

Internal distribution code:

- (A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

**Datasheet for the decision
of 16 September 2014**

Case Number: T 0510/11 - 3.5.05

Application Number: 08003026.5

Publication Number: 1962458

IPC: H04L12/56

Language of the proceedings: EN

Title of invention:

System and method for communicating over mesh networks using waveform-enhanced, link-state routing

Applicant:

HARRIS CORPORATION

Headword:

Link-state routing over mesh networks/HARRIS

Relevant legal provisions:

EPC Art. 56

RPBA Art. 15(3)

Keyword:

Oral proceedings - non-attendance of the party

Inventive step - (no)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0510/11 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 16 September 2014

Appellant: HARRIS CORPORATION
(Applicant) 1025 West NASA Boulevard
Melbourne, Florida 32919 (US)

Representative: Schmidt, Steffen J.
Wuesthoff & Wuesthoff
Patent- und Rechtsanwälte
Schweigerstrasse 2
81541 München (DE)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 9 December 2010
refusing European patent application
No. 08003026.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair A. Ritzka
Members: K. Bengi-Akyuerek
D. Prietzel-Funk

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division, posted on 9 December 2010, to refuse European patent application No. 08003026.5 on the ground of lack of inventive step (Article 56 EPC) with respect to claim 1, having regard to the disclosure of

D1: Z. Ren et al.: "An Adaptive Multi-Channel OLSR Routing Protocol Based on Topology Maintenance", Proceedings of IEEE Mechatronics & Automation, pp. 2222-2227, July 2005.

In an *obiter dictum*, the decision under appeal further stated that independent claim 7 and the dependent claims also lacked an inventive step (Article 56 EPC) in view of D1 and

D2: U. Lee et al.: "OLSR-MC: A Proactive Routing Protocol for Multi-Channel Wireless Ad-Hoc Networks", Proceedings of IEEE WCNC 2006, pp. 331-336, April 2006;

D3: Y. Qu et al.: "Multi-channel OLSR with a Dedicated Control Interface", Proceedings of Symposium on Performance Evaluation of Computer and Telecommunication Systems, pp. 1-8, August 2008.

Furthermore, the following document was cited in the examination proceedings:

D4: WO-A-2005/117348.

II. Notice of appeal, including the statement setting out the grounds of appeal, was received on 16 February 2011. The appeal fee was paid on the same day. With the

notice of appeal the appellant filed a new set of claims as an auxiliary request. It requested that the decision of the examining division be set aside and that a patent be granted on the basis of the claims filed in the first-instance proceedings on 25 November 2010 and underlying the appealed decision as a main request or of the auxiliary request.

- III. A summons to oral proceedings scheduled for 16 September 2014 was issued on 25 April 2014. In an annex to this summons, the board gave its preliminary opinion on the appeal pursuant to Article 15(1) RPBA. In particular, objections were raised under Article 56 EPC, mainly having regard to D2.
- IV. By letter of reply dated 21 July 2014, the appellant informed the board that it would not be attending the scheduled oral proceedings and that it "requested for a decision according to the state of the file". No comments were submitted on the substance of the board's communication under Article 15(1) RPBA.
- V. Oral proceedings were held as scheduled on 16 September 2014 in the absence of the appellant. The board established from the file that the appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of the claims underlying the appealed decision as a main request or, alternatively, the claims of the auxiliary request as filed with the notice of appeal. After due deliberation on the basis of the pending requests and the written submissions, the decision of the board was announced at the end of the oral proceedings.
- VI. Claim 1 of the **main request** reads as follows:

"A communications system, comprising:
a plurality of mobile nodes forming a mesh network;
a plurality of wireless communication links connecting
the mobile nodes together;
characterized in that
the mesh network comprises a TDMA mesh network; and
each mobile node comprises a communications device and
operative for transmitting data packets wirelessly to
other mobile nodes via the wireless communications link
from a source mobile node through intermediate
neighboring mobile nodes to a destination mobile node
using a link state routing protocol and multiple
waveforms, wherein at least one of the multiple
waveforms has different range, transmission distance or
reach resulting in different connectivity, and wherein
each mobile node comprises a network connectivity model
at each mobile node based on its waveform's range, and
constructs a routing table for its waveform's
connectivity and builds a single composite routing
table from the collection of waveform routing tables."

