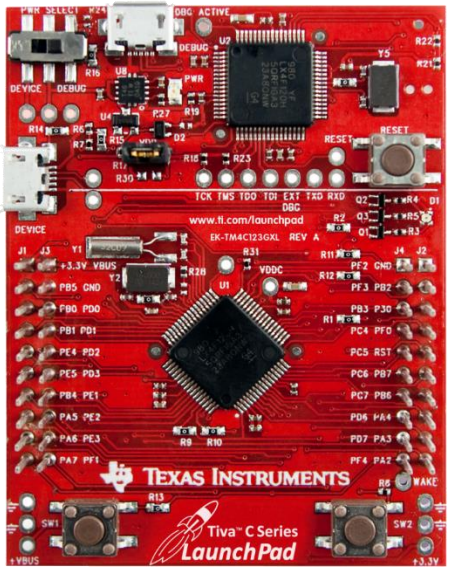
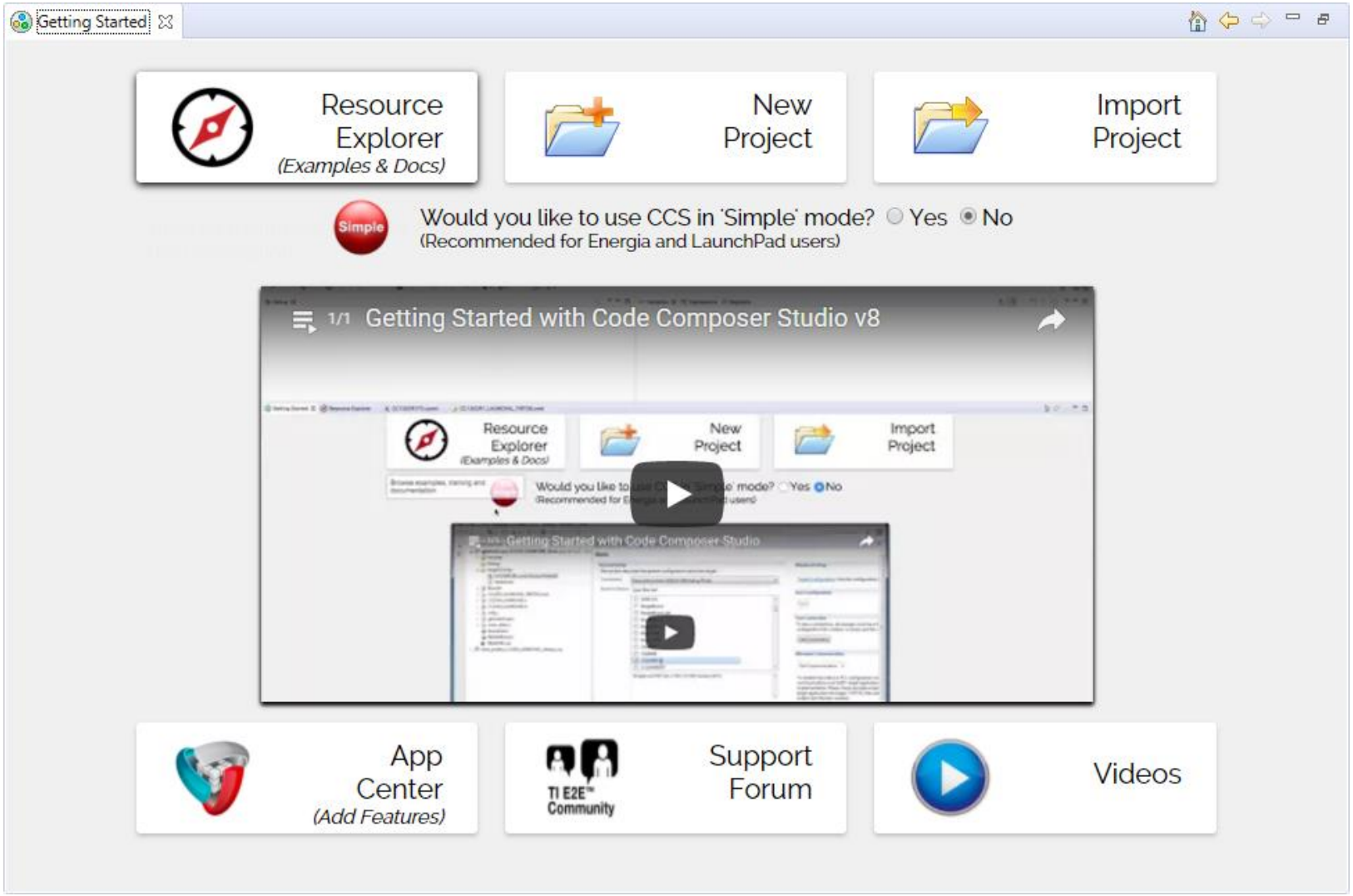
M01: Embedded Systems Architecture

