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# 1 MHz readout update

- **Already described in Barcelona**
  - Now released, interface updated
- **Side effect: TELL1 and Raw format**
  - We don't write what the TELL1 produces...

# Implementation

## ◆ The format was described in Barcelona

- No changes in the TELL1 output format
  - In fact a small detail on bit position
  - EDMS note 527942 updated
    - Approval in progress
    - **Please sign it if not yet done**, if you are on the approval list.
  
- Interface of the decoding tool changed
  - New event class `CaloAdc` which is a `CaloCellID + int`
  - The decoding tool returns a reference to a `std::vector<CaloAdc>`
    - Similarly a vector of `L0CaloAdc` or `CaloCellID` for trigger
  
- Code adapted and in cvs

## ◆ Describe each card by detector coverage and slot

- Area, (column, row) first, (column, row) last, crate and slot

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE DDDB SYSTEM "../DTD/structure.dtd">
<DDDB>
<!-- $Id: -->
<!-- Author : Olivier Callot -->
<!-- Created : 2005-08-24 -->

  <catalog name="Ecal">
    <condition name = "CellsToCards">
      <paramVector name = "cards" type = "int">

<!-- # a  cf  rf  cl  rl  cr sl -->

      <!-- Outer area -->

        0  0  0  6  7  9  8  1
        1  0  0 10  7 13  8  2
        2  0  0 14  7 17  8  3
        3  0  0 18  7 21  8  4
        4  0  0 22  7 25  8  5
        5  0  0 26  7 29  8  6
        6  0  0 30  7 33  8  7
        7  0  0 34  7 37  8  8
        8  0  0 38  7 41  8  9
        9  0  0 42  7 45  8 10
       10  0  0 46  7 49  8 11
```

## ◆ Similar for the TELL1 connection description

- TELL1 number, number of FE cards, list of card numbers.

```
<paramVector name = "Tell1" type = "int">  
  
    0  8    0  1  2  3  4  5  6  7  
    1  5    8  9 10 11 12  
    2  8   13 14 15 16 17 18 19 20  
    3  5   21 22 23 24 25  
    4  8   26 27 28 29 30 31 32 33  
    5  8   34 35 36 37 38 39 40 41  
  
    6  8   84 85 86 87 88 89 90 91  
    7  6   92 93 94 95 96 97  
    8  8   98 99 100 101 102 103 104 105  
    9  6  106 107 108 109 110 111  
  
   10  8  140 141 142 143 144 145 146 147  
   11  8  148 149 150 151 152 153 154 155  
   12  8  156 157 158 159 160 161 162 163  
  
   13  8  164 165 166 167 168 169 170 171  
   14  8  172 173 174 175 176 177 178 179  
   15  8  180 181 182 183 184 185 186 187  
  
   16  8  112 113 114 115 116 117 118 119  
   17  6  120 121 122 123 124 125  
   18  8  126 127 128 129 130 131 132 133  
   19  6  134 135 136 137 138 139
```

## ◆ One item added to 'structure.xml'

```
<conditioninfo name      = "CellsToCards"  
                condition = "/dd/ReadoutConditions/Ecal/CellsToCards" />
```

## ◆ And a catalogue to indicate the files

```
<catalog name="ReadoutConditions">  
  <catalogref href = "Local/Ecal/readout.xml#Ecal"/>  
  <catalogref href = "Local/Hcal/readout.xml#Hcal"/>  
  <catalogref href = "Local/Prs/readout.xml#Prs"/>  
  <catalogref href = "Local/Velo/readout.xml#Velo"/>  
</catalog>
```

# C++ processing

## ◆ A tool gets the condition

```
m_calor = getDet<DeCalorimeter>( "/dd/Structure/LHCB/" + m_detectorName );

//== First get the FE card description
Condition* cond = m_calor->condition( "CellsToCards" );
if ( 0 == cond ) {
    return Error( "Condition 'CellsToCards' not found." );
}

