Update on HPC Efforts in NUDT

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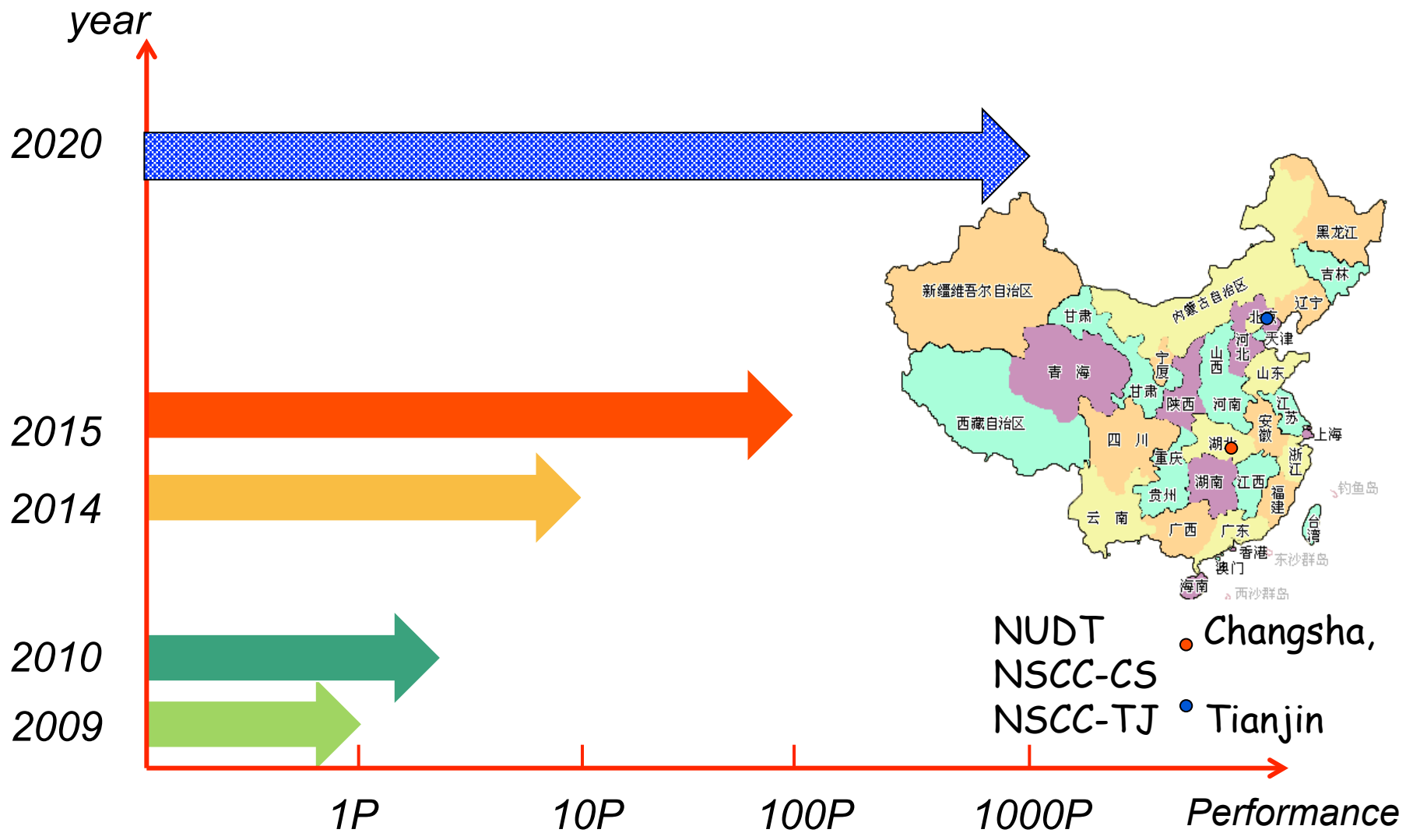
Outline

- Roadmap
- Hardware
- Software
- Application

Overview of TH Roadmap



Roadmap

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- 12-FiveY project (-2015)
  - System
    - 100P
    - funding
      - MOST (863)
      - Local government
  - Software(year 2011)
    - NSFC 37 million for basic algorithm and computable model
    - MOST(863) 80 million for Domain applications
- 13-FiveY project (-2020)
  - ~ 1 E
  - Funding ?

