

OSS LICENSE FILE

1 ---- python

Refer to generic LICENSE: PSFv2

A. HISTORY OF THE SOFTWARE

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see <http://www.cwi.nl>) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see <http://www.cnri.reston.va.us>) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see <http://www.zope.com>). In 2001, the Python Software Foundation (PSF, see <http://www.python.org/psf/>) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

All Python releases are Open Source (see <http://www.opensource.org> for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

Footnotes:

- (1) GPL-compatible doesn't mean that we're distributing Python under the GPL. All Python licenses, unlike the GPL, let you distribute a modified version without making your changes open source. The GPL-compatible licenses make it possible to combine Python with other software that is released under the GPL; the others don't.
- (2) According to Richard Stallman, 1.6.1 is not GPL-compatible, because its license has a choice of law clause. According to CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1 is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's direction to make these releases possible.

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% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
<D.M.Pick@qmw.ac.uk> tells me that `uk' was long in use before ISO3166
This code implemented by Dag.Gruneau@elsa.preseco.comm.se
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Suggested by Rene Liebscher <R.Liebscher@gmx.de> to avoid a GCC 2.91.*
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IMAP4_SSL contributed by Tino Lange <Tino.Lange@isg.de> March 2002.
Vladimir Marangozov <Vladimir.Marangozov@imag.fr>
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new WIN32 sbrk, mmap, munmap, lock code from <Walter@GeNeSys-e.de>.
'To: <[smtp:dd47@mail.xxx.edu]_at_hmhq@hdq-mdml-imgout.companay.com>?n'
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GET/SETACL contributed by Anthony Baxter <anthony@interlink.com.au> April 2001.
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.. example based on the PyModules FAQ entry by Aaron Watters <arw@pythonpros.com>
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Matt Austern <austern@apple.com>
GET/SETQUOTA contributed by Andreas Zeidler <az@kreativkombinat.de> June 2002.
```

```

container['From'] = 'Barry <barry@digicool.com>'
Author: Barry Warsaw <barry@python.org>
Barry Warsaw <barry@zope.com>
'Cc: fooz@bat.com, bart@toof.com\n'
bbbddd.com (John X. Doe)
Benjamin Peterson <benjamin@python.org>")
Fast locking mechanism described by Benoit Schillings (benoit@be.com)
Peter Bergner <bergner@vnet.ibm.com>
<bernhard@csd.uwm.edu>).
.. moduleauthor:: Bill Janssen <bill.janssen@gmail.com>
Bill Tutt <billtut@microsoft.com>. Minor tweaks
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Brian Quinlan (brian@sweetapp.com).
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Brooks Moses <brooks.moses@codesourcery.com>
Based on a suggestion from bruce@hams.com, make a trivial change to
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(buhr@iquest.net)
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Cody A.W. Somerville <cody-somerville@ubuntu.com>
Pack bins using idea from colin@nyx10.cs.du.edu
Conrad Irwin <conrad.irwin@gmail.com>
conway@virginia.edu
('Cynthia Person', 'cperson@dom.ain'))
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container['To'] = 'Dingus Lovers <cravindogs@cravindogs.com>'
chenham <csit@axway.com>
Casey Marshall <csm@gnu.org>
This code implemented by cvale@netcom.com
msg['References'] = SPACE.join(['<%d@dom.ain>' % i for i in range(10)])
url = "http://a b:c d@python.org/"
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According to David Ascher <da@ski.org>, utime() should be done
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AIX*) # Courtesy of dbakker@arrayasolutions.com
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 Frank Everdij <f.p.x.everdij@tudelft.nl>
 Father Time <father.time@xcar.wooster.local>
 Drake <fdrake@acm.org> will probably be listening there.
 Fred Drake <fdrake@eric.cnri.reston.va.us>
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ASCII Clock by Howard Jones <ha.jones@ic.ac.uk>, 1994")
According to hannu@opensound.com, all three of the ioctl's that
Java_raw_api.c author: Hans-J. Boehm <hboehm@hpl.hp.com>
"Ian T. Henry" <henryi@oxy.edu>
Gerald Hewes <hewes@openmarket.com>.
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 To: postmaster@zinfandel.lacita.com
 Sender: ppp-admin@zzz.org
 eq(msg['from'], 'ppp-request@zzz.org')
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 GET/SETANNOTATION contributed by Tomas Lindroos <skitta@abo.fi> June 2005.
 Antoine Pitrou <solipsis@pitrou.net>,
 FROM_ = "From some.body@dummy.domain
 (250, "Somebody OverHere <somebody@here.my.org>")
 somebody@where.xx -- an Internet email address
 Stuart Shelton <srcshelton@gmail.com>
 - Sudhir Shenoy (ssheno@gol.com), Dec. 1995.
 Samuli Suominen <ssuominen@gentoo.org>
 Oliver Steele (steele@cs.brandeis.edu).
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 Copyright (c) 2008 Steven G. Johnson <stevenj@alum.mit.edu>
 'From: Anudder Persin <subuddy.else@dom.ain>'\n'
 SUGIOKA Toshinobu <sugioka@itonet.co.jp>
 (('emailAddress', 'support@cacert.org'),))
 support_team@domain.tld
 (taradino@softhome.net) -- translated from the original Optik
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 Randolph Chung <tausq@debian.org>
 Thanks to Tony E. Bennett <tbenett@nvidia.com> and others.
 Tom Christiansen tchrist@convex.com convex!tchrist
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 % From: Torbjorn Granlund <tege@matematik.su.se>
 msg['From'] = 'test@dom.ain'
 ¥tfor test@mems-exchange.org; Wed, 28 Aug 2002 -0400""
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 python-mode.el, Author: Tim Peters, tim_one@email.msn.com
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 Added the POP3_SSL class. Methods loosely based on IMAP_SSL. Hector Urtubia <urtubia@mrbook.org> Aug 2003
 Sender: usenet@convex.com (news access account)
 matching pattern, which will match with ``<user@host.com>`` as well as
 Ulrich Weigand <uweigand@de.ibm.com>
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2 ---- acl

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3 ---- apr

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```

From network_io/unix/inet_ntop.c, network_io/unix/inet_pton.c:

```
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From dso/aix/dso.c:

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From strings/apr_strnatcmp.c, include/apr_strings.h:

strnatcmp.c -- Perform 'natural order' comparisons of strings in C.
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```

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6 ---- base-passwd

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From Gerald Hewes <hewes@openmarket.com>.
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7 ---- bash

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```
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```

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```
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```

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```
-- authors of bash
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
<540D661D.50908@gmail.com>

gnu@prep.ai.mit.edu
<Ewan.Mellor@eu.citrix.com>
Fixes bug reported by Len Giambrone <Len.Giambrone@intersystems.com>
Written by: Lionel Cons <Lionel.Cons@cern.ch> (original author)
Paul.Green@stratus.com.
Color support by Peter Anvin <Peter.Anvin@linux.org> and Dennis
fix for bug reported by Ruediger Kuhlmann <RKuhlmann@orga-systems.com>
Toomas Soome <Toomas.Soome@microlink.ee>, 2006.
Alexandre Duret-Lutz <adl@gnu.org>.
Fixes from ado@elsie.nci.nih.gov
akee@wpdis03.wpafb.af.mil (Earle F. Ake) contributed MIS and NILE.
Tanaka Akira <akr@ml7n.org>
Xin Ye <alyex.ye@gmail.com>, 2010.
Anders Roxell <anders.roxell@enea.com>
Andrej ʒnidarʒiĉ <andrej.znidarsic@gmail.com>, 2012.
bug reported by Andres Perera <andres.p@zoho.com>
Andrzej M. Krzysztofowicz <ankry@mif.pg.gda.pl> 2006, 2007.
anorland@hem2.passagen.se
Reported by Cedric Arbogast <arbogast.cedric@gmail.com>
Fixes problem reported by Cedric Arbogast <arbogast.cedric@gmail.com>
Arif E. Nugroho <arif_endro@yahoo.com>, 2008, 2009, 2010.
reported by <armands1@gmail.com>
arnold@audiofax.com
incorporated new version from Aharon Robbins <arnold@skeeve.com>
from Mohit Aron <aron@cs.rice.edu>
Alexander Shopov <ash@kambanaria.org>, 2007, 2010, 2012, 2013, 2014.
gregrrm <backuppc-users@whitleymott.net>
<barry.downes@gmail.com>
chet@cwru.edu and, optionally, to bash-testers@cwru.edu.
Linda Walsh <bash@tlinx.org>
Benno Schulenberg <benno@vertaalt.nl>, 2006, 2008, 2010, 2011, 2013, 2014.
reported by Benoit Vaugon <benoit.vaugon@gmail.com>
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Stephen R. van den Berg, berg@pool.informatik.rwth-aachen.de
Brian Fox <bfox@eos.crseo.ucsb.edu>
bfox@gnu.ai.mit.edu
bfox@gnu.org
<bill@ycc.com>
Bill Gradwohl <bill@ycc.com>
minor changes from Bjarni Ingi Gislason <bjarniig@rhi.hi.is>
Bj77rn Stenberg <bjst@enea.com>
Fixes bug reported by Satoshi Takahashi <blue3waters@gmail.com>
posted to usenet as <4i5p17$bnu@larry.rice.edu>
Erick Branderhorst <branderh@iaehv.nl>, 1996.
Written by Bruno Haible <bruno@clisp.org>.
Thanks to Chris F. A. Johnson <c.f.a.johnson@rogers.com> for this one
Language-Team: Catalan <ca@dodds.net>
Christophe Combelles <ccomb@free.fr>, 2008, 2009, 2010, 2011
Pointed out by Christopher F. A. Johnson <cfajohnson@gmail.com>
Cristian Oth77n Mart77nez Vera <cfuga@cfuga.mx>, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011.
Chet Ramey <chet.ramey@case.edu>
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```

MODIFIED BY chet@po.cwru.edu to make part of the bash test suite.
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 ;;Chip Salzenberg at ComDev/TCT <chip@tct.uucp>, <uunet!ateng!tct!chip>
 chkno@chkno.net
 Chris F. A. Johnson <chris@cfajohnson.com>
 Clark Wang <clark.wang@oracle.com>
 Clytie Siddall <clytie@riverland.net.au>, 2008, 2009, 2010.
 crispusfairbairn@gmail.com
 <cubranic@stat.ubc.ca>
 <curtis@greenkey.net>
 <d.l.tDecontes@free.fr>
 Damir Jerovšek <damir.jerovsek@gmail.com>, 2012.
 Language-Team: Danish <dansk@dansk-gruppen.dk>
 fix from Darin Johnson <darin@acuson.com> for prompt string with
 "Davide Brini" <dave_br@gmx.com>
 key. Fixes bug reported by David Parks <davidparks21@yahoo.com>
 daysleeper <daysleeper@centrum.cz>
 Clark Wang <dearvoid@gmail.com>
 From: Dengke Du <dengke.du@windriver.com>
 Flaherty <dennisf@denix.elk.miles.com> based on original patches by
 Dennis Williamson <dennistwilliamson@gmail.com>
 Bug report from <derflob@derflob.de>
 Bug and fix from John Kearney <dethrophes@web.de>
 Barely-tested code from Deven T. Corzine <deven@ties.org>.
 Language-Team: Bulgarian <dict@ludost.net>
 Molina <diegoaugustomolina@gmail.com>
 David Mackenzie <djm@gnu.ai.mit.edu>
 is taking place. Fixes bug reported by dnade.ext@orange-ftgroup.com
 <nathanael@gnat.ca> and Matthias Klose <doko@debian.org>
 Dreamcat4 <dreamcat4@gmail.com>
 Copyright (C) 1995-1997, 2000-2007, 2009-2010 by Ulrich Drepper <drepper@gnu.ai.mit.edu>
 Written by Ulrich Drepper <drepper@gnu.org>, 1995.
 Change from David Kaelbling <drk@sgi.com>. If you have problems
 Eduardo A. Bustamante López <dualbus@gmail.com>
 Last-Translator: Evgeniy Dushistov <dushistov@mail.ru>
 Maxim V. Dziumanenko <dziumanenko@gmail.com>, 2010.
 Blake <eblake@redhat.com>
 Additional logic fix from Edward Catmur <ed@catmur.co.uk>
 Paul Eggert <eggert@cs.ucla.edu>
 Contributed by Paul Eggert (eggert@twinsun.com).
 DJGPP support from Eli Zaretskii <eliz@gnu.org>
 emanuelczirai@cryptolab.net

Erwin Poeze <erwin.poeze@gmail.com>, 2009.
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 (estern Reserve Univer)-.92 E(sity)-.1 E -.15(ch)250.425 171 S(et@po.cwru.edu)
 Eugen Hoanca <eugen@urban-grafx.ro>, 2003.
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 Anthony Fok <foka@debian.org>, 2013.
 Evangelos Foutas <foutrelis@gmail.com>
 Fran Diegue <frandieguez@gnome.org>, 2012.
 Francisco Diéguez <frandieguez@ubuntu.com>, 2012.
 friedman@gnu.ai.mit.edu
 Original author: Noah Friedman <friedman@gnu.org>.
 Author: Noah Friedman <friedman@prep.ai.mit.edu>
 <g.clare@opengroup.org> in readline area on savannah
 ADR: 4 August 2001, fixed this per gazelle@interaccess.com
 Gerd Hofmann <gerd.hofmann.nbg@googlemail.com>
 (ghazi@noc.rutgers.edu)
 Try a simple heuristic from Stephen Gildea <gildea@intouchsys.com>.
 Stephen Gildea <gildea@x.org> March 1995
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 Ivan Mas̃r <helix84@centrum.sk>, 2007, 2008, 2009, 2010, 2011.
 Gerald Hewes <hewes@openmarket.com>.
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 Marcel Giannelia <info@skeena.net>
 Zi-You Dai <ioppooster@gmail.com>, 2008.
 Myhailo Danylenko <isbear@ukrpost.net>, 2009.
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jir@yamato.ibm.com
Jordi Mas i Hern?ndez <jmas@softcatala.org>, 2004 (correccions).
<johan.hattne@utsouthwestern.edu>
fix from Joachim Schmitz <jojo@schmitz-digital.de>
<jojo@schmitz-digital.de>
Joachim Schmitz <jojo@schmitz-digital.de>
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Julie Vermeersch <julie@lambdal.be>, 2004.
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Ziegler <jziegler@bnl.gov>
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Kyoichi Ozaki <k@afromania.org>, 2000.
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Samuel A. Falvo II <kc5tja@dolphin.openprojects.net> reports
<keithw@mit.edu>
Klemen Ko?ir <klemen.kosir@gmx.com>, 2012.
<kulkarniniraj14@gmail.com>
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Lefteris Dimitroulakis <ledimitro@gmail.com>, 2013.
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mickael9@gmail.com, Jan Rome <jan.rome@gmail.com>
ミロコラ ミレ サミイ 断クミミサミム <miroslavnikolic@rocketmail.com>, 2014.
Koskar <mkoskar@gmail.com> and most recently by Jordan Michael
Miroslav Lichvar <mlichvar@redhat.com>
Montxo Vicente i Sempere <montxo@alacant.com>, 2003.
Michael Snyder <msnyder@vmware.com>
From: Mark Kennedy <mark.t.kennedy@gmail.com> (<mtk@ny.ubs.com>)
The third cut came from Mark Kennedy, mtk@ny.ubs.com. 1998/08/25
from Nicolas ARGYROU <nargy@yahoo.com>
--karl, nathan@acm.org, 20Apr99.
<nathanael@gnat.ca> and Matthias Klose <doko@debian.org>
Nils Naumann <nau@gmx.net>, 1996-2013.
Nilg?n Belma Bug?ner <nilgun@buguner.name.tr>, 2006.
<nshyrovskiy@gmail.com>
ntomczak@vm.ucs.ualberta.ca
Olaf Bachmann <obachman@mathematik.uni-kl.de>
<ohnobinki@ohnopublishing.net> -- gentoo bug 378941]
Oleg Nesterov <oleg@redhat.com>
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Yongzhi Pan <panyongzhi@gmail.com>
Patrick Pfeifer <patrick@pfeifer.de>
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Peter Ho <peter@roboots.oxford.ac.uk>.
Petr P?sar <petr.pisar@atlas.cz>, 2008, 2009, 2010, 2011, 2012, 2013, 2014.
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Sergio Zanchetta <primes2h@ubuntu.com>, 2010, 2011.
Peter Toft <pto@linuxbog.dk> and Patrick Pfeifer

Jakub Bogusz <qboosh@pld-linux.org> 2010-2014.
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 Rainer Blome <rainer.blome@gmx.de>
 Ralph Coredroy <ralph@inputplus.co.uk>
 Raphael Droz <raphael.droz+floss@gmail.com>
 Roman Byshko <rbyshko@gmail.com>
 at the Eindhoven University of Technology. Email: rcb5@win.tue.nl
 Doug Kehn <rdkehn@yahoo.com>
 Petri Jooste <rkwpj@puk.ac.za>, 2004.
 Roger Zauner <rogerx.oss@gmail.com>
 <romerox.adrian@gmail.com>
 % From romildo@urano.iceb.ufop.br, 2 July 2000.
 Ron Savage <rpsavage@ozemail.com.au>
 Roman Rakus <rrakus@redhat.com>
 Rui Santos <rsantos@grupopie.com>
 request of "Richard Y. Kim" <ryk@ap.com>
 "Richard Y. Kim" <ryk@coho.net>
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 Sami Pietila <sami.pietila@gmail.com>
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 Fixes bug reported by Shawn Bohrer <sbohrer@rgmadvisors.com>
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 Jens Schweikhardt <schweikh@schweikhardt.net>
 <scotty.mcmillan@gmail.com>
 seanf@swdc.stratus.com.
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 Sergio Pokrovskij <sergio.pokrovskij@gmail.com>, 1998, 2006, 2009, 2011, 2014.
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 <siddhesh@redhat.com>
 Simon Marshall <sm2@sequent.cc.hull.ac.uk>
 Mark Elbrecht <snowball3@bigfoot.com> has sent me notice that bash-2.04
 a question from Michal Soltys <soltys@ziu.info>
 Signed-off-by: Sona Sarmadi <sona.sarmadi@enea.com>
 Juan Manuel Guerrero <st001906@hrz1.hrz.tu-darmstadt.de>
 Stefano Lattarini <stefano.lattarini@gmail.com>
 <stephane_chazelas@yahoo.fr>
 pointed out by Sung Pae <sungpae@gmail.com>
 sunshine@sunshineco.com: <PRE>bla</PRE> looks better than
 message to 'sv-request@li.org', having this message body:
 <svdb@stack.nl>, fix from Andreas Schwab <schwab@linux-m68k.org>
 szymon.kalasz@uj.edu.pl
 <tcort@minix3.org>
 Techlive Zheng <techlivezheng@gmail.com>
 Torbjorn Granlund <tege@matematik.su.se>
 <tmc@barnyard.syr.edu>
 Win32 code written by Tor Lillqvist <tml@iki.fi>.
 tml@tik.vtt.fi
 Tomislav Krznar <tomislav.krznar@gmail.com>, 2012, 2013.
 Linus Torvalds <torvalds@linux-foundation.org>, bug report originally
 Skicka synpunkter pť ńakversť, tningen till <tp-sv@listor.tp-sv.se>.
 `translation@iro.umontreal.ca'
 Original version by trome@cs.cmu.edu, .
 Written by Tom Trome <trome@redhat.com>
 suggested by Tom Trome <trome@redhat.com>
 <trome@redhat.com>
 Bill Trost, trost@reed.bitnet, trost@reed.edu
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 Mike Frysinger <vapier@gentoo.org>
 Wouter Vermaelen <vermaelen.wouter@gmail.com>
 Ville Skytta <ville.skytta@iki.fi>
 Sheffer <vince.sheffer@apisphere.com>
 Volkan Gezer <vlkngzr@gmail.com>, 2013.
 Trĩĩn Ngũĩĩn Quĩĩn <vnwildman@gmail.com>, 2012-2014.
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 Garrett Cooper <yanegomi@gmail.com>
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8 --- bc

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<signature of Ty Coon>, 1 April 1989
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9 ---- bridge-utils

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12 ---- conntrack-tools

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```
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```

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```
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This is free software, and you are welcome to redistribute it
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```

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13 ---- coreutils

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Brian Youmans <3diff@gnu.org>
Reported by Erik Bernstein in 739752@bugs.debian.org.
Marlys A. Nelson@uwrfl.edu, and Albert-Lunde@nwu.edu.
Ali Devin Sezer <Ali_Sezer@brown.edu>, 2002.
Andre Novaes Cunha           Andre.Cunha@br.global-one.net
Andries Brouwer              Andries.Brouwer@cwil.nl
Suggestion from Andries.Brouwer@cwil.nl. He reported that df failed
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at suggestion from Chip Bennett <BennettC@j64.stratcom.af.mil>
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fileutils: Andrzej Krzysztofowicz <ankry@mif.pg.gda.pl>, 2002.
 (automake_repo): Use anoncvs@sources.redhat.com.
 Anthony Thyssen anthony@griffith.edu.au
 Anthony Fok <anthony@thizlinux.com>, 2002.
 Analysis by arbogast.cedric@gmail.com in http://debbugs.gnu.org/8292.
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 stty.c: Fix some type mismatches. From Bruce Evans, bde@runx.oz.au.
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 msh@cis.ufl.edu says -lnsl (and -lsocket) are needed for his 386/AT
 Murray Cumming <murrayc@murrayc.com>
 Lennart Poettering <mzqohf@0pointer.de>
 Daniel Reed <n@ml.org>
 Patch from Nat Friedman <nat@novell.com>
 in message <30ajo5\$oe8@ccu2.auckland.ac.nz>.
 Ravnaas <ole.andre.ravnaas@collabora.co.uk> to allow you to
 Ole André Vadla Ravnås <ole.andre.ravnas@tandberg.com>
 Olivier Andrieu <oliv_a@users.sourceforge.net>
 Originally written by Alexandre Oliva <oliva@dcc.unicamp.br>.
 Oswald Buddenhagen <ossi@kde.org>
 Pierre Ossman <ossman@ossman.lkpg.cendio.se> (tiny change)
 Patch from Owen Taylor <otaylor@redhat.com>
 Owen Fraser-Green <owen@discobabe.net>
 Tom Parker <palfrey@tevp.net>
 Patrick von Reth <patrick.vonreth@gmail.com>
 Preston Brown <pbrown@kde.org>
 Nguyễn Đình Duy <pclouds@gmail.com>
 Peter Breitenlohner <peb@mpmu.mpg.de>

Paul Bolle <pebolle@tiscali.nl>
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 Wulf C. Krueger <philantrop@exherbo.org>
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 Benjamin Reed <rangerrick@befunk.com>
 rcs@cs.arizona.edu for discovering this
 Richard Hult <rhult@codefactory.se>
 <ricardo.kekki@movial.fi> to make dbus-binding-tool heed C symbol name
 Richard A. Hankins <richard.a.hankins@gmail.com>
 Richard Hughes <richard@hughsie.com>
 Richard Hult <richard@imendio.com>
 Patch suggested by Inguva Rajasekhar <ringuva@novell.com>.
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 Robert McQueen <robot101@debian.org>
 Patch from Rob Taylor <robtaylor@fastmail.fm>
 Rodrigo Moya <rodrigo@novell.com>
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 Author: Simon McVittie <simon.mcvittie@collabora.co.uk>
 <sjoerd@debian.org> to add --with-qt-moc and --with-qt3-moc
 Sjoerd Simons <sjoerd@luon.net>
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```
-- authors of diffutils
% `@verbx...x' would look like the `@verbx' command. --janneke@gnu.org
Paul.Green@stratus.com.
&& $CVS -d $USER@cvs.sv.gnu.org:/webcvs/$pkg co $pkg )
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Using memcopy instead of strcpy to fix segfault with fortify, thanks to Dave Reisner <falconindy@jabber.org>.

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Updating maximal length of a label in manpage to talk about bytes instead of characters, thanks to Francois Wendling <frwendling@gmail.com> (Closes: #655953).

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```
<one line to give the program's name and a brief idea of what it does.>
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```

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```
<program> Copyright (C) <year> <name of author>
This program comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
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```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, your program's commands might be different; for a GUI interface, you would use an "about box".

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[This is the first released version of the library GPL. It is
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Because of this blurred distinction, using the ordinary General
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concluded that weaker conditions might promote sharing better.

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▲

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<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!

-- authors of gdb
of stuff that BFD can use to do coff-encapsulated files. --gnu@cygnus.com
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
Message-Id: <199907230037.SAA01089@wiji.santafe.edu>
Youmans <3diff@flib.gnu.ai.mit.edu>.
Brian Youmans (3diff@gnu.org)
(Fix by Eric Anderson, 3jean@maas-neotek.arc.nasa.gov.)
Andrew Gierth <ANDREW@microlise.co.uk>.
Patch from Allan Skillman <Allan.Skillman@arm.com>.
Amit Pawar <Amit.Pawar@amd.com>
Andreas Kaufmann <Andreas.Kaufmann@synopsys.com>
dnl @author Andreas Krebbel <Andreas.Krebbel@de.ibm.com>
Patch submitted by Anil Paranjape <AnilP1@KPITCummins.com>
Anton Kolesov <Anton.Kolesov@synopsys.com> (tiny change)
Antti.Miettinen@ntc.nokia.com.
Bill Farmer <Bill@the-farmers.freereserve.co.uk>
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 README: Fix typo (reported by karl@hq.ileaf.com).
 Fixes submitted by Karl Berry (karl@nermal.hq.ileaf.com):
 configure: Fix up help message: from karl@owl.hq.ileaf.com
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```
<one line to give the program's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>
```

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```
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This program comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
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```

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-- authors of gdbm
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
Paul.Green@stratus.com.
Alexandre Duret-Lutz <adl@gnu.org>.
akee@wpdis03.wpa.fb.af.mil (Earle F. Ake) contributed MIS and NILE.
Tanaka Akira <akr@fsij.org>
Arun Persaud <arun@nubati.net>, 2012
Jason Downs <downsj@downsj.com>

Henning 'Faroul' Peters <Faroul@beyond.kn-bremen.de>, 25 Sep 1999
wide-character structures (report by <George.R.Goffe@seagate.com>).
null (reported by From: Ian Dall <Ian.Dall@dsto.defence.gov.au> for
<Jesse.Thilo@pobox.com>)
.so" suffix (patch by Jonathan Ward <Jonathan.Ward@hp.com>).
<Larry@Riedel.org>).

Nikulin <M.A.Nikulin@inp.nsk.su>.
define FROMWHO "Mark Hessling - (M.Hessling@gu.edu.au)
<Marcus.Brinkmann@ruhr-uni-bochum.de>).
<Matthew.Clarke@mindlink.bc.ca>).

Michael Schroeder <Michael.Schroeder@informatik.uni-erlangen.de>).
(report by Peter L Jordan <PJordan@chla.usc.edu>).
Paul.Green@stratus.com.
<R.Chamberlin@querix.com>).
<R.Hildebrandt@tu-bs.de>).
Gerben Wierda <Sherlock@rna.nl>).

configure macro (report by Thanh Ma <Thanh.Ma@casi-rusco.com>).
<Todd.Miller@courtesan.com>)
<Tony.Hoffmann@hia.nrc.ca>)

Ville Sulko <Ville.Sulko@bip.atk.tpo.fi>, 05 Aug 1996
a core dump reported by Aaron Campbell <aaron@cs.dal.ca>).
Campbell <aaron@ug.cs.dal.ca>).

Andrey Chernov <ache@astral.msk.su> 29 Mar 1996
Chernov <ache@nagual.pp.ru>).

Satoshi Adachi <adachi@wisdom.aa.ap.titech.ac.jp>).
declared (from Adam J Richter <adam@yggdrasil.com>)
(based on a bug report for tin 1.5.9 by Aaron Adams <adamsa@mac.com>).
feature of GNU sed 4.0 (reported by Ervin Nemeth <airwin@inf.bme.hu>).
(report by Andreas Jaeger <aj@arthur.rhein-neckar.de>).
akee@wpdis03.wpafl.af.mil (Earle F. Ake) contributed MIS and NILE.
comment by Akim Demaille <akim@epita.fr> to autoconf mailing list).
patch by A M Kuchling <akuchlin@mems-exchange.org>).

Author: Eugene V. Melaragno <aldomel@ix.netcom.com> 2000
<alexander_liberson@ninewest.com>, patch by Juergen Pfeifer).
(report by Adam Costello <amc@cs.berkeley.edu>, Debian #89222).
integrate patch by Andrew Kuchling <amk@magnet.com> for GPM (mouse)
written by Anatoly Ivasyuk (anatoly@nick.csh.rutgers.edu)
Tsouladze <andyt@nypoints.com>).

Paul M. Aoki <aoki@ucbvax.berkeley.edu>
report by Avery Pennarun <apenwarr@foxnet.net>)
Gene Rochlin <armsis@amber.berkeley.edu> 9/19/84.
newterm reported by Chipp C <at_1@zdnetwork.com>).

Adam Thompson <athompson@pangea.ca> tells us:
<ats@hubert.wustl.edu>).

Alex R.N. Wetmore <aw2t@andrew.cmu.edu>
Supervisor mode info by Ari Wuolle, <awuolle@delta.hut.fi>, 27 Aug 1996
bayern@morpheus.cis.yale.edu
<bbraun@synack.net>).

(report by Ben Kohlen <bckohlen@yahoo.com>).
the manpage (report by Bruce Evans <bde@zeta.org.au>).
options (reported by Nelson H. F. Beebe <beebe@math.utah.edu>).
<beren@mac.com>).

ELF libraries (patch by Bernd Ernesti <bernd@arresum.inka.de>).
Rosenkraenzer <bero@k5.sucks.eu.org>)
Rosenkraenzer <bero@redhat.de>).

Humberto Appleton <beto@cs.utexas.edu>, 880521 UT Austin
bf347@lafn.org (David Lawyer), 28 Jun 1997
<bgrayson@pine.ece.utexas.edu>).

Federico Bianchi <bianchi@magna.cisid.unipi.it>, 15 Jan 1997
Federico Bianchi <bianchi@pc-arte2.arte.unipi.it>, 1 Jul 1998
Federico Bianchi <bianchi@www.arte.unipi.it>
Bernd Kuemmerlen <bkuemmer@mevis.de> (for MacOS X).
<bledp@voila.fr>).

pair value (report by Brendan O'Dea <bod@compusol.com.au>).
(report by Brad Peppers <brad@linuxcanada.com>, cf: 960706).
Raiter <breadbox@muppetlabs.com>).
<brett@xylan.com>).

They are courtesy of Vincent Broman <broman@nosc.mil> 14 Jan 1997
brsmith@umn-cs.cs.umn.edu (Brian R. Smith) via BRL
Henderson <bryanh@giraffe.netgate.net>).
<bsittler@iname.com>).

Benjamin C. W. Sittler <bsittler@nmt.edu>
<btrompetter@firemail.de>, who attempted to create a 96000-line pad).
Please send changes with explanations to bug-gnu-emacs@prep.ai.mit.edu.
<link rev="made" href="mailto:bugs-ncurses@gnu.org">
der Poel <bvdpoel@kootenay.com>).

Alexandre Montaron <canal@mygale.org>, 18 Jun 1998
According to James Carlson <carlson@xylogics.com> writing in January 1995
<carolyn@dali.berkeley.edu>

New "safe" cursor movement (11/87) from <cgs@umd5.umd.edu>. Prevents
Charles Levert <charles@comm.polyml.ca>).

alternate character set (reported by Piotr Majka <charvel@link.pl>).
references (patch by Albert Chin-A-Young <china@thewrittenword.com>).
Chris Torek <chris@gyre.umd.edu> Thu, 7 Nov 85 EST

<chris@stockwith.co.uk>).
 Chris Johns <cjohns@plessey.com.au>
 <claesg@algonet.se>).
 Added contact & status info from G. Clark Brown <clark@sssi.com>.
 <cls@seawood.org>
 <khme> from <stephen%comp.lancs.ac.uk@ucl-cs.arpa>. <clear> could also
 Email: <compair@sd.cybernex.net>
 http://lntian.debian.org/full/csmall@debian.org.html#ncurses
 <cummings@primerd.prime.com> on 14 Dec 1992 and lightly edited by esr.
 <cwilson@ece.gatech.edu>, changed NCURSES_EXPORT macro to make it
 Magnus Bengtsson, d6mbeng@dttek.chalmers.se (Nov'93) *
 Daniel Glasser <dag@persoft.persoft.com>, 13 Oct 1993
 Liviu Daia <daia@stoilow.imar.ro>).
 current directory (reported by Mike Castle <dalgoda@ix.netcom.com>).
 Kegel <dank@kegel.com>).
 This function was originally written by Daniel Weaver <danw@znyx.com>
 synopsis (reported by Darren Hiebert <darren@hmi.com>).
 <dave@hiauly1.hia.nrc.ca>).
 Dave Wetzel <dave@turbocat.snafu.de> 22 Dec 1995
 David Breneman <daveb@dgtl.com> has this to say:
 current terminfo entry (report by David Gomez <david@pleyades.net>).
 Solaris (patch by David Mosberger <davidm@hpl.hp.com>).
 David Oliveira <davidoliveira@develop.prozone.ws>).
 This is adapted from a FreeBSD bug-report by Daniel Rudy <dcrudy@pacbell.net>
 <ddavis@ic.berkeley.edu>
 (reported by Ben Decker <deckerben@freenet.de>).
 L Dee Holtsclaw <dee@sunbeltsoft.com>).
 Hurd <deuce@lordlegacy.org> in newsgroup lucky.freebsd.bugs) -TD
 Furstenau <df@ravine.binary.net>).
 Thomas Dickey <dickey@clark.net> 13 Dec 1995
 HREF="mailto:dickey@his.com
 Maintainer: Thomas E. Dickey <dickey@invisible-island.net>
 David J. MacKenzie <djm@va.pubnix.com>, 14 Nov 1997
 rather than \$withval (patch by Darryl Miles <d1m@g7led.demon.co.uk>).
 Created by Dave Millen <dmill@globalnet.co.uk> 22.07.98
 Jacobowitz <dmj+@andrew.cmu.edu>).
 in termcap.c (patch by Dan Nelson <dnelson@emsphone.com>
 Jeff DelPapa <dp@world.std.com> writes:
 <dps@io.stargate.co.uk>).
 Ulrich Drepper <drepper@ira.uka.de>
 David Malone <dwmalone@maths.tcd.ie>).
 Cheers, earnie_boyd@yahoo.com
 features. Cheers, earnie_boyd@yahoo.com.
 <edward@onyx.berkeley.edu>
 Ehling <eh@eclipse.aball.de>).
 <ehud@unix.simonwiesel.co.il>).
 (reported by Daniel Eisenbud <eisenbud@cs.swarthmore.edu>).
 (report by David Ellement <ellement@sdd.hp.com>). This also fixes a
 conditions (reported by Enoch Wexler <enoch@wexler.co.il>) -TD
 from: Eric Z. Ayers (eric@ale.org)
 <eric@cls.usask.ca>).
 hanging in the air. (Thanks to Eric Fischer, <eric@fudge.uchicago.edu>
 <ernie_boyd@yahoo.com>).
 a terminfo environment by Eric S. Raymond <esr@snark.thyr-
 Eric S. Raymond <esr@snark.thyrsus.com>
 originally by Eric S. Raymond <esr@thyrsus.com>, written for animation
 <eugene@anime.net>, Sven Verdoolaege).
 Natter <f.natter@ndh.net>).
 Erik Fair <fair@ucbarpa.berkeley.edu>
 <faletti@berkeley.edu>
 Alberto Tomei Torres <fatomei@sandburg.unm.edu>).
 Saporito <fausap@itb.it>).
 <fehr@suse.de>).
 Michael Driscoll <fenris@lightspeed.net> 10 July 1996
 Charles A. Finnell of MITRE <finnell@mitre.org>, developed 07SEP90
 <fischman@math.ucla.edu>).
 <fjhenigman@mud.cgl.uwaterloo.ca>).
 change maintainer's mailing address to florian@gnu.org, change
 efficient (requested by Florian La Roche <florian@knorke.saar.de>)
 > patches by Fred Fish <fnf@ninemoons.com>
 Francisco A. Tomei Torres <francisco.tomei@cwix.com>).
 reported by Frank Heckenbach <frank@g-n-u.de>.
 Eric Freudenthal <freudent@eric.ultra.nyu.edu>
 Alan Frisbie <frisbie@flying-disk.com> writes:
 (adapted from report/patch by Tom Riddle <ftr@oracom.com>).
 Cristian Gafton <gafton@redhat.com>, responding to Duncan Simpson
 Byron Stanoszek <gandalf@winds.org>).
 Gary Samuelson <gary.samuelson@verizon.com>).
 George Andreou <gbandreo@tem.uoc.gr>).
 <gcooper@qantas.com.au>, using Purify on Solaris 5.6).
 George Land <georgeland@aol.com> 24 Sep 1996
 Hasse <gh@raditex.se>).
 (ghazi@noc.rutgers.edu)
 Johnson <gjohnson@season.com>). Note that most of the remaining ones

Maynard <glenn@zewt.org>).

problem reported by John M. Flinchbaugh <glynis@netrax.net> <gniibe@ml7n.org>).

