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YANG module for LoRa Networks
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Abstract

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

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[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 lora;

import ietf-interfaces {
    prefix if;
}

organization
    "Acklio";

contact
    "Ana Minaburo

```

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```

    ana@minaburo.com";

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

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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 = 'ianaif: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";
    }
}

```


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>>.

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