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Inter-Contact Routing in Cellular Networks

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Abstract* – Cluster phone: Intercontact routing using mobile phone system - The main aim is to provide communication in disaster area between rescue workers and trapped survivors. In the smartphone contains two components like message system and self-rescue system. Message system run on rescue workers mobile and self-rescue system run on trapped survivors mobile. As soon as the disaster occurs the affected people form a cluster and the one with the highest battery percentage will be assigned as the cluster head. Only the cluster head can communicate with the rescue worker. In order to route the messages AODV i.e. Ad hoc on demand distance vector routing protocol is used. The trapped survivors can use this system irrespective of the time and place. With this system installed in ones' smartphone the user has more chance of getting rescued quickly.

I. Introduction

Over the last decade, many communication plans have been implemented to improve the rescue efforts such as deploying Wireless Sensor Networks to form an Ad-hoc network. These Sensors gather the information about the trapped survivors and transfers the data to the Rescue workers but the major drawback of all these efforts is that they don't have a stable communication framework. As there won't be any cellular towers. The only reliable technology is short-range radios such as Wi-Fi and Bluetooth Although cellular towers can also be destroyed In addition, the extension of cell phones additionally gives wide chances to reinvestigate fiasco recuperation from the system perspective. In a fiasco recuperation, cell phones can possibly be the most achievable specialized instrument as it is controlled by all as of late. For instance, caught survivors of an auxiliary fall can speak with protect specialists and offer their area data through the short-run radio, for example, Wi-Fi of their cell phones when they are inside the correspondence scope of each other. Cell phones of safeguard laborers can likewise frame systems utilizing Wi-Fi hotspot and conquer the correspondence limitations in catastrophe recuperation.

To this end, in this paper, The proposed display ClusterPhone is a stage for correspondence in a fiasco recuperation, where cell phones are collaborated and made to cooperate to give information interchanges by misusing Wi-Fi and cell modules of cell phones, ClusterPhone consistently coordinates cell organizing, specially appointed systems administration and backings information transmission among save laborers and survivors in foundation obliged and framework less situations. ClusterPhone likewise empowers vitality productive steering techniques for caught survivors to find protect laborers and convey crisis messages, via

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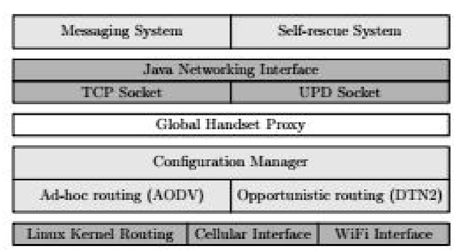
precisely tending to the wake-up booking of cell phones. The crisis message includes the coarse-grained location and position information of trapped survivors, which is derived from the last known locations of their smartphones and the network formed by these smartphones. The implementation of ClusterPhone is done as an application on the Android platform and deploy it on smartphones. Experimental results demonstrate that ClusterPhone can properly fulfill the communication requirements and also provides the facility to execute rescue operations. the design of ClusterPhone consists of a messaging system and a self-rescue system to provide communications and facilitate rescue operations in disaster recovery. The idea of ClusterPhone is motivated by the fact that people heavily reply on smartphones in their daily lives. The messaging system can accomplish different types of message transmissions by bridging cellular networks, ad hoc networks and opportunistic networks, and by connecting different routing protocols. The self-rescue system can send out emergency messages with location and position information through self-rescue grouping, wake-up scheduling and positioning, where they design a communications protocol that can fulfill these functions in an energy efficient manner. The outline, execution and assessment depend on cell phones, which empowers ClusterPhone to be introduced as a default application on cell phones by makers to help save tasks in a fiasco situations.

II. LITERATURE REVIEW

[1]Zongqing Lu, Guohong Cao and Thomas La Porta from the Pennsylvania State University has proposed a model for networking smartphone for disaster recovery the paper explains that how to network smartphones for providing communications in disaster recovery. By bridging the gaps among different kinds of wireless networks, they have designed and implemented a system called TeamPhone, which provides smartphones the capabilities of communications in disaster recovery. Specifically, The application consists of two components: a communication system and a self-rescue system for the survivors. The communication system consists of cellular networking, ad-hoc networks, and provides communications among rescue workers. The self-save framework is vitality productively bunches the cell phones of survivor and conveys crisis messages in order to help the safeguard activities. They have actualized TeamPhone as a crude application on the Android stage and conveyed it on cell phones. Investigation comes about demonstrate that TeamPhone can appropriately satisfy correspondence prerequisites and extraordinarily encourage save tasks in a fiasco recuperation.



