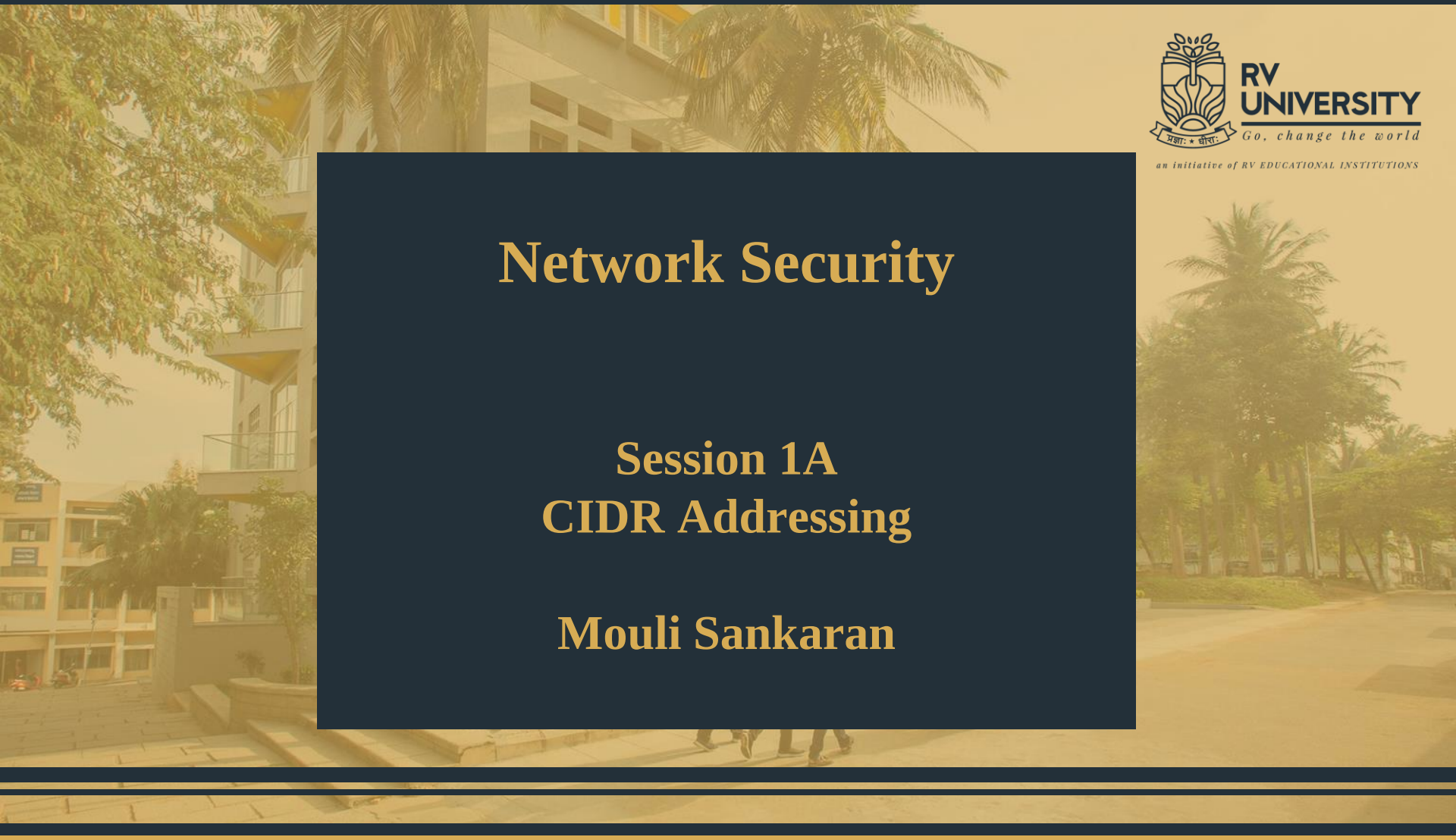

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Network Security

Session 1A
CIDR Addressing

Mouli Sankaran

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Session 1A: Focus

- Course Introduction
- Revision and Recap … Quiz 1 to Quiz 6
- CIDR Addressing
  - Class A, B and C
  - Subnet masks and CIDR values
- Subnetting a Class C address
  - Couple of examples
- Homework – 1 Problem

