Chapter 11

Real Time Operating System

Lesson 07

Exemplary Use of RTOS in System Design—Baby-weighing machine system (BWMS)

Baby-weighing machine system (BWMS)

- Used to record children's weight and growth.

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BWMS Tasks

- four tasks—task 0, task 1, task 2, and task 3

- task *key parsing*

- *task for current or voltage signal generation for transducer*

- task for *transducer signal measurement*

- task for *display, store and print.*

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Tasks

Same priority cooperative cyclic scheduling mode

Task 0 key-parsing	Task 1 I and V set	Task 2 Measure	Task 3 display, store and print

BWMS Round cyclic cooperative scheduling

RTOS scheduling

- Cooperative mode but the tasks are cyclically repeated

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An 8051 based baby Weighing Machine

Needed RTOS functions in the BWMS

- RTOS Full

- Functions for signals, semaphores, and messages

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BWMS

os-create task-1 {Key parsing and os_wait-signal 1 at never ending loop}

Task 0

os_create task-2 {I and V set and os-send message Msg1 for values, os_send_signal 2 at never ending loop }

Task 1

os-create task-3 {os-wait-signal 2; measure and os_send message Msg 2 for weight os_send_signal 3 at never ending loop}
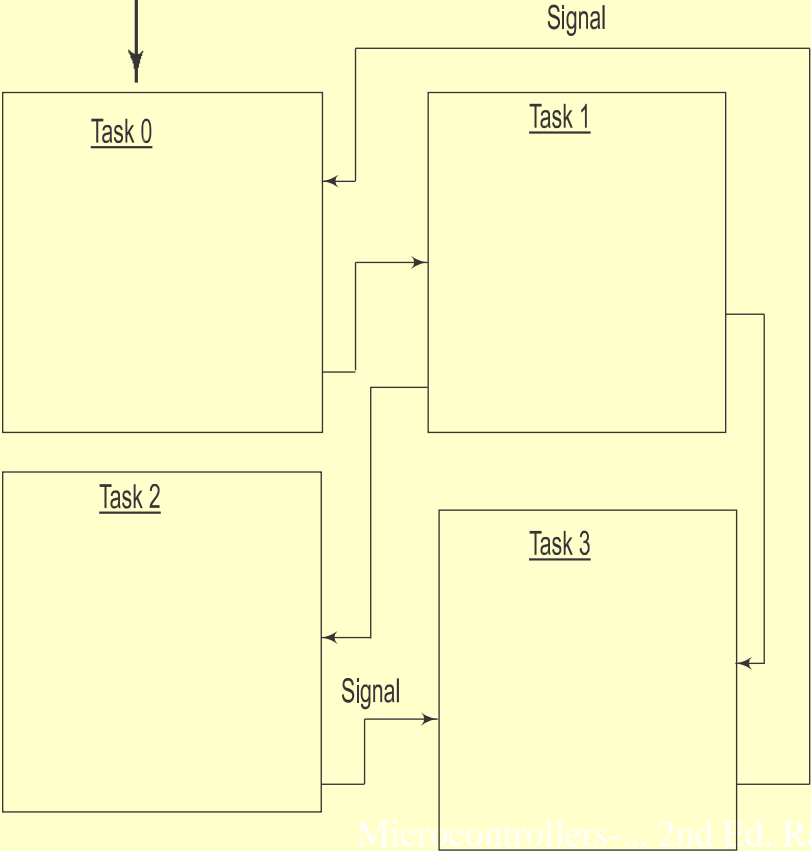
Task 2

{os-wait-signal 3; calculate weight display, save and print; os_send_signal 0 at never ending loop}

Task 3

BWMS

Main function {os_start at never ending loop}

Signal

Task 0

Task 1

Task 2

Task 3

Signal

Signal

BWMS

Main Function

{while (1) {os_start () };
Never ending loop

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Task_0

job0 () task_0 {os_send_sig (0);
os_create_task (1) {while(1) {os_wait
(K_Sig, 10, 0);

