Deloitte.

State of Louisiana
IT Consolidation

Facilities Management Strategy

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Current State Assessment Summary

Current State: Key Data Center Metrics

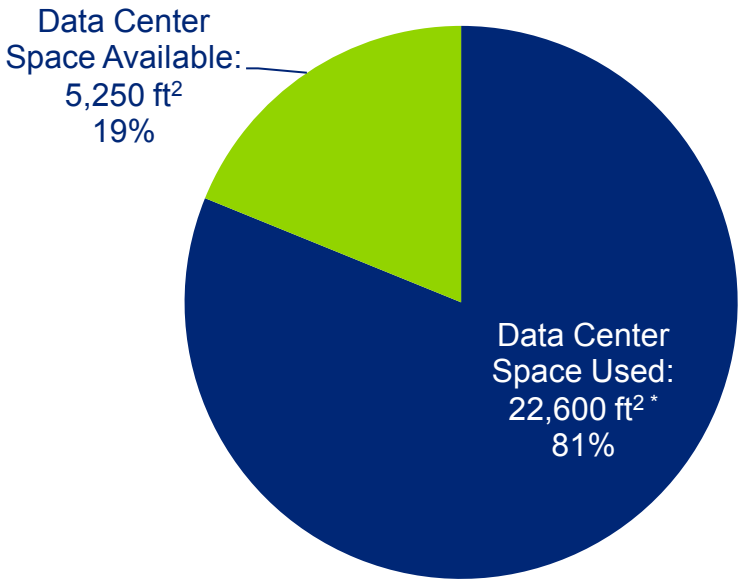
A summary of the key infrastructure assets are outlined below:

Data Center Metric	Count (est.)
Enterprise Data Centers	2
Department Data Centers	5+
Total Owned Data Center Floor Space	30,000+ sq.ft.
Percent of Data Center Space Utilized	81%
Number of Physical Server Instances	1,800+

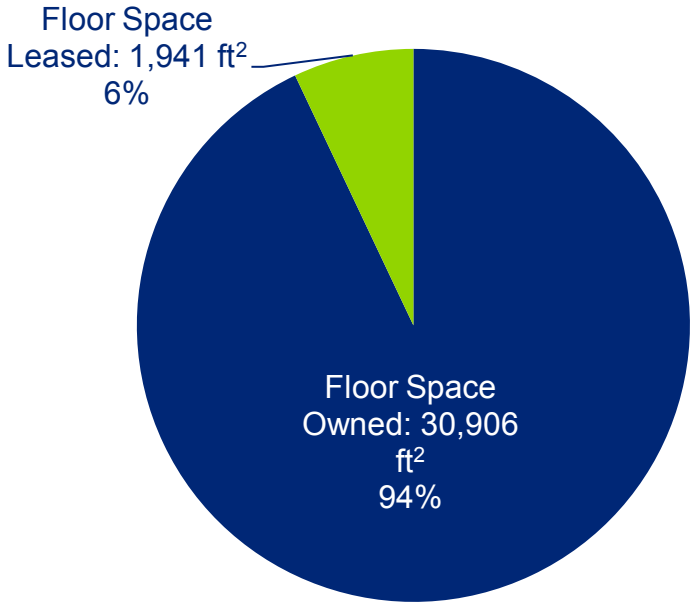
Current State: Data Center Capacity

The State owns and operates two enterprise data centers that host multiple departments: ISB and DPS. The remaining floor space consists of owned and leased floor space operated by individual departments.

Floor Space Utilization (ISB and DPS Data Centers)



Owned Floor Space (All In-Scope Departments)



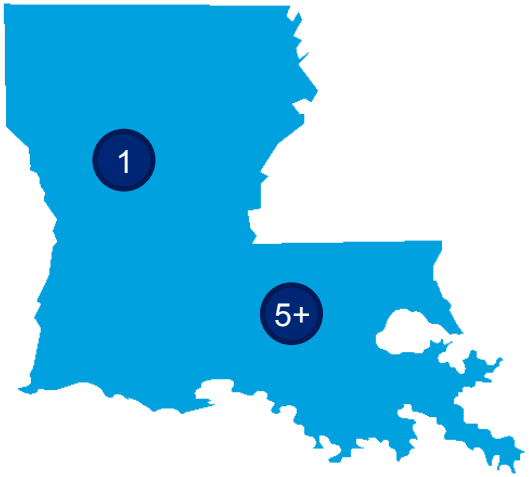
* Includes tenants at ISB that are not in-scope for consolidation

ISB and DPS account for over 5,000 ft^2 of available floor space for data center consolidation, with additional space made possible by moving existing systems to the cloud.

Current State: Department Data Centers

In the current state facilities plan, many departments have their own data centers, each requiring equipment, maintenance, and dedicated support staff.

Department	Data Center Locations	Notes
Administration	3	ISB, OGB, and OCD
Children and Family Services	0	Colocated in ISB, some equipment at LSU
Civil Service	0	Colocated in ISB
Economic Development	0	Colocated in ISB
Education	0	Colocated in ISB
Environmental Quality	0	Colocated in ISB
Health & Hospitals	1	Moving to Venyu – Bossier City
Natural Resources	0	Colocated in ISB
Public Safety and Corrections	1	DPS, Corrections servers hosted on-site
Revenue	0	Colocated in DPS
Transportation & Development	1	Backups at Venyu
Veterans Affairs	0	Small footprint in server rooms
Wildlife & Fisheries	1	Data Center with Flooding Issues, also at Venyu
Workforce Commission	1	On-site Data Center, moving to Venyu



5+ Data Centers are located in Baton Rouge alone, and numerous server rooms and server closets are spread throughout the State of Louisiana and operated by the individual departments

Current State: Services at ISB Data Center

The ISB data center is managed by OCS and hosts services for the Division of Administration. OCS provides raised floor space for other agencies via a chargeback model.

ISB Data Center Key Features and Challenges

- **Features** – The data center has redundant utilities and backup generators to maintain service uninterrupted in a disaster and has never experienced an outage.
- **Inefficient Use of Space** – OCS serves as a colocation provider for other departments, who are responsible for their respective racks, servers, storage, etc. This prevents OCS from consolidating storage and rack space and efficiently creating hot/cold aisles to better manage cooling and other resources.
- **Non-Ideal Location** – The data center is located near the river and has a risk of flooding along with other possible site hazards. Failover systems for email and other key components are hosted in the DPS data center. The DPS data center is only 7 miles away and potentially could be affected by the same regional disaster as ISB.

ISB Data Center Metric	Amount (est.)
Total Floor Space	15,000 ft^2
Used Floor Space	12,800 ft^2
Total Available Power	1,800 KW
Used Power	700 KW

Current State: Services at DPS Data Center

The DPS data center is managed by the Department of Public Safety. DPS also provides raised floor space for other agencies via a chargeback model.

DPS Data Center Key Features and Challenges

- **Features** – Battery Monitoring system installed, fire suppression system replaced, and currently undergoing a project to add new UPS, Generator, and 3 "PODS" that include 17 racks per POD.
- **Inefficient Use of Space** – DPS serves as a colocation provider for other departments, who are responsible for their respective racks, servers, storage, etc. This prevents DPS from consolidating storage and rack space and efficiently creating hot/cold aisles to better manage cooling and other resources.
- **Non-Ideal Location** – The data center is only 7 miles from the ISB data center. Failover for key systems are kept at ISB, and a regional disaster that strikes DPS may also impact ISB. DPS is not situated near a levee, but shares other possible site hazards with ISB.

