CalCloud and IBM: Cloud and Government for California

May 29th 2014
Welcome
Welcome

- 8:45AM Welcomes and Introductions – Mike Ross

- 9:00AM Presentation and Discussion: Introduction to cloud - developments we are seeing in governments - Peter Williams

- 10:00 AM California Cloud positioning – Jan Gavesen

- 10:15 CalCloud presentation - Jan Gravesen, Greg Kakigi, David Langston

- 11:40AM Final comments and reflections – Mike Ross

- 11:45AM Close
Central, state and local governments worldwide are under continuous pressure to do more with less. Cloud is a major enabler.

### Potential cloud computing benefits for government

<table>
<thead>
<tr>
<th>Speed, agility and scalability</th>
<th>Security-rich &amp; Highly available</th>
<th>Improved efficiency</th>
<th>Cost optimized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable faster delivery of services</td>
<td>Facilitate improved data security – Security as a Service</td>
<td>Help more effectively manage IT resources</td>
<td>Enable improved IT efficiency &amp; economies to reduce IT costs.</td>
</tr>
<tr>
<td>Help improve the agility and dexterity of government services</td>
<td>Help better manage compliance</td>
<td>Enable reduced need for human intervention with automation.</td>
<td>Pay in line with usage, if required.</td>
</tr>
<tr>
<td>Masking complexity</td>
<td>Help improve disaster recovery capability</td>
<td>Integrating functional “stovepipes” – enabling sharing of apps and data.</td>
<td>Shifts from fixed cost to variable cost.</td>
</tr>
<tr>
<td>Scalability to meet demand peaks</td>
<td>Form part of a wider community or city resilience strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement for lost skills.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Which of these stand out for you – if any?**

“Gentlemen, we have run out of money. Now we must think”

(Variously attributed to Winston Churchill and Ernest Rutherford)
Rethinking Government IT: Citizens’ expectations

Instant access to information, products and services

Seamless experiences that match product and service quality

To be engaged as individuals on their own terms—anytime and anywhere

Trusted, mutually beneficial relationships that go beyond one-time transactions

Transparency from their government

To what extent are these factors starting to apply – or is your focus more on cost savings?
How are governments using cloud?

Moldova and Estonia see cloud as an engine of national regeneration, and have some of the most advanced e-government plans of any country.

Sunderland (UK) plans to allow local NGOs and social entrepreneurs involved in providing services to the community to use its cloud. Birmingham (UK) may follow suit.

Townships in upstate New York collaborate to create and share common apps for licensing, property tax collection, fines and other basic functions.

Sunderland (UK) plans to allow local NGOs and social entrepreneurs involved in providing services to the community to use its cloud. Birmingham (UK) may follow suit.

Norfolk (UK) sees its cloud as a “community enablement” platform.

New South Wales (Aus) wants to charge vendors to sell services from its own cloud, to raise revenue.

Singapore is using its investment in a private-public e-government cloud also to stimulate the local IT sector.

Numerous governments see their clouds as platforms for enabling mobile technology – and thus new forms of citizen engagement.

The State of Michigan operates a shared technical platform for secure and simple file transfers for all its agencies, delivered from its MiCloud.

Canada (and provinces) primarily see cloud a form of outsourcing and cost reduction.

South African sees its cloud platform as a way to develop IT skills in the country.

Taiwan is using cloud as a way to encourage integration of its hardware, software and service industries. Eventually it plans to generate 50,000 jobs.

Catalonia (Spain) plans to let Catalan businesses use its private cloud. Cloud is part of the “public infrastructure” – like water or roads.
How are governments using cloud (2)?

The EU’s foresees an additional EUR 45 billion of direct spend on Cloud Computing in the EU in 2020 - with **cumulative impact on GDP of EUR 957 billion, and 3.8 million jobs, by 2020.**


The UK Government believes that G-Cloud will deliver more than **£12 billion in public sector efficiencies** over the next four years. G-Cloud includes a Public Sector Network, a procurement catalog and a vehicle for delivering standardized desktop images to all public sector employees.

http://www.cabinetoffice.gov.uk/sites/default/files/resources/government-cloud-strategy_0.pdf

The US Federal CIO Council identified cloud computing as a strategic IT priority in March 2009, with the goal of **lowering the costs of government IT spending and reducing the impact of government IT on the environment.** The Cloud Computing Executive Steering Committee (CCESC) was created to centralize security, planning and procurement, to make it cloud adoption easier.

The Andromede initiative in France is a **public-private partnership** led by Orange (telecomms provider) and Thales (IT and defense contractor). Seeded with a 95 million $US grant from National Digital Society Fund, Orange and Thales own a 67% stake.

http://www.thalesgroup.com/Press_Releases/Markets/Security/2012/20120420_DSC_Orange_and_Thales_welcome_French_State_support_for_their_joint_project_Androm%C3%A8de/
Open data

- Open data is data made available for anyone to use, at no cost.
- Nearly 50 countries now have open data policies, intended to:
  - Derive additional value from existing data.
  - Enable a higher level of accountability.
  - Encourage the development of locally developed applications that extend the services government can provide.
- Cloud is a natural platform for open data. Many vendors of open data tools are cloud based and will provide a complete set of services from creation of APIs, through publication to visualization. (Examples: Socrata; CKAN).

