# Kraken OVA Deployment Guide
## Kraken OVA 3.4

This Deployment Guide describes how to deploy Haivision's Kraken H.264/HEVC Video Encoder/Transcoder within a virtual environment from an Open Virtual Appliance (OVA) file.

> **ⓘ Note**
>
> Kraken is available as a virtual machine for VMware ESXi and vSphere environments. For hardware acceleration of video encoding and decoding, VMWare ESXi 6.5 with Update 1 must be installed on the host appliance.
> For Intel GPU accelerator support, processors from the SkyLake (or newer) generation with support for Intel Quick Sync Video (QSV) video are required. Iris Pro Graphics P580 or higher is recommended.
> As of release 3.0, Kraken supports NVIDIA GPUs which utilize NVENC.
> As of release 3.2, Kraken supports capture and encoding of SDI input using SFP SDI->IP gateway devices, specifically Embrionix SDI-SFP devices.
> The minimum disk space requirement for Kraken VMs is 250 GB.

This guide details how to enable GPU passthrough for hardware encoding and supported capture cards (when supported by the hardware, in the current release, either Iris Pro or NVIDIA Quadro). This guide assumes you are familiar with VM servers and hypervisor systems.

After completing the steps in this guide, you will have a Kraken Virtual Machine installed that will include Kraken's support for hardware-accelerated video encoding and access to the capture card.

For detailed Kraken configuration and operation information, please refer to the User's Guide (available at https://doc.haivision.com). For the default credentials, refer to the *Important Notice* (postcard shipped with appliances). You may download the *Important Notice* as well as the latest software and Release Notes through the Download Center on the Haivision Support Portal (http://support.haivision.com).

**Guide Contents**

# Confirming the BIOS Settings

To get started, you need to enable the "Virtualization Technology" in the CPU.

To confirm and update the BIOS settings:

1. Reboot the server.
2. When the system is starting up, press F2 to enter the system setup and open the system's BIOS menu.
3. Open the **Processor** submenu (i.e., scroll down to "Processor Settings" and press Enter).
4. Enable both the **Vt-d** (Intel Virtualization Technology for Directed I/O) and **Intel Virtualization Technology** BIOS settings, as shown in the following example.
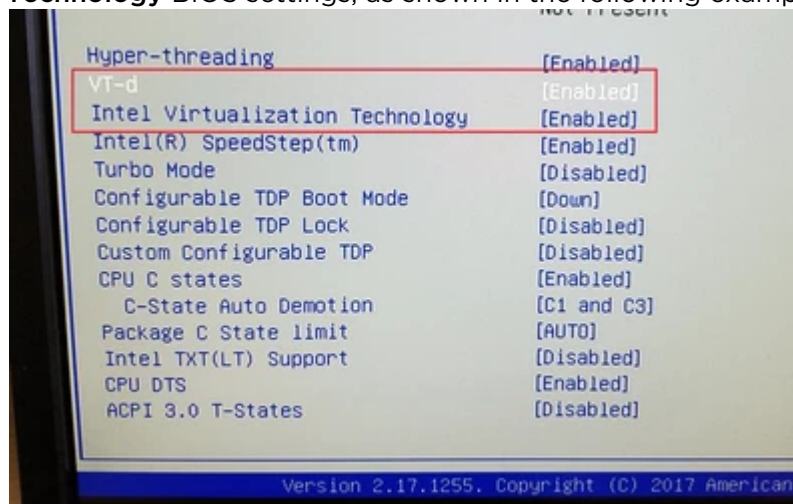


5. Select **Save & Exit**.

# Enabling Hardware Pass-through on the Host

Assuming VMWare ESXi 6.5 is installed with Update 1 on the host system, you must now enable the pass-through of the hardware devices on the system needed by Kraken. This first step is done at the host level.

1. Log into the hypervisor.
2. In the Navigator, select **Host→Manage→Hardware→PCI Devices**.
3. On an example host, locate the graphics card and the video capture devices to be enabled for pass-through.
   Following are examples of the devices available on Kraken CR (Intel Quick Sync Video (QSV)):
   - 0000:00:02.0 Intel Corporation Iris Pro Graphics P580
   - 0000:02:00.0 Blackmagic Design DeckLink Micro Recorder
   - 0000:03:00.0 Conexant Systems, Inc. CX23885 PCI Video and Audio Decoder|
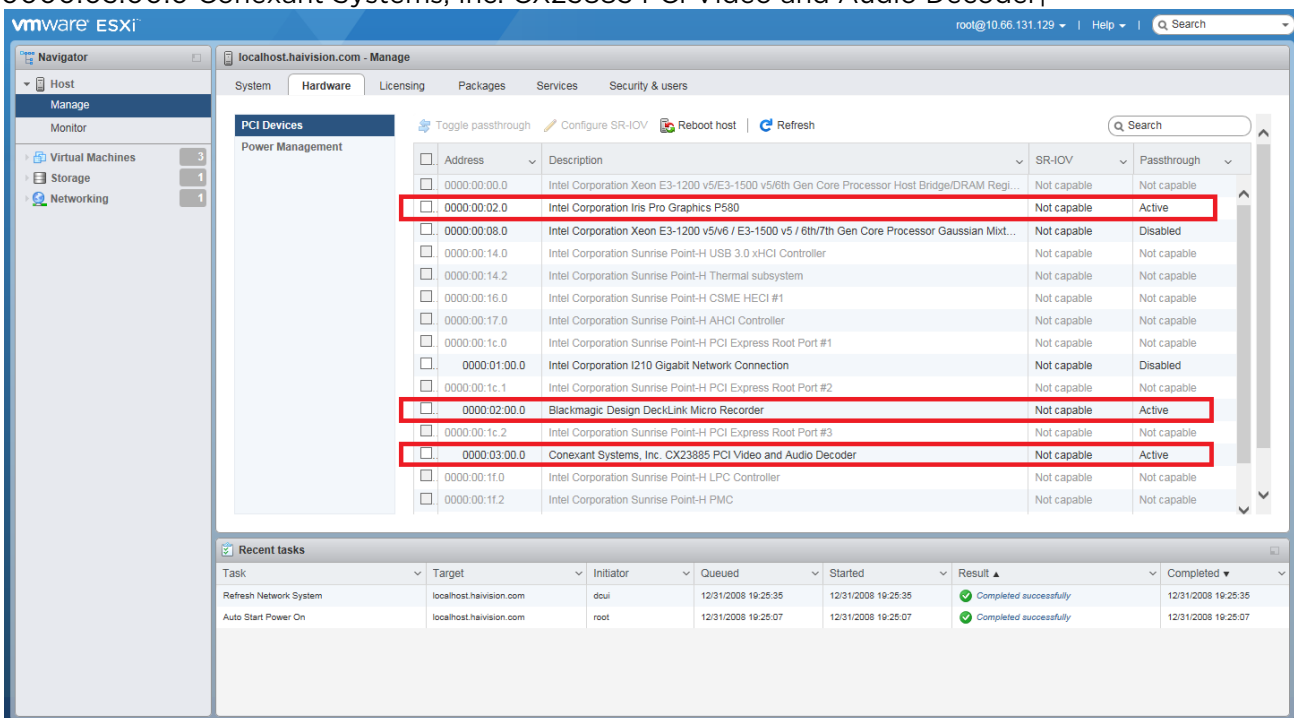