DPS Data Center Metric	Amount (est.)
Total Floor Space	12,850 ft^2
Used Floor Space	9,800 ft^2
Total Available Power	500 KW
Used Power	320 KW

Current State: Staffing

Based on the current-state survey, there are infrastructure administrators in each department. A consolidated facilities plan could better utilize infrastructure personnel.

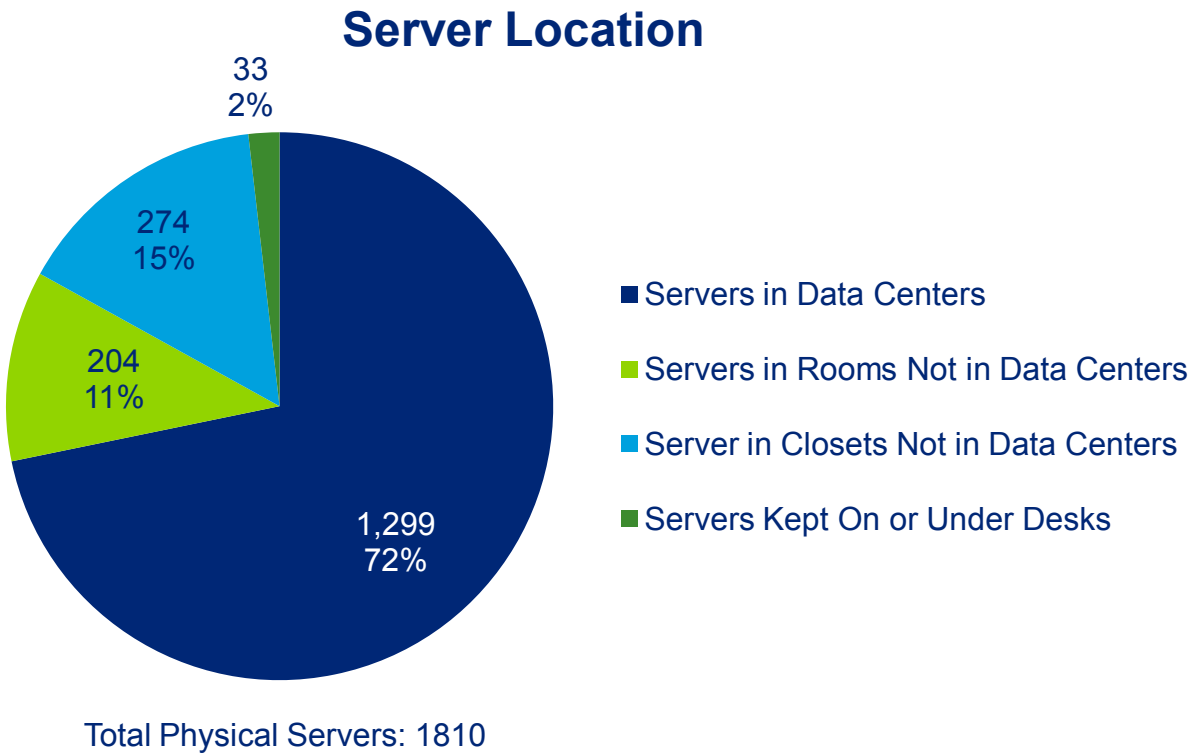
Department	Used Floor Space	Database Administrators	Systems Engineering	System Administrators	Data Center Operations
Administration	3130 ft^2	8	2.5	30.9	7.4
Children and Family Services	908 ft^2	2.9	1.1	1.6	17.0
Civil Service	15 ft^2	0.2	0.2	0.3	0.3
Corrections	0 ft^2 **	1	1	8.5	4
Economic Development	108 ft^2	0	0	0.8	0
Education	381 ft^2	3	2.5	1	0
Environmental Quality	108 ft^2	0	0	0	0
Health & Hospitals	584 ft^2	1	0	0	0
Natural Resources	279 ft^2	2	4	4	1
Public Safety	9800 ft^2	8	2	8.8	13.5
Revenue	460 ft^2	6	3	2	0
Transportation & Development	1000 ft^2	1	2.8	2.5	2
Veterans Affairs	TBD*	TBD*	TBD*	TBD*	TBD*
Wildlife & Fisheries	48 ft^2	0	0	0	0
Workforce Commission	TBD*	TBD*	TBD*	TBD*	TBD*
Total	**13,691 ft^2**	**33.1**	**19**	**60.3**	**45.1**

* Department did not respond to survey

**Corrections and Public Safety are listed together as 9800 ft^2

Current State: Server Location

Servers are stored throughout the State of Louisiana in a combination of data centers, server rooms, server closets, and desks. The majority of servers are hosted in the departments‟ data centers throughout the State of Louisiana, but 28% of all servers are still maintained in closets, server rooms, and desks.



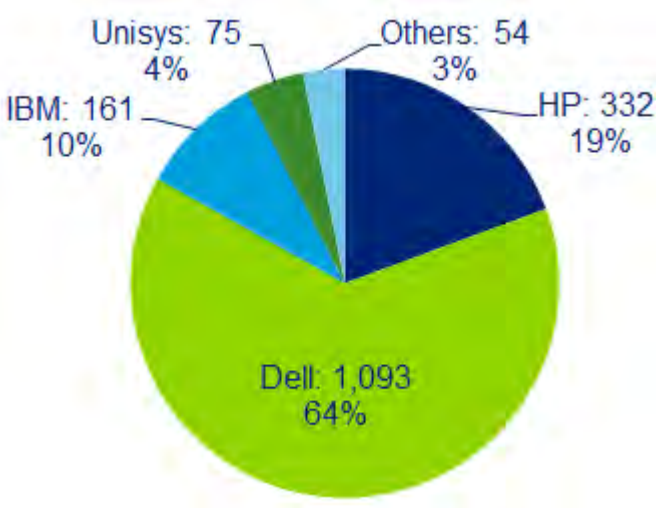
Total Physical Servers: 1810

Data was collected from survey, where servers kept under desks or in server rooms/closets are often underreported.

Current State: Physical Server Distribution

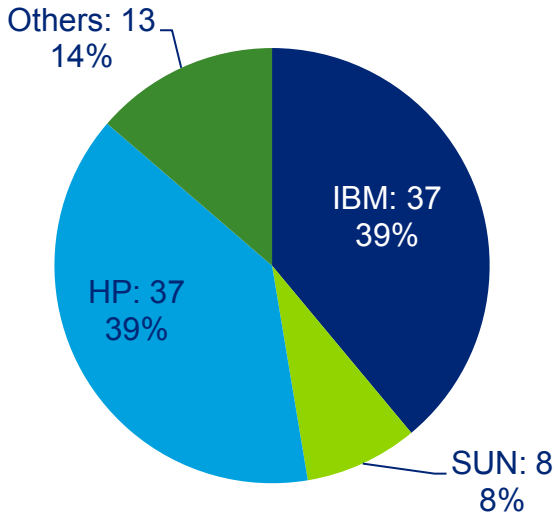
The State of Louisiana has not mandated standards for server purchases, so numerous server platforms are in-use throughout the State's data centers. Operational complexity can be reduced by consolidating and standardizing server platforms, further reducing acquisition and maintenance costs.

x86 Servers



Total Physical x86 Servers: 1715

Non-x86 Servers



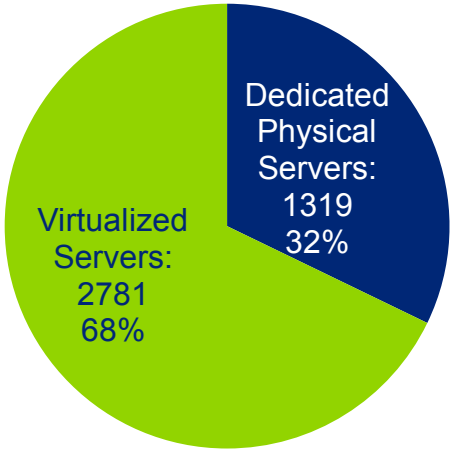
Total Physical Non-x86 Servers: 95

Based on the department survey responses received, the State of Louisiana uses servers from numerous hardware vendors requiring different skill sets, increased parts inventory, and separate maintenance contracts to maintain.