To what extent is open data part of your intentions for cloud?
Some government entities just want IaaS. But SaaS and BPaaS in government are growing significantly world-wide.

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2015</th>
<th>CAGR 2010-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPaaS</td>
<td>1</td>
<td>4.4</td>
<td>35%</td>
</tr>
<tr>
<td>SaaS</td>
<td>2.2</td>
<td>5.9</td>
<td>22%</td>
</tr>
<tr>
<td>PaaS</td>
<td>0.8</td>
<td>3.3</td>
<td>34%</td>
</tr>
<tr>
<td>IaaS</td>
<td>2.7</td>
<td>8.2</td>
<td>25%</td>
</tr>
</tbody>
</table>

Worldwide Government Cloud Spend - XaaS ($B)*

Source: Internally Modeled Cloud Opportunity Based on xGMV2H12, ACCC; MeasStat All; eSize= Non-business

Where do you see the action happening just now? How about in five years?
Functional areas that we see currently attracting the most interest for SaaS.

**Interest today:**
- Basic office automation
- Payments
- Permitting/code compliance
- Web hosting (for county websites)
- Finance/HR/ERP
- Law and order - public safety
- Emergency management: disaster recovery, business continuity
- Open data publication and tools
- GIS

**Other possibilities** (from IBM and/or business partners):
- Property tax?
- Asset and vehicle fleet management?
- Transportation management:
  - Traffic?
  - Public transit systems – ticketing, control?
- Licensing?
- Water/waste water management (for shared infrastructures)?
- Benefits case management?
- Legislative process support?
- Support for mobile apps (eg “311”)?

How does this fit with your perception? What areas are next?
One key component of BPaaS will be an underlying data and service model. These are beginning to exist.
Data consistency may be key to deriving value from BPaaS

- Avoidance of fragmentation is essential to effective business processes.
- Data consistency supports:
  - Integration of service delivery;
  - More effective analytics;
  - More effective policy formulation and responses (supports “one version of the truth”);
  - Flexibility and speed of response (for example in creating new applications);
  - Efficiency and lower operating costs.

Does your approach to cloud include achieving data consistency?
The “API Economy” threatens to upend conventional definitions of PaaS, SaaS and BPaaS

- Breaking software down into “functional primitives” – modules - that can be snapped together (via APIs) to create applications.
- Strong focus for mobile and social computing but also applicable to business and government applications.
  - Driven originally by mode of application development for smart phones.
- API tools strictly reside at the PaaS level, but effectively span SaaS and even BPaaS in a single construct.

To what extent do you see an API-based approach in your cloud plans?

- **API possibilities for government – modules for:**
  - Cadaster (person/citizen record)
  - Payment received
  - Payment made
  - Meetings:
    - Agendas, minutes
    - Video…
  - Sentiment analysis (from Twitter)
  - Roadworks or other service outage notification
  - Generic workflows
  - Various statutory reports
  - Permit issuance
  - Encryption
  - Security audit and attestation
  - (etc…)
Cloud offers an opportunity for entrepreneurial government entities to become service providers.

- IDC and others have identified the emergence of national or regional government cloud hubs via “government service providers”.

- For example:
  - A state may provide a cloud stack for its municipalities, so enabling them to retire their old standalone systems and save $$$.
  - Or a county may seek to do this for its peers within the region.
  - Some variants of these may be vendor-managed and/or owned.

- Concept implies need to make billing and metering capabilities available to the cloud owner.

What interest is there in becoming a service provider – perhaps using CalCloud as your platform?
A shared services model?

Lead Entity (State?)

Business Process as a Service

Complex Workflows
(Example - emergency response)

Simple Workflows
(Example - property tax transaction)

Data Models and Integration
(“Single view of the student/tax parcel/citizen/asset/criminal….”)

Application Catalog
(Multiple vendors)

Software as a Service

Infrastructure/Platform as a Service

• Collaboration tools
• Billing and metering
• Security
• etc

Who else do you see using your cloud platform? Other government entities? Local NGOs? Local businesses?
Possible business models for shared services

Business as usual

- MOUs probably needed but no other legal framework

Mutual aid - not for profit

- Subscription based (but yto cover costs only)
- Contractual underpinning - would probably need service level agreement

For profit (to the extent allowed)

- Need to create a for profit entity?
- More transactional than a consortium – focus is on sales
- Resellers contract with OEMs (like IBM) – either for referral fees or sales revenue

A whole new business

- Cloud reseller – IaaS, SaaS...

Where might you be looking on this spectrum?
Data residency and local content requirements are common worldwide. Edward Snowden almost certainly made them more so.

- Many government cloud buyers have geographically-defined data residency requirements (or just preferences):
  - Some are data resident but not “support resident”
  - Some also have stringent local employment conditions, to boost local economies by creating skills and jobs.
  - Restrictions also exist on sharing public clouds between specific countries.

