This document describes asn1c-0.9.19 *Revision* : 1.27

Chapter 1

Introduction to the ASN.1 Compiler

The purpose of the ASN.1 compiler, of which t
specifications in ASN.1 notation into some oth
and C++ target languages are supported, the la

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]

Chapter 2

Using the ASN.1 Compiler

2.1 Invoking the ASN.1 helper code

First of all, you should include one or more header files into your application. Typically, it is enough to include the header file of the main PDU type. For our Rectangle module, including the Rectangle.h file is sufficient:

```
#include <Rectangle.h>
```

The header files defines the C structure corresponding to the ASN.1 definition of a rectangle and the declaration of the ASN.1 type descriptor, which is used as an argument to most of the functions provided by the ASN.1 module. For example, here is the code which frees the Rectangle_t structure:

```
Rectangle_t *rect = ...;

asn_DEF_Rectangle.free_struct(&asn_DEF_Rectangle,
    rect, 0);
```

This code defines a *rect* pointer which points to the Rectangle_t structure which needs to be freed. The second line invokes the generic *free_struct()* routine created specifically for this Rectangle_t structure. The *asn_DEF_Rectangle* is the type descriptor, which holds a collection of routines to deal with the Rectangle_t structure.

The following member functions of the asn_DEF_Rectangle type descriptor are of interest:

ber_decoder This is the generic *restartable*[1] BER decoder (Basic Encoding Rules). This decoder would createle_t outhe ar structurey.erte

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

```
             * 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
```

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.

1.

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

```
int ret;           /* Return value */
char errbuf[128];  /* Buffer for error message */
size_t errlen = sizeof(errbuf);  /* Size of the buffer */

/* ... here may go Rectangle decoding code ... */

ret = asn_check_constraints(&asn_DEF_Rectangle,
```

s;

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 meacs 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

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