

## Development, Implementation and Deployment of an Educational Platform for the Teaching of Protocols and Network Programming using P4

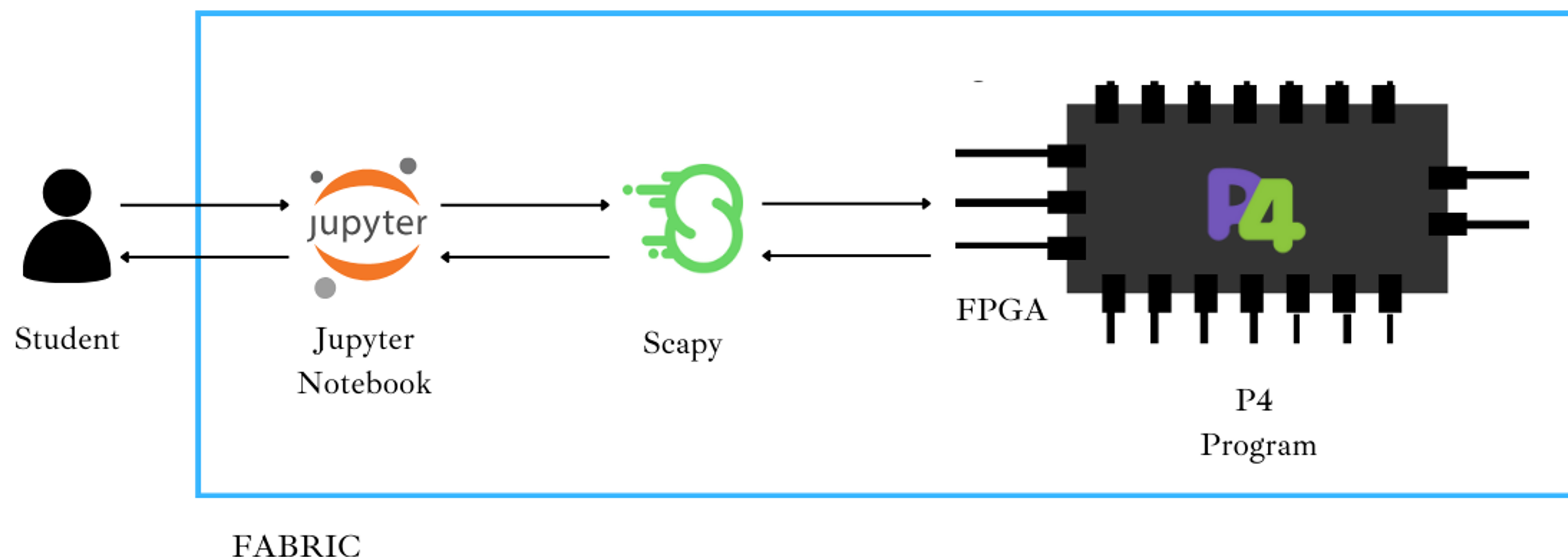
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### Introduction

- Programmable networking elements offer significant flexibility in the data plane.
- This flexibility facilitates the definition of different network behaviors.
- Students can learn basic protocols as well as some more advanced applications through this approach.
- The **FABRIC** testbed is an online platform crafted to assist and facilitate research endeavors.
- This platform facilitates the use of FPGAs distributed worldwide

### Motivation

- 1) The need for an **educational platform** focusing on protocols and network programming with P4.
- 2) Use of a federated testbed, such as FABRIC, utilizing as hardware the au280 Alveo **FPGA** board.



### Approach

- Create a variety of practice sessions covering topics like IP, TCP, UDP, SDN, P4, and INT.
- Utilize student IDs to customize challenges for each individual, ensuring a unique set of tailored exercises for every student.
- Integrate features for hardware compilation and exploration using FPGA boards, such as the au280 Alveo board through FABRIC.
- Develop a user-friendly interface in **Jupyter Notebook** that fosters active engagement, providing an interactive environment for students to learn about network protocols and programming.
- Implement a **P4 program** capable of performing a range of network functions, enabling students to utilize the switch for various applications.

### Results

- The platform will undergo testing with a limited number of students to gather statistics on their learning experiences.
- The aim is to collect data on the learning outcomes achieved by students using the platform.
- We will provide supporting evidence showcasing the need for this platform as a method for teaching network protocols and programmability.