RObust Header Compression WG (ROHC)

63rd IETF
Paris, France, August 1, 2005

Chairs:

Carsten Bormann <cabo@tzi.org>
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We assume people have read the drafts

Meetings serve to advance difficult issues by making good use of face-to-face communications

Be aware of the IPR principles, according to RFC 3979

ü Blue sheets
ü Scribe(s)

63rd IETF: ROHC WG Agenda

16:30 - Chair admonishments and agenda	**Jonsson (5)**
16:35 - WG and document status update	**Jonsson (10)**
16:45 - SigComp work, status and future	**West (20)**
17:05 - ROHC TCP & Formal Notation	**chairs (5)**
17:10 - HC over IPsec Security Associations	**Ertekin (20)**
17:30 - HC over MPLS (AVT work item)	**Ash (15)**
17:05 - ROHC RTP, time for a second version?	**Jonsson (15)**

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Document status update, 1(3)

Old

- **RFC 3095: Framework and four profiles** (was: draft-ietf-rohc-rtp-09.txt)
- **RFC 3096: RTP requirements** (was: draft-ietf-rohc-rtp-requirements-05.txt)
- **RFC 3241: ROHC over PPP** (was: draft-ietf-rohc-over-ppp-04.txt)
- **RFC 3242: LLA RTP** (was: draft-ietf-rohc-rtp-lla-03.txt)
- **RFC 3243: 0-byte RTP req's** (was: draft-ietf-rohc-rtp-0-byte-requirements-02.txt)
- **RFC 3320: SigComp** (was: draft-ietf-rohc-sigcomp-07.txt)
- **RFC 3321: SigComp extended** (was: draft-ietf-rohc-sigcomp-extended-04.txt)
- **RFC 3322: SigComp Req.** (was: draft-ietf-rohc-signaling-req-assump-06.txt)
- **RFC 3408: LLA R-mode** (was: draft-ietf-rohc-rtp-lla-r-mode-03.txt)
- **RFC 3409: ROHC RTP LLG** (was: draft-ietf-rohc-rtp-lower-guidelines-03.txt)
- **RFC 3759: ROHC Terminology & channel mapping examples**
- **RFC 3816: Definitions of managed objects for ROHC**
- **RFC 3843: A ROHC profile for IP** (was: draft-ietf-rohc-ip-only-05.txt)

Document status update, 2(3)

New RFCs since IETF 61

- **RFC 4019: Profiles for User Datagram Protocol (UDP) Lite (PS)**
- **RFC 4077: A Negative Acknowledgement Mechanism for Signaling Compression (PS)**

In RFC editor queue

- **draft-ietf-rohc-context-replication-06.txt (Proposed Standard)**
- **draft-ietf-rohc-tcp-requirements-08.txt (Informational)**
- **draft-ietf-rohc-over-reordering-03.txt (Informational)**

Approved, announcement to be sent

- **draft-ietf-rohc-tcp-field-behavior-04.txt (Informational)**

Document status update, 3(3)

Submitted to IESG

- **None!**

Passed WGLC

- **draft-ietf-rohc-rfc3242bis-00.txt (Proposed Standard)**

Current WG documents

- **RTP/Framework, 2 drafts (impl.guide, interop.status)**
- **TCP profile, 2 drafts (profile, notation)**
- **SigComp, 4 drafts (sigcomp-sip, impl./user guide, torture tests)**

Open Milestones (from WG charter page)

Apr 05

- **Problem analysis ROHC-over-channels-that-can-reorder-packets submitted to IESG for publication as Informational. DONE!!!**

May 05

- **I-Ds of ROHC IP/UDP/RTP bis, framework and profiles separated. Redefine?**

Sep 05

- **ROHC framework submitted to IESG for publication as Draft Standard.**

Sep 05

- **IP/TCP compression scheme submitted to IESG for publication as Proposed Standard. On track (in WGLC)!**

Nov 05

- **ROHC IP/UDP/RTP schemes submitted to IESG for publication as Draft Standard. Redefine?**

Dec 05

- **Possible recharter of WG to develop additional compression schemes**

WG Status, Goals and Milestones

Focus has been on ROHC TCP, now we can start looking at ROHC RTP again, taking into account new targets for ROHC RTP, as well as new requirements

Milestones may have to be revised based on new strategies for ROHC RTP

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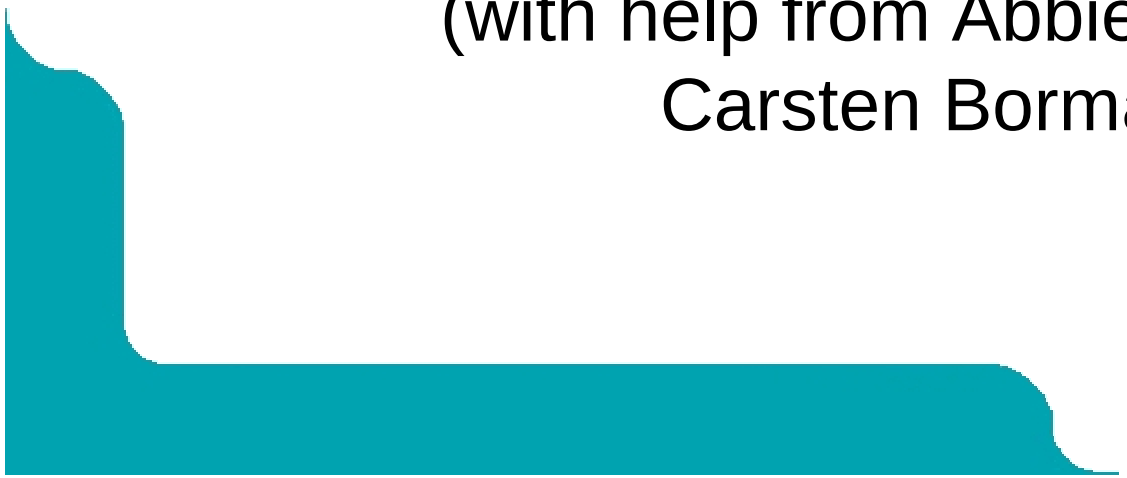
SigComp Status

Mark West

(with help from Abbie Surtees &
Carsten Bormann)



“Torture Tests”

- `draft-ietf-rohc-sigcomp-torture-tests-01.txt`
- What are they?
  - A set of tests for UDVM instructions
  - Test correct behaviour and many, if not all, boundary and corner cases
  - Useful starting point for verifying UDVM…

“Torture Tests”

- Most recent changes:
  - Added extra documentation / annotation of tests
    - To make understanding the tests and debugging easier
  - Changed / added some tests
    - Made COPY tests more detailed
    - Expanded state manipulation tests (e.g. wrong ID length, clashing partial hashes)
    - Remove unnecessary code from input-beyond-end-of-message test
    - Added an ‘infinite loop’ test
      - A compliant implementation may not stop on *exactly* the ‘correct’ cycle count…
        … but it has to stop sometime!

