eCos

Embedded Configurable Operating System

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Features

- Open Source
- Royalty Free
- Highly Configurable
- Very Portable
- Real Time
- Small Footprint
- Standards
- Networking

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History

- Cygnus Solutions
  - 1997 Project started
  - 1998 First release
- Red Hat
  - 1999 Cygnus acquired by Red Hat
  - 2000 RedBoot added
  - 2002 Red Hat lay off eCos team
- eCosCentric
  - 2002 eCos team form eCosCentric

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Licensing

- RHEPL
  - Red Hat eCos Public License
  - Allowed proprietary code to be linked with eCos
  - Required all changes to be returned to Red Hat
- GPL + exception
  - Standard GPL
  - Exception allows non-GPL code to be linked with eCos
  - No change requirement
  - No “plain” GPL code allowed in eCos

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Configuration

- Packages
  - Separate package for each subsystem
  - Independently selectable
  - Self describing
- Component Description Language
  - Describes features provided by package
  - Describes features required by package
- Inference Engine
  - Automatic resolution of constraints

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Configuration Tools

- GUI Configuration Tool
  - wxWindows based
  - Linux and Windows NT/2000/XP
  - Includes build and test systems
  - Large and small scale configuration
- Command line Tool
  - Linux and Windows (Cygwin)
  - Automation
  - Large scale configuration only
  - Small scale configuration by editing save file

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ConfigTool

Example Session

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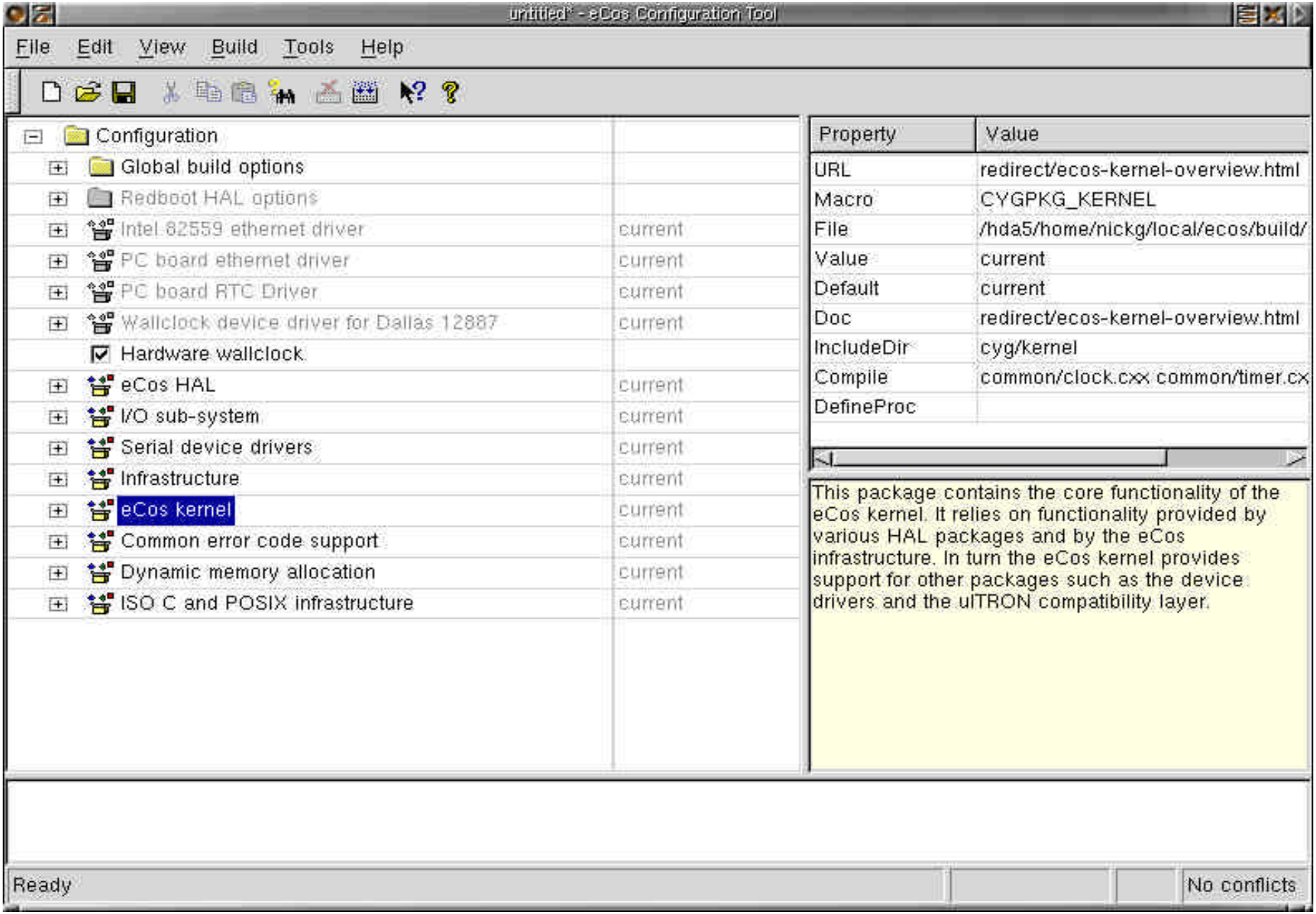

