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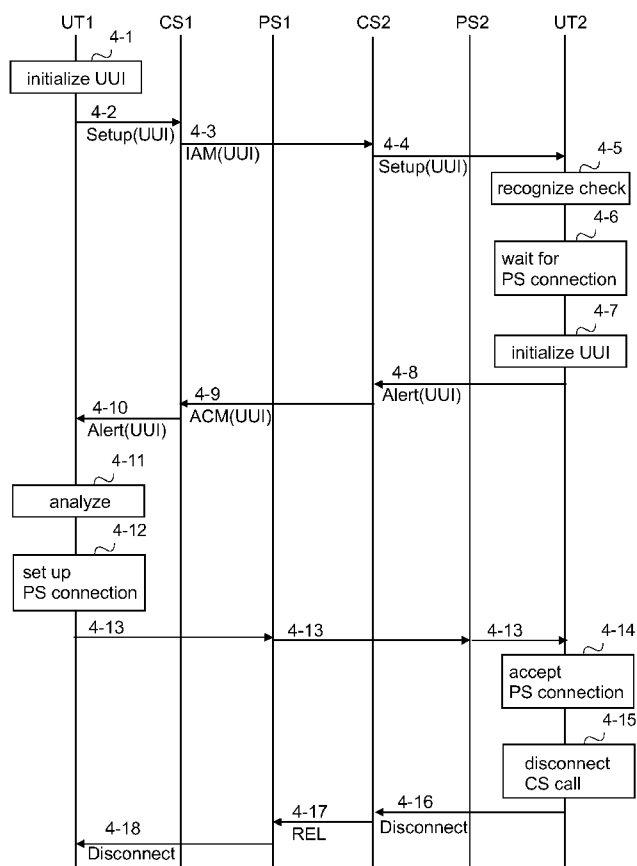
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(54) Title: ESTABLISHING A PEER-TO-PEER PACKET SWITCHED CONNECTION



(57) Abstract: In order to facilitate establishment of a valid peer-to-peer packet switched connection between two terminals providing access to a circuit switched network and a packet switched network, at least one condition relating to the peer-to-peer packet switched connection is transferred (4-2, 4-3, 4-4) from a calling terminal to a called terminal by using a circuit switched user-to-user signalling supplementary service such that the peer-to-peer packet switched connection is established (4-13) if the condition is fulfilled in the called terminal.

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ESTABLISHING A PEER-TO-PEER PACKET SWITCHED CONNECTION

FIELD OF THE INVENTION

The present invention relates to establishing a peer-to-peer connection, and particularly to establishing a peer-to-peer packet switched connection.
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BACKGROUND OF THE INVENTION

The evolvement of communication technology, particularly IP-based communication technology, and user terminals has enabled versatile communication possibilities. One communication type is a peer-to-peer connection in which a connection is established between two remote units. Establishing a peer-to-peer packet switched connection through the Internet, especially between mobile units having no permanent network address, is rather complicated and difficult, as discussed in US patent 6 219 710, for example. It describes a solution in which a monitor channel is used for transmitting an indication that peer-to-peer packet switched connection establishment is desired, and a network address, or identification information on the other unit with which identification information on a network address may be retrieved, is transmitted between the remote units. One of the disadvantages associated with the above arrangement is that although the network address is resolved, the peer-to-peer packet-switched connection may be established in vain, only to notice that it cannot be used as intended since one of the remote units does not support a required feature, for example.
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BRIEF DESCRIPTION OF THE INVENTION

An object of the present invention is thus to provide a method and an apparatus for implementing the method so as to alleviate the above disadvantages. The object of the invention is achieved by a method, a system, terminals and a computer program product which are characterized by what is stated in the independent claims. Preferred embodiments of the invention are disclosed in the dependent claims.
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The invention is based on the idea of utilizing a user-to-user signalling supplementary service (UUS), below UUS service, to transfer information required for the peer-to-peer packet-switched connection, called below PS connection. The UUS service is originally a circuit switched service that allows a subscriber to send/receive a limited amount of information to/from other sub-
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scriber over a signalling channel in association with a call or call set up to the other subscriber so that the subscriber can handle the UUS service independently within the call or call set up. The information is passed transparently (i.e. without modifying the contents) through the network.

5 An advantage of the invention is that prior to establishing a packet switched connection it can be ensured that the packet switched connection can be used for the purpose it was established and/or used as intended. For example, thanks to the invention, it may be ascertained that a certain application exists in both terminals prior to establishing a packet switched connection for
10 information exchange by the applications.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described in greater detail by means of preferred embodiments and with reference to the accompanying drawings, in which

15 Figure 1 shows a system architecture;
 Figure 2 is a block diagram of a terminal;
 Figures 3A and 3B illustrate examples of information according to the invention;
 Figure 4 illustrates signalling according to an embodiment of the in-
20 vention; and
 Figure 5 illustrates signalling according to another embodiment of the invention.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

25 The following embodiments are exemplary. Although the specification may refer to "an", "one", or "some" embodiment(s) in several locations, this does not necessarily mean that each such reference is made to the same embodiment(s), or that the feature only applies to a single embodiment.

 The present invention is applicable virtually to any communications system providing packet switched communications and supporting a circuit
30 switched UUS service, and particularly applicable to systems having both a circuit switched (CS) and a packet switched (PS) network. The communications system may be a fixed communications system and/or a wireless communications system or any combination thereof. Communications systems, especially wireless communications systems, develop rapidly. Such develop-
35 ment may require extra changes to the invention. Therefore, all words and ex-

pressions should be interpreted broadly, and they are intended to illustrate, not to restrict, the invention.

In the following, the present invention is described using a system utilizing a PLMN (Public Land Mobile Network) as a CS network and the Internet as a PS network, as an example of a system to which the present invention may be applied, without restricting the invention thereto. It should be appreciated that the systems, networks, and transmission methods used for transmitting the UUS service are irrelevant to the actual invention. Therefore, they need not be discussed in more detail here.

Figure 1 shows a very simplified system architecture only comprising a communications system 1, two terminals 2, 2', a circuit switched network 3, and a packet switched network 3'.

