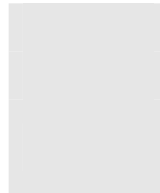


Proposal for P2P System using User Datagram Protocol

Document version 0.5

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1.

(Host)

C/S(Client and Server)

C/S 가 가 가

C/S

C/S

C/S

P2P(Peer to Peer)

(NAT, Network Address Translation) 가

P2P

2. Peer to Peer architecture

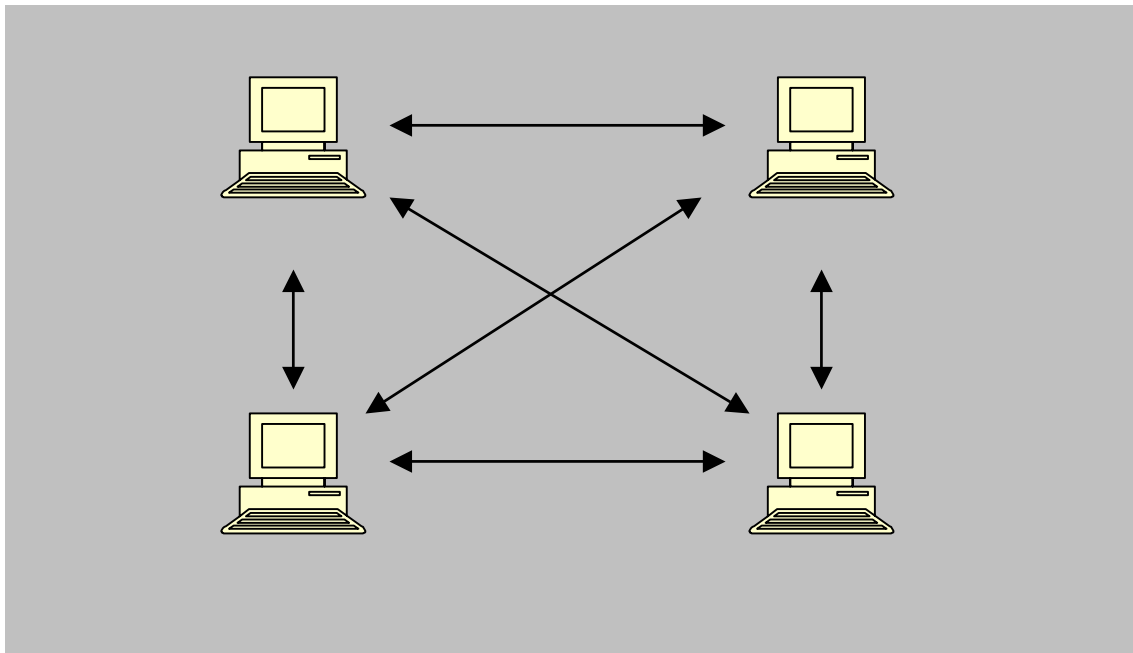
2.1. Types of P2P model

