ELFIO

Tutorial and User Manual

Abstract

ELFIO is a header-only C++ library intended for reading and generating files in the ELF binary format

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2 Introduction

ELFIO is a header-only C++ library intended for reading and generating files in the ELF binary format. It is used as a standalone library - it is not dependant on any other product or project. Adhering to ISO C++, it compiles on a wide variety of architectures and compilers.

While the library is easy to use, some basic knowledge of the ELF binary format is required. Such Information can easily be found on the Web.

The full text of this tutorial comes together with ELFIO library distribution

3 Getting Started With ELFIO

3.1 ELF File Reader

The ELFIO library is just normal C++ header files. In order to use all its classes and types, simply include the main header file "`elfio.hpp`". All ELFIO library declarations reside in a namespace called "ELFIO". This can be seen in the following example:

```
#include <iostream>
#include <elfio/elfio.hpp>              ❶

using namespace ELFIO                   ❷

int main( int argc, char** argv )
{
    if ( argc != 2 ) {
        std::cout << "Usage: tutorial <elf_file>" << std::endl;
    return 1;
}
```

❶ - Include `elfio.hpp` header file

❷ - The ELFIO namespace usage

This section of the tutorial will explain how to work with the reader portion of the ELFIO library.

The first step would be creating an `elfio` class instance. The `elfio` constructor has no parameters. The creation is normally followed by invoking the 'load' member method, passing it an ELF file name as a parameter:

```
// Create elfio reader
elfio reader;                           ❶

// Load ELF data
if ( !reader.load( argv[1] ) ) {        ❷
    std::cout << "Can't find or process ELF file " << argv[1] << std::endl;
    return 2;
}
```

❶ - Create `elfio` class instance

❷ - Initialize the instance by loading ELF file. The function load returns '`true`' if the ELF file was found and processed successfully. It returns '`false`' otherwise

The `load()` method returns '`true`' if the corresponding file was found and processed successfully.

All the ELF file header properties such as encoding, machine type and entry point are accessible now. To get the class and the encoding of the file use:

```
// Print ELF file properties
std::cout << "ELF file class    : ";
if ( reader.get_class() == ELFCLASS32 )          ❶
    std::cout << "ELF32" << std::endl;
else
    std::cout << "ELF64" << std::endl;

std::cout << "ELF file encoding : ";
if ( reader.get_encoding() == ELFDATA2LSB )      ❷
     std::cout << "Little endian" << std::endl;
else
    std::cout << "Big endian" << std::endl;
```

❶ - Member function get_class() returns ELF file class. Possible return values are: ELFCLASS32 or ELFCLASS64

❷ - Member function get_encoding() returns ELF file format encoding. Possible values are: ELFDATA2LSB or ELFDATA2MSB standing for little- and big-endianess correspondingly

Note:

Standard ELF types, flags and constants are defined in the elf_types.hpp header file. This file is included automatically into the project. For example: ELFCLASS32, ELFCLASS64 constants define values for 32/64 bit architectures. Constants ELFDATA2LSB and ELFDATA2MSB define values for little- and big-endian encoding.

ELF binary files consist of sections and segments. Each section has its own responsibility: some contains executable code, others –program's data, some are symbol tables and so on. See ELF binary format documentation for purpose and content description of sections and segments.

The following code demonstrates how to find out the amount of sections the ELF file contains. The code also presents how to access particular section properties like names and sizes:

```
// Print ELF file sections info
Elf_Half sec_num = reader.sections.size();                    ❶
std::cout << "Number of sections: " << sec_num << std::endl;
for ( int i = 0; i < sec_num; ++i ) {
    const section* psec = reader.sections[i];                 ❷
    std::cout << "  [" << i << "] "
              << psec->get_name()                             ❸
              << "\t"
              << psec->get_size()                             ❸
              << std::endl;
   // Access section's data
   const char* p = reader.sections[i]->get_data();            ❸
}
```

❶ - Retrieve the number of sections

❷ - Use operator[] to access a section by its number or symbolic name

❸ - get_name(), get_size() and get_data() are member functions of 'section' class

The 'sections' data member of ELFIO's 'reader' object permits obtaining the number of sections inside a given ELF file. It also serves for getting access to individual sections by using operator[], which returns a pointer to the corresponding section's interface.

