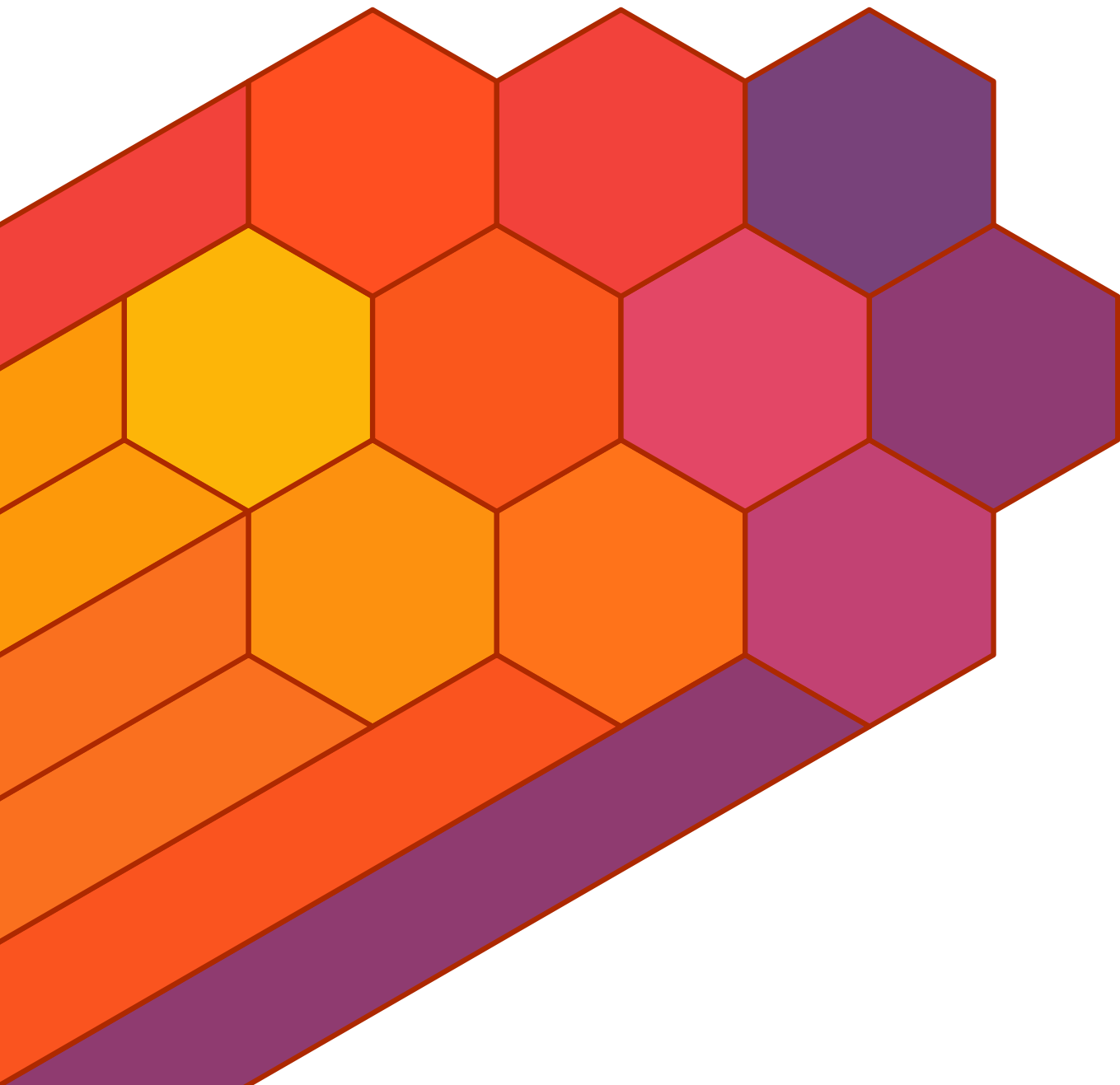


ucsd-psystem-vm
UCSD p-System Virtual Machine

Reference Manual

Mario Klebsch
mario@klebsch.de



This document describes ucsc-psystem-vm version 0.11 and was prepared 27 August 2010.

