streamout

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Chapter 1

Class Index

1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

Chapter 3

Class Documentation

3.1 Buffer Class Reference

`#include <Buffer.h>`

3.1.1 Detailed Description

Definition at line 8 of file Buffer.h.

The documentation for this class was generated from the following file:

- /home/runner/work/streamout/streamout/libs/core/include/Buffer.h

3.2 ROOTtreeDest::DATA Struct Reference

`#include <ROOTtreeDest.h>`

Public Attributes

- UInt_t DIFid
- UInt_t ASICid
- UInt_t CHANNELid
- UInt_t Thresh
- UInt_t DTC
- UInt_t GTC
- UInt_t DIF_BCID
- UInt_t frame_BCID
- UInt_t timeStamp
- ULong64_t AbsoluteBCID

3.2.1 Detailed Description

Definition at line 15 of file ROOTtreeDest.h.

3.2.2 Member Data Documentation

3.2.2.1 AbsoluteBCID

```
ULong64_t ROOTtreeDest::DATA::AbsoluteBCID
```

Definition at line 20 of file ROOTtreeDest.h.

3.2.2.2 ASICid

```
UInt_t ROOTtreeDest::DATA::ASICid
```

Definition at line 17 of file ROOTtreeDest.h.

3.2.2.3 CHANNELid

```
UInt_t ROOTtreeDest::DATA::CHANNELid
```

Definition at line 17 of file ROOTtreeDest.h.

3.2.2.4 DIF_BCID

```
UInt_t ROOTtreeDest::DATA::DIF_BCID
```

Definition at line 19 of file ROOTtreeDest.h.

3.2.2.5 DIFid

```
UInt_t ROOTtreeDest::DATA::DIFid
```

Definition at line 17 of file ROOTtreeDest.h.

3.2.2.6 DTC

```
UInt_t ROOTtreeDest::DATA::DTC
```

Definition at line 19 of file ROOTtreeDest.h.

3.2.2.7 frame_BCID

```
UInt_t ROOTtreeDest::DATA::frame_BCID
```

Definition at line 19 of file ROOTtreeDest.h.

3.2.2.8 GTC

```
UInt_t ROOTtreeDest::DATA::GTC
```

Definition at line 19 of file ROOTtreeDest.h.

3.2.2.9 Thresh

```
UInt_t ROOTtreeDest::DATA::Thresh
```

Definition at line 18 of file ROOTtreeDest.h.

3.2.2.10 timeStamp

```
UInt_t ROOTtreeDest::DATA::timeStamp
```

Definition at line 19 of file ROOTtreeDest.h.

The documentation for this struct was generated from the following file:

- /home/runner/work/streamout/streamout/libs/interface/ROOT/include/ROOTtreeDest.h

3.3 DIFPtr Class Reference

```
#include <DIFPtr.h>
```

Public Member Functions

- DIFPtr (unsigned char *p, const std::uint32_t &max_size)
- unsigned char * getPtr ()
- std::uint32_t getGetFramePtrReturn ()
- std::vector< unsigned char * > & getFramesVector ()
- std::vector< unsigned char * > & getLinesVector ()
- std::uint32_t getID ()
- std::uint32_t getDTC ()
- std::uint32_t getGTC ()
- std::uint64_t getAbsoluteBCID ()
- std::uint32_t getBCID ()
- std::uint32_t getLines ()
- bool hasLine (uint32_t line)
- std::uint32_t getTASU1 ()
- std::uint32_t getTASU2 ()
- std::uint32_t getTDIF ()
- float getTemperatureDIF ()
- float getTemperatureASU1 ()
- float getTemperatureASU2 ()
- bool hasTemperature ()
- bool hasAnalogReadout ()
- std::uint32_t getNumberOfFrames ()
- unsigned char * getFramePtr (uint32_t i)
- std::uint32_t getFrameAsicHeader (uint32_t i)
- std::uint32_t getFrameBCID (uint32_t i)
- std::uint32_t getFrameTimeToTrigger (uint32_t i)
- bool getFrameLevel (uint32_t i, uint32_t ipad, uint32_t ilevel)
- void dumpDIFInfo ()
- uint32_t getDIFid ()
- uint32_t getASICid (uint32_t i)
- uint32_t getThresholdStatus (uint32_t i, uint32_t ipad)

3.3.1 Detailed Description

Definition at line 11 of file DIFPtr.h.

3.3.2 Constructor & Destructor Documentation

3.3.2.1 DIFPtr()

```
DIFPtr::DIFPtr (
            unsigned char * p,
            const std::uint32_t & max_size )
```

Definition at line 7 of file DIFPtr.cc.

```
00007                                                   : theDIF_(p), theSize_(max_size)
00008 {
00009   theFrames_.clear();
00010   theLines_.clear();
00011   try
00012   {
00013     theGetFramePtrReturn_ = DIFUnpacker::getFramePtr(theFrames_, theLines_, theSize_, theDIF_);
00014   }
00015   catch(std::string e)
00016   {
00017     std::cout « "DIF " « getID() « " T ? " « hasTemperature() « " " « e « std::endl;
00018   }
00019 }
```

3.3.3 Member Function Documentation

3.3.3.1 dumpDIFInfo()

```
void DIFPtr::dumpDIFInfo ( )  [inline]
```

Definition at line 40 of file DIFPtr.h.

```
00041   {
00042     printf("DIF %d DTC %d GTC %d ABCID %lld BCID %d Lines %d Temperature %d \n", getID(), getDTC(),
      getGTC(), getAbsoluteBCID(), getBCID(), getLines(), hasTemperature());
00043
00044     if(hasTemperature()) printf("T: ASU1 %d %f ASU2 %d %f DIF %d  %f \n", getTASU1(),
      getTemperatureASU1(), getTASU2(), getTemperatureASU2(), getTDIF(), getTemperatureDIF());
00045     printf("Found %ld Lines and %ld Frames \n", theLines_.size(), theFrames_.size());
00046   }
```

3.3.3.2 getAbsoluteBCID()

```
std::uint64_t DIFPtr::getAbsoluteBCID ( )  [inline]
```

Definition at line 22 of file DIFPtr.h.

```
00022 { return DIFUnpacker::getAbsoluteBCID(theDIF_); }
```

3.3.3.3 getASICid()

```
uint32_t DIFPtr::getASICid (
            uint32_t i )  [inline]
```

Definition at line 49 of file DIFPtr.h.

```
00049 { return getFrameAsicHeader(i) & 0xFF; }
```

3.3.3.4 getBCID()

```
std::uint32_t DIFPtr::getBCID ( )  [inline]
```

Definition at line 23 of file DIFPtr.h.

```
00023 { return DIFUnpacker::getBCID(theDIF_); }
```

3.3.3.5 getDIFid()

```
uint32_t DIFPtr::getDIFid ( )  [inline]
```

Definition at line 48 of file DIFPtr.h.

```
00048 { return getID() & 0xFF; }
```

3.3.3.6 getDTC()

```
std::uint32_t DIFPtr::getDTC ( )  [inline]
```

Definition at line 20 of file DIFPtr.h.

```
00020 { return DIFUnpacker::getDTC(theDIF_); }
```

3.3.3.7 getFrameAsicHeader()

```
std::uint32_t DIFPtr::getFrameAsicHeader (
            uint32_t i )  [inline]
```

Definition at line 36 of file DIFPtr.h.

```
00036 { return DIFUnpacker::getFrameAsicHeader(theFrames_[i]); }
```

3.3.3.8 getFrameBCID()

```
std::uint32_t DIFPtr::getFrameBCID (
            uint32_t i )  [inline]
```

Definition at line 37 of file DIFPtr.h.

```
00037 { return DIFUnpacker::getFrameBCID(theFrames_[i]); }
```

3.3.3.9 getFrameLevel()

```
bool DIFPtr::getFrameLevel (
            uint32_t i,
            uint32_t ipad,
            uint32_t ilevel )  [inline]
```

Definition at line 39 of file DIFPtr.h.

```
00039 { return DIFUnpacker::getFrameLevel(theFrames_[i], ipad, ilevel); }
```

3.3.3.10 getFramePtr()

```
unsigned char * DIFPtr::getFramePtr (
            uint32_t i )  [inline]
```

Definition at line 35 of file DIFPtr.h.

```
00035 { return theFrames_[i]; }
```

3.3.3.11 getFramesVector()

```
std::vector< unsigned char * > & DIFPtr::getFramesVector ( )  [inline]
```

Definition at line 17 of file DIFPtr.h.

```
00017 { return theFrames_; }
```

3.3.3.12 getFrameTimeToTrigger()

```
std::uint32_t DIFPtr::getFrameTimeToTrigger (
            uint32_t i )  [inline]
```

Definition at line 38 of file DIFPtr.h.

```
00038 { return getBCID() - getFrameBCID(i); }
```

3.3.3.13 getGetFramePtrReturn()

```
std::uint32_t DIFPtr::getGetFramePtrReturn ( )  [inline]
```

Definition at line 16 of file DIFPtr.h.

```
00016 { return theGetFramePtrReturn_; }
```

3.3.3.14 getGTC()

```
std::uint32_t DIFPtr::getGTC ( )  [inline]
```

Definition at line 21 of file DIFPtr.h.

```
00021 { return DIFUnpacker::getGTC(theDIF_); }
```

3.3.3.15 getID()

```
std::uint32_t DIFPtr::getID ( )  [inline]
```

Definition at line 19 of file DIFPtr.h.

```
00019 { return DIFUnpacker::getID(theDIF_); }
```

3.3.3.16 getLines()

```
std::uint32_t DIFPtr::getLines ( )  [inline]
```

Definition at line 24 of file DIFPtr.h.

```
00024 { return DIFUnpacker::getLines(theDIF_); }
```

3.3.3.17 getLinesVector()

```
std::vector< unsigned char * > & DIFPtr::getLinesVector ( )  [inline]
```

Definition at line 18 of file DIFPtr.h.

```
00018 { return theLines_; }
```

3.3.3.18 getNumberOfFrames()

```
std::uint32_t DIFPtr::getNumberOfFrames ( )  [inline]
```

Definition at line 34 of file DIFPtr.h.

```
00034 { return theFrames_.size(); }
```

3.3.3.19 getPtr()

```
unsigned char * DIFPtr::getPtr ( )  [inline]
```

Definition at line 15 of file DIFPtr.h.

```
00015 { return theDIF_; }
```

3.3.3.20 getTASU1()

```
std::uint32_t DIFPtr::getTASU1 ( )  [inline]
```

Definition at line 26 of file DIFPtr.h.

```
00026 { return DIFUnpacker::getTASU1(theDIF_); }
```

3.3.3.21 getTASU2()

```
std::uint32_t DIFPtr::getTASU2 ( )  [inline]
```

Definition at line 27 of file DIFPtr.h.

```
00027 { return DIFUnpacker::getTASU2(theDIF_); }
```

3.3.3.22 getTDIF()

```
std::uint32_t DIFPtr::getTDIF ( )  [inline]
```

Definition at line 28 of file DIFPtr.h.

```
00028 { return DIFUnpacker::getTDIF(theDIF_); }
```

3.3.3.23 getTemperatureASU1()

```
float DIFPtr::getTemperatureASU1 ( )  [inline]
```

Definition at line 30 of file DIFPtr.h.

```
00030 { return (getTASU1() » 3) * 0.0625; }
```

3.3.3.24 getTemperatureASU2()

```
float DIFPtr::getTemperatureASU2 ( )  [inline]
```

Definition at line 31 of file DIFPtr.h.

```
00031 { return (getTASU2() » 3) * 0.0625; }
```

3.3.3.25 getTemperatureDIF()

```
float DIFPtr::getTemperatureDIF ( )  [inline]
```

Definition at line 29 of file DIFPtr.h.

```
00029 { return 0.508 * getTDIF() - 9.659; }
```

3.3.3.26 getThresholdStatus()

```
uint32_t DIFPtr::getThresholdStatus (
            uint32_t i,
            uint32_t ipad )  [inline]
```

Definition at line 50 of file DIFPtr.h.

```
00050 { return (((uint32_t)getFrameLevel(i, ipad, 1)) « 1) | ((uint32_t)getFrameLevel(i, ipad, 0)); }
```

3.3.3.27 hasAnalogReadout()

```
bool DIFPtr::hasAnalogReadout ( )  [inline]
```

Definition at line 33 of file DIFPtr.h.

```
00033 { return DIFUnpacker::hasAnalogReadout(theDIF_); }
```

3.3.3.28 hasLine()

```
bool DIFPtr::hasLine (
            uint32_t line )  [inline]
```

Definition at line 25 of file DIFPtr.h.

```
00025 { return DIFUnpacker::hasLine(line, theDIF_); }
```

3.3.3.29 hasTemperature()

```
bool DIFPtr::hasTemperature ( )  [inline]
```

Definition at line 32 of file DIFPtr.h.

```
00032 { return DIFUnpacker::hasTemperature(theDIF_); }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/DIFPtr.h
- /home/runner/work/streamout/streamout/libs/core/src/DIFPtr.cc

3.4 DIFSlowControl Class Reference

Handler of DIF Slow Control info.

```
#include <DIFSlowControl.h>
```

Public Member Functions

- DIFSlowControl (const std::uint8_t &version, const std::uint8_t &DIFid, unsigned char *buf)
  Constructor.
- std::uint8_t getDIFId ()
  get DIF id
- std::map< int, std::map< std::string, int > > getChipsMap ()
  Get chips map.
- std::map< std::string, int > getChipSlowControl (const int &asicid)
  Get one chip map.
- int getChipSlowControl (const std::int8_t &asicid, const std::string &param)
  Get one Chip value.
- void Dump ()
  print out full map

3.4.1 Detailed Description

Handler of DIF Slow Control info.

Author

L.Mirabito

Date

March 2010

Version

1.0

Definition at line 20 of file DIFSlowControl.h.

3.4.2 Constructor & Destructor Documentation

3.4.2.1 DIFSlowControl()

```
DIFSlowControl::DIFSlowControl (
            const std::uint8_t & version,
            const std::uint8_t & DIFid,
            unsigned char * buf )
```

Constructor.

Parameters

version	Data format version
DIFid	DIF id
buf	Pointer to the Raw data buffer

Definition at line 10 of file DIFSlowControl.cc.

```
00010
      : m_Version(version), m_DIFId(DIfId), m_AsicType(2)
00011 {
00012   if(cbuf[0] != 0xb1) return;
00013   int header_shift{6};
00014   if(m_Version < 8) m_NbrAsic = cbuf[5];
00015   else
00016   {
00017     m_DIFId      = cbuf[1];
00018     m_NbrAsic    = cbuf[2];
00019     header_shift = 3;
00020   }
00021   int size_hardroc1 = m_NbrAsic * 72 + header_shift + 1;
00022   if(cbuf[size_hardroc1 - 1] != 0xa1) size_hardroc1 = 0;
00023
00024   int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025   if(cbuf[size_hardroc2 - 1] != 0xa1) size_hardroc2 = 0;
```

```
00026   if(size_hardroc1 != 0)
00027   {
00028     FillHR1(header_shift, cbuf);
00029     m_AsicType = 1;
00030   }
00031   else if(size_hardroc2 != 0)
00032     FillHR2(header_shift, cbuf);
00033   else
00034     return;
00035 }
```

3.4.3 Member Function Documentation

3.4.3.1 Dump()

```
void DIFSlowControl::Dump ( )
```

print out full map

Definition at line 45 of file DIFSlowControl.cc.

```
00046 {
00047   for(std::map<int, std::map<std::string, int»::iterator it = m_MapSC.begin(); it != m_MapSC.end();
       it++)
00048   {
00049     std::cout « "ASIC " « it->first « std::endl;
00050     for(std::map<std::string, int>::iterator jt = (it->second).begin(); jt != (it->second).end();
       jt++) std::cout « jt->first « " : " « jt->second « std::endl;
00051   }
00052 }
```

3.4.3.2 getChipSlowControl() [1/2]

```
std::map< std::string, int > DIFSlowControl::getChipSlowControl (
            const int & asicid )  [inline]
```

Get one chip map.

Parameters

asicid	ASIC ID

Returns

a map of <string (parameter name),int (parameter value) >

Definition at line 41 of file DIFSlowControl.cc.

```
00041 { return m_MapSC[asicid]; }
```

3.4.3.3 getChipSlowControl() [2/2]

```
int DIFSlowControl::getChipSlowControl (
            const std::int8_t & asicid,
            const std::string & param )  [inline]
```

Get one Chip value.

Parameters

asicid	ASic ID
param	Parameter name

Definition at line 43 of file DIFSlowControl.cc.

