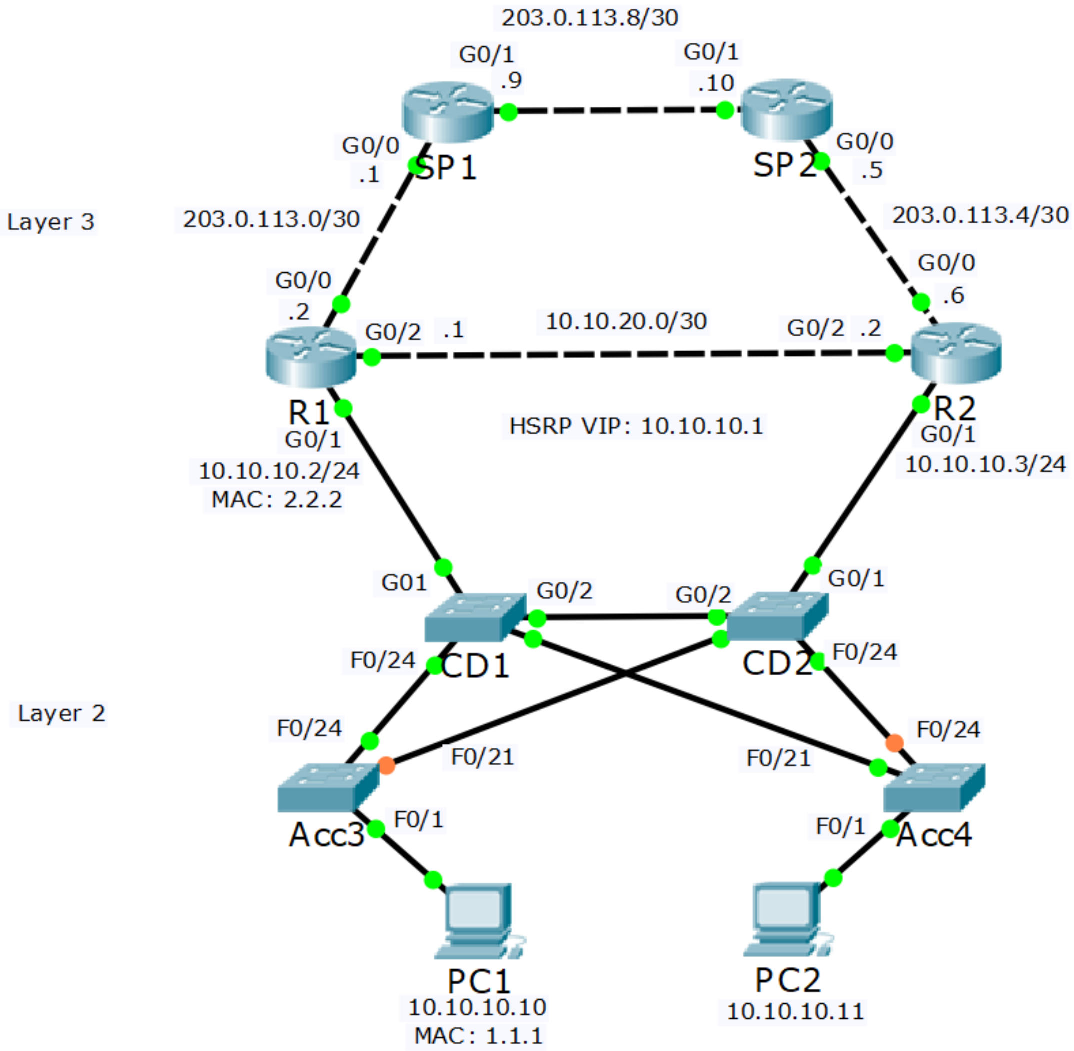
Ethernet Path Selection Review



- Layer 2 Ethernet path selection is controlled by the switch’s MAC address tables
- In this example PC1 wants to send traffic to 10.10.10.2 on R1

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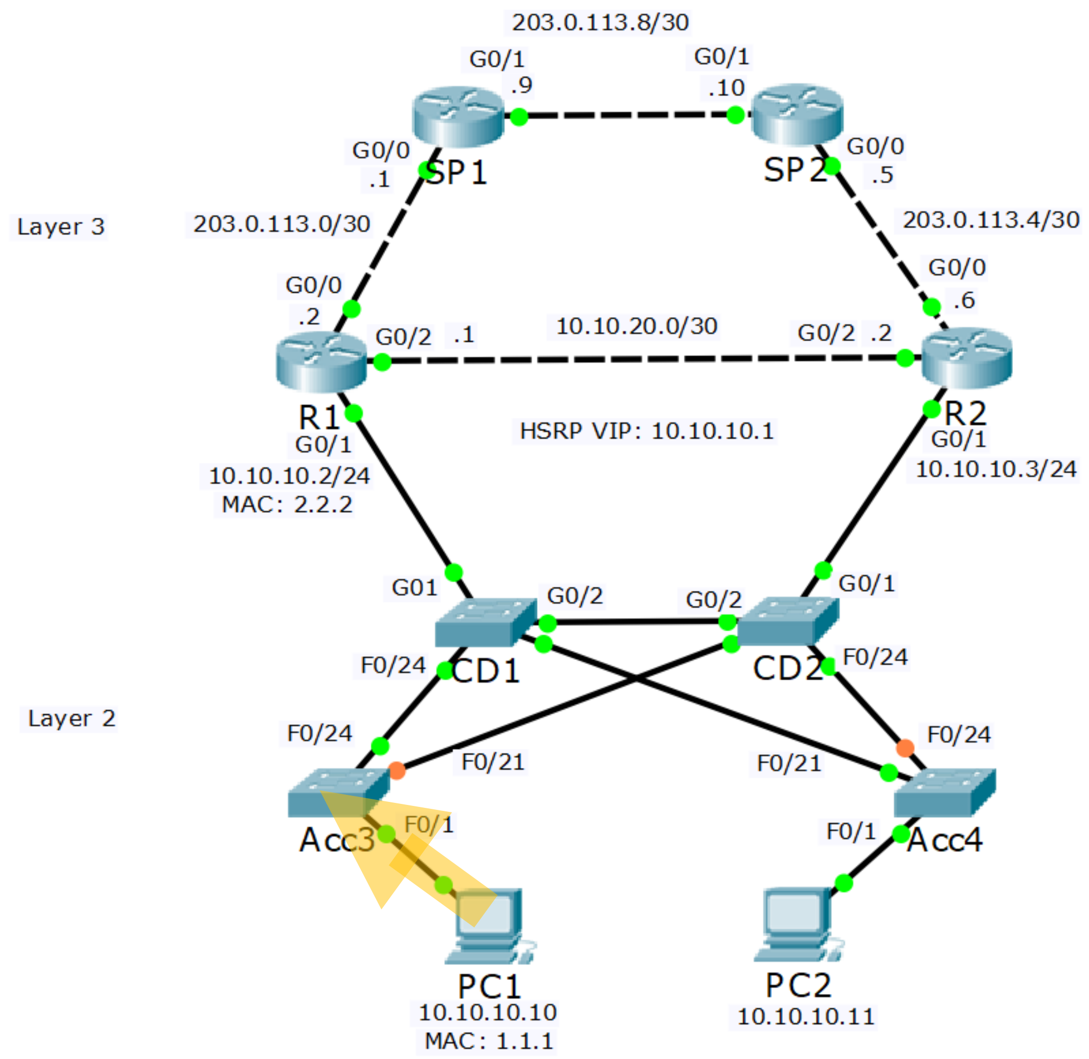
Ethernet Path Selection Review