or devices available on Kraken servers (NVIDIA Quadro)
- 0000:3b:00.1... NVIDIA Corporation GP107GL High Definition Audio Controller
- 0000:3b:00.2... NVIDIA Corporation GP107GL [Quadro P400]
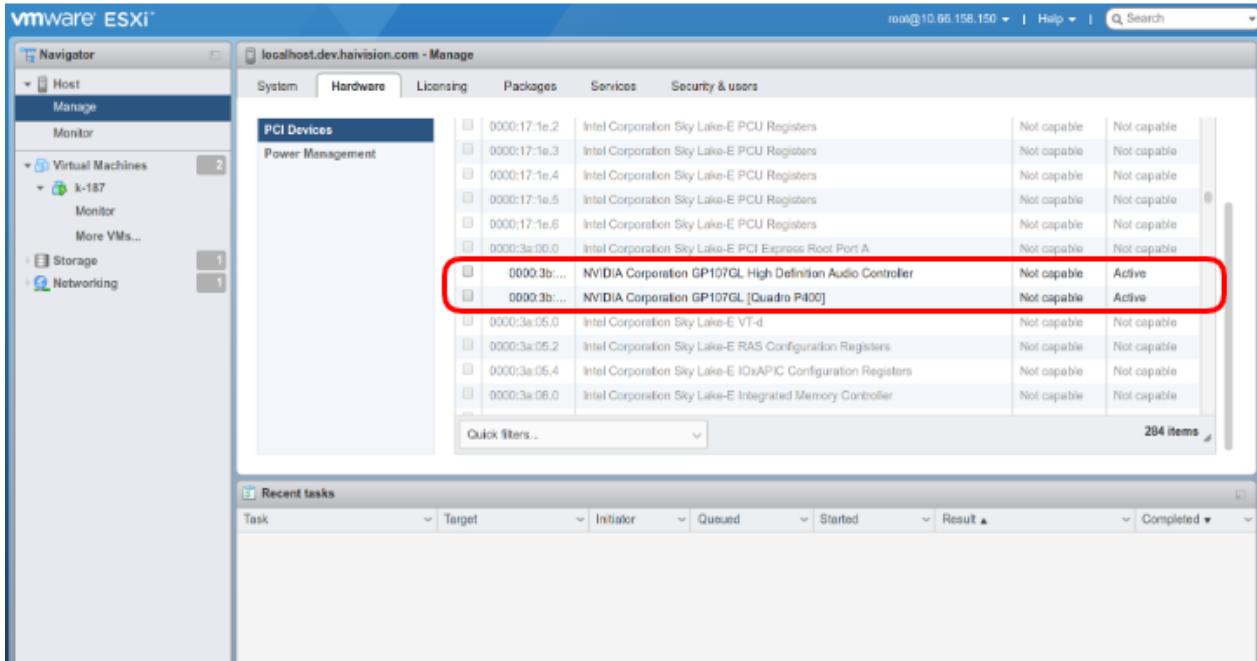
4. 
> ℹ️ **Note**
>
> The Graphics Controllers are identified differently depending on the CPU model. For example, on Skylake systems, it reports as: **Intel Corporation Iris Pro Graphics ####** (as shown in the above screenshot), while on Kaby Lake systems, it reports as: **Intel(R) Display controller**.

5. Reboot the host to confirm the settings if you changed anything.

> ✅ **Tip**
>
> You can toggle all selected devices at once, and then reboot.

> **ℹ Note**
>
> After making this change, you may notice that the VMWare ESXi host console boot screen no longer comes up completely. This is because the GPU pass-through is enabled at the host level and is unfortunately normal. The progress bar will stop at the message
> " `vmkapi_v2_1_0_0_vmkernel_shim loaded successfully.` " There will be no further visual indication from the host console that VMWare is booting up, but it is. After a couple of minutes, you will be able to navigate to the hypervisor with a Web browser and log in.
>
>
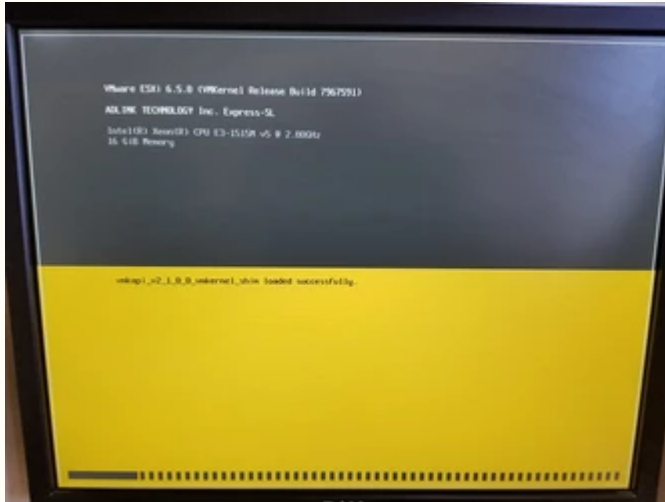
# Importing the Kraken OVA

Follow these instructions to import the Kraken OVA onto the hypervisor.

