Boot image header in RISC-V Linux

Author: Atish Patra <atish.patra@wdc.com>

Date: 20 May 2019

This document only describes the boot image header details for RISC-V Linux.

TODO:

        Write a complete booting guide.

The following 64-byte header is present in decompressed Linux kernel image:

```
u32 code0;                 /* Executable code */
u32 code1;                 /* Executable code */
u64 text_offset;           /* Image load offset, little endian */
u64 image_size;            /* Effective Image size, little endian */
u64 flags;                 /* kernel flags, little endian */
u32 version;               /* Version of this header */
u32 res1 = 0;              /* Reserved */
u64 res2 = 0;              /* Reserved */
u64 magic = 0x5643534952; /* Magic number, little endian, "RISCV" */
u32 magic2 = 0x05435352;  /* Magic number 2, little endian, "RSC\x05" */
u32 res3;                  /* Reserved for PE COFF offset */
```

This header format is compliant with PE/COFF header and largely inspired from ARM64 header. Thus, both ARM64 & RISC-V header can be combined into one common header in future.

Notes

- This header can also be reused to support EFI stub for RISC-V in future. EFI specification needs PE/COFF image header in the beginning of the kernel image in order to load it as an EFI application. In order to support EFI stub, code0 should be replaced with "MZ" magic string and res3(at offset 0x3c) should point to the rest of the PE/COFF header.

- version field indicate header version number

Bits 0:15	Minor version
Bits 16:31	Major version

  This preserves compatibility across newer and older version of the header. The current version is defined as 0.2.

- The "magic" field is deprecated as of version 0.2. In a future release, it may be removed. This originally should have matched up with the ARM64 header "magic" field, but unfortunately does not. The "magic2" field replaces it, matching up with the ARM64 header.

- In current header, the flags field has only one field.

Bit 0	Kernel endianness. 1 if BE, 0 if LE.

- Image size is mandatory for boot loader to load kernel image. Booting will fail otherwise.