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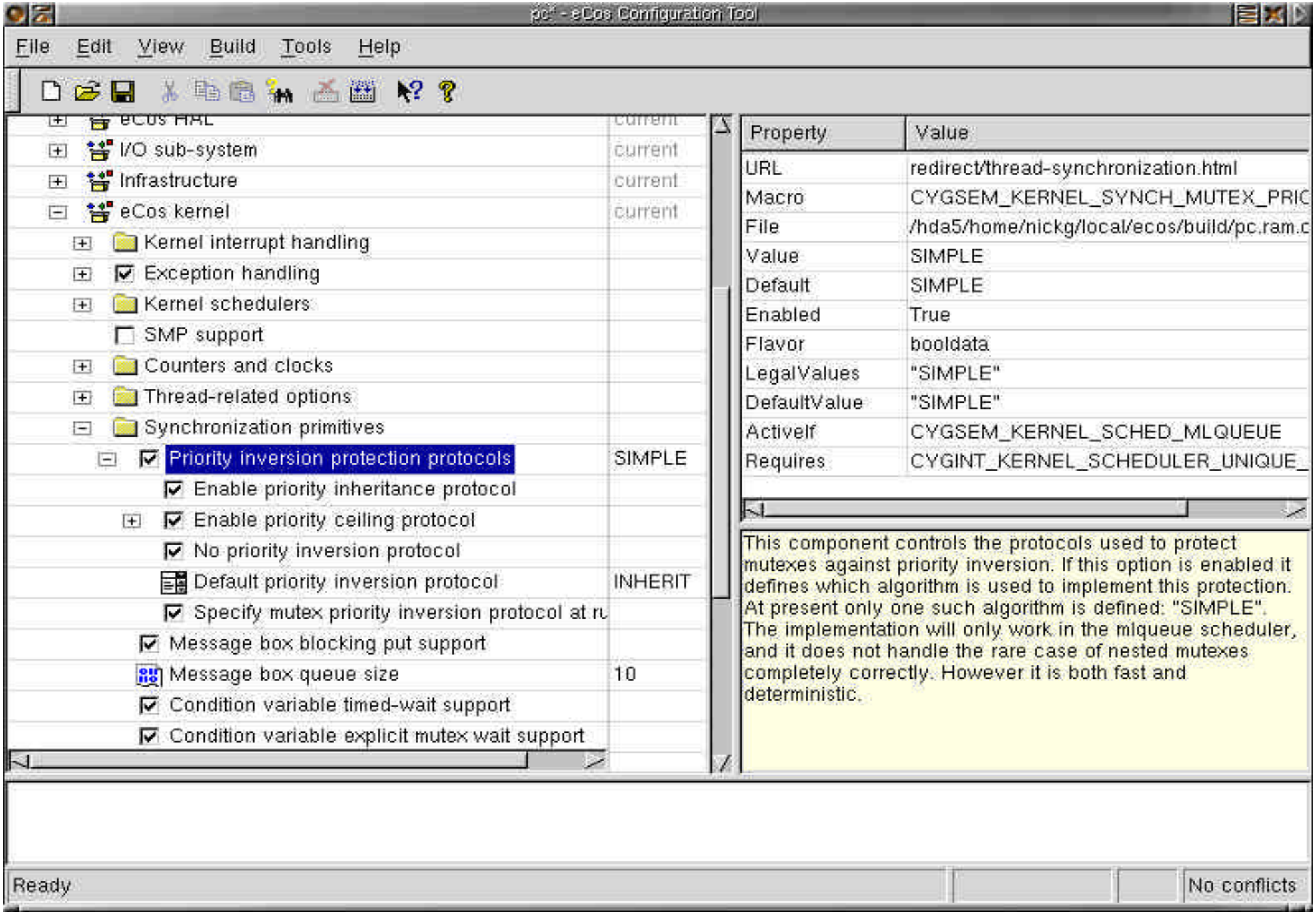

