SCHC Architecture
draft-ietf-schc-architecture

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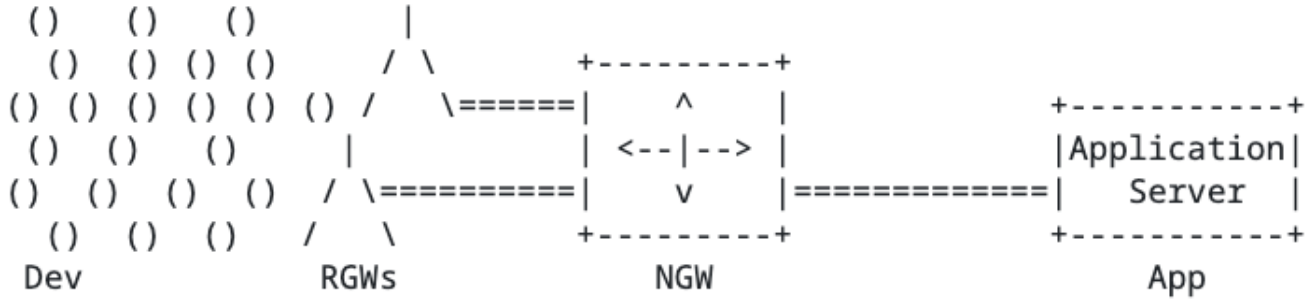
Alexander Pelov
Pascal Thubert
Laurent Toutain

Architecture requirements

- RFC 8724: based on the LPWAN architecture described in RFC 8376.



- RFC 8824: introduces several levels of SCHC.
- RFC 9363: defines a YANG Data Model for rules representation.

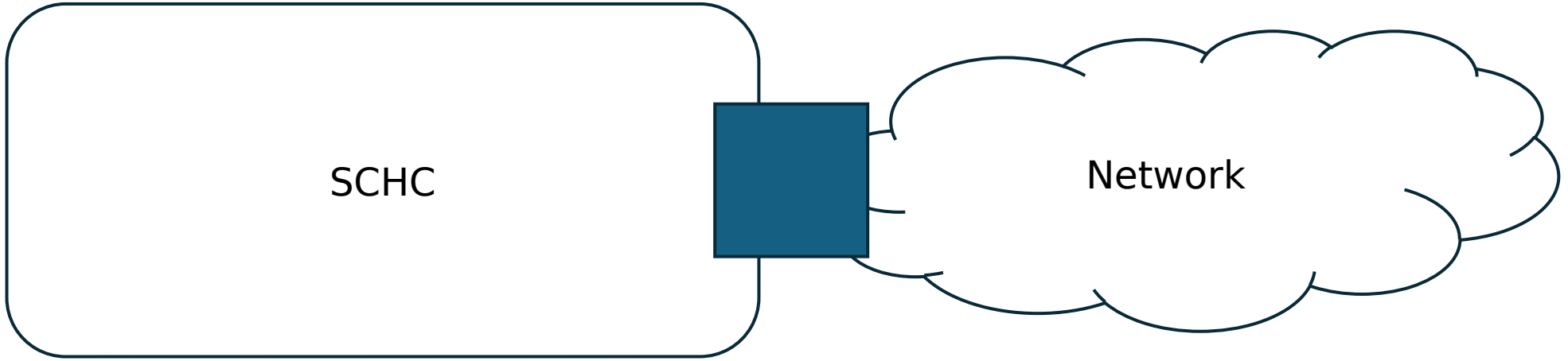
Architecture

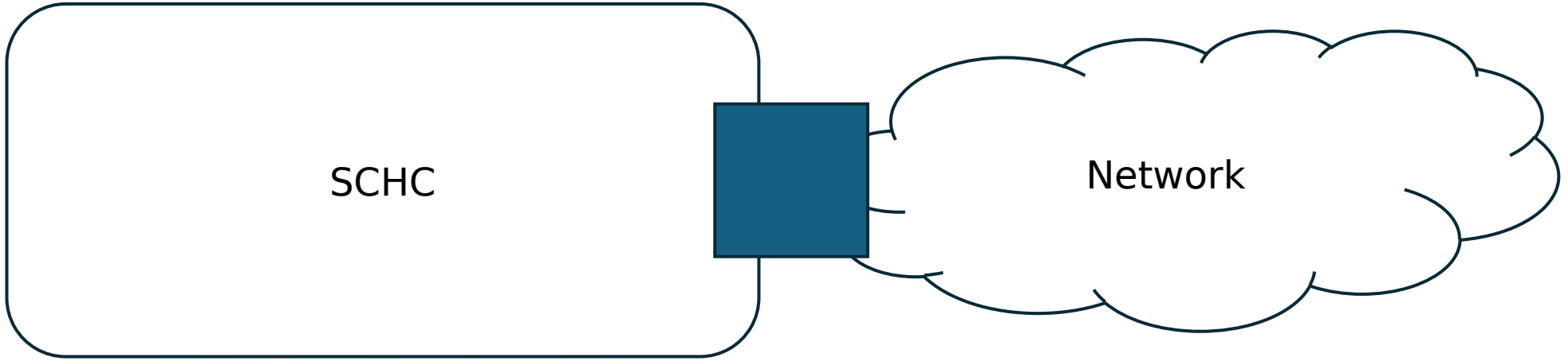
- Generalize the architecture to any network
  - Remove dependencies to LPWAN
- Defines a global framework:
  - Allowing SCHC on any network
    - Not only star topology
  - Allowing to combine several levels of SCHC:
    - Cryptographical boundaries,
    - Forwarding boundaries,
    - Different physical end points.
- Encompass all existing work on SCHC.

Terminology

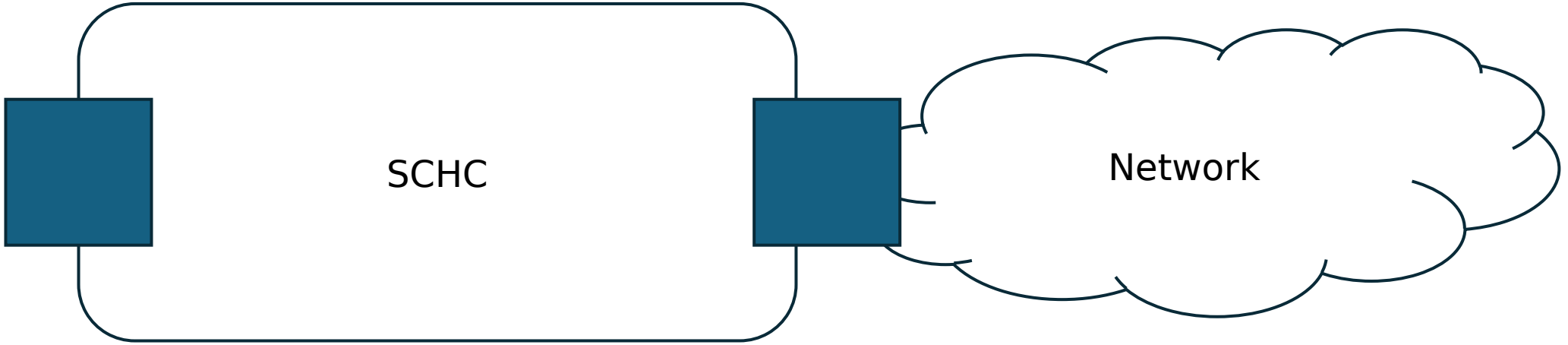
Architecture depends on LPWAN

Agnostic Architecture



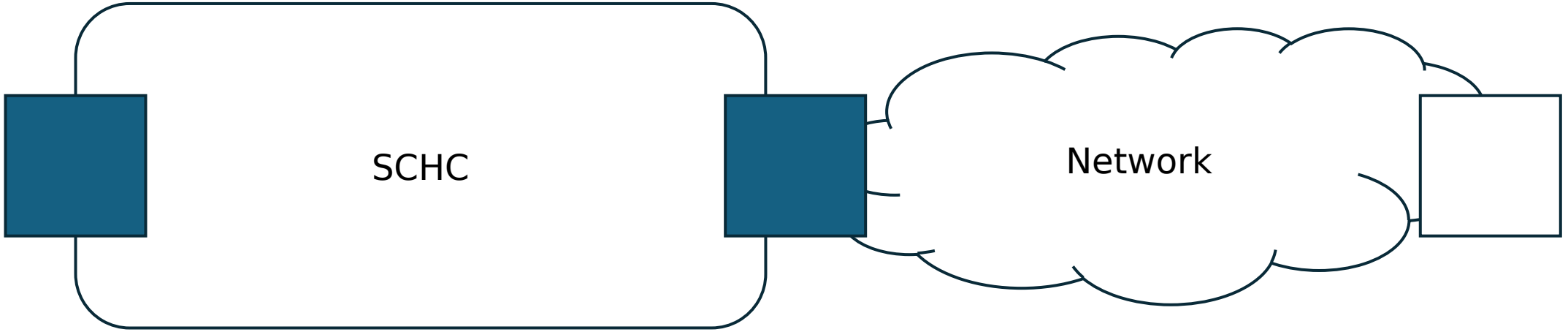


SCHC Network Gateway (SNG)

