

Using the Open Source ASN.1 Compiler

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Chapter 1

Introduction to the ASN.1 Compiler

The purpose of the ASN.1 compiler, of which 1 specifications in ASN.1 notation into some other and C++ target languages are supported, the language. The compiler reads the specification and emits

It would also create the code for converting this structure into platform-independent wire representation (a serializer API) and the decoder of such wire representation back into local, machine-specific type (a deserializer API).

1.1 Quick start with `asn1c`

After building and installing the compiler, the *asn1c*³

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Chapter 2

Using the ASN.1 Compiler

2.1 Invoking the ASN.1 helper code

der_encoder This is the generic DER encoder (Distinguished Encoding Rules). This encoder will take the target structure and encode it into a series of bytes. Please

- You may feed it the first buffer of 100 bytes of data, realize that the `ber_decoder` consumed only 95 bytes from it and later feed the decoder with 205 bytes buffer

Note that the initial (asn_DEF_Rectangle->ber_decoder) reference is gone, and also the last argument (0) is

```
    * Failed to encode the rectangle data.
    */
fprintf(stderr, "Cannot encode %s: %s\n",
        er.failed_type
        er(encodd;("o 23.991 -11.955 Td[}o"o 23.91 -11.955 Td
```

```
er = xer_encode(&asn_DEF_Rectangle, rect,  
               XER_F_BASIC, /* BASIC-XER or CANONICAL-XER */
```


the other hand, the successful decoding of the data from some external source does not necessarily mean that the data is fully valid either. It might well be the case that the specification describes some subtype constraints that were not taken into account during decoding, and it would actually be useful to perform the last check when the data is ready to be encoded or when the data has just been decoded to ensure its validity


```
#include <stdio.h>
#include <sys/types.h>
#include <Rectangle.h>    /* Rectangle ASN.1 type */

/*
 * This is a custom function which writes the
 * encoded output into some FILE stream.
 */
static int
```

```
if(ec.encoded == -1) {
    fprintf(stderr,
        "Could not encode Rectangle (at %s)\n",
        ec.failed_type ? ec.failed_type->name : "unknown");
    exit(65); /* better, EX_DATAERR */
} else {
    fprintf(stderr, "Created %s with BER encoded Rectangle\n",
        filename);
}

/* Also print the constructed Rectangle XER encoded (XML) */
xer_fprint(stdout, &asn_DEF_Rectangle, rectangle);
```

3.2 A "Rectangle" Decoder

This example will help you to create a simple BER decoder of a simple "Rectangle" type used throughout this document.

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6. Compile all files together using C compiler (varies by platform):

```
cc -I. -o rdecode *.c
```

7. Voila! You have just created the BER decoder of a Rectangle type, named **rdecode**!

Chapter 4

Constraint validation examples

This chapter shows how to define ASN.1 constraints and use the generated validation code.

4.1 Adding constraints into "Rectangle" type

Chapter 5

Abstract Syntax Notation: ASN.1

This chapter defines some basic ASN.1 concepts and describes several most widely used types. It is by no means an authoritative or complete reference. F(or)-333(mor)37(e)-334(complete)]TJ 0 -11.956 Td[(ASN.

5.1.3 The ENUMERATED type

The ENUMERATED type is semantically equivalent to the INTEGER type with some integer values explicitly named.

```
FruitId ::= ENUMERATED { apple(1), orange(2) }

-- The numbers in braces are optional,
-- the enumeration can be performed
-- automatically by the compiler
ComputerOSType ::= ENUMERATED {
    FreeBSD,           -- acquires value 0
    Windows,           -- acquires value 1
    Solaris(5),         -- remains 5
    Linux,              -- becomes 6
    MacOS               -- becomes 7
}
```

5.1.4 The OCTET STRING type

This type models the sequence of 8-bit bytes. This may be used to transmit some

5.3 ASN.1 Constructed Types

5.3.1 The SEQUENCE type

This is an ordered collection of other simple or constructed types. The SEQUENCE constructed type resembles the C "struct" statement.

```
Address ::= SEQUENCE {  
    -- The apartment number may be omitted  
    apartmentNumber    NumericString OPTIONAL,  
    streetName          PrintableString,  
    cityName            PrintableString,  
    stateName           PrintableString,  
    -- This one may be omitted too  
    zipNo               NumericString OPTIONAL  
}
```

5.3.2 The SET type

This is a collection of other simple or constructed types. Ordering is not important. The data may arrive in the order which is different from the order of specification. Data is encoded in the order not necessarily corresponding to the order of specification.

5.3.3 The CHOICE type

This type is just a choice between the subtypes specified in it. The CHOICE type

Bibliography

- [ASN1C] The Open Source ASN.1 Compiler. <http://lionet.info/asn1c>
- [AONL] Online ASN.1 Compiler. <http://lionet.info/asn1c/asn1c.cgi>
- [Dub00] Olivier Dubuisson — *ASN.1 Communication between heterogeneous systems* — Morgan Kaufmann Publishers, 2000. <http://asn1.elibel.tm.fr/en/book/>. ISBN:0-12-6333361-0.
- [ITU-T/ASN.1] ITU-T Study Group 17 – Languages for Telecommunication Systems <http://www.itu.int/ITU-T/studygroups/com17/languages/>