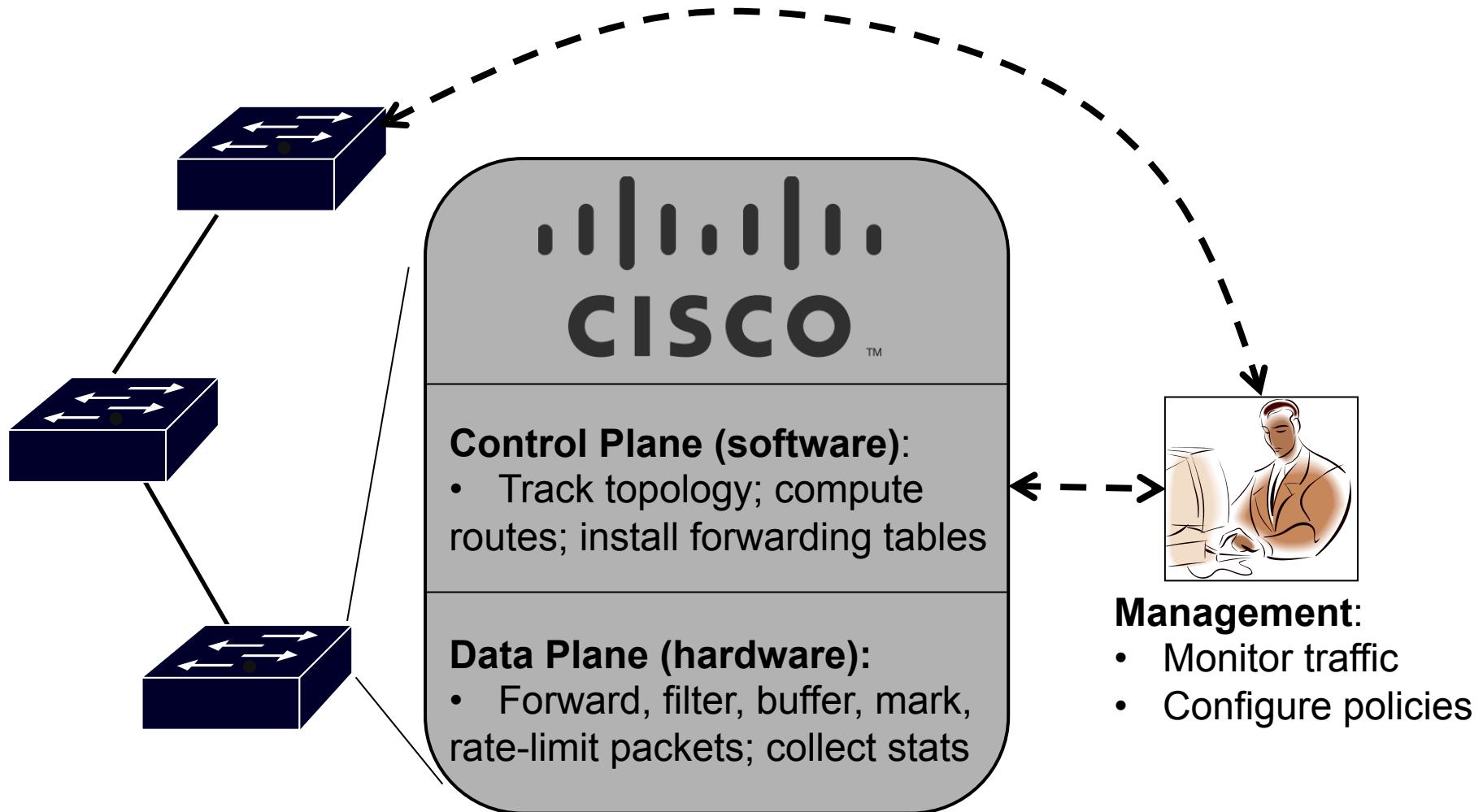


Advanced Programming Homework

1. The assignment involves a programming activity and includes an optional *problem*.
2. The submission must include all required files for compiling and executing the proposed solution.
3. It is allowed to develop the solution into teams, however the proposed solution should be discussed individually.

