Bracket

bicycle tracking

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Team objectives

- GPS positioning
- Sexy user interface
- Alarm function
- 1 month battery life

Use cases definition

A) "Normal mode" - Operating conditions

A1) The unit captures WiFi SSIDs and strength level(*) when motion is detected after a stationary status.
(This data is later updated when the bike is at "home" location, uploading the data via WiFi.

A2) The WiFi data is then translated into GPS coordinates.

(*) The accuracy of this method might be lower than GPS in some cases but has the advantage to work inside buildings/vehicles.
Major **advantages**: acquisition time is only a few **seconds** = **lower power consumption**, i.e. **longer battery life** than if GPS is used.

B)"Tracking mode" – Operating conditions

This mode can be triggered in three cases:

B1) User triggered via LoRa network.

B2) The accelerometer detects acceleration levels not corresponding to a bike normal operation.

B3) Geofencing function. (Pre-loaded WiFi SSIDs or by initial position + accelerometer estimation).

When in "tracking mode" the device will capture position data with GPS and transmit it to the server via LoRa.

C) Other use cases

TBC.

Use Cases - Power budget calculations

A) Minimum power requirements

No data recording while there is no movement.
Positioning through WiFi signals.
Data transmission 1-2 per day when at "home" location via Wifi.
No geo-fencing.

