Hybrid Cloud:
A Strategic Roadmap

Executive summary

The cloud is here to stay. Investments in cloud services are expected to continue growing at double digits over the coming years. Nevertheless, obstacles to the effective adoption of cloud services remain. Principally, IT decision makers have concerns about data security and regulatory compliance, which raises questions about the optimal cloud deployment model (private versus public). In addition, IT departments worry about losing control over how cloud services are procured, deployed and managed, since a purely reactive/ad hoc approach to the cloud could lead to spiralling costs, security issues and data interoperability problems.

In BT's view, the hybrid cloud is neither a point solution nor a transitory state toward a more unified model; on the contrary, a hybrid cloud is the optimal architecture for handling the inevitable complexity of a company's IT infrastructure. It is a catalogue of cloud services that allows the business to select the right cloud service delivery model for each application.

How do companies ensure that they adopt a strategic approach to cloud deployment and thus achieve maximum benefit from the latest cloud developments? In this paper, BT offers a three-pronged answer to this question:

1) Why adopt a hybrid cloud

Different needs require different cloud deployment models. BT recommends that companies adopt a hybrid cloud architecture that allows for easy integration of distinct cloud infrastructures and services.

2) Redesign the IT department for cloud service brokering

The role of IT in the business is evolving. IT departments will increasingly adopt a service broker and service integrator role, as opposed to building platforms themselves. This fundamental shift to focus on the 'I' of Information in IT, has implications for IT procurement, governance and compliance that should be considered.

3) Define your strategy and execute your services roadmap to the cloud

You can start today. It is critical that IT controls the development and management of the organisation's cloud strategy from the start. By defining your strategy with the cloud and by taking a piecemeal approach to its implementation you can define long-term goals, as well as reap short-term benefits.

Cloud is here to Stay

Strong uptake of cloud services

BT finds that its enterprise customers are showing increasing interest in cloud services. Yet the uptake and integration of cloud services in business is still in a very early stage of maturity. Indeed, most IT research firms report that the uptake of cloud services has increased significantly over the past year and is expected to continue growing at an average CAGR[1] of 29,2%[2]. In a survey of 200 European companies in 2013, research firm OVUM[3] found that the uptake of SaaS[4] and PaaS[5] has increased significantly compared to their 2012 findings. Looking further ahead, Gartner estimates that total spending on cloud services will increase from $110 billion in 2012 to $210 billion in 2016[6]. Research firm Canalys[7] is less optimistic but still expects CAGR of 9.8% over the period 2012-2017.

Demand for cloud services driven by needs of employees and the business

In BT's view, interest in cloud services is driven both by the needs of end-users and the needs of the business. The earlier mentioned OVUM study reports that cost control and improvements in business efficiency remain the primary drivers for European companies' investment in cloud services. Nevertheless, BT finds that many of its customers are taking a more strategic approach to cloud services and seek to not only reduce cost but also bolster the company's ability to compete in an increasingly dynamic and globalised market. Many of BT's customers are large organisations that employ thousands of people at multiple sites around the world. They typically have grown organically and via acquisition, leading to a fragmented IT infrastructure. In recent years however, companies have come to face an increasingly competitive and rapidly changing market environment, which is forcing them to simplify their operations so that they can both reduce costs and react faster to changing business needs. Hence from an IT perspective a cloud model that incorporates flexible provisioning, on-demand service and resource pooling begins to make increasing sense. In BT's experience, the following aspects of cloud services more and more appeal to business managers:

- **Business agility:** the ability to scale capabilities rapidly up and down in line with business need, is a key benefit. Especially important is the ability to reduce CAPEX spending via deployment of an on-demand model.

- **Empowerment of employees:** trends such as globalisation, technology consumerisation, Bring Your Own Device and the popularity of social media have all had a profound effect on what employees expect from corporate IT. Up to 70-80% of companies' employees work away from the office, and many work in international and cross-functional teams not only within their organisation but also across organisational boundaries.

