Network Support for Personal Information Services to PCS Users

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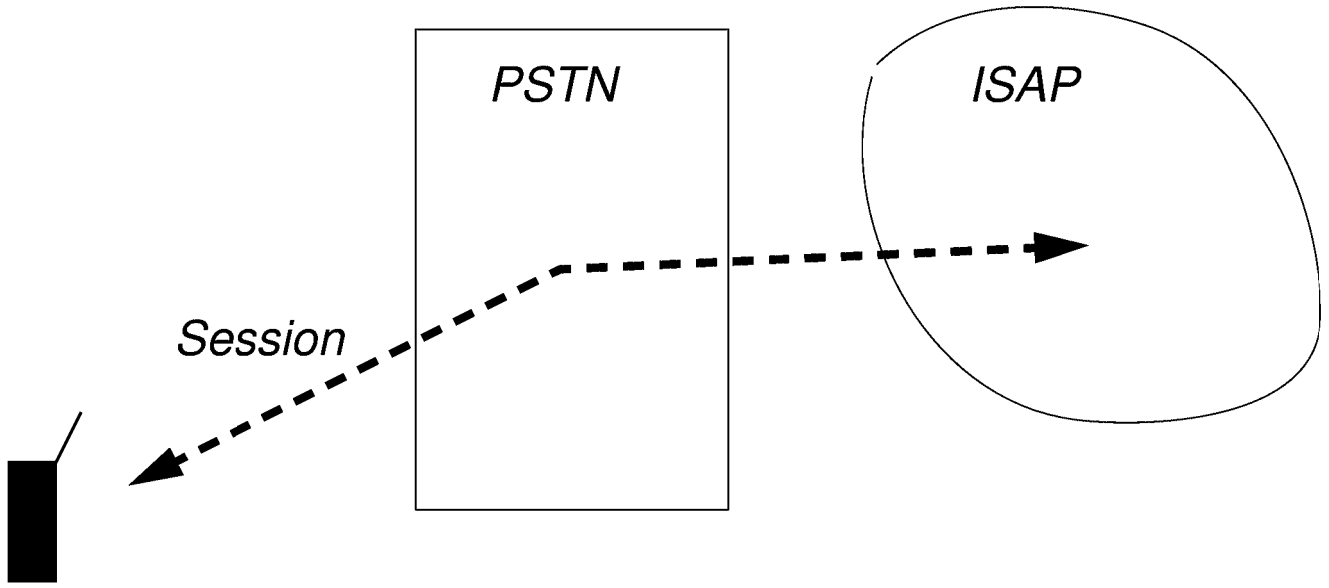
Outline

- Introduction
- Alternative system architectures
- System model
- Virtual mobility and service handoffs
- Maintaining service profiles
- Concluding remarks

Introduction

- Future networks for PCS will deliver a wide range of Personal Information Services and Applications (PISA)
  - personalized stock and financial information
  - electronic magazines
  - traveler information services
  - mobile banking, sales, inventory ...
- Services are provided by an Information Service and Applications Provider (ISAP) via the PCS network

Introduction contd.



Sessions may be

- connectionless e.g. personalized traffic information
- *connection-oriented* e.g. mobile file access

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Centralized ISAP architecture

- Information stored and processed at a central site
- ISAP and users communicate and exchange data using the PCS network, simply by placing a PCS call
  - Usual handoff procedure maintains physical connection continuity
  - Common higher-level protocols can be used for error-recovery and maintaining service continuity
- May be adequate for low-volume services or for initial stages of service penetration, but may not scale up