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[11]Sacha Trifunovic and others has proposed a paper on WIFI: Ad-Hoc-less opportunistic Networking which states, Opportunistic Networking offers many appealing application perspectives from local social-networking applications to supporting communications in remote areas or in disaster and emergency situations. However, in spite of the expanding infiltration of cell phones, artful systems administration isn't attainable with most prominent cell phones. There is still no help for Wi-Fi Ad-Hoc and conventions, for example,

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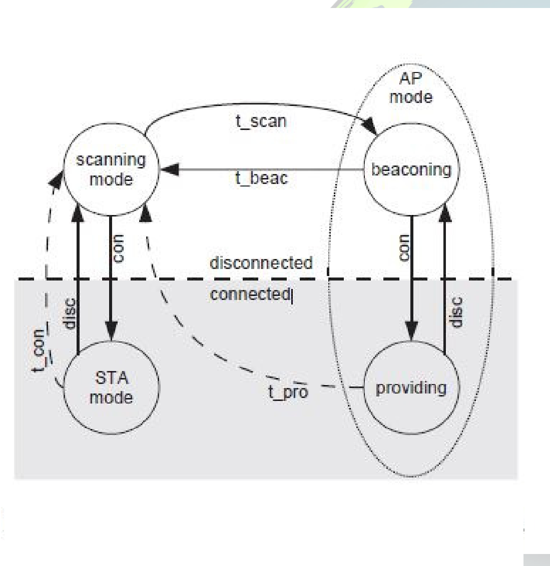
Bluetooth have extreme confinements (short range, blending). An element used to share Internet get to, which they use to empower sharp correspondences. they compare Wi-Fi -Opp to Wi-Fi Ad-Hoc by replaying real-world contact traces and evaluate their performance in terms of capacity for content dissemination as well as energy consumption. While achieving comparable throughput, WIFI is up to 10 times more energy efficient than its Ad-Hoc counterpart. Eventually, a proof of concept demonstrates the feasibility of WIFI, which opens new perspectives for opportunistic networking.



[12]Alex Delis and others proposed a model for localizing a GPS free node which can be used to track an exact node even if there is no internet connection. The paper says that an important problem in mobile ad-hoc wireless sensor networks is the localization of individual nodes, i.e., each node's awareness of its position relative to the network. In this paper, we present a variation of this issue (directional limitation) where every hub must know about the two its position and introduction with respect to the system. This variation is particularly significant for the applications in which versatile hubs in a sensor organize are required to move in a collective way. Utilizing worldwide situating frameworks for confinement in vast scale sensor systems isn't savvy and might be unreasonable in encased spaces. Then again, an arrangement of previous stays with all around known positions may not generally be accessible. To address these issues, Through simulation studies, they demonstrate that their algorithm scales well for large numbers of nodes and provides convergent localization over time, even with errors introduced by motion actuators and distance measurements. Besides, in view of our limitation calculation, they acquaint components with save arrange development amid coordinated portability in versatile sensor systems. Our recreations affirm that, in various reasonable situations, our calculation accommodates a versatile sensor arrange that is steady finished time irrespective of speed, while using only constant

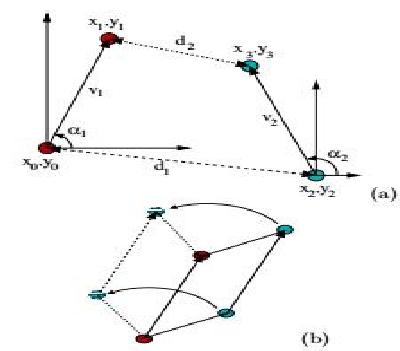


Figure 1: Typical movement of two nodes, with angles and distances (a). An example non-rigid geometry, where nodes move parallel keeping the distances exactly. Nodes can have infinite positions around each other (b).

[14]D. G. Reina, S. L. Toral, F. Barrero proposed a model for Modelling and Assessing Ad Hoc Networks in Disaster Scenarios. The paper says that the Ad hoc networks have been proved to be suitable for disaster scenarios since any infrastructure needs to be deployed

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in order to establish a wireless network. Routing protocols play an important role in the performance of mobile ad hoc networks. Routing protocols are responsible for deciding how the information is going to move through the network. one foremost parameter of impromptu systems is the versatility of hubs, little exertion has been made to assess the execution of portable specially appointed systems under portability models where the developments of safeguard groups amid emptying activities are demonstrated. The goal of this paper is to assess genuine case calamity situations

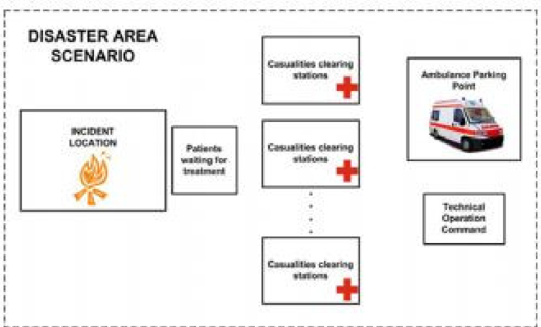

Fig. 1 Modeling Disaster Area Scenarios

as far as execution utilizing a few surely understood steering conventions metrics.

