Transmission of SCHC-compressed packets over IEEE 802.15.4 networks

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Main goal

SCHC (RFC 8724) exploits a priori knowledge of header field values

Traditional

SCHC-based
3.2. SCHC architecture concepts (I/III)

• SCHC Stratum
  • When SCHC is used to compress IPv6 packets over IEEE 802.15.4 networks, the SCHC Stratum is located on top of layer 2 and below layer 3
    – The compressed data of the SCHC Stratum may also comprise upper layer packet headers
    – For example, SCHC may be used to compress IP headers, IP/UDP headers or IP/UDP/CoAP headers (all at once)

• Discriminator
  • 6LoWPAN Dispatch Type set to:
    – SCHC Dispatch
    – SCHC Pointer Dispatch
3.2. SCHC architecture concepts (II/III)

- Single-instance networks
  - All network nodes have:
    - A single SCHC Instance for C/D
    - A single SoR (there is only one SCHC Instance)
  - SCHC Stratum Header is fully compressed
    - 0 bits sent over the air
  - All network nodes have:
    - A single SCHC Stratum Header
    - A single SoR for SCHC Stratum Header C/D
      » Comprises a single, implicit Rule for SCHC Stratum Header C/D
3.2. SCHC architecture concepts (III/III)

- **Multiple-instance networks**
  - At least some network nodes have:
    - More than one SCHC Instance for C/D
    - One SoR for each SCHC Instance
  - SCHC Stratum Header cannot (generally) be fully compressed
    - More than 0 bits sent over the air

- All network nodes have:
  - A single SCHC Stratum Header
  - A single SoR for SCHC Stratum Header C/D
    » May comprise several Rules for SCHC Strat. Header C/D
3.5. Multihop communication (I/VIII)

• SRO:
  • Single-instance networks:
    – A Rule and its RuleID MUST be unique network-wide
    – The means to ensure so are out of scope
    – To simplify the management of RuleIDs, in SRO, all nodes in the network MAY share the same SoR

```
   Host E
    /  
(RuleID 1) +-------+
(RuleID 2)   |Internet|
(RuleID 3)  +-------+
   6LBR        
    /  
   6LR  6LR        
    /    /  
(RuleID 1) (RuleID 1) 
(RuleID 2) (RuleID 2) 
(RuleID 3) (RuleID 3) 
   Host A Host B Host C

Pair of endpoints:
RuleID 1: A, B
RuleID 2: A, C
RuleID 3: A, E
```
3.5. Multihop communication (II/VIII)

• SRO:
  • Multiple-instance networks:
    – A not fully compressed SCHC Stratum Header MUST be used

```
Host E
  /            +---------+
(RuleID 2, I2)
(RuleID 1, I1)   ---- |Internet|
(RuleID 2, I1)
(RuleID 3, I1) /    +-------+
6LBR ------------

6LR / 6LR -----------+
(RuleID 1, I1) | (RuleID 1, I1)
(RuleID 2, I1) | (RuleID 2, I1)
(RuleID 3, I1) | (RuleID 3, I1)
(RuleID 2, I2) | (RuleID 2, I2)

Endpoints | Instance
RuleID 1:  A, B    I1
RuleID 2:  A, C    I1
RuleID 3:  A, E    I1
RuleID 2:  A, B    I2
```

Host A
(RuleID 1, I1)
(RuleID 2, I1)
(RuleID 3, I1)
(RuleID 2, I2)

Host B
(RuleID 1, I1)
(RuleID 2, I1)
(RuleID 2, I2)

Host C
(RuleID 1, I1)
(RuleID 2, I1)
3.5. Multihop communication (III/VIII)

• TRO:
  • Single-instance networks:
    – A Rule and its RuleID MUST be unique network-wide
    – The means to ensure so are out of scope

```plaintext
Host E
/    
(RuleID 1) +---------+
(RuleID 2)    |Internet|
(RuleID 3) / +---------+

6LBR -------
/
/    
6LR    6LR +---------+
/    |
/no Rules/ (no Rules) |
/    /    |
Host A  Host B  Host C
/    /    |
(RuleID 1) (RuleID 1) (RuleID 2)
/    /    |
(RuleID 2) (RuleID 2) (RuleID 2)
/    /    |
(RuleID 3) (RuleID 3) (RuleID 3)
```

Pair of endpoints
RuleID 1:    A, B
RuleID 2:    A, C
RuleID 3:    A, E
3.5. Multihop communication (IV/VIII)

- TRO:
  - Multiple-instance networks:
    - A not fully compressed SCHC Stratum Header MUST be used
3.5. Multihop communication (V/VIII)

• PRO:
  • Single-instance networks:
    – A RuleID MAY be used to identify different Rules used by different pairs of endpoints
3.5. Multihop communication (VI/VIII)

• PRO:
  • Multiple-instance networks:
    – A not fully compressed SCHC Stratum Header MUST be used
3.5. Multihop communication (VII/VIII)

- **Mesh-Under:**
  - Single-instance networks:
    - A RuleID MAY be used to identify different Rules used by different pairs of endpoints

```
Host E
    /            +---------+
   +--------+      Host F
   |Internet|

6LBR ---------------

(RuleID 3)      (RuleID 4)

m ------------ m

(no Rules)   (no Rules)

Host D          Host A          Host B          Host C
(RuleID 2)      (RuleID 1)      (RuleID 1)      (RuleID 2)
(RuleID 2)      (RuleID 1)      (RuleID 2)      (RuleID 4)
(RuleID 3)      (RuleID 1)      (RuleID 2)      (RuleID 2)

Pair of endpoints
RuleID 1:       A, B
RuleID 2:       A, C
RuleID 2:       D, B
RuleID 3:       A, E
RuleID 4:       B, F
```
3.5. Multihop communication (VIII/VIII)

• Mesh-Under:
  
  • Multiple-instance networks:
    
    – A fully compressed SCHC Stratum Header MAY be used
      
      » Only if it is possible to determine the SCHC Packet Instance needed to decompress a SCHC-compressed packet based on the packet source identifier (Mesh-Under header [RFC 4944])
4.1. Single-hop or SRO frame format

- Frame format:

\[
\begin{array}{c}
\text{IEEE 802.15.4 frame payload} \\
\text{SCHC Packet}
\end{array}
\]

| SCHC Dispatch | SCHC StratumHdr | Cmprd Header | Payload | Padding |

- SCHC Stratum Header
  - Determines the SCHC Instance to be used to decompress the next field
  - In compressed form: a RuleID and a compression residue
  - Single-instance networks: fully compressed (0 bits)
  - Multiple-instance networks: (generally) not fully compressed
    - RuleID size RECOMMENDED between 1 and 8 bits
Next Steps

• Define the SCHC Stratum Header format

• Define the number of strata for the transition protocol stack (section 5)
  – Traditional 6LoWPAN to compress IPv6 header
    • RFC 6282
  – Two SCHC Strata may be needed:
    • One for UDP and another for CoAP
Comments/Questions?

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