

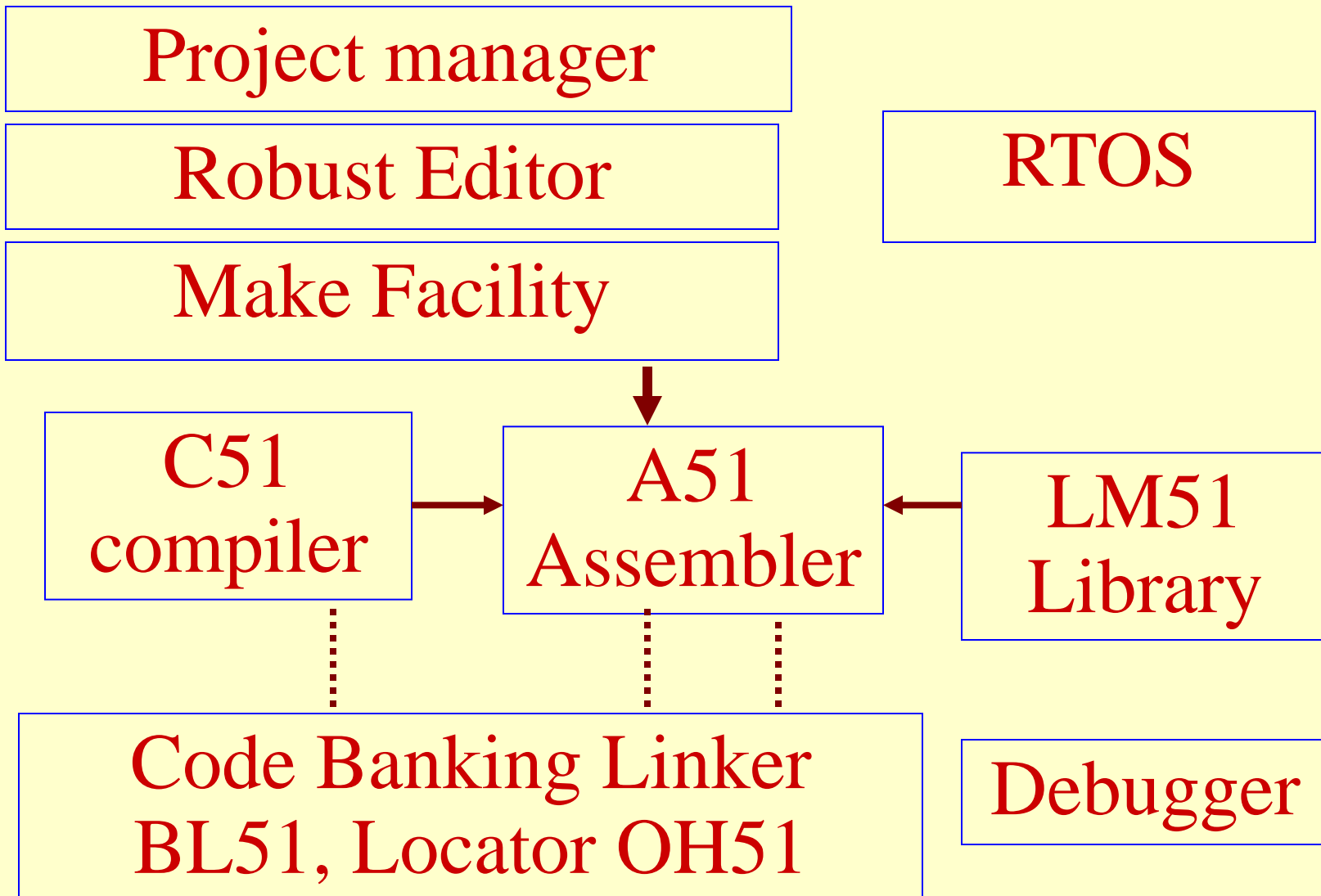
Chapter 12

Development Tools for Microcontroller Applications

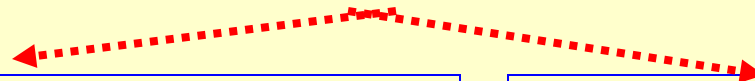
Lesson 04

Keil μ Vision 2 IDE- Facilities, Build Mode and Project Manager

μVision 2 IDE Facilities



μ Vision 2 IDE Modes



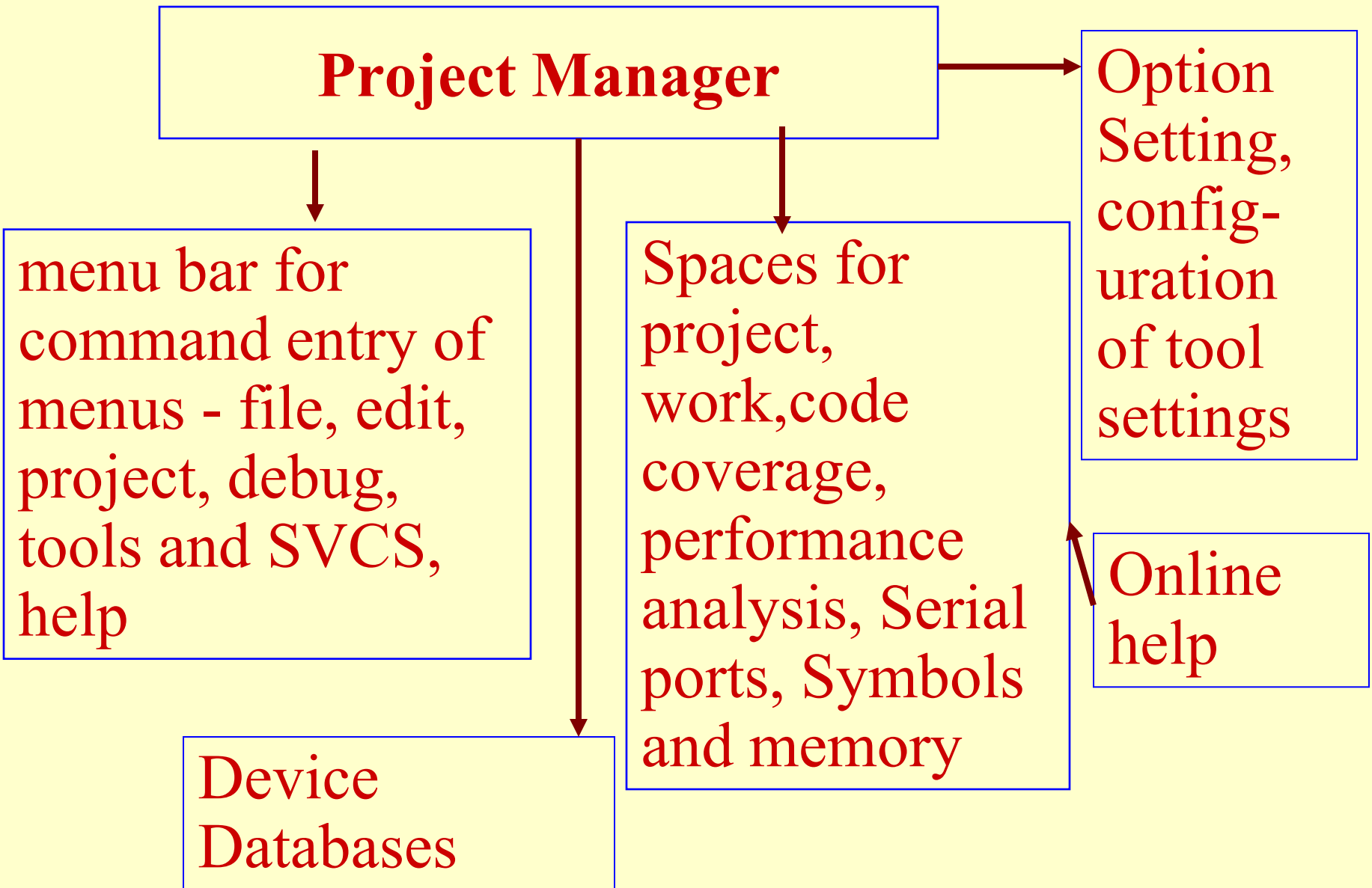
Build Mode

Project manager

Robust Editor-
Interactive error
correction

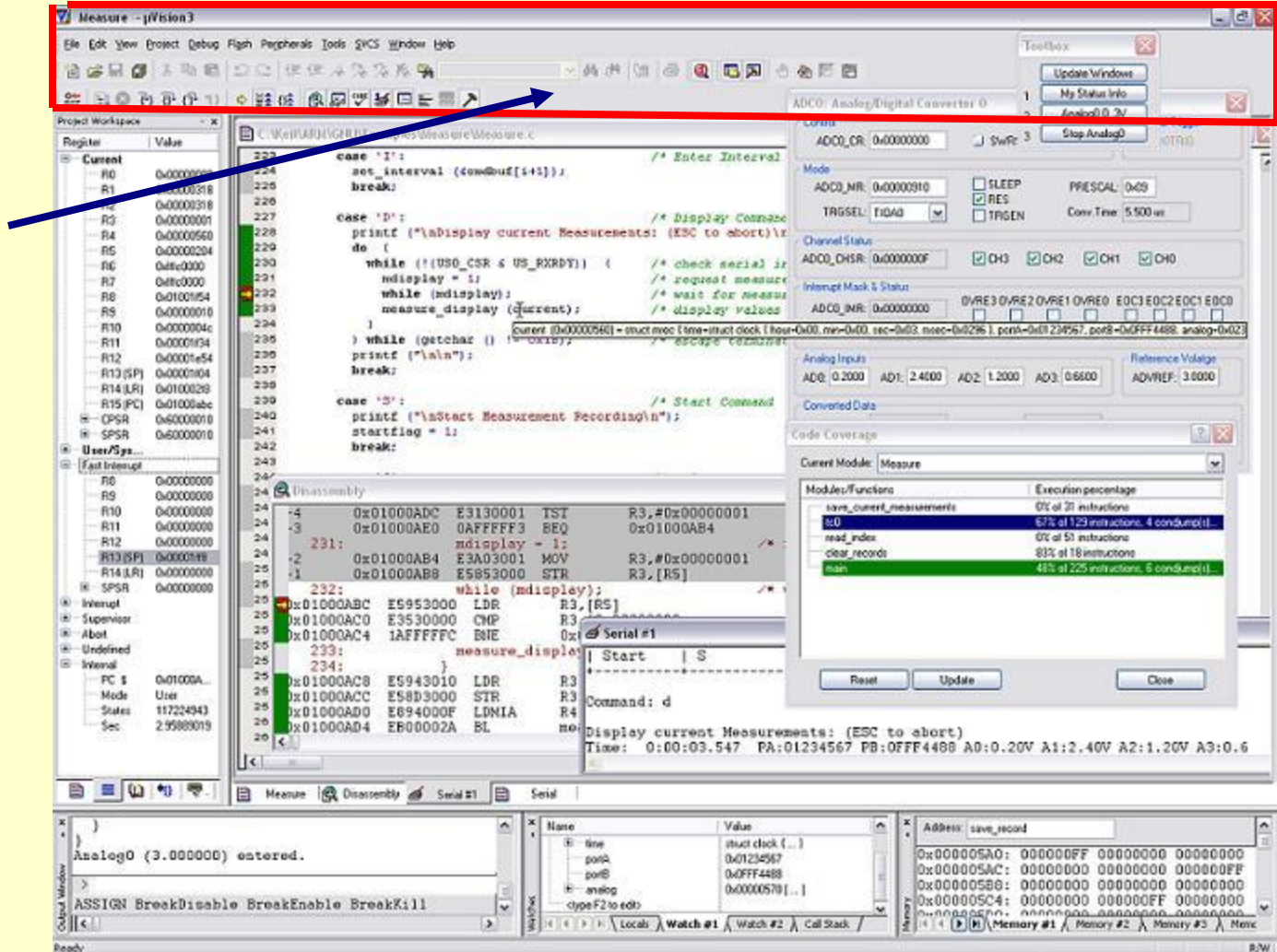
Make Facility

μ Vision 2
Debugger
Mode



Menu and Tool Bars

Menu
and
tool
bars



Work space - Codes

