Department of Electrical and Computer Engineering
University of Wisconsin-Madison

ECE 353

INTRODUCTION TO MICROPROCESSOR SYSTEMS

A Tutorial on Program Debugging using Keil µVision IDE

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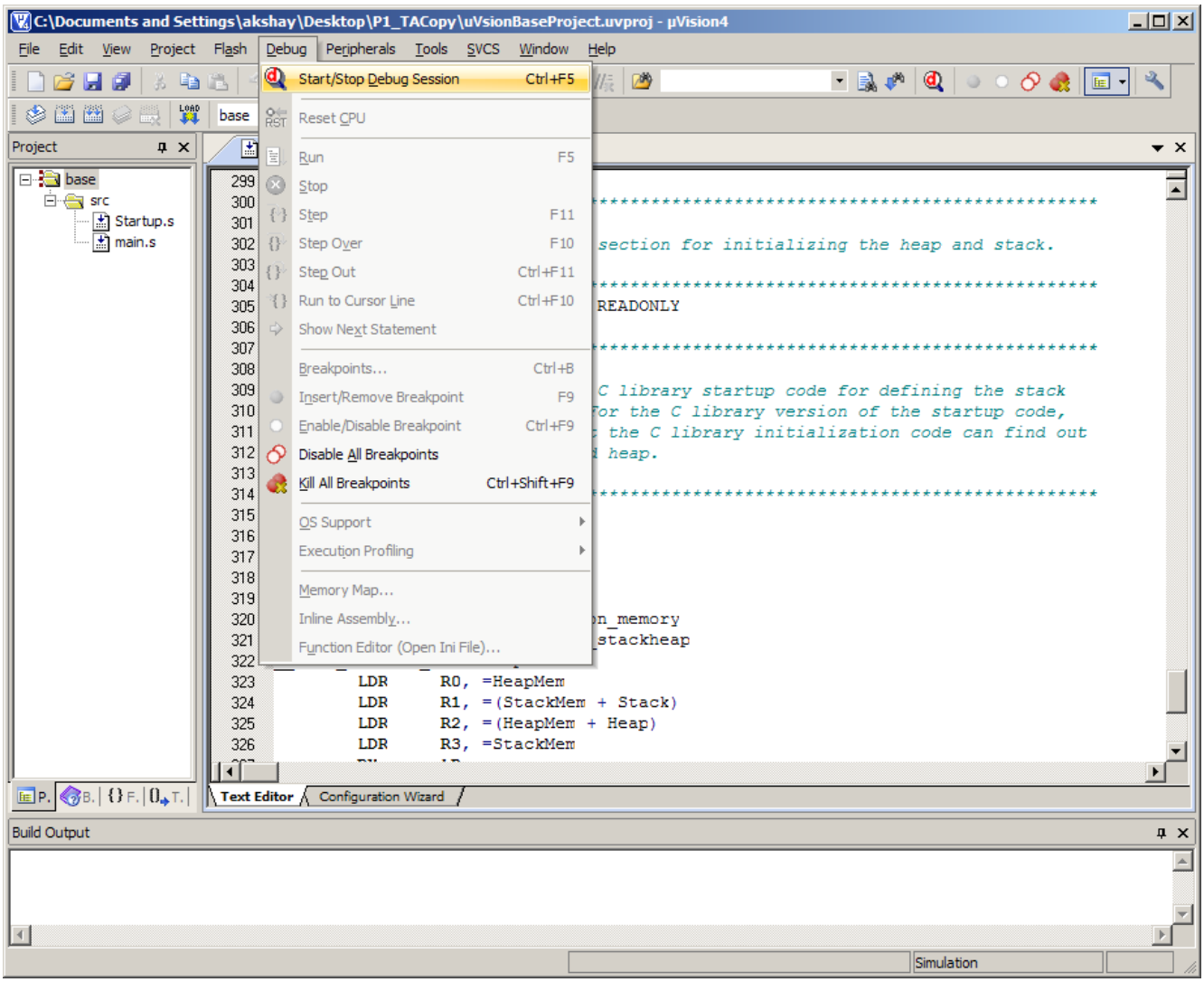
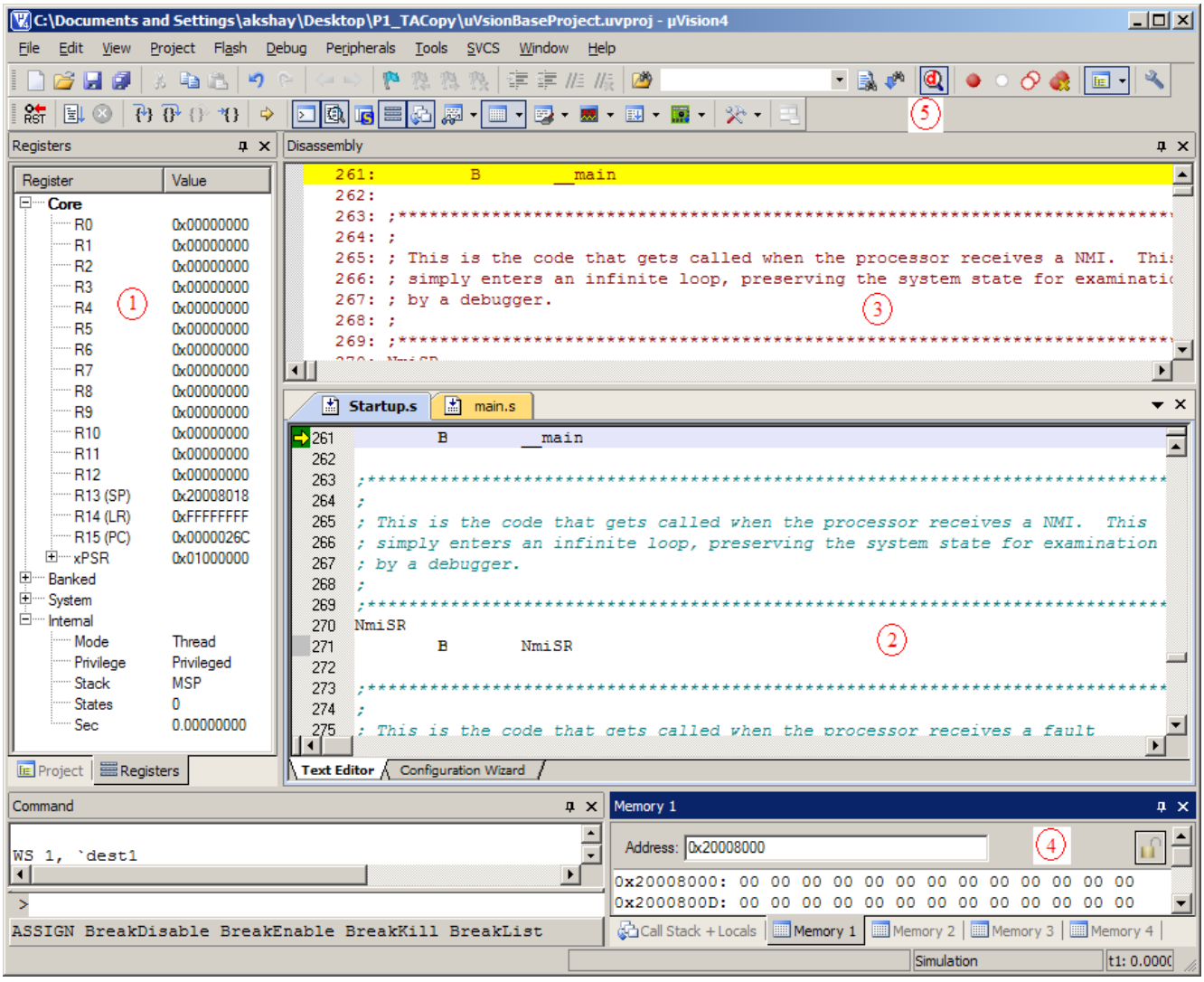
1. Debugger setup

