Abstract
Local government is under increasing pressure to adopt Cloud Computing, whilst Cloud licencing may be inevitable, Cloud computing challenges in regional and remote Australia require a pragmatic approach to selection and adoption.
Introduction

On 09th March 1967 Jodie Mitchell penned the words to ‘Both Sides’ a song that takes quizzical look at life and love, and one in which the chorus reflects on the nature of Clouds.

The words of the chorus also serve to frame the understanding of Cloud technologies in the Local Government marketplace and the mythology that accompanies their promotion and adoption.

Assertions made by users and vendors alike can be misleading, misunderstood or misrepresented. This paper seeks to identify and remove some of these misconceptions and to describe an approach for assessing Cloud adoption.

Clouds – defined

The US National Institute of Standards and Technology (NIST) defines Cloud computing as ‘a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction’\(^1\). This definition has since gained almost universal acceptance in Australian Government policy considerations.

The standard recognises three ‘as a service’ models including:

1. Software (SaaS);
2. Platform (PaaS) and
3. Infrastructure (IaaS).

Since publication of the standard, Data Centre (DCaaS); Business Process (BPaaS); and Web Services (WSaaS) have also come into common use as acceptable ‘as a Service’ models.

Each service model has five essential characteristics:

1. on demand self-service;
2. broad network access;
3. resource pooling;
4. rapid elasticity; and
5. measured services.

Despite the increase in number of ‘as a Service’ models these characteristics remain consistent across the service models. Finally, the standard recognises four deployment approaches:

1. Private;
2. Community;
3. Public; and
4. Hybrid.

\(^1\) NIST Special Publication 800-145 Definition of Cloud Computing, P1.
Adopting a Cloud capability is not axiomatic and requires the user to do some homework to achieve a positive outcome. The following discussion highlights some of the key points that should addressed in Cloud assessment and adoption.

**A short word on differentiating SaaS**

Whilst the primary focus of this discussion lies in the adoption of IaaS and PaaS, SaaS can be differentiated in the ‘as a Service’ landscape as it specifically addresses software licencing. SaaS can be distinguished from other ‘as a Service’ models because it is largely driven into the market place by application vendors on a ‘take it or leave it’ basis, (for example Microsoft’s approach to its Office suite of products) whilst IaaS and PaaS are capabilities shaped by vendor interest and subject to market demand.

Traditionally sold on an enterprise or a per user basis, the introduction of subscription based licencing has seen significant benefits for both users and vendors. In the latter instance, vendor benefits include improved volume management, a reduction in licence piracy and a better logistics outcome (distribution). The primary user benefit lies predominantly in the ability to pay for what is consumed and the benefits of operational funding.

In a recent survey conducted by the Local Government Association of Queensland (LGAQ) sixty per cent of Queensland councils noted that they subscribed to Cloud based SaaS capabilities, suggesting that SaaS is the most ubiquitous Cloud service in use across Local Government today.

**Clouds illusions – from both sides (Government, Vendor, User)**

Much has been published and discussed about the nature of Cloud technology, governments have published policy, vendors have published capability statements; and independent observers have reflected on the market, capabilities offered, and on vendor performance, all of which leaves a bewildering pile of material to collate and assess.

**Government policy**

The first point is that Cloud adoption is strongly supported by Australian Commonwealth and State government policy, most of whom have published ‘Cloud first’ strategies, supported in many cases by evaluation and accreditation schemes².

From a Commonwealth perspective, the Cloud first approach has seen a number of Cloud providers undertaking assessments under the auspices of the Australian Signals Directorate (ASD), gaining certification as Cloud service providers³.

Where recognition has been granted, it can be seen as a significant endorsement of the Cloud provider’s security model, thus setting aside a common misconception that Cloud capability is not secure for government use.⁴ Note that ASD certification is intended to address the use of Cloud compute from a security perspective (sovereignty, data in motion and at rest) and is not a commercial endorsement.

