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IML

Answers

Digital Communication II

Question 1

a) IntServ provides per microflow (indentified by source, dest, protocol, source port, dest port) guarantees while DiffServ provides per class guarantees. DiffServ require classification and policing at the edges, but once traffic is admitted the network knows that traffic conforms to some prior agreement (the SLA). In DiffServ, therefore, there is no need to maintain per microflow state within the network. In IntServ any guarantees provided are provided to microflows and so per microflow state must be maintained.

IntServ can make quite strong guarantees each time a microflow request is agreed; the resources required can be identified accurately. DiffServ requires that SLAs be provisioned for; this is not always easy so the guarantees (except for precise SLAs) will be somewhat probabilistic.

Inside an IntServ network routers have to provide per microflow queueing mechanisms or ensure in some way that microflows are protected from each other. Inside a DiffServ network routers need only provide a relatively small set of queuing classes. The IntServ routers would also have to implement a per microflow reservation protocol such as RSVP. DiffServ routers may have to implement some class allocation protocol but this would only be exercised on network management timescales (ie when an SLA changed).

On the edge of a DiffServ network, routers must groom traffic. This will include classification, policing and shaping.

b) Single ended SLAs are difficult to provision for since they don't say anything about where the traffic is going. If traffic is entering a network all one can do is assign some probability that it will go to a particular destination. In the extreme case where an absolute guarantee is needed that the traffic will be carried no matter what the destination, one has to allocate resource on a spanning tree to every destination, hardly a practical proposition in a large network. With double ended SLAs, the resource requirements can be identified accurately (although the resources will be reserved at all times) and thus a more efficient allocation results.

In the example, the double ended SLA would give rise to an allocation precisely as in the table, in the single ended SLA, the allocation for an absolute guarantee would be:

A to B 2
A to C 2
B to A 3
B to C 3
C to A 4
C to B 4

Question 2

a) The formula provides a moving average of round trip times, updating the current round trip time with observations. The greater the weight attached to recent observations, the close alpha is to zero. Observations can be taken from acknowledgements which acknowledge packets which have only been sent once. (There will be ambiguity in using acknowledgements of retransmitted packets. Getting an initial value for the RTT is difficult since there are a wide range of possibilities. Implementations tend not to remember RTTs from one connection to the next even within a set of transactions with the same destination. TCP implementations therefore have to be rather shy about timeouts when they start up. The formula will produce bad estimates under congestion when the variance is high or when routes are fluctuating. A TCP implementation is not so much concerned about the RTT as some high percentile of the RTT.

b) A TCP implementation can be more aggressive than it is allowed to be. The end user may actually see better performance than a well behaved implementation. This aggression would take the form