



Floating Content: Infrastructure-less Information Sharing in Urban Environments

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Infrastructure-less Content Sharing...

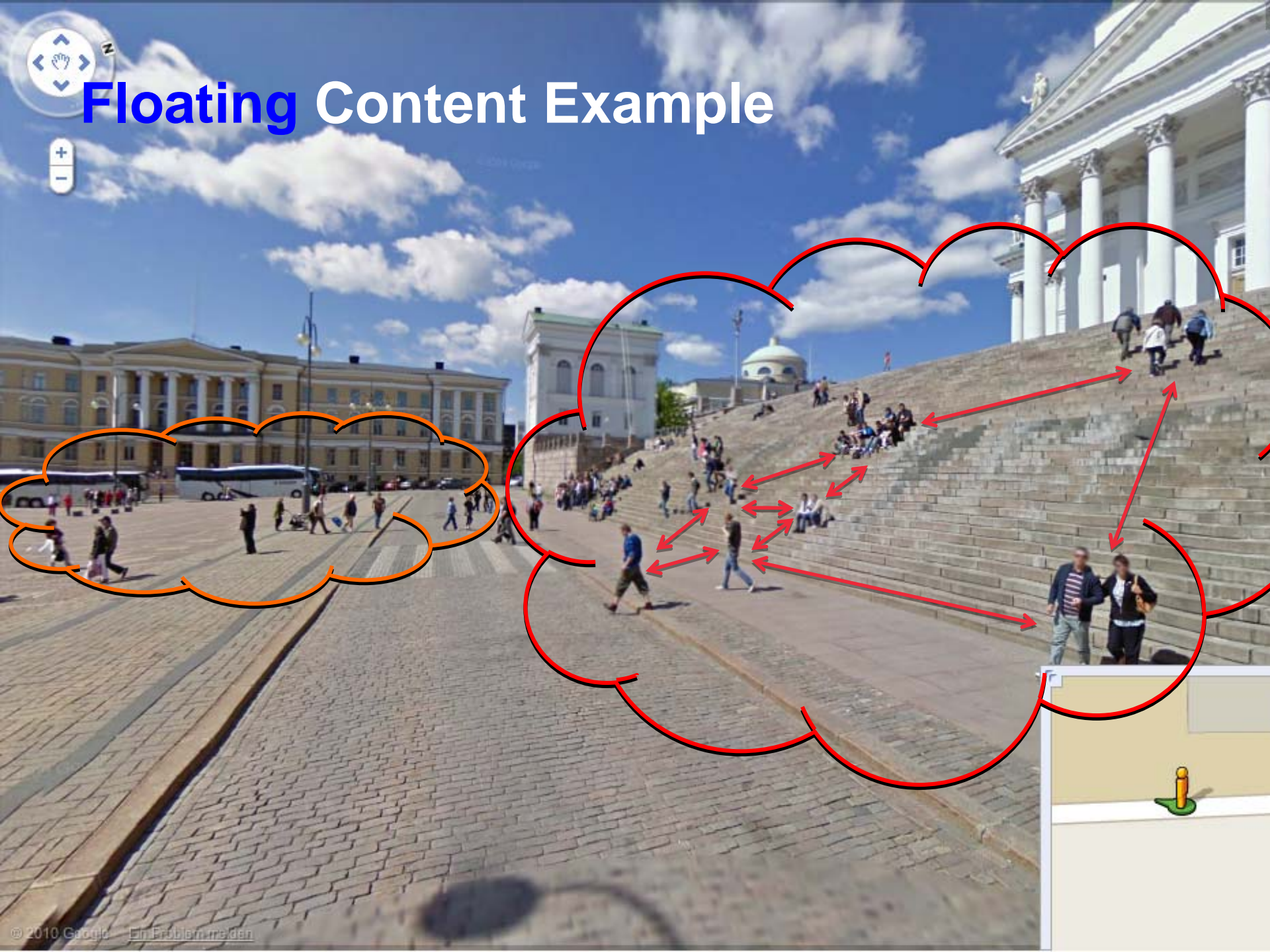
- Ad-hoc local social network-style information sharing: Digital graffiti w/o servers and infrastructure
- Leaves notes, comments, stories, etc. in places
- Define reach (area of interest) and lifetime
- Leverage delay-tolerant ad-hoc communication between mobile devices for information replication & acquisition

...in Urban Environments?!