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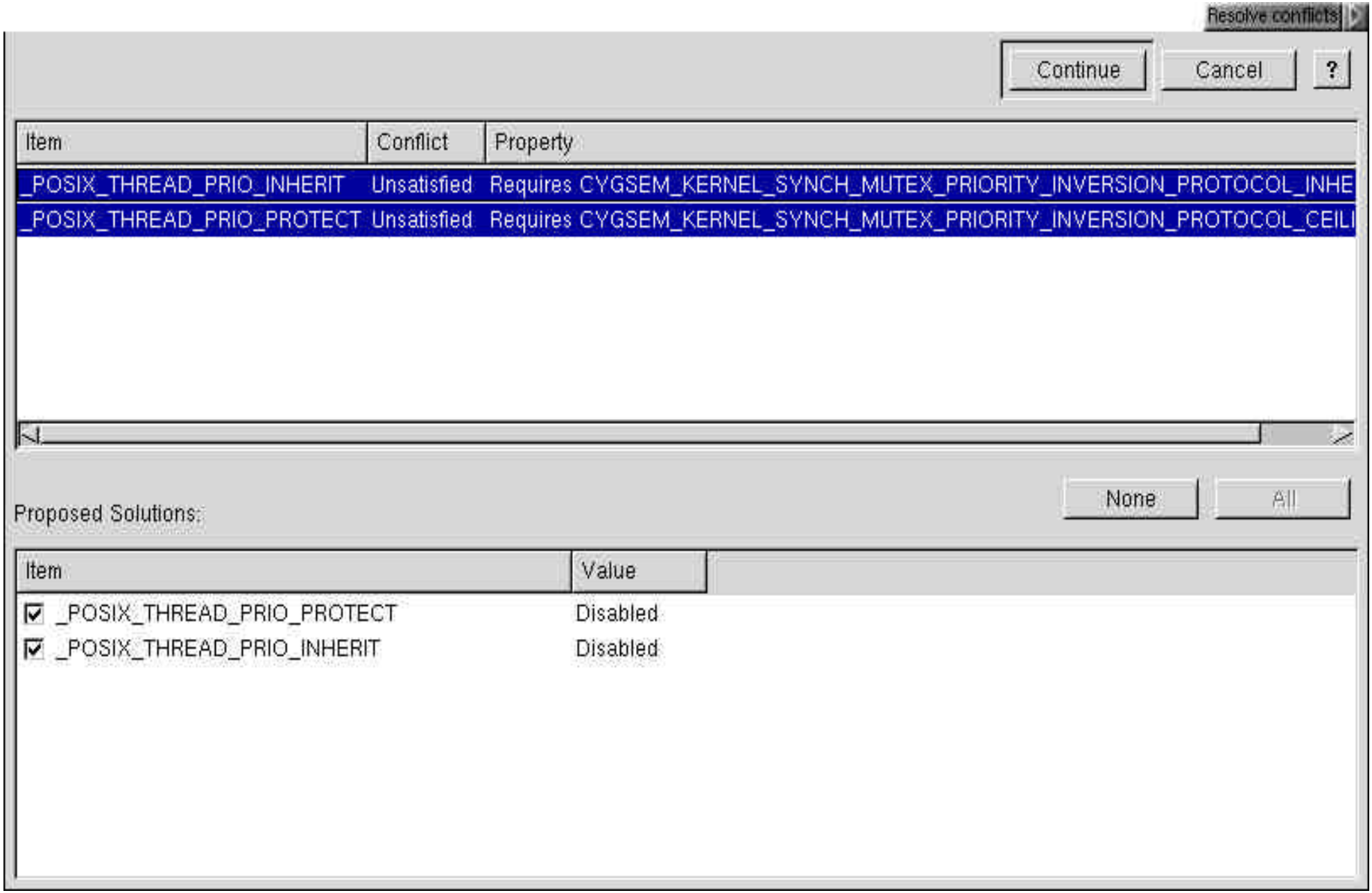