1. Log into the hypervisor and select "Virtual Machines".
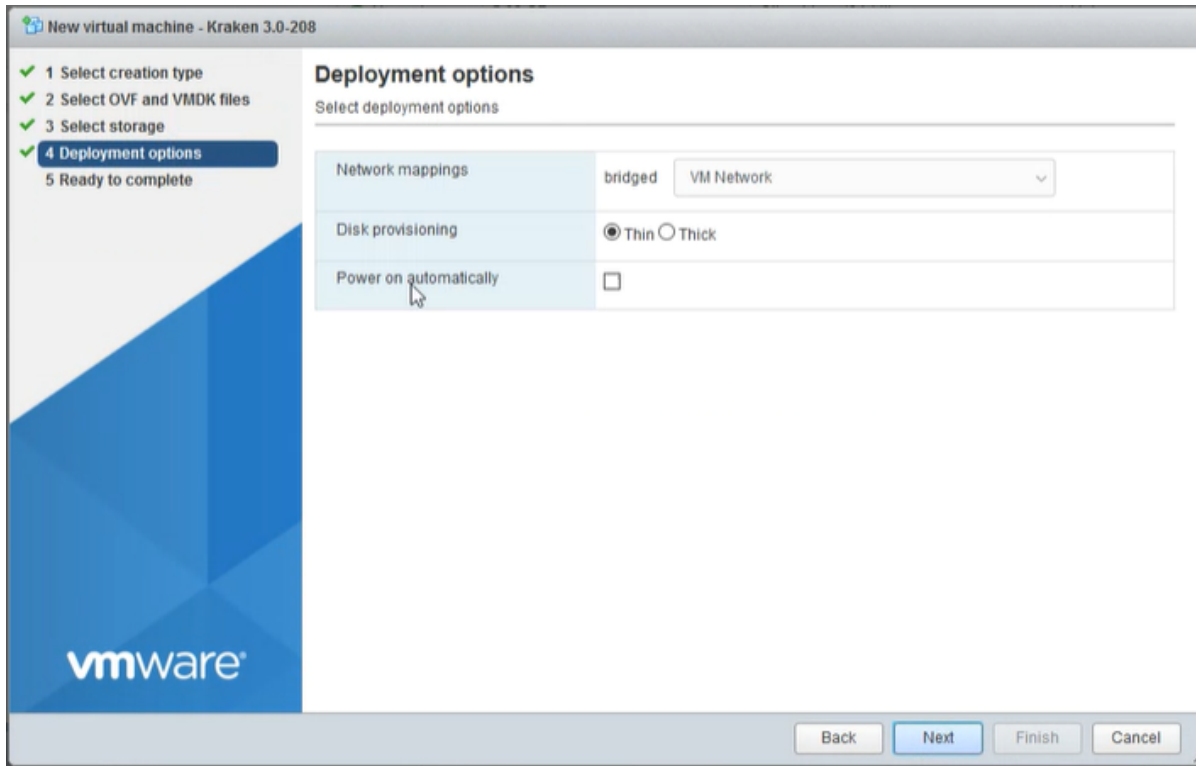2. Select "Create / Register VM".
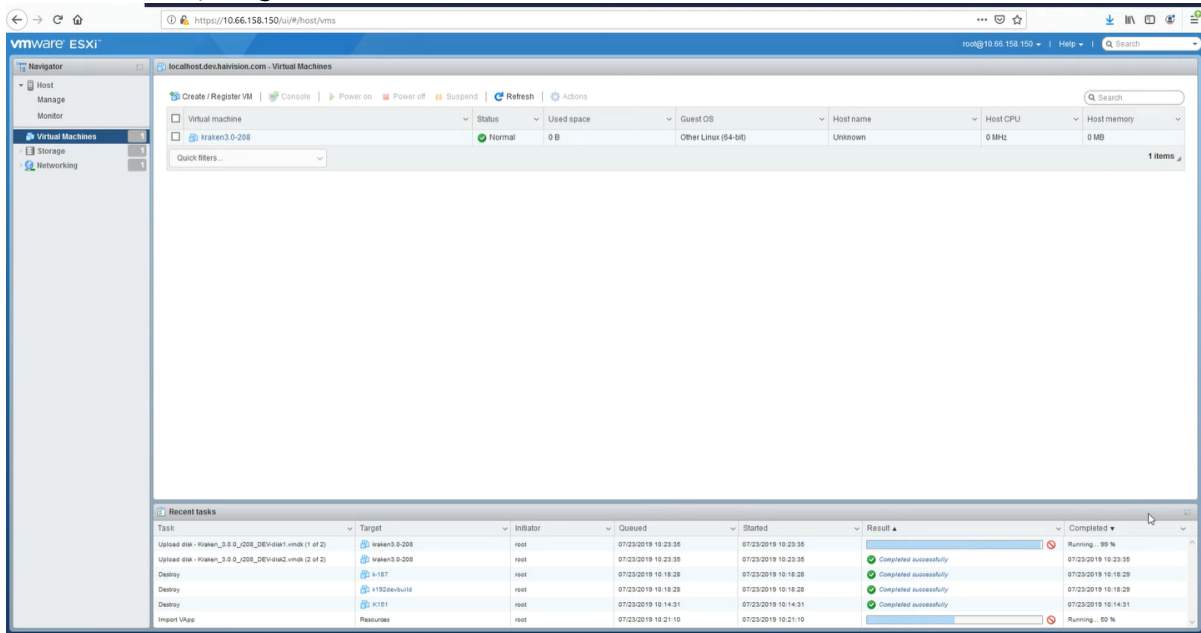


3. Select "Deploy a virtual machine from an OVF or OVA file."
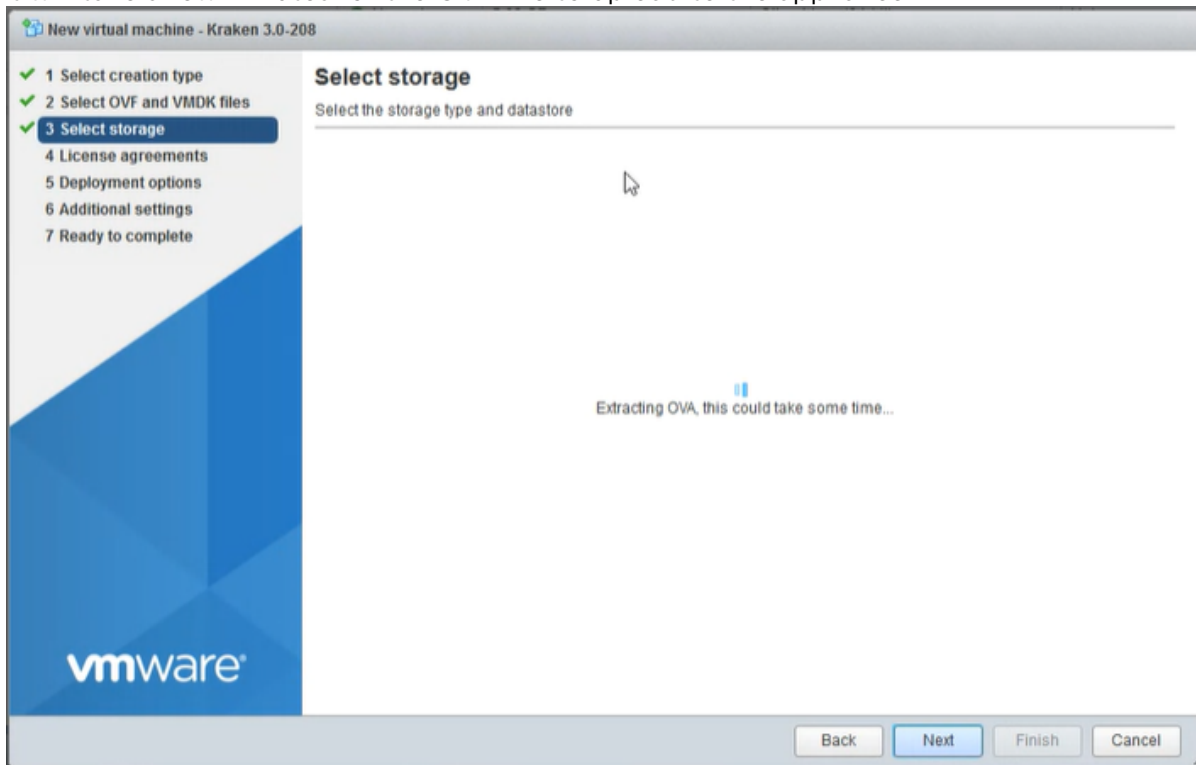4. 
> ✅ **Tip**
>
> Make sure you uncheck "Power on automatically".  This will allow you to enable the Intel or NVIDIA cards individually, which will save time and rebooting steps. (You can only change settings in Power Off state.)

