SPOTLIGHT

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As cloud adoption grows and organizational cloud maturity increases, enterprises focus more on privacy and security for data in use. Statutory Pseudonymization is emerging as a privacy-enhancing technology that effectively supports many enterprise data use cases.

Data Without the Drama — How to Process Data in the Cloud While Being Fully Compliant

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Introduction

Organizations are adapting to a digital-first world in which cloud data platforms play a key role. For instance, they are embracing edge computing as well as hybrid and multi-cloud architectures and shifting their compute strategies from centralized on-premises datacenters to distributed data infrastructure models. In addition, organizations are using powerful data analytics, increasingly infused with artificial intelligence (AI) and machine learning (ML), to drive valuable customer insight, smarter decision making, and competitive advantage.

Today, businesses must look beyond themselves for new ideas. We're seeing the emergence of industry platforms and ecosystems for business collaboration to gain access to different capabilities and new sources of data to build new business models or develop new products and services. Initiated by Europe, the Gaia-X project is an example of a digital ecosystem in which data and services are to be available, collated, and shared in an environment of trust.

Underpinning this digital transformation is digital trust — from trust in the data and technology to trust in the business partner or supplier. Data privacy and security are foundational to building digital trust and provide the glue for digital transformation. However, organizations anticipate that a wide range of external risks could affect their digital transformation and technology investment plans. Their foremost risk concern is business exposure to cyberincidents and data breaches, whether from ransomware attacks or technical cloud misconfigurations or via the supply chain. CEOs see the twin challenges of cybersecurity and data sovereignty as the foremost risk factors impacting their businesses during the next two years, according to IDC research (see Figure 1).

AT A GLANCE

WHAT'S IMPORTANT

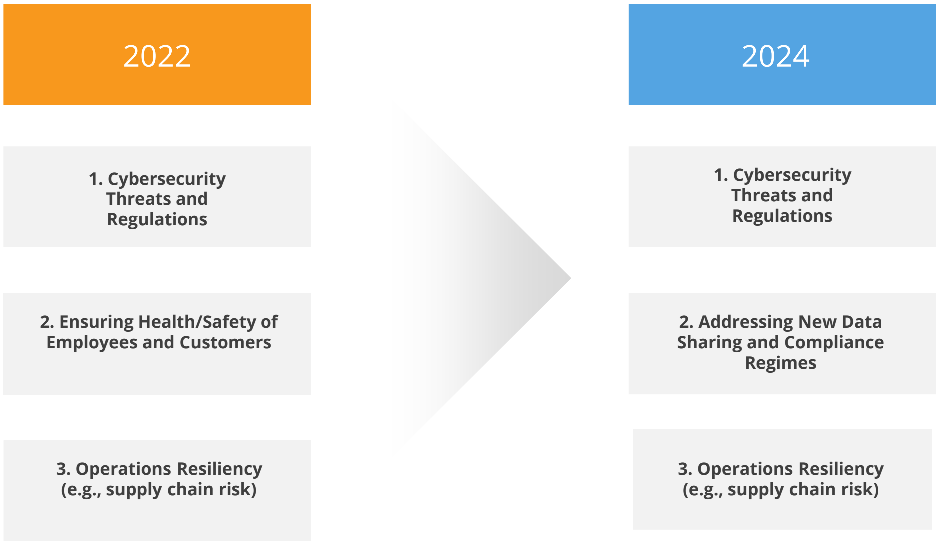
Cleartext processing in the cloud is the new frontier for privacy compliance. Statutory Pseudonymization is a technical safeguard to protect data in use.

