KuppingerCole Report

LEADERSHIP COMPASS

by **Mike Small** | March 2015

Infrastructure as a Service

This report provides an overview and analysis of the market for Infrastructure as a Service (IaaS). IaaS provides basic computing resources that the customer can use over a network to run software and to store data. This report provides you with a compass to help you to find the IaaS service that best meets your needs.

by **Mike Small**
mike.small**@kuppingercole.com**
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Leadership Compass
Infrastructure as a Service
By KuppingerCole

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1 Management Summary

This report provides an overview of some CSPs (Cloud Service Providers) and an analysis of the market for Infrastructure as a Service (IaaS). There is a relatively small number of large CSPs in this market however a number of specialist providers focussing on specific needs are emerging. One particular aspect of cloud services that is covered in this report is the assurance given to an enterprise customer in the areas of security and compliance. The range of CSPs covered in this report is limited to those that were able (and willing) to participate in time.

The Cloud provides an alternative way of obtaining IT services that offers many benefits including increased flexibility as well as reduced cost. One of the primary benefits of the cloud is that it enables companies of all sizes to focus on the differentiating factors of their business as opposed to the infrastructure required to run it. This is described in detail in KuppingerCole Scenario: Understanding Cloud Computing - 70157[1]

There is a wide range of types of cloud services and cloud deployment models and this has caused confusion among buyers about the benefits and the risks. The ready availability of cloud services has also made it easy for employees and associates to obtain and use these services without consideration of the potential impact on the organization. When acquiring a cloud service it is important that the business requirements for the service are understood and that the cloud service and CSP (cloud service provider) that is selected meets these needs.

IaaS provides a form of IT hosting service which requires no up-front capital expenditure. IaaS provides basic computing resources that the customer can use over a network to run software and to store data. IaaS allows the customer to transfer an existing workload to the cloud with minimal if any change needed. The customer does not manage or control the underlying cloud infrastructure but remains responsible for managing the OS and applications.

This report shows that there is a range of IaaS service providers with strengths in various areas. These include well established providers with several years in the market and mature products. In addition some of the established IT hosting service providers have also introduced IaaS services leveraging their expertise, infrastructure and reputation. Finally there are a number of specialized service providers focused on specific markets where specific kinds of assurance are required.

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[1] http://www.kuppingercole.com/report/scenariocloudcom7015713412

Figure 1: Overall Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

In the Overall Leadership rating, there are four vendors in the Leaders segment. Of these AWS is the clear leader at the moment but is being challenged by IBM with its acquisition of SoftLayer and Microsoft with its increased focus in this area. Rackspace is also a leader through its history of hosting and its commitment to fanatical support. The other vendors are rated as Challengers and some of these have the potential to close the gap. However some vendors are focused on very specific market segments and hence only aspire to leadership in those niches; for example Skyscape Cloud Services is focused entirely on the UK government market. An interesting newcomer to the market is vCloud Air from VMWare.

Figure 2 Product Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

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The Product Leadership rating shows close competition. Most of the vendors are in the Leaders segment, with the others being close to that segment. This shows a market with a limited number of established and proven solutions. Overall, the differences between the products offered are relatively small. Picking a vendor in this kind of market requires detailed consideration of the match of the product with specific customer requirements.
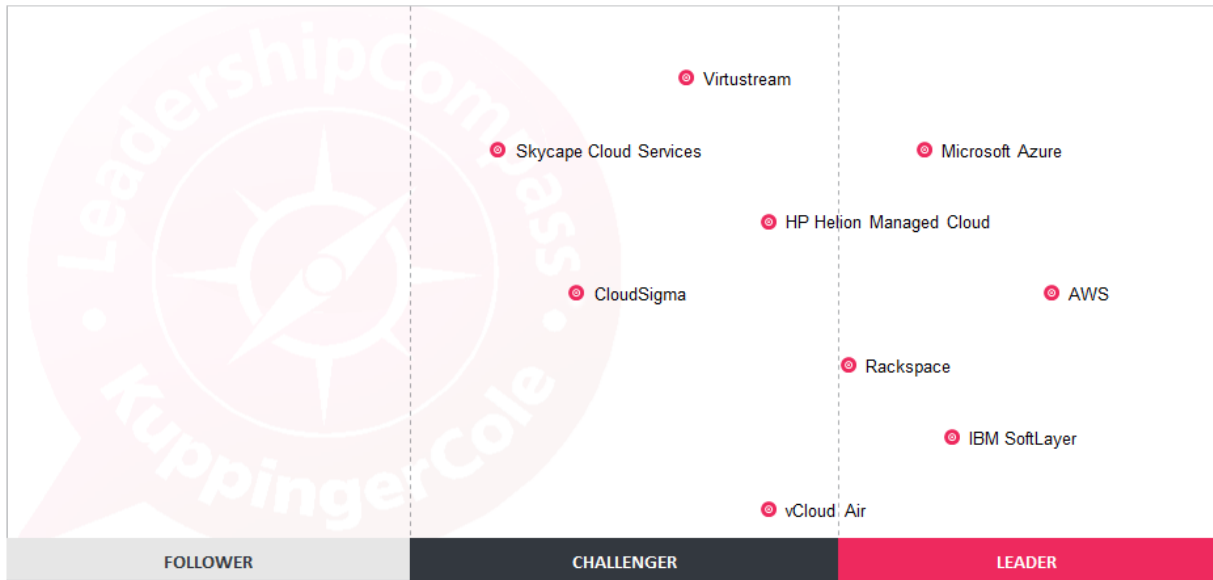

Figure 3: Market Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

In the Market Leadership rating things look a little different. The vendors in the Leader segment have a global presence with large customer bases and extensive partner ecosystems. The other vendors have a more specialized offering which is targeted on specific types of customer or geographical areas. These smaller vendors have very good products to offer for their target customers. Some of these smaller vendors may grow if they can convince the market that what they have to offer is something that more organizations require.
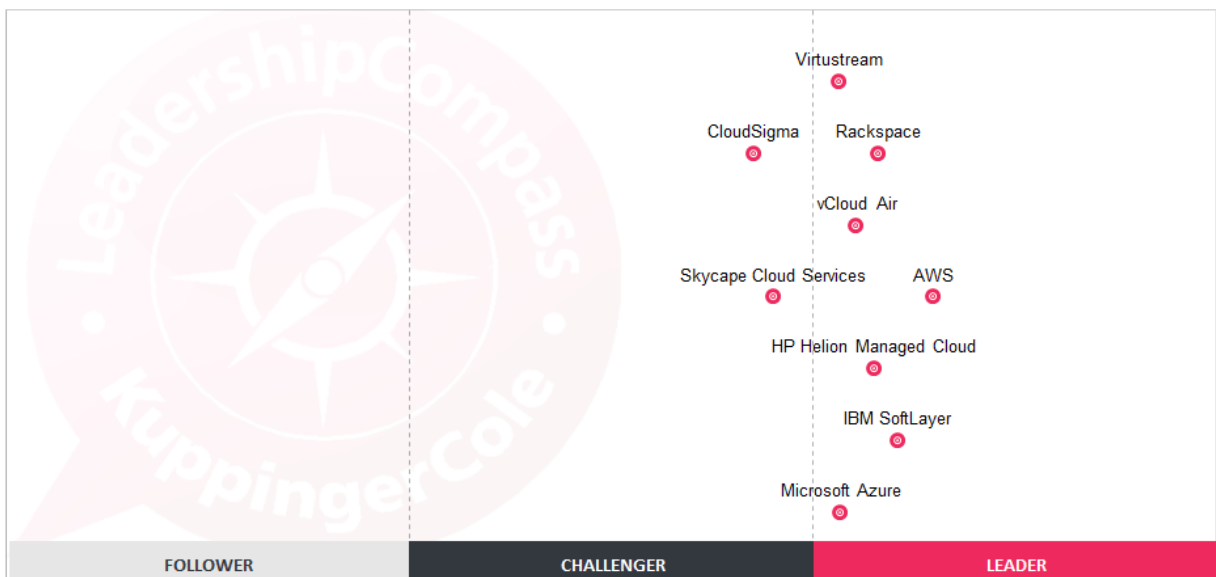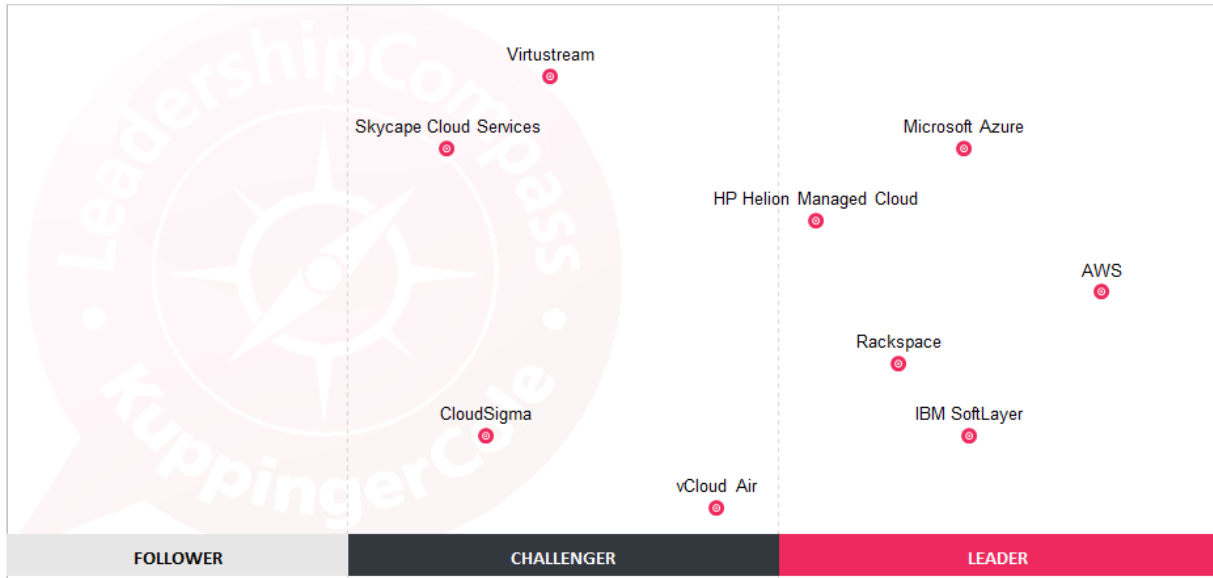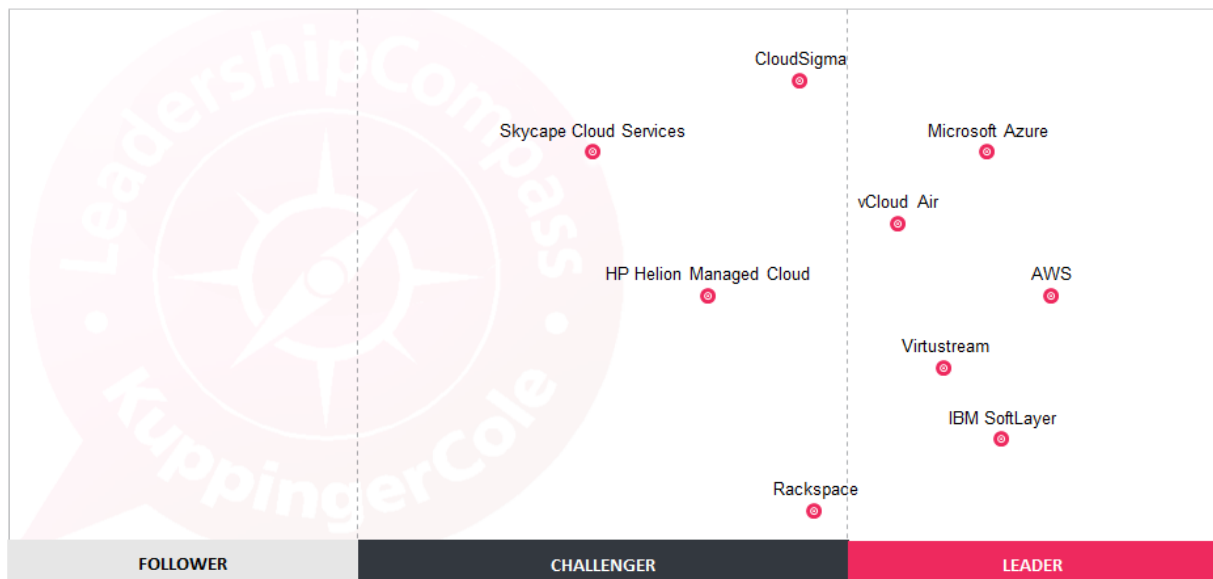
Figure 4: Innovation Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

