Optimizing Object Location in Mobile Distributed Object Systems

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Cellular wireless networks are becoming increasingly common access systems. This trend leads to an increasing need for high level services to be available in mobile environments. Distributed object technologies offer good solutions for complex service needs. Hovewer, these technologies, as they exist today, are not perfectly suited for wireless access. They need not only technical refinements, but their theoretical background needs to be extended as well.

One important mobility-specific issue in distributed object systems is object location and relocation according to the movements of the mobile units. In practice it is very common, that mobile clients wish to access services offered by servers in the fixed network. The services are available through method calls to remote objects representing the service sessions. Depending on the characteristics of the concerned service the following requirements may apply on the location of the objects:

1. **Fixed location** - The object must stay at its original location
   - *Predefined location* - The object must reside on a predetermined server (eg. centralized database access)
   - *Unmovable object* - The object cannot be relocated (eg. printing services)
2. **Nearest location** - In this case a nearest server is assigned to each cell. The object must be located on the server assigned to the current cell (eg. local time service)
3. **Optimized location** - The object may be located on any of several servers and may freely be relocated. Therefore the location of the object may be optimized by the system (eg. application servers)

Our work focusses on the third case. We set up a model for optimizing the location and relocations of the objects. Our model consists of a traffic model, covering the activity and movements of mobile units and a cost model for method calls and object transfers.

We tried to reuse existing traffic models used to dimension mobile network elements. These models fall into two main categories differing by their view of the network. *Traffic source models* describe the system from the mobile unit's point of view, while *network traffic models* describe the traffic as seen by the fixed network elements, like base stations. We found the network approach unsuitable for us, because it can hardly deal with the relative location of mobile units and object implementations. The traffic source model also needed some modifications.

We also present the optimal object location and movement strategy in our model. Certain parameters of the optimal strategy depends on the concrete topology of the network (the arrangement of mobile cells). We evaluated and analysed these parameters for a couple of simple regular topologies and give a method to evaluate them for other topologies.