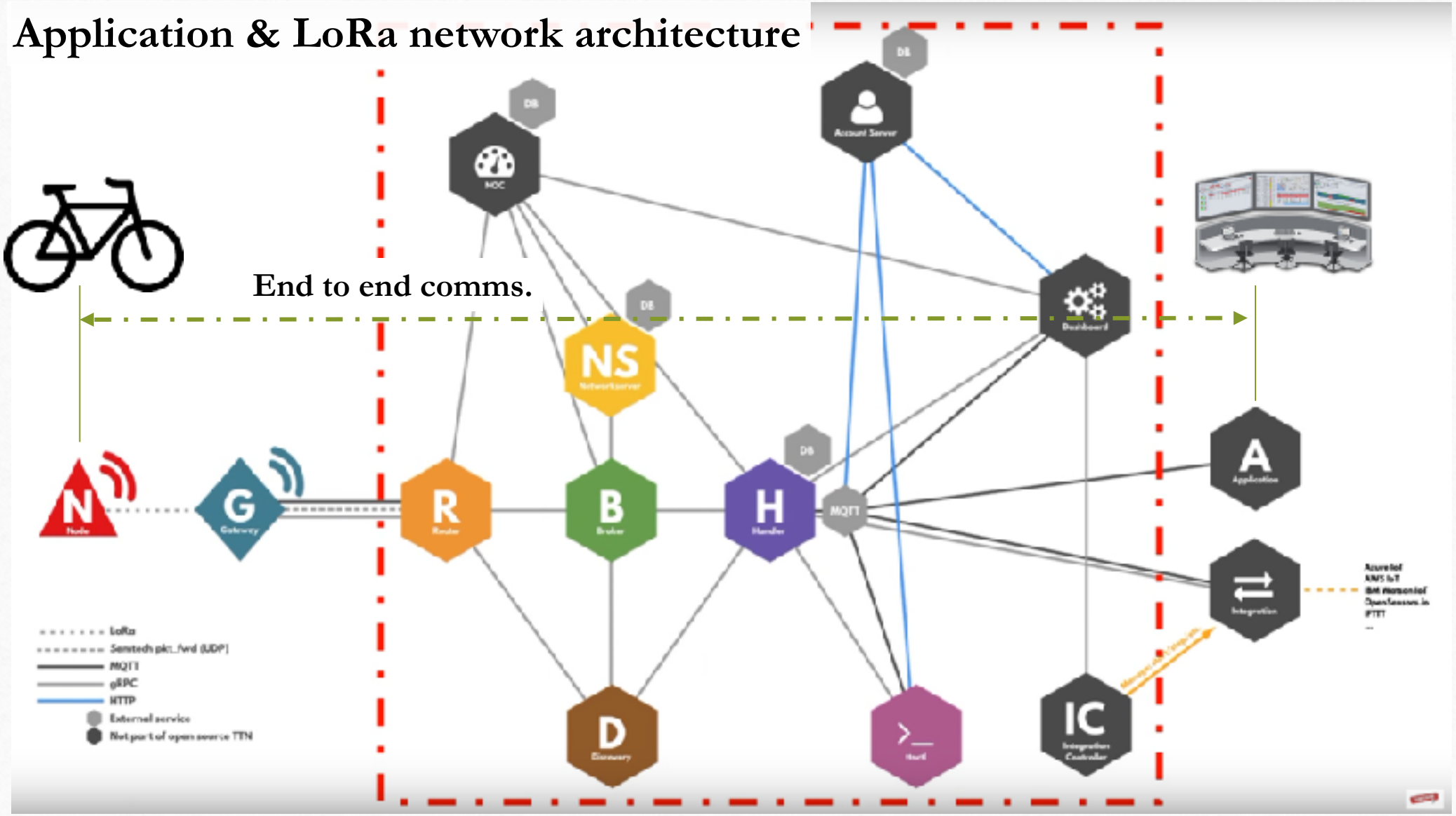
A) Medium power requirements

No data recording while there is no movement.
Positioning through WiFi signals.
Data transmission 1-2 per day when at "home" location via Wifi.
Geo-fencing active.

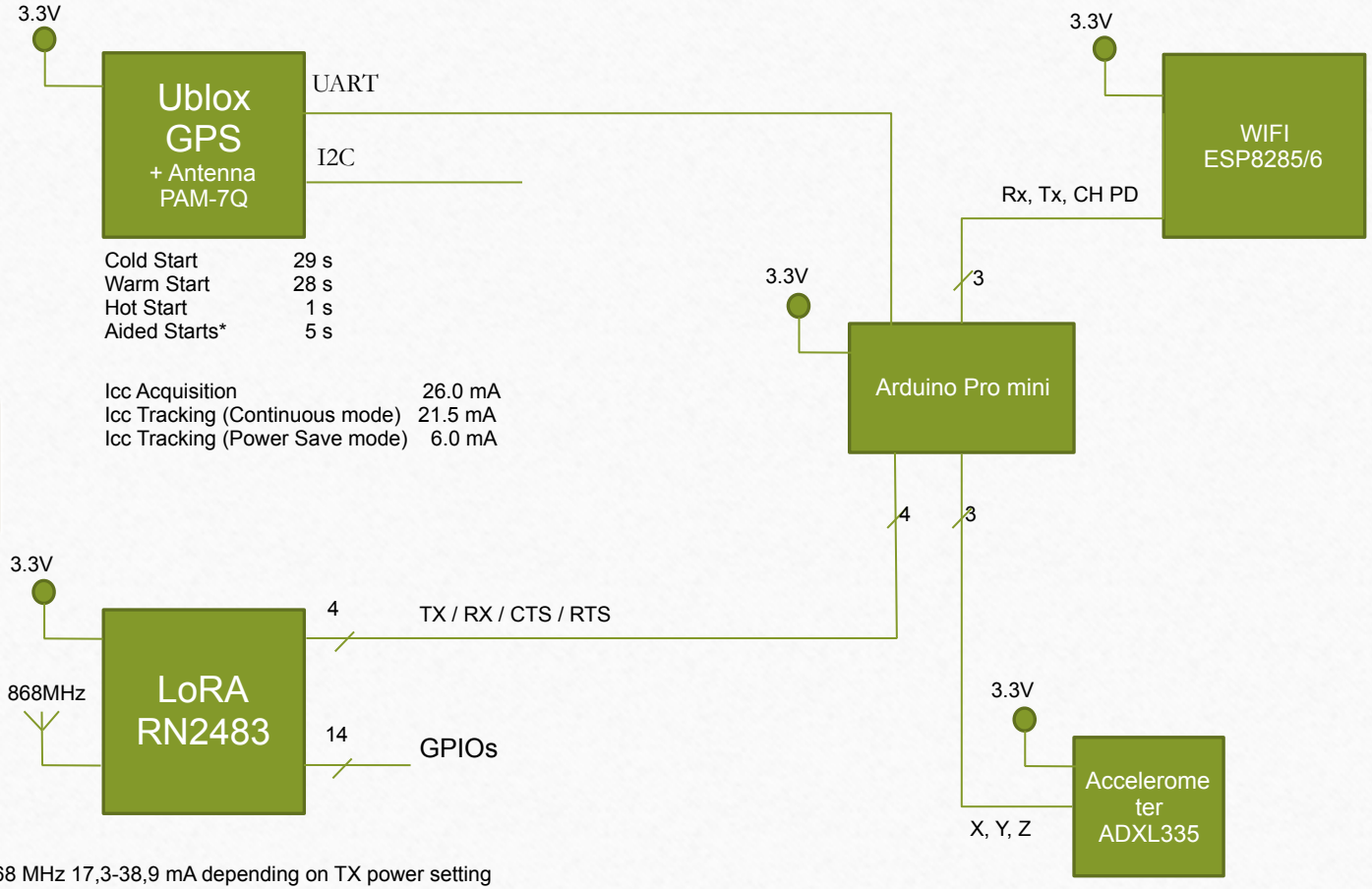
A) Constant monitoring power requirements

