Mobile Ad-Hoc Networks and its Consequences in Current Scenario

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Abstract— **Mobile Ad hoc Networks (MANETs) can be considered as an intricate representation of a distributed architecture system that encompasses wireless mobile terminals. These terminals can spontaneously and vigorously self-organize into random and provisional, network topologies used for ad-hoc and with the help of it individuals and devices are able to internetwork in an effortless manner in the zones where no communication infrastructure is present. In this paper, the authors are primarily focusing over the Mobile Ad hoc Networks (MANETs) and its consequences in current scenario.**

Keywords- Mobile Ad hoc Network (MANET), Wireless Network, Bluetooth, Mobile Nodes.

I. INTRODUCTION

With increase in the prominence of portable devices and mobile networks in modern years, the MANET, also known as Wireless Ad hoc Network, is growing rapidly. The formation of a MANET is performed by assembling of mobile devices like phones, laptops etc. where these devices will be interacting with one another. Indispensable network features are provided in distributed fashion by all the components participating in the network. By operating as an autonomous network, such Mobile Ad hoc Networks guides the approaches for countless state-of-the-art and thought-provoking applications. In a MANET, all mobile terminals can obtain internet amenities via the Internet gateway terminal, while communicating to each other, helping tremendous extension of internet amenities in the areas lacking proper suitable infrastructure. With the rapid growth in wireless network arena, this ad hoc network's competences are more likely to become extremely vital and the resolutions provided by this technology will be auxiliary to further acute and important imminent investigation and expansion e˜orts for diligence and conservatory. This research paper talks about the nuts and bolts of mobile ad hoc network. Also it takes it further talking about its welfares and consequences in current scenario.

II. WHAT IS MOBILE AD HOC

Mobile Ad hoc Network, popularly known as MANET, can be essentially considered as a network without a proper arrangement and having mobile nodes capable of communicating wirelessly. Also these mobile nodes are equipped with the facility to connect to each other at any abode and at any time vigorously. The mobile nodes in MANET communicate with each other wirelessly and these nodes can travel arbitrarily in the network causing the network topology to change in dynamic fashion [5]. Also these mobile nodes can function as a router at the same time making MANET a self-governing and/or self-directed organization of mobile nodes without any base station.

Figure 1. Mobile Ad hoc Network

The transmission area of each mobile node in MANET is kept restricted and because of which whenever the packets are transferred from a sender mobile node, the packets reaches to the ultimate receiver mobile node in the network via various other nodes in the network.

A. Wireless Networks

Wireless networks can be considered as networks providing connection suppleness between end-users at diverse areas and helping the network expansion to some construction or area using a physical wire free construction. Wireless Networks can be broadly categorized as structured and Ad hoc Networks [3]. So basically Ad hoc Network is one such type of wireless network where there is no fix physical structure.

Talking about the components in Structured Wireless Networks, such networks come with an Access Point, which works as central unit controlling each node in the network. The major disadvantage associated with Structured Wireless Networks is the immense encumbrance of maintaining the routing tables. Ad hoc Networks, on the other hand, don't really have any fix network topology to follow neither have any central unit controlling each node in the network [7]. And that is the reason behind the more complex communication system, than the structured ones, for the sending and receiving of packets of data in the network.

B. Features of MANET

First of all MANET does not endorse any kind of orthodox organization or having any central unit managing other mobile nodes. And that is why MANET is considered to be a Self-governing and/or self-directed without any structure. Each mobile node in the MANET contributes as an autonomous router and produces autonomous data. This makes it is difficult for the network administrator to detect problems and to manage the network as the administration is disseminated transverse in innumerable mobile nodes in the network. MANET follows the concept of multi hop routing wherein there is no centralized router there in the network [9]. Each and every mobile node considers itself as a router also and forward data packets for information dissemination between mobile nodes of the MANET.

