TOPICS

The Nature and History of Software Development

Problems with Software Development

Software Engineering Paradigms and Technology

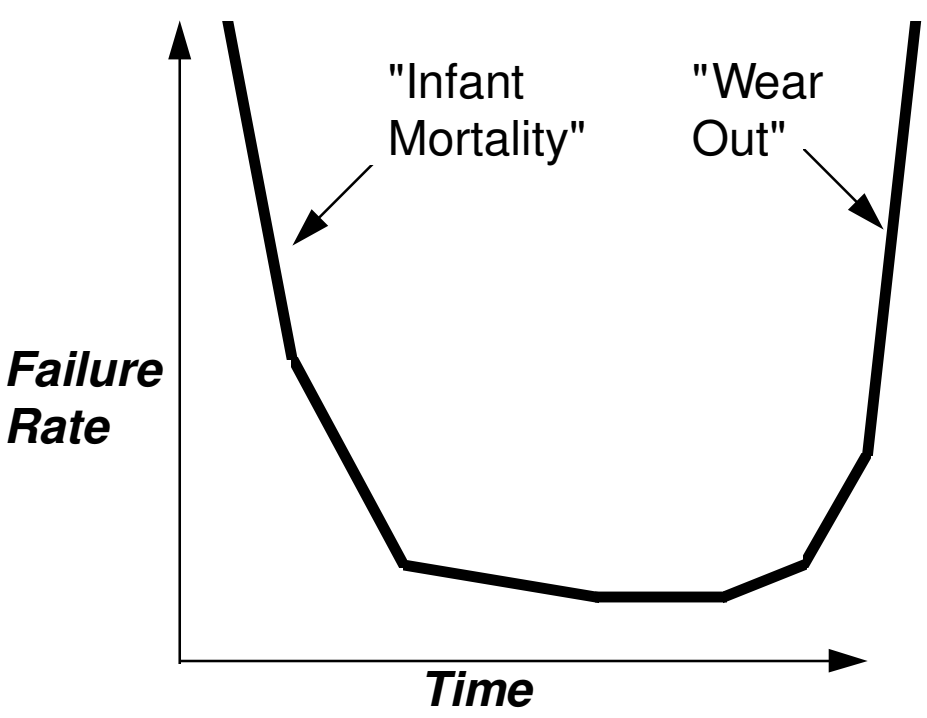
THE NATURE OF SOFTWARE

- Characteristics of Software
- Failure Curves for Hardware and Software
- Software Components
- Software Configuration
- Software Application Areas

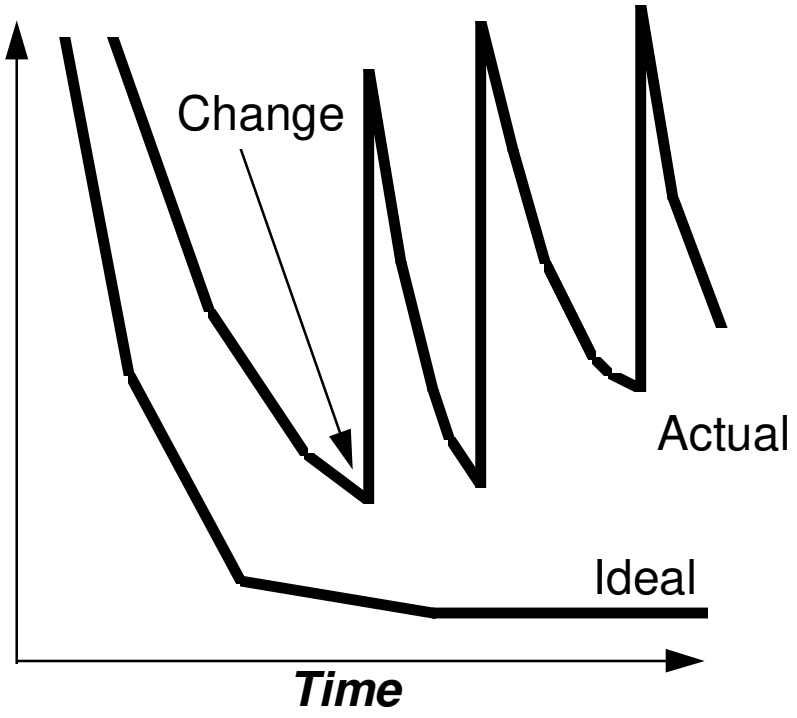
Characteristics of Software

- Software is *programs*, *documents*, and *data*.
- Software is developed or engineered; it is not manufactured like hardware.
- Software does not wear out, but it does *deteriorate*.
- Most software is custom-built, rather than being assembled from existing components.
- Software is a *business opportunity*.

