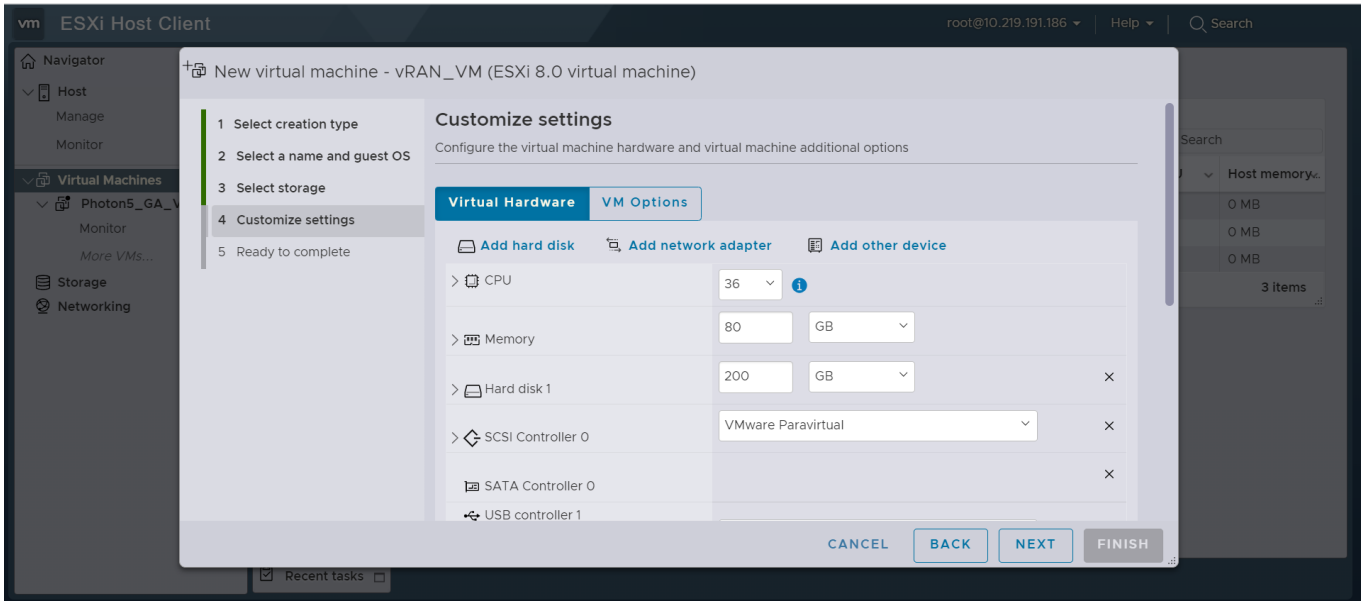




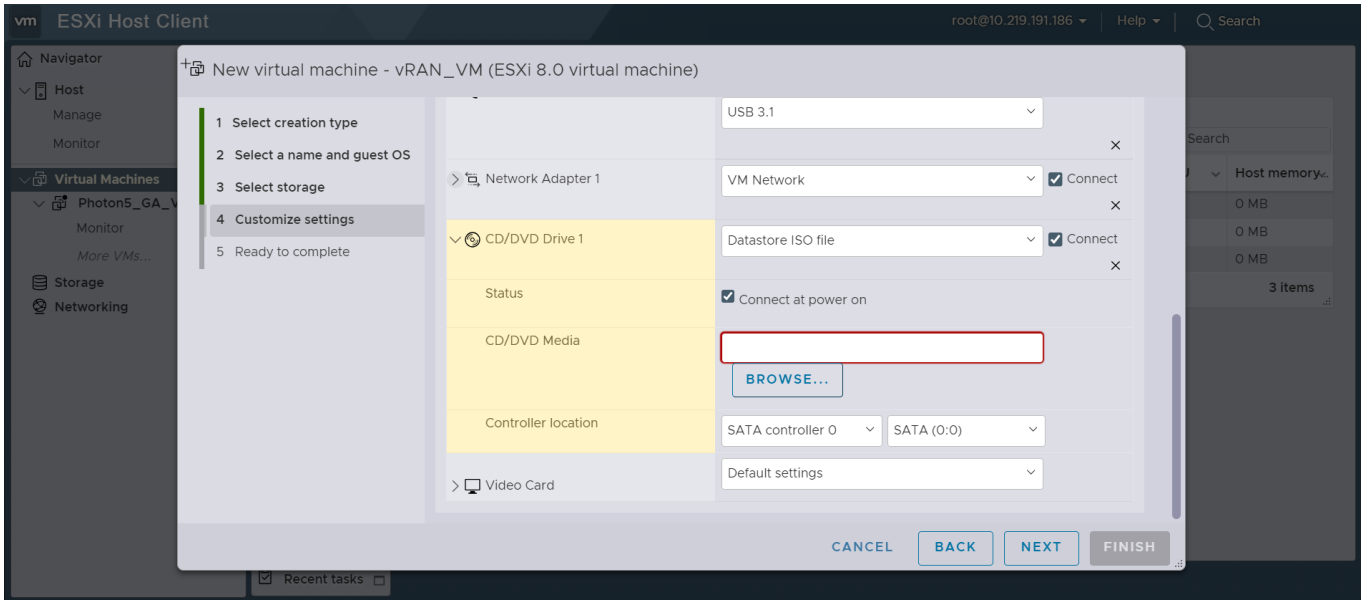
Apply the following recommended Memory and Hard Disk settings:

