Reputation System in Peer-to-Peer Networks

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Outline

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- The Parameters
- Reputation computation
- Application of Reputation
- Discussion

Introduction

❑ Compute a reputation scope for each peer.

❑ Rank which peers are better than others.

❑ Selectively searching.

❑ Reputation and Ranking mechanism are to improve efficiency in P2P network.

The Reasons

❑ Main purposes of reputation

  ❑ Selectively connect (Link, Peer, Topology)

    ❑ Increase probability of query hit

    ❑ Limit the searching scope

    ❑ Reduce the number of message

The Parameters

❑ There are three main parameters of reputation.

    ❑ The peer Behavior parameter

    ❑ The peer Ability parameter

    ❑ The peer Success Rate parameter

The Parameters

❏ The peer Behavior parameter

   ❏ Download : decrease the reputation

   ❏ Upload : Increase the reputation

   ❏ Share : Increase the reputation

   ❏ Uptimes : Increase the reputation

   ❏ Session Duration : Increase the reputation

The Parameters

❑ The peer Ability parameter
  ❑ Latency time: decrease the reputation

  ❑ Bandwidth : Increase the reputation

  ❑ Availability : Increase the reputation

  ❑ Process ability : Increase the reputation
    ❑Memory
    ❑Storage capacity
    ❑Processing power

The Parameters

□ The peer Success Rate parameter

$$SuccessRate = \frac{\sum QueryHit}{\sum QueryMsg}$$

The Parameters

- *Query miss must pay miss penalty. Miss is meant that we can't find out the designated files in this peer after querying.*

$$MissPenalty = TimeQueryNode + TimeQueryFiles$$

The Parameters

❑ **Debit-Credit Reputation Computation**

    ❑ Upload Credit (UC)

    ❑ Download Debit (DD)

    ❑ Sharing Credit (SC)

    ❑ Query-Response Credit (QRC): DCRC uses average query-response message size to give credit to peers for being online and processing the query-response messages.

The Parameters

- The total reputation score for a peer k who
    - processes **a** query-response messages,
   - facilitates **b** uploads,
    - performs **c** downloads
    - in **d** time factors

$$\text{Reputation Score}_k = (a \times QRC + \sum_l b \times UC_l - \sum_m c \times DD_l + d \times SC)$$

Reputation computation

❏ There are three main methods of reputation.

  ❏ *Self*

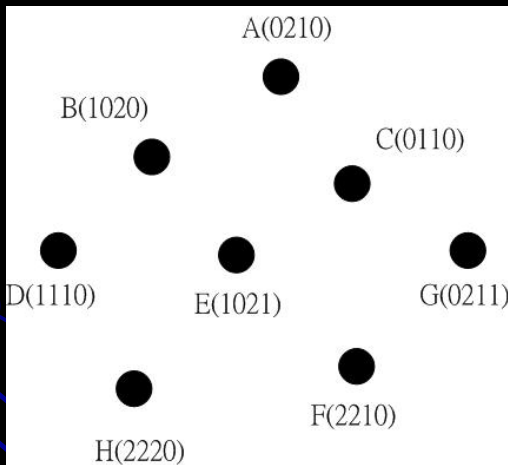 ❏ *Reputation computation Agent (RCA)*

  ❏ *Agent at random*

Reputation computation

- The solution utilizes a reputation computation agent (RCA) for fair periodic updates to each enrolled peer's reputation.
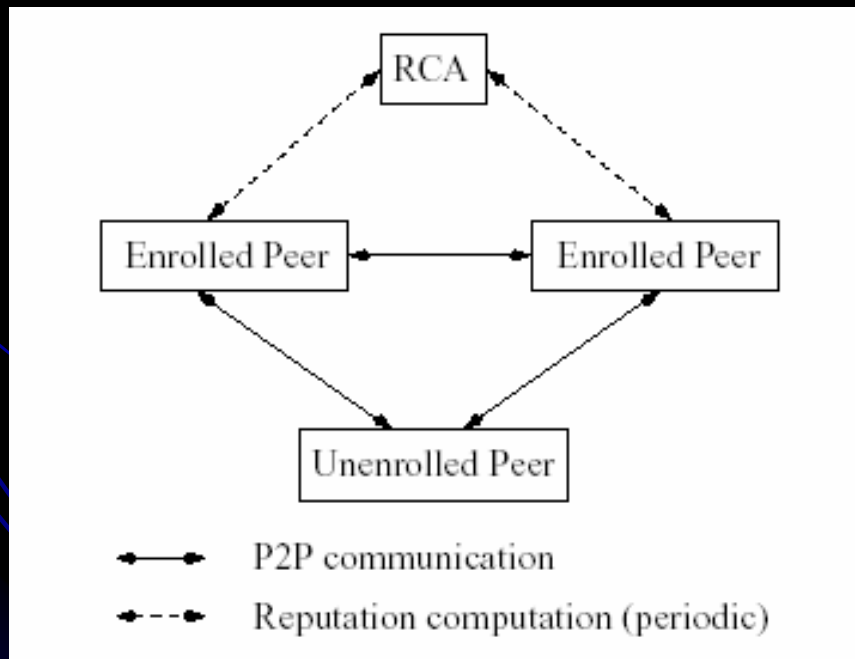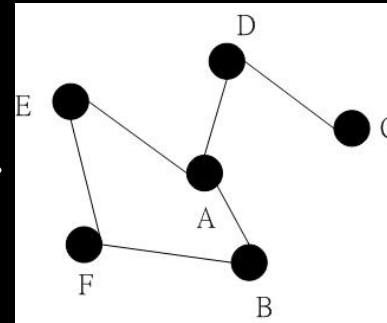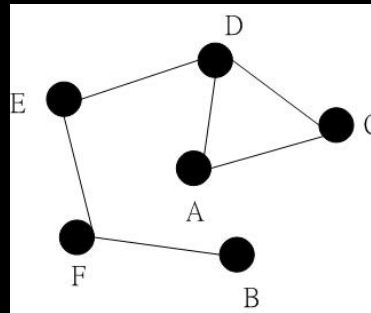
Reputation computation

