



# Writing Fine-grained Measurements App with P4 Programmable Switches

Hands-on Session 1: Intro to P4 and BMv2, writing a parser,  
and compiling P4 code

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<http://ce.sc.edu/cyberinfra>

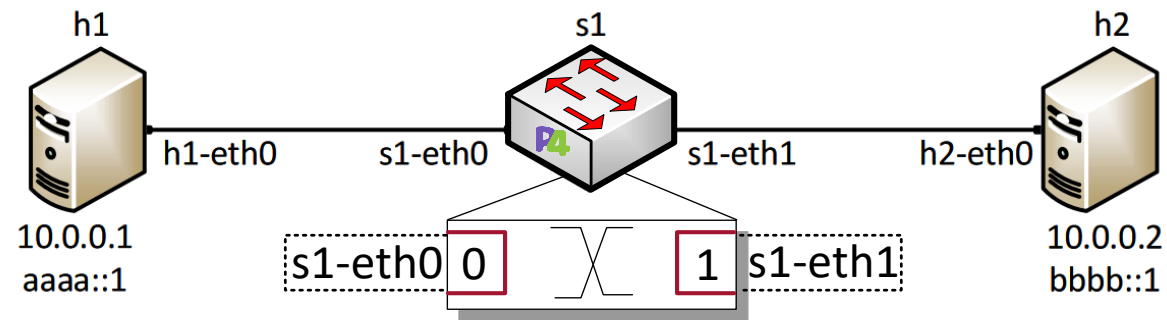
University of South Carolina (USC)  
Energy Sciences Network (ESnet)

September 18, 2023

# Lab 4: Parser Implementation

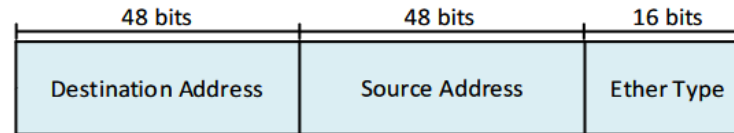
# Lab Topology and Objectives

- The topology consists of two hosts: h1 and h2; one P4 switch: s1
- Defining the headers for Ethernet, IPv4 and IPv6
- Implementing the parser
- Testing and verifying the switch behavior when IPv4 and IPv6 packets are received