More than ever, employees expect seamless access to their business applications and communication tools, independent of their location or the device they happen to be using. To meet those needs it is advisable to adopt a cloud-based architecture where resources are accessed over the network.

- **Rich functionality, easily implemented:** new SaaS providers offer rich functionality with low implementation and operational costs. As such, these services can easily be purchased and consumed by the business without intervention of the IT department. While many business users may favour this approach, the risk here is that they do not consider exit strategies, data security, compliance, total cost of ownership and data integration issues. The IT department has an important role in this regard, governing TCO, security, compliance, and overall data architecture.

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[1] Compound Annual Growth Rate. The year-over-year growth rate over a specified period of time.
[2] Gartner, Public Cloud Services Forecast, Sept 2012. CAGR 2011-2016: IaaS 41,8%; PaaS 26,6%; SaaS 19,1%.
[3] OVUM. Cloud services: Business Trends Survey 2013: European Results.
[4] Software-as-a-Service
[5] Platform-as-a-Service
[6] Gartner. Forecast: Public Cloud Services, Worldwide, 2010-2016, 4Q12 Update.
[7] Canalys. Private and public cloud computing forecasts: Market overview 2013.

• **Business ecosystems:** collaborating in projects across both geographic and organisational boundaries is more important than ever. A cloud architecture is useful in that regard because it offers the required flexibility, mobility and security. In particular, community clouds are gaining traction because such models offer both functional and commercial flexibility in a field where speed is of the essence. An example is the BT for Life Sciences cloud, where R&D divisions of multiple pharmaceutical companies share computing resources on a dedicated R&D cloud platform.

• **Big data:** while most large companies are beginning to recognise the Big Data opportunity, few have the in-house capabilities to properly process, analyse and protect high volumes of data. An on-demand model with specialised data storage and analytical services makes increasing sense in that regard.

• **Easy roll out internationally:** when companies open new offices internationally it is even more practical to rely on cloud-based services as opposed to investing in new on-site IT infrastructure.

While cost control is still an important criterion to consider when making the business case for cloud services, in BT's experience it is strategic factors and added business value such as the above that drive interest in cloud services. Most business managers recognise that the business environment is changing fundamentally as a result of digitization and that the cloud will be pivotal as the means to adapt to and exploit those changes.

BT recently commissioned a study among large companies in Belgium, the Netherlands, Germany and Switzerland to assess the impact of what is termed the real-time economy on business and corporate IT[8]. The senior executives interviewed in this survey nearly all recognise a profound change in their business environment caused by the ongoing digitalization. When asked what aspects of their business would be most impacted by the real-time economy, the vast majority of respondents (94%) agreed that they are facing a new IT paradigm where all IT, logistics and production systems are connected into a real-time network infrastructure. Most respondents (90%) also felt that they needed to adapt to a new marketing paradigm where customer requirements and feedback are directly integrated into the company

So while today mainly internal factors such as mergers, acquisitions and business restructuring drive the growing acceleration and connectedness of business processes, in the future managers believe that the mobile lifestyle of customers and employees will primarily drive the progress towards a real-time economy. Indeed, over fifty percent of the respondents expected a massive increase in speed and connectedness of their business processes in the coming years, which most think will benefit the customer experience and drive efficiency and profitability.

Obstacles Remain

While most companies have committed, in principle if not yet in practice, to the cloud, obstacles do remain. According to a recent study by IT research firm OVUM, concerns about data security and regulatory compliance are the two most important obstacles to cloud adoption, especially in Europe. European companies appear far less enthusiastic about public cloud and outsourced private clouds compared to US companies. OVUM ascribes this finding to the fact that most major public cloud providers are US-based, which creates data sovereignty issues for European companies.

Another obstacle to cloud implementation is the fear of losing control. A recent study by consulting firm KPMG[9] for example, found that many IT decision makers are hesitant about releasing services into the cloud because they fear losing control. Another major concern is the potential complexity of integrating cloud services with existing architecture and the costs associated with this.

