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(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)** [SE/SE]; S-164 83 Stockholm (SE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **NOLDUS, Rogier** [NL/NL]; Frankische Driehoek 29, NL-5052 BM Goirle (NL). **SCHILDERS, Koenraad, Martinus, Henricus, Antonius** [NL/NL]; Dorpstraat 32, NL-5133 AH Riel (NL).

(74) Agent: **KRIBBER, Klaus-Dieter**; Ericsson GmbH, Ericsson Allee 1, 52134 Herzogenrath (DE).

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(54) **Title:** EXECUTING SERVICE LOGIC IN A SIGNAL TRANSFER POINT

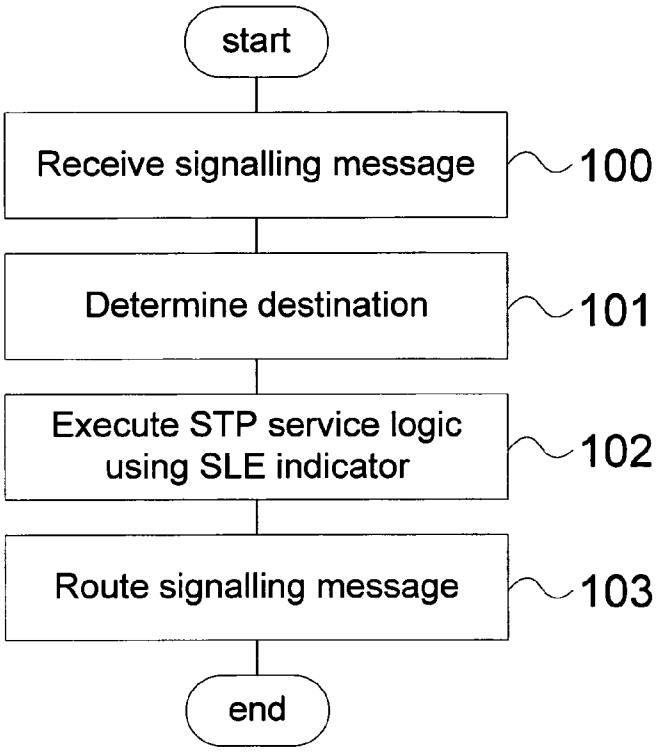


Figure 1

(57) **Abstract:** The invention refers to a method in a telecommunication system for processing a signalling message by a Signalling Transfer Point, STP. The method comprises the steps of receiving the signalling message (100), determining a destination for the signalling message (101) and routing the signalling message to the determined destination (103). The signalling message comprises a service logic execution indication. The STP determines, based on the service logic execution indication, whether STP-service logic shall be executed (102). The invention refers further to a corresponding, a computer program, a computer usable medium comprising the computer program and intelligent network.

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EXECUTING SERVICE LOGIC IN A SIGNAL TRANSFER POINT

TECHNICAL FIELD

The invention relates generally to a telecommunications system, such as a fixed telecommunication system or a mobile telecommunication system comprising an intelligent network for a call subject to an IN service. More particularly, the invention facilitates a method, node and system for providing at least one subscriber related IN service requested in a call.

BACKGROUND

When applying Intelligent Networks, IN, call establishment is intercepted at a designated node in the network. Control over the call is handed over to a control platform that has capabilities of identifying certain calls as associated with certain IN services, such as televoting, freephone, call forwarding, call queuing, call waiting and call barring. An example of a standardized way of offering techniques for providing IN services for mobile telephone systems is the known technique of Customized Applications for Mobile Network Enhanced Logic, CAMEL. CAMEL is designed for use with mobile telecommunication systems such as Global System for Mobile Communication, GSM, or Universal Mobile Telecommunications System, UMTS.

CAMEL enables mobile telecommunication system operators to offer IN services quickly and efficiently using intelligent network type tools, e.g., service logic building blocks, service databases, service trigger points or event detection points. A node such as a Service Control Point, SCP, stores and implements service logic invoked to provide IN services. A Service Switching Point, SSP handles service detection and switching functions necessary to invoke services at the SCP. The Service Switching Function, SSF, is the functional entity residing in the SSP, and an application in the SCP facilitates the execution of IN services.

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To support the implementation of IN services in a telecommunication network such as a Public Switched Telephone Network, PSTN, or a Public Land Mobile Network, PLMN, the Common Channel Signalling System 7, SS7, standard is used. SS7 allows for the transport of signalling data in so called signalling messages (e.g. ISDN User Part, ISUP, Mobile Application Part, MAP, Camel Application Part, CAP) and user data (e.g. speech, video) through a common network. Signalling messages such as ISUP are used, for example, to set up, manage and release trunk circuits that carry voice calls between central office switches. ISUP signalling messages also carry caller identification information, such as the calling party's telephone number and (optionally) calling party's name.

The SS7 network provides high-speed circuit switching and out-of-band signalling and comprises a number of nodes, in particular Signalling Transfer Points, STPs, and Signalling End Points, SEPs. Typical Signalling End Points are SCPs, Home Location Registers, HLRs, Mobile Switching Centres, MSCs, and Gateway Mobile Switching Centres, GMSC. These nodes are uniquely identified by their Signalling Point Codes, SPCs.

An STP is a router that relays SS7 messages between SEPs. The STP is connected to adjacent SEPs and STPs via signalling links. Based on the address fields of the SS7 messages that contain the global title, and based on the Global Title Translation, GTT, function, the STP routes the messages to the appropriate outgoing signalling link. A signalling message typically never goes directly from the originating SEP to the destination SEP. The message normally passes through an STP adjacent to the originating SEP so that it can be routed to the destination SEP.

The global title translation can result in a so called 'route on GT' (GT=Global Title) or in a so called 'route on SSN' routing indicator. If the GTT results in a routing indicator equal to 'route on GT', then the GTT function is to provide both a global title and the Destination Point Code, DPC, of the Signalling Connection Control Part, SCCP, node where that global title will be translated. This process is repeated until the GTT function results in a routing indicator equal to 'route-on-SSN' (SSN=Sub System Number), which means that the final destination has been determined. Route on SSN means that lower level Message Transfer Part, MTP, routing will be

used for this message from this point on. The STP will then translate the global title and determine, through its own translation tables the DPC of the Signalling End Point, as well as the Sub System Number of the application within that Signalling End Point, e.g. an SCP. In GSM, for example, the following SSNs are used as follows: HLR = 6, VLR = 7, MSC = 8.

