Demo Set-up Guide

e-Exam System v5

This document provides:

- The process for creating your own e-Exam System v5 USB stick based on the demonstration ISO image file.
- Details of how configure and start your computer from the e-Exam System v5 USB stick.
- Managing demo USB Sticks.

Acknowledgements

The e-Exam System version 5 platform project is supported by an Australian Government Office for Learning and Teaching grant. The project is being lead by the University of Queensland in partnership with the University of Tasmania with in kind support from both.
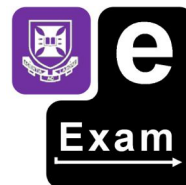
Project Team

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This is a work in progress! Last Updated (minor) 20 Apr 2015

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Get Started

Update:

- Releases dated 2014^ and later of the e-Exam version 5 should now boot most Intel~ based laptop hardware regardless of the operating system used to burn it to a USB stick - This includes computers that normally to run Apple OSX, Microsoft Windows* and Linux.

    ^ If you are using an older, pre 2014 release of the ISO then please see Note 3.
    * If you want to boot hardware that was sold with Microsoft Windows 8+ pre-installed please see Note 2.
    ~ See note 1.

Required Components

The following is needed to create a working e-Exam Demo USB stick.

- The e-Exam Demo ISO file. It can be downloaded via Transforming Exams website http://transformingexams.com
(this file is hosted by SourceForge)
- The file is quite large so to save trouble it is recommend to:
    o Use a download manager with resume capabilities. E.g: the free 'DownThemAll' add-on for Firefox https://addons.mozilla.org/en-US/firefox/addon/downthemall/
    o Check the downloaded ISO's checksum with the free 'Checksums calculator'. Get it from http://www.sinf.gr/en/hashcalc.html
- One USB storage device at least 20% bigger then the ISO onto which the ISO will be 'burnt' (e.g. a 4GB stick will work in most cases). It is best that the USB stick is formatted as a single FAT32 partition to begin. Most new USB sticks tend to be so out of the box.
- A computer with an Intel processor and enough hard drive space to store the ISO file (ranges from 2 to 3GB depending upon release) and at least one USB port.
- A USB 'burning' or 'imaging' application (in the case of Apple OSX we recommend you use the command line) – suggestions are given for each operating system in the relevant section.

Notes:

1. e-Exam USB sticks only boot computers with Intel processors and at least one USB port (they will not boot computers with ARM or AMD processors - future versions may be realised to cater for these processor architectures).
2. By default the demo e-Exam USB wont boot computers with Windows 8 stickers on them – i.e. UEFI hardware that comes with Windows 8 pre-installed, unless 'Secure Boot' is disabled via BIOS/UEFI settings. Please refer to the section 'Dealing with Pre-installed Windows 8'. However, we are still testing with regard Windows 8/UEFI hardware so the suggested solution(s) may not work in every case.
3. If you are using an older, pre 2014 release of e-Exam then please heed the following:
   a. If you want to create e-Exam USB sticks that boot Apple Mac Intel laptops (recent Air and Macbook Pro) we recommend you use OSX to create the USBs. Follow the instructions for Apple OSX.
      i. USBs created on OSX will boot both Apple and non-Apple Intel hardware although some error messages may be displayed on some models such as Air, (this niggle will be addressed in due course).
   b. If you do not have OSX then follow the instructions for Windows or Linux.
      i. We can't guarantee that USBs created using Windows will boot Apple hardware however they will work to boot all non-Apple Intel based hardware.

We endeavour to recommend and use free and preferably open source tools wherever possible.

Checking the Downloaded File MD5 Hash

1. Obtain the 'Checksums calculator' software to match your operating system from http://www.sinf.gr/en/hashcalc.html
2. Unzip the archive and run the file.
3. Locate the MD5 hash by clicking the (i) icon adjacent the file name on SourceForge file listing for e-Exam:
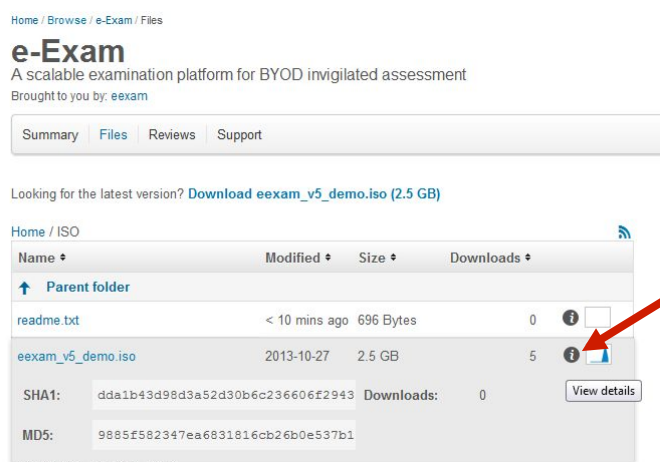
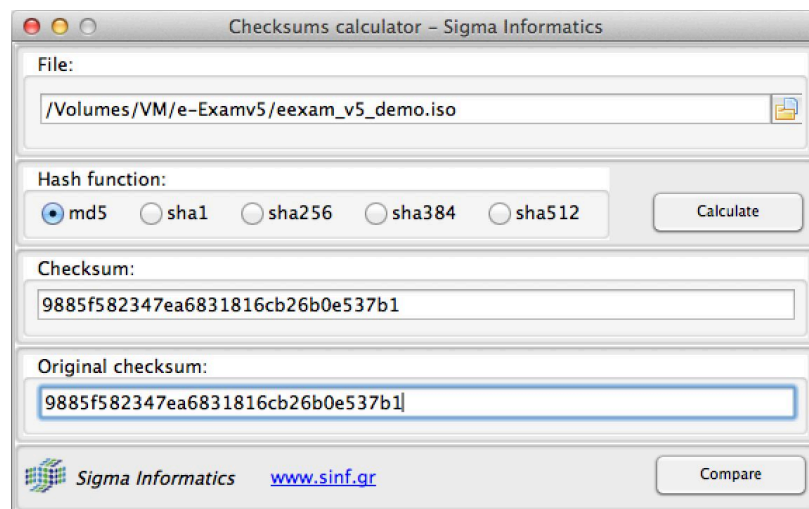Click an (i) icon to reveal the MD5 hash for a file.

4. Use the 'Checksums Calculator' to check the hash:
Select the newly downloaded file.

Select 'md5' and click 'Calculate'.

Copy and paste the MD5 hash from SourceForge in to the 'Original checksum' box.

Click 'Compare'.

If a dialog box appears with the result "checksums are identical" then the file is intact.

You can now proceed to create an e-Exam USB stick.

Create an e-Exam USB stick

The instructions below intended to be used to 'burn' the demo e-Exam ISO file to a single new (blank) USB stick.

To create multiple e-Exam USB sticks at once (in batches) see the section 'Initial Set-up of Blank USB Sticks for the e-Exam System'.

Warning! To avoid risk of unintentional data destruction, it is highly recommended that you remove all connected USB storage devices/card readers/portable hard disk drives etc before following any of these processes.

All data on the targeted storage device will be *irretrievably overwritten* so be sure to follow instructions carefully.

Windows

Using the procedures shown here via Windows (Vista/7/8) to create USB sticks results in USB sticks that can boot Intel based hardware that normally runs 'Windows' or Linux.

Two options are offered below (there are several other methods revealed by a web search!)

Win32 Disk Imager

Win32 Disk Imager is a tool used for writing images to USB sticks or SD/CF cards.

Download it http://sourceforge.net/projects/win32diskimager/

Run Win32DiskImager by opening the folder and double-clicking the Win32DiskImager.exe file.

The Win32DiskImager program starts.

Click on the small blue folder icon to locate the e-Exam ISO file on your computer. You will need to change the file format selection from '.img' to '*.*' in order to see the .iso file.

The USB stick will probably be located automatically – make sure the drive letter matches the correct device because this process destroys all existing data on the target device.