The terminals 2, 2' illustrate different endpoints of a communication, and they can be mobile terminals or fixed terminals or one of them can be a mobile and the other a fixed terminal. The terminal can be a user terminal (UT), such as a personal computer or a mobile phone, and/or it can be terminals used for machine-to-machine connections or user-to-machine connections, such as a server. Different embodiments of the terminal according to the invention are disclosed in more detail below with Figures 2, 4 and 5.

The networks 3, 3' illustrate means for transmitting information between user terminals, and they can be wireless networks or fixed networks. The type and functionality of the networks are irrelevant to the invention and therefore they are not discussed in detail here. For example, the packet switched network may be GPRS (General Packet Radio Service), an ad hoc network, utilize WLAN (Wireless Local Area Network), and/or Bluetooth to provide the packet switched connections. Thus, the packet switched network can even be a direct link which is spontaneously established as an ad hoc network between two terminals.

Figure 2 is a block diagram of a terminal according to an embodiment of the invention. The terminal is preferably a multi-access terminal providing access to both circuit switched services and packet switched services and supporting the UUS service and simultaneous PS and CS connections, such as so called 3rd generation mobile phones, ISDN terminals, ADSL terminals, GPRS class A and class B terminals, terminals with UTRAN capability, terminals with GERAN capability and multi-access terminals with GSM/UMTS and WLAN capabilities.

In the embodiment of Figure 2, a terminal 2 contains a CIFFA module 2-1 providing a connection interface function for applications (CIFFA) according to an embodiment of the invention, a CS module 2-2 comprising an interface for the circuit switched network CS, a PS module 2-3 comprising an interface for the packet switched network PS, and one or more applications 2-4. An application 2-4 is a service enabler, i.e. a capability which may be used, either by itself or in conjunction with other service enablers, to provide a service to the user of the terminal. An application may use enablers and connectivity to interact with network applications and services or with corresponding applications. Examples of different applications include games, calendar tools, file sharing, video sharing and whiteboarding. When an application requires a peer-to-peer connection, either by itself or instructed by a user, the terminal according to the invention utilizes CIFFA for establishing the peer-to-peer connection. Thus, CIFFA can also be considered to be an application or enabler and it provides an interface, a so-called application programming interface, for applications, said interface offering function calls to connection establishment, sending or receiving information, and disconnecting of the connection, for example. CIFFA may be implemented so that an application developer needs not to amend the application, or to take CIFFA into account when developing the application, or so that the application developer needs to amend/take into account CIFFA, as is well known to a person skilled in the art. CIFFA initialises user-to-user information (UUI) transferred by the UUS service. Examples of different UUIs are disclosed in Figures 3A and 3B. Further, CIFFA controls CS and PS modules so that information on connections is transferred between the CS and PS modules as will be illustrated below. Examples of different embodiments of the CIFFA are disclosed in more detail below with reference to Figures 4 and 5.

It is apparent to a person skilled in the art that the above-described modules and applications may be embedded in one unit or in separate units in a terminal. The modules are preferably controlled by an operating system of the terminal and connected to each other, or integrated to each other so that one module contains the interfaces, or one unit contains each module. CIFFA, as well as the applications, can be pre-installed or downloaded into a terminal. Furthermore, it is apparent to a person skilled in the art that the terminal also comprises other entities, functions and structures that need not be described in detail herein. Examples of these include processor(s), memory, input/output

bus, RF transceivers, user interfaces, etc.

Figures 3A and 3B illustrate UUIs according to an embodiment of the invention; Figure 3A illustrates a UUI of a calling party, called below UUI-orig, and Figure 3B illustrates a UUI of the called party, called below UUI-reply. UUI-reply is a response to UUI-orig, and they utilize "offer-answer" type of negotiation mechanism without restricting the invention thereto. In other words, with offer, i.e. UUI-orig, certain features are either offered by giving alternatives or requested, and with an answer, i.e. UUI-reply, information on selected features and supported required features is transmitted to the other party.

In the example shown in Figures 3A and 3B, the UUS service is a UUS service 1 in which the UUS service may be invoked with a call set up and the call may be terminated before a PS connection is established and in which UUI can be transferred with call originating signalling. In other words, when the UUS service 1 has been activated, a calling terminal and a called terminal, i.e. a calling party and a called party, respectively, can include UUI when accepting, rejecting, or terminating a call. UUI is information transferred by using the UUS service. UUS service for mobile terminals is currently being developed by 3GPP (3rd Generation Partnership Project), and specifications for the UUS service 1, now numbered as TS 22.087, can be found at <http://www.3gpp.org/ftp/Specs/html-info/22087.htm> if detailed information is required. For the UUS in fixed terminals, an ITU-T (International Telecommunication Union) specification Q.932 can be found at <http://www.itu.int/ITU-T/asn1/database/itu-t/q/> if a detailed information is required. An advantage of using the UUS service 1 is that it is possible to establish a PS connection without answering to a CS call which started the establishment of the PS connection. For the sake of clarity, UUIs in Figures 3A and 3B are in plain text format, although it is apparent to one skilled in the art that the information, or some of it, may be coded, packed or compressed.

UUI-orig 30 in Figure 3A comprises a CIFFA parameter 3-1 indicating that this UUS service 1 is for establishing a PS connection. The parameter 3-1 preferably indicates, in addition to CIFFA, the nature of the UUI. For example, in the illustrated example, the parameter 3-1 indicates that this is a request. It is apparent to one skilled in the art that the parameter indicating that the UUI is for a PS connection may have a different name and that the indication may be given as a parameter value.

A second parameter in UUI-orig 30 is a parameter 3-2 defining the application which is required in the called terminal, i.e. it defines the application for which the PS connection is intended. In the example of Figure 3A the application which is required in the called terminal is foo.

