“Challenges in Modern Networking”
ICN Panel
17:30 - 19:00

Panelists

- Carlos Becker Westphall, Federal University of Santa Catarina, Brazil
- Natalia Amelina, St. Petersburg State University, Russia Norwegian University of Science and Technology, Norway
- Tibor Gyires, Illinois State University, USA
- Marcial Fernandez, UECE, Brazil
- Anurag Jain, HCL Technologies, India

Software Defined Networking; OpenFlow

Tibor Gyires

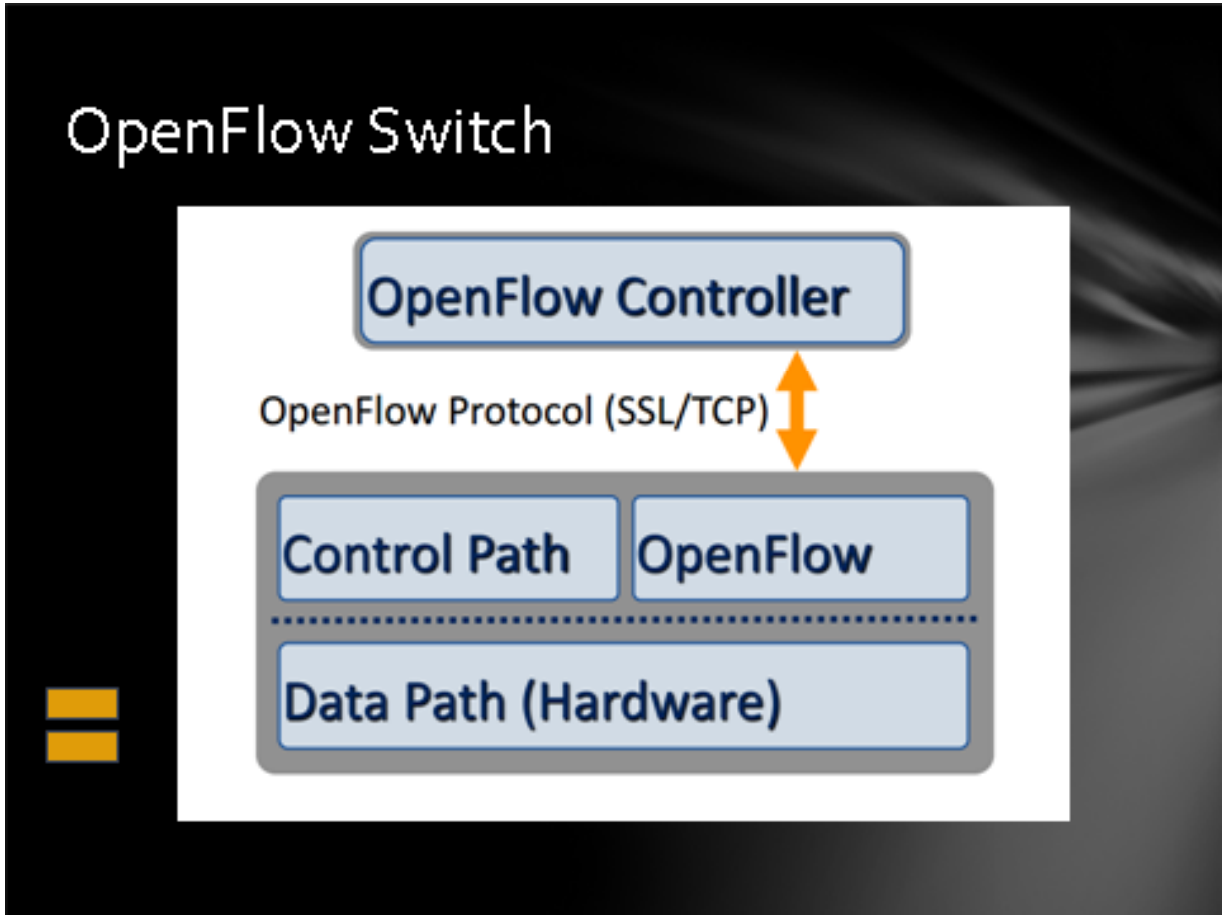
Illinois State university

USA

Motivation

- There are several ways to try out new protocols and predict future network growth, such as simulation, test bed, etc.
- Geni, Internet2, PlanetLab, Emulabs call for programmable switches and routers, long term, top-down, nation-wide (costly, unrealistic) plans.
- Shorter-term approach (bottom-up): develop your new protocols in your campus environment
- Solution: Control the research network without disrupting the production network using a new switch/router architecture

What is SDN/OpenFlow?



