

Applications of mobile ad-hoc networks

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[http://www.computingunplugged.com/issues/issue2004
09/00001371001.html](http://www.computingunplugged.com/issues/issue200409/00001371001.html)

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Continue from history of mobile ad-hoc networks

- There is current and future need for dynamic ad-hoc networking technology
- Mobile ad-hoc networks are of increasing interest for a distributed set of applications
- Future mobile ad-hoc networks will use mobile routers to provide Internet connectivity to mobile ad-hoc users
- A mobile router will also allow mobility of an ad-hoc network, where mobile users may use an Internet access within an ad-hoc network domain
- In summary
- Ad-hoc networks are suited for use in situations where an infrastructure is unavailable or to deploy one is not cost effective.

Classifications

- Applications of mobile ad-hoc networks at present could broadly be classified as
- Commercial application (that are third generation mobile ad-hoc networks)
- Military applications (that involved second and the third generation mobile ad-hoc networks)

Application of mobile ad-hoc networks

- To understand their application we have to see what they offer and how they establish
- Establishing this type of networks requires mobile devices with the right communicating chip on.
- While they could ideally be deployed at any where or in other words instantaneous deployment.

Instantaneous deployment and application of mobile ad-hoc networks

- When it comes to instantaneous network deployment
- Possible areas could be
- **some business environments**
- where the need for collaborative computing might be more important outside the office environment than inside, such as in a business meeting outside the office to brief clients on a given assignment.
- **Game theory**
- Originates from economics and has been applied in various fields.
- Game theory deals with multi-person decision making, in which each decision maker tries to maximize his utility.

Applications of mobile ad-hoc networks 1

- The cooperation of the users is necessary to the operation of ad-hoc networks; therefore, game theory provides a good basis to analyze the networks.
- Work has been going on to introduce the fundamental concepts of game theory and its applications in telecommunications.
- **Crisis management services applications**
- A mobile ad-hoc network can also be used to provide crisis management services applications

Applications of mobile ad-hoc networks 2

- As for example in a disaster recovery where the entire communication infrastructure is destroyed and resorting communication quickly is crucial.
- By using a mobile ad-hoc network, an infrastructure could be set up in hours instead of weeks, as is required in the case of wired line communication.
- Another application example of a mobile ad-hoc network is Bluetooth, which is designed to support a personal area network by eliminating the need of wires between various devices, such as printers and personal digital assistants.
- Could be hospitals (by the way I am thinking of developing some theoretical model on this aspect)
- Security i.e. law enforcement agencies etc

Applications of mobile ad-hoc networks 3

- In conclusion
- mobile ad-hoc networks allow the construction of flexible and adaptive networks with no fixed infrastructure.
- These networks are expected to play an important role in the future wireless generation.
- Future wireless technology will require highly-adaptive mobile networking technology to effectively manage multi-hop ad-hoc network clusters, which will not only operate autonomously but also will be able to attach at some point to the fixed networks.

Military applications

- **Combat operations**
- Some of the essential requirements of a combat operations include network deployability, network security, end to end IP, high mobile connectivity and anti jamming mechanisms.
- In most of the cases, military operations are often spontaneous i.e. with little or no fixed network infrastructure.
- these operations require a communications solution which is spontaneous too.
- In other words, the soldiers should be able to form a network when and where it is needed;

Combat operations 1

- Geographical location is one of the important factors of any military operation which makes the current geographical positioning systems less efficient to support such operations.
- As the soldiers in a combat operation cannot afford exposing themselves in a battlefield to acquire GPS coordinates.
- One of the other limitations of the current geographical positioning system is that the satellite signals cannot penetrate through caves, underground bunkers or inside shielded buildings.

Combat operations 2

- In comparison with geographical positioning systems, mobile ad-hoc networks can support the built-in geographical location by using an extremely accurate form of triangulation.
- This feature enables soldiers in a military operation to triangulate its position based on the mobile enabled vehicles or other devices.
- In mobile ad hoc networks, readings are faster than the geographical positioning systems because the soldiers don't have to wait for multiple satellites to acquire a centralized security.
- The devices use in combat operations must be able to address both communications security and a way to secure the network from unauthorized use.
- Mobile ad hoc networks also allow devices to transmit at a lower output power to the neighbors which benefits the over all network by lowering the probability of detection and by increasing the battery
- Therefore if the device is captured, the soldiers can list that device to maintain the integrity of the network.

Combat operations 3

- Through anti-jamming mechanism the soldiers in a military operation are neither dependent on a single frequency nor are constrained to any military band.
- Mobile ad hoc networks are best suited to jamming because noise can now be routed around problem areas.
- These self-forming will have the ability to reduce the probability of jamming. High-mobility connectivity communications devices must operate while vehicles or soldiers are mobile.

Combat operations 4

- Moreover, soldiers can receive real-time streaming video from aircraft flying over a battlefield. Modern soldiers grow up with computers and will demand the same applications and user interfaces available to the civilians.
- The soldiers using instant messaging can then send photos of enemy positions back to the central command and use voice over IP to communicate with the non-military personnel's in an occupied area

Combat operations 5

- Most of the above discussed scenarios are based on the various theoretical aspects of mobile ad hoc networks.
- Some of the unresolved issues of mobile ad hoc networks in the context of their usage for military operations are channel access mechanisms which must be able to combine different directional elements
- how can one initiate and maintain a network topology in directional mobile ad-hoc networks environments?
- At last but not least are the routing algorithms that are required to achieve standard, highly efficient multipoint data delivery services.

Combat operations 6

- In conclusion,
- we need a high directional communication mechanism; dramatically higher data rates; low detection portability and resistance to jamming in high networks to support future military operations.
- At present mobile ad hoc networks neither embraces directionality nor supports the qualities of services which are required in different combat operations.

Some other military applications

- **Packet radio network** designed to conduct a feasibility report on the usage of packet-switched radio communications to provide reliable computer communications.

The DARPA PACKET RADIO NETWORK, PRNET has evolved through the years (1973-1987) to be a robust, reliable, operational experimental network.

- Survivable adaptive radio networks program provides packet switched networking to the mobile battlefield elements in infrastructure-less environments. It is proved to be beneficial in improving radios performance by making them smaller, cheaper and power-thrifty.

Some other military applications 1

- **GloMo (Global Mobile Information Systems) project**
 - The goal of the project is to make the mobile environment a first-class citizen in the Defense Information Infrastructure by providing user friendly connectivity and access to services for wireless mobile users.
 - GloMo technologies are applicable to
 - Wide-Area Information Systems, Information Systems for Dismounted Forces, and Information System for Rapid Deployment of Forces.

Some other military applications 2

- The NTDR system is a DA-directed, experimental, mobile packet data radio network that links Tactical Operations Centers in a brigade area.
- The NTDR provides a self-organizing, self-healing, network capability. Radio network management is provided by a Network Management Terminal.
- The primary purpose of the NTDR is to provide data transport for the Army Battle Command System automated systems to units at brigade and below
- Lessons learned from this experimental fielding provide a portion of the technical baseline for radios being designed for future fielding

Question

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- Thanks