John Gilmore <hoptoad!gnu@lll-crg.arpa>
(patch by Goran Uddeborg <goeran@uddeborg.pp.se>).

<goldberger@su-csli.arpa>

Gary Darland <goodmanc@garnet.berkeley.edu>

Thomas Graf <graf@dms.at> cf: 20011020).

to confuse it (patch by Thomas Graf <graf@essi.fr>).

<greg.roelofs@philips.com>).

Greg Couch <gregc@ernie.berkeley.edu>

instead (report by George Goffe <grgoffe@excite.com> and Matt Taggart (report by George Goffe <grgoffe@yahoo.com>)).

etip.h (reported by Greg Schafer <gschafer@zip.com.au>).

greg_small <gts@populi.berkeley.edu>

Miller, from report/patch by Philip Guenther <guenther@gac.edu>).

Guido Flohr <gufl0000@stud.uni-sb.de>.

expression in view.c (report by Wolfgang Gutjahr <gutw@knapp.co.at>).

Wolfgang Gutjahr <gutw@knapp.com>).

(ha.jones@ic.ac.uk). It may be freely distributed as <haering_linux@gmx.de>):

> patches by Bruno Haible <haible@ilog.fr>:

Hans Verkuil <hans@wyst.hobby.nl>, 4 Dec 1995

merge Data General terminfo from Hasufin <hasufin@vidnet.net> - TD

Contact Bill Hedberg <hedberg@hannah.enet.dec.com> of Terminal Support

mixed (from report by Bjorn Helgaas <helgaas@dhc.net>).

You can obtain ECMA-48 for free by sending email to helpdesk@ecma.ch

Gerald Hewes <hewes@openmarket.com>.

for GNU libc (patch by H.J.Lu <hjl@lucon.org>)

Hans-Joachim Widmaier <hjwidmai@foxboro.com>).

Hopkirk <hops@sco.com>).

<horikawa@FreeBSD.org> (see FreeBSD docs/46709)).

(reported by Hugh Daniel <hugh@rat.toad.com>).

(reported by Huy Le <huyle@ugcs.caltech.edu>).

Igor Tamitegama <igor@pppl493-ft.teaser.fr>, 18 Jan 1997

fno-builtin option (reported by Igor Schein <igor@txc.com>).

<ilya@math.ohio-state.edu>).

command (report by Jose Luis Rico Botella <informatica@serpis.com>).

Robinson <infinity@cyberhighway.net>).

Stanislav Ievlev <inger@altlinux.org>).

memccpy() (reported by Sidik Isani <isani@cfht.hawaii.edu>)

Kimio Ishii <ishii@csl.sony.co.jp>).

Ismael Cordeiro <ismael@cordeiro.com>).

<itz@rahul.net>).

<j@interface-business.de>).

<bde@zeta.org.au>, via Jason Evans <jasone@canonware.com>).

Jason Evans <jasone@mrc.uidaho.edu>, solved by Alan Shutko

Jeff Siegal <jbs@quotix.com>

<jbuhler@cs.washington.edu>)

interface (reported by Jeffrey C Honig <jch@bsd.i.com>).

Jeff Bartig <jeffb@dont.doit.wisc.edu> 31 Mar 1995

<jevans@apple.com>).

jew@venus.sunquest.com

fixes suggested by Jeff Bradbury <jibradbury@lucent.com>:

with gcc 3.2 (patch by Dimitar Zhekov <jimmy@is-vn.bg>).

<jkohan@adan.fceia.unr.edu.ar>)

Jacob Mandelson <jlm@ugcs.caltech.edu>, 09 Nov 1996

Matos <jmatos@math.ist.utl.pt>, patch by Thomas Esser

<jmc@prioris.mini.pw.edu.pl>).

add os2 entry to misc/emx.src (<jmcoop@webmail.bmi.net>).

<jmh@mail.msen.com>).

John Martin <john@hds.com> is their termcap expert. They're mostly out of

This program was written by John Burnell (johnb@kea.am.dsir.govt.nz)

Net: josed@techsupp.wyse.com (Jose D'Oliveira)

<jouko@solutions.fi>).

<joy@cibalia.gkvk.hr>).

versions of 'make' on OS/2 (report by John Polterak <jp@eyup.org>).

Jungshik Shin <jshin@jtan.com>).

Jay S. Rouman <jsr@dexter.mi.org> 5 Jul 92

<lines> capability later corrected by J.T. Conklin <jtc@cygnus.com>

Jan Willem Stumpel <jw.stumpel@inter.nl.net>, 11 May 1997

BSDI. (requested by Mike Karels <karels@redrock.bsd.i.com>)

Kenneth Randell <kenr@datametrics.com> writes on 31 Dec 1998:

Kent Polk <kent@swrinde.nde.swri.edu>, 30 May 90

Updated: Oezguer Kesim <kesim@math.fu-berlin.de> 02 Nov 1997

than *BSD (patch by Mark Kettenis <kettenis@wins.uva.nl>).

Kevin Buettner <kev@primenet.com> (for elf64_ia64)

(Color support from Kevin Rosenberg <kevin@cyberport.com>, 2 May 1996)

Kevin Turner <kevint@aracnet.com>, 12 Jul 1998

Mark Sheppard <kimble@mistral.co.uk>, 4 May 1996

980808 (reported by Kim DeVaughn <kimdv@best.com> and Liviu

<kjahds@kjahds.com> Nov' 1995).

Kevin Braunsdorf <ksb@mentor.cc.purdue.edu>

Kubota <kubota@debian.org>).

color (reported by Klaus Weide <kweide@enteract.com>).
 (reported by Klaus Weide <kweide@tezcet.com>).
 > patch by Johnny C Lam <lamj@stat.cmu.edu>:
 from: Andrey V Lukyanov <land@long.yar.ru>.
 Alexander Latzko <latzko@marsenius.rutgers.edu>, 30 Dec 1996
 Alexander Lukyanov <lav@video.yars.free.net>, 14 Nov 1995
 New algorithm by Alexander V. Lukyanov <lav@yars.free.net>, Aug 1997
 to telnetd. Michael Deutschmann <ldeutsch@mail.netshop.net> informs us
 Jon Leech <leech@cs.unc.edu> tells us:
 Leitgeb <leitgeb@leland.stanford.edu>
 <leonardjo@hetnet.nl>.
 script (reported by Kriang Lerdsuwanakij <lerdsuwa@scf-fs.usc.edu>).
 Kriang Lerdsuwanakij <lerdsuwa@scf.usc.edu>. The computation
 <lerdsuwa@users.sourceforge.net>
 Craig Leres <leres@okeeffe.berkeley.edu>
 Lucas Gonze <lgonze@panix.com>.
 default to overwriting (report by Lars Hecking <lhecking@nmrc.ie>).
 lieder@skyler.mavd.honeywell.com says without -lsocket
 Todd Litwin <litwin@litwin.jpl.nasa.gov> 28 May 1993
 Catucci <lorenzo@argon.roma2.infn.it>
 Juergen Fluk <louis@dachau.marco.de>
 <lvirden@cas.org>
 Andres <ma@suse.de>.
 > Maciej W Rozycki <macro@ds2.pg.gda.pl>:
 <malman@bbn-vax.arpa>
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 Michael Jennings <mej@valinux.com>
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 Nathan Peterson <nathan@sco.com>, 03 Sep 1996
 update mailing-list information (now ncurses@bsd.i.com).
 Their e-mail address is at ndsales@newburydata.co.uk
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 <nzanella@cs.mun.ca>).
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 <paliwoda@kki.net.pl>
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 Author: Laurent Pautet <pautet@gnat.com>
 (from Pavel Roskin <pavel@absolute.spb.su>).
 Roskin <pavel_roskin@geocities.com>).
 Peter D. Smith <pdsmith@nbn.com> notes that his modgraph manual was
 Author : Per Foreby, perf@efd.lth.se *
 Codes and info from Peter Disdale <pete@pdlmail.demon.co.uk> 12 May 1997
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 <pok@nbsp.nsk.su>
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<rho@mipos2.intel.com>).

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<robert@proplus.com>)

Mark Dornfeld <romwa@ucbvax.berkeley.edu>
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<rsk@gsp.org>).

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<rwuest@sire.vt.com>)

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<scanm@biobase.dk>).

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<scott@gossamer-threads.com>).

seanf@swdc.stratus.com.

HREF="mailto:sharath_l@usa.net

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> fix 2 bugs in test/bs.c Erik Siga <siga@home.se>:

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Simon J. Gerraty <sjg@zen.void.oz.au> 10 Jan 1996

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<smikes@cubane.com>, for bash 2.05.0 on a Linux 2.0.36 system).

<solar@false.com>).

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W Orr <steveo@world.std.com>).

Steven Schwartz <steves@unitrends.com>.

Andreas Stolcke <stolcke@icsi.berkeley.edu>

Stephen Peterson <stv@utrecht.ow.nl>, 27 May 1995

also be reached at support@synergy.com.

Vassilopoulos <svas@leon.nrcps.ariadne-t.gr>)

<svivanov@pdm.ras.ru>).

<taggart@carmen.fc.hp.com>, fixes Debian .

Tanner <tanner@aecl.ca>)

<te@dbis.uni-hannover.de>).

<te@informatik.uni-hannover.de>)

Net: techsup@charm.sys.falco.com

Altos descriptions from Ted Mittelstaedt <tedm@agora.rain.com> 4 Sep 1993

Telford Tendys <telford@eng.uts.edu.au>).

Please e-mail changes to terminfo@thyrsus.com; the old termcap@berkeley.edu

Ruediger Kuhlmann <terminfo@ruediger-kuhlmann.de>, 18 Jul 2000

Please e-mail changes to terminfo@thyrsus.com; the old termcap@berkeley.edu

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Tim Theisen <tim@cs.wisc.edu> 22 Sept 1995

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R Lindsay Todd <toddr@rpi.edu>).

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with-gpm are given (report by Mr E_T <troll@logi.net.au>).

Net: troy@graphon.com (Troy Morrison)

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<uck4@rz.uni-karlsruhe.de>).

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<uwe@ptc.spbu.ru>).

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Jeff Wieland <wieland@acn.purdue.edu> 24 Feb 1995

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Author: Juan Jose Garcia Ripoll <worm@arrakis.es>.
 <wr6@uni.de>).
 Added Wyse 520 entries from Wm. Randolph Franklin <wrf@ecse.rpi.edu>.
 (reported by William P Setzer <wsetzer@pams.ncsu.edu>)
 Xiaodan Tang <xtang@qnx.com>)
 fix a typo in mvwchat() macro (reported by Cy <yam@homerow.net>).
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 Stephen Powell <zlinuxman@wowway.com> 23 Apr 2015
 Author: Zeyd M. Ben-Halim <zmbenhal@netcom.com> 1992, 1995

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See file CREDITS for list of people who contributed to this
project.

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#

Summary:

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This directory contains the source code for U-Boot, a boot loader for Embedded boards based on PowerPC, ARM, MIPS and several other processors, which can be installed in a boot ROM and used to initialize and test the hardware or to download and run application code.

The development of U-Boot is closely related to Linux: some parts of the source code originate in the Linux source tree, we have some header files in common, and special provision has been made to support booting of Linux images.

Some attention has been paid to make this software easily configurable and extendable. For instance, all monitor commands are implemented with the same call interface, so that it's very easy to add new commands. Also, instead of permanently adding rarely used code (for instance hardware test utilities) to the monitor, you can load and run it dynamically.

Status:

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In general, all boards for which a configuration option exists in the Makefile have been tested to some extent and can be considered "working". In fact, many of them are used in production systems.

In case of problems see the CHANGELOG and CREDITS files to find out who contributed the specific port. The MAINTAINERS file lists board maintainers.

Note: There is no CHANGELOG file in the actual U-Boot source tree; it can be created dynamically from the Git log using:

make CHANGELOG

Where to get help:

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In case you have questions about, problems with or contributions for U-Boot you should send a message to the U-Boot mailing list at <u-boot@lists.denx.de>. There is also an archive of previous traffic on the mailing list - please search the archive before asking FAQ's. Please see <http://lists.denx.de/pipermail/u-boot> and <http://dir.gmane.org/gmane.comp.boot-loaders.u-boot>

Where to get source code:

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The U-Boot source code is maintained in the git repository at [git://www.denx.de/git/u-boot.git](http://www.denx.de/git/u-boot.git) ; you can browse it online at <http://www.denx.de/cgi-bin/gitweb.cgi?p=u-boot.git;a=summary>

The "snapshot" links on this page allow you to download tarballs of any version you might be interested in. Official releases are also available for FTP download from the <ftp://ftp.denx.de/pub/u-boot/> directory.

Pre-built (and tested) images are available from <ftp://ftp.denx.de/pub/u-boot/images/>

Where we come from:

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- start from 8xxrom sources
- create PPCBoot project (<http://sourceforge.net/projects/ppcboot>)
- clean up code
- make it easier to add custom boards
- make it possible to add other [PowerPC] CPUs
- extend functions, especially:
 - * Provide extended interface to Linux boot loader
 - * S-Record download
 - * network boot
 - * PCMCIA / CompactFlash / ATA disk / SCSI ... boot
- create ARMBoot project (<http://sourceforge.net/projects/armboot>)
- add other CPU families (starting with ARM)
- create U-Boot project (<http://sourceforge.net/projects/u-boot>)
- current project page: see <http://www.denx.de/wiki/U-Boot>

Names and Spelling:

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The "official" name of this project is "Das U-Boot". The spelling "U-Boot" shall be used in all written text (documentation, comments in source files etc.). Example:

This is the README file for the U-Boot project.

File names etc. shall be based on the string "u-boot". Examples:

```
include/asm-ppc/u-boot.h
```

```
#include <asm/u-boot.h>
```

Variable names, preprocessor constants etc. shall be either based on the string "u_boot" or on "U_BOOT". Example:

```
U_BOOT_VERSION    u_boot_logo
IH_OS_U_BOOT      u_boot_hush_start
```

Versioning:

=====

Starting with the release in October 2008, the names of the releases were changed from numerical release numbers without deeper meaning into a time stamp based numbering. Regular releases are identified by names consisting of the calendar year and month of the release date. Additional fields (if present) indicate release candidates or bug fix releases in "stable" maintenance trees.

Examples:

```
U-Boot v2009.11      - Release November 2009
U-Boot v2009.11.1    - Release 1 in version November 2009 stable tree
U-Boot v2010.09-rc1  - Release candidate 1 for September 2010 release
```

Directory Hierarchy:

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```

/arch          Architecture specific files
/arm           Files generic to ARM architecture
/cpu          CPU specific files
/arm720t      Files specific to ARM 720 CPUs
/arm920t      Files specific to ARM 920 CPUs
/at91         Files specific to Atmel AT91RM9200 CPU
/imx          Files specific to Freescale MC9328 i.MX CPUs
/s3c24x0      Files specific to Samsung S3C24X0 CPUs
/arm925t      Files specific to ARM 925 CPUs
/arm926ejs    Files specific to ARM 926 CPUs
/arm1136      Files specific to ARM 1136 CPUs
/ixp          Files specific to Intel XScale IXP CPUs
/pxa          Files specific to Intel XScale PXA CPUs
/s3c44b0      Files specific to Samsung S3C44B0 CPUs
/sa1100       Files specific to Intel StrongARM SA1100 CPUs
/lib          Architecture specific library files
/avr32        Files generic to AVR32 architecture
/cpu          CPU specific files
/lib          Architecture specific library files
/blackfin     Files generic to Analog Devices Blackfin architecture
/cpu          CPU specific files
/lib          Architecture specific library files
/x86          Files generic to x86 architecture
/cpu          CPU specific files
/lib          Architecture specific library files
/m68k         Files generic to m68k architecture
/cpu          CPU specific files
/mcf52x2      Files specific to Freescale ColdFire MCF52x2 CPUs
/mcf5227x     Files specific to Freescale ColdFire MCF5227x CPUs
/mcf532x      Files specific to Freescale ColdFire MCF5329 CPUs
/mcf5445x     Files specific to Freescale ColdFire MCF5445x CPUs
/mcf547x_8x   Files specific to Freescale ColdFire MCF547x_8x CPUs
/lib          Architecture specific library files
/microblaze   Files generic to microblaze architecture
/cpu          CPU specific files
/lib          Architecture specific library files
/mips         Files generic to MIPS architecture
/cpu          CPU specific files
/mips32       Files specific to MIPS32 CPUs
/xburst       Files specific to Ingenic XBurst CPUs
/lib          Architecture specific library files
/nds32        Files generic to NDS32 architecture
/cpu          CPU specific files
/n1213        Files specific to Andes Technology N1213 CPUs
/lib          Architecture specific library files
/nios2        Files generic to Altera NIOS2 architecture
/cpu          CPU specific files
/lib          Architecture specific library files
/powerpc      Files generic to PowerPC architecture
/cpu          CPU specific files
/74xx_7xx     Files specific to Freescale MPC74xx and 7xx CPUs
/mpc5xx       Files specific to Freescale MPC5xx CPUs
/mpc5xxx      Files specific to Freescale MPC5xxx CPUs
/mpc8xx       Files specific to Freescale MPC8xx CPUs
/mpc8220      Files specific to Freescale MPC8220 CPUs
/mpc824x      Files specific to Freescale MPC824x CPUs
/mpc8260      Files specific to Freescale MPC8260 CPUs
/mpc85xx      Files specific to Freescale MPC85xx CPUs
/ppc4xx       Files specific to AMCC PowerPC 4xx CPUs
/lib          Architecture specific library files
/sh           Files generic to SH architecture
/cpu          CPU specific files
/sh2          Files specific to sh2 CPUs
/sh3          Files specific to sh3 CPUs
/sh4          Files specific to sh4 CPUs
/lib          Architecture specific library files
/sparc        Files generic to SPARC architecture
/cpu          CPU specific files
/leon2        Files specific to Gaisler LEON2 SPARC CPU
/leon3        Files specific to Gaisler LEON3 SPARC CPU
/lib          Architecture specific library files
/api          Machine/arch independent API for external apps
/board        Board dependent files
/common        Misc architecture independent functions
/disk          Code for disk drive partition handling
/doc           Documentation (don't expect too much)
/drivers       Commonly used device drivers
/examples      Example code for standalone applications, etc.
/fs            Filesystem code (cramfs, ext2, jffs2, etc.)
/include       Header Files
/lib          Files generic to all architectures

```

| | |
|---------|---|
| /libfdt | Library files to support flattened device trees |
| /lzma | Library files to support LZMA decompression |
| /lzo | Library files to support LZO decompression |
| /net | Networking code |
| /post | Power On Self Test |
| /rtc | Real Time Clock drivers |
| /tools | Tools to build S-Record or U-Boot images, etc. |

Software Configuration:

Configuration is usually done using C preprocessor defines; the rationale behind that is to avoid dead code whenever possible.

There are two classes of configuration variables:

- * Configuration `_OPTIONS_`:
These are selectable by the user and have names beginning with `"CONFIG_"`.
- * Configuration `_SETTINGS_`:
These depend on the hardware etc. and should not be meddled with if you don't know what you're doing; they have names beginning with `"CONFIG_SYS_"`.

Later we will add a configuration tool - probably similar to or even identical to what's used for the Linux kernel. Right now, we have to do the configuration by hand, which means creating some symbolic links and editing some configuration files. We use the TQM8xxL boards as an example here.

Selection of Processor Architecture and Board Type:

For all supported boards there are ready-to-use default configurations available; just type `"make <board_name>_config"`.

Example: For a TQM823L module type:

```
cd u-boot
make TQM823L_config
```

For the Cogent platform, you need to specify the CPU type as well; e.g. `"make cogent_mpc8xx_config"`. And also configure the cogent directory according to the instructions in `cogent/README`.

Configuration Options:

Configuration depends on the combination of board and CPU type; all such information is kept in a configuration file `"include/configs/<board_name>.h"`.

Example: For a TQM823L module, all configuration settings are in `"include/configs/TQM823L.h"`.

Many of the options are named exactly as the corresponding Linux kernel configuration options. The intention is to make it easier to build a config tool - later.

The following options need to be configured:

- CPU Type: Define exactly one, e.g. `CONFIG_MPC85XX`.
- Board Type: Define exactly one, e.g. `CONFIG_MPC8540ADS`.
- CPU Daughterboard Type: (if `CONFIG_ATSTK1000` is defined)
Define exactly one, e.g. `CONFIG_ATSTK1002`
- CPU Module Type: (if `CONFIG_COGENT` is defined)
Define exactly one of
`CONFIG_CMA286_60_OLD`
- FIXME --- not tested yet:
`CONFIG_CMA286_60`, `CONFIG_CMA286_21`, `CONFIG_CMA286_60P`,
`CONFIG_CMA287_23`, `CONFIG_CMA287_50`
- Motherboard Type: (if `CONFIG_COGENT` is defined)
Define exactly one of
`CONFIG_CMA101`, `CONFIG_CMA102`

- Motherboard I/O Modules: (if CONFIG_COGENT is defined)
 - Define one or more of
 - CONFIG_CMA302
- Motherboard Options: (if CONFIG_CMA101 or CONFIG_CMA102 are defined)
 - Define one or more of
 - CONFIG_LCD_HEARTBEAT - update a character position on the LCD display every second with a "rotator" |¥-/|¥-/
- Board flavour: (if CONFIG_MPC8260ADS is defined)
 - CONFIG_ADSTYPE
 - Possible values are:
 - CONFIG_SYS_8260ADS - original MPC8260ADS
 - CONFIG_SYS_8266ADS - MPC8266ADS
 - CONFIG_SYS_PQ2FADS - PQ2FADS-ZU or PQ2FADS-VR
 - CONFIG_SYS_8272ADS - MPC8272ADS
- Marvell Family Member
 - CONFIG_SYS_MVFS - define it if you want to enable multiple fs option at one time for marvell soc family
- MPC824X Family Member (if CONFIG_MPC824X is defined)
 - Define exactly one of
 - CONFIG_MPC8240, CONFIG_MPC8245
- 8xx CPU Options: (if using an MPC8xx CPU)
 - CONFIG_8xx_GCLK_FREQ - deprecated: CPU clock if get_gclk_freq() cannot work e.g. if there is no 32KHz reference PIT/RTC clock
 - CONFIG_8xx_OSCCLK - PLL input clock (either EXTCLK or XTAL/EXTAL)
- 859/866/885 CPU options: (if using a MPC859 or MPC866 or MPC885 CPU):
 - CONFIG_SYS_8xx_CPUCLK_MIN
 - CONFIG_SYS_8xx_CPUCLK_MAX
 - CONFIG_8xx_CPUCLK_DEFAULT
 - See doc/README.MPC866
 - CONFIG_SYS_MEASURE_CPUCLK

Define this to measure the actual CPU clock instead of relying on the correctness of the configured values. Mostly useful for board bringup to make sure the PLL is locked at the intended frequency. Note that this requires a (stable) reference clock (32 kHz RTC clock or CONFIG_SYS_8XX_XIN)

 - CONFIG_SYS_DELAYED_ICACHE

Define this option if you want to enable the ICache only when Code runs from RAM.
- 85xx CPU Options:
 - CONFIG_SYS_PPC64

Specifies that the core is a 64-bit PowerPC implementation (implements the "64" category of the Power ISA). This is necessary for ePAPR compliance, among other possible reasons.

 - CONFIG_SYS_FSL_TBCLK_DIV

Defines the core time base clock divider ratio compared to the system clock. On most PQ3 devices this is 8, on newer QorIQ devices it can be 16 or 32. The ratio varies from SoC to Soc.

 - CONFIG_SYS_FSL_PCIE_COMPAT

Defines the string to utilize when trying to match PCIe device tree nodes for the given platform.

 - CONFIG_SYS_PPC_E500_DEBUG_TLB

Enables a temporary TLB entry to be used during boot to work around limitations in e500v1 and e500v2 external debugger support. This reduces the portions of the boot code where breakpoints and single stepping do not work. The value of this symbol should be set to the TLB1 entry to be used for this purpose.

 - CONFIG_SYS_FSL_ERRATUM_A004510

Enables a workaround for erratum A004510. If set, then CONFIG_SYS_FSL_ERRATUM_A004510_SVR_REV and CONFIG_SYS_FSL_CORENET_SNOOPVEC_COREONLY must be set.

CONFIG_SYS_FSL_ERRATUM_A004510_SVR_REV
CONFIG_SYS_FSL_ERRATUM_A004510_SVR_REV2 (optional)

Defines one or two SoC revisions (low 8 bits of SVR) for which the A004510 workaround should be applied.

The rest of SVR is either not relevant to the decision of whether the erratum is present (e.g. p2040 versus p2041) or is implied by the build target, which controls whether CONFIG_SYS_FSL_ERRATUM_A004510 is set.

See Freescale App Note 4493 for more information about this erratum.

CONFIG_SYS_FSL_CORENET_SNOOPVEC_COREONLY

This is the value to write into CCSR offset 0x18600 according to the A004510 workaround.

- Generic CPU options:

CONFIG_SYS_BIG_ENDIAN, CONFIG_SYS_LITTLE_ENDIAN

Defines the endianness of the CPU. Implementation of those values is arch specific.

- Intel Monahans options:

CONFIG_SYS_MONAHANS_RUN_MODE_OSC_RATIO

Defines the Monahans run mode to oscillator ratio. Valid values are 8, 16, 24, 31. The core frequency is this value multiplied by 13 MHz.

CONFIG_SYS_MONAHANS_TURBO_RUN_MODE_RATIO

Defines the Monahans turbo mode to oscillator ratio. Valid values are 1 (default if undefined) and 2. The core frequency as calculated above is multiplied by this value.

- MIPS CPU options:

CONFIG_SYS_INIT_SP_OFFSET

Offset relative to CONFIG_SYS_SDRAM_BASE for initial stack pointer. This is needed for the temporary stack before relocation.

CONFIG_SYS_MIPS_CACHE_MODE

Cache operation mode for the MIPS CPU.
See also arch/mips/include/asm/mipsregs.h.
Possible values are:

CONF_CM_CACHABLE_NO_WA
CONF_CM_CACHABLE_WA
CONF_CM_UNCACHED
CONF_CM_CACHABLE_NONCOHERENT
CONF_CM_CACHABLE_CE
CONF_CM_CACHABLE_COW
CONF_CM_CACHABLE_CUW
CONF_CM_CACHABLE_ACCELERATED

CONFIG_SYS_XWAY_EBU_BOOTCFG

Special option for Lantiq XWAY SoCs for booting from NOR flash.
See also arch/mips/cpu/mips32/start.S.

CONFIG_XWAY_SWAP_BYTES

Enable compilation of tools/xway-swap-bytes needed for Lantiq XWAY SoCs for booting from NOR flash. The U-Boot image needs to be swapped if a flash programmer is used.

- ARM options:

CONFIG_SYS_EXCEPTION_VECTORS_HIGH

Select high exception vectors of the ARM core, e.g., do not clear the V bit of the c1 register of CP15.

CONFIG_SYS_THUMB_BUILD

Use this flag to build U-Boot using the Thumb instruction

set for ARM architectures. Thumb instruction set provides better code density. For ARM architectures that support Thumb2 this flag will result in Thumb2 code generated by GCC.

- Linux Kernel Interface:

CONFIG_CLOCKS_IN_MHZ

U-Boot stores all clock information in Hz internally. For binary compatibility with older Linux kernels (which expect the clocks passed in the bd_info data to be in MHz) the environment variable "clocks_in_mhz" can be defined so that U-Boot converts clock data to MHz before passing it to the Linux kernel.

When CONFIG_CLOCKS_IN_MHZ is defined, a definition of "clocks_in_mhz=1" is automatically included in the default environment.

CONFIG_MEMSIZE_IN_BYTES [relevant for MIPS only]

When transferring memsize parameter to linux, some versions expect it to be in bytes, others in MB.

Define CONFIG_MEMSIZE_IN_BYTES to make it in bytes.

CONFIG_OF_LIBFDT

New kernel versions are expecting firmware settings to be passed using flattened device trees (based on open firmware concepts).

CONFIG_OF_LIBFDT

- * New libfdt-based support
- * Adds the "fdt" command
- * The bootm command automatically updates the fdt

OF_CPU - The proper name of the cpus node (only required for MPC512X and MPC5xxx based boards).

OF_SOC - The proper name of the soc node (only required for MPC512X and MPC5xxx based boards).

OF_TBCLK - The timebase frequency.

OF_STDOUT_PATH - The path to the console device

boards with QUICC Engines require OF_QE to set UCC MAC addresses

CONFIG_OF_BOARD_SETUP

Board code has addition modification that it wants to make to the flat device tree before handing it off to the kernel

CONFIG_OF_BOOT_CPU

This define fills in the correct boot CPU in the boot param header, the default value is zero if undefined.

CONFIG_OF_IDE_FIXUP

U-Boot can detect if an IDE device is present or not. If not, and this new config option is activated, U-Boot removes the ATA node from the DTS before booting Linux, so the Linux IDE driver does not probe the device and crash. This is needed for buggy hardware (uc101) where no pull down resistor is connected to the signal IDE5V_DD7.

CONFIG_MACH_TYPE [relevant for ARM only][mandatory]

This setting is mandatory for all boards that have only one machine type and must be used to specify the machine type number as it appears in the ARM machine registry (see <http://www.arm.linux.org.uk/developer/machines/>). Only boards that have multiple machine types supported in a single configuration file and the machine type is runtime discoverable, do not have to use this setting.

- vxWorks boot parameters:

bootvx constructs a valid bootline using the following environments variables: bootfile, ipaddr, serverip, hostname. It loads the vxWorks image pointed bootfile.

CONFIG_SYS_VXWORKS_BOOT_DEVICE - The vxworks device name

CONFIG_SYS_VXWORKS_MAC_PTR - Ethernet 6 byte MA -address

CONFIG_SYS_VXWORKS_SERVERNAME - Name of the server

CONFIG_SYS_VXWORKS_BOOT_ADDR - Address of boot parameters

CONFIG_SYS_VXWORKS_ADD_PARAMS

Add it at the end of the bootline. E.g "u=username pw=secret"

Note: If a "bootargs" environment is defined, it will overwrite the defaults discussed just above.

- Cache Configuration:

CONFIG_SYS_ICACHE_OFF - Do not enable instruction cache in U-Boot

CONFIG_SYS_DCACHE_OFF - Do not enable data cache in U-Boot

CONFIG_SYS_L2CACHE_OFF - Do not enable L2 cache in U-Boot

- Cache Configuration for ARM:

CONFIG_SYS_L2_PL310 - Enable support for ARM PL310 L2 cache controller

CONFIG_SYS_PL310_BASE - Physical base address of PL310 controller register space

- Serial Ports:

CONFIG_PL010_SERIAL

Define this if you want support for Amba PrimeCell PL010 UARTs.

CONFIG_PL011_SERIAL

Define this if you want support for Amba PrimeCell PL011 UARTs.

CONFIG_PL011_CLOCK

If you have Amba PrimeCell PL011 UARTs, set this variable to the clock speed of the UARTs.

CONFIG_PL01x_PORTS

If you have Amba PrimeCell PL010 or PL011 UARTs on your board, define this to a list of base addresses for each (supported) port. See e.g. include/configs/versatile.h

CONFIG_PL011_SERIAL_RLCR

Some vendor versions of PL011 serial ports (e.g. ST-Ericsson U8500) have separate receive and transmit line control registers. Set this variable to initialize the extra register.

CONFIG_PL011_SERIAL_FLUSH_ON_INIT

On some platforms (e.g. U8500) U-Boot is loaded by a second stage boot loader that has already initialized the UART. Define this variable to flush the UART at init time.

CONFIG_SYS_NS16550_BROKEN_TEMT

16550 UART set the Transmitter Empty (TEMT) Bit when all output has finished and the transmitter is totally empty. U-Boot waits for this bit to be set to initialize the serial console. On some broken platforms this bit is not set in SPL making U-Boot to hang while waiting for TEMT. Define this option to avoid it.

- Console Interface:

Depending on board, define exactly one serial port (like CONFIG_8xx_CONS_SMC1, CONFIG_8xx_CONS_SMC2, CONFIG_8xx_CONS_SCC1, ...), or switch off the serial console by defining CONFIG_8xx_CONS_NONE

Note: if CONFIG_8xx_CONS_NONE is defined, the serial port routines must be defined elsewhere (i.e. serial_init(), serial_getc(), ...)

CONFIG_CFB_CONSOLE

Enables console device for a color framebuffer. Needs following defines (cf. smiLynxEM, i8042)

VIDEO_FB_LITTLE_ENDIAN graphic memory organisation (default big endian)

VIDEO_HW_RECTFILL graphic chip supports rectangle fill (cf. smiLynxEM)

VIDEO_HW_BITBLT graphic chip supports bit-blit (cf. smiLynxEM)

VIDEO_VISIBLE_COLS visible pixel columns (cols=pitch)

VIDEO_VISIBLE_ROWS visible pixel rows

VIDEO_PIXEL_SIZE bytes per pixel
 VIDEO_DATA_FORMAT graphic data format
 (0-5, cf. cfb_console.c)
 VIDEO_FB_ADRS framebuffer address
 VIDEO_KBD_INIT_FCT keyboard int fct
 (i.e. i8042_kbd_init())
 VIDEO_TSTC_FCT test char fct
 (i.e. i8042_tstc)
 VIDEO_GETC_FCT get char fct
 (i.e. i8042_getc)
 CONFIG_CONSOLE_CURSOR cursor drawing on/off
 (requires blink timer
 cf. i8042.c)
 CONFIG_SYS_CONSOLE_BLINK_COUNT blink interval (cf. i8042.c)
 CONFIG_CONSOLE_TIME display time/date info in
 upper right corner
 (requires CONFIG_CMD_DATE)
 CONFIG_VIDEO_LOGO display Linux logo in
 upper left corner
 CONFIG_VIDEO_BMP_LOGO use bmp_logo.h instead of
 linux_logo.h for logo.
 Requires CONFIG_VIDEO_LOGO
 CONFIG_CONSOLE_EXTRA_INFO additional board info beside
 the logo

When CONFIG_CFB_CONSOLE_ANSI is defined, console will support a limited number of ANSI escape sequences (cursor control, erase functions and limited graphics rendition control).

When CONFIG_CFB_CONSOLE is defined, video console is default i/o. Serial console can be forced with environment 'console=serial'.

When CONFIG_SILENT_CONSOLE is defined, all console messages (by U-Boot and linux!) can be silenced with the "silent" environment variable. See doc/README.silent for more information.

- Console Baudrate:

CONFIG_BAUDRATE - in bps
 Select one of the baudrates listed in
 CONFIG_SYS_BAUDRATE_TABLE, see below.
 CONFIG_SYS_BRGCLK_PRESCALE, baudrate prescale

- Console Rx buffer length

With CONFIG_SYS_SMC_RXBUFLen it is possible to define the maximum receive buffer length for the SMC.
 This option is actual only for 82xx and 8xx possible.
 If using CONFIG_SYS_SMC_RXBUFLen also CONFIG_SYS_MAXIDLE must be defined, to setup the maximum idle timeout for the SMC.

- Pre-Console Buffer:

Prior to the console being initialised (i.e. serial UART initialised etc) all console output is silently discarded. Defining CONFIG_PRE_CONSOLE_BUFFER will cause U-Boot to buffer any console messages prior to the console being initialised to a buffer of size CONFIG_PRE_CON_BUF_SZ bytes located at CONFIG_PRE_CON_BUF_ADDR. The buffer is a circular buffer, so if more than CONFIG_PRE_CON_BUF_SZ bytes are output before the console is initialised, the earlier bytes are discarded.

'Sane' compilers will generate smaller code if
 CONFIG_PRE_CON_BUF_SZ is a power of 2

- Safe printf() functions

Define CONFIG_SYS_VSNPRINTF to compile in safe versions of the printf() functions. These are defined in include/vsprintf.h and include snprintf(), vsnprintf() and so on. Code size increase is approximately 300-500 bytes. If this option is not given then these functions will silently discard their buffer size argument - this means you are not getting any overflow checking in this case.

- Boot Delay: CONFIG_BOOTDELAY - in seconds

Delay before automatically booting the default image;
 set to -1 to disable autoboot.
 set to -2 to autoboot with no delay and not check for abort (even when CONFIG_ZERO_BOOTDELAY_CHECK is defined).

See doc/README.autoboot for these options that work with CONFIG_BOOTDELAY. None are required.

CONFIG_BOOT_RETRY_TIME
 CONFIG_BOOT_RETRY_MIN
 CONFIG_AUTOBOOT_KEYED
 CONFIG_AUTOBOOT_PROMPT
 CONFIG_AUTOBOOT_DELAY_STR
 CONFIG_AUTOBOOT_STOP_STR
 CONFIG_AUTOBOOT_DELAY_STR2
 CONFIG_AUTOBOOT_STOP_STR2
 CONFIG_ZERO_BOOTDELAY_CHECK
 CONFIG_RESET_TO_RETRY

- Autoboot Command:

CONFIG_BOOTCOMMAND
 Only needed when CONFIG_BOOTDELAY is enabled;
 define a command string that is automatically executed
 when no character is read on the console interface
 within "Boot Delay" after reset.

CONFIG_BOOTARGS
 This can be used to pass arguments to the bootm
 command. The value of CONFIG_BOOTARGS goes into the
 environment value "bootargs".

CONFIG_RAMBOOT and CONFIG_NFSBOOT
 The value of these goes into the environment as
 "ramboot" and "nfsboot" respectively, and can be used
 as a convenience, when switching between booting from
 RAM and NFS.

- Pre-Boot Commands:

CONFIG_PREBOOT

When this option is #defined, the existence of the
 environment variable "preboot" will be checked
 immediately before starting the CONFIG_BOOTDELAY
 countdown and/or running the auto-boot command resp.
 entering interactive mode.

This feature is especially useful when "preboot" is
 automatically generated or modified. For an example
 see the LWMON board specific code: here "preboot" is
 modified when the user holds down a certain
 combination of keys on the (special) keyboard when
 booting the systems

- Serial Download Echo Mode:

CONFIG_LOADS_ECHO
 If defined to 1, all characters received during a
 serial download (using the "loads" command) are
 echoed back. This might be needed by some terminal
 emulations (like "cu"), but may as well just take
 time on others. This setting #define's the initial
 value of the "loads_echo" environment variable.

- Kgdb Serial Baudrate: (if CONFIG_CMD_KGDB is defined)

CONFIG_KGDB_BAUDRATE
 Select one of the baudrates listed in
 CONFIG_SYS_BAUDRATE_TABLE, see below.

- Monitor Functions:

Monitor commands can be included or excluded
 from the build by using the #include files
 <config_cmd_all.h> and #undef'ing unwanted
 commands, or using <config_cmd_default.h>
 and augmenting with additional #define's
 for wanted commands.

The default command configuration includes all commands
 except those marked below with a "*".

CONFIG_CMD_ASKENV * ask for env variable
 CONFIG_CMD_BDI bdiinfo
 CONFIG_CMD_BEDBUG * Include BedBug Debugger
 CONFIG_CMD_BMP * BMP support
 CONFIG_CMD_BSP * Board specific commands
 CONFIG_CMD_BOOTD bootd
 CONFIG_CMD_CACHE * icache, dcache
 CONFIG_CMD_CONSOLE coninfo
 CONFIG_CMD_CRC32 * crc32
 CONFIG_CMD_DATE * support for RTC, date/time...
 CONFIG_CMD_DHCP * DHCP support
 CONFIG_CMD_DIAG * Diagnostics
 CONFIG_CMD_DS4510 * ds4510 I2C gpio commands
 CONFIG_CMD_DS4510_INFO * ds4510 I2C info command

