

IBM Blockchain Hands-On Blockchain Explained

Lab One – VM – Exercises



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Overview

The purpose of this lab is to introduce you to the concepts of a blockchain by showing you how a blockchain transfers assets between participants in a business network. We will use car leasing as the scenario for the demo.

Introduction

Pre-requisites:

- 4 cores
- 4GB RAM
- VMWare V10+
- The lab virtual machine

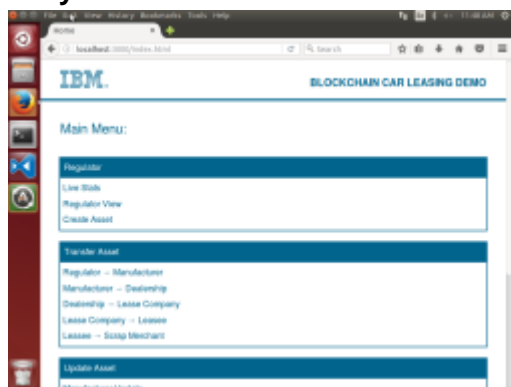
The virtual machine is based on Linux Ubuntu 14.04 and contains Hyperledger Fabric V0.6, Golang, Git, Vagrant, Visual Studio Code with the “Encode Decode” extension and Firefox.

A network needs to be visible to the virtual machine (even if the network is just to the host environment). If you do not see the up/down arrows in the status bar at the top of the screen, or if you receive errors about no network being available, please tell the lab leader. The virtual machine might need to be reconfigured in NAT mode.

There are no additional files or software that is proprietary to the lab in the virtual machine. This means that the lab may be run on a machine without a virtual machine if Hyperledger Fabric and the other pre-requisites have been installed.

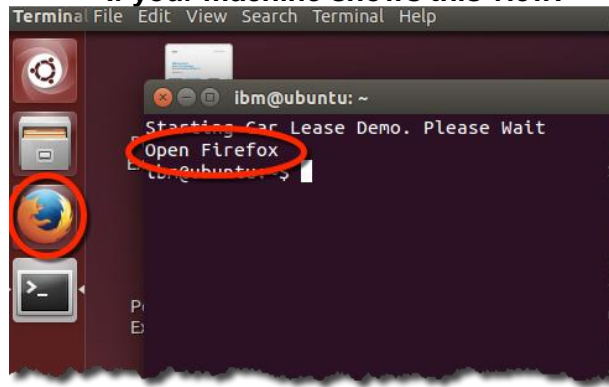
Where to start this guide

If your machine shows this view:



Go to Section 1.

If your machine shows this view:



Go to Appendix A.
Then back to Section1

Section 1. Asset Transfer and Disposal Scenarios

In the following sections, we will discover how blockchain is used to track ownership of an asset across multiple participants in a business network. The scenario describes how blockchain is used to model the lifecycle of vehicle ownership and control between the following participants:

- 1) Manufacturer to Dealership
- 2) Dealership to Leasing Company
- 3) Leasing Company to Leasee
- 4) Leasing Company to Scrap Merchant

The Scrap Merchant's role in this scenario will also demonstrate how asset disposal can be represented on the blockchain.

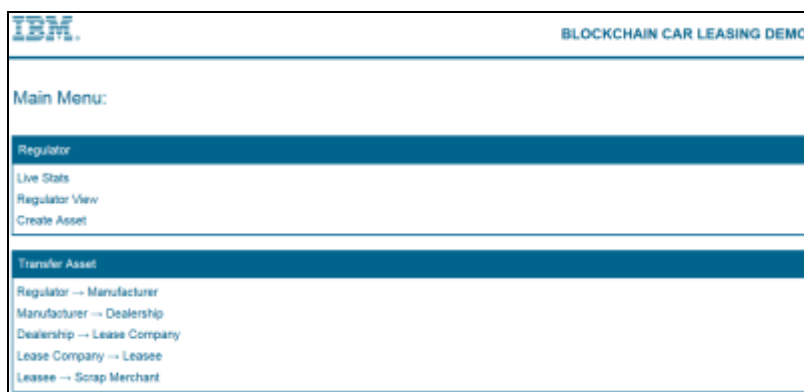
In this scenario each participant has entered into a business agreement with each other and all parties are known and trusted by each other. The above process of transferring vehicles has been negotiated and agreed with all participants. The order in which the above processes take place is strictly defined within the demo showing that for example a Manufacturer cannot transfer directly to a Leasee by missing out the dealership and Leasing company transfers.

These rules have been defined in the smart contract which has been written and signed by the regulator (the DVLA).

1.1. Starting the Asset Transfer Demo

1. Bring up a web browser (Firefox or Chrome are recommended) and go to the URL that your instructor has provided. If you completed Section 1, just use the URL route of the application that you already created.

You should be able to see the Car Leasing main menu.



1.2. Transferring an Asset to a Dealership

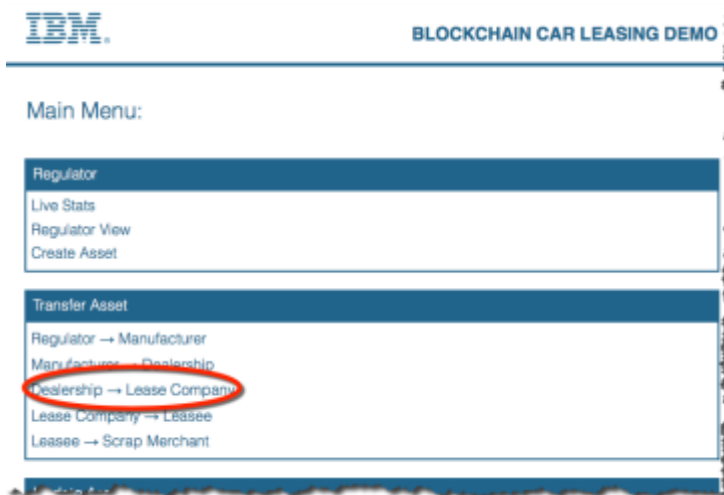
In the following section we will transfer the ownership of a vehicle from a dealership to a leasing company (known as “Beechvale Group”) using the blockchain.

Before transferring the vehicle to the dealership we will verify which assets the target dealership currently owns.

