

Mobile Cloud Computing

trends and challenges

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Outline

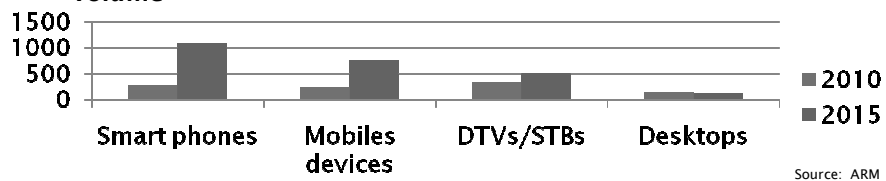
- Introduction
- Mobile : What does it mean?
- Cloud : What and How?
- Computing : More than ever challenging
- Conclusion



Introduction

Introduction Mobility : What does it mean? Cloud : What and where? Computing : more than ever challenging Conclusion

- **Mobile systems will outperform all others devices in volume**



- **A lot of complex technical challenges must be solved at the same time in the mobile area**
- **Emerging of Mobile Cloud Computing linked to problems solving in other areas**



Mobile : What does it mean?



MOBILE = No wire

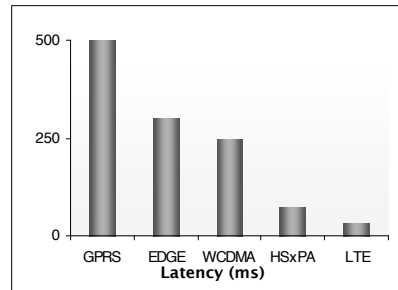
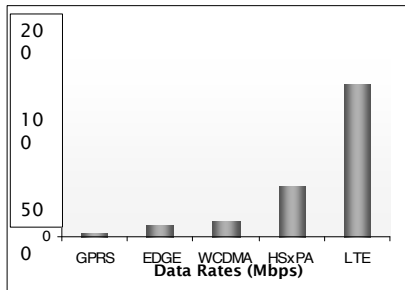
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- **Broadband Radio connection**
 - **From short voice conversation to continuous data connection**
- **System autonomy**
 - **A lot of new features are very power hungry**



A continuous and fast evolution

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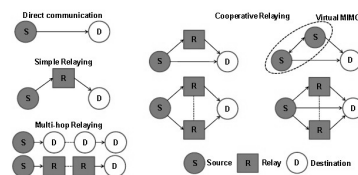
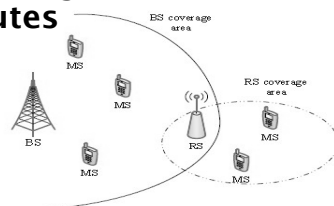
- new cellular mode is added every 3 years, a new frequency band is added every year, and a new auxiliary radio service added every 2 years
 → Higher capacity, higher data rates, increased connectivity



New interaction modes

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- Sharing of antennas providing multiple signal routes**



- Cognitive radios**
 - Spectrum sensing
 - Dynamic behavior
- intelligent and adaptive systems**
 - Optimization of Radio power based on content
 - Understanding the environment

Radio sub-system is already heavily multi processors with specialized DSP's



A lot of interfaces

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- **Diversity of standards**
 - **Highly computing intensive**
 - **Not possible to have a single interface per standard**
 - **Re-configurability is key: hardware and software**



Squaring the circle

Source : APPLE

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- **Moore's Law**

From 2006 to 2011 : 4 times more transistors in the same power budget

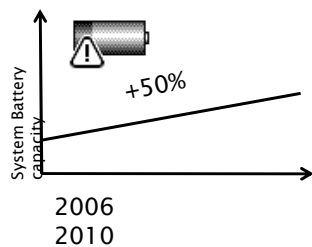
- **Form factor**

Thinner, lighter, and full of great ideas.

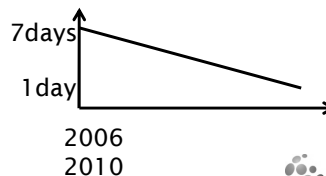
Once you pick up iPad 2, it'll be hard to put down. That's the idea behind the all-new design. It's 33 percent thinner and up to 15 percent lighter, so it feels even more comfortable in your hands. And it makes surfing the web, checking email, watching movies, and reading books so natural, you might forget there's incredible technology under your fingers.



- **Battery capacity**



- **System autonomy**



Cloud: What and Where

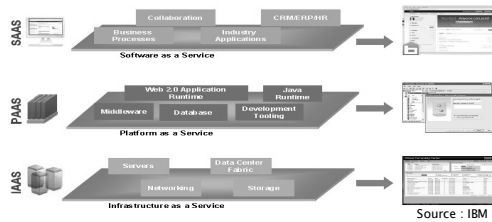


The "CLOUD" but which one?

