PPSP NAT traversal

draft-li-ppsp-nat-traversal-01

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Changes since 00

- Cover more NAT traversal issues and solutions in PPSP
  - Add necessity analysis and implementation considerations
  - Add RELOAD-ICE solution
  - Add a new type of NAT traversal service node
  - Add a new method to discover NAT traversal service
- Decouple NAT traversal service node/discovery from NAT traversal solution
  - A NAT traversal solution has multiple choices on the type of NAT traversal service node and the method of NAT traversal service discovery.

NAT traversal necessity

- Scenarios need NAT traversal: The ratio of NATed peer is high in the swarm. Without NAT traversal, some peers can't download or take long time to download needed chunks.
- Scenarios don't need NAT traversal:
  There is no NAT or the QoE is satisfied without NAT traversal solution.
- NAT traversal is necessary at least in some P2P streaming systems (e.g. UUSee).

NAT traversal solution overview

- ICE is the IETF standard NAT traversal solution.
  - ICE requires application to convey ICE parameters.
- Two solutions in the draft: PPSP-ICE and RELOAD-ICE
- PPSP-ICE and RELOAD-ICE solutions both use ICE, but use PPSP and RELOAD separately to convey ICE parameters (candidates and credentials for connectivity check).
- Candidate
  - Candidate (from ICE RFC5245): A transport address that is a potential point of contact for receipt of media.
  - ICE requires peers collecting candidates
- NATed peers need NAT devices or NAT traversal service nodes to discover/assign candidates.

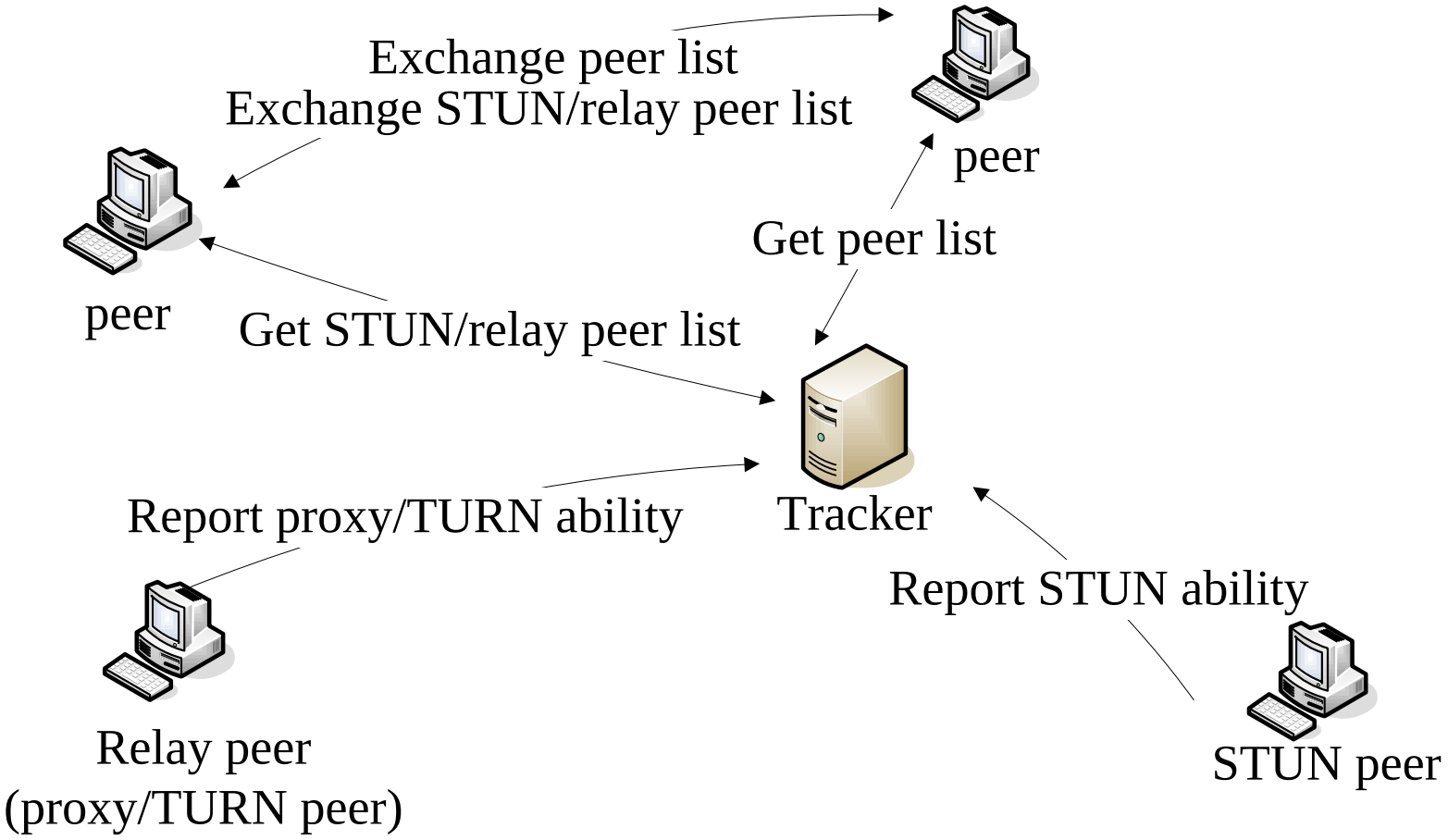
NAT traversal service nodes and candidates

