

Report of Checkpoint 1

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Notice: My code executes normally only when all registers in edsim51 are clean (i.e. zero) before running.

1.

(a) screenshot for \$ make clean↓

```
misubrian@misubrian-Katana-15-B13VFK:~/OS/project/CP1/misu$ make clean
rm *.hex *.ihx *.lnk *.lst *.map *.mem *.rel *.rst *.sym *.asm *.lk
rm: 無法刪除 '*.ihx': 沒有此一檔案或目錄
rm: 無法刪除 '*.lnk': 沒有此一檔案或目錄
make: *** [Makefile:25: clean] 錯誤 1
```

(b) screenshot for \$ make ↓

```
misubrian@misubrian-Katana-15-B13VFK:~/OS/project/CP1/misu$ make
sdcc -c testcoop.c
sdcc -c cooperative.c
cooperative.c:205: warning 85: in function ThreadCreate unreferenced function argument : 'fp'
sdcc -o testcoop.hex testcoop.rel cooperative.rel
misubrian@misubrian-Katana-15-B13VFK:~/OS/project/CP1/misu$
```

2.

(a) Before jumping to create main thread↓

The screenshot displays the EDsim51 emulator interface. On the left, the register set for the 8051 microcontroller is shown. The PC (Program Counter) is highlighted with a blue box and contains the value 0x007B. The SP (Stack Pointer) is circled in red and contains the value 0x07. The assembly code window on the right shows the following instructions:

```
0000| SJMP 0000H
0062| MOV 37H, #00H
0065| MOV DPTR, #000CH
0068*| LCALL 0093H
006B| LJMP 003CH
006E| LJMP 0078H
0071| RET
0072| MOV 34H, #00H
0075| RET
0076| RET
0077| RET
0078| MOV DPTR, #0062H
007B*| LCALL 0093H
007E| MOV 35H, #00H
0081| MOV A, 35H
0083| ADD A, #30H
0085| MOV R1, A
0086| MOV 81H, @R1
0088| POP 0D0H
008A| POP 83H
008C| POP 82H
008E| POP 0F0H
0090| POP 0E0H
0092| RET
0093| MOV A, #0FH
```

The assembly code window also shows the instruction at 0078: MOV DPTR, #0062H, which is circled in red. The instruction at 007B: LCALL 0093H is also circled in red.

Address of main (0x0062) is passed as parameter.
The stack point is still the bootstrap position , i.e. 0x07, now.

After jumping to ThreadCreate(main)↓

DPH	DPL	SP
0x00	0x62	0x09

RAM	Value
0x00	00
0x01	00
0x02	00
0x03	00
0x04	00
0x05	00
0x06	00
0x07	00
0x08	00
0x09	00
0x0A	00
0x0B	00
0x0C	00
0x0D	00
0x0E	00
0x0F	00

```

0077| RET
0078| MOV DPTR, #0062H
007B*| LCALL 0093H
007E| MOV 35H, 82H
0081| MOV A, 35H
0083| ADD A, #30H
0085| MOV R1, A
0086| MOV 81H, @R1
0088| POP 0D0H
008A| POP 83H
008C| POP 82H
008E| POP 0F0H
0090| POP 0E0H
0092| RET
0093| MOV A, #0FH
0095| CJNE A, 34H, 04H
0098| MOV 82H, #0FFH
009B| RET
009C| MOV 3AH, #00H
  
```

SP becomes 0x09 because the return address of bootstrap is pushed.

When finish creating main↓

DPH	DPL	SP
0x00	0x62	0x46

RAM	Value
0x00	00
0x01	00
0x02	00
0x03	00
0x04	00
0x05	00
0x06	00
0x07	00
0x08	7E
0x09	00
0x0A	00
0x0B	00
0x0C	00
0x0D	00
0x0E	00
0x0F	00
0x10	00
0x11	00
0x12	00
0x13	00
0x14	00
0x15	00
0x16	00
0x17	00
0x18	00
0x19	00
0x1A	00
0x1B	00
0x1C	00
0x1D	00
0x1E	00
0x1F	00
0x20	00
0x21	00
0x22	00
0x23	00
0x24	00
0x25	00
0x26	00
0x27	00
0x28	00
0x29	00
0x2A	00
0x2B	00
0x2C	00
0x2D	00
0x2E	00
0x2F	00
0x30	00
0x31	00
0x32	00
0x33	00
0x34	00
0x35	00
0x36	00
0x37	00
0x38	00
0x39	00
0x3A	00
0x3B	00
0x3C	00
0x3D	00
0x3E	00
0x3F	00
0x40	62
0x41	00
0x42	00
0x43	00
0x44	00
0x45	00
0x46	00
0x47	00
0x48	00
0x49	00
0x4A	00
0x4B	00
0x4C	00
0x4D	00
0x4E	00
0x4F	00

```

010C| ANL A, #0F8H
010E| MOV 0D0H, A
0110| PUSH 0D0H
0112| MOV 0D0H, 3CH
0115| MOV A, 39H
0117| ADD A, #30H
0119| MOV R0, A
011A| MOV @R0, 81H
011C| MOV 81H, 3BH
011F| MOV 82H, 39H
0122| RET
0123| PUSH 0E0H
0125| PUSH 0F0H
0127| PUSH 82H
0129| PUSH 83H
012B| PUSH 0D0H
012D| MOV A, 35H
012F| ADD A, #30H
  