1.2.1. Viewing the Dealership's Assets

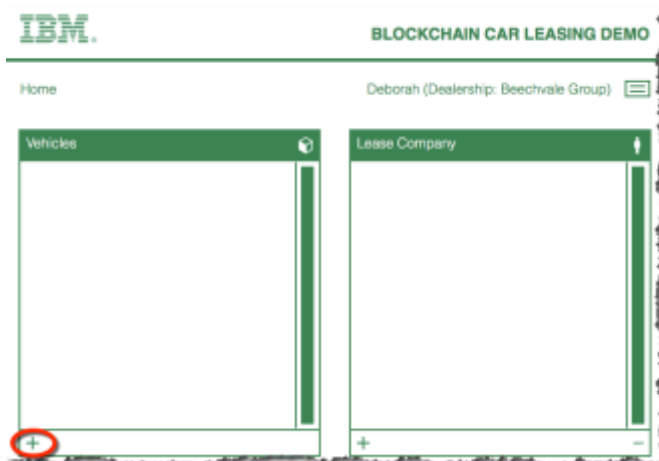
In this section, we will first act as a dealership to verify which assets the Beechvale dealership owns.

__2. From the Main Menu, click '**Dealership -> Lease Company**'.



We now see the application from the point of view of Deborah, who works for the Beechvale Group (a dealership).

__3. Click the plus sign in the '**Vehicles**' window to list the vehicles that are owned by this dealership according to the blockchain.



You should see a number of vehicles displayed. (There might be more or fewer depending on the scenario that has been set up.)

Vehicles			
948881310167423	Toyota Celica, Silver, DG16 FVG		<input type="checkbox"/>
549523556856725	Jaguar F-Type, Red, HE16 WDZ		<input type="checkbox"/>
523447019546831	Land Rover Defender, Silver, EY16 FRV		<input type="checkbox"/>



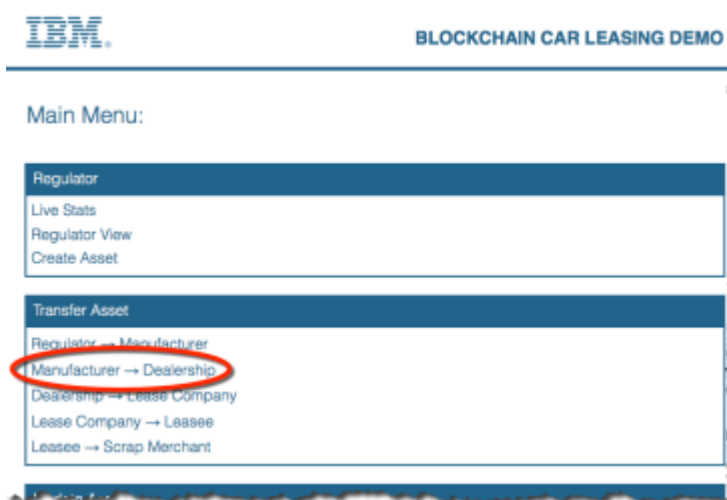
If you see no cars at all, this might be due to a timing issue in the lab environment. Try waiting a few seconds and try the previous step again. If the problem persists, ask the instructor.

- __4. Click the 'X' to dismiss the window and '**Home**' to return to the main menu.

1.2.2. Transferring the Asset

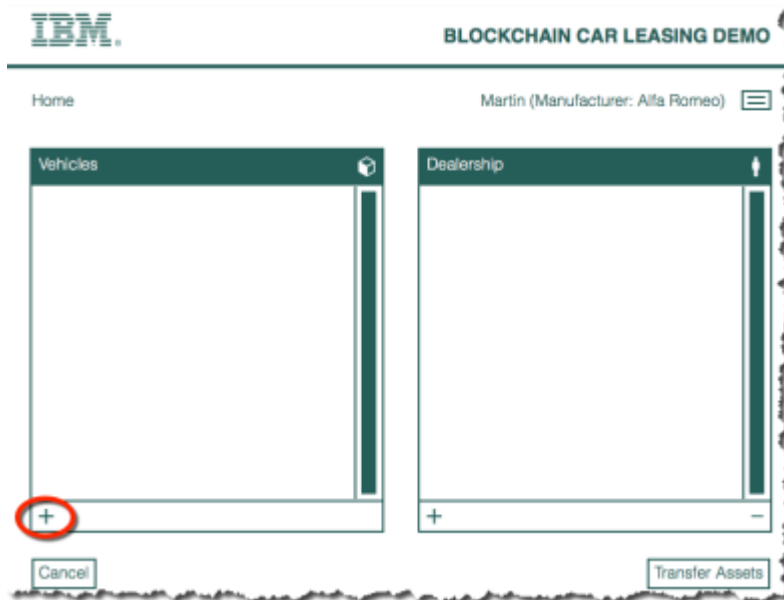
We will now transfer an Alfa Romeo car to the Beechvale Dealership from Alfa Romeo.

- __5. From the demo main menu, click the '**Manufacturer -> Dealership**' link in the Transfer Asset section.



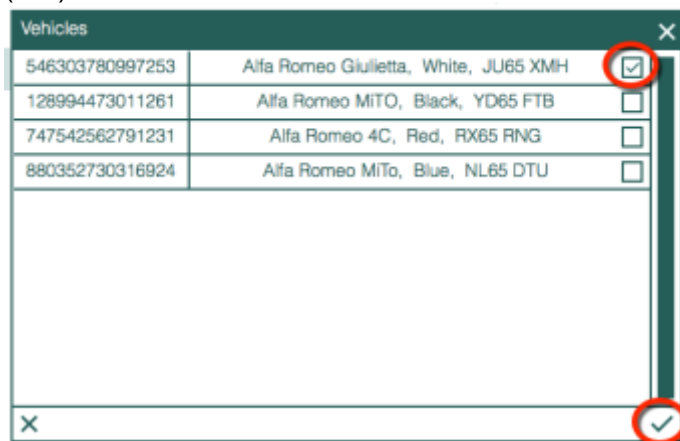
You are now viewing the application as Martin, who works for Alfa Romeo.

- __6. Click the '+' sign in the vehicles box.



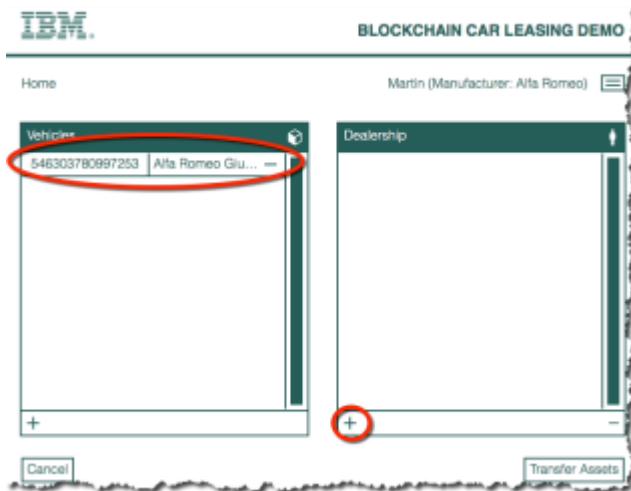
This queries the blockchain for the cars that are owned by Alfa Romeo.