- Dedicated STUN/TURN server
  - TURN: application-agnostic relay, assign relayed candidates to NATed peers
  - STUN: Discover reflexive candidates for NATed peers
- STUN/TURN peer
  - Peer providing STUN/TURN service
- Proxy peer
  - Peer providing application layer relay. Analogy to SIP or RELOAD relay
  - Assign proxy candidates to NATed peers
- STUN-like tracker
  - Tracker providing STUN-like function with PPSP message. E.g. tracker informs peer its reflexive candidate in PPSP CONNECT response.
  - Compared with STUN server/peer, STUN-like tracker saves messages.
  - Analogy to SIP rport

NAT traversal service discovery

- Traditional methods like DNS, DHCP and manual configuration.
  - Suitable for discovering dedicated STUN/TURN server and STUN-like tracker
- Tracker
  - Suitable for discovering STUN/TURN peer
- RELOAD
  - Suitable for discovering STUN/TURN peer
  - Used only for RELOAD-ICE solution
- Gossip
  - Suitable for discovering STUN/TURN peer
  - Complement to RELOAD/tracker method

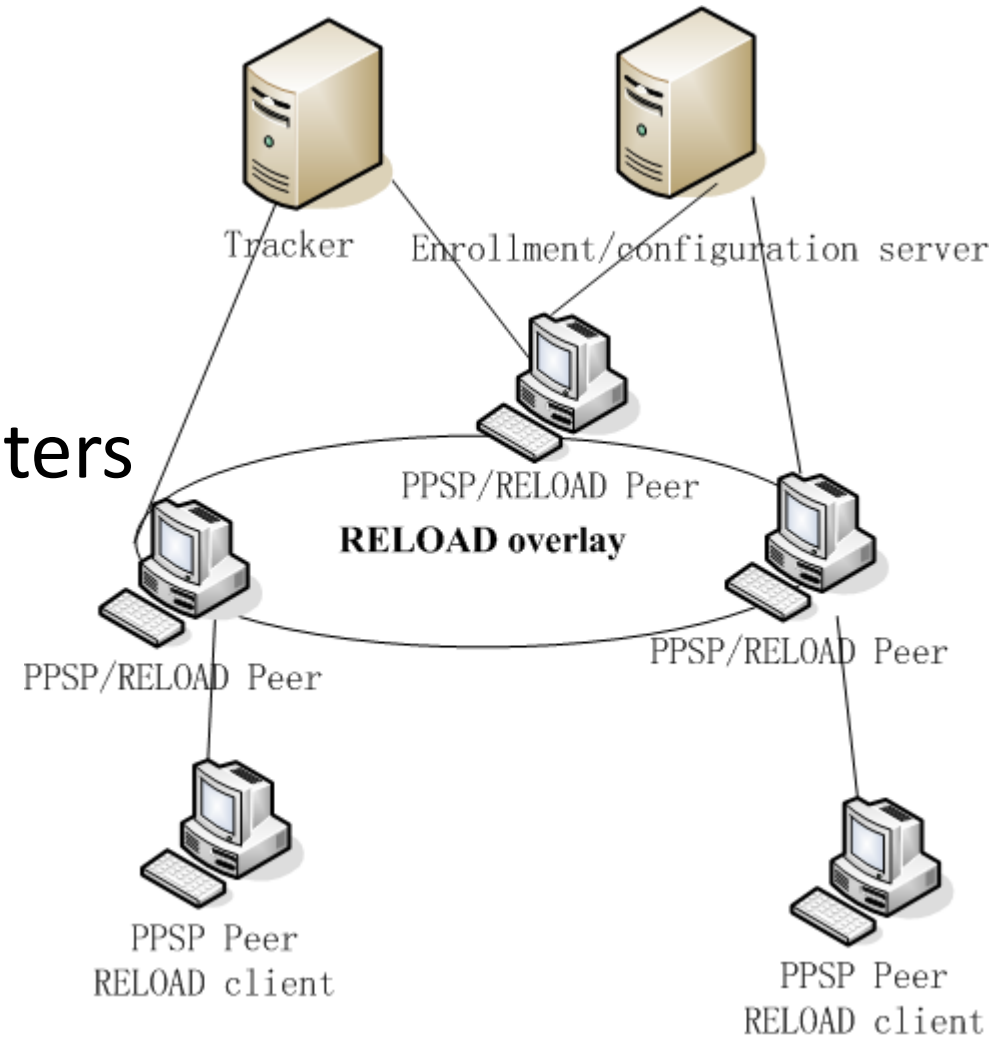
NAT traversal service discovery with tracker and gossip



