Privacy Preservation in Data Markets

Ioannis Markopoulos, Forthnet / TRUSTS & Safe-DEED | Alexandros Bampoulidis, RSA / TRUSTS & Safe-DEED |
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21 April 2021

Welcome & Agenda

Nina Popanton, Data Intelligence Offensive / TRUSTS

Agenda

- Welcome & Introduction
- GDPR Roles & Privacy Risks
- Trust by Design
- Q&A Session

GDPR Roles

Ioannis Markopoulos, Forthnet / TRUSTS & Safe-DEED

EU Regulation 2016/679, General Data Protection Regulation (GDPR)

- As a Regulation, the GDPR is directly applicable across the EU.

- The GDPR is a horizontal legislation that applies to all sectors and activities involving the management of personal data.

- The GDPR empowers individuals by enhancing their control over their personal data and by allocating significant responsibilities to the entities managing such data, namely, **data controllers** and **data processors**.

- The GDPR introduced a risk-based approach. The accountability principle, which requires **data controllers** to tailor and demonstrate the extent of their compliance obligations, represents de facto one of the most important novelty of this legislation

GDPR roles

- The **data controller** determines the **purposes** for which and the **means** by which personal data is processed. So, if your company/organisation decides 'why' and 'how' the personal data should be processed it is the data controller. Employees processing personal data within your organisation do so to fulfil your tasks as data controller.

- Your company/organisation is a **joint controller** when together with one or more organisations it jointly determines 'why' and 'how' personal data should be processed. Joint controllers must enter into an arrangement setting out their respective responsibilities for complying with the GDPR rules. The main aspects of the arrangement must be communicated to the individuals whose data is being processed.

- The **data processor** processes personal data only **on behalf of the controller**. The data processor is usually a third party external to the company.

Privacy Risks in Data Sharing

Alexandros Bampoulidis, RSA FG / TRUSTS & Safe-DEED

Personal Data

- Personal data = data that contains information about individuals

- The information might be private and sensitive

- Data controllers are responsible for protecting the individuals' privacy

Personal Data

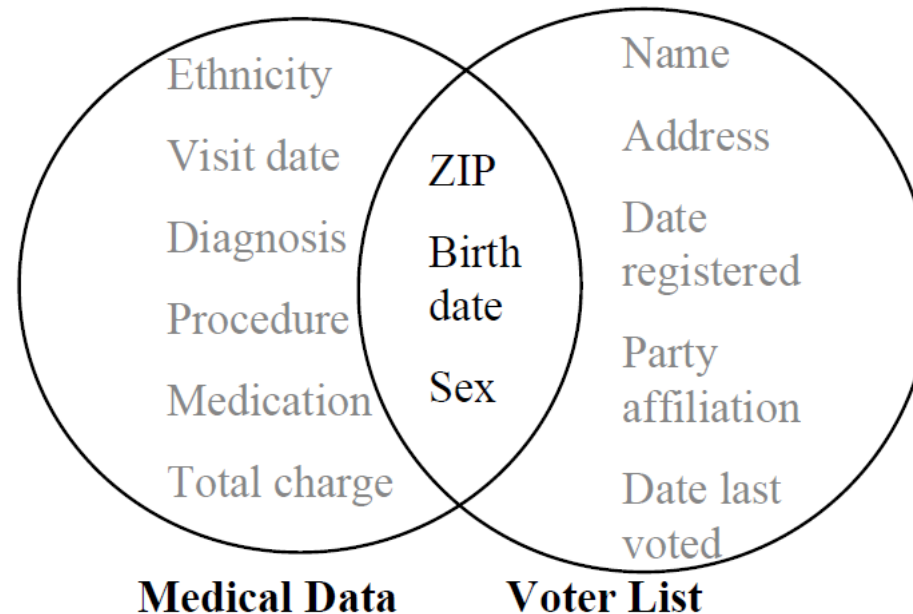|	Zip Code	Age	Nationality
1	13053	28	Russian
2	13068	29	American
3	13068	21	Japanese
4	13053	23	American
5	14853	50	Indian
6	14853	55	Russian
7	14850	47	American
8	14850	49	American
9	13053	31	American
10	13053	37	Indian
11	13068	36	Japanese
12	13068	35	American

