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- (54) Title: METHOD FOR BOOTING AN EMBEDDED DEVICE FROM AN EXTERNAL USB DEVICE

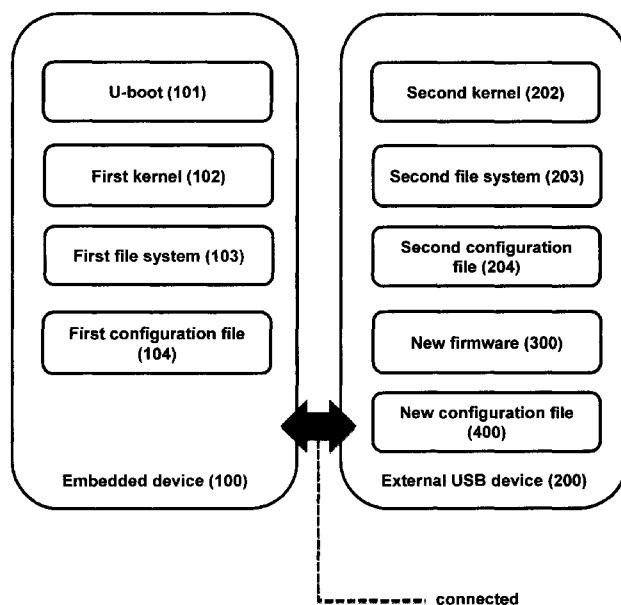


FIGURE 1

(57) Abstract: Disclosed herein is a method for booting an embedded device (100) by using an external USB device (200) without the need to know the IP address, service set identifier (SSID), username, password, or a combination thereof of the embedded device (100). In general, the method works by detecting the presence of the external USB device (200) (701). Once detected, a verification process is performed to confirm the authenticity of the external USB device (200) (702) before the embedded device (100) is booted via the external USB device (200). Subsequently, the external USB device (200) sets the IP address, SSID, username, password, or a combination thereof of the embedded device (100) to default (704), and then proceeds to scan the hardware of the embedded device (705) (100) in order to determine the relevant new firmware (300), new configuration file (400), or a combination thereof. A user will then be able to view the existing configuration of the embedded device (100) (707), and choose to update the existing firmware (708), the existing first configuration file (104) (709), or both by using the determined new firmware (300) and determined new configuration file (400).

**Declarations under Rule 4.17:**

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

Published:

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METHOD FOR BOOTING AN EMBEDDED DEVICE FROM AN EXTERNAL USB DEVICE

TECHNICAL FIELD OF THE INVENTION

- 5 The present invention relates generally to a method for booting an embedded device, and more particularly to a method for booting an embedded device by using an external USB device.

10 BACKGROUND OF THE INVENTION

- In a normal situation, an embedded device boot up by loading existing kernel, file system, and configuration file, which are stored within an internal storage of the embedded device. The embedded device is required to be updated with new firmware, new configuration file, or both from time to time for the purposes of debugging, maintenance, and management of the embedded device, such as
15 updating the firmware to enhance the capability of the device or just to fix some bug issues.

- Typically, such actions are carried out by a certain user who knows the existing configurations of the embedded device, such as the IP address, service set identifier (SSID), username, and password of the embedded device. This is where problems occur. For example, the embedded device cannot be accessed by people who does not know the existing configurations, or when the username and password are forgotten. At time like this, a user is forced to reset the
20 embedded device to factory default settings so that he or she is able to access and boot the embedded device. This solution is not the best because all the existing configurations will be erased and further settings have to be done to the embedded device. Alternatively, the user is able to access the embedded device by performing serial cable connection. While this alternate solution preserves the
25 existing configurations, it requires the user to physically handle the embedded device, and involves messy cables, all of which are tedious, time consuming, and require great effort.

Therefore, it has become an aim of the present invention to introduce a method for booting an embedded device by using an external USB device without knowing the IP address, SSID, username, password, or a combination thereof of the embedded device.

5

SUMMARY OF THE INVENTION

The core technical aspect of the present invention is directed to a method for booting an embedded device, such as a wireless access router, by using an external USB device, such as an external USB flash drive, in a circumstance
10 where the IP address, service set identifier (SSID), username, password, or a combination thereof of the embedded device is unknown to a user.