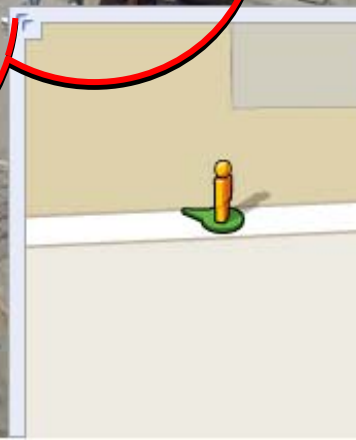
- Location privacy
- Content “privacy”
- Connectivity (to infrastructure)
- Geographic validity
- Temporal validity
- User identification

Novelty?

- Similar concepts have been “floating” around
 - At least as early as 2005 on floating
 - Geocasting and other approaches in late 90’s
- Related work often limited in scope
- Our contribution:
 - Thorough evaluation on feasibility
 - Figure out how to make this work in practice
- 3 publications in 2010 and 2011:
 - PerCom WiP 2010, Infocom 2011, PerCom 2011

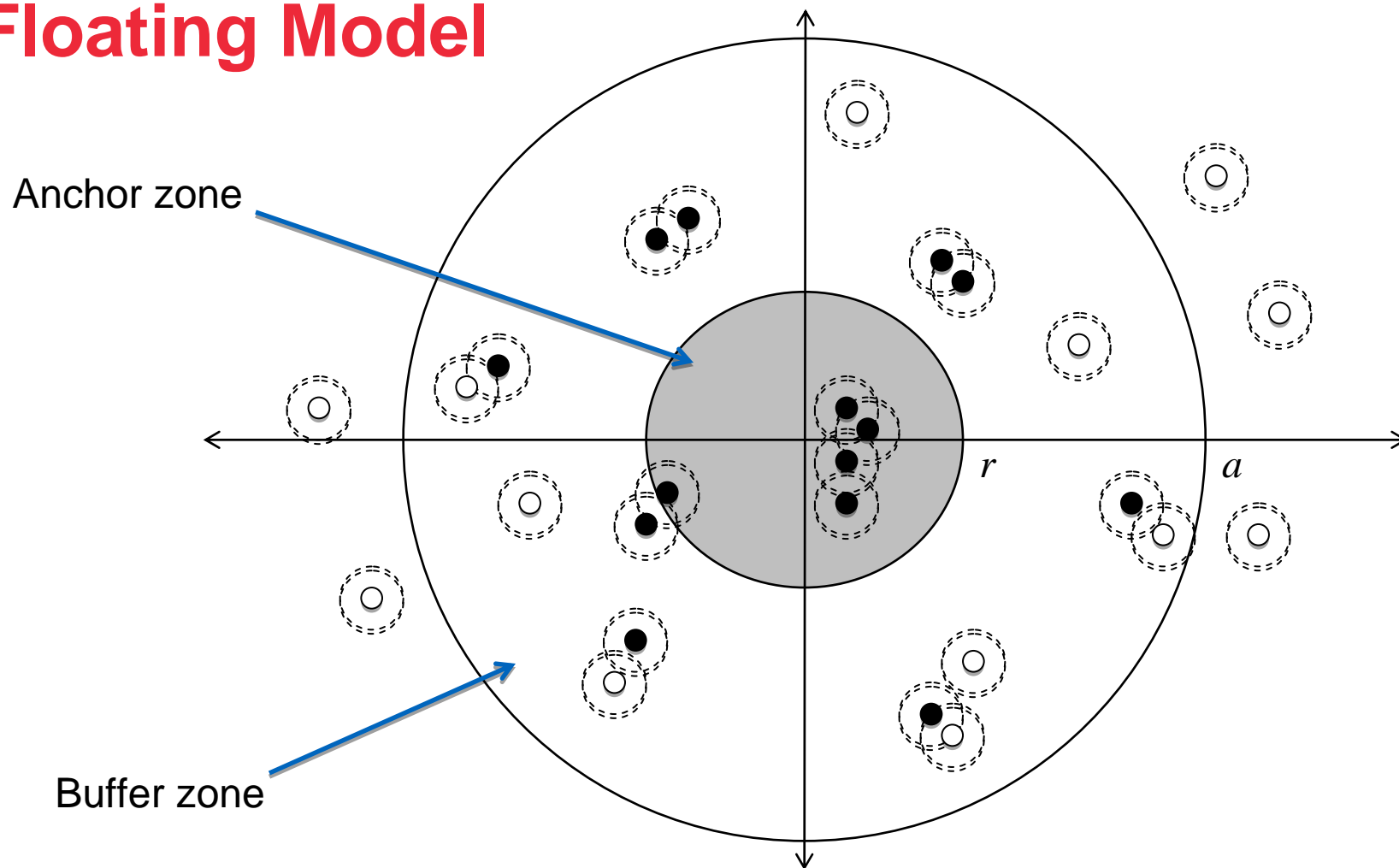


Floating Content Example





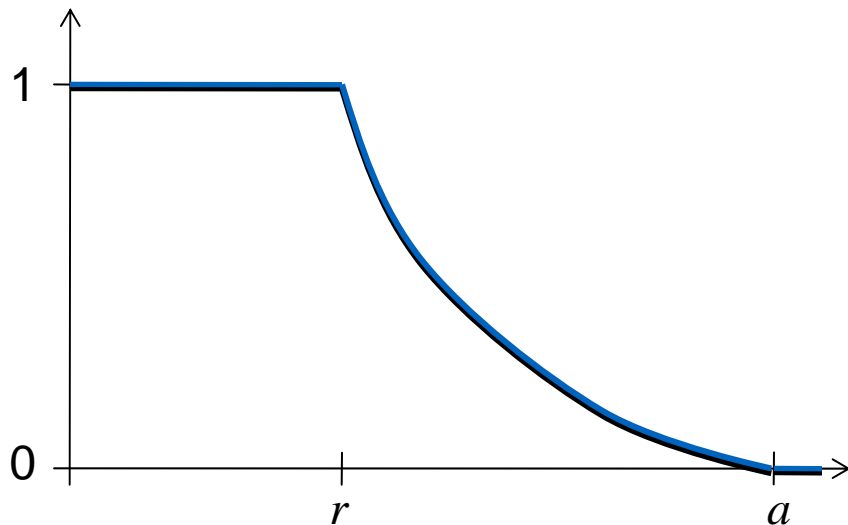
Floating Model



Replication & Deletion

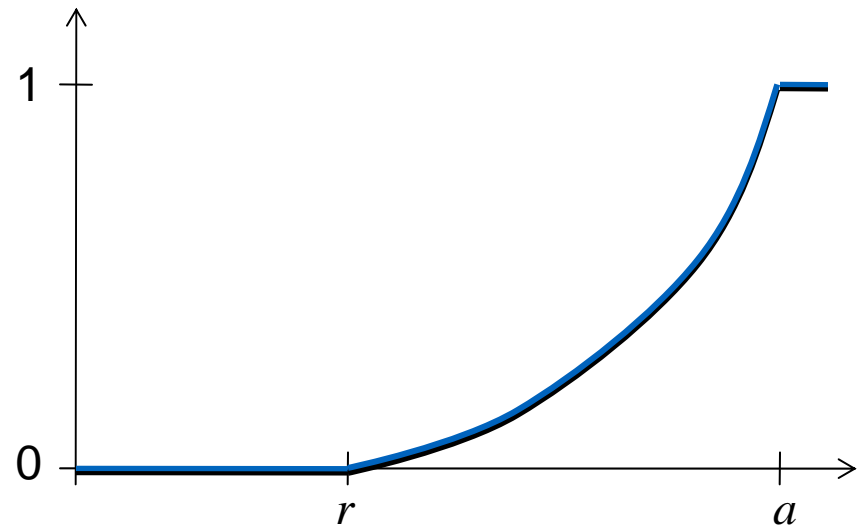
Replication

- $f(d)$ from anchor point
- r, a for priority scheduling
- 1 within anchor zone



Deletion

- Only if buffer space needed
- $f(d)$ from anchor point
- r, a as tie breakers