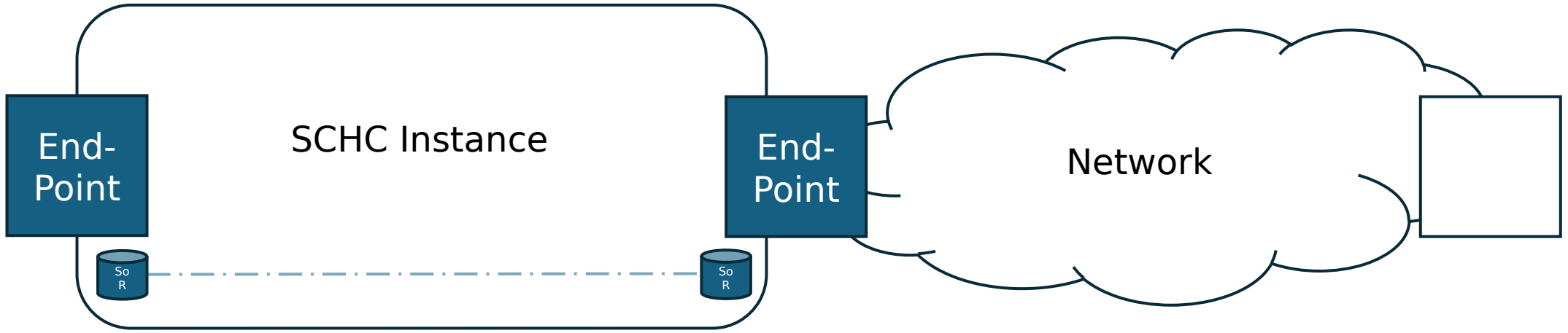


Device

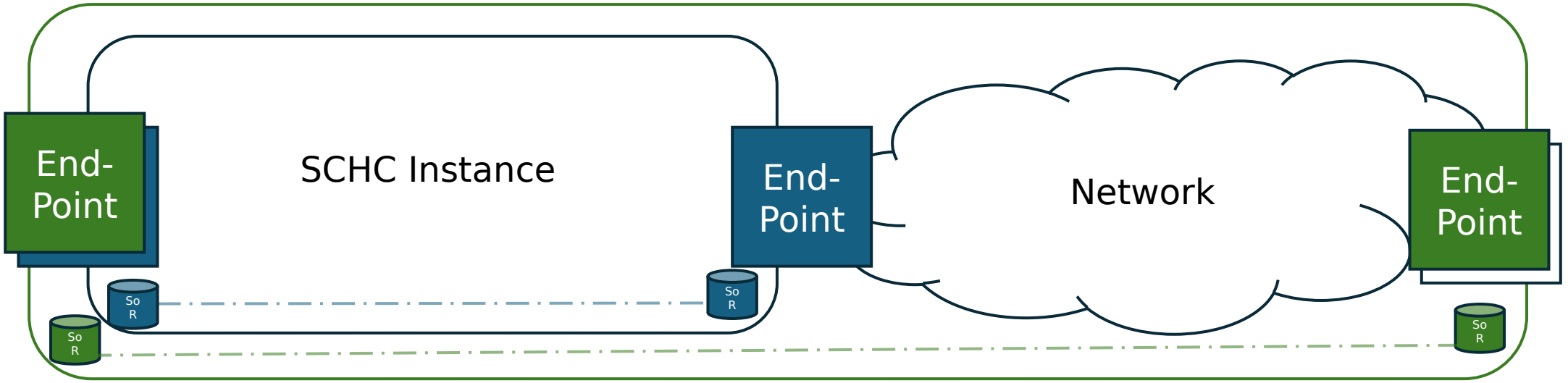
SCHC Network Gateway (SNG)



Device SCHC Network Gateway (SNG) Application


End-
Point
SCHC Instance
End-
Point
Network
So
R
So
R
Device
SCHC Network Gateway (SNG)
Application

RFC 8824


End-
Point
SCHC Instance
End-
Point
Network
End-
Point
So
R
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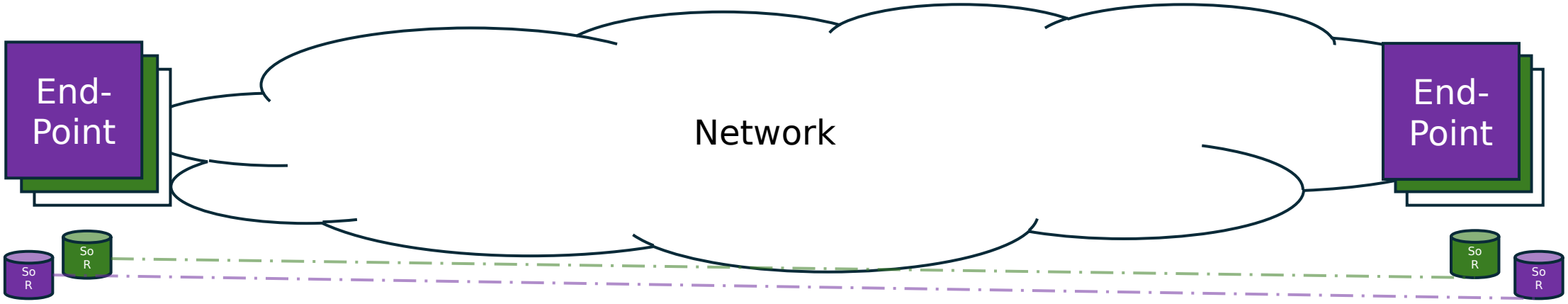
R
So
R
Device
SCHC Network Gateway (SNG)
Application

No SNG

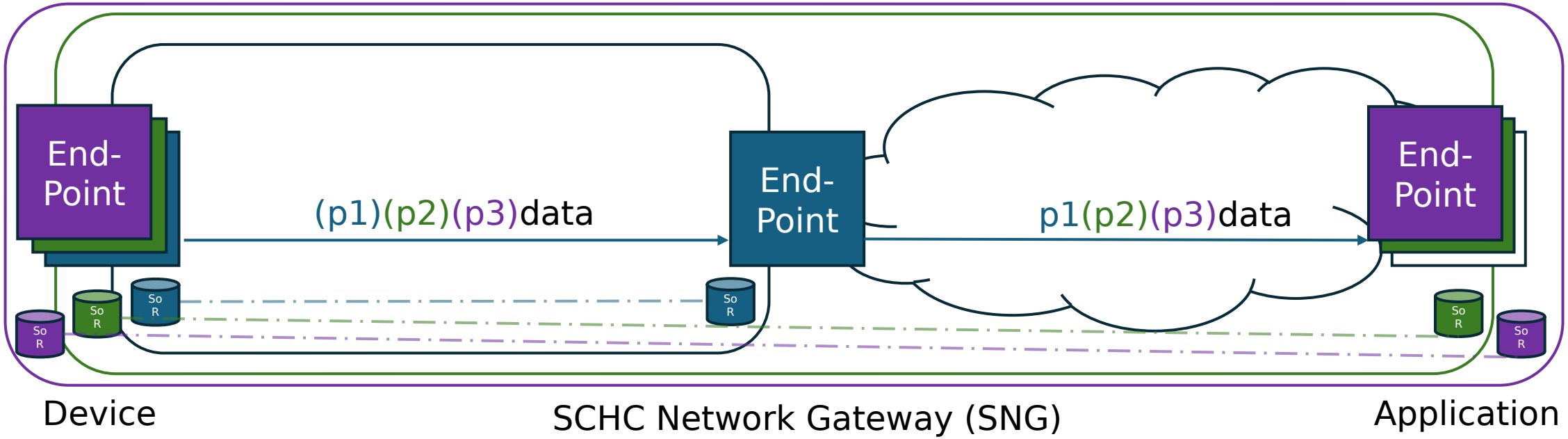


Device?

~~SCHC Network Gateway (SNG)~~

Application?

