rEFInd

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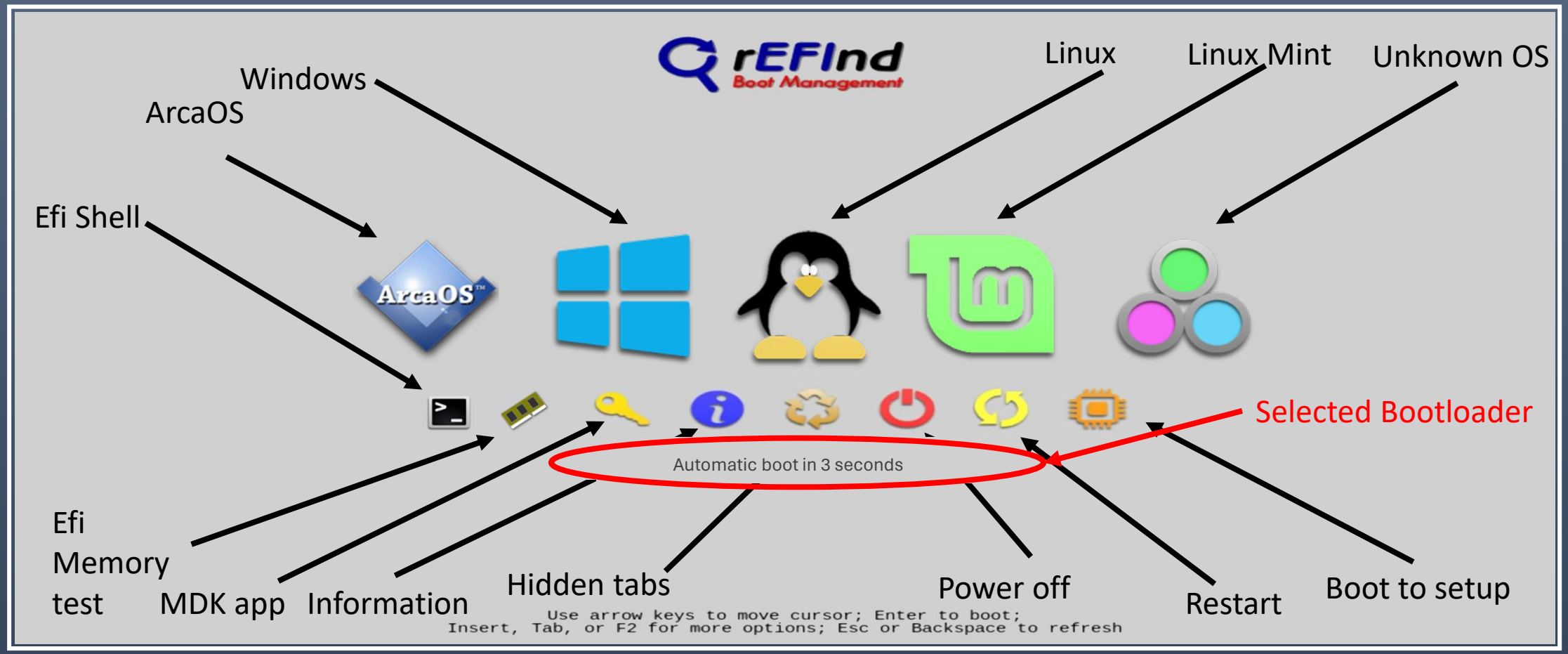
rEFInd Start screen



rEFInd - specifications

- rEFInd is a free (GNU licensed) program developed by Roderick W. Smith.
- Only for UEFI systems
- Dynamic detection of operating systems and tools.
- Customizable OS launch options.
- Graphic or text mode. The theme can be customized.
- Mac-specific features including a spoofing boot process
- Linux specific features, automatically detect the stub loader
- Support for “secure boot”

rEFInd configuration file

The rEFInd configuration file is rEFInd.Conf.
This file can be found in the EFI partition in \efi\refind\Refind