Highlights of future TH systems

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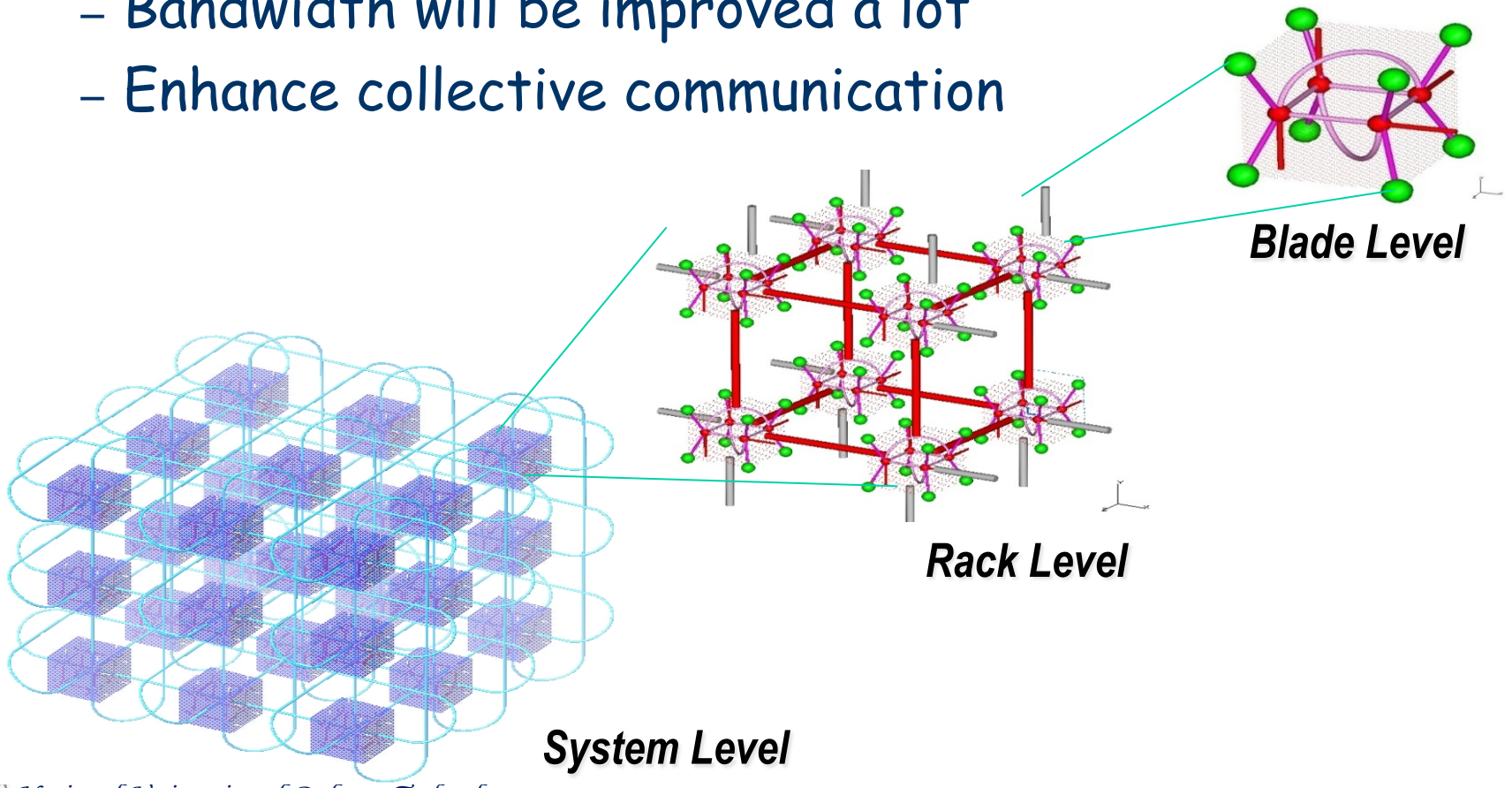
- Heterogeneous parallel architecture
- Multiple-dimension interconnection network
- Hierarchy I/O storage system
- Autonomic fault tolerant management
- Domain specific programming framework
- Adaptive power aware computing