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NAME

ucsd-psystem-vm – UCSD p-System virtual machine

DESCRIPTION

The *ucsd-psystem-vm* package is a virtual machine (p-code interpreter) for the UCSD p-System.

The *ucsd-psystem-vm* package makes it possible to run UCSD Pascal (an ancient programming environment) on today's Linux machines, and also *BSD. The p-code runs very much faster on modern hardware.

This is still experimental code. If you are in trouble, "Use the source, Luke!"

Running the Virtual Machine

For instructions on how to run the virtual machine, including details of how to fetch and manipulate disk images, see the *ucsdpsys_vm(1)* man page.

Nostalgia

If you are still reading, prepare to enter the nostalgic world of UCSD Pascal...

```
Command: E(dit, R(un, F(ile, C(omp, L(ink, X(ecute, A(ssem, D(ebug,? [II.0]
```

```
Welcome SYSTEM, to
```

```
U.C.S.D. Pascal System II.0
```

```
Current date is 30-Jun-79
```

BUILD

You will find complete instructions for building the *ucsd-psystem-vm* package in the BUILDING file in the source tarball.

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ucsd-psystem-vm version 0.11

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AUTHOR

Mario Klebsch

E-Mail: mario@klebsch.de

WWW: <http://www.klebsch.de/>

MAINTAINER

Peter Miller

E-Mail: pmiller@opensource.org.au

^/*

WWW: <http://miller.emu.id.au/pmiller/>

RELEASE NOTES

This section details the various features and bug fixes of the various releases.

Version 0.11 (2010-Aug-25)

- There is now “glue” support for the APPLESTU and TRANSCEN units, found in the ucsd-psystem-os project’s `host/klebsch` source directory.
- Some byte-sex issues have been fixed, in anticipation of trying to debug the cross compiler’s big-endian support. The virtual machine now takes the system’s byte sex from the byte sex of the first disk. All subsequent disk images are checked to be sure they are all the same.
- The `SYSCOM^ .MISCINFO` word is now emulated, and sets the various bits that the emulator has control of, including the word-machine and byte-sex indicators.
- Some more detail about ucsd-psystem-os has been added to the `ucsdpsys_vm(1)` man page.
- The `syscom^ .sysunit` field is now set to the unit that the `SYSTEM .PASCAL` file was found on, rather than always setting it to 4.
- When using a terminal emulator such as `xterm(1)` or `gnome-terminal(1)`, the `ucsdpsys_vm(1)` command is now able to track the actual terminal size, and adjust `CRTINFO .WIDTH` and `CRTINFO .HEIGHT` at run-time, so that they always reflect the actual terminal size. This is implemented using a `SIGWINCH` interrupt handler, and the `ncurses(3)` support for `SIGWINCH`; see `resizeterm(3)` for more information.
- The system date (in the system’s segment 0 procedure 1 stack frame, local variable 67) is now adjusted at run-time, to ensure that the system’s idea of the current date is always correct, and the resulting date stamps on disk files will be correct (well, as correct as a two digit year will ever be).

Version 0.10 (2010-Jun-19)

- The VM now implements the CSP inline-math `ATAN`, `COS`, `EXP`, `LN`, `SIN`, and `SQRT` opcodes.
- There is a new `ucsdpsys_svolio(1) -x` option, that may be used to extract all files from a disk image.

Version 0.9 (2010-May-17)

- A bug has been fixed in the CSP `ROUND` opcode. It was rounding in the wrong direction in some cases.
- There are two new opcodes: `LES POWR` for proper subset comparisons, and `GTR POWR` for proper superset comparisons.
- There is now a test suite for the virtual machine. It requires the **ucsd-psystem-xc** and **ucsd-psystem-fs** projects to be built and installed before it can be run.
<http://ucsd-psystem-fs.sourceforge.net/>
<http://ucsd-psystem-xc.sourceforge.net/>
- A bug has been fixed in the `IDSEARCH` function, it now recognises the `SEPARATE` symbol.
- A bug in the CSP `FILLCHAR` opcode has been fixed, it now treats the `Length` parameter as signed.
- A bug has been fixed in the `MOVERIGHT` code, it no longer panics on negative lengths. Lengths less than or equal to zero now do nothing.
- A bug has been fixed in the `MOVELEFT` code, it no longer panics on negative lengths. Lengths less than or equal to zero now do nothing.
- A bug has been fixed in the `XJP` opcode. It now treats the limits as signed integers. It was erroneously treating them as unsigned integers.