/*key_parsing codes*/

........;

os_send_signal (1);};};}

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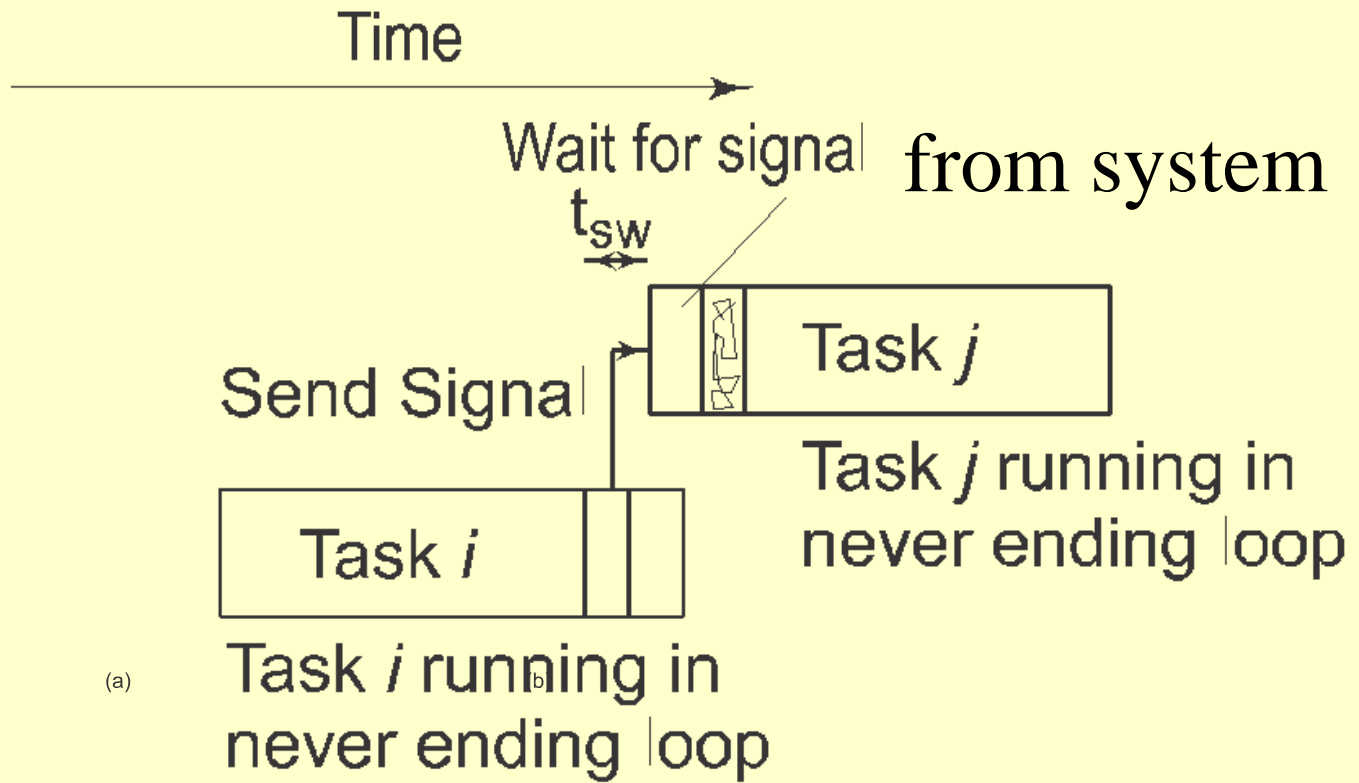Pearson Education

Task_1

job1 () task_1 {os_create_task (2)
{while(1) {os_wait (K_Sig, 10, 0);

/*I and V setting codes*/

........;

 os_send_message (msg1);

