ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

A Distributed Efficient and Accurate Routing Protocol to Increase the Capacity of Hybrid Wireless Networks

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ABSTRACT -A hybrid wireless network is efficient and reliable data routing for protocol is a critical component that affects the throughput capacity of a wireless network in data transmission. The routing protocols in hybrid wireless networks combine the cellular transmission mode (i.e. transmission mode) in infrastructure wireless networks and the ad-hoc transmission mode in mobile ad-hoc networks. A challenge here is if we can coordinately develop an efficient routing algorithm and effective cooperation incentives for reliable routing. The protocols used in the multi-hop routing to forward a message to the mobile gateway nodes that are closest to the base station or have the highest bandwidth to the base stations. The widespread base station, the mobile nodes have a high probability of encountering a BS while moving. Existing Two-Hop Routing protocols are produce High overhead and Low Reliability. Taking advantage of this feature, we propose a Distributed Three-hop Data Routing protocol (DTR) and a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widespread base stations to coordinately realize highly efficient data routing, and effective reputation management and trading market management for reliable data routing. In DTR a source node divides a message stream into a number of segments. The proposed protocol compares to Two-Hop Routing protocol improve the Network Efficiency and reduce the Overhead.

KEYWORDS: Hybrid wireless Network, Three- Hop, Distribution, Throughput, Data Routing, Overhead.

I. INTRODUCTION

Wireless networks including infrastructure wireless networks and mobile ad-hoc networks (MANETs) have attracted significant research interest. The growing desire to increase wireless network capacity for high performance applications has stimulated the development of hybrid wireless networks. A hybrid wireless network consists of both an infrastructure wireless network and a mobile ad-hoc network. Wireless devices such as smart-phones, tablets and laptops, have both an infrastructure interface and an ad-hoc interface. As the number of such devices has been increasing sharply in recent years, a hybrid transmission structure will be widely used in the near future. Such a structure synergistically combines the inherent advantages and overcome the disadvantages of the infrastructure wireless networks and mobile ad-hoc networks. In a hybrid wireless network that combines a mobile ad-hoc network and an infrastructure network, efficient and reliable data routing is important for high throughput. Existing routing schemes that simply combine ad-hoc and infrastructure routings inherit the drawbacks of ad-hoc routing including congestion and high overhead for route discovery and maintenance. In the absence of the central control infrastructure, in mobile adhoc network the data is routed to its destination through the intermediate nodes in a multi-hop manner. The multi-hop routing needs on-demand route discovery or route maintenance. The messages are transmitted in wireless channels and through dynamic routing paths, the mobile ad-hoc networks are not reliable as the infrastructure wireless networks. Because of the multi-hop transmission feature, mobile ad-hoc networks are only suitable for local area data transmission.

The infrastructure wireless network (e.g. cellular network) is the major means of wireless communication in our daily lives. In the inter-cell communication (i.e., communication between nodes in different cells) and internet access. It makes the support of universal network connectivity and ubiquitous computing by integrating all kinds of wireless devices into the network.

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Although current reputation systems help increase routing reliability, they rely on local information exchanges between nodes to evaluate node reputations, so they are not sufficiently effective and efficient. A challenge here is if we can coordinately develop an efficient routing algorithm and effective cooperation incentives for reliable routing.

A hybrid wireless network synergistically combines an infrastructure wireless network and a mobile ad-hoc network to leverage their advantages and overcome their shortcomings, and finally increases the throughput capacity of a wide-area wireless network. A routing protocol is a critical component that affects the throughput capacity of a wireless network in data transmission. Most current routing protocols in hybrid wireless network simply combine the cellular transmission mode (i.e., BS transmission mode) in infrastructure wireless networks and the ad-hoc transmission mode in mobile ad-hoc networks. The protocols used in the multi-hop routing to forward a message to the mobile gateway nodes that are closest to the BSes or have the highest bandwidth to the BSes. In an infrastructure network, nodes communicate with each other through base stations (BSes). Because of the long distance one-hop transmission between BSes and mobile nodes, the infrastructure wireless networks can provide higher message transmission reliability and channel access efficiency, but suffer from higher power consumption on mobile nodes and the single point of failure problem

