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CERTIFICATION

This is to certify that the attached translation is, to the best of my knowledge and belief, a true and accurate translation from Japanese into English of the attached Published Patent Application No. 1993-128022, dated May 25, 1993.

Jeff Cureton, Senior Managing Editor
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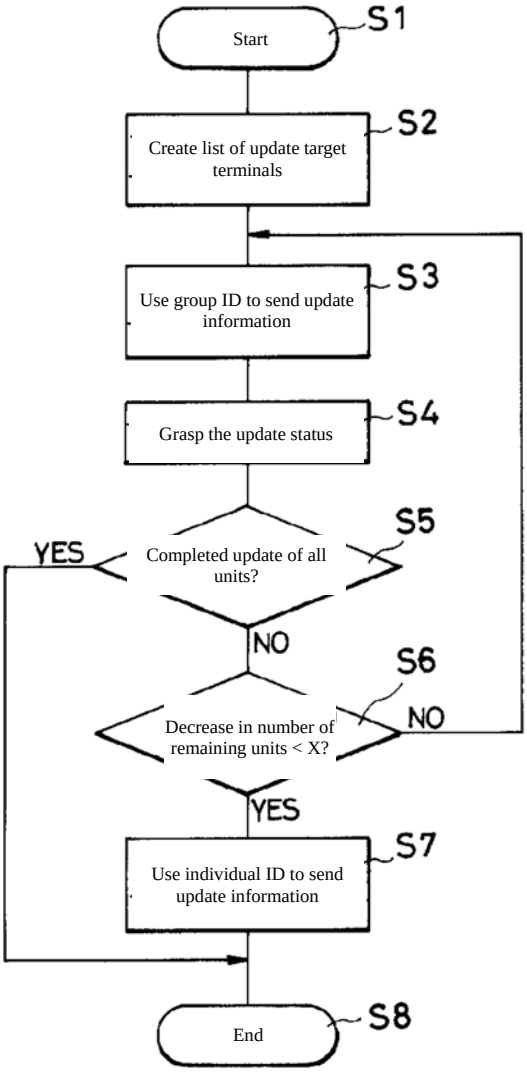
(54) [Name of Invention] Update Method for Mobile Communications Terminal

(57) [Abstract]

[Configuration] Combines a group ID showing the group unit among multiple mobile communications terminals, and an individual ID for each terminal, and in the update initial stage uses the group ID to perform transmission of update information (Step S3), and in the stage where the decrease number for the non-updated mobile communications terminals becomes fewer, uses the individual ID to update each mobile communications terminal one at a time (Step S7).

[Effect] Enables efficient update (with a small number of packets) of each terminal, and also enables update using a wireless channel with small line capacity.