Current State: Server Virtualization

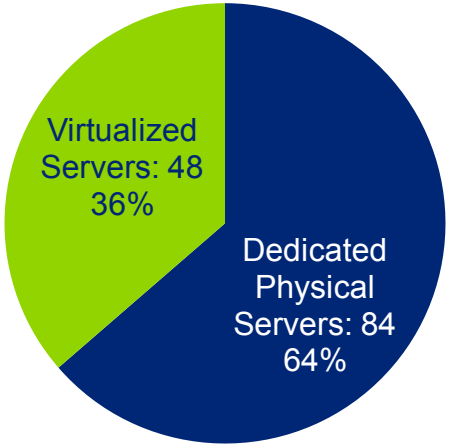
The State of Louisiana does not have a standardized virtualization platform, but over half of all servers are already virtualized. Virtualizing servers can help reduce the data center footprint, increase green IT efficiency, and lower hardware acquisition and maintenance costs.

Virtualized Servers (x86)



Total Intel Servers: 4100

Virtualized Servers (Non-x86)



Total Non-Intel Servers: 132

Of all non-mainframe servers, 67% are virtualized for the departments reported in the survey results, which is above average compared to other public sector organizations.

Future State Recommendations

Benefits of Consolidated Data Center Services

Consolidate siloed data centers to a State-wide data center service operated as a shared service to meet the needs of all Executive Branch departments at a lower total operating cost and position the State of Louisiana for adoption of emerging cloud computing technologies.

How the Recommended Solution Will Help

1. Reduce State-wide operational costs through physical consolidation and utilization of cloud-based services
2. Manage infrastructure upgrades centrally through a standardized set of processes and tools
3. Create a consistent provisioning process that can reduce provisioning time to in a matter of minutes or hours (vs. weeks or months) thereby improving agility and flexibility
4. Proactively get in front of future budget reductions through a lower overall operating cost for fewer and more robust enterprise data centers and infrastructure
5. Lower overall on-going maintenance and operating costs through fewer and more robust enterprise data centers and infrastructure, databases, backup systems and disaster recovery solutions.
6. Improve efficiency of IT staff supporting data center operations through shared services

Guiding Principles for Data Center Consolidation

The guiding principles developed by the working group provide alignment with agency business requirements and serve as the foundational baseline when developing the data center consolidation approach.

#	Guiding Principles
1	The future state data center(s) will be physically consolidated and provide business agility for the State of Louisiana at a cost structure that is lower than or equal to the current cost structure.
2	The environment will support public cloud, private cloud, managed services and colocation services (interim only)
3	The future state data center facilities will have most of the features of a Tier 2 rated data center (based on Uptime Institute) related to availability and reliability
4	The future state data center will maximize the use of virtualization across all layers to increase efficiency and minimize footprint/power/cooling requirements
5	Servers, storage, and other equipment will be standardized and consolidated where possible to improve operational efficiency and reduce acquisition costs
6	The future state consolidated data center solution will have Disaster Recovery capabilities
7	All service providers will be accountable for business requirements through service level agreements (SLAs)
8	The funding source (e.g., federal, grant, trust, etc.) of the IT asset will be tracked, monitored, and reported on

Data Center Consolidation – Major Cost Savings Drivers

The following projects will be undertaken as part of the consolidation in order to decommission legacy, siloed, or obsolete hardware and software where it does not impact the business, and drive cost savings and standardization across the environment.

IT Consolidation Activities	Description	Decision Criteria
Consolidation of Data Centers	Improve the overall effectiveness of enterprise data center service through reduction of the number of facilities and optimization of the service model. • Cost reduction - achieved through reduced overall facilities costs, staff, and improved operational efficiencies. • Standardized facility requirements, business processes • Improved risk profile • Improved operational maturity • Greater responsiveness to business needs	• Capacity (Electrical, HVAC) • Tier Rating • Location (Electrical Grid, Network Service Providers, FEMA Risk Index, Available Technical Resources in the Region, Cost of the above, etc.) • Maturity of Operational Processes
Rationalization of Server Operating Systems	Optimize the productivity of support operations and personnel by reducing the diversity of Server OS platforms and versions being supported.	• Established standards through the IT Governance process • Currently deployed base • Right functionality/fit for business requirements • Cost

Data Center Consolidation – Major Cost Savings Drivers (Contd.)

The following projects will be undertaken as part of the consolidation in order to decommission legacy, siloed, or obsolete hardware and software where it does not impact the business, and drive cost savings and standardization across the environment.

IT Consolidation Activities	Description	Decision Criteria
Storage Consolidation	Optimize the enterprise SAN and NAS storage service by centralizing storage in the data centers, tiering data based on business value using Information Lifecycle Management (ILM) and simplifying/reducing the diversity of SAN and NAS platforms and versions being supported	• Established standards through the IT Governance process • Currently deployed base • Right functionality/fit for business requirements • Cost
Standardization of Database	Optimize enterprise database services by centralizing database environments in the data centers and simplifying/reducing the diversity of database platforms and versions being supported	• Established standards through the IT Governance process • Currently deployed base • Right functionality/fit for business requirements • Cost
Defining RTO/RPO's of Applications	Define Recovery Time Objectives and Recovery Point Objectives for applications in order to tier application workloads of varying price points based on application requirements	• Business drivers • Application criticality • Impact to the business

Data Center Consolidation – Major Cost Savings Drivers (Contd.)