5. Click **Next** to choose the default datastore.
6. Click **Finish** to begin importing.
7. It will take a few minutes for the OVA file to upload to the appliance.

# Learning the Virtual Machine's IP Address

> 🛈 **Note**
>
> The virtual machine will power on after it is imported. You will see the Kraken "Loading Please Wait" screen in the VMWare console.

1. After the Kraken VM loads, the device's IP address is displayed on the console. Write it down.
2. If static IP addressing on the virtual machine is preferred, use the console to modify it (refer to the Kraken User's Guide for details).
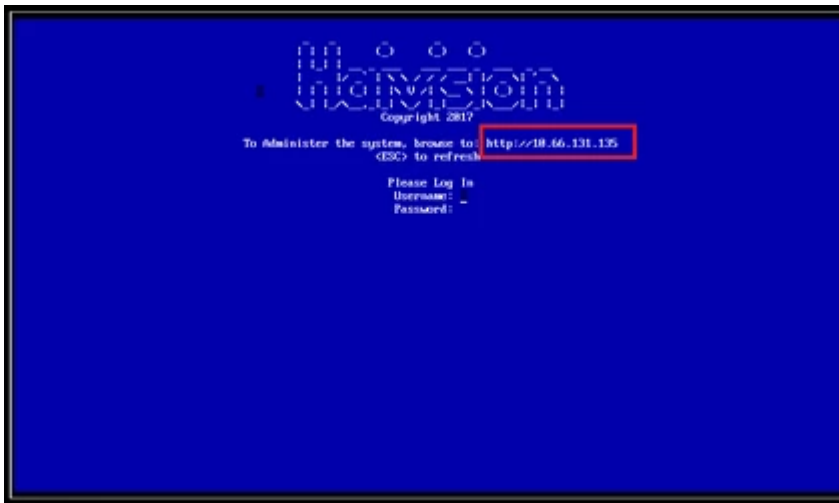


3. When changing to a static IP address, confirm that the settings are valid before moving on to the next step.

# Configuring the Kraken Virtual Machine

Now that the VM's IP address is known and configured, it is time to enable the hardware pass-through to the Virtual Machine.

1. Close the VM console window and "Shut Down" the Kraken VM using the hypervisor.
2. Select the Kraken VM and then select **Actions**→**Edit Settings**→**VM Options**.
3. Follow the steps below based on the capture card(s) installed.

## Intel Quick Sync Video (QSV)

1. Make the following strategic modifications:
    * Increase CPU count from 2 to the desired number.
      More CPU's assigned to the Kraken device increases its ingest and video reformatting capabilities.
    * Under Memory, make the "Reservation" setting equal to the "RAM" setting. 4096 is the default and will work for both.
    * Choose "Add other device"→"USB Device".
      At the bottom you will see a "New USB device" called "Blackmagic design DeckLink Micro Recorder".
    * Choose "Add other device"→"PCI Device" three times.
      All three of them will say "Iris Pro Graphics P580 - 0000:00:02.0".
    * Leave one of them alone, and set the other two PCI Devices to be "DeckLink Micro Recorder - 0000:02:00.0" and "CX23885 PCI Video and Audio Decoder - 0000:03:00.0".
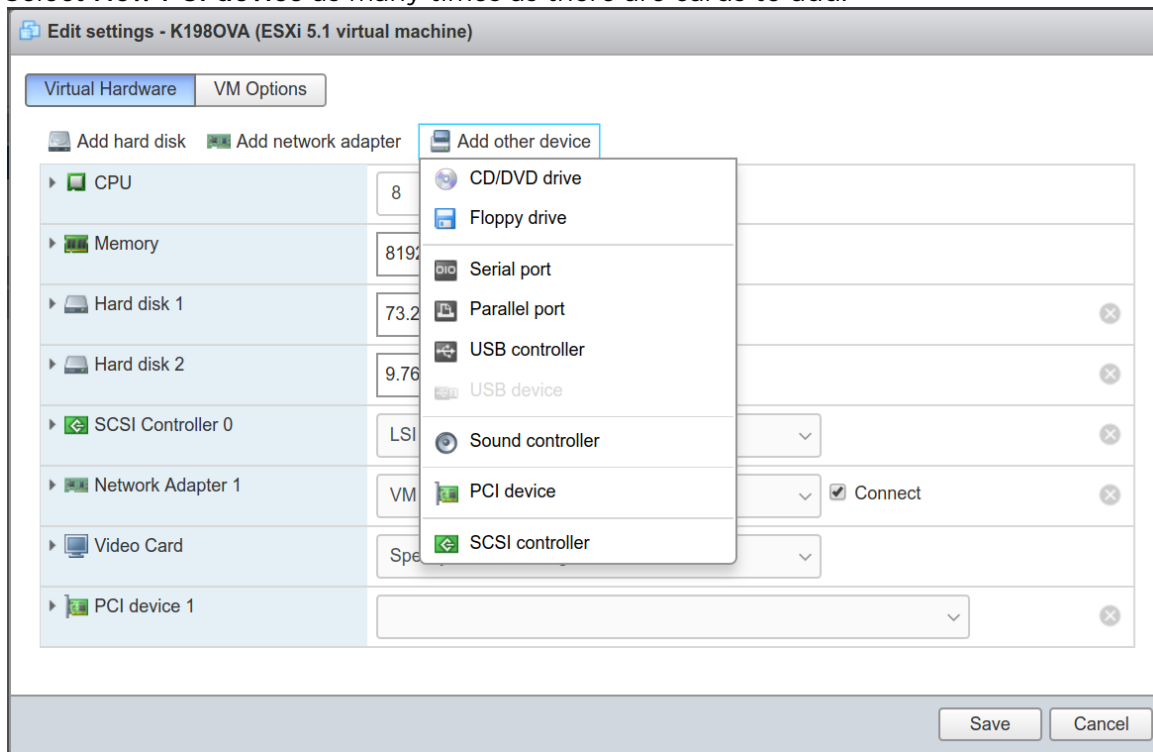2. Click **Save**.

