



# DNSSEC Deployment Metrics Research

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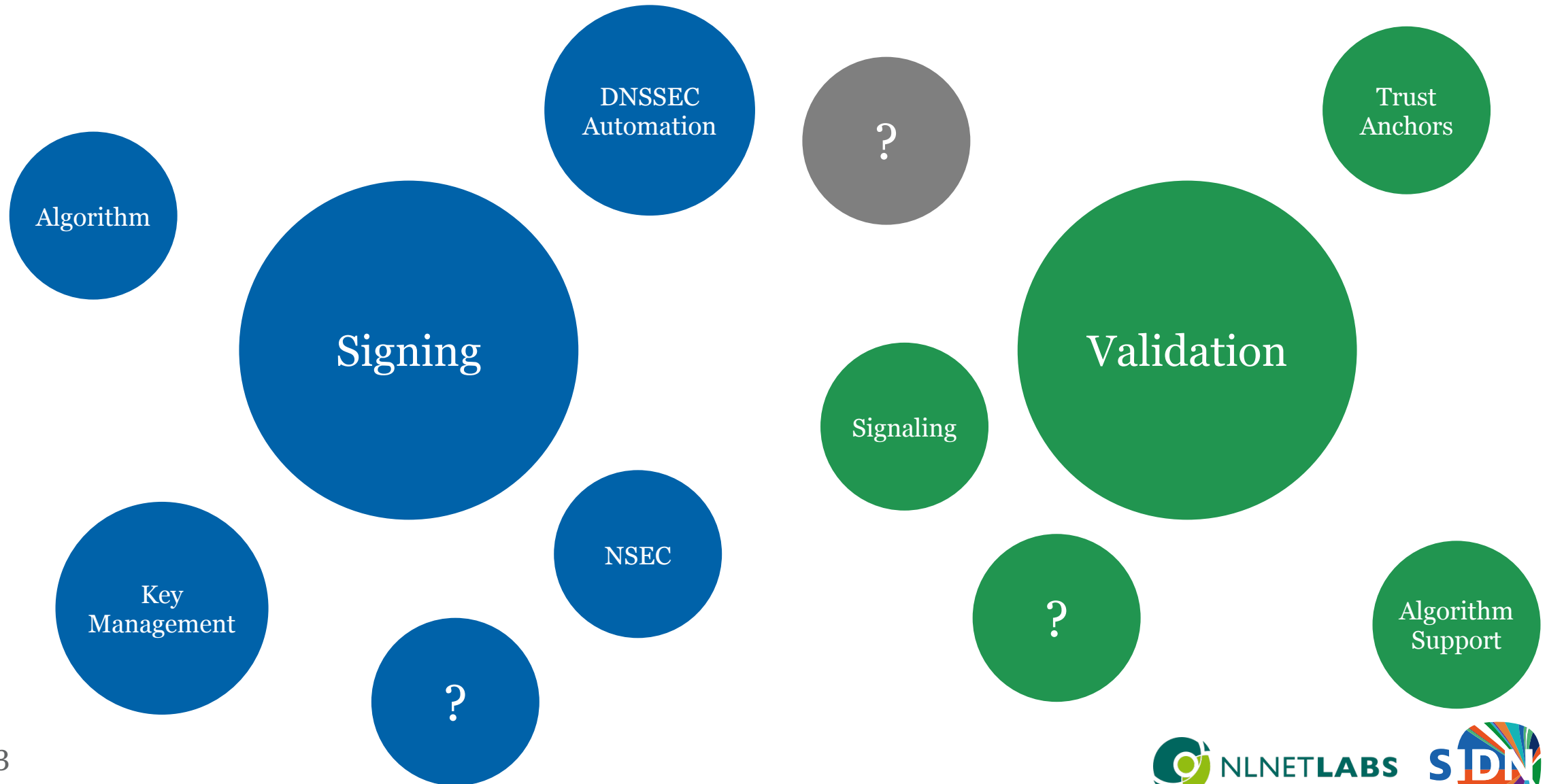
# The goal