KEY TAKEAWAYS

Statutory Pseudonymization has many business use cases:

- » Secure computation in the cloud
- » Data sovereignty and Schrems II-compliant processing
- » Privacy-compliant data analytics and collaboration
- » Unlocked data sets to expand trusted AI/ML capabilities

FIGURE 1: ***CEO Sentiment: Top 3 Risks with Greatest Impact on Business in 2022 and 2024***


2022
2024
1. Cybersecurity Threats and Regulations
1. Cybersecurity Threats and Regulations
2. Ensuring Health/Safety of Employees and Customers
2. Addressing New Data Sharing and Compliance Regimes
3. Operations Resiliency (e.g., supply chain risk)
3. Operations Resiliency (e.g., supply chain risk)

n = 390

Source: IDC's Worldwide CEO Sentiment Survey, 2022

Meanwhile, privacy regulations are tightening, adding further complexities to turning data into business insight. More data protection regulations, either modeled closely on the General Data Protection Regulation (GDPR) or with strong standards for protection, are emerging across the globe. Countries are taking more sovereignty measures to control the infrastructure and data generated in their jurisdictions, from rules on data residency to conditions on transborder data flows. The growing extraterritorial application of data governance laws subjects organizations to a growing tension between allowing digital innovation to accelerate and ensuring data and IT infrastructures comply with regulations and guidelines. The data sovereignty implications extend to the cloud environment given that organizations are increasingly moving their services and data to platforms managed by international cloud providers.

Using the public cloud is connected to the level of trust in the cloud service provider. For cloud customers, privacy and security concerns are inhibitors to moving regulatory sensitive data to the cloud, particularly in Europe. Security concerns center around the perceived increased security risk of storing data with a third-party provider, the lack of visibility into what data is within cloud applications, the extent to which they have control of who can access sensitive data and, lastly, the extent to which government and law enforcement can access and request customer data. For example, the reach of the U.S. CLOUD Act has inhibited public authorities in some European countries from using the cloud.

Cloud data can be safeguarded only if security and compliance features are well understood and properly configured from the outset. The industrywide shared responsibility model sets out security responsibilities across all types of cloud platforms, providing guidance to securely leverage the benefits of the cloud. Typically, the cloud service provider is responsible for the security of the cloud (the infrastructure), and the cloud customer is responsible for security in the cloud (data and resource configuration).

Encryption and access controls in the cloud can address security and compliance requirements for data at rest and data in transit. But problems arise when organizations want to process or collaborate with the data because it must be de-encrypted and is therefore transformed into a state that is unprotected. Statutory Pseudonymization, however, closes privacy and security gaps by protecting data in use, helping organizations realize their cloud and data strategies in a regulatory-compliant manner.

Definitions

Following are key terms and their definitions:

- **Data at rest:** Data that is in storage, including but not limited to archived data, records in databases, files stored on hard drives and on USB thumb drives, backup files, and files stored offsite on cloud storage platforms
- **Data in transit:** Data that is moving across networks between computer systems, applications, or locations
- **Data in use:** Data that is being updated, processed, erased, accessed, or shared by a system
- **Anonymization:** Personal data transformed in such a way that it can't be linked back to a specific individual
- **Traditional pseudonymization:** Replacement of a directly identifiable data value with a token or masking that reduces or removes the ability to infer the original values of those fields
- **Statutory Pseudonymization:** As defined in the GDPR and similar legislation, the replacement of both direct and indirect identifiers through a combination of de-identification techniques and dynamically changing pseudonyms or codes, which are kept separately and protected by technical and organizational measures (The re-identification of individuals is not possible without the use of additional information — or "keys" — held separately and securely by the data controller or its designee. More importantly, the process can be reversed only by using the keys when re-identification of the source data is authorized.)

Although anonymization and Statutory Pseudonymization may appear similar at first, they perform different functions in data protection law, such as the GDPR. The difference rests on whether the source data can be re-identified. Data that has been irreversibly anonymized ceases to be personal data and does not require compliance with data protection law.

However, uncertainties exist as to whether such procedures can provide a sufficient degree of anonymity. Studies have shown that even within independent anonymized data sets, identifying individuals is not that difficult when the databases are combined. Another downside to anonymization is that it decreases data utility. To preserve levels of utility, traditional anonymization techniques restrict data processing to enclaves or silos to mitigate the risks of re-identification.