Following are screen shots of the settings after all of the modifications are done.
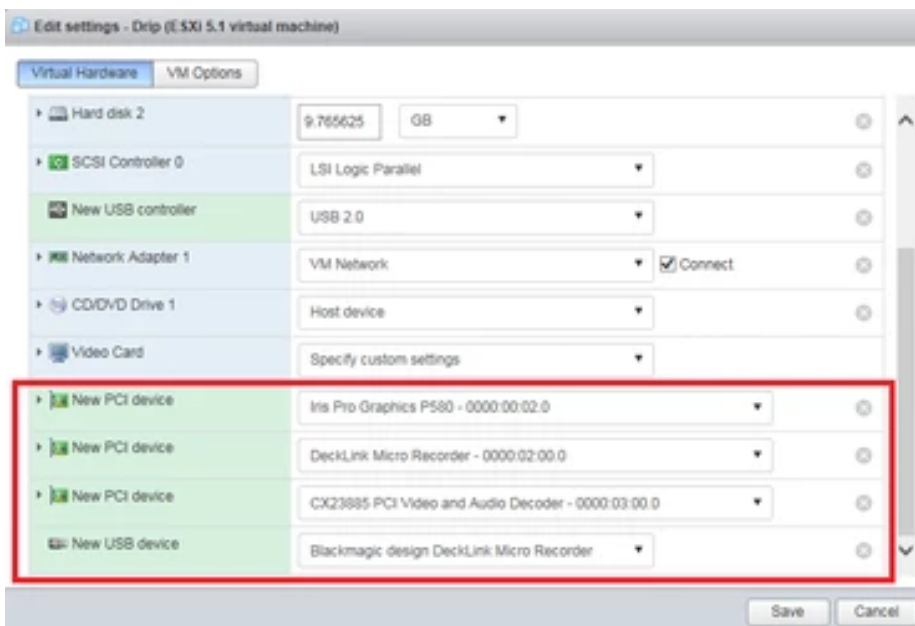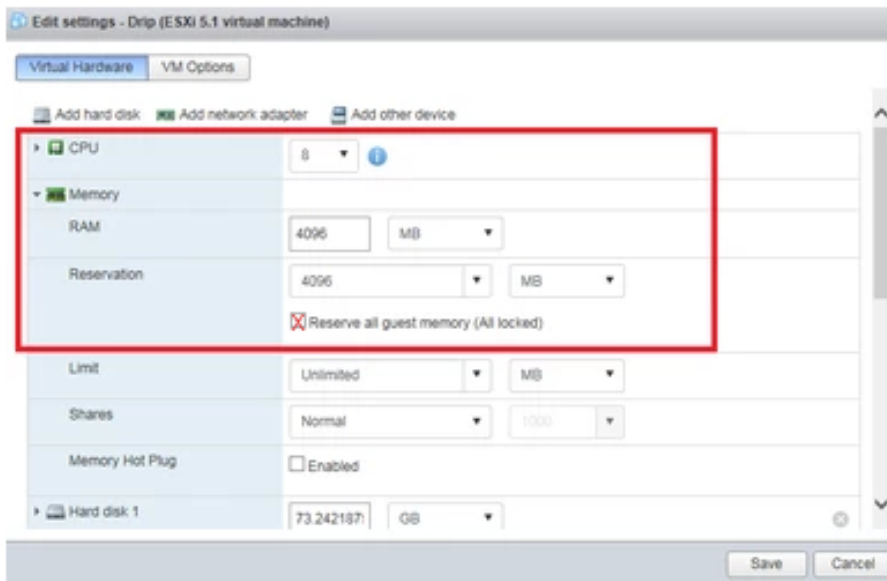
# VM Client Configuration for NVIDIA GPUs

Edit the VM settings to add and configure the NVIDIA Quadro P400 cards:

1. Select **Actions→Edit Settings→Virtual Hardware->Add other device**.
2. Select **New PCI device** as many times as there are cards to add.

3. Set the new PCI Devices to match the Quadro P400 cards selected under Enabling Hardware Pass-through on the Host.
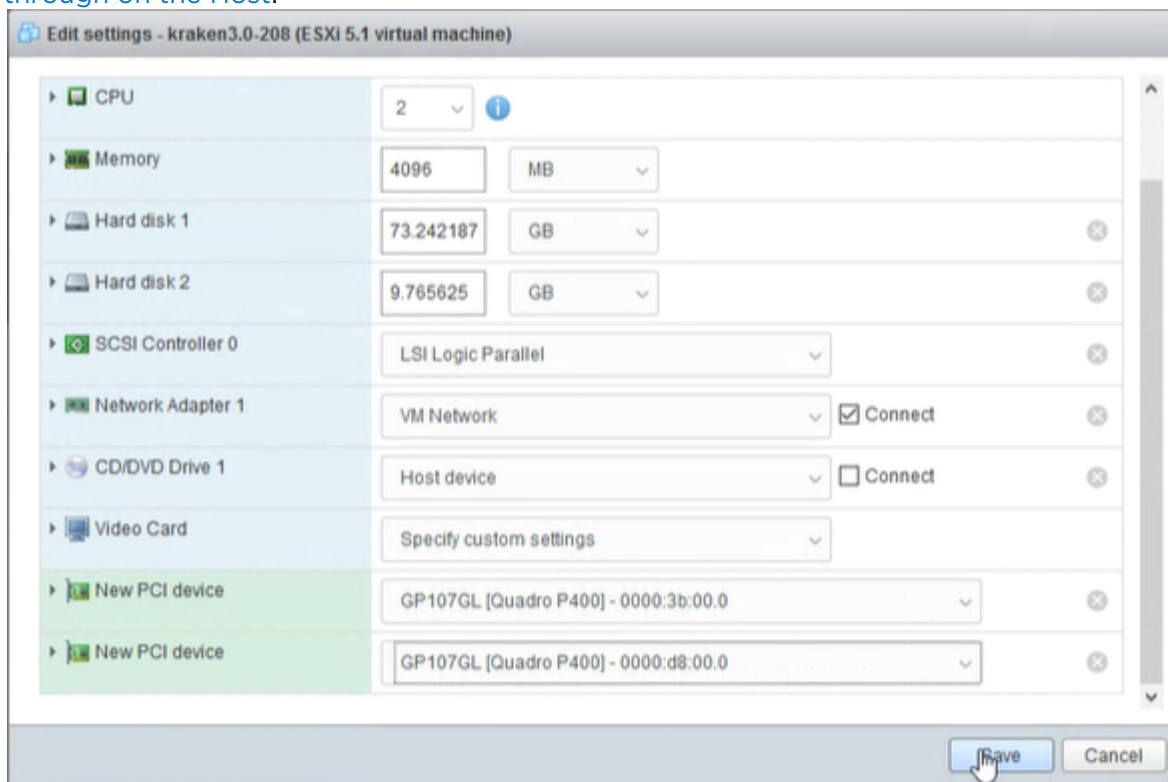


