



RTOS Debugger for Freescale OSEK

PowerPC 555 68HC12

- Real time, non-intrusive display of OSEK system resources
- OSEK specific display of analyzer listing
- Statistic evaluation and graphic display of task run times
- Statistic evaluation and graphic display of service run times
- Task related evaluation of function run times
- Task stack coverage
- PRACTICE functions for OS data
- OSEK related pull-down menu

The TRACE32 System includes a multitask debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the OSEK/VDX conform Real Time Kernel OSEK from Freescale.

Based on the ORTI (OSEK Runtime Interface) all informations of the OSEK RTOS and its configuration can be explored. This leaflet will guide you through the additional implemented features in TRACE32, to do an effective debugging on OSEK systems.

Multitask Debugging on TRACE32 with Motorola OSEK

Real time, non-intrusive display of Motorola OSEK system resources

The TRACE32 multitask debugger for OSEK provides special display functions. The system resources such as task list, messages, counters, alarms, stacks and resources can be displayed. In addition, by using the emulators

dual-port memory, the display of all these regions can be viewed non-intrusively in real time. The tables are updated permanently ("On The Fly"), without affecting the application at all.

The screenshot shows three overlapping windows from the TRACE32 debugger. The top window, titled 'E::task.dtask', displays a table of tasks. The middle window, 'E::TASK.DMESSAGE', shows a list of messages. The bottom window, 'E::TASK.DALARM', displays a table of alarms.

task	task priority	task state	current task stack
TASKSND	1	READY	NODE_STACK_1
TASKRCV	3	RUNNING	NODE_STACK_3
TASKPROD	2	WAITING	Poo11_STACK_0
TASKCONS	0	SUSPENDED	NO_STACK

message	message type	queue size	message state	notified task	event	alarm	alarm
MsgA	UNQUEUEDMESSAGE	1	MSGFREE	TASKRCV		MSGALARM	100
MsgB	QUEUEDMESSAGE	5	MSGFREE				

alarm	alarm state	assigned counter	notified task	event to set	time to expire	cycle period
MSGALARM	ALARMRUN	SYSTEMTIMER	TASKSND		0x0064	0x0000
PRODALARM	ALARMRUN	SYSTEMTIMER	TASKPROD	TIMEVENT	0x0001	0x0003
EVMSGALARM	ALARMRUN	MSGCOUNTER	TASKCONS		0x0001	0x0000

Task list window, message window and alarm window

The screenshot shows the 'E::TASK.DOS' window, which displays the configuration of the OSEK operating system. It shows the current state of the OS and the configuration for a specific task.

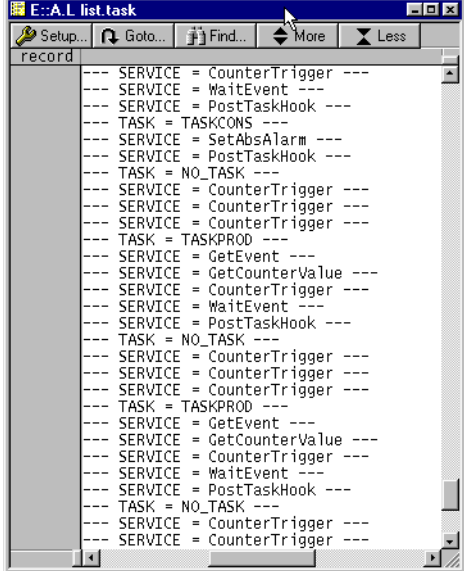
os	running	task identification	os services watch	executed isr identification
os1	TASKRCV		NO_SERVICE	TASK_LEVEL

Configuration of OSEK operating system window

Motorola OSEK specific display of analyzer listing

The data recorded in the analyzer can be displayed and interpreted specific to the operating system. Task switches are displayed symbolically

Analyzer listing, task selective recording, display of task switches and assembler mnemonics



