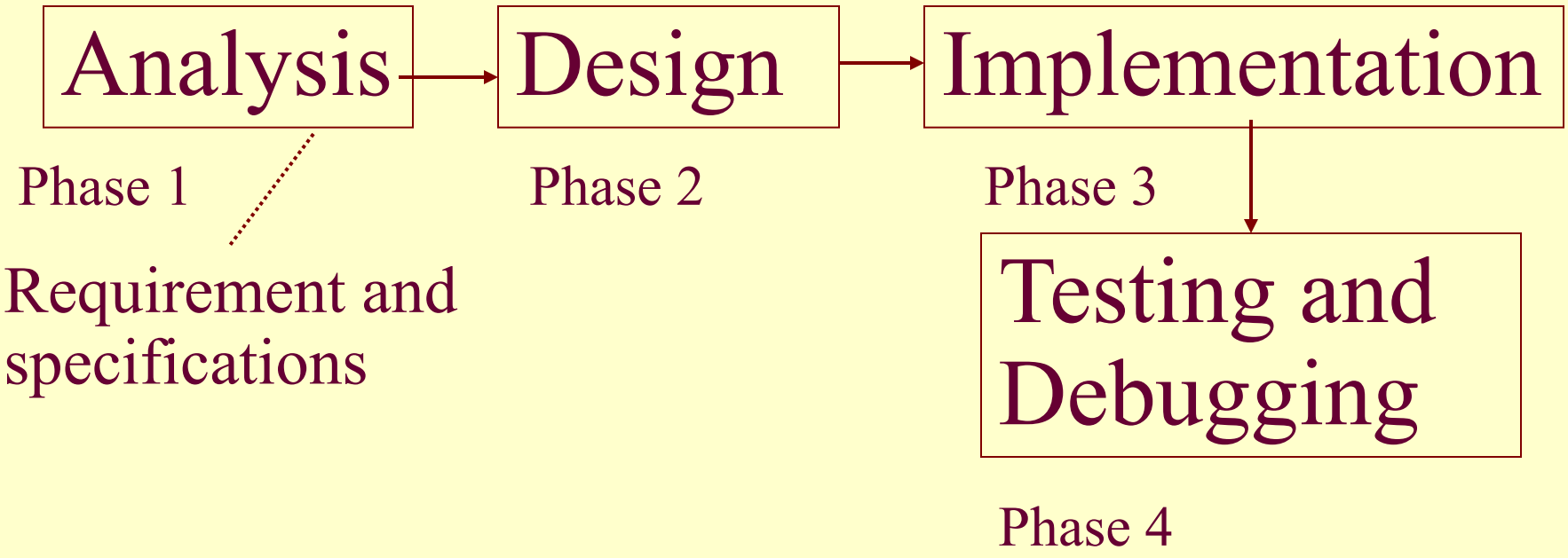
Chapter 12

Development Tools for Microcontroller Applications

Lesson 01

Software Development Process and Development Tools

Step 1: Development Phases



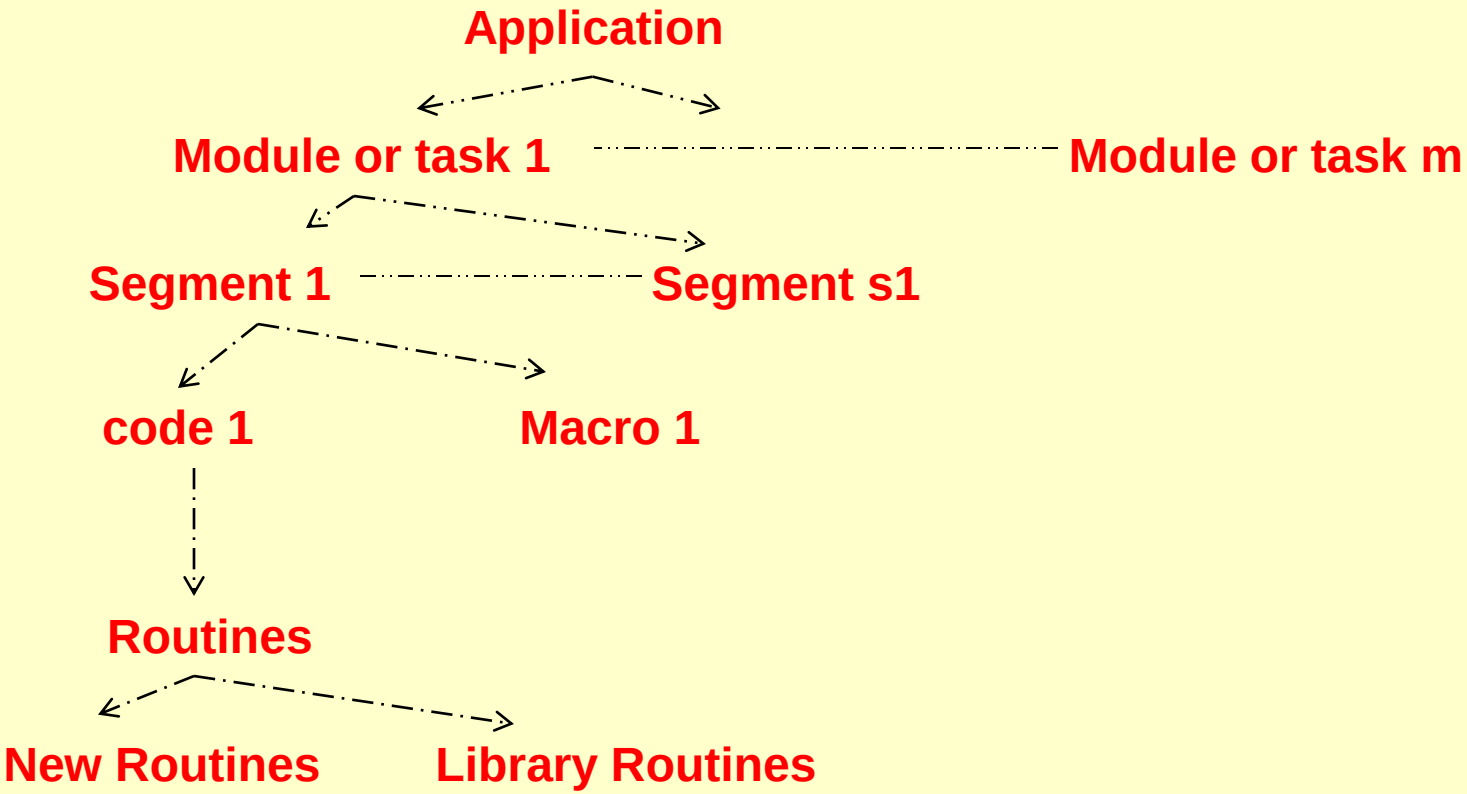
Phase 1: Analysis

- A listing of the requirements made
- Required system understood and analysed
- Specifications of the application to be developed

Phase 2: Design

- Assume an application (program) consisting of modules or tasks
- A module can be used in multiple parts of an application or in multiple applications or projects

Application contents— modules or tasks, segments, codes, macros, routines (functions) and library routines



Module

- A module consists of set of functions.
- The set independent of the results of next module

Task

- A task–a set of instructions
- The set performs some action or a set of actions in a system
- The running of the task controlled by systems software—Operating System (OS) or Real Time Operating System (RTOS)

Appropriate software-development tools for the design

- Firstly the tool selection
- Selection of appropriate modules or tasks, program segments, macros, routines and library routines, and their linkages done.

