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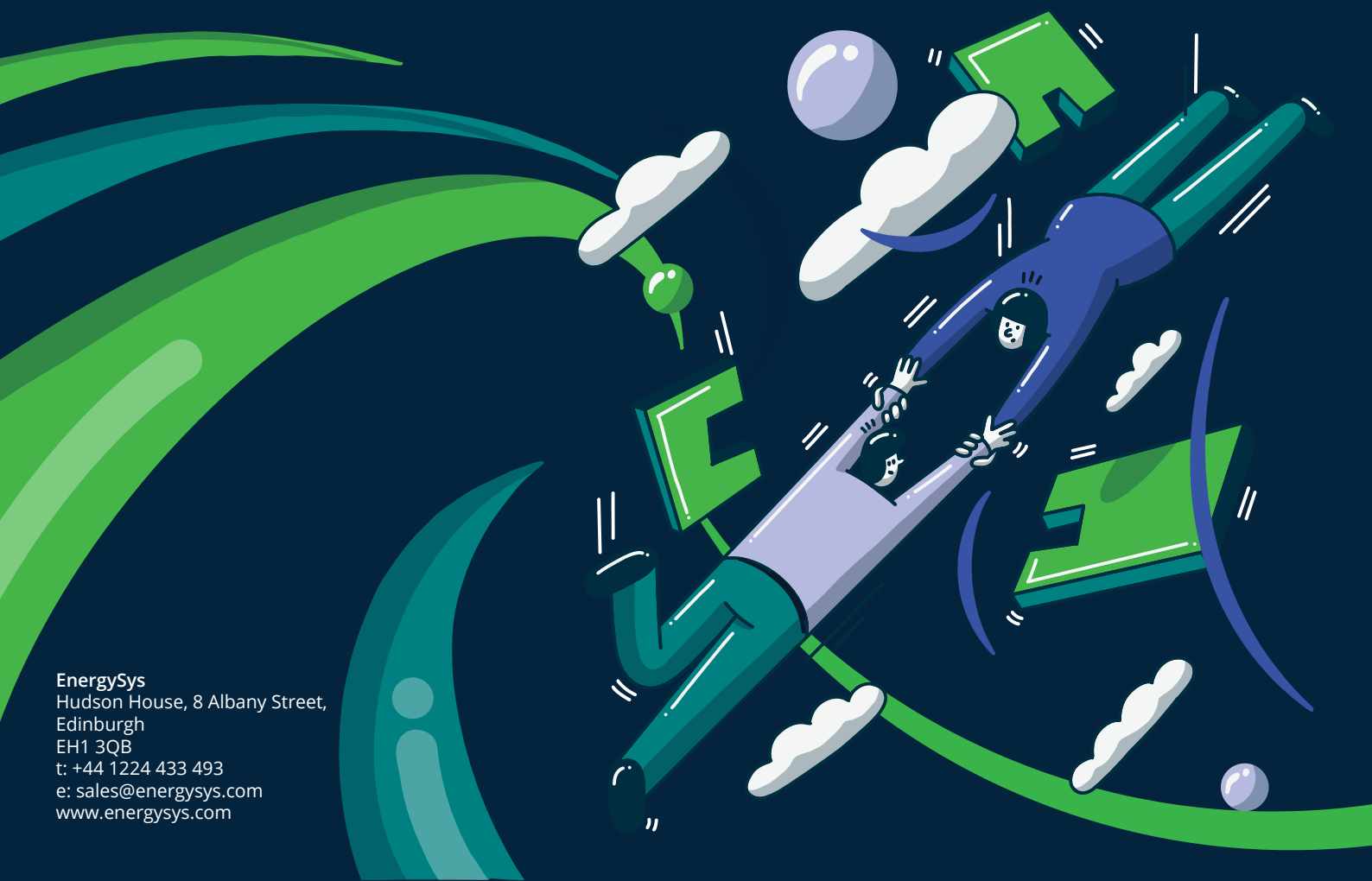
The End of Corporate Computing - Revisited

What's happening, and why it's happening now



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1 Introduction

1.1 Change is Coming

Cloud computing is going to revolutionise the oil and gas industry, and it will be necessary to understand and embrace the changes that are coming. For companies that don't recognise the need to transform, the most probable future involves painful decay, steady loss to competitors, and a slow march to irrelevance.