Finally, there is the Innovation Leadership rating- this shows a couple of new entrants in the leader category. The large vendors AWS, IBM, and Microsoft have a consistent track record in creating or acquiring important new products or capabilities for their products. To some extent this is due to their market leadership which provides the revenue to fund research or acquisitions. AWS claim that this innovation is driven by their customers. vCloud is rated in this segment because of the history of innovation from VMWare. The new vendor that stands out is Virtustream; they have created or acquired a set of new technologies under the xStream brand name for orchestrating, securing and governing enterprise cloud services.

However, since this is a relatively new market, all of the vendors in the survey have – in their own way – been innovators. They have identified the market needs of specific kinds of customer and created a product for these customers.

This is a new and evolving market segment and there is continual development of new products capabilities. In this survey we have placed special emphasis on security and compliance because these are major concerns of customers. So the innovation that we have been looking for includes that in these areas – i.e. IaaS services that are more trustworthy.

Picking solutions always requires a thorough analysis of customer requirements and a comparison with product features. Leadership does not always mean that a product is the best fit for a particular customer and his requirements. However, this Leadership Compass will help identifying those vendors customers should look at more closely.

This report provides an overview of some CSPs together with an analysis of the market for Infrastructure as a Service (IaaS). The range of CSPs covered in this report is limited to those that were able (and willing) to participate in time.

 It should be noted that it is not advisable to pick vendors based only on the information provided within this report. Customers must always define their specific requirements and analyse in greater detail what they need. This report does not provide any recommendations for picking a vendor for a specific customer scenario. This can be done only based on a more thorough and comprehensive analysis of customer requirements and a more detailed mapping of these requirements to product features, i.e. a complete assessment.

We look at four types of leaders:

- Product Leaders: Product Leaders identify the leading-edge products in the particular market segment. These products to a large extent deliver what we expect from products in that market segment. They are mature.
- Market Leaders: Market Leaders are vendors which have a large, global customer base and a strong partner network to support their customers. A lack in global presence or breadth of partners can prevent a vendor from becoming a Market Leader.
- Innovation Leaders: Innovation Leaders are those vendors which are driving new ideas, devices, or methods in the particular market segment. They provide several of the most innovative and upcoming features we hope to see in the particular market segment.
- Overall Leaders: Overall Leaders are identified based on a combined rating, looking at the strength of products, the market presence, and the innovation of vendors. Overall Leaders might have slight weaknesses in some areas but become an Overall Leader by being above average in all areas.

For every area, we distinguish between three levels of products:

- Leaders: This identifies the Leaders as defined above. Leaders are products which are exceptionally strong in particular areas.
- Challengers: This level identifies products which are not yet Leaders but have specific strengths which might make them Leaders. Typically these products are also mature and might be leading-edge when looking at specific use cases and customer requirements.
- Followers: This group contains products which lag behind in some areas, such as having a limited feature set or only a regional presence. The best of these products might have specific strengths, making them a good or even best choice for specific use cases and customer requirements but are of limited value in other situations.

In addition, we have defined a series of tables which

- Compare, for instance, the rating for innovation with the one for the overall product capabilities, thus identifying highly innovative vendors which are taking a slightly different path from established vendors, but also established vendors which no longer lead in innovation. These tables provide additional viewpoints on the vendors and should be considered when picking vendors for RFIs (Request for Information), long lists, etc. in the vendor/product selection process.
- Add additional views by comparing the product rating to other feature areas. This is important because not all customers need the same product, depending on their current situation and specific requirements. Based on these additional matrices, customers can evaluate which vendor fits best to their current needs but also is promising regarding its overall capabilities. The latter is important given that a product typically not only should address a pressing challenge but become a sustainable solution. It is a question of helping now, but also of being good enough for the next steps and future requirements. Here these additional matrices come into play.

Thus, the KuppingerCole Leadership Compass provides a multi-dimensional view of vendors and their products.

Our rating is based on a broad range of input and a long experience in that market segment. Input consists of experience from KuppingerCole advisory projects, feedback from customers using the products, product documentation, a questionnaire sent out before creating this report, and other sources.

3 Product Rating

KuppingerCole as an analyst company regularly performs evaluations of products/services and vendors. The results are, among other types of publications and services, published in the KuppingerCole Leadership Compass Reports, KuppingerCole Product Reports, and KuppingerCole Vendor Reports. KuppingerCole uses a standardized rating to provide a quick overview of our perception of the products/services or vendors. Providing a quick overview of the KuppingerCole rating of products requires an approach combining clarity, accuracy, and completeness of information at a glance. KuppingerCole uses the following categories to rate products/services:

- Security
- Functionality
- Integration
- Interoperability
- Usability

Security –Information Security is a key element and requirement in the KuppingerCole IT Model (#70129 Scenario Understanding IT Service and Security Management). Thus, providing a mature approach to security and having well-defined internal security concepts are key factors we look for when evaluating products/services.

The security of a cloud service is measured in terms of the confidentiality, availability and integrity of the processing of the customer's data by the service. In addition the service must be delivered in a way that ensures the continued compliance by the customer to laws and regulations. For example: particular compliance aspects concern privacy laws around personal data and regulations around the processing of financial data.

In the case of cloud services the assurance a customer has that the service is being delivered securely is also an important aspect. One of the key proofs that we look for in our evaluation is independent certification of the service against standards like ISO/IEC 27001 or attestation against best practices like AICPA Trust Services.

Another important factor covered by our evaluation is the cloud service contract and the extent to which this covers liability by the vendor for loss due a failure to deliver against promises. In many cases this liability is very limited and we take this into account.

Functionality – this is measured in relation to three factors. One is what the vendor promises to deliver. The second is the status of the industry. The third factor is what KuppingerCole would expect the industry to deliver to meet customer requirements. In mature market segments, the status of the industry and KuppingerCole expectations usually are virtually the same. In emerging markets they might differ significantly, with no single vendor meeting the expectations of KuppingerCole, thus leading to relatively low ratings for all products in that market segment. Not providing what customers can expect on average from vendors in a market segment usually leads to a degradation of the rating, unless the product provides other features or uses another approach which appears to provide customer benefits.

In the case of Infrastructure as a Service we expect that the services will include compute, storage and networking, and that the delivery will include public and private models. Our evaluation looks at the range of workload types supported and the range of sizing and availability options provided. We also expect there to be a clear service level agreement covering the level of the service provided.