Failure Curves for Hardware and Software



FAILURE CURVE FOR HARDWARE

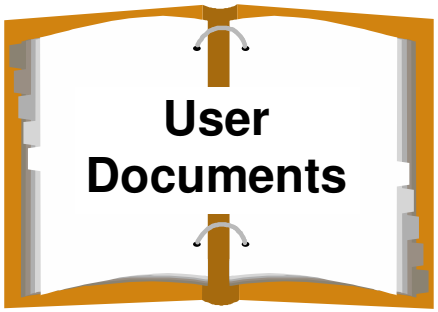


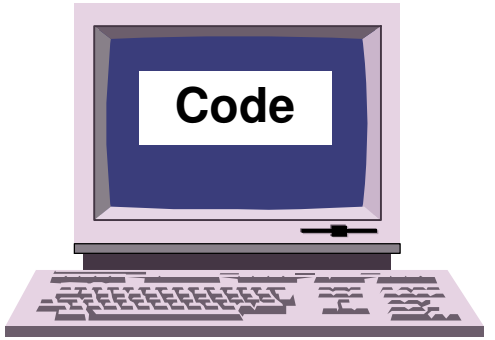
FAILURE CURVE FOR SOFTWARE

Software Components

- Software programs, or software systems, consist of *components*.
- A set of components which comprise a logical unit of software is called a *software configuration item*.
- Reuse and development of reliable, trusted software components improves software *quality* and *productivity*.
- Computer language forms:
  - Machine level (microcode, digital signal generators)
  - Assembly language (PC assembler, controllers)
  - High-order languages (FORTRAN, Pascal, C, Ada, ...)
  - Specialized languages (LISP, OPS5, Prolog, ...)
  - Fourth generation languages (databases, windows apps)

Software Configuration





Software Development Activities

- Planning Activity
  - Software Project Plan
- Requirements Definition Activity
  - Software Requirements Specification
  - Software Test Plan and Procedures
  - Data Structures and Dictionary
  - User Documents
- Design Activity
  - Software Design Documents
  - Software Test Plan and Procedures
  - Data Structures and Dictionary
- Coding and Testing Activity
  - Code
  - Software Test Plan and Procedures
- Delivery and Maintenance Activity
  - User Documents
  - Others as needed

Software Application Domains

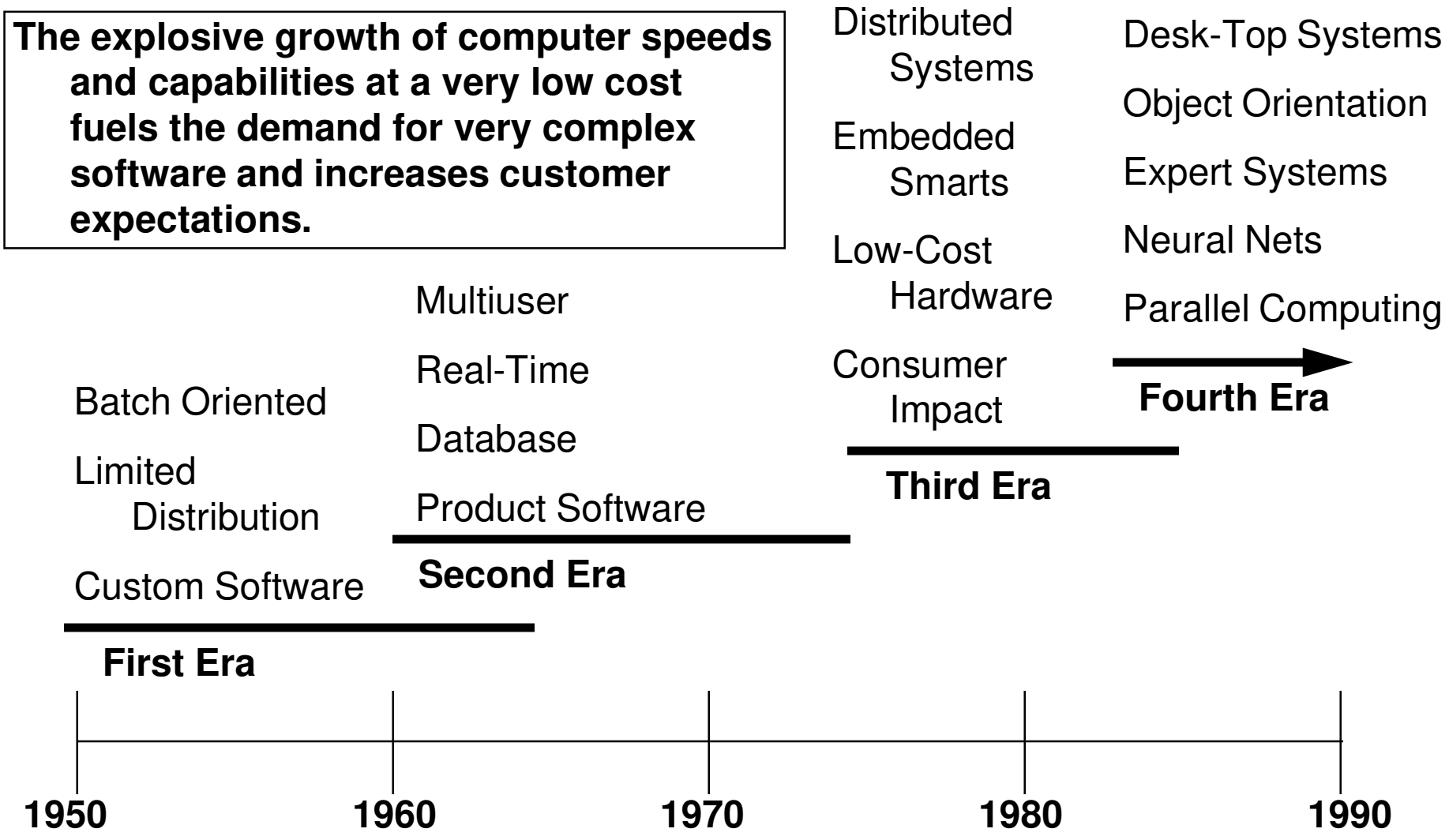
- System
  - compilers
  - editors
  - Operating Systems
- Real Time
  - machine control
  - auto controls
- Business
  - databases
  - stock management
- Personal Computer
  - all non-realtime above
- Embedded
  - appliance control
  - FPGA programs
  - auto controls
- Engineering and Scientific
  - simulation
  - computer-aided design
  - "number crunching"
- Artificial Intelligence
  - expert systems
  - neural networks