To start a debug session, open the project and click **Debug** → **Start/Stop Debug Session** or hit "Ctrl+F5".



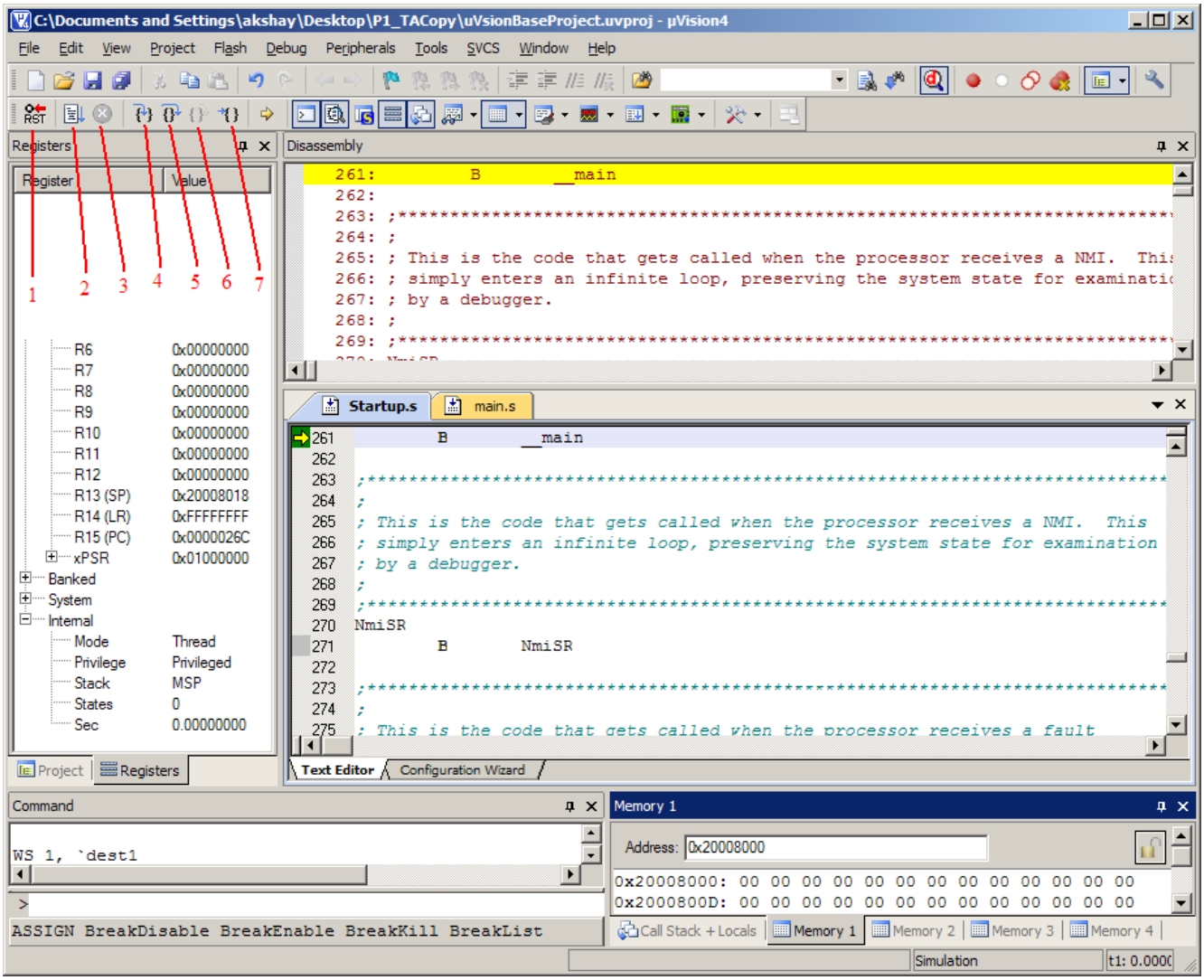
2. Understanding the Keil µVision debugger interface

1 – Registers Window – *Provides a snapshot of processor registers*
2 – Text Editor Window – *Displays the program and the current line being debugged*
3 – Disassembly Window – *Shows high-level source code and its associated assembler code*
4 – Memory Window – *Allows four separate memory areas to be watched*
5 – Debug Toolbar – *Allows easy access to debug options*