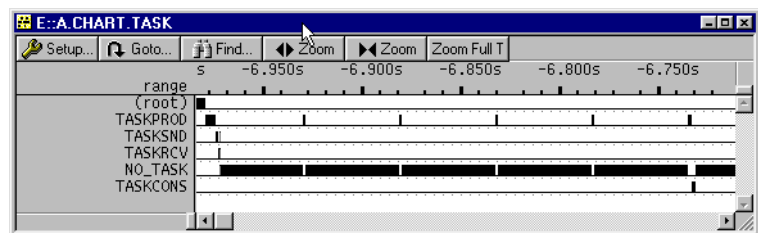
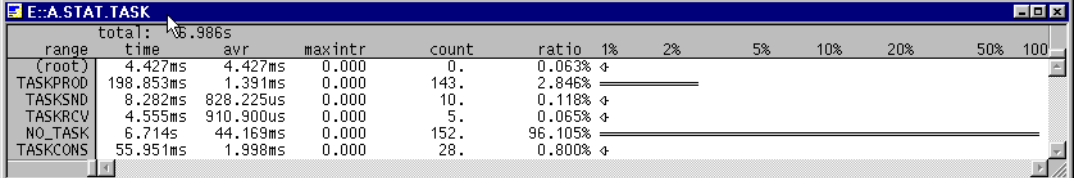
```

E::A.L list.task
record
--- SERVICE = CounterTrigger ---
--- SERVICE = WaitEvent ---
--- SERVICE = PostTaskHook ---
--- TASK = TASKCONS ---
--- SERVICE = SetAbsAlarm ---
--- SERVICE = PostTaskHook ---
--- TASK = NO_TASK ---
--- SERVICE = CounterTrigger ---
--- SERVICE = CounterTrigger ---
--- SERVICE = CounterTrigger ---
--- TASK = TASKPROD ---
--- SERVICE = GetEvent ---
--- SERVICE = GetCounterValue ---
--- SERVICE = CounterTrigger ---
--- SERVICE = WaitEvent ---
--- SERVICE = PostTaskHook ---
--- TASK = NO_TASK ---
--- SERVICE = CounterTrigger ---
--- SERVICE = CounterTrigger ---
--- SERVICE = CounterTrigger ---
--- TASK = TASKPROD ---
--- SERVICE = GetEvent ---
--- SERVICE = GetCounterValue ---
--- SERVICE = CounterTrigger ---
--- SERVICE = WaitEvent ---
--- SERVICE = PostTaskHook ---
--- TASK = NO_TASK ---
--- SERVICE = CounterTrigger ---
--- SERVICE = CounterTrigger ---

```

Statistic evaluation and graphic display of task run times

The analyzer can calculate statistic tables of task run times and task switches. A graphical diagram shows which task was active at a specific time, giving a clear view of the behaviour of the system.

range	total: 36.986s	time	avr	maxintr	count	ratio	1%	2%	5%	10%	20%	50%	100%
(root)		4.427ms	4.427ms	0.000	0.	0.063%	+						
TASKPROD		198.853ms	1.391ms	0.000	143.	2.846%	+						
TASKSND		8.282ms	828.225us	0.000	10.	0.118%	+						
TASKRCV		4.555ms	910.900us	0.000	5.	0.065%	+						
NO_TASK		6.714s	44.169ms	0.000	152.	96.105%	+						
TASKCONS		55.951ms	1.998ms	0.000	28.	0.800%	+						

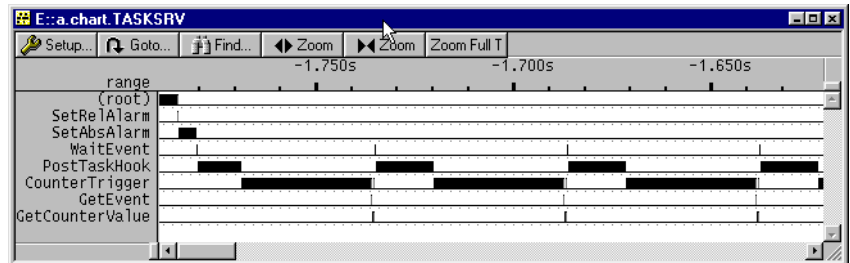
Statistics and flow of tasks

Statistic evaluation and graphic display of service run times

The statistic and graphic evaluation of service calls and service run times can be done. This is necessary, if one ser-

vice need much time and is called very often the performance of the operating system goes down..