1.3. Code Composer Studio

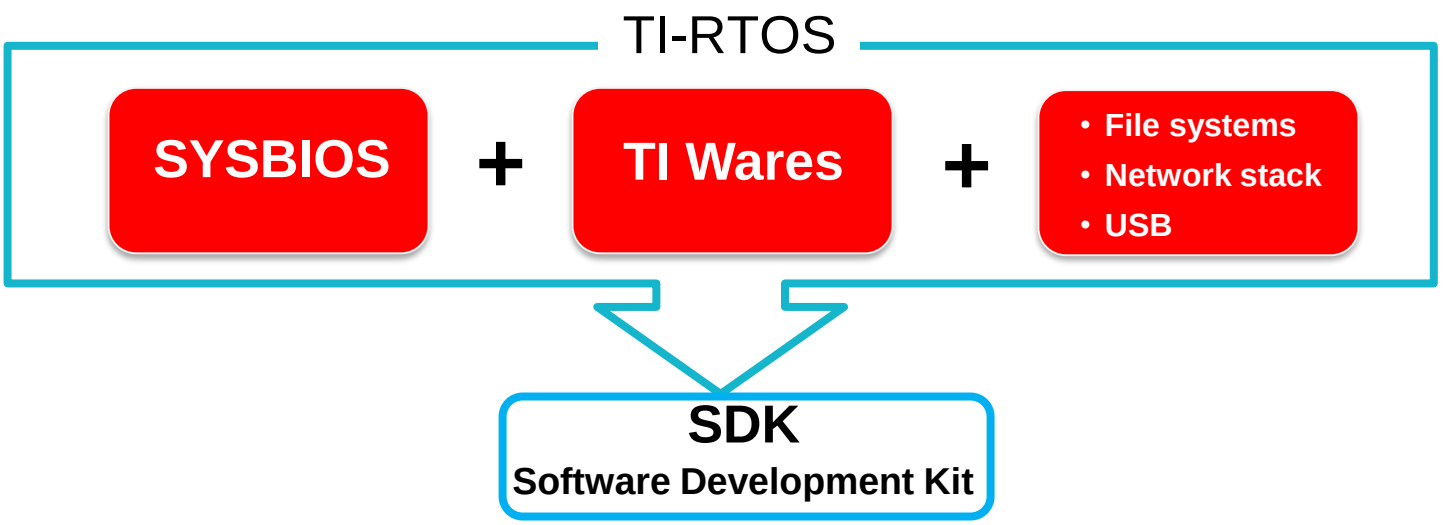
Reference: TI website, Tiva LaunchPad workshop



