

# 08\_IP-Subnetting-and-Introduction-to-NAT

EUAD04\_Subnetting-Nat  
Training Clarusway  
Pear Deck - September 1, 2020 at 2:11AM

## Part 1 - Summary

Use this space to summarize your thoughts on the lesson

## Part 2 - Responses

Slide 1



IP Subnetting and  
Introduction to NAT



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### ► Subnetting Basics



Why to use subnetting?

- Reduced Network Traffic
- Optimized Network Performance
- Simplified Management - Easier to identify and isolate network problems
- Facilitated Spanning of Large Geographical Distances - Connecting multiple smaller networks makes the system more efficient

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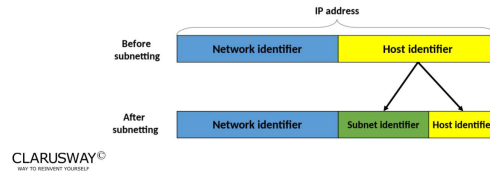


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## ► Subnetting Basics

- IPv4 address is divided into network ID and host ID by using octets
- In subnetting we can borrow some bits from host ID to use as subnetwork



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## ► Subnetting Basics

### Subnetting IPv4 Address:

- A **Class A, B, or C** TCP/IP network can be further divided, or subnetted, by a system administrator
- For example, you have 150 hosts on three networks that are connected by a router
- You are allocated a **Class C** address: 192.168.123.0  
Network ID Host ID
- You can use from 192.168.123.1 to 192.168.123.254  
(Just remember that the first and last address in any network or subnet cannot be assigned to any individual host, so you cannot use 192.168.123.0 and 192.168.123.255)

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## ► Subnetting Basics

### Subnetting IPv4 Address:

- With the allocated Class C IP address we can map 254 hosts on one network
- But our 150 hosts are located on **three** separate networks
- Instead of requesting more address blocks for each network, we can divide our block into three subnets

But how?

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## ► Subnetting Basics

### Subnetting IPv4 Address:

- Remember we can create subnets by borrowing bits from Host ID
- We need 3 subnets in total, so if we borrow 1 bit we will get 2 subnets which is not enough
- So we need more bits, if we borrow 2 bits we will get 4 subnets and our subnet mask will be:

11111111.11111111.11111111.11000000 → 255.255.255.192

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## ▶ Subnetting Basics



### Subnetting IPv4 Address:

- Since we borrowed 2 bits, there are only 6 bits left for Host ID which makes  $2^6 - 2 = 62$  hosts (*first and last numbers are reserved*)
- Our company has **3 networks** and **50 hosts** on each network
- We have **4 subnets**, and **62 host IDs** for each subnet (*that means 1 subnet with 62 host IDs will be reserved for future use*)

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### ► Subnetting Basics



#### Default gateways

- If a host needs to communicate with a host on another network, it will communicate through a router
- A router specified on a host is called **default gateway**
- So how does TCP/IP know if the destination host is on the same network or not?

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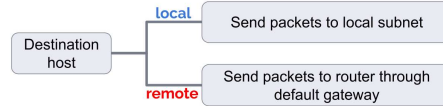
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## ► Subnetting Basics

### Default gateways

When a host wants to communicate with another device, it performs a comparison process using the defined subnet mask with the destination IP address and its own IP address



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## Subnetting Basics

- Source host : 192.168.123.46
- Subnet mask : 255.255.255.192
- Destination host : 192.168.123.202

Source IP : 11000000.10101000.01111011.00101110  
Subnet mask : 11111111.11111111.11111111.11000000  
Network ID : 11000000.10101000.01111011.00000000 (192.168.123.0)

Destination IP : 11000000.10101000.01111011.11001010  
Subnet mask : 11111111.11111111.11111111.11000000  
Network ID : 11000000.10101000.01111011.11000000 (192.168.123.192)

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Not the same! Two hosts are on different networks.

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## Subnetting Basics

### Classless Inter-Domain Routing (CIDR)

- In order to reduce the wastage of IP addresses, a new concept of **CIDR** is introduced
- CIDR provides the flexibility of borrowing bits of Host part of the IP address
- By using subnetting, one single Class A address can be used to have smaller sub-networks which provides better network management capabilities

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### Introduction to Network Address Translation (NAT)

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### ► Introduction to NAT



- Advantages:
  - Hides internal structure of the network from the outsider and thus increases network security
  - Eliminates address renumbering when a network evolves
  - Allows unlimited private IP address range
- Disadvantages:
  - Changes the IP addresses, thus troubleshooting becomes more complex
  - Translation results in switching path delays
  - Certain applications will not function while NAT is enabled
  - Complicates tunneling protocols such as IPsec

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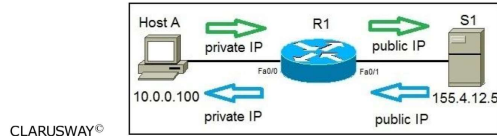
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## ► Introduction to NAT

Types of NAT:

- **Static NAT (SNAT):**
  - One-to-one mapping (A single private IP with a single global IP)
  - Each device needs a public IP address
  - Generally used for web hosting



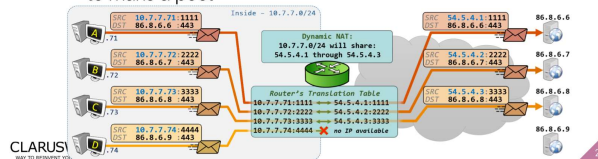
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## ► Introduction to NAT

Types of NAT:

- **Dynamic NAT (DNAT):**
  - Public IP is picked from a pool of IP addresses
  - If no IP is left, data packet is dropped by the NAT
  - Very costly as many global IP addresses have to be bought to make a pool



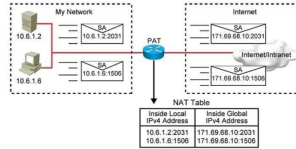
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## ► Introduction to NAT

Types of NAT:

- **Overloading or Port Address Translation (PAT):**
  - Most popular type of NAT
  - Port numbers are used to distinguish the traffic
  - Cost-effective as lots of users can be connected by using only one public IP address



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# THANKS!

## Any questions?

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