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**Datasheet for the decision
of 21 September 2006**

Case Number: T 0942/03 - 3.5.01

Application Number: 96309360.4

Publication Number: 0780770

IPC: G06F 12/08

Language of the proceedings: EN

Title of invention:
Hybrid numa coma caching system and methods for selecting
between the caching modes

Applicant:
SUN MICROSYSTEMS, INC.

Opponent:
-

Headword:
Hybrid caching system/SUN MICROSYSTEMS

Relevant legal provisions:
EPC Art. 54

Keyword:
"Novelty (yes)"

Decisions cited:
-

Catchword:
-

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Boards of Appeal

Chambres de recours

Case Number: T 0942/03 - 3.5.01

D E C I S I O N
of the Technical Board of Appeal 3.5.01
of 21 September 2006

Appellant:	SUN MICROSYSTEMS, INC. 4150 Network Circle Santa Clara, California 95054 (US)
Representative:	Harris, Ian Richard D Young & Co 120 Holborn London EC1N 2DY (GB)
Decision under appeal:	Decision of the Examining Division of the European Patent Office posted 18 February 2003 refusing European application No. 96309360.4 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman:	S. Steinbrener
Members:	R. Zimmermann
	G. Weiss

Summary of Facts and Submissions

I.   European patent application number 96 309 360.4
        claiming a priority date from 1995 concerns a
        multiprocessing system with a distributed shared memory
        which is based on a hybrid NUMA/COMA (non-uniform-
        memory /cache-only-memory) architecture.

II.   The European search report cited, among other prior art
        documents, the following publications:

        D1: Proceedings of the Annual International Symposium
            on Computer Architecture, Chicago, April 18 - 21,
            1994, no. 21, 18 April 1994, Institute of
            Electrical and Electronics Engineers,
            pages 82-93, T. Joe et al.: "Evaluating the
            Memory Overhead Required for COMA Architectures"

        D2: Computer Architecture News, vol. 20, no. 2, May
            1992, pages 80-91, P. Stenström et al.:
            "Comparative Performance Evaluation of Cache-
            Coherent NUMA and COMA Architectures"

III.   The examining division refused the application,
        considering a set of claims filed as main request on
        11 November 2002 and a further set of claims field as
        an auxiliary request in oral proceedings held before
        the examining division on 9 December 2002. According to
        the written decision, dated 18 February 2003, the
        subject-matter of the independent claims submitted as
        main request did not meet the patentability requirement
        of novelty, whereas the auxiliary request was not
        allowable under Rule 86(4) EPC. Lack of novelty was
        derived from document D2, sections 2.1, 3.1 and 5.2
        concerning a method for page migration in a CC-NUMA
        (cache-coherent NUMA) system. In the context of page

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migration, the CC-NUMA system of document D2 behaved temporarily as a COMA system, destroying novelty of the claimed invention.

Furthermore, under the heading "additional comments", the decision cited some passages in documents D1 and D2 and indicated that a mere combination of the known COMA and NUMA architectures, behaviour, or modes of performing would be obvious in the light of the prior art of documents D1 and D2.

IV.   The applicant lodged an appeal against the refusal decision. The notice of appeal, including an order for payment of the appeal fee, was filed on 15 April 2003, the written statement setting out the grounds of appeal was filed on 17 June 2003. With the statement of appeal grounds, the appellant filed various requests related to different sets of claims, claim 1 of the "primary request" reading as follows:

"1. A method of storing data in a computer system (300) having a plurality of subsystems (310, 320, 380) coupled to each other by a system interconnect (390), each said sub-system including a processor (311a), a COMA cache (314) configured to store a plurality of pages each comprising a plurality of data lines, a directory (316), and a hybrid non-uniform-memory-architecture/cache-only-memory-architecture (NUMA/COMA) cache (313a) configured to store at least one of said data lines, said method comprising the steps of: setting a cache mode for a data line, wherein said cache mode is one of a COMA cache mode and a NUMA cache mode;

a processor (311a) of one said sub-system (310)
initiating a data transaction associated with said data
line;
changing said cache mode for said data line from said
one of said COMA and NUMA cache modes to the other of
said COMA and NUMA cache modes in response to
identifying a pattern of data access from tracking
cache activity;
storing data associated with said data line in said
hybrid NUMA/COMA cache of said one sub-system;
storing said data in said COMA cache (314) of said one
sub-system where said cache mode for said data line is
said COMA mode."

