

ECSE-6600: Internet Protocols

Informal Quiz #11 SOLUTIONS

Shivkumar Kalyanaraman:
GOOGLE: "Shiv RPI"
shivkuma@ecse.rpi.edu



QoS (Slide set #12): Informal Quiz SOLUTIONS

QoS

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- √ A flat priced, undifferentiated best-effort service offering is a solid long-term non-commodity business
- √ Better-than-best-effort services would help spur new performance-hungry applications to be deployed on the Internet
- √ QoS, broadly speaking, is a spectrum of performance capabilities (specified or measured) ranging from best-effort to that of a leased line.
- √ A metric is specified “a priori” and “parameters” are measured “a posteriori” in a QoS system
- √ QoS is considered to be better if fewer parameters are specified at coarse granularity
- √ A FIFO service discipline can provide isolation between flows.
- √ Given a constant set of resources, the bandwidth and delay allocations is a zero-sum game irrespective of the scheduling approaches chosen
- √ Signaling is an example of a data-plane QoS mechanism
- √ An SLA is a control plane building block used to specify the service performance level, and may have other economic and legal agreements specified.
- √ Scheduling refers to the choice of packet to transmit, whereas buffer management refers to the decision to enqueue or drop a particular packet
- √ RTP is an example of a network-level QoS mechanism that raises the performance offered to applications.

QoS (contd)

- √ A token bucket bounds the characteristics of inbound traffic into a QoS network (I.e. creates a predictable traffic envelope)
- √ An arrival curve and service curves are cumulative functions of the number of bits arrived or serviced at a network element respectively.
- √ Arrival and service curves are useful to understand QoS performance parameters such as the worst case delay, buffer reqts, average service rates etc
- √ Priority queuing provides service isolation only for the highest priority flow, whereas round robin provides isolation for every flow.
- √ A delay guarantee can be provided by only using WFQ at the routers
- √ Service isolation and differentiation still does not guarantee avoidance of congestion collapse (which is an end-to-end problem)
- √ RED (the buffer management scheme) can provide service isolation between a mix of TCP and UDP flows
- √ Virtual time refers to the service that backlogged flow with weight = 1 would receive in a GPS scheduler.
- √ In a work-conserving GPS scheduler, every flow receives the same normalized service (service normalized by weights), which is also equal to the normalized average service (total service normalized by sum of weights).
- √ GPS scheduler provides weighted max-min fair allocations to competing flows

QoS ...

- √ FQ and WFQ transmit packets in the order of their finish times in an ideal bit-by-bit round robin or GPS scheduler
- √ FQ isolates/protects a flow against a misbehaving flow when RED would not
- √ Int-serv is an example of a stateless QoS architecture
- √ Diffserv is an example of a stateless QoS architecture
- √ Admission control is a function performed in the data-plane
- √ RSVP provides QoS routing capabilities
- √ RSVP PATH messages are used to identify the reverse path from receivers to any sender
- √ RSVP provides signaling for both unicast and multicast flows.
- √ In the differentiated services model, interior routers must handle fine-grained signaling and policy functionality
- √ Differentiated services would provide better-than-best-effort service in a scalable manner.
- √ Differentiated services architecture fully specifies the service semantics in a manner similar to int-serv's guaranteed and controlled load services
- √ The expedited forwarding PHB in diff-serv can be used to create a guaranteed bandwidth, low jitter service.

- ✓ The DPS approach moves state from the edge to the core of the network
- ✓ □ The DPS approach or edge-based closed-loop building blocks can be used to compose QoS services over multiple autonomous systems.
- ✓ □ One reason TCP is not best suited for video is because it can't handle multicast
- ✓ □ RTP provides useful transport functions for multimedia applications, but the network services are provided by RSVP, integrated services and differentiated services
- ✓ □ H.323 provides call control and codecs in addition to RTP
- ✓ □ A content delivery network is like a reverse web cache, paid for by the content provider to bring content close to the user, and hence impact performance