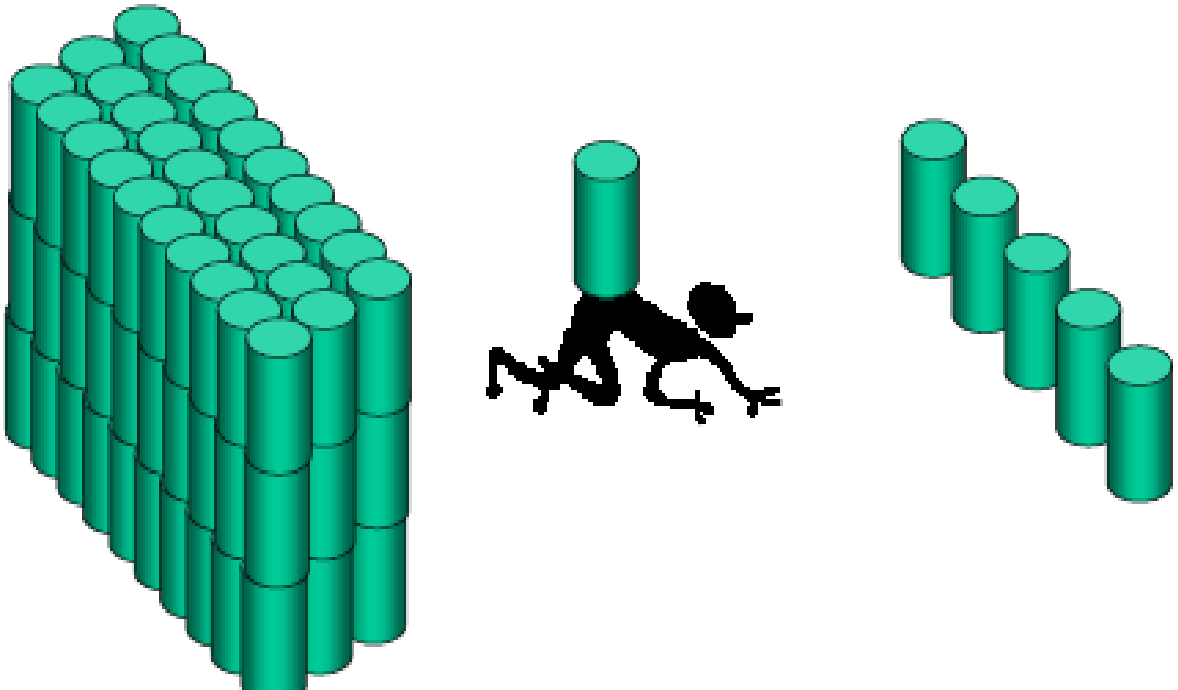
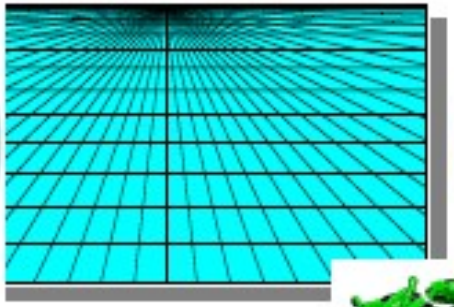
Introduction to Parallel Processing

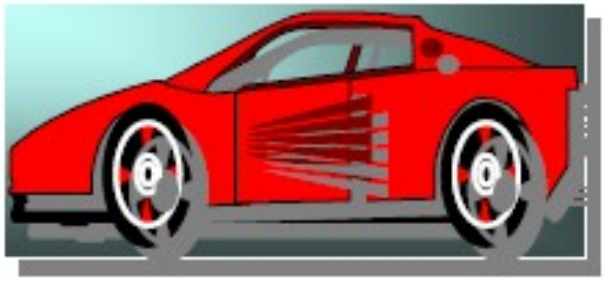
Sequential Processing

- 1 CPU
- Simple
- Big problems???



Application Demands





Challenging Applications in Applied Science/Engineering

- Astrophysics
- Atmospheric and Ocean Modeling
- Bioinformatics
- Biomolecular simulation: Protein folding
- Computational Chemistry
- Computational Fluid Dynamics (CFD)
- Computational Physics
- Computer vision and image understanding
- Data Mining and Data-intensive Computing
- Engineering analysis (CAD/CAM)
- Global climate modeling and forecasting
- Material Sciences
- Military applications
- Quantum chemistry
- VLSI design

Such applications have very high <u>computational</u> and <u>memory</u> requirements that cannot be met with single-processor architectures.

