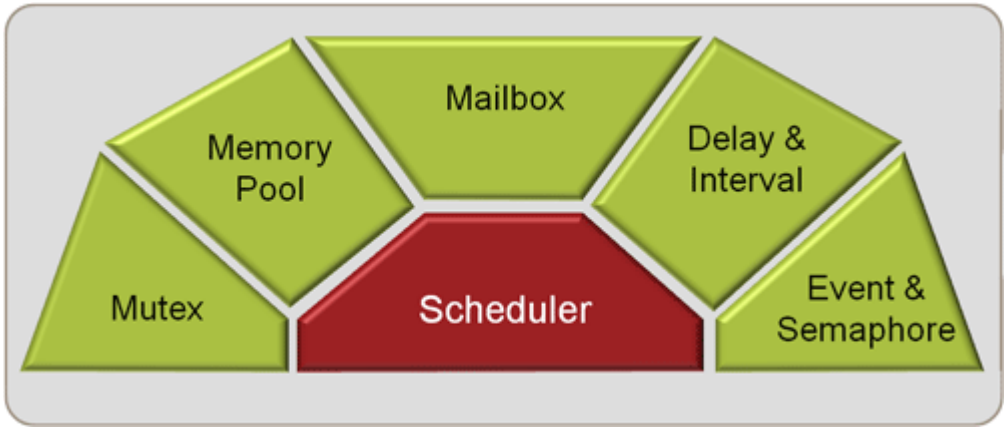
RTOS koncept část 2



Popis RTX Keil

- Startuje i končí procesy
- Obsluhuje meziprocesorovou komunikaci synchronizaci
- Spravuje přístup ke společným oblastem paměti i periferiím

meziprocesorová komunikace :

Event flags – proces má až 16 vlajek pro sledování události. Task čeká na všechny vlajky (AND-connection) nebo stačí jedna ze skupiny (OR-connection).

Semaphores – když více procesů čeká na přístup např. k společné paměti. Binární semafor obsahuje TOKEN. Kernel předá token prvnímu procesu, ostatní nemohou vejít do Kritické sekce. Když proces skončí vrací token semaforu a může ho vzít jiný proces.

Mutex – alternativnní prostředek pro synchronizaci přístupu např. k společné paměti.

Mailboxes – jeden proces pošle zprávu druhému. Vhodné pro implementaci protokolů horních vrstev jak TCP-IP, UDP a ISDN. Zprávu prezentuje ukazatel (pointer) do rámce paměti, který se obsluhuje dynamicky (alokuje i uvolňuje). Kernel probudí task když dostane zprávu

Technická Data :

Description	ARM7™/ARM9™	Cortex™-M
Defined Tasks	Unlimited	Unlimited
Active Tasks	250 max	250 max
Mailboxes	Unlimited	Unlimited
Semaphores	Unlimited	Unlimited
Mutexes	Unlimited	Unlimited
Signals / Events	16 per task	16 per task
User Timers	Unlimited	Unlimited
Code Space	<4.2 Kbytes	<4.0 Kbytes
RAM Space for Kernel	300 bytes + 80 bytes User Stack	300 bytes + 128 bytes Main Stack
RAM Space for a Task	TaskStackSize + 52 bytes	TaskStackSize + 52 bytes
RAM Space for a Mailbox	MaxMessages * 4 + 16 bytes	MaxMessages * 4 + 16 bytes
RAM Space for a Semaphore	8 bytes	8 bytes
RAM Space for a Mutex	12 bytes	12 bytes
RAM Space for a User Timer	8 bytes	8 bytes
Hardware Requirements	One on-chip timer	SysTick timer
User task priorities	1 - 254	1 - 254
Task switch time	<5.3 µsec @ 60 MHz	<2.6 µsec @ 72 MHz
Interrupt lockout time	<2.7 µsec @ 60 MHz	Not disabled by RTX

Podrobný popis a konfigurace RTX KEIL

Timer Tick Interrupt – generuje periodicky přerušení v privilegovaném modu. Hlavní časovač pro scheduler. Konfigurace v souboru **RTX_Config.c** .

System Task Manager – se aktivuje po každým **Timer Tick Interrupt,** má max. prioritu , přepíná kontext. Čas CPU je dělen na části (např. 10 ms) a procesy jsou simultanně prováděny. Funkce **os_tsk_pass** nebo **wait** způsobí přepnutí kontextu. Nastavení času přepnutí v souboru **RTX_Config.c** .

Task Management

Idle Task – jestliže žáden task neběží, ten **musí** pracovat. Periferie mohou pracovat.

```
for (;;);
```

Task Management

State	Description
RUNNING	The task that is currently running is in the RUNNING state. Only one task at a time can be in this state. The os_tsk_self() returns the Task ID (TID) of the currently executing task.
READY	Tasks which are ready to run are in the READY state. Once the running task has completed processing, RTX selects the next ready task with the highest priority and starts it.
WAIT_DLY	Tasks which are waiting for a delay to expire are in the WAIT_DLY State. Once the delay has expired, the task is switched to the READY state. The os_dly_wait() function is used to place a task in the WAIT_DLY state.
WAIT_ITV	Tasks which are waiting for an interval to expire are in the WAIT_ITV State. Once the interval delay has expired, the task is switched back to the READY State. The os_itv_wait() function is used to place a task in the WAIT_IVL State.
WAIT_OR	Tasks which are waiting for at least one event flag are in the WAIT_OR State. When the event occurs, the task is switched to the READY state. The os_evt_wait_or() function is used to place a task in the WAIT_OR state.
WAIT_AND	Tasks which are waiting for all the set events to occur are in the WAIT_AND state. When all event flags are set, the task is switched to the READY state. The os_evt_wait_and() function is used to place a task in the WAIT_AND state.
WAIT_SEM	Tasks which are waiting for a semaphore are in the WAIT_SEM state. When the token is obtained from the semaphore, the task is switched to the READY state. The os_sem_wait() function is used to place a task in the WAIT_SEM state.
WAIT_MUT	Tasks which are waiting for a free mutex are in the WAIT_MUT state. When a mutex is released, the task acquire the mutex and switch to the READY state. The os_mut_wait() function is used to place a task in the WAIT_MUT state.

WAIT_MBX	**Tasks which are waiting for a mailbox message are in the WAIT_MBX state. Once the message has arrived, the task is switched to the READY state. The os_mbx_wait() function is used to place a task in the WAIT_MBX state.** **Tasks waiting to send a message when the mailbox is full are also put into the WAIT_MBX state. When the message is read out from the mailbox, the task is switched to the READY state. In this case the os_mbx_send() function is used to place a task in the WAIT_MBX state.**
INACTIVE	Tasks which have not been started or tasks which have been deleted are in the INACTIVE state. The os_tsk_delete() function places a task that has been started (with os_tsk_create()) into the INACTIVE state.