



RTOS Debugger for LynxOS

PowerPC

- Real Time, non-intrusive Display of LynxOS System Resources
- Kernel and/or Application Debugging
- LynxOS specific Display of Trace Listing
- Statistic Evaluation and Graphic Display of Thread Run Times
- Thread related Evaluation of Function Run Times
- Statistic Evaluation and Graphic Display of Thread States
- Thread Stack Coverage
- PRACTICE Functions for OS Data
- LynxOS related Pull-Down Menu

The TRACE32 System includes a configurable multithread debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the LynxOS Real Time Kernel from LynuxWorks. In close cooperation with LynuxWorks, we built a high sophisticated LynxOS awareness, which enables you to do a most effective debugging with the TRACE32 systems on targets running LynxOS.

RTOS Awareness on TRACE32 for LynxOS

Real Time, Non-Intrusive Display of LynxOS System Resources

The TRACE32 RTOS debugger for LynxOS provides display functions, closely mirroring the command set of SKDB. Processes and threads can be displayed and inspected. In addition, by using the emulators dual-port memory (if available), 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. Moreover, these functions are still available, when the SKDB is not linked into your software.

The image shows two windows from the TRACE32 debugger. The top window, titled 'B::TASK.Process', displays a table of processes. The bottom window, titled 'B::TASK.Thread', displays a table of threads.

Process list window

magic	pid	ppid	prio	spaceid	signals	mask	sem	state	name
A0122A00	0.	0.	0.	0000	00000000	FFFFFFFF	00000000	ready	nullpr
A0122C1C	1.	1.	16.	0001	00000000	00000000	A0122C30	waiting	/init
A0122DB8	2.	1.	17.	0002	00000000	00000000	00000000	current	/hello_world

Thread list window

magic	tid	pid	prio	stklen	signals	mask	sem	state	name
A0107000	0.	0.	0.	0.	00000000	FFFFFFFF	00000000	ready	nullpr
A01073B0	1.	1.	16.	0.	00000000	00000000	A0122C30	waiting	/init
A0107760	2.	0.	17.	4096.	00000000	00000000	A0137CD4	waiting	TX
A0107B10	3.	0.	17.	4096.	00000000	00000000	A013840C	waiting	RX
A0107EC0	4.	2.	17.	0.	00000000	00000000	00000000	current	/hello_world

Thread list window

Kernel and/or Application Debugging

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. TRACE32 includes a complete MMU support, providing mechanisms to inspect the target memory using virtual addresses or physical addresses and to show the translation tables

Additionally, TRACE32 has a special MMU support for several address spaces, which allows you to debug several LynxOS applications (processes) at once. An internal logic provides you with an easy access to all process memory spaces. A special process detection mechanism allows to halt the application exactly on the entry point of a process, allowing you to debug your process right from main().

The image shows a window titled 'B::TASK.Watch.View "hello_world"'. It contains a table with columns for process, spaceid, state, and entry. There are also buttons for 'ENable', 'DISable', 'ENableBP', and 'DISableBP'.

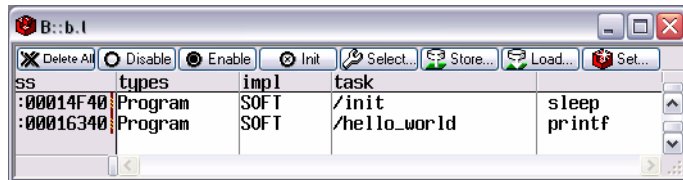
process	spaceid	state	entry
hello_world	0002	loaded	main
init	0001	no symbols	--
sh	--	no process	--

Process watch list

Thread Related Breakpoints

Any breakpoint set in the TRACE32 debugger can be set dependent to a specific thread. This means, that the

breakpoint will then only halt, if hit by the specified thread. This allows thread related debugging even in shared code.



