**Technical report**

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Cloud Computing

1. **Cloud Computing Definition:**

The concept of Cloud Computing began with large-scale Internet service providers such as Oracle Cloud, Microsoft Azure, and others who built their own infrastructure. From among them emerged an architecture: a system of horizontally distributed resources, introduced as massively scaled IT virtual services and managed as continuously configured and pooled resources.

1. **Cloud Computing Features:**

Self-service on demand: The services can be requested by the user or client through the internet directly. The user only pays for the time of use of the service.

Access to the network: The services are deployed in the cloud and are accessible from any medium with access to the network (Internet, Intranet or Extranet).

Common Resource Pool: Services are in the cloud to be used by multiple users under a multi-tenant model in different parts of the world. This generates an independence of the location of the resources taking advantage of the nature of the Internet.

Fast elasticity: The quantity or quality of services offered in the Cloud can increase or decrease rapidly depending on the changing needs of users.

Measured service: Each resource consumed by the user and that is billable must be measured, not only for charging but also control purposes. This service can be sold to the same user or customer within its context or environment.

1. **Cloud Computing Service Models:**

Software as a Service (SaaS): The term software as a service essentially refers to resident (installed) software in the cloud, although not all SaaS systems are cloud-based systems, if they are the majority. SaaS (Software as a Service) is the natural evolution of the term Software on demand for which it was known a few years ago. SaaS is a web-based software model that provides fully-featured software through a web browser. Applications are accessible from different client devices through a light client interface such as a browser.

Platform as a Service: In the platform-as-a-service (PaaS) model, the provider provides a development environment for application developers, who develop applications and offer their services through the vendor platform. The provider usually provides for the development of "toolkits,

Programming, development tools and standards, and distribution and payment channels "and receives a payment for providing the platform and distribution and sales services. This model allows the development and programming of software applications, given the low cost and quick opportunity offered by the channels established for marketing to customers.

Infrastructure as a service: The IaaS (Infrastructure as a Service) model provides the infrastructure needed to run applications. This model offers storage space, process capacity, servers and other physical equipment, in

Payment for use. It can also include the delivery of operating systems and virtualization technology to manage resources. The consumer is provided with the basic storage, processing, networking and other computing resources where the consumer is able to deploy and execute specific software that can include operating systems and applications. The consumer does not manage or control the fundamental infrastructure of the cloud, but has control over operating systems, Storage and deployed applications, and limited control of selected network and mail components is possible, e.g. Firewalls, hosted lodgings. In practice the IaaS client "rents" (pay for use and benefits) computer resources in its own data center, instead of buying and installing them.

1. **Benefits and risks:**

The advantages of the cloud are many, the fact that the company -in

It will not be necessary to install any additional hardware and therefore will require a lower initial investment than would have been done in the past to obtain similar productive yields, greater compatibility and Integration with other software applications, providing greater disaster recovery capability and reducing system downtime. Another of the great advantages of the cloud is that it allows the customer to monitor their activity continuously, which contributes to a transparent management that has a greater impact on the parties' "contractual welfare".

While it is true that hiring services in the cloud entails certain risks

And limits within the management of the company, some argue that it limits the freedom of Management of client companies and makes them excessively dependent on their service provider and, in turn, this reduces the freedom and creativity of the client company to structure and organize their information in a certain way.

As discussed earlier, there are a number of problems concerning the risks to data confidentiality, availability, integrity, and portability, as cloud computing jeopardizes the freedom of information provision of companies, Argument is especially worth considering if we accept that in the information society the most valuable asset of a company is precisely its information.

In this sense, the following fundamental risks are warned:

* Decreased availability due to reduced interoperability (captive from a single vendor): If a customer contracts exclusively with a single cloud service provider that guarantees a complete service, it can be difficult to transfer data and documents between different vendor systems Cloud (data portability) or exchange information with other entities using a different cloud system (interoperability).
* Decrease in system integrity by operating with shared resources: Cloud infrastructures are done through systems and shared resources. So, that the personal data of natural persons or organizations are inside more complicated security infrastructures.
* Reduced confidentiality: It is the risk that the servers where the cloud information is housed are not within the EU's territorial scope and therefore do not comply with the security regulations that the EU requires in relation to the protection of data.
* Reduced control capacity due to the complexity of the dynamics of outsourcing services: Cloud service providers often use other providers that may change throughout the contract, making it difficult to control them and can Cause changes during the provision of the service.