[15]Partha Sarathi Paul, Subrata Nandi, Saikat Kumar Dey has proposed a model for Challenges in Designing Testbed for Evaluating Delay Tolerant Hybrid Networks this paper was selected as the application need to be stable even in extreme conditions the paper tells that A. DTN in Challenged Networking Areas

Delay Tolerant Networking (DTN)[1] is an important component for challenged network application areas like rural internet, battlefield communication, post-disaster communication etc., which are characterized by intermittent connectivity and lack in infrastructure resources. A detailed study on DTN may be available in [2]. For example, Twi might, a disaster-ready Twitter application introduced in [3], has an opportunistic mode and may be used in an emergency network situations. DTN, despite its novelty, lacks in prompt responsiveness and reliability due to unpredictable delay and intermittent connectivity, which makes it hard to be used in challenged network applications solely by itself.

B. Hybrid Networks in Challenged Networking Areas For low-cost rural internet, [4] used mechanical backhauls as mobile access points to carry data to and from rural kiosks. Braunstein et. al. deployed a hybrid network architecture, called Extreme Networking System (ENS)[5], for medical emergency response support that consisted of three hierarchies; a Wi-Fi network, a wireless mesh network, and multiple back-haul networks. Authors of [6] suggested a rapid-deployable delay-constrained hybrid network for post- disaster communication using DTN and infrastructure-based ad hoc backbone along multiple tiers. Their architecture, the authors claimed, would provide a reliable and delay bound solution to post-disaster communication. they categorize the above-mentioned architectures as Delay-Tolerant Hybrid Network (DTHN), since such networks involve nodes having varying range of heterogeneity (device, mobility, interface, range, etc.), and also, they work in DTN mode due to lack of end-to-end connectivity.

C. Validation of Challenged Networking System Architectures Studying the performance of such challenged networking system architectures are themselves a challenge because such environments (like war, disaster etc) are often out of human control, and even when one occurs, testing under such environment is out of question. Possible alternatives are:

1. Analyzing mathematically of some similar abstract model,

2. Simulating the environment through a standard simulator,

3. Testing through some real laboratory-scale testbed.

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Alternative 1 is fine except that exact network conditions are hard to model and harder to analyze mathematically. 2 is better, although not the ideal, as it is hard to emulate all the real-life network conditions through computer programs.

D. Testbeds for DTN in [7], the Walker et al. demonstrated a laboratory-based multi-hop wireless testbed, called Mesh Test, that can subject virtual wireless nodes running DTN implementations. They have installed DTN2 Reference Implementation [8] on the testbed nodes and used ORBIT's testbed management software to control the nodes. Beuran et al. They utilized QOMET, an arrangement of devices for remote system imitating, for copying hub versatility in a virtual

Tier	Acronym	Devices	Device Spec.	Qty.	Interface
T-1	DTN	Smart Phones, Tablets	Google Nexus 7 (2012), LG Google Nexus 4	7	Wi-Fi
T-2	IDB	Laptops	Ubuntu Linux	3	Wi-Fi
T-3	DM	Custom-built Device	Raspberry Pi with Wi-Fi Interface	1	Wi-Fi
T-4	LWC	Long-range NLOS/nLOS Wi-Fi Link	Cambium PTP-500	2	Long-range Wi-Fi

Interface	Obs. Data Rate	Avg. Inter-Contact Gap
DTN-DTN	1-2 Mbps	Random
DTN-IDB	2-5 Mbps	25 min
IDB-DM	1-1.5 Mbps	30 min
LWC-LWC	6-10 Mbps	Always connected

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domain.

