

# EXHIBIT A



US007266079B2

(12) **United States Patent**  
**Fan**

(10) **Patent No.:** **US 7,266,079 B2**  
(45) **Date of Patent:** **Sep. 4, 2007**

(54) **DYNAMIC NETWORK LOAD BALANCING OVER HETEROGENEOUS LINK SPEED**

EP 0 910 195 4/1999

(75) Inventor: **Kan Frankie Fan**, Diamond Bar, CA (US)

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(73) Assignee: **Broadcom Corporation**, Irvine, CA (US)

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1127 days.

\* cited by examiner

(21) Appl. No.: **09/897,660**

*Primary Examiner*—Wing Chan  
*Assistant Examiner*—Richard Chang

(22) Filed: **Jul. 2, 2001**

(74) *Attorney, Agent, or Firm*—Squire, Sanders & Dempsey, LLP

(65) **Prior Publication Data**  
US 2002/0054567 A1 May 9, 2002

(57) **ABSTRACT**

**Related U.S. Application Data**

(60) Provisional application No. 60/233,338, filed on Sep. 18, 2000.

A method, apparatus, and computer program product for balancing transmission unit traffic over network links, including disposing transmission units into flows; grouping flows into first flow lists, each corresponding to a selected network link; determining a traffic metric representative of a traffic load on the selected network link; responsive to the traffic metric, regrouping flows into second flow lists corresponding to the selected network link, the regrouping balancing the transmission unit traffic among the network links; and transmitting the respective second flow list over the respective selected network link. The invention also can include a method for transmitting transmission units through a network, including receiving a transmission unit from a transmission unit source; classifying the transmission unit according to a predetermined flow characteristic; selecting a preselected network link over which the transmission unit is to be transmitted; and transmitting the transmission unit over the preselected network link.

(51) **Int. Cl.**  
**H04L 12/26** (2006.01)

(52) **U.S. Cl.** ..... 370/230; 370/235; 370/468

(58) **Field of Classification Search** ..... 370/230, 370/230.1, 229, 235, 232, 468  
See application file for complete search history.

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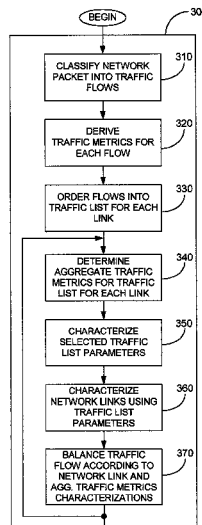
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**68 Claims, 9 Drawing Sheets**



