CONTRACT THEORY BASED CACHING AND PRICING STRATEGY FOR CONTENT CENTRIC NETWORKS

Chen Li, Jintian Li, Zhou Su, Qichao Xu
Shanghai University, P.R. China
zhousu@ieee.org
Introduction

- Background & Motivation
  - An ever-increasing number of contents
  - High pressures to provide users with a satisfied quality of experience
  - How to find the appropriate caching and pricing strategy?
    - Caching strategy in CCN nodes.
    - Contract theory based pricing strategy.

Solution

- Constraints for feasibility of contracts:
  \[ w_1 - \frac{1}{d_1} q(\theta) - \frac{1}{d_2} (1-\theta) q(\theta) - T(\theta) \geq 0 \]

- Incentive Compatible constraints
  \[ \forall i, j \neq i, i \neq j \]

- Based on the Lagrangian function, the optimal price in the contract for user \( \theta \), can be shown as:
  \[ q^*(\theta) = \begin{cases} 
  \frac{w_2 + w_3 (1 + \alpha_1)}{2 \alpha_2} + \frac{w_2 (1 - \theta)}{\alpha_2} & \text{if } \Delta_2 > 0 \\
  0 & \text{otherwise}
  \end{cases} \]

System Model

- Content Provider:
The content provider stores the original contents in the content servers, which are placed far away from users.

- CCN node:
CCN node can be seen as the agent of content server to cache contents for users.

- Users:
Users can achieve contents from BSs and CCN nodes \( \{ \theta_1, \theta_2, \ldots, \theta_n \} \)

Simulation Results

- Comparison of the utilities with three schemes

- The operator can obtain the maximum utility with different transmission delay in the proposed pricing and caching scheme.
CONTRACT THEORY BASED CACHING AND PRICING STRATEGY FOR CONTENT CENTRIC NETWORKS

Jintian Li