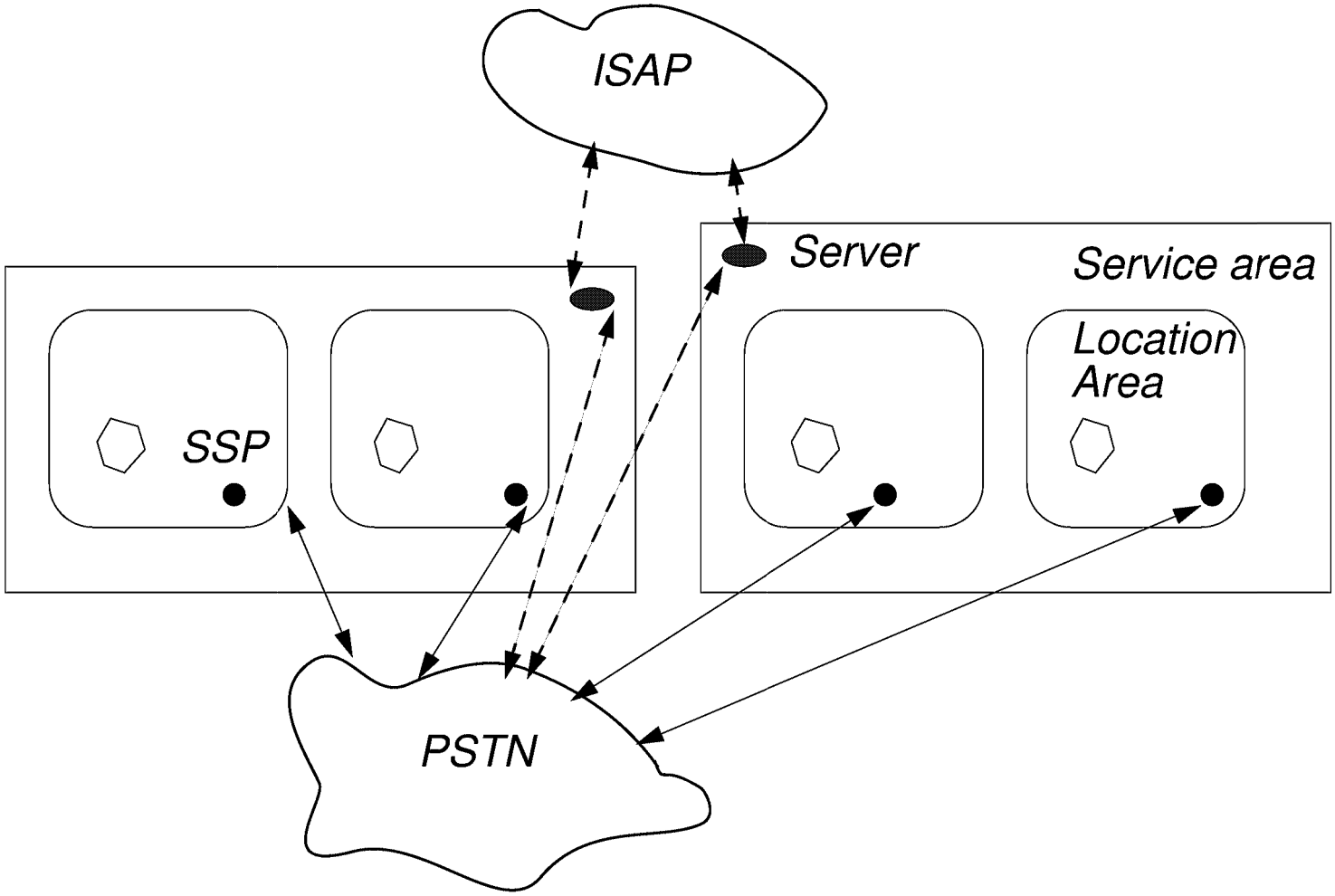
Multiple independent servers

- Several geographically dispersed servers which are
  - logically autonomous
  - connected independently to the PCS network
- Particularly well-suited when the information is geographically localized
  - vehicle traffic information services
  - local weather, community news, ...
- May not be suitable if information is to be available over a wide area and is of general interest
  - NY stock exchange information

Distributed servers

- Information is (partially) replicated across multiple servers which
  - function as a single logical information base
  - are connected to the PCS network
  - interconnected either via PCS network or the ISAP's private network
- This is the architecture assumed for the rest of the talk

