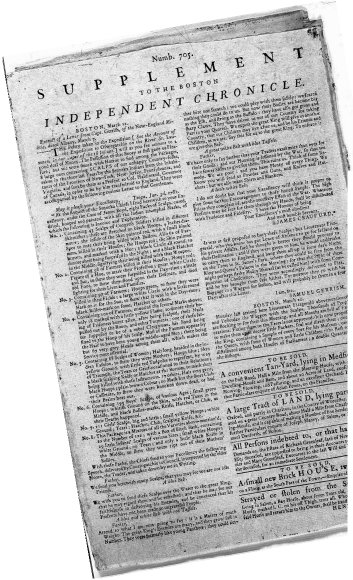
The Missing Piece: On Namespace Management in NDN and How DNSSEC Might Help

Pouyan Fotouhi Tehrani[1], Eric Osterweil[2], Jochen Schiller[3],
Thomas C. Schmidt[4], Matthias Wählisch[3]

[1]Weizenbaum Institut / Fraunhofer FOKUS [2]George Mason University [3]Freie Universität Berlin [4]Hamburg University of Applied Sciences

September 25, 2019


Numb. 705.

SUPPLEMENT

TO THE BOSTON

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Ted Cruz says veterans should sell cookie for funding like Girl Scouts: usatoday.com.co/ted-cruz-vets-…

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Twitter Attracts Suitors

by Stephen Morris

John Greim | LightRocket | Getty Images

July 14, 2015 – 11:36 AM EDT

(Bloomberg) -- Twitter is working closely with bankers after receiving an offer to be bought out for $31 billion, people with knowledge of the situation said.

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BloombergBusiness
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Oh, what a tangled web we weave, when first we practice to deceive!

– William Shakespeare

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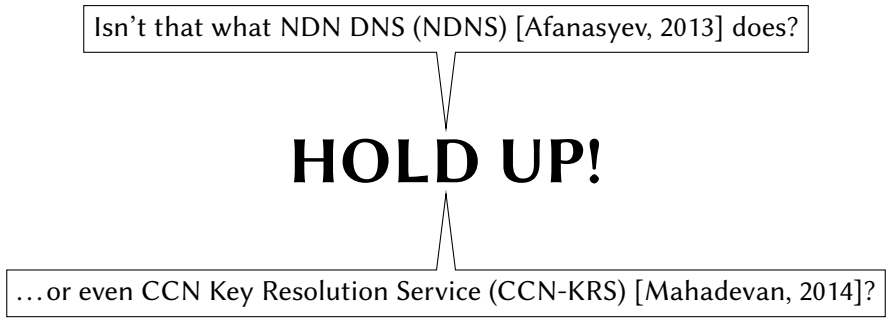
Walter Scott

HOLD UP!

Isn't that what NDN DNS (NDNS) [Afanasyev, 2013] does?

HOLD UP!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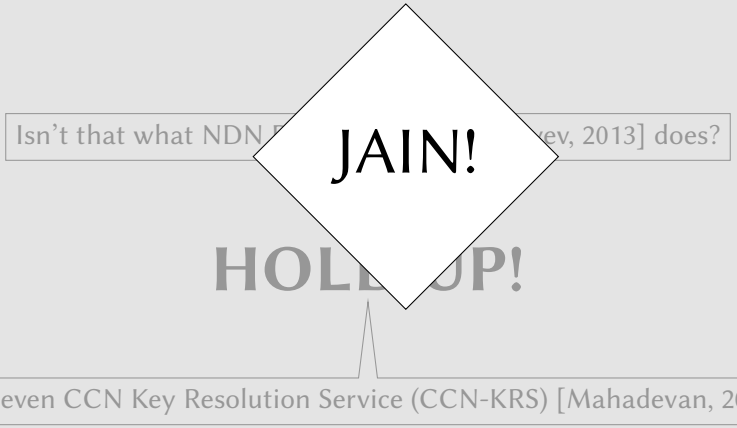
HOLD UP!
…or even CCN Key Resolution Service (CCN-KRS) [Mahadevan, 2014]?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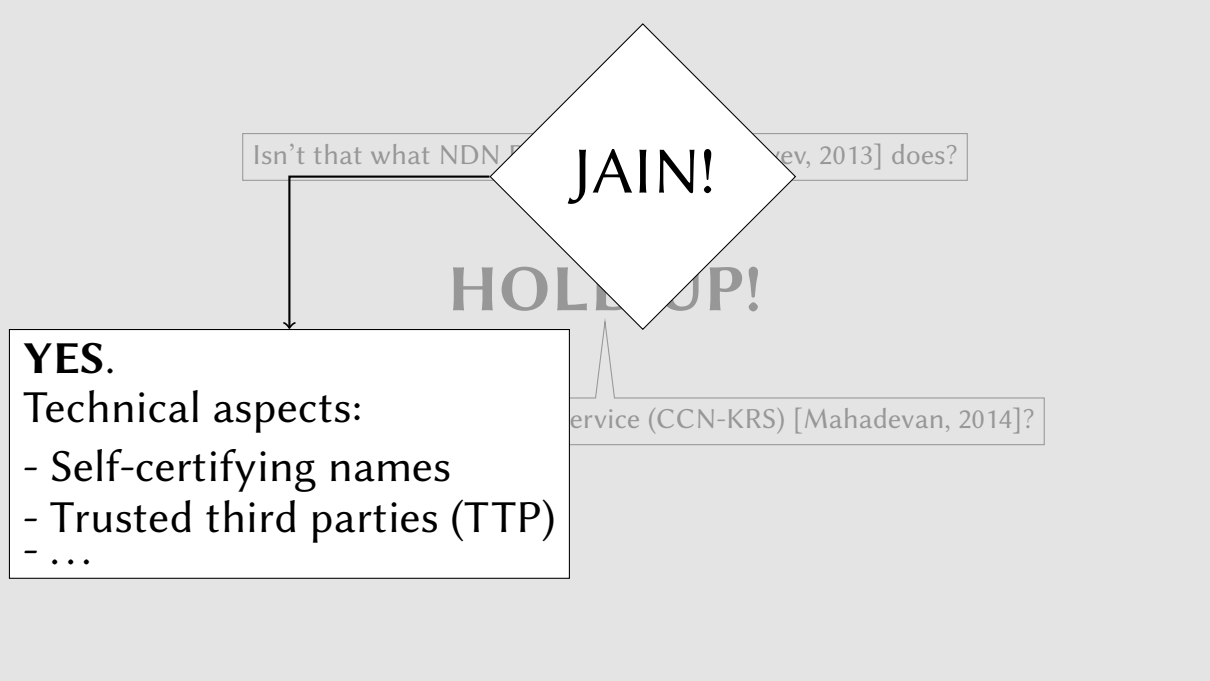
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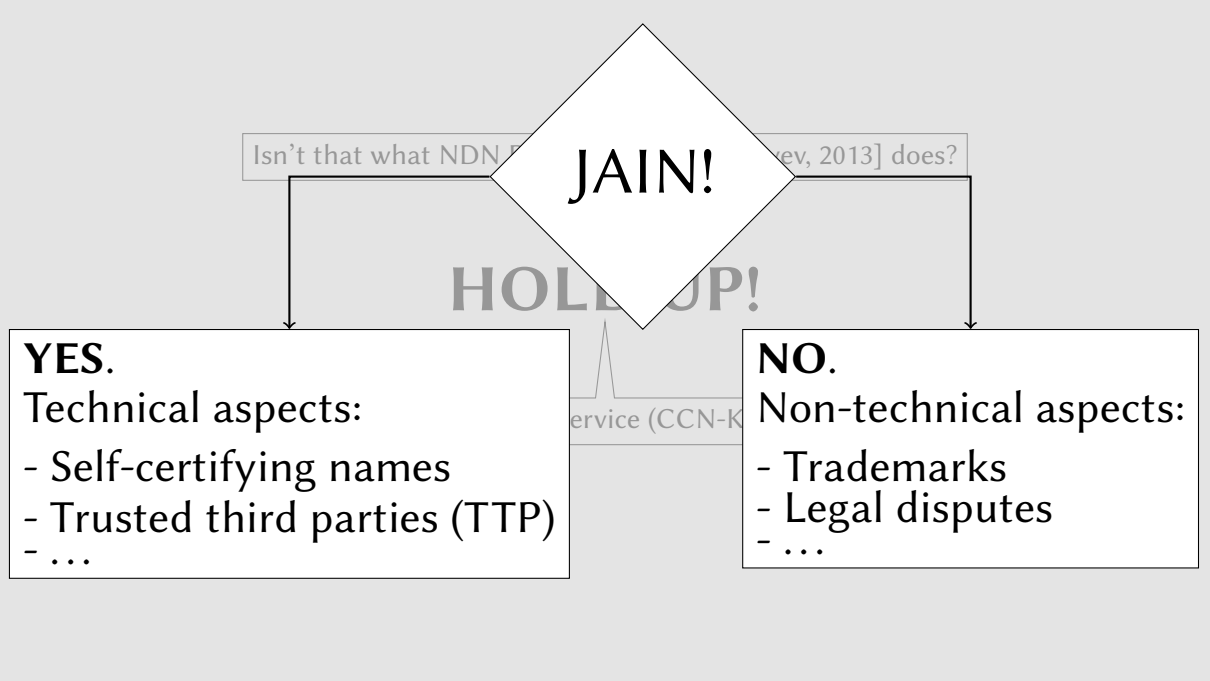
ervice (CCN-KRS) [Mahadevan, 2014]?
YES.
Technical aspects:
- Self-certifying names
- Trusted third parties (TTP)
- …


