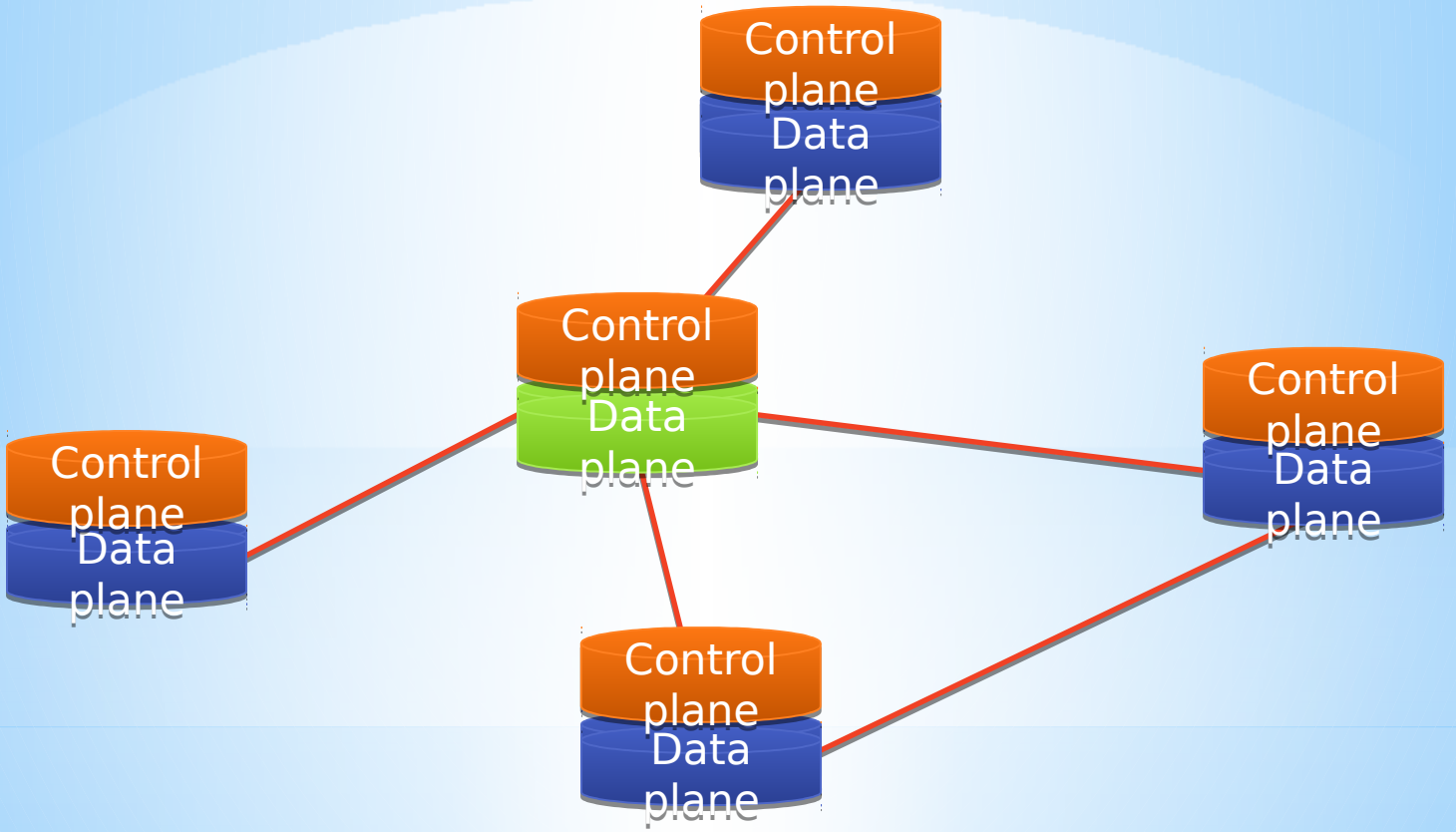
*SDN testbed for undergraduate education

