

CMSC433, Spring 2001 Programming Language Technology and Paradigms Jini

Alan Sussman
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Administrivia

- Read Chapter 15, pages 1003-1009, on Jini
- Project 4 - due tomorrow at 6PM
- 2nd midterm next Thursday, Nov. 15
 - practice exam posted by tomorrow
- Project 5 description by Thursday
- Office hours tomorrow moved to 10-11

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Last time

- Distributed computing issues
 - uniform view of local vs. remote objects doesn't work – need to modify interfaces, not just implementations
 - partial failures
 - true concurrency
 - latency
- Basic CORBA
 - language-independent RPC
 - standard set of software services
 - ORB, IDL, naming service

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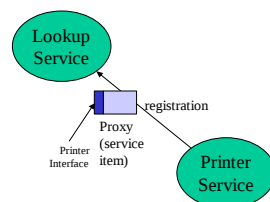
Jini overview

- Framework and services on top of Java RMI
- Finding services
 - finding registries (*discovery*)
 - putting entries into registries (*join*)
 - searching registries (*lookup*)
 - keeping registries up to date
- Transactions
- JavaSpaces
 - Shared persistent store

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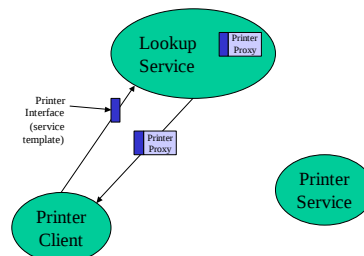
Providing Services



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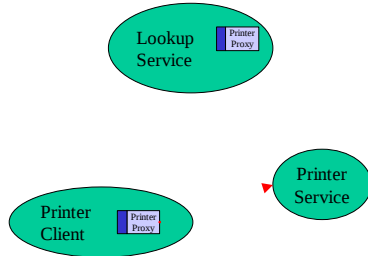
Finding providers



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Using Services



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Proxies

- Java classes that implement standard interfaces
- Classes get downloaded as needed
 - From http server?
- Proxies can use any mechanism to communicate with actual service
 - RMI stubs, local computation and any communication medium (e.g., sockets)

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Lego Mindstorm Proxies

- An example: Proxies for Lego Mindstorm robots
- Processor on Mindstorm not powerful enough to host a JVM
- Proxy can keep state about robot, communicate through infrared link

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Lookup services

- Broadcast looking for lookup services messages
- Each lookup service on network responds with a proxy
- Queries to lookup service are done through proxy
 - actual communication with lookup service is up to proxy

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Using a lookup service

- Can specify a list of classes/interfaces
 - only interested in results that are subtypes of all
- Can specify attributes
 - Location {
 - String building;
 - String floor;
 - String wing;
 - }
 - must match all attributes

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Service ID's

- When services first register, they are assigned a service ID
 - 128 GUID
- a particular service gets the same service ID on all lookup services
 - if you get the same service back from multiple lookup services, can detect duplicates

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Leasing

- When a service registers with a lookup service, it gets a limited duration lease
 - if lease expires without being renewed, service is de-listed
- Service must renew lease
 - makes sure service is still up and still reachable from lookup service

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Finding lookup services, revisited

- When a service is activated, broadcasts request to find lookup services
 - using multicast over local network
- When lookup service is activated, and at periodic intervals, broadcasts “I’m a lookup service”
 - services that learn about new lookup services register with them

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Attribute lookup

- Attributes have public references for fields
 - no primitive types
- To match
 - Lookup attribute must be subtype of stored attribute
 - Each non-null field must be equal

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Jini example

- Jini network among computers at home
- Jini wireless network among my cell phone, and PDA
- Don’t have to push an “I’m home” button
- Next time lookup services announce “I’m here”, devices will join

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Additional Jini services

- Transactions
- JavaSpaces

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Transactions

- Create a transaction from a transaction manager
 - requires maintaining a lease
- All actions performed as part of a transaction should only be visible to that transaction
 - until the transaction commits

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Committing a transaction

- All participants are asked to prepare the transaction
 - log it to persistent storage
 - so that it will survive crashes
- Then commit
 - or abort

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JavaSpaces

- Derived from Linda TupleSpace
- Persistent store that supports transactions
- Contains entry objects
 - i.e., records
- Stored objects are leased
 - if lease expires, entry removed

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JavaSpace operations

- write - add an entry
- read - find a matching entry
 - Can wait for matching entry (with timeout)
- notify - add listening for matching entries
- take - read and delete atomically

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JavaSpace matching

- Entry's match just like Jini lookup attributes
- Can provide don't cares
- Can use subtyping

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