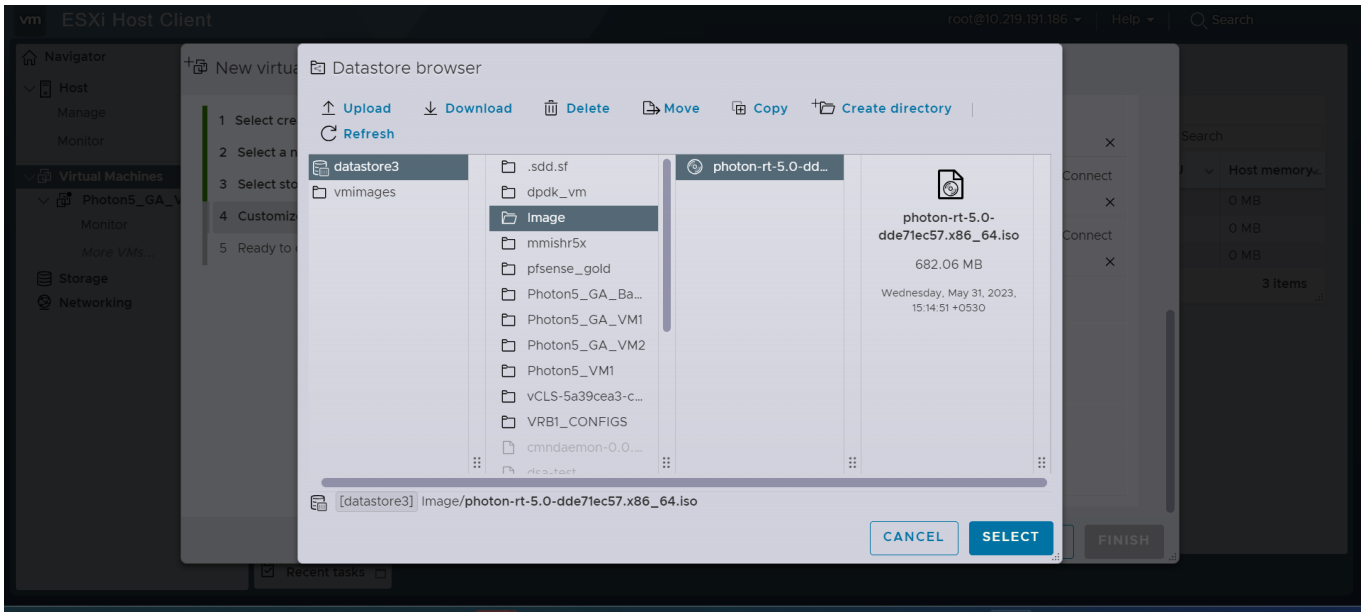
- Set RAM size to **80 GB** and select "**Reserve all guest memory**"
- Set disk space size to **200 GB**



