Global

maxmize $\Sigma_{i \in N} \Sigma_{j \in D_i} \Sigma_{k \in K_{ij}} (U_{ij}^k(x_{ij}^k) - \gamma \times x_{ij}^k \times I_{ij})$

subject to: $\Sigma_{j \in D_i} \Sigma_{k \in K_{ij}} x_{ij}^k \leq c_i, \forall i \in N$
$\Sigma_{i \in D_i} x_{ij}^k = z_j^k, \forall j \in N, \forall k \in K_{ij}$
$z_j^k, x_{ij}^k \in \{0, 1\}, \forall i \in N, \forall j \in D_i, \forall k \in K_{ij}$

D_i: set of neighbors of peer i.
K_{ij}: set of chunks that peer i has but peer j doens't
I_{ij}: = 1, if i, j are in the same ISP; = 0 otherwise
U_{ij}^k: utilty of i sends j with chunk k
c_i: upload capacity of i

local

maxmize $\Sigma_{j \in D_i} \Sigma_{k \in K_{ji}} (U_{ji}^k(x_{ji}^k) - \alpha x_{ji}^k (1 + I_{ji} L_{ij})) + \beta \Sigma_{j \in D_i} \Sigma_{k \in K_{ij}} x_{ij}^k (1 - I_{ij} P_{ij})$

subject to: same as global

L_{ij}: penalty rate posed on i's increment of download account when i downloads from j
P_{ij}: penalty rate posed on i's increment of upload account when i upload to j