Understanding and Troubleshooting UCS Licensing

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Introduction

This document describes terminology and operation of UCS Fabric Interconnect, UCS Central licensing and VMWare ESXi licensing. It also describes common issues observed in customer deployments.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Understanding UCS Fabric Interconnect Product ID's (PID's)

UCS licenses are generated on the generation of UCS Fabric Interconnects in use.

> **Warning**: Licenses for a Fabric Interconnect of one generation can be transferred between other Fabric Interconnects in the same generation, but not between different generations.

- 1st Generation 6100 series fabric interconnects
  UCS-6120XP

UCS-6140XP
- 2nd Generation 6200 series fabric interconnects
  UCS-FI-6248UP
  UCS-FI-6296UP
- 3rd Generation 6300 series fabric interconnects
  UCS-FI-6332UP
  UCS-FI-6332-16UP
- 4th Generation 6400 series fabric interconnectsUCS-FI-6454
- Other
  UCS-FI-M-6324 (UCS Mini)

Pre-Installed Licenses

Fabric Interconnects contain a number of pre-installed licenses dependent on model and whether an expansion model is installed. This is also known as RTU (Right To Use) licensing.

The image below outlines the number of pre-installed licenses that are available for use on each device

Fabric Interconnect Model	10G Port License Count	25G Port License Count	40G Port License Count	100G Port License Count
UCS-6120XP	8	N/A	N/A	N/A
UCS-6140XP	12	N/A	N/A	N/A
UCS-FI-6248UP	12	N/A	N/A	N/A
UCS-FI-6296UP	18	N/A	N/A	N/A
UCS-FI-M-6324 (UCS Mini)	4	N/A	N/A	N/A
UCS-FI-6332UP	N/A	N/A	8	N/A
UCS-FI-6332-16UP	8	N/A	4	N/A
UCS-FI-6454	N/A	18	N/A	2

When an expansion module is added to the UCS-FI-6248UP or UCS-FI-6296UP Fabric Interconnects, eight additional 10G Port Licenses are available.

These additional licenses can be used either on base ports of the Fabric Interconnect or the installed expansion module.

> **Warning**: Removing the expansion module from the base unit will remove the licenses from that Fabric Interconnect

For each port configured in excess of the pre-installed port license count, an additional license must be purchased.

