# 15 years of Lmod: A Retrospective

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# Outline

- The start of Lmod
- Why I used Lua?
- Where Lmod success comes from?
- Features added over time
- Lmod lessons learned
- Conclusions

# The start of Lmod

- In 2008, my friend and colleague Bill Barth asked:
- TACC has a software hierarchy with Tmod 3.2.10
- Impossible to change compilers or mpi modules
- Help?

# Key Insight

- Remember the state of $MODULEPATH
- When it changes, change loaded modules if necessary
- Support the idea of inactive modules
- Lmod was born

# Why implement in Lua?

- TCL is not my favorite language
- TCL/C Tmod was/is very complicated (and ugly!!)
- Worked in Lua to develop testing tools (more on this latter)
- Did consulting work in Python before TACC: Avoid conflicts
- If useful, the idea would be integrated into Tmod (Nope!)
- Happy accident: Lua is fast enough
- Lua is easier to protect from user environments (Esp. Python)

# Some Reasons for Lmod Success

- Initially no real competition (Tmod 4 started in 2017)
- Working at TACC helped
- Good enough documentation
- Easy transition from Tmod to Lmod (Lmod reads TCL modulefiles (Almost always works!?))
- Many Features not provided by other tools
- Unsolicited articles written by Jeff Layton about Lmod
- Many say: “It just works so I don’t worry about it.”
- Used by EasyBuild, OpenHPC and Spack
- Packages for Mac Brew, Fedora, Debian
- It is reliable (from testing)

# Hidden Reason for Lmod Success

- Testing Lmod has an extensive test suite (1400+ tests)
- Lmod uses the release early and often model.
- Almost 7000 check-in, 611 tags (versions)
- Can debug (via ml -D ... or ml -T) remotely
- My background is in 3-D Finite Element in C++
- I am a big fan of Design Patterns
- Lmod uses Singleton, Factories and Template pattern through-out for a code written in Lua.

# More on Testing

- The TM testing suite filters output to converts to canonical names
- Makes output path independent
- Tests both stderr and stdout output for each test
- Can repeatedly run a single test file or just the ones that failed
- Lmod is reliable because of testing
- Github Actions run tests on 4 version of Lua on both Ubuntu and macOS for every check-in. (Thanks Kenneth Host and Ward Poelmans!)
- There are also unit tests and installed Lmod set of tests

# Building trust with the user community

- Making it reliable (again via Testing)
- Timely answering the email and github issues
- Book: Team Geek
- Learning to be polite when answering and re-answering questions
- “You might consider ...”
- “Please test Lmod version ... when you get a chance to see if it works for you”
- Not getting upset when non-native English speakers sound insulting

# Features over time

- Tab completion for bash and z-shell
- Support for N/V then C/N/V finally N/V/V (Lmod 7+)
- Sematic versioning ($5.9 < 5.10$)
- Module properties
- Spider cache (speed up “module avail” and “module load”)
- Personal Collections
- ml
- sandbox (prevents modulefiles from calling internal routines)

# Features part II

- pushenv, sticky modules, i18n error messages
- Hooks, /etc/lmod/lmod_config.lua
- Tracking of module usage via hooks
- Hidden modules
- depends_on()
- source_sh(): source a shell script inside a modulefile
- LMOD_QUARANTINE_VARS
- ...

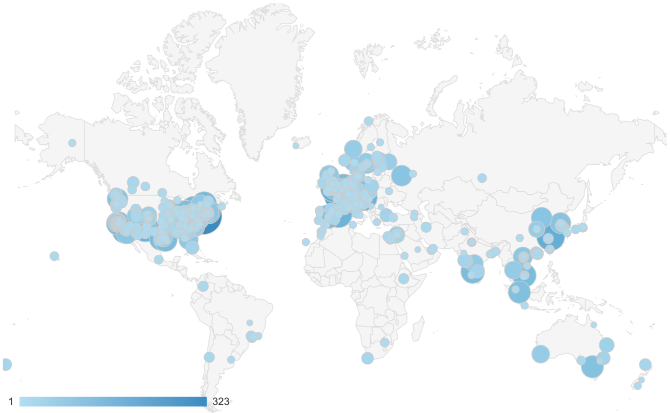
# Lmod lesson learned

- A private repo (bitbucket) as well as a public repo (github)
- make gittag TAG=...; make world_update
- git worktrees
- Exploiting Lmod to help XALT
- Learned way more than I ever wanted to know about bash, zsh, tcsh shell startup procedures
- Want tcsh to die, die, die
- That default interactive non-login bash shell startup is borked (We patch bash to get to work)
- Can be difficult to decide what a user is reporting. Bug or not?
- Getting users to use the bugReport script when submitting a bug.

# Lmod lesson learned (II)

- That `module() { eval "$(LMOD_CMD bash "$@")" }` works better than
- `module() { eval $(LMOD_CMD bash "$@") }` who knew?
- Cannot test every possibility, users will **ALWAYS** find a case I missed
- The moduleTable has been incredible notion to store the module state in your env.
- That other tools will use the spider cache output.
- No two site are run exactly the same way.
- There are ten or more ways that Lmod can be tailored.
- Communicating changes thru README.new

# Lmod Doc usage by City



# Conclusions

- Not every site works like TACC.
- That making Lmod available to the world has made it so much better.
- I have made many friends over the years through working on Lmod.
- Working on Lmod has been a fun part of the job.

# Future Topics

- Next Meeting will be Sept. 5th at 9:30 Central (14:30 UTC)
- Mathew Cawood will be running the meeting with a different zoom link