“Torture Tests”

- Recent changes have been fairly minor
  - Some extensions
  - Largely tidying-up and expanding descriptions
- Document has benefitted from additional tests; changes to improve the document; and review (thanks to Pekka and Cristian)
- We believe that this document is stable and ready to ship…

“Users’ Guide”

- `draft-ietf-rohc-sigcomp-user-guide-02.txt`
- What is it?
  - Describes a mnemonic-code for translation to byte-code
    - To simplify writing SigComp code
  - Shows various decompressors implemented in mnemonic-code
  - Shows how to do most of the common things that SigComp programmers should know

“Users’ Guide”

- Most recent changes:
  - Added a “readonly” directive in the mnemonic-code
    - Allows a coder to specify a read-only / read-write block
    - Useful for constraining choices in translation to bytecode
    - Not signalled to, nor binding on the UDVM
    - Possibly still some questions surrounding this?
      - There’s been no feedback on the proposed solution
  - Drastically simplified the “shared-mode” example
    - The previous code had never been run
    - We’ve done shared-mode, but not like it was shown in the users’ guide

“Users’ Guide”

- Assuming that we are happy with the directives
  - Are we?
  - And how concerned do we need to be about standardising these?
    - It’s not an interoperability issue…
- The guide has been around a while with no major changes
- We believe that the document is stable and ready to ship…

“Implementers’ Guide”

- `draft-ietf-rohc-sigcomp-impl-guide-05.txt`
- What is it?
  - A clarification of issues that have arisen since RFC 3320 was published
  - Things that implementers should be aware of…

“Implementers’ Guide”

- Most recent changes:
  - Added a clarification of the stack handling rules
  - Clarified when references are de-referenced in MULTILOAD

“Implementers’ Guide”

- Has been stable for a while
- But we did find the clarification of stack-handling recently
  - Which only affects the case where stack_fill is 65,535…
- … and MULTILOAD references
- Might be nice to keep this draft open
  - For example, to capture NACK implementation experience
    - Are we planning on having any NACK implementation experience..?

“SigComp for SIP”

- `draft-ietf-rohc-sigcomp-sip-01.txt [EXPIRED]`
- What was it?
  - RFC 3486 discusses the SIP-level aspects of using SigComp (e.g. negotiation)
  - This draft discusses the SigComp-level aspects, e.g.
    - Minimum SMS / DMS values
    - Locally available state items
    - ~~SigComp multiplexing~~
    - Compartment mapping

“SigComp for SIP”

- An update was planned (some time ago)
- Most of the document is (fairly) trivial
- Compartment mapping is non-trivial…

Compartment mapping

- Dialog
  - Good: state is relatively short-lived (server doesn't keep lots of state for idle hosts)
  - Bad: state is relatively short-lived (server doesn't keep useful state for active hosts)
  - Also, with caveats, good for interleaved dialogs (can this happen?!)

Compartment mapping

- Registration
  - Good: state is relatively long-lived (server has useful state for active hosts)
  - Bad: state is relatively long-lived (server keeps lots of state for idle hosts)
  - Requires large SMS to handle, e.g., interleaved dialogs
  - NACK can reduce the long-lived state / idle host problem (where available)

“SigComp for SIP”

- What’s the way forward?

RFC 3320

- Base spec., published Jan 2003
- Has been one interoperability test (Feb. 2003)
  - Tested SigComp with “Dummy Application Protocol”
  - No interop. testing of SIP over SigComp (so far as I am aware)
- However, spec seems to be stable
  - Few issues found
- What next..?

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Header Compression over IPsec (HCoIPsec)

<draft-ietf-ertekin-rqts-hcoipsec-01.txt>

63rd IETF

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Outline

- Motivation
- Concept of HCoIPsec
- Framework for Solution
- Open Issues

Motivation for HCoIPsec

- **IPsec [2401bis] mechanisms provide various security services for IP-based networks**

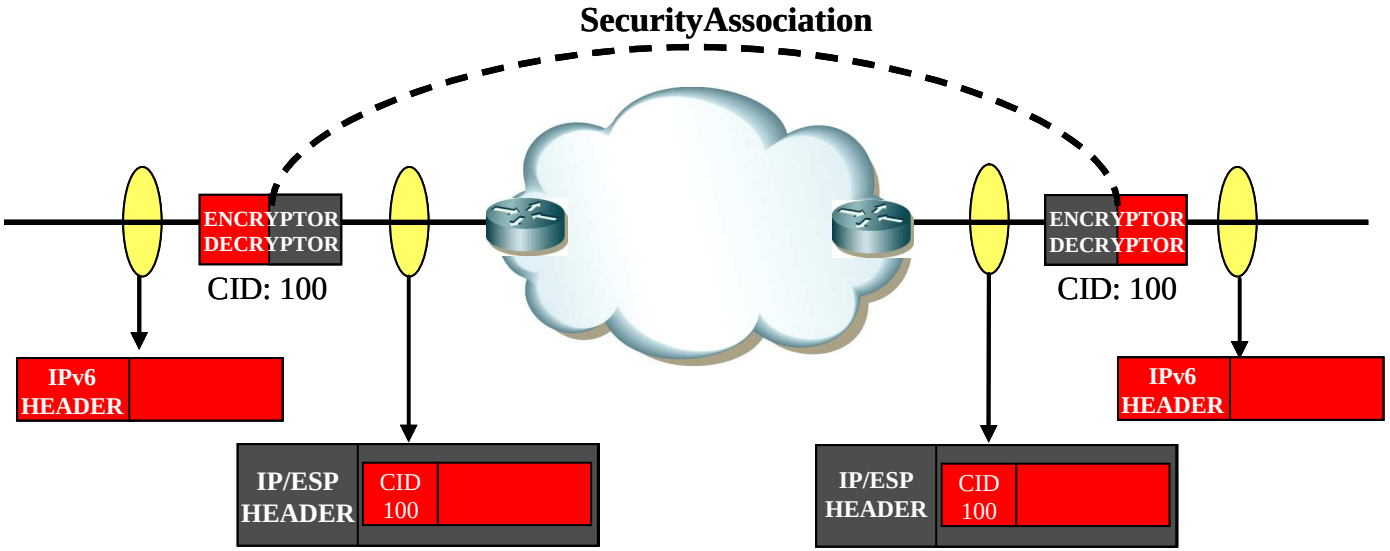
- **The benefits of IPsec mechanisms may come at the cost of increased overhead emanated into the network**
  - Traffic flow confidentiality requires the tunneling of IP packets between the encryption/decryption devices
    - Concept of IPsec tunnels are employed to mask the source-destination patterns that an intruder may ascertain, but the benefit comes at the cost of extra per-packet overhead

