Wide Area Network Service Location

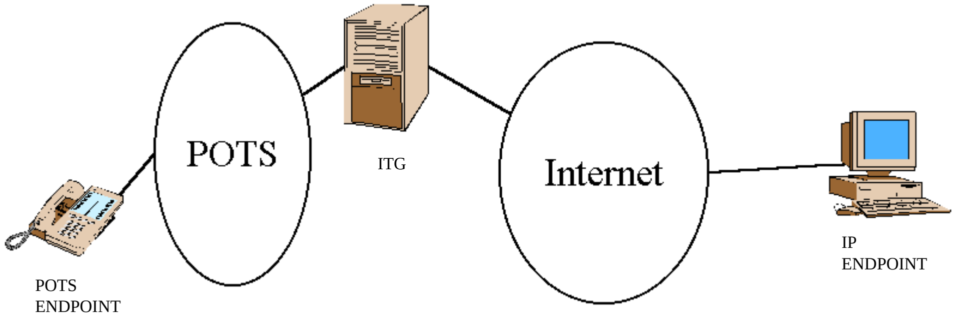
Jonathan Rosenberg and Henning Schulzrinne
Service Location Working Group

Overview

- Motivation
- Limitations of Current Protocol
- Proposed Extensions
  - Multicast Registrations
  - Brokers
  - Distance Attributes
  - Cost Representation (ITG's)
  - Notaries
  - New Semantics

Motivation

- Many wide area services:
  - Internet Telephony Gateways



  - Media Servers
  - H.323 Gatekeepers
  - Non-network services: hotels, restaurants, airlines, etc.
  - general URN's
- Don't always want service closest to you (ITG, hotel, airline)

Motivation

- No restriction on location of services: domain, AS, geography, etc.
- Wish to choose service based on some set of constraints (cost!)
- Protocol support needed
- Protocol Requirements:
  - Scalable (network bandwidth, processing, storage)
  - Security
  - Arbitrary constraints
  - Open (universal service availability)
  - Simple

Current Service Location Protocol

- Limitations of srvloc:
  - Registrations from SA to DA are uncontrolled, use fixed refresh intervals, and are unicast: inefficient and not scalable
  - SA's must know location of all DA's
  - DA's must store too much information when the service space is large
  - Cost minimizations not supported
  - No way to find distance to server from client

Multicast Registrations

- Hash service to multicast address
- Send service registrations to multicast group
- SA's no longer need to know IP addresses of DA's
- Only local clients of DA know its IP address: protects against security attacks
- New DA's can easily be added as needed
- Bandwidth can be tightly controlled:

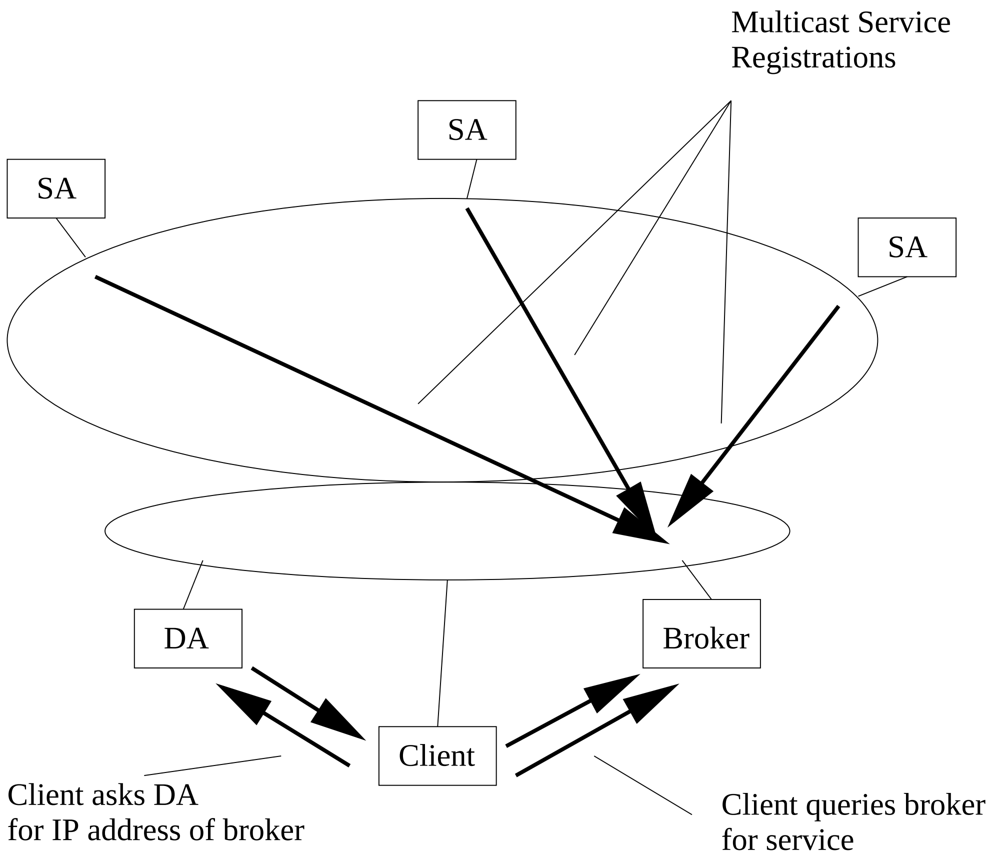
$$T = R(1/2)max(T_{min}2^{min(age-F,0)}, \frac{SL}{R}) \tag{1}$$

- Scales to wide area Internet

Brokers

- Each DA cannot handle all services (storage, processing, optimizations)
- Service specific DA's: brokers
- Brokers listen to multicast addresses for services they broker
- Brokers register themselves with DA's using current srvloc procedures
- Brokers do not respond to directory agent discovery requests
- Brokers accept service requests for the services they broker

Broker, SA and DA Interactions



Handling Cost

- Must represent cost in service announcements
- For ITG's, use CIDR-like aggregation of phone numbers:

```
1 415 822,   ($0.1)
1 415,       (($0.1) PLUS ($0.03  per MINUTE))
1,           (($0.1) PLUS ($0.1  per MINUTE))
49,          ($0.03  per MINUTE)
0,           ($0.2  per MINUTE)
```

Handling Cost

- Modify semantics of service requests
- Attributes can now:
  - represent client supplied data
  - be dynamically computed by the broker
- Can request minima of some linear combination of attributes
- Example:

```
telephony-gateway//( &(CALL_DEST == 498992324440)
                      (CALL_DURATION == SHORT)
                      (SPEECH_CODER == G.729)
                      (min COST + 2 * DISTANCE))
```

Distance attribute

- Desirable to find server closest to client (best connection quality in ITG case)
- Assume that broker is close to client
- Two approaches:
    - Timestamps - give one-way delays, but require sync'ed clocks
    - TTL Field - give one-way hop count, but sockets don't support reading TTL (except raw)
- Timestamps are most practical
- Broker computes delay between itself and SA, stores in DISTANCE attribute

Notaries

- **All SA's may not support same authentication scheme**
- **Public key signatures usually attest to authenticity, not truthfulness of information (a server who lies about its services - cost)**
- **Verifying truthfulness is important when service selection is automated**
- **Allow an SA to** *represent* **other SA's: notary**
- **Notary authenticates advertisements from other SA's with its own key**

Notaries

- Signing advertisements can indicate any level of verification:
  - Notary checks financial records of service providers
  - Notary uses the service and checks its own bills
  - Notary only vouches for authenticity of advertisements
- Client and broker must trust notary

Conclusion

- Many applications for wide area service location
- Current srvloc protocol has some limitations
- Proposed additions to resolve the limitations:
  - Multicast service registrations
  - Brokers
  - Cost representations
  - Distance attribute
  - Notaries
- Proposed as approach for locating ITG's