NAT-PT

Overview of NAT-PT

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NAT-PT Concepts

- An IPv4-to-IPv6 transition mechanism
- Defined in RFC 2766
- Allows native IPv6 enabled nodes to reach IPv4 networks
- V6 nodes do not require V4 support
- Maps V4 addresses into a V6 prefix
- Caveat 1: Client software must support V6
- Caveat 2: Robust V6 support in nodes (i.e. DHCPv6 and V6 DNS) is desirable

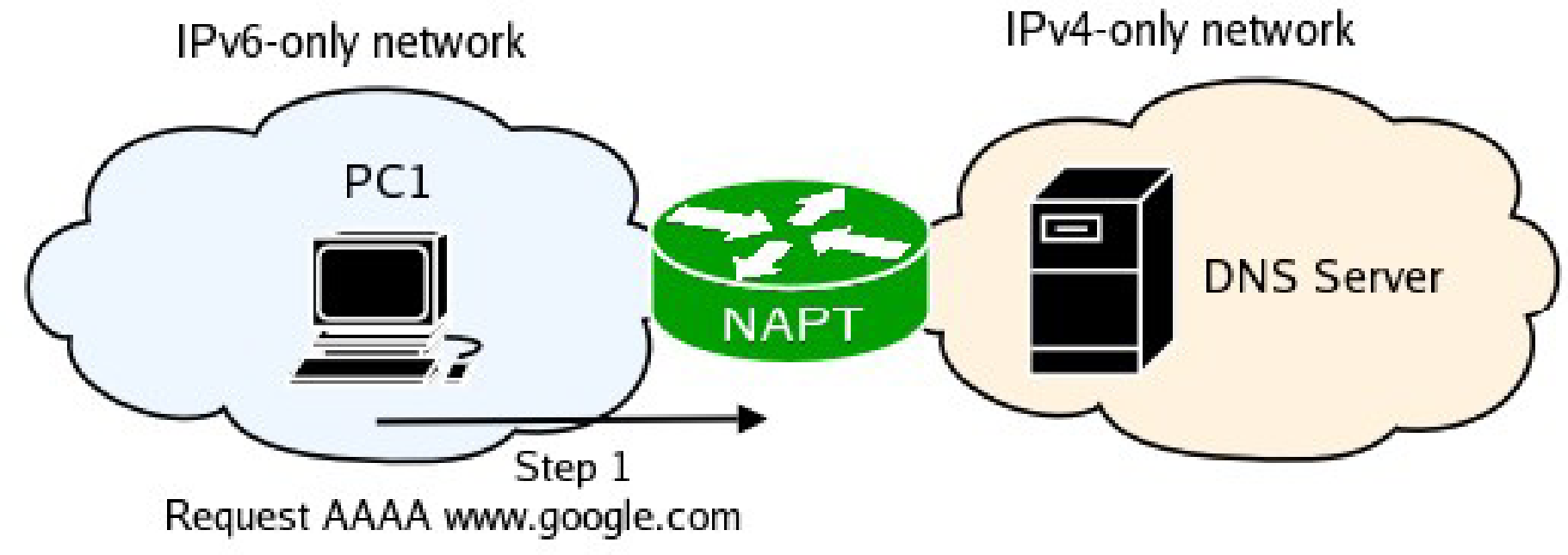
NAT-PT Address mapping

- Maps a 32 bit IPv4 address into a /96 IPv6 prefix (bottom 32 bits contain V4 address)
- Example – X's represent V4 address below
  - 2000:ffff::XXXX:XXXX
- The IPv6 prefix is configured in the NAT-PT device as the mapping prefix
- IPv6 packets addressed to destinations within this prefix are converted to IPv4
- The source IPv4 is obtained from one or more pool addresses in the NAT-PT device
- State is maintained to map V4 back to V6