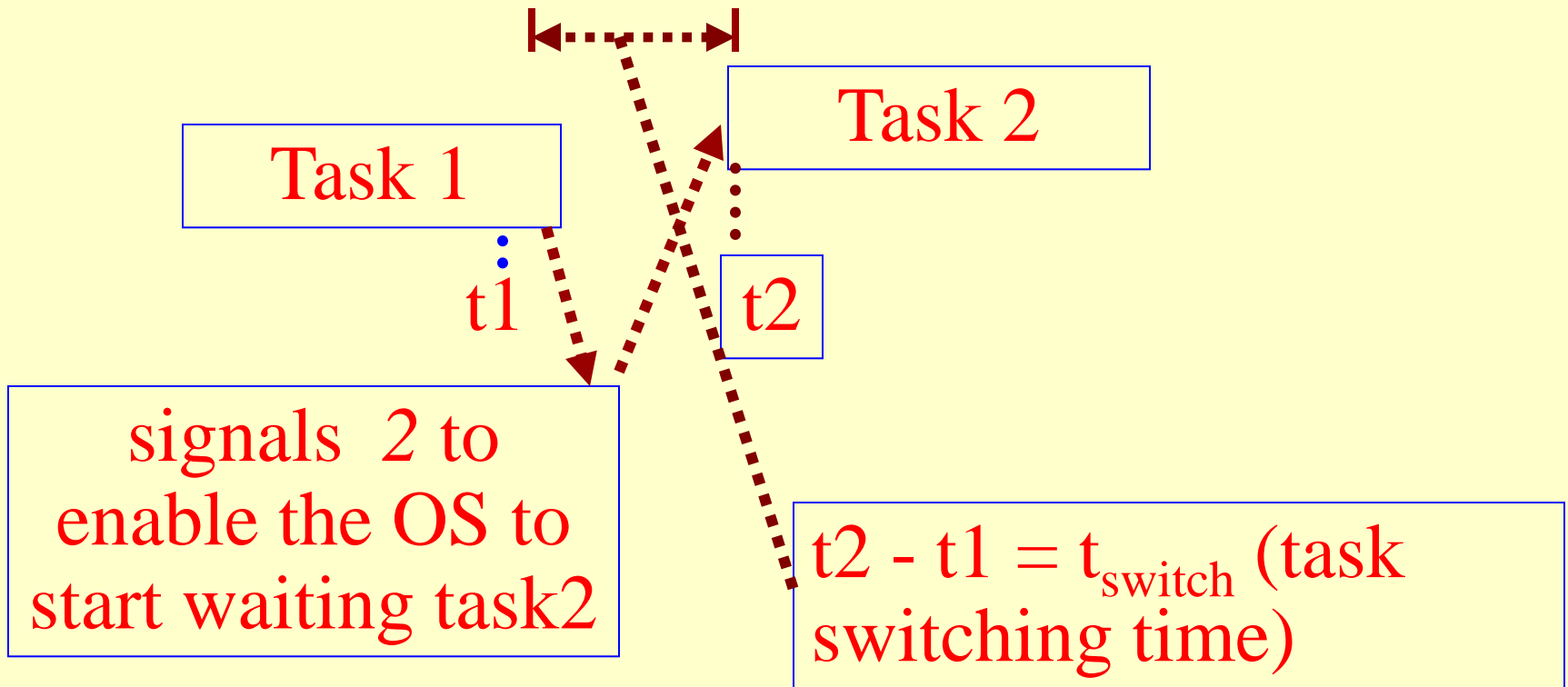os_send_signal (2);};};}

Time

Wait for signal from system

t_{sw}

Send Signal

Task j

Task j running in never ending loop

Task i

(a)

Task i running in never ending loop

(b)