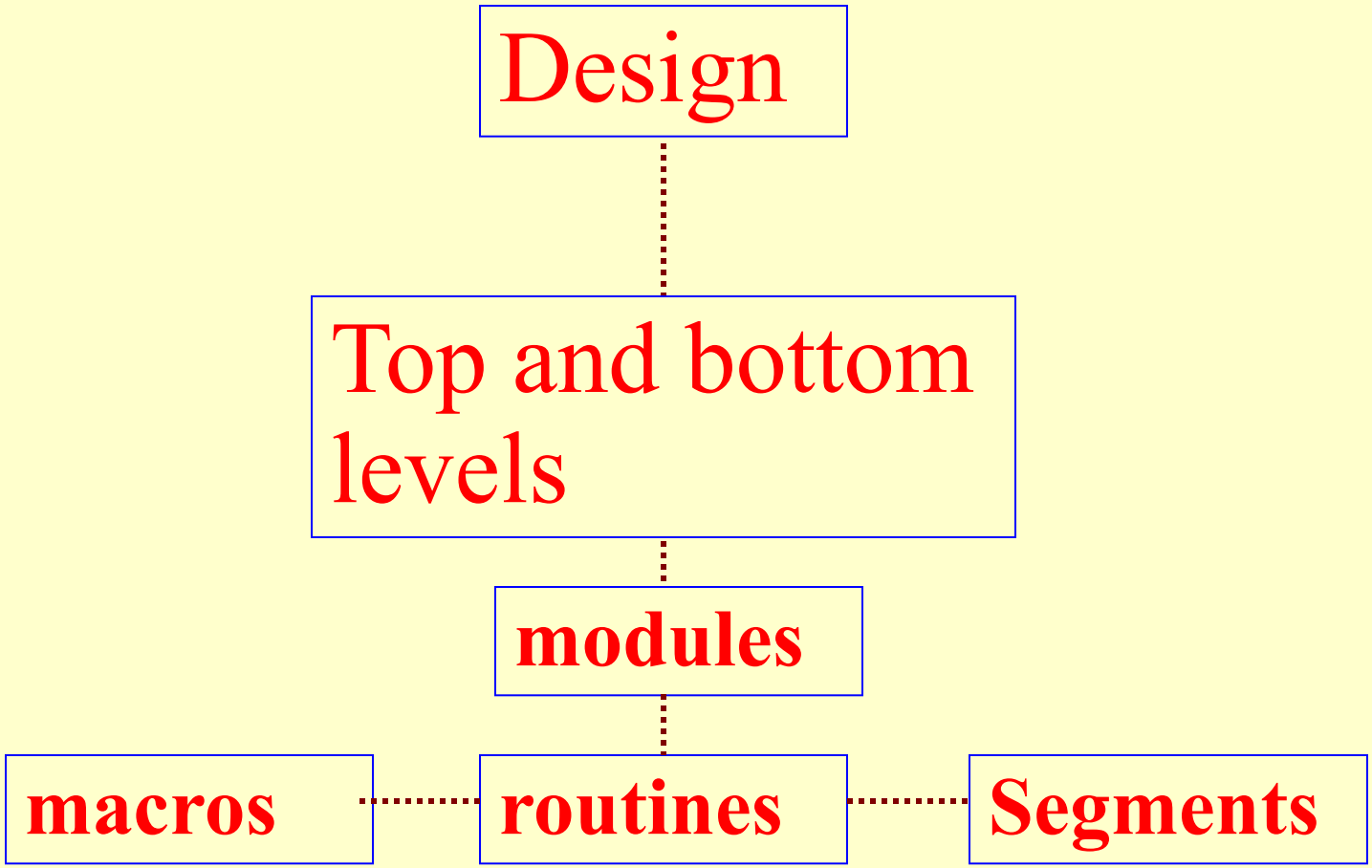
Selection of hardware for the design

- Based on requirements
- Hardware consists of the microcontroller, memory, needed external interfaces, and expansion circuits
- Selection of an appropriate target platform done for development

Emulator and Target Board

- Use of an emulator circuit for a microcontroller circuit helps in the test phase
- Use of a target board with a monitor– helps in the tests by final high speed run.

