
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

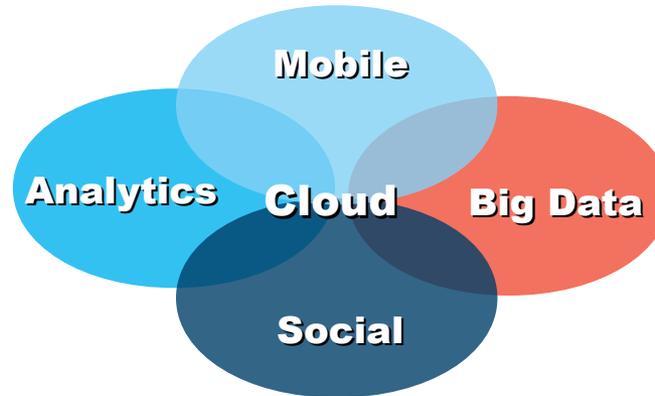
 Speed, agility and scalability	 Security-rich & Highly available	 Improved efficiency	 Cost optimized
<ul style="list-style-type: none"> ▪ Enable faster delivery of services ▪ Help improve the agility and dexterity of government services ▪ Masking complexity ▪ Scalability to meet demand peaks ▪ Replacement for lost skills. 	<ul style="list-style-type: none"> ▪ Facilitate improved data security – Security as a Service ▪ Help better manage compliance ▪ Help improve disaster recovery capability ▪ Form part of a wider community or city resilience strategy 	<ul style="list-style-type: none"> ▪ Help more effectively manage IT resources ▪ Enable reduced need for human intervention with automation. ▪ Integrating functional “stovepipes” – enabling sharing of apps and data. 	<ul style="list-style-type: none"> ▪ Enable improved IT efficiency & economies to reduce IT costs. ▪ Pay in line with usage, if required. ▪ Shifts from fixed cost to variable cost.

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



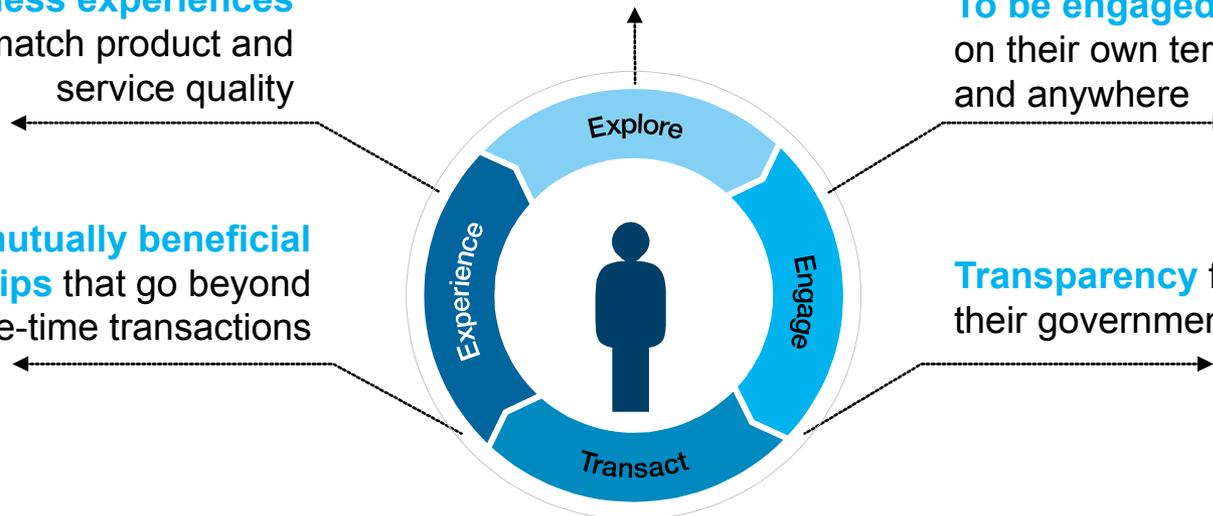
Instant access to information, products and services

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.

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**.

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

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

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

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**

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

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**.

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.**

http://ec.europa.eu/information_society/activities/cloudcomputing/docs/com/com_cloud.pdf

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 (telecoms 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

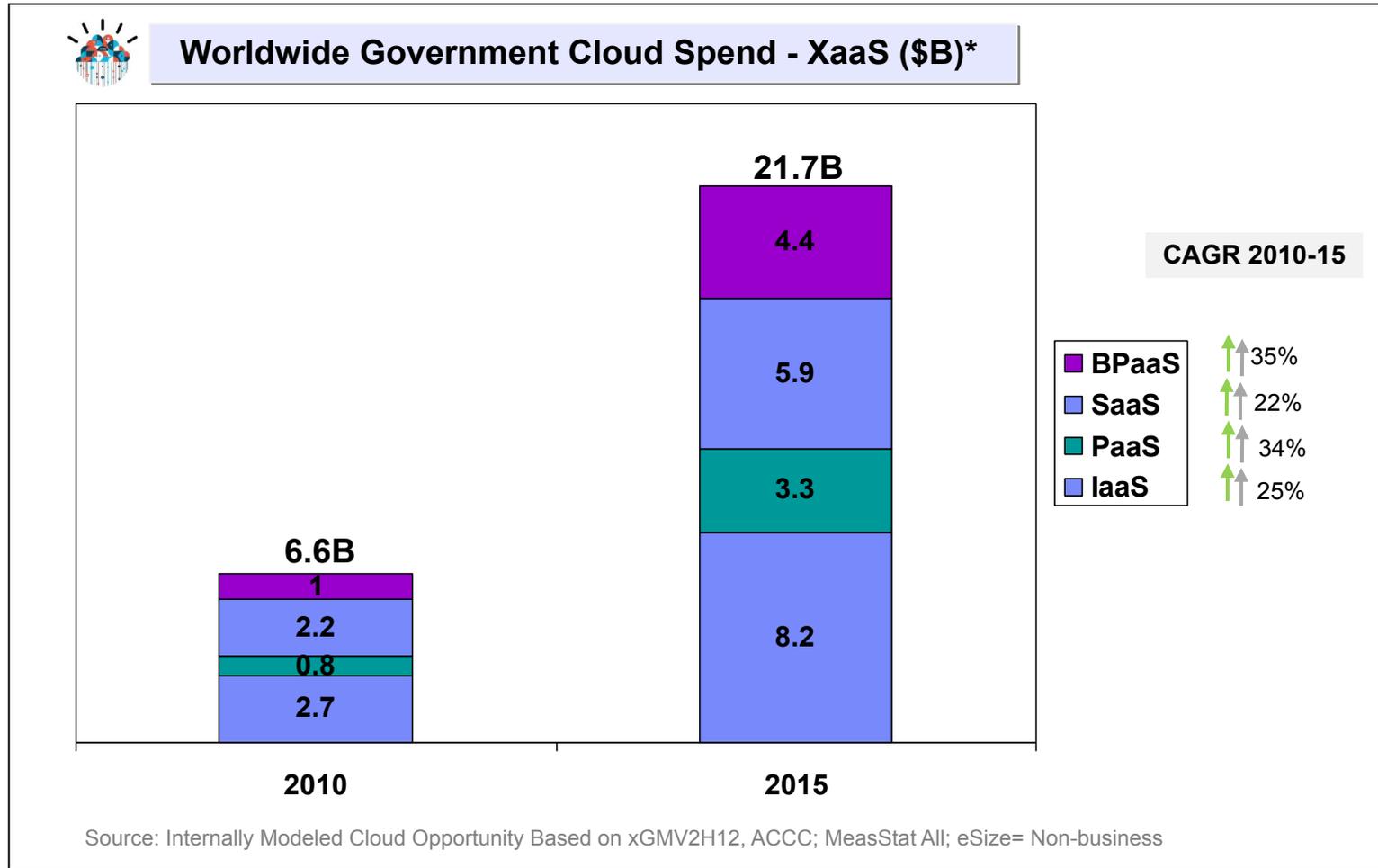
- Open data is data made available for anyone to use, at no cost.
- Nearly 50 countries now have open data policies, intended to:
 - Derive additional value from existing data.
 - Enable a higher level of accountability.
 - Encourage the development of locally developed applications that extend the services 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).



<http://www.data.gov/opendatasites>.

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.



**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:

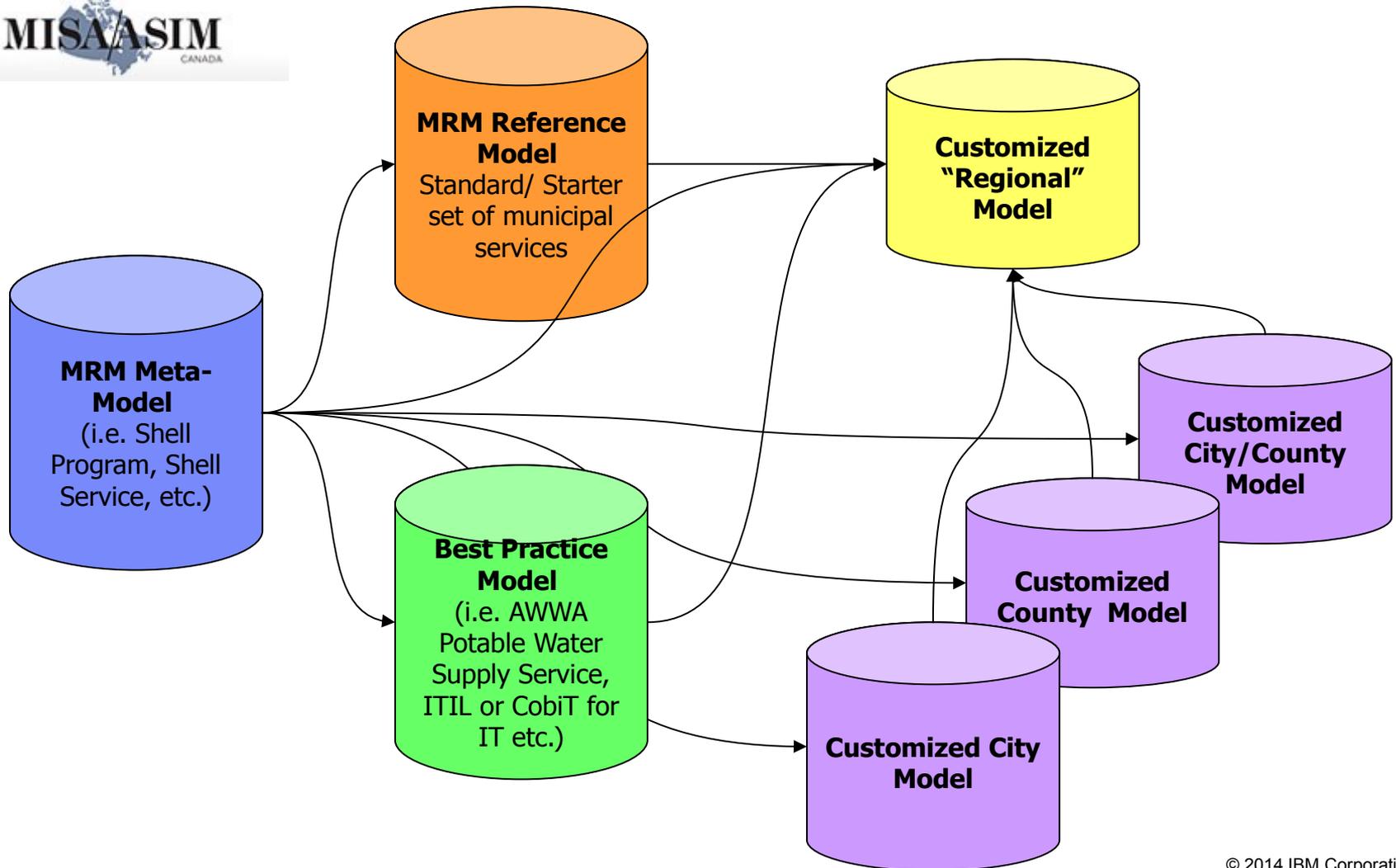
- Basic office automation
- Payments
- Permitting/code compliance
- Web hosting (for county websites)
- Finance/HR/ERP
- Law and order - public safety
- Emergency management: disaster recovery, business continuity
- Open data publication and tools
- GIS

