Internet Engineering Task Force
Internet-Draft
Intended status: Informational
Expires: May 3, 2018

N. Kuhn, Ed.
CNES
E. Lochin, Ed.
ISAE
H. Skinnemoen
AnsuR Technologies
S. Ghanem
Independent Senior Researcher
J. Bilbao
G. Peralta
Ikerlan
October 30, 2017

Network coding and satellites
draft-kuhn-nwcrg-network-coding-satellites-01

Abstract

This memo presents the current deployment of network coding in some satellite telecommunications systems along with a discussion on the multiple opportunities to introduce these technics at a wider scale.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at https://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on May 3, 2018.

Table of Contents

1. Introduction

Network coding schemes are inherent part of the satellite systems, since the challenging physical layer require specific robustness to guarantee an efficient usage of the expensive radio resource. Further exploiting these schemes is an opportunity for a better end user experience along with a better exploitation of the scarce resource.

In this context, this memo aims at:

- summing up the current deployment of network coding schemes;
- identifying opportunities for further usage of network coding in satellite systems.

1.1. Glossary

The glossary of this memo is related to the network coding taxonomy document [I-D.irtf-nwcrg-network-coding-taxonomy].

The glossary is extended as follows:

- XX: XX

1.2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. A note on satellite topology

The objective of this section of to provide a generic description of the components composing a generic satellite system and their interaction. It provides a high level description of a multi-gateway satellite network. Figure 1 shows a example of a multigateway satellite system. It is worth pointing out that some functionnal blocks aggregate the traffic coming from multiple users, and thus are opportunity for including network coding.

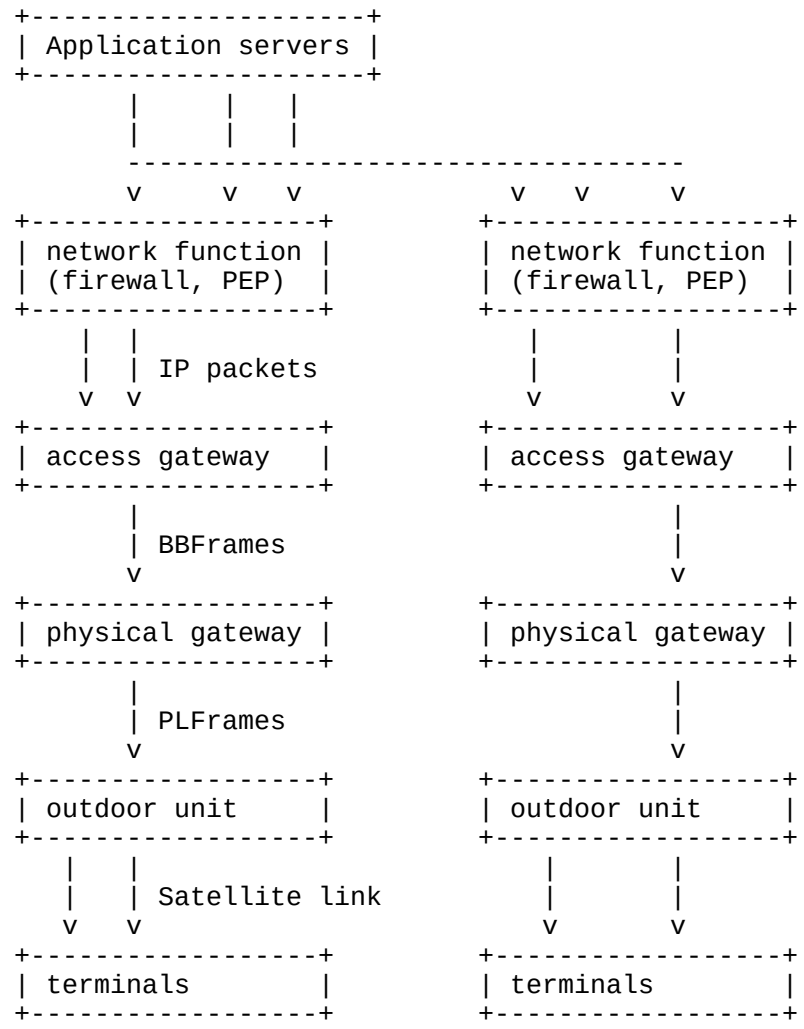

Figure 1: Data plane functions in a generic satellite multi-gateway system

3. Status of network coding in actually deployed satellite systems

Figure 2 presents the status of the network coding deployment in satellite systems. The information is based on the taxonomy document [I-D.irtf-nwcrg-network-coding-taxonomy] and the notations are the following: End-to-End Coding (E2E), Network Coding (NC), Intra-Flow Coding (IntraF), Inter-Flow Coding (InterF), Single-Path Coding (SP) and Multi-Path Coding (MP).

X1 embodies the source coding that could be used at application level for video streaming on a broadband access. X2 embodies the physical layer that is applied on the PLFRAME to have an optimal usage of the satellite capacity.

