Dimorphic Computing: Sustainable Performance Through Thick and Thin

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Overview

- New model of computing
- Transparently switches between thick and thin client modes of execution
- For apps that alternate between resource-intensive processing and intense user interaction
- Thin client mode allows efficient use of remote resources such as compute servers or large datasets.
- Thick client mode enables crisp interactive performance by eliminating the effects of Internet latency and jitter
- No application or OS modifications required
- No programming language restriction

Implementation

- Sensor-driven Migration Manager
- CPU, Network, and Interactivity sensors
- Transition based on migration profiles
- Migration profiles define finite state machines
- Unified Graphical Interface
- Seamless across state changes
- Based on an enhanced Thin Client
- Allows for use of hardware-accelerated rendering

Applications

- Application Domains: CAD, Digital Animation, Scientific Computing, Video Editing, etc...

Evaluation

- Evaluated using 4 applications

Crunch Results

<table>
<thead>
<tr>
<th>Application</th>
<th>Maya</th>
<th>QuakeViz</th>
<th>ADF</th>
<th>Kmenc15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (ms)</td>
<td>100</td>
<td>33</td>
<td>66</td>
<td>100</td>
</tr>
</tbody>
</table>

Interactive Results

<table>
<thead>
<tr>
<th>Application</th>
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<th>QuakeViz</th>
<th>ADF</th>
<th>Kmenc15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoothness (Frames per Second)</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

AgentISR

- Virtual Machine-based dimorphic computing prototype
- Uses an Agent abstraction
- Transparently and seamlessly relocates to achieve optimal performance

- Combines the strength of thick and thin clients
- Transitions are completely automated and transparent