- STUN/TURN/proxy peers report abilities to tracker.
- Peer gets STUN/TURN/proxy peer list from tracker or other peer.

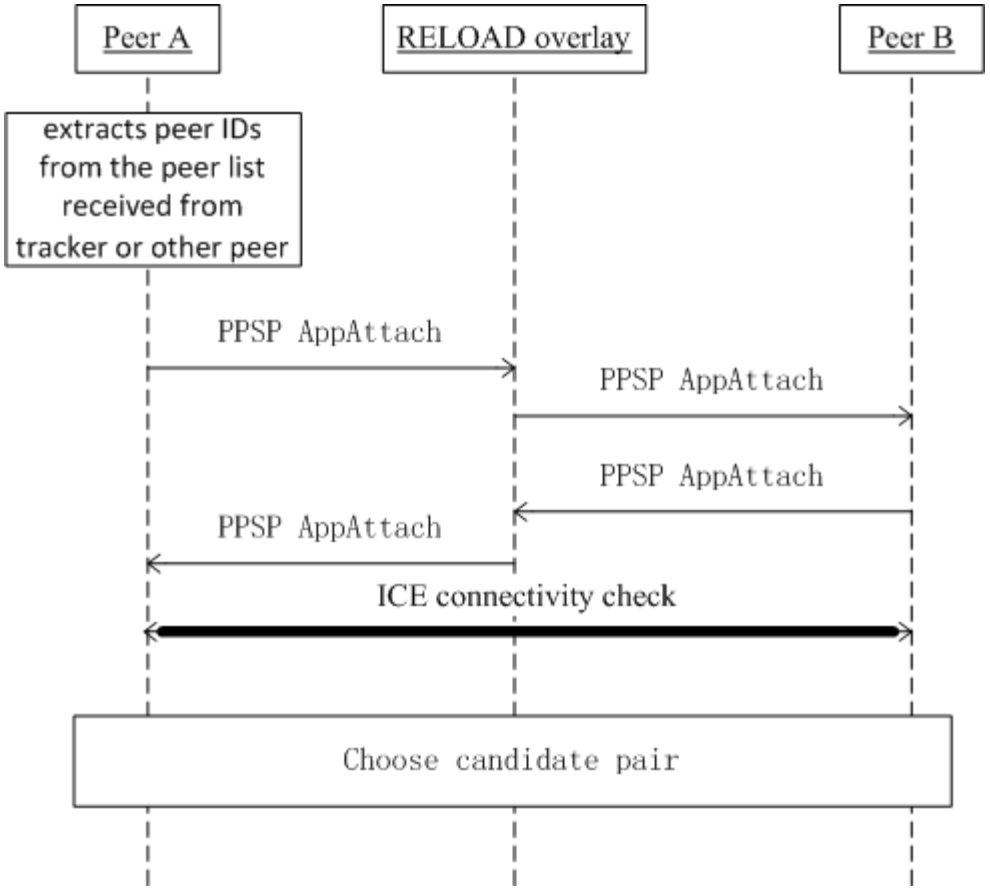
RELOAD-ICE solution

- PPSP peers form a RELOAD overlay
- Uses RELOAD to exchange ICE parameters
- MAY or MAY not use RELOAD to discover STUN/TURN peers