1. **Why is 'cloud computing' fashionable?**

Cloud computing is often referred to as "the fifth generation" after the mainframe, the PC, the client-server system, and the World Wide Web. After this long journey (long in the magnitude of the progress achieved, but not precisely because of the number of years that have passed), cloud computing is presented as a "democratization" of information technologies. It makes available to a great majority of people and small and medium companies access to new applications, platforms and infrastructure at any time, from anywhere. Proponents of cloud computing say it can reduce barriers to innovation and increase interoperability between currently incompatible technologies. Moreover, they see in cloud computing a way of rapidly adapting to new technologies by emerging countries that can make use of their infrastructure and applications by simply paying service fees without having to make a large initial outlay, which allows them to rank at the same level as their international competitors. In the case of these countries, the "mobile cloud", understood as the access to these applications from the mobile devices, carries the hope of reducing the digital divide that separates them from the developed economies.

The advantages of cloud computing add to its "green" side, so valued at a time when strong pressures are exerted on companies to implement sustainable policies. Cloud computing is a candidate to promote a ‘greener’ IT model, based mainly on the most efficient energy consumption of shared processing and storage centers compared to individual companies. At the beginning of 2010, all newspapers and digital newspapers echoed the

Google's request to the federal authorities of the United States to enter the energy market. Being a great consumer of electricity because of the numerous servers it has, now more than ever the Mountain View company has plans to obtain power from alternative sources of the style of solar plants that it has already installed.

In fact, cloud computing is not a new idea. "Salesforce, for example, has been operating for almost ten years and the phrase" the network is the computer "has also been coined, which sums up the concept of putting process Network, outside the user company. However, to date the supply of this type of service has been limited and its slow development. After a period of experimentation on the part of the pioneers of innovation, there is currently slow adoption of cloud computing and of cloud services by some companies. That is to say, we are at a point where the technology still does not have the sufficient acceptance so that it is spoken of a majority implantation. However, experts agree that this situation is about to change because technology has matured enough and a strong industry has been established, with players like Google, Microsoft, Salesforce, IBM or Amazon. If the evolution of demand is expected, as expected, to the usual distribution of any product or service in the market, in the near future this demand will increase when some obstacles.

1. **Cloud Computing Business Models:**

The National Institute of Standards and Technology of the United States of America NIST - (2009, defines four deployment models. These can be considered as the basic structure of Cloud Computing business models.

* Public model: Cloud infrastructure is available to the general public or may be geared to a particular industry. This infrastructure is owned by the organization offering cloud services.
* Private model: In the private Cloud Computing model, the infrastructure is oriented to serve a single organization. Its management can be carried out by the organization or by a third party.
* Community model: In the community model, the infrastructure is shared by different organizations and is oriented to serve a specific type of community according to their common interests. Its management can be carried out by the Organizations or by a third party.
* Hybrid model: This model is the union of the public model and the private model. Under this model, two or more clouds (private, public or community) are linked through standard or proprietary technology that facilitates the portability of data and applications, for example in the case of cloud bursting, where the load between clouds is balanced One of them has occupied its maximum capacity.

1. **Necessary factors for the adoption of Cloud Computing:**

Frost & Sullivan (2009) has identified 5 basic principles for cloud collaboration and various opportunities and threats in each of these two industry sectors:

* It is key that top management is clear about benefits and concepts. That there is a top-down deployment of the entire infrastructure of the organization.
* Be clear about policies and standards. All processes or components of each process based on the cloud must be standardized and defined with clear policies and where the entire organization is aligned.
* Every introduction of a novelty generates trainings, informative, project managers and greater organization to align the company under a single concept.
* Do not reinvent the wheel. Identify companies that have already deployed applications in the cloud and propose improvements applied to the business.

