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European Patent Application EP 19 160 813.2
SERVICE CHAIN FAULT DETECTION METHOD AND
APPARATUS
Huawei Technologies Co., Ltd.

On the communication pursuant to Art. 94(3) EPC dated 19.01.2022:

It is requested to proceed with the examination on the basis of new claims 1 to 23 replacing all claims on file and the remaining documents as currently on file.

I. Amendments

New claim 1 is based on previous claim 1 and on par. [0013], [0085], [0114], and [0115] of the originally filed description.

The following amendments are made in claim 1:

1st amendment: The feature directed to *“the first fault tracing detection request packet (1042) comprises a path identifier, ID, and the path ID is used to identify a path of a service chain”* has been rearranged to appear where the first fault tracing detection request packet is first mentioned in the claim. This is a mere clarification that does not alter the scope of the claim.

2nd amendment: The feature directed to *“determining, by the SFE, to communicate...”* has been amended to recite *“determining, by the SFE (111), a service function, SF, node (121), based on a forwarding entry stored in a memory (1102) of the SFE (111), to which the first fault*

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tracing detection request packet (1042) is to be sent.” The amended feature is supported by pars. [0114] and [0115] as well as pars. [0082] and [0088] of the original description.

3rd amendment: New claims 1 specifies that an ID of the SF node (121) is obtained “from the memory of the SFE”. The amendment is supported by par. [0085] of the original description.

4th amendment: Claim 1 has been amended to define that the second fault tracing detection response packet is sent before the first fault tracing detection response packet. The amendment is supported by par. [0085] of the original description.

Claim 8 has been amended to define that the second fault tracing detection response packet is received before the first fault tracing detection response packet. Original disclosure can be found in pars. [0013] and [0026] of the original description.

New claim 12 is based on previous claim 12 and on par. [0013], [0085], [0114], and [0115] of the original description.

New claim 19 is based on previous claim 19 and on par. [0026] of the original description.

The missing reference signs have been included in the new claims.

Thus, all amendments meet the requirements of Art. 123(2) EPC.

II. Clarity

In response to item 3.1 of the official communication, it is submitted that none of independent claims 1, 8, 12 and 19 uses either of the terms “*fault tracing detection*” or “*initiating fault detection*” in isolation.

Instead, the independent claims define:

- a “first fault tracing detection request packet” which comprises a path ID,
- a “first fault tracing detection response packet” which comprises the path ID and the ID of the SF node, and
- a “second fault tracing detection response packet” which comprises the path ID and the ID of the SFE.

Independent claim 1, 8, 12, and 19 further refer to a “*device for initiating fault detection*”, whose technical features relevant for the claimed invention are the fact that it is connectable to the service forwarding entity, SFE. It is hence submitted that none of the terms “fault tracing detection” or “initiating fault detection” pose any clarity problem regarding the subject-matter of claim 1, 8, 12, and 19.

The examining division further objects that allegedly it is not clear for the skilled person how a fault in a planned processing order of the service function nodes can actually be determined. The applicant respectfully disagrees. The method of claim 8 interacts with the method of claim 1 and comprises steps of determining that forwarding between the SFE node and the SF node is normal and that the forwarding between the SFE and the device for initiating fault detection is normal. Thus, these determinations in combination lead to the result that the forwarding between all devices (device for initiating fault detection, SFE node, and SF node) is normal. Thus, the claimed invention provides a way of determining service chain fault detection.

It is respectfully submitted that while interpreting these terms it should be noted that the claims of a patent application should be read and interpreted with an attempt to make technical sense of it (cf. GL F-IV 4.2) by a skilled person willing to understand, not desirous of misunderstanding. The skilled person, when considering a claim, takes into account the whole disclosure of the application and rules out interpretations which are illogical or which do not make technical sense (cf. CLBA II-A 6.1).

In response to item 3.2 of the communication, the objected wording “determining ... to communicate” has been cancelled from the claim. Therefore, the objection has been overcome. Instead, new claim 1 specifies that the SFE determines a service function, SF, node, based on a forwarding entry stored in a memory of the SFE, to which the first fault tracing detection request packet (1042) is to be sent. Further, the amended feature defines that the ID of the SF node is obtained from the memory of the SFE. Thus, the new claim wording is clear to the skilled person.

