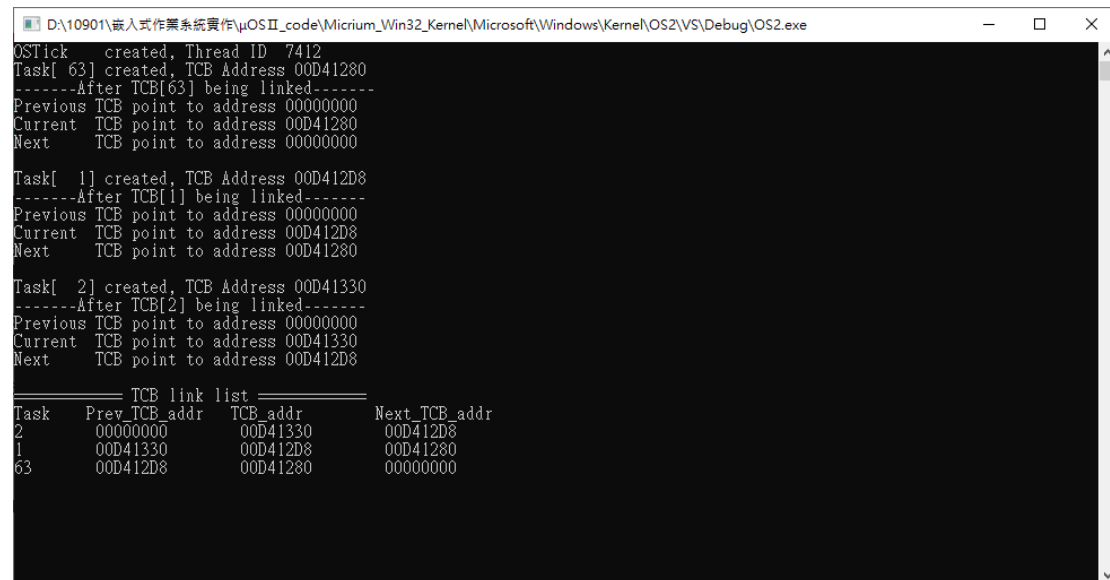


## [ PART I] Task Control Block Linked List

The screenshot results. (10%)



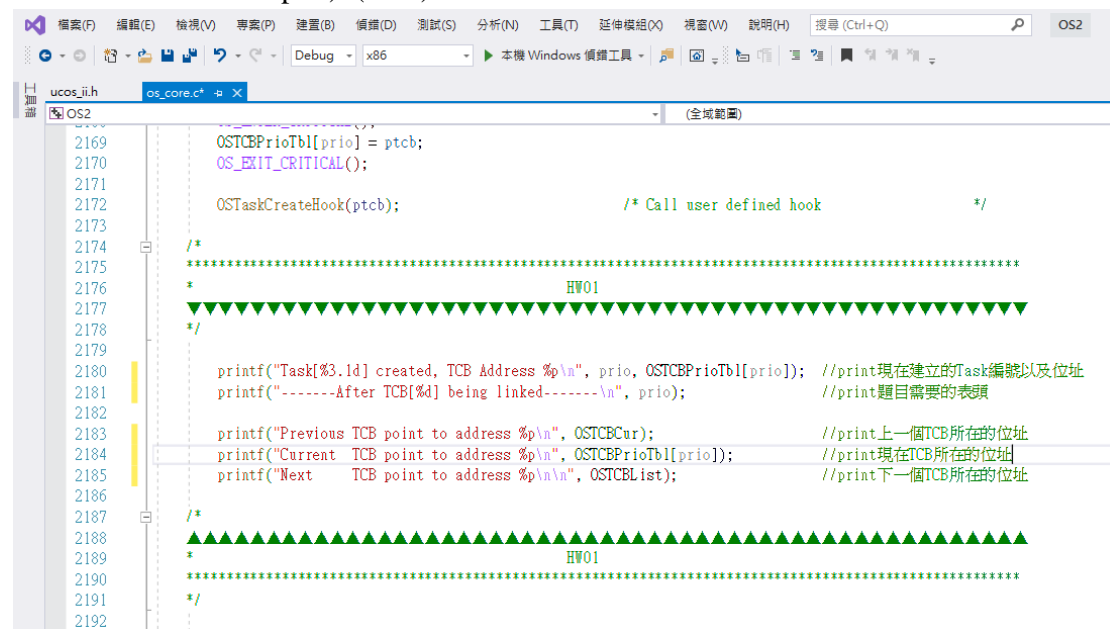
```
D:\10901\嵌入式作業系統實作\µOS II_code\Micrium_Win32_Kernel\Microsoft\Windows\Kernel\OS2\VS\Debug\OS2.exe
OSTick created, Thread ID 7412
Task[ 63] created, TCB Address 00D41280
-----After TCB[63] being linked-----
Previous TCB point to address 00000000
Current TCB point to address 00D41280
Next TCB point to address 00000000

Task[ 1] created, TCB Address 00D412D8
-----After TCB[1] being linked-----
Previous TCB point to address 00000000
Current TCB point to address 00D412D8
Next TCB point to address 00D41280

Task[ 2] created, TCB Address 00D41330
-----After TCB[2] being linked-----
Previous TCB point to address 00000000
Current TCB point to address 00D41330
Next TCB point to address 00D412D8

===== TCB link list =====
Task  Prev_TCB_addr  TCB_addr  Next_TCB_addr
2      00000000      00D41330    00D412D8
1      00D41330      00D412D8    00D41280
63     00D412D8      00D41280    00000000
```

