L2 & L3 Routing

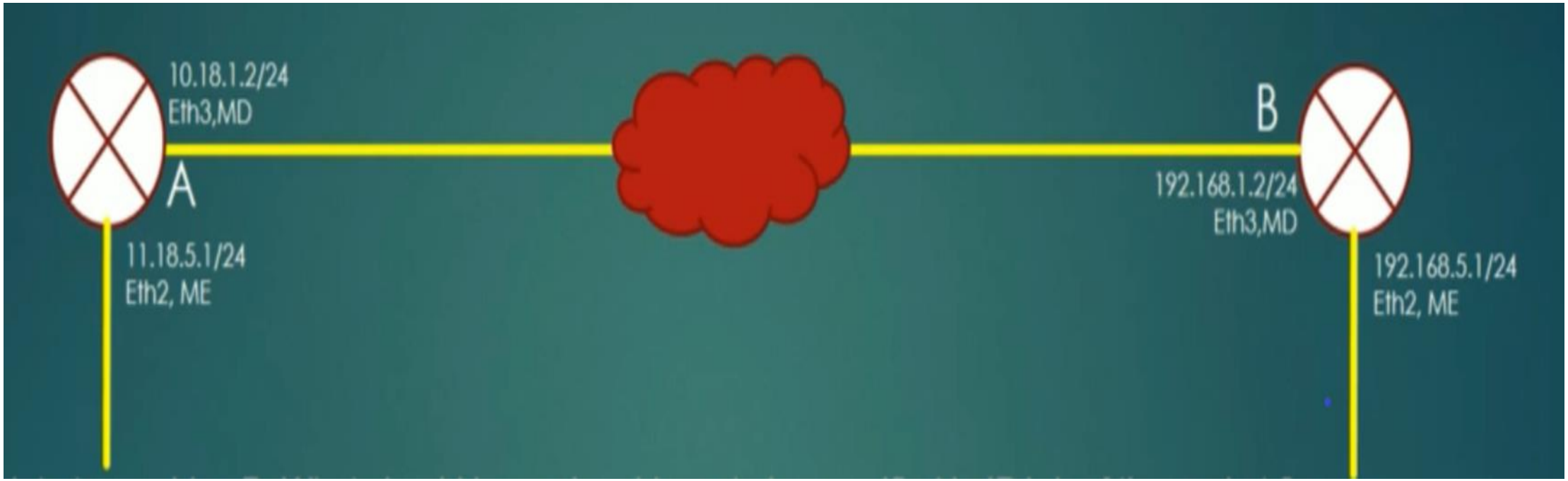
Topic- Loopback Interfaces

TOPIC COVERED IN THIS LECTURE

- Loopback interfaces – Introduction
- Properties of Loopback Interfaces
- Routing using Loopback IP Address as Destination Address

Loopback Interfaces

- When we send a packet destined to a remote machine, what is the IP address we should specify as source and destination IP address?



- If A wants to send data to machine B, what should be the source IP address to be specified in the IP header of the packet?

  10.18.1.2 or 11.18.5.1

- If A wants to send data to machine B, what should be the destination IP address to be specified in the IP header of the packet?

  192.168.1.2 or 192.168.5.1

Loopback Interfaces

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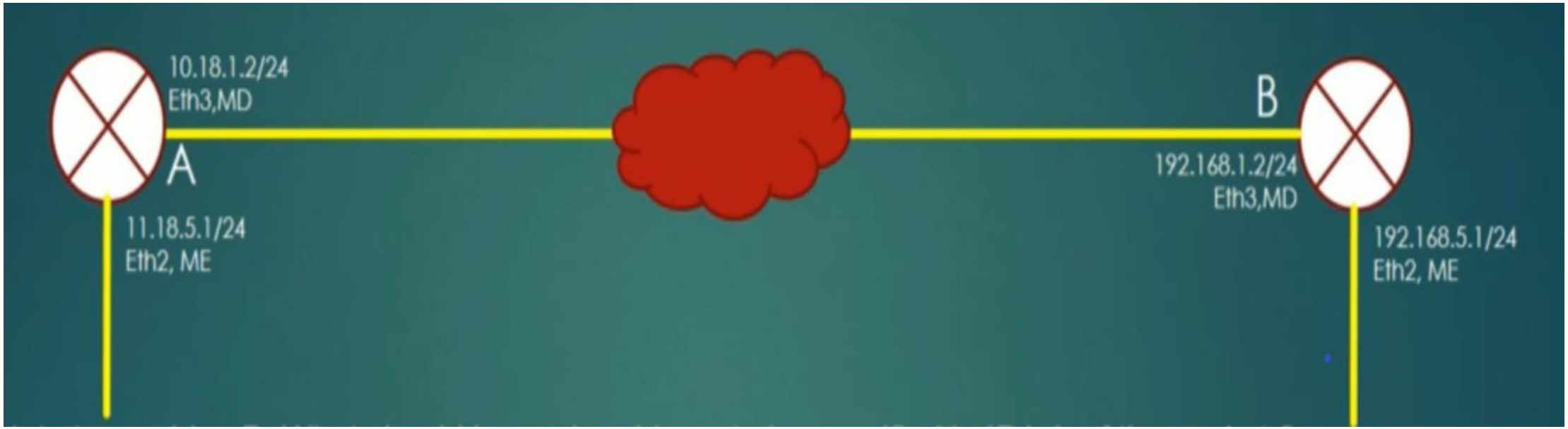
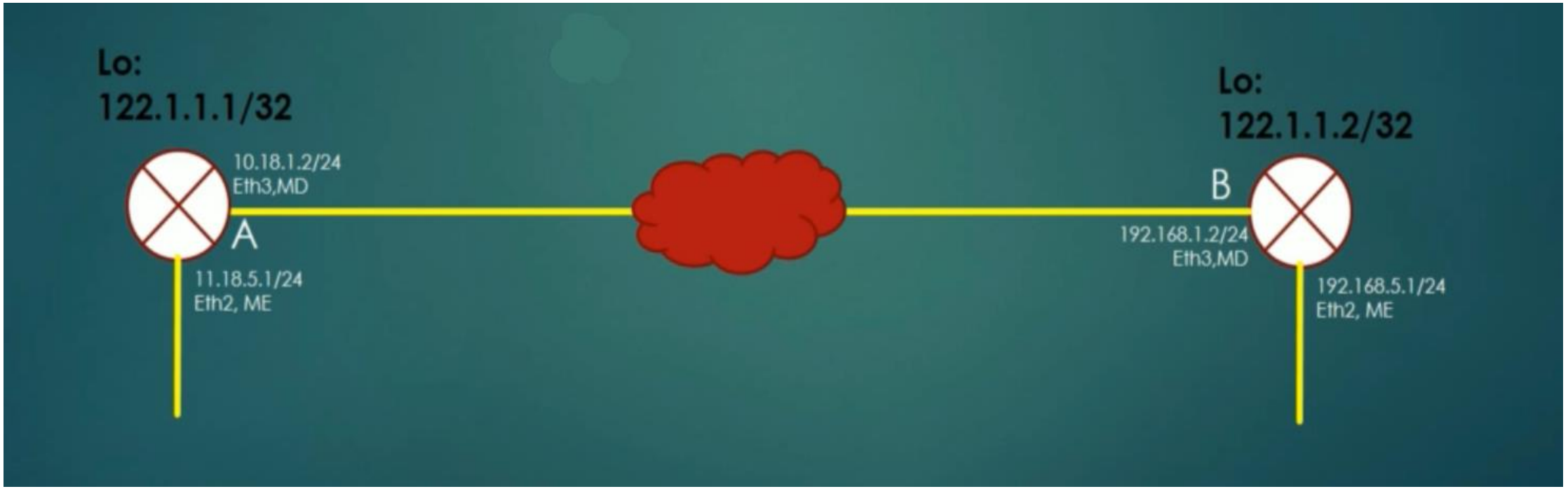