The bandwidth of a channel is the maximum throughput (i.e., transmission rate in bits/s) that can be achieved. The mobile gateway nodes then forward the messages to the BSes, functioning as bridges to connect the ad-hoc network and the infrastructure network. To handle the challenge, this paper presents a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widespread base stations to coordinately realize highly efficient data routing, and effective reputation management and trading market management for reliable data routing. The packets from a source node are distributively transmitted to base stations directly or indirectly, and then they are transmitted to the destination. The base stations form a P2P structure for reputation collection and querying to avoid local information exchanges, and for managing the service transactions between nodes in the trading market. By leveraging the single-relay transmission feature, base stations can monitor the actual transmitted packets of relay nodes to more accurately and efficiently evaluate their reputations and execute trading market management, as well as detect falsely reported reputation information. We further propose market-based policies to strengthen cooperation incentives. Simulation results show that MDR outperforms the traditional hybrid routing schemes and reputation systems in achieving high throughput.

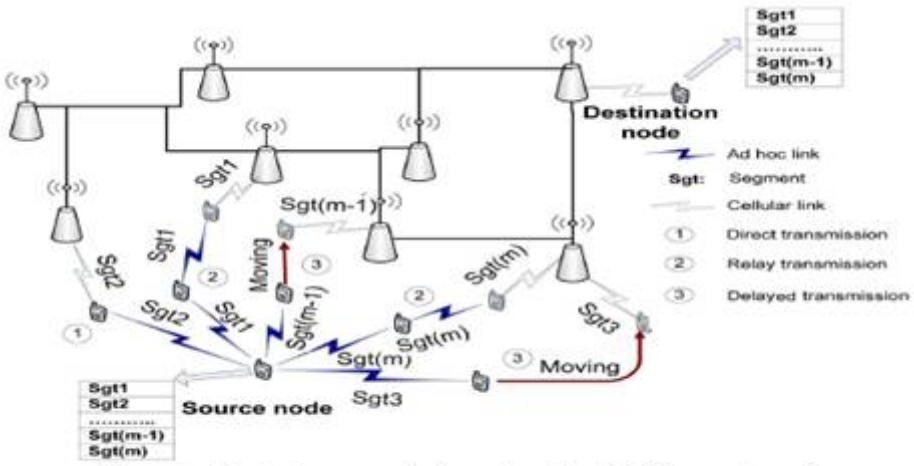

Fig. 1: Data transmission in the DTR protocol.

To increase the throughput of hybrid networks through highly efficient and reliable routing, a challenge here is if we take advantage of the widespread Base stations to coordinately develop an efficient routing algorithm and effective cooperation incentives for reliable routing; the routing algorithm facilitates the implementation of the cooperation incentives to overcome aforementioned drawbacks. To handle this challenge, we propose a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widely-scattered BSes to facilitate highly efficient single- relay distributed data routing, in which the segments of a message are transmitted directly or indirectly to BSes in a distributed manner through multiple relay nodes. The BSes form a P2P structure for

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reputation collection and querying to avoid local information exchanges, and for managing the service transactions between nodes in the trading market. By leveraging the single-relay transmission feature, BSes can monitor the actual transmitted packets of relay nodes to evaluate their reputation and execute trading market management, as well as detect falsely reported reputation information. Thus, a node's reputation is based on actual relaying behavior, and partial reputation information, which can calculate more accurate reputation.

