



Method, Radio Beacon and Onboard Unit for Generating
Parking Fee Transactions

The present invention relates to a method for generating a parking fee transaction for a vehicle, which comprises an onboard unit having an identifier. The invention further relates to a radio beacon and to an onboard unit for carrying out this method.

Onboard units (OBUs) are electronic devices carried by vehicles so as to be able to identify the vehicles in a wireless manner via radio, for example for the purpose of settling tolls in electronic road toll systems. OBUs can be implemented in the form of active or passive radio transponders, radio frequency identification (RFID) chips, near field communication (NFC) chips, dedicated short range communication (DSRC) transceivers, wireless access in vehicular environments (WAVE) and wireless local area network (WLAN) nodes, or the like. EP 2 299 409 A1 describes the use of an RFID chip in a vehicle in order to identify the vehicle when entering and exiting a parking space and thereby determine the time difference as the overall parking duration of the vehicle. It is the object of the invention to render such OBUs usable for settling parking fees.

In a first aspect of the invention, this object is achieved by a method for generating a parking fee transaction for a vehicle, which comprises an onboard unit having an identifier,

comprising the following steps:

- wirelessly polling the identifier by a roadside radio beacon as a current identifier;
- generating a parking fee transaction for the identifier if the current identifier is identical to a stored old identifier;
- storing the current identifier as the old identifier;
- waiting a predetermined time period; and



- repeating the above steps.

The invention is based on the finding that, by comparing the identifiers of OBUs located in the radio coverage range of the beacon - wherein the identifiers can be wirelessly polled at a particular time - to identifiers polled at an earlier time, it is possible to establish those identifiers, and consequently those OBUs and the vehicles thereof, which were present in the radio coverage range at both times and therefore almost certainly parked there. An astoundingly simple method for generating parking fee transactions is thus created, which can be scaled for any arbitrary number of parking spaces in the radio coverage range of a radio beacon.

According to a preferred embodiment of the invention, a position of the onboard unit is wirelessly polled together with the identifier and the parking fee transaction is only generated if, in addition to said identifiers being identical, the position is located in a predetermined area. This allows excessive radio coverage ranges of the radio beacon to be dealt with, for example when the parking area is smaller than the radio coverage range of the radio beacon.

A status of the onboard unit is preferably also wirelessly polled together with the identifier, and the parking fee transaction is only generated if, in addition to said identifiers being identical, the status is also identical to a predetermined value. It can thus be assured that parking fee transactions are only generated for those OBUs that have set a corresponding "parking status". For example, OBUs of vehicles located only temporarily in the radio coverage range of the radio beacon because they are temporarily stopped next to parked vehicles in a traffic jam may be ignored; and conversely, by deliberately setting the parking status on the OBU, a user can indicate that he is now parked and would like to pay the parking fees.

The generated parking fee transactions can be further processed and settled in a wide variety of ways. In a first

preferred embodiment, the parking fee transactions are wirelessly transmitted from the radio beacon to the onboard unit, where they are charged, for example, against a credit balance that is kept in the onboard unit (an
5 "electronic wallet") as a debit transaction. According to an alternative preferred embodiment, the generated parking fee transactions are transmitted from the radio beacon to a back office, for example a toll back office of a road toll system, a bank computer, a credit card billing center or the like, and
10 are charged there against a bank, credit or debit account of the user associated with the OBU identifier.

The method according to the invention operates in steps of the predetermined waiting time period and can accordingly charge fees for parking durations in these time units. It is
15 advantageous if the predetermined time period is 1 to 30 minutes, preferably 5 to 20 minutes, and particularly preferably 10 minutes, whereby short durations of less than 10 minutes remain free of charge and sufficient precision in terms of time is achieved for longer durations.

20 In a second aspect, the invention creates a radio beacon for generating a parking fee transaction for a vehicle, which comprises an onboard unit having an identifier, wherein the radio beacon has a radio coverage range covering at least a parking space and is configured

25 to wirelessly poll the identifier of an onboard unit located in the radio coverage range as a current identifier;

to generate a parking fee transaction for the current identifier if the current identifier is identical to a stored old identifier;

30 to store the current identifier as the old identifier; and
to repeat these steps after a predetermined time period.