The problem

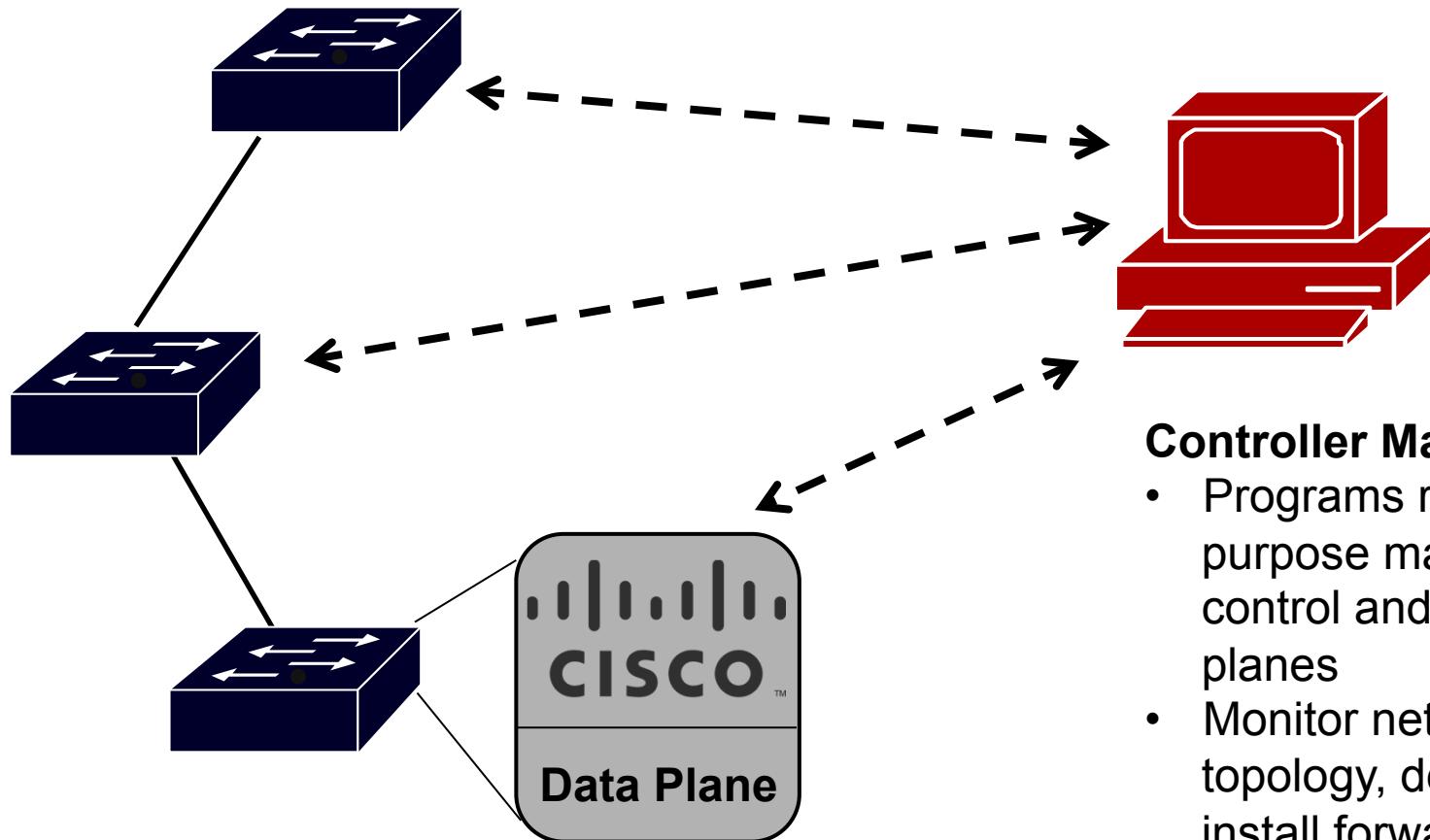
Traditional Networks



A Recent Idea: (Re)Move the Control Plane?

Move the control plane out of the switch boxes
and in to separate, general-purpose computers

