Cl◆ud ◆atch

Think Cloud Services for Government, Business & Research

Roadmap to a Cloud Market Structure Encouraging Pricing Transparency

First Iteration

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Index

CloudWATCH2 Mission

It is only when the innovation process is inclusive and open that we truly advance technology for humanity – from small businesses to public sector organisations and citizens as the new digital consumers. The use of open source software and open standards are becoming increasingly seen as enablers and levellers for public and private sectors alike, bundling skills to create new services and applications.

To support this CloudWATCH2 takes a pragmatic approach to market uptake and the exploitation of results coming from European sustainable competitiveness for wider uptake and commercial exploitation. It provides a set of services to help European R&I initiatives capture the value proposition and business case as key to boosting the European economy.

CloudWATCH2 services include:

- A cloud market structure roadmap with transparent pricing to enable R&I projects to chart exploitation paths in ways they had not previously considered, or help them avoid approaches that would not have been successful.
- Mapping the EU cloud ecosystem of products, services and solutions emerging from EU R&I projects. Identifying software champions and best practices in mitigating risks associated with open source projects, and ultimately, enable faster time-to-value and commercialisation.
- Impact meetings for clustering and convergence on common themes and challenges. Re-use of technologies will also be of paramount importance.
- Promoting trusted & secure services through roadshows and deep dive training sessions. Giving R&I initiatives a route to users at major conferences or in local ICT clusters.
- A portfolio of standards for interoperability and security that can facilitate the realisation of an ecosystem of interoperable services for Europe.
- Cloud interoperability testing in an international developer-oriented and hands-on environment. Findings will be transferred into guidance documents and standards.
- Risk management and legal guidelines with practical examples of cloud contracts' clauses that need to be assessed before purchasing cloud services to the cloud for private and public organisations to lower barriers and ensure a trusted European cloud market.

The focus of this Preliminary Version is to highlight systemic risks developing in the Infrastructure as a Service market that are noteworthy to stakeholders seeking to shape policies for a fair, transparent and resilient cloud market. This document outlines how the cloud computing market is structured, why it is essential for Europe and the types of activities necessary to create a complete market. This is a Preliminary Version that recommends 3 key actions the market must adopt to remain on the right path.

1 Executive Summary

Over the last decade, the public cloud computing market has grown rapidly. It underpins many digital services upon which we are dependent. The increasing pace of adoption of public cloud demonstrates confidence in its benefits. A major service disruption would have very harmful consequences for European economies and the Digital Single Market. From VOIP phones and email, to power grid operations and scientific research, the remote processing and storage of data, generically called "Cloud Computing", allows European SMEs, governments, research institutions and consumers to access digital services on an unprecedented scale and at a lower operating cost than owning and operating physical hardware and data centres.[1] Going backwards is not an option for Europe if we wish to remain globally competitive, and our dependence on cloud services is only going to increase.

The European Commission concluded that Cloud Computing is beneficial[2] and wants to increase adoption. Uptake, as in other markets, would be enhanced by the existence of fair, competitive and resilient markets within Cloud Computing services. These services are parts of a value chain starting with Infrastructure Services sold from large data centres and ending with fully developed Software-as-a-Service applications that run on that rented or owned Infrastructure hardware. There are often multiple competing SaaS offerings[3] for the consumer to choose from, under significant oversight[4] focussed on consumer protection. The Infrastructure-as-a-Service ("IaaS") market is not as well understood or scrutinised.

In any other market where essentiality and asymmetry co-exist, regulators focus very hard on ensuring fairness and confidence in that market. We identify risks in the Infrastructure-as-a-Service market commonly seen in more mature, intensely regulated markets such as financial services, insurance and energy. Through this comparative analysis, we are able to propose measures used in other mature markets to develop a resilient market that can withstand shocks, such as those seen in markets like the 2008 Global Financial Crisis or the 2001 California Energy Crisis. This Roadmap calls for an effective voluntary Code of Conduct that encourages self-regulation, the removal of restrictions on resale to enable greater pricing transparency and the avoidance of public policies that artificially sponsor one cloud provider over another.

