A Review of Services to Improved Performance of encrypted Cloud storage

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***Abstract*: Cloud Storage make them highly desirable for the present day multimedia communications. Traditional routing protocols may not suffice for real time communications it depends upon the conditions and our requirements. Though there has been considerable research in this area. Cloud Storage are being used in numerous application domains from emergency rescue and relief to networks. To support real-time communications (such as audio and video) over Cloud Storage new Quality of Service (QoS) provisioning mechanisms need to be developed. There are many challenges in QoS provisioning for Cloud Storage such as dynamically changing topology, wireless capacity limitations, heterogeneous network environment, limited battery power etc. Previous QoS surveys in Cloud Storage have only looked at QoS provisioning models, signaling and routing. This paper presents a complete survey of the challenges and current state of the art of Cloud Storage QoS Routing. We include a thorough overview of QoS routing metrics, resources, and factors affecting performance and classify the protocols found in the respective topics.**

Key Words: Cloud Storage routing, QoS, challenges.

INTRODUCTION

A Cloud Storage consists of mobile wireless nodes. The communication between these mobile nodes is carried out without any centralized control. The ease of deployment and the infrastructure less nature of Mobile Cloud Storage make them highly desirable for the present day multimedia communications [1]. Within the last couple of years there has been a tremendous increase in the use of wireless networks which have provided internet connectivity to mobile devices, creating the need for supporting real-time communication applications on highly mobile network environments. Within the wireless networks domain, Mobile Ad hoc networks (MANET) have become very po

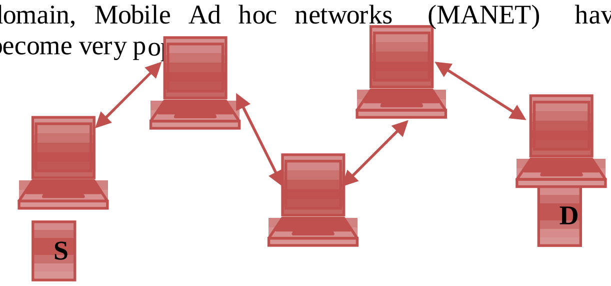

Fig. 1 Cloud Storage

Cloud Storage [4] is a network of mobile nodes, for example PDAs and laptops, connected wirelessly, without using any network infrastructure, such as wireless access points, routers or base stations, as shown in "Fig. 1". If the wireless nodes are not within wireless range of each other, end-to-end communication requires multi-hop routing of data packets.

Each node in the network also acts as a router, forwarding data packets to other nodes. Many routing protocols are used to manage the ad-hoc networks. These protocols are classified into three categories: flat, hierarchical, and geographic position assisted routing [2]. There are two types of flat routing protocols: reactive and proactive. The Ad-hoc On-Demand Distance Vector (AODV) protocol is a reactive protocol designed for ad-hoc networks [3]. AODV uses a broadcast route discovery mechanism which relies on dynamically established routing table entries at intermediate nodes. AODV floods the whole network with Route Request packets (RREQ) and Route Reply (RREP) packets. This flooding leads to high overhead.

Multipath on-demand protocols try to improve these problems by computing and caching multiple paths obtained during a single route discovery process. The link failures in the primary path, through which data transmission is actually taking place, cause the source to switch to an alternate path instead of initiating another route discovery. A new route discovery occurs only when all pre-computed paths break. This approach can result in reduced delay since packets do not need to be buffered at the source when an alternate path is available.

Current protocol provides multipath route discovery and path maintenance mechanism on the basis of a calculated cumulative metric value only on signal strength between two nodes in a path. This metric only address strength of link of the current path, does not address the durability of the path; which fully depends on the residual energy of node .Also does not consider the consistency of node through the previous behavior. Since it does not consider node's behavior and energy, it cannot be applied in heterogeneous MANETS having high mobility nature [4].

Quality of Service

QoS is a term widely used in the last recent years in the area of wire-based networks. QoS stands for Quality of Services and the truth is that there is much debate on what exactly QoS is supposes to mean. Most vendors implement QoS protocols having in mind specific scenarios and taking into consideration different parameters, network topologies and variables. The United Nations Consultative Committee for International Telephony and Telegraphy (CCITT) Recommendation E.800, has defined QoS as: "The collective effect of service performance which determines the degree of satisfaction of a user of the service". This is a widely accepted definition since it doesn't makes any reference to any minimum characteristics, such as Bandwidth or Delay, or mechanisms, such as Admission Control, SLA, Signaling Protocol.

