CSC 7970 Paper 2 Presentation

Networking Named Content

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*Van Jacobson, Diana K. Smetters, James D. Thornton, Michael F. Plass, Nicholas H. Briggs, and Rebecca L. Braynard. 2009. Networking named content. In Proceedings of the 5th international conference on Emerging networking experiments and technologies (CoNEXT '09). Association for Computing Machinery, New York, NY, USA, 1–12. DOI:https://doi.org/10.1145/1658939.1658941

Presentation on 2nd April 2020

Outline of this Presentation

- **Introduction**
- CCN Node Model
- Transport
- Routing
- Content-based Security
- Evaluation
- My thoughts
- References

Introduction

→ Trying to solve a 21st Century content distribution problem with a system created in 1960s and ‘70s won’t work.

→ **Abstraction**: from network’s **“where”** to **“what”** users’ care

→ Divide between existing networking model and the current day user requirements from the internet results compatibility issues like **Availability**, **Security**, **Location-dependence**

→ Paper produces an argument that **named data** is better abstraction than **named hosts**, there by proposes “Content Centric Networking”

→ **Resilience** and **Performance** evaluation is performed and results are analysed

Introduction: Comparison of IP and CCN Protocol Stacks

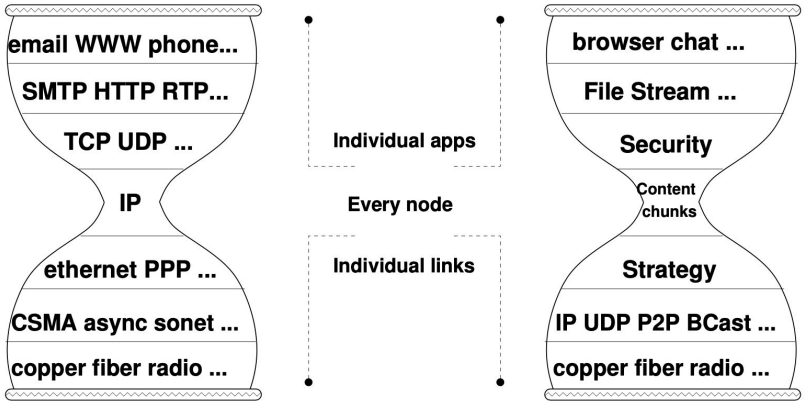

Figure: CCN moves the universal component of the network stack from IP to chunks of named content.

Introduction: Comparison of IP and CCN Protocol Stacks

→ Two Critical layers of CCN

1. Strategy
2. Security

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CCN Node Model

→ Exorbitant amount of data being pushed onto internet every year and people valuing internet for it's content required a new model of communication networking for internet. CCN tries to be that model.

→ CCN uses named data packets instead of conventional host identifiers for communication

→ The CCN model not radically different from the existing model. It retains the design decisions from existing model retaining it's simple, robust and scalable nature.