```
00043 { return getChipSlowControl(asicid)[param]; }
```

3.4.3.4 getChipsMap()

```
std::map< int, std::map< std::string, int > > DIFSlowControl::getChipsMap ( )  [inline]
```

Get chips map.

Returns

a map of < Asic Id, map of <string (parameter name),int (parameter value) >

Definition at line 39 of file DIFSlowControl.cc.

```
00039 { return m_MapSC; }
```

3.4.3.5 getDIFId()

```
std::uint8_t DIFSlowControl::getDIFId ( )  [inline]
```

get DIF id

Definition at line 37 of file DIFSlowControl.cc.

```
00037 { return m_DIFId; }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/DIFSlowControl.h
- /home/runner/work/streamout/streamout/libs/core/src/DIFSlowControl.cc

3.5 DIFUnpacker Class Reference

```
#include <DIFUnpacker.h>
```

Static Public Member Functions

- static std::uint64_t GrayToBin (const std::uint64_t &n)
- static std::uint32_t getStartOfDIF (const unsigned char *cbuf, const std::uint32_t &size_buf, const std::uint32_t &start=92)
- static std::uint32_t getID (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getDTC (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getGTC (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint64_t getAbsoluteBCID (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getBCID (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getLines (const unsigned char *cb, const std::uint32_t &idx=0)
- static bool hasLine (const std::uint32_t &line, const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getTASU1 (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getTASU2 (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getTDIF (const unsigned char *cb, const std::uint32_t &idx=0)
- static bool hasTemperature (const unsigned char *cb, const std::uint32_t &idx=0)
- static bool hasAnalogReadout (const unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getFrameAsicHeader (const unsigned char *framePtr)
- static std::uint32_t getFrameBCID (const unsigned char *framePtr)
- static bool getFramePAD (const unsigned char *framePtr, const std::uint32_t &ip)
- static bool getFrameLevel (const unsigned char *framePtr, const std::uint32_t &ip, const std::uint32_t &level)
- static std::uint32_t getAnalogPtr (std::vector< unsigned char * > &vLines, unsigned char *cb, const std::uint32_t &idx=0)
- static std::uint32_t getFramePtr (std::vector< unsigned char * > &vFrame, std::vector< unsigned char * > &vLines, const std::uint32_t &max_size, unsigned char *cb, const std::uint32_t &idx=0)
- static void dumpFrameOld (const unsigned char *buf)
- static std::uint32_t swap_bytes (const unsigned char *buf)

3.5.1 Detailed Description

Definition at line 11 of file DIFUnpacker.h.

3.5.2 Member Function Documentation

3.5.2.1 dumpFrameOld()

```
void DIFUnpacker::dumpFrameOld (
            const unsigned char * buf )  [static]
```

Definition at line 140 of file DIFUnpacker.cc.

```
00141 {
00142   bool         PAD[128];
00143   bool         l0[64];
00144   bool         l1[64];
00145   std::uint8_t un{1};
00146   for(std::size_t ip = 0; ip < 128; ip++) { PAD[ip] = false; }  // init PADs
00147   std::uint32_t idx1{4};
00148   for(int ik = 0; ik < 4; ik++)
00149   {
00150     std::uint32_t PadEtat{swap_bytes(&buf[idx1])};
00151     idx1 += 4;
00152     for(int e = 0; e < 32; e++)
00153     {
00154       PAD[((3 - ik) * 32) + (31 - e)] = PadEtat & un;  // binary operation
```

```
00155       PadEtat                         = PadEtat » 1;  // décalage des bit de 1
00156     }
00157   }
00158   // fill bool arrays
00159   for(int p = 0; p < 64; p++)
00160   {
00161     l0[p] = static_cast<bool>(PAD[(2 * p)]);      // _Lev0 (PAD paire)
00162     l1[p] = static_cast<bool>(PAD[(2 * p) + 1]);  // _Lev1 (PAD impaires)
00163   }
00164   std::bitset<64> bs0(0);
00165   std::bitset<64> bs1(0);
00166   for(std::uint32_t ip = 0; ip < 64; ip++)
00167   {
00168     bs0.set(ip, l0[ip]);
00169     bs1.set(ip, l1[ip]);
00170   }
00171   std::cout « "\t \t" « bs0 « std::endl;
00172   std::cout « "\t \t" « bs1 « std::endl;
00173 }
```

3.5.2.2 getAbsoluteBCID()

```
std::uint64_t DIFUnpacker::getAbsoluteBCID (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 47 of file DIFUnpacker.cc.

```
00048 {
00049   std::uint64_t Shift{16777216ULL};  // to shift the value from the 24 first bits
00050   std::uint64_t pos{idx + DU::ABCID_SHIFT};
00051   std::uint64_t LBC = ((cb[pos] « 16) | (cb[pos + 1] « 8) | (cb[pos + 2])) * Shift + ((cb[pos + 3] «
       16) | (cb[pos + 4] « 8) | (cb[pos + 5]));
00052   return LBC;
00053 }
```

3.5.2.3 getAnalogPtr()

```
std::uint32_t DIFUnpacker::getAnalogPtr (
            std::vector< unsigned char * > & vLines,
            unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 86 of file DIFUnpacker.cc.

```
00087 {
00088   std::uint32_t fshift{idx};
00089   if(cb[fshift] != DU::START_OF_LINES) return fshift;
00090   fshift++;
00091   while(cb[fshift] != DU::END_OF_LINES)
00092   {
00093     vLines.push_back(&cb[fshift]);
00094     std::uint32_t nchip{cb[fshift]};
00095     fshift += 1 + nchip * 64 * 2;
00096   }
00097   return fshift++;
00098 }
```

3.5.2.4 getBCID()

```
std::uint32_t DIFUnpacker::getBCID (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 55 of file DIFUnpacker.cc.

```
00055 { return (cb[idx + DU::BCID_SHIFT] << 16) + (cb[idx + DU::BCID_SHIFT + 1] << 8) + cb[idx +
      DU::BCID_SHIFT + 2]; }
```

3.5.2.5 getDTC()

```
std::uint32_t DIFUnpacker::getDTC (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 43 of file DIFUnpacker.cc.

```
00043 { return (cb[idx + DU::DTC_SHIFT] << 24) + (cb[idx + DU::DTC_SHIFT + 1] << 16) + (cb[idx + DU::DTC_SHIFT
      + 2] << 8) + cb[idx + DU::DTC_SHIFT + 3]; }
```

3.5.2.6 getFrameAsicHeader()

```
std::uint32_t DIFUnpacker::getFrameAsicHeader (
            const unsigned char * framePtr )  [static]
```

Definition at line 70 of file DIFUnpacker.cc.

```
00070 { return (framePtr[DU::FRAME_ASIC_HEADER_SHIFT]); }
```

3.5.2.7 getFrameBCID()

```
std::uint32_t DIFUnpacker::getFrameBCID (
            const unsigned char * framePtr )  [static]
```

Definition at line 72 of file DIFUnpacker.cc.

```
00073 {
00074   std::uint32_t igray = (framePtr[DU::FRAME_BCID_SHIFT] << 16) + (framePtr[DU::FRAME_BCID_SHIFT + 1] <<
      8) + framePtr[DU::FRAME_BCID_SHIFT + 2];
00075   return DIFUnpacker::GrayToBin(igray);
00076 }
```

3.5.2.8 getFrameLevel()

```
bool DIFUnpacker::getFrameLevel (
            const unsigned char * framePtr,
            const std::uint32_t & ip,
            const std::uint32_t & level )  [static]
```

Definition at line 84 of file DIFUnpacker.cc.

```
00084 { return ((framePtr[DU::FRAME_DATA_SHIFT + ((3 - ip / 16) * 4 + (ip % 16) / 4)] >> (7 - (((ip % 16) %
      4) * 2 + level))) & 0x1); }
```

3.5.2.9 getFramePAD()

```
bool DIFUnpacker::getFramePAD (
            const unsigned char * framePtr,
            const std::uint32_t & ip )  [static]
```

Definition at line 78 of file DIFUnpacker.cc.

```
00079 {
00080   std::uint32_t* iframe{(std::uint32_t*)&framePtr[DU::FRAME_DATA_SHIFT]};
00081   return ((iframe[3 - ip / 32] » (ip % 32)) & 0x1);
00082 }
```

3.5.2.10 getFramePtr()

```
std::uint32_t DIFUnpacker::getFramePtr (
            std::vector< unsigned char * > & vFrame,
            std::vector< unsigned char * > & vLines,
            const std::uint32_t & max_size,
            unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 100 of file DIFUnpacker.cc.

```
00101 {
00102   std::uint32_t fshift{0};
00103   if(DATA_FORMAT_VERSION >= 13)
00104   {
00105     fshift = idx + DU::LINES_SHIFT + 1;
00106     if(DIFUnpacker::hasTemperature(cb, idx)) fshift = idx + DU::TDIF_SHIFT + 1;
        // jenlev 1
00107     if(DIFUnpacker::hasAnalogReadout(cb, idx)) fshift = DIFUnpacker::getAnalogPtr(vLines, cb, fshift);
        // to be implemented
00108   }
00109   else
00110     std::uint32_t fshift = idx + DU::BCID_SHIFT + 3;
00111   if(cb[fshift] != DU::START_OF_FRAME)
00112   {
00113     std::cout « "This is not a start of frame " « cb[fshift] « "\n";
00114     return fshift;
00115   }
00116   do {
00117     // printf("fshift %d and %d \n",fshift,max_size);
00118     if(cb[fshift] == DU::END_OF_DIF) return fshift;
00119     if(cb[fshift] == DU::START_OF_FRAME) fshift++;
00120     if(cb[fshift] == DU::END_OF_FRAME)
00121     {
00122       fshift++;
00123       continue;
00124     }
00125     std::uint32_t header = DIFUnpacker::getFrameAsicHeader(&cb[fshift]);
00126     if(header == DU::END_OF_FRAME) return (fshift + 2);
00127     // std::cout«header«" "«fshift«std::endl;
00128     if(header < 1 || header > 48) { throw header + " Header problem " + fshift; }
00129     vFrame.push_back(&cb[fshift]);
00130     fshift += DU::FRAME_SIZE;
00131     if(fshift > max_size)
00132     {
00133       std::cout « "fshift " « fshift « " exceed " « max_size « "\n";
00134       return fshift;
00135     }
00136     if(cb[fshift] == DU::END_OF_FRAME) fshift++;
00137   } while(true);
00138 }
```

3.5.2.11 getGTC()

```
std::uint32_t DIFUnpacker::getGTC (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 45 of file DIFUnpacker.cc.

```
00045 { return (cb[idx + DU::GTC_SHIFT] « 24) + (cb[idx + DU::GTC_SHIFT + 1] « 16) + (cb[idx + DU::GTC_SHIFT
      + 2] « 8) + cb[idx + DU::GTC_SHIFT + 3]; }
```

3.5.2.12 getID()

```
std::uint32_t DIFUnpacker::getID (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 41 of file DIFUnpacker.cc.

```
00041 { return cb[idx + DU::ID_SHIFT]; }
```

3.5.2.13 getLines()

```
std::uint32_t DIFUnpacker::getLines (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 56 of file DIFUnpacker.cc.

```
00056 { return (cb[idx + DU::LINES_SHIFT] » 4) & 0x5; }
```

3.5.2.14 getStartOfDIF()

```
std::uint32_t DIFUnpacker::getStartOfDIF (
            const unsigned char * cbuf,
            const std::uint32_t & size_buf,
            const std::uint32_t & start = 92 )  [static]
```

Definition at line 28 of file DIFUnpacker.cc.

```
00029 {
00030   std::uint32_t id0{0};
00031   for(std::uint32_t i = start; i < size_buf; i++)
00032   {
00033     if(cbuf[i] != DU::START_OF_DIF && cbuf[i] != DU::START_OF_DIF_TEMP) continue;
00034     id0 = i;
00035     // if (cbuf[id0+DU::ID_SHIFT]>0xFF) continue;
00036     break;
00037   }
00038   return id0;
00039 }
```

3.5.2.15 getTASU1()

```
std::uint32_t DIFUnpacker::getTASU1 (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 60 of file DIFUnpacker.cc.

```
00060 { return (cb[idx + DU::TASU1_SHIFT] << 24) + (cb[idx + DU::TASU1_SHIFT + 1] << 16) + (cb[idx +
       DU::TASU1_SHIFT + 2] << 8) + cb[idx + DU::TASU1_SHIFT + 3]; }
```

3.5.2.16 getTASU2()

```
std::uint32_t DIFUnpacker::getTASU2 (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 62 of file DIFUnpacker.cc.

```
00062 { return (cb[idx + DU::TASU2_SHIFT] << 24) + (cb[idx + DU::TASU2_SHIFT + 1] << 16) + (cb[idx +
       DU::TASU2_SHIFT + 2] << 8) + cb[idx + DU::TASU2_SHIFT + 3]; }
```

3.5.2.17 getTDIF()

```
std::uint32_t DIFUnpacker::getTDIF (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 64 of file DIFUnpacker.cc.

```
00064 { return (cb[idx + DU::TDIF_SHIFT]); }
```

3.5.2.18 GrayToBin()

```
std::uint64_t DIFUnpacker::GrayToBin (
            const std::uint64_t & n )  [static]
```

Definition at line 13 of file DIFUnpacker.cc.

```
00014 {
00015   std::uint64_t ish{1};
00016   std::uint64_t anss{n};
00017   std::uint64_t idiv{0};
00018   std::uint64_t ishmax{sizeof(std::uint64_t) * 8};
00019   while(true)
00020   {
00021     idiv = anss >> ish;
00022     anss ^= idiv;
00023     if(idiv <= 1 || ish == ishmax) return anss;
00024     ish <<= 1;
00025   }
00026 }
```

3.5.2.19 hasAnalogReadout()

```
bool DIFUnpacker::hasAnalogReadout (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 68 of file DIFUnpacker.cc.

```
00068 { return (DIFUnpacker::getLines(cb, idx) != 0); }
```

3.5.2.20 hasLine()

```
bool DIFUnpacker::hasLine (
            const std::uint32_t & line,
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 58 of file DIFUnpacker.cc.

```
00058 { return ((cb[idx + DU::LINES_SHIFT] >> line) & 0x1); }
```

3.5.2.21 hasTemperature()

```
bool DIFUnpacker::hasTemperature (
            const unsigned char * cb,
            const std::uint32_t & idx = 0 )  [static]
```

Definition at line 66 of file DIFUnpacker.cc.

```
00066 { return (cb[idx] == DU::START_OF_DIF_TEMP); }
```

3.5.2.22 swap_bytes()

```
std::uint32_t DIFUnpacker::swap_bytes (
            const unsigned char * buf )  [static]
```

Definition at line 175 of file DIFUnpacker.cc.

```
00176 {
00177   unsigned char Swapped[4];
00178   for(std::size_t i = 0; i < 4; i++) Swapped[i] = buf[4 - 1 - i];
00179   return *reinterpret_cast<std::uint32_t*>(&Swapped[0]);
00180 }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/DIFUnpacker.h
- /home/runner/work/streamout/streamout/libs/core/src/DIFUnpacker.cc

3.6 DU Class Reference

`#include <Words.h>`

Static Public Attributes

- static const std::uint32_t START_OF_DIF {0xB0}
- static const std::uint32_t START_OF_DIF_TEMP {0xBB}
- static const std::uint32_t END_OF_DIF {0xA0}
- static const std::uint32_t START_OF_LINES {0xC4}
- static const std::uint32_t END_OF_LINES {0xD4}
- static const std::uint32_t START_OF_FRAME {0xB4}
- static const std::uint32_t END_OF_FRAME {0xA3}
- static const std::uint32_t ID_SHIFT {1}
- static const std::uint32_t DTC_SHIFT {2}
- static const std::uint32_t GTC_SHIFT {10}
- static const std::uint32_t ABCID_SHIFT {14}
- static const std::uint32_t BCID_SHIFT {20}
- static const std::uint32_t LINES_SHIFT {23}
- static const std::uint32_t TASU1_SHIFT {24}
- static const std::uint32_t TASU2_SHIFT {28}
- static const std::uint32_t TDIF_SHIFT {32}
- static const std::uint32_t FRAME_ASIC_HEADER_SHIFT {0}
- static const std::uint32_t FRAME_BCID_SHIFT {1}
- static const std::uint32_t FRAME_DATA_SHIFT {4}
- static const std::uint32_t FRAME_SIZE {20}

3.6.1 Detailed Description

Definition at line 7 of file Words.h.

