

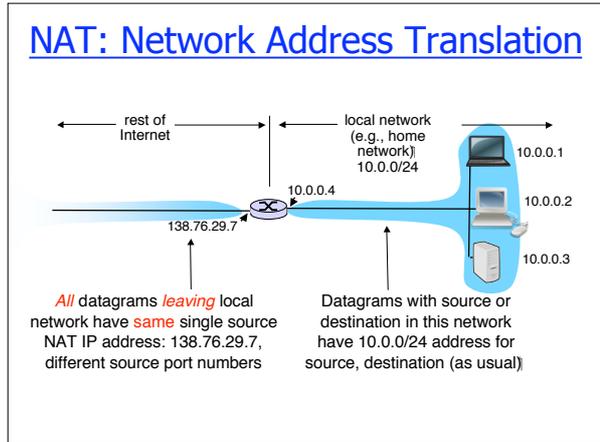


# Computer Networking

## Network Layer - NAT

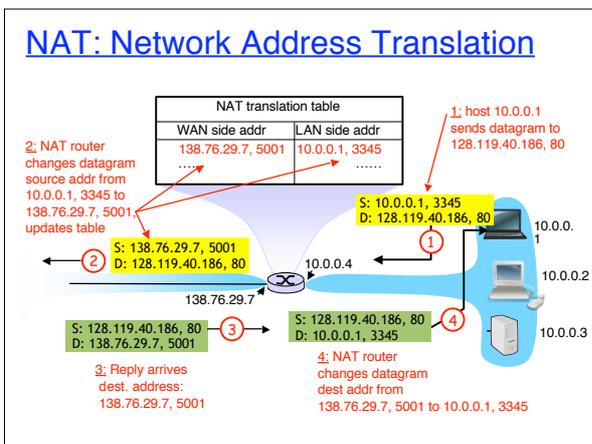
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- ### NAT: Network Address Translation
- **Motivation:** local network uses just one IP address visible from outside:
    - no need for allocation of a range of addresses from ISP:
      - just one IP address is used for all devices
    - can change addresses of devices in local network without notifying outside world
    - can change ISP without changing addresses of devices in local network
    - devices inside local net not explicitly addressable, but visible by outside world (a security plus).

- ### NAT: Network Address Translation
- Implementation:** NAT router must:
- *in outgoing datagrams:* **replace** (source IP address, port #) of every outgoing datagram to (NAT IP address, new port #) . . . remote clients/servers will respond using (NAT IP address, new port #) as destination addr.
  - **remember** (in NAT translation table) every (source IP address, port #) to (NAT IP address, new port #) translation pair
  - *in incoming datagrams:* **replace** (NAT IP address, new port #) in dest fields of every incoming datagram with corresponding (source IP address, port #) stored in NAT table



- ### NAT: Network Address Translation
- **16-bit port-number field:**
    - >60,000 simultaneous connections with a single LAN-side address!
  - **NAT is controversial:**
    - Routers should only process up to layer 3
    - Violates end-to-end argument
      - NAT possibility must be taken into account by app designers, e.g., P2P applications
    - Address shortage should instead be solved by IPv6