- enable the mouse
- use the touch screen
- set/disable the waiting timer
- specify icons, sizes
- stanzas
- screen resolution
- and much more

rEFInd configuration file

- In the rEFInd configuration file any line starting with the character ‘#’ is considered as informational text and is ignored.
- Each available command is documented by a number of lines of informational text.
- Example, the timeout command :

```
# Timeout in seconds for the main menu screen. Setting the timeout to 0
# disables automatic booting (i.e., no timeout). Setting it to -1 causes
# an immediate boot to the default OS *UNLESS* a keypress is in the buffer
# when rEFInd launches, in which case that keypress is interpreted as a
# shortcut key. If no matching shortcut is found, rEFInd displays its
# menu with no timeout.
#timeout 2
```

rEFInd configuration file - commands

- Timeout - timeout or if 0 disable automatic booting
- shutdown_after_timeout - shutdown instead of automatic boot
- use_nvram false - don’t store rEFInd’s variables in NVRAM
- screensaver timeout ‘secs’ - screensaver timeout, 0 disables timeout
- Banner - hide the rEFInd title banner
- label - hide boot option text label
- singleuser - remove submenu options (macOS) single-user/verbose modes
- safemode - remove option "safe mode“ (macOS)
- hwtest - remove submenu option to Apple’s HW test

rEFInd configuration file - commands

- arrows - disable scroll arrows (OS TAG line)
- hints - disable brief command summary
- editor - disable options editor
- badges - disable device-type badges
- all - disable all of the disable options
- hideui singleuser - hide user interface single user (macOS)
- hideui all - hide user interface (macOS)
- icons_dir <> - specify icons directory (relative to rEFInd's binary directory)

rEFInd configuration file - commands

- banner <> - specify banner file (bmp,png,Jpeg)
- banner_scale noscale/fillscreen - crop / stretch banner
- small_icon_size <> - specify small icon sizes (pixels)
- big_icon_size <> - specify large icon sizes (pixels)
- selection_big <> - specify selection background image
- selection_small <> - specify selection background image
- font <> - font to be used as a png file
- textonly <> - switch to text mode
- textmode <> - use UEFI text mode ‘n’

rEFInd configuration file - commands

- resolution <> - set screen resolution, X & Y or GOP
- enable_touch - enable touch screen
- enable_mouse - enable mouse support.
- mouse_size <> - set mouse pointer size
- mouse_speed <> - set mouse tracking speed
- use_graphics_for <> - launch specified OS in graphics mode
- showtools <>,<>.. - Show tools in following order
  - shell, gdisk, memtest, mok_tool, apple_recovery, windows_recovery, about, hidden_tags, reboot, exit, firmware, fwupdates, netboot
- dont_scan_tools <>,<>.. - tools to be excluded from the tools line

rEFInd configuration file - commands

• scanfor <>,<>..	- boot loaders to search for
• scan_driver_dirs.	- scan directory for drivers
• uefi_deep_legacy_scan	- UEFI boot mode device scan
• scan_delay <>	- delay disk scanning by ‘x’ seconds
• also_scan_dirs <>, <> ..	- also scan these directories
• dont_scan_volumes <>, <> ..	- partitions or disks not to scan
• dont_scan_dirs <>, <> ..	- directories not to scan
• dont_scan_files <>, <> ..	- files NOT to included as boot loaders
• scan_all_linux_kernels <>	- scan for Linux kernels without ".efi" extension

rEFInd configuration file - commands

• fold_linux_kernels <>	- launch kernel with the most recent time stamp
• extra_kernel_version_strings <>, <> ..	- treat strings as kernel version number for detection
• max_tags	- maximum # of tags to be displayed
• default_selection <>	- set the default menu selection
• enable_and_lock_vmx <>	- enable VMX bit and lock CPU MSR if unlocked
• spoof_osx_version 10.9	- tell a Mac's EFI that macOS is about to be launched

rEFInd configuration file - commands

- csr_values <> - set CSR values, Apple System Integrity
- include manual.conf <> - Include a secondary configuration file
- log level - 0 no logging, 1-4
- follow_symlinks - follow symbolic links
- windows_recovery_files - adds the specified filename(s) as recognized as Windows recovery tools
- max_tags - Limits the number of tags to display at once

rEFInd – things to note

- The Esc key will stop the timer
- Using the arrow keys stops the timer
- Moving the mouse (if enabled) stops the timer
- The arrow keys moves the selection
- The enter key selects the item to boot
- The Insert, Tab or F2 keys select an option (if available)
- The Minus key will allow you to hide an entry (use the recycle symbol to manage hidden tags)