Flow Table

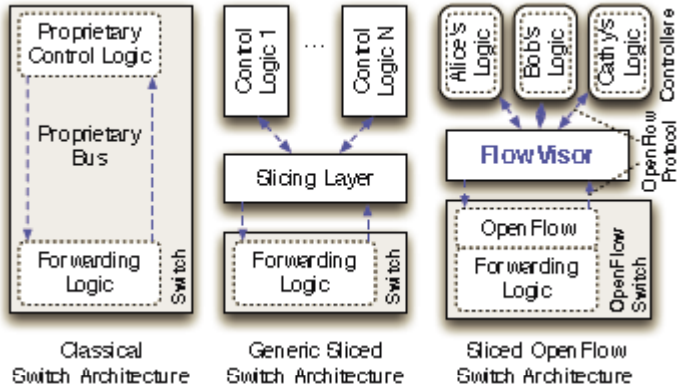
Each entry has an associated action:

- Forward this flow's packets to a given port
- Encapsulate and forward this flow's packets to a controller
- Drop this flow's packets
- Forward this flow's packets for regular layer 2/3 processing

Example Applications

- New routing protocols
- Network management/policy management
- VLANs
- Hand-off of mobile wireless VOIP users
- Non-IP network protocols, etc.

FlowVisor



"For example, imagine that Bob wants to create a new http load-balancer to spread port 80 traffic over multiple web servers. He requests a slice: its topology should encompass the web servers, and its flowspace should include all flows with port 80. FlowVisor allocates a control plane for Bob, and allows him to control his flows (but no others) in the data plane. Any events associated with his flows (e.g. when a new flow starts) are sent to his control plane. FlowVisor enforces his slice's topology by only allowing him to control switches within his slice." [3]

References

- [1] http://www.OpenFlowSwitch.org
- [2] McKeown, Nick, et.al, “OpenFlow: Enabling Innovation in Campus Networks,” Whitepaper, March 14, 2008
- [3] Rob Sherwood et. al., “Can the Production Network Be the Testbed?” www.openflow.org/wk/images/2/25/Flowvisor.pdf
- [4] http://www.openflow.org/documents/openflow-wp-latest.pdf
- [5] Greg Razka, “OpenFlow,” presentation at Illinois State University, USA, 2012.

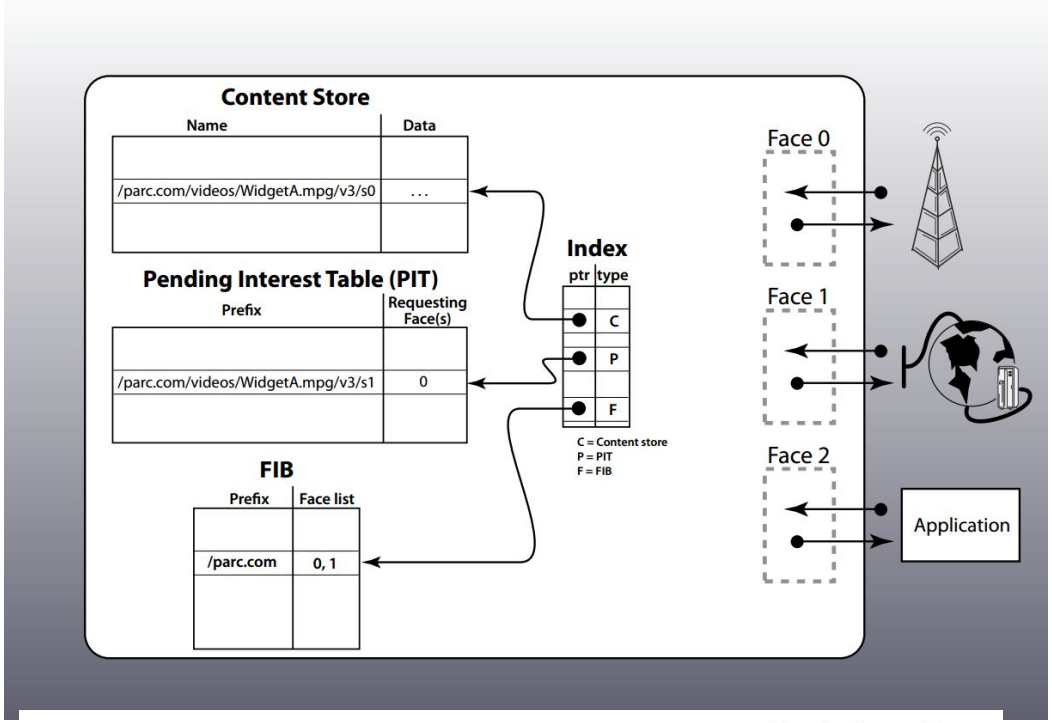
Prof. Marcial P Fernández
Universidade Estadual do Ceará - Brazil