3.6.2 Member Data Documentation

3.6.2.1 ABCID_SHIFT

```
const std::uint32_t DU::ABCID_SHIFT {14}  [static]
```

Definition at line 22 of file Words.h.

3.6.2.2 BCID_SHIFT

```
const std::uint32_t DU::BCID_SHIFT {20}  [static]
```

Definition at line 23 of file Words.h.

3.6.2.3 DTC_SHIFT

```
const std::uint32_t DU::DTC_SHIFT {2}  [static]
```

Definition at line 20 of file Words.h.

3.6.2.4 END_OF_DIF

```
const std::uint32_t DU::END_OF_DIF {0xA0}  [static]
```

Definition at line 12 of file Words.h.

3.6.2.5 END_OF_FRAME

```
const std::uint32_t DU::END_OF_FRAME {0xA3}  [static]
```

Definition at line 17 of file Words.h.

3.6.2.6 END_OF_LINES

```
const std::uint32_t DU::END_OF_LINES {0xD4}  [static]
```

Definition at line 14 of file Words.h.

3.6.2.7 FRAME_ASIC_HEADER_SHIFT

```
const std::uint32_t DU::FRAME_ASIC_HEADER_SHIFT {0}  [static]
```

Definition at line 29 of file Words.h.

3.6.2.8 FRAME_BCID_SHIFT

```
const std::uint32_t DU::FRAME_BCID_SHIFT {1}  [static]
```

Definition at line 30 of file Words.h.

3.6.2.9 FRAME_DATA_SHIFT

```
const std::uint32_t DU::FRAME_DATA_SHIFT {4}  [static]
```

Definition at line 31 of file Words.h.

3.6.2.10 FRAME_SIZE

```
const std::uint32_t DU::FRAME_SIZE {20}  [static]
```

Definition at line 32 of file Words.h.

3.6.2.11 GTC_SHIFT

```
const std::uint32_t DU::GTC_SHIFT {10}  [static]
```

Definition at line 21 of file Words.h.

3.6.2.12 ID_SHIFT

```
const std::uint32_t DU::ID_SHIFT {1}  [static]
```

Definition at line 19 of file Words.h.

3.6.2.13 LINES_SHIFT

```
const std::uint32_t DU::LINES_SHIFT {23}  [static]
```

Definition at line 24 of file Words.h.

3.6.2.14 START_OF_DIF

```
const std::uint32_t DU::START_OF_DIF {0xB0}  [static]
```

Definition at line 10 of file Words.h.

3.6.2.15 START_OF_DIF_TEMP

```
const std::uint32_t DU::START_OF_DIF_TEMP {0xBB}  [static]
```

Definition at line 11 of file Words.h.

3.6.2.16 START_OF_FRAME

```
const std::uint32_t DU::START_OF_FRAME {0xB4}  [static]
```

Definition at line 16 of file Words.h.

3.6.2.17 START_OF_LINES

```
const std::uint32_t DU::START_OF_LINES {0xC4}  [static]
```

Definition at line 13 of file Words.h.

3.6.2.18 TASU1_SHIFT

```
const std::uint32_t DU::TASU1_SHIFT {24}  [static]
```

Definition at line 25 of file Words.h.

3.6.2.19 TASU2_SHIFT

```
const std::uint32_t DU::TASU2_SHIFT {28}  [static]
```

Definition at line 26 of file Words.h.

3.6.2.20 TDIF_SHIFT

```
const std::uint32_t DU::TDIF_SHIFT {32}  [static]
```

Definition at line 27 of file Words.h.

The documentation for this class was generated from the following file:

- /home/runner/work/streamout/streamout/libs/core/include/Words.h

3.7 ROOTtreeDest Class Reference

`#include <ROOTtreeDest.h>`

Classes

- struct DATA

Public Member Functions

- ROOTtreeDest ()
- void start ()
- void processDIF (DIFPtr *)
- void processFrame (DIFPtr *, uint32_t frameIndex)
- void processPadInFrame (DIFPtr *, uint32_t frameIndex, uint32_t channelIndex)
- void processSlowControl (const SDHCAL_buffer &)
- void end ()

3.7.1 Detailed Description

Definition at line 12 of file ROOTtreeDest.h.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 ROOTtreeDest()

```
ROOTtreeDest::ROOTtreeDest ( )
```

Definition at line 8 of file ROOTtreeDest.cc.

```
00009 {
00010   dataReset();
00011   _tree = new TTree("RawData", "Raw SDHCAL data tree");
00012   _tree->Branch("data", &_data,
       "DIFid/i:ASICid:CHANNELid:Thresh:DTC:GTC:DIF_BCID:frame_BCID:timeStamp:AbsoluteBCID/l");
00013 }
```

3.7.3 Member Function Documentation

3.7.3.1 end()

```
void ROOTtreeDest::end ( )  [inline]
```

Definition at line 30 of file ROOTtreeDest.h.

```
00030 { ; }
```

3.7.3.2 processDIF()

```
void ROOTtreeDest::processDIF (
            DIFPtr * d )
```

Definition at line 25 of file ROOTtreeDest.cc.

```
00026 {
00027   _data.DIFid        = d->getDIFid();
00028   _data.DTC          = d->getDTC();
00029   _data.GTC          = d->getGTC();
00030   _data.DIF_BCID     = d->getBCID();
00031   _data.AbsoluteBCID = d->getAbsoluteBCID();
00032 }
```

3.7.3.3 processFrame()

```
void ROOTtreeDest::processFrame (
            DIFPtr * d,
            uint32_t frameIndex )
```

Definition at line 34 of file ROOTtreeDest.cc.

```
00035 {
00036   _data.ASICid     = d->getASICid(frameIndex);
00037   _data.frame_BCID = d->getFrameBCID(frameIndex);
00038   _data.timeStamp  = d->getFrameTimeToTrigger(frameIndex);
00039 }
```

3.7.3.4 processPadInFrame()

```
void ROOTtreeDest::processPadInFrame (
            DIFPtr * d,
            uint32_t frameIndex,
            uint32_t channelIndex )
```

Definition at line 41 of file ROOTtreeDest.cc.

```
00042 {
00043   _data.CHANNELid = channelIndex;
00044   _data.Thresh    = d->getThresholdStatus(frameIndex, channelIndex);
00045   if(_data.Thresh != 0) _tree->Fill();
00046 }
```

3.7.3.5 processSlowControl()

```
void ROOTtreeDest::processSlowControl (
            const SDHCAL_buffer &  )  [inline]
```

Definition at line 29 of file ROOTtreeDest.h.

```
00029 { ; }
```

3.7.3.6 start()

```
void ROOTtreeDest::start ( )
```

Definition at line 23 of file ROOTtreeDest.cc.

```
00023 { dataReset(); }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/interface/ROOT/include/ROOTtreeDest.h
- /home/runner/work/streamout/streamout/libs/interface/ROOT/src/ROOTtreeDest.cc

3.8 SDHCAL_buffer Class Reference

```
#include <SDHCAL_buffer.h>
```

Public Member Functions

- SDHCAL_buffer (unsigned char ∗b, const std::size_t &i)
- void set (unsigned char ∗b)
- unsigned char ∗ begin ()
- unsigned char ∗ end ()
- unsigned char operator[ ] (const std::size_t &pos)
- std::size_t size ()
- void setSize (const std::size_t &size)
- void printBuffer (uint32_t start, uint32_t stop, std::ostream &flux=std::cout)
- void printBuffer (uint32_t start=0, std::ostream &flux=std::cout)
- virtual ∼SDHCAL_buffer ()

3.8.1 Detailed Description

Definition at line 10 of file SDHCAL_buffer.h.

3.8.2 Constructor & Destructor Documentation

3.8.2.1 SDHCAL_buffer()

```
SDHCAL_buffer::SDHCAL_buffer (
            unsigned char * b,
            const std::size_t & i )  [inline]
```

Definition at line 13 of file SDHCAL_buffer.h.

```
00013 : m_Buffer(b), m_Size(i) {}
```

3.8.2.2 ~SDHCAL_buffer()

```
SDHCAL_buffer::~SDHCAL_buffer ( )  [virtual]
```

Definition at line 15 of file SDHCAL_buffer.cc.

```
00015 { std::cout « "SDHCAL_buffer destructor called" « std::endl; }
```

3.8.3 Member Function Documentation

3.8.3.1 begin()

```
unsigned char * SDHCAL_buffer::begin ( )  [inline]
```

Definition at line 15 of file SDHCAL_buffer.h.

```
00015 { return m_Buffer; }
```

3.8.3.2 end()

```
unsigned char * SDHCAL_buffer::end ( )  [inline]
```

Definition at line 16 of file SDHCAL_buffer.h.

```
00016 { return m_Buffer + m_Size; }
```

3.8.3.3 operator[]()

```
unsigned char SDHCAL_buffer::operator[] (
            const std::size_t & pos )  [inline]
```

Definition at line 17 of file SDHCAL_buffer.h.

```
00017 { return m_Buffer[pos]; }
```

3.8.3.4 printBuffer() [1/2]

```
void SDHCAL_buffer::printBuffer (
            uint32_t start,
            uint32_t stop,
            std::ostream & flux = std::cout )
```

3.8.3.5 printBuffer() [2/2]

```
void SDHCAL_buffer::printBuffer (
            uint32_t start = 0,
            std::ostream & flux = std::cout )  [inline]
```

Definition at line 21 of file SDHCAL_buffer.h.

```
00021 { printBuffer(start, size()); }
```

3.8.3.6 set()

```
void SDHCAL_buffer::set (
            unsigned char * b )  [inline]
```

Definition at line 14 of file SDHCAL_buffer.h.

```
00014 { m_Buffer = b; }
```

3.8.3.7 setSize()

```
void SDHCAL_buffer::setSize (
            const std::size_t & size )  [inline]
```

Definition at line 19 of file SDHCAL_buffer.h.

```
00019 { m_Size = size; }
```

3.8.3.8 size()

```
std::size_t SDHCAL_buffer::size ( )  [inline]
```

Definition at line 18 of file SDHCAL_buffer.h.

```
00018 { return m_Size; }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/SDHCAL_buffer.h
- /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_buffer.cc

3.9 SDHCAL_buffer_loop< SOURCE, DESTINATION > Class Template Reference

```
#include <SDHCAL_buffer_loop.h>
```

Public Member Functions

- SDHCAL_buffer_loop (SOURCE &source, DESTINATION &dest, bool debug=false, std::ostream &out=std::cout, bool verbose=false, std::ostream &verbose_out=std::cout)
- void loop (const std::int32_t &m_NbrEventsToProcess=0)
- void printAllCounters ()

3.9.1 Detailed Description

template<typename SOURCE, typename DESTINATION>
class SDHCAL_buffer_loop< SOURCE, DESTINATION >

Definition at line 28 of file SDHCAL_buffer_loop.h.

3.9.2 Constructor & Destructor Documentation

3.9.2.1 SDHCAL_buffer_loop()

```
template<typename SOURCE , typename DESTINATION >
SDHCAL_buffer_loop< SOURCE, DESTINATION >::SDHCAL_buffer_loop (
              SOURCE & source,
              DESTINATION & dest,
              bool debug = false,
              std::ostream & out = std::cout,
              bool verbose = false,
              std::ostream & verbose_out = std::cout )  [inline]
```

Definition at line 31 of file SDHCAL_buffer_loop.h.

```
00031                                                                    :
00032     m_Source(source), m_Destination(dest), m_Debug(debug), m_DebugOut(out), m_Verbose(verbose),
       m_VerboseOut(verbose_out)
00033   {
00034   }
```

3.9.3 Member Function Documentation

3.9.3.1 loop()

```
template<typename SOURCE , typename DESTINATION >
void SDHCAL_buffer_loop< SOURCE, DESTINATION >::loop (
            const std::int32_t & m_NbrEventsToProcess = 0 )  [inline]
```

Definition at line 35 of file SDHCAL_buffer_loop.h.

```
00036   {
00037     m_Destination.start();
00038     while(m_Source.nextEvent() && (m_NbrEventsToProcess == 0 || m_NbrEventsToProcess >= m_NbrEvents))
00039     {
00040       while(m_Source.nextDIFbuffer())
00041       {
00042         SDHCAL_buffer              buffer           = m_Source.getSDHCALBuffer();
00043         unsigned char*             debug_variable_1 = buffer.end();
00044         SDHCAL_RawBuffer_Navigator bufferNavigator(buffer);
00045         unsigned char*             debug_variable_2 = bufferNavigator.getDIFBuffer().end();
00046         if(m_Verbose) m_VerboseOut « "DIF BUFFER END " « (unsigned int*)debug_variable_1 « " " «
      (unsigned int*)debug_variable_2 « std::endl;
00047         if(m_Debug) assert(debug_variable_1 == debug_variable_2);
00048         uint32_t idstart = bufferNavigator.getStartOfDIF();
00049         if(m_Debug && idstart == 0) buffer.printBuffer();
00050         c.DIFStarter[idstart]++;
00051         if(!bufferNavigator.validBuffer()) continue;
00052         DIFPtr* d = bufferNavigator.getDIFPtr();
00053         if(m_Debug) assert(d != NULL);
00054         if(d != NULL)
00055         {
00056
      c.DIFPtrValueAtReturnedPos[bufferNavigator.getDIFBufferStart()[d->getGetFramePtrReturn()]]++;
00057           if(m_Debug) assert(bufferNavigator.getDIFBufferStart()[d->getGetFramePtrReturn()] == 0xa0);
00058         }
00059         c.SizeAfterDIFPtr[bufferNavigator.getSizeAfterDIFPtr()]++;
00060         m_Destination.processDIF(d);
00061         for(uint32_t i = 0; i < d->getNumberOfFrames(); i++)
00062         {
00063           m_Destination.processFrame(d, i);
00064           for(uint32_t j = 0; j < 64; j++) m_Destination.processPadInFrame(d, i, j);
00065         }
00066
00067         bool processSC = false;
00068         if(bufferNavigator.hasSlowControlData())
00069         {
00070           c.hasSlowControl++;
00071           processSC = true;
00072         }
00073         if(bufferNavigator.badSCData())
00074         {
00075           c.hasBadSlowControl++;
00076           processSC = false;
00077         }
00078         if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00079
00080         SDHCAL_buffer eod = bufferNavigator.getEndOfAllData();
00081         c.SizeAfterAllData[eod.size()]++;
00082         unsigned char* debug_variable_3 = eod.end();
00083         if(m_Verbose) m_VerboseOut « "END DATA BUFFER END " « (unsigned int*)debug_variable_1 « " " «
      (unsigned int*)debug_variable_3 « std::endl;
00084         if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00085         if(m_Verbose)
00086         {
00087           m_VerboseOut « "End of Data remaining stuff : ";
00088           eod.printBuffer();
00089         }
00090
00091         int nonzeroCount = 0;
00092         for(unsigned char* it = eod.begin(); it != eod.end(); it++)
00093           if(static_cast<int>(*it) != 0) nonzeroCount++;
00094         c.NonZeroValusAtEndOfData[nonzeroCount]++;
00095       }  // end of DIF while loop
00096       m_NbrEvents++;
00097     }  // end of event while loop
00098     m_Destination.end();
00099   }
```

3.9.3.2 printAllCounters()

```
template<typename SOURCE , typename DESTINATION >
void SDHCAL_buffer_loop< SOURCE, DESTINATION >::printAllCounters ( )  [inline]
```

Definition at line 100 of file SDHCAL_buffer_loop.h.

```
00100 { c.printAllCounters(m_DebugOut); }
```

The documentation for this class was generated from the following file:

- /home/runner/work/streamout/streamout/libs/core/include/SDHCAL_buffer_loop.h

3.10 SDHCAL_buffer_LoopCounter Struct Reference

`#include <SDHCAL_buffer_LoopCounter.h>`

Public Member Functions

- void printCounter (const std::string &description, const std::map< int, int > &m, std::ostream &out=std::cout)
- void printAllCounters (std::ostream &out=std::cout)

Public Attributes

- int hasSlowControl = 0
- int hasBadSlowControl = 0
- std::map< int, int > DIFStarter
- std::map< int, int > DIFPtrValueAtReturnedPos
- std::map< int, int > SizeAfterDIFPtr
- std::map< int, int > SizeAfterAllData
- std::map< int, int > NonZeroValusAtEndOfData

3.10.1 Detailed Description

Definition at line 11 of file SDHCAL_buffer_LoopCounter.h.

