Chair of Communication Networks
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BigData Analysis in a 4G Roaming Scenario

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1 Overview

Mobile roaming enables users to seamlessly access internet and communication services across the globe. These services are facilitated by Mobile Network Operators (MNOs) through extensive roaming agreements with numerous international counterparts. As a result, roaming interfaces have evolved into highly complex interconnection points, supporting a wide array of protocols and multiple generations of mobile network technologies. Large-scale MNOs, serving millions of inbound and outbound roaming users, must efficiently manage high volumes of network traffic — often processing thousands of packets per second. Even when focusing solely on control plane messages, this traffic generates substantial data, all of which passes through firewalls and contributes to extensive logging activity. Beyond firewall logs, several other data sources — such as diameter routing agents, DNS servers, and passive monitoring systems — offer valuable insights and can be integrated into a comprehensive analysis.

The aim of this research internship is to explore selected data sources within a controlled environment to identify correlations, uncover trends, and propose innovative approaches for leveraging this data in operational network management. The investigation will focus on a 4G roaming scenario, analyzing and comparing two distinct one-hour timeframes: A high-traffic hour during an international event, characterized by elevated roaming activity, and a regular hour on a typical day with no special events. Through this comparative analysis, the student will gain hands-on experience in data interpretation, network behavior analysis, and the development of actionable insights for real-world mobile network operations.

2 Objectives

1. Work into different data sources.
   a) Firewall logs.
   b) Diameter Routing Agent logs.
   c) DNS server logs.
   d) Logs from passive monitoring.
2. Investigate trends and correlations between the data sources.
3. Investigate the possible detection special events.
4. Investigate differences between the two distinct data sets.
5. Evaluate results and draw conclusions on the applicability of the collected information.
6. What can be done in future work?

3 Prerequisites

- Interest in mobile networks and roaming.
- Interest in BigData analysis.
- Motivation to explore and analyze complex network functions.
- Solid knowledge of Wireshark.

Additional points that are beneficial but not required:

- Basic understanding of mobile core networks, especially GTP, Diameter, and 4G Core architecture.
- Knowledge of the Elastic stack (mainly Kibana).

4 Further Information

This research internship is done in an open collaboration with Deutsche Telekom Technik GmbH. The topic shall be worked on as an intern at Telekom in order to access the relevant data. A follow-up Master Thesis is encouraged.