Notation



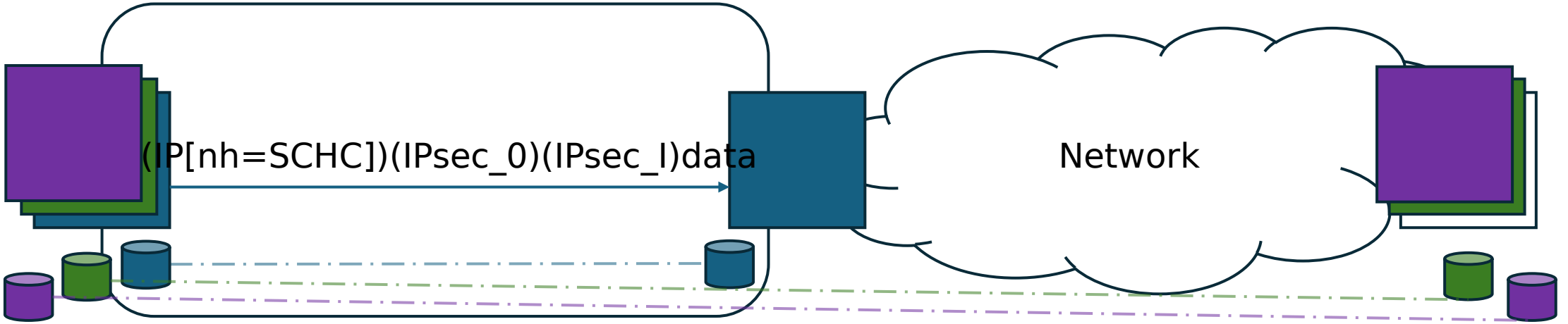
- ***(p)*** indicates the compression of protocol *p* (i.e. Rid + residue)

Terminology

- **SCHC End-point**: an implementation of the SCHC mechanisms, as defined in RFC 8724, with an associated Set of Rules.
- **SCHC Instance**: two SCHC end-points using exactly the same Set of Rule.
- **SCHC Network Gateway (SNG)**: SCHC End-Point located at the boundary of a regular IP network and a network that applies SCHC compression and fragmentation.
- **SCHC Device**: The other end of the SCHC instance formed with the SCHC Network Gateway.
- **SCHC Application**: entity sending packets to the SCHC Device or receiving packets from IP Gateway located on the regular Internet.

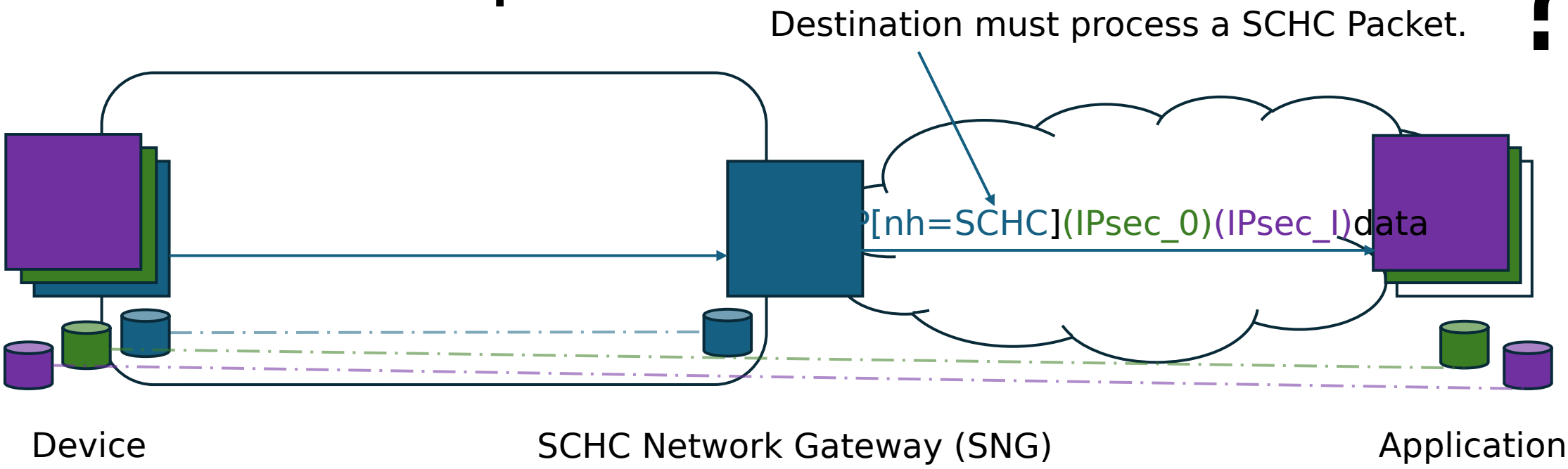
Stratum

IPsec Example



- ***(p)*** indicates the compression of protocol *p* (i.e. Rid + residue)
- ***p[f=x]*** indicates a header of protocol *p* with field *f* with the value of *x*

IPsec Example



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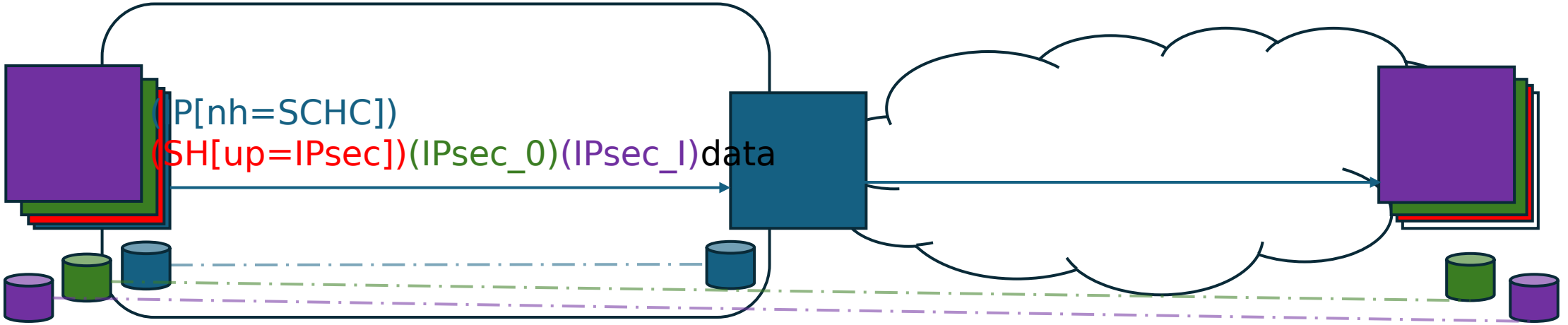
IPsec Example – Stratum Header



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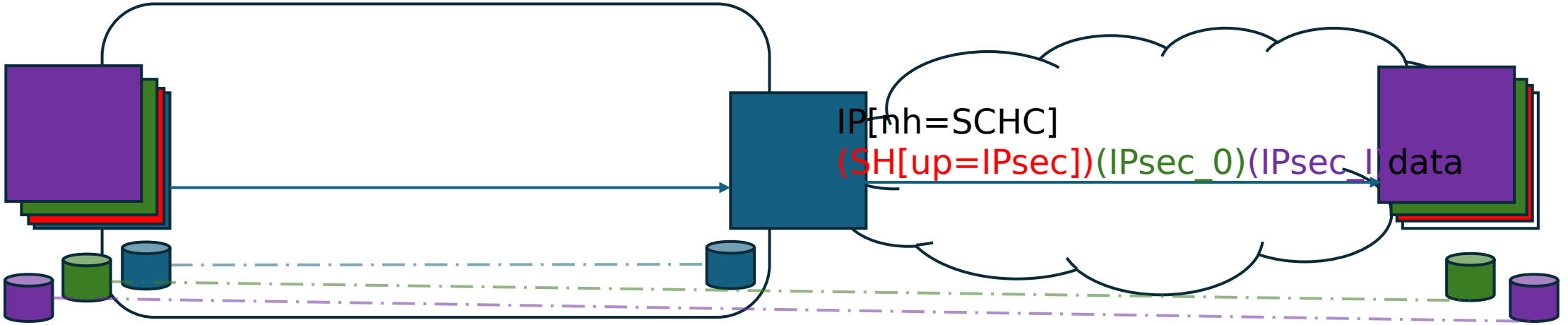

