Argonne opens computing center for transportation research

Argonne, in cooperation with the U.S. Department of Transportation's Research and Innovative Technology Administration, has announced the opening of the Transportation Research and Analysis Computing Center (TRACC). This new, state-of-the-art modeling, simulation and high performance computing center is opening its doors at the DuPage National Technology Park, co-located with the DuPage Airport Authority in West Chicago, Illinois.

TRACC, provides advanced computing capability and high-tech models of a number of different transportation-related systems, vehicles and components. A new high-performance computing system, installed at the TRACC site, delivers substantial power to compute exceedingly large and detailed simulations.

With this computing power, TRACC will be able to deliver second-by-second simulations of traffic in an entire metropolitan region, model the response of bridges under stress (such as high wind or flood conditions), evaluate vehicle crashworthiness through computational crash test simulations and examine the reliability and optimize the design of roadside safety structures. The center will also concentrate its computing power and modeling expertise in a number of different areas related to transportation systems and vehicle performance, including a wide variety of applications from aerodynamic drag on vehicles to injector spray dynamics, to road weather research, to underhood thermal management.

“These areas that we’re starting with are just a few specific examples of how you could use the high-performance computer,” said Dr. David Weber, TRACC Project Director. “Our modeling, simulation, visualization and high-performance computing capabilities will provide unique collaboration opportunities with colleagues in the transportation field from government, academia and private industry. We all benefit from this advanced modeling capability,” he said.

With respect to their use in traffic modeling, Weber expects that TRACC simulations will closely resemble actual road conditions, allowing transportation system planners and emergency planning specialists to develop alternative and contingency plans in advance. “If you lose part of your transportation network in an emergency, for example, what do you do? How do you get the people out in the most efficient way?” Weber said. “We think we’ll able to predict congestion patterns as they actually occur for both normal traffic and emergency traffic conditions.” Although TRACC models currently encompass only the Chicago area, they could easily be adapted for any metropolitan region.

The models that TRACC will generate have the potential to save lives on both the individual and community scales by better understanding crash behaviors and using that knowledge to enhance road side safety structures. For example, while the U.S. Department of Transportation and the vehicle industry currently perform computerized crash simulations in addition to their expensive real-world crash tests, TRACC technology will significantly increase the speed and accuracy with which these tests can be executed. “We take prototypic experiments and confirm that we can model them accurately, to validate the simulation methodology. Then we can use the computer models to extend them to a larger range of accident conditions, and examine system and component performance at higher levels of fidelity with our large-scale computing resources,” Weber said.

TRACC also has initial funding to perform modeling of bridge hydraulic behavior, such as the flooding of bridges during severe weather events. By seeing how bridges respond to stress from high winds and rising water, civil engineers might be able to prevent damage to bridges during severe storms or hurricanes.

“Tests are very expensive and can only look at a limited number of conditions,” stated Weber. TRACC provides a more cost-efficient way to look at a lot of different types of transportation issues and understand the effects in greater detail.” At the heart of TRACC lies a 128 node, 512 core, massively parallel computer. This high-performance computing system is complemented by state-of-the-art software and expert staff. The computing

system will be available using the high-speed networks available at the DuPage National Technology Park, thus providing access for technical collaborators to the computing and visualization facilities both at TRACC and at Argonne’s university partners at the University of Illinois and Northern Illinois University.

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