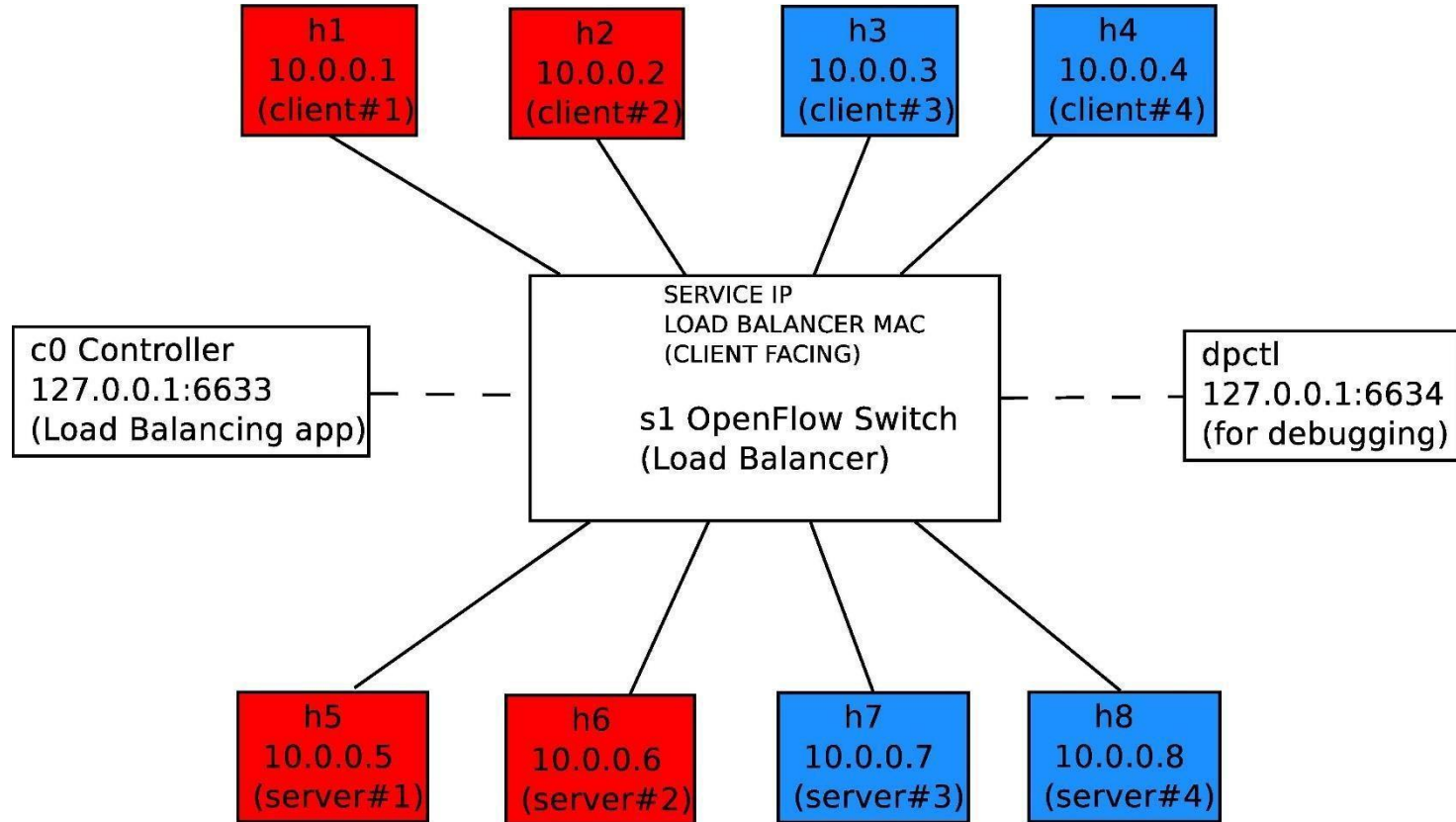


HY436: Software Defined Networks 2020

Assignment 1 Transparent Load Balancer

08/10/2020

Exercise Setup



Client-Switch communication for ICMP Packets (1/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .

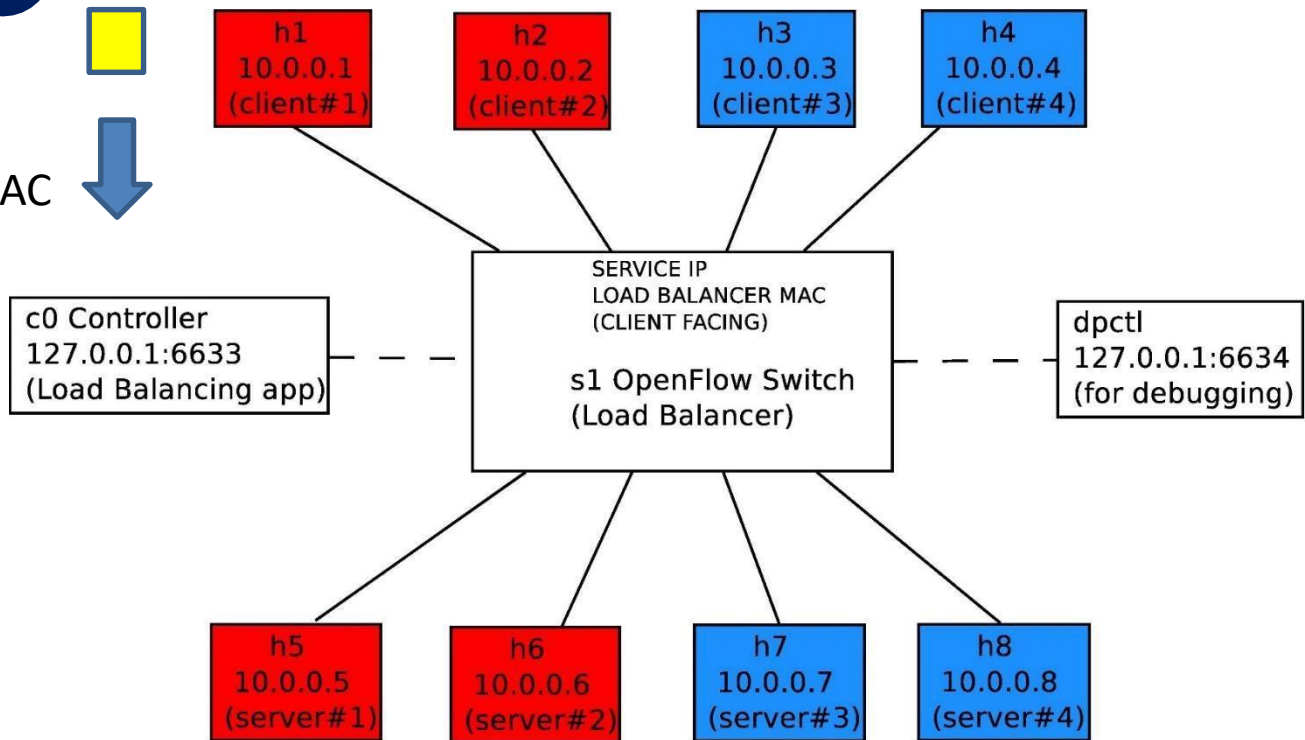
1

SrcIP: h1_IP

SrcMAC: h1_MAC

DstIP: ServiceIP

DstMAC: ServiceMAC



Client-Switch communication for ICMP Packets (1/4)