Codes entered and edited here

The screenshot displays the IAR Embedded Workbench IDE interface. The central window shows a C source file named 'C:\IAR\IAR\IAR\Examples\Measure\Measure.c'. The code is as follows:

```
223 case 'I': /* Enter Interval
224 set_interval (cmdbuf[1+1]);
225 break;
226
227 case 'D': /* Display Command
228 printf ("\nDisplay current Measurements: (ESC to abort)\n");
229 do {
230 while (!!(US0_CSR & US_RXRDY)) { /* check serial in
231 mdisplay = 1; /* request measure
232 while (mdisplay); /* wait for measure
233 measure_display (current); /* display values
234 }
235 } while (getchar () != '\n'); /* escape command
236 printf ("\n\n");
237 break;
238
239 case 'S': /* Start Command
240 printf ("\nStart Measurement Recording\n");
241 startflag = 1;
242 break;
243
244
245
246
```

Below the C code, the assembly view shows instructions for the same code block, including instructions like `IST R3,#0x00000001`, `BEQ 0x01000AB4`, `MOV R3,#0x00000001`, `STR R3,[RS]`, `LDR R3,[RS]`, `CMP R3`, `BNE 0x01000AC4`, `MOV R3,#0x00000001`, `STR R3,[RS]`, `LDR R3`, `STR R3`, `LDNIA R4`, and `BL`.

