ALTO-like Activities and Experiments in the P2P Network Experiment Council Japan

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S. Kamei

T. Momose

T. Inoue

T. Nishitani

Outline

- Background – P2P in Japan –
- P2P Network Experiment Council
- Experiments by our Council
- High-Level Results
- Consideration
- Feedback to ALTO WG

BACKGROUND - P2P IN JAPAN -

- Access Network Environment
  - Widely Spread Broadband Access Network (FTTH users are larger than DSL users sine 2008 June)
- P2P Applications
  - Major P2P File Sharing Applications (E.g. Winny, Share) were developed in Japan.
- P2P Traffic
  - Still remains dominant traffic (about 60% in 2008).
- ISP Operations
  - Many ISPs are shaping P2P file sharing traffic based on “Guideline for Packet Shaping (by ISP, CATV, Telecom Associations with Government regulator)”

P2P Network Experiment Council

- P2P Network Experiment Council
  - Established in August 2007
  - Purpose: promote new content delivery businesses, and spread P2P services to regional areas.
  - Members: contents holders, P2P providers, ISPs,… with Government as observer

- Activities
  - Formulation of guidelines for the promotion of the commercial use of P2P technology

    → For Security, Copyright, Privacy problems.
  - Feasibility tests of P2P technology

    → For Network load problems.

Our experiments

- Dummy nodes for measurement
  - Monitoring P2P traffic behavior
    - How each peer selects other peers
- Hint server for control
  - Controlling P2P traffic efficiently (like ALTO)
    - Reduce the network cost of peer transfer

Dummy nodes for measurement

53 measurement nodes in Japan and 2 nodes in Skorea.

Place¥	ISP
Soul	KT
Soul	SK Telecom

富山IX

場所	ISP	1)	2)	3)	4)
福井市	MiteneInternet	●	○	●	○
金沢市	インクル	●	●	●	○
富山市	コーラルネット	●	●	●	○
富山市	富山IX	–	●	■	–
富山市	FITWEB	■	●	■	

岡山IX

場所	ISP	1)	2)	3)	4)
倉敷市	倉敷CATV	●	●	●×2	○
岡山市	岡山IX	–	●	–	–
米子市	中海テレビ	●	●	■	–

場所	ISP	1)	2)	3)	4)
札幌市	HOTnet	●	○	○	○
札幌市	NTTCom検証設備	–	●×2	●	–

場所	ISP	1)	2)	3)	4)
山形市	CATV山形	●	●	●	○
秋田市	秋田CATV	●	●		

場所	ISP	1)	2)	3)	4)
大手町	NTTCom検証設備	–	●×3	●	○

場所	ISP	1)	2)	3)	4)
東海市	知多メディアス	●	●	●	○

場所	ISP	1)	2)	3)	4)
堂島	NTTCom検証設備	–	●×2	●	–
大阪市	スマートコネクト	–	●	●	○

場所	ISP	1)	2)	3)	4)
松山市	愛媛CATV	●	●	●	○

場所	ISP	1)	2)	3)	4)
福岡市	NTTCom検証設備	–	●	●	–
宮崎県	宮崎 IX	–	●	–	–
鹿児島市	グッドコム	●	●	●	○

場所	ISP	1)	2)	3)	4)
沖縄券	沖縄ケーブルネットワーク	●	●	●	○

Dummy nodes for measurement (Con'd)

- Peer Selection with P2P
  - Peers are selected regardless of their location.
  - Inefficient routes are selected in most cases.

Condition	Experiment 1	Experiment 2
A: Selects Peer in the same ISP	22%	29%
B: Selects Peer in the same region	19%	23%
A∧B	5%	7%