- __7. Click the checkbox against the first car to add it to the transfer request, then click the checkmark (tick) to save the choice.

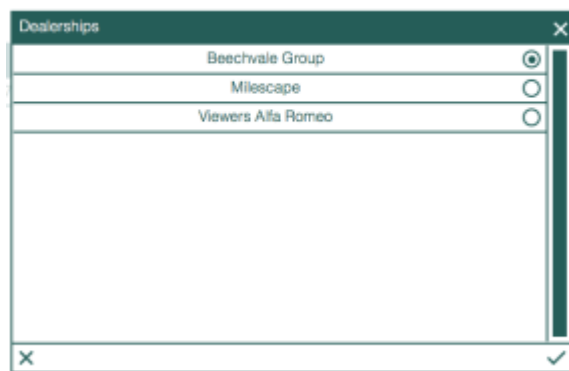


The Alfa Romeo you selected now appears in the list of vehicles to be transferred.

- __8. Click the '+' sign in the Dealership box.



- ___9. From the list of Dealerships, choose '**Beechvale Group**' then, click the checkmark to confirm your choice:

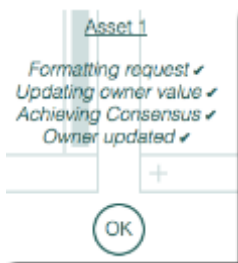


- ___10. Click '**Transfer Assets**'.

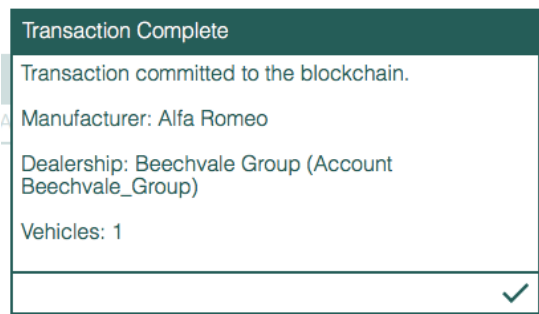
This adds a transaction to the blockchain that will transfer ownership of the Alfa Romeo car to the Beechvale Group.

The nodes in the blockchain network will now confirm the transaction; this takes a few seconds to complete.

- ___11. Click **OK** when the transaction has been validated by the blockchain network.



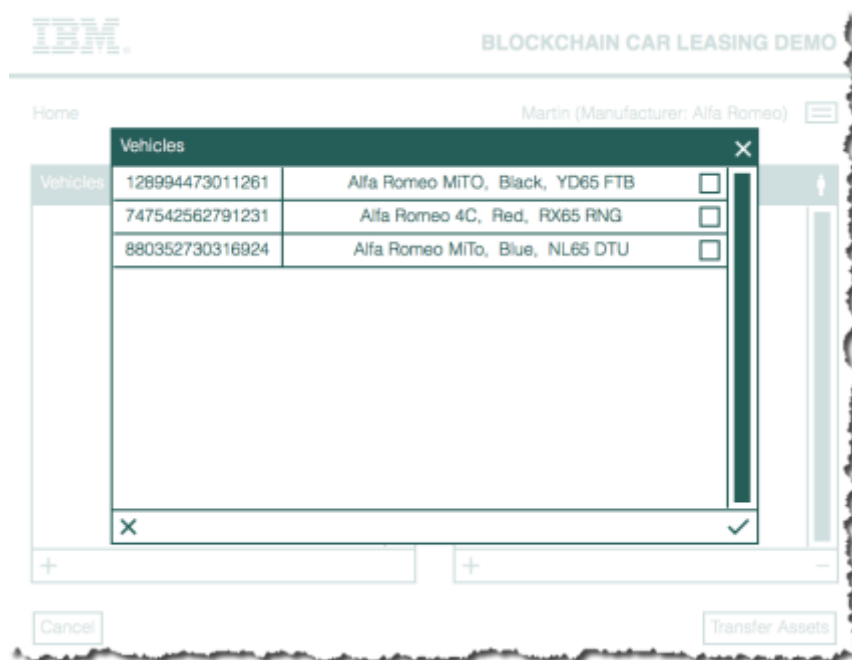
- ___12. Dismiss the transaction confirmation message.



1.2.3. Viewing the Updated Set of Manufacturer's Assets

The manufacturer's ability to control the asset has now been removed.

- __13. Click the '+' sign on the Vehicles box to verify that the manufacturer can no longer see the asset you transferred:



The manufacturer now controls one asset fewer; the transferred vehicle is no longer visible to the manufacturer.

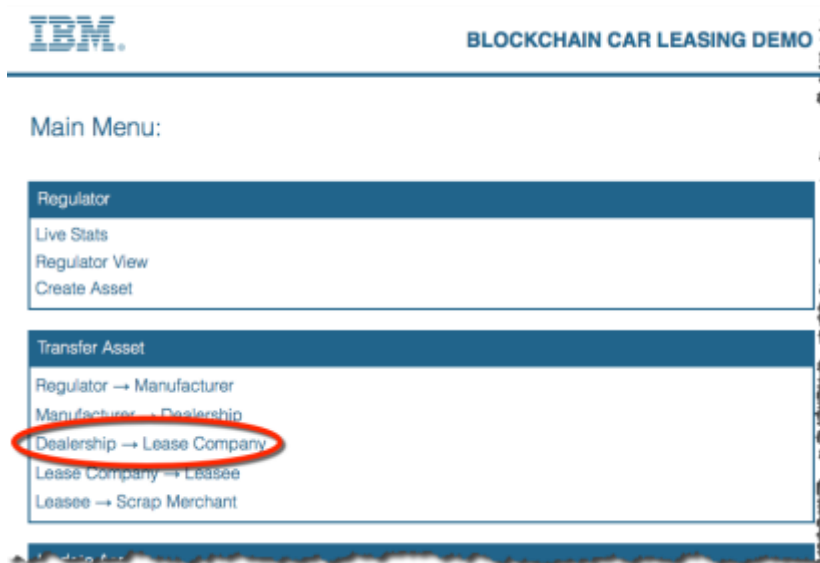
- __14. Click the 'X' to dismiss the window.

1.3. Transferring an Asset to a Leasing Company

In this section we will act as Deborah, who works for the Beechvale Group dealer. First we will verify that the asset you transferred earlier is now available to you to transfer; you will then transfer the asset to a leasing company.

In the previous section we transferred the ownership of a vehicle from the Alfa Romeo manufacturer to the dealership “Beechvale Group”. The vehicle will now appear in the list of vehicles Beechvale Group are able to control.

