

Cloud   
**Catalyst**

# **CLOUDCATALYST**

**Cloud Trends and  
Critical Success Factors  
for European SMEs**



## **CLOUDCATALYST PROJECT:**

BACKGROUND, OBJECTIVES, OUTPUTS AND TARGETS

## **CLOUD COMPUTING TRENDS:**

SURVEY DEMOGRAPHICS, KEY FINDINGS

## **CRITICAL SUCCESS FACTORS:**

OVERCOME TECHNICAL CHALLENGES FOR CLOUD EXPANSION

# WHY CLOUDCATALYST?

## PROJECT BACKGROUND

Cloud Computing adoption will contribute to increase the competitiveness of EU economy

The challenges of cloud computing expansion imply huge entrepreneurial opportunities

Partners have launched successful cloud initiatives and reach a vast network of stakeholders

Companies have a clear advantage in using cloud computing – more flexibility and lower fixed costs. Startups can get started in no-time with a pay as you go model

It is fundamental to develop highly efficient go-to-the-market strategies, focused on entrepreneurship acceleration and business exploitation.

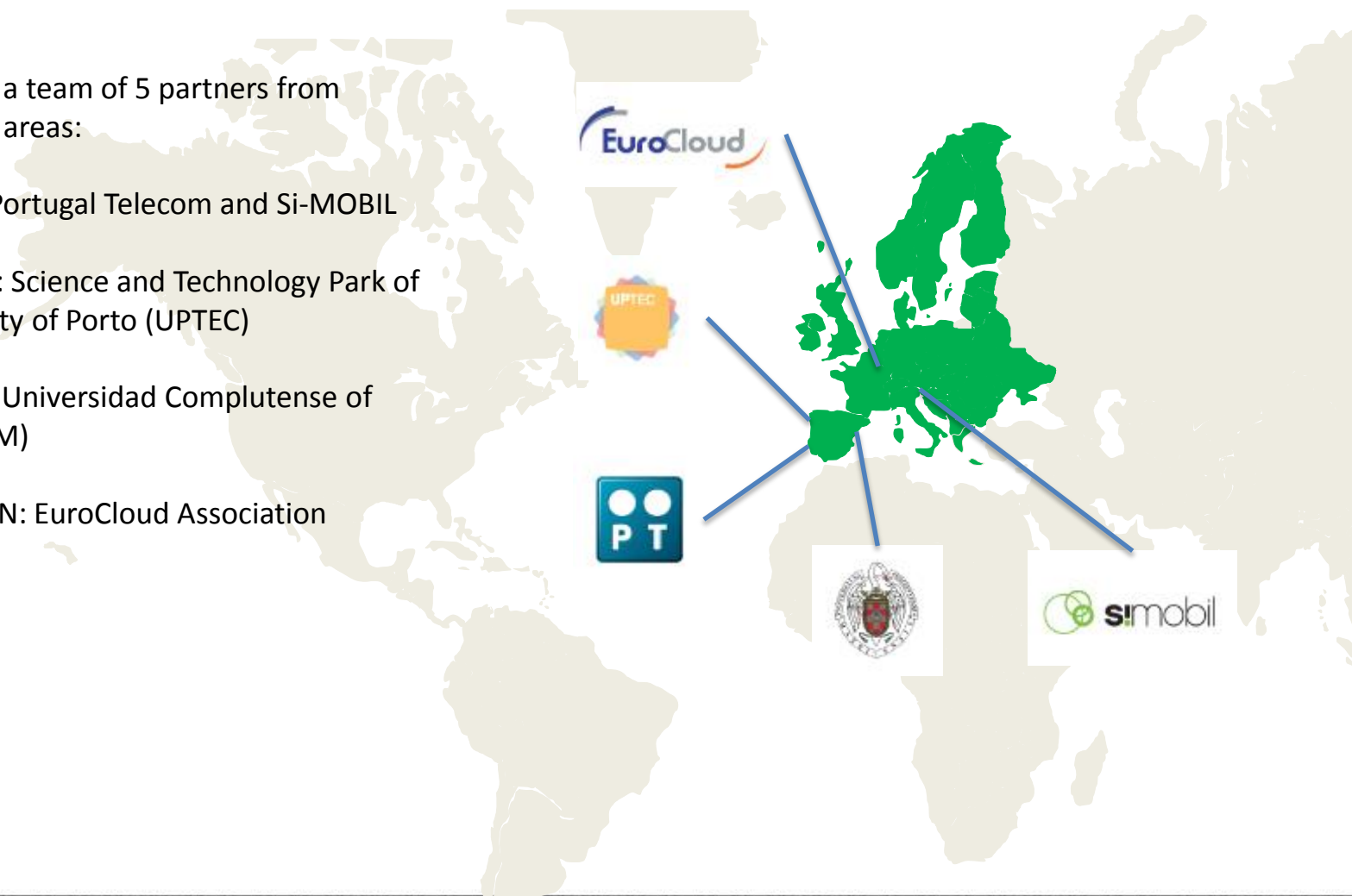
**CloudCatalyst** initiatives will foster collaboration between cloud stakeholders interested in the creation or expansion of innovative products and services.

# WHO ARE WE?

## PROJECT CONSORTIUM

CloudCatalyst is a team of 5 partners from complementary areas:

- **INDUSTRY:** Portugal Telecom and Si-MOBIL
- **INCUBATOR:** Science and Technology Park of the University of Porto (UPTEC)
- **ACADEMIA:** Universidad Complutense of Madrid (UCM)
- **ASSOCIATION:** EuroCloud Association



# WHAT ARE CLOUDCATALYST OBJECTIVES?

## OBJECTIVE 1

Support entrepreneurs, researchers, and software developers to create value-added Cloud products and services

## OBJECTIVE 2

Increase the awareness of Cloud Computing benefits and positive impact in the European economy

**ACTIONS TO FOSTER  
THE EMERGENCE OF A  
STRONG AND  
ENTHUSIASTIC  
COMMUNITY OF  
CLOUD ADOPTERS  
AND SUPPORTERS IN  
EUROPE**

