UNIVERSITY OF WATERLOO
Department of Electrical and Computer Engineering

Springfield: A Real-Time Parallel Simulation of Mobile Telecommunications

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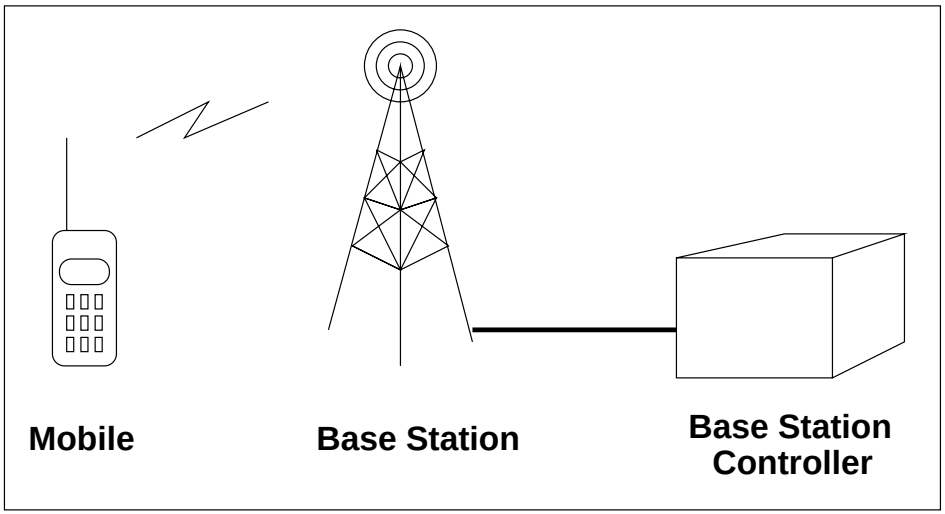
CCECE '98

May 27, 1998

Goals

- Simulate a realistic PCS system
- Allow real-time interaction
- Allow real-time viewing
- Support large geographic areas
- Support large numbers of users
- Provide customization of model parameters
- Allow the collection of statistical information about the system

Components



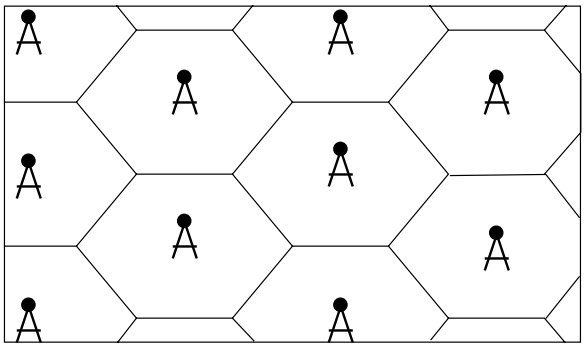
Mobile: portable phone

Base Station: communication centre; connects mobile to land lines

Base Station Controller: logic centre controlling base station(s)