Under item 3.3 of the communication, the examiner objects that the normal determination is based only on one ID of an SF node. The applicant respectfully disagrees that this causes a lack of clarity. As explained in par. [0128] of the description, it can be determined according to the ID of the SF node 121 in the fault tracing detection response packet, that the service chain passes through the SF node 121 connected to the SFE 111. Therefore, it can be deduced that forwarding between the SF node 121 and the SFE 111 is normal. This corresponds to the skilled person’s understanding that “forwarding is normal” means that a packet can be sent between the devices (here: SF and SFE).

III. Novelty

It is submitted that D1 fails to disclose:

- a) *determining, by the SFE (111), a service function, SF, node (121), based on a forwarding entry stored in a memory (1102) of the SFE (111), to which the first fault tracing detection request packet (1042) is to be sent;*

As has already been acknowledged by the examiner, D1 fails to disclose the feature directed to the second fault tracing detection response packet. Thus, D1 does not disclose feature a).

Further, it is submitted that D1 also fails to disclose that the second fault tracing detection response packet is sent before the first fault tracing detection response packet. Thus, D1 does not disclose

- b) *sending, by the SFE (111), a first fault tracing detection response packet (1032) to a device for initiating fault detection (131), wherein the first fault tracing detection response packet (1032) comprises the path ID and the ID of the SF node (121) ; and*

Furthermore, D1 does not disclose

- c) *before the sending, by the SFE (111), the first fault tracing detection response packet (1032), the method further comprises: sending, by the SFE (111), a second fault tracing detection response packet to the device for initiating fault detection, wherein the second fault tracing detection response packet comprises an ID of the SFE (111) and the path ID*

In D1, a label switching router (LSR) receives a fault detection command. The fault detection command includes a ring egress node address, a ring identity, and a ring direction (cf. par. [0066] of D1). The LSR sends the fault detection request packet after encapsulation with TTL along the ring direction to downstream nodes (cf. par. [0079] of D1). Thereafter, the LSR determines that whether the fault detection reply packet returned by a downstream node is received or not. If the packet is not received, it is determined that the downstream node has a fault; cf. pars. [0084] and [0085] of D1.

Thus, even if it is assumed that the downstream node of D1 corresponds to the SFE, D1 fails to disclose that the downstream node sends a response packet to a device for initiating fault detection.

Further, D1 fails to disclose that the SF node, to which fault tracing detection request packet (1042) is to be sent, is determined according to a forwarding entry present within the SFE.

Thus, D1 does not disclose feature c) as indicated above.

The subject matter of claims 8, 12 or 19 corresponds to that of claim 1, hence, their subject matter is also novel.

IV. Inventive Step

D1 is considered as closest prior art.

D1 does not disclose the above-mentioned distinguishing features a) to c).

By means of distinguishing features, the fault detection device (device for initiating fault detection) is informed about an SF node that a service chain passes through so that the fault detection device is able to detect if there a difference between an order of SF nodes that the service packet passes through on the service chain and the planned processing order. Further, the device is also informed by the ID of the SFE so that the device for initiating fault detection is aware that it is connected to a correct SFE.

Therefore, the objective technical problem can be regarded as how to configure a device for initiating fault detection so that it is able to detect a fault in an order of a service chain in an improved manner.

Starting from D1 and in view of aforementioned objective technical problem, a skilled person would not arrive at the claimed invention as, in D1, the decision whether a downstream node is faulty or not is based on whether a reply packet is returned by the downstream node or not. D1 fails to disclose any hint or motivation towards configuring a fault detecting device in a manner disclosed in claim 1.

Thus, the skilled person would not arrive at the claimed invention in view of D1. Neither are the above features obvious in view of the skilled person's general knowledge. Thus, the subject matter of claim 1 relies on an inventive step.

The subject matter of claims 8, 12 or 19 corresponds to that of claim 1, hence, it also involves an inventive step.

V. Conclusion

In view of the amendments made and the above explanations, it is believed that the application is now in a state acceptable for grant. Should the Examining Division, nevertheless, still see deficiencies in the documents on file, it is kindly asked to give the applicant the opportunity to file further arguments and, if necessary, amendments. Minor issues could be discussed by telephone.

Only as a measure of precaution, the applicant's request for

Oral Proceedings

is maintained if the Examining Division intends to reject the application. In this event, it is further requested that the Oral Proceedings be either held in Munich, or by videoconference.

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Dr. Matthias Hofmann

Enclosures

New claims 1 to 23, clean copy

New claims 1 to 23, marked-up version