

Calculating Packets Interarrival Times using Hashes and Registers

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The Cyberinfrastructure Lab at UofSC
Energy Sciences Network (ESnet)
National Science Foundation (NSF)

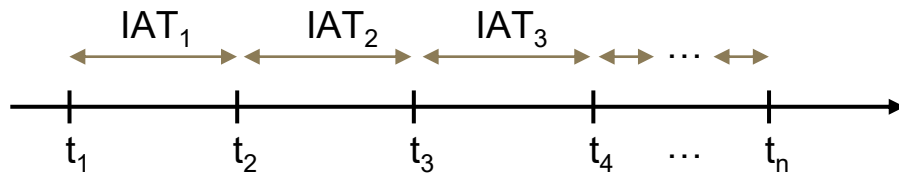
Internet2 Technology Exchange

Monday December 5th, 2022
Denver, Colorado

Hands on Session 2: Calculating Packets Interarrival Times using Hashes and Registers

Interarrival Times

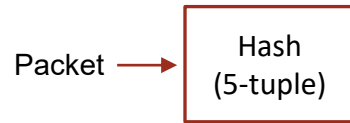
- The Interarrival time (IAT) is the time between two consecutive packets belonging to the same flow
- Calculating IAT is not possible on a general-purpose CPU, especially when the traffic rate is high
- Programmable switches offer a granular timestamp that can be leveraged to compute the IAT of packets



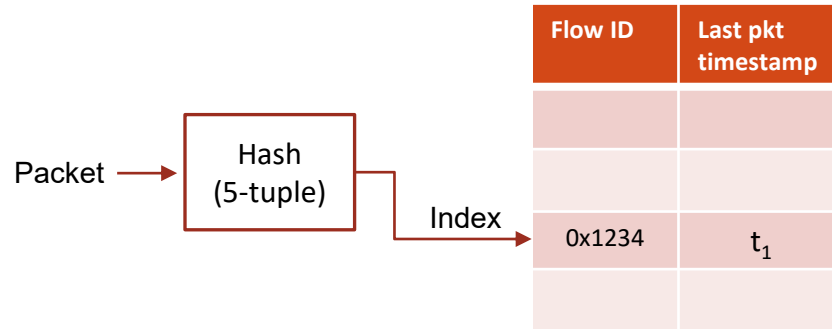
Hashing in P4

- The Interarrival time (IAT) is the time between two consecutive packets belonging to the **same flow**
- A flow can be identified by its 5-tuple fields:
 - Source IP address
 - Destination IP address
 - Source port
 - Destination port
 - Protocol
- It is possible to hash multiple fields in P4 and get a single digest value
- Cyclic Redundancy Check (CRC) is an example of a hash algorithm provided by the v1model