- TTL-based deletion

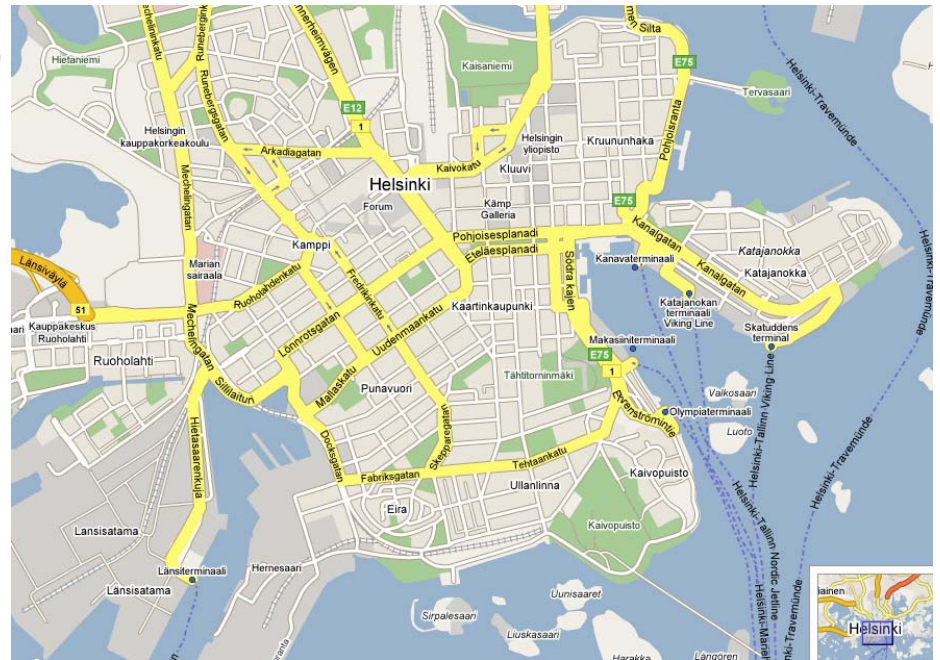


Two-Pronged Approach to Evaluation

- Analytical modeling
 - Not covered in this talk
 - Different scenarios, different mobility models
 - Main result: Criticality condition
- Simulations
 - Initially simple simulations to test feasibility
 - **First result:** Need 1 person per 50m² on average
 - This agrees with analytical criticality condition
 - In this talk: More detailed simulations

