# Self-Certifying Names for Named Data Networking

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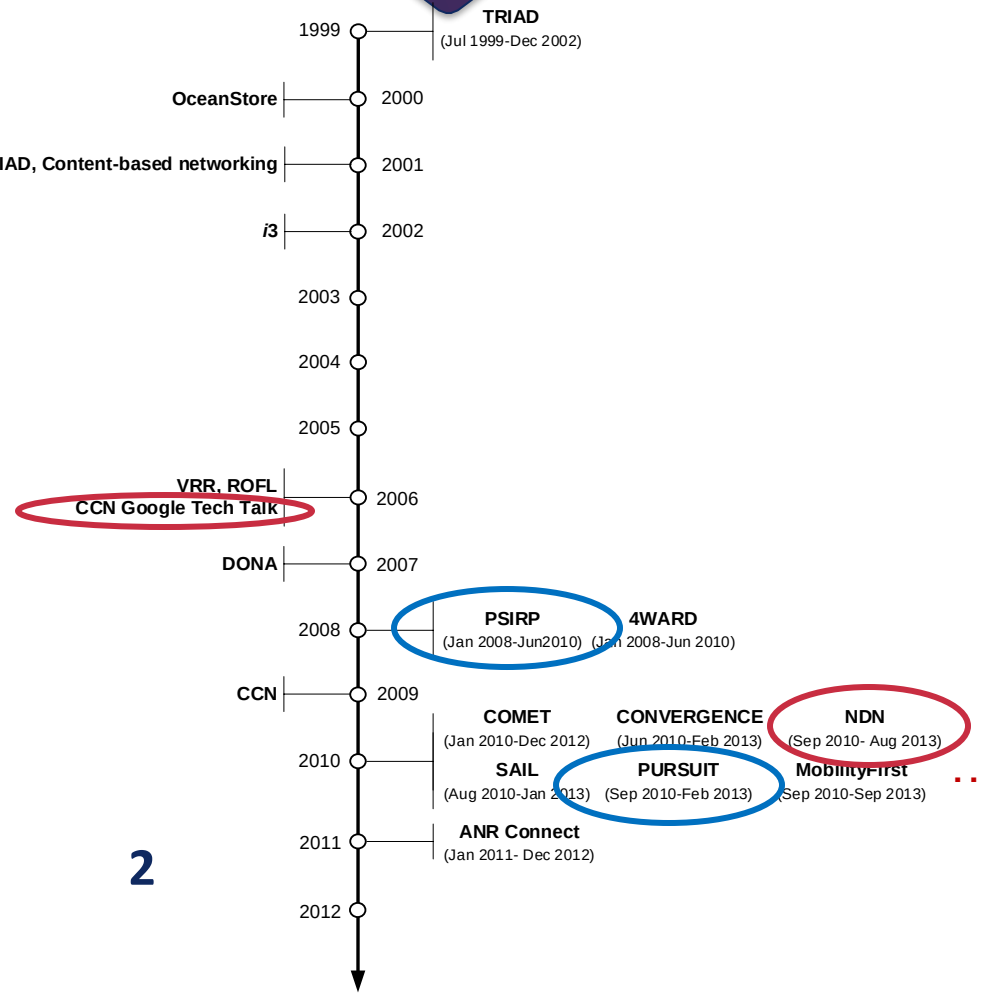
# NGI, ICN, NDN…




… continues

- Global Future Internet architecture effort circa 2008
- EU and US played key roles
- Different proposals, some key, common principles (ICN)
  - move away from IP addresses (topology)
  - use content (or information) names or identifiers
  - emphasis on content **authenticity** and **security**
- Recognized the size and inertia of the Internet
  - *clean-slate* architectures…

    but considerations for… smooth evolution…
    - overlays, co-existence…

✓ NDN: Named Data Networking



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# Named Data Networking
## and EU-US cooperation in networking research

- **NDN**
  - Started by Van Jacobson at Xerox PARC (as CCN: Content-Centric Networking) – Google Tech talk in 2006
  - Continued as US NSF funded NGI project with UCLA's Lixia Zhang as PI in 2010, leading many US U's groups
- Parallel EU efforts: FP7 PSIRP/PURSUIT, 4WARD/SAIL…
  - Key ICN survey paper by my AUEB/MMlab group:
    - "**A Survey of Information-Centric Networking Research**," *IEEE Communications Surveys and Tutorials*, 2014.
- The **EIFFEL** group/project/action: an EU-led FI/NGI think-tank with US participation: meeting (@MIT) on ICN
- Cisco embraced ICN/NDN; key Cisco groups at Boston and Paris
  - Cisco ICN focus moved to Paris lab, recently proposing: **Hybrid-ICN**
- ACM SIGCOMM ***Information-Centric Networking*** Conference started by an EU-US team (1st in Paris in 2014)
  - Tutorial (N. Fotiou and G.C. Polyzos) "**ICN Privacy and Name based Security**"
- **NDN testbed:** global, but mostly in the US and developed through US efforts
- (open) **NDN Consortium** @ NIST (US)