In many situations incoming and outgoing calls require the execution of only one IN service such as call forwarding, call queuing, call waiting. However, in many other situations it is desired that two or more IN services are executed one after the other (combined) for one call. Such a situation appears for example when a first service is used for determining whether the call is subject to a special tariff for Location Based Charging, LBC, and a second service is a prepaid service, which processes results from the LBC service to apply a special rating for the call.

Although CAMEL Phase 3 (3GPP TS 23.078 v3.19.0) specifies mechanisms to trigger multiple IN services in a call, these mechanisms are not always sufficient; in particular because IN services run independent from each other. One practical example where the mechanisms specified in CAMEL Phase 3 are not sufficient, is described in the following.

An MSC may invoke a CAMEL service to apply on-line charging for a mobile originated call. The CAMEL prepaid service typically bases its charging on the destination number received from the MSC. When the CAMEL service has given the control of the call back to the MSC, the MSC may invoke a second IN service, using the mechanism specified in CAMEL Phase 3. This second IN service may apply number portability check or may apply another service of which the result may influence the charging of the call. The prepaid service, on the other hand, already determined the charge of the call, based on the information received from the MSC. Hence, the result of this second IN service cannot be taken into account by the first IN service for e.g. determining how to charge the call.

An implementation according to 3GPP TS 23.078 v3.19.0 refers to an MSC with integrated gsmSSF (MSC/gsmSSF, SSF as specified for GSM) that invokes a first IN service. This first IN service performs service processing for a call and returns the result of the service processing in the form of a prefix added to the called party number, i.e. the called party number including the prefix is returned to the

MSC/gsmSSF. The MSC/gsmSSF then triggers a second IN service, whereby the triggering of the second IN service is caused by the presence of the prefix in the called party number. The second IN service may take special action, based on the presence of the prefix in the called party number. The first and the second IN service are invoked sequentially; that is to say, the second IN service is invoked when the first IN service has given the control of the call back to the MSC/gsmSSF. Hence, the result of this second IN service can't be taken into account by the first IN service for e.g. determining how to charge the call.

DE 19840634 A1 discloses a service control platform that has one or more service control points with service-specific logic for controlling the provision of services. A service interaction manager or SIM has a first communications unit for receiving service request messages produced by a service switching point for connection establishment involving one or more services. The SIM has a second communications unit for interaction with service control points and a control unit that determines and controls the services required for the connection, sending service request messages via the second control unit to activate service logic. The SIM sends the service requests to the respective service control points sequentially. If the first service, located in the first service control point, is e.g. a charging service and the second service, located in the second service control point, is e.g. a location based service, then the outcome of the location based service can't be taken into account for the invocation of the charging service.

WO 1997007637 A1 discloses a communication system for providing at least one subscriber affiliated service to a subscriber unit in response to a trigger generated by the subscriber unit during a call, the communication system comprising: a service control point (SCP) router, responsive to the trigger, having a subscriber database containing a list of subscriber units and associated services affiliated with each subscriber unit in the list, the SCP router further comprising means for identifying an address of the at least one subscriber affiliated service in the system and means for invoking the at least one subscriber affiliated service for use by the subscriber unit through the routing of the subscriber unit to the address so identified. The SCP router invokes the external services independently of one another, in accordance with a profile associated with the served subscriber. When the result of

one of the external services is required as input for the invocation of one of the other external services, then the SCP router is compelled to invoke these services sequentially and in specific order. If the first external service to be invoked is e.g. a charging service and the second external service to be invoked is e.g. a location based service, then the outcome of the location based service can't be taken into account for the invocation of the charging service.

SUMMARY

It is an object of the present invention to provide a method, a device, and a computer program for improving the invocation of multiple IN services for one call.

This object is achieved by the teaching of the independent claims.

The invention refers to a method in a telecommunication system for processing a signalling message by a Signalling Transfer Point, STP. The STP receives the signalling message, determines a destination for the signalling message and routes the signalling message to the determined destination. The signalling message comprises a Service Logic Execution, SLE, indication. The STP determines based on the SLE indication whether an STP-service logic shall be executed. If an STP-service logic shall be executed, the STP executes the STP-service logic.
The SLE indication triggers the STP to execute service logic. In other words, the SLE indication represents a trigger for the STP of the invention to execute service logic. Preferably it represents as well an indication specifying the type of service logic that shall be executed. The service logic can be an IN related service or a service related to the HLR or MSC.

Advantageously, Signalling Transfer Points according to the present invention that perform the global title translation in the Home Public Land Mobile Network may, depending on the SLE, indication, perform IN related services on behalf of the SCP or perform other types of services related to for example the HLR or MSC. To be able to execute these services, additional STP-service logic is located in the STP, or may be downloaded into the STP from a network node where it is stored, or may be made available to the STP by a push mechanism, remote procedure calls or other means.

The inventive processing of a signalling message by the STP, that performs apart from its routing tasks an execution of service logic that is available for processing at the STP, in other words the execution of so-called STP-service logic, advantageously reduces the required signalling for the processing of IN-calls invoking multiple IN services. It is a further advantage that less signalling is required from and towards the MSC/gsmSSF because the STP invokes the required node on receiving a signalling message containing a trigger, instead of the MSC/gsmSSF having to invoke the required node. It is a further advantage that a plurality of STPs with incorporated additional STP-service logic co-operate to perform multiple IN services when processing just one call.

Without the invention being limited to, it is possible that the STP also performs an analysis of the SLE indication and it is possible that it analyzes the signalling message for determining whether STP-service logic is to be executed. In that case, the STP-service logic is preferably invoked by the STP on detection of the service logic execution indication, and as a result of the analysis.

Advantageously it is possible that the STP provides a default STP-service logic for execution. In other words, there is dedicated STP-service logic available at the STP, which is executed on determination that STP-service logic shall be executed. This allows for an effective processing of signalling messages because the STP does not need to select a program.