Resource Explorer

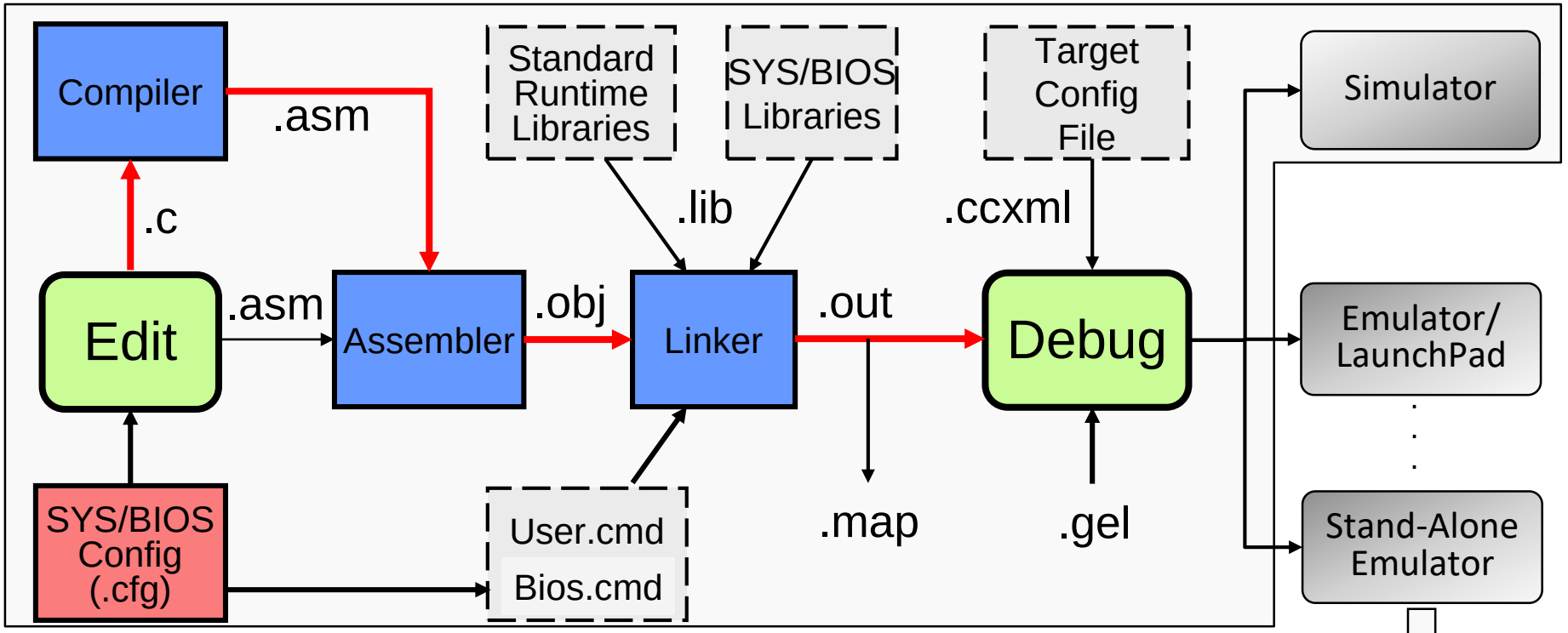


TI's Run-Time Software



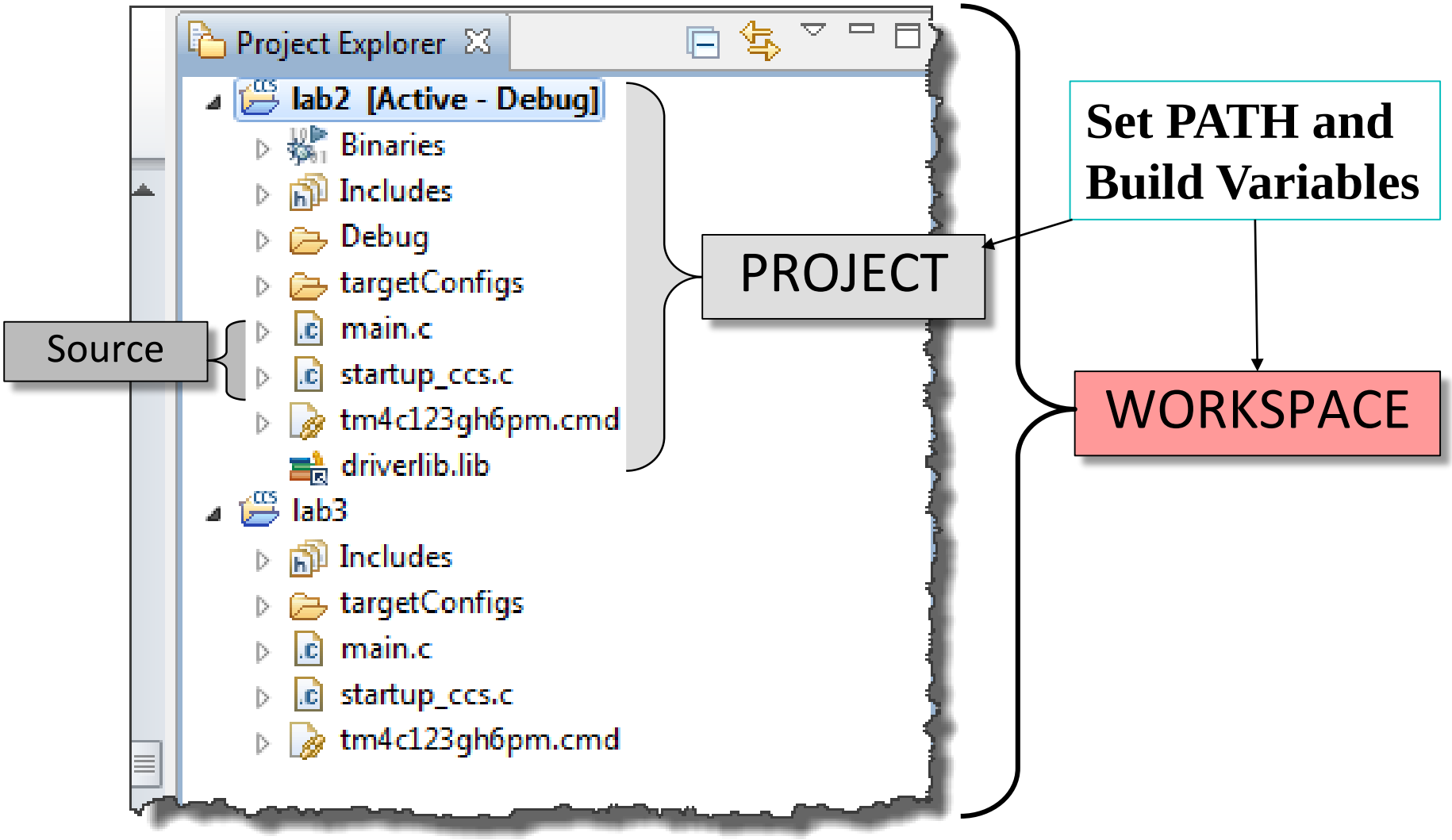
- **SYSBIOS – real-time kernel:**
  - **Scheduling, memory management, utilities**
- **TI wares (e.g. TivaWare) - drivers for LaunchPad**
  - **Low-level libraries, peripheral programming interface, tool-chain agnostic C code (by TM4C123GLaunchPadWorkshopSetup.exe)**
  - **Other libraries installed separately: Graphics, special sensors, wireless protocols**

