Explanation:

This assignment in a medium-scale network requires to implement the simulation of a simple worm propagation by utilizing the discrete-time simulation method. Each infected computer "x" randomly picks other 3 IP addresses, within the entire IP address space in a time unit.

What does each simulation code do?

In the l_p_s.py file, which stands for Local Preference Scanning, at each time step an infected computer with IP value "x" chooses the target IP value "y".

In the rndm.py file, which stands for Random Scanning, in a time unit, an infected computer "x" randomly chooses another IPs with the entire IPs space.

Screenshots and Results:

Installing numpy:

```
el962065@eustis3:~$ pip3 install numpy
Collecting numpy
  Downloading numpy-1.24.2-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (17.3 MB)
     |################################| 17.3 MB 15.2 MB/s
Installing collected packages: numpy
  WARNING: The scripts f2py, f2py3 and f2py3.8 are installed in '/home/net/el962065/.local/bin' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
Successfully installed numpy-1.24.2
```

Installing matplotlib:

```
el962065@eustis3:~$ pip3 install matplotlib
Collecting matplotlib
  Downloading matplotlib-3.7.1-cp38-cp38-manylinux_2_12_x86_64.manylinux2010_x86_64.whl (9.2 MB)
     |################################| 9.2 MB 10.3 MB/s
Collecting contourpy>=1.0.1
  Downloading contourpy-1.0.7-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (300 kB)
     |################################| 300 kB 46.5 MB/s
Requirement already satisfied: pillow>=6.2.0 in /usr/lib/python3/dist-packages (from matplotlib) (7.0.0)
Requirement already satisfied: python-dateutil>=2.7 in /usr/lib/python3/dist-packages (from matplotlib) (2.7.3)
Collecting importlib-resources>=3.2.0; python_version < "3.10"
  Downloading importlib_resources-5.12.0-py3-none-any.whl (36 kB)
Collecting cycler>=0.10
  Downloading cycler-0.11.0-py3-none-any.whl (6.4 kB)
Requirement already satisfied: packaging>=20.0 in /usr/lib/python3/dist-packages (from matplotlib) (20.3)
Collecting kiwisolver>=1.0.1
  Downloading kiwisolver-1.4.4-cp38-cp38-manylinux_2_5_x86_64.manylinux1_x86_64.whl (1.2 MB)
     |################################| 1.2 MB 17.6 MB/s
Requirement already satisfied: numpy>=1.20 in ./.local/lib/python3.8/site-packages (from matplotlib) (1.24.2)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/lib/python3/dist-packages (from matplotlib) (2.4.6)
Collecting fonttools>=4.22.0
  Downloading fonttools-4.39.3-py3-none-any.whl (1.0 MB)
     |################################| 1.0 MB 19.8 MB/s
Collecting zipp>=3.1.0; python_version < "3.10"
  Downloading zipp-3.15.0-py3-none-any.whl (6.8 kB)
Installing collected packages: contourpy, zipp, importlib-resources, cycler, kiwisolver, fonttools, matplotlib
  WARNING: The scripts fonttools, pyftmerge, pyftsubset and ttx are installed in '/home/net/el962065/.local/bin' which is not on PAT
H.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
Successfully installed contourpy-1.0.7 cycler-0.11.0 fonttools-4.39.3 importlib-resources-5.12.0 kiwisolver-1.4.4 matplotlib-3.7.1 z
ipp-3.15.0
```

Local Preference Scan:

```
el962065@eustis3:~$ python3 l_p_s.py

 ****** local_preference Scan Worm Propagation: Run1 ******
Time steps: 100 ---- Infected IPs: 126
Time steps: 200 ---- Infected IPs: 975
Time steps: 218 ---- Infected IPs: 1000.
All IPs infected!!!

 ****** local_preference Scan Worm Propagation: Run2 ******
Time steps: 100 ---- Infected IPs: 453
Time steps: 200 ---- Infected IPs: 990
Time steps: 235 ---- Infected IPs: 1000.
All IPs infected!!!

 ****** local_preference Scan Worm Propagation: Run3 ******
Time steps: 100 ---- Infected IPs: 584
Time steps: 185 ---- Infected IPs: 1000.
All IPs infected!!!
el962065@eustis3:~$
```

Random Scan:

```
el962065@eustis3:~$ python3 rndm.py

 ****** random_scan Scan Worm Propagation: Run1 ******
Time steps: 100 ---- Infected IPs: 37
Time steps: 200 ---- Infected IPs: 451
Time steps: 300 ---- Infected IPs: 930
Time steps: 400 ---- Infected IPs: 996
Time steps: 431 ---- Infected IPs: 1000.
All IPs infected!!!

 ****** random_scan Scan Worm Propagation: Run2 ******
Time steps: 100 ---- Infected IPs: 53
Time steps: 200 ---- Infected IPs: 544
Time steps: 300 ---- Infected IPs: 960
Time steps: 400 ---- Infected IPs: 998
Time steps: 404 ---- Infected IPs: 1000.
All IPs infected!!!

 ****** random_scan Scan Worm Propagation: Run3 ******
Time steps: 100 ---- Infected IPs: 7
Time steps: 200 ---- Infected IPs: 116
Time steps: 300 ---- Infected IPs: 706
Time steps: 400 ---- Infected IPs: 986
Time steps: 500 ---- Infected IPs: 998
Time steps: 565 ---- Infected IPs: 1000.
All IPs infected!!!
el962065@eustis3:~$
```

Usage:

This assignment is written in python language.

First, unzip Homework3. Then add the 2 python files to the Eustis machine (you need to connect to the UCF vpn if you are outside of campus). install numpy by the following command: "pip3 install numpy". Then, install matplotlib by the following command: "pip3 install matplotlib". Later, first run l_p_s.py file by typing "python3 l_p_s.py". At the end, run the rndm.py file by typing "python3 rndm.py"