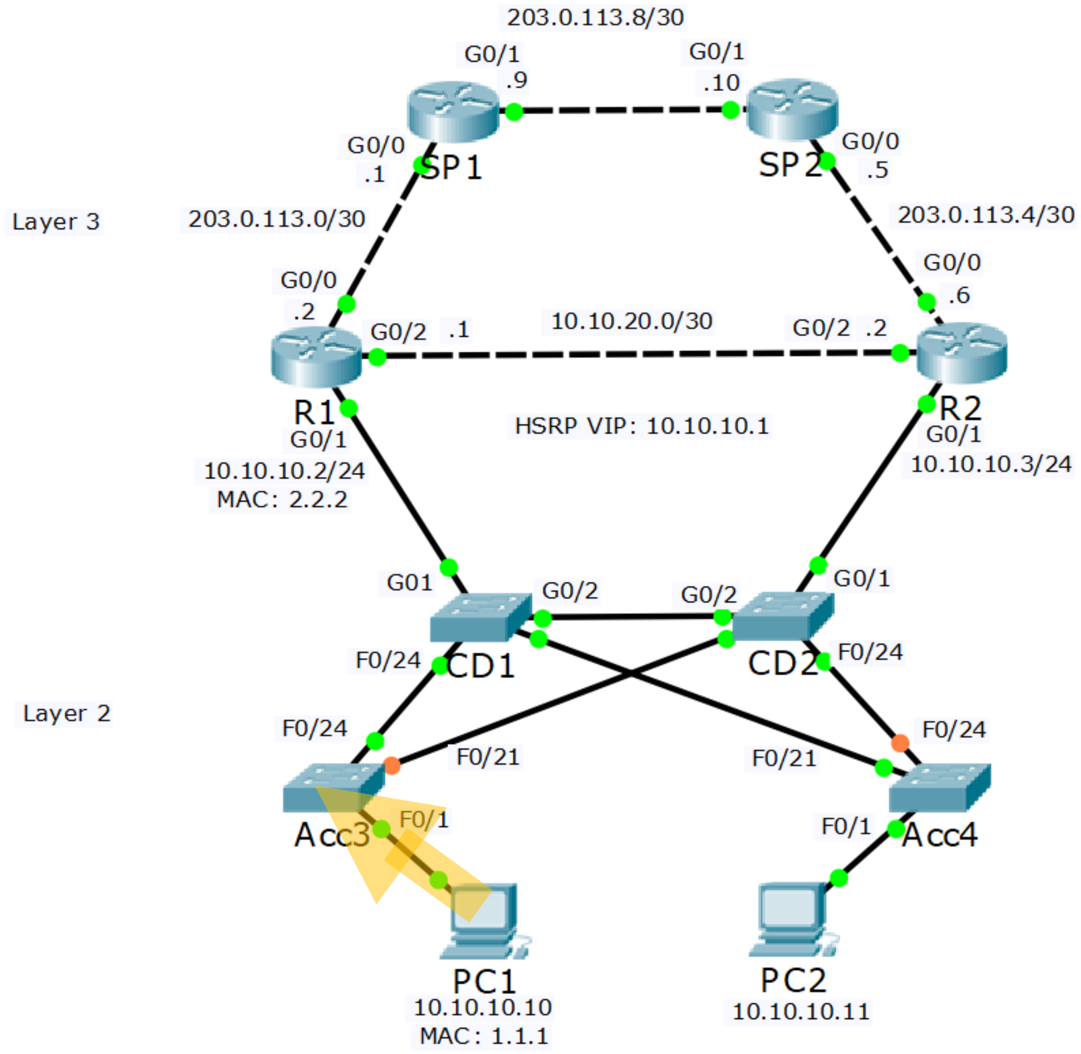
- If we didn’t have Spanning Tree…

Ethernet Path Selection Review



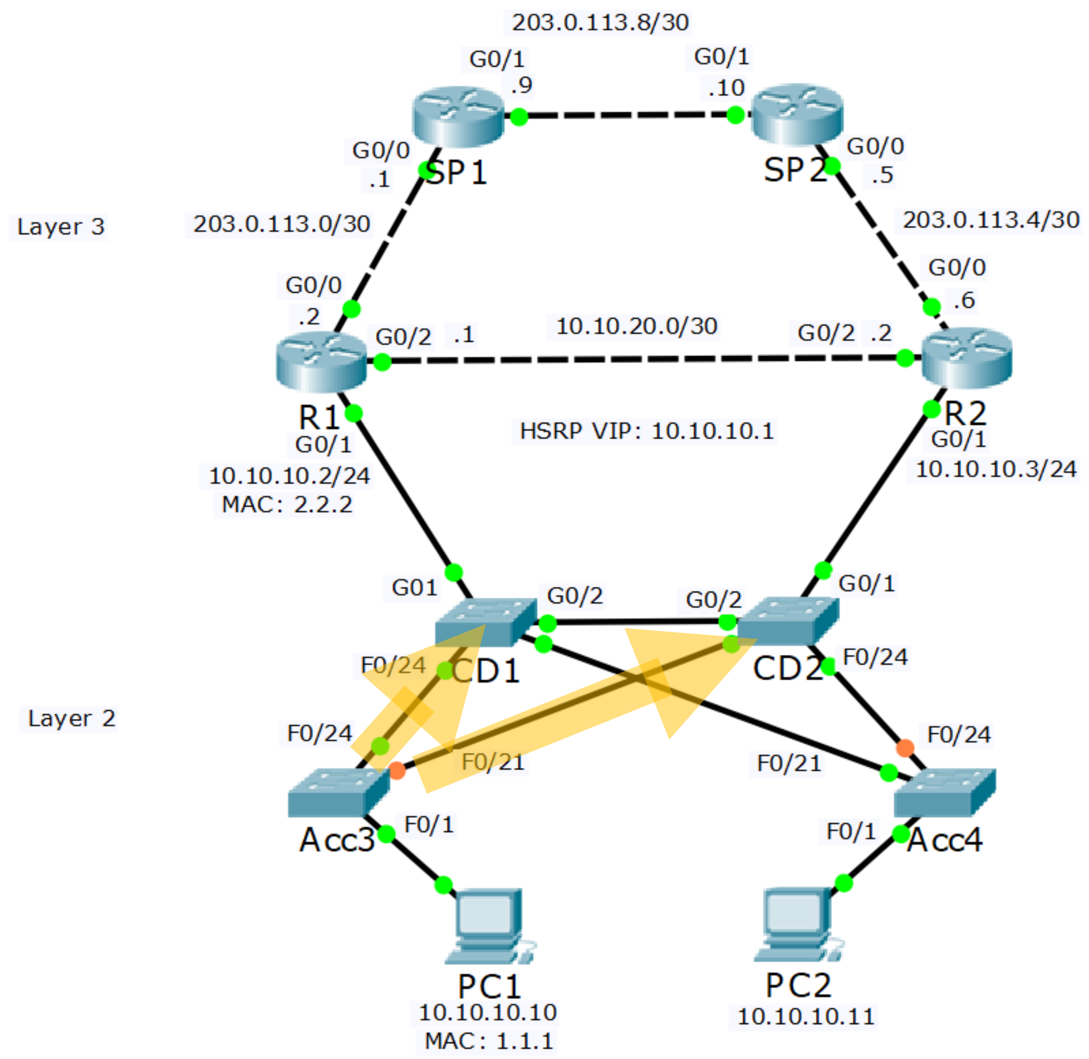
- PC1 sends an ARP request for 10.10.10.2
- Source MAC: 1.1.1
- Destination MAC: F.F.F

Ethernet Path Selection Review



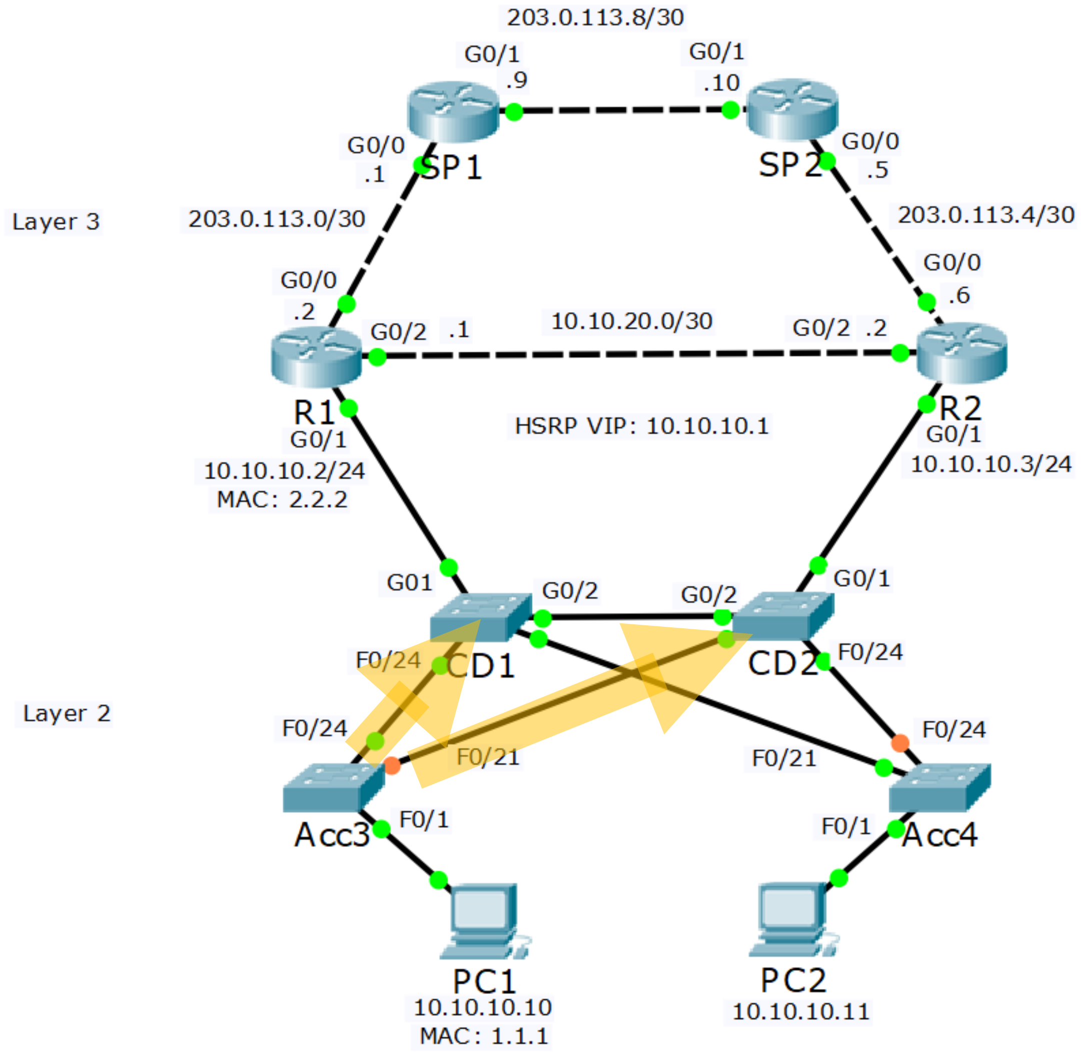
- Switch Acc3 learns that MAC address 1.1.1 is available via interface F0/1
- Any subsequent traffic for 1.1.1 will be forwarded out that port

Ethernet Path Selection Review



- Switch Acc3 floods the broadcast traffic out all ports apart from the one it was received on

Ethernet Path Selection Review



- Switch CD1 learns that MAC address 1.1.1 is available via interface F0/24
- Switch CD2 learns that MAC address 1.1.1 is available via interface F0/21
- Any subsequent traffic for 1.1.1 that hits either switch will be forwarded out those ports