5 Other parameters in Figure 3A relate to PS connection-related information which may include any kind of information. Examples of the PS connection-related information include a preferred access network for the PS connection, a preferred security mechanism with related parameters, information indicating in which phase of the CS call the PS connection is established and
10 how the CS call is treated, and information indicating the role of the calling terminal. Yet further examples of the further information include alternative communications network(s) with connection parameters and alternative security mechanism(s). In the example of Figure 3A, UUI offers (parameter 3-3) two alternative communication networks: the Internet and an ad hoc network to
15 which the type and name are given. UUI in Fig. 3A also indicates (parameter 3-4) the access network the calling party is to use and the required security mechanism (parameter 3-5) with parameter values to be used with the security mechanism. In addition, the illustrated UUI comprises the calling party's IP address (parameter 3-6) and port (parameter 3-7) used by the calling party for
20 listening and transmitting, and alternatives for the transport layer protocol to be used (parameter 3-8). Further, in the example of Figure 3A, UUI-orig 30 comprises a negotiation-procedure parameter 3-9, which value indicates that the PS connection is to be established during a CS call set up phase and the CS call set up is to be disconnected after the PS connection is established, and
25 that it is the master of the connection that initiates the establishment of the PS connection; and a role parameter (3-10), which value indicates that the calling terminal is going to be the master for the PS connection.

As can be seen from the above, quite a lot of PS connection-related information can be transferred and used in negotiations before the PS connection is established. However, it suffices for an UUI according to the invention
30 that it indicates, either directly or indirectly, that it is for a PS connection, and that it contains at least one condition which needs to be fulfilled in order for the PS connection to be established. Preferably the condition is that the called terminal contains or supports the required application, i.e. the value of the parameter 3-2, or one of the values of the parameter, but instead of this or in addition to these another condition or other conditions, such as use of the sug-
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gested security mechanism, can be used. Depending on the implementation, the terminals may be configured to use a value or values of a certain parameter or certain parameters, such as 3-2, as a condition, or they may be configured to use parameters with one value as conditions, or each parameter as a
5 condition.

UUI-reply 30' in Figure 3B illustrates a response to UUI-orig in Figure 3A. UUI-reply 30' in Figure 3B comprises a CIFFA parameter 3-1' indicating that this is a reply to a request to establish a packet switched connection, parameter 3-2' confirming that the terminal contains the required application,
10 and, as other PS connection-related information, the selected communication network (parameter 3-3'), an access network (parameter (3-4') used by the called party for the PS connection; confirmation (parameter 3-5') that the required security mechanism is supported with required values; an IP address (parameter 3-6') to be used with the PS connection for reaching the called
15 party; port (parameter 3-7) used by the called party for listening and transmitting; the selected transport layer protocol (parameter 3-8'); a negotiation-procedure parameter 3-9' which confirms that the suggested negotiation procedure is accepted; and a role parameter (3-10') which indicates that the called terminal is going to be a slave to the PS connection.

By giving the IP addresses in UUI-orig and UUI-reply, problems relating to solving out an IP address of a calling or called roaming subscriber, for example, are solved. Furthermore, since the address information is transmitted in UUI, the information reaches the called one even with an international call with a calling line identification restriction and/or change of original calling
20 number, and call forwarding. A further advantage is that since the given IP address is a reliable identifier, the invention is also usable in machine-to-machine PS connections.

UUI-orig and UUI-reply may also be used for selecting an application or applications which can be used on the PS connection. This can be performed by giving to the parameter 3-2 a value which comprises more than one
30 application, in which case the condition may be that at least one of the applications must be supported by the called one. Correspondingly, the value of the parameter 3-2' may comprise more than one application, the value being preferably a subset of the value of the parameter 3-2 if the calling party is the master. However, the value of the parameter 3-2' may comprise more applications
35 than the value of the parameter 3-2 even if the calling party is the master.

Although not shown in Figures 3A and 3B, UUI may also contain other information, such as information on how to establish an IP ad hoc network, i.e. ad hoc network type, name/identifier and authentication parameters. It is also apparent to one skilled in the art that some parameters having a single value in the illustrated examples may have more than one value as alternatives.

Depending on the implementation, a parameter having no alternatives in the offer may be considered to be a condition which needs to be fulfilled, or the terminals may be configured to use a value or values of a certain parameter, or certain parameters to be the condition, for example.

Figure 4 illustrates signalling according to an embodiment of the invention. In the example shown in Figure 4, it is assumed, for the sake of clarity, that the condition relating to establishing the PS connection is fulfilled, other requirements are met and the PS connection is established. A further assumption made here is that no circuit switched call is established, i.e. the UUS service 1 is used and that the condition is to have the same application in both terminals. Furthermore, it is assumed that the transferred UUIs are the ones illustrated in Figures 3A and 3B.

Figure 4 starts at the point in which the calling party, for example a user of a user terminal UT1, opens an application and requests a peer-to-peer connection to user B. Therefore UT1, or more precisely CIFFA in UT1, in point 4-1, initializes UUI, which is in the example UUI-orig illustrated in Figure 3A. Then UT1 sends a circuit switched call set up message 4-2 with UUI to a circuit switched network CS1 serving UT1. CS1 forwards UUI to a circuit switched network CS2 serving a called party's terminal UT2 in an initial address message IAM 4-3. CS2 forwards UUI in a call set up message 4-4 to UT2.

UT2, or more precisely, CIFFA in UT2, recognizes, in point 4-5, that UUI is for a PS connection and the calling party supports CIFFA application, and analyses, in point 4-5, the content of the received UUI. More precisely, in the illustrated example, CIFFA in UT2 checks whether or not the condition (in this example support for application foo) is fulfilled, checks other parameters/conditions and performs required selections, such as selecting the preferred connection network and transport layer. Since in the example illustrated in Figure 4, UT2 has the application indicated in UUI, i.e. the condition is fulfilled, as well as other conditions/parameters are fulfilled and/or accepted and

required selections made, and UUI in message 4-4 indicated that UT1 is the master for the PS connection, UT2 starts, in point 4-6, to wait for a PS connection request from UT1. In other words, CIFFA in UT2 instructs, in point 4-6, a PS module in UT2 to wait a PS connection request from UT1. UT2, or more precisely CIFFA in UT2, also responds to the set up message in point 4-7 where it initializes UUI for the response, UUI being UUI-reply illustrated in Figure 3B, and sends an alert message 4-8 with UUI to CS2, which forwards UUI in an address complete (ACM) message to CS1, wherefrom UUI is sent to UT1 with an alert message 4-9.

10 In response to receiving the alert message 4-10, UT1 analyzes, in point 4-11, the received UUI to find out whether or not the requested PS connection can be established, i.e. whether or not the condition was fulfilled. It may also analyze whether or not further negotiation on PS connection features is required. However, in this example no further negotiations are required.

