DL subchannelization extension for OFDM mode

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Purpose:

[Description of what the author wants 802.16 to do with the information in the presentation.]

DL subchannelization extension for OFDM mode

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Alvarion

Scope

- To Introduce an extension to 802.16**e** for providing DL subchannelization.
- An extension to OFDM 256FFT mode.
- Backward compatible to 802.16**d**

Key features

- Improved frequency reuse factor:
  - DL Subchannelization
  - Robust Low rate codes to support users at very low CINR.
- 16 subchannels DL subchannelization
  - Same subcarrier allocation as 16d UL.
- Midamble based channel estimation
  - All training info is contained within the sub channel
  - Facilitates AAS, Boosting.
- Designed in support for AAS.

Why DL subchannelization ?

- Provides link budget improvement:
  - Far away subscribers are assigned subchannel with high power.
  - Near by subscribers are assigned subchannel with low power.
  - Transmit power is limited by *average* power.
  - Thus some get more than average.
  - ~3-4 dB depending on path loss decay.

Why DL subchannelization ? (2)

- Improved frequency reuse factor
  - Partial usage of channel.
  - Same techniques as in OFDMA mode.
  - Sectors/cells are assigned non-overlapping sets of sub-carriers.
  - Reduced probability of two sectors colliding on same set.

Why DL subchannelization (3)

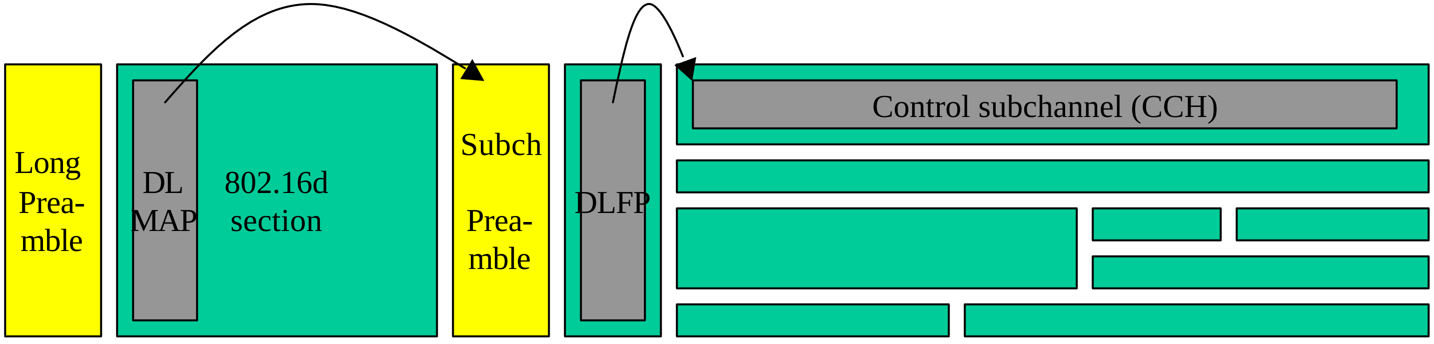
- Low overheads of DL preambles
- Important for AAS.

Design considerations

- Maximize element re-use from 802.16d
  - Carrier allocation
  - Subchannelization format
  - Midambles
- No drastic redesign for 802.16d SSs.
- Simple SS design
  - No concurrent reception
  - SS needs to receive a single burst (control or data) at a time.
  - Simple training structure.

Frame structure

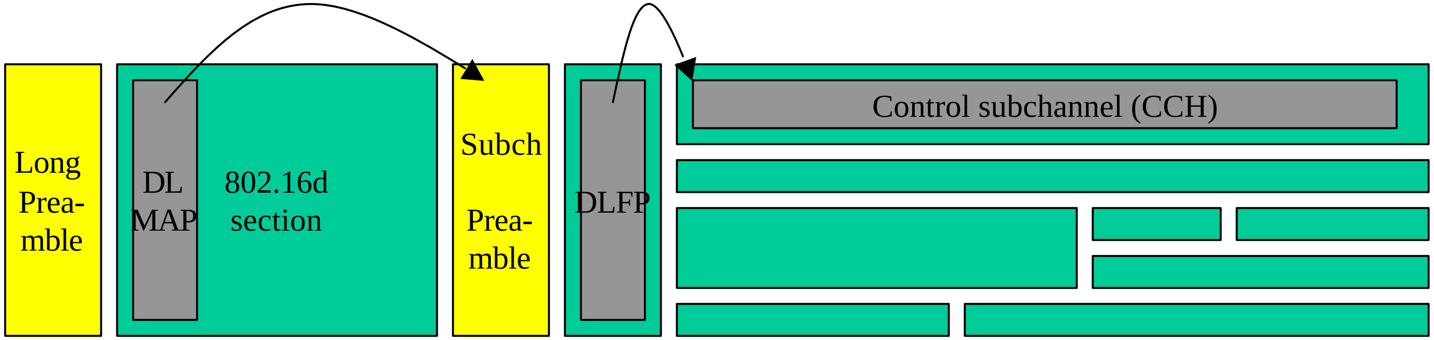
- Frame is divided between OFDM 802.16d and sub-channelized section.
- Subch. section pointed to in 16d map
- Subch. Section is composed of
  - A dedicated preamble.
  - An FCH burst which carries the Down link frames.
  - Subchannelized traffic.



