Sandia National Laboratories

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TRILINOS, HPSF, EPETRA DEPRECATION

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OUTLINE

- HPSF
- Security
- Epetra Deprecation
- License and Copyrights

TRILINOS AND HPSF

TRILINOS JOINED HIGH-PERFORMANCE SOFTWARE FOUNDATION!

- Part of the **Linux Foundation**
  - Non-profit organization established in 2000 to support Linux development and open-source software projects
  - A neutral home where Linux kernel development can be protected and accelerated.
  - Dedicated to building sustainable ecosystems around open-source projects to accelerate technology development and commercial adoption

https://www.linuxfoundation.org/

- High-Performance Software Foundation (**HPSF**) aims to build, promote, and advance a portable core software stack for HPC by increasing adoption, lowering barriers to contribution, and supporting development efforts

https://hpsf.io/

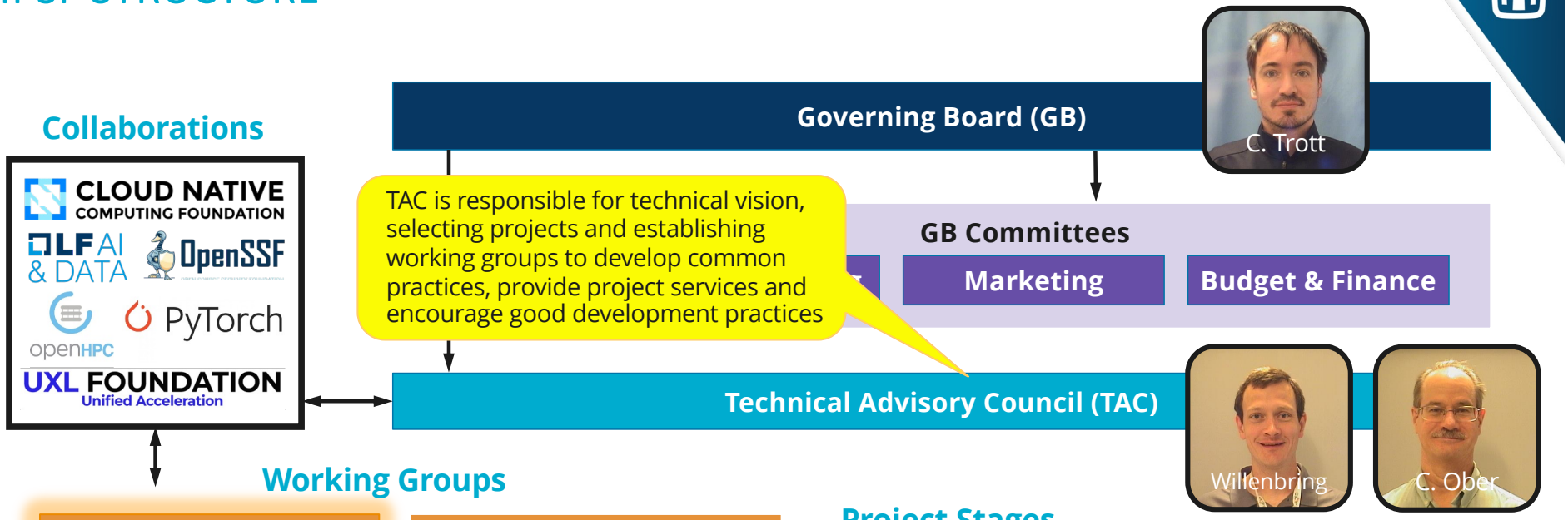
- HPSF goals
  - Serve as a neutral home for key projects in the high-performance software ecosystem
  - Promote use of HPSF projects in many open-source communities and organizations
  - Provide a transparent governance model that allows stakeholders from government, industry, and academia to steward the ecosystem together
  - Provide a clear path to incubate and onboard promising new projects
  - Ensure that HPC software is accessible and reliable by providing CI and turn-key builds
  - Ensure that HPC software is secure and ready for cloud through collaborations with CNCF and OpenSSF
  - Sponsor events and training to grow a diverse, skilled workforce for software in the HPSF ecosystem

