

CHORUSOS™ REAL-TIME OPERATING SYSTEM

RTOS Debugger for Chorus

68360

ARM7

PowerPC

X86

- Improved support for the Chorus Kernel debugger KDB
- Real time, non-intrusive display of Chorus system resources
- Chorus specific display of analyzer 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
- Chorus 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 Chorus/ClassiX Real Time Kernel from Chorus Systems.

Multitask Debugging on TRACE32 with ChorusOS

Improved support for the ChorusOS Kernel Debugger KDB

ChorusOS provides a kernel debugger called KDB, which runs on the target. TRACE32 provides an interface to this debugger. I.e. you can control the debugger and view its outputs inside the TRACE32 surface. The communication is set up via the emulator's dual

port memory, substituting the serial interface routines of KDB. This technique provides high speed, transparent communication with the target without the use of any serial hardware or other target resources.

```

E::term e:K_T32OUT e:K_T32IN
Local Site Number 1, Incarnation Number 1
Kernel initialization done
Kernel size: text 161280 + data 11100 + bss 820496 = 992876
Kernel modules : CORE SCHED_FIFO SEM MEM_FLM KDB TICK KBIM MON LAP LAP_BIND MUTE
X TIMEOUT
Boot actors set-up done

Type <return> to proceed with boot actors execution
assertion "count" failed: file "main.C", line 801
entering debugger via callDebug trap

--- Enter Debugger (internal)
--- Thread 1 (Idle) Actor b0001 1 (kern), Int Level 0
439362: kern:callDebug+0x2 rts

kdbg> IA
CHORUS/ClassiX r3.0.2 Site 1 Time 0
ACTOR-UI      KEY      LID  TYPE  STATUS  TH#  NAME
000b0001 00000001 00000001 00000001 0001 SUP  STARTED 001 kern
000b0001 00000002 00000002 00000003 0002 SUP  STARTED 000 N_syn
000b0001 00000003 00000003 00000000 0003 SUP  STARTED 000 PD
000b0001 00000004 00000004 00000004 0004 SUP  STARTED 000 AM
000b0001 00000005 00000005 00000001 0005 SUP  STARTED 001 C_INIT
kdbg>

```

Terminal window to the ChorusOS kernel debugger KDB

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. Additionally, TRACE32 has a special

MMU support, which allows you to debug ChorusOS applications (actors), too. An internal logic provides you with an easy access to all actor memory spaces.

Real time, non-intrusive display of ChorusOS system resources

The TRACE32 multitask debugger for ChorusOS provides display functions, closely mirroring the command set of KDB. The system resources actors, threads, ports 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. Moreover, these functions are still available, when the KDB is not linked to your software.

The image shows two screenshots from the TRACE32 debugger. The top screenshot is the 'Actor list' window for 'E::task.la', displaying a table of system actors. The bottom screenshot is the 'Detailed actor window' for 'E::TASK.LA 1ED5C', showing various system details for a specific actor.

magic	actor-ui	key	lid	type	status	th#	name	
0001EEEC	000B0000	00000001	00000001	00000001	1.	SUP	STARTED 3.	kern
0001EE24	000B0001	00000001	00000002	00000002	2.	SUP	STARTED 0.	PD
0001ED5C	000B0001	00000002	00000003	00000003	3.	SUP	STARTED 1.	KT_prs_s
0001EC94	000B0001	00000003	00000004	00000004	4.	SUP	STARTED 1.	KT_ebd_s

magic	actor-ui	key	lid	type	status	th#	name	
0001ED5C	000B0001	00000002	00000003	00000003	3.	SUP	STARTED 1.	KT_prs_s

SAVED MESSAGES: 0. msgs

thread-ctx lid name

00012B04	6.	main
----------	----	------

port-ctx lid enabled msg#

00011ED0	def	no	0.
00011DBC	1.	no	0.
00011E18	0.	yes	0.

rgn: start size offset alloc options

00019000	00005000	00000000	00005000	EX SU NS
000B7000	0000F000	00000000	0000F000	WR SU NS

Actor list window and detailed window of one specific actor

The image shows the 'Thread list' window for 'E::task.lt', displaying a table of threads with their context IDs, lid, priority, scheduling parameters, status, name, and owner.

ctx	lid	prio	sc	ms	pn	status	name	owner
00012EEC	1.	256.	00	- 01	- 00	ready		kern
00012E24	2.	100.	00	- 01	- 00	waiting	IpcDeferredHand	kern
00012D5C	3.	94.	00	- 01	- 00	waiting	IpcPortHandler	kern
00012B04	6.	10.	00	- 01	- 00	waiting	main	KT_prs_s
00012A3C	7.	10.	00	- 01	- 00	running	main	KT_ebd_s

Thread list window

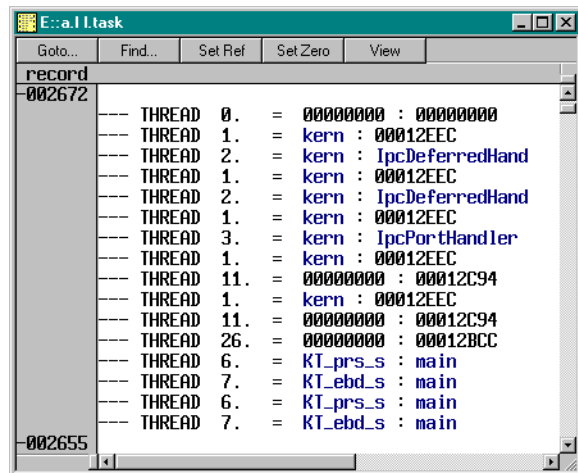
The image shows the 'Port list' window for 'E::TASK.LP', displaying a table of ports with their context IDs, port-uid, lid, enabled status, message count, and actor.