- **After the inner packet headers are encrypted, intermediary network nodes between encryption/decryption devices do not have access into the inner headers**

- ***Therefore, a mechanism which provides header compression functionality at an encryption device would be beneficial***
  - ***This concept we refer to as HCoIPsec***

Concept of HCoIPsec

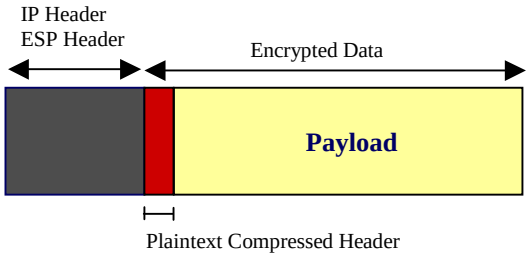
- **Approach to reduce the overhead associated with IPsec tunnels is to leverage the existing hop-by-hop HC algorithms**
  - However, IPsec security gateways may have multiple intermediary hops between encryption and decryption devices



- **An IPsec tunnel between two encryption devices provides source-destination association to which HC can be applied**
  - Allows traditional hop-by-hop HC to be extended to operate between tunnel endpoints

Concept of HCoIPsec

- **The envisioned procedure for HC on an encryption device is summarized as follows:**
  1) Receive packet on incoming interface
  2) Compress plaintext headers of the received packet
  3) Encrypt the packet with the compressed header
  4) Append the outer (ESP/IP) header to the encrypted packet
  5) Transmit the packet



- **Upon reception of an ESP tunneled packet carrying a compressed header, decompressor will**
  1) Remove outer ESP/IP header
  2) Decrypt the packet
  3) Decompress plaintext packet header
  4) Transmit the packet

Framework for Solution

- **draft-ietf-ertekin-rqts-hcoipsec-01.txt details the framework for HCoIPsec**
  - Defines work assumptions, and subsequently work items which need to be addressed to achieve HCoIPsec

- **More specifically, three work items need to be addressed to extend hop-by-hop HC schemes to operate between IPsec SA endpoints**
  - Header Compression Scheme Specific Extensions
    - For example, HC schemes need to be tolerant to increased rates of packet reordering, packet loss
    - ***Work item is addressed by existing drafts/RFCs (e.g., ROHC over Reordering channels)***
  - Initialization and Negotiation of Header Compression Channel
    - Leverage IKEv1 or IKEv2 to negotiate the HC channel parameters during SA establishment
    - ***Work item needs to be addressed***
  - Encapsulation and Identification of Header Compressed Packets
    - Not a significant issue for ROHC, as ROHC packets are self-describing
    - ***Work item needs to be addressed***

- ***These work items are mainly spawned from the need to decouple traditional HC algorithm dependencies on the underlying link layer***

Open Issues #1

- **Q: Can the ROHC uncompressed profile be used to multiplex compressed/uncompressed flows on a ROHC-enabled SA**
  - This may be desirable, as IPsec devices may have limitations on the number of IPsec SAs instantiated

- **Discussion, however, indicates that for inbound traffic to an IPsec device, access control enforcement aspects of IPsec processing may not allow the ROHC uncompressed profile to be used**
  - It was mentioned that “the processing should be the same for all packets which are mapped to an SA”
  - Outbound processing of IPsec traffic, however, is not an issue

- ***Proposed Resolution:*** **We can resort to establishing two SAs**
  - One SA would serve the flows which will and can be compressed
  - Other SA would serve the flows which will not or can not be compressed

Open Issues #2

- **Q: Traffic (de)multiplexing through use of an additional header**
  - Proposed to facilitate the case of ECRTP over IPsec
  - Additional header would, for example, enable identification of compressed packet types (e.g., FULL_HEADER, COMPRESSED_RTP_8, etc.)

- **Discussion on ROHC mailer indicated that this approach**
  - 1) Has the potential to consume too many protocol numbers, and thus may not be acceptable
  - 2) May not work with inbound processing of IPsec encrypted traffic, as nested processing of traffic is an optional feature of IPsec implementations

- **Is this an issue?**

- **It may be noteworthy that this type of packet identification mechanism is also used in ECRTP over MPLS**
  - Similar to the “Packet Type” encoding mechanism

- ***If traffic (de)multiplexing via an additional header is not allowed, a new mechanism may need to be defined for ECRTP over IPsec***

Way Ahead

- **Update the HCoIPsec I-D**
  - Expand on Section 7.0 (example operation) with more detail, clarify any ambiguities
    - Provide more detail on inbound and outbound processing of packets, with more emphasis on how HC and IPsec will operate in conjunction with one another
  - Add new text based on discussions held over the ROHC mailer list

- **Propose HCoIPsec as a ROHC WG charter item**
  - House additional draft for ROHC over IPsec under the ROHC WG

- **Release I-D detailing the extensions to IKE to support HC parameter negotiation**
  - Draft(s) will be coordinated with ROHC WG and IPsec WG (and perhaps the AVT WG)

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Protocol Extensions for Header Compression over MPLS

(draft-ash-avt-hc-over-mpls-protocol-01.txt)