UCS Ethernet Port Licensing Details

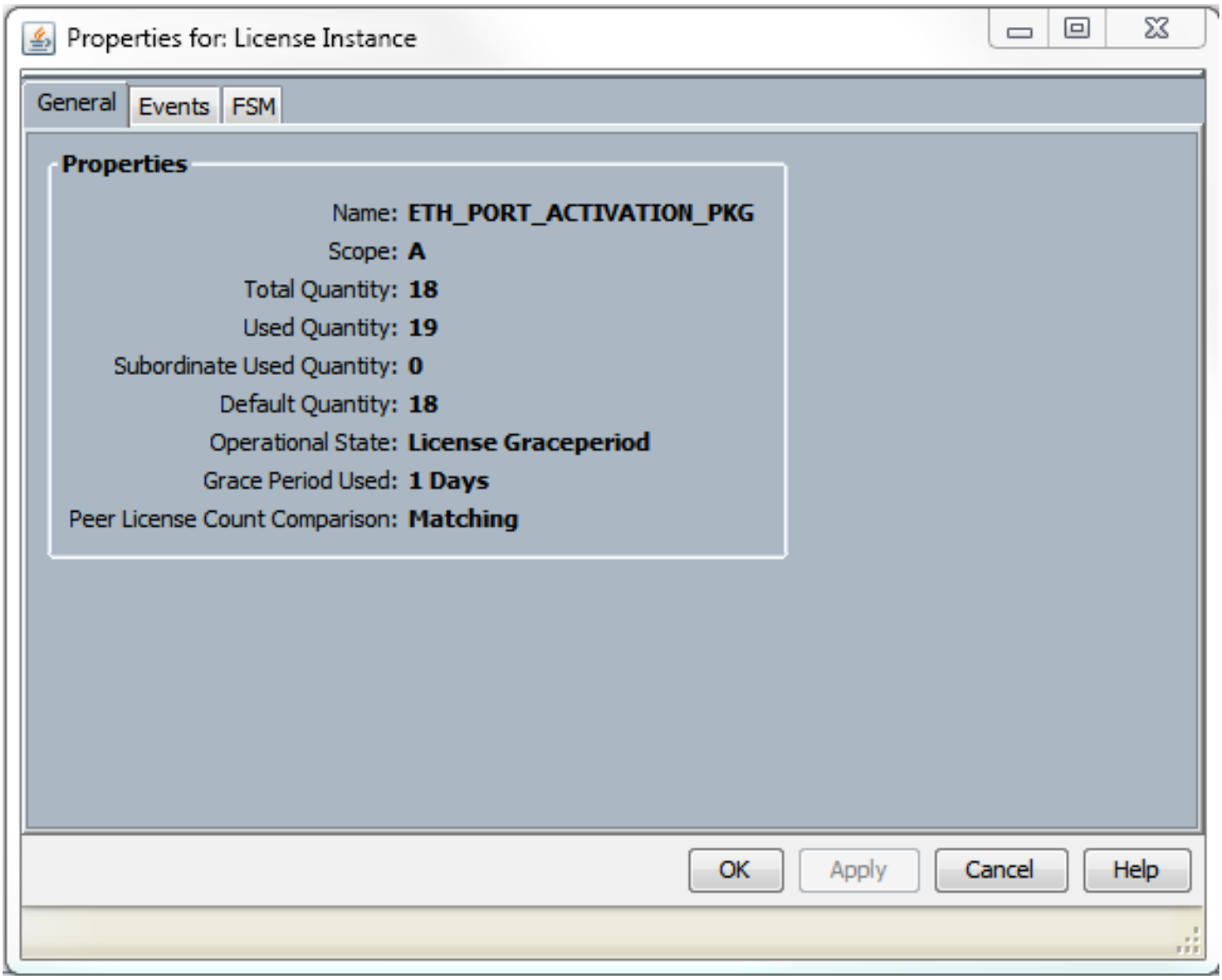
License status may be verified using the UCS Manager (UCSM) GUI or CLI

UCSM GUI

1. In the Navigation pane, click the **Admin** tab.

2. On the Admin tab, expand **All** > **License Management**.
3. In the Work pane, click the **General** tab.
4. Double click a feature in the table to view details for that feature, including the operational state and used grace period.

Details of the licensed feature will resemble the below image



UCSM CLI (UCSM Version 1.4 and above)

1. Log in to UCSM using a SSH client
2. Run the **scope license** command
3. Run **show usage** command

The image below is a sample of possible output

```
UCSB-6-A# scope license
UCSB-6-A /license # show usage
Feat Name Scope Default Total Quant Used Quant Subordinate Quant State Peer Count Comparison
Grace Used
------------------------------ ----- ------- ----------- ---------- -------------------- -------
------------ ---------------------- ----------
ETH_PORT_ACTIVATION_PKG A 18 18 19 0 License Graceperiod Matching 133200
ETH_PORT_C_ACTIVATION_PKG A 0 0 0 0 Not Applicable Matching 0
ETH_PORT_ACTIVATION_PKG B 18 18 16 0 License Ok Matching 0
ETH_PORT_C_ACTIVATION_PKG B 0 0 0 0 Not Applicable Matching 0
```

UCSM CLI (Prior to UCSM Version 1.4)

1. Log in to UCS Manager with SSH client
2. Run the **connect local-mgmt** command
3. Run **show license usage** command

Understanding License Counts and Status in UCSM

1. Default Quantity (RTU License)

The default quantity (also known as Right To Use or Paper License**)** is the number of pre-installed licenses that comes with the hardware

For example, a 6296UP comes with 18 ports license by default.