Alarm received or geo-fenced area broken
Data recorded every 5 min. or every 100m.
Positioning through GPS ~~WiFi~~ signals.
Position re-transmission every 10-15 min or based on position.

Application & LoRa network architecture



Bracket bicycle tracking — Our solution



Cold Start	29 s
Warm Start	28 s
Hot Start	1 s
Aided Starts*	5 s

Icc Acquisition	26.0 mA
Icc Tracking (Continuous mode)	21.5 mA
Icc Tracking (Power Save mode)	6.0 mA

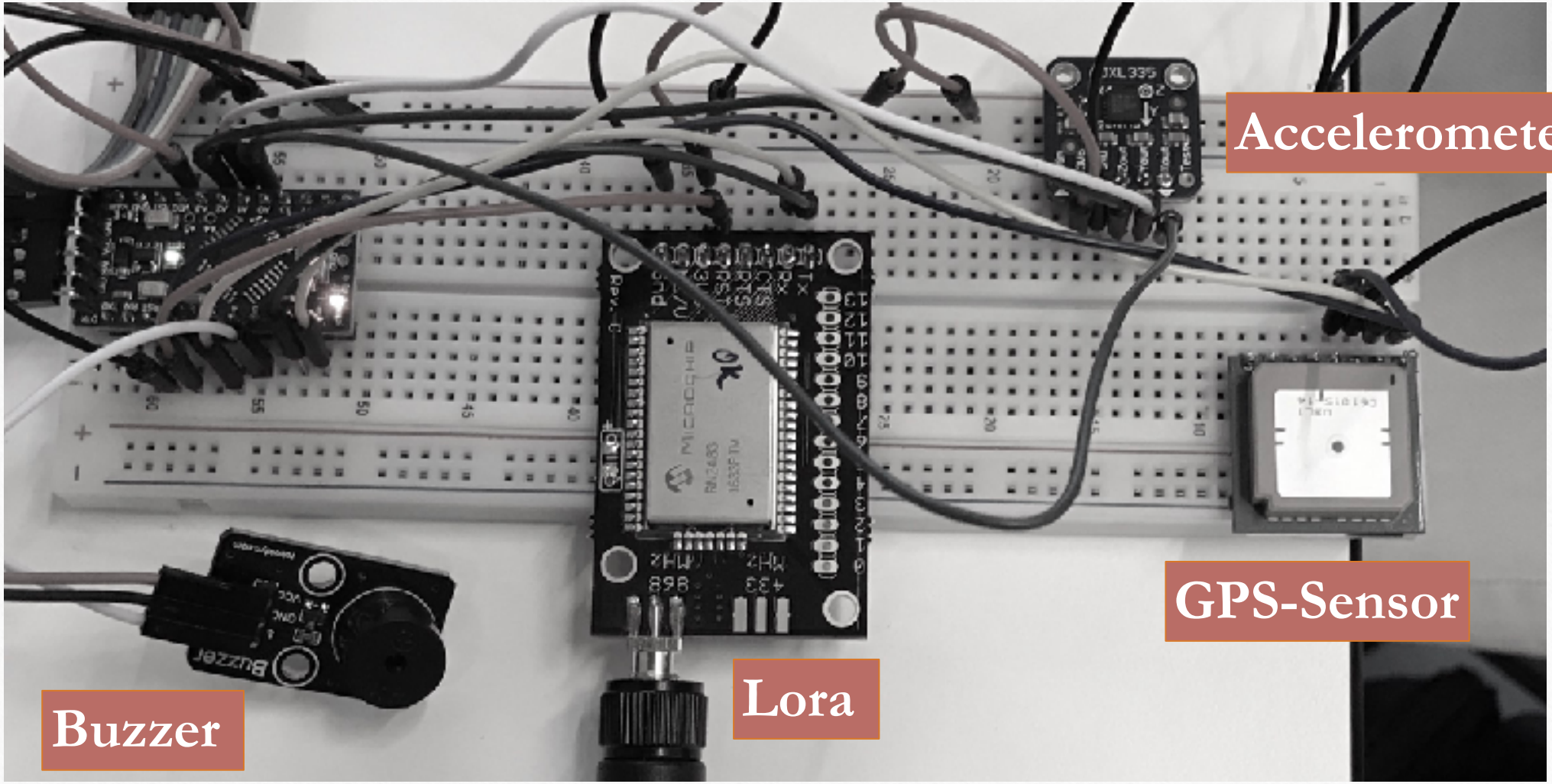
868 MHz 17,3-38,9 mA depending on TX power setting