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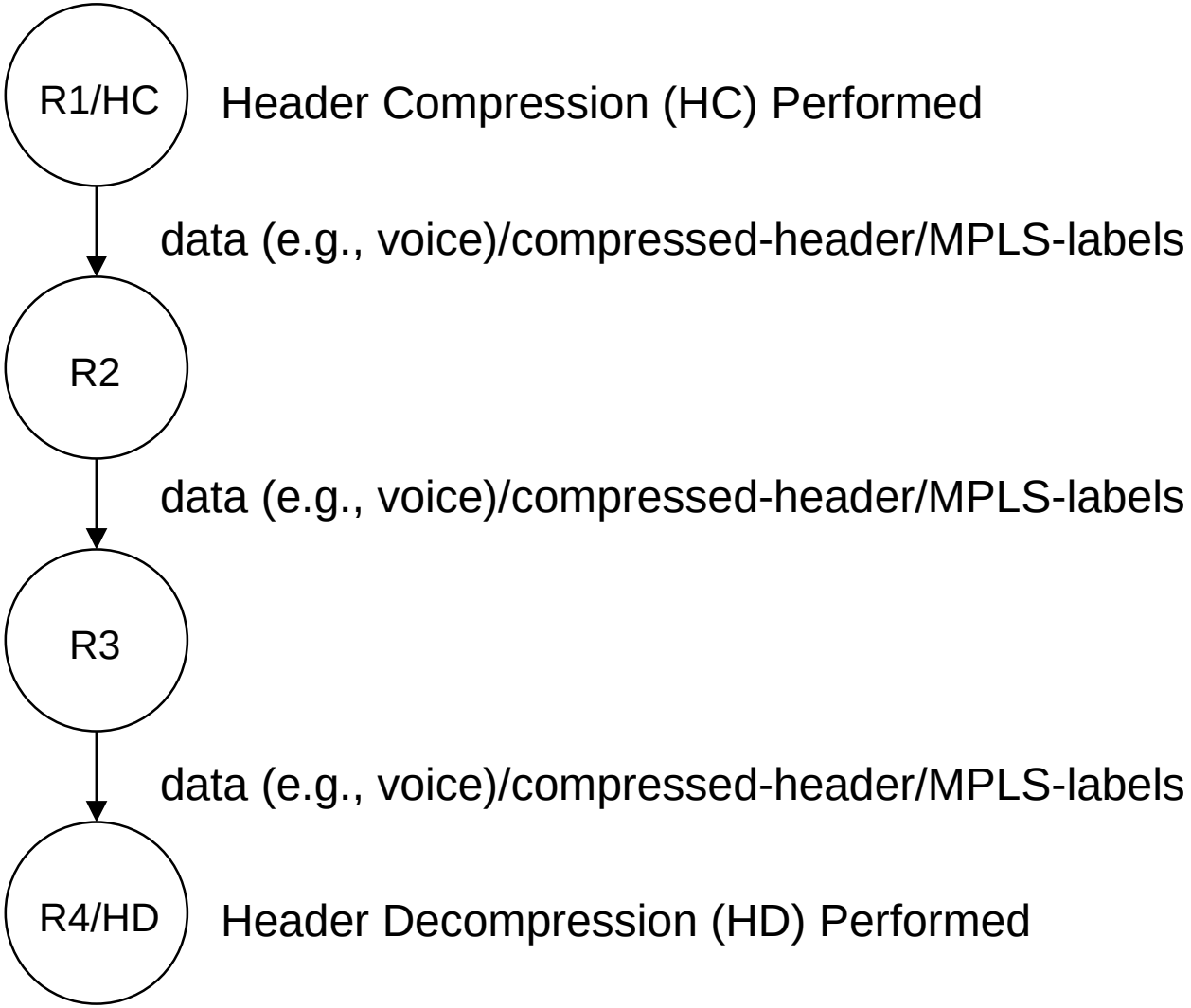
Protocol Extensions for Header Compression over MPLS (draft-ash-avt-hc-over-mpls-protocol-01.txt)

- **Work item & milestone added to AVT charter**
  - Work item: "in collaboration with the MPLS and ROHC WGs, to develop a solution for header compression of RTP across MPLS networks that avoid decompression and compression at each MPLS node”
  - Milestone: “Dec 05 Submit any extensions for RTP HC on MPLS networks for Proposed Standard"
- **Outline**
  - header compression over MPLS concept
  - changes from previous version
  - open issues
  - next steps

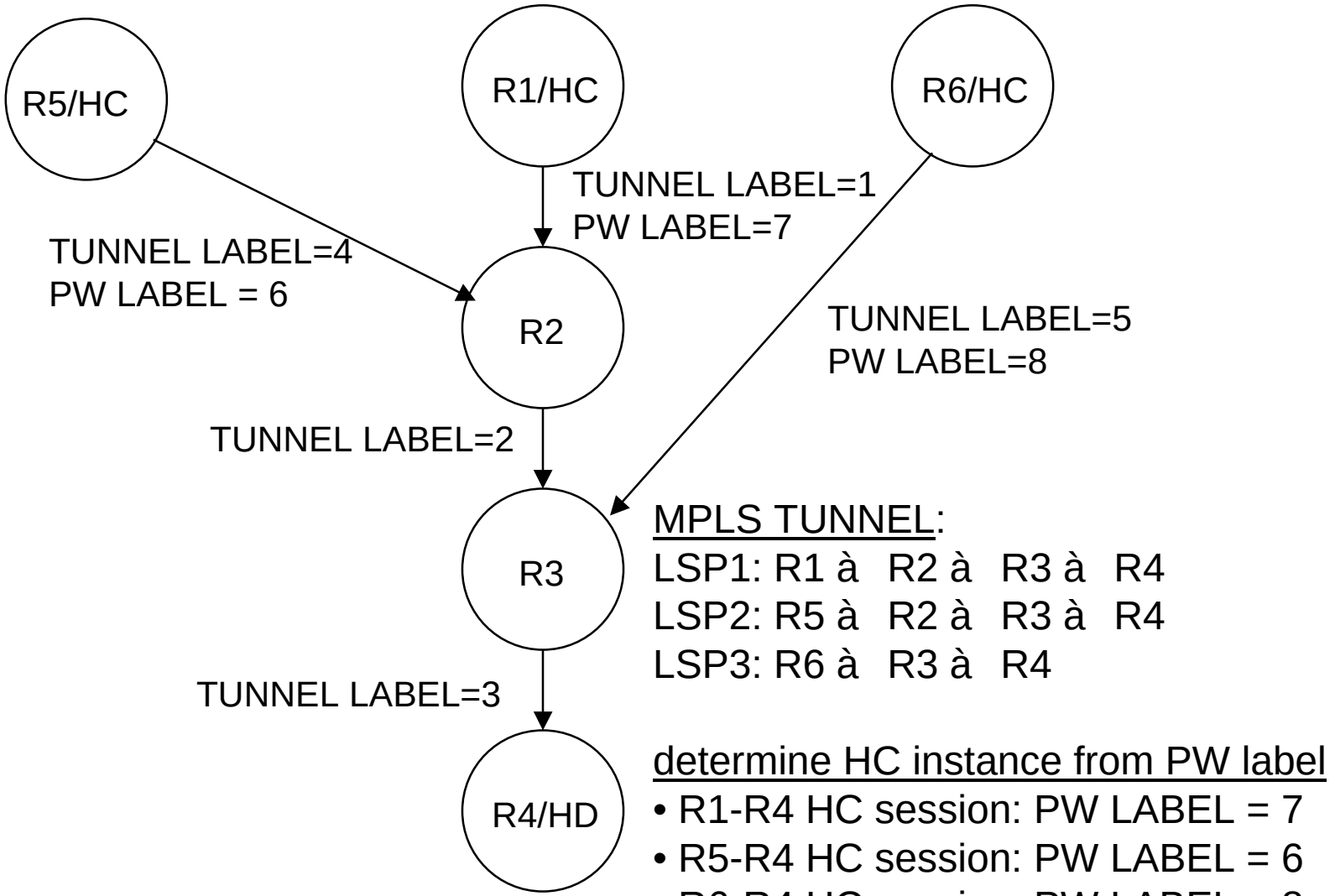
Header Compression over MPLS Concept



Changes from Previous Version (draft-ash-avt-hc-over-mpls-protocol-01.txt)

