

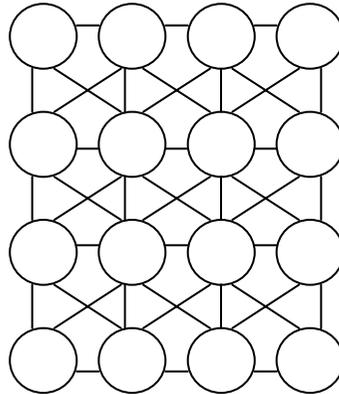
A Weakly Coupled Adaptive Gossip Protocol for Application Level Active Networks

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In association with **BT**exa**CT**

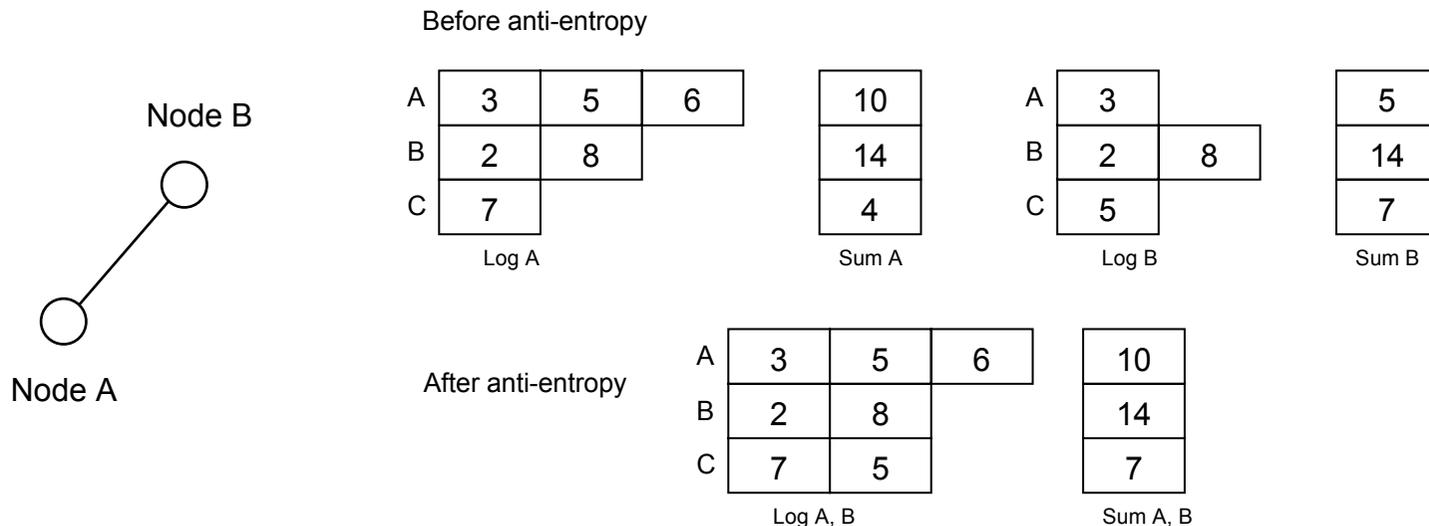
Problem Space



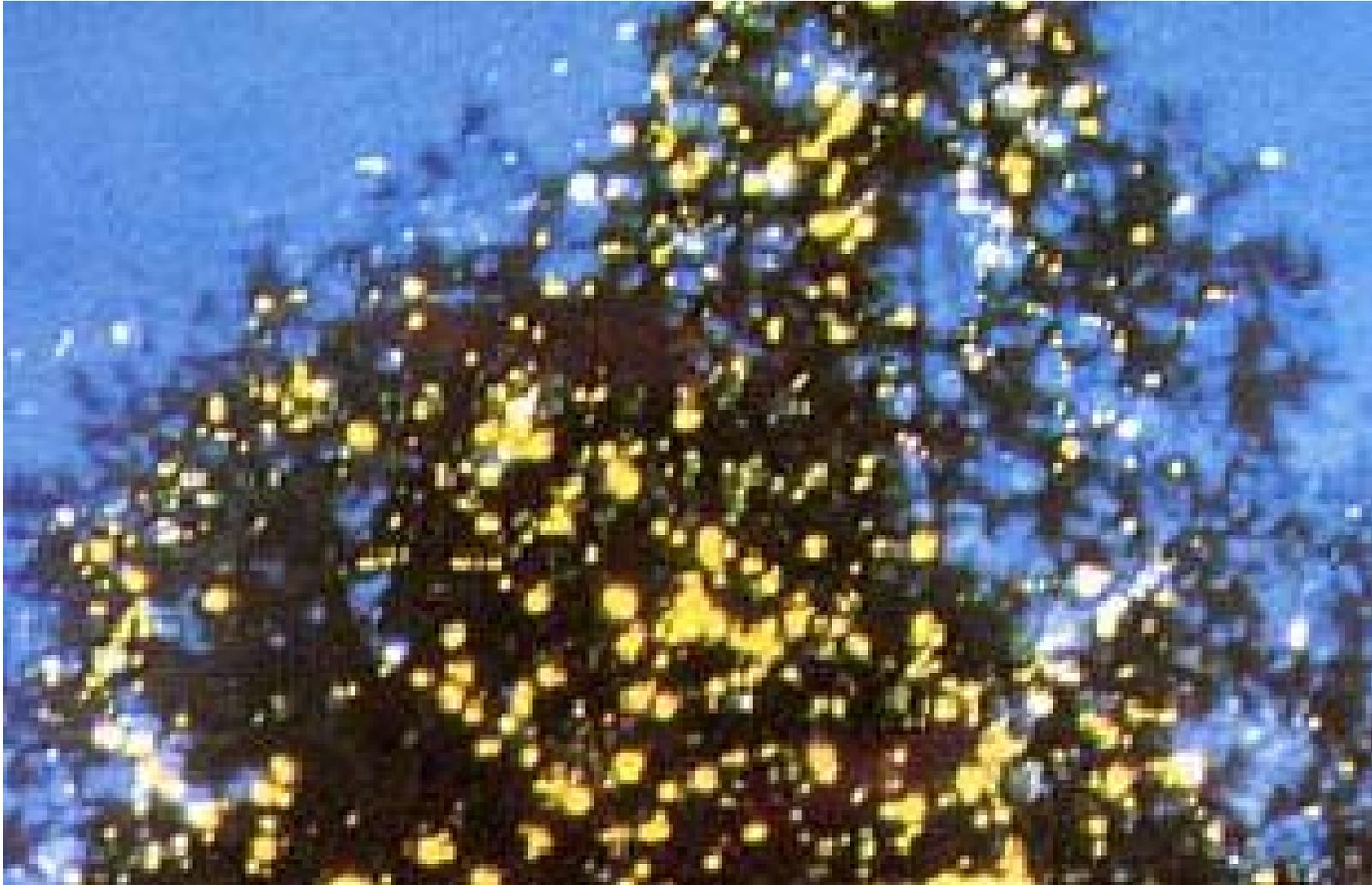
- Policy management of distributed networks requires that system and node policies are updated regularly
- The distribution of the updates needs to be
 - asynchronous
 - scalable, reliable and independent of the underlying topology
 - implemented without centralized planning
- The proposed protocol satisfies these requirements

Gossip protocols

- Efficient method of distributed information dissemination in wide-area networks
- Delayed propagation that provides weak consistency and better availability
- e.g. Time Stamped Anti-Entropy (TSAE)