Once these two items are correct, click on the Write button.
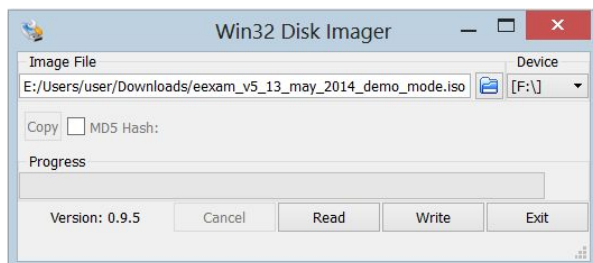
A warning may appear. Double check you have selected the correct USB drive, if so then click YES.
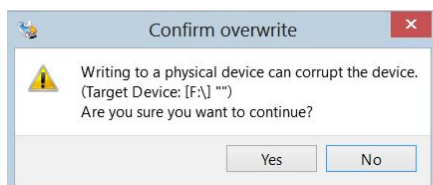
A progress bar will be displayed.
The process of making an e-Exam USB can take several minutes depending on the speed of your computer and the speed of the USB stick itself.

When the process is complete, you will see a 'complete' notification dialog box – click 'OK'.

Close down Win32 Disk Imager using the Exit button.

Perform a 'safe' removal for your USB and eject it.

The e-Exam USB is now ready for use.

Universal USB Installer

Obtain the Universal USB Installer from

http://www.pendrivelinux.com/universal-usb-installer-easy-as-1-2-3/#button

Load the software.

At the top of the window locate the 'Step 1' selection menu and choose "Try Unlisted Linux ISO"

Next to the 'step 2' field, click 'Browse' button to locate the e-Exam ISO file.

Insert the target USB stick.

From the 'Step 3' selection menu choose the target USB stick drive letter (be sure it is the correct storage device because this process will destroy all existing data on the selected device.) Leave other settings at their defaults.

Click 'create'.

Wait for the process to complete.

Perform a 'safe' removal for your USB and remove it.

The e-Exam USB is now ready for use.

Ref

http://www.ubuntu.com/download/desktop/create-a-usb-stick-on-windows

Mac OSX

USBs created using this process will be bootable on both Apple branded Intel based hardware and a range of non-Apple Intel hardware (i.e. regular 'windows' laptops).

Warning: To avoid unintentional data loss, follow the instructions very *very* carefully.

It is best to remove all 'removable' storage devices from the computer before starting (i.e. USB sticks, memory cards/card readers, portable HDDs etc).

Don't insert the target USB stick yet.

We assume you have the e-Exam v5 ISO file downloaded onto your Mac.

We will use the command line (Terminal).

First, open Terminal (in /Applications/Utilities/ or query Terminal in Spotlight).

Stage 1 Convert ISO to DMG

OSX doesn't play nicely with ISO files so we need to convert it to a Mac friendly format.

Terminal command structure:

hdiutil convert -format UDRW -o ~/**pathto**/*destination*.dmg ~/**pathto**/*source*.iso

Be sure to change the **pathto** to a real path and note:

- *destination* = the new dmg file to be created, for example you might want to name it 'e-exam-demo.dmg'.
- *source* = the name of the e-Exam ISO file you downloaded.

Tip: you can 'insert' the path and file at the active cursor position in Terminal by dragging the file from Finder into the Terminal window. This saves typing and lessens the chance of errors.

So, to convert the ISO file that was downloaded I typed the following command (be sure to adjust/insert path and file names to suit):

```
hdiutil convert -format UDRW -o /Volumes/VM/e-Examv5/e-exam-
demo.dmg /Volumes/VM/e-Examv5/eexam_v5_demo.iso
```

On the screen it looks similar to this (note; the stuff up to and including $ is your prompt and will look different on your computer):

```
MacBook-Pro:~ user$ hdiutil convert -format UDRW -o /Volumes/VM/e-
Examv5/e-exam-demo.dmg /Volumes/VM/e-Examv5/eexam_v5_demo.iso
Reading Master Boot Record (MBR : 0)…
Reading  (Apple_Free : 1)…
Reading  (DOS_FAT_32 : 2)…
Reading  (DOS_FAT_32 : 3)…
Reading  (DOS_FAT_32 : 4)…
........................................
Elapsed Time: 11.631s
Speed: 206.4Mbytes/sec
Savings: 0.0%
created: /Volumes/VM/e-Examv5/e-exam-demo.dmg
```

Then in just several seconds the conversion is done.

If you browse to the location using Finder you will see the new file.

Note down the full path to the 'created' file. You will need this later (or select it, copy and paste to a text editor).

e.g. /Volumes/VM/e-Examv5/e-exam-demo.dmg

Stage 2 Determine the allocated Identifier of the target USB stick.

We recommend that you use a new USB stick that is approximately 20% bigger than the DMG file. This gives a reasonable safety margin. I use 8GB sticks I have on hand but as will become apparent they are not 8GB in reality! 4GB will probably do too.

Do *not* format the stick to a Mac format. New sticks are normally formatted as FAT32 (windows format) out of the box and this is what we want.

Now we need to determine the correct disk ID of the USB stick.

Do not insert the USB stick yet.

I recommend that you remove all externally connected USB storage devices or external hard disk drives. This will help avoid making any tragic mistakes later! If you are not able to remove external drives then take extra heed of the instructions below!

To start we need to determine the current set of identifiers.

Type this command:

```
diskutil list
```

On the screen it will look similar to this:

```
MacBook-Pro:~ user$ diskutil list
/dev/disk0
   #:    TYPE NAME                SIZE        IDENTIFIER
   0:    GUID_partition_scheme *500.3 GB   disk0
   1:    EFI                     209.7 MB   disk0s1
   2:    Apple_HFS Macintosh HD 100.0 GB   disk0s2
   3:    Apple_Boot Recovery HD 650.0 MB   disk0s3
   4:    Apple_HFS APPS           90.0 GB   disk0s4
   5:    Apple_HFS FILES         208.3 GB   disk0s5
   6:    Apple_HFS VM            100.7 GB   disk0s6
```

This list will display all the 'drives' mounted on your Mac's file system. Your computer will look different.

In this case my Mac has one internal physical HDD given the identifier 'disk0'.

There are a number of partitions (volumes in Mac speak) numbered 0 to 6.

If you have more then one physical HDD these will be numbered disk1, disk2 and so on. The number of volumes on your HDD will likely be different.

So a computer with three physical HDDs (connected internally or externally) would display disk0, disk1, disk2.

We want to make sure that we do not burn to any of these because all existing data on it would be lost!

Now we need to find the correct target disk identifier.

Next insert the new USB stick and run the command again.

Type this command:

```
diskutil list
```

Again, on screen it would look similar to this:

```
MacBook-Pro:~ user$ diskutil list
/dev/disk0
   #:    TYPE NAME                SIZE       IDENTIFIER
   0:    GUID_partition_scheme *500.3 GB    disk0
   1:    EFI                     209.7 MB    disk0s1
   2:    Apple_HFS Macintosh HD 100.0 GB     disk0s2
   3:    Apple_Boot Recovery HD 650.0 MB     disk0s3
   4:    Apple_HFS APPS          90.0 GB     disk0s4
   5:    Apple_HFS FILES         208.3 GB    disk0s5
   6:    Apple_HFS VM            100.7 GB     disk0s6
/dev/disk1
   #:    TYPE NAME                SIZE       IDENTIFIER
   0:    FDisk_partition_scheme*7.7 GB       disk1
   1:    DOS_FAT_32 UNTITLED   7.7 GB         disk1s1
```

Again you see the list of drives mounted. You will notice one new disk in the list, in this case 'disk1'. This is my target USB stick.

You will notice the size of 7.7GB despite it saying 8GB on the box!

The identifier digit assigned will likely be one greater than the highest number seen in the previous command. However, this may not always be the case if you had mounted and removed other devices during your current session.

Again the example of a computer with three physical HDDs (disk0, disk1, disk2) it is likely the USB stick would be given the id of 'disk3'.

You must be *certain* of the correct designation of the USB stick because this will be the target of the 'burn'. On my Mac the USB stick was assigned 'disk1'.

Write down the diskID assigned to your USB.

Stage 3: Unmounting the target USB stick.

We now need to unmount (disconnect at a software level) the target disk (USB).

However, do not physically remove the USB stick from the computer.

The command structure:

diskutil unmountDisk /dev/disk**ID**

(replace **ID** with the disk number from the last command; in the previous example, **ID** would be 1). So I typed:

```
diskutil unmountDisk /dev/disk1
```

On screen it would look similar to this:

```
MacBook-Pro:~ user$ diskutil unmountDisk /dev/disk1
Unmount of all volumes on disk1 was successful
```

If you do not get the above success message, check that you had not opened a Finder window to the USB stick. If so close all Finder windows and other software programs and try again.

Stage 4. Burn to the stick

Now things get high stakes!

We are using the deadly 'dd' command.