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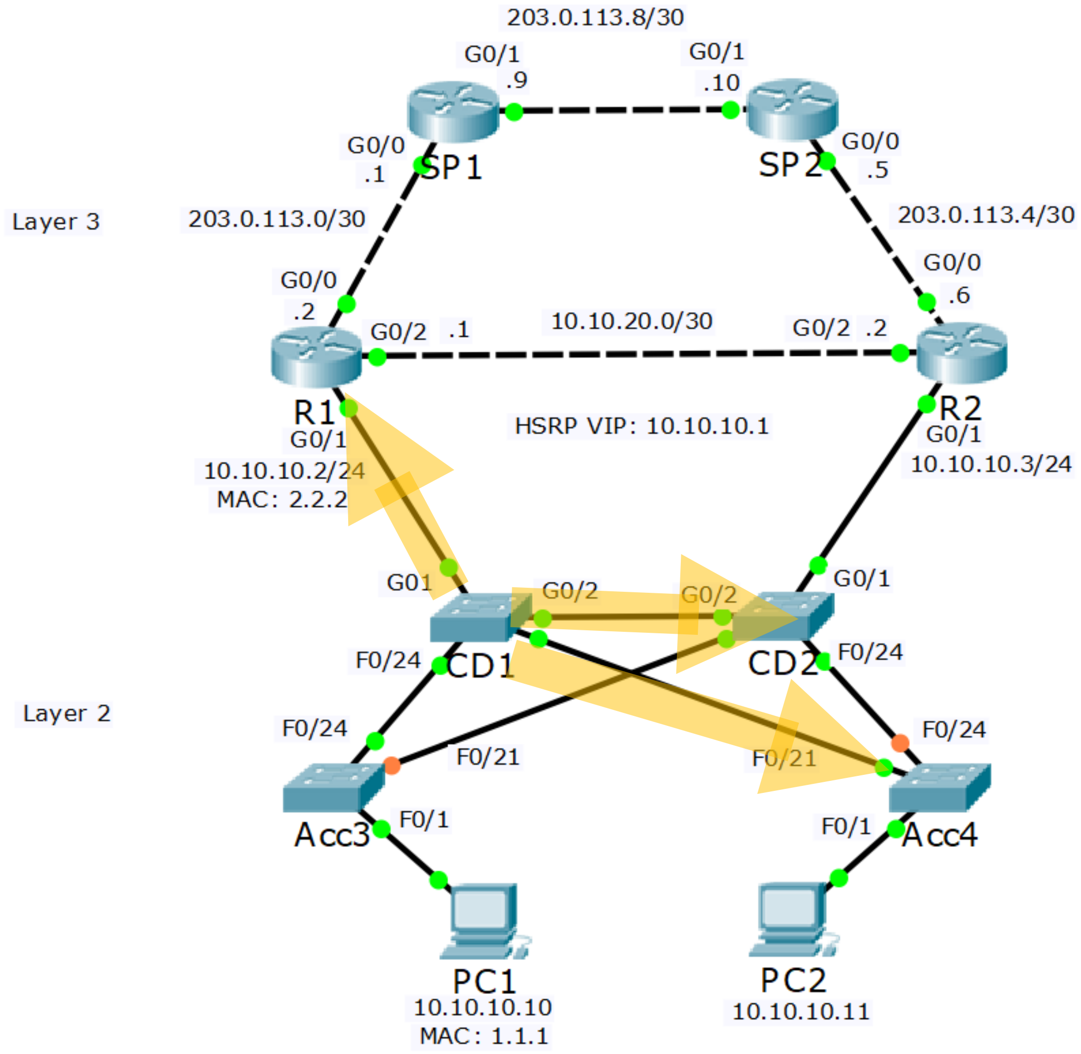
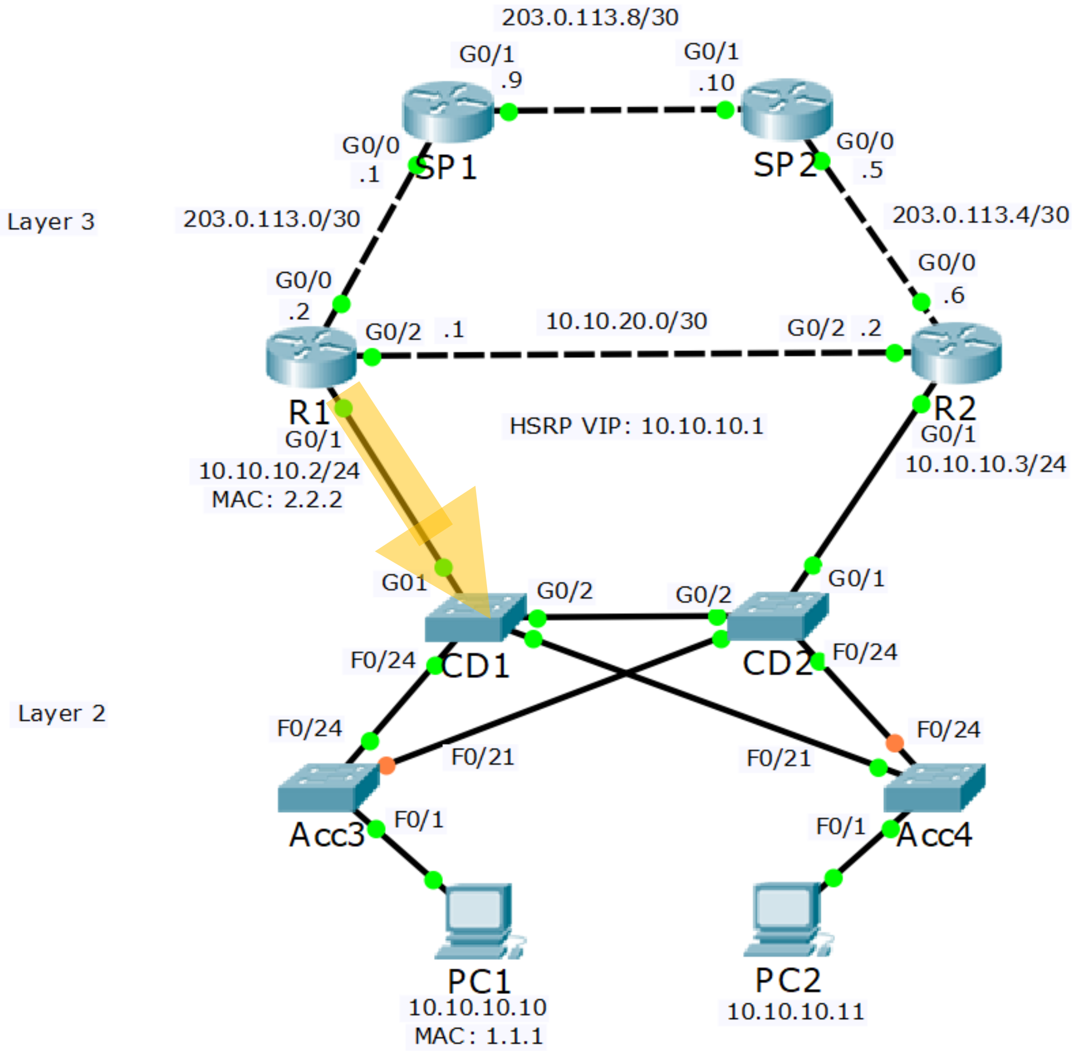
Ethernet Path Selection Review



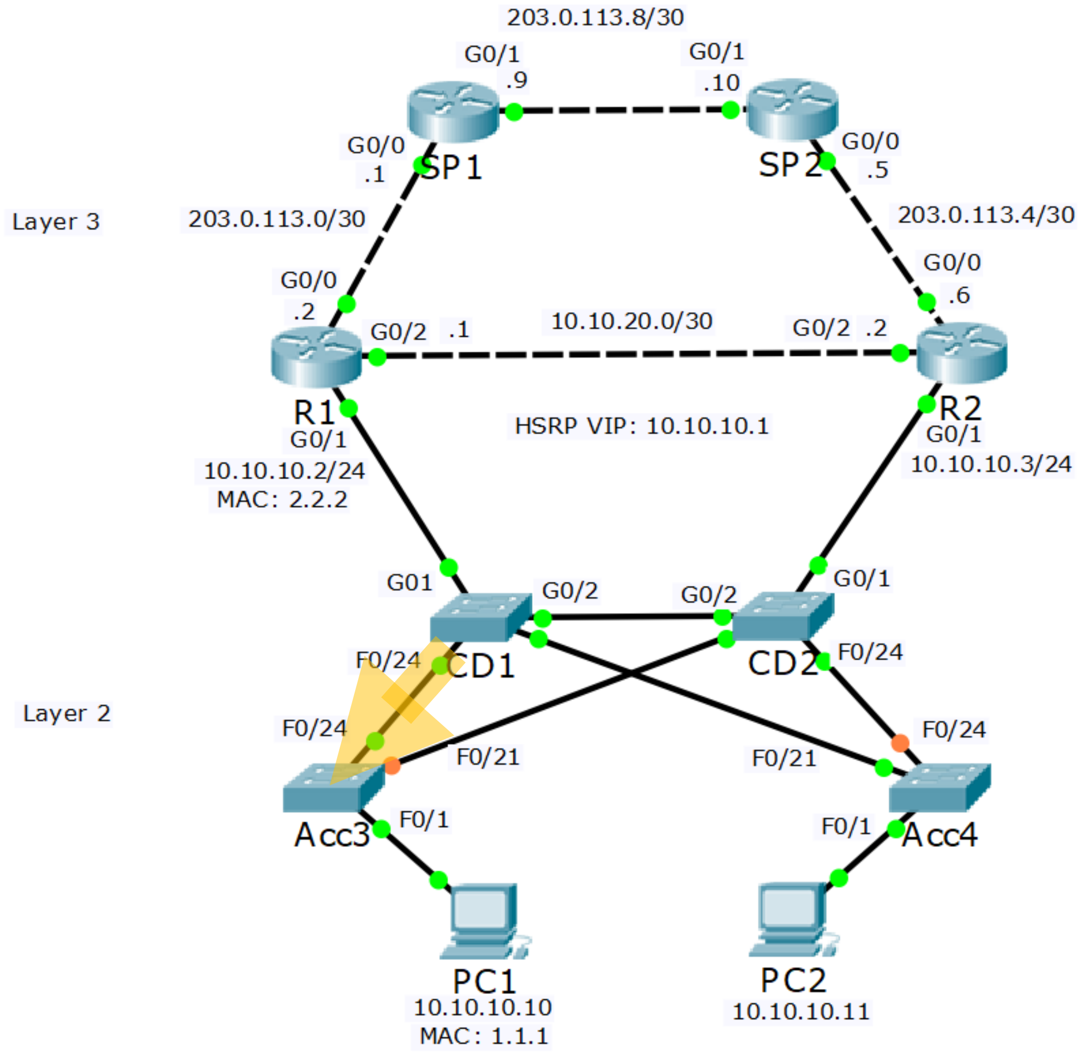
- Switch CD1 floods the broadcast traffic out all ports apart from the one it was received on
- The traffic reaches R1