15 More precisely, in the example, CIFFA in UT1 recognizes that the condition is fulfilled, as well as that other parameters are supported since UUI was in an alert message, and therefore CIFFA searches the received UUI for the selected connection network and relating address information (IP address and port number), the selected transport protocol and security mechanism values.

20 Since the condition was fulfilled, the terminal, or more precisely, CIFFA in UT1, instructs, using the searched information, the PS module to start, in point 4-12, to set up the PS connection by sending via packet switched networks PS1 and PS2 a connection request 4-13 to UT2, using the searched information. The PS connection may be connectionless or connection-oriented, and the details

25 of establishment bear no significance to the invention, and are therefore not described in detail here.

In response to receiving the message 4-13, UT2 notices that a PS connection request from UT1 is received and accepts it in point 4-14. Now a packet-switched connection is established and can be used for control traffic of the application and for user data. Since security mechanism information, such as IPsec keys, was exchanged before the actual establishment of the PS connection, the PS connection is a secured connection from the very beginning.

In addition, UT2 disconnects in point 4-15 the CS call without answering to the call, as was instructed by UUI in the message 4-4. UT2 disconnects the CS call by sending a disconnect message 4-16 to CS2 which sends

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a release message 4-17 to CS1, which then sends a disconnect message 4-18 to UT1, thereby notifying the UT1 that no CS call was established.

In an embodiment of the invention, UT2 is arranged to send after the alert message 4-8, a PS connection request to UT1 (i.e. message 4-13 is sent from UT2 to UT1), and when UT2 receives from UT1 an indication that the PS connection was successfully established, it continues from point 4-15 by disconnecting the call. Based on the information received in UUI in the alert message, UT1 knows the selected connection network, IP address and port number in UT2, thus knowing wherefrom to wait for the PS connection request.

In an embodiment of the invention, UT2 is arranged to send instead of the alert message 4-8, a PS connection request to UT1 (i.e. message 4-13 is sent from UT2 to UT1), and when UT2 receives from UT1 an indication that the PS connection was successfully established, it continues from point 4-15 by disconnecting the call.

As can be seen from the above, the PS connection was established without establishing a CS connection. However, it is obvious to one skilled in the art that the negotiation mechanism may be that PS connection is established after a CS connect message, i.e. after a CS connection has been established. Figure 5 illustrates such an embodiment.

In the example shown in Figure 5, it is assumed, for the sake of clarity, that the condition relating to establishing the PS connection is fulfilled, other requirements are met and the PS connection is established. A further assumption made here is that the UUS service 1 is used and that the condition is to have the same application in both terminals. Furthermore, it is assumed that the transferred UUIs both contain only a CIFFA attribute indicating that they are for establishing a PS connection, an IP address, a port number, and the application, i.e. the condition. However, UUIs may comprise one or more other parameters. A further assumption in the embodiment is that when UUI sent by the calling party contains no indication that the calling party is the master, or the one requesting establishment of the PS connection, the called party is to act as a master, or at least request the establishment.

Figure 5 starts at the point in which a calling party, such as the user of a terminal UT1, opens an application and requests a peer-to-peer connection to user B. Therefore UT1, or more precisely CIFFA in UT1, initializes in point 5-1 UUI which, as stated above, comprises parameters 3-1, 3-2, 3-3, 3-6 and 3-7 with their values as shown in the exemplary UUI-orig illustrated in Fig-

ure 3A, except that the Internet is given as the only possible communication network. Then UT1 sends a circuit switched call set up message 5-2 with UUI to a circuit switched network CS1 serving UT1. CS1 forwards UUI to a circuit switched network CS2 serving a called party's terminal UT2 in an initial address message IAM 5-3. CS2 forwards UUI in a call set up message 5-4 to UT2.

In the embodiment illustrated in Figure 5, UT2 responds to the set up message by sending an alert message 5-5 to CS2 which forwards an address complete (ACM) message 5-6 to CS1 wherefrom an alert message 5-7 is sent to UT1. Then UT1 remains waiting for a message from UT2.

Meanwhile UT2, or more precisely, CIFFA in UT2, recognizes in point 5-8 that the set up message 5-4 contained UUI for a PS connection, and checks in point 5-8, whether or not the condition is fulfilled. Since in the example illustrated in Figure 5, UT2 has the application indicated in UUI, i.e. the condition is fulfilled, the Internet can be used as the connection network, and while UUI in message 5-4 contained no additional conditions, requirements or required no selections, UT2 initializes in point 5-9 UUI for the response which, as stated above, comprises parameters 3-1', 3-2', 3-3', 3-6' and 3-7' with their values as shown in the exemplary UUI-reply illustrated in Figure 3B. Then UT2 sends UUI in a connect message 5-10 to CS2 which forwards UUI in a connect/answer (CON/ANM) message 5-11 to CS1. CS1 forwards UUI in a connect message 5-12 to UT1. In response to the connect message 5-12, UT1 establishes, in point 5-13, a PDP context in order to be ready to receive a PS connection request. Because of a connect-answer message, a CS call has also been established between UT1 and UT2.

UT2 may also analyse in point 5-8 whether or not further negotiation on PS connection features is required. However, in this example no further negotiations are required, and UT2, or more precisely, CIFFA in UT2, instructs, using the information received in the message 4-4, the PS module to start, in point 5-14, to set up the PS connection by sending via packet switched networks PS1 and PS2 a TCP connection request 5-15 to UT1. The PS connection may be connectionless or connection-oriented, and the details of establishment bear no significance to the invention and are therefore not described in detail here.

In response to receiving the message 5-14, UT1 notices that a PS connection request from UT2 is received and accepts it in point 5-15. Now a

packet-switched connection is established and can be used for control traffic of the application and for user data.

The CS call may be released at any time, even immediately after it has been established.

5 Although not shown in Figures 4 and 5, the call set up phase may be maintained for a longer period to negotiate PS connection features or to test IP connectivity or corresponding capabilities, for example. The features may be suggested by a slave and decided by a master. For example, the called party may indicate that the suggested phase in which the PS connection
10 should be established and/or how to handle the PS call are not appropriate for the called terminal. UT1 and UT2 may also negotiate which one is to start the establishment of the PS connection.

