

Analyzing GDPR Compliance of Named Data Networking

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SAINT LOUIS
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General Data Protection Regulation

GDPR



Data Protection Officer (DPO)



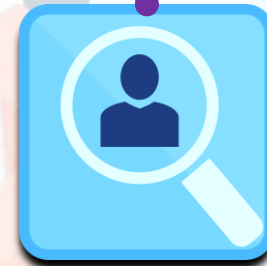
Compliance



25 May 2018



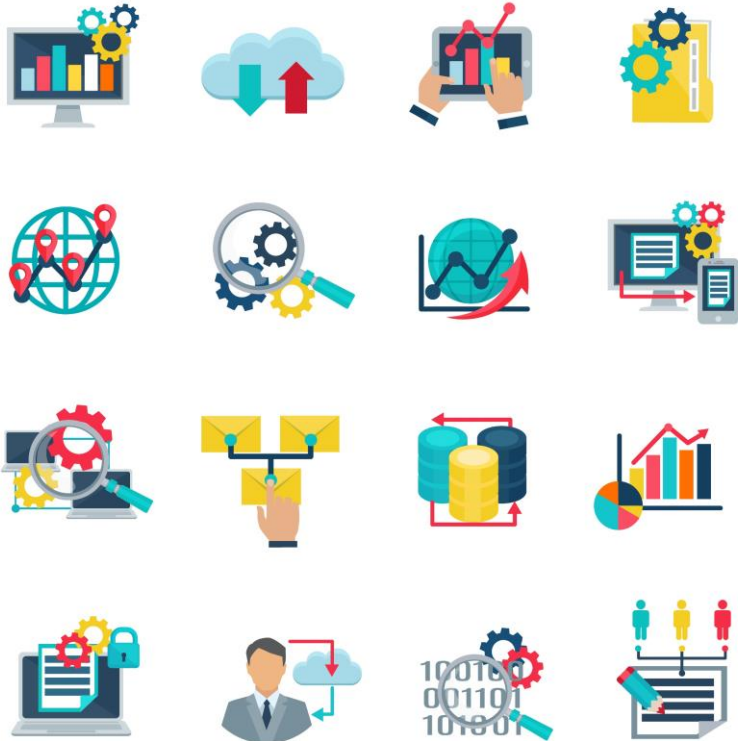
Data Breaches



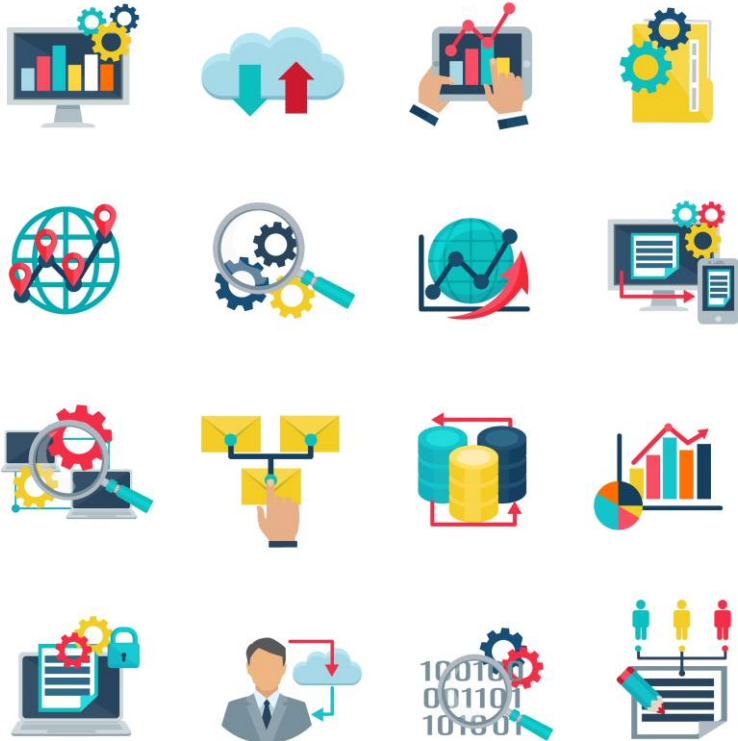
Personal Data



Harsh Fines for Risky/Critical Systems



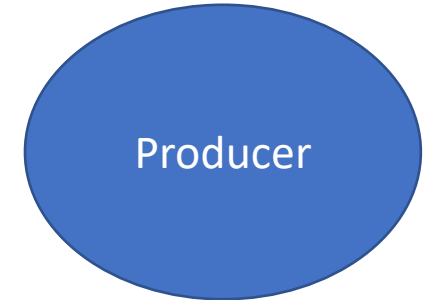
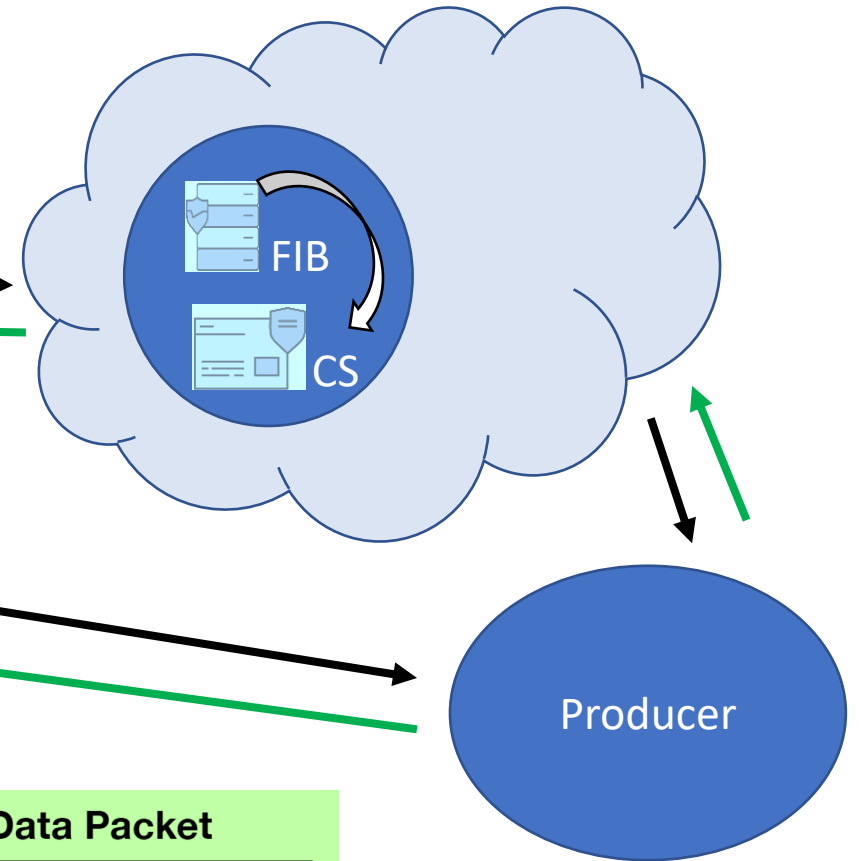
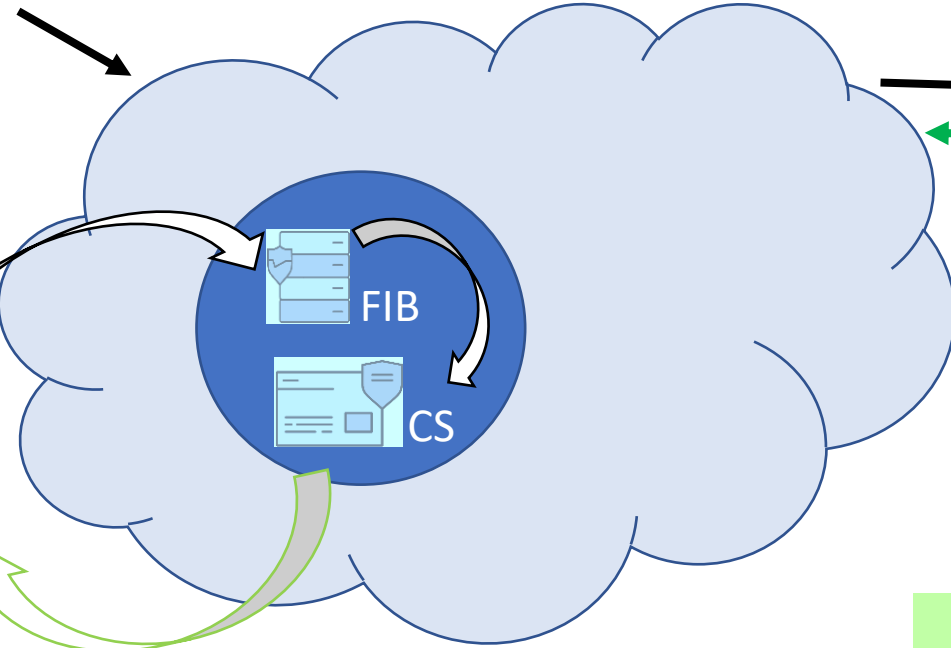
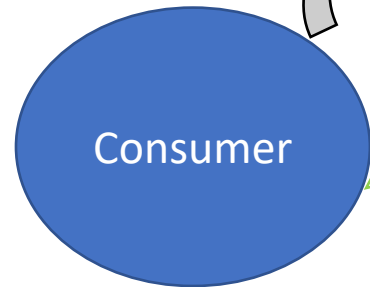
Money Saved for Prepared Systems



