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# SORT: A Self-Organizing Trust Model for Peer-to-Peer Systems

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*Abstract:*

***Open nature of peer-to-peer systems exposes them to malicious activity. Building trust relationships among peers can mitigate attacks of malicious peers. This paper presents distributed algorithms that enable a peer to reason about trustworthiness of other peers based on past interactions and recommendations. Peers create their own trust network in their proximity by using local information available and do not try to learn global trust information. Two contexts of trust, service, and recommendation contexts are defined to measure trustworthiness in providing services and giving recommendations. Interactions and recommendations are evaluated based on importance, recentness, and peer satisfaction parameters.***

***Additionally, recommender's trustworthiness and confidence about a recommendation are considered while evaluating recommendations. Simulation experiments on a file sharing application show that the proposed model can mitigate attacks on 16 different malicious behavior models. In the experiments, good peers were able to form trust relationships in their proximity and isolate malicious peers.***

*Index Terms*—***Peer-to-peer systems, trust management, reputation, security***

## INTRODUCTION

Peer-to-peer (P2P) systems rely on collaboration of peers to accomplish tasks. Ease of performing malicious activity is a threat for security of P2P systems. Creating long-term trust relationships among peers can provide a more secure environment by reducing risk and uncertainty in future P2P interactions. However, establishing trust in an unknown entity is difficult in such a malicious environ¬ment. Furthermore, trust is a social concept and hard to measure with numerical values. Metrics are needed to represent trust in computational models. Classifying peers as either trustworthy or untrustworthy is not sufficient in most cases. Metrics should have precision so peers can be ranked according to trustworthiness. Interactions and feedbacks of peers provide information to measure trust among peers. Interactions with a peer provide certain information about the peer but feedbacks might contain deceptive information. This makes assessment of trust¬worthiness a challenge.

### Existing system:

Abdul-rahman and Hailes evaluate trust in a discrete domain as an aggregation of direct experience and recommendations of other parties. They define a semantic distance measure to test accuracy of recommendations. Yu and Singh's model propagates trust information through referral chains. Referrals are primary method of developing trust in others. Mui et

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al. propose a statistical model based on trust, reputation, and reciprocity concepts. Reputation is propagated through multiple referral chains. Jøsang et al. discuss that referrals based on indirect trust relations may cause incorrect trust derivation. Thus, trust topologies should be carefully evaluated before propagating trust information. Terzi et al. introduce an algorithm to classify users and assign them roles based on trust relationships. Zhong proposes a dynamic trust concept based on McKnight's social trust model. When building trust relationships, uncertain evidences are evaluated using second-order probability and Dempster-Shaferian framework.

**Disadvantages:**

1. To perform the recommendation need to take distance support it's mandatory
2. There is no direct recommendation, chain rules are applied
3. Time complexity is very high
4. Loss of packets when the data is transmitted
5. Peers can't collect Global information

**Proposed system:**

We propose a Self-ORganizing Trust model (SORT) that aims to decrease malicious activity in a P2P system by establishing trust relations among peers in their proximity. In SORT, peers are assumed to be strangers to each other at the beginning. A peer becomes an acquaintance of another peer after providing a service, e.g., uploading a file. If a peer has no acquaintance, it chooses to trust strangers.

SORT defines three trust metrics. Reputation metric is calculated based on recommendations. It is important when deciding about strangers and new acquaintances. Reputation loses its importance as experience with an acquaintance increases. Service trust and recommendation trust are primary metrics to measure trustworthiness in the service and recommendation contexts, respectively. The service trust metric is used when selecting service providers. The recommendation trust metric is important when requesting recommendations. When calculating the reputation metric, recommendations are evaluated based on the recommendation trust metric.

**Advantages:-**

1. We are able to reduce the malicious activities in a P2P network
2. Distributed sharing is able to achieve with P2P establishment
3. There is no centralized server to distribute, each peer can be acts as self organize.
4. By Recommendation metric provides the support with another peer
5. Trust metric is able to avoid malicious behaviors, increase trustiness
6. Peers can collect Global information

**Scope:**

Depend upon the Recommendation we know the self organization turst model in the peer-to-peer system. The Recommendation is friend request.

## SYSTEM ARCHITECTURE:

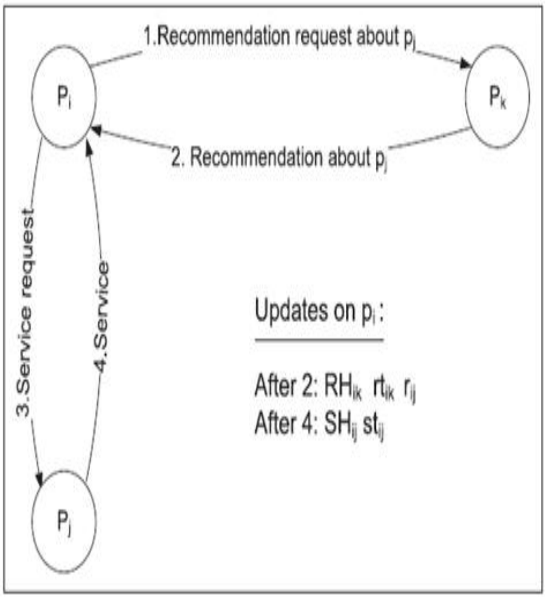


Fig. 1. Operations when receiving a recommendation and having an interaction.