- Implies a thrust towards private clouds that offer a complete yet self-contained cloud ecosystem:
  - Cloud economics and business models.
  - Many acquisition options: “government-owned, government-operated”, “government-owned, vendor-operated” and “vendor-owned, vendor-operated”.
  - May also enable local businesses.
  - Full spectrum of cloud levels (I/PaaS, SaaS, BPaaS) required.
  - Full spectrum of government use cases, via vendor and partner application catalog.
  - Very scalable - relatively small, up to very large, implementations.
Data residency does however come in many flavors

- All workloads (South Africa) or just some workloads (US – eg HIPAA or CJIS workloads; Algeria)?
- Legal requirement (Singapore) or just “broad preference” (Canada, many US states)?
  - (Preferences may or may not be stated in RFPs – so beware!)
- “In country” (Poland) or just “in EU” (Belgium)?
- Everything (South Africa) – or just data (ie support can be from elsewhere – New Zealand)?
- Security/privacy motive (most) and/or skills development (Senegal, South Africa)
- Other possibilities:
  - Non data residency is a form of disaster resilience (Caribbean nations).
  - May just not be willing to share public cloud with some other countries?

California is de facto data-resident. But are there additional requirements that may arise?
Opex vs Capex: the best option isn’t always clear cut…

- Many governments are attracted to the possibility of converting capital expense (as in a traditional IT procurement) to operating or revenue expense (in effect a rental).

- But not all. Some governments are not capital constrained. They have tight budget (opex) constraints, but still find it easy to raise debt.
  - But they still want to pay by usage…
  - They want a way to aggregate cloud expenses into a capital payment.

Would you prefer to buy cloud under a capex or an opex model?
Cloud offers users new capabilities, but achievement of lasting benefit requires effective collaboration with the IT function.

- In a recent survey of private sector SaaS users, we found that the “pacesetter” group who were gaining competitive advantage from SaaS did so through strong collaboration between IT and Lines of Business (LOB).

  - And that collaboration in fact benefitted the overall relationship between IT and LOB.

- We assume the same will apply to using SaaS and BPaaS to transform service delivery in the public sector!

### How do you see cloud placing demands upon, and changing, the IT - LOB relationship?

<table>
<thead>
<tr>
<th>Category</th>
<th>Pacesetters</th>
<th>Chasers</th>
</tr>
</thead>
<tbody>
<tr>
<td>SaaS strengthens the IT and LOB relationship</td>
<td>70%</td>
<td>39%</td>
</tr>
<tr>
<td>Strong IT and LOB collaboration on SaaS selection and deployment</td>
<td>71%</td>
<td>36%</td>
</tr>
<tr>
<td>Strong IT and LOB collaboration around SaaS security</td>
<td>35%</td>
<td>24%</td>
</tr>
<tr>
<td>IT respondents view LOB as a strategic partner for SaaS</td>
<td>72%</td>
<td>22%</td>
</tr>
<tr>
<td>LOB respondents view IT as a strategic partner for SaaS</td>
<td>66%</td>
<td>31%</td>
</tr>
</tbody>
</table>

Source: IBM Center for Applied Insights Champions of Software as a Service: How SaaS is fueling powerful competitive advantage
For more info, visit: ibm.com/ibmcai/saas
Concluding discussion

- What are you seeing as regards cloud and shared services?
- What governance and commercial arrangements are they seeing or envisaging?
- What functional priorities are you seeing right now? Why?
- What major technical needs exist right now?
  - What other issues exist – security, ...?
- What are the critical success factors for cloud – what three things MUST be in place?
- What are the critical pitfalls?
- Where will the market be in 5 years' time?
What does our cloud portfolio look like in California?

**CalCloud**
- IaaS offering with Windows, RHEL, AIX and Linux for z
- Available from California Department of Technology datacenters
- Full managed services platform
- Range of IDR and B/R tiers

**IBM Smart Cloud Enterprise+**
- SaaS and BPaaS offering – full managed services platform (ITILv3)
- IBM pSeries (AIX) and xSeries, and z/OS
- Range of service level options.

**IBM Softlayer**
- Flexible, very cost effective IaaS and PaaS.
- For public or private clouds but not on-premise
- San Jose data center
- SaaS, charge-back etc from 3rd party vendors on same platforms
- Fine-grained configuration and self-service management (APIs)

**IBM Private Modular Cloud (PMC)**
- Low-cost private on-prem “cloud in a box” – VMware/x86 and AIX
- Can be located in client, IBM or 3rd party data centers.
- Very rapid deployment, can grow in small “bite-size” increments
- Up to SaaS – either via own catalog or 3rd party.
- Software stack can run on Softlayer

**Build your own Cloud**
- Server and Storage platforms including Cloud-in-a-Box PureSystem offerings
- Cloud enabling Software tools and packages (IBM SmartCloud Foundation).
- Services for planning and implementing.
IBM Cloud approach for California’s public sector