rEFInd manual menu adjustments – stanza's

- A stanza is a way of adding a menu item, with control over that item.
- The stanza is added to the conf file
- In a stanza you can specify :
  - The volume label /partition label/ partition GUID, full path of the loader
  - Linux's ram disk name
  - Specify an icon
  - Specify a sub menu
  - Disable a stanza
  - Enable/disable graphics
  - Options

rEFInd manual menu adjustments – stanza's

- Here are three Stanzas

```
Menuentry "Ubuntu" {
    loader /EFI/ubuntu/grubx64.efi
    disabled
}

menuentry Arch {
    icon /EFI/rEFInd/icons/os_arch.png
    volume ARCHBOOT
    loader /vmlinuz-linux
    initrd /initramfs-linux.img
    options "root=/dev/sda3 ro"
}

menuentry "Windows via shell script" {
    icon \EFI\rEFInd\icons\os_win.png
    loader \EFI\tools\shell.efi
    options "fs0:\EFI\tools\launch_windows.nsh"
}
```

rEFInd - Icons

- All icons used in rEFInd can be found in the \efi\rEFInd\icons folder (± 80)
- rEFInd uses the OS subfolder name to select the icon
  - UBUNTU

os_ubuntul.png

  - LINUX

os_linux.png

- When an OS is not recognized it becomes 'unknown’ and the 'unknown’ icon used.

os_unknown.png

- By adding an icon with the same name as that of an operating system, rEFInd can display that icon

os_os2.png

rEFInd - Icons

- rEFInd uses icons with the following formats
  - Apple's ICNS
  - Portable Network Graphics (PNG) format
  - bitmap image file (BMP) format
  - Joint Photographic Experts Group (JPEG) format

  PNG and ICNS files work best for icons because they both support transparency.

rEFInd - Icons

- rEFInd uses icons with the following dimensions
  - OS icons 128x128 pixels
  - Tools 48x48 pixels (second row)
  - Special marks 32x32 pixels

Adding the ArcaOS icon

- So to the change the ‘unknown’ icon which will be displayed for ArcaOS, to a more recognisable icon we do the following:
  1. Create a suitable icon as a png file 128x128 pixels
  2. Copy that item with the name os_os2.png to the rEFInd icon directory
  3. Reboot

os_os2.png

If anybody wants a copy of my icon, just ask

rEFInd Installation – ArcaOS

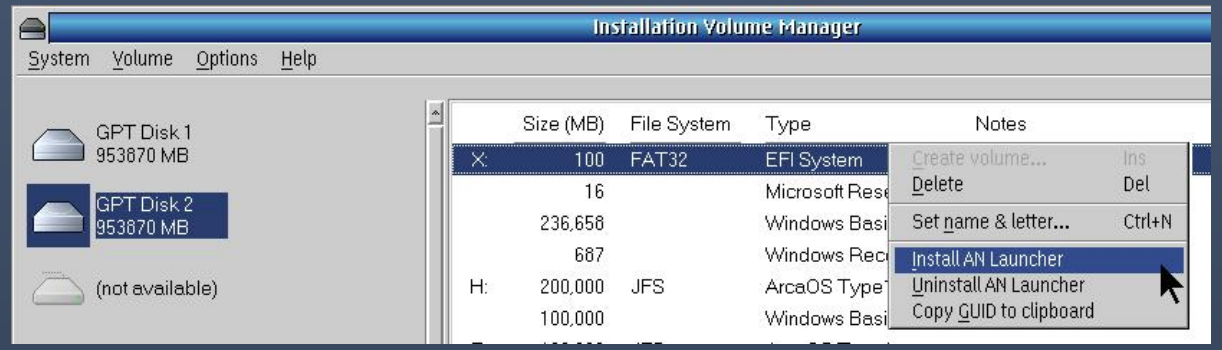
- Download the necessary files (rEFInd and EFI Shell programs)
- Make a backup (of the EFI partition)
- Install the AN Launcher
- Copy the rEFInd files to the ESP
- Copy the Shell program to the ESP
- Add rEFInd and Shell entries to the AN Launcher’s configuration file
- Optionally move rEFInd to be the first to boot

rEFInd Installation – ArcaOS (part 1)