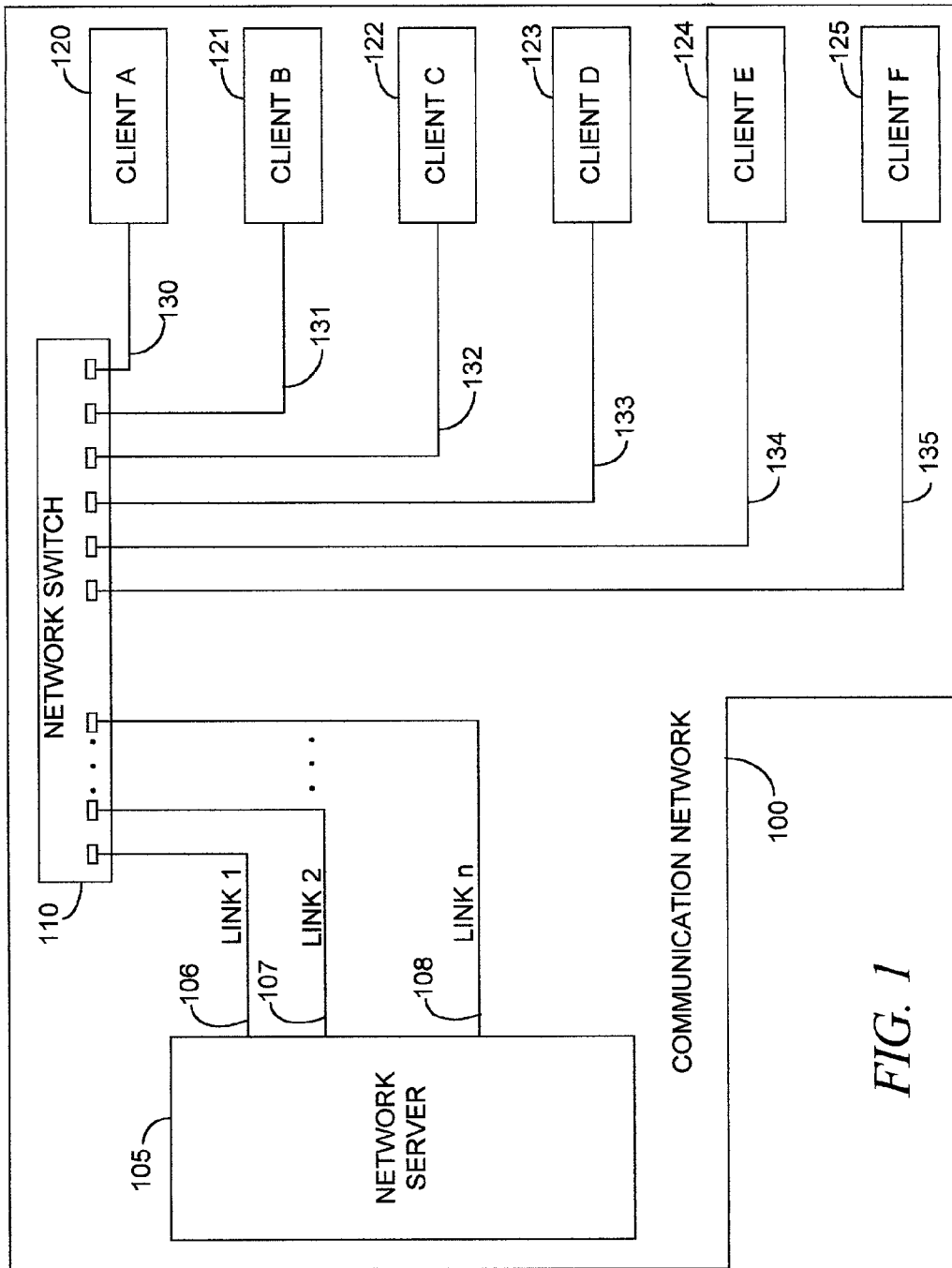


FIG. 1

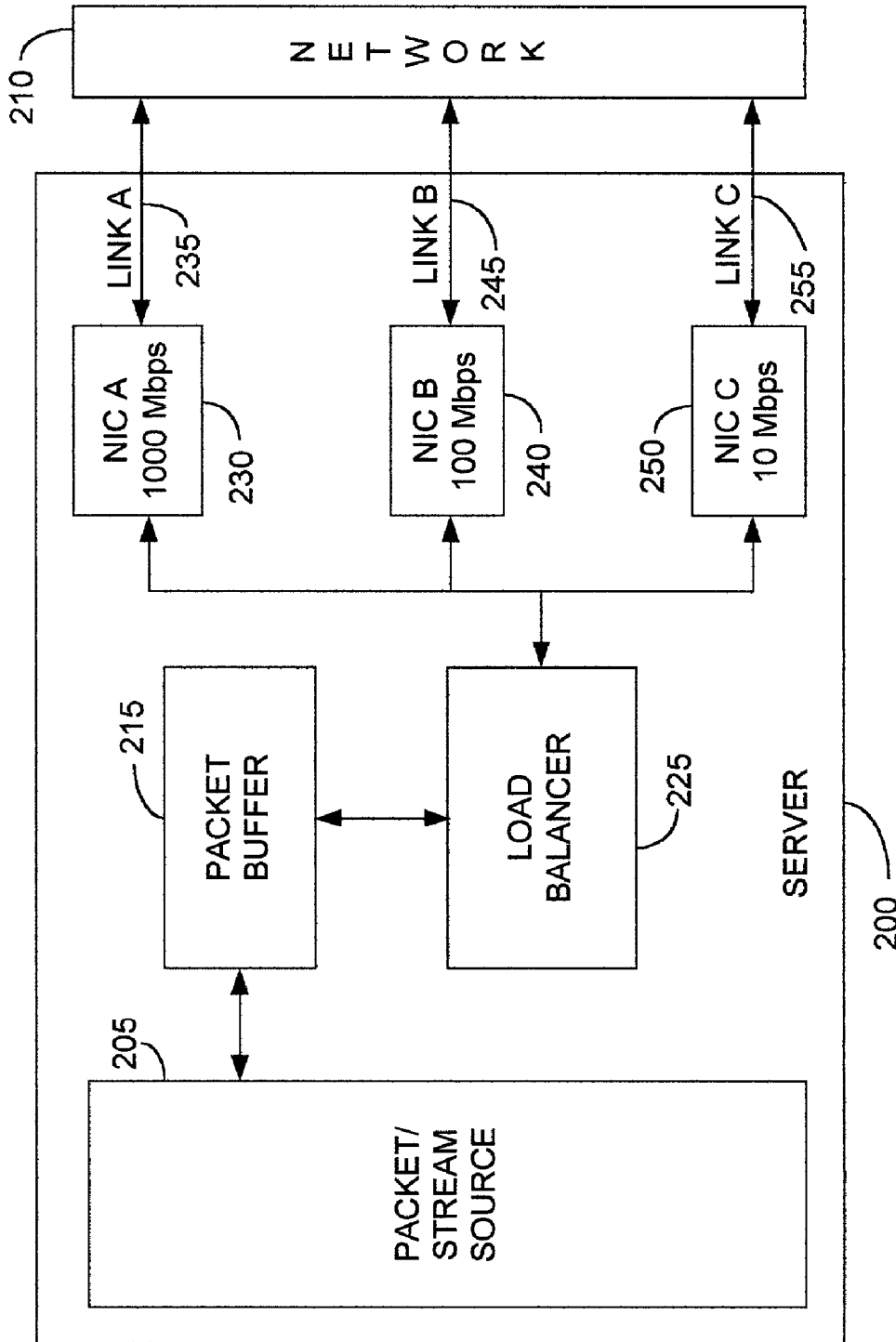


FIG. 2