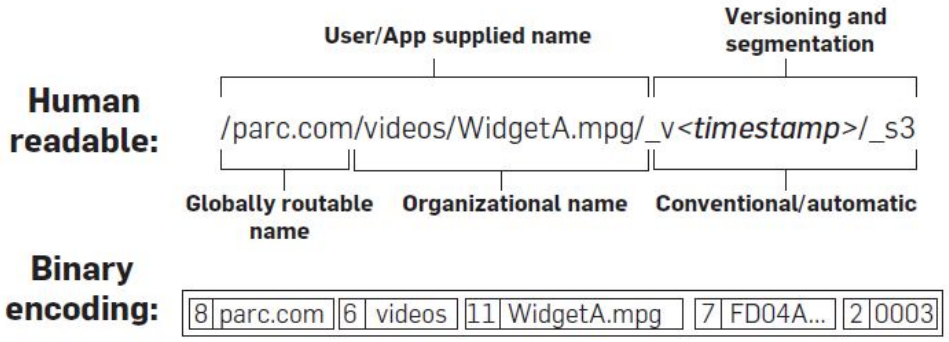
Content-Centric Networking

- Internet architecture is based on host location (IP address, network address, ASN).
- Usage of the Internet is in terms of ***what*** not ***where***.
- CCN: architecture built on named data rather than named host.
- Two packet types: Interest and Data
  - Hierarchical and dynamic naming scheme.
- CCN node has three components:
  - FIB: Forwarding Table, allows multiple output faces.
  - Content Store: Buffer, caches data packets.
  - PIT: Pending Interest Table, content waiting.

Content-Centric Networking

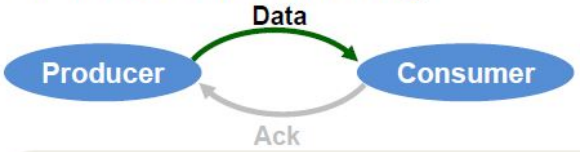
1. User wants a video.
2. Interested goes to PIT.
3. Node asks for who has the video.
4. Look at FIB for the global name
5. When receive video, put it on CS.
6. New user gets the local copy.