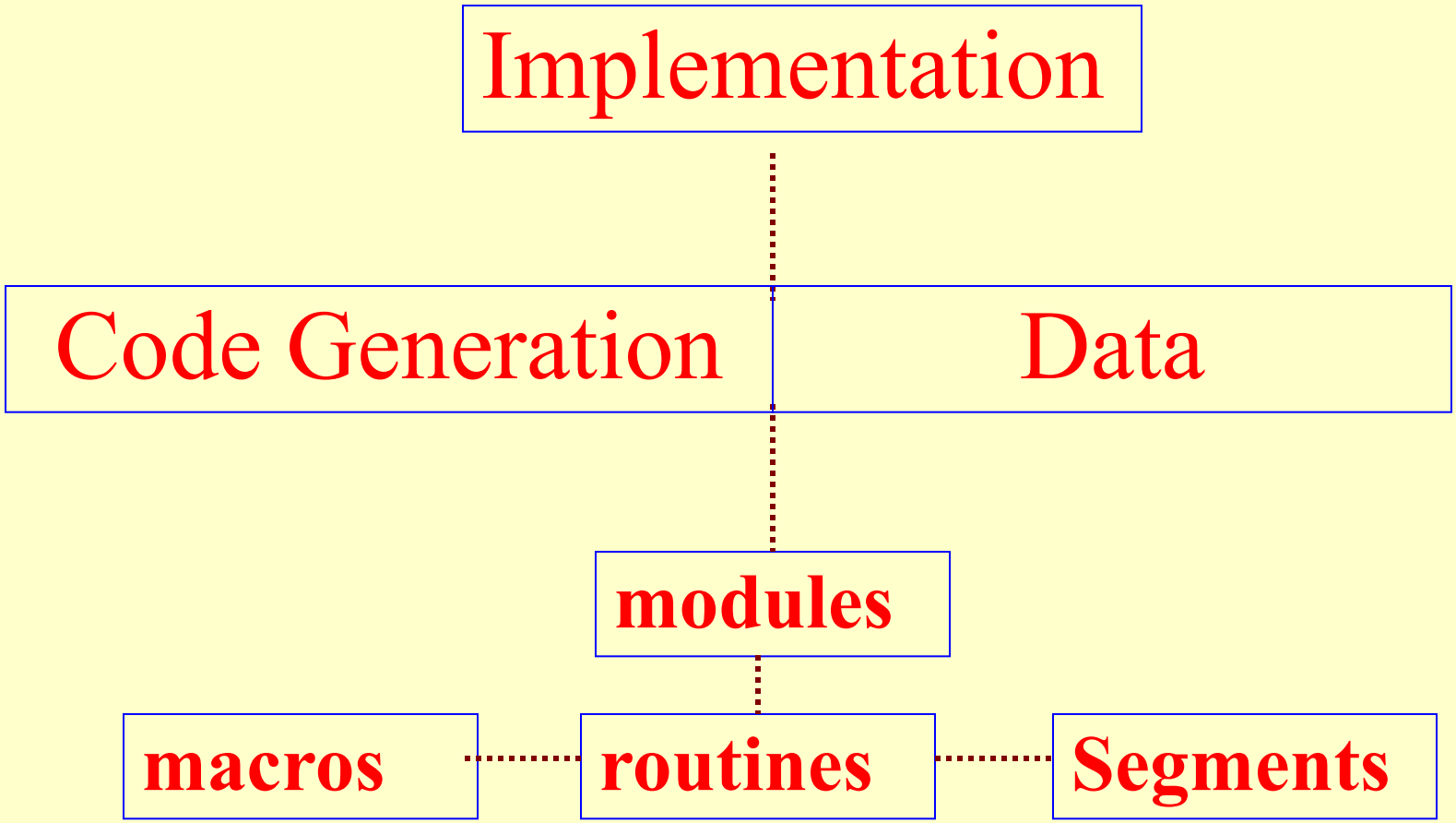
Step 2 in Development Phases



Phase 3: Implementation

- Each module or task implemented (coded)
- Coding for the segments
- Statements
- Macros
- Routines
- Appropriate software development tools employed for coding and using the macros and library routines