With two expansion modules installed, (each providing an additional 8 ports), the default quantity will be = 18 + (2 x 8)

Hence:

= 18 + 16

= 34 licenses available for use

2. Total Quantity

The total quantity = Default quantity + Any additional license files installed

For example: 34 (Default) + 24 purchased licenses

= 58 total licenses available for use

> **Note**: UCSM releases prior to 2.2(4b) show Total Quantity as Absolute Quantity

3. Used Quantity

The used quantity is the number of licenses currently being used by a configured port.

In the image, this equals 19 (on Fabric Interconnect A)

4. Grace Period

The grace period starts as soon as the used quantity is more than the total/absolute quantity.

In the image above, there is 1 more port in use than the absolute quantity and the system has been in grace-period for 133200 seconds or approximately 37 hours.

The grace period timer does not reset when the appropriate amount of licenses are added.

The license state however will change to "License OK"

Licenses are only assigned to configured ports. When a port is unconfigured, its license returns to the license pool.

After the grace period ends (currently 120 days) and the feature is still in grace period state:

- Cisco UCS Manager will show a Critical fault indicating the License Grace Period has expired
- If additional licenses are obtained and installed which means Total Quantity >= Used Quantity, the fault will clear
- If ports are unconfigured so that Used Quantity =< Total Quantity

> **Note**: Forwarding of data traffic will not be impacted when the grace period expires

Understanding When Ports Will Consume Licenses

All configured Ethernet ports will consume licenses.

This is regardless of whether the port is connected and has an active link or not.

To release unneccessarily consumed licenses, unused Ethernet ports should be unconfigured. See the below guide for details.

https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/ucs-manager/GUI-User-Guides/Network-Mgmt/3-1/b_UCSM_Network_Mgmt_Guide_3_1/b_UCSM_Network_Mgmt_Guide_3_1_chapter_01010.html#task_7066261484290578956

All FC ports that are not shutdown will consume licenses.

To release unneccessarily consumed licenses, unused FC ports should be shut down. See the below guide for details.

https://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/ucs-manager/GUI-User-Guides/Storage-Mgmt/3-2/b_UCSM_GUI_Storage_Management_Guide_3_2/b_UCSM_GUI_Storage_Management_Guide_3_2_chapter_011.html#task_87FF84DCA94343B982CC40F4FF7CA071

> **Note**: Unconfiguring or disabling a port will interrupt all traffic using this port. Only ports that are not currently in use should be unconfigured or disabled

License Types

1. 10GE Port Activation License

Each Fabric Interconnect generation has 10GE port licenses which can be purchased

- For the 1st Generation (6100) Fabric Interconnects, this license is *N10-L001*
- For the 2nd Generation (6200) Fabric Interconnects, this license is *UCS-LIC-10GE*
- For the 3rd Generation (633X) series Fabric Interconnects, this license is *UCS-LIC-6300-10G*

When installed via UCSM, they are added to the *ETH_PORT_ACTIVATION_PKG*

These can be used for any Ethernet based port role, including Uplink, Server, Appliance etc.

> **Tip**: These licenses can also act as C-series Direct Connect licenses when no C-Series Direct Connect licenses are currently available

If all C-series Direct Connect licenses have been exhausted and the user connects more rack servers to the Fabric Interconnect, it will attempt to obtain a license from the *ETH_PORT_ACTIVATION_PKG* pool instead.

The *Subordinate Quantity* field has been added to keep track of these port activation licenses that are being used for connected rack servers.

2. 10GE C-series Direct Connect License

These licenses are used for UCS C-series rack servers connected to UCS Manager via UCSM integration.

This license is applicable only for C-series servers integrated in a Single-Wire, Direct Connect setup - VIC directly connected to the Fabric Interconnect with inband CIMC (no connected CIMC port).