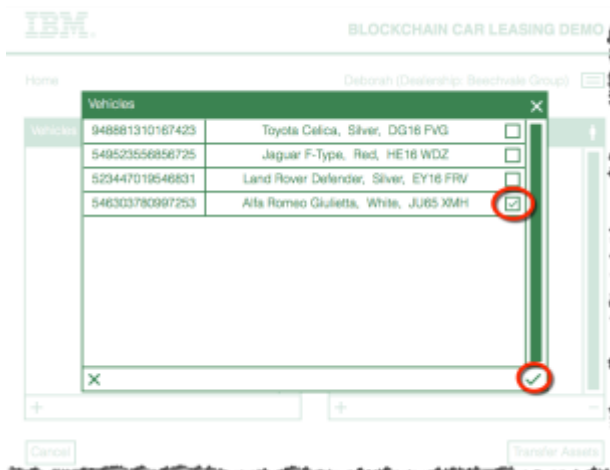
__15. From the main menu, click ‘**Dealership -> Lease Company**’.



You are now experiencing the application as Deborah again.

__16. Click the ‘+’ icon in the “Vehicles” box to show the list of vehicles that the dealer can see.

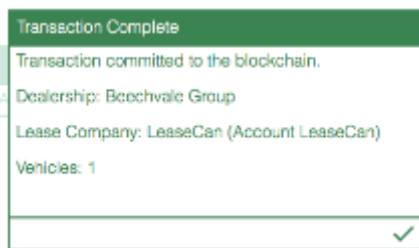
__17. Select the Alfa Romeo car and click the check mark (tick).



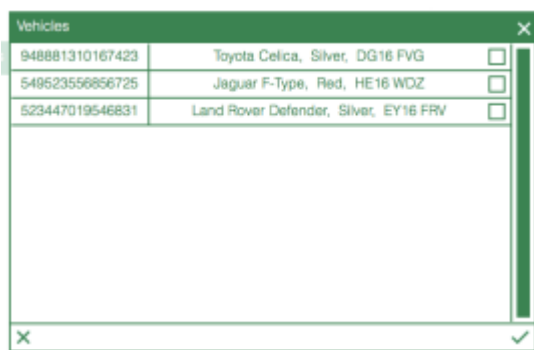
- __18. In the Lease Company window click the plus sign to select '**LeaseCan**'. Click the check mark to confirm.



- __19. Click the Transfer Assets button and wait for the transaction to be validated.
- __20. Click **OK** and then dismiss the Transaction complete window.



- __21. Click the '+' icon in the "Vehicles" box to verify that Deborah no longer has visibility of the car she just transferred. Click '**X**' to close the window.



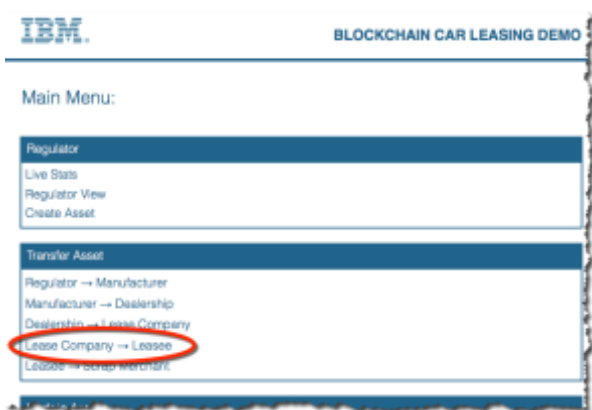
- __22. Return to the main menu.

1.4. Transferring an Asset to a Leasee

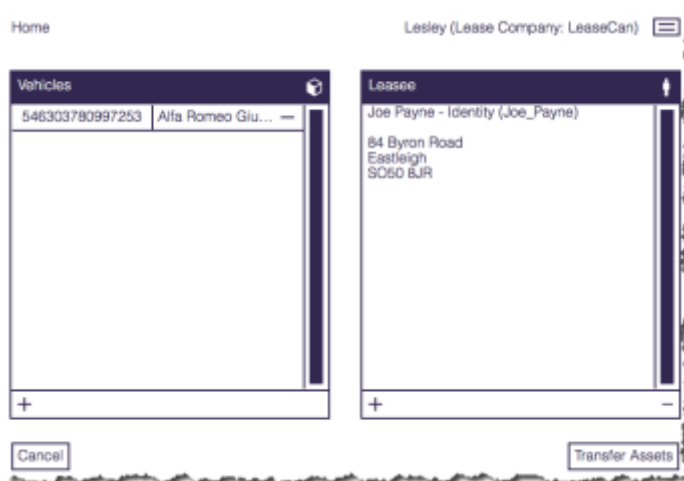
In this section, we will act as a representative of the lease company. First, we will verify that the asset you transferred earlier is now available to you acting as the lease company to transfer; we will then transfer the asset to a leasee.

In the previous section, we transferred the ownership of a vehicle from the dealership “Beechvale Group” to the lease company “LeaseCan”. The vehicle will now appear in the list of vehicles LeaseCan is able to control.

__23. From the main menu, click ‘**Lease Company -> Leasee**’.



__24. Use the two panels to prepare a transfer of the Alfa Romeo car to Joe Payne.



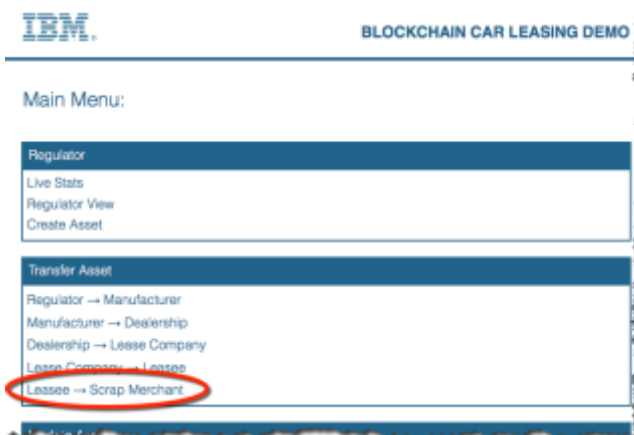
__25. Click the Transfer Assets button and wait for the transaction to be validated. Dismiss the confirmation prompts.

