CITRA

الهيئة العامة للاتصالات وتقنية المعلومات

COMMUNICATION & INFORMATION TECHNOLOGY REGULATORY AUTHORITY

Cloud Migration Guide

State of Kuwait

V1.5

Communication and Information Technology Regulatory Authority (CITRA)

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Introduction

This document was created by Communication and Information Technology Regulatory Authority as an appendix to the Cloud First Policy and to support the Cloud Regulatory Framework and Data Classification Policy. This document provides guidelines and recommendations for government entities and the private sector in the State of Kuwait to plan and implement the best strategies to migrate to cloud.
Migrating to cloud is a repetitive process that gradually develops as the entity develops a new set of skills, processes, tools and capabilities. However, establishing the right base in early stages is very important for an effective migration.

Just as there are obligations on service providers; there are obligations on cloud subscribers as well, within this document and "Cloud Service Providers Regulations and Commitments" document.

Therefore, those willing to migrate to cloud should commit and take into consideration and the following:

1. Comply to Cloud Regulatory Framework.
2. The entity that uses cloud platform and/or software services which host Tier 1 and Tier 2 data shall direct the providers of these services to register and obtain a permission from CITRA (or obtain a permission by registering on CITRA's website).
3. Comply with "*Data Classification Policy*" and "*Cloud First Policy*" issued by CITRA. Whereas the guidelines provided in this document are fully in line with these two policies.
4. The data classification process is considered the foundation step of the migration to cloud because of its process in identifying the type of data that can be migrated to cloud, as well as identifying their sensitivity level, protection methods, and choosing the suitable cloud model (refer to data classification policy).
5. Those willing to migrate to cloud must ensure that the service provider is licensed by CITRA if the data they plan to migrate to could is classified as 'Private and Sensitive Data' of Tier 3 or falls under Tier 4, as the service provider is not authorized to sign any contracts to provide cloud services before obtaining the required license from CITRA.
6. Those willing to migrate to cloud must comply with and adhere to the cloud cybersecurity standards referenced in the "*Cloud Regulatory Framework*" in addition to the cybersecurity-related regulations issued by CITRA, as the guidelines in this document are in line with them.
7. The service provider supports the entity / company willing to migrate to cloud during all the stages mentioned in this document or according to the migration plan determined by the entity / company and wherever is required to provide services according to the contract between the service provider and the entity / company and according to the service level agreement.

8. CITRA advises those wishing to migrate to cloud to review "*Cloud Service Providers Regulations and Commitments*" document for knowledge and guidance of CITRA's requirements related to licensing cloud service providers.

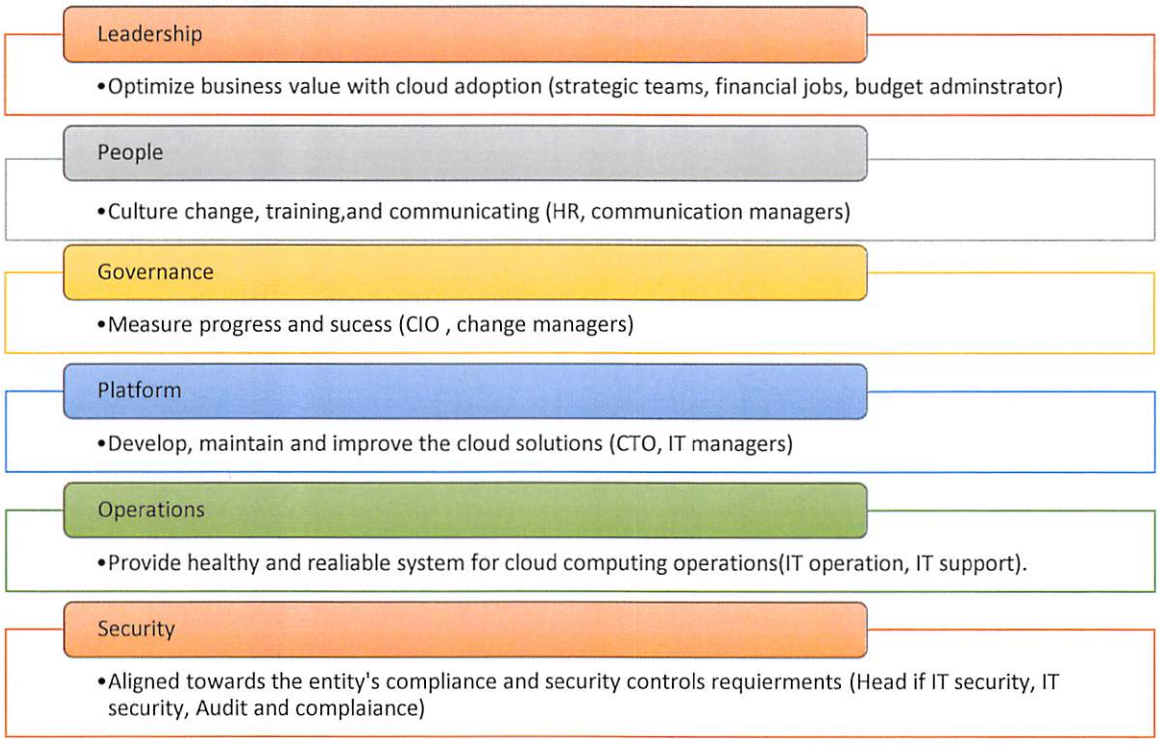
9. Those willing to migrate to cloud should review the document "*Subscribers Guide to Cloud Services* " issued by CITRA to know the benefits of cloud services and the subscribers' obligations as derived from the "*Cloud Regulatory Framework*".