4. Click **Save**.
5. Be sure to check the "Reserve all guest memory" checkbox.

> ℹ **Gliffy Macro Error**
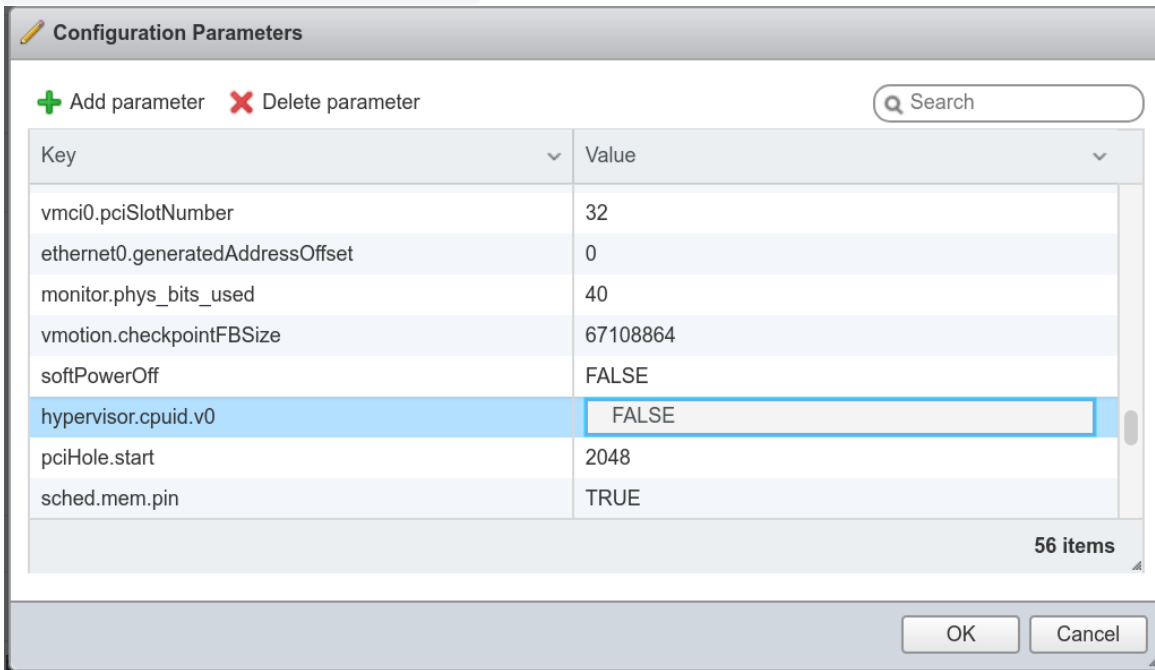>
> Cannot find a diagram with these parameters:
>
> • **Name:** VM_Reserve_Guest_Mem_checkbox

6. Select **Configuration Parameters** and then **+Add Parameter**.
7. Add the following two parameters:
   • `pciHole.start = "2048"` (Note: This only applies for VMs that have more than 2GB of configured memory.)

- `hypervisor.cpuid.v0 = "FALSE"`



8. Click **OK**, and then **Save**.

# Booting the Virtual Appliance

Now that the device passthrough to the VM has been enabled in the settings, power on the VM. The VM console will function briefly and then go black. This is because the GPU device is being passed to the Virtual Machine, making it unavailable for use by the console. You may notice that the host console to the monitor (which was stuck at `"vmkapi_v2_1_0_0_vmkernel_shim loaded successfully"`) disappears at this time as well.
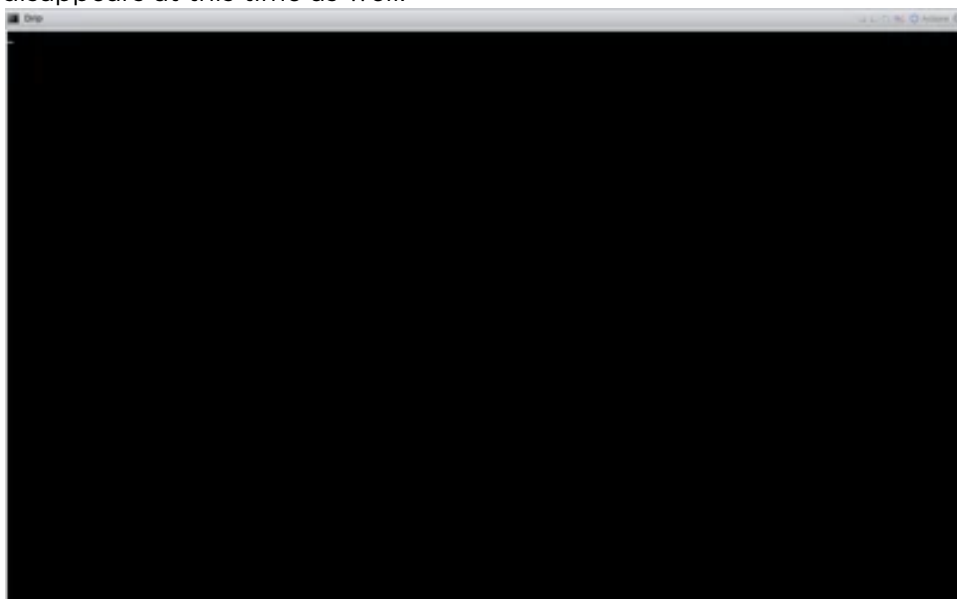


Using your Web browser, you can now navigate to the Web page of the Kraken virtual machine.
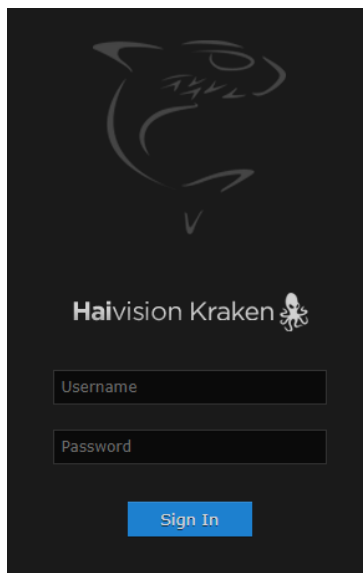
# Licensing the Virtual Appliance