System model



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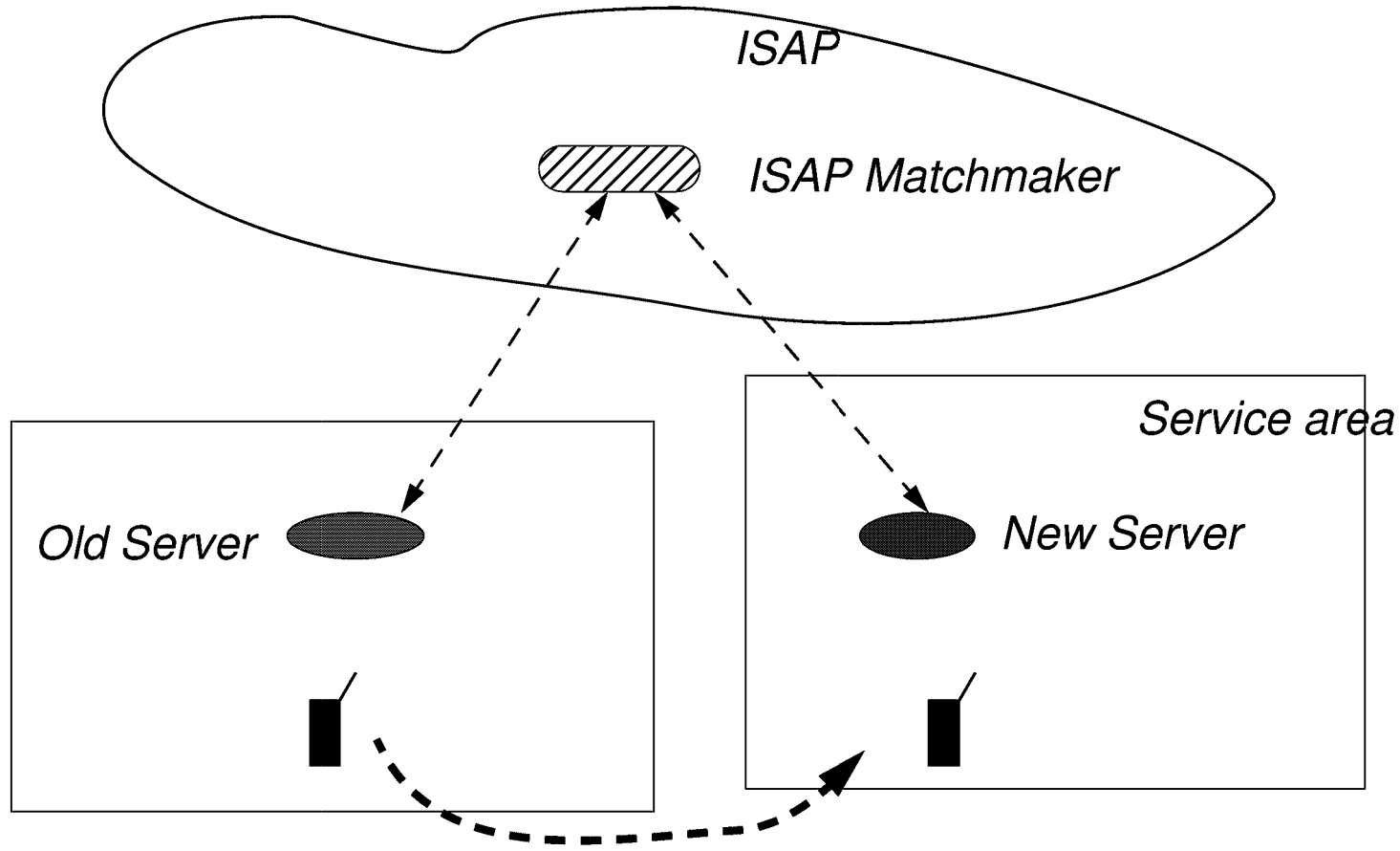
Network support for PISA

- Basic support
  - User and ISAP-initiated PCS calls
  - User location and *call handoffs* as the user moves
  - Billing, etc.

