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Datasheet for the decision of 25 January 2019

Case Number: T 1360/15 - 3.5.05

Application Number: 08731525.5

Publication Number: 2118751

IPC: G06F3/06, G06F12/00

Language of the proceedings: EN

Title of invention:
Selectively utilizing a plurality of disparate solid state storage locations

Applicant:
Microsoft Technology Licensing, LLC

Headword:
Storage management/MICROSOFT

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

Keyword:
Clarity - (yes, after amendments)
Added subject-matter - (no, after amendments)
Inventive step - all requests (no)

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Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1360/15 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 25 January 2019

Appellant: (Applicant)	Microsoft Technology Licensing, LLC One Microsoft Way Redmond, WA 98052 (US)
Representative:	Goddar, Heinz J. Boehmert & Boehmert Anwaltspartnerschaft mbB Pettenkoferstrasse 22 80336 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 5 January 2015 refusing European patent application No. 08731525.5 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 to refuse the present European patent application for lack of clarity (Article 84 EPC) and added subject-matter (Article 123(2) EPC) with respect to the claims of a main request and a second auxiliary request, for lack of novelty (Article 54 EPC) with respect to a first auxiliary request, and for lack of inventive step (Article 56 EPC) with respect to the main request and second auxiliary request. The objections under Articles 54 and 56 EPC were based on the disclosure of

D4: US-A-2006/0248259.

II. With its statement setting out the grounds of appeal, the appellant filed amended sets of claims according to a new main request and new first to third auxiliary requests. It requested that the examining division's decision be set aside and that a patent be granted on the basis of one of those claim requests.

III. In a communication annexed to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board expressed its preliminary opinion on the appeal. In particular, it raised objections under Articles 123(2) and 56 EPC, mainly in view of prior-art documents D4 and

D3: US-A-2005/0154821,

which had been cited in the course of the examination proceedings (see appealed decision, point 1.10).

IV. With a letter of reply dated 14 December 2018, the appellant submitted amended claims according to a new main request and first to third auxiliary requests, replacing the former claim requests on file, along with counter-arguments to the objections raised in the board's communication under Article 15(1) RPBA.

V. Oral proceedings were held on 25 January 2019, during which the appellant withdrew the first and second auxiliary requests and filed amended claims as fourth and fifth auxiliary requests. All the pending claim requests were discussed.

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 main request or the third auxiliary request, submitted with the letter dated 14 December 2018, or on the basis of the fourth or fifth auxiliary request submitted during the oral proceedings before the board.

At the end of the oral proceedings, the board's decision was announced.

VI. Claim 1 of the **main request** reads as follows:

"A computer implemented method (300) for selectively utilizing a plurality of disparate solid state storage locations, said method (300) comprising:

receiving class types for said plurality of disparate solid state storage locations (305), said class types expressing types of data which said plurality of disparate solid state storage locations are configured to hold;

determining characteristics of received data (310) associated with input/output operations, said characteristics of received data indicative of types of the input/output operations, and said types of the input/output operations indicative of how frequently the input/output operations require writing and reading said received data; and

allocating said received data to one of said plurality of disparate solid state storage locations based upon said determined characteristics of received data (315) correlating to the class type of said one of said plurality of disparate solid state storage locations,

wherein the determining characteristics of received data further comprises

accessing attributes of a file, said file stored in one of said plurality of disparate solid state storage locations, and said attributes of said file comprising data indicative of how often said file has been accessed;

moving said file from said one of said plurality of disparate solid state storage locations in which said file is stored to another of said plurality of disparate solid state storage locations based upon said attributes of said file."

Claim 1 of the **third auxiliary request** reads as follows (amendments to claim 1 of the main request highlighted by the board):

"A computer implemented method (300) for selectively utilizing a plurality of disparate solid state storage locations, said method (300) comprising:

receiving class types for said plurality of disparate solid state storage locations (305), said class types expressing types of data which said plurality of disparate solid state storage locations are configured to hold;

determining characteristics of received data (310) associated with input/output operations, said characteristics of received data indicative of types of the input/output operations, and said types of the input/output operations indicative of how frequently the input/output operations require writing and reading said received data, wherein the determining characteristics of received data further comprises accessing attributes of a file, said file stored in one of said plurality of disparate solid state storage locations, and said attributes of said file comprising data indicative of how often said file has been accessed; and

allocating said received data to one of said plurality of disparate solid state storage locations based upon said determined characteristics of received data (315) correlating to the class type of said one of said plurality of disparate solid state storage locations,

~~wherein the determining characteristics of received data further comprises accessing attributes of a file, said file stored in one of said plurality of disparate solid state storage locations, and said attributes of said file comprising data indicative of how often said file has been accessed;~~ wherein allocating said received data to one of said plurality of disparate solid state storage locations includes moving said file from said one of said plurality of disparate solid

state storage locations in which said file is stored to another of said plurality of disparate solid state storage locations based upon said attributes of said file,

wherein said received data can be categorized into the following classes based on the type of input/output operation:
(1) write once and read only after writing;
(2) write infrequently and read frequently; and
(3) write frequently and read frequently."

