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Socially Aware Single System Image

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Abstract

***Single System Image* (SSI):**
- A system that hides the heterogeneous and distributed nature of the available resources.
- Presents a single unified computing resource to users and applications.

***Project Goals*:**
- Enable users to build a cluster using multiple (virtual) machines owned by their social contacts and use the cluster as if it is a single machine.
- Form SSI clusters using wide-area nodes
- Allow users to select resources based on resource requirements and/or trustworthiness

Experiments

An SSI cluster using Kerrighed 2.4.4 setup and working on ProtoGENI nodes.

Planned experiments:
- Implement a distributed filesystem to work with SSI and utilize disk space on all participating nodes
- Implement Diaspora social networking features on nodes and enable importing of social data from existing social networks
- Extend SSI to wireless and mobile nodes, so that these nodes can harness the computing power of fixed nodes

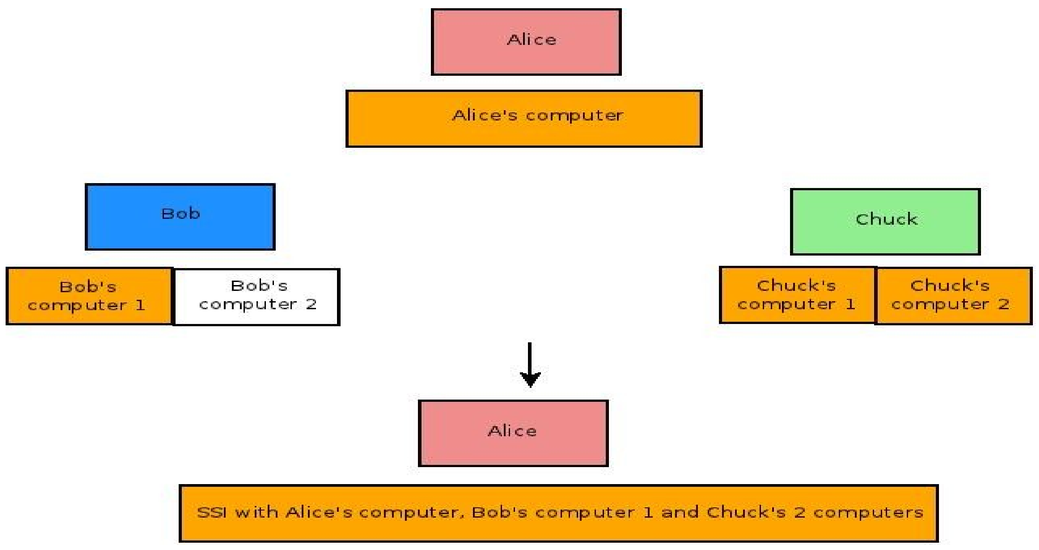

Fig.1: SSI Formation

Future Work

Social awareness integration
- Integration of social networking features like authentication and "friend list" into GENI control framework.
- GENI users can choose who to share their resources and in return whose resources to use depending not only on resource requirements but also on mutual trust.

Two-way reputation/credit score system
- Ranking/ reputation system for both resource owner as well as resource requester.
- Factors for ranking include but are not limited to:
  - The type/amount of resources provided or requested.
  - Access controls provided or requested.
  - Resource sharing / usage history of the owner / requester.

Research Objectives

SSI formation across wide-area nodes
- Currently, SSI works only for hosts in the same LAN.
- Efforts to extend SSI to VMs in different LANs (via VLAN) and determine feasibility of such an SSI system.

Trustworthiness and ease-of-use of SSI systems
- Access control provisions for resource sharing will enable security-conscious users and applications to use the system with minimal privacy issues.
- Explore and define rules for computers to share their resources with other computers based on the human social behavior of sharing resources.
- Allow ordinary people to use the benefits of cloud computing without modifying their application.

Friend	Resource	Permissions for Alice
Bob	Node 1 (500GB, 1GB RAM)	Storage and compute
Bob	Node 2 (200GB, 4GB RAM)	Storage
Chuck	Node 1 (300GB, 2GB RAM)	Storage and compute
Chuck	Node 2 (100GB, 3GB RAM)	Compute

Table.1: Sample Resource advertisement

Friend	Resource	Used by Alice
Bob	Node 1	Yes
Bob	Node 2	No
Chuck	Node 1	Yes
Chuck	Node 2	Yes

Table.2: Resources used by Alice

Use of GENI Infrastructure

- Experiments will involve SSI creation with nodes spread throughout the country.
- Creation of an SSI as of now requires participant nodes to be within the same LAN.
- GENI infrastructure enables access to country-wide (and international) nodes connected via VLANs, providing an ideal experimental setup.
- Other users can use this setup via GENI, giving us exhaustive feedback, thus enabling continuous evaluation and improvement.

Current and Proposed Publications

The Research Effort hopes to result in the following dissertation:

Ph.D. Dissertation: S3I: A novel approach to cluster computing using social networking attributes

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