II. RELATED WORK

In the year 2007 H. Shen and C. Xu, proposed a paper on "Locality-aware and churn-resilient load balancing algorithms in structured peer-to-peer networks," [16] based on a balancing algorithm in peer to peer network. Structured peer-to-peer overlay networks, like distributed hash tables (DHTs), map data items to the network based on a consistent hashing function. This paper presents a locality-aware randomized load- balancing algorithm to deal with both the proximity and network churn at the same time. In the year 2012 Z. Li and H. Shen, "MDR: A p2p-based market-guided distributed routing mechanism for high-throughput hybrid wireless networks"[21] Efficient and reliable data routing is important for high throughput in such networks. Existing routing schemes that simply combine ad-hoc and infrastructure routings inherit the drawbacks of ad-hoc routing and fail to take advantage of the infrastructure for high efficiency. Taking advantage of the high density of base stations, the packets from a source node are distributively transmitted to base stations directly or indirectly.

The packet transmission in MDR is modeled as a market trading behaviors, in which source nodes pay credits to relay nodes. The service price is determined by the supply and demand equilibrium of the nodes in the system. An erasure coding-based distributed routing algorithm is also proposed to facilitate an efficient and reliable market trading. Theoretical analysis demonstrates the distinguishing features of MDR and simulation results show that MDR outperforms the traditional hybrid routing schemes and reputation systems."Connectivity in ad-hoc and hybrid networks" [4] paper by Olivier Dousse, Patrick Thiran and Martin Hasler proposed that a large-scale wireless network, but with a low density of nodes per unit area. Assume here that power constraints are modeled by a maximal distance above which two nodes are not (directly) connected. The introduction of base stations will allow distant nodes to communicate through a fixed, wired infrastructure. It represents a trade-off between today's cellular networks and large-scale ad-hoc networks."Hybrid Wireless Network Protocols [7] "Ruay-Shiung Chang, Wei-Yeh Chen, and Yean-Fu Wen proposed that One is base-station (BS) oriented and the other is the ad hoc wireless network. In BS-oriented wireless networks, the mobile hosts communicate with base stations, while in the ad hoc wireless networks, the mobile hosts communicate with one another directly. The BS-oriented wireless network has better performance and is more reliable. In this paper, propose hybrid wireless network protocols to combine the advantages of BS-oriented and ad hoc wireless networks.The proposed system is more reliable, increases bandwidth utility, saves battery power, and is more fault-tolerant to BS failures.

III. PROPOSED SYSTEM

3.1 Distributed Three-Hop Routing Protocol with security (DTR) :

Distributed Three-hop Data Routing protocol (DTR), a source node divides a message stream into a number of segments. Each segment is sent to a neighbor mobile node. DTR and a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widespread base stations to coordinately realize highly efficient data routing, and effective reputation management and trading market management for reliable data routing. In DTR a source node divides a message stream into a number of segments. The proposed protocol compares to Two-Hop Routing protocol improve the Network Efficiency and reduce the Overhead. In relay transmission, a segment is forwarded to another mobile node with higher capacity to a BS than the current node. To overcome the aforementioned shortcomings, DTR tries to limit the number of hops. The first hop forwarding distributes the segments of a message in different directions to fully utilize the resources, and the possible second hop forwarding ensures the high capacity of the forwarder. DTR also has a congestion control algorithm to balance the traffic load between the nearby Base stations in order to avoid traffic congestion at Base Stations. Using self-adaptive and distributed routing with high speed and short-path ad-hoc transmission, DTR significantly increases the throughput capacity and scalability of hybrid wireless ne networks by overcoming the three shortcomings of the previous routing algorithms. It has the following Features: 1. Low overhead: 2. Hot spot reduction3. High reliability

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3.2 Advanced Distributed Three-Hop Routing Protocol Algorithm:

Step 1: The Message stream of source node divide the several segments.
Step 2: Source node distribute the segments to the near(first) Base Station.
Step 3: After a Base station receive the segments needs to forward the Destination node.
Step 4: DTR select the neighbor node based on the Capacity(each node periodically exchange their capacity level).
Step 5: The Base station sends a key to neighboring nodes.
Step 6: Nodes in the cluster sends a session acknowledgement to its Base station.
Step 7: The Base station sends a connection message to other base stations.
Step 8: The source sends message to the base station
Step 9: The neighbor node transmit the segments to Final Base station (near for Destination).
Step 10: After the destination Base Station receives the segments of a message it and re-arrange the segments in to original message and the sends to Destination node.