On the right side, the 'Toolbox' window is open, showing configuration for 'ADC0: Analog/Digital Converter 0'. It includes settings for 'Control', 'Mode', 'Channel Status', 'Interrupt Mask & Status', 'Analog Inputs', and 'Converted Data'. The 'Converted Data' window shows the following table:

Module/Function	Execution percentage
save_current_measurements	0% of 25 instructions
RD	67% of 123 instructions, 4 completed
read_index	0% of 51 instructions
clear_records	83% of 18 instructions
main	48% of 225 instructions, 5 completed

The 'Serial #1' window shows the command 'd' entered, and the 'Output Window' shows the message 'Analog0 (3.000000) entered.' and 'ASSIGN BreakDisable BreakEnable BreakKill'.

Project space for Registers and Memory Areas

Project Space

The screenshot displays the Measure software interface for a microcontroller project. A red box highlights the 'Registers' window on the left, which lists various registers and their current values. A blue arrow points to the 'Current' register. The main window shows the assembly code for the 'measure.c' file, with the 'while (mdisplay)' loop highlighted. The 'Disassembly' window shows the corresponding assembly instructions. The 'Serial #1' window displays the command 'd' and the output 'Display current Measurements: (ESC to abort)'. The 'ADC0: Analog/Digital Converter 0' window shows the configuration for the ADC, including the channel selection (CH0) and the reference voltage (3.000V). The 'Code Coverage' window shows the execution percentage for various functions: 'save_current_measurements' (0%), 'read_index' (0%), 'clear_records' (83%), and 'main' (48%). The 'Memory' window shows the memory address 0x00005A0 and its value 000000FF.

Register	Value
Current	
R0	0x00000000
R1	0x00003018
R2	0x00003018
R3	0x00000001
R4	0x00000560
R5	0x00000204
R6	0x00000000
R7	0x00000000
R8	0x01001054
R9	0x00000010
R10	0x00000004
R11	0x00001004
R12	0x00001054
R13 (SP)	0x00001004
R14 (LR)	0x01000200
R15 (PC)	0x01000000
CPSR	0x60000010
SPSR	0x60000010
User/Sys...	
Fast Interrupt	
R6	0x00000000
R9	0x00000000
R10	0x00000000
R11	0x00000000
R12	0x00000000
R13 (SP)	0x00001004
R14 (LR)	0x00000000
SPSR	0x00000000
Interrupt	
Supervisor	
Abort	
Undefined	
Internal	
PC #	0x01000A...
Mode	User
State	117224943
Sec	2.9500019

```
223 case 'I': /* Enter Interval
224 set_interval (sizeof(i+1));
225 break;
226
227 case 'D': /* Display Command
228 printf ("\nDisplay current Measurements: (ESC to abort)\n");
229 do {
230 while (!!(US0_CSR & US_RXRDY)) { /* check serial ir
231 mdisplay = 1; /* request measure
232 while (mdisplay); /* wait for measure
233 measure_display (current); /* display values
234 }
235 } while (getchar () != '\n'); /* escape command
236 printf ("\n\n");
237 break;
238
239 case 'S': /* Start Command
240 printf ("\nStart Measurement Recording\n");
241 startflag = 1;
242 break;
```

Module/Function	Execution percentage
save_current_measurements	0% of 20 instructions
read_index	0% of 50 instructions
clear_records	83% of 18 instructions
main	48% of 225 instructions, 5 conducted!

Address	save_record
0x000005A0	000000FF 00000000 00000000
0x000005A4	00000000 00000000 000000FF
0x000005B0	00000000 00000000 00000000
0x000005C4	00000000 000000FF 00000000

Codes at previous, current and next addresses

Codes at previous, current and next addresses

The screenshot displays the Keil uVision3 IDE with a C program for an ADC measurement. The code is as follows:

```
223 case 'I': /* Enter Interval
224 set_interval (conbuf[1+1]);
225 break;
226
227 case 'D': /* Display Command
228 printf ("\nDisplay current Measurements: (ESC to abort)\n");
229 do {
230 while (!!(US0_CSR & US_RXRDY)) { /* check serial ir
231 mdisplay = 1; /* request measure
232 while (!mdisplay); /* wait for measure
233 measure_display (&current); /* display values
234 }
235 } while (getchar () != '\n');
236 printf ("\n\n");
237
238 case 'S': /* Start Command
239 printf ("\nStart Measurement Recording\n");
240 startflag = 1;
241 break;
```

