Create Partitions (MBR)

- Search for **"GParted"** on the Internet. Download the CD image / USB image. Prepare according to the instructions given on that site and then follow the steps given below. For this seminar, we are going to use **GParted 18.0 Live CD**.
- Insert GParted Live CD/DVD or USB and boot the machine from it.
- The machine will automatically boot from the GParted Live CD/DVD or USB.
- A menu will appear on screen with "Gnome Partition Editor" at the bottom of the screen. From this menu select 1st option as **"GParted Live (Default settings)"**. [You can scroll menu items using arrow keys and select using enter key. This is usual way of selecting menu item hereafter].
- Next screen will show **"Configuring console-data"**. Select **"Policy for handling keymaps:"** as **"Don't touch keymap"** (which is default selection).
- Next it will ask **"Which language do you prefer?"**. Press enter to select the default i.e. **33: US English**.
- Then it will ask about **"Which mode do you prefer?"** (Related to GUI of GParted). Press enter to select the default values.
- Next screen will show an application window: **"GParted"**. This screen will show our hard disk(s) in a combo box at the right-side in the toolbar. Select the appropriate hard disk from the combo box (no need to select if there is a single hard disk). Assuming that all partitions are already deleted, the screen below will show single partition of type **"unallocated"** and its size will be equal to the detected size of the hard disk.
- Right click the **"unallocated"** and select **"New"** from the menu to create a new partition. This shows a dialog box titled as **"Create new Partition"**. Select the valid options :

  1. "Create as"
  2. "Filesystem"
  3. "Label"
  4. "New Size (MiB)"

Please ensure that you have selected **"Align to"** dropdown box as **"MiB"**. Do not change the values appearing in **"Free Space Preceding (MiB)"** and **"Free Space Following (MiB)"**. And then click **"Add"** button. This will create the first partition.

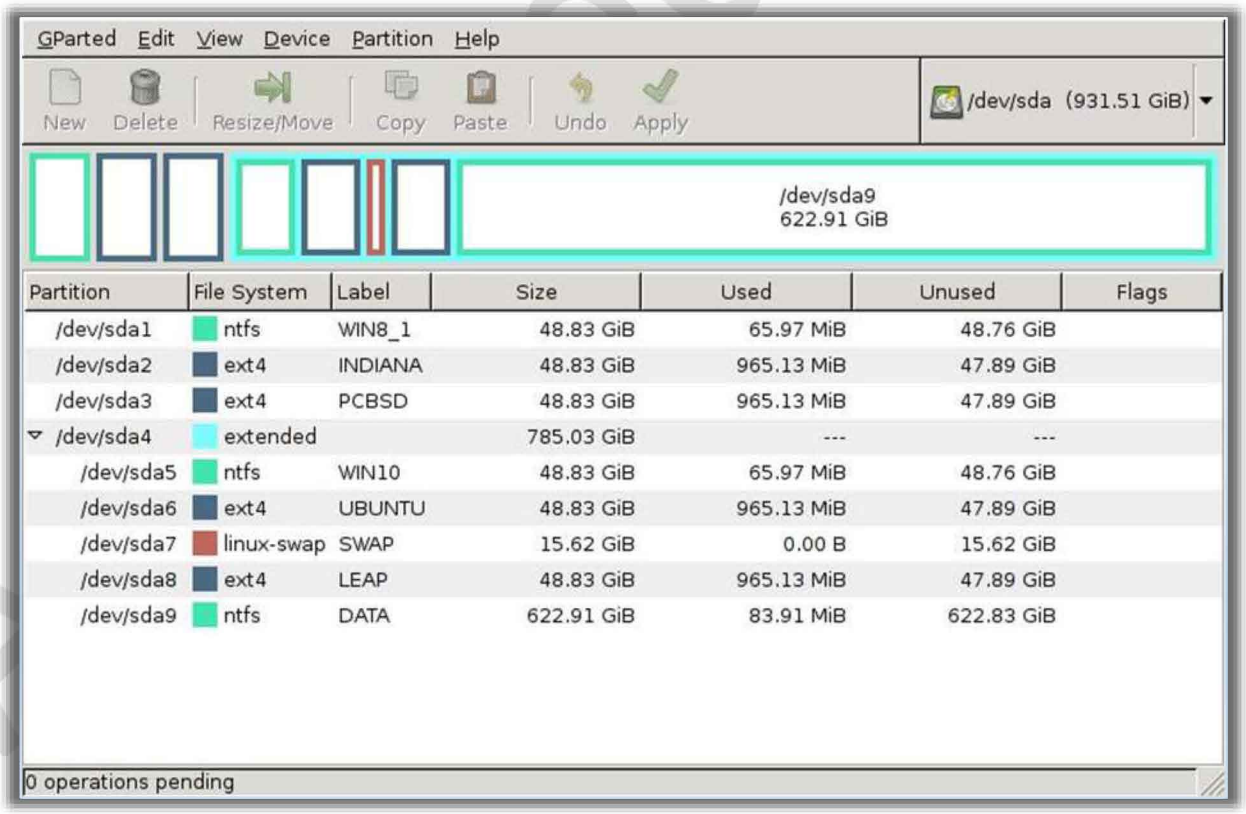
- This partition can be viewed at first line and remaining space will be shown on the next line as **"unallocated"**. Just like above step, right click "unallocated" to create "New" partition. Our selections for the above mentioned options for each partition is done considering :

a. Our hard disk size is **1 TB**.

b. Reserving recommended partition sizes for respective operating systems.

So, this may change according to your hard disk size and your needs.

- Click on **"Apply"** button on toolbar either every time after creating each partition **OR** only once after you have created all the partitions. A dialog box will appear showing the message **"Are you sure you want to apply pending operations?"** . Click **"Apply"**. After some time, the next message shows **"All operation successfully completed"**. Click the **"Close"** button on this dialog box.



- Finally, after creating all the partitions, the GParted window will look as shown in the image above.

- Click on the "Close" box of the GParted application window to close it.
- Double-click on the **"Exit"** icon on the desktop, which will lead to the dialog box "EXIT". Select **"Shutdown"** from it and click **"OK"**.
- After some time it will ask you to **"Remove the disc and close the tray and press ENTER key to continue".** So remove GParted CD/DVD from the CD/ DVD drive and press Enter key.

