Social-Aware Energy-Efficient Data Dissemination with D2D Communications

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**Architecture**

- A D2D link is established between two users if they are friends (socially connected) and their distance is within the requirement of D2D transmission.

**Motivation**

Design a social-aware data dissemination scheme that effectively selects seeds and schedules transmission to achieve the following goals:

- Reduce the total energy consumption of D2D transmission among users; and
- Reduce the finishing time of data dissemination.

**Our Solution: Seed Tree-Based Dissemination (STBD) Approach**

**Part 1: Seed selection**

(a) Single-Seed Scenario

- $V$ denotes the set of D2D users.
- $e_{ij} \in E$ denotes available D2D links between users.
- $w(e_{ij})$ denotes transmit power of D2D communication from user $i$ to $j$.

**Part 2: Transmission Scheduling**

- Transmission order can influence the finishing time of data dissemination.
- For example:

  (a) Finishing time = 6
  (b) Finishing time = 4

* The value on the edge is the time slot in which the transmission occurs.

- When a node determines the order of data transmission to its children, the following factors need to be considered:
  1. Number of descendants of child $i$;
  2. Depth of the subtree rooted at child $i$.

  $\text{influenceValue}_i = \beta \cdot \text{descendant}(i)_{\text{normal}} + (1 - \beta) \cdot \text{depth}(i)_{\text{normal}}$

  - The higher the influenceValue of a child is, the earlier it should receive data from its parent.

**Simulation Results**

- Reduce total energy consumption
- Reduce finishing time of data dissemination