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Trilinos Software Engineering Technologies and Integration Capability Area Overview

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
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Trilinos Software Engineering Technologies and Integration

- Numerical Algorithm Interoperability and Vertical Integration
  - Abstract Numerical Algorithms (ANAs)
  - Thyra (Interoperability and vertical integration of ANAs)
  - Epetra (Interoperability of element-based numerical algorithms)
- General Software Interoperability and Integration
  - Memory management (Teuchos::RCP, ...)
  - User input and configuration control (Teuchos::ParameterList, ...)
  - User introspection (Teuchos::FancyOStream, ...)
- Skin packages (wrappers for other languages)
  - PyTrilinos, ForTrilinos, Ctrilinos
- General Software Quality and Design
  - Separation of “Stable” vs. “Experimental” code
  - Day-to-day stability of “Stable” code
- Lean/Agile Software Engineering Principles and Practices
  - Internal Trilinos issues
  - External customer issues

Lean/Agile Software Engineering Principles and Practices

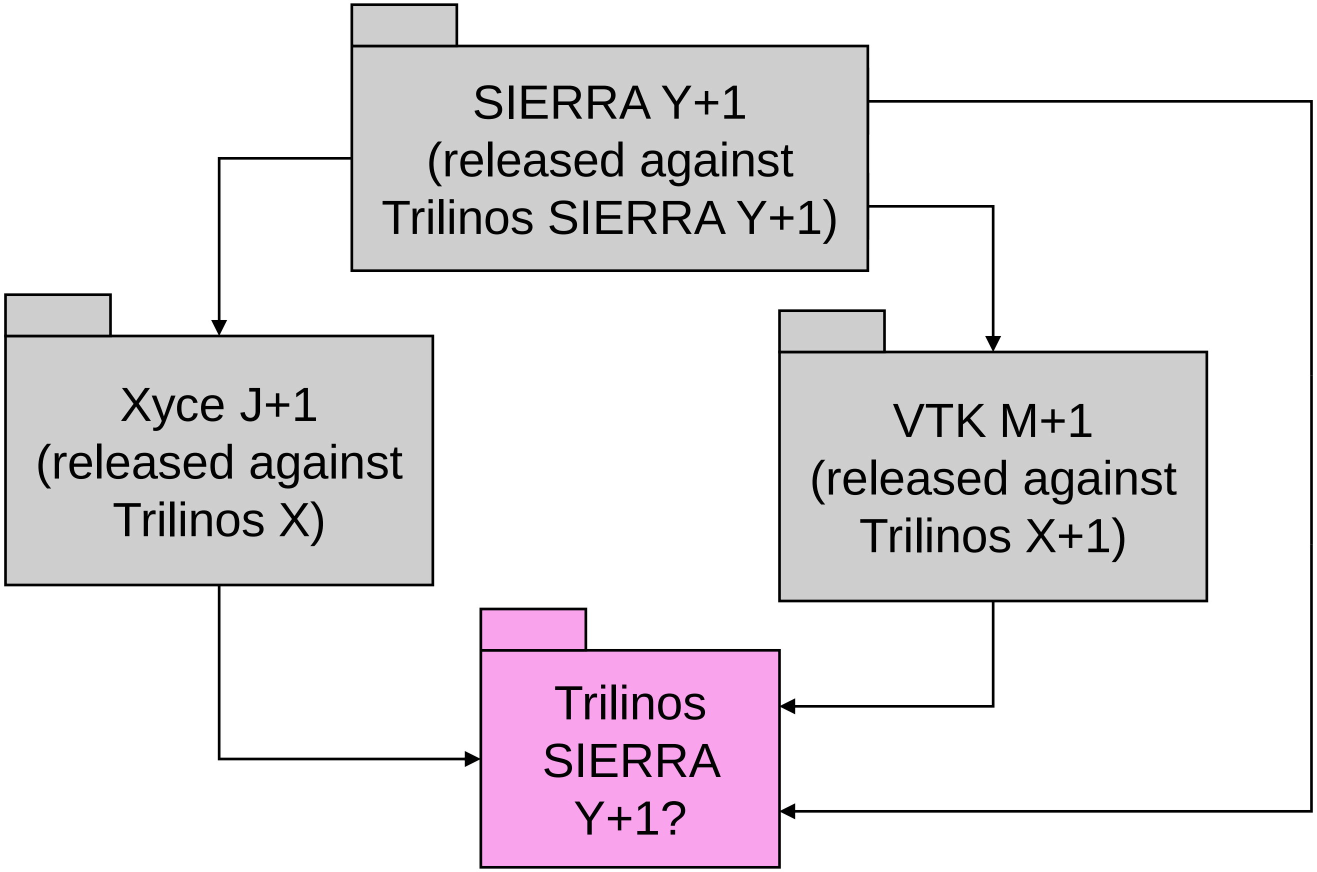
- Internal Trilinos development tools principles and practices
  - Scalability and robustness of build system and test tools
  - Continuous integration development principles and practices
  - Release process principles and practices

