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Mobility Support in Software Defined Networking
draft-liu-sdn-mobility-00

Abstract

This document discusses the SDN mobility problem and potential solutions.

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1. Introduction

Software defined networking provides a very flexible way to process IP packets and flows. It decouples the control and forwarding function of traditional IP appliance. IP mobility support has been specified by IETF. There is currently not much discussion regarding the mobility support in SDN network. This document discusses the motivation, problem and potential solution of the mobility support in SDN network.

2. Conventions and Terminologies

2.1. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL","SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2.2. Terminology

SDN: Software Defined Networking

3. Motivation of SDN mobility

IP mobility support has been specified in IETF for years. Both [RFC2002], [RFC3775], [RFC5555],[RFC5213] share the similar idea that it introduce an anchoring point to maintain the mapping of the home address and routing address of the mobile node. It uses tunnel to encapsulate the user traffic so that the application layer is not aware of the mobility event.

IP protocol has been used intensively in current cellular network architecture. For example, in LTE network architecture, IP support is enabled in the data plane. Also In the control plane and mobility supprot, IP moblitliy protocol is used. Both S2a/S2b/S2c interface is specified that can based on IP mobility protocol.

There is ongoing research work and discussions of using SDN in cellular network. SDN can provide the IP packets processing ability for the cellular core network. Mobility support is critical for the cellular core network. If mobility can be supported by SDN, the cellular core network can be significantly simplified. The data plane traffic routing can also be optimized. The following figure shows an architecture of the cellular core network that build upon SDN concept.

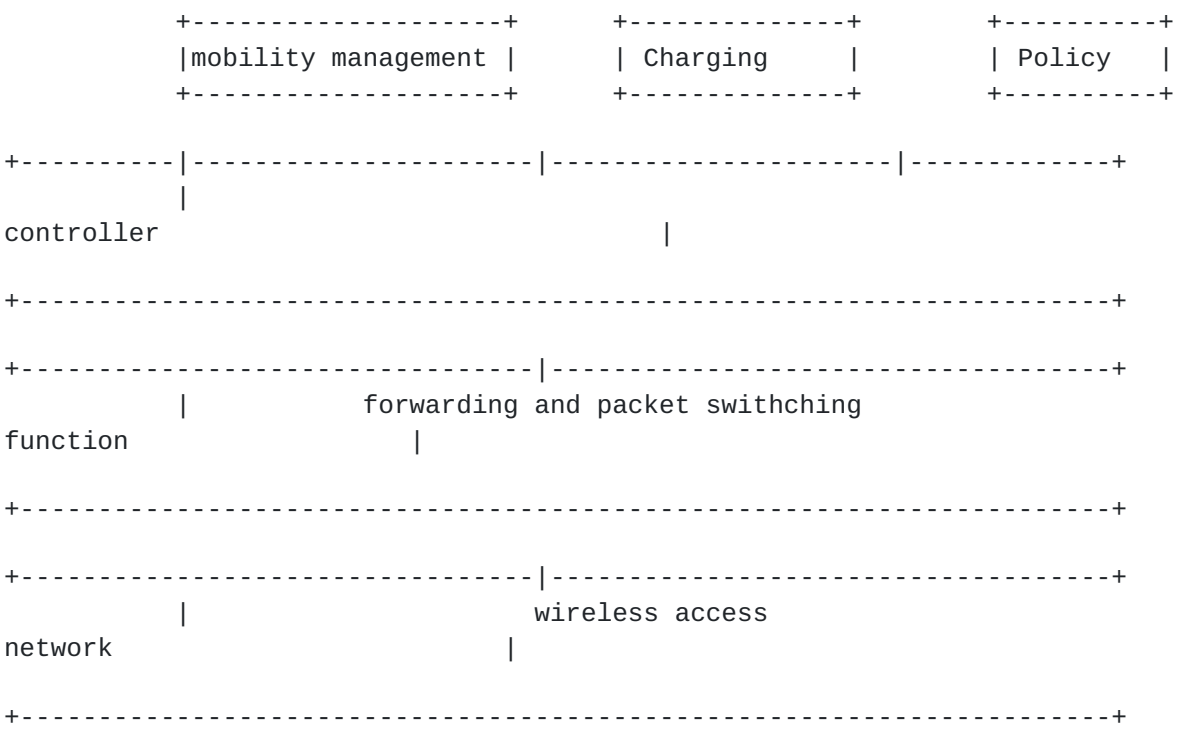

Figure 1. SDN based Mobile core network

4. SDN mobility problem analysis and potential solutions

The purpose of mobility management is to maintain the session continuity from the application's perspective. Normally, when a mobile node change its attachment point, its IP address will be changed accordingly. If there is no mobility support, the application layer session will be broken. For example, TCP session can not survive when the source IP address changes.

