This project proposes the architecture design and performance evaluation of Bluelayer for a Bluetooth-based ad hoc network. Bluelayer is an integrated method to design a decentralized scatternet formation algorithm and its adaptive routing protocol. In the scatternet formation algorithm design, two decentralized approaches are proposed. One is called Bluelayer and the other one is called modified Bluelayer. In the routing protocol design, a traffic dependent method is used to determine the optimal configuration for Bluelayer routing protocol.

Bluelayer randomly selects an init node as root to construct a tree-shaped subnet and propagates a counter limit $k_1$ as well as a constant $k$ in its downstream direction to determine new roots. Then each new root asks its upstream master to start a return connection procedure to convert the tree-shaped subnet into a web-shaped subnet for its immediate upstream root. At the same time, each new root repeats the same procedure as the root to build its own subnet until the whole scatternet is formed.

Based on the design of Bluelayer, modified Bluelayer adds a counter variable $v$, a return variable $r$, and a root decision criterion to determine appropriate new roots and generate an evenly distributed subnet configuration.

In addition, a hybrid routing protocol is designed for Bluelayer during scatternet formation phase. This routing protocol combines the reactive method globally and the proactive method locally to discover the optimal path for packet transmission. In Bluelayer, each root maintains its own N-tier routing information. According to the network traffic conditions, an adaptive computation algorithm is designed in each root to determine the optimal number of tiers in Bluelayer.

The detail for scatternet formation algorithms and routing protocol of Bluelayer are described as follows.

Keywords: Bluetooth, ad hoc network, scatternet formation, hybrid routing protocol