//== Cards
if ( cond->exists( "cards" ) ) {
    std::vector<int> temp = cond->paramAsIntVect( "cards" );
    //... process the vector of int which is the content of the file ...
}
```

## ◆ And then returns information

- List of cards in a given TELL1
- List of CaloCellID in a given card
- Number of TELL1, of cards, code of a card,...

## ◆ New interfaces to the readout tool

```
class CaloReadoutTool : public GaudiTool {
public:
    virtual StatusCode initialize();
    int nbFECards() const { return m_cards.size(); }
    std::vector<CaloCellID>& cellInFECard( int num ) { return m_cards[num].ids(); }
    int cardCode( int num ) { return m_cards[num].code(); }
    int nbTell1() const { return m_tell1.size(); }
    std::vector<int>& feCardsInTell1( int num ) { return m_tell1[num].feCards(); }
```

```
class ICaloEnergyFromRaw : virtual public IAlgTool {
public:
    virtual std::vector<CaloAdc>& adcs( ) = 0;
    virtual std::vector<CaloDigit>& digits( ) = 0;
```

```
class ICaloTriggerAdcsFromRaw : virtual public IAlgTool {
public:
    virtual std::vector<L0CaloAdc>& adcs( ) = 0;
```

```
class ICaloTriggerBitsFromRaw : virtual public IAlgTool {
public:
    virtual std::vector<CaloCellID>& firedCells( bool isPrs ) = 0;
```

# Other parameters

## ◆ Currently in XmlDDDB

- Not mentioning structural parameters, like number of cells and so on.
- Should be in Conditions, as these parameters will change.
- But implies a change to DeCalorimeter
  - Not yet done...

```
<userParameter name = "EtInCenter" type = "double"
    comment="10 GeV Et Max in center"> 10.*GeV </userParameter>

<userParameter name="EtSlope" type="double"
    comment="10 + .3*7 = 12.1 at 300 mrad"> 7.*GeV </userParameter>

<userParameter name="AdcMax" type="int"> 4095 </userParameter>

<userParameter name="ActiveToTotal" type="double"
    comment="Corrected for Gauss v15r*: 8.4/1.072, 20"> 7.84 </userParameter>

<userParameter name="ZShowerMax" type="double"
    comment="110 mm from the start of Shashlik"> -107.5*mm </userParameter>
```



# But...

## ◆ The sequence of processing changes

- In Boole, simulate up to and including the TELL1
  - Signal → ADC value
  - Zero suppression in PreShower
  - Production of trigger information and bits
  - Coding in a 'packed' format
- In Moore, simulate the processing in the farm
  - 2D zero suppress for ECAL, 1D for HCAL, **part of HLT processing**
  - Re-code the data in a more compact format
    - Storage should be minimised
    - Close to the old format, changes for PreShower and SPD bits
  - Replace the information in the Raw Buffer
- In Brunel, read the buffer for processing
  - Should accept both flavours of coding !

# New format for Prs-SPD bits

## ◆ Old proposal, 4 years old

- In 32 bits, put a cell ID and the information of 8 cells
  - The buffer was 32 bits information
  - Expected to have several neighbouring cells fired together

## ◆ New proposal

- Code on 16 bits the `Ca1oCe11ID` (14 bits) and the 2 bits of the cell, if any of them is ON.
  - Very similar to the coding in the TELL1 format, but there the identification is the channel number in the card !
- Gain: about 30 % of the data volume for this trigger bank
  
- No change on the other formats
  - Data still written in ADC counts.

# Status

## ◆ Code ready and tested

- Will be integrated with the new implementation of the Raw Buffer
  - TELL1 banks produced by Boole
  - If Moore is run, zero suppression and Raw Buffer modification
    - Allows to check the real event size
  - Decode and Zero suppress if needed in Brunel when accessing the data
    - Of course, one should use the same zero-suppress code !

## ◆ Need to gain experience with the new buffer

- Some debugging may still be needed
- Hope to have that operational as soon as some data is produced.
  - Needed to validate Gauss + Boole, the first part of DC06.