- use MPLS pseudowires (PWs) to create ‘point-to-point’ sessions between header compressor (HC) & header decompressor (HD)
  - avoids issue of CID collision
  - disadvantage: requires additional 4-byte label with each packet
- Lars-Erik's suggested outline used:
  - Section 2 'Terminology' is added
  - Section 3 'Header Compression over MPLS Protocol Overview' is added
  - Section 4 'Protocol Specifications' is reorganized
- PW setup & HC session configuration covered in Sections 3.1 & 4.1
  - PW Interface Parameters Sub-TLV used to signal HC session setup & HC parameter negotiation
  - Mechanisms analogous to HC-over-PPP [RFC3241, RFC3544]
- encapsulation of HC packets covered in Sections 3.2 and 4.2
- PW type assigned to each HC scheme
  - discussed in Section 4.1 & [IANA] (http://ietf.org/internet-drafts/draft-ietf-pwe3-iana-allocation-11.txt)

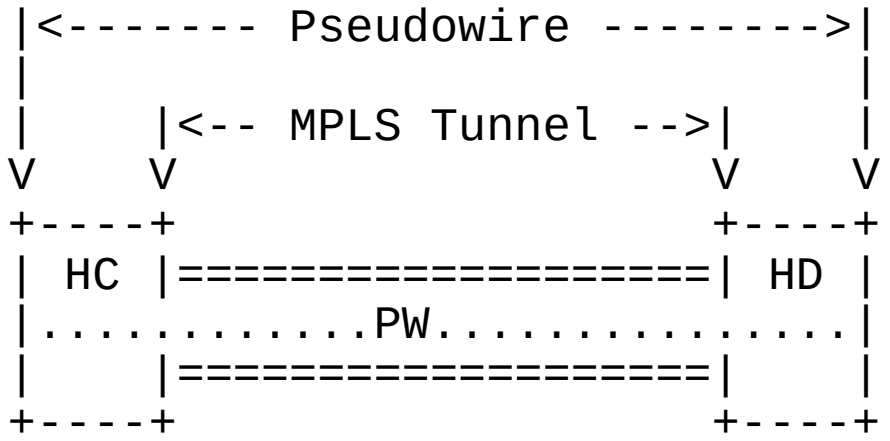
Header Compression over PW/MPLS



PW Setup & HC Session Configuration

(draft-ash-avt-hc-over-mpls-protocol-01.txt)

- PW between HC-HD established using [PW-SIG] signaling procedures
  - 'PW label' used as demultiplexer field by the HD
  - use CID at HD receiver to uniquely identify flow



- PW type indicates HC scheme used on PW [IANA]:
  0x001B cTCP [RFC1144] Transport Header-compressed Packets
  0x001C IPHC [RFC2507] Transport Header-compressed Packets
  0x001D cRTP [RFC2508] Transport Header-compressed Packets
  0x001E ROHC [RFC3095] Transport Header-compressed Packets
  0x001F ECRTP [RFC3545] Transport Header-compressed Packets

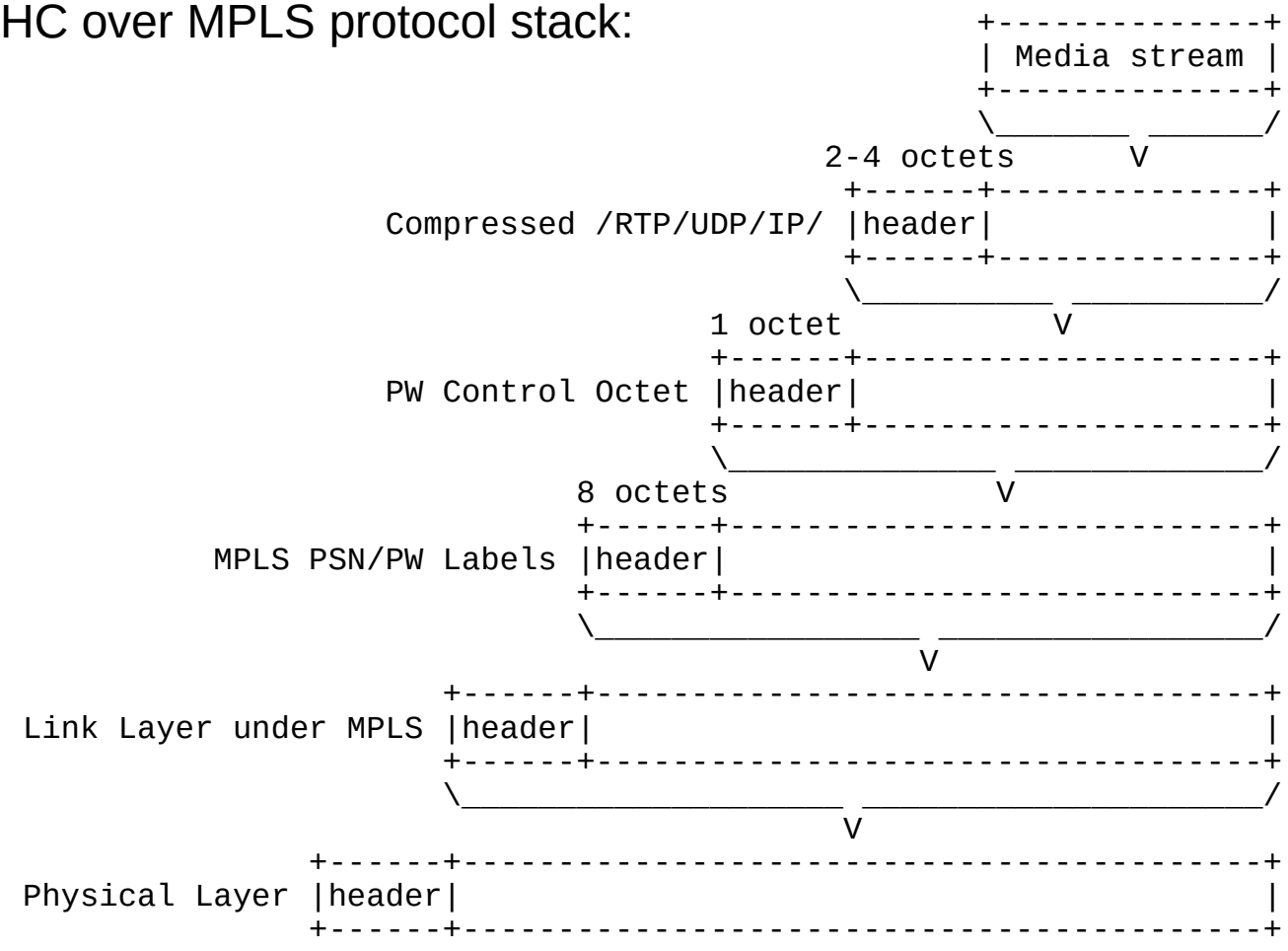
PW Setup & HC Session Configuration

(draft-ash-avt-hc-over-mpls-protocol-01.txt)

