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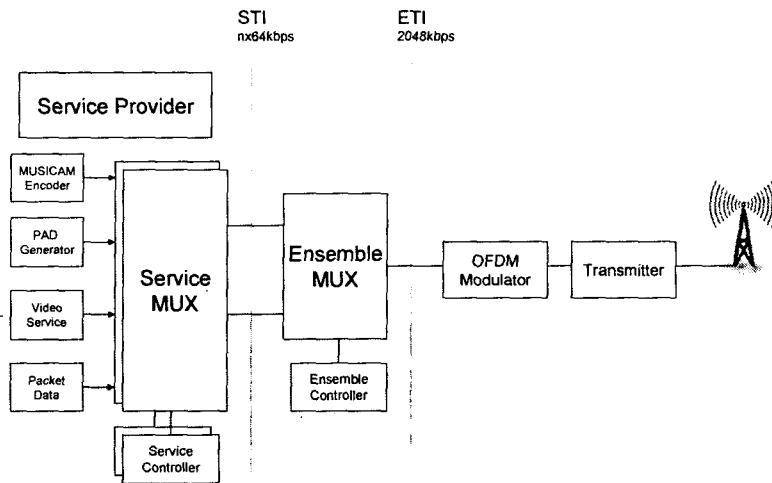
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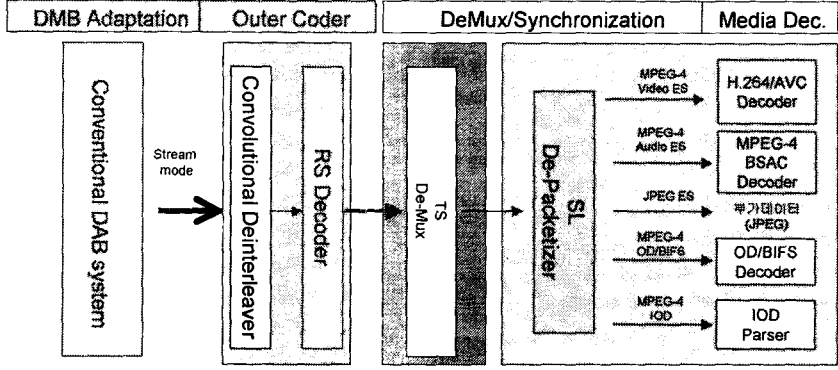
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# DMB Receiver