P2P

가 Host()가

가 Host . C/S 가

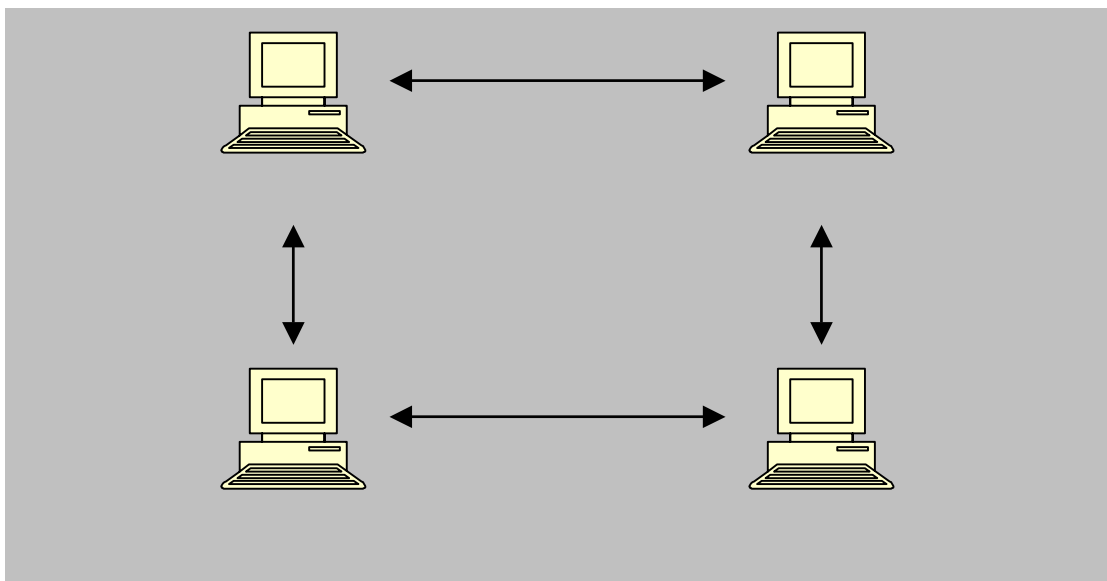
, P2P Host가



2.1. P2P

가 Host가 ,
가

가



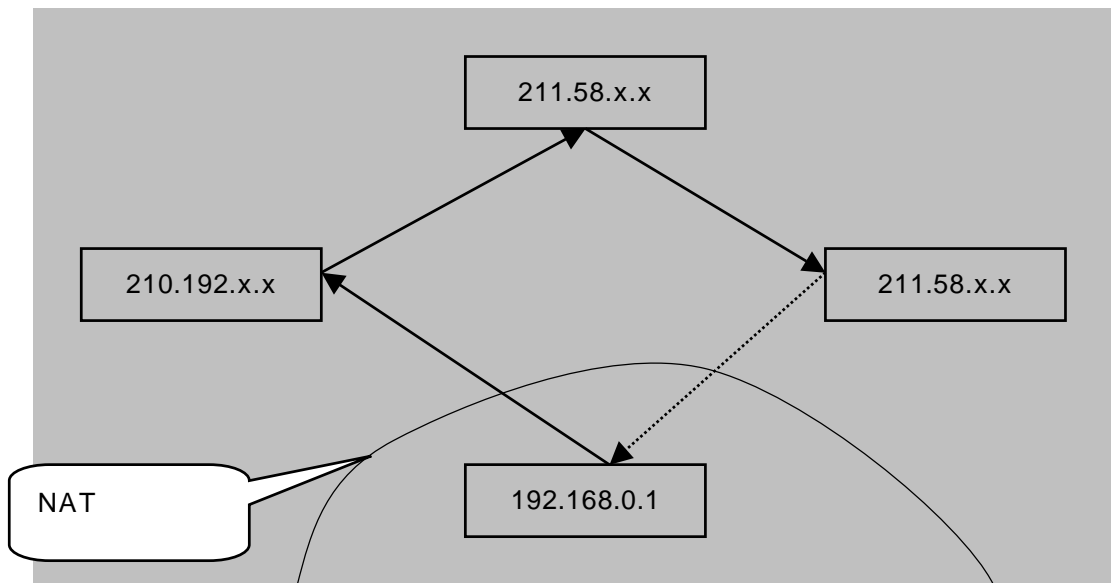
2.2. (Ring) P2P

가

가 Host
 Client 가 Host가
 TCP가 UDP Host Client

2.2. Weak point of P2P model

P2P 가 , P2P Host가
 Host 가 NAT



2.3. NAT

IP , IP
 가 NAT , IP
 IP IP가
 P2P ,

3. Proposal for P2P networking in NAT area