CCStudio Functional Overview

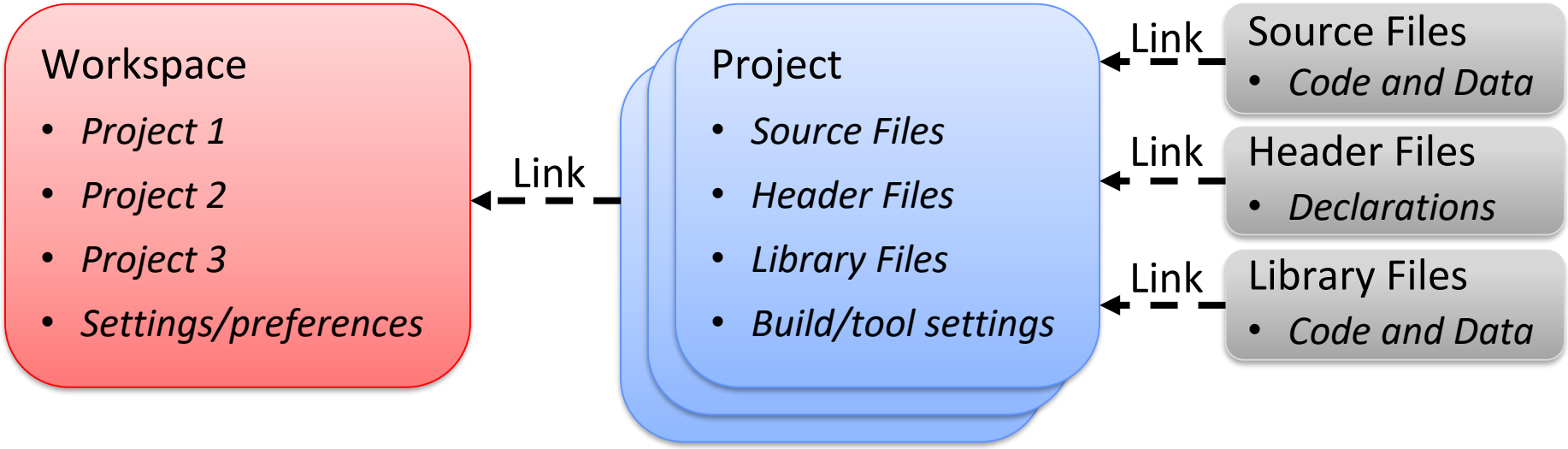


- Integrated Development Environment (IDE) based on Eclipse
- Contains all development tools – compilers, assembler, linker, debugger, BIOS and includes one target – the Simulator
- GEL files initialize the debugger so that it understands where memory, peripherals, etc. are

