CYCLON

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Random Selection?

- Fundamental assumption in many protocol proposals
- Crucial for epidemic protocols
- Maybe fine with a relatively small network size (a few hundreds or a few thousands)
- Questionable with large sizes of popular P2P systems (a few millions)
Approach

● Allow each node to keep only a tiny subset of the entire membership information

● Change the tiny subset appropriately so that a global randomness is maintained

● Questions:
  – How small can the tiny subset be?
  – How frequently the tiny subset needs to change?
  – How does it change?
Idea: Shuffle!

- Assume each node has a tiny subset of the entire membership
- Let each one shuffle the subset with one randomly selected from the tiny subset periodically
- Hope: over time the content of a subset at each node will be (completely) randomized
- Question: How to verify a randomized state?
Random Network

• An edge between two random nodes exists with a probability $P$.

• $P$ is the ratio of existing links among nodes, over the total number of possible links.
Basic Shuffle

Enhanced Shuffle

- CYCLON
Does shuffle work?

- Connectivity
- Convergence
  - Average shortest path length
  - Average clustering coefficient
- Degree distribution
- Dependency on shuffle length
Handling Churn

• Joining
  - P contacts Q
  - Q initiates c random walks
  - Each random walk exchanges an entry

• Leaving
  - Graceful: not discussed
  - Failure: detection

• Rigorous evaluation of churn missing!
Conclusion

- Practically a good idea to elaborate further!