Machanavajjhala et. al 2007

Quasi-Identifiers (QIs)

- QIs: attributes that do not directly identify individuals, but ,when combined, could serve as unique identifiers of individuals

Sweeney, 2000

Simple demographics often identify people uniquely

Personal Data

	Zip Code	Age	Nationality	Condition
1	130**	< 30	*	Heart Disease
2	130**	< 30	*	Heart Disease
3	130**	< 30	*	Viral Infection
4	130**	< 30	*	Viral Infection
5	1485*	≥ 40	*	Cancer
6	1485*	≥ 40	*	Heart Disease
7	1485*	≥ 40	*	Viral Infection
8	1485*	≥ 40	*	Viral Infection
9	130**	3*	*	Cancer
10	130**	3*	*	Cancer
11	130**	3*	*	Cancer
12	130**	3*	*	Cancer

Machanavajjhala et. al 2007

Personal Data – Search Logs

The New York Times

A Face Is Exposed for AOL Searcher No. 4417749

By Michael Barbaro and Tom Zeller Jr.

Aug. 9, 2006

Thelma Arnold's identity was betrayed by AOL records of her Web searches, like ones for her dog, Dudley, who clearly has a problem.
Erik S. Lesser for The New York Times

```
4417749  movies for dogs 2006-03-02 09:24:14
4417749  best dog for older owner    2006-03-06 11:48:24 1    http://www.canismajor.com
4417749  rescue of older dogs    2006-03-06 11:55:25 1    http://www.srdogs.com
4417749  big cuddly dog  2006-03-07 20:05:09 1    http://www.cuddlycanines.com
4417749  shedless dogs   2006-03-07 20:38:26 6    http://www.centralpets.com
4417749  dog for handicapped people  2006-03-08 14:39:38 6    http://www.dogsforthedisabled.org
4417749  pets    2006-04-19 18:33:21
4417749  dog who urinate on everything   2006-04-28 13:24:07 6    http://www.dogdaysusa.com
4417749  gwinnett animal shelter 2006-05-29 18:49:15 1    http://www.co.gwinnett.ga.us
4417749  doraville animal shelter    2006-05-29 19:24:15 2    http://local.yahoo.com
```

Personal Data - Location
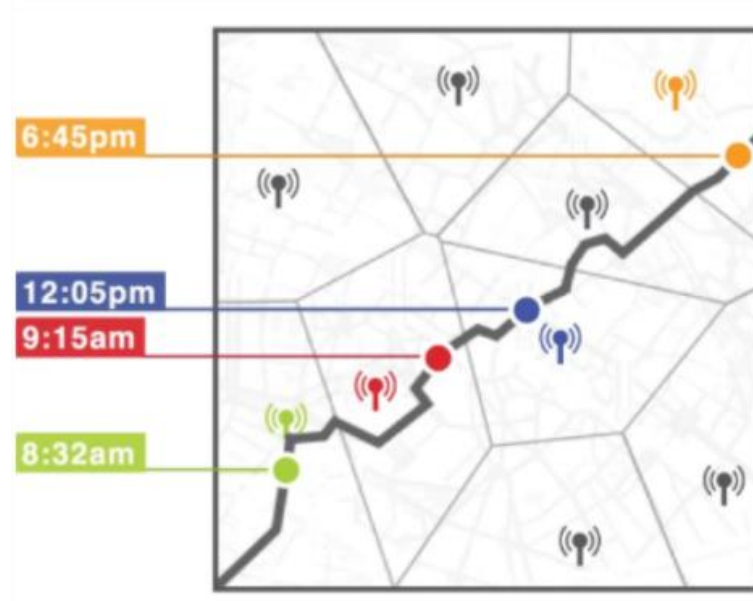
de Montjoye et. al, 2013

Personal Data – Movie Ratings

Netflix 2005 Ratings

movie	userid	rating	date
Star Wars	1488844	3	06/09/2005
The Godfather	822109	5	13/05/2005
Tenet	885013	4	19/10/2005
The Matrix	30878	4	26/12/2005
:	:	:	:

Narayanan and Shmatikov, 2008

IMDb ≡ Menu | All ▾ | Search IMDb

The Godfather (1972)
User Reviews
⊕ Review this title

3,620 Reviews

☑ Hide Spoilers   Filter by Rating: Show All   Sort by: Helpfulness

★ 10/10

For Me, This Is The Definitive Film

gogoschka-1   11 February 2018

This isn't just a beautifully crafted gangster film. Or an outstanding family portrait, for that matter. An amazing period piece. A character study. A lesson in filmmaking and an inspiration to generations of actors, directors, screenwriters and producers. For me, this is more: this is the definitive film. 10 stars out of 10.