- Download the necessary files:
- REFInd can be downloaded from:
  http://www.sourceforge.net/projects/rEFInd/ (rEFInd)
- The EFI Shell from:
  https://www.rodsbooks.com/refind/installing.html#addons
- Backup the complete EFI partition to an external location

rEFInd Installation – ArcaOS (part 2)

- Install AN Launcher (if not already installed)
- Select Computer->System setup ->
  - Select the ESP partition
  - Via the RHMB popup menu
  - Select ‘Install AN Launcher’
  - Save and close



rEFInd Installation – ArcaOS (part 3)

1. Extract rEFInd from the zip files.
2. Copy the complete rEFInd folder and contents to the efi folder so that a new folder \efi\rEFInd is created.
3. In the folder “\efi\rEFInd”, delete the folders: drivers_aa64 and drivers_ia32. These files are only needed for specific hardware.
4. It is also advisable to copy the configuration file rEFInd.conf use i.e. the name rEFInd.conf-sample

rEFInd Installation – ArcaOS (part 4)

- Extract the EFI Shell (shell64.efi) from the zip files making sure that you select the X64 directory.
- Copy the directories to \EFI\BOOT
- We should now have all the files in our EFI partition
- We now edit Launcher.cfg and add the two new lines to pint to the filees added, just before the line Help = ??:

```
Refind = \EFI\refind\refind_x64.efi
Shell    = \EFI\tools\shellx64.efi
```

rEFInd Installation – ArcaOS (part 5)

- Reboot and select in the Launcher menu item ‘rEFInd’
- Depending on whether you have any other systems installed you should see at least 2 unknown icons (..\LAUNCHER.EFI and ..\os2\os2ldr.efi) plus the default rEFInd buttons
- If you want to make rEFInd your default boot manager we need to change some settings in the NVRAM.
- Reboot and now select the ‘Shell’ from the launcher selection menu

rEFInd Installation – ArcaOS (part 6)

- The shell will be started and will try to run the AutoStart script “startup.nsh”, if it exists.
- Then the screen will display the Shell prompt.

rEFInd Installation – ArcaOS (part 6)

- Since we are adding rEFInd to the list of items to boot from, we need to add this entry to the NVRAM.
- The shell has a command which we can use to control the options stored in NVRAM.
- This is the bcfg command!
- With this command it is possible to Move, Add, Modify and Show the boot order and driver variables.
- Note that drives in the shell as specified as fs0:, fs1, etc.

rEFInd Installation – ArcaOS (part 7)

- First we will show the current boot variables with:
  bcfg dump -b option (-b acts as sort of “more” command).

```
Shell> bcfg boot dump -b
Option: 00. Variable: Boot0003
  Desc     - AN Launcher
  DevPath  - HD(1,GPT,33A1D84B-3B2E-4090-A766-0CFEFD223D1B,0x800,0x32000)/\EFI\BOOT\LAUNCHER.EFI
  Optional- N
Option: 01. Variable: Boot0001
  Desc     - ubuntu
  DevPath  - HD(1,GPT,33A1D84B-3B2E-4090-A766-0CFEFD223D1B,0x800,0x32000)/\EFI\ubuntu\shimx64.efi
  Optional- Y
Option: 02. Variable: Boot0002
  Desc     - Windows Boot Manager
  DevPath  - HD(1,GPT,33A1D84B-3B2E-4090-A766-0CFEFD223D1B,0x800,0x32000)/\EFI\Microsoft\Boot\bootmgfw.efi
  Optional- Y
Option: 03. Variable: Boot2001
  Desc     - EFI USB Device
  DevPath  -
  Optional- Y
Option: 04. Variable: Boot2002
  Desc     - EFI DVD/CDROM
  DevPath  -
  Optional- Y
Option: 05. Variable: Boot0000
  Desc     - test
  DevPath  - PciRoot(0x0)/Pci(0x17,0x0)/Sata(0x0,0x0,0x0)/HD(1,GPT,33A1D84B-3B2E-4090-A766-0CFEFD223D1B,0x800,0x32000)/\EFI\Boot\LAUNCHER.EFI
  Optional- N
Option: 06. Variable: Boot2003
  Desc     - EFI Network
  DevPath  -
  Optional- Y

Shell> _
```

rEFInd Installation – ArcaOS (part 8)

- To add rEFInd, to the NVRAM, we will use the bcfg command:

  bcfg boot add 0 fs0:EFI\rEFInd\rEFInd_x64.efi

  "rEFInd boot manager".