TABLE 2-3: CURRENT CONSUMPTION

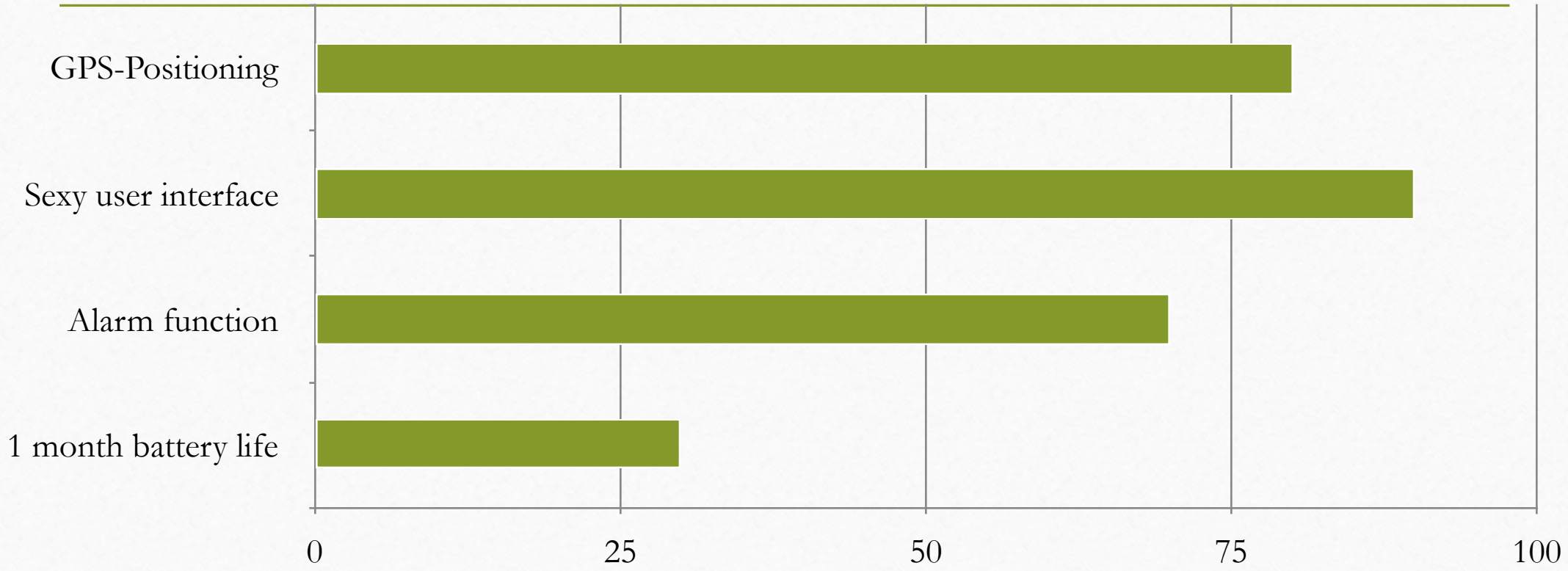
Mode	Typical Current at 3V (mA)
Idle	2.8
RX	14.2
Deep Sleep	0.0018