- Ans is: A can specify source IP = IP of any local interface and destination IP = IP of any local interface of B
- And lets call it IP-RULE
- Thus any combination of source IP 10.18.1.2 or 11.18.5.1 and destination IP 192.168.1.2 or 192.168.5.1 would lead to same result. That is packet would be delivered to B by network layer.

Loopback Interfaces

- There is a need to come up with special IP addresses which identify the L3 router as a device in the network and should be unique.
- Loopback addresses help achieve this goal.
- Loopback addresses are used to represent the identity of the networking device.



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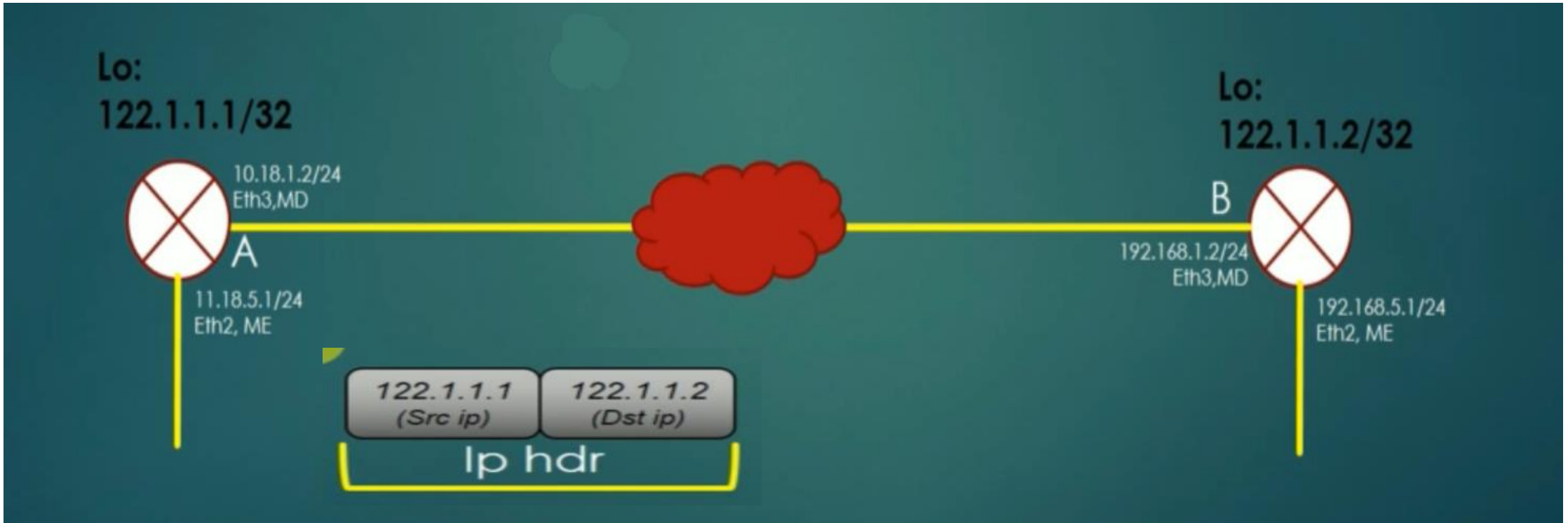
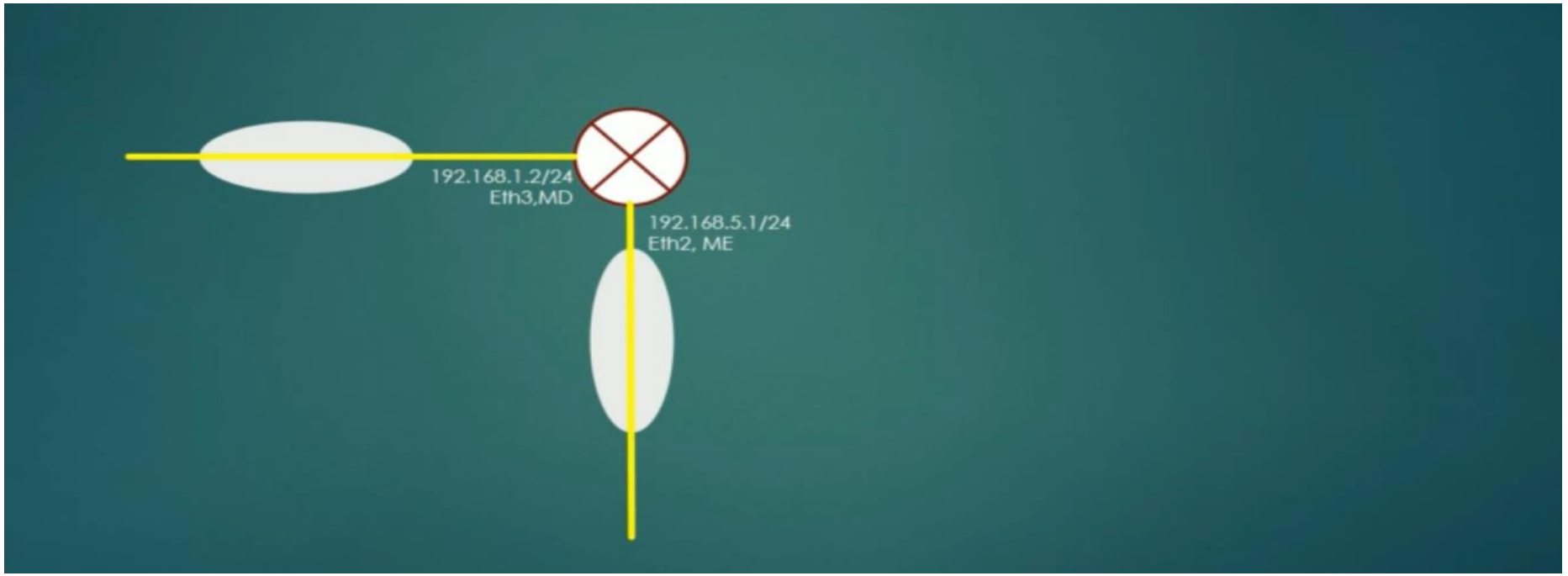