The radio beacon is advantageously configured to also wirelessly poll a position of the onboard unit together with the identifier and to generate the parking fee transaction only

if, in addition to said identifiers being identical, the position is located in a predetermined area.

The radio beacon is preferably configured to also wirelessly poll a status of the onboard unit together with the
5 identifier and to generate the parking fee transaction only if, in addition to said identifiers being identical, the status is also identical to a predetermined value.

It is particularly favorable if the radio beacon has a radio coverage range covering at least two parking spaces and
10 is configured

to wirelessly poll the identifiers of all onboard units located in the radio coverage range as current identifiers;

to generate a parking fee transaction for any current identifier that is identical to a stored old identifier;

15 to store the current identifiers as old identifiers; and to repeat these steps after the predetermined time period.

To this end, the radio beacon can calculate a parking space occupancy status by comparing the number of current identifiers to the number of parking spaces in the radio
20 coverage range.

Reference is made to the above comments regarding the method in terms of the advantages of the radio beacon according to the invention.

In a third aspect, the invention creates an onboard unit
25 for a vehicle, having a unique identifier and a stored modifiable status and comprising a transceiver for transmitting the identifier and the status in response to a wireless poll of a radio beacon, the onboard unit being characterized by having a first operating mode and a second operating mode, between
30 which the unit can be switched by way of a switch, wherein the status indicates the respective operating mode of the onboard unit.

The onboard unit of the invention is therefore suited in particular for those embodiments of the invention and of the
35 radio beacon, in which these consider a status that is set in

the OBU and generate parking fee transactions only for those OBUs for which the user has set the parking mode or parking status.

5 The onboard unit is preferably equipped with a position determination device for determining the current position of the onboard unit and is configured to transmit the position thereof in response to a wireless poll of the radio beacon.

According to a particularly preferred embodiment of the invention, the onboard unit can be equipped with a movement
10 sensor, which switches the onboard unit to the first operating mode when a movement thereof exceeds a threshold value and/or switches the onboard unit to the second operating mode when no movement thereof is detected for a period that exceeds a minimum time period. Automatic, movement-controlled switching
15 between the two operating modes, these being the first (tolling) mode for movement and the second (parking) mode for standstill over extended periods, can thus be achieved.

The tolling mode of the onboard unit, in which the same, for example, communicates as a conventional road toll OBU with
20 tolling radio beacons on the way, can be utilized according to the invention to settle a parking fee transaction, which was received in the parking mode from a parking radio beacon, using the infrastructure of the road toll system. After leaving the parking mode and the radio coverage range of the parking radio
25 beacon, the OBU transmits the parking fee transaction to the first tolling radio beacon it encounters on the way, for example, so as to pay the parking fee via the settling system of the tolling radio beacon.

It is particularly favorable if the onboard unit has a
30 power-saving third operating mode, which it temporarily enters from the second operating mode after receiving a wireless poll or parking fee transaction. Because the wireless polls of a parking radio beacon are issued comparatively infrequently, for example every 10 minutes, the onboard unit can thus save a
35 considerable amount of power.

The invention will be described in greater detail hereafter based on an exemplary embodiment, which is shown in the accompanying drawings. In the drawings:

FIG. 1 shows a schematic overview of the communication of an onboard unit in the tolling mode with tolling radio beacons on the way on a road;

FIG. 2 shows a schematic overview of the communication of onboard units in the parking mode with a parking radio beacon during parking;

FIG. 3 is a block diagram and FIG. 4 is a front view of an exemplary onboard unit according to the invention;

FIG. 5 is a state transition diagram of the part of the method according to the invention that is carried out in an onboard unit; and

FIG. 6 is a flow chart of the part of the method according to the invention that is carried out in a parking radio beacon.

In FIG. 1, a vehicle 1 is moving on a road 2 at a speed and in a driving direction 3, and in FIG. 2 several vehicles 1 are parked in each case in a parking space 4 of the road 2. The road 2 can be any arbitrary traffic or parking area, for example an expressway, a highway or an entire road system in FIG. 1, or a shoulder, a large parking space or a parking garage in FIG. 2; all of these are considered to be covered by the general concept of "road" 2.

