
Privacy Enhancing Technologies, a new revolution in Healthcare & Life Sciences?
Innovation for Health
April 6th 2023
Rotterdam, The Netherlands

Introduction speaker

- Nicky Hekster
- Joined the Dutch Blockchain Coalition mid 2022
  - Theme lead Health & care
- Prior to joining DBC: 35 years in IBM
  - Half of it in Healthcare & Life Sciences
  - IBM Watson Health
- Executive Professor at the TIAS School for Business and Society

What is the Dutch Blockchain Coalition (DBC)?

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- Founded in 2016, DBC is an ecosystem where government, industry and knowledge institutions are involved in the decentralized design of digital infrastructure.
- Decentralized systems are fundamental for scalable collaboration on complex issues such as the Energy Transition, Safety, Health & Care or Mobility, and decentralized design is also important in the public domain to make the infrastructure inclusive, verifiable, robust and agile.
- For this decentralized design of the infrastructure, blockchain technology is an important tool as part of a mix with other technologies.
- Within the DBC, decentralized and Privacy Enhancing Technologies are being looked at more broadly. Blockchain technology is therefore *not the goal*, but just one of the tools in the PET toolbox.

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Why PET in Healthcare & Lifesciences?

With respect to data some key values in this sector:

- Confidence and trust
- Treatment relationships
- Privacy & Security
- Legal correctness
- Controllability
- Irrefutability
- Transparency
- Liability
- Patient sovereignty
- …

What is Privacy Enhanced Technology?

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*Privacy-enhancing technology (PET) is a set of technologies that embody fundamental data protection principles by **minimizing** personal data use, **maximizing** data security.*

- First rudiments can be traced back to the 1970s. Due to the digital transformation of our society, the last decade showed a lot of developments in new approaches and algorithms.
- PETs allow users to protect the privacy of personally identifiable information (PII), which is often provided to and handled by services or applications.
- PETs use techniques to minimize an information system's possession of personal data without losing functionality.

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Decentralized technology: a myriad of solutions

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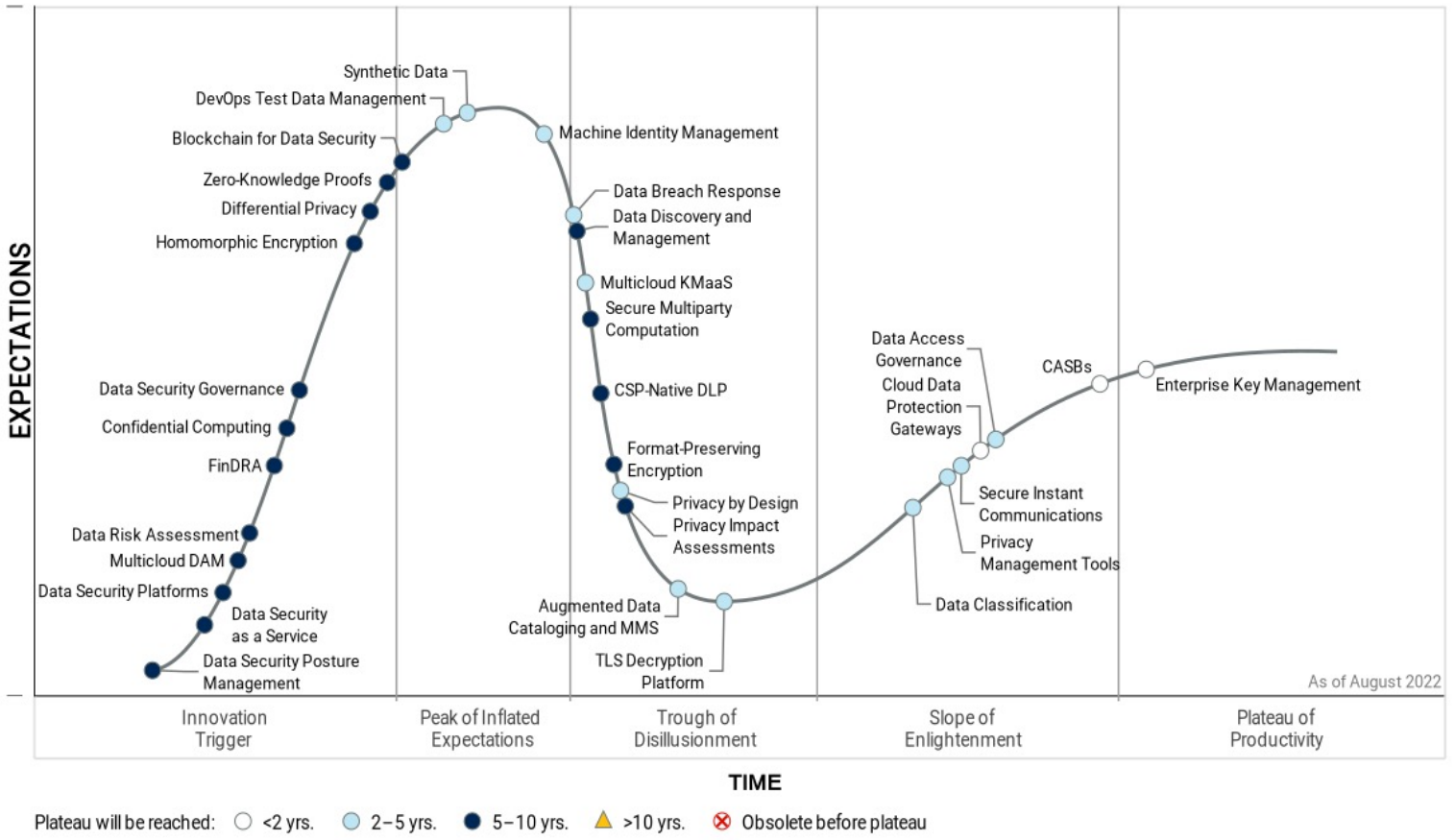
Values	Coordination	Technical interoperability	Transparency	Visibility	Confidence and trust	Provenance and traceability	Data minimization
	Sharing information	Data safety	Irreversability	Irrefutability	Access control	Data protection	Proportional data sharing
	Anonymization	Auditablility	Data quality	Automization	Certification	Governance	Anonymity
	Resilience	Integrity	Collaboration	Decentralized identity	Cost effectiveness	Data sovereignty	Sharing knowledge and insight
Components	Decentralized/ distributed	Permissioned/ Permissionless	Nodes	(Homomorphic) Encryption Hashes	Verifiable credentials	Synthetic data generation	Agent-based modeling
	Shared ledgers	Public/private keys	Timestamping	Digital fingerprint/ signature	Transactions	Peer-to-peer	Differential Privacy
	Smart contracts	Consensus protocols	Tokens/ incentive models	Zero-knowledge proofs	Data spaces	Directed acyclic graphs	Secure Set Intersection
	Wallets	Decentralized Autonomous Organization (DAO)	Crypto currencies	Self-Sovereign Identity (SSI)	Multi-party Computation	Proof of Stake / Proof of Work	Federated /Swarm Learning