- PW/MPLS layer conveys HC session configuration information
  - Interface Parameters Sub-TLV signal HC session setup & HC parameter negotiation
    - [RFC3241, RFC3544] principles & IPCP messages reused to enable PW/MPLS HC session configuration
    - sub-TLV specifies interface parameters & used to configure HC/HD ports at PW edges
- sub-TLV type values for
  - IPv4 network control protocol, IPCP [RFC1332]
  - IPv6 NCP, IPV6CP [RFC2472]
- IPCP/IPV6CP TLVs encapsulated in PW Interface Parameters Sub-TLV
  - used to negotiate HC parameters for their respective protocols
  - IPCP/IPV6CP TLVs supported include
    - Configuration Option Format, RTP-Compression Suboption, Enhanced RTP-Compression Suboption, TCP/non-TCP Compression Suboptions [RFC3544]
    - Configuration Option Format, PROFILES Suboption [RFC3241]

Encapsulation of HC Packets

- existing HC algorithms used to maintain contexts as specified in cTCP [RFC1144], IPHC [RFC2507], cRTP [RFC2508], ROHC [RFC3095], ECRTP [RFC3545]
- route each stream over appropriate PW
  - HC over MPLS protocol stack:



PW Control Octet
(draft-ash-avt-hc-over-mpls-protocol-01.txt)

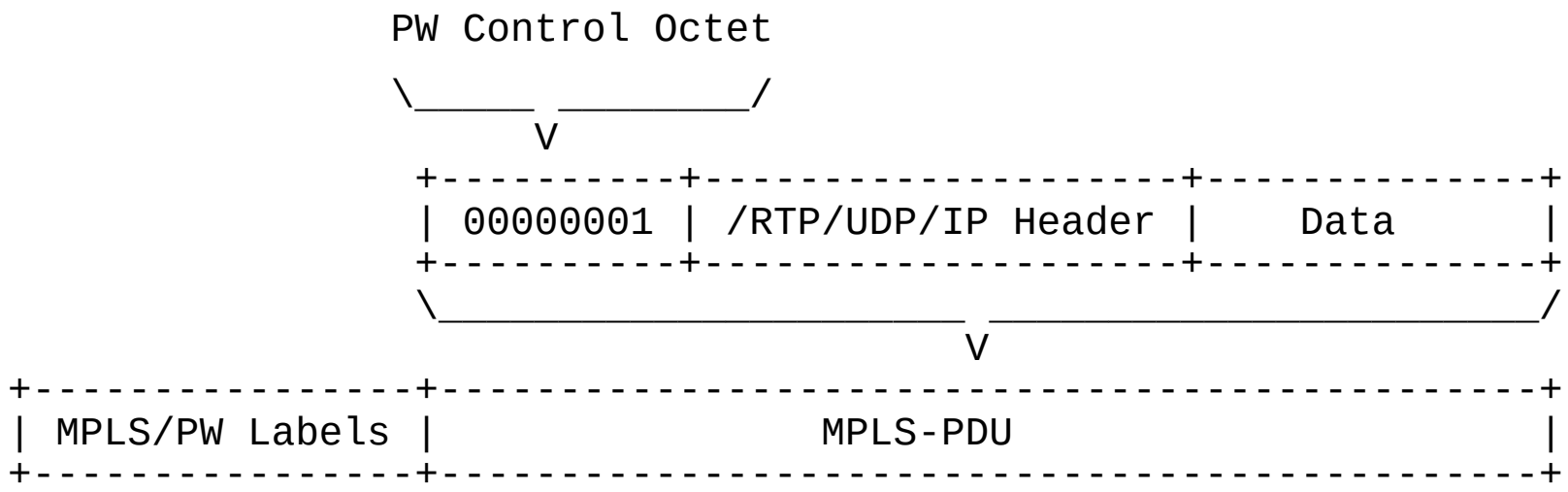
- 1-byte PW Control Octet (extends RFC 3544)

```
0 1 2 3 4 5 6 7 8
+-+-+-+-+-+-+-+-+
|0 0 0 0|Pkt Typ|
+-+-+-+-+-+-+-+-+
"Packet Type" encoding:
0: Reserved            1: FULL_HEADER
2: COMPRESSED_TCP      3: COMPRESSED_TCP_NODELTA
4: COMPRESSED_NON_TCP  5: COMPRESSED_RTP_8
6: COMPRESSED_RTP_16   7: COMPRESSED_UDP_8
8: COMPRESSED_UDP_16   9: CONTEXT_STATE
10-15 MUST NOT BE ASSIGNED
```

- first nibble set to 0000 to avoid being mistaken for IP
  - MPLS payload not IP
  - consistent with PWE3 control word [PWE3-CNTL-WORD], [ECMP-AVOID]

FULL_HEADER Packet
(draft-ash-avt-hc-over-mpls-protocol-01.txt)

- PW control octet is set to '00000001' indicating a FULL_HEADER packet format:



Open Issues
(draft-ash-avt-hc-over-mpls-protocol-01.txt)

- set up registry for unassigned values of PW Control Octet
  - rather than ‘MUST NOT BE ASSIGNED’
  - future expansion to meet new requirements
- clarify ‘IANA Considerations”
  - second sentence: "As discussed in Section 4.1, interface parameter sub-TLV type values *need to be* specified in [IANA] for both the network control protocol for IPv4, IPCP [RFC1332] and the IPv6 NCP, IPV6CP [RFC2472].“
  - [IANA] http://ietf.org/internet-drafts/draft-ietf-pwe3-iana-allocation-11.txt does not now specify sub-TLV type values for the network control protocol for IPv4, IPCP [RFC1332] and the IPv6 NCP, IPV6CP [RFC2472]
  - next spin of [IANA]: provide suggested updates to Luca (editor)

Next Steps
(draft-ash-avt-hc-over-mpls-protocol-01.txt)

- adopt I-D as AVT working group draft
- continue to progress I-D within AVT
  - with review by MPLS, PWE3, & ROHC WGs

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Going forward with ROHC RTP

RFC 3095 (PS)