1. **Working in the clouds, implications for business and the public sector:**

Big companies and governments have IT departments with these specialized profiles that are in charge of the management of their technological infrastructures and usually represent a very important expense within their budgets. Small and medium-sized companies, on the other hand, do not have the capital to invest in a specialized department and have to settle for technologies inferior to those of big companies. Cloud computing is partly a response to this need for small-sized companies, but big corporations and governments are becoming more interested in this new model as budget cuts have become commonplace during the economic crisis.

The main feature of cloud computing that is attracting the attention of companies and governments is the ability to transform the fixed costs of their data centers and IT departments into variable costs based on consumption. At a time when credit is scarce and new investments are limited, the flexibility of computing capacity on demand is particularly attractive, as businesses are not hampered by growing demand and costs are Reduce proportionally when demand decreases. Flexibility also fosters innovation in products and services, as small businesses can put their ideas into practice when they did not have the resources to do so. One should not fall into the error of understanding cloud computing as a simple technological change, since it may lead to a change in the functioning model of companies and governments.

The decision regarding cloud computing for most organizations will take shape in the type of cloud that they must implement, an aspect that will depend on the different purposes and does not have to stick to a single type of cloud. The choice of the cloud by small and medium-sized companies will be more limited, but for some large companies and government organizations, a cloud of their own can be a suitable alternative. This allows the organization to optimize the cloud for its own purposes.

1. **What companies do before they "jump in" to the cloud:**

And what happens if there is a power cut, a fire or a flood? Business continuity in the face of an unexpected event is one of the major concerns of companies. Systems designed to maintain continuity are complex, expensive and beyond the reach of most SMEs. Cloud-based services, accessible through the Network from anywhere, do not depend on equipment physically located in the company's buildings and therefore incorporate a low-cost solution for remote access, disaster recovery and Business continuity. Cloud computing providers invest heavily in infrastructures to ensure the availability of their services. These investments include real-time data replication, alternative routing of information flow against possible physical device errors, multiple power sources, and multiple Internet connections. Reproduction of security systems developed by suppliers is something that is beyond the reach of small and medium-sized enterprises, so the demanded service needs are not as sophisticated as those of large companies. Thus, one of the major headaches of large corporations according to the experts of the Future Trends Forum, the "service level agreements", can be offered in a standardized way and adjusted to the simplest needs required by companies.

Another of the doubts that arise SMEs refers to the risk that depends on the Internet connection to operate the business. What happens if this connection fails? Currently Internet connections are relatively fast, stable and reliable, so connectivity problems between major providers are rare. However, businesses that can not afford the loss of connection to cloud computing services can develop solutions to these losses through parallel connections to different providers or through 3G connections. The additional cost of these solutions is largely offset by the savings the cloud offers. Information security is another factor that worries businesses, but as shown in the Easynet Connect survey, only 13% of companies believe that cloud computing is not secure enough, since it provides greater security than alternatives Within reach of these companies.

In the end, the decision to jump into the cloud, like any other decision in the company, depends on the value you bring to the business. Facing the current economic environment, cloud computing is being sold mainly by invoking cost reduction opportunities for companies and few services focus on value added to the business. When the current economic cycle stabilizes and firms stop focusing on cost reduction, providers will face a greater challenge, how can cloud computing bring value to businesses? The situation they face is similar to the situation of the companies to which they are addressed. They have to offer services that add value to companies, just as companies themselves have to develop products and services that offer added value to their customers. And is that companies do not know what services they really want, but they are very clear those who do not want. In this way, cloud service providers must identify the latent needs of enterprises, develop customized services that meet these needs and generate demand for them.

1. **The competitive pressure on big companies to get on the cloud:**

Small and medium-sized companies seem to be in favor of adopting cloud computing because not doing so would mean giving up an attractive and novel offer of services and, moreover, at an affordable price. Most of the opinions agree that cloud computing is very interesting for SMEs, but when we talk about big companies, opinions diverge. A study by strategy consultancy McKinsey & Co. estimates that large companies could end up paying double for services in the cloud than for those same services internally. According to author William Forrest: "Those who are betting on a large-scale move from large enterprises to the cloud are likely to be disappointed, unless someone with a more attractive price appears than those who are currently operating in the market '. The fact is that large companies do not seem ready to adopt cloud computing in the short term, and most names security as the main stumbling block.