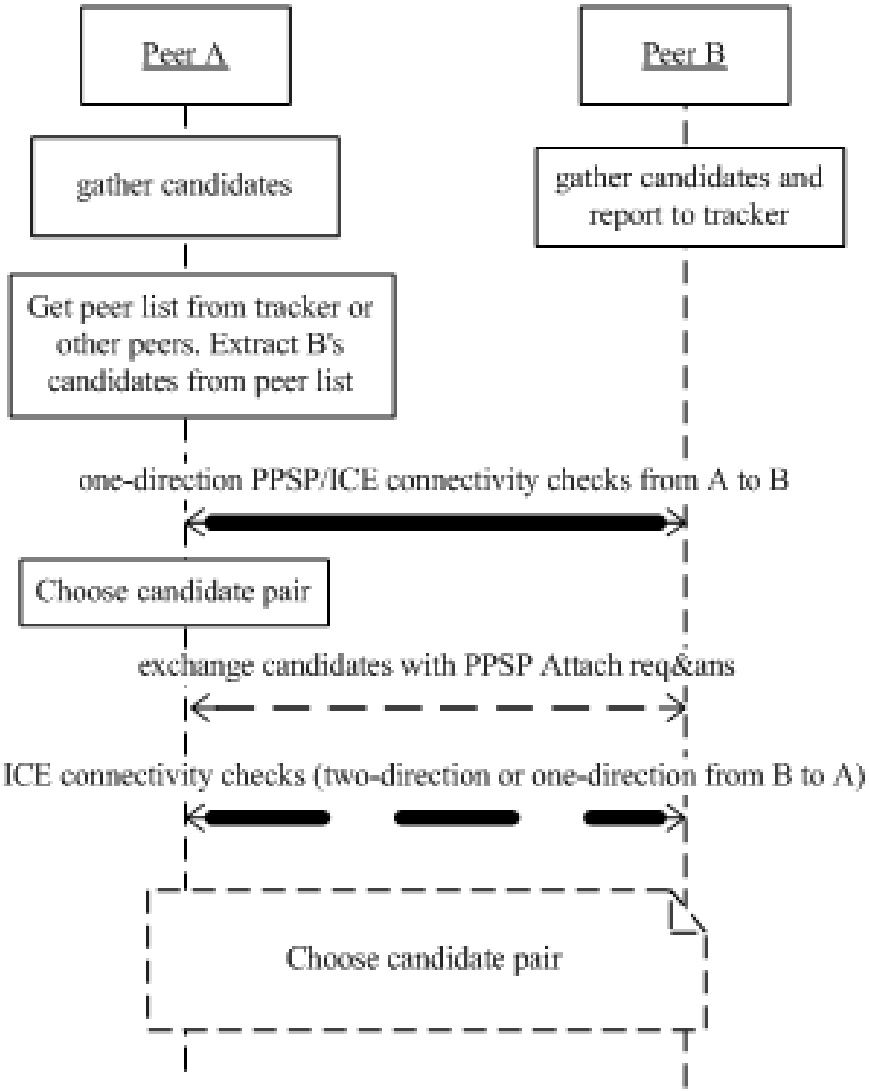
RELOAD-ICE solution

- A extracts B's peer ID from the peer list received from tracker or other peer.
- Peers exchange ICE parameters (candidates and auth data) with RELOAD AppAttach messages
  - AppAttach usually takes O(log N) overlay hops
  - requires gathering candidates before
- The rest process complies to standard ICE
- This solution can be used to build PPSP signal and media connection.