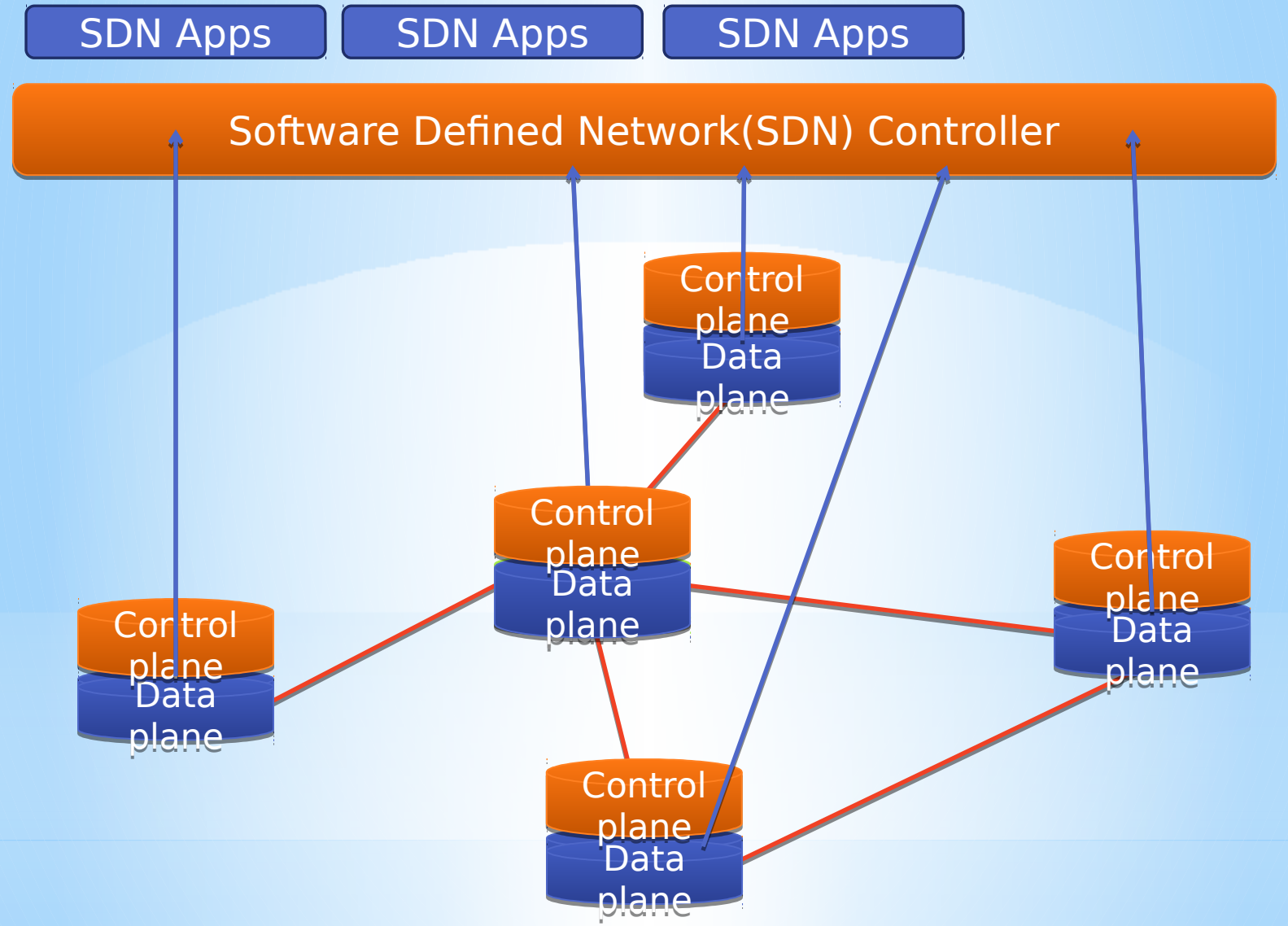
Presenter : Weerawardhana J.L.M.N.
Department of Computer Engineering,
University of Peradeniya.