10. Government entities must review and comply with the subscribers' responsibilities referenced in "*Cloud Service Providers Regulations and Commitments*" document.

11. The Central Agency for Information Technology (CAIT) is committed to the models and templates of the performance measurement indicators issued by CITRA on the extent to which government entities use cloud computing services and their compliance with the regulations and policies issued by CITRA, under the executive role of CAIT and the regulatory and supervisory roles of CITRA.

Key Pillars of Cloud Adoption

Evaluating readiness toward migrating to cloud in the main areas of the entity/company will help determine the best approach to save migrating effort. In this context, an effective migration plan focuses on six pillars and includes identifying the necessary requirements for each of the following areas: Leadership, People, Governance, Platform, Security, and Operations. The following chart explains the requirements of each area:



Migration Business Case

Building a clear and compelling busines case is a crucial step to provide entities/companies with data-driven reasons to support cloud migration. This includes:

1. Cost-analysis
2. Determining the cost of change
3. Evaluating staff
4. Determining business value

Determining migrating costs, required resources, and timeline will help to identify the applications for migration and help start the planning phase.

Cloud Center of Excellence, and Organizing Staff within the Organization

To encourage the acceptance of the change in an environment, the entity/company should support that change by spreading awareness, promoting it functionally and give incentives to employees who innovate in that field of change. For a successful migration to cloud, CITRA recommandes the entity/company who is willing to move to cloud to create a top-level centre or a sector within the entity/company called **Cloud Center (or Team) of Exellance (CCoE)** which will have many mandates and responsibilities as follows:

1. This center (or Team) of excellence will be responsible for the entire cloud migration process and for establishing required migration work procedures.
2. This team will create a unified structure that specializes in developing the desired benefit from cloud computing as the growth of initiatives on cloud computing increases for the entity/company.
3. This team will write and maintains all documents and reports for the transition to cloud computing, monitors progress, and improves quality and effectiveness.
4. The center (or Team) of excellence will include employees from various sectors and departments of the entity / company because cloud digital transformation process is not limited to the Information Technology Department (Sector) of the entity / company only, but rather it is a comprehensive transformation process for the entire entity / company along with its various sectors and departments.
5. In this context, The cloud center of exellance shall comprise two main funcional groups:

    5.1 **Cloud Business Office:** This section ensures that provided cloud services serve and suit the internal business needs. It is also responsible for change management within the entity/company. This group includes representatives from enterprise architecture, governance, training, financial and change management teams.

    5.2 **Cloud Engineering Office:** The responsibility of this group includes cloud technical matters, such as infrastructure automation, operational tools, processes, and security controls. This group includes representatives from infrastructure, operations, and security teams.

