

US007103725B2

## (12) United States Patent Glasco

### (54) METHODS AND APPARATUS FOR SPECULATIVE PROBING WITH EARLY COMPLETION AND DELAYED REQUEST

(75) Inventor: David B. Glasco, Austin, TX (US)

(73) Assignee: Newisys, Inc., Austin, TX (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 529 days.

This patent is subject to a terminal disclaimer.

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711/135

(58) **Field of Classification Search** ........ 711/141–149, 711/130, 135–136, 119–122, 117–118; 710/316–317, 710/100, 315 See application file for complete search history.

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(45) **Date of Patent:** 

\*Sep. 5, 2006

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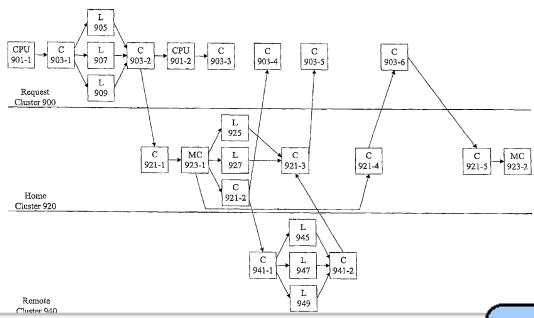
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Primary Examiner—Matthew Kim Assistant Examiner—Zhuo H. Li (74) Attorney, Agent, or Firm—Beyer Weaver & Thomas, LLP

### (57) ABSTRACT

According to the present invention, methods and apparatus are provided for increasing the efficiency of data access in multiple processor, multiple cluster systems. A cache coherence controller associated with a first cluster of processors can determine whether speculative probing can be performed before forwarding a data access request to a second cluster. The cache coherence controller can send the data access request to the second cluster if the data access request can not be completed locally.

### 51 Claims, 15 Drawing Sheets





Memory Integrity, LLC IPR2015-00158, -00159, -00163 EXHIBIT Memory Integrity - 2025

Figure 1A

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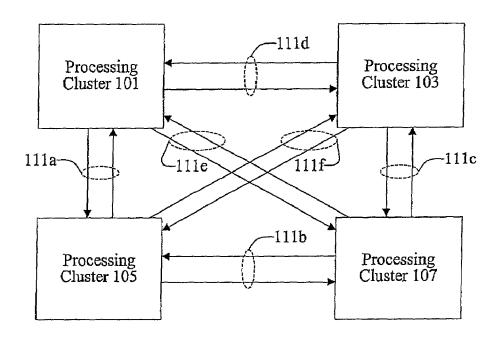
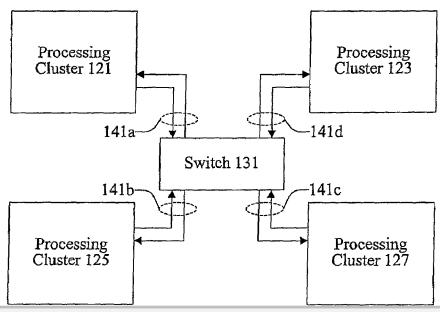


Figure 1B





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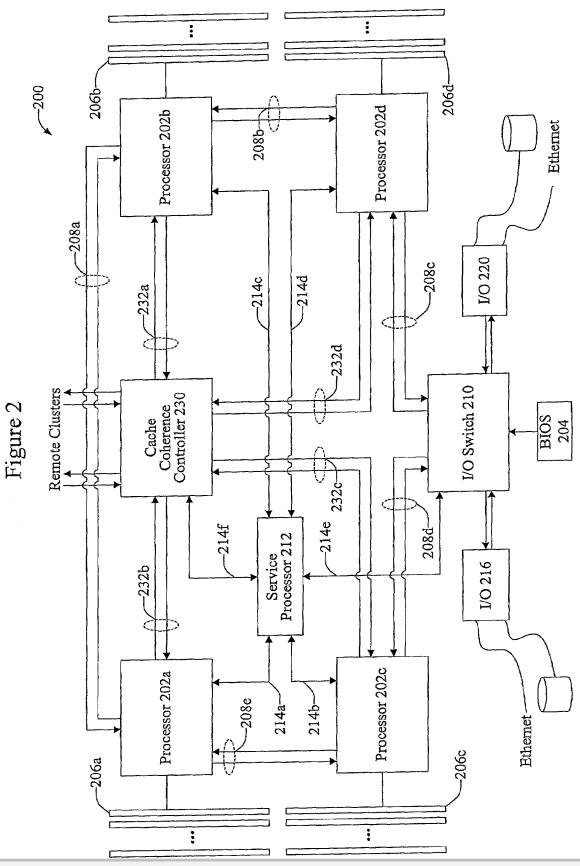
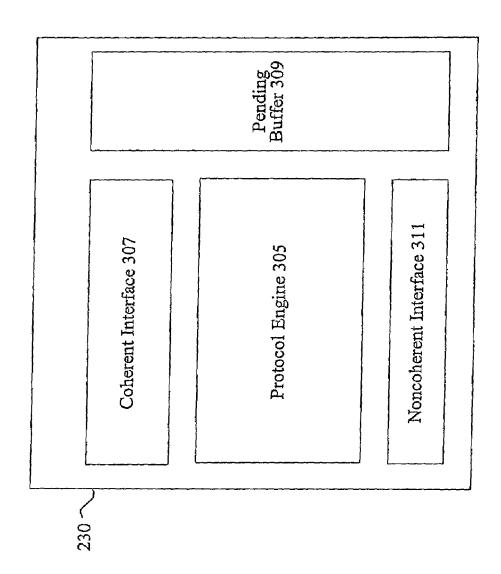




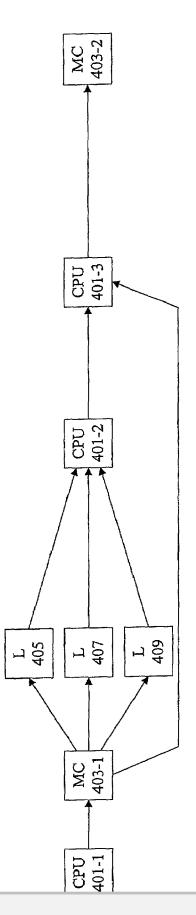
Figure 3





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Figure 4



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