

BR ranging code in 802.16m

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Venue:

Comment to C802.16m-08/725 "Proposed Baseline Content on the Uplink Control Structure for the 802.16m SDD

Base Contribution:

This is the base contribution.

Purpose:

To be discussed by TGM for the 802.16m SDD

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Introduction

- There have been some discussion in UL-Ctrl RG on the need of defining the ranging sequence per service class, per MS and per connection.
- This contribution analyzes the benefit of service class, MS or connection based ranging sequence and their application scenarios.

Text in C802.16m-08/725

- 11.x.2.5 Bandwidth Request Channel
 - Contention based [or non-contention based] random access is used to transmit a bandwidth request indicator on this control channel. [Inclusion of addition information in a bandwidth request indicator such as bandwidth request size, MS-ID, flow identifier, UL transmit power report and CINR report is FFS.]
- 11.x.2.5.2 PHY Structure
 - The structure of bandwidth request channel resource blocks, pilots and resource mapping are TBD. The ranging sequence design and mapping to subcarriers are TBD. [The ranging sequence can be defined per user class, per service class and per sector. Users are classified based on operator-specific network performance requirements and service level agreements.]

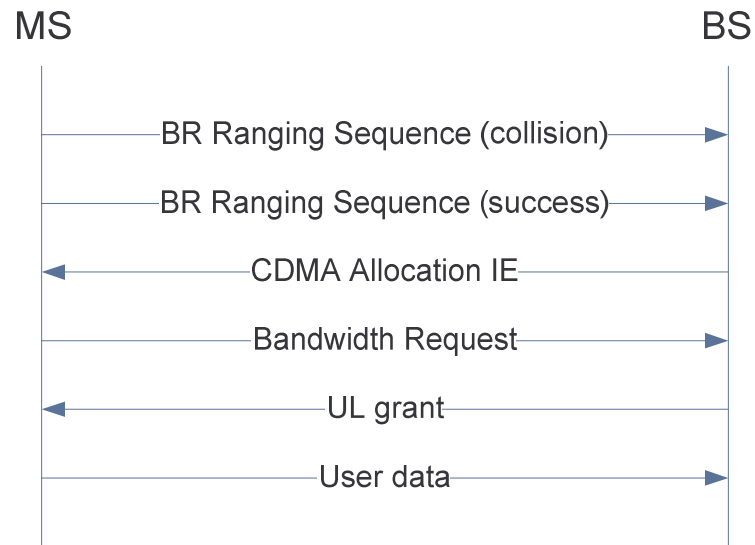
Motivation

- CINR report is used to provide DL measurement report and should not be included in bandwidth request indicator which is used for UL data transmission.
- If multiple ranging regions are defined for different purpose, the ranging sequences could be shared between multiple regions.
- The benefit of defining BR ranging sequence per service class, per MS or per connection has not been clearly identified.
- Defining BR ranging sequence per sector, per service class or per user class is not related to PHY structure.
- This contribution addresses these issues, and propose new text to be included in SDD.

Issues with .16e Bandwidth Request Mechanism

- Periodical allocation (e.g., UGS, ertPS) and periodical polling (e.g., rtPS) provide periodic allocation or unicast request opportunity to MS to meet realtime requirement of the traffic. However it only applies to RT traffic with periodical pattern.
- There are still traffic (e.g., on-line gaming, instant messaging) with realtime requirement but doesn't have periodical traffic pattern.
- Priority access services also require a prompt bandwidth allocation for the priority access applications or users.
- The bandwidth request mechanism using contention based BR ranging code cannot meet the requirement of these service types.
- A more efficient bandwidth request mechanism is required for these service types.

Ranging Sequence per Sector (as defined in .16e)

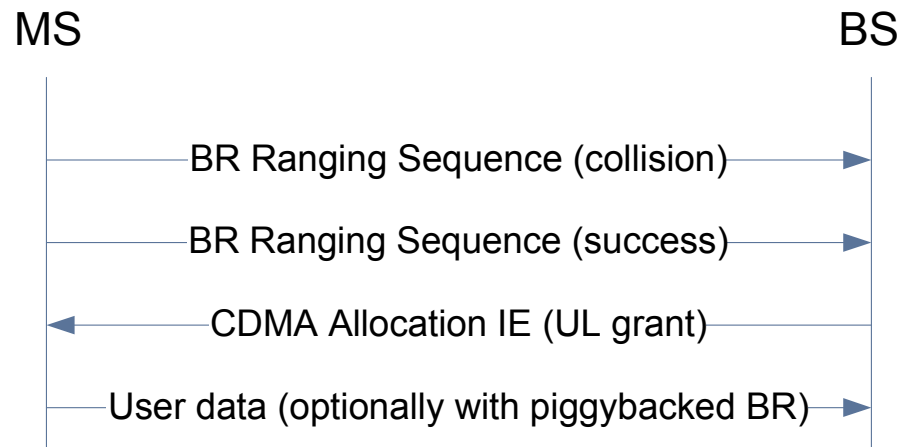


- The ranging sequences are shared among all the MSs in the sector
- One or more attempt using contention based BR ranging sequence
- Resource allocated in CDMA allocation IE is for MS to send BR message
- At least two round trips (assuming no collision on BR ranging sequence) are required
- Overhead of CDMA Allocation IE and BR for short packets. (e.g. Online Gaming, Instant messaging etc)