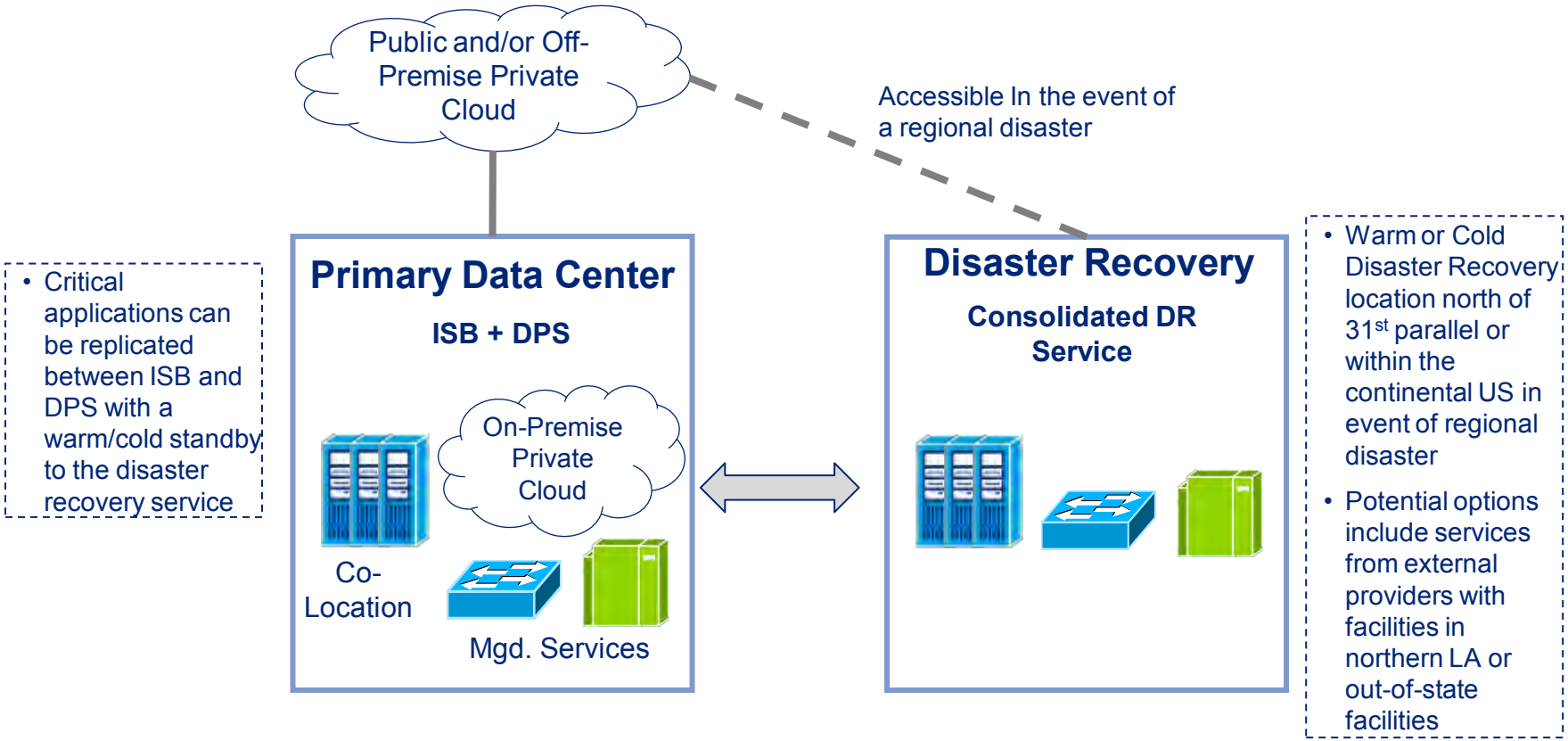
The following projects will be undertaken as part of the consolidation in order to decommission legacy, siloed, or obsolete hardware and software where it does not impact the business, and drive cost savings and standardization across the environment.

IT Consolidation Activities	Description	Decision Criteria
Network Consolidation & Convergence *(Refer to Network Strategy document)*	Optimize the productivity of support operations and personnel by reducing the diversity of network (data, voice, video) platforms and supporting infrastructure (e.g., firewalls) being supported	• Established standards through the IT Governance process • Currently deployed base of network infrastructure across the various data centers and server rooms • Right functionality/fit for business requirements • Cost
Data Center Staff Consolidation	Operate as one IT by consolidating staff and budgets supporting data center facilities, servers, storage, databases, and networks under a single IT shared services organization	• Staff who's primary (>50%) and secondary (25-50%) functions are related to data center services

State of Louisiana Consolidated Data Center Services Vision

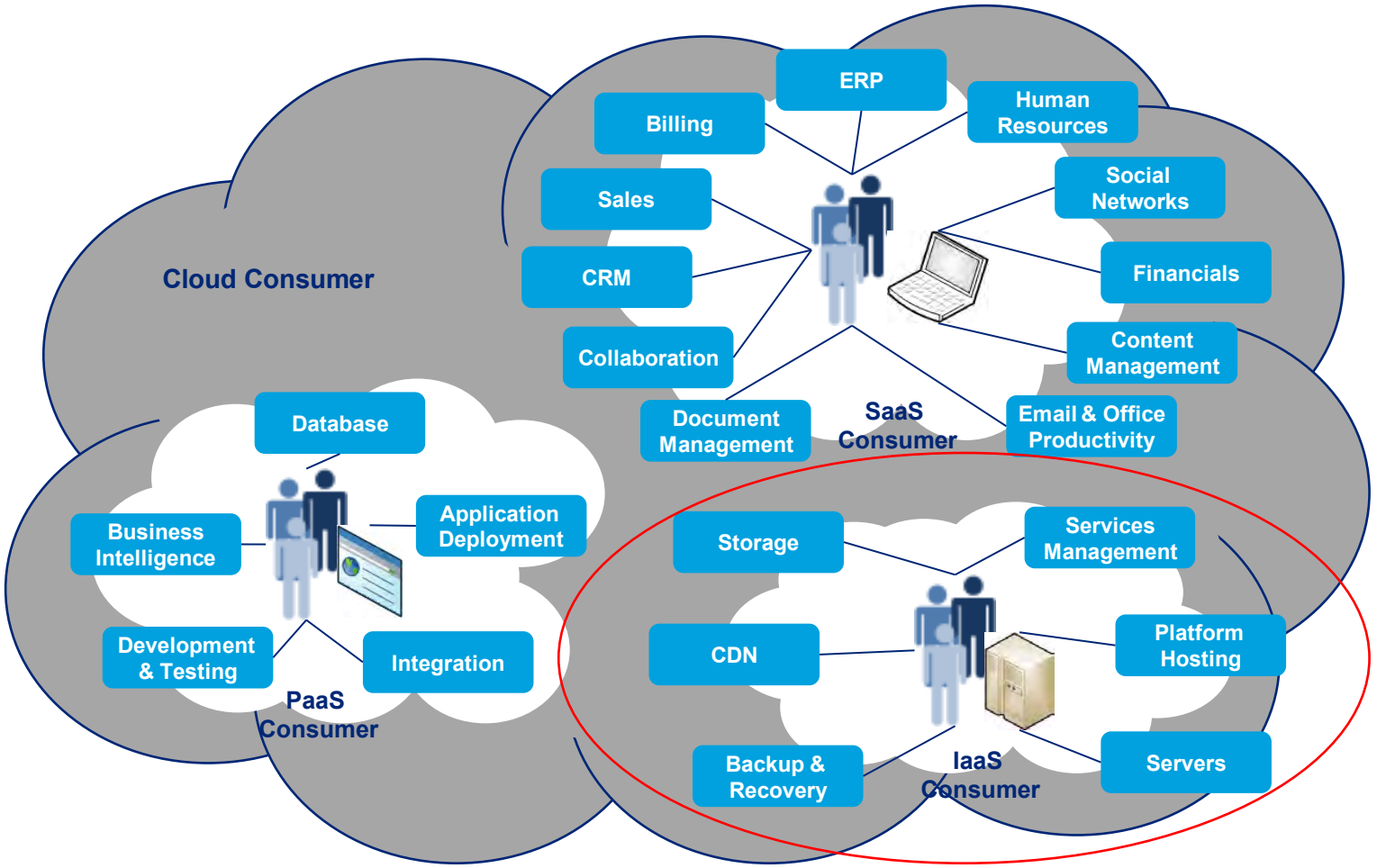
Based on agency requirements, there are four delivery models that need to be part of any future state solution:

- Public Cloud, Private Cloud, Managed Services and Colocation (short-term only; required to enable adoption)



