

Mobile Computing

Lecture 2

Multiplexing



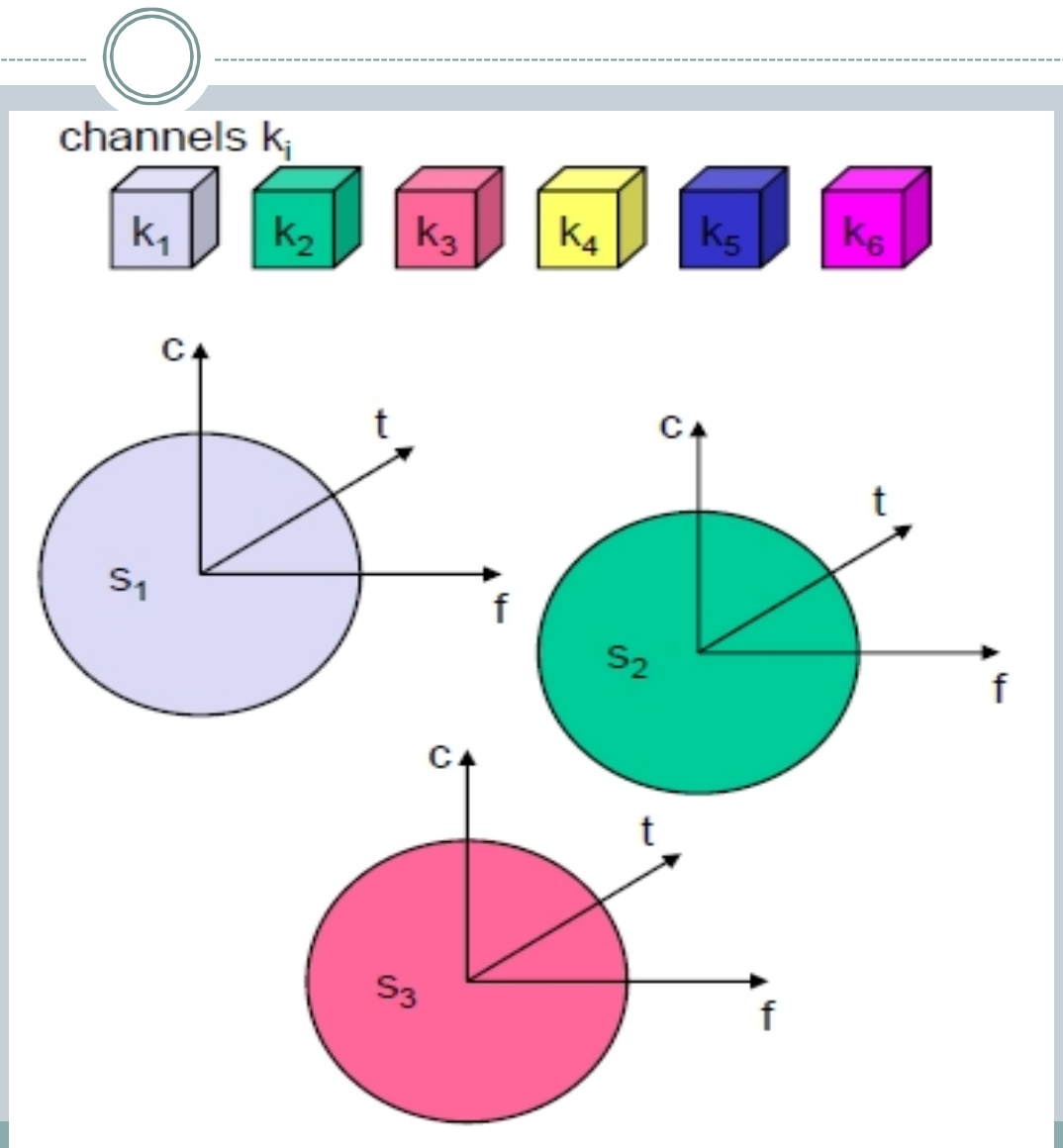
CONTENTS



- Multiplexing
- Need of multiplexing techniques
- Frequency multiplexing
- Time multiplexing
- Code multiplexing