3. Frequently used tools in the Debug Toolbar

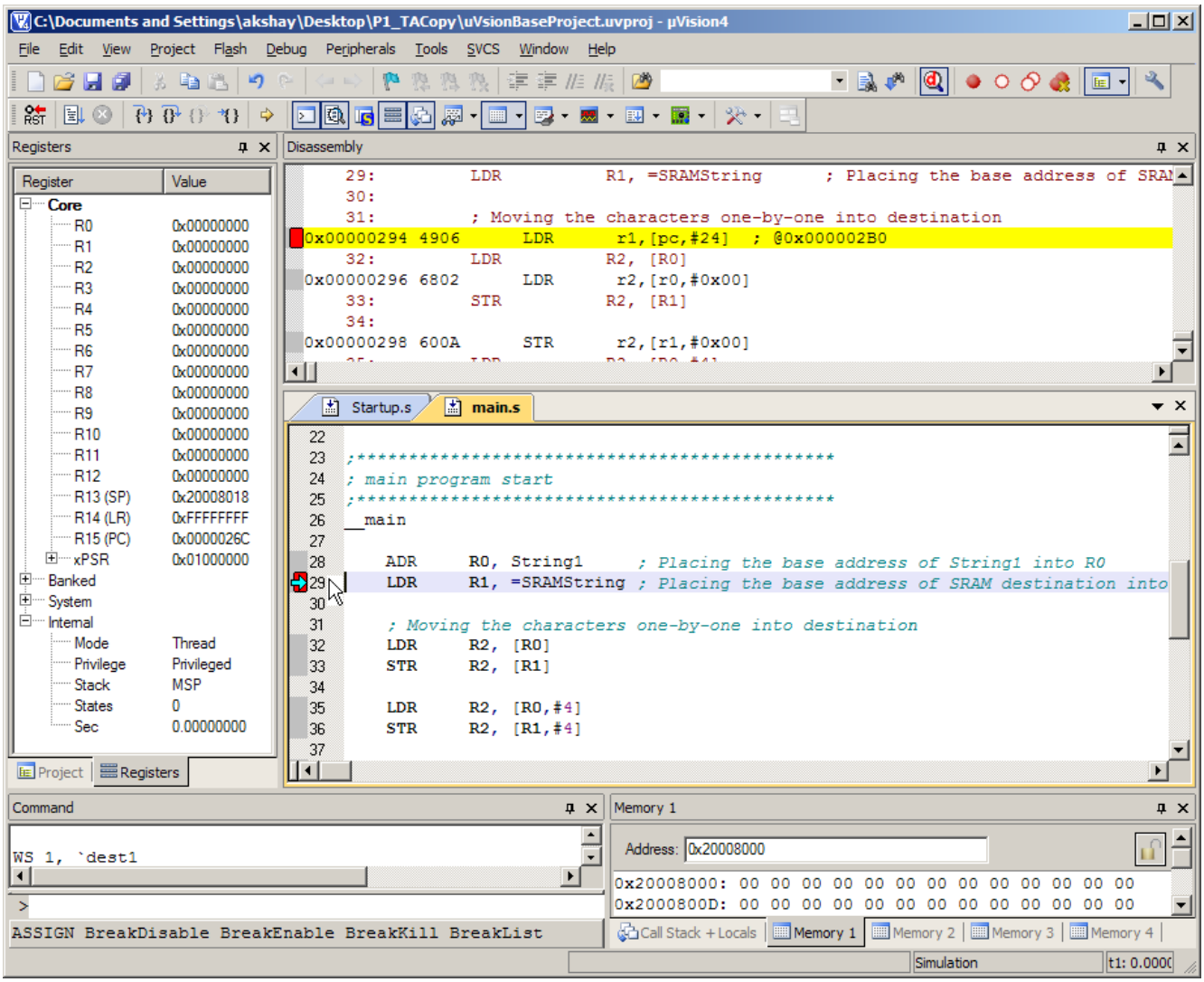
1 – Reset – *Reset the CPU (Program counter points to the first instruction)*
2 – Run – *Start code execution (Execution pauses upon reaching a Breakpoint)*
3 – Stop – *Stop code execution (Memory and Registers Windows get updated)*
4 – Step – *Step one instruction*
5 – Step Over – *Similar to **Step**, but executes functions without stepping into them*
6 – Step Out – *Step out of a function and return to the caller*
7 – Run To Cursor – *Start executing the program until the current cursor line is reached*



