Enhanced security guarantees for sensitive statistical studies

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Goal of UaESMC, FP7 project

To push the state of the art in the secure multiparty computation (SMC) above the threshold for applicability in many sectors of the society.

- **How**: by identifying common problems and solving them using cryptographic, game-theoretic and engineering means.

- **Source**: Talviste R,Laud P, 2012, Review of the state of the art in secure multiparty computation FP7 UaESMC http://www.usable-security.eu/files/d21.pdf

Interesting for statisticians

Description of use cases of applying secure multiparty computations, especially:

- **Case D4**: Statistical office collecting data with improved security,
- **D1** researcher hosting sensitive data in a cloud,
- **D2a**: A researcher interested in data from state databases using third-party miners and
- **D2b**: Researcher interested in data from state databases using built-in computing possibilities of state infrastructure

Puulmann-Vengerfeld P et al., 2012,Capability Model FP7 UaESMC http://usable-security.eu/files/D1.1.pdf.pdf

Total list of cases discussed:

- A: Three competitors
- B1: Two competitors and a “neutral” computer
- B2: energy market suppliers and customers
- B3: Several energy market suppliers and one customer OR one supplier and several customers
- C: An organization interested in its members’ info
- **A researcher**
  - D1: hosting sensitive data in a cloud
  - D2a: interested in data from state databases using third-party miners
  - D2b: interested in data from state databases using built-in computing possibilities of state infrastructure
- D3: **Statistical** data collection **organizations working together** for better results
- D4: **Statistics office** collecting data with **improved security**
- **State database**
  - E1: and interested non-state parties
  - E2: and interested non-state parties (with the computation outsourced)

Current state

- Researching the motivation and needs for enhanced security UaESMC FP7 project http://www.usable-security.eu/en

- Functionality: Privacy-preserving
  - data acquisition (existing sources or data entry)
  - database linking
  - statistical analysis
  - integration with reporting tools

Example: Income Analysis

Problem : How to analyse income over several organizations
and preserve privacy of data subjects,
and optimize infrastructure costs by using the cloud

Solution: Sharemind® on the public cloud:

- Amazon EC2,
- Microsoft Azure and
- Zone Media.

- None of the cloud service providers or customers, nor data suppliers can access data - individual incomes, or find out who they belonged to.

https://sharemind.cyber.ee/clouddemo/

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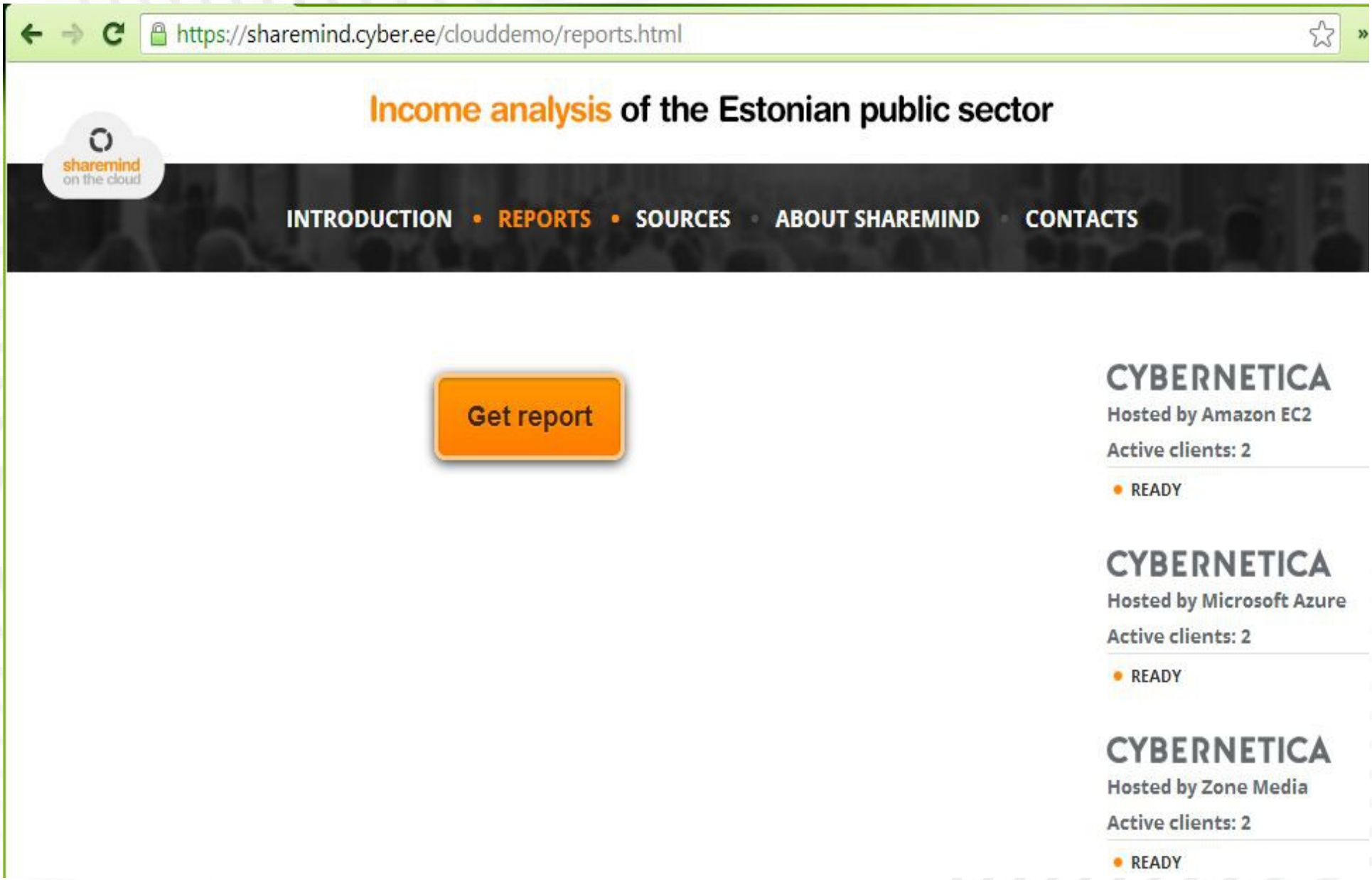
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Income analysis of the Estonian public sector