Scope of Public and Private Cloud Services

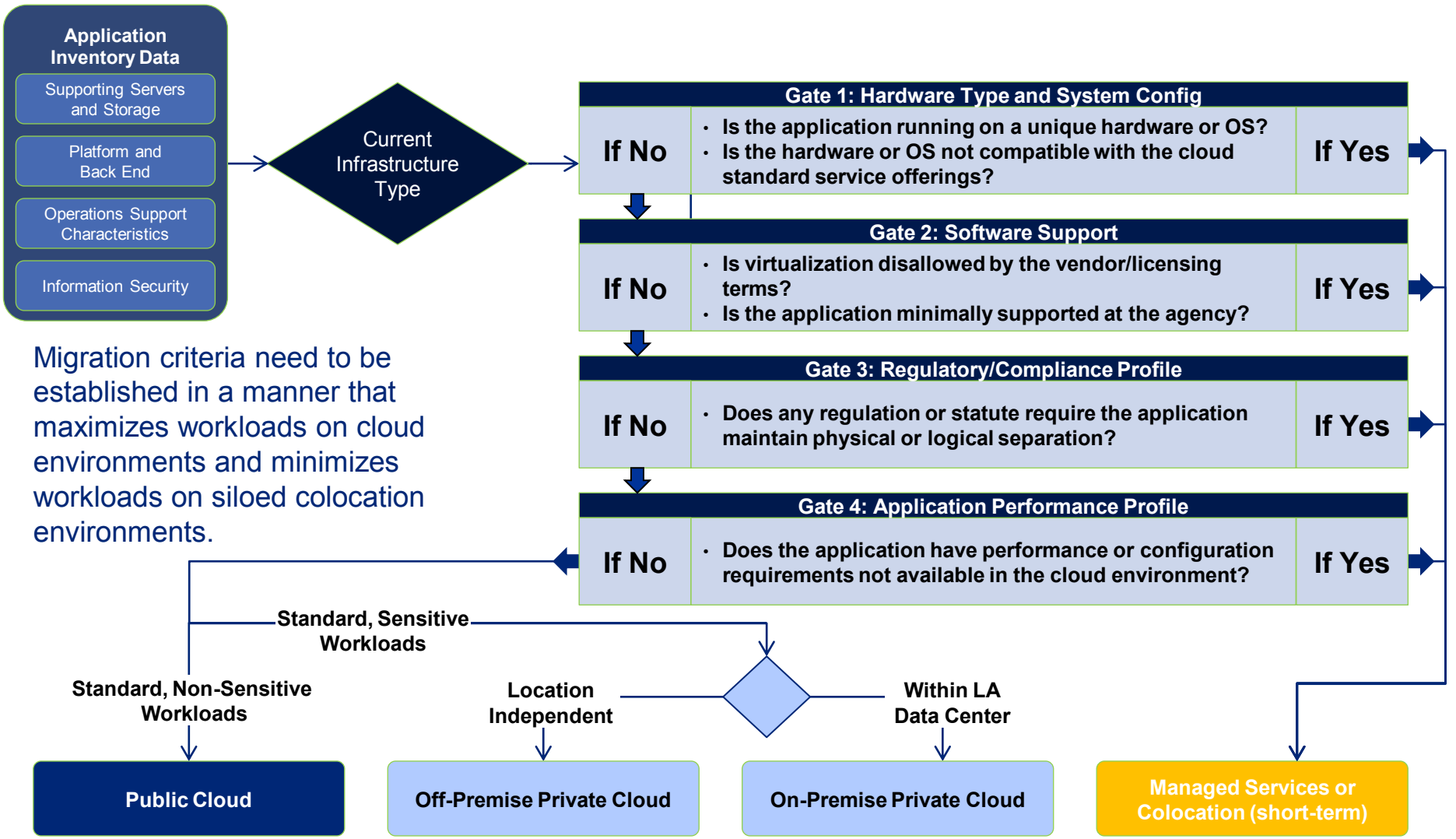
The scope of the State of Louisiana IT Facilities Consolidation project is for Infrastructure-as-a-Service (IaaS), which includes the compute resources to run applications. It does not include the actual applications or platforms.



Implementation Approach

Data Center Consolidation Migration Criteria

The following gates provide criteria to help determine the target data center solution.



Migration Wave Criteria

A migration wave groups agencies to determine when migrations will occur based on consistent criteria such as **risk**, **cost** and **business need**. Each wave will have a playbook of preparation tasks that will be followed, yielding a repeatable pattern and migration cadence for the project. Applying the wave criteria to the agencies‟ current characteristics gives a rough-cut master sequence for planning the transition, subject to adjustment by the State.

Wave 1	Wave 2	Wave 3
• Facilities with major risk factors e.g. lack of facility power/cooling redundancy, security, health & sustainability issues, etc. • Infrastructure going out of support • Agencies that have immediate staffing constraints • Facilities in-scope for real estate consolidation at the time the new service is available	• Workloads that need additional time to prepare for a cloud or shared service architecture • Facilities that require infrastructure upgrades (e.g., network) before migrating • Workloads supported by current platforms or software versions with no major risk factors	• Agencies that have recently deployed new data center infrastructure and facilities that still have a long useful life remaining • Agencies that have long-term contractual arrangements that are cost prohibitive to terminate • Workloads that require significant rearchitecture to be deployed to a shared service environment

Proposed Migration Waves

Based on survey data analyzed to date as well as agency CIO interviews, the following migration waves are proposed for the data center consolidation project. Actual migration dates will need to be validated with the agency business and technical leads.

Wave 1 Agencies	Reasoning
Wildlife and Fisheries	• Data center migration to ISB is in progress due to flooding in the dedicated Wildlife and Fisheries department data center
DOTD	• DOTD has minimal data center footprint in on-site department data center and is already participating in the ongoing mainframe consolidation • OTM has indicated that there are no IP conflicts and DOTD can be migrated at any time
OGB	• Department has leased data center space outside Capitol Park, but no other major concerns

Wave 2 Agencies	Reasoning
Veterans Affairs	• Agency has minimal data center footprint that can be migrated with little effort
Workforce Commission	• Workforce commission is in the process of migrating from on-site data center to cloud services provided by Venyu

Wave 3 Agencies	Reasoning
DRU	• DRU contracts with CGI, who manages DRU services from the Venyu-Baton Rouge data center
Health and Hospitals	• Health and Hospitals is in the process of migrating out of ISB to Venyu managed services

Migration Wave Capacity Analysis

Based on conservative industry for migrated servers, the combined capacity of ISB and DPS will be sufficient to accommodate the additional workloads that are not migrated to an off-premise cloud service.