It has the structure:

sudo dd if=[input path to file] of=[target diskID] bs=1m

This command will irrevocably overwrite all data on the target.

To burn to the USB stick with the disk identifier 'disk1' I type the following command all on a single line (remember to adjust your path to file and target diskID to suit):

```
sudo dd if=/Volumes/VM/e-Examv5/e-exam-demo.dmg of=/dev/rdisk1
bs=1m
```

After hitting 'return' you will be asked for your password.

On the screen it looks similar to this:

```
MacBook-Pro:~ user$ sudo dd if=/Volumes/VM/e-Examv5/e-exam-demo.dmg
of=/dev/rdisk1 bs=1m
Password:
```

This process will take a long time, depending on your computer, speed of the USB stick, size of the file etc, it could be anywhere from 10 minutes to 45 minutes.

There will be no indication of anything happening after you enter your password until it completes. Do not be tempted to disturb it! I tend to just go and have lunch or work on another computer to be safe. (See the tip box following if you want to monitor progress).

When the burn completes you will receive feedback like this:

```
2401+0 records in
2401+0 records out
2517630976 bytes transferred in 566.717266 secs (4442482 bytes/sec)
```

Also, you will probably notice a number of drives (Volumes) will appear on your desktop. These are part of the e-Exam USB.

Monitoring DD on OSX

Tip:

If you want to maintain a watch on the burn process you need to open a NEW Terminal window (do not close the existing one).

In the new terminal window type this command (remember to adjust the diskID to suit):

```
iostat -Iw 5 disk1
```

This gives an update of progress every 5 seconds for activity on disk1. Change the 5 to another number for a different interval.

Stage 5: safely remove the USB stick

The final step is to 'eject' the USB so you can safely remove it from the computer.

Type this command:

```
diskutil eject /dev/disk1
```

On screen:

```
MacBook-Pro:~ user$ diskutil eject /dev/disk1
Disk /dev/disk1 ejected
```

The USB stick can now be safely removed.

It is ready to use!

Ref

Instructions for creating Apple compatible bootable USB sticks (follow the link and start at 'step 2')
http://www.ubuntu.com/download/desktop/create-a-usb-stick-on-mac-osx

Linux

Ubuntu Desktop

You can use a standard Ubuntu LiveUSB, Ubuntu LiveCD or installed Ubuntu to perform this task.

Open the dash and search for **Startup Disk Creator**.

Select the **Startup Disk Creator** to launch the app.

Click the **'Other'** button to browse to the downloaded e-Exam ISO file.

Select the e-Exam ISO file and click **'Open'**.

Select the USB stick in the bottom box and

Select the radio button for '**discard on shutdown**…' (Note: The e-Exam ISO has defined storage areas).

Click **'Make Startup Disk'**.

When the process completes, eject each partition of the USB stick before removing it (e.g. right-click the USB icon and choose 'eject' or 'eject parent drive')

It is now ready for use.

Ref

http://www.ubuntu.com/download/desktop/create-a-usb-stick-on-ubuntu

Command Line

Warning: To avoid unintentional data loss, follow the instructions very *very* carefully.

It is best to remove all 'removable' storage devices from the computer before starting (i.e. USB sticks, memory cards/card readers, portable HDDs etc).

Don't insert the target USB stick yet.

At a command prompt, first switch to a root prompt by typing:

```
sudo su
```

next, we need to detect what device node is assigned to the USB stick.

Type the command:

```
tail -f /var/log/syslog
```

You now have a live view of the system log (syslog).

Now - plug in your USB stick.

You should see some messages on screen. Something like this:

```
Oct 27 00:35:07 Ubuntu kernel: [ 5054.646585] usb 2-1.1: new high-speed USB device number 5
using ehci_hcd
Oct 27 00:35:07 Ubuntu kernel: [ 5054.741437] scsi8 : usb-storage 2-1.1:1.0
Oct 27 00:35:07 Ubuntu mtp-probe: checking bus 2, device 5:
"/sys/devices/pci0000:00/0000:00:1d.0/usb2/2-1/2-1.1"
Oct 27 00:35:07 Ubuntu mtp-probe: bus: 2, device: 5 was not an MTP device
Oct 27 00:35:08 Ubuntu kernel: [ 5055.739177] scsi 8:0:0:0: Direct-Access     JetFlash
TS2GJFV30       8.07 PQ: 0 ANSI: 2
Oct 27 00:35:08 Ubuntu kernel: [ 5055.740198] sd 8:0:0:0: Attached scsi generic sg3 type 0
Oct 27 00:35:08 Ubuntu kernel: [ 5055.741593] sd 8:0:0:0: [sdc] 4005888 512-byte logical
blocks: (2.05 GB/1.91 GiB)
Oct 27 00:35:08 Ubuntu kernel: [ 5055.742214] sd 8:0:0:0: [sdc] Write Protect is off
Oct 27 00:35:08 Ubuntu kernel: [ 5055.742218] sd 8:0:0:0: [sdc] Mode Sense: 03 00 00 00
Oct 27 00:35:08 Ubuntu kernel: [ 5055.742712] sd 8:0:0:0: [sdc] No Caching mode page present
Oct 27 00:35:08 Ubuntu kernel: [ 5055.742715] sd 8:0:0:0: [sdc] Assuming drive cache: write
through
Oct 27 00:35:08 Ubuntu kernel: [ 5055.745326] sd 8:0:0:0: [sdc] No Caching mode page present
Oct 27 00:35:08 Ubuntu kernel: [ 5055.745329] sd 8:0:0:0: [sdc] Assuming drive cache: write
through
Oct 27 00:35:08 Ubuntu kernel: [ 5055.781564]  sdc: sdc1
```

```
Oct 27 00:35:08 Ubuntu kernel: [ 5055.784191] sd 8:0:0:0: [sdc] No Caching mode page present
Oct 27 00:35:08 Ubuntu kernel: [ 5055.784196] sd 8:0:0:0: [sdc] Assuming drive cache: write
through
Oct 27 00:35:08 Ubuntu kernel: [ 5055.784200] sd 8:0:0:0: [sdc] Attached SCSI removable disk
```

Locate the short identifier in [square] brackets that is repeating - [sdc] in this case. Generally Ubuntu designates USB sticks with the identifier 'sdx' … where x = an assigned letter.

Note it down on a piece of paper - sdc

Press Ctrl+C to terminate the tail process and get back to an active command prompt.

Next, locate the e-exam ISO file.

If the ISO file is at /pathto/e-exam.iso; note this path on a piece of paper.

Next, write the ISO onto the USB stick.

Warning! Be double sure you have the correct target disk. Typing a drive letter or number wrong will result in permanent data loss on a different drive. Pay extra attention while issuing the dd command!

Type the command:

dd if=/**pathto/e-exam.iso** of=/dev/**sdc** ibs=20M obs=20M

Be sure to:

- replace /**pathto/e-exam.iso** with the actual path to your ISO file.
- replace /dev/**sdc** with whatever target device you noted down earlier. If the repeating part is sdb ; use /dev/sdb , if it was disk1 then use /dev/disk1 and so on.

The dd process will take some time and will not show any progress indication.

When it is finished it will display something like this:

```
2401+0 records in
2401+0 records out
2517630976 bytes transferred in 566.717 secs (4442482 bytes/sec)
```

You will probably find that the multiple partitions of the newly created USB stick will mount (if are using the Terminal within Ubuntu desktop then you will notice that each will appear in the launcher bar or on your desktop).

You need to 'unmount' each of the partitions before removing the USB stick from the computer e.g. by typing:
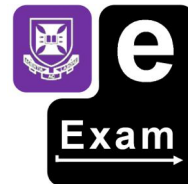
```
sudo umount /dev/sdc1
sudo umount /dev/sdc2
sudo umount /dev/sdc3
```

You can now remove the USB stick from the computer. It is now ready for use.

More Methods

http://www.webupd8.org/2009/04/4-ways-to-create-bootable-live-usb.html

Creating an ISO file from an Existing e-Exam USB stick

This is useful for creating back-ups at each stage before you make changes that could destroy a working stick!

OSX

There are two methods.

Method 1 Using Diskutil Imager (recommended)

This will create a smaller ISO than the DD method (Method 2) because it excludes the unused space.

For example, an e-Exam USB stick with all its active partitions may be 3.5GB sitting on a 8GB stick. This produces 3.5GB ISO – so it will copy the sum of the partitions rather than the entire USB stick.

Stage 1. Prep the USB.

It is best to close all programs and Finder windows.