6. This centre will help in communicating best practices internally and will lead the culture change process within the entity/company as follows:

   6.1 This center (or team) has a clear vision towards the change that the entity / company aspires to by moving to cloud.

   6.2 The center (or team) has a clear envisioning of the futuristic operating environment of the entity / company using cloud technology.

   6.3 The various sectors and departments within the entity / company undertake the process of refining the skills and efforts of the existing employees with the help of the center beyond the IT operations to ensure the continuity of the desired cultural change.

   6.4 The center (or team) will explain the impact of cloud migration on the existing staff of the entity/company and the impact on the organization structure.

   6.5 The cultural change contributes to the development and maturity of the roles and responsibilities of the different teams within the entity/company as they accomplish the tasks required to achieve the cloud digital transformation.

   6.6 Therefore, the center will be held responsible for aligning the way of different functional staff towards a unified vision and acceptance of change will pave the way to positive shift in behavior.

   6.7 The center (or team) of excellence in cloud computing measures, evaluates, and monitors the impact of cultural change on different sectors within the entity / company in a similar way of evaluating and monitoring a technology change.

7. Leadership (Top management) of the entity/company willing to migrate to cloud should enable the cloud center (or team) of excellence to establish an institutional change management framework for by:

   7.1 Preparing leaders and teams

   7.1.1 Preparing and appointing managers and department heads who will lead this change (Change Managers)

   7.1.2 Identify the team that will lead this change (executive sponsors, communications team, change management team).

   7.1.3 Setting goals, milestones, and KPIs.

   7.2 Visualizing the future and entity/company engagement

   7.2.1 Nominating leaders who will be responsible for the communication on the entity/company's Future cloud vision.

   7.2.2 Nominating and preparing Change Champions.

   7.2.3 Following up on workflow, progress, facing and solving challenges, and communicate on achieved successes.

   7.3 **Make Long-Term Changes**

   7.3.1 Identify and make the necessary changes to the organizational structure, functions, policies, processes, and work procedures of the entity's/company's information technology sector.

7.3.2 Aligning roles and responsibilities of information technology (IT) staff to suit the new operating model.

7.3.3 Developing and implementing training programs

7.3.4 Measuring and evaluating the outcomes of these changes.

Migration Strategy

The process of collecting systems and applications data and matching it with one of the migration strategies mentioned below is an essential step when the entity / company develops its strategy to migrate to the cloud. This step helps the entity/company to collect and classify its applications based on what is already there in the applications environment such as the existing internal dependencies, and migration technical complexities, in order to choose the best migration framework for each of these collected applications. The entity / company can collect and classify its systems according to one of the following migration strategy frameworks:

1. **Re-hosting Applications:** if the goal is to speed up the transfer of a large number of legacy systems, then the entity / company can transfer those systems to the cloud without any changes. This process is called re-hosting, whereby the organization / company transfers applications or servers from the current hosting environment to the infrastructure of the cloud environment. Re-hosting is considered one of the well-known transfer methods that can be used by entities/companies who have recently started their cloud migration journey. This method is one of the effective strategic plans that can be used to face the challenges and constraints related to deadlines or related to resistance to change within the entity / company. It should be noted that the re-hosting process can be automated using tools, and these applications can be easily re-architected being migrated to cloud.

2. **Re-platforming Applications:** as in the previous method, changing the application platform does not significantly change the core architecture of the application. Rather, this change of platform adds new features or improve application's optimization during the migration phase to the cloud. This strategic framework is cost efficient, as it does not require the cloud server to match the previous environment. The Platform-as-a-Service (PaaS) can be utilized in this framework.

3. **Re-architecting Applications:** this framework includes a reconsideration of how the application is architected in order to develop and improve services, redesign the application to fit the new cloud environment, and to improve the services provided by the application. The desired objectives of the application re-architecture may be to solve the tendencies (or constrains) related to the current application environment, or to improve availability and system reliability in order to achieve security or compliance requirements. During the process, the application itself may be modified, using cloud native features to achieve specific business requirements in terms of scalability and performance, which would be difficult to achieve in the current environment.This framework depends on the nature of the applications to be re-architected, and it may be possible to re-architect them during the migration phase if these applications do not fall within the "Mission-Critical" applications for the business continuity of the entity /

company. This framework can be used in the first stage of the migration if the time factor is not important. Otherwise, it is better to use this framework at other late stages.

