



## How does the OBU Calculate the Toll?

In case of additional questions contact **Satellic Customer Support** on

**00800/72 83 55 42**

(From Belgium and neighboring countries)

or **32 2 416 0 416**

(From any location)

Calls from mobile networks may be surcharged according to the terms and conditions of your mobile service operator.



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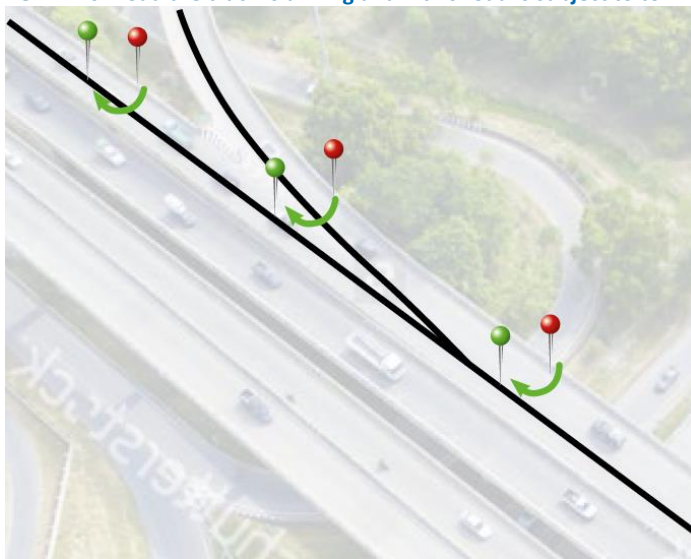
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# 1) How does the OBU calculate the toll?

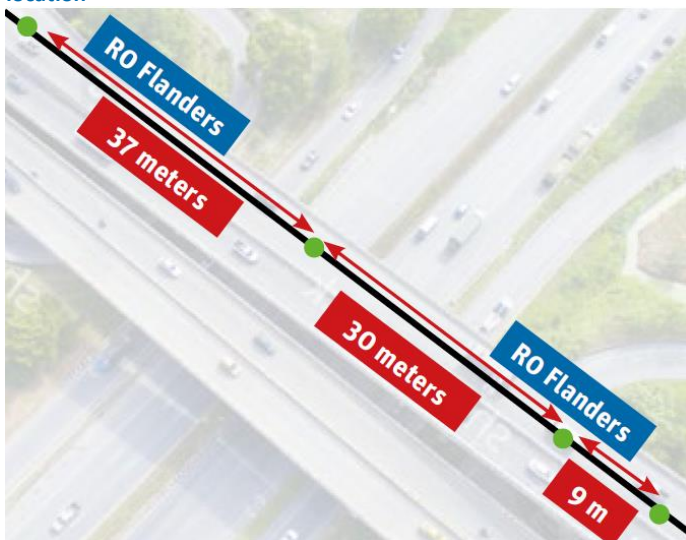
## GPS Positioning and Map Matching

Satellic uses an intelligent OBU which means it has its own integrated computer which matches the GPS coordinates and calculates the toll itself. The OBU receives the GPS position of the truck every second (red pushpins on the picture below). According to the position of the consecutive GPS signals it received, the OBU has enough information to match these GPS locations with the corresponding road registered in its internal map (green pushpins on the black lines on the picture below). The OBU can thus determine precisely:

- On which road the truck is driving and if this road is subject to toll



- The distance travelled on this road: it knows how many meters have been driven between each GPS location

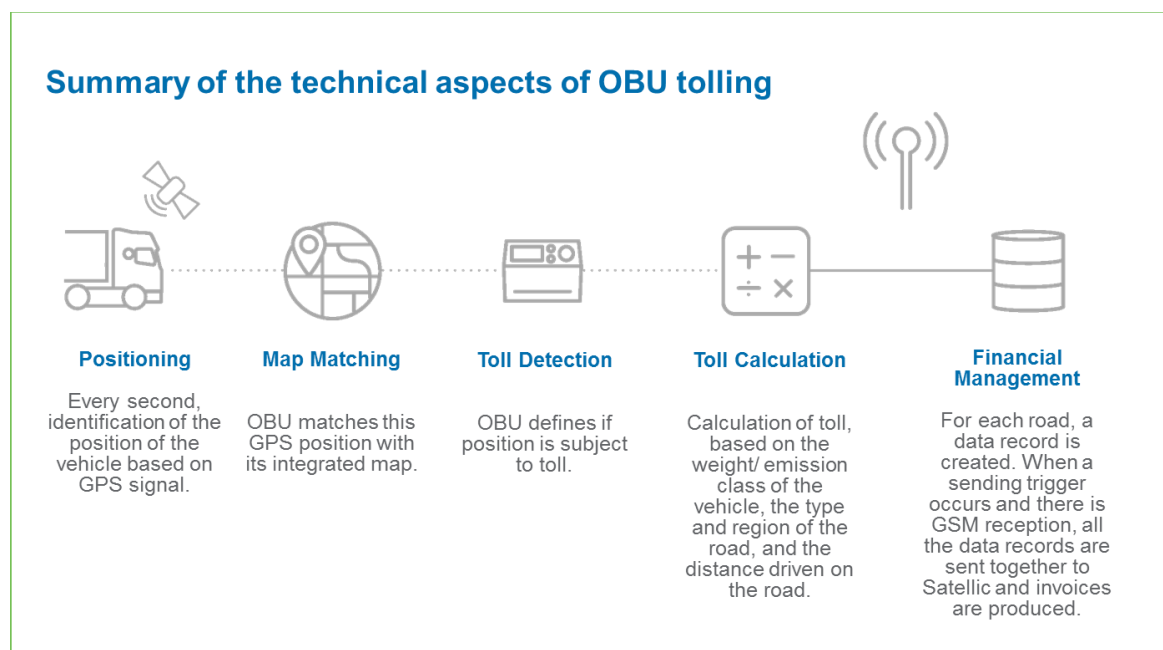


## How does the OBU calculate the toll?

Thanks to the GPS locations, to the internal map and to the fact that a specific OBU has been coupled to a specific vehicle, the OBU knows:

