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**An Incentive Mechanism Integrating Joint Power, Channel and Link Management for Social-Aware d2d Content Sharing and Proactive Caching**

**Abstract:**

In this paper, a downlink cellular traffic offloading framework with social-aware device-to-device (D2D) content sharing and proactive caching is studied. In the considered system model, each user equipment (UE) is intelligent to determine which content(s) to request/cache and to share according to its own preference. As the central controller, the base station (BS) can establish cellular transmissions and/or incentivize D2D communications for content dissemination (including proactive caching). By taking into account wireless features, social characteristics and device intelligence, we formulate a welfare maximization problem integrating power control, channel allocation, link scheduling and reward design. To solve this complicated problem, we propose a novel mechanism which consists of a newly developed optimization approach, called basis transformation method, for the joint resource management, and a specially devised pricing scheme for the reward determination. Theoretical and simulation results examine the desired properties of our proposed mechanism, and demonstrate its superiority in improving social welfare, network capacity and utility of the BS.

**Existing System:**

D2D communications can cause inevitable interference to cellular networks as a result of spectrum reuse. Such interference may exist between cellular and D2D links, or among different D2D links if they share a same channel. The existence of mutual interference results in the interaction among multiple UEs, which makes the resource management problem much more complicated. Thus, to guarantee satisfied communication qualities, the coordination of interference becomes necessary.

In a D2D-enabled cellular network, all information, such as channel gains, power costs and content availabilities, needs to be collected at the BS for facilitating the network management. However, due to the information asymmetry [5], the BS may not be aware of all information possessed by UEs so that intelligent UEs may strategically misreport their own private information in order to maximize their obtained rewards in serving as D2D transmitters. Hence, a welldesigned mechanism should not only reward Ues based on their contributions in traffic offloading, but also prevent them from any untruthful behaviors.

**Proposed System:**

A joint design of resource management and incentive mechanism for social-aware D2D content sharing with proactive caching is proposed, which can effectively offload cellular traffic and can significantly improve system’s energy and spectral efficiency.

• A basis transformation method is developed to jointly optimize power, channel and link management in two steps. Although this 2-step approach cannot theoretically provide the optimality or approximation guarantees, it can solve the problem in polynomial-time and ensure a good performance as shown in simulations.

• Based on the solution to the joint optimization, a novel reward scheme is devised, which satisfies both incentive compatibility and individual rationality.

• Simulations are conducted to show that our proposed mechanism can improve social welfare, network capacity and utility of the BS compared to counterparts.