UNIVERSITEIT ANTWERPEN

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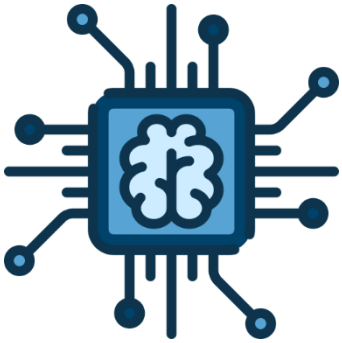
Faculteit Toegepaste Ingenieurswetenschappen

I-Distributed Artificial Intelligence



PGO 1: Cost Metrics and Pricing Models

v.21/09/2020

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Table of contents

1 Case ..... p. 2
1.1 Problem Statement ..... p. 2
1.2 Goal ..... p. 2

1 Case

1.1 Problem Statement

Bart is the technical lead in the City of Things project in Antwerp. This project connects 200 low-power communication endpoints with a cloud environment which are each able to communicate with 1000ths of low power sensor devices. For each application, the data will be transferred/processed and stored in a cloud storage environment with support for flat storage/SQL and no-SQL databases. Map-reduce, MQTT server, application server and webserver support are also available.

As a first application Bart wants to connect all A-Velo bikes in the city with the smart-city backbone in order to track their location/their accelerometer data and some air quality metrics while moving at a frequency of one measurement every 5 meters. This information will be processed in the backbone to detect danger zones for bicycles (pollution, road conditions, etc.). Each measurement 300 kB MQTT message will need 1 core of 1 processor for 1 ms and uses twice its size in memory. Every 5 minutes everything is recalculated using map-reduce and the same amount of time and memory for each message and this for all messages of the last week. Each measurement will be stored in a no-SQL database. The results of the map-reduce algorithm will be stored in a SQL database. Each entry will be a combination of all measurements during 5 minutes in a 1 MB entry slot. Be aware of the fact that those bicycles are not used in the same manner during each hour in a 24-hour day and that there will be a difference between weekdays and weekends.

1.2 Goal

Can you help Bart to look for the appropriate cloud infrastructure?

- Private vs Public?
- Which cloud provider?
- Which package of the specific provider?

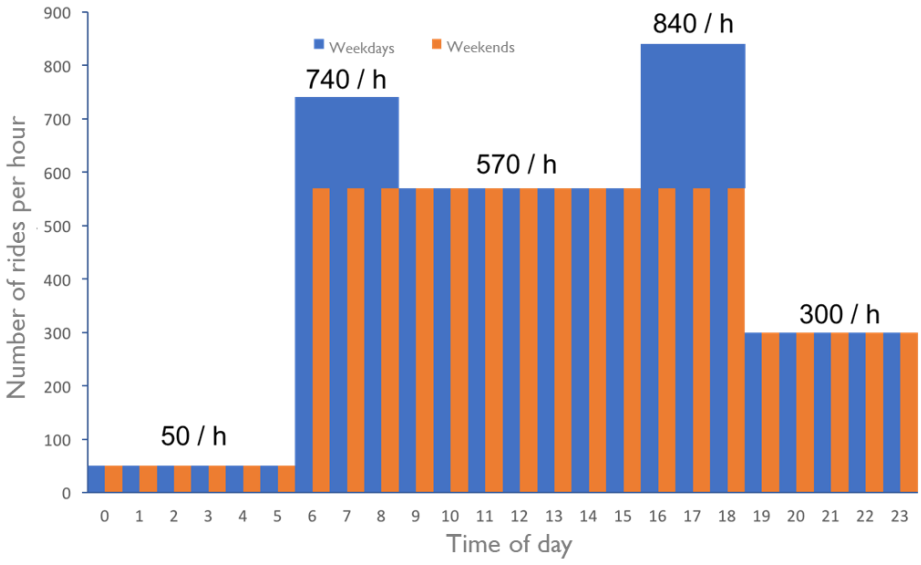

Figure 1: A-Velo rides histogram

Figure 2: A-Velo infograph 2014 [Source: Velo Antwerpen]