CCN Node Model: CCN packet types

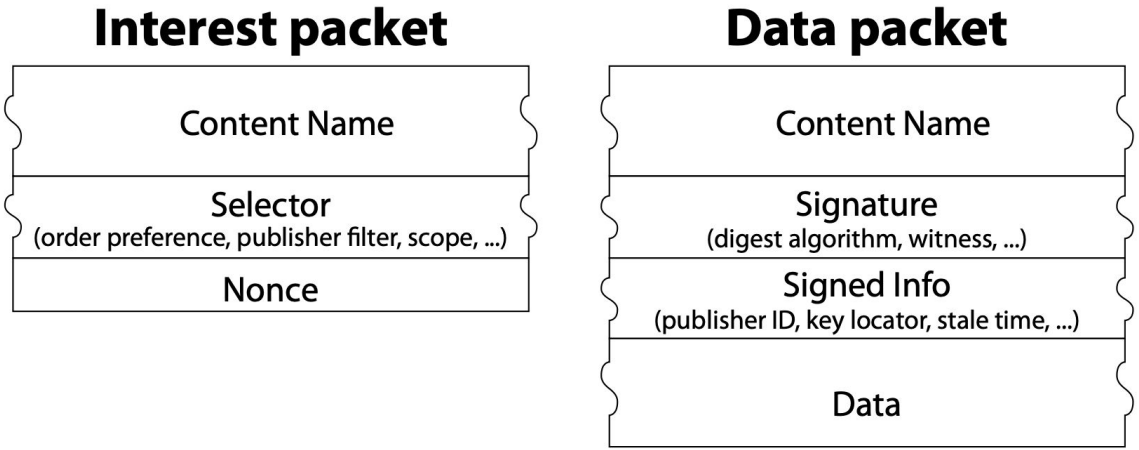

Figure: CCN packet types

CCN Node Model: CCN forwarding engine model

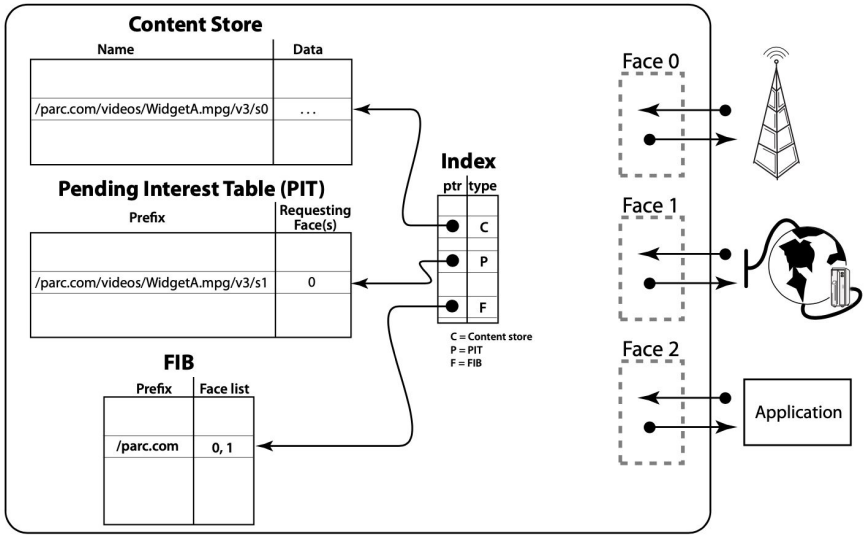

Figure: CCN forwarding engine model

CCN Node Model: CCN forwarding engine model

→ Interest Packet Processing

→ Data Packet Processing

→ Disruption Tolerant Networking

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Transport

→ Operating on unreliable packet delivery services, highly dynamic connectivity, ubiquitous computing.

→ Reliable and Resilient delivery: unsatisfied interests

→ Duplication: “nonce value”