Wave	Activities	Used Capacity	Remaining Capacity (ISB+DPS)
Wave 1	• Migration of Wildlife and Fisheries, DOTD, and OGB to ISB and/or DPS	1224 ft^2 465 kW	4026 ft^2 815 kW
Wave 1 Cloud Migration	• Migration of eligible Wildlife and Fisheries, DOTD, and OGB services to public/private cloud providers	-245 ft^2 -93 kW	4270 ft^2 907 kW
Wave 2 with Cloud Migration	• Migration of eligible Veterans Affairs and Workforce Commission services to public/private cloud providers • Migration of remaining services to ISB and/or DPS	960 ft^2* 365 kW*	3310 ft^2 543 kW
Wave 3 with Cloud Migration	• Migration of eligible DRU and Health and Hospitals services to public/private cloud providers • Migration of remaining services to ISB and/or DPS	481 ft^2 183 kW	2829 ft^2 360 kW

* Capacity sizes estimated, as departments did not respond to survey

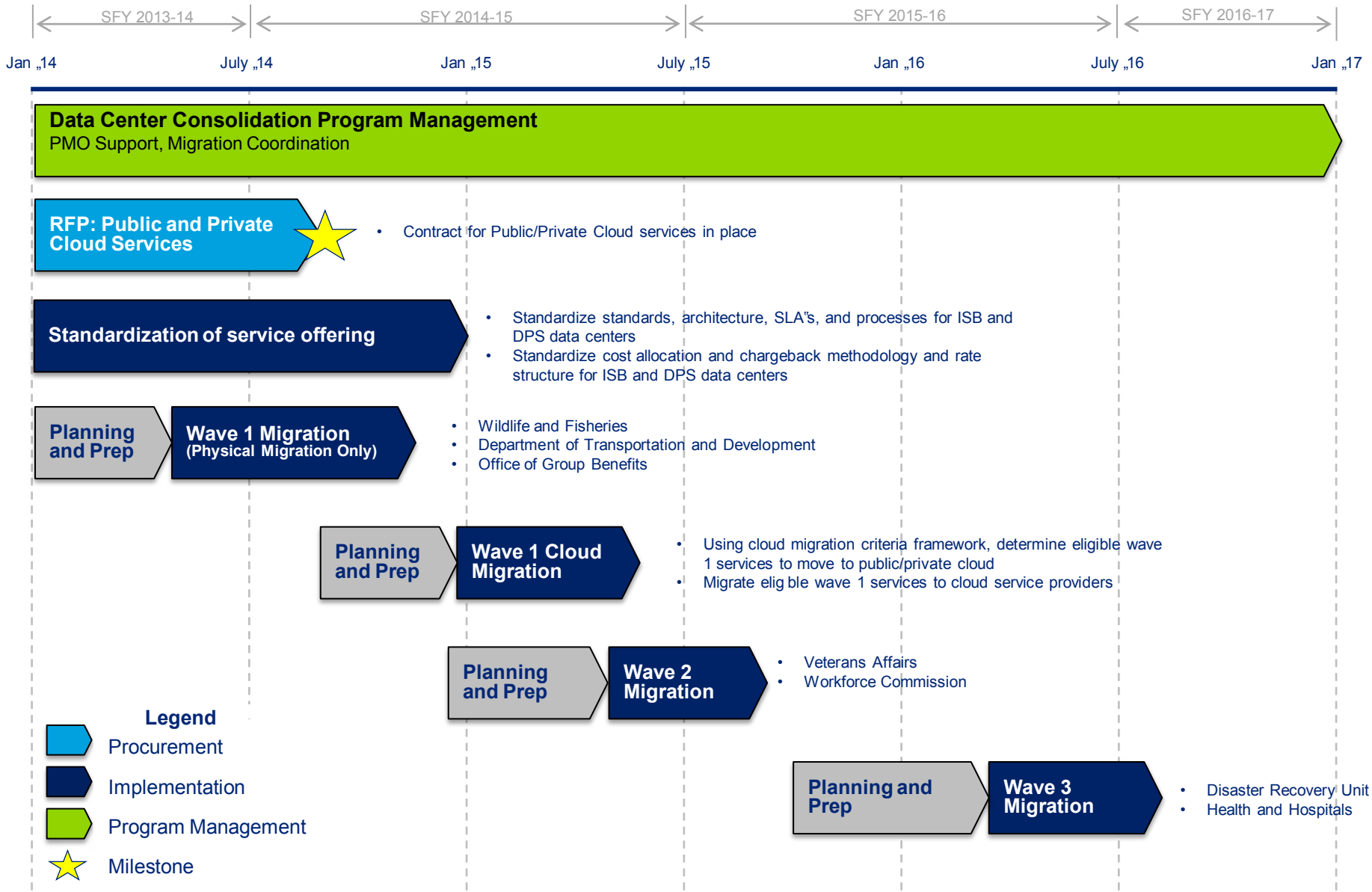
Key Dependencies

#	Dependency	Rationale
1	**Network Redesign**	• A simplified Virtual Data Center Network design needs to be established as the foundation to enable data replication, partitioning of agency workloads within the same data center, and seamless failover in the event of a disaster
2	**Application Dependency Mapping**	• Detailed characteristics of every application in each data center needs to be analyzed in advance to determine which tier it can be migrated to
3	**Information Security and Legal Approvals**	• Obtain formal approvals from ISO and Legal community, especially for cloud computing options to validate compliance with Federal and State of Louisiana regulations and policies

Key Dependencies (Continued)

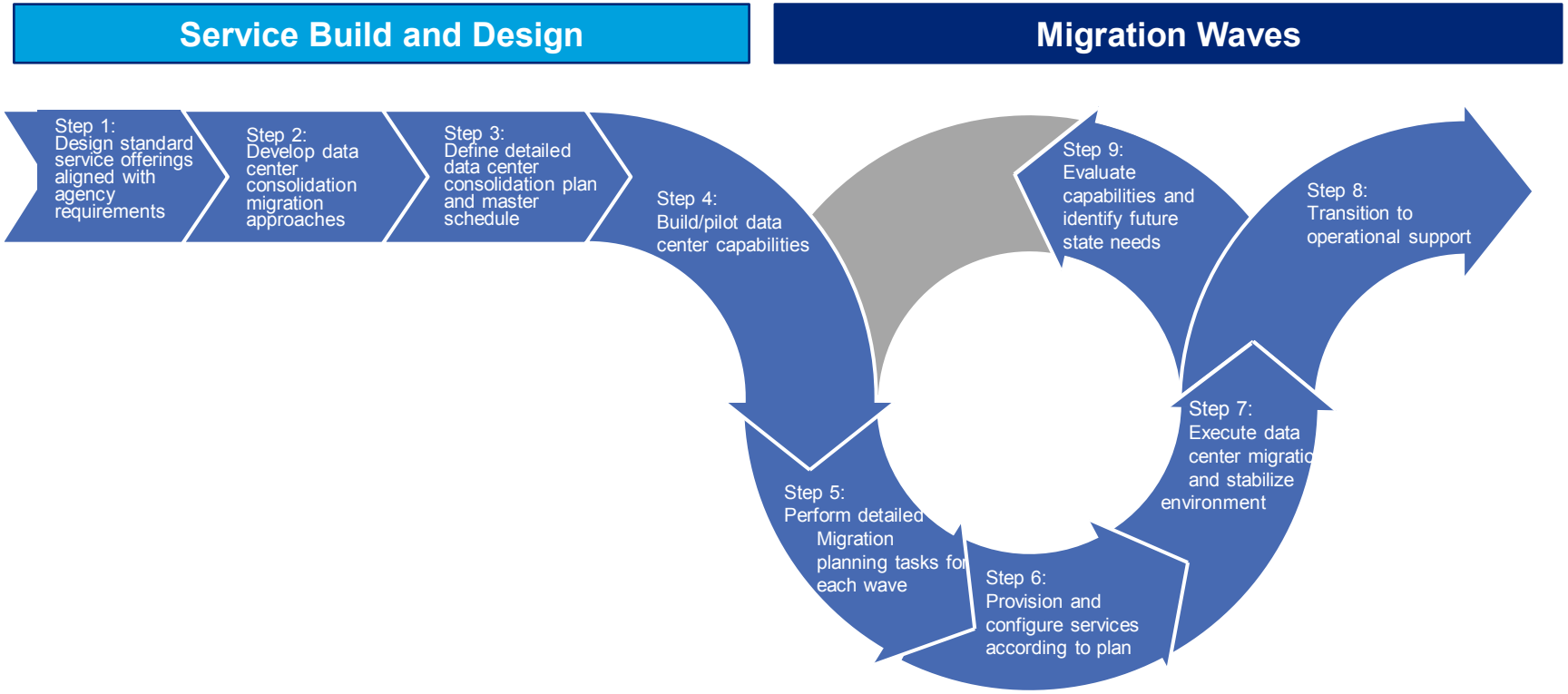
#	Dependency	Rationale
4	**Data Center Uptime**	• Organizations such as OGB have uptime requirements that may impact planned data center maintenance in a consolidated environment
5	**Data Center Capacity Readiness**	• ISB/DPS need to have the available heating/cooling, power, and space required to accommodate additional Departments‟ equipment
6	**Staff Security Training**	• With the consolidated IT operating services for the various Departments, IT staff will need to be trained on IT security topics such as HIPAA

