(12) **United States Patent** (10) **Patent No.:** **US 6,205,149 B1**

Lemaire et al. (45) **Date of Patent:** *****Mar. 20, 2001**

(54) **QUALITY OF SERVICE CONTROL MECHANISM AND APPARATUS**

(75) Inventors: **Thomas A. Lemaire**, Acton; **Paul J. Giacobbe**, Townsend; **John A. Flanders**, Ashland; **David Lipschutz**, Lexington; **Leonard Schwartz**, Bedford; **David C. Ready**, Westwood; **William D. Townsend**, Groton, all of MA (US)

(73) Assignee: **3Com Corporation**, Santa Clara, CA (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/927,650**

(22) Filed: **Sep. 11, 1997**

(51) **Int. Cl.^{7}** **H04L 12/28**
(52) **U.S. Cl.** **370/401**; 370/400
(58) **Field of Search** 370/395, 400, 370/401, 412, 420, 421, 428, 429, 396, 397, 407, 410

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,136,580 * 8/1992 Videlock 370/403
5,353,283 * 10/1994 Tsuchiya 370/230
5,461,611 * 10/1995 Drake, Jr. 370/420
5,485,455 * 1/1996 Dobbins 370/401
5,550,816 * 8/1996 Hardwick 370/392
5,563,874 * 10/1996 Kant 370/252
5,566,170 * 10/1996 Bakke 370/392
5,598,410 * 1/1997 Stone 370/469
5,625,622 * 4/1997 Johri 370/232
5,666,353 * 9/1997 Klausmeier 370/230
5,774,656 * 6/1998 Hattori 395/200.53
5,920,705 * 7/1999 Lyon 370/409
6,094,435 * 7/2000 Hoffman 370/414

