DU Simulator (DUSim) for Standalone (SA) and Non-Standalone (NSA) Mode, CU Tester: Setup and Installation Guide

**Prepare the Hardware Platform for KVM Host:**

Keysight’s “X100-5G” hardware platform is the validated platform that supports DU Simulator for both SA and NSA mode. Please follow below steps to prepare the KVM Host:

1. Unbox your X100-5G, then connect the Keyboard, monitor, and mouse.
2. Login into the system using user id **catapult** with password **catapult** and do the following command.
3. Isolate host CPU and Enable PCI Passthrough using below steps-

sudo vi /etc/default/grub (Edit existing line to add new parameters below)

GRUB\_CMDLINE\_LINUX\_DEFAULT="quiet splash video=vesafb:mtrr:3 isolcpus=1-21 nohz\_full=1-21 rcu\_nocbs=1-21 intel\_iommu=on iommu=pt"

sudo update-grub

1. Reboot the system
2. X100-5G has Ubuntu OS installed from factory. If you re-installed a new OS, please type in the following command:

sudo /etc/catapult/configure\_node.sh (change hostname if desired, enter number of 1G, 10G and 25G cards present on the PCI bus; the machine will reboot automatically)

**Note**: Supported NIC types are Intel Corporation 82599ES 10-Gigabit SFI/SFP*+* and 25G Mellanox Technologies MT27710 Family [ConnectX-4 Lx].

**Download VM image files and DUSim SA/NSA Packages Installer:**

The next step is to download and install the required packages from the IxLoad software download portal to your X100-5G (to any directory):

1. IxVM Image (IxVM Image for IxLoad 5G (KVM))
2. DUSim VM Image (VM Image for IxLoad 5G DUSim (KVM))
3. DUSim SA Package Installer
4. DUSim NSA Package Installer
5. This document

**Deploy Virtual Machines (VM) on KVM host:**

DU Simulator uses two VMs. One of the them is called DUSim HLS-VM (High level Split-VM) and other one is UE-VM. Downloaded item (2) and (1) in above are the VM’s Disk Image files.

**Configure and deploy HLS-VM:**

Copy compressed disk image file to KVM images directory and extract ‘HLS-VM.qcow2’ image file using below steps-

sudo cp DUSim\_Virtual\_Appliance\_KVM.qcow2.tar.bz2 /var/lib/libvirt/images/

cd /var/lib/libvirt/images/

sudo su

tar xvf DUSim\_Virtual\_Appliance\_KVM.qcow2.tar.bz2

Above step will extract below 4 files -

HLS-VM.qcow2

sample\_domain\_xml\_HLS-VM.xml

sample\_domain\_xml\_UE-VM.xml

sample\_domain\_xml\_CoreSim.xml

The XML domain file for HLS-VM-

A sample XML domain file ‘sample\_domain\_xml\_HLS-VM.xml’ is provided along with disk image file. The sample XML config assigns 16GB of memory, 19 CPUs and 4 network interfaces shown in picture below. Three of the network interfaces slot=0xa, slot=0xb and slot=0xc are SRIOV type interfaces. It is recommended to use SRIOV interface. The \***last three slots must have fixed slot id mapping**\* i.e. F1-C port has slot=0xa, F1-U port has slot=0xb and slot=0xc to assign to a port that goes to same switch or PF(physical function) as UE-VM (that we’ll deploy next).



UE-VM Traffic Port (slot=0xc)

F1-U Port (slot=0xb)

F1-C Port (slot=0xa)

Management

Create SRIOV VFs on X100-5G & Edit the sample XML file to update SRIOV VFs information for last 3 interfaces:

e.g. eth6 for F1-C, eth7 for F1-U and eth2 for UE-VM & HLS-VM Traffic port. To create 2 VFs on each NIC port, edit below files and write the number of VFs “2” in the file.

sudo vi /sys/class/net/eth6/device/sriov\_numvfs

sudo vi /sys/class/net/eth7/device/sriov\_numvfs

sudo vi /sys/class/net/eth2/device/sriov\_numvfs

List down PCI ID of VFs from eth6, eth7, and eth2.

sudo lspci | grep -i ethernet

Do assign a VF from eth6 to slot=0xa.

e.g. If VFs PCI-ID=01:10.1, the XML section for this interface below.

 <interface type='hostdev' managed='yes'>

 <driver name='vfio'/>

 <source>

 <address type='pci' domain='0x0000' bus='0x01' slot='0x10' function='0x1'/>

 </source>

 <address type='pci' domain='0x0000' bus='0x00' slot='0x0a' function='0x0'/>

 </interface>

Same way assigns a VF from eth7 to slot=0xb & update sample XML file.

Also assign a VF from eth2 to slot=0xc and update sample XML file, the 2nd VFs from eth2 will be assigned to UE-VM.

Once the sample XML file is updated with the new interface information. We are ready to define and start the VM.

sudo virsh define sample\_domain\_xml\_HLS-VM.xml

sudo virsh list --all

sudo virsh start HLS-VM

Open virt-manager tool & login to HLS-VM’s console with username **catapult**, password **catapult**

sudo virt-manager

Get IP address of br0 interface from Terminal

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**Configure and Deploy UE-VM:**

Copy compressed disk image file to KVM images directory

sudo cp Ixia\_Virtual\_Test\_Appliance\_9.10\_KVM.qcow2.tar.bz2 /var/lib/libvirt/images/

cd /var/lib/libvirt/images/

sudo su

tar xvf Ixia\_Virtual\_Test\_Appliance\_9.10\_KVM.qcow2.tar.bz2

Ixia\_Virtual\_Test\_Appliance\_9.10\_KVM.qcow2

sudo cp Ixia\_Virtual\_Test\_Appliance\_9.10\_KVM.qcow2 UE-VM.qcow2

Open the sample XML domain file ‘sample\_domain\_xml\_UE-VM.xml’ extracted earlier. Edit this XML file’s 2nd interface to add SRIOV interface e.g. from above HLS-VM example eth2’s (traffic port) other VF interface should be assigned here.

e.g. If the eth2’s other VF PCI-ID=01:10:0 then the interface section of XML is as below picture.



Traffic Port (towards HLS-VM)

Once the sample XML file is updated with the new interface information. We are ready to define and start the VM.

sudo virsh define sample\_domain\_xml\_UE-VM.xml

sudo virsh list --all

sudo virsh start UE-VM

Open virt-manager tool to open console

sudo virt-manager

Get the Management IP address.

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**Configure and Deploy EPC or 5G Core Simulator VM:**

**Note:** This is needed for the users who needs EPC Core or 5G Core (N1/N2/N3) needs to be simulated to test gNB-CU.

sudo cp Ixia\_Virtual\_Test\_Appliance\_9.10\_KVM.qcow2 CoreSim.qcow2

Open the sample XML domain file ‘sample\_domain\_xml\_CoreSim.xml’ extracted earlier. Edit this XML file’s 2nd interface to add SRIOV interface. It is recommended to use dedicated NIC port for this VM. So, use a different NIC than what were used for other VMs so far. The NIC can be a SRIOV VF NIC and assign the VF same way as UE-VM.

e.g. If the SRIOV VFs PCI-ID=82:10:0, then the XML’s interface section is below.



S1-C/S1-U

OR

N1/N2/N3

Once the sample XML file is updated with the new interface information. We are ready to define and start the VM.

sudo virsh define sample\_domain\_xml\_CoreSim.xml

sudo virsh list --all

sudo virsh start CoreSim

Open virt-manager tool to open console

sudo virt-manager

Get the Management IP address.



**Install DUSim SA Package:**

Copy the SA Package Installer (SA\_DUSim\_\*.tgz) downloaded earlier [ item (3)] to HLS-VM’s /home/catapult/ixload/install/ directory.

scp SA\_DUSim\_\*.tgz catapult@<HLS-VM’sIP>:/home/catapult/ixload/install/ (passwd: catapult)

Do SSH to HLS-VM using same credential as above and run below commands:

cd /home/catapult/ixload/install/

tar xvf SA\_DUSim\_\*.tgz (this will extract 3 files)

chmod u+x hlssa\_\*\_Installer.sh

./hlssa\_\*\_Installer.sh

At this point when SA package is successfully installed, user is ready to configure and run test using IxLoad User Interface.

**Install DUSim NSA Package:**

NSA Package installer needs more than 10GB of free space. User need to add a second Disk in the HLS-VM. Follow below steps –

Add a seconds HDD (e.g. of size 30GB) from virt-manager.

Reboot the VM.

sudo fdisk -l (find new added hdd Disk e.g. /dev/sdb: 30 GiB)

sudo vgdisplay

sudo lvdisplay

sudo pvcreate /dev/sdb

sudo vgextend lvm-vg1 /dev/sdb

sudo lvextend -l +100%FREE /dev/lvm-vg1/root

sudo resize2fs /dev/lvm-vg1/root

df -h (check available free space now)

Copy the NSA Package Installer (NSA\_DUSim\_\*.tgz) downloaded earlier [ item (4)] to HLS-VM’s /home/catapult/ixload/install/ directory.

scp NSA\_DUSim\_\*.tgz catapult@<HLS-VM’sIP>:/home/catapult/ixload/install/ (passwd: catapult)

Do SSH to HLS-VM using same credential as above and run below commands:

cd /home/catapult/ixload/install/

tar xvf NSA\_DUSim\_\*.tgz (this will extract 3 files)

chmod u+x ixloadInstaller\_\*.sh

./ixloadInstaller\_\*.sh

./dctInstall.sh

At this point when NSA package is successfully installed, user is ready to configure and run test using IxLoad User Interface.