3.1. 3 Models by network situation

P2P

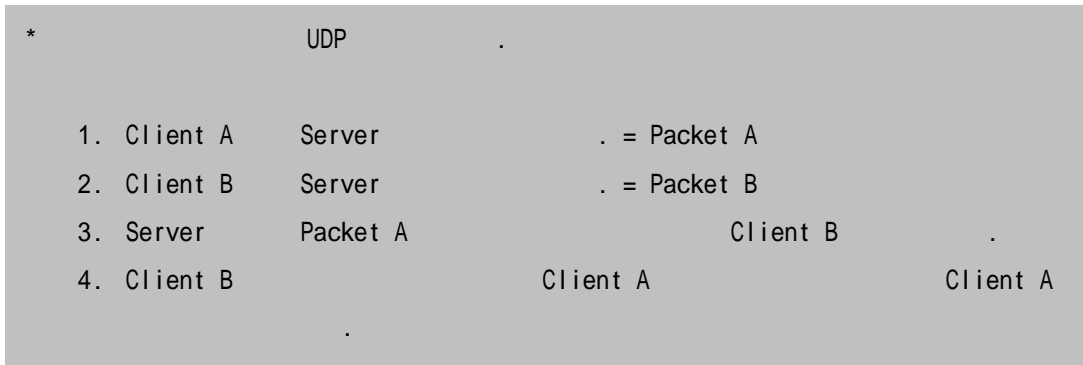
, 가
가

- Client A (IP) <-> Client B (IP)
 IP 가 가
 , 가
- Client A (IP) <-> Client B (IP)
 B A , A B 가 . C/S A가
 가 , P2P A B P2P
- Client A (IP) <-> Client B (IP)
 가 가 NAT
 가 , (C/S)
 , P2P 가 .

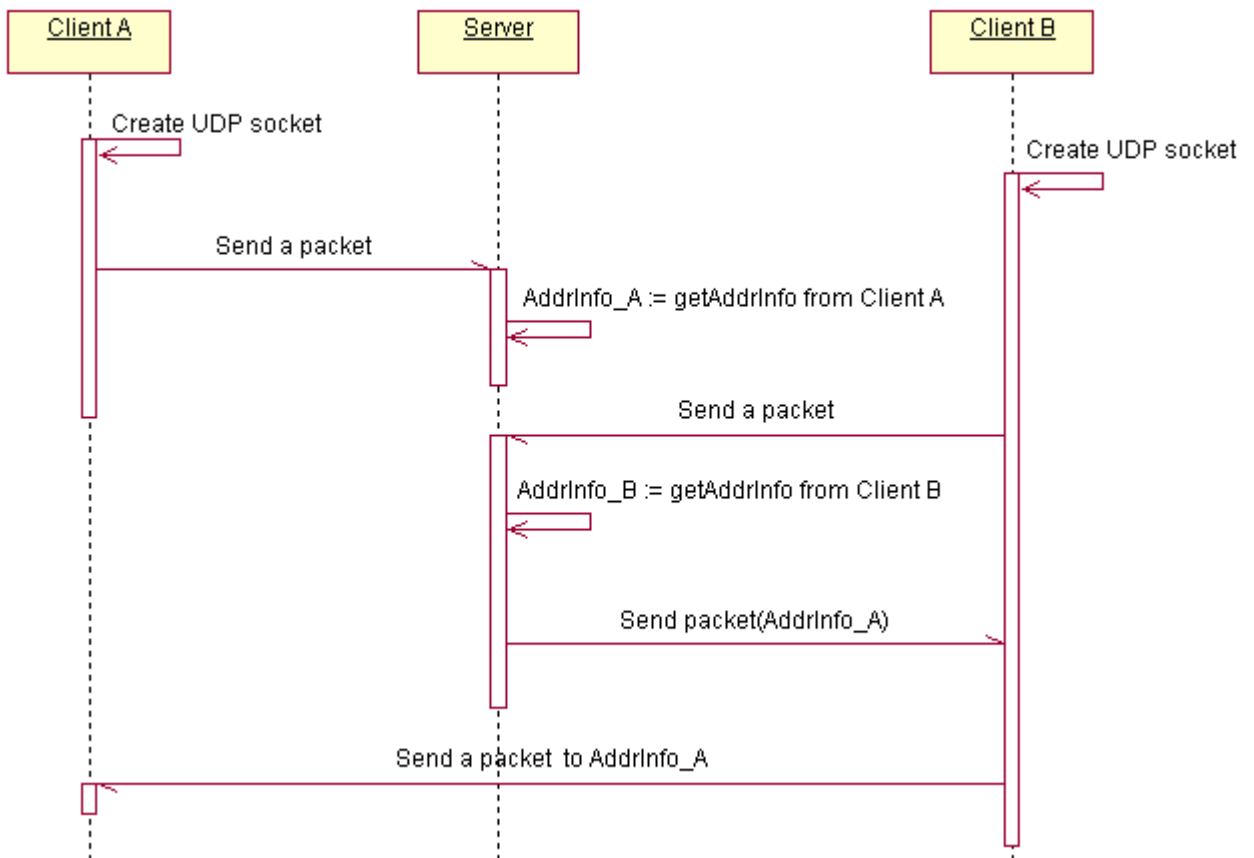
가 IP IP IP
 NAT NAT NAT
 (Port mapping) UDP Hole Punching