HPSF MEMBERSHIP AND PROJECTS

- **Premier**
  - aws
  - Hewlett Packard Enterprise
  - Lawrence Livermore National Laboratory
  - Sandia National Laboratories
- **General**
  - AMD
  - intel
  - NVIDIA
  - Argonne NATIONAL LABORATORY
  - OAK RIDGE National Laboratory
  - Los Alamos NATIONAL LABORATORY
  - kitware
  - cea
- **Associate**
  - C-DAC
  - UNIVERSITY OF OREGON
  - UNIVERSITY OF MARYLAND

- **Projects**
  - Spack
  - kokkos
  - AMReX
  - WarpX
  - Viskores
  - HPCToolkit
  - Charliecloud
  - E4S
  - APPTAINER
  - TRILINOS

HPSF STRUCTURE

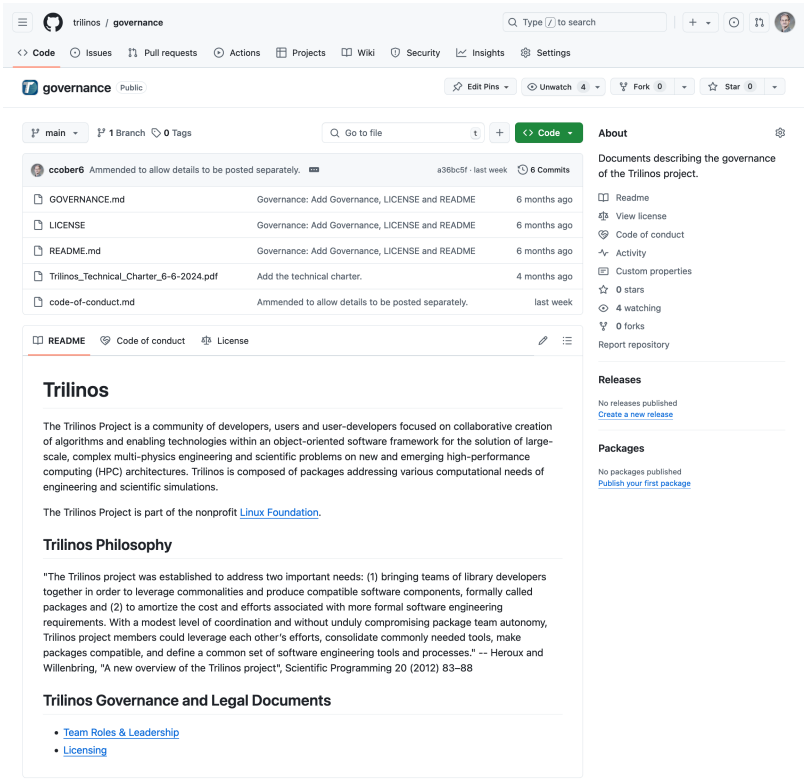


Project Stages

- Sandbox – Potential to be part of HPSF ecosystem
- **Established** – Major component of HPC ecosystem
- Core – Broad/sustained support from HPC community
- Emeritus – Nearing or at end of life

TRILINOS'S PROJECT PROPOSAL

1. Name of Project: **Trilinos**
2. Project Description
3. Statement on Alignment with HPSF's Mission
4. **Project Website** https://trilinos.org/ https://github.com/trilinos
5. **Code of Conduct**
6. **Governance Practices** Trilinos Technical Charter, Trilinos Governance
7. Sponsors from TAC
8. What is the project's solution for source control? GitHub
9. What is the project's solution for issue tracking? GitHub
10. Please list all external dependencies and their license



TRILINOS'S PROJECT PROPOSAL

11. Please describe your release methodology and mechanics
12. Please describe Software Quality efforts (CI, security, auditing)
13. Please list the **project's leadership team**
14. List **project committers** Pretest-Inspectors
15. Describe project's decision-making process
16. Maturity level of your project: **Established**
17. Official communication channels: GitHub and email
18. Social media accounts: Trilinos-Official - YouTube
19. Existing financial sponsorships: Sandia/DOE
20. Infrastructure needs or requests:
    - External CI support
    - Broader annual meeting (with HPSF?)
    - Refreshing our website

The Technical Steering Committee (TSC) has two groups:

1.Operational Leadership maintains CI/CD processes and develops software to meet application needs. The current members are:

1. Curtis Ober (SNL) (Trilinos Product Owner) – ccober6
2. Sam Browne (SNL) (DevOps Lead) – sebrowne
3. Roger Pawlowski (SNL) (Core Area Lead) – rppawlo
4. Christian Glusa (SNL) (Solvers Area Lead) – cgcgcg
5. Mauro Perego (SNL) (Discretization and Analysis Area Lead) – mperego

