Concept of Ranging Code Set in BWA

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Purpose: **This presentation presents the concept for Ranging Code Set.**

Concept of Ranging Code Set in BWA

2002. 1.

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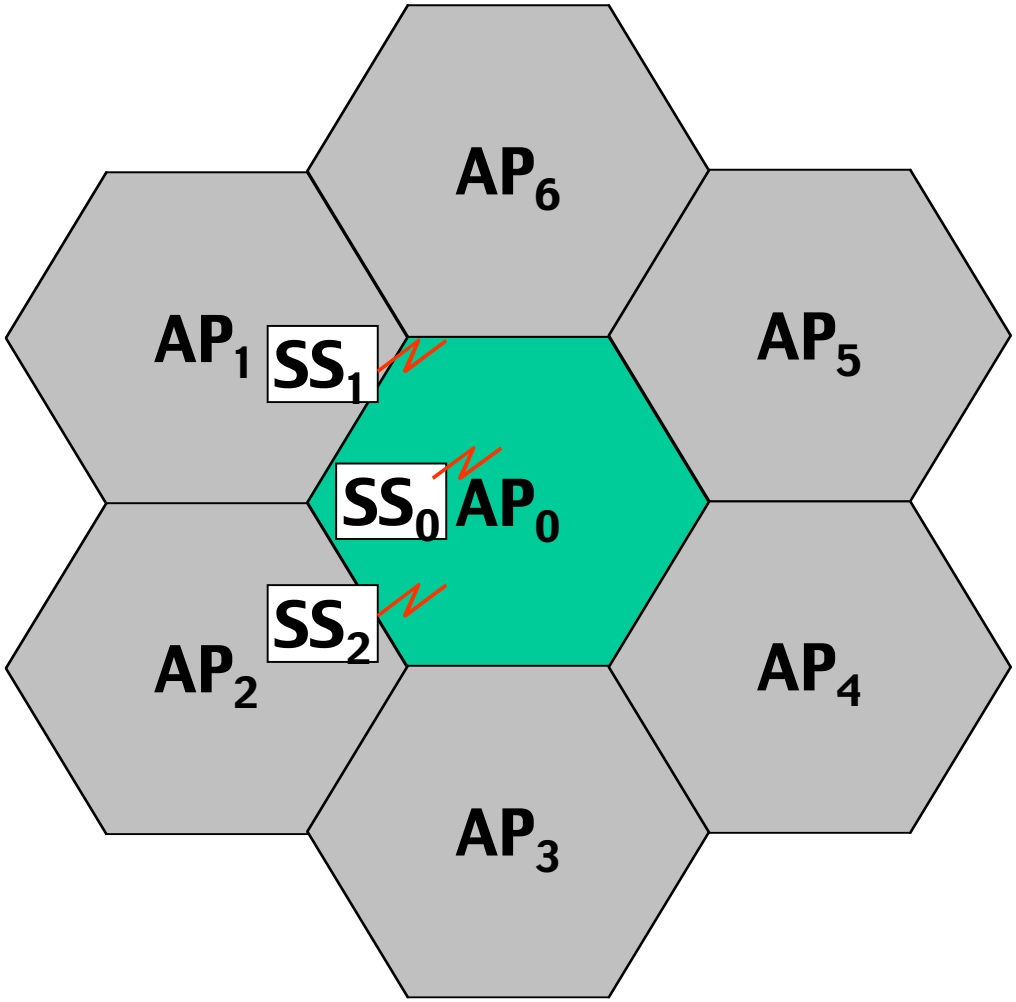
Problems of Ranging

- Ranging Request Signal from SS
  - Ranging Codes : All SSs of system use the same Ranging codes (Generating by the PRBS)
  - Uncontrolled power and time offset