In summary, this first of two iterations of the Roadmap commissioned as part of the CloudWatch2 project concludes that the Infrastructure-as-a-Service market is both essential and asymmetric, and as such, must take action to maximise buyer and regulatory confidence. This Roadmap calls for a Select Industry Group to create an effective Code of Conduct, the removal of restrictions on resale and other key recommendations that guide the cloud services markets towards a sustainable and transparent structure that promotes uptake.

1 https://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.pdf

2 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0529:FIN:EN:PDF

3 http://www.pcadvisor.co.uk/test-centre/Internet/14-best-cloud-storage-services-2016-uk-3614269/

4 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0011:FIN:EN:PDF

2 Introduction

Cloud computing is now pervasive in our everyday lives, and is big business. It is so fully integrated that it is not obvious how dependent we already are.

In the case of cloud storage, where consumers are backing up and sharing their personal or business-related documents and photographs to cloud storage services such as Dropbox and Google Drive from the US and Tresorit from Europe amongst others, the consumer is directly aware of cloud use. When accessing weather forecasts, traffic reports and map directions on a smartphone, it may be less obvious to the consumer that they are relying on cloud services. Our smartphones are not the only way we have established a dependence on cloud services.

Much of the content we enjoy on our TVs is delivered using cloud services, such as Netflix from the US and DailyMotion from Europe. The next scientific breakthroughs are likely to be expedited as a result of the adoption of high performance computing infrastructure.[5] We see use cases in banking[6], communications infrastructure for the UK National Health Service[7] and calls for its use in other industries such as air traffic control systems.[8] At the consumer level, this dependence is less obvious with, for example, remotely controlled heating in the home.[9]

Regulators are already looking at the previously mentioned cloud storage service offerings. In December 2015, the UK's Competition and Markets Authority launched a Consumer Law compliance review into Cloud Storage having identified possible "consumer protection issues."[10] In September 2015, the UK House of Commons Select Committee launched an Inquiry into the Digital Economy, investigating amongst other issues, the barriers faced by UK business in succeeding in the digital economy. Many European countries wish to ensure fair access to cloud services which are a key driver of economic growth in a Digital Single Market.

In June 2015, the new EU General Data Protection Regulation was finalised, in a bid to harmonise data protection as part of the drive towards a Digital Single Market across Europe. Technology giants as diverse as SAP, IBM, Cisco and Amazon responded with dismay, claiming the new rules will "kill off Europe's cloud computing industry."[11] This shows that regulatory action can be controversial. Many European digital services that are currently competing successfully on a global scale are reliant upon underlying cloud infrastructure services. Ill-conceived regulatory intervention could either allow a single point of failure to develop, or alternatively saddle European companies with a pricing or legal disadvantage relative to non-European competitors. Europe's digital future, with all the attendant employment opportunities and economic advantages, is at stake.

The aim of this preliminary publication of the Roadmap is to help guide the cloud services

5 http://www.helix-nebula.eu/sites/default/files/Helix_Nebula_EMBL_-_ISC12_-_Lueck_v1.1_0.pdf

6 Tangerine Bank (ex ING Direct) and Microsoft https://customers.microsoft.com/Pages/CustomerStory.aspx?recid=14594

7 http://n3.nhs.uk/n3cloudservices/

8 http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6699102

9 http://www.computerweekly.com/news/2240219911/British-Gas-brings-central-heating-control-to-smartphones-with-AWS-cloud

10 https://www.gov.uk/government/consultations/cloud-storage-consumer-law-compliance-review

11 http://www.reuters.com/article/us-eu-dataprotection-idUSKBN0OV0GO20150615

markets on a path to healthy self-regulation, with an awareness of the likelihood of future regulatory oversight. This Roadmap will be of interest to anyone heavily involved with the cloud market, particularly the cloud "infrastructure as a service" market because it is an essential yet overlooked layer. This document is of particular relevance to cloud providers, cloud resellers, major cloud buyers, as well as those who may have a duty of market oversight.