```

CONFIG_CMD_DS4510_MEM * ds4510 I2C eeprom/sram commands
CONFIG_CMD_DS4510_RST * ds4510 I2C rst command
CONFIG_CMD_DTT * Digital Therm and Thermostat
CONFIG_CMD_ECHO echo arguments
CONFIG_CMD_EDITENV edit env variable
CONFIG_CMD_EEPROM * EEPROM read/write support
CONFIG_CMD_ELF * bootelf, bootvx
CONFIG_CMD_ENV_CALLBACK * display details about env callbacks
CONFIG_CMD_ENV_FLAGS * display details about env flags
CONFIG_CMD_EXPORTENV * export the environment
CONFIG_CMD_EXT2 * ext2 command support
CONFIG_CMD_EXT4 * ext4 command support
CONFIG_CMD_SAVEENV saveenv
CONFIG_CMD_FDC * Floppy Disk Support
CONFIG_CMD_FAT * FAT command support
CONFIG_CMD_FDOS * Dos diskette Support
CONFIG_CMD_FLASH flinfo, erase, protect
CONFIG_CMD_FPGA FPGA device initialization support
CONFIG_CMD_GETTIME * Get time since boot
CONFIG_CMD_GO * the 'go' command (exec code)
CONFIG_CMD_GREPENV * search environment
CONFIG_CMD_HASH * calculate hash / digest
CONFIG_CMD_HWFLOW * RTS/CTS hw flow control
CONFIG_CMD_I2C * I2C serial bus support
CONFIG_CMD_IDE * IDE harddisk support
CONFIG_CMD_IMI iminfo
CONFIG_CMD_IMLS List all found images
CONFIG_CMD_IMMAP * IMMR dump support
CONFIG_CMD_IMPORTENV * import an environment
CONFIG_CMD_INI * import data from an ini file into the env
CONFIG_CMD_IRQ * irqinfo
CONFIG_CMD_ITEST Integer/string test of 2 values
CONFIG_CMD_JFFS2 * JFFS2 Support
CONFIG_CMD_KGDB * kgdb
CONFIG_CMD_LDRINFO ldrinfo (display Blackfin loader)
CONFIG_CMD_LINK_LOCAL * link-local IP address auto-configuration
(169.254.*.*)
CONFIG_CMD_LOADB loadb
CONFIG_CMD_LOADS loads
CONFIG_CMD_MD5SUM print md5 message digest
(requires CONFIG_CMD_MEMORY and CONFIG_MD5)
CONFIG_CMD_MEMINFO * Display detailed memory information
CONFIG_CMD_MEMORY md, mm, nm, mw, cp, cmp, crc, base,
loop, loopw, mtest
CONFIG_CMD_MISC Misc functions like sleep etc
CONFIG_CMD_MMC * MMC memory mapped support
CONFIG_CMD_MII * MII utility commands
CONFIG_CMD_MTDPARTS * MTD partition support
CONFIG_CMD_NAND * NAND support
CONFIG_CMD_NET bootp, tftpboot, rarpboot
CONFIG_CMD_PCA953X * PCA953x I2C gpio commands
CONFIG_CMD_PCA953X_INFO * PCA953x I2C gpio info command
CONFIG_CMD_PCI * pciinfo
CONFIG_CMD_PCMCIA * PCMCIA support
CONFIG_CMD_PING * send ICMP ECHO_REQUEST to network
host
CONFIG_CMD_PORTIO * Port I/O
CONFIG_CMD_READ * Read raw data from partition
CONFIG_CMD_REGINFO * Register dump
CONFIG_CMD_RUN run command in env variable
CONFIG_CMD_SAVES * save S record dump
CONFIG_CMD_SCSI * SCSI Support
CONFIG_CMD_SDRAM * print SDRAM configuration information
(requires CONFIG_CMD_I2C)
CONFIG_CMD_SETGETDCR Support for DCR Register access
(4xx only)
CONFIG_CMD_SF * Read/write/erase SPI NOR flash
CONFIG_CMD_SHA1SUM print sha1 memory digest
(requires CONFIG_CMD_MEMORY)
CONFIG_CMD_SOURCE "source" command Support
CONFIG_CMD_SPI * SPI serial bus support
CONFIG_CMD_TFTPSRV * TFTP transfer in server mode
CONFIG_CMD_TFTPPUT * TFTP put command (upload)
CONFIG_CMD_TIME * run command and report execution time (ARM specific)
CONFIG_CMD_TIMER * access to the system tick timer
CONFIG_CMD_USB * USB support
CONFIG_CMD_CDP * Cisco Discover Protocol support
CONFIG_CMD_MFSL * Microblaze FSL support

```

EXAMPLE: If you want all functions except of network support you can write:

```
#include "config_cmd_all.h"
```

#undef CONFIG_CMD_NET

Other Commands:

fdt (flattened device tree) command: CONFIG_OF_LIBFDT

Note: Don't enable the "icache" and "dcache" commands (configuration option CONFIG_CMD_CACHE) unless you know what you (and your U-Boot users) are doing. Data cache cannot be enabled on systems like the 8xx or 8260 (where accesses to the IMMR region must be uncached), and it cannot be disabled on all other systems where we (mis-) use the data cache to hold an initial stack and some data.

XXX - this list needs to get updated!

- Device tree:

CONFIG_OF_CONTROL

If this variable is defined, U-Boot will use a device tree to configure its devices, instead of relying on statically compiled #defines in the board file. This option is experimental and only available on a few boards. The device tree is available in the global data as gd->fdt_blob.

U-Boot needs to get its device tree from somewhere. This can be done using one of the two options below:

CONFIG_OF_EMBED

If this variable is defined, U-Boot will embed a device tree binary in its image. This device tree file should be in the board directory and called <soc>-<board>.dts. The binary file is then picked up in board_init_f() and made available through the global data structure as gd->blob.

CONFIG_OF_SEPARATE

If this variable is defined, U-Boot will build a device tree binary. It will be called u-boot.dtb. Architecture-specific code will locate it at run-time. Generally this works by:

```
cat u-boot.bin u-boot.dtb >image.bin
```

and in fact, U-Boot does this for you, creating a file called u-boot-dtb.bin which is useful in the common case. You can still use the individual files if you need something more exotic.

- Watchdog:

CONFIG_WATCHDOG

If this variable is defined, it enables watchdog support for the SoC. There must be support in the SoC specific code for a watchdog. For the 8xx and 8260 CPUs, the SIU Watchdog feature is enabled in the SYPCR register. When supported for a specific SoC is available, then no further board specific code should be needed to use it.

CONFIG_HW_WATCHDOG

When using a watchdog circuitry external to the used SoC, then define this variable and provide board specific code for the "hw_watchdog_reset" function.

- U-Boot Version:

CONFIG_VERSION_VARIABLE

If this variable is defined, an environment variable named "ver" is created by U-Boot showing the U-Boot version as printed by the "version" command. Any change to this variable will be reverted at the next reset.

- Real-Time Clock:

When CONFIG_CMD_DATE is selected, the type of the RTC has to be selected, too. Define exactly one of the following options:

```
CONFIG_RTC_MPC8xx    - use internal RTC of MPC8xx
CONFIG_RTC_PCF8563   - use Philips PCF8563 RTC
CONFIG_RTC_MC13XXX   - use MC13783 or MC13892 RTC
CONFIG_RTC_MC146818  - use MC146818 RTC
CONFIG_RTC_DS1307    - use Maxim, Inc. DS1307 RTC
CONFIG_RTC_DS1337    - use Maxim, Inc. DS1337 RTC
CONFIG_RTC_DS1338    - use Maxim, Inc. DS1338 RTC
CONFIG_RTC_DS164x    - use Dallas DS164x RTC
```

```

CONFIG_RTC_ISL1208 - use Intersil ISL1208 RTC
CONFIG_RTC_MAX6900 - use Maxim, Inc. MAX6900 RTC
CONFIG_SYS_RTC_DS1337_NOOSC - Turn off the OSC output for DS1337
CONFIG_SYS_RV3029_TCR - enable trickle charger on
                        RV3029 RTC.

```

Note that if the RTC uses I2C, then the I2C interface must also be configured. See I2C Support, below.

- GPIO Support:

```

CONFIG_PCA953X - use NXP's PCA953X series I2C GPIO
CONFIG_PCA953X_INFO - enable pca953x info command

```

The CONFIG_SYS_I2C_PCA953X_WIDTH option specifies a list of chip-ngpio pairs that tell the PCA953X driver the number of pins supported by a particular chip.

Note that if the GPIO device uses I2C, then the I2C interface must also be configured. See I2C Support, below.

- Timestamp Support:

When CONFIG_TIMESTAMP is selected, the timestamp (date and time) of an image is printed by image commands like bootm or iminfo. This option is automatically enabled when you select CONFIG_CMD_DATE .

- Partition Labels (disklabels) Supported:

Zero or more of the following:

```

CONFIG_MAC_PARTITION Apple's MacOS partition table.
CONFIG_DOS_PARTITION MS Dos partition table, traditional on the
                        Intel architecture, USB sticks, etc.
CONFIG_ISO_PARTITION ISO partition table, used on CDROM etc.
CONFIG_EFI_PARTITION GPT partition table, common when EFI is the
                        bootloader. Note 2TB partition limit; see
                        disk/part_efi.c
CONFIG_MTD_PARTITIONS Memory Technology Device partition table.

```

If IDE or SCSI support is enabled (CONFIG_CMD_IDE or CONFIG_CMD_SCSI) you must configure support for at least one non-MTD partition type as well.

- IDE Reset method:

CONFIG_IDE_RESET_ROUTINE - this is defined in several board configurations files but used nowhere!

CONFIG_IDE_RESET - is this is defined, IDE Reset will be performed by calling the function

```

ide_set_reset(int reset)

```

which has to be defined in a board specific file

- ATAPI Support:

```

CONFIG_ATAPI

```

Set this to enable ATAPI support.

- LBA48 Support

```

CONFIG_LBA48

```

Set this to enable support for disks larger than 137GB
Also look at CONFIG_SYS_64BIT_LBA.
Without these , LBA48 support uses 32bit variables and will 'only' support disks up to 2.1TB.

```

CONFIG_SYS_64BIT_LBA:

```

When enabled, makes the IDE subsystem use 64bit sector addresses.
Default is 32bit.

- SCSI Support:

At the moment only there is only support for the SYM53C8XX SCSI controller; define
CONFIG_SCSI_SYM53C8XX to enable it.

```

CONFIG_SYS_SCSI_MAX_LUN [8], CONFIG_SYS_SCSI_MAX_SCSI_ID [7] and
CONFIG_SYS_SCSI_MAX_DEVICE [CONFIG_SYS_SCSI_MAX_SCSI_ID *
CONFIG_SYS_SCSI_MAX_LUN] can be adjusted to define the
maximum numbers of LUNs, SCSI ID's and target
devices.
CONFIG_SYS_SCSI_SYM53C8XX_CCF to fix clock timing (80Mhz)

```

The environment variable 'scsidevs' is set to the number of SCSI devices found during the last scan.

- NETWORK Support (PCI):

CONFIG_E1000
Support for Intel 8254x/8257x gigabit chips.

CONFIG_E1000_SPI
Utility code for direct access to the SPI bus on Intel 8257x.
This does not do anything useful unless you set at least one
of CONFIG_CMD_E1000 or CONFIG_E1000_SPI_GENERIC.

CONFIG_E1000_SPI_GENERIC
Allow generic access to the SPI bus on the Intel 8257x, for
example with the "sspi" command.

CONFIG_CMD_E1000
Management command for E1000 devices. When used on devices
with SPI support you can reprogram the EEPROM from U-Boot.

CONFIG_E1000_FALLBACK_MAC
default MAC for empty EEPROM after production.

CONFIG_EEPRO100
Support for Intel 82557/82559/82559ER chips.
Optional CONFIG_EEPRO100_SROM_WRITE enables EEPROM
write routine for first time initialisation.

CONFIG_TULIP
Support for Digital 2114x chips.
Optional CONFIG_TULIP_SELECT_MEDIA for board specific
modem chip initialisation (KS8761/QS6611).

CONFIG_NATSEMI
Support for National dp83815 chips.

CONFIG_NS8382X
Support for National dp8382[01] gigabit chips.

- NETWORK Support (other):

CONFIG_DRIVER_AT91EMAC
Support for AT91RM9200 EMAC.

CONFIG_RMII
Define this to use reduced MII interface

CONFIG_DRIVER_AT91EMAC_QUIET
If this defined, the driver is quiet.
The driver doesn't show link status messages.

CONFIG_CALXEDA_XGMAC
Support for the Calxeda XGMAC device

CONFIG_LAN91C96
Support for SMSC's LAN91C96 chips.

CONFIG_LAN91C96_BASE
Define this to hold the physical address
of the LAN91C96's I/O space

CONFIG_LAN91C96_USE_32_BIT
Define this to enable 32 bit addressing

CONFIG_SMC91111
Support for SMSC's LAN91C111 chip

CONFIG_SMC91111_BASE
Define this to hold the physical address
of the device (I/O space)

CONFIG_SMC_USE_32_BIT
Define this if data bus is 32 bits

CONFIG_SMC_USE_IOFUNCS
Define this to use i/o functions instead of macros
(some hardware won't work with macros)

CONFIG_DRIVER_TI_EMAC
Support for davinci emac

CONFIG_SYS_DAVINCI_EMAC_PHY_COUNT
Define this if you have more than 3 PHYs.

CONFIG_FTMAC100
Support for Faraday's FTMAC100 Gigabit SoC Ethernet

CONFIG_FTMAC100_EGIGA

Define this to use GE link update with gigabit PHY.
 Define this if FTGMAC100 is connected to gigabit PHY.
 If your system has 10/100 PHY only, it might not occur
 wrong behavior. Because PHY usually return timeout or
 useless data when polling gigabit status and gigabit
 control registers. This behavior won't affect the
 correctness of 10/100 link speed update.

CONFIG_SMC911X

Support for SMC's LAN911x and LAN921x chips

CONFIG_SMC911X_BASE

Define this to hold the physical address
 of the device (I/O space)

CONFIG_SMC911X_32_BIT

Define this if data bus is 32 bits

CONFIG_SMC911X_16_BIT

Define this if data bus is 16 bits. If your processor
 automatically converts one 32 bit word to two 16 bit
 words you may also try CONFIG_SMC911X_32_BIT.

CONFIG_SH_ETHER

Support for Renesas on-chip Ethernet controller

CONFIG_SH_ETHER_USE_PORT

Define the number of ports to be used

CONFIG_SH_ETHER_PHY_ADDR

Define the ETH PHY's address

CONFIG_SH_ETHER_CACHE_WRITEBACK

If this option is set, the driver enables cache flush.

- TPM Support:

CONFIG_GENERIC_LPC_TPM

Support for generic parallel port TPM devices. Only one device
 per system is supported at this time.

CONFIG_TPM_TIS_BASE_ADDRESS

Base address where the generic TPM device is mapped
 to. Contemporary x86 systems usually map it at
 0xfed40000.

- USB Support:

At the moment only the UHCI host controller is
 supported (PIP405, MIP405, MPC5200); define
 CONFIG_USB_UHCI to enable it.
 define CONFIG_USB_KEYBOARD to enable the USB Keyboard
 and define CONFIG_USB_STORAGE to enable the USB
 storage devices.

Note:

Supported are USB Keyboards and USB Floppy drives
 (TEAC FD-05PUB).

MPC5200 USB requires additional defines:

CONFIG_USB_CLOCK

for 528 MHz Clock: 0x0001bbbb

CONFIG_PSC3_USB

for USB on PSC3

CONFIG_USB_CONFIG

for differential drivers: 0x00001000

for single ended drivers: 0x00005000

for differential drivers on PSC3: 0x00000100

for single ended drivers on PSC3: 0x00004100

CONFIG_SYS_USB_EVENT_POLL

May be defined to allow interrupt polling
 instead of using asynchronous interrupts

CONFIG_USB_EHCI_TXFIFO_THRESH enables setting of the
 txfilltuning field in the EHCI controller on reset.

- USB Device:

Define the below if you wish to use the USB console.
 Once firmware is rebuilt from a serial console issue the
 command "setenv stdin usbtty; setenv stdout usbtty" and
 attach your USB cable. The Unix command "dmesg" should print
 it has found a new device. The environment variable usbtty
 can be set to gserial or cdc_acm to enable your device to
 appear to a USB host as a Linux gserial device or a
 Common Device Class Abstract Control Model serial device.
 If you select usbtty = gserial you should be able to enumerate
 a Linux host by
 # modprobe usbserial vendor=0xVendorID product=0xProductID

else if using cdc_acm, simply setting the environment variable usbtty to be cdc_acm should suffice. The following might be defined in YourBoardName.h

CONFIG_USB_DEVICE

Define this to build a UDC device

CONFIG_USB_TTY

Define this to have a tty type of device available to talk to the UDC device

CONFIG_USBD_HS

Define this to enable the high speed support for usb device and usbtty. If this feature is enabled, a routine int is_usbd_high_speed(void) also needs to be defined by the driver to dynamically poll whether the enumeration has succeeded at high speed or full speed.

CONFIG_SYS_CONSOLE_IS_IN_ENV

Define this if you want stdin, stdout &/or stderr to be set to usbtty.

mpc8xx:

CONFIG_SYS_USB_EXTCLK_CLK 0xBLAH

Derive USB clock from external clock "blah"

- CONFIG_SYS_USB_EXTCLK_CLK 0x02

CONFIG_SYS_USB_BRG_CLK 0xBLAH

Derive USB clock from brgclk

- CONFIG_SYS_USB_BRG_CLK 0x04

If you have a USB-IF assigned VendorID then you may wish to define your own vendor specific values either in BoardName.h or directly in usbd_vendor_info.h. If you don't define CONFIG_USBD_MANUFACTURER, CONFIG_USBD_PRODUCT_NAME, CONFIG_USBD_VENDORID and CONFIG_USBD_PRODUCTID, then U-Boot should pretend to be a Linux device to it's target host.

CONFIG_USBD_MANUFACTURER

Define this string as the name of your company for

- CONFIG_USBD_MANUFACTURER "my company"

CONFIG_USBD_PRODUCT_NAME

Define this string as the name of your product

- CONFIG_USBD_PRODUCT_NAME "acme usb device"

CONFIG_USBD_VENDORID

Define this as your assigned Vendor ID from the USB Implementors Forum. This *must* be a genuine Vendor ID to avoid polluting the USB namespace.

- CONFIG_USBD_VENDORID 0xFFFF

CONFIG_USBD_PRODUCTID

Define this as the unique Product ID for your device

- CONFIG_USBD_PRODUCTID 0xFFFF

- ULPI Layer Support:

The ULPI (UTMI Low Pin (count) Interface) PHYs are supported via the generic ULPI layer. The generic layer accesses the ULPI PHY via the platform viewport, so you need both the genric layer and the viewport enabled. Currently only Chipidea/ARC based viewport is supported.

To enable the ULPI layer support, define CONFIG_USB_ULPI and CONFIG_USB_ULPI_VIEWPORT in your board configuration file.

If your ULPI phy needs a different reference clock than the standard 24 MHz then you have to define CONFIG_ULPI_REF_CLK to the appropriate value in Hz.

- MMC Support:

The MMC controller on the Intel PXA is supported. To enable this define CONFIG_MMC. The MMC can be accessed from the boot prompt by mapping the device to physical memory similar to flash. Command line is enabled with CONFIG_CMD_MMC. The MMC driver also works with the FAT fs. This is enabled with CONFIG_CMD_FAT.

CONFIG_SH_MMCIF

Support for Renesas on-chip MMCIF controller

CONFIG_SH_MMCIF_ADDR

Define the base address of MMCIF registers

CONFIG_SH_MMCIF_CLK
Define the clock frequency for MMCIF

- Journaling Flash filesystem support:
CONFIG_JFFS2_NAND, CONFIG_JFFS2_NAND_OFF, CONFIG_JFFS2_NAND_SIZE,
CONFIG_JFFS2_NAND_DEV
Define these for a default partition on a NAND device

CONFIG_SYS_JFFS2_FIRST_SECTOR,
CONFIG_SYS_JFFS2_FIRST_BANK, CONFIG_SYS_JFFS2_NUM_BANKS
Define these for a default partition on a NOR device

CONFIG_SYS_JFFS_CUSTOM_PART
Define this to create an own partition. You have to provide a
function struct part_info* jffs2_part_info(int part_num)

If you define only one JFFS2 partition you may also want to
#define CONFIG_SYS_JFFS_SINGLE_PART 1
to disable the command chpart. This is the default when you
have not defined a custom partition

- FAT(File Allocation Table) filesystem write function support:
CONFIG_FAT_WRITE

Define this to enable support for saving memory data as a
file in FAT formatted partition.

This will also enable the command "fatwrite" enabling the
user to write files to FAT.

- CBFS (Coreboot Filesystem) support
CONFIG_CMD_CBFS

Define this to enable support for reading from a Coreboot
filesystem. Available commands are cbfsinit, cbfsinfo, cbfsls
and cbfsload.

- Keyboard Support:
CONFIG_ISA_KEYBOARD

Define this to enable standard (PC-Style) keyboard
support

CONFIG_I8042_KBD
Standard PC keyboard driver with US (is default) and
GERMAN key layout (switch via environment 'keymap=de') support.
Export function i8042_kbd_init, i8042_tstc and i8042_getc
for cfb_console. Supports cursor blinking.

- Video support:
CONFIG_VIDEO

Define this to enable video support (for output to
video).

CONFIG_VIDEO_CT69000

Enable Chips & Technologies 69000 Video chip

CONFIG_VIDEO_SMI_LYNXEM
Enable Silicon Motion SMI 712/710/810 Video chip. The
video output is selected via environment 'videoout'
(1 = LCD and 2 = CRT). If videoout is undefined, CRT is
assumed.

For the CT69000 and SMI_LYNXEM drivers, videomode is
selected via environment 'videomode'. Two different ways
are possible:

- "videomode=num" 'num' is a standard LiLo mode numbers.
Following standard modes are supported (* is default):

| Colors | 640x480 | 800x600 | 1024x768 | 1152x864 | 1280x1024 |
|---------|---------|---------|----------|----------|-----------|
| 8 bits | 0x301* | 0x303 | 0x305 | 0x161 | 0x307 |
| 15 bits | 0x310 | 0x313 | 0x316 | 0x162 | 0x319 |
| 16 bits | 0x311 | 0x314 | 0x317 | 0x163 | 0x31A |
| 24 bits | 0x312 | 0x315 | 0x318 | ? | 0x31B |

(i.e. setenv videomode 317; saveenv; reset;)

- "videomode=bootargs" all the video parameters are parsed
from the bootargs. (See drivers/video/videomodes.c)

CONFIG_VIDEO_SED13806

Enable Epson SED13806 driver. This driver supports 8bpp and 16bpp modes defined by CONFIG_VIDEO_SED13806_8BPP or CONFIG_VIDEO_SED13806_16BPP

CONFIG_FSL_DIU_FB

Enable the Freescale DIU video driver. Reference boards for SOCs that have a DIU should define this macro to enable DIU support, and should also define these other macros:

CONFIG_SYS_DIU_ADDR
CONFIG_VIDEO
CONFIG_CMD_BMP
CONFIG_CFB_CONSOLE
CONFIG_VIDEO_SW_CURSOR
CONFIG_VGA_AS_SINGLE_DEVICE
CONFIG_VIDEO_LOGO
CONFIG_VIDEO_BMP_LOGO

The DIU driver will look for the 'video-mode' environment variable, and if defined, enable the DIU as a console during boot. See the documentation file README.video for a description of this variable.

CONFIG_VIDEO_VGA

Enable the VGA video / BIOS for x86. The alternative if you are using coreboot is to use the coreboot frame buffer driver.

- Keyboard Support:

CONFIG_KEYBOARD

Define this to enable a custom keyboard support. This simply calls drv_keyboard_init() which must be defined in your board-specific files. The only board using this so far is RBC823.

- LCD Support: CONFIG_LCD

Define this to enable LCD support (for output to LCD display); also select one of the supported displays by defining one of these:

CONFIG_ATMEL_LCD:

HITACHI TX09D70VM1CCA, 3.5", 240x320.

CONFIG_NEC_NL6448AC33:

NEC NL6448AC33-18. Active, color, single scan.

CONFIG_NEC_NL6448BC20

NEC NL6448BC20-08. 6.5", 640x480.
Active, color, single scan.

CONFIG_NEC_NL6448BC33_54

NEC NL6448BC33-54. 10.4", 640x480.
Active, color, single scan.

CONFIG_SHARP_16x9

Sharp 320x240. Active, color, single scan.
It isn't 16x9, and I am not sure what it is.

CONFIG_SHARP_LQ64D341

Sharp LQ64D341 display, 640x480.
Active, color, single scan.

CONFIG_HLD1045

HLD1045 display, 640x480.
Active, color, single scan.

CONFIG_OPTREX_BW

Optrex CBL50840-2 NF-FW 99 22 M5
or
Hitachi LMG6912RPPFC-00T
or

Hitachi SP14Q002

320x240. Black & white.

Normally display is black on white background; define CONFIG_SYS_WHITE_ON_BLACK to get it inverted.

CONFIG_LCD_ALIGNMENT

Normally the LCD is page-aligned (typically 4KB). If this is defined then the LCD will be aligned to this value instead. For ARM it is sometimes useful to use MMU_SECTION_SIZE here, since it is cheaper to change data cache settings on a per-section basis.

CONFIG_CONSOLE_SCROLL_LINES

When the console need to be scrolled, this is the number of lines to scroll by. It defaults to 1. Increasing this makes the console jump but can help speed up operation when scrolling is slow.

CONFIG_LCD_BMP_RLE8

Support drawing of RLE8-compressed bitmaps on the LCD.

CONFIG_I2C_EDID

Enables an 'i2c edid' command which can read EDID information over I2C from an attached LCD display.

- Splash Screen Support: CONFIG_SPLASH_SCREEN

If this option is set, the environment is checked for a variable "splashimage". If found, the usual display of logo, copyright and system information on the LCD is suppressed and the BMP image at the address specified in "splashimage" is loaded instead. The console is redirected to the "nulldev", too. This allows for a "silent" boot where a splash screen is loaded very quickly after power-on.

CONFIG_SPLASH_SCREEN_ALIGN

If this option is set the splash image can be freely positioned on the screen. Environment variable "splashpos" specifies the position as "x,y". If a positive number is given it is used as number of pixel from left/top. If a negative number is given it is used as number of pixel from right/bottom. You can also specify 'm' for centering the image.

Example:

setenv splashpos m,m
=> image at center of screen

setenv splashpos 30,20
=> image at x = 30 and y = 20

setenv splashpos -10,m
=> vertically centered image
at x = dspWidth - bmpWidth - 9

- Gzip compressed BMP image support: CONFIG_VIDEO_BMP_GZIP

If this option is set, additionally to standard BMP images, gzipped BMP images can be displayed via the splashscreen support or the bmp command.

- Run length encoded BMP image (RLE8) support: CONFIG_VIDEO_BMP_RLE8

If this option is set, 8-bit RLE compressed BMP images can be displayed via the splashscreen support or the bmp command.

- Do compresssing for memory range:

CONFIG_CMD_ZIP

If this option is set, it would use zlib deflate method to compress the specified memory at its best effort.

- Compression support:

CONFIG_BZIP2

If this option is set, support for bzip2 compressed

images is included. If not, only uncompressed and gzip compressed images are supported.

NOTE: the bzip2 algorithm requires a lot of RAM, so the malloc area (as defined by CONFIG_SYS_MALLOC_LEN) should be at least 4MB.

CONFIG_LZMA

If this option is set, support for lzma compressed images is included.

Note: The LZMA algorithm adds between 2 and 4KB of code and it requires an amount of dynamic memory that is given by the formula:

$$(1846 + 768 \ll (lc + lp)) * \text{sizeof}(\text{uint16})$$

Where lc and lp stand for, respectively, Literal context bits and Literal pos bits.

This value is upper-bounded by 14MB in the worst case. Anyway, for a ~4MB large kernel image, we have lc=3 and lp=0 for a total amount of $(1846 + 768 \ll (3 + 0)) * 2 = \sim 41\text{KB}$... that is a very small buffer.

Use the lzmainfo tool to determinate the lc and lp values and then calculate the amount of needed dynamic memory (ensuring the appropriate CONFIG_SYS_MALLOC_LEN value).

- MII/PHY support:

CONFIG_PHY_ADDR

The address of PHY on MII bus.

CONFIG_PHY_CLOCK_FREQ (ppc4xx)

The clock frequency of the MII bus

CONFIG_PHY_GIGE

If this option is set, support for speed/duplex detection of gigabit PHY is included.

CONFIG_PHY_RESET_DELAY

Some PHY like Intel LXT971A need extra delay after reset before any MII register access is possible. For such PHY, set this option to the usec delay required. (minimum 300usec for LXT971A)

CONFIG_PHY_CMD_DELAY (ppc4xx)

Some PHY like Intel LXT971A need extra delay after command issued before MII status register can be read

- Ethernet address:

CONFIG_ETHADDR

CONFIG_ETH1ADDR

CONFIG_ETH2ADDR

CONFIG_ETH3ADDR

CONFIG_ETH4ADDR

CONFIG_ETH5ADDR

Define a default value for Ethernet address to use for the respective Ethernet interface, in case this is not determined automatically.

- IP address:

CONFIG_IPADDR

Define a default value for the IP address to use for the default Ethernet interface, in case this is not determined through e.g. bootp. (Environment variable "ipaddr")

- Server IP address:

CONFIG_SERVERIP

Defines a default value for the IP address of a TFTP server to contact when using the "tftboot" command. (Environment variable "serverip")

CONFIG_KEEP_SERVERADDR

Keeps the server's MAC address, in the env 'serveraddr'
for passing to bootargs (like Linux's netconsole option)

- Gateway IP address:

CONFIG_GATEWAYIP

Defines a default value for the IP address of the
default router where packets to other networks are
sent to.

(Environment variable "gatewayip")

- Subnet mask:

CONFIG_NETMASK

Defines a default value for the subnet mask (or
routing prefix) which is used to determine if an IP
address belongs to the local subnet or needs to be
forwarded through a router.

(Environment variable "netmask")

- Multicast TFTP Mode:

CONFIG_MCAST_TFTP

Defines whether you want to support multicast TFTP as per
rfc-2090; for example to work with atftp. Lets lots of targets
tftp down the same boot image concurrently. Note: the Ethernet
driver in use must provide a function: mcast() to join/leave a
multicast group.

- BOOTP Recovery Mode:

CONFIG_BOOTP_RANDOM_DELAY

If you have many targets in a network that try to
boot using BOOTP, you may want to avoid that all
systems send out BOOTP requests at precisely the same
moment (which would happen for instance at recovery
from a power failure, when all systems will try to
boot, thus flooding the BOOTP server. Defining
CONFIG_BOOTP_RANDOM_DELAY causes a random delay to be
inserted before sending out BOOTP requests. The
following delays are inserted then:

1st BOOTP request: delay 0 ... 1 sec
2nd BOOTP request: delay 0 ... 2 sec
3rd BOOTP request: delay 0 ... 4 sec
4th and following
BOOTP requests: delay 0 ... 8 sec

- DHCP Advanced Options:

You can fine tune the DHCP functionality by defining
CONFIG_BOOTP_* symbols:

CONFIG_BOOTP_SUBNETMASK
CONFIG_BOOTP_GATEWAY
CONFIG_BOOTP_HOSTNAME
CONFIG_BOOTP_NISDOMAIN
CONFIG_BOOTP_BOOTPATH
CONFIG_BOOTP_BOOTFILESIZE
CONFIG_BOOTP_DNS
CONFIG_BOOTP_DNS2
CONFIG_BOOTP_SEND_HOSTNAME
CONFIG_BOOTP_NTPSERVER
CONFIG_BOOTP_TIMEOFFSET
CONFIG_BOOTP_VENDOREX
CONFIG_BOOTP_MAY_FAIL

CONFIG_BOOTP_SERVERIP - TFTP server will be the serverip
environment variable, not the BOOTP server.

CONFIG_BOOTP_MAY_FAIL - If the DHCP server is not found
after the configured retry count, the call will fail
instead of starting over. This can be used to fail over
to Link-local IP address configuration if the DHCP server
is not available.

CONFIG_BOOTP_DNS2 - If a DHCP client requests the DNS
serverip from a DHCP server, it is possible that more
than one DNS serverip is offered to the client.
If CONFIG_BOOTP_DNS2 is enabled, the secondary DNS
serverip will be stored in the additional environment
variable "dnsip2". The first DNS serverip is always
stored in the variable "dnsip", when CONFIG_BOOTP_DNS
is defined.

CONFIG_BOOTP_SEND_HOSTNAME - Some DHCP servers are capable to do a dynamic update of a DNS server. To do this, they need the hostname of the DHCP requester. If CONFIG_BOOTP_SEND_HOSTNAME is defined, the content of the "hostname" environment variable is passed as option 12 to the DHCP server.

CONFIG_BOOTP_DHCP_REQUEST_DELAY

A 32bit value in microseconds for a delay between receiving a "DHCP Offer" and sending the "DHCP Request". This fixes a problem with certain DHCP servers that don't respond 100% of the time to a "DHCP request". E.g. On an AT91RM9200 processor running at 180MHz, this delay needed to be *at least* 15,000 usec before a Windows Server 2003 DHCP server would reply 100% of the time. I recommend at least 50,000 usec to be safe. The alternative is to hope that one of the retries will be successful but note that the DHCP timeout and retry process takes a longer than this delay.

- Link-local IP address negotiation:

Negotiate with other link-local clients on the local network for an address that doesn't require explicit configuration. This is especially useful if a DHCP server cannot be guaranteed to exist in all environments that the device must operate.

See doc/README.link-local for more information.

- CDP Options:

CONFIG_CDP_DEVICE_ID

The device id used in CDP trigger frames.

CONFIG_CDP_DEVICE_ID_PREFIX

A two character string which is prefixed to the MAC address of the device.

CONFIG_CDP_PORT_ID

A printf format string which contains the ascii name of the port. Normally is set to "eth%d" which sets eth0 for the first Ethernet, eth1 for the second etc.

CONFIG_CDP_CAPABILITIES

A 32bit integer which indicates the device capabilities: 0x00000010 for a normal host which does not forwards.

CONFIG_CDP_VERSION

An ascii string containing the version of the software.

CONFIG_CDP_PLATFORM

An ascii string containing the name of the platform.

CONFIG_CDP_TRIGGER

A 32bit integer sent on the trigger.

CONFIG_CDP_POWER_CONSUMPTION

A 16bit integer containing the power consumption of the device in .1 of milliwatts.

CONFIG_CDP_APPLIANCE_VLAN_TYPE

A byte containing the id of the VLAN.

- Status LED: CONFIG_STATUS_LED

Several configurations allow to display the current status using a LED. For instance, the LED will blink fast while running U-Boot code, stop blinking as soon as a reply to a BOOTP request was received, and start blinking slow once the Linux kernel is running (supported by a status LED driver in the Linux kernel). Defining CONFIG_STATUS_LED enables this feature in U-Boot.

- CAN Support: CONFIG_CAN_DRIVER

Defining CONFIG_CAN_DRIVER enables CAN driver support on those systems that support this (optional) feature, like the TQM8xxL modules.

- I2C Support: CONFIG_HARD_I2C | CONFIG_SOFT_I2C

These enable I2C serial bus commands. Defining either of (but not both of) CONFIG_HARD_I2C or CONFIG_SOFT_I2C will include the appropriate I2C driver for the selected CPU.

This will allow you to use i2c commands at the u-boot command line (as long as you set CONFIG_CMD_I2C in CONFIG_COMMANDS) and communicate with i2c based realtime clock chips. See common/cmd_i2c.c for a description of the command line interface.

CONFIG_HARD_I2C selects a hardware I2C controller.

CONFIG_SOFT_I2C configures u-boot to use a software (aka bit-banging) driver instead of CPM or similar hardware support for I2C.

There are several other quantities that must also be defined when you define CONFIG_HARD_I2C or CONFIG_SOFT_I2C.

In both cases you will need to define CONFIG_SYS_I2C_SPEED to be the frequency (in Hz) at which you wish your i2c bus to run and CONFIG_SYS_I2C_SLAVE to be the address of this node (ie the CPU's i2c node address).

Now, the u-boot i2c code for the mpc8xx (arch/powerpc/cpu/mpc8xx/i2c.c) sets the CPU up as a master node and so its address should therefore be cleared to 0 (See, eg, MPC823e User's Manual p.16-473). So, set CONFIG_SYS_I2C_SLAVE to 0.

CONFIG_SYS_I2C_INIT_MPC5XXX

When a board is reset during an i2c bus transfer chips might think that the current transfer is still in progress. Reset the slave devices by sending start commands until the slave device responds.

That's all that's required for CONFIG_HARD_I2C.

If you use the software i2c interface (CONFIG_SOFT_I2C) then the following macros need to be defined (examples are from include/configs/lwmon.h):

I2C_INIT

(Optional). Any commands necessary to enable the I2C controller or configure ports.

eg: #define I2C_INIT (immr->im_cpm.cp_pbdir |= PB_SCL)

I2C_PORT

(Only for MPC8260 CPU). The I/O port to use (the code assumes both bits are on the same port). Valid values are 0..3 for ports A..D.

I2C_ACTIVE

The code necessary to make the I2C data line active (driven). If the data line is open collector, this define can be null.

eg: #define I2C_ACTIVE (immr->im_cpm.cp_pbdir |= PB_SDA)

I2C_TRISTATE

The code necessary to make the I2C data line tri-stated (inactive). If the data line is open collector, this define can be null.

eg: #define I2C_TRISTATE (immr->im_cpm.cp_pbdir &= ~PB_SDA)

I2C_READ

Code that returns TRUE if the I2C data line is high, FALSE if it is low.

eg: #define I2C_READ ((immr->im_cpm.cp_pbdad & PB_SDA) != 0)

I2C_SDA(bit)

If <bit> is TRUE, sets the I2C data line high. If it is FALSE, it clears it (low).

eg: #define I2C_SDA(bit) ¥
if(bit) immr->im_cpm.cp_pbdad |= PB_SDA; ¥
else immr->im_cpm.cp_pbdad &= ~PB_SDA

I2C_SCL(bit)

If <bit> is TRUE, sets the I2C clock line high. If it is FALSE, it clears it (low).

eg: #define I2C_SCL(bit) ¥
if(bit) immr->im_cpm.cp_pbdad |= PB_SCL; ¥
else immr->im_cpm.cp_pbdad &= ~PB_SCL

I2C_DELAY

This delay is invoked four times per clock cycle so this controls the rate of data transfer. The data rate thus is 1 / (I2C_DELAY * 4). Often defined to be something like:

#define I2C_DELAY udelay(2)

CONFIG_SOFT_I2C_GPIO_SCL / CONFIG_SOFT_I2C_GPIO_SDA

If your arch supports the generic GPIO framework (asm/gpio.h), then you may alternatively define the two GPIOs that are to be used as SCL / SDA. Any of the previous I2C_xxx macros will have GPIO-based defaults assigned to them as appropriate.

You should define these to the GPIO value as given directly to the generic GPIO functions.

CONFIG_SYS_I2C_INIT_BOARD

When a board is reset during an i2c bus transfer chips might think that the current transfer is still in progress. On some boards it is possible to access the i2c SCLK line directly, either by using the processor pin as a GPIO or by having a second pin connected to the bus. If this option is defined a custom i2c_init_board() routine in boards/xxx/board.c is run early in the boot sequence.

CONFIG_SYS_I2C_BOARD_LATE_INIT

An alternative to CONFIG_SYS_I2C_INIT_BOARD. If this option is defined a custom i2c_board_late_init() routine in boards/xxx/board.c is run AFTER the operations in i2c_init() is completed. This callpoint can be used to unreset i2c bus using CPU i2c controller register accesses for CPUs whose i2c controller provide such a method. It is called at the end of i2c_init() to allow i2c_init operations to setup the i2c bus controller on the CPU (e.g. setting bus speed & slave address).

CONFIG_I2CFAST (PPC405GP|PPC405EP only)

This option enables configuration of bi_iic_fast[] flags in u-boot bd_info structure based on u-boot environment variable "i2cfast". (see also i2cfast)

CONFIG_I2C_MULTI_BUS

This option allows the use of multiple I2C buses, each of which must have a controller. At any point in time, only one bus is active. To switch to a different bus, use the 'i2c dev' command. Note that bus numbering is zero-based.

CONFIG_SYS_I2C_NOPROBES

This option specifies a list of I2C devices that will be skipped when the 'i2c probe' command is issued. If CONFIG_I2C_MULTI_BUS is set, specify a list of bus-device pairs. Otherwise, specify a 1D array of device addresses

e. g.

