Self-updating Software

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overview

motivation
  · pervasive computing
    personal devices, appliances, sensors & actuators
  · dynamic reconfiguration
    change in needs, location, resources
    fixing errors and upgrading function

challenges
  · safety & reliability
    updates are consistent & reversible
  · automation
    minimal user effort
  · performance
    no service interruption
    scales to large distributed systems
  · multiple component suppliers
progress: dependency model

dependency model
- decouples components from one another
- components chosen by specifications
- makes automated repair & update possible

runtime scheme
- user requests new functionality
  eg, component A needs S
- client machine looks in local DB
- if not found, requests spec from server
  server identifies provider (eg, by URL)
- client downloads & integrates component B

progress: object update

colors are individual objects
arrows are object refs

circles are individual objects
green newer than red

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context
- in context of Thor, an OODB
- huge state, widely distributed
  trillions of objects
  millions of clients
- update should be atomic

lazy update scheme
- update treated as a transaction
- object only updated when necessary
- global state may be inconsistent
  but user transactions never notice

site 1

site 2

site 3

site 1

site 2

site 3
plans (next 6 months)

dependency model
  · finish design
  · build initial infrastructure
  · demonstrate on
    Java packages
    small shareware programs

object update
  · refine design
  · build scheme for lazy updates
    good performance
    clean & desirable semantics
  · demonstrate on
    Thor persistent object store