Proposed Timeline for Migration Waves



Data Center Migration Planning and Execution Process

To achieve efficiencies in planning and execution, a “Playbook” approach is employed to analyze service requirements and guide consolidations of agency workloads into the new data center service. This repeatable consolidation process will streamline the design of data center service offerings and guide the migration of application workloads to the new service based on feedback from the early waves.



Planning Steps

	Step 1: Design standard service offerings aligned with agency requirements	**Step 2:** Develop data center consolidation migration approaches	**Step 3:** Define detailed data center consolidation plan and master schedule
Key Activities	• Work with proposed Wave 1 agencies to develop detailed application and infrastructure profiles as a baseline • Develop detailed architecture and design for standard offerings for public cloud, private cloud, and managed services • Develop end-to-end service offering that includes help desk, security, DR, etc.	• Develop detailed migration approaches for public cloud, private cloud, and managed services • Refine migration approaches with Wave 1 agencies based on their application profiles • For critical applications with high availability requirements, identify approach to maintain service continuity during migration	• Work with agencies to finalize migration waves • Define required migration resources (agency, shared service team, and external provider if needed) • Develop migration timelines, based on resource requirements and application blackout periods • Develop pilot migration plan • Develop full migration plan
Deliverables	• Detailed application and infrastructure profiles for proposed Wave 1 agencies • Detailed architecture and design for end-to-end public, private, and managed services • Updated Service catalog	• Detailed migration approach and process flows for public cloud, private cloud, and managed services • Roles and responsibilities matrix for migration phase	• Final agency migration waves • Detailed migration plan • Migration resource requirements

Development and Provisioning of Services

	Step 4: Build/pilot data center capabilities	Step 5: Perform detailed migration planning tasks for each wave	Step 6: Provision and configure services according to plan
Key Activities	• Develop data center services build-out for service initiation • Develop provisioning processes • Develop service request process • Develop help desk ticketing, call and communication processes with agencies • Pilot migration approach with test applications • Test end-to-end services/functionality	• Work with agencies within each wave to develop point-in-time view of applications and infrastructure inventory • Finalize application, operational and migration requirements • Finalize application priority for migration phase • Obtain signoff from Wave 1 agencies on cutover and stabilization plan	• Provision services and infrastructure based on migration Wave 1 • Test infrastructure to validate compliance and availability to meet migration and operational demands • Communicate infrastructure and service readiness for specific migration wave
Deliverables	• Foundational data center service available • Service request process • Help desk service process • Pilot migration testing and documentation	• Updated application and infrastructure inventory • Final application and infrastructure cutover plan • Sign-off for each agency (technical, ISO, business, legal, etc.)	• Completed infrastructure readiness checklist • Completed service readiness checklist • Approval and sign-off for service migration (repeats for each migration wave)

Migration of Services

Step 7: Execute data center migrations, and stabilize environment

Step 8: Transition to operational support

Step 9: Evaluate capabilities and identify future state needs

Key Activities

- Communicate migration timelines to business, operations, and help desk
- Confirm resources, infrastructure and services are ready
- Execute migrations
- Test application functionality and access
- Remediate issues (if any exist)
- Communicate migration success to business
- Update Application documentation

- Complete transition of infrastructure services to shared services
- Setup KPI and SLA reports for technical and administrative reporting purposes
- Conduct additional hand-offs (i.e., help desk, monitoring tools) as required
- Document lessons learned during for specific migration wave

- Review migration wave progress reports, issues and challenges
- Evaluate infrastructure KPI's and SLA performance
- Review lessons learned from current and previous migration waves
- Make recommendations for service and migration wave improvement
- Prepare for next migration wave

Deliverables

- Data center migration
- Communication checklist
- Service readiness checklist
- Application migration documentation updates (location, service provider, etc.)

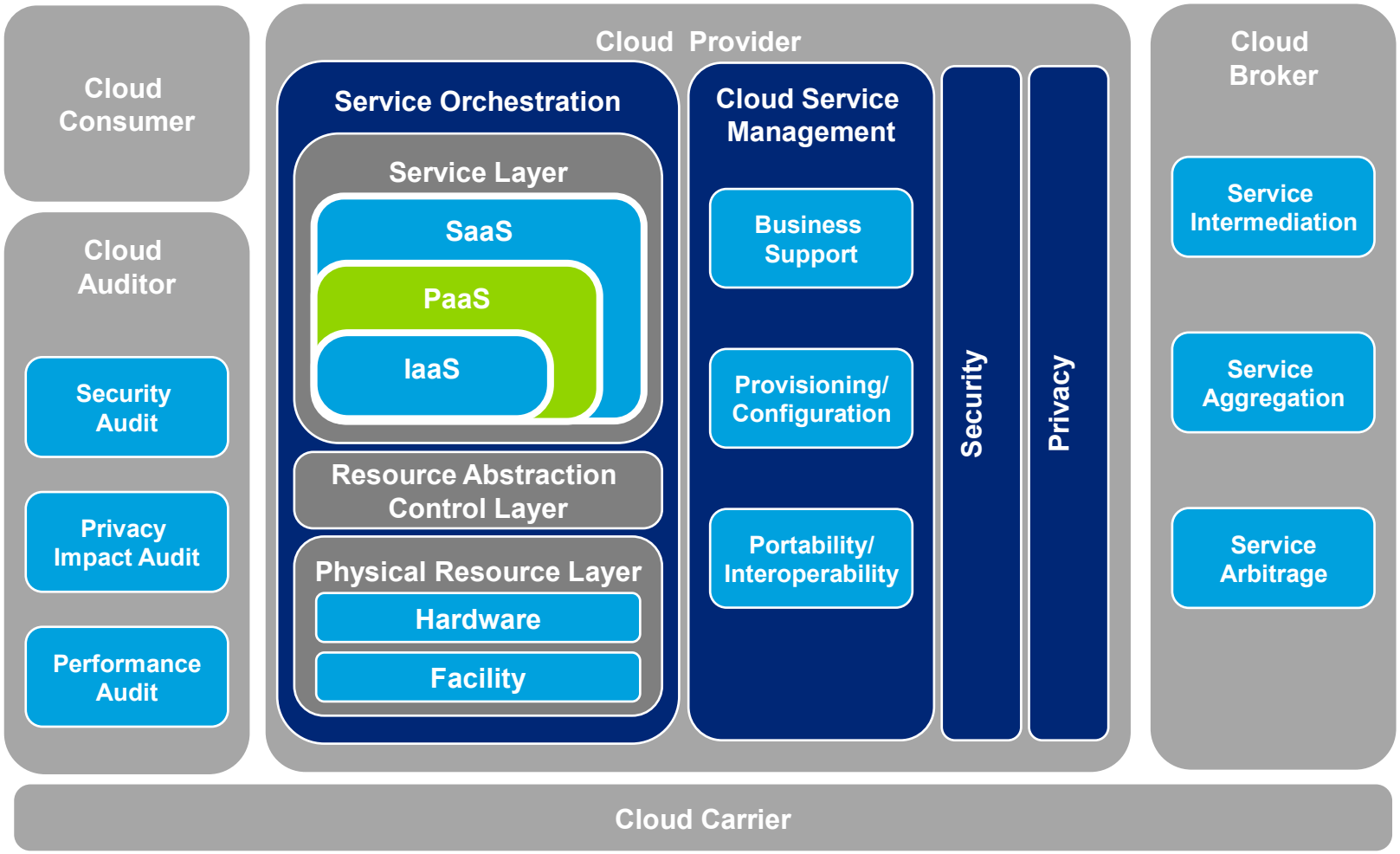
- Migration and operational transition reports
- Application and business sign-off on service transition
- Migration and transition lessons learned document