Properties of loopback interface

- Only interfaces have IP addresses, not machines.
- But there should be some way to identify the machine uniquely through IP addresses in the network.
- For this purpose, we create a special software interface called loopback interface on the machine, and assign IP address to it.
- Loopback interface is not hardware, but software based interface, and therefore you can create as many interfaces as you want.
- Loopback interfaces are not prone to hardware failures, because they are not hardware- high availability.
- Therefore, if A create a lo1 interface with IP = 12.1.1.1/32 and, B create a lo1 interface with IP = 13.1.1.1/32,
- A can send packet to B with source IP = 12.1.1.1 and destination IP = 13.1.1.1 also IP rule is still valid, since loopback are also local interface of the machine.
- It is good practice to assign source IP = IP of loopback interface of source machine, destination IP = IP of loopback interface of destination machine.
- Loopback interfaces are not used for any traffic exchange- it serves the purpose of device reachability in the network.
- Eg: machine A can send the data to machine B using B's loopback address as the destination address.
- Once packet reaches to machine B, machine B consumes the packet.
- B do not forward the packet out of loopback interface because loopback interface is a conceptual concept and not a physical interface.

Properties of loopback interface

- View loopback interface as just another interface.
- Loopback address itself is one subnet with mask value always 32.



- Loopback subnet (A.B.C.D/32) is always a local subnet for the local router and remote subnet for any other network device.

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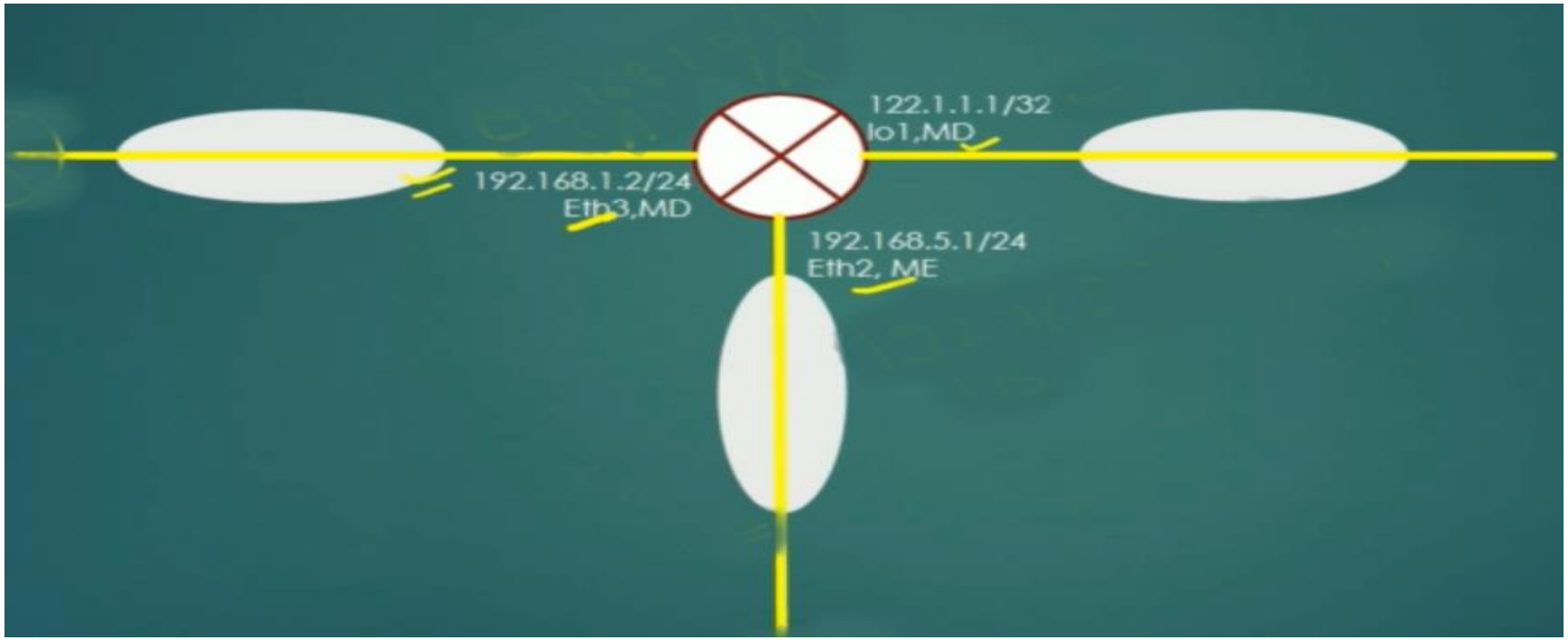

