An Adhoc Network for Wireless Technology: Daknet

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***Abstract* – Current trend in world technology advancements have changed the way people communicate with each other. The massive growth of internet boosted up developing countries to adopt the new scenario. but still some loop holes remained like the Internet Communication Technology advanced in urban areas of developing countries but the rural and remote areas were still lacking behind. In this paper an attempt has been made to familiarize the network that proved to be a blessing to remote people giving them opportunity to use the world's biggest chain of ad hoc networks Internet- called "DAKNET".**

IndexTerms*— *Wireless, data connectivity, network, Wi-Fi, donkeynet, dak, wireless catalyst

I. INTRODUCTION

Daknet is very easy to connect to the world. Now in remote villager travel to talk to family member or to get form which citizen in developed countries can call up on a computer in a matter of milliseconds. Now-a-days government tries to connect every village using advanced technology and think that telephone is the cheapest way to provide connectivity but in advanced technology, wireless technology make running copper wire to an analog telephone much more expensive than broadband internet connectivity. Daknet – an adhoc network uses wireless technology to provide digital connectivity. This technology take an advantage of existing technology to transport data and developed by MIT. Daknet derived from hindi word "DAK" for postal combines a physical means of transportation with wireless data transfer to extend the internet connectivity that a uplink, a cyber cafe or post office provides. DakNet has been successfully deployed in remote parts of both India and Cambodia at a cost two orders of magnitude less than that of traditional landline solutions. Villagers now get affordable Internet services and they are using them.

II. WHY DAKNET

Real time communications need large capital investment and hence high level of user adoption to receiver costs. The average villager cannot even afford personnel communications device such as a telephone or computer to recover cost, users must share the communication infrastructure Studies show that the current market for successful rural Information and Communication Technology (ICT) services does not appear to rely on real-time connectivity, but rather on affordability and basic interactivity. The poor not only need digital services, but they are willing and able to pay for them to offset the much higher costs of poor transportation, unfair pricing, and corruption.

III. AD HOC NETWORK

An ad-hoc wireless network is a collection of wireless mobile hosts forming temporary network without the aid of any established infrastructure or centralized control. Ad-hoc networks require a peer-to-peer architecture, and the topology of the network depends on the location of the different users, which changes over time.

In addition, since the propagation range of a given mobile is limited, the mobile may need to enlist the aid of other mobiles in forwarding a packet to its final destination. Thus the end-to-end connection between any two mobile hosts may consist of multiple wireless hops.

It is a significant technical challenge to provide reliable high speed end-to-end communications in ad-hoc wireless networks given their dynamic network topology, decentralized control and multihop connections.

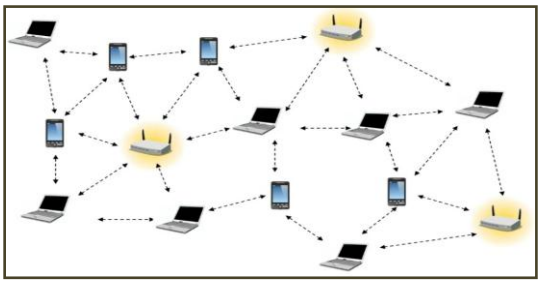


Figure 1 : Ad-Hoc Network

In the ad-hoc network, computers are brought together to form a network "on the fly." As shown in Figure, there is no structure to the network; there are no fixed points; and usually every node is able to communicate with every other node. An algorithm in ad-hoc network architectures uses a broadcast and flooding method to all other nodes to establish who's. Current research in ad-hoc wireless network design is focused on distributed routing. Every mobile host in a wireless adhoc network must operate as a router in order to maintain connectivity information and forward packets from other mobiles. Routing protocols designed for wired networks are not appropriate for this task, since they either lack the ability to quickly reflect the changing topology or may require excessive overhead. Proposed approaches to distribute routing that quickly adapt to changing topology without excessive overhead include dynamic source and associatively based routing. Other protocols that address some of the difficulties in supporting multimedia applications over ad-hoc wireless networks include rate-adaptive compression, power control, and resource allocation through radio clustering.

IV. AD-HOC MOBILE ROUTING PROTOCOL

Routing protocols between any pair of nodes within an ad-hoc network can be difficult because the nodes can move randomly and can also join or leave the network. This means that an optimal route at a certain time may not work seconds later. Discussed below are three categories that existing ad-hoc network routing protocols fall into (A) TABLE DRIVEN PROTOCOL (B) ON DEMAND PROTOCOL (C) HYBRID PROTOCOL