* cited by examiner

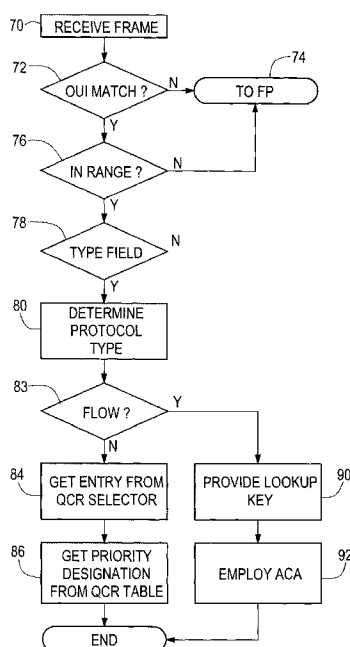*Primary Examiner*—Douglas W. Olms
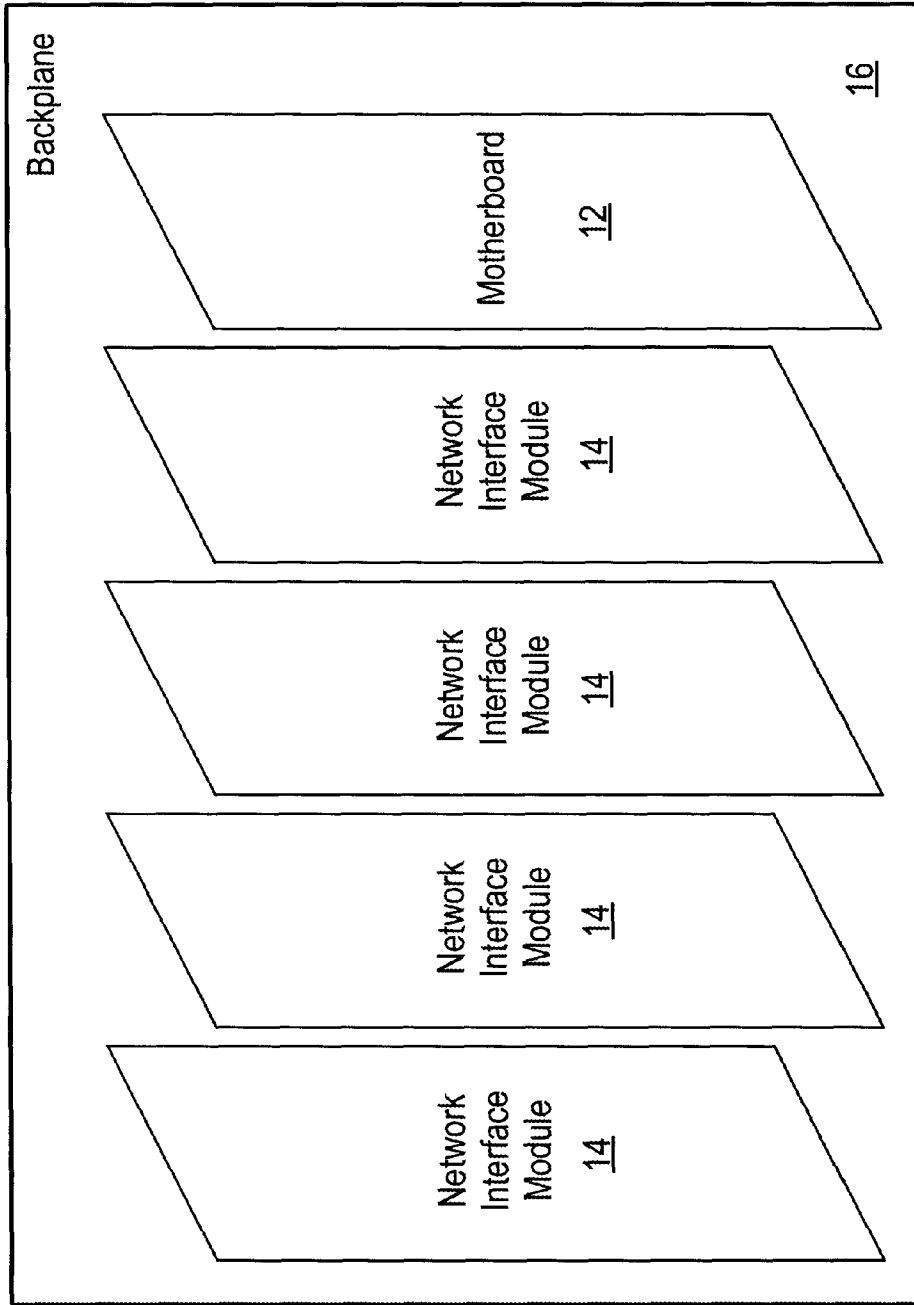*Assistant Examiner*—Ricardo M. Pizarro
(74) *Attorney, Agent, or Firm*—Weingarten, Schurgin, Gagnebin & Hayes LLP

