# Virtual Memory

Questions Answered in this Lecture:

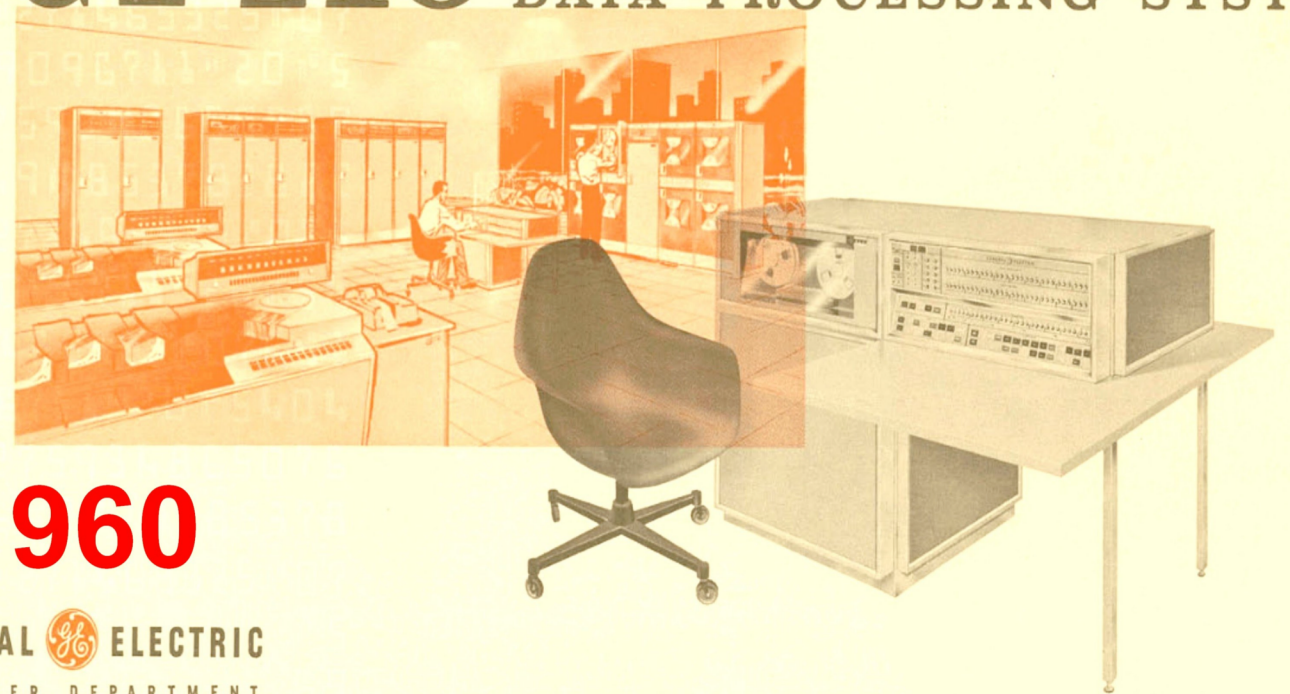
- What is an address space? (quick review)
- How do we implement virtual memory? (relocation, base+bounds, segmentation)
- What hardware do we need?

# 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**

GENERAL ELECTRIC
COMPUTER DEPARTMENT

*. . . employing magnetic ink character reading to bring automation to business data processing routines*