1.5. Transferring an Asset to a Scrap Merchant

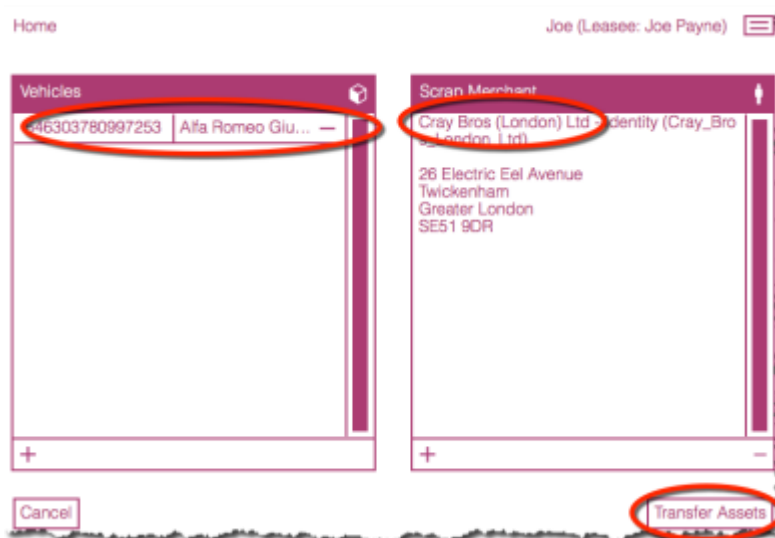
In this section we will act as the leasee, who in this greatly simplified scenario has the authority to send the vehicle to a scrap merchant. First, we will verify that the asset you transferred earlier is now available to us acting as the leasee; we will then transfer the asset to a scrap merchant.

In the previous section, we transferred the ownership of a vehicle from the lease company “LeaseCan” to Joe Payne. The vehicle will now appear in the list of vehicles Joe is able to control.

__26. From the main menu, click ‘**Leasee -> Scrap Merchant**’.



__27. Transfer the car to the Cray Bros (London) Ltd.



__28. When the transaction has been validated, return to the main menu.

1.6. Disposing of an Asset

In this section, we will act as the scrap merchant and dispose of the asset. First, we will verify that the asset you transferred earlier is now available to you acting as the scrap merchant. We will then dispose of the asset.

In the previous section, we transferred the ownership of an Alfa Romeo car from “Joe Payne” to the scrap merchant. The vehicle will now appear in the list of vehicles that the scrap merchant is able to control.

- __29. From the main menu, click ‘**Scrap Merchant -> Scrap**’.



- __30. Use the ‘+’ sign to prepare the asset for scrapping and click ‘**Scrap Assets**’ when ready. Note that there is no destination panel for this operation.



- __31. Dismiss the confirmation dialogs once the asset has been scrapped.
- __32. Verify that the asset can no longer be viewed by the scrap merchant.
- __33. Return to the main menu.

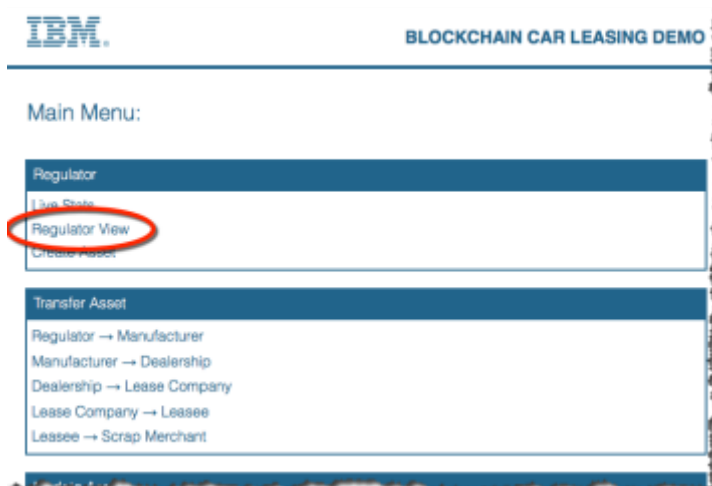
Once the asset has been transferred it is not removed from the blockchain; it has merely been marked as “scrapped”. In the next section we will demonstrate that the asset can still be viewed in the transaction logs.

1.7. Viewing Transactions

The regulator view has unrestricted access to all activities on the Blockchain. In this section we will act as the Regulator and view all asset transfer and disposal activity. We will then act as another user who has a more restricted view of the transactions.

1.7.1. The Regulator

- ___34. From the main menu, click '**Regulator View**'.




- ___35. From the main menu, click '**Regulator View**'.

You will see the activity in chronological order, with the most recent activity at the top of the list of transactions.

V5C ID	Description	Vehicle Details	Timestamp
[HB0556295]	Scrap: Cray_Bros_London_Ltd	Scrap V5C	02/11/2016 15:15:43
[HB0556295]	Transfer: Joe_Payne → Cray_Bros_London_Ltd	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 15:09:40
[HB0556295]	Transfer: LeaseCan → Joe_Payne	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:52:03
[HB0556295]	Transfer: Beechvale_Group → LeaseCan	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:42:42
[HB0556295]	Transfer: Alfa_Romeo → Beechvale_Group	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:21:13
[QX9386285]	Transfer: Jaguar_Land_Rover → Beechvale_Group	[523447019546831] Land Rover Defender, EY16 FRV, Silver	02/11/2016 12:05:16
[QO9895085]	Transfer: Jaguar_Land_Rover → Beechvale_Group	[549523556856725] Jaguar F-Type, HE16 WDZ, Red	02/11/2016 12:05:10
[BK3350947]	Transfer: Beechvale_Group → LeaseCan	[181255391772389] Jaguar XJ, FM65 ESL, Black	02/11/2016 12:05:05
[BK3350947]	Transfer: Jaguar_Land_Rover → Beechvale_Group	[181255391772389] Jaguar XJ, FM65 ESL, Black	02/11/2016 12:05:00
[RK3290457]	Transfer: Toyota → Beechvale_Group	[948881310167423] Toyota Celica, DG16 FVG, Silver	02/11/2016 12:04:55
[F3253857]	Transfer: Beechvale_Group → LeaseCan	[287437467447767] Toyota Auris, LM16 YHJ, Blue	02/11/2016 12:04:50
[HB0556295]	Transfer: Beechvale_Group → LeaseCan	[287437467447767] Toyota Auris, LM16 YHJ, Blue	02/11/2016 12:04:45

- ___36. In the "Search by V5C ID..." box, start typing the vehicle identifier of the Alfa Romeo you have been working with. In the example here this is **HB0556295** but your ID might be different.

This will filter the view so that only the transactions for this car are shown.



