



WiMAX System-Level Evaluation Methodology Update

Raj Jain

Professor of Computer Science and Engineering
Washington University in Saint Louis

Jain@wustl.edu

<http://www.cse.wustl.edu/~jain>

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- Goal
- Link-Level vs System-Level Models
- Accomplishments and Open Issues:
 - PHY Models
 - MAC
 - Overall System Simulation Approach
- Cross-Team Relationship
- This is only an incremental update since San Diego Plenary. See AATG website for a detailed presentation on methodology (July 2006), http://www.wimaxforum.org/apps/org/workgroup/aatg/download.php/8087/wimax_sim.ppt

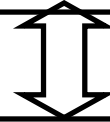


Goal

- Standardized methodology for system level simulation of WiMAX systems
- Can be used by any modeling system: NS2, Opnet
- Can be used by Equipment vendors/service providers to model their system
- This methodology will be used for AATG NS2 simulation
- Similar documents exist for 3GPP/3GPP2

WiMAX Model Components

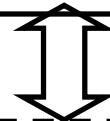
Applications (VOIP, VoD, Remote Backup, ...)
Workload Characteristics, QoS Requirements



Transport and IP Layers (TCP/UDP, IP, RTP, ...)
TCP/IP Parameters: MTU Size, Buffers, ...



MAC Layer (ARQ, Burst Allocation, FEC, ...)
Interference from other systems, ...



Physical Layer (Coding, Antenna, AAS, OFDM,...)
Topography (Height, Cell size, Customer density, ...)

Abstraction



Link-Level vs System-Level Models

Link-Level:

Goal: Study different signal transmission and reception schemes

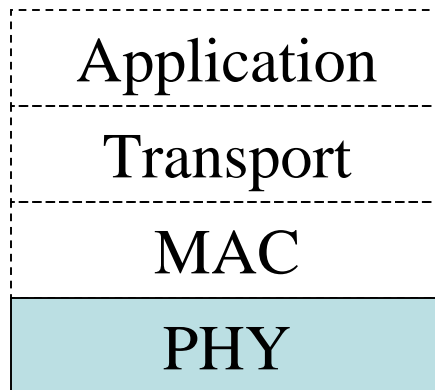
Single Link

Single Cell

Single Base Station

Emphasis on PHY

Some MAC



System-Level:

Goals: Application Level Performance

Multiple users

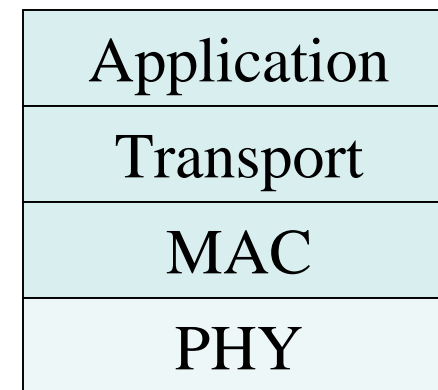
Multi-Cells

Multiple Base Stations

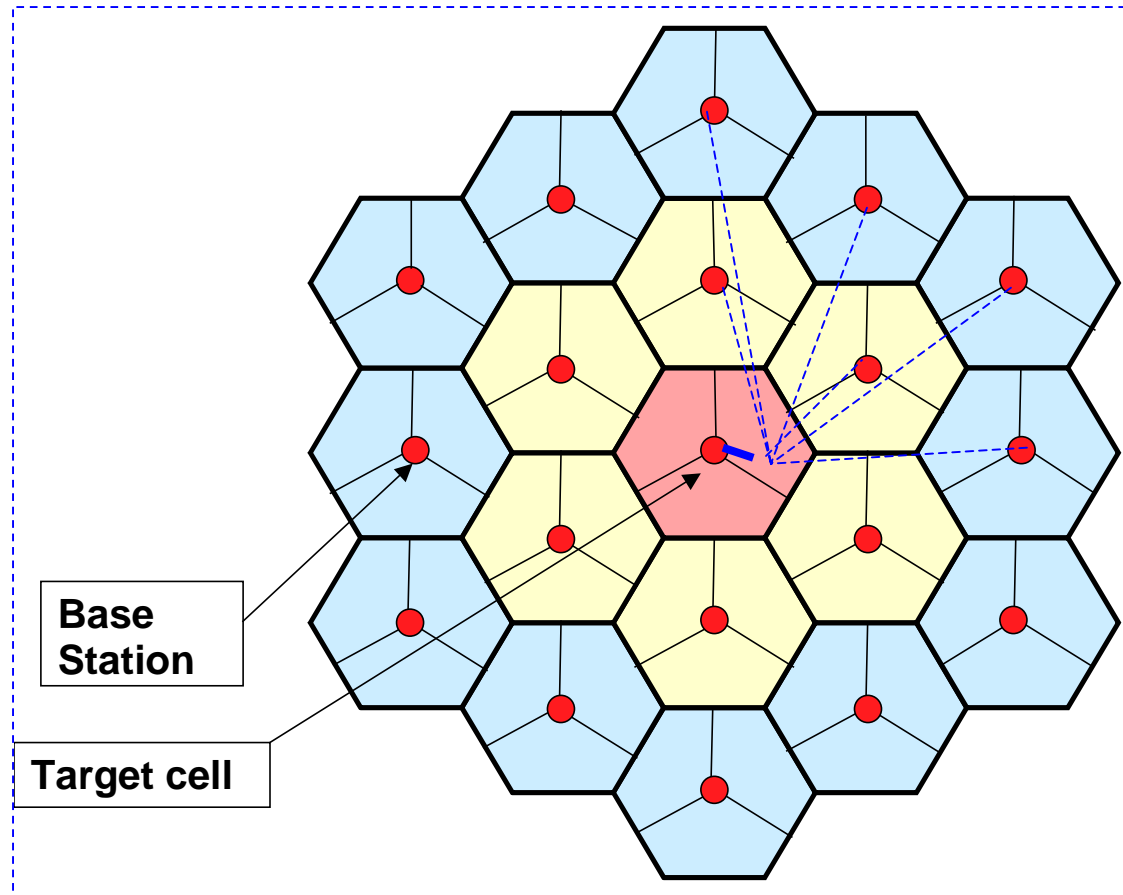
Large # of subscribers

Emphasis on All Layers

=> PHY abstraction



System Simulation Approach



System Simulation Approach

- Simulate multiple WiMAX cells
- Model different applications with different levels of penetration
- Simulate application traffic streams; use realistic traffic models
- Distribute user session randomly among the cells
- Utilize neighboring cell traffic to create interference in the center cell
- Abstract PHY to a table/graph mapping physical condition to Block Error Rate (BLER)
- Apply generic MAC scheduler and MAC layer interfacing with PHY abstraction
- No link level simulation



Acknowledgement

Contributions from the following companies have been used:

- Alvarion
- Arraycom
- AT&T
- Intel
- Lucent
- Motorola
- Postdata
- Siemens
- Sprint
- Telsima
- Venturi Wireless

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Recent Reviewers and Contributors

- Bong Ho/Postdata
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- Jiu Hui/Intel
- Jongnam Yun/Postdata
- Yaron Alpert/Alvarion
- Arvind Raghavan/Arraycom
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- Shyam Parekh/Lucent
- Tech Hu/Siemens
- Vafa Ghazi/Coware
- Arun Ghosh/AT&T

PHY Models

- Started with 3GPP and 3GPP2 concepts
- Changes to accommodate:
 - Broadband
 - SOFDMA
- Path Loss
- Established basic path loss formulas
 - Verify choice with MTG
- Resolved Error Probability Model
 - EESM/MIC/MIM
 - Established granularity: FEC block
- Open Issue:
 - Simplification of interference
 - Reconcile MWG system evaluation table parameters with our contribution



MAC

- List of MAC features identified
 - Good momentum on channel coding, scheduler
 - Discuss overhead numbers (N1 to N9)
 - Need to write up the enhanced proportional fair scheduler
- Packet processing flows clarified – See next slide
- Open Issues:
 - Need contributions on MAC features

