NSF Award from the Office of CyberInfrastructure, Office of the Director

Principal investigator: Noshir Contractor, industrial engineering and management sciences
McCormick School of Engineering and Applied Science and Kellogg School of Management

- **Project:** Collaborative Research: Coupled Models of Diffusion and Individual Behavior Over Extremely Large Social Networks
- **Start Date:** September 1, 2009
- **Total Award Amount:** $267,204

**How the results of this project will benefit society:**
The spread of contagions such as opinions, attitudes, beliefs, and diseases across a national population is a well-known complex problem; the recent fear of avian flu epidemics and financial contagion serve as excellent examples. Other examples include: opinions, fads, trends, norms, packet diffusion, worm propagation in computer networks, and database replication in sensor networks. The broader impacts of the project will be achieved by tools used to identify critical elements in the socio-technical networks before the start of cascades, and by potential interventions for controlling the cascades based on the understanding of the effects of individual and group behavior within the dynamically evolving socio-technical networks.

**The problem the project is trying to solve:**
MTML-Sim, a Multi-Theory Multi-Level (MTML) modeling framework, will provide practical methods to support academic researchers as well as policy makers before and during large-scale cascades caused by the spread of contagion.

**How this project will work:**
In this project the investigators propose to develop MTML-Sim: a Multi-Theory Multi-Level (MTML) modeling framework, operating over extremely large dynamic socio-technical networks, in which multiple contagions and behaviors are simultaneously co-evolving by repeated interactions. MTML-Sim will use computational agent-based methods resolved at an individual level to represent and compute the co-evolving dynamics. The goal is to scale MTML-Sim to billions of individual agents connected by multi-level social and information networks, and efficiently execute on 100,000-processor petascale architectures that will come online in the next few years.

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