1. Plug the USB into system and let it mount.

The icons for the e-Exam partitions should appear on the desktop.

2. Control-click (right click) on one of the e-Exam drive USB icons and choose:

Eject "Name_here".

3. A dialog will appear - click the 'Eject All' button.

The e-Exam dive icons should disappear from the desktop.

Do not physically remove the stick.

Stage 2. Create the ISO.

1. Open Disk Utility (Finder -> Go -> Utilities)

2. Click on the USB Drive located on the left hand pane (The actual USB drive, not any of the partitions)
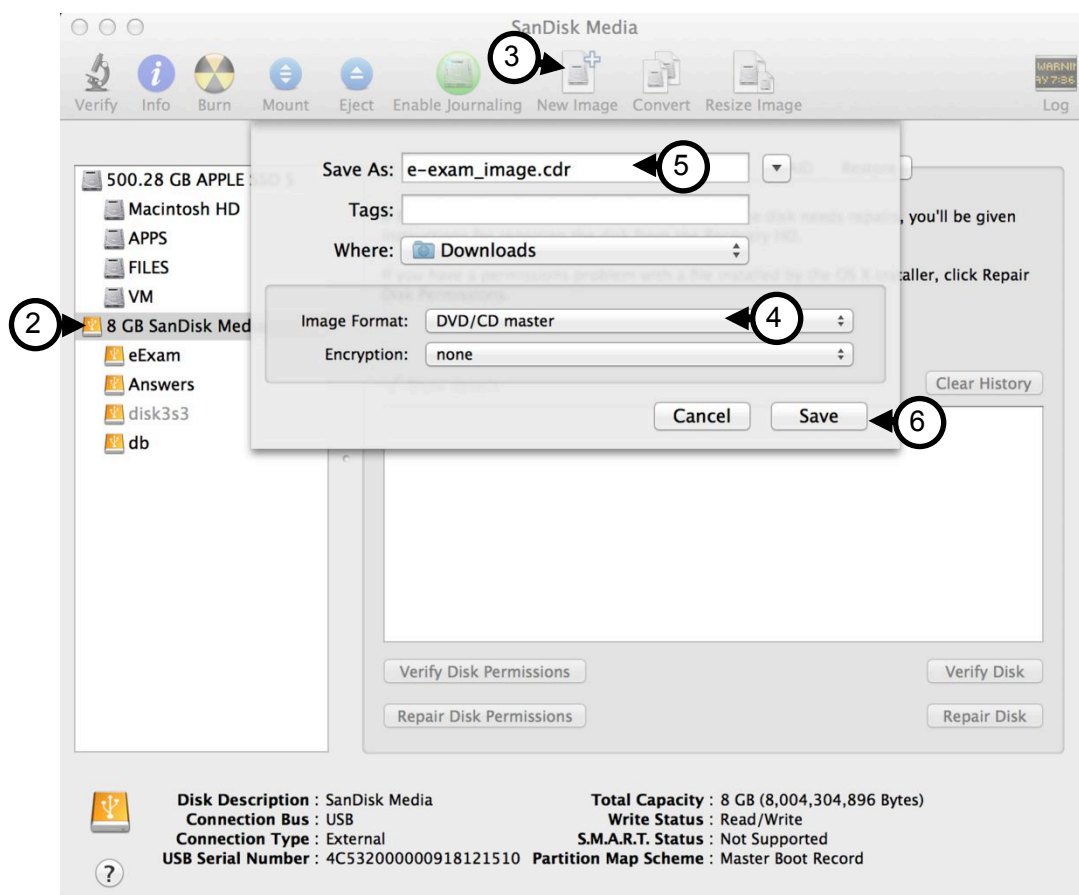
3. Press the 'New Image' button (located at the top of the window)

The new image dialog will appear.

4. On the bottom bar, change 'Image Format' to DVD/CD master. This will create an image in the .cdr format.

5. At the top of the dialog, change the name of the file and set the directory in which you want it saved.

6. Click 'save'.

It will take several minutes to complete.

7. To turn the .cdr file into a .iso file, just rename the file from IMAGENAME.cdr to IMAGENAME.iso, no 'conversion' is necessary.

Method 2 Using Terminal and DD

This is provided as an alternative.

Note: This creates an exact copy of the entire USB stick – even unnecessary space – so if using 8GB stick you get 8GB ISO.

You may have subsequent problems burning to 8GB sticks from a different manufacturer because not all 8GB sticks are exactly the same size!

To start we need to determine the current set of disk identifiers.

Do not insert the source USB stick yet.

Type this command:

```
diskutil list
```

On the screen it will look similar to this:

```
MacBook-Pro:~ user$ diskutil list
/dev/disk0
   #:    TYPE NAME              SIZE          IDENTIFIER
   0:    GUID_partition_scheme *500.3 GB   disk0
   1:    EFI                    209.7 MB   disk0s1
   2:    Apple_HFS Macintosh HD 100.0 GB   disk0s2
   3:    Apple_Boot Recovery HD 650.0 MB   disk0s3
   4:    Apple_HFS APPS          90.0 GB   disk0s4
   5:    Apple_HFS FILES        208.3 GB   disk0s5
   6:    Apple_HFS VM           100.7 GB   disk0s6
```

This list will display all the 'drives' mounted on your Mac's file system. Your computer will look different.

In this case my Mac has one internal physical HDD given the identifier 'disk0'.

There are a number of partitions (volumes in Mac speak) numbered 0 to 6.

If you have more then one physical HDD it will be numbered disk1, disk2 and so on. The number of volumes on your HDD will likely be different.

So a computer with three physical HDDs (connected internally or externally) would display disk0, disk1, disk2.

Now we need to find the correct source USB disk identifier.

Next insert the USB stick and run the command again.

Type this command:

```
diskutil list
```

Again, on screen it will look similar to this:

```
MacBook-Pro:~ user$ diskutil list
/dev/disk0
   #:    TYPE NAME                SIZE        IDENTIFIER
   0:    GUID_partition_scheme *500.3 GB   disk0
   1:    EFI                     209.7 MB    disk0s1
   2:    Apple_HFS Macintosh HD 100.0 GB    disk0s2
   3:    Apple_Boot Recovery HD 650.0 MB    disk0s3
   4:    Apple_HFS APPS           90.0 GB    disk0s4
   5:    Apple_HFS FILES         208.3 GB    disk0s5
   6:    Apple_HFS VM            100.7 GB    disk0s6
/dev/disk1
   #:    TYPE NAME                SIZE        IDENTIFIER
   0:    FDisk_partition_scheme*8.0 GB      disk1
   1:    DOS_FAT_32 eExam        209 MB      disk1s1
   2:    DOS_FAT_32 Answers      209 MB      disk1s2
   3:    DOS_FAT_32 system    1.6 GB       disk1s3
   4:    DOS_FAT_32 db         314 MB       disk1s4
```

Again you see the list of drives mounted. You will notice one new disk in the list, in this case 'disk1'. This is our source USB stick containing the e-Exam system.

You will notice the sum of the individual partitions doesn't add up to the full 8GB. This is because the e-exam image was smaller then the maximum capacity of the USB stick.

The identifier digit assigned will likely be one greater than the highest number seen in the previous command.

Again the example of a computer with three physical HDDs (disk0, disk1, disk2) it is likely the USB stick would be given the id of 'disk3'.

Be sure of the correct designation of the USB stick because this will be used as the source of the ISO. On my Mac it is 'disk1'.

Write down the diskID of your USB.

Unmount the disk (but do not physically remove it)

```
diskutil unmountDisk /dev/disk1
```

Now create the ISO:

```
sudo dd if=/dev/disk1 of=eexam.iso
```

If you browse to the location using the Finder you will see the new file.

Linux (command line)

At a command prompt, type 'dmesg'. Insert the USB,

Observe the output to find the identifier of attached disk, such as [sdb]

Then use dd to create the ISO.

```
$ sudo dmesg
[74506.074199] sd 35:0:0:0: [sdb] Attached SCSI disk
$ sudo dd if=/dev/sdb of=eexam.iso
```

Test the e-Exam USB stick

Before running the newly created e-Exam USB, your computer must be completely shut down. Not just put to sleep or suspended – you will be booting into a completely new operating system (Ubuntu) so you need to do a full shut down.

