802.16 CID Number Space Management

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Purpose:

Description of proposed amendments to enable efficient key retrieval implementations.

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CID Number Space Management

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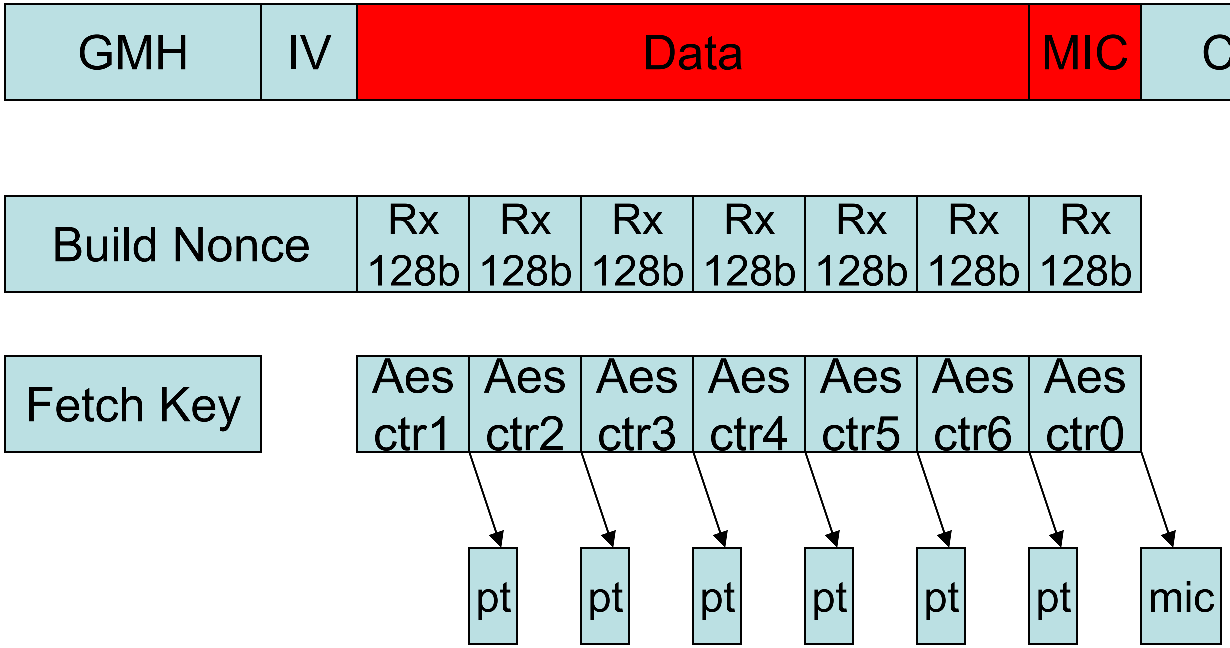
CIDs/Key mapping

- The CID determines the TEK
  - When a packet is received the receiver retrieves the key associated with that CID
  - The CID number space is 65536 entries long
    - A 65536 entry key table is not reasonable
    - So an implementation must use a search mechanism to find the key entry associate with a CID. The CID cannot be used directly as an index
      - CAM, hash function, binary chop, linear search etc
- It takes either time or lots of storage to get keys. You can’t save on both.