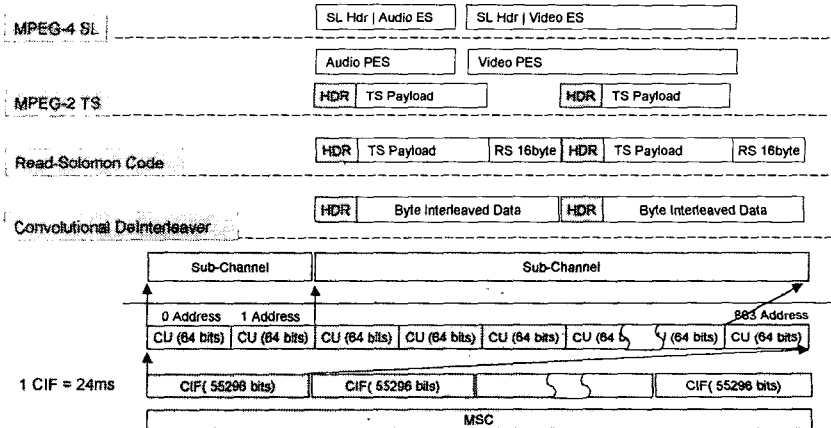
# DMB Broadcast Network



# Functional Block Diagram

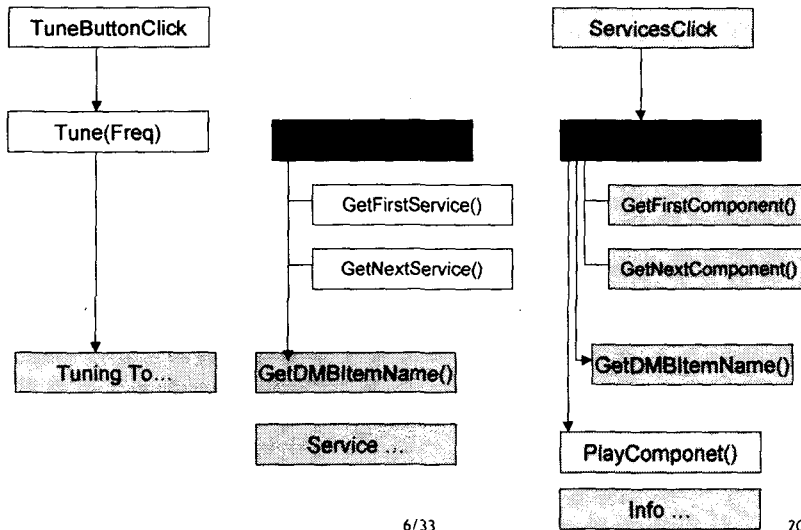


# DMB Packet Structure



DMB = 2.4Mbps = FIC(96kbps) + MSC(2.304Mbps)  
FIC = 32kbps(1/3 Code rate)

## DMB Component Tuning



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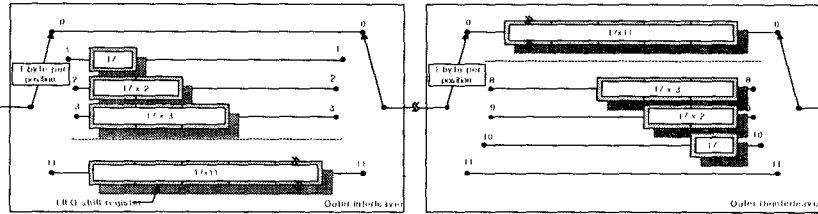
Outer Coder

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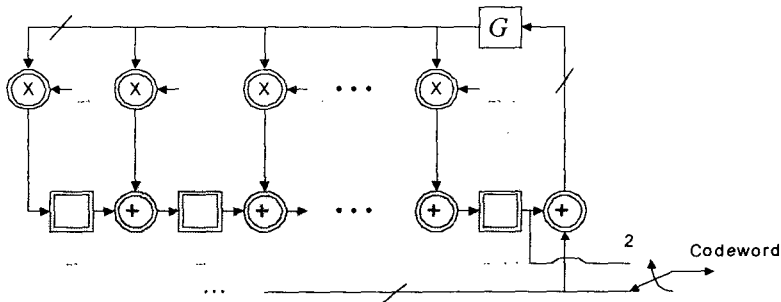
## Convolutional Interleaver

- ETS EN 300.744 (Sec. 4.3.2)
  - ◆ Interleave Depth : 12
  - ◆ 각 Branch : 17xN FIFO Shift Register(N= 0.. 11)
  - ◆ TS start code (0x47) : no interleaving



## Reed-Solomon Code

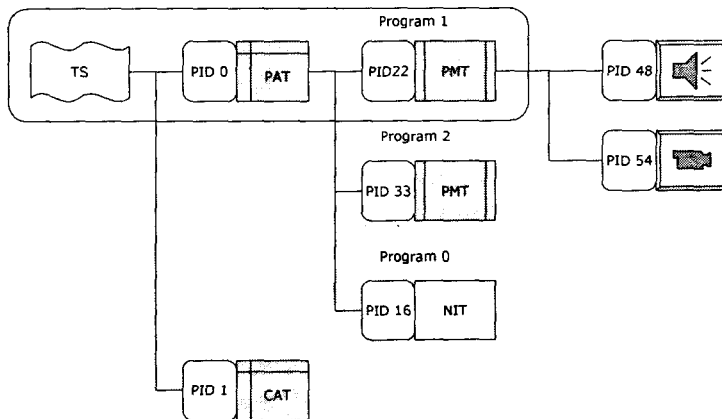
- RS(255,239,t=8) => RS(188,204,t=8) : 단축된 RS Code
  - ◆ 코드 발생 다항식 :  $g(x) = (x+\lambda_0)(x+\lambda_1)(x+\lambda_2)(x+\lambda_3)...(x+\lambda_{15}), \lambda = 02(\text{HEX})$
  - ◆ 필드 발생 다항식:  $p(x) = x^8 + x^4 + x^3 + x^2 + 1$
  - ◆ Set MPEG-2 TS Error Indicator



