CS 725/825 & IT 725

Lecture 22

Network and Link Layers

November 23, 2025

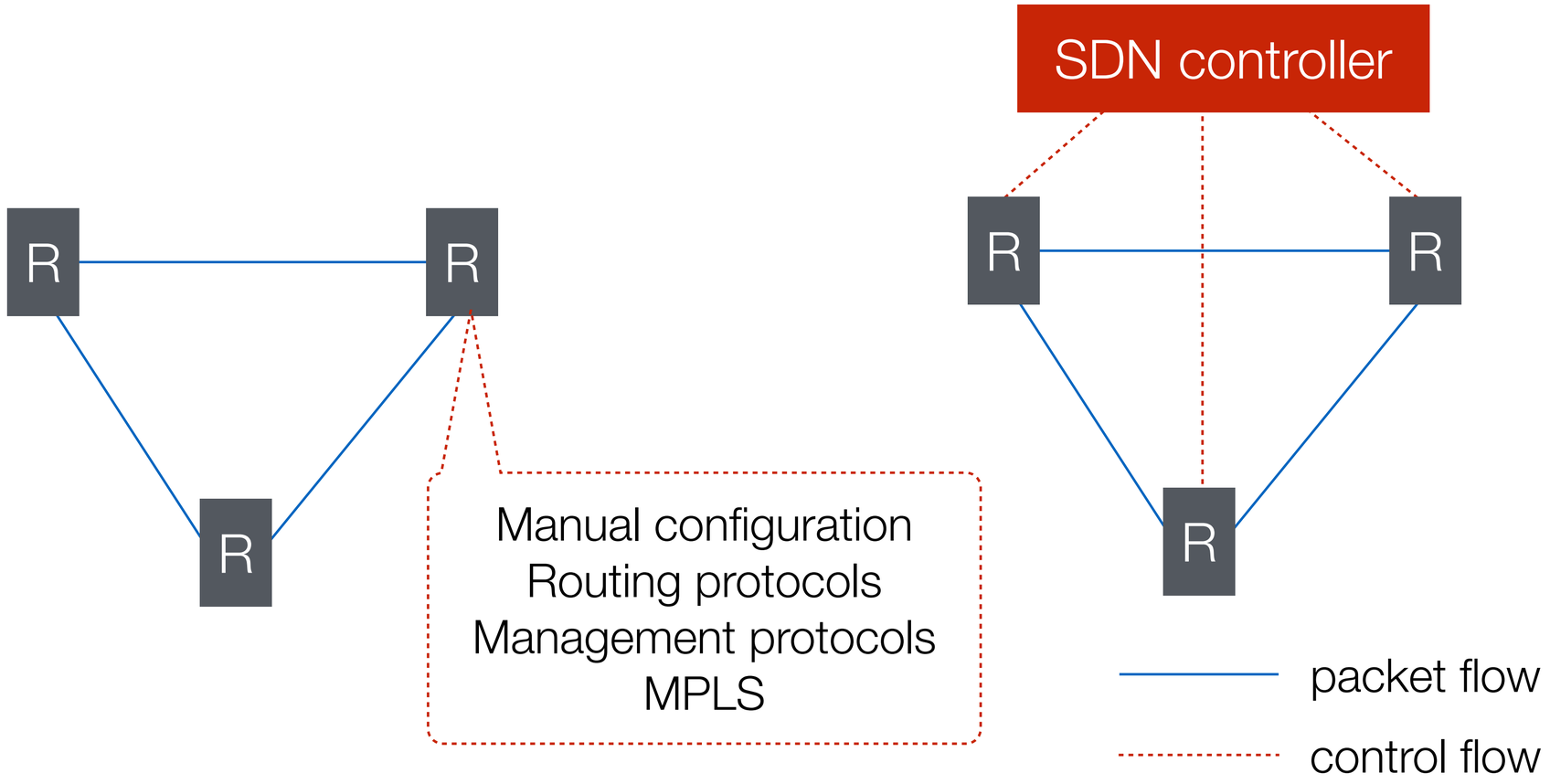
SDN

- Software Defined Networks
- Motivation:
  - many protocols, vendors, management platforms
  - virtualization, cloud, … (fill the buzzword of a day)
  - scale up in size and bandwidth
- Goals:
  - flexibility, agility, …
  - central management, programmatically configured (API)
  - open and vendor-independent

