Virtual Memory Layout on RISC-V Linux

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This document describes the virtual memory layout used by the RISC-V Linux Kernel.

RISC-V Linux Kernel 32bit

RISC-V Linux Kernel SV32

TODO

RISC-V Linux Kernel 64bit

The RISC-V privileged architecture document states that the 64bit addresses "must have bits 63â€“48 all equal to bit 47, or else a page-fault exception will occur.": that splits the virtual address space into 2 halves separated by a very big hole, the lower half is where the userspace resides, the upper half is where the RISC-V Linux Kernel resides.

RISC-V Linux Kernel SV39

Start addr	Offset	End addr	Size	VM area description
0000000000000000	0	0000003fffffffff	256 GB	user-space virtual memory, different per mm
0000004000000000	+256 GB	ffffffbfffffffff	~16M TB	... huge, almost 64 bits wide hole of non-canonica virtual memory addresses up to the -256 GB starting offset of kernel mappings.
				Kernel-space virtual memory, shared between all pr
ffffffc6fee00000	-228 GB	ffffffc6feffffff	2 MB	fixmap
ffffffc6ff000000	-228 GB	ffffffc6ffffffff	16 MB	PCI io
ffffffc700000000	-228 GB	ffffffc7ffffffff	4 GB	vmemmap
ffffffc800000000	-224 GB	ffffffd7ffffffff	64 GB	vmalloc/ioremap space
ffffffd800000000	-160 GB	ffffffff6fffffff	124 GB	direct mapping of all physical memory
ffffffff00000000	-4 GB	ffffffff7fffffff	2 GB	modules, BPF
ffffffff80000000	-2 GB	ffffffffffffffff	2 GB	kernel