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19 160 813.2

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H12303WOEP-A

München
14.12.2020

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European Patent Application 19160813.2
SERVICE CHAIN FAULT DETECTION METHOD AND APPARATUS
HUAWEI TECHNOLOGIES CO., LTD.

In response to the communication pursuant to Art. 94 (3) EPC dated August 3, 2020, it is requested to proceed with the further examination on the basis of new claims 1 to 27 replacing all claims previously on file and the remaining documents as currently on file.

I. AMENDMENTS

Newly filed claim 9 is amended based on the pending claim 9 and the feature "based on the received ID of the SF node", which is disclosed in paragraph [0128] or paragraph [0153] of the translated original description.

Newly filed claim 22 is amended based on the pending claim 22 and the feature "based on the received ID of the SF node", which disclosed on paragraph [0128] or paragraph [0153] of the translated original description.

Newly filed claim 13 is amended based on the pending claim 13 and the feature "based on the received ID of the SFE", which is disclosed in paragraph [0243] or paragraph [0244] of the translated original description.

Newly filed claim 22 is amended based on the pending claim 22 and the feature "based on the received ID of the SFE", which is disclosed

in paragraph [0243] or paragraph [0244] of the translated original description.

II. OBJECTIONS UNDER ART. 84 EPC

With respect to item 3.1 of the communication, the term "fault" of claims 1, 9, 14 and 22 is aimed to detect the sequence of a SF node in a service chain, such as the SFE of the independent claims determines communicating with a SF node corresponding to the path ID included in the received fault tracing detection request packet, and then obtains the ID of the SF node, and sends the path ID and the ID of the SF node to a device for initiating fault detection. The device for initiating fault detection can determine whether the sequence of a SF node is correctly based on the received ID of the SF node and the path ID, which is not the action performed by the SFE. As described on p. 20, l. 19 to 25 of the present description with reference to Fig. 1, the invention aims at implementing an improvement in conventional detection methods that are not able to detect an abnormality, i.e. fault, causing a service packet to be transmitted over a set of service function nodes in an order different from that originally foreseen. As explained with respect to Fig. 1, if a service processing order planned on a service chain specifies that a packet forwarded on the service chain should first pass the service function node 121 and then pass the service function node 122, and an abnormality causes the service packet to instead pass service function node 122 first and then service function node 121, a conventional detection device is not able to detect such a fault related to the abnormal order of the service function nodes passed by the service packet.

The invention proposes a solution to solve this problem based on the use of fault tracing detection request packets. The fault tracing detection request packets detect service function entities and service function nodes connected within a service chain, and the solution allows determining the locations of the service function nodes according to an order of sending fault tracing detection request packets comprising identifiers of the paths and service function nodes (cf. p. 20, l. 26 to 33 and p. 27, l. 10 to 23 of the present description). Specifically, the SFE of claim 1 obtains an ID of the SF node after determining the SFE communicates with the SF node, and the SFE send the ID of the SF node by sending a first fault tracing detection response packet (1032) to the device for initiating fault detection, and the first fault tracing detection response packet (1032) includes the ID of the SF node. According to the ID of the SF node, the device for initiating fault detection can obtain the result of fault detection.

The applicant submits that the wordings of newly filed claims 1, 9, 14 and 22 now define the terms that had been objected to in a clear manner and in terms of technical features. It is hence believed that claims 1, 9, 14 and 22 on file fulfils the requirements of Art. 84 EPC.

With respect to item 3.2, claims 9 and 22 are amended. Based on the amended claims 9 and 22, the objection is overcome.

In response to the request for two-part form in item 5.1, it is submitted that the subject matter of **claim 1 or 9** relates to a method whose method steps are interrelated with each other, while the inventive step concerns changes in several of these interrelated method steps. And the subject matter of **claim 14 or 22** relates to a complex apparatus of functionally inter-related parts, while the inventive step concerns changes in several of these parts of the apparatus. Therefore, the use of the two-part form is considered to be inappropriate, since it would give a distorted picture of the claimed invention and would lead to an artificial lack of clarity of the respective claim. Hence, it is requested to allow the one-part form in the present case.

III. NOVELTY (ART. 54 EPC)

Claim 1 on file was objected to for lacking novelty over D1. However, the subject-matter of claim 1 differs from D1 at least by the following distinguishing feature:

(i) determining to communicate with a service function, SF, node (121), wherein the first fault tracing detection request packet comprises a path identifier, ID, and the path ID is used to identify a path of a service chain.