SDN

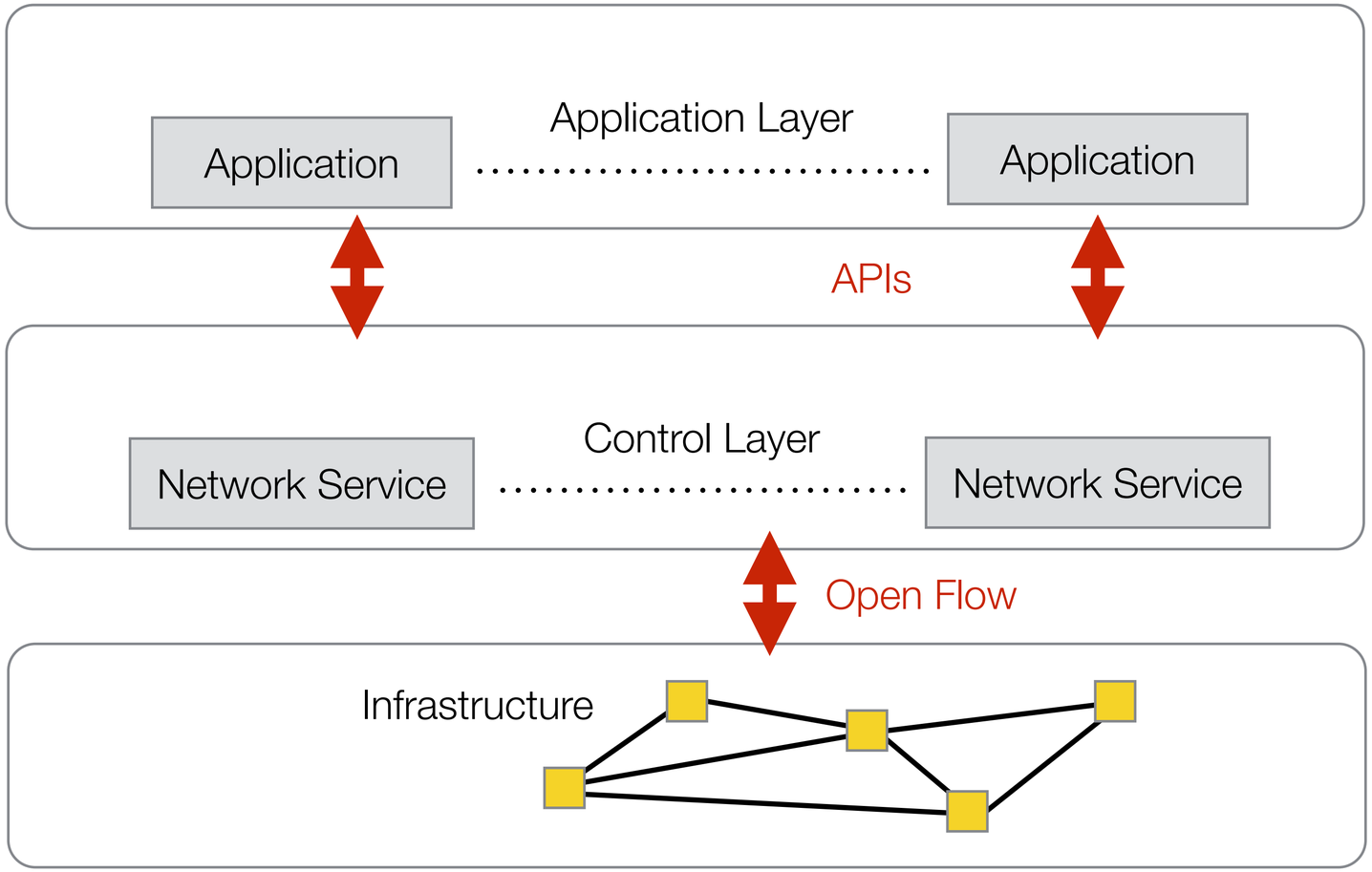
Traditional approach

Software Defined Networks (SDN)