- *Agent at random*

Peer	Agent Peer
A(0210)	G(0211)
B(1020)	E(1021)
C(0110)	D(1110)
D(1110)	C(0110)
E(1021)	B(1020)
F(2210)	H(2220)
G(0211)	A(0210)
H(2220)	F(2210)

Application of Reputation
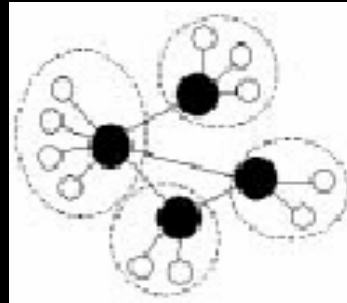
- ❑ Ranking
  - ❑ *Link (Path)*

  - ❑ *Peer*
    - ❑ *Super Peer*
    - ❑ *Good Peer*
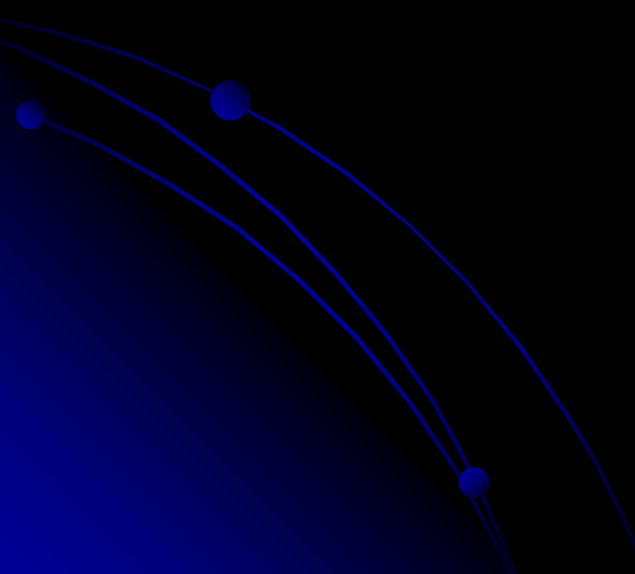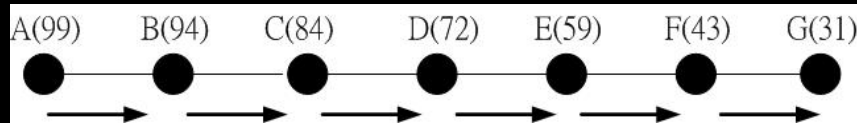