Signal between Two Tasks

Task 2

Task 1

t1

t2

signals 2 to enable the OS to start waiting task2

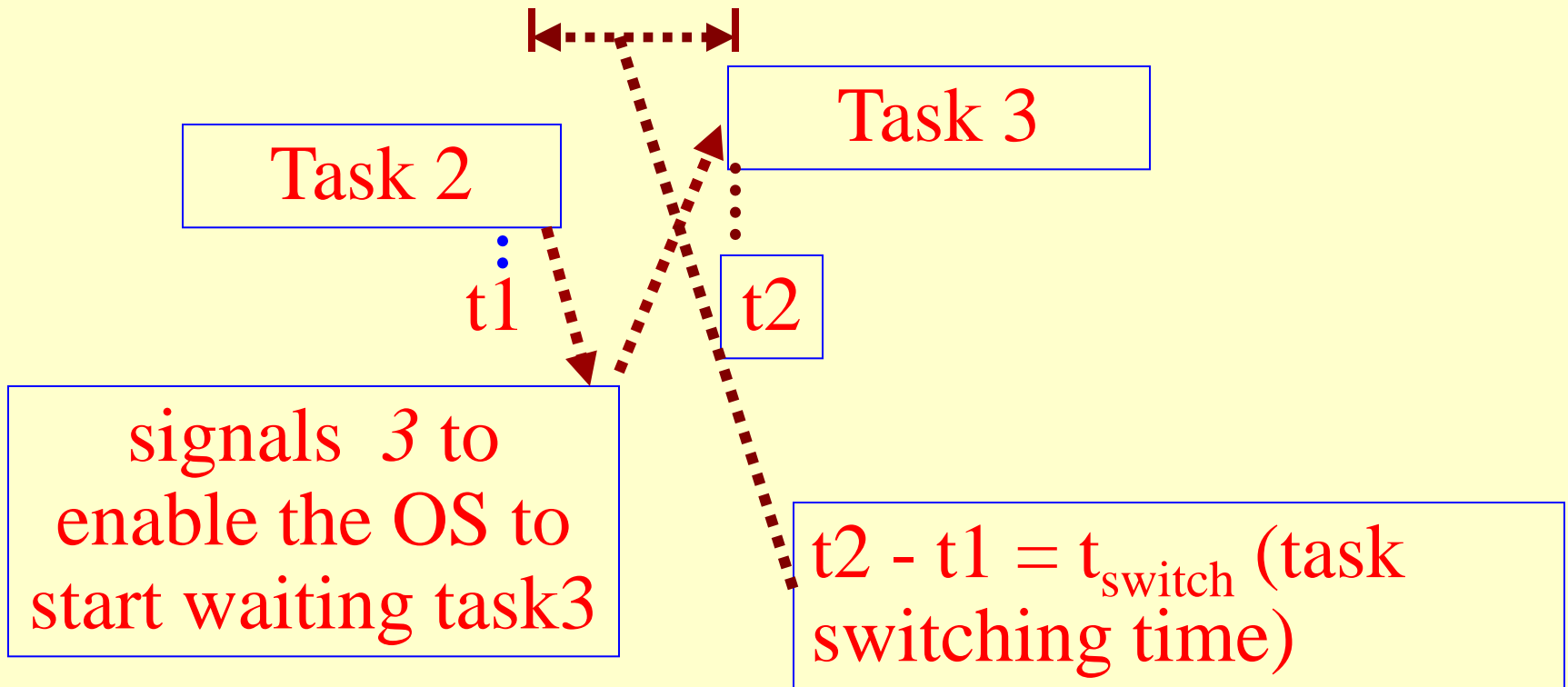t2 - t1 = t_{switch} (task switching time)

Task2

job2 () task_2 {os_create_task (3) {while(1) {os_wait (K_Sig, 10, 0); os_wait (msg1, 0, 0);

/*Record/Measure */

........;