Some Simulation Findings

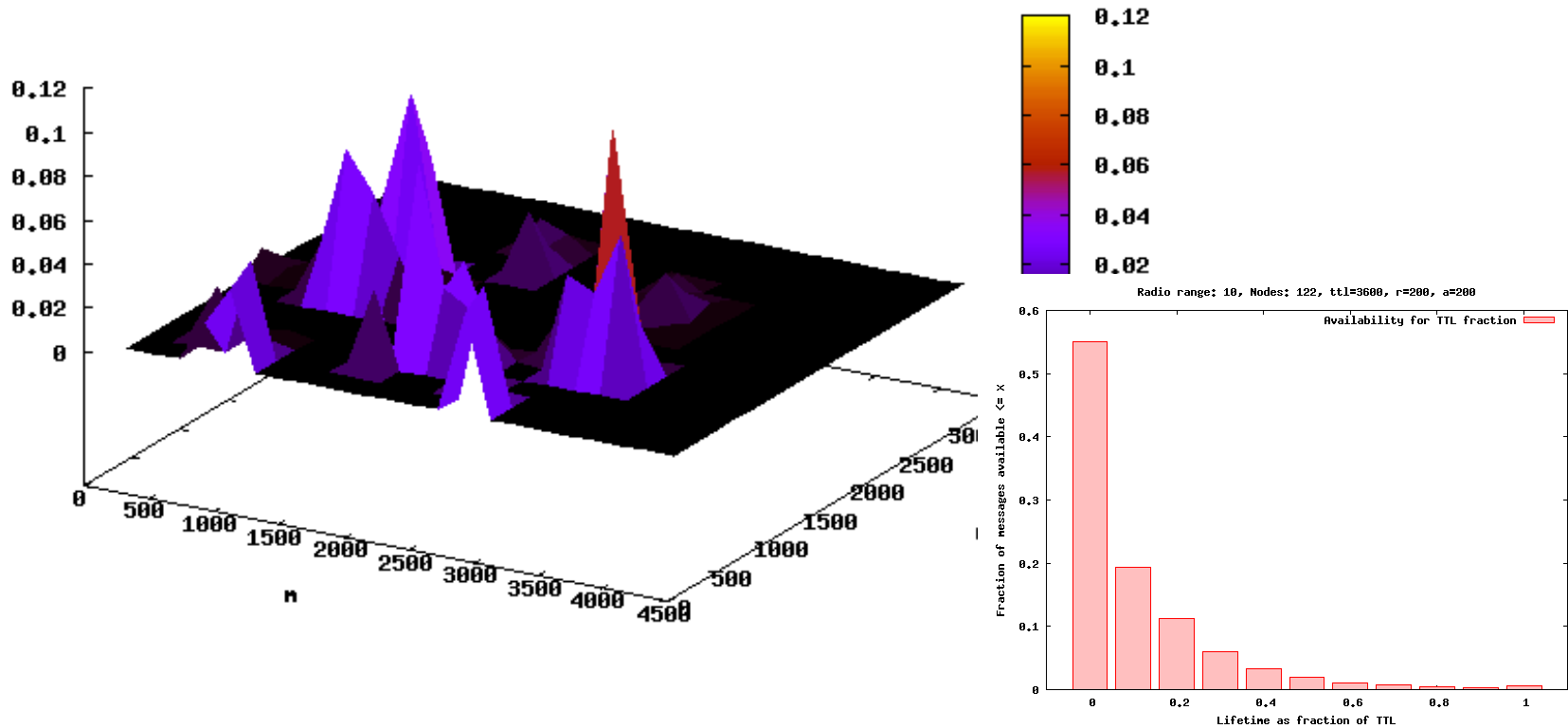
- ONE Simulator: 4500 x 3400m simulation area
 - Helsinki City Scenario
 - Restless nodes (tourists)
 - Moving around along shortest paths between points of interest
 - On foot, by car
 - Some trams following regular routes
 - 126, 252, 504 nodes
 - 10m, 50m radio range
 - $r = a = 200m, 500m$