sharemind on the cloud

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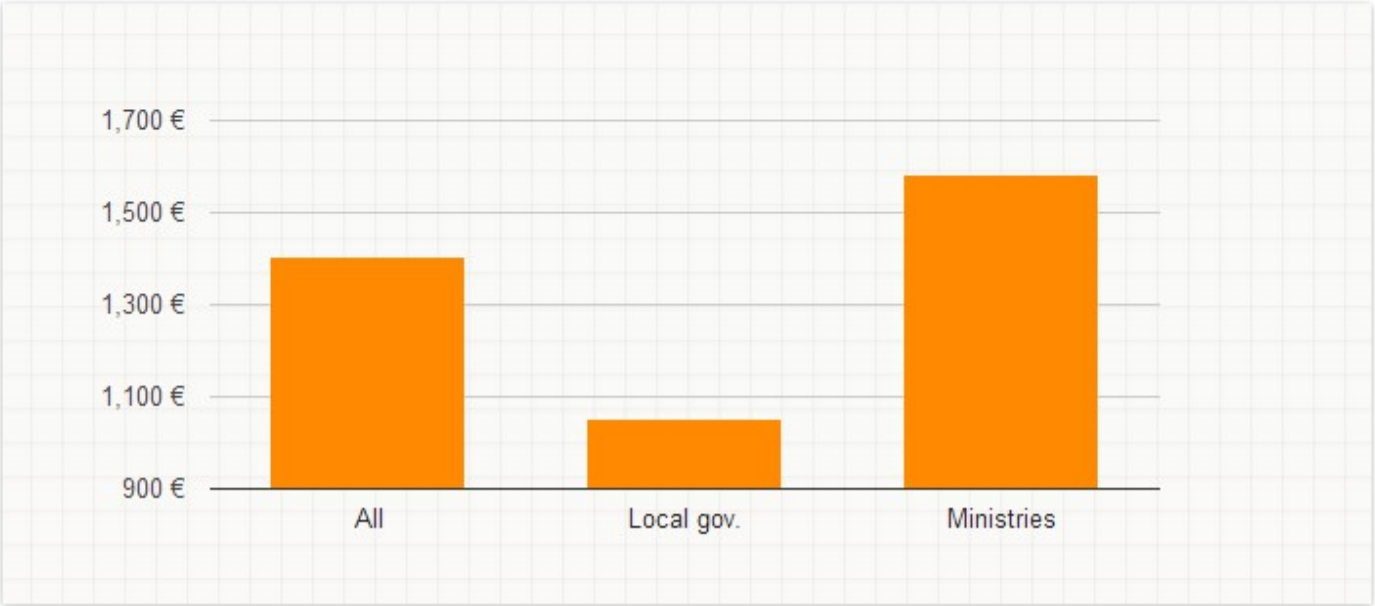
Overall average salary



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Hosted by Amazon EC2
Active clients: *disconnected*
✔ COMPUTATION FINISHED

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Hosted by Microsoft Azure
Active clients: *disconnected*
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Hosted by Zone Media
Active clients: *disconnected*
✔ COMPUTATION FINISHED

Where Next?