Integration—integration is measured by the degree to which the vendor has integrated the individual technologies or products/services in the portfolio. Thus, when we use the term integration, we are referring to the extent in which products/services interoperate with themselves. This detail can be uncovered by looking at what an administrator is required to do in the deployment, operation, management and discontinuation of the product/service. The degree of integration is then directly related to how much overhead this process requires.

In our evaluation of IaaS we look for 'out of the box' integration between the varieties of services provided by the vendor. Ideally we expect that a compute service should include the storage needed to run the workload; if the storage service is a separate offering it should be a snap fit. If a range of different service types are required to deliver a final service - for example delivery of a web application may require a database service, an application service, and dynamically scalable web servers - these should all be easy to integrate and we look at the tools and APIs provided by the vendor.

Interoperability—interoperability also can have many meanings. We use the term "interoperability" to refer to the ability of a product/service to work with other vendors' products/services, standards, or technologies. In this context it means the degree to which the vendor has integrated the individual

products/services or technologies with other products or standards that are important outside of the product/service family. Extensibility is part of this and measured by the degree to which a vendor allows its technologies and products to be extended for the purposes of its constituents. We think Extensibility is so important that it is given equal status so as to insure its importance and understanding by both the vendor and the customer. As we move forward, just providing good documentation is inadequate. We are moving to an era when acceptable extensibility will require programmatic access through a well-documented and secure set of APIs. Refer to the Open API Economy Document (#70352 Advisory Note: The Open API Economy) for more information about the nature and state of extensibility and interoperability.

In our evaluation of IaaS we look at how easy it would be for a customer to move a workload into the service and for the customer to switch providers at a later date. We expect the service to support a wide range of OS and workload types. There should be no requirement for vendor specific middleware. Where appropriate, the service should support standards. We also look to see how easy it would be for the customer to get their data back when the service is terminated.

Usability —usability refers to the degree in which the vendor enables the accessibility to its technologies and products/services to its constituencies. This typically addresses two aspects of usability – the end user view and the administrator view. Sometimes just good documentation can create adequate accessibility. However, overall we have strong expectations regarding well integrated user interfaces and a high degree of consistency across user interfaces of a product or different products/services of a vendor. We also expect vendors to follow common, established approaches to user interface design. In the case of cloud services we also look at the flexibility of contracts and pricing.

In our evaluation of IaaS we include consideration of the service management interface provided, the ease with which the customer can set up and configure their service, and the ability to monitor its use. We also take into account the flexibility in the contract terms and pricing.

We focus on security, functionality, integration, interoperability, and usability for the following key reasons:

- Increased People Participation—Human participation in systems at any level is the highest area of cost and potential breakdown for any IT endeavour.
- Lack of Security, Functionality, Integration, Interoperability, and Usability—Lack of excellence in any of these areas will only result in increased human participation in deploying and maintaining IT systems.
- Increased Identity and Security Exposure to Failure—Increased People Participation and Lack of Security, Functionality, Integration, Interoperability, and Usability not only significantly increase costs, but inevitably lead to mistakes and breakdowns. This will create openings for attack and failure.

Thus when KuppingerCole evaluates a set of technologies or products/services from a given vendor, the degree of product Security, Functionality, Integration, Interoperability, and Usability which the vendor has provided is of highest importance. This is because lack of excellence in any or all of these areas will inevitably lead to identity and security breakdowns and weak infrastructure.

4 Vendor Rating

For vendors, additional ratings are used as part of the vendor evaluation. The specific areas we rate for vendors are:

- Innovation
- Market position
- Financial strength
- Ecosystem

Innovation – this is measured as the capability to drive innovation in a direction which aligns with the KuppingerCole understanding of the particular market segment(s) the vendor is in. Innovation has no value by itself but needs to provide clear benefits to the customer. However, being innovative is an important factor for trust in vendors, because innovative vendors are more likely to remain leading-edge. An important element of this dimension of the KuppingerCole ratings is the support of standardization initiatives if applicable. Driving innovation without standardization frequently leads to lock-in scenarios. Thus active participation in standardization initiatives adds to the positive rating of innovativeness. Innovation, as well as being part of the vendor rating, also looks at the innovation in the particular market segment analysed in this KuppingerCole Advisory Report.

Market position – measures the position the vendor has in the market or the relevant market segments. This is an average rating over all markets in which a vendor is active, e.g. being weak in one segment doesn't lead to a very low overall rating. This factor takes into account the vendor's presence in major markets. Again, while being part of the vendor rating, this mainly looks at the market position in the particular market segment analysed in this KuppingerCole Advisory Report. Thus a very large vendor might not be a market leader in the particular market segment we are looking at.

Financial strength – even while KuppingerCole doesn't consider size to be a value by itself, financial strength is an important factor for customers when making decisions. In general, publicly available financial information is an important factor therein. Companies which are venture-financed are in general more likely to become an acquisition target, with massive risks for the execution of the vendor's roadmap or, in the case of IaaS, even the delivery of their IT services.

Ecosystem – this dimension looks at the ecosystem of the vendor for the particular product/service covered in this Advisory Report. It focuses mainly on the partner base of a vendor and the approach the vendor takes to act as a "good citizen" in heterogeneous IT environments.

Again, please note that in this report, most of these ratings apply to the specific product/service and market segment covered in the analysis, not to the overall rating of the vendor.

5 Vendor Coverage

KuppingerCole tries to include all vendors within a specific market segment in their documents. The scope of the document is global coverage, including vendors which are only active in regional markets like Germany, the US, or the APAC region.

However, there might be vendors which don't appear in this document for various reasons:

- Limited market visibility: There might be vendors and products/services which are not on our radar yet, despite our continuous market research and work with advisory customers. This usually is a clear indicator of a lack in Market Leadership.
- Denial of participation: Vendors might decide on not participating in our evaluation and refuse to become part of the Compass document. KuppingerCole tends to include their products anyway as long as sufficient information for evaluation is available, thus providing a comprehensive overview of leaders in the particular market segment.
- Lack of information supply: Products of vendors which don't provide the information we have requested for the report will not appear in the document unless we have access to sufficient information from other sources.
- Borderline classification: Some products might have only a small overlap with the market segment we are analysing. In these cases we might decide not to include the product in that KuppingerCole report.

The target is providing a comprehensive view of the products/services in a market segment. KuppingerCole will provide regular updates on their documents.

6 Market Segment

The Cloud provides an alternative way of obtaining IT services that offers many benefits including increased flexibility as well as reduced cost. It extends the spectrum of IT service delivery models beyond managed and hosted services to a standardized form that is packaged and commoditized. This is described in detail in KuppingerCole Scenario: Understanding Cloud Computing - 70157[2]

An organization can choose to run the IT services in-house – this is the most flexible but often is the most expensive arrangement. It can outsource the running of the services through a managed service or hosting agreement; this is less flexible but may be cheaper. Using the Cloud, Infrastructure as a Service provides a form of hosting service – which is less flexible than hosting (because of the take it or leave it contract), but requires no capital expenditure and can be set up very quickly.

Infrastructure as a Service (IaaS) provides basic computing resources that the customer can use to run software (both operating systems and applications) and to store data. IaaS allows the customer to

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[2] Understanding Cloud Computing - 70157

transfer an existing workload to the Cloud with minimal if any change needed. The customer does not manage or control the underlying Cloud infrastructure but remains responsible for managing the OS and applications.

There are a number of different categories of IaaS that are provided, which include:

- **Type of Service supported:** Compute services allow a programmatic workload to run and provide associated storage needs. There are also IaaS services that provide storage only – for example to provide disaster recovery. This document focusses on CSPs that provide compute IaaS (i.e. services which only provide storage capability are excluded)

- **Deployment models supported:** public, private, community and hybrid. In general cloud services are deployed using a public model. That is the components and the infrastructures used to deliver the service are shared between all tenants. Some services provide an option where, for an additional cost, a customer's workload is delivered using dedicated resources. This is sometimes called a virtual private cloud. However there are a number of products called "virtual private cloud" and the customer needs to take care to understand the details of these offerings. Some CSPs provide services that are limited to a specific type of customer (e.g. government agencies) with a guarantee to meet a certain level of compliance (community cloud). The hybrid deployment model provides a way for organizations to provide a service internally and use the cloud only when certain conditions arise. For example – when demand exceeds the level that can be supported internally.

- **Workload types supported:** some IaaS services only support a limited range of workload types (for example: web servers). Other services may be optimized for software development or scientific research. This document includes CSPs that provide an IaaS that supports a range of workload types. However it should be noted that in many cases the CSP will offer a variety of server types and locations that are optimized for specific uses.

- **OS types supported:** the service should provide the customer with a choice of the OS to run the workload. Only IaaS where there is a choice of OS are included.

- **Middleware required:** All compute IaaS make some assumptions about the technical stack needed. However some IaaS services require a very specific middleware which makes them more of a Platform than Infrastructure.

- **Management** – the CSP is responsible for managing and securing the IaaS infrastructure including the data centre, the physical network, physical hardware and hypervisor. The customer is usually responsible for managing and securing their hosted service. Sometimes the CSP will provide a managed IaaS service.

The service providers in this market come from different backgrounds. These can be summarized as:

- Organizations that have successfully provided an online service who have expanded to offer the expertise and infrastructure they developed for this to other organizations. The most obvious example of this is AWS.
- IT Hosting and Service providers who have adapted their products to include cloud offerings. Examples here include IBM and HP.

- Pure cloud providers – who have identified some aspects of cloud services for which they provide an optimal solution. Some of these have focused on specific types of use like online gaming; others have focused on specific requirements such as compliance.

