

Getting Started with LITMUS^{RT} @ TuToR 2016

What is LITMUS^{RT}?

LITMUS^{RT} is a real-time extension of the Linux kernel with a focus on multiprocessor real-time scheduling and synchronization that has been continuously maintained and updated since 2006. In the past decade, LITMUS^{RT} has been employed by several groups in North and South America, Europe, and Asia, and to date has played a part in over [45 conference and workshop papers and eight MSc and PhD theses](#).

Tutorial Overview

This tutorial is aimed at researchers and practitioners interested in using LITMUS^{RT} as a development and evaluation platform. It will get participants up-to-speed on how to use a LITMUS^{RT}-equipped Linux system as the foundation for the development and assessment of real-time workloads.

One area of emphasis will be the use of LITMUS^{RT}'s built-in tracing capabilities to record and evaluate scheduling traces (e.g., to observe actual execution costs, deadline miss ratios, tardiness, preemption and migration counts, etc.), and to measure system overheads (e.g., scheduling and context switch overheads, release latency, etc.).

The second focus area will be the development of custom real-time tasks that link against `liblrmus`, LITMUS^{RT}'s user-space library.

Prerequisites

- Basic familiarity with the Linux shell.
- A working knowledge of software development with C in a Linux environment (and related command-line tools such as `make`).
- A basic understanding of real-time scheduling.
- A laptop (either Windows, Mac, or Linux) with at least 10GiB of free disk space and sufficient RAM to comfortably run a large VM.
- Completion of the setup instructions prior to the event (a large download is required, see below).

Setup Instructions

These instructions are also available in [PDF format for download](#) for offline reference.

We have built a pre-packaged VirtualBox image running a LITMUS^{RT}-based Xubuntu distribution. The image comes pre-installed with all required libraries and tools.

First, download and install the latest version of VirtualBox:

- <https://www.virtualbox.org/wiki/Downloads>

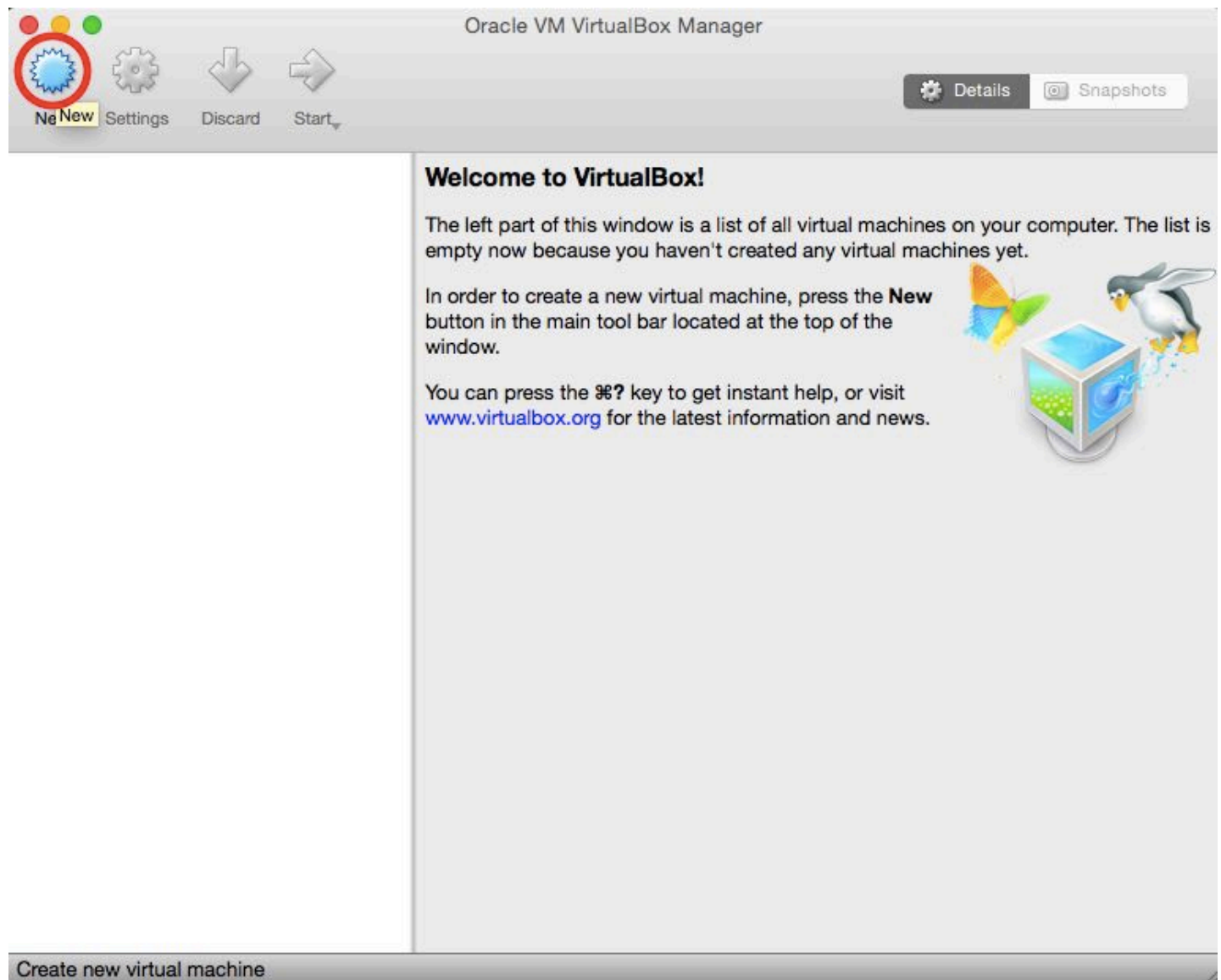
(Note: we recommend using the pre-built binaries.)