```

The stack point is at 0x46, which is in the range of 0x3F~0x4F, that is, stack of thread 0.
Also, we have the address of main (0x0062) in 0x40, 0x41.

Finally, restore the stack of bootstrap and return.↓

DPH	0x00
DPL	0x62
SP	0x09

0	0	0	0	0	0
---	---	---	---	---	---

RAM					
0x00 value					
C	D	E	F		
00	00	00	00		
00	00	00	00		
00	00	00	00		
00	00	00	00		
00	3F	00	00		
00	00	00	00		
00	00	00	00		
00	00	00	00		
00	00	00	00		

All Breakpoints					
-----------------	--	--	--	--	--

010C	ANL A, #0F8H
010E	MOV 0D0H, A
0110	PUSH 0D0H
0112	MOV 0D0H, 3CH
0115	MOV A, 39H
0117	ADD A, #30H
0119	MOV R0, A
011A	MOV @R0, 81H
011C	MOV 81H, 3BH
011F	MOV 82H, 39H
0122	RET
0123	PUSH 0E0H
0125	PUSH 0F0H
0127	PUSH 82H
0129	PUSH 83H
012B	PUSH 0D0H
012D	MOV A, 35H
012F	ADD A, #30H
0131	MOV 0A, A

(b) Before jumping to create Producer (thread 1) ↓

System Clock (MHz)		11.0592													
SBUF		100 Update Freq.													
R/O	W/O	TH0	TL0	R7	0x00	B	0x00								
0x00	0x00	0x00	0x00	R6	0x00	ACC	0x00								
RXD	TXD	THOD	0x00	R5	0x00	PSW	0x00								
1	1	TCON	0x00	R4	0x00	IP	0x00								
SCON	0x00	PCON	0x00	R3	0x00	IE	0x00								
pins		bits	TH1	TL1	R2	0x00	DPH	0x00							
0xFF	0xFF	P3	0x00	0x00	R1	0x30	DPL	0x0C							
0xFF	0xFF	P2	PC		R0	0x30	SP	0x3F							
0xFF	0xFF	P1	0x0068												
0xFF	0xFF	P0													
Data Memory		addr		0x00	0x00	value									
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	30	30	00	00	00	00	00	00	00	7E	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	46	00	00	00	01	00	00	00	00	00	00	09	00	3F	00
40	62	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Modify RAM	
addr	0x00
value	0x00

Remove All Breakpoints	
------------------------	--

RST Step Run New Load Save CPY Paste BP	
Time: 135us - Instructions: 80	
0056	JB 99H, 05H
0059	LCALL 0123H
005C	SJMP 0F8H
005E	CLR 99H
0060	SJMP 0E5H
0062	MOV 37H, #00H
0065	MOV DPTR, #000CH
0068*	LCALL 0093H
006B	LJMP 003CH
006E	LJMP 0078H
0071	RET
0072	MOV 34H, #00H
0075	RET
0076	RET
0077	RET
0078	MOV DPTR, #0062H
007B*	LCALL 0093H
007E	MOV 35H, 82H
0081	MOV A, 35H
0083	ADD A, #30H
0085	MOV R1, A
0086	MOV 81H, @R1
0088	POP 0D0H
008A	POP 83H

After initializing the stack of producer, SP is at 0x56. ↓

System Clock (MHz) 11.0592

100 Update Freq.

SBUF

R/O W/O

0x00 0x00

TH0 TL0

0x00 0x00

R7 0x00

B 0x00

R6 0x00

ACC 0x08

R5 0x00

PSW 0x09

R4 0x00

IP 0x00

R3 0x00

IE 0x00

R2 0x00

PCON 0x00

R1 0x00

DPH 0x00

R0 0x7E

DPL 0x0C

SP 0x56

TH0 TL0

0x00 0x00

TH0D 0x00

TCON 0x00

TH1 TL1

0x00 0x00

PC 0x0112

PSW 0 0 0 0 1 0 0 1

pins bits

0xFF 0xFF P3

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	30	30	00	00	01	00	00	01	7E	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	46	00	00	00	03	00	00	00	00	01	01	41	00	4F	00	00
40	6B	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	0C	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save CPY Paste BP