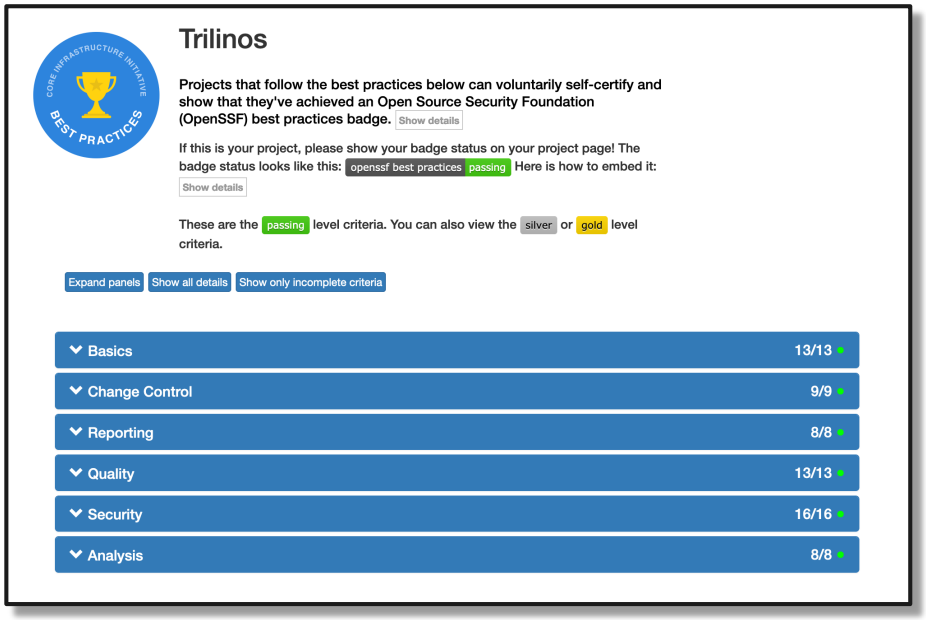
2.Strategic Leadership primarily defines and develops Trilinos strategic research directions to support future application needs. The current members are:

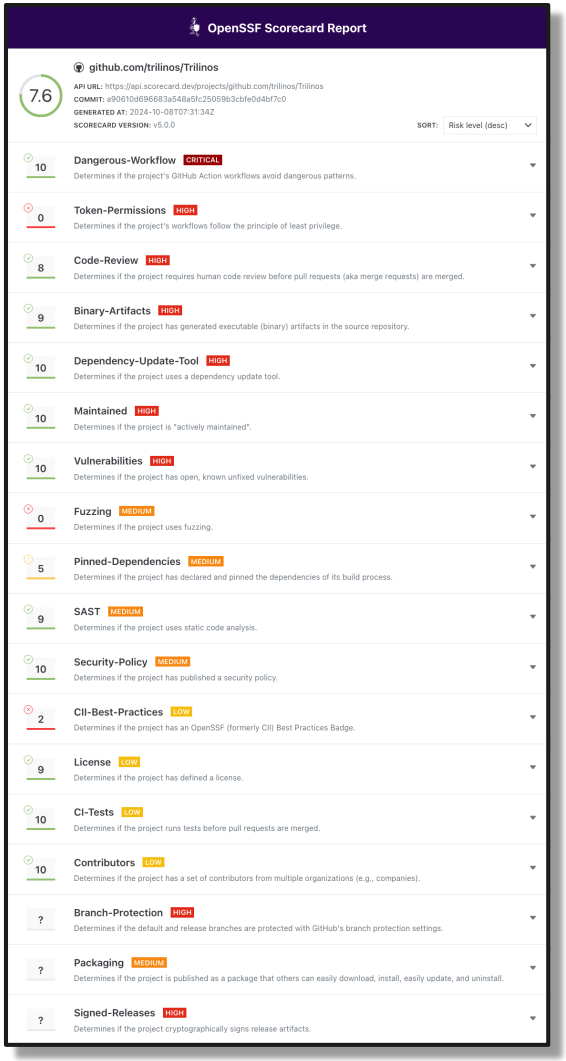
1. Eric Phipps (SNL) – etphipp
2. Siva Rajamanickam (SNL) – srajama1
3. Heidi Thornquist (SNL) – hkthorn
4. Jim Willenbring (SNL) – jwillenbring
5. Michael Wolf (SNL) – mmwolf

Package Owners lead the package team in performing research and development, and coordinating with other Trilinos packages.