Second, download and unpack the LITMUS^{RT} Xubuntu Image for VirtualBox (3.0 GiB):

- <http://www.litmus-rt.org/tutor16/litmus-2016.1.qcow.gz>

Third, create a new guest VM based on the downloaded image. The following steps describe how to create a new guest in VirtualBox using the provided image.

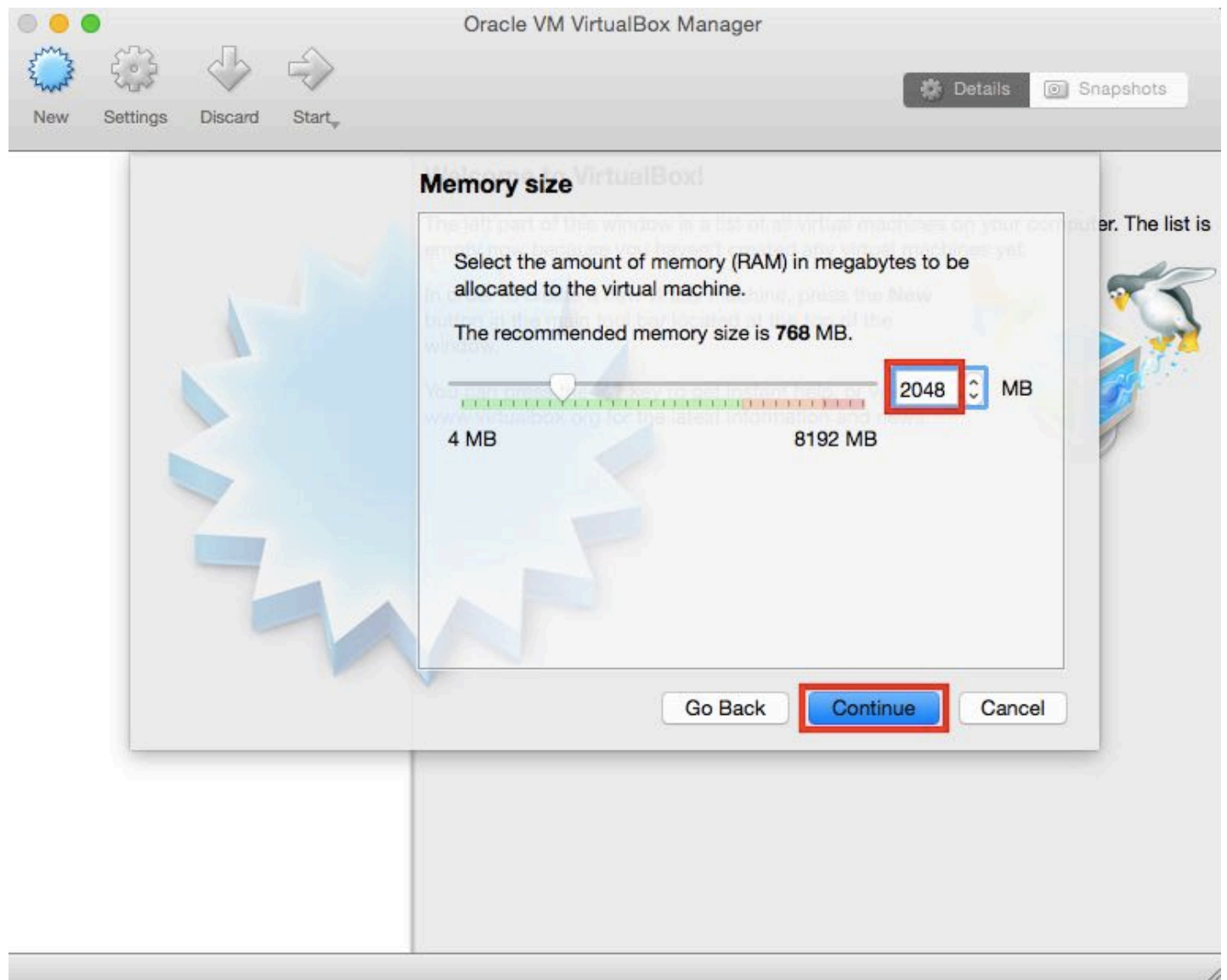
1) Create a new VirtualBox image by clicking the “New” button.