Ethernet Path Selection Review



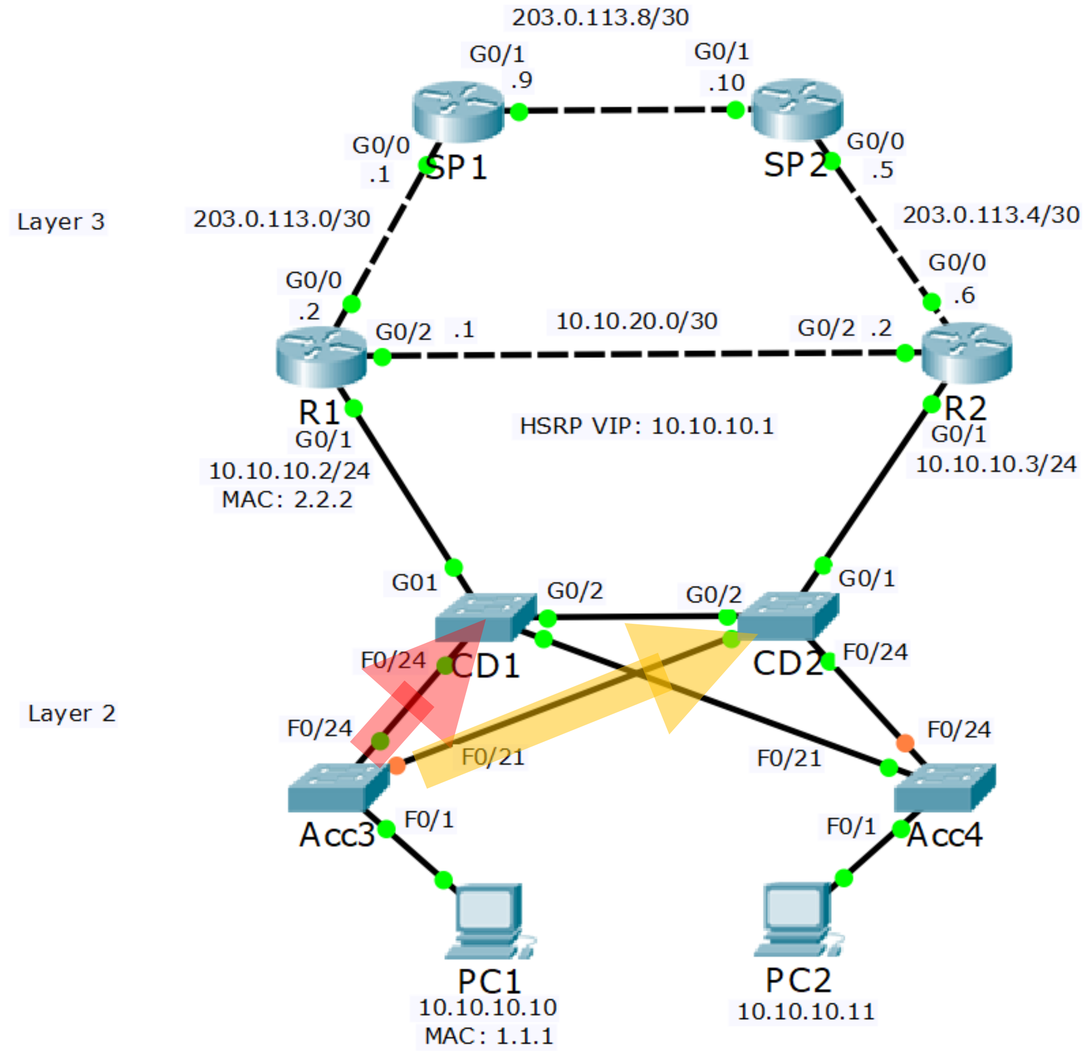
- R1 responds to the ARP request
- Switch CD1 learns that MAC address 2.2.2 is available via interface G0/1
- Any subsequent traffic for 2.2.2 will be forwarded out that port

Ethernet Path Selection Review



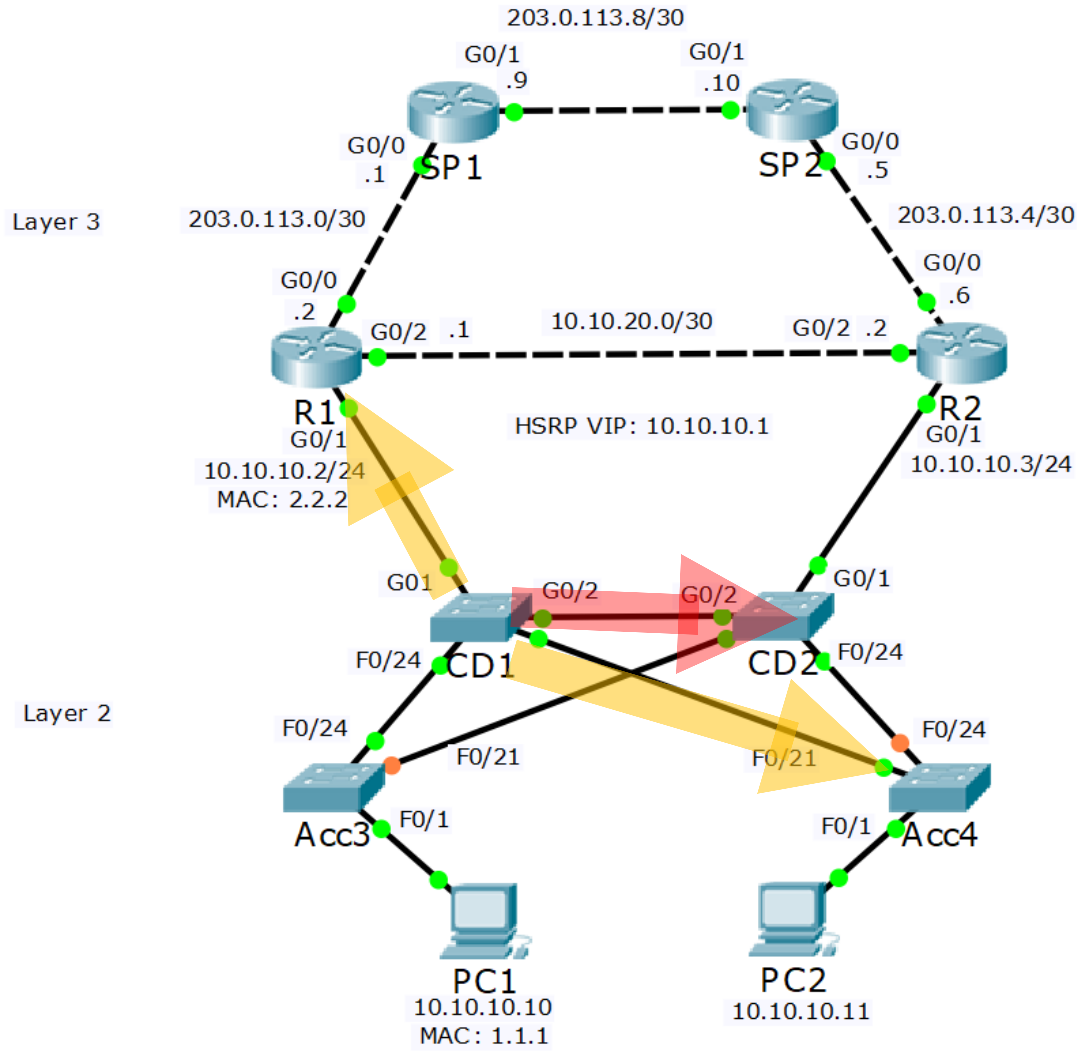
- Switch CD1 already knows to forward traffic for 1.1.1 out interface F0/24
- Switch Acc3 learns that MAC address 2.2.2 is available via interface F0/24
- Any subsequent traffic for 2.2.2 will be forwarded out that port
- We now have end to end path selection in both directions

Layer 2 Loops



- Let’s go back to the start…
- Switch Acc3 receives the ARP request from PC1 and floods the broadcast traffic out all ports apart from the one it was received on
- This includes port F0/24 facing CD1

Layer 2 Loops



- Switch CD1 receives the ARP request from Acc3 and floods the broadcast traffic out all ports apart from the one it was received on
- This includes port G0/2 facing CD2

