Opportunities and challenges for MNO’s in the mobile cloud

Uwe Herzog, Eurescom
herzog@eurescom.eu
Based on Eurescom study P2051

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Outline

- Understanding mobile cloud computing
- Mobile cloud services
- Players in the mobile cloud
- Operators’ position in the mobile cloud
- Recommendations to operators
- Conclusion
Understanding mobile cloud computing
Mobile Cloud Computing (MCC)

- MCC is:
  - the “adaptation” of cloud computing (CC) to the mobile environment
  - ‘anywhere anytime secure data access’
- Several players already made huge investments (Google, Amazon, Apple)
- MCC poses challenges due to the intrinsic nature and constraints of wireless networks and devices.
Mobile Cloud Computing (MCC)

- Enabled by today’s mobile BB (3G, Wifi, LTE) and device technologies (smartphones, tablets)
- Limited processing power and storage capacities stimulate MCC
- Services are brought to the user through a BB interface
- Today apps are tied to the devices market, MCC will break this up
  - Services no longer tied to the device
  - Lower the need / Frequency of changing devices
Unique requirements

MCC moves processing and data storage away from the device, delivered via web technologies

- **QoS (the wireless media is unstable)**
  QoS mechanisms in the radio access technologies to secure efficient delivery of the mobile cloud services.

- **Handset & Service Adaptation**
  Most available CC services need some adaptation in order to “fit” to the mobile device characteristics and form factors (e.g. screen size).

- **Security (data protection in mobile access / in the cloud)**
  Information exchanged over the cloud requires confidentiality and privacy.

- **Cloud Provider & MNOs cooperation**
  Mobile access networks pose more challenging requirements than fixed networks to deliver cloud services.
Enabling Concepts and Technologies

Cloud applications require permanent Internet connection

- **Web Technologies**
  - can potentially be launched from various platforms and require low latency.
  - e.g. Web2.0, HTML5/CSS3 (enables data caching, embedding audio/video, dynamic adaptation to the form factor), Mobile web browsers

- **Mobile Operating Systems**
  - the door to access the cloud.
  - e.g. iOS, Symbian, Android, Windows Phone, ...

- **Web Operating Systems**
  - Only a web browser and an Internet connection are needed, no local installations
  - Access to the services from any device, terminal-type independent
  - e.g. HP webOS, Chrome Web OS.
Security / privacy aspects

- **Mobile handset security**
  - Related to the integration of multiple wireless interfaces
  - Related to applications running on the device

- **Security in the mobile cloud**
  - Availability of resources
  - Security of data stored in the cloud
  - Unauthorised access

- **Data privacy concerns**
  - Not much different from fixed clouds
  - Apps are a potential risk
  - Privacy policies of cloud providers often not satisfying (cloud provider has physical control of data for which the customer is accountable)
  - Data location / jurisdiction
Handsets and Devices

- Smartphones, Tablets (bigger screen, not for telephony, heavier), e-book readers, netbooks, in-car entertainment systems, navigation systems, …
- Current smartphones designed to download and run apps locally, ever increasing need for new devices
- Smartphone penetration of customer base and % of handsets sold (Europe)

From Arthur D. Little 2010
Standardisation

- Standardisation activities:
  - mobile devices/networks (e.g. 3GPP, OMA, IETF, TISPAN)
  - cloud computing (e.g. ETSI, OCCI, OMG, OASIS, SNIA, ITU-T)

- There is no standard developing organisation or forum that clearly targets MCC
Cloud Broker

- An intermediary between cloud providers and end-users assisting end-users (provide one-stop shopping alternative)
- Three categories of cloud brokers:
  - **Cloud service intermediation** – providing services on top of existing cloud platforms (e.g., Identity, access management capabilities)
  - **Cloud aggregation** – bringing together multiple services; ensure interoperability and security (i.e., the glue).
  - **Cloud service arbitration** – providing flexible and choice by offering multiple similar services to select from.
Mobile Cloud Services
Mobile Cloud Services

- Cloud services in the mobile domain are a subset of generic mobile services
  - Integrating intelligent processing on the network side (computing within the cloud);
  - Providing scalability, elasticity and permanent availability;
  - With a flexible business model
  - Delivered in a pay-as-you-go fashion.