(57) **ABSTRACT**

Quality of Service ("QoS") variables for predetermined protocol Type data units are stored in a cache memory. For data units that are associated with a flow, thirteen bytes selected out of the Internet Protocol ("IP") header are employed as at least a portion of a key to perform a cache lookup to obtain at least one Quality of Service variable from the cache. Both routing and QoS information may be stored in the cache for retrieval upon a single lookup operation.
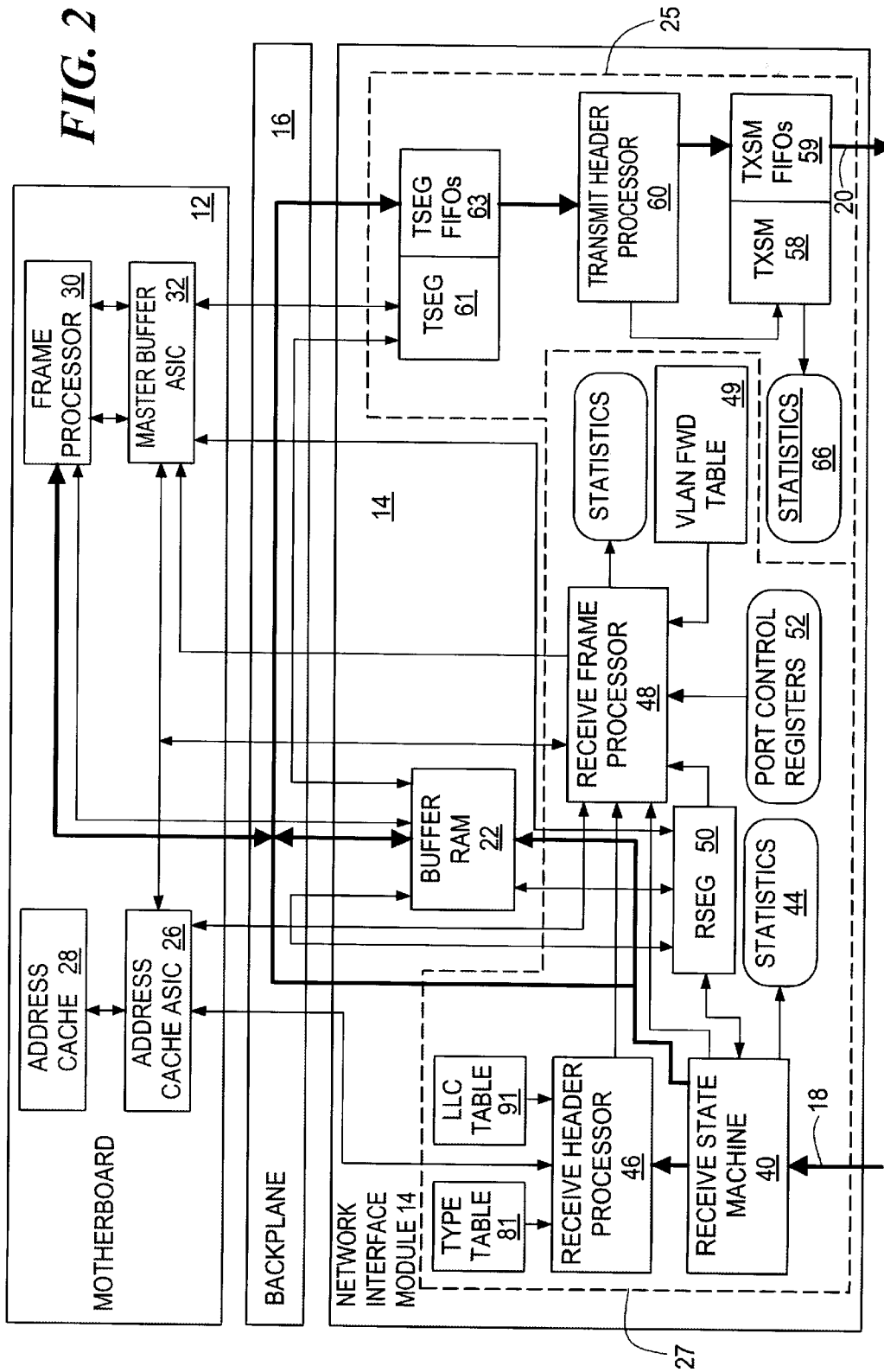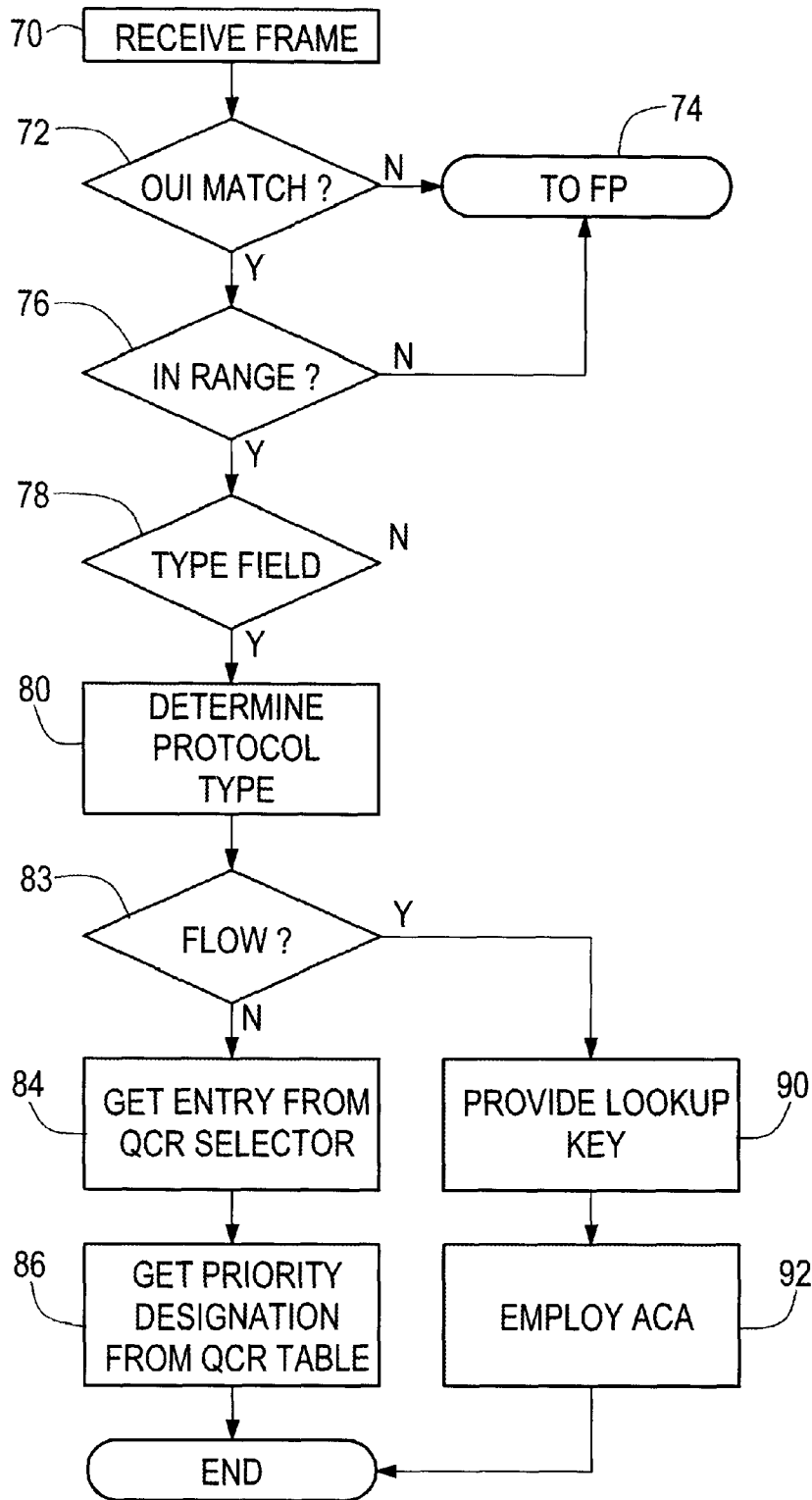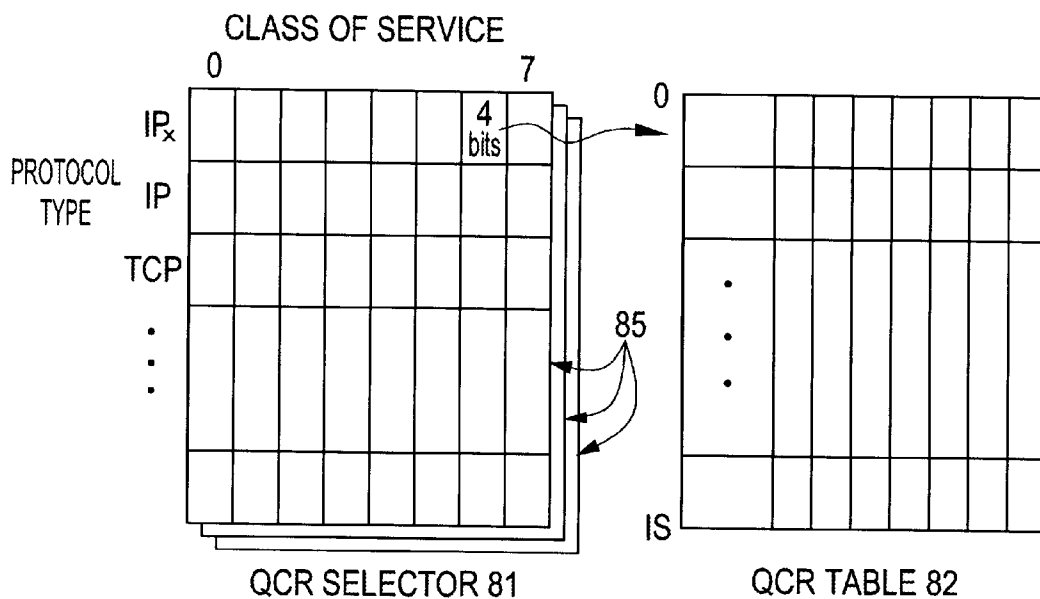
24 Claims, 4 Drawing Sheets