▪ 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?**

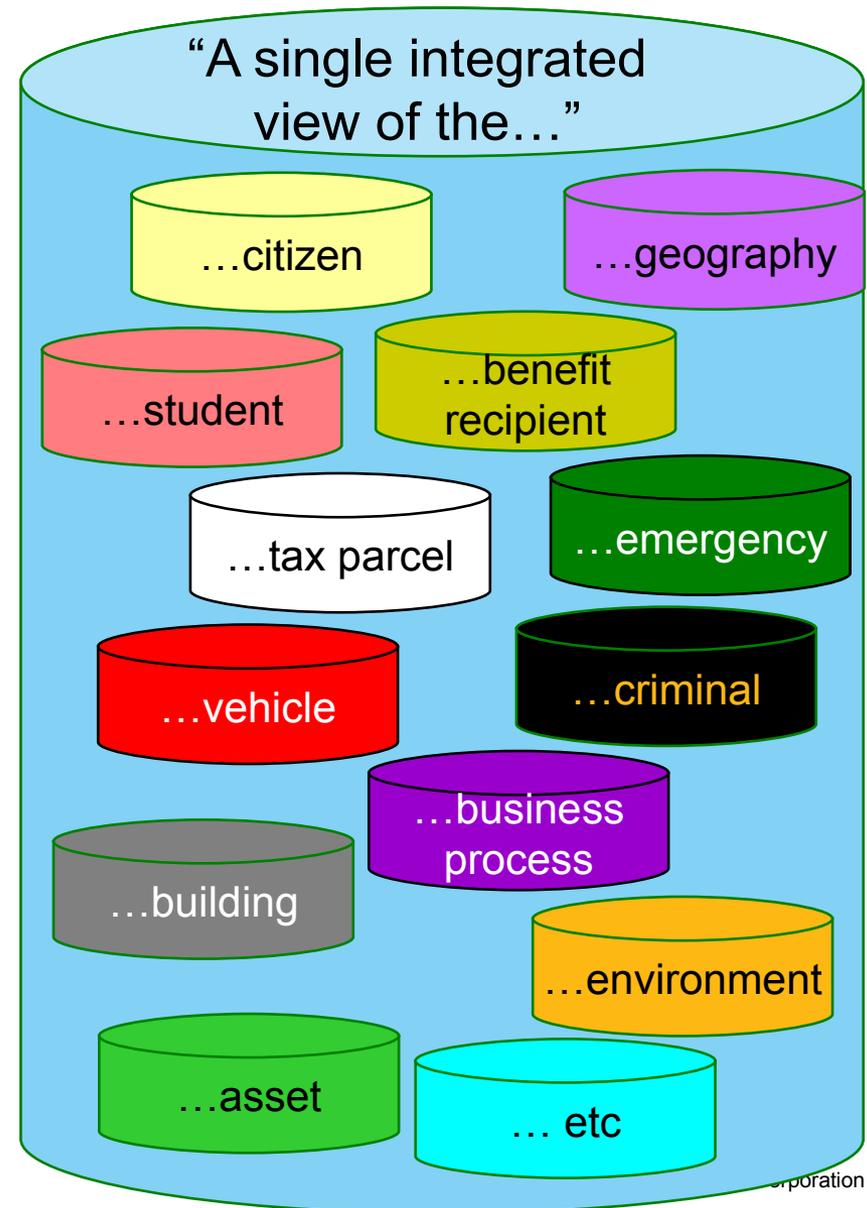
One key component of BPaaS will be an underlying data and service model. These are beginning to exist.



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.

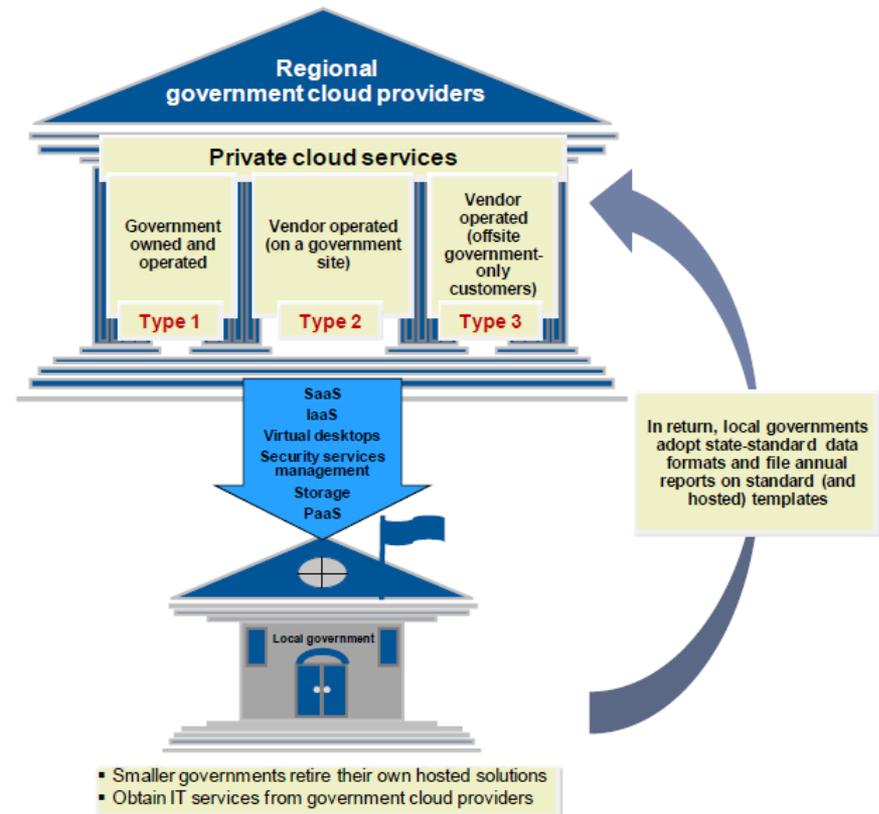
To what extent do you see an API-based approach in your cloud plans?

- **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 the cloud owner.

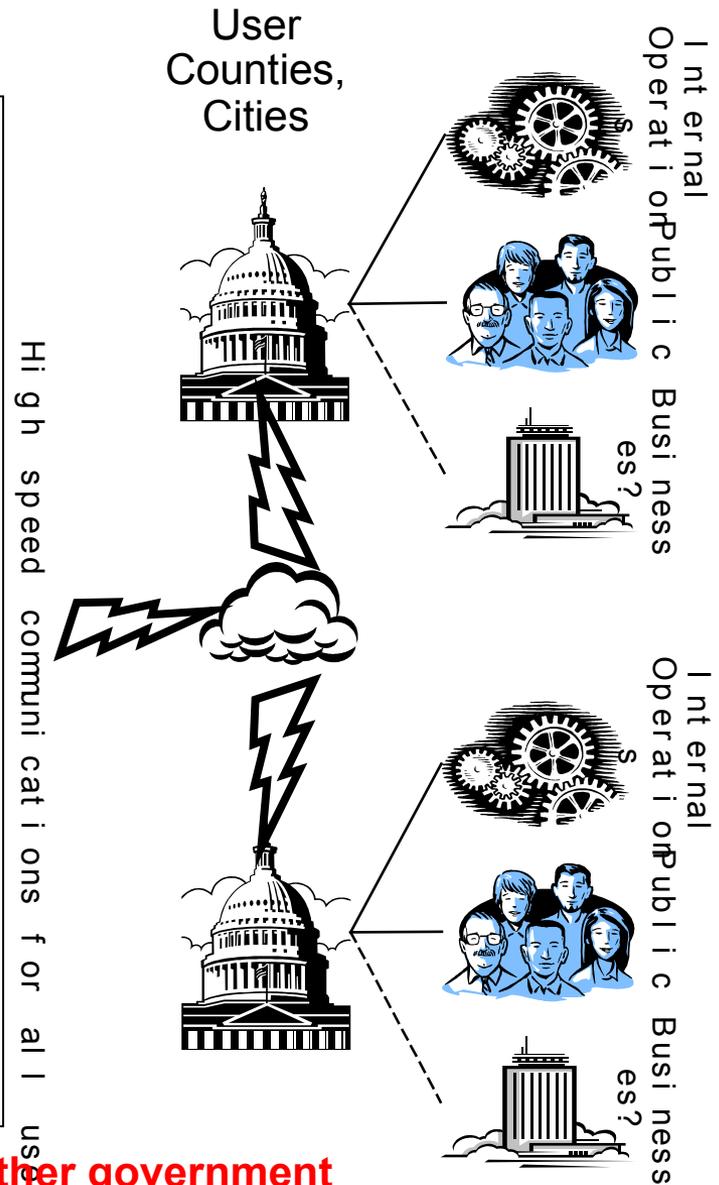
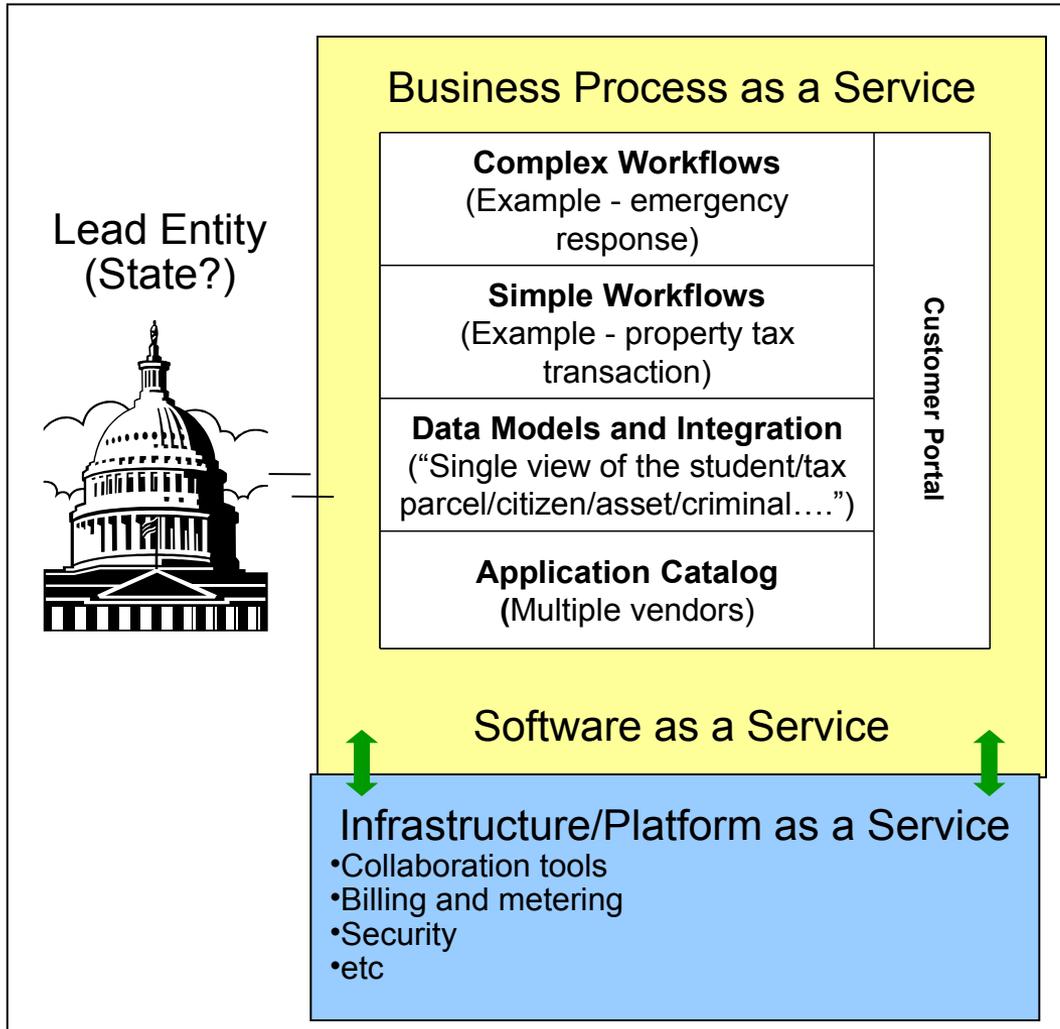
Trickle Down: State Government Cloud Hubs' Offerings of IT Services to Local Governments