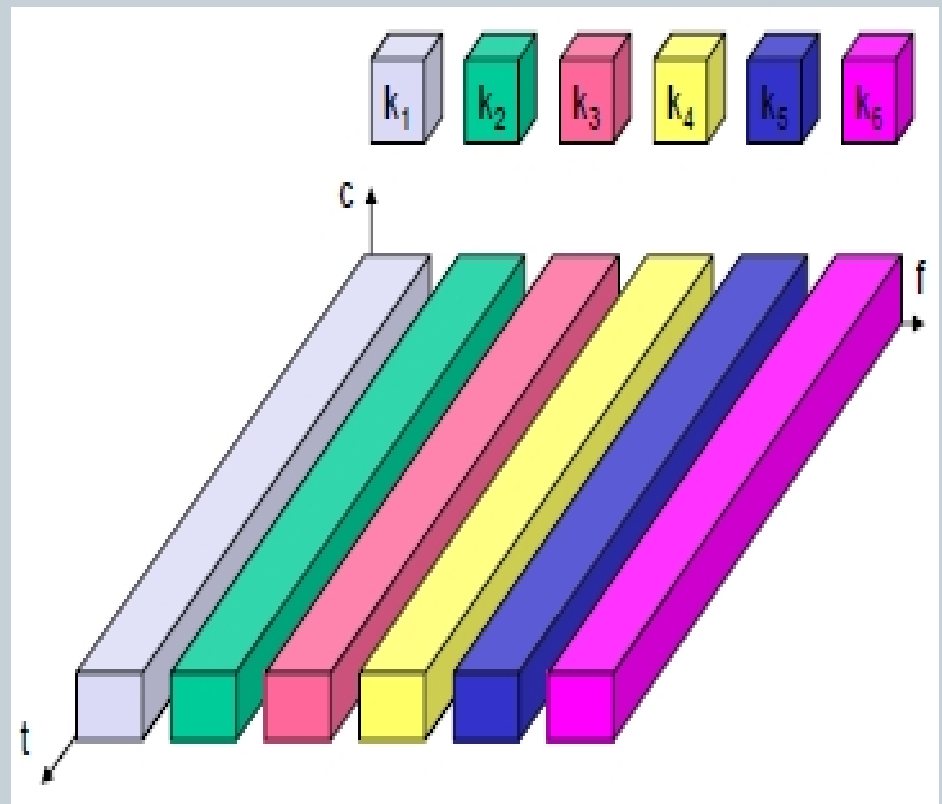
Multiplexing

- Multiplexing in 4 dimensions
 - space (s_i)
 - time (t)
 - frequency (f)
 - code (c)
- Goal: multiple use of a shared medium
- Important: guard spaces needed!