Claim 1 of the **auxiliary request** reads as follows:

"A communications system, comprising:
a plurality of mobile nodes forming a mesh network;
a plurality of wireless communication links connecting
the mobile nodes together;
wherein the mesh network comprises a TDMA mesh network;
and
each mobile node comprises a communications device and
is operative for transmitting data packets wirelessly
to other mobile nodes via the wireless communications
link from a source mobile node through intermediate
neighboring mobile nodes to a destination mobile node
using a link state routing protocol and multiple
waveforms, wherein

the multiple waveforms have different range, transmission distance or reach resulting in different connectivity, and wherein each mobile node builds a model of network connectivity, based on its waveform's range, and constructs a routing table for its waveform's connectivity and builds a single composite routing table from the collection of waveform routing tables, wherein a variety of composite routing tables is constructed depending upon what routing criteria or combination of criteria are being optimized, and wherein each mobile node is operative using a single link state routine message for all waveforms by transmitting separate HELLO messages to 1-hop neighbors and flooding one topology control message per waveform, wherein a state table is extended to segregate link state information for each of the 1-hop neighbors of the mobile node by waveform; and each mobile node's 1-hop neighborhood is distributed for each waveform in a single transmit control message to provide each mobile node the information it requires to build its network topology model of connectivity for each waveform; and each node builds its own composite route table from this multi-waveform network topology."

Reasons for the Decision

1. The appeal is admissible.
2. *Non-attendance of the appellant at oral proceedings*
 - 2.1 The appellant decided not to attend the scheduled oral proceedings before the board (cf. point IV above). Pursuant to Article 15(3) RPBA, the board is not

"obliged to delay any step in the proceedings, including its decision, by reason only of the absence at the oral proceedings of any party duly summoned who may then be treated as relying only on its written case".

2.2 In the present case, the appellant did not submit any comments in response to the objections raised in the board's communication under Article 15(1) RPBA. The board reconsidered and maintained those objections to the pending requests, and was in a position to take a decision at the end of the oral proceedings held in the absence of the appellant, in the exercise of its discretion according to Article 15(3) RPBA.

3. MAIN REQUEST

The claims of this request are identical to those underlying the appealed decision.

3.1 Article 52(1) EPC: Novelty and inventive step

In the board's judgment, claim 1 of this request does not meet the requirements of Article 52(1) EPC in conjunction with Article 56 EPC, for the following reasons:

3.1.1 In the decision under appeal, document D1 was considered as the closest prior art for claim 1 (cf. appealed decision, section 14.1). The board, however, considers document D2 to be the closest prior art for the subject-matter claimed, because it relates explicitly to the generation of waveform-specific routing tables like the present invention.

3.1.2 The board considers that D2 discloses the following limiting features of claim 1:

A communications system ("MANET system"), comprising:

- a) mobile nodes forming a mesh network ("multi-hop mesh network") and wireless communication links connecting the mobile nodes together (see e.g. section I);
- b) wherein each mobile node comprises a communications device being operative for transmitting data packets wirelessly to other mobile nodes via the wireless communications links from a source mobile node through intermediate neighbouring mobile nodes to a destination mobile node using a link state routing protocol ("OLSR-MC protocol") and multiple waveforms ("multiple channels") (see section IV);
- c) wherein the multiple waveforms have different range, transmission distance or reach resulting in different connectivity (inherently implied for different channels associated with different carrier frequencies; see D2, page 331, right-hand column, third paragraph: "... multiple channels ... realized at different frequencies, in a wireless multihop ad-hoc network ...");
- d) wherein each mobile node comprises a network connectivity model ("network topology information") at each mobile node based on its waveform's connectivity and builds a single composite routing table ("neighboring node table") (see e.g. page 333, left-hand column, third paragraph: "... channel information is 'piggybacked' in routing protocol control packets. Therefore, channel information is available to neighbor nodes along with network topology information ..." and page 333, left-hand column,

last paragraph: "... The neighboring node table at each of the nodes lists all available neighboring nodes, the link state, channel index, etc. ...").

As to feature c), the appellant (applicant) argued that frequencies of a multi-channel system did not differ significantly enough to affect the range of the signal to the extent that it would alter the connectivity (see e.g. applicant's response letter of 9 November 2010, page 4, first paragraph).