Where

boot add	- is the option to add to the boot
0	- at position zero (very first item)
fs0:	- the drive concerned
EFI\rEFInd\rEFInd_x64.efi	- the full pathname of the item to add
"rEFInd boot manager“	- the description (optional)

rEFInd Installation – ArcaOS (part 9)

- Assuming that the efi partition is on disk fs0:, we type:

  bcfg add boot 0 fs0:

  and then press the Tab key
- If after fs0: efi appears we then know we have the correct disk!
- If not, try fs1: and then the TAB key, or fs2: and so on, until the item efi appears.
- We then add the path name of the rEFInd boot file to this command plus a description.

rEFInd Installation – ArcaOS (part 10)

- The complete command looks something like this:

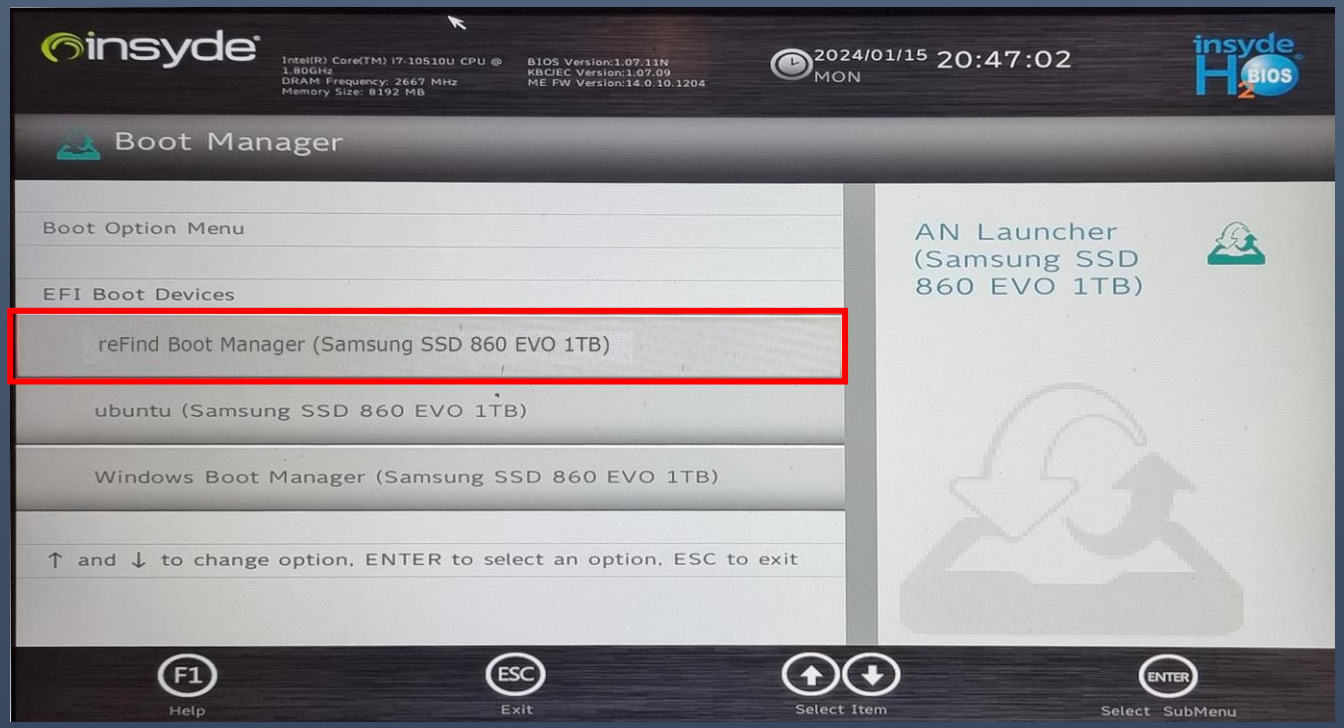
  bcfg add boot 0 fs0:EFI\rEFInd\rEFInd_x64.efi
  "rEFInd boot manager".

