Implementing a NAT Device using a P4 Switch

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Agenda

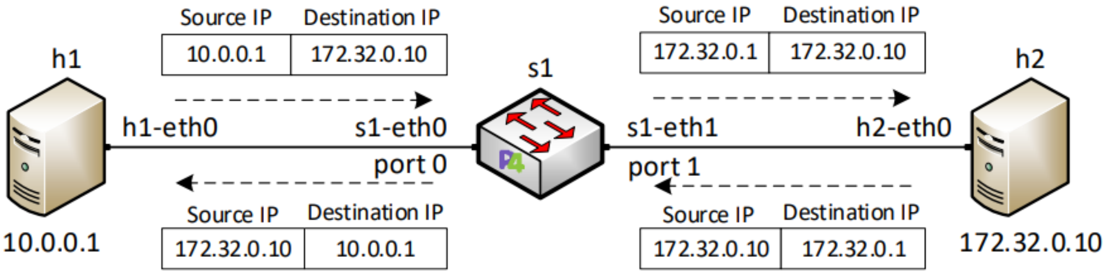
- Introduction
- Problem description
- Background on P4
- Proposed solution and implementation
- Contributions

Introduction

- Network address translation (NAT) conserves IP addresses that are legally registered and prevents their depletion
- This is important to being able to connect with the Internet
- NAT is used to achieve this
  - ➢Using configurable switches, we can create P4 programs to implement NAT

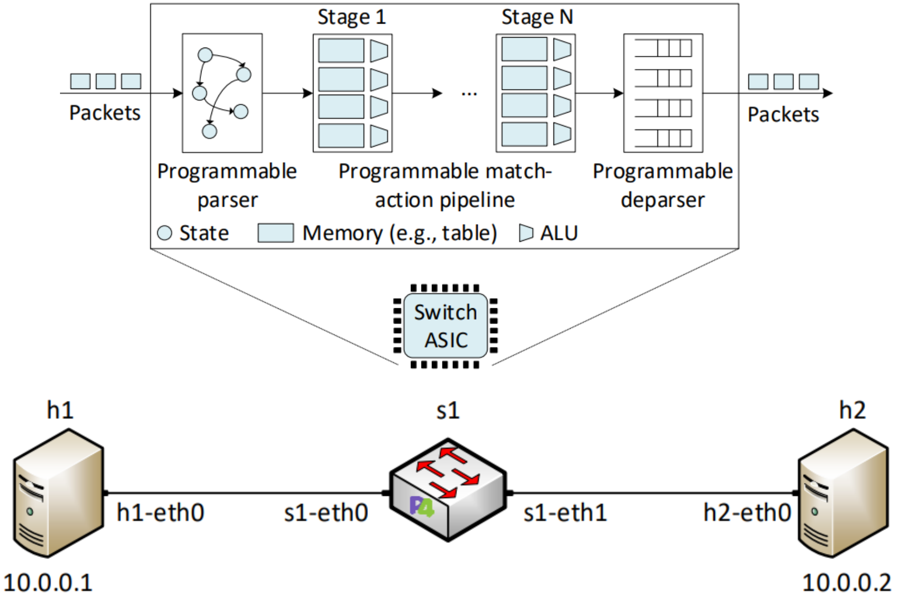
Problem Description

- Be able to communicate with networks outside the Local Area Network (LAN)
- Must translate a private IP address to a public IP address
- Implementing NAT on P4 programmable switch
- Testing the IP translation by sending packets to the Internet



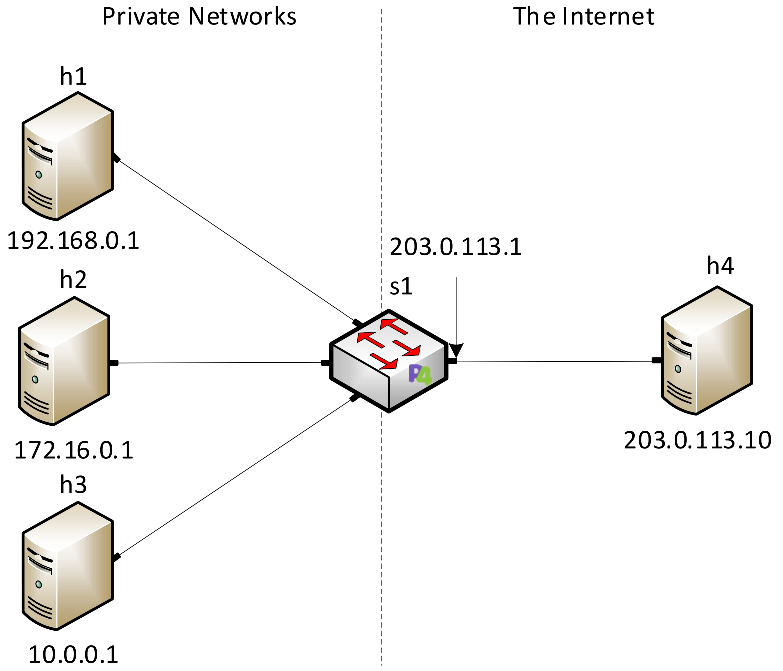
Background on P4

- P4 is a programing language used to describe the processing behavior of a switch
- Unlike traditional switches which come with a set of pre-defined protocols



Proposed Solution and Implementation

- Create a program using P4 to enable NAT on the internal network to allow communication with the Internet
- Develop a topology that represents all three private IP address ranges, the programable switch and the Internet
- For example, the private IP address 192.168.0.1 is translated to the public IP address 203.0.113.1
- We implemented NAT using match-action tables



Contributions

- Implemented a NAT device on P4
- Used match-action tables to perform the address translation
- Tested the implementation with a packet generator available in Linux
- Future works might include the implementation of dynamic NAT