CalCloud
- IBM’s lead-with Cloud IaaS offering for State, Local, and Education entities
- Full managed services platform
- Testing, storage and full production capabilities
- Range of IDR and B/R tiers
- Available from California Department of Technology through MOU with State

“CalCloud First” Policy

Softlayer
- Flexible, very cost effective IaaS and PaaS.
- For public or private clouds but not on-premise. Largely self-services
- San Jose data center
- Available from IBM via standard procurement approaches

Private Modular Cloud (PMC)
- Low-cost private on-prem “cloud in a box”,
- Can be located in client, IBM or 3rd party data centers.
- Proposed to clients who want private-on-premise turnkey cloud offering
- Available from IBM via standard procurement approaches

Build your own Cloud
- Server and Storage platforms including Cloud-in-a-Box PureSystem offerings
- Cloud enabling Software tools and packages (IBM Smart Cloud).
- Services for planning and implementing
- Available from IBM via standard procurement approaches.
SoftLayer supports “build your own” cloud environment—from private dedicated servers (including bare metal) to shared (public) multi-tenant models--pay-as-you-go.

- Dedicated servers (bare metal & virtual), Virtual Servers (Private or Public Shared multi-tenant) - Build Your Own Cloud
- Complete control of your cloud environment (000’s of APIs): applications and management – BYO or select from SL’s image catalog
- Global, highly secure, agile IPv4 & IPv6 networks end-to-end (Triple Network architecture), local and global load balancing that is pay-as-you-go
- Common x86 hardware architecture for all SoftLayer cloud models – ease of scalability and adoption of other models
- Flex Images™ image management - capture an image—physical or virtual—provision or migrate between technologies
- Perfect Fit for Cloud Native Workloads
- Support for AIX (2014)
- Multiple choices for hypervisor
Private Modular Cloud (PMC) offers cloud economies and rapid time to value for data resident locations where public cloud access may be problematic.

- Replicates the economics of cloud as private on-or off-promise platform
- IaaS and PaaS, with middleware catalog. This or 3rd party catalog for SaaS.
- Scalable from 120vms upto ‘000s.
- Rapid Deployment services – script based automated deployment of even complex software in hours.

- X86 now. Power/Pureflex (x86 and Power) in 2014.
- VMware version GA’d; SCO and Open Stack available as custom build now.
- Hybrid with Softlayer available as custom build now (PMC s/w stack on Softlayer platform).
- HIPAA implementations now under construction.
IBM SmartCloud Enterprise+ (SCE+) supports enterprise-class workloads and includes a full suite of managed services.

- High Availability clustering and three Active Directory scenarios to support complex enterprise applications
- Unmanaged VMs, Large VMs, Large Disks to extend workload coverage
- Database and Middleware Management Services (install, configure, alerts, backup and management)
- Global shared or dedicated managed environments at IBM Data Centers (DCs)
- Security designed-in and certified (compliance ISO27001/2 and SSAE16 for IBM DCs) – multiple levels of isolation

- IBM pSeries and xSeries enterprise class hardware, High-speed Tier 1 storage option
- Standard set of operating images offered in fixed sizes and SLA management up to and including Operating Systems
- IT Infrastructure Library (ITIL) lifecycle, asset, license, patch and configuration management
- Perfect Fit for Cloud Enabled enterprise class workloads
What does our cloud portfolio look like?

### California IBM cloud offerings

#### Comparative analysis

<table>
<thead>
<tr>
<th>Feature</th>
<th>CalCloud</th>
<th>SoftLayer</th>
<th>SCE+</th>
<th>PMC (pre-integrated)</th>
<th>SmartCloud Foundation (BYOC)</th>
<th>SCE+ POD (private SCE+ replica)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California data residency (primary and secondary)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Private cloud for public sector</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Build and manage your own private cloud</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Support for Windows, Linux, AIX, zLinux</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>PAYG</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Configurability/ flexibility</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Available from DOT through MOU with State</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

**Key:**
- ○ Low
- ● High

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What does our cloud portfolio look like?

- **Public/Pay-as-you-go**
  - CalCloud
  - SoftLayer
  - SCE+

- **Flexibility**
  - SmartCloud Foundation
  - Private Modular Cloud

- **Private/Build-your-own-cloud**

- **Standardization**
  - SCE+ POD
CalCloud Presentation
Overview of Department of Technology

California Department of Technology (OTech) provides information technology services to many state, county, federal and local government entities throughout California. Through the use of a scalable, reliable and secure statewide network, combined with expertise in voice and data technologies, OTech delivers comprehensive, cost-effective computing, networking, electronic messaging and training solutions to benefit the people of California.

Company Profile
• More than 700 Employees
• Support Approx. 3,000 Sites, in All 58 California Counties.
• Two Tier III Data Centers
• Main Services: Network, Email, Application Hosting, Equipment hosting, Server Based Computing..
Overview of CalCloud

Dedicated private cloud (IaaS) for State.

Service hosted on State data centers and behind State network (LAN/WAN) and security.

Provided by a cloud service vendor (IBM).