1

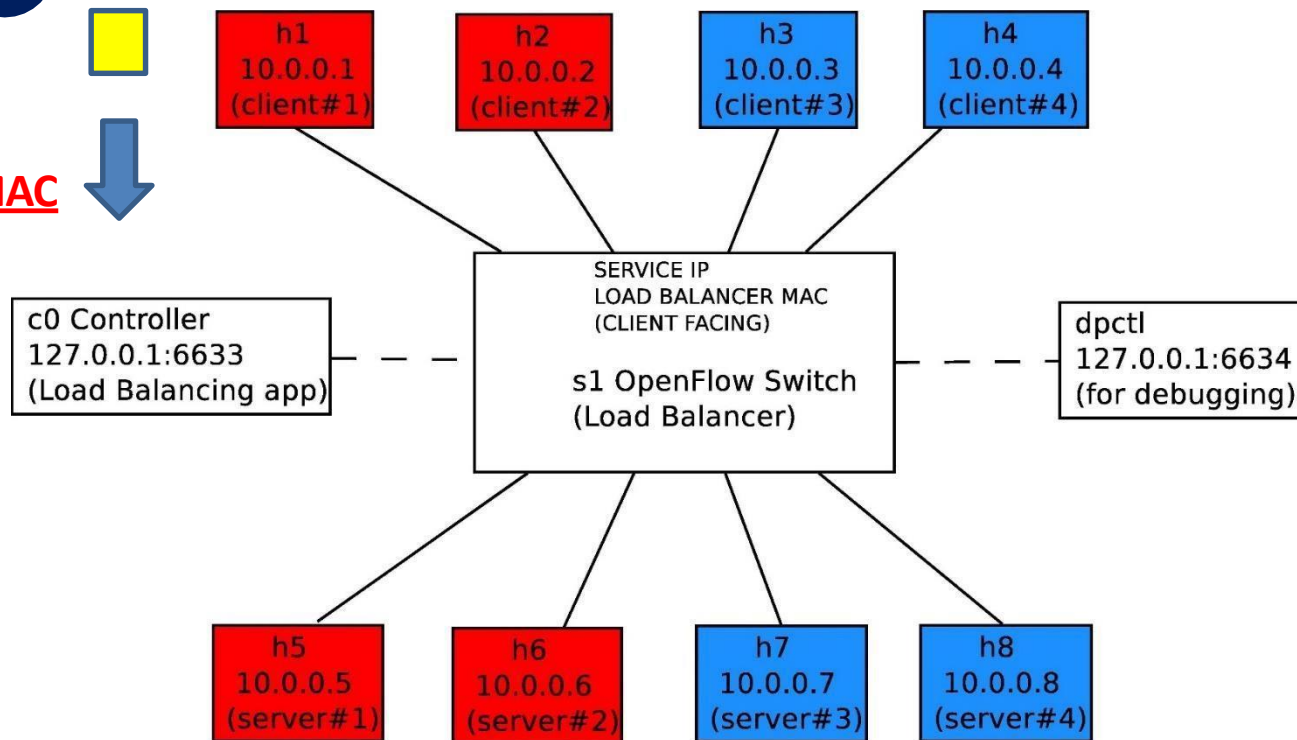
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SrcIP: h1_IP

SrcMAC: h1_MAC

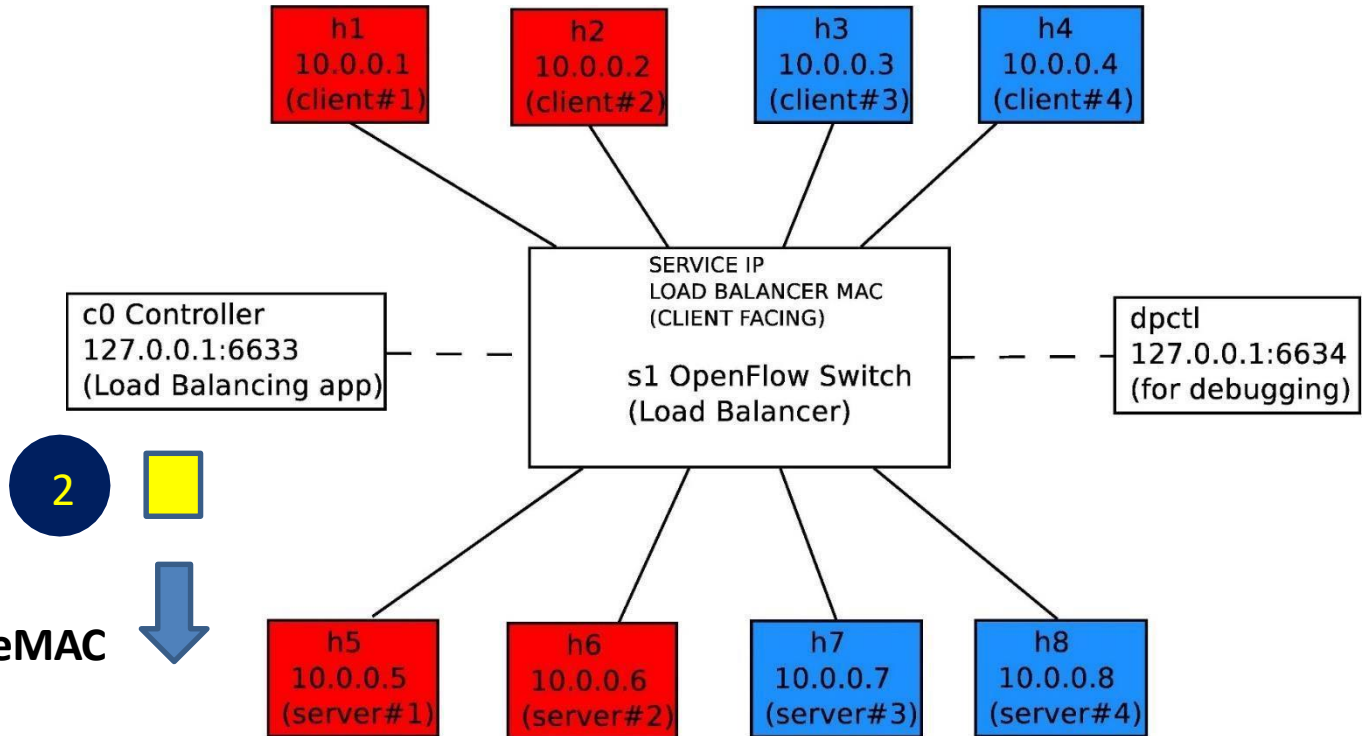
DstIP: ServiceIP

DstMAC: ServiceMAC



Switch-Server communication for ICMP Packets (2/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .



SrcIP: **h1_IP**

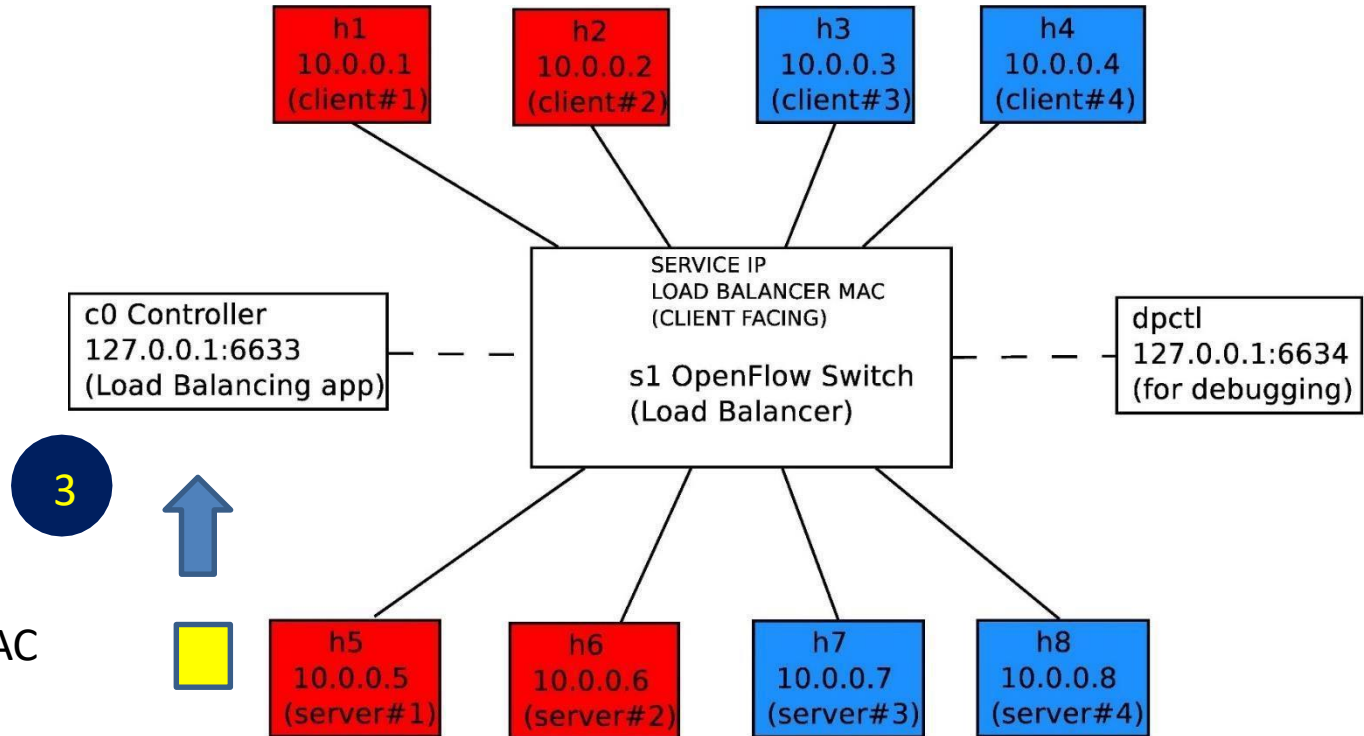
SrcMAC: **ServiceMAC**

DstIP: **h5_IP**

DstMAC: **h5_MAC**

Server-Switch communication for ICMP Packets (3/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .



SrcIP: h5_IP

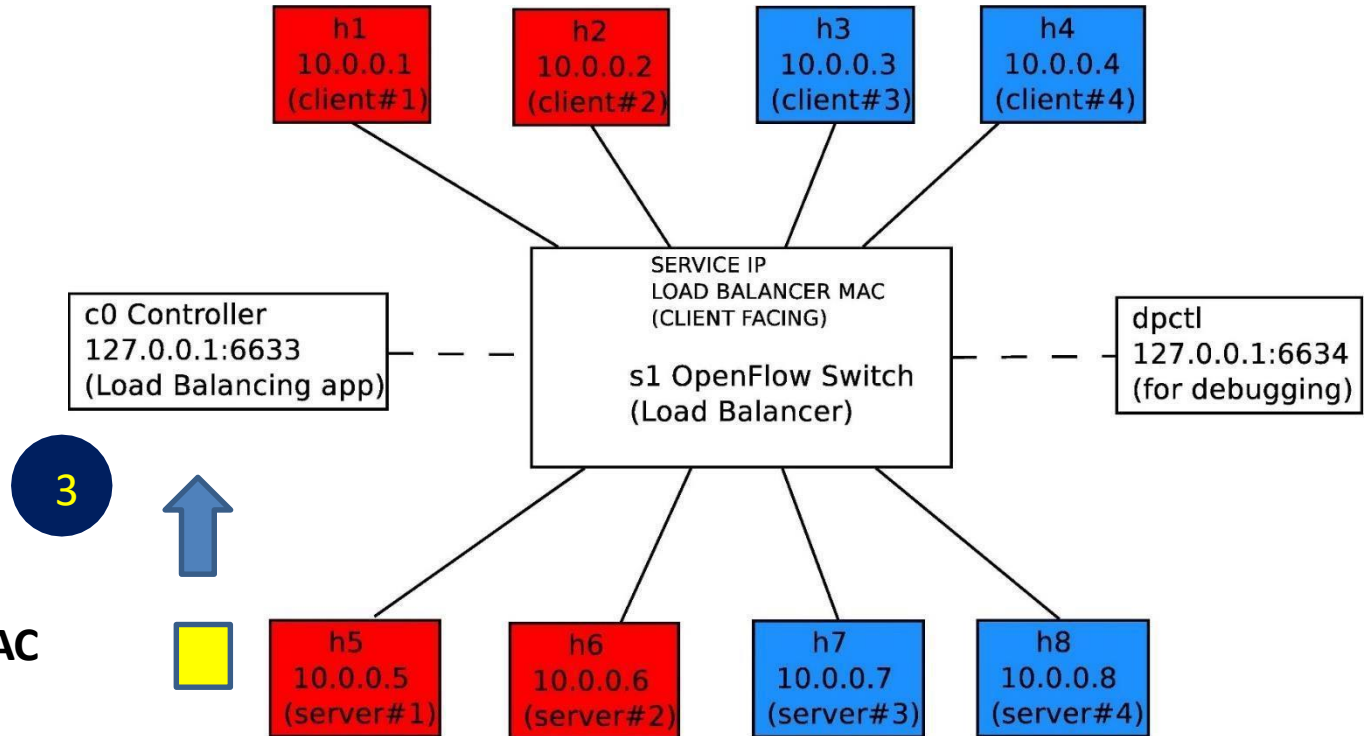
SrcMAC: h5_MAC

DstIP: h1_IP

DstMAC: ServiceMAC

Server-Switch communication for ICMP Packets (3/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .



SrcIP: **h5_IP**

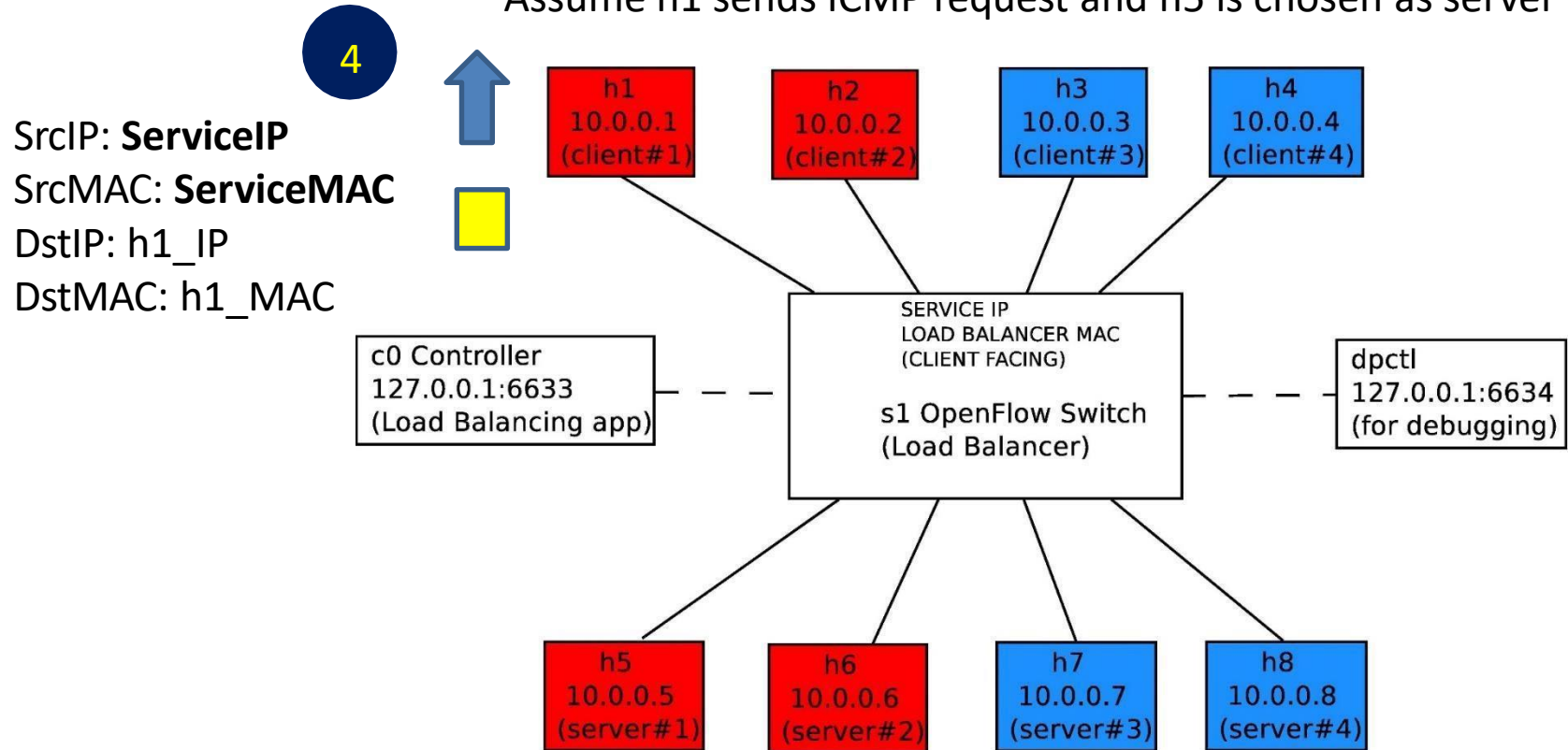
SrcMAC: **h5_MAC**

DstIP: **h1_IP**

DstMAC: **ServiceMAC**

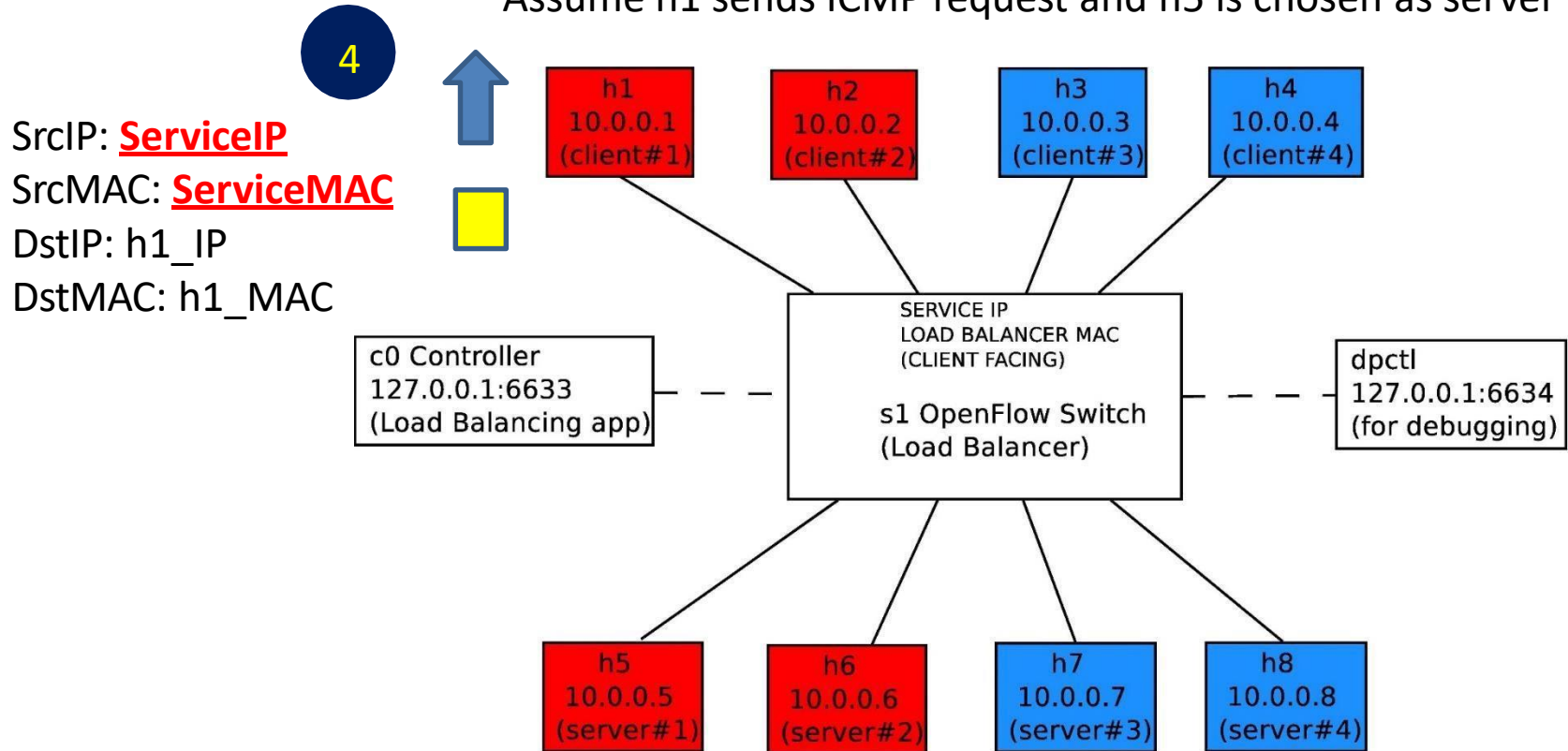
Switch-Client communication for ICMP Packets (4/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .



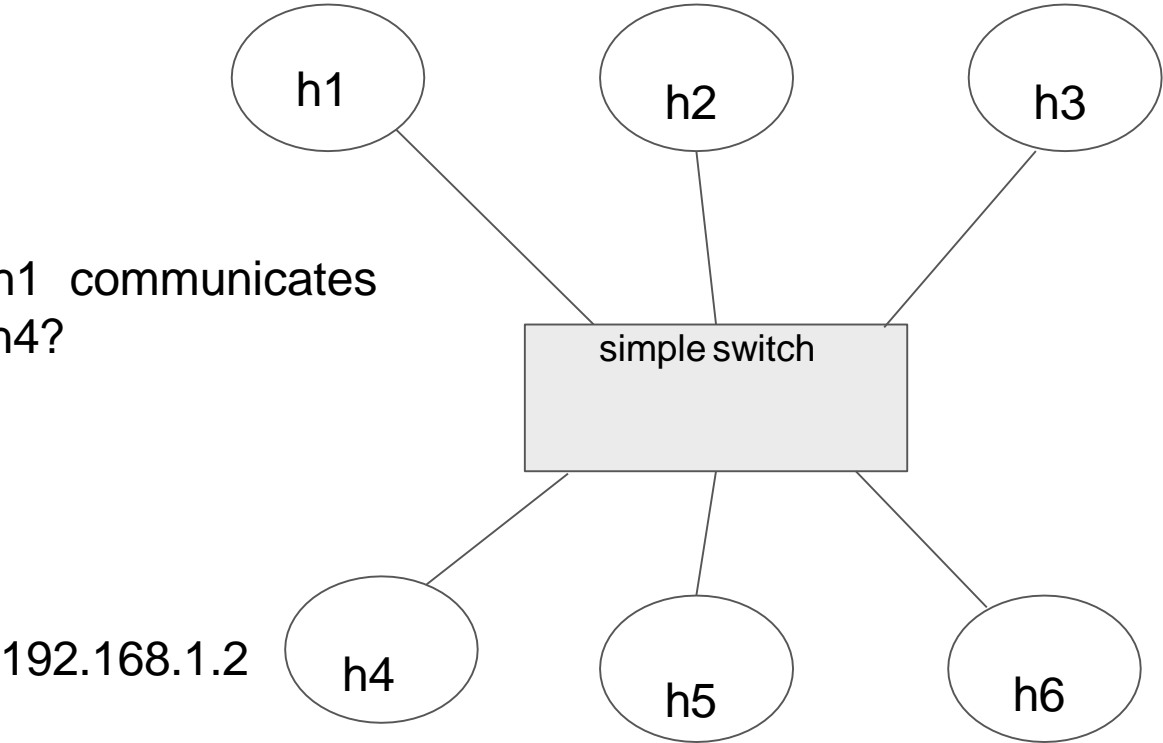
Switch-Client communication for ICMP Packets (4/4)