→ CCN flow and flow and sequencing is similar to TCP ack packets

Transport: Reliability and Flow Control

→ Flow Balance

→ Overlap of data and Requests: similar to TCP SACK

→ Congestion: CCN, No need of additional techniques to control

→ CCN flow and flow and sequencing is similar to TCP ack packets

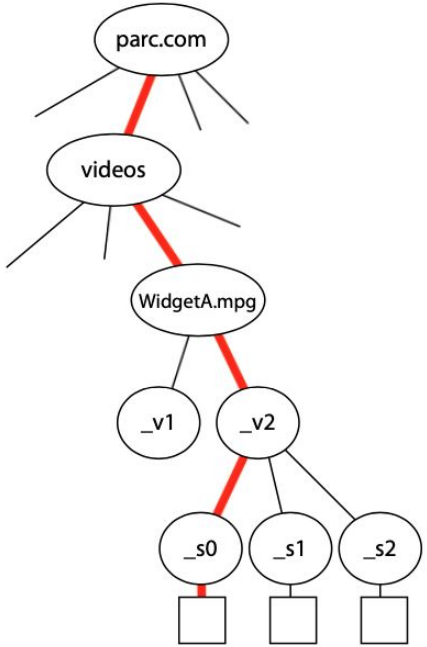
Transport: Sequencing

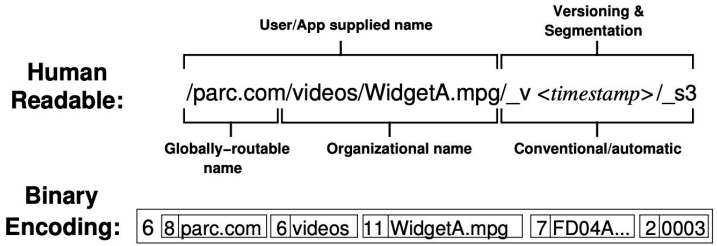
→ Sophisticated sequencing but similar to TCP ACK

→ Individual names, Components, Octers

→ SHA256 digest

→ specify RightmostChild for recent version of the content





Transport: Rich Connectivity, Mobility and Strategy

→ Supports Multiple interfaces

→ CNN data exchange is not affected by Rapid change in connectivity

→ Best face forwarding interests

→ FIB Entry: a program
Instructions: actions, triggers, attributes

→ CCN Strategy layer, CCN Strategy

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Routing

→ Routing mechanism that works well for IP should work well with CCN

→ Automatic protection in routing infrastructure

→ Link-state intra-domain routing
- Prefix based long match look-ups
- IP FIB Distributed machinery

→ Inter-domain routing
- bottom-up approach
- ISP dependance

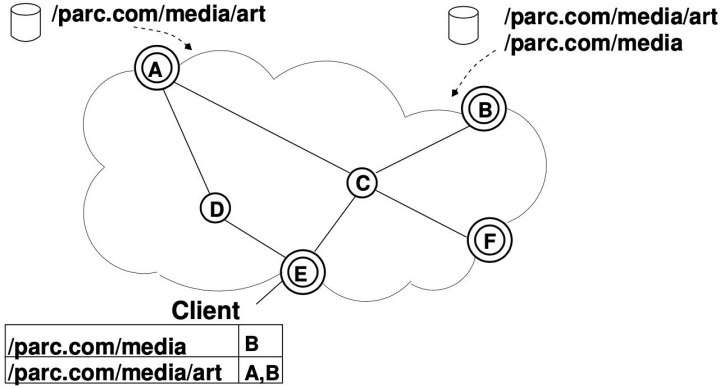

Figure: Routing Interests to a domain media content

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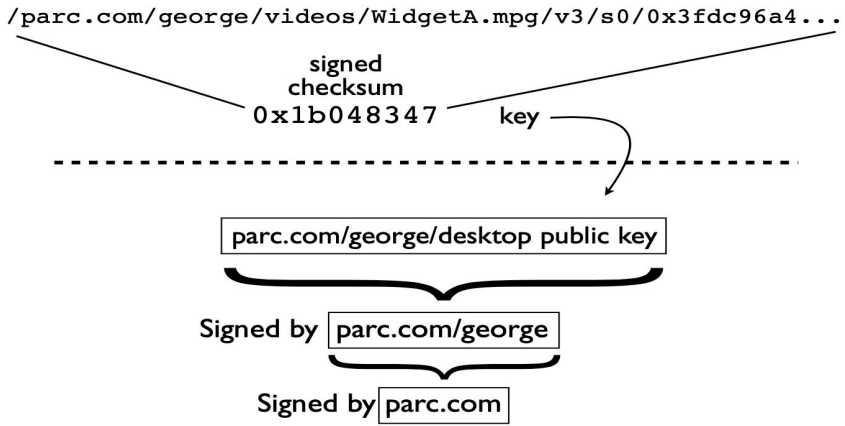
Content-based Security

