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**Chiruvolu**

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(54) **DOMAIN BASED CONGESTION MANAGEMENT**

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(52) **U.S. Cl.** ..... **370/230.1**; 370/231; 370/235.1
(58) **Field of Search** ..... 370/229–236, 370/400, 401, 410, 412–416, 352–354; 710/52–57

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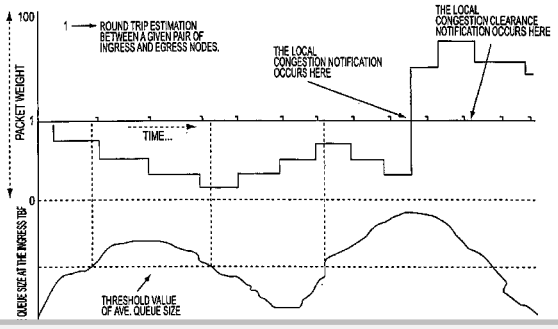
(57) **ABSTRACT**

The Domain-based Congestion Management method and apparatus detects and regulates congestion in a Diff-serv network. It use an improvRED method for congestion detection at the core routers and token bucket filters for traffic regulation at the ingress nodes. In addition, improvRED also provides feedback control. ImprovRED uses three thresholds for detecting congestion: a minth, a maxth and a FeedbackThreshold, which lakes a value between the minth and the maxth thresholds. Whenever the average queue size is greater than minth and less than Feedback-Threshold, all outgoing packets are marked appropriately to indicate a potential onset of a congestion period. When the average queue size is greater th FeedbackThreshold (but less than maxth) packets are dropped probabilistically and all the outgoing packets are marked appropriately to denote the dropping phase. When the average queue size is greater than the maximum threshold, all incoming packets are dropped.

**42 Claims, 16 Drawing Sheets**



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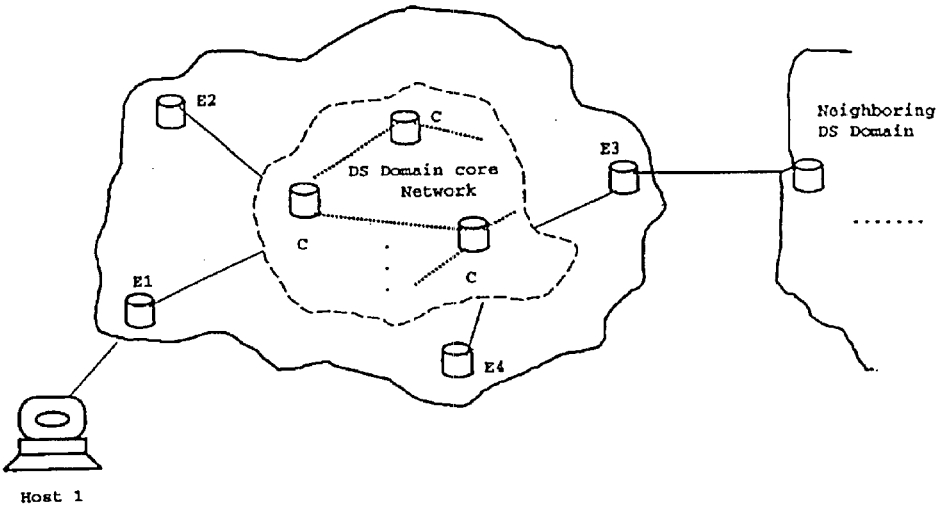


Fig. 1

DIFF-SERV DOMAIN

(PRIOR ART)

```
On every packet arrival

Calculate the average queue size based on exponential moving weighted average ← 100
if ( average queue size < minth) enqueue the packet ← 110

if ( minth < average queue size < FeedbackThreshold )
{

enqueue the packet, ← 120
mark the bits (bit1,bit2) for all outgoing packets queue with (1,0), if the bits are not
previously set as (1,1) ← 130
}
if ( FeedbackThreshold ≤ average queue size < maxth)
{

drop or enqueue the packet with the probability as decided by RED ← 140
mark the bits (bit1,bit2) for all outgoing packets with (1,1) ← 150

}

if (average queue size > maxth) drop the incoming packets ← 160
```

MODIFICATIONS TO THE RED ALGORITHM AT CORE NODES

FIG. 2

| Bit1 | Bit2 | Inference at the egress node |
|---|---|---|
| 0 | 0 | No congestion detected so far up to this domain |
| 0 | 1 | No local congestion, but Congestion occurred in a prior domain |
| 1 | 0 | Local congestion occurred, but no packet loss phase |
| 1 | 1 | Local congestion occurred and in packet loss phase |

A SIMPLE TWO-BIT SCHEME FOR REPRESENTING LOCAL DOMAIN CONGESTION

FIG. 3

DOCKET ALARM

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