SDN Architecture

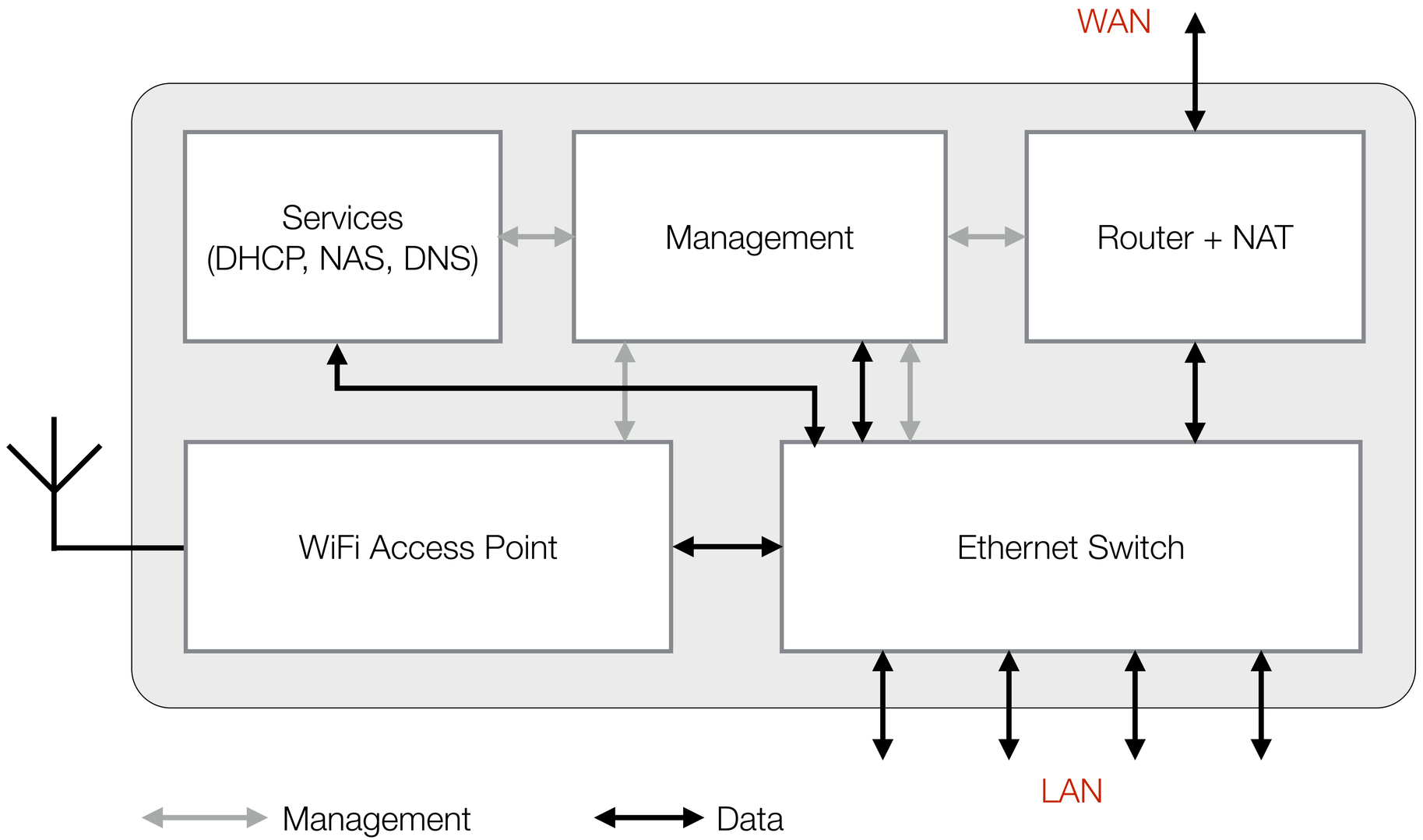
- Grossly simplified:



Is a home router a router?

