

Social-aware Routing in Delay Tolerant Networks

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Overview

- Delay Tolerant Networks (DTN)
- Legacy routing protocols
- Social-aware routing protocols
- Ongoing work

DTN architecture

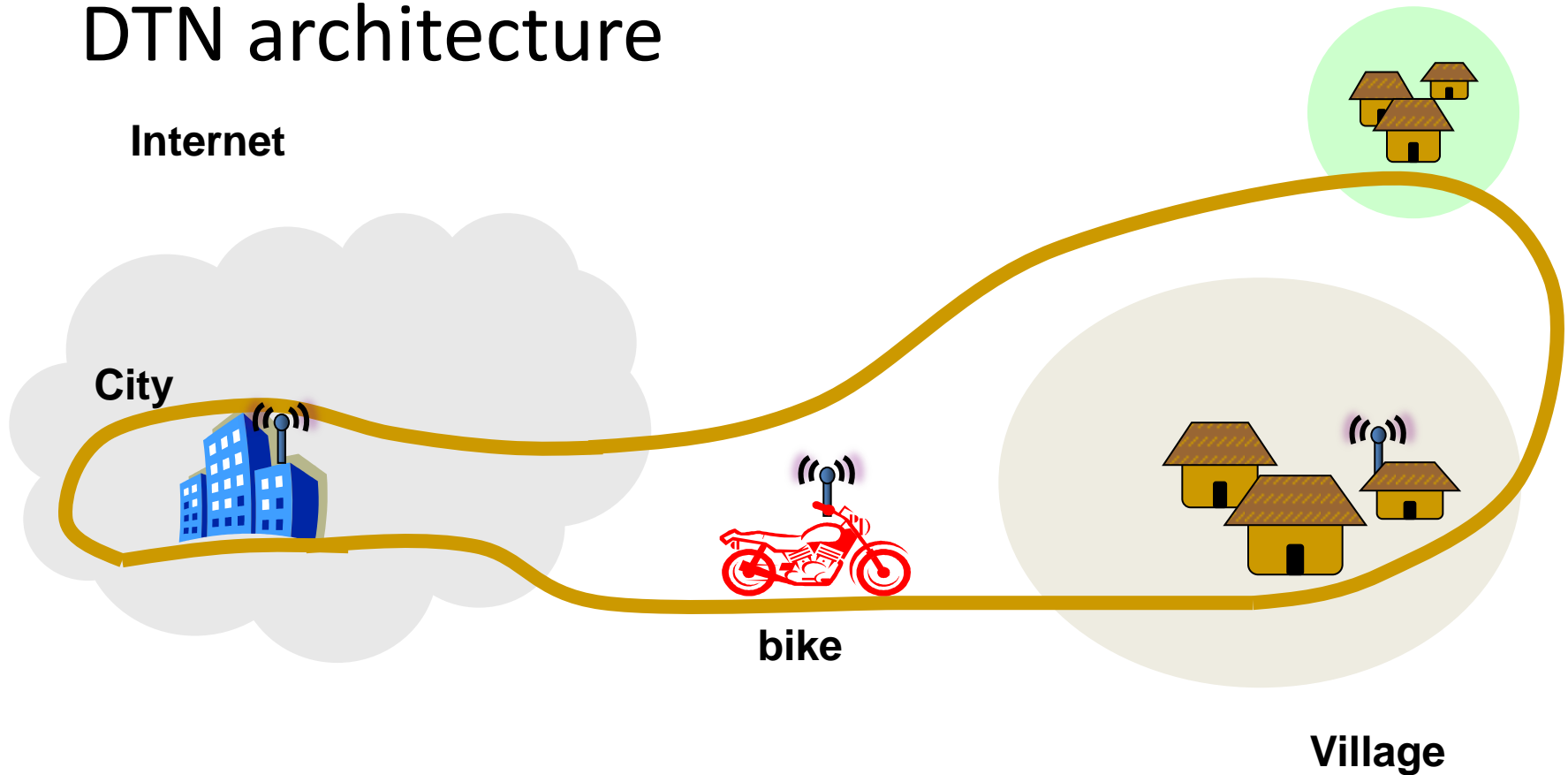


Fig 1 Routing problem

- No end-to-end path from city to village
- Bike is data mule: store-**carry**-forward

Routing in DTN

- Traditional network protocols (eg, TCP/IP) do not work
 - Fail to route messages if there is no end-to-end path at all times
- DTN routing protocols
 - Direct Delivery
 - Epidemic
 - etc.