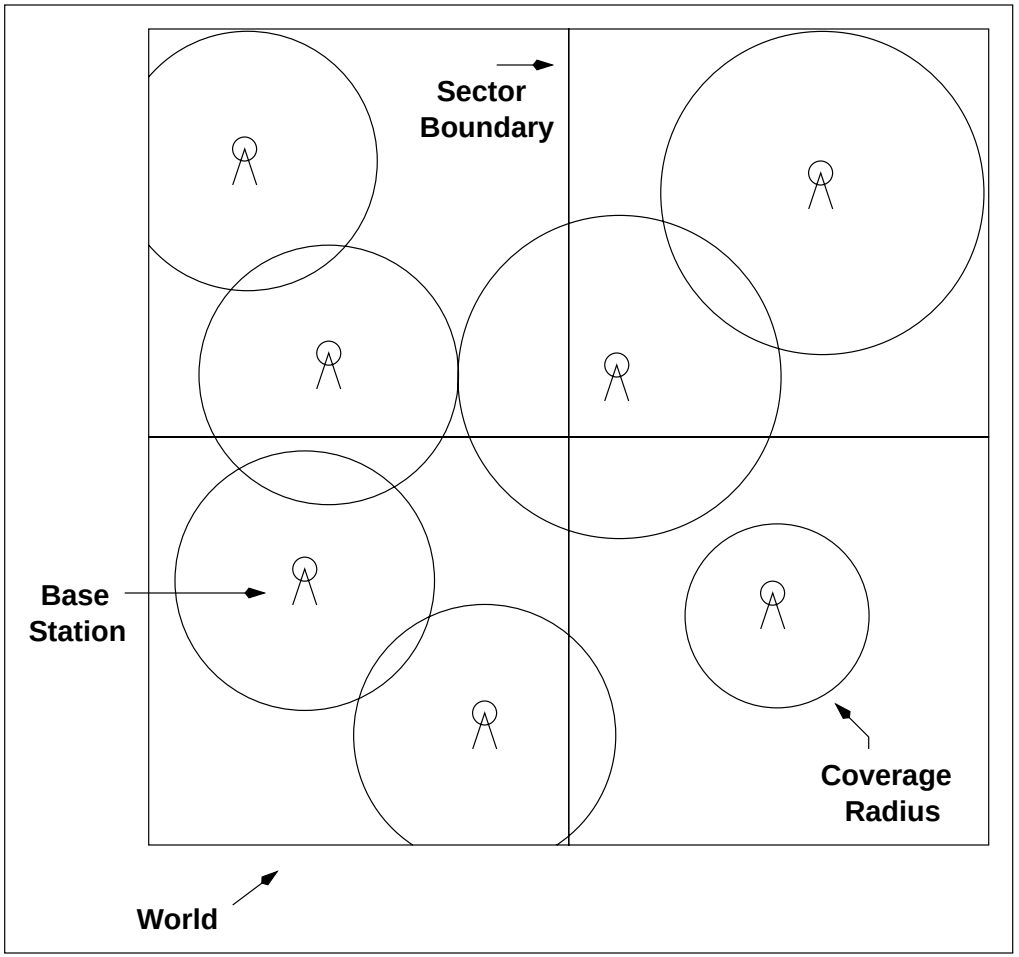
Cells

- base stations are arranged in "cells" in order to reuse frequencies
- cell based simulation uses a regular geometeric pattern
  - usually square (NEWS grid) or hexagonal layouts
  - boundaries are a simplification for modelling
- in reality:
  - layout is seldom regular
  - signal strength determines cell size
  - cells overlap
- *Springfield* uses signal based propogation modelling
  - based on Liljenstam and Ayani's (MASCOTS'96)