3 Background

For the purposes of this Roadmap, we define the use of cloud services simply as the *"remote processing and storage of data"*.

Throughout the history of computing, each time more processing capacity became available, or the cost of it decreased, more use cases were identified as economic. Thus, despite ongoing, rapid increases in capability, computing capacity was always a precious resource whose utilisation should be maximised. The sharing of capacity was encouraged through mechanisms such as pre-booking time on mainframes and simultaneous access by numerous users to which the mainframe software automatically allocated time.

This became more efficient as more users, who were increasingly physically remote from the compute infrastructure, could share the same resources. In fact, the history of data processing is characterised by a) increasing centralised computing capacity, accompanied by b) increasing distributed computing capacity, all interconnected by c) increasingly effective communications. With today's quality of high speed broadband internet access, users can be situated anywhere on the planet and access services anywhere else for most use cases.

3.1 Cloud Economics are all about Sharing

Much is made of the distinction between "public" cloud and "private" cloud, however, in essence these are extreme cases that describe the extent to which resources are shared. The more users that can share the same resources, the greater the economic benefits of sharing. Sharing can take place at each layer in the value chain: at the data centre layer, infrastructure layer, an optional platform layer and right at the top of the value chain, at the software layer.

As one accesses this 'stack' of cloud services at the higher layers, there is less ability to customise the services, but less effort and expertise is required of the user to consume the services. This is why the value chain exists as layers. Users *can* share a common software service. Software companies *can* share a common infrastructure service. Infrastructure companies *can* share a common data centre. Sharing is what drives the economics by exploiting increased resource utilisation and greater economies of scale.

3.2 Global Scale allows Single Points of Failure to Develop

There can be a downside to sharing. It can create a dependence on the centralised and perhaps insufficiently-redundant infrastructure which underpins services higher up the value chain. Our dependence on the economics and scalability of on-demand IaaS is where we must focus. It is also noteworthy that cloud service providers are included within the scope of the EU's Network and Information Security Directive[12] affirming that the connected, shared cloud infrastructure that Europe uses cannot be allowed to develop a single point of failure.

The emergence of a small number of *hyperscale* providers of shared compute and storage

12 https://ec.europa.eu/digital-agenda/en/news/network-and-information-security-directive-co-legislators-agree-first-eu-wide-legislation

infrastructure services may have foreseeable repercussions. Whereas before, a mainframe outage had an impact on only the small percentage of global users reliant on that particular mainframe; today, an outage of one of the world's leading cloud providers has an impact on a sizeable percentage of all the world's companies, with knock-on effects for consumers, connected markets and the wider economy.

In the extreme example of Facebook, hypothetically, a system-wide outage could impact over a billion people worldwide. One might argue that Facebook is a frivolous use case but many people rely on its communication services. In a study commissioned by Facebook, Deloitte estimated that in 2014, Facebook drove $227bn of economic impact and 4.5million jobs globally.[13] It is important to consider what would happen in the unlikely event of such hyperscale services collapsing because of the unprecedented scale of the impact.

13 http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/technology-media-telecommunications/deloitte-uk-global-economic-impact-of-facebook.pdf

4 The IaaS Market

The real estate market for data centres that underlies the Infrastructure-as-a-Service market is intensely competitive, and healthy as a result. IaaS is the lowest layer in the value chain which is truly available on-demand, thanks to the pioneering efforts of Amazon Web Services. All the end-user cloud services used by government, commerce, individuals and academia rely on accessing IaaS whether public, private or a public-private hybrid.