- Integration with customer application codes
  - Coordination of co-development with customer application codes (i.e. daily integration and asynchronous continuous integration)
  - Coordination of release schedules with customer application codes
  - Regulated backward compatibility and smooth upgrades

Backward Compatibility Considerations

- Backward compatibility is critical for:
  - Safe upgrades of Trilinos releases
  - Composability and compatibility of different software collections

Example of the Need for Backward Compatibility



Multiple releases of Trilinos presents a possible problem with complex applications

Solution:

=> Provide perfect backward compatibility of Trilinos X through Trilinos SIERRA Y+1

Backward Compatibility Considerations

- Backward compatibility is critical for:
  - Safe upgrades of Trilinos releases
  - Composability and compatibility of different software collections

- Maintaining backward compatibility for all time has downsides:
  - Testing/proving backward compatibility is expensive and costly
  - Encourages not changing (refactoring) existing interfaces etc.
    - => Leads to software “entropy” which kills a software product

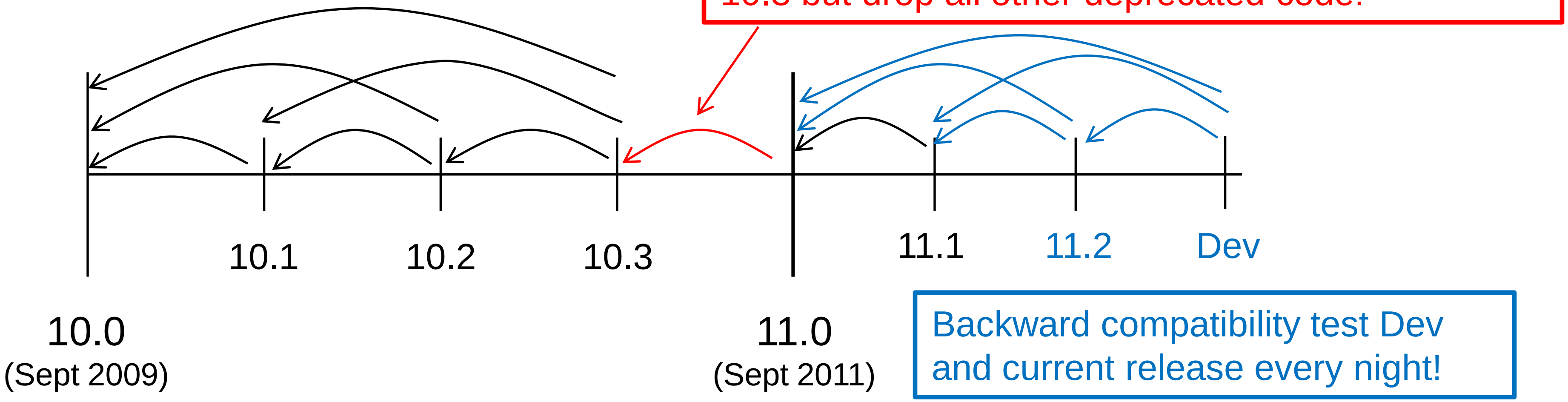
- A compromise: Regulated backward compatibility (Tentative)
  - Maintain a window of perfect backward compatibility over major version numbers (e.g. 1-2 years)
  - Provide “Deprecated” compiler warnings
    - Example: GCC’s __deprecated__ attribute enabled with

      –DTrilinos_SHOW_DEPRCATED_WARNINGS:BOOL=ON
  - Provide strong automated testing of Trilinos backward compatibility
  - Drop backward compatibility between major version numbers

Regulated Backward Compatibility for Trilinos (Tentative)

- Releases of Trilinos X guarantee backward comparability between releases X.Y and X.Z where Z > Y
  - Example: Trilinos10.5 is backward compatible with 10.0 through 10.4
  - Example: Trilinos 11.X is not compatible with Trilinos 10.Y
- Major Trilinos version numbers change every 1-2 years
  - Example: Major Trilinos versions change every 2 years with 2 releases per year

Maintain backward compatibility of 11.0 with only 10.3 but drop all other deprecated code!



Backward compatibility test Dev and current release every night!

- Actual Target (Tentative):
  - Keep major Trilinos version number for two years
  - Put out releases quarterly (with minor releases X.Y.Z as needed)

Trilinos Software Engineering Capabilities Area Webpage

http://trilinos.sandia.gov/capability_areas.html