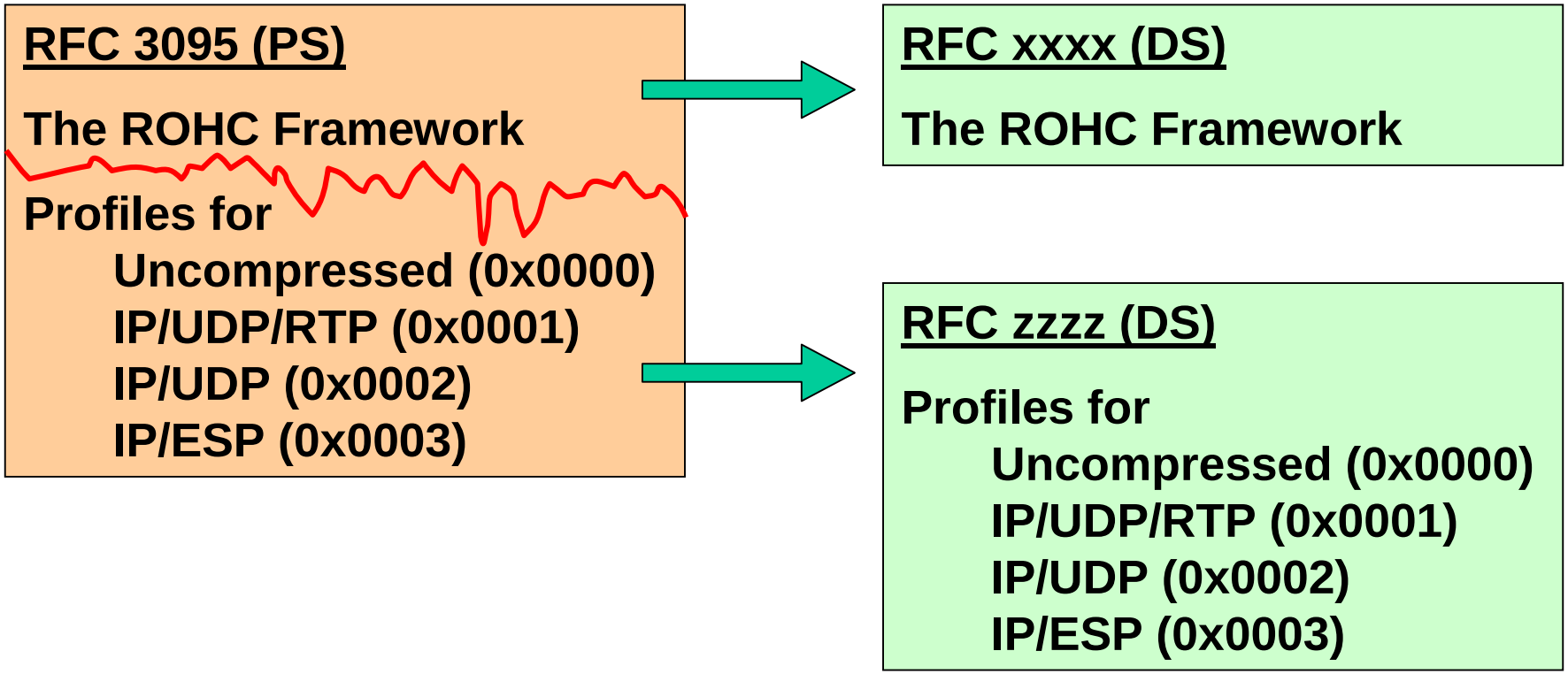
The ROHC Framework

Profiles for

- **Uncompressed (0x0000)**
- **IP/UDP/RTP (0x0001)**
- **IP/UDP (0x0002)**
- **IP/ESP (0x0003)**

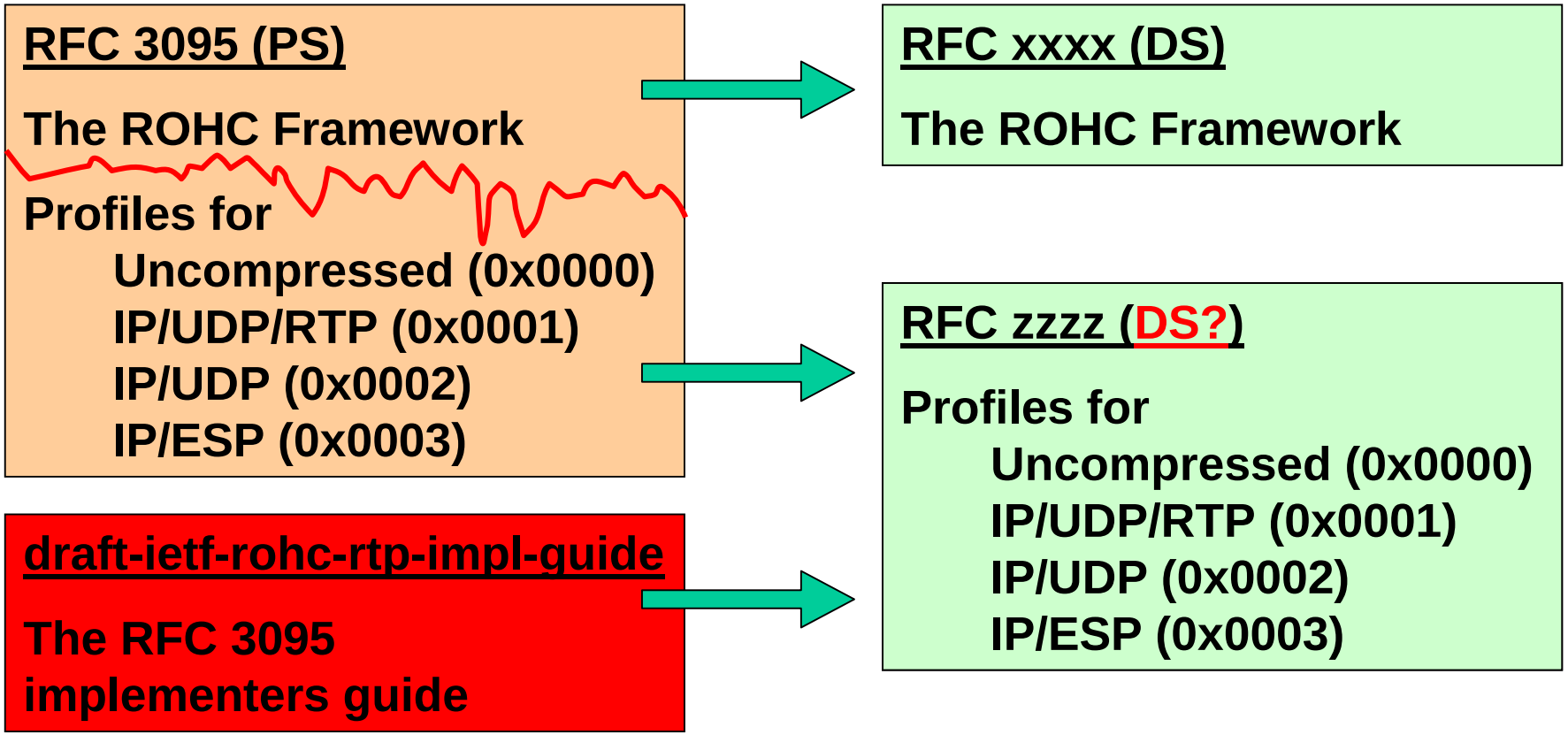
Going forward with ROHC RTP

Original intention was plan A:



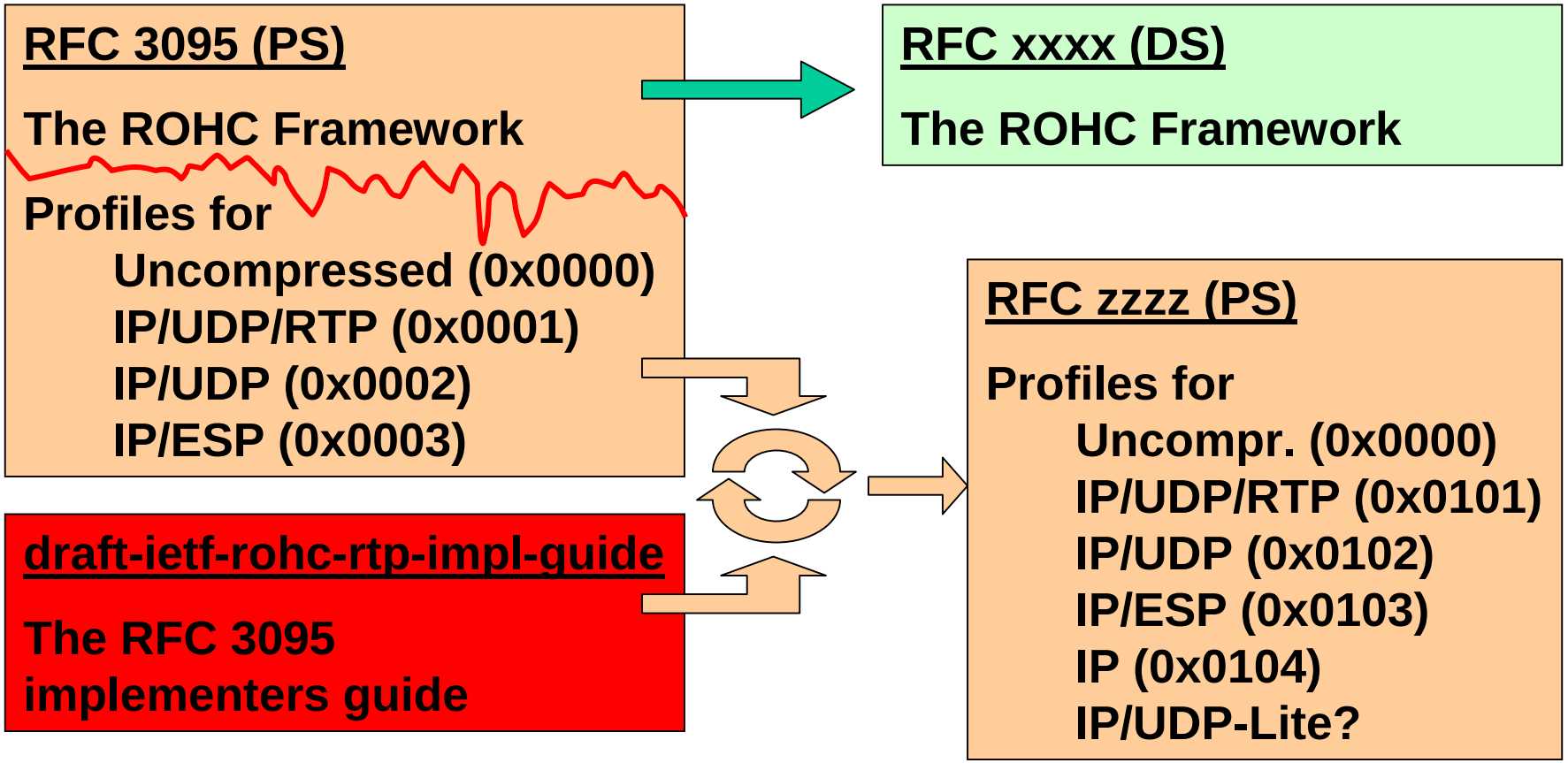
Going forward with ROHC RTP

Implementation revealed some ambiguities, plan B:



Going forward with ROHC RTP

Strong support for a revised profile set instead, plan C:



Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

1. General improvements

- Editorial restructuring, including separating framework/profiles
- List compression should not be used for IP extension headers
- List compression should only use the generic scheme
- Multiple operating modes should be avoided, as in ROHC-TCP
- UO-1-ID should not be allowed to carry extension 3
- No sequential compression for outer IP-ID
- ESP NULL-encryption compression should not compress trailer

Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

2. Minor improvements

- Meaning of CC=0 for CSRC list presence
- Size of list compression table for RTP CSRC
- The p-value for 5-bit SN
- The UDP profile should have same p-value as other profiles
- Local repair should be completely optional

Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

3. Improvements already applied to the IP-only profile

- Handling Multiple Levels of IP Headers
- The CONTEXT_MEMORY Feedback Option
- Compression of constant IP-ID (IPv4 only)

Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

4. Adding tolerance to reordering between compressor and decompressor

Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

5. Implementation stuff that should go out of the spec.

- Reverse decompression
- Implementation parameters and signals
- Decompressor resource limitations
- Implementation structures
- The state concept

Implementer's guide, Appendix B:

draft-ietf-rohc-rtp-impl-guide-13.txt

6. Issues for which we have not reached consensus

- **CRC should not be split into static and dynamic**
  - The split was supposed to reduce processing
  - Implementer's claim the split increases complexity
  - How can we quantify the cost/gain???

Suggested way forward with ROHC RTP

- **Make it officially clear that we do not intend to take RFC 3095 profiles to Draft Standard (i.e. remove those milestones)**
- **Instead add milestones for a revised profile set, simplified and addressing new requirements**
- **Revise our original plan to never publish the RTP implementer's guide, and add it to our charter as "The RFC 3095 implementer's guide" (potentially as BCP?). This way we will provide a stable reference for fixes to the 3095 profiles.**