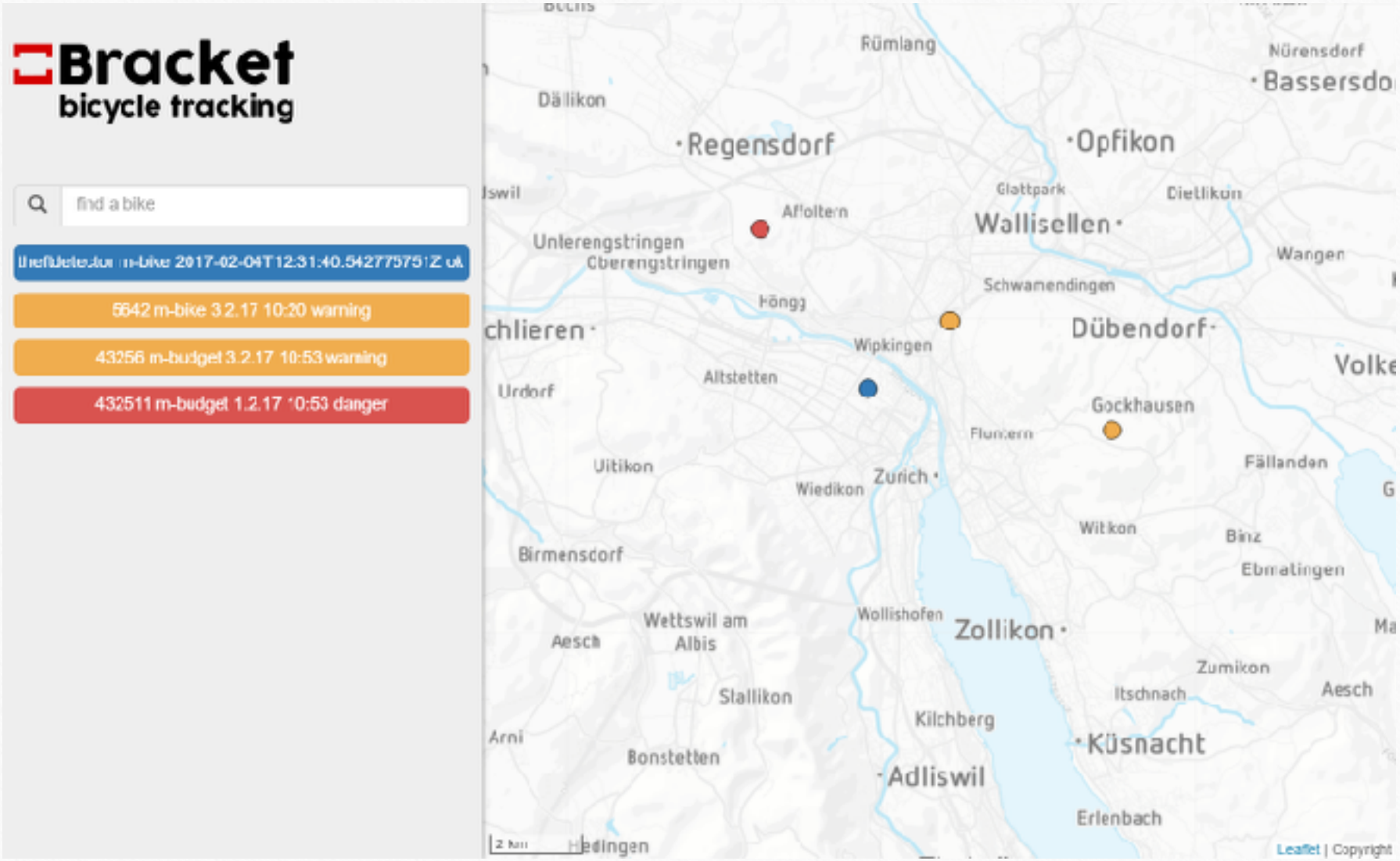
Accelerometer low power mode (typical) **335 uA**

Microcontroller	ATmega328 *
Board Power Supply	3.35 -12 V (3.3V model) or 5 - 12 V (5V model)
Circuit Operating Voltage	3.3V or 5V (depending on model)
Digital I/O Pins	14
PWM Pins	6
UART	1
SPI	1
I2C	1
Analog Input Pins	6
External Interrupts	2
DC Current per I/O Pin	40 mA
Flash Memory	32KB of which 2 KB used by bootloader *
SRAM	2 KB *
EEPROM	1 KB *
Clock Speed	8 MHz (3.3V versions) or 16 MHz (5V versions)