TRILINOS AND OPENSSF

- Thanks to Chris Siefert for getting this done!



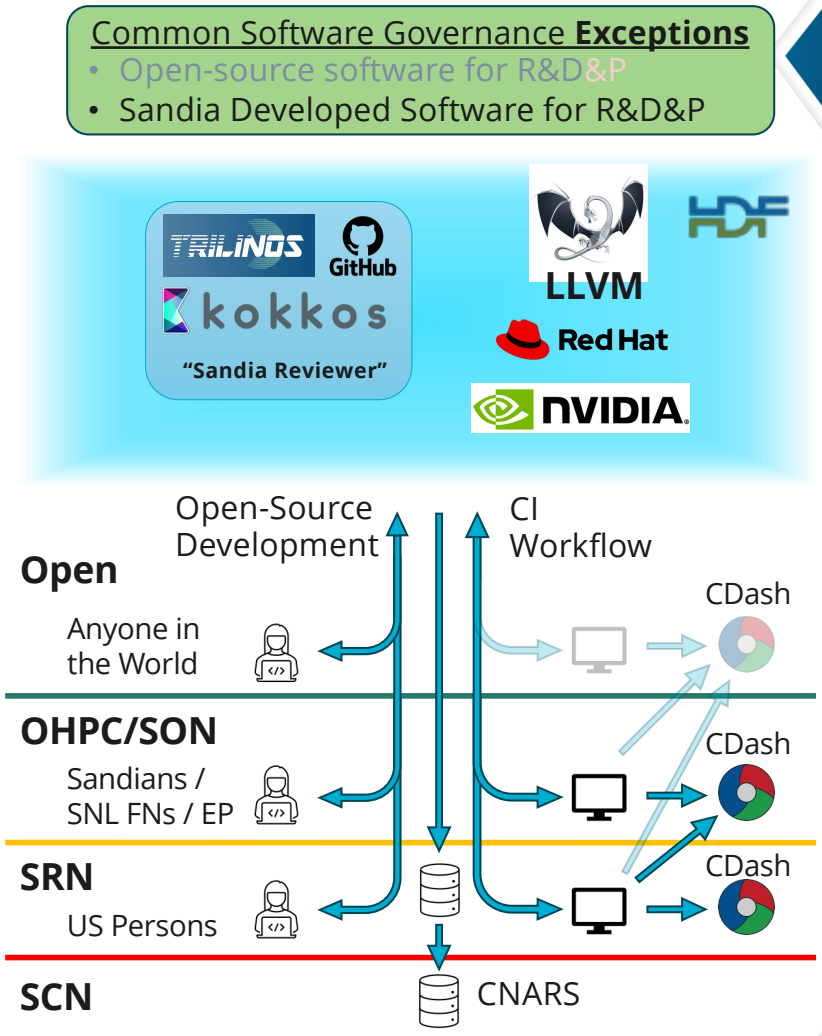


SECURITY

PREVIOUS TRILINOS CI/CD PROCESS

Three basic uses cases

1. Open-Source Development
    1. Developers and applications need to pull/build/test any open-source software directly
    2. Need as few/no hurdles and as flexible as possible
2. CI workflow
    1. Automated on OHPC/SON/SRN
    2. Code changes to applications in <1 day including integration testing
    3. Includes CI on SNL internal resources
3. Deploy for production use
    1. On OHPC/SON/SRN/SCN