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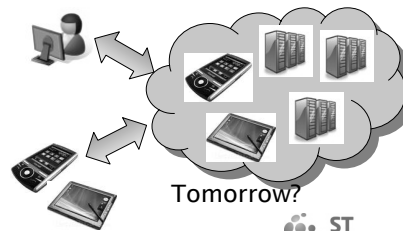
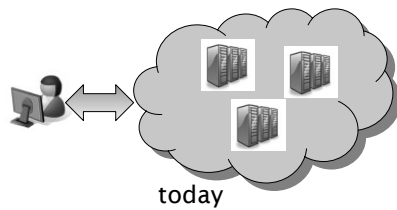
- Which flavour of the Cloud?

Layers of IT-as-a-Service



MAAS
Mobility as a Service ?

- Where is the cloud?



Security in the Cloud

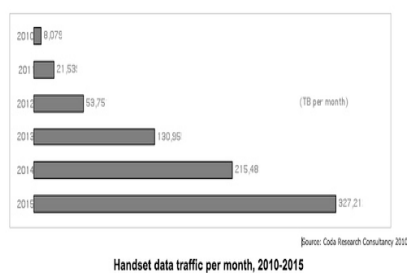
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- **One of the main issue for the cloud**
- **Terminal security is KEY**
- **Need strong authentication**
- **Data in the cloud must be protected**
- **Data location could be controlled**
- **Need to be forgotten**

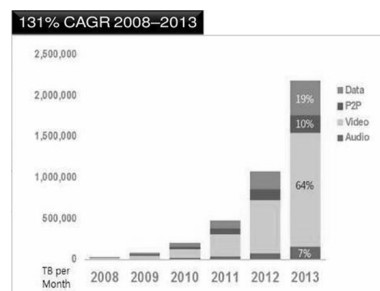


The “data deluge”

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Handset data traffic per month, 2010-2015



Mobile Data Traffic

- **Squaring the circle regarding energy efficiency and processing power**
- **Need for standards (HTML5, oneAPI,...) and application compliancy for the cloud**
- **Strong pressure on infrastructure and operators**
- **Needs for very efficient data mining techniques.**



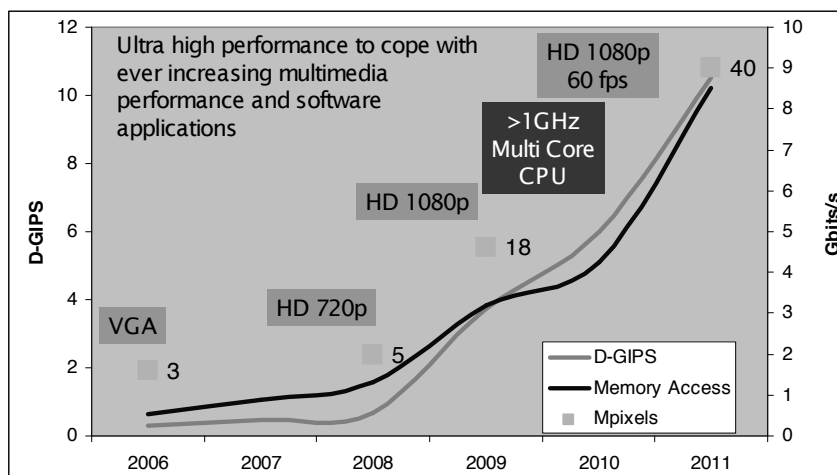
Computing : More then ever challenging



Multimedia Performance

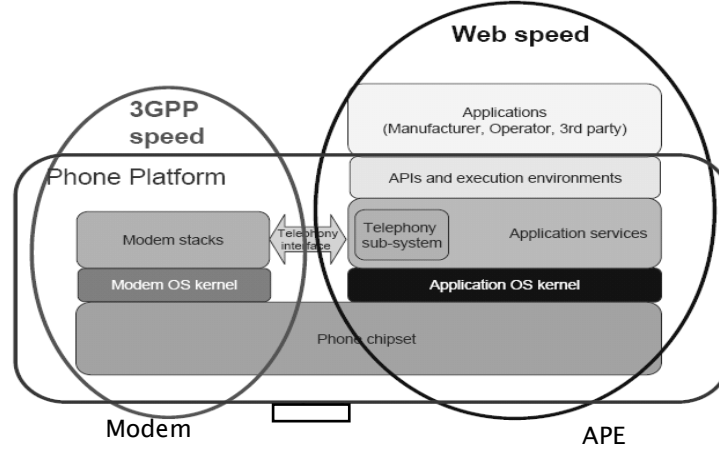
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Multimedia Processor Performance Requirements



