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Datasheet for the decision
of 7 October 2011

Case Number:	T 0486/08 - 3.5.06
Application Number:	03026773.6
Publication Number:	1533699
IPC:	G06F 9/50
Language of the proceedings:	EN

Title of invention:
A method of assigning objects to processing units

Applicant:
SAP AG

Opponent:
-

Headword:
Reassigning data objects/SAP

Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 123(2), 84, 56

Keyword:
"Original disclosure - yes"
"Clarity - yes"
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

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Case Number: T 0486/08 **-** 3.5.06

D E C I S I O N
of the Technical Board of Appeal 3.5.06
of 7 October 2011

Appellant: (Applicant)	SAP AG Dietmar-Hopp-Allee 16 D-69190 Walldorf (DE)
Representative:	Richardt Patentanwälte Wilhelmstraße 7 D-65185 Wiesbaden (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted 2 August 2007 refusing European patent application No. 03026773.6 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chairman:	D. H. Rees
Members:	S. Krischer
	C. Heath

Summary of Facts and Submissions

I.   The appeal is directed against the decision, posted on
        2 August 2007, of the examining division, to refuse the
        application 03 026 773.
        The reason for the refusal was the absence of claims on
        file, in violation of Article 78(1)(c) EPC. This
        situation had arisen because all of the applicant's
        requests were considered inadmissible under Rule 86(3)
        EPC 1973 owing to lack of clarity (Article 84 EPC).

II.   A notice of appeal was received on 2 October 2007. The
        fee was paid on the same day. A statement setting out
        the grounds of the appeal was filed on 20 November 2007.
        Oral proceedings were conditionally requested.

III.   The board issued a communication dated 21 February 2011.
        It raised a number of objections relating to a lack of
        clarity (Article 84 EPC). However it did not agree with
        the arguments put forward by the examining division in
        sections 4 to 5.3 of the summons to oral proceedings,
        dated 16 February 2007, that there was a lack of an
        inventive step. On the contrary, the board was of the
        opinion that the subject-matter of claim 1 of the
        auxiliary requests appeared to be inventive with
        respect to the closest prior art document D1, e.g. when
        combined with D7:

        D1   W. Leinberger, *et al.*: "Multi-Capacity Bin Packing
                Algorithms with Applications to Job Scheduling
                under Multiple Constraints"; TR 99-024; pages 1-
                23; XP002285342; retrieved from the Internet:
                http://www-users.cs.umn.edu/~karypis/publications/
                Papers/PDF/mrbinpack.pdf.

D7   E.G. Coffman, Jr., *et al.*: "APPROXIMATION
      ALGORITHMS FOR BIN PACKING: A SURVEY"; in
      "Approximation algorithms for NP-hard problems",
      D. Hochbaum (ed.), [Online] 1996, pages 1-53;
      XP002285343; retrieved from the Internet:
      http://www.ee.columbia.edu/~egc/webpapers/
      BPchapter.ps.

IV.   In a letter dated 6 June 2011, the appellant filed
       claims for a new sole request.

V.   The board issued a summons to attend oral proceedings
       to be held on 26 October 2011. It raised objections
       relating to a lack of support (Article 84 EPC) and lack
       of inventive step (Article 56 EPC).

VI.   In a letter dated 22 September 2011, the appellant
       filed a new sole request.

VII.   After consultation with the board, the rapporteur
       contacted the appellant by telephone on 4 October 2011
       to point out further minor problems to be overcome
       before grant of a patent could be ordered. In response,
       the appellant filed, with a letter dated 7 October 2011,
       another new set of claims and new description pages 3,
       4, 6 and 8.

VIII. On 7 October 2011, the board cancelled the oral
       proceedings to be held on 26 October 2011.

IX.   The appellant requests that the decision under appeal
       be set aside (implicitly requested) and that a patent
       be granted on the basis of claims 1-5 filed on
       7 October 2011.

The further text on file is:

description
pages 1, 5, 7, 9-19 as originally filed,
pages 2, 2a filed with telefax on 5 September 2006,
pages 3, 4, 6, 8 filed with telefax on 7 October 2011;

drawing sheets 1 to 21 as filed with a letter dated
22 December 2003.