[Scope of Patent Claims]
[Claim 1] A method for updating mobile communications terminals used when performing an update of software on each mobile terminal of a plurality of mobile communications terminals that perform communication using wireless channels, the method for updating mobile communications terminals being characterized by,
in an initial stage of the update, updating the plurality of mobile communications terminals in group units, and, in an end stage of the update, updating the plurality of mobile communications terminals individually.
[Detailed Description of Invention]
[0001]
[Field of Industrial Application] This Invention relates to a method for updating mobile communications terminals when updating software on each of a plurality of mobile communications terminals using wireless channels to perform communication.
[0002]
[Prior Art] In mobile communications systems performing communications through use of wireless channels to mobile communications terminals mounted on mobile units such as, for example, ships, aircraft, and automobiles, etc., software updates have sometimes been performed by replacing the ROM provided within said mobile communications terminals, or some such similar procedure.
[0003]
[Issues to be Resolved by the Invention] However, there are cases where, for example, updating the software of mobile communications terminals mounted on the above-mentioned mobile units is difficult.
[0004] Here, we consider a case where the above-mentioned mobile communications terminals are installed, for example, in 1,000 cargo transport vehicles (trucks) of a certain transport company. Since this transport company would ordinarily need to make use of the trucks as effectively as possible, the reality is that the trucks cannot all be concentrated at a specific site.
[0005] So, when performing software updates for the mobile communications terminals mounted on these trucks, etc., such as ROM replacement or some similar procedure, as many of the updates will not be able to be performed by the operators (drivers), ordinarily service personnel, etc., would need to visit each mobile communications terminal (in other words, the truck that is the mobile unit) and perform the update operation.
[0006] However, in the case where the above-mentioned transport company has installed a terminal in each truck, and the effective utilization of the trucks, as described above, involves continuous operation without returning each truck to the site, there would be cases where the above-mentioned service personnel, etc., would have difficulty getting their hands on the terminal.
[0007] As a result, update of the mobile communications terminal software loaded into the above-mentioned truck, achieved by ROM replacement, for example, could not be said to be a very effective procedure when personnel expenses, etc., are taken into consideration.
[0008] Because of these issues, a method for updating the mobile communications terminal software using wireless channels linked to base stations may be considered.
[0009] However, the mobile communications terminal software currently in use is in many cases very large in size. In addition, so-called wireless channels are limited in their communication capacity, and in particular the use of wireless channels with small capacity to perform software updates would have an unavoidable effect on the communication traffic used for normal communications services.
[0010] In other words, when using wireless channels with base stations like that described above to perform updates, updating over a data communication system with small line capacity is likely to be troublesome due to the need to transmit vast amounts of data to each mobile communications terminal.
[0011] This Invention was proposed to resolve the above-mentioned problems, with the objective of providing a method for updating mobile communication terminals that enables assured update of software within mobile communication terminals with a low transmission volume and without requiring ROM replacement, etc.
[0012]
[Procedure for Resolving the Issue] The update method in this Invention is proposed for attaining the above-mentioned objective, and is a method for updating mobile communications terminals used when performing an update of software on each mobile terminal of a plurality of mobile communications terminals that perform communication using wireless channels, the method being characterized by, in an initial stage of the update, updating the plurality of mobile communications terminals in group units, and, in an end stage of the update, updating the plurality of mobile communications terminals individually.
[0013] In other words, in this Invention, updating of the mobile communications terminal software in wireless data communication systems is performed by remote control by way of base stations. Here, the mobile communications terminal (unit) software is designed to operate on a nonvolatile RAM so that updates can be performed by wireless channels from the base station. Meanwhile, the base station side (sending side) forwards the update information (all or part of the software) to each of the mobile communication terminals, first performing the forwarding based on the group ID of each group unit (addressed to all units or to units residing in specified groups), investigating the number of terminals in this group unit where updating by one round of forwarding has ended, and if the remaining unit number has become fewer, using individual IDs to perform updates of one unit at a time. With this method, highly efficient updating is enabled.
[0014] Put in other words, the method for updating the mobile communications terminals in this Invention is related to a method that uses wireless channels for efficient updating of software in the mobile communications terminals, so that

multiple mobile communications terminals, to transmit update information to each mobile communications terminal in said group, and in the end stage of the update, or in other words, in the stage where the number of mobile communications terminals in the above-mentioned group that have not been updated has become fewer, individual IDs are used for each of the mobile communication terminals, to transmit update information to each mobile communications terminal, achieving updates of the software within the multiple mobile communications terminals with a small number of send packets. Use of the method in this Invention is particularly effective for data communication systems with small transmission capacity.

[0015]

[Action] With use of the update method in this Invention, in the initial stage of the update, multiple mobile communications terminals are updated in group units, while in the end stage of the update, when the number of mobile communications terminals that have not been updated has become fewer, the multiple communications terminals are individually updated.

[0016]

[Implementation Example] Below is a description of an Invention Implementation Example while referencing the illustrations.

[0017] The update method in this Invention Implementation Example is a method for update of mobile communications terminals when performing updates of software on each mobile terminal (m_1, m_2, m_3, m_4,…) of multiple mobile communication terminals performing communication using wireless channels (for example, the mobile communication terminals m_1, m_2, m_3, m_4,…mounted on the automobile, etc., mobile units M_1, M_2, M_3, M_4,…in Figure 2), and as shown in the Figure 1 flowchart, in the initial stage of the above-mentioned update, the above-mentioned multiple mobile communications terminals m_1, m_2, m_3, m_4,…are updated in a group unit (Step S3), and in the end stage of the above-mentioned update, so that the above-mentioned multiple mobile communications terminals m_1, m_2, m_3, m_4,…are updated in individually (Step S7).