- The user relates to the service that it affords rather than to the device
# Mobile Cloud Services

## Typical Mobile Cloud Services

- **Storage (lack of local resources)**
  DropBox, Boxnet, Funambol…

- **Email, Instant Messaging**
  Exchange, …

- **Mobile Device Management**
  Funambol, Android (since 2.2 it enables back up and restore of the system), …

- **mVoIP**
  Skype, Nimbuzz, Truphone, Vopium, …

## Services forecast

(Gartner’s ranked list of applications)

1. Money transfer
2. Location Based Services
3. Mobile Search
4. Mobile Health Monitoring
5. Mobile Payment / Mobile Commerce
6. Near Field Communications Services
7. Mobile Advertising
8. Mobile Instant Messaging
9. Mobile Music

## Mash-up Services

- Mash-up web applications are starting to arise, combination of different services.
- E.g. *Panoramio, Junaio, Google Googles.*
### Applications Stores

#### Device manufacturers' App Store

<table>
<thead>
<tr>
<th>Device</th>
<th>Launched</th>
<th>Apps</th>
<th>Downloads per day</th>
<th>Free apps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nokia Ovi</td>
<td>in 2009</td>
<td>50,000+</td>
<td>6.5 million</td>
<td>26%</td>
</tr>
<tr>
<td>RIM Blackberry App World</td>
<td>in 2009</td>
<td>17,000+</td>
<td>3 million</td>
<td>26%</td>
</tr>
<tr>
<td>Apple AppStore</td>
<td>in 2008</td>
<td>425,000+</td>
<td>&gt; 15 billion</td>
<td>28%</td>
</tr>
</tbody>
</table>

#### Mobile Operating systems' App Store

<table>
<thead>
<tr>
<th>Device</th>
<th>Launched</th>
<th>Apps</th>
<th>Downloads</th>
<th>Free apps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android Market</td>
<td>in 2008</td>
<td>250,000+</td>
<td>&gt; 4.5 billion</td>
<td>57%</td>
</tr>
<tr>
<td>Windows Phone MarketPlace</td>
<td>in 2009</td>
<td>25,000+</td>
<td></td>
<td>22%</td>
</tr>
</tbody>
</table>

#### MNOs’ App Store

<table>
<thead>
<tr>
<th>Device</th>
<th>Launched</th>
<th>Apps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange Application Shop</td>
<td>in 2009</td>
<td></td>
</tr>
<tr>
<td>Vodafone Mobile Applications Store</td>
<td>in 2010</td>
<td>800+</td>
</tr>
</tbody>
</table>

(Download values since the launch of the stores)
Players in the mobile cloud
Players in the mobile cloud
(Example of players in the different areas)

- **Service Providers**
  - Google
  - Microsoft
  - Yahoo
  - Facebook

- **Mobile Manufacturers**
  - HP
  - Nokia
  - Apple
  - Samsung

- **MNOs**
  - AT&T
  - Verizon
  - Orange
  - T-Mobile
  - TMN
  - Síminn
  - Vodafone
## Positioning of all actors

<table>
<thead>
<tr>
<th>Player</th>
<th>Mail</th>
<th>Storage</th>
<th>Communications</th>
<th>Enterprise</th>
<th>Content Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Service Providers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsoft</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Google</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Yahoo!</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Facebook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
<td></td>
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<tr>
<td>LinkedIn</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mobile Manufactures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Nokia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Apple</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MNOs</strong></td>
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<td></td>
</tr>
<tr>
<td>Vodafone</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>TMN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Orange</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Operators’ position in the mobile cloud
Operators’ position in the mobile cloud

1. MNO has no relation with the CP (bit-pipe’)
2. NaaS services
   Costumer contracts a private network service – e.g.: VPN from MNO
3. NaaS services
   SLA with a Cloud Provider – granting certain service level and QoS
4. MNO as a Cloud Provider

- All four models are not mutually exclusive, since all of them can coexist.
Operators’ position in the mobile cloud

- Before CC, MNO provided most of the services to their users
- So far MNOs take less benefit from mobile cloud computing.
  - Data traffic is increasing with MCC, but MNOs’ revenues are not following this rise.
  - Most profits are going to those providing the services – third parties.
    - Facebook, Google (with Google Apps), Nokia (with Ovi), …

![Data traffic and data revenues chart](chart.png)