# WHAT WILL BE CLOUDCATALYST RESULTS?

## MAIN OUTPUTS (1|2)

**SUPPORT ENTREPRENEURS, RESEARCHERS, AND SOFTWARE DEVELOPERS TO CREATE VALUE-ADDED CLOUD PRODUCTS AND SERVICES**

**MAJOR CLOUD  
TRENDS**



**STRATEGIC  
PLANNING FOR  
CLOUD ADOPTION**



**CLOUD  
ACCELERATOR  
TOOLBOX**



**GO-TO-THE-CLOUD  
SERVICE**



# WHAT WILL BE CLOUDCATALYST RESULTS?

## MAIN OUTPUTS (2|2)

**INCREASE THE AWARENESS OF CLOUD COMPUTING BENEFITS AND POSITIVE IMPACT  
IN THE EUROPEAN ECONOMY**

**BOOTCAMPS FOR  
STARTUPS AND  
SMES**



**DYNAMIC WEBSITE  
FOR THE CLOUD  
COMMUNITY**



**WORKSHOPS AND  
ANNUAL  
CONFERENCES**



**STRONG  
EXPLOITATION  
STRATEGY**



## **CLOUDCATALYST PROJECT:**

BACKGROUND, OBJECTIVES, OUTPUTS AND TARGETS



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SURVEY DEMOGRAPHICS, KEY FINDINGS

## **CRITICAL SUCCESS FACTORS:**

OVERCOME TECHNICAL CHALLENGES FOR CLOUD EXPANSION



## AN ONLINE SURVEY HAS BEEN CONDUCTED IN JULY AND AUGUST 2014

### THE OBJECTIVES OF THE SURVEY WERE TO:

- ✓ Identify broad-based cloud adoption trends
- ✓ Identify drivers and barriers to adoption
- ✓ Identify decision making patterns according to different target groups