A report that describes your implementation (please attach the screenshot of the code and **MARK** the modified part). (10%)



```
ucos_ii.h  os_core.c*
OS2
2169     OSTCBPrioTbl[prio] = ptcb;
2170     OS_EXIT_CRITICAL();
2171
2172     OSTaskCreateHook(ptcb); /* Call user defined hook */
2173
2174     /*
2175     * ----- HW01 -----
2176     *
2177     */
2178
2179     printf("Task[%3ld] created, TCB Address %p\n", prio, OSTCBPrioTbl[prio]); //print現在建立的Task編號以及位址
2180     printf("-----After TCB[%d] being linked-----\n", prio); //print題目需要的表頭
2181
2182     printf("Previous TCB point to address %p\n", OSTCBCur); //print上一個TCB所在的位址
2183     printf("Current TCB point to address %p\n", OSTCBPrioTbl[prio]); //print現在TCB所在的位址
2184     printf("Next TCB point to address %p\n\n", OSTCBList); //print下一個TCB所在的位址
2185
2186     /*
2187     * ----- HW01 -----
2188     *
2189     */
2190
2191     /*
2192     * ----- HW01 -----
2193     *
2194     */
```

```
ucos_ijk  OS2
OS2 (全域範圍) OS_TCBInit(NTBU prio, OS_STK* pt

1788 /*
1789 *
1790 *
1791 *
1792 */
1793 if (OSPrCoCur == 0) {
1794
1795     printf("===== TCB link list =====\n");
1796     printf("Task\TPrev_TCB_addr\TCB_addr\Next_TCB_addr\n");
1797     int a = 0;
1798     //OS_TCB* pointer = OSTCBList;
1799     //OS_TCB* pointer = OSTCBPrioTbl[2];
1800     //printf("pointer 的値: %p\n", pointer);
1801     //printf("pointer 的値: %d\n", pointer->OSTCBPrio);
1802     OS_TCB* pointer = OSTCBList;
1803     a = pointer->OSTCBPrio;
1804     printf("%d\t%p\t%p\n", a, OSTCBPrioTbl[a]->OSTCBPrio, OSTCBPrioTbl[a], OSTCBPrioTbl[a]->OSTCBNext);
1805     OS_TCB* pointer1 = OSTCBPrioTbl[a]->OSTCBNext;
1806     a = pointer1->OSTCBPrio;
1807     printf("%d\t%p\t%p\n", a, OSTCBPrioTbl[a]->OSTCBPrio, OSTCBPrioTbl[a], OSTCBPrioTbl[a]->OSTCBNext);
1808     OS_TCB* pointer2 = OSTCBPrioTbl[a]->OSTCBNext;
1809     a = pointer2->OSTCBPrio;
1810     printf("%d\t%p\t%p\n", a, OSTCBPrioTbl[a]->OSTCBPrio, OSTCBPrioTbl[a], OSTCBPrioTbl[a]->OSTCBNext);
1811 }
1812
1813 /*
1814 *
1815 *
1816 *
1817 *
1818 */
```