Executed 0x0110: PUSH 0D0H | Time: 269us

00F0| MOV 3BH, 81H

00F3| MOV 81H, 3DH

00F6| PUSH 82H

00F8| PUSH 83H

00FA| MOV A, #00H

00FC| PUSH 0E0H

00FE| PUSH 0E0H

0100| PUSH 0E0H

0102| PUSH 0E0H

0104| MOV 3CH, 0D0H

0107| MOV A, 39H

0109| MOV R7, A

010A| SWAP A

010B| RR A

010C| ANL A, #0F8H

010E| MOV 0D0H, A

0110| PUSH 0D0H

0112| MOV 0D0H, 3CH

0115| MOV A, 39H

0117| ADD A, #30H

0119| MOV R0, A

011A| MOV @R0, 81H

011C| MOV 81H, 3BH

011F| MOV 82H, 39H

We have address of producer (0x000C) in 0x50, 0x51.

(c) Consumer is running now, because this section of assembly code is initializing the UART, and the current thread ID (0x35) is 0. ↓

System Clock (MHz) 11.0592

100 Update Freq.

SBUF

R/O W/O

0x00 0x00

TH0 TL0

0x00 0x00

R7 0x01

B 0x00

R6 0x00

ACC 0x31

R5 0x00

PSW 0x01

R4 0x01

IP 0x00

R3 0x00

IE 0x00

R2 0x00

PCON 0x00

R1 0x30

DPH 0x00

R0 0x31

DPL 0x01

SP 0x3F

TH0 TL0

0x00 0x00

TH0D 0x20

TCON 0x00

TH1 TL1

0x00 0x00

PC 0x003F

PSW 0 0 0 0 0 0 0 1

pins bits

0xFF 0xFF P3

0xFF 0xFF P2

0xFF 0xFF P1

0xFF 0xFF P0

Modify RAM

addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	31	30	00	00	01	00	00	01	7E	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	46	56	00	00	03	00	00	00	00	01	01	41	00	4F	00	00
40	6B	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	0C	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save CPY Paste BP

Executed 0x003C: MOV 89H, #20H | Time: 288us

003C* MOV 89H, #20H

003F| MOV 8DH, #0FAH

0042| MOV 98H, #50H

0045| SETB 8EH

0047| MOV A, 37H

0049| JNZ 05H

004B| LCALL 0123H

004E| SJMP 0F7H

0050| MOV 99H, 36H

0053| MOV 37H, #00H

0056| JB 99H, 05H

0059| LCALL 0123H

005C| SJMP 0F8H

005E| CLR 99H

0060| SJMP 0E5H

0062| MOV 37H, #00H

0065| MOV DPTR, #000CH

0068* LCALL 0093H

006B| LJMP 003CH

006E| LJMP 0078H

0071| RET

0072| MOV 34H, #00H

0075| RET

0076| RET

0077| RET

(d) Producer is running, because the current thread ID is 1. ↓

System Clock (MHz) 11.0592 100 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x00
0x00	0x00	0x00	0x00	R6	0x00	ACC	0x00
RXD	TXD	THOD	0x20	R5	0x00	PSW	0x08
1	1	TCON	0x40	R4	0x00	IP	0x00
SCON	0x50			R3	0x00	IE	0x00

pins bits

0xFF	0xFF	P3	0xFA	0x54	TH1	TL1
0xFF	0xFF	P2				
0xFF	0xFF	P1				
0xFF	0xFF	P0				

PC 0x000C

8051

Modify RAM

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	30	31	00	00	03	00	00	02	7E	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	02	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	46	56	00	00	03	01	00	00	00	01	01	41	00	4F	00	00
40	4E	00	00	00	01	00	00	00	00	00	00	00	00	00	00	00
50	0C	00	00	00	00	00	00	09	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

Time: 384us - Instructions: 239

```
000C* MOV 38H,#41H
000F MOV 36H,38H
0012 MOV A,#5AH
0014 CJNE A,38H,03H
0017 SETB C
0018 SJMP 01H
001A CLR C
001B MOV 00H,C
001D JC 0BH
001F MOV R7,38H
0021 INC R7
0022 MOV A,R7
0023 MOV R6,A
0024 RLC A
0025 SUBB A,0E0H
0027 MOV R7,A
0028 SJMP 04H
002A MOV R6,#41H
002C MOV R7,#00H
002E MOV 38H,R6
0030 MOV 37H,#01H
0033 MOV A,37H
0035 JZ 0D8H
0037 LCALL 0123H
003A C MP 0F7H
```