

Towards a Reference Evaluation Model for IPv6 Mobility?

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Agenda

Motivation

Modeling aspects

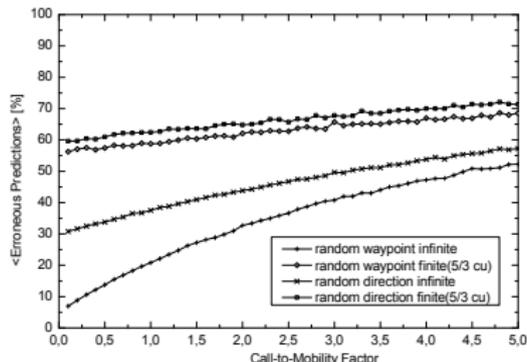
Two simple models

Outlook



Motivation

- ▶ Mobility protocols are an ongoing research topic
- ▶ Models for performance evaluation are tailored to paper perspectives
- ▶ Performance results depend on the ingredients
- ▶ Example for well-defined evaluation: Video/image compression
- ▶ Comparable results could enhance research quality



Aspects of Protocol Evaluation

Simulation:

- ▶ (Partial) full implementation of protocols
- ▶ Several simulators and protocol modules are around
- ▶ Simulation is composed of multiple protocol components
- ▶ Developer relies on underlying protocol modules

Analytical Evaluation:

- ▶ Higher abstraction of the problem
- ▶ Bound to modeling of the key characteristics



Requirements for an Evaluation Model

- ▶ Plausibility required for acceptance
- ▶ Implementable in various simulators
- ▶ Should account for different classes of scenarios
 - ▶ For example: Local movement (e.g. campus), inter-provider movement
- ▶ Tradeoff between flexibility and detailed specification
 - ▶ Which parameters are relevant for the problem?



Mobile IP Handover Process

- ▶ Link layer handoff
 - ▶ Movement prediction, movement between wireless cells
- ▶ Layer 3 movement detection
 - ▶ Link triggers, router advertisements
- ▶ Address reconfiguration
 - ▶ Stateless (with and w/o DAD), DHCP
- ▶ Signaling / Binding Update(s)



Characteristic Performance Parameters

- ▶ Mobile IP
 - ▶ Distance MN to HA and CN
- ▶ HMIP: Delay hiding by proxies
 - ▶ nAR to MAP ratio
 - ▶ Movement between MAP-domains
- ▶ FMIP: Delay hiding by predictions
 - ▶ Prediction probability
 - ▶ Anticipation time
 - ▶ L2 handover time
 - ▶ pAR to nAR distance
- ▶ PMIP: Network-based mobility management
 - ▶ MAG to LMA distance
 - ▶ LMA to MAG ratio and MAG to MN ratio



Modeling Network Topology

- ▶ Specify a network backbone
- ▶ Scenario characteristic: Network type
 - ▶ Intra-provider or inter-provider level
- ▶ Real-world measurements vs. synthetic models
 - ▶ Discussion about a topology reference for the Internet is out-of-scope of MobOpts
 - ▶ However, network topology is an important ingredients
- ▶ Consider correlation of topological movement and physical neighbourhood



Modeling Node Movement

- ▶ Again, choice between synthetic models and traces
- ▶ Entity movement vs. group movement
 - ▶ We mostly focus on single MN movement
- ▶ Movement along random directions or predefined paths
- ▶ Sharp vs. smooth movement
- ▶ Scenario characteristic: Speed (pedestrian, bicyclist, car)
 - ▶ 5 km/h, 20 km/h, 50 km/h
- ▶ Single or multi-hop movement



Performance Metrics

- ▶ Decide when to start measurement
- ▶ Resolution of gauging depends on probing interval

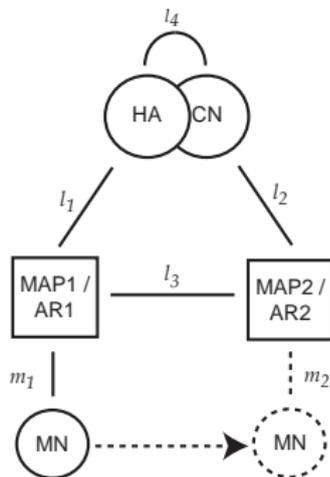
Typical metrics:

- ▶ Packet loss
- ▶ Delay
- ▶ Jitter
- ▶ Signaling load
- ▶ Routing costs



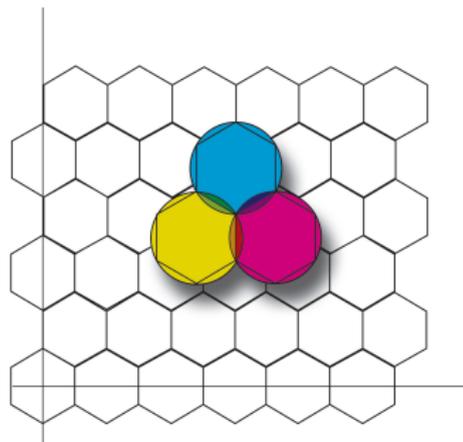
A Simple Topology Model

- ▶ Includes all mobile entities
- ▶ Abstracts network connectivity
- ▶ Link delays may be adjusted by measurements
- ▶ One access point per subnet
- ▶ Can be easily adapted for analytical work
- ▶ Counter approach: Topology generator with predefined parameters



A Simple Wireless Model

- ▶ Cell geometry is defined as honeycomb type
- ▶ Radio transmission is modeled as minimal enclosing circle
- ▶ Corresponds to a coherent spread out of HotSpots
- ▶ Includes prediction ranges, but neglects all physical aspects
- ▶ Supplement this by a mobility model



Before we go ahead with an Internet Draft, we should decide ...

- ▶ Do we want a detailed specification or a simple guide?
 - ▶ Example: Defining detailed topologies vs. handover scenarios
- ▶ Which scenarios do we want to cover?
- ▶ Do we want to focus on analytical or simulation-based evaluation?
- ▶ Should we use synthetic or real-world data?
 - ▶ Example: Synthetic vs. measured topologies



Conclusion & Outlook

- ▶ A reference evaluation model would be helpful
- ▶ Classify scenarios according to (general) mobility schemes, network type and movement pattern



K. Wehrle, J. Gross, M. Günes (Eds.):
Network Simulation Modeling.
Springer-Verlag. In preparation.