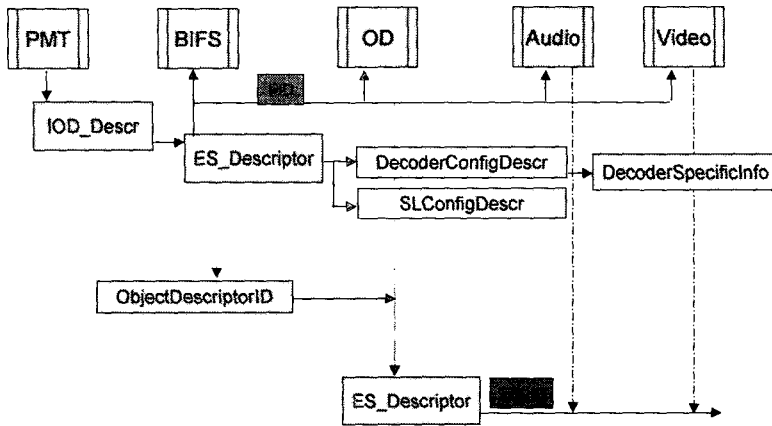
# MPEG-2 TS

## PSI(Program Specific Information)

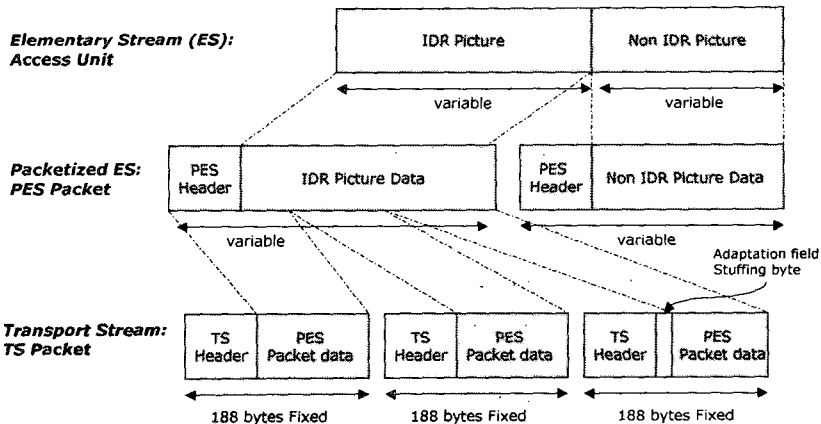
- 수신 주기  
◆ PAT, PMT : 500ms 이내



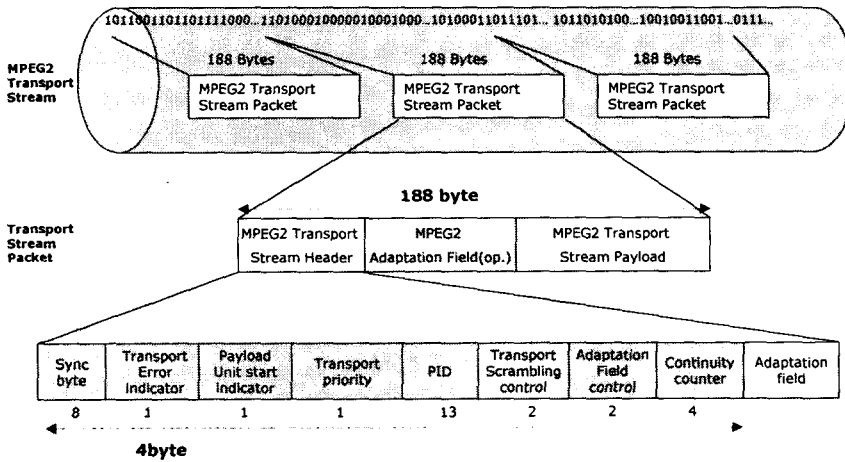
# DMB Contents Access



# MPEG-2 Transport Stream



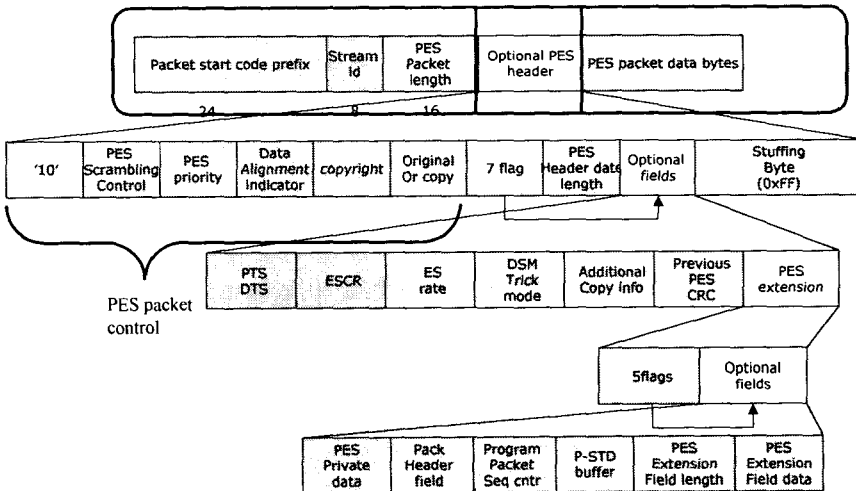
## MPEG-2 TS Packet



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## PES Packet



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ETSI  
TECHNICAL SPECIFICATION  
TS 26.101-1

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# MPEG-4 SL

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TECHNICAL SPECIFICATION  
TS 26.101-1

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## MPEG-4 SL

- Synchronization Layer:
  - ◆ "Flexible & configurable packetization facility that allows the inclusion of timing, fragmentation & continuation information on associated data packets"
  
- SLConfigDescriptor
  - ◆ ObjectDescriptor
  
- SL Packet Header
  - ◆ SL packet
  - ◆ Using SLConfigDescriptor

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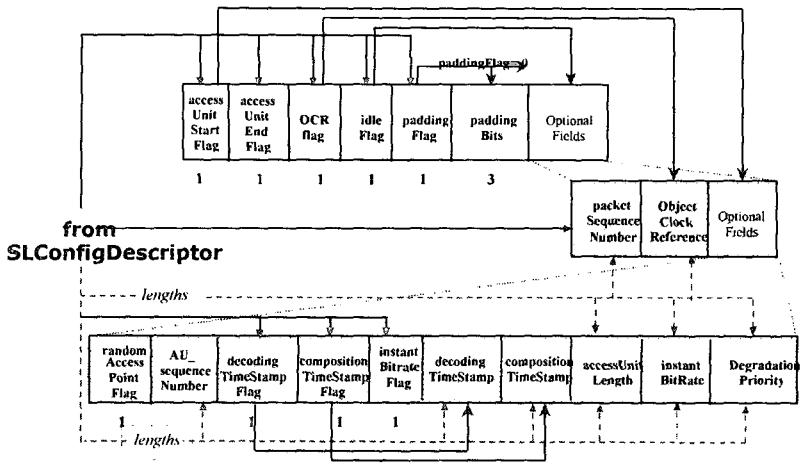
## MPEG-4 SL - SLConfigDescriptor

Field	Description
useAccessUnitStartFlag	SL Packet header의 accessUnitStartFlag 사용 Flag
useAccessUnitEndFlag	SL Packet header의 accessUnitEndFlag 사용 Flag
useRandomAccessPointFlag	(0)
hasRandomAccessUnitOnlyFlag	(0)
