

# IOT and Applications (Internet of Things)

## Lab session-2

**Practical-2:** Study of Different Operating System for Raspberry-Pi/Arduino Board. Understanding the process of OS Installation on Raspberry-Pi/Arduino Board.

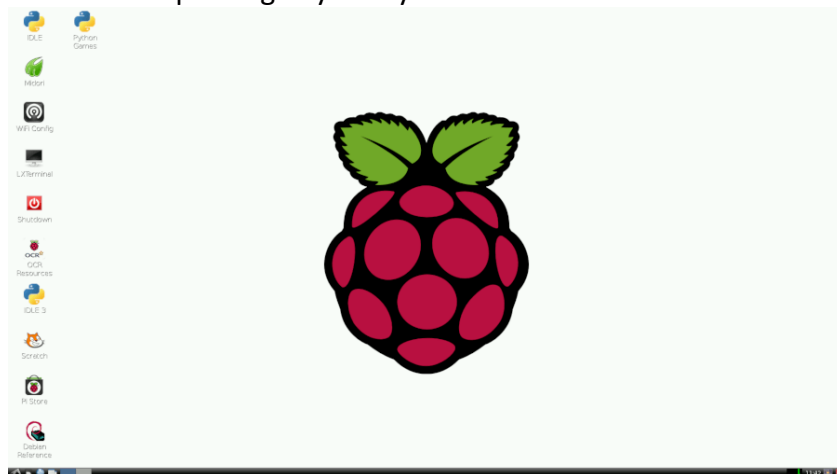
### **Raspberry-Pi Board**

- The Raspberry Pi supports several OSes and as such usually comes without one. Most of the time, however, it ships with an SD card that includes NOOBS (New Out of the Box Software) – an OS that includes of a variety of Operating Systems from which you can choose which to or you to choose which to run on your Raspberry Pi setup.

### ❖ Different Operating System for Raspberry-Pi Board:

#### 1) Raspbian

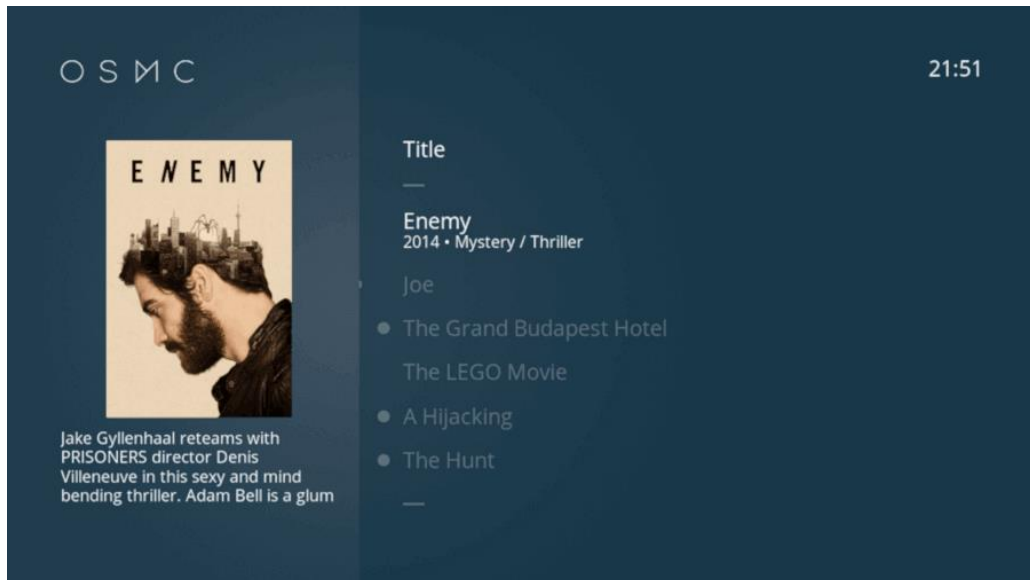
- Raspbian is a Debian-based engineered especially for the Raspberry Pi and it is the perfect general-purpose OS for Raspberry users.
- It employs the Open box stacking window manager and the Pi Improved Xwindows Environment Lightweight coupled with a number of pre-installed software which includes Minecraft Pi, Java, Mathematica, and Chromium.
- Raspbian is the Raspberry foundation's official supported OS and is capable of accomplishing any task you throw at it.