Step 3 in Development Phases



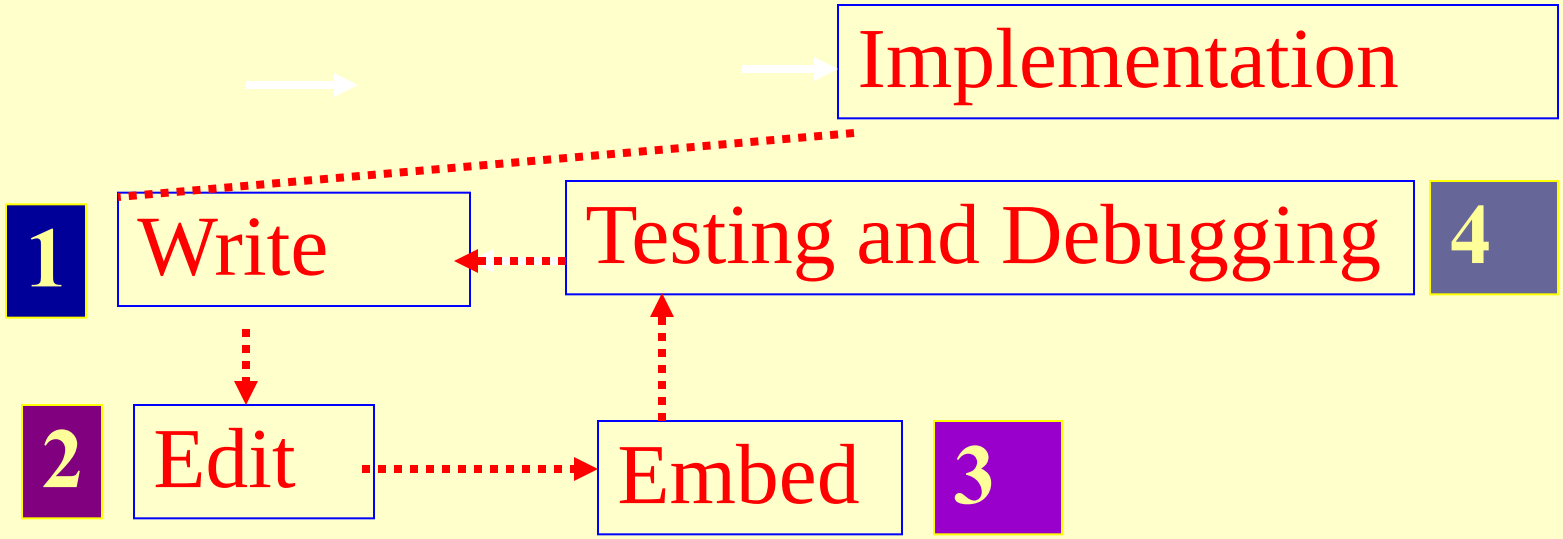
Phase 4: Testing and Debugging

- A targeted system prototype used during the development phase
- A cycle of the coding for the application codes used
- The cycle consists of design and implementation phases
- The developed codes embedded
- The embedding of machine codes done in the flash memory at the device
- The codes then tested

Cycle of Write, Testing and Debugging and Editing

- The developed codes embedded
- The embedding of machine codes done in the flash memory at the device
- The codes then tested

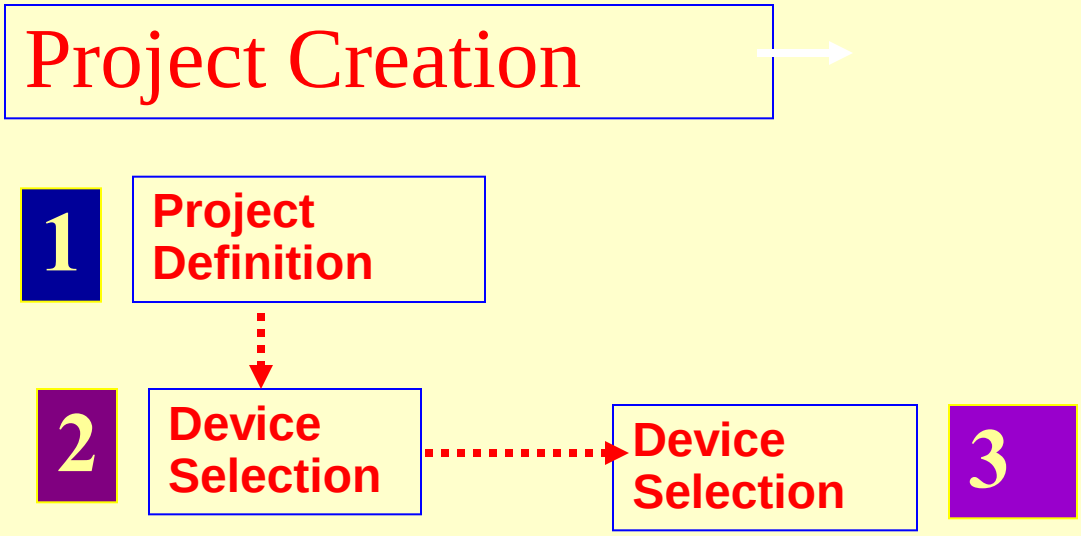
Write-edit-embed and test cycle



Step A in a software project development processes and development cycle

- A project creation
- The selection of a device (target microcontroller) from a *device database*
- Then the device configuring
- Then tools set
- Then used in the project

