

# Redes de Comunicação 2024/2025

TP02

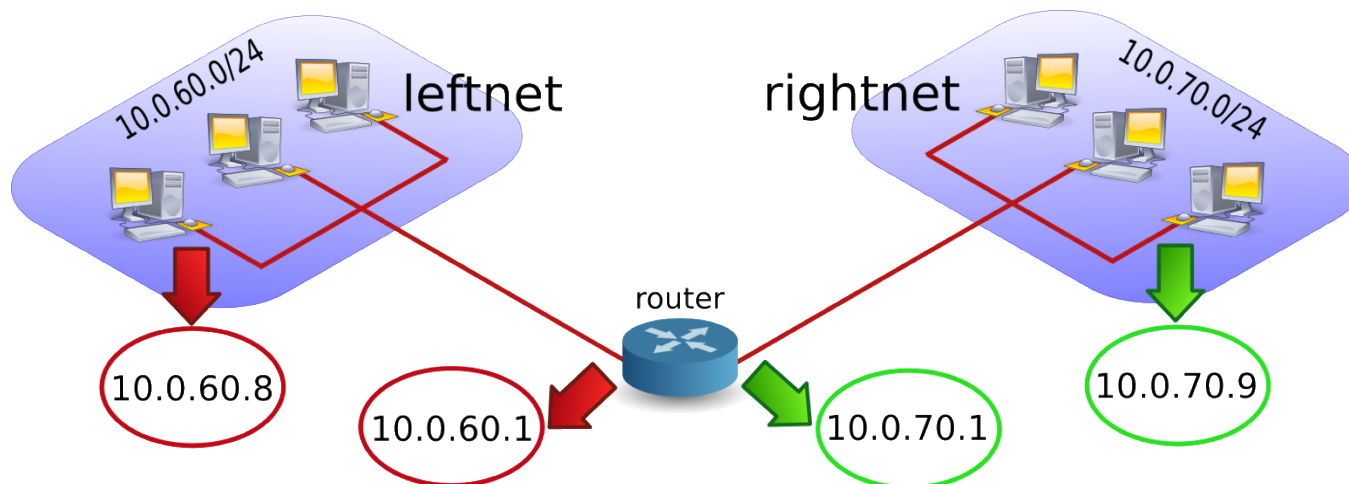
IP routing and addressing  
IP subnetting

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# Internet (IP) routing

- A router is responsible for the forwarding of IP packets across different (physical) networks
- A router (and also a host) uses a routing table to select the next destination (hop) for an IP packet
- The information in the routing table is referred to as routes
- Routes may be added manually (static routing ) or by specialized routing processes/protocols (dynamic routing)



# Network scenarios: challenges



1. Configure the interface `e0/0` in router c2600-1, using an IP address from the network 192.168.11.0/24
2. Confirm that you are able to reach (“ping”) router c2600-2 from router c2600-1
3. Configure the interface `e0/0` in router c2600-2, using an IP address from the same network

# IP subnetting

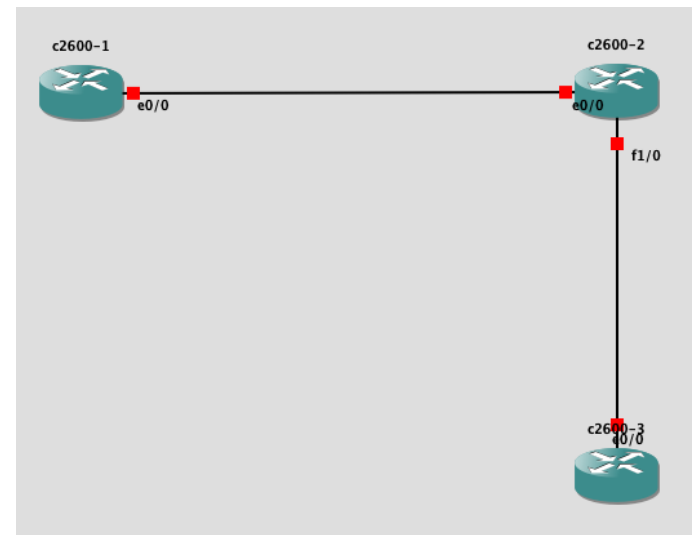
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- Further subdivision (subnetting) of the addressing space is possible
- As different physical networks need to use different IP address networks this is a very common operation