Competing at the IaaS layer requires an intimidating combination of excellence in technology development and access to huge amounts of investment capital, which must be put at risk in an environment of persistently falling IaaS pricing. This means that whilst the numbers of SaaS companies is growing exponentially, the number of IaaS companies competing to support them has dwindled, as evidenced by companies deciding to exit the pure public IaaS market such as Rackspace[14].

4.1 Mature

At the IaaS level, the market is characterised by relatively few, large and well-funded competitors that have relatively few distinguishing differences in the technical specifications of their core Infrastructure services. The competition is thus characterised by opaque pricing, limited performance benchmarking, efforts to limit portability and migration, and continual attempts to differentiate their offerings by moving up the value chain into Platform and SaaS offerings even if they sometimes compete with their own IaaS customers.

The U.S. National Institute of Standards & Technology (NIST) defines one of the characteristics of cloud services as requiring metering capability in order to monitor and report on usage,[15] however it does not mandate that each cloud provider use the same principles or metrics for reporting on usage. Independent metering and price benchmarking provides both the provider and consumer with an increased level of transparency of the utilised service. It further enables the end consumer to make more informed choices where an effective comparison is possible.

As often occurs in mature markets, there are relatively few market leaders, with most others operating at the fringes, often with business models that are subtly different to avoid being directly compared with the market-leading juggernauts. Competing in the public cloud IaaS market is hugely challenging. We have seen the mighty IBM make a false start, acquiring Softlayer in order to regain a seat at the table.

Technology titans such as Dell and more recently HP have both bowed out of the public IaaS race, with Dell recently making a bold move to get back in the game through the $67 billion acquisition, the largest ever such technology deal, of data storage behemoth EMC. EMC is the majority shareholder in VMware, who power many privately operated and consumed IaaS clouds, and various public IaaS clouds including Virtustream, who they acquired shortly before the Dell acquisition was announced.

Rackspace, regarded by many as one of the earliest public cloud providers, exited the

14 http://www.forbes.com/sites/mikekavis/2014/07/30/rackspaces-pivot-is-a-sign-of-the-times-for-iaas-providers/#523881841279

15 http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

pure public IaaS market, perhaps due to the challenge of accessing the requisite billions in investment capital. Instead, they are focussing on offering managed public IaaS, and offering its "fanatical support" on its erstwhile arch rival, Amazon Web Services, and Microsoft Azure.[16] GreenQloud, an Icelandic market entrant, quietly decommissioned its environmentally-friendly public IaaS cloud in favour of competing in the significantly less capital-intensive private cloud software market. However, there are new international entrants to the market such as Aliyun[17] as well as those who have veered away from direct competition. Although it is not abnormal for an industry to be dominated by relatively few large providers, it is normal and acceptable for competitors to try to differentiate themselves in the mind of the customer by innovating or advertising. Colluding to divide up a market, and thereby reduce competition, is illegal but we are not aware of any evidence of such behaviour in the market.

4.2 Commodity-Like

In a pure commodity market, price is the determining factor when deciding where to purchase. We see this characteristic reflected in rapid matching of any price changes between IaaS competitors.[18]

There remain some differences in quality of service. As a result of differences in processing speed, storage access speed and other items which are hard to benchmark, a regulator must rely on the market to assess and price out the differences. This is commonplace in some highly commoditised markets such as oil or coal, in which significant differences in energy content, sulphur content and pollutants exist, but through independent assessments accepted by both buyers and sellers, price adjustments are made and transactions occur smoothly. It is important to ensure that users can, and do, choose suppliers based on independent assessments, whether provided by third parties or themselves.

Most market scrutiny at this stage seems to be focused at the top of the value chain which is SaaS. While such scrutiny is entirely appropriate, we feel SaaS markets enjoy reasonable competition as well as sufficient regulatory oversight. There are numerous alternatives to most SaaS offerings.[19] We do not anticipate systemic issues in SaaS markets and focus no further on them in this Roadmap. IaaS markets are of more interest for the purposes of this Roadmap and we note that Regulators are also starting to pay attention.