MAC Layer Modelling

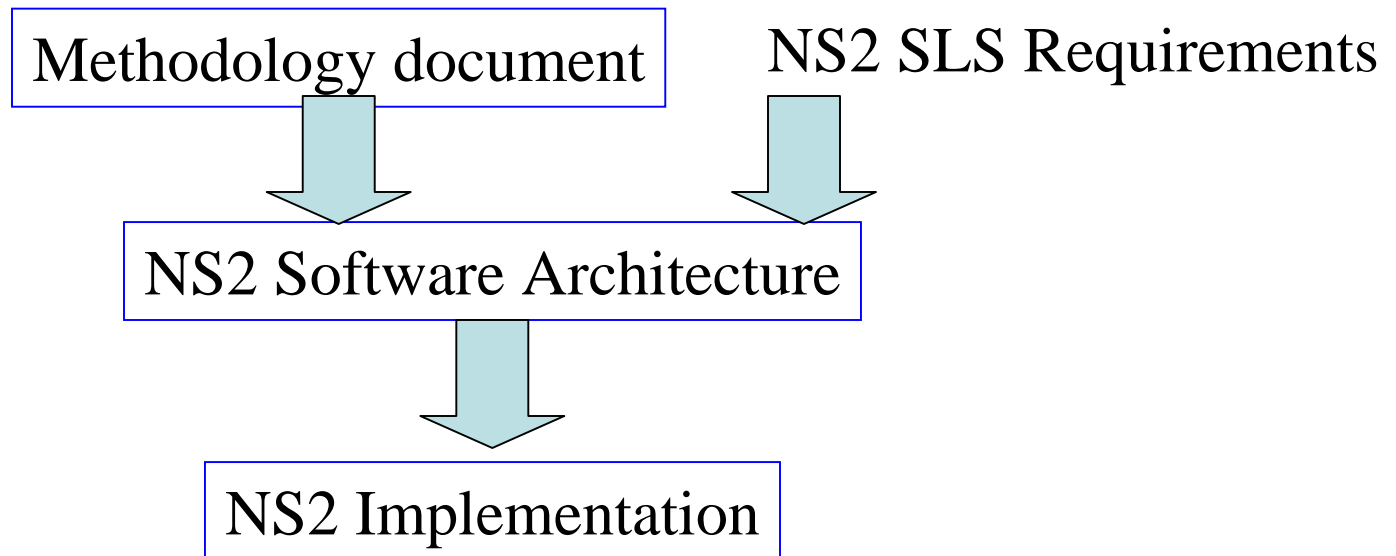
- **6.1 Convergence Sublayer**
- **6.2 MAC PDU FORMATS**
- **6.3 ARQ MECHANISMS**
- *6.4 MAC SUPPORT OF PHY LAYER*
- **6.5 DYNAMIC SERVICE FLOW OPERATION**
- **6.6 Scheduler**
 - 6.6.2 Scheduling Mechanisms
- **6.7 CHANNEL CODING**
- **6.8 HARQ**
- **6.9 MOBILITY MANAGEMENT (LATER RELEASE)**
- **6.10 POWER MANAGEMENT (SLEEP-IDLE MODE)**
- **6.11 SECURITY (LATER RELEASE)**
- **6.12 MBS (LATER RELEASE)**
- **6.13 UL/DL MAPS**
- **6.14 BUFFER MANAGEMENT**



Overall System Simulation Approach

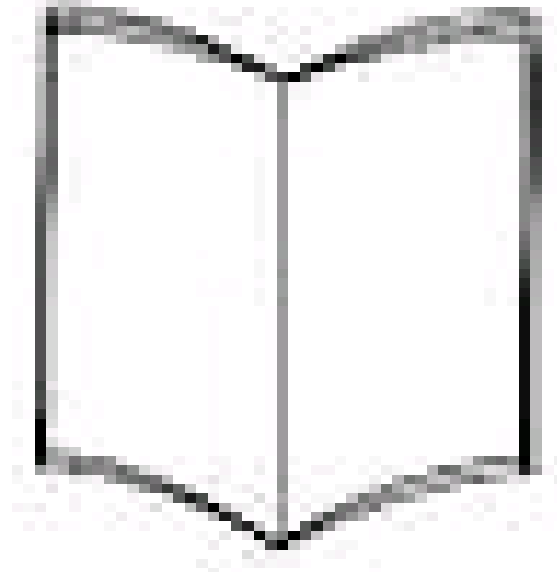
- 19 Cell Methodology
- Added traffic models
- Protocol Layer Modules
- NS2 program Modules
- Open Issues:
 - Write up user drop processing
 - Finalize user loading in neighbor cells
 - Settle on system simulation parameters

Cross-Team Relationship





Review



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