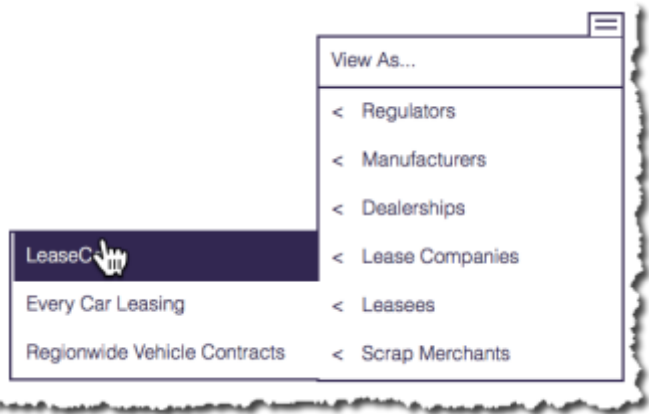
ID	From	To	Vehicle	Timestamp
[HB0556295]	Scrap: Cray_Bros_London_Ltd	Scrap V5C		02/11/2016 15:15:43
[HB0556295]	Transfer: Joe_Payne → Cray_Bros_London_Ltd	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White		02/11/2016 15:09:40
[HB0556295]	Transfer: LeaseCan → Joe_Payne	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White		02/11/2016 14:52:03
[HB0556295]	Transfer: Beechvale_Group → LeaseCan	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White		02/11/2016 14:42:42
[HB0556295]	Transfer: Alfa_Romeo → Beechvale_Group	[546303780997253] Alfa Romeo Giulietta, JU65 XMH, White		02/11/2016 14:21:13
[HB0556295]	Update: Alfa_Romeo	Registration: undefined → JU65 XMH		02/11/2016 12:03:08
[HB0556295]	Update: Alfa_Romeo	Colour: undefined → White		02/11/2016 12:03:03
[HB0556295]	Update: Alfa_Romeo	Model: undefined → Giulietta		02/11/2016 12:02:58
[HB0556295]	Update: Alfa_Romeo	Make: undefined → Alfa Romeo		02/11/2016 12:02:54
[HB0556295]	Update: Alfa_Romeo	VIN: undefined → 546303780997253		02/11/2016 12:02:49
[HB0556295]	Transfer: DVLA → Alfa_Romeo	Vehicle Template		02/11/2016 12:00:07
[HB0556295]	Create: DVLA	Create V5C		02/11/2016 11:59:19

__37. View the complete set of transactions again by using the backspace key to delete the characters you just entered.

1.7.2. Other users

Other users can only see part of the lifecycle of the vehicle. They are able to see what happened to the vehicle prior to their ownership and whilst they owned it but cannot see what happened to the vehicle after they transferred it.

__38. Click the three lines in the top right corner of the Regulator view to see the set of transactions through the eyes of another user. In the dropdown that appears hover over “Lease Companies” then click “Lease Can”.



The view now changes to show all transactions that:

- (a) relate to cars currently owned by LeaseCan, or
- (b) relate to cars once owned by LeaseCan, up to the point that they were transferred away.

__39. Start typing the identifier of the Alfa Romeo once more (**HB0556295** in the example, but again your ID will vary).

Note how the transactions shown against this car are restricted to the ones up to the point that LeaseCan transferred the car to Joe Payne.

Home Lesley (Lease Company: LeaseCan) 

HB Filters v Sort v

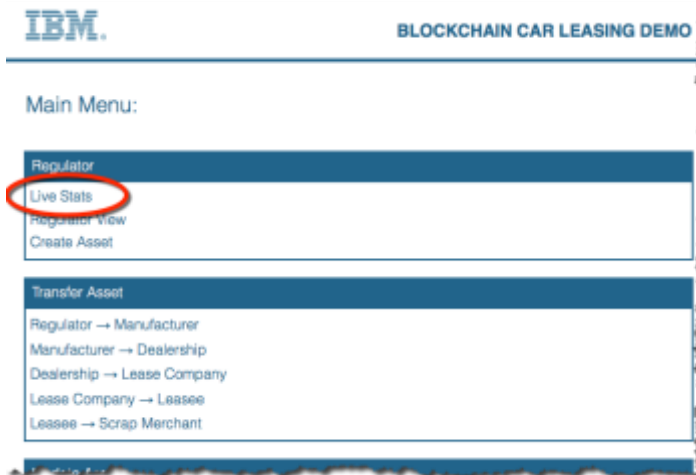
[HB0556295]	Transfer: LeaseCan → Joe_Payne	[546303780997253]	Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:52:03
[HB0556295]	Transfer: Beechvale_Group → LeaseCan	[546303780997253]	Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:42:42
[HB0556295]	Transfer: Alfa_Romeo → Beechvale_Group	[546303780997253]	Alfa Romeo Giulietta, JU65 XMH, White	02/11/2016 14:21:13
[HB0556295]	Update: Alfa_Romeo	Registration: undefined →	JU65 XMH	02/11/2016 12:03:08
[HB0556295]	Update: Alfa_Romeo	Colour: undefined →	White	02/11/2016 12:03:03
[HB0556295]	Update: Alfa_Romeo	Model: undefined →	Giulietta	02/11/2016 12:02:58
[HB0556295]	Update: Alfa_Romeo	Make: undefined →	Alfa Romeo	02/11/2016 12:02:54
[HB0556295]	Update: Alfa_Romeo	VIN: undefined →	546303780997253	02/11/2016 12:02:49
[HB0556295]	Transfer: DVLA → Alfa_Romeo	Vehicle Template		02/11/2016 12:00:07
[HB0556295]	Create: DVLA	Create VSC		02/11/2016 11:59:19

__40. Return to the main menu.

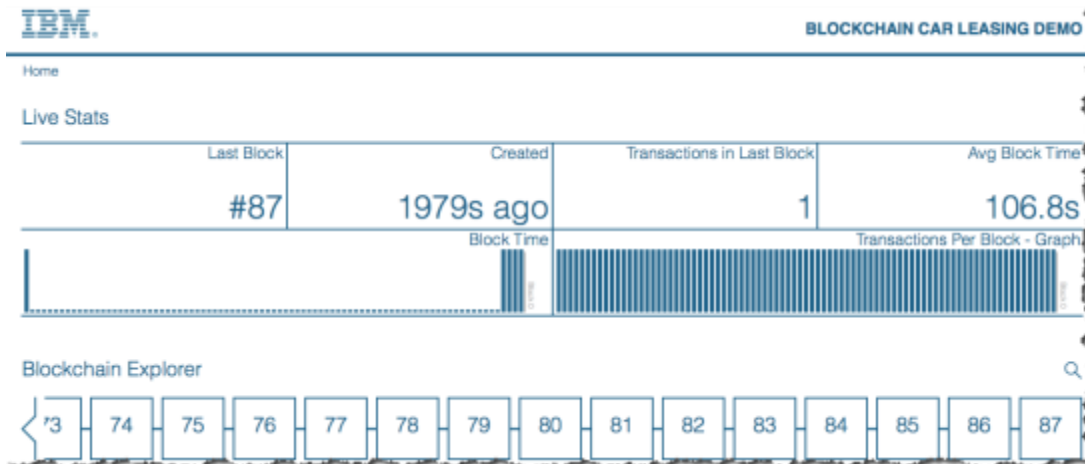
Section 2. Viewing the Blockchain

In this final section of the lab, we will introduce one of the key data structures that makes up the blockchain. The follow-on lab ("Blockchain Explored") will cover this topic in more detail.

- __41. From the main menu, click '**Live Stats**'.