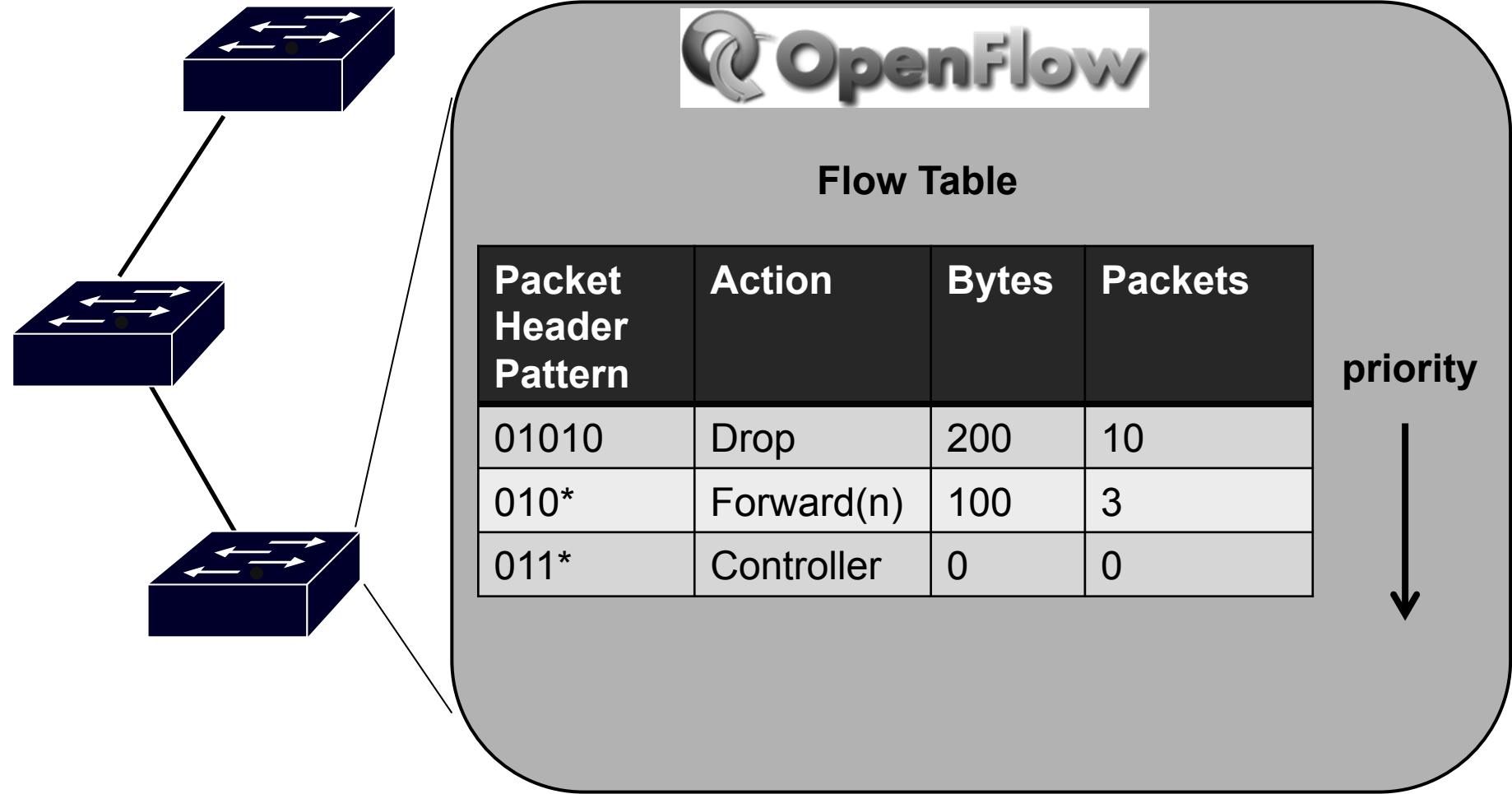
- Companies buy the forwarding hardware, but implement their own control software
- Simpler routers ==> cheaper, more flexible routers
 - the same hardware box can be a router, a switch, a NAT, a firewall, or some new combination
 - you don't have to buy that special million \$ load balancer from the networking company
- Accelerated innovation