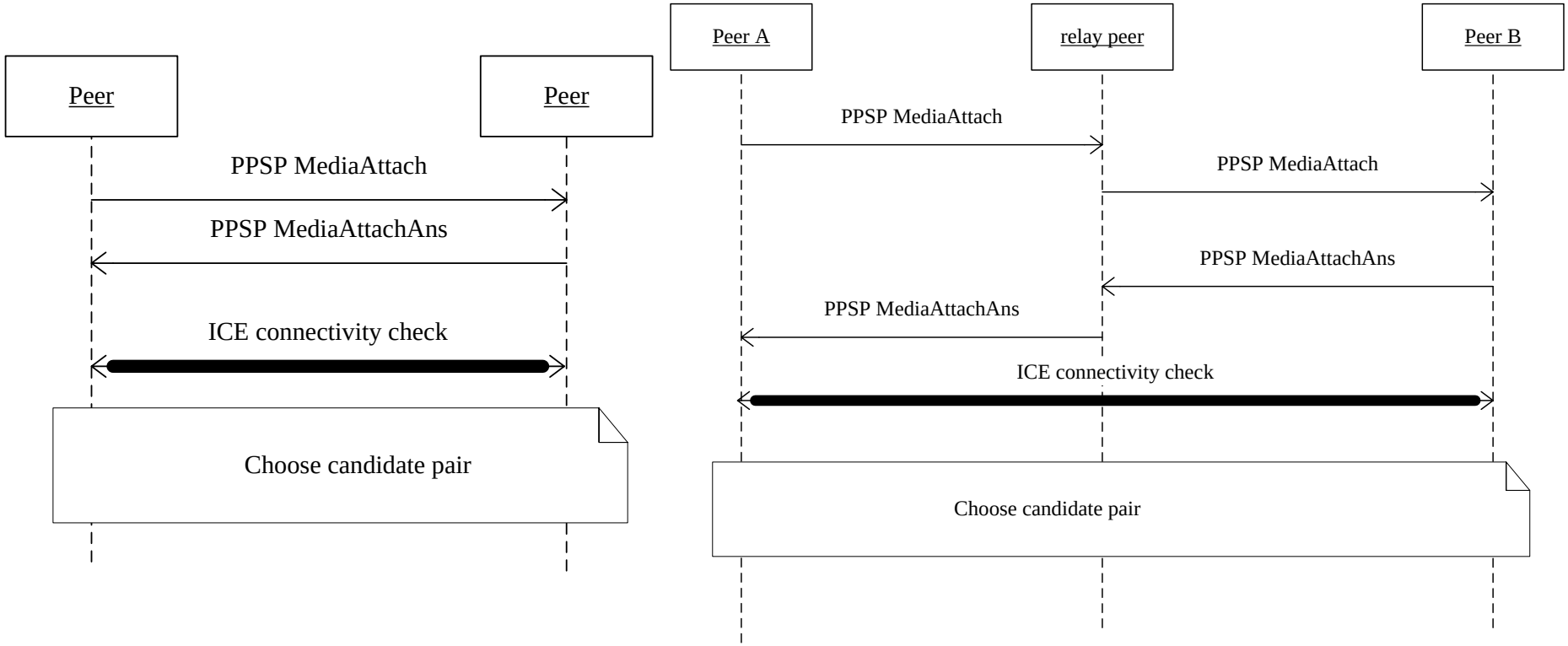


PPSP-ICE solution (signal traversal)

- One-direction connectivity checks are PPSP checks or modified ICE checks
  - Standard ICE connectivity checks require exchanging ICE parameters
- Optional ICE process for optimizing communication path



PPSP-ICE solution (media traversal)



- Media connection is built after PPSP connection is built
- ICE parameters are exchanged with PPSP messages

Solution comparison

	PPSP-ICE	RELOAD-ICE
Implementing work	less	more
Relying on centralized servers	tracker	RELOAD configuration/enrollment server
Increasing tracker workload	yes	no
NAT traversal latency	low	high
ALTO support	yes	No (can't rank peer IDs)
NAT traversal service node	All types	All types except proxy peer
NAT traversal service discovery	All methods except RELOAD	All methods

Implementation consideration

- The decision of supporting NAT traversal or not should be left to implementation.
- The choices of NAT traversal solution/method, NAT traversal service node and NAT traversal service discovery method should be left to implementation too.
- Implementation considerations: the ratio of NATed peer, the ratio of each NAT type, implementation overhead, etc.