Version 0.8 (2010-May-07)

- A number of omissions and inconsistencies in the documentation have been fixed.

Version 0.7 (2010-Apr-06)

- The project now uses GNU Autoconf to configure. The tarball compiles “out of the box”. Pre-built Debian packages are available on the web site.
- All of the commands consistently use *getopt_long(3)* for argument parsing. All commands now come with a man page.
- The project uses libexplain for better error reporting of Linux and Unix errors.
<http://libexplain.sourceforge.net/>

Version 0.5 (2001-Aug-02)

Long integer support has been added.

Version 0.4 (2001-Jun-08)

This time, portability has been improved. Disk access now functions even when *mmap(2)* is not available, using *lseek(2)*, *read(2)* and *write(2)* instead.

The code to implement the Turtle Graphics (and all dependencies on X11) has been moved to a separate process. This should make porting to other platforms much easier, because this is simply a dedicated server that reads turtle commands. (For historical reasons, it is called at the moment but still *ucsdpsys_xturtleserver(1)*, his background, he can not even hide it completely).

The PRINTER: Device is now also implemented, otherwise faulty are a few P-commands have been corrected.

Anyone who had a problem with the F(iler the eX(amine command crashing, should try again now.

Version 0.3 (2001-May-20)

The build instructions have been simplified. The Apple Pascal 1.1 demo now runs.

Version 0.2 (2001-May-10)

Things have improved. I now have Apple Pascal 1.3 and 1.1 version working. Running is perhaps slightly exaggerated, but at least the compiler seems to work.

Version 0.1 (2000-Sep-21)

Many years ago I learned programming at school using Apple-Pascal. From nostalgic feelings out (and because it was the best Pascal system, the more I could use), I've started to code interpreter for a p-Machine. Actually, not yet ripe for a publication, but in a discussion in *de.alt.folklore.computer* was considerable interest expressed in this software.

Although this program is the status of best-Alpha, it's here to download ready. Documentation non-existent, unfortunately. Use the source, Luke! Use the source, Luke!

NAME

How to build ucsd-psystem-vm

BEFORE YOU START

There are a few pieces of software you may want to fetch and install before you proceed with your installation of ucsd-psystem-vm.

curses This is a library for controlling and updating text consoles. It is used by ucsd-psystem-vm to translate the cursor escape sequences into whatever escape sequences are used by your text consol, or terminal emulator. These days, most systems use “ncurses“ instead. On a package based system, the package is called “libncurses-dev, “libncurses-devel, or something very similar.

libexplain

The *ucsd-psystem-vm* package depends on the libexplain package, a library of system-call-specific *strerror(3)* replacements.

<http://libexplain.sourceforge.net/>

X11 The *ucsd-psystem-vm* package depends on the X11 libraries, in order to emulate Turtle Graphics. Only the core functionality and Xt widgets are used.

GNU Groff

The documentation for the *ucsd-psystem-vm* package was prepared using the GNU Groff package (version 1.14 or later). This distribution includes full documentation, which may be processed into PostScript or DVI files at install time – if GNU Groff has been installed.

ucsd-psystem-xc (>= 0.8)

Cross compiler for UCSD Pascal, so that you don’t need a working system in order to make a working system. You need this project in order to run the test suite; it is used to compile short test programs to be run on the virtual machine.

<http://ucsd-psystem-xc.sourceforge.net/>

ucsd-psystem-fs (>= 1.15)

File system tools for UCSD Pascal, allows you to create and manipulate UCSD Pascal disk images. You need this project in order to run the test suite; it is used to construct disk images containing test programs to be run by the virtual machine.