CalCloud Vendor provides hardware, software, portal and OS administration (patching).

Usage based with no initial cost to the state.

Self-Service business model (via web portal) and Low cost service offering.
CalCloud “Shopping Cart”

The CalCloud self-service web portal will provide user a “shopping cart” experience.

<table>
<thead>
<tr>
<th>BUNDLE SIZE</th>
<th>CCU</th>
<th>MEMORY (GB)</th>
<th>STORAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>2</td>
<td>4 GB</td>
<td>90 GB</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>8 GB</td>
<td>90 GB</td>
</tr>
<tr>
<td>Large</td>
<td>8</td>
<td>16 GB</td>
<td>90 GB</td>
</tr>
<tr>
<td>Extra-Large</td>
<td>16</td>
<td>32 GB</td>
<td>90 GB</td>
</tr>
</tbody>
</table>
## CalCloud Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RedHat Server</td>
<td>RedHat Virtual server (version 6 and above)</td>
</tr>
<tr>
<td>Windows server</td>
<td>Windows Server (version 2008 and above)</td>
</tr>
<tr>
<td>AIX server</td>
<td>AIX server (P7+ chip set, Power VM)</td>
</tr>
<tr>
<td>Backup</td>
<td>Two Tiers of backup. Backup replicated to Vacaville. Tier I (One Hr. RPO) - Tier II (Daily incremental, weekly full)</td>
</tr>
<tr>
<td>Infrastructure DR</td>
<td>Two Tiers of DR (Oversubscribed and Reserved). DR provided at Vacaville site. Tier I (One Hr. RPO&amp;RTO) - Tier II (24hr. RPO &amp; 96hr. RTO)</td>
</tr>
<tr>
<td>Storage</td>
<td>Additional storage for servers. (15 msec. response)</td>
</tr>
<tr>
<td>Archive Storage</td>
<td>Additional archive storage for servers. (100 msec. response)</td>
</tr>
</tbody>
</table>
CalCloud R&R

Customer Application Environment
- Disaster Recovery
- Backup/Recovery
- Storage
- CalCloud Firewall
- CalCloud SAN/LAN/Switches
- Virtual Operating System
- Servers
- Load Balancing
- Firewall/IPS
- Network Management
- LAN/Switches/Routers
- Internet Connection
- Racks/Cabling
- Conditioned Air
- Redundant Power
- Raised Floor Space

CalCloud (OTech Virtual Private Cloud)

Customer Provided & Managed

OTech and Vendor Provided & Managed
CalCloud Server Rates

- All rates have volume discounts. The table below has volume one (<500 servers) pricing.

<table>
<thead>
<tr>
<th>OS</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Xlarge</th>
</tr>
</thead>
<tbody>
<tr>
<td>RedHat</td>
<td>$658</td>
<td>$914</td>
<td>$1266</td>
<td>$1841</td>
</tr>
<tr>
<td>With DR I</td>
<td>$1194</td>
<td>$1450</td>
<td>$1802</td>
<td>$2376</td>
</tr>
<tr>
<td>With DR II</td>
<td>$926</td>
<td>$1182</td>
<td>$1534</td>
<td>$2108</td>
</tr>
<tr>
<td>Windows</td>
<td>$679</td>
<td>$943</td>
<td>$1305</td>
<td>$1900</td>
</tr>
<tr>
<td>With DR I</td>
<td>$1200</td>
<td>$1495</td>
<td>$1857</td>
<td>$2450</td>
</tr>
<tr>
<td>With DR II</td>
<td>$955</td>
<td>$1219</td>
<td>$1581</td>
<td>$2174</td>
</tr>
<tr>
<td>AIX</td>
<td>$1133</td>
<td>$1717</td>
<td>$2628</td>
<td>$4852</td>
</tr>
<tr>
<td>With DR I</td>
<td>$1475</td>
<td>$2199</td>
<td>$3467</td>
<td>$6287</td>
</tr>
<tr>
<td>With DR II</td>
<td>$1294</td>
<td>$1940</td>
<td>$3105</td>
<td>$5589</td>
</tr>
</tbody>
</table>
## CalCloud Extra Rates

- **All rates have volume discounts.**

<table>
<thead>
<tr>
<th>Additional Service</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage (priced per GB)</td>
<td>$0.44 to $0.38 (at highest volume)</td>
</tr>
<tr>
<td>Archive Storage (priced per GB)</td>
<td>$0.19 to $0.16 (at highest volume)</td>
</tr>
<tr>
<td>RAM (priced per GB)</td>
<td>$18 to $15 (at highest volume)</td>
</tr>
<tr>
<td>Backup Tier I (priced per GB)</td>
<td>$0.35 to $0.27 (at highest volume)</td>
</tr>
<tr>
<td>Backup Tier 2 (priced per GB)</td>
<td>$0.26 to $0.24 (at highest volume)</td>
</tr>
</tbody>
</table>
CalCloud Service Roadmap

IaaS/PaaS (RedHat, Windows and AIX)  SaaS/AaaS

FY 13/14  FY 14/15  FY 15/16

DaaS/PaaS/STaaS
(SQL, DB2, Oracle..)
CalCloud architectural decisions

The CalCloud is engineered for flexible, secure, cost efficient enterprise class workloads

- **Personalization**
- **Scalability**
- **Security & Isolation**
- **Extensibility**
- **Low-Cost Accommodation**
- **Enterprise-Class**
- **Control**
- **Usability**

**Flexible Self-service** model, which adapts to departmental needs and is able to bring future services on-board.

CalCloud supports multiple **Security** standards and models and is a highly secure multi-tenancy architecture.

