ICS 52: Introduction to Software Engineering

Fall Quarter 2002

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Lecture Notes: CM, Management, and Evolution

Many slides taken from Ian Sommerville's text…

http://www.ics.uci.edu/~taylor/ICS_52_FQ02/syllabus.html

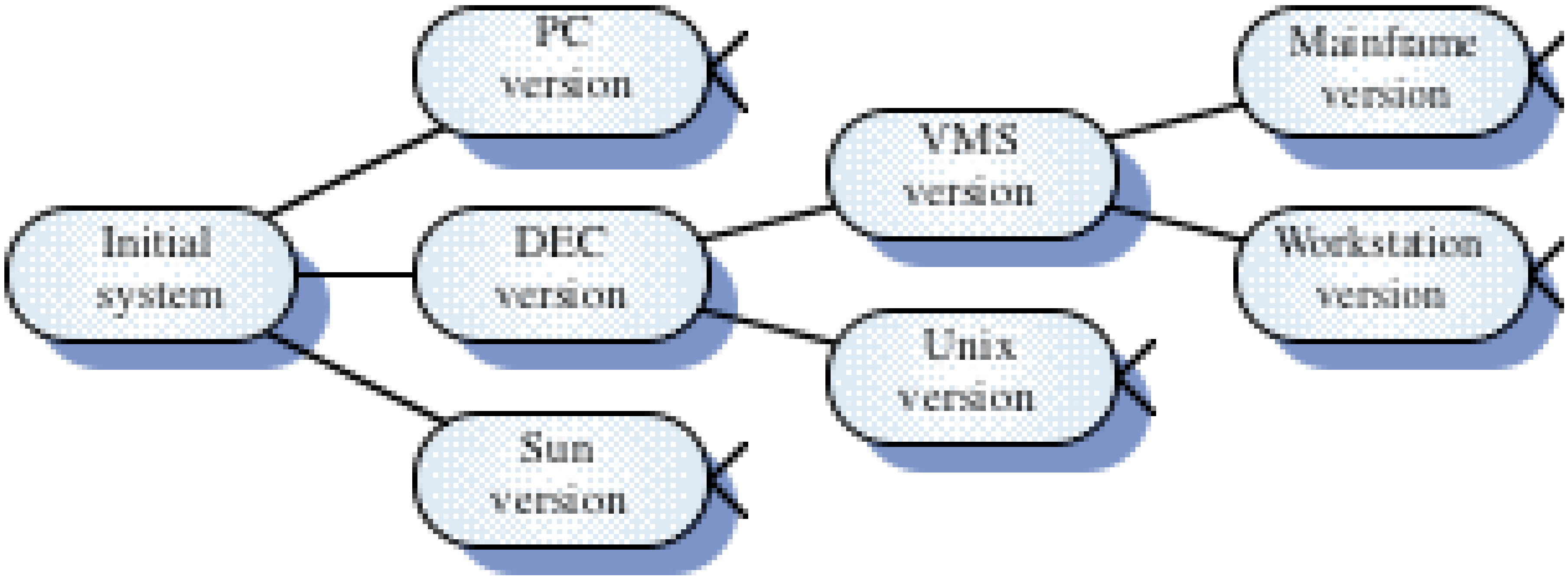
A “Survival Fare” of Topics

- ◆Configuration Management
- ◆Maintenance and Evolution
- ◆Project Management

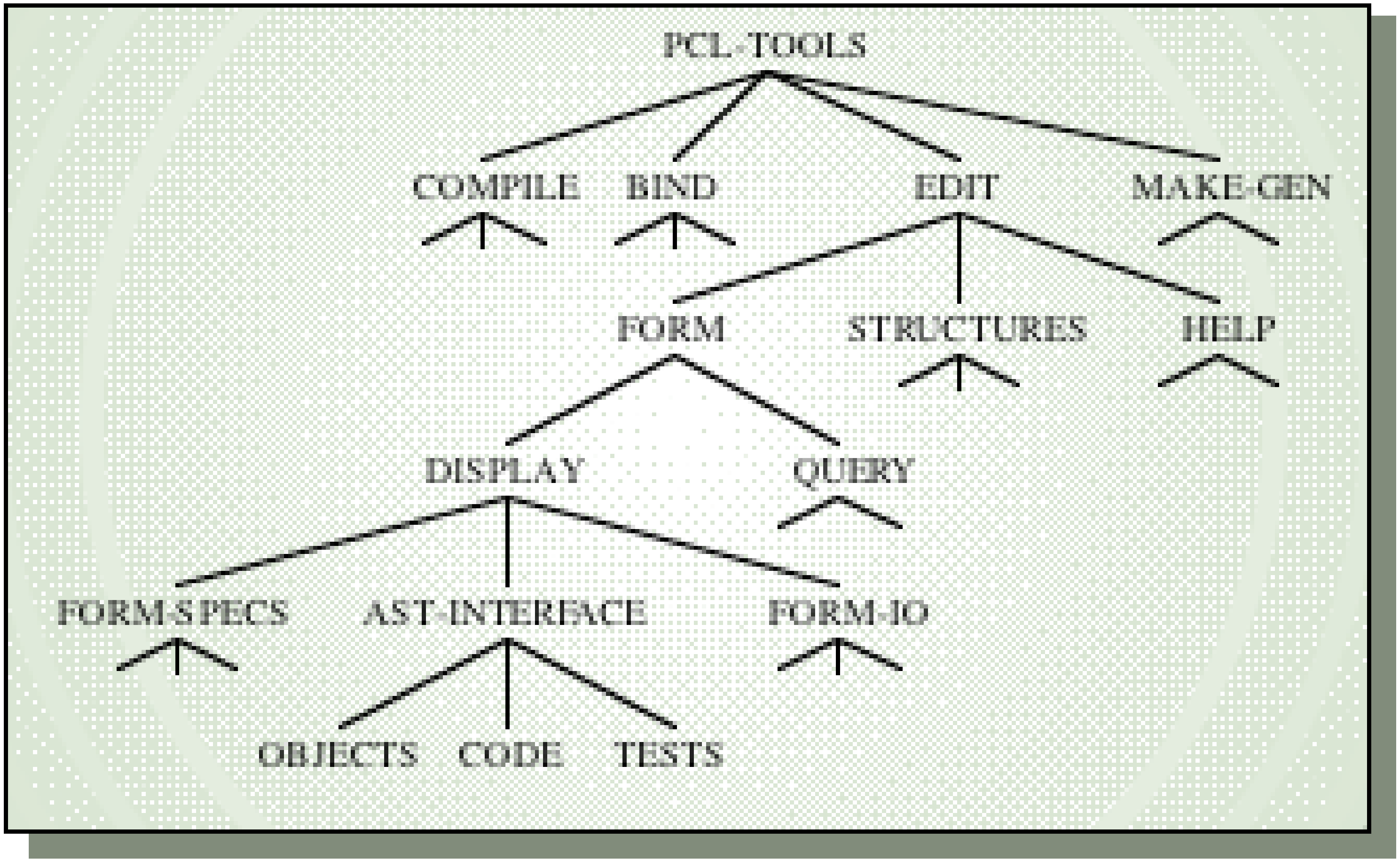
Configuration management

- New versions of software systems are created as they change
  - For different machines/OS
  - Offering different functionality
  - Tailored for particular user requirements
- Configuration management is concerned with managing evolving software systems
  - System change is a team activity
  - CM aims to control the costs and effort involved in making changes to a system

System families



Configuration Hierarchy (for 1 family member)



The configuration database

- All CM information should be maintained in a configuration database
- This should allow queries about configurations to be answered
  - Who has a particular system version?
  - What platform is required for a particular version?
  - What versions are affected by a change to component X?
  - How many reported faults in version T?
- The CM database should preferably be linked to the software being managed