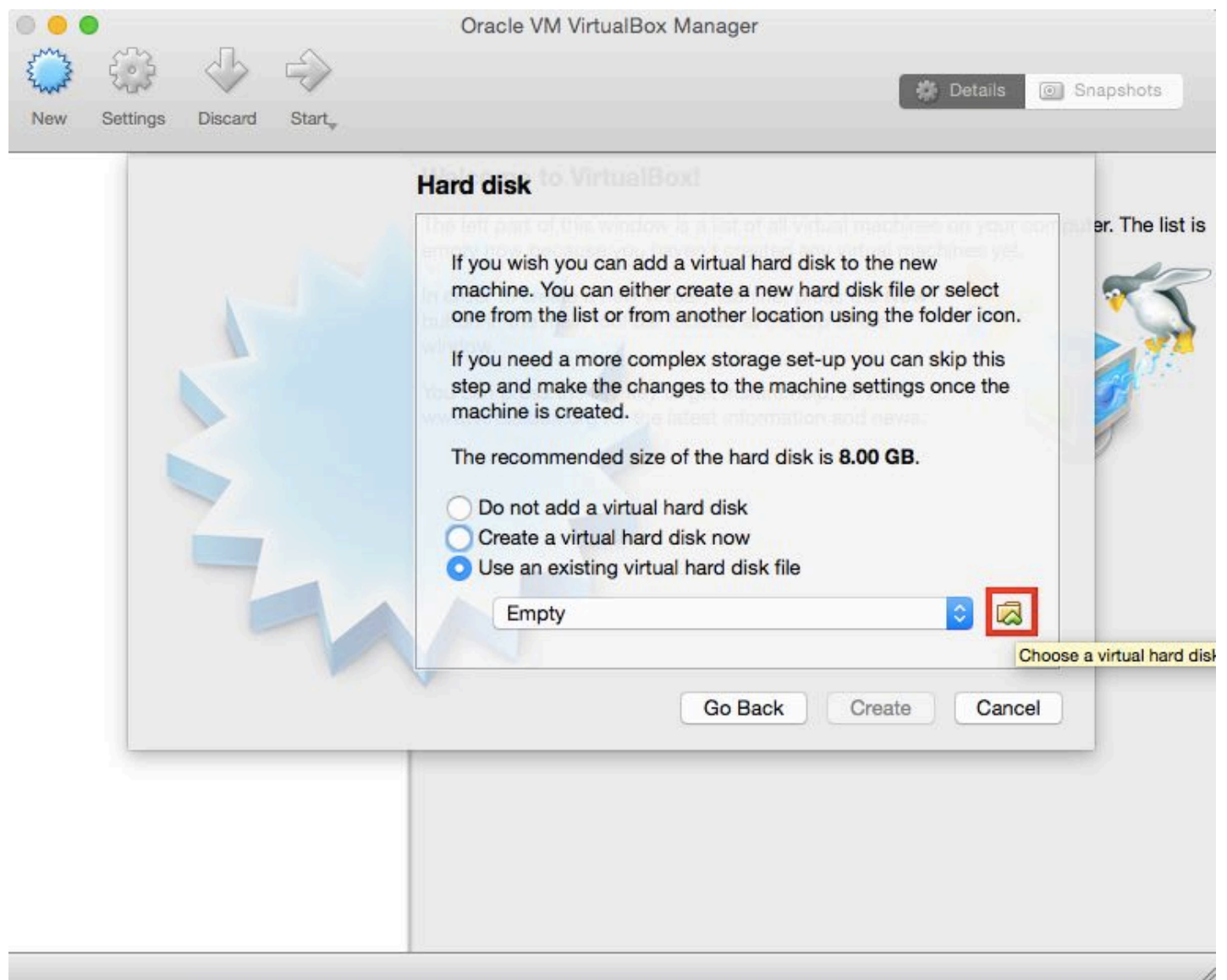
2) Select “Ubuntu (64-bit)” as the distro and hit “Continue.”



