

Key VM Structures in Linux

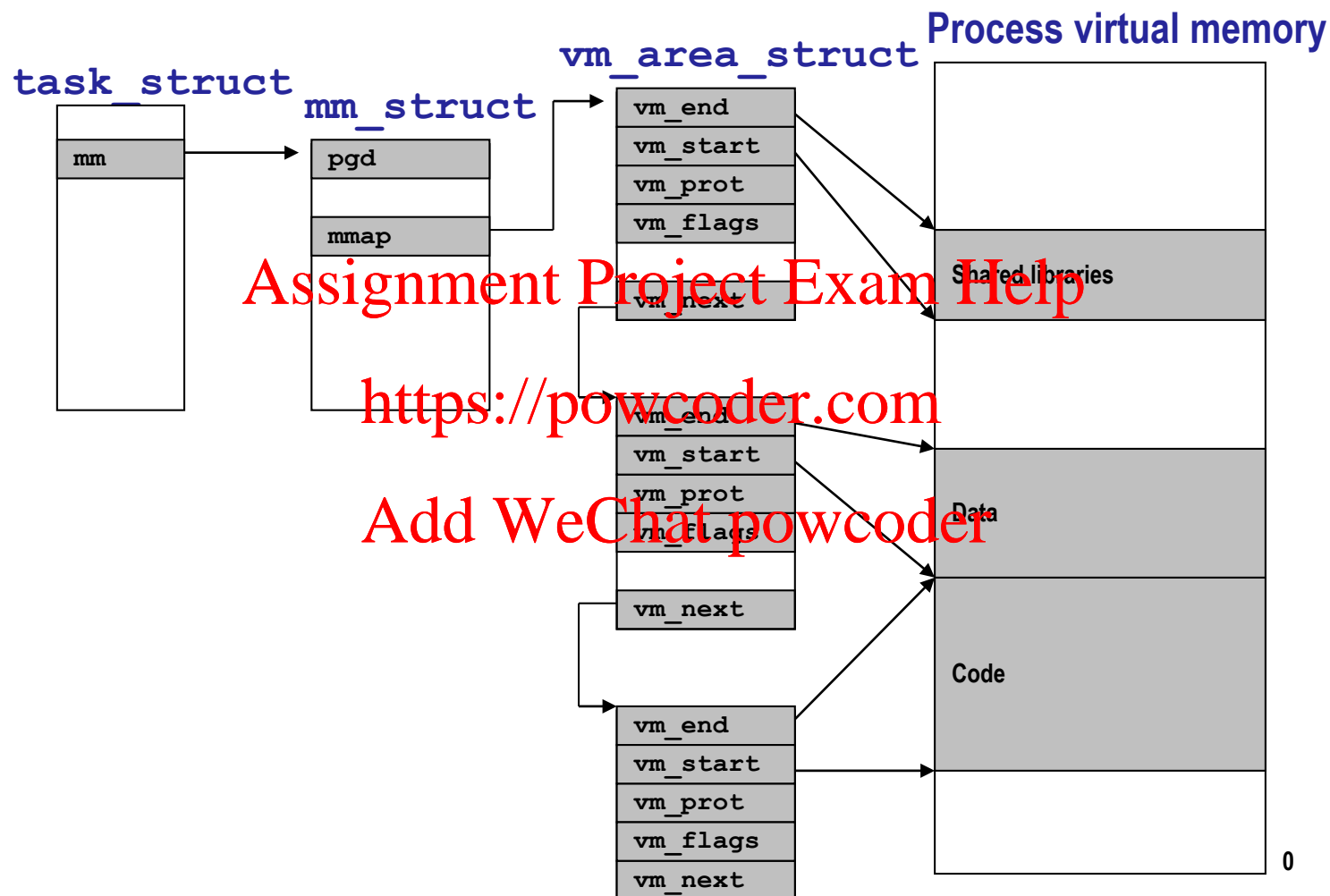
- **vm_area_struct**: describes the properties of a contiguous region of the virtual address space
 - Entire region may contain many pages
 - Entire region shares properties: permissions and associated operations
 - May be a file, library, group of libraries, etc.
- **mm_struct**: contains information about the process' entire virtual address space
 - Contains a list of `vm_area_struct` objects
 - Processes have distinct `mm_struct`s, threads share an `mm_struct`

