User Datagram Protocol (UDP)

Introduction

User Datagram Protocol (UDP) is a connectionless transport protocol and part of the TCP/IP protocol suite. UDP provides instruction for applications that involve setting up encapsulated IP data without the need to set up a connection between hosts (e.g., the three-way handshaking TCP). This means that UDP is an unreliable service with no guarantee of delivery or duplication of packets. The benefit of UDP is in the reduction of overhead of the protocol, and it is suitable in many applications.

UDP Segments

A UDP packet consists of an eight-byte header followed by the IP payload consisting of the source and destination ports and the UDP length which is the length of the packet. This is followed by the UDP checksum. There is no error control, retransmission, or flow control in UDP. Timeouts and requests for retransmits correct errors in delivery because UDP packets are smaller than TCP. UDP is very good in client/server environments where small packets are common between client and server. Many Internet applications use UDP (e.g., domain name service (DNS)).

Remote Procedure Call

Remote Procedure Call (RPC) can be considered as a type of Application Programming Interface (API) used to network layer programming. The idea behind RPC is so programmers do not have to worry so much about the networking details and can concentrate on the task at hand. When a client needs some data from a server, it initiates a RPC request on the server. These RPC’s, even though called from a client and responded to from a server, act as though it is a local call on the client. The client will normally run a process, issue an RPC and suspend execution of its process, wait for the result, and then resume the process that was suspended. To a programmer, an RPC is no different than a library call, which makes programming easier. There are some problems in programming with RPC’s. In typical programming, a pointer is passed to a subroutine; the subroutine is run and the results are passed back to the way of the point. With RPC’s, however, a pointer cannot be passed since the client and server are in different address spaces. Parameters passed with RPC are strictly limited because of this. Additionally, even passing parameters is difficult. For example, calling a simple RPC that requests the directory space of another machine (i.e., using the UNIX directory command ls–al) may not work because, on the other system, a directory command may not use the syntax ls–la. The same situation happens with global variables; these variables may not be the same on the local machine as they are on the server. Even with these issues and the constraints on parameter passing, RPC is well known and used in Internet programming.

Real-Time Transport Protocol
One area of work and development in UDP, which is widely used, is client/server RPC and real-time multimedia applications. Internet radio, videoconferencing, and internet telephony make use of real-time client/server RPC. Real-time Transport Protocol (RTP) multiplexes feed from audio, video, etc. and transport them on UDP data packets. Further, these UDP data packets can be unicasting, meaning to only one host, or multicasting, meaning the same UDP data packets can be destined for multiple hosts, thereby saving bandwidth and delivery time.

Summary

This presentation introduced the User Datagram Protocol (UDP)—a connectionless, with no guarantee of delivery, unreliable type of data transport. Even with these limitations, the benefits of UDP include the reduction of data traffic in the protocol, the ease of network programming using Remote Procedure Calls (RPC), and its wide use in multimedia applications.