- Service improvement recommendations
- Updated Issues log
- Updated lessons learned log

Appendix: Industry Frameworks

NIST Cloud Computing Reference Architecture

The National Institute of Standards and Technology (NIST) has established a cloud computing reference architecture, which identifies the major actors, their activities and functions in cloud computing.



Cloud Computing Actors

The NIST cloud computing reference architecture defines five major actors: *cloud consumer, cloud provider, cloud carrier, cloud auditor and cloud broker*.

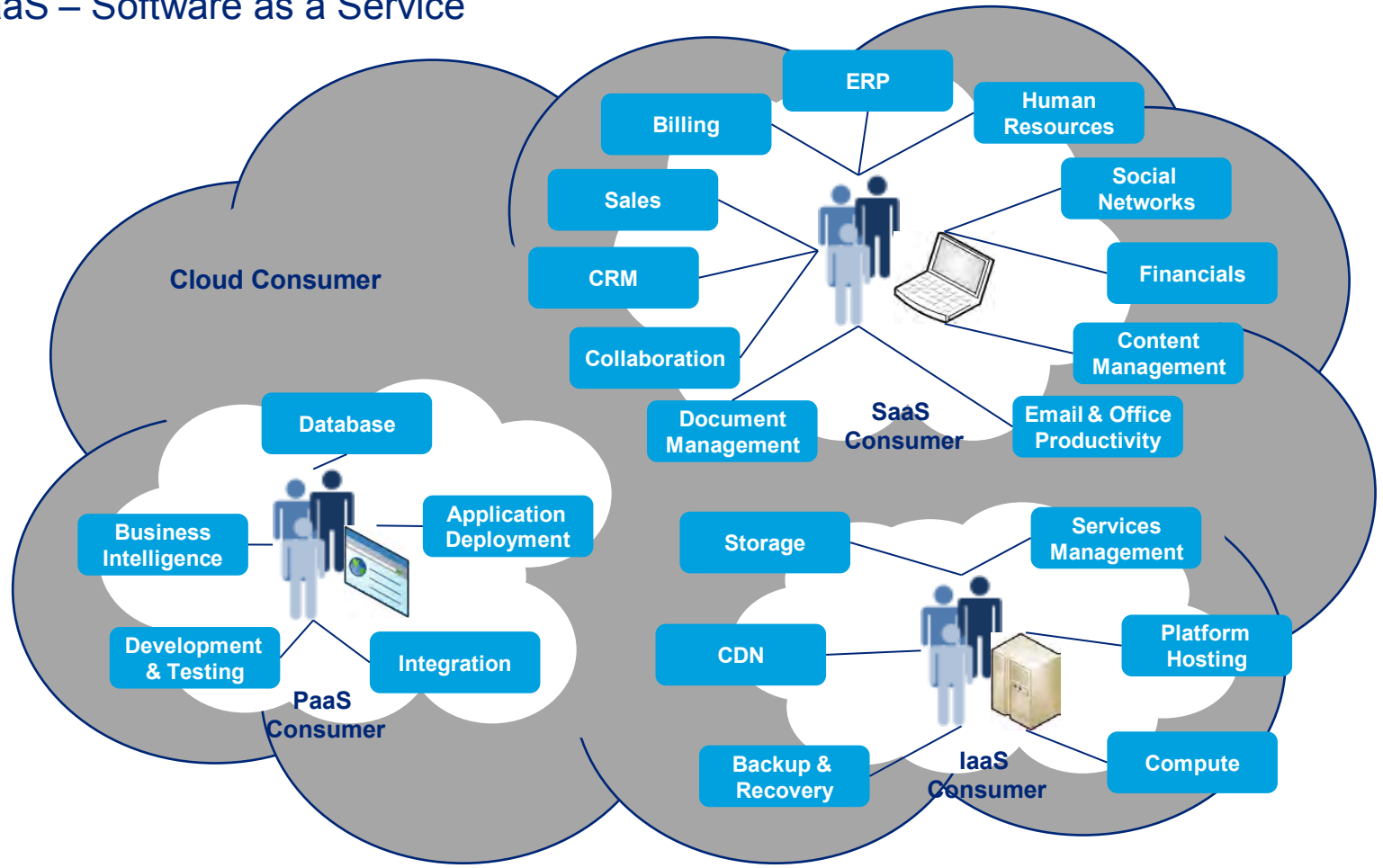
Each actor is an entity (a person or an organization) that participates in a transaction or process and/or performs tasks in cloud computing.

Actor	Definition
Cloud Consumer	A person or organization that maintains a business relationship with, and uses service from, *Cloud Providers.*
Cloud Provider	A person, organization, or entity responsible for making a service available to interested parties.
Cloud Auditor	A party that can conduct independent assessment of cloud services, information system operations, performance and security of the cloud implementation.
Cloud Broker	An entity that manages the use, performance and delivery of cloud services, and negotiates relationships between *Cloud Providers and Cloud Consumers.*
Cloud Carrier	An intermediary that provides connectivity and transport of cloud services from *Cloud Providers to Cloud Consumers.*

Sample Cloud Computing Services Available to a Cloud Consumer

Cloud Consumers can access three categories of services through the cloud:

- IaaS – Infrastructure as a Service
- PaaS – Platform as a Service
- SaaS – Software as a Service



Data Center Facility Tiers (Uptime Institute)

The Uptime Institute has established a four-tier system that provides a simple and effective means for identifying different data center site infrastructure design topologies. This classification system is an industry standard approach to site infrastructure functionality and addresses common benchmarking standard needs.

- **Tier I**: composed of a single path for power and cooling distribution, without redundant components, providing 99.671% availability, (~28.8 hours downtime per year)
- **Tier II**: composed of a single path for power and cooling distribution, with redundant components, providing 99.741% availability, (~22 hours downtime per year)
- **Tier III**: composed of multiple active power and cooling distribution paths, but only one path active, has redundant components, and is concurrently maintainable, providing 99.982% availability, (~1.6 hours downtime per year)
- **Tier IV**: composed of multiple active power and cooling distribution paths, has redundant components, and is fault tolerant, providing 99.995% availability, (~0.8 hours downtime per year)