Reading Assignment 4

Readings
Textbook Chapter 4; 12.3.
D. Panda: An Introduction to Service-Oriented Architecture from a Java Developer Perspective
D.Chakraborty, H. Chen: Service Discovery in the Future for Mobile Commerce
R.McGrath: Discovery and its Discontents: Discovery Protocols for Ubiquitous Computing
C.Dabrowski et al: Model-based Analysis of First Generation Service Discovery Systems

Questions (Total: 17)
1. **Identify the participants in, and briefly describe the process of, resolving the name** [http://ise.gmu.edu/~jpsousa/classes/622/index.html](http://ise.gmu.edu/~jpsousa/classes/622/index.html). (1)

The participants are: the client machine, the internet Domain Name Service (DNS), and the target machine. The client machine first requests the IP address corresponding to `ise.gmu.edu` to DNS. Depending on the type of resolution supported by the local DNS server, this request may be resolved with only one interaction (recursive resolution) or require at most 3 interactions (iterative resolution) between the client and DNS: to resolve `edu`, `gmu.edu` and `ise.gmu.edu`, respectively. After receiving the IP address, the client machine will send a request to the target machine on the (well-known) port for `http` asking to access `~jpsousa/classes/622/index.html`.

2. **Consider broadcast-based discovery and directory-based discovery.**
   a) **What is the difference between the two?** (1)
      
      Broadcast-based discovery takes place between two parties, namely, the client and the service providers; while directory-based discovery takes place through the service directory, who acts as a service broker.

   b) **In directory-based discovery, what mechanisms can be used to locate the directory?** (1)
      
      We could use directed discovery, where the clients are provided with specific addresses to service directories; or we could use broadcast, either client-initiated, or directory-initiated.

   c) **In broadcast-based discovery, how might a component obtain up-to-date knowledge of the available services?** (1)
      
      It depends. In client-initiated broadcast, clients broadcast a request every time they need a service, and therefore obtain the most up-to-date information. In supplier-initiated broadcast, there are two strategies: (a) clients wait until a new announcement for the desired service is broadcast, or (b) clients maintain caches of all service announcements for future reference.

   d) **At what geographical (and networking) scale is broadcast-based discovery feasible? How about directory-based discovery?** (1)
      
      Broadcast-based discovery is very limited geographically on subnet basis by “definition”. On the other hand directory-based discovery because is point-to-point can extend to much larger and geographically dispersed networks.

3. **Among the readings for this week:**
   a) Where (document and section) can you find a summary comparison of Jini, SLP, UPnP, and Salutation? An argument is made that some are more scalable than others: which are more scalable and why? (1.5)
      
      *Document: Service Discovery in the Future for Mobile Commerce, section: Critical*
comparison of existing service discovery techniques. SLP and Jini are more scalable because: (a) both rely on directory-based discovery, while others rely on multicast; (b) SLP is a lightweight protocol that makes few assumptions about the computer resources, and (c) Jini relies on Java for implementation, which is platform independent, therefore making Jini platform independent as well.

b) Where can you find a discussion of performance issues for current solutions? Briefly describe the classes of issues and how they might be addressed, if at all. (2.5)


<table>
<thead>
<tr>
<th>Issue</th>
<th>Addressed By</th>
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<tbody>
<tr>
<td>Multicast implosion avoidance.</td>
<td>Probabilistic response. A subset of potential responders answers the query.</td>
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<td></td>
<td>Timed Response. All responders can answer the query but in a form that limits response implosion.</td>
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<td>Strategies: 1. random burst, 2. random paced, 3. scheduled burst, 4. scheduled paced.</td>
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<td>Extension Policy.</td>
<td>Policies for assigning Time-to-live (TTL) values, Fixed Assignment, random assignment, requested assignment, adaptive assignment and priority assignment.</td>
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<td>Replica Selection.</td>
<td>Use of a decentralized algorithm to choose replicas, e.g. Greedy scheme, partition scheme, weighted scheme, balanced scheme and balanced-partition scheme.</td>
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4. Consider name resolution (aka lookup) versus service discovery.
   a) What is their common goal? (0.5)
      Decide which component to direct communication to and where to find it.

   b) What is the difference between the two? (0.5)
      Name resolution deals with reaching a specific component while service discovery involves searching for one component from many with specified capabilities.

   c) What key characteristics in your system/environment influences choosing one or the other? When would you choose service discovery as opposed to name lookup? (1)
      The environment is fairly static in terms of clients and services then we can use name resolution. If on the other hand the environment is more dynamic, e.g. if QoS characteristics of the services are required then we should used service discovery that can provide more up-to-date information.

5. Consider rich descriptions of services for the purposes of discovery.
   a) Give two examples of services where it would make sense to include static quality of service (QoS) attributes. What might those attributes be? (0.5)
      1. Finding a color printer.
      2. Finding a machine with 3-D graphics card and a dual core processor.

   b) Same for dynamic QoS attributes. (0.5)
      1. View high-resolution animation, based on the available CPU
      2. Finding a printer with a lowest volume of printing (smallest queue).
c) **Same for contextual attributes.**

1. Find a printer that is less than 20 feet away.
2. Library seating service, location in library with available seating closest to reference material that will be used by a student given the student’s major.