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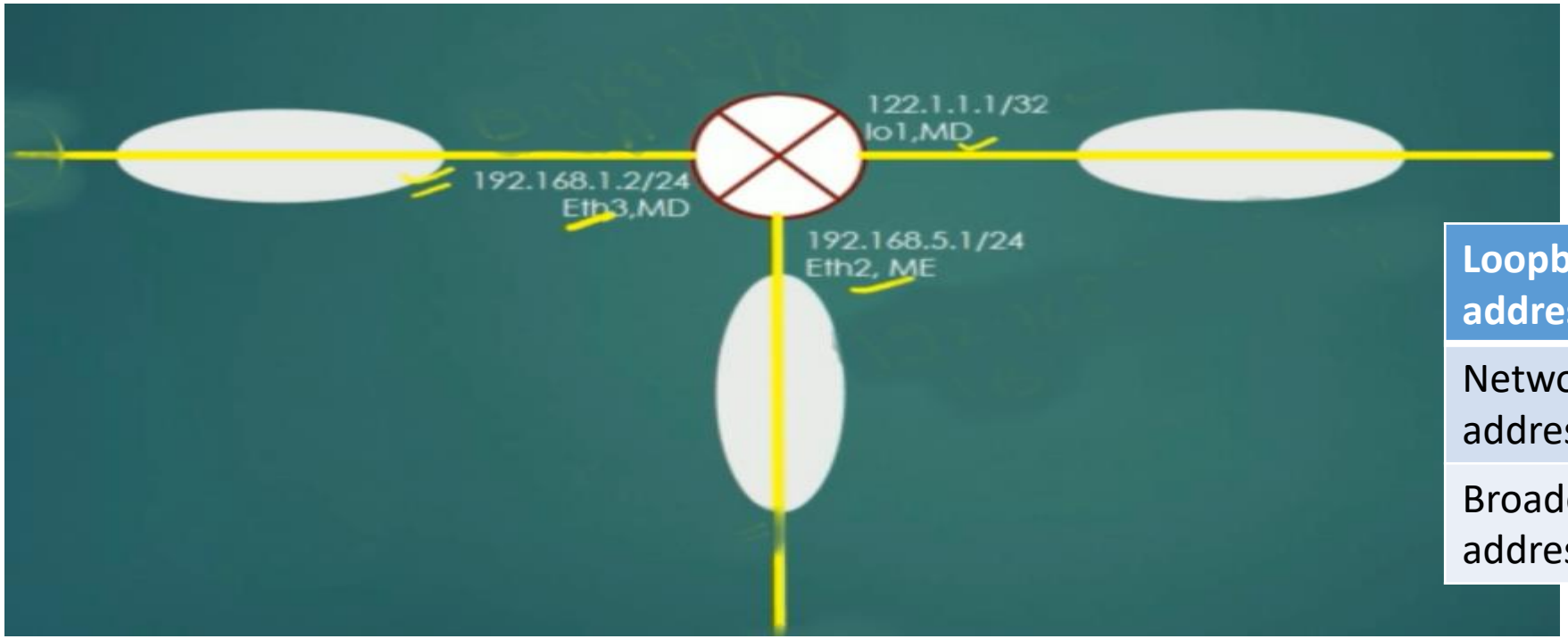

Loopback address	122.1.1.1/32
Network address	122.1.1.1/32
Broadcast address	122.1.1.1/32