* **SDN** stands for **S**oftware **D**efined **N**etworks

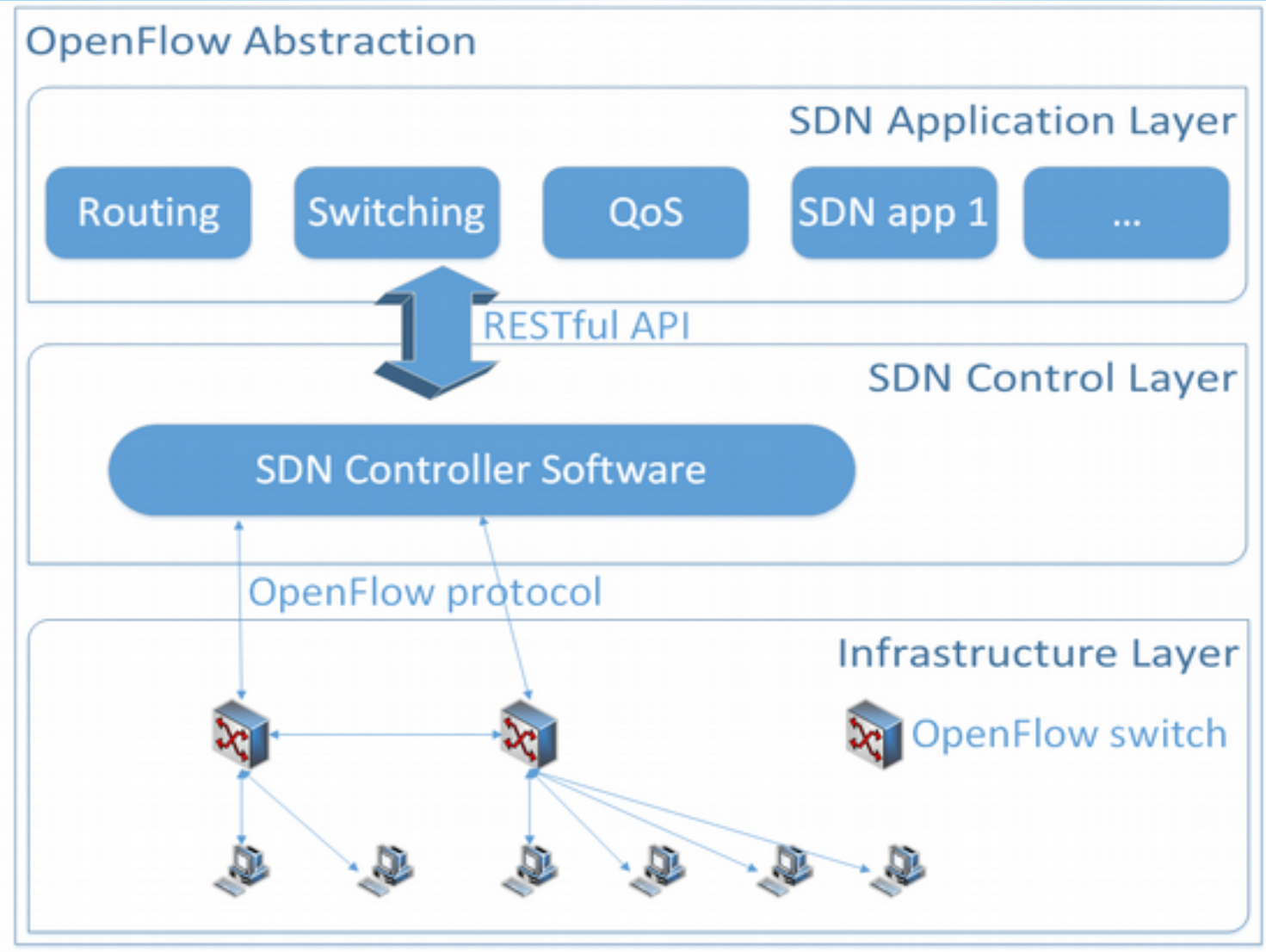
* First things first



*Think of a network like this


SDN Apps
SDN Apps
SDN Apps
Software Defined Network(SDN) Controller
Control plane
Data plane
Control plane
Data plane
Control plane
Data plane
Control plane
Data plane
Control plane
Data plane

*Now a SDN


OpenFlow Abstraction
SDN Application Layer
Routing
Switching
QoS
SDN app 1
...
RESTful API
SDN Control Layer
SDN Controller Software
OpenFlow protocol
Infrastructure Layer
OpenFlow switch