---

² Commonwealth Policy is a complex series of documents that begin with an umbrella document and then lead to specific technical, procedural, legal and security compliance requirements and can be found at: 

³ Queensland’s Cloud Computing Implementation Strategy can be found at: 

⁴ A list of ASD Certified Cloud Service providers can be found at: 

⁴ IBID.
The flaw in Commonwealth or State Government Cloud policy lies largely in the nature and location of the users it serves, typically large government agencies domiciled in major metropolitan centres with the financial strength to buy the right carriage capability.

**Vendor perspective**

From a vendor perspective, the primary arguments for the market adoption of Cloud capability are expressed as:

- greater access to enterprise grade technologies;
- a reduced need for capital funding, and by extension consumption based usage; and
- improved performance, scalability and security.

All of which are good arguments for a business case, but do not embrace the breadth of issues required for Cloud adoption. Critically, vendor access to government markets reflects the same flaw seen in Commonwealth and State government policy, assuming as it does ubiquitous access to good carriage services and the financial resources to fund same.

**User perspective**

The user conceptions around Cloud adoption may be considered from three perspectives:

**Management:** seeking to gain better business outcomes from the technology;

**Information Technology team:** seeking to deliver a positive Cloud experience whilst dealing with the integration issues, the need to acquire the right bandwidth to make the end user experience positive; and

**End user:** seeking a positive simple experience that enhances their ability to deliver work product.

Getting the balance right is critically dependant on understanding why a Cloud is required, how it will be used and what outcome it will provide.

**Cloud adoption**

**Decision factors**

Like any capability, selecting the right Cloud capability can be a challenge, whilst Cloud can be a useful adjunct to a technology strategy it should not be considered an end in itself. Making the right choice requires homework, so Local Government Cloud adoption needs to take into account several factors, including the:

1. business outcome is to be achieved;
2. current and planned technology alignment;
3. location and distribution of user community;
4. supporting communications and networking capability in place;
5. cost/benefits (including risk); and
6. Cloud capability and billing model.

**Business outcome**

The first consideration is to understand what is to be achieved in adopting a Cloud capability. Common outcomes sought in local government include:
• adoption of SaaS models to operationalise licence costs;
• adoption of PaaS/IaaS to improve provisioning/scaling of compute capability;
• need to drive change; and
• long term cost reductions.

By understanding what problem needs to be addressed, preconceptions can be assessed and weighed, and outcomes based solutions implemented.

**Technology alignment**
Cloud adoption must consider carefully the alignment of the Council’s current technology platforms and planned direction with the Cloud capabilities being sought. Technology alignment will need to consider several factors, including: the impacts of vendor strategies (e.g. changes to Microsoft’s licencing model in favour of SaaS); the technology strategy of Council, including life cycles of current technology investments, the current application stack and its level of integration; and the utility of moving capability from an on-premise environment to the Cloud.

**Location and distribution of the user community**
Cloud selection must also recognise the location and distribution of the user community, who can access the Cloud and with what level of utility. For a user interacting with Cloud based resources, a delay between a request for information and getting a response can seem like a lifetime. If a reasonable delay (latency) of around twelve milliseconds is assumed, the choice of Cloud provider may be limited to around 1,000 kilometres, and will be highly dependent on the quality of carriage services.

**Communications and networking capability**
Australia’s metropolitan centres are well serviced by strong, robust and redundant communications infrastructure and as previously indicated, Commonwealth and State Government Cloud policies are clearly predicated on this fact. Sizing and shaping the communications infrastructure is the key determinant of Cloud performance anywhere outside metropolitan centres.

Moving away from the major cities the communications challenges become somewhat different, metropolitan gives way to urban, urban to rural and rural to regional. This progression is marked by several factors: a gradual reduction in the availability of broadband capability; a rapid increase in cost; an increased reliance on Local Government infrastructure (Wide/Local Area Networks) and a marked reduction in redundancy provided through telecommunications carriers. In Queensland this is particularly acute west of the dividing range and in Far North Queensland, where councils operate significant network infrastructure, including dedicated fibre or alternative networking such as microwave technologies.

