Memory Management: Separation of Policy and Mechanism

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February 1, 2020

**Separation of Policy and Mechanism in Virtual Memory Management Systems**

Modern virtual memory management is modularized to separate concerns over access policy and algorithmic processing. In the model outlined by Tanenbaum and Bos in *Modern Operating Systems*, the external pager operates within the user space while the page fault handler and low-level MMU handler run in the kernel space (2015). The external pager doesn’t have access to the *M* and *R* bits of the page frames, so the page fault handler sifts through potential protection faults and determines a page replacement algorithm to use before signaling the pager to grab a page (Tanenbaum, 2002). Once the pager retrieves the data, it stores it in a part of its internal memory. It signals the page fault handler to remove it from the pager’s memory and send the page to the MMU handler for adding to the user’s page tables. After that whole process concludes, the fault-raising process continues as though nothing happened.

With this separation model in place, each of the three pieces are streamlined to perform the bare minimum they must. The external pager is just a worker that does as it’s told, free from performing logic to check permissions or algorithms to run. All it does is track the virtual page data and shuttle page frames and addresses as directed (Tanenbaum, 2002). The policy is entirely determined in the kernel space, where the page fault handler will have the access it needs. Another subtle benefit to this architecture is keeping the highly custom code separate. The MMU handler is composed of machine-dependent code, which must be rewritten before porting the operating system to another platform (Tanenbaum and Bos, 2015). This lightens the burden on those responsible for porting the kernel to new systems, resulting in a greater developer experience.

References

Tanenbaum, A. S. (2002, April 19). Mechanism versus Policy. Retrieved February 1, 2020, from http://www.informit.com/articles/article.aspx?p=26396&seqNum=3

Tanenbaum, A.S. & Bos, H. (2015).*Modern Operating Systems.*Chapter 3.