Theme: New Technologies

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Specific Problems

• New technologies bring research problems:
  – Simulating on the Cloud
  – Simulating on Sensor Networks

• Applications can call for need for new technologies
  – Identify new applications
Simulation on Sensor Networks

• Sensors collect data and use the data to simulate the "future". Sensors can also contain simulators

• Applications:
  – traffic simulations,
  – computer networks,
  – environmental monitoring,
  – emergency planning and response,
  – climate change, etc.
Important Issues

• How to incorporate data into potentially mobile sensors in real time
  – What if data are bad? (communication)
  – What if a sensor fails? (reliability)
  – Input modeling in the presence of correlated data streams (spatio-temporal correlation structure, incomplete/wrong information due to sensor failures, fast and energy-efficient input modeling algorithms)

• Execution Issues for centralized/decentralized simulation
  – Scheduling: how to assign processors to multiple concurrent simulations
  – Synchronization: communication among processors
Important Issues (cont’d)

• How to improve system performance
  – Replicated data, but with dependence
  – Location of sensors (dynamic vs. static optimal deployment)
  – Finite battery time of sensors should be considered
  – Modeling and optimization must be done continually due to data updates (modeling and optimization need to be done concurrently)
  – Distributed vs. centralized simulation
  – Security/robustness (a sensor may be hacked to send malicious data)
  – Detection of anomalous sensor behavior
  – Transient vs. steady-state vs. other? (nonstationarity, chaos, etc.)
Simulation on the Cloud

- Lack of community-wide simulation platforms (e.g., Hadoop)
- How to handle uncertainties in physical platform, e.g., uncertainties in timing
- Need for an economic model (not just time) due to CPU time cost
- Load distribution/scheduling and allocation of resources based on customers’ demand
- Do replications gain advantage for steady-state simulations?
- Lots of issues from sensor networks carry over...