In September 2015, the European Commission launched a consultation into standards in Information, Communications and Technology ("ICT")[20]. Such standards and benchmarks are crucial for interoperability, which reduce the risk of vendor lock-in, allow a phased approach to cloud adoption using hybrid cloud technologies, and promote vigorous competition across this market.

Building on some of the Final Recommendations from the first CloudWatch project[21], there is a need to broaden understanding of certain NIST characteristics and to refine them into measurable and certifiable standards. Educating stakeholders by helping them to understand these characteristics accelerates adoption of new standards.

16 https://www.rackspace.com

17 http://www.reuters.com/article/us-alibaba-cloud-idUSKCN0Q30TP20150729

18 http://techcrunch.com/2014/03/31/microsoft-azure-matches-amazons-price-cuts-and-introduces-new-basic-tier/

19 http://www.tomsitpro.com/articles/saas-providers,1-1554.html

20 https://ec.europa.eu/digital-agenda/en/news/have-your-say-standards-help-achieve-digital-single-market

21 http://www.cloudwatchhub.eu/sites/default/files/5-CW_MS21-MD-Final_recommendations.pdf

4.3 IaaS is Essential

Europe's SaaS companies, like their foreign competitors, with their promise of jobs and growth, are dependent upon IaaS vendors.

Companies wishing to be the next "unicorn" company valued at $1bn or more, are taking this single vendor risk with their eyes wide open. On an individual company basis, it is hard to argue with their logic, or with similar logic made by an increasing number of large enterprises who have announced they are going "all-in" with a single cloud provider, shutting down their own data centres[22]. The economics are too compelling. The use of cloud infrastructure services that truly meet the NIST definition of Cloud[23] confers an immense advantage to these companies over those that run their own infrastructure, or rely on lesser quality service providers that cannot offer the requisite scale and elasticity under a self-service model.

On a European, even global basis, many companies are choosing to rely on a single vendor. For any single customer, even an "all-in" migration to a major provider is no longer seen as a big risk. At AWS' last conference, they announced that Netflix, Hertz, The Guardian and a host of other major companies[24] were decommissioning their datacentres, relying on AWS entirely. Spotify, the popular European music streaming service, recently announced they are "all-in" on Google Cloud Platform[25]. This is arguably a sensible choice, as if Google were to have some kind of catastrophic failure, there is room at AWS and/or Microsoft Azure to absorb 100% of Google Compute Platform's customer base. This may not be true of all providers. The inability of the market to absorb demand from customers of a large provider that fails represents a risk. In a world where one provider's market share for mission critical services exceeds a certain level, there is a systemic risk that society as a whole must consider.

For an individual organisation, if their service in any particular cloud provider fails it may permanently damage them because the cloud services contract, unlike in more mature markets that are "commodity-like", does not cover liquidated damages, let alone consequential damages. Understandably, a provider does not want to bear the risk of having to pay all customers liquidated damages in the event of a widespread outage. In more mature commodity markets, the risk of such payments is spread across numerous resellers.

But when so many organisations globally make that same right decision, consider the Black Swan risk - what happens if there is a problem at the Cloud Provider organisational level, a failure to follow a process, a glitch in the software that follows the process, a financial failure, or a series of targeted cyber-attacks on a weakness identified at a single provider?

In most cases, the best the user can hope for is a refund of the portion of a monthly bill prorated for the duration of the outage relative to the service period being billed. This is usually a minute portion of the total costs incurred by the users in spoilage, lost revenue and lost customer confidence. A better solution would be to emulate how this same problem is handled in other mature markets - by having a proper resale market, with increased competition, fairer allocation of risk, and most importantly, the ability to manage risks, whether they be pricing risks or catastrophe-bond-style insurance risks.