Source: IDC Government Insights, 2011

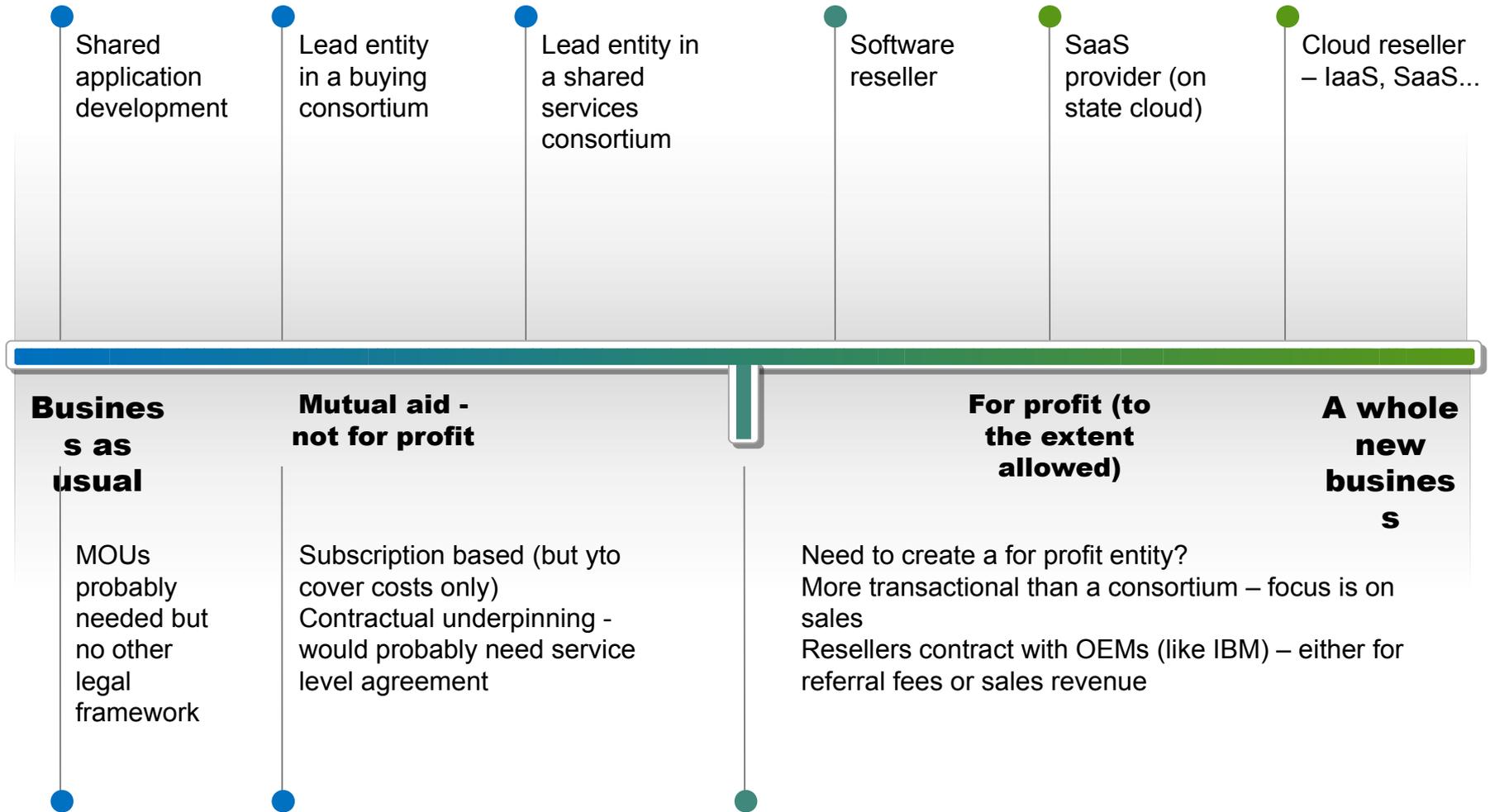
What interest is there in becoming a service provider – perhaps using CalCloud as your platform?

A shared services model?



Who else do you see using your cloud platform? Other government entities? Local NGOs? Local businesses?

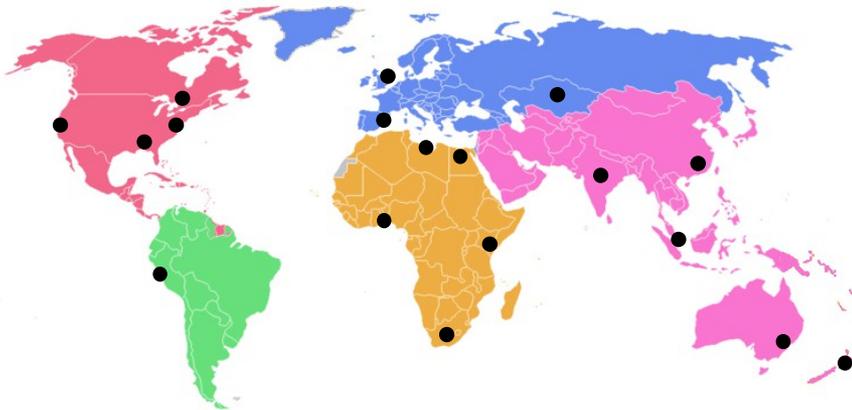
Possible business models for shared services



Where might you be looking on this spectrum?

Data residency and local content requirements are common world wide. 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.

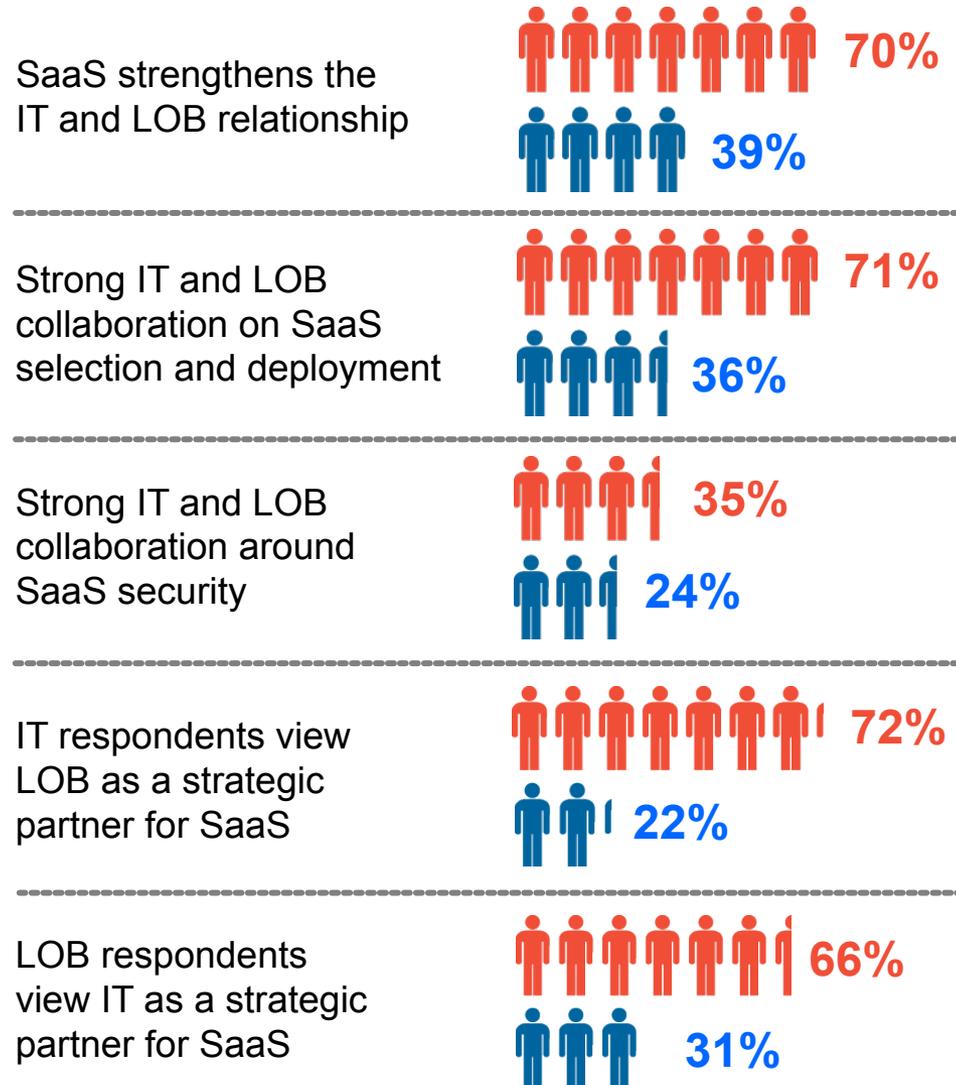


Would you prefer to buy cloud under a capex or an opex model?

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?



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?



