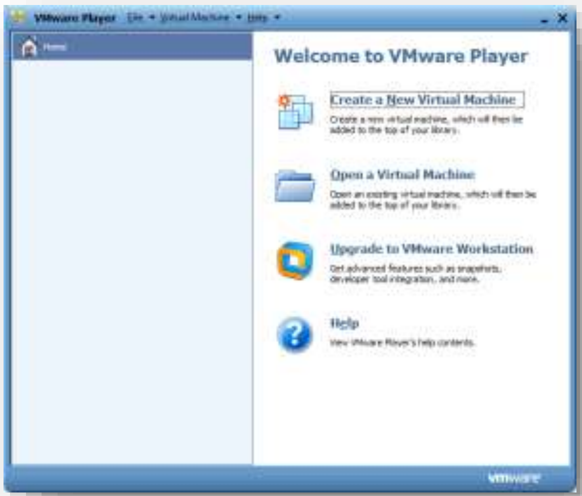
Tutorial: MQTT (Message Queuing Telemetry Transport)

1 Linux Ubuntu Computer

Boot your computer on Linux or use a VMware workstation

1.1 Installing Ubuntu in a VM on Windows

1. Download the Ubuntu iso (desktop not server) and the free VMware Player.
2. Install VMware Player and run it, you'll see something like this:



Welcome to VMware Player

Create a New Virtual Machine
Create a new virtual machine, which will then be added to the top of your library.

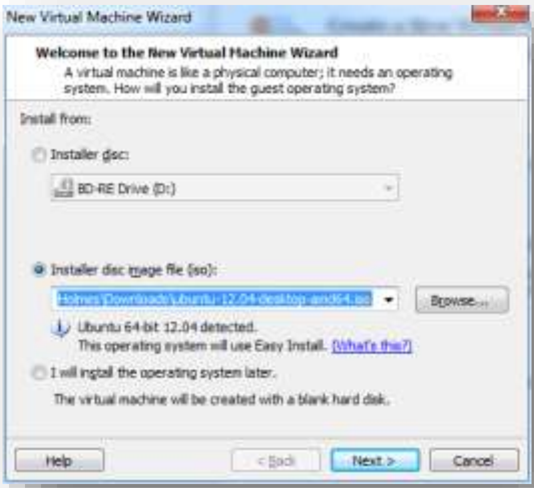
Open a Virtual Machine
Open an existing virtual machine, which will then be added to the top of your library.

Upgrade to VMware Workstation
Get advanced features such as snapshots, developer tool integration, and more.

Help
View VMware Player's help contents.

3. Select "Create a New Virtual Machine"
4. Select "Installer disc image file" and browse to the Ubuntu iso you downloaded.

You should see that it will use Easy Install – this takes



New Virtual Machine Wizard

Welcome to the New Virtual Machine Wizard
A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

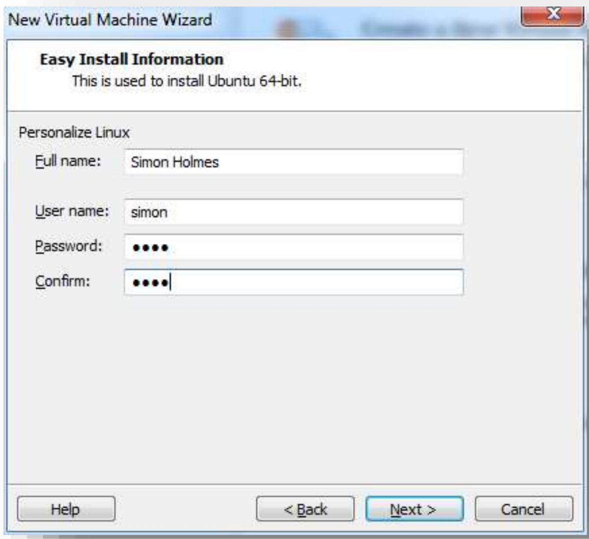
Installer disc:
BD-RE Drive (D:)

Installer disc image file (iso):
Holmes\Downloads\ubuntu-12.04-desktop-amd64.iso

Ubuntu 64-bit 12.04 detected.
This operating system will use Easy Install. (What's this?)