The screenshot results (with the given format) of four task sets. (Time ticks 0-30 or miss deadline). (40%)

2 個 task 的結果：

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OSTick created, Thread ID 8620  
task1 set = (0,1,3) task2 set = (0,3,6)

Tick	Event	CurrentTask ID	NextTask ID	ResponseTime	# of ContextSwitch
1	Completion	task(1)(0)	task(2)(0)	1	1
3	Preemption	task(2)(0)	task(1)(1)		
4	Completion	task(1)(1)	task(2)(0)	1	2
5	Completion	task(2)(0)	task(63)	5	4
6	Preemption	task(63)	task(1)(2)		
7	Completion	task(1)(2)	task(2)(1)	1	2
9	Preemption	task(2)(1)	task(1)(3)		
10	Completion	task(1)(3)	task(2)(1)	1	2
11	Completion	task(2)(1)	task(63)	5	4
12	Preemption	task(63)	task(1)(4)		
13	Completion	task(1)(4)	task(2)(2)	1	2
15	Preemption	task(2)(2)	task(1)(5)		
16	Completion	task(1)(5)	task(2)(2)	1	2
17	Completion	task(2)(2)	task(63)	5	4
18	Preemption	task(63)	task(1)(6)		
19	Completion	task(1)(6)	task(2)(3)	1	2
21	Preemption	task(2)(3)	task(1)(7)		
22	Completion	task(1)(7)	task(2)(3)	1	2
23	Completion	task(2)(3)	task(63)	5	4
24	Preemption	task(63)	task(1)(8)		
25	Completion	task(1)(8)	task(2)(4)	1	2
27	Preemption	task(2)(4)	task(1)(9)		
28	Completion	task(1)(9)	task(2)(4)	1	2
29	Completion	task(2)(4)	task(63)	5	4
30	Preemption	task(63)	task(1)(10)		
31	Completion	task(1)(10)	task(2)(5)	1	2

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OSTick created, Thread ID 13384  
task1 set = (0,8,15) task2 set = (0,2,5)

Tick	Event	CurrentTask ID	NextTask ID	ResponseTime	# of ContextSwitch
2	Preemption	task(2)(0)	task(1)(0)		
5	Completion	task(2)(0)	task(1)(0)	5	2
7	Preemption	task(2)(1)	task(1)(0)		
10	Completion	task(2)(1)	task(1)(0)	5	2
12	Preemption	task(2)(2)	task(1)(0)		
14	Completion	task(1)(0)	task(63)	14	6
15	Preemption	task(63)	task(2)(3)		
17	Preemption	task(2)(3)	task(1)(0)		
20	Completion	task(2)(3)	task(1)(1)	5	2
22	Preemption	task(2)(4)	task(1)(1)		
25	Completion	task(2)(4)	task(1)(1)	5	2
27	Preemption	task(2)(5)	task(1)(1)		
29	Completion	task(1)(1)	task(63)	14	6
30	Preemption	task(63)	task(2)(6)		
32	Preemption	task(2)(6)	task(1)(1)		
35	Completion	task(2)(6)	task(1)(1)	5	2
37	Preemption	task(2)(7)	task(1)(1)		
40	Completion	task(2)(7)	task(1)(2)	5	2
42	Preemption	task(2)(8)	task(1)(2)		
44	Completion	task(1)(2)	task(63)	14	6

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OSTick created, Thread ID 12188  
task1 set = (1,1,3) task2 set = (0,4,6)