3.10.2 Member Function Documentation

3.10.2.1 printAllCounters()

```
void SDHCAL_buffer_LoopCounter::printAllCounters (
            std::ostream & out = std::cout )
```

Definition at line 7 of file SDHCAL_buffer_LoopCounter.cc.

```
00008 {
00009   out « "BUFFER LOOP FINAL STATISTICS : " « std::endl;
00010   printCounter("Start of DIF header", DIFStarter, out);
00011   printCounter("Value after DIF data are processed", DIFPtrValueAtReturnedPos, out);
00012   printCounter("Size remaining in buffer after end of DIF data", SizeAfterDIFPtr, out);
00013   out « "Number of Slow Control found " « hasSlowControl « " out of which " « hasBadSlowControl « "
      are bad" « std::endl;
00014   printCounter("Size remaining after all of data have been processed", SizeAfterAllData, out);
00015   printCounter("Number on non zero values in end of data buffer", NonZeroValusAtEndOfData, out);
00016 }
```

3.10.2.2 printCounter()

```
void SDHCAL_buffer_LoopCounter::printCounter (
            const std::string & description,
            const std::map< int, int > & m,
            std::ostream & out = std::cout )
```

Definition at line 18 of file SDHCAL_buffer_LoopCounter.cc.

```
00019 {
00020   out « " statistics for " « description « " : ";
00021   for(std::map<int, int>::const_iterator it = m.begin(); it != m.end(); it++)
00022   {
00023     if(it != m.begin()) out « ",";
00024     out « " [" « it->first « "]=" « it->second;
00025   }
00026   out « std::endl;
00027 }
```

3.10.3 Member Data Documentation

3.10.3.1 DIFPtrValueAtReturnedPos

```
std::map<int, int> SDHCAL_buffer_LoopCounter::DIFPtrValueAtReturnedPos
```

Definition at line 17 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.2 DIFStarter

```
std::map<int, int> SDHCAL_buffer_LoopCounter::DIFStarter
```

Definition at line 16 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.3 hasBadSlowControl

```
int SDHCAL_buffer_LoopCounter::hasBadSlowControl = 0
```

Definition at line 15 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.4 hasSlowControl

```
int SDHCAL_buffer_LoopCounter::hasSlowControl = 0
```

Definition at line 14 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.5 NonZeroValusAtEndOfData

```
std::map<int, int> SDHCAL_buffer_LoopCounter::NonZeroValusAtEndOfData
```

Definition at line 20 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.6 SizeAfterAllData

```
std::map<int, int> SDHCAL_buffer_LoopCounter::SizeAfterAllData
```

Definition at line 19 of file SDHCAL_buffer_LoopCounter.h.

3.10.3.7 SizeAfterDIFPtr

```
std::map<int, int> SDHCAL_buffer_LoopCounter::SizeAfterDIFPtr
```

Definition at line 18 of file SDHCAL_buffer_LoopCounter.h.

The documentation for this struct was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/SDHCAL_buffer_LoopCounter.h
- /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_buffer_LoopCounter.cc

3.11 SDHCAL_RawBuffer_Navigator Class Reference

```
#include <SDHCAL_RawBuffer_Navigator.h>
```

Public Member Functions

- SDHCAL_RawBuffer_Navigator (const SDHCAL_buffer &b, const int &start=-1)
- ~SDHCAL_RawBuffer_Navigator ()
- bool validBuffer ()
- std::uint32_t getStartOfDIF ()
- unsigned char * getDIFBufferStart ()
- std::uint32_t getDIFBufferSize ()
- SDHCAL_buffer getDIFBuffer ()
- DIFPtr * getDIFPtr ()
- std::uint32_t getEndOfDIFData ()
- std::uint32_t getSizeAfterDIFPtr ()
- std::uint32_t getDIF_CRC ()
- bool hasSlowControlData ()
- SDHCAL_buffer getSCBuffer ()
- bool badSCData ()
- SDHCAL_buffer getEndOfAllData ()

Static Public Member Functions

- static void StartAt (const int &start)

3.11.1 Detailed Description

Definition at line 12 of file SDHCAL_RawBuffer_Navigator.h.

3.11.2 Constructor & Destructor Documentation

3.11.2.1 SDHCAL_RawBuffer_Navigator()

```
SDHCAL_RawBuffer_Navigator::SDHCAL_RawBuffer_Navigator (
            const SDHCAL_buffer & b,
            const int & start = -1 )  [explicit]
```

Definition at line 14 of file SDHCAL_RawBuffer_Navigator.cc.

```
00014                                                                                                                 :
      m_Buffer(b), m_SCbuffer(0, 0)
00015 {
00016   StartAt(start);
00017   m_DIFstartIndex = DIFUnpacker::getStartOfDIF(m_Buffer.begin(), m_Buffer.size(), m_Start);
00018 }
```

3.11.2.2 ~SDHCAL_RawBuffer_Navigator()

```
SDHCAL_RawBuffer_Navigator::~SDHCAL_RawBuffer_Navigator ( )
```

Definition at line 20 of file SDHCAL_RawBuffer_Navigator.cc.

```
00021 {
00022   if(m_TheDIFPtr != nullptr) delete m_TheDIFPtr;
00023 }
```

3.11.3 Member Function Documentation

3.11.3.1 badSCData()

```
bool SDHCAL_RawBuffer_Navigator::badSCData ( )
```

Definition at line 62 of file SDHCAL_RawBuffer_Navigator.cc.

```
00063 {
00064   setSCBuffer();
00065   return m_BadSCdata;
00066 }
```

3.11.3.2 getDIF_CRC()

```
uint32_t SDHCAL_RawBuffer_Navigator::getDIF_CRC ( )
```

Definition at line 45 of file SDHCAL_RawBuffer_Navigator.cc.

```
00046 {
00047   uint32_t i{getEndOfDIFData()};
00048   uint32_t ret{0};
00049   ret |= ((m_Buffer.begin()[i - 2]) « 8);
00050   ret |= m_Buffer.begin()[i - 1];
00051   return ret;
00052 }
```

3.11.3.3 getDIFBuffer()

```
SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getDIFBuffer ( )
```

Definition at line 33 of file SDHCAL_RawBuffer_Navigator.cc.

```
00033 { return SDHCAL_buffer(getDIFBufferStart(), getDIFBufferSize()); }
```

3.11.3.4 getDIFBufferSize()

```
std::uint32_t SDHCAL_RawBuffer_Navigator::getDIFBufferSize ( )
```

Definition at line 31 of file SDHCAL_RawBuffer_Navigator.cc.

```
00031 { return m_Buffer.size() - m_DIFstartIndex; }
```

3.11.3.5 getDIFBufferStart()

```
unsigned char * SDHCAL_RawBuffer_Navigator::getDIFBufferStart ( )
```

Definition at line 29 of file SDHCAL_RawBuffer_Navigator.cc.

```
00029 { return &(m_Buffer.begin()[m_DIFstartIndex]); }
```

3.11.3.6 getDIFPtr()

```
DIFPtr * SDHCAL_RawBuffer_Navigator::getDIFPtr ( )
```

Definition at line 35 of file SDHCAL_RawBuffer_Navigator.cc.

```
00036 {
00037   if(m_TheDIFPtr == nullptr) m_TheDIFPtr = new DIFPtr(getDIFBufferStart(), getDIFBufferSize());
00038   return m_TheDIFPtr;
00039 }
```

3.11.3.7 getEndOfAllData()

```
SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getEndOfAllData ( )
```

Definition at line 101 of file SDHCAL_RawBuffer_Navigator.cc.

```
00102 {
00103   setSCBuffer();
00104   if(hasSlowControlData() && !m_BadSCdata) { return
       SDHCAL_buffer(&(m_SCbuffer.begin()[m_SCbuffer.size()]), getSizeAfterDIFPtr() - 3 -
       m_SCbuffer.size()); }
00105   else
00106     return SDHCAL_buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3);  //
       remove the 2 bytes for CRC and the DIF trailer
00107 }
```

3.11.3.8 getEndOfDIFData()

```
std::uint32_t SDHCAL_RawBuffer_Navigator::getEndOfDIFData ( )
```

Definition at line 41 of file SDHCAL_RawBuffer_Navigator.cc.

```
00041 { return getDIFPtr()->getGetFramePtrReturn() + 3; }
```

3.11.3.9 getSCBuffer()

```
SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getSCBuffer ( )
```

Definition at line 56 of file SDHCAL_RawBuffer_Navigator.cc.

```
00057 {
00058   setSCBuffer();
00059   return m_SCbuffer;
00060 }
```

3.11.3.10 getSizeAfterDIFPtr()

```
std::uint32_t SDHCAL_RawBuffer_Navigator::getSizeAfterDIFPtr ( )
```

Definition at line 43 of file SDHCAL_RawBuffer_Navigator.cc.

```
00043 { return getDIFBufferSize() - getDIFPtr()->getGetFramePtrReturn(); }
```

3.11.3.11 getStartOfDIF()

```
std::uint32_t SDHCAL_RawBuffer_Navigator::getStartOfDIF ( )
```

Definition at line 27 of file SDHCAL_RawBuffer_Navigator.cc.

```
00027 { return m_DIFstartIndex; }
```

3.11.3.12 hasSlowControlData()

```
bool SDHCAL_RawBuffer_Navigator::hasSlowControlData ( )
```

Definition at line 54 of file SDHCAL_RawBuffer_Navigator.cc.

```
00054 { return getDIFBufferStart()[getEndOfDIFData()] == 0xb1; }
```

3.11.3.13 StartAt()

```
void SDHCAL_RawBuffer_Navigator::StartAt (
            const int & start )  [static]
```

Definition at line 9 of file SDHCAL_RawBuffer_Navigator.cc.

```
00010 {
00011   if(start >= 0) m_Start = start;
00012 }
```

3.11.3.14 validBuffer()

```
bool SDHCAL_RawBuffer_Navigator::validBuffer ( )
```

Definition at line 25 of file SDHCAL_RawBuffer_Navigator.cc.

```
00025 { return m_DIFstartIndex != 0; }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/core/include/SDHCAL_RawBuffer_Navigator.h
- /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_RawBuffer_Navigator.cc

3.12 textDump Class Reference

```
#include <textDump.h>
```

Public Member Functions

- textDump (std::ostream &out=std::cout)
- void start ()
- void processDIF (DIFPtr *)
- void processFrame (DIFPtr *, uint32_t frameIndex)
- void processPadInFrame (DIFPtr *, uint32_t frameIndex, uint32_t channelIndex)
- void processSlowControl (SDHCAL_buffer)
- void end ()

3.12.1 Detailed Description

Definition at line 13 of file textDump.h.

3.12.2 Constructor & Destructor Documentation

3.12.2.1 textDump()

```
textDump::textDump (
            std::ostream & out = std::cout )  [inline], [explicit]
```

Definition at line 16 of file textDump.h.

```
00016 : _out(out) { ; }
```

3.12.3 Member Function Documentation

3.12.3.1 end()

```
void textDump::end ( )
```

Definition at line 38 of file textDump.cc.

```
00038 { _out « "textDump end of report" « std::endl; }
```

3.12.3.2 processDIF()

```
void textDump::processDIF (
            DIFPtr * d )
```

Definition at line 11 of file textDump.cc.

```
00012 {
00013   if(NULL == d) return;
00014   _out « "DIF number is " « d->getDIFid() « std::endl;
00015   _out « "  DTC value is " « d->getDTC() « std::endl;
00016   _out « "  GTC value is " « d->getGTC() « std::endl;
00017   _out « "  DIF BCID is " « d->getBCID() « std::endl;
00018   _out « "  Absolute BCID is " « d->getAbsoluteBCID() « std::endl;
00019   _out « "  The number of frame is " « d->getNumberOfFrames() « std::endl;
00020 }
```

3.12.3.3 processFrame()

```
void textDump::processFrame (
            DIFPtr * d,
            uint32_t frameIndex )
```

Definition at line 22 of file textDump.cc.

```
00023 {
00024   _out « "  Displaying frame number " « frameIndex « std::endl;
00025   _out « "    ASIC ID is " « d->getASICid(frameIndex) « std::endl;
00026   _out « "    Frame BCID is " « d->getFrameBCID(frameIndex) « std::endl;
00027   _out « "    Frame Time To Trigger (a.k.a timestamp) is " « d->getFrameTimeToTrigger(frameIndex) «
      std::endl;
00028 }
```

3.12.3.4 processPadInFrame()

```
void textDump::processPadInFrame (
            DIFPtr * d,
            uint32_t frameIndex,
            uint32_t channelIndex )
```

Definition at line 30 of file textDump.cc.

```
00031 {
00032   _out « "    Displaying channel number " « channelIndex « std::endl;
00033   _out « "      Threshold status is " « d->getThresholdStatus(frameIndex, channelIndex) « std::endl;
00034 }
```

3.12.3.5 processSlowControl()

```
void textDump::processSlowControl (
            SDHCAL_buffer  )
```

Definition at line 36 of file textDump.cc.

```
00036 { _out « "textDump::processSlowControl not implemented yet." « std::endl; }
```

3.12.3.6 start()

```
void textDump::start ( )
```

Definition at line 9 of file textDump.cc.

```
00009 { _out « "Will dump bunch of DIF data" « std::endl; }
```

The documentation for this class was generated from the following files:

- /home/runner/work/streamout/streamout/libs/interface/Dump/include/textDump.h
- /home/runner/work/streamout/streamout/libs/interface/Dump/src/textDump.cc

Chapter 4

File Documentation

4.1 /home/runner/work/streamout/streamout/libs/core/include/Bits.h File Reference

```
#include <cstdint>
#include <iosfwd>
```

Typedefs

- using bit8_t = std::uint8_t

Functions

- std::ostream & operator<< (std::ostream &os, const bit8_t &c)

  Stream operator to print bit8_t aka std::uint8_t and not char or unsigned char.

4.1.1 Detailed Description

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Definition in file Bits.h.

4.1.2 Typedef Documentation

4.1.2.1 bit8_t

```
using bit8_t = std::uint8_t
```

Definition at line 10 of file Bits.h.

4.1.3 Function Documentation

4.1.3.1 operator<<()

```
std::ostream & operator<< (
            std::ostream & os,
            const bit8_t & c )
```

Stream operator to print bit8_t aka std::uint8_t and not char or unsigned char.

Definition at line 10 of file Bits.cc.

```
00010 { return os « c + 0; }
```

4.2 Bits.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include <cstdint>
00008 #include <iosfwd>
00009
00010 using bit8_t = std::uint8_t; /*<! type to represent 8bits words (1 byte) */
00011
00013 std::ostream& operator«(std::ostream& os, const bit8_t& c);
```

4.3 /home/runner/work/streamout/streamout/libs/core/include/Buffer.h File Reference

Classes

- class Buffer

4.3.1 Detailed Description

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Definition in file Buffer.h.

4.4 Buffer.h

Go to the documentation of this file.

```
00001
00006 #pragma once
00007
00008 class Buffer
00009 {
00010 private:
00011   bool m_Allocate{false};
00012 };
```

4.5 /home/runner/work/streamout/streamout/libs/core/include/DIFPtr.h File Reference

```
#include "DIFUnpacker.h"
#include <iostream>
#include <vector>
```

Classes

- class DIFPtr

4.5.1 Detailed Description

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Definition in file DIFPtr.h.