The next step is to license the Kraken virtual appliance:
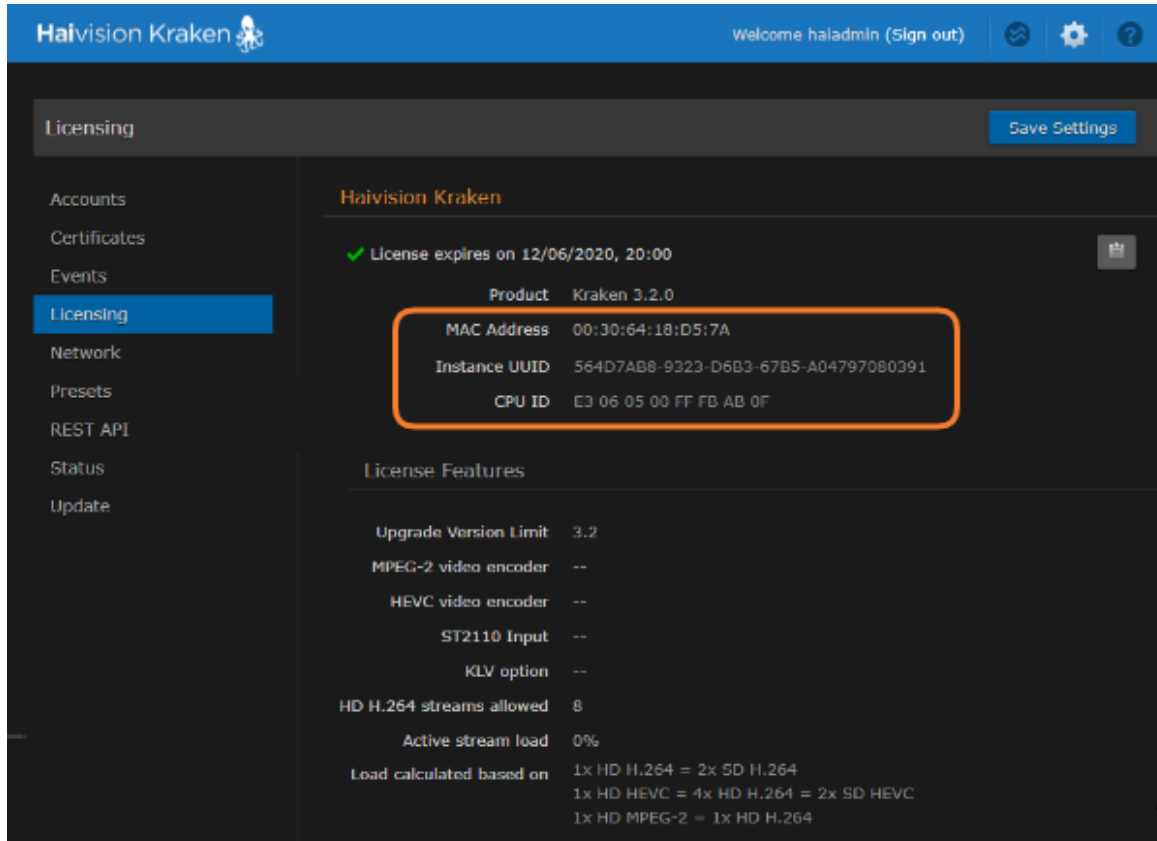
1. Sign in to the Web interface using one of the credentials provided in the *Important Notice*.
2. If you see a License Required dialog, click **Add License.**
   -or-
   Click the ⚙ **Administration** icon on the toolbar (the settings gear) and click **Licensing** from the sidebar.



The Licensing page provides three pieces of information required to generate the license:
   • MAC Address
   • Instance UUID
   • CPU ID
3. Click the 📋 icon to copy the current product details to the clipboard for use in the following step.
4. To request a license for your product:
   a. Log in to the Haivision Support Portal (https://support.haivision.com).
   b. After logging in, click **License Requests**.
   c. Click the **New** button.
   d. Select the appropriate device type and click the **Next** button.
   e. Fill in the form with the appropriate information, and click **Save**.
   Your license request is submitted and you will be contacted by a Haivision representative shortly with a license key for your product.
5. After you receive a license key, paste the license string in the License text box.

6. Click **Save Settings** to load the license.

The License Status is updated to show the new license information.

# Testing the Installation

At this point, the installation is complete and can be tested.

1. Click the ⬡ **Streaming** icon on the toolbar, and then click **Inputs** on the sidebar.
2. From the Inputs List view, click the ⊕ **Add** button to add an input.
3. Select the Source, as applicable for your system, for example, "DeckLink Micro Recorder 1", "Analog Capture 1" or ST2110.
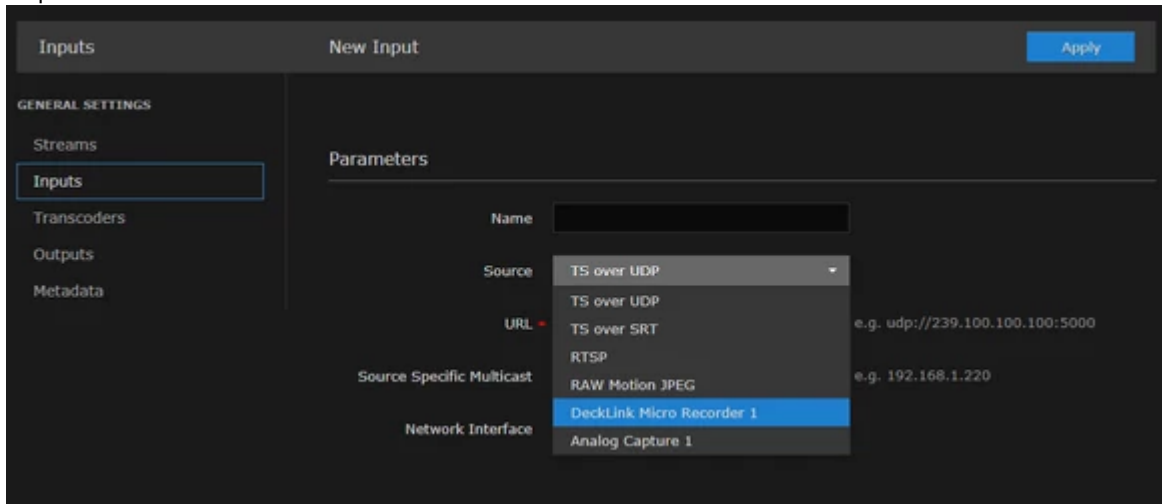


4. Click **Apply**.
5. Click **Transcoders** on the sidebar.
6. From the Transcoders List view, click the ⊕ **Add** button to add a transcoder.
7. On the "Encoder" drop-down, select either "Software" or the "Hardware (QSV)" encoder.
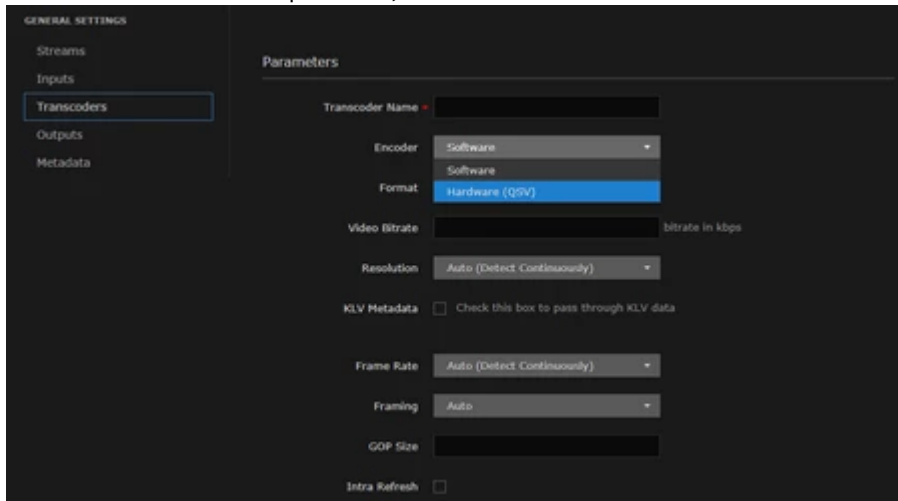