On the whole, many IT decision makers remain hesitant about the cloud because they have three pivotal questions to which they do not yest have acceptable answers:

• **What is the optimal cloud deployment model?**
Most IT decisions makers have concerns about data security and regulatory/compliance concerns. While a private cloud deployment addresses these issues in part, questions can then emerge about whether the full benefits of the cloud (resource sharing, rapid elasticity, enabling business ecosystems) are harnessed in such a model.

• **What will be the impact on the IT organisation?**
By moving services to the cloud, the role of IT is bound to change significantly. How will IT retain control over IT strategy, data security, compliance and total cost of ownership?

• **What is the optimal implementation strategy?**
How does IT ensure that the company takes a strategic approach to its new IT architecture and avoids a purely reactive, ad hoc accumulation of cloud services? How does IT make sure that they do not run into data interoperability problems? How do they make decisions about which cloud model to deploy and how do they manage their relationships with providers of cloud services?

In this paper, BT offers an answer to each of these questions:

1. Why adopt a hybrid cloud

2. Redesign the IT department for cloud service brokering

3. Define your strategy and execute on your services roadmap to the cloud

[8] The real-time economy: impact on business and corporate IT. Study by Experton, commissioned by BT in cooperation with Cisco, 2013
[9] Breaking through the cloud adoption barriers. KPMG Cloud Providers Survey, 2013.

Why a Hybrid Cloud

In BT's view there is no single cloud deployment model that is ideal for all business needs. Most companies are beginning to utilise a range of different public cloud services while simultaneously building private cloud infrastructures. Research firm OVUM for example, reports that more than 90% of European companies it surveyed have already invested or have plans to invest in SaaS. This is while the bulk of cloud spending in 2013 ($72.2 billion out of a total of $124.8 billion) is reported by research firm Canalys to be going to the private cloud.

A private cloud deployment model - whether owned on-premise infrastructure or sourced as a managed service - is often the preferred model for handling sensitive data and applications that are of strategic importance to the company or subject to regulatory conditions. However, if a private cloud is built in-house then it will require excess standby capacity and capital costs.

Such costs can be overcome to some extent by sourcing the private cloud as a managed service, hence BT's view that managed or hosted should be the preferred sourcing strategy for the private cloud.

Public cloud infrastructures are often called upon to handle peaks in demand for computing resources (IaaS), for testing (PaaS), and for non-critical/niche services (SaaS). The primary benefits of public cloud services are their commercial efficiency (due to resource sharing) and flexibility (pay for what you use, rapid up and down scaling of capacity). However, compared to a private cloud model, public cloud services can be more difficult to tailor to the unique needs of the customer and offer fewer security, privacy and compliance guarantees.

Community cloud services attempt to harness the benefits of both private and public clouds by offering a secure, semi-private and elastic service that is tailored to specific business processes (e.g. co-development, BT for Life Sciences R&D or BT Radianz for financial trading).

Different needs require different cloud deployment models. In light of this complexity, BT recommends that companies adopt a hybrid cloud architecture that allows for easy integration of distinct cloud infrastructures and services.

In BT's view, the hybrid cloud is neither a point solution nor a transitionary state toward a more unified model; on the contrary, a hybrid cloud is the optimal architecture for handling the inevitable complexity of a company's IT infrastructure. It is a catalogue of cloud services that allows the business to select the right cloud service model delivery model for each application.

It provides:

- Elasticity where you need it, either by relying on public cloud services for specific needs or by rapid scaling and rebalancing between different cloud infrastructures.
- Robustness for mission-critical applications such as ERP applications.
- Self Service to improve time to market and reduce service operations costs.
- Economies of scale by relying on standard technologies.
- Enabler of new business models that rely on ecosystems which go beyond the corporate boundaries.