Each of the vehicles 1 is equipped with an onboard unit (OBU) 5, which is able to carry out radio communication 8 with roadside radio beacons (roadside units, RSUs) 6, 7. The OBUs 5 can be separate devices or an integral part of the vehicle electronics system. The radio communication 8 is short range or dedicated short range communication (DSRC), preferably according to the standards CEN-DSRC, ITS-G5, IEEE 802.11p, WAVE, WLAN, RFID, NFC or the like. The radio beacons 6, 7 thus have a respective locally delimited radio coverage range 9, 10.

FIGS. 1 and 2 show two different types of radio beacons 6, 7 and application scenarios of the described components. The

radio beacons 6 of FIG. 1 are "tolling" radio beacons (tolling roadside units, T-RSUs) that are set up in a geographically distributed manner along the road 2. With the aid of periodically broadcast wireless polls 1, the tolling radio beacons 6 request all passing OBUs 5 to establish radio communication 8, as is illustrated based on the exemplary response 12. So as not to "miss" any passing OBU 5 due to the potentially high speed of the vehicle 1, the wireless polls 11 of the tolling radio beacons 6 are broadcast at relatively short intervals, for example every 100 ms. For the wireless polls 11, for example, so-called wave service announcement (WSA) messages are used in the WAVE standard, and so-called beacon service table (BST) messages are used in the CEN-DSRC standard.

Successful radio communication 8 with a passing OBU 5 substantiates that the OBU 5 is located in the locally delimited radio coverage range 9 of the tolling beacon 6, whereby a fee ("toll") can be charged for usage of the location of the tolling radio beacon 6. For example, the tolled location usage can be the driving on a road section, the entering of a particular territory ("city toll") or the like.

In contrast, "parking" radio beacons (parking roadside units, P-RSUs) 7 are employed in the parking scenario of FIG. 2, which use a wireless poll 11, for example a WSA or BST message, to request all the OBUs 5 located in the radio coverage range 10 to provide response messages 12 so as to charge a fee for the usage of the parking spaces 4, as will be described in greater detail hereafter. To this end, a parking radio beacon 7 may be in charge of one or more parking spaces 4, which together form a parking area P.

Because parked vehicles 1 are stopped, a parking radio beacon 7 can broadcast the wireless polls 11 thereof at considerably longer time intervals ΔT than the tolling radio beacon 6 of FIG. 1, for example every 10 minutes, which also defines the time resolution of the parking time billing.

The radio coverage range 10 of the parking radio beacon 7 can be adapted to the spatial expansion of the parking spaces 4 using optional measures, for example directional antennas, so as to avoid responses 12 of OBUs 5 of vehicles 1 that are not parked, for example passing vehicles. As an alternative or in addition, the OBUs 5 of the vehicles 1 can also be caused to assume different operating modes, which are adapted in each case to the scenarios of FIGS. 1 and 2, and more particularly a first toll operating mode (tolling mode, TM) for responses 12 to wireless polls 11 from tolling radio beacons 6, and a second parking operating mode (parking mode, PM) for responses 12 to wireless polls 11 from parking radio beacons 7. In the wireless polls 11, the radio beacons 6, 7 can optionally broadcast a respective beacon identifier, which indicates whether it is a tolling radio beacon 6 or a parking radio beacon 7. The beacon identifier can, for example, be indicated as a service of the beacon as part of a WSA or BST message.

Of course, the tolling radio beacons 6 and parking radio beacons 7 can also be implemented by one and the same physical unit, which alternately or simultaneously performs the functions of a tolling radio beacon and a parking radio beacon 6, 7. Such a combined unit 6, 7 can thus broadcast wireless polls 11 with the beacon identifier of a tolling radio beacon, for example continually at short intervals, and wireless polls 11 with the beacon identifier of a parking radio beacon 7 at longer intervals ΔT , which is to say occasionally "interspersed". Such a radio beacon 6, 7 is then in charge of both charging a toll for a road section of the road 2 and charging a fee for a parking area P, for example.