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## 2) OSMC

- OSMC (Open-Source Media Center) is a free, simple, open-source, and easy-to-use standalone Kodi OS capable of playing virtually any media format.
- It features a modern beautiful minimalist User Interface and is completely customizable thanks to the several built-in images that it comes with. Choose OSMC if you run the Raspberry Pi for managing media content.



## 3) Open ELEC

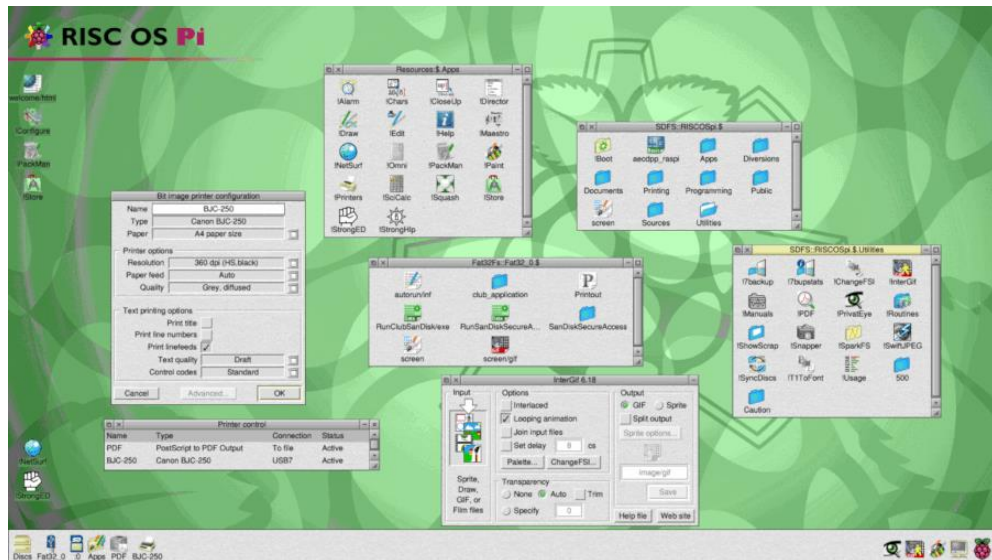
- Open ELEC (Open Embedded Linux Entertainment Center) is a small Linux-based JeOS (Just enough Operating System) developed from scratch to turn PCs into a Kodi media center.
- You can think of Open ELEC as a barebones Kodi as it has fewer customization options and limits access to certain areas e.g. SSH and it is more complex to customize.
- Nevertheless, Open ELEC is a powerful media center that might suit your needs if OSMC doesn't.



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## 4) RISC OS

- RISC OS is a unique open-source OS designed specifically for ARM processors by the creators of the original ARM. It is neither related to Linux nor Windows and is being maintained by a dedicated community of volunteers.
- If you want to choose RISC OS, you should know that it is very different from any Linux distro or Windows OS you have used so it will take some getting used to.