X.   Claim 1 of the sole request reads as follows:

"1.   A computer implemented method of assigning a given
      set of data objects (1, 2, 3,..., 20) to
      processing units (B1, B2, B3, ... BN) of a cluster
      (100) of processing units, each one of the data
      objects (1, 2, 3,..., 20) having an data object
      size and a data object load, the data object load
      being indicative of a mean number of access
      operations per time unit to the respective data
      object, the data objects (1, 2, 3,..., 20) being
      tables, arrays, lists or trees, each one of the
      processing units being a blade server, each blade
      server having the same storage capacity and the
      same load capacity, the method comprising the
      steps of:
      -      a) calculating (200) an index based on data
             object size and data object load for each
             one of the data objects (1, 2, 3,..., 20),
      -      b) sorting (201) of the data objects by
             index to provide a sequence of data objects
             (1, 2, 3,..., 20);
      -      c) for each processing unit of the cluster:

- assigning (206) of one or more of the
  data objects (1, 2, 3,..., 20) to the
  processing unit in the order of the
  sorted sequence until a remaining
  storage capacity or a remaining load
  capacity of the processing unit is too
  small for remaining data objects of the
  sequence, wherein the first data object
  of the sequence has the largest index;
- deleting (216) of the data objects
  (1, 2, 3,..., 20) that are assigned to
  the processing unit from the sequence,
whereby step 1c) is carried out repeatedly until
the sequence is empty in order to provide a
minimum number of the processing units, whereby
the remaining storage capacity is determined by
the difference between the storage capacity and
the aggregated size of data objects being assigned
to the processing unit, whereby the remaining load
capacity is determined by the difference between
the load capacity and the aggregated loads of data
objects being assigned to the processing unit,
and further comprising the steps of:
- d) determining (800) a first largest gap
  between the aggregated size of data objects
  being assigned to one of the processing
  units and the storage capacity,
- e) determining (800) a second largest gap
  between the aggregated load of data objects
  being assigned to one of the processing
  units and the load capacity,
- f) subtracting (802) the first largest gap
  divided by the minimum number of processing

units from the storage capacity to provide a
first threshold,

- g) subtracting (802) the second largest gap
  divided by the minimum number of processing
  units from the load capacity to provide a
  second threshold,

- h) performing (806) step 1c) again for
  performing an assignment procedure of the
  data objects to the processing units using
  the sequence of data objects (1, 2, 3,...,
  20) provided in step 1b), whereby for the
  second execution of step c) the storage
  capacity is set to the first threshold and
  the load capacity is set to the second
  threshold, wherein step 1c) is carried out
  repeatedly until the sequence is empty again.

XI.   Independent claim 3 of the sole request essentially
       differs from claim 1 by replacing "A computer
       implemented method of" by "A computer program product
       for".

XII.   Independent claim 5 differs substantively from claim 1
       only in the first paragraph:

       "5. A blade server having balancing means for
       dynamically assigning a given set of data objects (1,
       2, 3,..., 20) to a plurality of processing units of a
       cluster (100) of processing units, the processing units
       being blade server servers (B1, B2, B3,..., BN), each
       one of the data objects (1, 2, 3,..., 20) having an
       assigned index that is based on data object size and
       data object load, the data object load being indicative
       of a mean number of access operations per time unit to

the respective data object, the data objects being
tables, arrays, lists or trees, each one of the
processing units having the same storage capacity and
the same load capacity, the balancing means being
adapted to assign data objects to the blade server
servers by the steps of:"

Reasons for the Decision

1.   *Admissibility of the appeal*

        The appeal satisfies the requirements of the EPC for
        admissibility, see sections I and II above.

2.   *Clarity and original disclosure*

2.1   In the appealed decision, sections 1.2 and 1.3, an
        objection was raised for claim 1 with respect to
        Article 84 EPC. A lack of clarity arose for the second
        assignment procedure since after the first assignment
        procedure the processing units were filled with data
        objects. This objection appears to have arisen from a
        misunderstanding of the application by the examining
        division. The original description at page 14,
        lines 16-22, discloses that the second assignment step
        is "performed again with the reduced thresholds",
        without the sorting step (i.e. starting at step 204) if
        the sorting indices and the original object sequence
        have been saved. This and figure 18 clearly show that
        the assignments found by the first execution of step 1c)
        are not used in the second assignment which is created
        by the second execution of step 1c) in step 1h). This
        seems to have been misunderstood. An assignment is in

the first place a mapping that defines which data
objects should be stored on which processing unit. The
word "assignment" does not imply that the storing
according to the assignment has already been done, as
stated in the appealed decision, section 1.2, last
sentence ("Therefore the previously used processing
units still contain objects"). Current claim 1 also
specifies "assignment" and is therefore clear in this
respect.