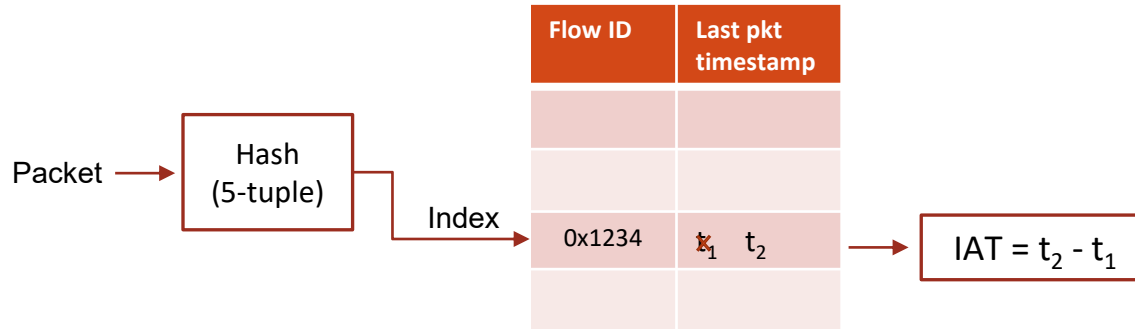
IAT Calculation in P4



IAT Calculation in P4



IAT Calculation in P4

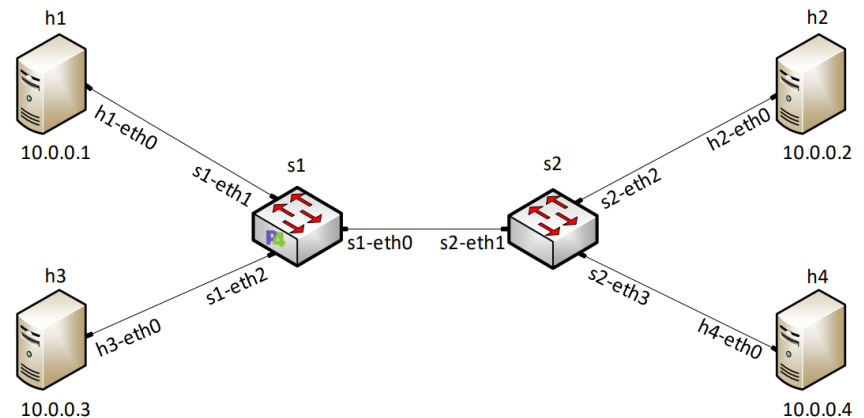
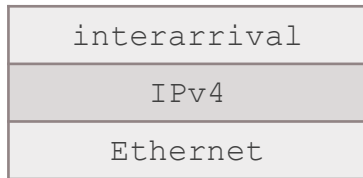


Lab 10: Calculating Packets Interarrival Times using Hashes and Registers

Lab Topology and Objectives

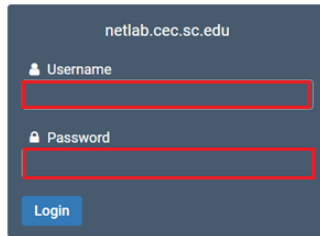
- The topology consists of four hosts: h1, h2, h3 and h4; one P4 switch: s1; one legacy switch
- The hosts h1 and h3 send packets with a custom header (`interarrival`)
- A flow is identified by the source IP and the destination IP of the packet
- The P4 switch s1 computes the IAT and inserts its value into the custom header
- Hosts h2 and h4 receive packets from hosts h1 and h3, respectively
- The IATs are shown on hosts h2 and h4

- Headers:



Accessing the Platform

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



netlab.cec.sc.edu

Username

Password

Login



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
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Accessing the Platform

- Please use the following link to access the platform:
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- Login using your credentials

Please enter a valid e-mail address.
You can leave this blank if you do not want to receive e-mail from the system.

✉ Change E-mail Address

E-mail Address

🕒 Date and Time Settings

Time Zone

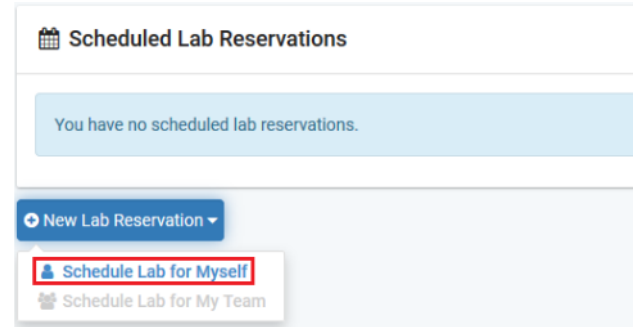
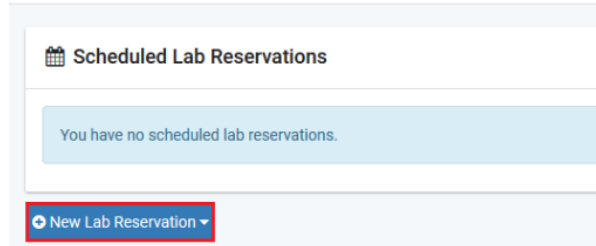
Date Display Format

Time Display Format

First Day of Week

Scheduling a Reservation

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



Internet2 Workshop 2 - P4 Programmable Data Planes	Jorge Crichigno, Jose Gomez, Elie Kfoury, Ali Sabeh	None	None
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Show entries Showing 1 to 2 of 2 items < >

Scheduling a Reservation

- Select the course
- For this session, we will use “P4 Applications and Custom Processing”

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 10: Calculating Packets Interarrival Times using Hashes and Registers

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

Lab Name
Lab 1: Introduction to Mininet
Lab 2: Introduction to P4 and BMv2
Lab 3: P4 Program Building Blocks
Lab 4: Defining and Processing Custom Headers
Lab 5: Monitoring the Switch Queue using Standard Metadata
Lab 6: Collecting Queueing Statistics using a Header Stack
Lab 7: Measuring Flow Statistics using Direct and Indirect Counters
Lab 8: Rerouting Traffic using Meters
Lab 9: Storing Arbitrary Data using Registers
Lab 10: Calculating Packets Interarrival Times using Hashes and Registers
Lab 11: Generating Notification Messages from the Data Plane using Digests

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				

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.**

Submit Previous Cancel

Website URL and Accessing the Platform

- Tutorial website with slides and URL to resources:

http://ce.sc.edu/cyberinfra/workshop_2022_ie2_p4.html

- Access to virtual platform for this tutorial:

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