Projects and Workspace



Project and Workspaces

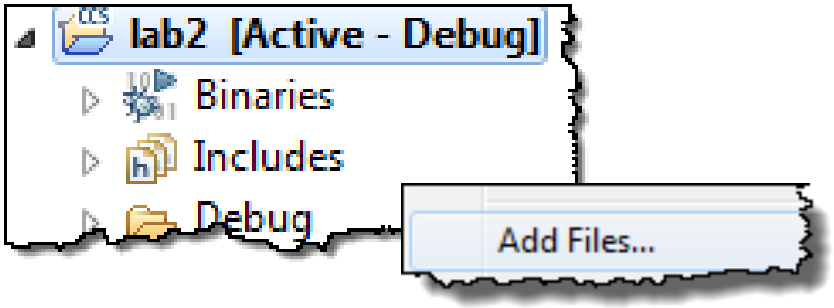


- WORKSPACE folder contains:
  - IDE settings and preferences
  - Projects can ***reside in*** the workspace folder or be ***linked*** from elsewhere
  - When importing projects into the workspace, linking is recommended
  - Deleting a project within the Project Explorer only deletes the link
- PROJECT folder contains:
  - Build and tool settings (for use in managed MAKE projects)
  - Files can be ***linked to*** or ***reside in*** the project folder
  - Deleting a linked file within the Project Explorer only deletes the link

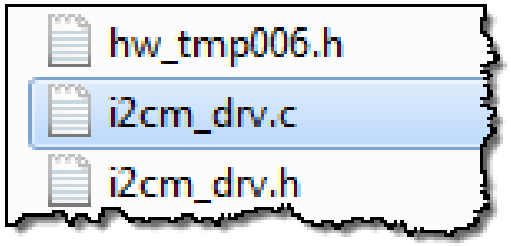
Two Ways of Adding Files

- **Users can ADD (copy or link) files into their project**
  - SOURCE files are typically COPIED
  - LIBRARY files are typically LINKED (referenced)

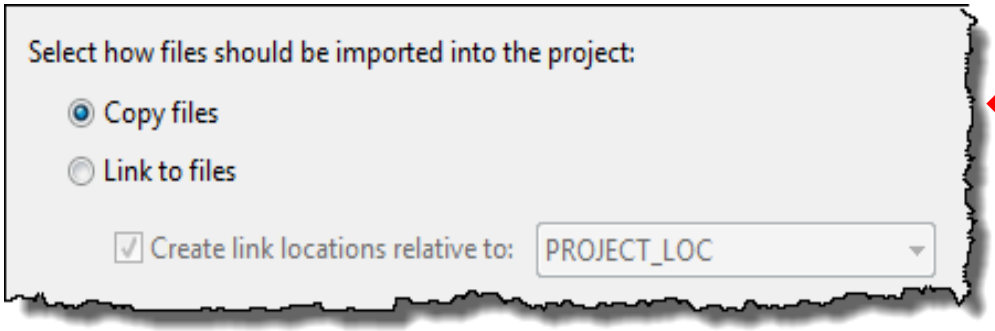
1 Right-click on project and select:



2 Select file(s) to add to the project:



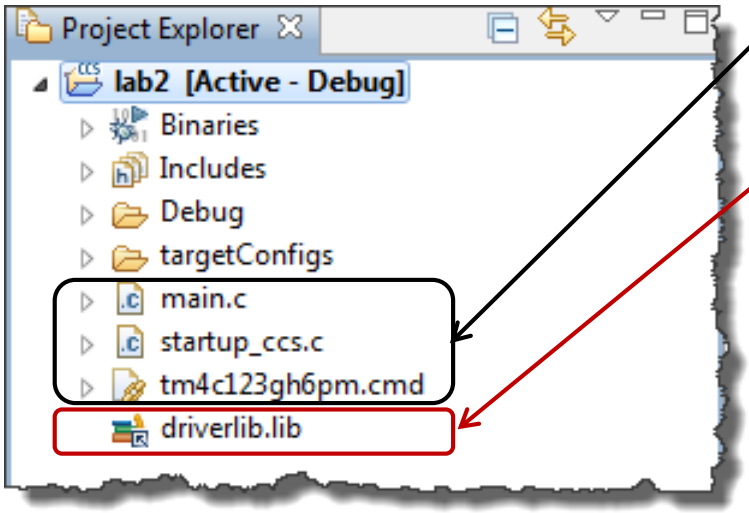
3 Select "Copy" or "Link"