Step A: Project and Application Creation

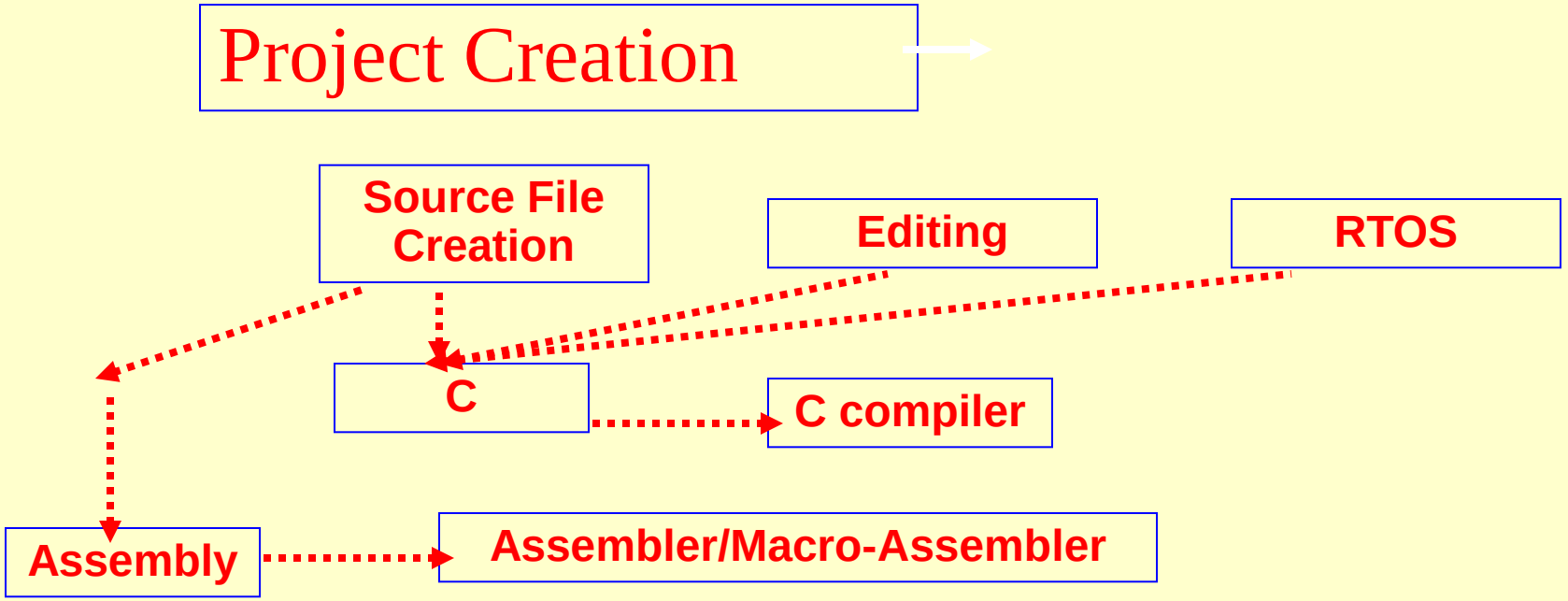


Step B in a software project development processes and development cycle

- Project file called *source file* created with the help of an editor

1. in assembly by using an assembler or macro assembler, or
2. in C by using a compiler, or
3. in C using an RTOS environment integrated with C compiler in case of a multi-tasking system.
4. in Visual Basic using an environment integrated with Visual Basic compiler