Favorite films: IMDb.com/list/mkjOKvqlSBs/

Lesser-Known Masterpieces: imdb.com/list/ls070242495/

406 out of 476 found this helpful. Was this review helpful? Sign in to vote.

Permalink

Mitigate Privacy Risks

- How? => Conform to privacy models

- How? => Distort the dataset

- Most prominent ways:
  - Distort the values of the dataset and share it
  - Do not share the raw data, but allow it to be queried and distort the responses

Anonymisation

Original

	Zip Code	Age	Nationality	Condition
1	13053	28	Russian	Heart Disease
2	13068	29	American	Heart Disease
3	13068	21	Japanese	Viral Infection
4	13053	23	American	Viral Infection
5	14853	50	Indian	Cancer
6	14853	55	Russian	Heart Disease
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8	14850	49	American	Viral Infection
9	13053	31	American	Cancer
10	13053	37	Indian	Cancer
11	13068	36	Japanese	Cancer
12	13068	35	American	Cancer

Distorted

	Zip Code	Age	Nationality	Condition
1	1305*	≤ 40	*	Heart Disease
4	1305*	≤ 40	*	Viral Infection
9	1305*	≤ 40	*	Cancer
10	1305*	≤ 40	*	Cancer
5	1485*	> 40	*	Cancer
6	1485*	> 40	*	Heart Disease
7	1485*	> 40	*	Viral Infection
8	1485*	> 40	*	Viral Infection
2	1306*	≤ 40	*	Heart Disease
3	1306*	≤ 40	*	Viral Infection
11	1306*	≤ 40	*	Cancer
12	1306*	≤ 40	*	Cancer