The assembly window shows the following code for lines 232-234:

```
232: 0x01000ABC E5953000 LDR R3, #0x00000001
233: 0x01000AC0 E3530000 CMP R3, #0x00000000
234: 0x01000AC4 1AFFFFFC BNE R3, #0x00000001
```

The code coverage window shows the following data:

Module/Function	Execution percentage
save_current_measurements	0% of 25 instructions
md	67% of 123 instructions, 4 conducted
read_index	0% of 51 instructions
clear_records	83% of 18 instructions
main	48% of 225 instructions, 5 conducted

Performance and Code coverage

Performance

The screenshot shows the Measure IDE interface. The main window displays a C program with the following code:

```
223 case 'I': /* Enter Interval
224 set_interval (count[1+1]);
225 break;
226
227 case 'D': /* Display Command
228 printf ("\nDisplay current Measurements: (ESC to abort)\n");
229 do {
230 while (!!(US0_CSR & US_RXRDY)) { /* check serial in
231 mdisplay = 1; /* request measure
232 while (mdisplay) /* wait for measure
233 measure_display (&current); /* display values
234
235 } while (!!(US0_CSR & US_RXRDY)); /* escape command
236 printf ("\n\n");
237 break;
238
239 case 'S': /* Start Command
240 printf ("\nStart Measurement Recording\n");
241 startflag = 1;
242 break;
```

The 'Code Coverage' window is open, showing the following table:

Module/Function	Execution percentage
save_current_measurements	0% of 20 instructions
RD	67% of 123 instructions, 4 completed
read_index	0% of 50 instructions
clear_records	83% of 18 instructions
main	48% of 225 instructions, 5 completed

The 'Serial #1' window shows the command 'd' entered, and the 'Output Window' shows the message 'Analog0 (3.000000) entered.'

Interrupt Masks and Statuses

interrupt-masks and statuses

The screenshot displays the Keil uVision3 IDE with the following components:

- Project Workspace:** Shows the source file `C:\Keil\ARM\EXAMPLES\Measure\Measure.c`.
- Register Window:** Lists registers R0 through R14, SPSR, and User/Sys, with their current values.
- Code Editor:** Contains C code for an ADC measurement loop. A blue arrow points from the text "interrupt-masks and statuses" to the `AD_CONVERTER` macro definition in the code.
- Disassembly Window:** Shows the assembly code corresponding to the C code, with instructions like `IST`, `BEQ`, `MOV`, `LDR`, `CMP`, `BNE`, `STR`, `LDR`, `STR`, `LDNIA`, and `BL`.
- Interrupt Mask & Status Window:** A red box highlights the `AD_CONVERTER` register, showing its value `0x00000000` and the bit fields `OVRE3` through `EODC0`.
- ADC Configuration Window:** Shows settings for the ADC, including `AD_CONVERTER` and `AD_CONVERTER` registers.
- Code Coverage Window:** Shows the execution percentage for various functions: `save_current_measurements` (0%), `read_index` (0%), `clear_records` (83%), and `main` (48%).
- Serial Window:** Shows the command `d` and the output `Display current Measurements: (ESC to abort)`.
- Output Window:** Shows the message `Analog0 (3.000000) entered.`
- Memory Window:** Shows the memory address `0x00005A0` and its value `000000FF`.

Device Inputs

Device inputs

The screenshot displays the Keil uVision3 IDE with the following components:

- Project Workspace:** Shows registers (R0-R15, CPSR, SPSR) and their current values.
- Code Editor:** Contains a C program for an ADC. The code includes a loop for displaying current measurements and a serial communication section. The current line of execution is highlighted in green.
- Disassembly:** Shows the assembly code corresponding to the C code, with instructions like `IST`, `BEQ`, `MOV`, `LDR`, `CMP`, `BNE`, `STR`, `LDR`, `STR`, `LDNIA`, and `BL`.
- Analog Input Settings (ADC0):** A dialog box showing configuration for Analog/Digital Converter 0. It includes fields for `ADC0_CR`, `ADC0_MR`, `TRGSEL`, `ADC0_DHR`, and `ADC0_DLR`. The `Analog Inputs` section is highlighted in red, showing `AD0: 0.2000`, `AD1: 2.4000`, `AD2: 1.2000`, `AD3: 0.6600`, and `ADVREF: 3.0000`.
- Serial Window:** Shows the serial output, including the command `d` and the resulting display: `Display current Measurements: (ESC to abort)` and `Time: 0:00:03.547 PA:01234567 PB:0FFF4488 AD:0.20V A1:2.40V A2:1.20V A3:0.6`.
- Toolbox:** Contains buttons for `Update Windows`, `My Status Info`, `Analog0 0.3V`, and `Stop Analog0`.
- Current Module:** Shows the execution percentage for various modules/functions, such as `save_current_measurements` (0% of 25 instructions) and `main` (4% of 225 instructions).

