A two-tier mobility generator for wireless simulations

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Outline

- **Introduction**
  - Existing issues
  - Our objectives
- **2TMM**
  - Traces
  - Parameters
- **Evaluation**

Introduction

Existing mobility models

- eg. Random Waypoint (RWP), Random Walk, etc
- ✓ Simple in implementation and analysis
- ✗ Realistic
- ✗ Comparable to real world movements
- ✗ Capture multiple types of mobility patterns

Introduction

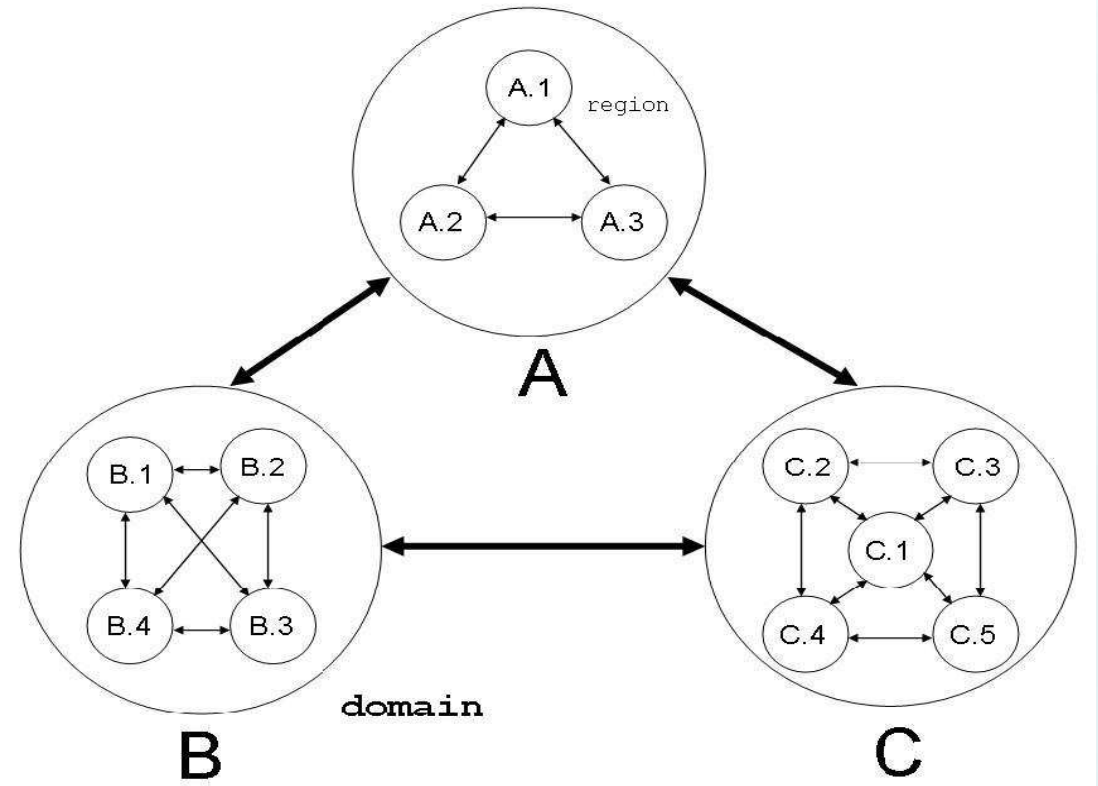
- **Realistic movements**
  - Affected by the geographical distance of the trip
  - Affected by the type of transportation used
  - Different types of transportation modes have different sets of characteristics

Introduction

- **A Multi-Tier Mobility Model**
  - To create more realistic movements in simulation
  - Each tier characterizes a different mobility pattern
    - introduced by the use of different transportation modes
- **A Parameterized Mobility Generator**
  - To generate realistic synthetic mobility traces for ns-2 simulations

A Two-Tier Mobility Model

- **Micro-mobility** (movements between Regions) and **Macro-mobility** (movements between Domain)



A Two-Tier Mobility Model

- **Developed based on experimental data collected from two sources**
  - **(macro-mobility) study of personal travel behavior held by US Department of Transportation in Lexington, Kentucky**
    - Used GPS on vehicles to record travel information for one week
    - 100 households with an average 3 vehicles per household
  - **(micro-mobility) data from Dartmouth College campus WiFi network**
    - Over 500 wireless cells visited by more than 6000 users for a period of 2 years

A Two-Tier Mobility Model

- **Observation from the data**
  - Different transportation modes can introduce different movement patterns
- **Parameters at each tier**
  - Original spatial distribution of the users
  - Preference of the movement (micro vs. macro)
  - User departure rate from the origination and arrival rate to the destination
  - Selected destination and preferred path
  - Trip length
  - User residence time in one particular region

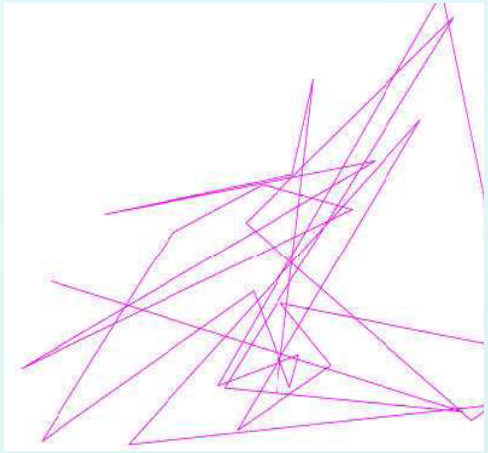
Evaluation

- To understand the impact of our model on the performance of ad-hoc routing protocols via ns-2 simulations

- Metrics for evaluation
  - Node density
  - Path duration
  - Data delivery rate
  - Control packet overhead
  - End-to-end delay

Evaluation

- **Two-Tier mobility model exhibits a stronger spatial locality**



Traveling pattern of an mobile node using Random Waypoint Model

Traveling pattern of an mobile node using Two-Tier Model

Evaluation

- **Two-Tier mobility model exhibits a higher clustering of nodes**