I will install the operating system later.
The virtual machine will be created with a blank hard disk.

5. Enter your full name, username and password and hit next



New Virtual Machine Wizard

Easy Install Information
This is used to install Ubuntu 64-bit.

Personalize Linux

Full name: Simon Holmes
User name: simon
Password: ••••
Confirm: ••••

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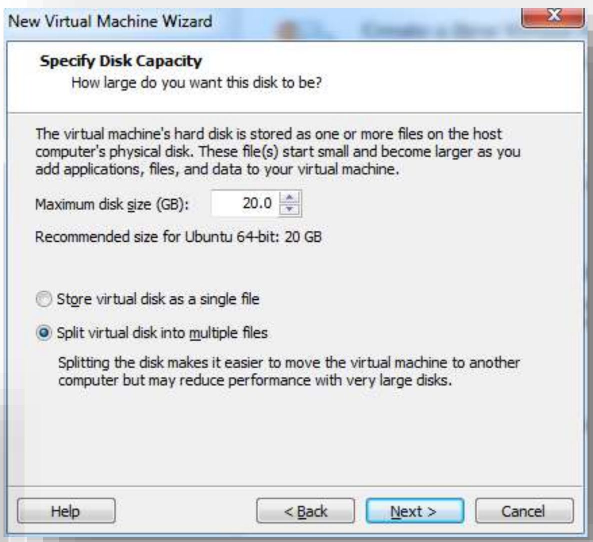
6. Select the maximum disk size and type. Unless you're planning on some really CPU intensive work inside the VM, select the "Split virtual disk into multiple files" option. Hit next when you're happy with the settings.


New Virtual Machine Wizard

Specify Disk Capacity
How large do you want this disk to be?

The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.

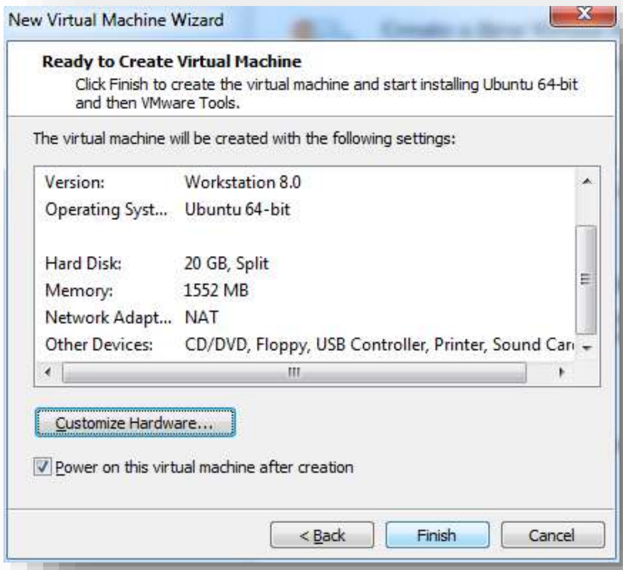
Maximum disk size (GB): 20.0

Recommended size for Ubuntu 64-bit: 20 GB

○ Store virtual disk as a single file

● Split virtual disk into multiple files

Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.