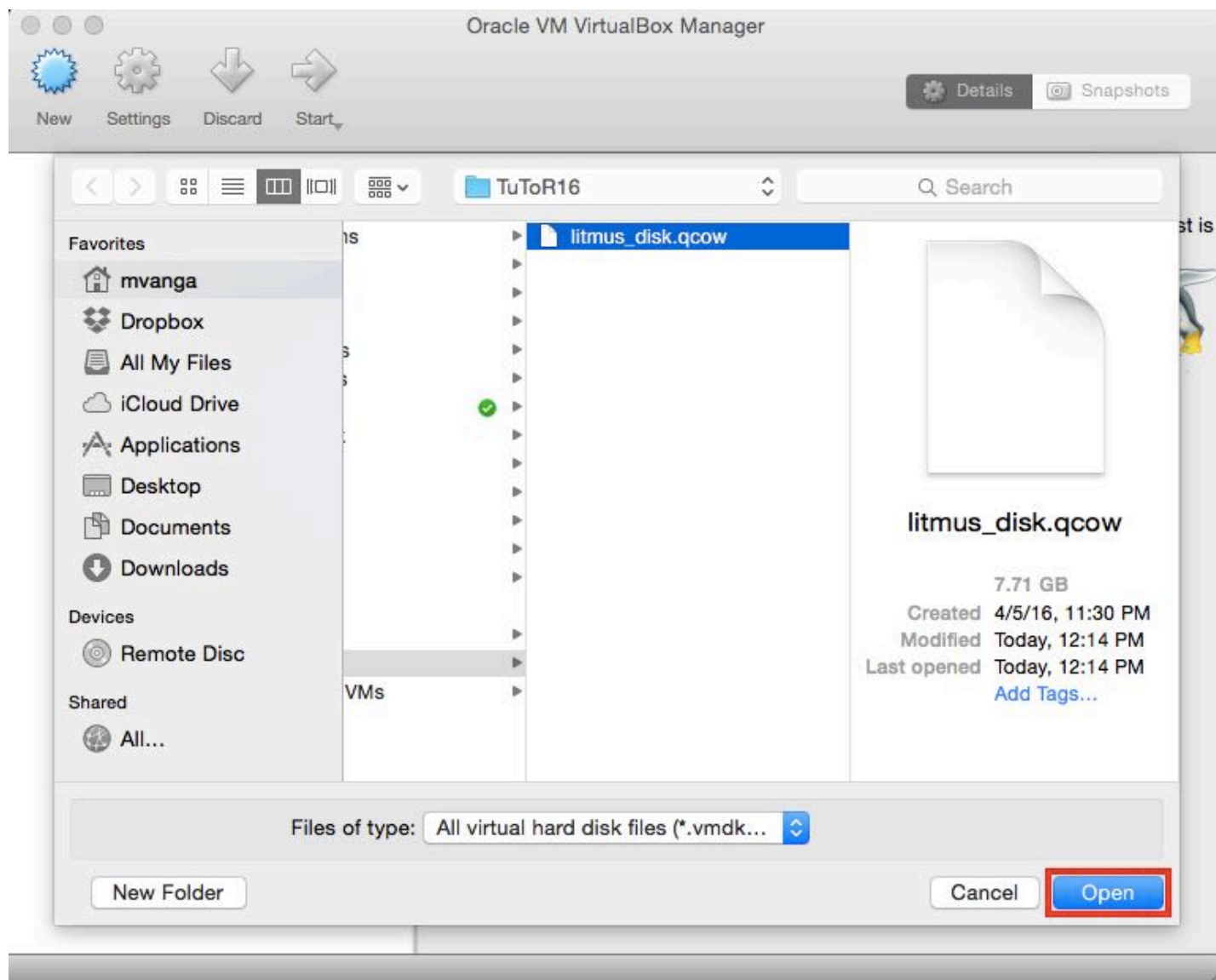
3) Ensure that the machine has sufficient RAM. We recommend 2GB for following along with the tutorial.



