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Datasheet for the decision of 26 October 2022

Case Number: T 0164/21 - 3.5.05

Application Number: 17201569.5

Publication Number: 3442172

IPC: H04L12/42, H04L12/24, H04L12/933

Language of the proceedings: EN

Title of invention:
NETWORK TOPOLOGY SYSTEM AND BUILDING METHODS FOR TOPOLOGIES AND ROUTING TABLES THEREOF

Applicant:
National Cheng Kung University

Headword:
Building of topologies and routing tables / Cheng Kung Univ.

Relevant legal provisions:
EPC Art. 56, 84, 123(2)

Keyword:
Claims - clarity after amendment (yes)
Inventive step - after amendment (yes)

Decisions cited:
T 1906/11

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Case Number: T 0164/21 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 26 October 2022

Appellant: (Applicant)	National Cheng Kung University No. 1, Daxue Rd. East Dist. Tainan City, R.O.C. (TW)
Representative:	dompatent von Kreisler Selting Werner - Partnerschaft von Patent- und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 27 August 2020 refusing European patent application No. 17201569.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	A. Ritzka
Members:	P. Tabery
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. The appeal is directed against the examining division's decision to refuse the European patent application.

II. The examining division decided that the application according to the main request did not meet the requirements of Articles 84 and 56 EPC. In addition, the claims of the auxiliary request did not meet the requirements of Article 123(2) EPC.

III. The documents referred to by the examining division included:

D1 EP 0 514 043 A2

D3 US 2017/085463 A1

IV. In its statement of grounds of appeal, the appellant requested that a patent be granted on the basis of the claims in accordance with either a main request or an auxiliary request, both having been submitted with the statement of grounds of appeal. If neither request was found allowable, oral proceedings were requested.

V. **Sole independent claim 1** of the **main request** reads as follows:

"A routing table building method for a network topology system comprising N nodes for data exchange, wherein the number of connections between the N nodes of the network topology system is less than N(N-1)/2, the N nodes are sequentially connected to form a ring communication configuration, an i-th node of the N nodes is further connected to [(i+m) mod N]th and [(i+p) mod N]th nodes of the N nodes according to a connection rule, an j-th node of the N nodes is further

connected to [(j-m) mod N]th and [(j+p) mod N]th nodes of the N nodes according to the connection rule, N is a positive even integer, i and j are less than N, m and p are not larger than N, i and m are positive odd numbers, j is a non-negative even number, and p is a positive even number, and the routing table building method comprising:

for an x-th node of the N nodes in the network, obtaining a plurality of shortest routes, wherein each of the shortest routes is obtained from the x-th node of the N nodes to an y-th node of the N nodes, x and y are less than N, and x is not equal to y;

for the x-th node of the N nodes in the network, obtaining a plurality of secondary shortest routes, wherein each of the secondary shortest routes is obtained from the x-th node to the y-th node, and the shortest route is defined to be a route passing through a minimum number of nodes, the secondary shortest route is defined to be another route passing through a secondary minimum number of nodes and the secondary minimum number of nodes is larger than the minimum number of nodes;

for a u-th-node of the N nodes, generating a first routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes; and

for a v-th node of the N nodes, generating a second routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes, wherein u is a positive odd number and is less than N, v is a non-negative even number and is less than N."

VI. The wording of the claims of the **auxiliary request** is not relevant for this decision.

Reasons for the Decision

1. The application at issue is for building optimised network topologies having a predictable number of connections.

2. Main request

The main request is based on the main request considered in the decision under appeal.

2.1 Amendments

Claim 1 differs from claim 1 of the main request considered in the decision under appeal in that the feature "*with said routing table building method reducing a number of connections between the N nodes*" has been replaced with:

> "*wherein the number of connections between the N nodes of the network topology system is less than N(N-1)/2*"

Furthermore, the term "*second minimum number of nodes*" has been replaced with:

> "*secondary minimum number of nodes and the secondary minimum number of nodes is larger than the minimum number of nodes*"

In claims 2 and 3, all occurrences of "*a u-th*" and "*a v-th*" node have been replaced with "*the u-th*" and "*the v-th*" node, respectively. Finally, the feature "*u is an odd number, v is an even number*" has been deleted.

2.2 Admissibility (Article 12(4) RPBA)

The board notes that the first amendment in claim 1 as well as the amendments in claims 2 and 3 remedy the

objections pursuant to Article 84 EPC raised in the decision under appeal. The second amendment relates to a more precise formulation of a feature interpreted very broadly by the examining division.

