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Original Research Paper

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TO ESTABLISH COMMUNICATION IN POST DISASTER USING DELAY TOLERANT NETWORK

Chandrima Chakrabarti*

Associate Professor, Narula Institute Of Technology, Kolkata
*Corresponding Author

ABSTRACT Crumb The delay-tolerant network (DTN) architecture envisions a protocol suite addressing many open issues in networking, and extending far beyond the current Internet suite's capabilities. The DTN Bundle Protocol (BP) has been implemented multiple times on different platforms with different features and optimizations. DTN and BP are not a singular complete concrete protocol stack, but rather a highly configurable core. Specific challenged networks have different constraints, and need individually optimized BP stacks, which may or may not ultimately be interoperable with one another. This chapter compares some BP configurations with similar non-BP-based designs and concludes with a perspective on future work in DTN, including the open question of whether or not a common underlying protocol like BP is necessary. Delay-tolerant networking (DTN) is an approach to computer network architecture that seeks to address the technical issues in heterogeneous networks that may lack continuous network connectivity. Examples of such networks are those operating in mobile or extreme terrestrial environments, or planned networks in space. In this paper, "DTN Monitor and Control system in Deep Space Network (DSN)" exemplifies a case how DTN Monitor and Control system can be adapted into a space network as it is DTN enabled. Also, a "DTN Status Diagnose and Treatment Creator" tool is devised to provide a platform for network operator to compose failure treatment methods according to the received DTN BSR(bundle status report), DTN implementation specific log message and the network specifically produced monitor and control data. Moreover, a GUI system is designed to provide visual interfaces to display the operation status and DTN topology lively, query the DTN status stored in the database, and guide the designated user to fix the DTN failure.

KEYWORDS : Delay Tolerant Network, Post Disaster Communication, mobility model, Routing, Deep Space Network

I. INTRODUCTION

Delay-tolerant networks (DTNs) were introduced in 2003 for fighting the enormous delays involved in deep space communications (in the order of minutes, hours, or even days) [1-3]. Such delays cannot be handled with existing (terrestrial) networking technologies and thus must be handled at the application level. Extending the concept of delay tolerance, it may be possible with the same design to handle long-term disruptions as well. Disruptions (intentional or unintentional) can be considered as unplanned delays. Depending on the context and application scenario, a DTN may be a "delay-tolerant," a "disruption-tolerant," network. More than a decade after its introduction, DTN is still lacking a killer application that will help it unveil its potential and result in wide adoption. The wide applicability of DTN in such diverse environments indicates that DTN is, in fact, an enabling network protocol stack and technology for building next-generation applications and apps for smart mobile devices that can cope transparently with long disconnections.

II. Related Work

Delay-Tolerant Network (DTN) is such a kind of network that cannot possibly maintain continuous connections among source and destination nutshell the while and exploits mobility of nodes for message propagation. DTN uses store-carry-forward approach were message travels from source to destination node through intermediate nodes by opportunistic contacts due to node movement. These intermediate nodes keep the message in their buffer, carry it while on the move and forward it to the next intermediate node encountered. Eventually, the message gets delivered to the destination node. An important application of DTN is considered to provide for emergency message delivery to key personnel in a disaster-stricken area.

III. Post Disaster Mobility Model

A. Network Scenario

In a disaster scenario, devices have no Internet connection and cannot build a network with end-to-end connectivity between all devices. Each device may be, for example, a smartphone, tablet or specialized rescue component [7]. Devices of pedestrians have limited battery life while devices installed on vehicles have unlimited battery life. We assume the same storage capacity for all devices. We call a node any device capable of receiving and forwarding messages in the network. Messages can be sent according to three scenarios:

1. All nodes send messages to any other participant node.
2. All nodes send messages to a command centre. This scenario describes a situation awareness phase, where devices act as sensors and inform a specialized centreof the situation around them.
3. Only command centres send messages to other command centres, assuming there is no direct connectivity between them and mobile devices relay messages.

We assume that nodes collaborate by forwarding messages to their neighbours according to a defined DTN protocol. The presence of malicious nodes in the system is out of the scope of this work.

B. Mobility Model

The mobility of nodes in the network affects their chances of forwarding messages to their destination. In the context of disaster scenarios, the role of the participants defines their movement. Role-based mobility models represent this fact by associating a mobility pattern with the participant. The main difference is made between pedestrians and vehicles, often called carriers. They can be classified according to their speed and to the area covered by their mobility: pedestrians are slower and cover small areas while vehicles are faster and cover a larger zone[4-5].

