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open-source development on mpe

definition of open source

- a software package for which the source code is freely available

- possible modification restrictions

- possible redistribution restrictions

- many differing license variations, i.e. ASF, BSD, GPL, etc, with strong religious-type feelings by their respective adherents

benefits of open source on the e3000

- one porter can leverage the efforts of hundreds of open source developers

- easy way to add leading-edge functionality to the platform

- popular open source apps are de-facto standards

- easier to hire people knowledgeable about open source apps than it is to hire people knowledgeable about MPE

history - in the beginning

- 1971 - what would become the Interex Contributed Software Library is born

- 1972 - the HP 3000 is born

- 1977 - first conference software swap tape is produced

- 1982 - last cumulative CSL tape; switch to "best of" + incremental

- 1988 - CSL switches to incremental-only format

- 1990 - CSL split into separate MPE and MPE/XL distributions

history - posix arrives

- 1992 - MPE/iX 4.5 arrives with support for POSIX 1003.1 (API) and 1003.2 (shell & utilities). This voluntary release achieved limited exposure, primarily in the ISV community.

- 1994 - MPE/iX 5.0 "Pull" arrives with more reliable POSIX support. Customers interested in this release had to explicitly request it.

- 1995 - MPE/iX 5.0 "Push" is distributed to all customers, and represents the first widespread exposure to POSIX

history - proliferation

- 1994 - NCSA web server, Lynx web browser, various BSD functionality ported by Mike Belshe & Steve Elmer

- 1995 - GNU gcc compiler & related tools ported by Mark Klein

- 1996 - Samba ported by Lars Appel

- 1997 - Apache, Syslog, BIND, Perl, NTP ported by Mark Bixby

- 1998 - Sendmail ported by Mark Bixby

- 2001 - PostgreSQL RDBMS ported by Mark Bixby

...and many more ports and porters
http://jazz.external.hp.com/src/

history - productization

- 1998 - Syslog, BIND, Samba

- 1999 - Apache

- 2000 - HP WebWise MPE/iX Secure Web Server

- 2001 - Sendmail (announced)

…all fully supported by HP!

the good - apps that port easily

- cryptography
- compression
- socket networking
- graphic manipulation
- many GNU utilities

the bad - ports unlikely to succeed

- select()-based terminal I/O

- pseudo TTYs

- multicasting sockets

the ugly - use extra care porting these kinds of apps because "here be dragons"

- threads (though threads are slowly improving on MPE!)

- dynamic loading

- heavy dependence on root uid 0 or setuid()

- reliance on link() and hard links

hidden pitfalls

- maximum socket read/write size is 30000 bytes

- some functions like link() exist but return errno == EIMPL when called

- use telnet instead of VT in the shell to avoid heavy CTRL-Y overhead; `set +o vi` for more improvement

- ld linker doesn't flag unresolved externals by default; to enable this, set the AUTOCONF environment variable to 1

- built-in cat command can lose bytes on "here docs" -- use /bin/cat instead, i.e.:
```
/bin/cat <<EOF >outfile
foo
bar
EOF
```

when posix is not enough

- you can call intrinsics instead

- gcc doesn't understand "#pragma intrinsic", so you will need to declare all parameters including any hidden ones

- CSEQ can generate intrinsic declarations for gcc - http://www.lund.com/Products/DevTool/index.html

- #include <mpe.h> for ccode() and _mpe_fileno()

- #include <fcntl.h> for _MPE_FILENO() and _POSIX_FILENO()

- gcc needs help for long pointers - http://raven.utc.edu/cgi-bin/WA.EXE?A2=ind9906A&L=hp3000-l&P=R2477

priv-mode

- POSIX functions requiring root uid 0 on Unix require priv-mode on MPE

  - bind() to ports < 1024
  - setuid()

- **extern GETPRIVMODE();**

- **extern GETUSERMODE();**

- PM NMPRGs and NMXLs *must* reside in MPE namespace

getting started

- Choose an application you're already familiar with

- Have the following manuals ready:

  - MPE/iX Developer's Kit Reference Manual Vol I&II

  - HP C/iX Library Reference Man.

  - corresponding Unix docs

- Make sure you have the latest version of gcc installed

- Make sure you have the latest PowerPatch installed

- Ready, set, go! Start following the application's installation instructions

do I need to be a C or unix expert?

- No! Most open source apps have already been designed to make porting easy

- 95-100% of most apps will work as-is on MPE

- Almost all of the problems you might encounter have already been solved by other MPE porters; if you get stuck, just ask for help on HP3000-L

- Open source is not just C; it could be Java or Perl or Python or …

configure

- Most apps use a GNU autoconf script to evaluate the build OS to determine which include files and functions exist

- GNU autoconf assumes ld will report unresolved externals which does not happen by default on MPE; to enable this:
  - **AUTOCONF=1 configure *parms...***
  - or regenerate configure from configure.in to get an MPE-specific configure script

- Sometimes autoconf will guess wrong, so perform a quick visual sanity check of the output before attempting your first compile

compile

- Almost every open source app uses the make command and Makefiles for compiling

- Makefiles describe dependency relationships and the rules for compiling

- Just type "make" and everything with missing or out-of-date object code will be compiled

compile (cont.)