4.6 DIFPtr.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006 #include "DIFUnpacker.h"
00007
00008 #include <iostream>
00009 #include <vector>
00010
00011 class DIFPtr
00012 {
00013 public:
00014   DIFPtr(unsigned char* p, const std::uint32_t& max_size);
00015   inline unsigned char*               getPtr() { return theDIF_; }
00016   inline std::uint32_t                getGetFramePtrReturn() { return theGetFramePtrReturn_; }
00017   inline std::vector<unsigned char*>& getFramesVector() { return theFrames_; }
00018   inline std::vector<unsigned char*>& getLinesVector() { return theLines_; }
00019   inline std::uint32_t                getID() { return DIFUnpacker::getID(theDIF_); }
00020   inline std::uint32_t                getDTC() { return DIFUnpacker::getDTC(theDIF_); }
00021   inline std::uint32_t                getGTC() { return DIFUnpacker::getGTC(theDIF_); }
00022   inline std::uint64_t                getAbsoluteBCID() { return
       DIFUnpacker::getAbsoluteBCID(theDIF_); }
00023   inline std::uint32_t                getBCID() { return DIFUnpacker::getBCID(theDIF_); }
00024   inline std::uint32_t                getLines() { return DIFUnpacker::getLines(theDIF_); }
00025   inline bool                         hasLine(uint32_t line) { return DIFUnpacker::hasLine(line,
       theDIF_); }
```

```
00026   inline std::uint32_t                getTASU1() { return DIFUnpacker::getTASU1(theDIF_); }
00027   inline std::uint32_t                getTASU2() { return DIFUnpacker::getTASU2(theDIF_); }
00028   inline std::uint32_t                getTDIF() { return DIFUnpacker::getTDIF(theDIF_); }
00029   inline float                        getTemperatureDIF() { return 0.508 * getTDIF() - 9.659; }
00030   inline float                        getTemperatureASU1() { return (getTASU1() >> 3) * 0.0625; }
00031   inline float                        getTemperatureASU2() { return (getTASU2() >> 3) * 0.0625; }
00032   inline bool                         hasTemperature() { return DIFUnpacker::hasTemperature(theDIF_);
       }
00033   inline bool                         hasAnalogReadout() { return
       DIFUnpacker::hasAnalogReadout(theDIF_); }
00034   inline std::uint32_t                getNumberOfFrames() { return theFrames_.size(); }
00035   inline unsigned char*               getFramePtr(uint32_t i) { return theFrames_[i]; }
00036   inline std::uint32_t                getFrameAsicHeader(uint32_t i) { return
       DIFUnpacker::getFrameAsicHeader(theFrames_[i]); }
00037   inline std::uint32_t                getFrameBCID(uint32_t i) { return
       DIFUnpacker::getFrameBCID(theFrames_[i]); }
00038   inline std::uint32_t                getFrameTimeToTrigger(uint32_t i) { return getBCID() -
       getFrameBCID(i); }
00039   inline bool                         getFrameLevel(uint32_t i, uint32_t ipad, uint32_t ilevel) {
       return DIFUnpacker::getFrameLevel(theFrames_[i], ipad, ilevel); }
00040   void                                dumpDIFInfo()
00041   {
00042     printf("DIF %d DTC %d GTC %d ABCID %lld BCID %d Lines %d Temperature %d \n", getID(), getDTC(),
       getGTC(), getAbsoluteBCID(), getBCID(), getLines(), hasTemperature());
00043
00044     if(hasTemperature()) printf("T: ASU1 %d %f ASU2 %d %f DIF %d  %f \n", getTASU1(),
       getTemperatureASU1(), getTASU2(), getTemperatureASU2(), getTDIF(), getTemperatureDIF());
00045     printf("Found %ld Lines and %ld Frames \n", theLines_.size(), theFrames_.size());
00046   }
00047   // Addition by GG
00048   inline uint32_t getDIFid() { return getID() & 0xFF; }
00049   inline uint32_t getASICid(uint32_t i) { return getFrameAsicHeader(i) & 0xFF; }
00050   inline uint32_t getThresholdStatus(uint32_t i, uint32_t ipad) { return (((uint32_t)getFrameLevel(i,
       ipad, 1)) << 1) | ((uint32_t)getFrameLevel(i, ipad, 0)); }
00051
00052 private:
00053   std::uint32_t               theSize_;
00054   std::uint32_t               theGetFramePtrReturn_;
00055   unsigned char*              theDIF_;
00056   std::vector<unsigned char*> theFrames_;
00057   std::vector<unsigned char*> theLines_;
00058 };
```

4.7 /home/runner/work/streamout/streamout/libs/core/include/DIFSlowControl.h File Reference

```
#include <bitset>
#include <cstdint>
#include <iostream>
#include <map>
#include <string>
```

Classes

- class DIFSlowControl

  Handler of DIF Slow Control info.

4.7.1 Detailed Description

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Definition in file DIFSlowControl.h.

4.8 DIFSlowControl.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include <bitset>
00008 #include <cstdint>
00009 #include <iostream>
00010 #include <map>
00011 #include <string>
00020 class DIFSlowControl
00021 {
00022 public:
00024
00029   DIFSlowControl(const std::uint8_t& version, const std::uint8_t& DIFid, unsigned char* buf);
00030
00032   inline std::uint8_t getDIFId();
00033
00035
00038   inline std::map<int, std::map<std::string, int» getChipsMap();
00039
00041
00045   inline std::map<std::string, int> getChipSlowControl(const int& asicid);
00046
00048
00052   inline int getChipSlowControl(const std::int8_t& asicid, const std::string& param);
00053
00055   void Dump();
00056
00057 private:
00059   DIFSlowControl() = delete;
00061   void FillHR1(const int& header_shift, unsigned char* cbuf);
00063   void FillHR2(const int& header_shift, unsigned char* cbuf);
00065   void FillAsicHR1(const std::bitset<72 * 8>& bs);
00067   void FillAsicHR2(const std::bitset<109 * 8>& bs);
00068
00069   unsigned int                              m_DIFId{0};
00070   unsigned int                              m_Version{0};
00071   unsigned int                              m_AsicType{0};  // asicType_
00072   unsigned int                              m_NbrAsic{0};
00073   std::map<int, std::map<std::string, int» m_MapSC;
00074 };
```

4.9 /home/runner/work/streamout/streamout/libs/core/include/↩ DIFUnpacker.h File Reference

```
#include <cstdint>
#include <iostream>
#include <vector>
```

Classes

- class DIFUnpacker

4.9.1 Detailed Description

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Definition in file DIFUnpacker.h.

4.10 DIFUnpacker.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include <cstdint>
00008 #include <iostream>
00009 #include <vector>
00010
00011 class DIFUnpacker
00012 {
00013 public:
00014   static std::uint64_t GrayToBin(const std::uint64_t& n);
00015   static std::uint32_t getStartOfDIF(const unsigned char* cbuf, const std::uint32_t& size_buf, const
       std::uint32_t& start = 92);
00016   static std::uint32_t getID(const unsigned char* cb, const std::uint32_t& idx = 0);
00017   static std::uint32_t getDTC(const unsigned char* cb, const std::uint32_t& idx = 0);
00018   static std::uint32_t getGTC(const unsigned char* cb, const std::uint32_t& idx = 0);
00019   static std::uint64_t getAbsoluteBCID(const unsigned char* cb, const std::uint32_t& idx = 0);
00020   static std::uint32_t getBCID(const unsigned char* cb, const std::uint32_t& idx = 0);
00021   static std::uint32_t getLines(const unsigned char* cb, const std::uint32_t& idx = 0);
00022   static bool          hasLine(const std::uint32_t& line, const unsigned char* cb, const
       std::uint32_t& idx = 0);
00023   static std::uint32_t getTASU1(const unsigned char* cb, const std::uint32_t& idx = 0);
00024   static std::uint32_t getTASU2(const unsigned char* cb, const std::uint32_t& idx = 0);
00025   static std::uint32_t getTDIF(const unsigned char* cb, const std::uint32_t& idx = 0);
00026   static bool          hasTemperature(const unsigned char* cb, const std::uint32_t& idx = 0);
00027   static bool          hasAnalogReadout(const unsigned char* cb, const std::uint32_t& idx = 0);
00028
00029   static std::uint32_t getFrameAsicHeader(const unsigned char* framePtr);
00030   static std::uint32_t getFrameBCID(const unsigned char* framePtr);
00031
00032   static bool getFramePAD(const unsigned char* framePtr, const std::uint32_t& ip);
00033   static bool getFrameLevel(const unsigned char* framePtr, const std::uint32_t& ip, const
       std::uint32_t& level);
00034
00035   static std::uint32_t getAnalogPtr(std::vector<unsigned char*>& vLines, unsigned char* cb, const
       std::uint32_t& idx = 0);
00036   static std::uint32_t getFramePtr(std::vector<unsigned char*>& vFrame, std::vector<unsigned char*>&
       vLines, const std::uint32_t& max_size, unsigned char* cb, const std::uint32_t& idx = 0);
00037   static void          dumpFrameOld(const unsigned char* buf);
00038   static std::uint32_t swap_bytes(const unsigned char* buf);  // Stolen from DCBufferReader
00039 };
```

4.11 /home/runner/work/streamout/streamout/libs/core/include/↩ SDHCAL_buffer.h File Reference

```
#include <iostream>
```

Classes

- class SDHCAL_buffer

4.11.1 Detailed Description

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See also

https://github.com/apingault/Trivent4HEP

Definition in file SDHCAL_buffer.h.

4.12 SDHCAL_buffer.h

Go to the documentation of this file.

```
00001
00006 #pragma once
00007
00008 #include <iostream>
00009
00010 class SDHCAL_buffer
00011 {
00012 public:
00013   SDHCAL_buffer(unsigned char* b, const std::size_t& i) : m_Buffer(b), m_Size(i) {}
00014   void           set(unsigned char* b) { m_Buffer = b; }
00015   unsigned char* begin() { return m_Buffer; }
00016   unsigned char* end() { return m_Buffer + m_Size; }
00017   unsigned char  operator[](const std::size_t& pos) { return m_Buffer[pos]; }
00018   std::size_t    size() { return m_Size; }
00019   void           setSize(const std::size_t& size) { m_Size = size; }
00020   void           printBuffer(uint32_t start, uint32_t stop, std::ostream& flux = std::cout);
00021   void           printBuffer(uint32_t start = 0, std::ostream& flux = std::cout) { printBuffer(start,
      size()); }
00022   virtual ~SDHCAL_buffer();
00023
00024 private:
00025   unsigned char* m_Buffer{nullptr};
00026   std::size_t    m_Size{0};
00027 };
```

4.13 /home/runner/work/streamout/streamout/libs/core/include/↩ SDHCAL_buffer_loop.h File Reference

```
#include "SDHCAL_RawBuffer_Navigator.h"
#include "SDHCAL_buffer.h"
#include "SDHCAL_buffer_LoopCounter.h"
#include <cassert>
#include <iostream>
#include <ostream>
```

Classes

- class SDHCAL_buffer_loop< SOURCE, DESTINATION >

4.13.1 Detailed Description

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Definition in file SDHCAL_buffer_loop.h.

4.14 SDHCAL_buffer_loop.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include "SDHCAL_RawBuffer_Navigator.h"
00008 #include "SDHCAL_buffer.h"
00009 #include "SDHCAL_buffer_LoopCounter.h"
00010
00011 #include <cassert>
00012 #include <iostream>
00013 #include <ostream>
00014 // function to loop on buffers
00015 //
00016 // template class should implement
00017 // bool SOURCE::next();
00018 // SDHCAL_buffer SOURCE::getSDHCALBuffer();
00019 //
00020 // void DESTINATION::start();
00021 // void DESTINATION::processDIF(DIFPtr*);
00022 // void DESTINATION::processFrame(DIFPtr*,uint32_t frameIndex);
00023 // void DESTINATION::processPadInFrame(DIFPtr*,uint32_t frameIndex, uint32_t channelIndex);
00024 // void DESTINATION::processSlowControl(SDHCAL_buffer);
00025 // void DESTINATION::end();
00026 //
00027
00028 template<typename SOURCE, typename DESTINATION> class SDHCAL_buffer_loop
00029 {
00030 public:
00031   SDHCAL_buffer_loop(SOURCE& source, DESTINATION& dest, bool debug = false, std::ostream& out =
      std::cout, bool verbose = false, std::ostream& verbose_out = std::cout) :
00032     m_Source(source), m_Destination(dest), m_Debug(debug), m_DebugOut(out), m_Verbose(verbose),
      m_VerboseOut(verbose_out)
00033   {
00034   }
00035   void loop(const std::int32_t& m_NbrEventsToProcess = 0)
00036   {
00037     m_Destination.start();
00038     while(m_Source.nextEvent() && (m_NbrEventsToProcess == 0 || m_NbrEventsToProcess >= m_NbrEvents))
00039     {
00040       while(m_Source.nextDIFbuffer())
00041       {
00042         SDHCAL_buffer              buffer           = m_Source.getSDHCALBuffer();
00043         unsigned char*             debug_variable_1 = buffer.end();
00044         SDHCAL_RawBuffer_Navigator bufferNavigator(buffer);
00045         unsigned char*             debug_variable_2 = bufferNavigator.getDIFBuffer().end();
00046         if(m_Verbose) m_VerboseOut << "DIF BUFFER END " << (unsigned int*)debug_variable_1 << " " <<
      (unsigned int*)debug_variable_2 << std::endl;
00047         if(m_Debug) assert(debug_variable_1 == debug_variable_2);
00048         uint32_t idstart = bufferNavigator.getStartOfDIF();
00049         if(m_Debug && idstart == 0) buffer.printBuffer();
00050         c.DIFStarter[idstart]++;
00051         if(!bufferNavigator.validBuffer()) continue;
00052         DIFPtr* d = bufferNavigator.getDIFPtr();
00053         if(m_Debug) assert(d != NULL);
00054         if(d != NULL)
00055         {
00056
      c.DIFPtrValueAtReturnedPos[bufferNavigator.getDIFBufferStart()[d->getGetFramePtrReturn()]]++;
00057           if(m_Debug) assert(bufferNavigator.getDIFBufferStart()[d->getGetFramePtrReturn()] == 0xa0);
00058         }
00059         c.SizeAfterDIFPtr[bufferNavigator.getSizeAfterDIFPtr()]++;
00060         m_Destination.processDIF(d);
00061         for(uint32_t i = 0; i < d->getNumberOfFrames(); i++)
00062         {
00063           m_Destination.processFrame(d, i);
00064           for(uint32_t j = 0; j < 64; j++) m_Destination.processPadInFrame(d, i, j);
00065         }
00066
00067         bool processSC = false;
00068         if(bufferNavigator.hasSlowControlData())
00069         {
00070           c.hasSlowControl++;
00071           processSC = true;
00072         }
00073         if(bufferNavigator.badSCData())
00074         {
00075           c.hasBadSlowControl++;
00076           processSC = false;
00077         }
00078         if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00079
00080         SDHCAL_buffer eod = bufferNavigator.getEndOfAllData();
00081         c.SizeAfterAllData[eod.size()]++;
```

```
00082         unsigned char* debug_variable_3 = eod.end();
00083         if(m_Verbose) m_VerboseOut « "END DATA BUFFER END " « (unsigned int*)debug_variable_1 « " " «
      (unsigned int*)debug_variable_3 « std::endl;
00084         if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00085         if(m_Verbose)
00086         {
00087           m_VerboseOut « "End of Data remaining stuff : ";
00088           eod.printBuffer();
00089         }
00090
00091         int nonzeroCount = 0;
00092         for(unsigned char* it = eod.begin(); it != eod.end(); it++)
00093           if(static_cast<int>(*it) != 0) nonzeroCount++;
00094         c.NonZeroValusAtEndOfData[nonzeroCount]++;
00095       }  // end of DIF while loop
00096       m_NbrEvents++;
00097     }  // end of event while loop
00098     m_Destination.end();
00099   }
00100   void printAllCounters() { c.printAllCounters(m_DebugOut); }
00101
00102 private:
00103   SDHCAL_buffer_LoopCounter c;
00104   SOURCE&                   m_Source;
00105   DESTINATION&              m_Destination;
00106   bool                      m_Debug{false};
00107   std::ostream&             m_DebugOut{std::cout};
00108   bool                      m_Verbose{false};
00109   std::ostream&             m_VerboseOut{std::cout};
00110   std::uint32_t             m_NbrEvents{1};
00111 };
```

4.15 /home/runner/work/streamout/streamout/libs/core/include/SDHCAL_buffer_LoopCounter.h File Reference

```
#include <iostream>
#include <map>
#include <string>
```

Classes

- struct SDHCAL_buffer_LoopCounter

4.15.1 Detailed Description

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Definition in file SDHCAL_buffer_LoopCounter.h.