The said method comprises a first step of having the embedded device to detect
15 the presence of the external USB device, i.e. whether the external USB device is connected to the hardware of the embedded device, which preferably may be performed by a universal boot loader (U-boot) of the embedded device; a second step of having the embedded device to verify the external USB device, i.e. to confirm the authenticity of the external USB device, wherein the verification
20 process preferably may be a key exchange mechanism; a third step of booting the embedded device via the external USB device by having the embedded device to detect and load the second kernel, second file system, and second configuration file of the external USB device; a fourth step of having the external USB device to set the IP address, SSID, username, password, or a combination
25 thereof of the embedded device to default; a fifth step of having the external USB device to scan the hardware of the embedded device; a sixth step of having the external USB device to list out, according to the scanning results of the fifth step, at least one new firmware that is related to the hardware of the embedded device, at least one new configuration file that is related to the hardware of the
30 embedded device, or a combination thereof; and a seventh step of viewing the existing configuration of the hardware of the embedded device, updating the existing firmware of the hardware of the embedded device with the listed out new firmware, updating the existing first configuration file of the hardware of the

embedded device with the listed out new configuration file, or a combination thereof.

5 In the event where the external USB device manages to list out one new firmware or one new configuration file that is related to the hardware of the embedded device, the existing firmware or the existing first configuration file of the hardware of the embedded device will be automatically updated with the listed out new firmware or the listed out new configuration file, respectively, upon booting.

10

In the event where the external USB device manages to list out one new firmware and one new configuration file that are related to the hardware of the embedded device, the existing firmware of the hardware of the embedded device will be updated with the listed out new firmware prior to updating the existing first
15 configuration file of the hardware of the embedded device with the listed out new configuration file.

In the event where the external USB device manages to list out more than new firmwares, more than one new configuration files, or a combination thereof that
20 are related to the hardware of the embedded device, the user will be able to choose which listed out new firmwares to be used to update the existing firmware of the hardware of the embedded device, which listed out new configuration file to be used to update the existing first configuration file of the hardware of the embedded device, or a combination thereof via a remote
25 debugging screen.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates the elements that are involved in the method of the present
30 invention for booting an embedded device by using an external USB device; and

Figure 2 is a flow chart depicting the method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The above mentioned and other features and objects of this invention will become more apparent and better understood by reference to the following
5 detailed description. It should be understood that the detailed description made known below is not intended to be exhaustive or limit the invention to the precise disclosed form as the invention may assume various alternative forms. On the contrary, the detailed description covers all the relevant modifications and alterations made to the present invention, unless the claims expressly state
10 otherwise.

The main aspect of the present invention relates to a method for booting an embedded device (100) by using an external USB device (200). The unique feature about this particular method is that a user is able to boot the embedded
15 device (100) for the purposes of debugging, management, and maintenance of the embedded device (100) without the need to know the IP address, service set identifier (SSID), username, password, or a combination thereof the embedded device (100).

20 Conventionally, in the condition where the IP address, SSID, username, password, or a combination thereof of the embedded device (100) is unknown to the user, the user is only able to access and boot the embedded device (100) by resetting the embedded device (100) to factory default settings. This is an undesirable action as the existing configurations of the embedded device (100)
25 will all be wiped out, and additional setting action will have to be taken after accessing the embedded device (100). The other way to access and boot the embedded device (100) while preserving the existing configurations is to perform serial cable connection. While this is more advantageously than the previously discussed technique, it is still unfavourable as it requires the user to physically
30 handle the embedded device (100) such as dismantling the embedded device (100) in order to access the hardware part, and involved messy cables, all of which are tedious, time consuming, and require great effort.

All of the aforementioned disadvantages are not present in the method as described herein.

The details of the present method will now be thoroughly discussed with the aid of Figure 1 and Figure 2. Two core devices are involved, namely the embedded device (100) such as a wireless access router, and the external USB device (200) such as an external USB flash drive.

Within the embedded device (100), it comprises several other elements, namely a universal boot loader (U-boot) (101), a first kernel (102), a first file system (103), and a first configuration file (104), whereas within the external USB device (200), it comprises several other elements, namely a second kernel (202), a second file system (203), a second configuration file (204), at least one new firmware (300) that is related to the hardware of the embedded device (100), and at least one new configuration file (400) that is related to the hardware of the embedded device (100).

The method comprises the initial step of having the embedded device (100) to detect for the presence of the external USB device (200) (701), i.e. whether the external USB device (200) is connected to the hardware of the embedded device (100).

Upon detecting that the external USB device (200) is present, the embedded device (100) will verify the external USB device (200) in order to confirm the authenticity of the external USB device (200) (702). The verification process can be of any known verification process. In one embodiment of the present invention, the verification process is a key exchange mechanism. Soon after the verification process, the embedded device (100) proceeds to detect and load the second kernel (202), the second file system (203), and the second configuration file (204) in order to boot the embedded device (100) via the external USB device (200) (703). The aforesaid detection and loading action are performed by the U-boot (101) of the embedded device (100). Referring to Figure 1, it can be

seen that the embedded device (100) and the external USB device (200) are connected to each, and the connection is represented by the bi-directional arrow.