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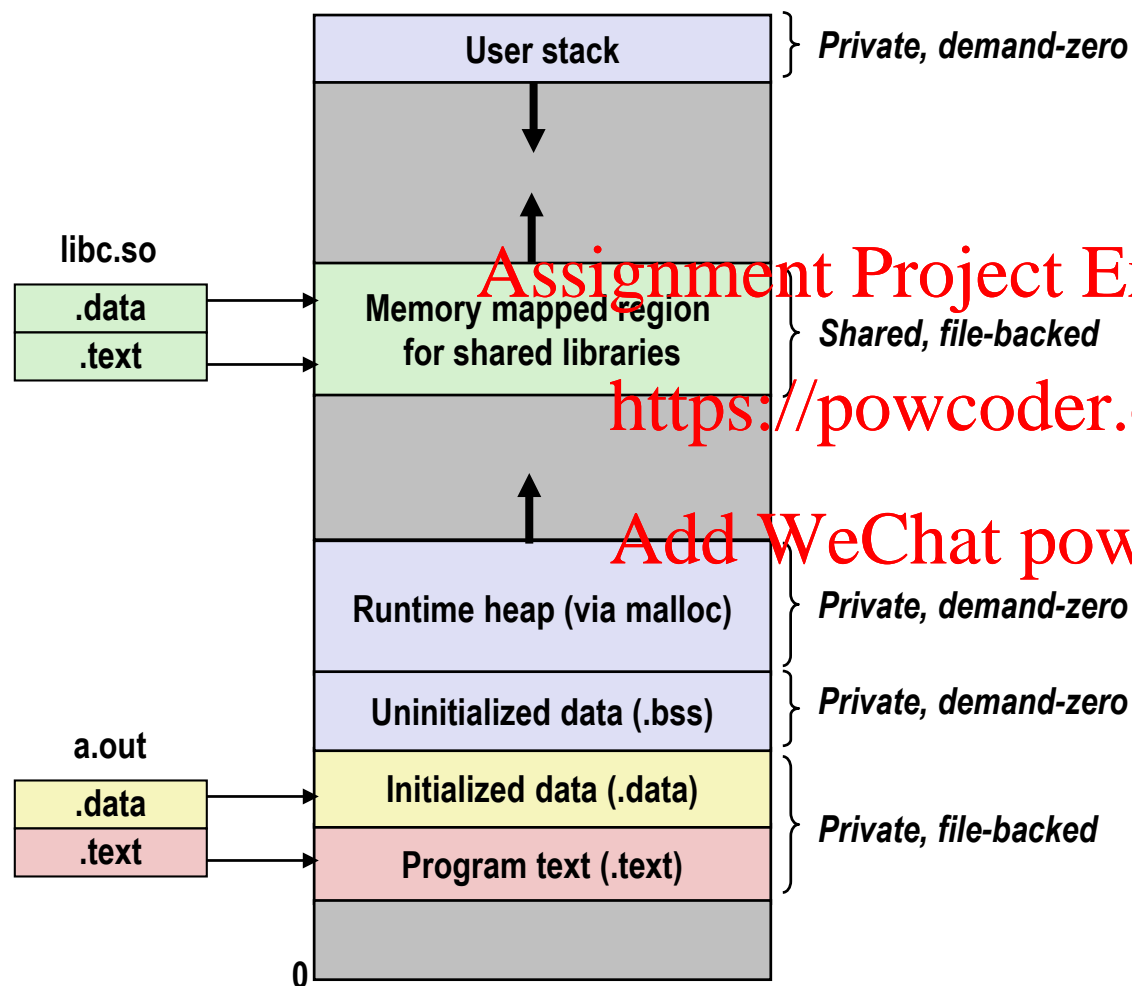
VM Structures in Linux



The `fork` Function Revisited

- VM and memory mapping explain how `fork` provides private address space for each process.
- To create virtual address for new process
 - Create exact copies of current `mm_struct`, `vm_area_struct`, and page tables.
 - Flag each page in both processes as read-only
 - Flag each `vm_area_struct` in both processes as private COW
- On return, each process has exact copy of virtual memory
- Subsequent writes create new pages using COW mechanism.

The execve Function Revisited



■ To load and run a new program `a.out` in the current process using `execve`:

■ Free `vm_area_struct`'s and page tables for old areas

■ Create `vm_area_struct`'s and page tables for new areas

- Programs and initialized data backed by object files.
- `.bss` and stack backed by anonymous files.

■ Set PC to entry point in `.text`

- Linux will fault in code and data pages as needed.