Isn't that what NDN
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ervice (CCN-K
YES.
Technical aspects:
- Self-certifying names
- Trusted third parties (TTP)
- …
NO.
Non-technical aspects:
- Trademarks
- Legal disputes
- …

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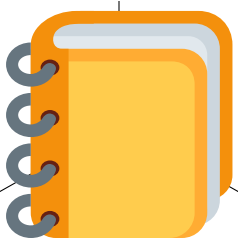
Internet Phone Book



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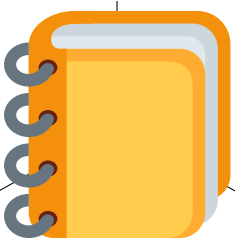
How entries are entered
and read from phonebook.

IETF for DNS

Internet Phone Book



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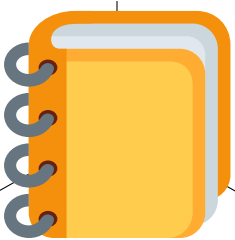

How to decide what names *should* be entered in the phonebook.

ICANN for DNS

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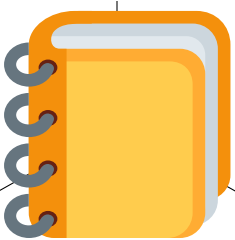

How to decide what names *should* be entered in the phonebook.

ICANN for DNS

Often contentious…

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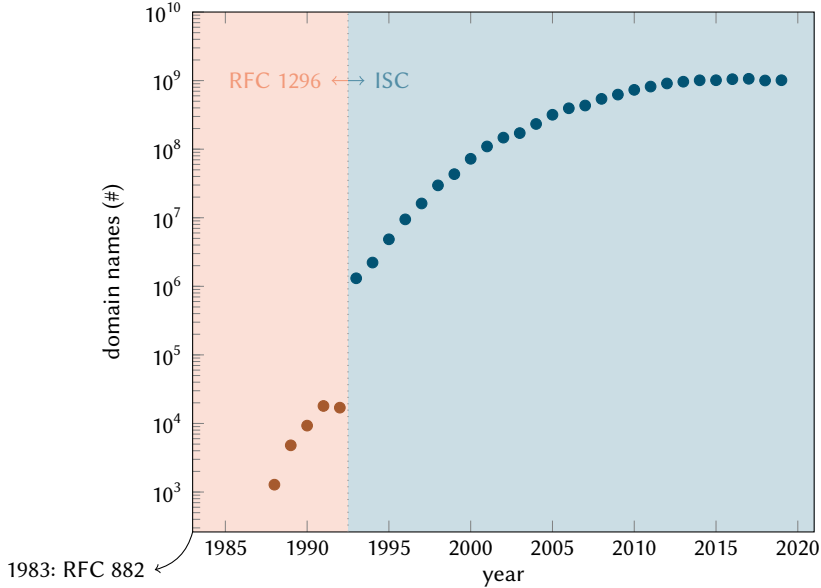
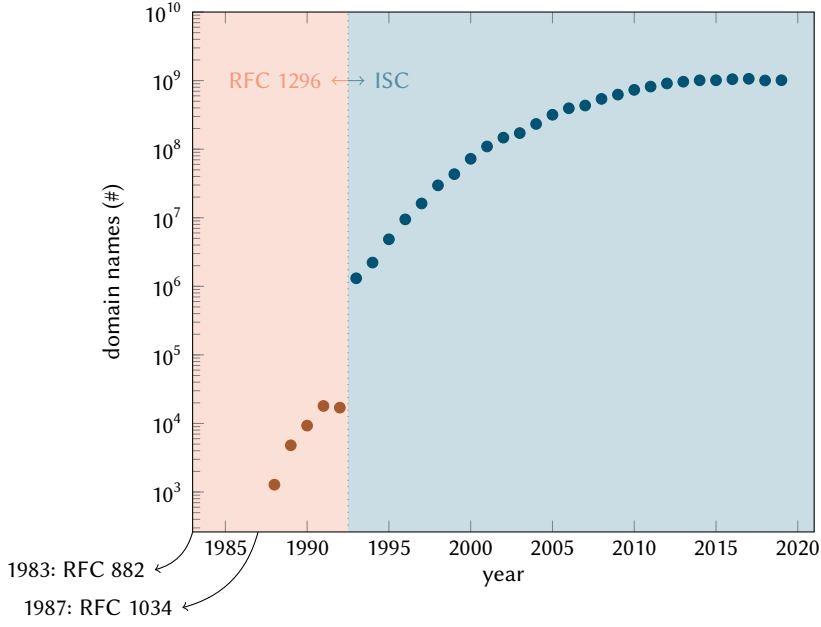
Internet Phone Book

But, why did we wind up needing this for (global) naming?