  - ❑ Topology

Application of Reputation

- Topology: Logical link in overlay network
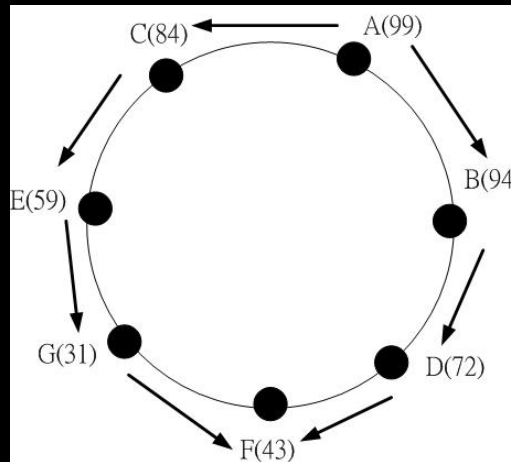 - Linear
  - Ring
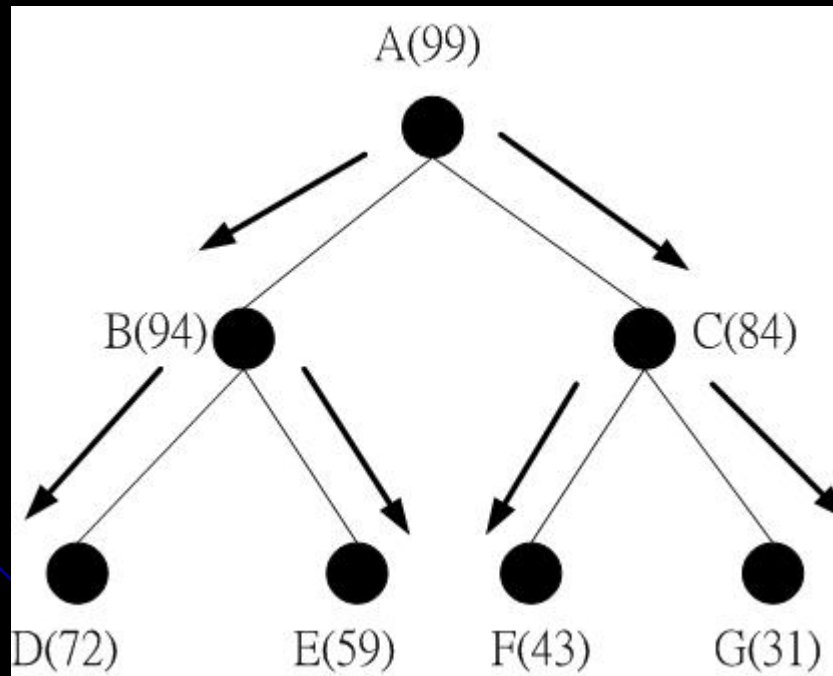 - Tree
  - Ring Tree

Application of Reputation

❑ Linear

A(99) B(94) C(84) D(72) E(59) F(43) G(31)
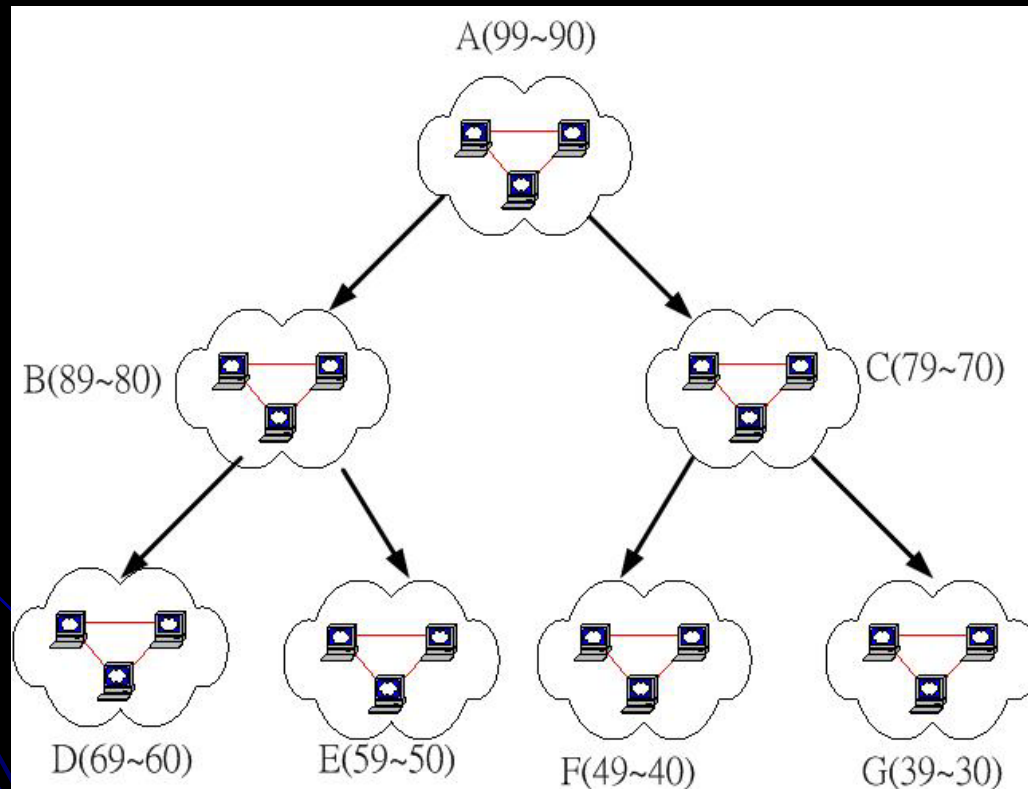
❑ Ring

C(84) ← A(99)
E(59)
B(94)
G(31)
D(72)
F(43)

Application of Reputation

- Tree

Application of Reputation

❑ Ring Tree

Discussion

- The other purpose of reputation is to solve security (Trust).

  - Attack

  - Virus

  - Garage Mail

  - Advertisement

- Reputation in interest-based group.

- Selectively searching.

Reference

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