California Cloud Positioning

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

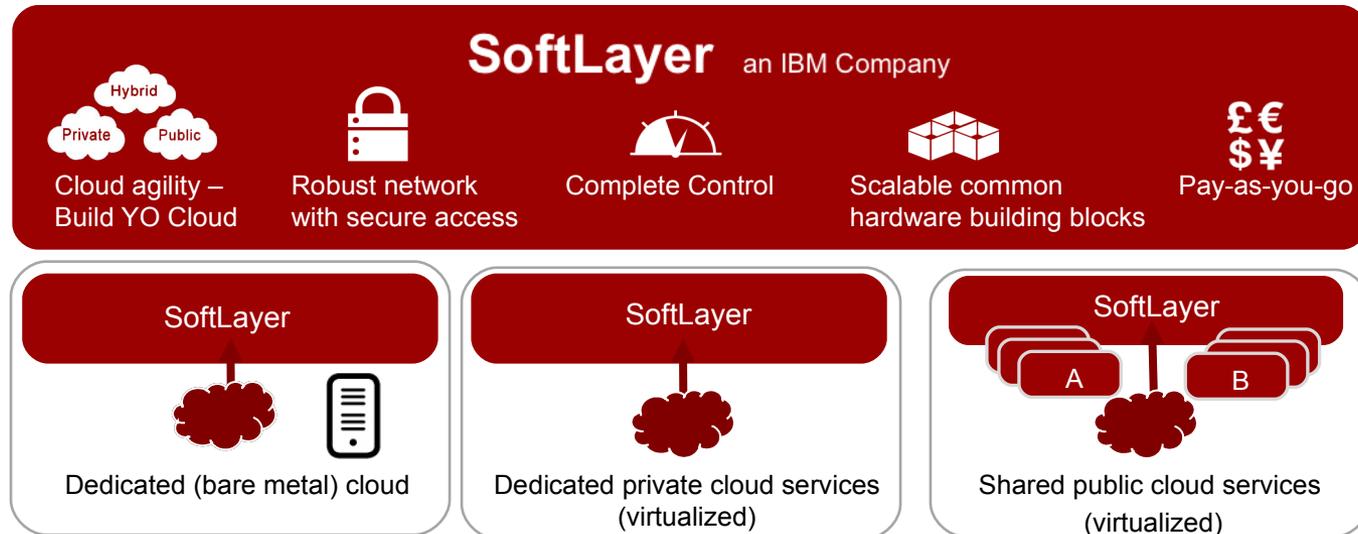
Private Modular Cloud (PMC)

- 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

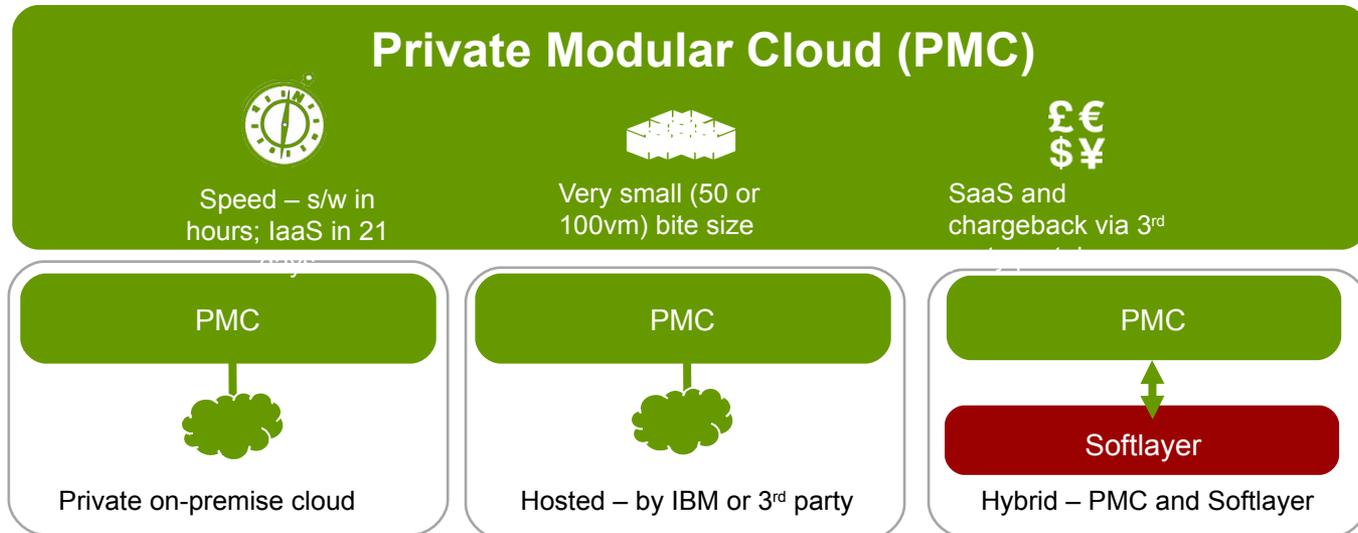
- Server and Storage platforms including Cloud-in-a-Box PureSystem offerings
- Cloud enabling Software tools and packages (IBM Smart Cloud).
- Services for planning and implementing
- Available from IBM via standard procurement approaches.

SoftLayer supports “build your own” cloud environment—from private dedicated servers (including bare metal) to shared (public) multi-tenant models -- pay-as-you-go



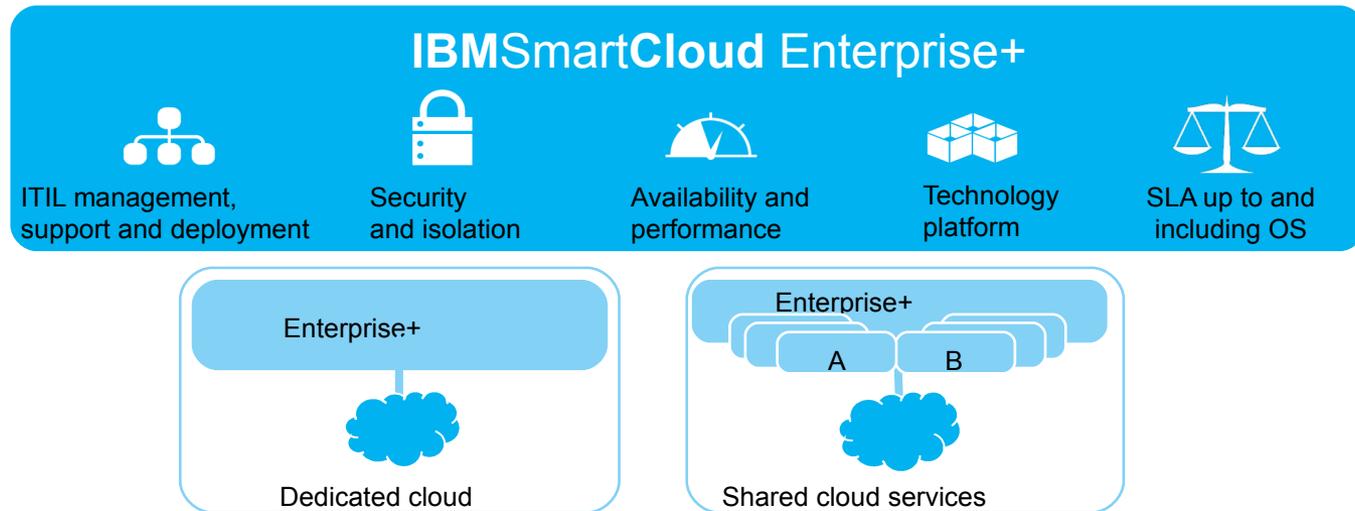
- Dedicated servers (bare metal & virtual), Virtual Servers (Private or Public Shared multi-tenant) - Build Your Own Cloud
- Complete control of your cloud environment (000's of APIs): applications and management – BYO or select from SL's image catalog
- Global, highly secure, agile IPv4 & IPv6 networks 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-premise 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.

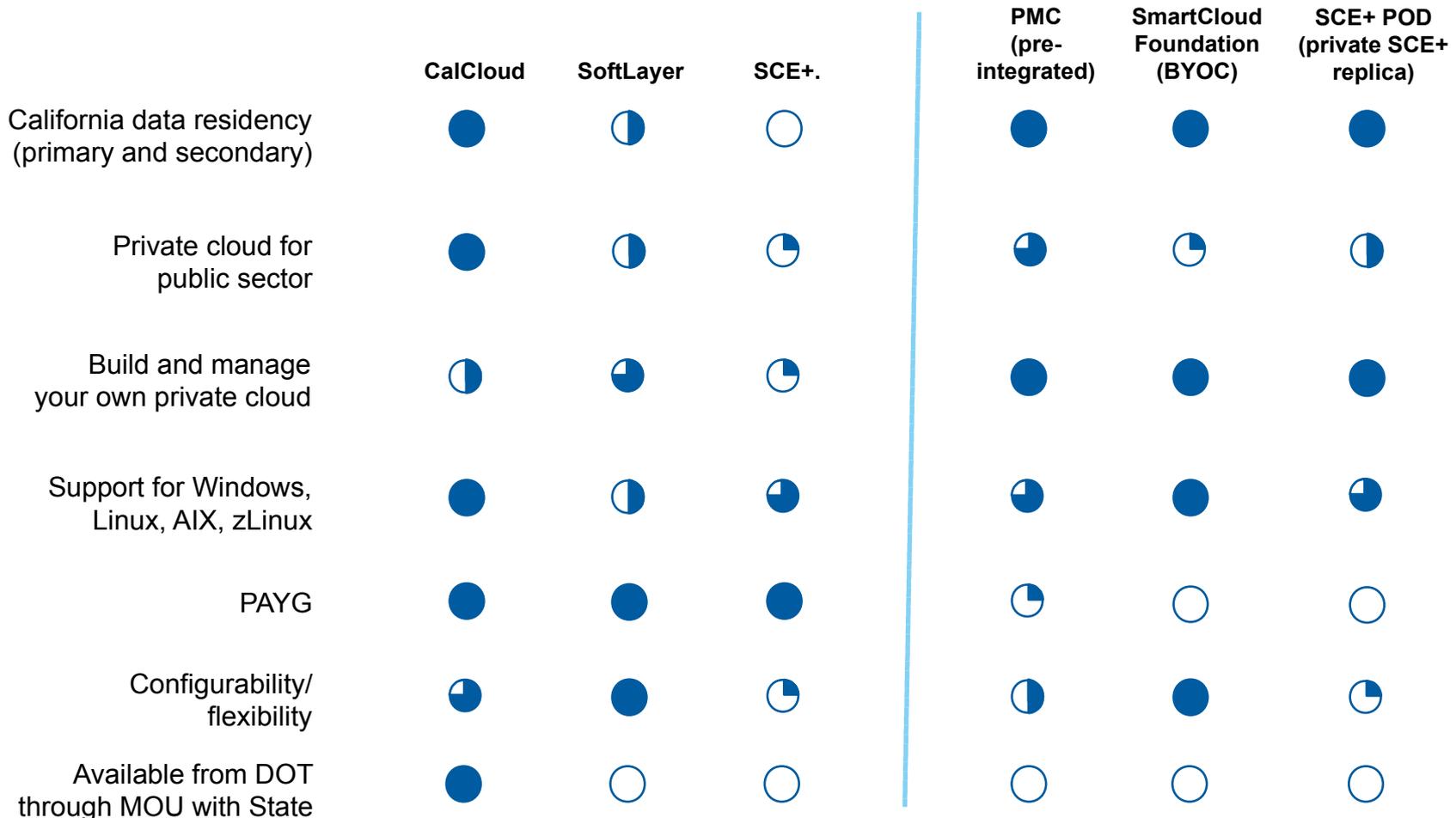
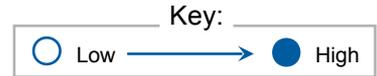
IBM SmartCloud Enterprise+ (SCE+) supports enterprise-class workloads and includes a full suite of managed services.