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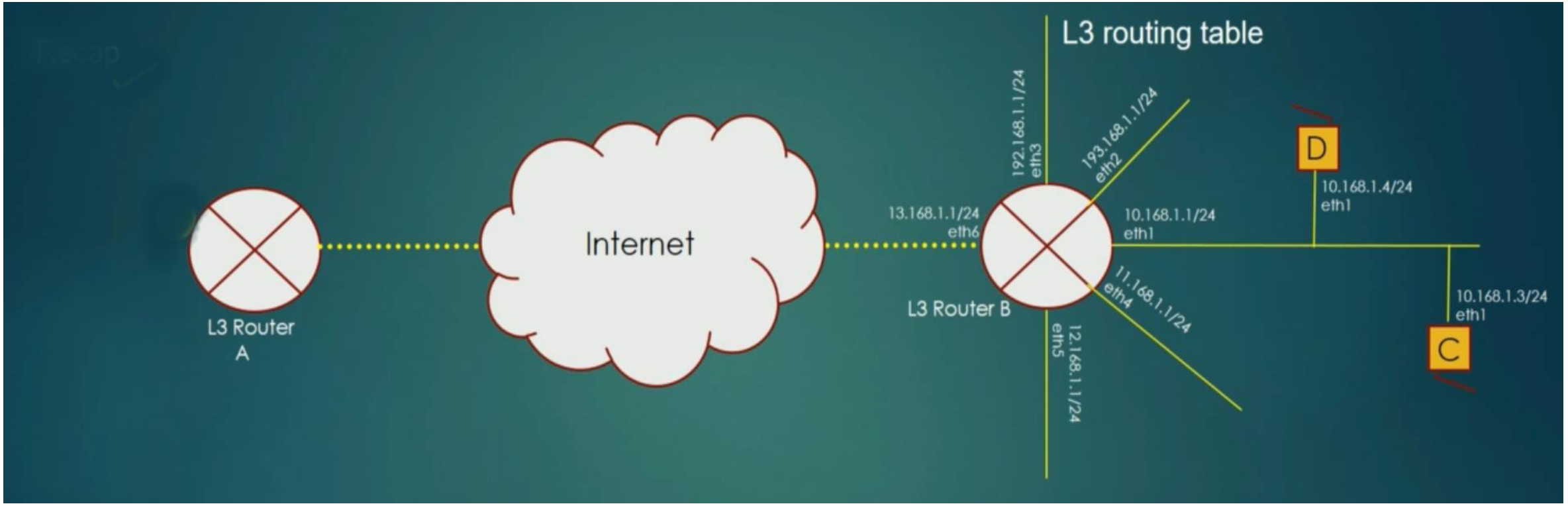
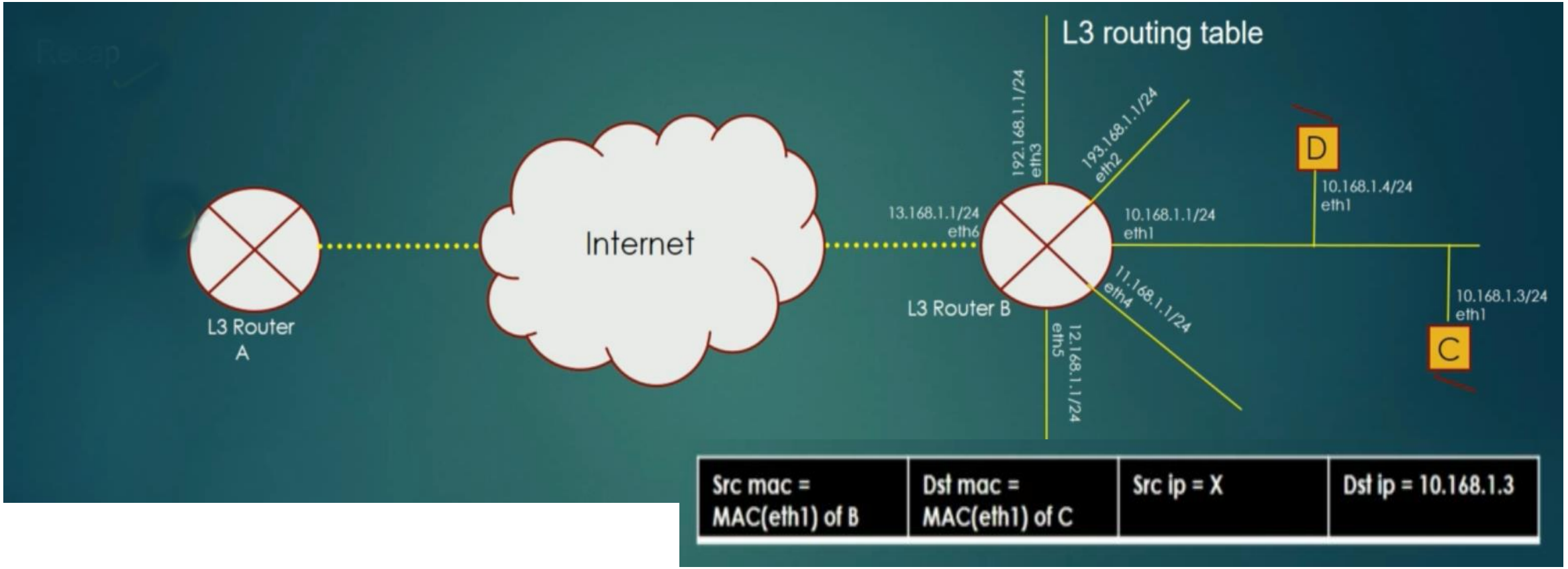
Layer 3 Routing Using Loopback IP Addresses