Redesign the IT department

For the business, the cloud offers a wide choice of feature-rich services that are easily deployable on a self-service model. If such purchasing is done in an uncontrolled manner and on an ad hoc basis across the business by different departments, this could well lead to security and interoperability issues, poor user experience and, over time, poor total cost of ownership. BT finds that procurement processes in most large organisations are not yet adapted for cloud purposes and can thereby hinder the adoption of cloud services due to cumbersome administrative processes. Or conversely, not be capable of properly monitoring what services are currently being utilised and whether they still have value for the business (or whether there is duplication, overlap or conflict with other services). Indeed, a recent OVUM survey showed that most European companies do not, as of yet, have dedicated cloud procurement, governance and compliance strategies.

BT takes the view that IT departments will increasingly adopt a service broker and service integrator role, as opposed to building platforms themselves. In this regard the core added value of the IT department is to ensure:

- Best TCO
- Governance and compliance
- Data security
- Business continuity
- Converting cloud innovations into business opportunities.

More specifically, as a service broker the IT department will be responsible for:

- Ensuring that the right SLAs are in place. In particular, IT departments will need to negotiate with service providers to make sure that SLAs cover business requirements on an end-to-end basis.
- Ensuring that reliable and high-quality service providers are selected by the business. Price cannot be the only decision criterion.
- Making sure that exit strategies are in place, for example, with regard to extracting and transferring data.
- Designing the overall service architecture and managing the portfolio of services.

Understanding the interdependencies between various services, applications and data, which is essential for managing Business Continuity and Disaster Recovery. Furthermore, IT departments will need to integrate various cloud components, for efficiency (avoiding duplication/ unnecessary processes), data security, governance and compliance.

Controls and Tools

In BT's experience, companies need to develop at least three key capabilities if they are to succeed in their new service broker role:

1. Define and maintain a service catalogue and governance framework that leverages the benefits of the cloud but avoids sprawl.
To retain a measure of control over cloud services, IT organisations should introduce a catalogue of approved services that are easy to deploy and procure. In other words, IT should introduce a measure of control over which services are deployed and how they are deployed, but must not impose lengthy procurement processes that obstruct the adoption of cloud by the business. A governance model[10] is to ensure that approval flows are automated and delegation in place to empower the business to consume cloud services.

Moreover it must ensure that services are consumed within the security and compliance boundaries and budget. Costs can be controlled using an internal charging model, with regular automated checks to ensure that the deployed resources are still required.

2. Implement an identity and access management framework that works across different cloud solutions.
This is crucially important, not only for security and compliance purposes, but also for user adoption. Multiple sign-on systems can be a major security vulnerability but can also be so cumbersome for users that it harms user adoption of cloud services. A hybrid cloud model demands a single sign-on framework if it is to succeed.

3. Conduct end-to-end monitoring of the user experience, not only at the element level.
The end-user experience will depend on the interplay of numerous services. Hence IT departments should strive to understand service performance from the user's perspective. This will remain a key responsibility of the IT department: monitoring and managing the overall performance of the company's IT services, even if those services are delivered by multiple providers on a cloud basis.

Service providers as service brokers: Toward a more mature cloud ecosystem

As the role of the IT departments evolves, the role of service providers and vendors are bound to transition too. Currently, there are few common standards that govern how cloud services are deployed and integrated with other cloud services[11]. As the market matures however, BT – like other service providers– will also adopt the role of cloud service broker, managing communication between different providers in the cloud ecosystem and thereby making it easier to procure and combine different cloud services. Service levels will also be easier to manage. The result is that customers will gain access to a complete end-to-end service.

[10] BT Advise governance, strategy & planning.
[11] BT chairs the ETSI Technical Committee on cloud service standards development. ETSI is one of three European Standards Organisation recognised by the European Committee. BT is also involved in TM Forum - Cloud Broker Catalyst and ETSI - Network Function Virtualisation.

