



μClinux

RTOS Debugger for uClinux

ARM
Blackfin
ColdFire
MicroBlaze
MIPS
NIOS-II
68K

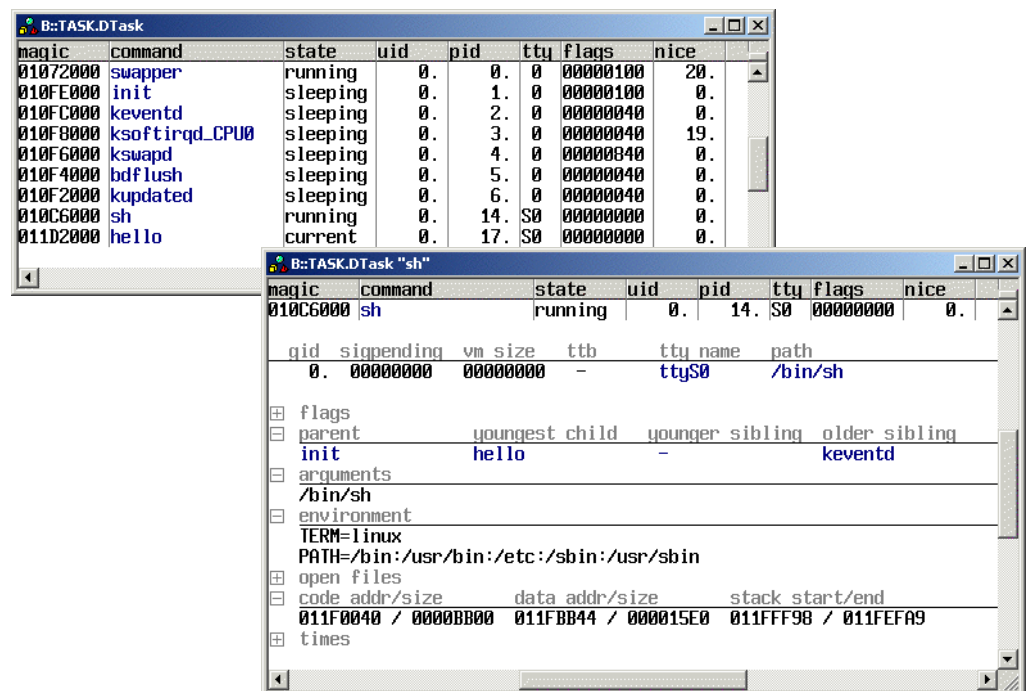
- Terminal Emulation for printf() Outputs and Console Driver
- Real Time, Non-Intrusive Display of uClinux System Resources
- Debugging uClinux Kernel, Drivers and Processes
- uClinux Specific Display of Trace Listing
- Statistic Evaluation and Graphic Display of Task Run Times
- Task Related Evaluation of Function Run Times
- Statistic Evaluation and Graphic Display of Task States
- Task Stack Coverage
- PRACTICE functions for OS data
- uClinux Related Pull-Down Menu

The TRACE32 System includes a configurable multitask debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the uClinux kernel. The uClinux awareness provides easy access to process lists and process information, generates performance analysis data on tasks or assists you in debugging uClinux processes.

Real Time, Non-Intrusive Display of uCLinux System Resources

The TRACE32 multitask debugger for uCLinux provides display functions to show the system resources of uCLinux. The task can be displayed and inspected, and the processes are shown similar to the shell's "ps" command. This functionality is still available, even if the system's "ps"

application is not available in your uCLinux image. 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.



Task list window and detailed window of one specific task

pid	ppid	uid	tty	flags	time	nice	count	state	command
0.	0.	0.	-	0100	00001A3C	20.	-100.	running	[swapper]
1.	0.	0.	-	0100	00000000	0.	9.	sleeping	init
2.	1.	0.	-	0040	00000000	0.	9.	sleeping	[keventd]
3.	0.	0.	-	0040	00000000	19.	1.	sleeping	[ksoftirqd_CPU0]
4.	0.	0.	-	0040	00000000	0.	9.	sleeping	[kswapd]
5.	0.	0.	-	0040	00000000	0.	7.	sleeping	[bdflush]
6.	0.	0.	-	0040	00000000	0.	7.	sleeping	[kupdated]
14.	1.	0.	ttyS0	0000	00000000	0.	4.	running	/bin/sh
17.	14.	0.	ttyS0	0000	00000000	0.	5.	running	hello