### PRIMARY GROUP OF RESPONDENTS

Organizations using or planning to use cloud computing

### TOTAL NUMBER OF RESPONDENTS:

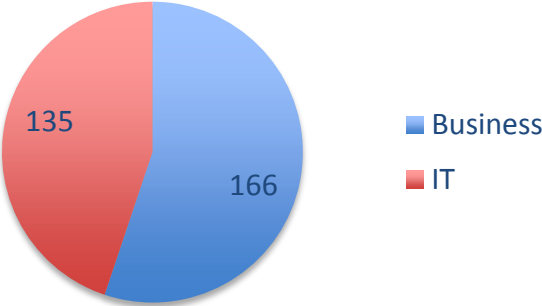
GLOBAL 308

STARTUPS 32

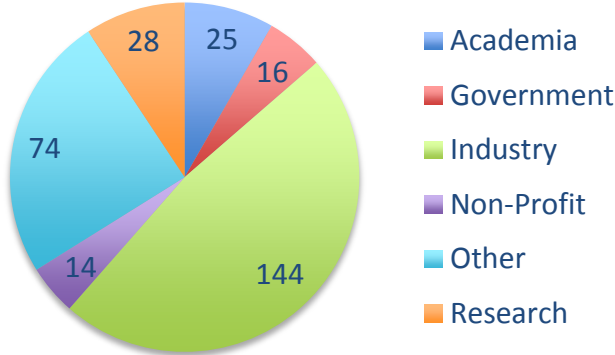
# SURVEY DEMOGRAPHICS



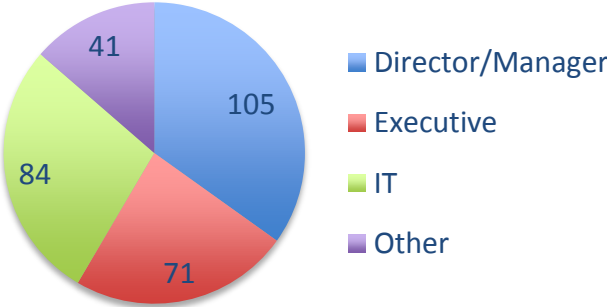
### Role of Respondents



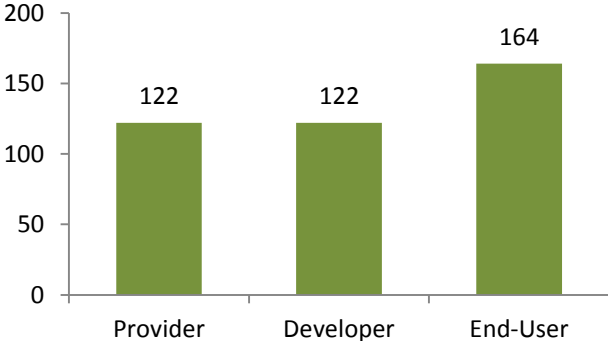
### Responses by Organization Type



### Position of Respondents



### Type of Cloud Stakeholder

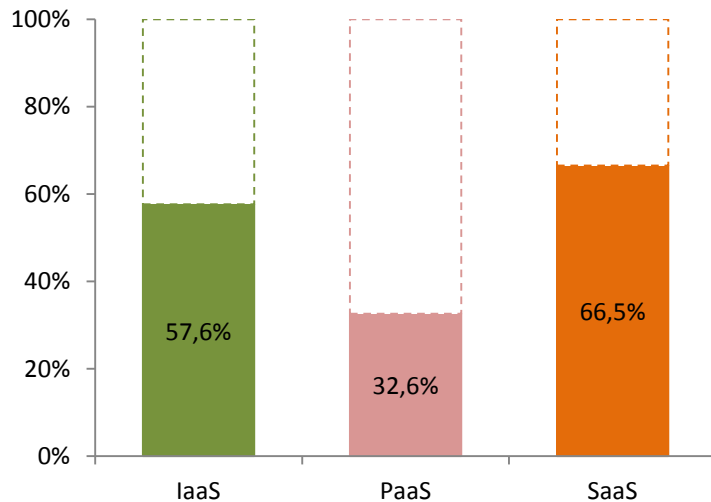


# UNDERSTANDING THE CLOUD COMPUTING STACK

## #1 : CHOOSE THE CLOUD SERVICE MODEL USED IN YOUR ORGANIZATION

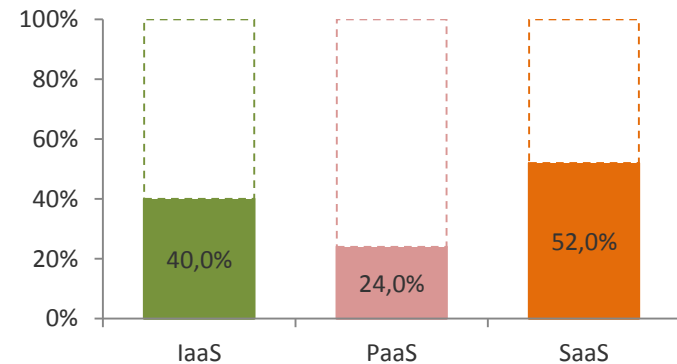
### GLOBAL

Answers 224



### STARTUPS

Answers 25



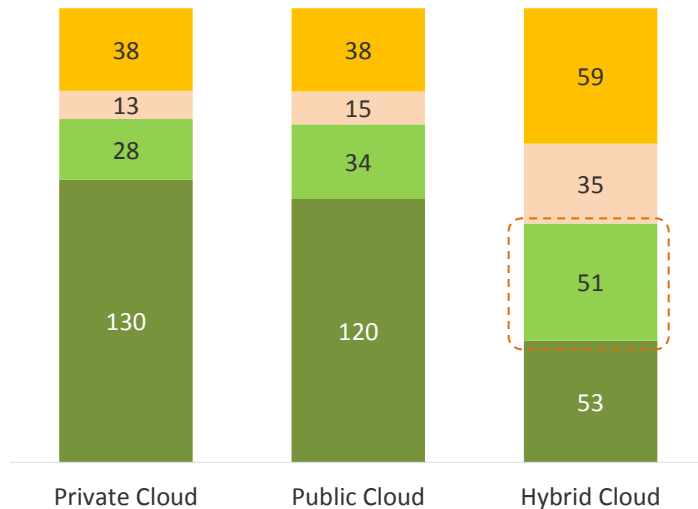
- **Cloud adoption** predominantly focused in **SaaS** and **IaaS**.
- **It reflects the main Cloud adoption drivers**, concerning criticalness and investment, merging the **basic needs of a common business**:
  - 1) Infrastructure (storage and processing capacity)
  - 2) Software

# CLOUD DEPLOYMENT MODELS

## #3: CHOOSE THE CLOUD DEPLOYMENT MODEL USED IN YOUR ORGANIZATION

### GLOBAL

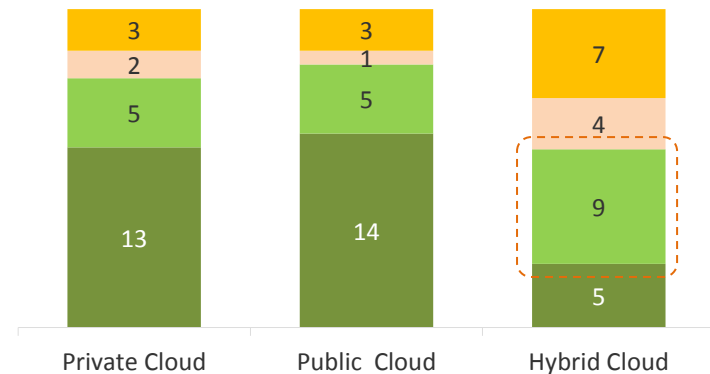
Answers 224



■ already adopted ■ adopt in near future  
■ adopt in distant future ■ no plans to adopt

### STARTUPS

Answers 25



- There is a **paradigmatic shift** from the classical deployment models – **Public and Private Cloud** are clearly predominant in the market – **to a new trend, the Hybrid Cloud** which collects the **biggest intention of future adoption**.
- This applies both to the **Global** and **Startups** samples.

# TOP RATED CLOUD SERVICES

#4: CLASSIFY THE SERVICES BELOW, ACCORDING TO THE ADOPTION RATE IN YOUR ORGANIZATION

## GLOBAL

Answers 224

### TOP 5 ALREADY ADOPTED

### NO PLANS TO ADOPT

	ALREADY ADOPTED		NO PLANS TO ADOPT
+	E-mail	155	HCM or Talent Management
	On-line Storage w/ back-up and/or DR	139	Accounting/Back office
	Infrastructure/compute power	89	Business intelligence and analytics
	Sales management	84	Security
	Content management	74	System & network management
-			

## STARTUPS

Answers 25

### TOP 5 ALREADY ADOPTED

### NO PLANS TO ADOPT

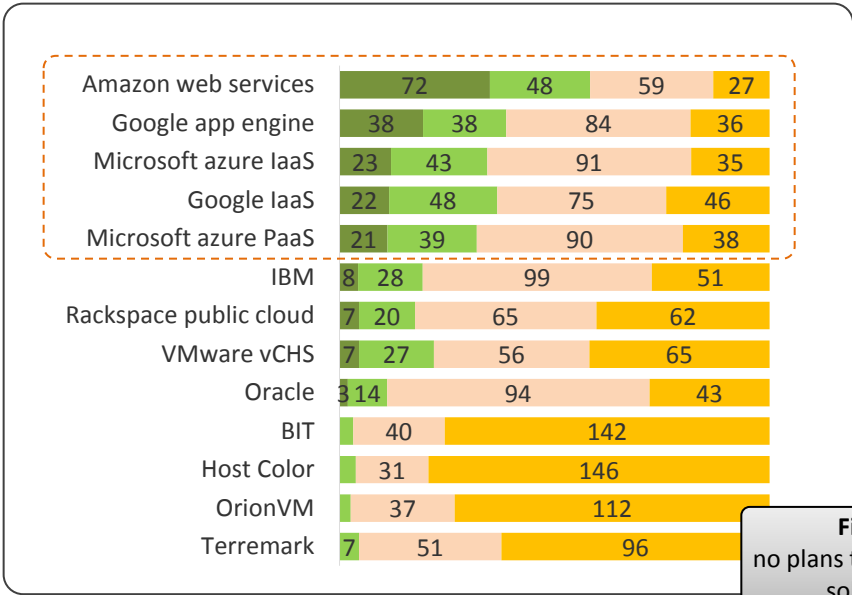
	ALREADY ADOPTED		NO PLANS TO ADOPT
+	On-line Storage w/ back-up and/or DR	21	Business intelligence and analytics
	E-mail	17	Content management
	Application Development	12	Accounting/Back office
	Infrastructure/compute power	12	HCM or Talent Management
	System & network management	9	Security
-			