Subsequently, the external USB device (200) set the IP address, SSID, username, password, or a combination thereof of the embedded device (100) to default (704). In other words, at this point, it is not necessary for the user to know the IP address, SSID, username, password, or a combination thereof of the embedded device (100).

At this point, the external USB device (200) scans the hardware of the embedded device (100) (705) in order to determine and list out at least one new firmware (300) that is related to the hardware of the embedded device (100), at least one new configuration file (400) that is related to the hardware of the embedded device (100), or a combination thereof (706). The user will then has the options of viewing the existing configuration of the hardware of the embedded device (100) (707), update the existing firmware of the hardware of the embedded device (100) with the listed out new firmware (300) (708), updating the existing first configuration file (104) of the hardware of the embedded device (100) with the listed out new configuration file (400) (709), or a combination thereof.

In the circumstance where the external USB device (200) only manages to list out one new firmware (300) or only one new configuration file (400) that is related to the hardware of the embedded device (100) (706), the existing firmware or the existing first configuration file (104) of the hardware of the embedded device (100) will be automatically updated with the listed out new firmware (300) or the listed out new configuration file (400), respectively (708) (709), upon booting.

In the circumstance where the external USB device (200) manages to list out one new firmware (300), and one new configuration file (400) that are related to the hardware of the embedded device (100) (706), the existing firmware of the hardware of the embedded device (100) is prioritized to be updated first with the

listed out new firmware (300) (708) before the existing first configuration file (104) of the hardware of the embedded device (100) is updated with the listed out new configuration file (400) (709).

- 5 In the circumstance where the external USB device (200) manages to list out more than one new firmwares (300), more than one new configuration files (400), or a combination thereof that are related to the hardware of the embedded device (100) (706), the user is able to choose, via a remote debugging screen, from the listed out new firmwares (300) which version of new firmware (300) is to
- 10 be used to update the existing firmware of the hardware of the embedded device (100) (708), from the listed out new configuration files (400) which version of new configuration file (400) is to be used to update the existing first configuration file (104) of the hardware of the embedded device (100) (709), or a combination thereof.

CLAIMS

- 1) A method to boot an embedded device (100) by using an external USB device (200), characterized in that the method comprises the steps of:
- 5 a) detecting, by the embedded device (100), for the external USB device (200) that is connected to the hardware of the embedded device (100) (701);
- b) verifying, by the embedded device (100), the external USB device (200) (702);
- 10 c) detecting and loading, by the embedded device (100), a second kernel (202), a second file system (203), and a second configuration file (204) of the external USB device (200) (703);
- d) setting, by the external USB device (200), the IP address, SSID, username, password, or a combination thereof of the embedded device (100) to default (704);
- 15 e) scanning, by the external USB device (200), the hardware of the embedded device (100) (705);
- f) listing out according to the scanning results of step (e), by the external USB device (200), at least one new firmware (300) that relates to the hardware of the embedded device (100), at least one new configuration file (400) that relates to the hardware of the embedded device (100), or a combination thereof (706); and
- 20 g) viewing the existing configuration of the hardware of the embedded device (100) (707), updating the existing firmware of the hardware of the embedded device (100) with the listed out new firmware (300) (708), updating the existing first configuration file (104) of the hardware of the embedded device (100) with the listed out new configuration file (400) (709), or a combination thereof.
- 25
- 30 2) A method in accordance with claim 1, wherein the step of detecting, by the embedded device (100), for the external USB device (200) that is connected to the hardware of the embedded device (100) (701) is

performed by a universal boot loader (U-boot) of the embedded device (100).

