Environment Modules:

Do what I say not what I do!

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Introduction

- ENVIRONMENT modules vs modules?
- Who is currently using modules?
- Who has written a module?
- Who doesn’t know what modules are?

- Planning…

What are modules?

- http://sourceforge.net/projects/modules/

- module load (module) # Use a module
- module unload (module) # Unload a module you have loaded
- module avail # List all available modules
- module list # List modules you have loaded
- module show (module) # Show what a module will do
- module help (module) # Show the help for the specified module

tcl only vs c version

Individual modules are written in tcl. (Mention the security feature.)

- started in 2002
- Smaller feature set
- Simpler to setup/ maintain
- Local support
- Documentation and test suite not as extensive
- One file to look at

- Much older
- Larger feature set
- Need to do more planning for setup
- Need to compile for each platform
- More people using it
- More complex

Example module: soft/gcc/4.7.2

```
#%Module#####################################################################
##
##      GNU Module
##
proc ModulesHelp { } {
  puts stderr "\tThe GCC module contains gcc, g++, and f77, popular compilers for C, C++, and Fortran.\n"
  puts stderr "\tVersion 4.7.2"
  puts stderr "\tWebsite: http://gcc.gnu.org/"

}

set sys        [uname sysname]
set os         [uname release]
set arch       [uname machine]

append-path MANPATH /soft/gcc-4.7.2/man

switch -glob $sys {
   SunOS* {
        switch -glob $os {
            5.10 {
                if { [string compare $arch "i86pc"] == 0} {
                        append-path PATH        /soft/gcc-4.7.2/SunOS5.10x86/bin
                } else {
                        append-path PATH        /soft/gcc-4.7.2/SunOS5.10/bin
                }
            }
            default {
                append-path PATH        /soft/gcc-4.7.2/SunOS5.8/bin
            }
        }
   }
   Linux* {
      switch -glob $os {
         default {
            if { [string compare $arch "x86_64"] == 0} {
               prepend-path PATH       /soft/gcc-4.7.2/ubuntuamd2010/bin
            } else {
               prepend-path PATH       /soft/gcc-4.7.2/ubuntu1/bin
            }
         }
      }
   }
}

conflict ecad/vcs/2013
```

Tips for writing your own module

- Keep it simple
- Prepend-path vs append-path
- setenv vs prepend-path
- Make it future compatible
- Avoid modifying LD_LIBRARY_PATH and similar things
- Write a module help function
- Try to avoid conflicts

Writing your first module

- module use ~/.modules
- copy an existing module to start with.
- Write a ModulesHelp function
- Test it on all of your platforms before putting it into production.
- use a .version file
- If you use a switch make a default and make it future proof.

Our setup

- MODULES_ROOT: -> rdist to clusters, clusters automount the directory.
- CSELabs: ubuntu64, ubuntu32, SunOS5.10, SunOS5.10X86
- CS: In reality we have 3-4 versions of the OS on the various platforms and more than what is listed above…
- DTC: Only ubuntu64

The details

- MODULES_ROOT cs:/project/rdist/config/opt/modules
- Git repository: https://github.umn.edu/mein/modules
- CS MODULES: /soft/rko-modules
- CS INITDIR: /soft/rko-modules/init
- CS MODULESFILESDIR: /soft/rko-modules/modulefiles
- development MODULESFILESDIR: ~mein/.modules
- development MODULES: ~mein/modules
- development INITDIR: ~mein/modules/init