C. Analysis Of DTN Protocols

We ran our experiments on the One simulator using the PDM mobility model proposed by. Our main goal is to evaluate different DTN protocols and identify relevant characteristics to classify them as more suitable for explorer or exploiter nodes. Our default scenario has the following settings: 10 neighbourhoods with 20 people each, 5 ambulances, 5 patrol cars,1 road repair unit, 20 rescue workers, 1 command centre, 60 houses, 1 police centre, 1 hospital, 1 coordination centre and 1 relief centre. The mobility model is PDM: people move in a neighbourhood while ambulances and patrol cars move between centres and neighbourhoods providing connection from clusters of people to the entire scenario [6-7]. Every node has a buffer size of 50 MB. Notice that this is a conservative value if we consider that most smartphones nowadays have at least 4 GB of storage. Another important parameter of our scenario is the message time-to-live or TTL. We set the TTL value at 360 minutes. Each of our tests covers 172, 800 seconds. For protocols like Spray-and-Wait and Spray-and-Focus, the number of message retransmissions is limited to 20 copies per node.

D. Disaster Area And Neighbourhood

Natural disasters, such as earthquakes, floods, hurricanes, volcano eruptions, tsunamis, among others, can severely damage communication infrastructure making it difficult for affected people and decision makers to receive and send information. Failures in cell towers, communication lines and power supplies, added to the burden of requests generated by users, can seriously compromise the exchange of data. In the hours following a disaster, communications are needed for spreading critical information to people in the affected area, as well for the communication of rescue teams and to achieve situation awareness. Several applications, such as Google People Finder and the Red Cross App's assume a scenario with Internet access and fully reliable power supplies. Such an assumption is valid because most of their users are people outside the disaster area. The main problem with this model is that information provided by users outside the disaster area is bound to be less accurate and to become outdated quickly. In disaster scenarios the most relevant information comes from people inside the affected areas. However, nowadays most of them have one or more mobile devices such as smartphones and tablets. Mobile devices are especially helpful in such scenarios because they have fair processing power, storage capacity, and battery life, enabling people to send relevant information through text, audio or images.

E. Evacuation And Return

After the disaster people who are affected need to be rescued from that situation[5]. Many volunteers from different organization will reach that place. Sometime its too difficult to handle this situation. In that case if we can establish a local system of media, a short-range network model then it will be helpful for the volunteers to rescue those affected people. For this DTN is one of the best options. The volunteers can send the massages to other volunteers if they are present at the vicinity or they can receive the massages when they are close to the sender device. Even the volunteers can forward the massages to some other person if those massages are not for them. If there is any need of resources and medical help then they can contact with the respective organization. By this way we can contact with the affected people and can evacuate them from that situation.

F. Post-Disaster Relief Operation

The goal of this project is to help in rescue those people who got stuck in disaster situation and is not able to contact with anyone by establishing hop-by-hop communication. For communication Bluetooth have been used in this project. Using Bluetooth as a medium network message can be transferred from one node to another node. The main objective of this project is to help in the rescue operation by establishing hop-by-hop communication. Using Bluetooth as a medium network the message can be transferred from one node to another node. We are using delay tolerant network (DTN) in this project and DTN uses Bluetooth to communicate with nodes and establish secure and reliable communication.

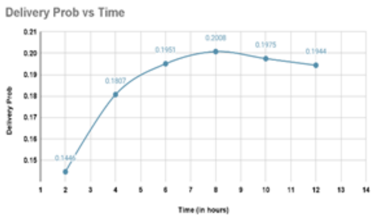

Fig. 1: Delivery Probability with Time using Prophet router

Figure 1 displays the system's delivery probability with time when Prophet router is used.

G. Centres

A. Control Station

For disaster recovery using a delay tolerant network, the situation that is proposed is there will be one control station which is stationery. This is acting as a base of the recovery centre.

B. Shelters

The model also consists of five shelters. Each shelter will be associated with 20 volunteers each. The shelter will be stationery. The shelter sends the details of the people evacuated from the disaster and provides them with temporary aid and energy resources.

C. Volunteers

The volunteers are twenty in number for each shelter. The volunteers are mobile and they carry the messages. They look for people to be rescued and thereafter transfer the messages to the other volunteers which in turn send the message to the shelters or control station.

H. Interaction Among Agents

Moving nodes are equipped with communicating devices that are capable of transferring data when they are within the range of each other. There are usually short-range radio (say, 50m range) with a very low data transmission rate.

CONCLUSIONS

We In this work we have proposed the used of hybrid DTN protocols for disaster scenarios, where nodes with different mobility patterns can apply different routing rules, in order to improve the exploration of an area searching for a destination, or improve the exploitation of the knowledge of neighbour nodes. These protocols have a better trade-off between delivery rates and overhead of message in the network.

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