- 3) A method in accordance with claim 1, wherein the step of verifying, by the
5 embedded device (100), the external USB device (200) (702) is performed by using a key exchange mechanism.
- 4) A method in accordance with claim 1, wherein in the event that there is
10 one new firmware (300) or one new configuration file (400) listed out by the external USB device (200) (706), the existing firmware or the existing first configuration file (104) of the hardware of the embedded device (100) is updated with the listed out new firmware (300) or the listed out new configuration file (400), respectively (708) (709), in an automatic manner upon booting.
- 15 5) A method in accordance with claim 1, wherein in the event that there are one new firmware (300) and one new configuration file (400) listed out by the external USB device (200) (706), the existing firmware of the hardware of the embedded device (100) is updated first with the listed out
20 new firmware (300) (708) before the existing first configuration file (104) of the hardware of the embedded device (100) is updated with the listed out new configuration file (400) (709).
- 25 6) A method in accordance with claim 1, wherein in the event there are more than one new firmwares (300), more than one new configuration files (400), or a combination thereof listed out by the external USB device (200) (706), a user is able to choose, via a remote debugging screen, from the listed out new firmwares (300) which version of new firmware (300) is to be used to update the existing firmware of the hardware of the embedded
30 device (100) (708), from the listed out new configuration files (400) which version of new configuration file (400) is to be used to update the existing first configuration file (104) of the hardware of the embedded device (100) (709), or a combination thereof.