As indicated by the appellant, the application
documents filed with the "primary request" corresponded
to the documents identified as main request in the
decision under appeal, with a minor clerical change in
dependent claim 25.

V.   The appellant requested that the decision under appeal
        be set aside and that a patent be granted on the basis
        of the application documents filed as primary request.
        In the event the Board did not grant the primary
        request, the appellant requested oral proceedings and
        grant of a patent on the basis of application documents
        according to a first, second and third auxiliary
        request.

VI.   According to the appellant's submissions, the examining
        division applied an unjustified distortion of the
        terminology used in the claims and the prior art.
        Neither document D1 nor D2 was directed to a hybrid
        NUMA/COMA system. The page migration described in

document D2, section 5.2 was a NUMA mode of operation
as correctly indicated in D2. If the authors had
considered it as a form of COMA operation they had said
so. Moreover, the claimed invention involved an
inventive step having regard to the prior art cited by
the examining division. Both documents, document D1 and
D2, only compared and contrasted separate NUMA and COMA
systems, without giving any hint to combine them
together into a hybrid NUMA/COMA system.

Reasons for the Decision

1.   The appeal complies with the requirements of
        Articles 106 to 108 and Rules 1(1) and 64 EPC and is
        thus admissible.

2.   The appeal leads to the reversal of the decision under
        appeal and to the remittal of the case to the examining
        division since the finding of lack of novelty does not
        hold and the substantive examination has not yet been
        completed in the first instance proceedings.

Novelty

3.   Novelty of the claimed invention is provided by the
        claimed combination of a Non-Uniform Memory
        Architecture (NUMA) and a Cache-Only Memory
        Architecture (COMA), which is the subject-matter of the
        method, computer system, and computer program product
        claims of the main request. The essential features of
        this combination result from the definition of a hybrid
        NUMA/COMA cache and the function of changing between
        COMA and NUMA cache modes in response to identifying a

pattern of data access from tracking cache activity
(see independent claims 1, 16, and 19).

4.   The Board does not agree with the examining division's
        interpretation of the CC-NUMA with page migration
        (NUMA-M) in document D2, page 87, section 5.2,
        2nd paragraph as a (temporary) COMA mode
        indistinguishable from the claimed invention. The page
        migration in NUMA-M is merely an operation on the
        distributed main memory of a (normal) CC-NUMA system.
        It does neither transform the NUMA memory into an
        "attraction memory" characteristic of the COMA design,
        nor does it imply the implementation of a COMA specific
        coherence and communication protocol. In NUMA-M, there
        are no tags associated with each memory block or data
        line; nor does NUMA-M provide a total decoupling of the
        location of data items from their physical addresses
        (see document D2, page 80, right-hand column,
        2nd paragraph, and page 90, left-hand column, section 6,
        2nd paragraph). The algorithm of Black, Gupta, and
        Weber applied in NUMA-M for page migration was
        explicitly developed for application with
        multiprocessors of the type implementing NUMA memory
        (see the citation in document D2, page 87, section 5.2,
        1st and 2nd paragraphs).

Inventive step

5.   Referring to the comments made in the decision under
        appeal in respect to inventive step (see point III
        "Additional comments" of the decision under appeal),
        the Board notes that these comments are very
        preliminary and have rather the character of mere
        assertions than of a reasoned conclusion on which the
        applicant could make relevant observations.

Remittal

6.   Since the only ground for refusal, lack of novelty,
        cannot be upheld and the substantive examination in
        respect to inventive step in particular has apparently
        not yet been completed, the case is to be remitted to
        the first instance to continue the examination on the
        basis of the main request.

        As the Board has not refused the appellant's main
        request, the appellant's auxiliary requests including a
        request for oral proceedings if the Board were mindful
        not to grant the main request, need not be considered.

Order

For these reasons it is decided that:

The decision under appeal is set aside. The case is remitted
to the first instance for further prosecution.

The Registrar: The Chairman:

P. Guidi   S. V. Steinbrener

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