4. Using Breakpoints

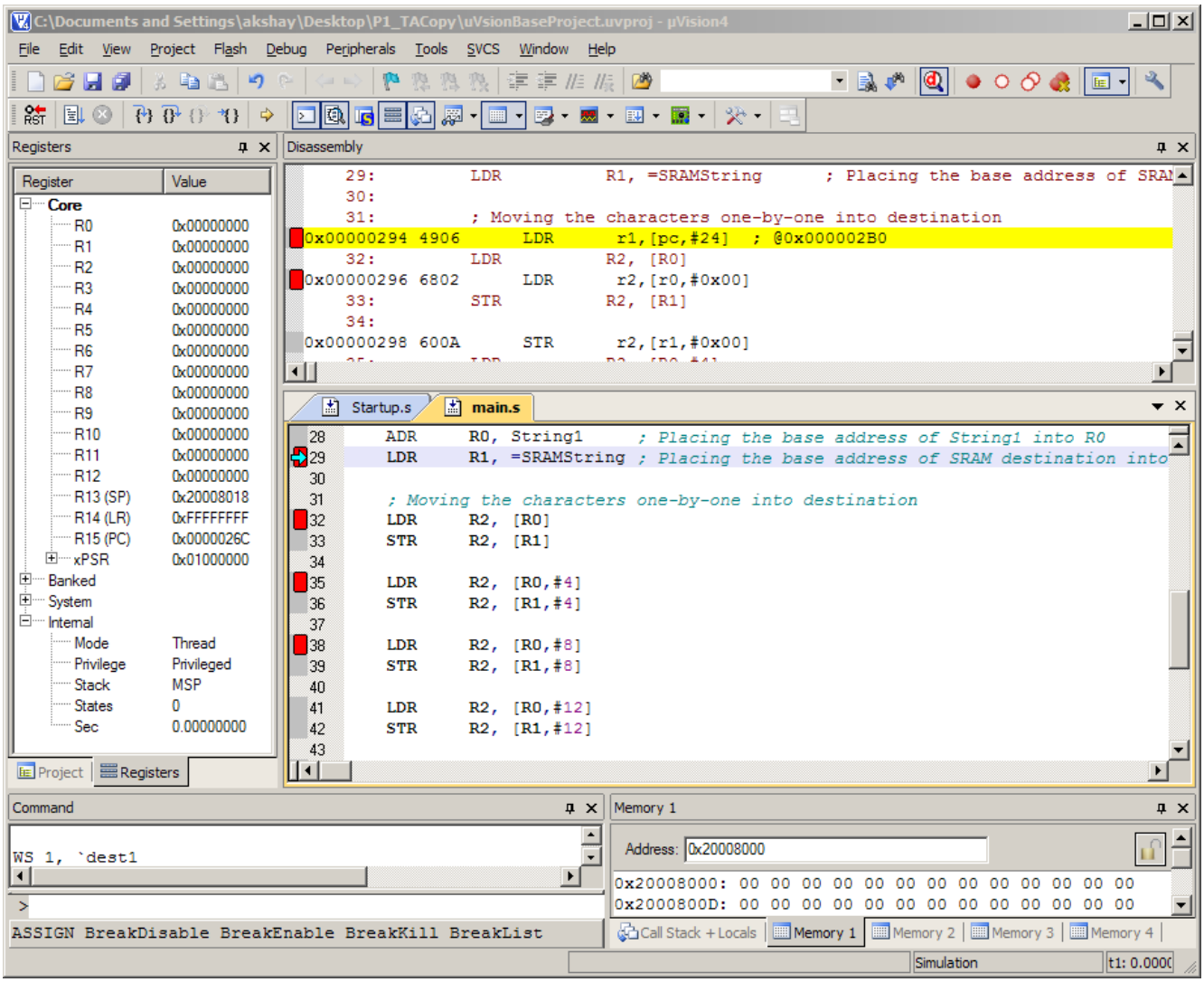
Breakpoints are trigger points in the program that halt execution or execute a debugger function. Breakpoints may be triggered by reading an instruction from program memory (an execution breakpoint), reading or writing a memory location (a memory access breakpoint), or by calculating a true value for a conditional expression (a conditional breakpoint).

To insert a Breakpoint, **double-click** a line of code to toggle an execution breakpoint for that line. Buttons on the toolbar may also be used to toggle an execution breakpoint. In addition, **right-click** a line of code to reveal more breakpoint options.



