* Router allow us to connect to the internet by different computer but have one unique ip address is required to represent them all
* Forms of NAT :
  + Static NAT – mapping an unregistered IP address to registered IP address on a one-to-one basis. Useful when device need to be accessible from outside network
  + Dynamic NAT – map an unregistered ip address from a group of registered IP addresses
* Overloading – a form of dynamic NAT that maps multiple unregistered IP addresses to a single registered IP by using different port this known also as PAT (Port Address Translation)
* When the IP address used on your internal network are registered IP addresses in use on another network NAT router must translate the internal addresses to registered unique addresses as well as translate the external registered addresses to addresses that are unique to the private network.
* This can be done either through static NAT or by using DNS and implementing dynamic NAT
* Internal network is usually LAN commonly referred to as stub domain
* Most of the network traffic in a stub domain is local so it wont travel outside the internal network.
* Inside Local Addresses will be used on the stub domain
* Outside Local Addresses are used to translate the unique IP address known as outside global addresses of device on the public network
* Most computer on the stub domain communicate with each other using the inside local addresses
* Computers that communicate a lot outside the network have inside global addresses, which means that they do not require translation
* When computer on the stub domain that has an inside local address wants to communicate outside the network, the packet goes to one of the NAT routers.
* The NAT router checks the routing table to see if it has an entry for the destination address.
* If it does , the NAT router then translates the packet and creates an entry for it in the address translation table
* Using an inside global address, the router sends the packet on to its destination
* A computer on the public network sends a packet to the private network. The source address on the packet is an outside global address . The destination address is an inside global address.
* The NAT routers look at the address translation table and determines that the destination address is in there.
* The NAT router translates the inside global address of the packet to the inside local address, and send it to the destination computer.
* TCP/IP protocol stack , multiplexing allows a computer to maintain several concurrent connection with computers using different TCP or UDP ports
* The addresses specify the two machines at each end while the port numbers ensure that the connection between the two computers has a unique identifier .
* Each port number uses 16 bits
* **How Dynamic NAT (Network Address Translation**
* **) works :**
  + Internal network has been set up with IP addresses that were not specifically allocated to that company by IANA they are **non-routable**  address because they are not unique
  + Company set up NAT enabled router
  + A computer on the stub domain attempts to connect to computer outside network
  + The router receives the packet from the computer on the stub domain
  + Router saves the computer’s non-routable IP address to an **address translation table** , replace the sending computer’s non-routable IP address with first available ip address out of the range of unique IP.
  + When packet comes back from destination computer the router checks the destination address on the packet. Took it in the address translation table to see which computer on the stub domain the packet belongs to.
  + It changes the destination address to the one saved in the address translation table and sends it to that computer
  + If it doesn't find a match in the table, it drops the packet.
  + The computer receives the packet from the router. The process repeats as long as the computer is communicating with the external system.
* **OVERLOADING :**
  + An internal network (stub domain) has been set up with non-routable IP addresses that were not specifically allocated to that company
  + The company sets up a NAT-enabled router. The router has a unique IP address
  + A computer on the stub domain attempts to connect to a computer outside the network, such as a Web server.
  + The router receives the packet from the computer on the stub domain.
  + The router saves the computer's non-routable IP address and port number to an address translation table
  + The router replaces the sending computer's non-routable IP address with the router's IP address
  + The router replaces the sending computer's source port with the port number that matches where the router saved the sending computer's address information in the address translation table.
  + The translation table now has a mapping of the computer's non-routable IP address and port number along with the router's IP address.
  + When a packet comes back from the destination computer, the router checks the destination port on the packet
  + Looks in the address translation table to see which computer on the stub domain the packet belongs to
  + It changes the destination address and destination port to the ones saved in the address translation table and sends it to that computer.
  + The computer receives the packet from the router. The process repeats as long as the computer is communicating with the external system.
  + Since the NAT router now has the computer's source address and source port saved to the address translation table, it will continue to use that same port number for the duration of the connection. A timer is reset each time the router accesses an entry in the table. If the entry is not accessed again before the timer expires, the entry is removed from the table.