- If the command is accepted, the following response is displayed

```
Target = 0000
Bcfg: add boot 0000 as 0
Shell>
```

rEFInd Installation – ArcaOS (part 13)

After restarting the computer, cross check that the correct start option is now selected in your UEFI-bios



rEFInd Installation – ArcaOS (part 14)

- Normally when rEFInd is started, it will find the AN Launcher and displays the  (UNKNOWN) icon.
- To be able to access ArcaOS on multiple partitions you can create the following stanza in the configuration file :

```
menuentry "ArcaOs D" {
    icon \EFI\refind\icons\os_os2.png
    loader \EFI\OS2\OS2LDR.EFI
   options " D:"   submenuentry "Drive E"{
   options " E:"    }
```

rEFInd Installation – ArcaOS (part 14)

- If you want more submenus then just add:

```
menuentry "ArcaOs D" {
    icon \EFI\refind\icons\os_os2.png
    loader \EFI\OS2\OS2LDR.EFI
   options " D:"   submenuentry "Drive E"{
   options " E:"    }
submenuentry "Drive F"{
   options " F:“}
submenuentry "Drive G"{
   options " G:“}
```

rEFInd Installation – Linux (Ubuntu)

Type:

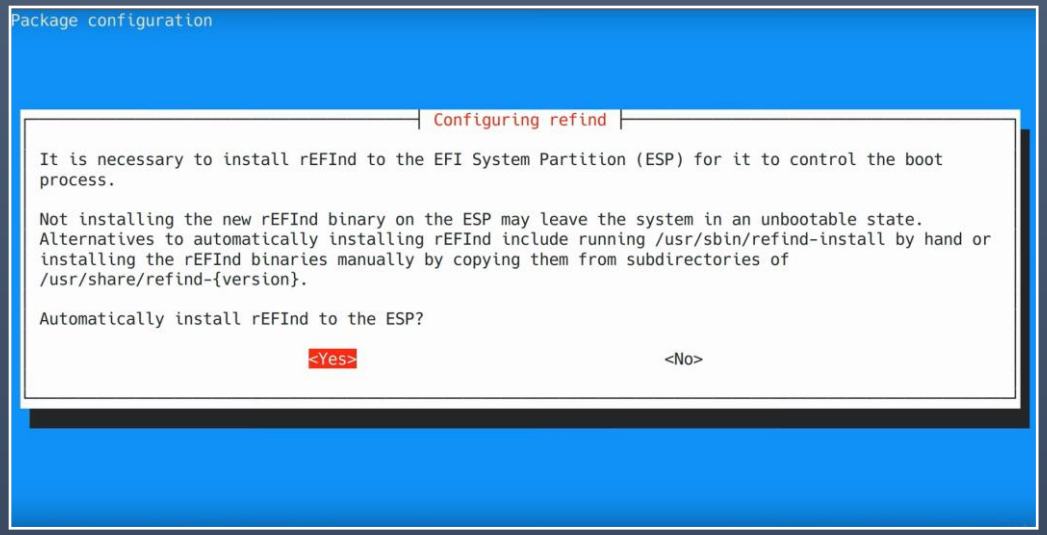
sudo apt-add-repository ppa:rodsmith/rEFInd

sudo apt-get update

sudo apt-get install rEFInd

At screen prompt select

Yes



- Shutdown the computer and reboot

rEFInd Installation – Linux (Ubuntu)

It is also possible to install rEFInd with secure boot!