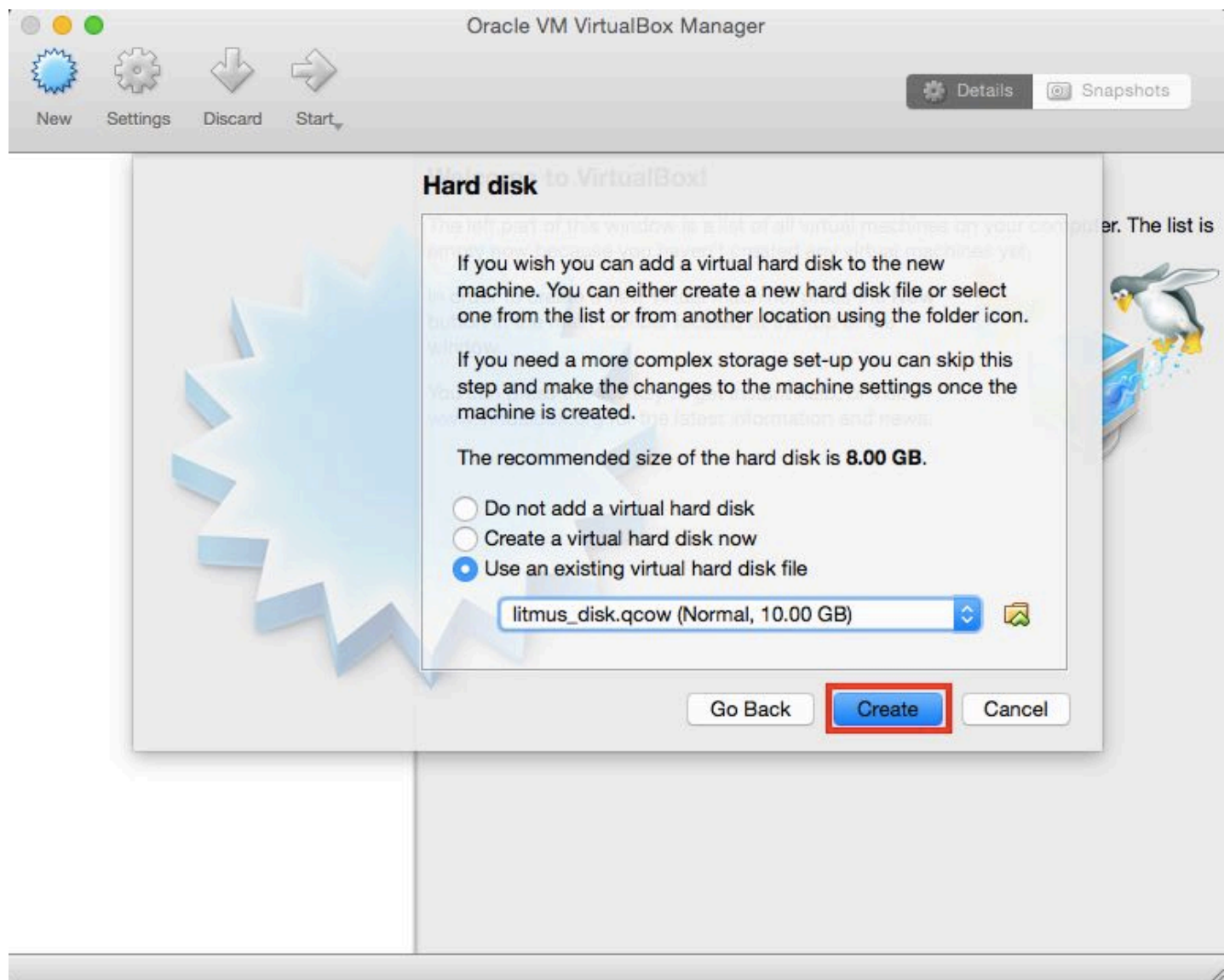
4) Select “Use an existing virtual hard disk file” and click the button to choose a disk image.