"Quality of Service is the collective effect of service performance which determines the degree of satisfaction of a user of the service". The provisioning of QoS based network services is in terms an extremely complex problem, and a significant part of this complexity lies in the routing layer. The goals of QoS routing are twofold: selecting paths that can satisfy given QoS requirements of arriving communication requests, and achieving global efficiency in resource utilization [19]. The following issues were addressed in QOS routing in other section of this paper.

About AODV Routing Protocol

Every mobile node in the network acts as a specific router and routes are obtained as needed, thus making the network self starting. Each node in the network maintains a routing table with the routing information entries to its neighboring nodes, and two separate counters: a node sequence number and a broadcast-id. When a node (say, source node 'S') has to communicate with another (say, destination node 'D'), it increments its broadcast-id and initiates path discovery by broadcasting a route request packet RREQ to its neighbors. The (source-addr, broadcast-id) pair is used to identify the RREQ uniquely. Then the dynamic route table entry establishment begins at all the nodes in the network that are on the path from S to D. As RREQ travels from node to node, it automatically sets up the reverse path from all these nodes back to the source. Each node that receives this packet records the address of the node from which it was received. This is called Reverse Path Setup. The nodes maintain this info for enough time for the RREQ to traverse the network and produce a reply to the sender and time depends on network size. If an intermediate node has a route entry for the desired destination in its routing table, it compares the destination sequence number in its routing table with that in the RREQ. If the destination sequence number in its routing table is less than that in the RREQ, it rebroadcasts the RREQ to its neighbors. Otherwise, it uncast a route reply packet to its neighbor from which it was received the RREQ if the same request was not processed previously (this is identified using the broadcast-id and sourced) [3, 5]. Once the RREP is generated, it travels back to the source, based on the reverse path that it has set in it until traveled to this node. As the RREP travels back to source, each node along this path sets a forward pointer to the node from where it is receiving the RREP and records the latest destination sequence number to the request destination. This is called Forward Path Setup. If an intermediate node receives another RREP after propagating the first RREP towards source it checks for destination sequence number of new RREP. The intermediate node updates routing information and propagates new RREP only, If the Destination sequence number is greater, OR If the new sequence number is same and hop count is small, OR Otherwise, it just skips the new RREP. This ensures that algorithm is loop-free and only the most effective route is used [5]. Figure 2 represents the working procedure of AODV protocol.

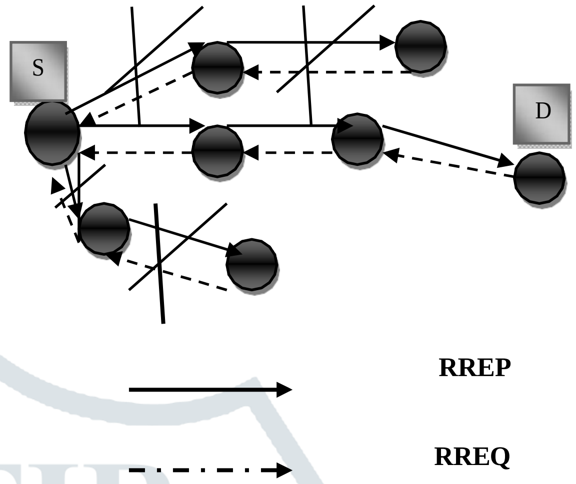

Fig. 2 AODV RREQ and RREP Procedure

PROBLEMS FACING THE PROVISION OF QOS IN MANETS

The following is a summary of the major challenges to providing QoS guarantees in MANETs.

Unreliable Wireless Channel

The wireless channel is prone to bit errors due to interference from other transmissions, thermal noise, shadowing, and multipath fading effects [7]. This makes it impossible to provide hard packet delivery ratio or link longevity guarantees.

Node Mobility

The nodes in a Cloud Storage may move completely independently and randomly as far as the communications protocols are concerned. This means that topology information has a limited lifetime and must be updated frequently to allow data packets to be routed to their destinations. Again, this invalidates any hard packet delivery ratio or link stability guarantees. Furthermore, a QoS state which is link- or node position dependent must be updated with a frequency that increases with node mobility. An important general assumption must also be stated here: for any routing protocol to be able to function properly, the rate of topology change must not be greater than the rate of state information propagation. Otherwise, the routing information will always be stale and routing will be inefficient or could even fail completely. This applies equally to QoS state and QoS route information. A network that satisfies this condition is said to be combinatorial stable [6].