7 Specific Features Analysed

When evaluating the products, as well as looking at the aspects of

- overall functionality
- size of the company
- number and spread of customers
- partner ecosystem
- contract
- core features listed in section 6

We also considered several specific aspects. These aspects focus on risk assurance.

7.1   Critical Risk Assurance

When adopting a cloud service there is an element of risk and choosing a CSP involves assessing and managing this risk. The risks involved include but are not limited to the level of technical security that the CSP provides. In many ways large CSPs are capable of implementing a higher degree of technical security in their infrastructure than a small to medium sized business. This is because of the benefits of scale which allow them to employ the best IT security professionals and to afford the best physical and logical security tools.

In our assessment we have considered the five critical risks that a cloud customer faces and for which the CSP needs to provide assurance. These are:

- Loss of compliance – many organizations depend upon their IT systems being in compliance with laws and regulations. Using a cloud service could put this at risk.
- Cyber Risks – there are a large variety of ways in which there could be unauthorized access to a customer's data held in the service.
- Legal risks – the use of a cloud service may raise legal problems for the customer. One area of particular concern is around compliance with privacy laws.
- Availability of service and data – the customer is dependent upon the availability of cloud service and the data. Loss of access to the service or data can occur for a variety of reasons some of which are technical and some due to other causes such as takeover or financial failure of the CSP.
- Lock in – there is a risk of the customer becoming locked into a particular CSP for contractual or technical reasons which make it difficult or expensive to migrate to another provider's service.

Not all of these risks are under the direct control of the CSP; for example it is up to the customer to identify their data that is subject to regulatory compliance. For each of the relevant risks we have looked at the steps taken by the CSP to mitigate its probability or impact. There are a number of factors that are common across a range of risks and we have focused on these in particular. The factors which have been used to assess the CSPs featured in this document are described below.

7.2 Security Architecture

The security of a service cannot easily be post-fitted; security needs to have been designed into the service from the outset. This architecture needs to take a holistic view of information security covering all of the aspects outlined in standards like ISO/IEC 27001:2013. These aspects include security policies, processes and people, as well as technology. The components that make up the service need to have been acquired to meet the security and architectural requirements, to have been correctly configured, and to be managed and disposed of in a secure manner. The CSP needs to offer proof that this is the case for the service that they offer.

7.3 Types of Assurance Offered

When a customer uses a cloud service they give control of the management of that service to the CSP. The customer therefore needs assurance that the service they receive corresponds with that which they agreed to and are paying for. This is especially true for areas like security which are not immediately transparent. There are several ways in at which assurance can be provided:

- CSP Assertion – the CSP describes the steps they take. This information may form part of the service description or be published, for example, in the CSA STAR (Security, Trust and Assurance Registry)[3]. This value of this level of assurance depends upon the customer's trust in the CSP.
- Contractual assurance – the contract for the service provides specific commitments concerning the details of the service provided. This is often provided indirectly through a Service Level Agreement (SLA). The value of this commitment is determined by the level of liability specified in the contract under circumstances where the CSP is in default as well as the difficulties in its enforcement.
- Independent validation – the service provided has been evaluated by an independent third party that provides a certification or attestation that the service conforms with the assertions. Examples of this include some forms of Service Organization Control (SOC) reports using the standards SSAE 16 or ISAE 3402. The value of this is determined by the match between the scope of the evaluation and the customer's requirements as well as its how frequently the validation is performed.
- Independent testing – the service provided has been independently tested to demonstrate that it conforms to the assertions. Testing involves measuring the effectiveness of the controls while validation only covers an assessment of the design of the controls processes. Examples of this include SOC 2 type II reports as well as some levels of certification with the Payment Card Industry data security Standard (PCI-DSS). The value of this is determined by the match between the scope of the evaluation and the customer's requirements as well as how frequently the testing is performed.

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[3] https://cloudsecurityalliance.org/star/

7.4 Certification and Attestation

As mentioned above Independent assessment of the service provided by a CSP is an important way for a customer to obtain assurance that the service provided is what is described and promised. While it is reasonable for the provider to make service monitoring information available; it may not be practical for the provider to allow every customer to perform their own audit. Periodic certification of providers by a trusted third party is a way to satisfy this need. In KuppingerCole's opinion certification and attestation can provide an independent confirmation of claims about services provided. However it is important to understand what these certifications and reports cover.

In our evaluation we look at the range of independent certifications and attestations of the service. The most important certifications include:

- Certification to ISO/IEC 27001. This is a well-established standard that provides a code of practice for information security management. Note that this standard was updated in 2013 and it will take time for CSPs to be certified against this new version.
- Attestations using standards such as SSAE 16/ISAE3402 for Service Organization Control Reports to AICPA Trust Services Principles and Criteria.
- Certification to PCI-DSS
- Certification to ISO 22301[4] which specifies the requirements for an effective business continuity management system for the service.
- There are also a number of industry sector specific certifications.
- The new standard ISO/IEC 27018[5] which provides a Code of practice for protection of personally identifiable information (PII) in public clouds acting as PII processors.

7.5 Data and Service Location

The CSP can locate the Cloud service in the geography of their choosing based on cost or other factors. Many of the legal issues around Cloud computing are related to the geography in which the data is held by the CSP. These issues include privacy of personal data and the risks of e-discovery and data seizure. In our evaluation we look at how transparent the CSP is about the geographic location of the services offered. We also looks at whether or not the cloud customer can chose where their data is located and processed and that the CSP provides guarantees that this choice will be respected. We also consider whether the actual geographic locations available match the needs of the customers.

7.6 Service Level Agreement (SLA)

For most cloud services the SLA which specifies the level of service provided will be defined by the CSP. In our evaluation we look for an SLA and then review this for clarity not only about what will be provided but also how this will be measured and the actions that need to be taken by the customer if it is not. A good SLA will specify not only service availability but also guaranteed performance levels. The service contract should also specify the recompense that the customer will receive if the SLA is not met.

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[4] http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=50038
[5] http://www.iso.org/iso/catalogue_detail.htm?csnumber=61498

7.7   Security of Customer Data

The division of responsibilities between the CSP and the customer for the security of the customer's data should be clearly defined. In our evaluation we look at the measures which the CSP takes to ensure this security should be transparent without creating unnecessary risks over disclosure of the technical steps taken. For example the responsibility for encrypting data at rest and in motion should be clear. If the data is encrypted by the CSP then we look at how keys are managed between the CSP and the customer. We look at the steps taken by the CSP to control access by their staff to the customer data and how staff activities are monitored. We also evaluate the steps taken to destroy data when resources assigned to a customer are reused and when media reach the end of their life.

7.8   Support for Standards and APIs

In order to minimize the risk of the customer becoming locked-in to one CSP, the components provided by the CSP for the customer to construct and manage their service should be based on standards. At a superficial level the cloud is inherently based on standards like TCP/IP and HTTP. However standards are still emerging for aspects like management, and CSPs tend to provide their own tools and APIs. Emerging standards include OpenStack[6], Open Cloud Computing Interface[7] (OCCI- which is a RESTful Protocol and API for all kinds of management tasks), and Cloud Data Management Interface[8] (CDMI). In our evaluation we review the extent to which the CSP has adopted standards to ensure portability of customers' workloads.

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[6] http://www.openstack.org/
[7] http://www.ggf.org/documents/GFD.185.pdf
[8] ISO/IEC 17826:2012

8 Market Leaders

Based on our evaluation we have identified different types of leaders in the Infrastructure as a Service market segment. The market leaders are shown in the figure below.
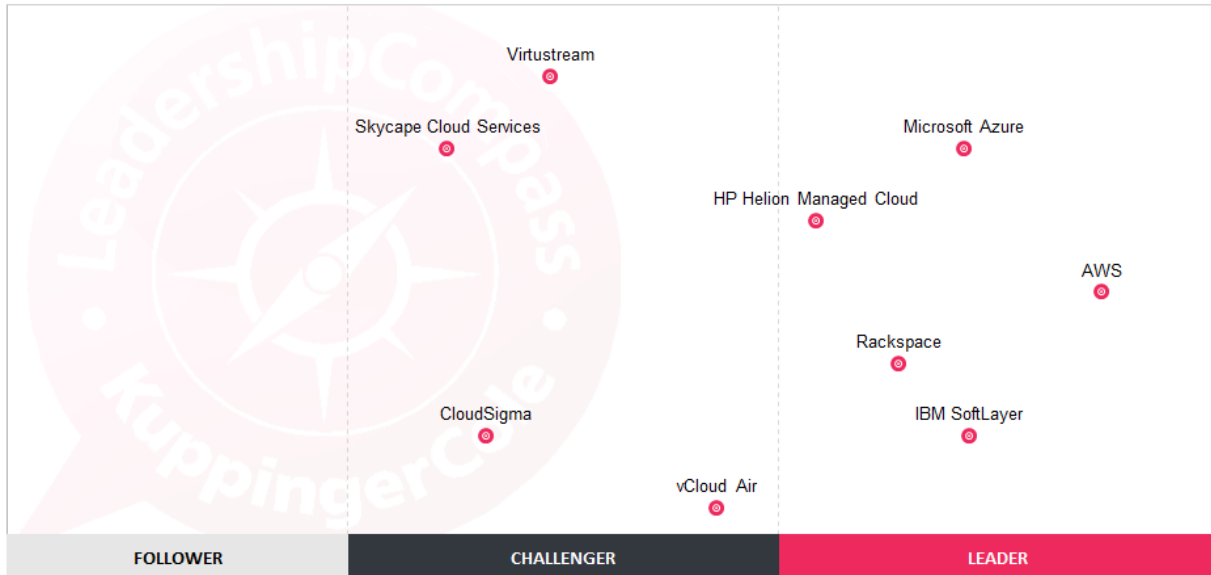

Figure 5: Market Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

We expect Market Leaders to be leaders on a global basis. Companies which are strong in a specific geographic region but sell little or nothing to other major regions are not considered market leaders. The same holds true for the vendor's partner ecosystem – without a global scale in the partner ecosystem, we don't rate a vendor as a Market Leader.