Windows 8.1 (64-bit)

- Search for **"Windows 8.1"** on the Internet. Download the CD image / USB image. Prepare according to the instructions given on that site and then follow the steps given below. For this seminar, we are going to use **Windows 8.1 (64-bit) Bootable DVD.**
- Boot the machine and insert Windows 8.1 bootable CD/DVD or USB.
- Press a key if the message **"Press any key to boot from CD or DVD"** appears.
- After some time the **"Windows Setup"** window will be opened. Keep the "Language" and other options with their default selections and click "Next".
- On next screen, click **"Install Now"**.
- Enter appropriate product key on next screen and click "Next".
- On the next screen, check the "I accept the license terms" checkbox and click "Next".
- Next screen asks "Which type of installation do you want?". Select "Custom: Install Windows only (advanced)".
- On the next screen, select the partition reserved for Windows 8.1 Installation (i.e. **1st Primary Partition in our case**).
- Click on the **"Format"** button to re-format the selected partition. A dialog box will appear showing a warning message that if you format the partition, all data stored on it will be lost. Click the "OK" button. Once the formatting is complete, click "Next".
- The "Installing Windows" screen will appear, showing the installation progress. This will take a few minutes to complete. During installation process machine will reboot twice.
- The "Personalize" screen appears. Give some name in the "PC name" text box, for example: "mypc" and click "Next".
- The "Settings" screen appears. Click the "Use express settings" button.
- The "Your account" screen appears. Give "Username", "Password", confirm the password and give password hint. Then, click the "Finish" button.

- If system detects any new device, it will prompt you for installing that device's software. Click on the “Install” button.
- On reboot, select Windows 8.1 (default) on boot loader screen (if it appears). As Windows 8.1 is the first OS we are installing, the boot loader screen won't appear.
- Enter password on login screen and press Enter key. For first login, system personalization setup will take few minutes.
- On login, test the system. Remove Windows 8.1 DVD and reboot the system.

OpenIndiana Hipster 2021.10 (64-bit)

- Search for **"OpenIndiana"** on the Internet. Download the CD image / USB image. Prepare according to the instructions given on that site and then follow the steps given below. For this seminar, we are going to use **OpenIndiana Hipster 2021.10 (64-bit) Live DVD.**
- Boot the machine and insert OpenIndiana Live CD/DVD or USB.
- The machine will boot automatically from the OpenIndiana Live CD/DVD or USB.
- After some time, a screen will appear showing a boot menu.
- Press Space bar key quickly to pause the timer. Press Enter key to select the default (1st option) "Boot Multi User". If you do not pause the timer, then, by default, this same option will be selected automatically.
- After some time you will be asked to select the language. Press Enter key to select the default language i.e.: "7. English".
- After some time, the machine boots completely into OpenIndiana Live DVD and the desktop will appear.
- Double-click on the **"Install OpenIndiana"** icon on the desktop.
- The **"OpenIndiana Installer (as superuser)"** window appears displaying the "Welcome" screen. Click the "Next" button.
- The "Disk" screen appears. Select the appropriate hard disk. Select **"Partition the disk"** radio button (if not already selected). Below, list boxes for each partition on the selected disk will be displayed. Click on the arrow buttons of only that list box which is of the partition reserved for OpenIndiana (in our case, the second list box from the top showing "Linux native"). From the menu, select **"Solaris2"**. A warning will appear to the right side of this list box which warns that the data on the partition will be erased. Click the "Next" button.
- The "Time Zone, Date and Time" screen appears. Select "Region" as "Asia" and select "Location" and "Time Zone" as "India". Or just click on "Kolkata" on the map above. Click the "Next" button.
- The "Locale" screen appears. Select "Language" as "English" and "Territory" as "India". Click the "Next" button.

- The "Users" screen appears. Give the "Root password" and confirm it. Give your name, log-in name, user password and confirm the user password in the appropriate text boxes provided. Also give appropriate name in the "Computer name" text box, for example, "mypc". Click the "Next" button.
- The final "Installation" screen appears, showing the Installation Summary. Read it carefully to confirm and to re-check your selections. Once confirmed, click the "Install" button.
- Installation will begin and the next screens will show the installation progress.
- After a few minutes, the "Finished" screen will appear showing that the installation is complete. Click the "Reboot" button to reboot the machine.
- Upon reboot, remove the OpenIndiana Live DVD and boot into the system.

Boot Flag Tweaking Using GParted Live DVD After OpenIndiana Installation

- After OpenIndiana Installation, we will boot, by default, into OpenIndiana. Upon booting and testing the OpenIndiana installation, we now need to go back and boot into the previously installed Windows 8.1. For this, we must now shift the boot flag to the 1st Primary Partition to boot into Windows 8.1. To do this, we will be using the **GParted 18.0 Live CD**.
- Insert GParted Live CD/DVD or USB and boot the machine from it.
- The machine will automatically boot from the GParted Live CD/DVD or USB.
- A menu will appear on screen with "Gnome Partition Editor" at the bottom of the screen. From this menu select 1st option as **"GParted Live (Default settings)"**. [You can scroll menu items using arrow keys and select using enter key. This is usual way of selecting menu item hereafter].
- Next screen will show **"Configuring console-data"**. Select **"Policy for handling keymaps:"** as **"Don't touch keymap"** (which is default selection).
- Next it will ask **"Which language do you prefer?"**. Press enter to select the default i.e. **33: US English**.
- Then it asks about **"Which mode do you prefer?"** (Related to GUI of GParted). Press enter to select the default values.
- After some time, the desktop appears with the **"GParted"** application window opened on it. Select the appropriate hard disk from the top-right section of the toolbar. No need to select if there is only one hard disk as in our case. Below, all partitions on the disk will be listed.
- The **2nd primary partition (OpenIndiana)** is set as the **"boot"** partition. That is, the "boot" flag is set to the 2nd primary partition. This is indicated by the "boot" written in the right-most "Flags" column for that partition.
- Right-click on the 2nd primary partition. From the menu, select "Manage Flags". In the dialog box that appears, uncheck the "boot" checkbox and click the "Close" button.