New Virtual Machine Wizard

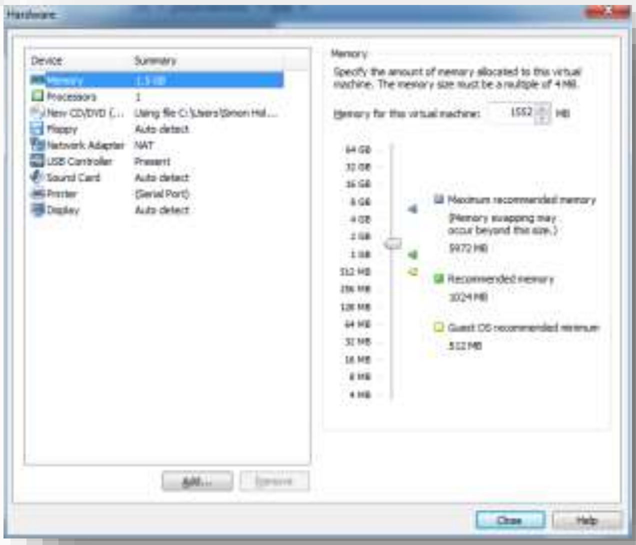
Ready to Create Virtual Machine
Click Finish to create the virtual machine and start installing Ubuntu 64-bit and then VMware Tools.

The virtual machine will be created with the following settings:

Version:	Workstation 8.0
Operating Syst...	Ubuntu 64-bit
Hard Disk:	20 GB, Split
Memory:	1552 MB
Network Adapt...	NAT
Other Devices:	CD/DVD, Floppy, USB Controller, Printer, Sound Car

7. This brings you to the confirmation page. Click "Customize Hardware"

8. In the hardware options section select the amount of memory you want the VM to use. In this instance I've gone for 1.5GB out of the 8GB installed in my laptop. Leave everything else as it is and click Close.


Hardware

Device	Summary
Memory	1.5 GB
Processors	1
New CD/DVD (...	Using file C:\Users\Simon Hol...
Floppy	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	(Serial Port)
Display	Auto detect

Memory

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine: 1552 MB

Maximum recommended memory (Memory swapping may occur beyond this size.) 5972 MB

Recommended memory 1024 MB

Guest OS recommended minimum 512 MB

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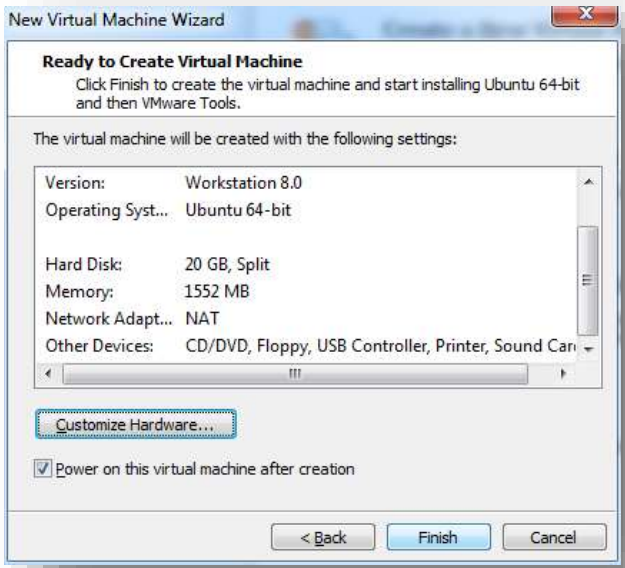
9. This brings you back to the confirmation page. Click Finish this time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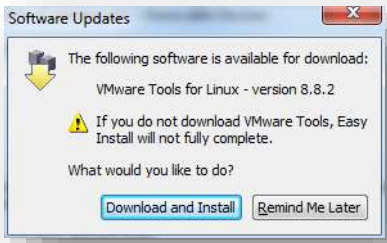
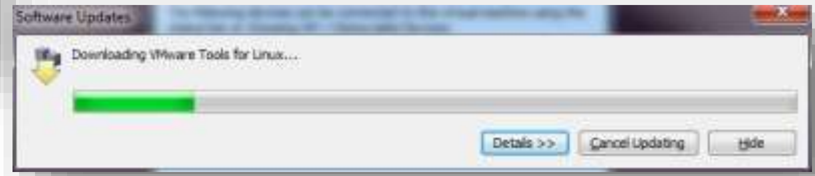

Software Updates

The following software is available for download:
VMware Tools for Linux - version 8.8.2
If you do not download VMware Tools, Easy Install will not fully complete.
What would you like to do?