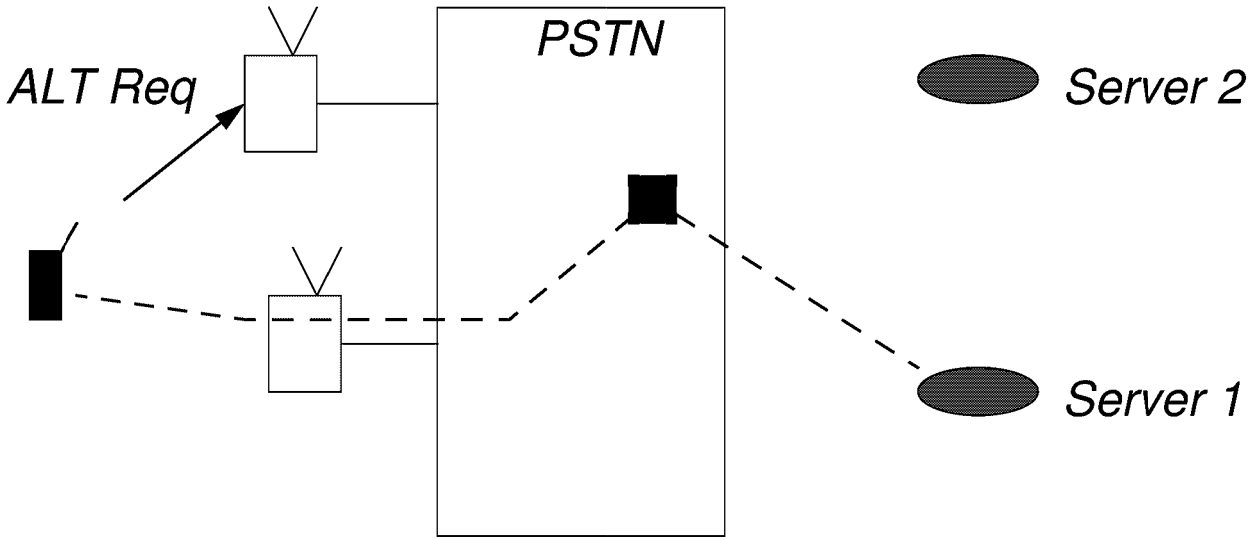
- Enhanced support
  - *Service handoffs*: Real mobility of user between service areas may result in *virtual mobility* of service from one server to a "closer" server
  - Single-number best-server (SNBS) service
  - Maintaining service profiles

