Communication with sockets and threads on a network
Due Tuesday December 14, 2021 at 11PM

For this assignment you will write 3 related programs "manage", "report", and "compute". You should hand in files manage.c, report.c, and compute.c to implement the functions described below. Hand them and a Makefile in your cs551/lab4 directory.

Manage's job is to coordinate the computations done by the "compute" processes. It is the first process started, and takes just one argument, the tcp port number to be used for communication. Manage starts up, does any initialization needed and waits for connections.

Compute's job is to compute perfect numbers. One or more computes can be started on any machine on the network. It takes three command line arguments, a hostname for manage, a port number for manage, and the number of threads it should use for computation. Compute connects to the manage process, and sends it a startup request, including the number of threads it will be using. Manage replies with one search range for each thread. Manage only gives out ranges that have not been tested. "Compute" sends manage any perfect number it finds, as it finds it (not at the end of a range). When one of its threads finishes its range, compute requests a new one from manage and gets that same thread to start on the new range.

Report's job is to query "manage" and print out the perfect numbers found (including which host found each), and for each compute running the hostname it is running on, how many numbers it has tested, and what the current ranges it is working on are. The number tested involves manage asking each compute for the number at the moment for the running threads. Report's first two arguments are the same as "compute" and identify the node and port of "manage". If invoked with the "-k" switch as a third argument, it also is used to inform the Manage process to shut down computation.

All "computes" should terminate cleanly on INTR, QUIT, and HANGUP signals. This means they stop computing and send "manage" a message saying they are terminating.

If "manage" receives one of these signals, or the -k message from report, it sends each compute a message to terminate immediately.

Manage should time each compute's last range and adjust the length of the new range for a target of 15 seconds.

SAMPLE REPORT

Perfect Numbers:

PN	(host)
6	(host1)
1310071	(host2)

Computes:

Host	Tested	Ranges
host1	2456	2-2000 4001-10000 110001-120000
host2	4567	22001-24000 130000-170000