

# Issues in Peer to Peer Systems and Content Distribution

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with contributions from

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We will address 3 issues in our presentation:

- Hierarchical DHTs
- Topology Aware DHTs
- Content Distribution in P2P systems

## Hierarchical DHTs

Structured peer-to-peer (P2P) lookup services organize peers into a flat overlay network and offer distributed hash table (DHT) functionality. Chord, CAN, Pastry and Tapestry are all flat DHT designs. Each peer is indistinguishable from another in the sense that all peers use the same rules for determining the routes for lookup messages. This approach is strikingly different from routing in the Internet, which uses hierarchical routing. Hierarchical routing in the Internet offers several benefits over non-hierarchical routing, including scalability and administrative autonomy.

Inspired by hierarchical routing in the Internet, we propose hierarchical DHTs where peers are organized in disjoint groups [1]. Each group maintains its own overlay network and intra-group lookup service. A top-level overlay is defined among the groups. Within each group, a subset of peers are labeled as “superpeers”. Superpeers, which are analogous to gateway routers in hierarchical IP networks, are used by the top-level overlay to route messages among groups. We consider designs for which peers in the same group are locally close. There are various issues related to Hierarchical DHTs that need to be investigated such as deployment and maintenance in face of peers joining and leaving the system.

## Topology Aware DHTs

Topological considerations are of paramount importance in the design of a P2P lookup service. We present TOPLUS [2], a lookup service for structured peer-to-peer networks that is based on the hierarchical grouping of peers according to network IP prefixes. TOPLUS can be employed in a straightforward manner to implement on-demand P2P caching of data in ISPs or corporate networks, and can serve as a benchmark for measuring the performance of other lookup services.

We will discuss the potential and the limitations of TOPLUS and topology-aware DHTs in general.

## Scalable Content Distribution using P2P systems

We are interested in the problem of distributing a multimedia stream simultaneously to a large number of users. There exist a large number of open and closed-loop schemes that all aggregate the client requests and serve several clients with a single stream that is transmitted via multicast, which assures an efficient resource usage both, of the server and the network resources.

The same paradigm has been advocated in the context of P2P systems where the native multicast distribution via IP multicast is replaced by an overlay multicast distribution using the nodes of the P2P system. We would like to question the use multicast overlay trees for content distribution in P2P systems and argue that pull based approaches involving parallel download [3] are more resilient to changes in node availability and the available network bandwidth resources.

## References

- [1] L. Garces-Erice, E. W. Biersack, K. W. Ross, P. A. Felber, and G. Urvoy-Keller, "Hierarchical P2P Systems", *Proceedings of Euro-Par 2003*, Klagenfurt, Austria, 2003.
- [2] L. Garces-Erice, K. W. Ross, E. W. Biersack, P. A. Felber, and G. Urvoy-Keller, "Topology-Centric Look-Up Service", Submitted to NGC 2003, 2003.
- [3] P. Rodriguez and E. W. Biersack, "Dynamic Parallel-Access to Replicated Content in the Internet", *IEEE/ACM Transactions on Networking*, 10(4):455–464, August 2002.