Similarly, for executables, the segments of the ELF file can be processed:

```
// Print ELF file segments info
Elf_Half seg_num = reader.segments.size();                    ❶
std::cout << "Number of segments: " << seg_num << std::endl;
for ( int i = 0; i < seg_num; ++i ) {
    const segment* pseg = reader.segments[i];                 ❷
    std::cout << "  [" << i << "] 0x" << std::hex
              << pseg->get_flags()                            ❸
              << "\t0x"
              << pseg->get_virtual_address()                  ❸
              << "\t0x"
              << pseg->get_file_size()                        ❸
              << "\t0x"
              << pseg->get_memory_size()                      ❸
              << std::endl;
    // Access segments's data
    const char* p = reader.segments[i]->get_data();           ❸
}
```

❶ - Retrieve the number of segments

❷ - Use operator[] to access a segment by its number

❸ - get_flags(), get_virtual_address(), get_file_size(), get_memory_size() and get_data() are member methods of 'segment' class

In this case, the segments' attributes and data are obtained by using the ‘segments’ data member of ELFIO's ‘reader’ class.

3.2 ELF Section Data Accessors

To simplify creation and interpretation of specific ELF sections, the ELFIO library provides accessor classes. Currently, the following classes are available:

- String section accessor
- Symbol section accessor
- Relocation section accessor
- Note section accessor
- Dynamic section accessor

More accessors may be implemented in future versions of the library.

Let's see how the accessors can be used with the previous ELF file reader example. The following example prints out all symbols in a section that turns out to be a symbol section:

```
if ( psec->get_type() == SHT_SYMTAB ) {                                    ❶
    const symbol_section_accessor symbols( reader, psec );                 ❷
    for ( unsigned int j = 0; j < symbols.get_symbols_num(); ++j ) {       ❸
        std::string   name;
        Elf64_Addr    value;
        Elf_Xword     size;
        unsigned char bind;
        unsigned char type;
        Elf_Half      section_index;
        unsigned char other;

        symbols.get_symbol( j, name, value, size, bind,
                            type, section_index, other );                  ❹
        std::cout << j << " " << name << std::endl;
    }
}
```

❶ - Check section’s type

❷ - Build symbol section accessor

❸ - Get the number of symbols by using the symbol section accessor

❹ - Get particular symbol properties – its name, value, etc.

First we create a ‘symbol_section_accessor’ class instance. Usually, accessors's constructors receive references to both the `elfio` and a ‘section’ objects as parameters. The get_symbol() method is used for retrieving particular entries in the symbol table.

3.3 ELFDUMP UTILITY

The source code for the ELF Dump Utility can be found in the "examples" directory. It heavily relies on dump facilities provided by the auxiliary header file <elfio_dump.hpp>. This header file demonstrates more accessor's usage examples.

3.4 ELF FILE WRITER

In this chapter we will create a simple ELF executable file that prints out the classical "Hello, World!" message. The executable will be created and run on i386 Linux OS platform. It is supposed to run well on both 32 and 64-bit Linux platforms. The file will be created without invoking the compiler or assembler tools in the usual way (i.e. translating high level source code that makes use of the standard library functions). Instead, using the ELFIO writer, all the necessary sections and segments of the file will be created and filled explicitly, each, with its appropriate data. The physical file would then be created by the ELFIO library.

Before starting, two implementation choices of elfio that users should be aware of are:

1. The ELF standard does not require that executables will contain any ELF sections – only presence of ELF segments is mandatory. `The elfio` library, however, requires that all data will belong to sections. It means that in order to put data in a segment, a section should be created first. Sections are associated with segments by invoking the segment's member function `add_section_index()`.