Often contentious…


RFC 1296 ⟷ ISC
domain names (#)
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
1985
1990
1995
2000
2005
2010
2015
2020
year
1983: RFC 882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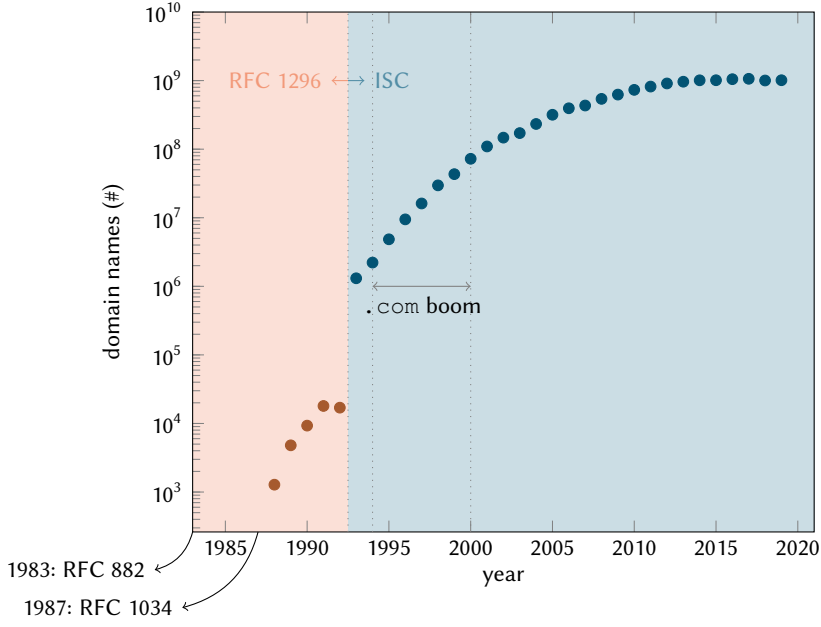
RFC 1296 ⟷ ISC
.com boom
domain names (#)
year
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
10^{5}
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1985
1990
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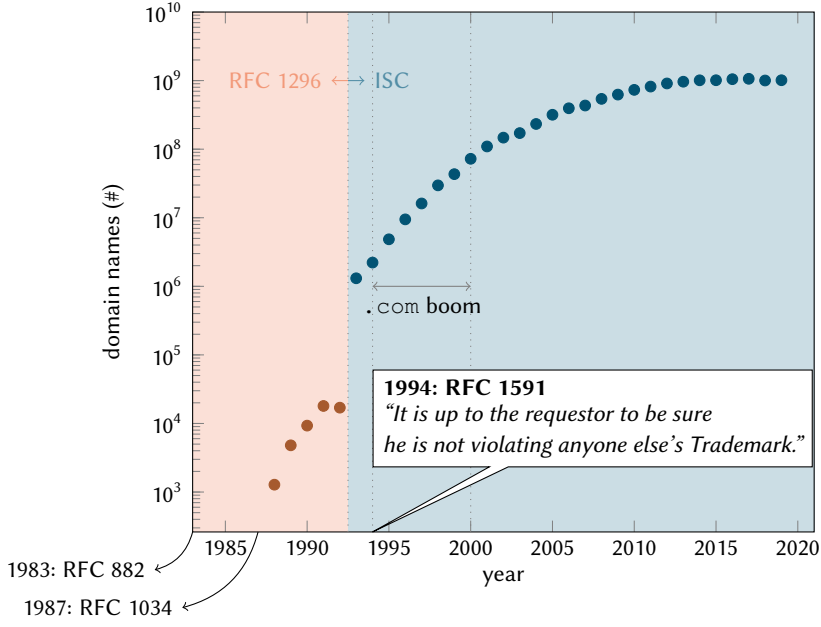
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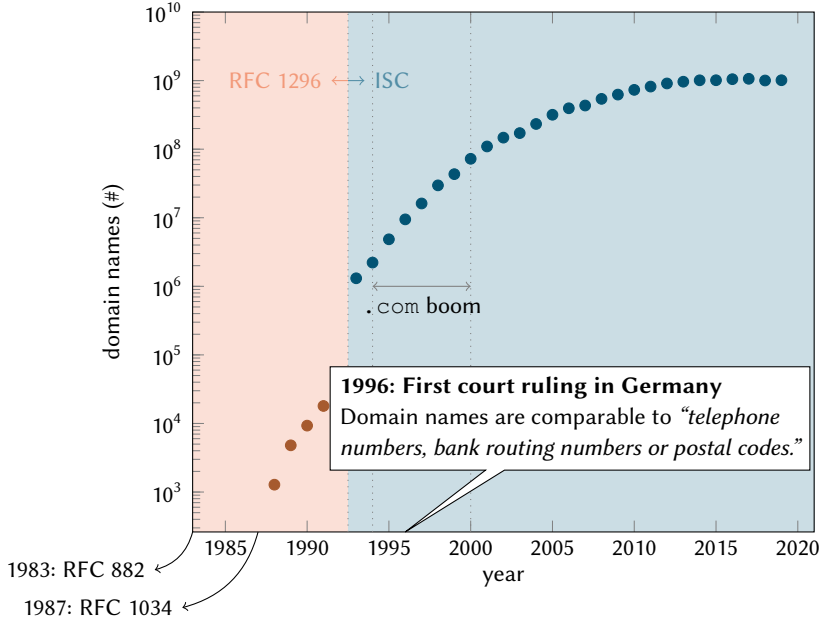
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
RFC 1296 ⟷ ISC
.com boom
1994: RFC 1591
"It is up to the requestor to be sure
he is not violating anyone else's Trademark."
1983: RFC 882
1987: RFC 1034
1985
1990
1995
2000
2005
2010
2015
2020
year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10^{10}
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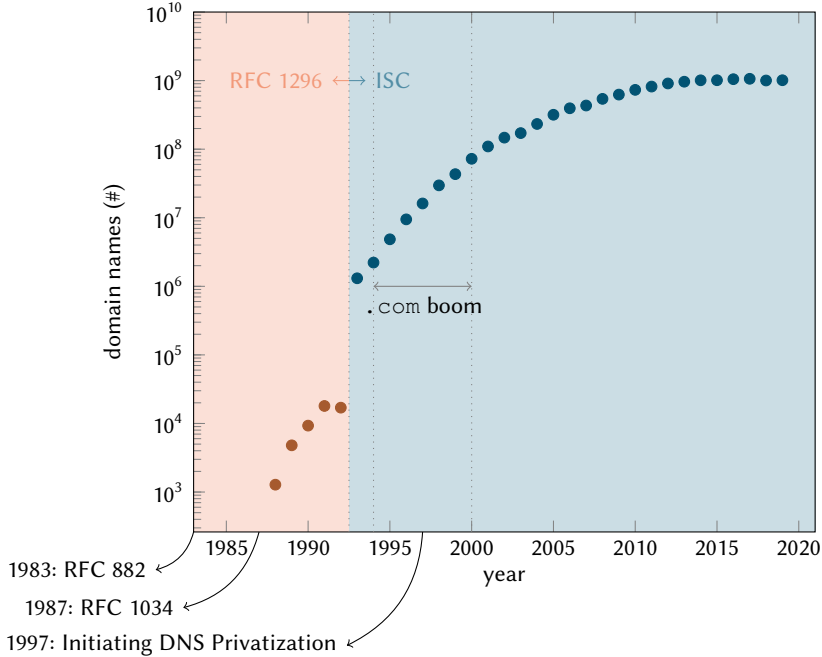
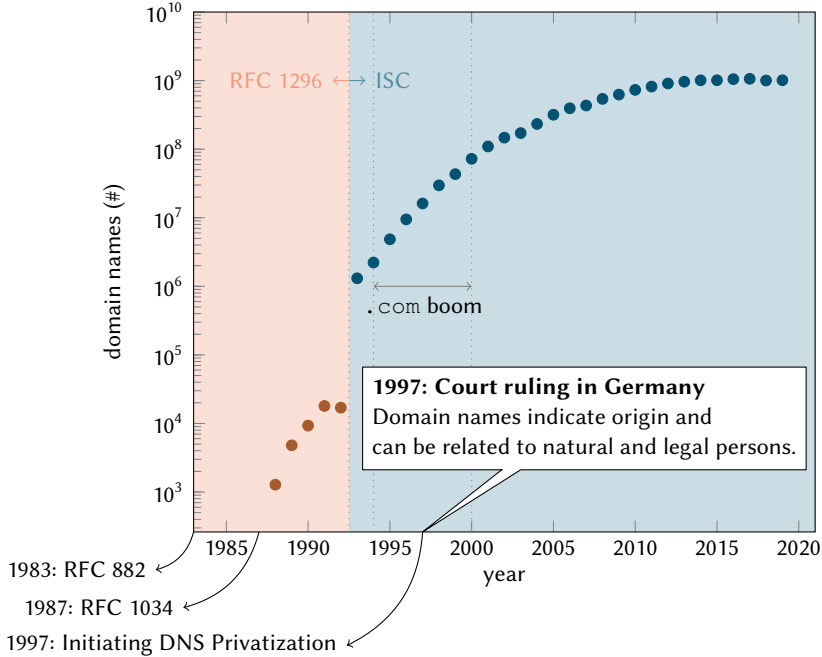
10^{6}
10^{5}
10^{4}
10^{3}
RFC 1296 ⟷ ISC
.com boom
1996: First court ruling in Germany
Domain names are comparable to "telephone numbers, bank routing numbers or postal codes."
1985
1990
1995
2000
2005
2010
2015
2020
year
1983: RFC 882
1987: RFC 1034


