



DbExplorer

DbExplorer migration from Linux SLC6 to Linux CC7

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Introduction

Introduction

DbExplorer is a browser of ATLAS Detector Control Data. It explores different Databases like DCS Archive or COOL (Database for data analysis). It is written in C++ language, and was written quite long time ago. It is based on Atlas/TriggerDAQ libraries, Root package and APIs for Databases access. During our work with DbExplorer we had access to CERN Gitlab repository with code.

Results:

- new CMake (working with Linux CC7 and with additional targets, like Doxygen documentation)
- new setup bash script
- code separated into directories
- removal of unused and commented code
- removal of some undefined behaviour code (like returning `c_str()` result from function)
- migration to C++11 and C++14
- replacement of some custom functions with BOOST and C++ ones
- TODO comments for future developers
- implementation of design patterns like strategy
- removal of all warnings
- simplified algorithms related to db access

Examples

Migration to C++11 and C++14:

Using range-for loops instead of iterator loops:

```
1 for (auto& elem : arr) {
2     //...
3 }
4
5 //instead of :
6
7 for (auto it = arr.begin(); it != arr.end(); ++it) {
8     //...
9 }
10
11 //or:
12
13 for (int i = 0; i < arr.size(); i++) {
14     //...
15 }
```

Cleaner, shorter code.

Migration to C++11 and C++14:

Replacing C - style arrays with C++11 std::array:

```
1 constexpr int arraySize = 5;
2 std::array<int, arraySize> arr;
3
4 // Instead of :
5
6 int arr [5];
```

Easier access to STL api.

Removal of undefined behaviour code:

```
- const char* G_Calculator::make_expr(vector<string> fpars, vector<double> _vals)
+ std::string G_Calculator::make_expr(vector<string> fpars, vector<double> _vals)
{
    if (fpars.size())
    {
@@ -64,7 +64,7 @@ const char* G_Calculator::make_expr(vector<string> fpars, vector<double> _vals)
        }

        if (GlobalSettings::get<bool>("debug")) clog<<"Expr "<<_expr<<" CALC_STR "<<tmp_str<<endl;
- return tmp_str.c_str();
+ return tmp_str;

    }
    else
```

Figure 1: Removal of undefined behaviour code

TODO comments for future developers

```
7
8 // TODO: consider moving some parts of Search methods to one
9 // separate method, because there is a lot of repeated code here
0 TString MyMainFrame::SearchItemInArch(Int_t view_t, const char* inItem)
1 {
2     std::vector< std::pair<std::string, std::string> > data;
3
4     if (map_db)
```

Figure 2: TODO comments for future developers

Code separated into directories

..	
CustomDialogWindows	DPESearch segfault fix2
DbExplorerMenu	move DbExplorer classes to separate directory, chan...
HistogramsTrendsAnd3DMenu	Eliminate segfault when closing main window
MainMenu	Add HelpPageProvider class, refactor and rename D...

Figure 3: Code separated into directories

Smart pointers and move semantics

```
104 std::vector<std::string> corDBConnect::GetCoolSys(std::string schema, std::string db_name) 110
105 {                                                                                               111
106     std::vector<std::string> res;                                                                 112
107     proxy->transaction().start(true);                                                           113
108                                                                                                   114
109     coral::AttributeList a_list;                                                                115
110     coral::IQuery* query = proxy->schema(schema).newQuery(); 116
111     query->addToTableList(db_name+"_NODES");                                                    117
112     query->setOutputList("NODE_NAME");                                                           118
113     query->setCondition("NODE_PARENTID = 0", a_list);                                           119
114     query->setRowCacheSize(20);                                                                    120
115     coral::ICursor& cursor = query->execute();                                                  121
116     while( cursor.next() ) {                                                                     122
117     {                                                                                               123
118         const coral::AttributeList& row = cursor.currentRow(); 124
119         res.push_back(row[0].data->std::string()); 125
120     }                                                                                               126
121     cursor.close();                                                                               127
122     delete query;                                                                                128
123                                                                                                   129
124     proxy->transaction().commit();                                                                130
125                                                                                                   131
126     return res;                                                                                  132
127 }                                                                                               133
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```

Figure 4: Smart pointers and move semantics

Lambdas and STL

```
1 bool digit = true;
2 if (!sys_name.length())
3     digit = false;
4 else for(unsigned int i = 0; i < sys_name.
5         length(); i++)
6     {
7         digit = isdigit(sys_name[i]);
8         if (!digit)
9             break;
10    }
```

