Project Number 001907

DELIS
Dynamically Evolving, Large-scale Information Systems

Integrated Project
Member of the FET Proactive Initiative Complex Systems

Deliverable D2.4.4

Software release and internet page of the network simulation environment SAHNE
Start date of the project: January 2004
Duration: 48 months
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Due date of deliverable: December 2006
Actual submission date: January 2007
Dissemination level: PU – public

Work Package 2.4: Integrated Application Testbed (IAT)
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SAHNE — A Simulation Environment for Ad-hoc Networks

SAHNE is a simulation environment for mobile ad hoc networks. It provides a graphical user interface based on LEDA (Library of Efficient Datatypes and Algorithms). Originally, it was designed for the simulation of topology control algorithms for directional communication using an infrared (IR) propagation model (proposed by Kahn and Barry 1997 [1]) on the physical layer. This model assumes that each node has several transceivers that can send in different directions. We investigated the properties of graph topologies that are suitable for this model and performed simulations of topology control protocols (based on graphs of the Yao family) using SAHNE.

SAHNE contains functions to assess the quality of the network topology, based on the measures congestion, dilation and energy, which are defined by Meyer auf der Heide et al. [2]. These measures are indicators for routing performance that do not rely on a specific routing algorithm. Consider a path system $P$ (consisting of, e.g., hop-optimal paths or energy-optimal paths) using the network topology. Then we define the maximum number of paths using an edge as the load of the edge. If we add the load of all interfering edges, then we obtain the congestion of an edge. The overall congestion is the maximum congestion of all edges in the network. Energy is the power consumption used for maintaining the network (unit energy) and the power used for the transmission of packets along the paths of $P$ (flow energy). The length of the longest path in $P$ is called dilation, which is an indicator for the routing time. SAHNE calculates hop-optimal and energy-optimal paths systems offline based on the current topology, determines interfering edges based on the signal-to-interference ratio and one of the propagation models.

The further development of SAHNE included the implementation of other propagation models, topology control strategies, routing algorithms and mobility models. Now, SAHNE can also simulate omni-directional transmission (using the free space propagation model with a variable path loss exponent) with variable transmission power. For this model a topology control protocol for the distributed construction of a hierarchical topology (HL graph) was implemented. On the network layer, a distance vector routing algorithm, DPS routing and DSR are available.

SAHNE supports mobility of the nodes. The available mobility models include variants of the random waypoint model. Furthermore, the motion of the mobile nodes can be defined in a scenario file, in which paths are defined by waypoints and speed values.

In the last period we provided a documentation and necessary adaptions such that SAHNE can be used with the latest version of LEDA. SAHNE is now available to the public in source code form and can be downloaded from the project webpage

http://wwwhni.uni-paderborn.de/alg/projekte/sahne.

The source code package includes a user guide and a documentation for the developer.

References