Accelerometer
GPS-Sensor
Lora
Buzzer

How far we´ve got

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bicycle tracking
find a bike
5642 m-bike 3.2.17 10:20 warning
43256 m-budget 3.2.17 10:53 warning
432511 m-budget 1.2.17 10:53 danger
Rümlang
Dällikon
Regensdorf
Opfikon
Nürensdorf
Bassersdo
Glattpark
Dietlikon
Affoltern
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Unterengstringen
Oberengstringen
Wangen
Schwamendingen
Höngg
Dübendorf
Wipkingen
Altstetten
Urdorf
Gockhausen
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Wollishofen
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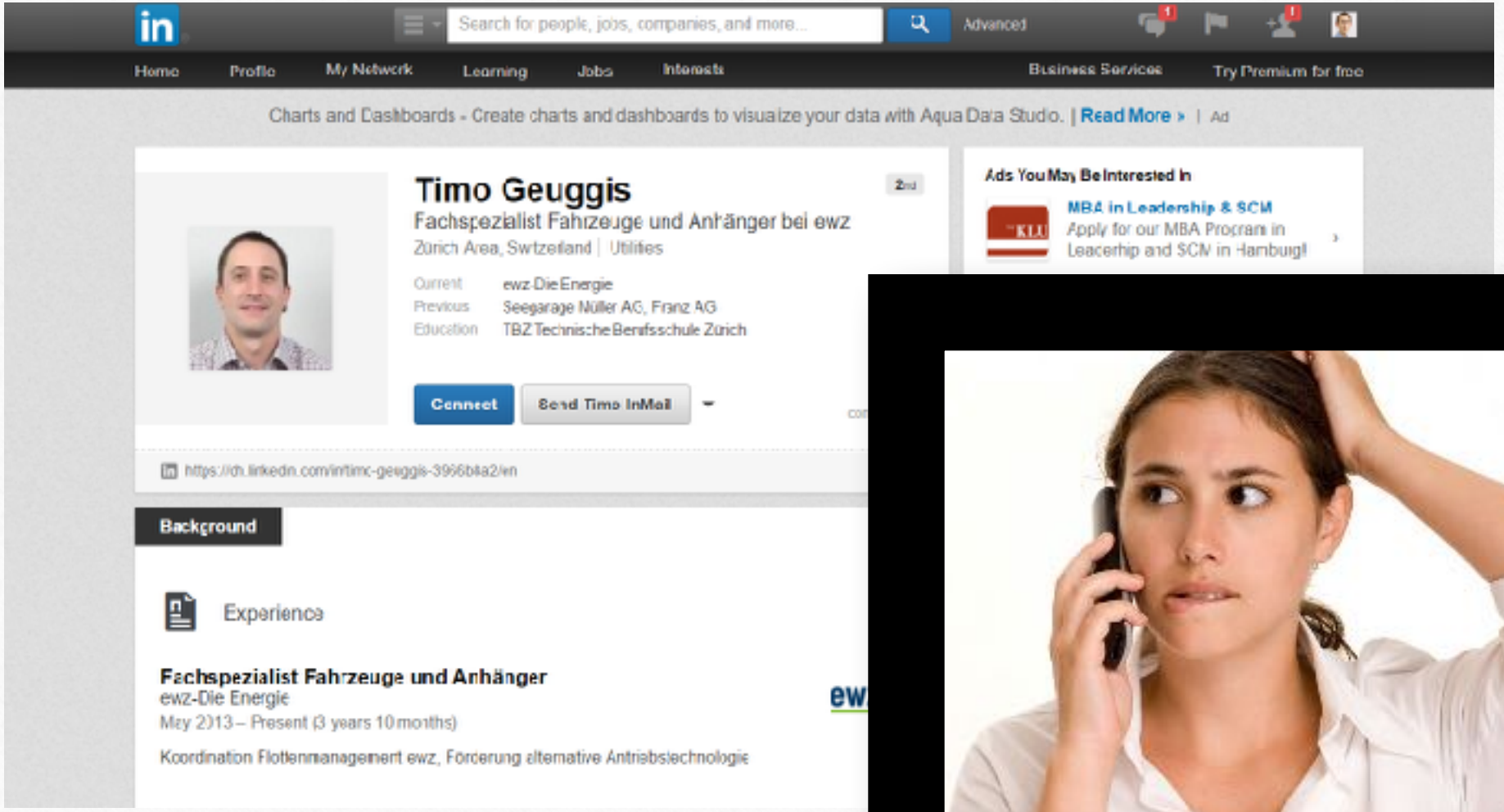
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ewz-Die Energie
May 2013 – Present (3 years 10 months)
Koordination Flottenmanagement ewz, Forderung alternative Antriebstechnologie

Next steps (Achievable)

- 1 year battery life
- Geofencing
- Kill switch

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THANK YOU!

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