RFC 1296 ⟷ ISC
.com boom
domain names (#)
year
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization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10^{9}
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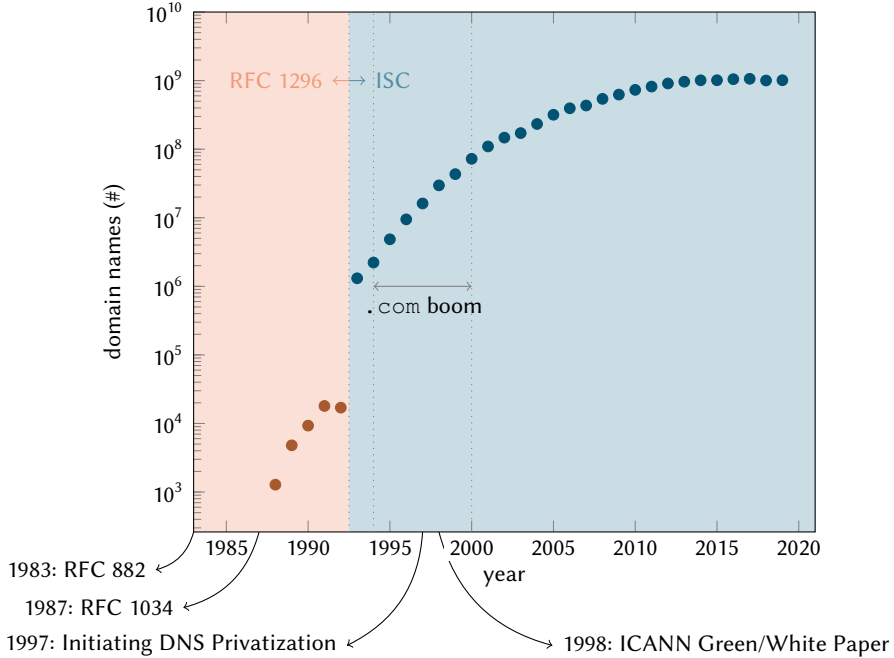
10^{7}
10^{6}
10^{5}
10^{4}
10^{3}
RFC 1296 ⟷ ISC
.com boom
1997: Court ruling in Germany
Domain names indicate origin and
can be related to natural and legal persons.
1985
1990
1995
2000
2005
2010
2015
2020
year
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization


RFC 1296 ⟷ ISC
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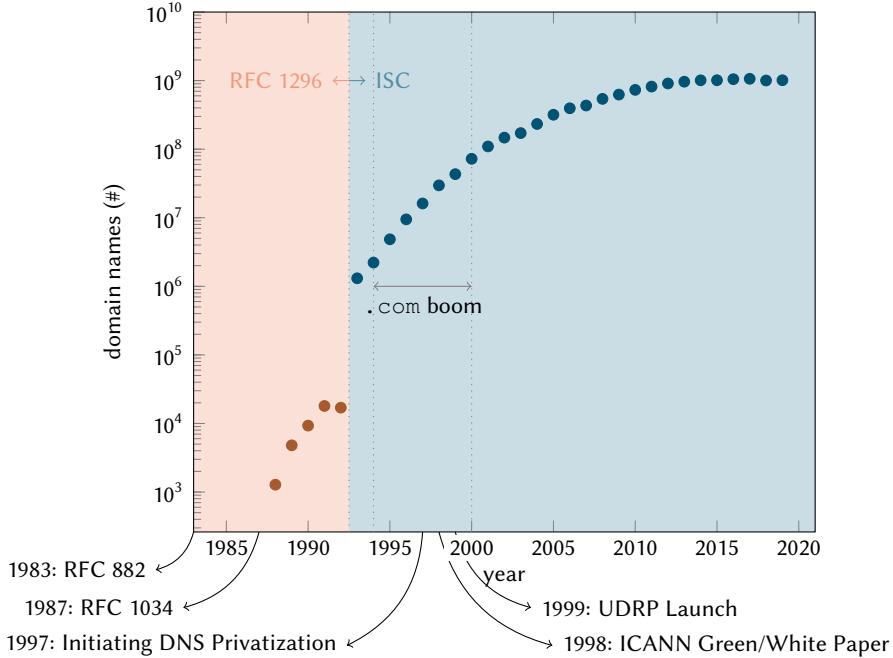
domain names (#)
year
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization
1998: ICANN Green/White Paper