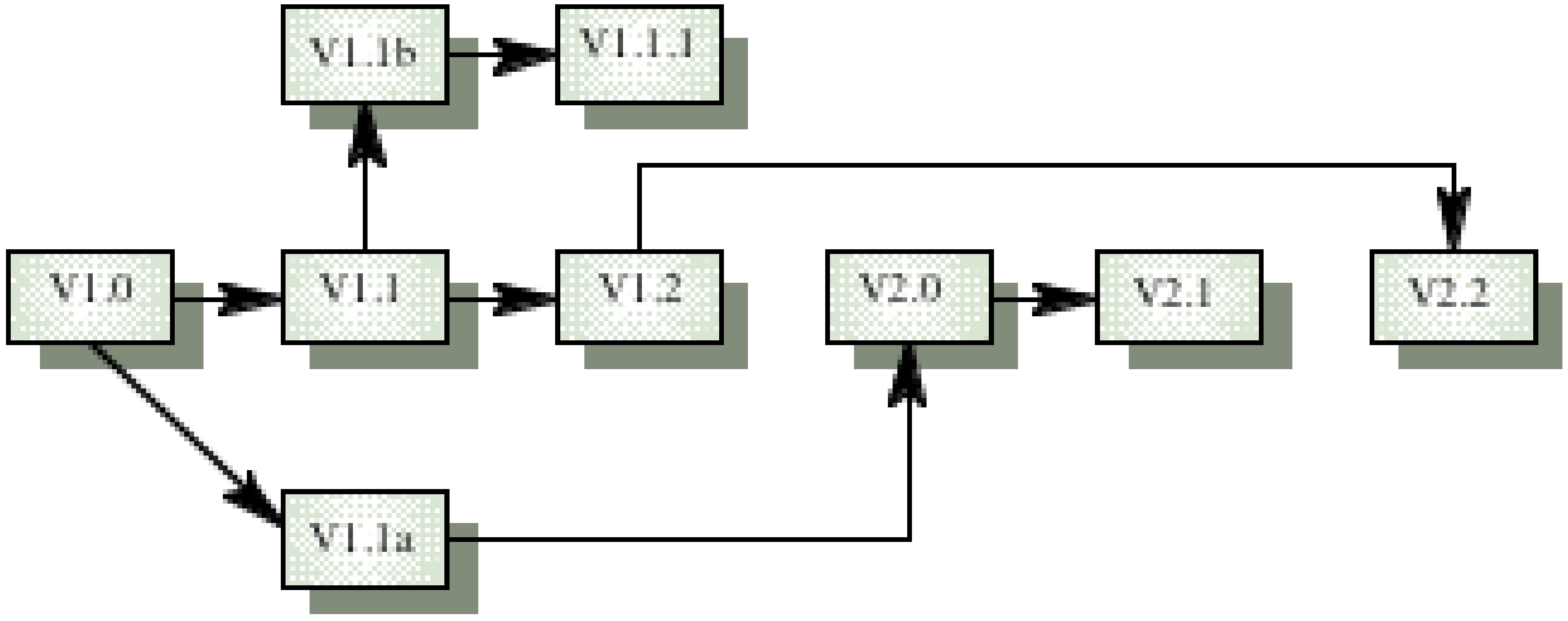
Versions/variants/releases

- *Version* An instance of a system which is functionally distinct in some way from other system instances
- *Variant* An instance of a system which is **functionally** identical but **non-functionally** distinct from other instances of a system
- *Release* An instance of a system which is distributed to users outside of the development team

Version identification

- Procedures for version identification should define an unambiguous way of identifying component versions
- Three basic techniques for component identification
  - Version numbering
  - Attribute-based identification
  - Change-oriented identification