In this paper, we'll explain what these changes are, and why the transformation is so radical. We'll explain exactly what cloud computing is, and what it's not. We'll show that what's happening could not have occurred before now, and that a fortunate convergence of technology and industry initiatives are creating a perfect storm of change. Finally, we'll show you the one diagram that explains it all, and might provide a guide for your own business transformation.

1.2 The Definiation of Cloud

There's a great deal of confusion about cloud, and what it really means. In part, this is a result of widespread "cloud washing", where vendors simply add the word "cloud" to products as an attempt to capitalise on market interest.

One of the most widely cited papers is from the US National Institute of Standards and Technology, which provides a definition of cloud computing (Mell, et al., 2011). They define five essential characteristics of cloud:

- On-demand, self-service. This means that consumers (or end users) can provision computing capabilities, like server time and storage, without needing to contact a service provider. In other words, the power is in the hands of the user and doesn't mandate third-party involvement.
- Broad network access. This characteristic implies that the access to services is over standard mechanisms, and that it doesn't require specialist or proprietary technology. You can use laptops, or phones or whatever device is appropriate for your work.
- Resource pooling. The resources, like compute power or network storage, are shared among multiple users, or tenants. There is no requirement to understand how this is achieved, or to know the location of the compute resources providing the service. Obviously, security and governance concerns must be addressed.
- Measured service. Usage of compute resources is measured and controlled to benefit the provider and the consumer. There is transparency, and users generally pay only for their metered use of resources. Charging can reflect demand, thereby controlling consumption and increasing efficiency.
- Rapid elasticity. This is one of the most important characteristics. The resources that I provision as a user, in a self-service model, can be scaled up or down to meet demand in an apparently unlimited fashion. In accordance with the measured service characteristic, I will only be charged for the resources I use.

It is essential, in evaluating the claims of vendors, to assess what is promised against these five characteristics. While the NIST paper does define a private cloud deployment model, very few organisations will have the demand or the ability to deliver a service with the characteristics above. Cloud is not the same as virtualisation, though it might use this technology. Cloud is not the same as

asking a provider to host your applications. Cloud is not a set of open source technologies. Cloud is an entirely different business model, as we will see.

1.3 The Three Tenets of Cloud Computing

With the above characteristics in mind, and recognising the need for a less technical description of the distinctive nature of cloud, we have developed our three tenets of cloud computing. These principles try to capture what we think is essential and different about cloud, and allow an evaluation against competing offers.

- First, cloud computing customers pay for service, not software or hardware.
- Second, cloud computing customers pay for value delivered, not value promised.
- Third, cloud computing customers expect to be in control, not without control.

These tenets are not antithetical to the list of characteristics summarised in the previous section. They simply provide a representation of the real benefits of the cloud. Paying only for what is used, and the value it delivers. Getting that value immediately, not after a prolonged project implementation. Having that service under your control, adding to the capacity when you need it, reducing that capacity when you don't. This is not about slightly better technology, or about different deployment models, but about an entire new way of buying computing. Service, not software.

2 Evolution of the Model

2.1 Through a Glass Darkly

The cloud computing model did not appear overnight. Its emergence and its likely dominance was forecast by many authors over many years. Companies like Sun Microsystems invested heavily in creating some of the products and services required for cloud but, ultimately, they could not bring it to the mass market. Just as is the case today, people were confused by apparently related initiatives, like thin client computing, that obscured the bigger and broader trend. The dot-com boom brought unprecedented investment in on-premises hardware and software, and after the bust in 2001 the market was left saturated with unwanted and unused computing equipment. The appetite for transformational change was low at this time, and many were cynical and distrustful of vendor promises.

