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Subramanian et al.

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(54) **ROUTING ARCHITECTURE INCLUDING A COMPUTE PLANE CONFIGURED FOR HIGH-SPEED PROCESSING OF PACKETS TO PROVIDE APPLICATION LAYER SUPPORT**

(75) Inventors: **Siva Subramanian**, Cary, NC (US);
Tal I. Lavian, Sunnyvale, CA (US)

(73) Assignee: **Nortel Networks Limited**, St. Laurent (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1028 days.

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Related U.S. Application Data

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(51) **Int. Cl.**⁷ **G06F 15/173**

(52) **U.S. Cl.** **709/238; 709/223; 709/225; 709/226; 709/227; 709/230; 709/232**

(58) **Field of Search** **709/200, 202, 709/223, 225, 226, 227, 238, 239, 230, 232**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,167,033	A	11/1992	Bryant et al.	709/235
5,377,327	A	12/1994	Jain et al.	709/235
5,495,426	A	2/1996	Waclawsky et al.	709/226
5,854,899	A	12/1998	Callon et al.	709/238
6,044,075	A	3/2000	Le Boudec et al.	370/351
6,078,953	A	6/2000	Vaid et al.	709/223
6,092,096	A *	7/2000	Lewis	709/200

6,134,589	A *	10/2000	Hultgren	709/227
6,151,633	A	11/2000	Hurst et al.	709/235
6,157,941	A *	12/2000	Verkler et al.	709/202
6,226,267	B1	5/2001	Spinney et al.	370/235
6,286,052	B1	9/2001	McCloghrie et al.	709/238
6,289,389	B1	9/2001	Kikinis	709/239
6,424,621	B1	7/2002	Ramaswamy et al.	370/230
6,560,644	B1 *	5/2003	Lautmann et al.	709/223
6,570,867	B1	5/2003	Robinson et al.	370/351
6,611,872	B1 *	8/2003	McCanne	709/238
6,611,874	B1 *	8/2003	Denecheau et al.	709/239
6,754,219	B1 *	6/2004	Cain et al.	370/401
6,757,289	B1 *	6/2004	Cain et al.	370/401
6,785,704	B1 *	8/2004	McCanne	718/105
6,792,461	B1 *	9/2004	Hericourt	709/225
6,810,421	B1 *	10/2004	Ishizaki et al.	709/226
6,810,427	B1 *	10/2004	Cain et al.	709/238

* cited by examiner

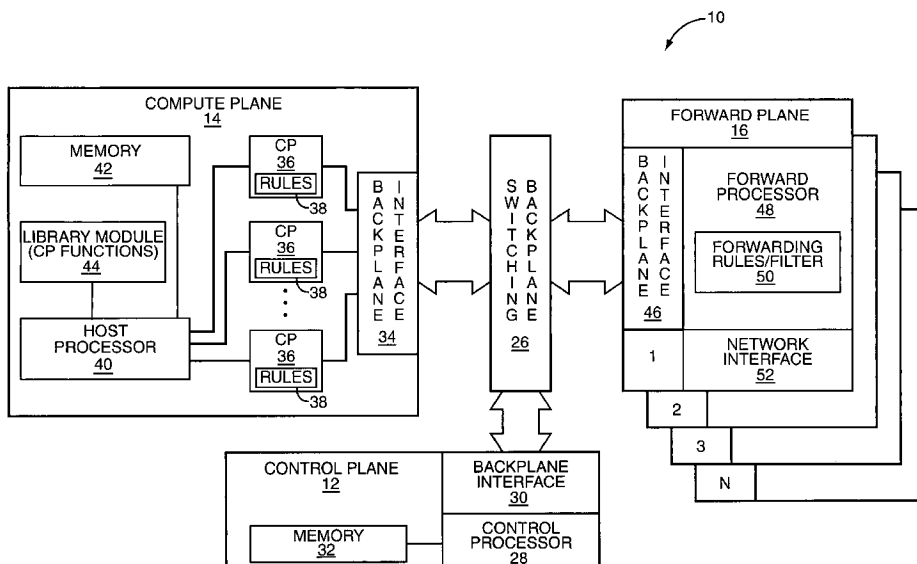
Primary Examiner—Nabil El-Hady

(74) *Attorney, Agent, or Firm*—Withrow & Terranova, PLLC

(57) **ABSTRACT**

The present invention provides a routing architecture including a control plane, a compute plane, and a forward plane. The forward plane provides traditional forwarding of packets to the next-hop address, along with any necessary header manipulation, while the control plane configures the forward plane and the compute plane for desired operation. The compute plane is configured for high-speed processing of packets to provide application level support, including manipulating application data in the payload of the packets during routing. The forward plane preferably implements forwarding rules using filters sufficient to forward a received packet to the next-hop address, to the compute plane for application processing, or to the control plane to facilitate control or configuration.

