White Paper

Military and Civilian Operations Executed with Supercomputing and Visualization Systems

How Raw Data and Information Turn into Decisions and Actions

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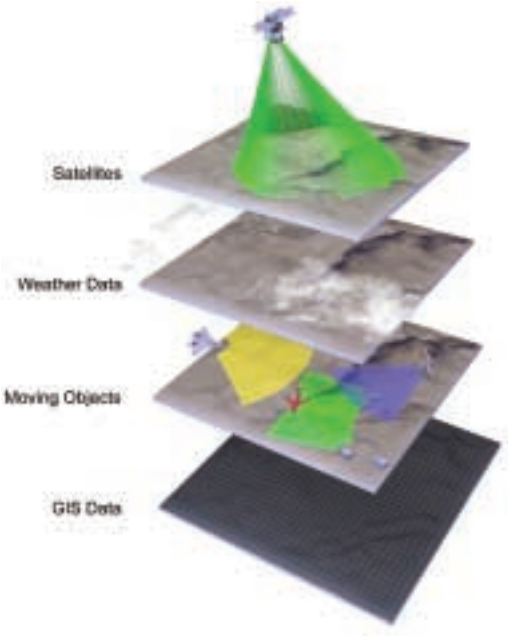
As military forces begin their transformation to network-centric operations, information and data have to be correlated and disseminated from the commanding general down to the unit planning cells and back. The data is large and complex, encompassing imagery; air, naval, and ground assets; and a variety of intelligence sources. The decisions are critical and have many lives hanging in the balance. So how do leaders, planners, and strategists do it? How can they create a war plan that has multiple objectives, includes multiple coalition partners and troops spread over a large geographic area, and will give them the results that they want? Before they do anything operationally, they want to formulate and simulate a strategy based on the information that they have, and there is a lot of it. Vast quantities of uncorrelated data from satellites, ships, aircraft, personnel, and other sources have to be brought together, prioritized, and disseminated to the appropriate people on time, every time. Imagine the complexity of the information and how it needs to be tailored and made usable to conduct an actual war plan. The act of combining the war plan with the operational task of balancing numerous forces spread over a large geographic region and encountering many conventional and unorthodox threats requires computationally and visually dominant systems. These systems have to be fast, accurate, dynamic, and reliable. They have to be supercomputers, not just because of the petabytes of flowing data and trillions of calculations, but because human life is at stake each and every time.



Before any campaign or strategic plan can be developed, a tremendous amount of intelligence must be gathered about the impending operation. Intelligence (military or business) means knowledge of: the adversary and the terrain; geographic, monetary, and political influence; force structure; command and control; technological edge; and how the adversary or competitor operates. This information can be gathered through numerous and complex sources and systems. Gathering this critical information, pooling assets, deciding a course of action, and architecting, refining, rehearsing, and executing plans takes tremendous organization and computational power. The need for this power is driven by the element that leaders and planners want to manipulate: time. The art of using these supercomputing systems can allow them to run and simulate plans for the future, thus trying to predict, forecast, and affect activities that are about to unfold.

Once complex information is organized and fused, it provides an individual with the best situational awareness possible. One may then transition from gathering information and organizing information to formulating a plan (creating action). Before any asset is deployed and subsequently employed, the user must understand every possible outcome. He or she wants to simulate the plan with numerous permutations of influences to get a desired outcome, which is why visualization and supercomputing are needed.

The real advantage that visualization provides by allowing users to predict and forecast is the ability to diffuse a situation before it arises. The power lies in knowing what one's adversaries or competitors will do before they take action. More importantly, the ability to predict what adversaries may be planning gives users the option to defend against or altogether pre-

vent that offense. Basically, generals have the opportunity to stop something before it occurs, whether it is a terrorist attack or a full-scale conflict. Supercomputing and data visualization provide the situational awareness and the capability to ensure peace and address conflict when it cannot be prevented.

To summarize, it is imperative that high-performance systems are used to gather information quickly (intelligence applications), pull information together logically (sensor fusion), create action plans and prepare against numerous and varied situations (simulation), and then do something about it with complete control (command-and-control applications). A fundamental, common foundation exists between the use of these applications in military operations, government, intelligence, and business.

While these technologies have a clear use within the military environment, the challenge is to find where these same principles fit into your own requirements, in your own industry. The same systems deployed on the battlefields can be used in locations just as dynamic and challenging across multiple disciplines.

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