 Although not explicitly shown above, the present invention has an advantage over 3GPP CSI (CAMEL subscription information): the present in-
15 vention does not restrict the use of other CS supplementary services, i.e. it can be used with different call forwarding services, such as CFU (unconditional call forwarding), CFB (call forwarding on mobile subscriber busy) and CFNR (call forwarding on no reply), and with "number restriction" services, such as CLIR (calling line identification restriction) and COLR (connected line identification
20 restriction), for example.

 In another embodiment of the invention, UT2 sends a disconnect message with UUI, instead of the connect message 5-10. In the embodiment, the PS connection between the UT1 and UT2 is established after the disconnected CS call establishment.

25 Although not shown above, if the condition is not met in UT2, UT2 preferably sends a disconnect message with UUI having "CIFFA_ERROR" as CIFFA-parameter 3-1", and the reason(s) why the PS connection cannot be established.

 Normally, as in the examples in Figures 4 and 5, the network is not
30 to interpret or act upon UUI, and the invention requires no changes to existing networks. However, in one embodiment of the invention, a switching centre in a CS network may be arranged to detect that the call set up signalling contains UUI relating to an establishment of a PS connection, and in response to the detection, not to allocate a traffic circuit for the call but to use a so-called zero
35 traffic circuit for the call set up.

In another embodiment of the invention, a switching centre, or any other network node via which call set up signalling passes, in a CS network may be arranged to detect that the call set up signalling contains UUI relating to an establishment of a PS connection, and in response to the detection, not to pass the call set up signalling. In other words, in response to UUI comprising the CIFFA parameter, UUI is filtered/blocked, i.e. not sent, but UUIs without CIFFA parameter are forwarded, unless the network node is arranged to filter UUIs with some other parameter. An advantage of this embodiment is that an operator may prevent non-chargeable use of the CS network.

The steps, points, messages and related functions described above in Figures 4 and 5 are in no absolute chronological order, and some of the points may be performed and/or some of the messages may be sent simultaneously or in an order different from the one given here. Other functions can also be executed between the points or within the points. Some of the points or part of the points can also be omitted. Other messages can be transmitted and/or other points can also be carried out between the illustrated ones. The messages are only examples and may also comprise other information. Furthermore, the messages may be different from the above-mentioned messages. For example, some other protocols, such as SIP (session initiation protocol), may be used for transferring UUIs.

Although the invention has been described above using a UUS service 1, it is obvious to one skilled in the art that the invention can be implemented with a UUS service 2 and a UUS service 3 as well. With the UUS service 2, UUI can be sent and received after the calling subscriber has received an indication that the remote party is being informed of the call and prior to the establishment of the connection. In the UUS service 2, UUI sent by the calling subscriber prior to receiving the acceptance of the call by the remote party, may as a network option be delivered to the remote party after the call has been established. In the UUS service 3, UUI can be sent and received only while the connection is established.

The terminals implementing the functionality of the present invention comprise not only prior art means but also means for establishing a PS connection utilizing UUS. More precisely, they comprise means for implementing an embodiment according to the present invention. Present terminals comprise processors and memory that can be utilized in the functions according to the invention. All modifications and configurations required for implementing the

invention may be performed as routines which may be implemented as added or updated software routines, application circuits (ASIC) and/or programmable circuits. Generally, program products include routines, programs, modules, objects, components, segments, schemas, data structures, etc. which perform
5 particular tasks or implement particular abstract data types and which can be stored in any computer-readable data storage medium and which may be downloaded into a terminal.

It will be obvious to a person skilled in the art that as technology advances, the inventive concept can be implemented in various ways. The inven-
10 tion and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

CLAIMS

1. A method of establishing a peer-to-peer packet switched connection, characterized by the method comprising:

transferring (4-2, 4-3, 4-4) at least one condition relating to the
5 peer-to-peer packet switched connection by using a circuit switched user-to-user signalling supplementary service;

checking (4-5) whether or not the condition is fulfilled; and

establishing (4-13) the peer-to-peer packet switched connection if
the condition is fulfilled.

10 2. A method as claimed in claim 1, wherein said condition indicates one or more applications (3-2), and at least one of the one or more applications needs to be supported by both peers.

3. A method as claimed in claim 1 or 2, wherein said transferring using the user-to-user signalling supplementary service further includes transferring
15 ring packet switched connection related information containing one or more items from a group comprising a communication network type (3-3), address information (3-6, 3-7) in a communication network, security mechanism (3-5), values relating to a security mechanism (3-5), a transport layer protocol (3-8), and information on a peer's role (3-10) in the peer-to-peer packet switched
20 connection.

4. A method as claimed in claim 1, 2 or 3, wherein said transferring using the user-to-user signalling supplementary service further includes transferring
information (3-9) on establishment of the peer-to-peer packet switched
25 connection, said information indicating at least when the peer-to-peer packet switched connection is to be established or which one of the peers is to establish the peer-to-peer packet switched connection.

5. A method as claimed in any of the preceding claims, wherein the user-to-user signalling supplementary service is a user-to-user signalling supplementary service 1 in which user-to-user information can be sent and received during origination of a call.
30

6. A method as claimed in any of the preceding claims, wherein the peer-to-peer packet switched connection is established (5-15) after a circuit switched call is established.

7. A method as claimed in claim 5, wherein the peer-to-peer packet switched connection is established (4-13) during a circuit switched call set up phase and no circuit switched call is established.

8. A terminal (2) comprising
5 a circuit switched interface (2-2) for circuit switched connections;
a packet switched interface (2-3) for packet switched connections;
and

one or more applications (2-4);
c h a r a c t e r i z e d in that the terminal further comprises a con-
10 nection interface (2-1) for receiving a request to establish a peer-to-peer con-
nection from an application and, in response to the request, for triggering es-
tablishment of a peer-to-peer packet switched connection by sending at least
one condition relating to the peer-to-peer packet switched connection using a
circuit switched user-to-user signalling supplementary service.

15 9. A terminal (2) as claimed in claim 8, wherein the connection inter-
face (2-1) is further configured, in response to receiving an indication that the
condition is fulfilled, to control the circuit switched interface (2-2) and the
packet switched interface (2-3) so that information on the peer-to-peer packet
switched connection is transferred between the circuit switched interface (2-2)
20 and the packet switched interface (2-3).