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### Problem Statement:

Calculated trust information is not global and does not reflect opinions of all peers. Classifying peers as either trustworthy or untrustworthy is not sufficient in most cases. Metrics should have precision so peers can be ranked according to trustworthiness.

### Implementation Modules:

1. Service Trust Metric
2. Reputation Metric
3. Recommendation Trust Metric
4. Selecting Service Providers

### Service Trust Metric:

When evaluating an acquaintance's trustworthiness in the service context, a peer first calculates competence and integrity belief values using the information in its service history. Competence belief represents how well an acquaintance satisfied the needs of past interactions .Let friend request denote the competence belief of pi about pj in the service context. Average behavior in the past interactions is a measure of the competence belief. A peer can be competent but may present erratic behavior. Consistency is as important as competence. Level of confidence in predictability of future interactions is called integrity belief [18], [17], [46]. Let I bij denote the integrity belief of pi about pj in the service context. Deviation from average behavior (cbij) is a measure of the integrity belief.

### Reputation Metric

The reputation metric measures a stranger's trust worthiness based on recommendations. In the following two sections, we assume that pj is a stranger to pi and pk is an acquaintance of pi. If pi wants to calculate rij value, it starts a reputation query to collect recommendations from its acquaintances. Trustworthy acquaintances and requests their recommendations. Let _max denote the maximum number of recommendations that can be collected in a reputation query and jSj denote the size of a set S. In the algorithm, pi sets a high threshold for recommendation trust values and requests recommendations from highly trusted acquaintances first. Then, it decreases the threshold and repeats the same operations.

### Recommendation Trust Metric:

Facebook has an incredible audience, 950 million strong and counting. This audience is immensely attractive to Brands and Marketers around the world. We've seen explosive growth in brand pages, types of advertising and other fun ways to monetize this audience. Don't invent new metrics, use online versions of Reach and GRPs to measure success. The value of Facebook in "spreading word of mouth," "getting your brand in front of friends of fans," and "engaging fans with five to seven posts a week on your fan page."They closed with the Facebook Insights tool (which is quite nice). This blog post is about the above recommendations, and their merit. But first let's punch up the value you'll get from this post.

Assume that pi wants to get a particular service. pj is a stranger to pi and a probable service provider. To learn pj's reputation, pi requests recommendations from its acquaintances. Assume that pk sends back a recommendation to pi. After collecting all recommendations, pi calculates rij. Then, pi evaluates pk's recommendation, stores results in RH ik, and updates rtik. Assuming pj is trustworthy enough, pi gets the service from pj. Then, pi evaluates this interaction and stores the results in SHij, and updates stij.

### Selecting Service Providers:

When pi searches for a particular service, it gets a list of service providers. Considering a facebook application, either post share the links to other peer .Connecting the all people with recomentation multiple peers, checking integrity is a problem since any file part downloaded from an uploader might be inauthentic.

Service provider selection is done based on service trust metric, service history size, competence belief, and integrity belief values. When pi wants to download a file, itselects an uploader with the highest service trust value

## ALGORITHMS USED:

**Algorithm 1.** GETRECOMMENDATIONS($p_j$)

$\mu_{rt} \Leftarrow \frac{1}{|A_i|} \sum_{p_k \in A_i} rt_{ik}$

$\sigma_{rt} \Leftarrow \frac{1}{|A_i|} \sqrt{\sum_{p_k \in A_i} (rt_{ik} - \mu_{rt})^2}$

$th_{high} \Leftarrow 1$

$th_{low} \Leftarrow \mu_{rt} + \sigma_{rt}$

$rset \Leftarrow \emptyset$

**while** $\mu_{rt} - \sigma_{rt} \leq th_{low}$ **and** $|rset| < \eta_{max}$ **do**

  **for all** $p_k \in A_i$ **do**

    **if** $th_{low} \leq rt_{ik} \leq th_{high}$ **then**

      $rec \Leftarrow$ RequestRecommendation($p_k$,$p_j$)

      $rset \Leftarrow rset \cup \{rec\}$

    **end if**

  **end for**

  $th_{high} \Leftarrow th_{low}$

  $th_{low} \Leftarrow th_{low} - \sigma_{rt}/2$

**end while**

return $rset$

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