3.2. UDP Hole Punching

IP 가 P2P IP
 가 가 P2P



[Sequence Diagram: UDP Hole Punching]



3.1. Sequence Diagram: UDP Hole Punching

가 NAT 가 NAT UDP NAT UDP NAT

Client A가 Server UDP Client A 2000

Server 20000 가 NAT Client A

NAT가 NAT P2P 가 ,
 가 NAT
 NAT UDP Hole Punching , P2P
 NAT

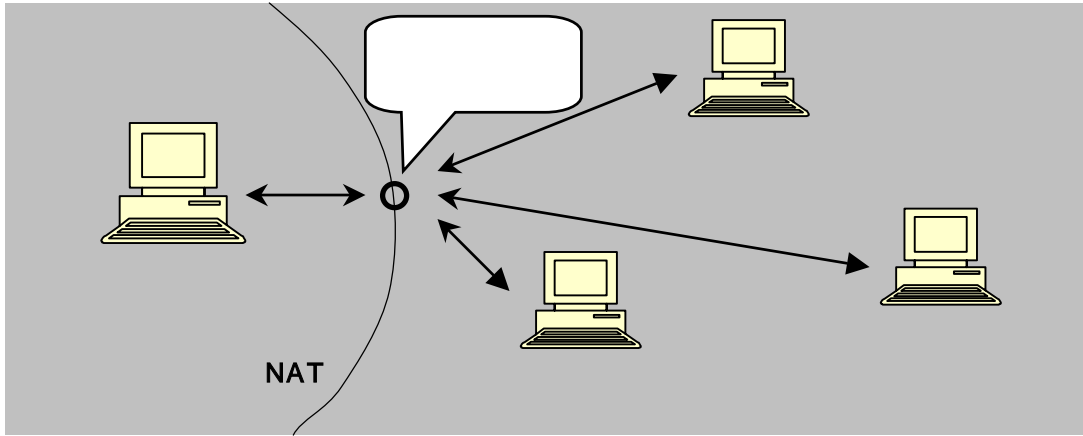
3.3. Types of Network Address Translation

NAT가 ,
 NAT 가
 P2P

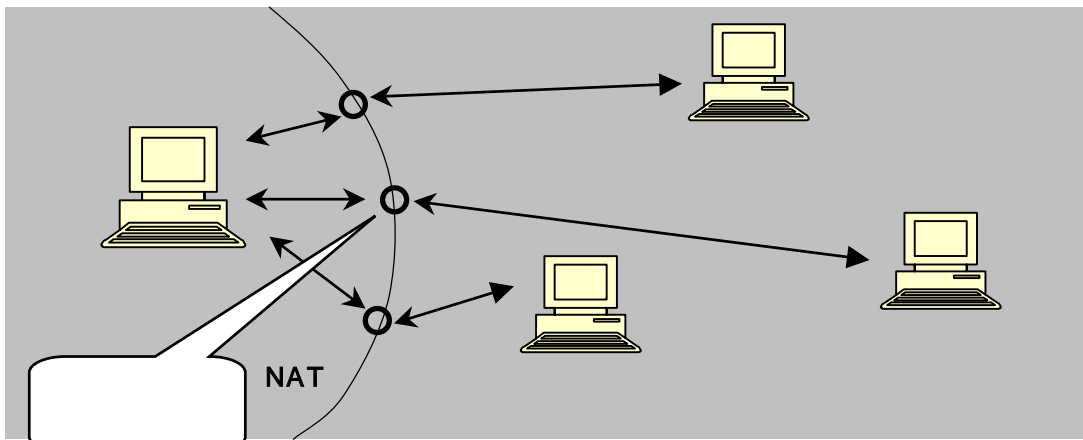
Type	Description
Full Cone	IP Port 가 Port가
Restricted Cone	Full Cone , 가 가
Port Restricted Cone	Restricted Cone , Port
Symmetric Cone	가 IP Port가 가 NAT