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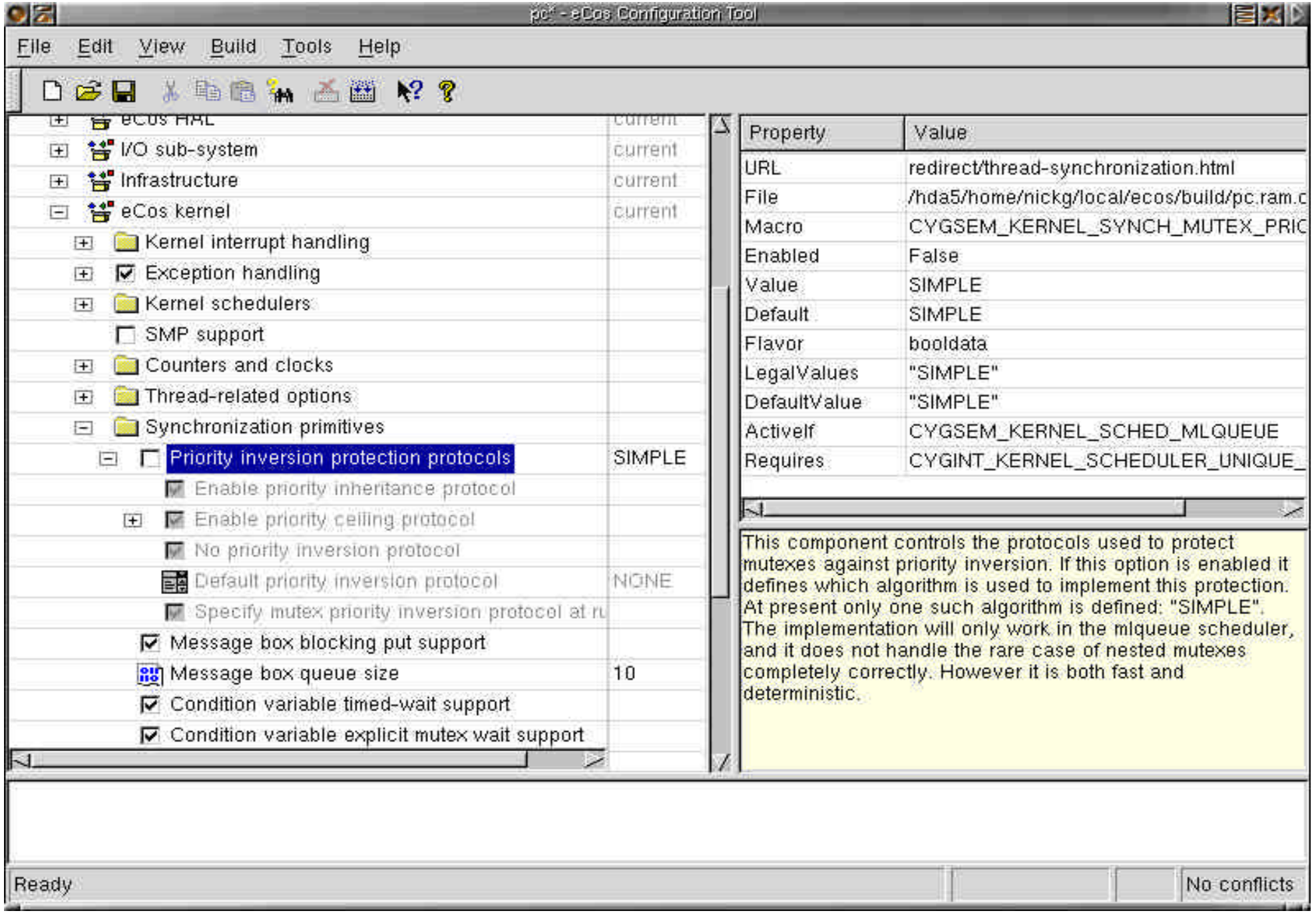