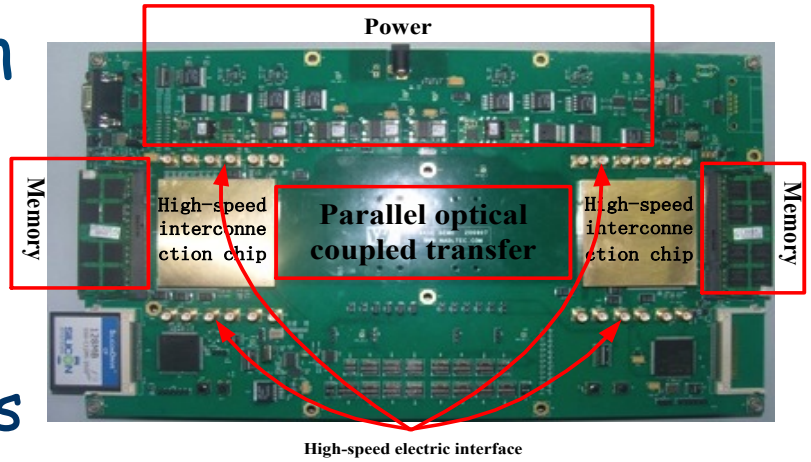
Hardware

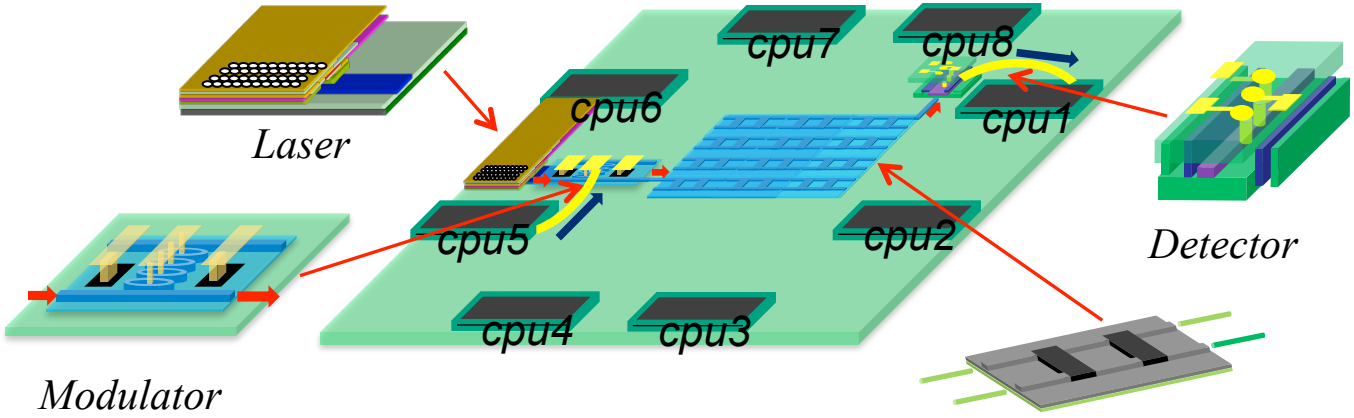
- Multiple-dimension interconnection network
  - Support more than 100,000 nodes
  - Bandwidth will be improved a lot
  - Enhance collective communication