Destination IP address in the packet = 10.168.1.3

Layer 3 Routing Using Loopback IP Addresses



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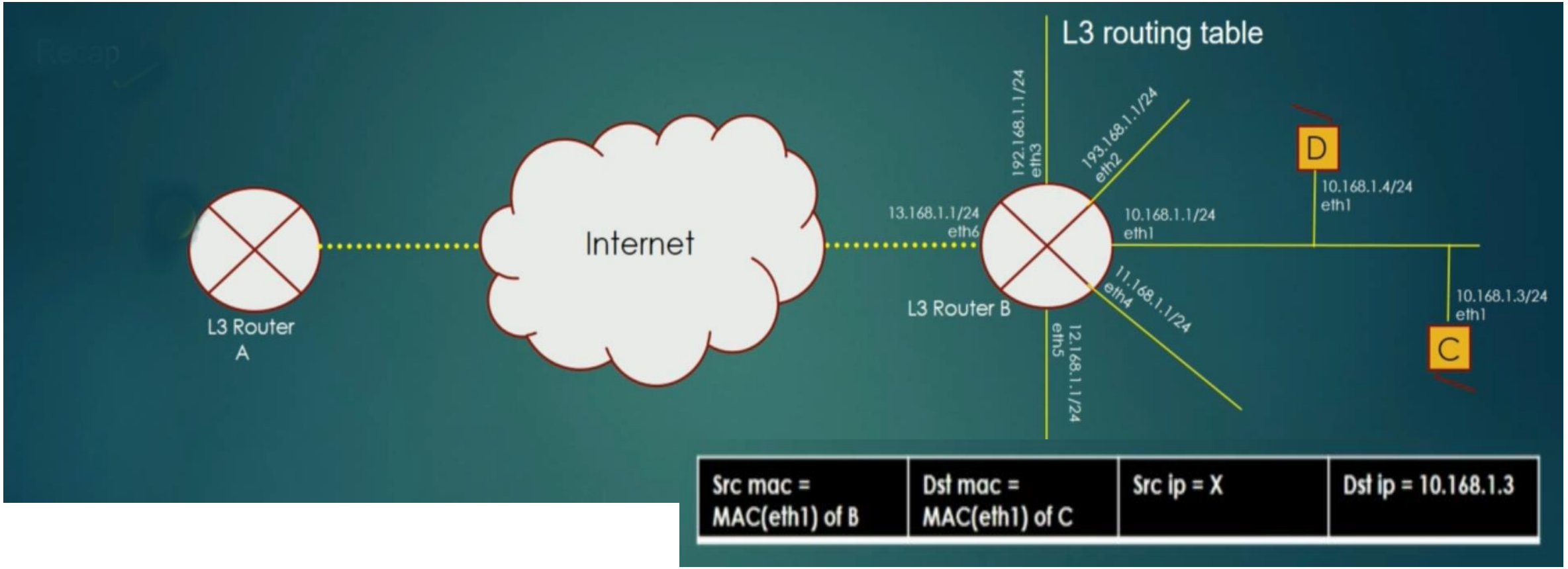
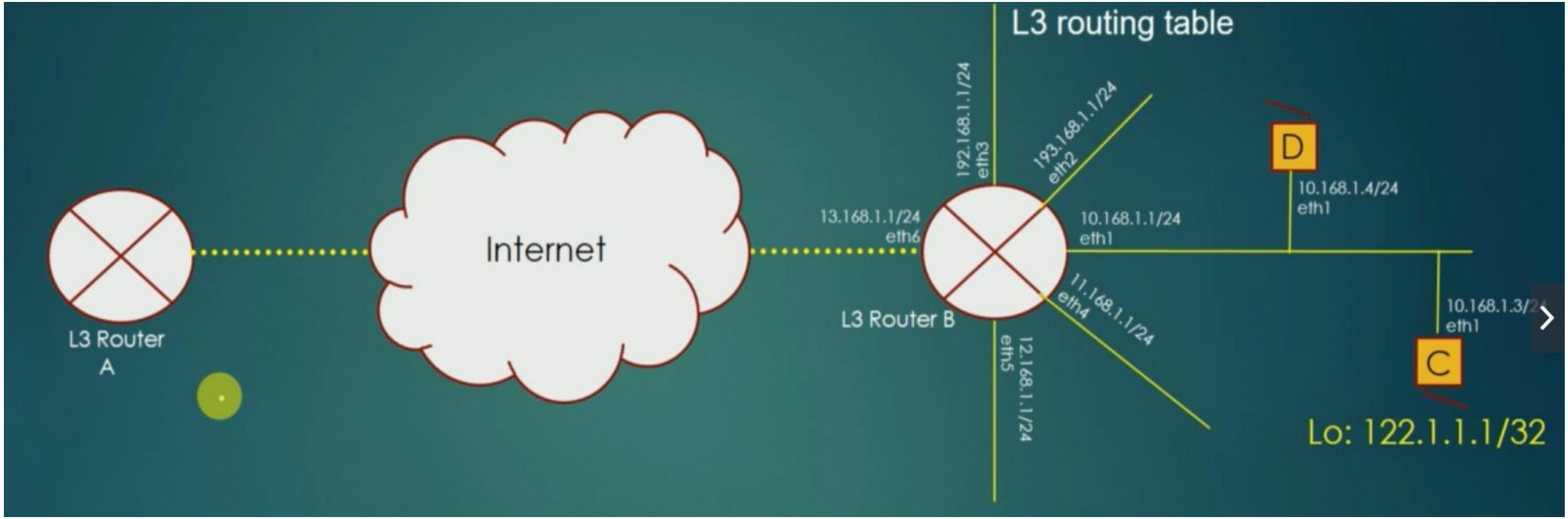


