PEDE: Personal Execution and Data Hosting Environment

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Personal Data
Personal Data Privacy

Power (W)

Time of Day
Personal Data Privacy

News

Power struggle: Texas woman uses gun to stop utility worker
Problems

• Data privacy loss

• Frozen innovation in analytics

• No data ownership or control
Personal Execution and Data Environment

Data
Control

Cloud Based App

Native App

Data sources

PEDE

PEDE App Store

Data
Control

[Diagram showing interactions between PEDE, Cloud Based App, Native App, and PEDE App Store]
Why in the Cloud?

- Universal *access*
- Data *durability*
- *Scalability*
PEDE Prototype

- Using **Infrastructure** and **Platform** clouds
- RESTful APIs and OAuth 2.0
- **Portability**
• **Sensors** and *control* switches
• Z-Wave, Zigbee, Ethernet, USB …
“Your decade old furnace is costing you $400/yr. Please consider energy efficient alternatives”
Example Applications

• Interactive monitoring and control

E-mail
“It is unusual for your oven to be on at this time of day. Would you like to turn it off?”

SMS
“You seem to be heading home, should I pre-heat the place?”
Related Work

• **Sandboxing** native applications
  – *Language* based, e.g. *Transmute* (Griffins et al.)
  – *System* based, e.g. *xBook* (Singh et al.), OSN (Sariou et al.)

• **Dataware manifesto** (McAuley et al.)

• **Privacy Analytics** (Haddadi et al.)
## Related Work

<table>
<thead>
<tr>
<th>Class</th>
<th>Work(s)</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hosting + <em>available</em> transformations</td>
<td><em>Data Capsule</em>, <em>Data Preservers</em> (Kannan et al.)</td>
<td>Online advertising, and transactions</td>
</tr>
<tr>
<td>Hosting + <em>access controlled</em> sharing</td>
<td><em>Personal Data Vaults</em> (Mun et al.), <em>Personal Containers</em> (Mortier et al.), <em>Personal Butler</em> (Wishart et al.), <em>Confidential Commuting</em> (Elsmore et al.)</td>
<td>Digital footprint</td>
</tr>
<tr>
<td>Hosting and compute <em>proxy for mobile devices</em></td>
<td><em>Virtual individual servers</em> (Caceres et al.)</td>
<td>Decentralized social networks</td>
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<tr>
<td>Hybrid hosting and computation – cloud and devices</td>
<td><em>Cloud4Home</em> (Kannan et al.), <em>Droplets</em> (Crowcroft et al.)</td>
<td>Non-data intensive applications</td>
</tr>
</tbody>
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Status

• **Scaling** virtual execution environments
  – *OS-level virtualization?*

• **API design**
  – Time series
  – *Image, video, and more?*

• **User study**
  – PEDE deployment with Windows Azure
  – *Essex Energy Corp*, Windsor, Ontario
Conclusion

- *Data privacy* is important

- *Privacy v/s Analytics*

- Lets *bridge the gap!*