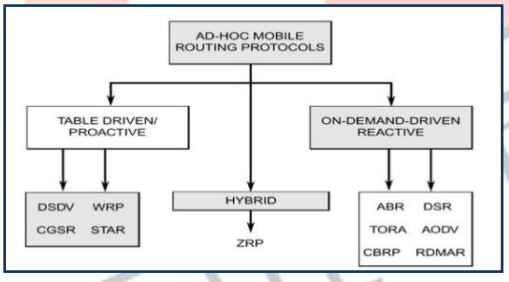


Figure 2 : Ad-Hoc MRP

(A)Table Driven Protocol : it's known as Proactive Protocols, work out routes in the background independent of traffic demands Each node uses routing information to store the location information of other nodes in the network and this information is then used to move data among different nodes in the network. This type of protocol is slow to converge and may be prone to routing loops. These protocols keep a constant overview of the network and this can be a disadvantage as they may react to change in the network topology even if no traffic is affected by the topology modification which could create unnecessary overhead. Even in a network with little data traffic, Table Driven Protocols will use limited resources such as power and link bandwidth therefore they might not be considered an effective routing solution for Ad-hoc Networks. Fisheye State Routing is an example of a Table Driven Protocol.

(B)On Demand Protocol : it's known as Reactive Protocols, establish routes between nodes only when they are required to route data packets. There is no updating of every possible route in the network instead it focuses on routes that are being used or being set up. When a route is required by a source node to a destination for which it does not have route information, it starts a route discovery process which goes from one node to the other until it arrives at the destination or a node in-between has a route to the destination. On Demand protocols are generally considered efficient when the route discovery is less frequent than the data transfer because the network traffic caused by the route discovery step is low compared to the total communication bandwidth. This makes On Demand Protocols more suited to large networks with light traffic and low mobility. An example of an On Demand Protocol is Dynamic Source Routing.

(C)Hybrid Protocol : it combine Table Based Routing Protocols with On Demand Routing Protocols. They use distance-vectors for more precise metrics to establish the best paths to destination networks, and report routing information only when there is a change in the topology of the network. Each node in the network has its own routing zone, the size of which is defined by a zone radius, which is defined by a metric such as the number of hops. Each node keeps a record of routing information for its own zone. Zone Routing Protocol (ZRP) is an example of a Hybrid routing protocol.

V. HOW ITS WORK

DakNet integrates inexpensive Customer Off-The-Shelf (COTS) hardware components, open source software, and FMS's proprietary software to create an asynchronous Internet hub and spoke system. Computers at the hub are connected to the internet in real time, while computers at the end of the spoke are connected asynchronously.

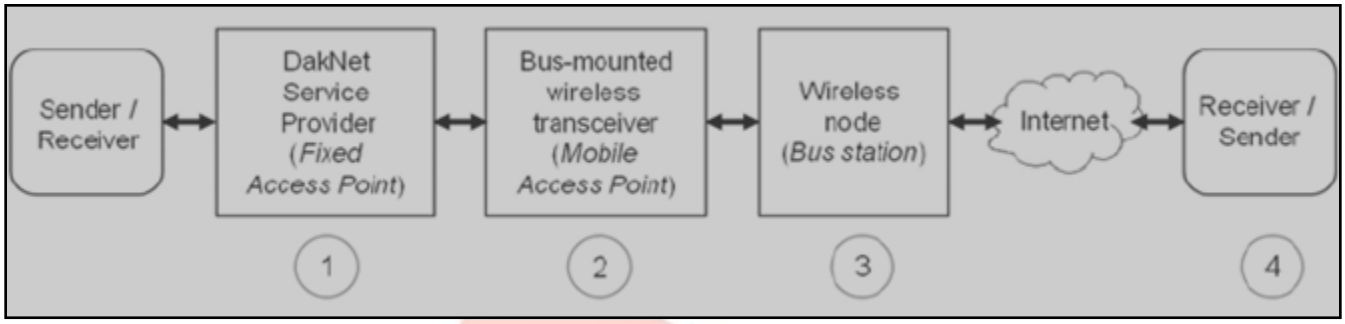


Figure 3 : Daknet Cycle

Traditional transport mechanisms such as cars, motorbikes, buses, or even donkeys transport data between the hub and spoke

VI. DAKNET ARCHITECTURE

DakNet is unique and proprietary network software that distributes bandwidth from Internet connection points as far as the road goes. Existing backbones become wireless uplinks for Mobile Access Points that are mounted on vehicles to provide broadband "drive-by WiFi" access as they pass through rural areas.The main parts of DakNet architecture are

(1)Mobile Access Point

DakNet offers data to be transmitted over short point-to-point links. It combines physical and wireless data transport to enable high-bandwidth intranet and internet connectivity among kiosks (public computers) and between kiosks and hubs. Data is transported by means of a mobile access point, which automatically and wirelessly collects and delivers data from/to each kiosk on the network. Low cost WIFI radio transceivers automatically transfer the data stored in the MAP at high bandwidth for each point- to- point connection. Mobile Access Point is mounted on and powered by a bus or motorcycle, or even a bicycle with a small generator. MAPs are installed on vehicles that normally pass by each village to provide store-and-forward connectivity.