The invention further proposes an STP, for processing signalling messages. The STP comprises an interface to a telecommunication network for sending and receiving signalling messages, each comprising a destination. Coupled to the interface, the STP comprises means for determining a destination address of a signalling message received by the interface. Also coupled to the interface and to the address determining means, the STP comprises routing logic means, for forwarding the signalling message to the determined destination address. The STP also comprises memory for storing an STP-service logic, and coupled to the memory, service logic program processing means, for executing the STP-service logic. The service logic program processing means is adapted to use a service logic execution indication comprised in the received signalling message. The service logic

program processing means is also coupled to the interface, the destination address determining means and routing logic means.

Preferably the STP of the invention can be interfaced to networks based on the SS7 protocol as well as other networks based on for example the Internet Protocol, IP.

The invention also proposes a computer program product loadable into the internal memory of a Signalling Transfer Point, STP, comprising software code portions for performing the steps of the method as proposed by the invention when the computer program product is run on an STP.

The invention further proposes an intelligent network for providing at least one subscriber related service to a subscriber unit in response to a trigger generated by the subscriber unit during a call, the intelligent network comprising the STP according to the invention.

Further preferred embodiments are described in the dependent claims.

According to a preferred embodiment of the proposed method, the service logic execution indication comprises a first indication indicating that STP-service logic shall be executed, and the step of executing the STP-service logic comprises the further step of determining depending on the first indication that STP-service logic shall be executed.

The use of the first indication allows for an easy determination whether STP-service logic needs to be executed. For example, the STP does not need to further analyze the signalling message to decide whether the invocation of STP-service logic is required. A particular use case for this embodiment is the processing of an SS7 signalling message containing a specific message like a TC_Begin message as the first indication. A TC_Begin message forms part of the Transaction Capabilities, TC, as defined in ITU-T Recommendation Q.771. TC is used to establish, continue and terminate a relationship between applications in Signalling End Points. The TC_Begin message is used to initiate such relationship. The inventive STP can therefore invoke STP-service logic on a first signalling message of this type.

In a further embodiment the service logic execution indication comprises a second indication indicating a particular STP-service logic, wherein the step of executing the STP-service logic further comprises the step of selecting, based on the second indication, the dedicated STP-service logic for execution. In this case, the STP is not limited to an invocation of default STP-service logic, but the particular STP-service logic to be invoked is a result of the analysis. A preferred use case for this embodiment for this second trigger is a certain operation code carried in the TC_Begin message, for example the Initial Detection Point, IDP. An IDP is identified with a specific operation code.

In advantageous embodiments, the indications are associated with an IN-related service or with a service related to for example, the HLR or MSC.

Advantageously, the step of executing the STP-service logic can be performed before the step of determining the destination for the signalling message. This allows for influencing the determination of the destination by the execution or the result of the execution of the STP-service logic. In other words, the destination of the signalling message can be conditional on the STP-service logic processing.

Advantageously, the step of executing the STP-service logic can be performed after the step of determining the destination for the signalling message. This allows for using the determined destination as an input parameter for the execution of the STP-service logic. In other words, the STP-service logic can process the determined destination.

In a further embodiment the execution of STP-service logic comprises the step of modifying the instruction (for example in the form of an application protocol operation such as CAP Initial Detection Point, IDP) contained in the signalling message whereby modifying the signalling message may involve at least one of the following steps:

- replacing at least one information element of the signalling message by the result,
- adding at least one information element to the signalling message,
- deleting at least one information element of the signalling message.

This allows for example for the modification of the IDP operation by adding, deleting or replacing at least one information element in the argument of the IDP operation. The modified IDP operation is then routed to its destination. If there is no result of the STP-service logic execution, then the IDP operation also proceeds to the next node. Modification of the IDP by the STP advantageously reduces the signal flow from and towards the MSC as otherwise a first IN service has to be invoked and the result sent back to the MSC wherein in a further step the MSC has to invoke a second IN service. By modifying the IDP by the STP the first IN service with modified IDP is invoked by the STP of the invention instead of by the MSC.

In a further embodiment the signalling message is transferred over an SS7, IP or Simple Object Access Protocol/eXtensible Markup Language, SOAP/XML, based network. This allows for flexible STP-service logic configuration installation.

In a further embodiment the service logic execution indication indicates an invocation of a Service Control Point, SCP, Home Location Register, HLR, Mobile Application Part, MAP, or Mobile Switching Centre, MSC, related service logic. This allows for an STP that can be used to support not only IN services related to the SCP but also other types of services related to for example the HLR and the MSC.

In a further embodiment, the STP comprises a look-up table means for obtaining subscriber data for determining depending on a first indication comprised in the service logic execution indication whether STP-service logic is to be executed. For example, this look-up table means can contain subscriber data referring to prepaid, postpaid and/or number portability information. The STP then includes the subscriber data, or the result of applying STP-service logic on said subscriber data, in the service request to the SCP. This data facilitates the SCP to, for example, adapt the charge of the call to special subscriber conditions, e.g. apply a lower rate of the call, because the STP had determined, and indicated in the service request, that the current call from this subscriber qualifies for a reduced tariff. In such use case, the SCP is not involved in determining whether the reduced rate applies; the SCP simply adapts the rate of the call to the indication received from the STP.

This allows execution of STP-service logic that require the availability of subscriber data that otherwise should be obtained by an additional invocation of an IN service towards a database.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in detail with reference to the following figures.

Figure 1 shows a flow diagram of method steps performed by a Signalling Transfer Point in an embodiment of the invention.

Figure 2 shows a sequence diagram depicting messages exchanged in a telecommunication network in an exemplary embodiment of the invention executed at call setup.

Figure 3 shows a block diagram of an embodiment of an STP according to the invention.

DETAILED DESCRIPTION

The invention will now be described with reference to the figures. The depicted lines between the elements represent connections between these elements. The arrows represent connections wherein a direction of a message from one element to another element is shown. The term connection refers to a functional connection and not necessarily to a physical connection.