CalCloud is designed to support the need for **Low-cost Accommodation** – the ability to combine low cost with the flexibility to accommodate a wide range of diverse government requirements.

CalCloud is **Extensible** with other hypervisors and OS, other storage solutions, and other compute tiers.

The **Usability** model provides an intuitive, relevant, role-based and customizable user interface.

CalCloud supports flexible dashboards, reporting services and service catalogs - state cloud service consumers will feel in **Control**.

The CalCloud provides **Enterprise-Class** availability and backup/restore and disaster recovery capabilities.

Cloud Service Provider Platform
CalCloud logical architecture diagram

**User Access Layer**
- Authentication
- LDAP
- Remedy
- Billing
- LogLogic (SIEM)
- Service Catalog
- Shopping Cart
- Provisioning
- Image Lifecycle Mgmt
- Reporting Services
- Events Dashboard
- Backup/Restore
- IDR
- Trouble Tickets
- Billing Status

**Management & Automation Layer**
- Service Automation Management
- Monitoring
- Usage and Accounting
- Image Lifecycle Mgmt
- Events Dashboard
- Backup/Restore
- IDR
- Trouble Tickets
- Billing Status

**Resource Abstraction & Control Layer**
- VMware
- POWER VM
- *z/VM
- *Solaris Zones
- *Xen/KVM (open source)
- Reporting Warehouse
- Storage and Backup Management

**Physical Resource Layer**
- Compute Nodes (Windows/RHEL x86)
- Compute Nodes (AIX on POWER)
- Network
- Common Cloud Storage
- Backup Storage

**CalCloud Managed Services**
- Reporting Warehouse
- Usage and Accounting

**CalCloud Managed Security**
- Authentication
- LDAP
- Remedy
- Billing
- LogLogic (SIEM)
- Service Catalog
- Shopping Cart
- Provisioning
- Image Lifecycle Mgmt
- Reporting Services
- Events Dashboard
- Backup/Restore
- IDR
- Trouble Tickets
- Billing Status

**Physical Resource Layer**
- Compute Nodes (Windows/RHEL x86)
- Compute Nodes (AIX on POWER)
- Network
- Common Cloud Storage
- Backup Storage

**Dept of Technology Managed zLinux / DS8000**
- Tenant Managed AIX Environments

**Physical environments not managed by CalCloud Managed Services**
- POWER VM
- *z/VM
- *Solaris Zones
- *Xen/KVM (open source)
CalCloud logical architecture diagram

CalCloud Managed Services

User Access Layer
- Tivoli Identity Manager
  - Authentication / Authorization
- Jazz/DASH Portal
  - Consumer Dashboard
  - Trouble Tickets
- SmartCloud Control Desk
  - Service Catalog
  - Shopping Cart
  - Provisioning
  - Lifecycle Mgmt
- Tivoli Common Reporting
  - Reporting
- SmartCloud Managed Backup
  - Instant Backup
  - Scheduled Backup

Management & Automation Layer
- IBM Service Delivery Manager
  - Service Automation Management
  - Monitoring
- Usage & Accounting
- Reporting Warehouse

Resource Abstraction & Control Layer
- IBM Flex System
  - CalCloud Portal and Management VMs
  - CalCloud Tenant VMs (x86 and POWER)
  - IBM Flex Fiber Channel Interconnect
- VMware
  - HA/DRS
  - vCenter
  - vSphere
  - vSRM

Physical Resource Layer
- PowerVM
  - PowerVM
  - PowerHA
  - Live Partition Mobility
  - PowerSC
- TSM for VE
  - Backup Archive Agent

CalCloud Managed Security
## CalCloud Storage Services
### Optimized, scalable and dynamic

<table>
<thead>
<tr>
<th>Deep integration with VMware</th>
<th>NetApp and VMware are deeply integrated in terms of Research &amp; Development Optimized for multi-tenant cloud storage environments</th>
<th>Encryption at Rest</th>
<th>Encryption at rest storage services using the Brocade Encryption Blade (BEB) with the SAN Directors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-tenant encryption key management</td>
<td>Customers will manage their own encryption keys</td>
<td>Highly scalable</td>
<td>Grows clusters non-disruptively Storage arrays can be added incrementally</td>
</tr>
</tbody>
</table>
| High Availability | • Provides RAID-Dual Parity (DP) without performance penalty  
• Ability to recover from two simultaneous disk failures | Intelligent Storage Optimization | • Rich set of intelligent storage optimization features for cloud service provider benefits the growth/cost curve for CalCloud as more and more consumers are on-boarded |
| Virtual Storage Tiering (VST) | • Supports multiple virtual storage tiers: Moves data in an automated between different tiers based on a data driven, real time and self-managed approach  
• Efficiently leverages Flash technology | Replication | • NetApp SnapMirroring for Tier 1 data replication between Gold Camp and Vacaville sites  
• Integrated with VMware SRM  
• POWER HA mirroring for AIX virtual machines |
CalCloud flexibility

