1st DFG/GENI Doctoral Consortium, San Juan, PR March 13th-15th, 2011

Emulating cloud dynamics for performance sensitive applications using GENI

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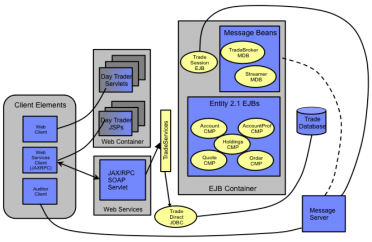
Our Research Focus

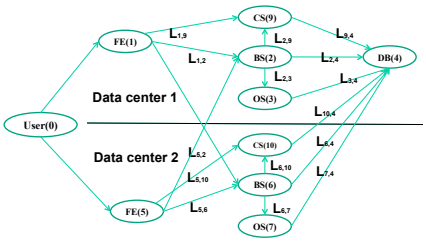
- Enterprises moving applications to the cloud.
  - Cost savings, geo-redundancy.
- Enabling performance aware enterprise applications on the cloud.
  - e.g., Enterprise Resource Planning, Supply Chain Management.
  - Latency and availability are critical.
  - Complex, multi-tiered, large-scale.
- Understanding sources of variability with performance in the cloud.
- Developing adaptive systems tuned to cloud dynamics.
  - Fine-grained per-component performance-aware transaction splitting.

How GENI is enabling our research

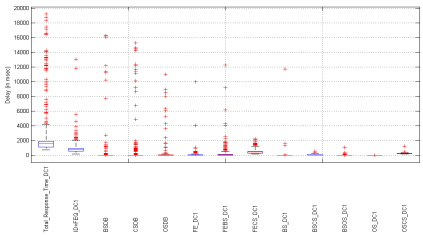
- Experiments on clouds in the wild – insightful, but not repeatable.
- Our goal: Emulate cloud dynamics using GENI.
- Controlled/repeatable environment to evaluate systems and compare algorithms.
- Highly programmable, dynamic instantiation during experiments.
- Well-dispersed, multi-site ProtoGENI nodes can emulate multiple data centers.
- PlanetLab slices on GENI represent geographically distributed users.
- Longer term goal: Emulate new data center architectures using ProtoGENI.



Enterprise Applications – Day Trader



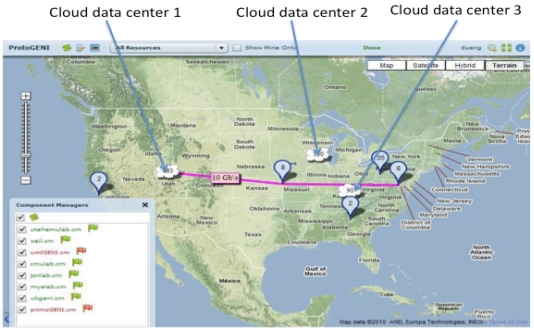
Deployment on the cloud – Components view



Performance variability of components in a real cloud deployment

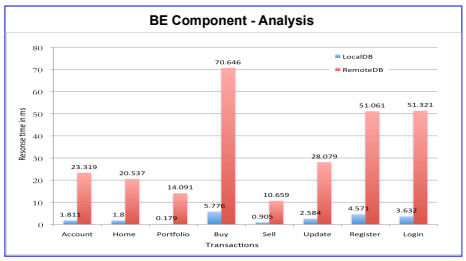
Current Status on GENI

- 'Chose two latency-sensitive enterprise applications to deploy on GENI slices.
  - J2EE 5.0 based Day Trader from Apache on Linux.
  - .NET based Stock Trader from Microsoft on Windows.
- Successfully deployed the applications on ProtoGENI site after overcoming initial hurdles with windows support.
- Initial experiments conducted with Day Trader by mirroring multiple components on different slices.



GENI Experiment topology

Initial results on GENI



Future Work

- Emulate real cloud characteristics. (delay, loss, bw expts)
- More ProtoGENI sites. (Multiple Data centers)
- Evaluate research prototype of our adaptive system.
- Use PlanetLab with ProtoGENI to test "external" geographically distributed users.

Experiences with GENI

- Flexible APIs to design experiments.
- Easy to get started, good documentation.
- Required lot of customization for Windows, great personal help from the support teams.
- Foresee potential need for increased node availability.
- Need for more stable performance with PlanetLab.

geni Exploring Networks of the Future
DFG Deutsche Forschungsgemeinschaft
GLab www.german-lab.de
NSF National Science Foundation WHERE DISCOVERIES BEGIN