This license is not available on 6100 Fabric Interconnects

For 6200 Fabric Interconnects, these licenses are purchaseable as: *UCS-L-6200-10G-C*

For 6300 Fabric Interconnects, these licenses are purchaseable as: *UCS-LIC-6300-10GC*

3. 25GE Port Activation License

These licenses perform the same function as the 10GE port licenses but are for 25GE ports.

They are only applicable for the 6400 series Fabric Interconnects.

These licenses are purchaseable as: *UCS-L-6400-25G*

4. 25GE C-series Direct Connect License

These licenses perform the same function as the 10GE C-series Direct Connect Licensing but are for 25GE ports.

They are only applicable for the 6400 series Fabric Interconnects.

These licenses are purchaseable as: *UCS-L-6400-25GC*

5. 40GE Port Activation License

These licenses perform the same function as the 10GE port licenses but are for 40GE ports.

They are only applicable for the 6300 series Fabric Interconnects.

These licenses are purchaseable as: *UCS-LIC-6300-40G*

6. 40GE C-series Direct Connect License

These licenses perform the same function as the 10GE C-series Direct Connect Licensing but are for 40GE ports.

They are only applicable for the 6300 series Fabric Interconnects.

These licenses are purchaseable as: *UCS-LIC-6300-40GC*

7. 100GE Port Activation License

These licenses perform the same function as the 10GE port licenses but are for 100GE ports.

They are only applicable for the 6400 series Fabric Interconnects.

These licenses are purchaseable as: *UCS-L-6400-100G*

8. UCS Mini (UCS-FI-M-6324) Scalability License

These licenses are used to license the UCS Mini scalability port (only usable on UCSM version 3.1 and higher).

The PID for this license is *UCS-6324-40G*

More about UCS C-series Direct Connect Licensing can be found in the *C-Direct Rack Licensing Support* section of the UCSM GUI Configuration Guide for your UCSM version

Determining Which Ports Are Using Valid Licenses in UCS Manager

From CLI

In UCS CLI mode to assess all ports that are using licenses, run the following commands:

1. **scope eth-server**
2. **show interface**
3. **exit**
4. **scope eth-storage**
5. **show interface**
6. **exit**
7. **scope eth-uplink**
8. **show interface**
9. **exit**
10. **scope fc-uplink**
11. **show interface**
12. **show fcoeinterface**
13. **exit**
14. **scope fc-storage**
15. **show interface fc**
16. **show interface fcoe**
17. **exit**

Example:

```
UCSB-B# scope eth-uplink
UCSB-B/eth-uplink # show interface
```

Fabric	Port-channel	Slot	Port	Oper State	State Reason	Chassis	Lic State	Grace Prd
A	1025	1	1	Up		1	License Ok	0
A	1025	1	2	Up		1	License Ok	0
A	1025	1	3	Up		1	License Ok	0
A	1025	1	4	Up		1	License Ok	0
A	1026	1	5	Up		2	License Ok	0
A	1026	1	6	Up		2	License Ok	0
A	1026	1	7	Up		2	License Ok	35532000
A	1026	1	8	Up		2	License Ok	35532000
B	1153	1	1	Up		1	License Ok	0
B	1153	1	2	Up		1	License Ok	0
B	**1153**	**1**	**3**	**Up**		**1**	**License Expired**	**27273600**
B	**1153**	**1**	**4**	**Up**		**1**	**License Expired**	**27273600**
B	1154	1	5	Up		2	License Ok	0
B	1154	1	6	Up		2	License Ok	0
B	1154	1	7	Up		2	License Ok	35118000
B	1154	1	8	Up		2	License Ok	35118000

> **Note**: The "eth-uplink" and "fc-uplink" scope commands are not available in UCS Manager 2.1 and none of the scope commands outlined above are available in UCS Manager 2.0

From Tech-Support Bundle

Alternatively, this information can be seen in the UCSM Tech-support bundle:

<DATETIME>_<HOSTNAME>_UCSM.tar --> UCSM_<A or B>_TechSupport.tar --> sam_techsupportinfo

The MIT.xml file inside of a UCSM Tech-support bundle details which ports are holding which type of license.