- **Already adopted: E-mail and Online Storage** are the most commonly adopted services, reflecting a significant maturation in its adoption.
- **No plans to adopt: Security and business intelligence** are the services that are still on hold, once most companies identify them as **low priority services to move to the cloud**

# PUBLIC CLOUD MARKET AWARENESS

#5: INDICATE IF YOU ARE AWARE/USING THE FOLLOWING PUBLIC CLOUD SOLUTIONS

## GLOBAL Answers 210

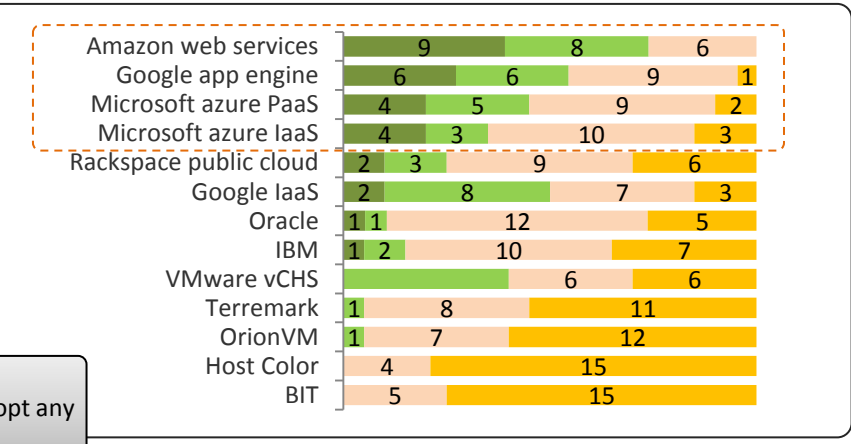


**Filter:**  
no plans to adopt any solution

## GLOBAL PROVIDERS

■ already using      ■ aware and likely to consider  
■ aware of and not considering      ■ not aware

## STARTUPS Answers 23

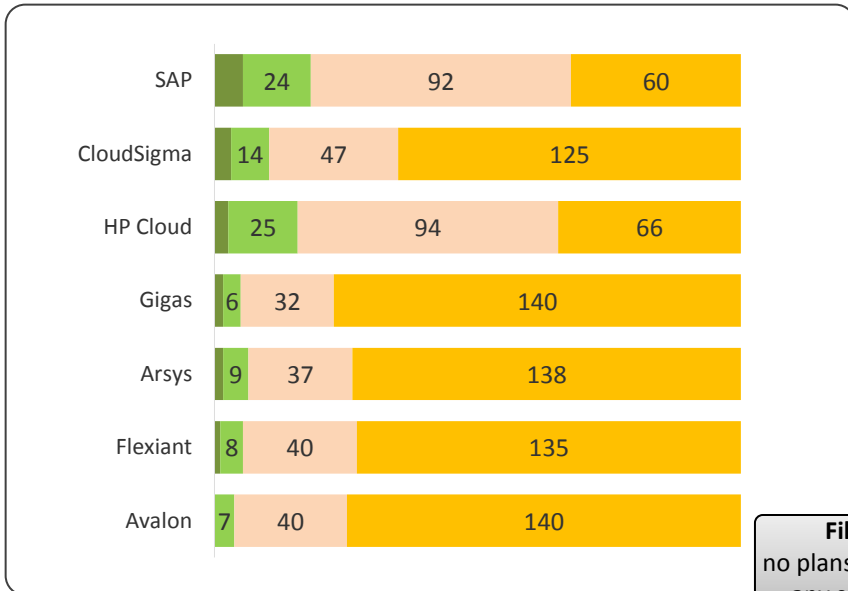


- **Amazon Web Services** stands out as a **reference in the Public Cloud market**, leading in both “already using” and “aware and likely to consider” which shows their competitiveness in this field, both in **Global and Startups** sample.
- **Competition from players such as Google, Rackspace and others is likely to intensify** – market expansion is an imperative for profitable growth.

# PUBLIC CLOUD MARKET AWARENESS

#5: INDICATE IF YOU ARE AWARE/USING THE FOLLOWING PUBLIC CLOUD SOLUTIONS

## GLOBAL Answers 210

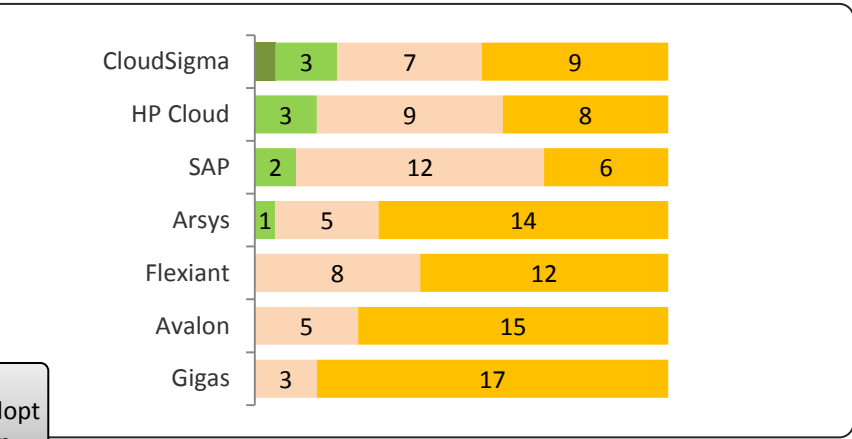


Filter:  
no plans to adopt  
any solution

## EUROPEAN PROVIDERS

■ already using      ■ aware and likely to consider  
■ aware of and not considering      ■ not aware