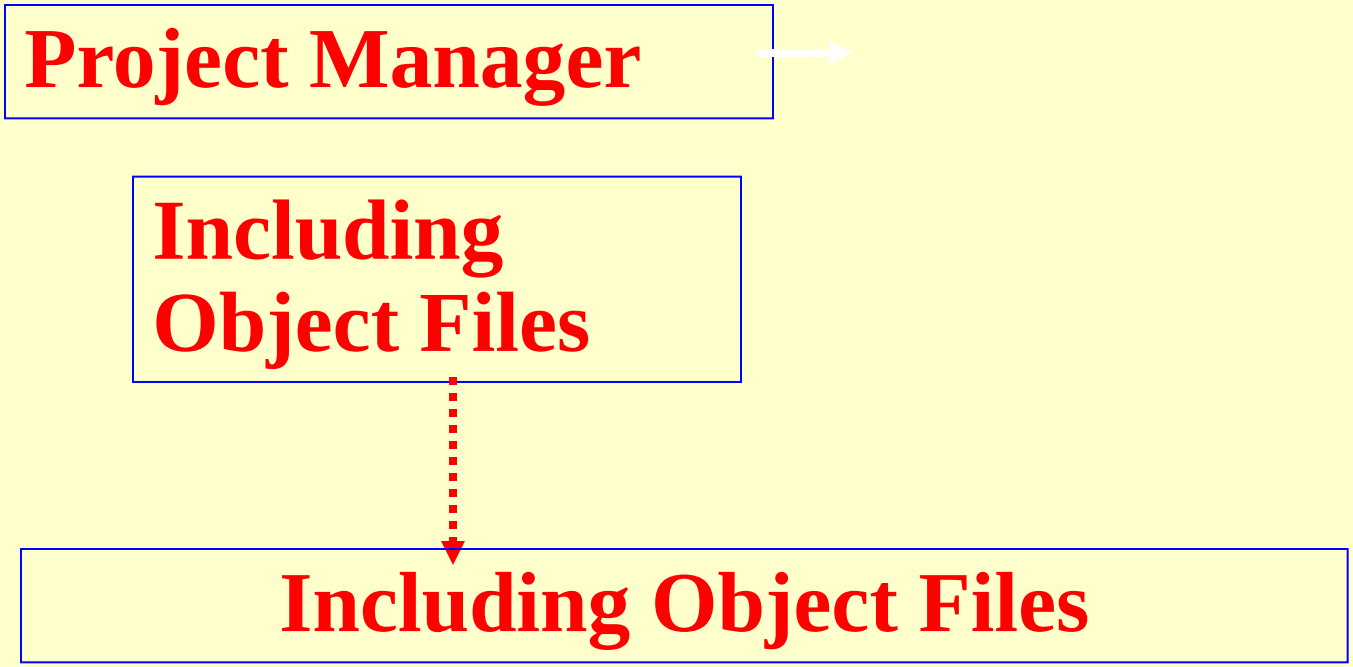
Step B: Project and Application Creation



Step C in a software project development processes and development cycle

- Other previously developed source files included in the project
- Project manager– helps in building the application