Terminology

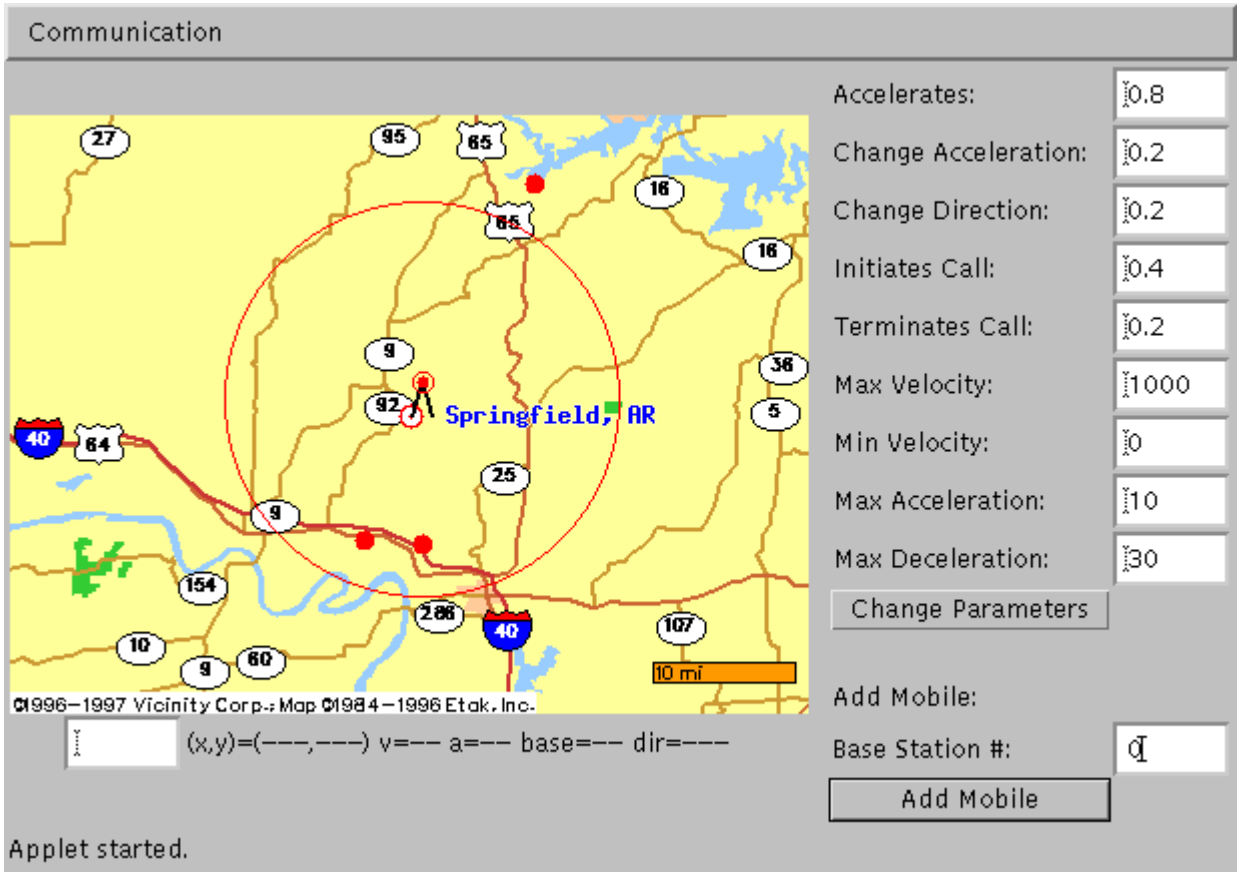
- cell vs sector
- base station vs BSC
- inter-cell hand-offs
- inter-sector hand-offs
- blocked calls
- dropped calls
- teletraffic model
- mobility model