Depending on the operating mode TM or PM of the OBU 5, and depending on the received beacon identifier, the OBU 5 can, for example, respond only to tolling radio beacons 6 if the OBU is in the tolling mode TM or only to parking radio beacons 7 if the OBU is in the parking mode PM.

The operating mode of an OBU 5 can further be encoded as a data message (status) st and transmitted as part of the response 12. A radio beacon 6, 7 can appropriately evaluate the status st received in a response 12, so that tolling radio beacons 6 only charge tolls for the passage of OBUs 5 where status st = "TM", and parking radio beacons 7 only charge fees for the parking of those OBUs 5 where status st = "PM". Moreover, the OBUs 5 can also measure their own respective positions p and transmit these to the parking radio beacons 7, which compare the received positions p to the respective parking areas P and only charge fees for the parking of those OBUs 5, the positions p of which are within the respective parking area P. This will be described in more detail hereafter with reference to FIGS. 3 to 6.

FIG. 3 shows an exemplary block diagram, FIG. 4 shows an exemplary outside view, and FIG. 5 shows an exemplary state transition diagram of an OBU 5, which can be switched between (at least) two operating modes TM and PM in accordance with the application scenarios of FIGS. 1 and 2. According to FIG. 3, to this end an OBU 5 comprises a transceiver 13 (for example according to one of said DSRC standards) for carrying out the radio communication 8, a microprocessor 14 controlling the transceiver 13, a memory 15, an input device 16, and an output device 17. The input and output devices 16, 17 can also be implemented in a manner that differs from the shown keyboard and monitor output, for example by way of voice input and output, sensor systems, advisory tones and the like. The input and output devices 16, 17 can also be formed by physically separate components such as car radios, navigation devices, smartphones, PDAs, tablets and the like and can be connected to the microprocessor 14 by wire or wirelessly, for example by way of NFC, Bluetooth®, WLAN or infrared.

The OBU 5 can optionally also comprise a movement sensor 18, for example in the form of a satellite navigation receiver for a global navigation satellite system (GNSS), such as GPS,

GLONASS, GALILEO and the like; instead of a GNSS receiver, it is also possible to use any other type of movement sensor 18, for example an inertia sensor (inertial measurement unit, IMU) or a sensor that is connected to components of the vehicle 1, for example a connection to the speedometer or engine of the vehicle 1.

In the simplest case, the movement sensor 18 can also be only a connection to the vehicle electronics system, for example the ignition lock of the vehicle, so that the position of the key (engine running - not running), for example, indicates the (anticipated) movement or parking status of the vehicle.

The OBU 5 can optionally also be equipped with a position determination device 18', which is able to determine the current position p of the OBU 5 - in response to a poll, periodically or continuously. The position determination device 18' can operate in any manner that is known in the art, for example by way of radio triangulation in a network of geographically distributed radio stations, which can be formed directly by the radio beacons 6, 7 or by base stations of a mobile communication network, for example, or by way of evaluation of the cell identifiers of a cellular mobile communication network, and the like. The position determination device 18' is preferably a satellite navigation receiver for position determination in a GNSS and in particular can also be formed by the same GNSS receiver that is used for the movement sensor 18.

In addition to the appropriate application and control programs and data, the memory 15 of the OBU 5 includes a unique identifier id of the OBU 5, which is established and saved, for example, during the output or user-specific initialization of the OBU 5 and which uniquely identifies the OBU 5 and/or the user thereof and/or the vehicle 1 and/or a settlement account of the user. The OBU identifier id is transmitted together with every response message 12 from the OBU 5 to a radio beacon 6, 7

so as to uniquely identify the OBU 5 with respect to the radio beacon 6, 7.

The memory 15 can further include the status st, which indicates the operating mode TM or PM of the OBU 5 for the corresponding scenario of FIG. 1 or 2. The status st can be modified or adjusted both depending on a movement (or non-movement) of the OBU 5 measured by the movement sensor 16 and by a user selection via the input device 16. For this purpose, the input device 16 may, for example, comprise a lockable button 16' (FIG. 4), which is labeled "PM" for "parking mode" PM and switches the OBU 5 to the parking mode PM by pressing and locking and sets the status st to the value "PM". The OBU 5 is reset to the tolling mode TM and the status st is set to the value "TM" by releasing or unlocking the button 16'. The output device 17 can optionally output appropriate advisory and/or confirmation messages.