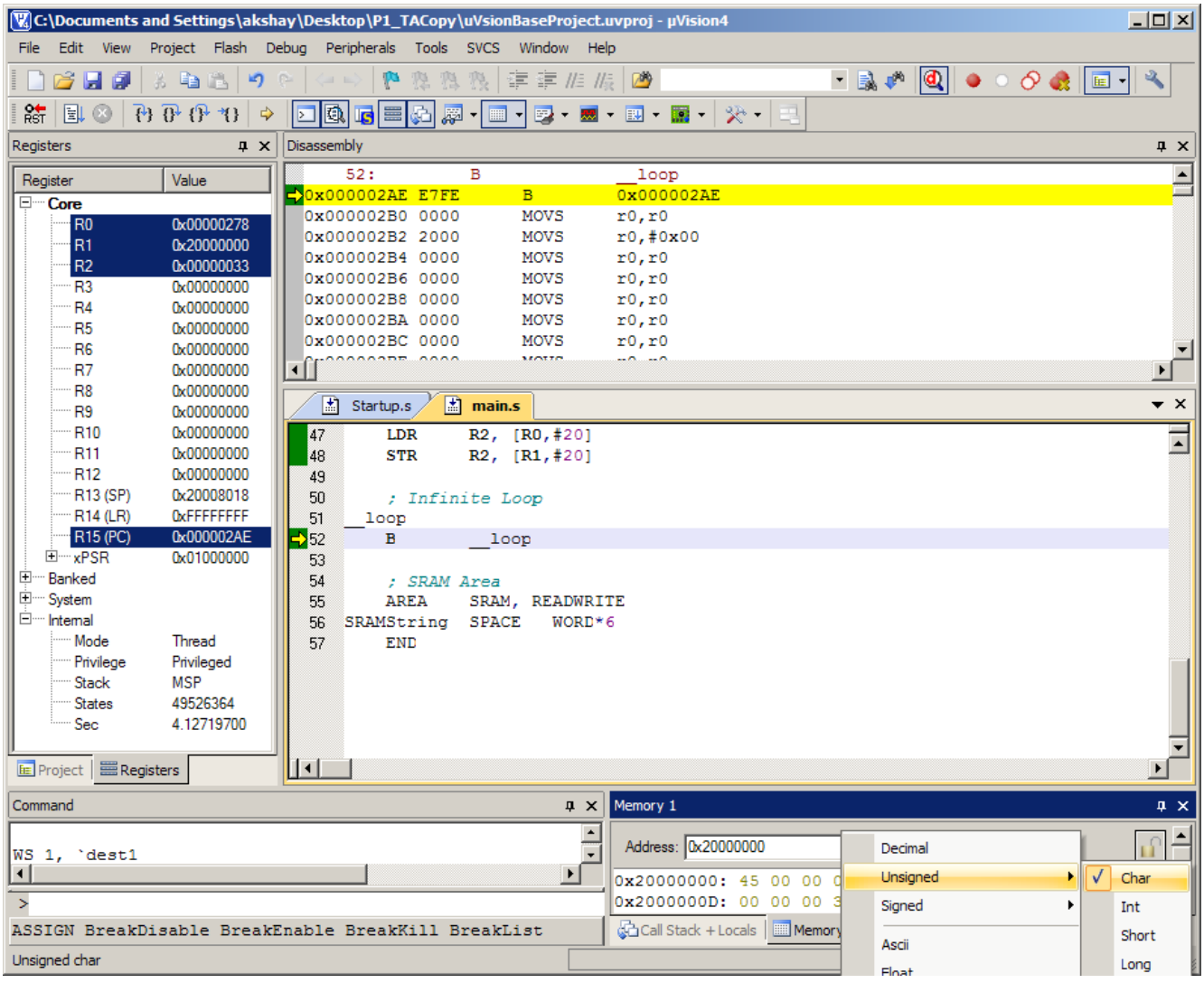
5. Using multiple Breakpoints

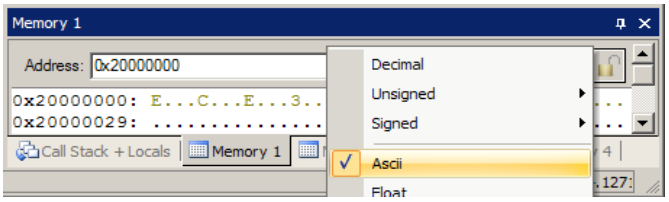
Multiple breakpoints can be used to efficiently debug the program. Multiple breakpoints are generally used along with the **Run** button to so that the execution stops at every breakpoint.