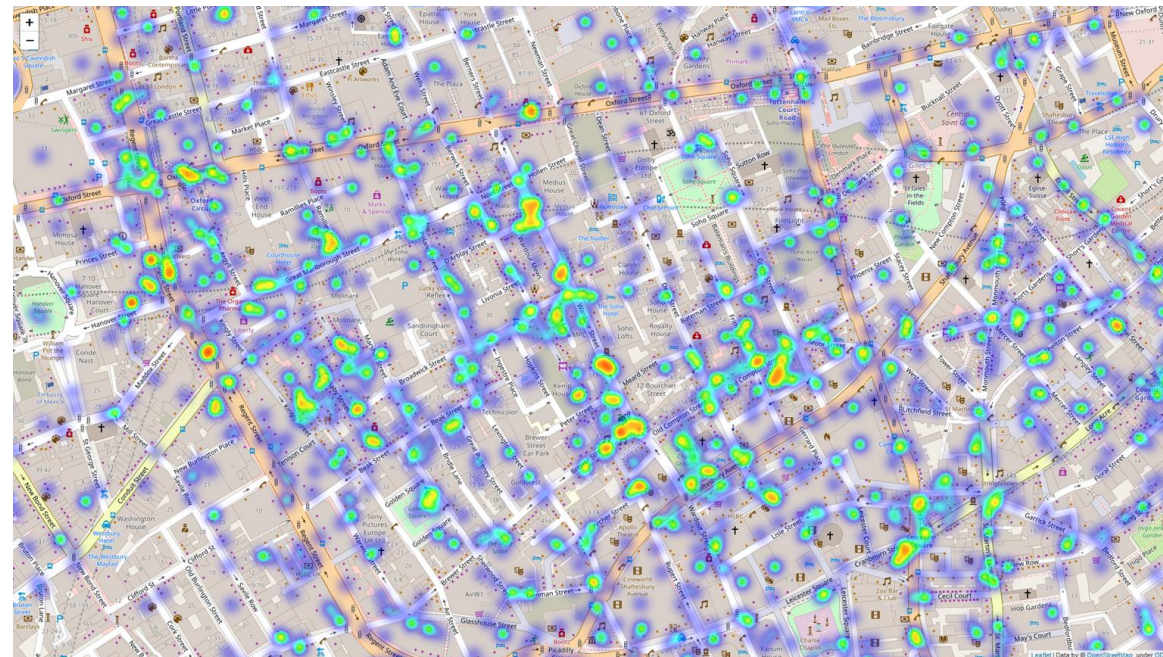Machanavajjhala et. al 2007

Differential Privacy

SELECT latitude, longtitude, count(*) FROM data WHERE age >= 20 AND age <= 30 GROUP BY latitude, longtitude;

Original
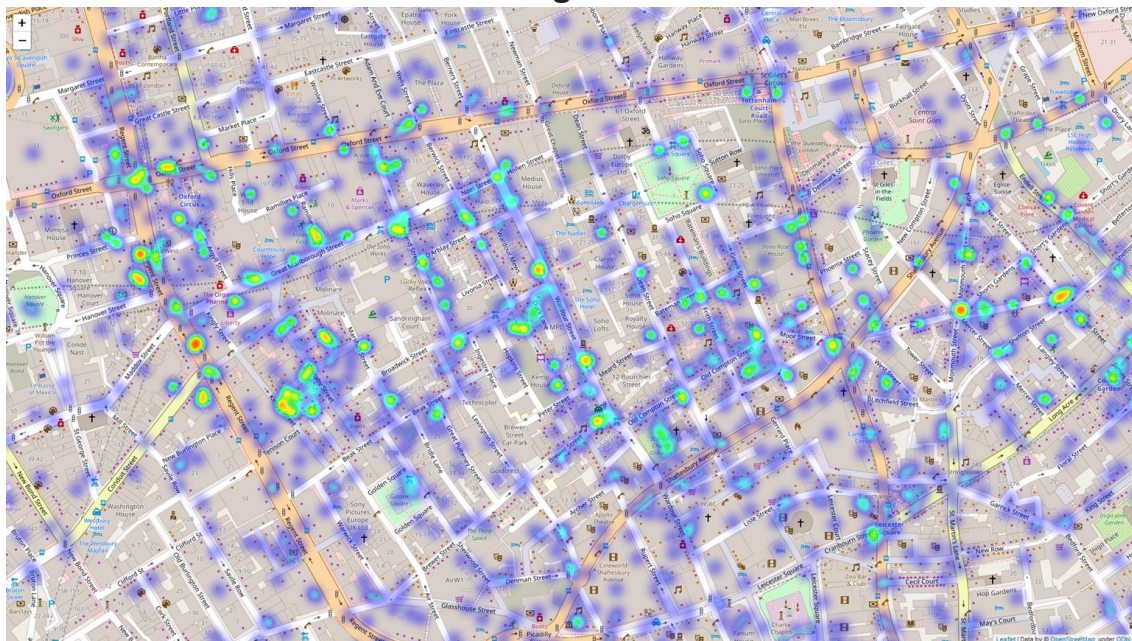
Distorted

Safe-DEED Personal Data Demonstrator

Trusts by Design –
How can MPC enable new BM scenarios?

Lukas Helminger, Know Center GmbH / TRUSTS & Safe-DEED

The slides for this presentation were created in cooperation with TU Delft.

How can MPC enable new BM scenarios?

How can MPC create new business opportunities?

Multi-Party Computation

How can MPC enable new BM scenarios?

- Opportunities for Jeff:

How can MPC enable new BM scenarios?

- Opportunities for Jeff:

How can MPC enable new BM scenarios?

- Opportunities for Jeff:

How can MPC enable new BM scenarios?

