

The Future of **Non-Technical** Cloud Computing

report from the
cloud computing expert working group meetings

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Non-Technical

- State of the Art
- Gaps
- European Focus
- Major Opportunities
- Economic
- Legalistic

Note: non-functional aspects (performance, resilience..) are dealt with under Technical although all relate to Ease of Use

Note: strong inter-relationship between technical and non-technical aspects

Current State of the Art

Including ongoing R&D

Economic Aspects

- Cost Reduction
- Pay per Use
- Improved Time to Market
- Return on Investment
- CAPEX to OPEX
- Going Green

Legislation, Governance, Policies

- No standards – vendor lock in
- Legality of operating / using CLOUDs
 - International jurisdiction
 - Privacy and personal data
- Security of operating / using CLOUDs
 - International jurisdiction
 - Security and investigatory powers
- No free market in services across CLOUDs

GAPS

- Economic Concerns
- Legislation, Governance, Policies

Economic Concerns

- Large, high risk investment to provide infrastructure
- Little knowledge of appropriate business models – how to extract value
- Relationship benefits of green computing to overall business model unknown
- Link to technical aspects on QoS / SLA weak
- Risk of vendor lock-in

Legislation, Governance, Policies

- Different national standards / styles of governance
 - Increases business risk of entering CLOUDs market
- Policies
 - No standards to avoid vendor lock-in
 - No standards to improve interoperability
 - Free market of services

European Focus

- Taking into account SWOT analysis
- Where should Europe focus effort?

Note: non-technical aspects in yellow

Note: take-home message in red

European Focus

- Global CLOUDs Ecosystem
 - Global legislation issues
 - Strong European partner eco-systems
 - Behaviour policies
 - Interoperability & standardisation efforts

- → to improve access of European organisations to world market in CLOUDs

European Focus

- New Business Models and Expert Systems
 - How to create and extract value
 - When to outsource (and where to)
 - How to improve ROI
 - How to reduce start-up time
 - How to build cloud-ready applications
- **→ To improve profitability of European organisations using CLOUDs**

European Focus

- Holistic Management and Control Systems
 - Integrate all tiers and layers
 - Address cross-boundary scalability, elasticity and multi-tenancy
 - **Respect policies, legislations and business knowledge**
 - Manage all aspects related to composition and execution management
- **→ to improve technical basis (removing disadvantages) for European organisations using CLOUDs**

European Focus

- Cloud Support Tools
 - Supporting to build up new platforms easily
 - New programming models and tools that deal with distribution and control
 - Enhanced features for provisioning, including respecting business obligations
 - Improved security and data protection
 - Efficient data management
 - Energy efficiency on all layers
 - Easy mash-ups of clouds exposing a single user interface etc.
- → to reduce barriers to adoption of CLOUDs by European organisations

European Focus

- Mediation of Services and Applications on Clouds
 - Improved accessibility & availability
 - Scalability according to needs
 - Enhanced computational power
 - Customizable products
 - Composition / aggregation of new higher-value products / applications based on existing ones
- → to improve platform for service delivery using CLOUDs for European organisations

European Focus

- Green IT
 - Up and downscaling
 - Energy proportionality
 - Policies
- → to improve both economic benefit and 'green credentials' of European organisations

European Focus

- Commodity and Special Purpose Clouds
 - Customised by and for specialised expert groups
 - Optimised for their requirements
- → to accommodate special niche markets utilising CLOUDs for and by European organisations

European Focus

- Open Source Cloudware
 - Interoperability
 - No vendor lock-in
 - Standards
- → to increase confidence of continuity for European organisations using CLOUDs

European Focus

- Movement from Grid To Cloud
 - Many similar technologies
 - Many similar legalistic / policy / governance issues
 - Strong European knowledge
- → to facilitate evolution from GRIDs to CLOUDs for European organisations

European Focus

- Start-up Networks
 - Economically viable way for SME start-ups to have access
- → to facilitate easier start-up using CLOUDs for European organisations

4 major opportunities

- IaaS
- PaaS
- SaaS Enhanced Service Provisioning
- CLOUDs Consultancy

General Recommendations

Whatever the view taken by businesses or academia it is clear that Cloud computing in the widest sense presents business opportunities and that to have credible offerings for those opportunities European industry and academia needs to work together to develop the appropriate technologies and other aspects such as economic models and legalistic structures.

The analysis above identifies clearly both opportunities and technical and non-technical topics needed to realize those opportunities. The prioritization is based on the perceived importance of the opportunity in economic terms and the estimated time necessary for R&D on the listed topics to produce useable results.

The expert group recommends that the EC – within the framework programme – opens a special topic on Cloud Computing with the list of topics **above** as specific work programme elements.



Research Topics

- Scale and elastic scalability
- Trust, security & privacy
- Data handling
- Programming models & resource control
- Systems development and management
- Economical aspects
- Legalistic issues

- [in the report these are characterised and prioritised]

Recommendations

- 1: The EU needs large scale research and experimentation test beds;
- 2: The EC together with industrial and public stakeholders should develop joint programmes encourage expert collaboration groups;
- 3: The EC should encourage the development and production of :
 - (a) CLOUD interoperation standards;
 - (b) an open source reference implementation;
- 4: The EC should promote the European leadership position in software through commercially relevant open source approaches;

And finally....Main Recommendations

- The Group recommends two high level actions to the EC:
 - 1: The EC should stimulate research and technological development in the area of Cloud Computing
 - 2: The EC together with Member States should set up the right regulatory framework to facilitate the uptake of Cloud computing