Direct delivery & Epidemic

- Direct delivery
 - The sender carries the messages until it meets the final recipient
 - Slowest delivery and lowest delivery ratio
 - No replication : Zero overhead
- Epidemic
 - Flooding-based: packets are replicated at each encounter until final recipient is reached.
 - Fastest delivery and highest delivery ratio
 - Largest possible overhead

Social-aware routing protocols

- Pocket Switched Network
 - Users with mobile devices
- Bubble Rap
 - Node centrality
 - Betweenness
 - Community
 - K-CLIQUE, weighted network analysis

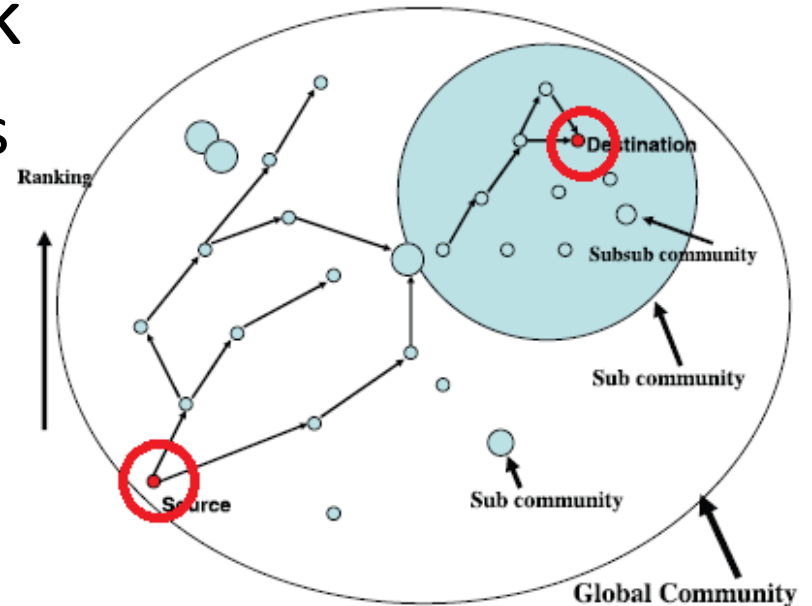
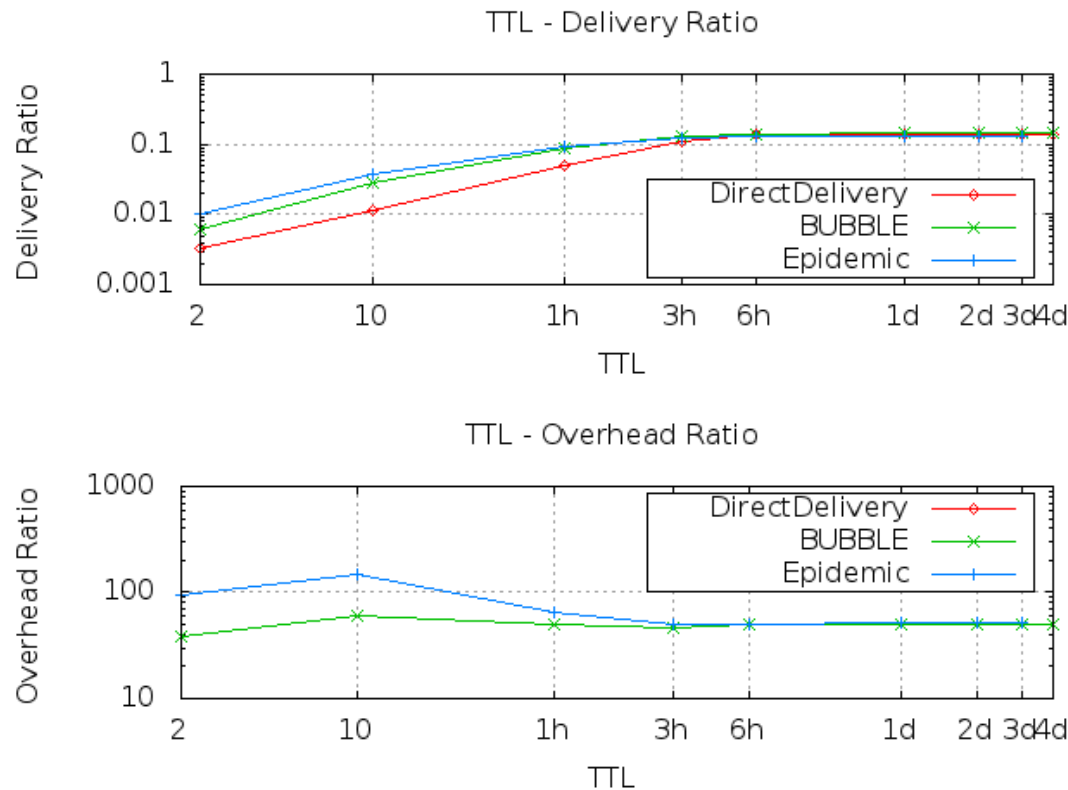