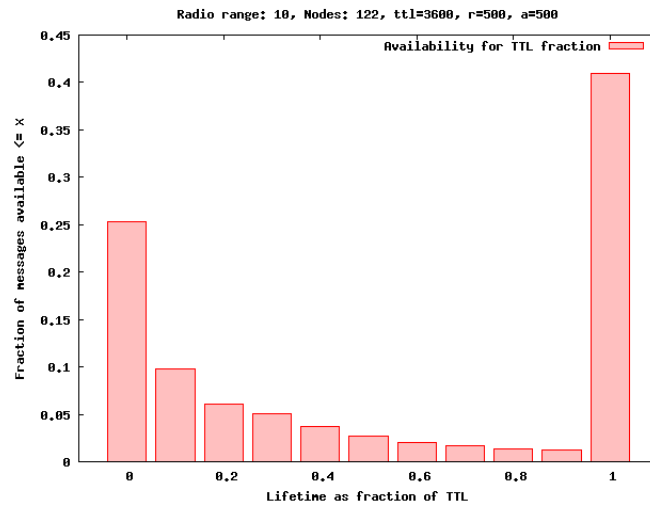
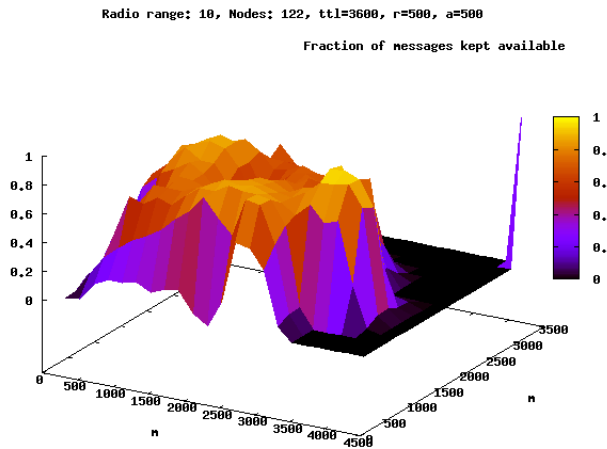
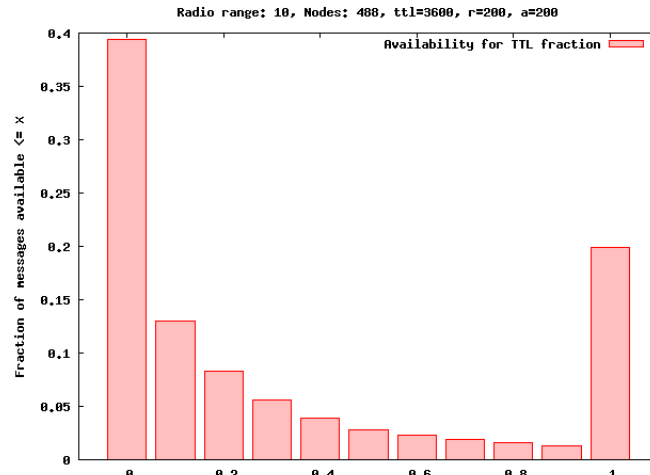
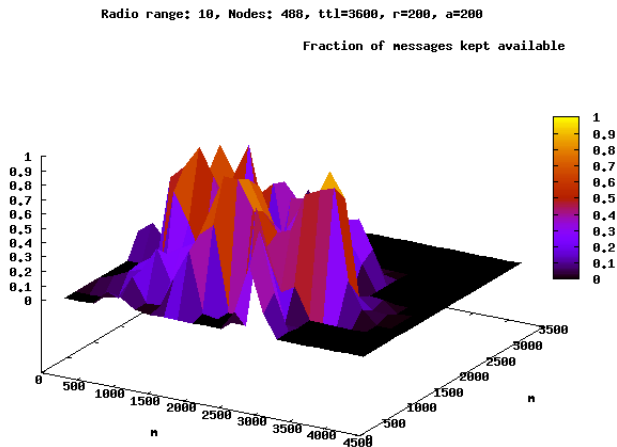
Unsuitably low density