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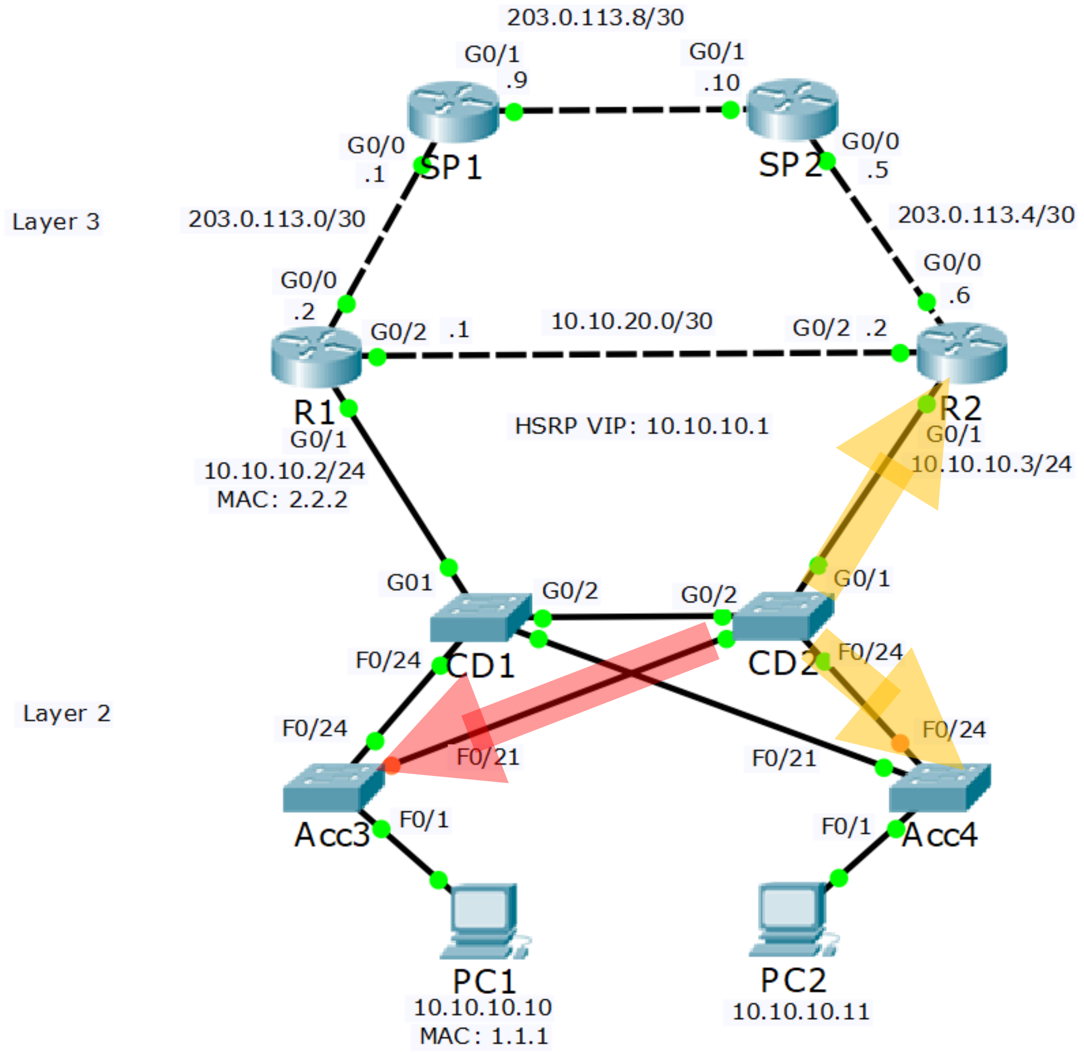
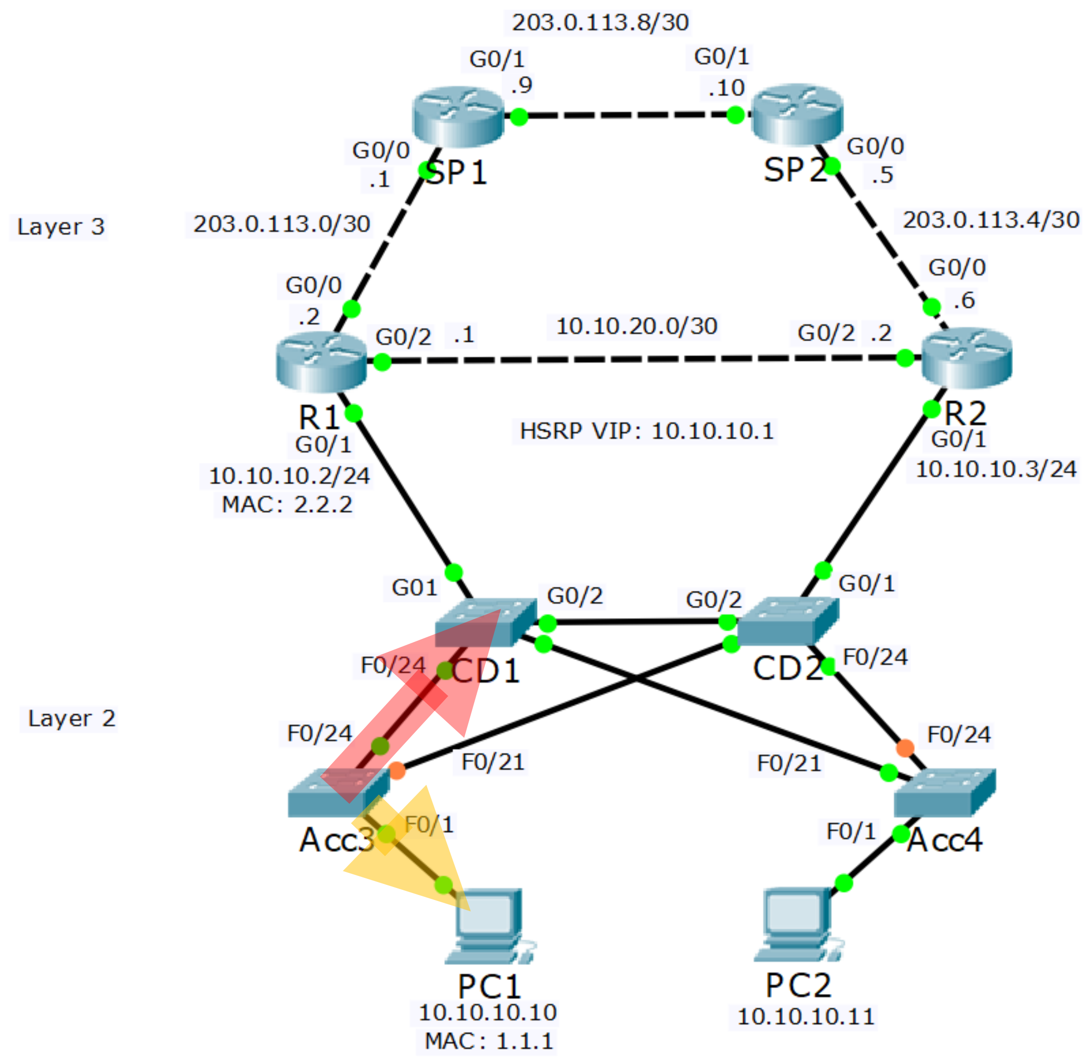
Layer 2 Loops



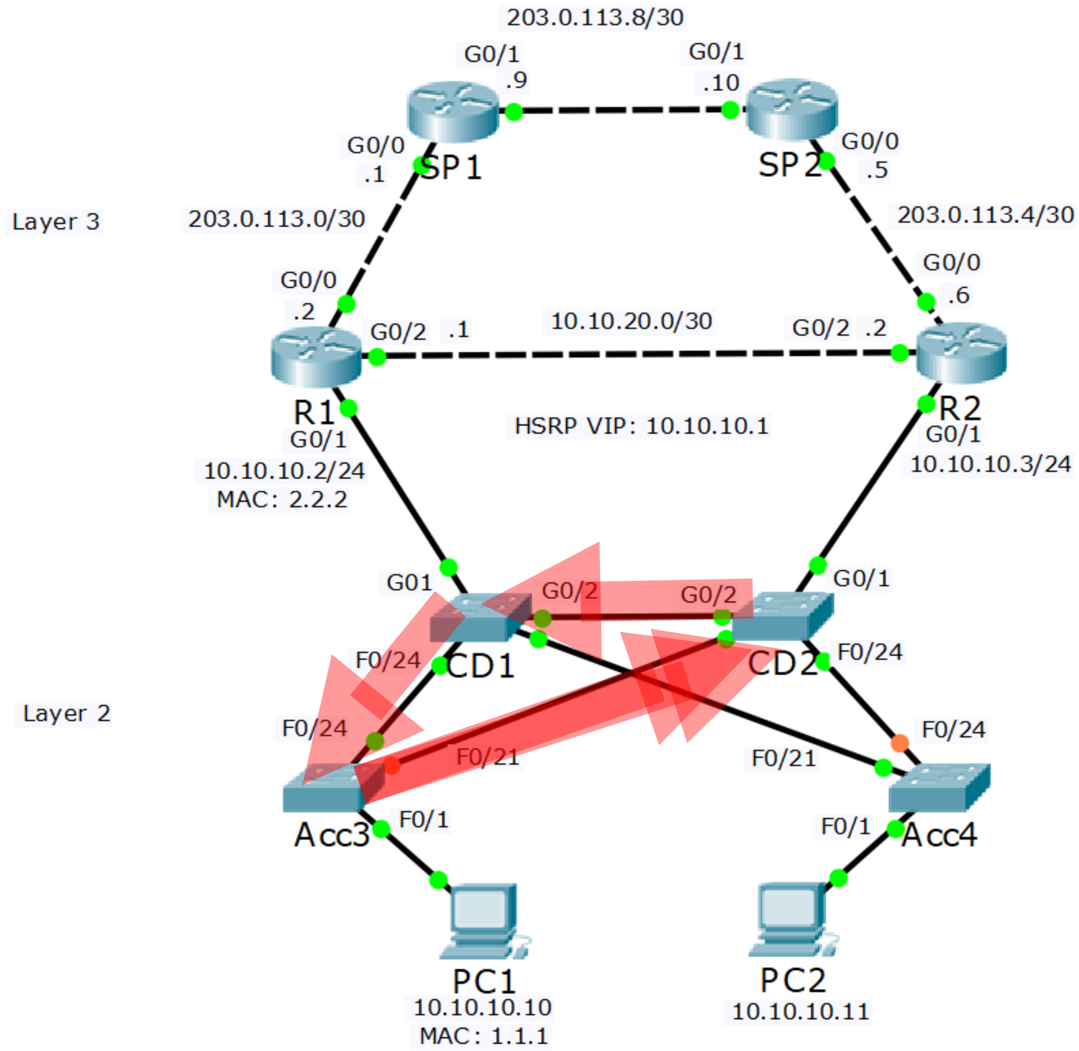
- Switch CD2 receives the broadcast traffic and floods it out all ports apart from the one it was received on
- This includes port F0/21 facing Acc3