10. A terminal (2), comprising
a circuit switched interface (2-2) for circuit switched connections;
and

a packet switched interface (2-3) for packet switched connections;
25 c h a r a c t e r i z e d in that the terminal further comprises a con-
nection interface (2-1) for receiving, in a user-to-user information of a circuit
switched user-to-user signalling supplementary service, a request to establish
a peer-to-peer packet switched connection, said user-to-user information com-
prising at least one condition relating to the peer-to-peer packet switched con-
30 nection; for checking, in response to the request, whether or not the condition
is fulfilled, and for sending a response to the request using the circuit switched
user-to-user signalling supplementary service, said response indicating the
outcome of the checking.

11. A terminal (2) as claimed in claim 10, wherein the connection in-
35 terface (2-1) is further configured, in response the condition being fulfilled, to
control the circuit switched interface (2-2) and the packet switched interface (2-

3) so that information on the peer-to-peer packet switched connection is transferred between the circuit switched interface (2-2) and the packet switched interface (2-3).

12. A terminal (2) as claimed in claim 8, 9, 10 or 11, wherein the
5 terminal (2) is arranged to establish the peer-to-peer packet switched connection without establishing a circuit switched connection.

13. A computer program product embodied in a device-readable medium and comprising program instructions, wherein execution of said program instructions cause a device containing the computer program product to
10 trigger, in response to a peer-to-peer connection request, establishment of a peer-to-peer packet switched connection by sending at least one condition relating to the peer-to-peer packet switched connection using a circuit switched user-to-user signalling supplementary service.

14. A computer program product as claimed in claim 13, wherein the
15 execution of said program instructions cause the device containing the computer program product to check, in response to receiving, in a user-to-user information of a circuit switched user-to-user signalling supplementary service, a request to establish a peer-to-peer packet switched connection, said user-to-user information comprising at least one condition relating to the peer-to-peer
20 packet switched connection, whether or not the condition is fulfilled and to send a response to the request using the circuit switched user-to-user signalling supplementary service, said response indicating the outcome of the check.

15. A computer program product as claimed in claim 13 or 14, wherein the execution of said program instructions cause the device containing
25 the computer program product to control a circuit switched interface of the device and a packet switched interface of the device so that information on the peer-to-peer packet switched connection is transferred between the circuit switched interface and the packet switched interface.

16. A communication system (1), comprising at least
30 a circuit switched network (3);
a packet switched network (3'); and
two or more terminals (2, 2'), both providing access to the circuit switched network and to the packet switched network and to a supporting user-to-user signalling supplementary service;
35 c h a r a c t e r i z e d i n t h a t
the terminals (2, 2') are arranged to exchange information relating

to a peer-to-peer packet switched connection by using a circuit switched user-to-user signalling supplementary service, said information comprising information relating to at least one condition relating to the peer-to-peer packet switched connection.

5 17. A communication system (1) as claimed in claim 16, wherein the terminals (2, 2') are arranged, in response to the condition being fulfilled, to establish the peer-to-peer packet switched connection.

 18. A communication system (1) as claimed in claim 17, wherein the terminals (2, 2') are arranged to exchange the information during a circuit
10 switched call set up phase and to establish the peer-to-peer packet switched connection without establishing a circuit switched call.

 19. A communication system (1) as claimed in claim 18, wherein the circuit switched network (3) is arranged to detect that the user-to-user signalling service is for a peer-to-peer packet switched connection, and, in response
15 to the detection, to use a zero traffic circuit for the call set up.

 20. A communication system (1) as claimed in claim 16, 17, or 18, wherein the circuit switched network (3) is arranged to detect that the user-to-user signalling service is for a peer-to-peer packet switched connection, and, in response to the detection, to block the information exchange.

20 21. A communication system (1) as claimed in claim 16, 17, 18, 19, or 20, wherein the terminals (2, 2') are arranged to include in said information address information to be used the with peer-to-peer packet switched connection.

 22. A communication system (1) as claimed in claim 16, 17, 18, 19,
25 or 20, wherein the terminals (2, 2') are arranged to include in said information security mechanism related information to be used the with peer-to-peer packet switched connection.