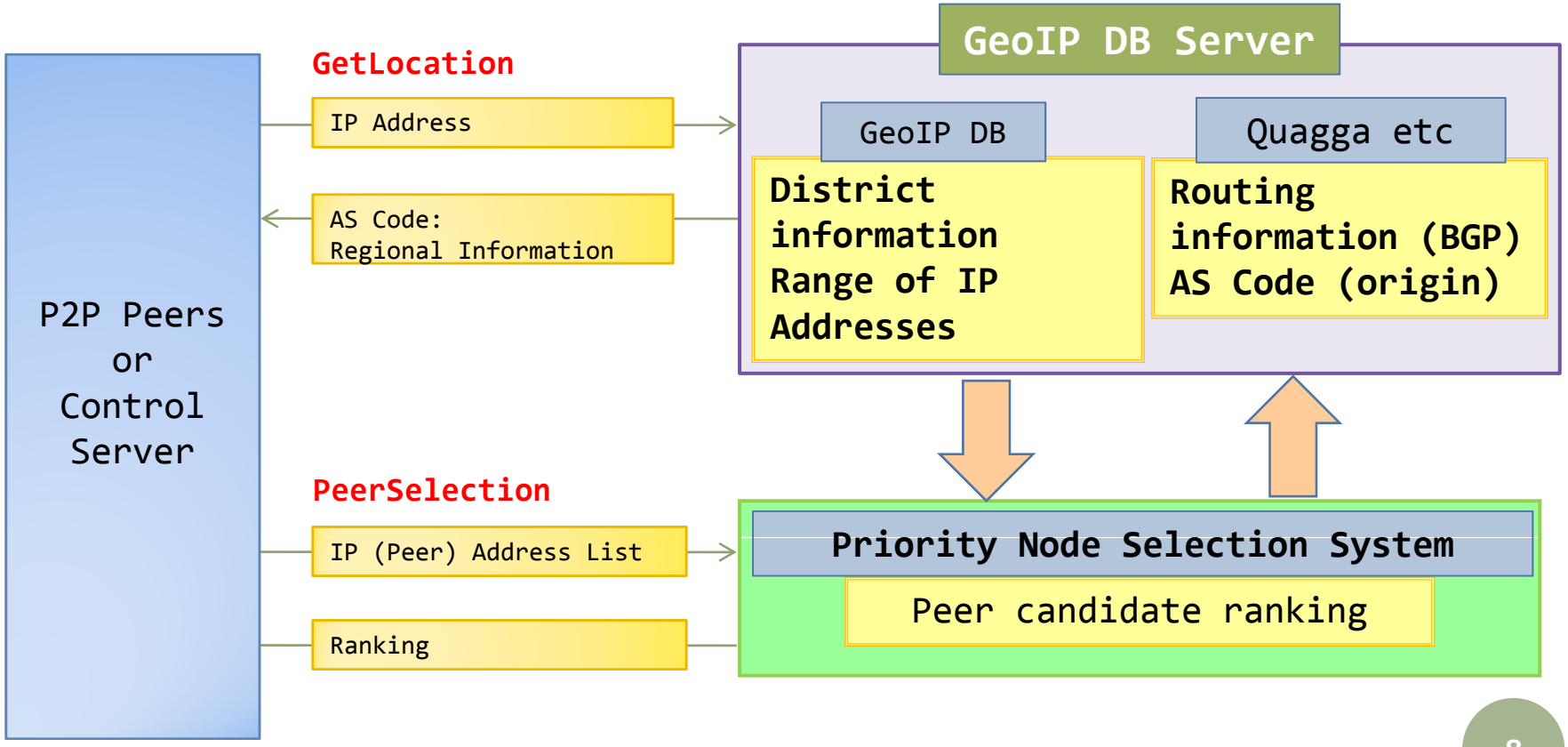
HINT SERVER FOR TRAFFIC CONTROL

- ALTO-like experiments in Japan
  - Discussion with ISPs, Contents Holders, P2P Vendors, and with Government.
  - Distance/Cost are defined as follows:
    - AS Path Similarity.
    - Geology Based Distance.
  - Implementation in Commercial P2P Applications
    - Tree Live Tracker-based Application
    - Mesh Live Peer-based Application
  - Hint server information is used only for HINT, without forcing.

HINT SERVER FOR TRAFFIC CONTROL

- Hint Server architecture

  GeoIP DB/Hint Server generates more connections between P2P clients residing in the neighborhood, for more efficient network usage.