Figure 4 : MAP on motorcycle

MAP equipment used on the bus/motorcycle includes

- ✓ A custom embedded PC running Linux with 802.11b wireless card and 512 Mbytes of compact flash memory.
- ✓ A 100-mW amplifier, cabling, mounting equipment, and a 14-in Omni directional antenna.
- ✓ An uninterruptible power supply powered by the bus battery.

A session occurs each time the bus comes within range of a kiosk and MAP transfers data. The speed of the connection between the access point and the kiosk or hub varies in each case. But on average, they can move about 21Mb or 42 Mb bidirectional per session.

The average good put or actual throughput for a session, during which the MAP and kiosk go in and out of connection because of mobility and obstructions, is 2.3Mbps. Omni directional antennas are uses on the bus and either directional or omni directional antennas are located at each of the kiosks or hubs. The actual throughput depends on gain of antenna and orientation of each kiosk with the road.

Figure 5 : MAP BASED VEHICLE

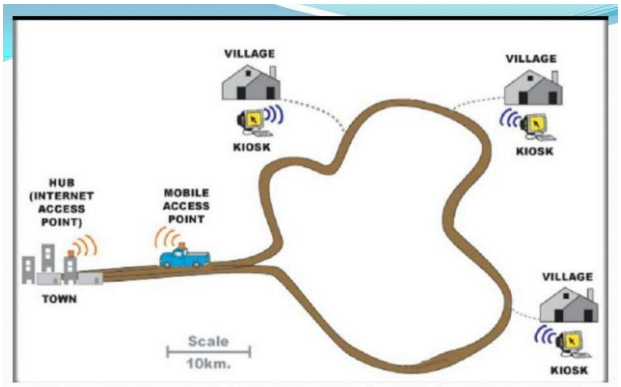
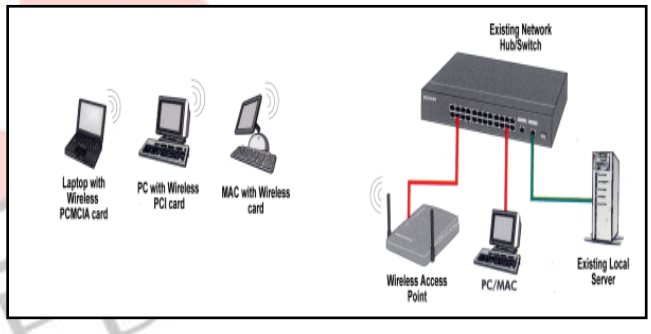


Figure 6 : Ad-Hoc Network

(2)Hub

It is a common connection point for devices in a network. It is used to connect segments of a LAN. It contains multiple ports Packet at one port copied to all other ports-all segments see all packets. When the vehicle passes near an internet access point the hub- it synchronizes all the data from different kiosks using the internet.



(3)Kiosk

It is a booth providing a computer related service such as ATM. In each village there is kiosk. It requires a user interface that can be used without training. It enable user to enter and display information on the same device. Either directional or

omni directional antennas are located at each of the kiosks or hubs. Amplifiers are used to boost the signal and range for higher. In Daknet a wireless card i.e wifi card is mounted on a vehicle that travels around to remote villages and exchanges updated information with each kiosk it encounters through WiFi.

Figure 8 : Kiosk

Advantages of using WiFi cards are :

- ✓ Increase mobility
- ✓ Cost for setting up a network is much less than running wires.
- ✓ WiFi has a global set of standards.
- ✓ support encryption in order to protect the data that is being transmitted.

VII. DAKNET PACKAGE

DakNet offers an affordable and complete connectivity package, including: Wireless hardware (wireless transceiver and antennas) , Networking software , Server and cache software , Custom applications, including email, audio/video messaging, and asynchronous Internet searching and browsing API enabling organizations to easily integrate DakNet with their existing applications.

VIII. MERIT & DEMERIT

(A) MERIT

- ✓ Since it avoids using phone lines or expensive equipment, Daknet provides one of the lowest-cost accessibility solutions in the world.
- ✓ The same hardware, software and user interface can be used to enjoy real-time information access.
- ✓ It has the ability to provide a seamless method of upgrading to always -on broadband connectivity.
- ✓ Easy to implement on widespread basis.
- ✓ Lower uplink costs and maintenance requirements.
- ✓ Bandwidth does not decrease with distance.
- ✓ Seed infrastructure that is scalable with demand.
- ✓ Reduced regulatory challenges and licensing fees.

(B) DEMERIT

- ✓ Token ring constraint if a lower tier goes down, all higher tier goes down
- ✓ Experience and Expertise person can only handled kiosk
- ✓ Efficiency of bandwidth reduced for each tier

IX. CONCLUSION

DakNet's low deployment cost and its enthusiastic reception by rural users has motivated dozens of inquires for further deployments. The larger goal is to shift the policy focus of the government's universal-service-obligation funds from wire line village telephones to wireless ad hoc networking. Country wide connectivity through Daknet.

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