Project 1

Network Properties in Spark GraphFrames

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1. **Degree Distribution:**
   a. **Generate a few random graphs. You can do this using networkx's random graph generators or GTGraph. Do the random graphs you tested appear to be scale-free?**
      erdos_renyi_graph – Not scale free
      powerlaw_cluster_graph – Scale free
      barabasi_albert_graph – Scale free

   b. **Do the Stanford graphs provided to you appear to be scale-free?**
      Since all the given graphs follow power law they are scale free.
      Amazon – Scale free
      Youtube – Scale free
      Dblp – Scale free

2. **Centrality:**
   a. **Rank the nodes from highest to lowest closeness centrality.**

Vertex	Closeness Centrality
C	0.07142857142857142
F	0.07142857142857142
D	0.06666666666666667
H	0.06666666666666667
E	0.058823529411764705
B	0.058823529411764705
G	0.05555555555555555
A	0.05555555555555555
I	0.047619047619047616
J	0.034482758620689655

   b. **Suppose we had some centralized data that would sit on one machine but would be shared with all computers on the network. Which two machines would be the best candidates to hold this data based on other machines having few hops to access this data?**
      Machines C and F should be the best candidates to hold centralized data so that other machines have few hops to access this data.

3. **Articulation Points:**
   a. **In this example, which members should have been targeted to best disrupt communication in the organization?**

Following is the list of members who should have been targeted to best disrupt the communication in the organization:

1. Nabil al-Marabh
2. Usman Bandukra
3. Lased Ben Heni
4. Mounir El Motassadeq
5. Ayub Ali Khan
6. Hamza Alghamdi
7. Ahmed Al Haznawi
8. Mohand Alshehri
9. Nawaf Alhazmi
10. Bandar Alhazmi
11. Nizar Trabelsi
12. Seifallah ben Hassine
13. Abu Walid
14. David Courtaillier
15. Abu Zubeida
16. Fayez Ahmed
17. Mamoun Darkazanli
18. Abdul Aziz Al-Omari
19. Salem Alhazmi
20. Saeed Alghamdi
21. Djamal Beghal
22. Mohammed Jaweed Azmath
23. Tarek Maaroufi
24. Jean-Marc Grandvisir
25. Mohamed Atta
26. Khalid Al-Mihdhar
27. Mehdi Khammoun
28. Imad Eddin Barakat Yarkas
29. Lotfi Raissi
30. Osama Awadallah
31. Marwan Al-Shehhi
32. Zakariya Essabar
33. Abu Qatada
34. Faisal Al Salmi
35. Ahmed Alghamdi
36. Mustafa Ahmed al-Hisawi
37. Nabil Almarabh
38. Agus Budiman
39. Haydar Abu Doha

40. Mohammed Belfas
41. Fahid al Shakri
42. Ramzi Bin al-Shibh
43. Abdelghani Mzoudi
44. Madjid Sahoune
45. Jerome Courtaillier
46. Ahmed Ressam
47. Abdussattar Shaikh
48. Satam Suqami
49. Wail Alshehri
50. Majed Moqed
51. Raed Hijazi
52. Kamel Daoudi
53. Mamduh Mahmud Salim
54. Essoussi Laaroussi
55. Ahmed Alnami
56. Karim Koubriti
57. Essid Sami Ben Khemais
58. Ahmed Khalil Ibrahim Samir Al-Ani
59. Mohammad Pervez
60. Zacarias Moussaoui
61. Ahmen Hannan
62. Mohamed Bensakhria
63. Ziad Jarrah
64. Mohamed Abdi
65. Waleed Alshehri
66. Said Bahaji
67. Samir Kishk
68. Rayed Mohammed Abdullah
69. Hani Hanjour