Problem Statement for SIP-signaled Peer-to-Peer Communication across Middleboxes

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Goals and Non-Goals

- Goals
  - Identify potential issues of SIP-based P2P communication related to NAT and firewall traversal
    - to be considered when designing standards for a SIP-based P2P infrastructure
- Non-Goals
  - Constrain a future P2P SIP architecture in any way
    - Still we need to list potential communication steps that might raise issues
    - Those steps are not necessary part of the final SIP-based P2P solution
  - Suggest NAT traversal methods to be selected for P2P solution

Potential Communication Steps

- Steps considered
  - middlebox detection
  - registration
  - search for relays
  - address lookup
  - call setup
  - call termination
- Not all steps might be necessary
- Several steps may be combined into one

Middlebox Detection

- Detect Middleboxes
  - on the signaling path
  - on the data path
- Communication means detection for
  - registration
  - incoming / outgoing signaling
  - data streaming to and from other terminals or relays
- Checks to be performed
  - sending and receiving UDP packets
  - opening incoming and outgoing TCP connections
  - use of certain fixed port numbers
  - the option to relay or tunnel signaling messages and streamed data
- NAT parameter detection
  - full cone, half cone, other funny cone, ...

Registration

- Authentication of the user
- Notification of communication capability and willingness
- Registration of contact parameters
- Notification of service provisioning capability and willingness

Further Steps

- Search and Connect Relay
  - Candidate relays may be suggested by infrastructure
- Address Lookup
  - Per-call lookup
  - Buddy list lookup
- Connection Establishment and Termination

Middlebox Traversal Methods

- Tunneling
  - in highly restricted environments only
  - controversial:
    - HTTP and DNS tunneling are not legitimate
    - TURN could be OK
- Network-initiated Middlebox Signaling
  - probably not the right choice for P2P SIP
- Terminal-initiated Middlebox Signaling
  - several methods known

Terminal-initiated Middlebox Signaling

- Specified
  - STUN (RFC3489)
  - UPnP (UPnP Forum)
  - SOCKS (RFC 1928)
  - RSIP (RFC 3103)
- Under development
  - STUN update (behave WG)
  - ICE (mmusic WG)
  - NSIS (nsis WG)

Open Issues for SIP-based P2P

- SIP-unrelated
  - ω middlebox detection beyond UDP
- SIP-related
  - ω terminal reachability
  - ω communication service requirements
  - ω communication service offers
- The relevance of these issues strongly depends on the choice of P2P architecture

Middlebox Detection Beyond UDP

- Limited or no middlebox detection for TCP and DCCP available
  - Middlebox signaling for TCP is covered by UPnP, SOCKS, RSIP, NSIS.
- TCP considered for signaling and for data
  - Several SIP-signaled services use TCP
  - RTP over TCP used when UDP is blocked
- Might get solved partially by ICE TCP
  - still in early state

Terminal Reachability

- Relevance depends on registration and relay detection process.
- Terminal might need to register first and then find and connect to a relay in order to be reachable.
- In between these two steps it would be reachable for signaling but unreachable for data transmission and should be registered as such.
- Currently, the SIP protocol does not provide explicit means for signaling such a state.

Communication Service Requirement

- The terminal might need to express its needs for relaying
  - ω signaling messages,
  - ω lookup requests,
  - ω data streams.
- Infrastructure nodes might need to suggested relays to be used to terminals.
- For both, request and suggestion, signaling means are required.
  - ω Extension Header Field for Service Route Discovery During Registration (RFC 3608) might offer means.

Communication Service Offering

- A terminal in an unrestricted (or just slightly restricted) environment might be able (and the user willing) to offer services to other peers, such as relay services and lookup services.
- Currently, the SIP protocol does not provide explicit means for signaling such offers.

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