→ CCN is based on notion of content-based security

→ Authenticate, Encrypt, Validate

Content-based Security: Content Validation



→ CCN is authenticates binding between names and content,

→ Authenticate, Encrypt, Validate

Content-based Security: Managing the trust

→ Data: peer-to-peer; Security: end-to-end

→ Contextual trust; Digital Certificates

→ Trusting Keys
SDSI/SPKI model

→ Evidence bases Security
Secure reference

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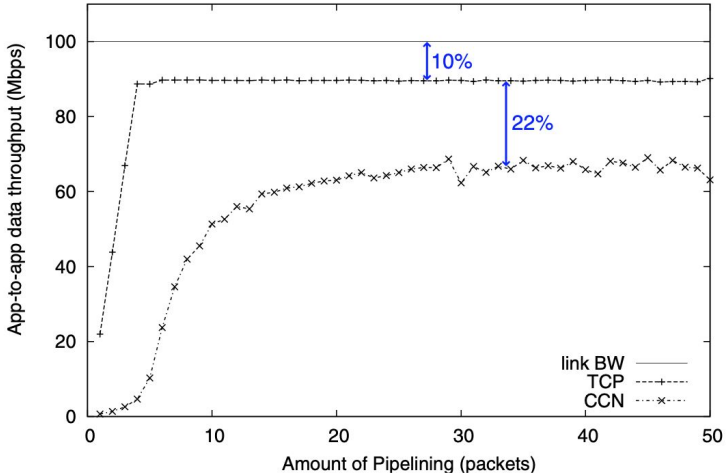
Evaluation: Data transfer efficiency

→ CNN is compared to TCP in terms of bulk data transfer performance

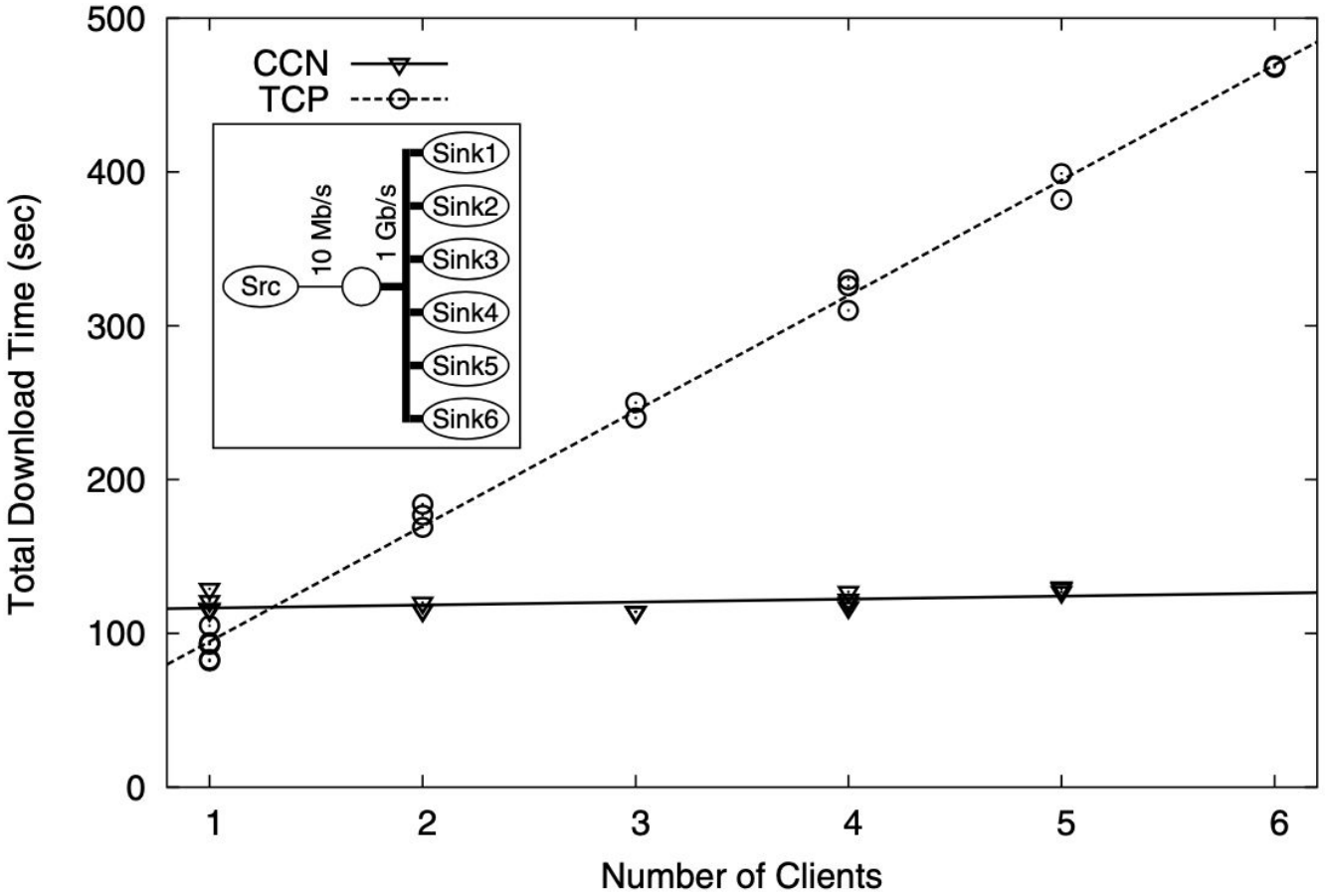
→ Amount of Pipelining and App-to-App throughput are plotted