Market Leadership is an indicator that the vendors have the capability to successfully execute projects. However this depends on other factors as well.   For example many IaaS customers want a self-service approach that allows them to develop new business models. On the other hand migrating enterprise workloads and applications to the cloud can require significant effort. This latter requires either the vendor to have a consulting arm or partnerships with system integrators capable of this kind of work.

In this market the successful smaller vendors target a market with known specific needs and work with appropriate partners to deliver solutions.

The undoubted market leader for this segment is AWS which has over a million active customers in 190 countries. (Active customers are non-Amazon customers with AWS account usage activity in December 2014.) AWS has more than 900 government agencies, 3,400 education institutions and more than 11,200 non-profits organizations leveraging the services. Also in the leadership segment are Rackspace with around 300,000 customers worldwide and IBM SoftLayer with over 21,000 customers in 140 countries.

In the challenger segment we see the vendors with a more focussed market approach. These vendors have a more specialized offering which is targeted at specific types of customer or geographical areas. These smaller vendors have very good products to offer for their target customers. Some of these smaller vendors may grow if they can convince the market that what they have to offer is something that more organizations require.

vCloud Air is a special case in this analysis. VMWare are a late entrant as a CSP however they have a significant share of the virtualization software market and a large partner ecosystem. They are intending to capitalise on these strengths to attract enterprise customers.

It has to be noted that this Market Leadership rating doesn't lead to any conclusions regarding how the products of the different vendors fit a specific customer's requirements.

Market Leaders (in alphabetical order):

- AWS
- HP Helion Managed Cloud
- IBM SoftLayer
- Microsoft Azure Infrastructure Services
- Rackspace

9 Product leaders

The second view we provide concerns Product Leadership. This view is mainly based on the analysis of product/service features and the overall capabilities of the various products/services.
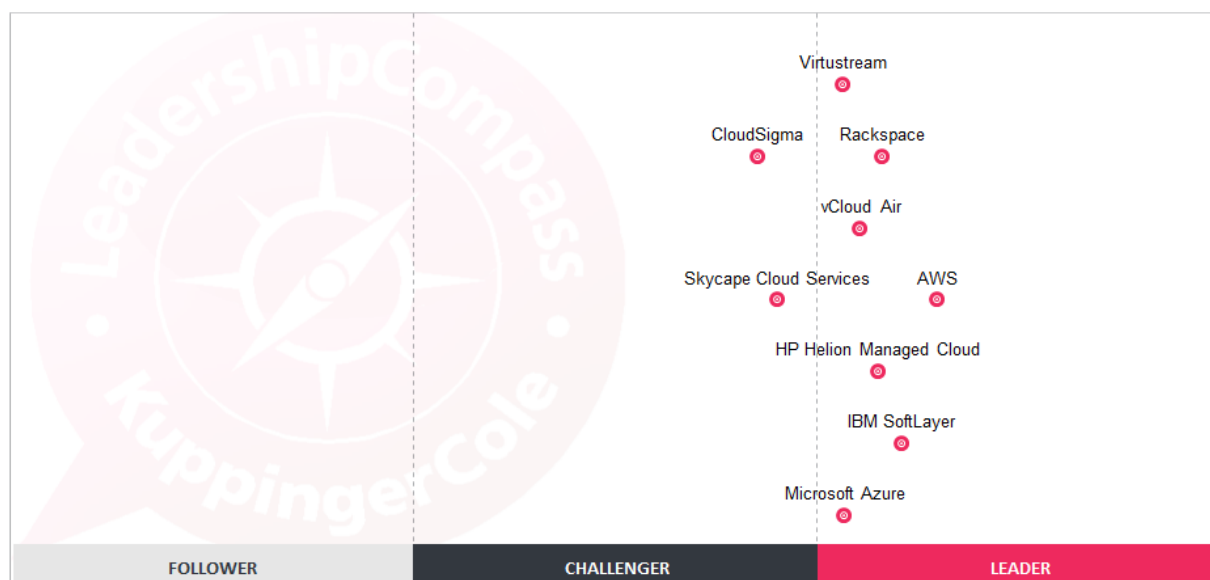

Figure 6: Product Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

The Product Leadership rating shows close competition. Most of the vendors are in the Leaders segment, with the others being close to that segment. This shows a market with a limited number of established and proven solutions. Overall, the differences between the IaaS products offered are relatively small; these differences only appear when the overall vendor offering is taken into account.

In many ways the basic compute and storage services are similar so it is the additional aspects that become the differentiators. These differentiators can be in the areas of security and compliance – some vendors have focused on the market that requires assurance around specific aspects in this area. They can also be in the area of platform services that make development of new applications easier. This can be seen through DevOps capabilities being offered by some vendors.

The challengers in this analysis all have good products; however these are more focused on specific market segments. For example Skyscape Cloud Services has a service that is highly specialized for compliance with UK government cloud service requirements.

Again, when selecting a product it is important to look at the specific features and map them to the customer requirements. There are examples where products which are not "feature leaders" are nevertheless a better fit for specific customer scenarios.

Product Leaders (in alphabetical order):

- AWS
- HP Helion Managed Cloud
- IBM SoftLayer
- Microsoft Azure Infrastructure Services
- Rackspace
- vCloud Air
- Virtustream

10 Innovation Leaders

The third angle we take when evaluating products/services concerns innovation. Innovation is, from our perspective, a key capability in IT market segments. Innovation is what customers require from vendors to continue to provide new functionality to meet their evolving requirements. Hence an analysis of a vendor's record of innovation is often as important as the current features of their product/service.
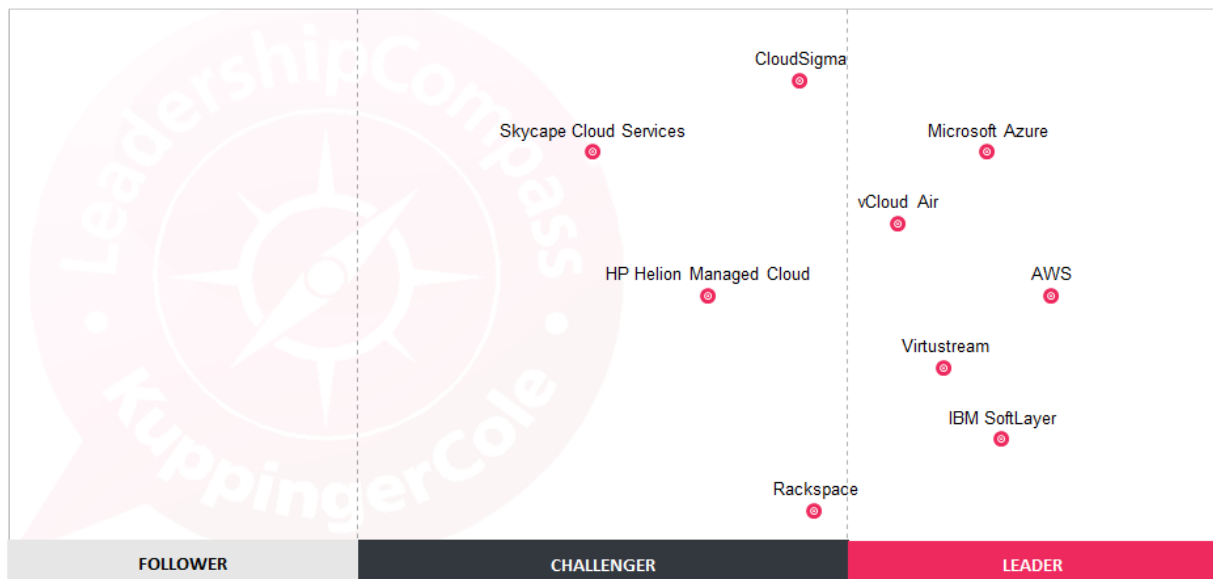
Figure 7: Innovation Leaders in the IaaS market segment [Note: There is only a horizontal axis. Vendors to the right are positioned better.].

We see five organizations in the innovation leader category. AWS, IBM and Microsoft have a consistent track record in creating or acquiring important new products or capabilities for their products and executing on the integration and delivery of new services. To some extent this is due to their market leadership which provides the revenue to fund research or acquisitions. However sometimes the integration takes time and sometimes elements of the acquired products are dropped. AWS claim that their innovation is driven by their customers and cite the the functionalities they added for Netflix as an example, which include AWS CodeDeploy, AWS CodePipeline (Netflix also influenced the development AWS DynamoDB). The new vendor that stands out is Virtustream. They have created or acquired a set of new technologies under the xStream brand name for orchestrating, securing and governing enterprise cloud services. In addition VMWare has a track record for innovation in the virtualization space and we expect them to bring that skill to the IaaS market with their vCloud Air service.

However, since this is a relatively new market, all of the vendors in the survey have – in their own way – been innovators. They have identified the market needs of specific kinds of customers and created a product for these customers. In this survey we have placed special emphasis on security and compliance because these are major concerns of customers. So the innovation that we have been looking for includes specifically these areas – i.e. IaaS services that are more trustworthy.