The present invention proposes a Signalling Transfer Point, STP, that, apart from its routing tasks, has the capability to execute service logic that is available for processing at the STP. Service logic in this context is constituted by programs that can be invoked at the STP and that perform certain functions that otherwise would be executed by, for example, the SCP, the HLR or the MSC. This allows for an STP that can be used to support not only IN services related to the SCP but also other types of services related to for example, the HLR or the MSC. It is to be noted that the inventive STP will not alter the routing of a signalling message as such. The STP may, however, apply 'IN-like behaviour' by inspecting the SS7 message, applying service logic processing on it, including the result of the service logic execution into the SS7 message and forwarding the SS7 message to its intended destination.

After receiving a signalling message the STP may first execute STP-service logic and then determine a destination for the message and route the message to the destination. It may however also first determine a destination for the signalling

message and then execute a selected STP-service logic that depends on a service logic execution indication and finally route the signalling message to a destination. STP-service logic execution involves the processing of information elements of the signalling message that are related to certain services to be executed by for example, the HLR, the MSC, or the SCP.

First a brief overview about the method performed by the STP as illustrated by figure 1 is given. On receiving a signalling message 100 the STP determines a destination for the signalling message 101. The STP executes 102 an STP-service logic based on the service logic execution indication that is carried in the signalling message. Furthermore, the STP routes 103 the signalling message to the determined destination.

The invention will now be described in more detail with reference to figure 1. The STPs according to the invention receive 100 signalling messages that comprise information concerning the establishment and control of a connection and concerning the management of the network. Exchange of signalling messages between telecommunication network nodes take place during e.g. a call setup.

Furthermore, certain signalling messages include addressing information also called Global Title, GT, that is used to direct the signalling message to an addressable node or destination in the telecommunication network. Addressable nodes are for example the SCP, the HLR or the MSC. A global title is an address (e.g., a dialled 800 number, calling card number, or mobile subscriber identification number) that is translated into a destination point code and subsystem number. The destination point code identifies the destination node, for example, the SCP, the HLR or the MSC. A subsystem number uniquely identifies a specific application (called subsystem) at the destination signalling point.

When a Signalling Connection Control Part, SCCP, message is routed through the signalling system, the point code of the final destination may not be known to the sending entity but may need to be determined along the way from the global title information contained in the message. In this case, the message is routed in two or more hops at the MTP routing level; in other words, the message is, for example, initially sent with the MTP DPC (destination point code) set to indicate an STP that

has a gateway role between the originating and destination local exchange carriers, and then the DPC is changed at the STP to the point code of the next hop destination (which may be the intended final destination). The identity of the final destination is contained in the SCCP global title. In order to correctly forward the SCCP message, the STP must carry out a global title translation to derive the required DPC for the next MTP hop; this translation is generally done by means of a look-up table.

In a signalling message transfer protocol like for example, the SS7 protocol, signalling messages are carried in for example the Signalling Connection Control Part, SCCP. The SCCP is used as the transport layer for e.g. TC-based services and MAP-based services; MAP-based services in turn use TC services. TC is used to establish, continue and terminate a relationship between applications in Signalling End Points, whereas MAP is used for call control, subscriber registration, short message service, etc. The SCCP provides besides connectionless and connection-oriented network services also global title translation capabilities above MTP level.

After having received a signalling message 101, the STP invokes the Global Title Translation, GTT, function to determine a destination of the signalling message. If the GTT function results in a routing indicator equal to 'route on GT' (GT=Global Title), then the GTT function is to provide both a global title and the Destination Point Code, DPC, of the SCCP node where that global title will be translated. This process is repeated until the GTT function results in a routing indicator equal to 'route-on-SSN' (SSN=Sub System Number), which means that the final destination of the signalling message, e.g. Service Control Point, SCP, Home Location Registers, HLR, Mobile Switching Services Centres, MSC, etc. has been determined.

The SCCP provides the ability to determine a destination for the signalling message by performing incremental routing using GTT. In performing GTT, an STP does not need to know the exact final destination of a message. It can, instead, perform intermediate GTT, in which it uses its tables to find another STP further along the route to the destination. That other STP, in turn, can perform final GTT, routing the

message to its actual destination. Intermediate GTT minimizes the need for STPs to maintain extensive information about nodes that are far removed from them.

The STP executes 102 the STP-service logic using the Service Logic Execution, SLE, indication. The execution of the STP service logic determines based on the SLE indication whether STP-service logic shall be executed. The SLE indication triggers the STP to execute service logic. In other words, the SLE indication represents a trigger for the STP of the invention to execute service logic. Preferably it represents as well an indication specifying the type of service logic that shall be executed. The service logic can be an IN related service or a service related to the HLR or MSC.

The invocation of, for example an IN service in the SCP involves the establishment of an IN dialogue between the SSF and the SCF. The Transaction Capabilities, TC, layer in the SS7 communication layer is responsible for establishing, maintaining and closing a (CAMEL) dialogue between two entities for example the SSF and the SCF. A dialogue is initiated by means of a TC_Begin message that in the context of this example can be considered as the first trigger. Other triggers for other services may e.g. be conveyed in a TC_Continue message. The TC_Begin message may contain operations like Initial Detection Point, IDP, that, in the context of this example, can be considered as the second trigger. Other second type triggers can be the Initiate Call Attempt operation or the Assist Request instructions operation. An IN service is started by the SSF by sending the IDP operation to the SCF. Furthermore, TC messages are routed by SCCP signalling messages throughout the SS7 signalling network and as such are also received by the STP of the invention.

When, for example, an SCCP signalling message is received at the STP, the STP checks for triggers to ascertain whether a certain STP-service logic related action is required. Such a trigger or indication is for example, a TC_Begin message carried in an SS7 signalling message and used to initiate a TC dialogue. Another trigger or indication might be a certain operation code carried in the TC_Begin message, for example the Initial Detection Point, IDP. An IDP is identified with a specific operation code.

Preferably the detection of the first trigger or indication is performed first. Furthermore, the second trigger or indication is detected in the following step. However it is possible that the first and second trigger are detected simultaneously. It is possible as well that the second trigger is detected before the first trigger. It is possible as well that the first and second trigger are the same. In the most general case the indication represents the trigger itself.

