

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:

Address of main (0x0062) is passed as parameter.

The stack point is still the bootstrap position, i.e. 0x07, now. ↓

The screenshot displays the edsim51 emulator interface. The top panel shows the System Clock (MHz) at 11.0592 and the Update Freq. set to 100. The left panel shows the SBUF, RXD, TXD, and SCOD registers, along with the pins and bits for P0, P1, P2, and P3. The right panel shows the registers R0 through R7, ACC, PSW, IP, IE, PCON, DPH, and DPL. The stack pointer (SP) is highlighted in red and shows the value 0x07. The PC register shows the value 8051. The bottom panel shows the Data Memory, which is currently empty. The rightmost panel shows the instruction list, with the instruction at address 0078 highlighted in red: MOV DPTR, #0062H. The instruction at address 0079 is also highlighted in red: LCALL 0093H.

After jumping to ThreadCreate(main):
 SP becomes 0x09 because the return address of bootstrap is pushed.↓

Register values:

DPH	0x00
DPL	0x62
SP	0x09

Assembly code:

```

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
  
```

When finish creating main:
 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. ↓

Register values:

TH1	0x00	TL1	0x00	R1	0x00	DPH	0x00
P3	0xFF	P2	0xFF	R0	0x00	DPL	0x62
P1	0xFF	P0	0xFF	PC	8051	SP	0x46

Assembly code:

```

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
  
```

Memory dump (Address 0x40):

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	00	00	00	00	00	00	00	00	00	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	00	00	00	00	00	01	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

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		
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	3F	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

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 D0, A

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

System Clock (MHz)		11.0592
SBUF		
R/O	W/O	TH0 TL0
0x00	0x00	0x00 0x00
RXD	TXD	THOD TL0D
1	1	0x00 0x00
SCON		TCON
0x00		0x00

pins		bits	TH1 TL1
0xFF	0xFF	P3	0x00 0x00
0xFF	0xFF	P2	
0xFF	0xFF	P1	
0xFF	0xFF	P0	

Data Memory	
addr	0x00 0x00 value
0	00 00 00 00 00 00 00 00 00 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 00 00 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 00
50	00 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

Modify RAM	
addr	0x00 0x00 value

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. ↓

The screenshot displays the 8051 simulator interface. On the left, the register window shows the following values: R7=0x00, R6=0x00, R5=0x00, R4=0x00, R3=0x00, R2=0x00, R1=0x00, R0=0x7E, B=0x00, ACC=0x08, PSW=0x09, IP=0x00, IE=0x00, PCON=0x00, DPH=0x00, DPL=0x0C, and SP=0x56 (highlighted with a red box). The PC register is 0x0112. The status bar indicates the current instruction is 0x0110: PUSH 0D0H. The assembly code window on the right shows the following instructions: 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; 0121: RET. The data memory window at the bottom shows the address 0x000C highlighted with a red box.

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

pins bits

TH1 TL1

0x00 0x00

PC

0x003F

PSW

0 0 0 0 0 0 0 1

Modify RAM

addr 0x00

value 0x00

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	09	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

003C*

MOV 89H, #20H

003F|

MOV 8DH, #0FAH

0042|

MOV 98H, #50H

0045|

SFB 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

0x00 0x00

TH0 TL0

0x00 0x00

R7 0x00

B 0x00

R6 0x00

ACC 0x00

R5 0x00

PSW 0x08

R4 0x00

IP 0x00

R3 0x00

IE 0x00

R2 0x00

PCON 0x00

R1 0x00

DPH 0x00

R0 0x7E

DPL 0x00

SP 0x4F

pins bits

TH1 TL1

0xFA 0x54

PC

0x000C

PSW

0 0 0 0 0 1 0 0 0 0

Modify RAM

addr 0x00

value 0x00

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	09	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

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|

SJMP 0F7H