An architecture based on SOA, RESTful and Mashup for C2 mobile applications

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Web 2.0

Outline

1. Introduction
   - Information Technology Structures

2. Problem Analysis

3. Basic Concepts
   - SOA and Webservices
   - Ontologies
   - Mobile Agents in NCW and Mobile Computing
   - Mashups
   - Security

4. Proof-of-Concept Implementation

5. Our contribution
   - Benefits
   - Problems

6. Bibliography
- Systems are installed in each machine from network.
- The Softwares migrated to web and are accessed via browser.
- Web 2.0 and Cloud Computing.

In other countries such as Brazil, military area uses commercial Information technology to manage their systems.

In such situation is common to find multiple systems that manage portions of specific activities of an organization.

Current solutions work for systems that make access to different databases through segregated networks.

http://democraciapolitica.blogspot.com.br/
The big challenge is to provide resources that would not be available in the Internet.

It is need to share different information in an environment of Network Centric Warfare.

http://ericpalmer.wordpress.com/category/ncw/
## Systems MD

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<tr>
<th>Sistema</th>
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<th>Órgão Central</th>
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<td>Carta-SAGBD</td>
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Cel J. Carlos S., 2006, O modelo de dados da OTAN, ECEME
Adoption Open Source

- The main problem to manage different systems is the interoperability among them
- Standardizing Open Source as a government policy
- Don’t have an intuitive interface, documentation and supported by a specialized team
The new languages and paradigms of software development with more features, increase the difficulty of systems interoperability.
Portfolio provides a comprehensive range of capabilities for the entire services lifecycle.

This approach promotes integrated and reusable business processes or services.

Applications should be provided as services.
SOA and Webservices

Concept of Web Services

- Also known as Webservices
- Created before the SOA
- The services offered are consumed by customers
- Service is the representation of Information Technology
  some business functionality
- WSDL uses XML-based description of services
| **two architectures more used** |

<table>
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<tr>
<th><strong>WS-*/SOAP:</strong></th>
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<tr>
<td>Several development tools.</td>
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<td>When used over HTTP, it is hardly blocked by firewalls and proxies.</td>
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<td>Proprietary platform and language independent.</td>
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<td>Complexity in patterns</td>
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<td>Messages are more extensive (Overhead)</td>
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Representational State Transfer

RESTful:

- Originated from a doctoral thesis in 2000
- It’s all based on the architecture proposed REST
- Ease of adoption, does not require intermediate layer.
- Uses the web to transport data with High performance
- Not yet defined patterns
- It is not intended to travel large data volumes
Ontologies

Concepts

- It is originated in the philosophy
- Represents knowledge and the relationships between the concepts
- Semantic heterogeneity
- Conflicts occur when two items of information appear to have the same spelling but differ in the real meaning
- It is necessary to the definition of an ontology on top all systems
Military Concepts

- The agents have context modified all over the time because the scenario in Network Warfare is dynamic.
- The connections are unstable.
- The most important activity in agent’s mission is to maintain the communication between them.
- Devices are capable of storing a wide variety of data.
Without the image, the text reads:

**Mashups Concepts**

- Combines services from different websites into a single website
- The creation of a service is made through two or more API from existing data
- Basically Mashups is a mix of various data sources, using RESTful
- Examples are Yahoo Pipes, Google Maps and Twitter
Mashups Concepts

- Are lighter and can provide services with low bandwidth in order to connect mobile customers
- Is the result of rapid development in small scale
- Provide immediate benefit at little cost
Virtual Private Network is a private communications network usually used by a company or group of companies / institutions, built over a public communications network.

Technologies used

- Eclipse
- TomCat
- Protégé
- Restlet
- Joomla
- OpenVPN
Access services published on the Intranet via Internet
Change and update data via HTTP using RESTful protocol
Restlet

- Virtual Host A
  - Application 1
- Virtual Host B
  - Application 2
  - Application 3

Clients:
- HTTP Client
- SMTP Client
- File Client

Servers:
- HTTP Server
- HTTPS Server
- AJP Server
Exemplos de REST Amazon
Using mobile devices gain access to resources available via the services provided Intraer.
To analyze the performance and availability of the exchange data.
Greater autonomy of the nodes in an NCW.
- Standardization of services through publication of Ontologies
- Reuse systems and cost savings
- Simple and open protocol
Challenges

- Complex services
- Security
Bibliography

Antoniou G. and Harmelen F. V.  
*A Semantic Web Primer.*  

Shu-Wai Chow  
*PHP Web 2.0 Mashup Projects.*  

Couloutis Dollimore J. and Kindberg T  
*Distributed Systems, concepts and design.*  
R. S. Rocha; Cel J. Carlos S., 2006

O modelo de dados da OTAN para intercâmbio de informações de comando e controle: conceituação, aplicações e reflexos para o SC2FTer / SISMC2.

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THANK YOU!