OS Homework CSE506

111493601 KISHAN NERELLA

11XXXXXXX DINESH BADDAM

Homework

1. The existing boot loader maps every 1 GB to virtual address space to the lower 1 GB of physical address space. Change the boot loader to map every 4 GB virtual address space to the lower 4GB physical address space.
2. Once the above is done, read and write to the ACHI controller without moving its bar5

Work Summary

The most difficult part of the assignment is to find which files in the FreeBSD source code corresponding to the boot loader. In the existing code, each level 2 page table is pointing to 2 MB of 1 GB. This is done within 1 page. All the level 3 page tables entries point to this ‘one’ level 2 page. All the level 4 page tables entries point to the ‘one’ level 3 page table. We changed this to create 4 level 2 page tables each corresponding to [0GB-1GB), [1GB-2GB), [2GB-3GB) and [3GB-4GB). Every level 3 page table entry alternates between the above ‘four’ level 2 page tables. Every level 4 page table entry still points to the single level 3 page table. These new page tables are defined in the file amd64\_tramp.S and the corresponding code is changed in elf64\_freebsd.c. Along with this kernmem in sys/linker.script is changed to point to the last 4 GB instead of last 1 GB. To make the 2nd part of the homework work, just removed the bar remapping in sys/pci.c

Code files changes

In freebsd source code,

release/11.0.0/sys/boot/i386/libi386/amd64\_tramp.S  
release/11.0.0/sys/boot/i386/libi386/elf64\_freebsd.c

In SBUNIX source code  
sys/linker.script  
sys/pci.c

Building/Testing

We have submitted homework.tgz. Along with the usual files that were submitted, a new folder homework/ has been included which include elf64\_freebsd.c, elf64\_freebsd.c.old, amd64\_tramp.S, amd64\_tramp.S.old, loader.new and loader.old.

elf64\_freebsd.c.old ---> Original freebsd source codeelf64\_freebsd.c ---> Changed freebsd source code  
amd64\_tramp.S.old ---> Original freebsd source code  
amd64\_tramp.S ---> Changed freebsd source code  
loader.old ---> Original loader that came with the handout  
loader.new ---> Changed loader that we built