```
#undef CONFIG_I2C_MULTI_BUS
#define CONFIG_SYS_I2C_NOPROBES {0x50, 0x68}
```

will skip addresses 0x50 and 0x68 on a board with one I2C bus

```
#define CONFIG_I2C_MULTI_BUS
#define CONFIG_SYS_I2C_MULTI_NOPROBES    {{0, 0x50}, {0, 0x68}, {1, 0x54}}
```

will skip addresses 0x50 and 0x68 on bus 0 and address 0x54 on bus 1

CONFIG_SYS_SPD_BUS_NUM

If defined, then this indicates the I2C bus number for DDR SPD.
If not defined, then U-Boot assumes that SPD is on I2C bus 0.

CONFIG_SYS_RTC_BUS_NUM

If defined, then this indicates the I2C bus number for the RTC.
If not defined, then U-Boot assumes that RTC is on I2C bus 0.

CONFIG_SYS_DTT_BUS_NUM

If defined, then this indicates the I2C bus number for the DTT.
If not defined, then U-Boot assumes that DTT is on I2C bus 0.

CONFIG_SYS_I2C_DTT_ADDR:

If defined, specifies the I2C address of the DTT device.
If not defined, then U-Boot uses predefined value for specified DTT device.

CONFIG_FSL_I2C

Define this option if you want to use Freescale's I2C driver in drivers/i2c/fsl_i2c.c.

CONFIG_I2C_MUX

Define this option if you have I2C devices reached over 1 .. n I2C Muxes like the pca9544a. This option adds a new I2C Command "i2c bus [muxtype:muxaddr:muxchannel]" which adds a new I2C Bus to the existing I2C Busses. If you select the new Bus with "i2c dev", u-bbot sends first the commandos for the muxes to activate this new "bus".

CONFIG_I2C_MULTI_BUS must be also defined, to use this feature!

Example:

Adding a new I2C Bus reached over 2 pca9544a muxes
The First mux with address 70 and channel 6
The Second mux with address 71 and channel 4

=> i2c bus pca9544a:70:6:pca9544a:71:4

Use the "i2c bus" command without parameter, to get a list of I2C Busses with muxes:

```
=> i2c bus
Busses reached over muxes:
Bus ID: 2
  reached over Mux(es):
    pca9544a@70 ch: 4
Bus ID: 3
  reached over Mux(es):
    pca9544a@70 ch: 6
    pca9544a@71 ch: 4
=>
```

If you now switch to the new I2C Bus 3 with "i2c dev 3" u-boot first sends the command to the mux@70 to enable channel 6, and then the command to the mux@71 to enable the channel 4.

After that, you can use the "normal" i2c commands as usual to communicate with your I2C devices behind the 2 muxes.

This option is actually implemented for the bitbanging algorithm in common/soft_i2c.c and for the Hardware I2C Bus on the MPC8260. But it should be not so difficult to add this option to other architectures.

CONFIG_SOFT_I2C_READ_REPEATED_START

defining this will force the i2c_read() function in

the `soft_i2c` driver to perform an I2C repeated start between writing the address pointer and reading the data. If this define is omitted the default behaviour of doing a stop-start sequence will be used. Most I2C devices can use either method, but some require one or the other.

- SPI Support: `CONFIG_SPI`

Enables SPI driver (so far only tested with SPI EEPROM, also an instance works with Crystal A/D and D/As on the SACSng board)

`CONFIG_SH_SPI`

Enables the driver for SPI controller on SuperH. Currently only SH7757 is supported.

`CONFIG_SPI_X`

Enables extended (16-bit) SPI EEPROM addressing. (symmetrical to `CONFIG_I2C_X`)

`CONFIG_SOFT_SPI`

Enables a software (bit-bang) SPI driver rather than using hardware support. This is a general purpose driver that only requires three general I/O port pins (two outputs, one input) to function. If this is defined, the board configuration must define several SPI configuration items (port pins to use, etc). For an example, see `include/configs/sacsng.h`.

`CONFIG_HARD_SPI`

Enables a hardware SPI driver for general-purpose reads and writes. As with `CONFIG_SOFT_SPI`, the board configuration must define a list of chip-select function pointers. Currently supported on some MPC8xxx processors. For an example, see `include/configs/mpc8349emds.h`.

`CONFIG_MXC_SPI`

Enables the driver for the SPI controllers on i.MX and MXC SoCs. Currently i.MX31/35/51 are supported.

- FPGA Support: `CONFIG_FPGA`

Enables FPGA subsystem.

`CONFIG_FPGA_<vendor>`

Enables support for specific chip vendors. (ALTERA, XILINX)

`CONFIG_FPGA_<family>`

Enables support for FPGA family. (SPARTAN2, SPARTAN3, VIRTEX2, CYCLONE2, ACEX1K, ACEX)

`CONFIG_FPGA_COUNT`

Specify the number of FPGA devices to support.

`CONFIG_SYS_FPGA_PROG_FEEDBACK`

Enable printing of hash marks during FPGA configuration.

`CONFIG_SYS_FPGA_CHECK_BUSY`

Enable checks on FPGA configuration interface busy status by the configuration function. This option will require a board or device specific function to be written.

`CONFIG_FPGA_DELAY`

If defined, a function that provides delays in the FPGA configuration driver.

`CONFIG_SYS_FPGA_CHECK_CTRL_C`

Allow Control-C to interrupt FPGA configuration

`CONFIG_SYS_FPGA_CHECK_ERROR`

Check for configuration errors during FPGA bitfile loading. For example, abort during Virtex II configuration if the INIT_B line goes low (which indicated a CRC error).

CONFIG_SYS_FPGA_WAIT_INIT

Maximum time to wait for the INIT_B line to deassert after PROB_B has been deasserted during a Virtex II FPGA configuration sequence. The default time is 500 ms.

CONFIG_SYS_FPGA_WAIT_BUSY

Maximum time to wait for BUSY to deassert during Virtex II FPGA configuration. The default is 5 ms.

CONFIG_SYS_FPGA_WAIT_CONFIG

Time to wait after FPGA configuration. The default is 200 ms.

- Configuration Management:

CONFIG_IDENT_STRING

If defined, this string will be added to the U-Boot version information (U_BOOT_VERSION)

- Vendor Parameter Protection:

U-Boot considers the values of the environment variables "serial#" (Board Serial Number) and "ethaddr" (Ethernet Address) to be parameters that are set once by the board vendor / manufacturer, and protects these variables from casual modification by the user. Once set, these variables are read-only, and write or delete attempts are rejected. You can change this behaviour:

If CONFIG_ENV_OVERWRITE is #defined in your config file, the write protection for vendor parameters is completely disabled. Anybody can change or delete these parameters.

Alternatively, if you #define _both_ CONFIG_ETHADDR and CONFIG_OVERWRITE_ETHADDR_ONCE, a default Ethernet address is installed in the environment, which can be changed exactly ONCE by the user. [The serial# is unaffected by this, i. e. it remains read-only.]

The same can be accomplished in a more flexible way for any variable by configuring the type of access to allow for those variables in the ".flags" variable or define CONFIG_ENV_FLAGS_LIST_STATIC.

- Protected RAM:

CONFIG_PRAM

Define this variable to enable the reservation of "protected RAM", i. e. RAM which is not overwritten by U-Boot. Define CONFIG_PRAM to hold the number of kB you want to reserve for pRAM. You can overwrite this default value by defining an environment variable "pram" to the number of kB you want to reserve. Note that the board info structure will still show the full amount of RAM. If pRAM is reserved, a new environment variable "mem" will automatically be defined to hold the amount of remaining RAM in a form that can be passed as boot argument to Linux, for instance like that:

```
setenv bootargs ... mem=¥${mem}
saveenv
```

This way you can tell Linux not to use this memory, either, which results in a memory region that will not be affected by reboots.

WARNING If your board configuration uses automatic detection of the RAM size, you must make sure that this memory test is non-destructive. So far, the following board configurations are known to be

"pRAM-clean":

IVMS8, IVML24, SPD8xx, TQM8xxL,
HERMES, IP860, RPXlite, LWMON,
FLAGADM, TQM8260

- Access to physical memory region (> 4GB)

Some basic support is provided for operations on memory not normally accessible to U-Boot - e.g. some architectures support access to more than 4GB of memory on 32-bit machines using physical address extension or similar. Define CONFIG_PHYSMEM to access this basic support, which currently only supports clearing the memory.

- Error Recovery:

CONFIG_PANIC_HANG

Define this variable to stop the system in case of a fatal error, so that you have to reset it manually. This is probably NOT a good idea for an embedded system where you want the system to reboot automatically as fast as possible, but it may be useful during development since you can try to debug the conditions that lead to the situation.

CONFIG_NET_RETRY_COUNT

This variable defines the number of retries for network operations like ARP, RARP, TFTP, or BOOTP before giving up the operation. If not defined, a default value of 5 is used.

CONFIG_ARP_TIMEOUT

Timeout waiting for an ARP reply in milliseconds.

CONFIG_NFS_TIMEOUT

Timeout in milliseconds used in NFS protocol. If you encounter "ERROR: Cannot mount" in nfs command, try longer timeout such as
#define CONFIG_NFS_TIMEOUT 10000UL

- Command Interpreter:

CONFIG_AUTO_COMPLETE

Enable auto completion of commands using TAB.

Note that this feature has NOT been implemented yet for the "hush" shell.

CONFIG_SYS_HUSH_PARSER

Define this variable to enable the "hush" shell (from Busybox) as command line interpreter, thus enabling powerful command line syntax like if...then...else...fi conditionals or '&&' and '||' constructs ("shell scripts").

If undefined, you get the old, much simpler behaviour with a somewhat smaller memory footprint.

CONFIG_SYS_PROMPT_HUSH_PS2

This defines the secondary prompt string, which is printed when the command interpreter needs more input to complete a command. Usually "> ".

Note:

In the current implementation, the local variables space and global environment variables space are separated. Local variables are those you define by simply typing 'name=value'. To access a local variable later on, you have write '\$name' or '\${name}'; to execute the contents of a variable directly type '\$name' at the command prompt.

Global environment variables are those you use setenv/printenv to work with. To run a command stored in such a variable, you need to use the run command, and you must not use the '\$' sign to access them.

To store commands and special characters in a variable, please use double quotation marks surrounding the whole text of the variable, instead of the backslashes before semicolons and special symbols.

- Commandline Editing and History:

CONFIG_CMDLINE_EDITING

Enable editing and History functions for interactive commandline input operations

- Default Environment:

CONFIG_EXTRA_ENV_SETTINGS

Define this to contain any number of null terminated strings (variable = value pairs) that will be part of the default environment compiled into the boot image.

For example, place something like this in your board's config file:

```
#define CONFIG_EXTRA_ENV_SETTINGS ¥  
    "myvar1=value1¥0" ¥  
    "myvar2=value2¥0"
```

Warning: This method is based on knowledge about the internal format how the environment is stored by the U-Boot code. This is NOT an official, exported interface! Although it is unlikely that this format will change soon, there is no guarantee either. You better know what you are doing here.

Note: overly (ab)use of the default environment is discouraged. Make sure to check other ways to preset the environment like the "source" command or the boot command first.

CONFIG_ENV_VARS_UBOOT_CONFIG

Define this in order to add variables describing the U-Boot build configuration to the default environment. These will be named arch, cpu, board, vendor, and soc.

Enabling this option will cause the following to be defined:

- CONFIG_SYS_ARCH
- CONFIG_SYS_CPU
- CONFIG_SYS_BOARD
- CONFIG_SYS_VENDOR
- CONFIG_SYS_SOC

CONFIG_ENV_VARS_UBOOT_RUNTIME_CONFIG

Define this in order to add variables describing certain run-time determined information about the hardware to the environment. These will be named board_name, board_rev.

CONFIG_DELAY_ENVIRONMENT

Normally the environment is loaded when the board is initialised so that it is available to U-Boot. This inhibits that so that the environment is not available until explicitly loaded later by U-Boot code. With CONFIG_OF_CONTROL this is instead controlled by the value of /config/load-environment.

- DataFlash Support:

CONFIG_HAS_DATAFLASH

Defining this option enables DataFlash features and allows to read/write in Dataflash via the standard commands cp, md...

- Serial Flash support

CONFIG_CMD_SF

Defining this option enables SPI flash commands 'sf probe/read/write/erase/update'.

Usage requires an initial 'probe' to define the serial flash parameters, followed by read/write/erase/update commands.

The following defaults may be provided by the platform to handle the common case when only a single serial flash is present on the system.

```
CONFIG_SF_DEFAULT_BUS      Bus identifier
CONFIG_SF_DEFAULT_CS       Chip-select
CONFIG_SF_DEFAULT_MODE      (see include/spi.h)
CONFIG_SF_DEFAULT_SPEED     in Hz
```

```
CONFIG_CMD_SF_TEST
```

Define this option to include a destructive SPI flash test ('sf test').

- SystemACE Support:

```
CONFIG_SYSTEMACE
```

Adding this option adds support for Xilinx SystemACE chips attached via some sort of local bus. The address of the chip must also be defined in the CONFIG_SYS_SYSTEMACE_BASE macro. For example:

```
#define CONFIG_SYSTEMACE
#define CONFIG_SYS_SYSTEMACE_BASE 0xf0000000
```

When SystemACE support is added, the "ace" device type becomes available to the fat commands, i.e. fatls.

- TFTP Fixed UDP Port:

```
CONFIG_TFTP_PORT
```

If this is defined, the environment variable tftpsrcp is used to supply the TFTP UDP source port value. If tftpsrcp isn't defined, the normal pseudo-random port number generator is used.

Also, the environment variable tftpdstp is used to supply the TFTP UDP destination port value. If tftpdstp isn't defined, the normal port 69 is used.

The purpose for tftpsrcp is to allow a TFTP server to blindly start the TFTP transfer using the pre-configured target IP address and UDP port. This has the effect of "punching through" the (Windows XP) firewall, allowing the remainder of the TFTP transfer to proceed normally. A better solution is to properly configure the firewall, but sometimes that is not allowed.

- Hashing support:

```
CONFIG_CMD_HASH
```

This enables a generic 'hash' command which can produce hashes / digests from a few algorithms (e.g. SHA1, SHA256).

```
CONFIG_HASH_VERIFY
```

Enable the hash verify command (hash -v). This adds to code size a little.

```
CONFIG_SHA1 - support SHA1 hashing
CONFIG_SHA256 - support SHA256 hashing
```

Note: There is also a shalsum command, which should perhaps be deprecated in favour of 'hash shal'.

- Show boot progress:

```
CONFIG_SHOW_BOOT_PROGRESS
```

Defining this option allows to add some board-specific code (calling a user-provided function "show_boot_progress(int)") that enables you to show the system's boot progress on some display (for example, some LED's) on your board. At the moment, the following checkpoints are implemented:

- Detailed boot stage timing

```
CONFIG_BOOTSTAGE
```

Define this option to get detailed timing of each stage of the boot process.

```
CONFIG_BOOTSTAGE_USER_COUNT
```

This is the number of available user bootstage records. Each time you call bootstage_mark(BOOTSTAGE_ID_ALLOC, ...)

a new ID will be allocated from this stash. If you exceed the limit, recording will stop.

CONFIG_BOOTSTAGE_REPORT

Define this to print a report before boot, similar to this:

Timer summary in microseconds:

| Mark | Elapsed | Stage |
|------------|------------|--------------------|
| 0 | 0 | reset |
| 3,575,678 | 3,575,678 | board_init_f start |
| 3,575,695 | 17 | arch_cpu_init A9 |
| 3,575,777 | 82 | arch_cpu_init done |
| 3,659,598 | 83,821 | board_init_r start |
| 3,910,375 | 250,777 | main_loop |
| 29,916,167 | 26,005,792 | bootm_start |
| 30,361,327 | 445,160 | start_kernel |

CONFIG_CMD_BOOTSTAGE

Add a 'bootstage' command which supports printing a report and un/stashing of bootstage data.

CONFIG_BOOTSTAGE_FDT

Stash the bootstage information in the FDT. A root 'bootstage' node is created with each bootstage id as a child. Each child has a 'name' property and either 'mark' containing the mark time in microsecond, or 'accum' containing the accumulated time for that bootstage id in microseconds. For example:

```
bootstage {
    154 {
        name = "board_init_f";
        mark = <3575678>;
    };
    170 {
        name = "lcd";
        accum = <33482>;
    };
};
```

Code in the Linux kernel can find this in /proc/devicetree.

Legacy uImage format:

| Arg | Where | When |
|-----|--------------------------|---|
| 1 | common/cmd_bootm.c | before attempting to boot an image |
| -1 | common/cmd_bootm.c | Image header has bad magic number |
| 2 | common/cmd_bootm.c | Image header has correct magic number |
| -2 | common/cmd_bootm.c | Image header has bad checksum |
| 3 | common/cmd_bootm.c | Image header has correct checksum |
| -3 | common/cmd_bootm.c | Image data has bad checksum |
| 4 | common/cmd_bootm.c | Image data has correct checksum |
| -4 | common/cmd_bootm.c | Image is for unsupported architecture |
| 5 | common/cmd_bootm.c | Architecture check OK |
| -5 | common/cmd_bootm.c | Wrong Image Type (not kernel, multi) |
| 6 | common/cmd_bootm.c | Image Type check OK |
| -6 | common/cmd_bootm.c | gunzip uncompression error |
| -7 | common/cmd_bootm.c | Unimplemented compression type |
| 7 | common/cmd_bootm.c | Uncompression OK |
| 8 | common/cmd_bootm.c | No uncompress/copy overwrite error |
| -9 | common/cmd_bootm.c | Unsupported OS (not Linux, BSD, VxWorks, QNX) |
| 9 | common/image.c | Start initial ramdisk verification |
| -10 | common/image.c | Ramdisk header has bad magic number |
| -11 | common/image.c | Ramdisk header has bad checksum |
| 10 | common/image.c | Ramdisk header is OK |
| -12 | common/image.c | Ramdisk data has bad checksum |
| 11 | common/image.c | Ramdisk data has correct checksum |
| 12 | common/image.c | Ramdisk verification complete, start loading |
| -13 | common/image.c | Wrong Image Type (not PPC Linux ramdisk) |
| 13 | common/image.c | Start multifile image verification |
| 14 | common/image.c | No initial ramdisk, no multifile, continue. |
| 15 | arch/<arch>/lib/bootm.c | All preparation done, transferring control to OS |
| -30 | arch/powerpc/lib/board.c | Fatal error, hang the system |
| -31 | post/post.c | POST test failed, detected by post_output_backlog() |
| -32 | post/post.c | POST test failed, detected by post_run_single() |
| 34 | common/cmd_doc.c | before loading a Image from a DOC device |
| -35 | common/cmd_doc.c | Bad usage of "doc" command |
| 35 | common/cmd_doc.c | correct usage of "doc" command |
| -36 | common/cmd_doc.c | No boot device |
| 36 | common/cmd_doc.c | correct boot device |

```

-37 common/cmd_doc.c      Unknown Chip ID on boot device
 37 common/cmd_doc.c      correct chip ID found, device available
-38 common/cmd_doc.c      Read Error on boot device
 38 common/cmd_doc.c      reading Image header from DOC device OK
-39 common/cmd_doc.c      Image header has bad magic number
 39 common/cmd_doc.c      Image header has correct magic number
-40 common/cmd_doc.c      Error reading Image from DOC device
 40 common/cmd_doc.c      Image header has correct magic number
 41 common/cmd_ide.c      before loading a Image from a IDE device
-42 common/cmd_ide.c      Bad usage of "ide" command
 42 common/cmd_ide.c      correct usage of "ide" command
-43 common/cmd_ide.c      No boot device
 43 common/cmd_ide.c      boot device found
-44 common/cmd_ide.c      Device not available
 44 common/cmd_ide.c      Device available
-45 common/cmd_ide.c      wrong partition selected
 45 common/cmd_ide.c      partition selected
-46 common/cmd_ide.c      Unknown partition table
 46 common/cmd_ide.c      valid partition table found
-47 common/cmd_ide.c      Invalid partition type
 47 common/cmd_ide.c      correct partition type
-48 common/cmd_ide.c      Error reading Image Header on boot device
 48 common/cmd_ide.c      reading Image Header from IDE device OK
-49 common/cmd_ide.c      Image header has bad magic number
 49 common/cmd_ide.c      Image header has correct magic number
-50 common/cmd_ide.c      Image header has bad checksum
 50 common/cmd_ide.c      Image header has correct checksum
-51 common/cmd_ide.c      Error reading Image from IDE device
 51 common/cmd_ide.c      reading Image from IDE device OK
 52 common/cmd_nand.c     before loading a Image from a NAND device
-53 common/cmd_nand.c     Bad usage of "nand" command
 53 common/cmd_nand.c     correct usage of "nand" command
-54 common/cmd_nand.c     No boot device
 54 common/cmd_nand.c     boot device found
-55 common/cmd_nand.c     Unknown Chip ID on boot device
 55 common/cmd_nand.c     correct chip ID found, device available
-56 common/cmd_nand.c     Error reading Image Header on boot device
 56 common/cmd_nand.c     reading Image Header from NAND device OK
-57 common/cmd_nand.c     Image header has bad magic number
 57 common/cmd_nand.c     Image header has correct magic number
-58 common/cmd_nand.c     Error reading Image from NAND device
 58 common/cmd_nand.c     reading Image from NAND device OK

-60 common/env_common.c   Environment has a bad CRC, using default

 64 net/eth.c             starting with Ethernet configuration.
-64 net/eth.c             no Ethernet found.
 65 net/eth.c             Ethernet found.