There are several potential ways for SDN network to support mobility. The following sections will discuss the potential solution in detail.

4.1. Enhance SDN to support mobility tunnel handling.

Current mobility protocol mainly follows the concept of mobility anchor. Mobility anchor point maintain the mapping of home address

and routing address. For example, in Mobile IP, the home agent maintain the mapping of home address and care of address. When the care of address changes due to mobile node's movement, the foreign agent or the mobile node will send binding update request to the home agent to update the binding cache entry. The foreign agent or the mobile node will set up bi-directional tunnel towards the home agent. All the user traffic will be encapsulated in the bi-directional tunnel.

To enable SDN to support mobility, one potential solution is to enable the SDN controller and SDN forwarding function to support IP mobility protocol related tunnelling processing.

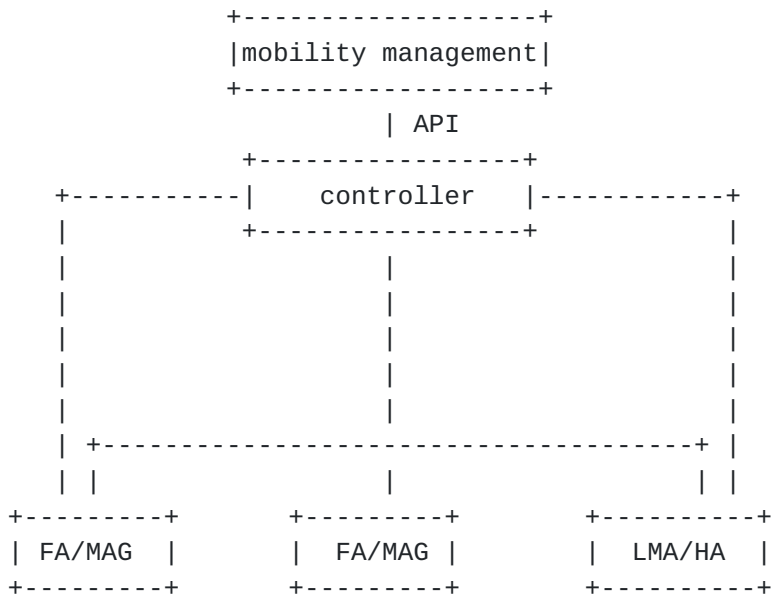

Figure 2. Enhance SDN to support mobility tunnel processing

The mobility management function could run on top of the controller. The controller controlls the forwarding function. To support mobility, the mobility management function monitors the mobile node's movement event. When the FA/MAG detects the mobile node's movement, it needs to update the binding cache entry that maybe maintained in the mobility management function. The mobility management function then control the forwarding function(FA/MAG) to do the mobility tunnel processing. When the packets arrives at the LMA/HA, the mobility management function will controll the forwarding function to decapsulate the packets and forward the packets to the Internet.

4.2. Routing based SDN mobility support

SDN provides a very flexiable way of packet and flow processing. It is in nature can react quickly on the routing changes of the network. When the mobile node changes its point of attachment, the forwarding function will notify the mobility management function running on top of the controller, the controller then calculate the forwarding rules based on the destination IP address of the IP packet. The controller then push the forwarding rules to the forwarding function and the IP packet will be forwarded accordingly. When the user session terminated, the mobility management function will delete the forwarding rules. In this manner, the application lalyer session continuity will be guaranteed since the mobile node's IP address is not changed during the movement.

There are lots of interesting problems need to be solved to make SDN support mobility. For example, the forwarding function needs to detect the movement event of the mobile node and notify the controller and mobility management function in a timely manner. A routing path needs to be set up from the MAG/FA to the Internet access point in a timely manner. To achieve this, new protocol and mechnism may need to be defined in IETF.

5. Security Considerations

TBD

6. IANA Considerations

None

7. References

7.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

7.2. Informative References

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[RFC5213] Gundavelli, S., Leung, K., Devarapalli, V., Chowdhury, K., and B. Patil, "Proxy Mobile IPv6", RFC 5213, August 2008.

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