Lack of Centralized Control

The major advantage of an ad hoc network is that it may be set up spontaneously, without planning, and its members can change dynamically. This makes it difficult to provide any form of centralized control. As such, communications protocols which utilize only locally available state and operate in a completely distributed manner are preferred [8]. This generally increases an algorithm's overhead and complexity, as QoS state information must be disseminated efficiently.

Channel Contention

In order to discover network topology, nodes in a MANET must communicate on a common channel. However, this introduces the problems of interference and channel contention. For peer-to-peer data communications these can be avoided in various ways. One way is to attempt global clock synchronization and use a TDMA-based system where each node may transmit at a predefined time. This is difficult to achieve due to the lack of a central controller, node mobility and the complexity and overhead involved [9]. Other ways are to use a different frequency band or spreading code (as in CDMA) for each transmitter. This requires a distributed channel selection mechanism as well as the dissemination of channel information. However data communications take place, without a central controller, some setup, new neighbor discovery and control operations must take place on a common contended channel. Indeed, avoiding the aforementioned complications, much MANET research, as well as the currently most popular wireless ad hoc networking technology (802.11x) is based on fully-contended access to a common channel, that is, with Carrier-Sense Multiple Access with Collision Avoidance (CSMA/CA). However, CSMA/CA greatly complicates the calculation of potential throughput and packet delay, compared to TDMA based approaches. This is because nodes must also take into account the traffic at all nodes within their carrier sensing range. Furthermore, the possibility of collisions also arises. Collisions waste channel capacity, as well as node battery energy, increase delay, and can degrade the packet delivery ratio. Finally, the well-understood hidden node [10] and exposed node [11] problems are a further consequence of channel contention. These problems are even more pronounced when we consider that nodes may interfere with transmissions outside of their transmission range [9, 12, 13], since receivers are able to detect a signal at a much greater distance than that at which they can decode its information.

Limited Device Resources

This is an historical limitation, since mobile devices are becoming increasingly powerful and capable. However, it still holds true that such devices generally have less computational power, less memory, and a limited (battery) power supply, compared to devices such as desktop computers typically employed in wired networks. This factor has a major impact on the provision of QoS assurances, since low memory capacity limits the amount of QoS state that can be stored, necessitating more frequent updates, which incur greater overhead. Additionally, QoS routing generally incurs a greater overhead than best-effort routing in the first place, due to the extra information being disseminated. These factors lead to a higher drain on mobile nodes' limited battery power supply. Finally, within the pool of QoS routing problems, many are NP-complete [6], and thus complicated heuristics are required for solving them, which may place an undue strain on mobile nodes' less-powerful processors.

FACTORS AFFECTING QOS PROTOCOL PERFORMANCE

When evaluating the performance of QoS protocols, a number of factors have a major impact on the results. Some of these parameters are a particular manifestation of characteristics of the MANET environment. They define the "scenario," whether in a simulation or in real life, and can be summarized as follows:

Node mobility

This factor generally encompasses several parameters: the nodes' maximum and minimum speeds, speed pattern, and pause time. The node's speed pattern determines whether the node moves at uniform speed at all times or whether it is constantly varying, and also how it accelerates, for example, uniformly or exponentially with time. The pause time determines the length of time nodes remain stationary between each period of movement. Together with maximum and minimum speed, this parameter determines how often the network topology changes and thus how often network state information must be updated. This parameter has been the focus of many studies, for example, [14, 15].

Network size

QoS state has to be gathered or disseminated in some way for routing decisions to be made, the larger the network, the more difficult this becomes in terms of update latency and message overhead. This is the same as with all network state information, such as that used in best-effort protocols [8].

Number, type and data rate of traffic sources

A smaller number of traffic sources results in fewer routes being required and vice versa. Traffic sources can be constant bit rate (CBR) or may generate bits or packets at a rate that varies with time according to the Poisson distribution, or any other mathematical model. The maximum data rate affects the number of packets in the network and hence the network load. All of these factors affect performance significantly [14].

Node transmission power

Some nodes may have the ability to vary their transmission power. This is important, since at a higher power, nodes have more direct neighbors and hence connectivity increases, but the interference between nodes does as well. Transmission power control can also result in unidirectional *links* between nodes, which can affect the performance of routing protocols. This factor has also been studied extensively, for example, in [15,16].

Channel characteristics

As detailed above, there are many reasons for the wireless channel being unreliable, that is, many reasons why bits, and hence data packets, may not be delivered correctly. These all affect the network's ability to provide QoS.