## STARTUPS Answers 23



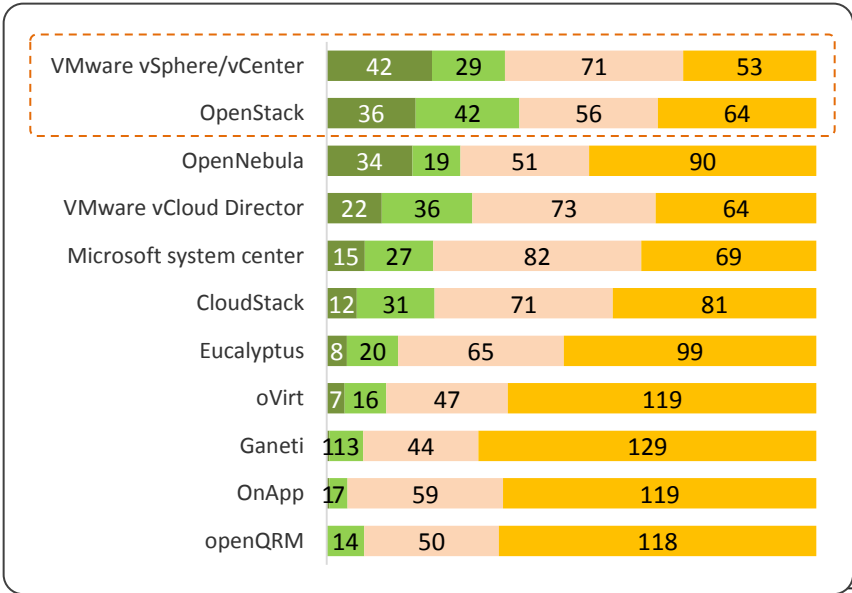
- **European Public Cloud providers** seem to have **low recognition from the market** as the majority of observations are related to “not aware”. **SAP is the first identified** and notable provider in **Global** sample, **but only few** of the enquired companies are using its Cloud solutions.
- **Startups** seem to **prefer CloudSigma** solutions, **instead of SAP’s**, maybe due to prices.

# PRIVATE CLOUD MARKET AWARENESS

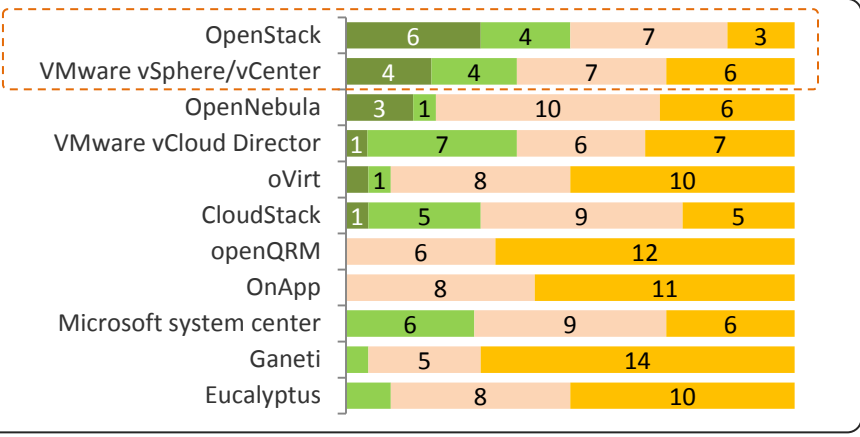
#6: INDICATE IF YOU ARE AWARE AND USING THE FOLLOWING PRIVATE CLOUD SOLUTIONS

## GLOBAL Answers 210

■ already using      ■ aware and likely to consider  
■ aware of and not considering      ■ not aware



## STARTUPS Answers 23



- **The awareness of Public Cloud Providers is higher than of the ones offering Private Cloud.**
- **OpenStack and VMware collect the higher results for notability followed by Microsoft and CloudStack, both in Global and Startups samples.**
- **OpenNebula stands out as the European provider with higher market awareness.**