Innovation Leaders (in alphabetical order):

- AWS
- IBM SoftLayer
- Microsoft Azure Infrastructure Services
- vCloud Air
- Virtustream

11 Product Evaluation

This section contains a quick rating for every product we've included in this report. For some of the products there are additional KuppingerCole Reports available, providing more detailed information.

In addition to the standard information we provide on the vendors and their products in other KuppingerCole Leadership Compass documents, we have added specific information around risk assurance. One is the spider graph indicating the strength of assurance in each of the five risk areas we have defined for cloud services. The benchmark for assurance is based on the level we expect to see as part of an IaaS for commercial use. Therefore, there may be specific applications or types of customers requiring better assurance.

The second indicator is a bar chart showing the "Assurance Index". This index has a value between 0 and 10. The value of 0 would indicate a complete lack of assurance, while a value of 10 will indicate strong assurance in all five risk areas shown in the spider graph. This index helps to identify the overall level of risk assurance for the service. However, offerings with a lower index might still be a good fit if some risk areas aren't relevant or if the customer is particularly looking for a specific feature or capability.

In the following analysis we have provided our ratings for the products and vendors in a series of tables. These ratings represent the aspects described previously in this document. Here is an explanation of the ratings that we have used:

- **Strong Positive:** this rating indicates that, according to our analysis, the product or vendor significantly exceeds the average for the market and our expectations for that aspect.
- **Positive:** this rating indicates that, according to our analysis, the product or vendor exceeds the average for the market and our expectations for that aspect.
- **Neutral:** this rating indicates that, according to our analysis, the product or vendor is average for the market and our expectations for that aspect.
- **Weak:** this rating indicates that, according to our analysis, the product or vendor is less than the average for the market and our expectations in that aspect.
- **Critical:** this is a special rating with a meaning that is explained where it is used. For example it may mean that there is a lack of information. Where this rating is given it is important that a customer considering this product look for more information about the aspect.

It is important to note that these ratings are not absolute. They are relative to the market and our expectations. Therefore a product with a strong positive rating could still be lacking in functionality that a customer may need if the market in general is weak in that area. Equally in a strong market a product with a weak rating may provide all the functionality a particular customer would need.

11.1 Amazon Web Services

Amazon Web Services (AWS) is a subsidiary of the well-known online retailer Amazon.com. AWS offers over 40 services including compute, storage, database, analytics, and applications. These services are delivered from AWS Regions (which consist of 2 or more data centres) around the world. AWS has more than a million active customers in 190 countries.

Strengths/Opportunities	Weaknesses/Threats
• Ability to respond to customer needs on a global scale. The opening of a German Region in response to local compliance requirements is a recent example. • AWS has designed information security needs into their services from the architecture up. • Expanded consulting services offering	• Customers who adopt their proprietary platform APIs may find it difficult to change provider at a later date.

Table 1: AWS IaaS Strengths and Weaknesses

All AWS infrastructure regions around the world are designed, built, and regularly audited to meet security and compliance standards, including ISO 27001, ISAE 3402, SOC 1 and SOC 2, PCI DSS Level 1 and others. AWS is fully compliant with all applicable EU Data Protection laws, and for customers that require it, AWS provides data processing agreements to help customers comply with EU data protection requirements.

AWS continues to innovate in the areas of security and compliance – for example a particular strength is the AWS CloudHSM which enables high performance encryption with secure key management.

Security	Strong Positive
Functionality	Strong Positive
Integration	Strong Positive
Interoperability	Positive
Usability	Strong Positive

Table 2: AWS IaaS Rating

AWS is very responsive to customer demand and continues to expand is service offering and global footprint.

12 Products at a Glance

This section provides an overview of the various products we have analysed within this KuppingerCole Leadership Compass on Infrastructure as a Service. As well as the rating overview, we provide additional comparisons that put Product Leadership, Innovation Leadership, and Market Leadership in relation to each other. These help to identify, for instance, highly innovative but specialized vendors or local players that provide strong product features but do not yet have a global presence and large customer base.

12.1 Ratings at a glance

Based on our evaluation, a comparative overview of the ratings of all the products covered in this document is shown in the table below:

Service	Security	Functionality	Integration	Interoperability	Usability
AWS	Strong Positive	Strong Positive	Strong Positive	Positive	Strong Positive
CloudSigma	Strong Positive	Positive	Positive	Positive	Positive
HP Helion Managed Cloud	Strong Positive	Positive	Positive	Strong Positive	Positive
IBM SoftLayer	Strong Positive	Strong Positive	Positive	Positive	Positive
Microsoft Azure Infrastructure Services	Strong Positive	Strong Positive	Positive	Positive	Positive
Rackspace	Strong Positive	Strong Positive	Positive	Strong Positive	Positive
Skyscape Cloud Services	Strong Positive	Positive	Positive	Positive	Positive
vCloud Air	Strong Positive	Strong Positive	Positive	Positive	Positive
Virtustream	Strong Positive	Strong Positive	Positive	Positive	Positive

Table 3: Comparative overview of the ratings for the product capabilities

In addition we also provide four additional ratings for the vendor. These go beyond the product view provided in the previous section. While the rating for Financial Strength applies to the vendor, the other ratings apply to the product.

Company	Innovation	Market Position	Financial Strength	Ecosystem
AWS	Strong Positive	Strong Positive	Strong Positive	Strong Positive
CloudSigma	Positive	Neutral	Neutral	Neutral
HP Helion Managed Cloud	Positive	Neutral	Strong Positive	Strong Positive
IBM SoftLayer	Strong Positive	Strong Positive	Strong Positive	Strong Positive
Microsoft Azure Infrastructure Services	Strong Positive	Positive	Strong Positive	Strong Positive
Rackspace	Positive	Strong Positive	Strong Positive	Strong Positive
Skyscape Cloud Services	Positive	Neutral	Neutral	Neutral
vCloud Air	Strong Positive	Weak	Strong Positive	Strong Positive
Virtustream	Strong Positive	Neutral	Neutral	Neutral

Table 4: Comparative overview of the ratings for the vendors

In the area of Innovation, we were looking for the service to provide a range of advanced features in our analysis. These advanced features include but are not limited to areas such as: performance guarantees, specific security features such as enhanced support for encryption as well as a track record of introducing new functionality in response to market demand. Where we could find no such features we rate it as "Critical".

In the area of market position we are looking at the visibility of the vendor in the market. This is indicated by factors including the presence of the vendor in more than one continent and the number of organizations using the services. Where the service is only being used by a small number of customers located in one geographical area we award a "Critical" rating.

In the area of Financial Strength, a "Weak" or "Critical" rating is given where there is a lack of information about financial strength. This doesn't imply that the vendor is in a weak or a critical financial situation. This is not intended to be an in depth financial analysis of the vendor; and it is also possible that vendors with better ratings might fail and disappear from the market. In the case of a cloud service provider financial failure or withdrawal from the market could create a major problem for a business that depended upon that provider for its business critical IT services.

Finally, a critical rating regarding Ecosystem applies to vendors which do not have, or have a very limited ecosystem with respect to numbers of partners and their regional presence. That might be company policy, to protect their own consulting and system integration business. However our strong belief is that the success and growth of companies in a market segment relies on strong partnerships.

12.2 The Market/Product Matrix

Furthermore, we've compared the position of vendors regarding combinations of our three major areas of analysis, i.e. market leadership, product leadership, and innovation leadership. This analysis provides additional information.
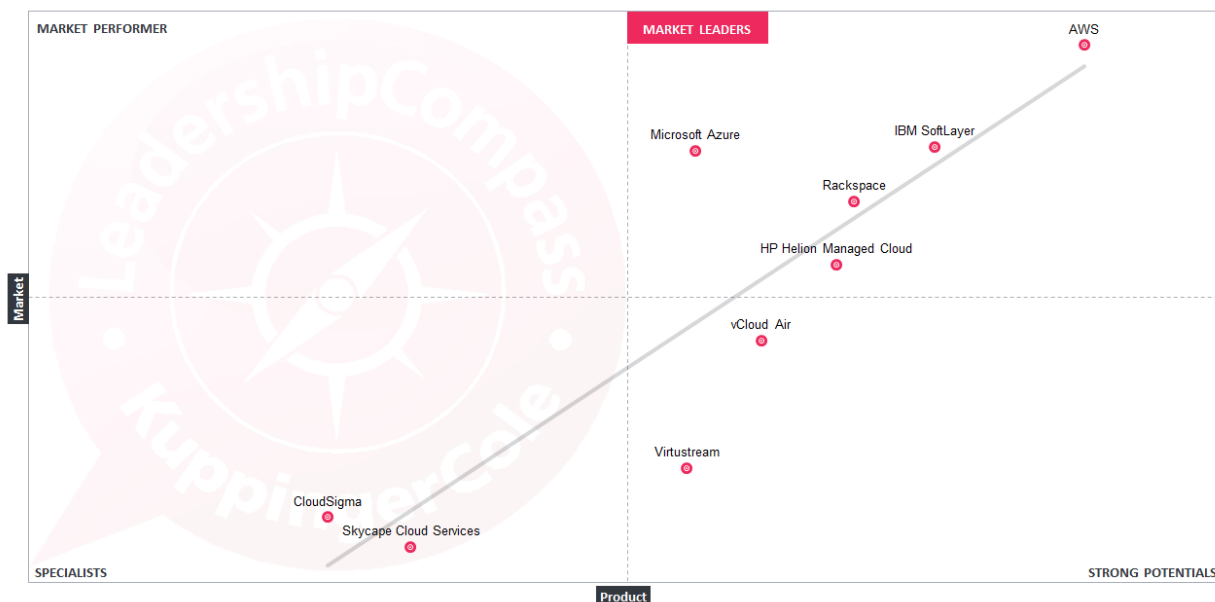

Figure 8: The Market/Product Matrix. Vendors below the line have a weaker market position than expected according to their product maturity. Vendors above the line are sort of "over-performers" when comparing Market Leadership and Product Leadership.