```
1 bool digit {true};
2 digit = std::all_of(sys_name.begin(),
3 sys_name.end(),
4 [](const auto& c)
5 {return std::isdigit(c);});
```

Global settings

```
namespace GlobalSettings{  
  
    /**  
     * Template class for containing GlobalApplication settings in std::map<T>  
     * @tparam T - type of parameter  
     */  
  
    template<typename T>  
    class Settings{  
        Settings() = default;  
  
        ~Settings() = default;  
  
        Settings(const Settings<T> &) = delete;  
  
        Settings<T> &operator=(const Settings<T> &) = delete;  
  
        std::map<std::string, T> _settings;  
        std::mutex RWMutex;  
  
        static Settings& instance() {  
            static Settings instance;  
            return instance;  
        }  
  
        T getSetting(const std::string& key){  
            std::lock_guard<std::mutex> lock(RWMutex);  
            try {  
                return _settings.at(key);  
            } catch (std::exception& exception){  
                std::clog<<exception.what()<<std::endl;  
                throw exception;  
            }  
        }  
  
        void setSetting(const std::string& key, const T& value){  
            std::lock_guard<std::mutex> lock(RWMutex);  
            _settings[key] = value;  
        }  
  
        template <typename T2>  
        friend void set(const std::string&, const T2&);  
        template <typename T2>  
        friend T2 get(const std::string&);  
  
};  
  
//get & set
```

Figure 5: Global settings

Linux version discovering

```
echo "-----DISCOVERING--LINUX--DISTRIBUTION-----"

LSB_RELEASE=`(lsb_release -a)`
SLC_REGEX='ScientificCERN(SLC)'
CENTOS_REGEX='CentOS'
RELEASE_REGEX='Release:[^0-9]*([0-9])'

if [[ $LSB_RELEASE =~ $SLC_REGEX ]]; then
    LINUX_INFO=`(echo ${BASH_REMATCH[1]} | tr A-Z a-z)`
elif [[ $LSB_RELEASE =~ $CENTOS_REGEX ]]; then
    LINUX_INFO=`(echo ${BASH_REMATCH[0]} | tr A-Z a-z)`
else
    echo "Unknown Linux distribution"
    exit 1
fi

[[ $LSB_RELEASE =~ $RELEASE_REGEX ]]
LINUX_INFO+=${BASH_REMATCH[1]}

echo $LINUX_INFO
```

Figure 6: Linux version discovering script

Sample strsplit refactor

```
int strsplit(TString s, const char delim, string *k ss)
{
    int nums, first, i;
    TString tap;
    ss = 0;
    s.Remove(TString::kBoth, delim);
    nums=s.CountChar(delim);
    if (!s.Length()) return 0;
    else if (!nums)
    {
        ss = new string[1];
        ss[0] = s.Data();
        return 1;
    }
    ss = new string[nums+1];
    if (nums)
    {
        first=s.First(delim);
        for (i=0; i<nums; i++)
        {
            tap=s(0,first);
            ss[i]=tap.Data();
            s=s(first+1,(s.Length()-first-1));
            first=s.First(delim);
        }
    }
    ss[nums]=s.Data();
    return (nums+1);
}

std::vector<std::string> strsplit(TString s, const char delim)
{
    int nums, first, i;
    TString tap;
    std::vector<std::string> ret;
    s.Remove(TString::kBoth, delim);
    nums=s.CountChar(delim);
    if (!s.Length()) return ret;
    else if (!nums)
    {
        ret.push_back(s.Data());
        return ret;
    }
    if (nums)
    {
        first=s.First(delim);
        for (i=0; i<nums; i++)
        {
            tap=s(0,first);
            ret.push_back(tap.Data());
            s=s(first+1,(s.Length()-first-1));
            first=s.First(delim);
        }
    }
    ret.push_back(s.Data());
    return ret;
}

int strsplit (TString s, const char delim, string*k ss){
    s.Remove(TString::kBoth, delim);
    int numofDelim = s.CountChar(delim);
    auto toRet = new string[numofDelim+1];
    std::vector<std::string> splitted = strsplit(s, delim);

    for(int i = 0 ; i < splitted.size(); ++i){
        toRet[i] = splitted[i];
    }

    ss = toRet;

    return numofDelim+1;
}

std::vector<std::string> strsplit(TString s, const char delim){
    s.Remove(TString::kBoth, delim);
    std::vector<string> toRet;
    boost::split<std::vector<std::string>, const std::string&>(toRet, string(s.Data()), boost::is_any_of(string(1, delim) ) );
    return toRet;
}
```

BEFORE

AFTER

Figure 7: Sample strsplit refactor

Questions?