Hardware

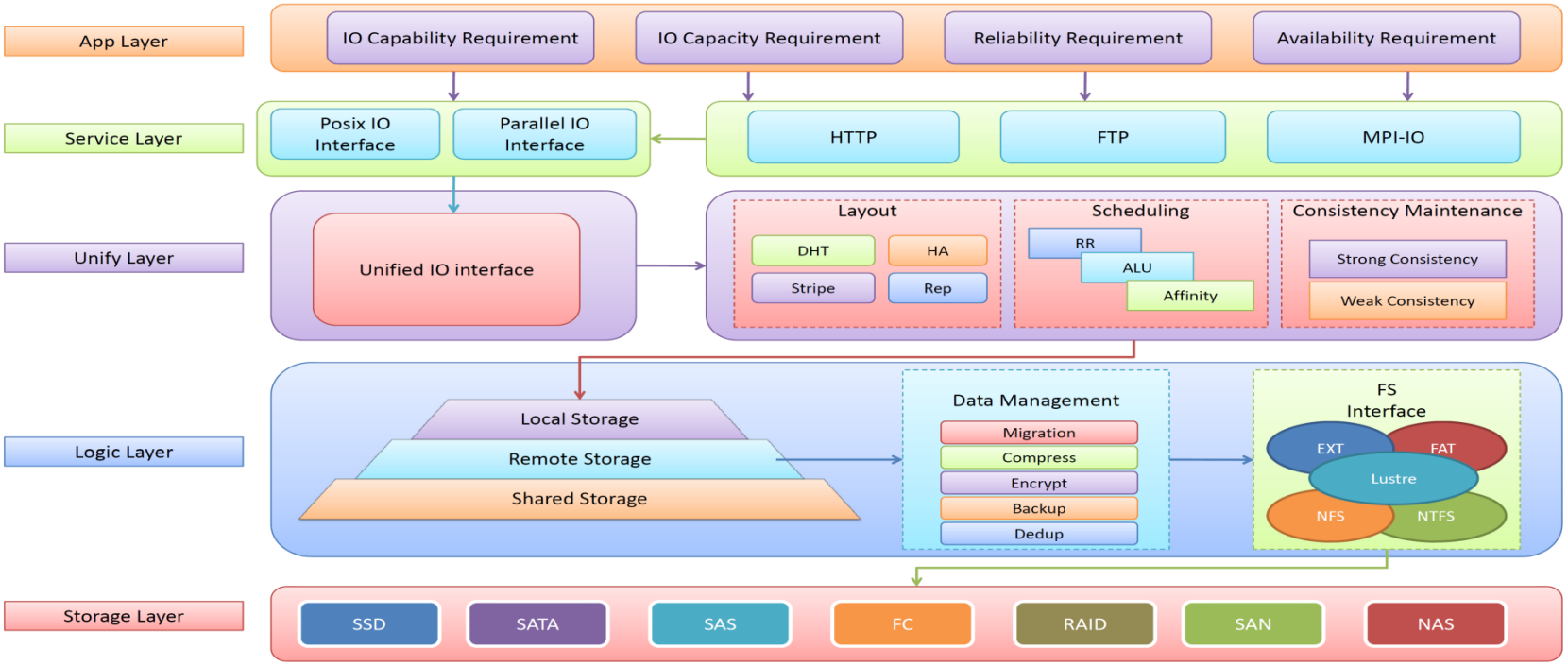
- Inter-chip optical connection
  - Optical interface between processors
  - Optical switch between CPUs is under research





