Rapid Mobility via Type Indirection

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Rapid Mobility

Iarge-scale mobile deployment becoming a reality



Our Approach

Warp: mobility infrastructure on structured P2P overlay

- route using in-network indirection
- directory service API (DOLR): RouteMsgToObject(ObjectID, Data)
- treat mobile nodes as objects on their proxy
- Flexible hierarchy for fast handoff
 - layers of overlay forwarding hops
 - longer hops in wide-area, shorter hops in LAN
 - implicit hierarchy: only modify short hops if moving locally
- Aggregate control traffic for mobile crowds
 - "elect" mobile trunk node to tunnel traffic for others
 - reduce control traffic to one handoff per crowd
- Routing, hierarchy, aggregation all managed by P2P protocol

Decentralized Object Location & Routing



- Decentralized directory API on structured peer to peer overlays
- Server "publishes" object: overlay distributes location pointers to log(n) nodes
- Clients route message towards object's ID, redirect when location pointer found
- Performance from locality-aware routing and local convergence properties

Registration / Routing



Fast Proxy Handover



Mobile Crowds



Type Indirection



- Leverage built-in indirection in object location layer of DOLR
- Can further iterate type indirection: e.g. PDAs on train passenger

Routing Performance

- compare warp to Mobile IP
- add redundant root to reduce end to end latency



Handoff Latency

compare time for Mobile IP, Warp and Warp full convergence



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Related Work

Fast handoffs

- hierarchical handoff (Caceres96)
- hierarchical Mobile IP (Perkins96)
- incremental route establishment (Keeton93)
- Session mobility (Snoeren00)
- ROAM (I3) (Zhuang03)
 - in-network traffic redirection pointers (triggers)
 - can do hierarchical mobility, node aggregation
 - placement of triggers up to mobile node

Summary

- Flexible name-based hierarchical mobility
 - treat mobile nodes as "objects" on overlay proxy
 - routing protocol manages traffic redirection points
 - virtual paths eliminate home agent and triangle routing
 - no notion of "home network"
- Aggregation to reduce control traffic
 - treat leaf nodes as "objects" on mobile trunks
 - Self-managing network redirection
 - rely on self-organizing protocol for aggregation, hierarchical handoff, fast route establishment
 - protocol adapts to node failures, topology changes

Thanks...

Comments, questions?

http://www.cs.berkeley.edu/~ravenben/tapestry