Layer 2 Loops



- Acc3 sends the traffic back to CD1 again, which will send it back to CD2, which will send it back to Acc3
- We now have a loop running clockwise between Acc3>CD1>CD2

Layer 2 Loops



- The broadcast traffic was also forwarded out interface F0/21 by Acc3
- We also have a loop running counter-clockwise between Acc3>CD2>CD1

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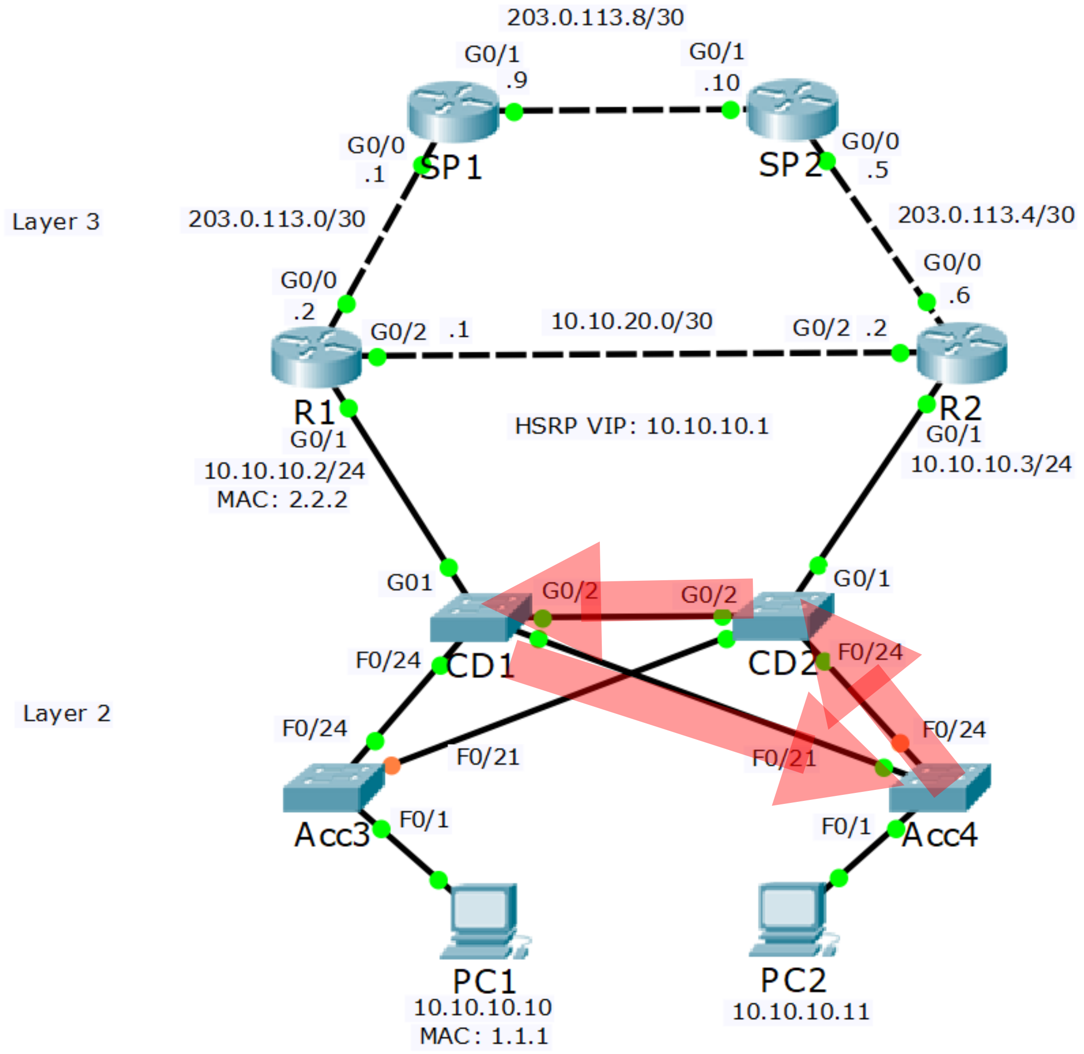
Layer 2 Loops



- The broadcast traffic was also forwarded out interface F0/21 by CD1
- We also have a loop running counter-clockwise between CD1>Acc4>CD2

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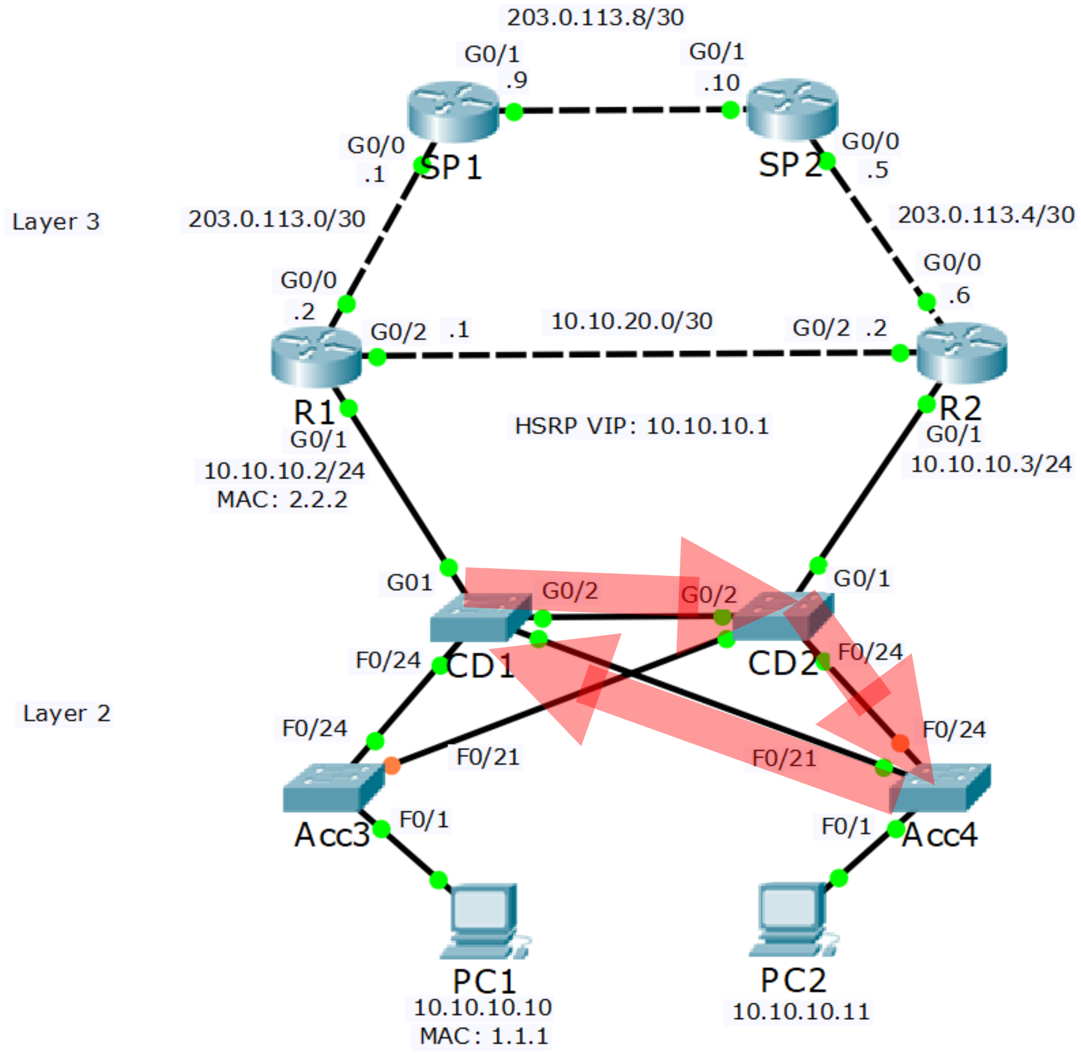
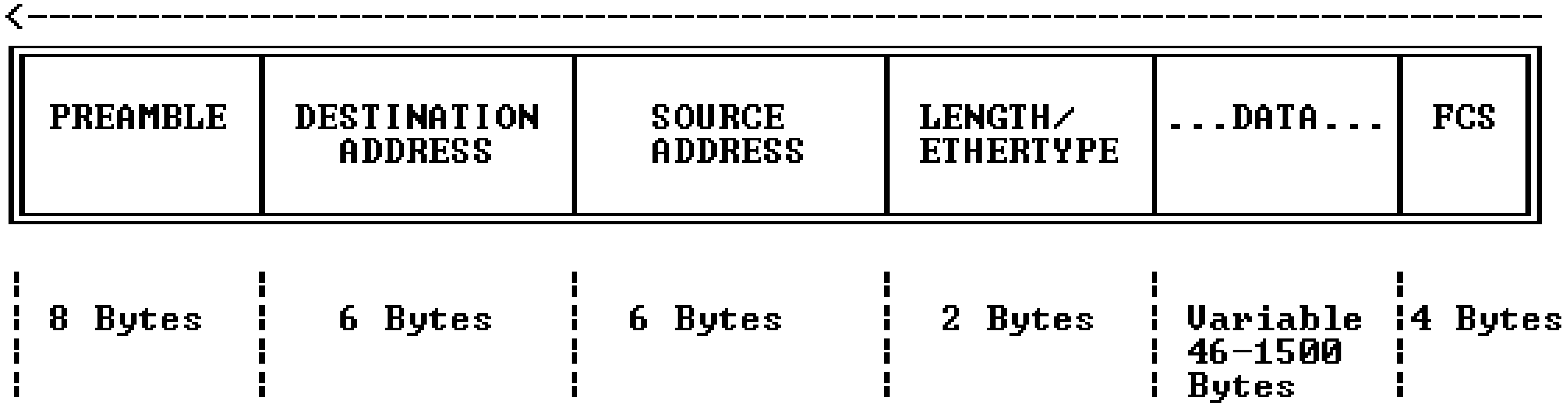
Layer 2 Loops