Issues with MPC:

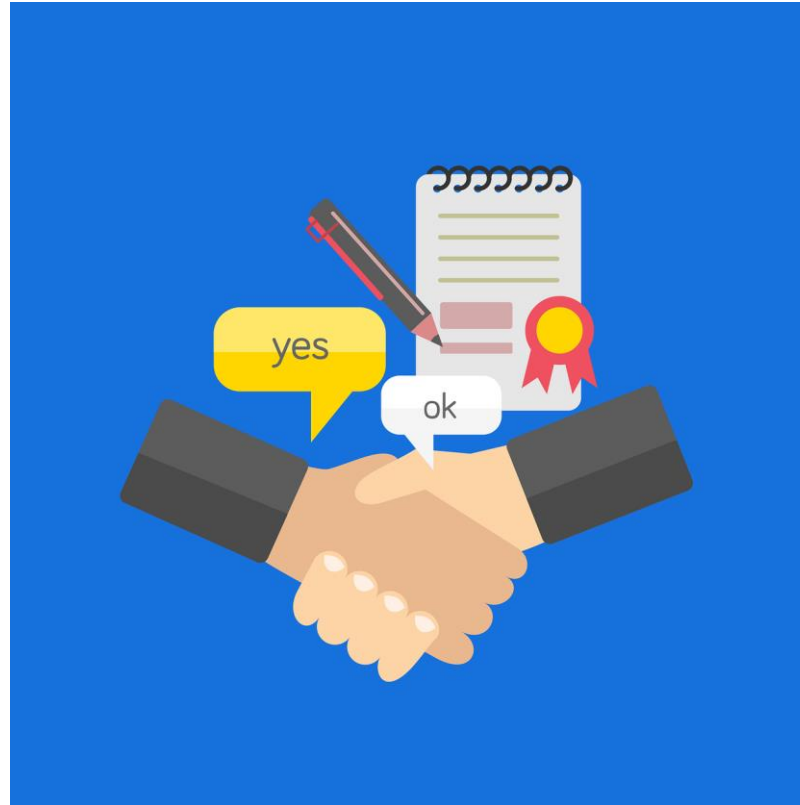# How can MPC enable new BM scenarios?

Issues with MPC:

How can MPC enable new BM scenarios?

Issues with MPC:

How can MPC enable new BM scenarios?

Aim of MPC:

How can MPC enable new BM scenarios?

Example of the working of a MPC:

How can MPC enable new BM scenarios?

Example of the working of a MPC:

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€30000

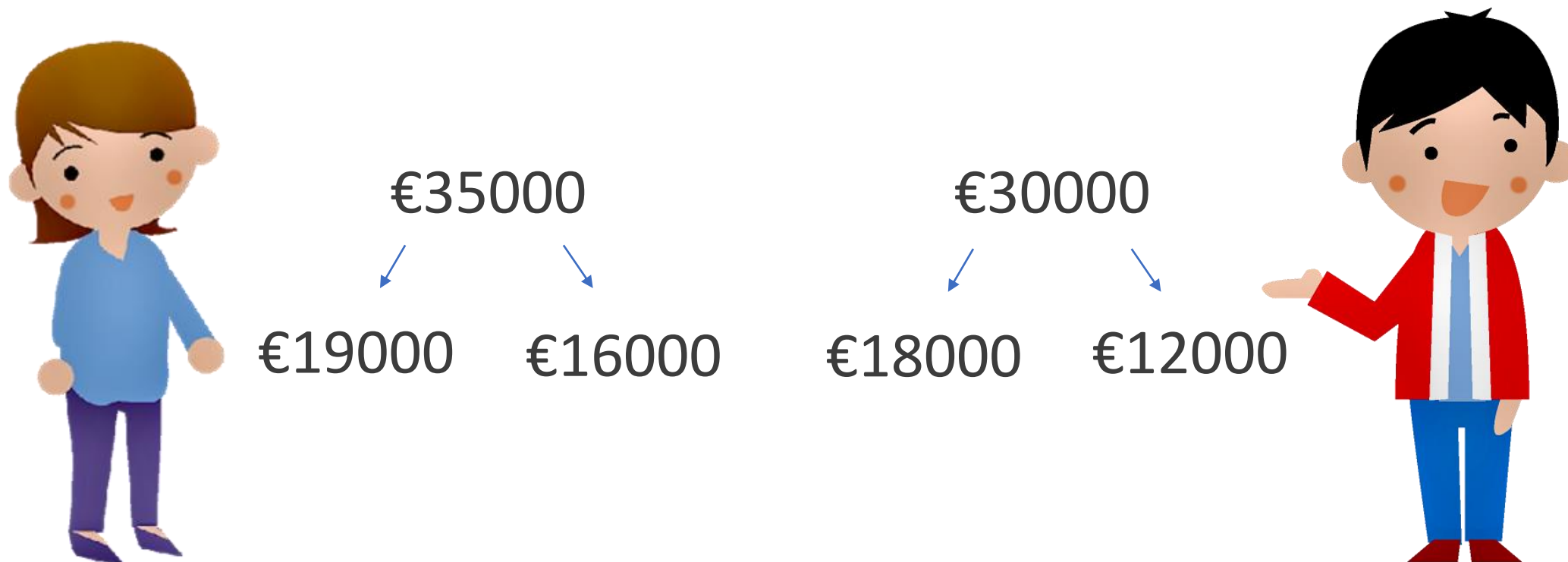# How can MPC enable new BM scenarios?