Statutory Pseudonymization as a Technical Safeguard to Protect Data in Use

The attack surface that organizations need to protect has expanded as a result of the shift to hybrid work, greater reliance on cloud services, accelerated digitalization, and sprawling data infrastructures across a multitude of applications, devices, and locations. The threat landscape is evolving, and cyberattacks and data breaches are growing in volume, variety, complexity, and precision. In IDC's 2022 *European Security Survey,* 54% of respondents said they had experienced an increase in the volume of cyberattacks during the prior 12 months.

The business cost and reputational impacts from cyberincidents require organizations to rethink their data protection strategies as well as upscale data privacy and security infrastructure for cloud computing environments. Protecting data while in use, though, is challenging because applications have generally required cleartext — not encrypted — to compute. Traditional technical trust controls such as access management do not provide the privacy and security assurance to share and collaborate with sensitive data sets across IT environments.

Furthermore, organizations are trying to obtain more value from their data to improve their products and services. For example, more chief data officers and data analytical roles are being created to drive such data-enabled transitions. However, data privacy and security have become flash points in the drive to achieve digital transformation. Concerns about potential privacy violations and the prioritization of locking data down on premises through standard security measures have mistakenly led many organizations to forgo the benefits of data computation in the cloud and multi-party data sharing and collaboration. But organizations don't have to make an either-or choice between data utility and regulatory privacy and security. They can have both through Statutory Pseudonymization.

While not a new privacy-preserving technique, Statutory Pseudonymization has been redefined by and gained special prominence through the GDPR. According to the regulation, the ability to Statutorily Pseudonymize data has several advantages:

- Allows organizations to lawfully repurpose data beyond the original stated reason for its collection
- Is an important safeguard when processing data for scientific, historical, or statistical purposes
- Decouples privacy and accuracy, enabling data protection by design and by default without compromising data accuracy
- Constitutes a data security risk reduction technique that can reduce the danger of identification or harm from a data breach
- Constitutes a security measure that can help organizations meet their data security obligations

Business Benefits of Statutory Pseudonymization

This section discusses some primary business benefits of Statutory Pseudonymization.

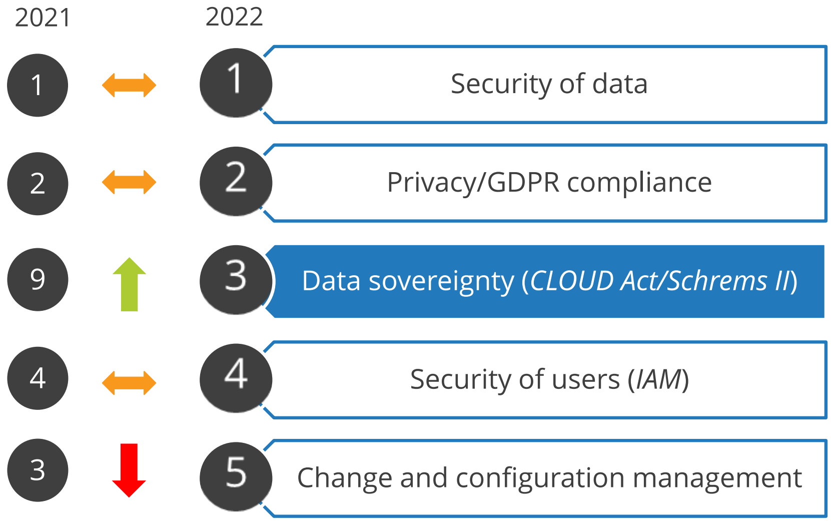
Secure Computation in the Cloud

Cloud adoption is expanding. Organizations are modernizing their on-premises IT estates with a hybrid and multi-cloud architecture for greater agility, flexibility, and cost and operational efficiencies. Organizations don't like the idea of losing control of their data, a concern that extends to multi-tenant cloud environments. There is the perceived increased security risk of storing data with a third-party provider, the lack of visibility into what data is within cloud applications, and the extent to which organizations have control over who can access sensitive data. By implementing Statutory Pseudonymization, organizations can deploy and process sensitive workloads in the cloud without compromising data privacy and compliance and with the security assurance that the cloud provider has no access to or control of the data.