Assume h1 sends ICMP request and h5 is chosen as server . . .



Simple switch

how h1 communicates
with h4?



h1 pings h4 (Simple switch)

- Host h1 sends ARP request asking 'Who has IP 192.168.1.2'?

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- Switch receives the ARP request and **broadcasts** it out of all of its ports.
- Host h4 receives ARP req and answers back with ARP reply. Switch receives the ARP reply, sends it to h1 and stores in its table the <port,mac> information of h4 so that it doesn't have to broadcast again.

h1 pings h4 (Simple switch)

- Host h1 sends ARP request asking 'Who has IP 192.168.1.2'?
- Switch receives the ARP request and **broadcasts** it out of all of its ports.
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- Host h1 sends an ICMP req and the switch forwards it towards h4.

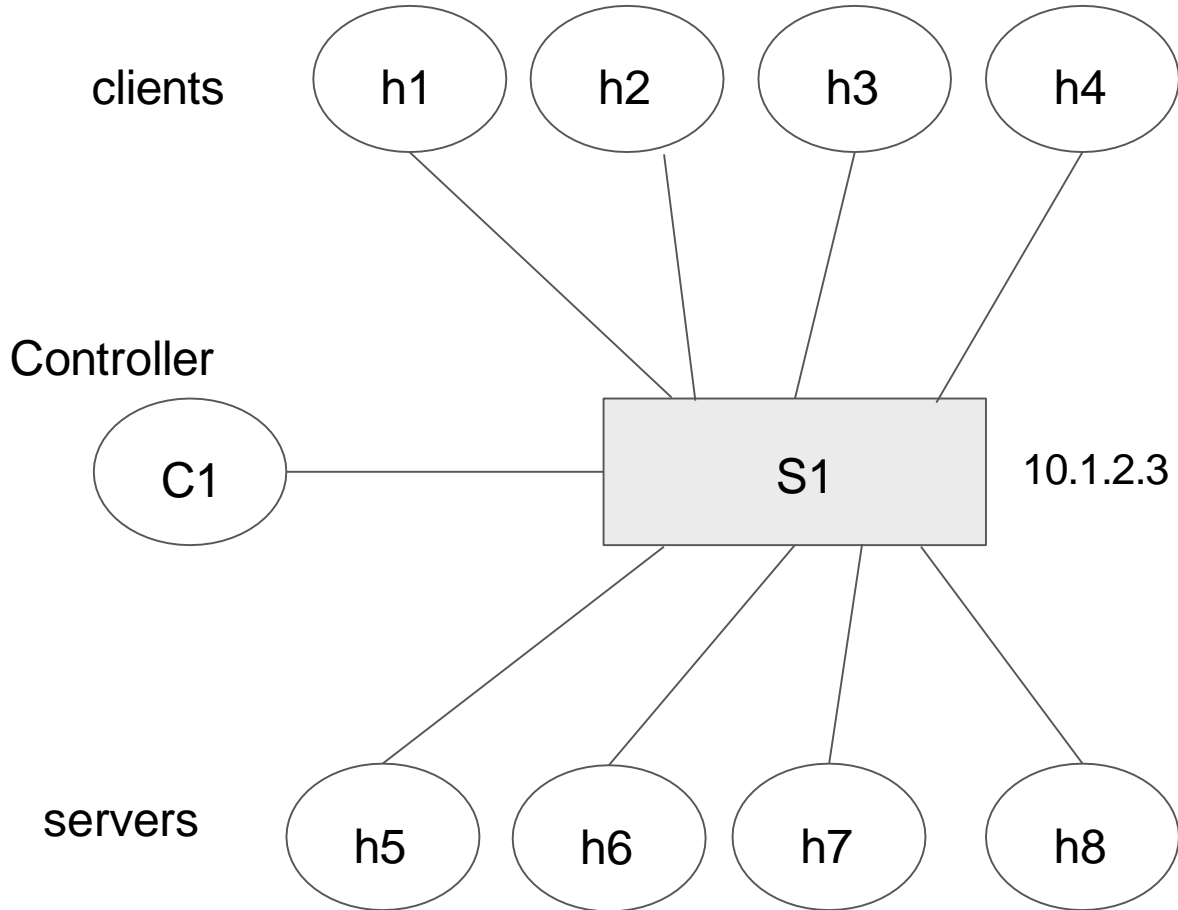
h1 pings h4 (Simple switch)

- Host h1 sends ARP request asking 'Who has IP 192.168.1.2'?
- Switch receives the ARP request and **broadcasts** it out of all of its ports.
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- Host h1 sends an ICMP req and the switch forwards it towards h4.
- Host h4 answers with ICMP rep and the switch forwards the reply back to h1

OpenFlow Switch:

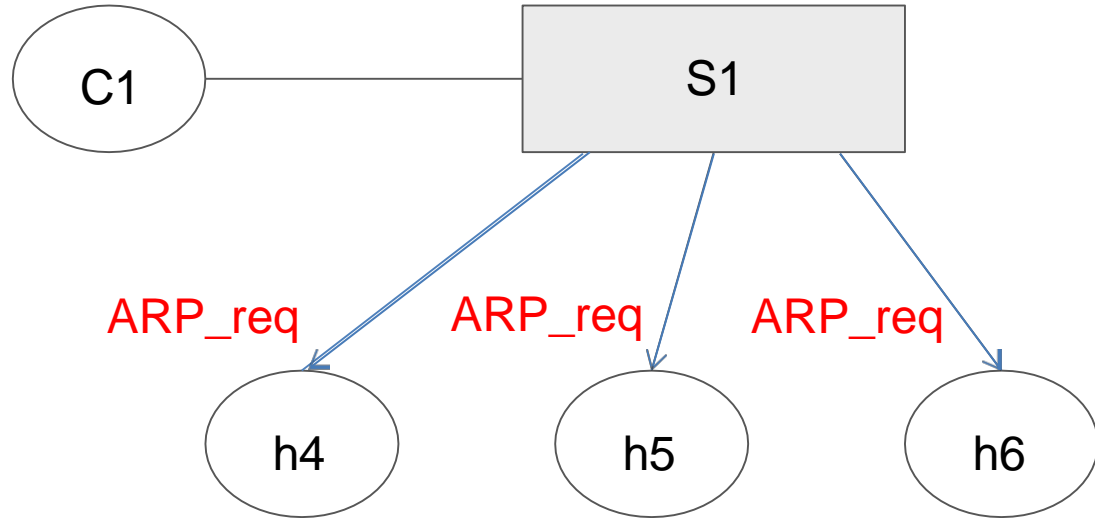
Basic steps

- Handle connection up
- Serve the clients connecting to the service IP **according to the existing communication policies**