37 Claims, 4 Drawing Sheets



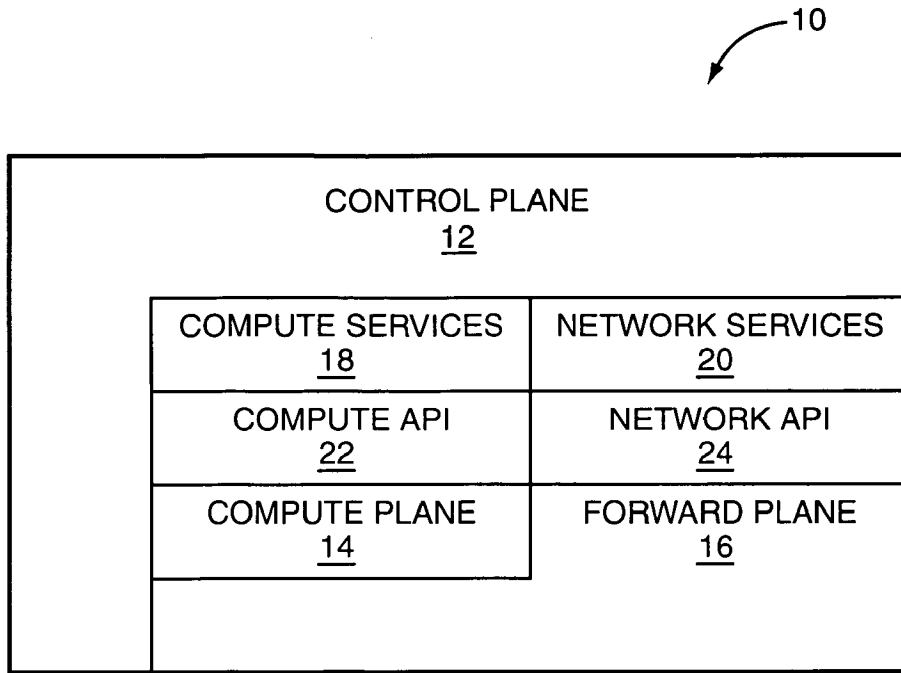


FIG. 1

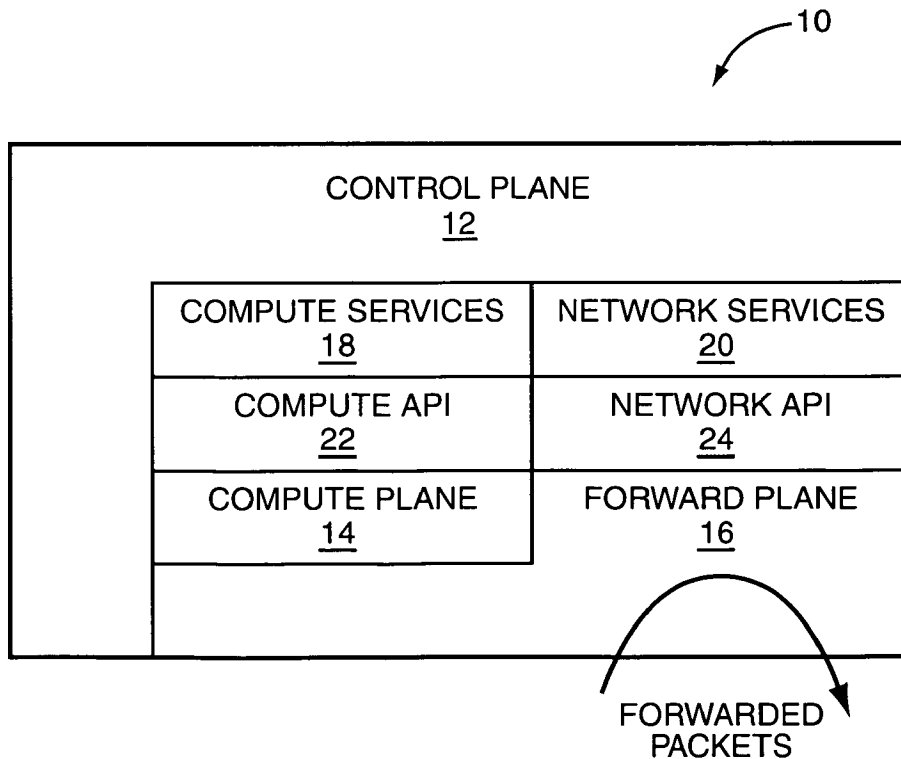