- **COPY**
  - Copies file from original location to *project folder* (two copies)
- **LINK**
  - References (points to) source file in the *original folder*
  - Can select a "reference" point – typically PROJECT_LOC

Portable Projects

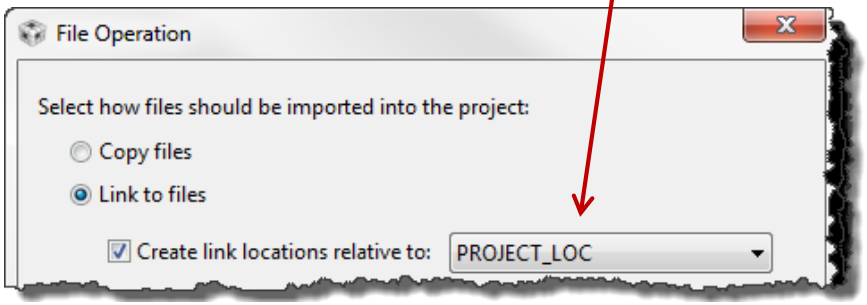
- **Benefit for making project portable:**
  - Simplifies project sharing
  - Easily re-locate projects
  - Link to new release of software libraries
  - Migrate to other hardware platforms



Copied files are not a problem (they move with the project folder)

Linked files may be an issue.

