Blockchains' federation for integrating distributed health data using a patient-centered approach

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CONTEXTUALIZATION
MOTIVATIONS
MOTIVATIONS

PAULA'S CASE
• Henly, S.J., Wyman, J.F., Gaugler, J.E.: Health trajectory research: A call to action for nursing science. Nursing Research 60 (3 SUPPL.) (may 2011).
https://doi.org/10.1097/NNR.0b013e31821cc240
RELATED WORKS/BACKGROUND

Centralized storage

Distributed storage
PROPOSAL OF SOLUTION

BLOCKCHAINS' FEDERATION

Institutions and services

Main blockchain

Patient A blockchain

Patient B blockchain

Patient C blockchain

Patients

A
B
C
Blockchains’ federation and web services

PROPOSAL OF SOLUTION

ARCHITECTURE

One per patient in all the architecture

- Resources API
- Patients’ blockchains
- Main blockchain
- Connector
- Connector REST API

Information Systems

Development of PHT-aware software

Patient A's EHRs

Patient B's EHRs

URL Resource
Key resource

Host BC
Port BC
Key to write
PROPOSAL OF SOLUTION

ENABLING PHT-AWARE SOFTWARE
VALIDATION

DESCRIPTION AND CASE STUDY

• Scenario of Paula

• Main hypothesis:
  ➢ Data integration is done correctly
  ➢ Data accessible by the two institutions

• Others measurements of performance
• Main hypothesis are confirmed:
  ✓ Data integration is done correctly
  ✓ Data accessible by the two institutions

• Performance test:
  • Times of table ➔ Avg. of 20 executions

<table>
<thead>
<tr>
<th>Time measurement</th>
<th>Value (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locate patient’s blockchain</td>
<td>0.079</td>
</tr>
<tr>
<td>Save evidence’s resource</td>
<td>0.21</td>
</tr>
<tr>
<td>Add evidence to patient’s blockchain</td>
<td>4.784</td>
</tr>
<tr>
<td>Retrieve evidence’s resource</td>
<td>0.209</td>
</tr>
<tr>
<td>Recover evidences from patient’s blockchain</td>
<td>0.128</td>
</tr>
</tbody>
</table>
FUTURE WORKS

- A more complete validation:
  - Scalability tests
  - Stress tests
  - More performance tests
  - Formal comparison with other proposals
CONCLUSIONS

- Blockchains’ federation concept

- Personal Health Trajectory achieved
  - Patient data correctly integrated
  - Data accessible by the institutions

- PHT-aware software development is possible!

- No new health systems are offered...

A way to develop new patient-centered systems is offered
THANKS FOR ATTENTION!

Contact information

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