FIG. 2

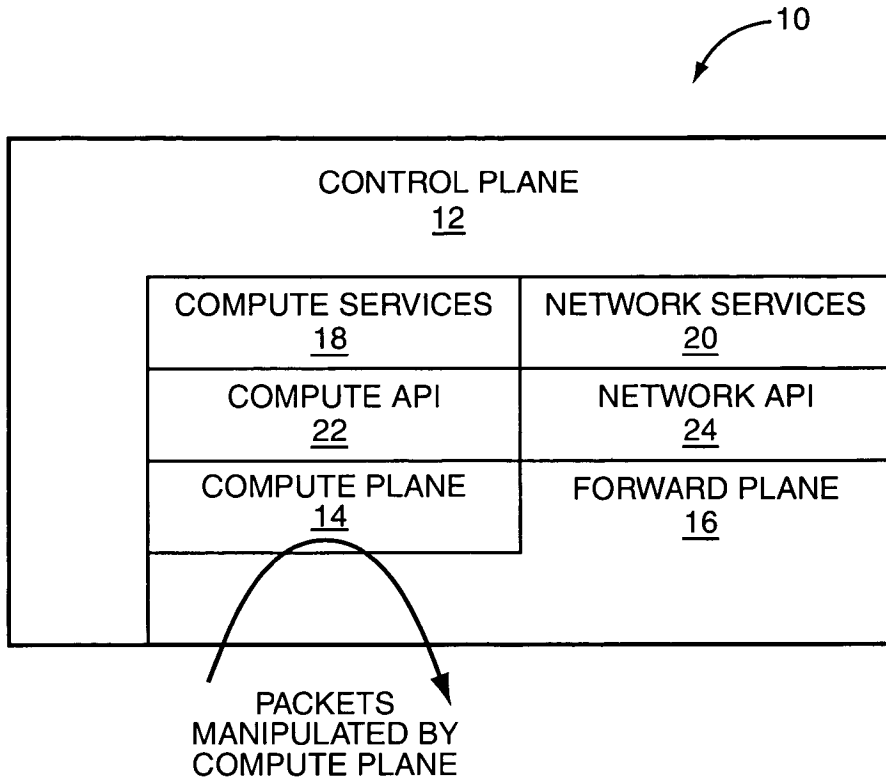
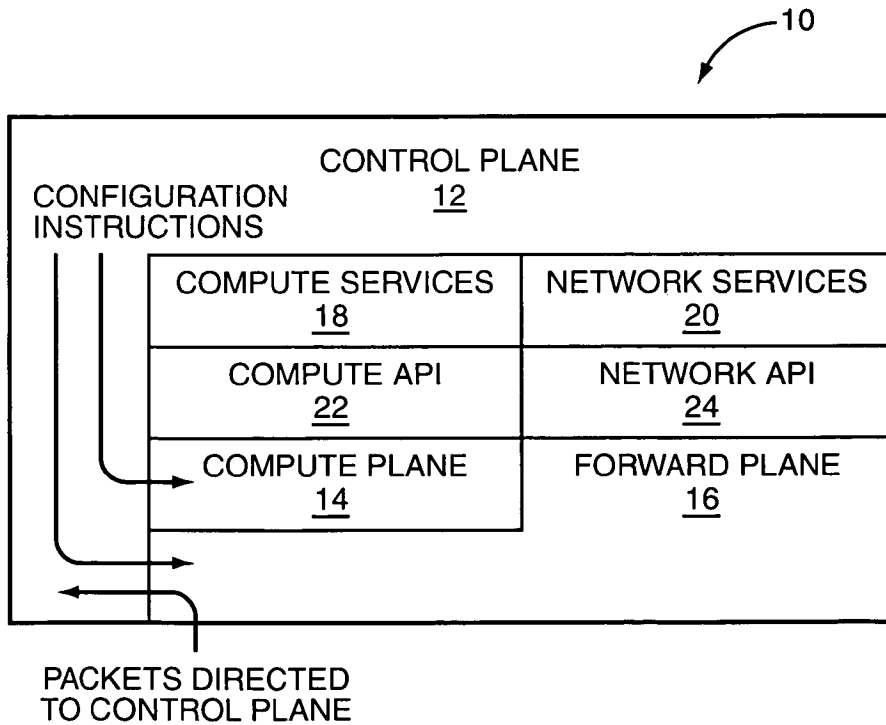