Named Data Networking

Interest Packet

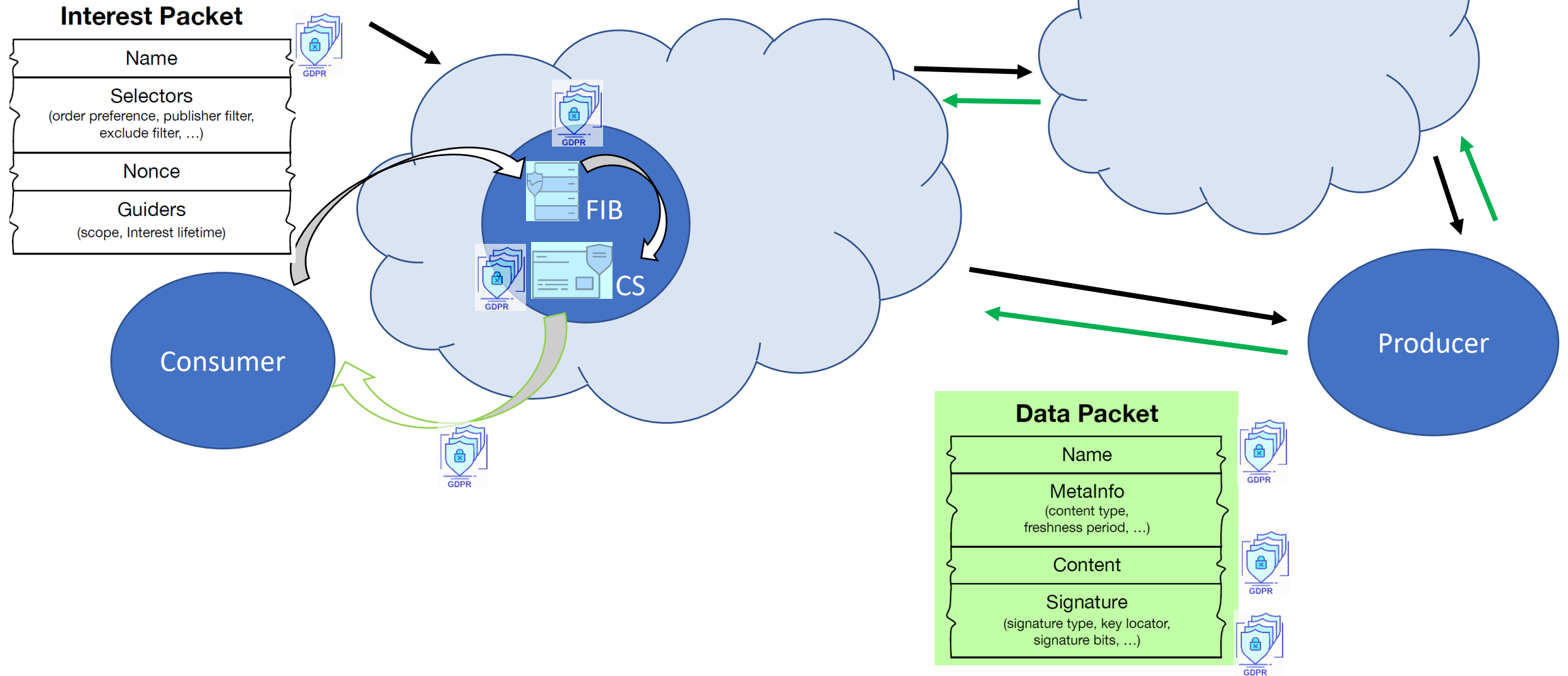
Name
Selectors (order preference, publisher filter, exclude filter, ...)
Nonce
Guiders (scope, Interest lifetime)



Data Packet

Name
MetaInfo (content type, freshness period, ...)
Content
Signature (signature type, key locator, signature bits, ...)