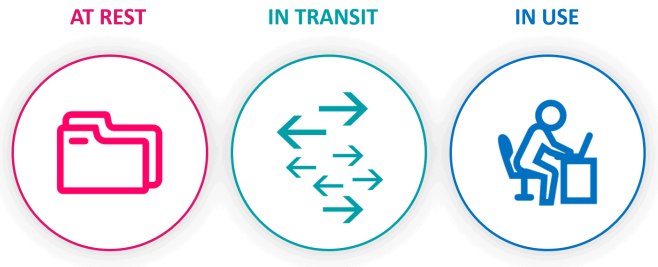
Gartner hypecycle for Data Security, August 2022



Gartner

The promise of PET

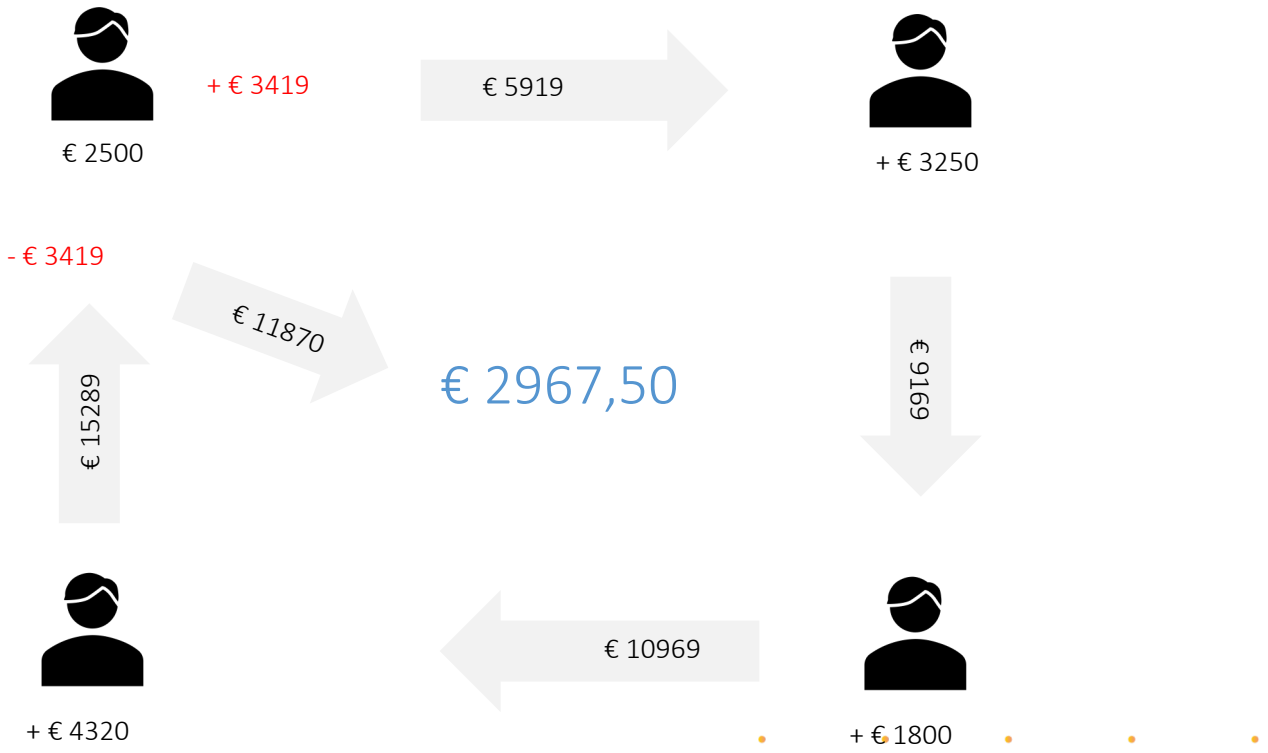
- Unlike common data-at-rest security controls, privacy-enhancing technology protects data-in-use or data-in-transit.
- As a result, organizations can implement data processing and data analytics that were previously impossible because of privacy or security concerns.
- Gartner predicts that by 2025, 60% of large organizations will use at least one PET technique in analytics, business intelligence and/or cloud computing.