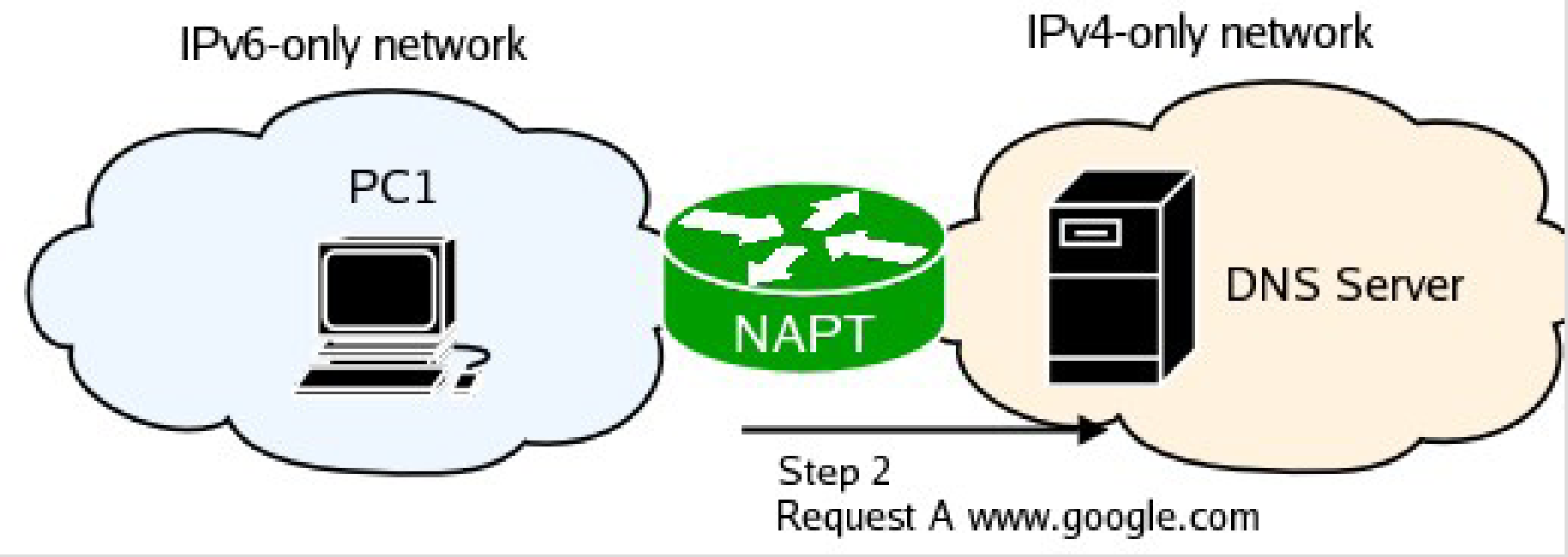
NAT-PT DNS translation

- But how do nodes know to map V4 destinations into a V6 prefix?
  - Answer: Spoof DNS replies so that V4 addresses are mapped into the V6 mapping prefix
- DNS replies which contain IPv4 “A” records are translated to IPv6 “AAAA” records
- Several NAT-PT implementations support this DNS spoofing internally
- Can also be performed by a separate server (example: totd nameserver)