4. **Re-purchasing:** in this framework, the entity / company decides to switch from the Perpetual Licenses that result from purchasing entire systems or applications that are not designed to work on a cloud environment, to monthly subscriptions (Pay-as-You-Go) for the same applications or systems if they support the Software-as-a-Service (SaaS) model or other systems and applications that provide the same services but are developed to work on a cloud environment.
5. **Retiring Applications:** this framework includes a strategy to eliminate applications that can or may be dispensed to reduce costs and minimize the number of applications to be managed and protected.
6. **Maintained Applications:** this framework includes the retention of important applications that the entity/company wants to keep on-premise within their data center and is not ready to be migrated to cloud. In this case, the entity/company shall keep part of the services provided by these applications in its current environment and migrate part of it to cloud. This framework applies to entities/companies that have systems and applications that are subject to laws or regulations that require them to save or operate some aspects of the services they provide on their data centers (on-premise). Hybrid Cloud can be utilized in this framework.

Choosing the Best Migration Strategy

Depending on business priorities and approach to risk management, the entity can migrate to cloud in several phases. Sometimes, the process starts with migrating applications to cloud and stabilize the migration, and then work on the changes to the database at a following phase. This is considered one of the best ways to migrate.

Timeframe, scale, financial constraints, and resource requirements must be considered to determine the best migration. For example: If the goal of the migration to cloud is to avoid costs, then, re-platforming application framework is the best option for eliminating the need to renew hardware.

Migration Readiness and Planning

Migration readiness and planning is a method that consists of tools, processes, and best practices to prepare the entity/company for cloud migration. These can be divided into five steps as follows:

1. **Migration readiness assessment:** This step requires analyzing the entity / company's information technology (IT) environment, including but not limited to employee skills, cloud security, existing applications review, and the scope for migration. This step involves key stakeholders and team members from across IT leadership and teams from various departments of the IT sector such as networks, operations, security, risks and compliance, application development, enterprise architecture, and the entity's/company's Cloud Center of Excellence (which was mentioned above) or Cloud Business Office.

2. **Application discovery and classification** is the process of understanding and categorizing the entity's/company's on-premise environment(s), identifying existing physical and virtual servers, and the applications running on these servers. This will help the entity/company develop a strategic approach for each group of applications. Automated discovery tools can be used to save effort if manual discovery and data collection and analysis is time consuming.

3. **Applications Portfolio Analysis:** helps collect and classify applications with common traits into groups or categories. Categorizing applications into groups helps in determining the order of migration and the migration strategy for each category, as well as special cases.

4. **Migration Planning:** contributes to manage the overall migration effort. This step includes outlining the scope, schedule, resource plan, issues and risks, coordination, and communication to all stakeholders. The migration plan considers critical factors such as the migration order for workloads, when resources are needed, and tracking the progress of the migration.

5. **Technical Planning:** requires the following:

   5.1 conducting a portfolio analysis and building an initial backlog of prioritized applications by grouping data based on the use patterns.

   5.2 The applications of the portfolio are prioritized, and the team gathers information about the current architecture of each application or set of applications.

   5.3 The team develops the future architecture and capture workload details to execute a streamlined migration. For greater agility, the teams should analyze and migrate the applications in batches of a limited number of prioritized applications.

   5.4 Continue deeper analysis of the next batch of applications while the previous one is being migrated. An Iterative process will help ensure continuous progress as the initial design plans become dated.

   5.5 Organizing applications into migration patterns and into move groups to determine the number of migration teams, cost, and migration project timeline.

   5.6 Maintain a backlog of applications for each migration team in the overall project plan. As the entity migrate, it gains technical and organizational expertise that it will build into its planning and execution processes.

The Virtual Cloud Environment Controls

1. **Security:** Building security into the virtual cloud architecture achieves cost savings and improves security. The migration plan must present a structured approach towards security, risk, and compliance capabilities that will accelerate the entity's/company's readiness and planning for the migration. Security and data confidentiality measures must comply with regulations and policies issued by CITRA's Cybersecurity Department.

2. **Operations:** The IT operations department defines the current operating procedures and identifies the process changes and training needed to support the migration. The entity/company must examine and know its currently operates and envision how it would like to operate in the future. In this context, when a future state is envisioned, operational decisions should be based on the specific applications being migrated

to the cloud, as well as the appropriate cloud operating model for a specific application or set of applications.