Use a relative path via PATH Variable

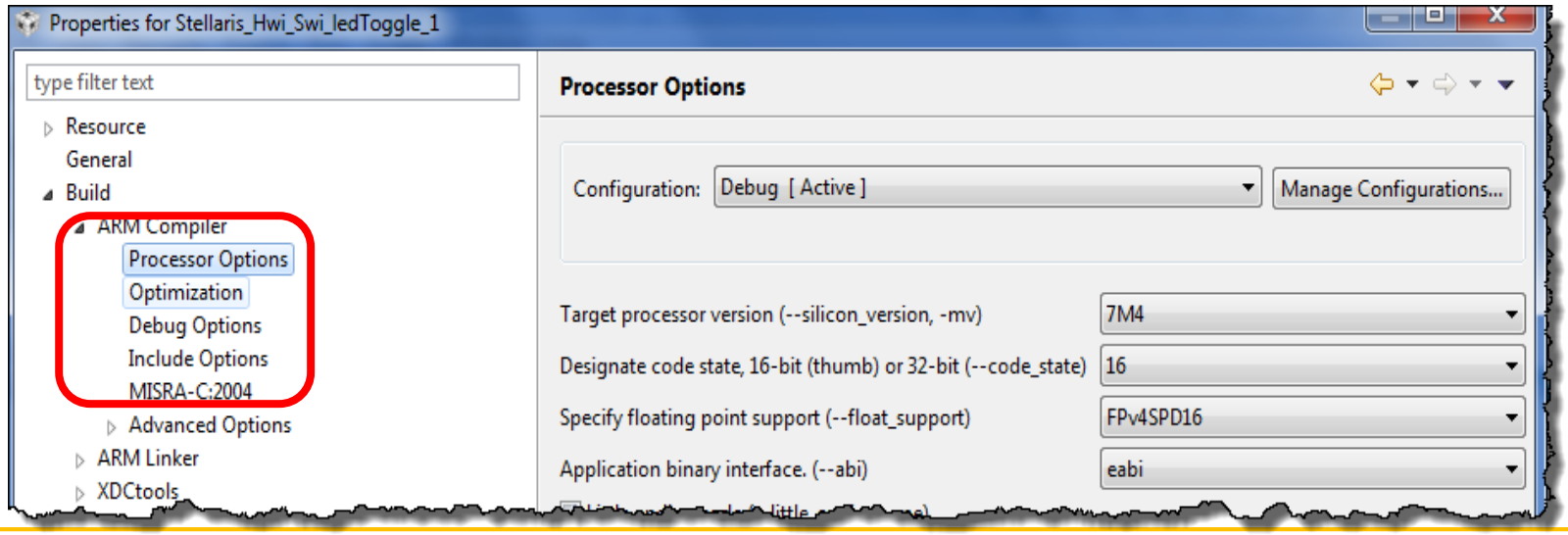


PATH and Build Variables

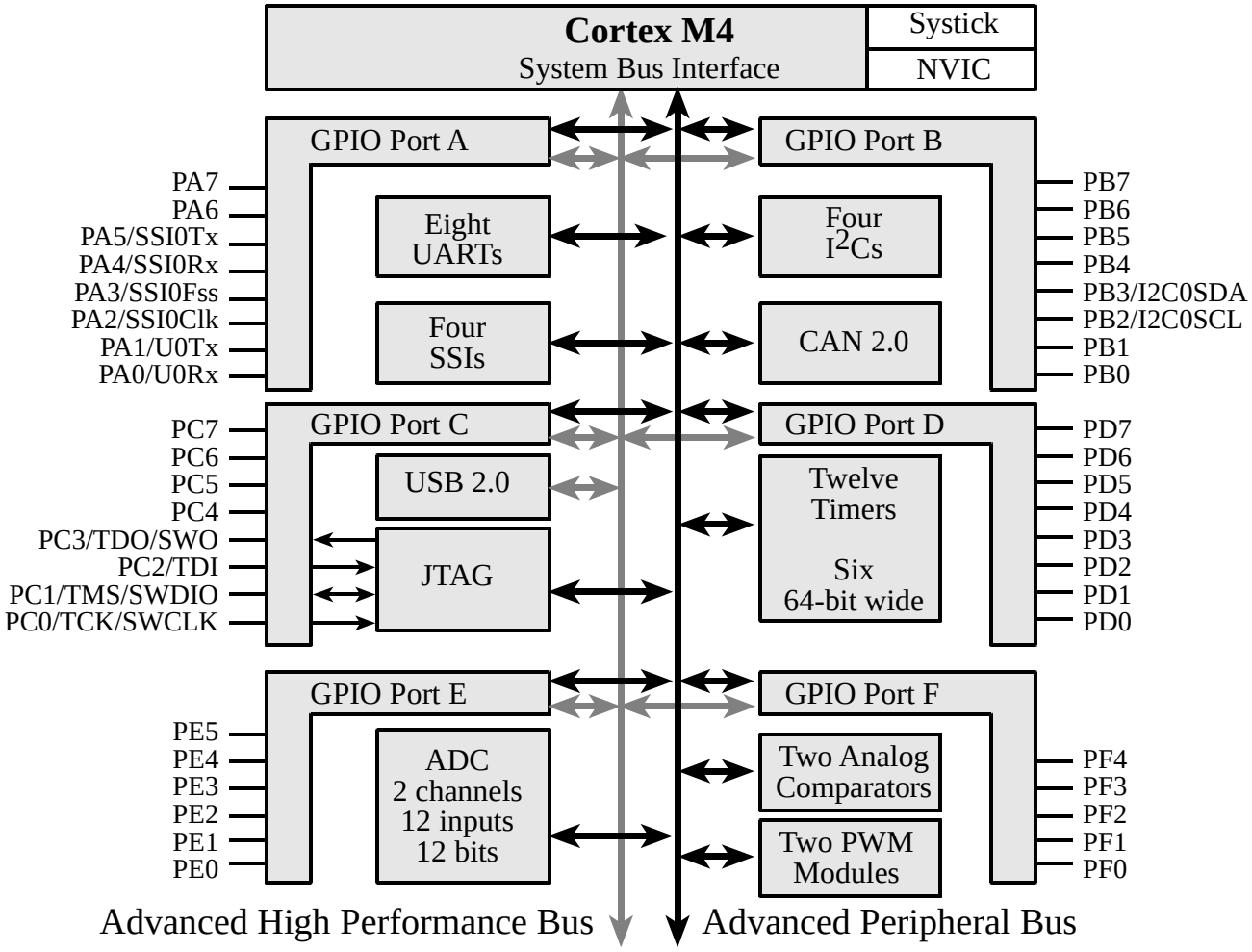
- **Path Variables**
  - **Used by CCS (Eclipse) to store the base path for relative linked files**
  - **Example: PROJECT_LOC is set to the path of your project, used as a reference point for relative paths, e.g. ${PROJECT_LOC}/../files/main.c**
- **Build Variables**
  - **Used by CCS (Eclipse) to store base path for build libraries or files**
  - **Example: CG_TOOL_ROOT is set to the path for the code generation tools (compiler/linker), used to find #include .h files, or object libraries, e.g. ${CG_TOOL_ROOT}/include or ${CG_TOOL_ROOT}/lib**
  - **Add Build Variable for TivaWare as** TIVAWARE_INSTALL