Module avail

```
 ~(mein@jessica) % module avail
------------------------------------------------------------ /home/staff01/mein/.modules -------------------------------------------------------------
2.062                 C3                  compile              mm/v7.5/l1/c2        ocaml/4.11            thrift/0.9.0(default)
2.064                 D                   crap                 mm/v7.5/l2/c1(default) old/perl/5.8        unload1
2013                  D1                  foo                  mm/v7.5/l2/c2        r/3.0.2               unload2
3.0.1                 D2                  foo2                 mm/v7.8/l1(default)  something             unload3
4.01                  D3                  fpc/2.6.2(default)   mm/v7.8/l1/c1(default) test/1.0             use.own
5.6.14                INCISIV             go/1.1.2(default)    mm/v7.8/l1/c2        test/2.0              vcs
A                     alternate           gradle               mm/v7.8/l2/c1(default) test/3.0             wah
B                     bah/1.3             junk                 mm/v7.8/l2/c2        test/4.0              whatistest
C                     bar                 mm/v7.5(default)     module-cvs           test/a                wt
C1                    big                 mm/v7.5/l1(default)  module-info          test/b
C2                    bingo               mm/v7.5/l1/c1(default) modules             test/c
------------------------------------------------------------ /soft/rko-modules/modulefiles ------------------------------------------------------------
X11/R6.3(default)                 java/mysql-connector              soft/cuda/1.1                     soft/ptolemy
admin                             java/sablecc                      soft/cuda/2.3(default)            soft/pyrobot/4.8.2
compilers/compilers(default)      java/servlet                      soft/cuda/local                   soft/pyrobot/4.9.3(default)
compilers/icc/5.0.1               java/weka/3.6.0                   soft/dataplot                     soft/python/2.6
compilers/icc/7(default)          java/xerces                       soft/dia/0.97(default)            soft/python/2.7(default)
crosstool/0.38/ppc405             lisp/acl/6(default)               soft/dmd/2.059                    soft/python/3.2
crosstool/0.42/arm                lisp/clisp/2.35                   soft/dmd/2.062                    soft/qgis/1.2.0
crosstool/0.43/i686               lisp/clisp/2.41                   soft/dmd/2.064(default)           soft/qgis/1.6.0(default)
dot                               lisp/clisp/2.44(default)          soft/emacs/23.1(default)          soft/qiime/1.7.0(default)
ecad/ads                          lisp/cmulisp/19d(default)         soft/esterel                      soft/qt/3.3.7
ecad/cadence/IC                   lisp/cmulisp/old                  soft/explorer                     soft/qt/4.7.3(default)
ecad/cadence/ICC                  local                             soft/fpc/2.6.2(default)           soft/r/2.13.1
ecad/cadence/INCISIV              math/mathematica/7.0.1            soft/gcc/3.0                      soft/r/2.15.1
ecad/cadence/IUS                  math/mathematica/8.0.1(default)   soft/gcc/3.2                      soft/r/3.0.1(default)
ecad/cadence/LDV                  math/matlab/v.2008b               soft/gcc/3.3                      soft/r/3.0.2
ecad/cadence/SOC                  math/matlab/v.2009a               soft/gcc/3.4                      soft/rational
ecad/cosmoscope                   math/matlab/v.2009b               soft/gcc/4.0                      soft/ros/fuerte(default)
ecad/ecad(default)                math/matlab/v.2010b               soft/gcc/4.1                      soft/ruby/1.9.1
ecad/hspice/04(default)           math/matlab/v.2011a               soft/gcc/4.2                      soft/ruby/1.9.2(default)
ecad/irsim                        math/matlab/v.2011b               soft/gcc/4.3                      soft/sas
ecad/lc/2                         math/matlab/v.2012a               soft/gcc/4.5.2(default)           soft/scaffold
ecad/lc/3(default)                math/matlab/v.2013a(default)      soft/gcc/4.7.2                    soft/sesc/gcc3.4.4(default)
ecad/lc2                          math/octave/v.3.0.0               soft/geany/1.23(default)          soft/sm
ecad/magic/6.5                    math/octave/v.3.4.2(default)      soft/glc_player/2.3.0(default)    soft/sml/110.59
ecad/magic/7.1(default)           math/sage                         soft/gmp/5.0.1(default)           soft/sml/110.71(default)
ecad/sim                          mcad/adams                        soft/gnat                         soft/spim/v.6.1
ecad/simplesim                    mcad/ansys/140(default)           soft/gnuplot                      soft/spim/v.7.1(default)