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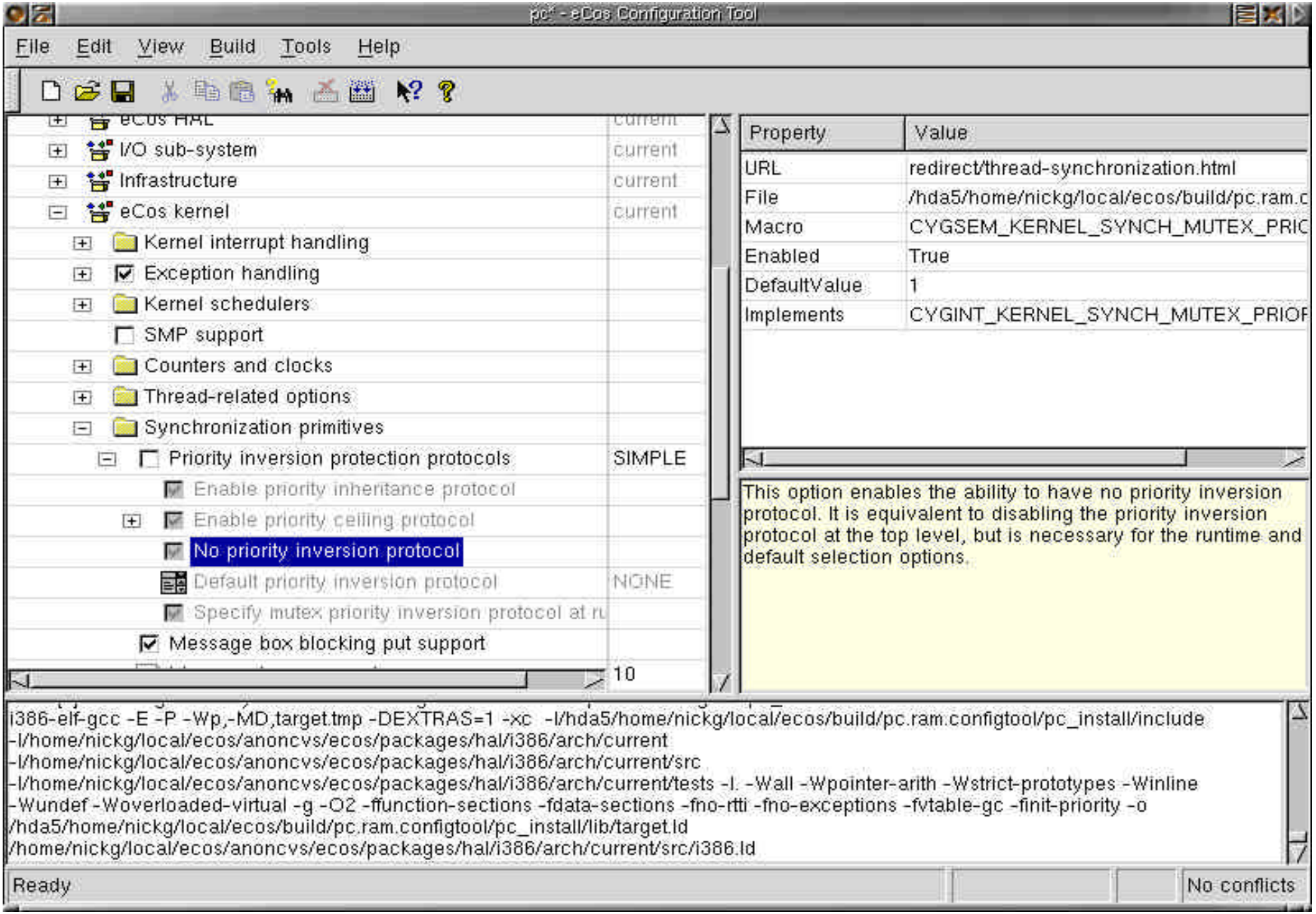