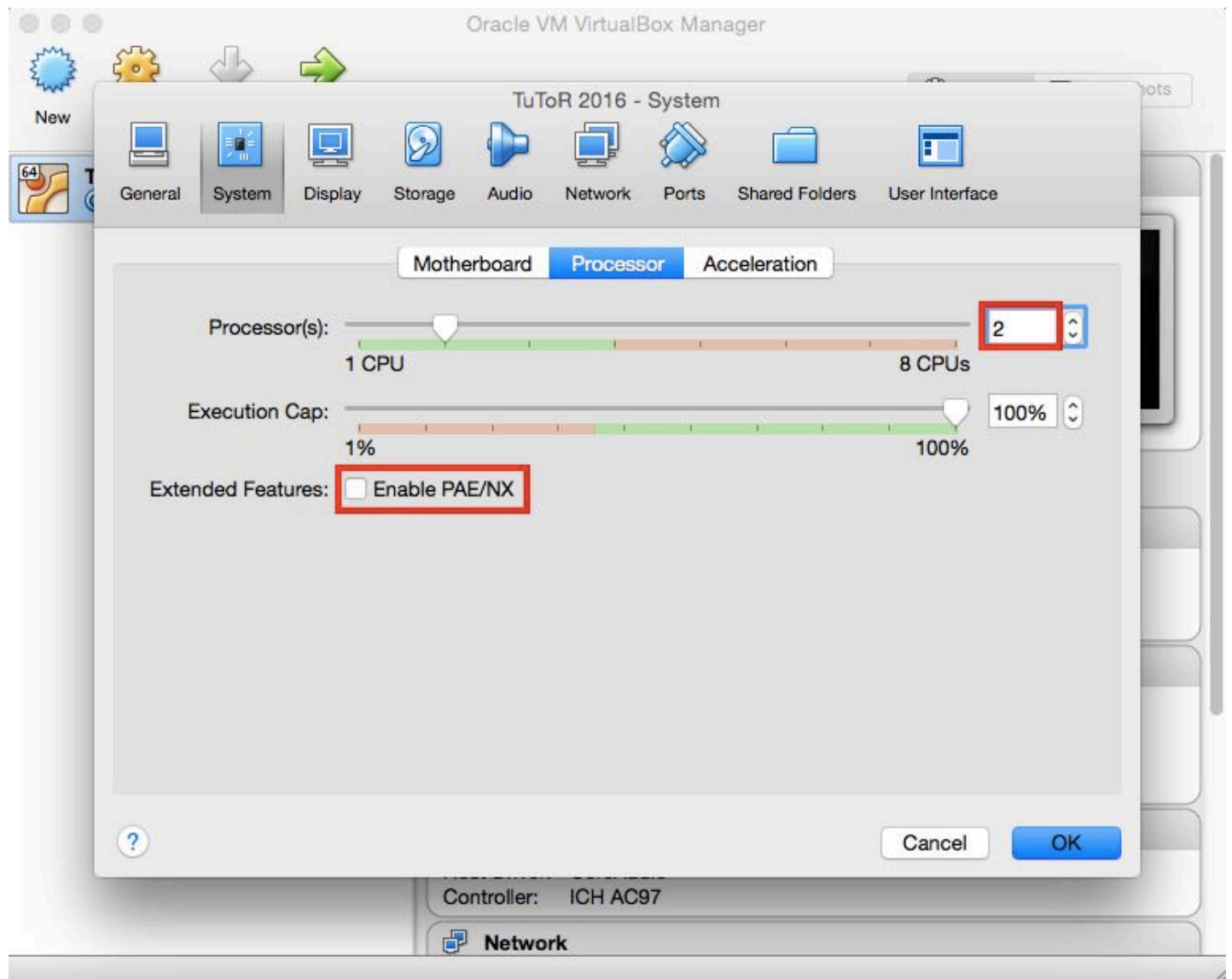
5) Navigate to and select the LITMUS^{RT} QCOW image and hit “Open.”