Radio range: 10, Nodes: 122, ttl=3600, r=200, a=200

Fraction of messages kept available



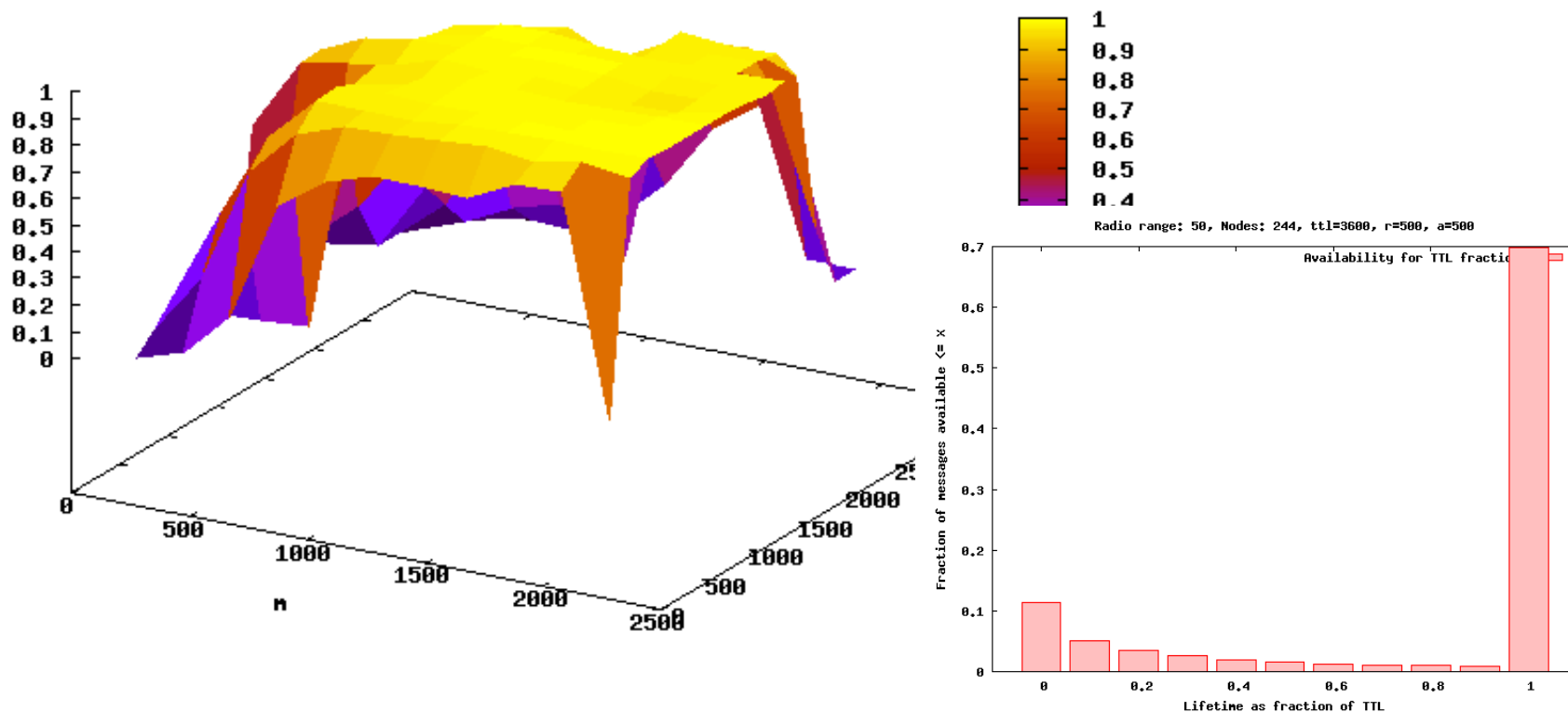
Medium density or larger anchors



Closer to a “reliable” environment

Radio range: 50, Nodes: 244, ttl=3600, r=500, a=500

Fraction of messages kept available



Some Conclusions

- Simple, yet appealing geo cooperation model
- Workable already for modestly dense scenarios
 - Simulations agree well with theoretical modeling
- Some built-in DoS protection and garbage collection
- API and content sharing applications to come
- Probabilistic operation and user acceptance?

Present & Future Work

- Theoretical foundations about criticality criteria
 - Will be published at Infocom 2011
- Second round of simulations completed
 - First round: 1 MS thesis + PerCom WiP 2010
 - Second round: Full paper PerCom 2011
- More extensive simulation studies
 - Impact of location fuzziness
 - More diverse mobility models
 - Varied offered loads, resource sharing
- Implementation for Android in progress