Programming Assignment 3

Internet worm propagation simulation

Instructions to run:

Random worm:

Compile: $ gcc randomworm.c –o randomworm.out

Execute: $ **./randomworm.out**

Output: random_out.txt

Local Preference worm:

Compile: $ gcc localworm.c –o localworm.out

Execute: $ **./localworm.out**

Output: local_pref_out.txt

Variables Used:

Scan_rate=2; → eeta, num of scans within that IP address space

Address_space =100000 → Omega, address space

simulTime =1400 → Num of time ticks

simulN =3 → Three simulations.

It[sim][tick] → array to store infected IP at that tick and simulation.

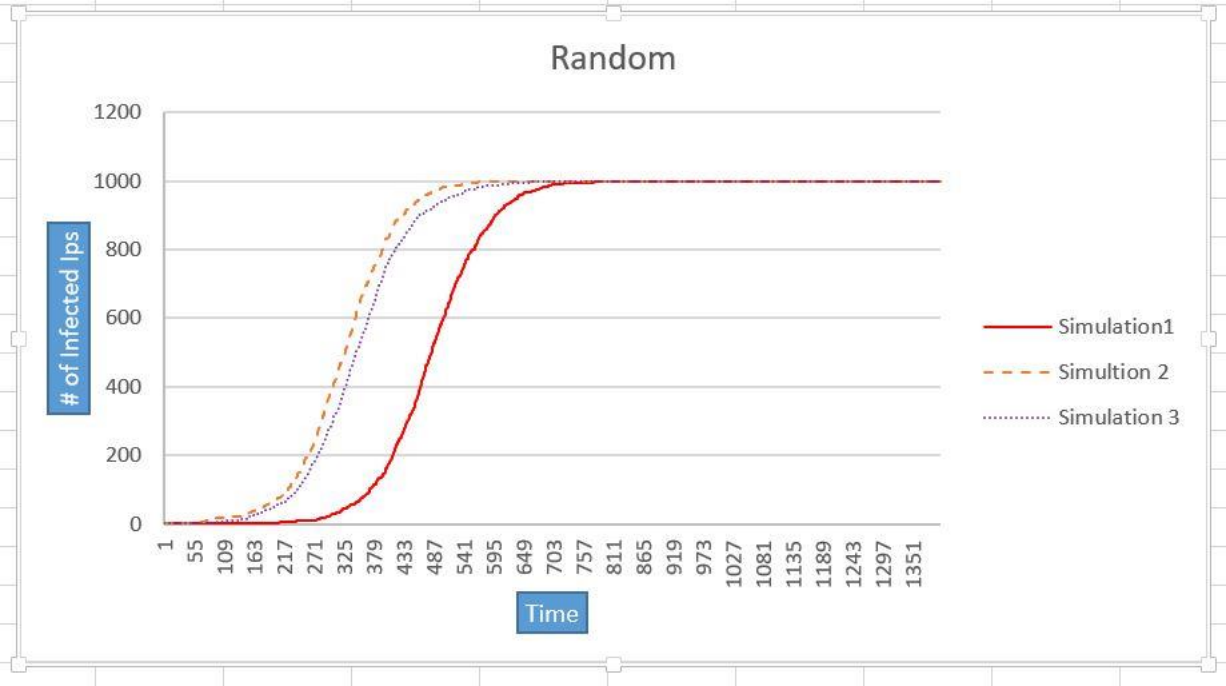
Simulation of Random worm propogation:

Discrete-Time-Simulation technique is used to model the worm propagation. Since only 1000 machines from 100000 IP addresses are vulnerable the simulation takes time.

The simulation is designed as follows:

- Simulation time is chosen as 1400. Create a method for random_num generation between 0 and 1. Initialize nodestatus of all IPs in address spaces as empty and then set all he given susceptible IPs as Susceptible.
- In random worm propagation for each time tick, each infected IP scans at a scan rate of 2, and if the IP addresses are susceptible and are not infected already, those will be infected.
- nodestatus vector keeps track of infected and non infected and suseptibile IPs. Three simulations are carried out with the help of for loop and a while loop is set for simulation time of 1400 ticks.
- Inside the while loop for each infected machine generate 2 new ip addresses and check if they are susceptible and not infected, and then infect them and incremented the value in infected_Ip num accordingly.

- Once we cover all infected IPs for that time tick at that scan rate, we store the updated IP counter in It array for that simulation and for that time tick.
- Once all the simulation is done, we write the output in random_out.txt file.
- We then import it to excel Rsheet.xls and plot the following chart.