Change at web speed

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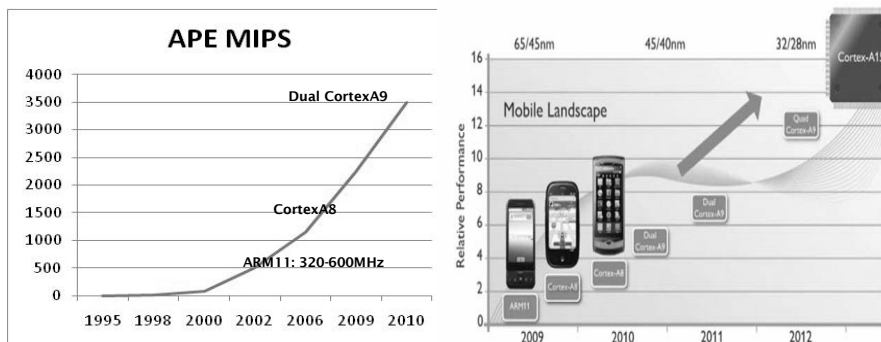


- Modem certification and integration is tacit know-how intensive
- APE is the CORE of the user experience



Never enough processing power

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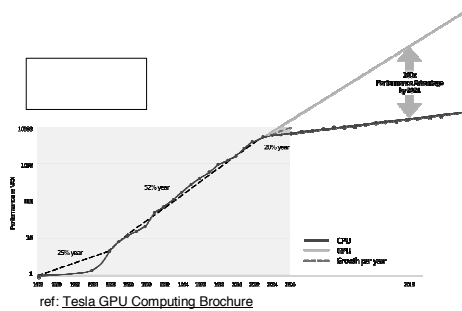
- More and more APE processing power dedicated to applications
- Additionally, HW-Accelerated 2D/3D graphics, Video, Imaging and Audio Engines



The Gap Between CPU and GPU

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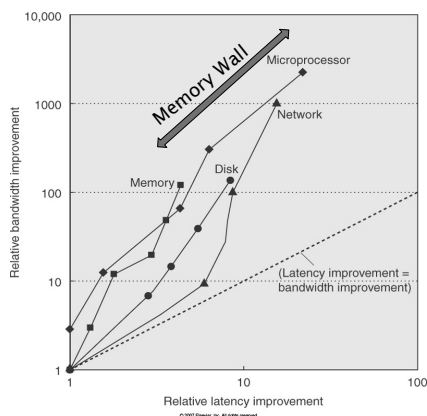
- GPU evolution is very rapid
- One of the biggest IP block in modern systems
- Must be used not only for graphic



Memory is not on the same pace

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- A single problem to solve : **“brings data to CPU in the power budget, but...”**



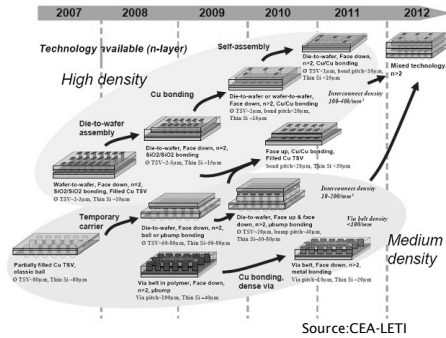
- Memory evolution not aligned with CPU needs
 - More than 12GB/s needed
- Multiple channels
- DDR2 => DDR3 => DDR4
- LPDDR1 => LPDDR3 => WideIO



WideIO and 3D Integration : The holy Grail ?

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- A lot of 3D flavors already
- Virtuous regarding performance and therm management



- Standards for WideIO I/F in progress (Jedec JC42.6, JC11)
- The most promising solution to reach very high bandwidth for smartphones



But still a long way to go !

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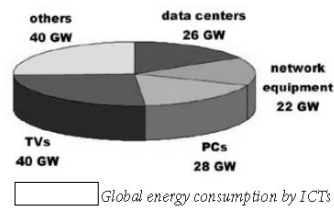
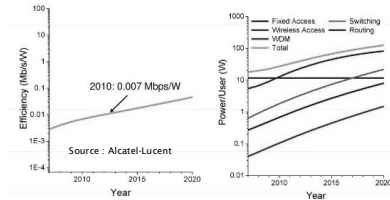
- Mass production in TSV for imaging module or memories
- Thermal budget with very strong constraint
- Lack of strong standardization: The MtM problem
- Testing is becoming a very complex issue
- Big issue in the supply chain
 - ● Same supplier of different dies
 - ○ Logic and memory
 - ● Several dies from various suppliers



The Cloud power efficiency : A major issue

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- **Mandatory to improve cloud power efficiency**
- **16-20% YoY increase for overall ICT power consumption**
- **Data centers hitting the power wall**
- **Energy consumption becoming big part of OPEX for operators**



Conclusion

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- **Very promising approach especially for mobile devices**
- **Embrace all the difficult problems of high-tech industry**
- **Mobile cloud computing still in infancy even if already in the cloud**
- **Highly dependant of problems in other domains.**
- **Economical issues may slow down its pervasion**



**THANK YOU
for your attention !**