- In which Region (Flanders, Brussels or Wallonia) the truck has driven
- On which road types the truck has driven (highway, regional or local)
- The distance driven by the truck on each road
- The weight and emission class of the vehicle

Based on that data, the OBU calculates the toll estimate which appears on the OBU screen. This calculation is stored in the OBU. When there is GSM reception and a certain time has passed or a certain number of kilometres have been driven, the calculation of the cost is sent to Satellic.



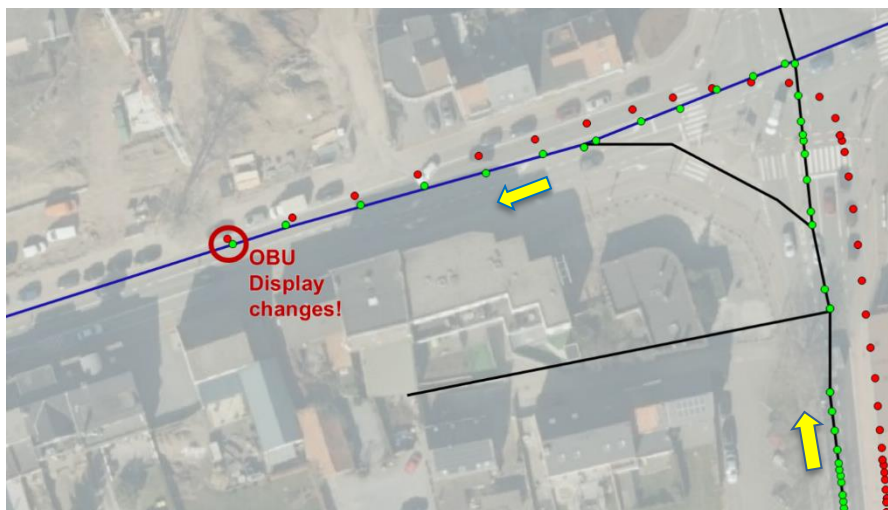
## 2) Particular cases: Delay on the OBU Display, different amount on OBU Display and Detailed Trip Statement, driving under a bridge or in a tunnel

### OBU Toll calculation and Detailed Trip Statement

As we saw before, the calculation of the toll driven on a particular day is not sent directly to Satellic but only when a sending trigger occurs and there is mobile communication possible. Consequently, it is possible that Satellic receives the data records corresponding to a specific period of time some hours or even some days later: the toll corresponding to a journey (or in most cases the final part of that journey) can sometimes not be processed on the day of the journey since the data hasn't yet reached the Satellic systems. This is visible on the detailed trip statement on which it is visible that the toll was driven on a specific day, but processed on a later day.

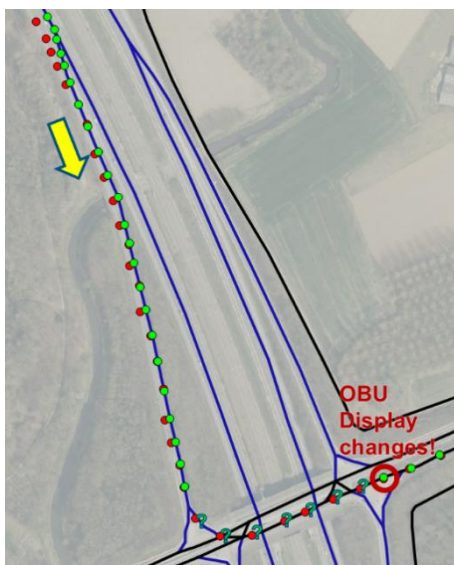
### 10 seconds delay on the OBU Display

For the record, the GPS position is sent to the OBU every 1 second. The OBU always waits till it has enough GPS positions to determine precisely on which road the truck has driven. By average it takes approximately 10 seconds before the OBU is sure of its decision. The exact duration of the delay is mainly depending on the speed of the vehicle and the complexity of the road network. We prefer accuracy over speed so the OBU does not display anything if it is not sure on which road the truck was driving. That is why the current tariff rate of the OBU is displayed with some delay on the OBU Display in the upper left corner of the display, however the toll is calculated correctly from the beginning of the road.



See picture: the red dots are the GPS signals received by the OBU while the green dots represent the fact of matching those GPS signals with the internal map of the OBU. The red circle indicates the location where the OBU is when the display changes to indicate the blue road is a tolled road. (while the black road is not toll liable)

## Tolling on bridges and in tunnels



As you can see on the picture, if you leave a tolled road (blue) and continue driving on a non-tolled bridge (black), the OBU will only decide the road you took if you are already on the other side of the bridge. The upper left value of the OBU display shows normally the tariff rate of the road you are driving on. But because this rate is only updated when you are at the other side of the bridge, it can give the impression that the bridge is tolled while it is not in this case.