Example of the working of a MPC:

€30000

€18000   €12000
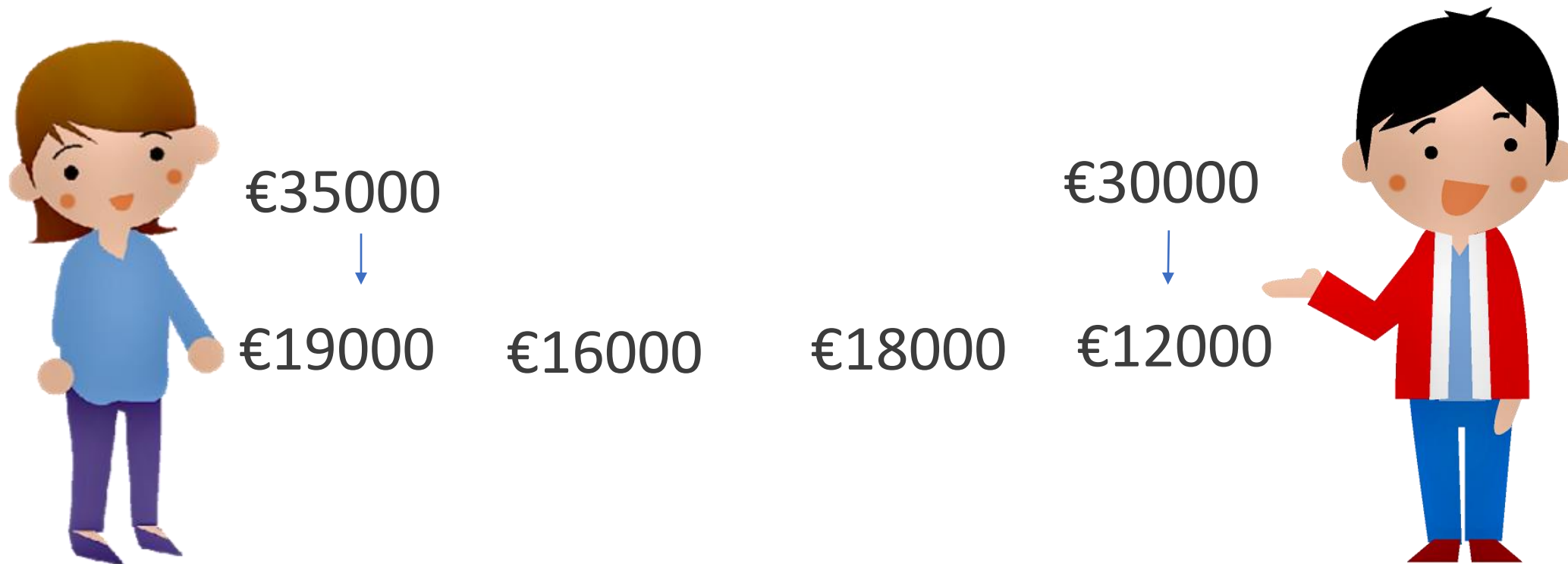
How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000   €30000

€19000   €16000   €18000   €12000

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000

€30000

€19000   €16000   €18000   €12000

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000   €30000

€19000   €16000   €12000
€18000

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000

€19000
€18000

€30000

€12000
€16000

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000

€19000
€18000

€30000

€12000
€16000 +
—————
€28000

How can MPC enable new BM scenarios?