https://www.gartner.com/en/newsroom/press-releases/2022-05-31-gartner-identifies-top-five-trends-in-privacy-through-2024

E.g. calculating the average salary/month in a group of four employees

But, without disclosing what each indivual earns



Zooming in on Multi-Party Computation

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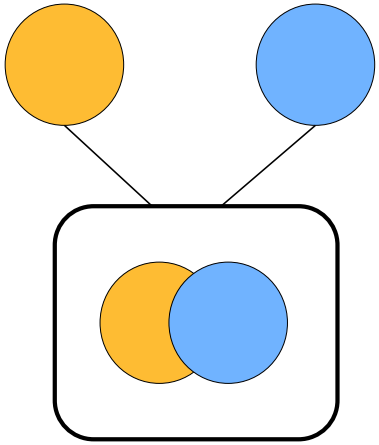
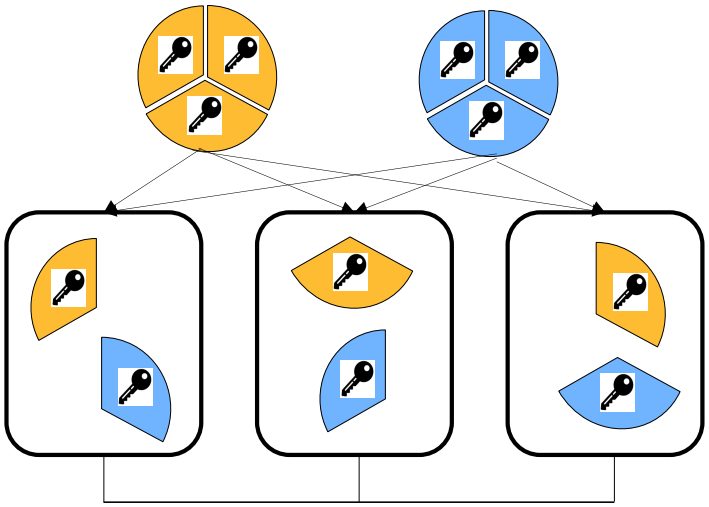
From centralized data …