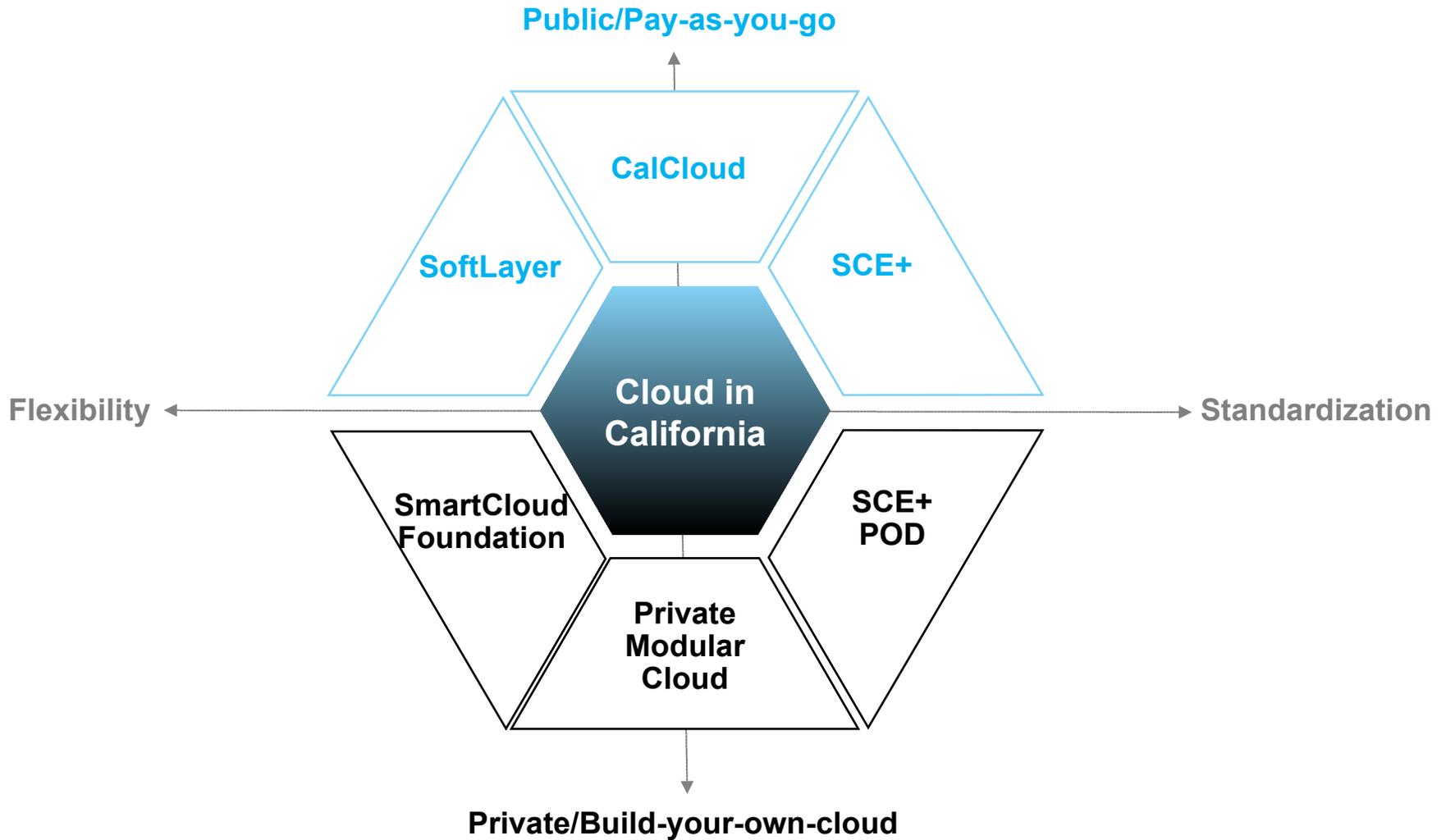
- High Availability clustering and three Active Directory scenarios to support complex enterprise applications
- Unmanaged VMs, Large VMs, Large Disks to extend workload coverage
- Database and Middleware Management Services (install, configure, alerts, backup and management)
- Global shared or dedicated 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*



What does our cloud portfolio look like?





CalCloud Presentation

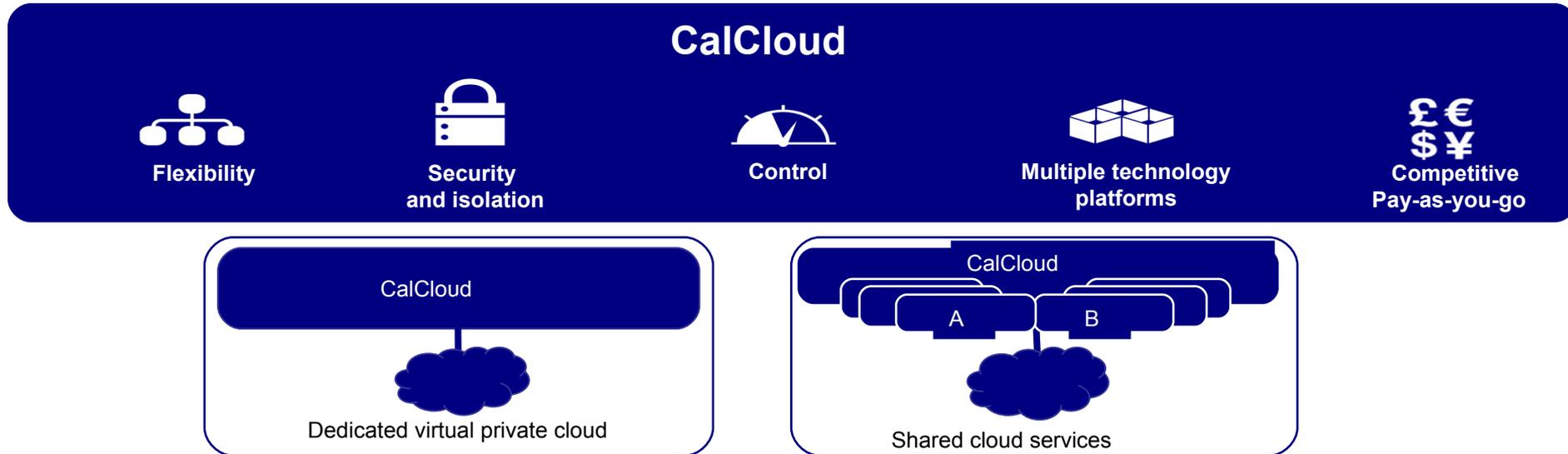
Overview of Department of Technology

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).

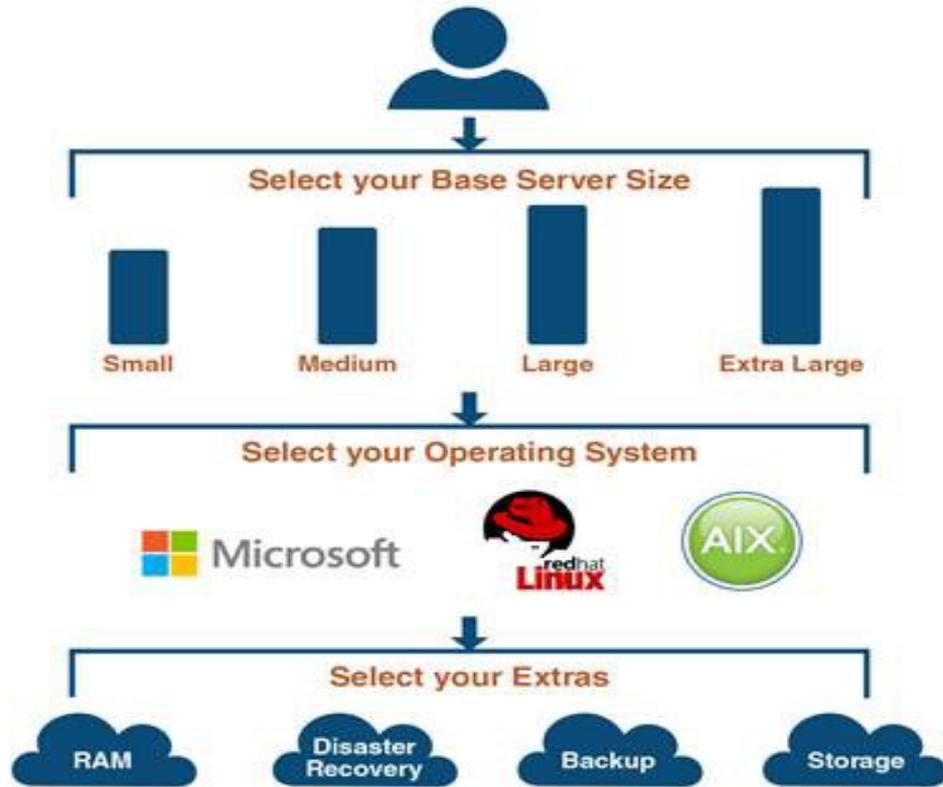
CalCloud Vendor provides hardware, software, portal and OS administration (patching).

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.

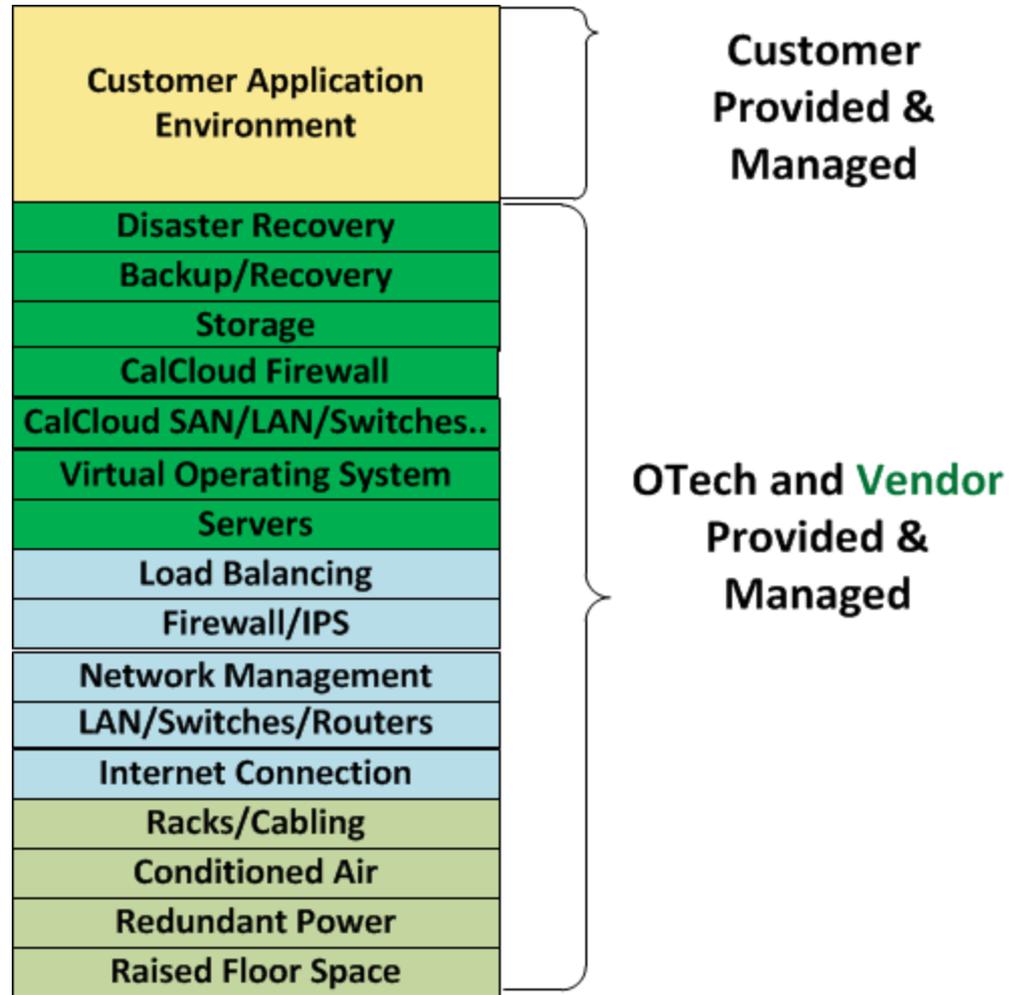


BUNDLE SIZE	CCU	MEMORY (GB)	STORAGE
Small	2	4 GB	90 GB
Medium	4	8 GB	90 GB
Large	8	16 GB	90 GB
Extra-Large	16	32 GB	90 GB