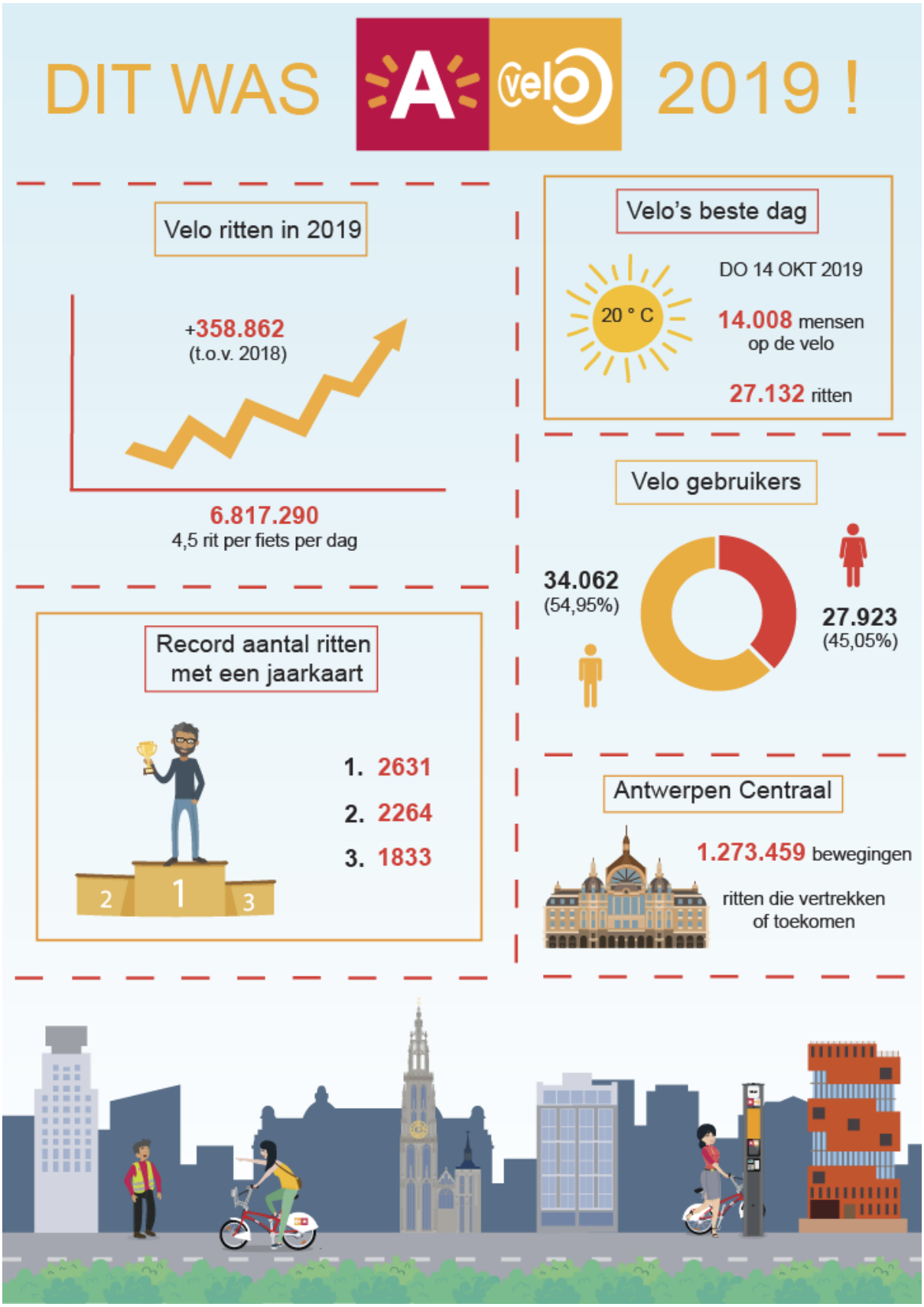

Figure 3: A-Velo infograph 2019 [Source: Velo Antwerpen]