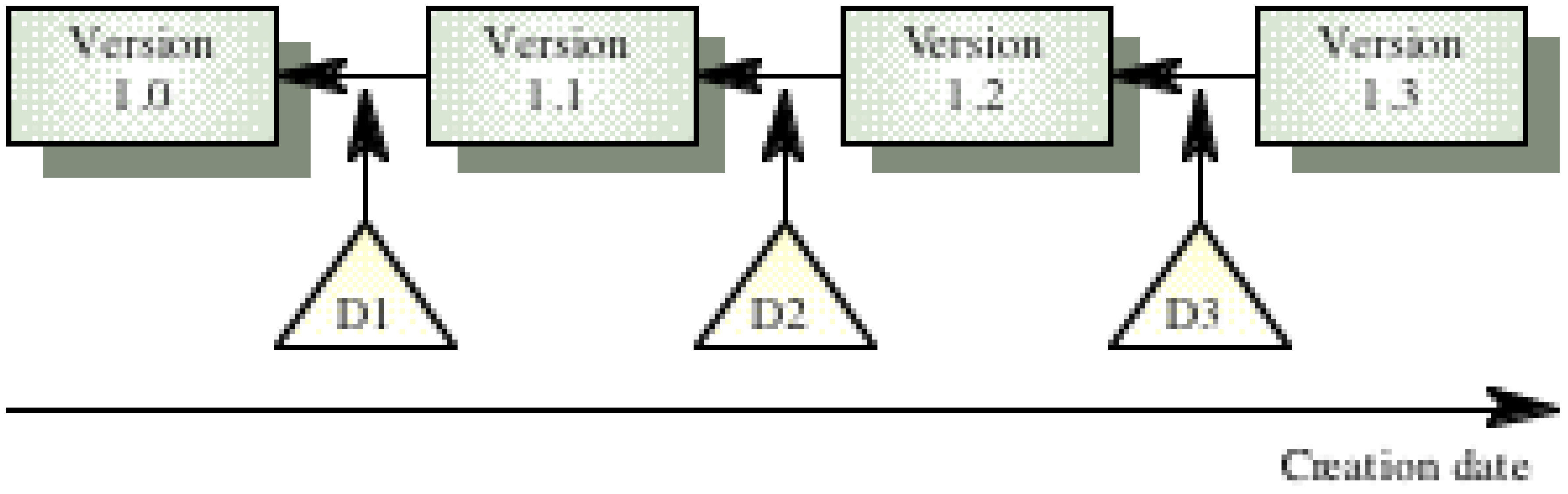
Version derivation structure



Version management tools

- Version and release identification
  - Systems assign identifiers automatically when a new version is submitted to the system
- Storage management.
  - System stores the differences between versions rather than all the version code
- Change history recording
  - Record reasons for version creation
- Independent development
  - Only one version at a time may be checked out for change. Parallel working on different versions