Open to the entire public sector in California
CalCloud Storage Services
Optimized, scalable and dynamic

Intelligent Storage Optimization

Data Growth with Traditional Storage
- FlashCache/FlashPools
- RAID-DP
- Thin provisioning
- Snapshot

Data Growth with Efficient Storage
- In-line Compression
- FlexClone®
- Thin Replication
- Data Growth with Efficient Storage

Change the cost/growth curve for cloud computing
CalCloud Security Goals

• Provide a service that is equally or more secure to that which can be provided with a physical, dedicated infrastructure
• Support both mission-critical and non-mission-critical systems
• Provide an infrastructure that can meet the operational and compliance requirements of the State and supported agencies
• Establish and operate a CalCloud Security Advisory Council
CalCloud Security Stack

CalCloud provides a comprehensive and tiered security model

- Workload Specific Security (HIPAA)
- Workload Specific Security (PCI DSS)
- Workload Specific Security (IRS 1075)
- Workload Specific Security (SSA)
- Workload Specific Security (other)

The Federal Risk and Authorization Management Program (FEDRAMP – Includes NIST 800-53)

IBM + California Dept of Technology Security Controls (ISeC) (CalCloud Information Security Controls)

Hosted inside the California Dept of Technology’s data centers and inside Department of Technology firewall(s)
CalCloud Security Controls

- Formal security control program
- Final set in works - exceeds 1500 individual controls
- Base set of controls (ISeC) derived from ISO/IEC 27002, FEDRamp, and IBM/CalTech best practices
- Compliance support to other authorities available (infrastructure controls only)
- CalCloud ISeCs can be shared with customer security personnel under strict confidentiality agreement
## Select CalCloud Security Features

<table>
<thead>
<tr>
<th>Encrypted Two-Factor Authenticated Sessions</th>
<th>Cloud Border Security</th>
<th>Admin Access Only from Territorial U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of All Administrative Actions</td>
<td>Least Privilege and Separation of Duties Practices</td>
<td>Data are Property of the State</td>
</tr>
<tr>
<td>Infrastructure Hardening</td>
<td>Coordinated Security Incident Handling</td>
<td>Vendor(s) Background Checked</td>
</tr>
<tr>
<td>Encryption at Rest as an Option</td>
<td>Coordinated Change Control</td>
<td>Security Awareness Training Including IRS Disclosure</td>
</tr>
<tr>
<td>Strong Tenant Isolation</td>
<td>Coordinated OS Patching and Vulnerability Mgt</td>
<td>No Shared Credentials</td>
</tr>
<tr>
<td>Isolated Network Security Tiers</td>
<td>Configuration and Vulnerability Monitoring</td>
<td>Controlled Administrative Access</td>
</tr>
</tbody>
</table>
Contacts

Neeraj Chauhan, Program Director for CalCloud, California Department of Technology
Neeraj.Chauhan@state.ca.go

Chuck Skiko, IBM Client Executive, Southern California Public Sector
cskiko@us.ibm.com

Sheila Bayati, IBM Client Executive, Southern California Public Sector
bayati@us.ibm.com
Thank you
Further background slides
# IBM SmartCloud and CalCloud Services offer multiple tiers and software options

<table>
<thead>
<tr>
<th>Workloads</th>
<th>Ideal for migration of traditional and higher availability applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>RedHat Linux, Windows, AIX, Linux for z (planned)</td>
</tr>
<tr>
<td>Management level</td>
<td>Self Service with multiple disaster recovery and backup/restore tiers</td>
</tr>
<tr>
<td>Availability</td>
<td>99.9%; 99.99% for storage</td>
</tr>
<tr>
<td>Security</td>
<td>Multiple levels of isolation</td>
</tr>
<tr>
<td>Software usage</td>
<td>CalCloud provides operating system / pay as you go / bring your own middleware</td>
</tr>
<tr>
<td>Pricing</td>
<td>Monthly usage-based</td>
</tr>
<tr>
<td>Hosting</td>
<td>Hosted at the State of California's data centers at Gold Camp and Vacaville</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Customizable reports, dashboards, approval procedures, templates</td>
</tr>
<tr>
<td>Security</td>
<td>ISeC and FEDRAMP standard HIPAA, CJIS, SAS70 etc. available upon request</td>
</tr>
</tbody>
</table>

**IBM SmartCloud Enterprise+**

- **Multi-tenant, private government cloud, priced based on usage.**
- **Robust multi-tenant solution, including managed production services.**

