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Two Phase Validation Approach for ACID Transaction in Cloud

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Abstract—

Two Phase validation schemes based on IP address the objective to reduce the overall network traffic incurred by mobility management and packet delivery. The proposed schemes are peer-peer-based, i.e., Wireless Mesh Networks (WMNs) have gained Increasing attention as an attractive means to provide connectivity in complement to access as offered by regular Internet Service Providers (ISPs). a grass-root technique, however, often suffers from detrimental operating conditions and poor quality. Network virtualization, on the other hand, has been widely advocated as a possibility to overcome what has often been referred to as the ossification of the Internet. Combining the concept of network virtualization with WMN technology, therefore, appears to be promising and desirable. We develop analytical models based on stochastic Petri nets to evaluate the performance of the proposed schemes. We demonstrate that there exists an optimal threshold of the forwarding chain length, given a set of parameters characterizing the specific mobility and service patterns of a mobile user. We also demonstrate that our schemes yield significantly better performance than schemes that apply a static threshold to all mobile users. A comparative analysis shows that our IP forwarding schemes out per-form routing-based mobility management protocols for WMNs, especially for mobile Internet applications characterized by large traffic asymmetry for which the downlink packet arrival rate is much higher than the uplink packet arrival rate. We further present a distributed solution to manage multi-WMNs, and a mobility-aware context use case to demonstrate the usefulness of our approach.

Keywords: Two Phase management; IP forwarding; wireless mesh networks; performance analysis

I. Introduction

Wireless Mesh Networks (WMNs) are spreading to connect heterogeneous home users. Their aim is to support (mobile) users seamlessly with cheap and easy to maintain connectivity. The mesh topology of WMNs provides high flexibility as mesh routers are connected with multiple others providing the physical infrastructure for flexible routing and transport connections. Network virtualization can make use of this mesh topology by sharing, and also by combining links for desired network properties. Wi-Fi-based wireless networks and mobile IP networks, WMNs have the advantages of low cost, easy deployment, self-organization and self-healing, and compatibility with existing wired and wireless networks through the gateway/bridge function of mesh routers. A WMN consists of mesh routers and mesh clients [1]. Mesh routers are similar to ordinary routers in wired IP networks, except that they are connected via (possibly multichannel multi-radio) wireless links. A major expected use of

WMNs is as a wireless backbone for providing last-mile broadband Internet access [2] to mesh clients in a multi-hop way, through the gateway that is connected to the Internet. Because mesh clients may move within a WMN and change their points of attachment frequently, mobility management is a necessity for WMNs to function appropriately. Mobility management consists of location management and handoff management [3]. Location management keeps track of the location information of mesh clients, through location registration and location update operations. Handoff management maintains ongoing connections of mesh clients while they are moving around and changing their points of attachment. the different contextual features and preferences of the users in current WMN environments, the users need to be linked to different wireless access networks with different bandwidth and robustness features, probably belonging to different Internet Service Providers (ISPs) with different security policies. The customers use different devices with different capabilities, which run different applications with different QoS requirements. As WMNs are edge networks connecting (mobile) users, they are expected to play an important role when introducing the required context-based user-centric networks. Moreover, WMNs are adaptable, self-configuring, and self-organizing to a high degree. As a consequence, WMNs are well suited to demonstrate the benefit of context-based approaches considering heterogeneous node capabilities and user preferences.

II. Two Phase Routing Based Schema

Routing-Based Schemes The iMesh [9] is an infrastructure-mode 802.11-based WMN. iMesh adopts a cross-layer approach for mobility management and develops a routing-based mobility management scheme. A link-layer handoff is triggered when a mesh client moves out of the covering area of its current serving mesh router. After the link-layer handoff is completed, the routing protocol used in iMesh, the Optimized Link State Routing (OLSR) protocol, broadcasts an HNA message announcing the new route of the mesh client. Mobility management in iMesh, therefore, incurs significant overhead due to the broadcasting of the HNA message. MEsh networks with MObility management (MEMO) [10] is the implementation of an applied WMN with support of mobility management. MEMO uses a modified AODV routing protocol, called as AODV-MEMO, for integrated routing and mobility management. Like the Ant scheme, MEMO also adopts MAC-layer triggered mobility management . Although this cross-layer design (Layers 2 and 3) helps reducing the handoff latency, the use of flooding by mesh clients to inform correspondence nodes about location handoffs leads to high signaling cost and bandwidth consumption. A common problem of iMesh and MEMO is that both of them are based on routing protocols proposed for mobile ad hoc networks that rely on broadcasting for route discovery or location change notification, thus excessive signaling overhead is incurred. WMM [5] is a novel-routing-based mobility management scheme proposed for WMNs. Location cache is used in combination with routing tables in the WMM scheme for integrated routing and location management. Because location update and location information synchronization can be done while mesh routers route packets, the WMM scheme does not incur significant signaling overhead, as in tunneling-based and multicasting-based schemes.