Subnet Mask	CIDR	Subnet Mask	CIDR
255.128.0.0	/9	255.255.240.0	/20
255.192.0.0	/10	255.255.248.0	/21
255.224.0.0	/11	255.255.252.0	/22
255.240.0.0	/12	255.255.254.0	/23
255.248.0.0	/13	255.255.255.0	/24
255.252.0.0	/14	255.255.255.128	/25
255.254.0.0	/15	255.255.255.192	/26
255.255.0.0	/16	255.255.255.224	/27
255.255.128.0	/17	255.255.255.240	/28
255.255.192.0	/18	255.255.255.248	/29
255.255.224.0	/19	255.255.255.252	/30

# IP subnetting (example 1)

- Consider that you need to use the network 192.168.11.0/24 in this scenario
- As router c2600-2 interconnects two different (physical) networks, we need two different IP sub-networks (non-overlapping address ranges)
- Simpler approach to create two subnet: use two /25 networks!



# IP subnetting (example 1)

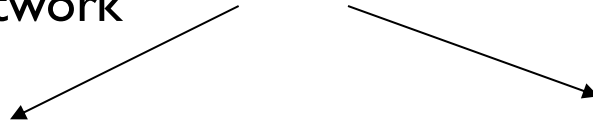
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/24 supports 256 addresses (254 addresses for hosts)

/25 supports 128 addresses (126 addresses for hosts)

/25 = 11111111 11111111 11111111 10000000

We can now use the new bit in the netmask to create two subnetworks of the original network



If the bit is "0":

Network: 192.168.11.0/25

Netmask: 255.255.255.128

Network address: 192.168.11.0

Broadcast address: 192.168.11.127

IP address range: 192.168.11.1 to 126

If the bit is "1":

Network: 192.168.11.128/25

Netmask: 255.255.255.128

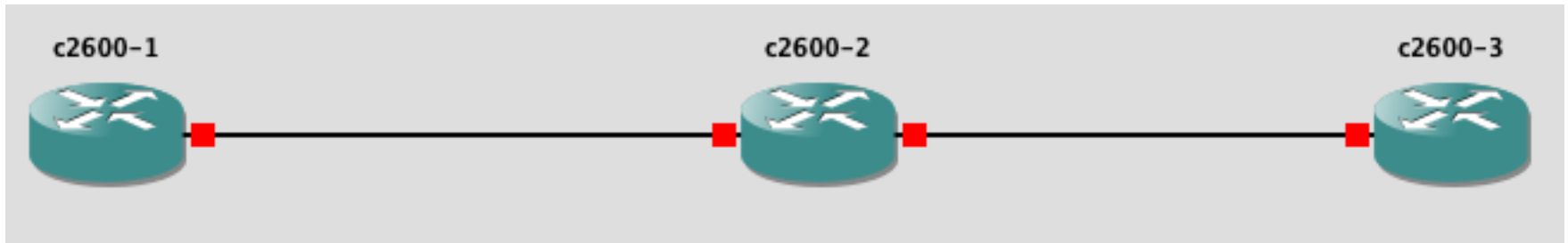
Network address: 192.168.11.128

Broadcast address: 192.168.11.255

IP address range: 192.168.11.129 to 254

# IP subnetting (example 2)

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Consider that you need to use the network 192.168.192.0/18 in this scenario:

Subnet this network, in order to obtain two subnets for the network scenario above

# IP subnetting (example 2)

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/19 = 11111111 11111111 11100000 00000000

We use the new bit in the netmask to create two subnetworks

If the bit is "0":

Network: 192.168.192.0

(3<sup>rd</sup> decimal number of network address is 192 = 11000000)

Netmask: 255.255.224.0 (or /19)

Network address: 192.168.192.0 (first address of range)

Broadcast address: 192.168.223.255  
(3<sup>rd</sup> decimal number of address is 223 = 11011111)

IP address range: 192.168.192.1 to 192.168.223.254

If the bit is "1":

Network: 192.168.224.0

(3<sup>rd</sup> decimal number of network address is 224 = 11100000)

Netmask: 255.255.224.0 (or /19)

Network address: 192.168.224.0 (first address of range)

