Some thoughts for the New Concepts forum

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To share some thoughts on potential future improvements and evolution of IEEE 802.16.

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Some thoughts for the New Concepts session

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Alvarion
Introduction

• This presentation is a compilation of ideas which can improve the 802.16 standard
  – MAC and above issues
  – PHY improvements
MAC and upper layer issues
UL Allocation Container

• “Macro” UIUC which replaces several UIUC elements to different stations
  – Reduces map overhead for many small payloads
• Base station decides how often to invoke
• Needs primitives for establishment, reliable changes (addition, deletion), teardown
• Suitable for
  – streaming apps (UGS)
  – group polling
TDM extensions in the MAC

- TDM = NxT1(E1) | FT1(E1)
- Clock recovery problem
  - TDM frame synchronization
  - TDM Clock transfer
- Efficiency problem
  - Payloads are typically small
  - Map elements in each frame incurs large overhead
    - UL map per user, DL MAC header, UL MAC header
  - Can use the previously described group allocation
TDM extensions in the MAC (2)

• Should be a new Convergence Sublayer
  – Signaling (e.g. V5.x) needs to be encapsulated in regular data connections
  – Specify format of MAC SDUs carrying TDM traffic
• Scheduling (UGS)
ARQ

- Problem: Current ARQ is not suitable to varying channel conditions (e.g. mobility)
  - SS may suffer degradation => small number of subchannels allocated => low data rate => max. fragment size should be small to fit into MAC frame => high MAC overhead
- Solution: return to block-based ARQ (802.16-D1) where block size [not fragment size] is small enough to fit into MAC frame at the lowest possible data rate
  - Allows re-fragmentation
Hybrid ARQ

• The re-TX request needs to identify the failed TO

• Each UIUC needs a “shadow UIUC” describing how to send the supplemental information
  – Define the coding and interleaving method for the supplemental information in Hybrid ARQ

• Easier on UL
  – BST knows who is the sender, what UIUC was used, how much airtime is needed for the supplemental information
Upper layer interface between VoIP (multimedia) terminal/gateway and BS

- Converting VoIP signaling to request for service addition or change
- Similar to Packet Cable (DOCSIS, http://www.packetcable.com):
  - PacketCable™ Audio/Video Codecs Specification
  - PacketCable™ Dynamic Quality-of-Service Specification
  - PacketCable™ Network-Based Call Signaling Protocol Specification
  - etc.
Integration with Mobile IP
Repeater support

• Extension to P-MP rather than a generic mesh
• Dead zone coverage
• Centrally scheduled in the BST
  – Takes into account duplex restrictions etc.
PHY issues
MIMO on DL

- Doubles the data rate to high-end stations
- 2-antenna training on DL is defined already
- Define how data is conveyed
DL OFDMA encapsulation

• Mainly for AAS
• Most messages are unicast – no aggregation mechanism to reduce granularity loss
• OFDMA reduces overhead per message
Hybrid ARQ

- Hybrid ARQ has significant implications on the PHY

- Need to define the coding and interleaving method for the supplemental information in Hybrid ARQ
Summary

• A collection of ideas presented for potential improvements to the IEEE 802.16 air interface
  – MAC enhancements
  – PHY enhancement
  – Convergence layers to services