"ps"-like process list window

uCLinux Specific Display of Trace Listing

The data recorded in the trace buffer can be displayed and interpreted specific to the operating system. The task

switches are displayed symbolically, either exclusively or in addition to other information.

```

B:TRace.List List.TASK address cycle d.l symbol List.Mix
performance address cycle d.l symbol
--- TASK = 011D2000 hello
-0000070300 D:01074040 wr-long 011D2000 \\image\sched\aligned_data
621 tsk->cpus_runnable = 10L << cpu;
| mov r3,#0x1
-0000070299 R:0100E460 fetch E1A03413 \\image\sched\schedule+0x234
-0000070298 R:0100E464 fetch E5863034 \\image\sched\schedule+0x238

#define task_has_cpu(tsk) ((tsk)->cpus_runnable != ~0UL)

static inline void task_set_cpu(struct task_struct *tsk, unsi
620 {
        tsk->processor = cpu;
        | str r4,r6,#0x301
-0000070297 D:011D2030 wr-long 00000000 \\hello\Global\_ebss+0x8840
        | mov r3,r3,lsl r4
-0000070296 R:0100E468 fetch E10F2000 \\image\sched\schedule+0x23C
-0000070295 R:0100E46C fetch E3C22000 \\image\sched\schedule+0x240
        | str r3,r6,#0x341
-0000070294 D:011D2034 wr-long 00000001 \\hello\Global\_ebss+0x8844
        task_set_cpu(next, this_cpu);
642 spin_unlock_irq(&runqueue_lock);

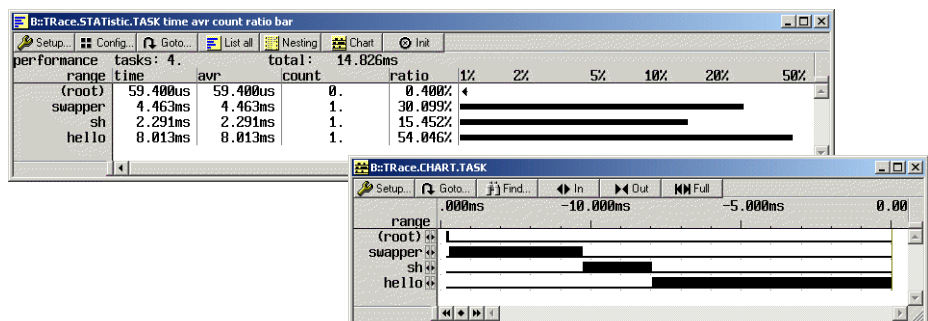
```

Trace listing, task switch (access at aligned_data), memory accesses, assembler and HLL information

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.