→Comparable Bulk data performance, CCN performs better when there are multiple Interests.



	Bytes (packets) Sent	Received	Overheads Encap	Transact
Web page (6429 bytes)				
HTTP	723 (9)	7364 (9)	15%	11%
CCN/ETH	811 (8)	8101 (6)	26%	13%
CCN/UDP	325 (3)	6873 (5)	7%	5%
Secured Web page (16944 bytes)				
HTTPS	1548 (16)	21232 (22)	25%	9%
CCN/ETH	1791 (16)	20910 (14)	23%	11%
CCN/UDP	629 (5)	18253 (14)	8%	4%

Evaluation: Content Distribution efficiency



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My Thoughts

→ Language is **simple** and **clear.**

→ Sample Size for Evaluation is small, i.e **only two hosts** (Google and Wells Fargo) are considered for comparison.

→ Paper doesn't talk much about **scalability** of CCN

→ The CCN model **is not radically different from the existing model**, as I initially presumed. So it can be implemented without having to heavily change the existing hardware.

→ **Resilience** and **Performance** evaluation analysis can be extended to next-gen applications such as AR/VR, IoT, driverless cars and 5G.

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This presentation uses slides and interpretations from below sources also

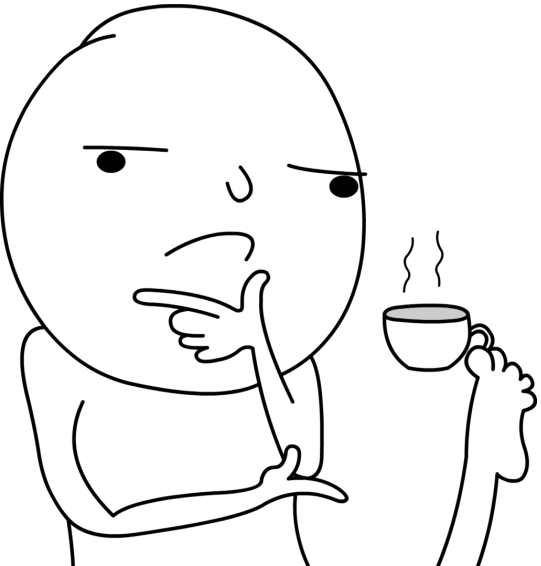
https://www.slideshare.net/haroonrashidlone/named-data-networking?qid=7ca0463d-3cd8-48ac-b42c-032d82da1c84&v=&b=&from_search=2

https://www.networkworld.com/article/3313338/introducing-named-data-networking.html

https://slideplayer.com/slide/6229117/

https://www.slideshare.net/meshingom/content-centric-networks

Queries??

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