CalCloud Services

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

CalCloud R&R



CalCloud (OTech Virtual Private Cloud)

CalCloud Server Rates

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

OS	Small	Medium	Large	Xlarge
RedHat	\$658	\$914	\$1266	\$1841
With DR I	\$1194	\$1450	\$1802	\$2376
With DR II	\$926	\$1182	\$1534	\$2108
Windows	\$679	\$943	\$1305	\$1900
With DR I	\$1200	\$1495	\$1857	\$2450
With DR II	\$955	\$1219	\$1581	\$2174
AIX	\$1133	\$1717	\$2628	\$4852
With DR I	\$1475	\$2199	\$3467	\$6287
With DR II	\$1294	\$1940	\$3105	\$5589

CalCloud Extra Rates

- **All rates have volume discounts.**

Additional Service	Rate
Storage (priced per GB)	\$0.44 to \$0.38 (at highest volume)
Archive Storage (priced per GB)	\$0.19 to \$0.16 (at highest volume)
RAM (priced per GB)	\$18 to \$15 (at highest volume)
Backup Tier 1 (priced per GB)	\$0.35 to \$0.27 (at highest volume)
Backup Tier 2 (priced per GB)	\$0.26 to \$0.24 (at highest volume)

CalCloud Service Roadmap

IaaS/PaaS (RedHat,
Windows and AIX)

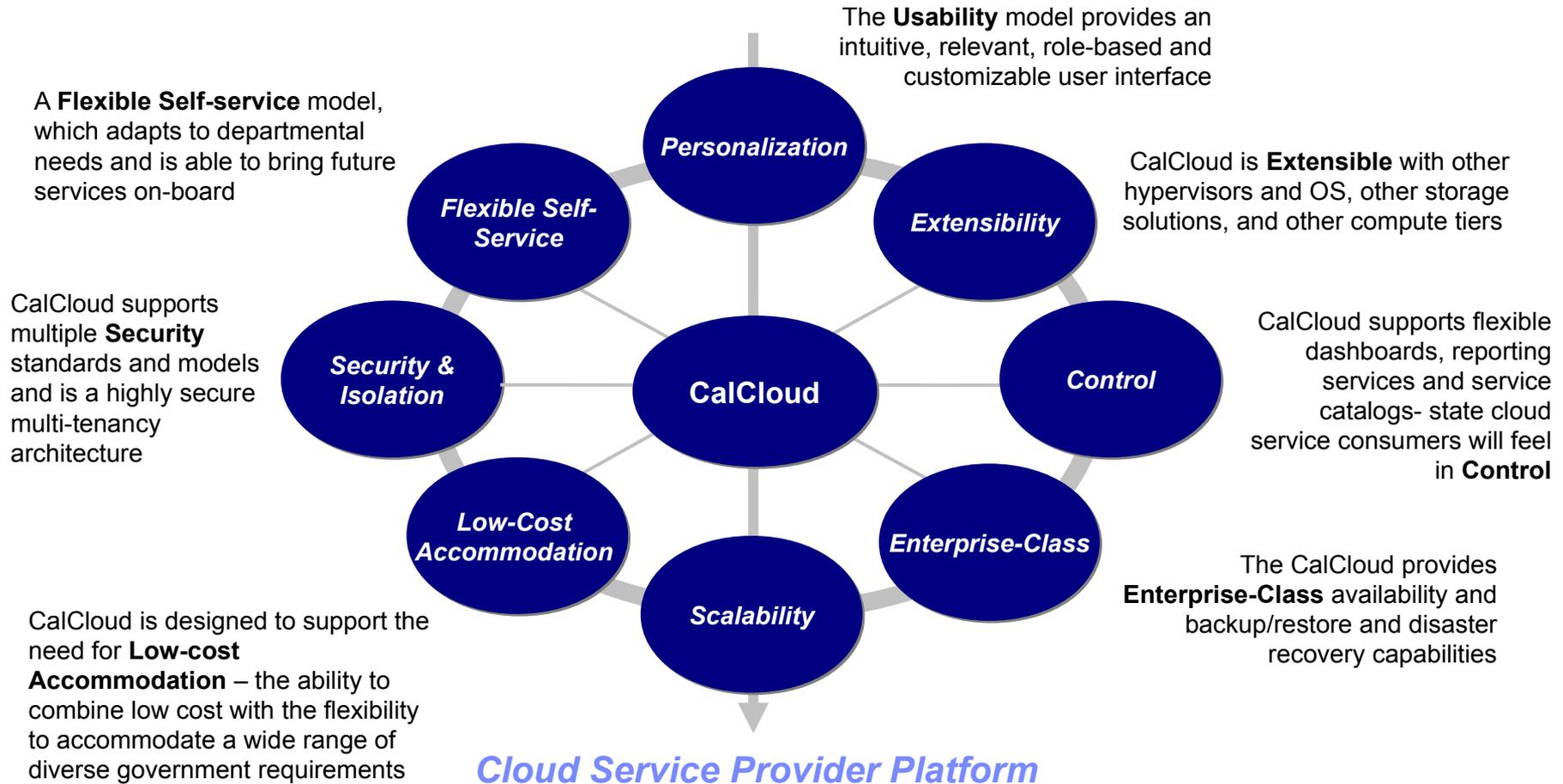
SaaS/AaaS



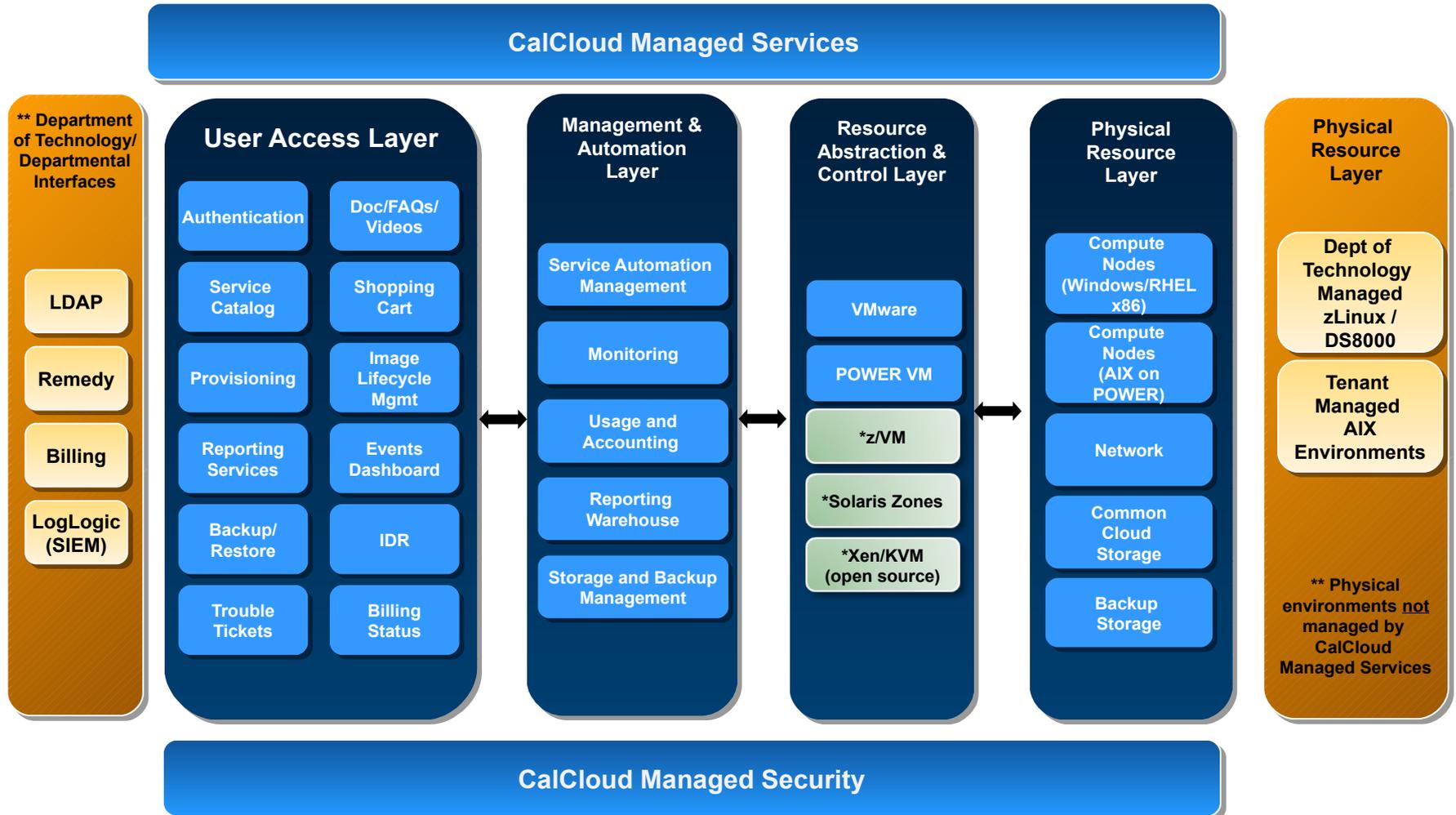
DaaS/PaaS/STaaS
(SQL,DB2,Oracle..)