[0018] First, ahead of the explanation for the Figure 1 flowchart, we will discuss the communication system being applied in this Invention Implementation Example. This communication system is configured as shown in Figure 2, for example.

[0019] In Figure 2, the communication system for the Implementation Example is composed of one or more communication base stations BS, and multiple mobile communication terminals m1, m2, m3, m4, … Note that the above-mentioned base stations BS may also be connected to a user center US by cable lines. In addition, the above-mentioned mobile communication terminals m1, m2, m3, m4, … are data communication terminals with possible utilizations including vehicle mounting in automobiles or telemetry, etc., for remote automatic systems.

[0020] In this Implementation Example, the software updates for these mobile communication terminals m1, m2, m3, m4,

[0021] Figure 3 is a schematic overview of the mobile communication terminals m1, m2, m3, m4, … in this Implementation Example.

[0022] In Figure 3, the transceiver 13 is a device for modulating wireless signals sent from the above-mentioned base station BS received by antenna 16, outputting to a modem 12, and for modulating signals encrypted by the modem 12, outputting as a wireless signal by way of the antenna 16.

[0023] The above-mentioned modem 12 is a device for decrypting signals demodulated by the above-mentioned transceiver 13, sending them to a processor 11, or encrypting data sent from the said processor 11 and outputting to the transceiver 13.

[0024] The above-mentioned processor 11 processes the data decrypted by the above-mentioned modem 12, and if necessary, outputs by way of a terminal 10 for the outside interface, forwards data input from the outside interface by way of the said terminal 10, or forwards data generated by the terminal itself, to the above-mentioned modem 12.

[0025] Furthermore, the software for the above-mentioned processor 11 operates on a RAM 15 so that updates can be performed by remote control by way of a wireless channel. In addition, when software is stored in a ROM 14 inside the above-mentioned mobile communications terminal, the content of the ROM 14 must also be forwarded to the above-mentioned RAM 15. At this time, the software inside the above-mentioned RAM 15 must be checked to see whether it was damaged or not, to judge whether forwarding should be performed or not. In other words, this kind of check and judgment is performed to prevent overwriting of the software that was updated by the above-mentioned wireless channel.

[0026] Here, for data communication in this Implementation Example, there is both a one-to-one communication format whereby individual IDs used to individually update the above-mentioned multiple mobile communication terminals m1, m2, m3, m4, … , and a one-to-multiple communication format using a group ID for updating the above-mentioned multiple mobile communication terminals m1, m2, m3, m4, … in groups.

[0027] For the cases of using the individual IDs and group IDs in software for the above-mentioned mobile communication terminals m1, m2, m3, m4, …, the relationship between the number of send packets, and the number of units for which update has not been completed, is shown in Figure 4 and Figure 5.

[0028] The following refers to Figure 4 and Figure 5. When the above-mentioned individual ID is used, since a response (hereafter called Ack; Acknowledgement) showing that each of the mobile communications terminals has received each of the above-mentioned send packets is received, the update information can be reliably transmitted. As a result, as shown in Figure 4, the number of units waiting for an update will decrease in a linear manner with respect to the number of send packets.

[0029] On the other hand, when using the above-mentioned group ID, since the update information is sent at the same

time for multiple mobile communications terminals resident in the group, without terminals being specified, transmission of one round of update information enables updates of multiple terminals. However, in the case of this group ID, since a one-to-one response cannot normally be obtained there is no firm guarantee that a given packet reached each mobile communications terminal.

[0030] For this reason, when the above-mentioned group ID is used, at the point when the update ends, information notifying this fact must be sent to the base station BS separately from the above-mentioned Ack response. In this case, since the updates for all terminals will not end by sending just one round of update information, these will be repeatedly sent, but as shown in Figure 5, the number of units where the update has not ended will tend to exponentially decrease in relation to the number of send packets.