-80 common/cmd_net.c      usage wrong
 80 common/cmd_net.c      before calling NetLoop()
-81 common/cmd_net.c      some error in NetLoop() occurred
 81 common/cmd_net.c      NetLoop() back without error
-82 common/cmd_net.c      size == 0 (File with size 0 loaded)
 82 common/cmd_net.c      trying automatic boot
 83 common/cmd_net.c      running "source" command
-83 common/cmd_net.c      some error in automatic boot or "source" command
 84 common/cmd_net.c      end without errors

```

FIT uImage format:

| Arg | Where | When |
|------|--------------------|---|
| 100 | common/cmd_bootm.c | Kernel FIT Image has correct format |
| -100 | common/cmd_bootm.c | Kernel FIT Image has incorrect format |
| 101 | common/cmd_bootm.c | No Kernel subimage unit name, using configuration |
| -101 | common/cmd_bootm.c | Can't get configuration for kernel subimage |
| 102 | common/cmd_bootm.c | Kernel unit name specified |
| -103 | common/cmd_bootm.c | Can't get kernel subimage node offset |
| 103 | common/cmd_bootm.c | Found configuration node |
| 104 | common/cmd_bootm.c | Got kernel subimage node offset |
| -104 | common/cmd_bootm.c | Kernel subimage hash verification failed |
| 105 | common/cmd_bootm.c | Kernel subimage hash verification OK |
| -105 | common/cmd_bootm.c | Kernel subimage is for unsupported architecture |
| 106 | common/cmd_bootm.c | Architecture check OK |
| -106 | common/cmd_bootm.c | Kernel subimage has wrong type |
| 107 | common/cmd_bootm.c | Kernel subimage type OK |
| -107 | common/cmd_bootm.c | Can't get kernel subimage data/size |
| 108 | common/cmd_bootm.c | Got kernel subimage data/size |
| -108 | common/cmd_bootm.c | Wrong image type (not legacy, FIT) |
| -109 | common/cmd_bootm.c | Can't get kernel subimage type |
| -110 | common/cmd_bootm.c | Can't get kernel subimage comp |
| -111 | common/cmd_bootm.c | Can't get kernel subimage os |
| -112 | common/cmd_bootm.c | Can't get kernel subimage load address |
| -113 | common/cmd_bootm.c | Image uncompress/copy overwrite error |

```

120 common/image.c      Start initial ramdisk verification
-120 common/image.c      Ramdisk FIT image has incorrect format
121 common/image.c      Ramdisk FIT image has correct format
122 common/image.c      No ramdisk subimage unit name, using configuration
-122 common/image.c      Can't get configuration for ramdisk subimage
123 common/image.c      Ramdisk unit name specified
-124 common/image.c      Can't get ramdisk subimage node offset
125 common/image.c      Got ramdisk subimage node offset
-125 common/image.c      Ramdisk subimage hash verification failed
126 common/image.c      Ramdisk subimage hash verification OK
-126 common/image.c      Ramdisk subimage for unsupported architecture
127 common/image.c      Architecture check OK
-127 common/image.c      Can't get ramdisk subimage data/size
128 common/image.c      Got ramdisk subimage data/size
129 common/image.c      Can't get ramdisk load address
-129 common/image.c      Got ramdisk load address

-130 common/cmd_doc.c    Incorrect FIT image format
131 common/cmd_doc.c      FIT image format OK

-140 common/cmd_ide.c     Incorrect FIT image format
141 common/cmd_ide.c      FIT image format OK

-150 common/cmd_nand.c     Incorrect FIT image format
151 common/cmd_nand.c      FIT image format OK

- FIT image support:
  CONFIG_FIT
  Enable support for the FIT uImage format.

  CONFIG_FIT_BEST_MATCH
  When no configuration is explicitly selected, default to the
  one whose fdt's compatibility field best matches that of
  U-Boot itself. A match is considered "best" if it matches the
  most specific compatibility entry of U-Boot's fdt's root node.
  The order of entries in the configuration's fdt is ignored.

- Standalone program support:
  CONFIG_STANDALONE_LOAD_ADDR

  This option defines a board specific value for the
  address where standalone program gets loaded, thus
  overwriting the architecture dependent default
  settings.

- Frame Buffer Address:
  CONFIG_FB_ADDR

  Define CONFIG_FB_ADDR if you want to use specific
  address for frame buffer. This is typically the case
  when using a graphics controller has separate video
  memory. U-Boot will then place the frame buffer at
  the given address instead of dynamically reserving it
  in system RAM by calling lcd_setmem(), which grabs
  the memory for the frame buffer depending on the
  configured panel size.

  Please see board_init_f function.

- Automatic software updates via TFTP server
  CONFIG_UPDATE_TFTP
  CONFIG_UPDATE_TFTP_CNT_MAX
  CONFIG_UPDATE_TFTP_MSEC_MAX

  These options enable and control the auto-update feature;
  for a more detailed description refer to doc/README.update.

- MTD Support (mtdparts command, UBI support)
  CONFIG_MTD_DEVICE

  Adds the MTD device infrastructure from the Linux kernel.
  Needed for mtdparts command support.

  CONFIG_MTD_PARTITIONS

  Adds the MTD partitioning infrastructure from the Linux
  kernel. Needed for UBI support.

- SPL framework
  CONFIG_SPL
  Enable building of SPL globally.

  CONFIG_SPL_LDSCRIPT

```


LDSCRIPT for linking the SPL binary.

CONFIG_SPL_MAX_SIZE

Maximum binary size (text, data and rodata) of the SPL binary.

CONFIG_SPL_TEXT_BASE

TEXT_BASE for linking the SPL binary.

CONFIG_SPL_RELOC_TEXT_BASE

Address to relocate to. If unspecified, this is equal to CONFIG_SPL_TEXT_BASE (i.e. no relocation is done).

CONFIG_SPL_BSS_START_ADDR

Link address for the BSS within the SPL binary.

CONFIG_SPL_BSS_MAX_SIZE

Maximum binary size of the BSS section of the SPL binary.

CONFIG_SPL_STACK

Address of the start of the stack SPL will use

CONFIG_SPL_RELOC_STACK

Address of the start of the stack SPL will use after relocation. If unspecified, this is equal to CONFIG_SPL_STACK.

CONFIG_SYS_SPL_MALLOC_START

Starting address of the malloc pool used in SPL.

CONFIG_SYS_SPL_MALLOC_SIZE

The size of the malloc pool used in SPL.

CONFIG_SPL_FRAMEWORK

Enable the SPL framework under common/. This framework supports MMC, NAND and YMODEM loading of U-Boot and NAND NAND loading of the Linux Kernel.

CONFIG_SPL_DISPLAY_PRINT

For ARM, enable an optional function to print more information about the running system.

CONFIG_SPL_INIT_MINIMAL

Arch init code should be built for a very small image

CONFIG_SPL_LIBCOMMON_SUPPORT

Support for common/libcommon.o in SPL binary

CONFIG_SPL_LIBDISK_SUPPORT

Support for disk/libdisk.o in SPL binary

CONFIG_SPL_I2C_SUPPORT

Support for drivers/i2c/libi2c.o in SPL binary

CONFIG_SPL_GPIO_SUPPORT

Support for drivers/gpio/libgpio.o in SPL binary

CONFIG_SPL_MMC_SUPPORT

Support for drivers/mmc/libmmc.o in SPL binary

CONFIG_SYS_MMCSD_RAW_MODE_U_BOOT_SECTOR,

CONFIG_SYS_U_BOOT_MAX_SIZE_SECTORS,

CONFIG_SYS_MMC_SD_FAT_BOOT_PARTITION

Address, size and partition on the MMC to load U-Boot from when the MMC is being used in raw mode.

CONFIG_SPL_FAT_SUPPORT

Support for fs/fat/libfat.o in SPL binary

CONFIG_SPL_FAT_LOAD_PAYLOAD_NAME

Filename to read to load U-Boot when reading from FAT

CONFIG_SPL_NAND_BASE

Include nand_base.c in the SPL. Requires

CONFIG_SPL_NAND_DRIVERS.

CONFIG_SPL_NAND_DRIVERS

SPL uses normal NAND drivers, not minimal drivers.

CONFIG_SPL_NAND_ECC

Include standard software ECC in the SPL

CONFIG_SPL_NAND_SIMPLE

Support for NAND boot using simple NAND drivers that expose the cmd_ctrl() interface.

CONFIG_SYS_NAND_5_ADDR_CYCLE, CONFIG_SYS_NAND_PAGE_COUNT,
 CONFIG_SYS_NAND_PAGE_SIZE, CONFIG_SYS_NAND_OOBSIZE,
 CONFIG_SYS_NAND_BLOCK_SIZE, CONFIG_SYS_NAND_BAD_BLOCK_POS,
 CONFIG_SYS_NAND_ECCPOS, CONFIG_SYS_NAND_ECCSIZE,
 CONFIG_SYS_NAND_ECCBYTES
 Defines the size and behavior of the NAND that SPL uses
 to read U-Boot

CONFIG_SYS_NAND_U_BOOT_OFFS
 Location in NAND to read U-Boot from

CONFIG_SYS_NAND_U_BOOT_DST
 Location in memory to load U-Boot to

CONFIG_SYS_NAND_U_BOOT_SIZE
 Size of image to load

CONFIG_SYS_NAND_U_BOOT_START
 Entry point in loaded image to jump to

CONFIG_SYS_NAND_HW_ECC_OOBFIRST
 Define this if you need to first read the OOB and then the
 data. This is used for example on davinci platforms.

CONFIG_SPL_OMAP3_ID_NAND
 Support for an OMAP3-specific set of functions to return the
 ID and MFR of the first attached NAND chip, if present.

CONFIG_SPL_SERIAL_SUPPORT
 Support for drivers/serial/libserial.o in SPL binary

CONFIG_SPL_SPI_FLASH_SUPPORT
 Support for drivers/mtd/spi/libspi_flash.o in SPL binary

CONFIG_SPL_SPI_SUPPORT
 Support for drivers/spi/libspi.o in SPL binary

CONFIG_SPL_RAM_DEVICE
 Support for running image already present in ram, in SPL binary

CONFIG_SPL_LIBGENERIC_SUPPORT
 Support for lib/libgeneric.o in SPL binary

CONFIG_SPL_TARGET
 Final target image containing SPL and payload. Some SPLs
 use an arch-specific makefile fragment instead, for
 example if more than one image needs to be produced.

Modem Support:

[so far only for SMDK2400 boards]

- Modem support enable:
 CONFIG_MODEM_SUPPORT

- RTS/CTS Flow control enable:
 CONFIG_HWFLOW

- Modem debug support:
 CONFIG_MODEM_SUPPORT_DEBUG

Enables debugging stuff (char screen[1024], dbg())
 for modem support. Useful only with BDI2000.

- Interrupt support (PPC):

There are common interrupt_init() and timer_interrupt()
 for all PPC archs. interrupt_init() calls interrupt_init_cpu()
 for CPU specific initialization. interrupt_init_cpu()
 should set decremter_count to appropriate value. If
 CPU resets decremter automatically after interrupt
 (ppc4xx) it should set decremter_count to zero.
 timer_interrupt() calls timer_interrupt_cpu() for CPU
 specific handling. If board has watchdog / status_led
 / other_activity_monitor it works automatically from
 general timer_interrupt().

- General:

In the target system modem support is enabled when a
 specific key (key combination) is pressed during
 power-on. Otherwise U-Boot will boot normally

(autoboot). The `key_pressed()` function is called from `board_init()`. Currently `key_pressed()` is a dummy function, returning 1 and thus enabling modem initialization.

If there are no modem init strings in the environment, U-Boot proceed to autoboot; the previous output (banner, info printf) will be suppressed, though.

See also: `doc/README.Modem`

Board initialization settings:

During Initialization u-boot calls a number of board specific functions to allow the preparation of board specific prerequisites, e.g. pin setup before drivers are initialized. To enable these callbacks the following configuration macros have to be defined. Currently this is architecture specific, so please check `arch/your_architecture/lib/board.c` typically in `board_init_f()` and `board_init_r()`.

- `CONFIG_BOARD_EARLY_INIT_F`: Call `board_early_init_f()`
- `CONFIG_BOARD_EARLY_INIT_R`: Call `board_early_init_r()`
- `CONFIG_BOARD_LATE_INIT`: Call `board_late_init()`
- `CONFIG_BOARD_POSTCLK_INIT`: Call `board_postclk_init()`

Configuration Settings:

- `CONFIG_SYS_LONGHELP`: Defined when you want long help messages included; undefine this when you're short of memory.
- `CONFIG_SYS_HELP_CMD_WIDTH`: Defined when you want to override the default width of the commands listed in the 'help' command output.
- `CONFIG_SYS_PROMPT`: This is what U-Boot prints on the console to prompt for user input.
- `CONFIG_SYS_CBSIZE`: Buffer size for input from the Console
- `CONFIG_SYS_PBSIZE`: Buffer size for Console output
- `CONFIG_SYS_MAXARGS`: max. Number of arguments accepted for monitor commands
- `CONFIG_SYS_BARGSIZE`: Buffer size for Boot Arguments which are passed to the application (usually a Linux kernel) when it is booted
- `CONFIG_SYS_BAUDRATE_TABLE`:
List of legal baudrate settings for this board.
- `CONFIG_SYS_CONSOLE_INFO_QUIET`
Suppress display of console information at boot.
- `CONFIG_SYS_CONSOLE_IS_IN_ENV`
If the board specific function
`extern int overwrite_console (void);`
returns 1, the stdin, stderr and stdout are switched to the serial port, else the settings in the environment are used.
- `CONFIG_SYS_CONSOLE_OVERWRITE_ROUTINE`
Enable the call to `overwrite_console()`.
- `CONFIG_SYS_CONSOLE_ENV_OVERWRITE`
Enable overwrite of previous console environment settings.
- `CONFIG_SYS_MEMTEST_START`, `CONFIG_SYS_MEMTEST_END`:
Begin and End addresses of the area used by the simple memory test.
- `CONFIG_SYS_ALT_MEMTEST`:
Enable an alternate, more extensive memory test.
- `CONFIG_SYS_MEMTEST_SCRATCH`:
Scratch address used by the alternate memory test
You only need to set this if address zero isn't writeable
- `CONFIG_SYS_MEM_TOP_HIDE` (PPC only):
If `CONFIG_SYS_MEM_TOP_HIDE` is defined in the board config header, this specified memory area will get subtracted from the top (end) of RAM and won't get "touched" at all by U-Boot. By fixing up `gd->ram_size` the Linux kernel should gets passed the now "corrected" memory size and won't touch it either.

This should work for arch/ppc and arch/powerpc. Only Linux board ports in arch/powerpc with bootwrapper support that recalculate the memory size from the SDRAM controller setup will have to get fixed in Linux additionally.

This option can be used as a workaround for the 440EPx/GRx CHIP 11 errata where the last 256 bytes in SDRAM shouldn't be touched.

WARNING: Please make sure that this value is a multiple of the Linux page size (normally 4k). If this is not the case, then the end address of the Linux memory will be located at a non page size aligned address and this could cause major problems.

- CONFIG_SYS_LOADS_BAUD_CHANGE:
Enable temporary baudrate change while serial download
- CONFIG_SYS_SDRAM_BASE:
Physical start address of SDRAM. `_Must_` be 0 here.
- CONFIG_SYS_MBI0_BASE:
Physical start address of Motherboard I/O (if using a Cogent motherboard)
- CONFIG_SYS_FLASH_BASE:
Physical start address of Flash memory.
- CONFIG_SYS_MONITOR_BASE:
Physical start address of boot monitor code (set by make config files to be same as the text base address (CONFIG_SYS_TEXT_BASE) used when linking) - same as CONFIG_SYS_FLASH_BASE when booting from flash.
- CONFIG_SYS_MONITOR_LEN:
Size of memory reserved for monitor code, used to determine `_at_compile_time_` (!) if the environment is embedded within the U-Boot image, or in a separate flash sector.
- CONFIG_SYS_MALLOC_LEN:
Size of DRAM reserved for `malloc()` use.
- CONFIG_SYS_BOOTM_LEN:
Normally compressed uImages are limited to an uncompressed size of 8 MBytes. If this is not enough, you can define CONFIG_SYS_BOOTM_LEN in your board config file to adjust this setting to your needs.
- CONFIG_SYS_BOOTMAPSZ:
Maximum size of memory mapped by the startup code of the Linux kernel; all data that must be processed by the Linux kernel (bd_info, boot arguments, FDT blob if used) must be put below this limit, unless "bootm_low" environment variable is defined and non-zero. In such case all data for the Linux kernel must be between "bootm_low" and "bootm_low" + CONFIG_SYS_BOOTMAPSZ. The environment variable "bootm_mapsize" will override the value of CONFIG_SYS_BOOTMAPSZ. If CONFIG_SYS_BOOTMAPSZ is undefined, then the value in "bootm_size" will be used instead.
- CONFIG_SYS_BOOT_RAMDISK_HIGH:
Enable `initrd_high` functionality. If defined then the `initrd_high` feature is enabled and the bootm ramdisk subcommand is enabled.
- CONFIG_SYS_BOOT_GET_CMDLINE:
Enables allocating and saving kernel cmdline in space between "bootm_low" and "bootm_low" + BOOTMAPSZ.
- CONFIG_SYS_BOOT_GET_KBD:
Enables allocating and saving a kernel copy of the bd_info in space between "bootm_low" and "bootm_low" + BOOTMAPSZ.
- CONFIG_SYS_MAX_FLASH_BANKS:
Max number of Flash memory banks
- CONFIG_SYS_MAX_FLASH_SECT:
Max number of sectors on a Flash chip
- CONFIG_SYS_FLASH_ERASE_TOUT:
Timeout for Flash erase operations (in ms)
- CONFIG_SYS_FLASH_WRITE_TOUT:

Timeout for Flash write operations (in ms)

- CONFIG_SYS_FLASH_LOCK_TOUT
Timeout for Flash set sector lock bit operation (in ms)
- CONFIG_SYS_FLASH_UNLOCK_TOUT
Timeout for Flash clear lock bits operation (in ms)
- CONFIG_SYS_FLASH_PROTECTION
If defined, hardware flash sectors protection is used instead of U-Boot software protection.
- CONFIG_SYS_DIRECT_FLASH_TFTP:

Enable TFTP transfers directly to flash memory; without this option such a download has to be performed in two steps: (1) download to RAM, and (2) copy from RAM to flash.

The two-step approach is usually more reliable, since you can check if the download worked before you erase the flash, but in some situations (when system RAM is too limited to allow for a temporary copy of the downloaded image) this option may be very useful.
- CONFIG_SYS_FLASH_CFI:
Define if the flash driver uses extra elements in the common flash structure for storing flash geometry.
- CONFIG_FLASH_CFI_DRIVER
This option also enables the building of the cfi_flash driver in the drivers directory
- CONFIG_FLASH_CFI_MTD
This option enables the building of the cfi_mtd driver in the drivers directory. The driver exports CFI flash to the MTD layer.
- CONFIG_SYS_FLASH_USE_BUFFER_WRITE
Use buffered writes to flash.
- CONFIG_FLASH_SPANSION_S29WS_N
s29ws-n MirrorBit flash has non-standard addresses for buffered write commands.
- CONFIG_SYS_FLASH_QUIET_TEST
If this option is defined, the common CFI flash doesn't print it's warning upon not recognized FLASH banks. This is useful, if some of the configured banks are only optionally available.
- CONFIG_FLASH_SHOW_PROGRESS
If defined (must be an integer), print out countdown digits and dots. Recommended value: 45 (9..1) for 80 column displays, 15 (3..1) for 40 column displays.
- CONFIG_SYS_RX_ETH_BUFFER:
Defines the number of Ethernet receive buffers. On some Ethernet controllers it is recommended to set this value to 8 or even higher (EEPROM or 405 EMAC), since all buffers can be full shortly after enabling the interface on high Ethernet traffic.
Defaults to 4 if not defined.
- CONFIG_ENV_MAX_ENTRIES

Maximum number of entries in the hash table that is used internally to store the environment settings. The default setting is supposed to be generous and should work in most cases. This setting can be used to tune behaviour; see lib/hashtable.c for details.
- CONFIG_ENV_FLAGS_LIST_DEFAULT
- CONFIG_ENV_FLAGS_LIST_STATIC
Enable validation of the values given to environment variables when calling env set. Variables can be restricted to only decimal, hexadecimal, or boolean. If CONFIG_CMD_NET is also defined, the variables can also be restricted to IP address or MAC address.

The format of the list is:
type_attribute = [s|d|x|b|i|m]
access_attribute = [a|r|o|c]
attributes = type_attribute[access_attribute]
entry = variable_name[:attributes]

```
list = entry[,list]
```

The type attributes are:

```
s - String (default)
d - Decimal
x - Hexadecimal
b - Boolean ([1yYtT|0nNfF])
i - IP address
m - MAC address
```

The access attributes are:

```
a - Any (default)
r - Read-only
o - Write-once
c - Change-default
```

- CONFIG_ENV_FLAGS_LIST_DEFAULT

Define this to a list (string) to define the ".flags" environment variable in the default or embedded environment.

- CONFIG_ENV_FLAGS_LIST_STATIC

Define this to a list (string) to define validation that should be done if an entry is not found in the ".flags" environment variable. To override a setting in the static list, simply add an entry for the same variable name to the ".flags" variable.

- CONFIG_ENV_ACCESS_IGNORE_FORCE

If defined, don't allow the -f switch to env set override variable access flags.

The following definitions that deal with the placement and management of environment data (variable area); in general, we support the following configurations:

- CONFIG_BUILD_ENVCRC:

Builds up envcrc with the target environment so that external utils may easily extract it and embed it in final U-Boot images.

- CONFIG_ENV_IS_IN_FLASH:

Define this if the environment is in flash memory.

- a) The environment occupies one whole flash sector, which is "embedded" in the text segment with the U-Boot code. This happens usually with "bottom boot sector" or "top boot sector" type flash chips, which have several smaller sectors at the start or the end. For instance, such a layout can have sector sizes of 8, 2x4, 16, Nx32 kB. In such a case you would place the environment in one of the 4 kB sectors - with U-Boot code before and after it. With "top boot sector" type flash chips, you would put the environment in one of the last sectors, leaving a gap between U-Boot and the environment.

- CONFIG_ENV_OFFSET:

Offset of environment data (variable area) to the beginning of flash memory; for instance, with bottom boot type flash chips the second sector can be used: the offset for this sector is given here.

CONFIG_ENV_OFFSET is used relative to CONFIG_SYS_FLASH_BASE.

- CONFIG_ENV_ADDR:

This is just another way to specify the start address of the flash sector containing the environment (instead of CONFIG_ENV_OFFSET).

- CONFIG_ENV_SECT_SIZE:

Size of the sector containing the environment.

- b) Sometimes flash chips have few, equal sized, BIG sectors. In such a case you don't want to spend a whole sector for the environment.

- CONFIG_ENV_SIZE:

If you use this in combination with CONFIG_ENV_IS_IN_FLASH and CONFIG_ENV_SECT_SIZE, you can specify to use only a part

of this flash sector for the environment. This saves memory for the RAM copy of the environment.

It may also save flash memory if you decide to use this when your environment is "embedded" within U-Boot code, since then the remainder of the flash sector could be used for U-Boot code. It should be pointed out that this is **STRONGLY DISCOURAGED** from a robustness point of view: updating the environment in flash makes it always necessary to erase the **WHOLE** sector. If something goes wrong before the contents has been restored from a copy in RAM, your target system will be dead.

- CONFIG_ENV_ADDR_REDUND
CONFIG_ENV_SIZE_REDUND

These settings describe a second storage area used to hold a redundant copy of the environment data, so that there is a valid backup copy in case there is a power failure during a "saveenv" operation.

BE CAREFUL! Any changes to the flash layout, and some changes to the source code will make it necessary to adapt <board>/u-boot.lds* accordingly!

- CONFIG_ENV_IS_IN_NVRAM:

Define this if you have some non-volatile memory device (NVRAM, battery buffered SRAM) which you want to use for the environment.

- CONFIG_ENV_ADDR:
- CONFIG_ENV_SIZE:

These two #defines are used to determine the memory area you want to use for environment. It is assumed that this memory can just be read and written to, without any special provision.

BE CAREFUL! The first access to the environment happens quite early in U-Boot initialization (when we try to get the setting of for the console baudrate). You ***MUST*** have mapped your NVRAM area then, or U-Boot will hang.

Please note that even with NVRAM we still use a copy of the environment in RAM: we could work on NVRAM directly, but we want to keep settings there always unmodified except somebody uses "saveenv" to save the current settings.

- CONFIG_ENV_IS_IN_EEPROM:

Use this if you have an EEPROM or similar serial access device and a driver for it.

- CONFIG_ENV_OFFSET:
- CONFIG_ENV_SIZE:

These two #defines specify the offset and size of the environment area within the total memory of your EEPROM.

- CONFIG_SYS_I2C_EEPROM_ADDR:
If defined, specified the chip address of the EEPROM device. The default address is zero.

- CONFIG_SYS_EEPROM_PAGE_WRITE_BITS:
If defined, the number of bits used to address bytes in a single page in the EEPROM device. A 64 byte page, for example would require six bits.

- CONFIG_SYS_EEPROM_PAGE_WRITE_DELAY_MS:
If defined, the number of milliseconds to delay between page writes. The default is zero milliseconds.

- CONFIG_SYS_I2C_EEPROM_ADDR_LEN:
The length in bytes of the EEPROM memory array address. Note that this is NOT the chip address length!

- CONFIG_SYS_I2C_EEPROM_ADDR_OVERFLOW:
EEPROM chips that implement "address overflow" are ones like Catalyst 24WC04/08/16 which has 9/10/11 bits of address and the extra bits end up in the "chip address" bit slots. This makes a 24WC08 (1Kbyte) chip look like four 256

byte chips.

Note that we consider the length of the address field to still be one byte because the extra address bits are hidden in the chip address.

- CONFIG_SYS_EEPROM_SIZE:

The size in bytes of the EEPROM device.

- CONFIG_ENV_EEPROM_IS_ON_I2C

define this, if you have I2C and SPI activated, and your EEPROM, which holds the environment, is on the I2C bus.

- CONFIG_I2C_ENV_EEPROM_BUS

if you have an Environment on an EEPROM reached over I2C muxes, you can define here, how to reach this EEPROM. For example:

```
#define CONFIG_I2C_ENV_EEPROM_BUS "pca9547:70:dY0"
```

EEPROM which holds the environment, is reached over a pca9547 i2c mux with address 0x70, channel 3.

- CONFIG_ENV_IS_IN_DATAFLASH:

Define this if you have a DataFlash memory device which you want to use for the environment.

- CONFIG_ENV_OFFSET:

- CONFIG_ENV_ADDR:

- CONFIG_ENV_SIZE:

These three #defines specify the offset and size of the environment area within the total memory of your DataFlash placed at the specified address.

- CONFIG_ENV_IS_IN_REMOTE:

Define this if you have a remote memory space which you want to use for the local device's environment.

- CONFIG_ENV_ADDR:

- CONFIG_ENV_SIZE:

These two #defines specify the address and size of the environment area within the remote memory space. The local device can get the environment from remote memory space by SRIO or PCIE links.

BE CAREFUL! For some special cases, the local device can not use "saveenv" command. For example, the local device will get the environment stored in a remote NOR flash by SRIO or PCIE link, but it can not erase, write this NOR flash by SRIO or PCIE interface.

- CONFIG_ENV_IS_IN_NAND:

Define this if you have a NAND device which you want to use for the environment.

- CONFIG_ENV_OFFSET:

- CONFIG_ENV_SIZE:

These two #defines specify the offset and size of the environment area within the first NAND device. CONFIG_ENV_OFFSET must be aligned to an erase block boundary.

- CONFIG_ENV_OFFSET_REDUND (optional):

This setting describes a second storage area of CONFIG_ENV_SIZE size used to hold a redundant copy of the environment data, so that there is a valid backup copy in case there is a power failure during a "saveenv" operation. CONFIG_ENV_OFFSET_REDUND must be aligned to an erase block boundary.

- CONFIG_ENV_RANGE (optional):

Specifies the length of the region in which the environment can be written. This should be a multiple of the NAND device's block size. Specifying a range with more erase blocks than are needed to hold CONFIG_ENV_SIZE allows bad blocks within the range to be avoided.

- CONFIG_ENV_OFFSET_OOB (optional):

Enables support for dynamically retrieving the offset of the environment from block zero's out-of-band data. The "nand env.oob" command can be used to record this offset. Currently, CONFIG_ENV_OFFSET_REDUND is not supported when using CONFIG_ENV_OFFSET_OOB.

- CONFIG_NAND_ENV_DST

Defines address in RAM to which the nand_spl code should copy the environment. If redundant environment is used, it will be copied to CONFIG_NAND_ENV_DST + CONFIG_ENV_SIZE.

- CONFIG_SYS_SPI_INIT_OFFSET

Defines offset to the initial SPI buffer area in DPRAM. The area is used at an early stage (ROM part) if the environment is configured to reside in the SPI EEPROM: We need a 520 byte scratch DPRAM area. It is used between the two initialization calls (spi_init_f() and spi_init_r()). A value of 0xB00 seems to be a good choice since it makes it far enough from the start of the data area as well as from the stack pointer.

Please note that the environment is read-only until the monitor has been relocated to RAM and a RAM copy of the environment has been created; also, when using EEPROM you will have to use getenv_f() until then to read environment variables.

The environment is protected by a CRC32 checksum. Before the monitor is relocated into RAM, as a result of a bad CRC you will be working with the compiled-in default environment - *silently*!!! [This is necessary, because the first environment variable we need is the "baudrate" setting for the console - if we have a bad CRC, we don't have any device yet where we could complain.]

Note: once the monitor has been relocated, then it will complain if the default environment is used; a new CRC is computed as soon as you use the "saveenv" command to store a valid environment.

- CONFIG_SYS_FAULT_ECHO_LINK_DOWN:

Echo the inverted Ethernet link state to the fault LED.

Note: If this option is active, then CONFIG_SYS_FAULT_MII_ADDR also needs to be defined.

- CONFIG_SYS_FAULT_MII_ADDR:

MII address of the PHY to check for the Ethernet link state.

- CONFIG_NS16550_MIN_FUNCTIONS:

Define this if you desire to only have use of the NS16550_init and NS16550_putc functions for the serial driver located at drivers/serial/ns16550.c. This option is useful for saving space for already greatly restricted images, including but not limited to NAND_SPL configurations.

- CONFIG_DISPLAY_BOARDINFO

Display information about the board that U-Boot is running on when U-Boot starts up. The board function checkboard() is called to do this.

- CONFIG_DISPLAY_BOARDINFO_LATE

Similar to the previous option, but display this information later, once stdio is running and output goes to the LCD, if present.

Low Level (hardware related) configuration options:

- CONFIG_SYS_CACHELINE_SIZE:

Cache Line Size of the CPU.

- CONFIG_SYS_DEFAULT_IMMR:

Default address of the IMMR after system reset.

Needed on some 8260 systems (MPC8260ADS, PQ2FADS-ZU, and RPXsuper) to be able to adjust the position of the IMMR register after a reset.

- CONFIG_SYS_CCSRBAR_DEFAULT:

Default (power-on reset) physical address of CCSR on Freescale PowerPC SOCs.

- CONFIG_SYS_CCSRBAR:

Virtual address of CCSR. On a 32-bit build, this is typically the same value as CONFIG_SYS_CCSRBAR_DEFAULT.

CONFIG_SYS_DEFAULT_IMMR must also be set to this value,
for cross-platform code that uses that macro instead.

- CONFIG_SYS_CCSRBAR_PHYS:
Physical address of CCSR. CCSR can be relocated to a new physical address, if desired. In this case, this macro should be set to that address. Otherwise, it should be set to the same value as CONFIG_SYS_CCSRBAR_DEFAULT. For example, CCSR is typically relocated on 36-bit builds. It is recommended that this macro be defined via the _HIGH and _LOW macros:


```
#define CONFIG_SYS_CCSRBAR_PHYS ((CONFIG_SYS_CCSRBAR_PHYS_HIGH  
* 1ull) << 32 | CONFIG_SYS_CCSRBAR_PHYS_LOW)
```
- CONFIG_SYS_CCSRBAR_PHYS_HIGH:
Bits 33-36 of CONFIG_SYS_CCSRBAR_PHYS. This value is typically either 0 (32-bit build) or 0xF (36-bit build). This macro is used in assembly code, so it must not contain typecasts or integer size suffixes (e.g. "ULL").
- CONFIG_SYS_CCSRBAR_PHYS_LOW:
Lower 32-bits of CONFIG_SYS_CCSRBAR_PHYS. This macro is used in assembly code, so it must not contain typecasts or integer size suffixes (e.g. "ULL").
- CONFIG_SYS_CCSR_DO_NOT_RELOCATE:
If this macro is defined, then CONFIG_SYS_CCSRBAR_PHYS will be forced to a value that ensures that CCSR is not relocated.
- Floppy Disk Support:
CONFIG_SYS_FDC_DRIVE_NUMBER

the default drive number (default value 0)

CONFIG_SYS_ISA_IO_STRIDE

defines the spacing between FDC chipset registers
(default value 1)

CONFIG_SYS_ISA_IO_OFFSET

defines the offset of register from address. It depends on which part of the data bus is connected to the FDC chipset. (default value 0)

If CONFIG_SYS_ISA_IO_STRIDE CONFIG_SYS_ISA_IO_OFFSET and CONFIG_SYS_FDC_DRIVE_NUMBER are undefined, they take their default value.

if CONFIG_SYS_FDC_HW_INIT is defined, then the function fdc_hw_init() is called at the beginning of the FDC setup. fdc_hw_init() must be provided by the board source code. It is used to make hardware dependant initializations.
- CONFIG_IDE_AHB:
Most IDE controllers were designed to be connected with PCI interface. Only few of them were designed for AHB interface. When software is doing ATA command and data transfer to IDE devices through IDE-AHB controller, some additional registers accessing to these kind of IDE-AHB controller is required.
- CONFIG_SYS_IMMR: Physical address of the Internal Memory.
DO NOT CHANGE unless you know exactly what you're doing! (11-4) [MPC8xx/82xx systems only]
- CONFIG_SYS_INIT_RAM_ADDR:

Start address of memory area that can be used for initial data and stack; please note that this must be writable memory that is working WITHOUT special initialization, i. e. you CANNOT use normal RAM which will become available only after programming the memory controller and running certain initialization sequences.

U-Boot uses the following memory types:
 - MPC8xx and MPC8260: IMMR (internal memory of the CPU)
 - MPC824X: data cache
 - PPC4xx: data cache
- CONFIG_SYS_GBL_DATA_OFFSET:

Offset of the initial data structure in the memory area defined by CONFIG_SYS_INIT_RAM_ADDR. Usually CONFIG_SYS_GBL_DATA_OFFSET is chosen such that the initial data is located at the end of the available space (sometimes written as (CONFIG_SYS_INIT_RAM_SIZE - CONFIG_SYS_INIT_DATA_SIZE), and the initial stack is just below that area (growing from (CONFIG_SYS_INIT_RAM_ADDR + CONFIG_SYS_GBL_DATA_OFFSET) downward.

Note:

On the MPC824X (or other systems that use the data cache for initial memory) the address chosen for CONFIG_SYS_INIT_RAM_ADDR is basically arbitrary - it must point to an otherwise UNUSED address space between the top of RAM and the start of the PCI space.

- CONFIG_SYS_SIUMCR: SIU Module Configuration (11-6)
- CONFIG_SYS_SYPCR: System Protection Control (11-9)
- CONFIG_SYS_TBSCR: Time Base Status and Control (11-26)
- CONFIG_SYS_PISCR: Periodic Interrupt Status and Control (11-31)
- CONFIG_SYS_PLPCR: PLL, Low-Power, and Reset Control Register (15-30)
- CONFIG_SYS_SCCR: System Clock and reset Control Register (15-27)
- CONFIG_SYS_OR_TIMING_SDRAM:
SDRAM timing
- CONFIG_SYS_MAMR_PTA:
periodic timer for refresh
- CONFIG_SYS_DER: Debug Event Register (37-47)
- FLASH_BASE0_PRELIM, FLASH_BASE1_PRELIM, CONFIG_SYS_REMAP_OR_AM,
CONFIG_SYS_PRELIM_OR_AM, CONFIG_SYS_OR_TIMING_FLASH, CONFIG_SYS_OR0_REMAP,
CONFIG_SYS_OR0_PRELIM, CONFIG_SYS_BR0_PRELIM, CONFIG_SYS_OR1_REMAP, CONFIG_SYS_OR1_PRELIM,
CONFIG_SYS_BR1_PRELIM:
Memory Controller Definitions: BR0/1 and OR0/1 (FLASH)
- SDRAM_BASE2_PRELIM, SDRAM_BASE3_PRELIM, SDRAM_MAX_SIZE,
CONFIG_SYS_OR_TIMING_SDRAM, CONFIG_SYS_OR2_PRELIM, CONFIG_SYS_BR2_PRELIM,
CONFIG_SYS_OR3_PRELIM, CONFIG_SYS_BR3_PRELIM:
Memory Controller Definitions: BR2/3 and OR2/3 (SDRAM)
- CONFIG_SYS_MAMR_PTA, CONFIG_SYS_MPTPR_2BK_4K, CONFIG_SYS_MPTPR_1BK_4K, CONFIG_SYS_MPTPR_2BK_8K,
CONFIG_SYS_MPTPR_1BK_8K, CONFIG_SYS_MAMR_8COL, CONFIG_SYS_MAMR_9COL:
Machine Mode Register and Memory Periodic Timer
Prescaler definitions (SDRAM timing)
- CONFIG_SYS_I2C_UCODE_PATCH, CONFIG_SYS_I2C_DPMEM_OFFSET [0x1FC0]:
enable I2C microcode relocation patch (MPC8xx);
define relocation offset in DPRAM [DSP2]
- CONFIG_SYS_SMC_UCODE_PATCH, CONFIG_SYS_SMC_DPMEM_OFFSET [0x1FC0]:
enable SMC microcode relocation patch (MPC8xx);
define relocation offset in DPRAM [SMC1]
- CONFIG_SYS_SPI_UCODE_PATCH, CONFIG_SYS_SPI_DPMEM_OFFSET [0x1FC0]:
enable SPI microcode relocation patch (MPC8xx);
define relocation offset in DPRAM [SCC4]
- CONFIG_SYS_USE_OSCCLK:
Use OSCM clock mode on MBX8xx board. Be careful,
wrong setting might damage your board. Read
doc/README.MBX before setting this variable!
- CONFIG_SYS_CPM_POST_WORD_ADDR: (MPC8xx, MPC8260 only)
Offset of the bootmode word in DPRAM used by post
(Power On Self Tests). This definition overrides
#define'd default value in commproc.h resp.
cpm_8260.h.
- CONFIG_SYS_PCI_SLV_MEM_LOCAL, CONFIG_SYS_PCI_SLV_MEM_BUS, CONFIG_SYS_PICMR0_MASK_ATTRIB,
CONFIG_SYS_PCI_MSTR0_LOCAL, CONFIG_SYS_PCIMSK0_MASK, CONFIG_SYS_PCI_MSTR1_LOCAL,
CONFIG_SYS_PCIMSK1_MASK, CONFIG_SYS_PCI_MSTR_MEM_LOCAL, CONFIG_SYS_PCI_MSTR_MEM_BUS,
CONFIG_SYS_CPU_PCI_MEM_START, CONFIG_SYS_PCI_MSTR_MEM_SIZE, CONFIG_SYS_POCMR0_MASK_ATTRIB,
CONFIG_SYS_PCI_MSTR_MEMIO_LOCAL, CONFIG_SYS_PCI_MSTR_MEMIO_BUS, CPU_PCI_MEMIO_START,
CONFIG_SYS_PCI_MSTR_MEMIO_SIZE, CONFIG_SYS_POCMR1_MASK_ATTRIB, CONFIG_SYS_PCI_MSTR_IO_LOCAL,
CONFIG_SYS_PCI_MSTR_IO_BUS, CONFIG_SYS_CPU_PCI_IO_START, CONFIG_SYS_PCI_MSTR_IO_SIZE,
CONFIG_SYS_POCMR2_MASK_ATTRIB: (MPC826x only)

Overrides the default PCI memory map in arch/powerpc/cpu/mpc8260/pci.c if set.

- CONFIG_PCI_DISABLE_PCIE:
Disable PCI-Express on systems where it is supported but not required.
- CONFIG_PCI_ENUM_ONLY
Only scan through and get the devices on the busses.
Don't do any setup work, presumably because someone or something has already done it, and we don't need to do it a second time. Useful for platforms that are pre-booted by coreboot or similar.
- CONFIG_SYS_SRIO:
Chip has SRIO or not
- CONFIG_SRIO1:
Board has SRIO 1 port available
- CONFIG_SRIO2:
Board has SRIO 2 port available
- CONFIG_SYS_SRIO_n_MEM_VIRT:
Virtual Address of SRIO port 'n' memory region
- CONFIG_SYS_SRIO_n_MEM_PHYS:
Physical Address of SRIO port 'n' memory region
- CONFIG_SYS_SRIO_n_MEM_SIZE:
Size of SRIO port 'n' memory region
- CONFIG_SYS_NDFC_16
Defined to tell the NDFC that the NAND chip is using a 16 bit bus.
- CONFIG_SYS_NDFC_EBCO_CFG
Sets the EBCO_CFG register for the NDFC. If not defined a default value will be used.
- CONFIG_SPD_EEPROM
Get DDR timing information from an I2C EEPROM. Common with pluggable memory modules such as SODIMMs

SPD_EEPROM_ADDRESS
I2C address of the SPD EEPROM
- CONFIG_SYS_SPD_BUS_NUM
If SPD EEPROM is on an I2C bus other than the first one, specify here. Note that the value must resolve to something your driver can deal with.
- CONFIG_SYS_DDR_RAW_TIMING
Get DDR timing information from other than SPD. Common with soldered DDR chips onboard without SPD. DDR raw timing parameters are extracted from datasheet and hard-coded into header files or board specific files.
- CONFIG_FSL_DDR_INTERACTIVE
Enable interactive DDR debugging. See doc/README.fsl-ddr.
- CONFIG_SYS_83XX_DDR_USES_CS0
Only for 83xx systems. If specified, then DDR should be configured using CS0 and CS1 instead of CS2 and CS3.
- CONFIG_ETHER_ON_FEC[12]
Define to enable FEC[12] on a 8xx series processor.
- CONFIG_FEC[12]_PHY
Define to the hardcoded PHY address which corresponds to the given FEC; i. e.
#define CONFIG_FEC1_PHY 4
means that the PHY with address 4 is connected to FEC1

When set to -1, means to probe for first available.
- CONFIG_FEC[12]_PHY_NORXERR
The PHY does not have a RXERR line (RMII only).
(so program the FEC to ignore it).
- CONFIG_RMII
Enable RMII mode for all FECs.
Note that this is a global option, we can't have one FEC in standard MII mode and another in RMII mode.

- CONFIG_CRC32_VERIFY
Add a verify option to the crc32 command.
The syntax is:

=> crc32 -v <address> <count> <crc32>

Where address/count indicate a memory area
and crc32 is the correct crc32 which the
area should have.
- CONFIG_LOOPW
Add the "loopw" memory command. This only takes effect if
the memory commands are activated globally (CONFIG_CMD_MEM).
- CONFIG_MX_CYCLIC
Add the "mdc" and "mwc" memory commands. These are cyclic
"md/mw" commands.
Examples:

=> mdc.b 10 4 500
This command will print 4 bytes (10,11,12,13) each 500 ms.

=> mwc.l 100 12345678 10
This command will write 12345678 to address 100 all 10 ms.

This only takes effect if the memory commands are activated
globally (CONFIG_CMD_MEM).
- CONFIG_SKIP_LOWLEVEL_INIT
[ARM, NDS32, MIPS only] If this variable is defined, then certain
low level initializations (like setting up the memory
controller) are omitted and/or U-Boot does not
relocate itself into RAM.

Normally this variable MUST NOT be defined. The only
exception is when U-Boot is loaded (to RAM) by some
other boot loader or by a debugger which performs
these initializations itself.
- CONFIG_SPL_BUILD
Modifies the behaviour of start.S when compiling a loader
that is executed before the actual U-Boot. E.g. when
compiling a NAND SPL.
- CONFIG_USE_ARCH_MEMCPY
CONFIG_USE_ARCH_MEMSET
If these options are used a optimized version of memcpy/memset will
be used if available. These functions may be faster under some
conditions but may increase the binary size.
- CONFIG_X86_NO_RESET_VECTOR
If defined, the x86 reset vector code is excluded. You will need
to do this when U-Boot is running from Coreboot.
- CONFIG_X86_NO_REAL_MODE
If defined, x86 real mode code is omitted. This assumes a
32-bit environment where such code is not needed. You will
need to do this when U-Boot is running from Coreboot.

Freescall QE/FMAN Firmware Support:

The Freescale QUICCEngine (QE) and Frame Manager (FMAN) both support the
loading of "firmware", which is encoded in the QE firmware binary format.
This firmware often needs to be loaded during U-Boot booting, so macros
are used to identify the storage device (NOR flash, SPI, etc) and the address
within that device.

- CONFIG_SYS_QE_FMAN_FW_ADDR
The address in the storage device where the firmware is located. The
meaning of this address depends on which CONFIG_SYS_QE_FW_IN_XXX macro
is also specified.
- CONFIG_SYS_QE_FMAN_FW_LENGTH
The maximum possible size of the firmware. The firmware binary format
has a field that specifies the actual size of the firmware, but it
might not be possible to read any part of the firmware unless some
local storage is allocated to hold the entire firmware first.
- CONFIG_SYS_QE_FMAN_FW_IN_NOR
Specifies that QE/FMAN firmware is located in NOR flash, mapped as
normal addressable memory via the LBC. CONFIG_SYS_FMAN_FW_ADDR is the
virtual address in NOR flash.

- CONFIG_SYS_QE_FMAN_FW_IN_NAND
Specifies that QE/FMAN firmware is located in NAND flash.
CONFIG_SYS_FMAN_FW_ADDR is the offset within NAND flash.
- CONFIG_SYS_QE_FMAN_FW_IN_MMC
Specifies that QE/FMAN firmware is located on the primary SD/MMC device. CONFIG_SYS_FMAN_FW_ADDR is the byte offset on that device.
- CONFIG_SYS_QE_FMAN_FW_IN_SPIFLASH
Specifies that QE/FMAN firmware is located on the primary SPI device. CONFIG_SYS_FMAN_FW_ADDR is the byte offset on that device.
- CONFIG_SYS_QE_FMAN_FW_IN_REMOTE
Specifies that QE/FMAN firmware is located in the remote (master) memory space. CONFIG_SYS_FMAN_FW_ADDR is a virtual address which can be mapped from slave TLB->slave LAW->slave SRIO or PCIE outbound window->master inbound window->master LAW->the ucode address in master's memory space.

Building the Software:

Building U-Boot has been tested in several native build environments and in many different cross environments. Of course we cannot support all possibly existing versions of cross development tools in all (potentially obsolete) versions. In case of tool chain problems we recommend to use the ELDK (see <http://www.denx.de/wiki/DULG/ELDK>) which is extensively used to build and test U-Boot.

If you are not using a native environment, it is assumed that you have GNU cross compiling tools available in your path. In this case, you must set the environment variable CROSS_COMPILE in your shell. Note that no changes to the Makefile or any other source files are necessary. For example using the ELDK on a 4xx CPU, please enter:

```
$ CROSS_COMPILE=ppc_4xx-
$ export CROSS_COMPILE
```

Note: If you wish to generate Windows versions of the utilities in the tools directory you can use the MinGW toolchain (<http://www.mingw.org>). Set your HOST tools to the MinGW toolchain and execute 'make tools'. For example:

```
$ make HOSTCC=i586-mingw32msvc-gcc HOSTSTRIP=i586-mingw32msvc-strip tools
```

Binaries such as tools/mkimage.exe will be created which can be executed on computers running Windows.

U-Boot is intended to be simple to build. After installing the sources you must configure U-Boot for one specific board type. This is done by typing:

```
make NAME_config
```

where "NAME_config" is the name of one of the existing configurations; see boards.cfg for supported names.

Note: for some board special configuration names may exist: check if additional information is available from the board vendor: for instance, the TQM823L systems are available without (standard) or with LCD support. You can select such additional "features" when choosing the configuration, i. e.

```
make TQM823L_config
- will configure for a plain TQM823L, i. e. no LCD support

make TQM823L_LCD_config
- will configure for a TQM823L with U-Boot console on LCD

etc.
```

Finally, type "make all", and you should get some working U-Boot images ready for download to / installation on your system:

- "u-boot.bin" is a raw binary image
- "u-boot" is an image in ELF binary format
- "u-boot.srec" is in Motorola S-Record format

By default the build is performed locally and the objects are saved in the source directory. One of the two methods can be used to change this behavior and build U-Boot to some external directory:

1. Add O= to the make command line invocations:

```
make O=/tmp/build distclean
make O=/tmp/build NAME_config
make O=/tmp/build all
```

2. Set environment variable BUILD_DIR to point to the desired location:

```
export BUILD_DIR=/tmp/build
make distclean
make NAME_config
make all
```

Note that the command line "O=" setting overrides the BUILD_DIR environment variable.

Please be aware that the Makefiles assume you are using GNU make, so for instance on NetBSD you might need to use "gmake" instead of native "make".

If the system board that you have is not listed, then you will need to port U-Boot to your hardware platform. To do this, follow these steps:

1. Add a new configuration option for your board to the toplevel "boards.cfg" file, using the existing entries as examples. Follow the instructions there to keep the boards in order.
2. Create a new directory to hold your board specific code. Add any files you need. In your board directory, you will need at least the "Makefile", a "<board>.c", "flash.c" and "u-boot.lds".
3. Create a new configuration file "include/configs/<board>.h" for your board
3. If you're porting U-Boot to a new CPU, then also create a new directory to hold your CPU specific code. Add any files you need.
4. Run "make <board>_config" with your new name.
5. Type "make", and you should get a working "u-boot.srec" file to be installed on your target system.
6. Debug and solve any problems that might arise.
[Of course, this last step is much harder than it sounds.]

Testing of U-Boot Modifications, Ports to New Hardware, etc.:

=====

If you have modified U-Boot sources (for instance added a new board or support for new devices, a new CPU, etc.) you are expected to provide feedback to the other developers. The feedback normally takes the form of a "patch", i. e. a context diff against a certain (latest official or latest in the git repository) version of U-Boot sources.

But before you submit such a patch, please verify that your modification did not break existing code. At least make sure that *ALL* of the supported boards compile WITHOUT ANY compiler warnings. To do so, just run the "MAKEALL" script, which will configure and build U-Boot for ALL supported system. Be warned, this will take a while. You can select which (cross) compiler to use by passing a 'CROSS_COMPILE' environment variable to the script, i. e. to use the ELDK cross tools you can type

```
CROSS_COMPILE=ppc_8xx- MAKEALL
```

or to build on a native PowerPC system you can type

```
CROSS_COMPILE=' ' MAKEALL
```

When using the MAKEALL script, the default behaviour is to build U-Boot in the source directory. This location can be changed by setting the BUILD_DIR environment variable. Also, for each target built, the MAKEALL script saves two log files (<target>.ERR and <target>.MAKEALL) in the <source dir>/LOG directory. This default location can be changed by setting the MAKEALL_LOGDIR environment variable. For example:

```
export BUILD_DIR=/tmp/build
export MAKEALL_LOGDIR=/tmp/log
CROSS_COMPILE=ppc_8xx- MAKEALL
```

With the above settings build objects are saved in the /tmp/build, log files are saved in the /tmp/log and the source tree remains clean during the whole build process.

See also "U-Boot Porting Guide" below.

Monitor Commands - Overview:

=====

```
go - start application at address 'addr'
run - run commands in an environment variable
bootm - boot application image from memory
bootp - boot image via network using BootP/TFTP protocol
bootz - boot zImage from memory
tftpboot- boot image via network using TFTP protocol
         and env variables "ipaddr" and "serverip"
         (and eventually "gatewayip")
tftpboot - upload a file via network using TFTP protocol
rarpboot- boot image via network using RARP/TFTP protocol
diskboot- boot from IDE devicebootd - boot default, i.e., run 'bootcmd'
loads - load S-Record file over serial line
loadb - load binary file over serial line (kermit mode)
md - memory display
mm - memory modify (auto-incrementing)
nm - memory modify (constant address)
mw - memory write (fill)
cp - memory copy
cmp - memory compare
crc32 - checksum calculation
i2c - I2C sub-system
sspi - SPI utility commands
base - print or set address offset
printenv- print environment variables
setenv - set environment variables
saveenv - save environment variables to persistent storage
protect - enable or disable FLASH write protection
erase - erase FLASH memory
flinfo - print FLASH memory information
nand - NAND memory operations (see doc/README.nand)
bdinfo - print Board Info structure
iminfo - print header information for application image
coninfo - print console devices and informations
ide - IDE sub-system
loop - infinite loop on address range
loopw - infinite write loop on address range
mtest - simple RAM test
icache - enable or disable instruction cache
dcache - enable or disable data cache
reset - Perform RESET of the CPU
echo - echo args to console
version - print monitor version
help - print online help
? - alias for 'help'
```

Monitor Commands - Detailed Description:

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TODO.

For now: just type "help <command>".

Environment Variables:

=====

U-Boot supports user configuration using Environment Variables which can be made persistent by saving to Flash memory.

Environment Variables are set using "setenv", printed using "printenv", and saved to Flash using "saveenv". Using "setenv" without a value can be used to delete a variable from the environment. As long as you don't save the environment you are working with an in-memory copy. In case the Flash area containing the environment is erased by accident, a default environment is provided.

Some configuration options can be set using Environment Variables.

List of environment variables (most likely not complete):

```
baudrate - see CONFIG_BAUDRATE
bootdelay - see CONFIG_BOOTDELAY
bootcmd - see CONFIG_BOOTCOMMAND
bootargs - Boot arguments when booting an RTOS image
```


bootfile - Name of the image to load with TFTP

bootm_low - Memory range available for image processing in the bootm command can be restricted. This variable is given as a hexadecimal number and defines lowest address allowed for use by the bootm command. See also "bootm_size" environment variable. Address defined by "bootm_low" is also the base of the initial memory mapping for the Linux kernel — see the description of CONFIG_SYS_BOOTMAPSZ and bootm_mapsize.

bootm_mapsize - Size of the initial memory mapping for the Linux kernel. This variable is given as a hexadecimal number and it defines the size of the memory region starting at base address bootm_low that is accessible by the Linux kernel during early boot. If unset, CONFIG_SYS_BOOTMAPSZ is used as the default value if it is defined, and bootm_size is used otherwise.

bootm_size - Memory range available for image processing in the bootm command can be restricted. This variable is given as a hexadecimal number and defines the size of the region allowed for use by the bootm command. See also "bootm_low" environment variable.

updatefile - Location of the software update file on a TFTP server, used by the automatic software update feature. Please refer to documentation in doc/README.update for more details.

autoload - if set to "no" (any string beginning with 'n'), "bootp" will just load perform a lookup of the configuration from the BOOTP server, but not try to load any image using TFTP

autostart - if set to "yes", an image loaded using the "bootp", "rarpboot", "tftpboot" or "diskboot" commands will be automatically started (by internally calling "bootm")

If set to "no", a standalone image passed to the "bootm" command will be copied to the load address (and eventually uncompressed), but NOT be started. This can be used to load and uncompress arbitrary data.

fdt_high - if set this restricts the maximum address that the flattened device tree will be copied into upon boot. For example, if you have a system with 1 GB memory at physical address 0x10000000, while Linux kernel only recognizes the first 704 MB as low memory, you may need to set fdt_high as 0x3C000000 to have the device tree blob be copied to the maximum address of the 704 MB low memory, so that Linux kernel can access it during the boot procedure.

If this is set to the special value 0xFFFFFFFF then the fdt will not be copied at all on boot. For this to work it must reside in writable memory, have sufficient padding on the end of it for u-boot to add the information it needs into it, and the memory must be accessible by the kernel.

fdtcontroladdr- if set this is the address of the control flattened device tree used by U-Boot when CONFIG_OF_CONTROL is defined.

i2cfast - (PPC405GP|PPC405EP only)

if set to 'y' configures Linux I2C driver for fast mode (400kHz). This environment variable is used in initialization code. So, for changes to be effective it must be saved and board must be reset.

initrd_high - restrict positioning of initrd images:

If this variable is not set, initrd images will be copied to the highest possible address in RAM; this is usually what you want since it allows for maximum initrd size. If for some reason you want to make sure that the initrd image is loaded below the CONFIG_SYS_BOOTMAPSZ limit, you can set this environment variable to a value of "no" or "off" or "0". Alternatively, you can set it to a maximum upper address to use (U-Boot will still check that it does not overwrite the U-Boot stack and data).

For instance, when you have a system with 16 MB RAM, and want to reserve 4 MB from use by Linux, you can do this by adding "mem=12M" to the value of the "bootargs" variable. However, now you must make sure that the initrd image is placed in the first 12 MB as well - this can be done with

```
setenv initrd_high 00c00000
```

If you set initrd_high to 0xFFFFFFFF, this is an indication to U-Boot that all addresses are legal for the Linux kernel, including addresses in flash memory. In this case U-Boot will NOT COPY the ramdisk at all. This may be useful to reduce the boot time on your system, but requires that this feature is supported by your Linux kernel.

paddr - IP address; needed for tftpboot command
loadaddr - Default load address for commands like "bootp", "rarpboot", "tftpboot", "loadb" or "diskboot"
loads_echo - see CONFIG_LOADS_ECHO
serverip - TFTP server IP address; needed for tftpboot command
bootretry - see CONFIG_BOOT_RETRY_TIME
bootdelaykey - see CONFIG_AUTOBOOT_DELAY_STR
bootstopkey - see CONFIG_AUTOBOOT_STOP_STR
ethprime - controls which interface is used first.
ethact - controls which interface is currently active.
For example you can do the following
=> setenv ethact FEC
=> ping 192.168.0.1 # traffic sent on FEC
=> setenv ethact SCC
=> ping 10.0.0.1 # traffic sent on SCC
ethrotate - When set to "no" U-Boot does not go through all available network interfaces.
It just stays at the currently selected interface.
netretry - When set to "no" each network operation will either succeed or fail without retrying.
When set to "once" the network operation will fail when all the available network interfaces are tried once without success.
Useful on scripts which control the retry operation themselves.
npe_ucose - set load address for the NPE microcode
tftpserverport - If this is set, the value is used for TFTP's UDP source port.
tftpdstport - If this is set, the value is used for TFTP's UDP destination port instead of the Well Know Port 69.
tftpblocksize - Block size to use for TFTP transfers; if not set, we use the TFTP server's default block size
tftptimeout - Retransmission timeout for TFTP packets (in milliseconds, minimum value is 1000 = 1 second). Defines when a packet is considered to be lost so it has to be retransmitted. The default is 5000 = 5 seconds. Lowering this value may make downloads succeed faster in networks with high packet loss rates or with unreliable TFTP servers.
vlan - When set to a value < 4095 the traffic over Ethernet is encapsulated/received over 802.1q VLAN tagged frames.

The following image location variables contain the location of images used in booting. The "Image" column gives the role of the image and is not an environment variable name. The other columns are environment variable names. "File Name" gives the name of the file on a TFTP server, "RAM Address" gives the location in RAM the image will be loaded to, and "Flash Location" gives the image's address in NOR

flash or offset in NAND flash.

Note - these variables don't have to be defined for all boards, some boards currently use other variables for these purposes, and some boards use these variables for other purposes.

| Image | File Name | RAM Address | Flash Location |
|------------------|-------------|----------------|----------------|
| u-boot | u-boot | u-boot_addr_r | u-boot_addr |
| Linux kernel | bootfile | kernel_addr_r | kernel_addr |
| device tree blob | fdtfile | fdt_addr_r | fdt_addr |
| ramdisk | ramdiskfile | ramdisk_addr_r | ramdisk_addr |

The following environment variables may be used and automatically updated by the network boot commands ("bootp" and "rarpboot"), depending the information provided by your boot server:

- bootfile - see above
- dnsip - IP address of your Domain Name Server
- dnsip2 - IP address of your secondary Domain Name Server
- gatewayip - IP address of the Gateway (Router) to use
- hostname - Target hostname
- ipaddr - see above
- netmask - Subnet Mask
- rootpath - Pathname of the root filesystem on the NFS server
- serverip - see above

There are two special Environment Variables:

- serial# - contains hardware identification information such as type string and/or serial number
- ethaddr - Ethernet address

These variables can be set only once (usually during manufacturing of the board). U-Boot refuses to delete or overwrite these variables once they have been set once.

Further special Environment Variables:

- ver - Contains the U-Boot version string as printed with the "version" command. This variable is readonly (see CONFIG_VERSION_VARIABLE).

Please note that changes to some configuration parameters may take only effect after the next boot (yes, that's just like Windoze :-).

Callback functions for environment variables:

For some environment variables, the behavior of u-boot needs to change when their values are changed. This functionality allows functions to be associated with arbitrary variables. On creation, overwrite, or deletion, the callback will provide the opportunity for some side effect to happen or for the change to be rejected.

The callbacks are named and associated with a function using the U_BOOT_ENV_CALLBACK macro in your board or driver code.

These callbacks are associated with variables in one of two ways. The static list can be added to by defining CONFIG_ENV_CALLBACK_LIST_STATIC in the board configuration to a string that defines a list of associations. The list must be in the following format:

```
entry = variable_name[:callback_name]
list = entry[, list]
```

If the callback name is not specified, then the callback is deleted. Spaces are also allowed anywhere in the list.

Callbacks can also be associated by defining the ".callbacks" variable with the same list format above. Any association in ".callbacks" will override any association in the static list. You can define CONFIG_ENV_CALLBACK_LIST_DEFAULT to a list (string) to define the ".callbacks" environment variable in the default or embedded environment.

Command Line Parsing:

There are two different command line parsers available with U-Boot:

the old "simple" one, and the much more powerful "hush" shell:

Old, simple command line parser:

- supports environment variables (through setenv / saveenv commands)
- several commands on one line, separated by ';'.
- variable substitution using "... \${name} ..." syntax
- special characters ('\$', ';') can be escaped by prefixing with '\', for example:
setenv bootcmd bootm \${address}
- You can also escape text by enclosing in single apostrophes, for example:
setenv addip 'setenv bootargs \$bootargs ip=\${ipaddr}:\${serverip}:\${gatewayip}:\${netmask}:\${hostname}::off'

Hush shell:

- similar to Bourne shell, with control structures like
if...then...else...fi, for...do...done; while...do...done,
until...do...done, ...
- supports environment ("global") variables (through setenv / saveenv commands) and local shell variables (through standard shell syntax "name=value"); only environment variables can be used with "run" command

General rules:

- (1) If a command line (or an environment variable executed by a "run" command) contains several commands separated by semicolon, and one of these commands fails, then the remaining commands will be executed anyway.
- (2) If you execute several variables with one call to run (i. e. calling run with a list of variables as arguments), any failing command will cause "run" to terminate, i. e. the remaining variables are not executed.

Note for Redundant Ethernet Interfaces:

Some boards come with redundant Ethernet interfaces; U-Boot supports such configurations and is capable of automatic selection of a "working" interface when needed. MAC assignment works as follows:

Network interfaces are numbered eth0, eth1, eth2, ... Corresponding MAC addresses can be stored in the environment as "ethaddr" (=>eth0), "eth1addr" (=>eth1), "eth2addr", ...

If the network interface stores some valid MAC address (for instance in SRAM), this is used as default address if there is NO corresponding setting in the environment; if the corresponding environment variable is set, this overrides the settings in the card; that means:

- o If the SRAM has a valid MAC address, and there is no address in the environment, the SRAM's address is used.
- o If there is no valid address in the SRAM, and a definition in the environment exists, then the value from the environment variable is used.
- o If both the SRAM and the environment contain a MAC address, and both addresses are the same, this MAC address is used.
- o If both the SRAM and the environment contain a MAC address, and the addresses differ, the value from the environment is used and a warning is printed.
- o If neither SRAM nor the environment contain a MAC address, an error is raised.

If Ethernet drivers implement the 'write_hwaddr' function, valid MAC addresses will be programmed into hardware as part of the initialization process. This may be skipped by setting the appropriate 'ethmacskip' environment variable. The naming convention is as follows:
"ethmacskip" (=>eth0), "eth1macskip" (=>eth1) etc.

Image Formats:

U-Boot is capable of booting (and performing other auxiliary operations on) images in two formats:

New uImage format (FIT)

Flexible and powerful format based on Flattened Image Tree -- FIT (similar to Flattened Device Tree). It allows the use of images with multiple components (several kernels, ramdisks, etc.), with contents protected by SHA1, MD5 or CRC32. More details are found in the doc/uImage.FIT directory.

Old uImage format

Old image format is based on binary files which can be basically anything, preceded by a special header; see the definitions in include/image.h for details; basically, the header defines the following image properties:

- * Target Operating System (Provisions for OpenBSD, NetBSD, FreeBSD, 4.4BSD, Linux, SVR4, Esix, Solaris, Irix, SCO, Dell, NCR, VxWorks, LynxOS, pSOS, QNX, RTEMS, INTEGRITY;
Currently supported: Linux, NetBSD, VxWorks, QNX, RTEMS, LynxOS, INTEGRITY).
- * Target CPU Architecture (Provisions for Alpha, ARM, AVR32, Intel x86, IA64, MIPS, NDS32, Nios II, PowerPC, IBM S390, SuperH, Sparc, Sparc 64 Bit;
Currently supported: ARM, AVR32, Intel x86, MIPS, NDS32, Nios II, PowerPC).
- * Compression Type (uncompressed, gzip, bzip2)
- * Load Address
- * Entry Point
- * Image Name
- * Image Timestamp

The header is marked by a special Magic Number, and both the header and the data portions of the image are secured against corruption by CRC32 checksums.

Linux Support:

=====

Although U-Boot should support any OS or standalone application easily, the main focus has always been on Linux during the design of U-Boot.

U-Boot includes many features that so far have been part of some special "boot loader" code within the Linux kernel. Also, any "initrd" images to be used are no longer part of one big Linux image; instead, kernel and "initrd" are separate images. This implementation serves several purposes:

- the same features can be used for other OS or standalone applications (for instance: using compressed images to reduce the Flash memory footprint)
- it becomes much easier to port new Linux kernel versions because lots of low-level, hardware dependent stuff are done by U-Boot
- the same Linux kernel image can now be used with different "initrd" images; of course this also means that different kernel images can be run with the same "initrd". This makes testing easier (you don't have to build a new "zImage.initrd" Linux image when you just change a file in your "initrd"). Also, a field-upgrade of the software is easier now.

Linux HOWTO:

=====

Porting Linux to U-Boot based systems:

U-Boot cannot save you from doing all the necessary modifications to configure the Linux device drivers for use with your target hardware (no, we don't intend to provide a full virtual machine interface to Linux :-).

But now you can ignore ALL boot loader code (in arch/powerpc/mbxboot).

Just make sure your machine specific header file (for instance include/asm-ppc/tqm8xx.h) includes the same definition of the Board Information structure as we define in include/asm-
<arch>/u-boot.h, and make sure that your definition of IMAP_ADDR uses the same value as your U-Boot configuration in CONFIG_SYS_IMMR.

Configuring the Linux kernel:

No specific requirements for U-Boot. Make sure you have some root device (initial ramdisk, NFS) for your target system.

Building a Linux Image:

With U-Boot, "normal" build targets like "zImage" or "bzImage" are not used. If you use recent kernel source, a new build target "uImage" will exist which automatically builds an image usable by U-Boot. Most older kernels also have support for a "pImage" target, which was introduced for our predecessor project PPCBoot and uses a 100% compatible format.

Example:

```
make TQM850L_config
make oldconfig
make dep
make uImage
```

The "uImage" build target uses a special tool (in 'tools/mkimage') to encapsulate a compressed Linux kernel image with header information, CRC32 checksum etc. for use with U-Boot. This is what we are doing:

* build a standard "vmlinux" kernel image (in ELF binary format):

* convert the kernel into a raw binary image:

```
${CROSS_COMPILE}-objcopy -O binary ¥
-R .note -R .comment ¥
-S vmlinux linux.bin
```

* compress the binary image:

```
gzip -9 linux.bin
```

* package compressed binary image for U-Boot:

```
mkimage -A ppc -O linux -T kernel -C gzip ¥
-a 0 -e 0 -n "Linux Kernel Image" ¥
-d linux.bin.gz uImage
```

The "mkimage" tool can also be used to create ramdisk images for use with U-Boot, either separated from the Linux kernel image, or combined into one file. "mkimage" encapsulates the images with a 64 byte header containing information about target architecture, operating system, image type, compression method, entry points, time stamp, CRC32 checksums, etc.

"mkimage" can be called in two ways: to verify existing images and print the header information, or to build new images.

In the first form (with "-l" option) mkimage lists the information contained in the header of an existing U-Boot image; this includes checksum verification:

```
tools/mkimage -l image
-l ==> list image header information
```

The second form (with "-d" option) is used to build a U-Boot image from a "data file" which is used as image payload:

```
tools/mkimage -A arch -O os -T type -C comp -a addr -e ep ¥
-n name -d data_file image
-A ==> set architecture to 'arch'
-O ==> set operating system to 'os'
-T ==> set image type to 'type'
-C ==> set compression type 'comp'
-a ==> set load address to 'addr' (hex)
-e ==> set entry point to 'ep' (hex)
-n ==> set image name to 'name'
-d ==> use image data from 'datafile'
```

Right now, all Linux kernels for PowerPC systems use the same load address (0x00000000), but the entry point address depends on the kernel version:

- 2.2.x kernels have the entry point at 0x0000000C,
- 2.3.x and later kernels have the entry point at 0x00000000.

So a typical call to build a U-Boot image would read:

```

-> tools/mkimage -n '2.4.4 kernel for TQM850L' ¥
> -A ppc -O linux -T kernel -C gzip -a 0 -e 0 ¥
> -d /opt/elsk/ppc_8xx/usr/src/linux-2.4.4/arch/powerpc/coffboot/vmlinux.gz ¥
> examples/uImage.TQM850L
Image Name: 2.4.4 kernel for TQM850L
Created: Wed Jul 19 02:34:59 2000
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 335725 Bytes = 327.86 kB = 0.32 MB
Load Address: 0x00000000
Entry Point: 0x00000000

```

To verify the contents of the image (or check for corruption):

```

-> tools/mkimage -l examples/uImage.TQM850L
Image Name: 2.4.4 kernel for TQM850L
Created: Wed Jul 19 02:34:59 2000
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 335725 Bytes = 327.86 kB = 0.32 MB
Load Address: 0x00000000
Entry Point: 0x00000000

```

NOTE: for embedded systems where boot time is critical you can trade speed for memory and install an UNCOMPRESSED image instead: this needs more space in Flash, but boots much faster since it does not need to be uncompressed:

```

-> gunzip /opt/elsk/ppc_8xx/usr/src/linux-2.4.4/arch/powerpc/coffboot/vmlinux.gz
-> tools/mkimage -n '2.4.4 kernel for TQM850L' ¥
> -A ppc -O linux -T kernel -C none -a 0 -e 0 ¥
> -d /opt/elsk/ppc_8xx/usr/src/linux-2.4.4/arch/powerpc/coffboot/vmlinux ¥
> examples/uImage.TQM850L-uncompressed
Image Name: 2.4.4 kernel for TQM850L
Created: Wed Jul 19 02:34:59 2000
Image Type: PowerPC Linux Kernel Image (uncompressed)
Data Size: 792160 Bytes = 773.59 kB = 0.76 MB
Load Address: 0x00000000
Entry Point: 0x00000000

```

Similar you can build U-Boot images from a 'ramdisk.image.gz' file when your kernel is intended to use an initial ramdisk:

```

-> tools/mkimage -n 'Simple Ramdisk Image' ¥
> -A ppc -O linux -T ramdisk -C gzip ¥
> -d /LinuxPPC/images/SIMPLE-ramdisk.image.gz examples/simple-initrd
Image Name: Simple Ramdisk Image
Created: Wed Jan 12 14:01:50 2000
Image Type: PowerPC Linux RAMDisk Image (gzip compressed)
Data Size: 566530 Bytes = 553.25 kB = 0.54 MB
Load Address: 0x00000000
Entry Point: 0x00000000

```

Installing a Linux Image:

To downloading a U-Boot image over the serial (console) interface, you must convert the image to S-Record format:

```
objcopy -I binary -O srec examples/image examples/image.srec
```

The 'objcopy' does not understand the information in the U-Boot image header, so the resulting S-Record file will be relative to address 0x00000000. To load it to a given address, you need to specify the target address as 'offset' parameter with the 'loads' command.

Example: install the image to address 0x40100000 (which on the TQM8xxL is in the first Flash bank):

```

=> erase 40100000 401FFFFFF

..... done
Erased 8 sectors

=> loads 40100000
## Ready for S-Record download ...
^examples/image.srec
1 2 3 4 5 6 7 8 9 10 11 12 13 ...
...
15989 15990 15991 15992
[file transfer complete]
[connected]

```

```
## Start Addr = 0x00000000
```

You can check the success of the download using the 'iminfo' command;
this includes a checksum verification so you can be sure no data
corruption happened:

```
=> imi 40100000
```

```
## Checking Image at 40100000 ...
Image Name: 2.2.13 for initrd on TQM850L
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 335725 Bytes = 327 kB = 0 MB
Load Address: 00000000
Entry Point: 0000000c
Verifying Checksum ... OK
```

Boot Linux:

The "bootm" command is used to boot an application that is stored in
memory (RAM or Flash). In case of a Linux kernel image, the contents
of the "bootargs" environment variable is passed to the kernel as
parameters. You can check and modify this variable using the
"printenv" and "setenv" commands:

```
=> printenv bootargs
bootargs=root=/dev/ram
```

```
=> setenv bootargs root=/dev/nfs rw nfsroot=10.0.0.2:/LinuxPPC nfsaddrs=10.0.0.99:10.0.0.2
```

```
=> printenv bootargs
bootargs=root=/dev/nfs rw nfsroot=10.0.0.2:/LinuxPPC nfsaddrs=10.0.0.99:10.0.0.2
```

```
=> bootm 40020000
## Booting Linux kernel at 40020000 ...
Image Name: 2.2.13 for NFS on TQM850L
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 381681 Bytes = 372 kB = 0 MB
Load Address: 00000000
Entry Point: 0000000c
Verifying Checksum ... OK
Uncompressing Kernel Image ... OK
Linux version 2.2.13 (wd@denx.local.net) (gcc version 2.95.2 19991024 (release)) #1 Wed Jul 19 02:35:17 MEST 2000
Boot arguments: root=/dev/nfs rw nfsroot=10.0.0.2:/LinuxPPC nfsaddrs=10.0.0.99:10.0.0.2
time_init: decremter frequency = 187500000/60
Calibrating delay loop... 49.77 BogoMIPS
Memory: 15208k available (700k kernel code, 444k data, 32k init) [c0000000,c1000000]
...
```

If you want to boot a Linux kernel with initial RAM disk, you pass
the memory addresses of both the kernel and the initrd image (PPBCOOT
format!) to the "bootm" command:

```
=> imi 40100000 40200000
```

```
## Checking Image at 40100000 ...
Image Name: 2.2.13 for initrd on TQM850L
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 335725 Bytes = 327 kB = 0 MB
Load Address: 00000000
Entry Point: 0000000c
Verifying Checksum ... OK
```

```
## Checking Image at 40200000 ...
Image Name: Simple Ramdisk Image
Image Type: PowerPC Linux RAMDisk Image (gzip compressed)
Data Size: 566530 Bytes = 553 kB = 0 MB
Load Address: 00000000
Entry Point: 00000000
Verifying Checksum ... OK
```

```
=> bootm 40100000 40200000
```

```
## Booting Linux kernel at 40100000 ...
Image Name: 2.2.13 for initrd on TQM850L
Image Type: PowerPC Linux Kernel Image (gzip compressed)
Data Size: 335725 Bytes = 327 kB = 0 MB
Load Address: 00000000
Entry Point: 0000000c
Verifying Checksum ... OK
Uncompressing Kernel Image ... OK
## Loading RAMDisk Image at 40200000 ...
```



```

Image Name:   Simple Ramdisk Image
Image Type:   PowerPC Linux RAMDisk Image (gzip compressed)
Data Size:    566530 Bytes = 553 kB = 0 MB
Load Address: 00000000
Entry Point:  00000000
Verifying Checksum ... OK
Loading Ramdisk ... OK
Linux version 2.2.13 (wd@denx.local.net) (gcc version 2.95.2 19991024 (release)) #1 Wed Jul 19 02:32:08 MEST 2000
Boot arguments: root=/dev/ram
time_init: decremter frequency = 18750000/60
Calibrating delay loop... 49.77 BogoMIPS
...
RAMDISK: Compressed image found at block 0
VFS: Mounted root (ext2 filesystem).

```

```
bash#
```

Boot Linux and pass a flat device tree:

First, U-Boot must be compiled with the appropriate defines. See the section titled "Linux Kernel Interface" above for a more in depth explanation. The following is an example of how to start a kernel and pass an updated flat device tree:

```

=> print oftaddr
oftaddr=0x300000
=> print oft
oft=oftrees/mpc8540ads.dtb
=> tftp $oftaddr $oft
Speed: 1000, full duplex
Using TSEC0 device
TFTP from server 192.168.1.1; our IP address is 192.168.1.101
Filename 'oftrees/mpc8540ads.dtb'.
Load address: 0x300000
Loading: #
done
Bytes transferred = 4106 (100a hex)
=> tftp $loadaddr $bootfile
Speed: 1000, full duplex
Using TSEC0 device
TFTP from server 192.168.1.1; our IP address is 192.168.1.2
Filename 'uImage'.
Load address: 0x200000
Loading:#####
done
Bytes transferred = 1029407 (fb51f hex)
=> print loadaddr
loadaddr=200000
=> print oftaddr
oftaddr=0x300000
=> bootm $loadaddr - $oftaddr
## Booting image at 00200000 ...
Image Name:   Linux-2.6.17-dirty
Image Type:   PowerPC Linux Kernel Image (gzip compressed)
Data Size:    1029343 Bytes = 1005.2 kB
Load Address: 00000000
Entry Point:  00000000
Verifying Checksum ... OK
Uncompressing Kernel Image ... OK
Booting using flat device tree at 0x300000
Using MPC85xx ADS machine description
Memory CAM mapping: CAM0=256Mb, CAM1=256Mb, CAM2=0Mb residual: 0Mb
[snip]

```

More About U-Boot Image Types:

U-Boot supports the following image types:

"Standalone Programs" are directly runnable in the environment provided by U-Boot; it is expected that (if they behave well) you can continue to work in U-Boot after return from the Standalone Program.

"OS Kernel Images" are usually images of some Embedded OS which will take over control completely. Usually these programs will install their own set of exception handlers, device drivers, set up the MMU, etc. - this means, that you cannot expect to re-enter U-Boot except by resetting the CPU.

"RAMDisk Images" are more or less just data blocks, and their parameters (address, size) are passed to an OS kernel that is being started.

"Multi-File Images" contain several images, typically an OS

(Linux) kernel image and one or more data images like RAMDisks. This construct is useful for instance when you want to boot over the network using BOOTP etc., where the boot server provides just a single image file, but you want to get for instance an OS kernel and a RAMDisk image.

"Multi-File Images" start with a list of image sizes, each image size (in bytes) specified by an "uint32_t" in network byte order. This list is terminated by an "(uint32_t)0". Immediately after the terminating 0 follow the images, one by one, all aligned on "uint32_t" boundaries (size rounded up to a multiple of 4 bytes).

"Firmware Images" are binary images containing firmware (like U-Boot or FPGA images) which usually will be programmed to flash memory.

"Script files" are command sequences that will be executed by U-Boot's command interpreter; this feature is especially useful when you configure U-Boot to use a real shell (hush) as command interpreter.

Booting the Linux zImage:

On some platforms, it's possible to boot Linux zImage. This is done using the "bootz" command. The syntax of "bootz" command is the same as the syntax of "bootm" command.

Note, defining the CONFIG_SUPPORT_INITRD_RAW allows user to supply kernel with raw initrd images. The syntax is slightly different, the address of the initrd must be augmented by it's size, in the following format: "<initrd addr>:<initrd size>".

Standalone HOWTO:

One of the features of U-Boot is that you can dynamically load and run "standalone" applications, which can use some resources of U-Boot like console I/O functions or interrupt services.

Two simple examples are included with the sources:

"Hello World" Demo:

'examples/hello_world.c' contains a small "Hello World" Demo application; it is automatically compiled when you build U-Boot. It's configured to run at address 0x00040004, so you can play with it like that:

```
=> loads
## Ready for S-Record download ...
^examples/hello_world.srec
1 2 3 4 5 6 7 8 9 10 11 ...
[file transfer complete]
[connected]
## Start Addr = 0x00040004

=> go 40004 Hello World! This is a test.
## Starting application at 0x00040004 ...
Hello World
argc = 7
argv[0] = "40004"
argv[1] = "Hello"
argv[2] = "World!"
argv[3] = "This"
argv[4] = "is"
argv[5] = "a"
argv[6] = "test."
argv[7] = "<NULL>"
Hit any key to exit ...

## Application terminated, rc = 0x0
```

Another example, which demonstrates how to register a CPM interrupt handler with the U-Boot code, can be found in 'examples/timer.c'. Here, a CPM timer is set up to generate an interrupt every second. The interrupt service routine is trivial, just printing a '.' character, but this is just a demo program. The application can be controlled by the following keys:

? - print current values of the CPM Timer registers

```

b - enable interrupts and start timer
e - stop timer and disable interrupts
q - quit application

=> loads
## Ready for S-Record download ...
~>examples/timer.srec
1 2 3 4 5 6 7 8 9 10 11 ...
[file transfer complete]
[connected]
## Start Addr = 0x00040004

=> go 40004
## Starting application at 0x00040004 ...
TIMERS=0xffff00980
Using timer 1
    tgr @ 0xffff00980, tmr @ 0xffff00990, trr @ 0xffff00994, tcr @ 0xffff00998, tcn @ 0xffff0099c, ter @ 0xffff009b0

```

```

Hit 'b':
    [q, b, e, ?] Set interval 1000000 us
    Enabling timer
Hit '?':
    [q, b, e, ?] .....
    tgr=0x1, tmr=0xff1c, trr=0x3d09, tcr=0x0, tcn=0xef6, ter=0x0
Hit '?':
    [q, b, e, ?] .
    tgr=0x1, tmr=0xff1c, trr=0x3d09, tcr=0x0, tcn=0x2ad4, ter=0x0
Hit '?':
    [q, b, e, ?] .
    tgr=0x1, tmr=0xff1c, trr=0x3d09, tcr=0x0, tcn=0x1efc, ter=0x0
Hit '?':
    [q, b, e, ?] .
    tgr=0x1, tmr=0xff1c, trr=0x3d09, tcr=0x0, tcn=0x169d, ter=0x0
Hit 'e':
    [q, b, e, ?] ...Stopping timer
Hit 'q':
    [q, b, e, ?] ## Application terminated, rc = 0x0

```

Minicom warning:

```
=====
```

Over time, many people have reported problems when trying to use the "minicom" terminal emulation program for serial download. I (wd) consider minicom to be broken, and recommend not to use it. Under Unix, I recommend to use C-Kermit for general purpose use (and especially for kermit binary protocol download ("loadb" command), and use "cu" for S-Record download ("loads" command). See http://www.denx.de/wiki/view/DULG/SystemSetup#Section_4.3. for help with kermit.

Nevertheless, if you absolutely want to use it try adding this configuration to your "File transfer protocols" section:

| | Name | Program | Name | U/D | FullScr | IO-Red. | Multi | | |
|---|--------|-----------------------------|------|-----|---------|---------|-------|--|--|
| X | kermit | /usr/bin/kermit -i -l %l -s | Y | U | Y | N | N | | |
| Y | kermit | /usr/bin/kermit -i -l %l -r | N | D | Y | N | N | | |

NetBSD Notes:

```
=====
```

Starting at version 0.9.2, U-Boot supports NetBSD both as host (build U-Boot) and target system (boots NetBSD/mpc8xx).

Building requires a cross environment: it is known to work on NetBSD/i386 with the cross-powerpc-netbsd-1.3 package (you will also need gmake since the Makefiles are not compatible with BSD make). Note that the cross-powerpc package does not install include files; attempting to build U-Boot will fail because <machine/ansi.h> is missing. This file has to be installed and patched manually:

```

# cd /usr/pkg/cross/powerpc-netbsd/include
# mkdir powerpc
# ln -s powerpc machine
# cp /usr/src/sys/arch/powerpc/include/ansi.h powerpc/ansi.h
# ${EDIT} powerpc/ansi.h ## must remove __va_list, _BSD_VA_LIST

```

Native builds *don't* work due to incompatibilities between native and U-Boot include files.

Bootimg assumes that (the first part of) the image booted is a stage-2 loader which in turn loads and then invokes the kernel

proper. Loader sources will eventually appear in the NetBSD source tree (probably in sys/arc/mpc8xx/stand/u-boot_stage2/); in the meantime, see ftp://ftp.denx.de/pub/u-boot/ppcboot_stage2.tar.gz

Implementation Internals:

The following is not intended to be a complete description of every implementation detail. However, it should help to understand the inner workings of U-Boot and make it easier to port it to custom hardware.

Initial Stack, Global Data:

The implementation of U-Boot is complicated by the fact that U-Boot starts running out of ROM (flash memory), usually without access to system RAM (because the memory controller is not initialized yet). This means that we don't have writable Data or BSS segments, and BSS is not initialized as zero. To be able to get a C environment working at all, we have to allocate at least a minimal stack. Implementation options for this are defined and restricted by the CPU used: Some CPU models provide on-chip memory (like the IMMR area on MPC8xx and MPC826x processors), on others (parts of) the data cache can be locked as (mis-) used as memory, etc.

Chris Hallinan posted a good summary of these issues to the U-Boot mailing list:

Subject: RE: [U-Boot-Users] RE: More On Memory Bank x (nothingness)?
From: "Chris Hallinan" <clh@net1plus.com>
Date: Mon, 10 Feb 2003 16:43:46 -0500 (22:43 MET)
...

Correct me if I'm wrong, folks, but the way I understand it is this: Using DCACHE as initial RAM for Stack, etc, does not require any physical RAM backing up the cache. The cleverness is that the cache is being used as a temporary supply of necessary storage before the SDRAM controller is setup. It's beyond the scope of this list to explain the details, but you can see how this works by studying the cache architecture and operation in the architecture and processor-specific manuals.

OCM is On Chip Memory, which I believe the 405GP has 4K. It is another option for the system designer to use as an initial stack/RAM area prior to SDRAM being available. Either option should work for you. Using CS 4 should be fine if your board designers haven't used it for something that would cause you grief during the initial boot! It is frequently not used.

CONFIG_SYS_INIT_RAM_ADDR should be somewhere that won't interfere with your processor/board/system design. The default value you will find in any recent u-boot distribution in walnut.h should work for you. I'd set it to a value larger than your SDRAM module. If you have a 64MB SDRAM module, set it above 400_0000. Just make sure your board has no resources that are supposed to respond to that address! That code in start.S has been around a while and should work as is when you get the config right.

-Chris Hallinan
DS4.COM, Inc.

It is essential to remember this, since it has some impact on the C code for the initialization procedures:

- * Initialized global data (data segment) is read-only. Do not attempt to write it.
- * Do not use any uninitialized global data (or implicitly initialized as zero data - BSS segment) at all - this is undefined, initialization is performed later (when relocating to RAM).
- * Stack space is very limited. Avoid big data buffers or things like that.

Having only the stack as writable memory limits means we cannot use normal global data to share information between the code. But it turned out that the implementation of U-Boot can be greatly simplified by making a global data structure (gd_t) available to all functions. We could pass a pointer to this data as argument to _all_

functions, but this would bloat the code. Instead we use a feature of the GCC compiler (Global Register Variables) to share the data: we place a pointer (gd) to the global data into a register which we reserve for this purpose.

When choosing a register for such a purpose we are restricted by the relevant (E)ABI specifications for the current architecture, and by GCC's implementation.

For PowerPC, the following registers have specific use:

- R1: stack pointer
- R2: reserved for system use
- R3-R4: parameter passing and return values
- R5-R10: parameter passing
- R13: small data area pointer
- R30: GOT pointer
- R31: frame pointer

(U-Boot also uses R12 as internal GOT pointer. r12 is a volatile register so r12 needs to be reset when going back and forth between asm and C)

=> U-Boot will use R2 to hold a pointer to the global data

Note: on PPC, we could use a static initializer (since the address of the global data structure is known at compile time), but it turned out that reserving a register results in somewhat smaller code - although the code savings are not that big (on average for all boards 752 bytes for the whole U-Boot image, 624 text + 127 data).

On Blackfin, the normal C ABI (except for P3) is followed as documented here:
http://docs.blackfin.uclinux.org/doku.php?id=application_binary_interface

=> U-Boot will use P3 to hold a pointer to the global data

On ARM, the following registers are used:

- R0: function argument word/integer result
- R1-R3: function argument word
- R9: GOT pointer
- R10: stack limit (used only if stack checking is enabled)
- R11: argument (frame) pointer
- R12: temporary workspace
- R13: stack pointer
- R14: link register
- R15: program counter

=> U-Boot will use R8 to hold a pointer to the global data

On Nios II, the ABI is documented here:
http://www.altera.com/literature/hb/nios2/n2cpu_nii51016.pdf

=> U-Boot will use gp to hold a pointer to the global data

Note: on Nios II, we give "-G0" option to gcc and don't use gp to access small data sections, so gp is free.

On NDS32, the following registers are used:

- R0-R1: argument/return
- R2-R5: argument
- R15: temporary register for assembler
- R16: trampoline register
- R28: frame pointer (FP)
- R29: global pointer (GP)
- R30: link register (LP)
- R31: stack pointer (SP)
- PC: program counter (PC)

=> U-Boot will use R10 to hold a pointer to the global data

NOTE: DECLARE_GLOBAL_DATA_PTR must be used with file-global scope, or current versions of GCC may "optimize" the code too much.

Memory Management:

U-Boot runs in system state and uses physical addresses, i.e. the MMU is not used either for address mapping nor for memory protection.

The available memory is mapped to fixed addresses using the memory controller. In this process, a contiguous block is formed for each memory type (Flash, SDRAM, SRAM), even when it consists of several

physical memory banks.

U-Boot is installed in the first 128 kB of the first Flash bank (on TQM8xxL modules this is the range 0x40000000 ... 0x4001FFFF). After booting and sizing and initializing DRAM, the code relocates itself to the upper end of DRAM. Immediately below the U-Boot code some memory is reserved for use by malloc() [see CONFIG_SYS_MALLOC_LEN configuration setting]. Below that, a structure with global Board Info data is placed, followed by the stack (growing downward).

Additionally, some exception handler code is copied to the low 8 kB of DRAM (0x00000000 ... 0x00001FFF).

So a typical memory configuration with 16 MB of DRAM could look like this:

```
0x0000 0000 Exception Vector code
:
0x0000 1FFF
0x0000 2000 Free for Application Use
:
:
:
:
0x00FB FF20 Monitor Stack (Growing downward)
0x00FB FFAC Board Info Data and permanent copy of global data
0x00FC 0000 Malloc Arena
:
0x00FD FFFF
0x00FE 0000 RAM Copy of Monitor Code
... eventually: LCD or video framebuffer
... eventually: pRAM (Protected RAM - unchanged by reset)
0x00FF FFFF [End of RAM]
```

System Initialization:

In the reset configuration, U-Boot starts at the reset entry point (on most PowerPC systems at address 0x00000100). Because of the reset configuration for CS0# this is a mirror of the onboard Flash memory. To be able to re-map memory U-Boot then jumps to its link address. To be able to implement the initialization code in C, a (small!) initial stack is set up in the internal Dual Ported RAM (in case CPUs which provide such a feature like MPC8xx or MPC8260), or in a locked part of the data cache. After that, U-Boot initializes the CPU core, the caches and the SIU.

Next, all (potentially) available memory banks are mapped using a preliminary mapping. For example, we put them on 512 MB boundaries (multiples of 0x20000000: SDRAM on 0x00000000 and 0x20000000, Flash on 0x40000000 and 0x60000000, SRAM on 0x80000000). Then UPM A is programmed for SDRAM access. Using the temporary configuration, a simple memory test is run that determines the size of the SDRAM banks.

When there is more than one SDRAM bank, and the banks are of different size, the largest is mapped first. For equal size, the first bank (CS2#) is mapped first. The first mapping is always for address 0x00000000, with any additional banks following immediately to create contiguous memory starting from 0.

Then, the monitor installs itself at the upper end of the SDRAM area and allocates memory for use by malloc() and for the global Board Info data; also, the exception vector code is copied to the low RAM pages, and the final stack is set up.

Only after this relocation will you have a "normal" C environment; until that you are restricted in several ways, mostly because you are running from ROM, and because the code will have to be relocated to a new address in RAM.

U-Boot Porting Guide:

[Based on messages by Jerry Van Baren in the U-Boot-Users mailing list, October 2002]

```
int main(int argc, char *argv[])
{
    sighandler_t no_more_time;
```

```

signal(SIGALRM, no_more_time);
alarm(PROJECT_DEADLINE - toSec (3 * WEEK));

if (available_money > available_manpower) {
    Pay consultant to port U-Boot;
    return 0;
}

Download latest U-Boot source;

Subscribe to u-boot mailing list;

if (clueless)
    email("Hi, I am new to U-Boot, how do I get started?");

while (learning) {
    Read the README file in the top level directory;
    Read http://www.denx.de/twiki/bin/view/DULG/Manual;
    Read applicable doc/*.README;
    Read the source, Luke;
    /* find . -name "*.chS" | xargs grep -i <keyword> */
}

if (available_money > toLocalCurrency ($2500))
    Buy a BDI3000;
else
    Add a lot of aggravation and time;

if (a similar board exists) { /* hopefully... */
    cp -a board/<similar> board/<myboard>
    cp include/configs/<similar>.h include/configs/<myboard>.h
} else {
    Create your own board support subdirectory;
    Create your own board include/configs/<myboard>.h file;
}

Edit new board/<myboard> files
Edit new include/configs/<myboard>.h

while (!accepted) {
    while (!running) {
        do {
            Add / modify source code;
        } until (compiles);
        Debug;
        if (clueless)
            email("Hi, I am having problems...");
    }
    Send patch file to the U-Boot email list;
    if (reasonable critiques)
        Incorporate improvements from email list code review;
    else
        Defend code as written;
}

return 0;
}

void no_more_time (int sig)
{
    hire_a_guru();
}

```

Coding Standards:

All contributions to U-Boot should conform to the Linux kernel coding style; see the file "Documentation/CodingStyle" and the script "scripts/Lindent" in your Linux kernel source directory.

Source files originating from a different project (for example the MTD subsystem) are generally exempt from these guidelines and are not reformatated to ease subsequent migration to newer versions of those sources.

Please note that U-Boot is implemented in C (and to some small parts in Assembler); no C++ is used, so please do not use C++ style comments (//) in your code.

Please also stick to the following formatting rules:

- remove any trailing white space
- use TAB characters for indentation and vertical alignment, not spaces
- make sure NOT to use DOS '¥r¥n' line feeds

- do not add more than 2 consecutive empty lines to source files
- do not add trailing empty lines to source files

Submissions which do not conform to the standards may be returned with a request to reformat the changes.

Submitting Patches:

Since the number of patches for U-Boot is growing, we need to establish some rules. Submissions which do not conform to these rules may be rejected, even when they contain important and valuable stuff.

Please see <http://www.denx.de/wiki/U-Boot/Patches> for details.

Patches shall be sent to the u-boot mailing list <u-boot@lists.denx.de>; see <http://lists.denx.de/mailman/listinfo/u-boot>

When you send a patch, please include the following information with it:

- * For bug fixes: a description of the bug and how your patch fixes this bug. Please try to include a way of demonstrating that the patch actually fixes something.
- * For new features: a description of the feature and your implementation.
- * A CHANGELOG entry as plaintext (separate from the patch)
- * For major contributions, your entry to the CREDITS file
- * When you add support for a new board, don't forget to add this board to the MAINTAINERS file, too.
- * If your patch adds new configuration options, don't forget to document these in the README file.
- * The patch itself. If you are using git (which is *strongly* recommended) you can easily generate the patch using the "git format-patch". If you then use "git send-email" to send it to the U-Boot mailing list, you will avoid most of the common problems with some other mail clients.

If you cannot use git, use "diff -pN OLD NEW". If your version of diff does not support these options, then get the latest version of GNU diff.

The current directory when running this command shall be the parent directory of the U-Boot source tree (i. e. please make sure that your patch includes sufficient directory information for the affected files).

We prefer patches as plain text. MIME attachments are discouraged, and compressed attachments must not be used.

- * If one logical set of modifications affects or creates several files, all these changes shall be submitted in a SINGLE patch file.
- * Changesets that contain different, unrelated modifications shall be submitted as SEPARATE patches, one patch per changeset.

Notes:

- * Before sending the patch, run the MAKEALL script on your patched source tree and make sure that no errors or warnings are reported for any of the boards.
- * Keep your modifications to the necessary minimum: A patch containing several unrelated changes or arbitrary reformat will be returned with a request to re-formatting / split it.
- * If you modify existing code, make sure that your new code does not add to the memory footprint of the code ;-) Small is beautiful! When adding new features, these should compile conditionally only (using #ifdef), and the resulting code with the new feature disabled must not need more memory than the old code without your modification.
- * Remember that there is a size limit of 100 kB per message on the u-boot mailing list. Bigger patches will be moderated. If they are reasonable and not too big, they will be acknowledged. But patches

bigger than the size limit should be avoided.

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NOTE! This license does *not* cover the so-called “standalone” applications that use U-Boot services by means of the jump table provided by U-Boot exactly for this purpose — this is merely considered normal use of U-Boot, and does *not* fall under the heading of “derived work”.

The header files “include/image.h” and “include/asm-*/u-boot.h” define interfaces to U-Boot. Including these (unmodified) header files in another file is considered normal use of U-Boot, and does *not* fall under the heading of “derived work”.

Also note that the GPL below is copyrighted by the Free Software Foundation, but the instance of code that it refers to (the U-Boot source code) is copyrighted by me and others who actually wrote it.
— Wolfgang Denk

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26 ---- mtd-utils

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27 ---- trace-cmd

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Mathieu Desnoyers
June 2, 2011

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That's all there is to it!

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```
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```

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-- authors of glibc
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12345678@x.y.uk
Julian Hill (<news:36118128.5A14@virgin.net>,) reports that
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Test case by Yoshito Kawada <KAWADA@jp.ibm.com>.
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200009L. Patch by Markus Kuhn <Markus.Kuhn@cl.cam.ac.uk>.
Reported by Martin.v.Loewis@t-online.de [PR libc/2598].
Patch mostly by Martin von Gagern <Martin.vGagern@gmx.net>.
Matthew Fortune <Matthew.Fortune@imgtec.com>
Patch by Matthew Clarke <Matthew.Clarke@mindlink.bc.ca>.
Matthieu Crapet <Matthieu.Crapet@ingenico.com>
Moshe Olshansky <OLSHANSK@il.ibm.com>
% Tetsuji Oriata (Oriata@jp.ibm.com) and Others, 2000
Reported by P̄draig Brady <P@draigBrady.com>, diagnosed by
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Simos Xenitellis <S.Xenitellis@rhnc.ac.uk>, 1999, 2000, 2001.
Contributed by Jiro Sekiba <SEKIBA@jp.ibm.com>.
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33 ---- grep

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```
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% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
Brian Youmans          3diff@gnu.org
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From Paul.Green@stratus.com.
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&& $CVS -d $USER@cvs.sv.gnu.org:/webcvs/$pkg co $pkg )
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```
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#
```

```
# Contains hfsplus and ntfs code contributed by Heiko Wegeler <heiko.wegeler@googlemail.com>.
# Package sleuthkit version >=3.1.1 is required for HFS+. Package ntfs-3g and ntfsprogs is required for NTFS.
#
# Requires gawk, a really-recent hdparm, and various other programs.
# This needs to be redone entirely in C, for 64-bit math, someday.
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# along with this program; if not, write to the Free Software Foundation,
# Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
#
# Note for OCZ Vertex-LE users: the drive firmware will error when
# attempting to trim the final sector of the drive. To avoid this,
# partition the drive such that the final sector is not used.
```

```
-- authors of hdparm
bugfix for --security-erase-enhanced, courtesy of Cyril Guyot<hitachigst.com>
new -E "set cdrom speed" option (Matthias Oster <Matthias.Oster@eikon.tum.de>)
Courtesy of Andrzej Krzysztofowicz <ankry@green.mif.pg.gda.pl>:
# Contains hfsplus and ntfs code contributed by Heiko Wegeler <antiram@users.sourceforge.net>.
manpage / help-text cleanups from Benno Schulenberg <bensberg@justemail.net>
support for "-t" on "md" devices (from boris@xtalk.msk.su)
new -R and -U "(un)register hwif" options (Christian Lademann <cal@zls.de>)
Chris Caputo <ccaputo@alt.net>.
This package was debianized by Christopher L Cheney <ccheney@debian.org> on
fixed "hdparm -c" (broken in 2.6) (kudos to clive@epos.demon.co.uk)
fix display of drive capacity (Stephane Eranian <eranian@cello.hpl.hp.com>)
applied APM fixes from Gildas Bazin <gbazin@netcourrier.com>
I would welcome any feedback to <gernot@hillier.de>
Robert Hancock <hancockrwd@gmail.com>
fix minor -T/-t mixup in manpage -- hankedr@mail.auburn.edu
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Tested-by: Mark Lord <liml@rtr.ca>
Author: mlord@pobox.com (Mark Lord)
move cache timings to new -T option -- piercarl@sabi.demon.co.uk
courtesy of Sergei Kirjanov <rewlad@gmail.com>
Stephen Gran <sgran@debian.org> Wed, 10 Aug 2005 -0400
clean compile fixes from Steven Augart <steve@augart.com>
Copyright (c) 2004 Thomas Fritzsche <tf@noto.de>
A bit mangled in 2006 and 2008 by Thomas Orgis <thomas@orgis.org>
is courtesy of Tomi Leppikangas (tomilepp@paju.uulu.fi).
updated Makefile to use "destdir" prefix -- Ytiddo <ytiddo@dicksonstreet.com>
```

36 ---- htop

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```
<one line to give the program's name and a brief idea of what it does.>
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```

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(at your option) any later version.
```

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```
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This is free software, and you are welcome to redistribute it
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
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```
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 lk_fclose(&fp); // avoid zombies, jw@suse.de (#88501)
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 hypermap.m4 was contributed by shields@tembel.org (Michael Shields).
 Original from Simon Kaczor <shogun@step.polyml.ca>
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 Shawn K. Quinn <tt/skquinn@wt.net/> wrote:
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 *
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man/explicit_bzero.3
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man/funopen.3bsd
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man/queue.3bsd
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include/bsd/sys/endian.h
man/expand_number.3
man/closefrom.3
man/flopen.3
man/getpeereid.3
man/pidfile.3
src/expand_number.c
src/hash/sha512.h
src/hash/sha512c.c
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src/reallocf.c
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man/fparseln.3
src/fparseln.c

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include/bsd/readpassphrase.h
man/readpassphrase.3
man/strlcpy.3
man/strtonum.3
src/arc4random.c
src/arc4random_openbsd.h
src/arc4random_uniform.c
src/arc4random_unix.h
src/closefrom.c
src/getentropy_aix.c
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src/hash/md5.c

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Files:

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```
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44 ---- libcgroup

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From Gerald Hewes <hewes@openmarket.com>.
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```

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```

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```

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```
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Paul.Green@stratus.com.
Alexandre Duret-Lutz <adl@gnu.org>.
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Gordon Matzigkeit <gord@gnu.ai.mit.edu>, 1996
Gerald Hewes <hewes@openmarket.com>.
Joseph Beckenbach <jrb3@best.com> says some releases of gcc
Harald Welte <laforge@netfilter.org>
Originally written by Alexandre Oliva <oliva@dcc.unicamp.br>.
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```
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```

