Extending SDN to Cellular Network End Devices

Ibrahim Ben Mustafa, Mostafa Uddin, Tamer Nadeem

Computer Science Department, Old Dominion University

Motivation

- Too complex and expensive to add new services to the current cellular architecture.
- Hard to insure truly end to end QoE.
- Lacking of fine-grained context Awareness of end device.

Proposed Solution

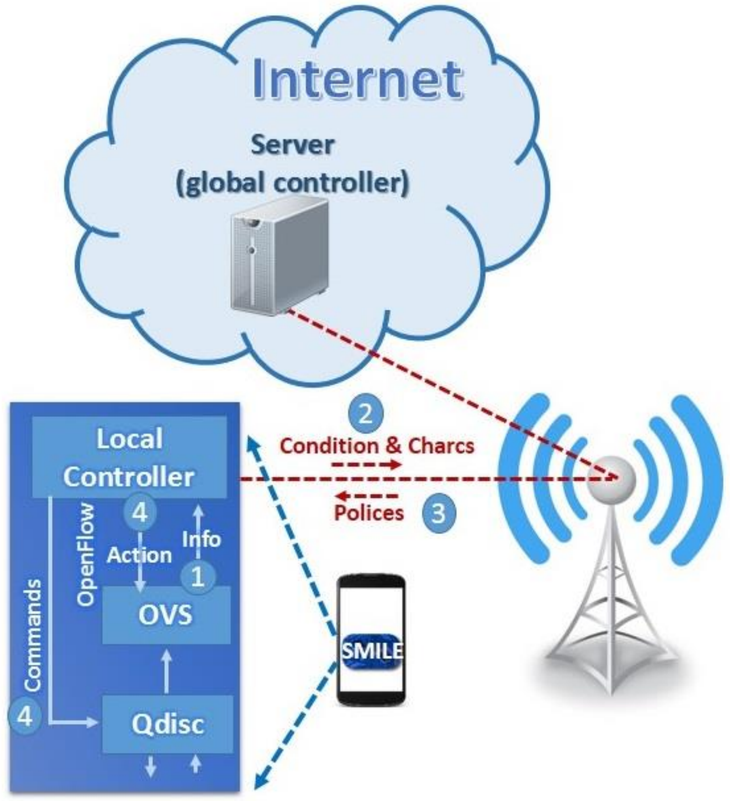
SMILE (Smart and Intelligent wireless Edge) framework that extends SDN-like paradigm to end devices.

SMILE Advantages

- Removing the dependency on network infrastructure.
- Bringing Context-awareness of end devices makes network management smarter for the users.
- Lightweight and distributed solution of network management.
- Allowing users to interact with the network.
- Fine-grained control and reliable monitoring capability.

For full list of projects, visit our Lab webpage at http://swimsys.cs.odu.edu/

SMILE Architecture



- **Local Controller**
  - Controls the flow manager (OVS) & the scheduler (Qdisc)
  - Provide the global controller with device condition and status.
  - Apply polices as assigned by global controller.
- **OpenVSwitch (OVS)**
  - measures flow statistical info and send them to local controller
- **TC Qdisc**
  - Limiting the rate of ingoing flows as directed by the local controller.
- **Global controller**
  - Managing the network resources based on the characteristics and conditions of end devices.

Use Case

- Clients with poor wireless links, big screens,. etc, are likely to experience poor video quality when competing with other devices with good links.
- Our goal: utilizing SMILE framework to set a context aware policy that mitigates the competition and improves the QoE of those suffering devices.

Experiment Setup

- Two YouTube apps on a smartphone and tablet stream the same video encoded with several bitrates.
- The smartphone placed near the AP, while the tablet taken away to weaken the wireless signal.
- limits the AP capacity to 1.7 Mbps to make the players compete for bandwidth.

Preliminary Results

- The competing flow of the smartphone terribly impacting the throughput of video app on the tablet.