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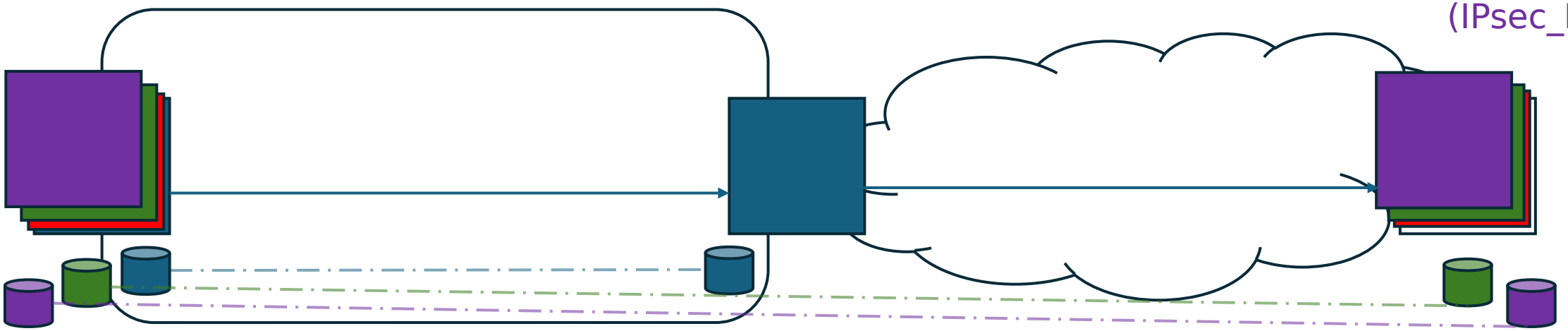
IPsec Example – Stratum Header

IP[nh=IPsec]
IPsec_0
(IPsec_I)data



Device

SCHC Network Gateway (SNG)

Application

- ***(p)*** indicates the compression of protocol *p* (i.e. Rid + residue)
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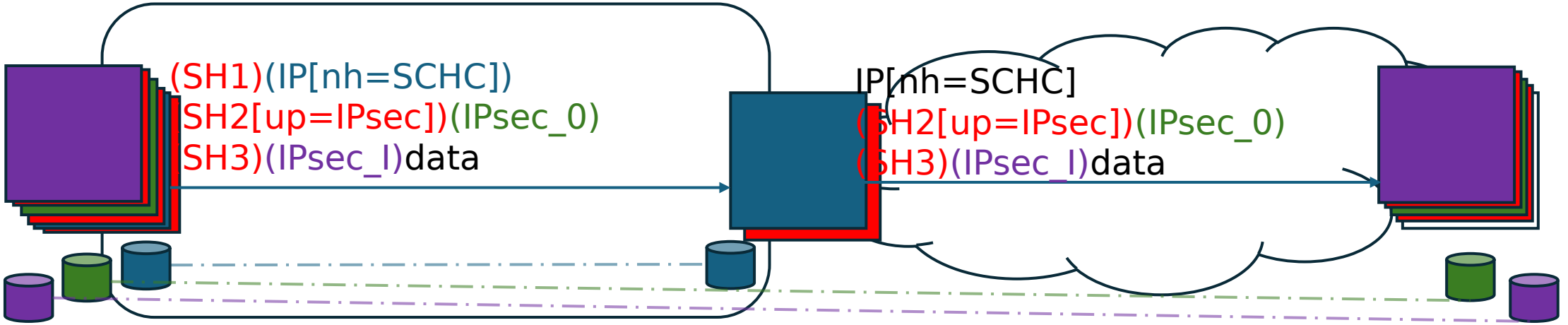
IPsec Example – Stratum Header



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SCHC Architecture

STRATUM

End-Point

End-Point

End-Point

End-Point

STRATUM

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End-Point

STRATUM

End-Point

End-Point

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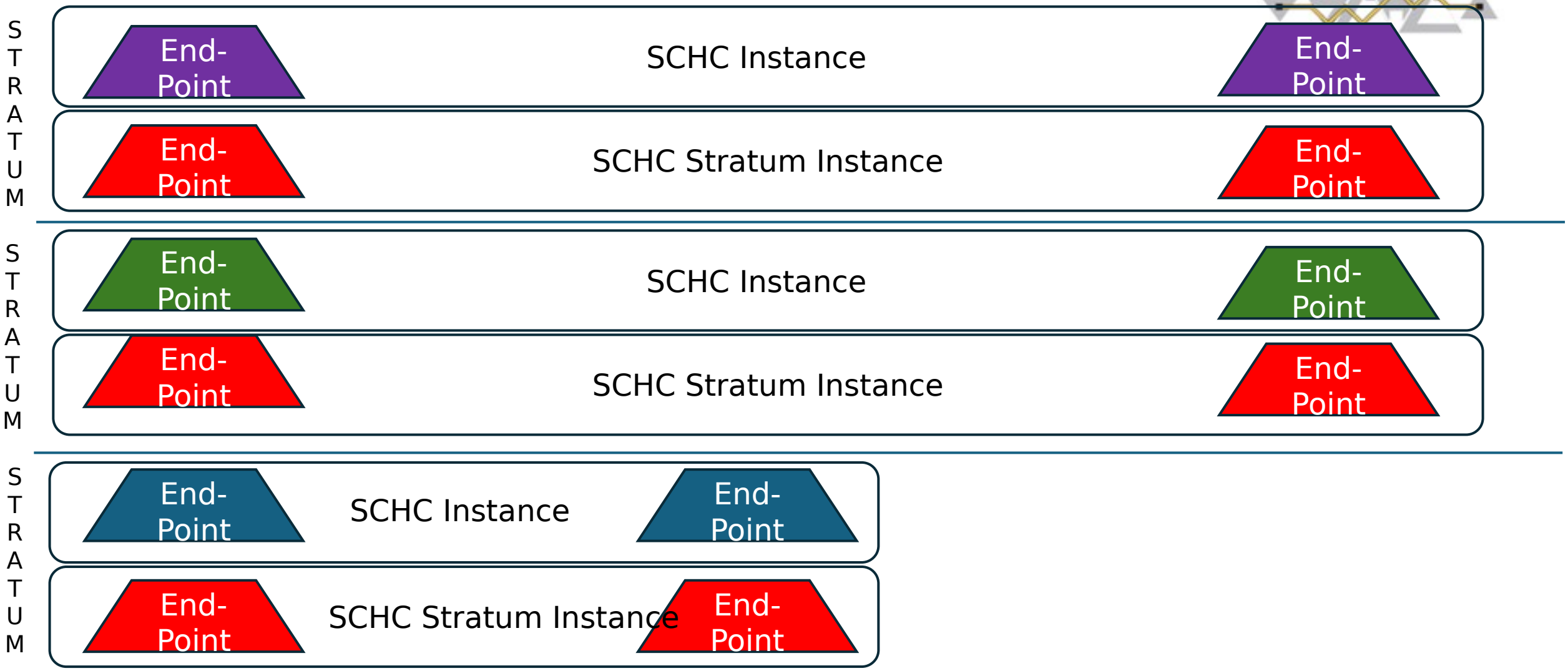
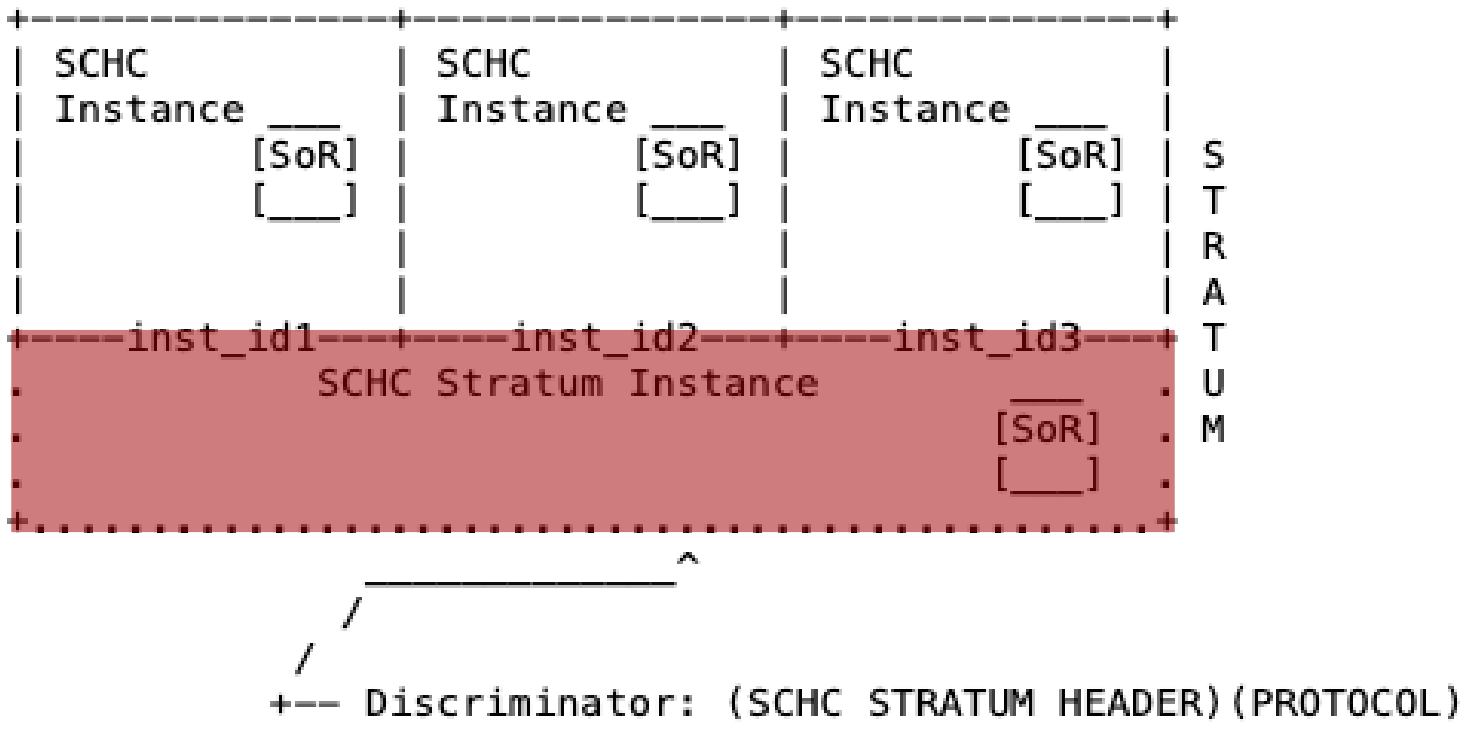
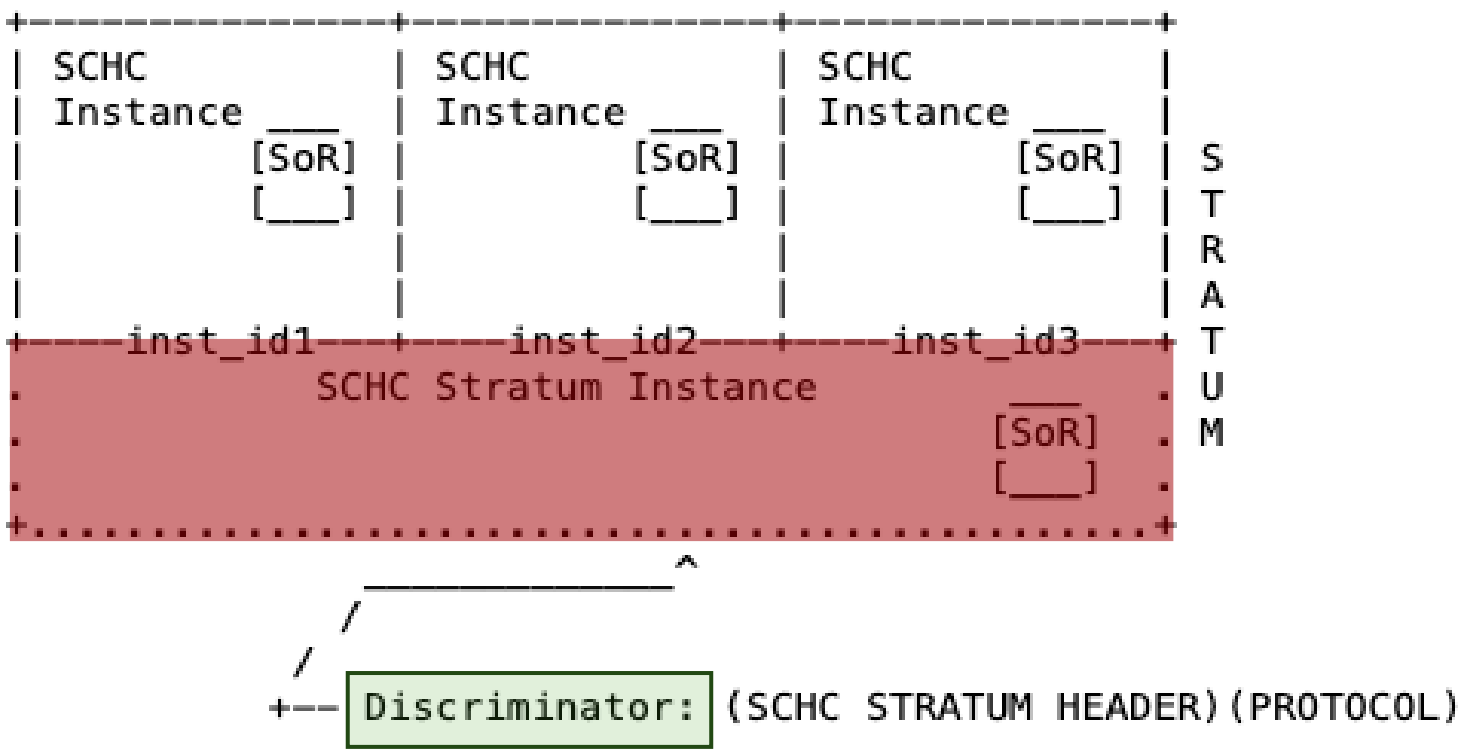
SCHC Architecture