NETWORK RESOURCES REQUIRED TO PROVIDE QOS

Therefore, the following is a list of network resources:

Node computing time

While mobile devices are being manufactured with increasingly powerful processors, they are still limited in computing power, especially when they must not only run the applications, but also the protocols required to support the network and the applications. However, this is probably the least critical resource, as communication protocols usually do not place a heavy burden on the processor.

Node battery charge

Some might argue that this is the most critical resource, since if a node's battery is drained, it cannot function at all. Node failures can also cause network partitioning, leading to a complete network failure and no service provisioning at all. Hence, power aware and energy efficient MAC and routing protocols have received a great deal of research attention (see [17] and references therein). However, these efforts are beyond the immediate scope of this article.

Node buffer space (memory)

Almost inevitably, at some point during a network's operation, more than one node will be transmitting at once, or there may be no known route to another device. In either of these cases data packets must be buffered while awaiting transmission. Furthermore, when the buffers are full, any newly arriving packets must be dropped, contributing to the packet loss rate.

Channel capacity

All nodes must share the transmission medium we must somehow express the fraction of the medium's total capacity that is granted for each node's use [18]. The way to express this depends on the MAC layer technique employed. In a purely contention-based MAC, "transmission opportunities" may be envisioned, although no node can be guaranteed channel access, merely granted it with a certain probability. In a Time Division Multiple Access (TDMA)-based solution, channel capacity is expressed in timeslots. Similarly, in FDMA, it is frequency bands, and in spread spectrum techniques, spreading codes. Since, in MANETs, nodes must communicate on the same channel to discover network topology, FDMA and spread spectrum techniques are only employed if there is a separate signaling channel over which to allocate channels to pairs of communicating nodes. The majority of QoS routing solutions in the literature on single-channel MAC protocols and are thus contention- or TDMA based, as we show in this work.

RELATED WORK

The In [19], the authors proposed an extension to AODV to support QoS, assuming the availability of some stationary links in the network. The authors introduced the notion of node stability, based on a node's history, which incorporated both a node's mobility and its packet processing ratio. Only stable nodes were considered for routing. However, the authors did not consider the impact that unpredictable link failures would have on re-routing.

In [20] authors have proposed a stable, weight-based, on-demand routing protocol. The "weight" carried in the protocol messages used to select stable routes is based on three components: Route Expiration Time (RET), which is the predicted time of link breakage between two nodes due to mobility, Error Count (EC), which captures the number of link failures due to mobility, and Hop Count (HC). The authors have assumed that all nodes are synchronized via a Global Positioning System (GPS), so that two adjacent nodes may predict the RET. While the proposed scheme may combat against link breaks due to mobility, link breaks due to the draining node energy is a factor that also must be accounted for when computing weights for stable routing.

In [21], the authors have proposed a stable route selection scheme based on Link Expiration Time Threshold (LETth). The Link Expiration Time (LET) is computed based on a prediction of neighbor mobility. LET computation needs to know the position of the neighbors, and hence requires periodic topology updates. However, the authors have not considered the impact that unpredictable link failures would have on re-routing.

In [22], the authors proposed a new metric, Energy- Drain-Rate, which is defined as the rate at which energy is consumed at a given node at time t. The corresponding cost function is defined as:

$$C_R = min\ T_r^i(t), \text{ where } T_r^i(t) = \frac{E_r^i(t)}{DR_r^i(t)},$$

Where DRi r(t) and Ei r(t) are the drain rate and the residual battery power respectively, of node i at time t along the path r. Thus the life-time of a path R is determined by the minimum Ti r (t) along that path. The Minimum Drain Rate (MDR) mechanism selects the route with maximum life-time. Each node monitor its energy consumption during a given past interval and maintains the drain rate value using an exponential weighted moving average. The proposed MDR algorithm attempts to select the best possible stable route for a given source and destination. The periodic route update used in MDR, however, soon becomes costly, as it increases control overhead and degrades performance at higher network loads. From the proposals reviewed so far [5, 21] it is clear that there is a need for a routing protocol that can provide stability to the routes selected for routing QoS-enabled applications, and also has mechanisms for fast re-routing to tackle unpredictable link breakages. Furthermore, for the scheme to be scalable, the stability should come at minimum or no overhead. In what follows, we propose modifications to the AODV protocol that, with high probability, provide routes that are stable for session duration, and that also incorporate a fast make-before-break mechanism.