Destination IP address in the packet = 10.168.1.3

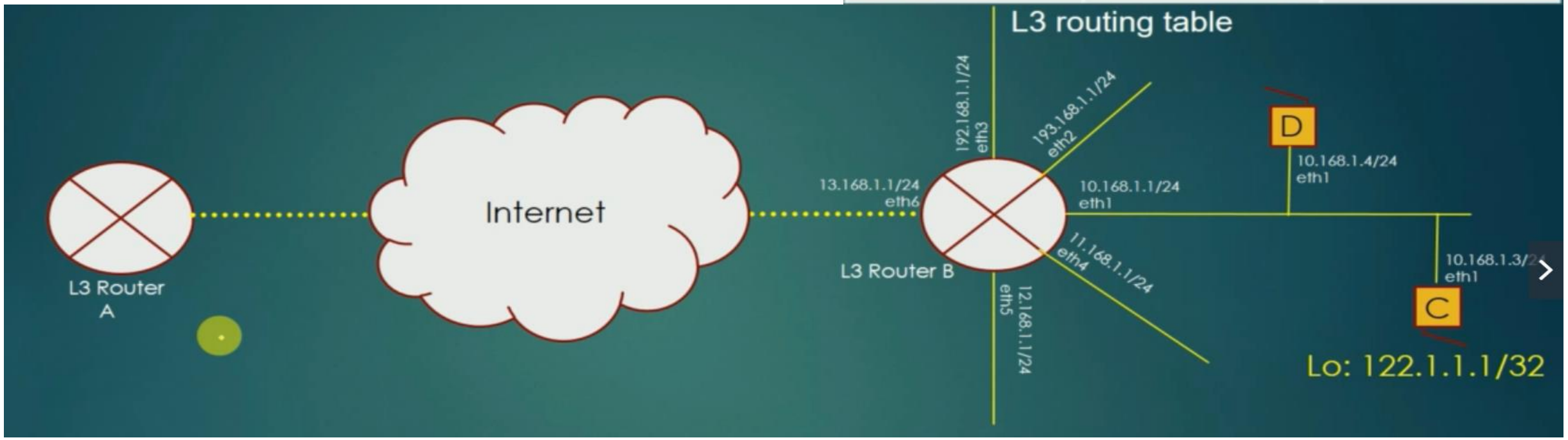
Destination IP address falls in the local subnet of router B, therefore router B propagates the packet to the destination C via L2 routing.

Layer 3 Routing Using Loopback IP Addresses



Destination IP address in the packet = 122.1.1.1

Destination Subnet	Gateway Ip	OIF
10.168.1.0/24	-	-
122.1.1.1/32	10.168.1.3	eth1



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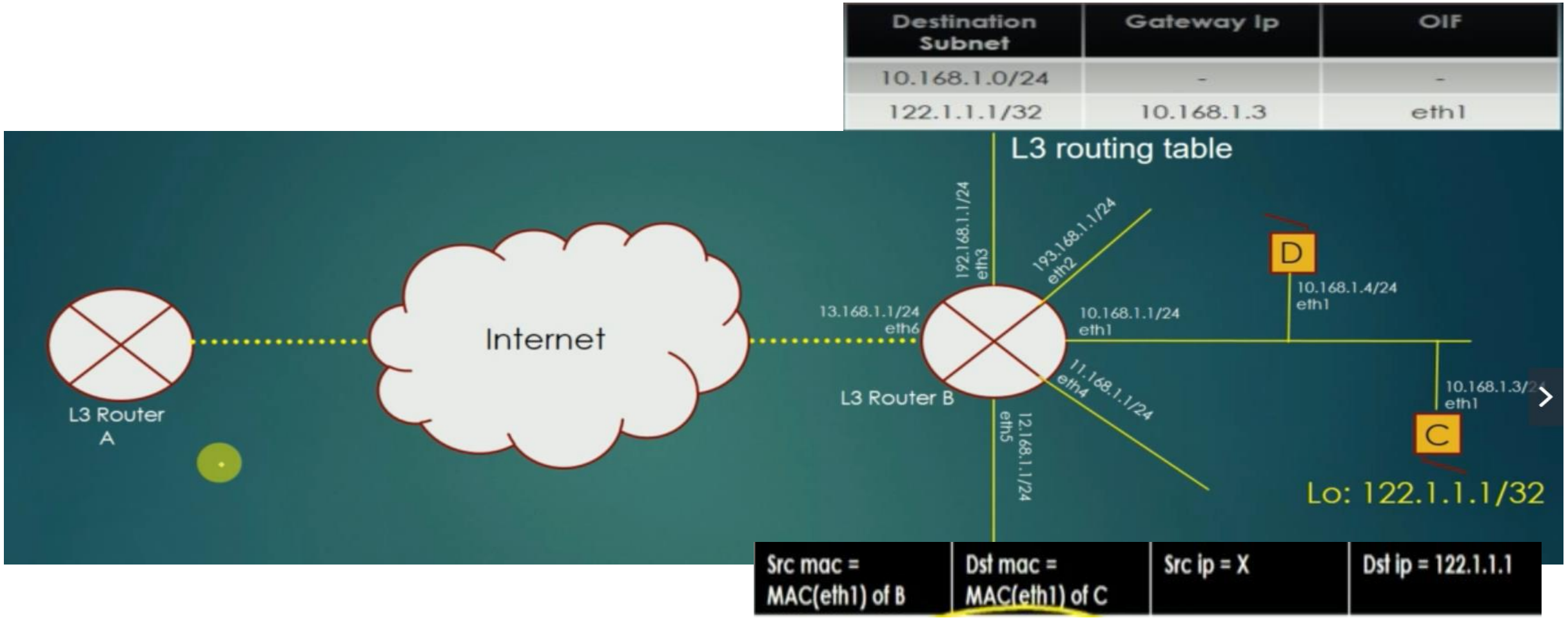
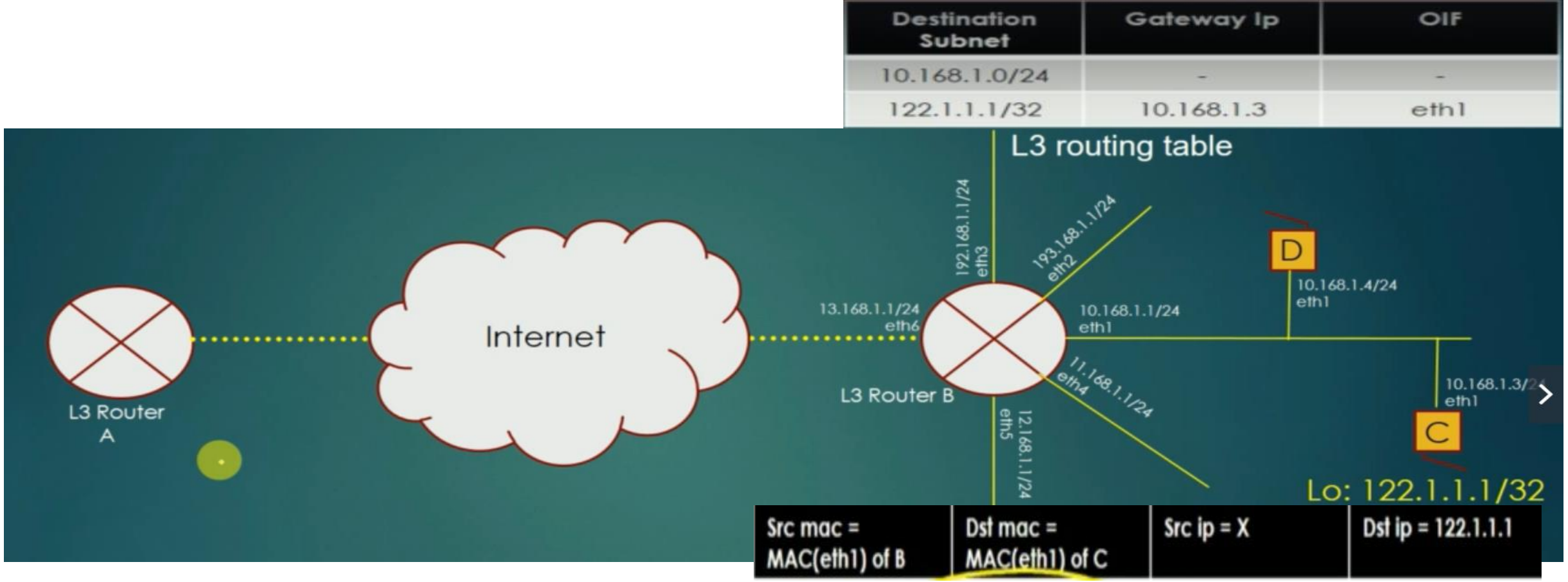