22 http://www.computerworlduk.com/cloud-computing/guardian-goes-all-in-on-aws-public-cloud-after-openstack-disaster-3629790/

23 http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

24 http://uk.businessinsider.com/netflix-intuit-juniper-go-all-in-on-amazon-cloud-2016-1?r=US&IR=T

25 https://news.spotify.com/us/2016/02/23/announcing-spotify-infrastructures-googley-future/

4.4 The IaaS Market Is Asymmetric

Asymmetry in this context is an inequality of bargaining power between seller and buyer; there are more dependent buyers, using a shared service, than vendors. In a market without mechanisms to motivate fairness and reliability, certain features can be expected to surface such as:

- Unbalanced contractual terms between parties
- Poor allocation of risk
- Opaque pricing
- Vendor lock-in through contractual terms, pricing practices or other measures
- Attempts by vendors to capture consumer surplus by e.g. restrictions on resale
- No clear path towards self-regulatory measures
- Unfair competition through vertical integration (into SaaS in this case)
- Control of resale through vertical constraints

We do not at this stage assess the degree to which this occurs in the IaaS market but we flag it as a concern. It will be discussed more fully in our final Roadmap due in 2017 (D4.3). There are already initiatives aimed at correcting some of these issues. For example, European projects funded under the the Horizon 2020 programme: The SLA-Ready[26] project aims to provide a common reference model and informative services which encourage greater transparency and standardisation in Service Level Agreements (SLA) to the benefit of SMEs; the SLALOM project[27] aims to specify SLA terms that are practical, understandable, safe and fair; finally this Roadmap asks whether IaaS providers will support these efforts and various others that encourage transparency and interoperability or will the benefits to suppliers, of lock-in and absence of transparency, prevent their support?

4.5 The Prospect of Oversight

We have alluded to the likelihood of regulatory scrutiny of *any* market that is both *essential* and *asymmetric*. In markets where significant asymmetry exists and where the market is essential to economic well-being, regulatory scrutiny is usually intense.

To be quite clear, we are not calling for this regulation. We merely note that it is a normal feature of essential markets in which significant seller-buyer asymmetry exists. The most extreme example of such a market and associated oversight is perhaps the financial markets. Regulation is aimed at creating confidence in the market by ensuring reliability, stability, efficiency and fairness. For example, after the 2008 Financial Crisis, the UK FSA was split into two regulators: The Financial Conduct Authority ("FCA");[28] and the Prudential Regulation Authority ("PRA").[29] The FCA aims to protect consumers (i.e. correct for asymmetry) and the PRA aims to ensure safety and soundness (reliability of an essential service), and both aim to promote competition.

Financial markets are a clear example of an essential, asymmetric market subject to intense regulation. The perceived disparities in expertise, insight, leverage and control of financiers relative to the general public are clearly significant (Asymmetry), while consumer reliance on the market is clearly also intense (Essential). As a result, extreme

26 http://www.sla-ready.eu

27 http://slalom-project.eu/

28 http://www.fca.org.uk

29 http://www.bankofengland.co.uk/pra/Pages/default.aspx

regulatory measures are imposed and, when either the "essential" or the "asymmetry" standards are touched, all judgements tend to go against the seller, as the larger party. In the event of market failures or smaller issues in such markets, the blame is almost immediately assigned to the supplier (bankers). Consumer protections are extremely strong. At the retail level, for example, a consumer may sign a credit or banking agreement, secure in the knowledge that legal protections are stringent[30], and ambiguities are likely to be interpreted against the bank in legal proceedings.[31]

Such regulations can be imposed proactively but often the most onerous are imposed after a market failure event such as the Great Depression or the 2008 Banking Crisis. Lehman Brothers had an A+ credit rating just months before going bankrupt and dragging down the world financial systems in 2008. As a society, we clearly need to get better at planning for highly unlikely Black Swan risks. What if one day a major IaaS provider failed? What might happen? After service outages, we would surely see frantic build-outs of private clouds at inefficient data centres, bankruptcies of a large number of digital SMEs, irreparable damage to trust of public cloud infrastructure and a significantly adverse knock-on effect in other markets across Europe.