range	total: 1.790s	time	avr	maxintr	count	ratio	1%	2%	5%	10%	20%	50%
(root)	4.700ms	4.700ms	0.000	0.000	0.	0.262%						
SetRelAlarm	179.500ms	179.500ms	0.000	0.000	1.	0.010%						
SetAbsAlarm	5.901ms	737.685us	0.000	0.000	8.	0.329%						
WaitEvent	11.318ms	305.905us	0.000	0.000	37.	0.632%						
PostTaskHook	547.444ms	12.165ms	0.000	0.000	45.	30.579%						
CounterTrigger	1.200s	16.215ms	0.000	0.000	74.	67.026%						
GetEvent	6.538ms	181.613us	0.000	0.000	36.	0.365%						
GetCounterValue	14.229ms	395.256us	0.000	0.000	36.	0.794%						



Statistics and flow of services

Task related evaluation of function run times

The statistic and graphic evaluation of function calls and function run times can be done dependant to the actual running task. This is necessary, if dif-

ferent tasks call one single function at the same time, or if a task switch occurs in between the function.

range	total: 2.397s	max	avr	ratio
tree				
\OSSetInterruptMask+0x0C@TASKCONS		260.000us	260.000us	0.000%
\OSSetInterruptMask+0x0C@TASKCONS		240.250us	240.250us	0.004%
\OSSetInterruptMask+0x0C@TASKCONS		120.745us	120.745us	0.001%
\OSSetInterruptMask+0x0C@TASKCONS		93.495us	93.495us	0.003%
ple\samplesr\PreTaskHook@TASKCONS		0.000	0.000	0.000%
(root)@TASKPROD		85.344ms	85.344ms	0.690%
smsg\OSSendMessage+0x13F@TASKPROD		68.797ms	68.797ms	0.610%
\OSSetInterruptMask+0x0C@TASKPROD		54.164ms	54.164ms	0.012%
smsg\OSSignalMessage+0x47@TASKPROD		53.860ms	53.860ms	0.011%
ChangeTaskStateVoid+0xB5@TASKPROD		53.578ms	53.578ms	0.013%
\OSSetInterruptMask+0x0C@TASKPROD		53.252ms	53.252ms	0.001%
le\smgs\OSMsgUnLock+0x12@TASKPROD		53.226ms	53.226ms	0.006%
le\samplesr\PostTaskHook@TASKPROD		0.000	0.000	0.000%
stest\OSOrtRunningTaskId@TASKPROD		52.833ms	26.540ms	0.012%
\OSSetInterruptMask+0x0C@TASKPROD		52.790ms	52.790ms	0.001%
\OSSetInterruptMask+0x0C@TASKPROD		52.746ms	52.746ms	0.003%
\OSSetInterruptMask+0x0C@TASKPROD		52.651ms	52.651ms	0.002%
\OSSetInterruptMask+0x0C@TASKPROD		52.588ms	52.588ms	0.000%