- The "boot" written in the right-most "Flags" column for the 2nd primary partition will now have disappeared.
- Right-click on the **1st primary partition (Windows 8.1)**. From the menu, select "Manage Flags". In the dialog box that appears, check the "boot" checkbox and click the "Close" button.
- Now, "boot" will be written in the right-most "Flags" column for the 1st primary partition (Windows 8.1).
- Click on the "Close" box of the GParted application window to close it.
- Double-click on the **"Exit"** icon on the desktop, which will lead to the dialog box "EXIT". Select **"Shutdown"** from it and click **"OK"**.
- After some time it will ask you to “Remove the disc and close the tray and press ENTER key to continue”. So remove GParted CD/DVD from the CD/ DVD drive and press Enter key.

PCBSD 10.0.0 (Joule) (64-bit)

- Search for **"PCBSD"** on the Internet. Download the CD image / USB image. Prepare according to the instructions given on that site and then follow the steps given below. For this seminar, we are going to use **PCBSD 10.0.0 (Joule) Bootable DVD.**
- Insert PCBSD CD/DVD or USB pendrive and boot the machine.
- The machine will boot automatically from the PCBSD Bootable CD/DVD or USB pendrive.
- After some time, a screen titled "PC BSD / TrueOS Installation" will appear. Select first option **"Graphical Install"** using arrow keys, and press Enter key.
- After some time, "PC-BSD" GUI screen appears. Select language as "English" and click the "Next" button.
- The next screen shows "System Selection". Select "Desktop (PC-BSD)" and click the "Next" button.
- The next screen asks for "Disk Selection". Click the "Customize" button.
- On the next screen, select "Advanced (Experienced with file-systems)" and click the "Next" button.
- On the next screen, the **"Selected Disk"** drop-down list box will show as **"ada0"** (i.e. the first - and in our case - the only hard disk). In the **"Selected Partition"** drop-down list box, select the partition reserved for PCBSD installation. In our case it is the **3rd Primary Partition**, that is, **"ada0s3 ... (Linux native)"**.
- In the **"Boot-Loader"** drop-down list box, select **"NONE"**. Click the "Next" button.
- On the next "Mount points" screen, click the **"Swap Size"** button and give a swap partition size of **"4000" MB** or leave it as default and click the "OK" button. Then, click the "Next" button.
- Read the "disk summary" given on the next screen carefully and click the "Finish" button. Upon doing so the installer will warn that "You have chosen not to install a boot-loader". Ignore the warning and click the "OK" button.
- Clicking the "Next" button on "Disk Selection" screen will ask for "Start the Installation Now?". Click the "Yes" button to begin installation.
- Installation begins and the next screen will show the installation progress.

- Finally, after some time a message appears saying that the installation is complete. Click the "Finish" button to reboot the system.

Boot Flag Tweaking Using GParted Live DVD

A) Boot Flag Tweaking by GUI Method

- After PCBSD Installation, we will still boot, by default, into the previously installed Windows 8.1. Now, we must shift the boot flag to the 3rd Primary Partition to test the installed PCBSD. To do this, we will be using the **GParted 18.0 Live CD**.
- Insert GParted Live CD/DVD or USB and boot the machine from it.
- The machine will automatically boot from the GParted Live CD/DVD or USB.
- A menu will appear on screen with "Gnome Partition Editor" at the bottom of the screen. From this menu select 1st option as **"GParted Live (Default settings)"**. [You can scroll menu items using arrow keys and select using enter key. This is usual way of selecting menu item hereafter].
- Next screen will show **"Configuring console-data"**. Select **"Policy for handling keymaps:"** as **"Don't touch keymap"** (which is default selection).
- Next it will ask **"Which language do you prefer?"**. Press enter to select the default i.e. **33: US English**.
- Then it asks about **"Which mode do you prefer?"** (Related to GUI of GParted). Press enter to select the default values.
- After some time, the desktop appears with the **"GParted"** application window opened on it. Select the appropriate hard disk from the top-right section of the toolbar. No need to select if there is only one hard disk as in our case. Below, all partitions on the disk will be listed.
- The **1st primary partition (Windows 8.1)** is set as the **"boot"** partition. That is, the "boot" flag is set to the 1st primary partition. This is indicated by the "boot" written in the right-most "Flags" column for that partition.
- Right-click on the 1st primary partition. From the menu, select "Manage Flags". In the dialog box that appears, uncheck the "boot" checkbox and click the "Close" button.

- The "boot" written in the right-most "Flags" column for the 1st primary partition will now have disappeared.
- Right-click on the **3rd primary partition (PCBSD)**. From the menu, select "Manage Flags". In the dialog box that appears, check the "boot" checkbox and click the "Close" button.
- Now, "boot" will be written in the right-most "Flags" column for the 3rd primary partition (PCBSD).
- Click on the "Close" box of the GParted application window to close it.
- Double-click on the **"Exit"** icon on the desktop, which will lead to the dialog box "EXIT". Select **"Shutdown"** from it and click **"OK"**.
- After some time it will ask you to “Remove the disc and close the tray and press ENTER key to continue”. So remove GParted CD/DVD from the CD/ DVD drive and press Enter key.

PCBSD Installation Continued...

- Now, the machine will boot into the installed PCBSD upon rebooting.
- After some time, a screen will appear showing a boot menu.
- Press Space bar key quickly to pause the timer. Press Enter key to select the default (1st option) "Boot Multi User". If you do not pause the timer, then, by default, this same option will be selected automatically.
- After some time, “Confirm Resolution” screen appears, confirm the default screen resolution settings and click the “Yes” button.
- On next “PC-BSD” welcome screen, select language as "English" and click the “Next” button.
- On the next screen, select "System Timezone" as “Asia/Kolkata” and give "System Hostname" as “mypc”. Click the “Next” button.
- On the next screen, give the “Root Password” and confirm (repeat) the same. Click the “Next” button.
- On the next screen, give your "Name", "Username", password and confirm (repeat) the password and click the “Next” button.

- On the next screen, click the "Finish" button to finish the setup.
- On the login screen, select username from the dropdown box. Give password and click the login button (arrow button).
- Test the PCBSD installation and then shutdown the machine.