4.16 SDHCAL_buffer_LoopCounter.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include <iostream>
00008 #include <map>
00009 #include <string>
```

```
00010
00011 struct SDHCAL_buffer_LoopCounter
00012 {
00013 public:
00014   int                hasSlowControl    = 0;
00015   int                hasBadSlowControl = 0;
00016   std::map<int, int> DIFStarter;
00017   std::map<int, int> DIFPtrValueAtReturnedPos;
00018   std::map<int, int> SizeAfterDIFPtr;
00019   std::map<int, int> SizeAfterAllData;
00020   std::map<int, int> NonZeroValusAtEndOfData;
00021
00022   void printCounter(const std::string& description, const std::map<int, int>& m, std::ostream& out =
      std::cout);
00023   void printAllCounters(std::ostream& out = std::cout);
00024 };
```

4.17 /home/runner/work/streamout/streamout/libs/core/include/↩ SDHCAL_RawBuffer_Navigator.h File Reference

```
#include "DIFPtr.h"
#include "SDHCAL_buffer.h"
#include <iostream>
```

Classes

- class SDHCAL_RawBuffer_Navigator

4.17.1 Detailed Description

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Definition in file SDHCAL_RawBuffer_Navigator.h.

4.18 SDHCAL_RawBuffer_Navigator.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include "DIFPtr.h"
00008 #include "SDHCAL_buffer.h"
00009
00010 #include <iostream>
00011 // class to navigate in the raw data buffer
00012 class SDHCAL_RawBuffer_Navigator
00013 {
00014 public:
00015   explicit SDHCAL_RawBuffer_Navigator(const SDHCAL_buffer& b, const int& start = -1);
00016   ~SDHCAL_RawBuffer_Navigator();
00017   bool           validBuffer();
00018   std::uint32_t  getStartOfDIF();
00019   unsigned char* getDIFBufferStart();
00020   std::uint32_t  getDIFBufferSize();
00021   SDHCAL_buffer  getDIFBuffer();
00022   DIFPtr*        getDIFPtr();
00023   std::uint32_t  getEndOfDIFData();
00024   std::uint32_t  getSizeAfterDIFPtr();
```

```
00025   std::uint32_t  getDIF_CRC();
00026   bool           hasSlowControlData();
00027   SDHCAL_buffer  getSCBuffer();
00028   bool           badSCData();
00029   SDHCAL_buffer  getEndOfAllData();
00030   static void    StartAt(const int& start);
00031
00032 private:
00033   void          setSCBuffer();
00034   SDHCAL_buffer m_Buffer{0, 0};
00035   SDHCAL_buffer m_SCbuffer{0, 0};
00036   std::uint32_t m_DIFstartIndex{0};
00037   DIFPtr*       m_TheDIFPtr{nullptr};
00038   bool          m_BadSCdata{false};
00039   static int    m_Start;
00040 };
```

4.19 /home/runner/work/streamout/streamout/libs/core/include/Words.h File Reference

Classes

- class DU

4.19.1 Detailed Description

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Definition in file Words.h.

4.20 Words.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 class DU
00008 {
00009 public:
00010   static const std::uint32_t START_OF_DIF{0xB0};
00011   static const std::uint32_t START_OF_DIF_TEMP{0xBB};
00012   static const std::uint32_t END_OF_DIF{0xA0};
00013   static const std::uint32_t START_OF_LINES{0xC4};
00014   static const std::uint32_t END_OF_LINES{0xD4};
00015
00016   static const std::uint32_t START_OF_FRAME{0xB4};
00017   static const std::uint32_t END_OF_FRAME{0xA3};
00018
00019   static const std::uint32_t ID_SHIFT{1};
00020   static const std::uint32_t DTC_SHIFT{2};
00021   static const std::uint32_t GTC_SHIFT{10};
00022   static const std::uint32_t ABCID_SHIFT{14};
00023   static const std::uint32_t BCID_SHIFT{20};
00024   static const std::uint32_t LINES_SHIFT{23};
00025   static const std::uint32_t TASU1_SHIFT{24};
00026   static const std::uint32_t TASU2_SHIFT{28};
00027   static const std::uint32_t TDIF_SHIFT{32};
00028
00029   static const std::uint32_t FRAME_ASIC_HEADER_SHIFT{0};
00030   static const std::uint32_t FRAME_BCID_SHIFT{1};
00031   static const std::uint32_t FRAME_DATA_SHIFT{4};
00032   static const std::uint32_t FRAME_SIZE{20};
00033 };
```

4.21 /home/runner/work/streamout/streamout/libs/core/src/Bits.cc File Reference

```
#include "Bits.h"
#include <iostream>
```

Functions

- std::ostream & operator<< (std::ostream &os, const bit8_t &c)

  Stream operator to print bit8_t aka std::uint8_t and not char or unsigned char.

4.21.1 Detailed Description

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Definition in file Bits.cc.

4.21.2 Function Documentation

4.21.2.1 operator<<()

```
std::ostream & operator<< (
            std::ostream & os,
            const bit8_t & c )
```

Stream operator to print bit8_t aka std::uint8_t and not char or unsigned char.

Definition at line 10 of file Bits.cc.

```
00010 { return os « c + 0; }
```

4.22 Bits.cc

Go to the documentation of this file.

```
00001
00006 #include "Bits.h"
00007
00008 #include <iostream>
00009
00010 std::ostream& operator«(std::ostream& os, const bit8_t& c) { return os « c + 0; }
```

4.23 /home/runner/work/streamout/streamout/libs/core/src/Buffer.cc File Reference

4.23.1 Detailed Description

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Definition in file Buffer.cc.

4.24 Buffer.cc

Go to the documentation of this file.

```
00001
```

4.25 /home/runner/work/streamout/streamout/libs/core/src/DIFPtr.cc File Reference

```
#include "DIFPtr.h"
```

4.26 DIFPtr.cc

Go to the documentation of this file.

```
00001
00005 #include "DIFPtr.h"
00006
00007 DIFPtr::DIFPtr(unsigned char* p, const std::uint32_t& max_size) : theDIF_(p), theSize_(max_size)
00008 {
00009   theFrames_.clear();
00010   theLines_.clear();
00011   try
00012   {
00013     theGetFramePtrReturn_ = DIFUnpacker::getFramePtr(theFrames_, theLines_, theSize_, theDIF_);
00014   }
00015   catch(std::string e)
00016   {
00017     std::cout « "DIF " « getID() « " T ? " « hasTemperature() « " " « e « std::endl;
00018   }
00019 }
```

4.27 /home/runner/work/streamout/streamout/libs/core/src/DIFSlowControl.cc File Reference

```
#include "DIFSlowControl.h"
#include <cstdint>
#include <iostream>
```

4.27.1 Detailed Description

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Definition in file DIFSlowControl.cc.

4.28 DIFSlowControl.cc

Go to the documentation of this file.

```
00001
00005 #include "DIFSlowControl.h"
00006
00007 #include <cstdint>
00008 #include <iostream>
00009
00010 DIFSlowControl::DIFSlowControl(const std::uint8_t& version, const std::uint8_t& DIfId, unsigned char*
       cbuf) : m_Version(version), m_DIFId(DIfId), m_AsicType(2)
00011 {
00012   if(cbuf[0] != 0xb1) return;
00013   int header_shift{6};
00014   if(m_Version < 8) m_NbrAsic = cbuf[5];
00015   else
00016   {
00017     m_DIFId      = cbuf[1];
00018     m_NbrAsic    = cbuf[2];
00019     header_shift = 3;
00020   }
00021   int size_hardroc1 = m_NbrAsic * 72 + header_shift + 1;
00022   if(cbuf[size_hardroc1 - 1] != 0xa1) size_hardroc1 = 0;
00023
00024   int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025   if(cbuf[size_hardroc2 - 1] != 0xa1) size_hardroc2 = 0;
00026   if(size_hardroc1 != 0)
00027   {
00028     FillHR1(header_shift, cbuf);
00029     m_AsicType = 1;
00030   }
00031   else if(size_hardroc2 != 0)
00032     FillHR2(header_shift, cbuf);
00033   else
00034     return;
00035 }
00036
00037 inline std::uint8_t DIFSlowControl::getDIFId() { return m_DIFId; }
00038
00039 inline std::map<int, std::map<std::string, int» DIFSlowControl::getChipsMap() { return m_MapSC; }
00040
00041 inline std::map<std::string, int> DIFSlowControl::getChipSlowControl(const int& asicid) { return
       m_MapSC[asicid]; }
00042
00043 inline int DIFSlowControl::getChipSlowControl(const std::int8_t& asicid, const std::string& param) {
       return getChipSlowControl(asicid)[param]; }
00044
00045 void DIFSlowControl::Dump()
00046 {
00047   for(std::map<int, std::map<std::string, int»::iterator it = m_MapSC.begin(); it != m_MapSC.end();
      it++)
00048   {
00049     std::cout « "ASIC " « it->first « std::endl;
00050     for(std::map<std::string, int>::iterator jt = (it->second).begin(); jt != (it->second).end();
      jt++) std::cout « jt->first « " : " « jt->second « std::endl;
00051   }
00052 }
00053
00054 void DIFSlowControl::FillHR1(const int& header_shift, unsigned char* cbuf)
00055 {
00056   int nasic{cbuf[header_shift - 1]};
00057   int idx{header_shift};
00058   for(int k = 0; k < nasic; k++)
00059   {
00060     std::bitset<72 * 8> bs;
00061     // printf("%x %x \n",cbuf[idx+k*72+69],cbuf[idx+k*72+70]);
00062     for(int l = 71; l >= 0; l--)
00063     {
00064       //  printf("%d %x : %d -->",l,cbuf[idx+k*72+l],(71-l)*8);
```

```
00065       for(int m = 0; m < 8; m++)
00066       {
00067         if(((1 << m) & cbuf[idx + k * 72 + l]) != 0) bs.set((71 - l) * 8 + m, 1);
00068         else
00069           bs.set((71 - l) * 8 + m, 0);
00070         // printf("%d",(int) bs[(71-l)*8+m]);
00071       }
00072       // printf("\n");
00073     }
00074     FillAsicHR1(bs);
00075   }
00076 }
00077
00078 void DIFSlowControl::FillHR2(const int& header_shift, unsigned char* cbuf)
00079 {
00080   // int scsize1=cbuf[header_shift-1]*109+(header_shift-1)+2;
00081   int nasic{cbuf[header_shift - 1]};
00082   int idx{header_shift};
00083   // std::cout<<" DIFSlowControl::FillHR nasic "<<nasic<<std::endl;
00084   for(int k = 0; k < nasic; k++)
00085   {
00086     std::bitset<109 * 8> bs;
00087     // printf("%x %x \n",cbuf[idx+k*109+69],cbuf[idx+k*109+70]);
00088     for(int l = 108; l >= 0; l--)
00089     {
00090       //  printf("%d %x : %d -->",l,cbuf[idx+k*109+l],(71-l)*8);
00091       for(int m = 0; m < 8; m++)
00092       {
00093         if(((1 << m) & cbuf[idx + k * 109 + l]) != 0) bs.set((108 - l) * 8 + m, 1);
00094         else
00095           bs.set((108 - l) * 8 + m, 0);
00096         // printf("%d",(int) bs[(71-l)*8+m]);
00097       }
00098       // printf("\n");
00099     }
00100     FillAsicHR2(bs);
00101   }
00102 }
00103
00104 void DIFSlowControl::FillAsicHR1(const std::bitset<72 * 8>& bs)
00105 {
00106   // Asic Id
00107   int asicid{0};
00108   for(int j = 0; j < 8; j++)
00109     if(bs[j + 9] != 0) asicid += (1 << (7 - j));
00110   std::map<std::string, int> mAsic;
00111   // Slow Control
00112   mAsic["SSC0"]          = static_cast<int>(bs[575]);
00113   mAsic["SSC1"]          = static_cast<int>(bs[574]);
00114   mAsic["SSC2"]          = static_cast<int>(bs[573]);
00115   mAsic["Choix_caisson"] = static_cast<int>(bs[572]);
00116   mAsic["SW_50k"]        = static_cast<int>(bs[571]);
00117   mAsic["SW_100k"]       = static_cast<int>(bs[570]);
00118   mAsic["SW_100f"]       = static_cast<int>(bs[569]);
00119   mAsic["SW_50f"]        = static_cast<int>(bs[568]);
00120
00121   mAsic["Valid_DC"]  = static_cast<int>(bs[567]);
00122   mAsic["ON_Discri"] = static_cast<int>(bs[566]);
00123   mAsic["ON_Fsb"]    = static_cast<int>(bs[565]);
00124   mAsic["ON_Otaq"]   = static_cast<int>(bs[564]);
00125   mAsic["ON_W"]      = static_cast<int>(bs[563]);
00126   mAsic["ON_Ss"]     = static_cast<int>(bs[562]);
00127   mAsic["ON_Buf"]    = static_cast<int>(bs[561]);
00128   mAsic["ON_Paf"]    = static_cast<int>(bs[560]);
00129   // Gain
00130   for(int i = 0; i < 64; i++)
00131   {
00132     int gain{0};
00133     for(int j = 0; j < 6; j++)
00134       if(bs[176 + i * 6 + j] != 0) gain += (1 << j);
00135     mAsic["Channel_" + std::to_string(i) + "_" + "Gain"]       = gain;
00136     mAsic["Channel_" + std::to_string(i) + "_" + "cTest"]      = bs[112 + i];
00137     mAsic["Channel_" + std::to_string(i) + "_" + "Valid_trig"] = static_cast<int>(bs[25 + i]);
00138   }
00139
00140   mAsic["ON_Otabg"]  = static_cast<int>(bs[111]);
00141   mAsic["ON_Dac"]    = static_cast<int>(bs[110]);
00142   mAsic["ON_Otadac"] = static_cast<int>(bs[109]);
00143   // DAC
00144   int dac1{0};
00145   for(int j = 0; j < 10; j++)
00146     if(bs[j + 99] != 0) dac1 += (1 << j);
00147   mAsic["DAC1"] = dac1;
00148   int dac0{0};
00149   for(int j = 0; j < 10; j++)
00150     if(bs[j + 89] != 0) dac0 += (1 << j);
00151   mAsic["DAC0"]            = dac0;
```