Next Step

- Get more comments to refine the draft
- Call on participation in the draft
- Design NAT-traversal required messages in details with authors of tracker protocol and peer protocol
- Adopt as WG document?

Thank you!

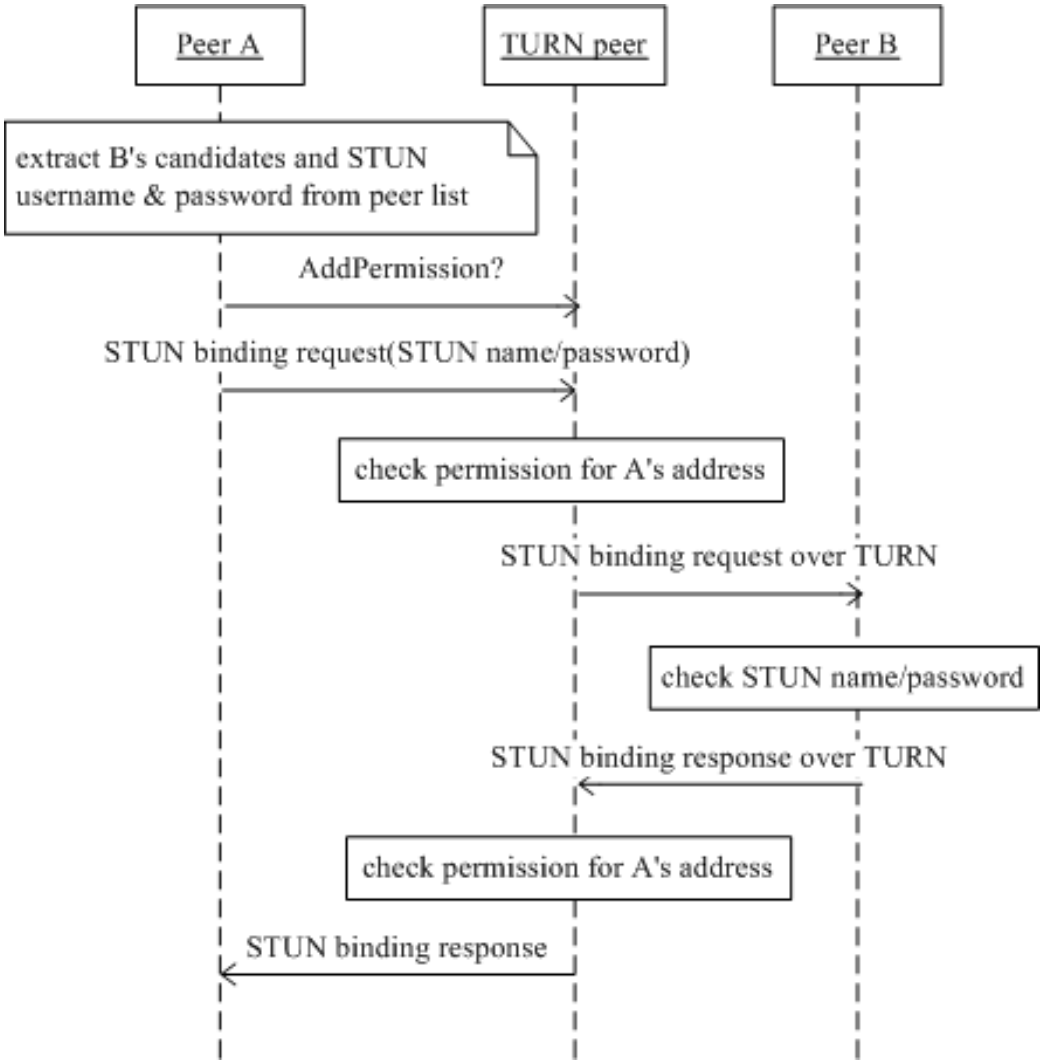
Questions?

Thank you!

Questions?

One-direction ICE connectivity check without offer/answer

- Authentication change
  - Don’t use STUN name fragment. Put the whole STUN user name & password in peer list
  - A adds permission in B’s serving TURN peer by some means



One-direction PPSP connectivity check

- Compared with ICE connectivity check, PPSP connectivity check
  - can use PPSP's own authentication method, and avoid the STUN/TURN authentication problem
  - uses PPSP messages instead of STUN binding messages
  - uses proxy candidate instead of relayed candidate