```
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```

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```

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```
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`Gnomovision' (which makes passes at compilers) written by James Hacker.
```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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50 ---- libnetfilter-queue

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```

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```

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<signature of Ty Coon>, 1 April 1989
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```
-- authors of libnetfilter-queue
Paul.Green@stratus.com.
Alexandre Duret-Lutz <adl@gnu.org>.
akee@wpdis03.wpafb.af.mil (Earle F. Ake) contributed MIS and NILE.
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Joseph Beckenbach <jrb3@best.com> says some releases of gcc
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Originally written by Alexandre Oliva <oliva@dcc.unicamp.br>.
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(2005/08/11) added parsing function (Eric Leblond <regit@inl.fr>)
dnl Copyright    2004 Scott James Remnant <scott@netsplit.com>.
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```

51 ---- libnfnetwork

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
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Mon. October 27, 2008. ken@netfunctional.ca. Summary for 1.0.0 libpcap release
Mon. September 10, 2007. ken@xelerance.com. Summary for 0.9.8 libpcap release
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 Monday October 23, 2001. mcr@sandelman.ottawa.on.ca. Summary for 0.7 release
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 Requested by Michele Marchetto <michele@openbsd.org> on behalf
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L. Peter Deutsch <ghost@aladdin.com> wrote the original ansi2knr and
Glenn Burkhardt <glenn@aol.ultranet.com>
Originally by Gordon Matzigkeit <gord@gnu.ai.mit.edu>, 1996
dnl Bruno Haible <haible@clisp.cons.org>, 2000-2006, 2008-2010.
Patch by Bruno Haible <haible@ilog.fr>.
Gerald Hewes <hewes@openmarket.com>.
Jackie Huang <jackie.huang@windriver.com>
Jeff Johnson <jbj@redhat.com>
Pinard <pinard@iro.umontreal.ca> and Jim Avera <jima@netcom.com>.
J.Otto Tennant <jot@cray.com> contributed the Cray support.
Samuel A. Falvo II <kc5tja@dolphin.openprojects.net> reports
Mark Hatle <mark.hatle@windriver.com>
originally written by Michael D. Black, mblack@csihq.com
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Jim Meyering (meyering@na-net.ornl.gov)
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Contributed by Noel Cragg (noel@cs.oberlin.edu), with fixes by
 Originally written by Alexandre Oliva <oliva@dcc.unicamp.br>.
 Philippe De Muyter <phdm@info.ucl.ac.be>
 Philippe De Muyter <phdm@macqel.be>
 Philip Cox <phil@yucc.yorku.ca>
 Pinard <pinard@iro.umontreal.ca> and Jim Avera <jima@netcom.com>.
 Matt Porter <porter+@osu.edu>: Modification for versions 0.10 und 0.11
 Keep this file name-space clean" means, talk to roland@gnu.ai.mit.edu
 Ross Burton <ross.burton@intel.com>
 seanf@swdc.stratus.com.
 echo "# Juan Manuel Guerrero <st001906@hrz1.hrz.tu-darmstadt.de>
 message to 'sv-request@li.org', having this message body:
 Wade Hampton (tasi029@tmn.com).
 <tgl@sss.pgh.pa.us>
 Win32 code written by Tor Lillqvist <tml@iki.fi>.
 get started, please write to 'translation@iro.umontreal.ca' to reach the
 Tom Tromey <tromey@cygnus.com>.
 Tom Tromey <tromey@redhat.com>
 Thanks to Stanislav Brabec <utx@k332.feld.cvut.cz>.
 To subscribe send a mail to <uwe-lrzzsz-subscribe@bulkmail.ohse.de>.
 There is a mailing list for lrzzsz: <uwe-lrzzsz@bulkmail.ohse.de>.
 finger uwe-tool-versions@tirka.ohse.de
 Maintainer: Uwe Ohse <uwe@ohse.de>
 Uwe Ohse <uwe@tirka.gun.de>
 Thanks to Nick Rossi <voyager@eskimo.com>.

55 ---- lsof

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```

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```

Bug Reports

-- authors of lsof
 q4 detection. Steve Bonds <3vhmxxm02@sneakemail.com>
 Corrected some problems Amir Katz <Amir_Katz@bmc.com>
 Brian L. Gentry <BGentry@nationsrent.com> of success
 <BRAUNBEC@de.ibm.com> and Tom Whitty <TWHITTY@cerner.com>.
 Bill Melvin <Bill.Melvin@esc.edu> that make it
 Brett Bartick <Brett.bartick@nomura.com> reported the problem
 Carl Lindberg <Carl_Lindberg@BLaCKSMITH.com>.
 This code was provided by Casper Dik <Casper.Dik@holland.sun.com>.
 still available from Casper Dik <Casper.Dik@oracle.com> and a
 dnode.c change and Casper Dik <Casper.Dik@sun.com>
 Roberts <Clint.Roberts@ttius.com>. I have no solution
 Craig Everhart <Craig_Everhart@transarc.com> helped
 Dewan Rashid <Dewan.Rashid@ir.com>.
 supplied by Dick Dunbar <Dick.Dunbar@Siebel.com>
 <Donna.Yobs@veritas.com>
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<Erich.Wimmer@digital.com>.
 Harvey Garner <Harvey.Garner@championusa.com> about
 flags. Holger VanKoll <Holger.VanKoll@swisscom.com>
 <Horst.Scheuermann@uni-trier.de> provided a development
 <I.D.Fitchet@ftel.co.uk>.
 stanza. Carl Cook <Info@quantum-sci.com> reported the
 a report from Jan Blunck <J.Blunck@tu-harburg.de>. As
 Jan Wortelboer <J.H.P.Wortelboer@uva.nl>.
 James Mathiesen <James-Mathiesen@deshaw.com>.
 Richier <Jean-Luc.Richier@imag.fr>. Jean-Luc's
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 Paul Morrison <John.Paul.Morrison@MultiActive.com>
 <Joshua.Wright@jwu.edu> modified NetBSD and OpenBSD
 <KEITH_KALET@HP-USA-om41.om.hp.com>.
 Chandrasekhar <Kris.Chandrasekhar@compaq.com>
 Chandrasekhar <Kris.Chandrasekhar@digital.com>
 Contributed by Lionel Cons <Lionel.Cons@cern.ch> #
 Based on a report from Michael Schmitz <MSchmitz@lbl.gov>
 problem was reported by Peter Klosky <PKlosky@bdm.com>.
 Based on a report from Pasi Kaara <Pasi.Kaara@atk.tpo.fi>
 <Philip.Edwards@sn.wpafb.af.mil>.
 Byrnes <Robert.Byrnes@deshaw.com>.
 Dahlem <Robert.Dahlem@ffm2.siemens.de> supplied
 Robert Jelinek <Robert.Jelinek@MorganStanley.com>.
 <TERRY@spcvx.spc.edu> kindly provided a test
 Terry Kennedy <TERRY@tmk.com>. Updated for recent FreeBSD ZFS
 Toshiya Nakamura <TOSHIYAN@jp.ibm.com> helped test
 <BRAUNBEC@de.ibm.com> and Tom Whitty <TWHITTY@cerner.com>.
 Mauterer <Thomas.Mauterer@philosys.de> contributed
 warning was requested by Tom Matthews <Tom.MATTHEWS@rbs.com>.
 <Trojan.Krastev@ricoh-usa.com> brought the bug to
 <Valdis.Kletnieks@vt.edu> informed me this was
 from Alexis Ballier <aballier@gentoo.org>.
 Additional changes by Vic Abell <abe@cc.purdue.edu>:
 Victor A. Abell <abe@purdue.edu>
 abe@purdue.edu.
 a test system. Andrey Chernov <ache@freebsd.org> provided
 Ambrose C. Li <acli@mingpaoxpress.com>.
 Wendy Lin <af5@taiyang.cc.purdue.edu>. I
 Applied a patch from Armin Gruner <ag@muc.de> that
 AIX. Ann Janssen <ajanssen@nebook.com> made me aware
 Allan Nathanson <ajn@apple.com>. Allan also
 Kephart <akephart@austin.ibm.com> supplied the
 At the request of Alek O. Komarnitsky <alek@komar.org>
 <alonbl@gentoo.org> added the LINUX_HASSELINUX environment
 Amir J. Katz <amir@ndsoft.com> pointed out that
 <anders@FreeBSD.org>. Adjusted for FreeBSD 5.0-CURRENT
 out by Thomas Anders <anders@hmi.de>. The error was
 Anderson <anderson@ligo.caltech.edu>. Also updated
 checksum with Andrew Bell <andrew.bell.ia@gmail.com>
 <andrew@compclass.com>. Updated Configure to accept
 reported by Andrew Hill <andrewh@tirin.openworld.co.uk>.
 <andy.lavr@reactor-xg.kiev.ua> and Pav Lucistnik
 Angelos D. Keromytis <angelos@dsl.cis.upenn.edu>
 Based on a report from Aaron Rhodes <arhodes@psionic.com>
 Andrew Brown <atatat@tatdot.net>, Thomas Klausner
 Andrzej Tobola <ato@iem.pw.edu.pl>.
 from Sheldon Hearn <axl@iafrica.com>, David O'Brien
 David Bacon <bacon@birc.eecs.lehigh.edu>.
 <bbehre@networkstoragecorp.com> reported those needs.
 change was suggested by Marc Bejarano <beej@alum.mit.edu>.
 Bela Lubkin <belal@caldera.com>.
 Added for Bela Lubkin <belal@mammoth.ca.caldera.com>
 Bela Lubkin <belal@sco.com>
 Steve Bellenot <bellenot@math.fsu.edu>. Steve
 Smithurst <ben@scientia.demon.co.uk> supplied
 after Brian Redman <ber@ms.com> reported his IRIX
 from Compaq by Berkley Shands <berkley@cs.wustl.edu>.
 <berkley@cse.wustl.edu> Had to used relaxed ANSI
 help from Billy Ho <bho@pyramid.com>.
 at 2.6 and above.) Bill Watson <bill.watson@uk.sun.com>
 location. Bill Goodridge <bill@its.brooklyn.cuny.edu>
 supplied by Bjarni Ingi Gislason <bjarniig@rhi.hi.is>.
 provided by Ben Lewis <bl@purdue.edu>.
 <blaadeleng@yahoo.com> reported the problem.
 Heddy Boubaker <boubaker@amfou.cenatls.cena.dgac.fr>
 At the suggestion of Manuel Bouyer <bouyer@antioche.eu.org>
 <bowman@math.utah.edu> reported the problem.
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 <bt@tekon.de> provided and tested it.
 reported by Bob Ward <bward@thehartford.com>.
 Carson Wilson <carson@mcs.com> reported the need
 provided by Carson Gaspar <carson@taltos.org>. Made
 of a report from Casper Dik <casper@holland.sun.com>.

Cato Auestad <cato@cato.ninja>. Cato did the testing. testing were provided by Calle Dybedahl <cdy@algonet.se> <cfs@cowlabs.com> <cfs@jurassic.eng.sun.com> also helped test. Larson <chad@larsons.org>. Changed commented-out Jon Champlin <champlin@us.ibm.com> suggested this <charles_silvers@symantec.com>. Testing help was from Christopher Schanzle <chris@cam.nist.gov>. <chrisd@dlpco.com> provided a test system and Don <clark.channing@heb.com> from David Clissold <cliss@austin.ibm.com> and Marc At the request of Chris Markle <cmarkle@sendmail.com> <connor@phreak.csd.sgi.com>, added -xansi to CFLAGS <conrads@cox.net>, who helped test the update. Wesley <craig_harmer@symantec.com>, Gary Millen Chris Sylvain <csylvain@itg.ummc.umaryland.edu> <curt@grumpy.cse.nd.edu> provided test systems. Dumazet <dadal@cosmosbay.com> supplied a patch. sleep(). A comment from Dan Mercer <dam@mmm.com> Dan A. Mercer <damerger@mmm.com> that, "Prints types. Daniel Braniss <danny@cs.huji.ac.il> reported the <davegul@hotmail.com> changed DEC OSF/1 process table David Day <dday76@gmail.com>. Doug Crabill <dgc@purdue.edu> provided a test <diana@mpl.ucsd.edu>. Lutz Poetschulat <dl9cu@db0zwi.de>. Mazieres <dm@cs.nyu.edu> provided a test system. Berezin <dmitryb@oit.rutgers.edu>. report from Dan Nelson <dnelson@emphone.com>. <don_oles@able.com.ua> for FreeBSD systems where the root <donald.zoch@amd.com>. Don Draper <dond@sco.com>. Siebert <douglas-siebert@iowa.edu> reported the Douglas B. Jones <douglas@gpc.peachnet.edu> Dale Talcott <dtalcott@purdue.edu>. Had to build <dumazet@risgw.ris.fr> requested and helped test Duncan McEwan (duncan@comp.vuw.ac.nz) info was noticed by Ermin Borovac <e.borovac@bom.gov.au>. Earle <earle@netbsd4me.jpl.nasa.gov> reported the Based on a report from Bernd Eckenfels <eckel@lina.inka.de> <ecronin@eecs.umich.edu> Adapted from work by Eric Dumazet <edumazet@cosmosbay.com>. <edwin@FreeBSD.org>. Paul Eggert <eggert@twinsun.com> supplied it. Based on a report from Mark W. Eichin <eichin@thok.org> <ejajko@portal.com>. The fix was offered as a patch to <elias@hi.is> helped identify the patches as Halldor Agustsson <elias@rhi.hi.is> provided a test <emcwhorter@xsis.xerox.com>. 11.00. Erwin Reyns <ereyns@europarl.eu.int> helped Grant Erickson <erick205@umn.edu>. See the descriptions of reported by Erik Trulsson <ertr1013@student.uu.se> test system was provided by Erwin Lansing <erwin@FreeBSD.org>. Raymond <esr@thyrsus.com>. <evil4chine@googlemail.com>. In The Machine) <will3@earthlink.net> on Linux news Shaynis <eyal.shaynis@telrad.co.il>. The fix was Copyright (c) 2004, 2005 - Fabian Frederick <fabian.frederick@gmx.fr> Frederick Fabian <fabian.frederick@skynet.be>, the Bela Lubkin <filbo@deepthought.armory.com>. report from Filippo Natali <filippo@widestore.net>. R. Vanderpool <fish@daacdev1.gsfc.nasa.gov> helped Francis Le Bourse <flebourne@intelcom.fr>. Lee was supplied by Florian M. Weps <fmw@hactrn.ch>. Jason Fortezzo <fortezza@mechanicalism.net>. Made supplied by Frank Sanders <frank.sanders@siemens.com>. Winkler <frank.winkler@germany.sun.com> graciously report came from Gabor Liptak <gaborliptak@usa.net>. reported by Gary Plewa <gary.m.plewa-1@lowes.com>. Gary Millen <gary.millen@veritas.com>, Rainer Orth <gary_millen@symantec.com> and Chuck Silvers the NAME column. Guy Dallaire <gdallair@geocities.com> At the request of Marcin Gozdzalik <gozdzal@gmail.com> <h.m.brand@xs4all.nl> reported the problems and tested At the request of Hal Brooks <hal@uga.edu> added support John Heasley <heas@netbsd.org> added log-structured <hejianet@linux.vnet.ibm.com> reported the need for this. Michael Hennecke <hennecke@rz.uni-karlsruhe.de>. were suggested by Steven Hinkle <hinkle@bsd.i.com>. <hogden@rge.com>. <holder@phy.ucsf.EDU>, added DEC OSF/1 code to Pham <hung_pham@unc.edu>, and Curt Freeland <hvv@hippo.ru>. Ingimar Robertson <iar@skyrr.is>, enabling lsof to

Igor Schein <igor@txc.com>.
Caci <ik5pvx@infogroup.it> who helped test it.
Igor Schein <ischein@air-boston.com> reported the
Henri Karrenbeld <ishtar@cal044202.student.utwente.nl>
Gregory A. Ivanov <ivga@mts.ru>. Gregory tested the
Jelinek <jakub@redhat.com> that enhances lsof's ability
James Antill <james.antill@redhat.com>. I have not
<jampalp@cisco.com> pointed out that it was incorrect --
9 FCS. Janet Hempstead <jan@library.carleton.ca>
<jankenbrandt@penton.com> reported the problem.
Based on a report from jayjwa <jayjwa@atr2.ath.cx>
provided by Jeff Johnson <jbj@redhat.com> and Maciej
suggested by Jeffrey C. Honig <jch@bsd.i.com>.
<jchl@arastra.com> reported the bug and helped with its
This work-around was supplied by John Polstra <jdp@polstra.com>.
<jeff.howie@federated.ca> added support for command
information from Jesse Perry <jesse.perry@compaq.com>.
Jia He <jiakernel@gmail.com> reported the problem.
<jim@corp.phone.com>, added more kernel address
To assist Jim Mintha <jim@geog.ubc.ca> with the
Jim Mintha <jim@ic.uva.nl>.
Reid <jim@mpn.cp.philips.com>. Terry Kennedy
Jim Reid <jim@rfc1035.com>.
Guojun <jin@george.lbl.gov> noticed and reported the
provided by Jerome Marchand <jmarchan@redhat.com> and
<johan@smilfinken.net> and Eric Williams (aka The Ghost
was reported by Jan Dvorak <johnydog@go.cz>.
<josb@cncdsl.com>.
Jan Ole Suhr <josuhr@informatik.tu-clausthal.de>
Based on a query from Jean-Pierre Radley <jpr@jpr.com>
Based on a report from John Jackson <jrj@purdue.edu>
<jstoner@blackboard.com> enhanced support for the
<julian@cadence.com>.
<jws@anaconda.cc.purdue.edu> provided a test system.
allocation, reported by Jeff Stewart <jws@purdue.edu>.
GlibC 2.14 for Linux. Marek Behun <kabel@blackhole.sk>
<kawaljeet.malviya@gmail.com> who tested the corrected
Kapil Chowksey <kchowksey@hns.hns.com>
<ken@compclass.com>, and Andrew Merrill
changes. Kevin Smith <kevin@pyramid.com> helped
a report from Kieran Broadfoot <kieran.broadfoot@gs.com>.
reported by Kim Culhan <kimc@kim.net>.
Homme <kjetilho@ifi.uio.no>.
<kjoonlee@gmail.com>. Some older dialects -- e.g.
<krader@sequent.com> reported the problem.
bug, reported by Kris Kennaway <kris@obsecurity.org>
Kenneth Stailey <kstailey@disclosure.com> suggested
Stailey <kstailey@kstailey.tzo.com>
Kenneth Stailey <kstailey@speakeasy.net> for
Stailey <kstailey@yahoo.com>.
available by Vincent Kujala <kujala@geog.ubc.ca>
Joshua Kinard <kumba@gentoo.org> reported the bug and
Vajk <kvajk@cup.hp.com>, that adjusts a private
Based on a bug report from Karel Zak <kzak@redhat.com>
supported dialects. John Smith <lbalbalba@hotmail.com>
Diane Lebel <lebel@zk3.dec.com>, and John Speno.
Penn <lee@dlpco.com> provided a test system.
Prompted by Marty Leisner <leisner@sdsp.mc.xerox.com>
provided by Larry Rosenman <ler@lerctr.org>.
E. Lindberg <lindberg@clindberg.org>. The changes
<lingman@lucid.net.au>.
the owner of a process. Lionel Cons <lionel.cons@cern.ch>
system provided by Loc Le <lple@us.ibm.com>.
With help from Laurent P. Montaron <lpm@sequent.com>
available by sending e-mail to lsof-l-request@rcac.purdue.edu with
library Makefile. Timothy J. Luoma <luomat@peak.org>
provided by Michael Antlitz <mantlitz@prophasys.com>
Stephenson <marc@austin.ibm.com>, and on a test
<marc@mecworks.com> added sockfs to the mount scan
<marc@offline.be>, added tests to the /proc-based
<marck@rinet.ru> provided test systems.
provided by Matt Thurmaier <matt@compclass.com>
Delanoy <max_ok@yahoo.com>.
mode bug, reported by Mayer Ilovitz <mayer@cooper.edu>.
<mcallister@mit.edu> to the DU readmnt() function.
Scott McClung <mcclung@primenet.com> tested.
addition was suggested by Mike Depot <mdepot@comcast.net>
with Michael Haro <mharo@area51.fremont.ca.us> for
from Michael A. Hovan III <mhovan@BLaCKSMITH.com>
Michael Hocke <michael.hocke@nyu.edu> suggested a work-around
Mike Miscevic <miscevic@hotpop.com>. Casper Dik
<misiek@misiek.eu.org>, who also tested the fix.
<miwi@FreeBSD.org>.
Janardhan Molumuri <mjanardhan@gmail.com> reported the

improvements, supplied by Marian Jancar <mjancar@suse.cz>. At the request of Marjo F. Mercado <mmercado@xceedium.com> reported by Mark Price <mprice@sequent.com>. Miklos Szeredi <mszeredi@suse.cz>. The support includes a <nikke@ing.umu.se> did 4.3.1 testing. Lesniewski <nimir@kis.p.lodz.pl>. Jeff helped test FreeBSD ports packager, David O'Brien <obrien@FreeBSD.org> O'Brien <obrien@NIXI.com> that recognizes FreeBSD 3.2. SunOS dlsof.h. Alexandre Oliva <oliva@dcc.unicamp.br> <onno@simplex.nl>. <partain@mekb2.sps.mot.com>. Elias Halldor Agustsson reported by Pav Lucistnik <pav@FreeBSD.org>. An updated reported by Per Allansson <per@appgate.com>. Per helped <peter@memex.co.uk> for bringing this to my attention. <phonkane@cc.hut.fi>. Pekka tested the fix. J. Bertoncini <pjb@anl.gov>. system. Paul Kranenburg <pk@cs.few.eur.nl> supplied Packager: Poky <poky@yoctoproject.org> <prj@po.cwru.edu>. Schiffer <pschiffe@redhat.com> provided a test system. Philip Shin <pschin@xceedium.com>. Phillip supplied the Starreveld <pstarrev@csc.com>. Picked some lint Piet Vines <psv2b@eservices.virginia.edu> reported the zone with Paul Szabo <psz@maths.usyd.edu.au>. Based on a report from Peter Valchev <pvalchev@openbsd.org> from Peter Valchev <pvalchev@sightly.net>. Vernam <pvernam@draper.com> reported the problem and helped Fontaniere <pyf@cc.in2p3.fr>, who tested the fixes. Quentin Fennessy <quentin@dvorak.amd.com>, who Ray Phillips <r.phillips@jkmrc.uq.edu.au> Phillips <r.phillips@mailbox.uq.edu.au>. An lsof With help from Richard Allen <ra@hp.is> taught Roger Cornelius <rac@tenzing.org>. problem reported by Radko Keves <rado@daemon.sk>. i386 architecture. Allen Hewes <rallen@hotmail.com> provided Ralph Forsythe <ralph@contact-paging.com> provided with Robert T. Brown <rbrown@netmentor.com>. The Richard Coley <rcoley@pyra.co.uk> helped. Doug Kehn <rdkehr@yahoo.com>. Ryabinkin <rea@freebsd.org>. Taught Configure to recognize Maria Dart <renata@slac.stanford.edu> tested on ZFS Richier <richier@imag.fr>. Passarella <rmpassar@pyramid.com> supplied the pointed out by Robert Kiessling <robert@easynet.de>. were supplied by Robert Lipe <robertl@caldera.com>. of Ollivier Robert <roberto@eurocontrol.fr>, who <rogerk@veritas.com> provided technical information. <rrouenza@cup.hp.com> provided a test system. Solaris 2.x. W. Richard Stevens <rstevens@kohala.com> <rtg@tir.com> pointed out the problem. Tested courtesy of Ulrich Bernhard <rzubu@rzu.unizh.ch>. [saggerer@zk3.dec.com] helped put me in contact <samuel.thibault@ens-lyon.org> added support for the Stuart Anderson <sba@srl.caltech.edu> provided the <sergent@csociety.ecn.purdue.edu>. The change Incorporated patch from Jonathan Sergent <sergent@io.com> kindly provided by Jonathan Sergent <sergent@purdue.edu>. reported by Sami Farin <sfarin@ratol.fi>. This <slaubs@woodward.com>, modified dlsof.h for PTX with Chang Song <song@zk3.dec.com>, the developer DuBois <spcedt@armory.com>. This may require some John Speno <speno@lopan.isc-net.upenn.edu> provided Steven Blackmon <stblackm@cisco.com> and Prasad Jampala <stefan.marquardt@hagebau.de> helped test. Stephane Chazelas <stephane.chazelas@gmail.com>. Steve Ginsberg <steve@dhapdigital.com> and Kenneth a report from Steve Gonczi <steve@relicore.com>. GlibC, provided by Steve Logue <stevel@mail.cdsnet.net>. Pavol Rusnak <stick@gk2.sk>. Pavol also reported the [vdso]". Scott Worley <sworley@chkno.net> reported Thomas Sydelko <sydelko@ecn.purdue.edu> kindly Sylvain Robitaille <syl@alcor.concordia.ca> reports <sziszi@petra.hos.u-szeged.hu> help test. The lsof Johannes Tax <tax@blueadog.oit.unc.edu>, Hung T. <tchrist@jhereg.perl.com>. This was offered as a provided by Terry Kennedy <terry@tmk.com>. Josh Soref <timeless@gmail.com>. code from there. Tin Le <tin@netimages.com> Tristan Nefzger <tn@bhtrader.com> requested the <tom.qin@citigroup.com> about lsof memory usage. Foerster <toralf.foerster@io-warnemuende.de>, who <trawick@gmail.com>. The patch has not been applied to Based on a report from Dan Trinkle <trinkle@cs.purdue.edu> Marc Aurele La France <tsi@ualberta.ca>. Marc provided

help from Scott Ellentuch <tuc@ttsg.com>.
Tom Weaver <tvweaver@austin.ibm.com> provided
change was supplied by Roy Marples <uberlord@gentoo.org>.
was suggested by Bob Farmer <ucs_br@unx1.shsu.edu>.
Richard van Meurs <vanmeurs.anva@atriserv.nl>. He
was reported by Mike Frysinger <vapier@gentoo.org>.
Vladislav Nespor <vladislav.nespor@id.ethz.ch>. Renata
based on a report from Jun Biao WANG <wangjunb@cn.ibm.com>.
Warren Young <warren@etr-usa.com>. The 00FAQ changes
<wfp5p@tiger.itc.virginia.edu> provided a test
<whitaker@cenapad.unicamp.br> reported the problem.
Will Day <willday@rom.oit.gatech.edu> and Frank
Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at> updated
Rupprecht <wolfgang@wsrcc.com> led to the change.
Shields <wxs@FreeBSD.org> provided an 8.0-CURRENT test
Shields <wxs@atarininja.org> and Dmitry Morozovsky
abstact UNIX sockets. Masatake Yamato <yamato@redhat.com>
Yuliy Minchev <yuliy@mobiltel.bg>.
Dan Farmer <zen@trouble.org> reported the problem.
<zube@cs.colostate.edu>, that RedHat Linux 6.0 still
<zube@tlaloc.stat.colostate.edu> reported the

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```
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```

<signature of Ty Coon>, 1 April 1989
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```
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```
-- authors of mtools
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
Martin Kraemer <Martin.Kraemer@mch.sni.de>.
Paul.Green@stratus.com.
Robert King (Robert.King@mailbox.gu.edu.au) wrote this page for the
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uscsi ioctl interface. By James Dugal, jpd@usl.edu, 11-96. Tested
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60 ---- netbase

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 Wietse Venema (wietse@wzv.win.tue.nl)

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```

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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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```
-- authors of netcat
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
Paul.Green@stratus.com.
Alexandre Duret-Lutz <adl@gnu.org>.
akee@wpdis03.wpafb.af.mil (Earle F. Ake) contributed MIS and NILE.
dnl Ulrich Drepper <drepper@cygnus.com>, 1995-2000.
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Keep this file name-space clean means, talk to drepper@gnu.org
Original author: Noah Friedman <friedman@prep.ai.mit.edu>
(ghazi@noc.rutgers.edu)
Originally written by Giovanni Giacobbi <giovanni@giacobbi.net>.
Originally by Gordon Matzigkeit <gord@gnu.ai.mit.edu>, 1996
dnl Bruno Haible <haible@clisp.cons.org>, 2000-2006, 2008-2010.
Gerald Hewes <hewes@openmarket.com>.
Original idea and design by Avian Research <hobbit@avian.org>,
% marginal hacks, juha@viisa.uucp (Juha Takala)
Mark Hatle <mark.hatle@windriver.com>
Email: matt.thomas@altavista-software.com
% --karl, nathan@acm.org, 20apr99.
Originally written by Alexandre Oliva <oliva@dcc.unicamp.br>.
Originally written by Fran,cois Pinard <pinard@iro.umontreal.ca>, 1996.
```

Khem Raj <raj.khem@gmail.com>
% From romildo@urano.iceb.ufop.br, 2 July 2000.
Roy Li <rongqing.li@windriver.com>
EMail: rstevens@kohala.com
Lubomir Sedlacik <salo@Xtrmntr.org>, 2003.
seanf@swdc.stratus.com.
% From: Torbjorn Granlund <tege@matematik.su.se>
get started, please write to `translation@iro.umontreal.ca' to reach the
Tom Tromey <tromey@cygnus.com>.
Tom Tromey <tromey@redhat.com>

62 ---- netkit-telnet

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-- authors of netkit-telnet
dab@cray.com.
.¥" Changed to -mdoc by David A. Holland <dholland@ftp.uk.linux.org>
New maintainer: David A. Holland, dholland@hcs.harvard.edu
Assorted alpha/glibc patches. (Erik Troan, ewt@redhat.com)
Fix bug found by Herbert Xu (herbert@gondor.apana.org.au) - telnet
jbuhler@cs.washington.edu
Signed-off-by: Li Xin <lixin.fnst@cn.fujitsu.com>
8-bit fix to telnet. (Lukas Wunner, lukas@design.de)
TODO list stuff provided by Laszlo Vecsey <master@internexus.net>
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(Olaf Kirch, okir@caldera.de)
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Issue found by Tym Twillman (tymm@coe.missouri.edu).
From: Bill Hawes <whawes@star.net>

63 ---- pciutils

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-- authors of pciutils

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Andreas Jaeger <aj@suse.de>
Problem reported by Andreas Haumer <andreas@xss.co.at>, but I chose instead of the libpci. Thanks to Anicka <anicka@anicka.net>
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The basic library functions are written in C and are freestanding. Also included in the distribution is a set of C++ wrapper functions, and a just-in-time compiler that can be used to optimize pattern matching. These are both optional features that can be omitted when the library is built.

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That's all there is to it!

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66 --- readline

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Fix from Timothy Redaelli <drizzt@gentoo.org>
Change from David Kaelbling <drk@sgi.com>. If you have problems
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Additional logic fix from Edward Catmur <ed@catmur.co.uk>
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dnl Bruno Haible <haible@clisp.cons.org>, 2000-2003.
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Frames: this is from "Richard Y. Kim" <ryk@coho.net>
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Bug-Reported-by: Jared Yanovich <slovichon@gmail.com>
sunshine@sunshineco.com: <PRE>bla</PRE> looks better than

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```
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```
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 Petr Písar <petr.pisar@atlas.cz>, 2008, 2010.
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 Stephen Davis <stephend@ksr.com>
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 message to 'sv-request@li.org', having this message body:
 Skicka anmř.rkningar př. řřversř.ttningen till <sv@li.org>.
 Tapani Tarvainen <tarvaine@tukki.jyu.fi>
 All of the above are from Tapani Tarvainen, tarvaine@tukki.jyu.fi.
 Taco Witte <tcwitte@cs.uu.nl>, 2004, 2005.
 Tedi Heriyanto <tedi_h@gmx.net>, 2002, 2003, 2004.
 % From: Torbjorn Granlund <tege@matematik.su.se>
 Based on strlen implementation by Torbjorn Granlund (tege@sics.se)
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 Tom R. Hageman <tom@basil.icce.rug.nl>
 Tomislav Krznar <tomislav.krznar@gmail.com>, 2012.
 Tom Tromey <tromey@cygnus.com>.
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 Francisco Javier Tsao Santřan <tsao@enelparaiso.org>, 2008, 2011.
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 Thanks Chris Weber <weber@bucknell.edu>
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 Yasuyuki Furukawa <yasu@on.cs.keio.ac.jp>, 1999.
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 Ysbeer <ysbeer@af.org.za>, 2004
 Yuri Chornoivan <yurchor@ukr.net>, 2012.
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Fix bug discovered and fixed by Marcel Ritter <Marcel.Ritter@rrze.uni-erlangen.de>
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typo: s/incorrectable/uncorrectable/ (by A Costa <agcosta@gis.net>).
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alyoshin.s@gmail.com <alyoshin.s@gmail.com>, 2008.
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 modifications prepared by Janek Rójski <baggins@pld.org.pl>
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 spelling fixes 's/super user/superuser/' (by Benno Schulenberg <bensberg@justemail.net>).
 Bernhard Rosenkraenzer <bero@redhat.de>: fix for truncated long
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 fixed CAVEATS section (by Justin Pryzby <justinpryzby@users.sourceforge.net>)
 fixed groupmms compilation when PAM is disabled (by Johannes Winkelmann <jw@smts.ch>).
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 Kang Kai <kai.kang@windriver.com>
 Typo: missing "." on end of sentence (submitted by Stepan Kasal <kasal@ucw.cz>).
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 fixed UTM path detection (by Kelledin <kelledin@users.sf.net>)
 Sami Kerola <kerolasa@rocketmail.com>
 comment added by Kevin Tian <kevin.tian@intel.com>
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 (patch by Lasse Collin <lasse.collin@tukaani.org>)
 Leandro Azevedo <leorock182@gmail.com>
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 Roman Festhook <linux@polesye.net>, 2001-2005.
 Holger Wansing <linux@wansing-online.de>
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a sequential one (Lucas Correia Villa Real <lucasvr@gobolinux.org>)
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 made by Mohan Kokal <magnus@texas.net> that make installation a lot
 Michał Moskal <malekith@pld.org.pl>
 .¥”・懋ヲ エ 湔溜 : ASPLINUX<man@asp-linux.co.kr> 2000 7 29 シ
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 Copyright (c) 1997 , Guy Maor <maor@ece.utexas.edu>
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 ENABLE_NSCD_SIGHUP) (Marek Michał Liewicz <marekm@linux.org.pl>)
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 Marek Michał Liewicz <marekm@pld.org.pl>
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 updated (by Konstantinos Margaritis <markos@debian.org>).
 Michael Bunk <mb@computer-leipzig.com>
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 chgpasswd: new tool (by Jonas Meurer <mejo@debian.org>).
 Seraphim Mellos <mellos@ceid.upatras.gr>
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 updated for 4.0.18 (by Miguel Figueiredo <mfigueiredo@gmail.com>).
 Michael H. Jackson, mhjack@tscnet.com
 point this bug to Michael Kerrisk <michael.kerrisk@gmx.net>).
 .¥” (michael@cantor.informatik.rwth-aachen.de)
 .¥” Copyright (c) 1993 Michael Haardt (michael@morla.de), Fri Apr 2 MET DST 1993
 s/twtでてヲコ/twtでSz/ (fix by Michał 十 {mnicki <michal.lomnicki@gmail.com>}).
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 (by Jakub Mikusek <mick3y@o.k.pl>).
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 Martin Mares <mj@gts.cz>
 .¥” by Maki KURODA <mkuroda@aisys-jp.com>
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69 ---- sqlite3

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70 ---- stat

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-- authors of tar

% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org

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Version 3, 29 June 2007

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| 06-Apr-1994 | Jamie Hanrahan jeh@cmkrnl.com | |
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| Keith Owens <kaos@ocs.com.au>. Not a maintainer, just a beta tester. | | |
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| 12. Fix calculating version number (kitoh_@mix.or.jp, Walter Haidinger) | | |
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11. TC 2.0 doesn't have mktime() (Christian, mmp@earthling.net)

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Mike White mwhite@pumatech.com wizzip DLL

mxserver@lists.wku.edu (courtesy of Hunter Goatley) were no longer available

Charles Hannum mycroft@ai.mit.edu bug report

Neil Parks neil.parks@pcchio.com MSDOS

Robert E. Newman Jr. newmanr@ssl.msfc.nasa.gov bug report

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Sergio Monesi pel0015@cdc8g5.cdc.polimi.it Acorn

Patrick Ellis pellis@aic.mdc.com VMS zip -h appearance

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Piet W. Plomp piet@icce.rug.nl MSC 7.0, SCO 3.2v4.0

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Ultrix from Bernhard Simon <simon@zid.tuwien.ac.at>
Thanks to Emil Sit <sit@mit.edu> for educating me :-)
Many thanks to smb@ulysses.att.com (Steven Bellovin) for the reference
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and Rob Austein <sra@hactrn.net> for fixing it. (CVE-2011-4577)
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numbered 2 because it goes with version 2 of the ordinary GPL.]

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The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library, or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link a program with the library, you must provide complete object files to the recipients so that they can relink them with the library, after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the library.

Also, for each distributor's protection, we want to make certain that everyone understands that there is no warranty for this free library. If the library is modified by someone else and passed on, we want its recipients to know that what they have is not the original version, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a

program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

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d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License.

You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

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c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

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Version 2.1, February 1999

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Preamble

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Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

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