

# GPT (GUID PARTITION TABLE) AND UEFI

## 1- What is UEFI (UNIFIED EXTENSIBLE FIRMWARE INTERFACE)

A firmware is, general speaking, a set of small programs stored in a special chip of an electronic device such as a laptop, mobile phone, etc. These programs are extremely important because they are crucial to control and manage the hardware of the electronic device. In complex devices such as a computer, the firmware helps the operating system to manage and control hardware (hard drives, network cards, keyboard, memory, etc..).

UEFI is the modern firmware installed nowadays on any computer and it makes BIOS (the old traditional firmware) obsolete. This special firmware is a kind of miniature operating system which starts up immediately after booting the computer.

Some of the most important function of UEFI are:

- It starts the boot process and it is responsible for manage and control the computer before the operating system is loaded in memory.
- It starts and configures the hardware installed on the computer
- Run the POST (Power On Self Test) to test the hardware of the computer and if it detects any error then, it warns about the problem and it will not allow the system to continue booting until the failure is solved.
- It starts the boot loader that will allow the startup of the operating system.
- It helps the operating system the operating system to manage and control the hardware installed in the computer.
- It provides an interface between the user and the hardware before the operating system is loaded. That is important, for instance, to select the boot order of a computer when more than one boot device (hard drive, USB, DVD, SD,...) is attached to the motherboard

## 2- What is a GPT partition table?. Partition types. Flags. Main features

### **a) GUID Partition Table (GPT):**

- Is the modern partition table format and it makes the old **MBR** partition table obsolete. All modern personal computer operating systems support GPT.
- Holds information about the partitions of a hard drive. For each partition, a partition table can store information about size, partition type, starting LBA block, ending LBA block sector and flags.
- Forms parts of the modern **Unified Extensible Firmware Interface (UEFI)** standard that makes obsolete the old traditional **BIOS**.

### **b) Partition types:**

- Primary partitions: A primary partition contains one filesystem and can contain an operating system.
- The old Extended partitions and Logical Partitions required if you worked with a MBR partition table are not any longer needed and they do not exist.

### **c) Bootable (or Active) partition flag:**

- Some operating systems require a partition flagged as "boot partition". Only one partition of the disk may have this flag.
- This flag is used to mark the partition that contains the boot loader.

### **d) Hidden partition flag**

- Partitions may be either visible or hidden. You can hide a partition if you don't want this partition to be visible under Windows. It can be used to hide data, or to be sure they won't be accidentally removed.
- Linux partition don't have such a hidden identifier but that's not a real problem since it's possible to simply not mount a partition if you don't want its contents to be visible.

### **e) Main features:**

- Maximum size disk: 9,4 **ZiB**
- Maximum number of primary partitions: By default 128 primary partitions, but the GPT format allows  $2^{32}$  partitions.

### **3- Typical partition on a computer running Windows**

#### **1st Partition: The EFI system partition**

The EFI System Partition or ESP is used by computers that have the Unified Extensible Firmware Interface (UEFI). When a computer is booted, UEFI firmware loads files stored on the ESP to start operating systems and various utilities. An ESP contains the boot loaders of installed operating systems (which are typically contained in other partitions), device driver files for hardware devices present in a computer and used by the firmware at boot time, system utility programs that are intended to be run before an operating system is booted

Typical features: Primary, FAT32, 500MiB, Flags: boot and esp

#### **2nd Partition: The Microsoft reserved partition (MSR)**

Microsoft System Reserved or MSR should be located after the EFI System Partition (ESP) and before the Windows partition. The Windows operating system uses this partition for compatibility purposes. No meaningful data is stored within the MSR. Some users may want to delete this partition, however it is required for GPT partition drives.

Typical features: Primary, NTFS, 500MiB

#### **3rd Partition: The Windows partition**

The Windows partition is where the operating system is located.

Typical features: Primary, NTFS, 20GiB at least.

#### **4th Partition: The Recovery tools partition**

Recovery partition is a windows special partition on computer that is used to restore the system to factory settings in an unfortunate event of system corruption. Recovery partition is usually not visible in file explorer to protect recovery partition from being modified or deleted, it doesn't have any drive letter to make it invisible from file explorer

Recovery partition is a final resort option and it will wipe out all data and programs in the Windows system partition.

Typical features: Primary, NTFS, From 500MiB to 1GiB.

### **4- Typical partition on a computer running Windows**

#### **1st Partition: The EFI system partition**

The EFI System Partition or ESP is used by computers that have the Unified Extensible Firmware Interface (UEFI). When a computer is booted, UEFI firmware loads files stored on the ESP to start operating systems and various utilities. An ESP contains the boot loaders of installed operating systems (which are typically contained in other partitions), device driver files for hardware devices present in a computer and used by the firmware at boot time, system utility programs that are intended to be run before an operating system is booted

Typical features: Primary, FAT32, 500MiB, Flags: boot and esp

#### **2nd Partition: The SWAP partition**

Swap space can be used for two purposes, to extend the virtual memory beyond the installed physical memory (RAM), and also for [suspend-to-disk](#) support.

Typical features: Primary, Linux Swap, equal to RAM memory for hibernation but its optimal size depends on a lot of variables.

### 3rd Partition: The Root partition (/)

The Root partition is where the operating system is located.

Typical features: Primary, Ext4, 20-30GiB at least.

### 4th Partition: The Home partition (/home)

A partition to store user data separately from system data. The Home partition should be mounted in the /home folder. This will enable you to upgrade or reinstall Debian Linux without erasing user data files.

Typical features: Primary, Ext4.