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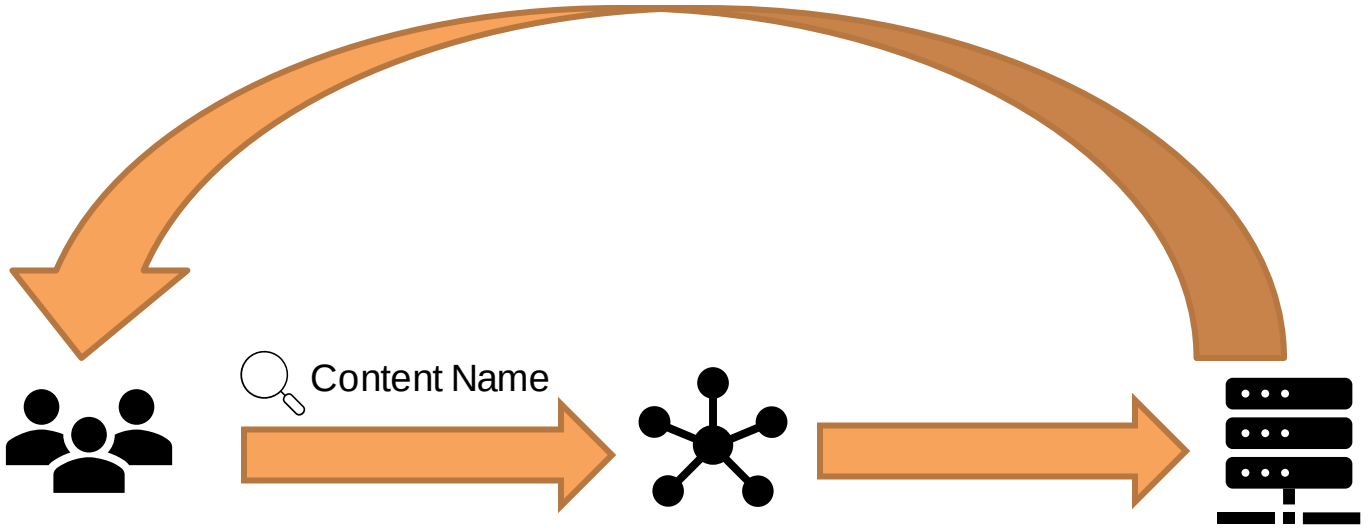
# The Information-Centric Networking NGI paradigm

- Information-Centric Networking (ICN) builds (inter-)networking functions around **information** (content) and information (content) **identifiers**




- ✓ Location/topology independence
- ✓ Better (automatic) support for…
  - caching
  - multicast
  - multihoming
- ✓ Improved security and privacy
- ✓ Better support for mobility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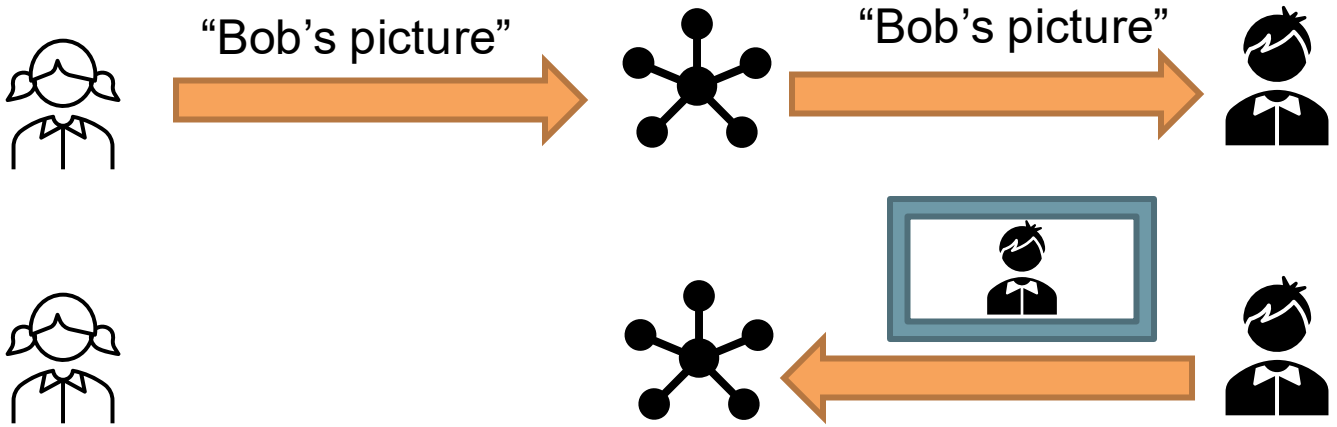
# Content Authenticity: A Challenge