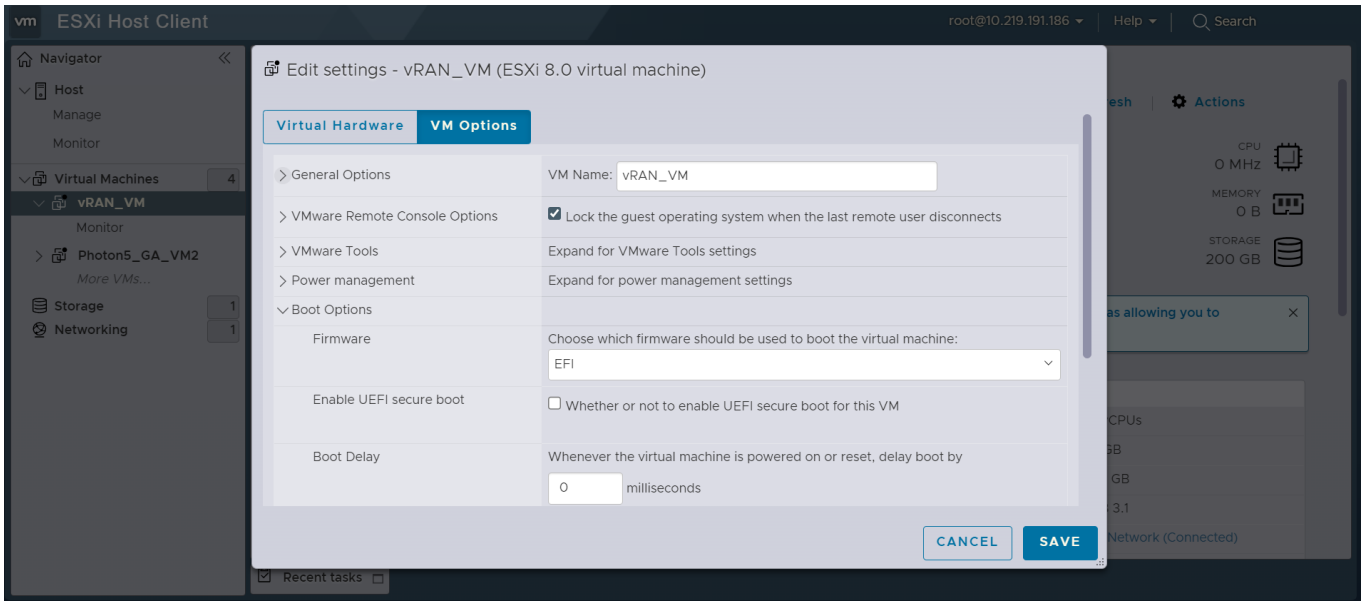


Specify Photon OS ISO image under CD/DVD Drive by clicking the drop-down to select **Datastore ISO file** and then choose the desired ISO using the **BROWSE** button. Click **NEXT.**