Additionally, as discussed in Section 7.3, the WMM scheme can be virtually viewed as a variant of mobility management schemes based on pointer forwarding, since relevant operations in the WMM scheme resemble forwarding pointer setup and reset operations in pointer forwarding approaches.

Algorithm 1. Two-Phase Validation - 2PV(TM).

1 Send “Prepare-to-Validate” to all participants

2 Wait for all replies (a True/False, and a set of policy versions for each unique policy)

3 Identify the largest version for all unique policies

4 If all participants utilize the largest version for each unique policy

5 If any responded False

6 ABORT

7 Otherwise

8 CONTINUE

9 Otherwise, for all participants with old versions of policies

10 Send “Update” with the largest version number of each policy

11 Go to 2

In the case of view consistency (Definition 2), there will be at most two rounds of the collection phase. A participant may only be asked to reevaluate a query using a newer policy by an Update message from the TM after one collection phase.

For the global consistency case (Definition 3), the TM retrieves the latest policy version from a master policies server (Step 2) and uses it to compare against the version numbers of each participant (Step 3). This master version may be retrieved only once or each time Step 3 is invoked. For the former case, collection may only be executed twice as in the case of view consistency. In the latter case, if the TM retrieves the latest version every round, global consistency may execute the collection many times. This is the case if the policy is updated during the round. While the number of rounds are theoretically infinite, in a practical setting, this should occur infrequently.4.2 Two-Phase Validate Commit Algorithm the 2PV protocol enforces trusted transactions, but does not enforce safe transactions because it does not validate any integrity constraints. Since the Two-Phase Commit atomic protocol commonly used to enforce integrity constraints has similar structure as 2PV, we propose integrating these protocols into a Two-Phase Validation Commit protocol. 2PVC can be used to ensure the data and policy consistency requirements of safe transactions. Specifically, 2PVC will evaluate the policies and authorizations within the first, voting phase. That is, when the TM sends out a Prepare-to-Commit message for a transaction, the participant server has three values to report

1) the YES or NO reply for the satisfaction of integrity constraints as in 2PC, 2) the TRUE or FALSE reply for the satisfaction of the proofs of authorizations as in 2PV, and

3) The version number of the policies used to build the proofs (vi; pi) as in 2PV. The process given in Algorithm 2 is for the TM under view consistency. It is similar to that of 2PV with the exception of handling the YES or NO reply for integrity constraint validation and having a decision of COMMIT rather than CONTINUE. The TM enforces the same behavior as 2PV in identifying policies inconsistencies and sending the Update messages. The same changes to 2PV can be made here to provide global consistency by consulting the master policies server for the latest policy version (Step 5).

Algorithm 2. Two-Phase Validation Commit - 2PVC (TM).

1 Send “Prepare-to-Commit” to all participants

2 Wait for all replies (Yes/No, True/False, and a set of policy versions for each unique policy)
3 If any participant replied No for integrity check
4 ABORT
5 Identify the largest version for all unique policies
6 If all participants utilize the largest version for each unique policy
7 If any responded False
8 ABORT
9 Otherwise
10 COMMIT
11 Otherwise, for participants with old policies
12 Send "Update" with the largest version number of each policy
13 Wait for all replies
14 Go to 5

The resilience of 2PVC to system and communication failures can be achieved in the same manner as 2PC by recording the progress of the protocol in the logs of the TM and participants. In the case of 2PVC, a participant must forcibly log the set of ðvi; piÞ tuples along with its vote and truth value. Similarly to 2PC, the cost of 2PVC can be measured in terms of log complexity (i.e., the number of times the protocol forcibly logs for recovery) and message complexity (i.e., the number of messages sent). The log complexity of 2PVC is no different than basic 2PC and can be improved by using any of log-based optimizations of 2PCsuch as Presumed-Abort (PrA) and Presumed-Commit (PrC)