B) Boot Flag Tweaking by Terminal Method

- After testing PCBSD Installation, we now need to reset boot flag back to Windows 8.1 (1st primary) partition and boot from it in order to be prepared for the next Windows 10 installation. To do this, we will be using the **GParted 18.0 Live CD**.
- Insert GParted Live CD/DVD or USB and boot the machine from it.
- The machine will automatically boot from the GParted Live CD/DVD or USB.
- A menu will appear on screen with "Gnome Partition Editor" at the bottom of the screen. From this menu select 1st option as **"GParted Live (Default settings)"**. [You can scroll menu items using arrow keys and select using enter key. This is usual way of selecting menu item hereafter].
- Next screen will show **"Configuring console-data"**. Select **"Policy for handling keymaps:"** as **"Don't touch keymap"** (which is default selection).
- Next it will ask **"Which language do you prefer?"**. Press enter to select the default i.e. **33: US English**.
- Then it asks about **"Which mode do you prefer?"** (Related to GUI of GParted). Press enter to select the default values.
- After some time, the desktop appears with the **"GParted"** application window opened on it. Close this window by clicking the close box.
- Double-click on the desktop **"Terminal"** icon.
- Give commands in the same order as given below:

  > **sudo fdisk -l**

  This command will list all the hard disks in your machine and you will get to know how they are named. As we have only one hard disk, it will be named as **"/dev/sda"**. Using this name, give the next command as:

> **sudo fdisk /dev/sda**

This command runs the fdisk tool for disk **/dev/sda**.

Now, give the following fdisk commands in the same order as given below:

> **p**

This command will list the partition table and all the partitions. The **boot flag** is seen as set on the **3rd Primary Partition (PCBSD) (/dev/sda3)**.

> **a**

This command toggles the boot flag and will ask for partition number.

> **1**

Giving partition number 1 will **set** the **boot flag** to **Partition 1**, that is, to the **1st Primary Partition (Windows 8.1) (/dev/sda1)**.

> **a**

This command toggles the boot flag and will ask for partition number.

> **3**

Giving partition number 3 will **remove** the **boot flag** from **Partition 3**, that is, from the **3rd Primary Partition (PCBSD (/dev/sda3)**.

> **p**

This command will list the partition table and all the partitions. The **boot flag** is now seen as set on the **1st Primary Partition (Windows 8.1) (/dev/sda1)**.

> **w**

Writes the changes done to the disk.

> **sudo reboot**

This command will reboot the machine.

- After some time it will ask you to "Remove the disc and close the tray and press ENTER key to continue". So remove GParted CD/DVD from the CD/ DVD drive and press Enter key.
- Now, the machine will boot into the previously installed Windows 8.1 upon rebooting.

Creating Windows 10 Installer USB Pendrive

- Download latest version of "Rufus".
- Download "Windows 10" disk image (.iso) file and store it in some folder on your machine.
- Insert your USB Pendrive - which you want to use to install Window 10 - into your machine.
- Run the "Rufus" application executable. The "Rufus" window appears.
- Select your USB Pendrive from the "Device" drop-down list box.
- From "Boot selection" drop-down list box, select **"Disk or ISO image"**. At its right side, there will be another drop-down list box. Click on it and choose "SELECT". Browse to your Windows 10 disk image (.iso) file. Select it and click the "Open" button.
- Keep "Image Option" as "Standard Windows Installation".
- Select "Partition Scheme" as "MBR". This will cause "Target System" to be automatically set to "BIOS (or UEFI-CSM)".
- Keep the "File system" as "NTFS".
- Keep all remaining options selected as per their default values.
- Click the "START" button.
- A warning message box may appear informing that all data on the USB Pendrive will be destroyed. Click the "OK" button.
- After some time, your Windows 10 Installer USB Pendrive will be prepared.
- Now, you can use it to install Windows 10 on some machine.

Windows 10 (64-bit)

- Search for **"Windows 10"** on the Internet. Download the CD image / USB image and prepare a CD/DVD or USB pendrive using it. For this seminar, we are going to use **Windows 10 (64-bit) Bootable USB Pendrive** which is prepared following the above given steps.
- Insert the Windows 10 bootable CD/DVD or USB pendrive and boot the machine from it.
- Press a key if the message "Press any key to boot from USB" appears.
- After some time the **"Windows Setup"** window will be opened. Keep the "Language" and other options with their default selections and click the "Next" button.
- On next screen, click the **"Install Now"** button.
- Enter appropriate product key on next screen and click the "Next" button.
- On the next screen, check the "I accept the license terms" checkbox and click the "Next" button.
- The next screen asks "Which type of installation do you want?". Select "Custom: Install Windows only (advanced)".
- On the next screen, select the partition reserved for Windows 10 Installation (i.e. **1st Logical Partition in our case**).
- Click on the **"Format"** button to re-format the selected partition. A dialog box will appear showing a warning message that if you format the partition, all data stored on it will be lost. Click the "OK" button. Once the formatting is complete, click the "Next" button.
- The "Installing Windows" screen will appear, showing the installation progress. This will take few minutes to complete. During the installation process, the machine will reboot twice.
- Finally, the "Personalize Settings" screen appears titled as "Get going fast". Click the "Use express settings" button.
- The next screen asks you to "Create an account for this PC" screen appears. Give the "Username", "Password", confirm the password and give password hint. Then, click the "Next" button.

- On login, test the system. Remove the Windows 10 Bootable USB Pendrive and reboot the system.
- Upon reboot, you will be able to see the “BootMgr” - bootloader of Windows 10 showing two options: "Windows 10" and "Windows 8.1" to boot from.

Creating Ubuntu Installer USB Pendrive

- Download latest version of "Fedora Media Writer" for whichever OS (Windows / Linux / macOS) that you are working in. We will be using "Fedora Media Writer" on Windows 10.
- Download "Ubuntu" disk image (.iso) file and store it in some folder on your machine. For this seminar, we are going to install Ubuntu 18.04.6 LTS.
- Insert your USB pendrive - which you want to use to install Ubuntu - into your machine.
- Run the "Fedora Media Writer" application. The "Fedora Media Writer" window appears. Click the "Custom image" option.
- Browse to the location where you have kept your Ubuntu disk image (.iso) file. Select it and click the "Open" button.
- The "Write Custom Image" window appears. Select the inserted USB pendrive from the given listbox and click "Write to Disk" button.
- After some time, your Ubuntu Installer USB pendrive will be prepared.
- Now, you can use it to install Ubuntu on some machine.

