



# Internet Telephony Gateway Location

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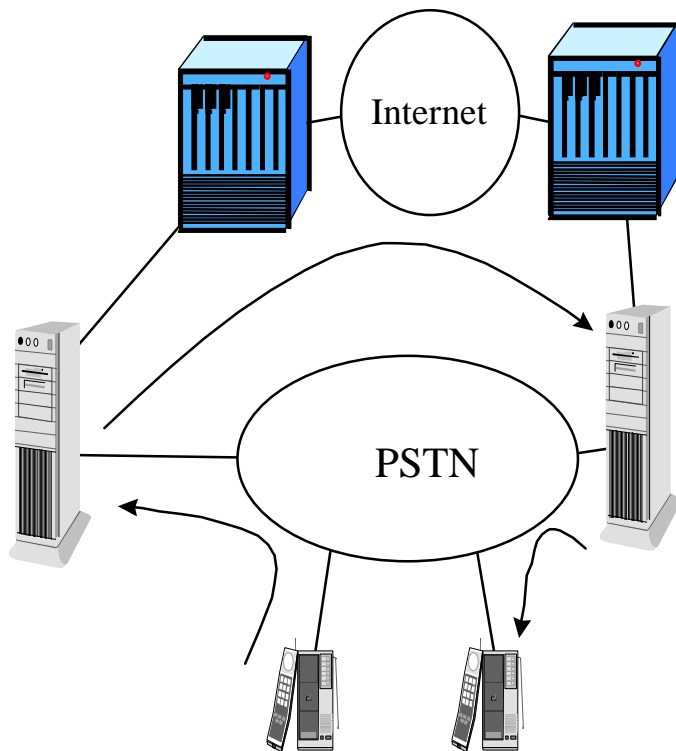
# Contents

- Scenarios
- Problem Definition
- Requirements
- Issues
- Potential Solutions
- New Solution - BMA

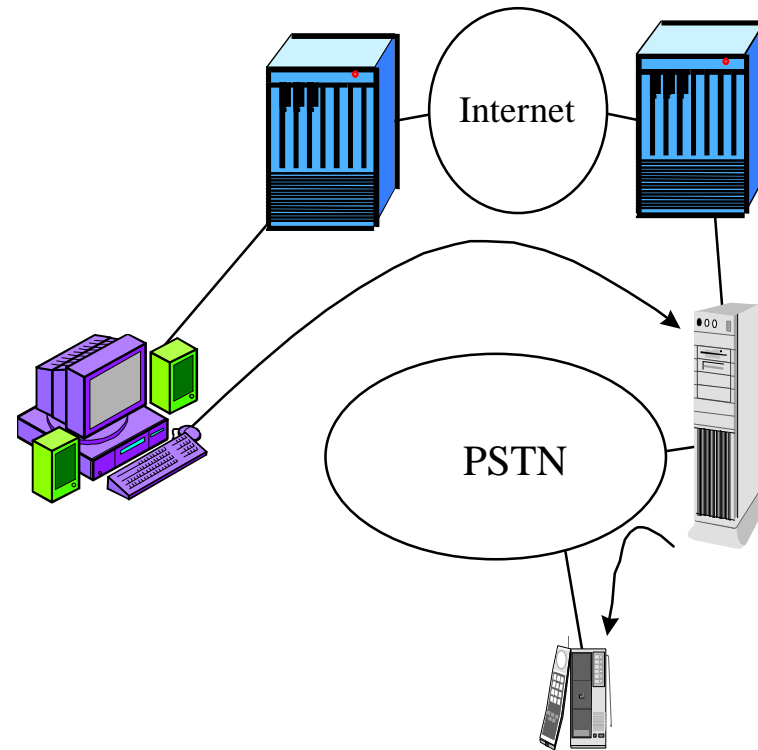


# Scenarios

PSTN to PSTN



PC to PSTN





# Problem Statement

- For PC to PSTN case, PC must determine the IP address of the remote gateway.
- For PSTN to PSTN case, local gateway must determine the IP address of remote gateway
- Need mechanism to assist in such location
- *“Gateway selection is an application layer routing problem”*



