Internet Engineering Task Force   A. Minaburo, Ed.
Internet-Draft   Acklio
Intended status: Informational   L. Toutain, Ed.
Expires: December 10, 2016   Telecom Bretagne
                                                        Y. Delibie, Ed.
                                                               Kerlink
                                                         June 8, 2016

YANG module for LoRa Networks
draft-minaburo-yang-lora-00

Abstract

   This document presents a YANG module definition for managing LoRa-
   based devices.

Status of This Memo

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

   Internet-Drafts are working documents of the Internet Engineering
   Task Force (IETF). Note that other groups may also distribute
   working documents as Internet-Drafts. The list of current Internet-
   Drafts is at http://datatracker.ietf.org/drafts/current/.

   Internet-Drafts are draft documents valid for a maximum of six months
   and may be updated, replaced, or obsoleted by other documents at any
   time. It is inappropriate to use Internet-Drafts as reference
   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on December 10, 2016.

Table of Contents

1. Introduction

   This document provides a YANG module description for managing a LoRa
   endpoints.

   SemTech [LoRa] (c) is a low-rate, low-power, long-range radio
   technology. It could be used as a base radio technology for building
   Low-Rate Wide-Area Networks (LR-WAN), also known as LPWA (Low-Power
   Wide Area). SemTech [LoRa] (c) has the following characteristics:

   o Works in narrow, license-free (ISM) bands with good propagation
      properties (< 1GHz)

   o Low- to very-low throughput (270 bps--200 kbps)

   o Low-power operation (25 mW in Europe)

   o Far-Reaching communication capabilities (20 km with line-of-sight,
      several km in urban environment)

   o Strong channel access restrictions (1% to 10% duty cycling)

   The management of LoRa-based devices can be done through a standard
   approach, compatible with the best network-operator practices, namely
   NETCONF or RESTCONF. A formal definition of the parameters and the
   values to be managed is thus required, which can be done with the
   YANG module language. The following document presents a YANG module
   definition for managing a LoRa-based end-device.

1.1. Requirements Language

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in RFC 2119 [RFC2119].

2. LoRa Data Model

The data model has the following structure for Lora configuration:

```
+- RW ietf-lora
   +- RW Lora
      +- RW Mode
      |   +- RW Channel Bandwidth      enumeration
      |   +- RW Coding Rate            enumeration
      |   +- RW Spreading Factor       int8
      +- Physical Layer
      |   +- RW Preamblelength         int32
      |   +- RW Channel Frequency Range  enumeration
      |   +- RW Channel                int8
      |   +- RW SymbolTimeout          int32
      +- MAC Layer
         +- RW FrPayloadEncryption    boolean
         +- RW Delay                  int32
         +- RW FixlengthPayloadOn     boolean
```

The data model defines a state container Mode which include the three principal characteristics of the LoRA interface which determine the parameters of the channel

Figure 1

3. LoRa YANG module

This model imports typedefs from [RFC6991].

```
module lora {

    namespace "urn:lora";
    prefix lo;

    import ietf-interfaces {
       prefix if;
    }

    organization
      "Acklio";

    contact
    "Ana Minaburo
```

```
  ana@minaburo.com";

 description
    "This module contains a collection of YANG definitions for
configuring the LORA () network interface.

Copyright (c) 2015 IETF Trust and the persons identified as
authors of the code. All right reserved.

Redistribution and use in source binary forms, with or
without modification, is permitted pursuant to, and subject
to the license terms contained in, the Simplified BSD License
Relating to IETF Documents
(http://trustee.ietf.org/license-info)

This YANG module version is part of draft-minaburo-yang-lora-00;
see the draft itself for full legal notices.";

  revision 2015-11-01 {
    description
      "Initial Description";
    reference
      "LoRa MAC Class A Specification R3.1 by Semtech";
 }


  grouping mode {
     description "Principal factors to change modulation";
     leaf channel-bandwidth {
        description "Physical Channel Bandwidth";
        type enumeration {
          enum 125 { description "125 KHz"; value 0; }
          enum 150 { description "150 KHz"; value 1; }
          enum 500 { description "500 KHz"; value 2; }
        }
     }

     leaf coding-rate {
       description "LORA error correction scheme";
        type enumeration {
           enum 4_5 { description "value 1; }
           enum 4_6 { value 2; }
           enum 4_7 { value 3; }
           enum 4_b { value 4; }
        }
     }

     leaf spreading-factor {
```

```
            description "Modulation to enable spread signals to
                            transmit signals at the same time";
          type uint8 {
            range "6 .. 12";
        }
      }

      }

    augment "/if:interfaces/if:interface" {
          description "              // To be defined later";
        when "if:type = 'ianaieft:lora'";
          description "LORA channel";

        container lora {
          uses mode;
            container physical-layer {
                description "LORA phisical layer";
                leaf preamble-length {
                    description "Header packet definition";
                  type int32;
                  default 7;
          }

              leaf channel-frequency-range {
                description "Band Choice depends on Country";
                type enumeration {
                mandatory true;
                enum europe;
                enum usa;
                enum japan;
                enum china;
               }
             }

              leaf channel {
                description "Physical Channels";
                type uint8 {
                  range "0..10";
                }
             }

              leaf symbol-timeout {
                  description "Waiting the free band";
                type uint32;
                }
               }
```

```
            container mac-layer {
                description " LORA MAC layer format";
                leaf payload-encryption {
                    description "Known if the encryption is used";
                  type boolean;
                  default "false";
                 }

                leaf delay {
                   description "Delay value";
                   type int32;
                }

                leaf fixed-length-payload {
                  description "If Modulation is not variable";
                 type boolean;
                 default "false";
                 }
            }
          }
        }
    }
```

The data model defines a state container Mode which include the three
principal characteristics of the LoRA interface which determine the
parameters of the channel

                              Figure 2

4. Acknowledgements

   We want to thank Alexander Pelov for all his inputs and corrections
   on this work

5. IANA Considerations

   This memo includes no request to IANA.

6. Security Considerations

   All drafts are required to have a security considerations section.
   See RFC 3552 [RFC3552] for a guide. TO DO

7. References

7.1. Normative References

[RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
            Requirement Levels", BCP 14, RFC 2119,
            DOI 10.17487/RFC2119, March 1997,
            <http://www.rfc-editor.org/info/rfc2119>.

7.2. Informative References

[LoRa]   Semtech, "https://web.archive.org/web/20150510011904/
            https://www.semtech.com/wireless-rf/lora.html", May 2015.

[RFC3552]   Rescorla, E. and B. Korver, "Guidelines for Writing RFC
            Text on Security Considerations", BCP 72, RFC 3552,
            DOI 10.17487/RFC3552, July 2003,
            <http://www.rfc-editor.org/info/rfc3552>.

Authors' Addresses

   Ana Minaburo (editor)
   Acklio
   2bis rue de la Chataigneraie
   Cesson-Sevigne, Bretagne 35510
   FR

   Email: ana@ackl.io

   Laurent Toutain (editor)
   Telecom Bretagne
   2 Rue de la Chataigneraie
   Cesson-Sevigne, Bretagne 35510
   FR

   Phone: +33299127026
   Email: laurent.toutain@telecom-bretagne.eu

   Yannick Delibie (editor)
   Kerlink
   1 rue Jacqueline Auriol
   Thorigne-Fouillard, Bretagne 35235
   FR

   Phone: +33299122900
   Email: yannick.delibie@kerlink.fr