CalCloud architectural decisions

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



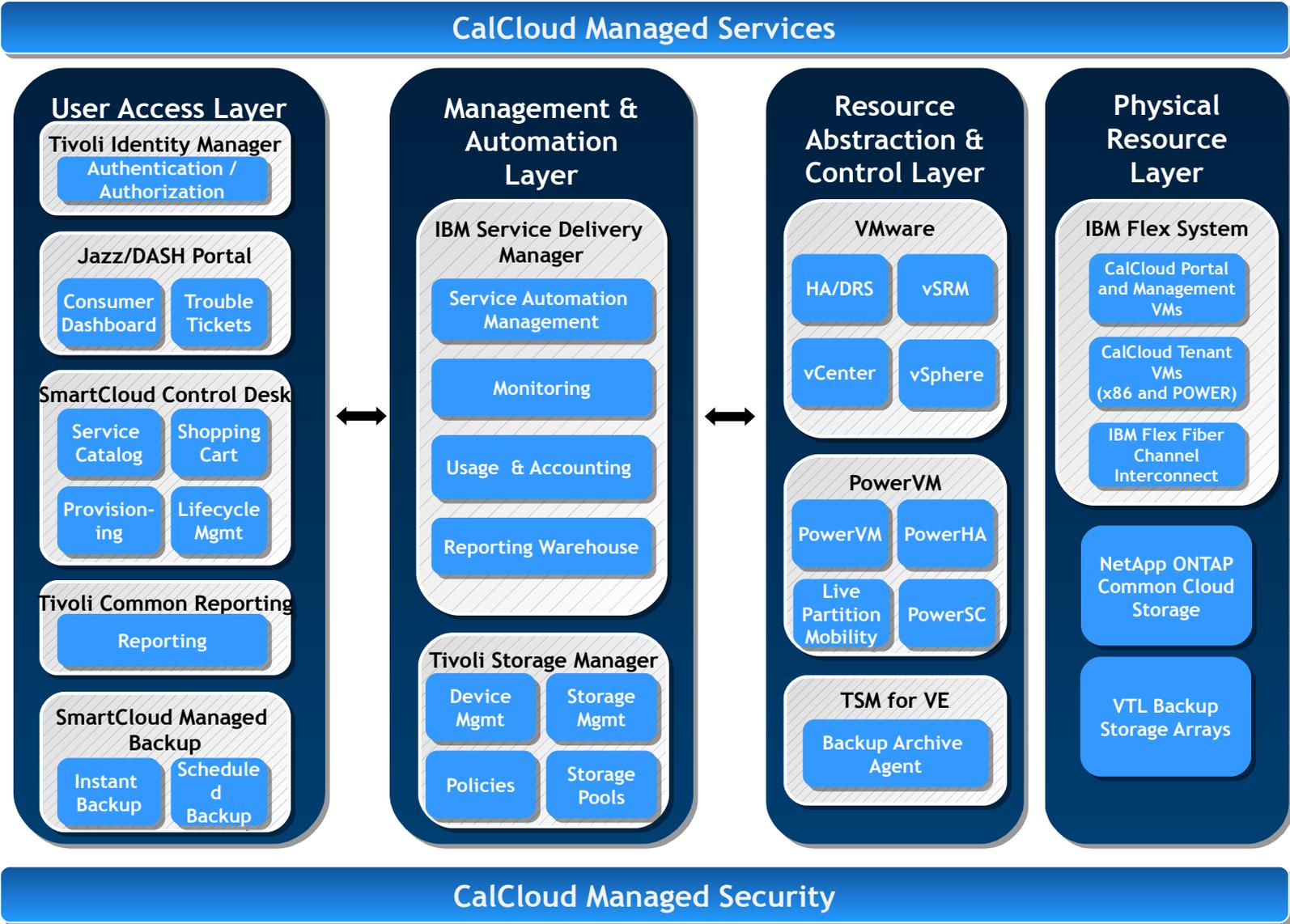
CalCloud logical architecture diagram



CalCloud logical architecture diagram

** Department of Technology/ Departmental Interfaces

- LDAP
- Remedy
- Billing
- LogLogic SIEM



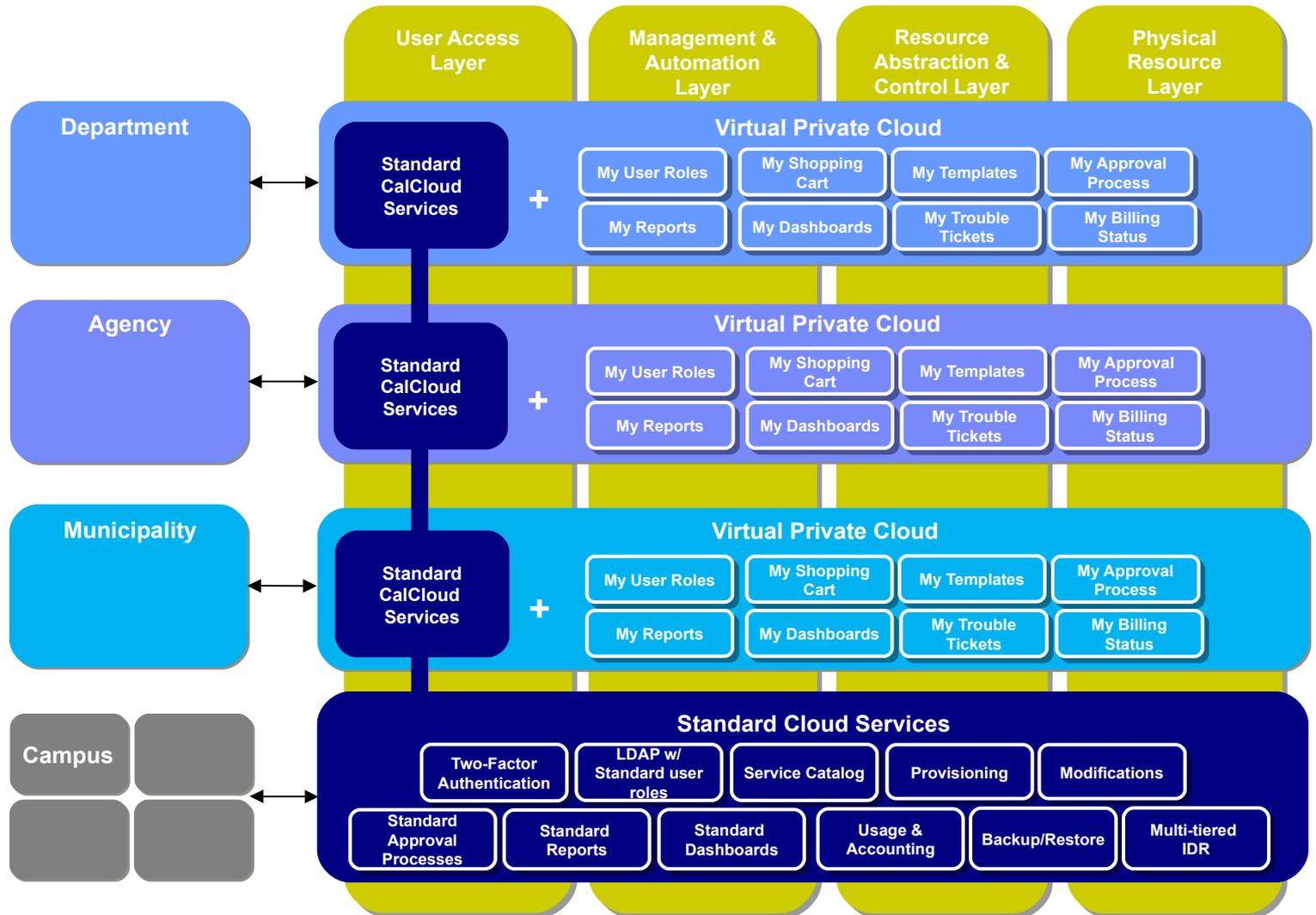
CalCloud Storage Services

Optimized, scalable and dynamic

Deep integration with VMware	<p>NetApp and VMware are deeply integrated in terms of Research & Development Optimized for multi-tenant cloud storage environments</p>	Encryption at Rest	<p>Encryption at rest storage services using the Brocade Encryption Blade (BEB) with the SAN Directors</p>
Multi-tenant encryption key management	<p>Customers will manage their own encryption keys</p>	Highly scalable	<p>Grows clusters non-disruptively Storage arrays can be added incrementally</p>
High Availability	<ul style="list-style-type: none"> • Provides RAID-Dual Parity (DP) without performance penalty • Ability to recover from two simultaneous disk failures 	Intelligent Storage Optimization	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

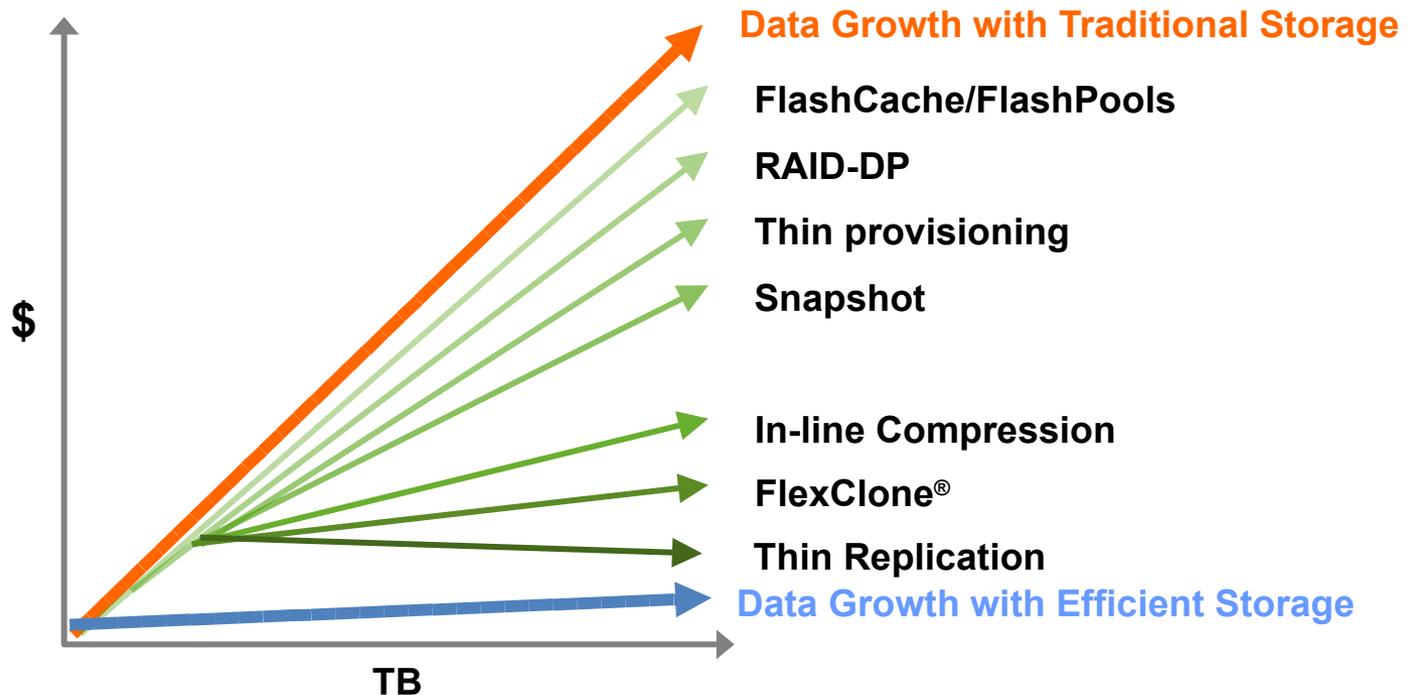
Open to the entire public sector in California



