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(415) 576-0200

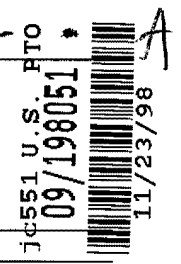
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BOX PATENT APPLICATION

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By: *Kenneth R. Allen*



Sir:

Transmitted herewith for filing is the

- patent application of
- continuation patent application of
- divisional patent application of
- continuation-in-part patent application of

Inventor(s)/Applicant Identifier: Guy Riddle

For: METHOD FOR AUTOMATICALLY DETERMINING A TRAFFIC POLICY IN A PACKET COMMUNICATIONS NETWORK

This application claims priority from each of the following Application Nos./filing dates:  
60/066,962 filed November 26, 1998  
the disclosure(s) of which is (are) incorporated by reference.

Enclosed are:

- 6 sheet(s) of  formal  informal drawing(s).
- A  signed  unsigned Declaration & Power of Attorney

**In view of the Unsigned Declaration as filed with this application and pursuant to 37 CFR §1.53(b), Applicant requests deferral of the filing fee until submission of the Missing Parts of Application.**

DO NOT CHARGE THE FILING FEE AT THIS TIME.

*Kenneth R. Allen*  
Kenneth R. Allen  
Reg No.: 27,301  
Attorneys for Applicant

Telephone: (650) 326-2400

Facsimile: (650) 326-2422

PA 162212 v1

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**PATENT APPLICATION**

**METHOD FOR AUTOMATICALLY DETERMINING A TRAFFIC  
POLICY IN A PACKET COMMUNICATIONS NETWORK**

Inventor:

Guy Riddle (USA)  
18243 Knuth Road  
Los Gatos, CA 95033

Assignee:

Packeteer, Inc.  
(a corporation of Delaware)  
10495 N. DeAnza Boulevard  
Cupertino, California 95014

Entity: Small

TOWNSEND and TOWNSEND and CREW LLP  
Two Embarcadero Center, 8<sup>th</sup> Floor  
San Francisco, California 94111-2824

**METHOD FOR AUTOMATICALLY DETERMINING A TRAFFIC  
POLICY IN A POLICY BASED BANDWIDTH ALLOCATION  
SYSTEM**

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CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority from a commonly owned U.S. Provisional Patent Application, Serial No. 60/066,962, in the name of Guy Riddle, entitled Method for Automatically Determining a Traffic Policy in a Policy Based Bandwidth Allocation.”

Reference is made to:

U.S. Patent No. \_\_\_\_\_, in the name of Robert L. Packer, entitled "Method for Rapid Data Rate Detection in a Packet Communication Environment Without Data Rate Supervision," based on Serial No. 08/762,828 filed 12/6/96 which relates to a technique for automatically determining the data rate of a TCP connection;

Copending U.S. Patent Application Serial No. 08/977,376, in the name of Robert L. Packer, entitled "Method for Managing Flow Bandwidth Utilization at Network, Transport and Application Layers in Store and Forward Network," relates to a technique for automatically allocating bandwidth based upon data rates of TCP connections according to a hierarchical classification paradigm; and

Copending U.S. Patent Application Serial No. 08/742,994, in the name of Robert L. Packer, entitled "Method for Explicit Data Rate Control in a Packet Communication Environment Without a Data Rate Supervision," relates to a technique for automatically scheduling TCP packets for transmission.

The contents of the foregoing patent applications are incorporated herein by reference.

### BACKGROUND OF THE INVENTION

This invention relates to digital packet telecommunications, and particularly to management of network bandwidth based on information ascertainable from multiple layers of OSI network model. It is particularly useful in conjunction with bandwidth allocation mechanisms employing traffic classification in a digitally-switched packet telecommunications environment normally not subject to data flow rate control.

The ubiquitous TCP/IP protocol suite, which implements the world-wide data communication network environment called the Internet and is also used in private networks (Intranets), intentionally omits explicit supervisory function over the rate of data transport over the various media which comprise the network. While there are certain perceived advantages, this characteristic has the consequence of juxtaposing very high-speed packet flows and very low-speed packet flows in potential conflict for network resources, which results in inefficiencies. Certain pathological loading conditions can result in instability, overloading and data transfer stoppage. Therefore, it is desirable to provide some mechanism to optimize efficiency of data transfer while minimizing the risk of data loss. Early indication of the rate of data flow which can or must be supported is imperative. In fact, data flow rate capacity information is a key factor for use in resource allocation decisions. For example, if a particular path is inadequate to accommodate a high rate of data flow, an alternative route can be sought out.

Internet/Intranet technology is based largely on the TCP/IP protocol suite, where IP, or Internet Protocol, is the network layer protocol and TCP, or Transmission Control Protocol, is the transport layer protocol. At the network level, IP provides a "datagram" delivery service. By contrast, TCP builds a transport level service over the datagram service to provide guaranteed, sequential delivery of a byte stream between two hosts.

TCP flow control mechanisms operate exclusively at the end stations to limit the rate at which TCP endpoints emit data. However, TCP lacks explicit data rate control. The basic flow control mechanism is a sliding window, superimposed on a range of bytes beyond the last explicitly-acknowledged byte. Its sliding operation limits the amount of unacknowledged transmissible data that a TCP endpoint can emit.

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Another flow control mechanism is a congestion window, which is a refinement of the sliding window scheme, which employs conservative expansion to fully utilize all of the allowable window. A component of this mechanism is sometimes referred to as "slow start".

5           The sliding window flow control mechanism works in conjunction with the Retransmit Timeout Mechanism (RTO), which is a timeout to prompt a retransmission of unacknowledged data. The timeout length is based on a running average of the Round Trip Time (RTT) for acknowledgment receipt, i.e. if an acknowledgment is not received within (typically) the smoothed RTT + 4\*mean  
10 deviation, then packet loss is inferred and the data pending acknowledgment is retransmitted.

Data rate flow control mechanisms which are operative end-to-end without explicit data rate control draw a strong inference of congestion from packet loss (inferred, typically, by RTO). TCP end systems, for example, will 'back-off', i.e., inhibit  
15 transmission in increasing multiples of the base RTT average as a reaction to consecutive packet loss.

#### Bandwidth Management in TCP/IP Networks

Conventional bandwidth management in TCP/IP networks is accomplished  
20 by a combination of TCP end systems and routers which queue packets and discard packets when certain congestion thresholds are exceeded. The discarded, and therefore unacknowledged, packet serves as a feedback mechanism to the TCP transmitter. (TCP end systems are clients or servers running the TCP transport protocol, typically as part of their operating system.)

25           The term "bandwidth management" is often used to refer to link level bandwidth management, e.g. multiple line support for Point to Point Protocol (PPP). Link level bandwidth management is essentially the process of keeping track of all traffic and deciding whether an additional dial line or ISDN channel should be opened or an extraneous one closed. The field of this invention is concerned with network level  
30 bandwidth management, i.e. policies to assign available bandwidth from a single logical link to network flows.

In a copending U.S. Patent Application Serial No. 08/977,376, in the name of Robert L. Packer, entitled "Method for Managing Flow Bandwidth Utilization at

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