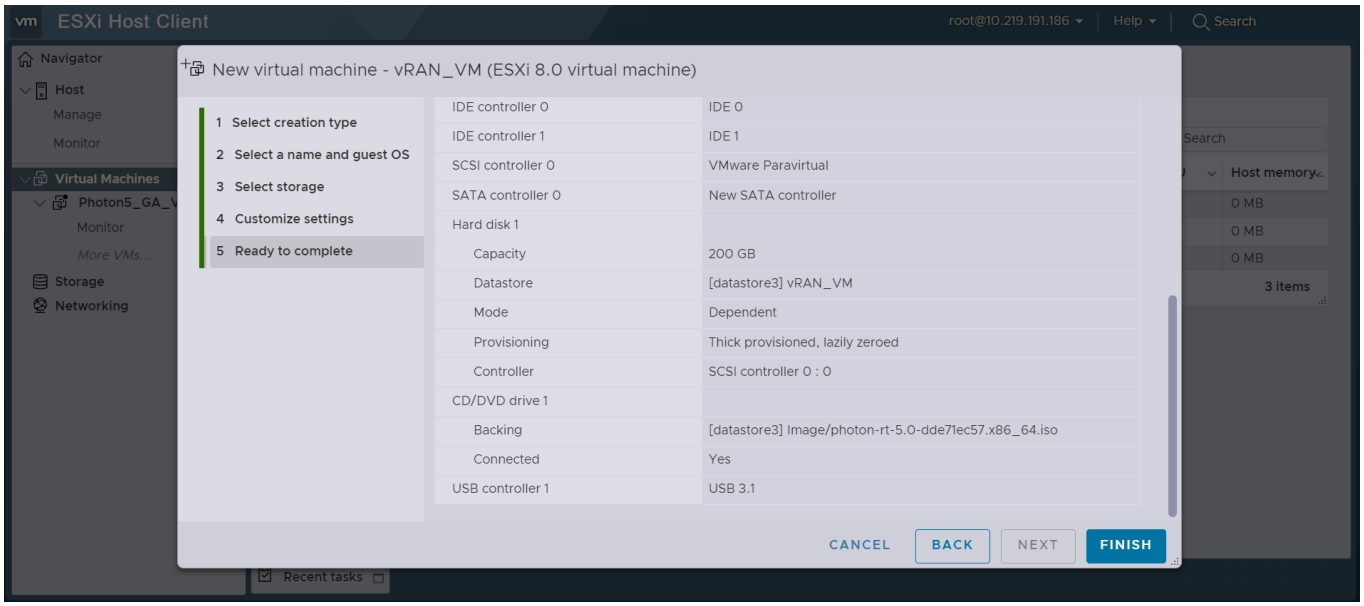




Select the **“VM Options”** tab and then select “**EFI**” under Firmware.

