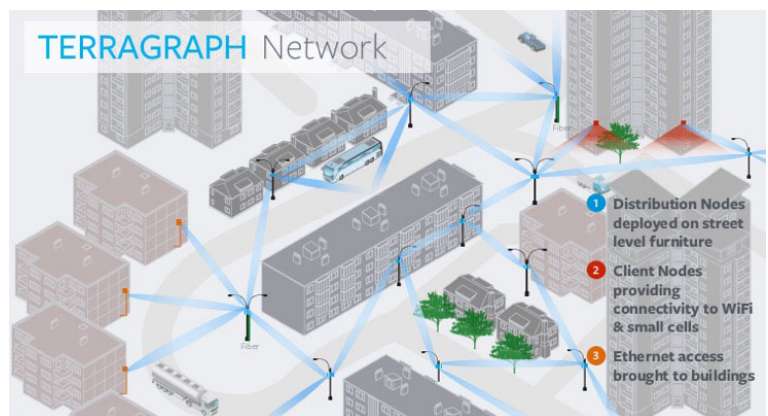


## Bachelor's Thesis

# Using Reinforcement Learning for Management of Wireless Access Networks

## ■ Motivation

Digging cables into the ground is one of the biggest cost factors for telecommunication providers in the expansion of high-speed broadband access. This is especially true for the so-called *last mile* of the connection into the building and the customer's home. Therefore, telecommunication providers are looking into alternative ways of expanding their access networks. A promising technology in this regard is *mmWave* (60GHz) communication, which offers wide available bandwidth and high directionality. However, using wireless technology makes it much more difficult to reliably provide a level of *Quality-of-Service* (QoS). To address this challenge, we teamed up with *Deutsche Telekom* and *Facebook* to develop *Terranet* – a simulator for Hybrid 5GHz/60GHz access networks based on Facebook's *Terragraph*<sup>1</sup> technology with a focus on regular 802.11ac to bridge the very last hop to the customer.



Facebook's *Terragraph* Wireless WAN Concept

## ■ Your Task

Our preliminary results show that centralized radio resource management of Wi-Fi can greatly improve the overall throughput and fairness of the system. However, this necessitates a suitable controller that can handle a changing radio environment. Your task would be to implement and integrate such a radio resource controller using reinforcement learning techniques in combination with existing platforms, such as *OpenAI's Gym*<sup>2</sup>.

## ■ Necessary Skills

- Experience in Python Programming
- You are familiar in Unix environments. This will not work on your M\$ Windows machine.
- Basic knowledge of the 802.11 standard family
- *Optional*: Familiarity with the concept of Reinforcement Learning
- *Optional*: Experience with the quirks of using Network Namespaces in Linux

<sup>1</sup><https://terragraph.com>

<sup>2</sup><http://gym.openai.com/>