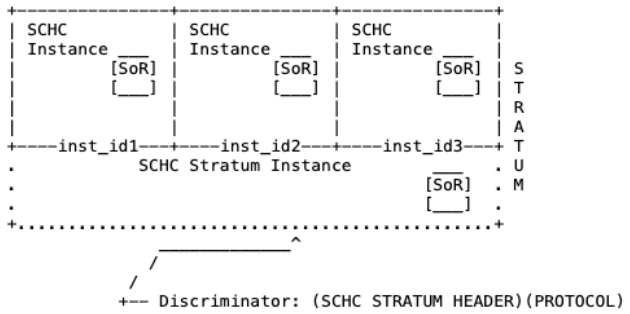
Architecture



Architecture



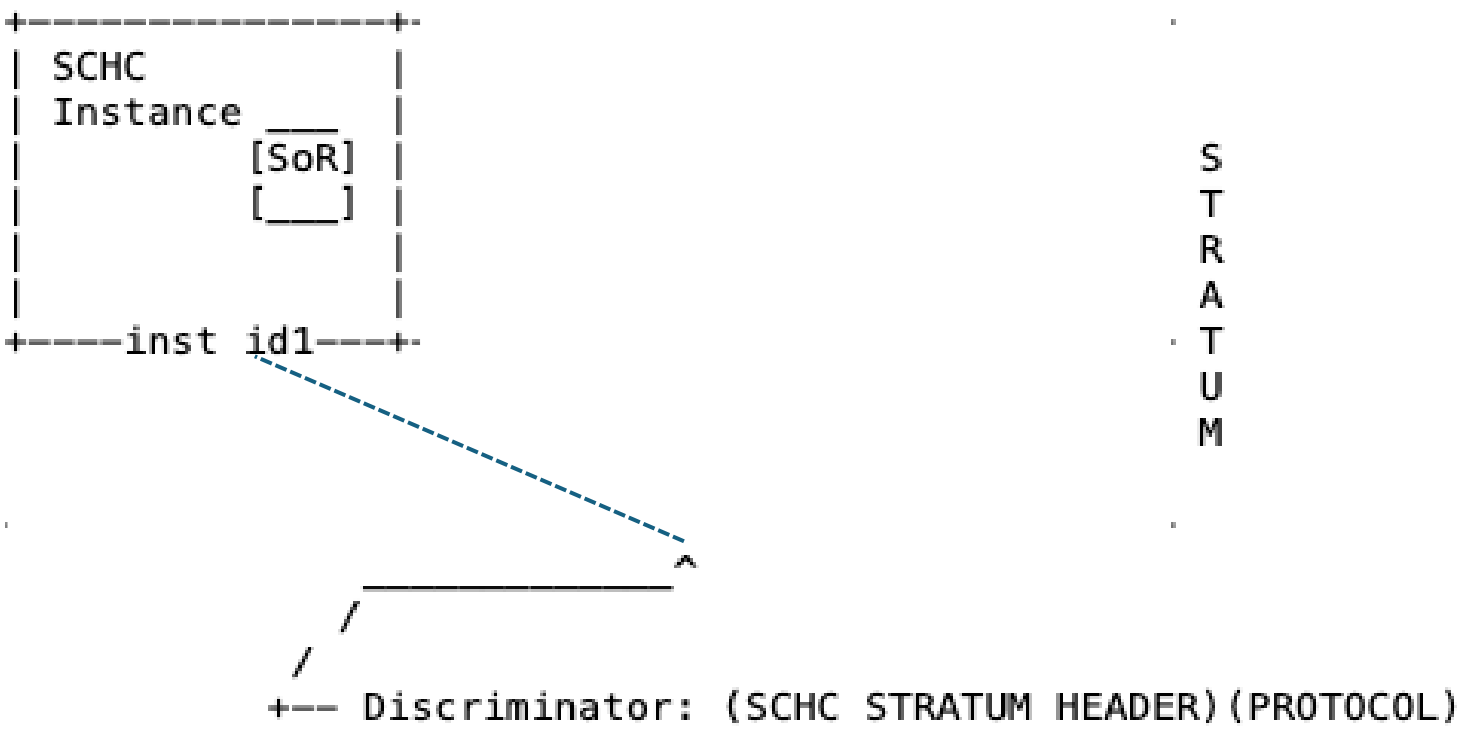
Terminology



- **Discriminator**: information present <u>outside</u> of the SCHC packet allowing to identify a SCHC Stratum. It can be, non-exhaustively:
  - the ID of the interface, VLAN, SSID, or PPP session
  - A source and destination MAC or IP addresses of the packet carrying SCHC packets
  - A source and destination port number of the transport layer carrying SCHC packets
  - A next header field
  - An MPLS label
  - A TLS Association
  - Any other kind of connection id.
  - **...**