6. Watching memory regions using Memory Windows

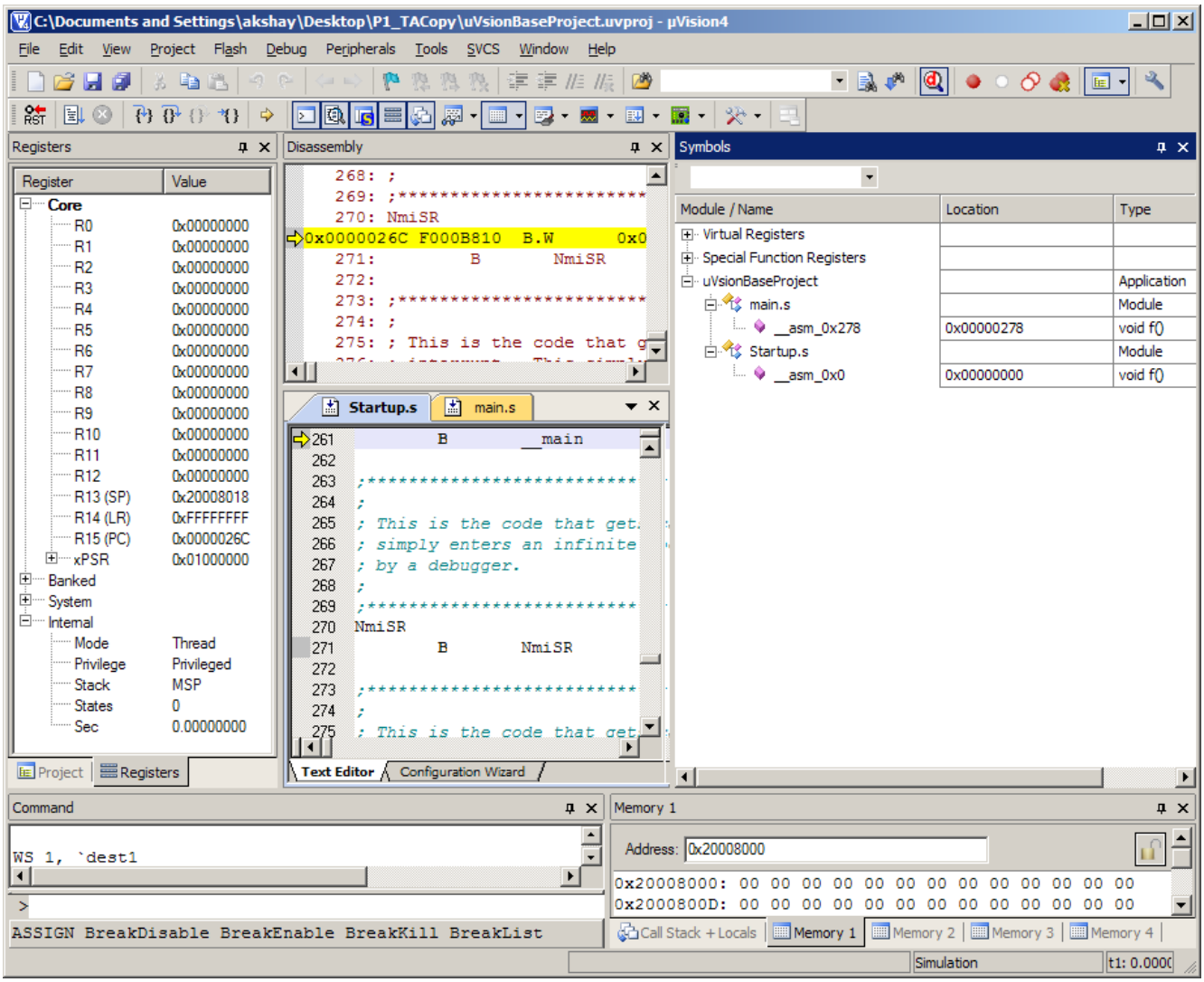
The Memory Window allows separate memory areas to be watched. To open the Memory Window, click **View → Memory Windows → Memory 1/2/3/4.** Once opened enter the address or symbolic name.
In addition, the contents of the memory can be watched in different formats such as Decimal, Char, ASCII etc. **Right-click** any part of the window to modify the format.





7. Viewing project specific symbols

The Symbol Window displays the symbols or variables used in the project along with its attributes. To open the symbol window, click **View → Symbol Window.**



8. Accessing Additional debug windows

The Keil µVision IDE provides additional debug windows such as Analysis Windows, Serial Windows etc which can be accessed by click **View** button from the Menu bar.