Data Sovereignty and Schrems II-Compliant Processing

When organizations are dealing with on-premises infrastructures, data sovereignty is clear cut. However, storing and processing data in the cloud is more complex. Since the 2020 Schrems II ruling that invalidated the EU-U.S. Privacy Shield, organizations have been grappling with whether they can legally and safely transfer personal data under the GDPR outside the EU. IDC research shows data sovereignty becoming a leading trust and compliance concern for organizations when shaping their cloud strategies. Ranked ninth in IDC's 2021 *European Security Survey,* data sovereignty jumped six spots in the 2022 survey, coming in third behind privacy/GDPR compliance and data security (see Figure 2).

FIGURE 2: ***Trust Concerns Impacting Cloud Strategy***



n = 700

Source: IDC's European Security Survey, 2021 and 2022

For most organizations, suspending or ceasing analytical activities that involve transfers of data to non-EU companies is simply not a viable option. Similarly, it is not feasible to copy or move their entire data processing infrastructure to the EU. Statutory Pseudonymization has come to the forefront of privacy and data protection discussions as a viable technical measure that, when deployed effectively, can enable organizations to continue conducting lawful transfers of personal data outside the EU.

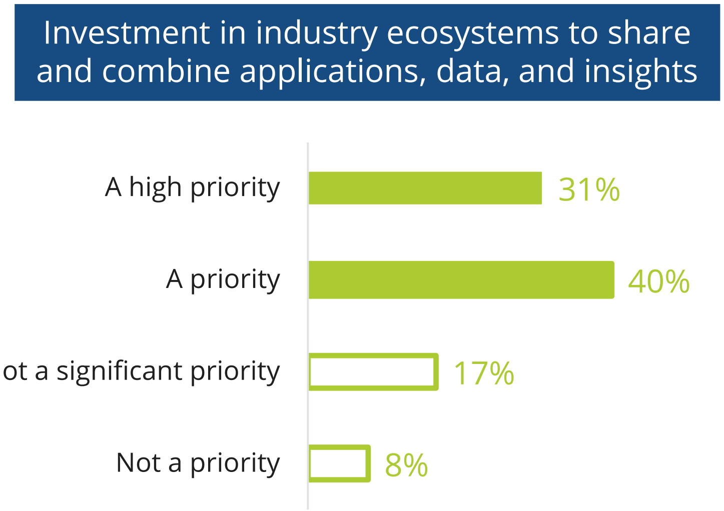
The European Data Protection Board (EDPB) 2021 Schrems II guidance sets out the steps that organizations should follow to legitimize the transfers of personal data to third countries. It includes, where required, adopting additional contractual, organizational, and technical protective measures to safeguard against overreaching government surveillance. Statutory Pseudonymization is one of the supplementary technical measures that the EDPB's recommendations highlight as being legally effective.

Privacy-Compliant Data Analytics and Collaboration

Encouraged as a data protection best practice, data-at-rest encryption has become the default modus operandi for securing sensitive data. Consequently, data sets from such highly regulated industries as financial services and healthcare often sit siloed, unable to be shared or combined with third parties for analytics.

Yet encryption is primarily a security measure for making data unintelligible to unauthorized users. In environments where data is constantly moving between different parties and combined with other data, encryption (though providing effective data protection) is an inhibitor to creating valuable business insights. But organizations are becoming more aware of the importance of working together to analyze their collective data, with the assumption that the whole is greater than the parts. In an IDC survey, investment in industry ecosystems to share and combine applications, data, and insights is a priority or a high priority for 71% of organizations (see Figure 3).