However, the channels in a multi-channel system as described in D2 typically have different carrier frequencies and are thus associated with different waveforms. Moreover, distinct frequencies suffer differently from multi-path and fading effects (see e.g. D4, page 1, lines 22-27: "... certain ranges of transmission frequencies suffer from more multi-path and fading than other ranges of frequency transmission in a particular setting ..."). Therefore, the board holds that the respective channels of D2 have different transmission ranges resulting in distinct connectivity as claimed (see also e.g. D3, page 8, lines 4-7).

3.1.3 Thus, the difference between the subject-matter of claim 1 and the disclosure of D2 is considered to be that

- i) the mesh network is a TDMA mesh network;
- ii) the single composite routing table is built from the collection of waveform routing tables.

Consequently, the subject-matter of claim 1 of this request is found to be novel over D2 (Article 54 EPC).

3.1.4 However, the board finds that distinguishing features i) and ii) are associated with different

technical effects, i.e. arbitrating access to the mesh network and determining the overall routing table, and thus with partial objective problems to be solved. This means in turn that the contribution of those features to an inventive step can be assessed individually, i.e. on the merits of each distinguishing feature *per se*.

- 3.1.5 As to feature i), the board takes the view that using the TDMA access scheme for arbitrating medium access constitutes one of the most common implementation measures in the context of mobile mesh networks (see also the application as filed, page 11, lines 27-28: "... It should be understood that many of the mesh networks operate using a Time Division Multiple Access (TDMA) protocol ...").
- 3.1.6 As regards feature ii), the skilled person would recognise that D2 teaches that the overall routing table ("neighboring node table") is directly determined based on the respective "channel index" information (see e.g. page 333, right-hand column, penultimate paragraph). However, the board holds that deriving the overall routing table successively from the corresponding individual routing tables associated with the respective channels represents another equally likely implementation alternative which the skilled person would choose depending on practical constraints (such as e.g. implementation complexity), without exercising inventive skills.
- 3.1.7 Accordingly, in the board's view, distinguishing features i) and ii) constitute a mere juxtaposition of obvious processes without producing any surprising synergistic effect.

3.1.8 In view of the above, the subject-matter of claim 1 of this request does not involve an inventive step having regard to D2 and the skilled person's common general knowledge.

3.2 In summary, this request is not allowable under Article 56 EPC.

4. AUXILIARY REQUEST

Claim 1 of this request differs from claim 1 of the main request basically in that it further specifies that

- e) a variety of composite routing tables is constructed depending upon what routing criteria or combination of criteria are being optimised;
- f) each mobile node is operative using a single link state routine message for all waveforms by transmitting separate HELLO messages to 1-hop neighbours and flooding one topology control message per waveform;
- g) a state table is extended to segregate link state information for each of the 1-hop neighbours of the mobile node by waveform;
- h) each mobile node's 1-hop neighbourhood is distributed for each waveform in a single transmit control message to provide each mobile node the information it requires to build its network topology model of connectivity for each waveform and each node builds its own composite route table from this multi-waveform network topology.

The board is satisfied that the above amendments are supported by the disclosure of page 26, lines 1-2 and 18-28 of the application as filed.

- 4.1 Article 52(1) EPC: Novelty and inventive step
 - 4.1.1 The feature analysis and reasoning outlined in point 3.1.2 above with respect to claim 1 of the main request apply *mutatis mutandis* to claim 1 of this request.
 - 4.1.2 Moreover, the board finds that D2 implicitly discloses feature e), i.e. constructing the routing tables based on various routing criteria, since the use of OLSR inherently means that different routing metrics such as the "shortest path" criterion may be used. Document D2 is also found to anticipate features f) to h), i.e. using channel-specific HELLO messages and a single control message for all channels (see in particular D2, section IV.A).
 - 4.1.3 The observations concerning claim 1 of the main request set out in points 3.1.3 to 3.1.7 above with regard to the distinguishing features, the objective problems, and the argumentation on obviousness apply *mutatis mutandis* to claim 1 of this request.
 - 4.1.4 In view of the above, the subject-matter of claim 1 of this request also does not involve an inventive step having regard to D2.
- 4.2 In conclusion, this request is likewise not allowable under Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



K. Götz-Wein

A. Ritzka

Decision electronically authenticated