This file exists in tech-supports from UCSM versions 2.2(6) and above.

This is helpful for determining which ports may be using subbordinate licenses (Eg. Pulling from the *UCS-LIC-10GE* pool instead of the *UCS-L-6200-10G-C* pool).

Open the file in a program such as Notepad++ and search the entire file for "**licenseTarget**"

This should provide a list similar to the below output:

```
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-B/slot-1-aggr-port-0-port-32" isRackPresent="yes" portId="32" sacl="addchild,del,mod" slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-B/slot-1-aggr-port-0-port-31" isRackPresent="yes" portId="31" sacl="addchild,del,mod" slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
```

```
B/slot-1-aggr-port-0-port-30" isRackPresent="yes" portId="30" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
A/slot-1-aggr-port-0-port-29" isRackPresent="yes" portId="29" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
A/slot-1-aggr-port-0-port-32" isRackPresent="yes" portId="32" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
A/slot-1-aggr-port-0-port-31" isRackPresent="yes" portId="31" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
A/slot-1-aggr-port-0-port-30" isRackPresent="yes" portId="30" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_ACTIVATION_PKG-cisco-1.0/inst-
B/slot-1-aggr-port-0-port-39" isRackPresent="no" portId="39" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_ACTIVATION_PKG-cisco-1.0/inst-
B/slot-1-aggr-port-0-port-29" isRackPresent="no" portId="29" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_ACTIVATION_PKG-cisco-1.0/inst-
B/slot-1-aggr-port-0-port-19" isRackPresent="no" portId="19" sacl="addchild,del,mod"
slotId="1"/>
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_ACTIVATION_PKG-cisco-1.0/inst-
B/slot-1-aggr-port-0-port-48" isRackPresent="no" portId="48" sacl="addchild,del,mod"
slotId="1"/>
```

From the above output, we can clearly identify which ports on which FI's are claiming the various licenses

For example, in

```
<licenseTarget aggrPortId="0" dn="sys/license/feature-ETH_PORT_C_ACTIVATION_PKG-cisco-1.0/inst-
B/slot-1-aggr-port-0-port-32" isRackPresent="yes" portId="32" sacl="addchild,del,mod"
slotId="1"/>
```

- ***ETH_PORT_C_ACTIVATION_PKG*** is the license package (correlates to *UCS-L-6200-10G-C* PID)

- ***inst-B*** indicates that it's a port on FI-B

- ***port-32*** indicates that it's port number 32 on the FI

- ***slotId="1"*** indicates that it's slot 1 of the FI (onboard ports). Slots 2 - 4 are applicable if you have expansion cards in the FI.

Known UCS Manager Licensing Issues

1. Incorrect license counts or grace period faults seen in UCS Manager

Symptom:

The license counts from UCS Manager does not match the licenses used

This can manifest with any of the below observations

- Default quantity less than expected for the hardware
- Used quantity is greater than the number of configured ports
- Used quantity is less than the absolute quantity but grace period alert still shows
- *License Grace Period alert is shown while the used quantity <= the total quantity*

Problem:

These issues are tracked by bugs CSCus10255 and CSCui19338 .

Impacted version: All prior to 2.2(4b)

Resolution:

- Upgrade to version 2.2(4b) or above

2. License file host-id different than both FIs

Symptom:

An error is seen when uploading a license file, that the host-id does not match the Fabric Interconnects.

Problem:

This error is seen when the license file's Host ID does not match the Fabric Interconnect that is being licensed.

Verification:

The Fabric Interconnect Host ID can be found by running the following commands via CLI

- **scope license**
- **show server-host-id**

```
UCSB-6-A# scope license
UCSB-6-A /license # show server-host-id

Server host id:
Scope Host Id
----- -------
A VDH=SAL1937NSER
B VDH=SAL1937NSF3
```

The license file can be opened in a rich text editor (such as Notepad++).

