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Datasheet for the decision of 12 March 2019

Case Number: T 2022/14 - 3.5.05

Application Number: 09710947.4

Publication Number: 2263145

IPC: G06F3/06

Language of the proceedings: EN

Title of invention:
HYBRID MEDIA STORAGE SYSTEM ARCHITECTURE

Applicant:
NetApp, Inc.

Headword:
Hybrid Storage/NETAPP

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

Keyword:
Amendments - main request, added subject-matter (yes)
Claims - clarity - main request (no)
Inventive step - auxiliary request (yes)

Decisions cited:

Catchword:

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Case Number: T 2022/14 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 12 March 2019

Appellant: (Applicant)	NetApp, Inc. 495 East Java Drive Sunnyvale, CA 94089 (US)
Representative:	Rupprecht, Kay Meissner Bolte Patentanwälte Rechtsanwälte Partnerschaft mbB Widenmayerstraße 47 80538 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 8 May 2014 refusing European patent application No. 09710947.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	A. Ritzka
Members:	E. Konak
	D. Prietzel-Funk

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the patent application in suit.

II. The examining division decided, *inter alia*, that the main request lacked clarity (Article 84 EPC) and an inventive step (Article 56 EPC) with regard to the following document:

D1: US 5 778 418.

III. With its statement setting out the grounds of appeal, the appellant filed claims 1 to 13 of an amended main request. The appellant requested that the decision be set aside and a patent be granted based on its amended main request. It requested oral proceedings as an auxiliary measure.

IV. In its preliminary opinion annexed to the summons to oral proceedings, the board raised objections under Article 84 EPC and Article 56 EPC with regard to D1 or, alternatively, the following document, cited in the search report:

D3: US 2005/172074

V. In its reply, the appellant re-filed its last main request and filed claims 1 to 3 of two auxiliary requests. At the oral proceedings held before the board, the appellant replaced these auxiliary requests with claim 1 of a new first auxiliary request.

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

" A storage system comprising:
a plurality of storage media (140, 150) organized as hybrid storage media that cooperate to provide a total storage space of the storage system (120), the hybrid storage media including solid-state devices (SSDs) and hard disk drives (HDDs);
characterized in that:
the system comprises a log-structured file system (240) that implements a first data layout format for the SSDs (330) and a second data layout format for the HDDs (360), said system configured to control the hybrid storage media by performing the initial placement of data among storage space locations of the hybrid storage media, migration of selected data from the SSDs to the HDDs, and write allocation of available storage space locations of the hybrid storage media,
wherein the migration of the selected data from the SSDs (330) to the HDDs (360) includes:
identifying related file data stored according to said first data layout format at the SSDs (330),
copying the related file data into a log (146) of the log-structured file system (240), and
storing the blocks of related file data at the HDDs (360) according to said second data layout format using regions of the HDDs (360), where each region contains a contiguous range of file block numbers;
and further wherein a write anywhere technique is implemented for the SSDs (330) in accordance with the first data layout format to enable placement of data anywhere in free, available space on the SSDs (330), and a sequential write technique is implemented for the HDDs (360) in accordance with the second data layout format by streaming data to the HDDs."

VII. Claim 1 of the first auxiliary request differs from claim 1 of the main request in that

- "a log-structured file system (240) that implements" is deleted, and

- the feature of "copying the related file data into a log (146) of the log-structured file system (240)" is replaced with "copying the related file data into a memory".

Reasons for the Decision

1. Main request

1.1 The appellant argued at the oral proceedings before the board that the only support in the application as originally filed for the feature of "copying the related file data into a log (146) of the log-structured file system (240)" in claim 1 was the sentence bridging pages 4 and 5 of the description. This sentence reads as follows:

"*In an illustrative embodiment, the NVLOG 146 may be used to temporarily store ("log") certain data access operations, such as write operations, that are processed by the virtualization system prior to storing the data associated with those operations to the electronic and/or magnetic storage media during a consistency model event, e.g., a consistency point (CP), of the system.*"

1.2 It cannot be directly and unambiguously derived from this sentence that the NVLOG, which the appellant confirmed to be the "log of the log-structured file system", is used also for the migration of the selected data from the solid-state devices to the hard disk

drives, as the claim states, let alone that "the related file data" is copied into the log.