NEW TRILINOS CD/CI PROCESS

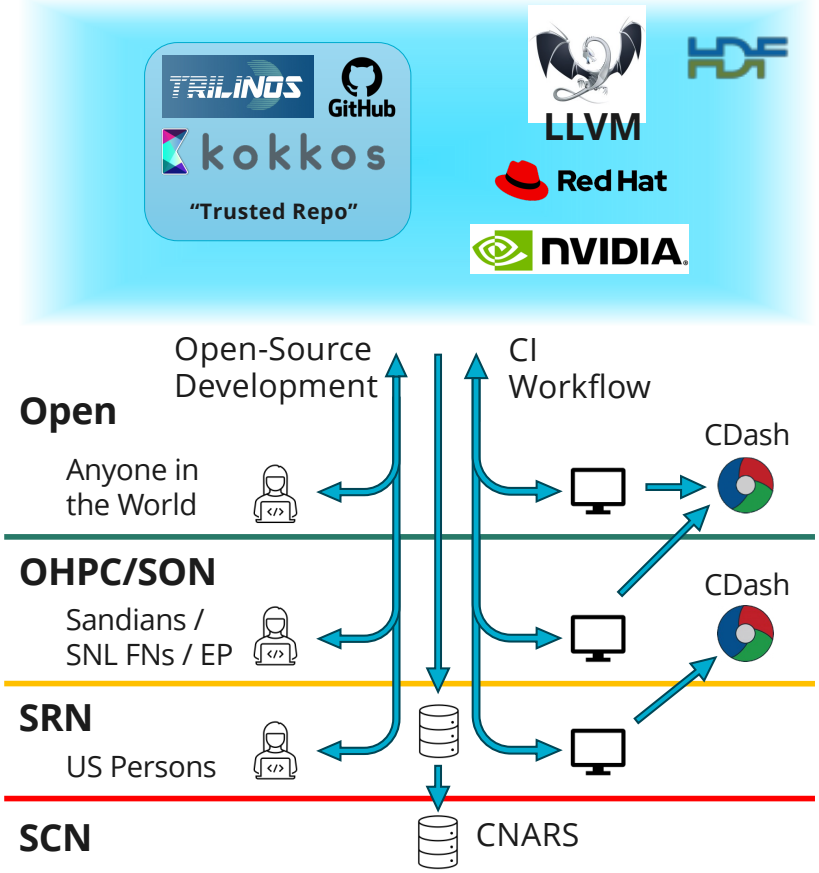
Common Software Governance **Exceptions**
- Open-source software for R&D&P
- Sandia Developed Software for R&D&P

Complications

1. Non-Sandian or Foreign National Leadership
    1. True of most OSS, e.g., RHEL, LLVM, HDF5, Boost, …
2. Having only Sandia reviewers causes complications
    1. Does not allow for external independent development
3. Posting CI results to external website requires approval?

Goals

1. Developers need to be able to “git clone/pull/push” freely
2. Install directly from external repo, e.g., spack install
3. CI needs to be short (<1 day)
4. Trilinos is a “trusted repo”
    1. Improve security with containers, SAST and SCA, e.g., GitHub.
    2. Collaborate with CNCF and OpenSSF to ensure it is secure and ready for cloud
5. Post Sandia internal build/test results externally
6. Utilize external/open cycles for CI Workflow



OS DEVELOPMENT AND CI RESULTS RELEASE

Software Governance

- Move from "Sandia Developed Software" to "Open-Source Software" for R&D&P

Cybersecurity

- Use containers to limit access to Sandia resources.
- Utilize security analysis tools to prevent inclusion of malicious software.
- Run on OHPC/SON to limit access to information.

Information Release (IR)

- Post Trilinos CI results to an open external website
- Work with DC to develop process outside IR application.
- Document the process.

Classification (DC)

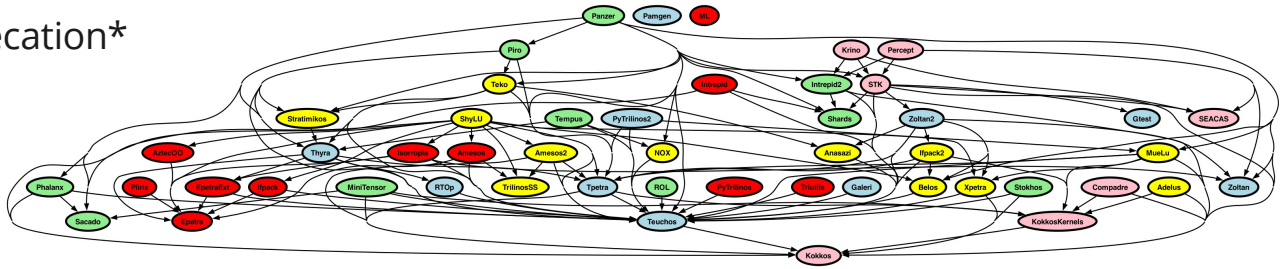
- Requested perpetual DC to help with the automation of process.
- Everything starts in the open, runs on the OHPC/SON, and is posted to the Open.
- Work with Cybersecurity to manage security issues.