1. With the computer turned off, insert the USB stick.
2. Turn on (power on) the computer/laptop – i.e. press and release the power button.
3. Quickly press the one time boot key (tap repeatedly on windows hardware - F12 is common, see a longer list under the 'Boot settings' section – on Macs hold down Alt/Option and wait...).
4. A boot menu should appear.
5. Select the USB device to boot (on a Mac this might appear as 'Windows' or 'EFI') and press enter.
6. The e-Exam system should start.

If your normal operating system starts, shut down and try again or check the information in the 'Boot Settings' section.

For more detailed start-up and hardware set-up guides to match your hardware, see the guides on the transformingexams.com site:

- [W8] for setting up windows 8 machines to allow booting from an e-Exam USB stick,
- [Wa] for automating the start up of an e-Exam SUB stick on 'Windows' hardware (See also the section titled 'Changing the BIOS (Set up) Boot Priority').
- [Wm] for manualy starting up an e-Exam SUB stick (via 'one time boot' key) on 'Windows' hardware, or
- [A] for starting up an e-Exam SUB stick using Apple hardware, and
- [Wk] for a list of common 'boot' keys.

Note - Refer to the 'e-Exam v5 Features Guide' for use of the e-Exam system software itself.

Boot Settings

Specific information for accessing the boot menu or configuring your hardware to facilitate booting via an e-Exam USB stick is outlined below.

Common One Time Boot Keys by Manufacturer

The following list covers Intel based hardware from a number manufacturers including Apple (i.e. the most common machines that normally run 'Windows', Apple OSX or Linux).

Common Intel based hardware boot menu access keys

Brand	Model	One Time Boot Key	BIOS Set-up Key
Acer	All	F12 (note some models need to be enabled in the BIOS setting –see below)	Del, F2
Apple	Intel laptops: MacBook Pro, Air.	ALT/Option (hold down the key, turn on the power and keep holding down the key until the boot choice appears. Then select 'windows' or 'EFI').	-
ASUS	EEE-PC Eee PC 1025c, 7021, 900, 1000H	Esc	F9 or F2
ASUS	R503C	F8	Del or F2
Dell	Mini 9	0	2
Dell	Most others, including Alienware	F12	F2
Dell	Venue 11 tablet PCs. (note venue 7 and 8 tables use a micro USB port so need an adapter) See also Win 8 boot settings.	Shutdown first. Then hold 'Volume Down' button and turn on the power. Keep pressing 'volume down' until the boot menu appears.	-
eMachines		F12	Tab, Del
Fujitsu		F12	F2
HP/Compaq	Older models	ESC	F10
HP/Compaq	Newer	F9	
HP	2000, Pavilion, ENVY, dv6 and dv7 PC, dv9700	ESC > F9	ESC >F10
Lenovo	All	F12	F1, F2
Microsoft	Surface (*not yet working on e-Exam System)	Hold 'Volume down' then power on.	Hold Vol up then power on.
NEC		F5	F2
Packard Bell		F8	F1, Del
Samsung		F12	
Samsung	NC10, Series 5 Ultra and Series 7 Chronos	Esc	F2
Sharp		F2	F2
Sony	VAIO	Esc	
Sony	VAIO, PCG, VGN	F11	F1, F2, F3
Sony	VGN	Esc, F10	F2
Sony	VAIO e series	F12	ASSIST (while computer is off)
Toshiba	All	F12	F1, Esc or F2

This list may not be exhaustive. If your computer is not shown or the key doesn't work, try a web search for the user manual for your computer make and model.

Notes:

- In some cases the computer may have the one time boot menu locked out. You can probably enable the one time boot menu by altering the BIOS/EFI (Set up) settings - see the following section.
- On some computers you may need to disable the 'Boot booster' or 'Fast Boot' in the BIOS/EFI (Set up) settings in order to gain access to the one time boot key – but if you change the boot priority/order this becomes a moot point (see next section).
- On some computers you may need to enable the 'external devices' within the BIOS/EFI (Set up) settings to allow booting from USB sticks.
- If you have a recently purchased computer/laptop with a Windows 8 sticker on it – i.e. Windows 8+ pre-installed, please see the relevant sub-section at the end of this document for instructions on enabling the ability to boot using a USB device.
- Some models with a mix of USB3 and USB2 ports wont boot from the USB3 ports (these have usually blue inside the port). Put the e-Exam USB stick into a USB2 port and try again.

Devices: Incompatible or Not Recommended for Use

- Hardware containing AMD or ARM processors (such as mobile phones, tablet devices running iOS or Android, Raspberry pie etc)
- PowerPC based Apple Macs (these are now quite old)
- Older Intel hardware (approx pre 2004) may not boot from USB due to BIOS limitations.
- Some hardware may not work due to graphics card/driver incompatibilities (it actually does boot but the screen goes blank).
- Microsoft Surface (may boot but is unstable and likely to crash).
- Chromebooks (require a switch to developer mode in order to enable booting from USB. The switch to developer mode is destructive to existing data).

Changing the BIOS (Set up) Boot Priority (non-Apple Hardware)

On most Intel based machines (those that normally run 'windows'), you can change the Boot Priority specified in the BIOS/UEFI (CMOS / Set up settings) on a more permanent (but reversible) basis. This will allow the e-Exam USB stick to be started automatically. This won't impact the normal operation of your computer because if no bootable USB stick is present it will still boot your regular operating system.

It also means you won't need to remember the one time boot key anymore!

Exceptions:

- The BIOS/UEFI from some manufacturers (e.g. ASUS) are not capable of setting a generic USB device in the boot priority list.

- This section is irrelevant for Apple hardware as the boot priority cannot be set.

You will need to enter the BIOS/UEFI settings area in the early stages of the boot process by pressing the 'setup' key. The specific key varies by manufacturer and a list is given in the previous section. The key may be displayed briefly just after you power on the computer. E.g. a message such as "Press F2 for setup" may be momentarily displayed.

Note: For those running Windows - this is a different menu to that of the Windows 'Advanced Boot Options' screen available via F8.

To change the boot priority/order:

1. With your computer powered off.

2. Turn the power on (press and release the power button) while rapidly tapping the 'set-up' key.

3. Keep tapping the setup key until a message such as 'preparing BIOS setup menu' appears or the BIOS/UEFI screen itself appears.

4. Once inside the BIOS settings area you need to locate the 'Boot Priority (or Boot Order' or 'Boot Sequence') menu.

   - If you are not able to use a mouse, you will find instructions on the screen as to which keys you need to press in order to navigate, select menu items, alter settings, save changes etc.

5. Within the Boot Priority sub-menu you need to change the sequence of boot devices.

6. Put the USB device(s) / Removable storage device(s) first in the list. If you are unsure which option is the correct USB device, try to identify the hard disk drive and place it last.

7. Save and Exit.

Refs:

One time boot keys https://craftedflash.com/info/how-boot-computer-from-usb-flash-drive

BIOS setup access keys by motherboard brand (not computer brand) http://pcsupport.about.com/od/fixtheproblem/a/biosaccess_mb.htm

Dealing with Pre-installed Windows 8 and Secure Boot

Laptops with a Windows 8 sticker (i.e. sold with Windows 8+ pre-installed) will prevent you from booting to the e-Exam USB stick (Ubuntu) via the one time boot menu or via changed boot priority due to 'secure boot' settings. This may also be the case if you installed Windows 8 yourself using UEFI.

On some brands, even the one time boot menu itself is locked out.

The first thing to try is to disable 'secure boot' (You may also need to unlock the one time boot menu and/or enable 'Legacy BIOS' mode amongst other things) in order to enable the booting of alternative operating systems (the e-Exam system uses the Ubuntu operating system).

To do so you need to boot into Windows 8+ and follow a lengthy series of menus to gain access to the UEFI/BIOS settings.

1) gain access to the UEFI/BIOS settings.

Option A - At a 'Power' button (found in the Charms bar > Settings or login screen bottom right):
   - Hold down a 'Shift' key while clicking 'Restart'.
     [go to step 2]

Option B - Inside Windows 8 tiles (Metro):
   - Go to Charms (Win+C)
   - Select 'Settings' (gear icon)
   - Select 'Change PC settings', next,
     - If in Win 8.0: Select 'Update and recovery', then 'Recovery'. … or
     - If in Win 8.1: Select 'General'.
   - Then, Select 'Advanced startup',
   - Select 'Restart now'.
     [go to step 2]

Option C - Command line:
   - Shutdown.exe /r /o
     [go to step 2]

2) At the Boot 'Choose an option' screen:
   - Select 'Troubleshoot' then,
   - Select 'Advanced Options' then,
   - Select 'UEFI Firmware Settings' (or 'Start-up Settings' if UEFI isn't present) then,

Click 'Restart'.