2.2   The current independent claims are based on claim 1 of
        auxiliary request ii submitted with the grounds of
        appeal. This claim is itself based on a combination of
        original claims 1-5 and contains additionally the
        following clarifications [indications for the original
        disclosure of these amendments are put in brackets]:

- "*computer-implemented* method": to distinguish the
  method from a mental act [original description
  page 8, lines 9, 10];
- "assigning *a given set of* data objects": to make
  the *offline* character of the algorithm clear
  [figure 3; page 10, lines 16-22];
- "the data object load being indicative of a mean
  number of access operations per time unit to the
  respective data object": to define the data object
  load [page 3, lines 10-13; page 10, lines 26-29];
- "the data objects *being tables, arrays, lists or
  trees*": to clarify the broad expression "data
  object" [page 6, line 27];
- "each one of the processing units being *a blade*":
  to clarify the expression "processing unit" which
  could also be a "micro-processor" without any

associated memory for which such an assignment
method does not make sense [page 8, line 12];

- "each blade *having the same storage capacity and
  the same load capacity*": the "first threshold" and
  the "second threshold" which are the same for all
  blade servers make only sense if all of them have
  the same storage and load capacity [page 8,
  lines 12-15];

- "*whereby step 1c) is carried out repeatedly until
  the sequence is empty in order to provide a
  minimum number of processing units*": otherwise the
  assignment can consist of only one data object and
  does not have to be complete; see also the summons
  to oral proceedings in examination, dated
  16 February 2007, section 4.1 [original claim 2];

- step 1h) "for performing an assignment procedure
  ... *using the sequence of data objects provided in
  step 1b)*" and "wherein step 1c) is carried out
  repeatedly until the sequence is empty again":
  this makes clear that the second assignment
  procedure restarts from beginning, reuses the
  sorted sequence of step 1b) and performs a
  complete assignment with virtually reduced storage
  and load capacities [page 14, paragraph 4].

2.3   In its communication, the board raised a number of
        further clarity objections, in response to which the
        appellant filed the current claims incorporating the
        following further amendments:

- "blade *server*": the expression "blade" is a
  colloquial short form for "blade server" but also
  designates many other things like a sword or a
  knife [original description page 2, lines 5, 10];

- step 1c) "in the order of the sorted sequence"
  (instead of "in sequential order"): this refers
  back to the sequence defined some lines before in
  the claim;

- step 1c) "or" (instead of "and"): the negation of
  the fitting test [figure 2 (212)] is fulfilled if
  one of the two capacities is too small;

- step 1c) "for *remaining* data objects of the
  sequence": the term "consecutive" was misleading
  since it could induce that the data objects
  assigned to the same processing unit *must directly
  follow* each other in the sequence, without an
  object in between them; this would even result in
  another known bin-packing algorithm, the so-called
  Next-Fit Decreasing (NFD) algorithm for which
  there is no support in the description; [original
  description page 9, line 23 reads: "it is
  determined whether there is a next object in the
  ordered sequence that fits into both gaps"; see
  also figure 2 (212)];

- step 1c) "wherein the first data object of the
  sequence has the largest index": to clarify that
  the data object with the largest index is tried
  first [page 9, line 7: "... processing of the
  object sequence starts with the first data object
  of the sequence, i.e. the object having the
  largest sorting index value"];

- step 1f) "*minimum* number of processing units" [see
  original description page 14, line 14 in
  combination with page 10, line 10];

- step 1h) "whereby for the second execution of
  step c) the storage capacity is set to the first
  threshold and the load capacity is set to the
  second threshold": claim 1 of auxiliary request ii

defines the "remaining storage capacity" and the
"remaining load capacity" differently, which leads
to an ambiguity in the second execution of
step 1c) [figure 18].