Delta-based versioning

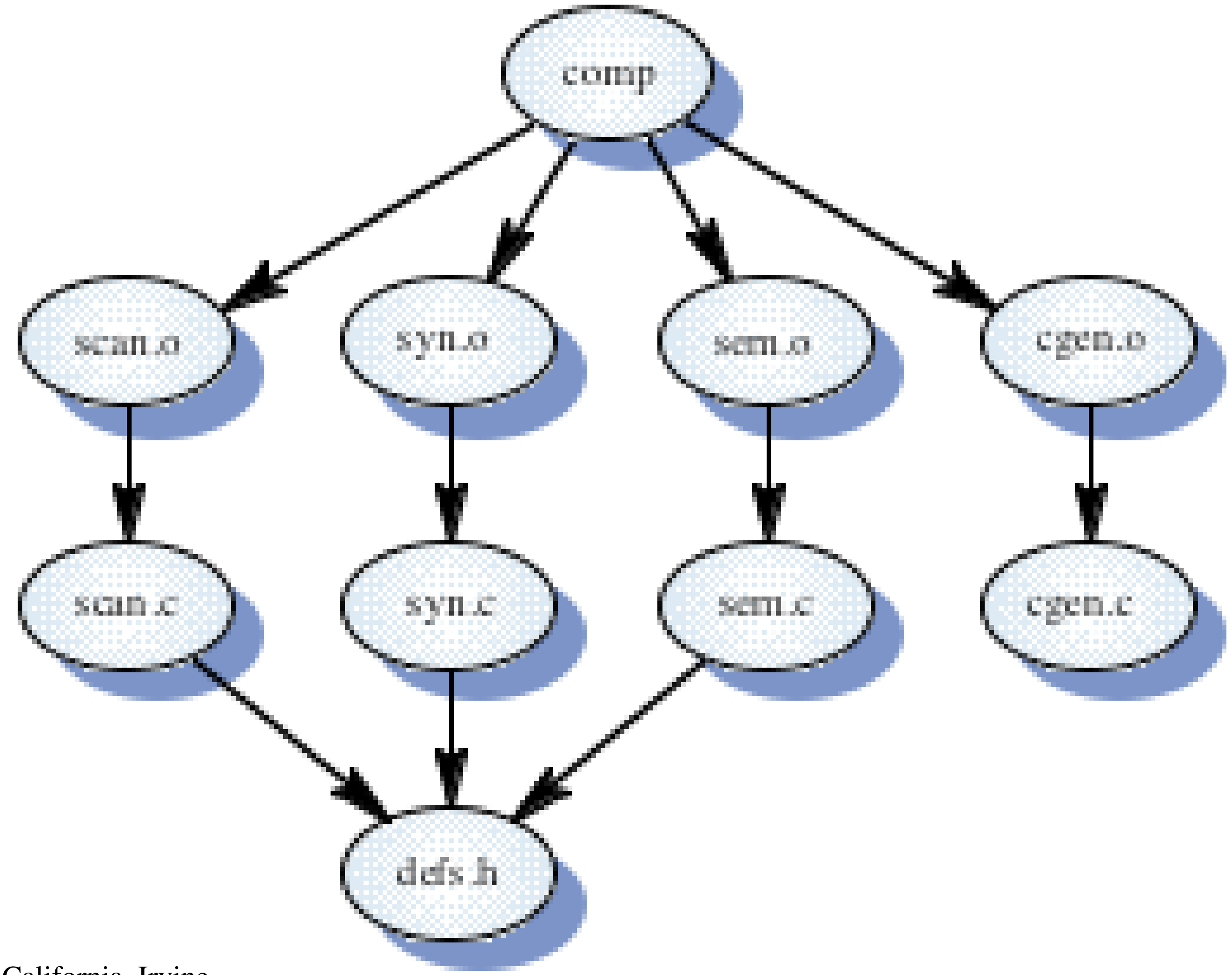


System building

- Building a large system is computationally expensive and may take several hours
- Hundreds of files may be involved
- System building tools may provide
  - A dependency specification language and interpreter
  - Tool selection and instantiation support
  - Distributed compilation
  - Derived object management