FIGURE 3: ***Sharing Applications, Data, and Insights Is an Investment Priority***



n = 340

Source: IDC's Future Enterprise Resilience Survey, 2022

Unlocked Data Sets to Expand Trusted AI/ML Capabilities

ML algorithms are rapidly increasing their demand for more computation and larger data sets. IDC research shows that few organizations have enough internal data to achieve this on their own. Traditional ML approaches require centralized data collection and model training. Regulatory restrictions around data privacy, latency problems, and high transfer costs are inhibitors to bringing larger data sets together, which in turn limits the training and fine-tuning of algorithms. Statutory Pseudonymization enables multi-party AI/ML models to be trained and processed in the cloud on a joint data set from multiple organizations, without revealing the constituent data sets that would compromise data privacy.

Privacy-Enhancing Technologies

Privacy-enhancing technologies (PETs) are emerging technologies that embody data protection principles to achieve specific privacy or data protection functionality. They help implement data protection by design and default principles effectively and integrate necessary safeguards for data processing. There are various PET types, and each technology has particular data protection capabilities and use limitations (see Table 1). Only Statutory Pseudonymization provides the combined data safeguards — data confidentiality and de-identification — that enable protected multi-cloud processing, compliant internal data transfers, and confidential AI/ML analytics without compromising data utility and accuracy.

TABLE 1: ***Different Types of PETs***

PET Type	Description	Weakness
Trusted execution environment (confidential computing)	Preserves data confidentiality by performing computation on encrypted data in a hardware-based trusted execution environment	May necessitate code changes to existing applications Security risk via side-channel attacks
Homomorphic encryption	Provides strong security and confidentiality by enabling computations on encrypted data without first decrypting it	Requires significant computational resource Supports a limited number of computational operations
Secure multi-party computation	A protocol that allows computation or analysis on combined data without the different parties revealing their own private input	Does not protect the data output High communications overhead to support data exchanges between nodes
Differential privacy	Random injection of noise to alter the data in the data set	Difficult to tailor the optimal trade-off level between data privacy and utility
Synthetic data	Artificial data generated by data synthesis algorithms, which replicate patterns and the statistical properties of real data	Synthetic data may not represent outliers present in the data set

Source: IDC, 2023

Considering the Anonos Data Embassy Software Platform

Anonos is a global provider of data privacy and security technology, with more than a decade of experience in developing privacy-preserving software that helps organizations turn regulated and sensitive data into a competitive advantage. The company's Data Embassy software platform, which is protected by 26 granted international patents, leverages GDPR-compliant Statutory Pseudonymization to make it possible to legally analyze, combine, and use data across untrusted environments, turning it into a business asset without violating privacy, security, or regulatory restrictions.

Anonos' Data Embassy software centers around Variant Twins: nonidentifiable yet 100% accurate variations of the source data required for specific use cases. The patented system uses a combination of state-of-the-art privacy-enhancing and de-identification techniques, including Statutory Pseudonymization, to replace directly and indirectly identifying personal data, such as a person's name and date of birth, with unique de-identifiers that prevent attribution of the data to a specific person without permission. Protection rules are centrally customized, configured, and enforced, and they can be adjusted as required with downstream changes automatically applied.

Variant Twins provide unique feature advantages compared with more traditional solutions in the following ways:

- **Universal data protection.** Variant Twins can travel anywhere because granular data privacy and security controls are embedded within them, so they remain protected while in use, regardless of their location.
- **Specific scope of use.** Variant Twins are designed to provide only the minimal level of identifying information necessary for a particular purpose, preventing processing or analysis beyond that specific use case.

- **100% accuracy.** Variant Twins have the same mathematical properties as equivalent source data, ensuring no degradation in accuracy or value, so they deliver the same results as processing cleartext but without the risks of unauthorized re-identification.
- **Dynamic pseudonymization.** Protections in each transformed Variant Twin vary by time, purpose, place, and use to prevent multiple data sets from being recombined to re-identify a data subject, defeating linkage and inference attacks.
- **Controlled re-linking.** Only when authorized can a Variant Twin be re-linked to other Variant Twins or to source data, which is held separately and under the exclusive control of the designated party, so the resulting insights can be applied.
- **Auditability.** The re-linkability of Variant Twins, combined with audit logs of all activities within Data Embassy, ensures full capture of data lineage and protections applied.