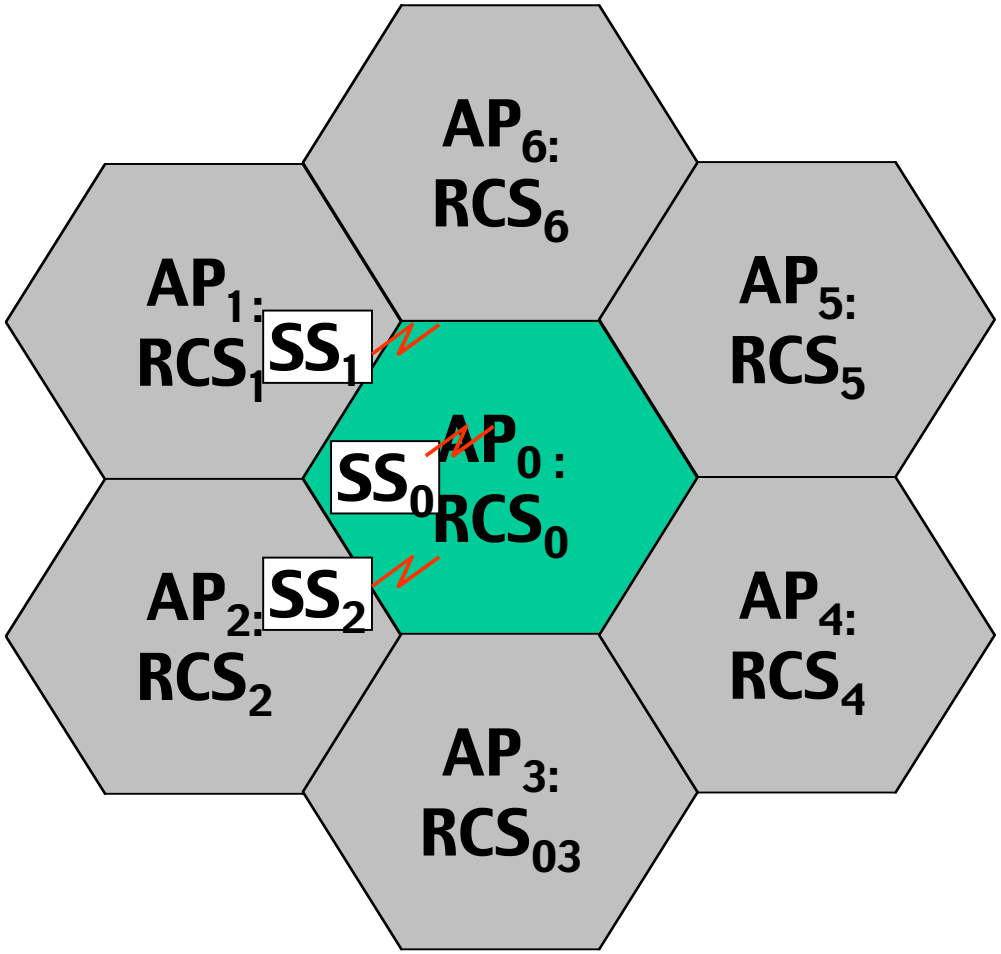
- AP s Ranging Signal Detection
  - Identifying by Ranging Code and Ranging Sub-channel
  - Can t know which SS transmits the Ranging Signal
  - Can t distinguishes Ranging Request Signals of own SSs from the adjacent cells s SSs