The network topology in the MANET is never fixed. It vicissitudes repeatedly and arbitrarily. This change in topology is caused by the random movement of mobile nodes. This causes mutual network sub partitions, variations in routes and perchance damage to data-packet [14]. Expanding a MANET can cause serious Network Scalability concerns. There are so many mobile ad hoc network applications which require enormous number of mobile nodes in the network e.g. sensor and tactical networks.

C. Welfares of MANET

In the scenarios, where the structured networks implementations are very expensive or such networks are not available at all or cannot be trusted even if available, MANET is considered to be greatly preferred network. The implementation of MANET is very swift without much user interference. Moreover there is no need for an exhaustive preparation and also there is no need to install a base station [2]. By linking Ad hoc networks to internet, integration of so many different devices is possible and this integration helps for other users to use the accessible devices and/or services. MANET is also equipped to be used with the latest and future communication architectures, e.g. 4G, and their services.

III. MANET ARCHITECTURE

Mobile Ad hoc network has an exclusive architecture as illustrated in Figure 2. As shown in the figure a MANET architecture is an amalgam of many components. Although this diagram is quite a simplified version of the original complex architecture of MANET. At the base of MANET it has the supporting technologies

including IEEE 802.11 standard for Wireless LAN and Bluetooth specifications. Also this part has Medium Access Control (MAC) protocol with Antennas and Power Control specification.

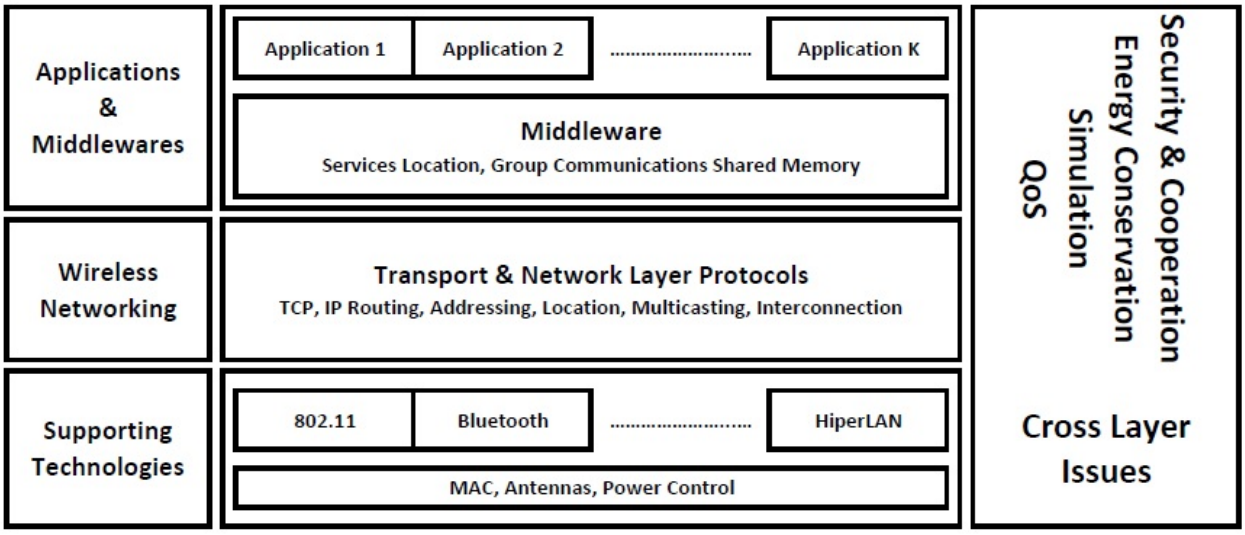

Figure 2. MANET Architecture

At the top of these supporting technologies we have Wireless Networking implementation protocols. This middle part contains the Transport and Network Layer Protocols and these protocols have specifications related to TCP, IP Routing, Addressing, Location, Multicasting and Interconnection [12]. At the very top of this MANET architecture it has the Applications & Middleware. This part has all the middleware specifications related to Services Location, Group Communications and Shared Memory. On the top there are numerous application interacting directly with the middleware. This all architecture is implemented with the essential features like Security & Cooperation, Energy Conservation, Simulation and Quality of Services. Also the Cross Layer Issues are handled in an appropriate manner to avoid any discrepancies and performance issues.