Make-oids

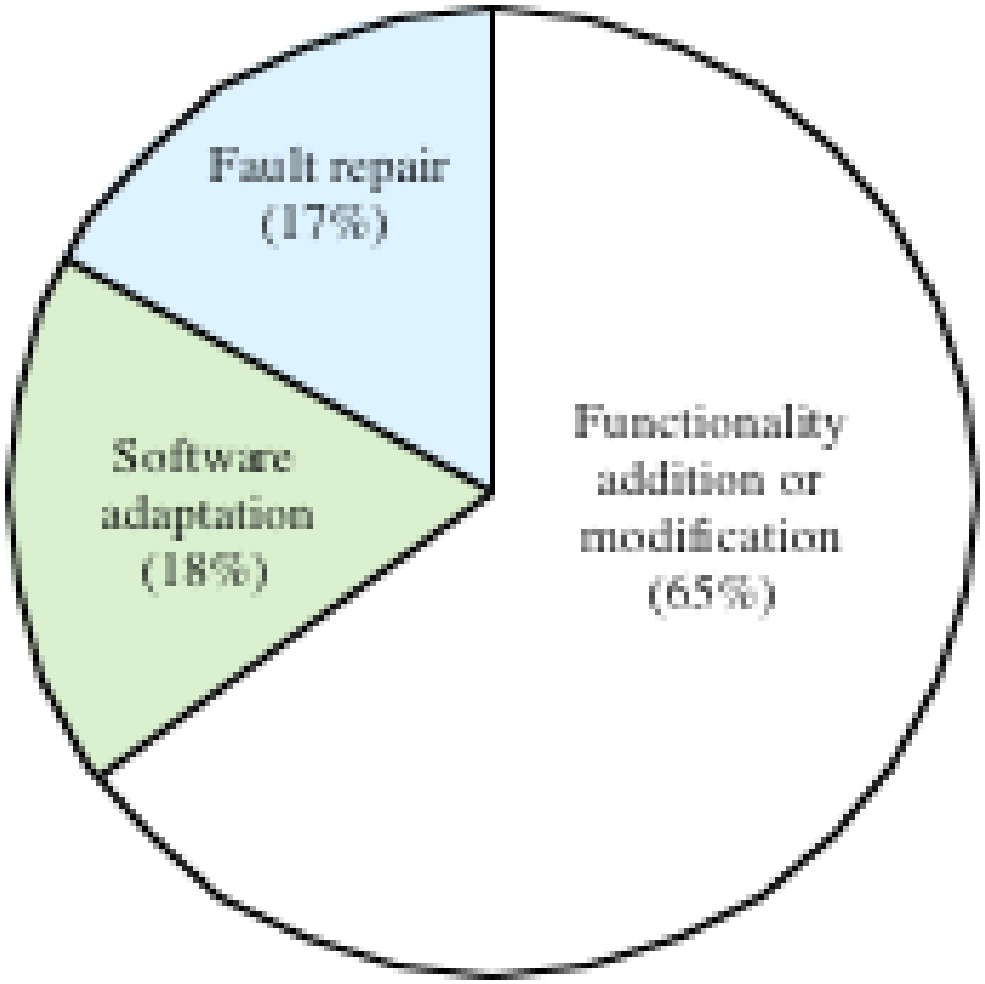
Component dependencies



Types of maintenance

- Maintenance to repair software faults
  - Changing a system to correct deficiencies in the way meets its requirements
- Maintenance to adapt software to a different operating environment
  - Changing a system so that it operates in a different environment (computer, OS, etc.) from its initial implementation
- Maintenance to add to or modify the system's functionality
  - Modifying the system to satisfy new requirements

Distribution of maintenance effort



Management of Software Engineering

- Planning
  - Objectives
  - Necessary resources
  - How to acquire resources
  - How to achieve goals
- Organizing
  - From small group structure to large organizations
- Staffing: the key resource in software development
- Directing
  - ensure continuing understanding and buy-in
- Controlling
  - Measure performance and take corrective action when necessary

Project Control: Task-based

- Work Breakdown Structures
  - Hierarchical statement of the tasks to be performed
    - » a subset of a statement of the process which will be followed
- "Off-line" management schemes
  - Gantt charts
    - » Bar charts where length of bar proportional to the length of time planned for the activity
    - » Can be used as a statement of schedule
    - » Useful for analysis of resource deployment (e.g. maximum number of engineers needed at any one time)
  - PERT charts
    - » A network of activities showing dependencies (precedence relationships
    - » Exposes critical path
    - » Shows maximal possible parallelism in project execution