CalCloud Storage Services

Optimized, scalable and dynamic

Intelligent Storage Optimization

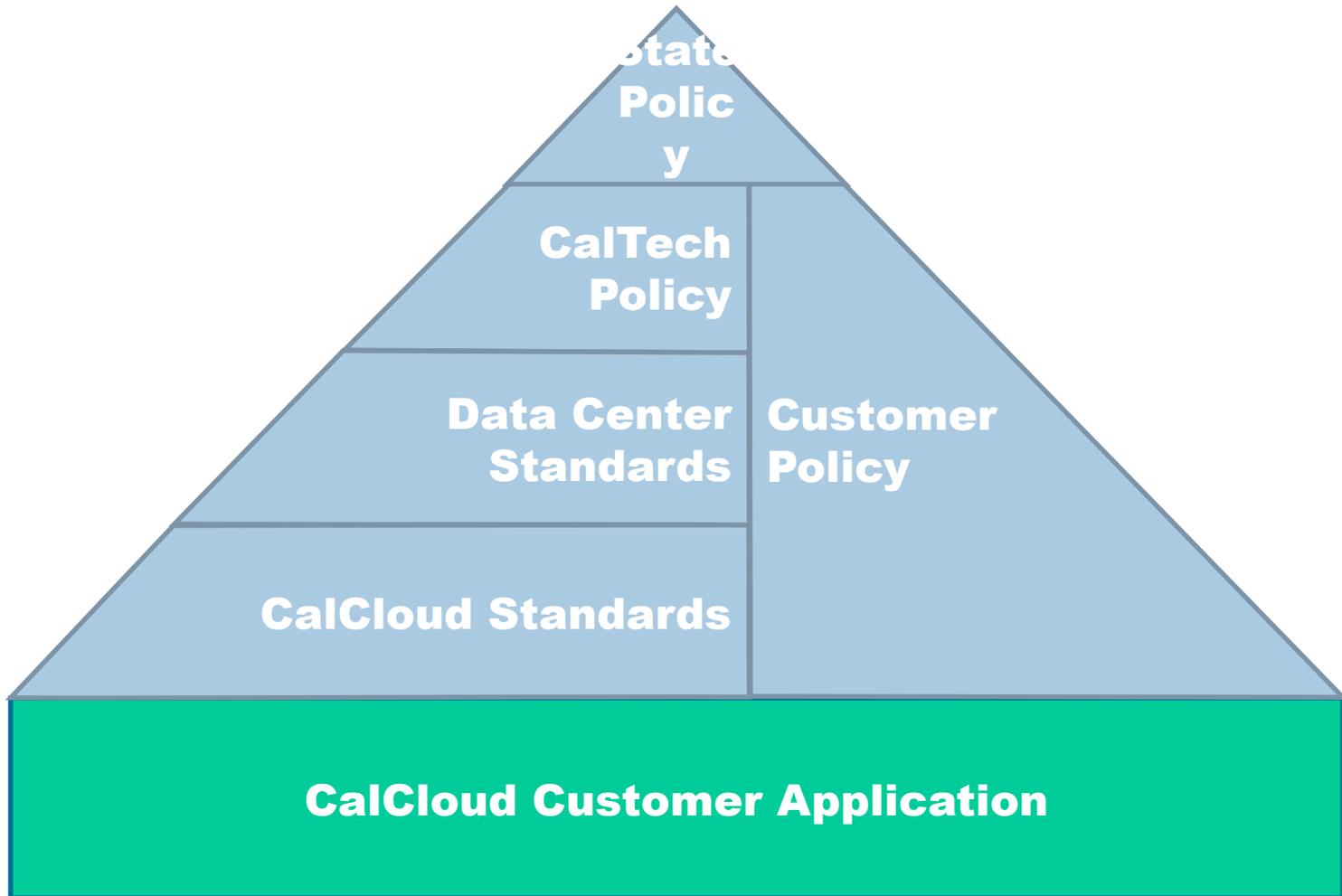


Change the cost/growth curve for cloud computing

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 Policy Pyramid



CalCloud Security Stack

CalCloud provides a comprehensive and tiered security model



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

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

Contacts

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Thank you



Further background slides

IBM SmartCloud and CalCloud Services offer multiple tiers and software options



Multi-tenant, private government cloud, priced based on usage.

IBM SmartCloud Enterprise+

Robust multi-tenant solution, including managed production services.

Workloads	Ideal for migration of traditional and higher availability applications	Ideal for migration of traditional and higher availability applications
Operating system	RedHat Linux, Windows, AIX, Linux for z (planned)	Windows, Linux, AIX, z/OS Linux for z (planned)
Management level	Self Service with multiple disaster recovery and backup/restore tiers	Fully managed
Availability	99.9%; 99.99% for storage	98.5-99.9% availability options; 99.99% for storage.
Security	Multiple levels of isolation	Multiple levels of isolation
Software usage	CalCloud provides operating system / pay as you go / bring your own middleware	IBM provides operating system and tool licenses
Pricing	Monthly usage-based	Monthly usage-based and fixed contract
Hosting	Hosted at the State of California's data centers at Gold Camp and Vacaville	Hosted at IBM Data Centers in Boulder or Raleigh
Adaptation	Customizable reports, dashboards, approval procedures, templates	Standard reports and templates
Security	ISeC and FEDRAMP standard HIPAA, CJIS, SAS70 etc. available upon request	ISeC above hypervisor

SoftLayer and CalCloud Services offer multiple tiers and software options



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

PMC and CalCloud Services offer multiple tiers and software options

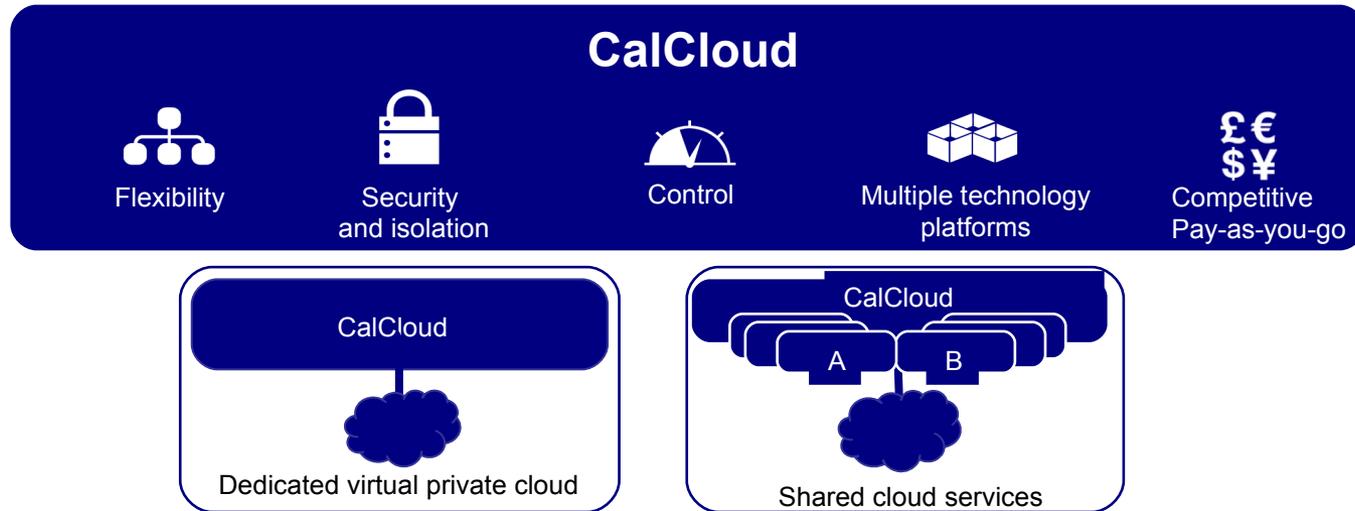


Private Modular Cloud



Workloads	Suitable for full management of traditional and higher availability applications	Ideal for building your own on-premise cloud
Operating system	RedHat Linux, Windows, AIX, Linux for z (planned)	Windows, RedHat Linux, AIX (planned), Linux for z (planned)
Hypervisors	VMware, POWER VM, z/VM	VMware
Management level	Self Service with multiple disaster recovery and backup/restore tiers and SLAs	Either Self Service (by client) or Fully Managed (IBM SO)
Availability	99.9%; 99.995% for storage	SLAs will be agreed in Fully Managed option
Security	Multiple levels of isolation. Inside CGEN. ISeC and FEDRAMP standard. HIPAA, CJIS, SAS70 etc. available upon request. IDS, Anti-Virus (McAfee), POWER SC	Multiple levels of isolation.
Software usage	CalCloud provides operating system / pay as you go / bring your own middleware	Client provides operating system and middleware
Pricing	Monthly usage-based	Capital expenditure
Hosting	Hosted at the State of California's data centers at Gold Camp and Vacaville	(a) On-premise (client), (b) SoftLayer data center (San Jose), or (c) Third-Party data center
Adaptation	Customizable Cognos reports, web 2.0 dashboards, approval procedures	Adaptable portal layer
PaaS	Not initially	Not initially

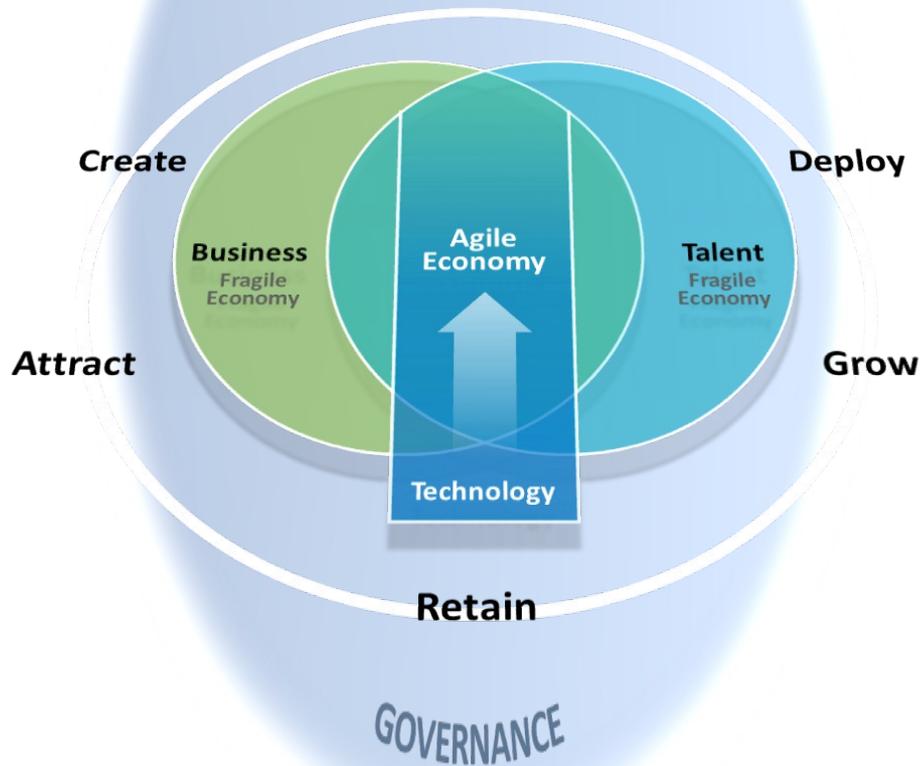
CalCloud supports enterprise-class workloads and includes a full suite of managed services for public sector organizations in California



- 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, growth and retention
Enabling technology



IBM INSTITUTE FOR BUSINESS VALUE

Improving economic competitiveness and vitality

A smarter approach to economic development



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