Service Handoffs

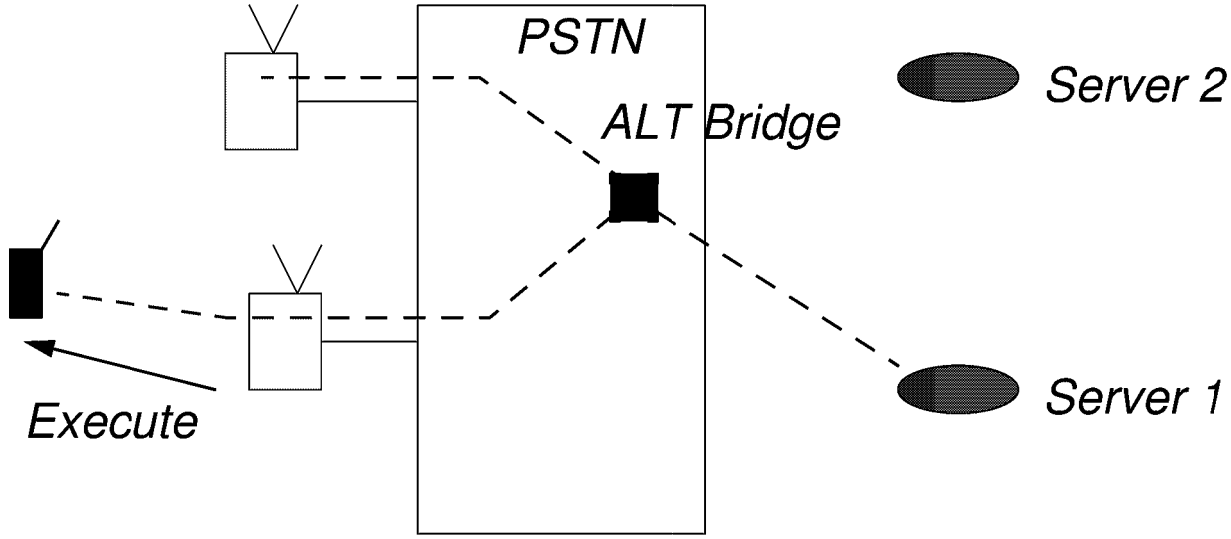


Physical connection transfer from old to new server

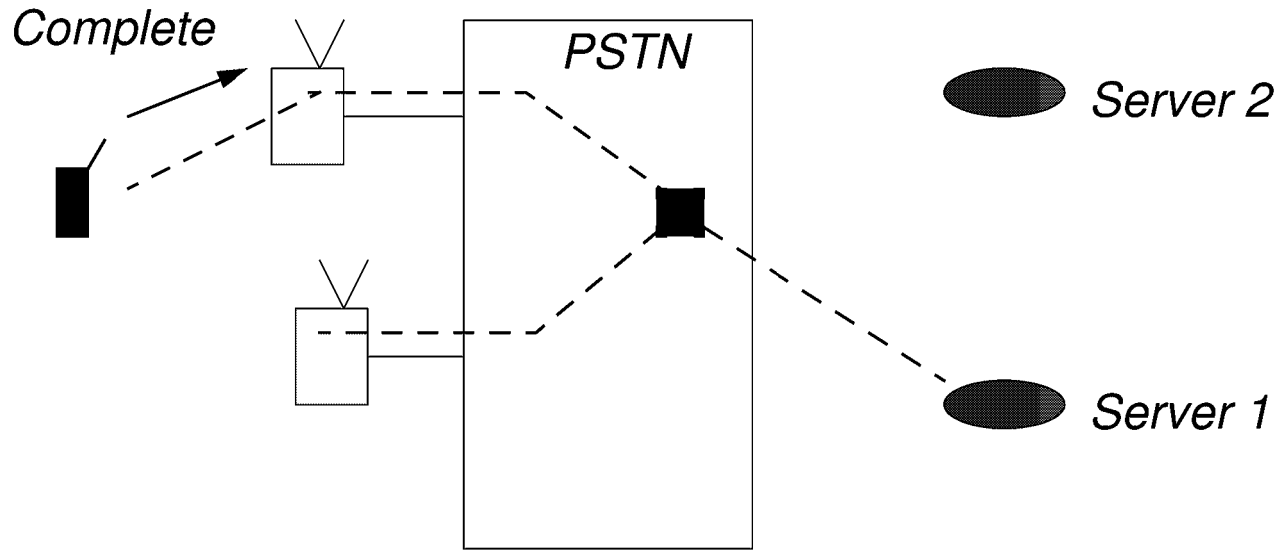
- Analogous to call handoff process, but performed between servers



Physical connection transfer contd.