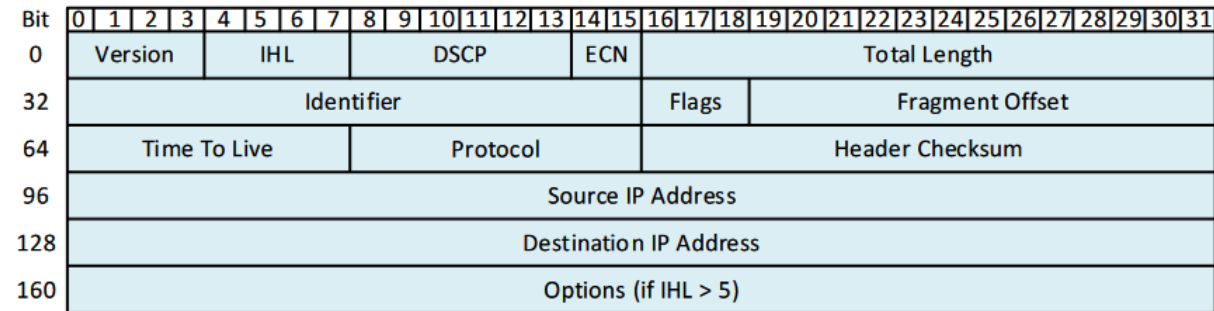


# Headers Format

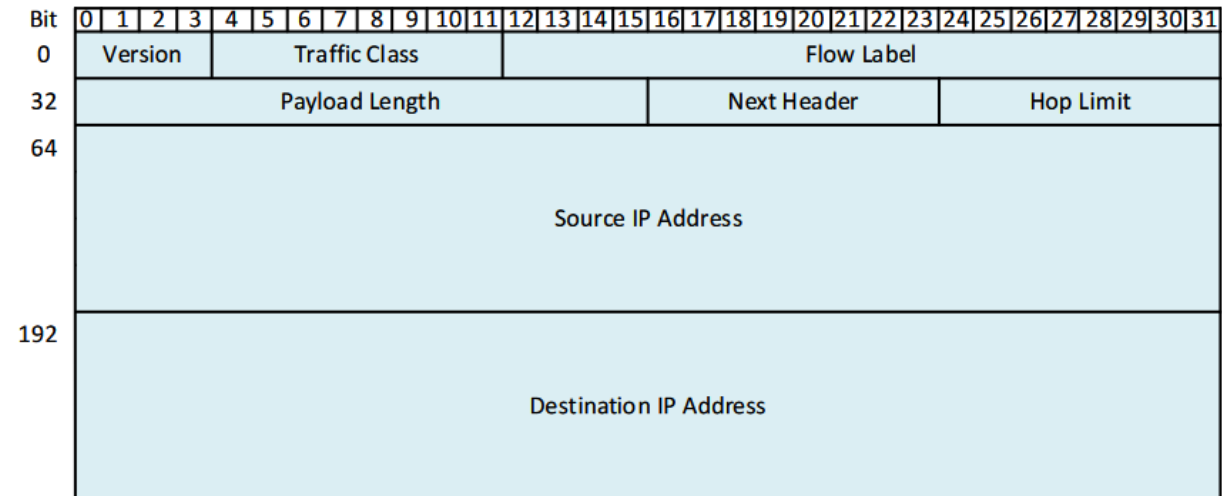
- Ethernet header:



- IPv4 header:

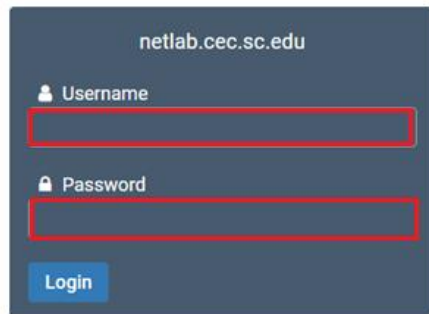


- IPv6 header:



# Accessing the Platform

- Please use the following link to access the platform:
  - <https://netlab.cec.sc.edu/>
- Login using your credentials



Welcome, u200!

This is the first time you have logged into this account.

You will now be asked to provide some account settings. These can be changed later.

🔒 Change Password - user200

New Password

Retype New Password

Submit

Help

Cyberinfrastructure  
Lab @ UofSC

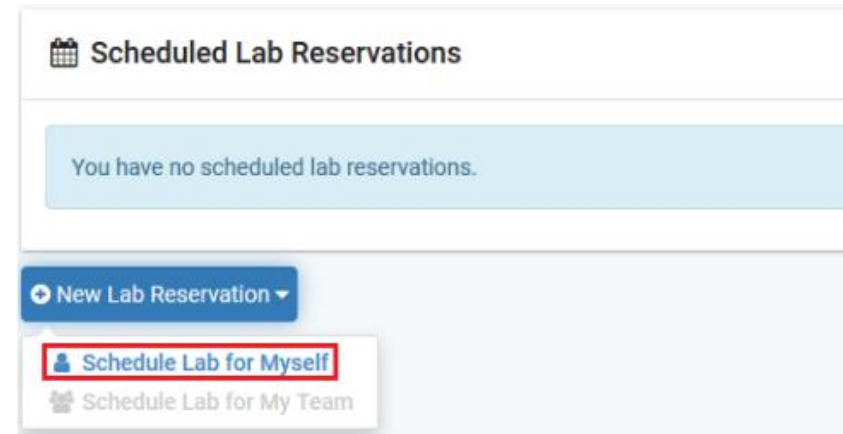
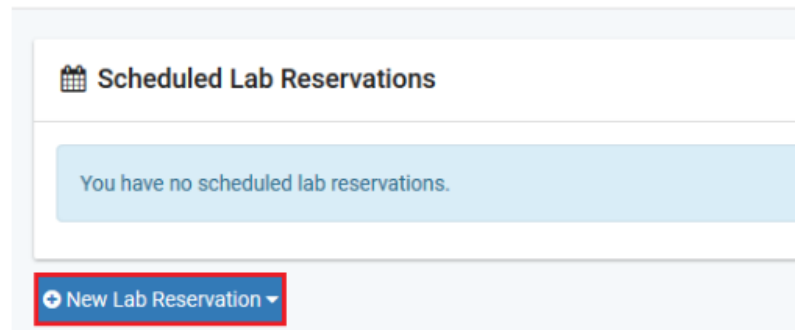
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The image shows two screenshots of a web application interface, connected by orange arrows. The first screenshot is titled 'Change E-mail Address' and features a light blue message box at the top that reads: 'Please enter a valid e-mail address. You can leave this blank if you do not want to receive e-mail from the system.' Below this is a form with an email address field containing 'testuser@example.edu' and two buttons: 'Submit' (highlighted with a red border) and 'Help'. The second screenshot is titled 'Date and Time Settings' and contains four dropdown menus: 'Time Zone' set to '(GMT-05:00) Eastern Time (US & Canada)', 'Date Display Format' set to 'YYYY-MM-DD (2016-09-15)', 'Time Display Format' set to '24 Hour (15:37)', and 'First Day of Week' set to 'Sunday'. It also has 'Submit' and 'Help' buttons at the bottom, with the 'Submit' button highlighted by a red border.