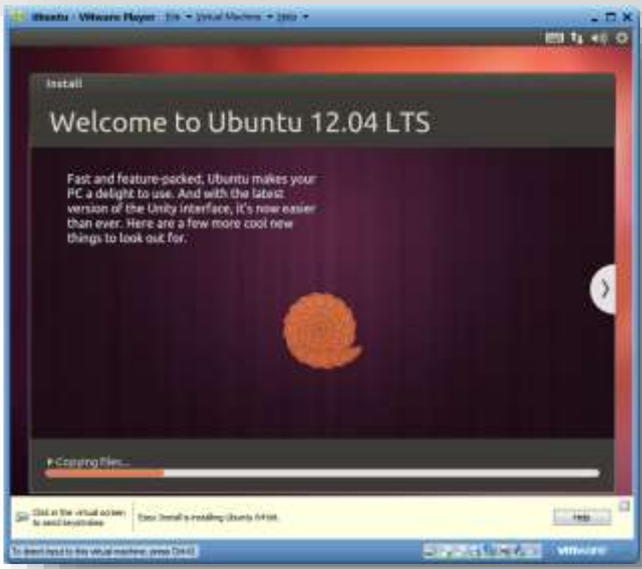
10. You will probably be prompted to download VMware Tools for Linux. Click "Download and Install" to continue

11. Wait for it to install


Software Updates

Downloading VMware Tools for Linux...

12. Ubuntu will then start to install, so keep waiting (or do what I did and go to bed!)


Install

Welcome to Ubuntu 12.04 LTS

Fast and feature-packed, Ubuntu makes your PC a delight to use. And with the latest version of the Unity interface, it's now easier than ever. Here are a few more cool new things to look out for.

Copying files...

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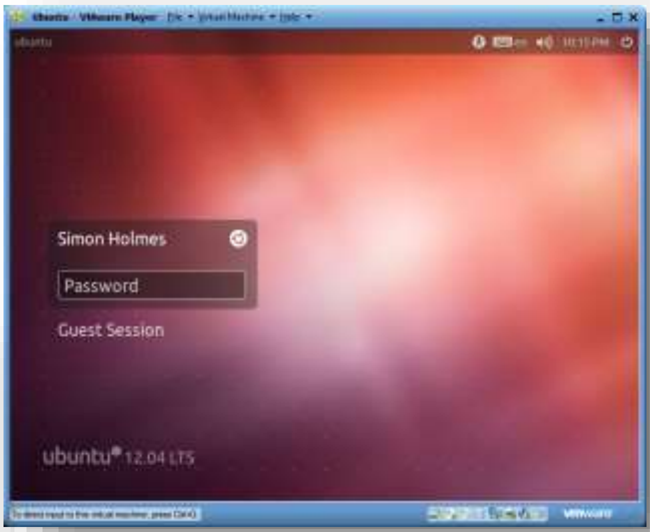
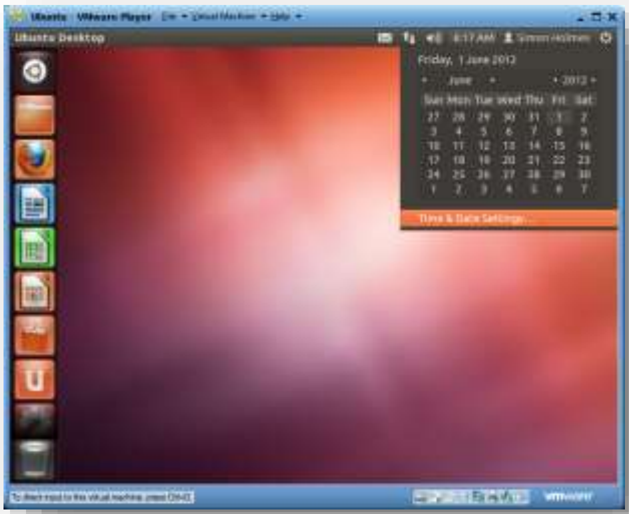
13. When all is done you'll be presented with the Ubuntu login screen. So enter your password and you're on your way.