Future state:

- Privacy-preserving statistical software and resulting study accuracy will be studied in 2014
- Gathering feedback to the statistical software from researchers

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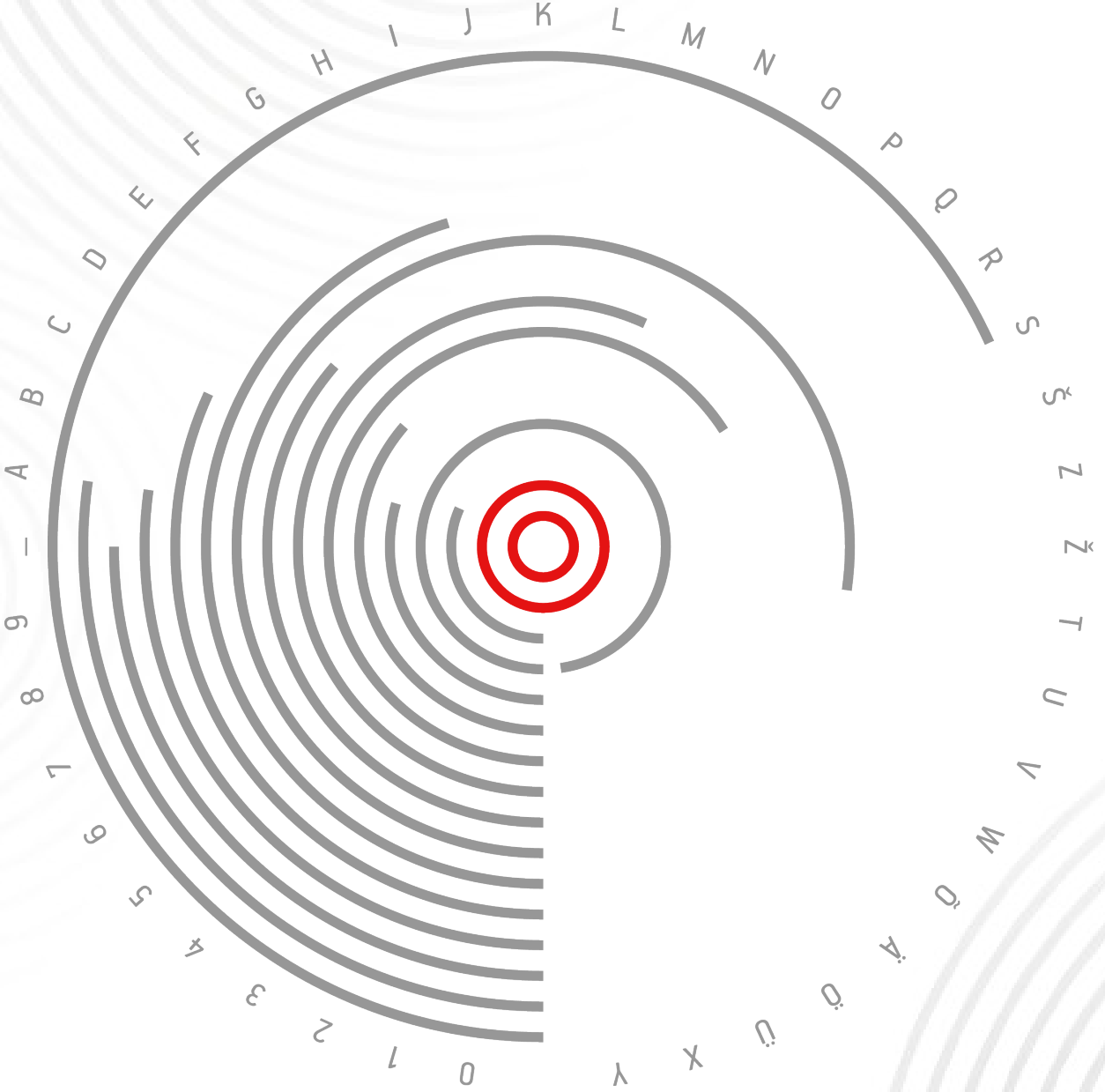

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