2. The `elfio` writer class, while constructing, creates a string table section automatically.

Our usage of the library API will consist of several steps:

- Creating an empty elfio object
- Setting-up ELF file properties
- Creating code section and data content for it
- Creating data section and its content
- Addition of both sections to corresponding ELF file segments
- Setting-up the program's entry point
- Dumping the elfio object to an executable ELF file

```
#include <elfio/elfio.hpp>

using namespace ELFIO;

int main( void )
{
    elfio writer;

    writer.create( ELFCLASS32, ELFDATA2LSB );                          ❶

    writer.set_os_abi( ELFOSABI_LINUX );                               ❷
    writer.set_type( ET_EXEC );
    writer.set_machine( EM_386 );

    section* text_sec = writer.sections.add( ".text" );                ❸
    text_sec->set_type( SHT_PROGBITS );
    text_sec->set_flags( SHF_ALLOC | SHF_EXECINSTR );
    text_sec->set_addr_align( 0x10 );

    char text[] = { '\xB8', '\x04', '\x00', '\x00', '\x00',    // mov eax, 4
                    '\xBB', '\x01', '\x00', '\x00', '\x00',    // mov ebx, 1
                    '\xB9', '\x20', '\x80', '\x04', '\x08',    // mov ecx, msg
                    '\xBA', '\x0E', '\x00', '\x00', '\x00',    // mov edx, 14
                    '\xCD', '\x80',                            // int 0x80
                    '\xB8', '\x01', '\x00', '\x00', '\x00',    // mov eax, 1
                    '\xCD', '\x80' };                          // int 0x80
    text_sec->set_data( text, sizeof( text ) );                        ❹

    segment* text_seg = writer.segments.add();                         ❺
    text_seg->set_type( PT_LOAD );                                     ❻
    text_seg->set_virtual_address( 0x08048000 );
    text_seg->set_physical_address( 0x08048000 );
    text_seg->set_flags( PF_X | PF_R );
    text_seg->set_align( 0x1000 );

    text_seg->add_section_index( text_sec->get_index(),                ❼
                                 text_sec->get_addr_align() );

    section* data_sec = writer.sections.add( ".data" );                ❸
    data_sec->set_type( SHT_PROGBITS );
    data_sec->set_flags( SHF_ALLOC | SHF_WRITE );
    data_sec->set_addr_align( 0x4 );

    char data[] = { '\x48', '\x65', '\x6C', '\x6C', '\x6F',    // "Hello, World!\n"
                    '\x2C', '\x20', '\x57', '\x6F', '\x72',
                    '\x6C', '\x64', '\x21', '\x0A' };
    data_sec->set_data( data, sizeof( data ) );                        ❹

    segment* data_seg = writer.segments.add();                         ❺
    data_seg->set_type( PT_LOAD );                                     ❻
    data_seg->set_virtual_address( 0x08048020 );
    data_seg->set_physical_address( 0x08048020 );
    data_seg->set_flags( PF_W | PF_R );
    data_seg->set_align( 0x10 );

    data_seg->add_section_index( data_sec->get_index(),                ❼
                                 data_sec->get_addr_align() );

    writer.set_entry( 0x08048000 );                                    ❽

    writer.save( "hello_i386_32" );                                    ❾

    return 0;
}
```

❶ - Initialize empty ‘elfio’ object. This should be done as the first step when creating a new ‘elfio’ object as other API is relying on parameters provided – ELF file 32-bits/64-bits and little/big endianness

❷ - Other attributes of the file. Linux OS loader does not require full set of the attributes, but they are provided when a regular linker used for creation of ELF files

❸ - Create a new section, set section’s attributes. Section type, flags and alignment have a big significance and controls how this section is treated by a linker or OS loader

❹ - Add section’s data

❺ - Create new segment

❻ - Set attributes and properties for the segment

❼ - Associate a section with segment containing it

❽ - Setup entry point for your program

❾ - Create ELF binary file on disk

Let’s compile the example above (put into a source file named 'writer.cpp') into an executable file (named 'writer'). Invoking 'writer' will create the executable file "hello_i386_32" that prints the "Hello, World!" message. We'll change the permission attributes of this file, and finally, run it:

```
> ls
writer.cpp
> g++ writer.cpp -o writer
> ls
writer  writer.cpp
> ./writer
> ls
hello_i386_32  writer  writer.cpp
> chmod +x ./hello_i386_32
> ./hello_i386_32
Hello, World!
```