Destination IP address in the packet = 122.1.1.1

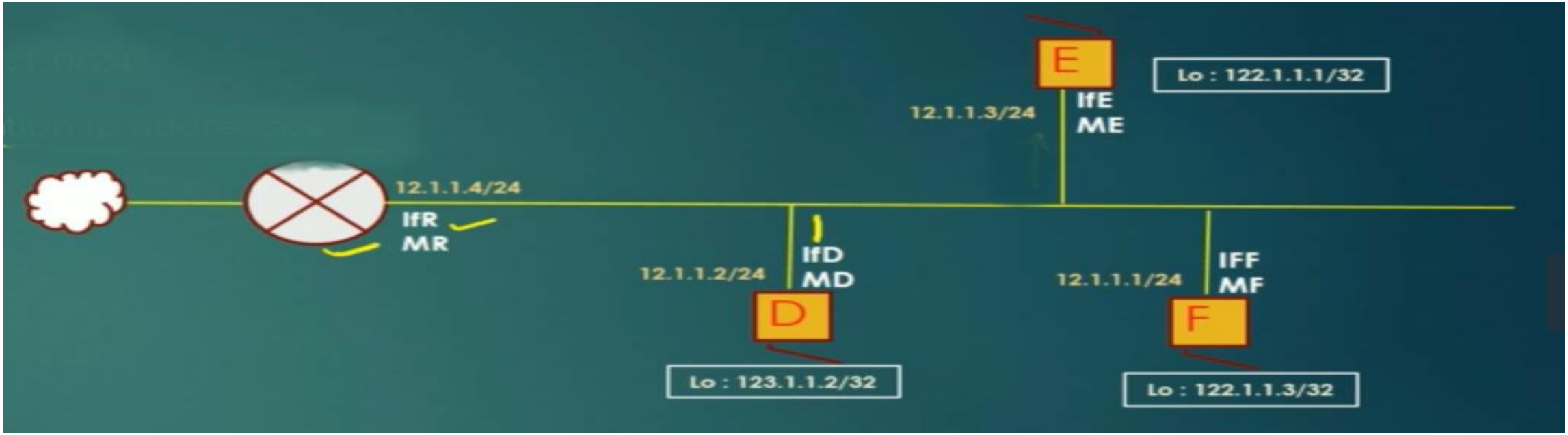


- Destination IP address in the packet = 122.1.1.1
- Dst IP address falls in the subnet (122.1.1.1/32) which is remote subnet wrt router B, therefore router B propagates the packet further to the destination C via L3 routing.
- If dest address is loopback address of the dest machine, packet never undergoes L2 routing.

Layer 3 Routing Using Loopback IP Addresses

- Machines D,E and F are present in the same local subnet 12.1.1.0/24
- D,E and F can communicate with each other using Destination IP addresses as 12.1.1.x using pure L2 routing.
- Ex: D can send a packet to E using Dst. IP address as 12.1.1.3

Layer 3 Routing Using Loopback IP Addresses



- But can D send a packet to E using Dst. IP =122.1.1.1?
- 122.1.1.1 do not falls in any local subnet of D.
- Therefore, D is trying to send a packet to remote subnet.
- Hence, D can send a packet to E using only L3 routing and for that D should have following L3 routing entry.

L3 entry:	**122.1.1.1/32**	**122.1.1.3**	**IFD**

- If Dst address is loopback address of dst machine, packet never undergoes L2 routing even if communication machine are physically present in same subnet.

Thank You