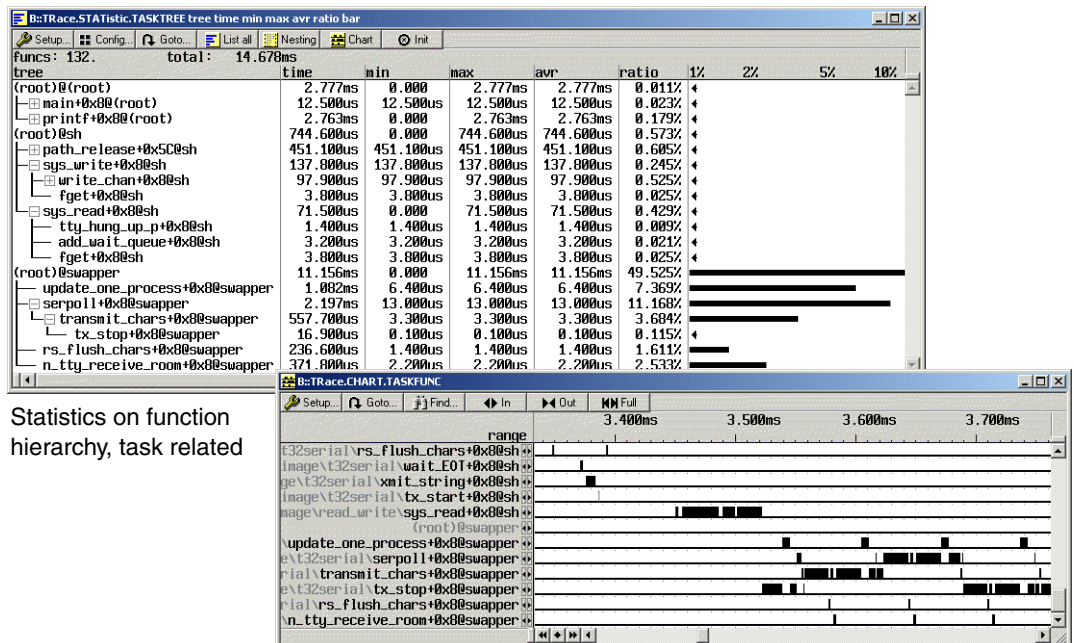


Statistics and flow of tasks

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.



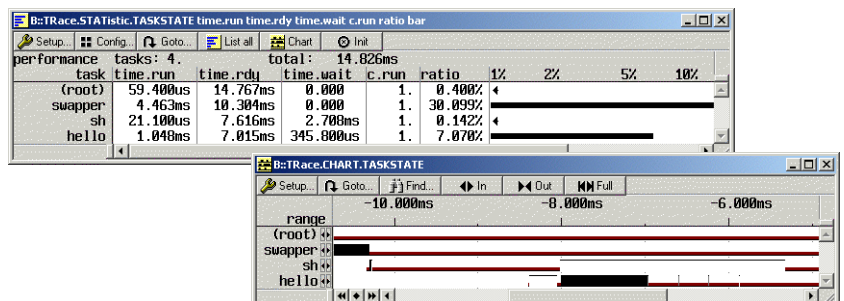
Statistics on function hierarchy, task related

Flow of functions, related to the calling tasks

Statistic Evaluation and Graphic Display of Task States

These tabular and graphical analyses of the status of tasks show the various states (i.e. running, ready, waiting, suspended and undefined) and times each

task spent in each state. A graphical view of the data can help to highlight prioritisation problems, critical paths etc.



Statistics and flow of task states

Debugging uCLinux Kernel, Drivers and Processes

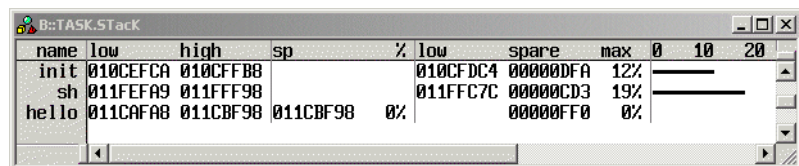
Due to the fact, that TRACE32 is a hardware debugging tool, you are able to debug anything you want, including bootstrap code, initialization phase, interrupt routines, drivers, kernel, etc. Additionally, TRACE32 allows you to debug uCLinux applications (pro-

cesses), too. TRACE32 is capable of loading several debug files and relocate them individually, which is necessary to provide application debugging. The uCLinux awareness assists you in the application debugging phase.

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.



name	low	high	sp	%	low	spare	max	0	10	20
init	010CEFC4	010CFFB8			010CFDC4	00000DFA	12%			
sh	011FEFA9	011FFF98			011FFC7C	00000CD3	19%			
hello	011CAFAB	011CBF98	011CBF98	0%		00000FF0	0%			

Task stack coverage window

PRACTICE functions for OS data.

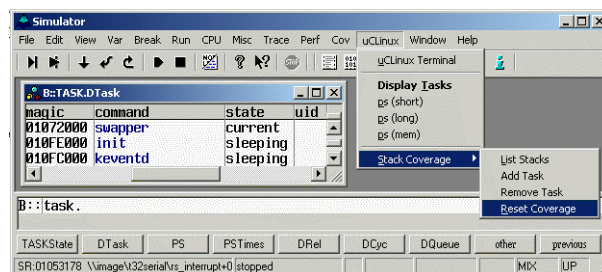
The support includes extended PRACTICE functions for uCLinux specific data. E.g. the function "TASK.PROC.

CODEADDR("hello") returns the start addressid of the code segment of the specified process.

uCLinux 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 uCLinux support with an example for such specific menus, which provides fast access to the uCLinux features.



TRACE32 with uCLinux menu

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