The figure shows number of infected computers at each time tick. We can see that by 792th time tick all the 1000 machines are infected. In the figure we showed the curves for 3 runs of simulation.

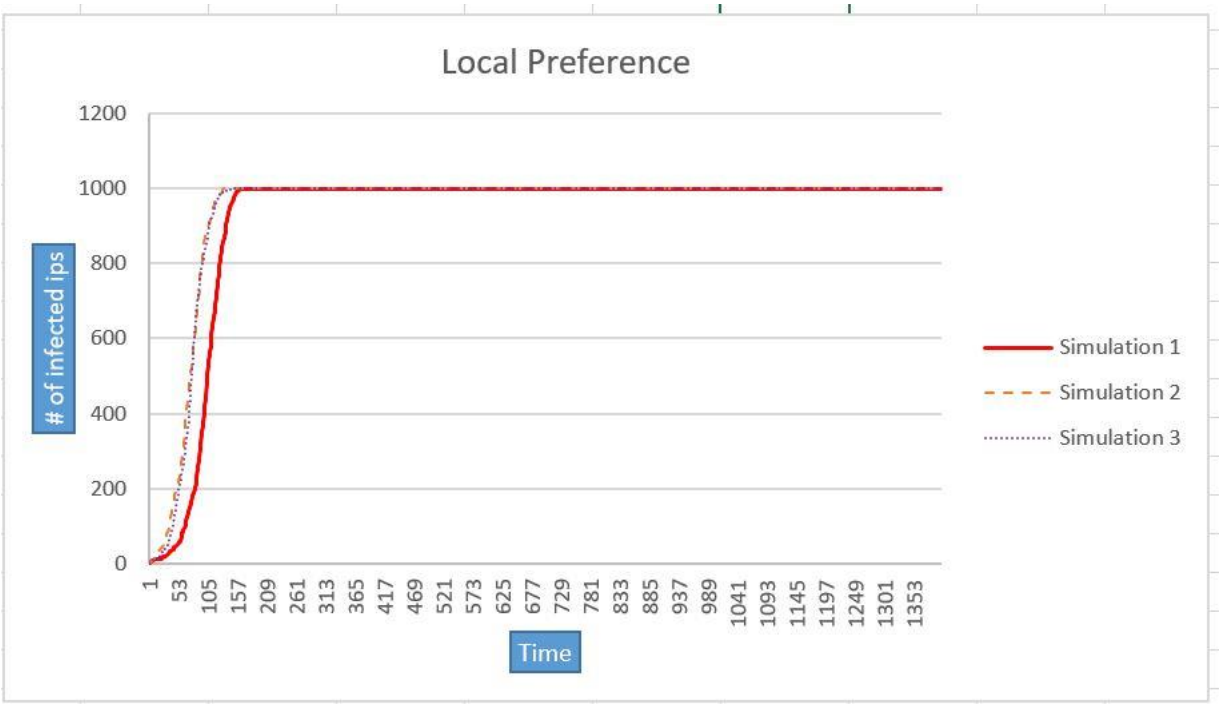
Simulation of Local-Preference Scanning worm propagation:

Local-Preference scanning worm propagation is modelled using discrete time simulation Technique. In local preference scanning worm propagation at each time tick, each infected machine scans for 2 local ip addresses (with range of x-10 to x+10) with 60% probability, and random addresses for 100,000 ip addresses with 40% probability. Here since local preference scanning is used the susceptible machines are clustered together, all 1000 machines should be infected in faster time compared to previous one.

The simulation is designed as follows:

- Run three simulations using for loop.
- Run the while loop for 1400-time ticks.
- Inside the loop for each infected computer, generate a random number between 0 and 1 and if the probability is less than 60% generate 2 local IP addresses and check if they are susceptible and not infected, if so then infect them. Increment IP.
- If the probability is less than 40% generate 2 random ip addresses from 100,000 ip addresses space and then infect them.Increment IP.

- At the end of the loop save the nodestate to prevnodestate and save the number of infected IP in It array.
- After the simulations are completed write the data of number of infected in each time tick in array to a file local_pref_out.txt.
- From the file using excel LSheet.xls and generate a figure of number of infected machines at each time tick.



The figure shows number of infected computers at each time tick. We can see that by 162th time tick all the 1000 machines are infected. We can also see that the curve is s-shaped. In the figure we showed the curves for 3 runs of simulation. Simulation 3 and 2 converge faster than simulation 1.