802.16d section Subchannelized section

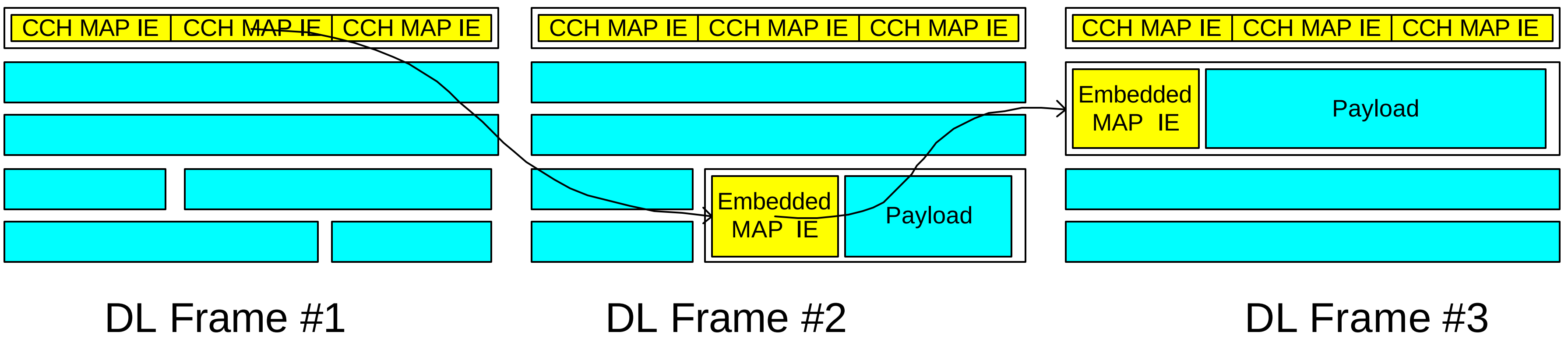
FCH and Downlink Frame Prefix

- FCH is transmitted on the entire BW
- QPSK using rate 1/8
- => Very robust to interference.
- Contains DLFP
  - BSID, frame number, DCD count
  - Pointer to Control Subchannel
  - Rate and length of first burst in CCH



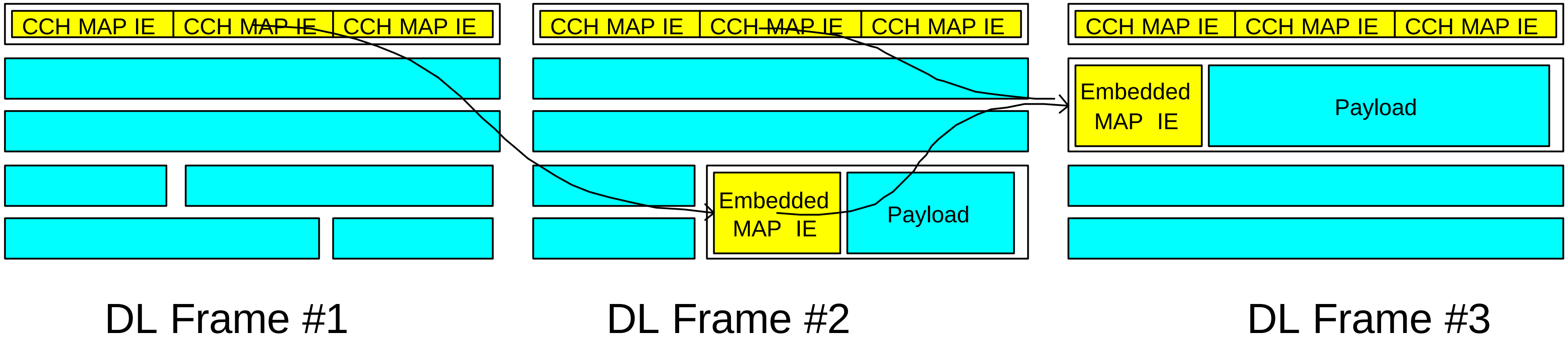
The CCH

- Composed of short PHY bursts, of known length and modulation.
- Each burst contains several MAP-IE, which points to an allocation in the next frame.
- The pointed allocation may contain additional embedded map elements.
- A chain of maps is created.



The CCH (2)

- Map elements may be echoed in the CCH, for recovery in case that one of the embedded map elements was lost.
- BST shall **not** assume that a SS is capable of listening simultaneously to the CCH and to the payload channel.
  - No requirement for concurrent reception of bursts.



CCH (3)

- CCH may be boosted relative to data sub-carriers
- => provides improved CINR rejection.

- Location of CCH may depend on BSID.
- => boosted CCHs of different cells do not collide with one another.

Robust low rate FEC codes

- Concatenated basic code (CC BTC CTC LDPC ?) with repetition codes.
- Similar to OFDMA mode.
- 2x and 4x repetitions.
  - 3dB and 6dB improvement in AWGN
  - More in selective fading conditions.
- Only for QPSK
- Repeated symbols are spread in frequency thus providing enhanced frequency diversity.

AAS support

- Proposed structure readily supports AAS
  - DL OFDMA minimizes overhead due to preambles
  - CCH may be used as primary control channel.
  - Preamble+FCH may be repeated to form beam-pattern diversity.

- CCH bursts can either be
  - Transmitted on a wide beam. Boosted relative to other subchannels.
  - Composed of bursts directed towards specific users or regions.
  - Composed of bursts using beam pattern diversity

Thank you !