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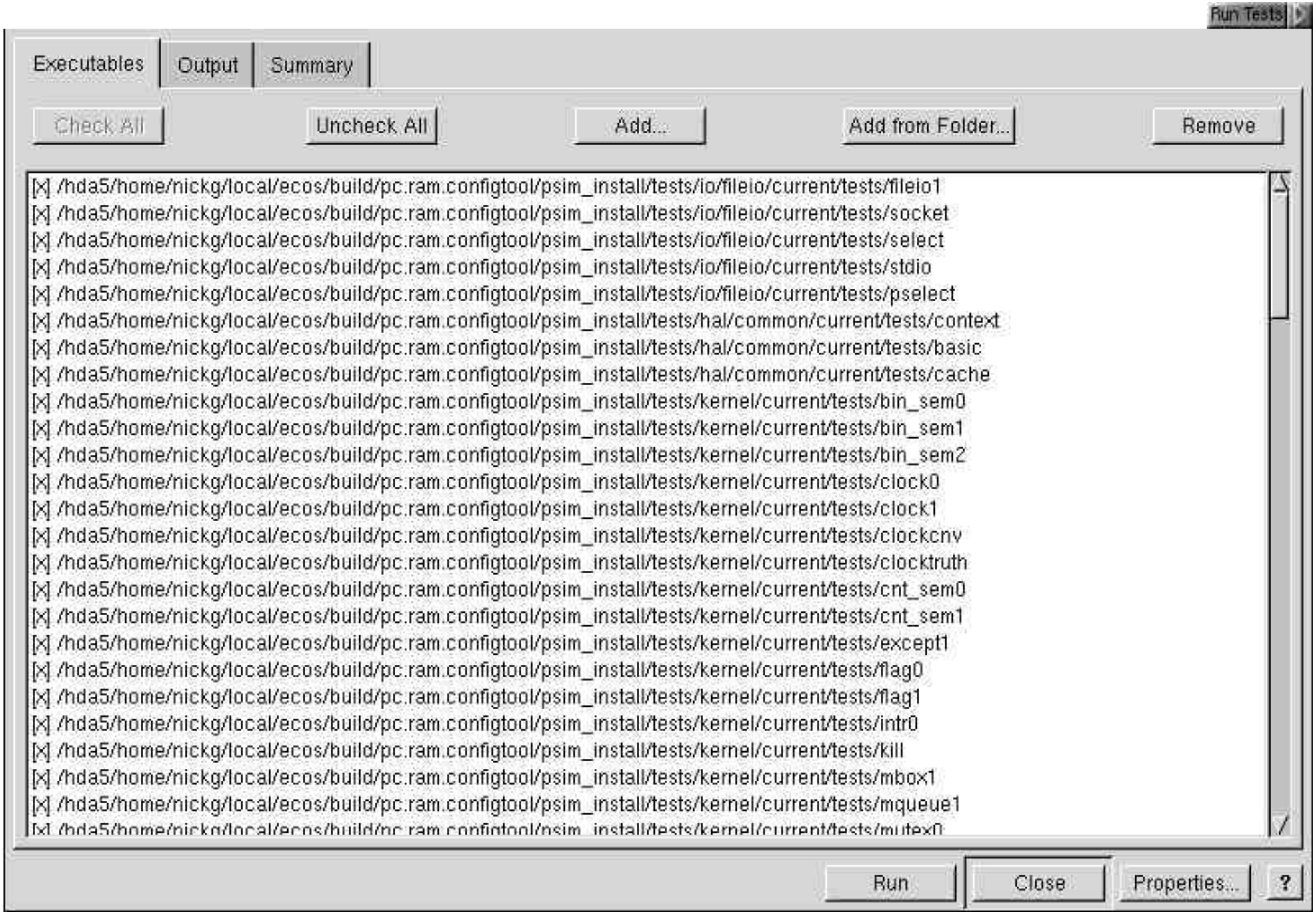