Controller Machine

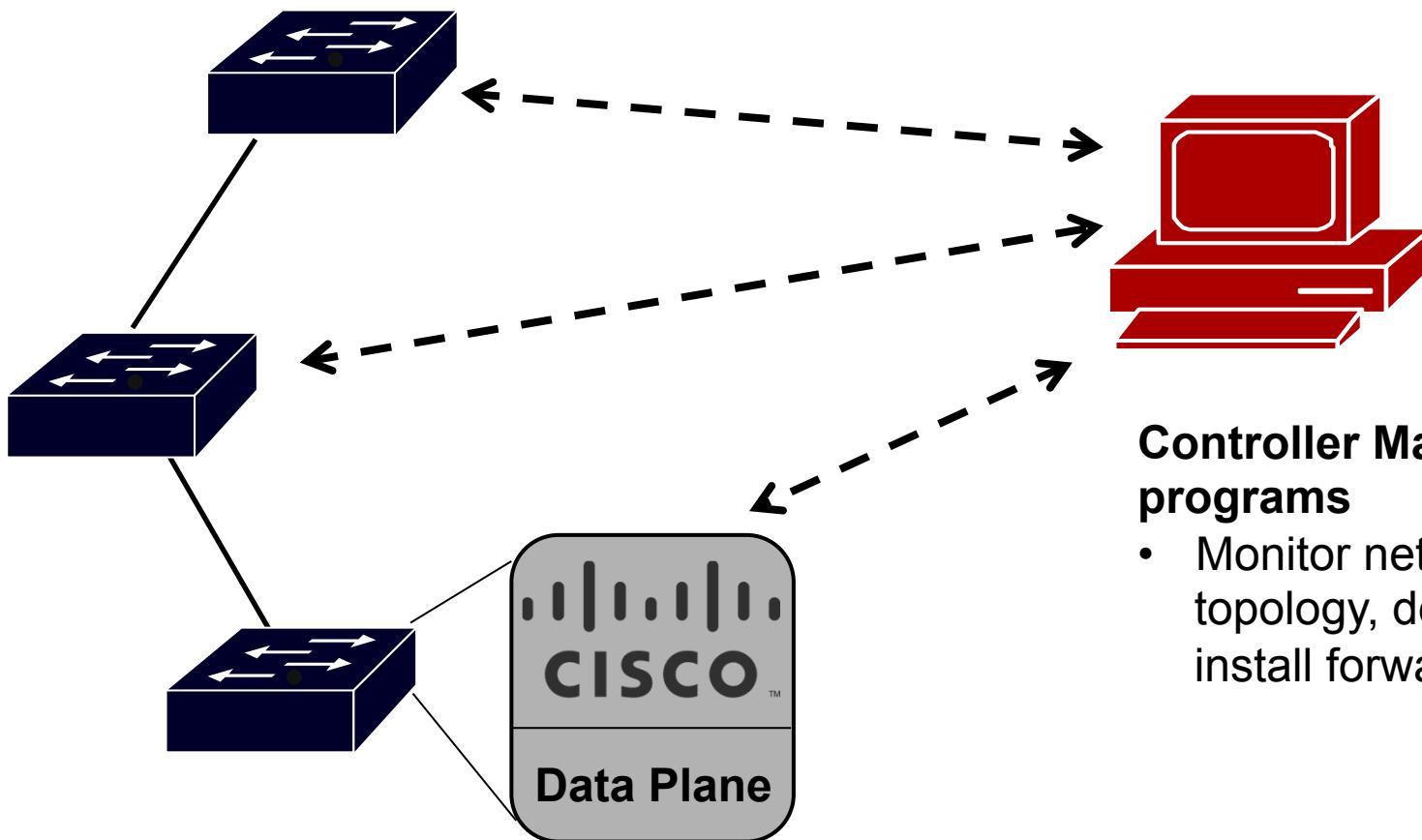
- Programs running on general-purpose machines implement control and management planes
- Monitor network traffic, track topology, decide on routes, install forwarding tables

Switches



The Homework

- Simpler view of network programming
- Design and implement a Domain Specific Programming Language for
 - Monitor network traffic,
 - track topology,
 - decide on routes,
 - install forwarding tables



Controller Machine runs DSL programs

- Monitor network traffic, track topology, decide on routes, install forwarding tables

STEPS OF THE HOMEWORK



Step 1

Modelling in OCAML an abstract network switch
that receives, processes and forwards data to the
destination

Main data structure: forwarding table

Step 2

Design the Controller Language

The main primitive of the Controller Language

Install a forwarding Table

Drop a forwarding rule

Delete a forwarding rule

Install Security Policies for packets

Install rules to block traffic

Handling Mobility

Step 3

Implementing the interpreter for the control language using OCAML

Step 4

Simulating the interaction between the abstract network switch and the controller

Mandatory

- Step 1: Modelling abstract network switch
- Step 2: Design the controller language with primitive for
 - Install a forwarding Table
 - Drop a forwarding rule
 - Delete a forwading rule
- Step 3 Implement the interpreter of the Controller Language
- Step 4: Implement the interaction between te abstract network switch and the controller

Optional

- Step 2: Design the controller language with primitive for
 - Install a forwarding Table
 - Drop a forwarding rule
 - Delete a forwading rule
 - **Install Security Policies for packets**
 - **Install rules to block trafic**
 - Handling Mobility

Grading

- The breakdown for the programming assignment is as follows:
- Problem set (Mandatory): 60%
- Problem set (Optional): 30%
- Other factors (code quality): 10%

Submission

- The AP homework should be submitted by e-mail by
31-10-2016 (midnight)
to gian-luigi.ferrari@unipi.it with the subject prefix **[AP-HW1]**.
- The submission must include all required files for compiling and executing the proposed solution.