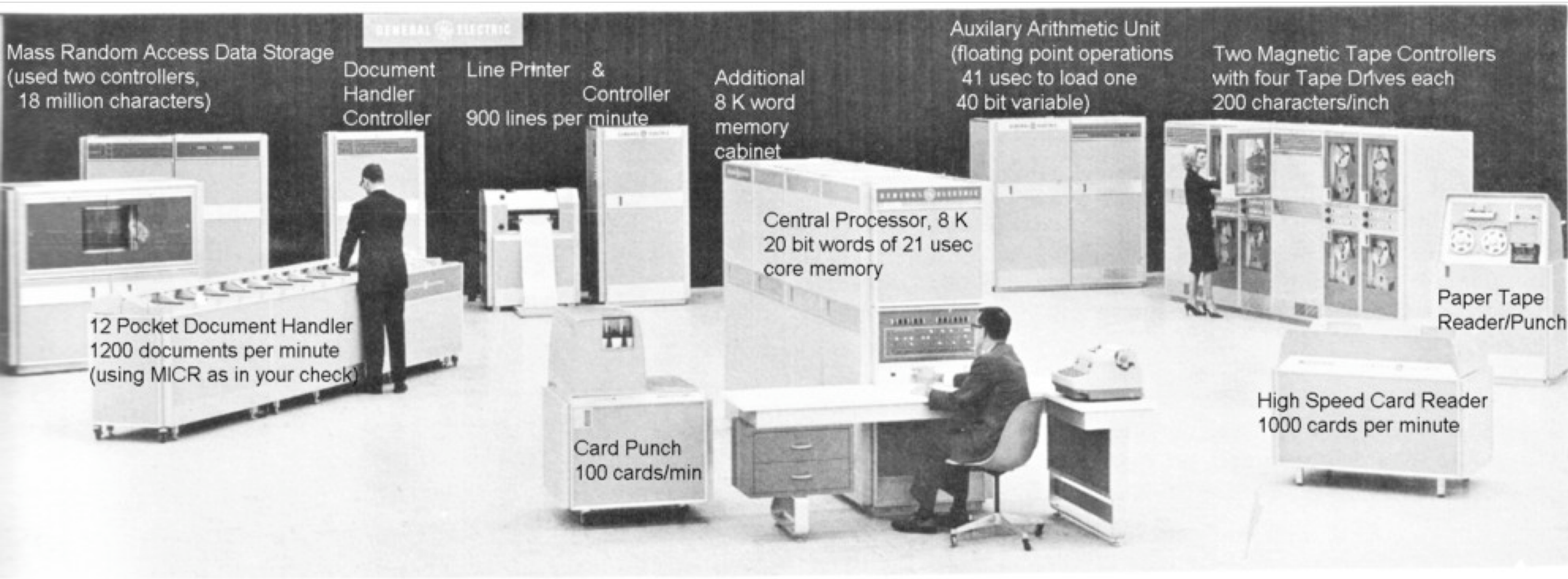



Figure I-1. The GE-225 Information Processing System

# IBM 7094 (~1960)

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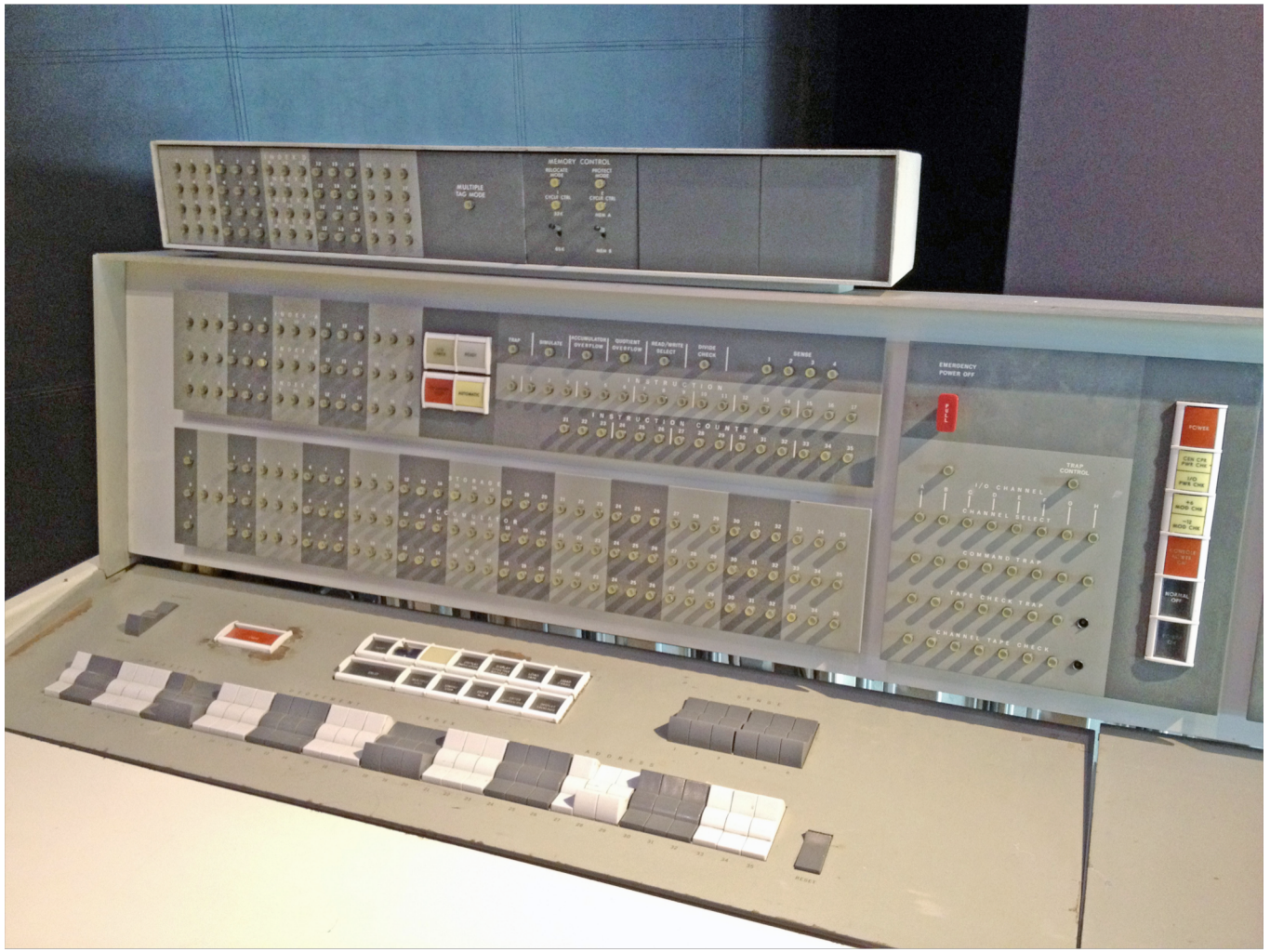