Wireless mesh networks properties

The particular characteristics of WMNs [1] are derived from the (mesh) topology and the dynamics of wireless environments. Instead of being another type of ad-hoc network, WMNs diversify the capabilities of ad-hoc networks, presenting low up-front costs, easy network maintenance, robustness, reliable service coverage, and minimal mobility of mesh routers. In addition to being widely accepted in the traditional application sectors of ad-hoc networks, WMNs are thus undergoing rapid commercialization in many other application scenarios, such as broadband home networking, community networking, building automation, and Internet access particularly in rural areas. At the same time, WMNs are already being used in free wireless access initiatives, like funkfeuer1 and freifunk2 based on technology. Nevertheless, the distinct characteristics of WMNs, setting them apart from traditional wireless networks, bring up new challenges to communication protocols, network management, reliability assurance, and security [1]. Scalability, for instance, has been identified as a major problem of important WMN protocols, but there are other open issues, such as the support of multicast applications and the utilization of multi-radios and multi-channels. In particular, the characteristics of the nodes have to be considered in the routing protocols since they can no longer be assumed to be similar. Proposed IP Forwarding Schemes the total communication cost as a function of K in both schemes, under different SMRs. The exists an optimal threshold K that results in minimized total communication cost. For example, when SMR1, the optimal K is 10 for the static anchor scheme, whereas it is 11 for the Two Phaseanchor scheme. Another observation is that the total communication cost in both schemes decreases, as SMR increases. This is because given fixed session arrival rates, the mobility rate decreases as SMR increases, thus the signaling cost incurred by location management as well as the total communication cost decreases. It is interesting to note in the

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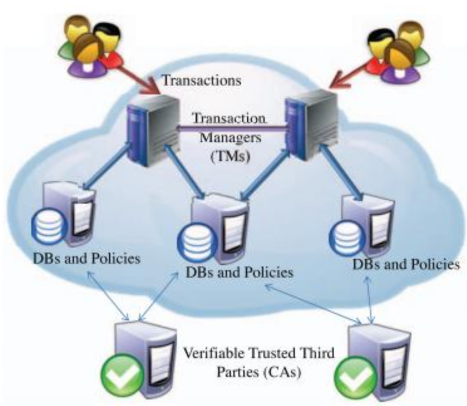
Two Phase anchor scheme always performs better than the static anchor scheme, under the given parameter values in Table 4 and the investigated SMRs. However, since, the Two Phase anchor scheme incurs additional overhead of resetting the forwarding chain of an MC upon session arrival, it is expected that in cases that session arrival rates are considerably high, the additional overhead will offset its advantage. This is demonstrated, which plots the cost difference between the static anchor scheme and Two Phaseanchor scheme, as a function of SMR, when SMR is small, the Two Phaseanchor scheme performs better than the static anchor scheme. However, as SMR increases, there exists a crossover point beyond which the static anchor scheme starts performing better than the Two Phaseanchor scheme. It is interesting to see that there exists another crossover point of SMR beyond which the Two Phaseanchor scheme is superior again. This is because when SMR is considerably

III. Evolution Analysis



In this section a discussion is presented, which aims at giving first insights about important performance characteristics of the proposed solution for context-aware characterization and management of WMNs. To demonstrate the potential of proactive WMN management, we add prediction (mobility prediction) to the approach. We analyze the performance of the proposed schemes, in terms of the total communication cost incurred per time unit. Additionally, we compare the proposed schemes with two baseline schemes. In the first baseline scheme, IP forwarding is not used, meaning that every movement of an MC will trigger a location update event. Thus, it is essentially the same as having K in the proposed schemes. In the second baseline scheme, IP forwarding is employed, but the same threshold of the forwarding chain length is preset for all MCs, e.g., K for all MCs. We also carry out the performance comparison between our schemes and the WMM scheme proposed in [5]. A detailed description of the WMM scheme and the SPN model constructed for it will be given the parameters and their default values used in the performance evaluation. The time unit used is second. All costs presented below are normalized with respect to.

IV. Conclusion

In this paper, the importance of introducing IP forwarding has been argued to provide highly adaptive WMNs. With the demand of such flexible WMNs, a novel architecture consisting of multiple virtual networks has been proposed and selected related work, which demonstrates the importance of providing solutions to integrate context in WMNs, has been surveyed. we plan to investigate how our proposed schemes can be extended to WMNs that have multiple gateways. In addition, we plan to investigate the proposed schemes under more realistic mobility models other than the random walk model. We will also investigate how caching of location information of MCs can be used to reduce the signaling cost incurred by our proposed schemes.

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