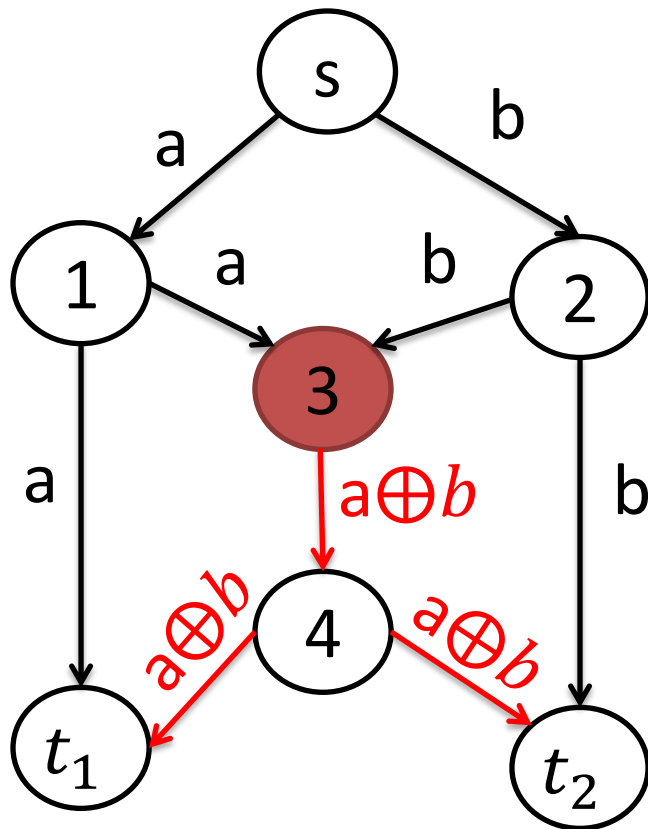
Fig 2 Bubble Rap forwarding^[2]

Bubble Rap –infocom06 dataset

- Using social-based approach reduce the overhead significantly while still maintaining approximately the same delivery ratio.



Ongoing work



$$a \oplus a \oplus b = b$$

- Network coding
 - Improves throughput in regular networks
 - Improves robustness in wireless networks
- My goal
 - Leverage network coding to improve delivery ratio in DTN while reducing overhead.

Thank you for your attention.

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References

- [1] P. Hui, J. Crowcroft, and E. Yoneki. ***BUBBLE Rap: Social-Based Forwarding in Delay Tolerant Networks***. IEEE Trans. Mobile Computing, vol. 10, no. 11, Nov. 2011, pp. 1576–89.
- [2] Ahlswede, R., Cai, N., Li, S. Y., & Yeung, R. W. (2000). ***Network information flow***. *Information Theory, IEEE Transactions on*, 46(4), 1204-1216.