T11: SDN solutions for data centers in mobile networks

Critique

Birkner, Rüdiger

1. In the paper Toward Software-Defined Cellular Networks (SDCN), a new approach at cellular data networks based on SDN is presented. However, it is not mentioned how the existing infrastructure can be incrementally changed/extended towards a SDCN.
2. The paper only addresses data networks. What is the additional infrastructure needed to have traditional voice services working alongside?

Chothia, Zaheer

1. This is a position paper and the idea is to explain the LTE architecture and motivate how different components can be realized more efficiently. An example is that SDN enables more fine-grained traffic steering on individual flows. This helps for instance by reducing traffic on middleboxes or pre-emptively installing rules during migrations to reduce setup time.
2. From a high level their position makes sense, but is very abstract. Take billing as an example: switches maintain counters and these could be used to monitor quotas, but do switches expose sufficient information and provide guarantees that are strong enough. I imagine real cost models are much more complex (think of peering and roaming).
3. Given the venue and early stage of work the paper acts as a point for discussion and to connect different players. It just sketches how the SDN hammer can be applied to a cellular use case and what extensions are needed, but a more comprehensive design is certainly needed.

Van Gelder, Jasper

1. In Toward Software-Defined Cellular Networks:
   "In addition, a SDN controller running on a commodity server would have much more computing resources than most base stations. As a result, a SDN controller can make a more efficient allocation of radio resources to handle new users."

   Why don't you add a small server to a base station then? But yes I would be more convenient to have one central server, but this would mean overhauling your whole network.

2. In Moving the Mobile Evolved Packet Core to the Cloud they want the controller to instantiate GTP-U but isn't a regular flow here also possible? and does it not provide the same functionality as GTP-U?

3. In Toward Software-Defined Cellular Networks they name all these features for the switch but how are you going to keep track of which switch supports what functionality and what do you do if a certain switch does not support for example support header compression? this basically means that when you want to use a new feature you would have to upgrade/update all switches. When you need to upgrade a switch you are as flexible as you are now.
Defence

Pappas, Chris

1. Cellular network has always been a centralized and tightly controlled network. The centralized-nature of SDN would make SDN a good fit into the cellular network.

2. Although cellular networks have adopted IP in their backbone networks, the use of IP is rather primitive—Only mainly for GTP tunnels between gateways. The tunnelling solutions have limitations, such as routing inefficiencies. It was interesting to read how SDN could possibly solve these inefficiencies.

3. There are MVNOs in the market even before the days of SDN. What challenges do MVNO operators and cellular operators face? How does SDN solve or alleviate the problems? It would be great if the papers mention this in more detail.

Shinde, Pravin

1. The paper outlines the problem in existing cellular network due to inflexibility and complexity, and proposes SDN as a solution.

2. It explains the challenges in using SDN in terms of number of subscribers, mobility and real time adaptation

3. Has useful information like cost of Cisco router, which makes the scale of problem more clear

4. The requirement of adapting policies in real-time based on the subscriber attributes makes the challenge harder

5. The paper points to the potential benefit of using SDN in cellular network for following:
   a. Simplified handover of mobile subscribers
   b. Cheaper middle-boxes due to reduce traffic with fine-grained openflow rules
   c. Easier accounting with solution based on byte counting rules in openflow
   d. Distributed enforcement of QoS policies.

6. Authors present the changes needed to make openflow work on cellular network

Schmid, Stefan

1. A cellular network is also an infrastructure network and therefore also based on NCS. So the same arguments as above apply here. Mobile networks have to support certain special services like mobility (handover and mobile IP) and subscription based QoS and maximal bandwidth.

2. The first paper (Toward Software-Defined Cellular Networks) identifies how SDN could be applied to mobile networks to improve certain services. The paper by Ericsson shows efforts how to implement parts of the EPC with OpenFlow. It provides some implementation details, but no performance results are given.

Yu, Xinyuan
1. Today’s cellular network architecture have two major limitations. Firstly, centralizing data-plane functions forces all traffic through the P-GW. Secondly, the network equipment has vendor-specific configuration interfaces, and communicate through complex control-plane protocols, with large growing parameters.

2. Software defined networking can enable better solutions in the case of directing traffic through middle-boxes. Today’s cellular doesn’t have fine-grained control over routing. It may cause traffic through unnecessary middle-boxes. SDN provides fine-grained packet classifier and flexible routing, which can direct traffic through correct middle box.

3. Today’s cellular providers do not have direct control over routing. SDN could push new forwarding rules to multiple switches for a lower set-up delay. In this way, cellular networks could respond quickly to subscriber mobility.