SAND2011-8211P

CMake TPL Support

Using Find_package

Pros/Cons

Will Dicharry, Brent Perschbacher

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Current Issues

1. **CMake Compatibility**
   - We currently don't use standard interfaces defined by Cmake.
     - **find_package(<name> [REQUIRED] [COMPONENTS] component…)**
     - **Foo_INCLUDE_DIRS, Foo_LIBRARIES, Foo_FOUND, …**
   - We typically don't use existing Find*.cmake logic.
     - ***Exceptions: CUDA, Qt***
2. **TPL Components**
   - Some TPLs have multiple components.
     - **Boost**
   - Packages aren't always interested in all provided components.
     - **Boost, HDF5**
3. **TPL versions**
   - Some packages need a different version of a TPL than another package
     - **SuperLU**
4. **TPL dependencies**
   - TPLs depend on one another.
     - **ExodusII, NetCDF4, HDF5**
   - Dependencies can be required or optional.

Sandia National Laboratories

CMake Compatibility

- **CMake is widely used.**
- **Client applications/libraries expect find_package interface.**
- **Some Find Modules are robust.**
  - Boost
  - Qt
  - CUDA
  - Trilinos
- **Some aren't.**
  - MPI
- **Can override behavior of FindFoo.cmake at the project level by setting CMAKE_MODULE_PATH.**
  - Not locked into the system implementation.
- **Utilizing interfaces that developers expect improves interoperability.**

Sandia National Laboratories

TPL Components/Versions

- **Some packages depend only on certain components of TPLs.**
- **Some subpackages depend only on certain components of TPLs.**
- **find_package provides a standard interface for handling this.**
  - find_package(Foo COMPONENTS bar baz)
  - Foo_LIBRARIES, Foo_bar_LIBRARY, Foo_baz_LIBRARY
- **TPL dependency isn't all or nothing.**
  - Packages can choose a minimal set of dependencies.
  - Language bindings.
- **Specific versions of TPLs are sometimes required.**
  - find_package(Foo 4.3.7 [EXACT])
- **Interface is distinct from Trilinos package architecture dependencies.**
  - Inconsistent

Sandia National Laboratories

TPL Dependencies

- **Some TPLs depend on other TPLs.**
- **Current options:**
  - TPL1 depends on TPL2 -> put TPL2 libraries in TPL1.
  - Client packages enable both manually.
- **Solution: Find_package can call find_package internally.**
  - Similar to option 1.
  - Duplicates possible.
  - Handles REQUIRED/COMPONENTS issues nicely.
  - What about optional dependencies?
- **Probably will have issues crossing between system/custom find modules.**

Sandia National Laboratories

TPL Support Options

- **Determine how we will work with current dependencies structure:**

1. **Packages call find_package?**
   - Dependency decisions are made by packages.
   - How do we handle conditional compilation?
   - Would need to change package code.
2. **Done from package architecture?**
   - Global dependency decisions based on complete package set.
   - How to handle REQUIRED/COMPONENTS?
   - Transparent to packages.

Sandia National Laboratories

Conclusion

- **Any other requirements we're missing**
  - Cmake compatibility
  - TPL components
  - TPL versions
  - TPL dependencies
- **Who would like to be the involved in the design?**
- **Anyone opposed to moving to find_package?**

Sandia National Laboratories

Future Directions

- **Automation of TPL build and install.**
  - The new Jenkins test setup provides a build farm with a variety of platforms (~20 machines currently).
  - Jenkins can dynamically distribute testing loads.
  - How do we make sure the right TPLs are available?
  - Options:
    - **TPL extra repository**
    - **Find modules that download**
- **Package dependencies using find_package.**
  - Does it make sense to use find_package for Trilinos package dependencies?
  - This might assist with some of the subpackage issues.
    - **Find_package(Thyra COMPONENTS Core EpetraAdapters)**

Sandia National Laboratories