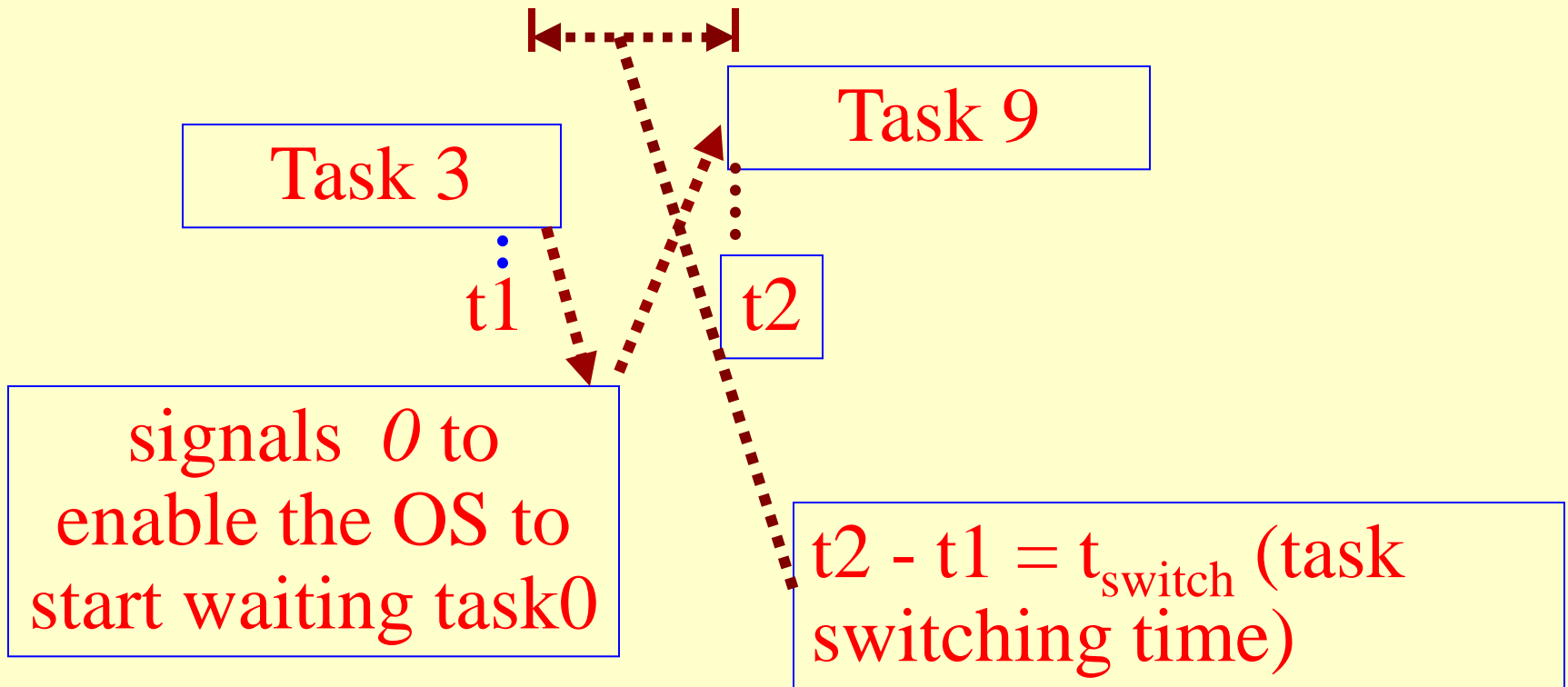os_send_message (msg2); os_send_signal (3);};};}

Signal between Two Tasks

Task 3

Task 2

t1

t2

signals *3* to enable the OS to start waiting task3

$t2 - t1 = t_{switch}$ (task switching time)

Task_3

job3 () task_3 {{{os_wait (K_Sig, 10, 0); os_wait (msg2, 0, 0);

/*Calculate, Save */

........;

;};};}

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Signal between Two Tasks

Task 9

Task 3

t1

t2

signals *0* to enable the OS to start waiting task0

t2 - t1 = t_{switch} (task switching time)