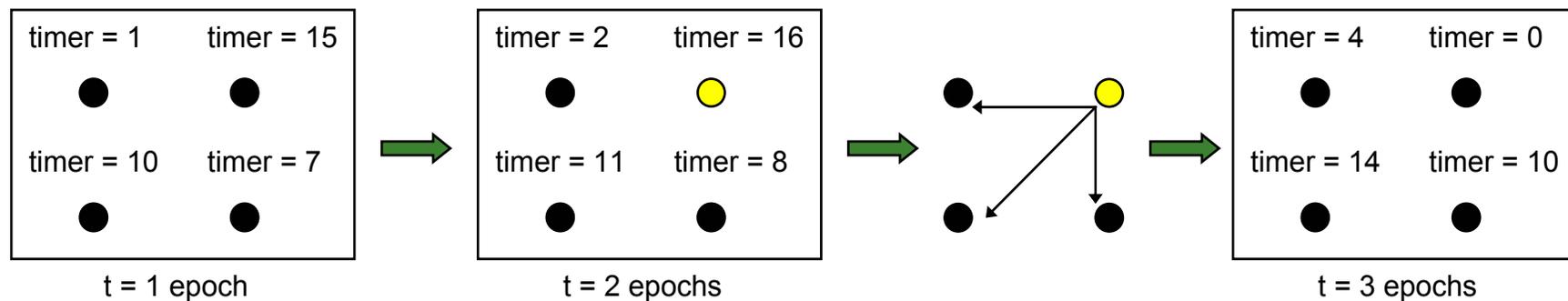


Firefly synchronization



Firefly synchronization

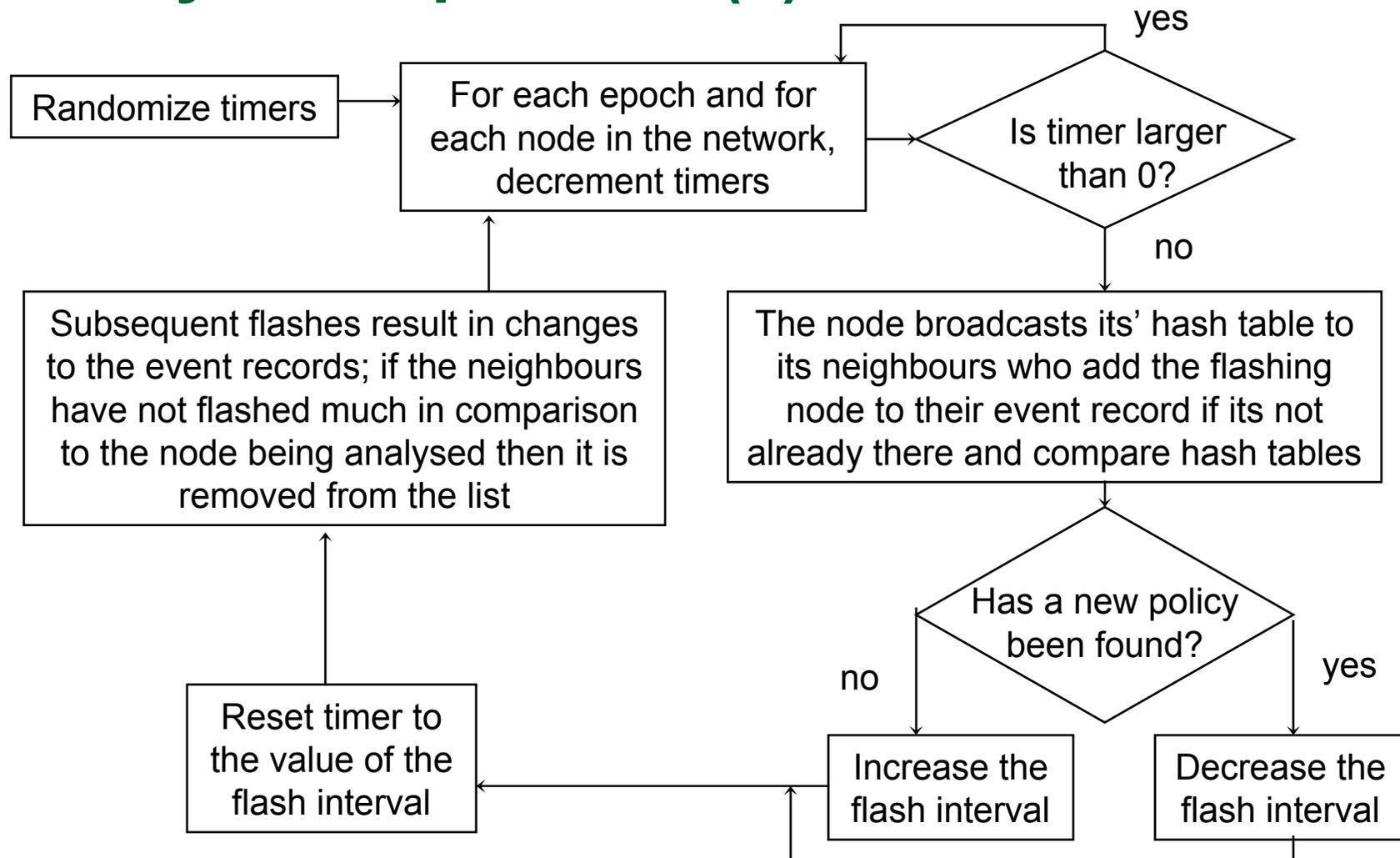
- A biologically inspired model based on fireflies was designed
- Fireflies alter their internal timers to flash at the same rate as their neighbours
- An example of self organization using a non-deterministic distributed mechanism