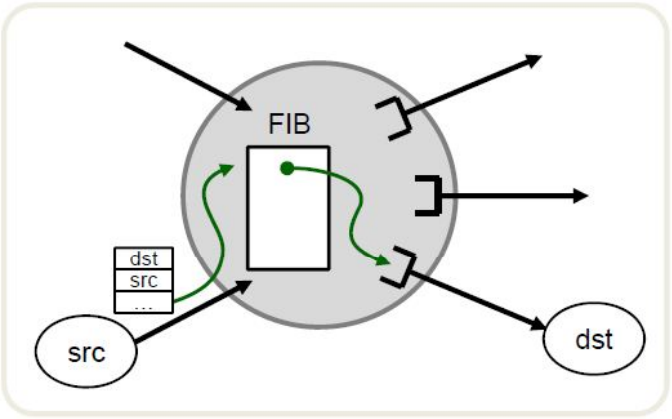




Content-Centric Networking

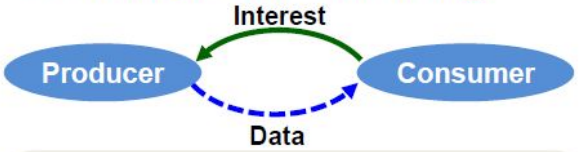
IP Packet Forwarding

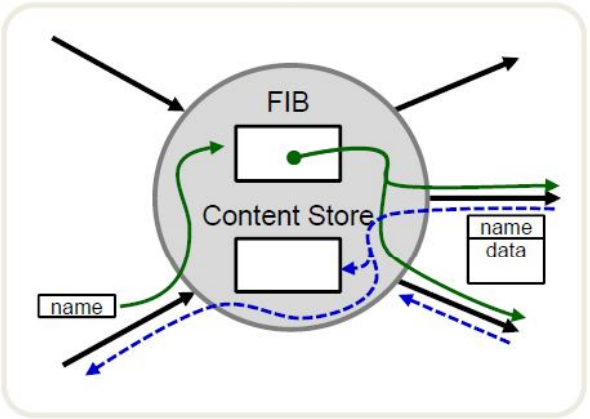


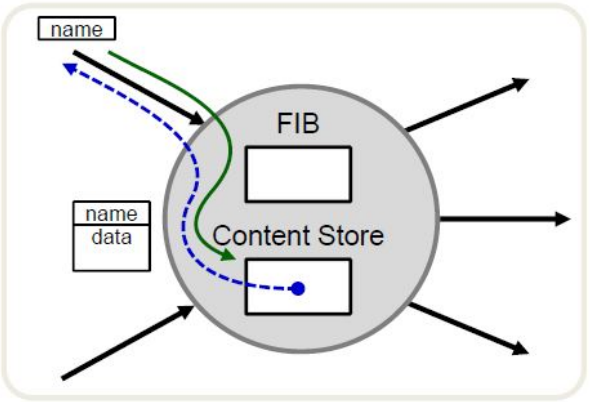