Statistics on function hierarchy, process related

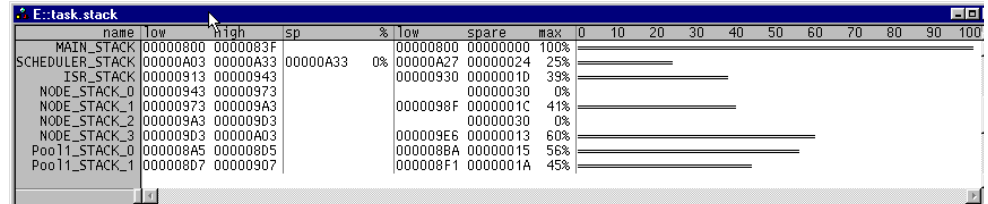
record	func	ti.fore	address	cycle	d.1
-011550		1.000us	P:0098EC	rd-word	d.1
-011549		43.500us	P:0098EE	rd-word	d.1
-011548		1.000us	P:009504	rd-word	
-011547		1.000us	P:009506	rd-word	
-011546	OSSetInterruptMask+0	0.250us	P:009508	rd-word	
-011545		0.250us	D:0009EF	rd-word	d.1
-011544		40.500us	A0:00269C	rd-byte	
-011543		1.000us	P:009504	rd-word	
-011542		1.000us	P:009506	rd-word	
-011541	OSSetInterruptMask+0x	0.250us	P:009508	rd-word	
-011540		0.250us	D:0009EF	rd-word	d.1
-011539		64.000us	A0:00269C	rd-byte	
-011538		1.000us	P:00801A	rd-word	d.1
-011537		1.000us	P:00801C	rd-word	
-011536	[PostTaskHook	0.250us	P:00801E	rd-word	d.1
-011535		0.250us	D:0009E6	wr-word	
-011534		22.500us	D:0009E6	rd-word	
--- TASK = TASKRCV ---					
-011533		10.250us	D:000AAC	wr-byte	
-011532		1.000us	P:008018	rd-word	
-011531		1.000us	P:00801A	rd-word	d.1
-011530		0.250us	P:00801C	rd-word	
-011529	[PreTaskHook	0.250us	D:0009E6	wr-word	d.1
-011528		0.250us	D:0009E6	rd-word	d.1

Analyzer listing, function call hierarchy and process switches

Task Stack Coverage

In real time systems it is quite important to know, how much stack space each task consumes. For this purpose

a special window shows the current and the maximum usage of each separate task.



Process stack coverage window

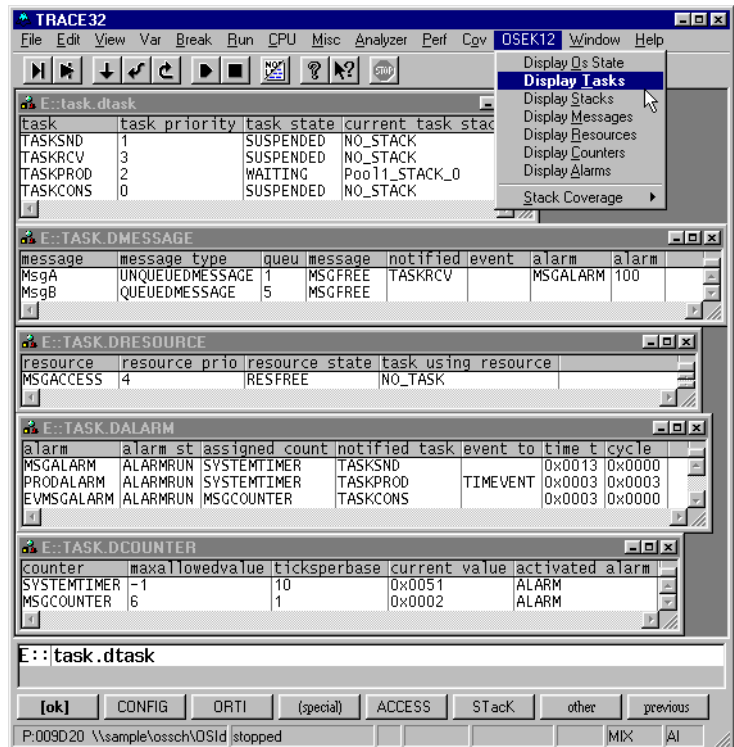
PRACTICE functions for OS data

The support includes extended PRACTICE functions for process specific data. E.g. the function "TASK.CONFIG(magic)" returns the address of the so called magic value.

Motorola OSEK related pull-down menu

Because the menu bar of the TRACE32 user interface can be fully customized, you can create a new pull down menu, including operating sys-

tem specific commands. We deliver OSEK support with an example for such specific menus, which provides fast access to the OSEK features.



TRACE32 with OSEK menu

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