8. Set up and start a transcoding session with the device of interest to test it.

# Appendix A: Provisioning Embrionix SFP Gateways

This topic explains how to prepare the Embrionix SFP to ingest raw video and output IP streams. Following is a summary of the setup steps to route data from the SFP device to Kraken:

1. Assign an IP address to the SFP device.
2. Set up the video flow (see following sections):
   - Provisioning the Embrionix SFP Device EMOPT-2E-2110-E Using the Embrionix UI
   - Provisioning the Embrionix SFP Device EMOPT-2E-2110-E Using Curl

3. Set up the input (Kraken Web Interface, see Configuring Inputs in the Kraken User's Guide).

## Provisioning the Embrionix SFP Device EMOPT-2E-2110-E Using the Embrionix UI

- Recommended to use emSET Version 4.00 Software. emSET is a server/client software that can be run on Windows or Linux platforms. The server software can be installed on one PC, and multiple instances of clients can connect to the server remotely or locally via an internet browser. The software discovers Embrionix IP products and provides full access to configure, control and monitor each device. See https://www.embrionix.com/product/emSET.
- Recommended to use Windows 7 or 10.
- Code and documentation: https://app.box.com/s/h7leewkbvcpsis21raugp0dxbqzpou3i
- EmbUI (User Interface for interacting and configuring Embrionix SFPs) is included in the package.
- The Hosting Ethernet board IP address is used as the Gateway on the Embrionix SFP.
- Flows must be configured with the Ethernet host board IP as the gateway. Port 20000 is used by default (for video) but can be configured to other valid values via the EmbUI. Audio uses port 20001 and Ancillary uses port 20002 (future use).
- The Embrionix SFP IP address and HTTP port used for the provisioning must be provided to the Kraken Web Interface. The program will retrieve the internal Embrionix routing information and flow settings and start the captures.

Following is an example of the provisioning of an Embrionix device:

Hosted by:

- Ethernet controller: Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Network Connection
  inet 10.0.2.100  netmask 255.255.255.0  broadcast 10.0.2.255
- Embrionix settings:

  At the device level:

```
curl -X GET 10.0.2.105:80/emsfp/node/v1/self/information/
"emsfp_version": "A2xx",
"type": "3 - 2110 Encapsulator","asic_slot_00": "0x000003bb","asic_slot_01":
```

  At the port level:

```
"local_mac":"40:a3:6b:a0:9a:8c"
"ip_addr":"10.0.2.105"
"subnet_mask":"255.255.255.0"
```

```
        "gateway":"10.0.2.100"
        "hostname":"emsfp-xx-xx-xx"
        "port":"80"
```

At the flow level:

```
        "src_ip_addr":"10.0.2.105"
        "src_udp_port":"10000"
        "dst_ip_addr":"10.0.2.100"
        "dst_udp_port "20000"
        "dst_mac":"00:1b:21:be:ff:9c"
```

## Provisioning the Embrionix SFP Device EMOPT-2E-2110-E Using Curl

First, locate the MAC address of the SFP labeled on the SFP device. For example, 40:A3:58:A0:7A:0E-0F

Configuration is done via the default IP address extracted from the last 3 digits of the MAC and fix digit 1.

To obtain this Control IP address, you need to do the following steps;

1. From the device MAC address visible on the emSFP i.e. 40:A3:6B:A0:39:40-41
2. Only use the last 3 Bytes: A0:39:40 (note the -41 is for the second port, not used for provisioning)
3. Convert each byte from Hexadecimal (HEX) to Decimal (DEC).
   • A0=160
   • 39=57
   • 40=64
4. The control IP address will then be formed the following way:.

Fix digit (10).3rd Last byte of MAC in DEC(160).2nd last byte of MAC in DEC(57).Last byte of MAC in DEC(64).

So 10.160.57.64.
See "emSET Version 4.00 Software User guide emSET-UG01-400" Chapter 3.4 for details.

Once you can ping the SFP via the hosting NIC card, you can configure it via this command:

```
curl -X PUT -d '{"ip_addr":"your.new.sfp.ip" "subnet_mask":"255.255.255.0"
"gateway":"your.gate.way.ip"}' 10.160.57.64.:80/emsfp/node/v1/self/ipconfig
```

The SFP should reboot and you will lose connection (curl: (56) Recv failure: Connection reset by peer).

When it comes back, enter this command:

```
curl -X GET your.new.sfp.ip:80/emsfp/node/v1/self/ipconfig
```

You should get back something in the form of:

```
{"version":"1","local_mac":"40:A3:6B:A0:39:40","ip_addr":"your.new.sfp.ip","subnet_mask
":"255.255.255.0","gateway":"your.gate.way.ip","hostname":"emsfp-
a0-39-40","port":"80","dhcp_enable":"1","alias_ip":"0.0.0.0","alias_ip_subnet":"0.0.0.0
","ctl_vlan_id":"0","ctl_vlan_pcp":"0","ctl_vlan_enable":"0","data_vlan_id":"0","data_v
lan_enable":"0","bootstatus1":"005","bootstatus2":"000"} (
```

Then configure the video flow output:

```
curl -X PUT -d '{"dst_ip_addr":"dest.host.add.ip" "dst_mac":"dest.host.mac.add"}'
your.new.sfp.ip:80/emsfp/node/v1/flows/a04f66a2-9910-11e5-8894-feff819cdc9f/
```

```
dest.host.add.ip in the form 10.0.0.124
```

```
dest.host.mac.add in the form 38:d5:47:e2:79:a5
```

Validate the flow traffic:

```
curl -X GET your.new.sfp.ip:80/emsfp/node/v1/flows/a04f66a2-9910-11e5-8894-
feff819cdc9f/
```

The response will be in the form of:

```
{"version": "2","label": "st2110 flow","id": "a04f66a2-9910-11e5-8894-
feff819cdc9f","source_id": "a0008e96-990d-11e5-8894-feff819cdc9f","type": "3","name":
"tx_flow0","network":
{"src_ip_addr":"your.new.sfp.ip","src_udp_port":"10000","dst_ip_addr":"dest.host.add.ip
","dst_udp_port":"20000","dst_mac":"dest.host.mac.add","vlan_tag":"0","ssrc":"0","pkt_c
nt":"1516032","rtp_pt":"96","ttl":"64","dscp":"0","enable":"1"},"format":
{"format_type":"video","sdp_file_url":"10.0.2.105/emsfp/node/v1/sdp/
a04f66a2-9910-11e5-8894-
feff819cdc9f","format_code_valid":"1","format_code_t_scan":"4","format_code_p_scan":"4"
,"format_code_mode":"0","format_code_format":"64","format_code_rate":"6144","format_cod
e_sampling":"8192"},"jumbo_frame":"0"}
```

Validate that the pkt_cnt":"1516032" gets updated (input needs to be active).

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