## 5) Windows IOT Core

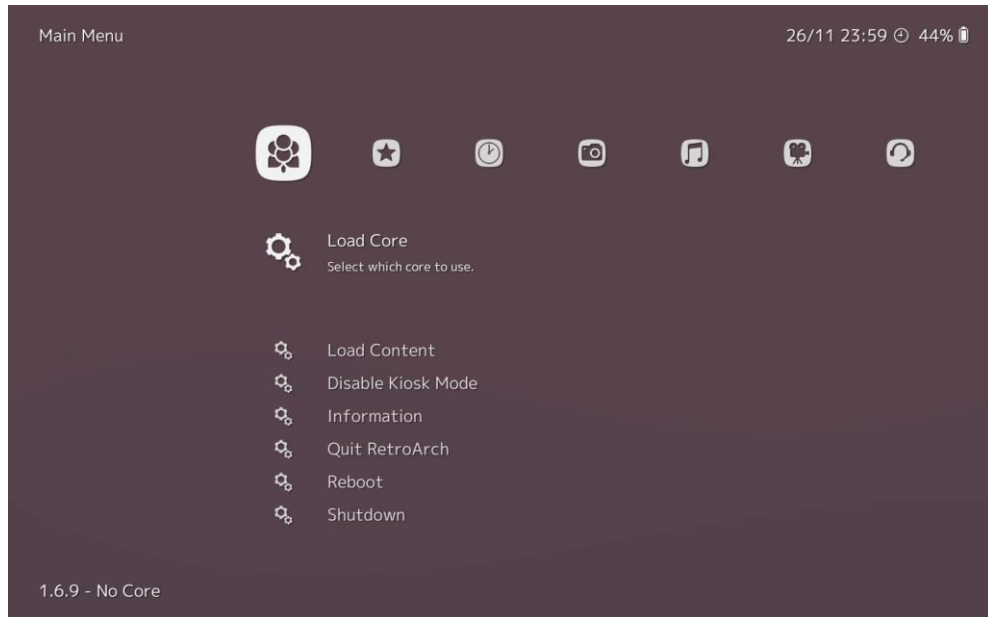
Windows IoT Core is a Windows OS built especially for the Raspberry Pi as a development platform for programmers and coders. Its aim is for programmers to use it to build prototypes of IoT devices using the Raspberry Pi and Windows 10.



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## 6) Lakka

- Lakka is a free, lightweight, and open-source distro with which you can turn even the smallest PC into a full-blown game console without the need for a keyboard or mouse.
- It features a beautiful User Interface and so many customization options you might get overwhelmed. Its PS4-like UX brings style to the Raspberry Pi so pick it if you're a gamer.



## 7) Rasp BSD

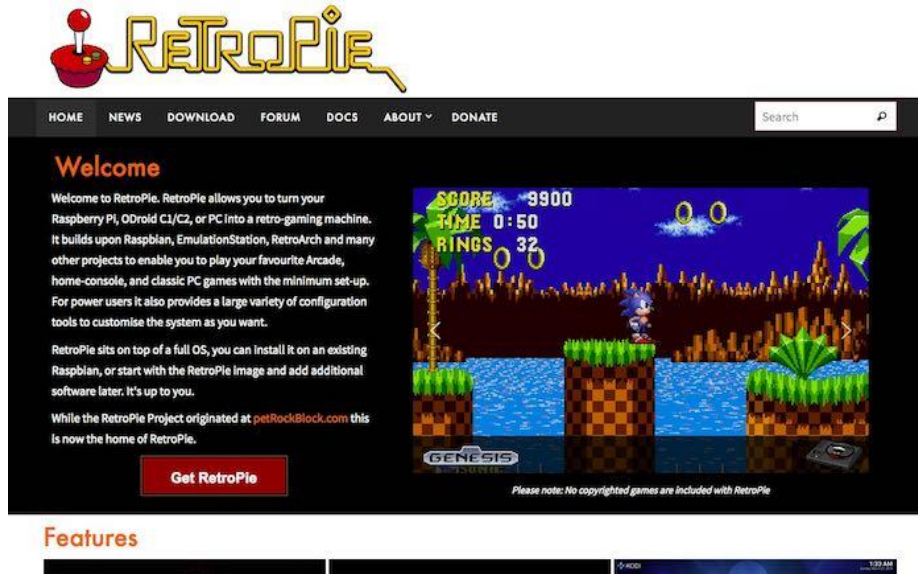
- Rasp BSD is a free and open-source image of FreeBSD 11 that has been preconfigured in 2 images for Raspberry Pi computers.
- If you didn't know, FreeBSD isn't Linux, but it works in pretty much the same way as it is a descendant of the research by the Berkeley Software Distribution and it is among the world's most broadly used Operating Systems today with its code existing in-game consoles e.g. PlayStation 4, macOS, etc.