RFC 1296 ⟷ ISC
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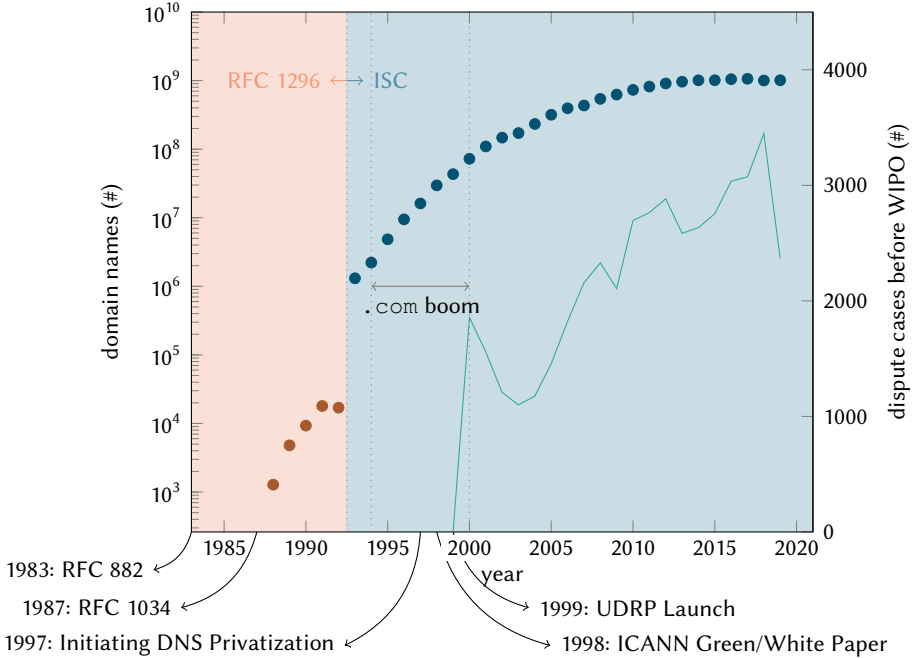
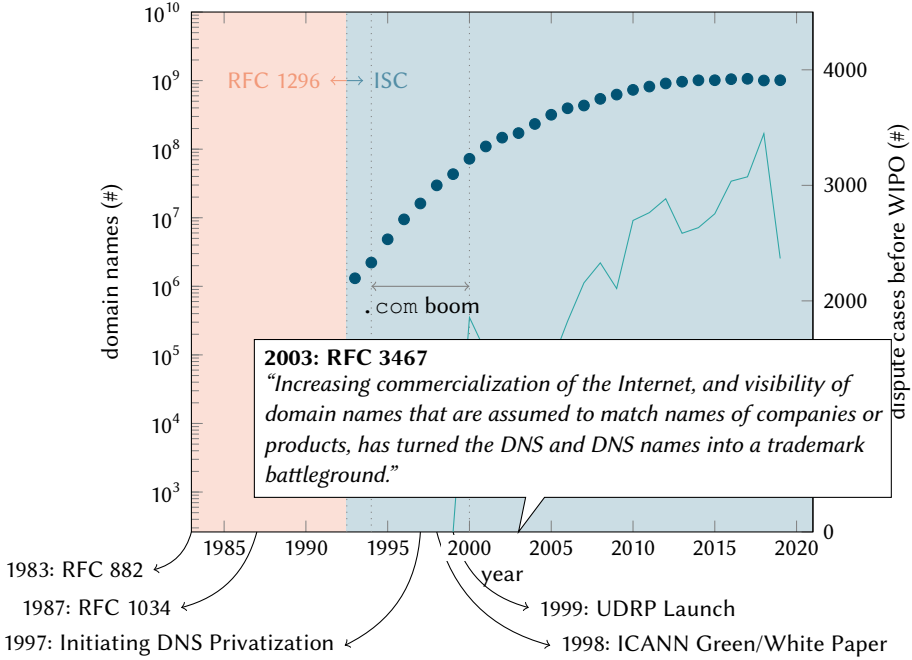
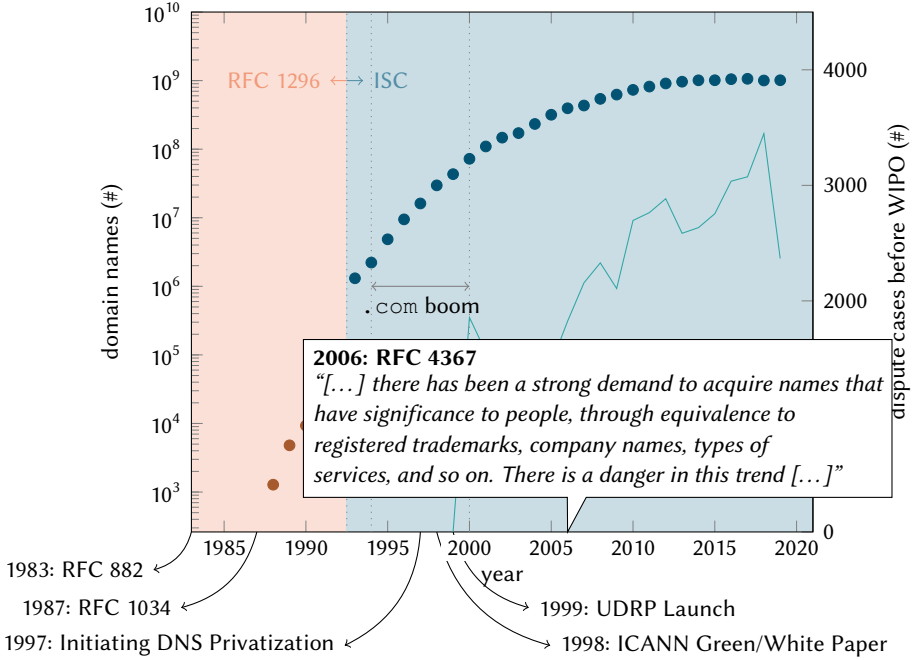
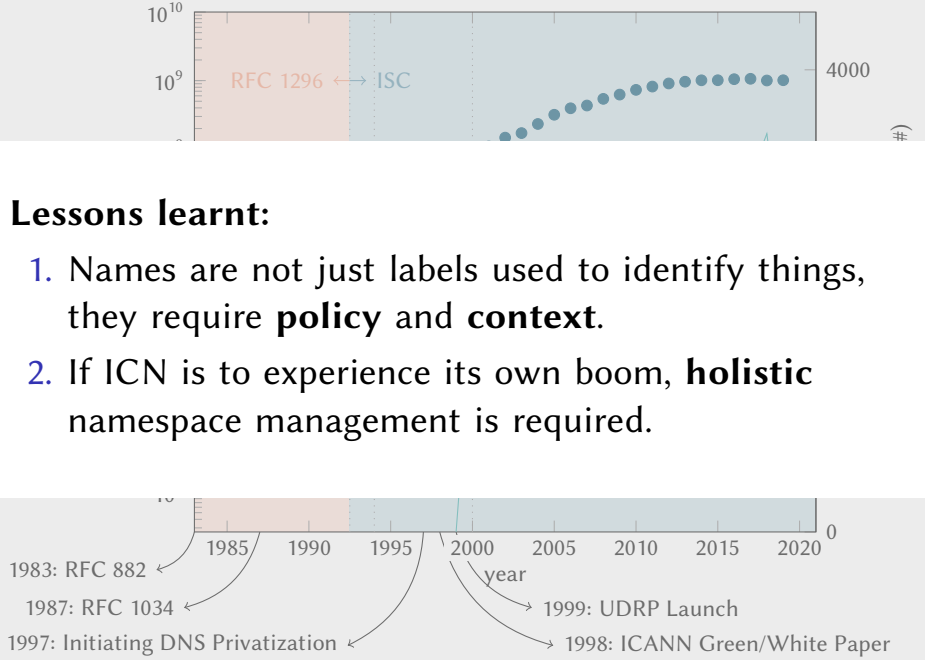
1997: Initiating DNS Privatization
1998: ICANN Green/White Paper
1999: UDRP Launch