Example of the working of a MPC:

€35000

€19000
€18000 ➕
─────
€37000

€30000

€12000
€16000 ➕
─────
€28000

€37000 ➕ €28000 ➖ €65000

How can MPC enable new BM scenarios?
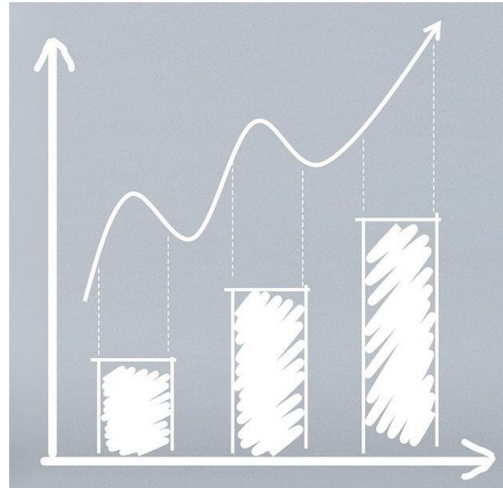
Last questions

How can MPC enable new BM scenarios?

Last questions

How can MPC enable new BM scenarios?

Last questions

CONFIDENTIAL

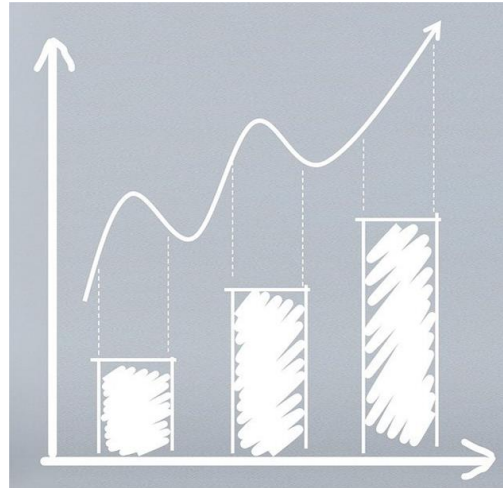# How can MPC enable new BM scenarios?

Last questions

Safe-DEED Personal Data Demonstrator

Q&A Session – Ask your Questions

Safe-DEED:
Professional Partners Community

Join the Safe-DEED Professional Partners Community

The Safe-DEED Professional Partners Community (PPC) brings together technology, business, and legal researchers to advance the state-of-the-art in **privacy-preserving algorithms** and **data valuation**, to enable **data-centric business model innovation**, and **increase trust** by a better understanding of the legal and ethical frameworks under which dataenabled services operate.

Get access to early technology prototypes, latest information on data-driven business strategies, and contact to Safe-DEED consortium members.

TRUSTS
Trusted Secure Data
Sharing Space

Safe-DEED

Join the Safe-DEED Professional Partners Community

Why should you join?

- One consultation with our experts to help your organisation deal with challenges like privacy-preserving algorithms and data valuation etc.
- Use case discussion with a research partner of your choice
- Free marketing: your logo on the Safe-DEED website and a blog entry
- Contact to other companies interested in privacy enhancing technologies

Register to become a member & profit:

safe-deed.eu/register

Join the Networks!

Join the TRUSTS Stakeholder Advisory Board

Who we are looking for

- high-level stakeholders, who will provide unique insights as per the TRUSTS platform, e.g. by highlighting areas where the TRUSTS solution will add value

- Regular meetings will be held with the SAB members during the project

- SAB members will support the TRUSTS project, by increasing its visibility and status via dissemination activities

- The Executive Board selects the Members of the Stakeholder Advisory Board upon a proposal by the Coordinator

Join the TRUSTS MeetUp-Network

How can you benefit from TRUSTS:

- Exchange with partners of the project and other MeetUp Networkers concerning current challenges of data markets, data sharing and accompanying chances and challenges

- Get involved in the European Data Community

- Receive insights into the project's outputs

- Learn from Use Cases and Best Practices for your company

→ *Contact* [*nina.popanton@dataintelligence.at*](mailto:nina.popanton@dataintelligence.at) *for more information!*

Next Safe-DEED & TRUSTS Webinar

Business aspects

Safe the date: May 10, 11 am (CEST)

Thank you !

Stay in touch: Follow us on LinkedIn and Twitter!

Contact: nina.popanton@dataintelligence.at