In case you already compiled the ‘elfdump’ utility, you can inspect the properties of the produced executable file (the ‘.note’ section was not discussed in this tutorial, but it is produced by the sample file writer.cpp located in the ‘examples’ folder of the library distribution):

```
./elfdump hello_i386_32

ELF Header

  Class:      ELF32
  Encoding:   Little endian
  ELFVersion: Current
  Type:       Executable file
  Machine:    Intel 80386
  Version:    Current
  Entry:      0x8048000
  Flags:      0x0

Section Headers:
[  Nr ] Type              Addr     Size     ES Flg Lk Inf Al Name
[    0] NULL              00000000 00000000 00      0   0  0
[    1] STRTAB            00000000 0000001d 00      0   0  0 .shstrtab
[    2] PROGBITS          08048000 0000001d 00 AX   0   0 16 .text
[    3] PROGBITS          08048020 0000000e 00 WA   0   0  4 .data
[    4] NOTE              00000000 00000044 00      0   0  1 .note
Key to Flags: W (write), A (alloc), X (execute)


Segment headers:
[  Nr ] Type           VirtAddr PhysAddr FileSize Mem.Size Flags    Align
[    0] LOAD           08048000 08048000 0000001d 0000001d RX       00001000
[    1] LOAD           08048020 08048020 0000000e 0000000e RW       00000010

Note section (.note)
    No Type     Name
  [ 0] 00000001 Created by ELFIO
  [ 1] 00000001 Never easier!
```

Note:

The `elfio` library takes care of the resulting binary file layout calculation. It does this on base of the provided memory image addresses and sizes. It is the user's responsibility to provide correct values for these parameters. Please refer to your OS (other execution environment or loader) manual for specific requirements related to executable ELF file attributes and/or mapping.

Similarly to the ‘reader’ example, you may use provided accessor classes to interpret and modify content of section’s data.

4 ELFIO LIBRARY CLASSES

This section contains detailed description of classes provided by `elfio` library

4.1 ELFIO

4.1.1 Data members

The ELFIO library's main class is '`elfio`'. The class contains two public data members:

Data member	Description
`sections`	The container stores ELFIO library section instances. Implements operator[], add() and size(). operator[] permits access to individual ELF file section according to its index or section name. operator[] is capable to provide section pointer according to section index or section name. begin() and end() iterators are available too.
`segments`	The container stores ELFIO library segment instances. Implements operator[], add() and size(). operator[] permits access to individual ELF file segment according to its index. operator[] is capable to provide section pointer according to segment index. begin() and end() iterators are available too.

4.1.2 Member functions

Here is the list of `elfio` public member functions. The functions permit to retrieve or set ELF file properties.

Member Function	Description
`elfio``()`	The constructor.
`~elfio``()`	The destructor.

`void`
`create``(`
`  unsigned char file_class,`
`  unsigned char encoding )`
	Cleans and/or initializes `elfio` object.
	`file_class` is either ELFCLASS32 or ELFCLASS64. *`file_class`* is either ELFDATA2LSB or ELFDATA2MSB.

`bool`
`load``(`
`  const std::string& file_name )`
 	
`bool`
`load``( std::istream &stream )`
	Initializes `elfio` object by loading data from ELF binary file. File name is provided as a std::string in *`file_name`* or as an opened std::istream in *`stream`*.
	Returns true if the file was processed successfully.

bool **save**(const std::string& file_name) bool **save**(std::ostream &stream)	Creates a file in ELF binary format. File name is provided as a std::string in *file_name* or as an opened std::ostream in *stream*. Returns true if the file has been created successfully.
unsigned char **get_class**()	Returns ELF file class. Possible values are ELFCLASS32 or ELFCLASS64.
unsigned char **get_elf_version**()	Returns ELF file format version.
unsigned char **get_encoding**()	Returns ELF file format encoding. Possible values are ELFDATA2LSB and ELFDATA2MSB.
Elf_Word **get_version**()	Identifies the object/executable file version.
void **set_version**(Elf_Word value)	Sets the object/executable file version
Elf_Half **get_header_size**()	Returns the ELF header's size in bytes.
Elf_Half **get_section_entry_size**()	Returns a section's entry size in ELF file header section table.
Elf_Half **get_segment_entry_size**()	Returns a segment's entry size in ELF file header program table.
unsigned char **get_os_abi**()	Returns operating system ABI identification.
void **set_os_abi**(unsigned char *value*)	Sets operating system ABI identification.
unsigned char **get_abi_version**();	Returns ABI version.
void **set_abi_version**(unsigned char *value*)	Sets ABI version.
Elf_Half **get_type**()	Returns the object file type.
void **set_type**(Elf_Half *value*)	Sets the object file type.
Elf_Half **get_machine**()	Returns the object file's architecture.