RFC 1296 ⟷ ISC
.com boom
domain names (#)
dispute cases before WIPO (#)
year
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization
1998: ICANN Green/White Paper
1999: UDRP Launch


RFC 1296 ⟷ ISC
.com boom
domain names (#)
dispute cases before WIPO (#)
year
2003: RFC 3467
"Increasing commercialization of the Internet, and visibility of domain names that are assumed to match names of companies or products, has turned the DNS and DNS names into a trademark battleground."
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization
1998: ICANN Green/White Paper
1999: UDRP Launch


RFC 1296
ISC
.com boom
domain names (#)
dispute cases before WIPO (#)
year
2006: RFC 4367
"[…] there has been a strong demand to acquire names that have significance to people, through equivalence to registered trademarks, company names, types of services, and so on. There is a danger in this trend […]"
1983: RFC 882
1987: RFC 1034
1997: Initiating DNS Privatization
1998: ICANN Green/White Paper
1999: UDRP Launch



Lessons learnt:

1. Names are not just labels used to identify things, they require **policy** and **context**.
2. If ICN is to experience its own boom, **holistic** namespace management is required.

Agenda

Introduction

Namespace Management in ICN

NDNSSEC: NDN + DNSSEC

Conclusion and Research Roadmap

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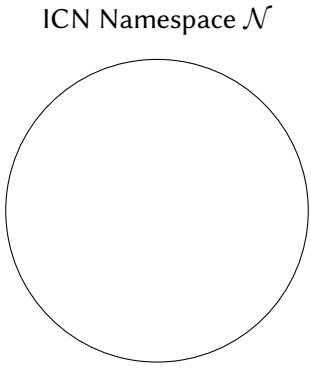
NDNSSEC: NDN + DNSSEC

Conclusion and Research Roadmap

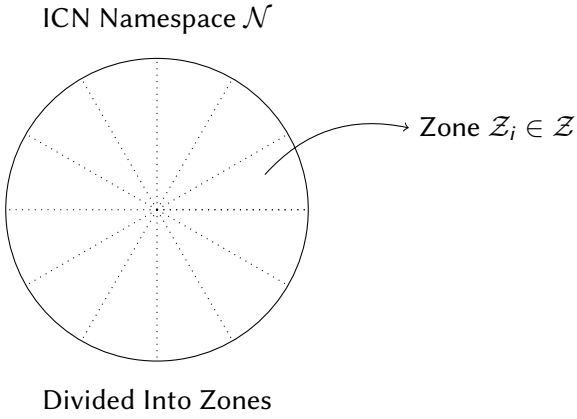
Namespace Management Concept

Generic ICN



Namespace Management Concept

Generic ICN



Namespace Management Concept

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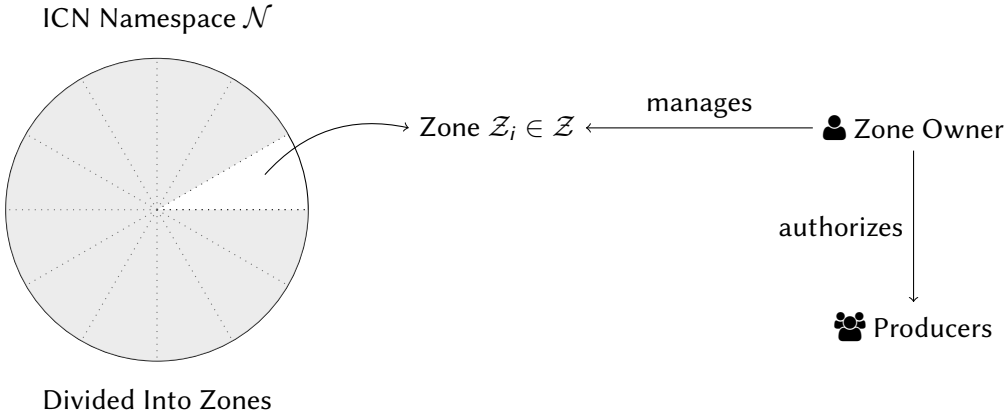

Namespace Management Concept

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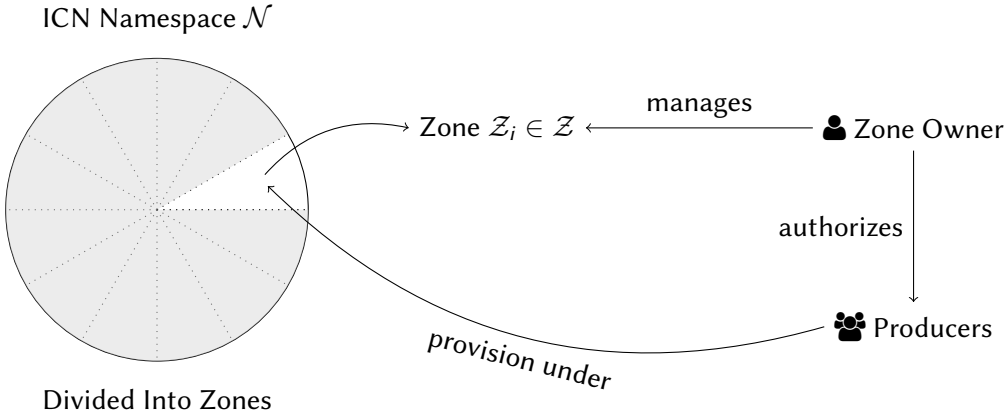