FIG. 5 shows several of the possible operating states of the OBU 5 again in detail in the form of a state transition diagram. The OBU 5 can be switched from the tolling mode TM into the parking mode PM by pressing the button 16' and/or if the movement sensor 18 determines no movement of the OBU 5 over a minimum time period of 5 minutes, for example. The OBU can be set from the parking mode PM back to the tolling mode TM by releasing the button 16' and/or by a movement of the OBU 5 detected by the movement sensor 18.

In the parking mode PM, the OBU 5 can temporarily assume a power-saving sleep mode ("sleep"), and more particularly as soon as it has received a wireless poll 11 of a parking radio beacon 7 and sent a response 12. The OBU 5 can also wake up from the sleep mode after a predetermined time period Δt has lapsed and return to the parking mode PM. The time period Δt is preferably shorter than the time period Δt between consecutive wireless polls 11 of a parking radio beacon 7. As an alternative or in addition, the OBU 5 could also be awakened again by receiving a subsequent wireless poll 11.

FIG. 6 shows the method for generating parking fee transactions in the application scenario of FIG. 2 that is being carried out in a parking radio beacon 7 in cooperation with the OBU 5 of FIGS. 3 to 5.

5 In a first step 19, a wireless poll 11 is broadcast by the parking radio beacon 7 so as to request the OBUs 5 located in the radio coverage range 10 to provide responses 12. In step 20, the responses 12 arriving from the OBUs 5 are received, wherein each response 12 includes at least the respective
10 identifier id_i of the OBU 5 with the index i and - optionally - the status st_i thereof and/or the position p_i thereof determined by the position determination device 18'. The received identifiers id_i , statuses st_i and positions p_i are temporarily stored in the parking radio beacon 7 as a current
15 dataset set_{curr} .

 Thereafter, a check is carried out within a loop 21 covering all received identifiers id_i as to whether or not the respective status st_i is set to the parking mode "PM", see decision 22. In addition (or as an alternative), it can be
20 checked in the decision 22 whether or not the respective position p_i - provided this was transmitted - falls within a predetermined geographical region, more particularly the parking area P of the parking radio beacon 7. If only some of the conditions that are checked in decision 22 are met (branch
25 "n" of 22), the subsequent steps 23 and 24 are skipped and the loop 21 is continued or exited for step 25 upon completion. In contrast, if all the conditions are met, which is to say in the present case: $st_i = PM$ and $p_i \in P$ (branch "y" of 22), it is checked in a further decision 23 whether the respective
30 identifier id_i corresponds to a previously stored "old" identifier $id_{i,last}$, which is to say whether or not it occurs in a dataset $set_{last}\{id_{i,last}\}$ of old identifiers $id_{i,last}$. These "old" identifiers $id_{i,last}$ were determined during an earlier execution of the method and stored in the dataset set_{last} , as will be
35 described hereafter.

If the respective current identifier id_i does not agree with any old identifier $id_{i,last}$, which is to say does not occur in the dataset set_{last} (branch "n" of 23), the loop 21 is continued or exited for step 25 after it is completed; if there
5 is agreement (branch "y" of 23), the method branches to step 24, in which a parking fee transaction $ta(id_i)$ is generated for the current identifier id_i , as will be described in greater detail later.

After step 24, the loop 21 is continued or, after
10 completion thereof, a transition is made to step 25.

In step 25, the current identifiers id_i determined in step 20 are resaved as "old" identifiers $id_{i,last}$, which is to say the current dataset set_{curr} is (now) stored as an "old" dataset set_{last} .

15 Thereafter, in step 26, a wait is carried out for the predetermined time period ΔT , which is between the individual wireless polls 11 of the parking radio beacon 7, and then the method is repeated (loop 27).

