City-based Sematic Grids: Building the new urban utility infrastructure

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Objective

• The objective of this study is to understand the ubiquitous availability of semantic grids as a new urban utility, analogous, but not exactly identical, to electric grids or communication networks.

Focus on 2 dimensions

• Technological
  – Engineering Systems approach

• Appropriation at a territorial level
  – Institutions
  – Incentives
  – Entrepreneurship
Some Digital Cities Patterns

digitalcity.com

Kyoto Digital City

dds.nl

Digital Bristol
Digital Cities: What we know

- **Mobilization of the Information Society** is one of the most critical factors to be considered in the design, implementation and exploitation of digital cities;
- **Knowledge networks** have the potential to attract people, mobilize the information society and…
- **make both public administration and markets more effective**, which helps promoting **learning trajectories** for the inclusive development of society, …
- … but **require effective infrastructures, incentives and adequate institutional frameworks**;
- **Market mechanisms** do not necessarily work at the level of the issues associated with digital cities, namely in less favourable zones.
- They require an **effective mix of public support mechanisms** that take a relatively long-term perspective
- **Digital cities cannot be promoted independently of an innovation policy** fostering capacity and connectivity
## Emerging Trends of Next Generation Digital Cities

<table>
<thead>
<tr>
<th>Layer of Analysis</th>
<th>From</th>
<th>To</th>
<th>Implications and requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure/access</td>
<td>Conspicuous objects</td>
<td>Invisible infrastructure</td>
<td>Embedding ICT infrastructures in urban daily life, fostering <strong>human-centered systems</strong></td>
</tr>
<tr>
<td></td>
<td>Fixed access</td>
<td>Roaming</td>
<td>Competitive <strong>mobile services</strong> and improved regulatory framework for <strong>increased individual participation</strong></td>
</tr>
<tr>
<td>Content/ services</td>
<td>One-way distribution of information</td>
<td>On-line collaboration and participation</td>
<td>Specific knowledge of institutional and local contexts in order to help developing <strong>interactive contents</strong></td>
</tr>
<tr>
<td></td>
<td>Web functionalities</td>
<td>Networked Activities</td>
<td>New competences in content and services development, <strong>enhancing user activities and networks</strong></td>
</tr>
<tr>
<td>Human and social Context</td>
<td>Technology supply</td>
<td>Mobilization of users</td>
<td>Mobilizing <strong>“change agents”</strong> to foster communities of practice, CoP’s, and <strong>user involvement</strong></td>
</tr>
<tr>
<td></td>
<td>Standards</td>
<td>Interoperability</td>
<td>Building <strong>individual and social competences</strong> through knowledge-based adaptive human centred environments</td>
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</tbody>
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Why Portugal?

Percentage of population living in urban areas

% population living in urban areas for Europe and Portugal for the period between 1950-2030 (estimates since 1991), Source: United Nations, 2002
The “Donnut” effect

- Emerging urbanization trends:
  Increasing urban population, but reduced urban density

The progressive integration of mobile ICTs with sustainable mobility equipments and concepts will facilitate improving well being in urban regions if adequate incentives, infrastructures and institutions are adaptatively implemented through a policy learning process.
Engineering Systems Approach

• “Engineering Systems emphasizes non-traditional properties or goals of systems, often called “ilities”. They usually arise from taking a long-term or life cycle view of systems. These include:
  – Flexibility, robustness, agility, adaptability, scalability, safety, durability, sustainability, reliability, recyclability, maintainability, quality.

• Certain characteristics of systems or their context, which are usually not goals per se, are of great importance to Engineering Systems. [...] They also affect how the system can be initially designed and understood. These include:
  – Complexity, uncertainty, emergence, systems architecture”

“Illities” have not been considered...
Grid Computing

• Grid computing refers to the **large-scale integration of computer systems** (via high-speed networks) to provide on-demand access to data-crunching capabilities and functions not available to one individual or group of machines.

• Using **shared languages and interaction protocols**, grid systems reach out across the globe to access the computing resources, information and services required to satisfy local user needs.

• Grid technology **enables large-scale scientific and business collaboration** among members of virtual organizations, remote experimentation, and high-performance distributed computing and data analysis.

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**GRID-ENABLED VIRTUAL-REALITY DIVE TOUR**

The small company can manage to deliver this supercomputerlike capability by employing the grid to contract out the task of assembling the far-flung computational resources needed to produce a realistic simulation. When a potential customer wants to navigate the virtual Caribbean waters, ScubaTours's computers contact remote servers that handle the details of accessing remote databases and software. These servers thus render relevant cartographic and image information, render data into three-dimensional graphics, integrate real-time video from on-site cameras, and superimpose appropriate commercial information. All these assets, as well as the software that generates a compelling virtual experience, are obtained via a mix of long-term contracts and competitive bidding from multiple suppliers and brokers (such as Computer Games Corp. and Computers, Inc.), each serving many clients and thus achieving favorable economies of scale. Other providers on the grid (not shown) offer reputation management, billing, and similar functions. [See page 85 for a more detailed explanation of how grid systems could enable this sophisticated business application.]

Ian Foster, “Global Computer”, Scientific American,
Tim Berners-Lee, James Hendler and Ora Lassila, “Semantic Web”, Scientific American,
Grid resources linked together in a “Digital City” infrastructure
"The radio system for the Car2Car Communication is derived from the standard IEEE 802.11 (WiFi).

As soon as two or more vehicles are in radio communication range, they connect automatically and establish an ad hoc network.

As the range of a single Wireless LAN link is limited to a few hundred meters, every vehicle is also router and allows sending messages over multi-hop to farther vehicles.

The routing algorithm is based on the position of the vehicles and is able to handle fast changes of the ad hoc network topology".

Source: www.car-to-car.org
Grid Architecture