30 http://ec.europa.eu/consumers/archive/rights/docs/ccd_implementation_report_en.pdf

31 http://www.bailii.org/ew/cases/EWHC/QB/2009/3417.html

5. Why Does This Matter For Europe?

The objective of the European Commission's Digital Agenda is to foster innovation, economic growth and progress. The strategy is built around seven pillars,[32] one of which is "Enhancing Interoperability and Standards".

Europe's Tech communities are incubating digital SMEs that leverage the scalability of on-demand infrastructure offered by a small number of global IaaS providers. Many cannot migrate between, or simultaneously use, different IaaS vendors. For those that *can* interoperate, is there sufficient diversity of supply at the IaaS layer to be resilient to unexpected outages, whether caused by technology, business process or financial weakness? As digital SMEs prove their case to be successful and scalable, they repeatedly face competition from their own IaaS providers' SaaS products.

End users of any service, specifically IaaS, are wary of vendor lock-in, yet vendors are motivated to achieve it. There are numerous examples of where this is the case, most prominent would be punitively high fees required to retrieve data when switching providers, or more passively, the cost of transferring data out being much higher than depositing data.[33] Regulators normally actively seek to protect consumers from any hidden "barriers to switching" as seen in regulatory actions related to bank accounts[34] and energy suppliers[35].

The European Commission has itself concluded that one of the three key actions necessary in order to deliver on the goals of the Digital Agenda 2020 are to "cut through the jungle of standards" because "...individual vendors have an incentive to fight for dominance by locking in their customers, inhibiting standardised, industry-wide approaches."[36] One area that is not mentioned is how contractual prohibitions or restrictions on resale also create lock-in and inhibit longer term commitments to public IaaS despite associated pricing discounts.

32 https://ec.europa.eu/digital-agenda/en/digital-agenda-europe-2020-strategy

33 https://aws.amazon.com/blogs/aws/aws-lowers-its-pricing-again-free-inbound-data-transfer-and-lower-outbound-data-transfer-for-all-ser/

34 https://www.fca.org.uk/static/fca/documents/fsa-know-your-rights-guide.pdf (See also Note 14)

35 http://www.goenergyshopping.co.uk/en-gb

36 http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52012DC0529&from=EN

6 Key Recommendations

6.1 Encourage Self-Regulation and Fair Conduct

In markets where self-regulatory initiatives such as 'Codes of Professional Conduct' are present, it encourages pricing transparency, enables switching and interoperability, and facilitates access to unbiased information for the buyer. Where such initiatives have been introduced in mature markets in Europe such as energy[37,38], telecommunications[39,40] and financial services,[41] the benefits are obvious. The resulting increases in transparency, ability to switch and fairness leads to increased competitiveness, confidence, uptake and resilience.

6.2 Maintain Vendor Neutral Policies

Policies should encompass a wide view of this layer of the market in order to avoid unnecessary 'sponsoring'. It may be unnecessary to favour certain Infrastructure-as-a-Service providers solely due to geographical location of their headquarters.

6.2.1 Unnecessary Sponsoring

Providers based in Europe are advantaged by data protection regulations that require data remain in the EU. Recent revelations, showing that data that leaves the EU for other jurisdictions could be accessed at will and without due process by foreign authorities, have strongly reinforced this advantage. The major incumbent providers who try to compensate for this must build data centres in the EU. Hence, the EU still receives the investment, infrastructure and jobs

6.2.2 Higher Value Available in SaaS

The cost of subsidising European IaaS providers would be better invested further up the value chain. Public policy would be served best by promoting the most resilient, competitive and complete market in IaaS possible in order to provide European SMEs, new SaaS entrants, and government and research institutions access to economical and reliable IaaS. IaaS is already a relatively mature industry after only 10 years in existence and can operate as a market analogous to other mature commodity markets. Policy appears appropriately directed at achieving a more competitive, resilient market. This may prove to be an important area of further research and industry consultation.