Gantt Chart Example

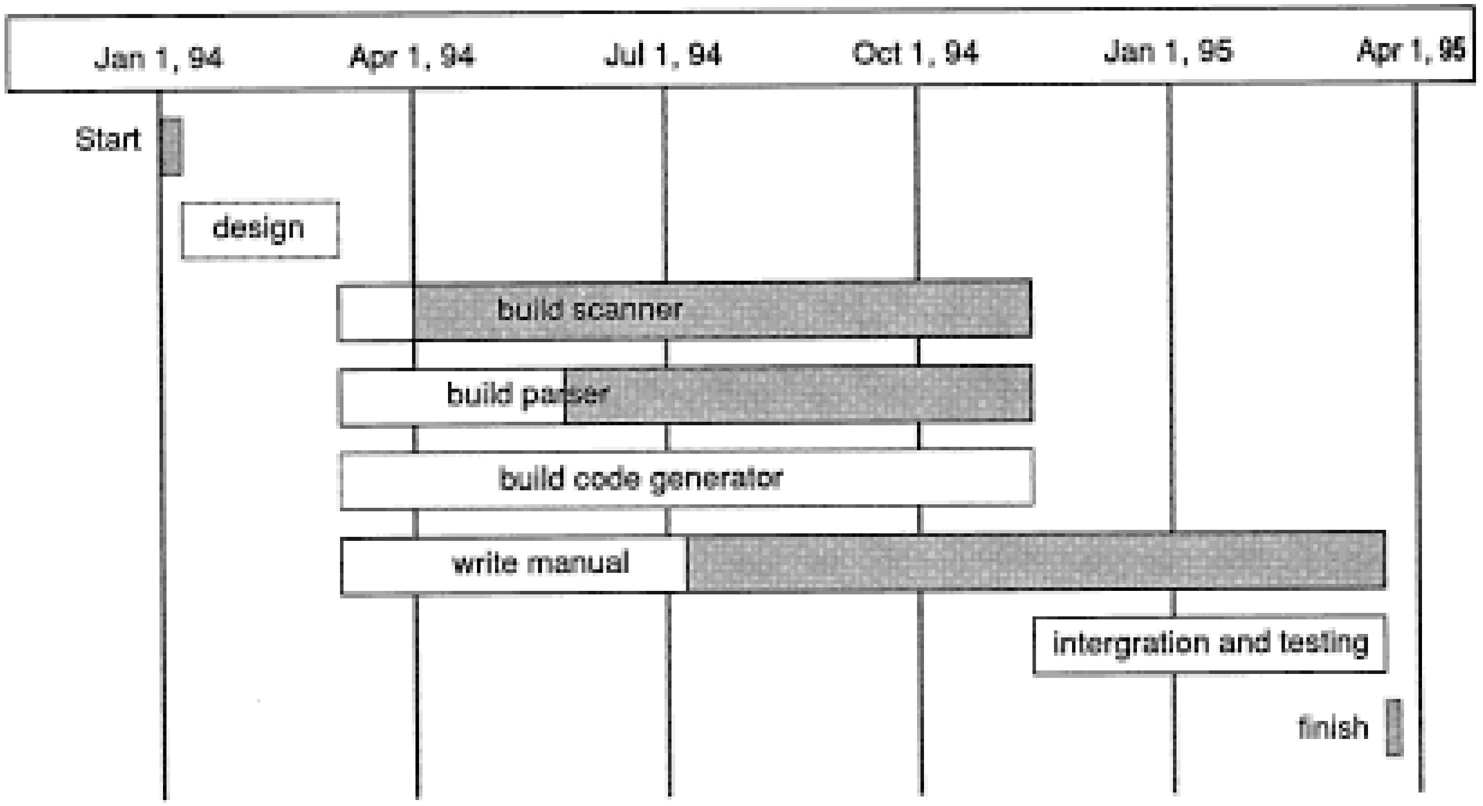


Figure 8.2 Gantt chart for a simple compiler project.