* FIB: Forwarding Information Base

CCN Interest Forwarding

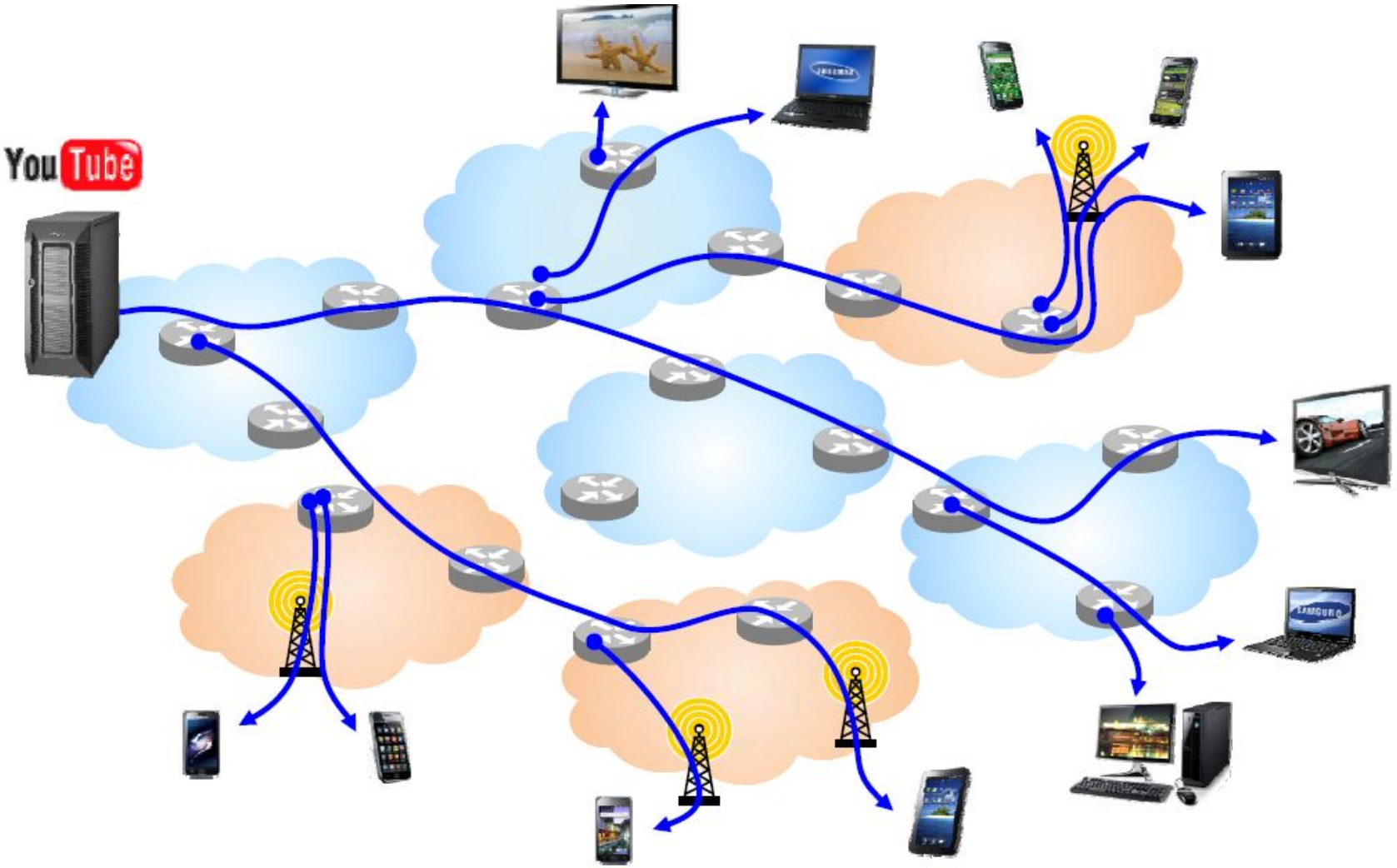






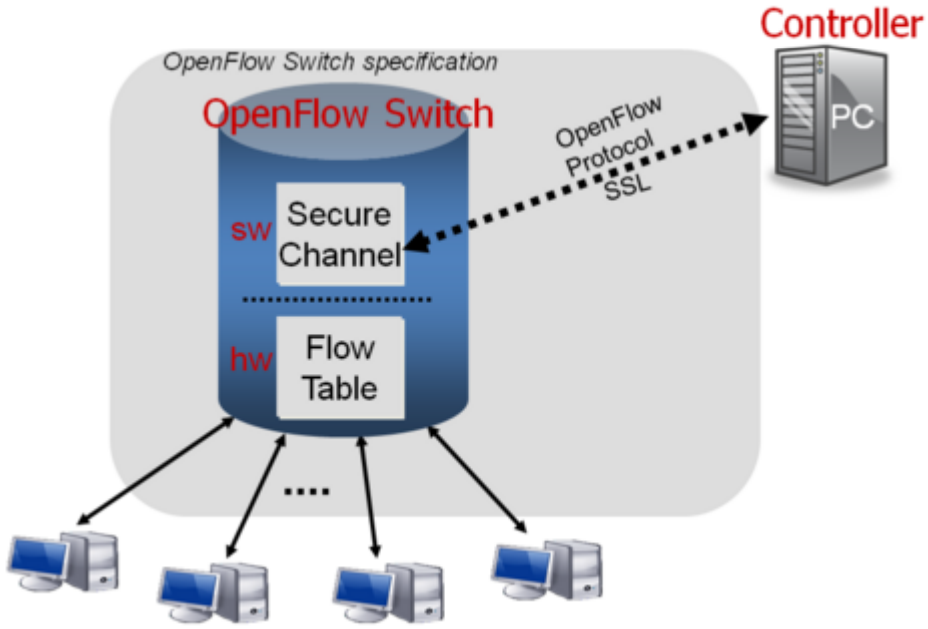
※ Source: Jacobson V, "Content Centric Networking", SAIT Talk, 2010