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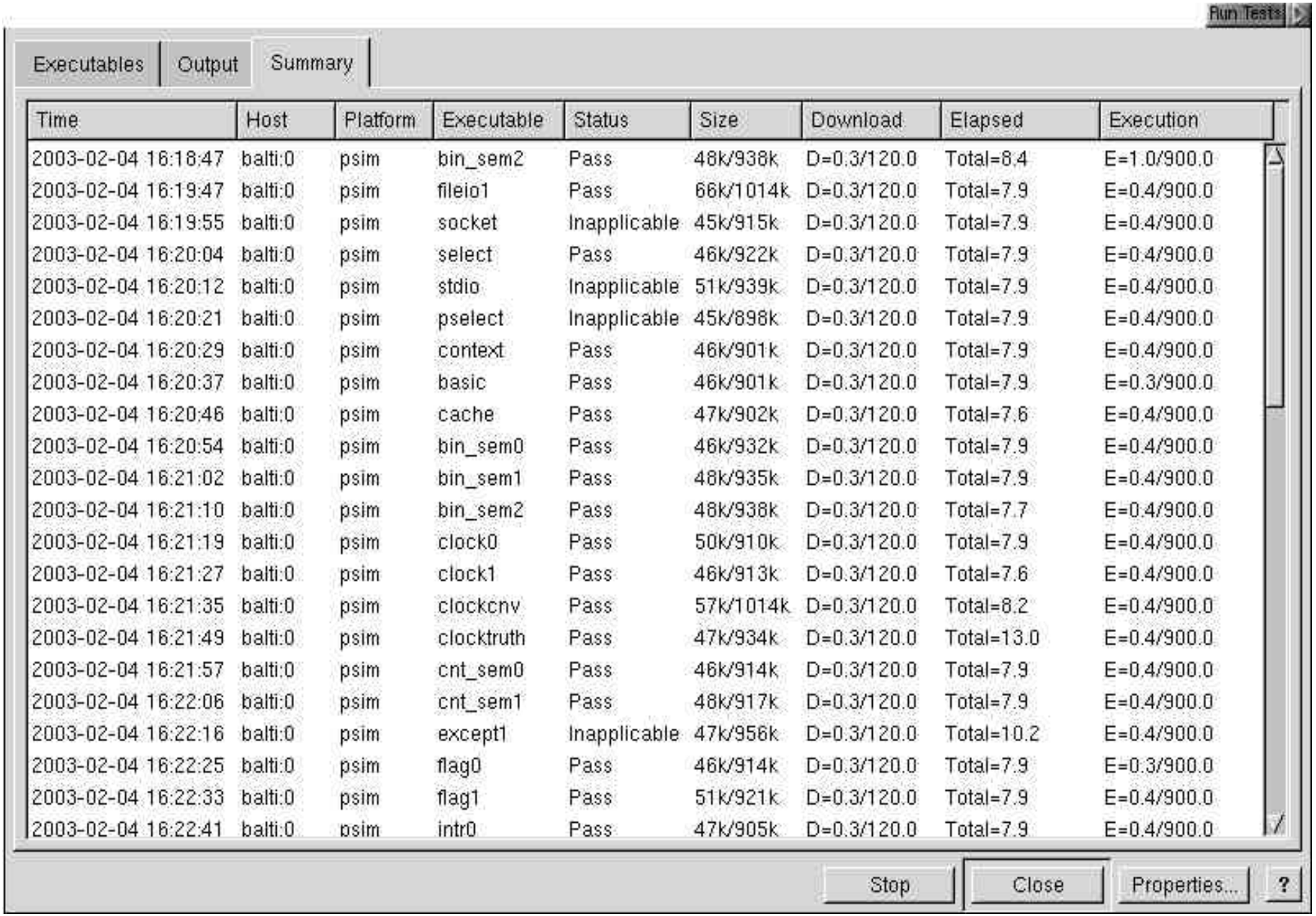