The capability of Camel Application Part, CAP, is defined by means of so called 'operations'. An operation may be regarded as a mechanism for one entity to start a procedure in a peer entity. For example, the gsmSSF in an MSC invokes a CAMEL service by sending the IDP operation to the SCP. The sending of IDP to SCP means that the gsmSSF starts a procedure in the SCP. The SCP may, in turn, send an operation to the gsmSSF; by doing so, the SCP starts a procedure in the gsmSSF. The entity receiving an operation may send a response to the sender of the operation. An IDP operation is identified by its operation code, an argument field, a result and errors field. The argument contains information elements such as called party number, calling party number, calling party's category, that are used as input parameters for the procedure call.

After detection of the second trigger, for example the IDP operation code, the service logic of the STP checks which type of service logic has to be executed by the SCP. The IDP operation carries an information element called Service Key. The Service Key identifies the CAMEL service to be executed in the SCP.
Furthermore, the IDP operation may also contain the Mobile Station Integrated Services Digital Network Number, MSISDN. The STP may keep a list of subscribers for which the STP shall perform certain IN-related actions.
The STP may also execute, dependent on the SLE indication, service logic that is related to, for example, the HLR or MSC.

Although the invention is described based on Camel Application Part, CAP, IDP operation, it is also applicable to Intelligent Network Application Part, INAP, operations and to Mobile Application Part, MAP, operations. Furthermore, the invention is also applicable for signalling messages related to the TC layer.

It shall be noted that the invention may be applied to any protocol that may be conveyed in signalling messages that traverse an STP.

The further description of the invention is based on the IDP operation.

Once the STP has ascertained that the SCCP message contains an IDP operation for a particular IN service it checks if the IDP relates to a call from a subscriber who has a subscription to a particular IN service.

The execution of STP-service logic comprises the step of modifying the instruction (typically in the form of an application protocol operation such as CAP Initial DP) contained in the signalling message, whereby modifying the signalling message may involve at least one of the following steps:

- replacing at least one information element of the signalling message by the result,
- adding at least one information element to the signalling message,
- deleting at least one information element of the signalling message.

An IDP operation comprises various IN service information elements, which are needed for service logic execution in the SCP. The information elements that are included in the IDP, are a selection of information elements, e.g. Service Key, called party number, calling party number, location number, etc. Depending on the type of service, the IDP may have an Extension Container, EC, in which a second group of information elements can be carried. The IN service uses these information elements as input parameters for its service logic processing. As an example, a Location Based Charging, LBC, service may use the location number in the IDP which identifies the location of the calling party. If the calling party is in his home zone preferential rate calling may be applied for this call. The STP-service logic could add a prefix to the calling party number indicating that preferential charging should be applied by the SCP. In another example the STP may modify the Called Party Number or the Calling Party's Category. Modifying the Called Party Number by placing a prefix in front of the dialled number may result in that a prepaid service uses a different charge rate for the call.

The result of such IN-related activity by the STP may be included in the IDP, by modifying selected information elements in the IDP or by placing the result partially or fully in the EC of the IDP.

The invention has so far suggested that the STP may perform a check on the contents of the IDP and, based on the contents of the IDP and based on the result of STP-service logic processing, include one or more information elements in the EC of the IDP. These additional information elements may be used by the IN service logic in the SCP to adapt its service logic processing. Examples include, but shall not be limited to:

- information element indicates that a subscriber is in a so called Home Zone and that preferential rate is to be applied by the SCP;
- information element indicates that the number dialled by that subscriber qualifies for a particular tariff reduction to be applied by the SCP, for example a so called 'Family & Friend' tariff reduction.

In these cases, the additional information provided to the IN service in the SCP is used by the IN service internally only; it does not necessarily affect the further processing of the call. These types of additional information elements in the IDP may be classified as 'Indication'.

Another type of additional information element in the IDP may be 'Instruction'. The IN-related activity performed by the STP may e.g. be number translation. The STP may include the translated number in an EC. The IN service in the SCP uses that information element to send a Connect operation to the MSC. The Connect operation contains the translated number as indicated in the Extension Container of the IDP. Examples include, but shall not be limited to:

- Virtual Private Network, VPN: the STP performs the VPN number translation and places the translated number in the IDP. The IN Service send a Connect operation containing the translated number.
- Personal Number Translation: the STP performs the personal number translation and places the translated number in the IDP.
- Call Barring: the STP performs call barring check. If the call is not allowed, the STP places an indication to that extent in the IDP. The IN service in the SCP may take the action of releasing the call.

Furthermore, STPs according to the invention are arranged to handle signalling messages that are transferred over SS7, IP and Simple Object Access Protocol/eXtensible Markup Language, SOAP/XML, based networks wherein the

signalling messages may indicate an invocation of an SCP based IN service (e.g. prepaid service), a Home Location Register, HLR, service (e.g. location update service) or an MSC service (e.g. subscription data insertion service), service related program depending on the service logic execution indication.

STPs that receive signalling messages that do not require the execution of the STP-service logic, will simply perform global title translation and route the message to a next node. By means of executing the global title translation function, the signalling point code of the addressed node is obtained, for example the SPC of the SCP where the IN service resides.

The STP routes 103 the signalling message containing the modified or extended IDP to a next STP, an SCP, an HLR or an MSC in accordance with normal SCCP signalling rules. If the STP has performed for example, IN related service, the IN application residing in the addressed SCP that receives the modified or extended IDP, may now utilize the additional information in the IDP to complete the requested IN service processing. The STP may in principle use all information that is present in the IDP operation argument to perform the limited IN-related actions. Routing the signalling message to a destination is based on the routing indicator in the SCCP message that may have the value 'route on GT' or 'route on SSN'.