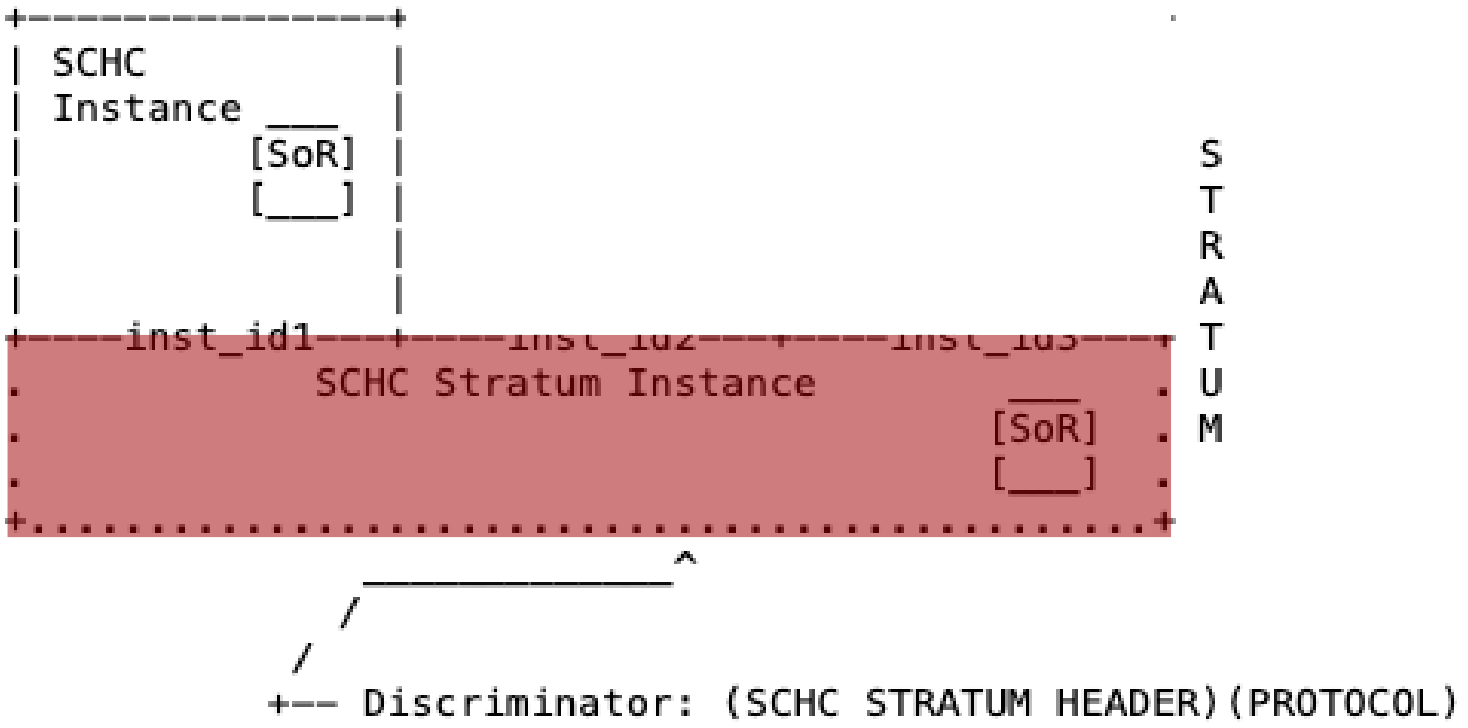
In the LPWAN environment (RFC 8724), the Discriminator was not explicitly defined, but referred as a tunnel.

Stratum – SCHC Stratum Instance



- No SoR => Empty

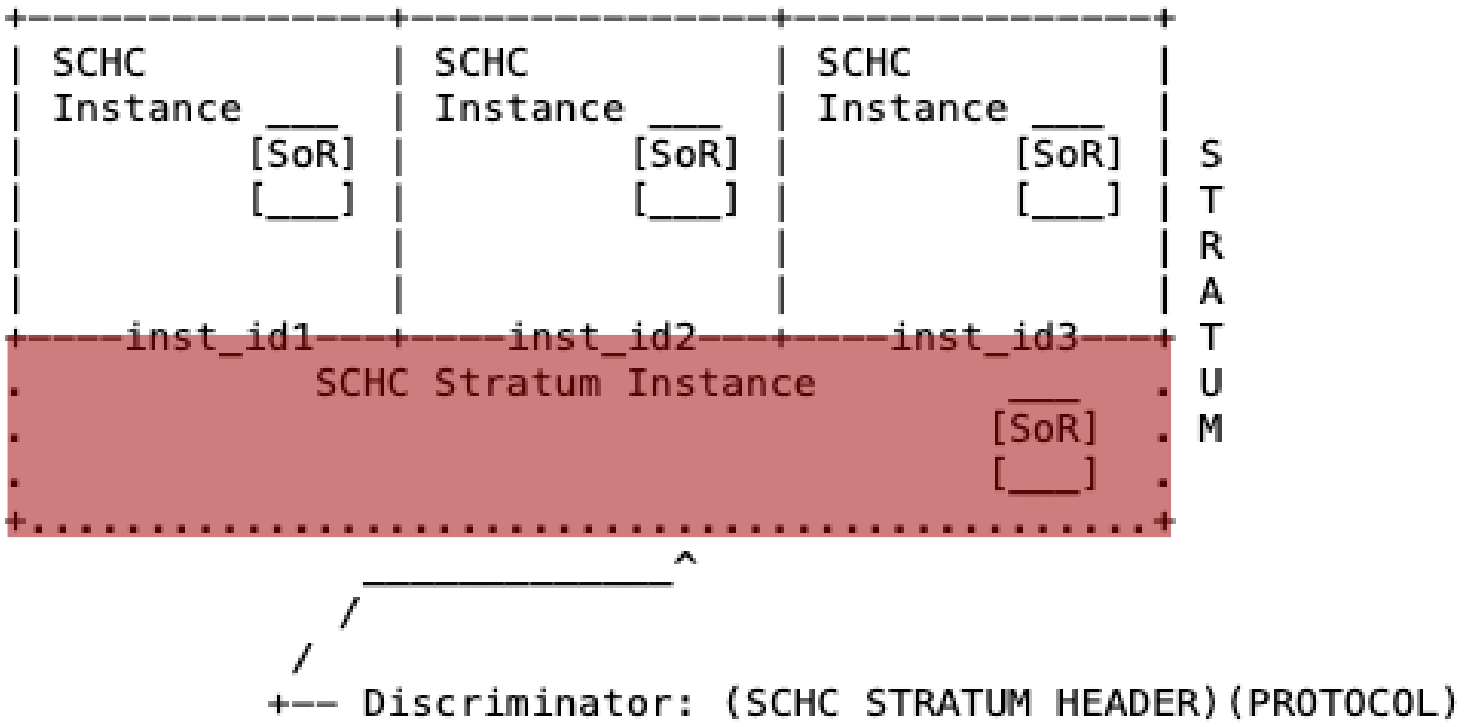
Stratum – SCHC Stratum Instance

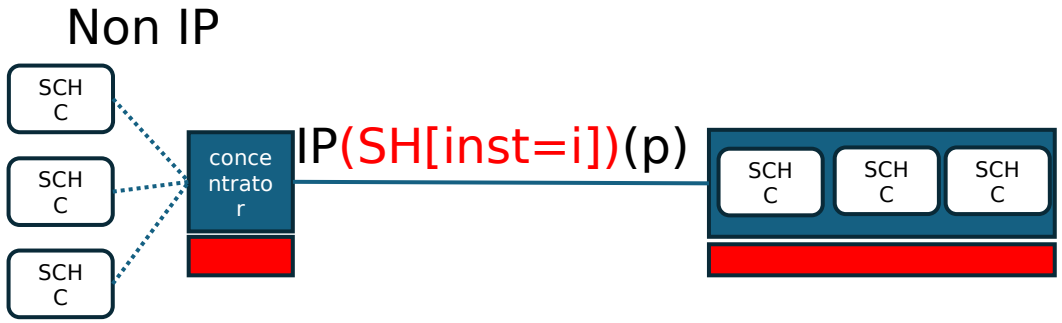


- 1 rule => Rule ID not needed
-

FID	FL	POS	DI	TV	MO	CDA
SCHC.proto	8	1	Bi	value	equal	not-sent

Stratum – SCHC Stratum Instance





Or

-

FID	FL	POS	DI	TV	MO	CDA
SCHC.ins_id	10	1	Bi	0x00	MSB(7)	LSB
SCHC.proto	8	1	Bi	value	equal	not-sent
SCHC.CRC	8	1	Bi		ignore	value-sent

