Overlay Self-Organization for Traffic Reduction in Multi-Broker Publish-Subscribe Systems

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Publish-Subscribe Systems

- **Characteristics:**
  - Many components and a dispatcher;
  - Components may send messages and subscribe to some classes of messages;
  - The dispatcher forwards received messages to the correct subscribers;
  - Asynchronous (loosely-coupled) communication model.

- **Problem:**
  - The dispatcher may be a single point of failure.
  - Need of a dispatcher composed of multiple elements (called brokers).
  - Finding the optimal overlay network for these brokers to reduce the total traffic.
Idea: Overlay Self-Organization

- Finding a method to self-optimize the broker overlay network spontaneously.
- Use only simple local rules and the limited local knowledge of each broker.
Overlay Self-Organization Algorithm

Phase 1: Training

- Collect traffic information.
- Count how much traffic belonging to a certain class (subscription) has been received/forwarded to neighbor brokers.

Phase 2: Reconfiguration

- Use information collected during Phase 1 to predict the effects of a reconfiguration using a utility function.
- Evaluate such function for a significant amount of possible reconfigurations and apply the one that maximizes it.
Results and Conclusions

• What we have learned from experimental results:
  – The algorithm scales well;
  – Convergence is preserved also in case of churn and selfishness;
  – Artificially added noise to increase the optimality of the solution.

• Feel free to come and see our poster for more details.