

# Mobile Ad-Hoc Network Test Bed

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## 1. Introduction

As the networking field is expanding, numerous applications are being created to satisfy the end user. Especially the ones involving the Ad-Hoc networks are becoming famous because of the features they provide to the applications namely ease of deployment, cost effectiveness and robustness. Research in this field is expanding at a rapid pace. Our aim was to provide a platform for such attempts. We came up with a Test bed that could provide the basic functionality for doing so. This paper explains how we achieved our goals-from the concept phase to the coding phase along with the application areas of our work.

**2. Vocabulary-** Ad-Hoc networks [1], Broadcast [2], Multicast [3], Sensor networks [4] , Unicast [5], Threads[6].

Ad-Hoc networks are the wireless networks that can be deployed rapidly without any infrastructure such as access points. This feature makes them more attractive compared to their wired counterparts. In Ad-Hoc networks neighborhood data is very important for communication purposes. To enable communication between nodes that are configured to be in Ad-Hoc mode, the operating systems provide few interfaces. Information like neighborhood availability is not made available to the user's application by the operating system. We developed few modules that could provide the user's application with the data like neighborhood availability and one that facilitates communication (text) between the nodes (neighboring). In short our application modules impart intelligence to the nodes by which they will be able to recognize who their neighbors are, in real time, just like humans do. As humans have the luxury of looking at their neighbors and recognizing them, which is not the case with the PDA s and laptops that we used, we provided the PDA S with a mouth and an ear to recognize their neighbors. Infact, this process is just like what we humans do to find who our neighbors are without the visual input involved i.e. only with our mouth and ears. One would regularly announce his/her presence and would also be listening for those of his/her neighbor. If any announcement is heard, one would make note of it and carry on. This is the same thing that we converted into code to be implemented on the PDAS and laptops. The important modules in our application are Neighborhood discovery module, Neighborhood maintenance module and the communication module.

## 2. Neighborhood discovery module

This module involves the routing mechanisms like multicast through which all the nodes in the network can announce at regular intervals their availability. The regular interval is a crucial parameter in the network convergence. The smaller it is the faster the network becomes stable. It is also called the convergence time of the network. The multicast inherently provides a security feature by which a node whose authenticity cannot be proven will not be able to join the network. This is the starting point for the research projects on node authentication (security) in Mobile Ad-hoc networks where nodes are free to move around. The module also provides the functionality that enables the nodes to continuously listen for the neighbor discovery messages being sent by its neighbors, if there are any. As soon as a neighbor's message is heard, it is added to the neighbor table which is a global data structure i.e. it is available to all the other modules in the application. There is a checking mechanism involved to make sure that redundant neighbor information is not stored in the neighbor table. Only neighbors whose messages were not heard previously will be added to the table of neighbors. This is important for the routing process to be successful as it depends on the validity of the data present in the neighbor table.

## 3. Neighborhood maintenance module

This module maintains the authenticity or validity of the data present in the neighborhood table. This module makes checks to see whether the data in the table is valid or not by constantly monitoring the data that is heard by the node. If a neighbor whose information is already present in the table is not heard for a certain amount of time, it is considered to have moved away or turned off and the information regarding the node is removed from the neighborhood table.

#### 4. The communication module

This module facilitates the nodes to communicate with each other by using low level mechanisms provided by the operating system called sockets. This module uses the Unicast mechanism, in which a node specifies a destination nodes address and starts communicating with it. The destination address is provided by the neighborhood table data structure. All the above said processes are intertwined i.e. one uses the data collected by the other. Mechanism to prevent dead lock situation is also provided in the application. These modules are developed in such a way as to facilitate extensibility. The whole frame work is created to be light weight threads.



#### 5. Applications

Simulating Key management scenarios, Routing protocol implementations, Neighborhood aware network applications, Simulating Cluster computing networks, Simulating Smart sensor networks, Simulation of Mobile Ad-hoc networks in real time.

#### 6. Conclusion

We provided the concepts and were successful in making the concepts concrete by creating the code. We hope that the Test Bed would not only facilitate research in the intended fields of application but also make learning a happening and fun process.

#### 7. Acknowledgements

I would like to acknowledge Dr.Kameshwara Rao Namuduri and Dr.Pendse for their support and guidance.

#### 8. References

- [1] [http://w3.antd.nist.gov/wahn\\_home.shtml](http://w3.antd.nist.gov/wahn_home.shtml)
- [2] <http://www.scit.wlv.ac.uk/~jphb/comms/iproute.html>
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