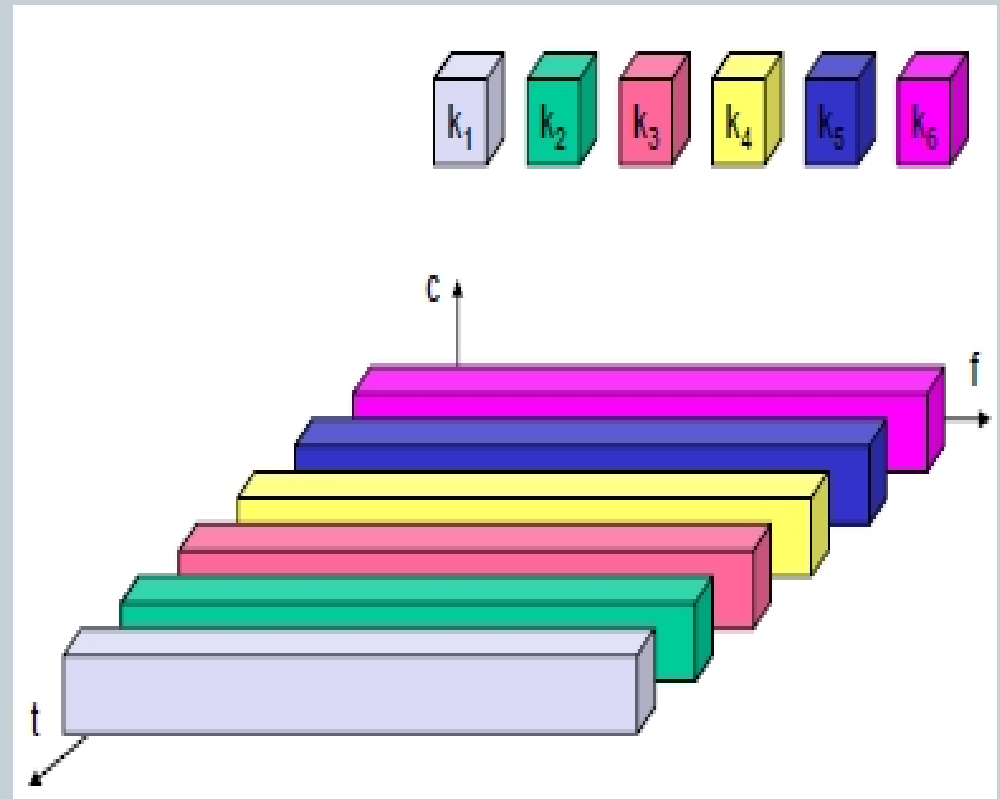
Frequency multiplex

- Separation of the whole spectrum into smaller frequency bands
- A channel gets a certain band of the spectrum for the whole time
- Advantages:
 - no dynamic coordination necessary
 - works also for analog signals
- Disadvantages:
 - waste of bandwidth if the traffic is distributed unevenly
 - Inflexible
 - guard spaces



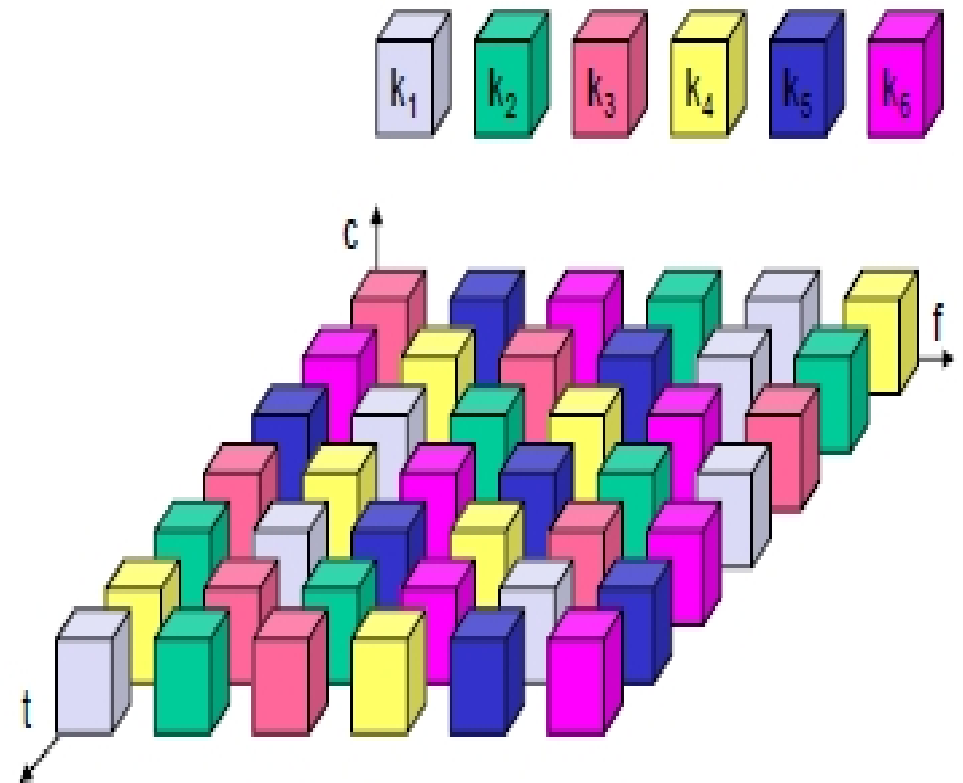
Time multiplex

- A channel gets the whole spectrum for a certain amount of time
- Advantages:
 - only one carrier in the medium at any time
 - throughput high even for many users
- Disadvantages:
 - Precise Synchronization necessary



Time and frequency multiplex

- Combination of both methods
- A channel gets a certain frequency band for a certain amount of time
- Example: GSM
- Advantages:
 - better protection against tapping
 - protection against frequency selective interference
 - higher data rates compared to code multiplex
- but: precise coordination required



Code multiplex

- Each channel has a unique code
- All channels use the same spectrum at the same time
- Advantages:
 - bandwidth efficient
 - no coordination and synchronization necessary
 - good protection against interference and tapping
- Disadvantages:
 - lower user data rates
 - more complex signal regeneration
- Implemented using spread spectrum technology