Hence, the amendments submitted with the statement of grounds of appeal address issues that led to the decision under appeal. Since these amendments do not introduce undue complexity and are suitable to address the issues which led to the decision under appeal, the board exercises its discretion to admit the main request into the proceedings (Article 12(4) RPBA).

2.3 Allowability of the amendments (Article 123(2) EPC)

2.3.1 The appellant argued that the added feature "*the number of connections between the N nodes of the network topology system is less than N(N-1)/2*" was commonly known to be the number of connections of a fully connected network. It was also derivable from the description (see lines 7-9 of page 8, lines 6-7 of page 9 and lines 15-16 of page 16) that the network topology system of the application had to be an un-fully connected network. It was evident that the number of connections of the network topology system shown in Figure 1 was less than the number of connections of the fully connected network. Therefore, "*the number of connections between the N nodes of the network topology system is less than N(N-1)/2*" was also clearly derivable from Figure 1.

The board concurs with the appellant that the calculation of the number of connections of a fully connected network is commonly known. To determine whether an amendment conforms with the requirements of Article 123(2) EPC, the only relevant question is whether a skilled person faced with the amended version

of the application, as compared to a skilled person having seen only the version originally disclosed, would derive from that amended version any additional technically relevant information (in line with decision T 1906/11). In the current case, the claimed "*secondary shortest route*" cannot exist in a fully connected network where each node is directly connected to any other node. Therefore, the "*secondary shortest route*" already implies that the number of connections between the N nodes is less than in a fully connected network, i.e. what is specified in the added feature. Thus, the added feature does not alter the claimed subject-matter and as a consequence cannot add subject-matter.

2.3.2 For the amendment where the feature "*second minimum*" had been replaced with "*secondary minimum number of nodes and the secondary minimum number of nodes is larger than the minimum number of nodes*", the appellant referred to lines 8-11 and 23-29 of page 13 of the description.

The board holds that this amendment is unambiguously derivable from these passages, from which it is evident that, according to the invention, there may be several shortest routes and several second shortest routes. Since the second shortest routes cannot be as short as the shortest routes, it follows that they are longer than the shortest routes. This corresponds to the definition in the amended feature.

2.3.3 Consequently, the board asserts that the set of claims fulfils the requirements of Article 123(2) EPC.

2.4 Clarity and conciseness (Article 84 EPC)

In the decision under appeal, the examining division held that claim 1 lacked clarity since the feature "*reducing a number of connections*" was unclear.

Furthermore, claims 2 and 3 were considered to lack conciseness as the features "*u is an odd number*" and "*v is an even number*" were already contained in claim 1. Finally, it was unclear how "*a first route*" or "*a second route*" of claims 2 and 3 related to the shortest or secondary shortest route of claim 1.

The appellant argued that the claims were clear. On the one hand, the amendments removed features which the examining division considered unclear. On the other hand, it was evident that "*a first route*" and "*a second route*" of claims 2 and 3 were examples and did not refer to the shortest and secondary shortest route of claim 1, respectively.

The board concurs with the appellant that the amendments and arguments submitted with the statement of grounds of appeal overcome the clarity objections raised in the decision under appeal.

Therefore, the board asserts that the claims fulfil the requirements of Article 84 EPC.

2.5 Novelty (Article 54(1) EPC)

2.5.1 In the decision under appeal, the examining division held that the subject-matter of claim 1 differed from document **D3** by the following underlined part:

> "*an i-th node of the N nodes is further connected to [...] [(i+p) mod N]th nodes*"

The examining division considered that Figure 4 of document **D3** disclosed that "*an i-th node of the N nodes is further connected to [(i+m) mod N]th*" node and "*an j-th node of the N nodes is further connected to [(j-m) mod N]th*" node for m=1. It also mapped the two shortest routes disclosed in document **D3** to the shortest and secondary shortest routes of claim 1.

2.5.2 The appellant argued that the term "*secondary minimum*" used in claim 1 had been misinterpreted by the examining division. Consequently, the features referring to it were not disclosed in document **D3**:

> "*the secondary shortest route is defined to be another route passing through a secondary minimum number of nodes and the secondary minimum number of nodes is larger than the minimum number of nodes*"
>
> "*generating a first routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes*"
>
> "*generating a second routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes*"

2.5.3 The board asserts that claim 1 now specifies that the "*secondary shortest route*" passes through a number of nodes that is larger than the minimum number of nodes. Therefore, the examining division's interpretation that the secondary shortest route may be of the same length as the shortest route is excluded by the amended wording. The board thus concurs with the appellant that the cited features constitute further distinguishing features of claim 1 over the teaching of document **D3**.

