

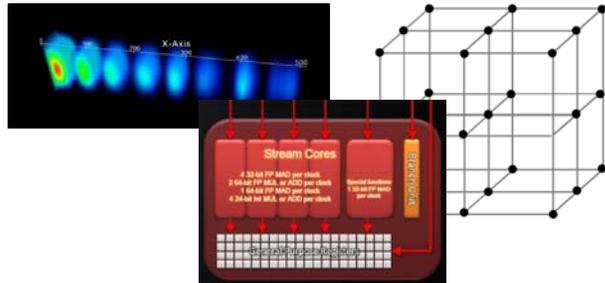


S&T Campaign: Computational Sciences
Predictive Simulation Sciences

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Research Objective

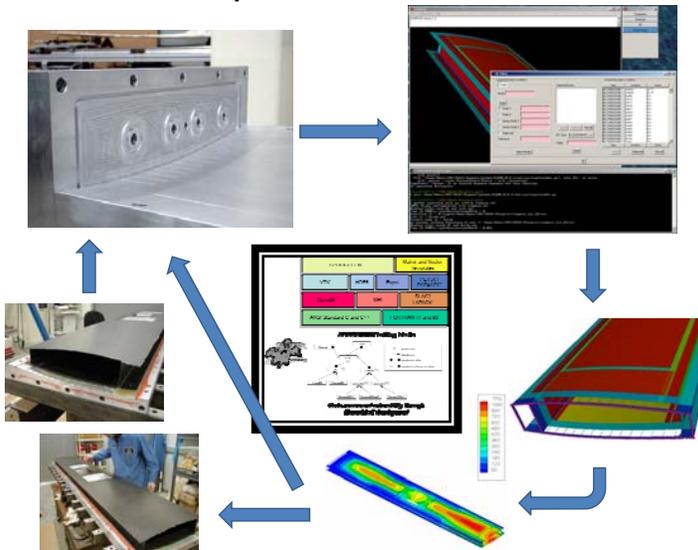
- ARL's goal is to develop an accurate/stable finite difference/time domain physics-based model of laser-beam interactions with materials leveraging high performance computing methods
 - Ultimately the ability to accurately predict the laser/material interactions will be coupled to higher length scale and multi-physics models
 - Lasers are commonly used in 3D printing devices to provide a heat source for targeted melting or sintering of materials



The structured grid/time stepping formulation of the traditional FDTD method fits well with advanced computing architectures such as GPUs and low power many-core processors

Challenges

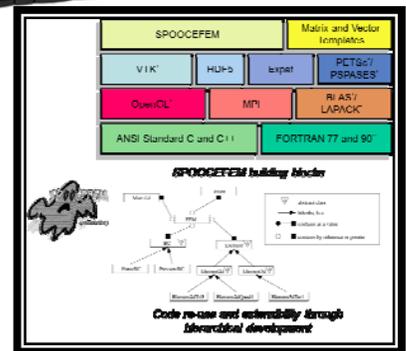
- Accurate understanding of processing parameters is key to predictive modeling
 - Need to work with process experts and developers



Manufacturing process cycle with integrated M&S capability. Cycle shows initial tooling and CAD model provide inputs to M&S capability. Prediction of resin injection and part production, iterates with tooling modification as needed.

ARL Facilities and Capabilities Available to Support Collaborative Research

- ARL-APG is home to the U.S. Army Distributed Shared Resource Center for High Performance Computing including multiple CPU/GPU hybrid systems



Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- ARL has a robust computer architectures research capability with many advanced architectures available for development
- We would like to collaborate with academia to develop some of the physical M&S capabilities gaps in our current set of tools