<http://ucsd-psystem-fs.sourceforge.net/>

ucsd-psystem-um

This is optional. User Manual for UCSD Pascal II.0, reconstructed as HTML pages, and also as PDF. A facsimile of the original scanned pages is also available, cleaned and aligned. You do not need this project in order to build the *ucsd-psystem-vm* project.

<http://miller.emu.id.au/pmiller/ucsd-psystem-um/>

SITE CONFIGURATION

The **ucsd-psystem-vm** package is configured using the *configure* program included in this distribution.

The *configure* shell script attempts to guess correct values for various system-dependent variables used during compilation, and creates the *Makefile* and *lib/config.h* files. It also creates a shell script *config.status* that you can run in the future to recreate the current configuration.

Normally, you just *cd* to the directory containing *ucsd-psystem-vm*’s source code and then type

```
$ ./configure
...lots of output...
$
```

Running *configure* takes a few seconds. While it is running, it prints some messages that tell what it is doing. If you don’t want to see the messages, run *configure* using the quiet option; for example,

```
$ ./configure --quiet
$
```

To compile the **ucsd-psystem-vm** package in a different directory from the one containing the source code,

you must use a version of *make* that supports the *VPATH* variable, such as *GNU make*. Change directory to the directory where you want the object files and executables to go and run the *configure* script. The *configure* script automatically checks for the source code in the directory that *configure* is in and in *..* (the parent directory). If for some reason *configure* is not in the source code directory that you are configuring, then it will report that it can't find the source code. In that case, run *configure* with the option `--srcdir=DIR`, where *DIR* is the directory that contains the source code.

By default, *configure* will arrange for the *make install* command to install the **ucsd-psystem-vm** package's files in */usr/local/bin*, and */usr/local/man*. There are options which allow you to control the placement of these files.

`--prefix=PATH`

This specifies the path prefix to be used in the installation. Defaults to */usr/local* unless otherwise specified.

`--exec-prefix=PATH`

You can specify separate installation prefixes for architecture-specific files. Defaults to *{prefix}* unless otherwise specified.

`--bindir=PATH`

This directory contains executable programs. On a network, this directory may be shared between machines with identical hardware and operating systems; it may be mounted read-only. Defaults to *{exec_prefix}/bin* unless otherwise specified.

`--mandir=PATH`

This directory contains the on-line manual entries. On a network, this directory may be shared between all machines; it may be mounted read-only. Defaults to *{prefix}/man* unless otherwise specified.

The *configure* script ignores most other arguments that you give it; use the `--help` option for a complete list.

On systems that require unusual options for compilation or linking that the *ucsd-psystem-vm* package's *configure* script does not know about, you can give *configure* initial values for variables by setting them in the environment. In Bourne-compatible shells, you can do that on the command line like this:

```
$ CC='gcc -traditional' LIBS=-lposix ./configure
...lots of output...
$
```

Here are the *make* variables that you might want to override with environment variables when running *configure*.

Variable: CC

C compiler program. The default is *c++*.

Variable: CPPFLAGS

Preprocessor flags, commonly defines and include search paths. Defaults to empty. It is common to use `CPPFLAGS=-I/usr/local/include` to access other installed packages.

Variable: INSTALL

Program to use to install files. The default is *install* if you have it, *cp* otherwise.

Variable: LIBS

Libraries to link with, in the form `-lfoo -lbar`. The *configure* script will append to this, rather than replace it. It is common to use `LIBS=-L/usr/local/lib` to access other installed packages.

If you need to do unusual things to compile the package, the maintainer encourages you to figure out how *configure* could check whether to do them, and mail diffs or instructions to the maintainer so that they can be included in the next release.

BUILDING UCSD-PSYSTEM-VM

All you should need to do is use the following command, and wait:

```
$ make
...lots of output...
$
```

When this finishes you should see a directory called *bin* containing several programs.

If you have GNU Groff installed, the build will also create a *etc/reference.ps* file. This contains the README file, this BUILDING file, and all of the man pages.