During the next repetition in the loop 27, the previously
20 determined current identifiers id_i now constitute the "old" identifiers $id_{i,last}$, and if in step 20 again "new" current identifiers id_i are determined, these can then be compared in step 23 to the "old" identifiers $id_{i,last}$ from the last dataset set_{last} . As a result, it is checked during each loop execution
25 27 whether or not an OBU identifier id_i determined by a parking radio beacon 7 based on a wireless poll 11 was already present during a wireless poll 11 dating back by the time period ΔT ; if so, a vehicle 1 comprising an OBU 5 having this identifier id_i has obviously spent at least the time period ΔT in the radio
30 coverage range 10 of the parking radio beacon 7, so that a corresponding parking fee transaction $ta(id_i)$ can be generated for the OBU identifier id_i for parking over the time period ΔT (step 24).

The parking fee transactions $ta(id_i)$ generated in step 24
35 can be settled directly by the radio beacon 7, for example by

charging these to a user account that is kept in the radio beacon 7. Alternatively, the parking fee transactions $ta(id_i)$ can be forwarded by the radio beacon 7 to a remote back office (not shown), which keeps user accounts, toll accounts, bank
5 accounts, credit accounts and the like under the identifiers id_i , so that the parking fee transactions $ta(id_i)$ can be charged there against a corresponding settlement account. However, it is also possible for the generated parking fee transaction(s) $ta(id_i)$ to be returned from the radio beacon 7
10 to the OBU 5 with the identifier id_i and to be charged there against a settlement account (an "electronic purse") that is kept in the OBU 5.

Another option is to temporarily store the parking fee transaction(s) $ta(id_i)$ returned from the parking radio beacon 7
15 to the OBU 5 in the OBU 5 and, when the OBU 5 returns to the tolling mode TM, have the OBU 5 send it/them to a tolling radio beacon 6 on the way for settlement purposes, as if it were a toll transaction. FIG. 5 shows a corresponding operating mode "post ta ", which the OBU 5 temporarily assumes after returning
20 from the parking mode PM and in which it awaits the next tolling radio beacon 6 on the way, so as to deliver the parking fee transaction(s) $ta(id_i)$ to the same, whereupon the OBU again returns to the "normal" tolling mode TM.

The procedures shown in FIG. 6 can, of course, be
25 appropriately modified according to programming methods known to a person skilled in the art. For example, the decision 22 could be eliminated or included in step 20, and it could be checked whether the status st_i of an identifier id_i is set to "PM" and/or the position p_i of an identifier id_i falls in the
30 area P, wherein then only those identifiers id_i , where status $st_i = \text{"PM"}$ or position $p_i \in P$, are stored as current identifiers in the current dataset set_{curr} . The loop 21 could also be implemented differently and, for example, steps 22 to 24 or 23 to 24 could be carried out immediately after receipt
35 of a response 12 for an identifier id_i if this takes place so

quickly in terms of data processing that this can be done between consecutively arriving responses 12. It should be noted in this regard that, according to some DSRC standards, the responses 12 of several OBUs 15 replying to one common wireless poll 11 are variably spread over time so as to prevent collisions of responses 12, whereby sufficient time can remain between individual responses 12 for steps 22 to 24 or 23 to 24.

A parking radio beacon 7, the radio coverage range 10 of which covers several parking spaces 4, at the same time receives a complete overview of the occupancy status of the parking spaces 4 in its parking area P as a result of the responses 12 of the OBUs 5 in step 20. For this purpose, the beacon only needs to compare the number of identifiers id_i received in step 20 to the number of parking spaces 4 in the area P, so as to obtain a proportional or percentage-based utilization rate of the parking spaces 4, for example "80%" if 4 out of 5 parking spaces are occupied, and so forth. The parking space occupancy status thus determined can be sent to a back office for parking area management measures, for example.

The invention is thus not limited to the shown embodiments, but encompasses all variants and modifications that are covered by the scope of the accompanying claims.