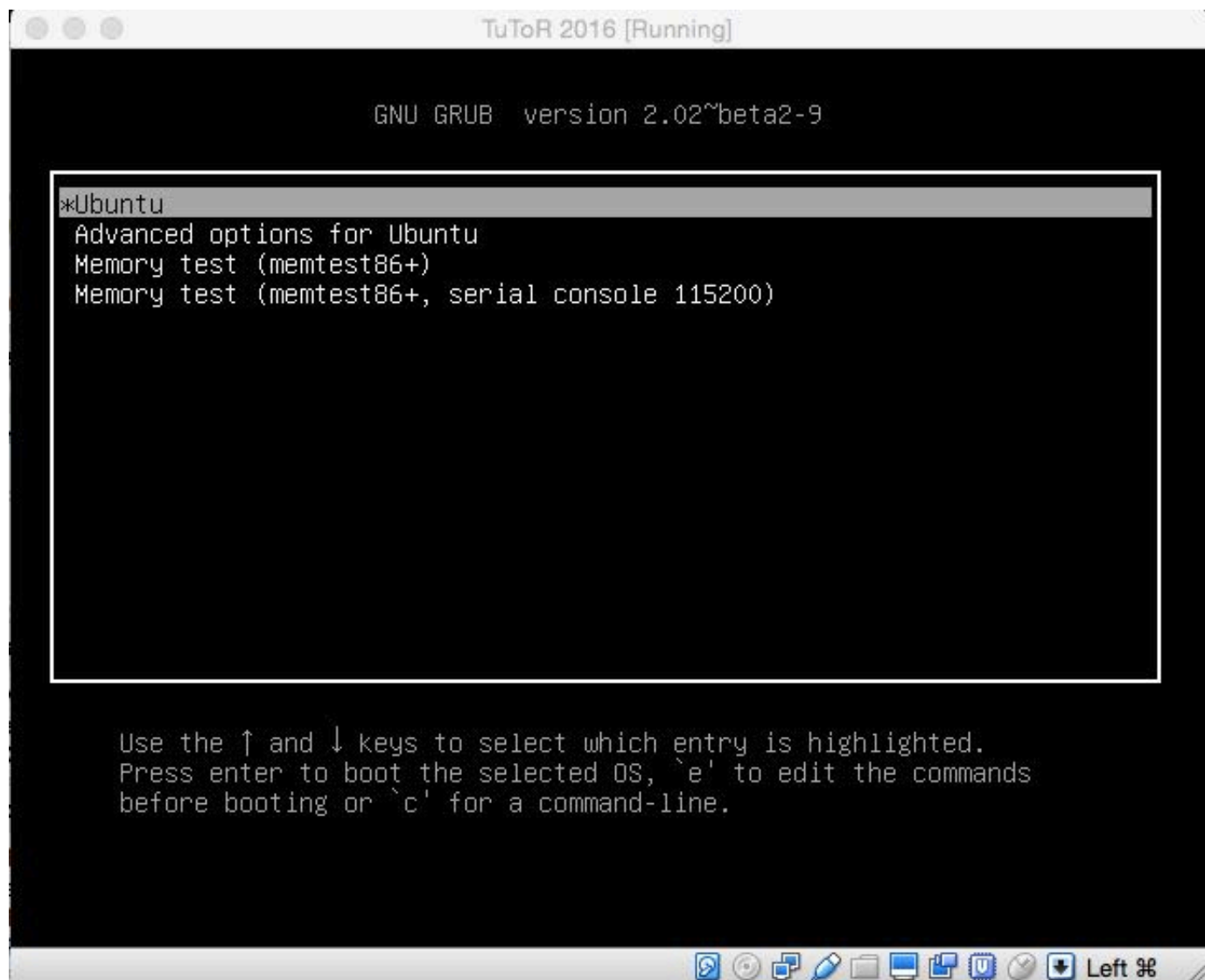
6) Now simply click “Create” and the virtual machine should be created.



7) Before booting up, click “Settings > System > Processor” and ensure that 2 processors are selected and that PAE/NX is disabled.



8) Booting the VM should bring up GRUB. The first option (Ubuntu) boots by default into LITMUS^{RT}.



Login information

You may log in with the following credentials:

1. regular user account:
 - User name: `litmus`
 - Password: `litmus`
2. super user account:
 - User name: `root`
 - Password: `litmus`

All LITMUS^{RT}-related files (including source code) are installed under the `/opt` directory.

Manual: A Guide to LITMUS^{RT}

The material covered in the tutorial (how to select scheduling policies, how to launch tasks, how to create new tasks, how to trace, etc.) is also made available as a manual for later reference.

The manual is available online in both HTML and PDF format.

- [A guide to LITMUS^{RT} \(HTML\)](#), best for online reading.
- [A guide to LITMUS^{RT} \(PDF\)](#), best for offline reading.

Reading the manual prior to the tutorial is not required, but recommended.