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Static Context Header Compression (SCHC) over LoRaWAN
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Abstract

The Static Context Header Compression (SCHC) specification describes generic header compression and fragmentation techniques for LPWAN (Low Power Wide Area Networks) technologies. SCHC is a generic mechanism designed for great flexibility, so that it can be adapted for any of the LPWAN technologies.

This document provides the adaptation of SCHC for use in LoRaWAN networks, and provides elements such as efficient parameterization and modes of operation.

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1. Introduction

The Static Context Header Compression (SCHC) specification [I-D.ietf-lpwan-ipv6-static-context-hc] describes generic header compression and fragmentation techniques that can be used on all LPWAN (Low Power Wide Area Networks) technologies defined in

[I-D.ietf-lpwan-overview]. Even though those technologies share a great number of common features like start-oriented topologies, network architecture, devices with mostly quite predictable communications, etc; they do have some slight differences in respect of payload sizes, reactiveness, etc.

SCHC gives a generic framework that enables those devices to communicate with other Internet networks. However, for efficient performance, some parameters and modes of operation need to be set appropriately for each of the LPWAN technologies.

This document describes the efficient parameters and modes of operation when SCHC is used over LoRaWAN networks.

2. Terminology

This section defines the terminology and acronyms used in this document. For all other definitions, please look up the SCHC specification [I-D.ietf-lpwan-ipv6-static-context-hc].

o DevEUI: an IEEE EUI-64 identifier used to identify the device during the procedure while joining the network (Join Procedure)

o DevAddr: a 32-bit non-unique identifier assigned to a device statically or dynamically after a Join Procedure (depending on the activation mode)

o TBD: all significant LoRaWAN-related terms.

3. Static Context Header Compression Overview

This section contains a short overview of Static Context Header Compression (SCHC). For a detailed description, refer to the full specification [I-D.ietf-lpwan-ipv6-static-context-hc].

Static Context Header Compression (SCHC) avoids context synchronization, which is the most bandwidth-consuming operation in other header compression mechanisms such as RoHC [RFC5795]. Based on the fact that the nature of data flows is highly predictable in LPWAN networks, some static contexts may be stored on the Device (Dev). The contexts must be stored in both ends, and it can either be learned by a provisioning protocol or by out of band means or it can be pre-provisioned, etc. The way the context is learned on both sides is out of the scope of this document.


```
     Dev                                                 App
+--------------+                                  +--------------+
|APP1 APP2 APP3|                                  |APP1 APP2 APP3|
|              |                                  |              |
|      UDP     |                                  |      UDP     |
|     IPv6     |                                  |     IPv6     |
|              |                                  |              |
|   SCHC C/D   |                                  |              |
|   (context)  |                                  |              |
+-------+------+                                  +-------+------+
        |   +--+     +----+     +---------+                .
        +~~ |RG| === |NGW | === |SCHC C/D |... Internet ..
            +--+     +----+     |(context)|
                                +---------+
```

Figure 1: Architecture

Figure 1 represents the architecture for compression/decompression, it is based on [I-D.ietf-lpwan-overview] terminology. The Device is sending applications flows using IPv6 or IPv6/UDP protocols. These flows are compressed by an Static Context Header Compression Compressor/Decompressor (SCHC C/D) to reduce headers size. Resulting information is sent on a layer two (L2) frame to a LPWAN Radio Network (RG) which forwards the frame to a Network Gateway (NGW). The NGW sends the data to a SCHC C/D for decompression which shares the same rules with the Dev. The SCHC C/D can be located on the Network Gateway (NGW) or in another place as long as a tunnel is established between the NGW and the SCHC C/D. The SCHC C/D in both sides must share the same set of Rules. After decompression, the packet can be sent on the Internet to one or several LPWAN Application Servers (App).

The SCHC C/D process is bidirectional, so the same principles can be applied in the other direction.

In a LoRaWAN network, the RG is called a Gateway, the NGW is Network Server, and the SCHC C/D can be embedded in different places, for example in the Network Server and/or the Application Server.

Next steps for this section: detailed overview of the LoRaWAN architecture and its mapping to the SCHC architecture.

4. LoRaWAN Architecture

An overview of LoRaWAN [lora-alliance-spec] protocol and architecture is described in [I-D.ietf-lpwan-overview]. Mapping between the LPWAN architecture entities as described in

[I-D.ietf-lpwan-ipv6-static-context-hc] and the ones in [lora-alliance-spec] is as follows:

o Devices (Dev) are the end-devices or hosts (e.g. sensors, actuators, etc.). There can be a very high density of devices per radio gateway. This entity maps to the LoRaWAN End-device.

o The Radio Gateway (RGW), which is the end point of the constrained link. This entity maps to the LoRaWAN Gateway.

o The Network Gateway (NGW) is the interconnection node between the Radio Gateway and the Internet. This entity maps to the LoRaWAN Network Server.

o LPWAN-AAA Server, which controls the user authentication and the applications. This entity maps to the LoRaWAN Join Server.

o Application Server (App). The same terminology is used in LoRaWAN.

```
()   ()   ()       |                      +------+
 ()  () () ()     / \       +---------+   | Join |    () () () () () () /   \==
()  ()   ()      |          | <--|--> |   +------+  |Application|    ()  ()  ()
```

```
 ()   ()   ()    /    \          +----------+            +-----------+
End-Devices  Gateways     Network Server
```

Figure 1: LPWAN/LoRaWAN Architecture

SCHC C/D (Compressor/Decompressor) and SCHC Fragmentation are performed on the LoRaWAN End-device and the Application Server. While the point-to-point link between the End-device and the Application Server constitutes single IP hop, the ultimate end-point of the IP communication may be an Internet node beyond the Application Server. In other words, the LoRaWAN Application Server acts as the first hop IP router for the End-device. Note that the Application Server and Network Server may be co-located, which effectively turns the Network/Application Server into the first hop IP router.

4.1. Device classes (A, B, C) and interactions

TBD

4.2. Device addressing

TBD

4.3. General Message Types

TBD

4.4. LoRaWAN MAC Frames

TBD

5. SCHC over LoRaWAN

5.1. Rule ID management

Rule ID can be stored and transported in the FPort field of the LoRaWAN MAC frame.

TBD

5.2. IID computation

TBD

5.3. Fragmentation

TBD

5.3.1. Reliability options

TBD

5.3.2. Supporting multiple window sizes

TBD

5.3.3. Downlink fragment transmission

TBD

5.3.4. SCHC behavior for devices in class A, B and C

TBD

6. Security considerations

TBD

7. Acknowledgements

TBD

8. References

8.1. Normative References

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8.2. Informative References

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[lora-alliance-spec]
Alliance, L., "LoRaWAN Specification Version V1.0.2", <http://portal.lora-alliance.org/DesktopModules/Inventures_Document/FileDownload.aspx?ContentID=1398>.

Appendix A. Examples

Appendix B. Note

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