[0031] As described above, when the group ID is used, at first the decrease in the number of non-updated units is very fast, but as the number of remaining mobile communications terminals decreases, the amount of decrease in the number of the said non-updated units slows, and cannot be said to be very efficient.

[0032] Based on this, in the Invention Implementation Example a combination of the above-mentioned individual ID and group ID is used, and their respective characteristics utilized to achieve efficient updates.

[0033] In other words, the updates in this Implementation Example perform actions as shown in the algorithm on the base station BS side in Figure 1, to achieve efficient updates that bring out the respective characteristics of the above-mentioned individual ID and group ID. Note that while the explanation for Figure 1 presents as an example the case of the above-mentioned base station BS performing the updates for each mobile communication terminal m_1, m_2, m_3, m_4,…, the base station BS could, for instance, be replaced by a user center US.

[0034] In Figure 1, first, when the update process starts in Step S1, each of the mobile communications terminals m_1, m_2, m_3, m_4,…to be targeted for updates in Step S2 is listed up.

[0035] Next, in Step S3, the above-mentioned group ID is used to send the update information. Here, this update information may be either all or part of the software for the above-mentioned mobile communications terminals. Note that, in the case of the above-mentioned packet communication, it will be divided into multiple packets, so that sending one round of update information in this Implementation Example means sending a series of packets.

[0036] Furthermore, following Step S3, in Step S4, the processing acquires update conditions. Here, for the mobile communications terminals that were able to receive all of the data without error, the update is finished and information to this effect is sent to the base station BS. The base station BS receiving this information counts the number of mobile communications terminals where the update has been completed, and deletes from the update target list the mobile communications terminals where the update has been

[0037] After that, in Step S5, the process checks whether any mobile communications terminals remain on the target list, and if there are no non-update mobile communication terminals remaining (Yes), proceeds to Step S8, and ends the update operation.

[0038] In addition, if in Step S5 there are non-update mobile communications terminals remaining (No), the process proceeds to Step S6, and in Step S6, investigates the decrease in the number of non-updates in the current send. If this is larger than a certain value X (No), the process returns to Step S3, and uses the group ID again to forward the update information.

[0039] In this Step S6, when the decrease number for the above-mentioned non-updated number is smaller than the above-mentioned value X (Yes), the process proceeds to Step S7, and in this Step S7, uses the individual ID to send the update information to the remaining terminals, and then proceeds to Step S8 and ends the processing.

[0040] Note that, for the value X in Step S6, 1 (a small value) is normally used.

[0041] Here, in forwarding using an individual ID as described above, since an Ack response can be received (received by the base station BS) for each packet, there is no need to receive and confirm information notifying the update end as seen in the above-mentioned group ID (however, such may also be received as backup confirmation).

[0042] In addition, depending on the mobile communications terminal, there may be units that cannot send the update information because, for example, they are inside a building, or located in the shadow of obstructing objects. In this case, even if a packet is sent for the specified number of rounds, since the lack of an Ack response may be judged to be evidence of a condition like that described above where the update information cannot be sent, the process suspends the forwarding and ends while units remain on the update target list with a report of these update results.

[0043] Figure 6 shows the action flow of each of the above-mentioned mobile communications terminals side, and shows the action flow of each mobile communications terminal when a packet from the base station BS is received (the update information is composed of multiple packets, and this is one packet among those).

[0044] In this Figure 6, if each mobile communications terminal receives update information in Step S11, in Step S12, stores the received update information in an area for temporary storage of update information within the above-mentioned RAM 15 of the mobile communications terminal.

[0045] Next, in Step S13, the process investigate whether the update information is completed or not. Specifically, since the update information may be divided into multiple packets for sending, completion is confirmed when the series of packets have all been received without error. If not completed in this Step S13 (No), the process does not perform any more processing, and proceeds to Step S18 where it ends.

[0046] In addition, when completion is achieved in Step S13 (Yes), the process proceeds to Step S14, and in Step S14,

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