Complete datasets combined on a single computer, analysis at a central location

… to virtually coupled data



Data input encryption at the source

Privacy engine executes partial analyses

Analysis result

Data encrypted and split, partial analyses spread over several computers

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MPC and Fraud Detection

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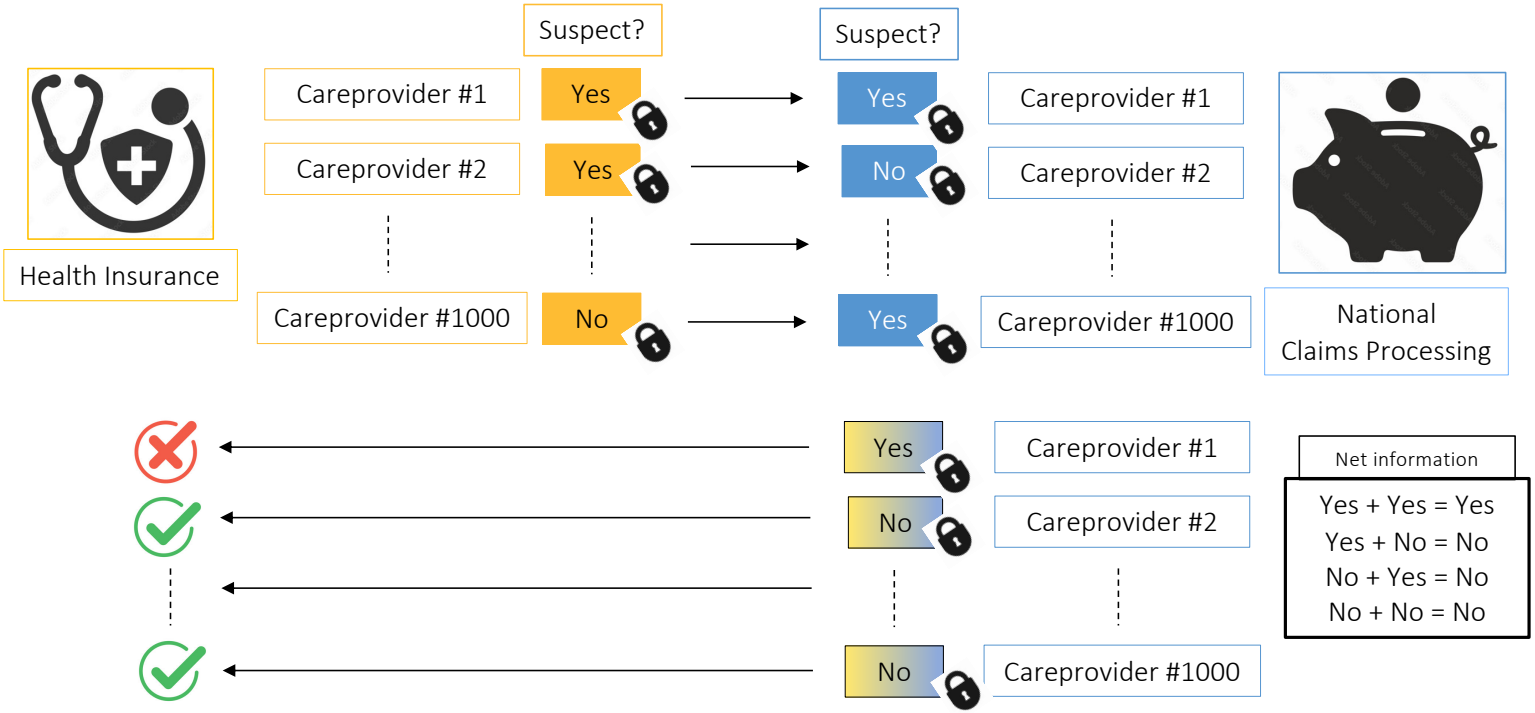

MPC can check in a confidential manner whether the National Claims Processing also has a fraud signal for certain healthcare providers.

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Some use cases

- Lancelot (MPC + AI), linking patient data in a privacy-safe manner, https://www.zorgvisie.nl/lancelot-patienten-data-koppelen-op-een-privacy-veilige-manier/ and
  Heracles, a privacy-preserving infrastructure for data analysis and algorithm development, https://www.tno.nl/nl/newsroom/2022/12/heracles-project-benutten/
- Triall (SSI + blockchain), an infrastructure for eClinical software that transitions centralized clinical trials to decentralized ones, https://www.triall.io
- GAIA-X / Health (blockchain + SSI + AI), the development of a European data infrastructure while preserving data sovereignty and identity, https://www.data-infrastructure.eu/Redaktion/EN/Dossier/gaia-x.html#doc2845524bodyText7
- HealthBlocks (Web3, blockchain, tokens + AI) a health app that rewards you for a healthy lifestyle, giving you access to health services and makes it possible to share your data with others in a privacy-preserving way, https://www.healthblocks.ai
- Population Health Data (MPC + AI) creates and manages a public infrastructure for care and health data and facilitates the exchange of knowledge, https://populationhealthdata.nl

Conclusion

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- PET, a toolbox of cryptographic techniques that enable (patient) information (PII) to be shared in a privacy-friendly manner.
- One example, PET makes it possible for more parties to jointly calculate data, as if they had a shared database, such that parties cannot view each other's data and privacy is guaranteed.
- PET significantly increases the effectiveness of for example detecting fraud, or measuring the effectiveness of drugs, and is applicable to many other use cases.
- Although PET is still relatively new, it is no longer theoretical: more and more companies are marketing it operationally in Healthcare and Life Sciences.
- All implementations require a DPIA for compliance with e.g. GDPR.

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Thanks for your attention!