Development of Virtual Power Plants
We are working in the emerging intersection between information, computation, and complexity
• Design
• Environmental modeling
• Controls with massive, heterogeneous sensor nets
• Training
• Engineering analytics
• Merged environments
MIT Media Lab ...

“... one of the world’s top computing science laboratories”

New York Times, April 26, 2011
Today we cannot model the richness, fullness, or complexity of engineered, human, or natural systems.
These problems are process rich ...

.... but our current models are process poor
Process rich?

- Coupled linkage across scales
- Coupled linkage across systems
- Self organization & emergence
- Complexity
- Conflicting payoff matrices
We are seeking ...

A simple, straightforward way to make better decisions for the complex of systems in our world
VE-Suite:
Creating a common decision space
National Excellence in Technology Transfer Award

2006
2009
2010
VE-Suite

Analytics

Analysis

Visualization

Design
• 100+ million points
• Any data source
• Any visualization platform
• Any compute platform
• Realtime sensor visualization
Interaction
- Realtime interaction
- Any user interface
- Physics engine (interferences)
- Information management
- Interactive design and optimization
• data bases + models + simulation

• Realtime power plant dynamic simulation

• Today - many software packages

• Possible - any software package

• Future - from atom to power plant
The traveling salesman problem
Our approach
Building Blocks (objects)
Fully coupled, complex system management

- Sparse matrix theory
- Hierarchical networks
- Combinatorial graphs
- Information theory
Create an object (block)

- Models and information to be linked
- Define coupling
- Define common “spatial” frame
- Define information needs
Create an object of objects

- Blocks and information to be linked
- Define coupling
- Define common “spatial” frame
- Define information needs
Repeat
Hierarchical Networks
Integration

- Computational building blocks that can be used to easily build complex systems
- Intuitive engineering decision support tools
- One computational platform from concept to product
2000+ downloads

osgBullet & osgWorks
Sensor Project
Simple tools for complex systems
Three interests

- Use of the VE-Suite open source package
- Development of new applications
- Research focused on new understandings in simulation, modeling, and decision science