Here, you can verify whether the Host ID matches that of the Fabric Interconnect.

Never edit and save this license file.

```
1  SERVER this_host ANY
2  VENDOR cisco
3  INCREMENT ETH_PORT_ACTIVATION_PKG cisco 1.0 permanent 18 \
4      VENDOR_STRING=<LIC_SOURCE>UCS_SWIFT</LIC_SOURCE><SKU>UCS-LIC-10GE==</SKU> \
5      HOSTID=VDH=FOX1519G9NG \
6      NOTICE="<LicFileID>20150618144300293</LicFileID><LicLineID>1</LicLineID> \
7      <PAK></PAK>" SIGN=0486DA7EFD5C
```

Turning on special characters in the editor is also useful to ensure there is no corruption.

This can be done in View -> Show Symbol -> Show All Characters

```
SERVER this_host ANY
VENDOR cisco
INCREMENT ETH_PORT_ACTIVATION_PKG cisco 1.0 permanent 18 \
    VENDOR_STRING=<LIC_SOURCE>UCS_SWIFT</LIC_SOURCE><SKU>UCS-LIC-10GE==</SKU> \
    HOSTID=VDH=FOX1519G9NG \
    NOTICE="<LicFileID>20150618144300293</LicFileID><LicLineID>1</LicLineID> \
    <PAK></PAK>" SIGN=0486DA7EFD5C
```

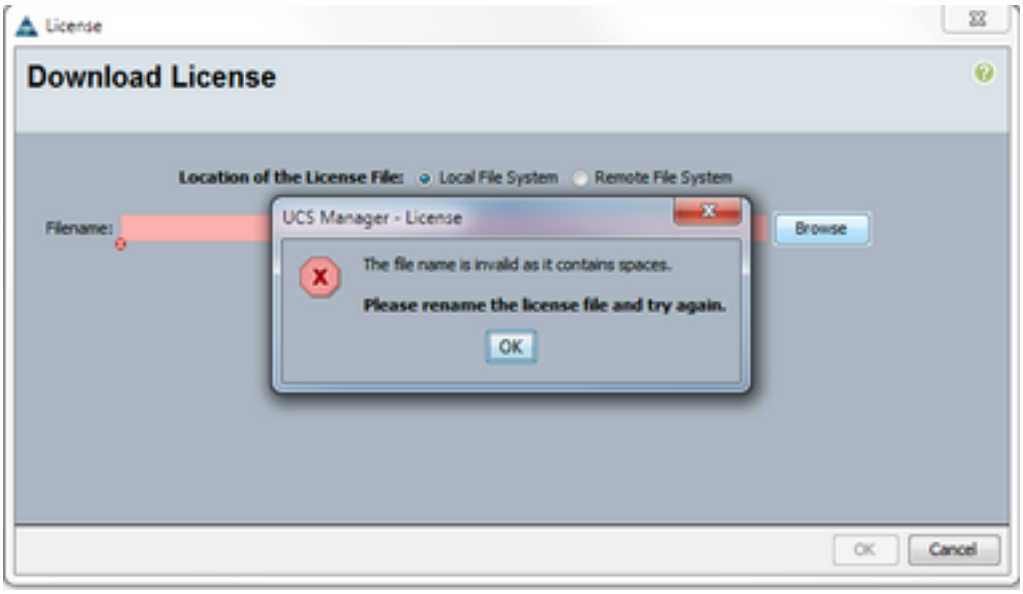
Resolution:

Re-host the license for the correct Host ID

3. The file name is invalid as it contains spaces

Symptom:

The below error is seen when uploading a license file



Problem:

The license file *OR* the path to the license file contains a space

Resolution:

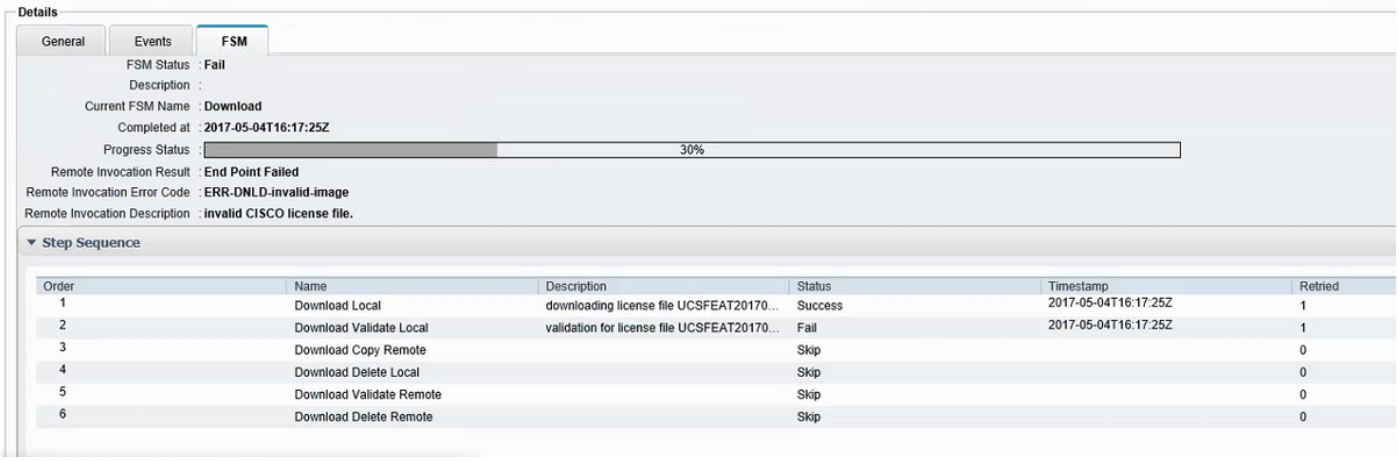
Change the filename or file-path to remove all spaces

4. A valid license has been provided but fails to pass the 'Download Validate Local'

Problem:

A license upload failed with an error regarding validation of the license file

- Examining the license file, using Notepad++ or a similar text editting tool, reveals a matching Host ID and a valid license format
- The software used to upload the file was HTML 5 in Internet Explorer
- FSM provides an output similar to the following



Resolution:

Utilise a non-IE browser, such as Chrome, to upload the *.lic file

The *.lic file can alternatively be uploaded using UCSM Java client or using a TFTP server and SSH

There is a bug CSCuz21644 filed for this issue

UCS Central Licensing

Current UCS Central licensing can be performed using Cisco Smart Licensing or legacy PAK based licensing

You cannot use both licensing mechanisms at the same time.

When Smart Licensing is in use, licenses are evaluated per server

UCS-MDMGR-LIC= may be used to order per server licenses

When legacy PAK based licensing is used, licenses are evaluated per registered UCS domain

UCS-MDMGR-1DMN= may be used to order per domain licenses

Third Party Licensing on UCS

VMware ESXi

If you have purchased a VMware product through Cisco, it's license is provided the via normal Cisco PAK mechanism.

You must claim the PAK, then take the code provided from this and retrieve the VMWare activation license.