Source: Ghezzi, et.al., pg. 436

PERT Chart Example

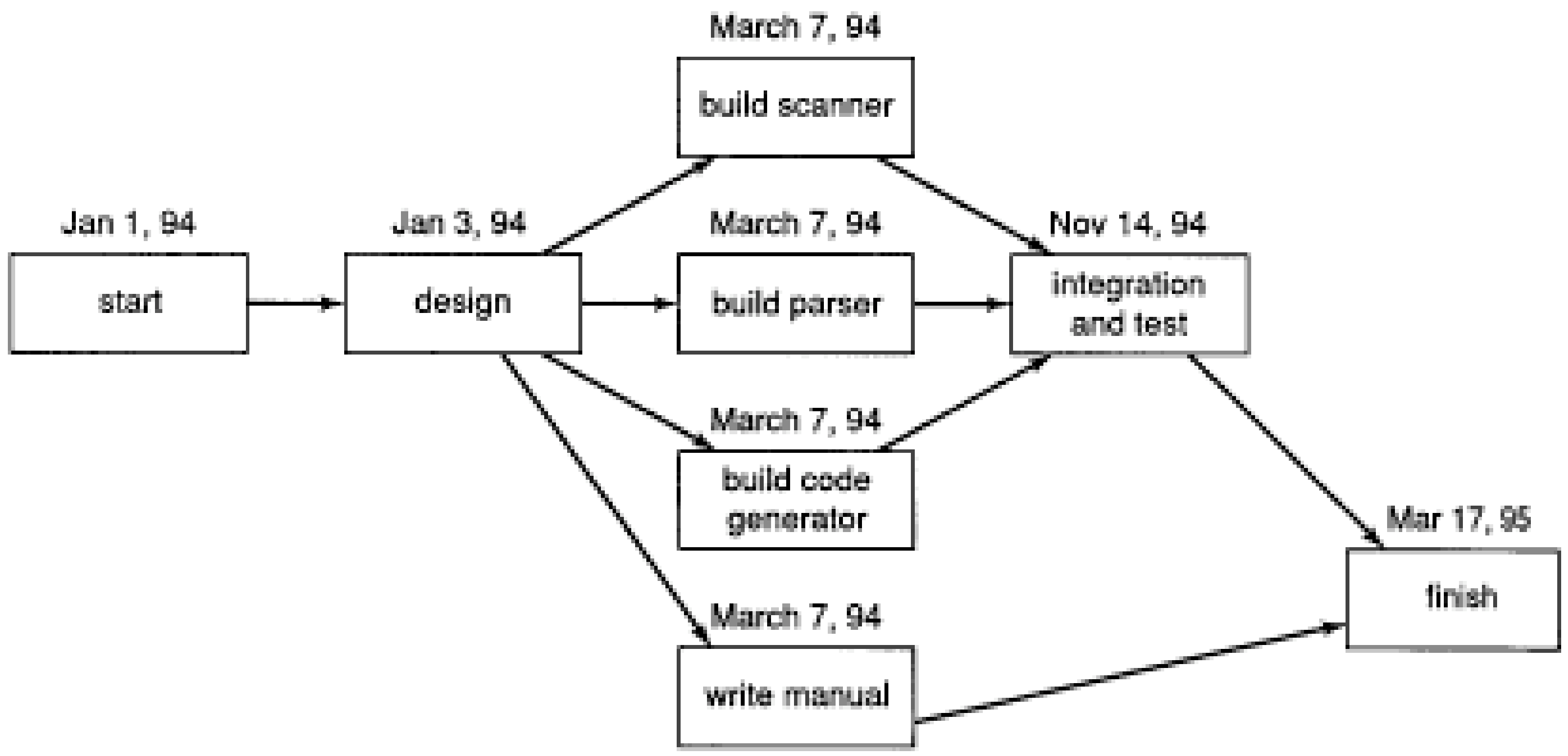


Figure 8.4 PERT chart for a simple compiler project. Activities on the critical path are shown in bold.

Source: Ghezzi, et.al., pg.. 438