```
00152   mAsic["EN_Raz_Ext"]      = static_cast<int>(bs[23]);
00153   mAsic["EN_Raz_Int"]      = static_cast<int>(bs[22]);
00154   mAsic["EN_Out_Raz_Int"]  = static_cast<int>(bs[21]);
00155   mAsic["EN_Trig_Ext"]     = static_cast<int>(bs[20]);
00156   mAsic["EN_Trig_Int"]     = static_cast<int>(bs[19]);
00157   mAsic["EN_Out_Trig_Int"] = static_cast<int>(bs[18]);
00158   mAsic["Bypass_Chip"]     = static_cast<int>(bs[17]);
00159   mAsic["HardrocHeader"]   = static_cast<int>(asicid);
00160   mAsic["EN_Out_Discri"]   = static_cast<int>(bs[8]);
00161   mAsic["EN_Transmit_On"]  = static_cast<int>(bs[7]);
00162   mAsic["EN_Dout"]         = static_cast<int>(bs[6]);
00163   mAsic["EN_RamFull"]      = static_cast<int>(bs[5]);
00164   m_MapSC[asicid]          = mAsic;
00165 }
00166
00167 void DIFSlowControl::FillAsicHR2(const std::bitset<109 * 8>& bs)
00168 {
00169   int asicid{0};
00170   for(int j = 0; j < 8; j++)
00171     if(bs[j + (108 - 7) * 8 + 2] != 0) asicid += (1 << (7 - j));
00172   std::map<std::string, int> mAsic;
00173   for(int i = 0; i < 64; i++)
00174   {
00175     int gain{0};
00176     int mask{0};
00177     mAsic["Channel_" + std::to_string(i) + "_" + "cTest"] = bs[i];
00178     for(int j = 0; j < 8; j++)
00179       if(bs[64 + i * 8 + j] != 0) gain += (1 << j);
00180     mAsic["Channel_" + std::to_string(i) + "_" + "Gain"] = gain;
00181     for(int j = 0; j < 3; j++)
00182       if(bs[8 * 77 + 2 + i * 3 + j] != 0) mask += (1 << j);
00183     mAsic["Channel_" + std::to_string(i) + "_" + "Mask"] = mask;
00184   }
00185   mAsic["PwrOnPA"] = static_cast<int>(bs[8 * 72]);
00186   mAsic["Cmdb3SS"] = static_cast<int>(bs[8 * 72 + 1]);
00187   mAsic["Cmdb2SS"] = static_cast<int>(bs[8 * 72 + 2]);
00188   mAsic["Cmdb1SS"] = static_cast<int>(bs[8 * 72 + 3]);
00189   mAsic["Cmdb0SS"] = static_cast<int>(bs[8 * 72 + 4]);
00190   mAsic["SwSsc0"]  = static_cast<int>(bs[8 * 72 + 5]);
00191   mAsic["SwSsc1"]  = static_cast<int>(bs[8 * 72 + 6]);
00192   mAsic["SwSsc2"]  = static_cast<int>(bs[8 * 72 + 7]);
00193
00194   mAsic["PwrOnBuff"] = static_cast<int>(bs[8 * 73]);
00195   mAsic["PwrOnSS"]   = static_cast<int>(bs[8 * 73 + 1]);
00196   mAsic["PwrOnW"]    = static_cast<int>(bs[8 * 73 + 2]);
00197   mAsic["Cmdb3Fsb2"] = static_cast<int>(bs[8 * 73 + 3]);
00198   mAsic["Cmdb2Fsb2"] = static_cast<int>(bs[8 * 73 + 4]);
00199   mAsic["Cmdb1Fsb2"] = static_cast<int>(bs[8 * 73 + 5]);
00200   mAsic["Cmdb0Fsb2"] = static_cast<int>(bs[8 * 73 + 6]);
00201   mAsic["Sw50k2"]    = static_cast<int>(bs[8 * 73 + 7]);
00202
00203   mAsic["Sw100k2"]   = static_cast<int>(bs[8 * 74]);
00204   mAsic["Sw100f2"]   = static_cast<int>(bs[8 * 74 + 1]);
00205   mAsic["Sw50f2"]    = static_cast<int>(bs[8 * 74 + 2]);
00206   mAsic["Cmdb3Fsb1"] = static_cast<int>(bs[8 * 74 + 3]);
00207   mAsic["Cmdb2Fsb1"] = static_cast<int>(bs[8 * 74 + 4]);
00208   mAsic["Cmdb1Fsb1"] = static_cast<int>(bs[8 * 74 + 5]);
00209   mAsic["Cmdb0Fsb1"] = static_cast<int>(bs[8 * 74 + 6]);
00210   mAsic["Sw50k1"]    = static_cast<int>(bs[8 * 74 + 7]);
00211
00212   mAsic["Sw100k1"]   = static_cast<int>(bs[8 * 75]);
00213   mAsic["Sw100f1"]   = static_cast<int>(bs[8 * 75 + 1]);
00214   mAsic["Sw50f1"]    = static_cast<int>(bs[8 * 75 + 2]);
00215   mAsic["Sel0"]      = static_cast<int>(bs[8 * 75 + 3]);
00216   mAsic["Sel11"]     = static_cast<int>(bs[8 * 75 + 4]);
00217   mAsic["PwrOnFsb"]  = static_cast<int>(bs[8 * 75 + 5]);
00218   mAsic["PwrOnFsb1"] = static_cast<int>(bs[8 * 75 + 6]);
00219   mAsic["PwrOnFsb2"] = static_cast<int>(bs[8 * 75 + 7]);
00220
00221   mAsic["Sw50k0"]      = static_cast<int>(bs[8 * 76]);
00222   mAsic["Sw100k0"]     = static_cast<int>(bs[8 * 76 + 1]);
00223   mAsic["Sw100f0"]     = static_cast<int>(bs[8 * 76 + 2]);
00224   mAsic["Sw50f0"]      = static_cast<int>(bs[8 * 76 + 3]);
00225   mAsic["EnOtaQ"]      = static_cast<int>(bs[8 * 76 + 4]);
00226   mAsic["OtaQ_PwrADC"] = static_cast<int>(bs[8 * 76 + 5]);
00227   mAsic["Discri_PwrA"] = static_cast<int>(bs[8 * 76 + 6]);
00228   mAsic["Discri2"]     = static_cast<int>(bs[8 * 76 + 7]);
00229
00230   mAsic["Discri1"]      = static_cast<int>(bs[8 * 77]);
00231   mAsic["RS_or_Discri"] = static_cast<int>(bs[8 * 77 + 1]);
00232
00233   mAsic["Header"] = asicid;
00234   for(int i = 0; i < 3; i++)
00235   {
00236     int B = 0;
00237     for(int j = 0; j < 10; j++)
00238       if(bs[8 * 102 + 2 + i * 10 + j] != 0) B += (1 << j);
```

```
00239     mAsic["B" + std::to_string(i)] = B;
00240   }
00241
00242   mAsic["Smalldac"]  = static_cast<int>(bs[8 * 106]);
00243   mAsic["DacSw"]     = static_cast<int>(bs[8 * 106 + 1]);
00244   mAsic["OtagBgSw"]  = static_cast<int>(bs[8 * 106 + 2]);
00245   mAsic["Trig2b"]    = static_cast<int>(bs[8 * 106 + 3]);
00246   mAsic["Trig1b"]    = static_cast<int>(bs[8 * 106 + 4]);
00247   mAsic["Trig0b"]    = static_cast<int>(bs[8 * 106 + 5]);
00248   mAsic["EnTrigOut"] = static_cast<int>(bs[8 * 106 + 6]);
00249   mAsic["DiscrOrOr"] = static_cast<int>(bs[8 * 106 + 7]);
00250
00251   mAsic["TrigExtVal"]   = static_cast<int>(bs[8 * 107]);
00252   mAsic["RazChnIntVal"] = static_cast<int>(bs[8 * 107 + 1]);
00253   mAsic["RazChnExtVal"] = static_cast<int>(bs[8 * 107 + 2]);
00254   mAsic["ScOn"]         = static_cast<int>(bs[8 * 107 + 3]);
00255   mAsic["CLKMux"]       = static_cast<int>(bs[8 * 107 + 4]);
00256
00257   // EnOCDout1b   EnOCDout2b   EnOCTransmitOn1b   EnOCTransmitOn2b   EnOCChipsatb   SelStartReadout
      SelEndReadout
00258   mAsic["SelEndReadout"]    = static_cast<int>(bs[8 * 108 + 1]);
00259   mAsic["SelStartReadout"]  = static_cast<int>(bs[8 * 108 + 2]);
00260   mAsic["EnOCChipsatb"]     = static_cast<int>(bs[8 * 108 + 3]);
00261   mAsic["EnOCTransmitOn2b"] = static_cast<int>(bs[8 * 108 + 4]);
00262   mAsic["EnOCTransmitOn1b"] = static_cast<int>(bs[8 * 108 + 5]);
00263   mAsic["EnOCDout2b"]       = static_cast<int>(bs[8 * 108 + 6]);
00264   mAsic["EnOCDout1b"]       = static_cast<int>(bs[8 * 108 + 7]);
00265   m_MapSC[asicid]           = mAsic;
00266 }
```

4.29 /home/runner/work/streamout/streamout/libs/core/src/↩ DIFUnpacker.cc File Reference

```
#include "DIFUnpacker.h"
#include "Words.h"
#include <bitset>
#include <cstdint>
#include <iostream>
```

4.29.1 Detailed Description

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Definition in file DIFUnpacker.cc.

4.30 DIFUnpacker.cc

Go to the documentation of this file.

```
00001
00005 #include "DIFUnpacker.h"
00006
00007 #include "Words.h"
00008
00009 #include <bitset>
00010 #include <cstdint>
00011 #include <iostream>
00012
00013 std::uint64_t DIFUnpacker::GrayToBin(const std::uint64_t& n)
00014 {
00015   std::uint64_t ish{1};
00016   std::uint64_t anss{n};
```

```
00017   std::uint64_t idiv{0};
00018   std::uint64_t ishmax{sizeof(std::uint64_t) * 8};
00019   while(true)
00020   {
00021     idiv = anss » ish;
00022     anss ^= idiv;
00023     if(idiv <= 1 || ish == ishmax) return anss;
00024     ish «= 1;
00025   }
00026 }
00027
00028 std::uint32_t DIFUnpacker::getStartOfDIF(const unsigned char* cbuf, const std::uint32_t& size_buf,
       const std::uint32_t& start)
00029 {
00030   std::uint32_t id0{0};
00031   for(std::uint32_t i = start; i < size_buf; i++)
00032   {
00033     if(cbuf[i] != DU::START_OF_DIF && cbuf[i] != DU::START_OF_DIF_TEMP) continue;
00034     id0 = i;
00035     // if (cbuf[id0+DU::ID_SHIFT]>0xFF) continue;
00036     break;
00037   }
00038   return id0;
00039 }
00040
00041 std::uint32_t DIFUnpacker::getID(const unsigned char* cb, const std::uint32_t& idx) { return cb[idx +
       DU::ID_SHIFT]; }
00042
00043 std::uint32_t DIFUnpacker::getDTC(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
       + DU::DTC_SHIFT] « 24) + (cb[idx + DU::DTC_SHIFT + 1] « 16) + (cb[idx + DU::DTC_SHIFT + 2] « 8) +
       cb[idx + DU::DTC_SHIFT + 3]; }
00044
00045 std::uint32_t DIFUnpacker::getGTC(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
       + DU::GTC_SHIFT] « 24) + (cb[idx + DU::GTC_SHIFT + 1] « 16) + (cb[idx + DU::GTC_SHIFT + 2] « 8) +
       cb[idx + DU::GTC_SHIFT + 3]; }
00046
00047 std::uint64_t DIFUnpacker::getAbsoluteBCID(const unsigned char* cb, const std::uint32_t& idx)
00048 {
00049   std::uint64_t Shift{16777216ULL};  // to shift the value from the 24 first bits
00050   std::uint64_t pos{idx + DU::ABCID_SHIFT};
00051   std::uint64_t LBC = ((cb[pos] « 16) | (cb[pos + 1] « 8) | (cb[pos + 2])) * Shift + ((cb[pos + 3] «
       16) | (cb[pos + 4] « 8) | (cb[pos + 5]));
00052   return LBC;
00053 }
00054
00055 std::uint32_t DIFUnpacker::getBCID(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
       + DU::BCID_SHIFT] « 16) + (cb[idx + DU::BCID_SHIFT + 1] « 8) + cb[idx + DU::BCID_SHIFT + 2]; }
00056 std::uint32_t DIFUnpacker::getLines(const unsigned char* cb, const std::uint32_t& idx) { return
       (cb[idx + DU::LINES_SHIFT] » 4) & 0x5; }
00057
00058 bool DIFUnpacker::hasLine(const std::uint32_t& line, const unsigned char* cb, const std::uint32_t&
       idx) { return ((cb[idx + DU::LINES_SHIFT] » line) & 0x1); }
00059
00060 std::uint32_t DIFUnpacker::getTASU1(const unsigned char* cb, const std::uint32_t& idx) { return
       (cb[idx + DU::TASU1_SHIFT] « 24) + (cb[idx + DU::TASU1_SHIFT + 1] « 16) + (cb[idx + DU::TASU1_SHIFT +
       2] « 8) + cb[idx + DU::TASU1_SHIFT + 3]; }
00061
00062 std::uint32_t DIFUnpacker::getTASU2(const unsigned char* cb, const std::uint32_t& idx) { return
       (cb[idx + DU::TASU2_SHIFT] « 24) + (cb[idx + DU::TASU2_SHIFT + 1] « 16) + (cb[idx + DU::TASU2_SHIFT +
       2] « 8) + cb[idx + DU::TASU2_SHIFT + 3]; }
00063
00064 std::uint32_t DIFUnpacker::getTDIF(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
       + DU::TDIF_SHIFT]); }
00065
00066 bool DIFUnpacker::hasTemperature(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx]
       == DU::START_OF_DIF_TEMP); }
00067
00068 bool DIFUnpacker::hasAnalogReadout(const unsigned char* cb, const std::uint32_t& idx) { return
       (DIFUnpacker::getLines(cb, idx) != 0); }
00069
00070 std::uint32_t DIFUnpacker::getFrameAsicHeader(const unsigned char* framePtr) { return
       (framePtr[DU::FRAME_ASIC_HEADER_SHIFT]); }
00071
00072 std::uint32_t DIFUnpacker::getFrameBCID(const unsigned char* framePtr)
00073 {
00074   std::uint32_t igray = (framePtr[DU::FRAME_BCID_SHIFT] « 16) + (framePtr[DU::FRAME_BCID_SHIFT + 1] «
       8) + framePtr[DU::FRAME_BCID_SHIFT + 2];
00075   return DIFUnpacker::GrayToBin(igray);
00076 }
00077
00078 bool DIFUnpacker::getFramePAD(const unsigned char* framePtr, const std::uint32_t& ip)
00079 {
00080   std::uint32_t* iframe{(std::uint32_t*)&framePtr[DU::FRAME_DATA_SHIFT]};
00081   return ((iframe[3 - ip / 32] » (ip % 32)) & 0x1);
00082 }
00083
00084 bool DIFUnpacker::getFrameLevel(const unsigned char* framePtr, const std::uint32_t& ip, const
```

```
      std::uint32_t& level) { return ((framePtr[DU::FRAME_DATA_SHIFT + ((3 - ip / 16) * 4 + (ip % 16) / 4)]
      » (7 - (((ip % 16) % 4) * 2 + level))) & 0x1); }
00085
00086 std::uint32_t DIFUnpacker::getAnalogPtr(std::vector<unsigned char*>& vLines, unsigned char* cb, const
       std::uint32_t& idx)
00087 {
00088   std::uint32_t fshift{idx};
00089   if(cb[fshift] != DU::START_OF_LINES) return fshift;
00090   fshift++;
00091   while(cb[fshift] != DU::END_OF_LINES)
00092   {
00093     vLines.push_back(&cb[fshift]);
00094     std::uint32_t nchip{cb[fshift]};
00095     fshift += 1 + nchip * 64 * 2;
00096   }
00097   return fshift++;
00098 }
00099
00100 std::uint32_t DIFUnpacker::getFramePtr(std::vector<unsigned char*>& vFrame, std::vector<unsigned
       char*>& vLines, const std::uint32_t& max_size, unsigned char* cb, const std::uint32_t& idx)
00101 {
00102   std::uint32_t fshift{0};
00103   if(DATA_FORMAT_VERSION >= 13)
00104   {
00105     fshift = idx + DU::LINES_SHIFT + 1;
00106     if(DIFUnpacker::hasTemperature(cb, idx)) fshift = idx + DU::TDIF_SHIFT + 1;
      // jenlev 1
00107     if(DIFUnpacker::hasAnalogReadout(cb, idx)) fshift = DIFUnpacker::getAnalogPtr(vLines, cb, fshift);
      // to be implemented
00108   }
00109   else
00110     std::uint32_t fshift = idx + DU::BCID_SHIFT + 3;
00111   if(cb[fshift] != DU::START_OF_FRAME)
00112   {
00113     std::cout « "This is not a start of frame " « cb[fshift] « "\n";
00114     return fshift;
00115   }
00116   do {
00117     // printf("fshift %d and %d \n",fshift,max_size);
00118     if(cb[fshift] == DU::END_OF_DIF) return fshift;
00119     if(cb[fshift] == DU::START_OF_FRAME) fshift++;
00120     if(cb[fshift] == DU::END_OF_FRAME)
00121     {
00122       fshift++;
00123       continue;
00124     }
00125     std::uint32_t header = DIFUnpacker::getFrameAsicHeader(&cb[fshift]);
00126     if(header == DU::END_OF_FRAME) return (fshift + 2);
00127     // std::cout«header«" "«fshift«std::endl;
00128     if(header < 1 || header > 48) { throw header + " Header problem " + fshift; }
00129     vFrame.push_back(&cb[fshift]);
00130     fshift += DU::FRAME_SIZE;
00131     if(fshift > max_size)
00132     {
00133       std::cout « "fshift " « fshift « " exceed " « max_size « "\n";
00134       return fshift;
00135     }
00136     if(cb[fshift] == DU::END_OF_FRAME) fshift++;
00137   } while(true);
00138 }
00139
00140 void DIFUnpacker::dumpFrameOld(const unsigned char* buf)
00141 {
00142   bool         PAD[128];
00143   bool         l0[64];
00144   bool         l1[64];
00145   std::uint8_t un{1};
00146   for(std::size_t ip = 0; ip < 128; ip++) { PAD[ip] = false; }  // init PADs
00147   std::uint32_t idx1{4};
00148   for(int ik = 0; ik < 4; ik++)
00149   {
00150     std::uint32_t PadEtat{swap_bytes(&buf[idx1])};
00151     idx1 += 4;
00152     for(int e = 0; e < 32; e++)
00153     {
00154       PAD[((3 - ik) * 32) + (31 - e)] = PadEtat & un;  // binary operation
00155       PadEtat                         = PadEtat » 1;  // décalage des bit de 1
00156     }
00157   }
00158   // fill bool arrays
00159   for(int p = 0; p < 64; p++)
00160   {
00161     l0[p] = static_cast<bool>(PAD[(2 * p)]);      // _Lev0 (PAD paire)
00162     l1[p] = static_cast<bool>(PAD[(2 * p) + 1]);  // _Lev1 (PAD impaires)
00163   }
00164   std::bitset<64> bs0(0);
00165   std::bitset<64> bs1(0);
```

```
00166   for(std::uint32_t ip = 0; ip < 64; ip++)
00167   {
00168     bs0.set(ip, l0[ip]);
00169     bs1.set(ip, l1[ip]);
00170   }
00171   std::cout « "\t \t" « bs0 « std::endl;
00172   std::cout « "\t \t" « bs1 « std::endl;
00173 }
00174
00175 std::uint32_t DIFUnpacker::swap_bytes(const unsigned char* buf)
00176 {
00177   unsigned char Swapped[4];
00178   for(std::size_t i = 0; i < 4; i++) Swapped[i] = buf[4 - 1 - i];
00179   return *reinterpret_cast<std::uint32_t*>(&Swapped[0]);
00180 }
```

4.31 /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_↩ buffer.cc File Reference

```
#include "SDHCAL_buffer.h"
```

4.31.1 Detailed Description

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Definition in file SDHCAL_buffer.cc.

4.32 SDHCAL_buffer.cc

Go to the documentation of this file.