Tick	Event	CurrentTask ID	NextTask ID	ResponseTime	# of ContextSwitch
1	Preemption	task(2)(0)	task(1)(0)		
2	Completion	task(1)(0)	task(2)(0)	1	2
4	Preemption	task(2)(0)	task(1)(0)		
5	Completion	task(1)(1)	task(2)(0)	1	2
6	Completion	task(2)(0)	task(2)(1)	6	5
7	Preemption	task(2)(0)	task(1)(1)		
8	Completion	task(1)(2)	task(2)(1)	1	2
10	Preemption	task(2)(1)	task(1)(2)		
11	Completion	task(1)(3)	task(2)(1)	1	2
12	Completion	task(2)(1)	task(2)(2)	6	5
13	Preemption	task(2)(1)	task(1)(3)		
14	Completion	task(1)(4)	task(2)(2)	1	2
16	Preemption	task(2)(2)	task(1)(4)		
17	Completion	task(1)(5)	task(2)(2)	1	2
18	Completion	task(2)(2)	task(2)(3)	6	5
19	Preemption	task(2)(2)	task(1)(5)		
20	Completion	task(1)(6)	task(2)(3)	1	2
22	Preemption	task(2)(3)	task(1)(6)		
23	Completion	task(1)(7)	task(2)(3)	1	2
24	Completion	task(2)(3)	task(2)(4)	6	5
25	Preemption	task(2)(3)	task(1)(7)		
26	Completion	task(1)(8)	task(2)(4)	1	2
28	Preemption	task(2)(4)	task(1)(8)		
29	Completion	task(1)(9)	task(2)(4)	1	2
30	Completion	task(2)(4)	task(2)(5)	6	5

3 個 task 的結果：

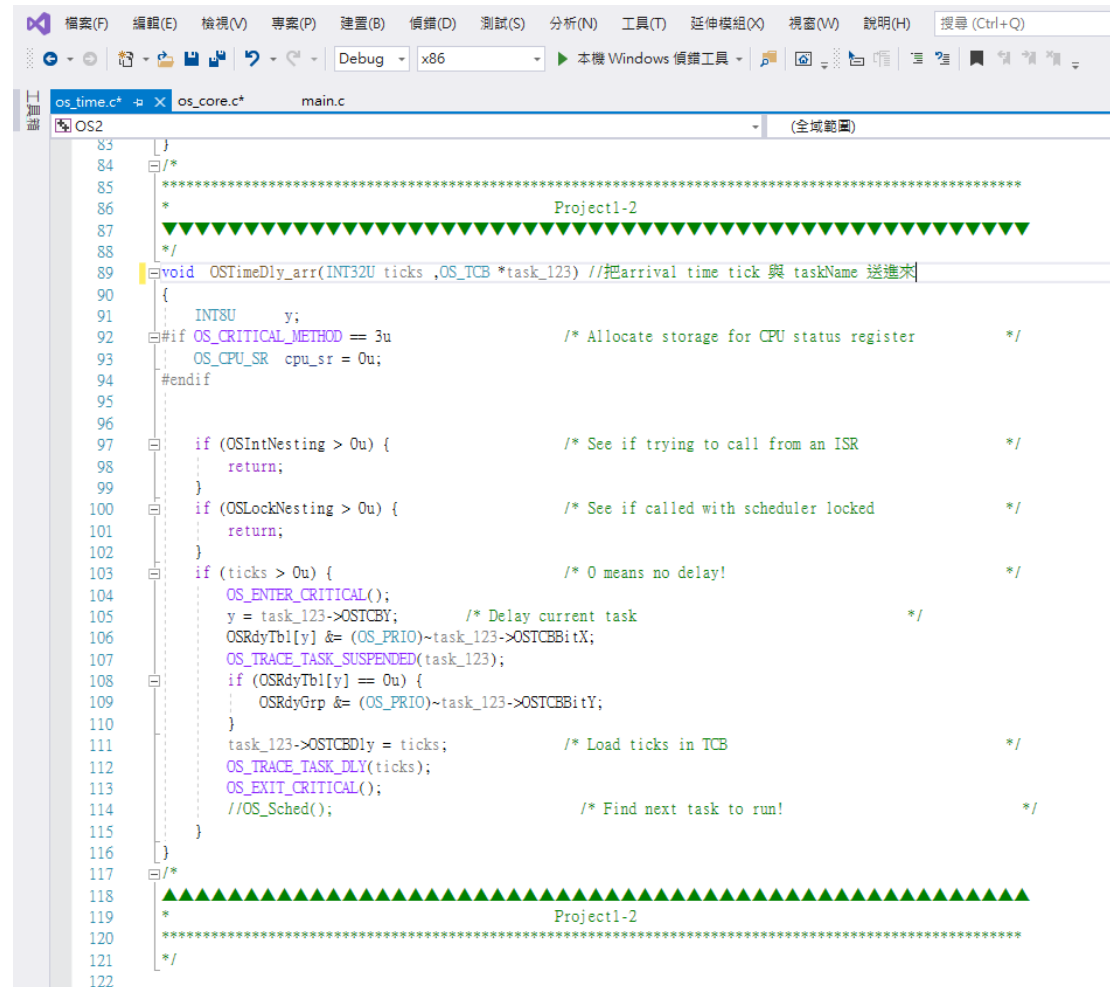
D:\10901\嵌入式作業系統實作\μOS II\_code\Micrium\_Win32\_Kernel\Microsoft\Windows\Kernel\OS2\VS\Debug\OS2.exe