Build Configurations

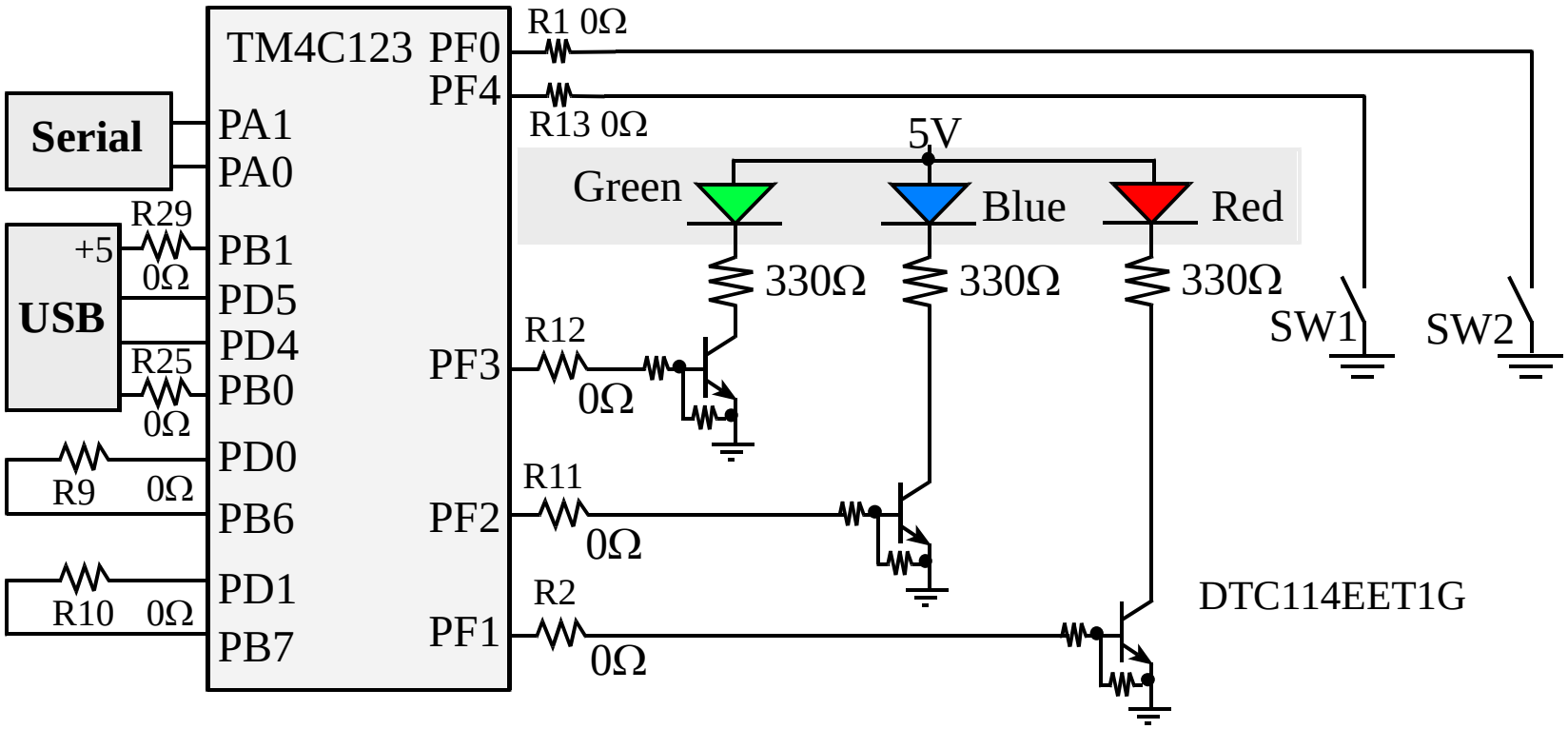
- Two pre-defined BUILD CONFIGURATIONS:
  - Debug (symbols, no optimization) – great for LOGICAL debug
  - Release (no symbols, optimization) – great for PERFORMANCE
- Create your own custom build configurations
  - Right-click on the project and select Properties
  - Then click "Processor Options" or any other category:



TM4C123GH6PM GPIO Ports



SW and LED on LaunchPad



- **SW1, SW2 on the LaunchPad are Negative logic**
  - **Require internal pull-up resistor (set bits in PUR)**
- **The RGB LEDs on PF1-3 are positive logic**