# Early terminals: The Teletype

# TeleTYpe

# DEC VT100

# What we want from multiprogramming

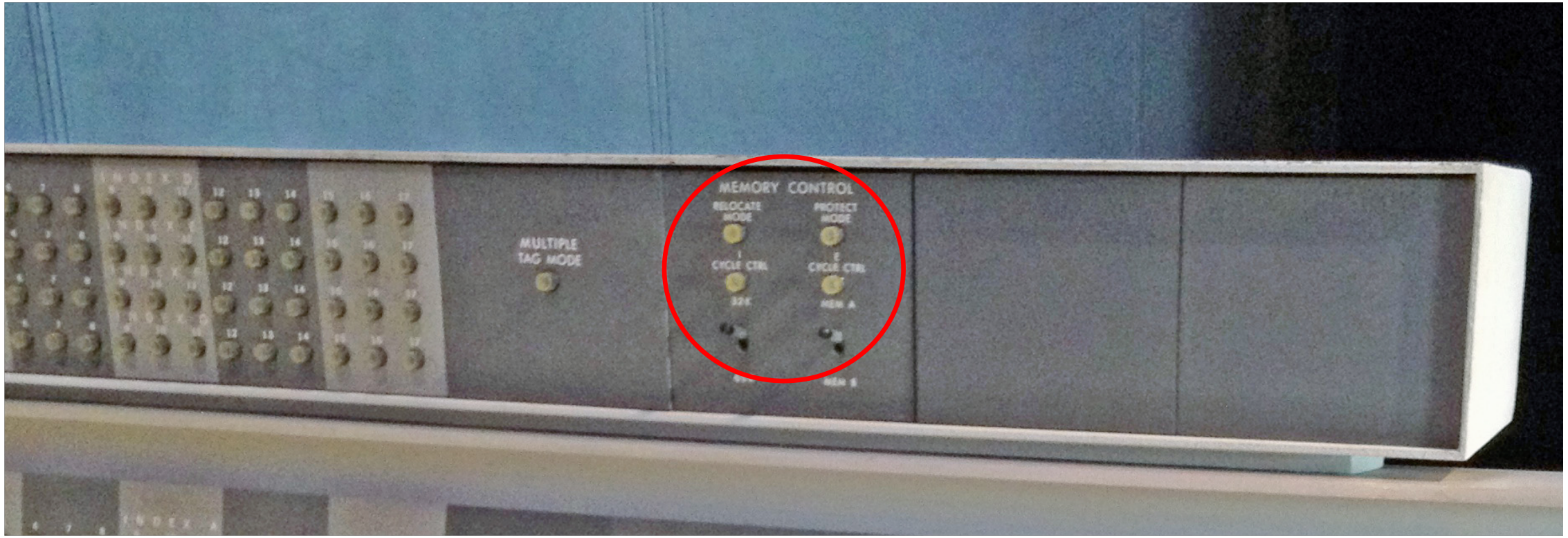
- Protection
- Efficiency
- Sharing (of resources, of addr space portions)
- Transparency
  - User not aware of sharing
  - Works regardless of proc count

# 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!