# Requirements

- Multicriteria Selection
  - Cost
  - Proximity
  - Vendor
  - Administrator
  - Codec support
  - Protocol support
    - Signaling
    - Encryption
  - Confederation Memberships
  - Billing Methods
- Scalable
  - bandwidth
  - CPU
  - Storage
- Universal
  - A gateway anywhere can potentially be used by any client
  - Any billing model
- Fast
  - Gateway Location part of post dial delay
- Simple
- Flexible
  - Selection Criteria can be anything



# Value added from Multi-criteria

- Client selectable gateways can offer many services:
  - Caller can choose based on billing method - calls to 900 numbers can be billed to credit card or ecash - anonymity
  - Caller selectable service provider - separate ITSP from ISP - like choosing long distance carrier
  - Cost/proximity tradeoffs - business vs. personal calls
- Selectability on a call by call basis is key



# Solution Space

- One way or another, its a database problem
- Centralized Databases
  - Service Location Protocol
  - Web Searching
- Distributed Databases
  - DNS
  - LDAP and X.500
  - Whois++
- Replicated Databases
  - Routing Protocols
  - New solution -  
**Brokered Multicast Advertisements**



# Service Location Protocol

- Under development in IETF - RFC 2165
- Service Agents register with Directory Agents in domain
- Directory Agents multicast advertisements to alert service agents and user agents to presence
- User agents query directory agent with service attributes
- Directory agent returns service
- Doesn't scale when there are many SA's and DA's
  - SA must register with each DA
  - SA must know IP address of each DA
  - Unscoped, uncontrolled multicast advertisements from DA's bad



# Web Search Engines

- Gateways have web pages with meta information characterizing them
- Webbots pick up data
- Users access search engines to find a gateway
- Drawbacks
  - Based on “pull” technology of webbots - stale and out of date information
  - Not automated - user must perform search before making a phone call
  - Slow
  - Centralized



# DNS

- Use something like TPC.INT domain to hold phone number to IP address maps
- Kitchen sink RR can hold gateway attributes as well
- Pros
  - Uses existing infrastructure
- Cons
  - Potentially huge DNS searches and accesses often required (cost and phone number inequivalence)
  - Necessarily restricts the business model - a gateway entry can only serve the phone numbers which correspond to its DNS name



# LDAP and X.500

- Use single worldwide database
- Cons
  - Multicriteria selection and cost - phone number inequivalence are very bad for hierarchical databases
  - Hard for an ISP to control which gateways are used by customers
  - No ISP value added
  - Database root loading



# Routing - MBGP

- Treat gateways as a router to a non-IP domain, use MBGP to distribute routing information
- Pros
  - Multiple IP, PSTN hops possible
  - Based on existing infrastructure
- Cons
  - No support for multicriteria!
  - Local ISP policy affected by remote ISP policies (OK for routing, BAD for application level routing)
  - Aggregation nearly impossible with application layer attributes