Claim 1 of the **fourth auxiliary request** reads as follows (amendments to claim 1 of the third auxiliary request highlighted by the board):

"A computer implemented method (300) for selectively utilizing a plurality of disparate solid state storage locations, said method (300) comprising:

receiving class types for said plurality of disparate solid state storage locations (305), said class types expressing types of data which said plurality of disparate solid state storage locations are configured to hold;

determining characteristics of received data (310) associated with input/output operations, said characteristics of received data indicative of types of the input/output operations, and said types of the input/output operations indicative of how frequently the input/output operations require writing and reading said received data, wherein the determining characteristics of received data further comprises accessing attributes of a file, said file stored in one of said plurality of disparate solid state storage

locations, and said attributes of said file comprising data indicative of how often said file has been accessed; and

allocating said received data to one of said plurality of disparate solid state storage locations based upon said determined characteristics of received data (315) correlating to the class type of said one of said plurality of disparate solid state storage locations, wherein the allocating said received data to one of said plurality of disparate solid state storage locations includes moving said file from said one of said plurality of disparate solid state storage locations in which said file is stored to another of said plurality of disparate solid state storage locations based upon said attributes of said file,

wherein the receiving class types for said plurality of disparate solid state storage locations includes receiving class types for three disparate solid state storage location (A240, B245, C250), and wherein the three disparate solid state storage locations are configured respectively to hold data which is ~~said received data can be categorized into the following classes based on the type of input/output operation~~:

(1) ~~write~~ written once and read infrequently ~~only after writing~~;
(2) ~~write~~ written infrequently and read frequently; and
(3) ~~write~~ written frequently and read frequently."

Claim 1 of the **fifth auxiliary request** comprises all the features of claim 1 of the fourth auxiliary request except that the last paragraph has been replaced with the following clause (amendments to claim 1 of the fourth auxiliary request highlighted by the board):

"wherein the receiving class types for said plurality of disparate solid state storage locations includes receiving a first class type~~s~~ for ~~three~~ a first disparate solid state storage location~~s~~ (A240~~, B245, C250~~), a second class type for a second disparate solid state storage location (B245), and a third class type for a third disparate solid state storage location (C250)~~, and~~ wherein the ~~three~~ first, the second, and the third disparate solid state storage location~~s~~ are configured respectively to hold data which is:
(1) written once and read infrequently;
(2) written infrequently and read frequently; and
(3) written frequently and read frequently, and

wherein the computer implemented method further comprises:
moving a file stored on the second disparate solid state storage location (B245) to the first disparate solid state storage location (A240) if the file has not been read frequently for a certain period of time."

Reasons for the Decision

1. *The present invention*

The present application is concerned with data allocation to solid-state storage devices (as opposed to platter-based storage devices) by means of pre-determined device class types. It describes two embodiments, a *first embodiment* relating to data allocation to class types (such as storage devices that hold data which is written/read frequently or infrequently) based on the characteristics of received data (such as "user data" written infrequently and read

frequently or "operating system files" written and read frequently) to select a suitable storage location (see paragraphs [0049] to [0064] in conjunction with Fig. 3 of the present application as filed) and a *second embodiment* relating to data allocation to said class types based on the received characteristics of an input/output operation (such as device or file access frequency) to select a suitable storage location (see paragraphs [0068] to [0071] in conjunction with Fig. 4 as filed). It is also proposed to move a certain data file from one of the available storage devices to another one, depending on the frequency of access to the data file (see paragraph [0056]) or to the storage device itself (see paragraph [0068]).

The alleged technical problem to be solved by the present invention is to "enable a low cost per storage ratio" (see e.g. paragraph [0027] as filed).

2. MAIN REQUEST

Claim 1 of the main request comprises the following limiting features, as labelled by the board (amendments to claim 1 of the main request underlying the appealed decision highlighted by the board):

A computer-implemented method for selectively utilising a plurality of disparate solid-state storage locations, said method comprising the steps of:

A) receiving class types for said plurality of disparate solid-state storage locations, said class types expressing types of data which said plurality of disparate solid-state storage locations are configured to hold;

B) determining characteristics of received data associated with input/output operations, said

characteristics of received data indicative of types of the input/output operations, and said types of the input/output operations indicative of how frequently the input/output operations require writing and reading said received data;

C) allocating said received data to one of said plurality of disparate solid-state storage locations based upon said determined characteristics of received data correlating to the class type of said one of said plurality of disparate solid-state storage locations,

D) wherein the determining characteristics of received data further comprises accessing attributes of a file, said file stored in one of said plurality of disparate solid-state storage locations, and said attributes of said file comprising data indicative of how often said file has been accessed;

E) moving said file from said one of said plurality of disparate solid-state storage locations in which said file is stored to another of said plurality of disparate solid-state storage locations based upon said attributes of said file.