The computer will now restart and, depending upon the manufacturer, one of the following should happen:

- If 'UEFI Firmware Settings' was available and chosen, then the computer may automatically boot directly to the UEFI firmware settings screen.
- Or you may be presented with a choice to enter the BIOS / UEFI set up area, be sure to select it.
- Otherwise, the computer will restart somewhat normally - you will need to press the 'BIOS set-up key' early in this process (tap repeatedly if you are unsure of the timing). The specific key varies by manufacturer (see list in guide 'Wk'). A message such as "Press F2 for setup" may be displayed briefly after the power is cycles on.

3) Once inside the UEFI/BIOS settings area, the options you see will depend on the manufacturer. Look for menu items such as 'Security', 'Authentication', 'UEFI', or 'Boot'. First try to:

1. Disable 'secure boot' or disable 'security check at boot'.
2. Change the boot priority to place the USB device first (see previous section).

Try these two settings first by saving, existing and rebooting with the USB inserted.

If the e-Exam System still fails start, try the following…

- Some systems don't permit automatic boot from a USB stick, while they do will allow manual start-up via the 'one time boot' key. Try a manual start up via the one-time boot key next.

If that fails then, depending on the design of your particular BIOS/UEFI you might also need to try one or more of the following:

- Enable 'external' boot devices – i.e. USB devices.
- Enable or switch to 'legacy boot' mode. It may appear as disable 'UEFI boot' or set 'launch CSM' to enabled –
  - o Note some computers allow both modes to be active at once.
  - o Those that only allow one mode to be active – i.e. 'legacy mode' or 'UEFI mode', when set to the former may prevent Windows 8 from booting. Try it and see, you can always reverse the setting later.
- You may also need to enable the 'boot menu' (so that you can make use of the 'one time boot' key).
- If you find the options greyed out (unable to be changed), you may need to use a BIOS/CMOS administrator password or may need to turn off a security setting to unlock the options.

If you are having trouble, try a web search for the user manual for your computer make and model. Search for your computer brand and model along with key words such as 'boot menu' or 'bios set up'.

Save and Exit.

You should now be able to boot using the e-Exam USB stick.

Note: a possible minor side effect of disabling secure boot for computer with Windows 8.1 that has not been updated is that it may cause a watermark to appear in bottom right corner of the screen stating that "SecureBoot isn't configured correctly". Microsoft has released a hotfix on 17 Oct 2013 to remove the notice if you find it annoying, see http://support.microsoft.com/kb/2902864. In any case this will not affect the normal operation of Windows 8.1.

Refer to the 'e-Exam v5 Features Guide' for use of the e-Exam system itself.

Managing e-Exam USB Sticks

The e-Exam System allows for manual configuration of settings such that the same USB stick can be converted to perform different tasks.

Possible settings are:

- Exam type (demo, paper, moodle, remote) – see details in the table below.

- Include student names (yes/no) - this toggles the student name input field on or off for the e-Exam Start dialog used for 'paper' and 'moodle' exam types.

- Wipe student data on shut down (yes/no) – when set to yes the 'clear my data' dialog will appear upon shut down. This allows the USB to be reset to 'as new' when using it for demos/practice. See further information below.

- Sound muted (yes/no) – when set to yes, this sets the sound volume to zero. It can still be manually adjusted by users.

- Start URL – this sets the starting URL for when the web browser is tigered while using the 'remote' exam type only. The setting is ignored for 'paper' and 'moodle' exam types.

  o Note: to adjust permitted network destinations (IP addresses) the IP table of the operating system will also need to be changed. On the Demo ISO this is currently fixed to the UQ LMS server. This will require IT technical skills make these changes, however this only needs to be done once per institution.

The settings applicable to each exam type are set out in the table below.

Type	Reset	Names	Sound	Start URL
Demo	Y	N/A	Y	Y
Paper	Y	Y	Y	N/A
Moodle	Y	Y	Y	N/A
Remote	Y*	N/A	Y	Y

*Currently not applicable but may be utilised in future feature enhancements.

To locate the settings file:

1. Having mounted the e-Exam USB stick inside another operating system, go to the 'eExam' partition and locate the '.config' file (you will need to have hidden files visible or use Terminal to 'ls -a')

2. Open this file in a text editor.

Setting the Exam Type

The USB can be configured to use a particular type of exam only - as it would in production.

To configure the exam type:

1. Mount the USB into another operating system capable of mounting multi-partition USB sticks (OSX or Linux). Note: 'windows' won't work for this step because it can't mount multi-partition USB sticks. If you only have a 'windows' computer, you can use a generic Ubuntu Live USB to boot a 'windows' computer and then mount the e-Exam USB within it.

2. Go to the 'eExam' partition and locate the '.config' file (you will need to have hidden files visible or use Terminal to 'ls -a')

3. Open this file in a text editor.

4. Change the [examtype] setting to the applicable value:

```
[examtype]
xxxx
```

5. Save the file.

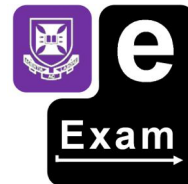The choices for xxxx under [examtype] are:

- demo = all options available, but with the 'e-Exam Starter' dialog inactive – each must be started manually by the user. The reset feature, sound mute and start URL (where applicable) settings can be used. Users will need to manually launch/use each exam type:
  - To manually launch paper (word doc mode) press the 'Q' button on the left side bar. Open the relevant doc file. Once inside the word processor perform File > Save As, place the file into the 'Answers' drive and prefix your student ID to the file name.
  - To manually launch moodle (on-board LMS) mode press the 'M' button on the left side bar. At the Moodle login screen use the username 'student' and pass 'StudentAccount1#'.
  - To manually launch remote LMS mode - Connect to a network e.g. join a wireless network, then press the 'Bb' button on the left side bar.

- paper = word processed exams using Libre Office Writer. This will have the e-Exam Starter dialog request a student ID number, student names (the name box can be disabled) and then proceed to copy the question file, rename it prefixing the student ID number to the file name and placing this copy into the Answers partition. It then opens the file ready for the student to begin typing their responses. This exam type can be used in conjunction with the reset, sound mute and names settings.

- moodle = computer marked question type exams using the on-board Moodle LMS quiz features. This will have the e-Exam Starter dialog request a student ID number, names (the name box can be disabled) and then proceed to create a student Moodle account on-the-fly using the details given. It then opens the web browser to the start page for the exam having already logged the student into their account. This exam type can be used in conjunction with the reset, sound mute and name settings. If the name box is disabled then the text 'exam candidate' will be used in place of the student name.

- remote = for use with remote LMS based exams, e.g. LMS on a server. This initiates a connection to the LMS server by opening a browser to the defined URL (in this case the UQ Blackboard login page). Notes:
  - If relying on a wireless connection, the user must manually connect to the wireless network before pressing the 'start exam' button or the 'Bb' button. *This may be automated in a future version.*
  - There are matching IP address(es) set in the IP tables, thus if you want to change to another online LMS both the start URL setting and the system IP tables need to be edited. The latter requires a system (squashfs) re-build to be performed.

Changing the Exam Content

The e-Exam System v5 Demo serves as a base platform from which to build custom exam environments. The sample ISO files contain a couple of examples to get you started. There is a 'post paper' exam using the word processor ('paper') exam type and a computer marked exam example using the on-board LMS ('Moodle' exam type). There are example exams are provided on the transforming exams website as ZIP downloads. Additional examples may be added over time.

The example exams provided on the TransformingExams.com site are:

- Example 'paper equivalent' exam. This small ZIP file contains a .doc file and ancillary config files. This utilises the on-board office suite. This style of exam can be done as an e-Exam or via pen-on-paper giving students a choice. This is prepared using a regular word processor and either printed or copied onto the e-Exam platform. This approach is ideal for first the stage of a transition to e-exams. Tip: save as '.doc' format and avoid '.docx' format.
- Example 'post paper' exam. This is a larger ZIP file that contains .doc file, sample multimedia files, sample applications and ancillary config files. This also utilises the on-board office suite along with multi media components and additional software tools. This style of exam requires a computer is used by all students as it contains elements that cant be done via pen-on-paper. This could be extended to use any common office file format such as a spreadsheet file and presentation files, or indeed other file formats such as CAD files provided the appropriate software is added to the e-Exam system.