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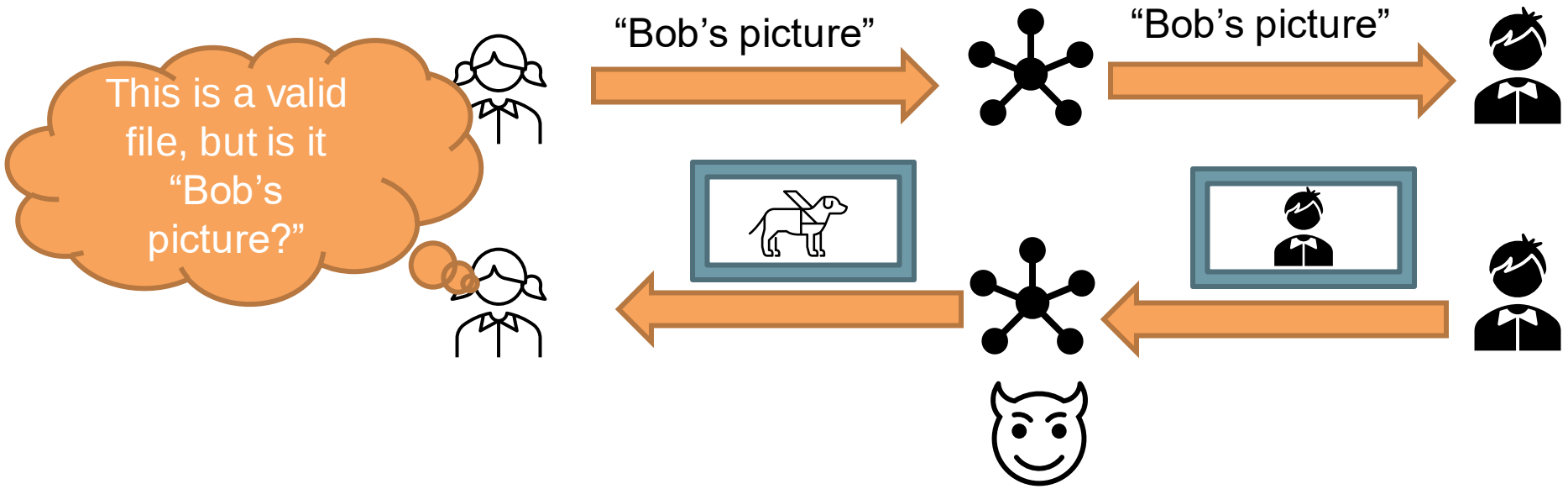
# Content Authenticity: A Challenge…





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# Content Authenticity: TTPs vs. self-sovereignty

- A Third, Trusted Party (TTP) can vouch for the binding between the "content name" and the content data
  - Usually using a digital certificate

**Can we get rid of the TTP and give content owners self-sovereignty?**

✓ **Yes, we can** (with a twist: **give-up** *human readable* names)


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# Content Authenticity using *Decentralized Identifiers*

- An exciting technology under standardization!
- Decentralized Identifiers (DID) can be used as content names
- All cryptographic material associated with a DID is stored in a "DID document"
- We use an approach that allows "DID documents" to be stored securely within the content items themselves!

**Self-certification, Self-sovereignty, Decentralization**


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# Experiments on the NDN testbed

- We will evaluate the performance and security properties of our scheme
  - Time to recover from failures
  - Resilience to network attacks
- Measure performance enhancements enabled by our solution
  - Easier, **secure** content replication
  - More chances for **secure** multisource
  - Better support for **secure** “streaming”-like services

- EU-US dialog on NGI security, privacy, trust, decentralization, self-sovereignty


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# Thank you

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