void **set_machine**(Elf_Half *value*)	Sets the object file's architecture.
Elf_Word **get_flags** ()	Returns processor-specific flags associated with the file.
void **set_flags**(Elf_Word *value*)	Sets processor-specific flags associated with the file.
Elf64_Addr **get_entry**()	Returns the virtual address to which the system first transfers control.
void **set_entry**(Elf64_Addr *value*)	Sets the virtual address to which the system first transfers control.
Elf64_Off **get_sections_offset**()	Returns the section header table's file offset in bytes.
void **set_sections_offset**(Elf64_Off *value*)	Sets the section header table's file offset. Attention! The value can be overridden by the library, when it creates new ELF file layout.
Elf64_Off **get_segments_offset**()	Returns the program header table's file offset.
void **set_segments_offset**(Elf64_Off *value*)	Sets the program header table's file offset. Attention! The value can be overridden by the library, when it creates new ELF file layout.
Elf_Half **get_section_name_str_index**()	Returns the section header table index of the entry associated with the section name string table.
void **set_section_name_str_index**(Elf_Half value)	Sets the section header table index of the entry associated with the section name string table.
endianess_convertor& **get_convertor**()	Returns endianess convertor reference for the specific `elfio` object instance.
Elf_Xword **get_default_entry_size**(Elf_Word *section_type*)	Returns default entry size for known section types having different values on 32 and 64 bit architectures. At the moment, only SHT_RELA, SHT_REL, SHT_SYMTAB and SHT_DYNAMIC are 'known' section types. The function returns 0 for other section types.

4.2 SECTION

Class ‘section’ has no public data members.

4.2.1 Member functions

`section` public member functions listed in the table below. These functions permit to retrieve or set ELF file section properties

Member Function	Description
`section``()`	The default constructor. No section class instances are created manually. Usually, ‘add’ method is used for ‘sections’ data member of ‘elfio’ object
`~section``()`	The destructor.
`Elf_Half` **`get_index()`**	Returns section index. Sometimes, this index is passed to another section for inter-referencing between the sections. Section’s index is also passed to ‘segment’ for segment/section association

`Set functions:`
 	
`void` **`set_name`**`( std::string )`
`void` **`set_type`**`( Elf_Word )`
`void` **`set_flags`**`( Elf_Xword )`
`void` **`set_info`**`( Elf_Word )`
`void` **`set_link`**`( Elf_Word )`
`void` **`set_addr_align`**`( Elf_Xword )`
`void` **`set_entry_size`**`( Elf_Xword )`
`void` **`set_address`**`( Elf64_Addr )`
`void` **`set_size`**`( Elf_Xword )`
`void` **`set_name_string_offset`**`( Elf_Word )`
	Sets attributes for the section

`Get functions:`
 	
`std::string` **`get_name`**`()`
`Elf_Word` **`get_type`**`()`
`Elf_Xword` **`get_flags`**`()`
`Elf_Word` **`get_info`**`()`
`Elf_Word` **`get_link`**`()`
`Elf_Xword` **`get_addr_align`**`()`
`Elf_Xword` **`get_entry_size`**`()`
	Returns section attributes

`Elf64_Addr` **`get_address`**`()`
`Elf_Xword` **`get_size`**`()`
`Elf_Word` **`get_name_string_offset`**`()`	

`Data manipulation functions:`
 	
`const char*` **`get_data`**`()`
 	
`void` **`set_data`**`(`
`const char* pData,`
`Elf_Word size )`
 	
`void` **`set_data`**`(`
`const std::string& data )`
 	
`void` **`append_data`**`(`
`const char* pData,`
`Elf_Word size )`
 	
`void` **`append_data`**`(`
`const std::string& data )`
	Manages section data

4.3 SEGMENT

Class 'segment' has no public data members.