Define your strategy and execute your services roadmap to the cloud

Phase 1:
Define your cloud strategy

In BT's experience it is crucial that organisations adopt a strategic approach in their migration to the hybrid cloud. Too often companies are purely reactive in the way cloud services are adopted, leading to problems with total cost of ownership, security and interoperability. Hence it is critical that IT from the start leads in the development and management of the organisation's cloud strategy.

The overriding principle to developing a cloud strategy is that one size doesn't fit all. Every organisation is unique and must make an effort to define its opportunities, needs and risks. Once the various needs of the business have been identified, IT should prioritise those needs in context of available resources and risks. So that IT supports the business in identifying the right cloud services. A key lesson, in this regard, is to focus on the benefits of a specific service to your business. Too often, people focus on the generic benefits of cloud services, as articulated by the vendor or analysts, even when they may be irrelevant to your needs. For example, elasticity is often seen as a benefit of the cloud yet often core components of the IT platform are stable and do not need the flexibility to scale up and down. Companies end up paying the price for elasticity (in monetary terms or poorer security) when they do not in fact need it.

BT takes the view that IT's emerging role as a service broker pertains mainly to Software-as-a-Service (SaaS) models. Implementing Infrastructure-as-a-Service (Iaas) or Platform-as-a-service (PaaS) has less dramatic implications for your IT organisation. Therefore, as you redesign your IT processes you can already start executing on your cloud strategy by implementing these cloud-services according to your data and process critical assessment (see next chapter).

Phase 1: Build your cloud strategy

1. Define the needs of your business: assess the opportunities and threats, and subsequently prioritise how IT can support the business better

2. Identify where cloud services can better support your business, by looking at the benefits for your business

3. Define your desired future state and plan backwards

Plan backward, build forward

When building the cloud implementation strategy, BT recommends that companies work according to the principle: plan backwards, build forward. When BT consultants work with customers to develop a cloud strategy they typically begin by defining the desired future state of the company, after which a roadmap is planned backward to where the company is today. In this way short-term requirements and long-term goals are properly aligned.
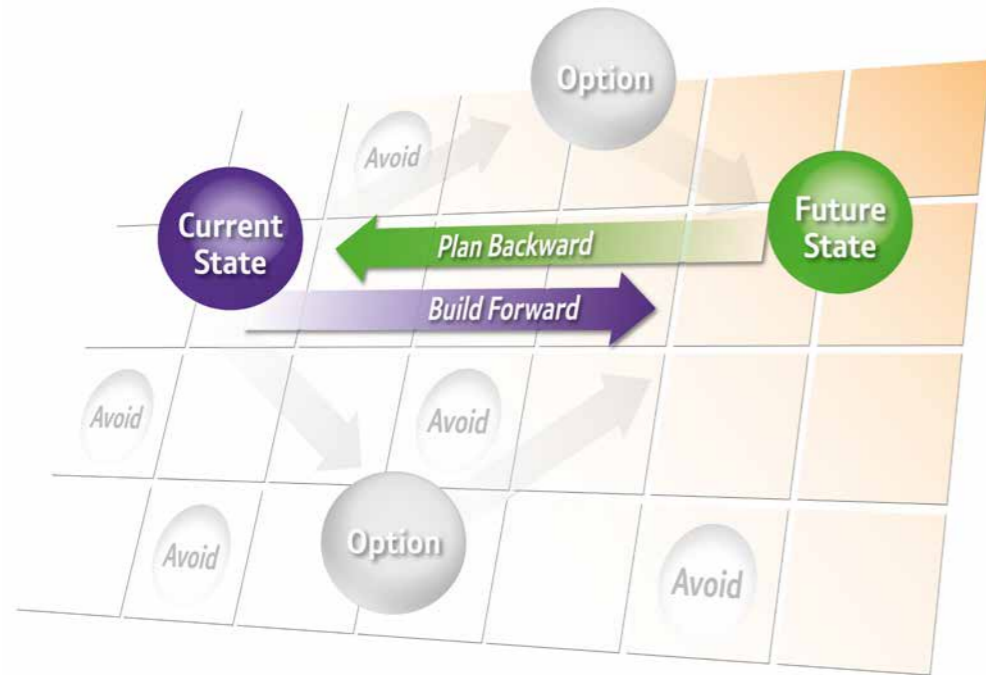

Fig. 1: IT optimised within the business by planning backward, and building forward.