OSTick created, Thread ID 9044  
task1 set = (0,4,6) task2 set = (2,2,10) task3 set = (1,1,5)

Tick	Event	CurrentTask ID	NextTask ID	ResponseTime	# of ContextSwitch
1	Preemption	task(1)(0)	task(3)(0)		
2	Completion	task(3)(0)	task(1)(0)	1	2
5	Completion	task(1)(0)	task(2)(0)	3	3
6	Preemption	task(2)(0)	task(3)(1)		
7	Completion	task(3)(1)	task(1)(1)	1	2
10	MissDeadline	task(1)(1)			

A report that describes your implementation (please attach the screenshot of the code and **MARK** the modified part). (40%)

arrival time的代码：



```
83 }
84 /*
85 ****
86 **** Project1-2
87 ****
88 */
89 void OTimeDly_arr(INT32U ticks, OS_TCB *task_123) //把arrival time tick 與 taskName 送進來
90 {
91     INT8U y;
92     #if OS_CRITICAL_METHOD == 3u /* Allocate storage for CPU status register */
93         OS_CPU_SR cpu_sr = 0u;
94     #endif
95
96     if (OSIntNesting > 0u) { /* See if trying to call from an ISR */
97         return;
98     }
99     if (OSLockNesting > 0u) { /* See if called with scheduler locked */
100         return;
101     }
102     if (ticks > 0u) { /* 0 means no delay! */
103         OS_ENTER_CRITICAL();
104         y = task_123->OSTCBY; /* Delay current task */
105         OSRdyTbl[y] &= (OS_PRIO)~task_123->OSTCBBitX;
106         OS_TRACE_TASK_SUSPENDED(task_123);
107         if (OSRdyTbl[y] == 0u) {
108             OSRdyGrp &= (OS_PRIO)~task_123->OSTCBBitY;
109         }
110         task_123->OSTCBDly = ticks; /* Load ticks in TCB */
111         OS_TRACE_TASK_DLY(ticks);
112         OS_EXIT_CRITICAL();
113         //OS_Sched(); /* Find next task to run! */
114     }
115 }
116
117 /*
118 ****
119 **** Project1-2
120 ****
121 ****
122 */
```

```
OS2
886
887
888 void OSStart (void)
889 {
890
891
892     if (OSRunning == OS_FALSE) {
893
894         OSTimeDly_arr(task1_inl[0], OSTCBPrioTbl[1]); //設定task1的arrival time
895         OSTimeDly_arr(task2_inl[0], OSTCBPrioTbl[2]); //設定task2的arrival time
896         OSTimeDly_arr(task3_inl[0], OSTCBPrioTbl[3]); //設定task3的arrival time
897
898
899         OS_SchedNew(); /* Find highest priority's task priority number */
900
901         OSPrioCur = OSPrioHighRdy;
902         OSTCBHighRdy = OSTCBPrioTbl[OSPrioHighRdy]; /* Point to highest priority task ready to run */
903         OSTCBCur = OSTCBHighRdy;
904         OSStartHighRdy(); /* Execute target specific code to start task */
905
906     }
907 }
908
909
```

