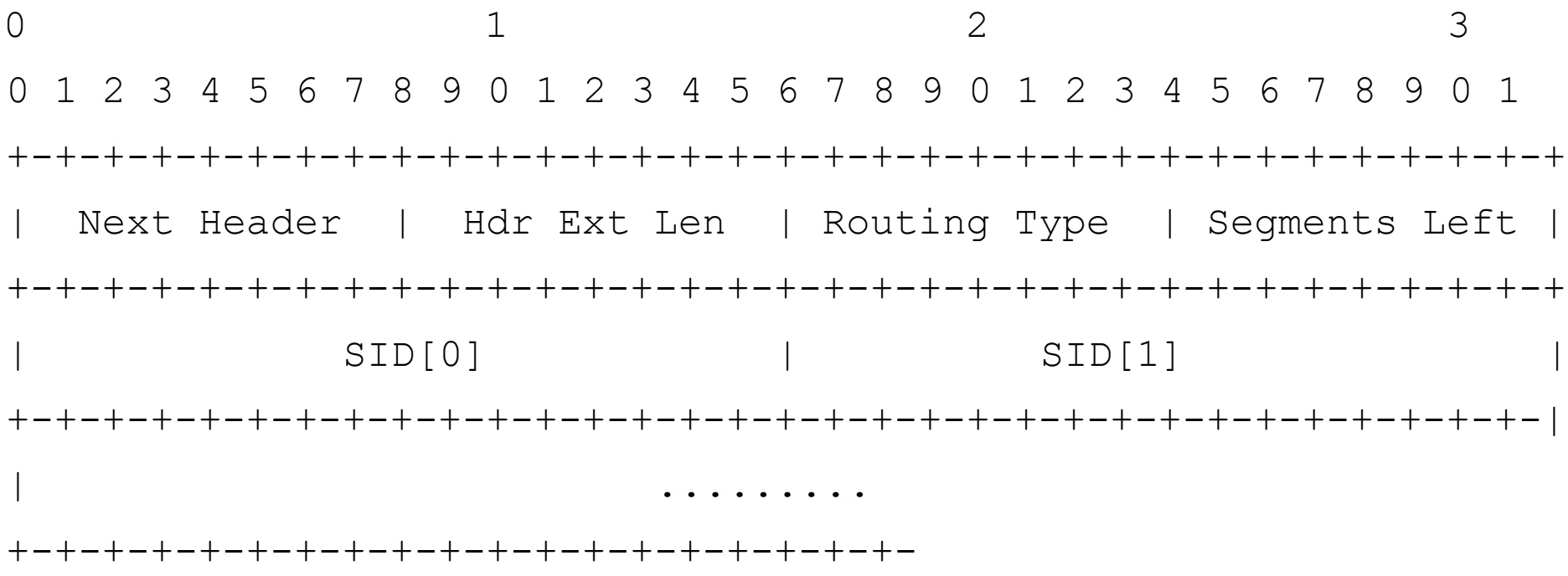
The IPv6 Compressed Routing Header (CRH)