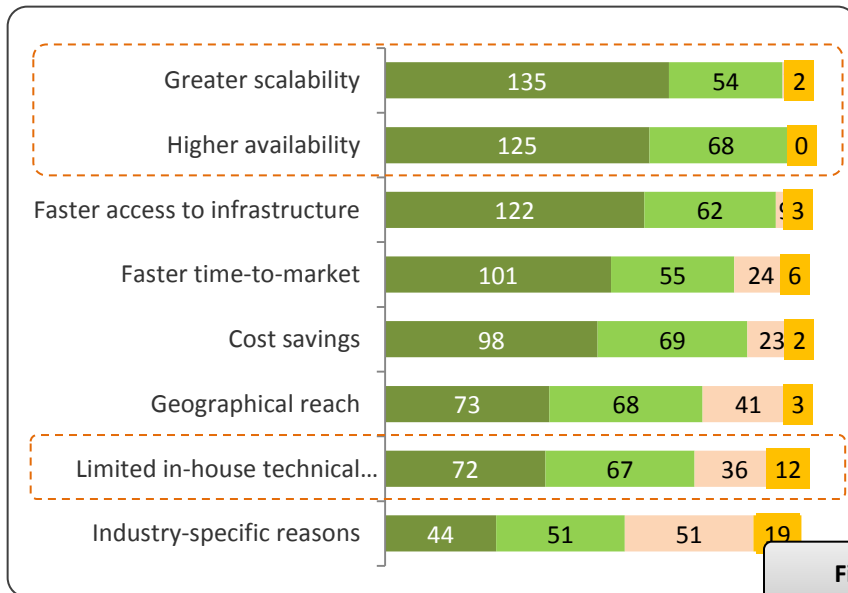


# CLOUD PERCEIVED BENEFITS

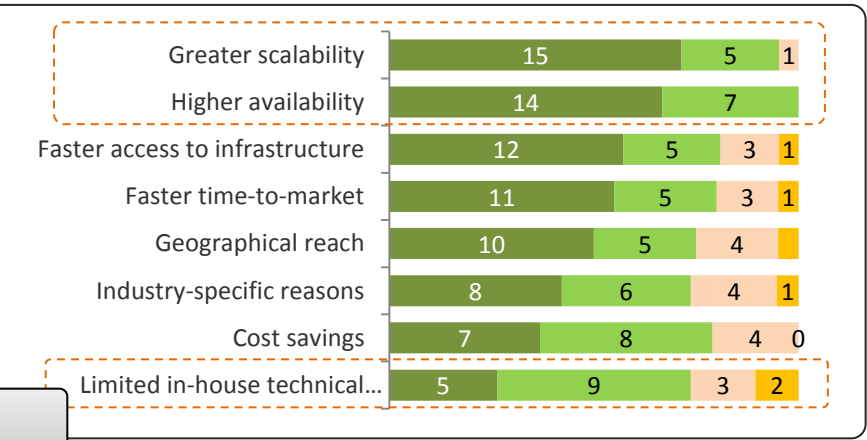
## #7: RATE THE TOP MOTIVATORS TO MOVE TO THE CLOUD

### GLOBAL Answers 204

1 - not at all important 2 - not important  
3 - important 4 - very important



### STARTUPS Answers 22



Filter:  
Not Applicable

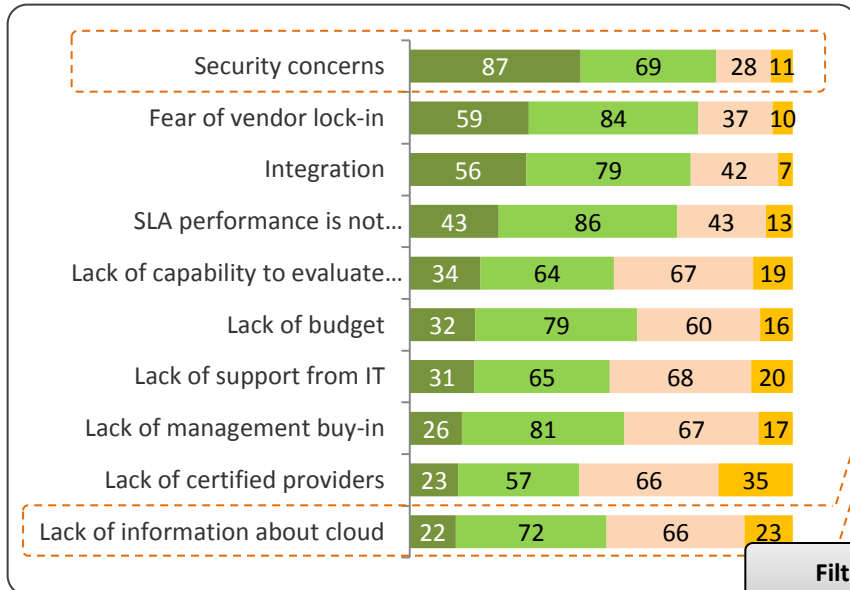
- **Scalability and availability** seem to be the top two motivators for companies move to the Cloud.
- The **availability of technical resources** is **not a key differentiator** in the **Cloud services**
- Through we are still in the middle of an economic crisis, **cost savings don't stand out as a driver for cloud adoption. This should be a bigger concern for startups than for larger and more mature companies.**

# BARRIERS TO CLOUD ADOPTION

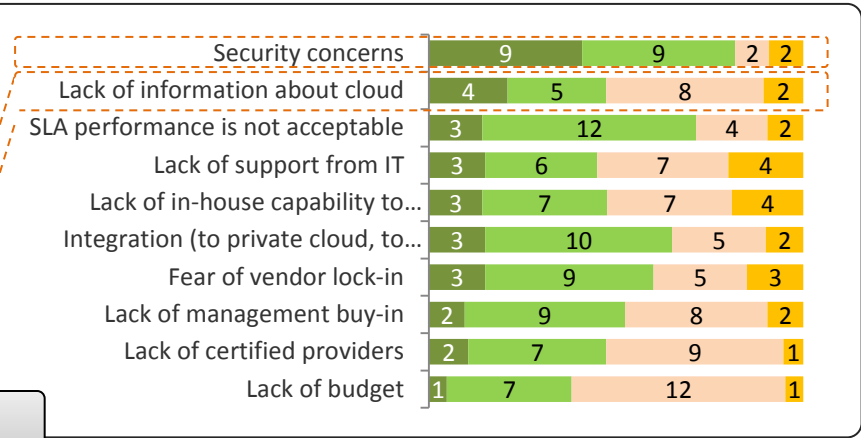
## #8: RATE THE TOP BARRIERS TO MOVE TO THE CLOUD

### GLOBAL Answers 204

1 - not at all important 2 - not important  
3 - important 4 - very important



### STARTUPS Answers 22



Filter:  
Not Applicable

- **Security stands as the top barrier for cloud adoption, both in Global and Startups samples, which reflects that that businesses are reluctant to trust in Cloud security capabilities.**
- **Lack of information appears to be a relevant barrier for Startups, which reflects that there should be targeted information for Startups that should be widespread.**

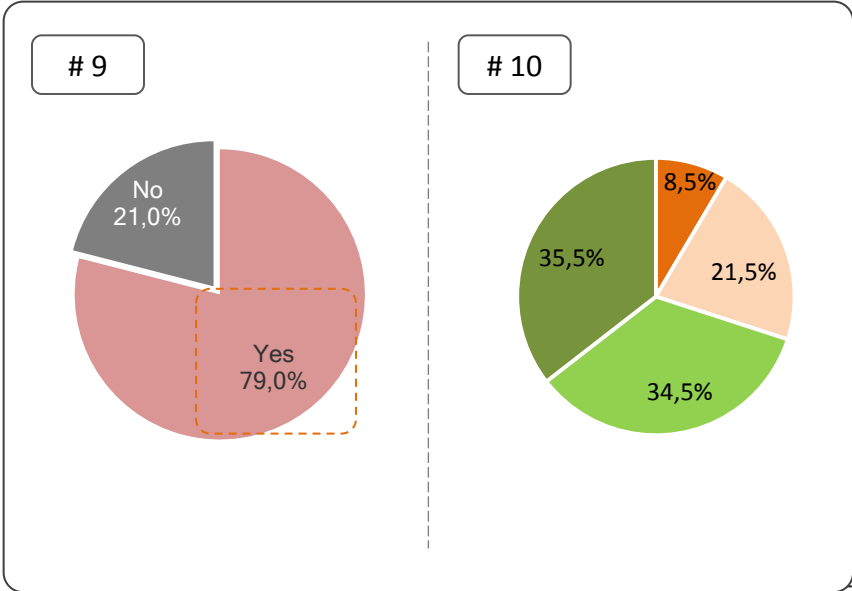
# DATA LOCATION

#9: DO YOU KNOW WHERE YOUR DATA IS LOCATED?