3.1. NAT

Symmetric Cone 가 NAT
 ,
 1:n Symmetric Cone . Symmetric Cone
 1:1 ,

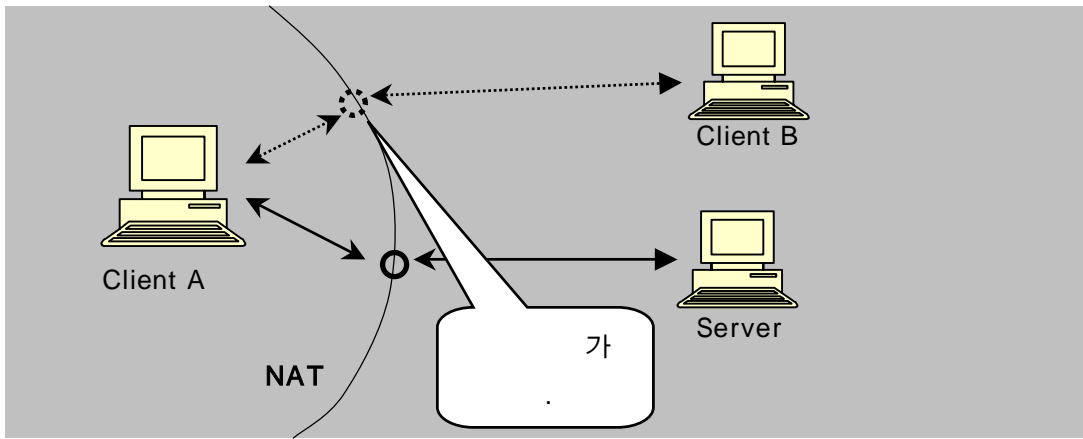


3.2. Full, Restricted, Port Restricted Cone



3.3. Symmetric Cone

Symmetric Cone TCP 1:1 ,
 P2P . UDP Hole Punching Client A Client B
 . UDP Hole Punching , Symmetric Cone 가 Client A
 Client B .