1/4

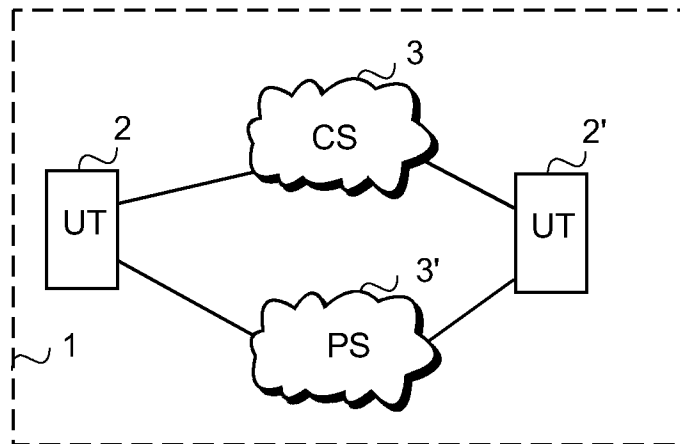


FIG. 1

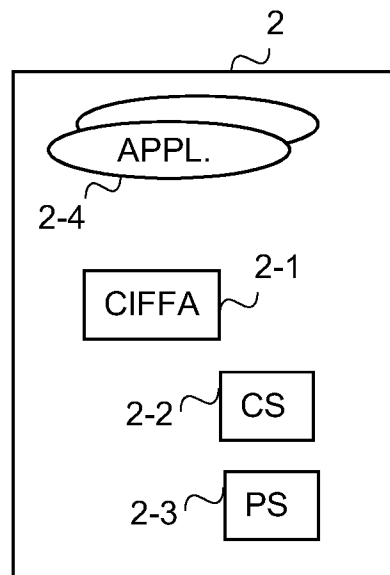


FIG. 2

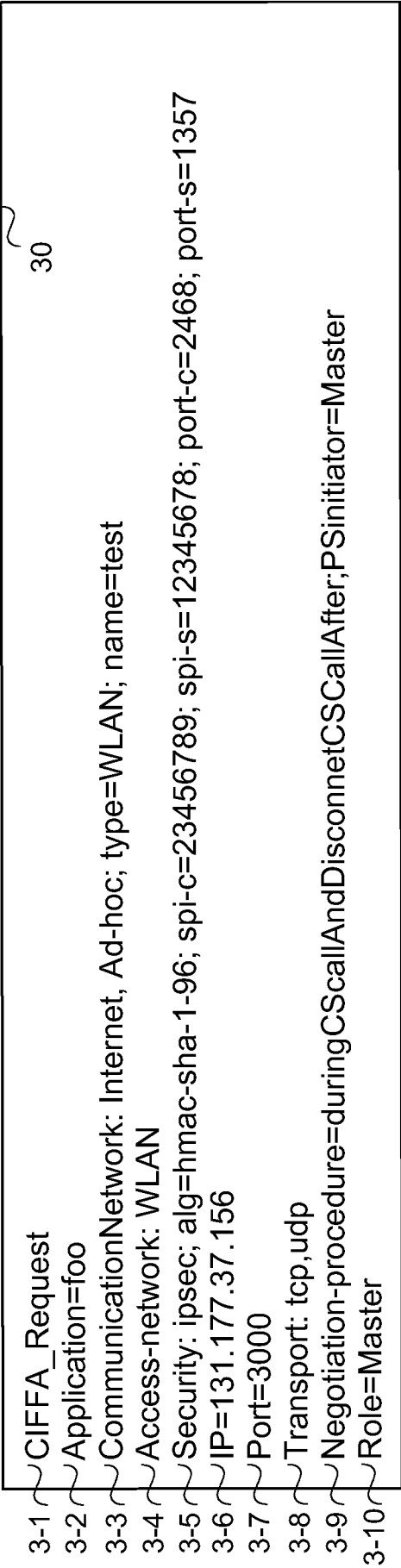


FIG.3A

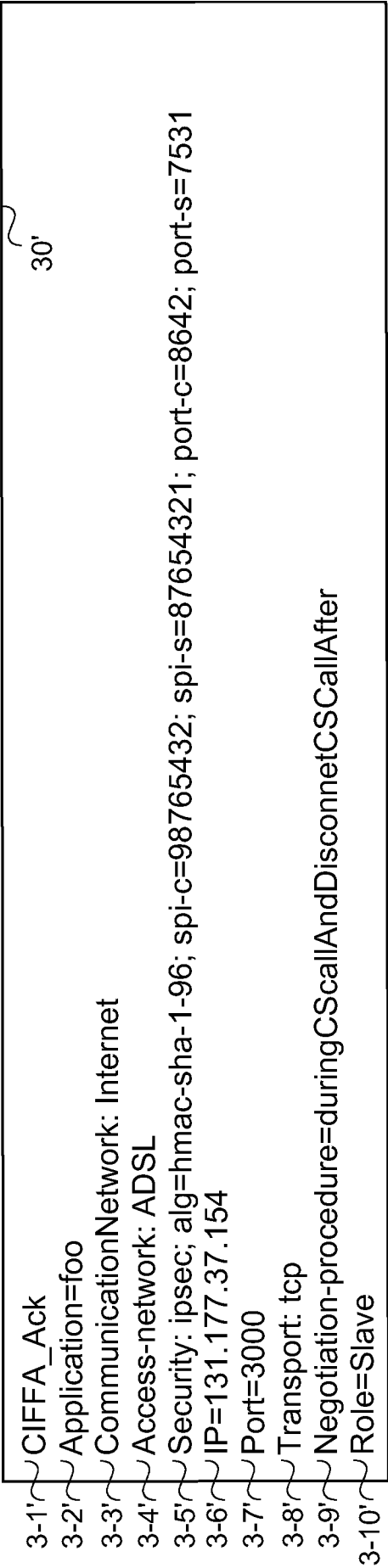


FIG.3B

3/4

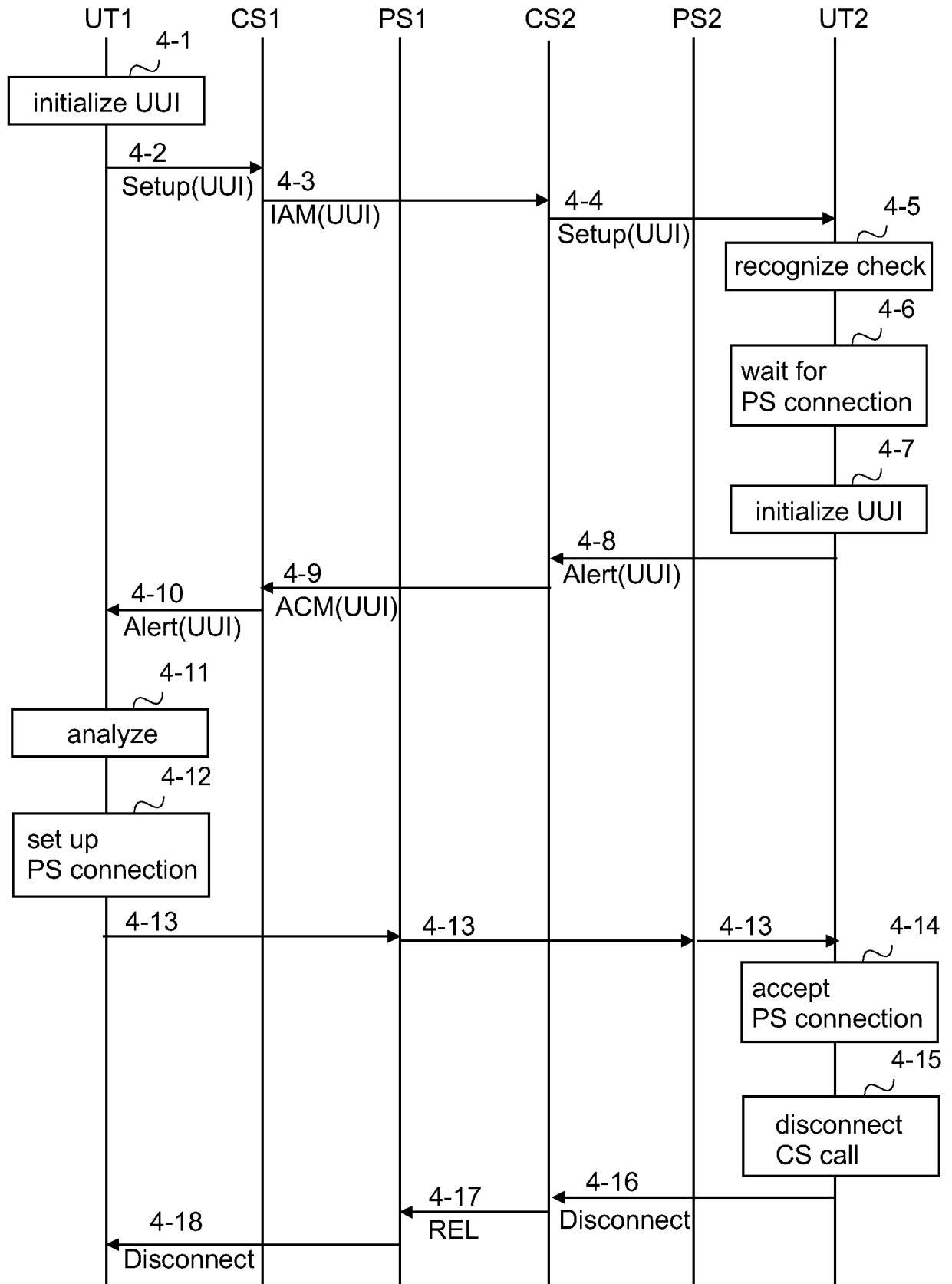


FIG.4

4/4

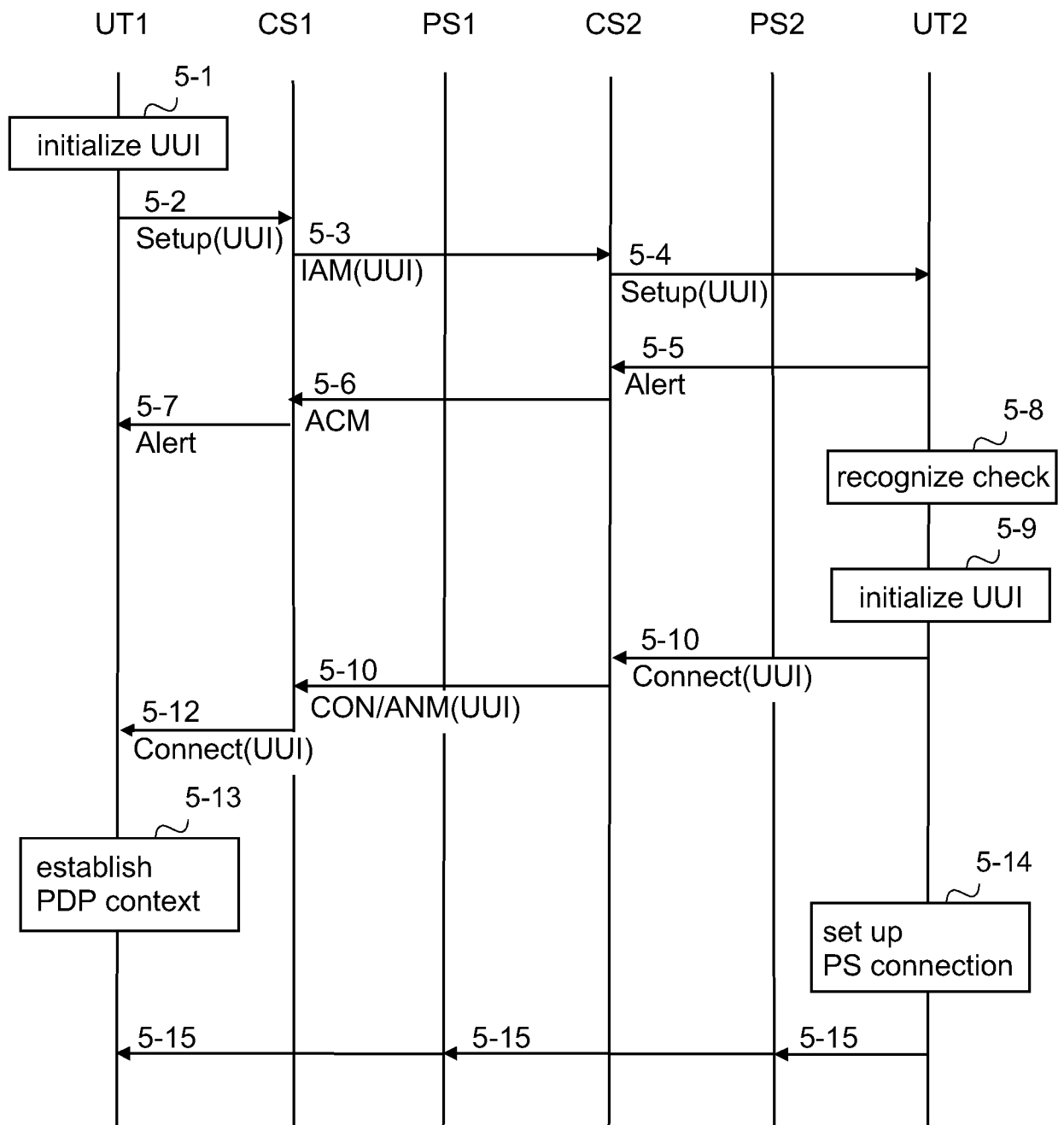


FIG.5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2007/050379

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC8: H04L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

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

EPO-Internal, WPI, INSPEC, IPCOM, IEEE Xplore

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1672866 A1 (SIEMENS SPA ITALIANA) 21 June 2006 (21.06.2006), paragraphs 0011, 0016, 0017, and 0035 and claim 1	1, 3, 6, 8-11, 13-17, 21-22
A	EP 1650998 A1 (TELIASONERA FINLAND OYJ) 26 April 2006 (26.04.2006), abstract, paragraph 0041	1-22
A	US 2002/0090975 A1 (LAIHO K. et al.) 11 July 2002 (11.07.2002)	1-22
A	WO 2005/027375 A1 (ERICSSON TELEFON AB L M et al.) 24 March 2005 (24.03.2005)	1-22
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☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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"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
17 September 2007 (17.09.2007)

Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2007/050379

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CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

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H04L 29/06 (2006.01)

H04L 29/08 (2006.01)