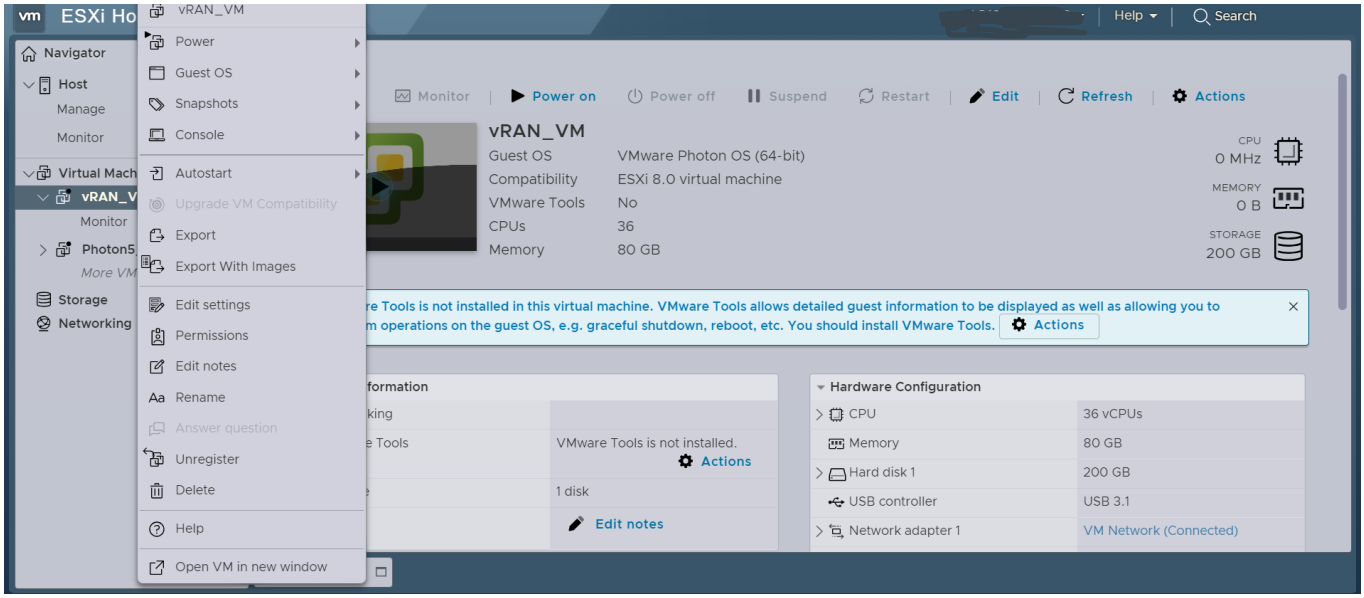


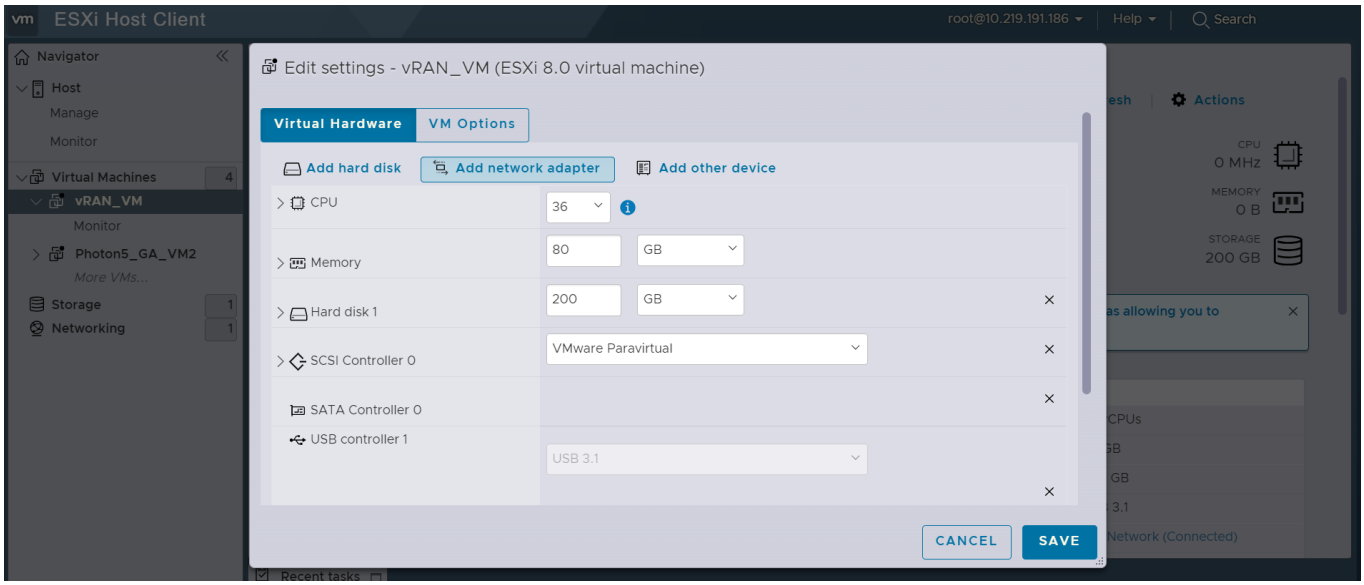
Review the provided settings and select **FINISH.**