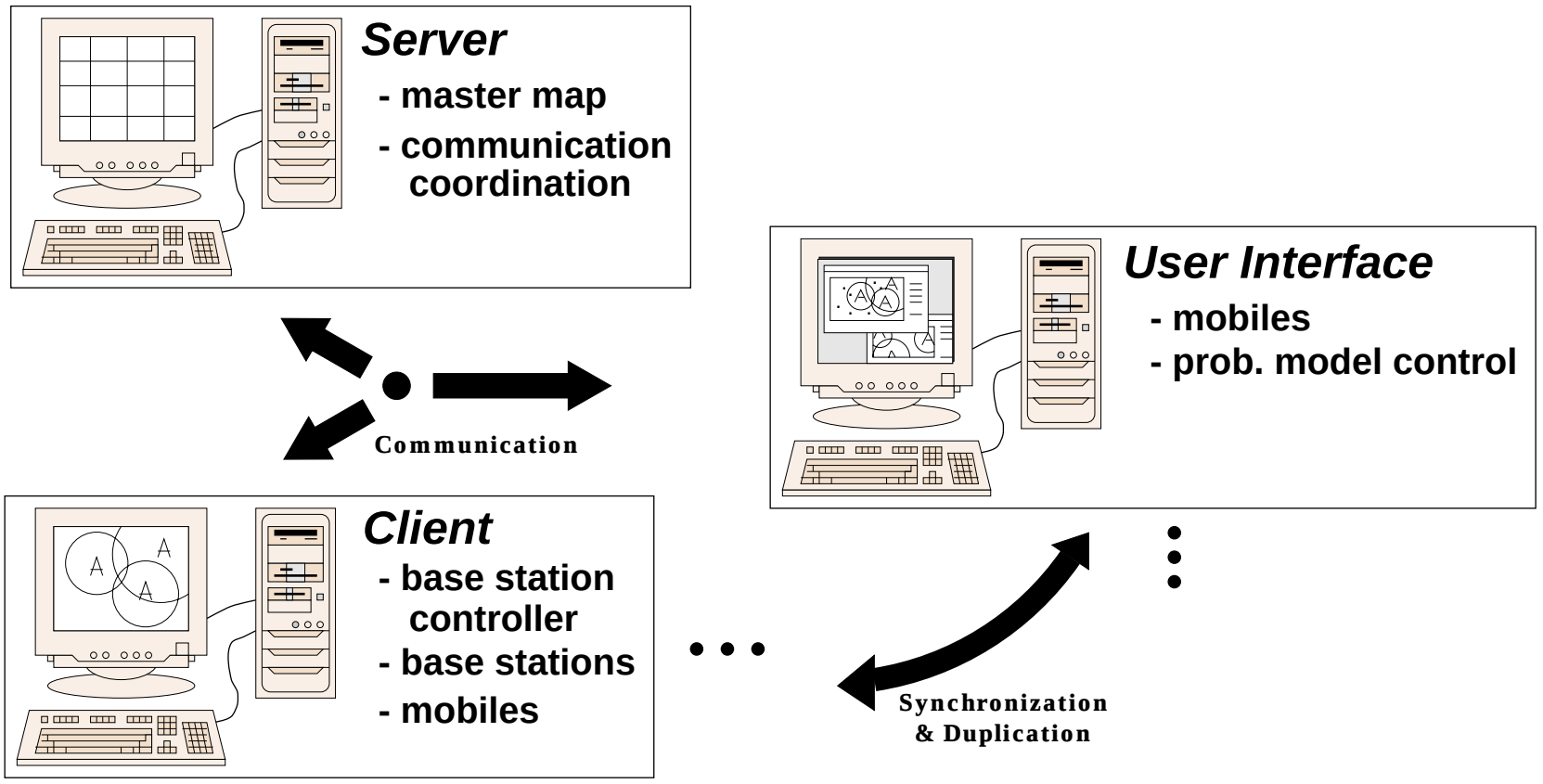
Implementation

- Implemented in Java
- Real-Time (vs Time Warp)
- Double precision math
- Sector based partitioning
- Teletraffic model: Poisson arrivals
- Mobility model: variable speed, acceleration, angular direction
- Propagation model: Constant shadow fading
- Number of Cells (Base Stations): variable

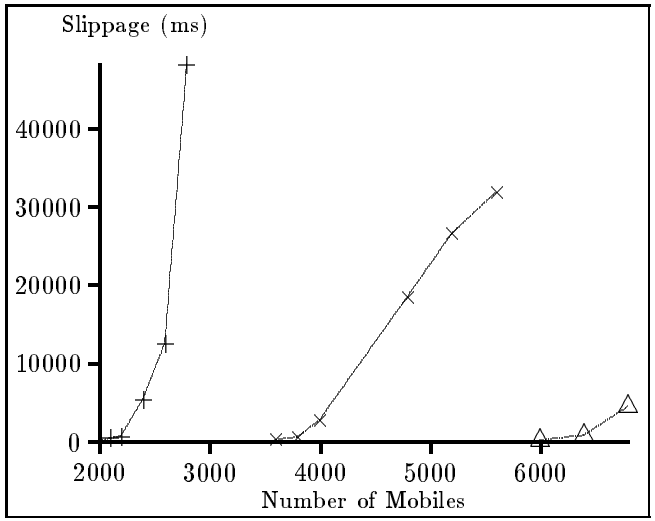
User Interface



Model


Server
- master map
- communication coordination
Communication
User Interface
- mobiles
- prob. model control
Client
- base station controller
- base stations
- mobiles
Synchronization & Duplication

Results



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