In the following sections, we'll consider some of the most interesting forecasts of the future, and discuss why the future these authors foresaw did not come sooner. There's a natural tendency to see events in hindsight as evidence of steady progression to the current state, but there were few people in 2003 who forecast exactly how the promise of cloud would be realised, or the fact that an online book seller would lead the way. Forecasting the future is always easiest in hindsight.

2.2 The Network is the Computer

In 1984, John Gage of Sun Microsystems created the phrase "The Network is the Computer", later used as Sun's company tagline (Edstrom, 2013). This was a remarkably prescient statement, given that Ethernet had only been in existence since 1973, and the World Wide Web would not be invented until 1989. Further, it wasn't universally acknowledged or understood. A t-shirt produced by a competitor around that time declared that: "The Network is the Network. The Computer is the Computer. Sorry for any Confusion". Microsoft produced early versions of Windows with no built-in networking stack, and it wasn't until 1993 that a specialised version of Windows 3.1 was released to support peer-to-peer networking.

Gage's statement recognised that the power of systems, networked together, would provide vastly greater capabilities than even the sum of the systems they connected. The real power lay in the network, not in the individual workstations or servers.
Over the following thirty years, we've seen Gage's vision dramatically realised, and the number of networked devices has grown exponentially, with device numbers estimated to have exceeded 16 billion in 2015.

This underlines the fact that radical transformation is not always initiated by revolution, but rather by the slow, soft click of multiple different pieces falling into place, like tumblers in a lock. It requires these different pieces of the puzzle to come together at the right time, and the result is dramatic change.

2.3 The End of Corporate Computing

Sun Microsystems, among others, made frequent reference to the electric power generation and distribution business as a model for computing. They argued that the evolution of the industry, from companies with small-scale, privately-owned electrical generation capability, to large-scale industrial

generation, mirrored the likely changes in IT. In short, few companies own their own generators, and most people rely on power utilities for service. In future, they argued, few people would have their own data centres, and everyone would buy service from utility computing providers.

At that time, no-one argued this better than Nicholas Carr. In two seminal papers, written in 2003 and 2005, Carr described the commoditisation of other infrastructure technologies, like electricity distribution and railways. At the start of a new revolution, the benefits accrue to only a few companies. Those who are first movers, or who have superior insights into the potential of the technology, can gain considerable advantage. However, as the technology matures, this advantage dwindles. Further, the full economic value of technology is only realised when it is open and shared. This process is, to some degree, inevitable. The "characteristics and economics of infrastructural technologies, whether railroads or telegraph lines or power generators, make it inevitable that they will be broadly shared—that they will become part of the general business infrastructure." (Carr, 2003)

In applying these lessons to IT, and suggesting that we are now seeing the "end of corporate computing" (Carr, 2005), Carr was undoubtedly being provocative. However, based on the historic parallels, he probably anticipated widespread resistance to his message, and considered the provocation justified. For example, many shipping companies viewed the emergence of the railways as an additive business, rather than one that would decimate their industry. As a result, they delayed change and many went bust.

The lessons for oil and gas, traditionally a highly conservative industry, are clear. There is a strong desire to cling to traditional models of procurement and supply of IT, demonstrated by both providers and consumers. The truth is that the core functions of IT have become "costs of doing business that must be paid by all but provide distinction to none." (Carr, 2003)

Carr makes the point that IT is a competitive necessity, but no longer strategic, and in such cases the risks it creates are more important than any advantage it confers. Few companies consider their risks adequately, not least the real possibility that they are spending more than they need to on resources that provide far less value than they need to.

Though Carr's vision of the future was undoubtedly correct, even though it is still not fully realised, his thinking evolved in the two years between the papers. In the earlier document, his solution focussed on reducing the costs of IT, better managing storage and reducing the investment in expensive, underutilised desktop PCs. He mentioned, in passing, that companies would increasingly "fulfill their IT requirements simply by purchasing fee-based "Web services" from third parties—similar to the way they currently buy electric power or telecommunications services." However, by 2005, he is calling for the end of the corporate data centre, and a switch to centralised utility computing.