FIG. 1

FIG. 2

70 — RECEIVE FRAME

72 — OUI MATCH ? — N → TO FP — 74

Y

76 — IN RANGE ? — N →

Y

78 — TYPE FIELD — N

Y

80 — DETERMINE PROTOCOL TYPE

83 — FLOW ? — Y →

N

84 — GET ENTRY FROM QCR SELECTOR

90 — PROVIDE LOOKUP KEY

86 — GET PRIORITY DESIGNATION FROM QCR TABLE

92 — EMPLOY ACA

END

FIG. 3

CLASS OF SERVICE

0   7

PROTOCOL TYPE

IPx   4 bits

IP

TCP

85

0

IS

QCR SELECTOR 81   QCR TABLE 82

FIG. 4

QUEUE PRIORITY

QUEUE DEPTH

```
0  1  2  3
0  1  2  3
0  1  2  3
0  1  2  3
0  1  2  3
0  2  1  3
0  2  1  3  END
```
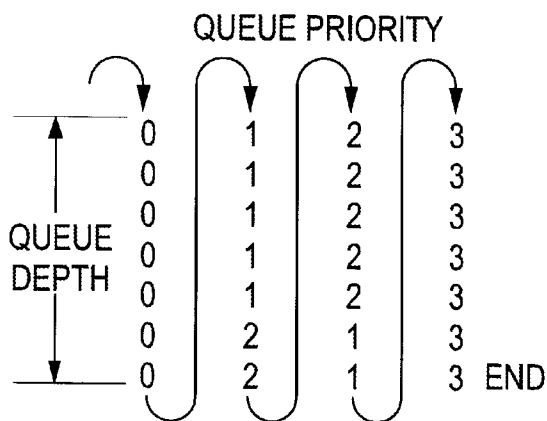
FIG. 5

FIG. 6
```
0 1 2 3
1 2 3 0
2 3 0 1
3 0 1 2  END
```

FIG. 7
```
0 1 2 3
1 0 2 3
0 1 2 3
2 0 1 3
0 1 2 3
1 0 2 3
0 1 2 3
3 0 1 2
0 1 2 3
1 0 2 3
0 1 2 3
2 0 1 3
0 1 2 3
1 0 2 3
0 1 2 3  END
```

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

fastcase®
Smarter legal research.