TOWARDS A SMART CLOUD GATE FOR SMART DEVICES

Manel Gherari, Abdelkrim Amirat, Mourad Oussalah & Riddah Laouar

LAMIS Laboratory Tebessa, Algeria
LIM Laboratory Souk-Ahras, Algeria
LINA Laboratory France
Introduction

The size of the cloud computing market by 2013, as predicted by Gartner. Merrill Lynch gives similar estimates, predicting a growth to $160 billion by 2013.

$150 BILLION

$750 MILLION

The amount Amazon.com’s AWS expects to earn in 2011, as predicted by UBS analysts.

54%

57%

SECURITY: THE TOP CONCERN for migrating applications to the cloud, according to a very recent LinkedIn* survey out of 7052 participants. GeGrid conducted a similar survey and also concluded Security as a top concern for migrating.

A 2010 survey by Mimecast discovered 57% of respondents agreed cloud computing actually improved their security.

7/10

7 OUT OF 10

A study by Mimecast in 2010 discovered that 7 out of 10 companies using cloud services are willing to and will move new applications to the cloud. Many would have done so by 2011.

60%

VIRTUALIZATION

By 2014, approximately 60% of server workloads will be virtualized, according to predictions from Gartner. Compare that to 12% of server workloads virtualized in 2008.

FOR MORE CLOUD COMPUTING INFORMATION GO TO HTTP://WWW.CLOUDSPECTATOR.COM
Visions

- Information at your fingerprint any Where any Time.
- provide ubiquitous PC-like functionality to mobile users.
- Making mobile devices efficient by extending battery life, storage capacity, etc...
Mobile Cloud Computing as a Solution

- Mobile Cloud computing (MCC) has been introduced to be a potential technology for mobile services.
- MCC integrates the Cloud computing into the mobile environment and overcomes obstacles related to their performance.
Cloud Computing

- Shared pool of configurable computing resources
- On-demand network access
- Provisioned by the Service Provider
## Cloud Models

<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Cloud</strong></td>
<td>• The Cloud infrastructure is provisioned for open use by the general public</td>
</tr>
<tr>
<td><strong>Private Cloud</strong></td>
<td>• The Cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers</td>
</tr>
<tr>
<td><strong>Community Cloud</strong></td>
<td>• The Cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns</td>
</tr>
<tr>
<td><strong>Hybrid Cloud</strong></td>
<td>• The Cloud infrastructure is a composition of two or more distinct cloud infrastructures</td>
</tr>
</tbody>
</table>
Cloud Service Model

**SaaS**
Software as a Service
- Email
- CRM
- Collaborative
- ERP

**PaaS**
Platform as a Service
- Application Development
- Decision Support
- Web
- Streaming

**IaaS**
Infrastructure as a Service
- Caching
- Legacy
- File
- Networking
- Technical
- Security
- System Mgmt

**CONSUME**

**BUILD ON IT**

**MIGRATE TO IT**
Mobile Cloud Computing at its simplest refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device [MCC Forum].
Mobile application and the Cloud
MCC Advantages

- Extends battery life
- Enhance storage capacity and bandwidth
- Reliability
Battery Life

Challenges

Traditional approaches require

✓ A radical change in the hardware structures
✓ Changing the battery

MCC’s solution

✓ Offloading
✓ Delegation
Storage capacity

Challenges

✓ More storage capacity,
✓ Change the phone

MCC’s Solution

Everything is in the Cloud
Reliability

Challenges

✓ Loosing your Phone
✓ Accidantely deleting your data

MCC’s solution

Data are stored in the Cloud
The purpose of Mobile Cloud Computing is to improve the performance of mobile devices by leveraging the Cloud.

Among the main concerns of researchers in this area is

- how to extend battery life?
- How to manage the complexity of processing and communication in the Cloud?
- and more other concerns.
MCC Acess Model ‘Delegation’
Mobile Cloud Middleware addresses the issues of interoperability between multiple Cloud, transparent delegation and asynchronous execution of mobile tasks that require processing resources and dynamic allocation of cloud infrastructures. [Huber.F and al. 2014]
Deciding what to Offload is done according to the mobile’s context parameters (bandwidth capacity, battery, data size)

What, When, How to Offload from the mobile to the cloud?
Evidence Mobile Cloud Offloading Architecture

(F. Huber et al. 2013)
Discussion

- Both Mobile and Cloud Context are managed separately.
- The Cloud is not fully exploited in a systematic and methodic way.
- MCC still a recent paradigm to be fully acknowledged and handled. Thus it lack tools for modeling its basic concepts and reasoning about them.
Motivations

- Context awareness is often addressed at middleware level.
- MC-Apps are developed in an ad-hoc manner.
- An abstract view of MC-Apps facilitates reasoning on the application before its implementation.
- Develop MC-Apps that are not frequently faced with bugs and panes.
Motivations (suite...)

- Traditional ADLs do not have means to describe this new kind of applications.
  - MC-Apps are more complicated and have richer architectural features and more constraints than a traditional applications.

- MCC demands a radically new software architectural paradigm that addresses challenges related to Mobile Cloud Application development.
Objectives

- Enable the development of MC-Apps to be in a methodic and systematic way.
- Have awareness on both contexts of the Mobile and the Cloud.
- Foster the reusability auto-adaptability of MC-Apps since the latter will have an architectural representation.
Proposed Approach

- In order to handle mobile’s and cloud’s contexts simultaneously, we will try to gather all basic concepts of both contexts to ensure a better, methodic, systematic MC-Apps development process.
Proposed Development Environment

Architectural level

Middlewares Level

RunTime Level
We propose an ADL for modeling MC-Apps Architectures to allow the developer implementing its Mc-Apps in a well-structured manner.
Smart Mobile Cloud Middleware: to address communication issues between the mobile and the cloud, SMCM implements a cloud services composition mechanism
SCG keeps a tractability link between the re-configuration of the Mc-Apps and its architecture and vice-versa.

SCG manages the evolution of the architecture and re-configuration of MC-Apps.

More points.
Smart Cloud Gate’ architecture (Middleware Level)

Cloud services Ranking is based on:
- Quality Of Services
- Pricing Models
- Time of response
- Service Level Agreement
- And more …

As for the mobile context the following information are needed to be extracted:
- Mobile device’s location
- Mobile device’s time
- Usage history and user preferences
MC-Apps’s Architecture Evolution Mechanism

The ranking of Cloud services based on profiling technique and mobile Context informations

1. Mobile device’s Time
2. Mobile device’s Location
3. Evolution path

Set 1
Architectures V1.n

Set 2
Architectures V2.n

Set 3
Architectures V3.n

Contexte i,j

Architectures V1.1

Architectures V2.1

Architectures V3.1
MC-ADL will be implemented with EMF&GMF.

- **ADD Rules**
- **Modify Rules**
- **Delete Rules**

Architecture V0

Profiling the cloud and the mobiles

Architecture V1

Context 1

context 2

Architecture V2.1

Architecture V2
SCG is continuously operating since it will keep monitoring both architecture and the application as well for the cloud.
Conclusion

- We aim to make the development of MC-APPS a sophisticated, methodic process by proposing a smart environment allowing their description and managing their architecture’s evolution.
Thank You

We thank you for sending this invitation. And also for paying us much attention.
for looking after our scientific intention.
And help us go far with our humble ambition.
Although it have been a day full of tension.
But for us it was the best situation.
It will be in every story of our mentioned.
Because simply you got us at the perfect direction.