Birla Institute of Technology & Science, Pilani
Pilani Campus

**II SEMESTER 2020-2021**
**Assignment-2**

**Course No.:** **IS F462** **Course Title:** **Network Programming**
**Deadline:** **As on Canvas** **Maximum Marks:** **60M (15%)**

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**Note:**

- Maximum of three students per group. Upload code in Canvas.
- Name your file idno1_idno2_idno3_assignment1.tar .

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**P1.** A file contains N (>10000) IPv4 or Ipv6 addresses of hosts. A programmer wants to find out RTT values for each of them as quickly as possible using I/O multiplexing. Conceive and implement a program which computes RTT values for each of the hosts. Program should measure RTT three times for every host and print all three RTTs in one line like {hots – RTT1 RTT2 RTT3}.

- Your program should take a text file with one IP (v4/v6) address per line as command line argument.
- Program should use a proper method to compute correct RTT values.
- Program should use all possible methods to increase throughput (number of ips/time).

Deliverables:

- Brief Design Document (.pdf)
- rtt.c

[20 M]

**P2.** In this problem implement pre-forking model for a web server with the following specifications.

- Parent process starts up the server and creates a process pool with each child calling accept() call.
- Server should be self-regulated as per the incoming traffic. Parent should regulate the process pool according to the parameters specified: MinSpareServers, MaxSpareServers. These parameters are specified as command line arguments to the server.
- The MaxSpareServers is the desired maximum number of idle child server processes. An idle process is one which is not handling a request. If there are more than MaxSpareServers idle, then the parent process will kill off the excess processes.
- The MinSpareServers is the desired minimum number of idle child server processes. An idle process is one which is not handling a request. If there are fewer than MinSpareServers idle, then the parent process creates new children: It will spawn one, wait a second, then spawn two, wait a second, then spawn four, and it will continue exponentially until it is spawning 32 children per second. It will stop whenever it satisfies the MinSpareServers.
- Server should recycle the child once it finishes handling MaxRequestsPerChild number of connections. This parameter is also taken as command line parameter.

- Child waits over listening socket. Whenever it accepts a connection, it prints its pid, client's ip and port. Child receives the HTTP request, sleeps for 1 second, and sends a dummy reply.
- Whenever a parent makes a change to the process-pool, it prints the number of children in process pool, number of clients being handled, action being taken, post-action status.
- Use UNIX Domain sockets for any parent-child communication.
- By sending Ctrl-c signal, parent process prints number of children currently active, and for each child how many clients it has handled.
- Server takes care of zombie processes.
- httperf or ab tool can be used to generate traffic to test web server.

Deliverables:

- Brief Design Document (.pdf)
- prefork_server.c

[20 M]

**P3.** Consider the need for group communication among the users on the LAN. Design a solution using IP multicasting and broadcasting for these requirements.

- Users can create groups of their interest.
- Any user can search for existing groups using relevant keywords on the LAN. User should get a reply with group multicast ip and port.
- Users can join groups of their interest. A user can be part of multiple groups.
- A user can send messages to one group at a time but receive message from multiple groups.
- Every 1 minute, communication client shares the file names available (and can be requested by members) with it with all members in the group. If a receiving client is part of other groups, the same list is shared with all other groups.
- If user can't find a file name in the list with him/her, user can search for a file by circulating a special message in the group. This message is propagated to other groups also if the client is part of multiple groups. The replies received within a minute are consolidated and sent directly to the requester in a unicast. File is downloaded by using unicast communication.
- A user can initiate a poll asking members to vote using special message. This message is restricted to that group only.
- There should be no central server hosting data. All data is managed by the nodes themselves.

Deliverables:

- group_comm.c
- pdf file explaining design decisions

[20M]

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