Towards an Architecture for Personal Broadband

Elisabeth Maida, MIT
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MIT Communications Futures Program

"Defining the roadmap for communications
and its impact on adjacent industries."

Agenda

- *Previous and Related Work*

- Proposed Functional Elements

- Potential Industry Models

- Discussion

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Previous and Related Work

- *Relevant Literature*
  - Corliano and Khan, Economic Tussles in the Public Mobile Access Market (British Telecom)
  - Personal Router, http://pr.lcs.mit.edu/research (MIT)
  - Bandwidth Markets

- *Industry Efforts*
  - IETF seamoby working group: CARD
  - IRAP
  - UMA
  - IMS/SIP
  - ...

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Proposed Functional Elements

1. Network Discovery - identify which networks are available
   - *Does the user need to provide their information in order to receive a list of networks? If so, what information is required?*
   - *Does the user only see a subset of the available networks?*

2. Access Network Selection - select the appropriate network
   - *Who decides which network should be selected?*

3. Authentication and Authorization - gain access to the network
   - *Who performs the authentication and authorization?*
   - *Are authentication and authorization always required?*

4. Accounting – track usage of the network

5. Billing and Settlement – pay for the usage

"Pieces of the Puzzle"

Function	Existing Systems and Protocols
Network Discovery	– Candidate Access Router Discovery (CARD, IETF, RFC 4066) – Service Location Protocol (IETF) – International Roaming Access Protocols (IRAP) – Beacon Management – Universal Description, Discovery, and – Integration (UDDI)
Access Network Selection	– CARD (depending on implementation) – 3G roaming – Personal router
Authentication and Authorization	– Extensible Authentication Protocol (EAP)
Accounting	– RADIUS and Diameter
Billing and Settlement	– TBD

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Data Flow

- The user receives bits from whichever network serves as their access point.

- With Personal Broadband, the bits will not flow through the home provider *by default*.

- There are two possible models:
  - Triangular routing via the home provider or a 3rd party
  - Direct routing
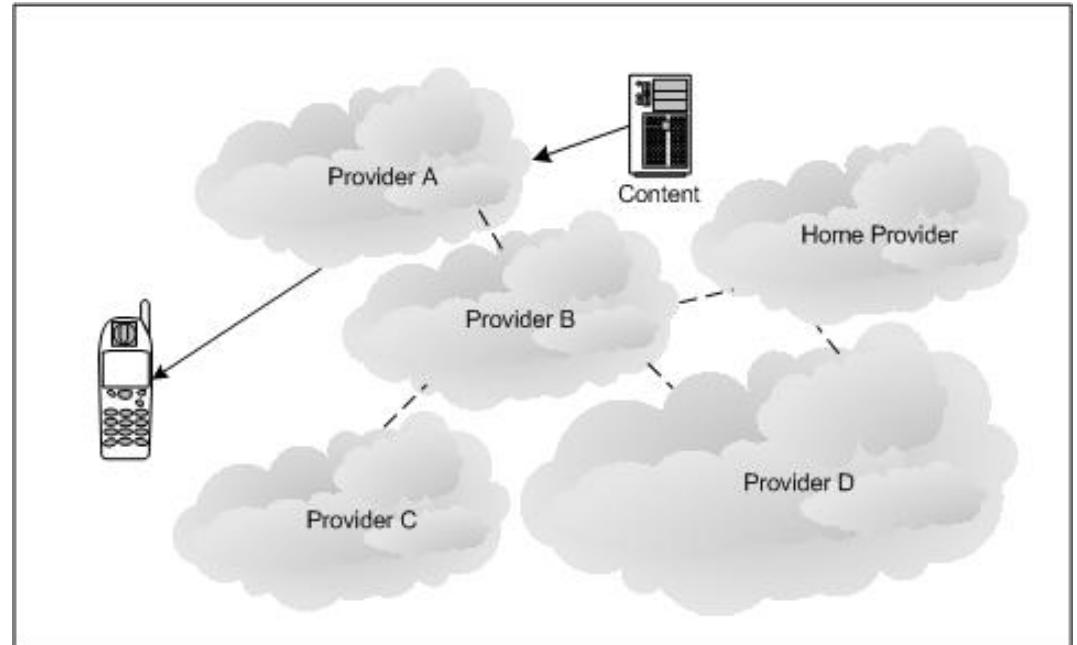
The control bits and the data bits do not need to follow the same route.