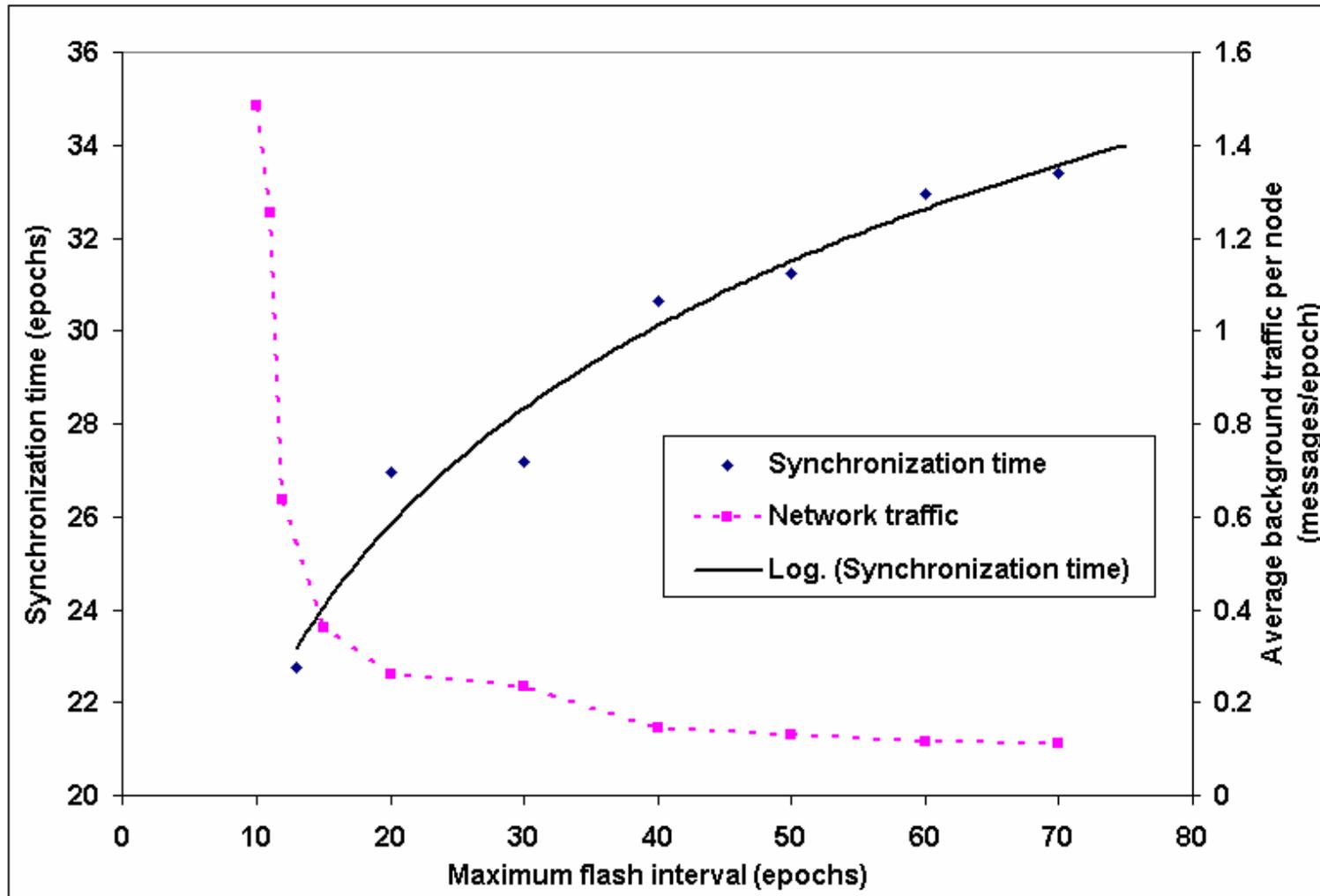
Firefly/Gossip Model (1)