The needs of large companies differ from those of small and medium enterprises, but does it mean that the former can not benefit from cloud computing? The answer is neither yes nor no. It is true that the advantages for large corporations may not be as obvious as in the case of small enterprises, but that does not mean that they can not benefit from the services offered by the cloud. According to the experts of the Future Trends Forum, "the cloud is good for all, but not for everything". In fact, despite the fact that most of the existing cloud computing services are more focused on small businesses, the interest in this new service model increases with the size of the company. Ignoring the potentiality of the cloud can be a long-term strategic mistake.

1. **The effect of the cloud on the services sector:**

This sector is the best positioned to lead the transition to the cloud, as it is composed of businesses whose main asset is people, without complex supply chains and physical assets that require on-site management systems, as with factories and large Warehouses. This particularity should translate into a great agility to capture new business opportunities, being able to redefine its processes and even the limits of the company as market conditions evolve. For this, companies focus on those activities that are differential in order to serve customers, while rely on external experts for other activities. For this reason, service companies are beginning to consider the use of experts for the management of infrastructures, applications and software, delegating these tasks to suppliers of cloud computing services.

The financial sector is one of the sectors most affected by the economic recession, especially in the case of savings banks. Every day you can read new news about the inefficient management of the boxes and the need for mergers to reduce the number of entities. Mergers involve complex processes not only because of the human aspect of the integration of two different management models, but also because of the disparity of computer models by which they are usually characterized. However, in these processes there are opportunities for cloud adoption. Entities should review disparate computing systems in detail before merging, providing a unique opportunity to define a cloud computing adoption strategy that transforms current processing centers into private clouds and identifies both the information and computational resources that are Susceptible of being transferred to the public clouds. However, for this to happen, the IT managers in the boxes must know the opportunities offered by the clouds, so the big cloud providers must make sure that they are aware of them. Microsoft seems to take the lead in this regard by presenting the benefits of its cloud computing services in the IX edition of the Microsoft Forum of Savings Banks. At the same time, large Spanish banks are seeking opportunities to expand their international business by acquiring assets from other entities, as shown by the bid by Banco Santander and BBVA, the two main Spanish financial institutions, by the offices of the Royal Bank of Spain Scotland in the UK. Virtualization is a technology established in these entities, but these acquisitions represent an opportunity to take advantage of the benefits of the cloud.

The media, especially the television networks, are also undergoing a consolidation process similar to that of savings banks. With the entry of digital terrestrial television (DTT) and the multiplication of channels, the chains have reduced their advertising revenues and are undergoing a process of readjustment. New business models tend to reduce staffing costs by replacing fixed staff with external collaborators. In this way, most journalists work as freelancers, so they lack access to the important information sources and technological tools of the communication groups. These self-employed claims greater access to information from large groups, and adoption of the cloud is presented as an opportunity to solve this problem. By means of the services of cloud computing the information would be available from any terminal, reason why the autonomous journalists would have access to it from its own computers or mobile phones. With this model, the communication groups would manage the access permissions of each collaborator and would be able to control the information that each journalist accesses depending on the type of collaboration.

As regards the services sector, tourism is undoubtedly a key lever for the Spanish economy. This is a much more fragmented sector, where large chains such as NH Hotels and AC Hotels coexist, and a multitude of individual businesses, such as small hotels, restaurants and camp sites. Cloud computing is attractive for both ends, but especially for small businesses. These will have access to computer capabilities that will enable better management of information and offer customers quality online services of any major hotel chain. However, the cloud can have an even greater impact on the sector, making it easier to share information between travel agencies and tourists' final destinations, thereby encouraging greater specialization of the sector, with a model in which agencies are responsible for attracting customers, while hospitality and accommodation focus on customer experience and satisfaction.