IV. MANET SUPPORTING TECHNOLOGIES (STANDARDS)

In present scenario there are two key technologies emerged to provide support for Mobile Ad hoc Network implementation. These two standards are: the Bluetooth technology specifications for short-range wireless communications and the IEEE 802.11 standard for Wireless LANs.

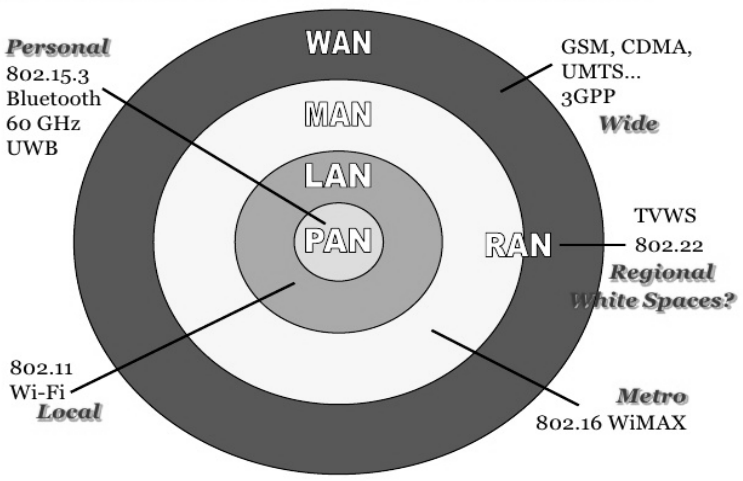

Figure 3. IEEE 802 Wireless Technologies

The Bluetooth technology is considered to be the default standard for cost effective and small range mobile communications in between mobile computers, mobile phones, and additional moveable nodes in the network. Bluetooth standards are issued by SIG (The Bluetooth Special Interest Group). The establishment of Bluetooth standards is accomplished by combining the cooperative efforts of more than twenty hundred business prominent organizations [10]. The list of such organizations include big names of technical arena e.g. Microsoft, IBM, 3Com, Intel, Toshiba, Ericsson, Motorola, Nokia. Besides that, this Bluetooth specification was also instrumental in the approval of the first WPAN standard which was approved by the IEEE 802.15 Working Group for Wireless

Personal Area Networks (PAN). This IEEE 802.15.1 standard is established on the lower parts of the Bluetooth specification.

In general, the Bluetooth devices are used to primarily implement Wireless Ad hoc Transmissions of data and speech. Such Bluetooth components are incorporated into a microchip and responsible for the transmission among static and/or moveable electronic peripherals e.g. mobile phones, digital cameras, computers, printers. This technology is so economic in execution, that it is not surprising that such Bluetooth microchips might come to be entrenched in nearly almost all consumer electronic peripherals in the future.

V. MANET CONSEQUENCES

Apart from being such a wonderful technology, there are some consequences as well. We'll discuss the major ones here. First of all the collection of all mobile nodes in a MANET has a very limited wireless transmission range. This makes the network topology to alter in consistent variations, which in turn increasing more management overhead because of which there will be more bandwidth depletion. Also the wireless connection attributes are also changing with the time which might disturb the communication between sender and the receiver [4]. As in the case of wireless transmission, the nature of the medium is broadcast. There are so many restrictions that each mobile node has to take care while communicating with other mobile nodes in the MANET like a mobile node must not interrupt any constant session while acquiring access to a mutual medium.

Data packet loss in the MANET is quite huge and the causes behind this contains inflamed system downtime due to the presence of unnoticeable nodes, unusual bit error rate in the wireless network, mobile node's consistent movement causing the route ruptures at regular intervals and many more. The route during the transmission, when a data packet is sent to be received by a distant receiver, changes quite frequently and the prime reason causing is the consistent movement of the mobile node in the network. This same movement is also responsible for data packet loss during the transmission.