[16]GaoJun Fan and ShiYao Jin has proposed a model to overcome the network coverage issues in smartphones the paper represents Advances in wireless communication and Micro Electro Mechanical Systems (MEMS) have enabled the development of low-cost, low-power, multi-functional, tiny sensor nodes which can sense the environment, perform data processing and communicate with each other over short distances. Due to a wide range of potential applications including environment monitoring, object tracking, scientific observing and traffic control and etc., Wireless Sensor Network (WSN) have attracted a plethora of research efforts. A typical large-scale WSN generally consists of one or more sinks (or base stations) and tens or thousands of sensor nodes that organized themselves into a multi-hop wireless network and deployed either randomly or according to some predefined statistical distribution over a geographical region of interest. A sensor node by itself has severe resource constraints, such as limited memory, battery power, and signal processing, computation and communication capabilities; hence it can sense only a small portion of the environment. However, a group of sensors collaborating with each other can accomplish a much bigger task efficiently. With integration of sensing, computation, and wireless communication, the sensor nodes can sense physical information, process crude information, and report them to the sink or base stations that can make application specific decisions and link to the outside world via the Internet or satellites [1, 2]. WSN is mainly distinguished from the conventional wireless ad hoc network by their unique and dynamic This paper presents a thorough survey of the existing coverage schemes for WSN, and it also outlines several open problems. The purpose is to provide a better understanding of coverage technology and to stimulate new research directions in this area. The remainder of the paper is organized as follows. they introduce some design criterions in coverage problem for WSN that followed by the related problem in other fields. Next, they classify coverage schemes into three categories: point coverage, area coverage and path coverage, what is more, they make a summary and comparison of existing coverage scheme for WSN. After that, they outline two directions that should be further studied in the design of coverage

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scheme. Conclusions are drawn in the last section.

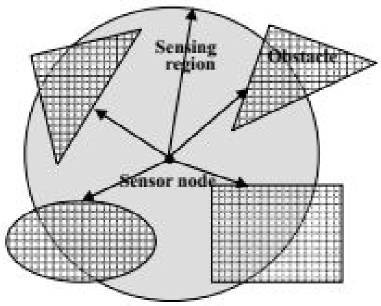

Figure 1. A sensor node surround by non-penetrate obstacle.

[17]This paper is considered for the routing task, in which a message is to be sent from a source node to a destination node (in a sensor or ad hoc wireless network). Due to propagation path loss, the transmission radii are limited. Thus, routes between two hosts in the network may consist of hops through other hosts in the network. The nodes in the network may be static (e.g. thrown from an aircraft to a remote terrain or a toxic environment), static most of the time (e.g. books, projectors, furniture) or moving (vehicles, people, small robotic devices). Wireless networks of sensors are likely to be widely deployed in the near future because they greatly extend our ability to monitor and control the physical environment from remote areas and enhance our exactness of data acquired through joint effort among sensor hubs and online data preparing at those hubs. Systems administration these sensors (engaging them with the capacity to arrange among themselves on a bigger detecting errand) will alter data assembling and handling by and large. Sensor systems have been as of late concentrated in [EGHK, HCB, HKB, KKP]. A comparative remote system that got noteworthy consideration as of late is specially appointed system [IETF,MC]. Mobile ad hoc networks consist of wireless hosts that communicate with each other in the absence of a fixed infrastructure. A few cases of the conceivable employments of specially appointed systems administration incorporate warriors on the war zone, crisis catastrophe alleviation work force, and systems of workstations. Macker and Corson [MC] recorded subjective and quantitative free measurements for judging the execution of directing conventions. Alluring subjective properties [MC] include: appropriated
operation, loop-freedom, demand-based operation and 'sleep' period operation, while hop count and delivery rates are among quantitative metrics. We shall further elaborate on these properties and metrics, in order to address the issue of routing in wireless networks while trying to minimize the energy consumption and/or reduce the demands on nodes that have significantly depleted batteries. This is an important problem since battery power at each node is limited. Our final goal is to design routing protocols with the following properties.

a) Minimize energy required per routing task. Bounce check was customarily used to gauge vitality prerequisite of a directing errand, therefore utilizing consistent metric per jump. Be that as it may, if hubs can change their transmission control (knowing the area of their neighbors) at that point the consistent metric can be supplanted by a power metric that relies upon remove between hubs [E, RM, HCB].The distance between neighboring nodes can be estimated on the basis of incoming signal strengths (if some control messages are sent using fixed power). Relative coordinates of neighboring nodes can be obtained by exchanging such information between neighbors [CHH]. On the other hand, the area of hubs might be accessible straightforwardly by speaking with a satellite, utilizing GPS (Global Positioning System), if hubs are outfitted with a little low power GPS recipient. We will use location information in making routing decisions as well, to minimize energy per routing task.

b) *Loop-freedom.* The proposed routing protocols should be inherently loop-free, to avoid timeout or memorizing past traffic as cumbersome exit strategies.

c) *Maximize the number of routing tasks that network can perform.* Some nodes participate in
routing packets for many source-destination pairs, and the increased energy consumption may result in their failure. Thus pure power consumption metric may be misguided in the long term. A longer path that passes through nodes that have plenty of energy may be a better solution.