Claims:

1. A method for generating a parking fee transaction for a vehicle, which comprises an onboard unit having an identifier,
5 comprising the following steps in a roadside radio beacon:
 - wirelessly polling an identifier by the radio beacon as a current identifier;
 - generating a parking fee transaction for the
10 identifier if the current identifier is identical to a stored old identifier;
 - storing the current identifier as the old identifier;
 - waiting a predetermined time period; and
 - repeating the above steps.
- 15 2. The method according to claim 1, characterized in that a position of the onboard unit is also wirelessly polled together with the identifier and the parking fee transaction is only generated if, in addition to said current and old identifiers being identical, the position is located in a
20 predetermined area.
3. The method according to claim 1 or 2, characterized in that a status of the onboard unit is also wirelessly polled together with the identifier and the parking fee transaction is only generated if, in addition to said current and old
25 identifiers being identical, the status is identical to a predetermined value.
4. The method according to any one of claims 1 to 3, characterized in that the parking fee transaction is transmitted from the radio beacon to the onboard unit via
30 radio.
5. The method according to any one of claims 1 to 4, characterized in that the parking fee transaction is transmitted from the radio beacon to a back office.
6. The method according to any one of claims 1 to 5,
35 characterized in that the predetermined time period is 1 to 30

minutes, preferably 5 to 20 minutes, and particularly preferably 10 minutes.

7. A radio beacon for generating a parking fee transaction for a vehicle, which comprises an onboard unit having an identifier, wherein the radio beacon has a radio coverage range covering at least one parking space and is configured

to wirelessly poll the identifier of an onboard unit located in the radio coverage range as a current identifier;

to generate a parking fee transaction for the current identifier if the current identifier is identical to a stored old identifier;

to store the current identifier as the old identifier; and
to repeat these steps after a predetermined time period.

8. The radio beacon according to claim 7, characterized by the radio beacon being configured to also wirelessly poll a position of the onboard unit together with the identifier and to generate the parking fee transaction only if, in addition to said current and old identifiers being identical, the position is located in a predetermined area.

9. The radio beacon according to claim 7 or 8, characterized by the radio beacon being configured to also wirelessly poll a status of the onboard unit together with the identifier and to generate the parking fee transaction only if, in addition to said current and old identifiers being identical, the status is also identical to a predetermined value.

10. The radio beacon according to any one of claims 7 to 9, characterized by the radio beacon having a radio coverage range that covers at least two parking spaces and being configured

to wirelessly poll the identifiers of all onboard units located in the radio coverage range as current identifiers;

to generate a parking fee transaction for any current identifier that is identical to a stored old identifier;

to store the current identifiers as old identifiers; and
to repeat these steps after the predetermined time period.

11. The radio beacon according to claim 10, characterized
by the radio beacon calculating a parking space occupancy
5 status based on a comparison of the number of current
identifiers to the number of parking spaces in the radio
coverage range.

12. An onboard unit for a vehicle, having a unique
identifier and a stored modifiable status and comprising a
10 transceiver for transmitting the identifier and the status in
response to a wireless poll of a radio beacon,

wherein the onboard unit has a first operating mode and a
second operating mode, between which the unit can be switched
by way of a switch, and is configured to respond in the second
15 operating mode to wireless polls of a radio beacon that is
configured according to any one of claims 7 to 11, and

wherein the status indicates the respective operating mode
of the onboard unit.

13. The onboard unit according to claim 12, characterized
20 by being equipped with a position determination device for
determining the current position of the unit and being
configured to transmit the position thereof in response to a
wireless poll of the radio beacon.

14. The onboard unit according to claim 12 or 13,
25 characterized by being equipped with a movement sensor, which
switches the onboard unit to the first operating mode when a
movement thereof exceeds a threshold value.

15. The onboard unit according to any one of claims 12 to
14, characterized by being equipped with a movement sensor,
30 which switches the onboard unit to the second operating mode
when no movement thereof is detected for a period that exceeds
a minimum time period.

16. The onboard unit according to any one of claims 12 to
15, characterized by being configured to transmit a parking fee
35 transaction received from a radio beacon in the second

operating mode to a further radio beacon in the first operating mode.

17. The onboard unit according to any one of claims 12 to 16, characterized by having a power-saving third operating
5 mode, which it temporarily enters from the second operating mode after receiving a wireless poll or parking fee transaction.