Payment and Assumption of Risk

- The Personal Broadband architecture should support many possible business models.

- In order to test the flexibility of the architecture, we have considered the following models:
    - The user pays a home provider on an on-going basis (e.g. cell phones).
    - The user pays a 3rd party aggregator (e.g. iPass, Boingo, Paypal).
    - The user pays on the spot market.
    - The user pays nothing and the cost is subsidized through other channels (e.g. advertising).

- *What other business models should we use to evaluate the architecture?*

Subscription and Roaming

The user has a long-term relationship with a home provider (HP). The home provider establishes relationships with other providers (n by n).
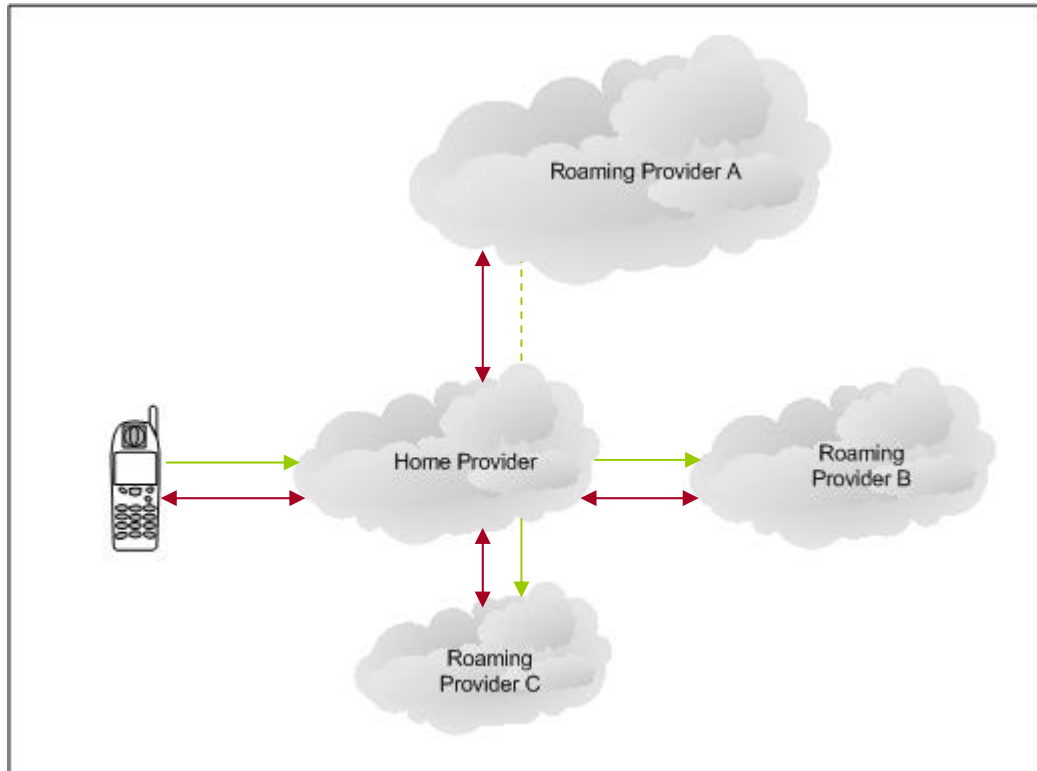
Payment Flow

The user pays the HP directly. The HP distributes the $ to other providers based on their agreements.
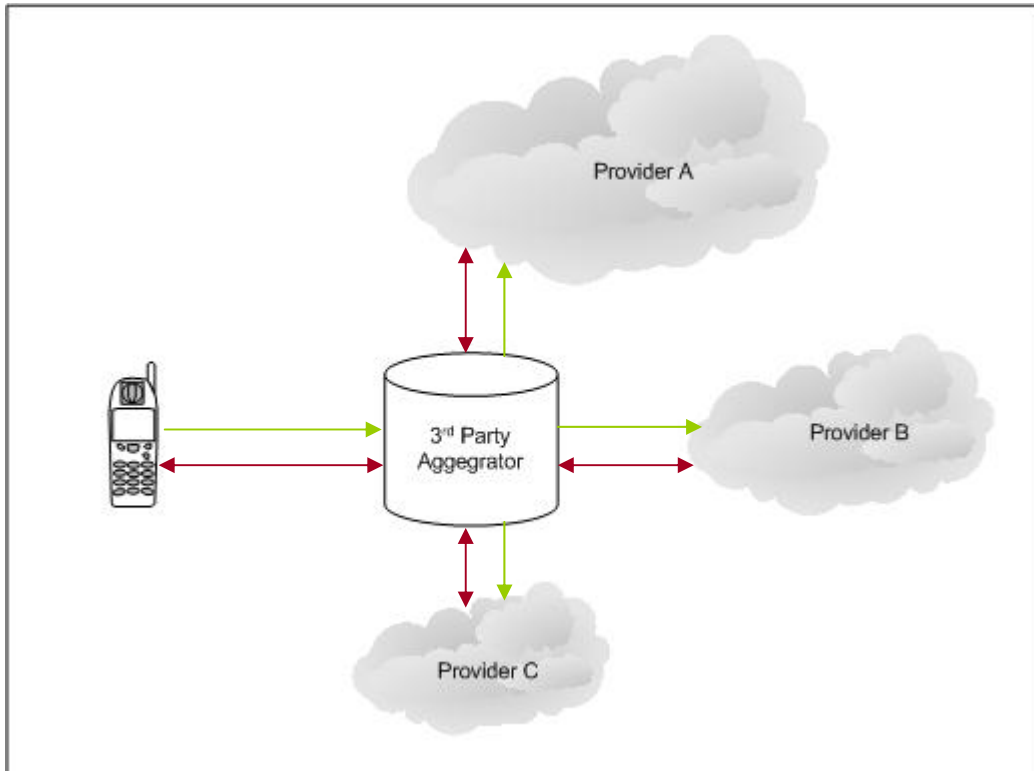
Assumption of Risk

HP: User is malicious and will not pay their bill; other providers will not provide QoS and will not bill correctly

User: HP will misuse their profile information, will not bill correctly, and not establish sufficient relationships

Other providers: HP will not pay and user is malicious

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3rd Party Aggregator

The user has a long-term relationship with a 3rd party aggregator.
The 3rd party establishes relationships with the providers (1 by n).

Payment Flow

The user pays the 3rd party directly. The 3rd party distributes the $ to other providers based on their agreements.
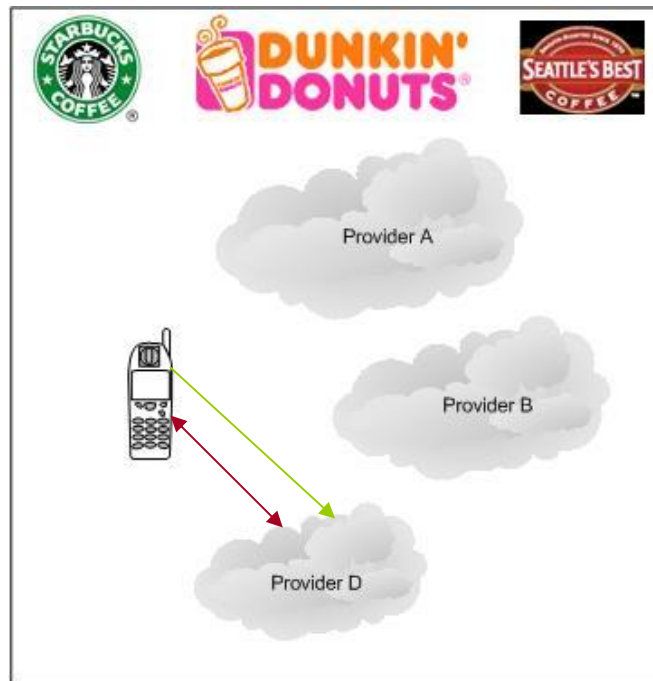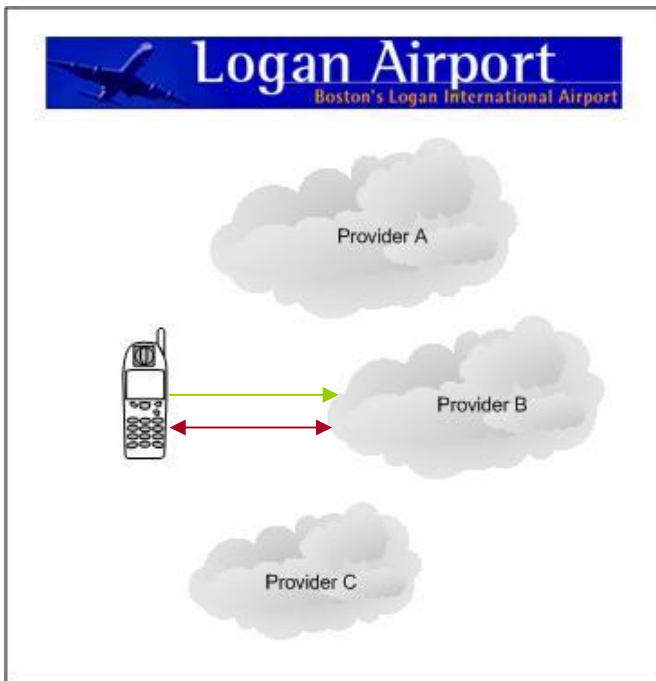
Assumption of Risk

3rd party: User is malicious and will not pay their bill; other providers will not provide QoS and will not bill correctly

User: 3rd party will misuse their profile information, will not bill correctly, and not establish sufficient relationships

Other providers: 3rd party will not pay and user is malicious

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Spot Market

The user establishes a short-term relationship with an available provider. Risk is either dynamically assumed or the participants are part of a common framework.
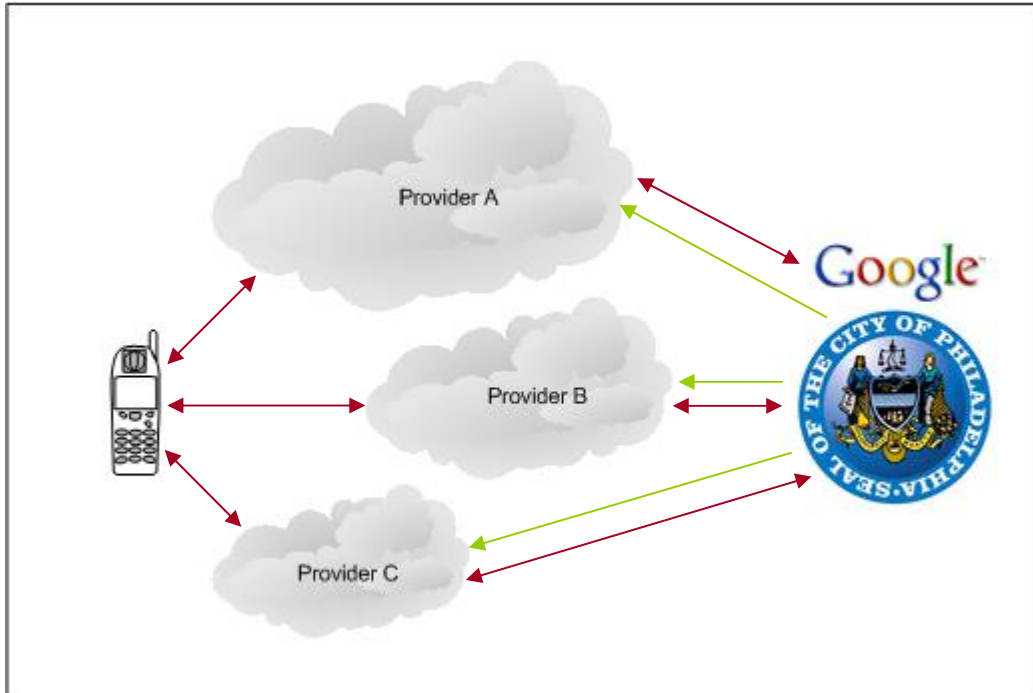

Payment Flow
The user pays on the spot market.

Assumption of Risk
User: Provider misrepresents services, misuses their information, and bills incorrectly
Provider: User is malicious and will not pay

Subsidized Access

The user pays nothing and the cost is subsidized through a 3rd party.

Payment Flow
A 3rd party pays the providers.

Assumption of Risk

3rd party: Providers will not bill correctly

User: Providers will misuse their profile information and will not provide sufficient service

Other providers: 3rd party will not pay and user is malicious

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