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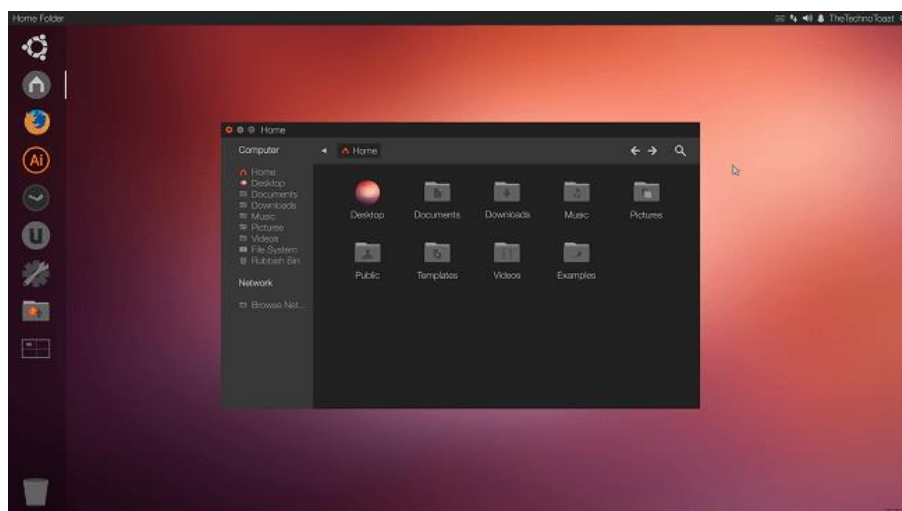
## 8) Retro Pie

- RetroPie is an open-source Debian-based software library with which you can emulate retro games on your Raspberry Pi, PC, or ODroid C1/C2 and it currently stands as the most popular option for that task.
- RetroPie used the Emulation Station frontend and SBC to offer users a pleasant retro gaming experience so you can't go wrong with it.



## 9) Ubuntu Core

- Ubuntu Core is the version of Ubuntu designed for Internet of Things applications. Ubuntu is the most popular Linux-based Operating System in the world with over 20+ derivatives and given that it has an active and welcoming forum, it will be easy to get up and running with Ubuntu Snappy Core on your Raspberry Pi.