3.4. Symmetric Cone UDP Hole Punching

3.4. Modification of UDP Hole Punching

가, Symmetric Cone NAT
 가
 가
 + 1' 100% , +1 가

Symmetric Cone

UDP Hole Punching

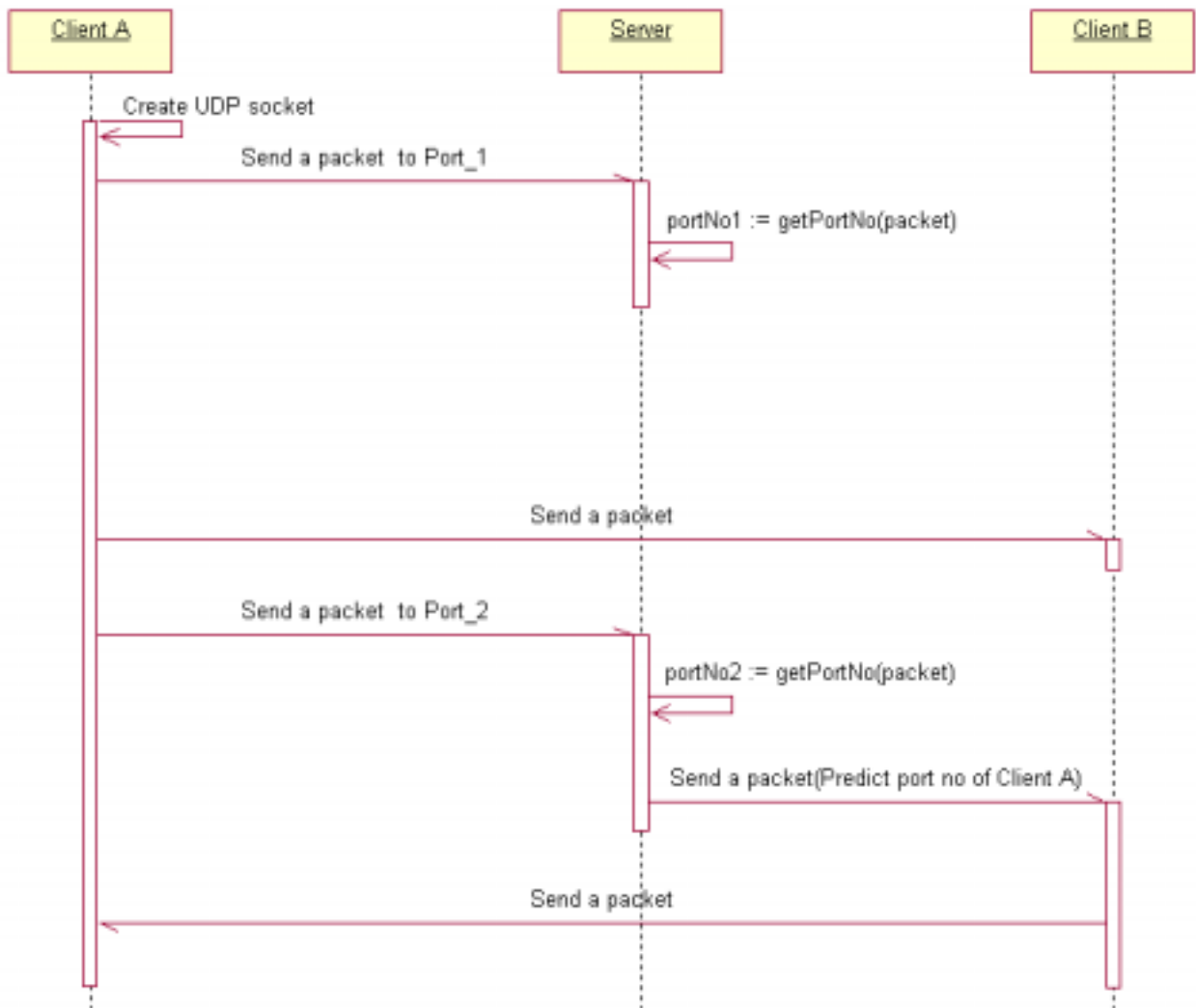
< Client A(IP/Symmetric) <-> Client B(IP/Not Symmetric) >	
1. Client A	Server Port 1
2. Client A	Client B
3. Client A	Server Port 2
4. Client B	Client A

가 1 ~ 3 Client A
 Client B 가

1. Client A -> Server : Port 1
2. Client A -> Client B : Port + 1 (?)
3. Client A -> Server : (2) + 1

Client A Client B 1 3
 .(Server 가 Client A NAT
 .) 3 1 3
 . Client A -> Client B 가

[Sequence Diagram: UDP Hole Punching between Symmetric and Not Symmetric]