EPETRA DEPRECATION

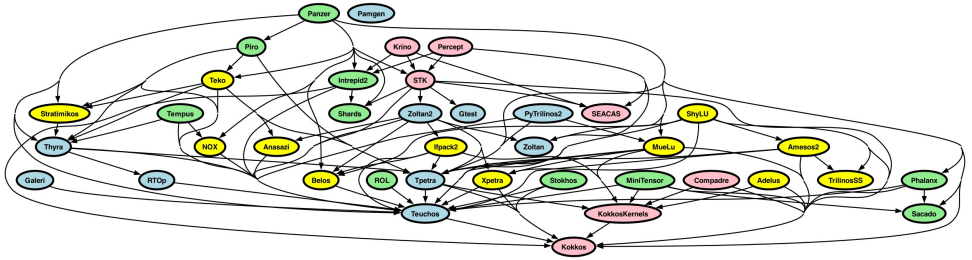
EPETRA / EPETRAEXT DEPRECATION

- Driver
  - Tpetra has been available for many years.
  - Reduce costs related to supporting duplicative code.
  - Reduce complexity associated with the number of Trilinos packages.

Pre-deprecation*



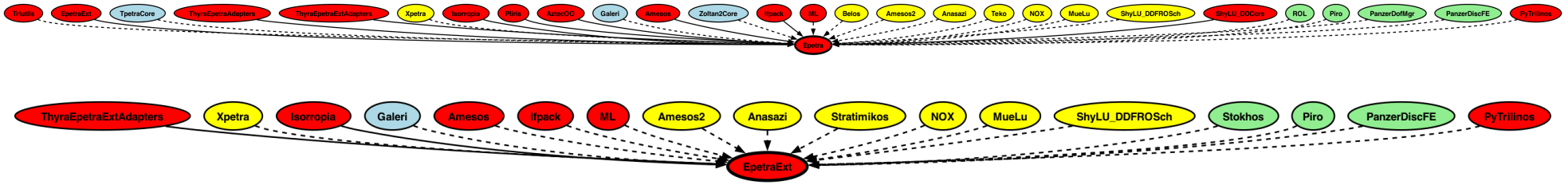
Post-deprecation*



* Required Dependencies

AFFECTED PACKAGES

- Packages slated for deprecation/archival (15) (solid lines)
  - Amesos, AztecOO, Epetra, EpetraExt, Ifpack, Intrepid, Isorropia, ML, New Package, Pliris, PyTrilinos, ThyraEpetraAdapters, ThyraEpetraExtAdapters, Triutils, and ShyLU_DDCore
- Packages with optional library/test dependency (18) (dashed lines)
  - Amesos2, Anasazi, Belos, Galeri, MueLu, NOX, PanzerDiscFE, PanzerDofMgr, Piro, ROL, ShyLU_DDFROSch, Teko, TpetraCore, TrilinosCouplings, Stokhos, Stratimikos, Xpetra, and Zoltan2Core
- Packages with only optional test dependency (3) (dashed lines)
  - Ifpack2, Tempus, and Zoltan2



TIMELINE FOR EPETRA DEPRECATION

- FY2024
  - DevOps added a build without deprecated packages. All is passing!
    - However equivalent Tpetra functionality may be missing.
  - DevOps introduced compiler warnings if a deprecated package is utilized.
    - If you are seeing these warnings, **do not ignore** and fix it (e.g., move to Tpetra stack).
  - Trilinos packages begun removal/replacement of Epetra functionality and tests.
- FY2025
  - Stakeholders should begin removal/replacement of Epetra functionality.
    - Can develop/test/compare with and without Epetra.
    - Notify package developers as soon as possible, if missing functionality or have performance regression!
  - Ross Bartlett is working on coverage code to CDash. Package leads should utilize it.
- End of FY2025 (~Sep. 2025)
  - Deprecation/Archival of Epetra/EpetraExt with Trilinos 17.0

FY2024

- Enabling any deprecated package generates a configure-time warning
- Secondary Tested (ST) packages are auto-ENABLED by default

< 16.0 Release

FY2025 Package Deprecation

- Enabling any deprecated package generates a configure-time warning
- Including any header from any deprecated package generates a build-time warning (on by default, may be disabled with SHOW_DEPRECATED_WARNINGS)
- ST packages are DISABLED by default
- Deprecated packages + HIDE_DEPRECATED_CODE yields a configure error