The later paper also contains the missing piece of the puzzle, in the story of Samuel Insull, advisor to Thomas Edison and creator of one of the largest monopolistic utilities of the early twentieth century. Insull had worked with Edison, and was a keen believer in the potential of electricity to transform the world. He was appointed President of Chicago Edison in 1892, when the company was one of many small electricity supply companies in Chicago. A true visionary, Insull understood the power of scale, and invested heavily in generating capacity and in acquisitions. By 1913, Commonwealth Edison, as it had become, had a monopoly on electricity supply in Chicago.

Applying ideas that he had first seen in the UK, Insull developed variable pricing models based on metered supply, cutting bills but encouraging use. By 1930, approximately 80% of US electricity demand was met by utilities, and Insull played his part in this revolution.

Returning to IT, Carr recognised that overcoming entrenched management assumptions, traditional practices and past investments, would require that "a modern-day Samuel Insull" arrived "with a clear vision of how the IT utility business will operate, as well as with the imagination and wherewithal to make it happen. Like his predecessor, this visionary will build highly efficient, large-scale IT plants, weave together sophisticated metering and pricing systems and offer attractive and flexible sets of services tailored to diverse clients." Enter Jeff Bezos, founder, chairman and CEO of Amazon.com.

2.4 Turning a Page

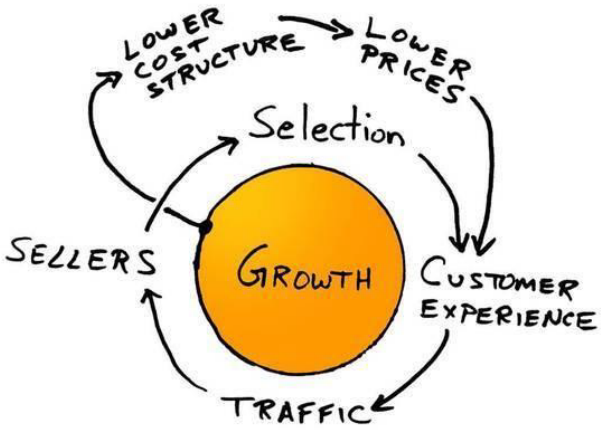
In 2003, just when Carr was producing the first of his two papers, Benjamin Black and Chris Pinkham were writing their own paper for Jeff Bezos at Amazon. This described a vision for Amazon infrastructure that "was completely standardized, completely automated, and relied extensively on web services for things like storage." (Black, 2009)

Early in 2004, Bezos gave the green light to the creation of EC2, the first of Amazon's cloud services, to deliver virtual servers as a service. Again, with the benefit of hindsight, we can see that Amazon was never a book company, and was always an infrastructure company. As such, this move was daring, and somewhat ahead of its time, but absolutely aligned with the DNA of the company. With his commitment to providing service at scale, and metered usage of resources, and variable charging, Bezos was undoubtedly the "modern-day Samuel Insull" that the fulfilment of Carr's vision had required.

3 The End of Corporate Computing: Revisited

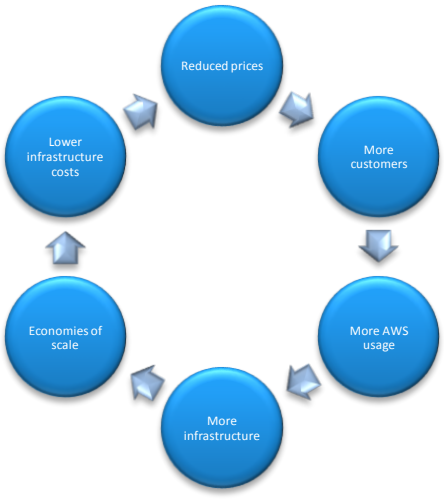
3.1 Creating the Utility in the Utility Model

That scale is key should not be in doubt, but Bezos and his team brought their own perspective to the combination of elements contributing to ultimate success. The Amazon Flywheel, also known as the Virtuous Cycle, captures the essence of the company's business model (Seely, 2016). Proving that nothing is new under the sun, this draws heavily on Sam Walton's Productivity Loop (Snyder, et al., 1994).