usePaddingFlag	(0)
useTimeStampFlag	(1) TimeStamp 사용을 나타낸다. 즉, accessUnitRate, compositionUnitRate, startDecodingTimeStamp, startcompositionTimeStamp field가 SL Packet header 포함된다
useIdleFlag	정해지지 않은 기간 동안 아무런 데이터도 생성하지 않음, 전송오류를 나타내는 idleFlag의 사용을 나타냄
durationFlag	모든 SL packet이 DTS와 CTS가 동일한 간격을 갖는 경우를 나타내는 flag
timeStampResolution	(90,000 Hz), 초당 clock tick의 개수
OCRResolution	(90,000 Hz), OTB(object time base)의 해상도, 초당 주기(cycle)
timeStampLength	(<= 33), SL Packet header에서 time stamp의 길이. 범위는 0~64bit
OCRLength	(<= 33), SL Packet header에서 OCR(objectClockReference)의 field 길이

## MPEG-4 SL - SLConfigDescriptor

Field	Description
AU_Length	(0), SL Packet header에 accessUnitLength field의 length, 범위는 0~32 bit
instantBitrateLength	instantBitrate field의 length
degradationPriorityLength	(0), degradationPriority field의 length
AU_seqNumLength	(0), AU_sequenceNumber field의 length
packetSeqNumLength	(0), packetSequenceNumber field의 length
timeScale	Access unit과 composition unit의 duration의 표현하기 위해 사용 해상도이며, durationFlag가 설정된 경우 반드시 사용
accessUnitDuration	Access unit의 점유하는 시간 accessUnitDuration * 1/timeScale seconds durationFlag가 설정된 경우 반드시 사용
compositionUnitDuration	Composition unit의 점유하는 시간 compositionUnitDuration * 1/timescale seconds durationFlag가 설정된 경우 반드시 사용
startDecodingTimeStamp	첫 번째 AU가 디코딩 되는 시간
startCompositionTimeStamp	첫 번째 AU가 디코딩 되어서 Composition unit일치 되는 시간

