A World on NDN

Affordances and Implications of the Named Data Networking Future Internet Architecture
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- Examines the social impacts of NDN generated by key aspects of the architecture and critical departures from TCP/IP.

- Plan to release as a tech report this Winter; your comments welcome!

- Reviews four departures from TCP/IP which underscore social impacts: **semantic classification, provenance, publication, decentralized communication**.

- Uses three use cases to illustrate how these departures work in context: Internet of Things, Video Publishing, Social Networking.

- Discusses implications of these departures for social issues such as **free speech, security and privacy, law enforcement, network neutrality**.

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- **Key differences between NDN and TCP/IP**
  - Routing and forwarding based on application's **semantic classification** of data;
  - **Provenance** via Data signatures;
  - **Publication by default**: data widely distributed and cached, rely on encryption for access control;
  - Wide distribution and caching enables **decentralized communication.**

- **We illustrate each of these with a use context**

	Internet of Things	Video Publishing	Social Network
Semantic classification	X		
Provenance		X	
Publication		X	X
Decentralized communication			X

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Emphasizing semantic classification, provenance, publication, decentralized communication impacts:

- **Free speech**
  - Easy multi-homing and decentralized communication **benefits** data consumers and producers.
  - Default towards publication and decentralized communication support free speech by providing alternative communications paths and opportunistic communication
  - Pervasive provenance and persistent publication **potentially complicates** free speech for producers.
  - Of course, accountability for our speech may not be a bad thing.

- **Trust, security and privacy**
  - Provenance encourages an **increase in trust** in content, some relief for spoofing data and phishing.
  - Defaults of publication and semantic classification create **both challenges and opportunities for information privacy**.
    - In particular, NDN "defaults" improve anonymous information seeking, but not anonymous publication.
  - Reduction in value of security-by-obscurity.
  - Challenge of encryption-based access control.

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Emphasizing semantic classification, provenance, publication, decentralized communication impacts:

- **Law Enforcement**
    - Encryption poses challenges to surveillance by deep packet inspection
    - Data-centric networking will further shift notions of jurisdiction away from loose geography of IP addresses.
    - Widespread caching and use of repos may change the notion of "hosting" content, impact takedown notices.

- **Network neutrality**
    - Policies / strategies embedded in FIB, PIT, Content Store
    - Will congestion management change as traffic transparency increases through name-based addressing?
        - E.g.: Will ISPs author their own strategy modules to prioritize certain types of data?

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- Openings for policy
  - Define "fair" congestion management policies when semantically-rich names are widely used.
  - Define next-generation digital rights management (DRM) and intellectual property in an NDN world.
  - Define ownership and legal jurisdiction for pervasive in-network storage.

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Open questions – how to…

1. Balance semantically meaningful, consistent names that simplify application development, and opaque names that better protect privacy;

2. Standardize mechanisms for establishing trust relationships, and develop practices for key assignment, distribution and revocation, given NDN's reliance upon content signatures for identity and security;

3. Provide usable, secure implementations of more complex multi-participant encryption schemes—something that appears possible but non-trivial;

4. Mitigate information leakage in names with encrypted names, respect of routers for content lifetime hints, and other emerging best practices;