ecad/sis                          mcad/ilog                         soft/go/1.1.2(default)            soft/squad
ecad/snns                         mcad/lamcalc                      soft/gpuocelot/2.0.969(default)   soft/stage/2.1
ecad/sonnet/11.52(default)        mcad/proe/wildfire(default)       soft/gpuocelot/svn-rev-2253       soft/stage/2.1.1(default)
ecad/sonnet/12.56                 mcad/proe/wildfire/4(default)     soft/gsl/1.15(default)            soft/stklos/1.10(default)
ecad/suprem                       mcad/truss                        soft/gtk/3.2(default)             soft/subversion/1.2.3
ecad/switcap                      modules                           soft/guile/1.8.8                  soft/subversion/1.4.6
ecad/vcs/2012(default)            mozilla/firefox(default)          soft/guile/2.0.3                  soft/subversion/1.5-latest
ecad/vcs/2013                     mozilla/firefox/2.0.0.11(default) soft/guile/2.0.6(default)         soft/subversion/1.5.4
globus                            mozilla/firefox/3.0.10            soft/haskell/2011                 soft/subversion/1.5.5
gnu                               mozilla/firefox/3.5.1             soft/haskell/2012(default)        soft/subversion/1.5.6
hpc/mpi/1.2.4                     mozilla/firefox/3.5.5             soft/haskell/6.12                 soft/subversion/1.5.7
hpc/mpi/1.2.7(default)            mozilla/thunderbird/1.0.6         soft/icon/9.4                     soft/subversion/1.6-latest
hpc/openmpi/1.1.4                 mozilla/thunderbird/1.5.0.7       soft/icon/9.5(default)            soft/subversion/1.6.17(default)
hpc/openmpi/1.3(default)          mozilla/thunderbird/2.0.0.4       soft/iminer                       soft/subversion/1.6.3
hpc/pvm3.4                        mozilla/thunderbird/2.0.0.6(default) soft/kerberos                  soft/subversion/1.7-latest
hpc/upcc                          null                              soft/liberty                      soft/subversion/1.7.5
java/6(default)                   openwin                           soft/linearroad                   soft/tcl/8.4.5
java/6/14                         perl/5.14.1(default)              soft/llvm+clang/3.2(default)      soft/tcl/8.5(default)
java/6/21                         perl/5.8.7                        soft/lua                          soft/tecplot/2010(default)
java/6/35                         prolog/5                          soft/mendeley/9.8.2(default)      soft/tecplot/360
java/6/38(default)                prolog/5.6(default)               soft/mercurial/1.8.1(default)     soft/tinyos/1.1.0
java/7/04                         prolog/sicstus/2.1                soft/merlin                       soft/tinyos/1.1.15(default)
java/7/07                         prolog/sicstus/3.12.1(default)    soft/mongodb/2.2.1(default)       soft/udraw
java/7/11                         prolog/sicstus2.1                 soft/mysql/5.0.18                 soft/umn-troff
java/7/21(default)                prolog/sicstus3.12.1              soft/mysql/5.1.31                 soft/unison/2.13.16
java/ant/v.1.8.0                  pvs2                              soft/mysql/5.5.22(default)        soft/unison/2.40.102(default)
java/ant/v.1.8.2(default)         scheme/drscheme/410               soft/mysql/5.6.14                 soft/unison/2.9.1
java/cytoscape/2.6.1(default)     scheme/drscheme/425(default)      soft/nodejs                       soft/valgrind/3.7.0(default)
java/eclipse/3.6                  scheme/mit(default)               soft/ns2/ns2_old                  soft/virtualgl/2.1.4(default)
java/eclipse/3.7(default)         scheme/racket/5.0.2               soft/ns2/v.2.32(default)          soft/visit/2.6.0(default)
java/j2me/2.0                     scheme/racket/5.1.1(default)      soft/ns3                          soft/vthought
java/j2me/2.1(default)            soft/RealPlayer/11                soft/nusmv                        soft/vxl/1.14.0(default)
java/jaf-1.0.2                    soft/RealPlayer10                 soft/ocaml/3.08                   soft/webkit/1.1.15.4
java/java3d                       soft/acroread/7.0.1               soft/ocaml/3.11                   soft/webkit/1.6.1(default)
java/javacc                       soft/acroread/7.0.9(default)      soft/ocaml/4.01(default)          soft/worldnet
java/javacup                      soft/agi                          soft/omnetpp                      soft/xemacs/21.4(default)
java/javamail-1.3                 soft/android                      soft/opencv/2.2.0(default)        soft/xmotif/2.0(default)
java/javax                        soft/anjuta/2.2.3(default)        soft/opencv/2.3.1                 stat
java/jdk-1.6.0_21                 soft/beta                         soft/opendx/4.4.0                 system
java/jdk-1.7.0_04                 soft/blender/2.49                 soft/openni                       tex/3.0
```