Phase 2: Execute on your strategy: build your services roadmap

In the next phase it is important that companies get the details right and execute the plan. A key lesson in this phase is to anticipate well. The cloud market is exceptionally dynamic at present and not yet mature. Regulation is evolving rapidly and new standards for cloud interoperability will emerge soon. As such, it is important that companies anticipate these changes and are able to adapt their roadmap on the go.

BT recommends that companies begin by assessing their current application landscape and architecture in detail, covering:

• Who is using what? How are applications accessed and from where?

• Expected life time of the applications

• Process criticality to the business and RPO & RTO requirements

• Data sensitivity and data security requirements

• Strategic value of the applications (commodity or differentiator)

Once this overview is in place, each application can be mapped to the optimal cloud solution. The diagram below illustrates the nine different cloud models. On the horizontal axis the Deployment Model ranges from (hosted) private cloud through community cloud to public cloud on the right. On the vertical axis the Service Model ranges from Infrastructure as a Service through Platform as a Service to Software as a Service.

Phase 2: Execute on your strategy and define your hybrid cloud services roadmap

1. Assess your current application landscape and architecture and define gaps

2. Map your applications to the best cloud solution

3. Select and contract the right cloud service providers

4. Produce an actionable plan

5. Execute on your cloud services roadmap

Generally speaking (as illustrated in the model in figure 2), the best value for money, ease of use and rich functionality will be found in public SaaS models. However, this does not mean that all applications should be placed in a public SaaS cloud.

BT recommends that companies consider two additional factors in choosing the optimal cloud solution for a specific application:

1) Data Sensitivity

2) Process Criticality

Data can range significantly in its sensitivity, from very low (e.g. publically available information, published annual reports) to very high (e.g. data that provides a strategic advantage, unpublished annual reports, privacy regulated personal information).

Similarly, Process Critically can range from low (e.g. general conferencing systems) to high (e.g. ERP systems that could bankrupt the business if they were to become available). Including Data Sensitivity and Process Criticality to the model will imply drawing two additional arrows that go in the opposite direction as illustrated in figure 3. Applications that deal with highly sensitive data and are extremely critical to your business are best served by Private Cloud solutions like Private IaaS. On the other hand, applications that are not critical to your business and predominantly deal with public domain information can be placed in the Public SaaS.

Community Clouds have a special role since they deliver cloud benefits such as rich functionality and economies of scale, but also offer additional security and compliance controls that are relevant for a specific community
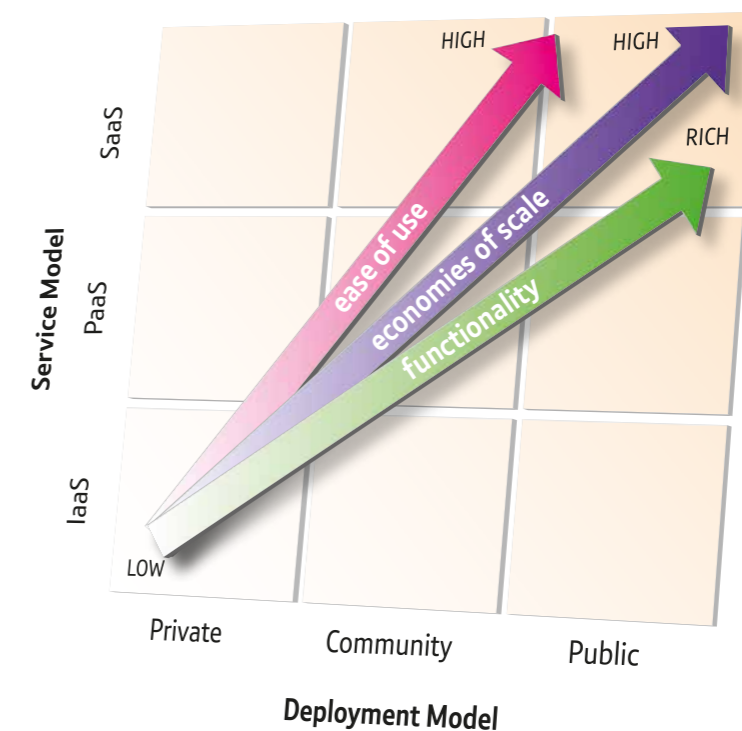

