ATDM Agile Components

- Developing CS components to support applications
  - Embedded in teams
  - Develop directly in the applications

- Four major thrust areas
  - Mesh Database
  - Discretization Tools
  - Time Integration and Nonlinear Solvers
  - ANA Abstractions

Mesh Database
(Sjaardema and Carleton)

- Rethink how application uses the mesh database
  - "Mesh as scaffolding"
  - I/O and simple tools
  - Application can define optimal structures
  - Adaptivity is low priority

- Requirements
  - Very large meshes (too big for writing to disk)
  - Structured, unstructured and hybrid mesh (mixed struct/unstruct blocks in the same mesh)

- Capabilities: Focus on IOSS in SEACAS
  - Focus on IOSS abstractions (Kokkos version of interface)
  - Data Warehouse integration
  - Inline refinement with STK/Percept
  - CGNS: structure and unstructured concrete mesh db for CFD
  - Hybrid tools

Discretization Tools

- Finite element packages (Panzer and Phalanx)
  - Panzer and Phalanx (Bettencourt, Cyr, Gates, Miller, Pawlowski)
    - Transition to Kokkos
    - Transition to Intrepid2/refactor (DynRankView)
    - Exploratory AMT (Kokkos and Darma)
    - New DG Capability
    - High Order Elements (H-Div, H-Grad, H-Curl)
  - Intrepid2 (Kim, Perego)
    - High Order Elements (H-Div, H-Grad, H-Curl)
    - Refactor to use DynRankView directly

- Tools for Reentry
  - Tpetra Block CRS (Bradley)
  - Transition and Optimization of assembly kernels for Kokkos (Bradley)
  - DOMI: structured grid tools (Spotz): Demo, possibly Kokkosization

Time Integration, Nonlinear Solvers and Abstractions for ANAs

- Time Integration (Ober, Pawlowski, Conde, Mota)
  - New time integration library: Tempus
  - See Curt's talk!
  - Requirements gathering based on Rythmos
  - Planned this year:
    - Implicit RK
    - IMEX for EM
    - Integration into ATDM applications
    - Second derivatives in time

- Nonlinear and Abstractions (Toth, Bartlett, Pawlowski)
  - Modify Thyra Vector abstraction for nonlinear solve to avoid rtops
  - Demonstration of nonlinear in EMPIRE
  - Begin a long term plan for refactor of Thyra Objects
  - ModelEvaluator Paper