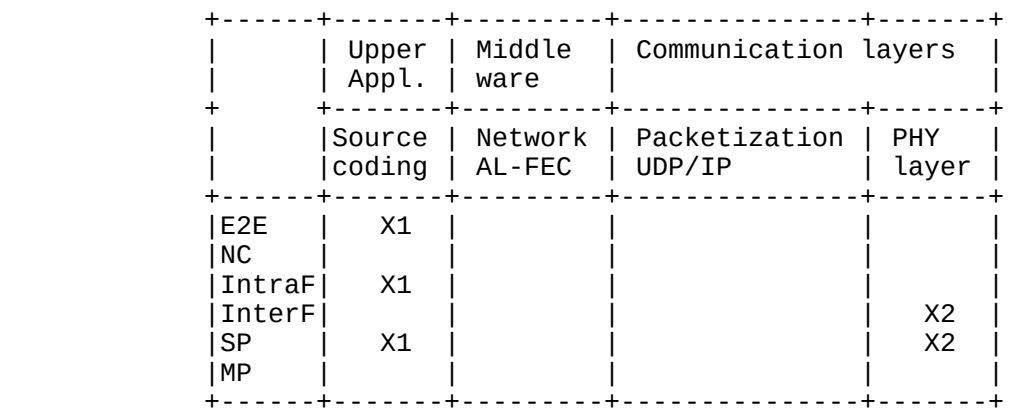

Figure 2: Network coding and satellite systems

4. Opportunities for more network coding in satellite systems

This section extends Section 3 by presenting the opportunities for more network coding in satellite systems.

These opportunities are further detailed in Section 5 and listed in this section:

- (1) two way relay channel mode;
- (2) reliable multicast;
- (3) improving random access;
- (4) network coding and hybrid access;

We propose to include some of the identified opportunities in the Figure 3.

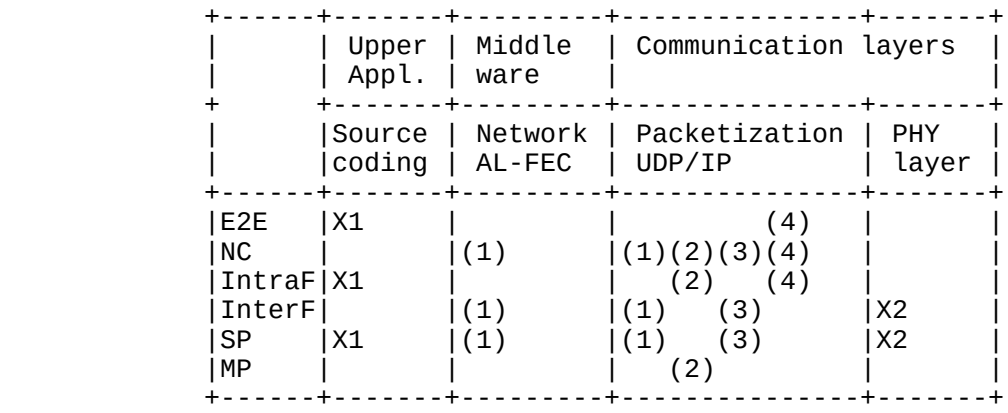

Figure 3: Opportunites for more network coding and satellite systems

Opportunities for more network coding in SATCOM seems to be more relevant at the middle ware or at the communication layer levels.

5. Deployability and related use cases

This section details use-cases where the usage of network coding schemes could improve the overall system and the deployability of the opportunities that are provided in Section 4.

5.1. Network coding and VNF

Related to the foreseen virtualized network infrastructure, the network coding schemes could be proposed as VNF and their deployability enhanced.

5.2. Network coding and PEP

Related to the impact and integration of network coding in Proxy-Enhanced-Proxy RFC 3135 [RFC3135] architecture. In particular how network coding can be integrated inside a PEP with QoS scheduler as defined, for instance, in RFC 5865 [RFC5865].

6. Acknowledgements

7. Contributors

Many thanks to

8. IANA Considerations

This memo includes no request to IANA.

9. Security Considerations

This document, by itself, presents no new privacy nor security issues.

10. References

10.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC3135] Border, J., Kojo, M., Griner, J., Montenegro, G., and Z. Shelby, "Performance Enhancing Proxies Intended to Mitigate Link-Related Degradations", RFC 3135, DOI 10.17487/RFC3135, June 2001, <https://www.rfc-editor.org/info/rfc3135>.

[RFC5865] Baker, F., Polk, J., and M. Dolly, "A Differentiated Services Code Point (DSCP) for Capacity-Admitted Traffic", RFC 5865, DOI 10.17487/RFC5865, May 2010, <https://www.rfc-editor.org/info/rfc5865>.

10.2. Informative References

[I-D.irtf-nwcrg-network-coding-taxonomy] Adamson, B., Adjih, C., Bilbao, J., Firoiu, V., Fitzek, F., samah.ghanem@gmail.com, s., Lochin, E., Masucci, A., Montpetit, M., Pedersen, M., Peralta, G., Roca, V., Saxena, P., and S. Sivakumar, "Network Coding Taxonomy", draft-irtf-nwcrg-network-coding-taxonomy-05 (work in progress), July 2017.

Authors' Addresses

Nicolas Kuhn (editor)
CNES
18 Avenue Edouard Belin
Toulouse 31400
France

Phone: 0033561273213
Email: nicolas.kuhn@cnes.fr

Emmanuel Lochin (editor)
ISAE
10 Avenue Edouard Belin
Toulouse 31400
France

Email: emmanuel.lochin@isae.fr

Harald Skinnemoen
AnsuR Technologies
Martin Linges Vei 25
Fornebu 1364
Norway

Email: harald@ansur.no

Samah A. M. Ghanem
Independent Senior Researcher
West Bank
Palestine

Email: samah.ghanem@gmail.com

Josu Bilbao
Ikerlan
Spain

Email: JBilbao@ikerlan.es

Goiuri Peralta
Ikerlan
Spain

Email: gperalta@ikerlan.es