

# Capacity of Cellular Systems

- ❖ Channel capacity: maximum number of users in a fixed frequency band
- ❖ Radio capacity : value for spectrum efficiency
- ❖ Reverse channel interference
- ❖ Forward channel interference
- ❖ How determine the radio capacity?

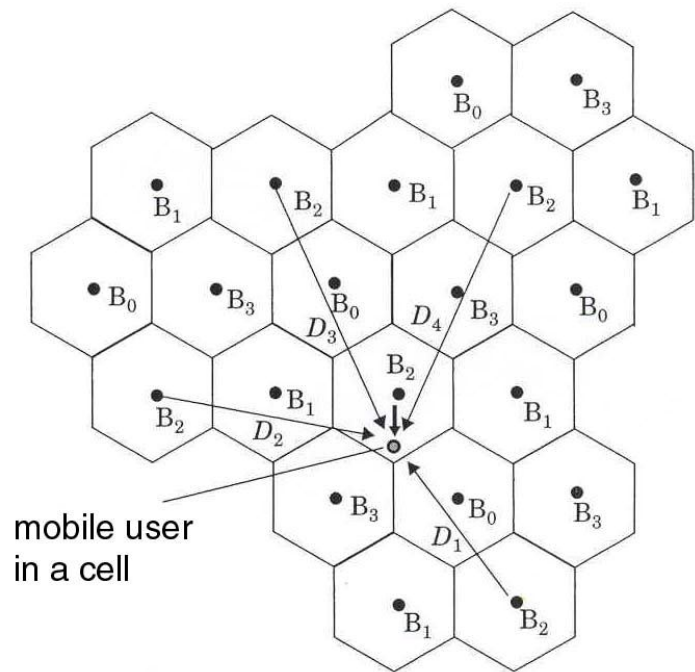
# Co-Channel Reuse Ratio Q

$$Q = D/R$$

- ❖ Q ... co-channel reuse ratio
- ❖ D ... distance between two co-channel cells
- ❖ R ... cell radius

# Forward channel interference

- ❖ cluster size of 4
- ❖  $D_0$  ... distance serving station to user
- ❖  $D_K$  ... distance co-channel base station to user



# Cellular Wireless Network Evolution

- **First Generation: Analog**
  - AMPS: Advance Mobile Phone Systems
  - Residential cordless phones
- **Second Generation: Digital**
  - IS-54: North American Standard - TDMA
  - IS-95: CDMA (Qualcomm)
  - GSM: Pan-European Digital Cellular
  - DECT: Digital European Cordless Telephone

# Cellular Evolution (cont)

- **Third Generation: T/CDMA**

- combines the functions of: cellular, cordless, wireless LANs, paging etc.
- supports multimedia services (data, voice, video, image)
- a progression of integrated, high performance systems:
  - (a) **GPRS (for GSM)**
  - (b) **EDGE (for GSM)**
  - (c) **1xRTT (for CDMA)**
  - (d) **UMTS**

# Cellular systems around the world

- US systems (cont'd)

- **PCS1900:** Personal Communications System, 1900 MHz band  
Based on GSM and DCS1800

- **CDMA2000:**  
Third-generation, digital system  
Evolution of IS-95

- **General:** Dual-mode terminals AMPS/xxxx  
Network protocol IS-41  
Only AMPS national coverage, rest local