You can remove the program binaries and object files from the source directory by using the following command:

```
$ make clean
...lots of output...
$
```

To remove all of the above files, and also remove the *Makefile* and *lib/config.h* and *config.status* files, use the following command:

```
$ make distclean
...lots of output...
$
```

The file *etc/configure.in* is used to create *configure* by a GNU program called *autoconf*. You only need to know this if you want to regenerate *configure* using a newer version of *autoconf*.

TESTING UCSD-PSYSTEM-VM

The *ucsd-psystem-vm* package comes with a test suite. To run this test suite, use the following command:

```
$ make sure
...lots of output...
Passed All Tests
$
```

The tests take a few seconds each, with a few very fast, and a couple very slow, but it varies greatly depending on your CPU.

If all went well, the message

```
Passed All Tests
```

should appear at the end of the make.

INSTALLING UCSD-PSYSTEM-VM

As explained in the *SITE CONFIGURATION* section, above, the *ucsd-psystem-vm* package is installed under the */usr/local* tree by default. Use the `--prefix=PATH` option to *configure* if you want some other path. More specific installation locations are assignable, use the `--help` option to *configure* for details.

All that is required to install the *ucsd-psystem-vm* package is to use the following command:

```
$ sudo make install
Password:
...lots of output...
$
```

Control of the directories used may be found in the first few lines of the *Makefile* file and the other files written by the *configure* script; it is best to reconfigure using the *configure* script, rather than attempting to do this by hand.

If you don't have the *sudo*(8) command installed on your system, the install looks like this

```
$ su
Password:
```

```
# make install
...lots of output...
# exit
$
```

GETTING HELP

If you need assistance with the *ucsd-psystem-vm* package, please do not hesitate to contact the maintainer at Peter Miller <pmiller@opensource.org.au> Any and all feedback is welcome.

When reporting problems, please include the version number given by the following command:

```
$ ucsdpsys_vm --version
ucsdpsys_vm version 0.11.D001
...warranty disclaimer...
$
```

Please do not send this example; run the program for the exact version number.

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AUTHOR

Mario Klebsch	E-Mail:	mario@klebsch.de
	WWW:	http://www.klebsch.de/

MAINTAINER

Peter Miller	E-Mail:	pmiller@opensource.org.au
^^*	WWW:	http://miller.emu.id.au/pmiller/

NAME

ucsdpsys_svolcvt – de-interleave Apple Pascal disk images

SYNOPSIS

ucsdpsys_svolcvt < *svol-file* > *dsk-file*

ucsdpsys_svolcvt < *dsk-file* > *svol-file*

DESCRIPTION

The *ucsdpsys_svolcvt* program is a utility to convert UCSD volume images from *.svol* format to *.dsk* format and vice versa. The conversion is symmetric, no options are needed to specify which conversion is needed.

OPTIONS

The following options are understood:

-V

--version

Print the version number and exit.

SEE ALSO

ucsdpsys_vm(1)

UCSD p-System virtual machine

ucsdpsys_svolio(1)

manipulate UCSD p-System disk images

BUGS

The size of the volume file must be multiple of 4KB (the Apple][track size)

EXIT STATUS

The *ucsdpsys_svolcvt* command will exit with a status of 1 on any error. The *ucsdpsys_svolcvt* command will only exit with a status of 0 if there are no errors.

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ucsdpsys_svolcvt version 0.11

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AUTHOR

Mario Klebsch

E-Mail: mario@klebsch.de

WWW: <http://www.klebsch.de/>

MAINTAINER

Peter Miller

E-Mail: pmiller@opensource.org.au

^^*

WWW: <http://miller.emu.id.au/pmiller/>

NAME

ucsdpsys_svolio – UCSD p-System volume I/O

SYNOPSIS

```
ucsdpsys_svolio -e volume-file
ucsdpsys_svolio -l volume-file
ucsdpsys_svolio [-t ] volume-file content-file
ucsdpsys_svolio -x volume-file
```

DESCRIPTION

The *ucsdpsys_svolio* program is used to read UCSD volume images. It can list the directory and read files in binary mode as well as in text mode. When reading files, the data is written to the standard output.