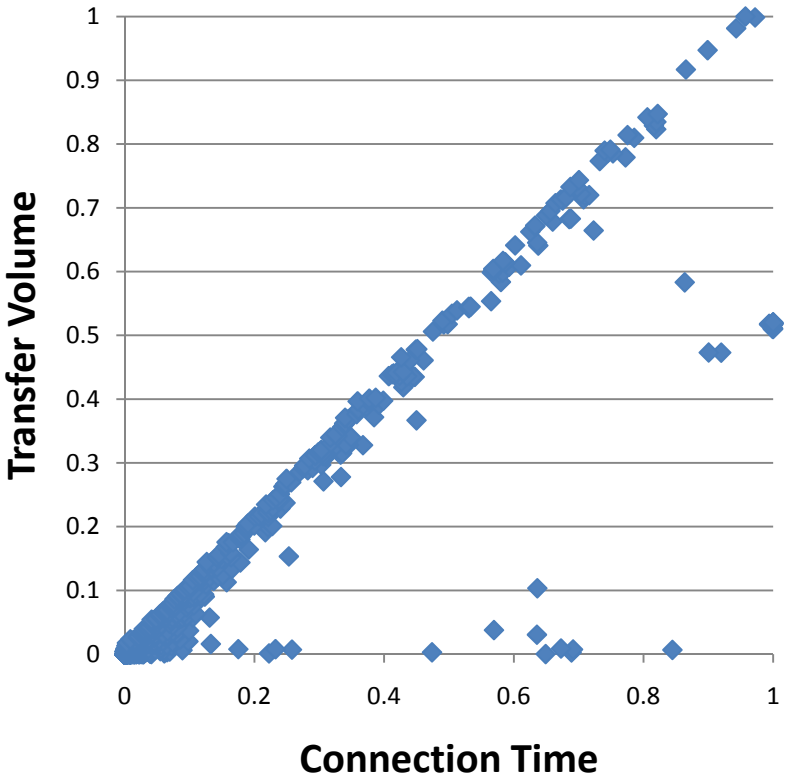
HINT SERVER FOR TRAFFIC CONTROL

- normalized distance is adopted for selection of a suitable peer
  - (type 1) AS path length
    - The degree of matching of paths from an originating AS to the AS that a target peer belongs to.
    - Examples: the originating AS is A
      - 4/6 between A-B-C, and A-B-D,
      - 6/8 between A-B-C-D and A-B-C-E.
  - (type 2) Geology Based Distance
    - Geology Based Distance between prefectural capitals that target peers belong to.
    - Distances between prefectural capitals are sorted into ascending order, and then into bands, with weights 1 to 15 assigned to them so that there are a more or less equal number of "capital pairs" in each band.