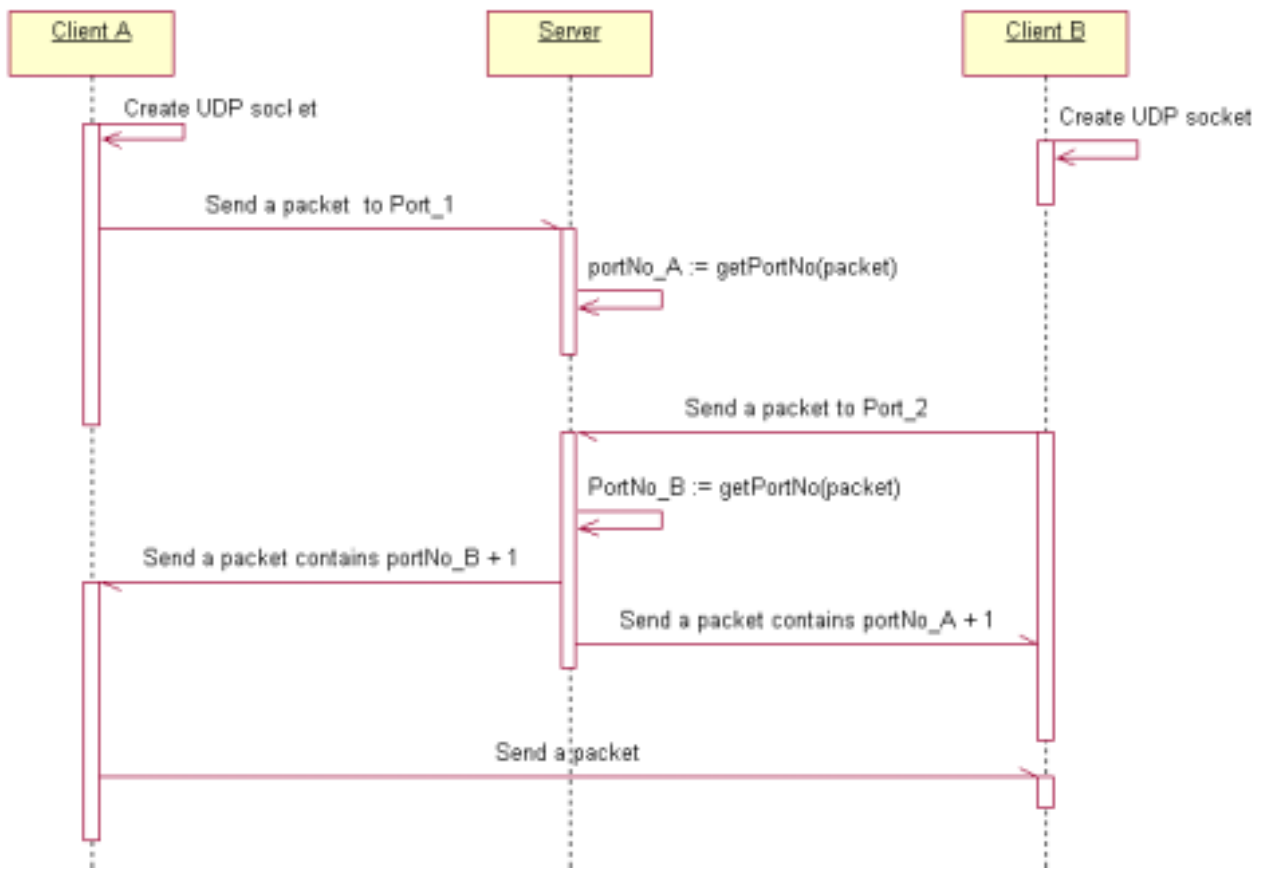


3.5. Symmetric UDP Hole Punching

Symmetric P2P
 Symmetric NAT P2P
 가 , ,
 Symmetric .

< Client A(IP/Symmetric) <-> Client B(IP/Symmetric) >				
1.	Client A	Server	Port 1	.
2.	Client B	Server	Port 1	.
3.	Server	Client B가		Client A
4.	Server	Client A가		Client B
5.	Client		+ 1	.

[Sequence Diagram: UDP Hole Punching between Symmetric and Symmetric]



3.6. Symmetric Symmetric UDP Hole Punching

4. Conclusion

NAT NAT P2P . 가

NAT 가 Full Cone ,
NAT . 가 NAT
, UDP Hole Punching .

```
< Symmetric Cone >  
  
Client send a packet to Server on port 1 = NATPort_A  
Client send a packet to Server on port 2 = NATPort_B  
  
if NATPort_A != NATPort_B  
    the NAT is Symmetric Cone.  
else  
    the NAT is not Symmetric Cone.
```