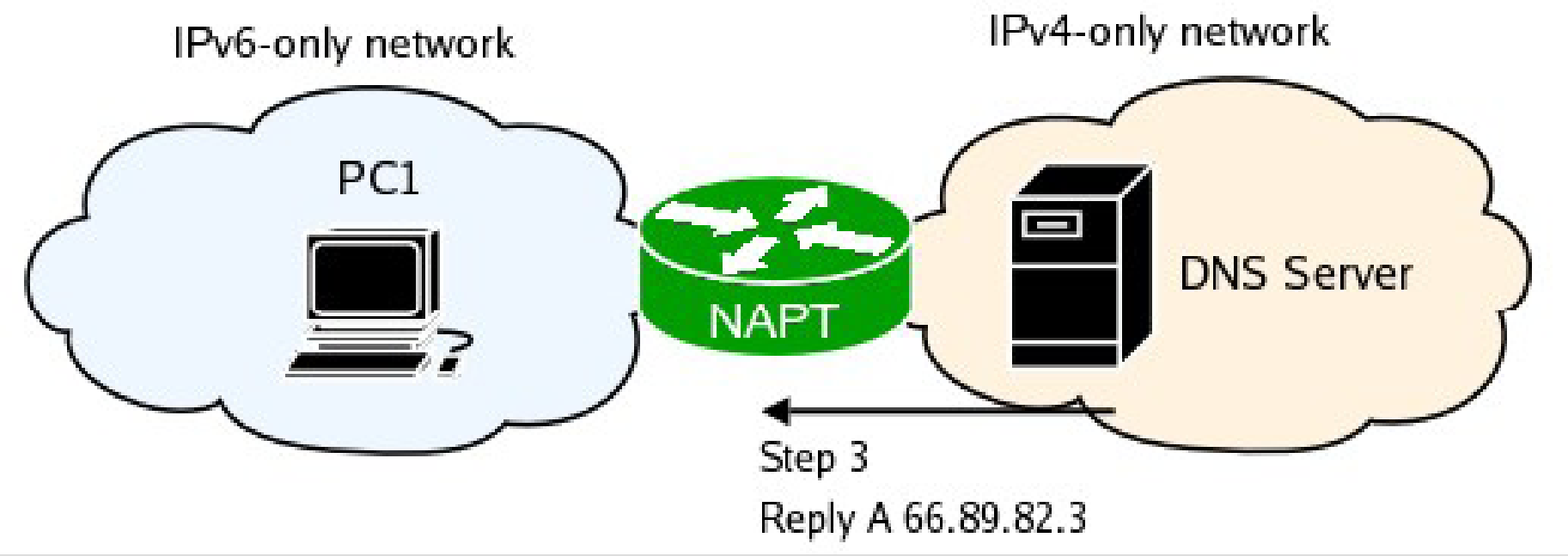
Example – Step 1



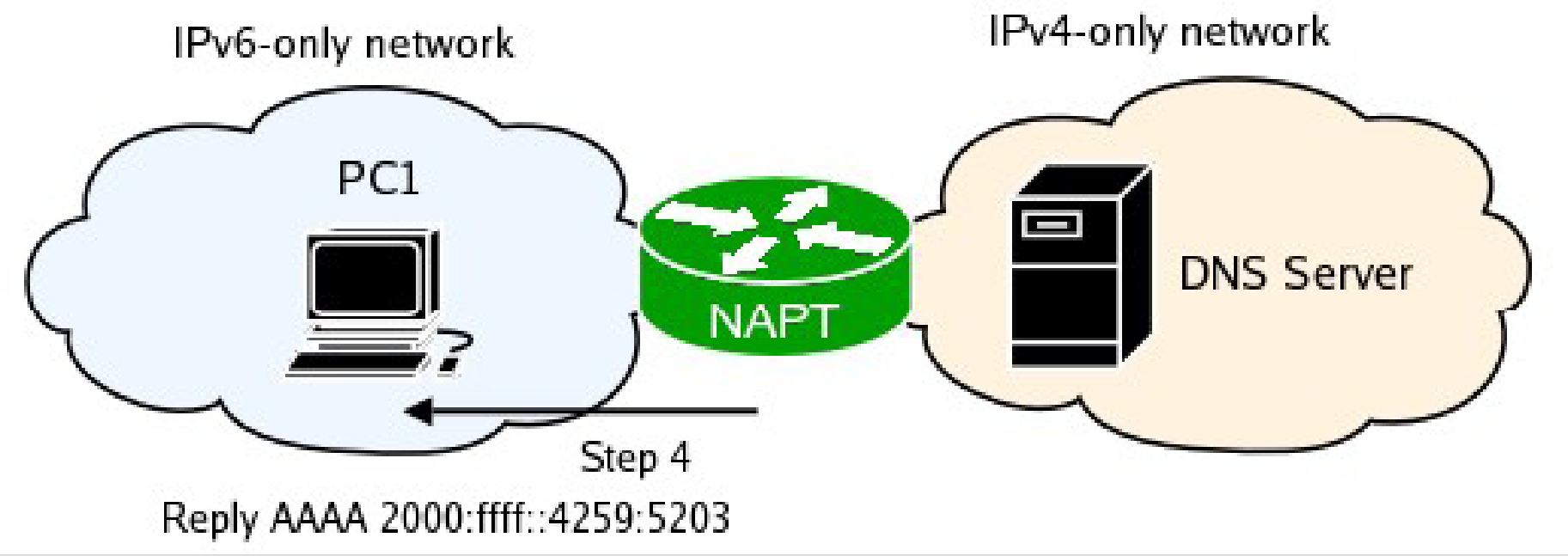
Example – Step 2



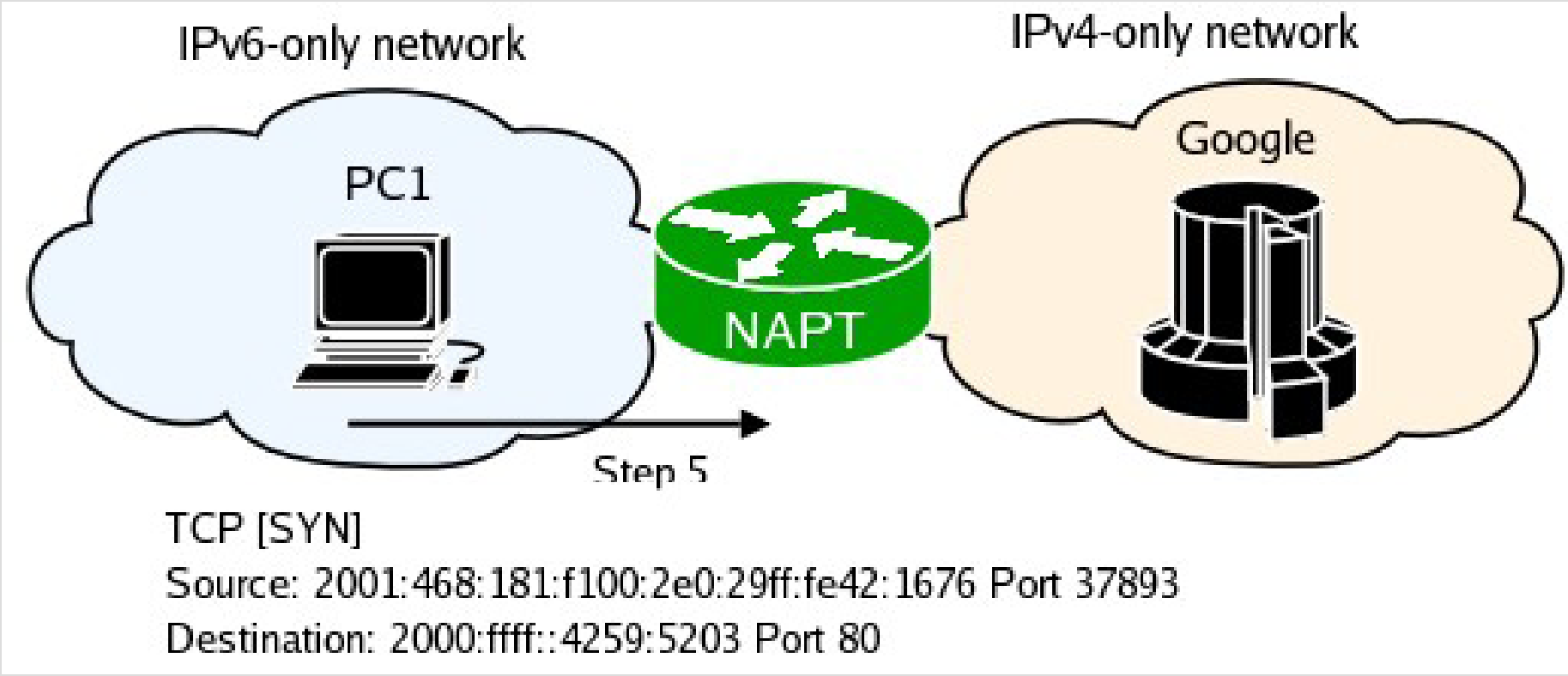
Example – Step 3



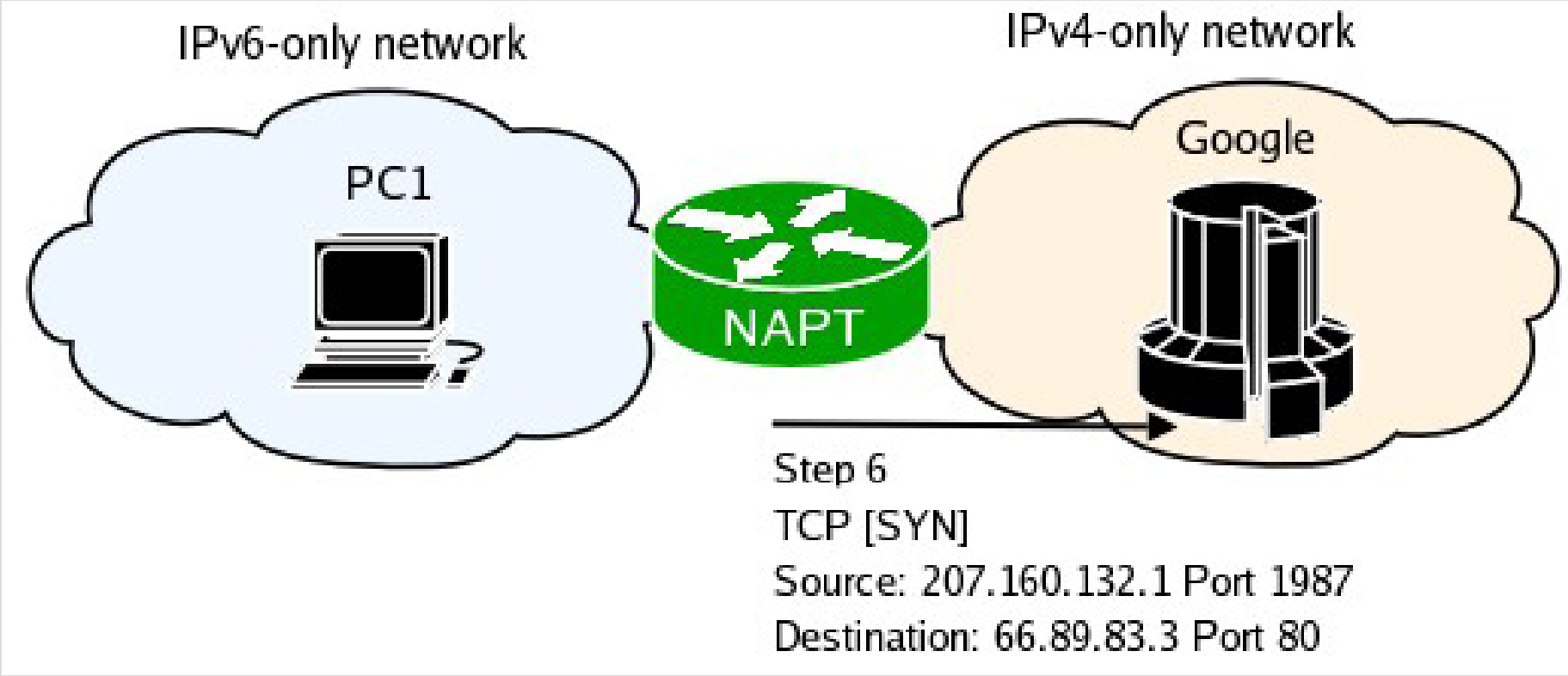
Example – Step 4



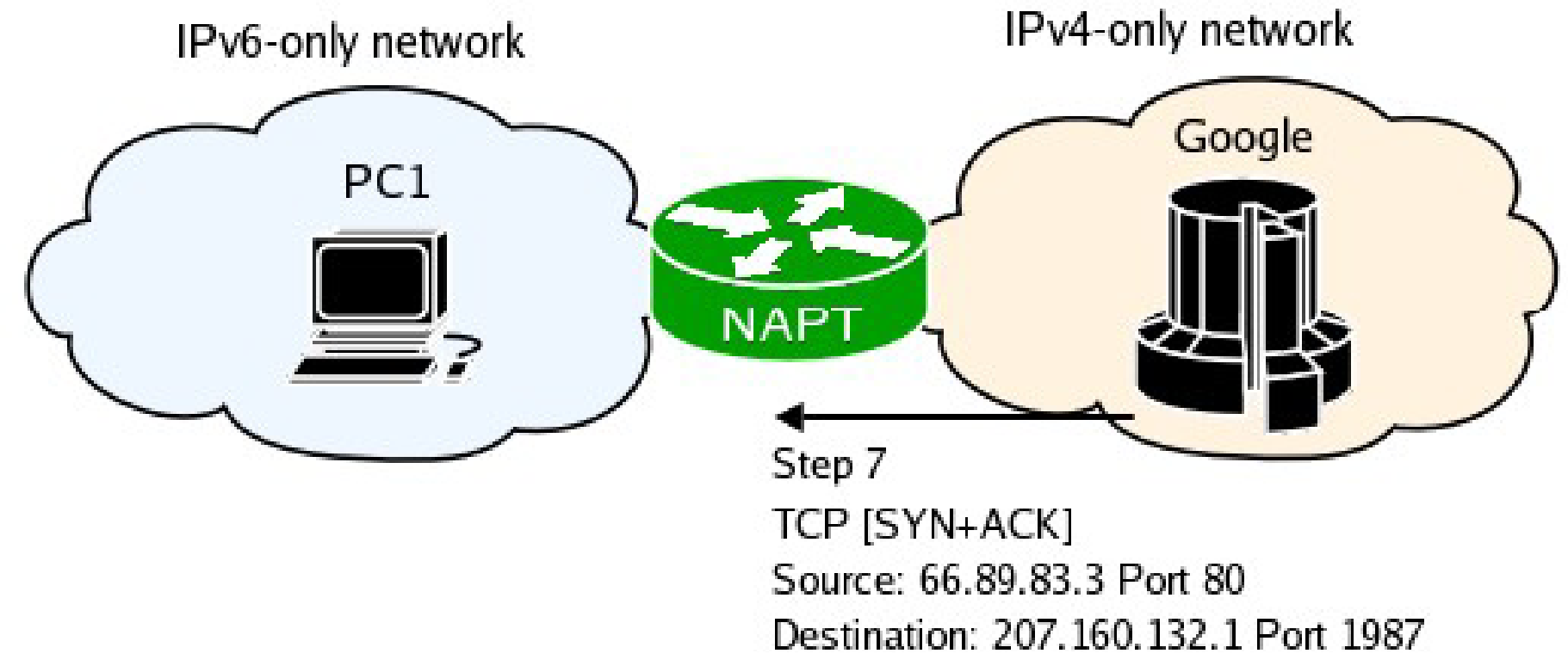
Example – Step 5