**Global mobile data revenues and data traffic, 2008-2013**

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>CAGR (%)</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data traffic (PB)</td>
<td>238</td>
<td>455</td>
<td>800</td>
<td>1,381</td>
<td>2,370</td>
<td>4,015</td>
<td>76</td>
<td>1,587</td>
</tr>
<tr>
<td>Data revenues (US$ mil.)</td>
<td>175</td>
<td>202</td>
<td>227</td>
<td>255</td>
<td>287</td>
<td>322</td>
<td>13</td>
<td>84</td>
</tr>
</tbody>
</table>

Source: Informa Telecoms & Media
Operators’ position in the mobile cloud

- MNOs are increasingly starting to offer some mobile cloud services:
  - Applications & Stores
    - Example: Vodafone 360 (social computing cloud-based service: combines contact lists, getting friends locations etc.), Orange Market, ...
  - Storage
    - backup of address book, SMS, videos, photos and music.
    - Example: AT&T Address book (synchronize contacts), AT&T Mobile Share (access to photos / videos from any device), Deutsche Telekom (cloud storage), Sapo Fotos, Sapo Videos, ...
  - NaaS
    - Charge applications through the network operator (direct billing).
    - Example: Orange is doing it with several applications.
Operator’s strengths

- Market position, customer base, presence, trust and accountability.
- Real-time billing systems and payment solutions.
- NaaS service solutions (network and payments resources).
- Privacy/security of client data.
- Dependable and distributed infrastructure (3G, Wi-Fi, LTE).
- 24/7 customer service & proximity (e.g. as opposed to OTT)
- Possesses the strongest and more direct relationship with the end-user.
- Over the top (OTT) players want to negotiate with operators
  - Example: Google and Verizon.
Operator’s weaknesses

- Cost of network expansion is covered by the MNOs, while other players often benefit from the improved network capabilities.
- Inadequate data plans.
  - Data revenues do not follow the data traffic increase.
- Lack of reputation and culture in the software domain.
- Weak relationship with the software developer community.
- Too long development processes (can take several months).
- Restricted in service innovation due to strong regulation and regulatory restrictions.
Operator’s opportunities

- Leverage customer data - take applications to the next level.
- Offer end to end mobile services to the customer - make the network intelligent.
- To be a provider of content, applications and payment.
- MNOs have great level of insight to their customer segments
  - offer segment targeting for mobile applications as a service to developers.
  - expose applications to the right consumer segment (profiling information).
- Leverage position - enhance security aspects (identity management, authentication and authorization processes).
- Act as a broker
- Attract the developers community
  - tap through cloud services with OS agnostic apps.
  - provide network and billing APIs – revenue sharing plan with developers
MNO’s threats

- The biggest threat that MNOs face is to be a dumb-pipe
  - Web applications reinforce OTT players position which continue benefiting from "free" bandwidth.
  - OTT players could be the winners in the mobile cloud value chain if mobile network operators remain dumb-pipes.

- Several aspects have led some MNOs to become dumb-pipes and might take others there too:
  - Aggressive strategies of OTT players: pushing MNOs to lose revenues and lose touch with clients.
  - 80% of mobile application developers see MNOs as mere bit pipes.
  - Developers have both power and choice:
    - they are responsible for most of the innovation on mobile devices
    - they act independently from the mobile industry (OEMs and operators).

- There is also pressure from social media like Facebook on SMS services. Many MNOs are experiencing less SMS usage as people move to Facebook.

- iOS 5 automatically transfers SMS via IP if the receiver’s device is compatible

- Mobile VoIP: By 2015 5bn USD lost revenues (Juniper), DT blocks Skype on their iPhones, Apple removed Google voice from AT&T iPhones
Recommendations to operators

- **Form alliances**
  - MNOs by nature no sw developers → form alliances with developers – e.g. provide network APIs in exchange of cooperation in the creation/deploy of services.
  - with App stores – E.g. in the billing domain (like Nokia Ovi & Orange or Apple & AT&T).

- **Push/support future technology in term of standardization**
  - E.g. GSMA OneAPI, WAC

- **Pricing models for data plan and network usage**
  - Unlimited versus capped data plan.
  - Investigate in QoS mechanism and traffic mgmt to offer policy control tariffs

- **Leverage operators’ assets**
  - Trusted operator / personal data storage (tracking, traceability).
  - Network, proximity, latency
  - Billing, Managing, after sale support
Conclusion
Conclusion

- MCC is a growing business with enormous opportunities.
- Operators are, at the moment, “behind” in the MCC business.
- Operators have many means to grow in the MCC business.
- Different roads can be taken, depending on each operator’s interests.