By providing a wide selection of product, and driving down the cost of supply and the price, Amazon can improve customer experience, increase traffic to its web site, and add to its sellers. This increase in volume adds to the range of product on offer, and the opportunities to cut costs and prices. The virtuous cycle.

A similar philosophy drives the Amazon Web Services (AWS) business, as shown in the diagram below.



This is the AWS version of the virtuous cycle, and it is relentless in its commitment to drive down costs and add value. Simple though it is, it explains the current dominance of Amazon, and has allowed AWS, pursued by Microsoft and Google, to become the current top utility provider of this generation.

It is the one diagram that explains why the cloud has become the single greatest disruptive force that IT has ever seen, and represents an unending focus and drive rarely seen in corporate IT.

It seems unlikely that we will have to wait twenty years for the majority of the world's compute resource to be provided by a combination of these newly emerging utilities.

3.2 The Multiplication Power of the Cloud

Carr identified that interconnection and interoperability has been, and continues to be, core to the development and standardisation of IT. However, standardisation in cloud services, most notably in web services, has released a dramatic and potentially unique range of productivity benefits.

As a matter of convention, there exist standard, and fairly uniform, ways to make programmatic calls on cloud services. This means that combining two or more services is straightforward, and far easier than was ever the case with on-premises systems. Integration tools like Zapier (www.zapier.com) and IFTTT (https://ifttt.com) make the construction of simple workflows cheap and extremely simple. The results, though, are remarkably powerful, not least in the fact that many services can be combined without high cost, because of the cloud consumption cost model. Scale brings economies.

This is what we call the "multiplicative impact of the cloud". Users are not limited to a small subset of applications, or a limited number of touch points. They can combine an arbitrary number of distinct services from different providers, and by doing so they can build a wide range of new applications. It is possible to create, quite literally, an infinite number of new tools.

3.3 Power to the User

The infrastructure analogues developed by Carr are compelling in their insight, as we have seen. However, one key benefit of cloud does not fit well with the industrial analogues he has identified. Cloud empowers users in a way that seems to be unique. The contrast with the tendency of traditional IT to disempower users is stark.

Cloud is moving IT back to being an enabler of users. There is an expectation that IT will be manageable by users, and the contribution to the business will be immediate and direct. From provisioning to reporting to analytics, users want and need to be in control.

Excessive control and restriction on agility, long the characteristics of traditional IT, are no longer acceptable. IT practitioners need to recognise this trend, and move to a role that enables and empowers, not restricts and constrains. The role of IT practitioners in the future is akin to that of the guard in American football. Their job is not to make the play, but to protect the quarterback and create openings for the running backs. This is not natural to the current generation of IT professionals.

3.4 A Case Study

EnergySys Limited is a software developer for oil and gas. The company has long experience in hydrocarbon accounting and production reporting, and in 2001 they started the job of building a true multi-tenant, secure, cloud platform for production data management.

The EnergySys Platform is now in use by clients around the globe, including West Africa, Switzerland, the UK, the US, the Caribbean, and the Middle East. The system is completely configurable, and has been used successfully for a wide range of assets, including onshore gas networks, offshore gas and oil gathering systems, LNG plant, crude oil pipelines, gas distribution systems, and many others. It is, first and foremost, built for cloud.

The company is undoubtedly qualified to build IT infrastructure. It understands hardware and software, and has significant experience in building and maintaining scalable infrastructure based on the latest operating system technologies. However, it does none of that.