Insufficient bandwidth will lead to poor performance and a suboptimal user experience. Sizing the required bandwidth needs to take into consideration what applications or resources are being Cloud enabled, and the bandwidth required for optimal performance. It is important to ensure that both Cloud and other demand is considered in the sizing process, as

---

5 Latency considerations would allow a Sydney based Cloud provider to service Brisbane, however selection of a Melbourne based Cloud would introduce significant increases in latency and may negatively impact the user experience.

6 Note that the introduction of microwave links also has a negative impact on latency and the user experience.
increased demand from one will impact the other. One approach is to shape the carriage to limit demand, e.g. allocating bandwidth specifically to the Cloud.

Cloud selection must consider the nature of the communications infrastructure between the point of provision and the point of use to assure that the user experience is positive and constructive.

**Cost benefits (including risk)**

Understanding the costs of Cloud provision complimented by a benefits model are also central to the decision making. In local government, the cost/benefit model should take into consideration the:

- tangible elements such as acquisition and sustainment;
- fixed cost factors including locking in fixed resources defined periods;
- variable factors such as volume of storage; data movement across networks; interconnect between Clouds or Clouds and on premise infrastructure; or foreign exchange⁷;
- the ability of Council to program and manage business hours services (e.g. test and development sites that are available between Monday and Friday);
- risk including the stability of the Cloud provider,
- data sovereignty, and the protection of data at rest and in motion;
- significant staff implications around ease of use and access; and/or;
- potential impacts of exit from the Cloud, including data movement and data protection (erasure on exit).

Care is also required to assess the impacts of legislated responsibilities and community service obligations, for example dynamic scaling of resources in response to a continuing disaster management scenario.

**Cloud capability and pricing model**

The final consideration lies in the Cloud capability, what services are on offer, in particular scope and capacity and most importantly where the service stops (the demarcation point).

Most Cloud providers set the demarcation point at the operating systems levels (above physical/logical asset), leaving application management and infrastructure management to the consumer. It is critical that consumers understand the demarcation point with a view to understanding the impact for in house resources or the need for third party managed services.

Billing is a key consideration for Cloud adopters noting the vendor proposition advancing the benefits of an operating cost model in which monthly costs are largely fixed.

Some Cloud pricing models such as SaaS reflect traditional billing models, for example purchase of software licences via a subscription model (Pay per month/per annum etc.). The most common model for Infrastructure (IaaS) and Platform (PaaS) is provided on a fixed size/fixed fee approach. In this model the infrastructure and related elements are specified and baselined and a price applied for a fixed period.

A number of smaller vendors are now offering access to shared capability that is based on resources consumption measured by processor access, processor usage and/or data consumed/stored, such models render access to compute resources at the lowest measurable cost.

---

⁷ AWS offers services in US dollars meaning that monthly operating costs will vary.
A reflection on Cloud brokerage

Cloud brokerage addresses a gap in the marketplace for those Councils seeking ICT transformation where the selection, establishment and daily management of the Cloud will be outsourced, and the ICT team focus turns to business enablement. A good Cloud Broker will provide a range of services including:

- Provision of advice on the Cloud selection, including risk, price and options management;
- Managed services that embrace:
  - Cloud management e.g. commissioning/decommissioning; scaling; and
  - ICT management at and beyond the Cloud provider demarcation point;
- Buffering between the consumer and the Cloud provider on resource.

Summary

When a Cloud technology and the needs of the enterprise are correctly matched, a positive outcome will result, provided that Council identifies and understands all of the factors that will:

- deliver an integrated technology outcome; and
- influence or impact the achievement of a positive user experience.

Central to success is understanding what outcome is to be achieved, and how the selected Cloud will service the need.