This is possible by using a shim, a pre-bootloader

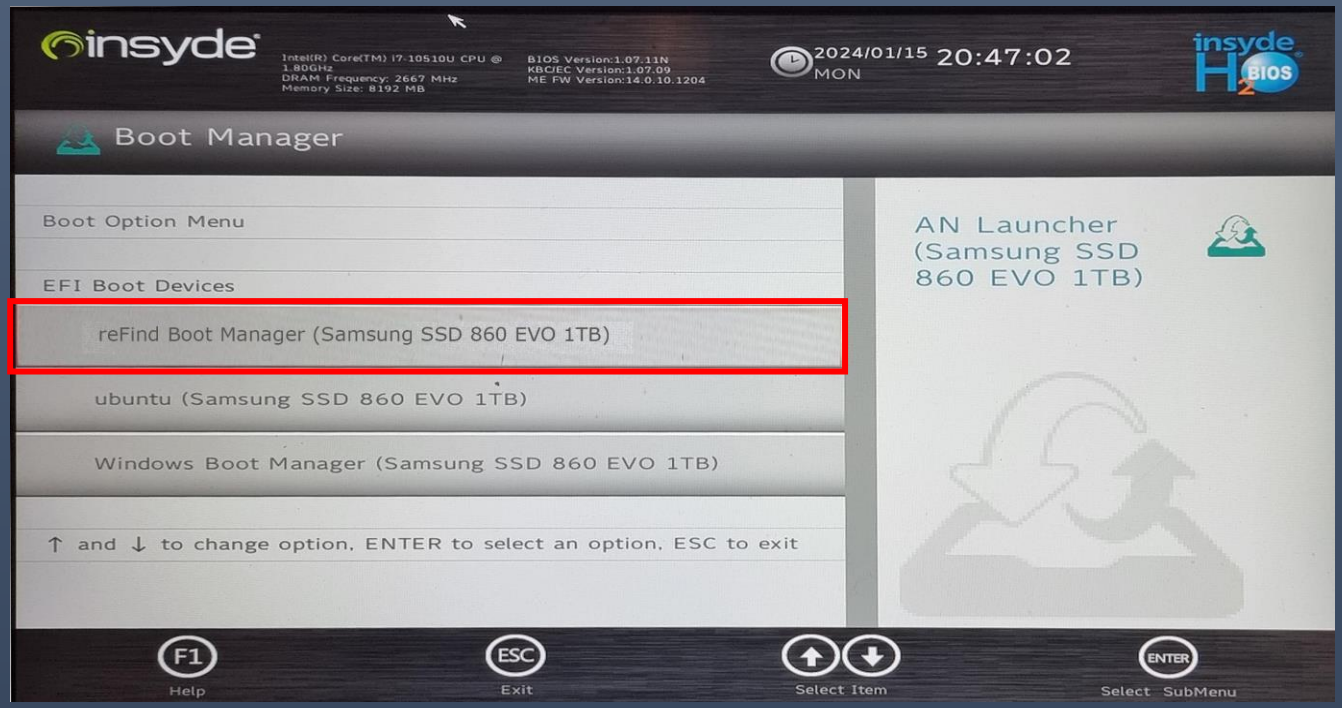
The shim verifies the bootloader by computing its signature and verifying it with the certificates in the database; if it is ok, the bootloader starts.

See the full documentation at

https://www.rodsbooks.com/efi-bootloaders/secureboot.html

rEFInd Installation – Linux (Ubuntu)

After restarting the computer, cross check that the correct start option is selected in your UEFI-bios



rEFInd Installation – Windows 64bit (deel 1)

Download the zip file of rEFInd from sourceforge

http://www.sourceforge.net/projects/rEFInd/

From an elevated command prompt, type:

diskmgmt.msc (to identify the EFI-partition)
select disk ‘n’
List partition (to get partition number)
select partition ‘n’
assign letter=X
exit

Unzip the zip file and copy the entire rEFInd folder and contents to the efi folder so that a new folder \efi\rEFInd is created.

rEFInd Installation – Windows 64bit (deel2)

- In the folder “\efi\rEFInd”, delete the folders: drivers_aa64 and drivers_ia32. These files are only needed for specific hardware.
- To set rEFInd as the default EFI launcher, from a command prompt, type the following:

  bcdedit /set "{bootmgr}" path \EFI\rEFInd\rEFInd_x64.efi

- If required, type bcdedit /set "{bootmgr}" description "rEFInd description“, to set a custom description.
- Reboot system, and select the UEFI BIOS.

rEFInd adding a memory test

- There are various efi applications available which can be detected by rEFInd.
- Besides the EFI Shell there is also a memory test available.