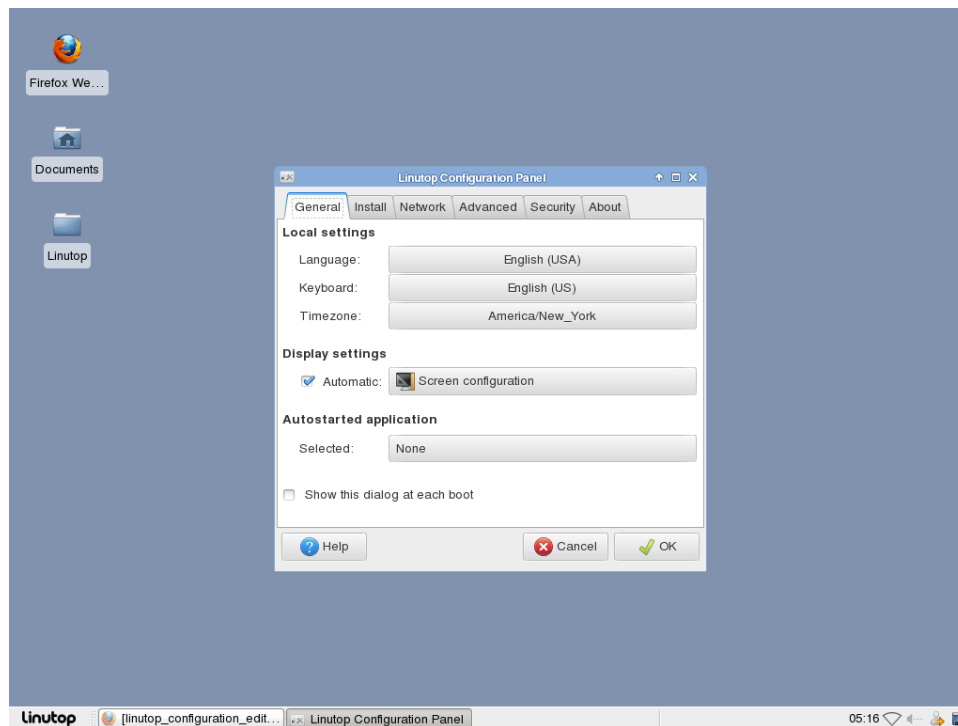




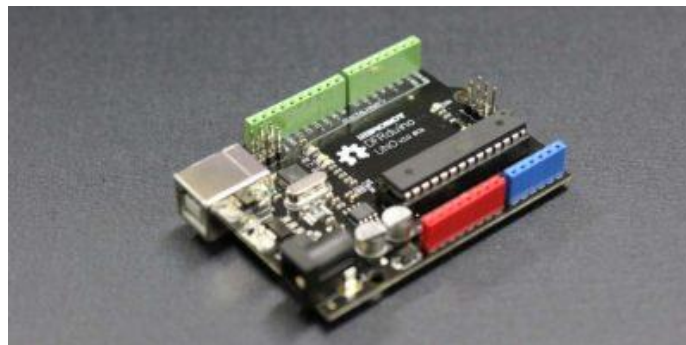
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## 10) Linutop

- Linutop OS is a secure Raspbian-based Web Kiosk and digital signage player. It is dedicated to professionals with the need to deploy public Internet stalls and digital signage solutions using Raspberries.
- This OS is perfect if you run hotels, restaurants, shops, city halls, offices, museums, etc. and it is compatible with Raspberry Pi B, B+ and 2.



## Arduino Board



Arduino IDE is designed to run well on Windows 10, macOS, and Linux. However, in contrast to Raspberry Pi, which is a fully-fledged computer, Arduino runs as a single-board microcontroller. Therefore, a real time

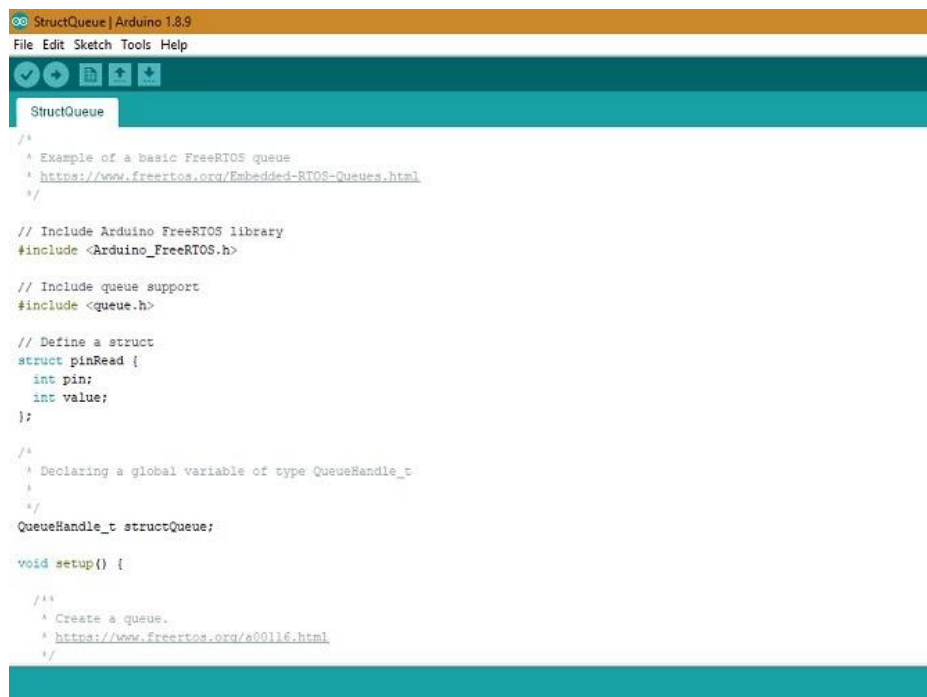
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operating system (RTOS) is preferred in actual Arduino projects since it has a smaller footprint, better control over the tiny peripherals, and no buffering delays.