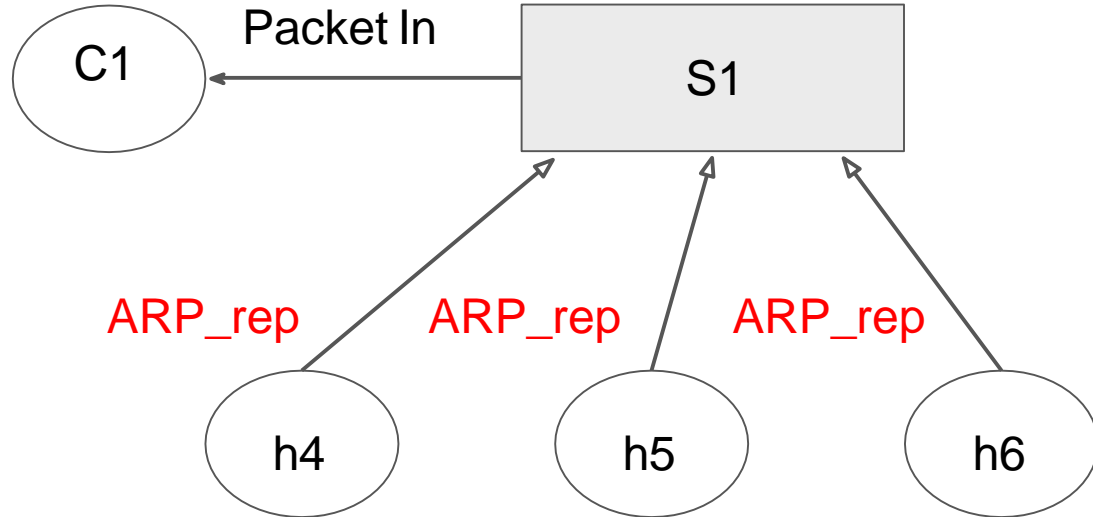
1. Handle connection up (1/2)

- C1 generates ARP requests for each server
- ARP request packets are flooded



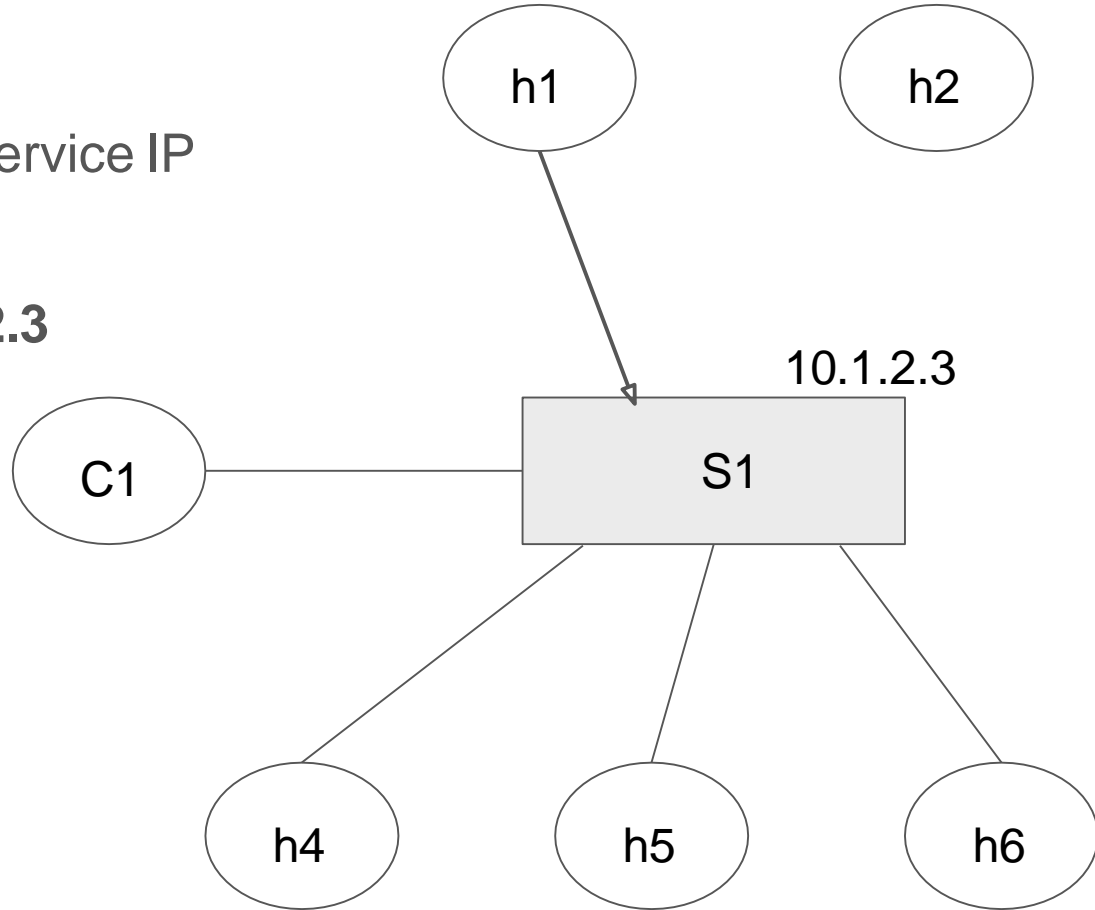
1. Handle connection up (2/2)

- Servers respond with ARP reply
- Switch generates Packet In events
- Stores info <MAC,PORT>