Task Synchronisation among three tasks waiting for K_MSG

Task 2

1

Message K_MSG

2

message 2 to enable read at mailbox waiting at task3

3

Task 3

4

message 2 read at mailbox, waiting ends at task3 on msg2 sending

RTOS
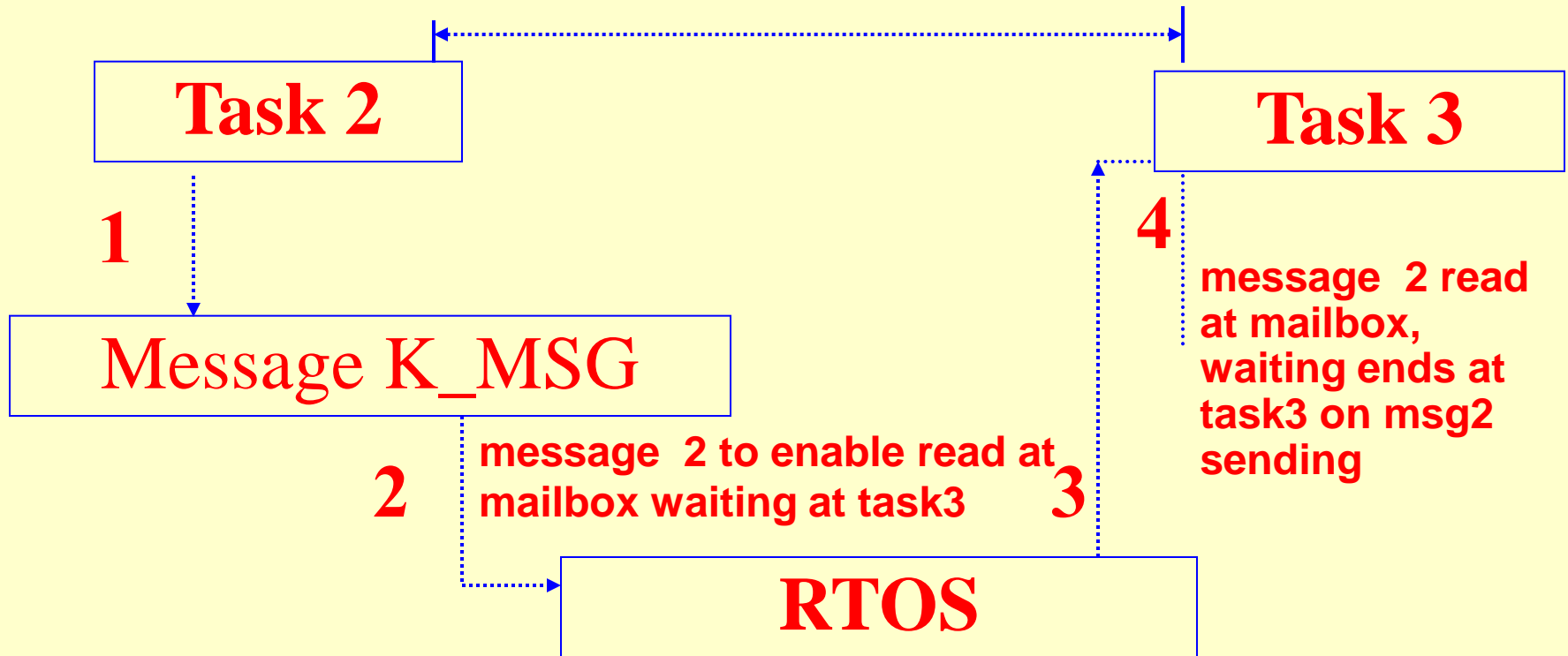
Example- Two Tasks 2 and 3 Message passing

Summary

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We learnt

- four tasks—task 0, task 1, task 2, and task 3
- task0 *key parsing*
- *task1 for current or voltage signal generation for transducer*
- task2 for *transducer signal measurement*

We learnt

- task3 for *display, store and print.*
- Scheduling method – Cooperative cyclic
- Three IPC methods - signal, semaphore and mailbox RTOS functions used

End of Lesson 07 on

Exemplary Use of RTOS in System Design—Baby-weighing machine system (BWMS)