- The most common compile error is for missing #include files, of which several really aren't needed on MPE

- If in doubt, try commenting it out!

- ```
#ifndef MPE /* generic */
#include <sys/param.h>
#endif
```

- ```
#ifdef HAVE_SYS_PARAM_H
#include <sys/param.h>
#endif /* GNU autoconf */
```

- But you may have to end up manually #define-ing a few missing constants; consult Unix include files for the missing constants

compile (cont.)

- Compile-time options determine how #include files are parsed

- You will always need **-D_POSIX_SOURCE**

- Socket programs will always need **-D_SOCKET_SOURCE**

- You may very infrequently also need **-D_MPEXL_SOURCE**

- You can usually specify these at configure time, i.e.:

```
CPPFLAGS="-D_POSIX_SOURCE" \
configure parms...
```

run

- The moment of truth for unresolved externals! Try running every program with bogus parameters to check for unresolved externals.

- Did the autoconf script guess correctly?

- Does the app support other OSes where the solutions are more MPE-like?

- Were required libraries like -lsocket or -lsvipc omitted from the link?

- Do the jazz Porting Wrappers have an implementation?

- Do other ports have an implementation?

- If not, ask HP3000-L for advice!

test

- If the app has a test suite, run it and investigate all failures

- Perform your own MPE-specific testing on any logic that you had to alter during the porting process

- Test the key features that you think MPE users are most likely to need

- Consider releasing an alpha test distribution, but be prepared for low participation

package

- For simple apps, a tar or :STORE-to-disk archive may suffice

- Complex apps may require a custom INSTALL script to create the proper MPE accounting structure

- Think about future updates -- do you want to allow multiple versions on the same machine at the same time?

- If you're thinking of doing multiple ports, spend the time on your first port designing a common installation architecture template

- Test your package by installing and/or building it on a machine different from your own

submit

• You are NOT finished until you have submitted your MPE changes back to the original developers for inclusion into future releases!!!

• When making porting changes, copy the same look & feel from changes supporting other OSes

• Submit your changes in GNU diff format, i.e.:

```
diff -ruN orig_src_dir \
mpe_src_dir
```

software tools

- GNU gcc bundle - a C/C++ compiler and a whole lot more

  - http://jazz.external.hp.com/src/gnu/gnuframe.html

  - commercial support available from http://www.gccsupport.com/

- Porting Wrappers - implementations of various missing functions

  - http://jazz.external.hp.com/src/px_wrappers/index.html

  - unsupported freeware

- Porting Scanner - analyzes source and binaries to determine effort

  - http://jazz.external.hp.com/src/ps/index.html

  - unsupported freeware

- libbsd (deprecated) - more missing functions and header files

  - http://jazz.external.hp.com/src/bsd/libbsd.html

  - unsupported freeware

knowledge resources

- Various MPE manuals from http://docs.hp.com/mpeix/all/

  - MPE/iX Developer's Kit Reference Manual Vol 1&2

  - MPE/iX Shell and Utilities Reference Manual, Vol 1&2

  - HP C/iX Library Reference Manual

  - HP C/iX Reference Manual

  - Berkeley Sockets/iX Reference Guide

- Mark Bixby's MPE/iX Porting Guide

  - http://www.bixby.org/mark/porting.html

- Lars Appel's HPe3000 Page

  - http://www.editcorp.com/Personal/Lars_Appel/index.html

- HP3000-L mailing list

  - Where there is no such thing as a stupid porting question!

csy public access development system

- Register for Internet access to a fully-loaded HP e3000 989-400 system

- Port or develop new open source software

- Develop new closed source software

- Test software on the newer releases of MPE

- Support not included

- For full details, please see http://jazz.external.hp.com/pads/

partnership

- Open source works best as a community effort

- The original porters will not feel offended if somebody else wants to build on their MPE ports

- CSY welcomes community involvement in enhancing HP-supported open source products

- Your porting efforts allow CSY to adopt key infrastructure technologies as supported products

the future

- an updated and supported version of Sendmail

- periodic updates as needed of Apache, Samba, WebWise and other key open-source based products

- investigate fixing certain high-visibility port-enabling issues

join the hp3000-L community!

- Available as a mailing list and as the Usenet newsgroup comp.sys.hp.mpe

- In-depth discussions of all things HP e3000

- Talk with other people involved with open source and porting on MPE

  - seek advice, exchange tips & techniques

- Keep up with the latest HP e3000 news

- Interact with CSY

- http://jazz.external.hp.com/papers/hp3000-info.html