Interferences from the adjacent cells



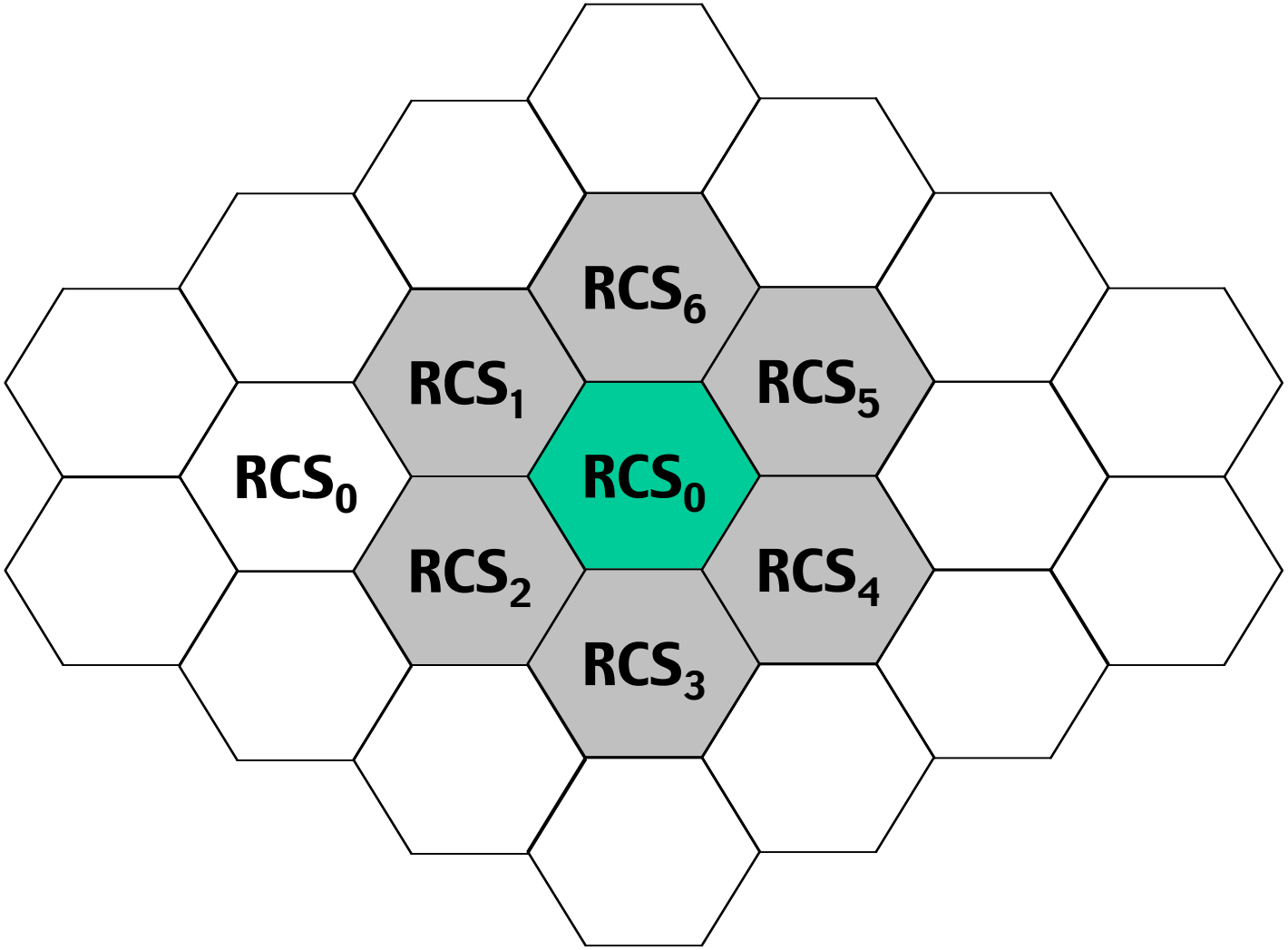
- AP_0 can receive Ranging Request Signals from SS_1 and SS_2.
- SS_0, SS_1 or SS_2 may select the same Ranging Code.
- AP_0 can t distinguishes Ranging signal of SS_0 from SS_1 and SS_2.
- Ranging Request signal of SS_1 or SS_2 meets the ranging success criteria then AP_0 will send the Ranging Response signal to SS_1 or SS_2.
- The probability of ranging success goes down.

Using the different Ranging Codes



- Each cells uses the diffe rent Ranging Codes; Ra nging Code Set(RCS)
- AP_0 detects the Raging Request Signals using o nly RCS_0.
  - AP_0 can prevent the Rang ing Request Signals from SS_1, SS_2.

Assignment of Ranging Code Set



Adaptation on IEEE802.16a

- Broadcasting RCS information through UCD message
  - Ranging Codes : Generated by the PRBS($1+X^1+X^4+X^7+X^{15}$)
    - Length of : 53 bits, The number of Ranging codes : 48
  - Ranging Code Set
    - Length of the PRBS : 2^{15}-1 =32767
    - Each Ranging Code Set has the 48 Ranging Codes.
    - The number of Ranging Code Set is 12.
- Add Ranging Code Set index element to UCD message.

Updated UCD message

Syntax	Size	Notes
UCD_Message_Format() {	°	°
Management Message Type = 0	8 bits	°
Uplink channel ID	8 bits	°
Configuration Change Count	8 bits	°
Mini-slot size	8 bits	°
Ranging Backoff Start	8 bits	°
Ranging Backoff End	8 bits	°
Request Backoff Start	8 bits	°
Request Backoff End	8 bits	°
Ranging Code Set	4 bits	New element
TLV Encoded information for the overall channel	Variable	TLV Specific
Begin PHY Specific Section {	°	°
For(I=1;I<=n;I++)	°	°
Uplink_Burst_Profile	Variable	°
}	°	°
}	°	°
}	°	°

Quasi-random Selection of Ranging Code

- To avoid the confliction of selecting the same ranging code among SSs within one cell, SS selects ranging code by foll owing rule instead of random selection.

  Ranging Code Index = {SS MAC Address} modulo {The number of Ra nging Codes}

- Higher contention resolution adding one step for selecting Ranging code
- Prevent the delay of back off cause of confliction

Summary

- Using Ranging Code Set
  - Avoid the Ranging Request Signal from the adjacent cells.
  - Simple implementation
    - Only addition one element to UCD message
  - Increasing of Ranging Success probability
- Quasi-random Selection of Ranging Code
  - To avoid the selection of the same Ranging code within one cell
  - Higher contention resolution of selecting Ranging Code
  - Can prevent the delay of backoff