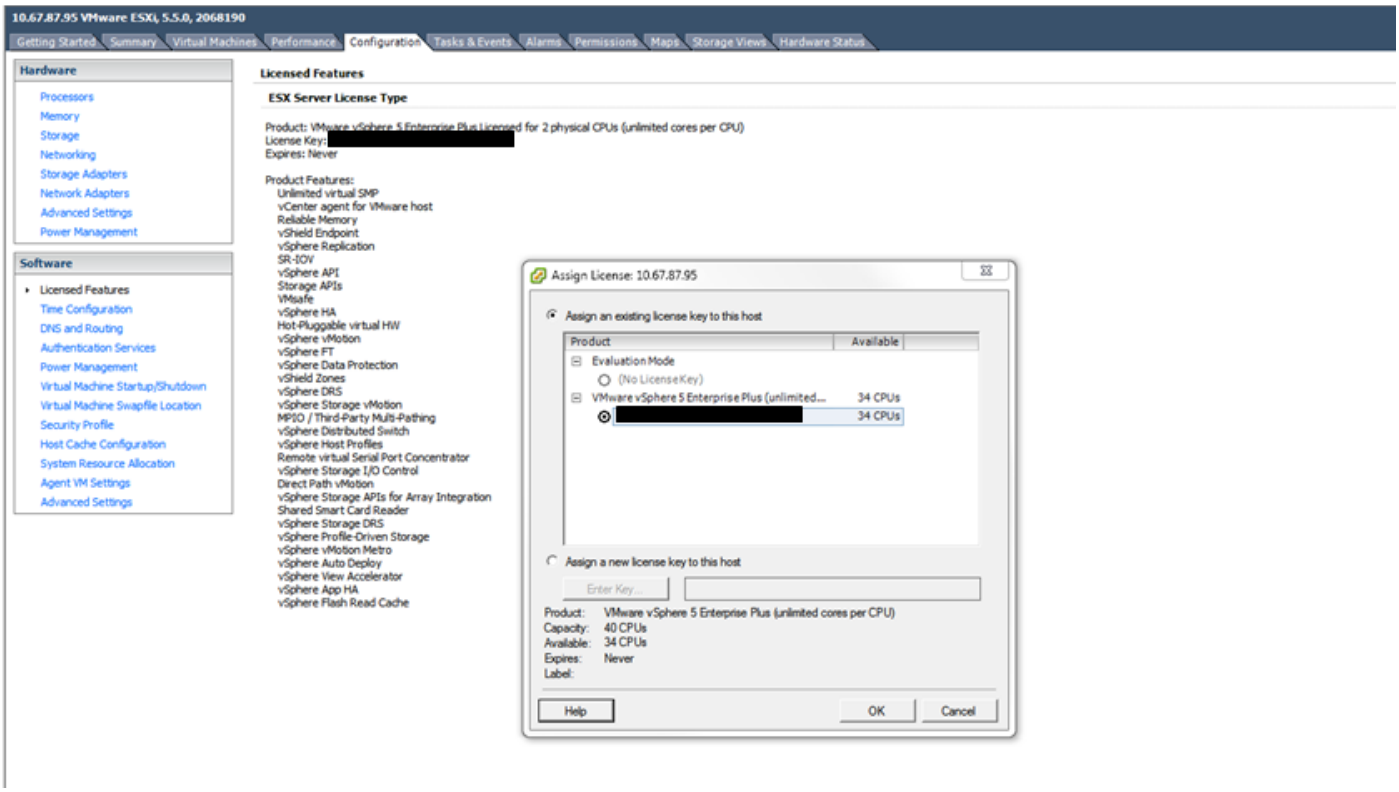
Use the following link to claim activation licenses:

https://www.vmware.com/vmwarestore/newstore/oem_login.jsp?Name=CISCO-AC

To install the license via vSphere client:

1. Click on the **host**
2. Click the **configuration** tab, “**Licensed Features**” in the left table (Under Software)
3. Click “**Edit**” in the top right corner
4. In the popup, select “**Assign a new license key to this host**” and click “**Enter Key**” and paste the code in

Note: The code should be of the following format: xxxxx-xxxxx-xxxxx-xxxxx-xxxxx



Licensing Errors

The license key entered does not have enough capacity for this entity

The host has more CPUs than the license has capacity for (Eg. A 2 CPU host with a 1 CPU license)

You may need to combine multiple single CPU licenses to create a multi-CPU license.

This can be done from the VMware licensing portal linked below

https://my.vmware.com/group/vmware/my-licenses

Invalid license file

There are a number of common causes. See VMware KB 1005440 for more details