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Namespace Management in ICN

NDNSSEC: NDN + DNSSEC

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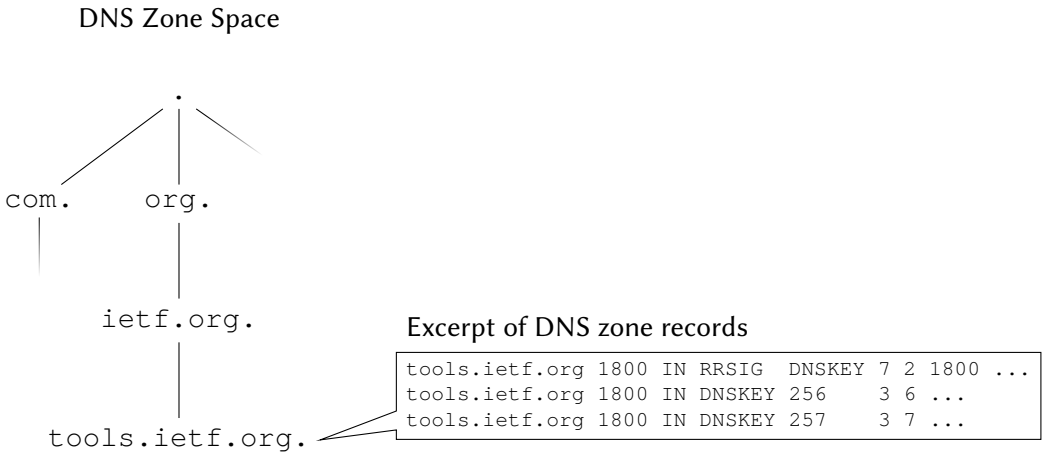
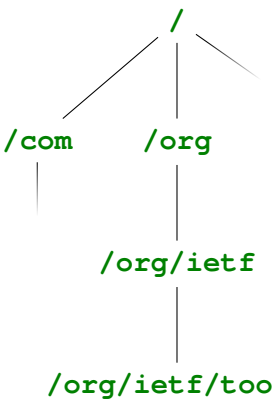
NDNSSEC


DNS Zone Space
.
com.
org.
ietf.org.
tools.ietf.org.
Excerpt of DNS zone records
tools.ietf.org 1800 IN RRSIG DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256 3 6 ...
tools.ietf.org 1800 IN DNSKEY 257 3 7 ...

NDNSSEC: DNS Zone Appropriation for NDN

ndnified DNS Zone Space

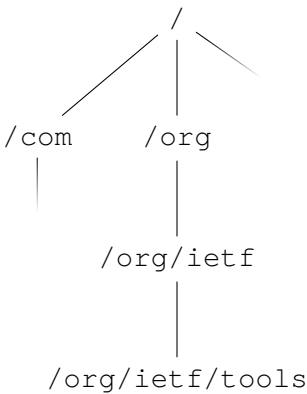


Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
```

NDNSSEC: Producer Authorization

ndnified DNS Zone Space



Producer

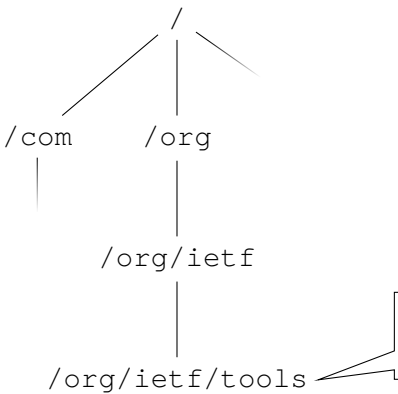
Zone Owner

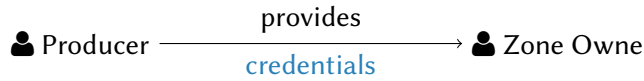
Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
```

NDNSSEC: Producer Authorization

ndnified DNS Zone Space





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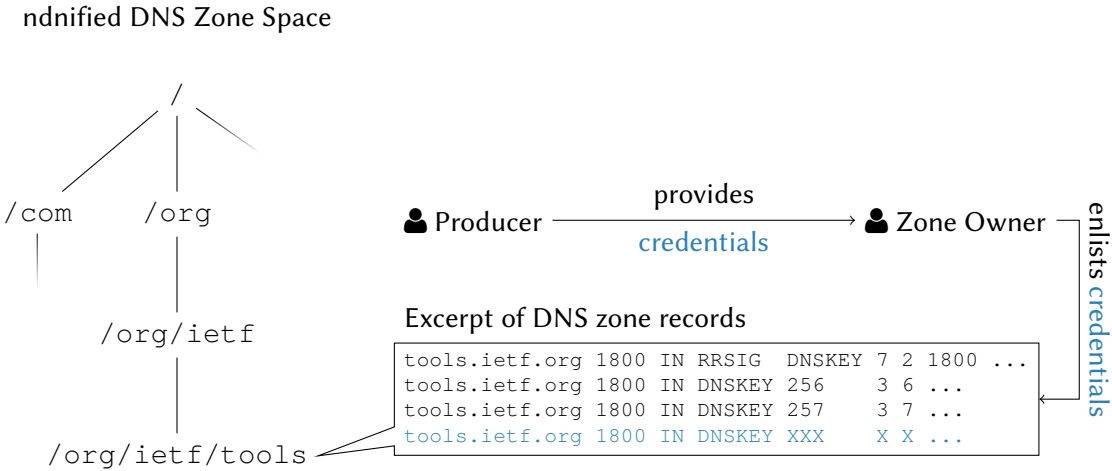
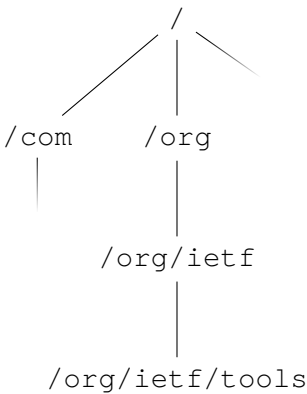
NDNSSEC: Producer Authorization



NDNSSEC: Data Publishing

ndnified DNS Zone Space



Data Packet

/html/rfc882
Meta Info
Content

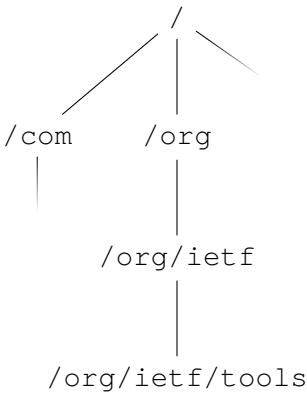
Producer

Excerpt of DNS zone records

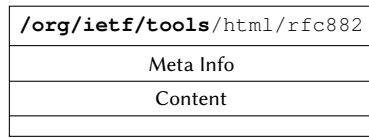
```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
tools.ietf.org 1800 IN DNSKEY XXX    X X ...
```