Parallel Processing

Parallel processing is the ability of an entity to carry out multiple operations or tasks simultaneously.

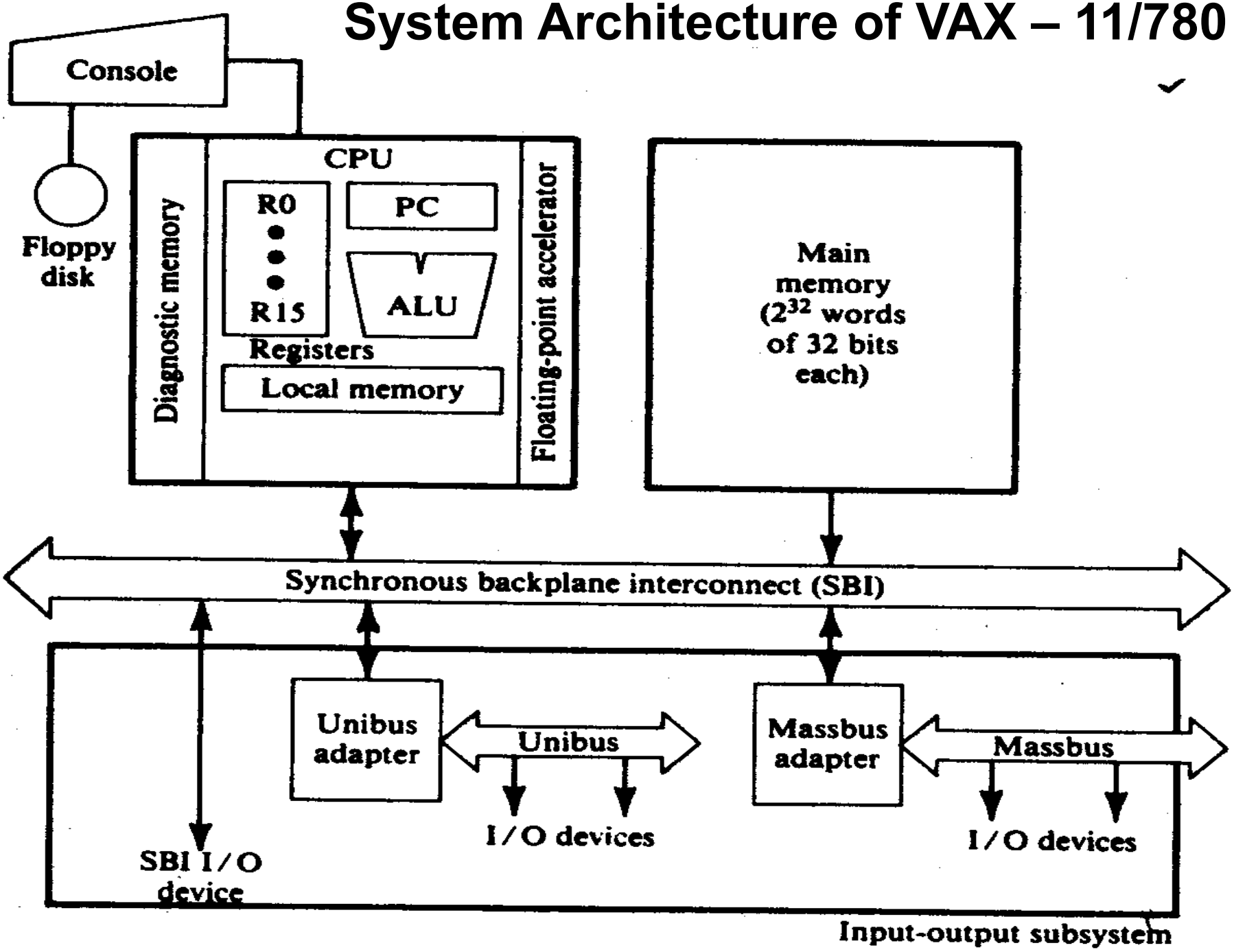
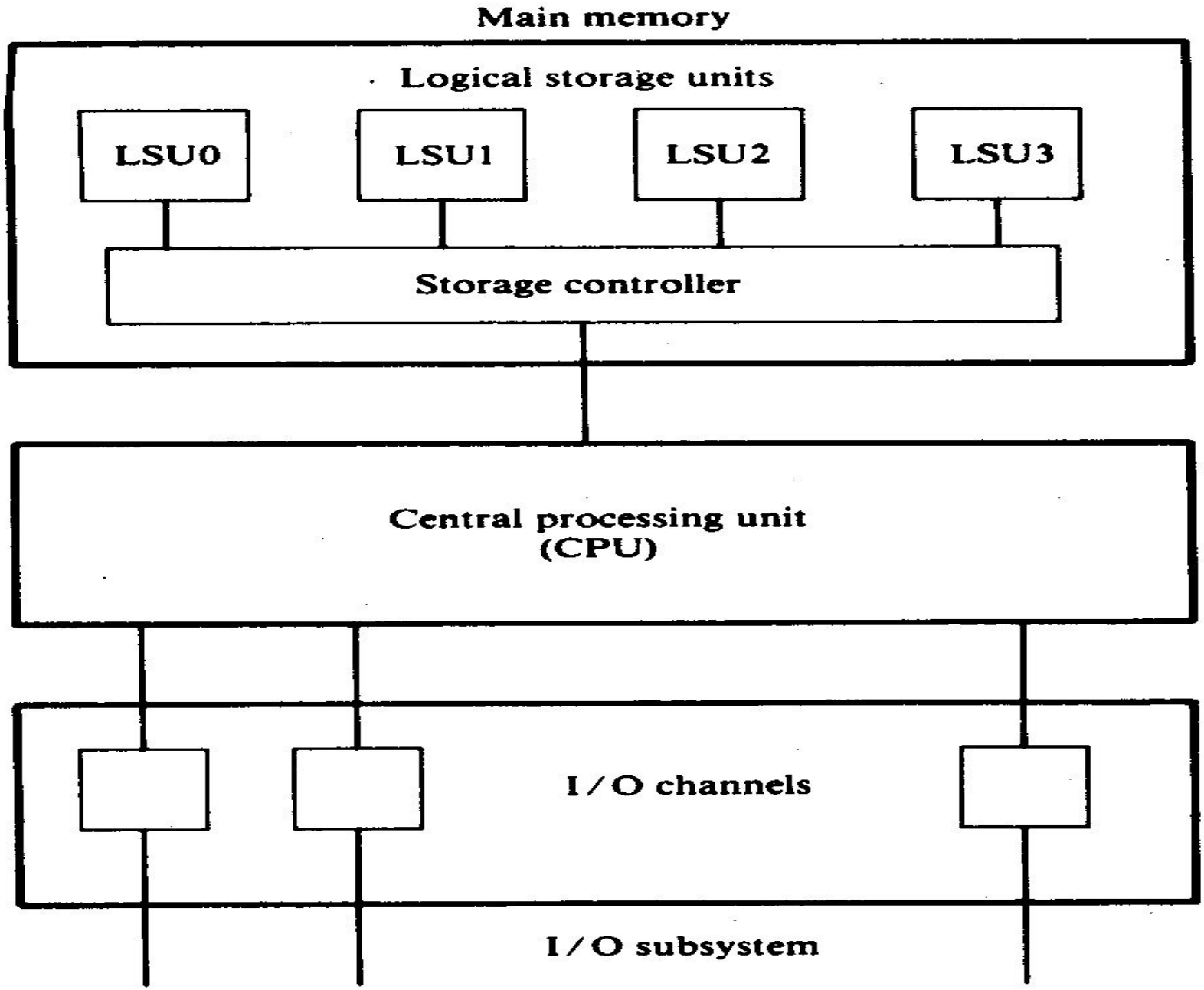
- Parallelism can be achieved within the CPU and with many CPU's.
  - Uniprocessor
  - Multiprocessor

Parallelism in Uniprocessor Systems

Basic Uniprocessor Architecture

- Major Components
  - Main memory
  - CPU
  - I/O Subsytem

System Architecture of VAX – 11/780



System Architecture of IBM System 370/ Model 168