```
00001
00006 #include "SDHCAL_buffer.h"
00007
00008 void SDHCAL_buffer::printBuffer(unsigned int start, unsigned int stop, std::ostream& flux)
00009 {
00010   flux « std::hex;
00011   for(unsigned int k = start; k < stop; k++) flux « (unsigned int)(m_Buffer[k]) « " - ";
00012   flux « std::dec « std::endl;
00013 }
00014
00015 SDHCAL_buffer::~SDHCAL_buffer() { std::cout « "SDHCAL_buffer destructor called" « std::endl; }
```

4.33 /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_↩ buffer_LoopCounter.cc File Reference

```
#include "SDHCAL_buffer_LoopCounter.h"
```

4.33.1 Detailed Description

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Definition in file SDHCAL_buffer_LoopCounter.cc.

4.34 SDHCAL_buffer_LoopCounter.cc

Go to the documentation of this file.

```
00001
00005 #include "SDHCAL_buffer_LoopCounter.h"
00006
00007 void SDHCAL_buffer_LoopCounter::printAllCounters(std::ostream& out)
00008 {
00009   out « "BUFFER LOOP FINAL STATISTICS : " « std::endl;
00010   printCounter("Start of DIF header", DIFStarter, out);
00011   printCounter("Value after DIF data are processed", DIFPtrValueAtReturnedPos, out);
00012   printCounter("Size remaining in buffer after end of DIF data", SizeAfterDIFPtr, out);
00013   out « "Number of Slow Control found " « hasSlowControl « " out of which " « hasBadSlowControl « "
       are bad" « std::endl;
00014   printCounter("Size remaining after all of data have been processed", SizeAfterAllData, out);
00015   printCounter("Number on non zero values in end of data buffer", NonZeroValusAtEndOfData, out);
00016 }
00017
00018 void SDHCAL_buffer_LoopCounter::printCounter(const std::string& description, const std::map<int, int>&
       m, std::ostream& out)
00019 {
00020   out « " statistics for " « description « " : ";
00021   for(std::map<int, int>::const_iterator it = m.begin(); it != m.end(); it++)
00022   {
00023     if(it != m.begin()) out « ",";
00024     out « " [" « it->first « "]=" « it->second;
00025   }
00026   out « std::endl;
00027 }
```

4.35 /home/runner/work/streamout/streamout/libs/core/src/SDHCAL_↩ RawBuffer_Navigator.cc File Reference

```
#include "SDHCAL_RawBuffer_Navigator.h"
```

4.35.1 Detailed Description

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Definition in file SDHCAL_RawBuffer_Navigator.cc.

4.36 SDHCAL_RawBuffer_Navigator.cc

Go to the documentation of this file.

```
00001
00005 #include "SDHCAL_RawBuffer_Navigator.h"
00006
00007 int SDHCAL_RawBuffer_Navigator::m_Start = 92;
00008
00009 void SDHCAL_RawBuffer_Navigator::StartAt(const int& start)
00010 {
00011   if(start >= 0) m_Start = start;
00012 }
00013
00014 SDHCAL_RawBuffer_Navigator::SDHCAL_RawBuffer_Navigator(const SDHCAL_buffer& b, const int& start) :
       m_Buffer(b), m_SCbuffer(0, 0)
00015 {
00016   StartAt(start);
00017   m_DIFstartIndex = DIFUnpacker::getStartOfDIF(m_Buffer.begin(), m_Buffer.size(), m_Start);
00018 }
00019
00020 SDHCAL_RawBuffer_Navigator::~SDHCAL_RawBuffer_Navigator()
00021 {
00022   if(m_TheDIFPtr != nullptr) delete m_TheDIFPtr;
00023 }
00024
00025 bool SDHCAL_RawBuffer_Navigator::validBuffer() { return m_DIFstartIndex != 0; }
00026
00027 std::uint32_t SDHCAL_RawBuffer_Navigator::getStartOfDIF() { return m_DIFstartIndex; }
00028
00029 unsigned char* SDHCAL_RawBuffer_Navigator::getDIFBufferStart() { return
       &(m_Buffer.begin()[m_DIFstartIndex]); }
00030
00031 std::uint32_t SDHCAL_RawBuffer_Navigator::getDIFBufferSize() { return m_Buffer.size() -
       m_DIFstartIndex; }
00032
00033 SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getDIFBuffer() { return SDHCAL_buffer(getDIFBufferStart(),
       getDIFBufferSize()); }
00034
00035 DIFPtr* SDHCAL_RawBuffer_Navigator::getDIFPtr()
00036 {
00037   if(m_TheDIFPtr == nullptr) m_TheDIFPtr = new DIFPtr(getDIFBufferStart(), getDIFBufferSize());
00038   return m_TheDIFPtr;
00039 }
00040
00041 std::uint32_t SDHCAL_RawBuffer_Navigator::getEndOfDIFData() { return
       getDIFPtr()->getGetFramePtrReturn() + 3; }
00042
00043 std::uint32_t SDHCAL_RawBuffer_Navigator::getSizeAfterDIFPtr() { return getDIFBufferSize() -
       getDIFPtr()->getGetFramePtrReturn(); }
00044
00045 uint32_t SDHCAL_RawBuffer_Navigator::getDIF_CRC()
00046 {
00047   uint32_t i{getEndOfDIFData()};
00048   uint32_t ret{0};
00049   ret |= ((m_Buffer.begin()[i - 2]) « 8);
00050   ret |= m_Buffer.begin()[i - 1];
00051   return ret;
00052 }
00053
00054 bool SDHCAL_RawBuffer_Navigator::hasSlowControlData() { return getDIFBufferStart()[getEndOfDIFData()]
       == 0xb1; }
00055
00056 SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getSCBuffer()
00057 {
00058   setSCBuffer();
00059   return m_SCbuffer;
00060 }
00061
00062 bool SDHCAL_RawBuffer_Navigator::badSCData()
00063 {
00064   setSCBuffer();
00065   return m_BadSCdata;
00066 }
00067
00068 void SDHCAL_RawBuffer_Navigator::setSCBuffer()
00069 {
00070   if(!hasSlowControlData()) return;
00071   if(m_SCbuffer.size() != 0) return;  // deja fait
00072   if(m_BadSCdata) return;
00073   m_SCbuffer.set(&(getDIFBufferStart()[getEndOfDIFData()]));
00074   // compute Slow Control size
00075   std::size_t maxsize{m_Buffer.size() - m_DIFstartIndex - getEndOfDIFData() + 1};  // should I +1 here
       ?
00076   uint32_t    k{1};                                                               // SC Header
00077   uint32_t    dif_ID{m_SCbuffer[1]};
```

```
00078   uint32_t    chipSize{m_SCbuffer[3]};
00079   while((dif_ID != 0xa1 && m_SCbuffer[k] != 0xa1 && k < maxsize) || (dif_ID == 0xa1 && m_SCbuffer[k +
      2] == chipSize && k < maxsize))
00080   {
00081     k += 2;  // DIF ID + ASIC Header
00082     uint32_t scsize = m_SCbuffer[k];
00083     if(scsize != 74 && scsize != 109)
00084     {
00085       std::cout « "PROBLEM WITH SC SIZE " « scsize « std::endl;
00086       k           = 0;
00087       m_BadSCdata = true;
00088       break;
00089     }
00090     k++;          // skip size bit
00091     k += scsize;  // skip the data
00092   }
00093   if(m_SCbuffer[k] == 0xa1 && !m_BadSCdata) m_SCbuffer.setSize(k + 1);  // add the trailer
00094   else
00095   {
00096     m_BadSCdata = true;
00097     std::cout « "PROBLEM SC TRAILER NOT FOUND " « std::endl;
00098   }
00099 }
00100
00101 SDHCAL_buffer SDHCAL_RawBuffer_Navigator::getEndOfAllData()
00102 {
00103   setSCBuffer();
00104   if(hasSlowControlData() && !m_BadSCdata) { return
      SDHCAL_buffer(&(m_SCbuffer.begin()[m_SCbuffer.size()]), getSizeAfterDIFPtr() - 3 -
      m_SCbuffer.size()); }
00105   else
00106     return SDHCAL_buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3);  //
      remove the 2 bytes for CRC and the DIF trailer
00107 }
```

4.37 /home/runner/work/streamout/streamout/libs/interface/Dump/include/textDump.h File Reference

```
#include "DIFPtr.h"
#include "SDHCAL_buffer.h"
#include <iostream>
#include <ostream>
```

Classes

- class textDump

4.37.1 Detailed Description

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Definition in file textDump.h.

4.38 textDump.h

Go to the documentation of this file.

```
00001
00005 #pragma once
00006
00007 #include "DIFPtr.h"
00008 #include "SDHCAL_buffer.h"
00009
00010 #include <iostream>
00011 #include <ostream>
00012
00013 class textDump
00014 {
00015 public:
00016   explicit textDump(std::ostream& out = std::cout) : _out(out) { ; }
00017   void start();
00018   void processDIF(DIFPtr*);
00019   void processFrame(DIFPtr*, uint32_t frameIndex);
00020   void processPadInFrame(DIFPtr*, uint32_t frameIndex, uint32_t channelIndex);
00021   void processSlowControl(SDHCAL_buffer);
00022   void end();
00023
00024 private:
00025   std::ostream& _out;
00026 };
```

4.39 /home/runner/work/streamout/streamout/libs/interface/↩ Dump/src/textDump.cc File Reference

```
#include "textDump.h"
#include <iostream>
```

4.39.1 Detailed Description

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Definition in file textDump.cc.

4.40 textDump.cc

Go to the documentation of this file.

```
00001
00005 #include "textDump.h"
00006
00007 #include <iostream>
00008
00009 void textDump::start() { _out « "Will dump bunch of DIF data" « std::endl; }
00010
00011 void textDump::processDIF(DIFPtr* d)
00012 {
00013   if(NULL == d) return;
00014   _out « "DIF number is " « d->getDIFid() « std::endl;
00015   _out « "  DTC value is " « d->getDTC() « std::endl;
00016   _out « "  GTC value is " « d->getGTC() « std::endl;
00017   _out « "  DIF BCID is " « d->getBCID() « std::endl;
00018   _out « "  Absolute BCID is " « d->getAbsoluteBCID() « std::endl;
00019   _out « "  The number of frame is " « d->getNumberOfFrames() « std::endl;
00020 }
00021
```

```
00022 void textDump::processFrame(DIFPtr* d, uint32_t frameIndex)
00023 {
00024   _out « "  Displaying frame number " « frameIndex « std::endl;
00025   _out « "    ASIC ID is " « d->getASICid(frameIndex) « std::endl;
00026   _out « "    Frame BCID is " « d->getFrameBCID(frameIndex) « std::endl;
00027   _out « "    Frame Time To Trigger (a.k.a timestamp) is " « d->getFrameTimeToTrigger(frameIndex) «
      std::endl;
00028 }
00029
00030 void textDump::processPadInFrame(DIFPtr* d, uint32_t frameIndex, uint32_t channelIndex)
00031 {
00032   _out « "    Displaying channel number " « channelIndex « std::endl;
00033   _out « "      Threshold status is " « d->getThresholdStatus(frameIndex, channelIndex) « std::endl;
00034 }
00035
00036 void textDump::processSlowControl(SDHCAL_buffer) { _out « "textDump::processSlowControl not
      implemented yet." « std::endl; }
00037
00038 void textDump::end() { _out « "textDump end of report" « std::endl; }
```

4.41 /home/runner/work/streamout/streamout/libs/interface/ROOT/include/ROOTtreeDest.h File Reference

```
#include "DIFPtr.h"
#include "SDHCAL_buffer.h"
#include "TTree.h"
```

Classes

- class ROOTtreeDest
- struct ROOTtreeDest::DATA

4.41.1 Detailed Description

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Definition in file ROOTtreeDest.h.

4.42 ROOTtreeDest.h

Go to the documentation of this file.

```
00001
00006 #pragma once
00007
00008 #include "DIFPtr.h"
00009 #include "SDHCAL_buffer.h"
00010 #include "TTree.h"
00011
00012 class ROOTtreeDest
00013 {
00014 public:
00015   typedef struct
00016   {
00017     UInt_t    DIFid, ASICid, CHANNELid;
00018     UInt_t    Thresh;
00019     UInt_t    DTC, GTC, DIF_BCID, frame_BCID, timeStamp;
00020     ULong64_t AbsoluteBCID;
00021   } DATA;
```

```
00022
00023   ROOTtreeDest();
00024
00025   void start();
00026   void processDIF(DIFPtr*);
00027   void processFrame(DIFPtr*, uint32_t frameIndex);
00028   void processPadInFrame(DIFPtr*, uint32_t frameIndex, uint32_t channelIndex);
00029   void processSlowControl(const SDHCAL_buffer&) { ; }
00030   void end() { ; }
00031
00032 private:
00033   DATA   _data;
00034   TTree* _tree;
00035   void   dataReset();
00036 };
```

4.43 /home/runner/work/streamout/streamout/libs/interface/ROOT/src/↩ ROOTtreeDest.cc File Reference

```
#include "ROOTtreeDest.h"
```

4.43.1 Detailed Description

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Definition in file ROOTtreeDest.cc.

4.44 ROOTtreeDest.cc

Go to the documentation of this file.

```
00001
00006 #include "ROOTtreeDest.h"
00007
00008 ROOTtreeDest::ROOTtreeDest()
00009 {
00010   dataReset();
00011   _tree = new TTree("RawData", "Raw SDHCAL data tree");
00012   _tree->Branch("data", &_data,
       "DIFid/i:ASICid:CHANNELid:Thresh:DTC:GTC:DIF_BCID:frame_BCID:timeStamp:AbsoluteBCID/l");
00013 }
00014
00015 void ROOTtreeDest::dataReset()
00016 {
00017   _data.DIFid = _data.ASICid = _data.CHANNELid = 0;
00018   _data.Thresh                                 = 0;
00019   _data.DTC = _data.GTC = _data.DIF_BCID = _data.frame_BCID = _data.timeStamp = 0;
00020   _data.AbsoluteBCID                                                          = 0;
00021 }
00022
00023 void ROOTtreeDest::start() { dataReset(); }
00024
00025 void ROOTtreeDest::processDIF(DIFPtr* d)
00026 {
00027   _data.DIFid        = d->getDIFid();
00028   _data.DTC          = d->getDTC();
00029   _data.GTC          = d->getGTC();
00030   _data.DIF_BCID     = d->getBCID();
00031   _data.AbsoluteBCID = d->getAbsoluteBCID();
00032 }
00033
00034 void ROOTtreeDest::processFrame(DIFPtr* d, uint32_t frameIndex)
00035 {
00036   _data.ASICid     = d->getASICid(frameIndex);
```

```
00037   _data.frame_BCID = d->getFrameBCID(frameIndex);
00038   _data.timeStamp  = d->getFrameTimeToTrigger(frameIndex);
00039 }
00040
00041 void ROOTtreeDest::processPadInFrame(DIFPtr* d, uint32_t frameIndex, uint32_t channelIndex)
00042 {
00043   _data.CHANNELid = channelIndex;
00044   _data.Thresh    = d->getThresholdStatus(frameIndex, channelIndex);
00045   if(_data.Thresh != 0) _tree->Fill();
00046 }
```