NDNSSEC: Data Publishing

ndnified DNS Zone Space



Data Packet



prefix w/ zone apex

Producer

Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
tools.ietf.org 1800 IN DNSKEY XXX    X X ...
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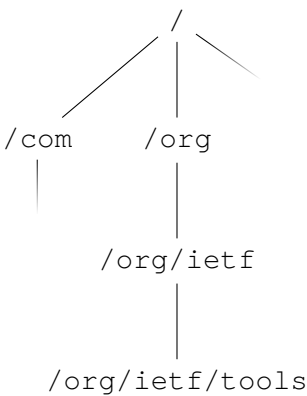
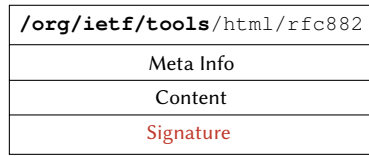
NDNSSEC: Data Publishing

ndnified DNS Zone Space



Data Packet



prefix w/ zone apex

Producer

sign

Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
tools.ietf.org 1800 IN DNSKEY XXX    X X ...
```

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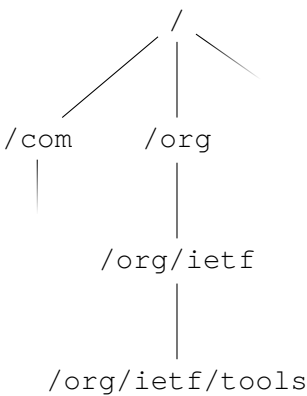
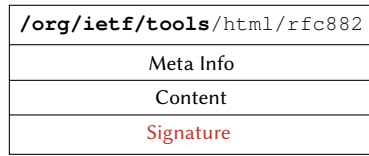


Data Packet



prefix w/ zone apex

Producer

register on NDN

sign

Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
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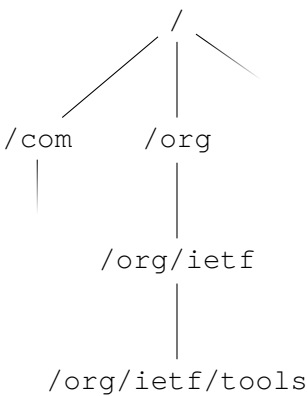
NDNSSEC: Producer Authentication

ndnified DNS Zone Space



Data Packet

/org/ietf/tools/html/rfc882
Meta Info
Content
Signature

Consumer

Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
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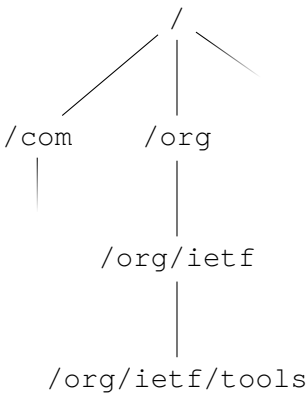
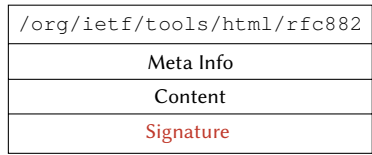
ndnified DNS Zone Space



Data Packet



retrieves

Consumer

Excerpt of DNS zone records

```
tools.ietf.org 1800 IN RRSIG  DNSKEY 7 2 1800 ...
tools.ietf.org 1800 IN DNSKEY 256    3 6 ...
tools.ietf.org 1800 IN DNSKEY 257    3 7 ...
tools.ietf.org 1800 IN DNSKEY XXX    X X ...
```

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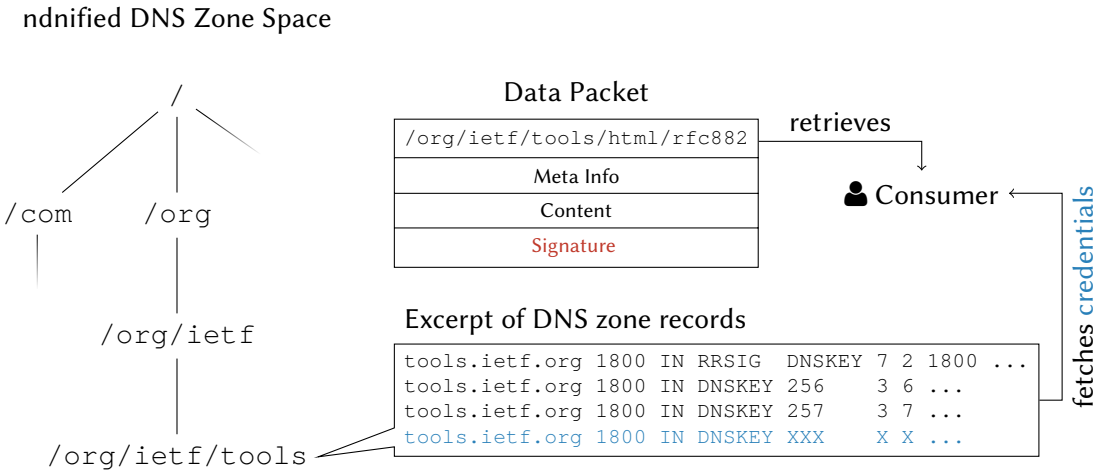

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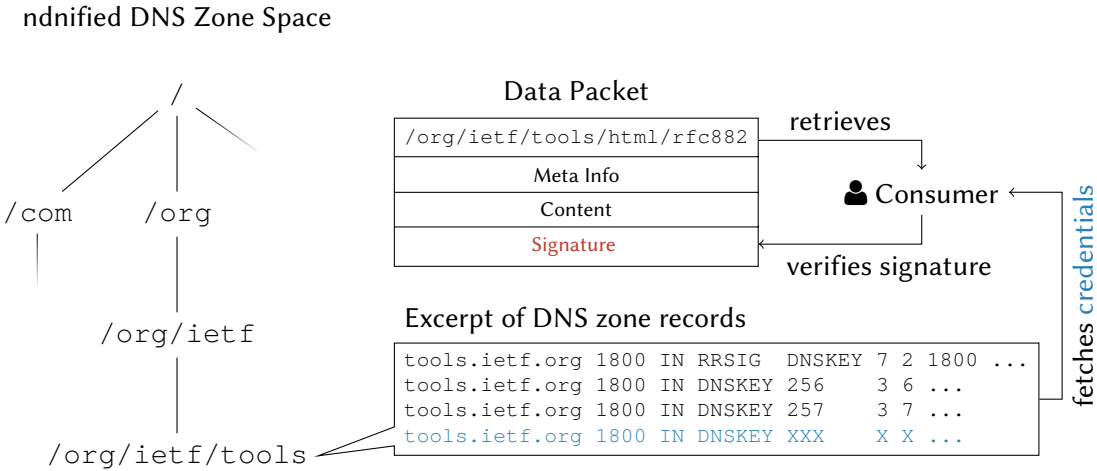

Conclusion and Research Roadmap

Multi-stakeholder scenarios require namespace management.

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Where we are

- ✔ Ecosystem to globally manage and secure names (based on DNS)

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Where we want to be

- ➜ DNS data w/o DNS transport

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Multi-stakeholder scenarios require namespace management.

Where we are

- ✔ Ecosystem to globally manage and secure names (based on DNS)
- ✔ Prototype to synergize with NDN

Where we want to be

- ➜ DNS data w/o DNS transport
- ➜ Evaluate performance and feasibility (synchronization disparities, etc.)

Thanks! It's time for

Questions, Comments, and Criticisms.