<table>
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</thead>
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<tr>
<td>Operating system</td>
<td>Windows, Linux, AIX, z/OS Linux for z (planned)</td>
</tr>
<tr>
<td>Management level</td>
<td>Fully managed</td>
</tr>
<tr>
<td>Availability</td>
<td>98.5-99.9% availability options; 99.99% for storage.</td>
</tr>
<tr>
<td>Security</td>
<td>Multiple levels of isolation</td>
</tr>
<tr>
<td>Software usage</td>
<td>IBM provides operating system and tool licenses</td>
</tr>
<tr>
<td>Pricing</td>
<td>Monthly usage-based and fixed contract</td>
</tr>
<tr>
<td>Hosting</td>
<td>Hosted at IBM Data Centers in Boulder or Raleigh</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Standard reports and templates</td>
</tr>
<tr>
<td>Security</td>
<td>ISeC above hypervisor</td>
</tr>
</tbody>
</table>
## SoftLayer and CalCloud Services offer multiple tiers and software options

<table>
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<th>Workloads</th>
<th>Suitable for full management of traditional and higher availability applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>RedHat Linux, Windows, AIX, Linux for z (planned)</td>
</tr>
<tr>
<td>Hypervisors</td>
<td>VMware, POWER VM, z/VM</td>
</tr>
<tr>
<td>Management level</td>
<td>Self Service with multiple disaster recovery and backup/restore tiers and SLAs</td>
</tr>
<tr>
<td>Availability</td>
<td>99.9%; 99.99% for storage</td>
</tr>
<tr>
<td>Security</td>
<td>Multiple levels of isolation. Inside CGEN, ISeC and FEDRAMP standard. HIPAA, CJIS, SAS70 etc. available upon request. IDS, Anti-Virus (McAfee), POWER SC</td>
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<tr>
<td>Software usage</td>
<td>CalCloud provides operating system / pay as you go / bring your own middleware</td>
</tr>
<tr>
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<td>Hosted at the State of California’s data centers at Gold Camp and Vacaville</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Customizable Cognos reports, web 2.0 dashboards, approval procedures</td>
</tr>
<tr>
<td>PaaS</td>
<td>Not initially</td>
</tr>
<tr>
<td></td>
<td>Clients are interested in cloud economics and self management – “Build Your Own Cloud”</td>
</tr>
<tr>
<td></td>
<td>Windows, RedHat Linux, Ubuntu, CentOS, FreeBSD, CloudLinux</td>
</tr>
<tr>
<td></td>
<td>VMware, Hyper-V, Citrix, Parallels</td>
</tr>
<tr>
<td></td>
<td>Self Service</td>
</tr>
<tr>
<td></td>
<td>No SLAs – users can self-configure IDR and B/R</td>
</tr>
<tr>
<td></td>
<td>Multiple levels of isolation. IDS. Anti-Virus (McAfee)</td>
</tr>
<tr>
<td></td>
<td>SoftLayer provides operating system and DB licenses</td>
</tr>
<tr>
<td></td>
<td>By the hour or month</td>
</tr>
<tr>
<td></td>
<td>IBM San Jose data center</td>
</tr>
<tr>
<td></td>
<td>Can manage through rich set of APIs plus Nimsoft Monitoring</td>
</tr>
<tr>
<td></td>
<td>DBaaS (SQL Server, MySQL, NoSQL)</td>
</tr>
</tbody>
</table>
### PMC and CalCloud Services offer multiple tiers and software options

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</tbody>
</table>

### Private Modular Cloud

- **Ideal for building your own on-premise cloud**
- **Windows, RedHat Linux, AIX (planned), Linux for z (planned)**
- **VMware**
- **Either Self Service (by client) or Fully Managed (IBM SO)**
- **SLAs will be agreed in Fully Managed option**
- **Multiple levels of isolation.**
- **Client provides operating system and middleware**
- **Capital expenditure**
- **(a) On-premise (client), (b) SoftLayer data center (San Jose), or (c) Third-Party data center**
- **Adaptable portal layer**
- **Not initially**
CalCloud supports enterprise-class workloads and includes a full suite of managed services for public sector organizations in California.

- Small, Medium, Large and X-Large VMs
- RedHat Linux, Windows, AIX, and Linux for z
- Hosted at California Dept of Technology’s data centers in Rancho Cordova and Vacaville
- Ability to customize reports, dashboards, approval procedures, quotas, user roles per each organization
- Security designed-in and certified ISeC and FEDRAMP – multiple levels of isolation
- Inside CalNet security firewalls
- IBM pSeries and xSeries enterprise class hardware based on Flex System
- Standard set of operating images offered in fixed sizes and SLA management up to and including Operating Systems
- Fit for Cloud Enabled enterprise class workloads
- Multiple disaster recovery and backup/restore tiers
- Accommodates IBM and non-IBM hardware and software
- Low cost – 25-30% of current prices
Cloud as an economic development engine

- Attraction, creation, deployment, growth and retention
- Enabling business and technology

To what extent is cloud an economic development engine for you?