NDN Relevance of GDPR Compliance



Motivation and Background

Relevant fines tracked by CMS.Law

ETID-118, Failure to Separate Personal Data

ETID-226, Application Semantics

ETID-34, Failure to respond to data erasure

ETID-422, Lost ability to track and access data



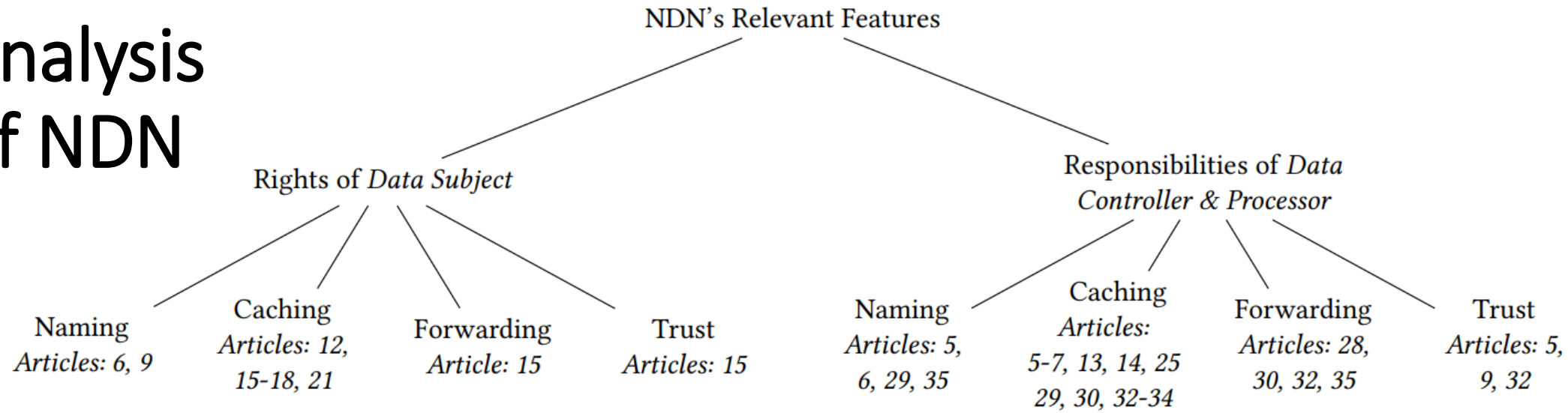
Recent Initiatives

Addressing Compliance via:

Retrofitting old Systems and Assessing new technologies

- IoT Networks
- Software Defined Networking API
- Storage Systems
- Access Control

Our GDPR Analysis of NDN



No.	Article Title
6	Lawfulness of processing
9	Processing of special data categories
12	Transparent information communication
15	Right of access by the data subject
16	Right to rectification
17	Right to erasure
18	Right to restriction of processing
21	Right to object

No.	Article Title
5	Principles of processing
6	Lawfulness of processing
7	Conditions for consent
13	Conditions for data collection
14	Conditions for indirect data collection
25	Protection by design and by default
28	Processor
29	Processing under controller's authority
30	Records of processing activity
32	Security of processing
33,34	Data breach notification
35	Data protection impact assessment

Naming

Arts. 5, 6, 29, 35



Data Packet

Name

MetaInfo

(content type,
freshness period, ...)

Content

Signature

(signature type, key locator,
signature bits, ...)



Outside core NDN forwarding operations?



Does the name contain sensitive or identifying information?

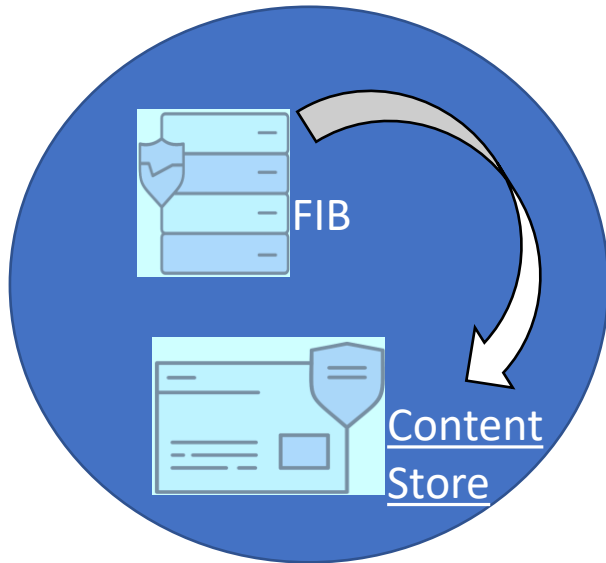


If the name contains any identifier, can it be controlled?