Draft-bonica-6man-comp-rtg-hdr

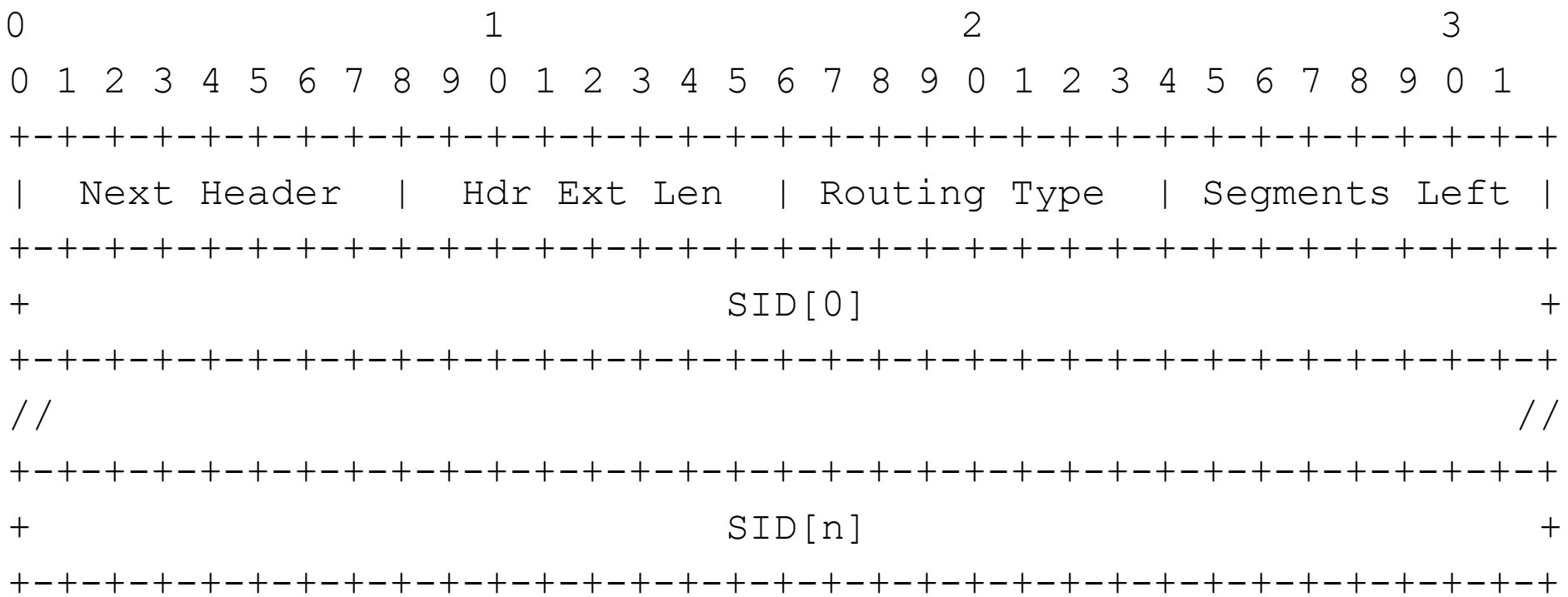
Remembering RH0

- General purpose Routing header
  - Defined in RFC 1883 and deprecated in RFC 5095
- Contained a list of nodes to be visited on route to the packet's ultimate destination
  - Each node identified by an IPv6 address
- Issues
  - Extension header length
  - Security (cause for deprecation)
- IPv6 Compressed Routing Header (CRH) addresses these issues
  - 16 and 32-bit versions

Packet Format: CRH-16



Packet Format: CRH-32



Differences between RH0 and CRH

- Security recommendation
  - Filter at network edge
- Contains a list of Segment Identifiers (SIDs) instead of a list of IPv6 addresses
- SIDs are listed in reverse order
  - So the Segments Left field can be used as an index into the SID list

Segment Identifiers (SID) and FIB Entries

- Each SID identifies a FIB entry
- A FIB entry contains all information required to forward the packet
  - An IPv6 address
  - A forwarding method and its optional parameters
- Forwarding methods examples
  - Forward through the least-cost path
  - Forward through a specified interface

The FIB

- Can be populated by an operator, using CLI
- Can be populated by a controller, using PCEP or NETCONF
- Can be populated by a distributed routing protocol (IS-IS, OSPF)

Compression Strategy

- Indirection
  - A short SID represents a long FIB entry
  - The FIB entry contains all information required to forward the packet
- Benefits
  - No restriction on FIB entry length
  - Therefore, forwarding behavior can be robust
    - No need for special numbering plans
    - Compare to SR uSID proposal et al.
- Cost
  - One additional lookup
  - However, even with the additional lookup, line speed forwarding has been demonstrated

Independence From Segment Routing

- The CRH is a generic IPv6 feature
- While it is available for use by SR, it is also available for use by non-SR applications
- Many operators who have expressed interest in CRH
  - Are not interested in SR service instructions
  - Are not interested in the SR control plane
  - Are averse to encoding instructions in an IPv6 addresses
  - Are averse to deploying the OAM extensions required when instructions are encoded in IPv6 addresses

Why Two CRH Versions?

- 16-bit version
  - Best Compression
  - FIB can contain 65K entries
  - Sufficient for most networks (up to 60K routers)
- 32-bit version
  - Good compression
  - Required for networks containing more than 60K routers
  - May be required more in the future

Implementation Experience

- LINUX-based implementation available
  - CRH-16 only
- ASIC-based implementation available
  - CRH-16 only
- One experimental deployment
- Under evaluation by many network operators

Next Steps

- Call for WG Adoption