IV. PERFORMANCE EVALUATION:

4.1 Network Simulator – NS-2:

NS-2 is an open-source simulation tool running on Unix-like operating systems. It is a discreet event simulator. It has many advantages that make it a useful tool, such as support for multiple protocols and the capability of graphically detailing network traffic.

4.2 Simulation setting:

We conducted the simulation experiments using network simulator-2 and considered the network with 10 mobile nodes. Here the base station transmit the packets randomly. The DTR algorithm will be running on background, it will measure the Performance of Packet delivery ratio, Delay, Average energy consumption, overhead and Throughput.

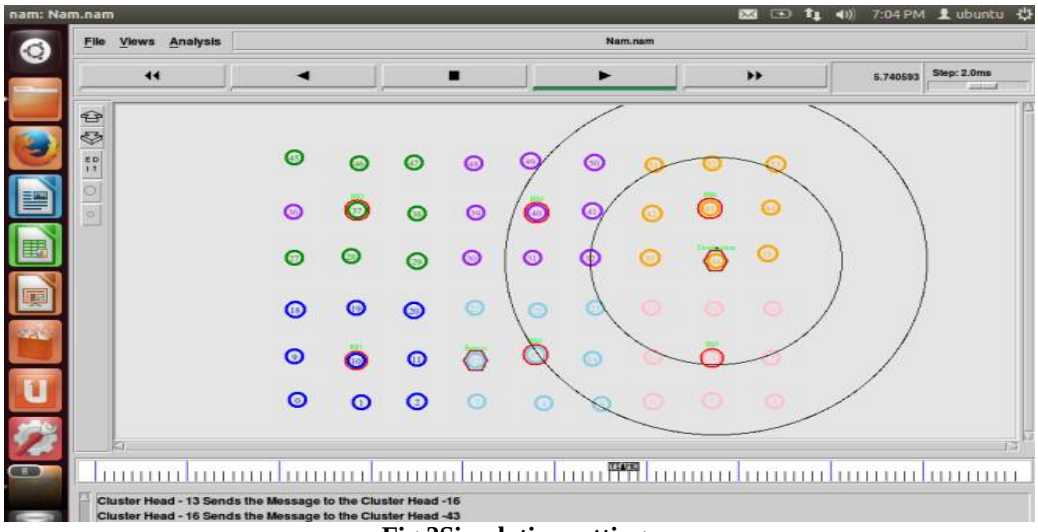

Fig.2Simulation setting

4.3 Data routing Process in DTR:

Data Routing Process in DTR divided Two steps:

1. Uplink Data Routing- Source node to First BS
2. Downlink data Routing and Data Reconstruction- Final BS to Destination node

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4.4 Simulation results:

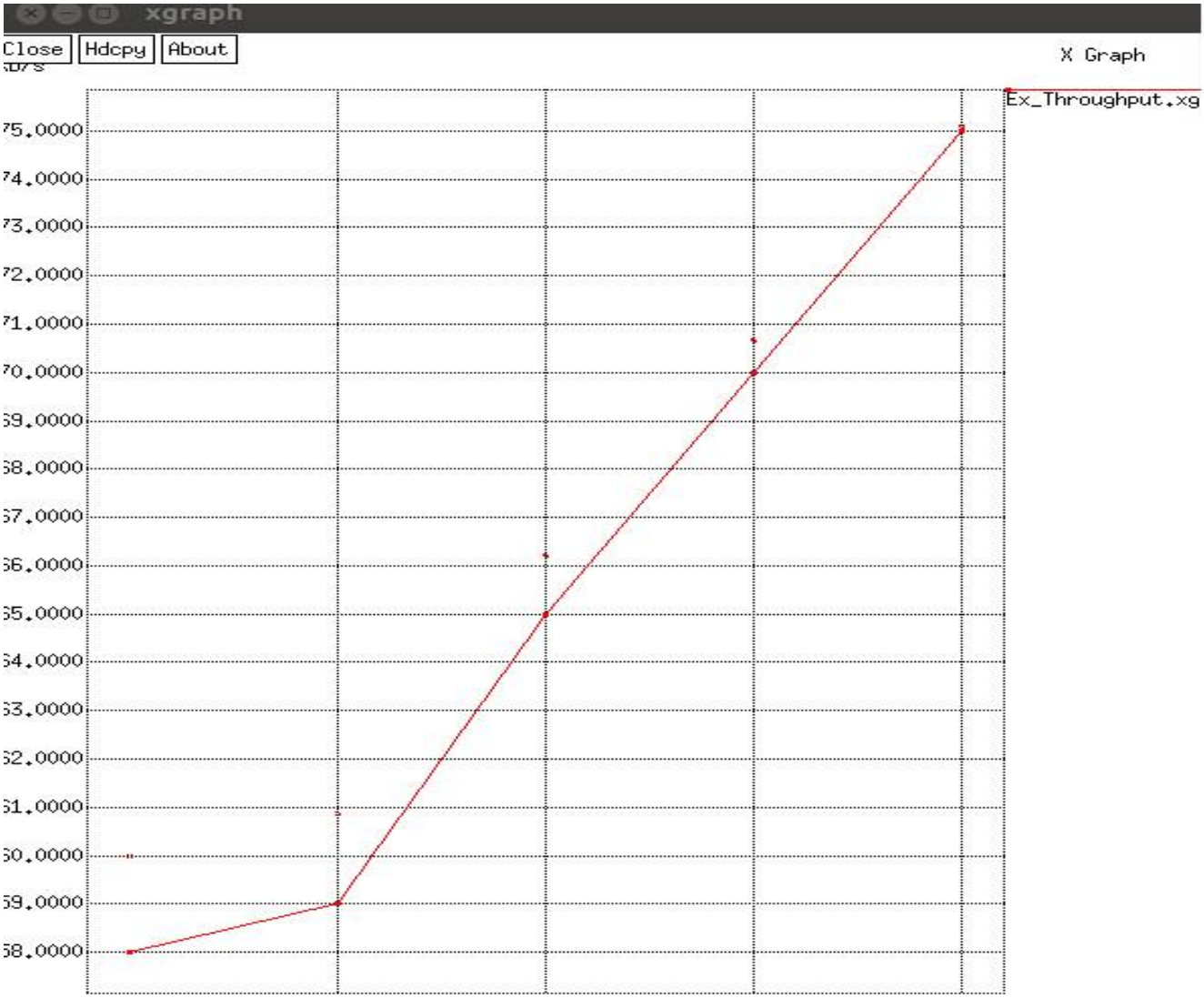

Fig 3 Throughput of existing system

The comparison between the two graphs is been done here that is the existing system and the proposed system throughput is calculated.