Moreover, the board notes that claim 1 specifies a ring configuration where "*an i-th node of the N nodes is further connected*" to other nodes according to a rule specified in the claim. In the decision under appeal, it was assumed that document **D3** disclosed these further connections using m=1, i.e. connections to neighbouring nodes were mapped to the claimed further connections. However, since the connections to neighbouring nodes are already part of the ring communication configuration, the board finds that they cannot constitute the claimed *further* connections.

The board notes that Figure 4 of document **D3** discloses shortcut connections from/to even nodes only. It thus neither discloses that an odd node is further connected to other nodes, nor that an even node is further connected to an odd node, as claimed. In paragraph [0037], document **D3** discloses in another embodiment an irregular series of shortcut connections between nodes "*1, 3, 6, 9, 11, and 15*" and a level 2 ring "*using node addresses 1, 6, 11, and 15*". Although this embodiment has even more features in common with the claimed invention, the board holds that the embodiment of Figure 4 constitutes the closest prior art. The latter is directed to the same purpose as the current invention, i.e. having a predictable number of connections of each node.

The board thus holds that the differences between the subject-matter of claim 1 and document **D3** reside in that:

> "*an i-th node of the N nodes is further connected to [(i+m) mod N]th and [(i+p) mod N]th nodes of the N nodes according to a connection rule, an j-th node of the N nodes is further connected to [(j-m) mod N]th*" node,
>
> "*the secondary shortest route is defined to be another route passing through a secondary minimum number of nodes and the secondary minimum number of nodes is larger than the minimum number of nodes*",
>
> "*generating a first routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes*", and
>
> "*generating a second routing table according to the plurality of the shortest routes and the plurality of secondary shortest routes*".

2.6 Inventive step (Article 56 EPC)

2.6.1 In the decision under appeal, the examining division held that the technical effect was that odd nodes could also be used to provide shortcuts for the delivery of packets. The associated objective technical problem was formulated as how to adapt the ring of document **D3** to support the fast delivery of packets in all nodes of the ring. The examining division considered that adding a shortcut among any pair of nodes of the ring was a straightforward selection that the person skilled in the art would make, starting from document **D3** alone, when confronted with the above problem. In an auxiliary line of reasoning, the examining division held that the solution was obvious in view of the teaching of document **D3** in combination with document **D1**. Starting from paragraph [0053] of document **D3**, the skilled person would have investigated possible solutions to forward packets more efficiently among different elements of the ring. Document **D1** presented in Figure 4 a solution to this problem which the skilled person would have implemented in the system of document **D3**.

2.6.2 The appellant argued that the invention achieved the technical effect that the number of connections of each of the nodes could be predicted, so creating an unexpected connection could not occur during networking. The solution was not obvious in view of document **D3**, which aimed to reduce the number of connections between nodes. Furthermore, the skilled person would not have combined the teaching of documents **D3** and **D1** as **D1** only dealt with a fully connected network.

2.6.3 The board considers that document **D3** alone presents a solution to the objective technical problem formulated by the appellant. Therefore, the skilled person is faced with the problem of providing an alternative

solution. When solving this problem, the skilled person could have implemented the claimed solution. However, the claimed solution comprises very specific rules for building a "*chordal ring*" type network topology. Notably, although claim 1 comprises different rules for setting up shortcut connections for odd and even nodes, these rules use the same parameters (m and p) to define the shortcut connections. Therefore, the board considers that, in the absence of any suggestion in document **D3**, the skilled person would not have modified what is disclosed in document **D3** to arrive at the claimed solution without employing inventive skills.

As to the combination of documents **D3** and **D1**, the board notes that document **D1** presents the topology of Figure 4 as a solution "*to control the overall density of the network by controlling the number of intermediate arc connections within the rings of the network*" (see column 3, lines 7-9) rather than as a solution to the problem identified by the examining division. Therefore, the board holds that the skilled person would not have combined the teaching of documents **D3** and **D1** without employing inventive skills.

2.6.4 Consequently, the board holds that the subject-matter of **claim 1** involves an inventive step over the disclosure of document **D3** taken alone as well as in combination with the teaching of document **D1**.

2.7 In view of the above, the **main request** is allowable.

3. Consequently, the appeal is allowable.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The case is remitted to the examining division with the order to grant a patent in the following version:

Description, pages:
1 and 4-17 as originally filed
2, 2a and 3 filed in electronic form on 24 July 2019

Claims:

1-4 of the main request filed with the statement of grounds of appeal on 29 December 2020

Drawings, sheets:

1/3-3/3 as originally filed

The Registrar: The Chair:

K. Götz-Wein A. Ritzka

Decision electronically authenticated