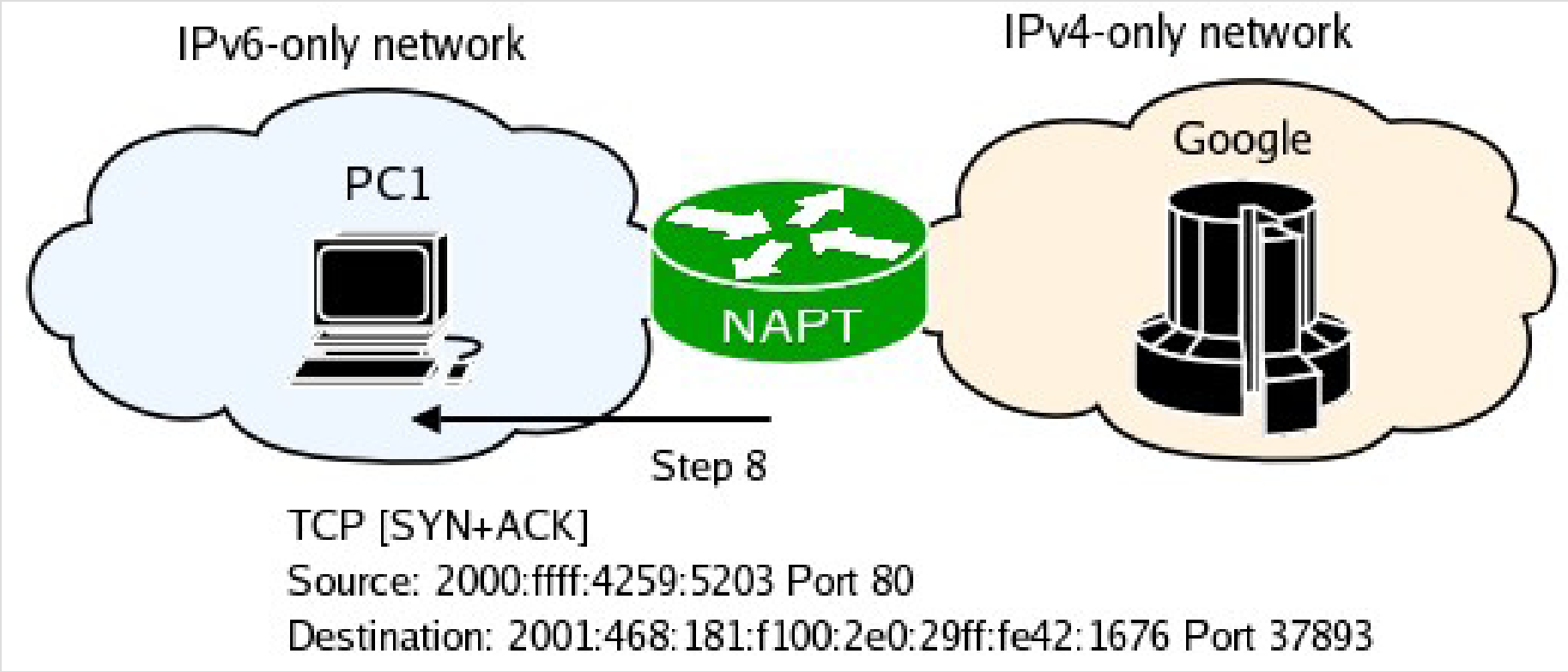
Example – Step 6



Example – Step 7



Example – Step 8



NAT-PT Implementations

- Few implementations at this point
- Cisco – apparently stable/supported
- BT Ultima product (discontinued?)
- Linux (naptd)
  - http://www.lucastomicki.net/naptd.php
- FreeBSD – no support in recent releases?

NAT-PT standards status

- RFC2766 released in Feb 2000
- A number of concerns since release
  - Incompatible with protocols that embed IP addresses in payload
  - Keepalive issues due to state timeout
  - Loss of information due to incompatible semantics between V6 and V4
  - DNS issues (e.g. breaks DNSSEC)
- RFC4966 released in Jul 2007 lists these concerns and others as reasons to move to historic
- Some continued interest in IETF

Conclusions

- NAT-PT can be useful in environments which have robust V6 support
- Current incomplete state of V6 support (i.e. DHCPv6 and V6 DNS) in Windows XP and MacOS X limits deployability.
- Other transition technologies (Dual Stack, 6to4, Teredo) likely more useful for now
- NAT-PT useful for experiments in testing native IPv6 support in applications (i.e. Web browsers, email clients, etc.)