2.1 *Articles 123(2) and 84 EPC*

Following the amendments made in feature D), the board is satisfied that the subject-matter of present claim 1 is now supported by the original application (see e.g. paragraph [0068] along with claims 1 and 7 as filed) and is clearly defined. Thus, the objections raised under Articles 123(2) and 84 EPC in the decision under appeal (see Reasons 3.1.2 and 3.1.3) are considered to be overcome.

2.2 *Novelty and inventive step (Articles 54 and 56 EPC)*

The board concurs with the conclusion of the decision under appeal that the subject-matter claimed is novel over document **D4** but lacks an inventive step, for the reasons set out below.

2.2.1 The board understands that features A) to C) relate to the process of *storing* data in one of the available storage locations, whereas features D) and E) are concerned with the process of *treating* (such as moving) already stored data, which is commonly known as "data life-cycle management" in the context of storage systems. Hence, the term "data" is understood as referring to information units which *are to be* stored in one of the available storage locations, while the term "file" is supposed to refer to information units which were *already stored* in one of those storage locations (see also appealed decision, Reasons 3.1.3).

2.2.2 Document D4 apparently discloses the following limiting features of present claim 1:

A computer-implemented method for selectively utilising disparate solid-state storage locations ("high-speed FRAM memory"; "low-speed NAND memory"; see Fig. 3), said method comprising the steps of:

A) receiving class types ("BDTA"; "FDTA") for said storage locations, said class types expressing types of data ("DTA") which said storage locations are configured to hold (see e.g. paragraph [0020]: *"The data classification unit 140 receives data DTA ..., and classifies the data DTA ... as either 'busy data' BDTA or 'free data' FDTA ..."*);

B) determining characteristics of received data associated with input/output operations ("busy

data"; "free data"), said characteristics of received data indicative of types of the input/output operations, and said types of the input/output operations indicative of how frequently ("access frequency") the input/output operations require writing and reading said received data (see e.g. paragraph [0020]: *"... busy data BDTA is defined herein as data having a relatively high access frequency ... free data FDTA is defined herein as data having a relatively low access frequency ..."* and paragraph [0031]: *"... the input data is classified according to access frequency as either busy data or free data ..."*);

C) allocating said received data to one of said storage locations based upon said determined characteristics of received data correlating to the class type of said one of said storage locations (see e.g. Fig. 4, steps S255 and S257),

D) wherein the determining characteristics of received data further comprises ~~accessing attributes of a file, said file stored in one of said storage locations, and said attributes of said file comprising data indicative of how often said file has been accessed;~~

E) ~~moving said file from said one of said plurality of disparate solid state storage locations in which said file is stored to another of said plurality of disparate solid state storage locations based upon said attributes of said file~~.

2.2.3 It is undisputed that document D4 fails to disclose features D) and E), i.e. the method steps relating to the treatment of *already stored* data. As to feature D), the board also accepts that paragraph [0020] of D4 does not directly and unambiguously disclose that a file

attribute indicating "how often said file has been accessed", i.e. the file's real (rather than expected) access frequency in operation, is indeed accessed when treating an already stored file. Consequently, the subject-matter of present claim 1 is novel over D4 (Article 54 EPC).

2.2.4 As to the objective technical problem to be solved by claim 1 based on the above distinguishing features, the board follows, in the appellant's favour, the formulation put forward by the appellant at the oral proceedings before the board, namely "how to intelligently manage the storing allocation of D4 to increase overall data processing speed".

2.2.5 The board takes the view that, in order to solve the above-mentioned objective problem, the person skilled in the field of storage management systems would seek feasible ways of dealing with the realistic situation that the actual attribute of an already stored file no longer matches the pre-defined class type of its associated storage location (see also appellant's letter of 14 December 2018, page 6, first paragraph: *"... the real access frequency to the concerned file can deviate from the expected range of the concerned class-type ... How to deal with the said file in such situation is the objective technical problem which the subject matter of claim 1 is directed to*").