In [23] QoS routing has received attention recently for providing QoS in wireless ad hoc networks and some work has been carried out to address this critical issue. Here, we provide a brief review of existing work addressing the QoS routing issues in wireless ad hoc networks. In general, QoS routing can be classified into two basic paradigms: source QoS routing and hop-by-hop QoS routing. Hereafter, the term routing will refer to QoS routing unless otherwise specified. With source routing, the source node of a communication request locally computes the entire constrained path to the intended destination with the global state information that it locally maintains. Gathering and maintaining global state information can introduce excessive protocol overhead in dynamic networks and thus have the scalability issue. Moreover, the calculation of constraint(s)-based routes would be computationally intensive for the calculating nodes. The predictive location- based QoS routing protocol. This protocol is mainly to alleviate the scalability issue with respect to communication overhead in implementing source routing. Instead of disseminating the state of each link network wide, each node broadcasts its node status (including its current position, velocity, moving direction, and available resources on each of its outgoing links) across the network periodically or upon a significant change. With such information, at any instant each node can locally depict an instant view of the entire network. To accommodate a QoS request, the source locally computes a QoS satisfied route (if available) and route data packets along the calculated path. Moreover, the source can predict route break and predicatively compute a new route before the old route breaks by using the global state it stores. This routing protocol is suitable for providing soft QoS in small or medium-sized networks wherein mobile hosts are equipped with Global Positioning System (GPS) receivers and their moving behavior is predictable.

The routing protocols for MANETs may be broadly classified as table driven protocols [25, 26] and on-demand driven protocols [27, 28]. Table driven protocols need to maintain the global routing information about the net-work in every mobile node for all the possible source-destination connection and acquire to exchange routing information periodically. This kind of protocol has the property of lower latency and higher overhead.

On-demand routing protocol creates routes only when the source nodes request. When a node requires a route to a destination, it initiates a route discovery process within the network. On-demand routing protocols are characterized as having higher latency and lower over-head. A majority of existing research on the QoS-aware routing in MANETs is based on two kinds of route protocols. However, the table-driven QoS protocols request globe network state information which is not good for scalability and on-demand QoS protocols need initiates a route discovery based on flooding, which are not fit the dynamic and capability constrain in MANETs. In [19], a load-balanced AODV (LB-AODV) is proposed to con-trol the overhead of on-demand routing in MANETs.

QoS-aware routing has received much attention re-cently for providing QoS in wireless ad-hoc networks and some work has been carried out to address this criti-cal issue. Here, we provide a brief review of existing work addressing the QoS-aware routing issues in wire-less ad-hoc networks. There have already been several surveys and overviews regarding the QoS-aware routing issues and solutions. Authors in [24] summarized the im-portant QoS-related issues in MANETs in 2001, and the issues that required further attention. They updated and expanded their article in 2004 [20]. A fairly comprehensive overview of the QoS in networking could be found in [21-23]. The main conclusions from the literature are highlighted below:

1. Many of the underlying algorithmic problems, such as multi-constraint routing, have been shown to be NP-complete [6].
2. QoS and BE, routing can only be successfully achieved if the network is combinatorially stable. The dynamic topology, the error-prone channel, the lack of central control and the insecure medium have always been roadblocks for the development of QoS-aware routings [22].
3. Different techniques are required for QoS provi-sioning when the network size becomes very large, since QoS state updates would take a relatively long time to propagate to distant nodes [23].
4. The amount of state propagation and topology up-date information must be kept to a minimum. In particular, every change in available bandwidth should not result in updated state propagation [20].
5. QoS-aware routing protocol is designed without considering the situation when multiple QoS routes are being setup simultaneously. If two QoS routes cannot be fully established because they are blocking each other, both will be deleted. Hence how to setup QoS routes when there are multiple competing requests needs further study [24].
6. The protocols should be designed to accommodate multiple classes of traffic, in particular, to ensure that lower-class traffic is not starved of network resources in the presence of RT traffic [23].

CONCLUSION

QoS in MANET is a new but rapidly growing area of interest. This great research and market interest is firstly because of the rising popularity and necessity of multimedia application and secondly because of the potential commercial usage of MANET. Thus QoS support in MANET has become an unavoidable task. In this report we have tried to give a brief introduction to QoS issues in networks. In this paper we have presented a comprehensive overview of the state-of-the-art research work on QoS support in MANETs. We have presented the issues and challenges involved in providing QoS in MANETs in terms of the research work on QoS models, QoS resource reservation signalling, QoS routing and QoS MAC, which are required to ensure high levels of QoS.

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