4.3.1 Member functions

`segment` public member functions listed in the table below. These functions permit to retrieve or set ELF file segment properties

Member Function	Description
`segment``()`	The default constructor. No segment class instances are created manually. Usually, 'add' method is used for 'segments' data member of 'elfio' object
`~segment``()`	The destructor.
`Elf_Half` **`get_index()`**	Returns segment's index

`Set functions:`
 	
`void` **`set_type`**`( Elf_Word )`
`void` **`set_flags`**`( Elf_Word )`
`void` **`set_align`**`( Elf_Xword )`
	Sets attributes for the segment

`void set_virtual_address( Elf64_Addr )`
`void set_physical_address( Elf64_Addr )`
`void set_file_size( Elf_Xword )`
`void set_memory_size( Elf_Xword )`	

`Get functions:`
 	
`Elf_Word get_type()`
`Elf_Word get_flags()`
`Elf_Xword get_align()`
`Elf64_Addr get_virtual_address()`
`Elf64_Addr get_physical_address()`
`Elf_Xword get_file_size()`
`Elf_Xword get_memory_size()`
	Returns segment attributes

`Elf_Half`
`add_section_index(`
`  Elf_Half index,`
`  Elf_Xword addr_align )`
 	
`Elf_Half`
`get_sections_num()`
 	
`Elf_Half`
`get_section_index_at(`
`  Elf_Half num )`
	Manages segment-section association

`const char* get_data()`	Provides content of segment's data

4.4 STRING_SECTION_ACCESSOR

4.4.1 Member functions

Member Function	Description
`string_section_accessor(` `  section* section_ )`	The constructor

`const char*`
`get_string(`
`  Elf_Word index )`
	Retrieves string by its offset (index) in the section

`Elf_Word`
`add_string(`
`  const char* str )`
 	
`Elf_Word`
`add_string(`
	Appends section data with new string.
	Returns position (index) of the new record

const std::string& str)	

4.5 SYMBOL_SECTION_ACCESSOR

4.5.1 Member functions

Member Function	Description
symbol_section_accessor(const elfio& elf_file, section* symbols_section)	The constructor
Elf_Half **get_index()**	Returns segment's index
Elf_Xword **get_symbols_num**()	Returns number of symbols in the section
Get functions: bool **get_symbol**(Elf_Xword index, std::string& name, Elf64_Addr& value, Elf_Xword& size, unsigned char& bind, unsigned char& type, Elf_Half& section_index, unsigned char& other) bool **get_symbol**(const std::string& name, Elf64_Addr& value, Elf_Xword& size, unsigned char& bind, unsigned char& type, Elf_Half& section_index, unsigned char& other) bool **get_symbol**(const Elf64_Addr& value, std::string& name, Elf_Xword& size, unsigned char& bind,	Retrieves symbol properties by symbol index, name or address

`  unsigned char&    type,`
`  Elf_Half&         section_index,`
`  unsigned char&    other )`	

`Elf_Word`
`add_symbol``(`
`  Elf_Word      name,`
`  Elf64_Addr    value,`
`  Elf_Xword     size,`
`  unsigned char info,`
`  unsigned char other,`
`  Elf_Half      shndx )`
 	
`Elf_Word`
`add_symbol``(`
`  Elf_Word      name,`
`  Elf64_Addr    value,`
`  Elf_Xword     size,`
`  unsigned char bind,`
`  unsigned char type,`
`  unsigned char other,`
`  Elf_Half      shndx )`
 	
`Elf_Word`
`add_symbol``(`
`  string_section_accessor& pStrWriter,`
`  const char*              str,`
`  Elf64_Addr              value,`
`  Elf_Xword               size,`
`  unsigned char           info,`
`  unsigned char           other,`
`  Elf_Half                shndx )`
 	
`Elf_Word`
`add_symbol``(`
`  string_section_accessor& pStrWriter,`
`  const char*              str,`
`  Elf64_Addr              value,`
`  Elf_Xword               size,`
`  unsigned char           bind,`
`  unsigned char           type,`
`  unsigned char           other,`
`  Elf_Half                shndx )`
	Adds symbol to the symbol table updating corresponding string section if required