FIG. 3



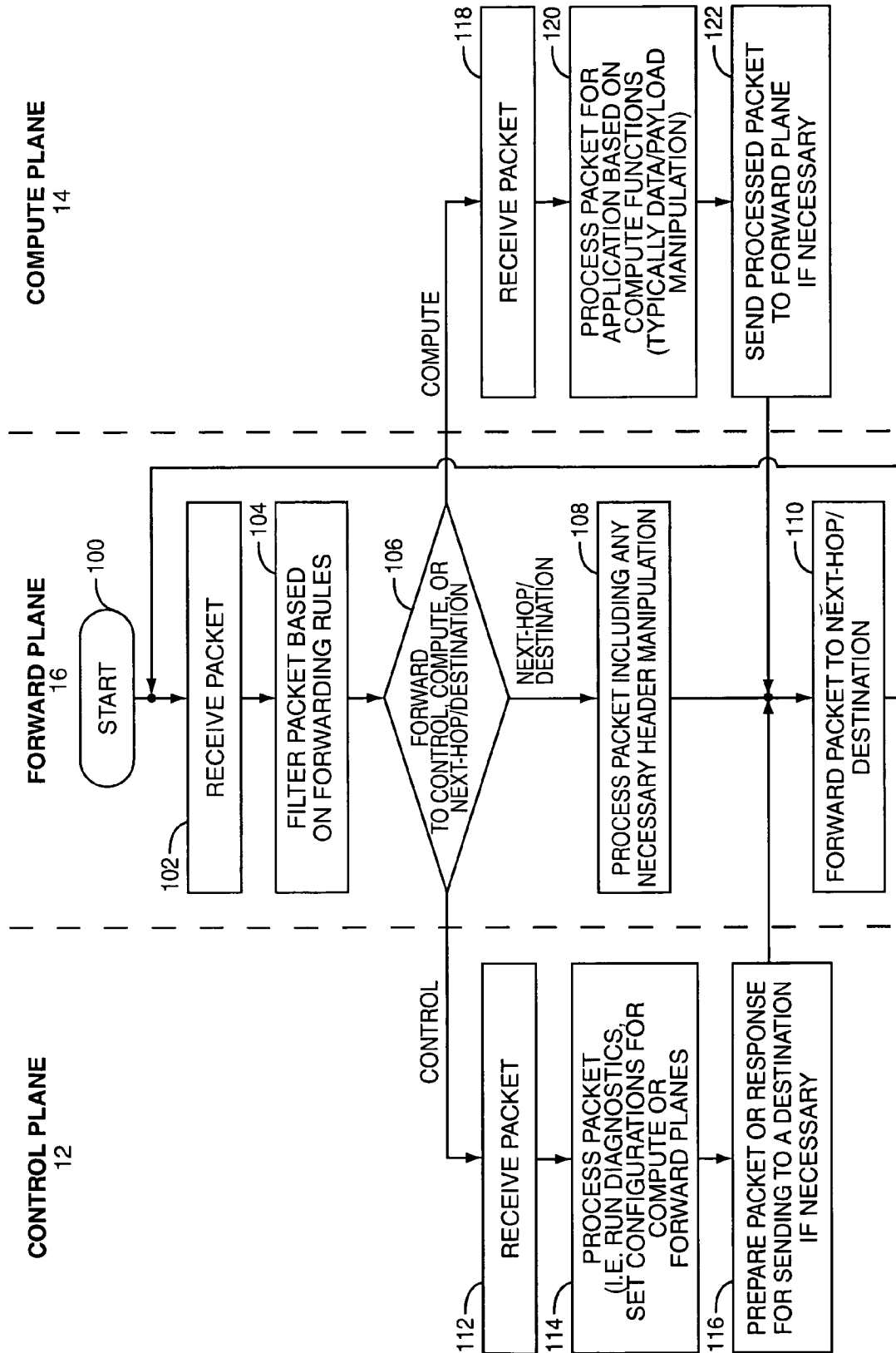


FIG. 5

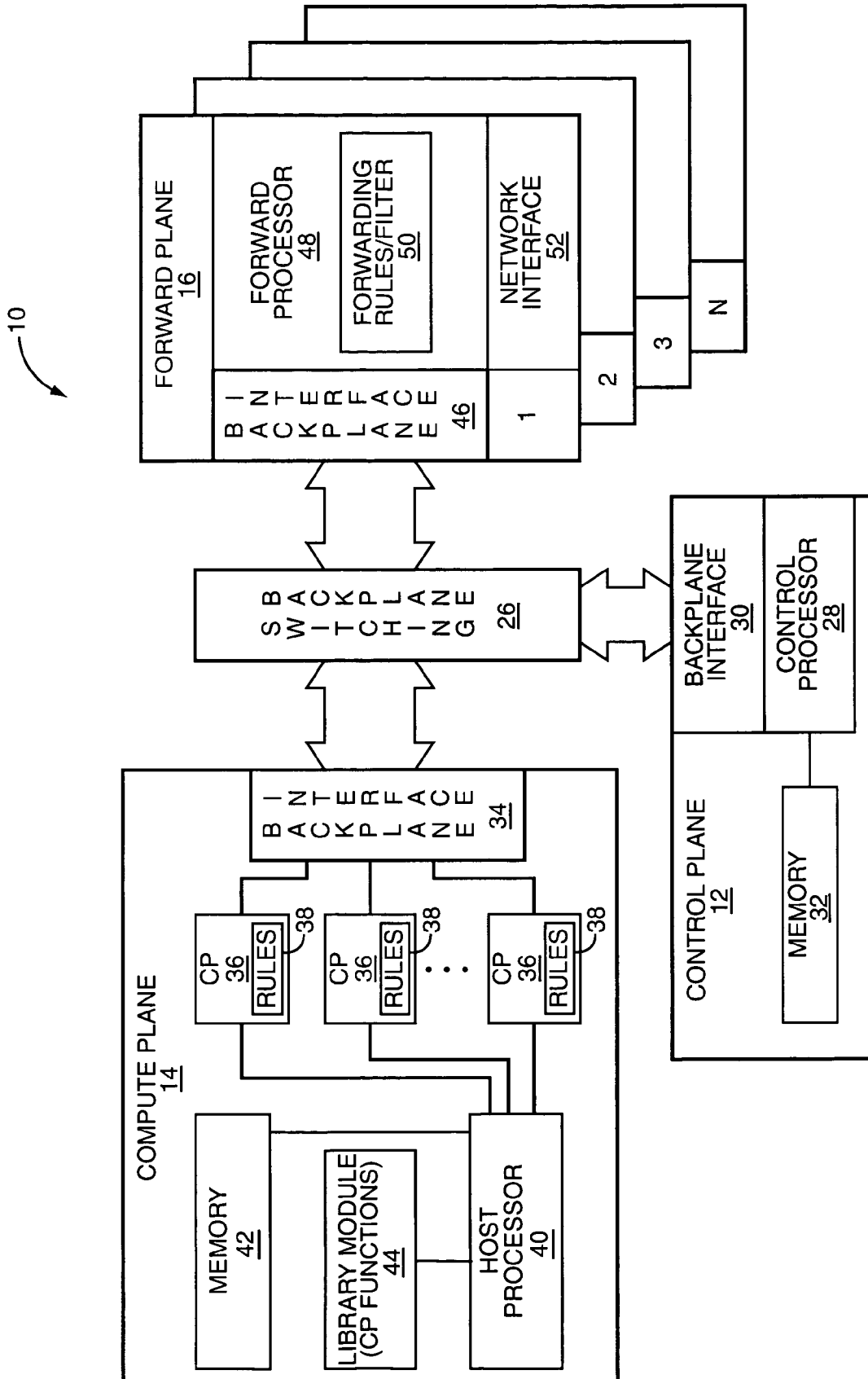


FIG. 6

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