Virtual Memory

Questions Answered in this Lecture:

• What is an address space? (quick review)
• How do we implement virtual memory? (relocation, base+bounds, segmentation)
• What hardware do we need?
Announcements

• Introducing your new TA: Boyang Li (OO: T 3-4, TH 1:30-3 @ SB 007B)
• Project 1b deadline extended to Thursday night
• The arctic interrupt is coming
• Reading: OSTEP 13, 15, 16 + optionals
THE NEW GENERAL ELECTRIC

GE 210 DATA PROCESSING SYSTEM

1960

...employing magnetic ink character reading to bring automation to business data processing routines
Figure I-1. The GE-225 Information Processing System
IBM 7094 (~1960)
IBM 7094 (~1960)
Early terminals: The Teletype
TeleTYpe
DEC VT100
What we want from multiprogramming

- Protection
- Efficiency
- Sharing (of resources, of addr space portions)
- Transparency
  - User not aware of sharing
  - Works regardless of proc count
Address Space Refresher
Our First Virtualization Mechanisms

- Timesharing (mem dumping)
- Static relocation (compiler)
- Programmable Base
- Programmable Base + Bounds
- Segmentation
Relocation on the IBM machine
Summary

• Next time we’ll look at a more elegant approach to virtual memory (with HW support)
• Reminder: reading
• Reminder: Project 1b due Thursday night!