The *volume-file* can be either in *.svol* format or in *.dsk* format, used by Apple][emulators. The *.svol* format does not specify a byte order. The *ucsdpsys_svolio* program tries to automatically determine the correct byte order.

Deprecated

This tool has been deprecated, in favour of the *ucsdpsys_disk(1)* command in the *ucsd-psystem-fs* project.

OPTIONS

The following options are understood:

-e

--extend

This option is used to show extended directory listing of *volume-file*.

-l

--list This option is used to show the directory of *volume-file*.

-t

--text This option is used to read the file using text mode. In text mode, the first two blocks are skipped (they do contain UCSD editor internal data), DLEs and line endings are converted.

-V

--version

This option is used to print the version and exit.

-x

--extract-all

This option may be used to extract all files from the volume.

EXAMPLES

To read the contents of the volume file *apple1.svol*, execute

```
ucsdpsys_svolio -l apple1.dsk
```

To extract *SYSTEM.PASCAL* you can use

```
ucsdpsys_svolio apple1.dsk system.pascal > system.pascal
```

To take (yet another) view of *GRAFDEMO.TEXT*, execute

```
ucsdpsys_svolio -t apple3.dsk grafdemo.text | less
```

SEE ALSO

ucsdpsys_vm(1)

UCSD p-System virtual machine, used to execute the UCSD p-System executables on a UCSD p-System disk image.

ucsdpsys_volcvt(1)

convert Apple][Pascal disk images

Apple Pascal Operating System Reference Manual (1980)

Appendix C, File Formats/Text files

ucsdpsys_fsck(1)

Check and repair a UCSD p-System filesystem image. (From the *ucsd-psystem-fs* project.)

ucsdpsys_disk(1)

Read, write and remove files on a UCSD p-System filesystem image. (From the *ucsd-psystem-fs* project.)

ucsdpsys_mkfs(1)

Create a new UCSD p-System filesystem image. (From the *ucsd-psystem-fs* project.)

ucsdpsys_fs(5)

A description of the UCSD p-System file system format. (From the *ucsd-psystem-fs* project.)

BUGS

The *ucsdpsys_svolio(1)* command can not write to *volume-file*, that is why this command is deprecated.

ucsdpsys_disk(1)

This command from the *ucsd-psystem-fs* project is able to modify disk images.

- It is able to insert files into disk images.
- It is able to remove files from disk images.
- It understands numerous interleave patterns, for both reading and writing.

<http://ucsd-psystem-fs.sourceforge.net/>

EXIT STATUS

The *ucsdpsys_svolio* command will exit with a status of 1 on any error. The *ucsdpsys_svolio* command will only exit with a status of 0 if there are no errors.

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AUTHOR

Mario Klebsch

E-Mail: mario@klebsch.de

WWW: <http://www.klebsch.de/>

MAINTAINER

Peter Miller

E-Mail: pmiller@opensource.org.au

^^*

WWW: <http://miller.emu.id.au/pmiller/>

NAME

ucsdpsys_vm – UCSD p-System virtual machine

SYNOPSIS

ucsdpsys_vm [*option...*]

DESCRIPTION

The *ucsdpsys_vm* program is a UCSD p-System virtual machine. It is able to run UCSD Pascal II.0 (an ancient programming environment) on today's computer systems.

OPTIONS

The following options are understood:

-a

--apple execute the system in Apple compatibility mode. In Apple compatibility mode, the P-system is initialized using the same addresses as the original Apple][p-System.

-b *batch-file*

--batch=filename

Starts the system in batch mode. Input is read from *batch-file*, output is written to the standard output (unless **-x** is used). If '-' is specified as *batch-file*, the standard input is used.

-D

--no-emulation

By default, every read of the memory word containing the system date is faked at run-time to have the correct date (see *time(2)* and *localtime(3)* for more information). This ensures disk file date stamps are always up-to-date, without manual intervention (via the Filer's Date command).

This only makes sense if the stack frame for segment 0 procedure 1 is sufficiently large (local address 67). The emulation is not done for stack frames that are too small. This is a sufficient heuristic to avoid stack scribbles in the DIAGNOSTIC program.