Terminology

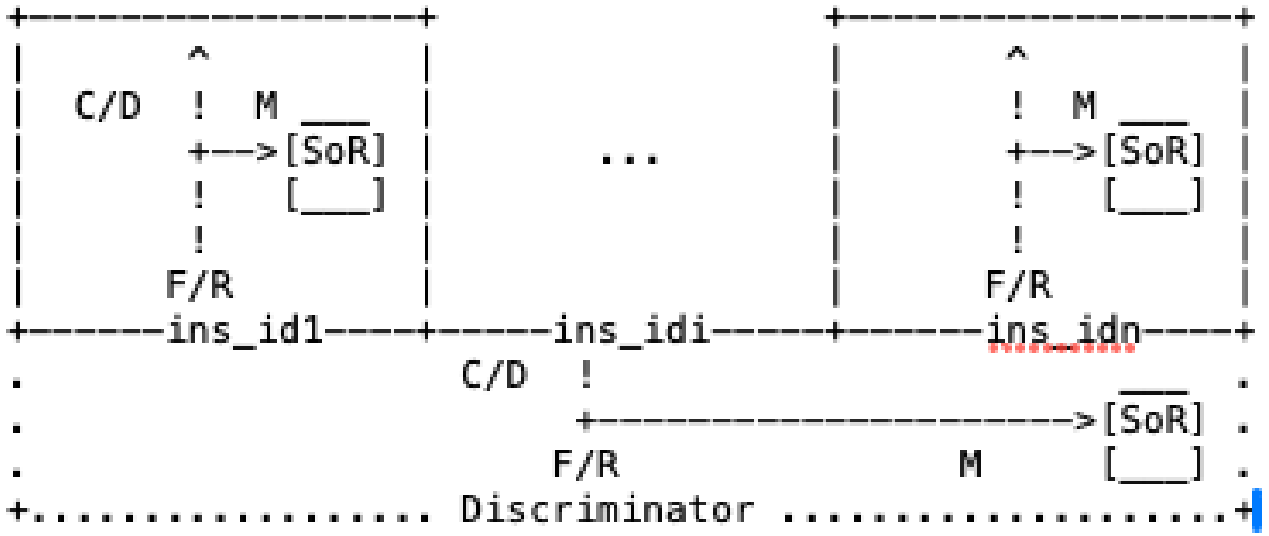
- **SCHC Stratum**: the fundamental block for the SCHC mechanism; can be stacked at different locations in the network
- **SCHC Stratum instance**: a SCHC instance used to carry some specific information for the control of the upper SCHC instances in the Stratum. This can include in a non exhaustive manner:
  - a CRC,
  - a protocol identifier,
  - an instance ID,....

  The SCHC stratum instance may be empty.
- **SCHC Stratum header**: Fields defined in this Stratum Instance.

Management

Management

- Add a dedicated rule nature for management (M)
  - Compression rules for IPv6/UDP/CoAP/CORECONF
- Only these rules can modify their own SoR
  - Need for Access Control draft



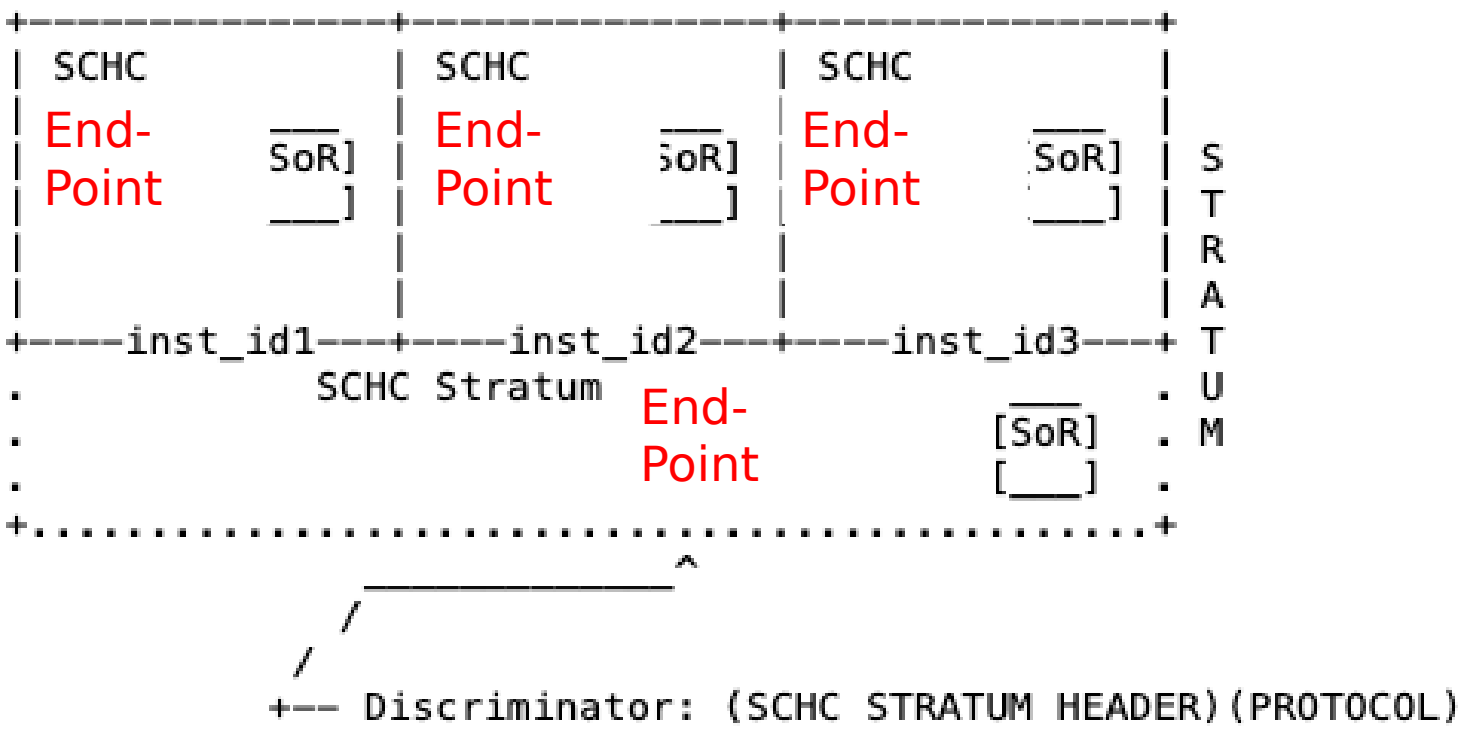
Next Topics

- Rule Provisioning and naming
- Global Action on rules:
  - Proxy ping
    - Removed Section from OAM draft
  - Flow Management (TCP compression, …)
    - draft-minaburo-schc-flow-compression
- …

Questions?