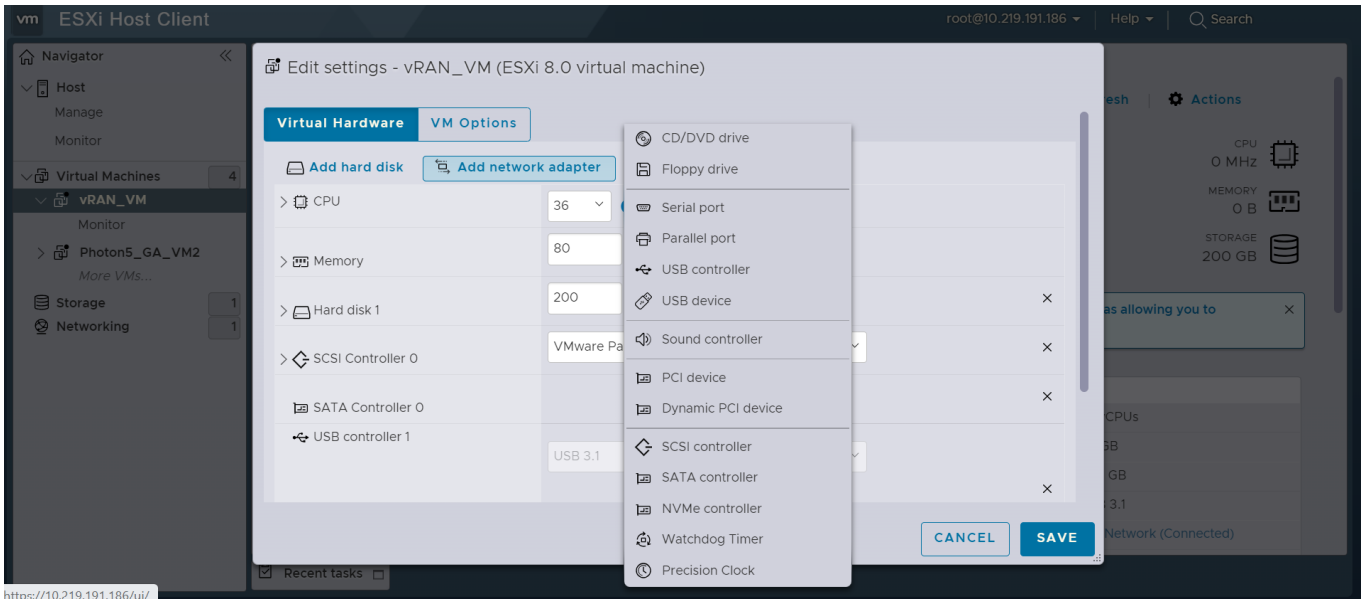
7.2 Assigning VFs to VM

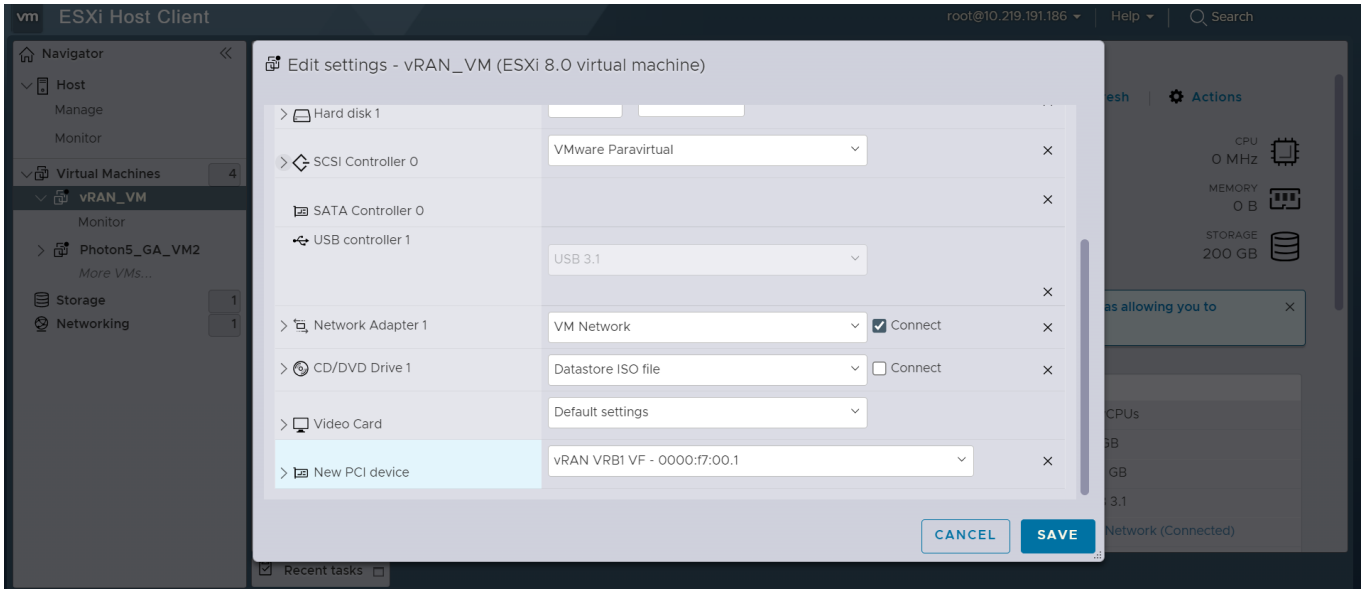
Go to "**Edit settings**" and select "**Add other devices**". Add the desired number of VFs.





Select “**PCI devices”,** go to “**New PCI device**” and select the PCI VF device to be added.





8 Photon OS installation and configuration in a VM

8.1 Photon OS Installation

- Steps to follow for Photon OS installation

8.2 Photon OS Networking Configuration

Adding proxy information to "**/etc/sysconfig/proxy**"

- Make "**PROXY_ENABLED**" flag to "yes"
- Modify **HTTP_PROXY** or **HTTPS_PROXY** etc. depending upon organization requirement
- After adding proxy, source the proxy path using
  #source /etc/sysconfig/proxy

Adding DNS Addresses

- Adding nameserver

Enabling SSH and Setting of static IP address

- Permitting Root Login with SSH
- Setting a static IP address on Photon OS

8.3 Photon OS Boot Configuration

On the Photon OS Kernel Boot, the parameters can be modified by editing "**/boot/photon.cfg**" through "**photon_cmdline**". For details, please refer to:

- Changing boot parameters in Photon OS

Recommended parameters to start with (need to match the settings used to create the VM):

```
init=/lib/systemd/systemd ro loglevel=3 quiet no-vmw-sta nosoftlockup
mce=ignore_ce nowatchdog cpuidle.off=1 nmi_watchdog=0
cgroup.memory=nokmem apparmor=0
systemd.legacy_systemd_cgroup_controller=yes noswap
pcie_aspm.policy=performance intel_idle.max_cstate=1 fsck.mode=force
fsck.repair=true processor.max_cstate=1 isolcpus=2-35 irqaffinity=0-1
nohz=on nohz_full=2-35 rcu_nocb_poll=1 rcu_nocbs=2-35 idle=halt audit=1
clock=tsc clocksource=tsc tsc=nowatchdog selinux=0 enforcing=0
softlockup_panic=0 iommu=pt intel_iommu=on default_hugepagesz=1G
hugepagesz=1G hugepages=40 skew_tick=1 cgroup_memory=1
```

9 Revision History

Version	Description	Date
1.0	Documentation for Initial Release 2.0.0	08/24/2023

10 Customer Support

To submit an Intel® Premier Support (IPS) ticket, please go to
https://www.intel.com/content/www/us/en/secure/my-intel/dashboard.html

11 Legal Information

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