Proposed Solution

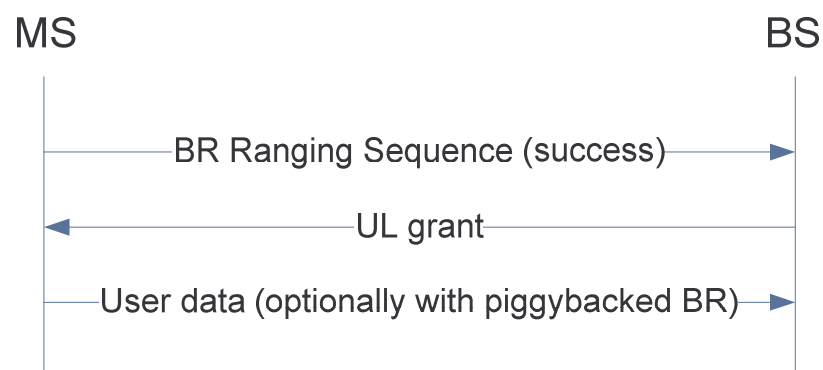
- One or a set of dedicated BR ranging sequence is assigned to the MSs.
 - The service flows with the same minimum QoS requirement could be assigned with the same ranging sequence.
- The ranging sequence can be allocated during service establishment/activation process (e.g., DSA process).
- After receiving the dedicated BR ranging sequence from an MS, the BS allocates the bandwidth based on the minimum QoS requirement for the associated service class or connection or MS.
- The MS that sends the same ranging sequence as identified in the cdma allocation IE uses the allocation to send UL data.
- If more bandwidth is required, a piggybacked BR is sent together with the data.
- The following slides illustrate the flows of bandwidth request and grant procedures using BR ranging request per service class, per MS or per connection.

Ranging Sequence per Service Class



- One or more ranging sequences are shared among all the MSs in the sector using the same service class
- One or more attempt using contention based BR ranging sequence
- Resource allocated in CDMA allocation IE is for MS to send data based minimum QoS requirement of the service class
- If more bandwidth is required, the MS can piggyback its BR in user data.
- Only one round trip (assuming no collision on BR ranging sequence) is required.

Ranging Sequence per MS or per Connection



- A dedicated ranging sequence is allocated to an MS or to a connection.
- One attempt using non-contention based BR ranging sequence
- BS directly provides UL grant to the MS based on
 - minimum QoS requirement of the MS (defined in user profile) for per MS based ranging sequence
 - minimum QoS requirement of the connection (defined in service flow information) for per connection based ranging sequence
- If more bandwidth is required, the MS can piggyback its BR in user data.
- Only round trip is required.

Example Application Scenarios

- Ranging sequence per service class
 - Non periodical realtime application such as on-line gaming, instant messaging
- Ranging sequence per MS
 - Users with high priority to access the system with minimum QoS requirement defined for the user
- Ranging sequence per connection
 - Application with high priority to access the system with minimum QoS requirement defined for the application

Benefit

- The proposed solution provides a fast bandwidth request mechanism for realtime services.
- Non-contention based cdma code removes delay due to code collision.
- One round trip delay due to bandwidth request message is also removed.
- Overhead associated with CDMA Allocation IE or BR message is also removed.

Proposed Text

- **11.x.2.5. Bandwidth Request Channel**
 - Contention based [or non-contention based] random access is used to transmit a bandwidth request indicator on this control channel. [Inclusion of addition information in a bandwidth request indicator such as bandwidth request size, MS-ID, flow identifier, UL transmit power report and CINR report is FFS.]
 - Bandwidth request region could be partitioned based on service class or user class, and bandwidth request ranging sequence could be shared or reused between bandwidth request regions.
 - Bandwidth request indicator could indicate information such as MS-ID, flow identifier and/or UL transmit power report. Based on the received bandwidth request indicator, BS could provides UL grant to the MS based on minimum QoS requirement for the service class, MS or connection. The MS may piggyback additional bandwidth request together with data traffic.
 - The ranging sequence can be defined per user class, per service class, per connection and/or per sector. Users are classified based on operator-specific network performance requirements and service level agreements.
- **11.x.2.5.2 PHY Structure**
 - The structure of bandwidth request channel resource blocks, pilots and resource mapping are TBD. The ranging sequence design and mapping to subcarriers are TBD. [The ranging sequence can be defined per user class, per service class and per sector. Users are classified based on operator-specific network performance requirements and service level agreements.]

Note: RED text is for removal and BLUE text is for insertion