- The functional requirements for this model are:
 - low network traffic and synchronization time
 - scalable
 - efficiency in different networks
- To achieve this, each node is given a:
 - timer
 - flash interval – period the node waits before it “flashes” i.e. communicates with its neighbours
 - event record – a list of the node’s neighbours with an indication of how frequently they have flashed
 - hash table – a list of the policies added to the node with a timestamp for each

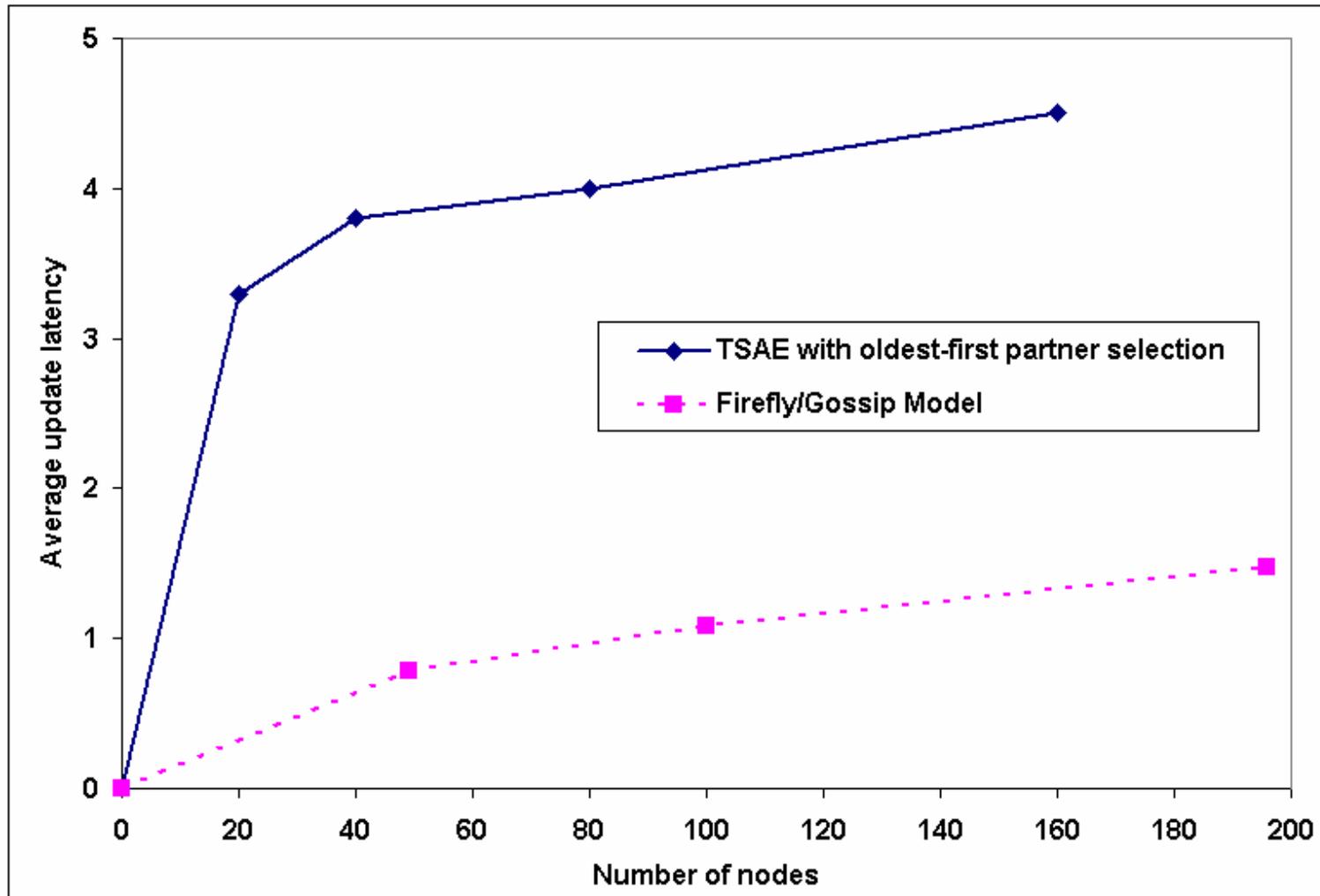
Firefly/Gossip Model (2)