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Platforms

- Twelve Architectures
  - ARM, IA32, MIPS, PowerPC, SPARC, M68k/Coldfire, H8/300H, SuperH, V850, FRV, AM3x, Calmrisc
- Seventy+ Platforms
  - Development boards, target devices etc.
- Simulators
  - ISA simulators for all architectures
  - Platform simulators for some
- Linux Synthetic Target

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Hardware Abstraction Layer

- Responsibilities
  - Startup, Interrupts, Exceptions
  - Cache, MEMC, INTC, MMU, Timer, IO access
  - Context switch, Runtime services
- Multiple Packages
  - Architecture
  - Variant
  - Platform
  - Common and extension packages

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Kernel

- Schedulers, threads
- Mutexes, semaphores, flags, messages
- Real Time
- Implemented in C++
  - Manage configuration complexity
  - Initialization with static constructors
  - Internal API
- Native C API

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Devices

- Serial
  - 16550, 8250, QUICC, SMC, on-chip
- Ethernet
  - AMD, Cirrus Logic, Intel, Motorola, NS, SMSC
- Flash
  - AMD, ATMEL, Intel, Compact Flash
- Interconnects
  - PCI
  - USB slave
  - PCMCIA

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Networking

- Four TCP/IP Stacks!
  - OpenBSD, FreeBSD, LwIP, RedBoot
- Ethernet Drivers
  - Shared by all stacks
- Other Protocols
  - SNMP, TFTP, FTP, HTTP, BOOTP, DNS
- Future
  - PPP

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Filesystems

- Filesystem Infrastructure
  - POSIX compliant
  - Integrates BSD socket API
- Currently Supported
  - ROM filesystem + tools
  - RAM filesystem
  - JFFS2
- Future
  - VFAT, NFS client

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Standard APIs

- POSIX
  - 1003.1-1996 at present
  - 1003.1-2001 moving towards
  - 1003.13 Minimal Realtime System Profile
- µITRON
  - Version 3.02 Level S/E
- ANSI C
  - C-89 compatible C and math libraries
  - Some C-99 compatibility

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Tools

- GCC
  - Stand-alone ELF tools
  - Constructor priority order
  - Sections and garbage collection
- GDB
  - Command line and Insight
- Simulators
  - GDB
  - SID
  - Bochs

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RedBoot

- ROM Monitor
  - Kernel-less eCos application
- Program Loading
  - Serial - SRecords, X/Y modem
  - Ethernet – SRecords, TFTP
  - Flash
  - eCos, stand-alone, Linux (some platforms)
- GDB Remote Protocol
- Flash file system
- Exports services to applications

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Debugging

- GDB Remote Protocol
  - Supplied by RedBoot – serial and ethernet
  - Built into program
- Hardware
  - JTAG, BDM, ICE
- Trace Buffer
- Kernel Instrumentation
- diag_printf()

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Community

- sources.redhat.com/ecos
- Download latest version
- Anonymous CVS
- Snapshots
- Mailing lists

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Version 2.0

- Tested Stable Release
- Supported Platforms
  - Concentrate on popular targets: ARM, PowerPC, MIPS, IA32, SuperH.
- Tested tool chains
- Installation and Configuration

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