

Some views on cloud computing research and innovation

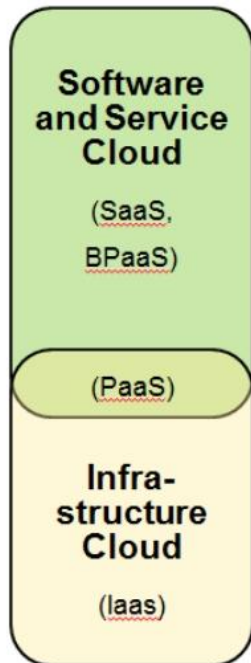


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NESSI Steering Committee

NESSI Cloud White Paper 2012



Product & Service Innovation

“Innovate with Cloud”

Applications provided as services (efficiently assembled from PaaS services), offering *transformational benefits and capabilities to businesses, public bodies, citizens (e.g., the “next” facebook)*

Engineering & Governance Innovation

“Agile design & operation”

Techniques and tools to exploit cloud opportunities *to more dynamically and responsively build, operate and manage interoperable cloud-scale applications (à la “DevOps in the Cloud”)*

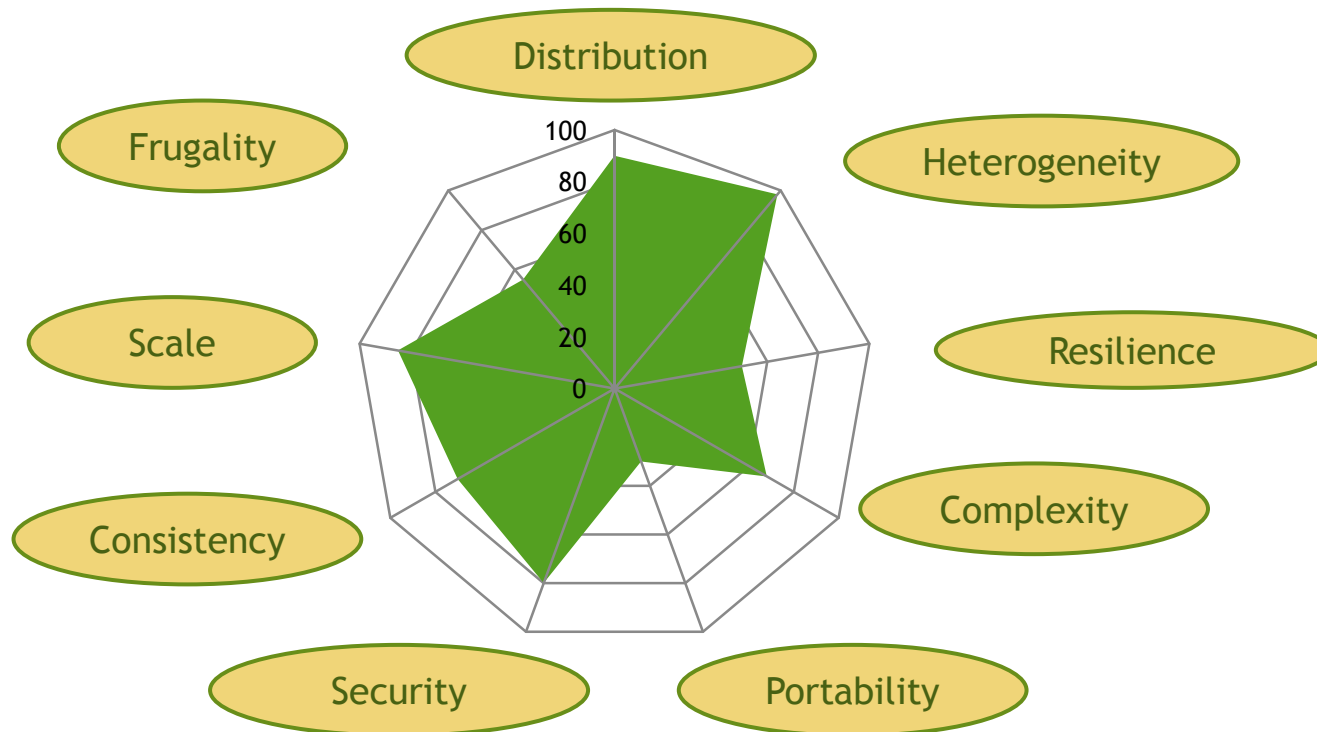
“Transforming ICT”

Scalable computing, IoT & networking resources offered as services, *thus eliminating need for infrastructure (pre-)invest by application providers*

“Adaptive Cloud Infrastructures”

Application-aware mechanisms *to build resilient, sustainable infrastructures for service deployment and operation (e.g., adaptation of cloud depending on usage setting of application)*

Cloud Computing vs some computer science hard problems



* Not relevant values!