VI. APPLICABLE AREAS FOR MANET

The Mobile Ad hoc Network is very much useful in numerous areas. MANET can be primarily used in military purpose where the conventional network can be replaced by MANET for all its mobile vehicles and resources thus securing the network from intruders. MANET can also enhance the work nature to be cooperative, which can help in turn to simplify the business situations. MANET will be reasonably useful for life salvaging and emergency procedures for misfortune support scuffles. Such emergency procedures are supposed to be applied where there are smashed and non-prevailing communication assembly and rapid arrangements of a communication network is obligatory.

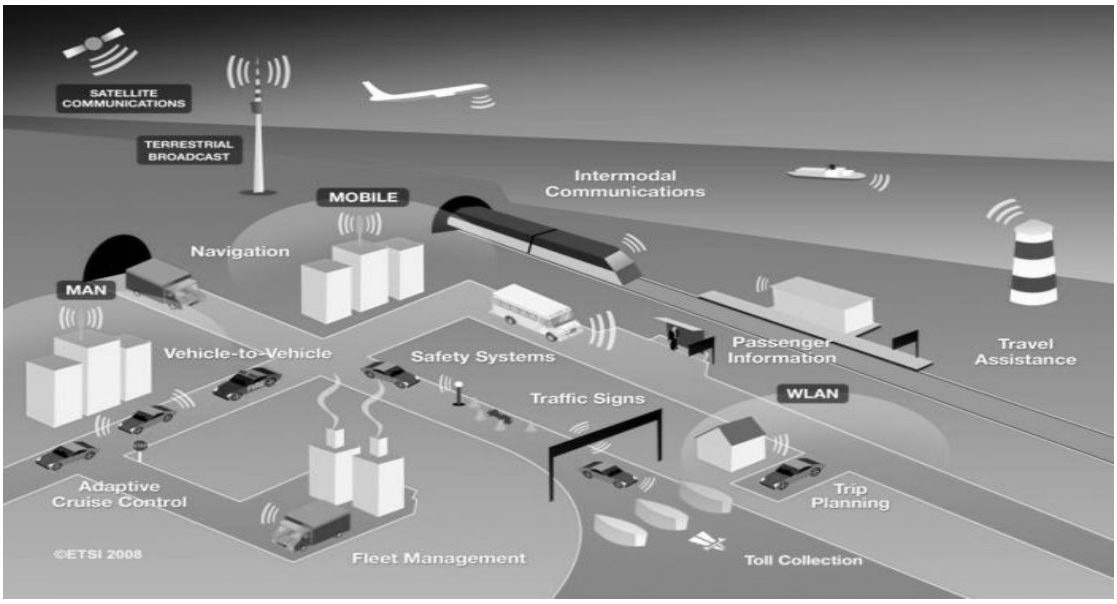

Figure 4. MANET Applicable Areas

The MANET can be effectively used with networks based on sensors. One can effectively control household equipment whether these equipment are situated nearby or at some distance. Also MANET can be used to sense and provide information related to weather and some objects can also be tracked using this wonderful technology. Education segment can utilize MANET to improvise the management elementary communication amenities for technologically equipped meeting rooms or Lecture Theaters or research laboratories. And lastly a restricted

MANET can create modesty in the interchange in between numerous mobile nodes e.g. a mobile computer and a mobile phone.

VII. CONCLUSION

MANET is the considered to be a much evolved technology now but still it contains some more potential to be discovered. The MANET is primarily developed over the basic concept of the wireless networks. There are quite a handful benefits of MANET technology, but as usual there are some consequences as well. Most of the consequences can be resolved, thus making the MANET a wonderful and efficient wireless network to work with. Network of any kind always faces the challenge providing security which becomes more prominent when it comes to wireless network technologies and the MANET cannot be an exception as well. With the help of some security safeguards this security problem can be fixed and better results can be obtained using numerous MANET applications.

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