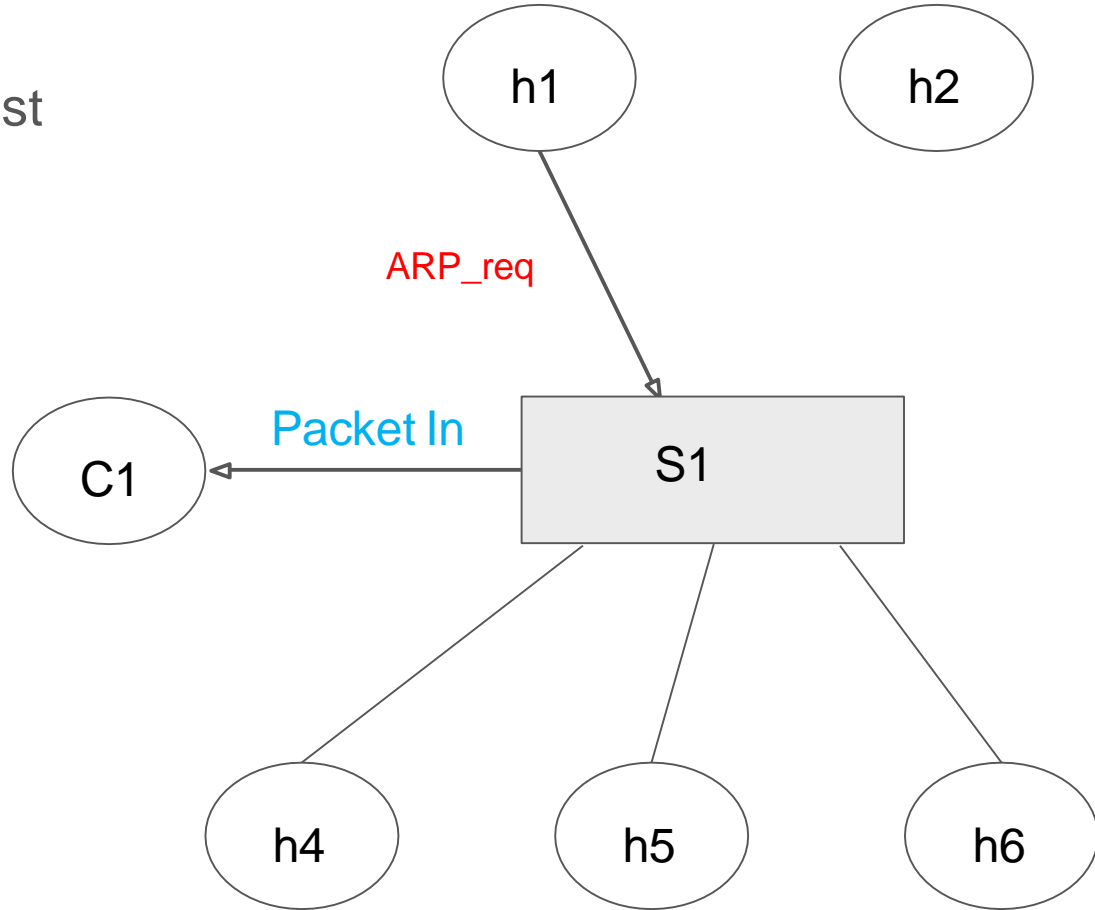
2. Serve the clients request

- Clients contact **only** with service IP
- **Example: h1 pings 10.1.2.3**



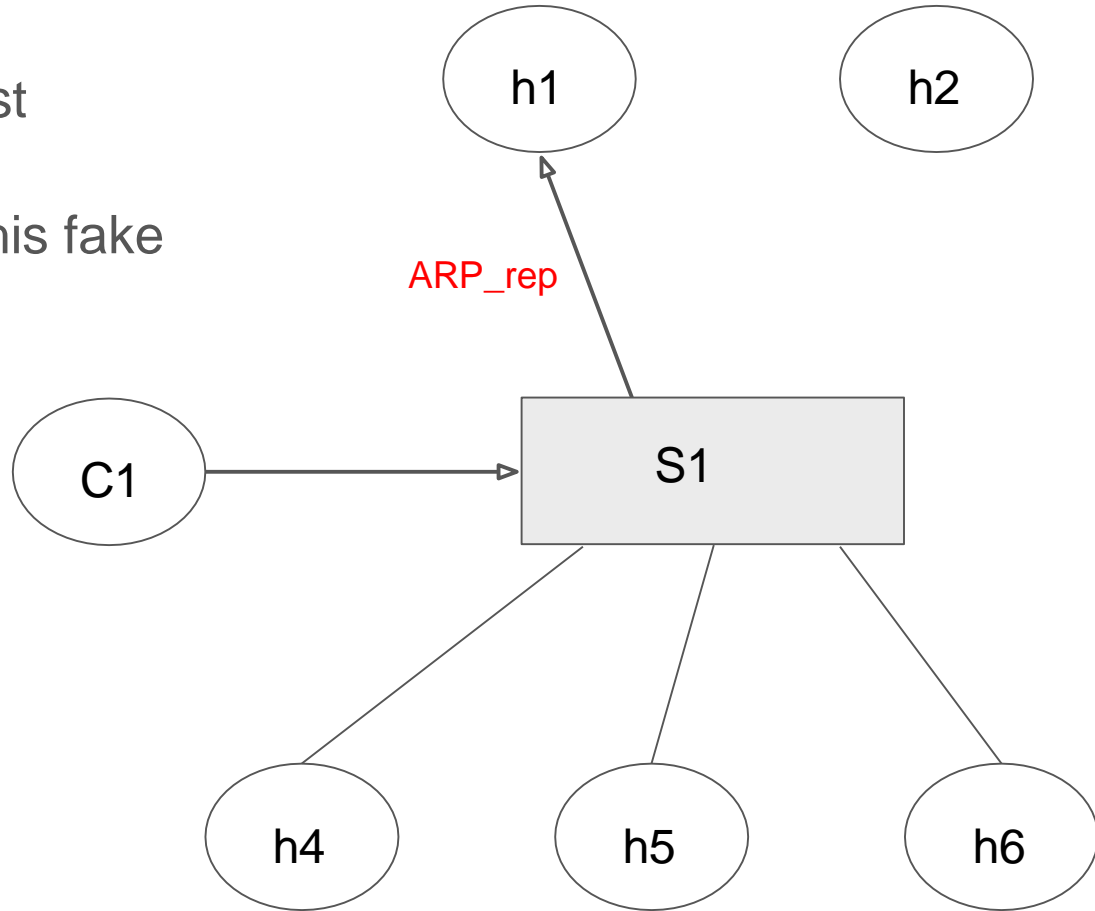
ARP message (1/2)

- Host h1 sends ARP request
- Packet In event raised



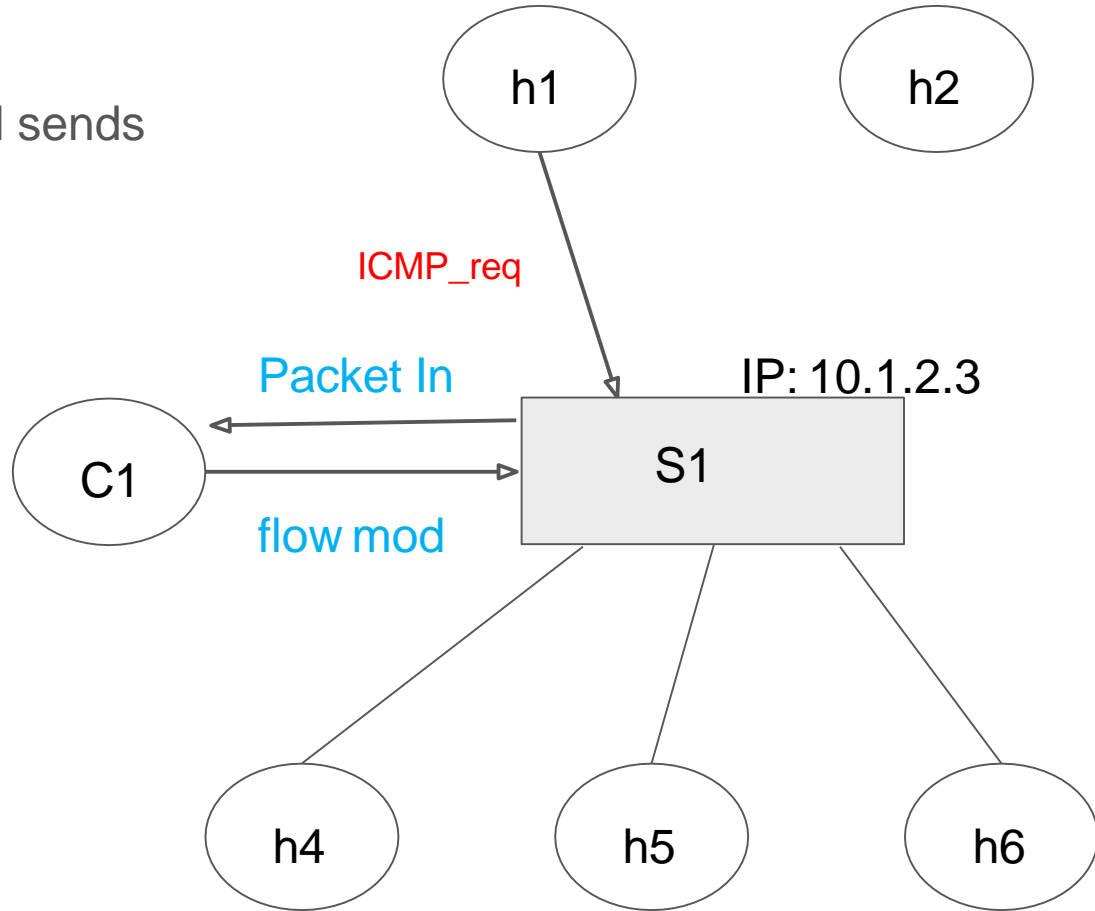
ARP message (2/2)

- Host h1 sends ARP request
- Controller C1 replies with his fake MAC
- What are the addresses of the ARP reply packet?