In this comparison it becomes clear which vendors are better positioned in our analysis of Product Leadership compared to their position in the Market Leadership analysis. Vendors above the line are sort of "over-performing" in the market. It comes as no surprise that these are mainly the very large vendors, while vendors below the line frequently are innovative but focused on specific regions.

We've defined four segments of vendors to help in classifying them:

Market Leaders: This segment contains vendors which have a strong position in our categories of Product Leadership and Market Leadership. These vendors have an overall strong to excellent position in the market.

Strong Potentials: This segment includes vendors which have strong products, being ranked high in our Product Leadership evaluation. However, their market position is not as good. That might be because of various reasons, like a regional focus by the vendors or the fact that they are niche vendors in that particular market segment.

Market Performers: Here we find vendors which have a stronger position in Market Leadership than in Product Leadership. Typically such vendors have a strong, established customer base due to other market segments they are active in.

Specialists: In this segment we typically find specialized vendors which have – in most cases – specific strengths but neither provide full coverage of all features which are common in the particular market segment nor count among the software vendors with overall very large portfolios.

This visualisation shows that the majority of the vendors in this analysis fall into two categories: market leaders and specialists. There is no surprise at which vendors are the leaders; AWS, IBM and Rackspace are long standing players in this market. At the other end there is an emerging group of CSPs that have specialized their service to specific market needs. For example Virtustream has a focus on the enterprise market. Skyscape Cloud Services has been successful in the UK local and national government market.

12.3 The Product/Innovation Matrix

This view shows how Product Leadership and Innovation Leadership are correlated. It is not surprising that there is a pretty good correlation between the two views with few exceptions. This distribution and correlation is typical an emerging market where there are a few leaders and a number of innovators. There has not been time for some of the leaders to have become bogged down and ceased innovation. There are also no "Me-too" vendors.
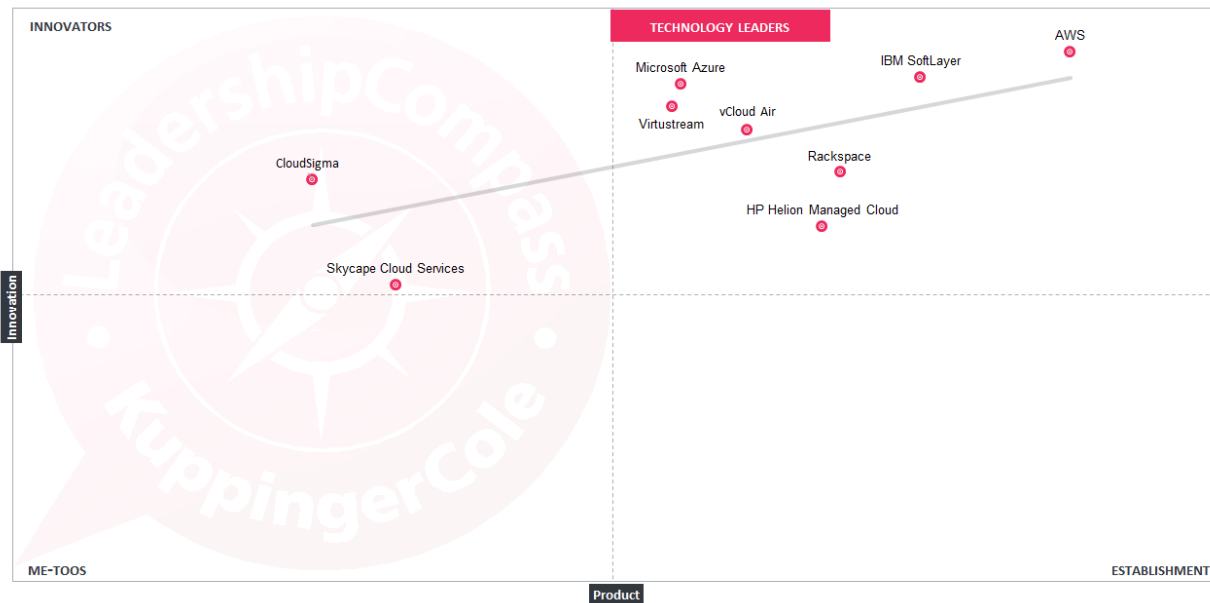

Figure 9: The Product/Innovation Matrix. Vendors below the line are less innovative, vendors above the line are, compared to the current Product Leadership positioning, more innovative.

Again we've defined four segments of vendors. These are

Technology Leaders: This group contains vendors which have technologies which are strong regarding their existing functionality and which show a good degree of innovation.

Establishment: In this segment we typically find vendors which have a relatively good position in the market but don't perform as strong when it comes to innovation. However, there are exceptions if vendors take a different path and focus on innovations which are not common in the market and thus do not count that strong for the Innovation Leadership rating.

Innovators: Here we find highly innovative vendors with a limited visibility in the market. It is always worth having a look at this segment because vendors therein might be a fit especially for specific customer requirements.

Me-toos: This segment mainly contains those vendors which are following the market. There are exceptions in the case of vendors which take a fundamentally different approach to provide specialized point solutions. However, in most cases this is more about delivering what others have already created.

All of the vendors analysed show a high degree of innovation. Vendors to the left are focussed on specific market segments and their innovation is targeted on the needs of their market.

12.4 The Innovation/Market Matrix

The third matrix shows how Innovation Leadership and Market Leadership are related. Some vendors might perform well in the market without being Innovation Leaders. This might impose a risk for their future position in the market, depending on how they improve their Innovation Leadership position. On the other hand, vendors which are highly innovative have a good chance for improving their market position but might also fail, especially in the case of smaller vendors.
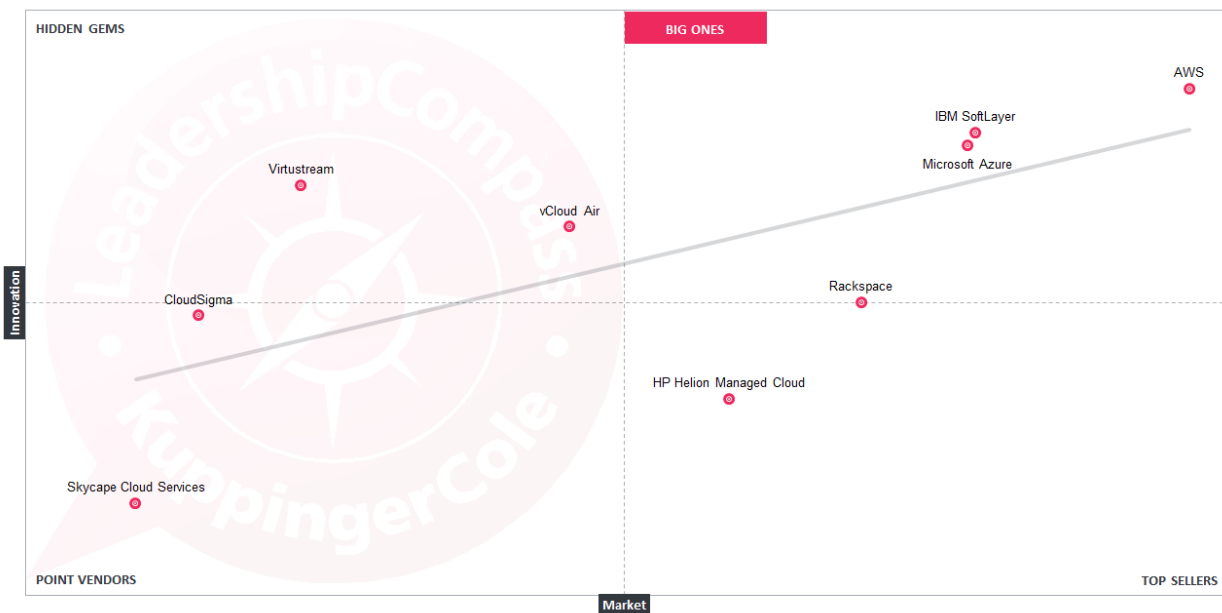

Figure 10: The Innovation/Market Matrix. Vendors below the line are performing well in the market compared to their relative weak position in the Innovation Leadership rating, while vendors above the line show based on their ability to innovate, the biggest potential to improve their market position

The four segments we have defined here are

Big Ones: These are market leading vendors with a good to strong position in Innovation Leadership. This segment mainly includes large software vendors.

Top Sellers: In this segment we find vendors which have an excellent market position compared to their ranking in the Innovation Leadership rating. That can be caused by a strong sales force or by selling to a specific community of "customer customers", i.e. a loyal and powerful group of contacts in the customer organizations.

Hidden Gems: Here we find vendors which are more innovative than would be expected given their Market Leadership rating. These vendors have a strong potential for growth, however they also might fail in delivering on that potential. Nevertheless this group is always worth a look due to their specific position in the market.

Point Vendors: In this segment we find vendors which typically either have point solutions or which are targeting specific groups of customers like SMBs with solutions focused on these, but not necessarily covering all requirements of all types of customers and thus not being among the Innovation Leaders. These vendors might be attractive if their solution fits the specific customer requirements.