The terminal size (width and height) in the CRTINFO member of the SYSCOM area are also faked at run-time, so that when virtual terminals, such as *xterm(1)* and *gnome-terminal(1)*, are resized the CRTINFO.WIDTH and CRTINFO.HEIGHT fields track the actual size of the terminal.

This option may be used to suppress the date and crtinfo emulation.

-d

--dump

This options causes the memory images to be written out to a file even when there is no panic.

-f *volume-file*

--forget=filename

Uses *volume-file* for I/O on disk volumes in *forget-changes* mode, which discards all changes to the volume, when *ucsdpsys_vm* exits. This option may be given more than once.

-g

--trace-max

Enter P-code debug mode.

-n *system-name*

--name=system-name

Uses *system-name* instead of SYSTEM.PASCAL. In contrast to the original Apple system, the system file is found on any of the volumes.

-r *volume-file*

- read=*volume-file***
Uses *volume-file* for I/O on disk volumes in *read-only* mode. This option may be given more than once.
- t *filename***
- trace-file=*file-name***
Write the p-instructions executed to *trace-file*. This recorded instructions can be compared to a recording made on an Apple II emulator. If '-' is specified as *trace-file*, the data is written to the standard output.
- V**
- version**
prints the version number and exits
- w *volume-file***
- write=*filename***
Uses *volume-file* for I/O on disk volumes in *read-write* mode. This option may be given more than once.
- x**
- xterm**
Start an *xterm(1)* for `CONSOLE:` and `SYSTEM:`. Especially useful when using the debugger and its messages are output to the standard output and stderr.

EXAMPLES

A simple method of working with the UCSD p-System is to use *ucsdpsys_vm* with `work.svol` as #4: in read-write mode and `system.svol` as #5: in read-only mode.

```
$ ucsdpsys_vm -w work.svol -r system.svol
$
```

To use the UCSD system disk image on #4:, the UCSD utility disk image on #5:, and your work disk image on #9: you can execute

```
$ ucsdpsys_mkfs --label=work work.vol
$ ucsdpsys_vm -f system.vol -r utility.vol -w work.vol
$
```

Using the disk images supplied by the `ucsd-psystem-os` project.

ucsd-psystem-os

There is a project that works from the original UCSD II.0 source code, it may be found at <http://ucsd-psystem-os.sourceforge.net/>

By using this project, you have access to disk images that are not ethically questionable in any way, because UCSD issued a non-commercial royalty-free license in 2006.

You also have access to the source code, should you want to know how something works, or even to fix a bug. The `ucsd-psystem-os` project encourages contributions.

system.charset

You need `SYSTEM.CHARSET` file from your Apple Pascal system disk in order to use Turtle Graphics. This file contains the bit-mapped front for characters. A utility called *ucsdpsys_disk(1)* can be used to extract `SYSTEM.CHARSET` from an UCSD disk image.

```
$ ucsdpsys_disk -f system.vol --get system.charset
$
```

There is an alternative that allows you to create a `system.charset` from an X11 font, or even create your own. The *bigtext(1)* command comes from the <http://bigtext.sourceforge.net> project.

```
$ bigtext --apple-pascal fixed > system.charset.text
```



```
$ ucsdpsys_charset -e system.charset.text system.charset
$
```

You can also turn a SYSTEM.CHARSET file into text so that you can edit it by using

```
$ ucsdpsys_charset -d system.charset system.charset.text
$
```

Disk Images

You will need UCSD disk images. You may find disk images on

<http://miller.emu.id.au/pmiller/ucsd-psystem-os/disk-image/>

You can use *wget*(1) to fetch the files

```
$ wget http://miller.emu.id.au/pmiller/ucsd-psystem-os/\
disk-image/system.vol
$ wget http://miller.emu.id.au/pmiller/ucsd-psystem-os/\
disk-image/utility.vol
$
```

RUNNING

To boot the UCSD Pascal system, you do not need SYSTEM.APPLE (it is replaced by this p-code interpreter). So you just can boot SYSTEM: from *system.vol* without any other files.