In the following the invention is explained with respect to the signal flow which is shown in figure 2. The signal flow relates to a call setup towards a called party where special charging is applied for the calling party. The figure depicts a sequence diagram showing messages exchanged in a telecommunication network at call setup. A switching node, MSC, 200 receives 300 a call setup message originating from a calling entity (not depicted), to a first destination number. This message may be, but is not limited to, a DSS1 Setup message, a DTAP Setup message or an ISUP IAM, depending on the call case and on the network. In step 301 the switching node 200 initiates a dialogue with the SCP 202 by means of sending the TCAP message TC_Begin. The address to use for the sending of this TC_Begin message may be part of the calling party's user profile in the MSC 200, or may be provisioned in the MSC 200. The TC_Begin message traverses the STP 201 which comprises STP-service logic and configuration data for determining how

to respond to incoming signalling messages. On receiving the TC_Begin message, the service logic in the STP 201 is triggered and selects a procedure 302, depending on the received TC_Begin message. As a result of execution of said service logic in the STP 201, the STP 201 sends 303 the Number Portability, NP, query towards the NP database 203. The NP database contains information where the called party is presently subscribed, i.e. which network the called party belongs to. This information (Routing prefix, RP) is sent back 304 to the STP 201. At step 305 the STP continues execution of the service logic procedure and forwards 306 the TC_Begin message to the SCP 202. The TC_Begin message contains the result obtained by the NP query; in this way the SCP receives a dialogue establishment request containing the information needed to determine charging information for the call. This charging information is sent 307 towards the MSC 200, in the form of an Apply Charging, ACH, message. The MSC 200 continues with the call setup procedure 308 and applies charging to the call in accordance with the received Apply Charging message, ACH.

Allowing according to the invention a processing of a signalling message by the inventive STP, performing apart from its routing tasks an execution of service logic that is available for processing at the STP, in other words the execution of a so-called STP-service logic, reduces advantageously the required signalling for the processing of for example IN-calls invoking multiple IN services. For example, as can be observed by figure 2, less signalling is required from and towards the MSC/gsmSSF because the STP on receiving a signalling message containing a trigger, applies the required service instead of the MSC/gsmSSF invoking this service. It is a further advantage that a plurality of STPs with incorporated additional STP-logic may co-operate to execute multiple STP-based IN services when processing the signalling of just one call.

IN services that are initiated from an SSF and wherein the IN service controls a CS call, fall within the scope of this invention. In this context, an IN service is started with an Initial IN message comprising an IDP operation. The sending of an IDP towards the SCP results in the setting-up of an 'IN dialogue' between the SSF and the SCP and the starting up of an IN service in the SCP.

IDPs that also fall within the scope of this invention are IDPs related to SMS control service and GPRS control service. These IDPs are known as 'IDP SMS' and 'IDP GPRS' respectively. Furthermore, IDPs that fall within the scope of this invention are IDPs related to IN services that are started from an SCP due to an Initiate Call Attempt, ICA, operation. ICA may be used by an SCP to instruct an MSC/SSF to establish an outgoing call leg. An SCP can receive a stimulus from e.g. the internet, Unstructured Supplementary Service Data, USSD, or other application to set up a call. In that case the SCP sends an ICA operation to the SSF. The sending of the ICA, results in an 'IN dialogue' between the SCP and the SSF. The IN service in the SCP in this case had already been started-up by the stimulus from the internet or the USSD. Likewise, an SCP may also offer a USSD service. A user (GSM phone) can invoke a USSD service. Depending on the USSD service code and the configuration in the HLR, a USSD service request can be sent from a user, through MSC and HLR, to the SCP. The user starts in such a way the USSD service in the SCP. No IDP operation is involved here.

The STP may be interfaced to signalling networks based on the SS7 protocol as well as other networks based on for example the IP protocol. The STP-service logic program can be stored on a separate carrier and loaded into the internal memory of the STP as well as downloaded into the STP from a network node where it is stored. The STP may further comprise means adapted to obtain subscriber data (e.g. prepaid, post-paid or number portability information).
The means for obtaining subscriber data comprises preferably a look-up table. In addition or as an alternative the means adapted to obtain subscriber data obtains subscriber data by receiving a message.

Figure 3 shows a block diagram of an STP for processing signalling messages comprising an interface means to a telecommunication network for sending and receiving signalling messages comprising a destination for the signalling message, destination address determining means, coupled to the interface, for determining a destination address of a signalling message received by the interface, routing logic means, coupled to the interface and coupled to the address determining means, for forwarding the signalling message to the determined destination address. The STP further comprises memory for storing a service logic program, service logic program

processing means, coupled to the memory, for executing the STP-service logic program, said execution being based on a service logic execution indication comprised in the received signalling message. The service logic program processing means is also coupled to the interface, the destination address determining means and routing logic means.

The invention is applicable to intelligent networks, in particular to those providing at least one subscriber related IN service to a subscriber unit in response to a trigger generated by the subscriber unit during a call, the intelligent network comprising the STP according to the invention.

While the invention has been described with respect to a call as a communication event triggering the execution of the STP-service logic, it is apparent that the present invention is applicable to any communication event requiring the execution of IN service logic.

Without restrictions to the scope of the invention, the invention has been described for use in GSM and UMTS systems. However, the present invention may be employed as well in other systems using the Intelligent Networks concept, like in the fixed telephone network (PSTN) implementing an IN service. The present invention may also be employed for other 2G or 3G networks than GSM and UMTS, such as CDMA, GPRS, etc.

The invention has been illustrated by the accompanying figures and described in the foregoing description. However, it is to be understood that the invention is not limited to the particular embodiments described, but is capable of numerous re-arrangements, modifications and substitutions falling under the scope of the following claims.

Claims

1. A method in a telecommunication system for processing a signalling message by a Signalling Transfer Point, STP, comprising the steps of:

- receiving the signalling message (100),
- determining a destination for the signalling message (101),
- routing the signalling message to the determined destination (103)

characterised in that

the signalling message comprises a service logic execution indication, and that the STP performs the further steps of:

determining based on the service logic execution indication (102) whether an STP-service logic shall be executed, and
if an STP-service logic shall be executed, executing the STP-service logic.

2. The method according to claim 1, wherein the service logic execution indication comprises a first indication indicating that STP-service logic shall be executed, and wherein the step of executing the STP-service logic comprises the further step of determining depending on the first indication that STP-service logic shall be executed.

3. The method according to claim 1 or 2, wherein the service logic execution indication comprises a second indication indicating a particular STP-service logic, wherein the step of executing the STP-service logic further comprises the step of selecting based on the second indication the STP-service logic for execution.

4. The method according to any of the previous claims, wherein the step of executing the STP-service logic is performed before the step of determining the destination for the signalling message.

5. The method according to any of claim 1, 2 or 3, wherein said STP-service logic is executed after the step of determining the destination for the signalling message.

6. The method according to any of the previous claims comprising the further steps of:

- providing a result from the service logic execution,
- modifying the signalling message using the result,
- routing the modified signalling message to the determined destination.

