ALTO protocol extension:
Aggregate network map and cost map into CPID
draft-wang-alto-alto-cpid-00.txt

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Objective

• Address ALTO requirements
  – Provides network information to P2P applications to achieve better peer selection

• Use less information exchanged between clients and ALTO server for peer selection

• Make it difficult to get the ISP or P2P privacy
  – ISP can not monitor the matching behaviors of P2P application
  – P2P client is hard to get the full cost info of ISP’s network
Key points

• CPID
  – A new type of PID
  – Specify a network aggregation, represent a source/destination group
  – Also reflect the costs/weights between peers implicitly

• Network map and path rating in CPID
  – Dissolve topology into CPID: use network map and cost map to construct CPID
  – COST(peer1, peer2) = FUNC(CPID1, CPID2)
Architecture

• Based on P4P/merged solution
  – Can inherit the architecture, messages, and other mechanisms

• Transfer the guidance only using CPID
  – Get CPID when peer joins for the first time and store locally, or when a former CPID expires, or when triggered by other events
  – Gather the candidates together with their CPIDs
  – Peer selection according to the calculated cost using source and destination CPIDs
Example — ALTO Client Embedded in P2P Tracker

ALTO server

Get CPID

P2P Tracker/ ALTO client

store

New peer joins

Gather peers and Ranking using CPIDs

Request peer list

Reply with “good” peers

Connect to peers
Example — ALTO Client Embedded in P2P Client

ALTO server

Get CPID

Peer/ ALTO client

Ranking using CPIDs

Gather peers

With their CPIDs

Connect to “good” peers

...
Thank you

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CPID construction example

• Procedure
  – Abstract Topology and policy of n groups into an n * n weight matrix
    • $w_{ij}$ is weight or priority from group I to group j
  – Matrix decomposition for n * n weight matrix
    • Many decomposition methods, such as LU decomposition, SVD……
  – CPID combination

$$\begin{pmatrix}
w_{11} & w_{12} & \cdots & w_{1n} \\
w_{21} & \ddots & \vdots & \vdots \\
\vdots & \ddots & \ddots & \vdots \\
w_{n1} & \cdots & \cdots & w_{nn}
\end{pmatrix} = 
\begin{pmatrix}
c_{sou11} & c_{sou12} & \cdots & c_{sou1n} \\
c_{sou21} & c_{sou22} & \cdots & c_{sou2n} \\
\vdots & \ddots & \ddots & \vdots \\
c_{sou n1} & c_{sou n2} & \cdots & c_{sou nn}
\end{pmatrix} \times 
\begin{pmatrix}
c_{des11} & c_{des12} & \cdots & c_{des1n} \\
c_{des21} & c_{des22} & \cdots & c_{des2n} \\
\vdots & \ddots & \ddots & \vdots \\
c_{des n1} & c_{des n2} & \cdots & c_{des nn}
\end{pmatrix}$$

• Peer selection criteria
  – Weight from peer in group i to peer in group j: $\sum_{x=1}^{n} c_{sou ix} \times c_{des xj}$
  – Peer selection according to re-calculated weights
• Dimensionality can be reduced a lot by PCA