# MPEG-4 SL – SL Paket Header



# Object Synch.를 위한 Time 정보

- MPEG-2 PCR
  - ◆ MPEG-2 TS
  - ◆ 수신 주기 : 100ms 이내
  
- MPEG-4 OCR
  - ◆ MPEG-4 SL
  - ◆ 수신 주기 : 700ms 이내
  
- MPEG-4 CTS
  - ◆ MPEG-4 SL
  - ◆ 수신 주기 : 700ms 이내

## MPEG-4 BSAC

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## MPEG-4 BSAC

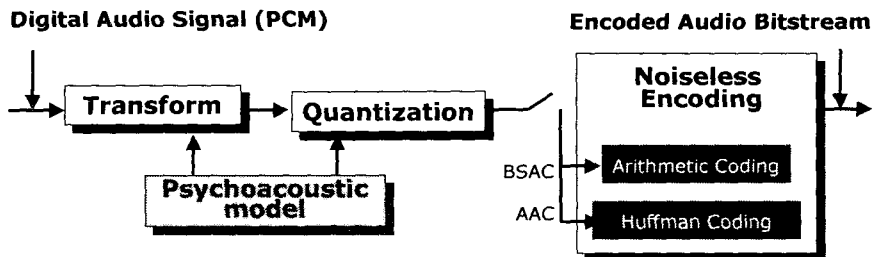
- ISO/IEC 14496-3 ER-BSAC
  - ◆ AudioSpecificConfig
  - ◆ GASpecificConfig

```
Syntax
bsac_base_element()
{
    frame_length;
    bsac_header();
    general_header();
    byte_alignment();
    for(slayer=0;slayer < slayer_size;slayer++)
        bsac_layer_element(slayer)
}
```

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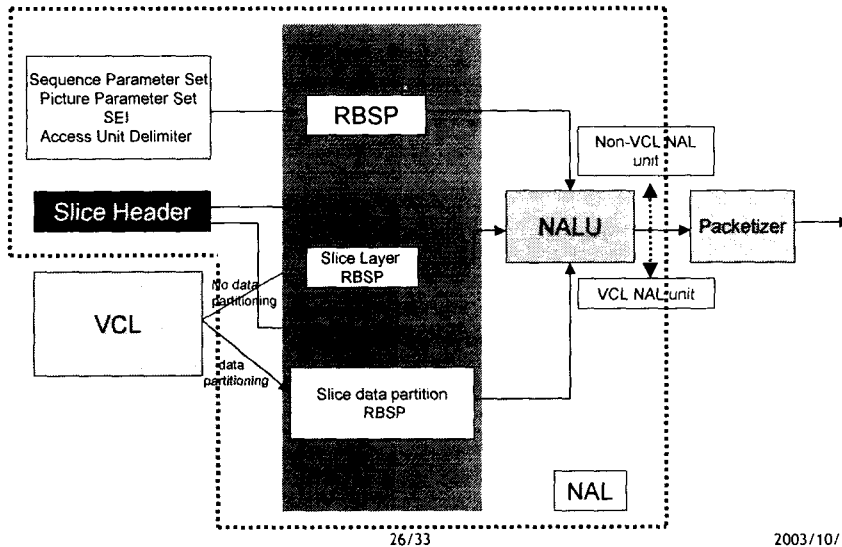
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## MPEG-4 BSAC



