ICN-IP Hybrid Coexistence Architectures

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1. Background

- **InformatioN-Centric Networking** (ICN) architectures a novel approach to revolutionize the current IP-based Internet Paradigm. (Fig 1)
- ICN offers -Caching of data - Content based security - Location independent routing - Independence from end-to-end connections [2]
- For a smooth shift from the current Internet Paradigm, **hybrid ICN** architectures can be used. They focus on supporting ICN features with the traditional IP routing, with minimal changes to the current software/hardware or internet infrastructure [3].

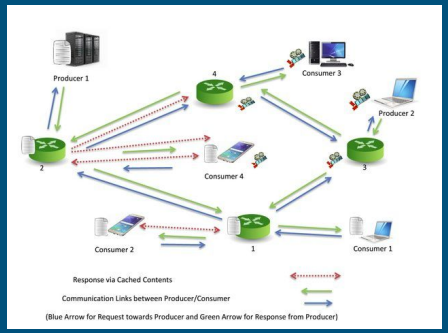

Fig 1 [1]: Information-Centric Networking

2. Objective

Investigating the presence and implementation of security and privacy features in hybrid-based ICN/IP coexistence architectures.

Two architectures were considered for the study:

- Hybrid Information-Centric Networking (hICN) (Fig 2)
- Content Centric Inter-Networking (CONET) (Fig 3)

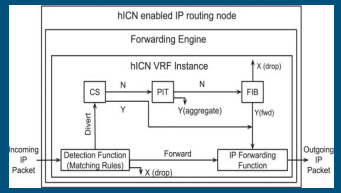

Fig 2: **hICN**: Implemented with current IP routers and include ICN features by manipulating their current features [2].

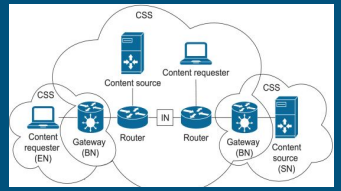

Fig 3: **CONET**: Formed of various CONET sub-systems connected together with the traditional internet paradigm. Common components of Sub system: Border Nodes, Server Nodes and End-Nodes [2].

3. Method

- For hICN and CONET, ICN characteristics: ▰caching, ▰naming, ▰forwarding, ▰content-centric security were analyzed to understand the architectures.
- Knowledge gathered was used to investigate the presence and implementation of Security & Privacy (S&P) features listed in table 1 & table 2

4. Results

Supported features by the two architectures are presented in tables 1 & 2.

- Both the architectures do not have support for **Access Control & Confidentiality**, which can be employed by the creator by encrypting the data. This is due to the content-centric nature of the architectures.
- There's a **partial unlinkability** as the users can't be linked from the packets, but linkability between the packets may be possible.
- **The data-centric security** model is employed by both architectures. In hICN it is ensured by Auth-Header and Transport Manifest, whereas CONET relies on its self-certifying naming technique.

Security Features	hICN	CONET
Availability	Present	Present
Access Control	Absent	Absent
Non-repudiation	Present	Present
Integrity	Present	Present
Authentication	Present	Present

Table 1: Security features in hICN & CONET

Privacy Features	hICN	CONET
Anonymity	Present	Present
Confidentiality	Absent	Absent
Unlinkability	Partial	Partial

Table 2: Privacy features in hICN & CONET

5. Conclusion & Future Works

- The focus was on only two hybrid architectures, presenting their S&P features and their relevance to ICN.
- Interesting to note, most Security features (Non-repudiation, Integrity & Authentication) are covered by the content based security nature of these architectures. Whereas security features depend on the implementation of the architecture as a whole.
- However, the results drawn in this research do not represent the features of all the hybrid architectures. Hence, more hybrid architectures should be investigated to form a more general idea of hybrid architectures.

References

[1]Sobia Arshad et al. "Recent Advances in Information-Centric Networking-Based In-ternet of Things (ICN-IoT)". In: IEEE Internet of Things Journal PP (Oct. 2018), pp. 1–1. DOI:10.1109/JIOT.2018.2873343.

[2]Bengt Ahlgren et al. "A survey of information-centric networking". en. In: IEEE Communications Magazine 50.7 (July 2012), pp. 26–36. issn: 0163-6804. doi:10.1109/MCOM.2012.6231276. url: http://ieeexplore.ieee.org/document/6231276/.

[3]Mauro Conti et al. "The Road Ahead for Networking: A Survey on ICN-IP Coexistence Solutions". en. In:IEEE Communications Surveys & Tutorials 22.3 (2020), pp. 2104–2129.issn: 1553-877X, 2373-745X.doi: 10.1109/COMST.2020.2994526. Url: https://ieeexplore.ieee.org/document/9094202.