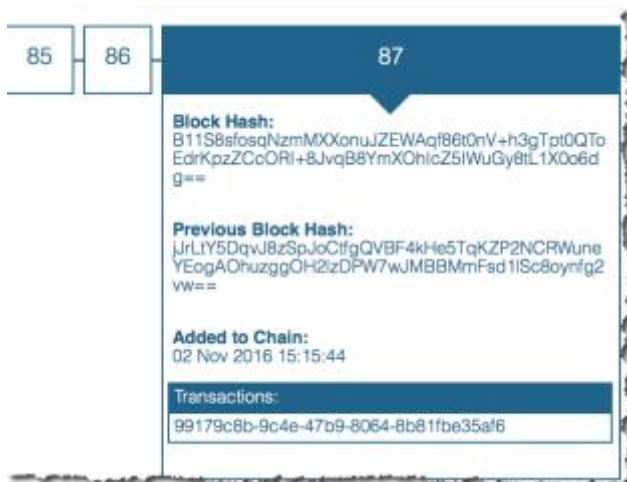
- __42. Wait for the screen to be populated. (The blockchain is being queried, and this will take longer the more transactions there are.)



- __43. Review the various pieces of information being shown.

Last Block:	The block number of the last committed block (higher numbers are more recent)
Created:	How long ago since the last block was committed
Transactions in Last Block:	The number of transactions in the last block; in this demo, this is usually one.
Avg Block Time:	The average time between each block being committed
Block Time:	A graph showing how much time was between each block
Transactions Per Block - Graph:	How many transactions were in each block (again, this is usually one)
Blockchain Explorer:	Allows you to look at a specific block's details in the blockchain.

- __44. Click a block in the Blockchain Explorer pane to see more information about it.



We will look at the blocks in more detail in the follow-on lab: "Blockchain Explored".

Congratulations on completing the Blockchain Explained lab!

Appendix A. Starting the sample Application

The Asset Transfer Demo environment exists in a VMWare virtual machine. The operating system is Linux Ubuntu. The following section will guide you through what you need to do in order to access the Main demo page.

The VM should log you in automatically. If it doesn't or if the system locks later you can sign on to the Ubuntu system with the following credentials:

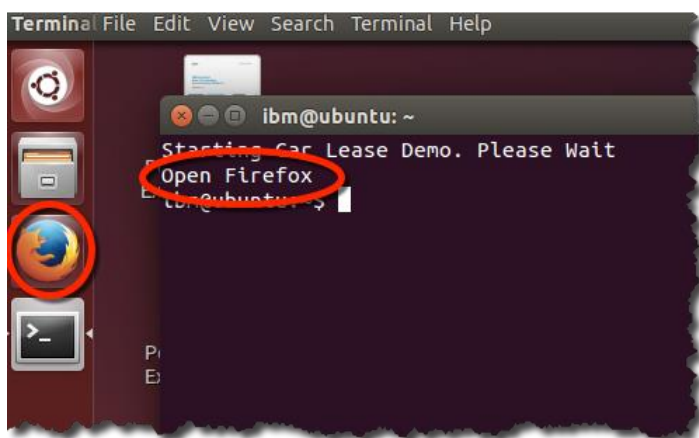
User: **IBM**

Password: **passw0rd**

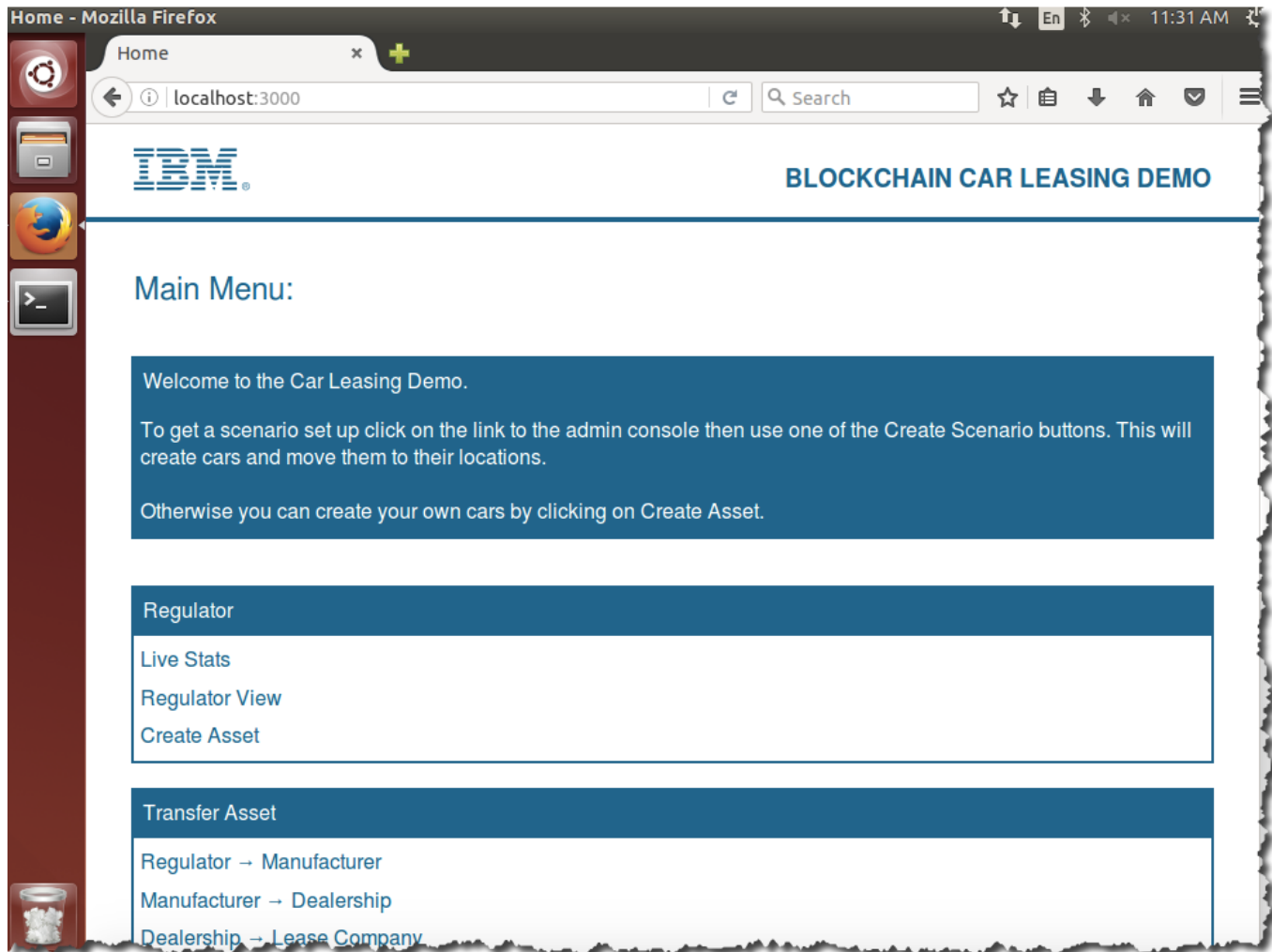
(to sign on just press enter after entering the password)

When the machine starts and user is logged, in you might see a window with "Starting Car Lease Demo" displayed. Before continuing, wait for the words "Open Firefox" to appear. Alternatively, the Firefox web browser might already be open at the Car Leasing demo main menu.

