

Wireless Multimedia Systems Fall, 2008 (Lecture 6)

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1. Today's topic:

Power Saving for WLAN

CDMA and 3G Wireless Mobile Network Trend

Mobility in IP Network

Suggested Reading:

◆Required Reading:

- ◆ [Kohno95]Ryuji Kohno, Reuven Meidan, and Laurence B. Milstein Spread Spectrum Access Methods for Wireless Communications, IEEE Communication Magazine, 1995
- ◆ [Dahlman98]Erick Dahlman, Bjorn Gudmundson, Mat Nilsson and Johan Skold, UMTS/IMT-2000 Based on Wideband CDMA, IEEE Communication Magazine 1998
- ◆ [Ojanpera98] T. OJanpera, R. Prasad, "An Overview of Third-Generation Wireless Personal Communications: An European Perspective, IEEE Personal Communication Magazine 1998

a) Spread Spectrum & CDMA

- (1) Direct Sequence Cellular CDMA
- (2) Characteristics of DS/CDMA
 - (a) Universal Frequency Reuse
 - (b) Power Control (Reverse Link and Forward Link)
 - (c) Soft Handoff and Space Diversity
 - (d) Cellular User Capacity
 - (e) Current DS Designs

Spread Spectrum Access Method for Wireless Communications (CDMA)

<I> Universal Frequency Reuse

Direct Sequence Cellular CDMA:

<II> Power Control:

Reverse Link

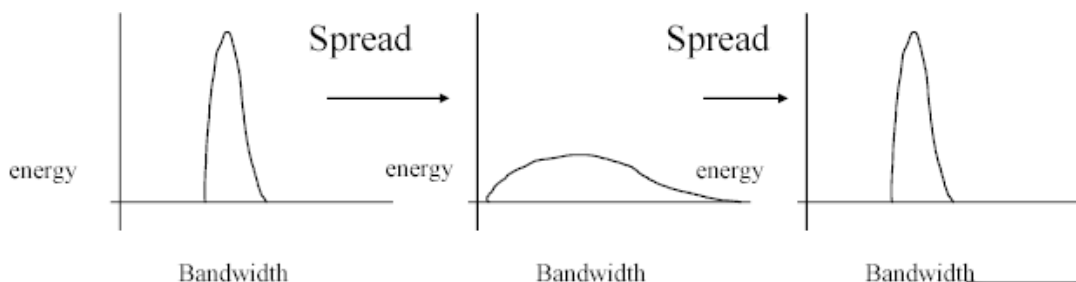
Forward Link

<III> Soft Handoff and Space Diversity

<IV> Cellular User Capacity to determine the allowed number of user for a CDMA cellular system

$$\left(\frac{E_b}{\eta_0}\right)_{eff} = \frac{1}{\frac{\eta_0}{E_b} + \frac{2}{3G}(M-1)(1+K)\alpha}$$

A. Spread Spectrum



B Spreading Factor & Processing Gain

Code Tree: OVVSF (orthogonal variable spreading factor) could produce processing gain at the receiver for difference service rate.

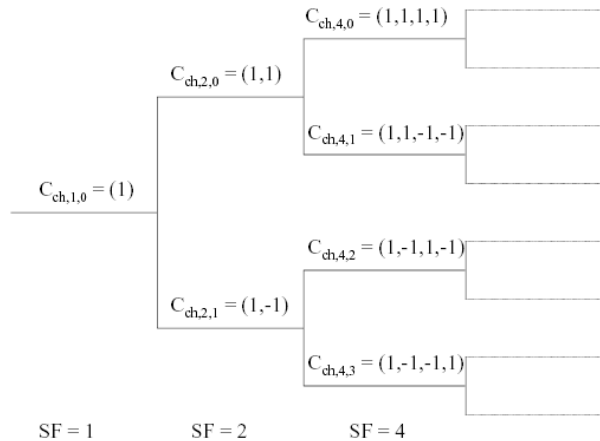


Figure 2.7: Code-tree for generation of OVFSF codes.

e.g.

SF=2 cases:

$$(1, 1) \otimes (1, 1) = 1+1=2 \text{ (Processing Gain)}$$

$$(1, 1) \otimes (1, -1) = 1-1=0 \text{ (orthogonal)}$$

SF=4 cases:

$$(1, 1, 1, 1) \otimes (1, 1, 1, 1) = 1 + 1 + 1 + 1 = 4 \text{ (Processing Gain)}$$

$$(1, 1, 1, 1) \otimes (1, 1, -1, -1) = 1+1-1-1 = 0 \text{ (Orthogonal)}$$

Shared Resource:

Power is the common shared resource for users.

b) Wideband CDMA & 3GPP

(1) GSM Evolution to UMTS/IMT-2000

- a. The Radio Perspective
- b. The Network Perspective
- c. The Global Approach

(2) Key W-CDMA Features

- ◆ Performance Improvements
 - Capacity Improvements (3 dB, 384 kb/s, 1.9 Mb/s, 130 users)
 - Coverage and Link Budget Improvements (reuse GSM cell, 144 kb/s)
- ◆ Service Flexibility
 - Support of a wide range of services with maximum rate of 2 Mb/s, the possibility for multiple parallel services on one connection
 - A fast and efficient packet-access scheme
- ◆ Operator Flexibility
 - Support of asynchronous inter-base-station operation
 - Efficient support of different deployment scenarios, HCS, hot-spot
 - Support of evolutionary technologies such as adaptive antenna arrays and multi-user detection
 - A TDD mode designed for efficient operation in uncoordinated environment

c) Evolutions of PCS networks

GSM: VLR/HLR

GPRS: SGSN/GGSN

d) Coming Challenges:

All IP Mobile Network (Mobile IP & Cellular IP)

QoS Backbone (types of backbone, IP backbone (Integrated Service, DiffServe))

Advanced 802.11 Management:

<I> 802.11 Power Saving

Infrastructure: TIM

Beacon Message:

Timestamp

Beacon Interval

Capability Information

SSID (Service Set Identity, ESS or IBSS)

Supported Rates

CF Parameter Set

IBSS Parameter Set

TIM

DTIM, Delivery Traffic Indication MAP (for broadcast and multicast)

Association Request: (Capability Information, Listen Interval, SSID, Supported Rates)

Association Response: (Capability Information, Status Code, Station ID, Supported Rates)

Ad hoc (IBSS): ATIM