14. Click the clock in the top right to set your time and date settings

15. Once you've set that up, you're up and running with Ubuntu in VMware Player on your Windows machine. Congratulations and enjoy!

2 Mosquitto

Mosquitto is an open source (BSD licensed) message broker that implements the MQ Telemetry Transport protocol version 3.1. MQTT provides a lightweight method of carrying out messaging using a publish/subscribe model. This makes it suitable for "machine to machine" messaging such as with low power sensors or mobile devices such as phones, embedded computers or microcontrollers like the Arduino.

2.1 Installing Mosquitto

As of version 11.10 Oneiric Ocelot, mosquitto will be in the Ubuntu repositories so you can install as with any other package. If you are on an earlier version of Ubuntu or want a more recent version of mosquitto, add the mosquitto-dev PPA to your repositories list – see the link for details. mosquitto can then be installed from your package manager.

```
sudo apt-add-repository ppa:mosquitto-dev/mosquitto-ppa
sudo apt-get update
```

If the command "apt-add-repository" is not recognized, it can be installed with:

```
sudo apt-get install python-software-properties
```

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3 MQTT Man pages

For more information on MQTT, see http://mqtt.org/ or the Mosquitto MQTT man page.

4 Test Mosquitto with test.mosquitto.org (a MQTT server/broker)

This is test.mosquitto.org. It hosts a publicly available Mosquitto MQTT server/broker. MQTT is a very lightweight protocol that uses a publish/subscribe model. This makes it suitable for "machine to machine" messaging such as with low power sensors or mobile devices.

4.1 The server

The server listens on the following ports:

1883 : MQTT, unencrypted

8883 : MQTT, encrypted

8884 : MQTT, encrypted, client certificate required

8080 : MQTT over WebSockets, unencrypted

8081 : MQTT over WebSockets, encrypted

The encrypted ports support TLS v1.2, v1.1 or v1.0 with x509 certificates and require client support to connect. In all cases you should use the certificate authority file mosquitto.org.crt to verify the server connection. Port 8884 requires clients to provide a certificate to authenticate their connection. If you wish to obtain a client certificate, please get it touch.

You are free to use it for any application, but please do not abuse or rely upon it for anything of importance. You should also build your client to cope with the broker restarting.

Please don't publish anything sensitive, anybody could be listening.

4.2 Caveats

This server is provided as a service for the community to do testing, but it is also extremely useful for testing the server. This means that it will often be running unreleased or experimental code and may not be as stable as you might hope. It may also be. Finally, not all of the features may be available all of the time, depending on what testing is being done. In particular, websockets and TLS support are the most likely to be unavailable.

In general you can expect the server to be up and to be stable though.

4.3 Things that use this service

4.3.1 D3 MQTT topic tree visualizer

http://test.mosquitto.org/sys/ allows to visualize the $SYS tree of the broker. See how the tree change dynamically.

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4.3.2 Demo and manipulation on temperature gauge

http://test.mosquitto.org/gauge/ is an HTML5 canvas gauge for temperature obtained from an MQTT subscribe.

A local process runs every 15 seconds to update the value by adding a random value in the range +/-2 degrees.

Publish to the "temp/random" topic to change the gauge and to test it :

```
mosquitto_pub -h test.mosquitto.org -t temp/random -m 23.0
```

Subscribe to the "temp/random" and see what happen as soon temp/random changes :

```
mosquitto_sub -h test.mosquitto.org -t temp/random -v
```

Write a temperature profile in a file and publish it with time stamps.
Trace in an other file, the change of the temperature through the client/subscribe.

Display and compare both files wth gnuplot (install gnuplot if necessary).