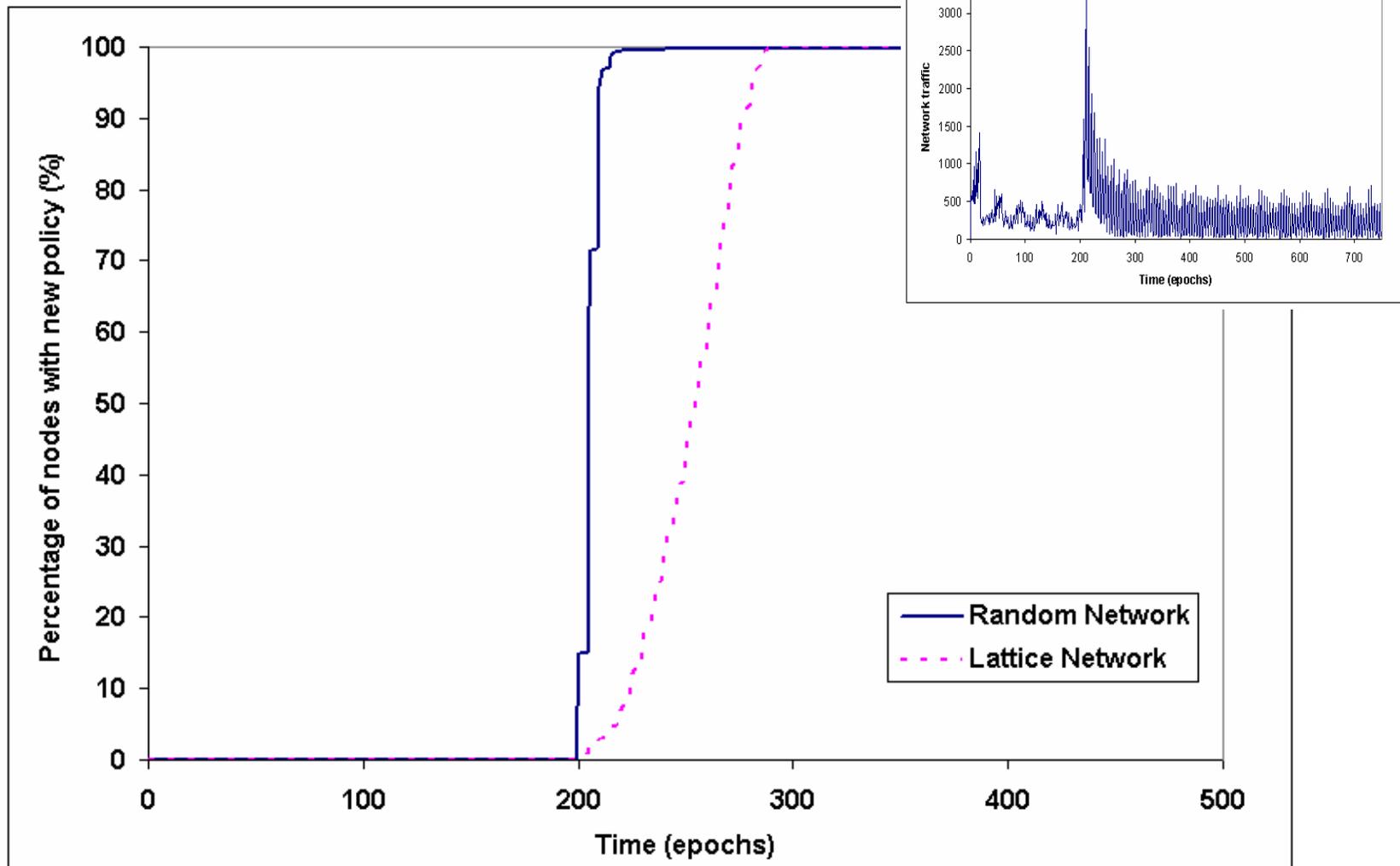
Optimization tests



Scalability tests



Topology tests



Conclusions

- An autonomous and self-organized method of distributing updates in systems such as active networks, GRID and sensor networks
- The mechanism is robust in response to node failures and performs better than TSAE
- Further work could involve assessing how the algorithm works in small worlds and scale-free topologies and with different policy arrival rates