The problem with Key Retrieval Time

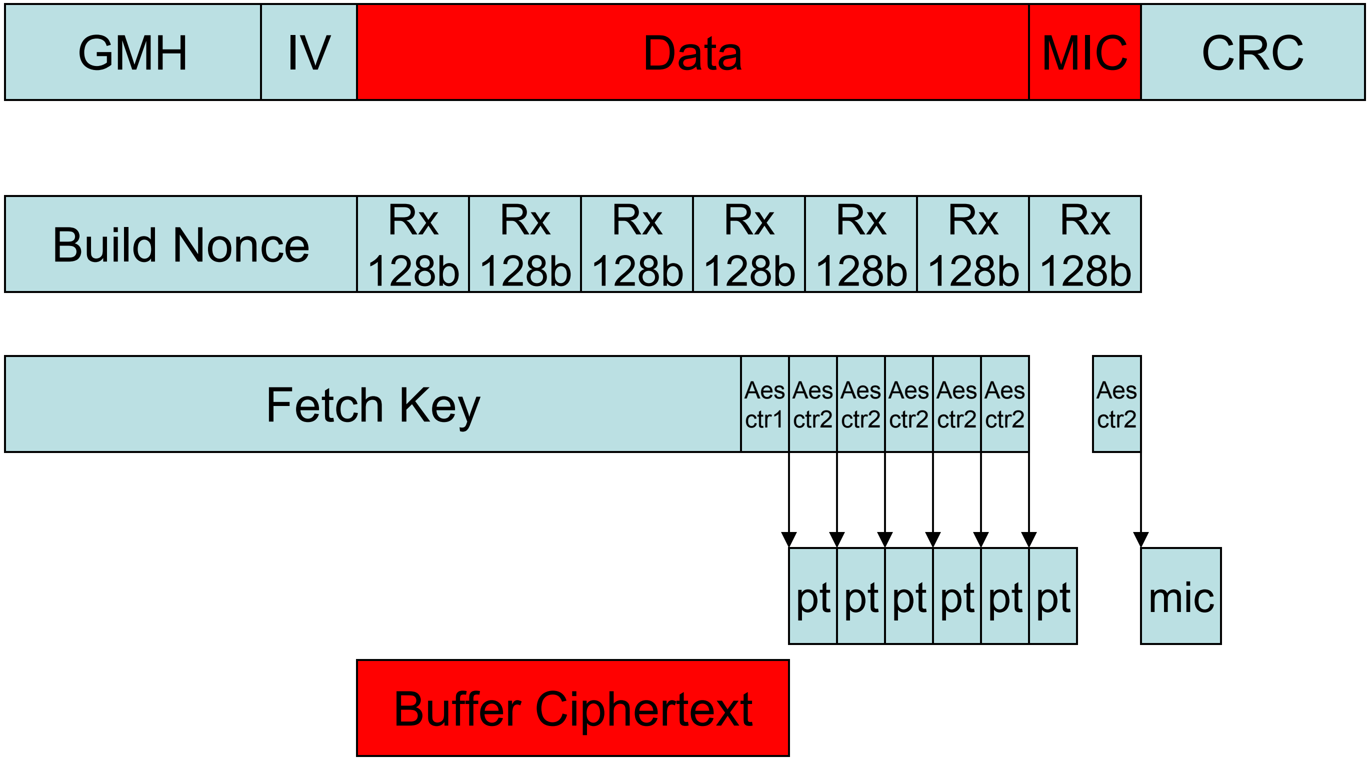
- In early decrypt models, popular with stream cipher modes (like CCM), the key is fetched as soon as the CID arrives and this is used to generate a stream cipher to decrypt the incoming packet.
- The longer the key retrieval latency, the larger the elasticity (buffering) required at the front of the MAC

Key Available Early



- Cipher stream generated ahead of data
  - Plain text available as soon as data arrived + 1 XOR gate
  - AES latency = 11 clocks.
  - Buffering requirement less than internal buffer in AES block
    - No additional buffering requirement

Key Available Late



- Cipher stream generated after data arrival
  - Data must be buffered
  - Plaintext can be delayed through MAC on short packets

A Solution

- SS Indicates max number of supported SAs == max number of key entries in key table
- BS gives SS an offset into the CID space
  - BS partitions CID space between SSs
  - All assigned secure CIDs go in that space
- SS calculates (CID-offset) on receipt of packet
  - Can use this to index directly into key table
  - Single memory lookup!

Benefits

- No complex key retrieval hardware
  - Hashing, binary chopping, scanning
- Deterministic key retrieval time
- Short key retrieval time
- Guaranteed no buffering at front of MAC

Where to Apply

- Enhanced security requires more per CID state
  - 2 * 128 bit keys
  - Rx PN
  - Tx PN
- CID space management should be mandated along when enhanced security is implemented