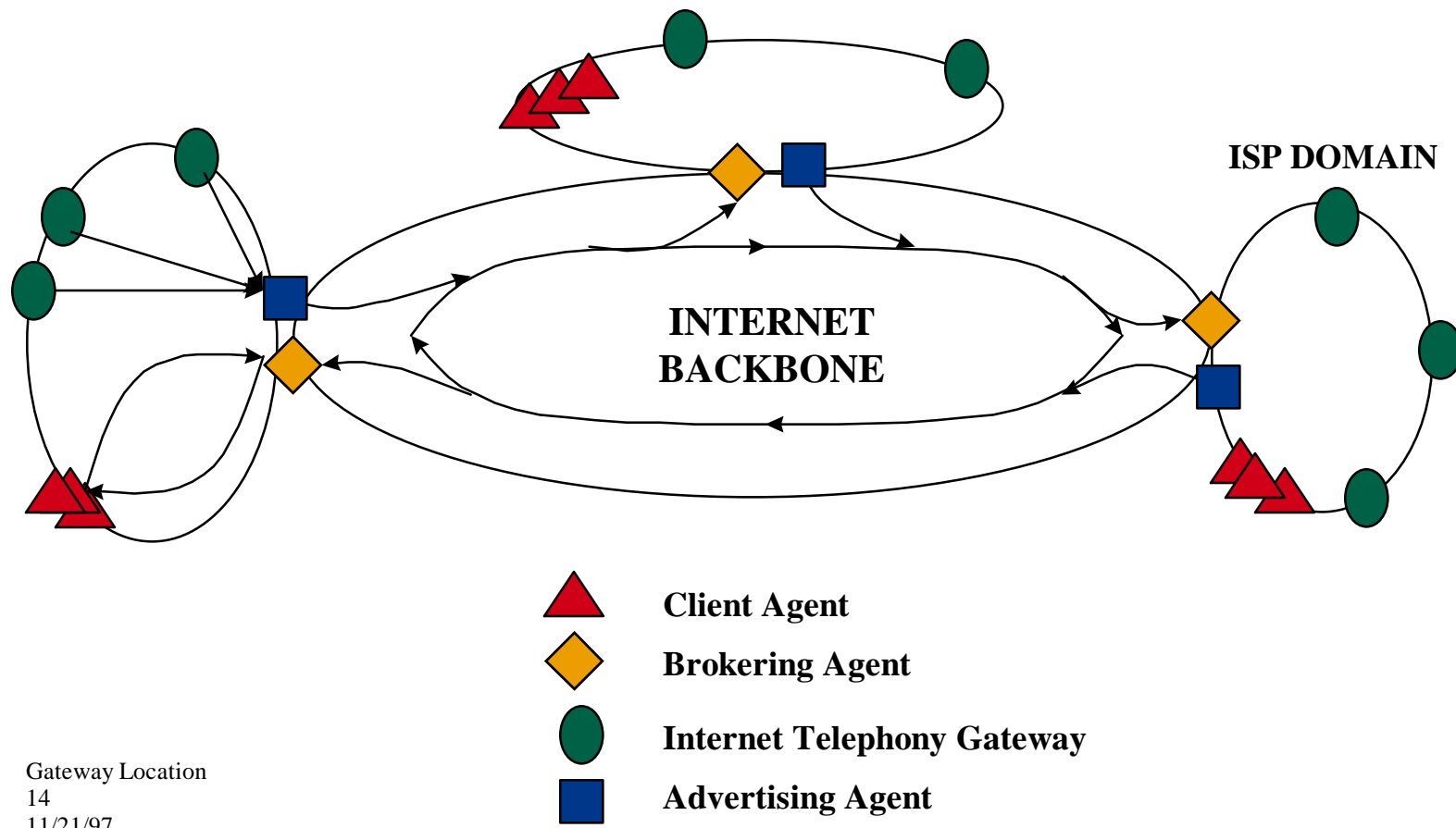


# New Solution - BMA

- Brokered Multicast Advertisements
- Use scalable wide area multicast to distribute gateway attributes
- Each ISP collects attributes in local database
- Clients query local database
- Pros
  - Replicated database at each ISP allows for policy injection for value-add
  - Use of SAP/RTCP scalable multicast approaches tightly controls bandwidth usage
  - Database queries resolved locally - fast operation
  - Using client database query allows for multicriteria selection and user specified preferences for each call
  - Replicating databases in an ISP trivially supported - just listen to group
  - Can use application level multicast in areas where network multicast not supported
  - Gateways from other providers easily used
- Cons
  - Multicast not available everywhere



# BMA Model





# Conclusions

- Gateway discovery is an important piece of the IP telephony puzzle
- Gateway discovery is a multicriteria selection problem
- Supporting client based selection is an important value-added service
- BMA Architecture is a scalable, fast, efficient, and feature rich method for locating gateways