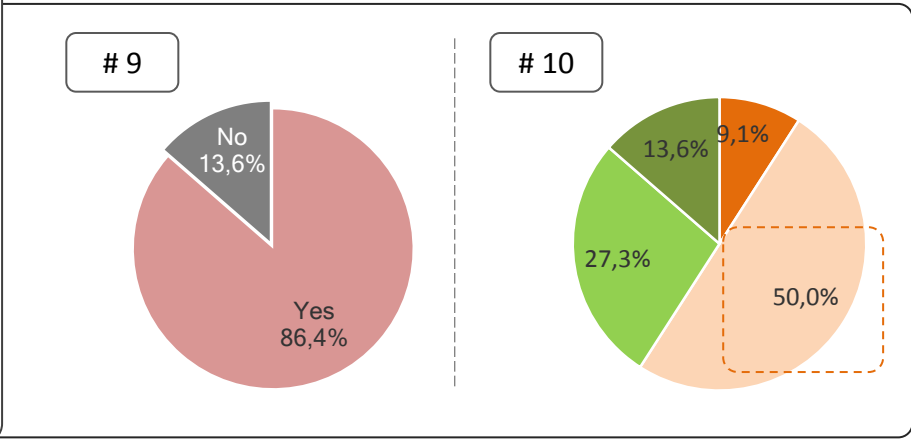
#10: HOW IMPORTANT IS KEEPING DATA IN YOUR COUNTRY?

## GLOBAL Answers 200

1 - not at all important 2 - not important  
3 - important 4 - Very important



## STARTUPS Answers 22



- The **great majority of the enquired companies** is aware of their data location
- In global terms, **the majority of the companies** think that **keeping data in their countries is important or very important**
- **65%** of the startups say that it is **either not important or not at all important**, probably because they are **price takers**, and not influential enough to negotiate prices in favor to location.

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## **CRITICAL SUCCESS FACTORS:**

OVERCOME TECHNICAL CHALLENGES FOR CLOUD EXPANSION

# CRITICAL SUCCESS FACTORS

## STEPS

- Identify technical challenges and how to overcome them
- Does European research meet cloud technical Challenges?
- Guidance on use, adoption and Migration to cloud computing

## SCOPE



Startups and SMEs -  
vendor/cloud supply  
perspective

Help companies finding gaps to  
effectively target the cloud market



Startups and SMEs -  
end user/cloud  
demand  
perspective

Help cloud "natural adopters"  
companies addressing technical  
challenges



Project coordinators  
and cloud  
experts/researchers

Recommendations  
repository for future  
research



Incubators and entities  
providing support to new  
market

Help companies to  
defining their IT strategy

# KEY CHALLENGES IN CLOUD COMPUTING



Interoperability and portability across cloud providers

Seamless migration of workloads across cloud providers

Trusted computing

Proactive autonomic computing

Elastic management of complex multi-vm services

Power-efficient applications

Networking across cloud sites

Dynamic SLA negotiation

Dynamic configuration and automated provisioning

Data integrity, localization and confidentiality

SOURCE: The future of Cloud Computing, January 2010  
Advances in Clouds, May 2012

A roadmap for advanced Cloud Technologies under H2020, December 2012

Internet Computing, Key Challenges in Cloud Computing: Enabling the Future Internet of Services, July-August 2013

# STUDY METHODOLOGY

Tools: Survey through email and online questionnaires  
Target: Key experts participating in EU funded projects



## Key survey statistics:

- All respondents = 29  
FP7 projects respondents = 25  
Other respondents (CIP, AAL and eInfrastructures) = 4
- FP7 projects response rate = 36%  
From a universe of 69 coordinators (Call 5, 8 and 10), 25 responded to the questionnaire



## The survey questions:

- “Rank the technical challenges for Cloud expansion according to the priorities addressed in your project”
- “In case you think your project addresses other important challenges that are not on the list, please describe them”
- “Define critical success factors to overcome the top 3 technical challenges that you have identified”

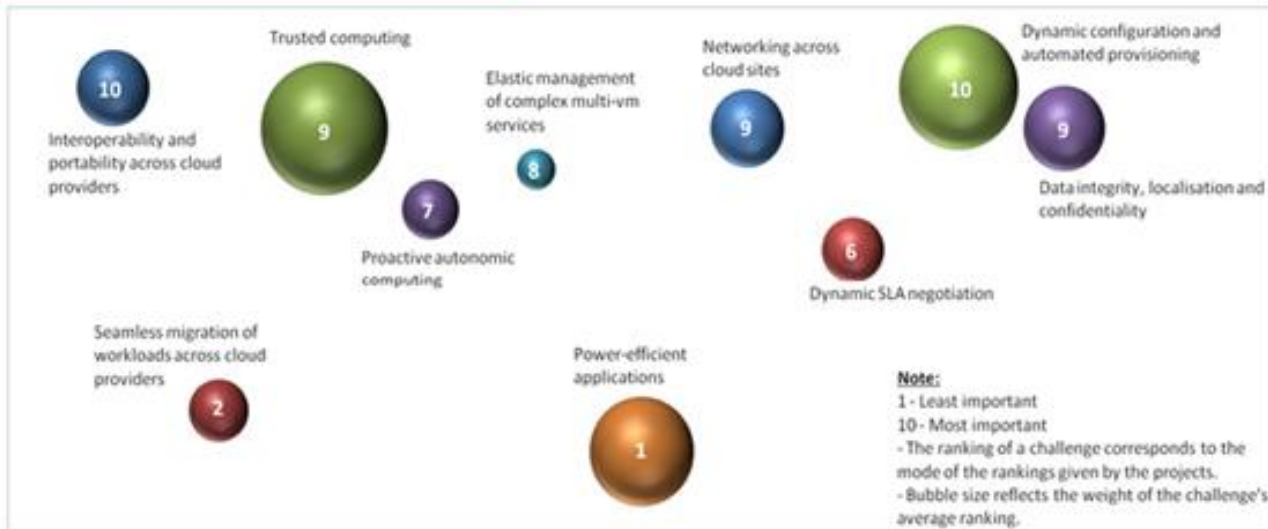


# THE EXPERT'S VIEW

## RANKING THE CHALLENGES

### CHALLENGES AT A GLANCE

R  
A  
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TECHNICAL CHALLENGES FOR CLOUD EXPANSION



#### THE MOST IMPORTANT

“Interoperability and portability across cloud providers”