Caching

Arts. 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 21, 25, 29, 30, 32, 33, 34



Can the data be located upon request?



Processing is only insertion and deletion of cache? Proof?



Will the data be transferred?

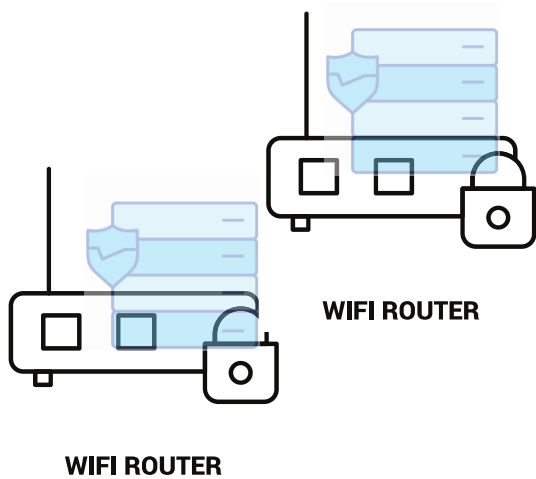


Is there a possibility that personally identifiable information will be cached?



Stateful Forwarding

Arts. 15, 28, 30, 32, 35



More than PIT and FIB operations, or will access control/custom forwarding strategies be used?



Can sensitive producers know who accessed their data?



How will records of data trail be kept if needed?



Built-in-Trust

5, 9, 15, 32



Data Packet

Name

MetaInfo
(content type,
freshness period, ...)

Content

Signature
(signature type, key locator,
signature bits, ...)

Are users identifiable in the trust schema?



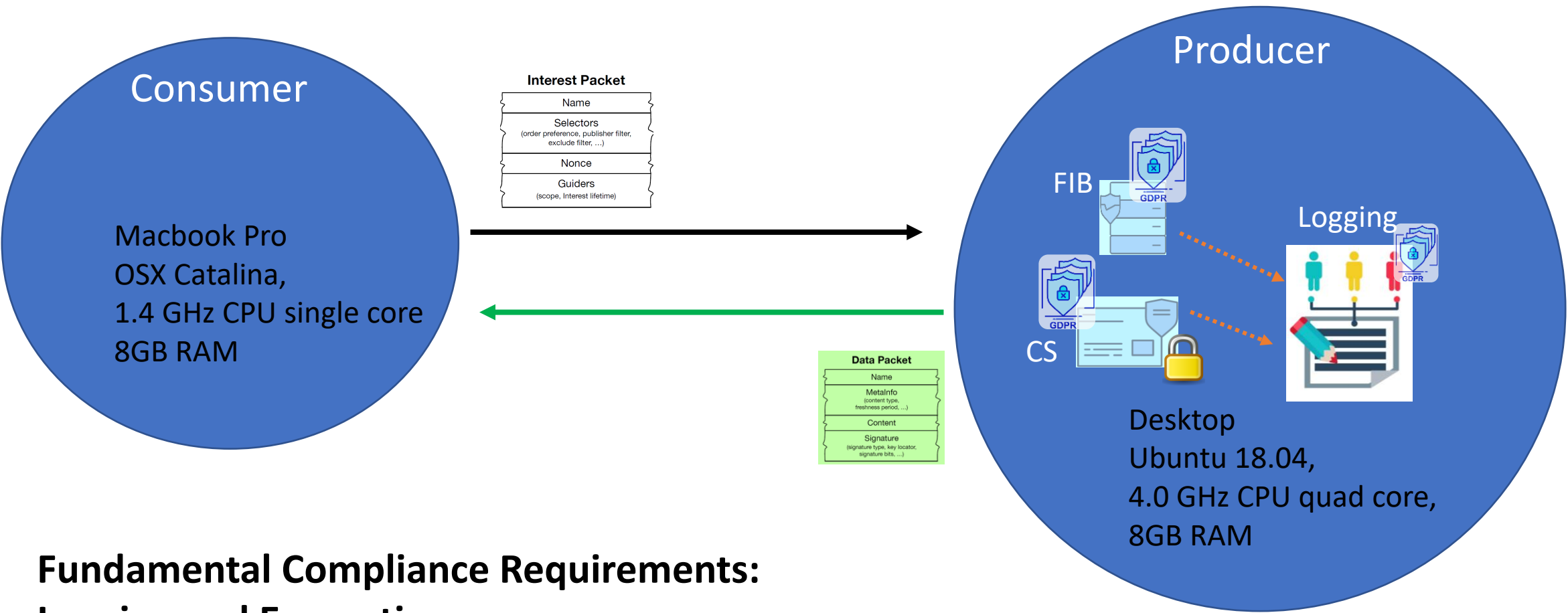
Do trust schemas reveal sensitive information?