1. **Cloud Computing Success Stories:**

New York Times Case

As Gottfrid (2007) detailed, the New York Times needed to convert 11 million articles and images from its archive (from 1851 to 1980) into PDF format. His internal IT department said it would take them seven weeks. Meanwhile, a developer using 100 instances of Amazon EC2 with a simple Web services interface to operate Hadoop (an open source implementation similar to MapReduce) completed the work in 24 hours for less than $ 300.

Animoto Productions Case

As detailed in Animoto Productions (2008), Animoto Productions, creator of a mash - up tool to create video from images and music, used Amazon's Amazon Simple Service (Amazon Simple Storage Service, Amazon Elastic Compute Cloud) to scale from 50 to 3500 servers in as little as three days. Currently the company has active instances that have reached the consumption of up to 5000 servers considering itself one of the most important success cases of the Web Services of Amazon.

SmugMug case

As detailed in Amazon Web Services Case Studies: SmugMug, in early 2006, the photo-sharing company SmugMug began an investigation to find an effective storage solution for its new billion-image repository. One week after starting to use the service Amazon Simple Storage Service, SmugMug was storing all of its new images through that service. Since then, the company's customers have added more than 10 terabytes of new images each month. The company reports that it has saved more than $ 500,000 in storage costs, all with a zero increase in personnel or data center space.

## Café OMA:

The collaboration tools it offered us, the ease of accessing mail on multiple devices from anywhere and the flexibility to grow at our pace, made us lean toward the Microsoft Cloud.

All this process has had a key accompaniment. OMA climbed into the cloud with Microsoft's Office 365 by Cloud System.

Once the trip to the cloud began, the movement of the mail was very simple. Cloud System did the process in two weeks migrating more than 160 users to the new mail and securing all the information. This partner ensures that the main benefits that Office 365 offers to OMA are collaboration and mobility.

4iKIM:

4iKIM introduces a new concept in the integrated management of information and knowledge. It allows to manage information from different sources and formats, as well as share and collaborate creating knowledge, always accessible in the cloud from any browser and device. The alliance between 4iKIM and Windows Azure brings cost reduction, productivity, high availability, maximum security and unlimited scalability.

Aleph Software:

Aleph Software is the first company to have certified its Windows Azure BPM software. GPN6 Azure automates business processes and enables you to deploy in the cloud from small processes (requests, approvals) to complex workflow applications, which can be used immediately, without investments, with the possibility of growing as needed and paying for the use Is made of them, that is, by the time and the users who use them.

Catalansoft:

Our product, FBO Explorer, is a cloud management service for flying, helicopter, glider and ultralight schools and clubs. The fact that it is based on Windows Azure allows a great scalability, reliability in the custody of the data and also lowers our cost of distribution to zero.

ICA AB:

Oracle's private cloud device has been the key tool for the Oracle platform as a service of ICA Gruppen AB. With this simple, immediate and convergent infrastructure solution, we cut our operating expenses by up to $ 2.5 million over three years and achieved an 85% reduction in total cost of ownership

Tech Mahindra:

"We needed a system that we could get up and running very quickly and be profitable. Oracle's private cloud device was the perfect answer, especially thanks to its simplicity and rapid deployment capabilities."

Pravin Bolar, Senior Vice President and Global Director of Solutions (Infrastructure Services) at Tech Mahindra.

Secure-24:

"By deploying an Oracle Private Cloud Appliance-based infrastructure, we can reduce acquisition costs by 50 percent and 90 percent deployment costs. With the Oracle solution, we can automate the provisioning and support of highly- Available. "

Mike Jennings, CEO of Secure-24.

1. **Conclusion:**

In short, the benefits of cloud computing services are obvious to

The light of the vertiginous growth that is observed in the sector. However, it is also true that the risks that its contracting may entail can affect aspects highly relevant to the security of a company's business, although management of such risks could result in cost savings and

Productive efficiency of the company.

The existence of the potential legal risks described above, however, does not Assumes that the hiring of cloud computing services must be discouraged. On the other hand, a responsible provision of cloud computing services that enables companies to remotely manage their information will result in cost savings - primarily derived from storage and information processing - even taking into account the possible need of greater investment in conditions of Internet connectivity or of some specific structure of resident hardware.