

`draft-vazquez-nfvrg-netcod-
function-virtualization-00.txt`

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1. Why this draft.
 2. Why this draft here.
 3. Objectives of the draft.
 4. Structure of the draft.
 5. TBD.
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Why this Draft

1. **BECAUSE** the novel concept **network coding (NC)** seen as **network function (NCF)** has operative advantages.
 - BUT it is NOT a traditionally implemented network function in dedicated hardware.
 - NC enables in-network optimized re-encoding, providing throughput gains and network-controlled degrees of reliability.

Why this Draft here

2. BECAUSE the virtualization of the network coding function (VNCF) has operative advantages

- NCF relies on having access to networking, computation, and storage resources throughout the network.
 - NCF can be optimized having access to network statistics/analytics.
 - NCF can be integrated with Network Function Virtualization (NFV) frameworks as possible architectural functional design solution.
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Objectives of the Draft

OBJECTIVE 1

To show that NC can be designed as a (modular) network function, NCF.

OBJECTIVE 2

To show how NCF requirements of connectivity, computation and storage resources find a natural framework in NCFV architectural frameworks (understood from NC perspective).

Structure of the Draft

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The authors also want to acknowledge the following ongoing projects.

1. **GEO-VISION** - GNSS driven EO and Verifiable Image and Sensor Integration for mission-critical Operational Networks. EU funded project under the call H2020-GALILEO-2014-1 by the **European Global Navigation Satellite Systems Agency** (project reference 641451).
2. **SatNetCode** - Satellite Network-Coding for high performance, semantic-aware mission-critical visual communications. This project is funded by the **European Space Agency**.
3. **Hencsat** - Highly Efficient Network Coding for Satellite Applications **Test-bed**. This project is funded by the **European Space Agency**.

Section 3: NC as a network function

NC design involves different domains. We can identify at least three domains:

Coding domain - domain for the design of network coding codebooks, coherent or non-incoherent encoding/decoding schemes, performance benchmarks, appropriate mathematical-to-logic maps, etc. This is a domain fundamentally designed by coding theorists.

Functional domain - domain for the design of the functional properties of NC to achieve the desired design requirements upon abstractions of networks and systems. This domain jointly requires to consider physical-logical abstraction, identification of network coding application to either inter-flow or intra-flow network coding, service intent and related networking for the provision of quality of service.

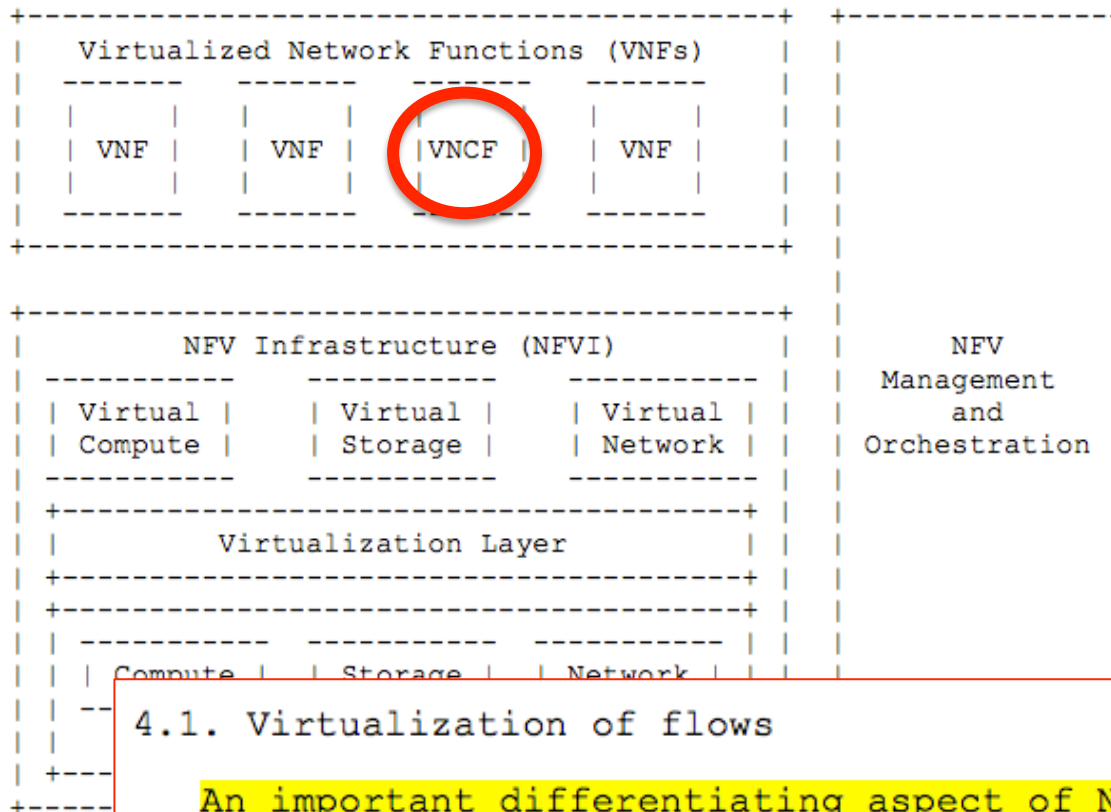
Protocol domain - domain for the design of physical signaling/transporting of the network coded information flow.

Section 3: NC as a network function

NC elementary functionalities can be grouped as a set of toolboxes that the designer can use. We define the following three toolboxes:

- **Coding/Re-encoding/Decoding Functionalities (CRDF)**.
- **Flow Engineering Functionalities (FEF)** performing optimization of available network resources to optimally perform NC to meet the service design targets depending on the (statistical) status of the networks (congestion, link failures, etc).
- **Physical/Abstraction Functionalities (PAF)** performing interaction with available storage and computation physical resources that are abstracted by the other toolboxes.

Section 4: Virtual Network Coding function



4.1. Virtualization of flows

An important differentiating aspect of NC with respect to traditional networking technologies is the following. A network flow for a NC network function is understood as a stream of physical packets logically grouped from the network coding perspective.

NC can optimize the NC operation abstracting such physical flow as a mathematical model, which can be subject of computational manipulation. This makes NC to be naturally integrated into a virtualized framework of abstract entities such as virtual network or network slices. This is because in the NC case, not only the network and resources are abstracted, but also the stream of packets is abstracted.



TBD

1. More detailed description of the modular functionalities.
2. More detailed example(s).
3. Connect to virtualized network / network slicing.

Thank you!