How can eviction of certificates revealing sensitive chains of trusts be evicted?



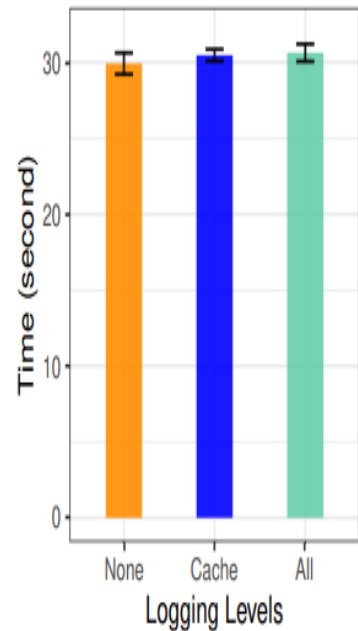
Experimental Results on a per node basis.



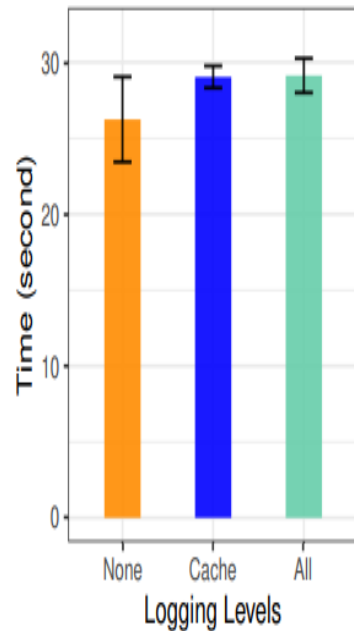
**Fundamental Compliance Requirements:
Logging and Encryption**