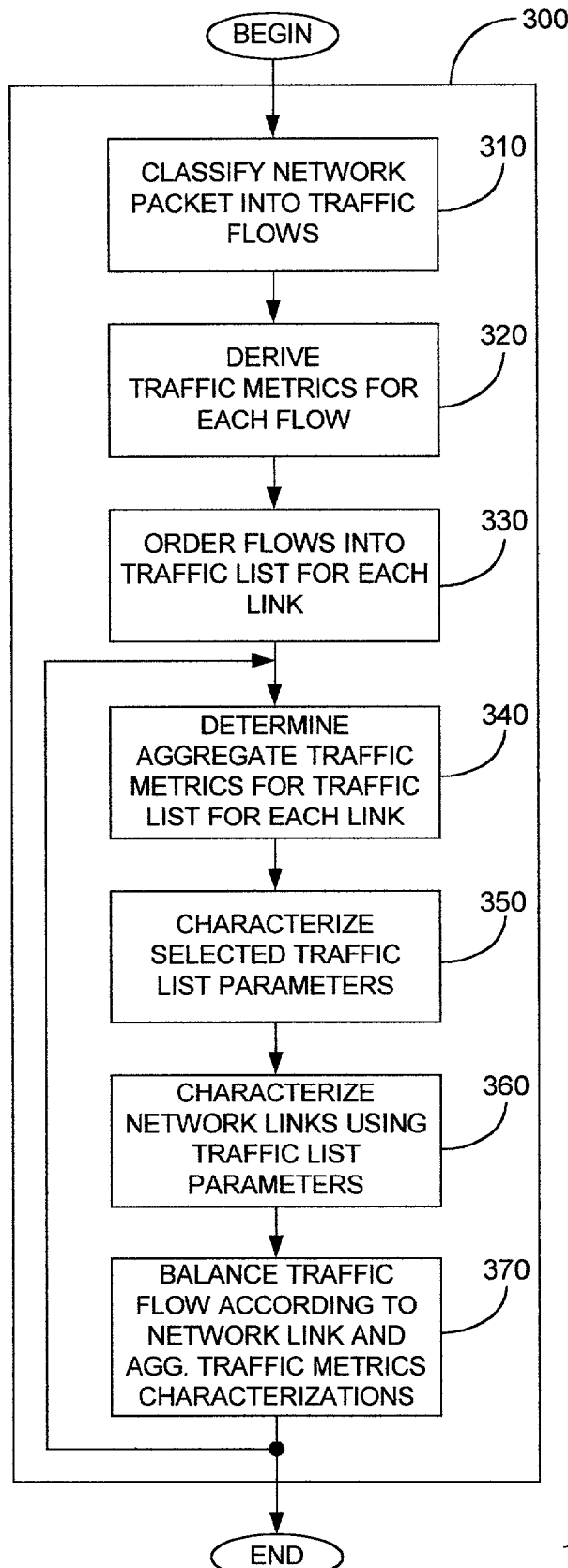


FIG. 3

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