2.4   Corresponding clarifications were performed for the
        other independent claims 3 and 5.

2.5   As to the amendments filed on 22 September 2011, beside
        some reference numerals added, they concern only
        steps 1c), 3c) and 5c) where the expression "wherein
        the first data object of the sequence has the largest
        index" had been added [original description page 9,
        lines 7, 8].

2.6   As to the amendments filed on 7 October 2011, in the
        claims the only substantive changes concern reference
        numerals. In the description, the expression "a
        preferred embodiment of" was deleted before "the
        invention" on page 3, 4, 6 and 8, since the details
        described in these passages concern the invention as
        defined in the independent claims and not an embodiment
        thereof. Furthermore, on page 8, the expression "a
        preferred embodiment" was replaced by "an alternative"
        since figures 19 and 20 describe a variant different
        from the subject-matter of the independent claims.

2.7   The board concludes that after these amendments the
        claims of the current sole request fulfil the
        requirements for clarity of Article 84 EPC and for
        original disclosure of Article 123(2) EPC.

3.   *Inventiveness*

3.1   The board agrees with the examining division in the
       determination of the closest prior art document (D1) as
       expressed in their summons to oral proceedings,
       dated 16 February 2007, page 3, section 5.1.

3.2   Current claim 1 thus has the following differences
       from D1: a second execution of step 1c) with virtually
       reduced storage/load capacities; the data object load
       being indicative of a mean number of access operations
       per time unit to the respective data object; the
       processing units are blade servers; the data objects
       are tables, arrays, lists or trees.

3.3   However, the board disagrees with the examining
       division's assessment of inventive step (sections 4.2
       and 4.3): The invention executes step 1c) a second time
       with virtually reduced storage/load capacities (called
       first and second thresholds in the claims) in order to
       smooth the data distribution on the blade servers by a
       reassignment from the start. None of the available
       documents appears to disclose this special use of the
       First Fit Decreasing bin packing algorithm (FFD) for
       that purpose. (FFD is the well-known name of the
       algorithm defined in step 1c).)

3.4   Reassignment from the start should not be confused with
       a *repacking* of bins as disclosed in D7, page 11, middle
       of the page and page 14, section 2.2.6. These two
       features were equated in the examining division's
       summons to oral proceedings, page 5, section 5.3,
       hyphen 4. But they are actually different since the
       repacking disclosed in D7 tries to improve the bin

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packing in order to minimize the number of bins,
whereas the reassignment in the invention tries to
improve the *distribution* of the data within the *same
number* of bins.

3.5   The board also takes a different view from that
       expressed in the summons to oral proceedings, page 2,
       section 4:

       "Choosing a specific resource distribution optimi-
       zation algorithm as defined by the independent
       claims does not provide any surprising effect over
       any other resource distribution optimization
       algorithm as e.g. disclosed by D1 or D7."

       and in section 4.3:

       "... the features in the independent claims seem to
       define a non-technical solution for solving an NP-
       hard problem. This solution cannot contribute to
       inventive step according to Article 56 EPC as the
       features are of a purely mathematical and
       theoretical nature (see e.g. D1 or D3), thus falling
       under the exclusion of Article 52(2)(a) EPC."

       The board considers that the present case does not
       present a theoretical solution to a theoretical problem
       (NP-hardness), but rather a concrete technical solution
       to the technical problem of smoothing the distribution
       of data objects on a set of blade servers. This is done
       in an unusual way by using a well-known algorithm (FFD)
       from the different field of bin packing with a
       specially adapted input value (the virtually reduced
       storage/load capacities or first/second thresholds).

3.6   This solution is not suggested by any of the documents
        on file. Therefore, the requirement of Article 56 EPC
        is fulfilled.

Order

For these reasons it is decided that:

1.   The decision under appeal is set aside.

2.   The application is remitted to the department of first
        instance with the order to grant a patent on the basis
        of claims 1-5 of the sole request filed on 7 October
        2011, the description pages 1, 5, 7 and 9-19 as
        originally filed, pages 2 and 2a as filed on
        5 September 2006, pages 3, 4, 6 and 8 as filed on
        7 October 2011, and the drawing sheets 1 to 21 as filed
        with a letter dated 22 December 2003.

The Registrar: The Chairman:

B. Atienza Vivancos   D. H. Rees