# Scheduling a Reservation

- Click on New Lab Reservation
- Click on Schedule Lab for Myself



# Scheduling a Reservation

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- Select the course
- For this session, we will use “Intro. To P4 Programmable Data Planes”

Multiple course topics are available. Please select one.

## **Intro. to P4 Programmable Data Planes**

Introduction to P4 programmable data planes with BMv2

## **P4 Applications and Custom Processing**

This lab series presents P4 applications, stateful elements, and custom packet processing



# Scheduling a Reservation

- Select the Lab
- For this session, we will run:
  - Lab 4: Parser Implementation

Introduction to P4 programmable data planes with BMv2 <span style="float: right;">Search</span>	
Lab Name	Action
Lab 1: Introduction to Mininet	▼
Exercise 1: Building a Basic Topology	▼
Lab 2: Introduction to P4 and BMv2	▼
Exercise 2: Compiling and Running a P4 Program	▼
Lab 3: P4 Program Building Blocks	▼
Lab 4: Parser Implementation	▼
Exercise 3: Parsing UDP and RTP	▼
Lab 5: Introduction to Match-action Tables (Part 1)	▼
Lab 6: Introduction to Match-action Tables (Part 2)	▼
Exercise 4: Implementing NAT using Match-action Tables	▼
Lab 7: Populating and Managing Match-action Tables at Runtime	▼
Exercise 5: Configuring Match-action Tables at Runtime	▼

# Scheduling a Reservation

- Select the next available POD and allocate time

**Pod Scheduler**

October - 2019 -

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2

Selected Day: **October 1, 2019**

Current Time: **16:43**  
Eastern Time (US & Canada)

	NTP_H1_1201	NTP_H2_1202	NTP_H3_1203	NTP_H1_1204
16:00				
17:00	Reservation 4246			
18:00				
19:00				

Buttons: Previous, Cancel



**Add Reservation**

Pod: NTP\_H2\_1202

Reservation Type: Individual Self Study

Class Name: Cyberinfrastructure Training

Reserve For: testuser

Lab Exercise: Lab 1: Introduction to Mininet

Time Zone: Eastern Time (US & Canada)

Start Time: 2019-10-01 16:49

End Time: 2019-10-01 19:00

Length of Reservation: 2 hrs.

Buttons: Submit, Previous, Cancel

# Website URL and Accessing the Platform

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- Tutorial website with slides and URL to resources:

<https://research.cec.sc.edu/cyberinfra/workshop-techex1>

Access to virtual platform for this tutorial:

<https://netlab.cec.sc.edu/>