- The broadcast traffic was also forwarded out interface F0/24 by CD2
- We also have a loop running clockwise between CD2>Acc4>CD1

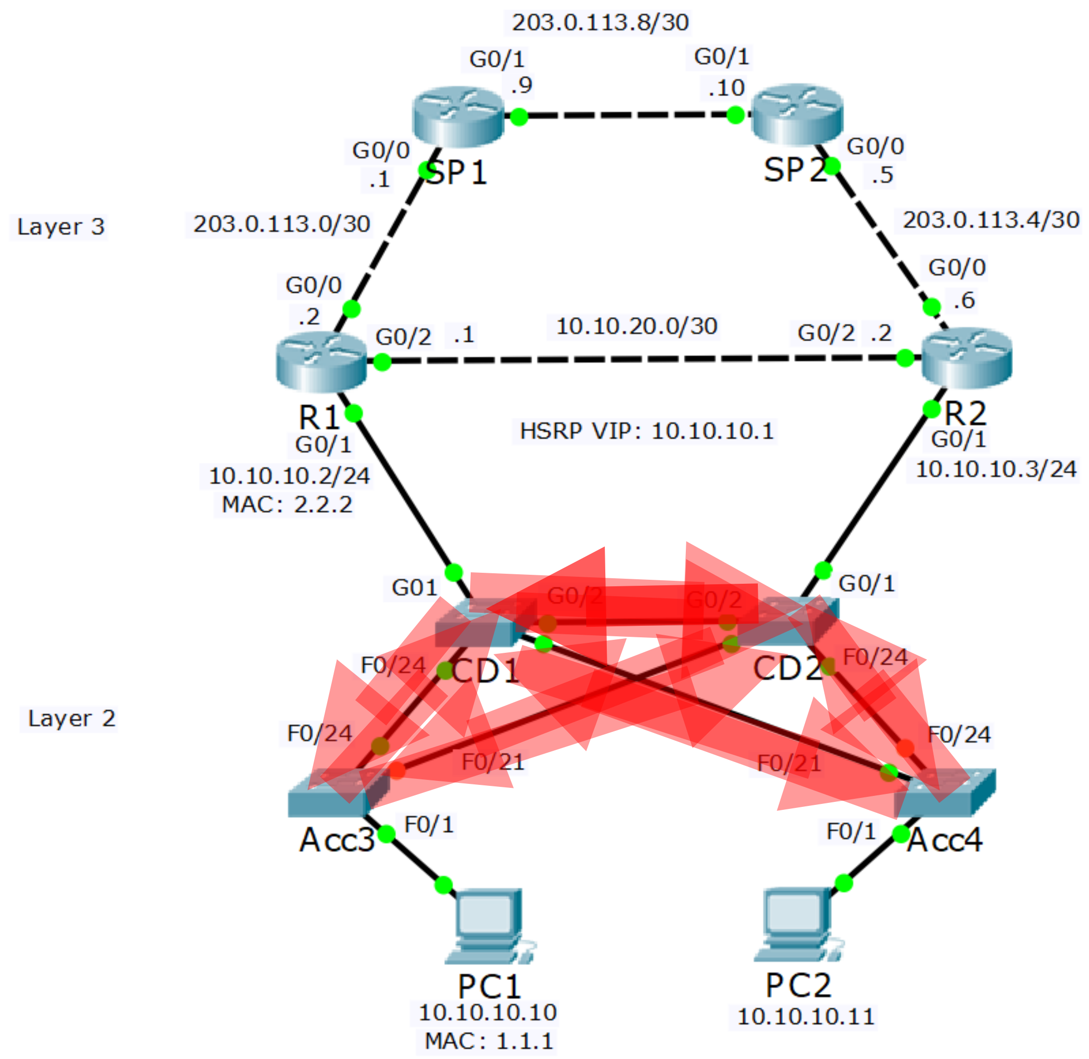
The Ethernet Header

- The Layer 2 Ethernet header does not have a TTL field to stop the looping traffic



PREAMBLE	DESTINATION ADDRESS	SOURCE ADDRESS	LENGTH/ ETHERTYPE	...DATA...	FCS
8 Bytes	6 Bytes	6 Bytes	2 Bytes	Variable 46-1500 Bytes	4 Bytes

Layer 2 Loops



- There will be more broadcast traffic on a production network than a single ARP request
- We now have a broadcast storm
- The network will crash because the amount of looping broadcast traffic will quickly overwhelm the switch’s CPU and bandwidth

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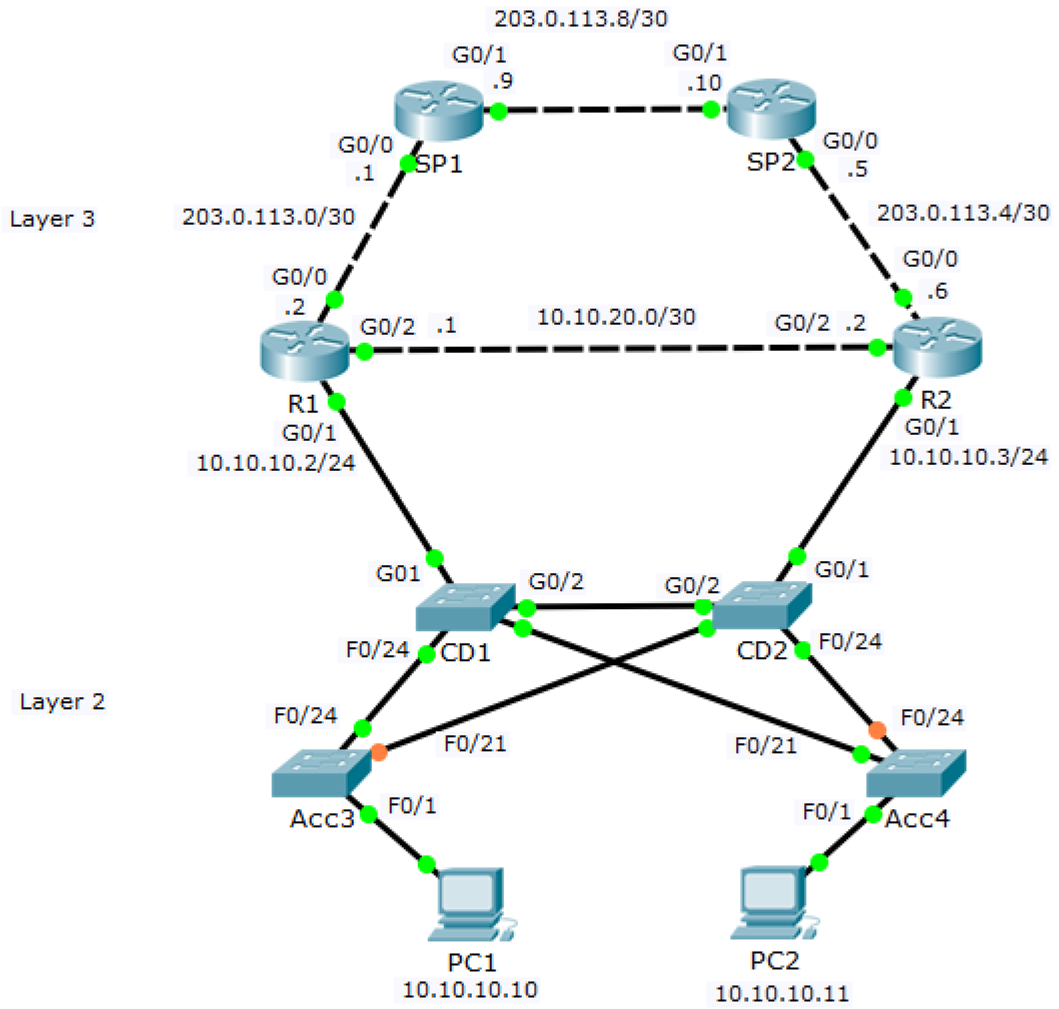
STP Spanning Tree Protocol



- A broadcast storm is disastrous for the LAN and must be avoided at all costs
- The Spanning Tree Protocol is used to prevent Layer 2 loops
- It does this by detecting potential loops and blocking ports to prevent them