- to perform a survey of academic and industry literature related to the deployment of DNSSEC
  - to find and document the different techniques and metrics used to measure all aspects of DNSSEC deployment
  - to make recommendations to ICANN org for which metrics to measure to obtain the most comprehensive view of DNSSEC deployment across the Internet [1]
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- The outcome [2]

[1] <https://www.icann.org/en/system/files/files/rfp-dnssec-deployment-metrics-research-17may21-en.pdf>

[2] <https://www.icann.org/en/system/files/files/dnssec-deployment-metrics-research-08aug22-en.pdf>

# Challenge: DNSSEC deployment is a wide field



# Our approach

1. Study a broad range of research
  - from academia
  - presented at conferences by the industry (RIPE, ICANN DNSSEC workshop, ...)
2. Gap analysis with identified metrics
3. Develop assessment framework to assess measurement techniques

# Identified metrics: 5 categories

- Domain name metrics
- Resolver metrics
- Client metrics
- Software metrics
- Ecosystem metrics

# Identified metrics: 5 categories

- Domain name metrics
  - 34 different metrics identified
  - DNSSEC signing most often measured
- Resolver metrics
- Client metrics
- Software metrics
- Ecosystem metrics



# Identified metrics: 5 categories

- Domain name metrics
- Resolver metrics
  - 17 different metrics identified
  - Most often: Is a resolver able to fetch and validate signatures
- Client metrics
- Software metrics
- Ecosystem metrics

# Identified metrics: 5 categories

- Domain name metrics
- Resolver metrics
- Client metrics
  - 3 different metrics identified
  - E.g. does a client rely on a validating resolver
- Software metrics
- Ecosystem metrics



# Identified metrics: 5 categories

- Domain name metrics
- Resolver metrics
- Client metrics
- Software metrics
  - 4 different metrics identified
  - E.g. default parameters
- Ecosystem metrics

# Identified metrics: 5 categories

- Domain name metrics
- Resolver metrics
- Client metrics
- Software metrics
- Ecosystem metrics
  - 6 different metrics identified
  - E.g. DNSSEC fees

# Measurement techniques

- Not every metric can be measured with every measurement technique
- 3 main measurement categories
  - Active
  - Passive
  - Manual



# Technique Assessment

- Measurement technique has large impact on each metric
- Assess each technique based on:
  - **Coverage** – which parts of the ecosystem can be measured and with what bias?
  - **Feasibility** – can the measurement run continuously, and does it rely on 3<sup>rd</sup> parties?
  - **Reproducibility** – are all measurement parameters known?
- On a scale from - - (double minus) to ++ (double plus)

# Measurement techniques: Examples

	Coverage	Feasibility	Reproducibility
Advertising network	=	=	+
Proxy network	-	=	-

# Recommendations

- What's the goal of the measurement?
- Goal 1: Protecting DNS *transactions* with DNSSEC
- Goal 2: Increasing DNSSEC *deployment quality*
- Goal 3: Making DNSSEC deployments *future-proof*



# Goal 1: Protecting DNS **transactions** with DNSSEC

- Focus on DNS transactions instead of validating resolvers or signed domain names
- Ideally measured at resolvers
- Realistically measured indirectly

# Goal 2: Increasing DNSSEC deployment **quality**

- Focus on conformance with standards and best common practices
- E.g.
  - Signing algorithm and key size
  - Correct rollovers
  - Cookie support



# Goal 3: Making DNSSEC deployments **future-proof**

- Look at mid-term and long-term challenges of DNS and DNSSEC
  - KSK rollovers
  - Quantum computers
- E.g.
  - Support of RFC5011
  - Reliable transport of larger messages
  - Experience with KSK rollovers

# Open questions and next steps

- Who should start these measurements?
- How can we address the measurement challenges?
- Can we formulate other goals?
  
- The report:

<https://www.icann.org/en/system/files/files/dnssec-deployment-metrics-research-08aug22-en.pdf>

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*Any questions?*