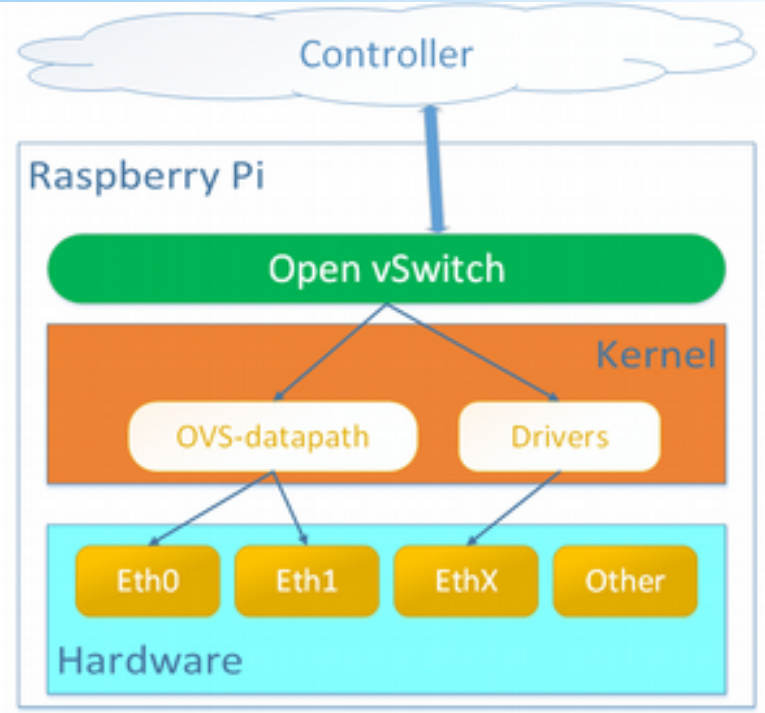
*OpenFlow

*The problem

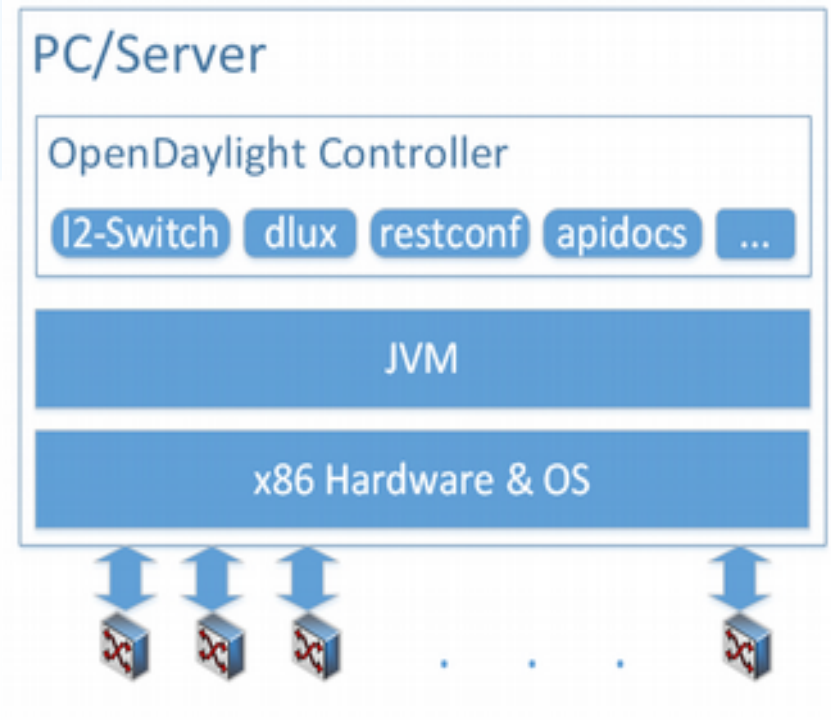
- *The cost
  - *SDN is a new trend
  - *Lots of research going on
  - *But OpenFlow capable switches are expensive
- *Solution
  - *Small scale low cost SDN testbed
  - *Using low cost hardware(Raspberry Pi)
  - *With extensive documentation for reproducibility