2 個 task 的 code :

```
OS2
89
90
91
92
93
94
95 int task1_in[3] = { 1, 1, 3 }; //task set 1
96 int task2_in[3] = { 0, 4, 6 }; //task set 2
97 int task3_in[3] = { 0, 0, 0 }; //task set 3
98
99 //P.S. 優先權手動設定
100
101
102
103
104
105
106
```

```
OS2
281
282
283
284
285
286
287
288
289
290 void task1(void* p_arg) {
291     (void)p_arg;
292     while (1) {
293         Sleep(task1_in[1]*1000); //設定執行時間
294         if (task1_in[2] > task2_in[2]) {
295             if (task2_in[0] == 0) {OSTimeDly(task1_in[2] - (task1_in[2] / task2_in[2] * task1_in[1] + task1_in[1])) + task2_in[1]);} //有arrival time的
296             else { OSTimeDly(task1_in[2] - (task1_in[2] / task2_in[2] * task2_in[1] + task1_in[1])); } //優先權比較高的
297         }
298         else if (task1_in[2] < task2_in[2]) {
299             OSTimeDly(task1_in[2] - task1_in[1]); //優先權比較低的
300         }
301     }
302 }
303
304 void task2(void* p_arg) {
305     (void)p_arg;
306     while (1) {
307         Sleep(task2_in[1] * 1000); //設定執行時間
308         if (task2_in[2] > task1_in[2]) {
309             if (task1_in[0] == 0) {OSTimeDly(task2_in[2] - (task2_in[2] / task1_in[2] * task1_in[1] + task2_in[1])) + task1_in[1]);} //有arrival time的
310             else { OSTimeDly(task2_in[2] - (task2_in[2] / task1_in[2] * task1_in[1] + task2_in[1])); } //優先權比較高的
311         }
312         else if (task2_in[2] < task1_in[2]) {
313             OSTimeDly(task2_in[2] - task2_in[1]); //優先權比較低的
314         }
315     }
316 }
317
318
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### 3 個 task 的 code :

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os_core.c  main.c
OS2 (全域範圍)
323
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325
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327
328
329 void task1(void* p_arg) {
330     (void)p_arg;
331     while (1) {
332         Sleep(task1_in[1]*1000); //設定執行時間
333         OSTimeDly(task1_in[2] - task1_in[1] - task3_in[1] + task3_in[0]); //優先權次高的
334         //OSTimeDly(2);
335         //printf("OSTimeDly1=%d\n", task1_in[2] - task1_in[1] - task3_in[1] + task3_in[0]);
336     }
337 }
338
339 void task2(void* p_arg) {
340     (void)p_arg;
341     while (1) {
342         Sleep(task2_in[1] * 1000); //設定執行時間
343         OSTimeDly(task2_in[2] / task3_in[2] * task3_in[1] + task1_in[1]); //優先權最高的
344         //OSTimeDly(6);
345         //printf("OSTimeDly2=%d\n", (task2_in[2] / task3_in[2] * task3_in[1] + task1_in[1]);
346     }
347 }
348
349 void task3(void* p_arg) {
350     (void)p_arg;
351     while (1) {
352         Sleep(task3_in[1] * 1000); //設定執行時間
353         OSTimeDly(task3_in[2] - task3_in[1]); //優先權最低的
354         //OSTimeDly(4);
355         //printf("OSTimeDly3=%d\n", task3_in[2] - task3_in[1]);
356     }
357 }
358
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```

```
os_core.c  main.c
OS2 (全域範圍)
34
35
36
37
38 int resp_t1, resp_t2, resp_t3; //ResponseTime
39 int ctx1=0, ctx2=0, ctx3=0; //ContextSwitch
40 int input_t1=0, input_t2=0, input_t3=0, input_t11=0, input_t21=0, input_t31=0; //進入幾次
41 int task1_in[3] = { 0, 4, 6 }; //task set 1
42 int task2_in[3] = { 2, 2, 10 }; //task set 2
43 int task3_in[3] = { 1, 1, 5 }; //task set 3
44
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```

[illegible]