7. The method according to claim 6, wherein the step of modifying the signalling message comprises at least one of the following steps:

- replacing at least one information element of the signalling message by the result,
- adding at least one information element to the signalling message,
- deleting at least one information element of the signalling message.

8. The method according to any of the previous claims, wherein the signalling message is transferred over a Common Channel Signalling System 7, SS7 or Internet Protocol, IP.

9. The method according to any of the previous claims, wherein the service logic execution indication indicates an invocation of a Service Control Point, SCP, Home Location Register, HLR, Mobile Application Part, MAP, or Mobile Switching Centre, MSC, related service logic.

10. A Signalling Transfer Point, STP, (400) for processing signalling messages, comprising:

- an interface (401) to a telecommunication network for sending and receiving signalling messages, said signalling messages each comprising a destination.
- a destination address determining means (402), coupled to the interface, for determining a destination address of a signalling message received by the interface,
- a routing logic means (403), coupled to the interface and coupled to the address determining means, for forwarding the signalling message via the interface to the determined destination address,

characterised in that the STP comprises

- a memory (404) for storing an STP-service logic,
- a service logic program processing means (405), coupled to the memory, the interface, the destination address determination means and the routing logic means, for executing the STP-service logic, said service logic program processing means adapted to use a service logic execution indication comprised in the received signalling message for the execution.

11. An STP according to claim 10, further comprising means (406) for obtaining subscriber data for determining depending on a first indication comprised in the service logic execution indication whether STP-service logic shall be executed.

12. A service logic program product loadable into the an internal memory of a Signalling Transfer Point, STP, comprising software code portions for performing the steps according to any of the claims 1 to 9, when said product is run on an STP.

13. The service logic program product according to claim 12, stored on a computer usable medium.

14. An intelligent network for providing at least one subscriber related service to a subscriber unit in response to a trigger generated by the subscriber unit during a call, the intelligent network comprising the STP according to claim 10 or 11.

5

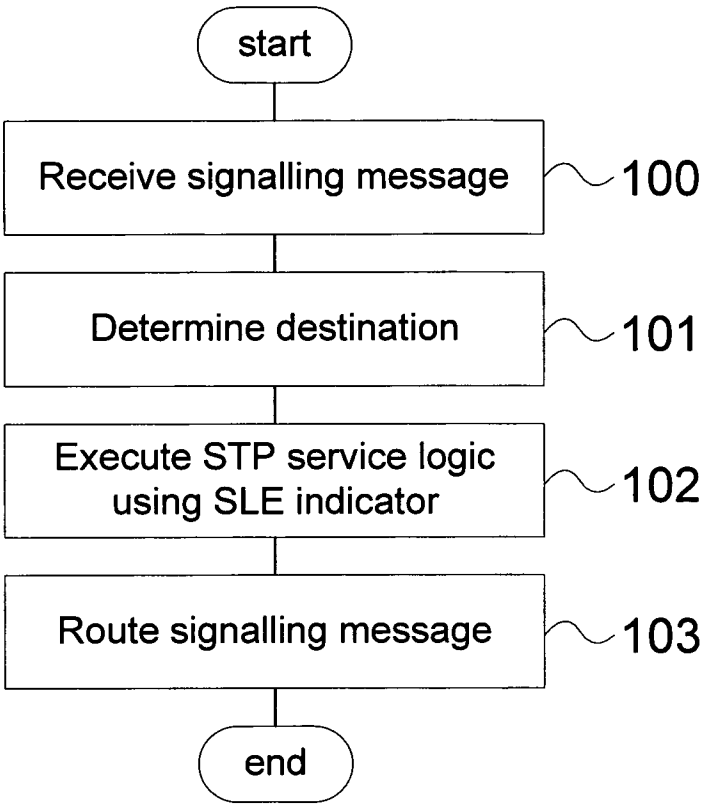

start
Receive signalling message
100
Determine destination
101
Execute STP service logic using SLE indicator
102
Route signalling message
103
end