The company focusses on doing only the things it does best. In other words, building the best platform for hydrocarbon accounting and production reporting that the world has ever seen. It has no servers. It has no data centres. Its email and calendar and team sites are in the cloud. It uses Google Suite and Office 365. It stores the source code for its platform in a cloud repository. Code build is done in the cloud. All document management is in the cloud. Every physical document is scanned and stored in the cloud. It uses multiple tools for web video conferencing, and for internal meetings. It uses GoToMeeting for client presentations and for demonstrations. All its platform services are hosted in AWS.

The company uses SSO to access all services, with multi-factor authentication to ensure security. It operates a least privilege model to ensure that people only have rights to do the things they need to do.

As we have said, the job of EnergySys Limited is to build the best hydrocarbon accounting and production reporting system that the world has ever seen. It turns out that someone else does all the other things better.

4 Conclusions

4.1 Sink or Swim

The choice is stark. Either develop a strategy for the cloud, or plan to be out of business within ten years. Clearly, this is not a maxim that will apply to everyone. Companies like Shell or ExxonMobil have the resources to swim against the tide for long, long periods. Even so, the effort required to fight the currents is substantial, and erosion will eventually wear away even the biggest and strongest rocks.

As with all matters of evolution, it is not necessary to fight but to adapt. There is a role for the IT organisation in most companies, but it is not the traditional job of managing servers and licensing and deploying upgrades. The responsibility of IT professionals is enablement, allowing the business the freedom to deliver extraordinary results, and to do so in a way that is safe and secure. It is working out how to allow users to use any tool they like, to do their work in the best way possible, and to maintain and secure the data that is the lifeblood of any company. In many ways, it is a much more challenging and exciting role. It is central to the business, rather than being a constraint on the business. It is looking for tools to support new ways of working, and faster ways to grow and maintain business. It is placing the user at the centre of the world, once more.

4.2 Making a Start

Given all of the arguments above, it is natural to ask the question: “Where do we start?”.

Fortunately, the answer is that it doesn’t matter. Starting is enough. Choose an area of the business where there are service providers in the cloud, and evaluate the options and make the change. Do it quickly, though, as time is against you. In simple terms, just start.

A number of oil and gas companies have developed an interesting approach. They talk of “cloud first”. While this is an appealing concept, suggesting that cloud will be the first choice for future applications, it masks a degree of reticence and discomfort. No-one is suggesting that companies should wholesale replace their on-premises solutions, but there is a strong case for evaluating all aspects of the business and deciding if cloud could provide a better service at lower cost.

Note that this isn’t about having your applications hosted. If the product you use is not built for cloud, and is not multi-tenancy, and the hosting company is asking you to pay for a particular size of server and a particular amount of storage, whether virtual or otherwise, this is not cloud. It is always useful to refer to the NIST characteristics, or our cloud tenets, to evaluate what is being offered.

There may be reasons why you might still choose to host an application, of course. Cloud options might not be available for your application. You might simply be looking to transfer the responsibility for maintenance of systems and upgrades and so on. These are certainly legitimate reasons, but you will not benefit from the advantages that true cloud offers, including advantageous economics brought by the economies of scale.

As a final point, be aware that any change will be met with reasons why it won’t work for the use case that is being considered. Data volumes are too large, or latency is too high, or communications are unreliable. In most cases, there is a solution, and the key is to actively look for them, rather than accept the excuses.

4.3 Changing the Model

One further point is worth making. For most companies, the fact that you currently buy servers and operating systems, and buy and install databases, doesn't imply that you should do so in the future. Replacing your on-premises kit with virtual kit in the Amazon cloud is probably beneficial, but it misses the point. Unless you are a software development business, your requirement is for the applications that run on these compute resources, not for the compute resources themselves. Your goal should be to buy service, not software.

Oil and gas companies require production accounting, reservoir simulation, well test interpretation, and so on. These are the services to look for in the cloud. These are the services that will deliver the real benefits of cloud to a business.

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