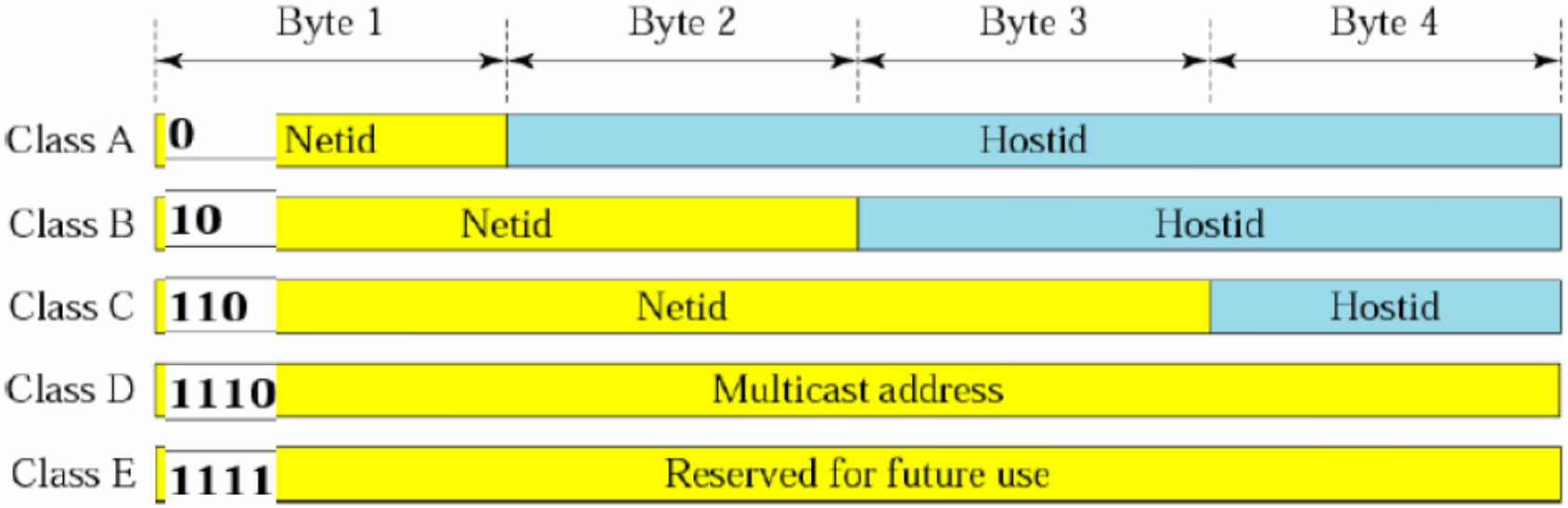
Course page where the course materials will be posted as the course progresses:

CIDR Addressing

CIDR: Classless Inter-Domain Routing

Quiz 1: IP Addresses: Class A, B, C, D and E

- Give the address pattern of below class addresses:



Q1: Is the above Net ID and Host ID separation as per **classful** or **classless** scheme? **ANS: Classful**

Note: In the classless or CIDR addressing scheme the separation of Net ID and Host ID is based on other value, which is a **Subnet mask**

Quiz 2: Default Subnet masks for Class A, B, C Addresses

Q1: Give the **subnet masks** for each class of addresses.

Format: **NetID**: **network**, **HostID**: **node** (**network.node**. …etc. for each byte of the address)

Q2: Give the **CIDR** values for each of them below.

Format: Slash notation: /x where, x is the suffix

Note: CIDR notation, in which an address is written with a **suffix** indicating the **number of bits of the prefix**, that correspond to the network ID part of the address

Class	Format	CIDR: /x Values	Default Subnet Mask
A	*network.node.node.node*	**/8**	255.0.0.0
B	*network.network.node.node*	**/16**	255.255.0.0
C	*network.network.network.node*	**/24**	255.255.255.0

Quiz 3: Give the Matching CIDR Values and Subnet Masks (in the classless scheme)

Subnet Mask	CIDR Value
255.0.0.0	/8
255.128.0.0	/9
255.192.0.0	/10
255.224.0.0	/11
255.240.0.0	/12
255.248.0.0	/13
255.252.0.0	/14
255.254.0.0	/15
255.255.0.0	/16

Subnet Mask	CIDR Value
255.255.128.0	/17
255.255.192.0	/18
255.255.224.0	/19
255.255.240.0	/20
255.255.248.0	/21
255.255.252.0	/22
255.255.254.0	/23
255.255.255.0	/24

Subnet Mask	CIDR Value
255.255.255.128	/25
255.255.255.192	/26
255.255.255.224	/27
255.255.255.240	/28
255.255.255.248	/29
255.255.255.252	/30
255.255.255.254	/31
255.255.255.255	/32

128, 64, 32, 16, 8, 4, 2, 1

Values 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1 1 1 1 1 1 1 1

Bits b7 b6 b5 b4 b3 b2 b1 b0

Byte

Note: The last two subnet masks are not useful as Subnet mask, because **all zeros** and **all ones** are **not used** for **host IDs**. So, there cannot be any network with these two values as subnet masks, because no hosts can be on the network with these subnet masks..