## ❖ Different Operating System for Arduino Board:

### 1) Free RTOS

- Some of the advantages of Free RTOS include over the air (OTA) updates, an exhaustive collection of IoT libraries, managing data sharing and hardware resources across multiple tasks, and more predictable memory use.



```

StructQueue | Arduino 1.8.9
File Edit Sketch Tools Help

StructQueue

/*
 * Example of a basic FreeRTOS queue
 * https://www.freertos.org/Embedded-RTOS-Queues.html
 */

// Include Arduino FreeRTOS library
#include <Arduino_FreeRTOS.h>

// Include queue support
#include <queue.h>

// Define a struct
struct pinRead {
    int pin;
    int value;
};

/*
 * Declaring a global variable of type QueueHandle_t
 */
QueueHandle_t structQueue;

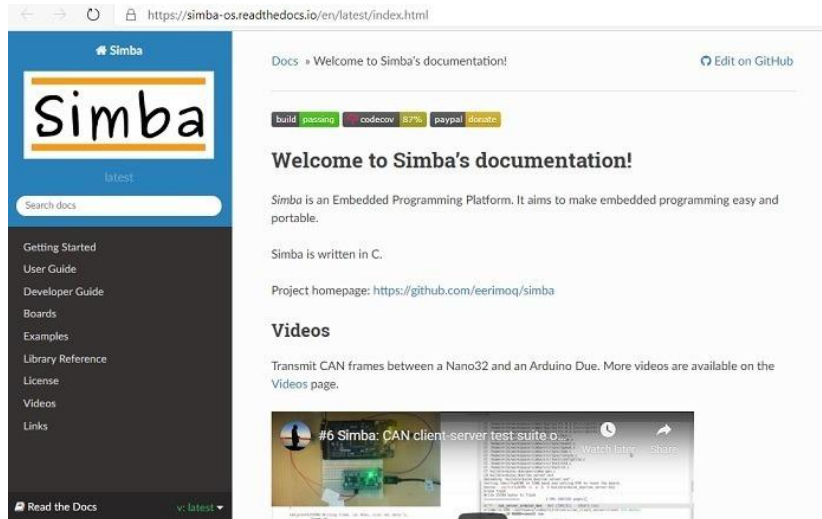
void setup() {

    /*
     * Create a queue.
     * https://www.freertos.org/a00116.html
     */
  
```

### 2) Simba

- If you want extensive support for all kinds of Arduino boards on a dedicated embedded platform, Simba offers a brilliant option. Not only does it support Arduino Uno and Mega, but also Zero, Due, Nano32, Pro Micro, and more.
- Among the advantages of Simba are a simple shell design, fast debugging, and a fairly extensive standard library that is comprised of a vast range of functions from USB to Math, sensors, and global navigation satellite systems.

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## 3) Trampoline

- In embedded industry parlance, a trampoline refers to short snippets of code which execute other lines of code. This has inspired a no-frills static RTOS for small embedded systems called Trampoline. It is available as a GitHub project and runs on Arduino Uno and Mega boards.
- The main advantages of Trampoline include real time predictability, support for very low RAM (32 kB), ROM (128 kB), and CPU (16 bit). What this means is that Trampoline has been designed for tiny cyber physical systems such as miniature drones and digital controllers such as brakes.

## 4) Duin OS

Based on Free DOS, an open-source operating system, Duin OS is an RTOS designed exclusively for Arduino boards. It currently supports Free RTOS-based embedded projects which are available as a GitHub repository.

The advantages of Duin OS include basic multitasking and multi-threading, low RAM and CPU requirements and efficient signaling.

## Understanding the process of OS Installation on Raspberry-pi/Arduino Board.

### ➤ HOW TO INSTALL RASPBIAN OS IN YOUR RASPBERRY PI:

**Step 1:** Download the Required Software and Files.

**Step 2:** Get the SD Card and the Card Reader.

**Step 3:** Check the Drive in Which the SD Card Is Mounted.



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**Step 4:** Format the SD Card.

**Step 5:** Write the **OS** on the SD Card.

**Step 6:** Eject the SD Card.

➤ **HOW TO INSTALL OS IN YOUR ARDUINO:**

**Step 1:** On your host computer, goto <https://create.arduino.cc/>. Click Getting Started.

**Step 2:** Click Set up a generic Intel® IoT Platform.

**Step 3:** If you already have an Arduino Create account, provide your login credentials. If you don't, see the note below to create a new account.

**Step 4:** Click I'M UNSURE IF AN OS IS CURRENTLY INSTALLED ON MY DEVICE.

**Step 5:** Enter a new user name and password to use to log in to your target platform.

**Step 6:** If you need to specify proxy settings, click Set it up here and provide any required proxy information. Click DONE.

**Step 7:** When finished, click NEXT to continue with the setup.

**Step 8:** Select Ubuntu to install on your target platform, then click Download OS.