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Alternatively, some nodes in the sensor or ad hoc network may be temporarily inactive,

and power consumption metric may be applied on active nodes.

d) *Minimize communication overhead.* Due to limited battery power, the communication overhead must be minimized if number of routing tasks is to be maximized. For instance, shortest path based solutions are too sensitive to small changes in local topology and activity status (the later even does not involve node movement).

e) *Avoid memorizing past traffic or route*. Arrangements that expect hubs to retain course or

past movement are touchy to hub line estimate, changes in hub action and hub versatility while

steering is continuous (e.g. observing condition). Adaptability in choosing courses is along these lines favored.

f) *Localized algorithms*. Confined calculations [EGHK] are conveyed calculations that look like insatiable calculations, where straightforward neighborhood conduct accomplishes a coveted worldwide target. In a confined steering calculation, every hub settles on choice to which neighbor to forward the message construct exclusively with respect to the area of itself, its neighboring hubs, and goal. While neighboring hubs may update each other location whenever an edge is broken or created, the accuracy of destination location is a serious problem. In some cases, such as monitoring environment by sensor networks, the destination is a fixed node known to all nodes (i.e. monitoring center). Our proposed algorithms are directly applicable in such environments. All non-restricted steering calculations proposed in writing are varieties of briefest weighted way calculation (e.g. [CN, LL, RM, SWR]).

g) *Single-path routing algorithms.* The errand of finding and keeping up courses in versatile systems is nontrivial since have portability causes visit erratic topological changes. Most previously proposed position based routing algorithms (e.g. [BCSW, KV]) for remote specially appointed systems depended on sending the real message along numerous ways toward a zone where goal is ideally found, planning to accomplish vigor. Notwithstanding, we have appeared in our past work that solitary way procedures might be significantly more strong (for example, they can ensure conveyance [BMSU]) and with less correspondence overhead. The significant communication overhead can be avoided if a variant of source-initiated on-demand routing strategy [BMJHJ, RT] is applied. In the strategy, the source hub issues a few pursuit 'tickets' (each ticket is a 'short' message containing sender's id and area, goal's id and best known area and time when that area was accounted for, and steady measure of extra data) that will search for the correct position of goal hub. At the point when the principal ticket lands at the goal hub D, D will report back to the source with brief message containing its correct area, and conceivably making a course for the source. The source hub at that point sends full information message ('long' message) toward correct area of goal. The productivity of goal look relies upon the comparing area refresh conspire. A majority based area refresh plot is being created in. Different plans might be utilized, with different exchange offs between the achievement and flooding rates (counting an infrequent flooding). In the event that the directing issue is partitioned as depicted, the versatility issue is algorithmically isolated from the steering issue, which enables us to consider (in this paper) just the instance of static systems with known goal in our calculations and trials. The decision is advocated at whatever point the goal does not move essentially between its discovery and message conveyance, and data about neighboring hubs is consistently kept up. Yet another routing method may forward message toward imprecise destination location, hoping that closer nodes will locate destination more accurately.

h) *Maximize delivery rate.* Our localized algorithms achieve a very high delivery rates for dense networks, while further improvements are needed for sparse networks. We have designed power, cost, and power-cost routing algorithms that guarantee delivery, which is an extension to be reported elsewhere [SD]. The final important goal of a routing algorithm is to handle node mobility with proper *location update schemes.* This issue seems to be the most complex of all discussed here, as argued in an upcoming report [S].Ad hoc and sensor networks are best modeled by *minpower* graphs

constructed in the following way. Each node *A* has its transmission range *t(A)*. Two nodes *A* and *B* in the network are neighbors (and thus joined by an edge) if the Euclidean distance between their coordinates in the network is less than the minimum between their transmission radii (i.e. $d(A,B) < min\{t(A), t(B)\}$).
On the off chance that all transmission ranges are equivalent, the comparing diagram is known as the unit chart. The minpower and unit diagrams are substantial models when there are no impediments in the flag way. Ad hoc and sensor networks with obstacles can be modeled by subgraphs of minpower or unit graphs. The properties of power metrics, the proposed algorithms and their loop free properties in this paper are valid for arbitrary graphs. We have utilized, be that as it may, just unit diagrams in our trials.

SUMMARY TABLE:

Protocol	Number of messages generated	Message delivery ratio	Average delay	Resource consumption
Direct contact	Single	Low	High	Less
Epidemic	N-1	High	Low	High
Two-hop	K	Medium	Medium	Less
Tree based	1+log(N/2)	Medium	High	Medium
Spray and Wait	>K	Medium	Medium	Medium

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