When using the *ucsd-psystem-os* project's disk images, the SYSTEM.LIBRARY provides access to this p-system interpreter's implementation of Turtle Graphics unit, Apple Stuff unit, and Transcendental unit.

Volumes cannot be mounted or unmounted when the system is running. You have to specify which images are used on the units when starting the virtual machine. The first image will be unit #4, the second one will be unit #5. Units #6, #7 and #8 are reserved for PRINTER:, REMIN: and REMOUT:. So, the third image will be unit #9 and so on.

The system has three modes for the volumes: Read-Only, Read-Write and Forget-Changes. The Forget-Changes mode is read-write, but the data will not be written back to the (UNIX) volume image file. If the virtual machine is exited, all changes to "forget volumes are lost.

DEBUGGER COMMANDS

When you run the virtual machine using the *ucsdpsys_vm -g* option, the following command are available:

- p** Print evaluation stack
- d** *from to*
Dump memory in HEX and ASCII
- I** *SegNo ProcNo*
Disassemble P-code
- t** Dump call stack including local variable and arguments
- v** Dump local variable area of the current procedure/function
- g** Go (start execution)
- n** Execute next instruction, do not trace subroutines.
- f** finish current procedure/function, execution stops at the first instruction after returning.
- r** Show registers
- q** Quit interpreter

SEE ALSO

ucsdpsys_disk(1)

read and write p-System disk images (from the *ucsd-psystem-fs* project, <http://ucsd-psystem-fs.sourceforge.net/>)

ucsdpsys_mkfs(1)

Create new disk images (from the ucsd-psystem-fs project).

ucsdpsys_charset(1)

encode and decode system.charset files. (from the ucsd-psystem-xc project, <http://ucsd-psystem-xc.sourceforge.net/>)

UCSD p-System Reference Manual

<http://miller.emu.id.au/pmiller/ucsd-psystem-um/>

The UCSD P-System Museum

<http://www.threedee.com/jcm/psystem/index.html>

WISH LIST

FIXME: This section probably belongs in the README file.

- better volume handling (especially mounting/unmounting disks)
- REMIN: and REMOUT:
- BREAK-handling
- removing (or hiding) the debug stuff
- resizing the TURTLEGRAPHICS screen
- adding more colors to TURTLEGRAPHICS
- better documentations (in the source code as well as in separate files)
- Porting the device drivers (mainly the console and turtlegraphics) to Windows and MacOS (could be obsolete with MacOS X)

EXIT STATUS

The *ucsdpsys_vm* command will exit with a status of 1 on any error. The *ucsdpsys_vm* command will only exit with a status of 0 if there are no errors.

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ucsdpsys_vm version 0.11

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AUTHOR

Mario Klebsch

E-Mail: mario@klebsch.de

WWW: <http://www.klebsch.de/>

MAINTAINER

Peter Miller

E-Mail: pmiller@opensource.org.au

^^*

WWW: <http://miller.emu.id.au/pmiller/>

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NAME

ucsdpsys_xturtleserver – X11 Turtle Graphics server

SYNOPSIS

ucsdpsys_xturtleserver
ucsdpsys_xturtleserver -V

DESCRIPTION

The *ucsdpsys_xturtleserver* program is used by the *ucsdpsys_vm(1)* program to draw graphics, via the specially crafted TURTLEGRAPHICS unit. This command is not usually invoked directly by the user.

OPTIONS

The following options are understood:

-V Print the version of the *ucsdpsys_xturtleserver* program being executed.

All other options will produce a diagnostic error.

EXIT STATUS

The *ucsdpsys_xturtleserver* command will exit with a status of 1 on any error. The *ucsdpsys_xturtleserver* command will only exit with a status of 0 if there are no errors.

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AUTHOR

Mario Klebsch E-Mail: mario@klebsch.de
 WWW: <http://www.klebsch.de/>

MAINTAINER

Peter Miller E-Mail: pmiller@opensource.org.au
 ^^* WWW: <http://miller.emu.id.au/pmiller/>