Ubuntu 18.04.6 LTS (64-bit)

- Search for **"Ubuntu"** on the Internet. Download the CD image / USB image and prepare a CD/DVD or USB pendrive using it. For this seminar, we are going to use **Ubuntu 18.04.6 LTS Bootable USB Pendrive** which is prepared following the above given steps.
- Insert the Ubuntu 18.04.6 bootable CD/DVD or USB pendrive and boot the machine from it.
- The machine will automatically boot from the Ubuntu 18.04.6 Bootlable CD/DVD or USB pendrive.
- After some time, the "Welcome" screen will appear. Here, select language as "English" and click on the "Try Ubuntu" button.
- After some time, the desktop will appear. Double-click on the **"Install Ubuntu 18.04.6 LTS"** desktop icon.
- The Ubuntu installer begins and shows the "Welcome" screen. Keep the language selected as default, that is, **"English"** and click the "Continue" button.
- The "Keyboard Layout" screen appears. Keep the keyboard layout selected as default, that is, **"English (US)"** and click the "Continue" button.
- The "Updates and other software" screen appears which asks what applications you want to install. Select **"Normal installation"** and click the "Continue" button.
- The "Installation type" screen appears. Select **"Something else (You can create or resize partitions yourself, or choose multiple partitions for Ubuntu)"** and click the "Continue" button.
- The next screen lists all the partitions on our disk and asks us to choose the partition on which to install Ubuntu. Select the partition reserved for Ubuntu installation (that is, **/dev/sda6** in our case) from the list and click the **"Change ..."** button below. A small dialog box will appear. In it, click on the **"Use as:"** drop-down box and from the menu select **"Ext4 journaling file system"**. Check the **"Format the partition"** checkbox and give **"Mount point"** as **"/"** by typing or by selecting from the drop-down menu. Then, click the "OK" button on this dialog box.
- A dialog box will appear asking for "Write previous changes to disk and continue?". Click the "Continue" button on this dialog box. After some time, a tick-mark will appear against the /dev/sda6 (Ubuntu partition).

- Select the partition reserved for Swap (that is, **/dev/sda7** in our case) from the list and click the **"Change ..."** button below. Keep **"Use as:"** as **"swap area"**. Check the **"Format the partition"** checkbox if it is enabled and give **"Mount point"** as **"swap"** by typing or by selecting from the drop-down menu if it is enabled. Then, click the "OK" button on this dialog box.
- Below, in the **"Device for boot loader installation"** drop-down list box. Select the Ubuntu partition, that is, **/dev/sda6** in our case and click the **"Install Now"** button.
- The next screen will ask "Where are you?". Select the time-zone as "Asia, Kolkata" simply by clicking on the map above. Click the "Continue" button.
- The next screen will ask "Who are you?". Give your "Name", "Computer Name", "Username", "Password" and confirm the password. Select "Require my password to log in" option and click the "Continue" button.
- Installation begins and the next screen will show the installation progress.
- Finally, after some time a message appears saying that the installation is complete. Click the "Restart Now" button to reboot the system.
- The final screen will ask you to remove the installation medium and press Enter key.

Installing VirtualBox on Windows 10

- Search for “VirtualBox” on the Internet. Download the setup file and then follow the steps given below. For this seminar, we will be using **"VirtualBox 6.1.18"**.
- Copy virtual box setup file to some folder on the machine and double-click it to run it. The "Oracle VM VirtualBox 6.1.18 Setup" begins.
- The "Welcome" screen appears. Click the “Next” button.
- On the next screen, select the location for installing VirtualBox and click the “Next” button.
- The next screen asks you to allow creation of shortcuts and menu entries. Keep the default selections. Click the “Next” button.
- The next screen shows “Warning: Network Interfaces”. Click the “Yes” button to continue the installation.
- The "Ready to Install" screen appears. Click the "Install” button to begin installation. If “User Account Control” message box asks for permission for installing the software, click the “Yes” button.
- During this installation process, it may ask for permission to install certain device drivers. Click the “Install” button there.
- After some time, the screen will show that "Installation is complete". Click the “Finish” button. The setup window closes and "Oracle VM VirtualBox Manager" application starts. Its desktop shortcut will be created on the desktop. You can double-click this icon as well to start the "Oracle VM VirtualBox Manager" as well.
- Create the following directory structure on your DATA partition. In our case, it is **E:\VirtualBox\Machines**.
- In the "Oracle VM VirtualBox Manager" window, go to "File" menu and select “Preferences”. In the "General" tab, give the above directory path (E:\VirtualBox\Machines) as the “Default Machine Folder" (It is recommended to use NTFS partition to save this data). Click the "OK" button.

Using VirtualBox on Windows 10

- Open "Oracle VM VirtualBox Manager" by double-clicking on the desktop shortcut.
- Click the “New” button on toolbar to create new virtual machine, which will open the “Create Virtual Machine” wizard.
- The "Name and operating system" window appears. Give operating system **"Name"** as **“FEDORA WORKSTATION”**. Check that the "Machine Folder" is the same as the "Default Machine Folder" given above. Select operating system **"Type"** as **“Linux”** and **"Version"** as **"Fedora (64-bit)"**. Click the "Next" button.
- The "Memory size" window appears. Give appropriate memory size to the virtual machine keeping in mind the constraints of your actual, physical underlying memory size. We will give it as **4096 MB** as we have 8 GB of actual, physical memory. Click the "Next" button.
- The "Hard disk" window appears. Select “Create a virtual hard disk now” and click the “Create” button.
- The next window asks for "Hard disk file type". Select **“VDI (VirtualBox Disk Image)”** and click the “Next” button.
- The next window asks "Storage on physical hard disk". Select **“Fixed size”** and click the “Next” button.
- The next screen asks for "File location and size". Give appropriate disk size to the virtual machine keeping in mind the constraints of your actual, physical underlying disk partition size. We will give the virtual disk size as **20.00 GB** as we have 50 GB of actual, physical disk partition. Click the "Create" button.
- The "FEDORA WORKSTATION" virtual machine will be created after some time and it will be visible in the left-pane of "Oracle VM VirtualBox Manager". Select it and click the "Settings" button on the top toolbar.
- In the **"Settings"** dialog box, click **"System"** from the left-pane. In the right-pane, click on the **"Motherboard"** tab. In the **"Boot Order"** box, **deselect "Floppy"**. From the **"Chipset"** drop-down list box, select **"ICH9"**. Click on the **"Processor"** tab and give appropriate number of Processor Cores to the Virtual Machine keeping in mind the constraints of your actual, physical underlying processor. As we have 8 cores on our actual, physical processor, we will give **4 cores** to the virtual machine.