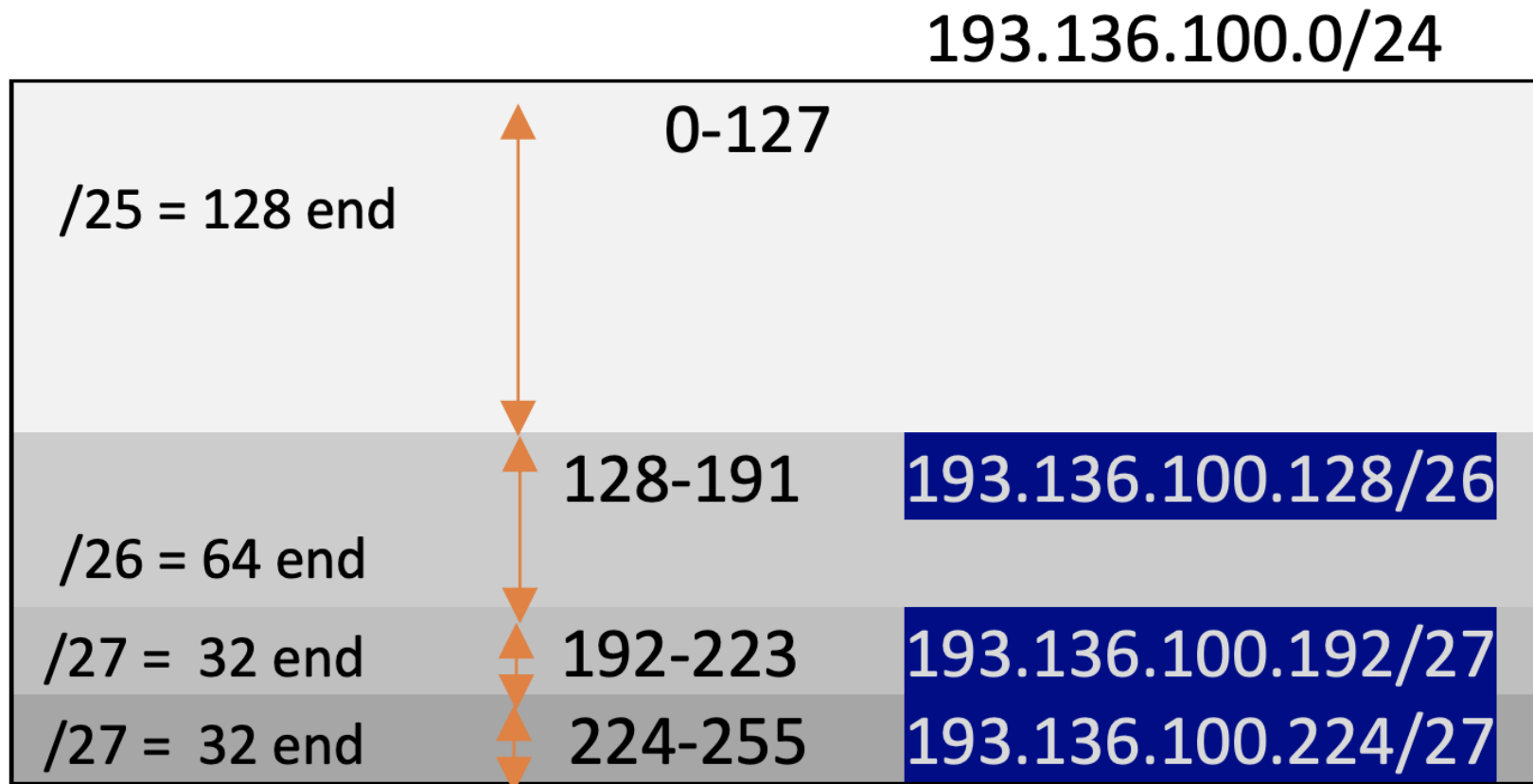
Broadcast address: 192.168.255.255  
(3<sup>rd</sup> decimal number of address is 255 = 11111111)

IP address range: 192.168.224.1 to 192.168.255.254



# IP subnetting (example 3)

Using the network 193.136.100.128/25 create 3 subnets:



# IP subnetting (example 3)

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Using the network 193.136.100.128/25 create 3 subnets:

**Network 1:** 193.136.100.128/26

Netmask: 255.255.255.192 (or /26)

IP address range: 193.136.100.129 to 193.136.100.190

Broadcast address: 193.136.100.191

**Network 2:** 193.136.100.192/27

Netmask: 255.255.255.224 (or /27)

IP address range: 193.136.100.193 to 193.136.100.222

Broadcast address: 193.136.100.223

**Network 3:** 193.136.100.224/27

Netmask: 255.255.255.224 (or /27)

IP address range: 193.136.100.225 to 193.136.100.254

Broadcast address: 193.136.100.255

# TP02: Summary

*What we have covered here?*

- Static versus dynamic routing
- Using GNS3 to configure (simple) network scenarios
- IP address subnetting