The next problem

- Complexity
  - Lots of competing standards
  - Poor documentation
  - And hard to understand for a beginner
- Solution
  - Simple methodology to introduce SDN to beginners
  - Using our SDN testbed



SDN switch



SDN controller

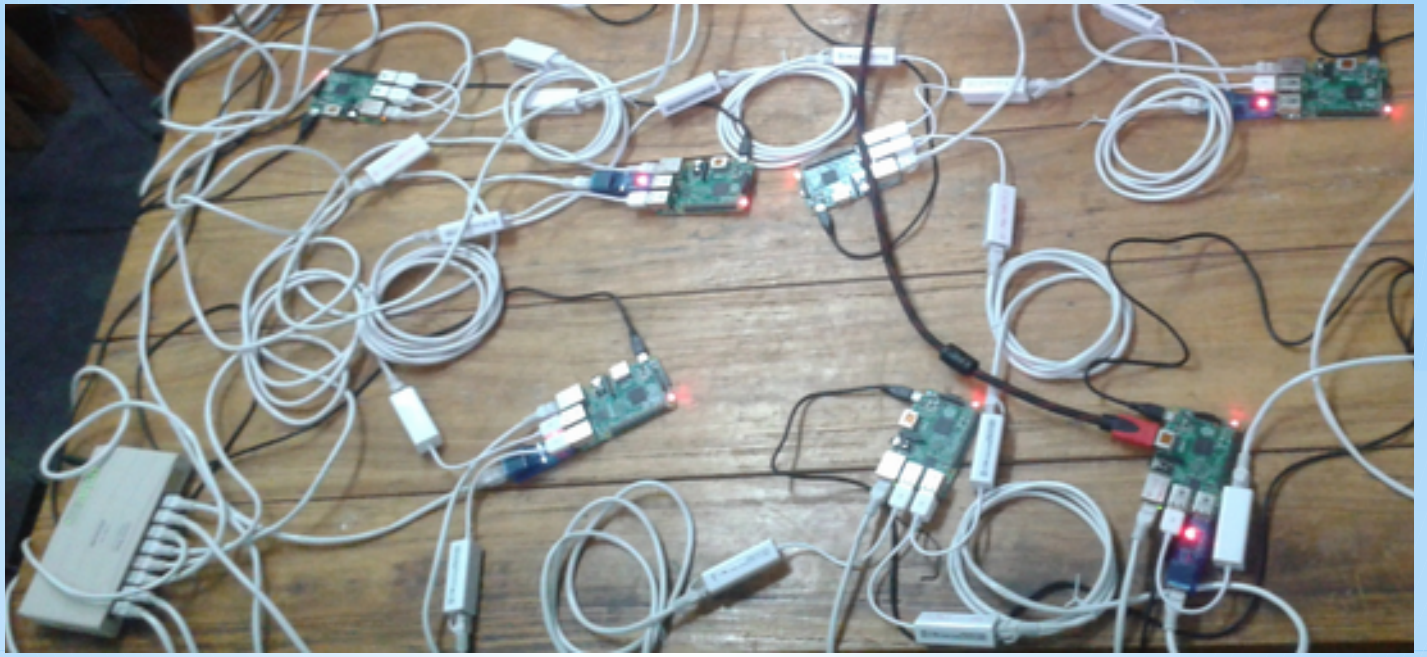
*System Model

*Features

*Dynamic Flow forwarding rules

*Firewall capabilities

*Automatic host discovery



Switch port	MAC src	MAC dst	Eth type	VLAN ID	IP src	IP dst	IP port	TCP sport	TCP dport	Action
1	-	-	-	-	-	-	-	-	-	to IP1
-	-	-	-	2	-	-	-	-	-	drop
-	-	-	-	-	IP2	IP4	-	-	-	to IP4 Copy to controller
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**TP1**	**TP4**	**to TP4**

No Match! Forward to the controller

*An example

*Limitations

- *Low throughput
  - *Slow processor
  - *Slow ethernet over USB (100Mbit)
- *Stability
  - *Weak physical connectors
  - *Power problems
  - *Software stability

*Future

- Full featured small-scale SDN
- Traffic visualization
- Dynamic resource allocation
- Network function virtualization