(ii) sending, by the SFE (111), a first fault tracing detection response packet to a device for initiating fault detection, wherein the first fault tracing detection response packet comprises the path ID and the ID of the SF node (121).

The communication refers to the disclosure in paragraphs 65 to 88 of D1 that the ring identity disclosed therein to be included in a detection request packet would be equivalent to a path identifier according to claim 1. However, D1 defines a ring identity as the identifier of a ring label switched path, LSP:

"*Ring ID refers to a ring identity, and is used to determine a detected ring LSP. The ring identity in the MPLS ring network is unique. That is, every ring LSP is unique.*" (see [0021] of D1)

Further, D1 defines a "ring LSP" to be a group of nodes, e.g. of label switch routers, LSR, "*forming a closed ring, wherein each node is connected through a bidirectional communication facility to two adjacent nodes*" (cf. [0002] of D1). For example, as disclosed in par. [0030] with respect to Fig. 3, the ring LSP shown therein is formed by the eight LSRs LSR1 to LSR8.

Further, paragraph [0046] and paragraph [0047] of D1 discloses that the ring ingress node sends the detection request packet to a first intermediate node LSR2 after the ring ingress node LSR1; LSR2 searches the protocol layer of the ring LSP, acquires an outgoing label of LSR2, replaces the outgoing label of LSR1 with the outgoing label of LSR2, and then sends the detection request packet with the replaced label to a next node LSR3; LSR3 replaces the outgoing label of LSR2 in the received detection request packet with an outgoing label of LSR3, and sends the detection request packet to LSR4; LSR4 ejects the outgoing label in the detection request packet, and sends the detection request packet to the ring egress node LSR5. **The LSR of D1 can not perform service processing provided by an SF node. And in D1, any LSR of the ring is used for transmitting the received packet to the next LSR, the structure between the two LSRs is not the same as the structure between an SFE and an SF node of claim 1, such as LSR1 sends a detection request packet to LSR2, and LSR2 sends the detection request to LSR3. LSR2 does not perform determining whether to communicate with a node equivalent to the SF node of claim 1 and does not send a response to LSR1 with an ID of the node.**

Thus, contrary to claim 1, D1 does not disclose feature (i) and feature (ii).

In view of this, the subject-matter of amended claim 1 is new over D1.

The subject matter of claim 9, 14 or 22 corresponds to that of claim 1, hence, it is also novel.

IV. INVENTIVE STEP (ART. 56 EPC)

D1 is considered to be the closest prior art.

By means of distinguishing features (i) and (ii), the invention achieves the technical effect of allowing detecting faults that cause a service packet to be transmitted over a service chain, the service chain passes service function nodes in an order deferring from the order foreseen in a planned processing order. This is achieved by the use of a fault tracing detection request packet, and the fault tracing detection request packet may be sent over a particular path of a service chain identified by a corresponding path identifier. This is further achieved by obtaining an identifier of a service function node reached by the fault tracing detection request packet over the aforesaid particular path. This allows that each fault tracing detection request packet provided by a service classifier is used to obtain an identifier of one service function node of the service chain (cf. p. 27, l. 15 to 17). A device for initiating fault detection may thereby learn

information about the service function nodes that the service chain passes through and about the order thereof (cf p. 20, l. 26 to 33 of the present description).

In view of this, the objective technical problem addressed by the present invention can be defined as **how to improve the detection of faults in a service chain**.

The question to be answered is hence whether a person skilled in the art would be prompted to modify the method and an apparatus disclosed in D1 according to distinguishing features (i) and (ii). This is believed not to be the case, since a skilled person wanting to improve the detection of faults in the multi-protocol label switching LSP transport ring network disclosed in **D1 would not even take into consideration the problem of improving the detection of faults in a service chain as the ring of D1 does not implement the function of the service chain and does not include the SF node of the service chain**.

Thus, the subject-matter of amended claims 1 is not only new, but further involves an inventive step.

The subject matter of claim 9, 14 or 22 corresponds to that of claim 1, hence, it also involves an inventive step.

V. CONCLUSION

Thus, the documents now on file should meet all requirements of the EPC. However, if the Examining Division still sees deficiencies in the documents now on file, a telephone conversation with the applicant's representative is suggested. Only as a measure of precaution the applicant's request for

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is maintained if the Examining Division does intends to reject the application.

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Enclosures:
New set of claims 1 – 27, clean and marked version