Breakpoint list with thread dependent breakpoints

Thread Stack Coverage

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

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

name	low	high	sp	%	low	spare	max	0	10	20	30	40
/init			9FFFEF24									
TX	A0169B20	A016AB20	A016AAE0	1%	A016A470	00000940	41%	[Progress bar]				
RX	A016AB20	A016BB20	A016BAE0	1%	A016AC13	000000EB	94%	[Progress bar]				
/hello_world			9FFFEF24									

Thread stack coverage window

Dynamic Thread Performance Measurement

While LynxOS is running, TRACE32 is capable of recurrently evaluating the current running thread and collecting the results. The percentage, each thread consumes of the system, is then

displayed graphically and updated permanently. The longer time you let the measurement run, the more exact are the results. This feature is available even without any hardware trace.

name	runtime:	ratio	1%	2%
runtime:	41.541%			
ratio		1%	2%	
nullpr	97.849%			
/init	0.000%			
TX	0.000%			
RX	0.000%			
/hello_world	2.151%			

Performance measurement list

LynxOS Specific Display of Trace Listing

The data recorded in the real time trace buffer (if available) can be displayed and interpreted specific to the operating system. The thread switches are

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

Statistic Evaluation and Graphic Display of Thread Run Times

Out of the real time trace buffer (if available), the analyzer can calculate statistic tables of thread run times and thread switches. A graphical diagram

shows which thread was active at a specific time, giving a clear view of the behaviour of the system.

Thread Related Evaluation of Function Run Times

The statistic and graphic evaluation of function calls and function run times (if available) can be done dependent to the actual running thread. This is nec-

essary, if different threads call one single function at the same time, or if a thread switch occurs in between the function.

Statistic Evaluation and Graphic Display of Thread States

If covered by the real time trace, these tabular and graphical analyses of the status of threads show the various states (i.e. running, ready, waiting, suspended and undefined) and the times

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

PRACTICE functions for OS data

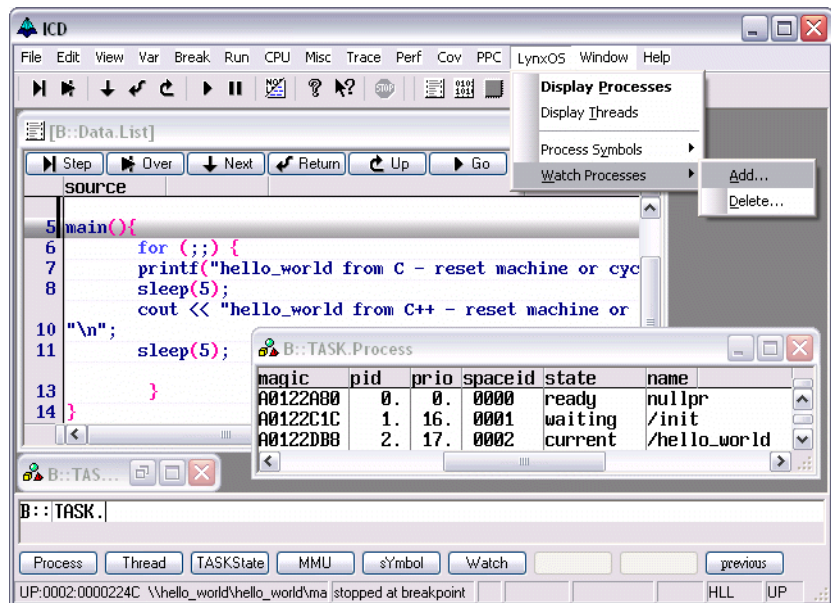
The support includes extended PRACTICE functions for LynxOS specific data, to be used in setup and test scripts. E.g. the function

“task.proc.space (“hello_world”)” returns an id specifying the MMU memory area that this process uses.

LynxOS 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 system specific commands. We deliver

LynxOS support with an example for such specific menues, which provides fast and easy access to the LynxOS awareness features.



TRACE32 with source window, process list and opened LynxOS menu

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