1.3 The appellant also drew the board's attention to page 19, lines 5 to 7 which reads "*... the identified cold data is retrieved from the SSDs, loaded into memory 124 and a CP is performed to direct the cold data to the appropriate region on the HDDS*". Although "*the cold data*" mentioned in this sentence includes "the related file data" (see page 18, lines 19 to 24), as required by the claim, there is no mention here of the use of a "log".

1.4 For these reasons, the board judges that the application was amended in the examination proceedings in such a way that it contains subject-matter which extends beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.

1.5 It further became apparent at the oral proceedings before the board that the "write anywhere techniques" implemented in claim 1 were known to the person skilled in the relevant art from the Write Anywhere File Layout (WAFL) file system. However, according to claim 1, these techniques are not implemented by the WAFL but by "a log-structured file system". Thus, what claim 1 refers to as "a log-structured file system" is not what the person skilled in the relevant art would understand by the term "log-structured file system". Therefore, claim 1 of the main request further lacks clarity, contrary to the requirements of Article 84 EPC.

2. First auxiliary request

2.1 Added subject-matter

In claim 1 of the first auxiliary request, the appellant amended the above-discussed feature to "copying the related file data into a memory" to reflect the disclosure on page 19, lines 5 to 7 (see 1.3 above). Therefore, claim 1 of the first auxiliary request meets the requirements of Article 123(2) EPC.

2.2 Clarity

2.2.1 The appellant further deleted the feature "a log-structured file system (240) that implements", thereby addressing the contradiction between this feature and the fact that it implements "write anywhere techniques" (see 1.5 above). Although the resulting claim does not refer to any file system at all, it is implicit that the claimed storage system requires the presence of a file system.

2.2.2 Amended claim 1 of the first auxiliary request still includes some features which were objected to in the contested decision for lack of clarity. These objections are, however, not convincing. In particular, the board judges that "write anywhere techniques ... to enable placement of data anywhere in free, available space" refers to techniques well-known to the person skilled in the relevant art from the WAFL. The clarity objection to "the first data layout format" and "second data layout format" is based on a reading of these terms in isolation which ignores the fact that the claim later defines these data layout formats to be write anywhere techniques and a sequential write technique, respectively. Finally, the term "related file data" is broad but sufficiently clear in its proper context as it can only refer to other blocks of data which would meaningfully be streamed together with the selected block from the hard disk drives after

their migration to the hard drives, e.g. blocks belonging to the same file.

2.2.3 Therefore, claim 1 of the first auxiliary request meets the requirements of Article 84 EPC.

2.3 Inventive step

2.3.1 The subject-matter of claim 1 of the first auxiliary request differs from the hybrid storage systems disclosed in D3 or D1 in that it uses write anywhere techniques for the solid-state devices and migrates related blocks of data together from the solid-state devices to the hard disk drives, writing them in a sequential stream to regions with contiguous ranges of file block numbers on the hard disks.

2.3.2 The effect of the distinguishing features is an overall improvement in the performance of the hybrid storage as the storage system benefits from advantages of the WAFL for solid-state drives but also mitigates its adverse effect of fragmentation on files that are sequentially read or streamed from hard disk drives .

2.3.3 The objective technical problem solved by claim 1 of the first auxiliary request can thus be regarded as how to improve the performance of the hybrid storage devices of D3 or D1.

2.3.4 Although neither D3 nor D1 discloses the details of the file system they use, it is implicit that the systems they disclose do have file systems. Selecting the WAFL file system, which implements the write anywhere techniques that claim 1 refers to, from the file systems known at the priority date of the application does not by itself involve an inventive step. However,

the subject-matter of claim 1 goes beyond the straightforward use of the WAFL on a hybrid storage system and addresses the problem of fragmentation that would arise as a result of the use of write anywhere techniques of the WAFL on hard disk drives. For this purpose, the data blocks to be migrated from the solid-state devices to the hard disk drives are grouped together with related blocks of data and written in a sequential stream to regions with contiguous range of file block numbers on the hard disks. The claimed sequential write technique is not suggested or hinted at by the prior art available on file, nor would the skilled person have come to this solution using their common general knowledge without an inventive step.

2.3.5 Therefore, claim 1 of the first auxiliary request meets the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent based on the claim of the first auxiliary request submitted during the oral proceedings before the board and the drawings and the description to be adapted.

The Registrar: The Chair:

K. Götz-Wein A. Ritzka

Decision electronically authenticated