

IRTF NWCRG, Mar. 2018, London

# ***Network Coding for Content-Centric Networking / Named Data Networking: Requirements and Challenges***

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draft-matsuzono-nwcrg-nwc-ccn-reqs-01

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# *Previous Meetings at Singapore*

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- We presented our initial draft at NWCRG and ICNRG, and got some questions and comments, e.g.,
  - Relationship between coding information header and security envelope
  - Design choice regarding who determines the encoding vector, requestor or producer, and its impact on latency
  - Clarification of the objective and scope of this document
- Summary of Changes from -00
  - Editorial update
  - Adds the clarification regarding payload encryption w/o coding information
  - Adds a case where producer statically decides the encoding vector
  - Describe the potential challenge for convolutional coding

# *Objective and Scope of the Document*

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- Consider research challenges, as well as,
  - Gather and show the research results and establish common understanding about NC for CCN/NDN
  - Clarify requirements for NC for CCN/NDN
  - Provide useful insights to netcoders who apply and implement NC into CCN/NDN
- Describing specific mechanisms/solutions is out of scope of this document
  - Actual protocol proposal will be done in other draft.

# Structure (-01)

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# *Changes/Modifications*

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- Section 4.1 (Requirements for Content Naming)
  - Adds a case where;
    - coding information is specified in the metadata filed (not in the NAME), and
    - the coding information is encrypted together with the payload.
    - This may make it difficult to re-encode at intermediate nodes. in terms of computational overhead for decryption
- Section 4.5 (Requirements for Security and Privacy)
  - Adds the case of NC plus payload encryption

# *Changes/Modifications*

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- Sec. 4.2.5 (Publisher Operation)
  - Adds a scenario where producer takes the lead in determining the used encoding vectors and generating the coded packets
    - Latency can be reduced, compared to the case where producer generates new coded packets after receiving interests.
    - Content requestors need to obtain the names of coded packets prior to the requests.

# *Changes/Modifications*

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- Sec. 4.5.1 (Challenge for Convolutional Coding)
  - Adds an example and the benefit of convolutional coding approach on an end-to-end basis.
  - Consider research challenges:
    - How to apply it into CCN ?
      - e.g., How producer gets consumer's reception status in order to adjust coding parameters ?
    - How to exploit CCN/NDN features to enhance performance gains ?
      - How In-network cache and hop-by-hop adaptation should cooperate with convolutional coding approach ?
    - Feasibility and practicality
      - The NC operation is more complex than block coding from coding and signaling aspects

# *Next Step*

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- In the next revision;
  - Describe the issues and challenges of “Security and Privacy” and “Routing Scalability” in more detail
  - Identify additional potential research challenges if useful
- Start introducing actual protocol proposal
  - Hopefully show experimental results