Fig. 2: Service model and deployment model.

Fig. 3: The role of process criticality/data sensitivity

Figure 3 is obviously a generic guideline. Enterprises that intend to leverage many cloud services would be well served to develop a model that is tailored to their organisation.

Once the optimal cloud models have been selected, companies can select and contract their cloud service providers. A key criterion for choosing a service provider is that they have tools and controls in place that allow the customer – the IT department – to take on its role as service broker. In other words, it is crucial that the parties agree on their respective roles and responsibilities, especially with regard to how data is processed and stored, and how the customer can exit the relationship. BT finds that this is often overlooked by the business if the IT department is not involved.

The provider contract may include:

• SLAs and associated reporting for each service

• Quality/audit/legal/regulatory expectations for data confidentiality/privacy, regulatory reporting, audit and system compliance with regulatory requirements

• Specific terms and potential monetary recovery for contract failures such as recurring SLAs, confidentiality/non-disclosure, reputational loss, Intellectual Property, and limitation of liability/indemnity

• Applicability of terms to federated Cloud Service Providers (CSP)

• Joint management/governance requirements

• Delineation of client and CSP roles/responsibilities such as service changes and steady state monitoring/administration.

At this stage companies should be ready to implement their cloud migration roadmap. This will entail prioritising the steps involved, by weighing the value to the business and costs involved. BT recommends that companies follow a pragmatic, actionable approach:

• Start with systems that can be migrated easily and prioritise those migrations that have the highest value to the business (e.g. heavily used applications, standard applications and services). BT finds that these often will fall in the top-right corner of our earlier described model (public SaaS as this offers the lowest TCO and maximum functionality, although this may not apply to all applications).

• Focus on systems and applications that need a level of customisation.

• Finally focus on systems and applications where high levels of customisation apply and where you need the freedom to experiment. BT customers often start their implementation on a small scale with limited groups of users, and in this way test new services or migration paths.

Finally, it is important to be flexible. The market is evolving rapidly and hence it is important to be able to adapt your roadmap when circumstances require it.

Conclusion

The implications of the hybrid cloud for your IT organisation may seem daunting and encourage you to take a long-term approach. However, this should not stop you from initiating the process and take on the cloud today. It is possible to start adopting the cloud, even if the IT organisation is not yet fully prepared for their services broker role.

(Private) IaaS is often the best fit for organisations that are taking the first steps towards a services model, as it offers a high level of service, IT customisation and control.
This model is in all likelihood already applicable and feasible to implement in certain areas of your business or for specific IT requirements.

At the other end of the spectrum, Public SaaS is a fully outsourced model that will require a high level of 'service management' and a low level of 'IT management'.

By adopting this model, the level of control you will obtain over service and (IT) feature updates are typically very low. Therefore, your business users will need to be capable of expressing their requirements as services rather than process models and/or IT features. To realize the benefits of public SaaS your IT department needs to be equipped and resourced to manage a service rather than an IT infrastructure.

Given these diverse requirements, BT recommends that you align your cloud adoption to the IT department's service oriented management capabilities and the readiness of the business. As your organisation evolves, new types of cloud services can be added, which will ultimately result in a well balanced mix of services: a true hybrid cloud.

Interested to learn more about how BT can help you in defining and executing on your strategic roadmap to the cloud?

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