Thank you

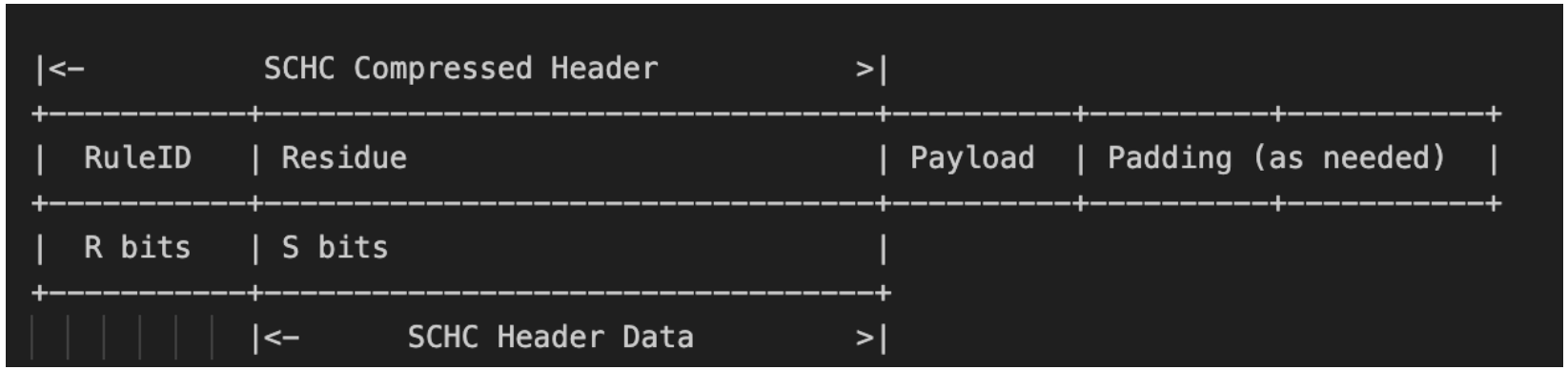
Architecture



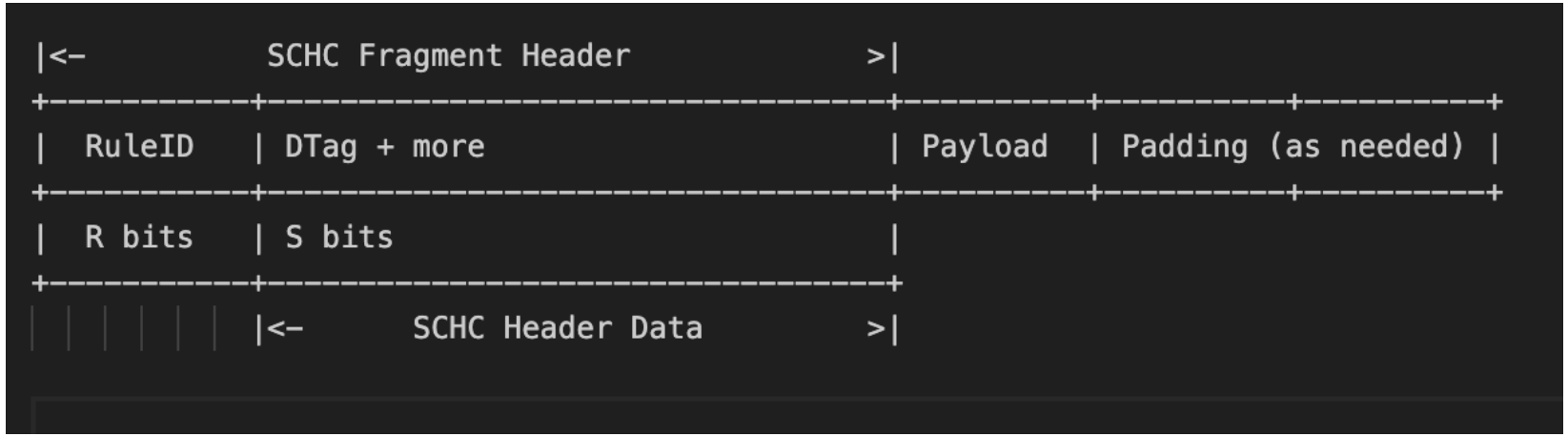
On naming headers

be 0)

This is only old stuff – no new stuff here

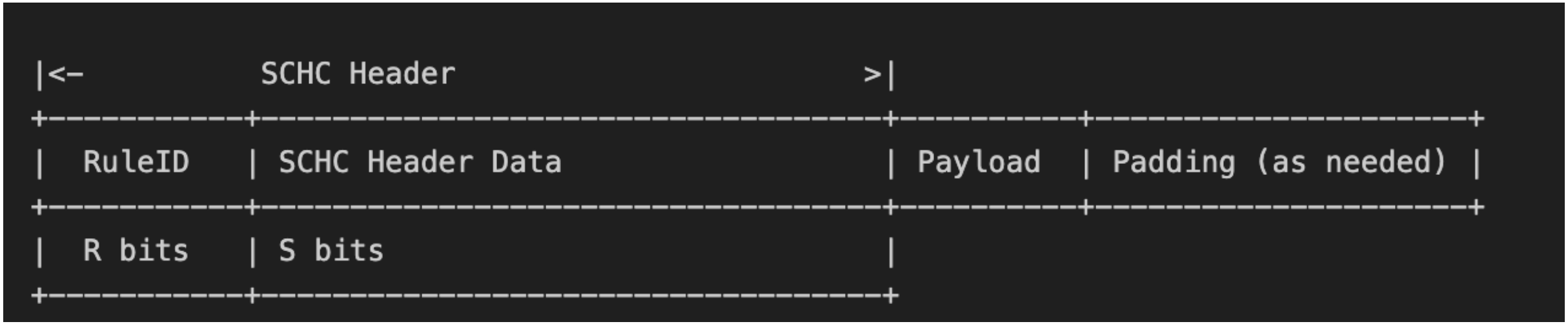


SCHC Compressed Header



SCHC Fragment Header
(there are many sub-types, e.g. Ack, All-

Definition: SCHC Header (and its format)



Covers both existing types from RFC8724:
SCHC Compressed Header (RFC8724)
SCHC Fragment Header (RFC8724)

Definitions
Packet and Fragment are from RFC8724

- **SCHC Packet.** The output bitstream resulting from the application of SCHC Compression to an input bitstream. It includes the SCHC-compressed data and any necessary metadata for decompression.

- **SCHC Fragment.** The output bitstream resulting from the application of SCHC Fragmentation to an input bitstream. It includes the SCHC-fragmented data and any necessary metadata for reassembly.

- **SCHC Transmission Unit (STU).** A common term for both "SCHC Packet" and "SCHC Fragment". It is the packet resulting from the application of SCHC Compression and/or Fragmentation to a network packet. It includes the SCHC-compressed and/or SCHC-fragmented data and any necessary metadata for decompression and/or reassembly.

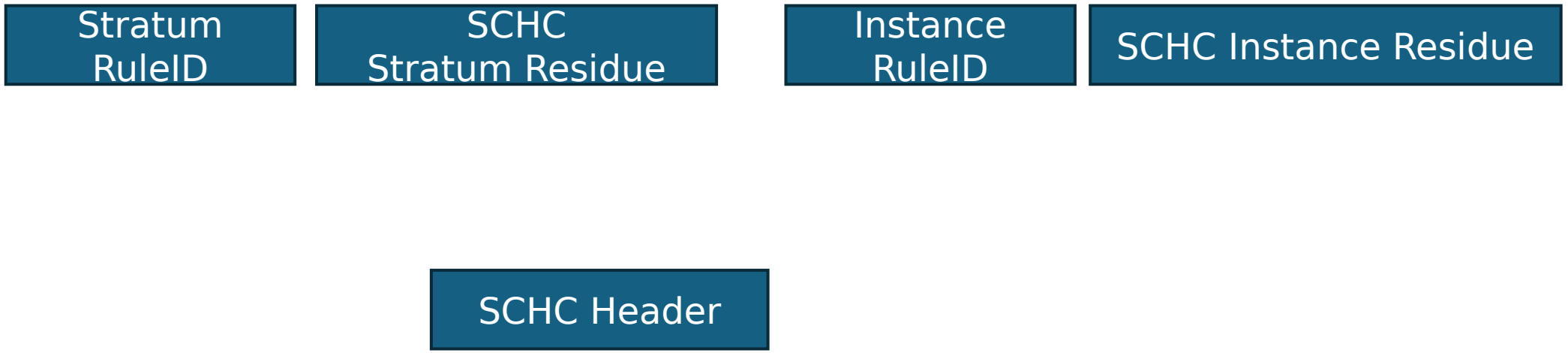
(STU pronounced as STEW, e.g. thick soup: https://en.wikipedia.org/wiki/Stew

Definitions related to stratum

- **(proposition de definition)** *SCHC Stratum.*
  The domain of operation of one or more related SCHC Instances and the necessary mechanisms for their co-existence and operation.

Definitions related to stratum

- **SCHC Stratum Instance.** A dedicated SCHC Instance used to carry some specific information necessary for the operation of the SCHC Stratum, such as which SCHC End-Point should process the data, CRC, etc.
- **SCHC Stratum Header.** An abstract protocol header that is utilized for the operation of the SCHC Stratum. It is abstract in the sense that it is never sent over the wire as-is - SCHC Compression is applied and the SCHC Stratum Residue is sent.
- **SCHC Stratum Residue.** The remaining data after applying SCHC Compression to the SCHC Stratum Header. It represents the bits that get sent over the wire. Note that in a majority of LPWAN cases, the SCHC Stratum Residue is empty.

SCHC Header and SCHC Stratum option A

SCHC Header and SCHC Stratum option B