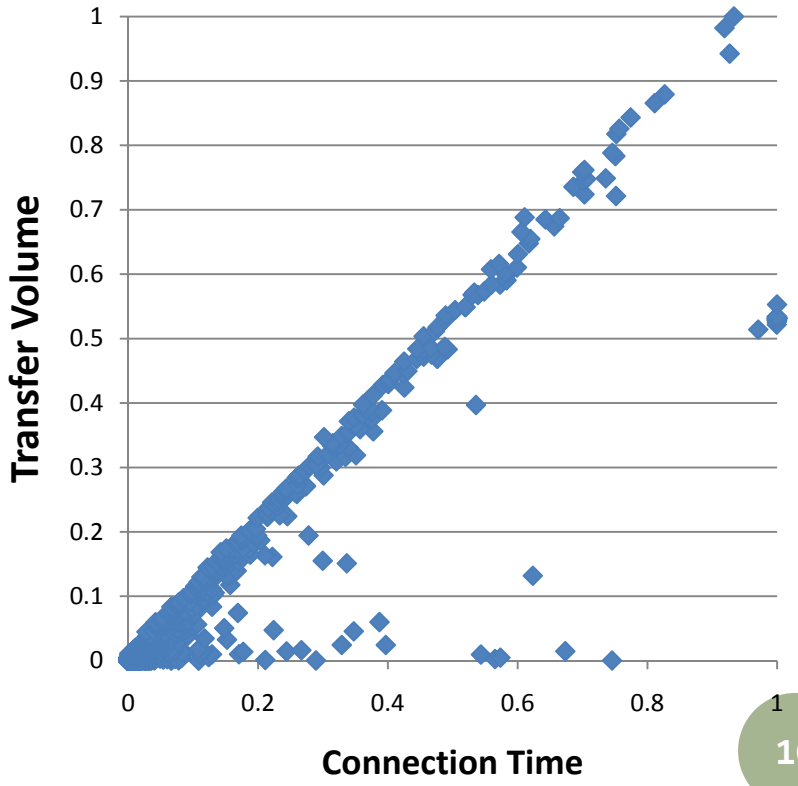
EXPERIMENT1 TREE/LIVE TRACKER-BASED

- Transfer Volume is proportional to connection time

w/ Hint Server



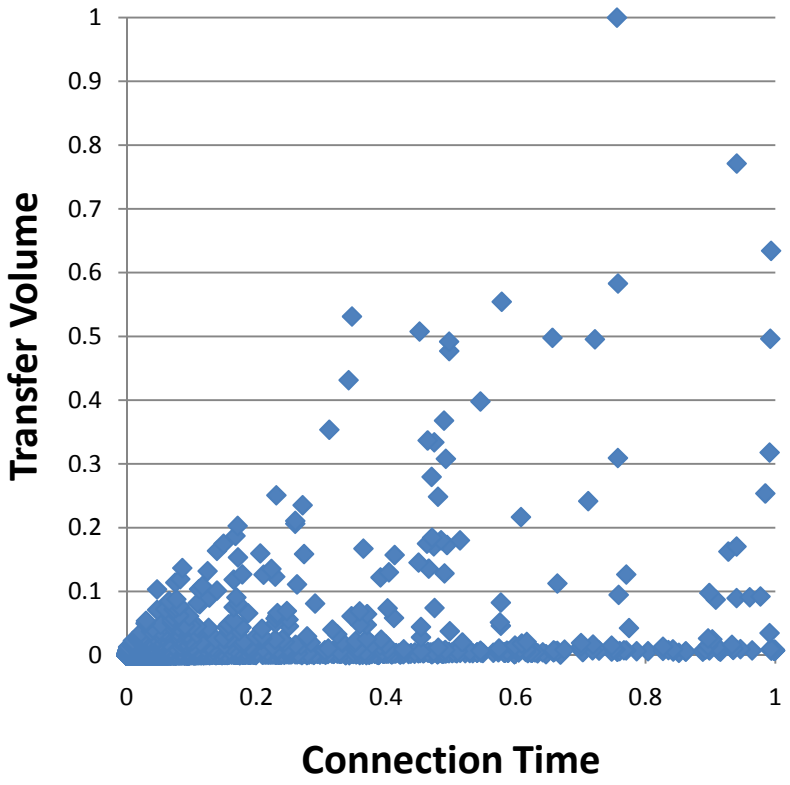
w/o Hint Server



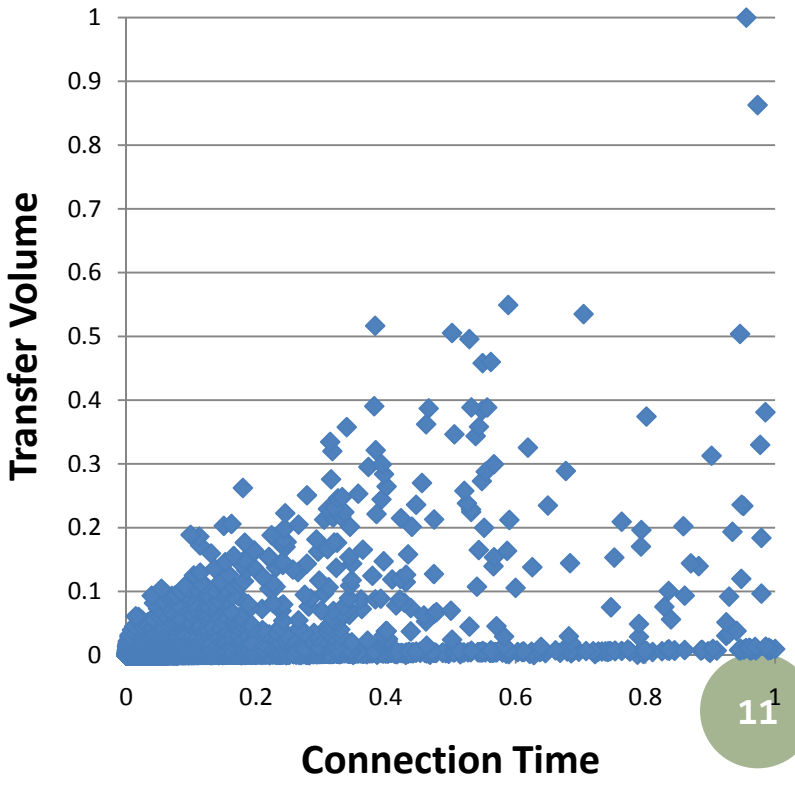
EXPERIMENT2 MESH/LIVE PEER-BASED

- Transfer Volume is not proportional to connection time

w/ Hint Server

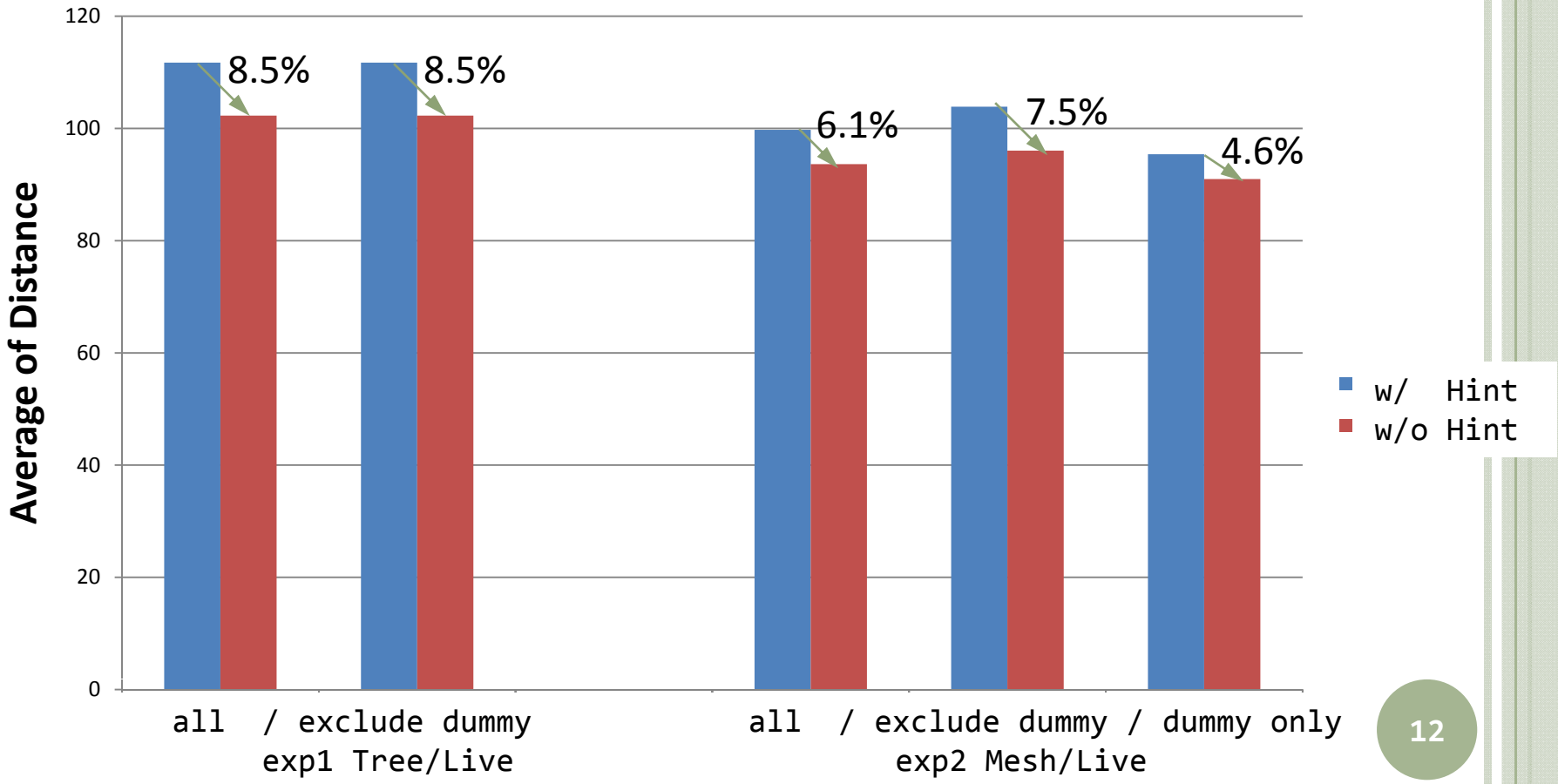


w/o Hint Server



Distance Reduction

- Measure communicated peers from dummy nodes.
- Reduction effects are less than 10%



CONSIDERATIONS

- Hint Server mechanism is well operated.
  - Significant differences are observed.
- Effective measurement is difficult.
  - These results are only from sampled data.
  - There are many noise data, control session etc…
- Limited effectiveness because:
  - Low contents hit rate
    - There are many ISPs in Japan.
    - A few hundreds of peers for these experiments.
  - No guideline for implementation
    - P2P Application vendors may think peer limitation is trade-off of traffic volume and system stability.

Feedback to ALTO WG

- Cooperation of ALTO Servers:
  - Hierarchical Peer Selection:
    - As the first step, coarse information about the whole network is used to select ISPs. Next, fine information within the ISP is used to select a peer.
    - It may be able to increase hit rate, merging same IX ISPs and so on.
- Measurement mechanism:
  - to evaluate the effect of introducing a ALTO Server
    - current P2P applications have their own measurement mechanisms.
  - to determine the implementation policy for ALTO Clients.