Figure 1

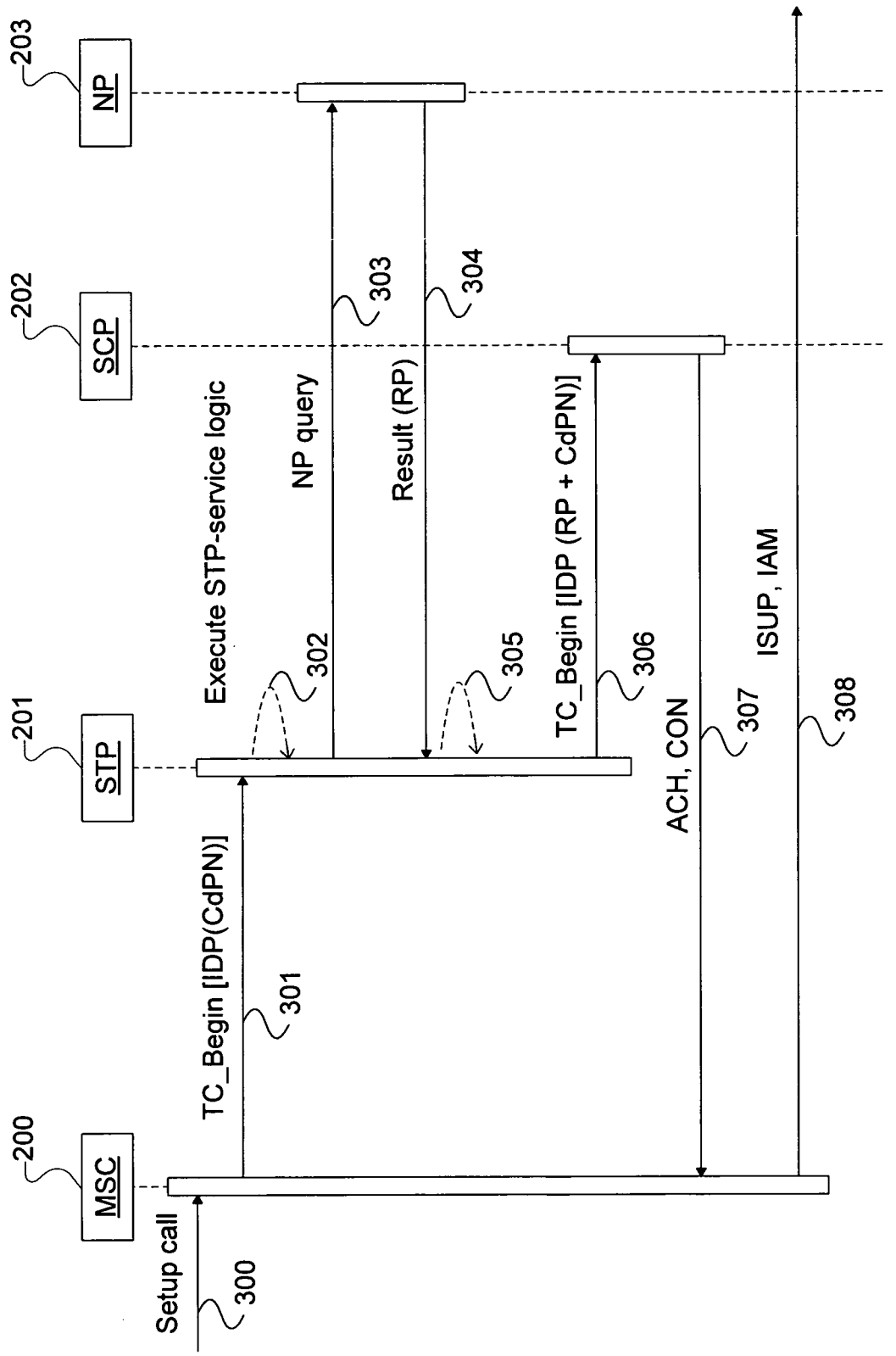

203
NP
202
SCP
201
STP
200
MSC
Setup call
300
TC_Begin [IDP(CdPN)]
301
Execute STP-service logic
302
NP query
303
Result (RP)
304
305
TC_Begin [IDP (RP + CdPN)]
306
ACH, CON
307
ISUP, IAM
308

Figure 2

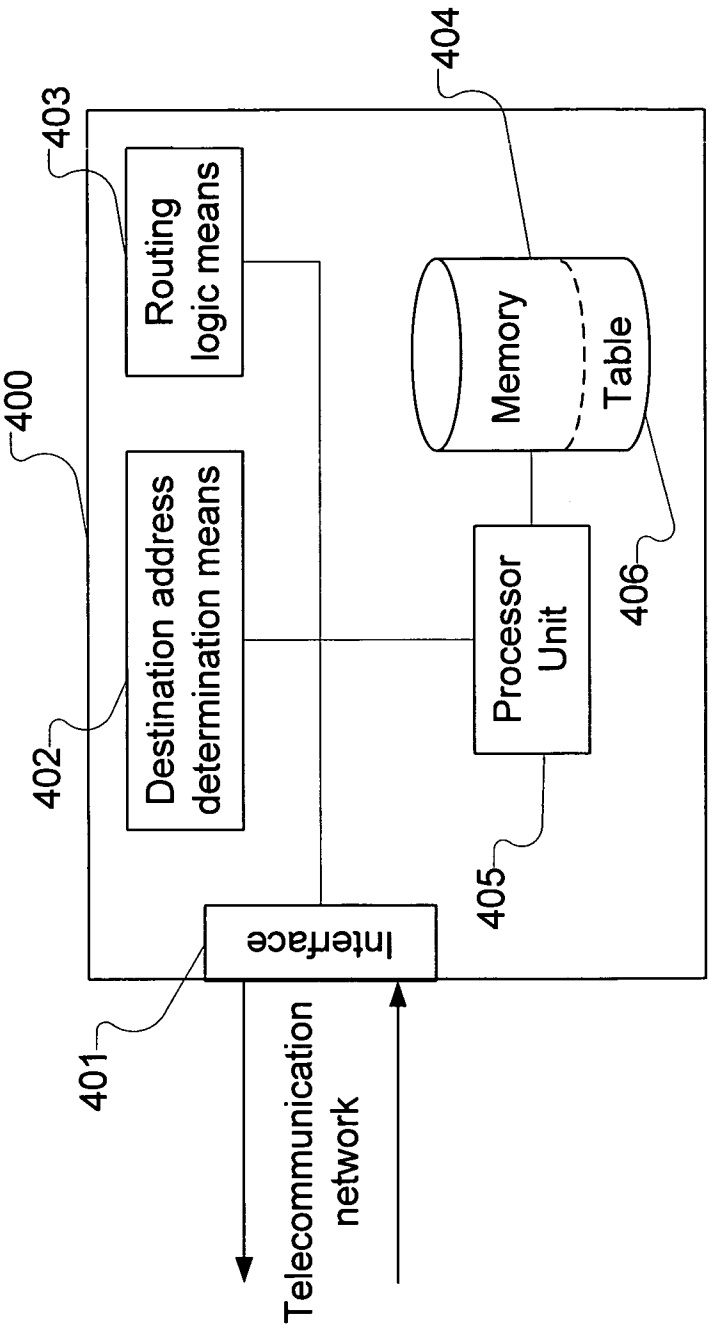

400
401
402
403
404
405
406
Routing logic means
Destination address determination means
Memory
Table
Processor Unit
Interface
Telecommunication network

Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/008565

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04Q3/00

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)
H04Q

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 practical, search terms used)
EPO-Internal, WPI Data, IBM-TDB, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 811 790 A (SIEMENS AG) 25 July 2007 (2007-07-25) paragraphs [0018] - [0020] paragraphs [0026], [0028] - [0036]	1-14
X	US 6 735 441 B1 (TURGEON J L ET AL) 11 May 2004 (2004-05-11) column 5, line 26 - column 6, line 9 column 13, line 10 - column 14, line 57	1-14
X	US 2002/054674 A1 (CHANG J T-K ET AL) 9 May 2002 (2002-05-09) paragraphs [0008], [0009] paragraphs [0023] - [0027] paragraphs [0070] - [0076]	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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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	Date of mailing of the international search report
10 June 2008	23/06/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Vercauteren, Steven

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2007/008565

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1811790 A	25-07-2007	NONE	
US 6735441 B1	11-05-2004	NONE	
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