ctx	port-uid	lid	enabled	msg#	actor
00011F88	000B0000	00000001	def no	0.	kern
00011F2C	000B0001	00000001	def no	0.	PD
00011ED0	000B0001	00000002	def no	0.	KT_prs_s
00011E74	000B0001	00000003	def no	0.	KT_ebd_s
00011E18	000A0001	00000001	0. yes	0.	KT_prs_s
00011DBC	000A0001	00000002	1. yes	0.	KT_prs_s

Port list window

ChorusOS specific display of analyzer listing

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

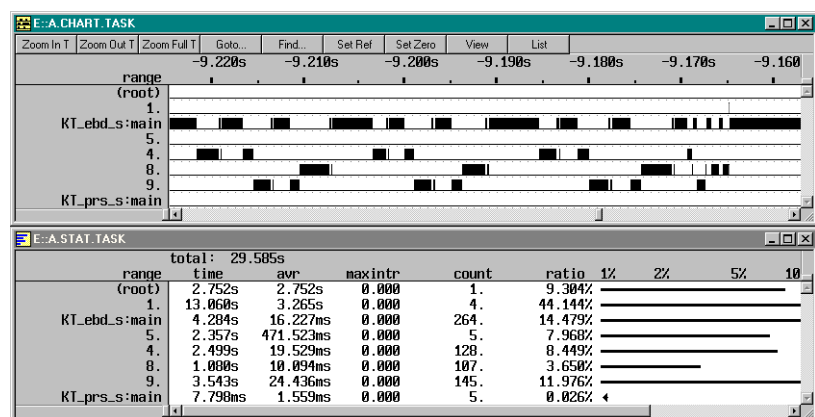


Analyzer listing, display of thread switches

Statistic evaluation and graphic display of thread run times

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.



Statistics and flow of threads

Thread related evaluation of function run times

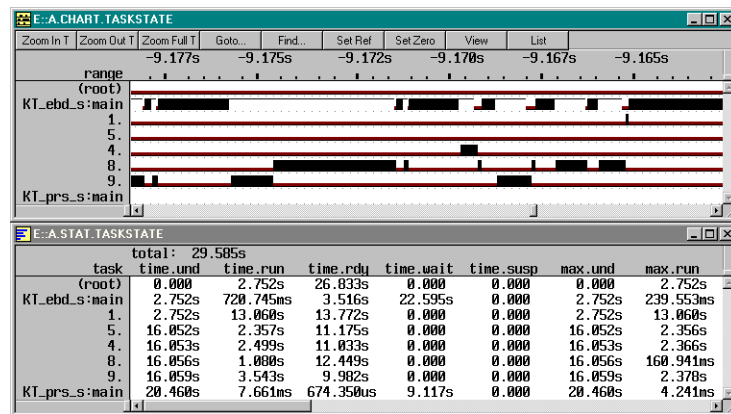
The statistic and graphic evaluation of function calls and function run times can be done dependant to the actual running thread. This is necessary, if dif-

ferent 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

These tabular and graphical analyses of the status of threads show the various states (i.e. running, ready, waiting, suspended and undefined) and times each thread spent in each state. A

graphical view of the data can help to highlight prioritisation problems, critical paths etc.

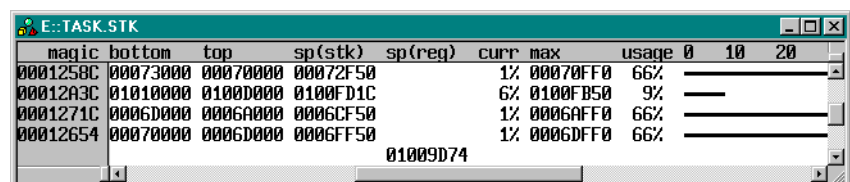


Statistics and flow of thread states

Thread Stack Coverage

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

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



Thread stack coverage window

PRACTICE functions for OS data

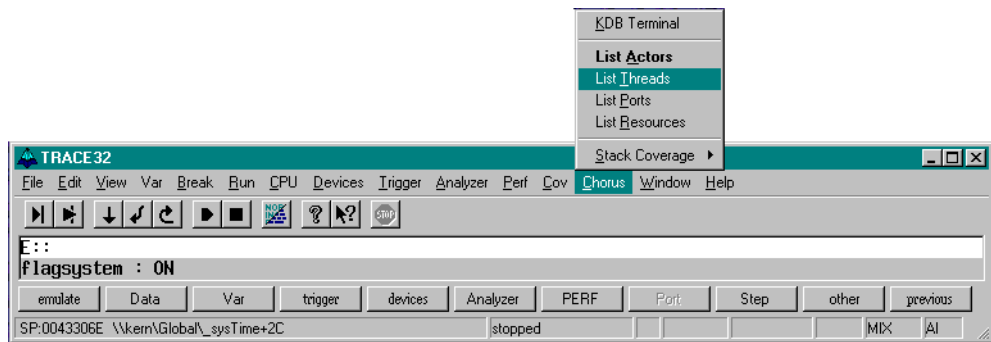
The support includes extended PRACTICE functions for process specific data. E.g. the function "task.actor.start

("myActor_s", 1)" returns the code address of the supervisor actor "myActor".

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



TRACE32 with ChorusOS menu

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