`Elf_Xword`
`arrange_local_``symbols(`
`  std::function<void(`
`    Elf_Xword first,`
`    Elf_Xword second )> func = nullptr)`
	ELF standard requires that symbols with STB_LOCAL binding will be ordered prior any other entries in the symbol table.
	The function rearranges the symbols and invokes a callback for each swap between

	symbols. Also see **swap_symbols**() function of relocation section accessor

4.6 RELOCATION_SECTION_ACCESSOR

4.6.1 Member functions

Member Function	Description

relocation_section_accessor(
  const elfio& elf_file_,
  section* section_)
	The constructor

Elf_Xword **get_entries_num**()	Retrieves number of relocation entries in the section

bool
get_entry(
  Elf_Xword index,
  Elf64_Addr& offset,
  Elf_Word& symbol,
  Elf_Word& type,
  Elf_Sxword& addend)
 	
bool
get_entry(
  Elf_Xword index,
  Elf64_Addr& offset,
  Elf64_Addr& symbolValue,
  std::string& symbolName,
  Elf_Word& type,
  Elf_Sxword& addend,
  Elf_Sxword& calcValue)
	Retrieves properties for relocation entry by its index. Calculated value in the second flavor of this function may not work for all architectures

void
add_entry(
  Elf64_Addr offset,
  Elf_Xword info)
 	
void
add_entry(
  Elf64_Addr offset,
  Elf_Word symbol,
  unsigned char type)
 	
void
	Adds new relocation entry. The last function in this set is capable to add relocation entry for a symbol, automatically updating symbol and string tables for this symbol

add_entry(
  Elf64_Addr offset,
  Elf_Xword info,
  Elf_Sxword addend)
 	
void
add_entry(
  Elf64_Addr offset,
  Elf_Word symbol,
  unsigned char type,
  Elf_Sxword addend)
 	
void
add_entry(
  string_section_accessor str_writer,
  const char* str,
  symbol_section_accessor sym_writer,
  Elf64_Addr value,
  Elf_Word size,
  unsigned char sym_info,
  unsigned char other,
  Elf_Half shndx,
  Elf64_Addr offset,
  unsigned char type)	

Void
swap_symbols(
  Elf_Xword first,
  Elf_Xword second)
	A helper function that changes (swaps) symbol numbers in relocation entries.
	The function can be used as a callback for **arrange_local_symbols()**.

4.7 DYNAMIC_SECTION_ACCESSOR

4.7.1 Member functions

Member Function	Description

dynamic_section_accessor (
  elfio& elf_file_,
  section* section_)
	The constructor

Elf_Xword **get_entries_num**()	Retrieves number of dynamic section entries in the section
bool **get_entry**(Elf_Xword index,	Retrieves properties for dynamic section entry by its index. For most entries only `tag` and `value` arguments are relevant. `str` argument

`Elf_Xword& tag,`
`Elf_Xword& value,`
`std::string& str )`
	is empty string in this case. If `tag` equal to DT_NEEDED, DT_SONAME, DT_RPATH or DT_RUNPATH, `str` argument is filled with value taken from dynamic string table section.

`void`
`add_entry``(`
`Elf_Xword& tag,`
`Elf_Xword& value )`
 	
`void`
`add_entry``(`
`Elf_Xword& tag,`
`std::string& str )`
	Adds new dynamic section entry. The second variant of the function updates the dynamic string table updating the entry with string table index.

4.8 NOTE_SECTION_ACCESSOR

4.8.1 Member functions

Member Function	Description

`note_section_accessor``(`
`const elfio& elf_file_,`
`section* section_ )`
	The constructor

`Elf_Word` **`get_notes_num`**`()`	Retrieves number of note entries in the section

`bool`
`get_note``(`
`Elf_Word index,`
`Elf_Word& type,`
`std::string& name,`
`void*& desc,`
`Elf_Word& descSize )`
	Retrieves particular note by its index

`void`
`add_note``(`
`Elf_Word type,`
`const std::string& name,`
`const void* desc,`
`Elf_Word descSize )`
	Appends the section with a new note