Here we see the same vendors being placed in the Big Ones segment, with some under-performing (below the line) and some over-performing in innovation, when compared to their market position.

The CSPs that fall into the Point Vendors segment are specialists and there is no surprise here.

The vendor to watch based on this analysis is Virtustream which could have a strong potential for growth. Virtustream has created and acquired some key technologies that enable the delivery of cloud services with enterprise grade governance and security capabilities. The question is whether this company will focus on the delivery of cloud services or the exploitation of this software through other CSPs.

13 Overall Leadership

Finally, we've put together the three different ratings for leadership, i.e. Market Leadership, Product Leadership, and Innovation Leadership and created an Overall Leadership rating. This is shown below in figure 11.
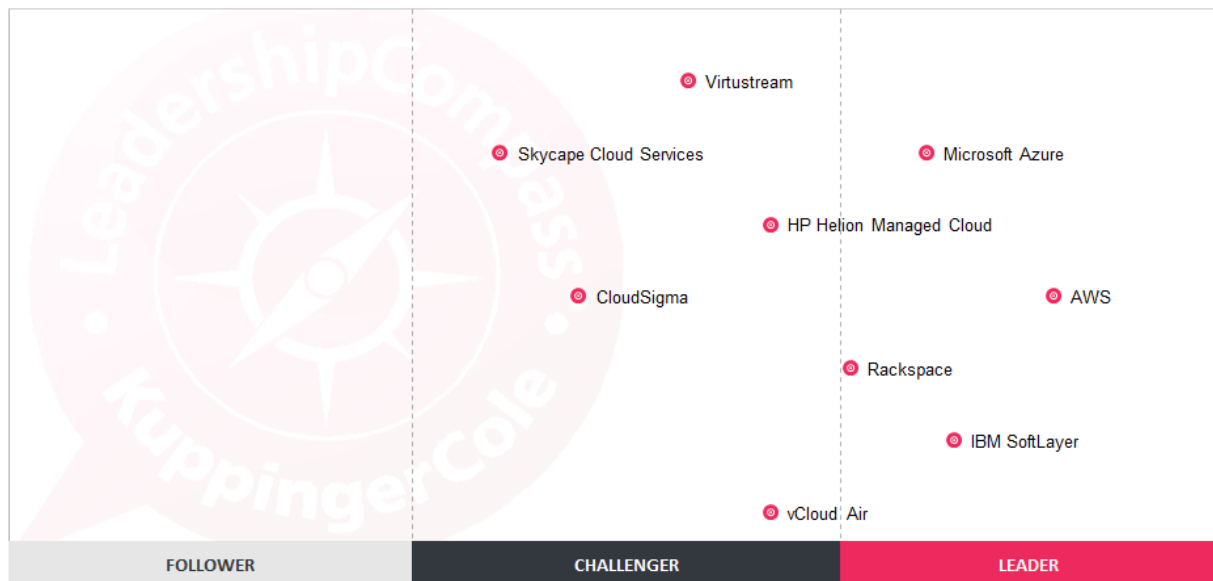
Figure 11: The Overall Leadership rating for the IaaS market segment

In this segment it is clear that the overall leader is AWS closely followed by IBM and Rackspace.

AWS was an early entrant into the market and has characterised its offerings by innovation, keen pricing and striving to match the needs of its customers. It has a wide range of products although this survey focusses specifically on the infrastructure as a service products. These products cater to the needs of a wide range of users from the "Born on the Cloud" with a credit card and a dream, through to the enterprise with existing applications to migrate. In the past 2 years AWS has introduced a number of important security and compliance features relevant to the needs of enterprise customers. These include AWS CloudHSM which enables high performance encryption with secure key management, expanding the geographic location of their data centres to satisfy local legal requirements as well as technical enhancements such as support of ADFS and SAML to enable enterprise control of administrative access to AWS through an internal AD.

IBM is also a significant player in this market and boosted its position through the acquisition of SoftLayer. This provides an alternative to virtualization giving the ability to provision customer's workloads to "bare metal" servers to achieve very high performance. IBM has the capability and customer base to exploit this technology as the basis for a complete stack of IBM cloud services through its Bluemix PaaS and specific SaaS offerings. From a security and compliance perspective IBM adds value through its knowledge and expertise in this area together with the recently announced cloud specific enhancements to its security software.

Microsoft has recently refocused its business on delivering cloud services. Its cloud offering, Microsoft Azure, started out as a Platform as a Service but now includes IaaS capabilities through Microsoft Azure Infrastructure Services which include Azure Virtual Machines and Azure Virtual Network. Its brand, worldwide presence and vision put it in this segment.

Rackspace is another CSP in the leadership segment. It has a mature offering with solid security and compliance characteristics exploiting its long experience of hosting IT services.

Again: Leadership does not automatically mean that these vendors are the best fit for a specific customer requirement. It is essential for each customer to perform a thorough evaluation of their requirements, and to map these against the features provided by the vendor's products is mandatory.

Overall Leaders are (in alphabetical order):

- AWS
- IBM SoftLayer
- Microsoft Azure Infrastructure Services
- Rackspace

14 Vendors and Market Segments to Watch

In addition to the vendors in this report there are a number that were not able to participate for various reasons. Here are some of the ones to look out for:

14.1   COLT

Colt were the first vCloud Virtual Datacentre Service Provider in Europe and now have one of the largest VMware vCloud footprints in Europe. Colt vCloud Virtual Data Centre is a self-managed service, intended for customers that have already invested in VMware and wish to retain control over how they use their IT infrastructure. The service is delivered from 8 EU data centre locations in Europe which means the services, data and applications can stay within the customer's country, and remain in line with local regulations.

14.2   FireHost

FireHost provides cloud services with an emphasis on security and compliance aspects. The company was originally founded in the US in 2009 and expanded into Europe in 2012. It has data centres in Dallas TX, Phoenix AZ, London UK, Amsterdam in the Netherlands and Singapore. FireHost is a rapidly growing company with a focus for growth in Europe supported by the data centres in London and Amsterdam.

FireHost's Secure Managed Cloud has been purpose built for high security and high performance. Its Intelligent Security Model protects customer data from the data centre through the application layer using a multi-layered, defence in depth model that provides the highest level of security available today. All of its security services are engineered and tightly integrated into its service offering. The service is built on top of a high performance infrastructure that is highly available and fully redundant.

The FireHost model for cloud services with security and compliance included closely matches the KuppingerCole five critical security and compliance challenges. KuppingerCole believe that this there will be strong growth in this segment of market for cloud services as organizations look for the flexibility of the cloud combined with the assurance needed for enterprise workloads.

14.3 GoGrid

GoGrid is a privately held company based in the US. It is a "pure-play" infrastructure-as-a-service (IaaS) provider and the IaaS service was launched in 2008. It has data centres in San Franciso CA, Ashburn VA and Amsterdam in the Netherlands. GoGrid's Amsterdam, NL data centre is managed by Equinix. GoGrid currently provides a range of cloud services ranging from Cloud Hosting and Private Cloud to dedicated hosting. GoGrid offers managed security services as an add-on. These can provide breach real time security monitoring, and alerting, vulnerability detection, threat detection and compliance monitoring.

14.4 OVH

OVH is an independent company founded in 1999 and based in Roubaix in France. OVH's approach is to offer better value than its competitors. OVH built and runs its own 8 datacentres and has complete control of its production chain. The datacentres are located in France, the USA and Asia. OVH claims to have 400,000 professional customers. OVH offers a number of cloud solutions including: dedicated cloud which allows the customer to create virtual datacentres based on VMware vSphere, public cloud compute, storage, network and content delivery. OVH service has ISO/IEC 27001 certification SOC 2 attestation and CSA STAR self-certification.

15 Glossary

Term	Definition
Cloud Computing	The Cloud is an environment which allows the delivery of IT services in a standardized way. This standardization makes it possible to optimize the procurement of IT services from both external and internal providers. The Cloud covers a wide spectrum from shared applications delivered over the internet to virtual servers hosted internally. In the KuppingerCole model, Cloud Computing maps to the IT Service and Security layer where IT services are produced.
CSP	Cloud Service Provider
IaaS	Infrastructure as a Service; describes Cloud Computing solutions that provide basic infrastructure services, e.g. computing power, storage, and other foundational features.
Information Security	The methodology of securing information.
ISAE 3402 also SSAE 16	International Standard on Assurance Engagements (ISAE) No. 3402, Assurance Reports on Controls at a Service Organization from the International Auditing and Assurance Standards Board (IAASB). It is an international standard for public accountants to issue a report for use by user organizations and their auditors on the controls at a service.
ISO/IEC 27001/2	ISO/IEC 27001:2013 is a well-established standard that provides a code of practice for information security management. It is supplemented by ISO/IEC27002:2013 which provides detailed advice and control objectives.

IT Service Management	The methodology of managing IT services; unlike Business Service Management, IT Service Management focuses on IT services at all layers, from high-level services such as CRM to (technical) web services. IT Service Management monitors and measures all services in a consistent fashion and provides billing and accounting capabilities.
PaaS	Platform as a Service; describes Cloud Computing solutions that provide a set of services such as application infrastructure or IT management services.
PCI-DSS	Payment Card Industry Data Security Standard. PCI DSS provides a baseline of technical and operational requirements designed to protect cardholder data held in IT systems.
SaaS	Software as a Service; describes Cloud Computing applications provided as a service through external (public) or internal (private) clouds.
SOC	Service Organization Controls report on a service provider – produced by auditors based on ISAE 3402 or SSAE 16 described above.

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