HISTORY OF SOFTWARE DEVELOPMENT

- Role of Software
- Industrial View

Role of Software

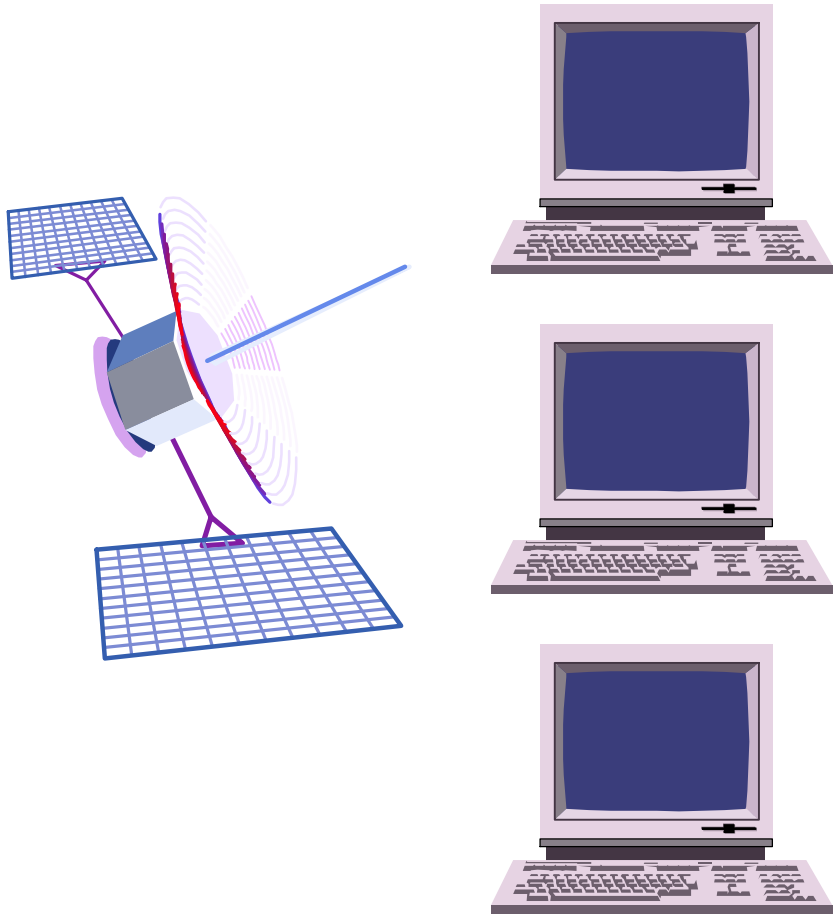
The explosive growth of computer speeds and capabilities at a very low cost fuels the demand for very complex software and increases customer expectations.



Role of Software, Continued

Where Do We Go From Here?

- Parallel computing to extend speed of computation
- Object-oriented methods of software design
- Software frameworks evolve to handle larger and multiprogram systems
- Heavy dependence on graphics interfaces
- Artificial intelligence and neural computing become useful
- National computing motivates huge software systems
- Advanced programming languages



Industrial View

- Why does it take so long to finish a working software system?
- Why are development costs so high?
- Why can't we find all software errors before software is delivered?
- How can we measure the progress of software development?
- How can we survive in the global economy?