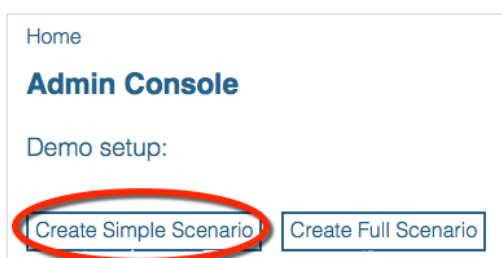
- ___45. If the web browser is not already open, wait for the initial setup to complete. Setup has completed when the words "Open Firefox" appear. At this point, click the Firefox icon on the left hand side of the screen.



You should now see the car leasing demo main menu.



__46. From the Car Leasing demo front page, click '**Admin Console**' and '**Create Simple Scenario**'.



This will preload the blockchain with a set of transactions. (The Full Scenario works fine too; the difference between the Simple Scenario and the Full Scenario is that in the Full Scenario more assets are initially loaded onto the blockchain; this takes a couple of minutes longer to initialize, however.)

Wait for the initialization to complete.

- __47. Click '**OK**' to close the Creating Scenario log, and then dismiss the 'Scenario Creation complete' by clicking the check mark.



- __48. Click 'Home' to return to the main menu.
- __49. Go to Section 1 to run the demo

Appendix B. The Admin Console

On the Main Menu there is a link to a demo “Admin Console” which provides various features.



[Home](#)

Admin Console

[Reset Demo](#)

Current Configuration:

Configuration:	
Trace:	On ●

The admin console provides the following main functions:

- 1. Reset Demo.**

This button will stop and restart the blockchain technology and reset the blockchain to a point in time.

- 2. Toggle Trace on and off.**


The demo has implemented a tracing feature to enable problem determination. Trace entries are written to a `trace.log` file in “`/home/Documents/Demo/Server_Side/logs`”

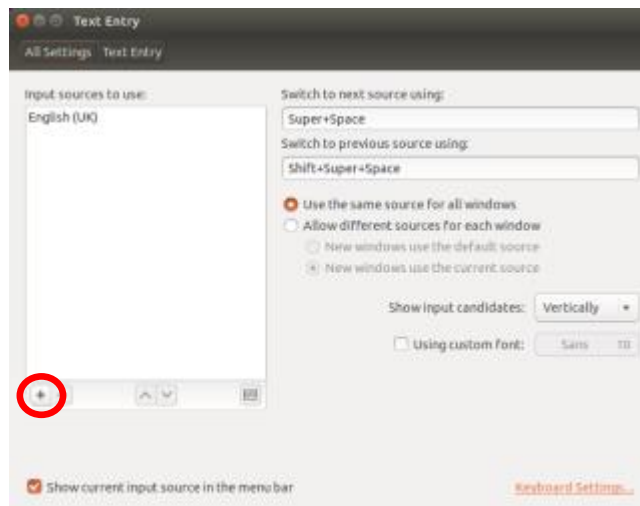
Appendix C. Keyboard Language Change

To change the keyboard language to enable you to use foreign laptops follow these steps:

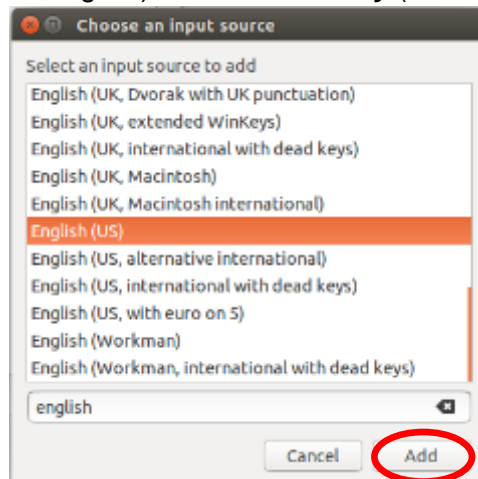
__50. Click on the  icon in the top right & select **Text Entry Settings...**



__51. Select the  symbol

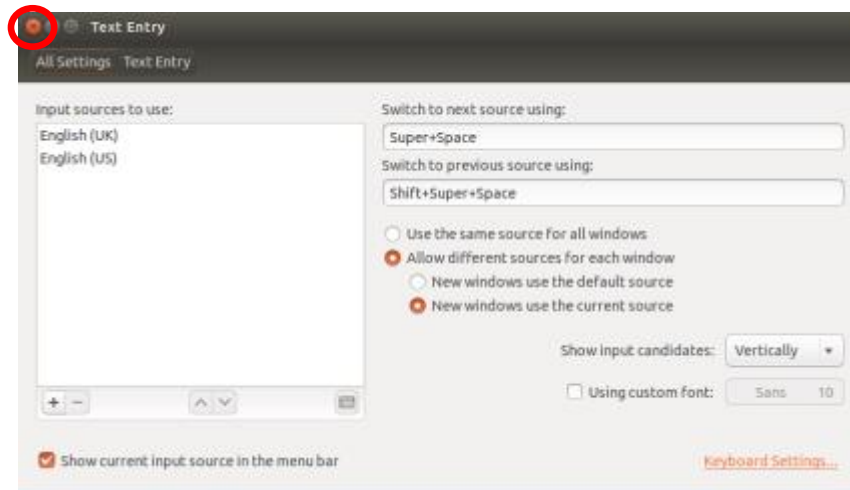


__52. Type your **Language** (E.G. English) and then **country** (E.G. US)

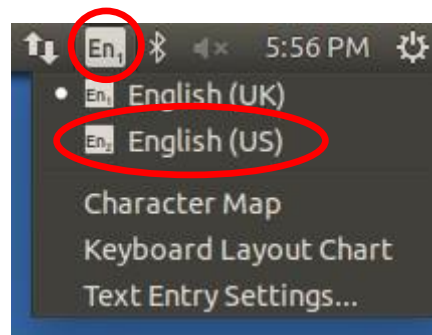


__53. Select the appropriate keyboard and click 'Add'

__54. **Close the Settings box**



__55. **Select the 'EN' in the top right of the screen and select your new keyboard**



Your keyboard is now ready to use

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