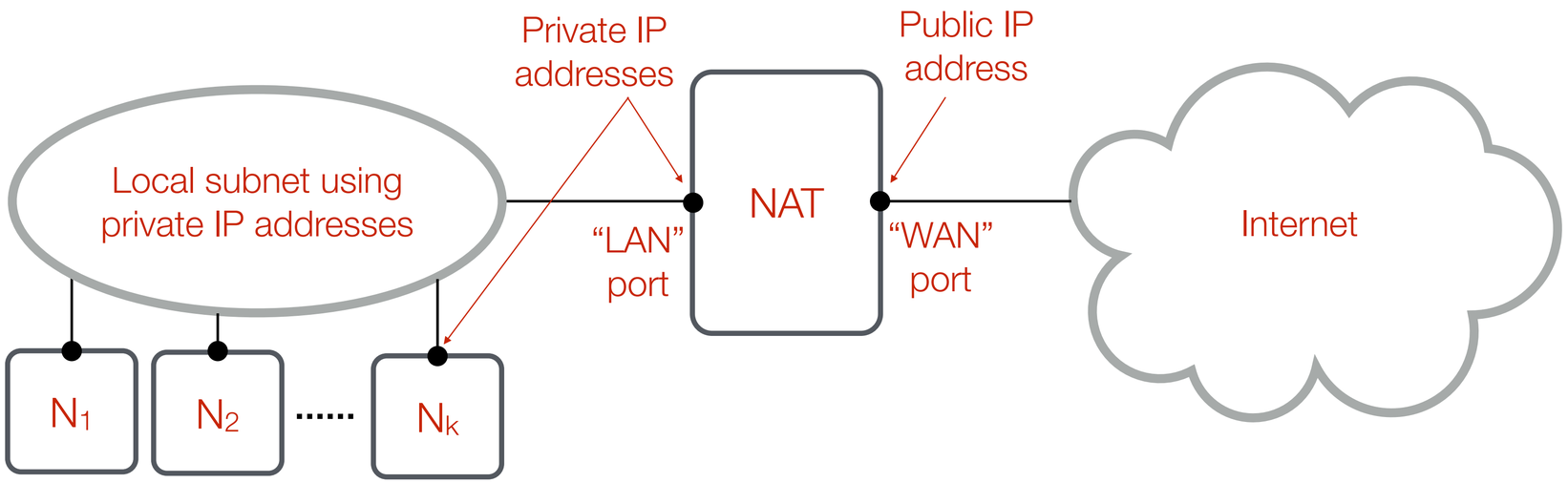
- Ethernet switch
- WiFi Access Point
- IP router
- Network Address Translation (NAT)
- DHCP server
- (NAS server)
- (print server)
- (DNS server)