To set up a different exam on an existing e-Exam System USB follow the steps below. You can obtain one of the sample exam ZIP files or create your own. Tip: for those creating their own be sure to save as '.doc' format and avoid the '.docx' format.

To change the exam file(s) on an existing e-Exam USB you will need to:

1. Create or obtain the exam files (e.g. Download and unzip the example exam files).
2. Mount the USB into another operating system capable of mounting multi-partition USB sticks (i.e. inside OSX or Linux). Note: 'windows' won't work for this step because it can't mount multi-partition USB sticks. If you only have a 'windows' computer, you can use a generic Ubuntu Live USB to boot a 'windows' computer and then mount the e-Exam USB within it.
3. Replace the contents of the 'eexam' partition with the contents of the ZIP file.
4. Boot a computer using the e-Exam USB to try.

The minimum files required in the eexam partition are:

- One x '.config' file: the per exam configuration file.
- One x '.background' file: an image file to serve as the wallpaper/background. This should be unique per exam.
- One x '.doc' file. This contains the exam questions. The exam document file name must begin with the string 'STUDENTNO_' (without the quotes). E.g. STUDENTNO_s2_2014_bilogy_final_exam.doc. This file will be opened and will be copied to the answers partition where the STUDENTNO strong is replaced with the student's ID number. This file thus becomes the student own response file. It is then opened by the system for the student. Note: do not use spaces in the file name.
- One x .123456789hash file (random number hash file).

Recommended Quality Control for Exam Files

It is recommended that you test the exam files by booting to the e-Exam System USB before mass-producing USBs! First try the exam paper in the e-exam system:

1. Place the exam file(s) onto the 'eexam' partition of an existing e-Exam System USB.
2. Adjust the .config file to enable the 'reset feature' (see 'Enabling the reset feature').
3. Boot a computer to the E-Exam System USB to try the exam.
4. If changes are necessary follow on here otherwise jump to the next step. Make any adjustments in the word processor to ensure the final version will display correctly. Then save the file, exit the word processor.
5. Then press the 'Shut Down' button.
   a. If no changes were necessary choose 'Clear my data', then confirm the shut down. The USB will be 'reset' to as-new condition. Jump to step 6.
   OR
   b. If you did make changes choose 'keep my data', then confirm the shut down. The adjusted exam file will be retained on the 'answers' partition. Continue on to update the exam file with the new version.
      i. Mount the USB into another operating system capable of mounting multi-partition USB sticks (i.e. inside OSX or Linux).
      ii. Copy the updated exam file from the 'answers' partition.
      iii. Replace the original exam file on the 'eexam' partition with the updated file.
      iv. Adjust the file name to ensure it begins with the string STUDENTNO_
      v. Reset the USB stick (See Manually Resetting the USB stick' or by booting back into the e-Exam System USB and choosing 'Clear my data' upon shut down).
6. Mount the USB into another operating system capable of mounting multi-partition USB sticks (again).
7. Adjust the .config file to disable the 'reset feature' (see 'Enabling the reset feature').
8. Un-mount the e-Exam USB stick.

The customised e-Exam System USB should now be ready to use (or duplicate). You might like to do another round of testing/resetting to be sure!

A Note on Managing Computer Marked Question Type Exams

Note: The Moodle feature is currently still in demonstration status and should not be used for production environments.

See the separate document "Setting Up Moodle Mode Exams - e-Exam System v5".

Enabling the 'Reset' Feature

Recent versions of the e-Exam System v5 Demo contain a feature to allow the USB stick to be 'reset' to an as-new condition after it has been used by a 'student' user. Therefore a reset can be done from within the e-Exam System interface itself rather then having to mount the USB stick on a secondary operating system.

This is to allow a single USB to be shared between multiple students for practice and demonstration purposes. For example, when a USB stick is put on a short term loan in a library or for use in drop-in help desk sessions. This feature should not be used for real exams!

If configured, the reset option is invoked as an extra 'reset' step when the 'Shut Down' button on the side bar is used. If so, the 'clear exam' dialog box appears on which the user has three choices.
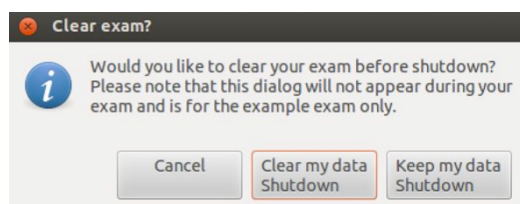
- 'Cancel' – cancels the action and returns the user to the desktop.
- 'Clear my data shut down'
    - This re-sets the stick to an 'as new' state. This will wipe student data and any answers files in the 'Answers' partition. This should be used before the USB stick is returned.
- 'Keep my data shut down'
    - This is used when a student user wants to continue practicing. It will retain student data and answers file(s) so they can practice recovery and loss of power scenarios.

After pressing either of the shutdown buttons, the regular shut down confirmation dialog will appear and will need to be confirmed as normal.

To enable this extra reset step:
1. Mount the USB into another operating system capable of mounting multi-partition USB sticks (OSX or Linux).
2. Go to the 'eExam' partition and locate the '.config' file (you will need to have hidden files visible or use Terminal to 'ls -a').
3. Open this file in a text editor.
4. Change the setting like so:

```
[wipe_student_data_on_shutdown]
yes
```
5. Save the file.

The next time you boot using the USB stick the re-set function will be available.

To disable the reset feature just delete the 'yes' word leaving the line blank.

Initial Set-up of Blank USB Sticks for the e-Exam System

In order to turn multiple new blank USB sticks into e-Exam System USB sticks we will need to 'burn' a disk image file (ISO) containing the e-Exam operating system and application files onto each.

This is a one to many 'bit for bit' duplication process and so is exact and can take some time.

> Note: if you already have e-Exam USBs and would like to re-use them for another exam see the 'Recycling Existing e-Exam USB sticks for the Next Exam' section.

USB sticks formatted with a single FAT32 partition are best for this initial set-up. Fortunately when USB sticks manufactured and sold new they are commonly formatted as a single FAT32 Windows partition; so it is just what we need!

> Note: *All files on the USB stick will be irrevocably overwritten*. If there are files on the USBs that you would like to keep, please back these up first. You do not need to remove the files. Do not change the format of the partition and do not create multiple partitions yourself.

To perform the 'burn' you will need:

- Multiple USB sticks – each formatted as a single FAT32 partition (commonly so when purchased new). If the USB sticks are not a single FAT32 partition see 'Returning an e-Exam USB Stick to a Generic Storage Device' to do so.
- A USB hub. USB 3.0 is recommended, as it will provide for faster data throughput. The more ports the better. You can connect multiple smaller hubs to the one computer as well. We are currently using a 16 port copybox as a hub and a 20 port generic USB hub.
- A computer with multiple USB ports. Again, USB 3.0 ports are recommended. We currently use a Windows computer to perform this task but it could be done on another OS.
- An ISO to USB duplication application. We are currently using the freeware 'ImageUSB' windows application (obtain it from http://www.osforensics.com/tools/write-usb-images.html). It will produce multiple e-Exam USBs (multi-partition USBs) from a single ISO file. This software has been found to be fast and accurate. However, it only runs on Windows.
  - Note: The resulting e-Exam USBs can be used to boot both 'windows' and Apple hardware. However, once a USB becomes an e-Exam USB it will contain multiple partitions and so it cannot be mounted fully *in* windows – only the first partition will mount. Therefore in order to administer or change their contents afterwards you will need OSX or Linux.
  - Note: Commercially available 'copy boxes' often come with their own proprietary software most of which only work with Windows.

An example follows of a batch burn process using Windows with a generic USB hub and the free ImageUSB tool.

1. Start the computer.
2. Connect the USB Hub(s).
3. Start ImageUSB.
4. Inset USB sticks into the hub(s) one by one. Note some computers may reach a limit of the number of USBs they can accept at one time, so it is important to observe that each new USB is mounted properly.
5. Refresh the drive list in ImageUSB and count to ensure the dives listed match the number of USB sticks.
6. Select the ISO file as the source (you may need to change the file type being sought in the dialog box in order to see your ISO file).
7. Select the destination drive letters (USBs).
8. Start the duplication process (you will need to confirm twice).
9. Wait until the process is completed. Status messages will show progress.
10. Unmount/eject the finished USBs.

Each USB stick will be identical. You can test one by booting a computer to the e-Exam USB stick - and remember to 'reset' it if it is to be used for an exam.