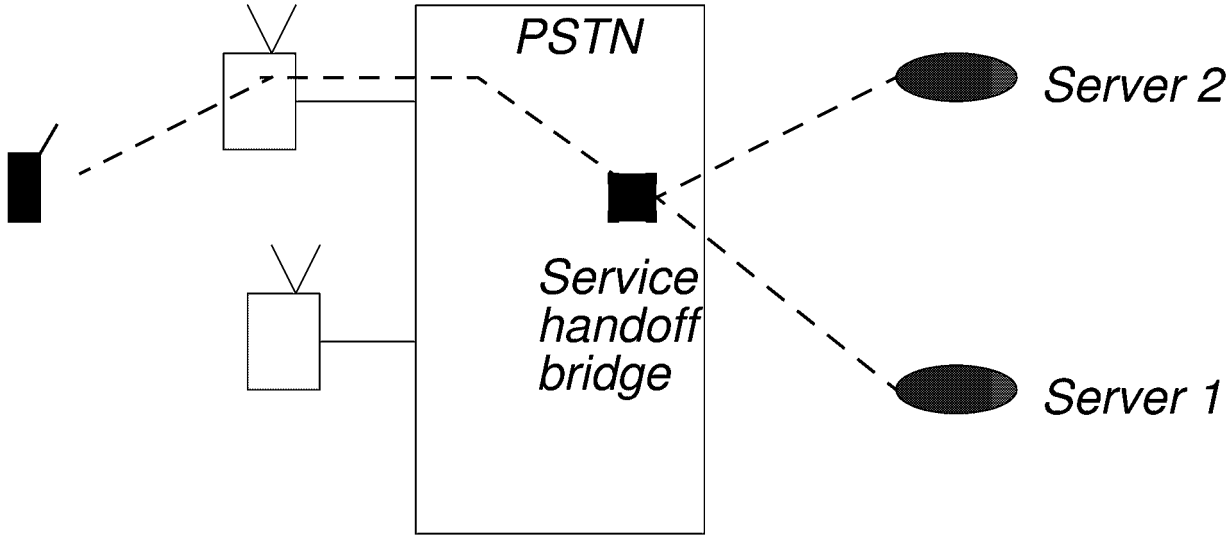


Physical connection transfer contd.



Physical connection transfer contd.

PSTN informs ISAP matchmaker that user has moved and a bridge set-up is initiated by the matchmaker



Context information transfer between old and new servers

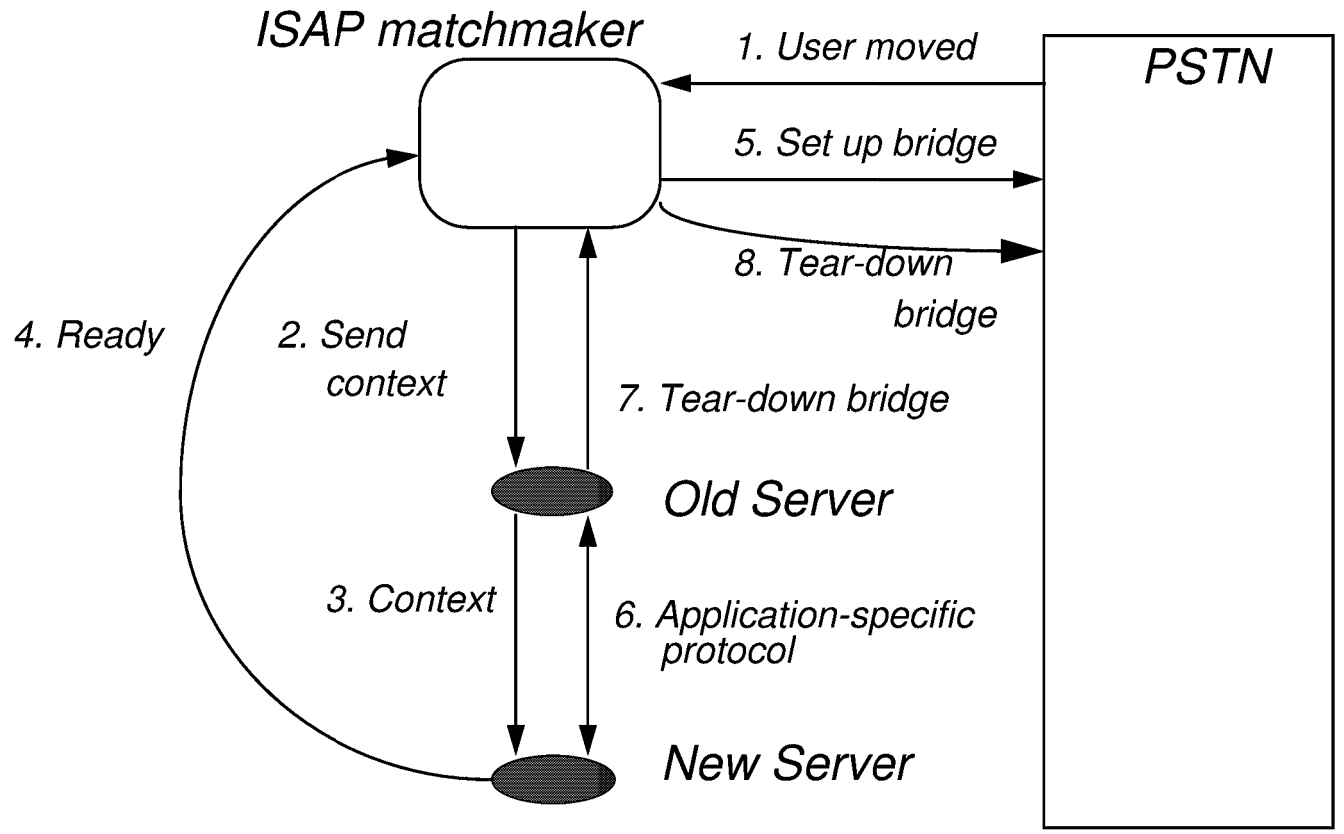
The new server needs to know the context of the user with respect to the service