Anatomy of a Home Router



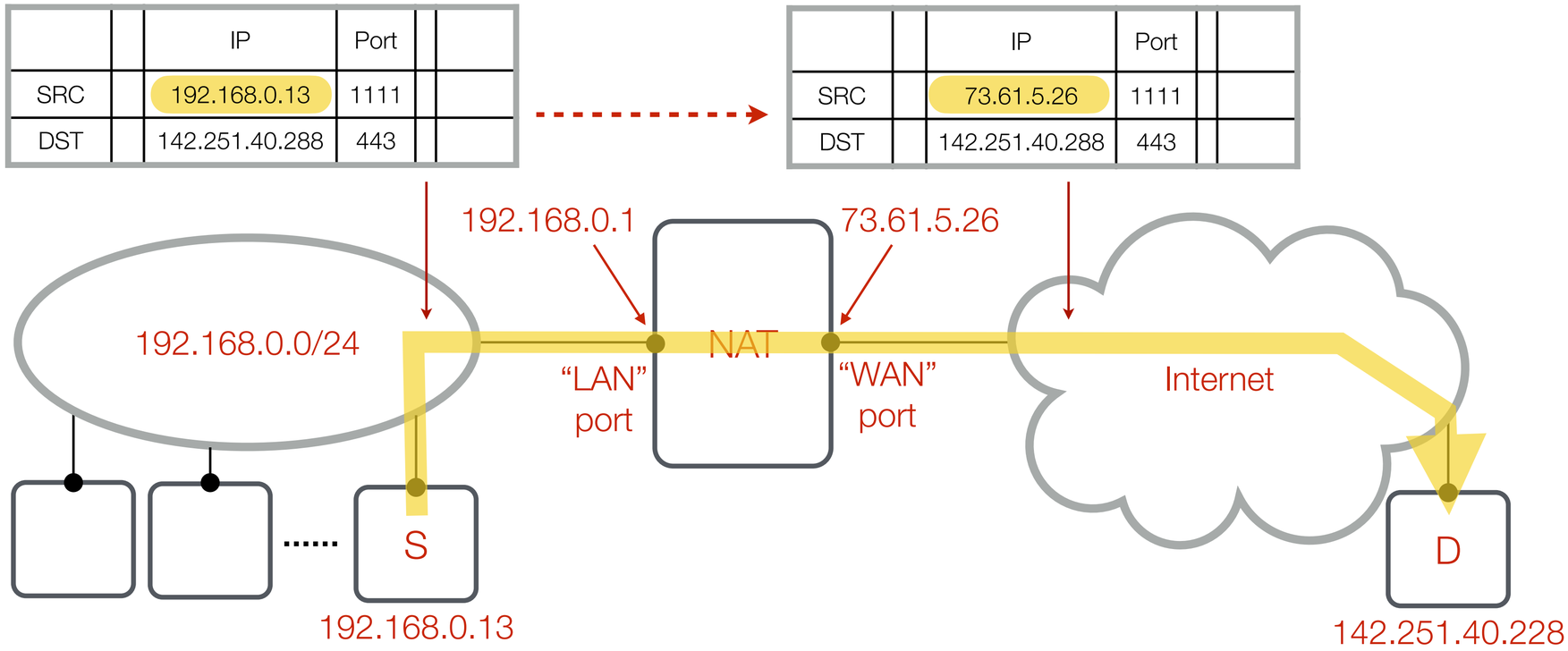
NAT

- Network Address Translation
- Motivation:
  - allow multiple nodes to share a single IP address
  - prevent external traffic from entering the local network



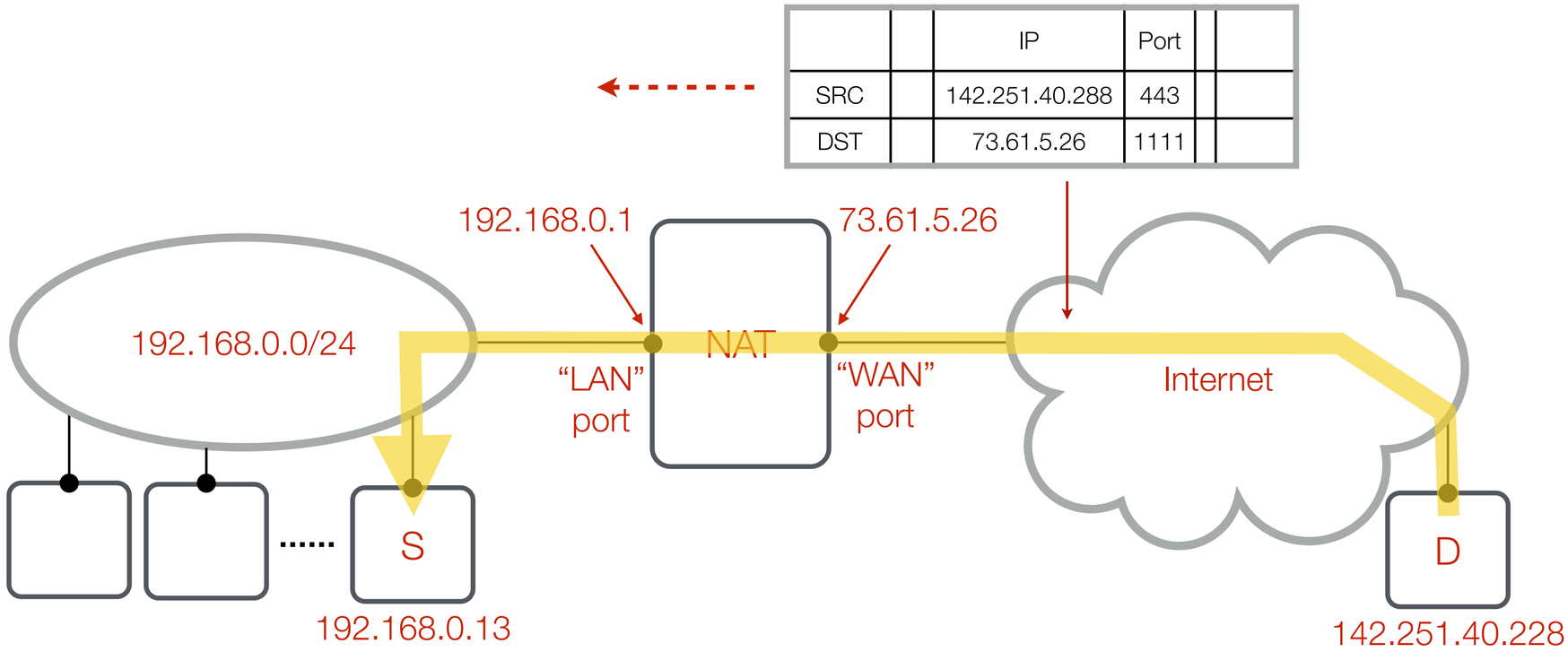
NAT

- Communication is initiated from a local node (S)
- Local (private) source IP address changed to the public IP address of the NAT box