Software

Large-scale Hybrid Tiered File System

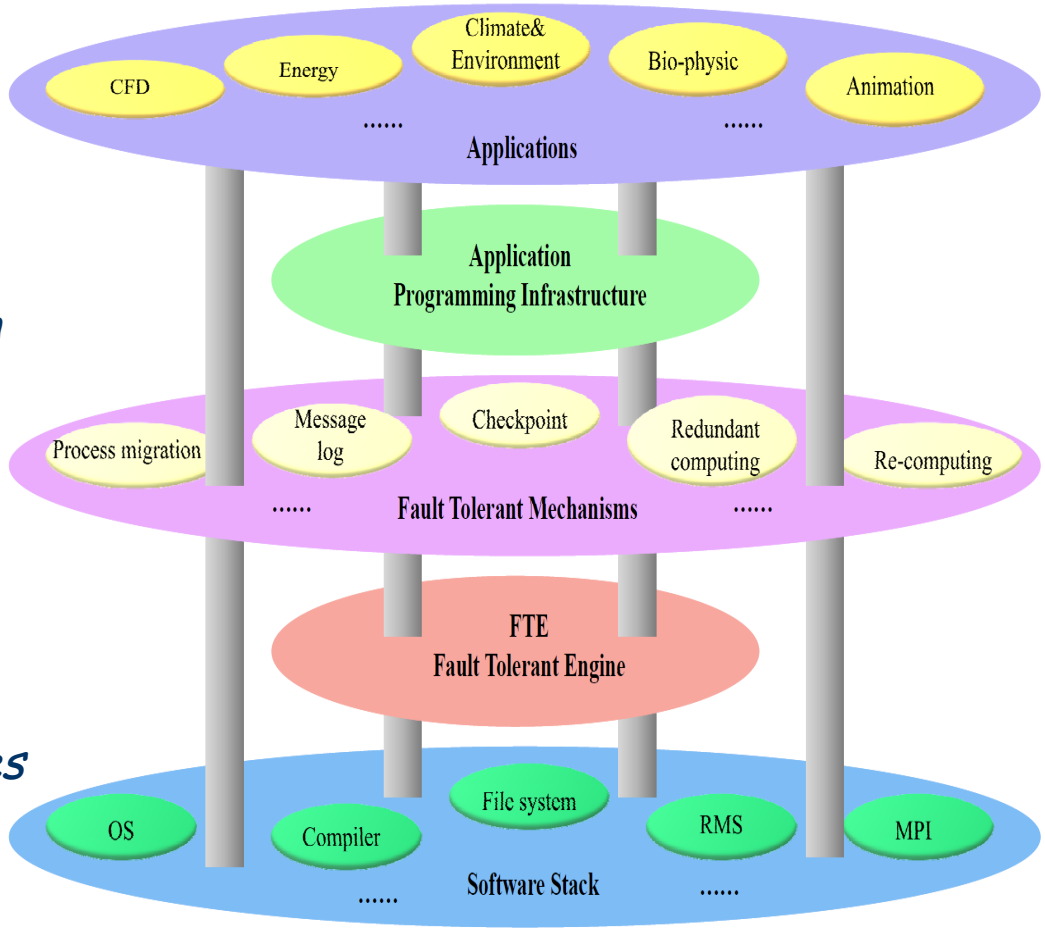


- *Scalability to achieve >1TB/s I/O bandwidth by leveraging spatial locality*
- *Usability by federating multi-level storage into unified name space*
- *Flexibility by key components re-configuration for application optimization*
- *Applicability for supercomputers and clusters with hybrid infrastructure*

Software

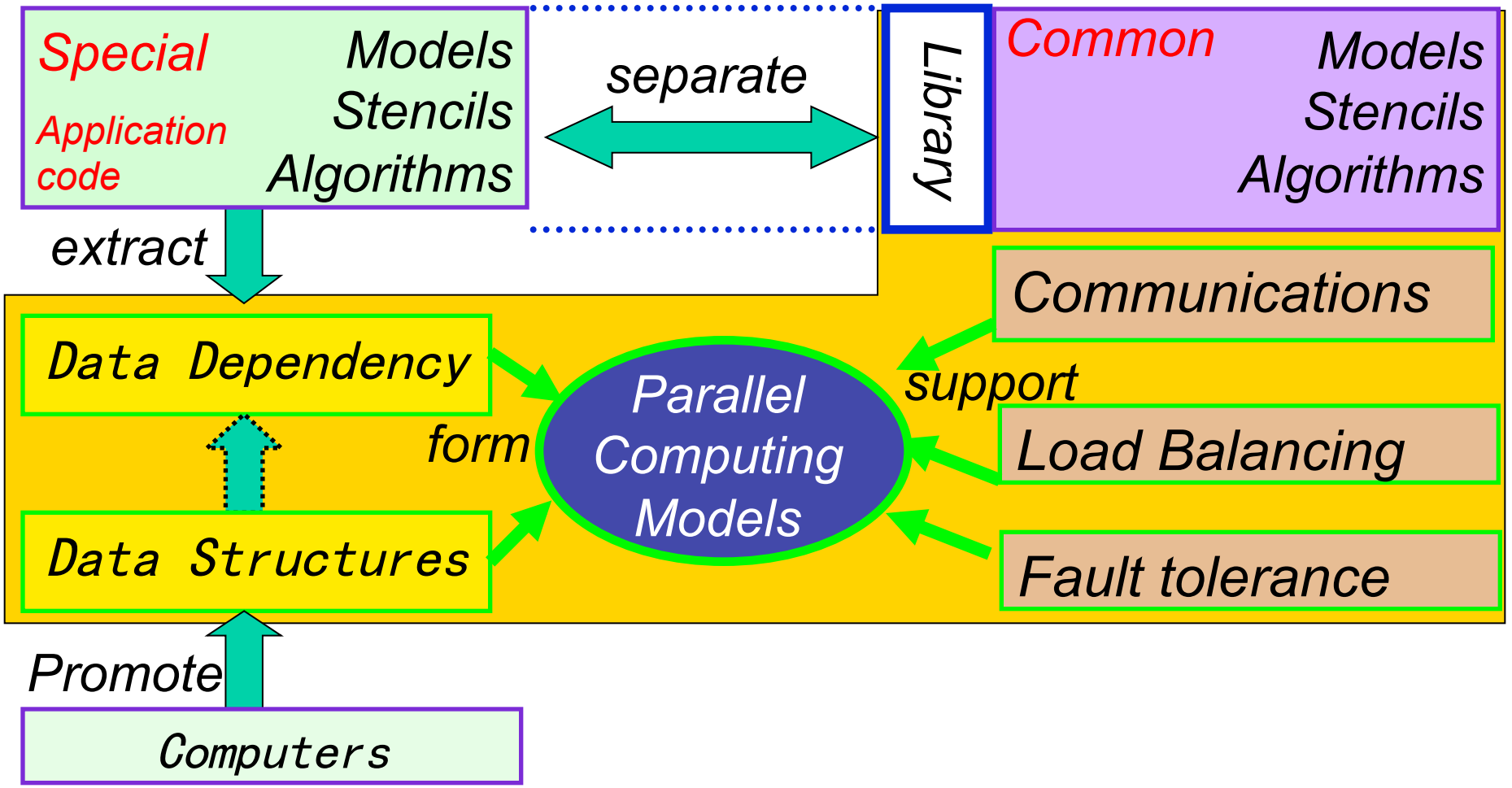
Resilience computing Framework

- Capability to support post-petaflops and Exascale computing
- Collaboration with whole system software stack
- Coherent fault detection
- Coordinate fault tolerant decision
- Cooperation of multiple fault recovery mechanics
- Combination of proactive and reactive strategies
- Customizable fault detection, prediction and recovery approaches
- Support various parallel models