“Dynamic configuration and automated provisioning”



#### THE LEAST IMPORTANT

“Seamless migration of workloads across cloud providers”

“Power-efficient applications”



# INTEROPERABILITY AND PORTABILITY ACROSS CLOUD PROVIDERS



## KEY RECOMMENDATIONS

### **Competitive infrastructure cloud market**

- Ability for users to compare cloud offerings
- Possibility to select the offer that best suits their needs
- Easily change providers if they are unsatisfied with the service
- Ability to find a more competitive offer



## CRITICAL SUCCESS FACTORS

### **Avoid Lock-in**

- Reducing lock-in to proprietary solutions through means of increased portability and interoperability

### **Assure standardization**

- Standardized formats for transferred data, billing and identity management

### **Business strategy and support tools**

- Creation of practical guidelines and best practices' catalog
- Identification of key elements in applications that ease or prevent their migration to the cloud

### **Open clouds and federation**

- Creating bridges between global communities
- Massive adoption of open source Cloud Computing projects
- Cloud federation, sustainable collaboration schemes
- Ability to build full-fledged multi-cloud applications



## KEY RECOMMENDATIONS

### **Security parameters management**

- Cloud interoperation opens new challenges in the management of security parameters between cloud providers
- Authentication across multiple clouds (each cloud can use a particular authentication mechanism and technology)



## CRITICAL SUCCESS FACTORS

### **Fulfilment of SLAs and implementation of certification schemes**

- Check the existing security measurements and SLA metrics
- Fair and safe contract terms

### **Check transparency and interoperability among providers**

- Management of security parameters between cloud providers
- Step-by-step analysis of the full cloud service supply chain
- Proven data provenance and enforcement of related policies

### **Verifiable devices**

- Overcome security / privacy challenges from IoT devices through cloud based processing

# NETWORKING ACROSS CLOUD SITES



## KEY RECOMMENDATIONS

### **Federated cloud networking**

- Unify and consolidate data-centers in a virtual way, so that different distributed data-centers can be exposed as a single cloud-like virtual data-center, and networks of different data centers can be interconnected in a virtual overlay
- Automatic provision of inter-cloud networking to support the automated deployment of applications and services across different clouds and data-centers



## CRITICAL SUCCESS FACTORS

### **Discover the shortest paths in an overlay network with the minimum monitoring effort**

- Networking across cloud sites should be based on a self-healing and self-optimizing overlay network between cloud sites

### **Overcome limitations on networking, such as data import/export bottlenecks or service disruptions**

- Identify at real time components of a composite application which have failed and switch to an alternative component without overall application disruption

# DATA INTEGRITY, LOCALISATION AND CONFIDENTIALITY



## KEY RECOMMENDATIONS

### Privacy, confidentiality and trust

- To avoid privacy and confidentiality risks, cloud providers should be adapted to different legislations, and some standards of good practices, policies and procedures should be defined
- Security vulnerabilities need to be better understood and handled to overcome the lack of trust in utilizing clouds and the fears of privacy invasions and confidentiality breaches



## CRITICAL SUCCESS FACTORS

### Overcome barriers related to different legislations

- Assure consistency in data schemas migration (by using data models), fulfillment of SLAs, and implementation of privacy warranty mechanisms

### Implement an open cloud philosophy

- Adoption of open standards and open format in cloud-related solutions
- Cloud standardization needs to happen the OpenStand way

### Foster awareness raising actions

- Create a new culture around the importance of data security and new competences to empower the end-users

### Promote certification mechanisms

- Implement certification schemes for applications and services offered in the cloud

# DYNAMIC CONFIGURATION AND AUTOMATED PROVISIONING



## KEY RECOMMENDATIONS

### **Service oriented capabilities**

- Enable the dynamic provisioning of multi-tier services on top of cloud infrastructures
- Service oriented capabilities needed to manage services (i.e. groups of interconnected compute, network, and storage elements) as basic entities, and to provide elasticity and quality of service (QoS) for a broad range of multi-tier applications deployed in the cloud



## CRITICAL SUCCESS FACTORS

### **Proper analysis/prediction of adaptation actions**

- Use of model-driven and software patterns, intelligent software, context-aware systems

### **Mapping the services dynamically on the resources**

- Applications and services running in a cloud environment must provide interface endpoints for provisioning, configuration, and monitoring
- Applications must be classified by compliance levels

### **Reduce the degree of human intervention in provisioning**

- Monitoring must be done continuously and SLA levels should be described so that automatic reactions can be deployed

### **Dynamic configuration and automated provisioning of analytics as a service**

- Enable this through simple interfaces that do not require the specification of low-level details about a cloud deployment

# FINAL REMARKS

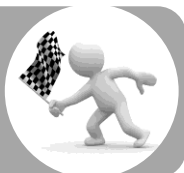
The Top 10 technical challenges for cloud adoption were identified by the consortium based on European Commission reports



Experts participating in EU funded projects were asked to rank these challenges and identify others:  
-Most important: Dynamic configuration and automated provisioning  
-Least important: Seamless migration of workloads across cloud providers



For each of the 10 technical challenges:  
-Experts identified critical success factors  
-The consortium outlined key recommendations for companies addressing these challenges



The key challenges, success factors and key recommendations identified will facilitate the detection of new market opportunities for EU businesses



This study aims to encourage actions leading towards EU cloud research, complementing the work done by the experts' group developing the cloud computing vision for Europe and future research and policy directions