Logging Experimental Results

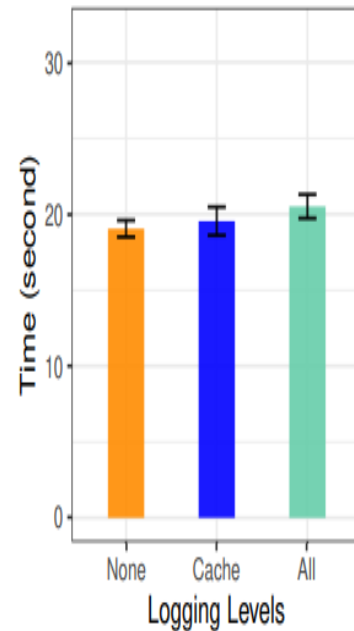
End-to-End Latency of Logging Levels



(a) No Caching

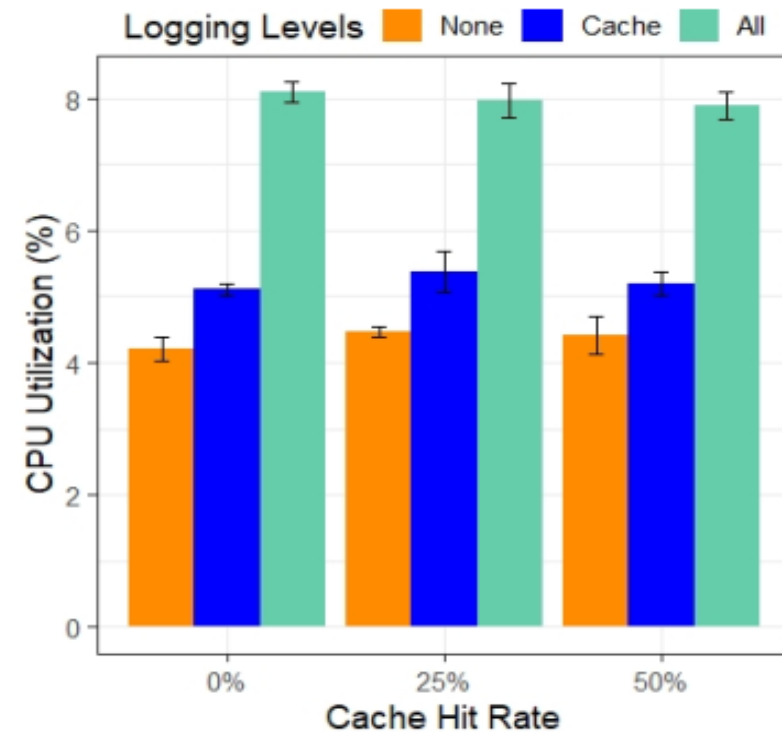


(b) 25% Cache Hit Rate



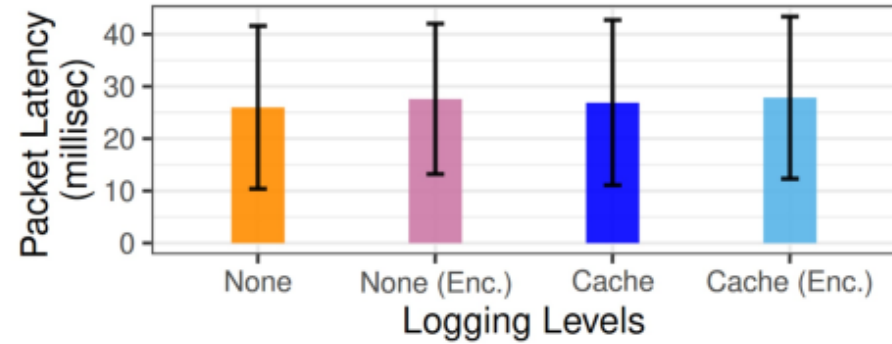
(c) 50% Cache Hit Rate

Effect of Logging on CPU Utilization

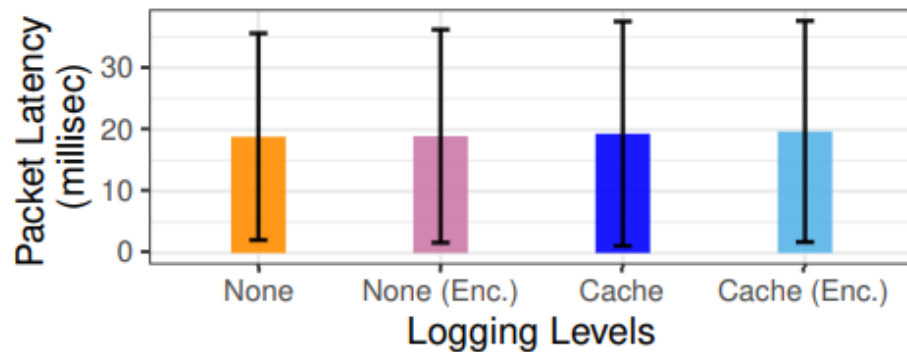


Experimental Results of Encryption

Impact of Data Decryption during cache hit

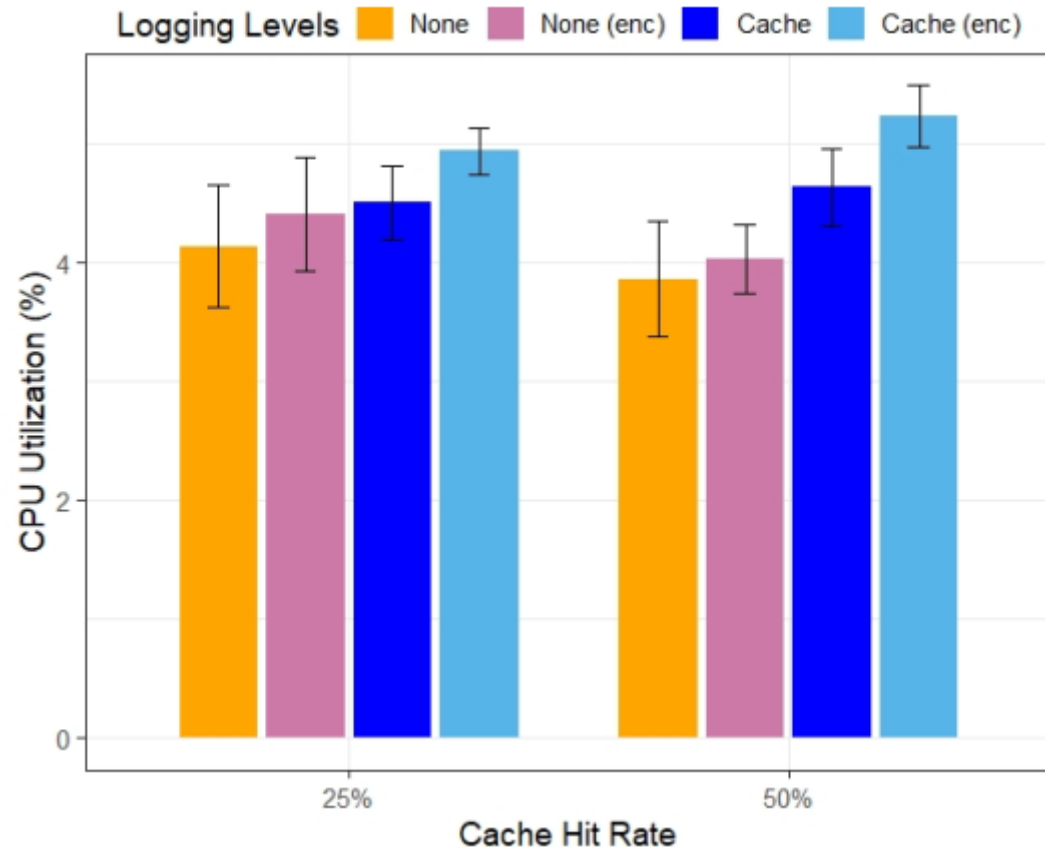