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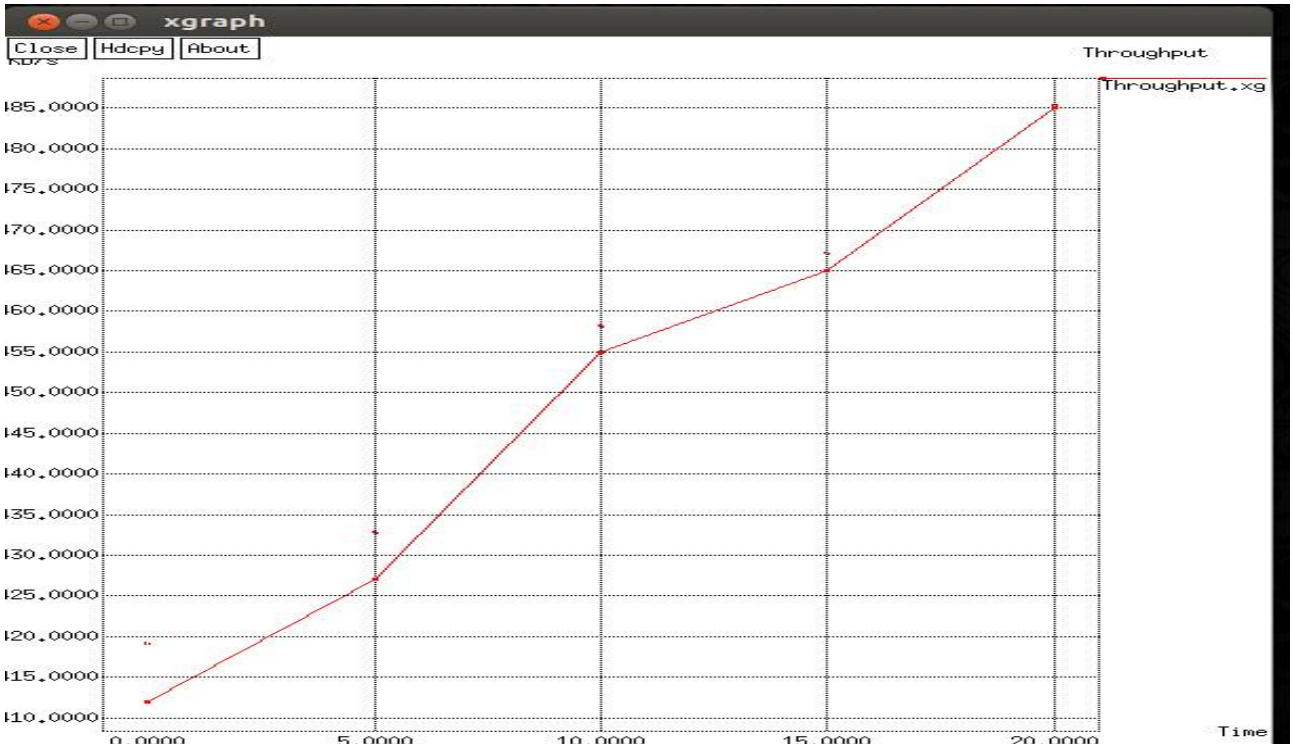

Fig 4 Throughput of proposed system

The graph shows the throughput of the proposed system which is 30 % greater than the case of the existing system .The computations are limited to nodes thus reducing the energy consumption of each node.

V. CONCLUSION

A hybrid wireless network combining an infrastructure wireless network and a mobile ad-hoc network leverages their advantages to increase the throughput capacity of the system. However, current hybrid wireless networks simply combine the routing protocols in the two types of networks for data transmission, which prevents them from achieving higher system capacity. In this paper, we propose a Distributed Three-hop Routing (DTR)and a peer-to-peer (P2P)-based Market-guided Distributed Routing mechanism (MDR). MDR takes advantage of widespread base stations to coordinately realize highly efficient data routing, and effective reputation management and trading market management for reliable data routing. The data routing protocol that integrates the dual features of hybrid wireless networks in the data transmission process. In DTR, a source node divides a message stream into segments and transmits them to its mobile neighbors, which further forward the segments to their destination through an infrastructure network. DTR limits the routing path length to three, and always arranges for high-capacity nodes to forward data. Unlike most existing routing protocols, DTR produces significantly lower overhead by eliminating route discovery and maintenance. In addition, its distinguishing characteristics of short path length, short-distance transmission, and balanced load distribution provide high routing reliability and efficiency. DTR also has a congestion control algorithm to avoid load congestion in base stations in the case of unbalanced traffic distributions in networks. Theoretical analysis and simulation results show that DTR can dramatically improve the throughput capacity and scalability of hybrid wireless networks due to its high scalability, efficiency, and reliability and low overhead. In future any one good algorithm will be used for improve the hybrid network efficiency.

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