https://www.memtest.org/download/v7.00/mt86plus_7.00.binaries.zip

- The extracted program (memtest64.efi) should be placed in /EFI/TOOLS/ and it should automatically be found at the next reboot

rEFInd –add the efi-shell to the rEFInd menu

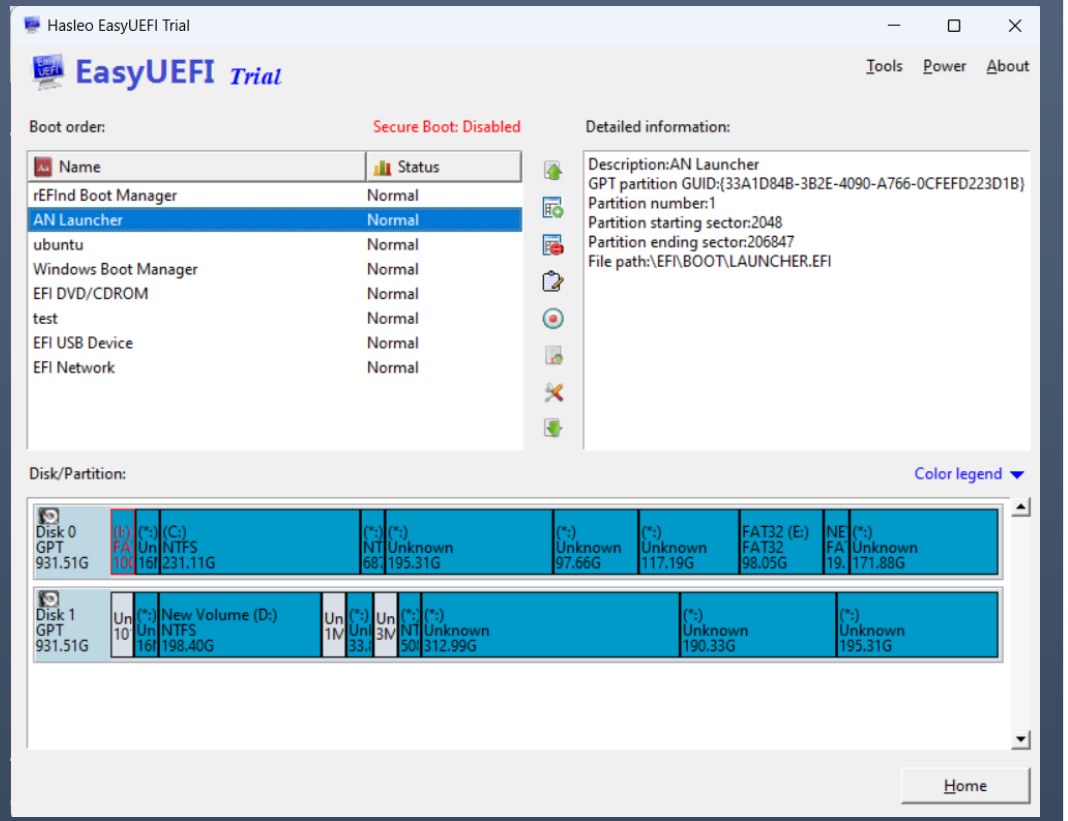
- The UEFI Shell can easily be added to the rEFInd startup menu.
- download the iso file
- From the ISO copy the file 'efi\boot\bootx64.efi' to the folder \EFI\TOOLS with the name shellx64.efi
- Shut down computer and restart
- Now in the EFI shell there is the rEFInd menu

EasyUEFI – a windows tool

- There is a shareware tool available for windows to handle the boot entries in the NVRAM

  EasyUEFI

http://www.easyuefi.com/index-us.html



rEFInd quirks, plus points

- A highly customisable boot manager high learning curve
- Very well documented
- When the mouse has been enabled, rEFInd does not highlight the ‘Item’ that will be executed, unless the mouse is moved!
- rEFInd remembers the previous ‘Item’ executed
- An ubuntu update might change some settings

Questions?

Thank You

References/Downloads

Bootloaders - comparisons

https://en.wikipedia.org/wiki/Comparison_of_bootloaders

EFI Shell - binary

https://www.intel.com/content/dam/www/public/us/en/zip/efi-1-10-update.zip

Shell Commands

https://docstore.mik.ua/manuals/hp-ux/en/5991-1247B/ch04s13.html

Memory Test - efi

https://www.memtest.org/download/v7.00/mt86plus_7.00.binaries.zip