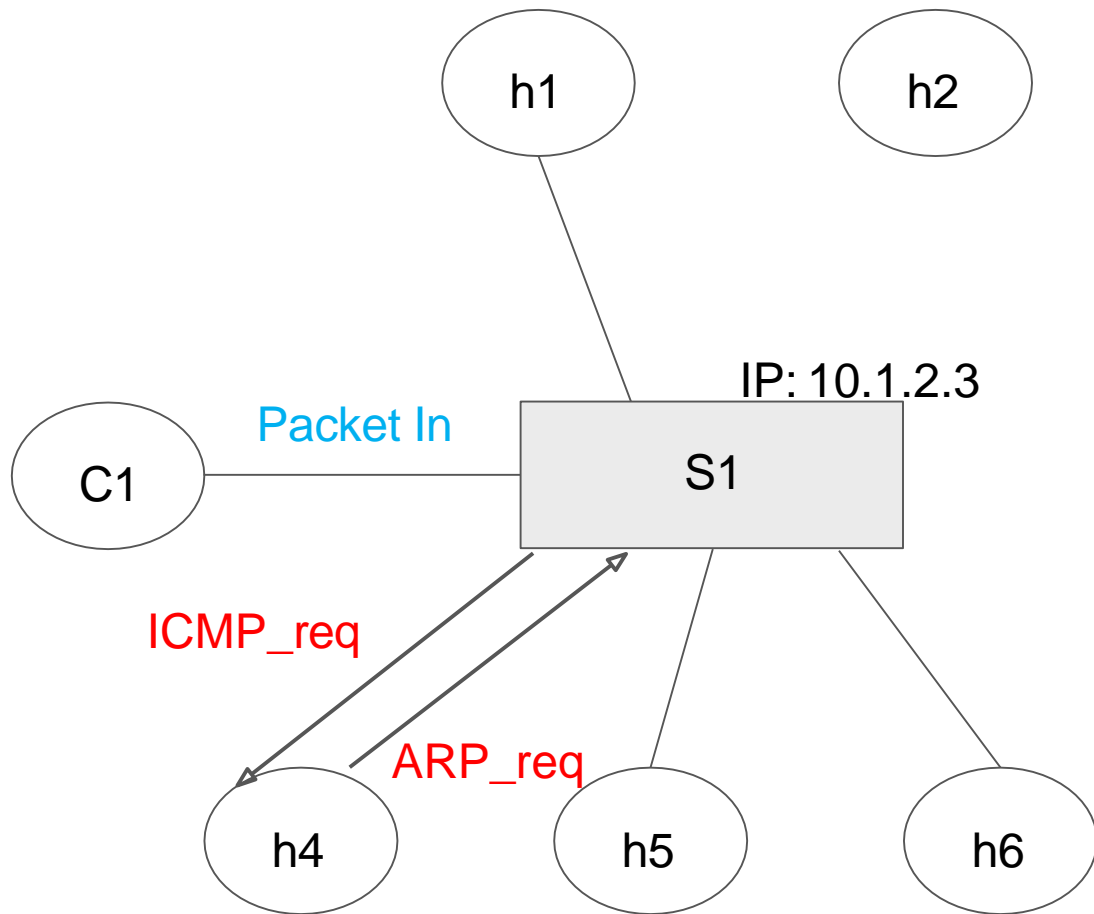
ICMP client to switch

- Host h1 learned the MAC and sends an ICMP request
- S1 needs to rewrite
 - Dst MAC
 - Dst IP
 - Src MAC
- Controller also sends a flow mod msg. Why?



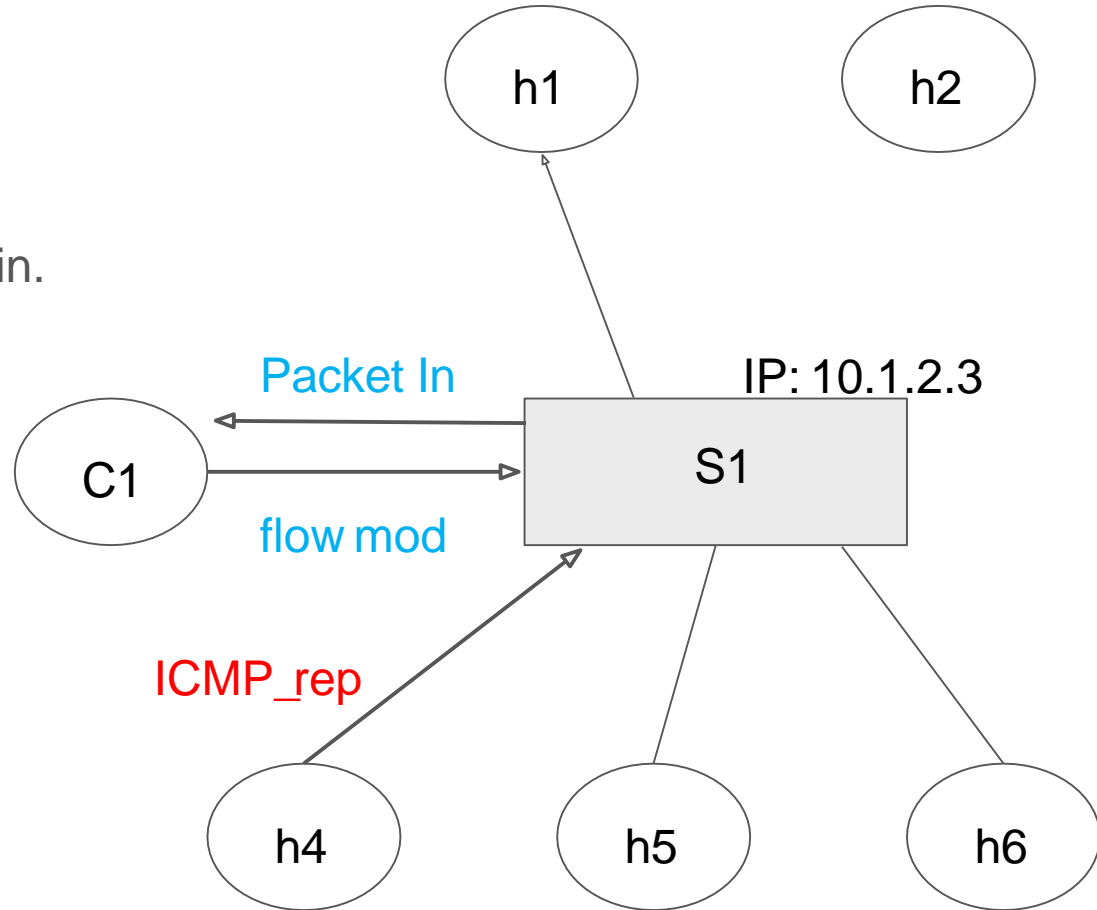
ARP server to switch

- Host h4 receives the ICMP request
- Host h4 sees an unknown src IP → sends ARP req
- S1 must handle the ARP req and answer with his fake MAC



ICMP server to switch

- Host h4 sends ICMP rep
- s1 must rewrite headers again.
Which fields?
- A second flow mod also needs to be installed



- ICMP reply reaches h1
- Example finished