Quiz 4: Subnetting Class C addresses

- How many usable subnet masks are possible with Class C addresses? List all of them. **Ans: 7**

Network ID (in decimal)	Binary	Decimal	CIDR
255.255.255.	00000000	0	/24
255.255.255.	10000000	128	/25
255.255.255.	11000000	192	/26
255.255.255.	11100000	224	/27
255.255.255.	11110000	240	/28
255.255.255.	11111000	248	/29
255.255.255.	11111100	252	/30

In **decimal** and **binary** formats.

Note: Since the first 24 bits correspond to the network ID part of the address, Subnetting is possible only with the remaining 8 bits which are reserved for the host IDs in a Class C address.

Note: As mentioned in the previous slide the least two bits are not useful as Subnet mask, because **all zeros** and **all ones** are **not used** for **host IDs**.
So, there cannot be any network with these two values as subnet masks.
So, /31 and /32 are not valid subnet masks.

Important note: only the host IDs cannot be all zeros.
But the subnet mask with all zeros (the first entry in the above table) is valid, which means that it is same as the default subnet mask of Class C address.

Quiz 5: Given A Class C subnet Mask

- Suppose the **subnet mask in CIDR notation is /26**, **answer** the following **questions**.

The subnet mask is: 255.255.255.192 In Hexadecimal: FF.FF.FF.C0

1. How many subnets does the chosen subnet mask produce? **Ans: $2^2 = 4$**
2. How many valid hosts per subnet are available? **Ans: $(2^6 - 2) = 62$**
3. What are the valid subnets? **Ans: 0, 64, 128, 192**
4. What's the broadcast address of each subnet? **Ans: 63, 127, 191, 255**
5. What are the valid hosts in each subnet? **Ans: 1 to 62, 65 to 126, 129 to 190, 193 to 254.**

The **answers** only give the last byte (**host ID part of class C address**).
The higher part of them will be same as the **Network ID** of the chosen address.
For example, if the **network ID** of the address is: **192.10.22**, then the **First subnet** is: **192.10.22.0, second subnet is: 192.10.22.64, etc.** and the **broadcast addresses** of the **first subnet** is: **192.10.22.63**

Notice that the higher byte (**192**) of the address should match with Class C starting bit pattern **110** ..

Note: The broadcast address (all 1's), which is always the number right before the next subnet.
Note: Also, the broadcast address of the last subnet is always 255.

Quiz 6: Given A Class C subnet Mask

- Suppose the **subnet mask in CIDR notation is /27**, **answer** the following **questions**.

For the subnet mask is: 255.255.255.224 In Hexadecimal: FF.FF.FF.E0

1. How many subnets does the chosen subnet mask produce? **Ans: $2^3 = 8$**
2. How many valid hosts per subnet are available? **Ans: $(2^5 - 2) = 30$**
3. What are the valid subnets? **Ans: 0, 32, 64, 96, 128, 160, 192**
4. What's the broadcast address of each subnet? **Ans: 31, 63, 95, 127, 159, 191, 255**
5. What are the valid hosts in each subnet? **Ans: 1-30, 33-62, 65-94, 97-126, 129-158, 161-190, 193-122, 125-254.**

The **answers** only give the last byte (**host ID part of class C classful address**).
The higher part of them will be same as the **Network ID** of the chosen address.
For example, if the **network ID** of the address is: **223.120.160**, then the
First subnet is: **223.120.160.0, second subnet is: 223.120.160.32, etc.**
and the **broadcast addresses** of the **first subnet** is: **223.120.160.31**

Notice that the higher byte (**223**) of the address should match with Class C starting bit pattern **110** ..

Home Work: Given A Class C subnet Mask

- Suppose the **subnet mask in CIDR notation is /28**, **answer** the following **questions**.

1. How many subnets does the chosen subnet mask produce?
2. How many valid hosts per subnet are available?
3. What are the valid subnets?
4. What's the broadcast address of each subnet?
5. What are the valid hosts in each subnet?

Practice this problem
Today at home!!!

Summary

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