- In the **"Settings"** dialog box, click on **"Display"** from the left-pane. In the right-pane, click on the **"Screen"** tab and give appropriate **"Video Memory"** size. We will give it as **128 MB**. Click the "OK" button on the "Settings" dialog box.

Fedora Workstation 34 (on VirtualBox)

- As we are going to install "Fedora Workstation 34" on our virtual machine, search for it on the internet and download its CD/DVD or USB pendrive image and keep it on some folder on the machine.
- Open "Oracle VM VirtualBox Manager". Select the previously created FEDORA WORKSTATION virtual machine from the left-pane and click "Settings" button on the toolbar.
- In the **"Settings"** dialog box, click on **"Storage"** from the left-pane. In the right-pane right-click on "Controller: IDE" and select "Remove Controller" from the menu. Right-click on "Controller: SATA" and select "Optical Drive". The "Optical Drive Selector" dialog box appears. In it, select "Add" button from the toolbar, browse to the Fedora Workstation 34 .iso file and select it and click the "Open" button. The .iso file will now be visible in the "Optical Drive Selector". Select it and click the "Choose" button.
- The .iso file will appear under the "Controller: SATA". Click the "OK" button on the "Settings" dialog box.
- Click "Start" button on the toolbar to start the Virtual Machine. The Virtual Machine will boot by default into Fedora Workstation Live 34.
- The first screen shows a boot menu. From it, select "Start Fedora-Workstation-Live 34".
- After some time, desktop appears. Select "Install to Hard Drive".
- The "Welcome" screen appears. Select language as "English" and "English (India)". Click the "Continue" button.
- From the main screen, select "Time & Date". The "Time & Date" screen appears. Select "Region" as "Asia" and "City" as "Kolkata". Click the "Done" button.
- From the main screen, select "Installation Destination". The "Installation Destination" screen appears. Select the detected virtual hard disk and select **"Storage Configuration"** as **"Custom"**. Click the "Done" button.
- The **"Manual Partitioning"** screen appears. In the drop-down list box in the left-pane, select **"Standard Partition"**. Below, click on the "+" button. The "Add a New Mount Point" dialog box appears. Give **"Mount Point"** as **"/"** and type in the **"Desired Capacity"** as **"20 GiB"**. Click the "Add mount point" button.

- In the same screen, select the created partition in the left-pane and in the right-pane check that the file system is **"Ext4"**. Click the **"Update Settings"** button, if it is enabled. Afterwards, click the "Done" button.
- "Summary of Changes" window appears showing the disk selection and formatting summary. Read it carefully and click "Accept Changes" button.
- On the main screen, now, click the "Begin Installation" button.
- After some time, a message will appear on screen saying that the Installation is complete. Click the "Finish Installation" button.
- Shut down the virtual machine.
- In the "Oracle VM VirtualBox Manager", select the FEDORA WORKSTATION virtual machine from the left-pane and click "Settings" button on the toolbar. In the **"Settings"** dialog box, click on **"Storage"** from the left-pane. In the right-pane, right-click on "Fedora Workstation" .iso file under "Controller: SATA" and select "Remove Attachment" from the menu. A message box will appear asking you to confirm whether you really want to remove the Optical Drive. Click the "Remove" button. Click the "OK" button on the "Settings" dialog box.
- Select the FEDORA WORKSTATION virtual machine from the left-pane and click the "Start" button from the top toolbar to boot into the virtually installed Fedora Workstation 34 Operating System.
- Upon booting into Fedora Workstation 34, it will ask for "Name", "Username" and password. Enter the necessary information and start using the Fedora Workstation 34 OS.
- Shutdown the virtual machine. Close the "Oracle VM VirtualBox Manager" and shutdown the machine.

Making Entry Of Other Operating Systems In Ubuntu GRUB

- Boot the machine and boot into the installed Ubuntu.

- In Ubuntu, open the "Terminal". Now, we need to open and edit a file named **"40_custom"** which is contained inside directory **"grub.d"** which in turn is contained inside **"etc"** directory which comes under **"/"** (root). So, to open and edit this file give the following command in the Terminal (We will be using the "nano" editor) :

  > **sudo nano /etc/grub.d/40_custom**

  (Give root password)

  This command opens the file /etc/grub.d/40_custom in the "nano" editor in the Terminal itself.

- Now, add "OpenIndiana" entry at the end of this file as follows :

  menuentry 'OpenIndiana Hipster 2021.10' --class indiana --class os {

  set root='hd0,msdos2'

  chainloader +1

  }

- Press "Enter" key twice after the closing curly brace of "OpenIndiana" entry, which will leave a gap. Then, add "PCBSD" entry as follows :

  menuentry 'PCBSD 10.0.0 (Joule)' --class pcbsd --class os {

  set root='hd0,msdos3'

  chainloader +1

  }

- Note that hard disk counting, here, starts from 0 onwards and so our hard disk is the first and only hard disk and hence, it is indicated as hd0. Partition counting begins from 1 onwards and so "OpenIndiana" partition (2nd Primary Partition) is indicated as msdos2 and "PCBSD" partition (3rd Primary Partition) is indicated as msdos3.

- Press "Enter" key after the closing curly brace of "PCBSD" entry.
- To save the changes to the file: press key-combination **Control+O**. It will ask whether the file to be written to is /etc/grub.d/40_custom. Press "Enter" key to write the changes to the file.
- Press key-combination **Control+X** to exit the "nano" editor.
- Give the following command in the Terminal to update the Ubuntu GRUB so that it can take in both the above newly made entries:

  > **sudo update-grub2**

- Reboot the machine and go to the Ubuntu GRUB. You will find both the entries: "OpenIndiana Hipster 2021.10" and "PCBSD 10.0.0 (Joule)" made in the Ubuntu GRUB. Boot into both the operating systems.
- Upon completing this step, now, all the installed operating systems are easily accessible for us and we can boot into any of the installed operating systems at any time easily.

Installing VirtualBox on Ubuntu

- Boot the machine and boot into the installed Ubuntu.
- Connect your machine to Internet via LAN cable or Wi-Fi. For this seminar, we will be connecting our machine to the internet via LAN cable.
- Open the "Terminal" and give the following commands in the same order as given below:

  > **sudo apt update**

  (Give root password)

  > **sudo apt upgrade**

  > **sudo apt-get install virtualbox**

- All the above commands will take some time. After the 3rd command has finished its work, the system may show a message box prompting you to reboot the machine to install all upgrades. It make take some time for this reboot message box to appear. Wait till this reboot message box appears and then reboot the machine and boot again into Ubuntu.
- In the left-bottom corner of the Ubuntu desktop there is a "Show Applications" button. Click on it. You will find "VirtualBox" installed inside it. Scroll up and down to locate it. Right-click on this "VirtualBox" and select "Add to Favourites" option from the menu. Doing so, will add "VirtualBox" to the left-most vertical "Favourites" bar on the desktop for easy access.
- Click on this "VirtualBox" icon. The "Oracle VM VirtualBox Manager" opens.
- In the "Oracle VM VirtualBox Manager" window, go to "File" menu and select “Preferences”. In the "General" tab, go to “Default Machine Folder" click on the arrow button in the drop-down list box and select "Other ..." from the menu and browse to the same directory as the one used for Virtual Machine on Windows 10 i.e. : **Other Locations** > **DATA partition > VirtualBox > Machines**. Click the "Open" button. That directory will be selected as the "Default Machine Folder". Click the "OK" button.

Using VirtualBox on Ubuntu

- Open "Oracle VM VirtualBox Manager" by clicking on the desktop icon.
- Click the “New” button on toolbar to create new virtual machine, which will open the “Create Virtual Machine” wizard.
- The "Name and operating system" window appears. Give operating system **"Name"** as **“WIN2K19”**. Check that the "Machine Folder" (if this option is visible) is the same as the "Default Machine Folder" given above. Select operating system **"Type"** as **“Microsoft Windows”** and **"Version"** as **"Windows 2019 (64-bit)"**. If this particular version is not available, then select **"Other Windows (64-bit)"**. Click the "Next" button.
- The "Memory size" window appears. Give appropriate memory size to the virtual machine keeping in mind the constraints of your actual, physical underlying memory size. We will give it as **4096 MB** as we have 8 GB of actual, physical memory. Click the "Next" button.
- The "Hard disk" window appears. Select “Create a virtual hard disk now” and click the “Create” button.
- The next window asks for "Hard disk file type". Select **“VDI (VirtualBox Disk Image)”** and click the “Next” button.
- The next window asks "Storage on physical hard disk". Select **“Dynamically allocated”** and click the “Next” button.
- The next screen asks for "File location and size". Give appropriate disk size to the virtual machine keeping in mind the constraints of your actual, physical underlying disk partition size. We will give the virtual disk size as **25.00 GB** as we have 50 GB of actual, physical disk partition. Click the "Create" button.
- The "WIN2K19" virtual machine will be created after some time and it will be visible in the left-pane of "Oracle VM VirtualBox Manager". Select it and click the "Settings" button on the top toolbar.
- In the **"Settings"** dialog box, click **"System"** from the left-pane. In the right-pane, click on the **"Motherboard"** tab. In the **"Boot Order"** box, **deselect "Floppy"**. From the **"Chipset"** drop-down list box, select **"ICH9"**. Click on the **"Processor"** tab and give appropriate number of Processor Cores to the Virtual Machine keeping in mind the constraints of your actual, physical underlying processor. As we have 8 cores on

our actual, physical processor, we will give **4 cores** to the virtual machine.

- In the **"Settings"** dialog box, click on **"Display"** from the left-pane. In the right-pane, click on the **"Screen"** tab and give appropriate **"Video Memory"** size. We will give it as **128 MB**. Click the "OK" button on the "Settings" dialog box.

Windows Server 2019 (on VirtualBox)

- As we are going to install "Windows 2019 Server (64-bit)" on our virtual machine, search for it on the internet and download its CD/DVD or USB pendrive image and prepare a bootable CD/DVD or USB pendrive by following the steps on that site. For this seminar, we will be using **Windows Server 2019 (64-bit) Bootable DVD**.
- Open "Oracle VM VirtualBox Manager". Select the previously created WIN2K19 virtual machine from the left-pane and click "Settings" button on the toolbar.
- In the **"Settings"** dialog box, click on **"Storage"** from the left-pane. In the right-pane, if the WIN2K19.vdi disk file is shown under "Controller: IDE", then right-click on "Controller: IDE" and select "Remove Controller" from the menu.
- Click on the "Add a new storage controller" button which will be found among the small picture buttons below and select "Add SATA Controller" from the menu. "Controller: SATA" will be added. Now, right-click on "Controller: SATA" and select "Add Hard Disk" from the menu. A message box appears asking which type of hard disk you would like to add to the SATA Controller. Click on the "Choose existing disk" button. Then, browse to the WIN2K19.vdi file, select it and click the "Open" button. The WIN2K19.vdi disk file will be added to the SATA Controller.
- Again, right-click on "Controller: SATA" and now select "Add Optical Drive" from the menu. On the message box that appears asking what type of Optical Disk you would like to add, click the "Leave Empty" button. An "Empty" optical drive will be added to the SATA Controller. Select it and in the right-side, under "Attributes" pane, click on the small CD icon and from the menu that appears, select your CD/DVD Drive. Click the "OK" button on the "Settings" dialog box to close it.
- Insert Windows Server 2019 (64-bit) Bootable CD/DVD into your machine.
- Select the WIN2K19 virtual machine from the left-pane. Click "Start" button on the toolbar to start the Virtual Machine. The Virtual Machine will boot by default into the Windows 2019 bootable CD/DVD.
- The first screen will show "Loading Files ..." for some time.
- After some time the **“Windows Setup”** window will be opened. Keep the "Language" and other options with their default selections and click the “Next” button.
- On the next screen, click the **“Install Now”** button.

- On the next screen select the operating system to install as **"Windows Server 2019 Standard (Desktop Experience) x64"** and click the “Next” button.
- On the next screen, check the "I accept the license terms" checkbox and click the “Next” button.
- The next screen asks “Which type of installation do you want?”. Select “Custom: Install Windows only (advanced)”.
- On the next screen, select the partition reserved for Windows Server 2019 Installation. In our case it will be our entire virtual hard disk of 25.00 GB. Select it and click the "Next" button.
- The “Installing Windows” screen will appear, showing the installation progress. This will take few minutes to complete. During the installation process, the virtual machine will reboot twice.
- Finally, the “Customize Settings” screen appears. Give the "Password" and confirm the password. Then, click the "Finish" button.
- Before login, you will need to press key combination **Ctrl+Alt+Delete or** go to the **"Input" menu** > "**Keyboard" > "Insert Ctrl-Alt-Del" or** go to the **"Input" menu** > "**Keyboard" > "Keyboard Settings"** and check which host key and key combination you will need to use to log in and use the same. Login and test the system.
- Remove the Windows Server 2019 bootable DVD and shutdown the virtual machine.
- Close "Oracle VM VirtualBox Manager" and shutdown the machine.

openSUSE Leap 15.2 (64-bit)

- Search for **"openSUSE"** on the Internet. Download the CD image / USB image. Prepare according to the instructions given on that site and then follow the steps given below. For this seminar, we are going to use **openSUSE Leap 15.2 (64-bit) Bootable DVD.**
- Insert the openSUSE Leap bootable CD/DVD or USB pendrive and boot the machine from it.
- The machine will automatically boot from the openSUSE Leap Bootlable CD/DVD or USB pendrive.
- After some time, the "Welcome" screen of openSUSE Leap 15.2 will appear showing a menu. From the menu, go to "Installation" using arrow keys and press "Enter" key. A message "Loading Linux Kernel ..." will appear with a progress bar.
- After some time, the installer begins and the "Language, Keyboard and License Agreement" screen appears. Keep the "Language" selection as default, that is, "English (US)" and keep the "Keyboard Layout" selection also as default, that is, "English (US)" and click the "Next" button.
- The "Network Settings" screen appears. Keep all default selections as they are. Click the "Next" button.
- The "System Role" screen appears. Select the **"Desktop with KDE Plasma"** option and click the "Next" button.
- The "Suggested Partitioning" screen appears giving the suggested partitions for installing openSUSE Leap. At the bottom of the screen, click the **"Expert Partitioner"** button and from the menu that appears, select **"Start with Existing Partitions"**.
- The "Expert Partitioner" screen will appear showing the list of partitions on our disk in the right-pane. Select the partition reserved for openSUSE Leap 15.2 installation **(/dev/sda8**, in our case). With the partition selected, at the bottom of the screen, click the **"Modify"** button and from the menu that appears select **"Edit Partition ...".** On the next screen select **"Format device"** radio button and select the **"Filesystem"** as **"Ext4"** from the drop-down list box. Select **"Mount device"** radio button and give **"Mount Point"** as **"/"** (root) by typing or selecting from the drop-down list box. Click the "Next" button.

- In the "Expert Partitioner" screen, select the partition reserved for "Swap" device (**/dev/sda7**, in our case). With the partition selected, at the bottom of the screen, click the **"Modify"** button and from the menu that appears select **"Edit Partition ...".** On the next screen select **"Format device"** radio button and select the **"Filesystem"** as **"Swap"** from the drop-down list box. Select **"Mount device"** radio button and give **"Mount Point"** as **"swap"** by typing or selecting from the drop-down list box. Click the "Next" button.

- In the "Expert Partitioner" screen, letter **"F"** will have appeared alongside the openSUSE Leap partition (/dev/sda8) and alongside the "Swap" partition (/dev/sda7) indicating that they will be formatted. Their mount points will also be seen alongside the partitions. Click the "Accept" button.

- Now, the "Suggested Partitioning" screen will show the partition selections as we have decided in the above steps. Click the "Next" button.

- The "Clock and Time Zone" screen appears. Select "Region" as "Asia" and "Time Zone" as "Kolkata" or simply click on the world map given above and click the "Next" button.

- On the next screen, give "User's Full Name", "Username", "Password" and confirm the password. Keep the "Use this password for system administrator" and "Automatic Login" checkboxes as UNCHECKED. Click the "Next" button.

- On the next screen, give password for "root" user and confirm the password. Click the "Next" button.

- The "Installation Settings" screen appears. Click on the **"Booting"** headline.

- The "Bootloader Settings" screen appears. In the "Boot Code Options" tab, keep "Boot Loader" selection as it is by default, that is, "GRUB2".

- **UNCHECK the "Boot From Master Boot Record" checkbox and CHECK the "Boot From Partition" checkbox**. Click the "OK" button.

- Back on "Installation Settings" screen, under the "Booting" headline, a message in red will have appeared saying that "the installer will not modify the MBR of the disk".

- Click the **"Install"** button.

- An error message may appear warning again that the installer will not modify the MBR of the disk and because of it the system may not be bootable. Ignore this message and click the "Continue" button.

- The "Confirm Installation" window appears. Click the "Install" button on this window.
- The installation process begins and the next screen shows the installation progress.
- Once the installation is complete, the machine will reboot automatically. Remove the openSUSE Leap bootable CD/DVD or USB pendrive from the machine.

Making Entry Of openSUSE Leap In Ubuntu GRUB

- As we have chosen to install openSUSE Leap Bootloader on its own partition, we cannot boot into openSUSE Leap easily as of now.
- We need to make entry of openSUSE Leap into our Ubuntu GRUB, which in turn, has its entry in the Windows BootMgr.
- Boot into the installed Ubuntu.
- Open the "Terminal" and give the following command:

  > **sudo update-grub2**

  (Give root password)

  This command will find the newly installed openSUSE Leap on /dev/sda8 and will automatically make its entry in the Ubuntu GRUB and will update the Ubuntu GRUB accordingly.
- Reboot the machine and go into Ubuntu GRUB. You will find the new entry of openSUSE Leap 15.2 in the Ubuntu GRUB. Go to the openSUSE Leap entry using arrow keys and press "Enter" key to boot from openSUSE Leap.