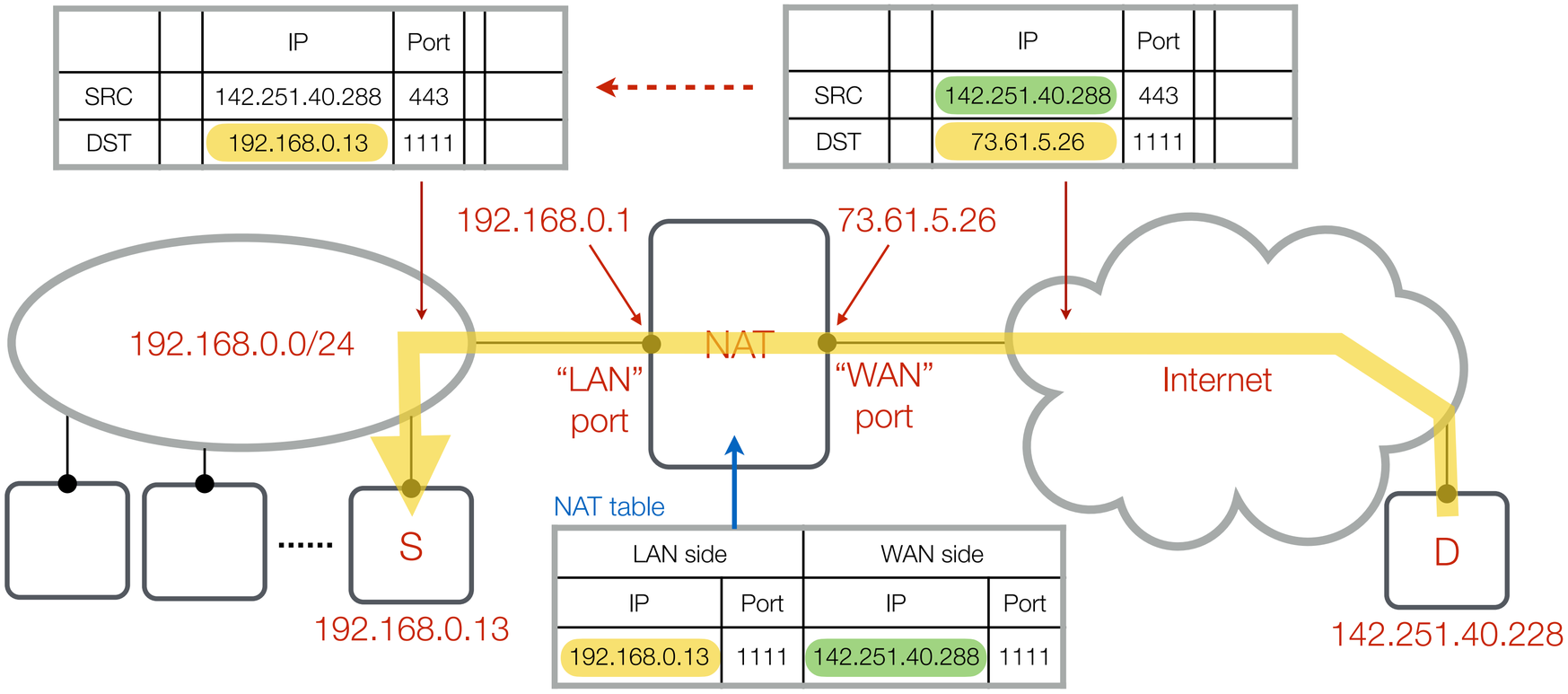
NAT

- Response is delivered to the NAT box
- The NAT box needs to know which local IP (and port) to use to deliver the packet



NAT

- NAT box observes outgoing connection requests and keeps track of a src/dst IP/port translation in NAT table
- Source IP/port is used to look up the table



NAT

- There can be a port number conflict on the WAN side, so the port numbers can and do get translated too: