P2P-SIP:
Architectures and Algorithms

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P2P-SIP Models

3 Models

- SIP server uses DHT (distributed hash table) for looking up current contact address

- Distributed SIP proxies host the DHT
  - Clients request is forwarded by the SIP proxies based on p2p lookup (proxy mode)
  - Clients perform look up using the proxies and initiate direct connection (redirect mode)

- Clients participate in hosting DHT, clients act as P2P nodes.
P2P-SIP Signaling: Model 1

- SIP server use P2P based DHT for look up
  - DHT as a network service
  - SIP Proxy can become point of failure
    - Not really P2P
  - Capability needed in clients to fallback and use the DHT service directly when proxy fails
- Who hosts DHT service
  - Capable clients
- Can be considered for enterprise networks
P2P-SIP Signaling: Model 2

- P2P in SIP proxies (Distributed Proxies)
  - Distributed proxies provide DHT service
  - Proxies are distributed at network access points e.g. Wireless Access Points,
  - Proxies can relay or forward requests or can act as look up service providers
    - SIP Proxy mode or Redirect mode
    - Proxy mode in P2P useful for NAT/Firewall
  - Registration to proxy=>$Store in DHT
  - No change in existing clients needed: evolutionary
  - Client must not depend on local proxy
P2P-SIP Signaling: Model 3

P2P in end points

- Different types of end point and end points capability
- Wireless endpoints
  - Impact of mobility on number of messages, power utilization and network utilization
- Not all end point can participate to PROVIDE DHT look up as a SERVICE
- Clients use look up service from other clients and proxies who are participating in P2P network
P2P-SIP Media: Models

- Media over p2p overlay
  - Route around failures
  - Emergency traffic
  - QoS
  - Firewalls/NAT’s
  - Measurement overheads can be involved
P2P Schemes

- Structured – Chord etc.
- Unstructured
  - Query routing
- Hybrid
  - Hash based structure over an unstructured
    - E.g. All user id’s starting A will be stored in fixed set of super nodes and a structured query can be run over that small set. It’s like an indirect, other similar mechanism
P2P Algorithms

- Chord, Pastry, Kademlia etc.
- Performance comparison
  - Call set up delay - search complexity and locality principles (which node the query goes to and messages going back and forth)
  - Flexibility to choose neighbors i.e. nodes which will route query – e.g. locality based neighbor space.
  - Feature comparison e.g. wild card searches etc, other possible features.
P2P Algorithms

- Based on feature – extensibility
  - How do you provide vmail/ conferencing etc.
Advantages

- Self organizing
  - Works even if server down
  - Inbuilt resiliency and reliability
- Plug and Play
- Low cost
- Media overlay
  - Best path
  - Alternate path (useful for emergency situation)
Open problems

- Voice mail
- 911
- Interoperability between multiple P2P islands based on different substrates (algorithms)
- Trust – Identity – Anonymity
- Security
Current Implementation Architecture

Enterprise Deployment

SIP Proxy on P2P Substrate

P2P Network (DHT Service)

Clients acting as P2P nodes

Our typical deployment model

DHCP
Current Implementation: Case 1

IP PBX exists and is working
- Phone comes into wireless zone
- Acquires IP address using DHCP
- Requires address of IP-PBX
  - Either in DHCP options header
  - DHCP like request
- Registers to the IP-PBX – Information about this phone stored in DHT
- Can make calls
  - Lookup at Server
  - Forwarding at Server
Current Implementation: Case 2

IP PBX doesn’t exist or is not working
- Phone comes into wireless zone
- Acquires IP address using DHCP
- Requires address of IP-PBX
  - Doesn’t get it in DHCP response
  - Either gets it from bootstrap server or uses the one in local cache
- Registers to the IP-PBX – disseminate its reach-ability info
- Making calls
  - Lookup at Server (IP-PBX)
  - Forwarding at Server (IP-PBX)