Software

Parallel programming Framework



Software

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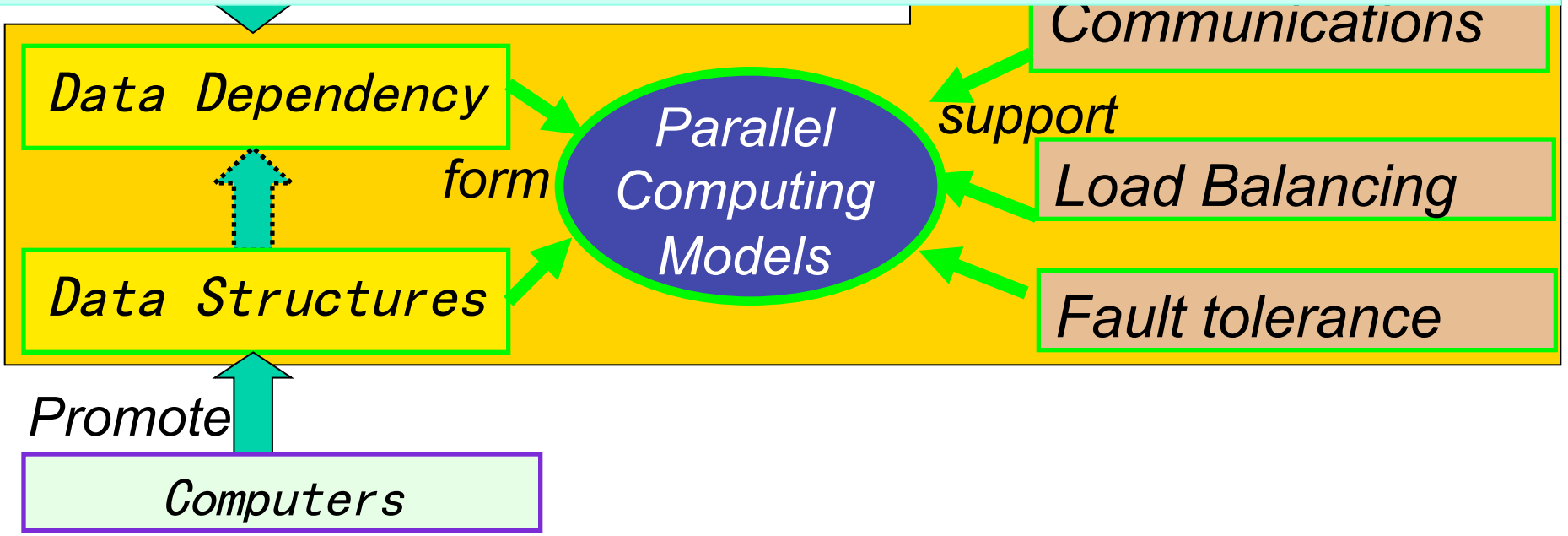
Parallel programming Framework

Hide the complexity of programming(mil cores/hybrid)
Integrate the efficient parallel fast numerical algorithms
Provide efficient data structures and solver libraries
Support software engineering for code reusing USERS