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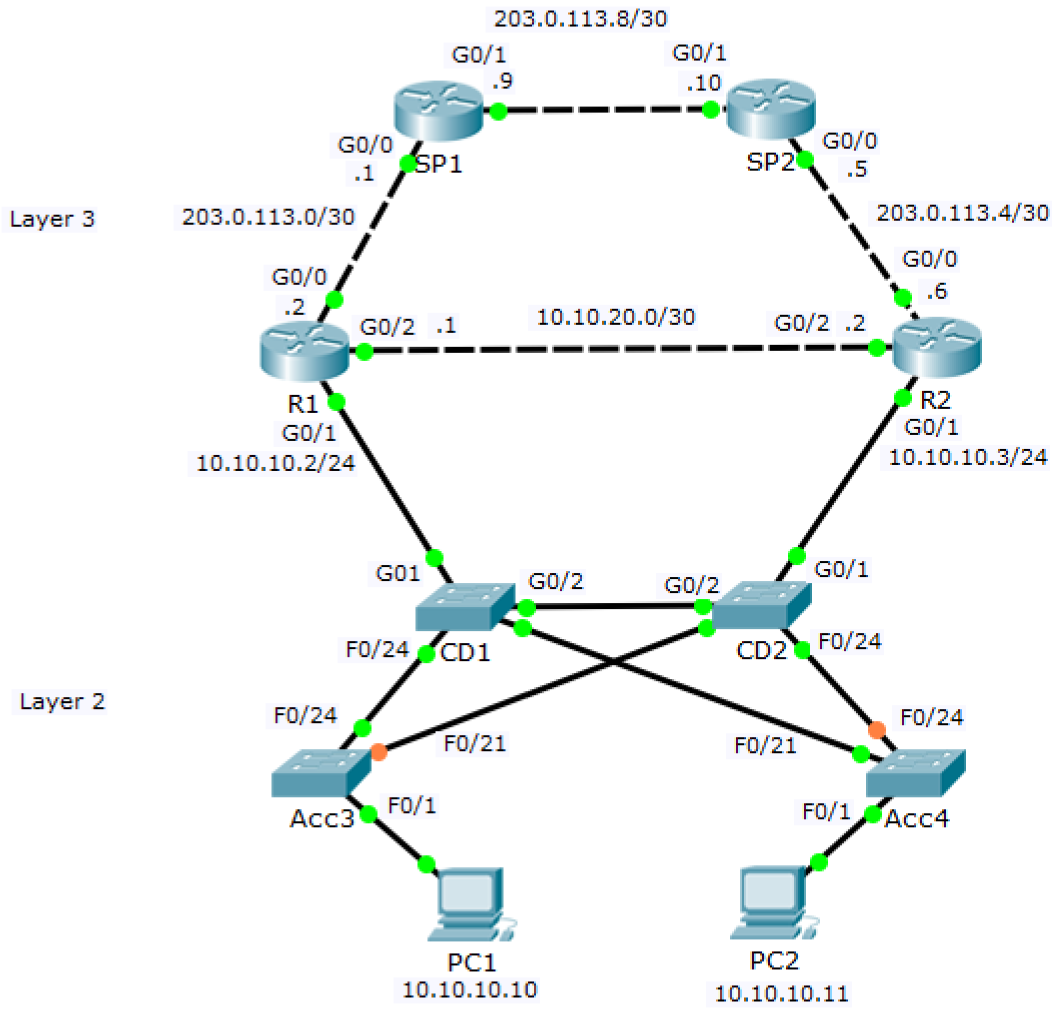
STP Spanning Tree Protocol



- In our example network, port F0/21 on Acc3 has been blocked to prevent the loops between CD1-CD2-Acc3
- Port F0/24 on Acc4 has been blocked to prevent the loops between CD1-CD2-Acc4

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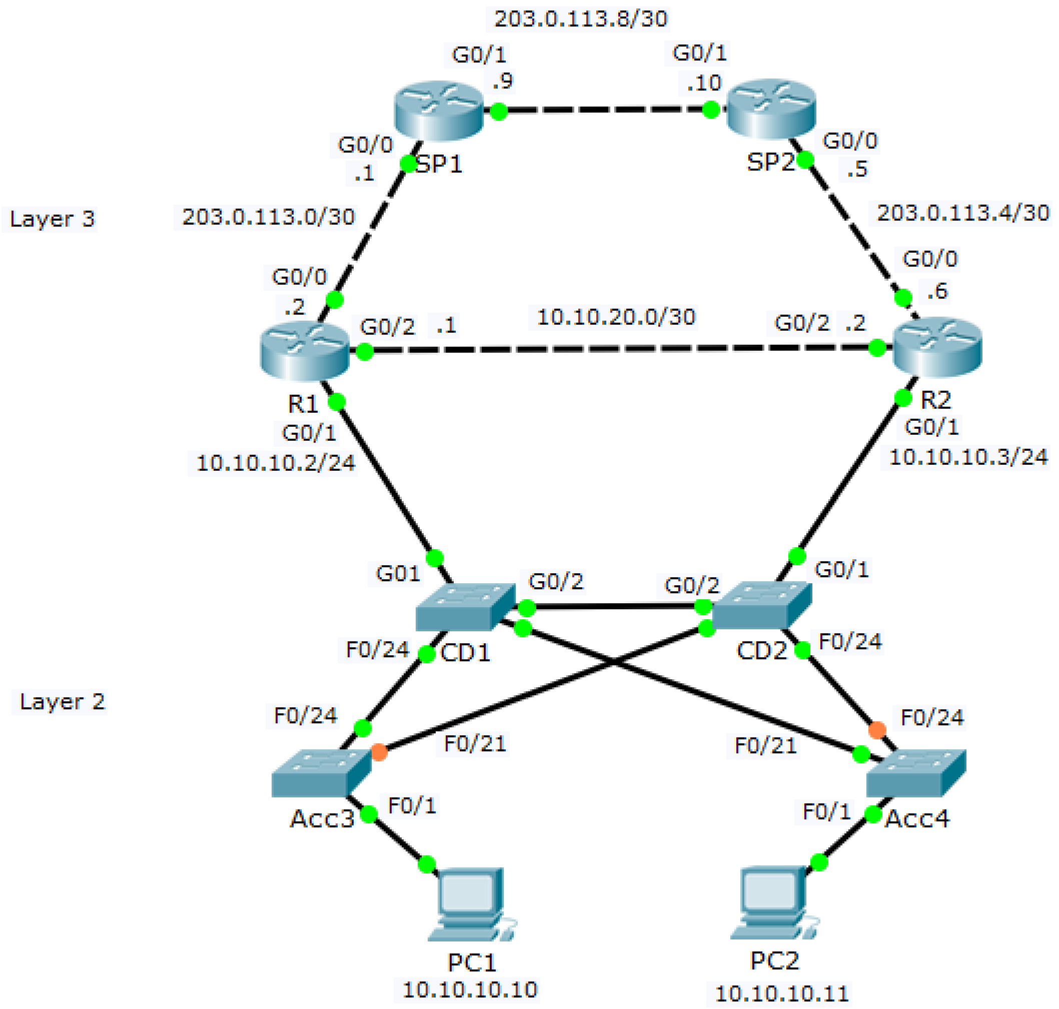
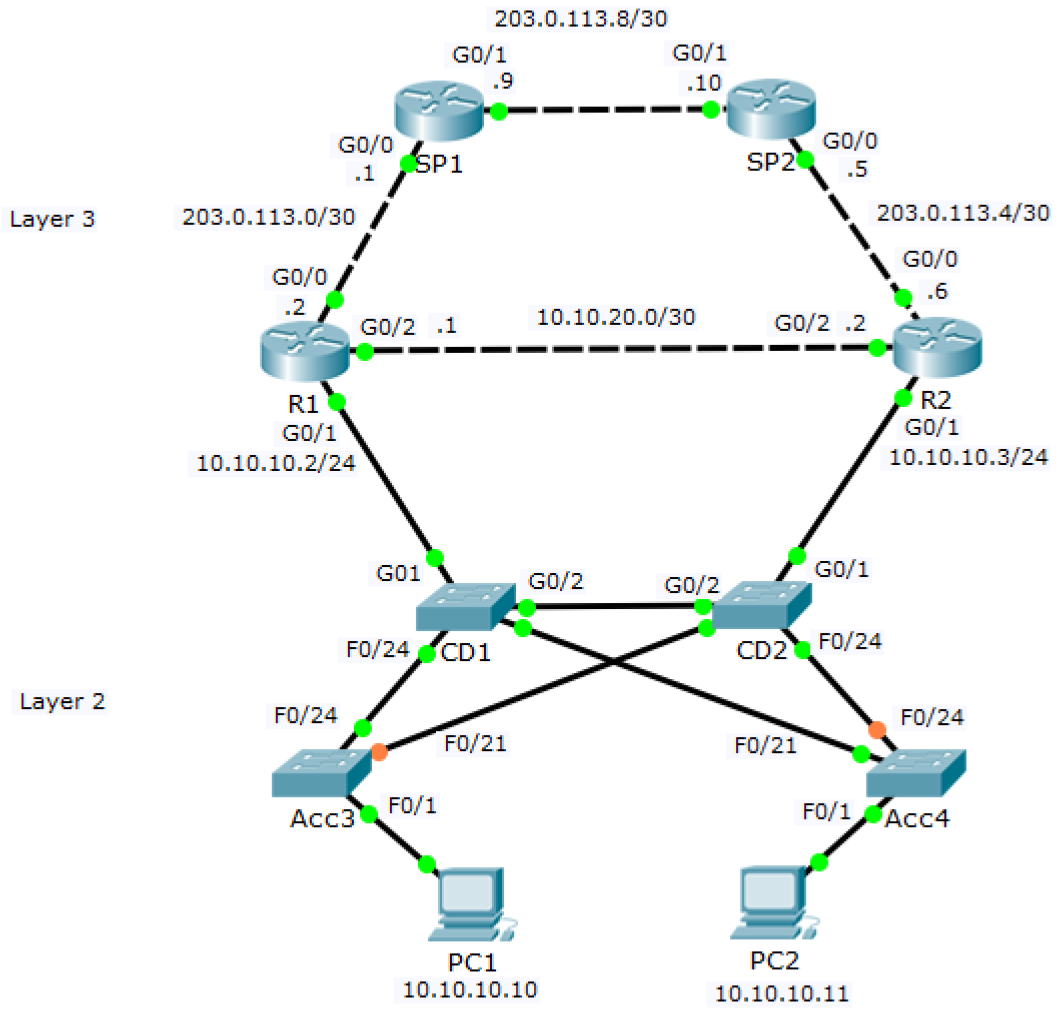
STP Spanning Tree Protocol



- The access layer switches can only use half of their physically cabled uplink bandwidth
- Spanning Tree is a necessary evil because a broadcast storm would be a far worse scenario

STP Spanning Tree Protocol



- Spanning Tree automates failover as well as performing loop prevention
- If an Access Layer switch's uplink to CD1 fails, the link to CD2 will transition from a blocking to a forwarding state
- Legacy Spanning Tree can take up to 50 seconds to converge

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