(a) 25% Cache Hit Rate



(b) 50% Cache Hit Rate

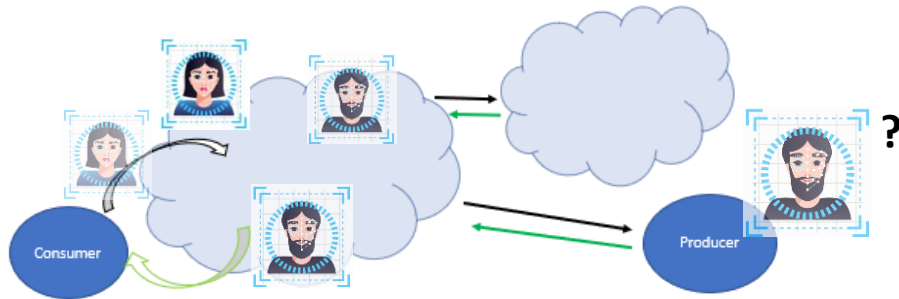
Effect of Encryption on CPU Utilization



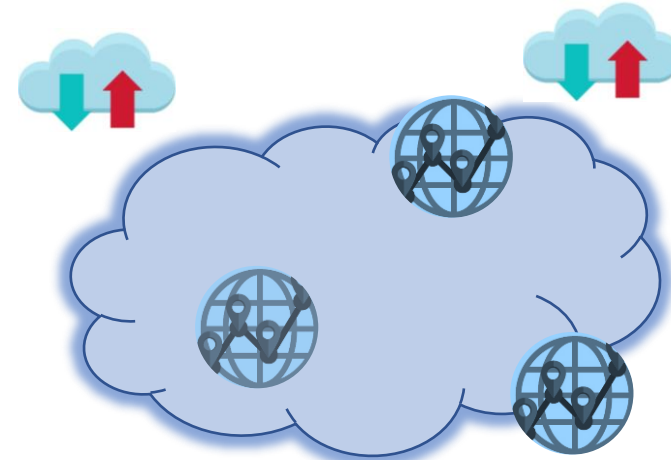
Concluding Discussion and Insights



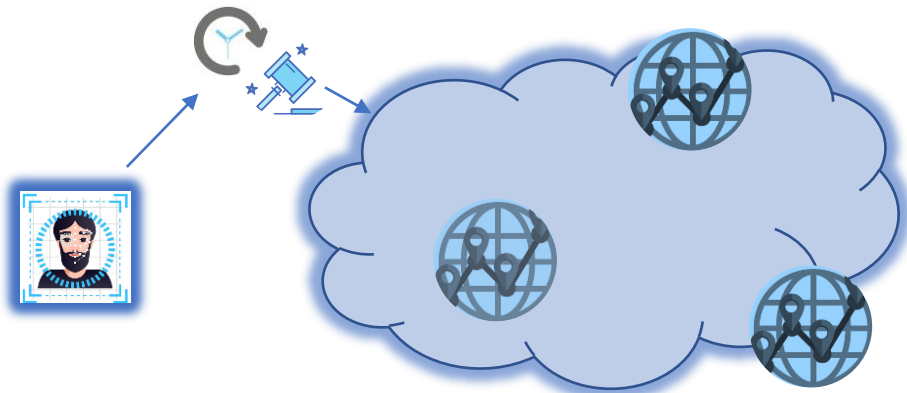
Consumer Identification



Distributed Auditing Framework



Timely Request Processing



Compliance at Application Layer



Thank you!

Q & A and discussion in breakout room!