Software

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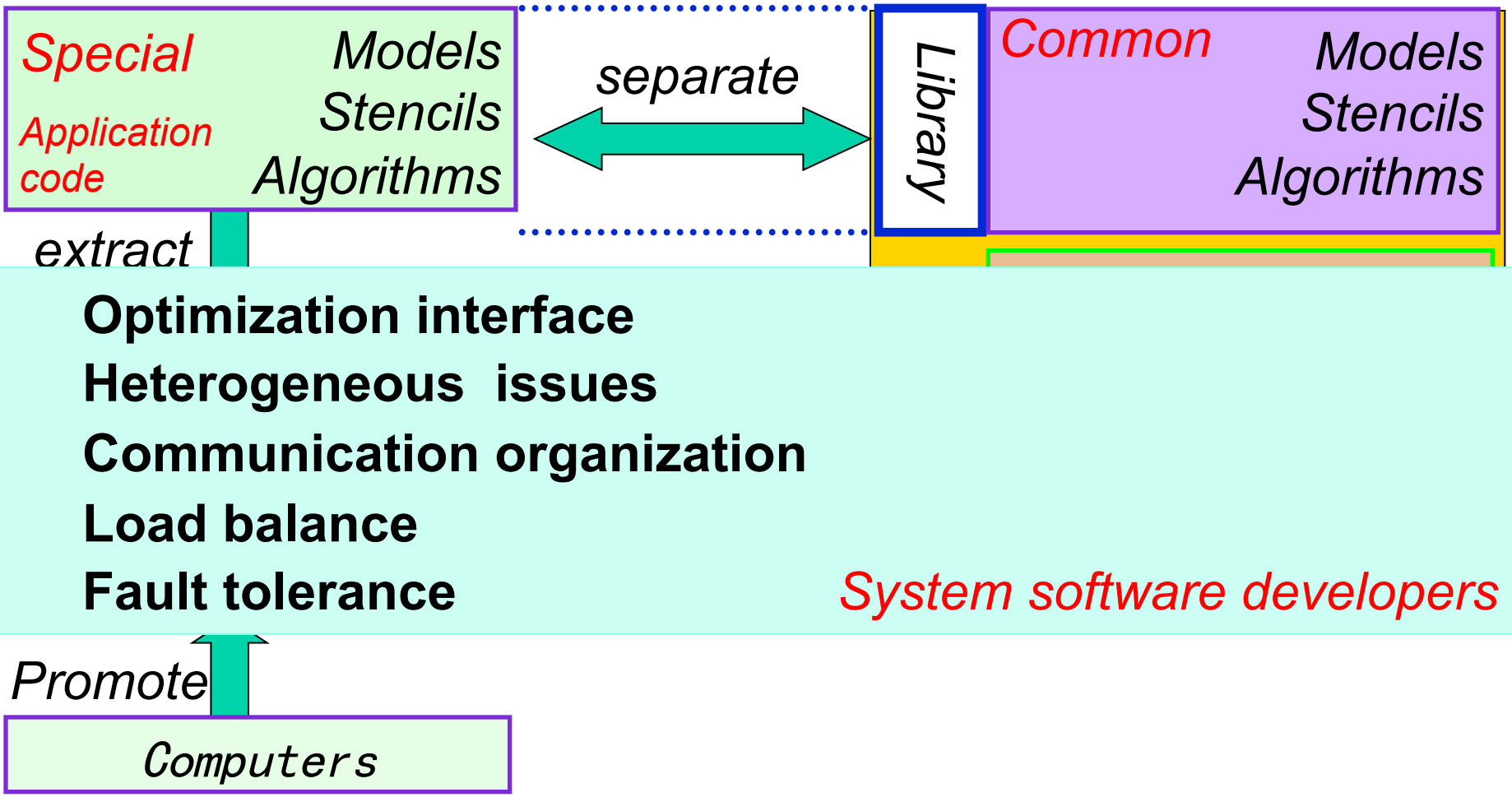
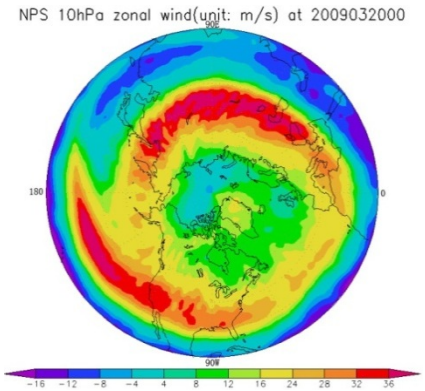
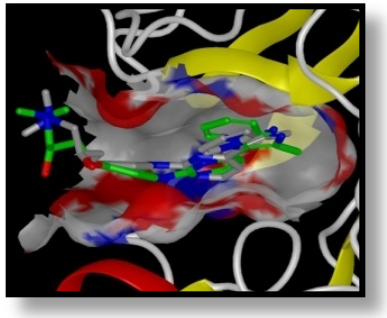
Parallel programming Framework

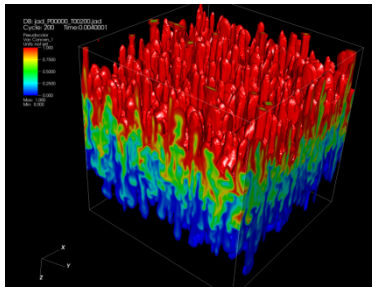


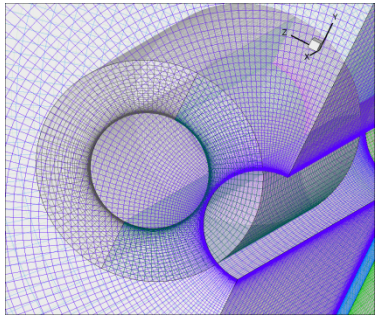
Applications

- Five priority areas
  - Climate & Environment
  - Bio-medicine
  - New energy
  - Equipment engineering
  - Animation









Summary

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- Towards Next generation of TH system
  - Heterogeneous architecture
  - New enabling technology
  - High performance scalable interconnection
  - Balance the computing and data accessing
  - Feasible fault tolerant mechanics
  - Usable domain-specific programming framework
  - Selected priority application areas

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Thank you