Aalto University School of Electrical Engineering
Department of Communications and Networking
S-38.3184 Network traffic measurements and analysis IV/2013

Exam 26.5.2013
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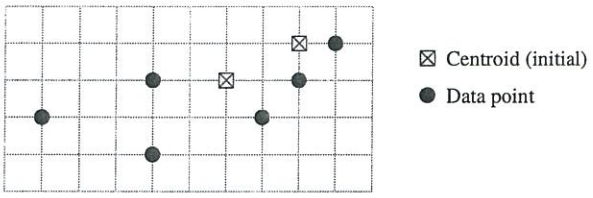
1. Explain the following terms and discuss their roles in network measurements: (6 p)
   a) Central limit theorem (CLT)
   b) Scatterplot
   c) Classification (in data mining)
   d) Zipf's Law
   e) Self-similarity
   f) Memorylessness property

2. Clustering: Figure below depicts a data set with 6 points indicated with circular symbols.
   a) Carry out the k-means clustering algorithm for $k = 2$. The initial locations for the two centroids are indicated with small rectangular symbols.
   b) Does the algorithm converge to the same solution for all initial locations?



3. Describe methods for clock syncronisation. What kind of clock errors there exists? List **four** different type of network measurements and how important clock syncronisation is in each and what is required accuracy between clocks and between clocks and UTC. (6 p)

4. Define flow. Why flow is important concept in network measurements? What roles granularity and timeout have with flows? (6 p)

5. Explain the difference between active and passive network measurements. Which one is more suitable for: (6 p)
   a) Monitoring access network link utilization
   b) Identifying applications using largest amount of bandwidth
   c) Monitoring performance of VoIP call center
   d) Checking available throughput in VPN connection between main office and branch office (point-to-point, using XTS-AES-256)