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37 http://www.energie-nederland.nl/wp-content/uploads/2013/08/Gedragscode-Consument-en-Energieleverancier-2015.pdf [NL]

38 https://www.ofgem.gov.uk/information-consumers/domestic-consumers/switching-your-energy-supplier/confidence-code

39 http://stakeholders.ofcom.org.uk/binaries/telecoms/policy/mobile/cop.pdf

40 http://www.arcep.fr/?id=8146 [FR]

41 example of voluntary dispute resolution in German financial services http://www.bafin.de/DE/Verbraucher/BeschwerdenAnsprechpartner/Ansprechpartner/Finanzombudsstellen/finanzombudsstellen_node.html [DE]

6.3 Remove Restrictions On Resale

The desire to capture the consumer surplus by keeping tight controls on resale motivates restrictive contracts with resellers. These provisions should be removed in all their forms. A vibrant secondary market is essential to the health of other competitive markets, particularly those seen as commoditised. Financial markets are a classic example. The Deutsche Börse has tried to found a Cloud Exchange[42] but the major providers are not listed as participants. Without clear ability to buy for resale, vendor lock-in and price discrimination is further facilitated. As a result, the company ended registration for new users of the marketplace in January 2016 and the public marketplace was terminated in March 2016.

Furthermore, efforts to promote more sharing between users such as Helix Nebula[43] could be frustrated by restrictions on sharing between members. Even if, as is likely, IaaS providers allow such sharing between members of a single buying consortium, further sharing between different consortium initiatives might be frustrated. Any ongoing restrictions on resale are likely to delay the implementation of new procurement frameworks that have been underway for years.

Scale depends on resale because of the need to reach the wider market with new cloud offerings. Resale contracts must sufficiently evolve beyond referral or commission only models in order to accelerate market uptake of cloud services. This allows the market to fairly and transparently determine appropriate wholesale prices, increases competition and encourages more usage by allowing resellers to navigate through the technical and financial complexities of such transactions. By removing restrictions on resale, users such as large research institutions down to SMEs are more likely to procure cloud services on terms that fairly apportion risk.

An unfettered ability to 'buy for resale' would increase cloud uptake by allowing resellers to intermediate, and put capital to work to reduce the extreme disparities seen in the terms and conditions related to contract length and payment for cloud services. The variety of contract offerings would rise dramatically allowing users to contract with substantially more flexibility than is currently possible.

42 https://cloud.exchange/en/

43 http://www.helix-nebula.eu/helix-nebula-vision

7 Summary

In summary, the preliminary version of this Roadmap concludes that systemic risks may form or may already exist in the Infrastructure as a Service layer of the cloud computing market.

Due to the essentiality (Europe's critical dependence on this Infrastructure) and asymmetry (inequality of bargaining power in the seller-buyer relationship) of this market, we conclude that oversight is likely and imminent, and that steps should be taken by the industry to achieve a fair, transparent and competitive market in advance of any regulatory action. We call for the removal of restrictions on resale, greater pricing transparency, risk intermediation and to draw awareness to the risks of creating public policies artificially 'sponsor' one provider over another.

We further call for the introduction of a Code of Professional Conduct - *before* the need to introduce retroactive legislation, often too much, and too late in response to a market shock or collapse – is often an important step to facilitate self-regulation. Any Select Industry Group engaged to draft and adopt such a Code of Professional Conduct must fairly represent industry, policy makers, government and other influential stakeholders. The formation of such a working group and the terms of a Professional Code of Conduct is recommended through an EC-funded initiative following the publication of the Final Version of this document in 2017, however CloudWatch2 members are qualified to recommend members of such a Select Industry Group in order to ensure expedient adoption after final publication.

Disclaimer
The information, views and recommendations set out in this publication are those of the CloudWATCH2 consortium and do not reflect the views of the European Commission.

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