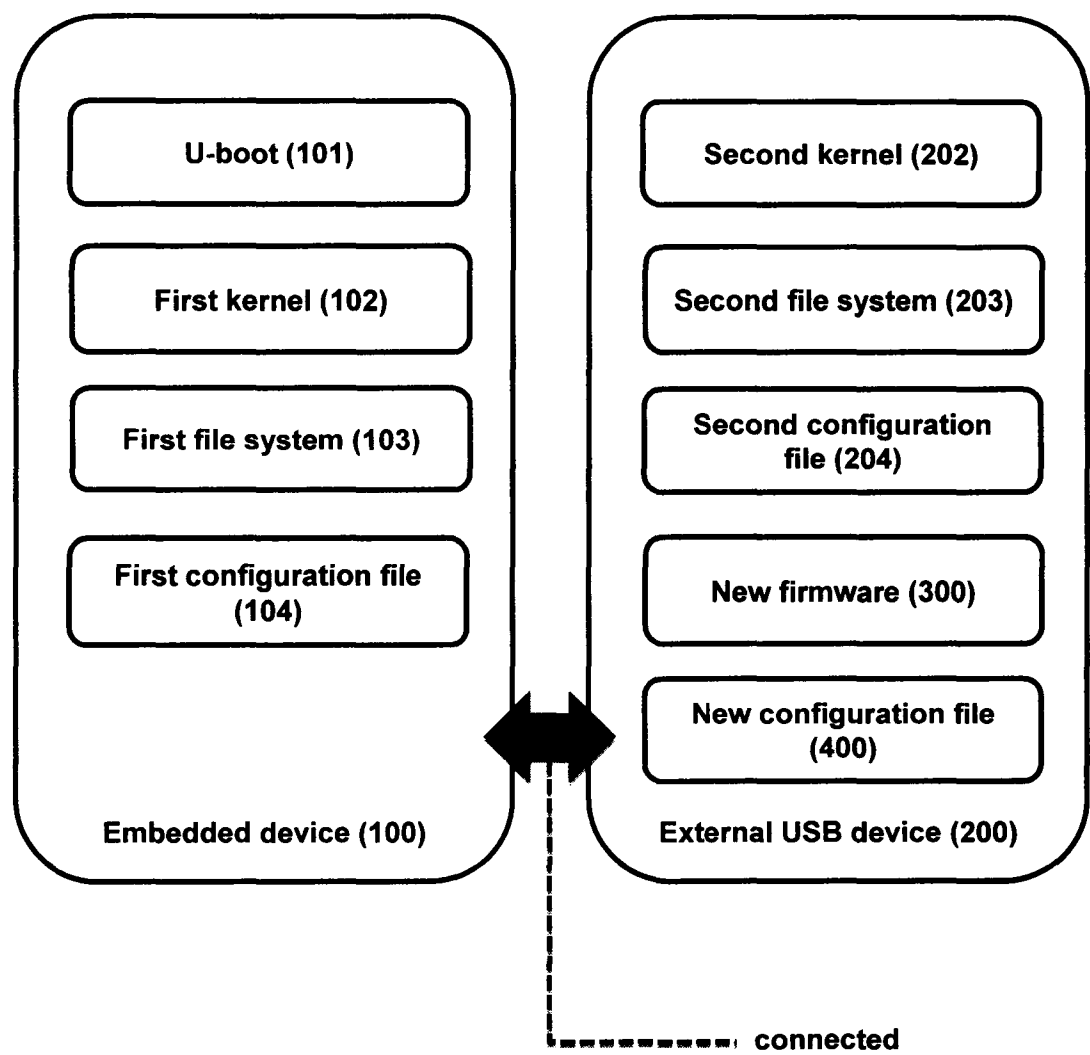


FIGURE 1

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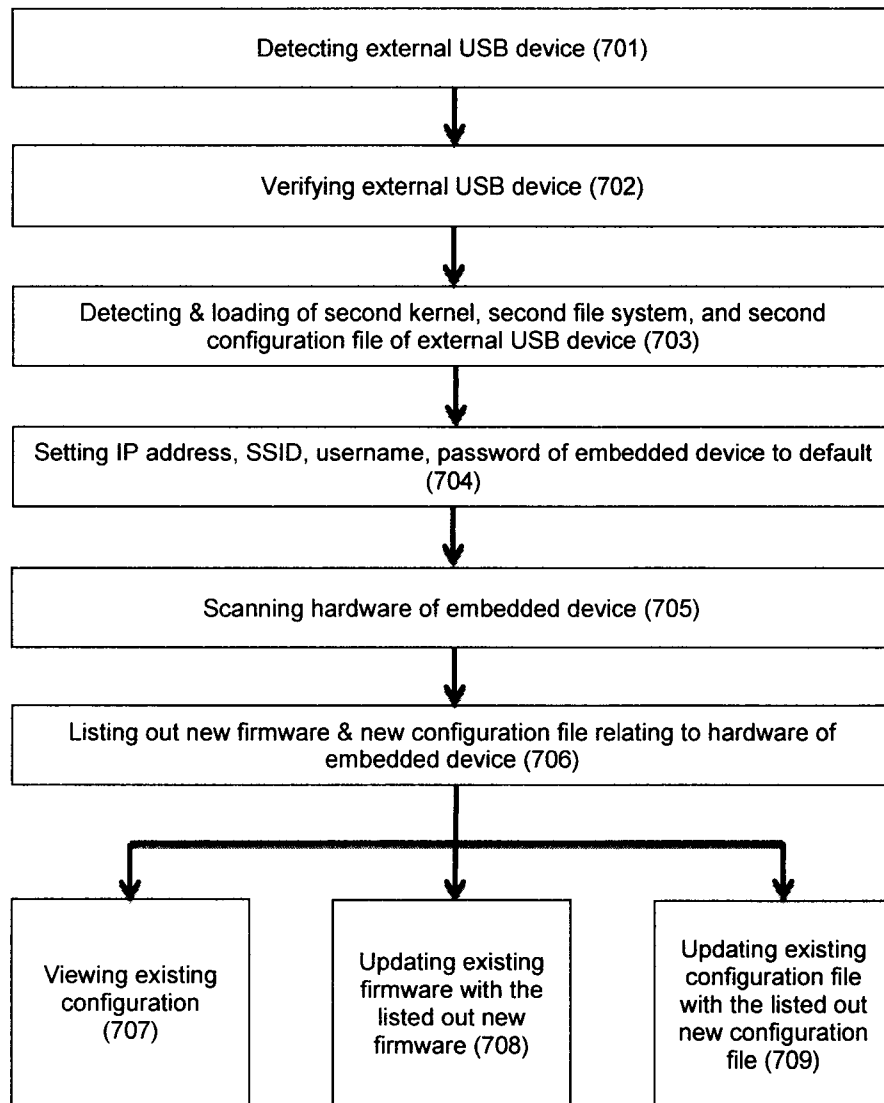


FIGURE 2

INTERNATIONAL SEARCH REPORT

International application No

PCT/MY2014/000136

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06F9/44

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, COMPENDEX, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/085631 A1 (YOUNG JOEL K [US] ET AL) 20 April 2006 (2006-04-20) abstract claims 1,2,4 figures 1,2,3 page 1, paragraph [0003] page 1, whole paragraph [0016], [0017] page 1, paragraph [0018], lines 1-2 page 2, whole paragraph [0026] page 2, paragraph [0028], lines 1-9 ----- -/--	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 October 2014

Date of mailing of the international search report

05/11/2014

Name and mailing address of the ISA/

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Leineweber, Harald

INTERNATIONAL SEARCH REPORT

International application No

PCT/MY2014/000136

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 768 022 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 28 March 2007 (2007-03-28) abstract figures 1,2,3 claims 1,2,3,4,5,6,13,14,15,16 column 1/2, paragraph [0006]-[0010] column 2, paragraph [0016], lines 35-38 column 2,3 paragraph [0020]-[0021] column 4, paragraph [0033] column 4, paragraphs [0034]-[0036] column 5/6, paragraph [0051], line 58 and lines 1-3 column 7, paragraph [0064] -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2014/000136

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006085631	A1	20-04-2006	NONE

EP 1768022	A2	28-03-2007	CN 1929581 A 14-03-2007
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