Anonos' product strategy aligns with addressing the key privacy challenges of multi-party data sharing and analytics, particularly in cloud environments. The main data protection use cases for Data Embassy are the following:

- **Breach- and ransomware-resistant data processing:** Reduced surface area for external attacks or internal data misuse by obscuring identifying elements of personal data
- **Surveillance-proof data processing:** Lawful international data transfers and processing to protect the identity of EU data subjects
- **External and internal data sharing:** Breakdown of barriers that limit expanded access to third-party expertise in analytics, AI, ML, and new data monetization opportunities delivered via public cloud infrastructure
- **Data supply chain defensibility:** Insulation of parties in the data supply chain from noncompliance liability

Challenges

Anonos also faces some market challenges:

- More education is needed on the issue of cleartext processing in the cloud and Statuary Pseudonymization as one potential solution to the issue. IDC believes many organizations have not fully recognized the benefits of Statutory Pseudonymization as a security and data protection by design mechanism for personal data processing in the cloud. Cloud and security professionals are not yet fully attuned to its potential because they have been focused on traditional technical security controls.
- Cloud providers are working on solutions for confidential computing, which are addressing the topic of cleartext processing from a different angle.

Anonos will need to invest in further market education to broaden the general understanding of the topic of cleartext processing in the cloud and partner with large cloud providers to position Statuary Pseudonymization as a complementary technology solution.

Conclusion

Cloud adoption continues to grow, and organizations are focusing on privacy and security for data in use as their cloud maturity increases. Statutory Pseudonymization is emerging as one PET that effectively supports many enterprise data use cases, and IDC believes the market for it will continue to grow. To the extent that Anonos can address the challenges outlined in this paper, the company has a significant opportunity for success.

About the Analysts

Carla Arend, *Associate Vice President, Cloud Research, Europe*

Carla Arend is an Associate Vice President with the European research team and heads up IDC's European cloud research. Arend provides industry clients with key insight into market dynamics, vendor activities, and end-user adoption trends in the European cloud market. As part of her research, she covers topics such as how European organizations are adopting cloud, how cloud drivers and inhibitors are evolving, cloud management, cloud security, data management in the cloud, IoT and cloud, AI and cloud, DevOps and cloud, as well as GDPR impact on cloud and cloud code of conduct.

Ralf Helkenberg, *Research Manager, European Privacy and Data Security*

As research manager for the European Security group, Ralf Helkenberg provides insight and analysis on the European privacy and data security markets. His research covers the evolving regulatory landscape and the market dynamics and technology trends within privacy management, de-identification, data discovery, encryption, key management, and data loss prevention.

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More About Anonos

Anonos® is a global innovator in data privacy and security, providing the only enterprise software that protects data in use with total accuracy. The globally patented and award-winning Data Embassy® platform uses a combination of state-of-the-art privacy-enhancing technologies, including synthetic data, Statutory Pseudonymization, and other de-identification capabilities, to create Variant Twins®. These are non-identifiable yet 100% accurate variations of source data engineered for specific use cases to meet desired business outcomes. Because granular data privacy and security controls are centrally customized, configured and technologically enforced, Variant Twins can travel safely anywhere – across departments, outside the enterprise, or around the globe. Accuracy is 100% guaranteed because Variant Twins have the same mathematical value as the equivalent source data on which they're based, and their cleartext utility leads to faster enterprise insight and ROI. From testing though production, organizations can expand and expedite data-driven initiatives without compromising privacy, security, accuracy or speed.

To learn more, schedule a briefing at www.anonos.com.

IDC Custom Solutions

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