16.0 Release

End of FY205 Package Removal

- Enabling any deprecated package generates yields a configure error
- ST packages are auto-ENABLED by default

17.0 Release

LICENSING AND COPYRIGHT

LICENSING AND COPYRIGHT

General Information

- We have a guidance wikipage (https://github.com/trilinos/Trilinos/wiki/Guidance-on-Copyrights-and-Licenses).
- Completed one last copyright assertion for Trilinos through Sandia and DOE!
- Copyrights and licenses can be included in files and directories.
- COPYRIGHT and LICENSE files are placed at base directory of packages or included software.
- Generally following Linux Foundation's Copyright Notices in Open Source Software Projects.
- Do not remove someone else's copyright, unless you have permission!
- Updates to the copyright and license were not completed on Epetra Stack packages, because they are slated for deprecation.
- Updates were not done on snap-shotted packages.

COPYRIGHT AND LICENSE FILES

- COPYRIGHT file
  - Title
  - NTESS copyright statement
  - General Teuchos contributors statement
- LICENSE file
  - SPDX License Identifier
  - Copyright statement
  - License statement
- File Header
  - A compact template
  - Removed ~270k lines of repetitive comments!

```
                    Teuchos: Common Tools Package
                       Copyright (2004) NTESS

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LLC (NTESS). Under the terms of Contract DE-NA0003525 with NTESS, the
U.S. Government retains certain rights in this software.

Copyright the Teuchos contributors.
```

```
SPDX-License-Identifier: BSD-3-Clause

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LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
POSSIBILITY OF SUCH DAMAGE.
```

```
// @HEADER
// ************************************************************************
//                    Teuchos: Common Tools Package
//
// Copyright 2004 NTESS and the Teuchos contributors.
// SPDX-License-Identifier: BSD-3-Clause
// ************************************************************************
// @HEADER
```

COPYRIGHT AND LICENSE – GENERAL COMMENTS

- Generally, you **do not** need to add your copyright to the copyright header.
  - Your contribution is captured in the git history.
  - You have "signed-off" with the Developer Certificate of Origin ("DCO")
  - "Copyright the <package name> contributors." statement.
- Many files do not need the Copyright Header
  - Source code only needs the Copyright Header (may include test code?)
  - Exclude files related to building the software (e.g., cmake files and build scripts)
  - Exclude documentation (falls under different copyright law)
- Package README.md
  - Added "Copyright and License" and "Questions?" sections.

```
# Teuchos: Common Tools Package

## Copyright and License
See teuchos/COPYRIGHT, teuchos/LICENSE, https://trilinos.github.io/license.html and individual file headers for additional information.

## Questions?
Contact lead developers:
 * Teuchos team       (GitHub handle: @trilinos/teuchos)
* Roger Pawlowski     (GitHub handle: [rppawlo](https://github.com/rppawlo) or rppawlo@sandia.gov)
* Roscoe A. Bartlett  (GitHub handle: [bartlettroscoe](https://github.com/bartlettroscoe) or rabartl@sandia.gov)
```

QUESTIONS?

TRILINOS PHILOSOPHY

"The Trilinos Project is an effort to facilitate the design, development, integration and ongoing support of mathematical software libraries within an object-oriented framework for the solution of large-scale, complex multi-physics engineering and scientific problems. Trilinos addresses two fundamental issues of developing software for these problems: (i) ***Providing a streamlined process and set of tools for development of new algorithmic implementations*** and (ii) ***promoting interoperability of independently developed software***."

Heroux, et al, "An Overview of the Trilinos Project", ACM Transactions on Mathematical Software, Vol. V, No. N, December 2004, Pages 1–27.

"The Trilinos project was established to address two important needs: (1) bringing teams of library developers together in order to ***leverage commonalities and produce compatible software components***, formally called packages and (2) to ***amortize the cost and efforts associated with more formal software engineering requirements***. With a modest level of coordination and without unduly compromising package team autonomy, Trilinos project members could ***leverage each other's efforts, consolidate commonly needed tools, make packages compatible***, and define a common set of software engineering tools and processes."

Heroux and Willenbring, "A new overview of the Trilinos project", Scientific Programming 20 (2012) 83–88