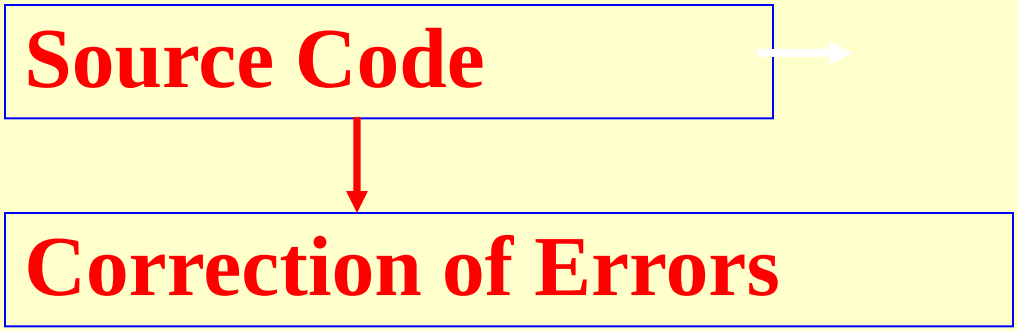
Step C: Object Files



Step D in a software project development processes and development cycle

- Source-file errors corrected

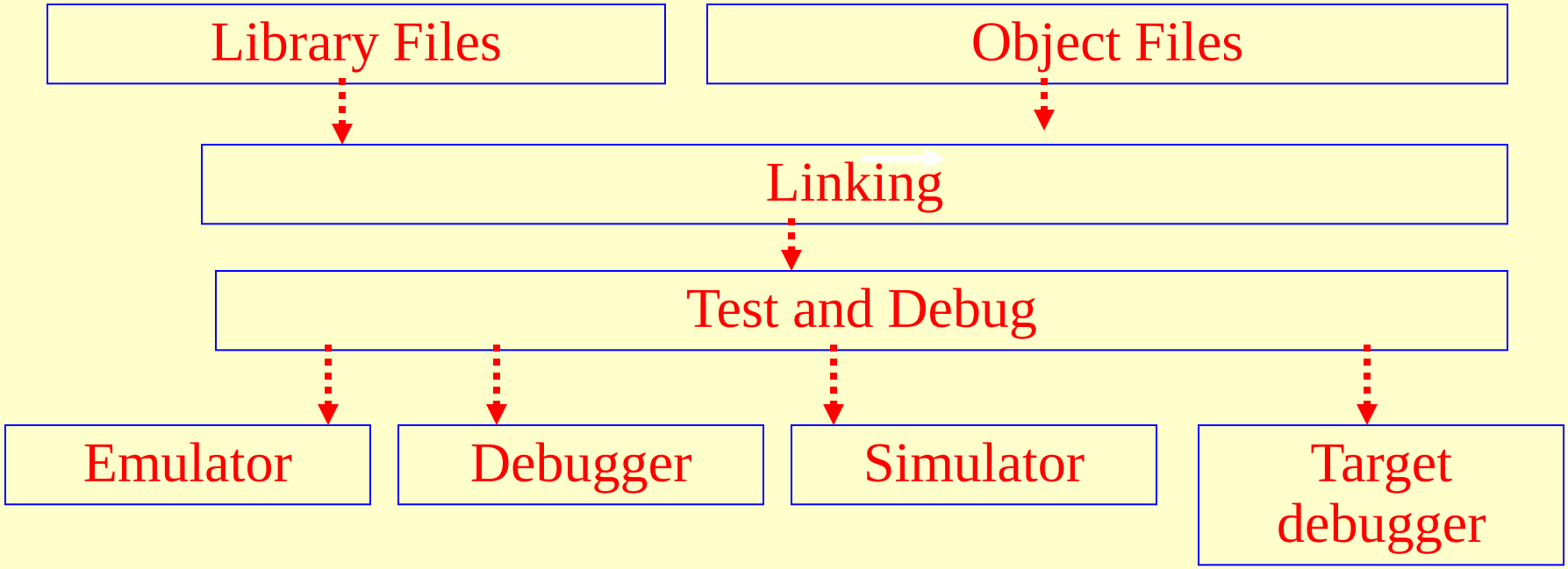
Step D: Object Files



Step E in a software project development processes and development cycle

- The *source and library files* linked
- Tested using (i) suitable emulator, or (ii) a suit- able debugger/ simulator/ target debugger using a monitor

Step E: Project and Application Creation



Software Development Tool– make facility inIDE

- An IDE provides an integrated development environment
- Managing
- Organising
- Editing
- An integrated *make* facility

Software Development Tool– Editor in IDE

- Editor used to make assembly or C source file
- Assembler or C compiler used when coding in assembly or C, respectively
- RTOS (internally integrated with the C compiler) used in case of multi-tasking systems and real-time constrained systems

Software Development Tool in IDE

- Source file from the assembler or C compiler
- Linker with a C library using a library manager
- Links all the files from the RTOS or from the assembler, compiler, and library
- The codes locate at the appropriate and distinct addresses

Software Development Tool– Locator in IDE

- Locator creates a hex- file
- Used by a device programmer
- Burns the codes into the target PROM
- Used for program testing using an ICE or an IDE debugger tool

RTOS

Multiple Tasks

Task Synchronisation

Task Scheduling

Inter Process Communication using signal, semaphores, ...

Summary

We learnt

Software Development Steps

- Analysis
- Design
- Implementation
- Testing and Debugging
- Write Edit Embed and Test cycle

We learnt

Software Development Tools

- Assembler
- Library Manager
- Linker
- Locator
- Debugger/Simulator
- IDE
- RTOS

End of Lesson 01 on

Software Development Process and Development Tools