

# Wireless Network Pricing

## Chapter 1: Introduction

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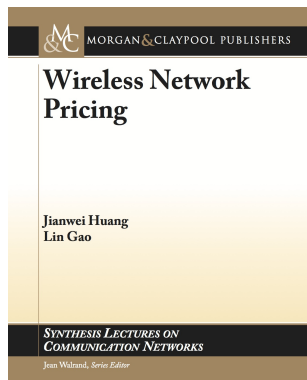
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# The Book



- E-Book **freely** downloadable from NCEL website: <http://ncel.ie.cuhk.edu.hk/content/wireless-network-pricing>
- Physical book available for purchase from Morgan & Claypool (<http://goo.gl/JFGLai>) and Amazon (<http://goo.gl/JQKaEq>)

# Why this Book?

- Today's wireless communications and networking practices are **tightly coupled** with economics considerations.
- To the extent that **it is almost impossible** to make a sound technology choice **without understanding its economic implications**.

# A Wireless Utopia

- Wireless spectrum is **unlimited**
- Wireless communication is **fast and reliable**
- Heterogeneous wireless technologies **co-exist in harmony**
- Wireless users have **reasonable** data needs
- Wireless providers **maximize social welfare**

# The Wireless Reality

- Wireless spectrum is **very limited**
- Wireless communication is **slow and unreliable**
- Heterogeneous wireless technologies **compete and interfere with each other**
- Wireless users have **exploding** data needs
- Wireless providers **maximize profits**

# How Economics Might Help?

- **Narrow** the gap between dream and reality
- **Increase** the performance of wireless networks
- **Improve** the satisfactions of users and service providers

# Match Supply and Demand

- **Limited** wireless resource vs. **fast growing** wireless demands
  - ▶ Spectrum allocation and auction
  - ▶ Secondary spectrum markets and information markets
- **Limited** data rates vs. demands for **fast** Internet access
  - ▶ Smart data pricing
  - ▶ Wi-Fi data offloading
  - ▶ User-provided networking

# Technology-Economics Coupling

- Different **technology characteristics**
  - ▶ Cellular vs. Wi-Fi: coverage, data rate, and cost
- **Distributed** and **heterogeneous** networks
  - ▶ Different operators have different interests
  - ▶ Sophisticated devices capable of adaptation and optimization
- New technology changes the **value of services**
  - ▶ Cellular technology upgrade (3G → 4G → 5G)
  - ▶ Skype Wi-Fi adoption

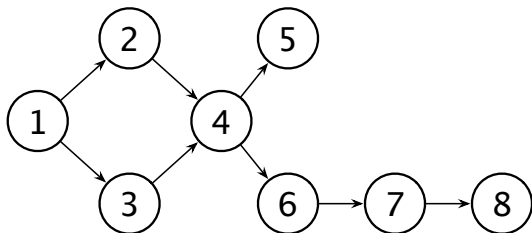


# We Are Talking About Wireless

- How is wireless network economics different from Internet economics?
- Characterization of **network resources** is more complex for wireless
  - ▶ Stochastic due to shadowing, fading, and mobility
  - ▶ Spatial heterogeneous
  - ▶ Mutual interferences
- Characterization of **end user** is more complex for wireless
  - ▶ Application QoS
  - ▶ Energy constraint and efficiency
  - ▶ Channel conditions
- Heavy **dependence** on wireless technology
- Lead to new **technology, policy, and economics considerations.**

# How to Use This Book?

- Textbook for a single semester entry level graduate course
- Chapter dependence:



## Extended Reading

<http://ncel.ie.cuhk.edu.hk/content/wireless-network-pricing>