Note: a 'helper' script is available from the project team that can produce multiple USBs from a single ISO file using the OSX command line. However this script is much slower than the 'ImageUSB' application. See the 'Administrative Helper Scripts' section for details.

Recycling Existing e-Exam USB Sticks for the Next Exam

It is possible reuse e-Exam USB sticks multiple times. You can extend their life by performing file operations on these USB sticks (copy, delete, rename) rather then performing a 'full burn' of an ISO

file to sticks each time. Performing a full burn will shorten their usable life and will likely take longer than simple file operations as well.

A typical workflow to recycle a set of used e-Exam USBs (collect answers and set up for the next exam):

1. Insert used USBs into a USB Hub connected to a computer.
2. Copy answer file(s) from multiple USBs to a single folder on the computer (while checking each has copied correctly).
3. Check that there is an answer file for each student that sat the exam (manual process).
4. Delete answer files (delete all files on the answer partition of each USB).
5. Delete exam question files (delete all files on the eexam partition of each USB).
6. Delete database files (as applicable - delete all files on the db partition of each USB).
7. Copy the new exam question file(s) to multiple USB sticks (see also 'Recommended Quality Control for Exam Files').

A collection of 'Administrative Helper Scripts' is available to perform such tasks on multiple USB sticks at once (batch).

Administrative Helper Scripts

Several bash or Python scripts are available to assist with administrating e-Exam USBs. These scripts assume you have one or more e-Exam USBs already created. These scripts require OSX or Linux and run via the command line. Please contact the project team to obtain them. Graphical interface versions of these tools are planned.

The scripts are:

- **copy_from.py** This can be used to collect the response file(s) from multiple e-Exam USBs after an exam. This command line script will copy the contents of the specified partition of one or more e-Exam USBs to a specified destination on the host computer. The script will prompt for the relevant source and destinations. The default source is 'answers'. You can drag an empty folder into the command line to insert the path to the destination. E.g. if 20 e-Exam USBs are connected via a Hub then the contents of all 20 'answers' partitions will be copied to the specified folder on your computer.

- **copy_to.py** This can be used to copy a new set of exam files onto multiple e-Exam USBs before an exam. This command line script will copy the contents of the specified folder on the host computer to one or more e-Exam USBs to a specified partition. The script will prompt for the relevant source and destinations. The default destination is 'eexam'. You can drag the folder containing the exam files into the command line to insert the path for the source.

- **delete.py** This can be used to remove exam answer files or question files from one or more e-Exam USBs in order to get ready for the next exam. This command line script will delete all contents of the specified partition of one or more e-Exam USBs. The script will prompt for the partition name. It defaults to 'answers'. Use with care!

- **cleanup.sh** This command line script will reset a *single* e-Exam USB to 'as-new' for an exam and clean up various 'junk' files left after mounting in OSX. This script was designed re-set an e-Exam USB. It acts upon volumes with the names 'system', 'db', 'answers' and 'eExam'. It is configured to reset 'paper' type exams (e.g. after quality control/testing to get it ready for duplication). This script will not remove the exam question file from the eexam partition. However, it will remove the .eexam.sql from the db partition so it may not be suitable for 'moodle' type exams – see variants below. Variations on this script are:
  - _all – as above but does extra and inoculates the partitions against several types OSX temp files.
  - _keeplibre – as per _all but keeps the .libre folder that contains libre office temp files.
  - _keepmoodle - as per _all but keeps the .exam.sql file that contains the latest version of the Moodle database.
  - _batch.py – Python script. Functions as per _all but does so for all attached devices that have volumes with the names 'system', 'db', 'answers' and 'eExam'.

- **Copybox.sh** This allows for simple bit for bit duplication of USBs from an ISO file. Normally only used to set-up new blank USBs with the e-Exam System. Use with great care [further

information TBA]. See also 'Initial Set-up of Blank USB Sticks for the e-Exam System'. At present using this script is much slower then tools like ImageUSB.
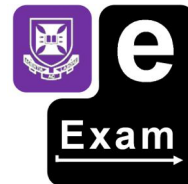
Manually Resetting the e-Exam System USB Stick

The USB stick can also be manually reset for the next student user. This is used for practice and between testing and getting ready for duplication.

To do so:

1. Mount the USB into another operating system capable of mounting multi-partition USB sticks (OSX or Linux).
2. Go to the 'answers' partition and delete the following files and directories:
   - .user_info
   - .libreoffice (directory)
   - any .doc files (or other student created response files) that are present.
3. Go to the 'db' partition and delete the following file (this resets moodle to the default database and example demo exam – but don't do this for Moodle exams where you want to keep updated Moodle material, instead follow the guidance given in 'Managing Moodle exams'):
   - .eexam.sql

The e-Exam USB can now be reused for the next student/user as if it were new.

However, it is likely a range of temp/junk files will remain. For completeness, the full list of files that can be removed are:

rm -r /Volumes/System/.fseventsd
rm -r /Volumes/eExam/.fseventsd
rm -r /Volumes/Answers/.fseventsd
rm -r /Volumes/db/.fseventsd
rm -r /Volumes/System/.Trash*
rm -r /Volumes/eExam/.Trash*
rm -r /Volumes/Answers/.Trash*
rm -r /Volumes/db/.Trash*
rm -r /Volumes/System/.TemporaryItems
rm -r /Volumes/eExam/.TemporaryItems
rm -r /Volumes/Answers/.TemporaryItems
rm -r /Volumes/db/.TemporaryItems
rm -r /Volumes/System/\$RECYCLE*
rm -r /Volumes/eExam/\$RECYCLE*
rm -r /Volumes/Answers/\$RECYCLE*
rm -r /Volumes/db/\$RECYCLE*
rm /Volumes/System/._.*
rm /Volumes/eExam/._.*
rm /Volumes/Answers/._.*
rm /Volumes/db/._.*
rm -r /Volumes/System/.Spotligh*
rm -r /Volumes/eExam/.Spotligh*
rm -r /Volumes/Answers/.Spotligh*
rm -r /Volumes/db/.Spotligh*
rm /Volumes/Answers/.user_info
rm /Volumes/db/log
rm /Volumes/db/temp_backups/*
rm /Volumes/Answers/*.bak
rm /Volumes/Answers/*odt
rm /Volumes/Answers/*.doc
rm /Volumes/eExam/.DS_Store
rm /Volumes/eExam/.bootlog
rm -r /Volumes/Answers/*.tmp
rm -r /Volumes/Answers/.libre*
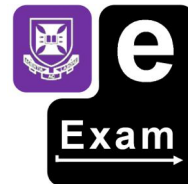
Plus, to reset the Moodle database to default demo mode:

rm /Volumes/db/.eexam.sql

Plus, to remove an exam question script (document) and associated materials (for the next exam):

rm /Volumes/eExam/*.doc
rm -r /Volumes/eExam/Materials

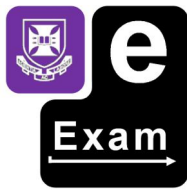## Returning an e-Exam USB Stick to a Generic Storage Device

To convert a multi-partition e-Exam System USB stick back into a standard USB stick that can be used for file storage then you will need to re-partition it. This will also work to re-birth e-Exam USB sticks that failed to 'burn' correctly (e.g. dud sticks).

Warning! Re-partitioning the USB device so will completely wipe all data on the device.

To re-partition an e-Exam USB stick so you will need to use an operating system capable of mounting/reading multi-partition removable devices – i.e. OSX or Linux. This can't be easily done within Windows. If you only have Windows then you can use a generic bootable Live Linux USB or CD to boot the computer into Linux and perform these operations.

1. Mount the e-Exam USB stick inside the operating system.
2. Go to the appropriate tool:
   a) In OSX use 'Disk Utility'
      1. In Disk Utility, select the root of the USB device (not one of the volumes).
      2. Click on the 'Partition' button.
      3. Change the 'Partition layout' to '1 partition' – by default it will select MS-DOS (FAT) and use all of the available device capacity.
      4. Click apply.
      5. It will unmount the volumes and perform the re-partitioning.
   b) In Linux use 'GParted' (see the user manual here: http://gparted.org/display-doc.php?name=help-manual).
      6. Select the root of the USB device (not one of the volumes).
      7. Unmount all of the partitions.
      8. Select and delete each partition.
      9. Create a single new FAT32 partition to fill all the space.
      10. Click apply.
      11. It will perform the re-partitioning.

You can now unmount/remount the USB as a standard a single FAT32 partition storage device.

Good luck :-)