

## Capacitated Multiple Allocation P-Hub Median Problem on a Cluster Based Network under Congestion

**Authors :** Çağrı Özgün Kibiroğlu, Zeynep Turgut

**Abstract :** This paper considers a hub location problem where the network service area partitioned into predetermined zones (represented by node clusters is given) and potential hub nodes capacity levels are determined a priori as a selection criteria of hub to investigate congestion effect on network. The objective is to design hub network by determining all required hub locations in the node clusters and also allocate non-hub nodes to hubs such that the total cost including transportation cost, opening cost of hubs and penalty cost for exceed of capacity level at hubs is minimized. A mixed integer linear programming model is developed introducing additional constraints to the traditional model of capacitated multiple allocation hub location problem and empirically tested.

**Keywords :** hub location problem, p-hub median problem, clustering, congestion

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