ECSE-6600: Internet Protocols

Informal Quiz #09

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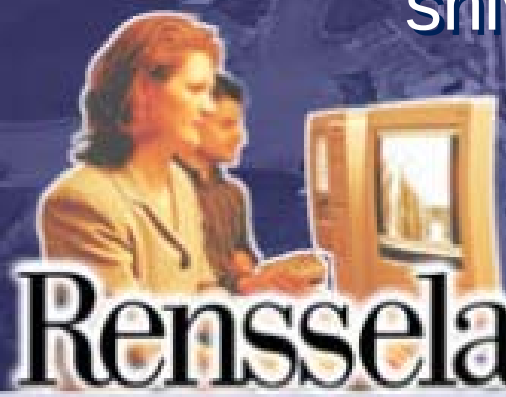

Rensselaer

RSVP

Multicast (Slide set #10): Informal Quiz

Multicast

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- ☐ ☐ Multicast is useful for one-to-many data-delivery applications where the receivers are interested in receiving the same information at roughly the same time.
- ☐ ☐ Multicast only saves bandwidth, and does not save on operating system resources like processes/threads etc.
- ☐ ☐ Multicast is superior to replicated unicast, in that the sender does not necessarily need to maintain state or process control traffic for each receiver, and does not duplicate transmissions on shared links to other receivers
- ☐ ☐ IP multicast places the relaying function at the network layer, whereas application multicast places it at the application layer.
- ☐ ☐ Application level multicast may be inefficient in terms of bandwidth usage, and may not be scalable in terms of the routing algorithms (I.e. tree maintainence) used
- ☐ ☐ The original IP multicast model uses a “closed” group model, and allows only limited size and dynamism in terms of group membership
- ☐ ☐ The original IP multicast model assumes that senders know the set of receivers.

Multicast

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- ☐ ☐ The original IP multicast is very simple from the perspective of the source, because it just uses the group address as the destination address
- ☐ ☐ The address resolution part of IP multicast (to get a link level multicast address) is more complex than ARP (used for unicast)
- ☐ ☐ The simple address resolution allows receivers to easily listen to ongoing multicast transmissions to the group on their subnets
- ☐ ☐ Besides address resolution, receivers explicitly try to join multicast groups using the IGMP procedure
- ☐ ☐ An IP multicast routing tree is built and maintained using the combination of IGMP (at the leaves) and a routing protocol
- ☐ ☐ TTL scoping allows both nested and overlapping scopes
- ☐ ☐ A packet addressed to 225.13.40.3 will not leave the site (or administrative domain)
- ☐ ☐ In IGMP, the querier sends a membership query to every group address separately
- ☐ ☐ In IGMP, all members of the group respond to the membership query.
- ☐ ☐ In IGMP, the membership report is broadcast to all nodes on the subnet.

Multicast (contd)

- On Ethernet-based broadcast domains (even if switches are used), even though multicast restricts the number of receivers interrupted by multicast transmissions, such transmissions are flooded to all collision domains and eats up *link and network* bandwidth just like broadcast.
- IGMPv2 allows receivers to join a list of source-specific groups, I.e. a list of (S,G) pairs.
- IGMPv2 requires explicit leave group messages, and reduces leave-latency and tree-prune latencies.
- A multicast routing protocol builds unicast paths from the source to every destination in the multicast group.
- A multicast routing protocol has to actively discover the existence of new receivers or sources and connect them through one or more distribution trees.
- The anonymity, open/dynamic group semantics of the original IP multicast model dramatically simplifies IP multicast routing.
- PIM-SM uses a flood and prune approach of multicast routing.

Multicast (contd)

- Scalability in multicast routing is typically achieved by using shared trees and not requiring off-tree state.
- DVMRP uses a data-driven routing approach (I.e. it computes trees only when the data actually shows up)
- Explicit join refers to the sources explicitly searching for a (S,G) based distribution tree and joining with it.
- DVMRP performs (among other things) a reverse path check before forwarding packets
- RPM refers to the combination of a reverse path check for the current node, a reverse path check for the child node, truncation of leaves which do not have receivers, and on-demand pruning of branches (I.e. multiple router hops) which do not have receivers.
- DVMRP keeps (S,G) state in routers even after pruning, to allow the possibility of grafting.
- The MBONE (which used DVMRP) was suitable for a large number of multi-way, highly interactive videoconferences.
- PIM is a multicast routing protocol that is tied to RIP and OSPF as its underlying unicast routing protocols.
- Reliable multicast transport protocols try to optimize reverse control traffic and retransmission traffic so that the efficiency benefits of multicast are not lost
- Source-based trees are efficient in terms of the state maintained in routers

Multicast (contd)

- Shared trees are efficient in terms of routes from sources to destinations
- The MSDP protocol works across domains and solves the problem of discovering the rendezvous point (RP) in the source-domain
- The MASC protocol assigns group addresses randomly to groups all over the Internet
- RTP does not provide acks or NAKs, and therefore is not a reliable multicast transport protocol
- Implosion refers to the inefficient transfer of packets and retransmissions from sources to group receivers
- Subcasting would solve the ack or NAK implosion problem
- All reliable multicast protocols use the temporal redundancy scheme (similar to TCP)
- Multi-rate multicast congestion control schemes usually involve sending congestion indications back to the source which controls the transmission rate
- Single-rate multicast congestion control schemes have to solve the problems of drop-to-zero and TCP friendliness.
- The SSM paradigm solves access control, source-discovery and address allocation problems elegantly compared to the original IP multicast model
- Application-level multicast is useful for small groups.
- Application-level multicast builds overlay trees on top of overlay meshes based upon performance measures of point-to-point links of the mesh