The board therefore finds that the skilled person would, for example, consult prior-art document **D3**, which is concerned with dynamic storage management and teaches that, in the event of temporal changes of storage-data characteristics (see e.g. paragraph [0053], emphasis added: *"... data attribute 7010 is a name assigned to a state of*

temporal change in the characteristics required of a physical storage region by the data stored ..."), the data units already stored in certain storage locations are to be transferred from the former location to the most suitable storage location, depending on their monitored "real" data attributes (see also D3, paragraphs [0052] to [0061], in conjunction with Fig. 2). In particular, D3 likewise discloses the following teaching in respect of the background art in paragraphs [0007] and [0008] (emphasis added):

> "*[0007] In a system which combines disk devices of different characteristics, the method used for allocating the data to the physical storage region provided by the most suitable disk device involves, for example, technology whereby the data access frequency is monitored and data is moved to the most suitable physical region on the basis of the access frequency ...*"
>
> "*[0008] ... if the access frequency has exceeded the threshold value, then the data is moved to a physical storage region provided by the disk device operating at a higher speed ...*".

Therefore, the board concludes that D3 teaches the measures of features D) and E) of present claim 1 and that the person skilled in the field of storage management systems would apply those measures to the system of D4 in order to solve the above objective problem. Thereby, the skilled person would arrive at the claimed subject-matter without exercising inventive skills.

2.2.6 As to the teaching of D3, the appellant argued that the skilled person would not apply the scheme of D3 to

the storage system of D4, because the system of D3 was only concerned with moving files in *one* direction and not in *two* directions, as required by present claim 1.

In that regard, the board notes, firstly, that moving data to the most suitable physical storage region on the basis of the access frequency (as taught in paragraph [0007] of D3; see point 2.2.5 above) compellingly implies that the movement must equally take place in both directions, for example from a low-speed to a high-speed memory as well as from a high-speed to a low-speed memory in the system particularly described in D4. Secondly, it is apparent to the board that the relevant feature E) of present claim 1 does not reflect the situation of file movements in *two* directions. It merely indicates that a file is moved from *one* of the storage locations in which said file is stored to *another* of the storage locations based upon the file's attribute, without addressing any other move direction.

2.2.7 Also, the appellant's argument that, according to the teaching of D3, a high-speed memory which was fully loaded had the consequence that the file concerned had to be moved back to the low-speed memory must fail, for the simple reason that neither the claimed subject-matter nor document D3 addresses the issue of overloaded storage devices.

2.3 In view of the above, the main request is not allowable under Article 56 EPC.

3. AUXILIARY REQUESTS

Claim 1 of the third to fifth auxiliary requests on file differs from claim 1 of the main request

essentially in that it further specifies that (emphasis added)

F) the allocating step according to feature C) includes the moving step according to feature E) and the received data, based on the type of input/output operation, can be categorised into different classes: (1) write once and read only after writing, (2) write infrequently and read frequently and (3) write frequently and read frequently (**third auxiliary request**);

G) the receiving step according to feature A) includes receiving three class types for three storage locations, where those storage locations are configured respectively to hold data which is (1) written once and read infrequently, (2) written infrequently and read frequently and (3) written frequently and read frequently (**fourth and fifth auxiliary requests**);

H) the method further comprises the step of moving a file stored on the second storage location to the first storage location if the file has not been read frequently for a certain period of time (**fifth auxiliary request**).

3.1 *Inventive step (Article 56 EPC)*

3.1.1 The feature analysis and reasoning outlined in point 2.2 above apply *mutatis mutandis* to claim 1 of the auxiliary requests on file.

3.1.2 As to added feature F), the board holds that applying different specific classes associated with read/write operations (i.e. relating to "access frequency") in the systems of D4 or D3 is unrelated to the actual movement of files and is a mere design choice, depending

primarily on the storage-system administrator's preferences as to the granularity of the class types to be generally supported in the underlying storage systems.

3.1.3 As to added features G) and H), the appellant argued that they were based on paragraphs [0037] and [0059] of the original application and specified that there are as many storage locations (i.e. more than two) as there are class types according to claim 1 and that they had the effect of "even more optimising the storage allocations".

In that regard, the board notes that neither the teaching of D4 nor that of D3 is restricted to the use of only two storage locations. Rather, document D4 indicates, for example, that the underlying invention relates to "heterogeneous types of nonvolatile memory" (see e.g. D4, paragraph [0002]; emphasis added), while D3 relies on numerous storage locations from which the most suitable one is to be selected for the data file to be moved in case of temporal changes in file attributes, i.e. if the monitored data attributes do not match with the assigned class types of the storage location in question (see e.g. D3, paragraphs [0007], [0008], [0058] to [0060] and in particular Figs. 2, 19, 22 clearly showing several attribute-dependent movements between various storage locations). Therefore, the board holds that the skilled person would, in the event that the storage system of D4 were to comprise more than two storage locations, readily apply the movement of data files between those available storage locations dependent on the data file's attribute (including the attribute relating to "access frequency") in the same manner as proposed by the teaching of D3 and would thus arrive in an obvious

way at the claimed subject-matter.

3.2 In conclusion, the present third to fifth auxiliary requests are 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