- User only reads information e.g. news or electronic magazine
  - Context is simply page and issue or version number
- User can read and write information as in a file system
  - Context is the whole file (or list of changes to the file) and a timestamp.
- User can read and write information as in a database
  - Context is transaction id (supplied by user), and locks and updates (supplied by old server)

User location information access

- ISAP matchmaker needs user location information to determine which is to be the new server
  - PCS network provides the information about
    - every change of cell
      - ISAP needs locations of PCS cells
    - every change of location area
      - ISAP needs locations of PCS location areas
    - every change of service area
      - PCS network needs locations of ISAP service areas
  - User equipment transparently sends location to ISAP e.g. using a GPS receiver

Call flow example



Single-number best-server (SNBS) redirection

Suppose the user originates the call to the ISAP.

Ideally, the user calls a single "worldwide" ISAP telephone number, which is mapped to an appropriate server depending upon the user's location.

- Can be done by ISAP matchmaker after the call goes through.
- This can also be done by PCS network - *SNBS service*
  - ISAP provides locations of service areas and servers to the PCS network
  - PCS network decides which server to assign to the user depending upon user location

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Maintaining Service Profiles

- Just as PCS network maintains user profiles, ISAP will also need to maintain service profiles
  - e.g. for traffic information service, profile contains
    - roads, tunnels, bridges which user is interested in
    - communication mode (pager,fax,...)

- Similar to PCS database hierarchy (HLR / VLR), we propose a hierarchy for service profiles:
  - Home Service Database (HSD), which could be centralized or distributed
  - Visitor Service Database (VSD), which is associated with each ISAP server

Service profile database management protocol

Similar to IS-41 protocol for managing user location, protocol needed for service profile database

- When user moves into new service area, HSD needs to be updated, the new VSD gets user's service profile and old VSD purged of user's profile
- Unlike IS-41, protocol might need *exactly-one* semantics: exactly one profile should be *active* at any time to prevent race conditions:
  - e.g. suppose user move causes two VSDs to contain service profile, which in turn causes both to initiate transactions on user database concurrently.

Concluding remarks

- Proposed a distributed server architecture for PISA, analogous to underlying PCS network architecture
- Outlined network support for virtual mobility and service handoffs
  - physical connection transfer analogous to call handoff
  - context information transfer for different applications
  - utilizing user location information to select servers
- Outlined network support for Single-number Best-server (SNBS) facility
- Proposed two-level HSD and VSD database hierarchy for service profiles, analogous to PCS network's HLR and VLR
- Further work:
  - protocols for profile replica management
  - *asymmetric* protocols for user-ISAP interaction