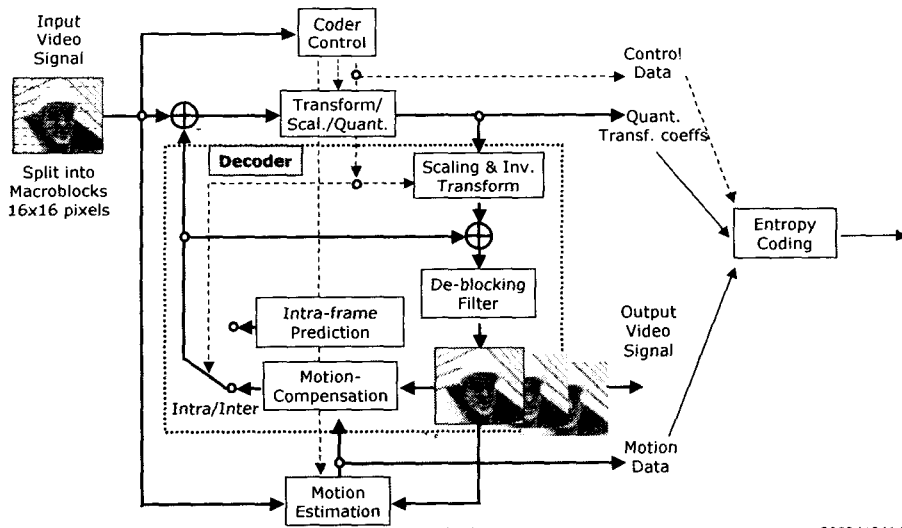
## MPEG-4 AVC

## H.264/MPEG-4 AVC Layer Structure



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## Basic Coding Structure



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## Random Access

- 0.5초 단위의 Random Access
  - ◆ IDR(Instantaneous Decoding Refresh) Picture
    - ◆ A coded picture containing only slices with I slice types that cause the decoding process to mark all reference picture as "unused for reference" immediately after decoding IDR picture
  - ◆ I Slice

## Parameter Sets

- Sequence, Picture Parameter Sets
  - ◆ Decouples the transmission of infrequently changing information from the transmission of coded macroblock data.
  - ◆ Each slice containing the coded macroblock data references the picture parameter set containing its decoding parameters.
  - ◆ In turn, the picture parameter set references a sequence parameter set that contains sequence level decoding parameter information.
  - ◆ DecoderSpecificInfo

```
aligned(8) class AVCDecoderSpecificInfo extends DecoderSpecificInfo : bit(8)
tag=DecSpecificInfoTag {
    AVCVideoConfigurationRecord config;
}
```

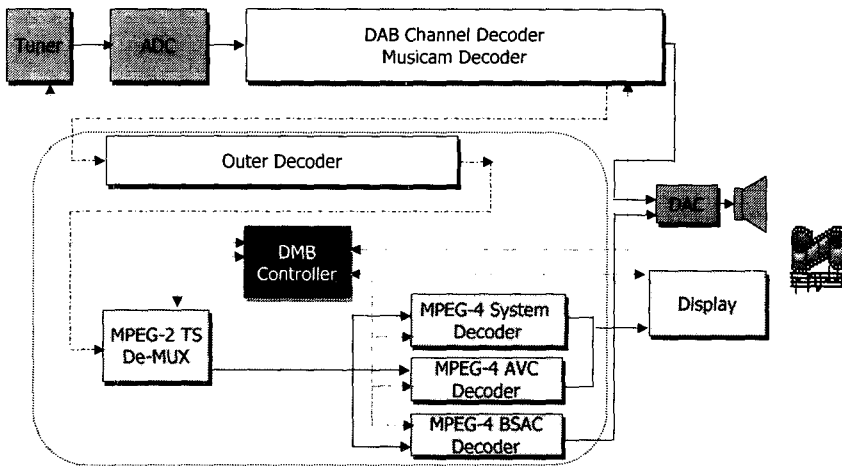
## Parameter Sets

```
aligned(8) class AVCDeroderConfigurationRecord {
    unsigned int(8) configurationVersion = 1;
    unsigned int(8) AVCPProfileIndication;
    unsigned int(8) profile_compatibility;
    unsigned int(8) AVCLevelIndication;
    bit(6) reserved = '111111'b;
    unsigned int(2) lengthSizeMinusOne;
    bit(3) reserved = '111'b;
    unsigned int(5) numOfSequenceParameterSets;
    for (i=0; i< numOfSequenceParameterSets; i++) {
        unsigned int(16) sequenceParameterSetLength ;
        bit(8*sequenceParameterSetLength) sequenceParameterSetNALUnit;
    }
    unsigned int(8) numOfPictureParameterSets;
    for (i=0; i< numOfPictureParameterSets; i++) {
        unsigned int(16) pictureParameterSetLength;
        bit(8*pictureParameterSetLength) pictureParameterSetNALUnit;
    }
}
```

## DMB Terminal



# DMB Terminal Example



# Question?