Automount tips/tricks

```
For languages like Perl that need a platform independent path:
mkdir /export/soft/perl5.14.1/$OSNAME$OSREL   for each platform

auto.soft entries:
perl5.14.1 soft.cs.umn.edu:/export/soft/perl5.14.1
perl5.14.1-bin soft.cs.umn.edu:/export/soft/perl5.14.1/$OSNAME$OSREL-bin

Then in /soft/perl.5.14.1   ln -s /soft/perl5.14.1/-bin bin
```

```
Inside of your modules do something like this:
if { [file isdirectory /soft/perl5.14.1/SunOS5.10] } {   ### NOTE ###
   prepend-path     PATH            /soft/perl5.14.1/bin
   prepend-path     MANPATH         /soft/perl5.14.1/man
}
```

How do I distribute a new module?

```
module avail soft/gcc
soft/gcc/3.0            soft/gcc/4.0            soft/gcc/4.5.2(default)
soft/gcc/3.2            soft/gcc/4.1            soft/gcc/4.7.2
soft/gcc/3.3            soft/gcc/4.2
soft/gcc/3.4            soft/gcc/4.3


cat .version
#%Module1.0
##
set ModulesVersion "4.5.2"
```

Create it in my development space ~/.modules
Test it on all platforms
Copy it over to MODULES ROOT
Check it into revision control
Rdist it out to clients
Test it again!

How do I retire an old module?

```
Retire an old module:
#%Module#####################################################################
# gcc 3.0 module
set sys        [uname sysname]
set os         [uname release]
set arch       [uname machine]

puts stderr "The soft/gcc/3.0 module is outdated and will be going away\n"
puts stderr "please update your . files to use the soft/gcc module instead.\n"
puts stderr "For questions or comments please email: operator@cselabs.umn.edu\n”

append-path MANPATH /soft/gcc-3.1/man
switch -glob $sys {
   IRIX* {
```

Test it in my development ~/.modules
Copy it over to MODULES ROOT
Check it in to Revision control.
Rdist it out to the clients.
Test it again.

How do users init modules?

- .cshrc:

```
source /soft/rko-modules/tcl/init/tcsh
module load soft/gcc java perl gnu local compilers system
module load openwin math/mathematica scheme user
```

- .bashrc:

```
. /soft/rko-modules/tcl/init/bash
module load soft/gcc java perl gnu local compilers system
module load openwin math/mathematica scheme user
```

- .bash_profile:

```
[[ -f ~/.bashrc ]] && . ~/.bashrc
```

TCSH VS BASH

- TCSH module avail goes to stderr
- BASH has tab completion
- BASH has different ways of initializing the shell depending on if its an interactive shell or not.
- The more shells you support the more work for you, and it makes it harder to debug issues.

Extra stuff you need/want!

- ~template
- resetenv
- webpage explaining how modules work
- We have a webpage that lists available modules and when you click the module it displays the help info.

How do I upgrade the modules system?

- ~mein/modules
    - It has ~mein/modules/init which points to ~mein/modules and has a modulesrc file that just points to ~mein/.modules
- ~mein/.cshrc

```
#set MODULESINIT="/home/staff01/mein/modules/init/tcsh"
 set MODULESINIT=“/soft/rko-modules/tcl/init/tcsh"
```

Once I’m happy push the new version out to clients and reset my .cshrc and test on all platforms.

What do you need to do?

- Layout your modules directory (bin,init,man, modulefiles) and plan for how you will upgrade it. If you have multiple arch's and your not using tcl version this is complicated.
- Put modulefiles directory under revision control
- Come up with a basic set of modules and groups for modules inside of the modulefiles directory.
- Scheme for testing new modules.
- Scheme for retiring old and deploying new modules.
- Figure out how you want users to init modules. (resetenv, shells supported etc)
- Plan for users to get more info on how modules work, init, resetenv, etc..