Device Modes

Device Modes

The screenshot displays the Measure software interface for an AVR microcontroller. The main window is titled "Measure - jVision3" and contains several panes:

- Project Workspace:** Shows the source code for "C:\W\IAR\IAR\EXAMPLES\Measure\Measure.c". The code includes a main loop with cases for entering intervals, displaying current measurements, and starting measurement recording. A red arrow points to the "set_interval" function call in the code.
- Register:** Lists the current values of registers R0 through R15, CPSR, and SPSR.
- Disassembly:** Shows the assembly code for the current instruction, including instructions like "LDR R3, [R5]", "CMP R3", "BNE 0x01000AC4", "LDR R3, [R5]", "STR R3, [R5]", "LDR R3, [R5]", "STR R3, [R5]", "LDNIA R4", and "BL".
- ADC0: Analog/Digital Converter 0:** A configuration dialog box is open, showing settings for Mode (AD_CONVERTER), ADO0_MR (0x00000910), TRIGSEL (TIGAD), and Channel Status (CH0, CH1, CH2, CH3). A red box highlights this dialog.
- Serial #1:** A terminal window showing the command "d" and the output "Display current Measurements: (ESC to abort)".
- Code Coverage:** A table showing the execution percentage for various modules/functions: "save_current_measurements" (0%), "md" (67%), "read_index" (0%), "clear_records" (83%), and "main" (48%).
- Output Window:** Shows the message "Analog0 (3.000000) entered." and "ASSIGN BreakDisable BreakEnable BreakKill".
- Memory:** A table showing memory addresses and values, including "save_record" at 0x000005A0.

Device Outputs

The screenshot displays the Keil uVision3 IDE with a C program for an ADC. The program includes a menu with options for interval, display, and start measurement. The assembly window shows the corresponding assembly code. The toolbox on the right is configured for the ADC0 module. The serial window shows the command 'd' and the output 'Display current Measurements: (ESC to abort)'. The watch window shows the value of the 'struct clock' variable.

```
223 case 'I': /* Enter Interval
224 set_interval (cmdbuf[1+1]);
225 break;
226
227 case 'D': /* Display Command
228 printf ("\nDisplay current Measurements: (ESC to abort)\n");
229 do {
230 while (!!(US0_CSR & US_RXRDY)) { /* check serial is
231 mdisplay = 1; /* request measure
232 while (mdisplay); /* wait for measure
233 measure_display (&current); /* display values
234 }
235 } while (getchar () != '\n'); /* escape command
236 printf ("\n\n");
237 break;
238
239 case 'S': /* Start Command
240 printf ("\nStart Measurement Recording\n");
241 startflag = 1;
242 break;
```

Serial Window Output:

```
Command: d
Display current Measurements: (ESC to abort)
Time: 0:00:03.547 PA:01234567 PB:0FFF4488 AD:0.20V A1:2.40V A2:1.20V A3:0.6
```

Watch Window:

Name	Value
struct clock (...)	0x01234567
portB	0x0FFF4488
analog	0x0000578[...]

Device outputs

File menu commands

New

Open

Save

Save As

Device database

Print

Print setup

1-9 open

View menu commands

Status bar

Tool bar

File Toolbar

Build

Debug

Project

Output

Source Browser

Disassembly

Watch and call
stack

Memory

Code-coverage

Performance

Symbol

Serial

Toolbox

Options

Windows menu commands

cascade

Tile vertically

Arrange Icon

1-9 Active

To arrange
and show
over lapping
windows

Summary

We learnt

IDE Vision 2 IDE

- Two modes- build mode and debug mode
- Project Manager
- Menus, bars, commands, Work space
- Windows

End of Lesson 04

Keil μ Vision 2 IDE- Facilities, Build Mode and Project Manager