Cloud federation and cooperation

- ICT 7 « Federated cloud networking »
- ▶ independance wrt cloud providers (public cloud) or technology providers (private cloud)
- ▶ facilitating management and automation in hybrid use cases
- ▶ off-loading and migration support for data and services

Service discovery and composition

- ICT7 2014
- ▶ reduce the cost and delays to develop services (internally or within sectorial ecosystems)
- ▶ automation of interoperability or of integration of legacy

Cloud Security

- ❑ ICT7 2014
- ▶ trust in infrastructures and services (integrity, confidentiality, privacy), location of data and processes
- ▶ transparency, compliance, certification
- ▶ secure-by-design systems
- ▶ traceability between requirements and implementations

Cloud interworking with networks, IoT, CPS

- ❑ clouds at the core of complex architectures
- ▶ services spanning cloud and heterogeneous systems (dedicated architectures, multiple devices)
- ▶ cooperation of multi-layer autonomic system (cloud, core network, edge networks, applications)
- ▶ dedicated IaaS or PaaS for specific domains
- ▶ network control for efficiency and reliability (network virtualisation, SDN, NaaS)
- ▶ access to local and global contexts

Cloud for critical large scale information systems

- clouds at the core of interoperating information systems
- ▶ fully distributed computing and data with sound design patterns
- ▶ automation of deployment and management of services and applications
- ▶ seamless and consistent management of the cloud stack

Programming models for clouds

- the cloud is the computer
- ▶ languages or frameworks with distribution, resilience, parallelism, events built-in
- ▶ high level abstractions and API, integrated in PaaS
- ▶ DSL for cloud management and sectorial PaaS or SaaS

Evolution of cloud architectures

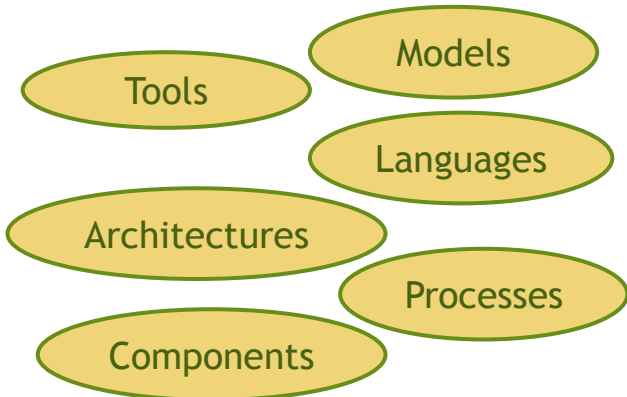
- keeping the cloud components up-to-date
- ▶ evolution of the current stack (IaaS/PaaS/SaaS)
- ▶ optimised hardware abstractions and low level resources management
- ▶ builtin energy efficiency control and optimisation
- ▶ co-evolution of databases and cloud computing

Innovation and appropriation

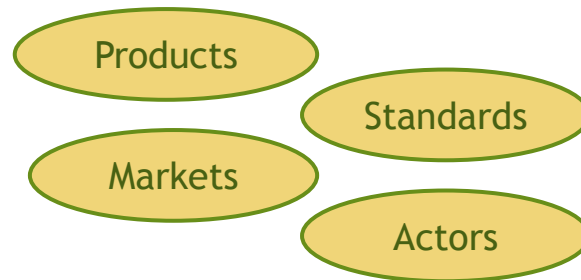
- ▶ Standards
 - ▶ influencing
 - ▶ applying
- ▶ Education
 - ▶ engineers
 - ▶ decision makers
 - ▶ everyone
- ▶ Organisations
 - ▶ impacts on internal processes and skills
- ▶ Market places
 - ▶ digital services economy
 - ▶ utility models

EC Work programmes and Industry requirements

► Projects deliver



► Organisations and users want



- how to improve in the fast and dynamic cloud R&I domain?
- how can cloud computing help R&I in other sectors?