Content-Centric Networking



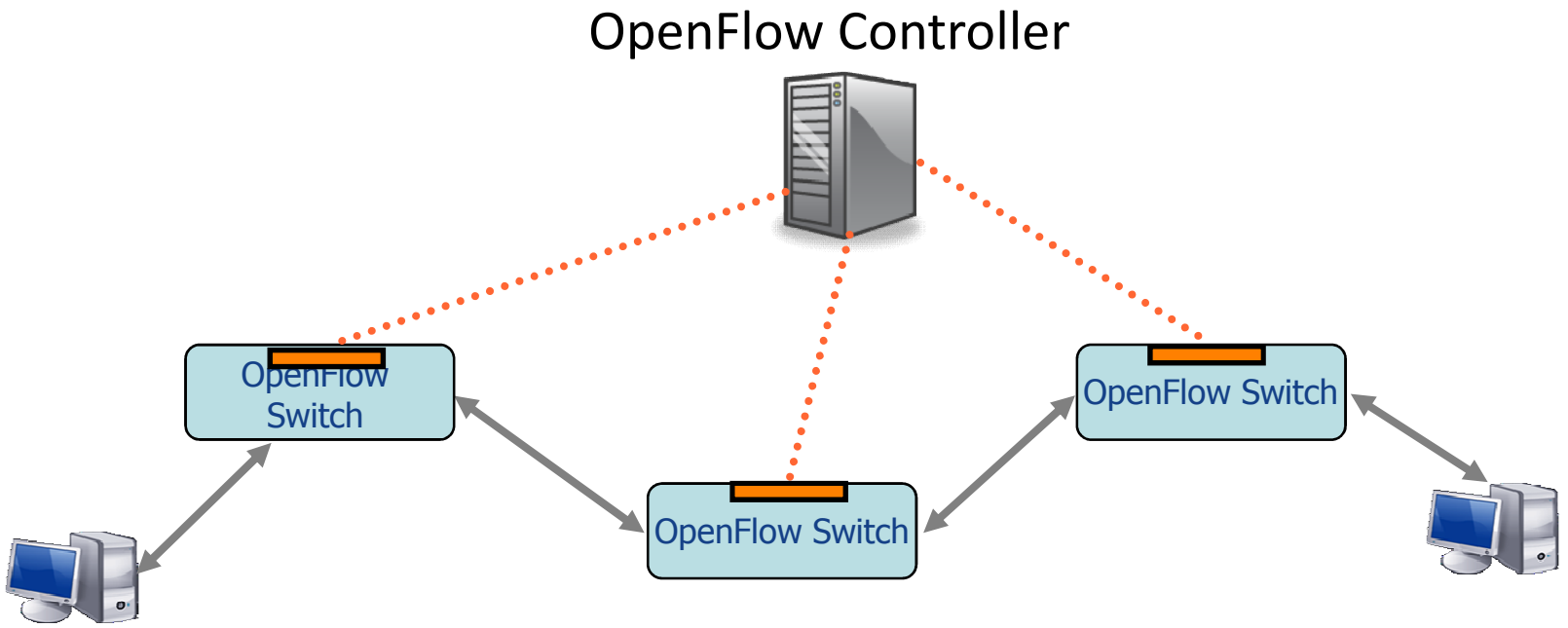
OpenFlow

- Stanford Clean Slate Program.
- Basic Idea: An open protocol to remotely add/remove flow entries in off-the-shelf switches.
- Uses SSL to provide secure communication controller-switches.
- OpenFlow commands act direct on switch's hardware forward table
  => scalable.



OpenFlow Network

- Centralized control.
- Low overhead on switches.



Open Issues...

- OpenFlow and CCN are approaches for “short distance” networks.
- OpenFlow in low layers and CCN i
- CCN is user friendly.
- OpenFlow is efficient.
- An OpenFlow device (switch) does not have enough memory to cache CCN data.
- CCN Interest packet does not need to forward to the OpenFlow controller to find the content.