Service Migration in Distributed Virtual Machines for Adaptive Computing

Song Fu and Cheng-Zhong Xu
Department of Electrical and Computer Engineering, Wayne State University

Motivation
Grand applications run on a large number of computers. Fault is a common phenomenon in such an environment. It results in reordering the entire computation.

Our solution: Runtime service migration
Particular features:
- It is performed locally, without global coordination.
- It is real-time, responsive to faults.
- Service state space is moderate and migration overhead is low.
- It can be applied in heterogeneous environments and service pre-installation is not required.

Service Migration in Distributed Virtual Machines
The semantics of service migration is to suspend the residing execution entities, stop the service programs of a virtual server on the source node, migrate the runtime service data and states along with the execution entities/states to a destination node, initiate a new virtual server with restored services on the destination, and resume application execution.

Experimental Results
Software: Linux 8.6, Solaris v8, SPLASH-2 benchmark
Hardware: 5 Sun E3500 (four-UltraSPARCIII, 400MHz), 3 Sun E3000 (four-UltraSPARCIII, 336MHz), Dell PowerEdge 2400 (dual-CPU, 733 GMHz), 100Mbps Ethernet

Migration Decision Problem
Migration decision concerns when a migration will occur and to which hosting server a service/agent will move. The formal predication should well-match the actual executions.

Hybrid mobility
- Service migration: for virtual server load balance and fault resilience.
- Computational agent migration: for access locality and load balance.

Migration decision – a crucial performance issue
- Migration candidate determination (who)
- Migration timing (when)
- Destination server selection (where)

Selected Publications