3. **Platform:** defining the platform work stream will provide guidelines, principles, and patterns for implementing new solutions on the cloud and scaling migration. The entity/company can repeatedly setup cloud environments that can scale as the entity / company deploys new or migrate existing applications or workloads to the cloud once the platform is in place. Cloud environments can accommodate changing requirements and workloads, and the platform can streamline cloud infrastructure configuration. The following are key elements of the platform work stream:

   3.1 Pre-defined configurations for accounts, networks, identity and billing frameworks, and optional packages that the entity can choose from.

   3.2 An initial multi-account structure and pre-configured baseline security that can be easily adopted in the entity's/company's organizational model.

   3.3 Network configurations that support the most common patterns for network isolation, implement baseline network connectivity between cloud and on-premises networks, and provide user-configurable options for network access and administration.

   3.4 Pre-defined identity and billing frameworks and settings for cross-account user identity and access management, as well as centralized cost management and reporting.

   3.5 Pre-defined packages that the user can choose from to help manage and monitor cloud usage and costs.

Migrating to the Cloud

From the first Migration to the full Migration Execution

The first migrations, which applications are transferred in the form of waves, each wave contains a set of applications; This phase will determine the core operations, security aspects and platform to operate at scale. Successful high-impact and low-complexity applications/workloads migrations will help accelerate the entity's/company's momentum toward full cloud. Therefore, as applications run in the new cloud environment, capabilities and migration skills of the teams will mature which will contribute in making informed decisions about workloads migrations. CITRA recommends that applications with low associated risks and low impact on operations to be migrated first and considered as representative of the applications in the application portfolio to be migrated to the cloud, in order to monitor how they operate and the success of those first migrations.

The migration execution phase comes after the success of the first migrations phase. the teams within the entity will grow to support their initial wave of migrations. The core team will expand based on the experience gained from the first wave of transfers, to form sprint teams that contribute to accelerating the migration process for the remaining waves of applications to be transferred to the cloud, where these teams work in parallel with each other to migrate those applications during their migration stages mentioned below.

Core Migration Teams

The core migration teams will serve as the central project management, coordinating resources, documenting the migration process, and building common solutions. This team consists of each of the following teams:

1. **Cloud Business Office:** This team communicates, manages resources, and budgets, reports, identifies, and controls risks, and leads change management.
2. **Cloud Engineering and Operations:** builds and validates the fundamental components that ensure development, test, and production environments are scalable, automated, maintained, and monitored. This team also prepares landing zones as needed for migrations.
3. **The Innovation leads:** develops both standard and scalable solutions in coordination with the platform engineering, migration, and transformation teams to facilitate each migration. They work on larger or more complex technical issues.
4. **Discovery and Migration Portfolio Planning team**: Accelerate the flow of activities by executing application discovery and optimizing application backlogs. This function aims to minimize resistance (objections) and maximize resource investments.

Applications Migration Stages

Each application in the execution phase of the migration follows the same following six-stage process: discover, design, build, integrate, validate, and cutover.

1. **Discover:** In this step, the application portfolio and planning backlog are analyzed to help the team to understand the current and future architectures of the application. There are two categories of information that must be considered:
   1.1. Discover Business Information such as the application owner, roadmap/business plan, cutover plans, and operation runbooks.
   1.2. Discover Technical Information such as server statistics, connectivity, process information, and data flow, which can be found by using discovery tools with the confirmation of the application owner.
   1.3. Once the data is analyzed, for each application, the application owner and migration sprint team agree on a migration plan.
2. **Design:** In this step, the migration team develops and documents the cloud architecture, application architecture, and supporting operational components and processes. The information gathered in the discovery stage shall be used to design the application for the targeted cloud environment. A document is created that contains infrastructure architecture design information, services to be used in production, data flow information, foundational elements, monitoring design, and how the application will consume external resources.
3. **Build:** In this step, the created migration design is executed. The required people, tools, and reusable templates are identified and given to the migration team. A migration team will be selected based on the chosen migration strategy for the application. The team will use standardized and pre-defined methods, and tools to migrate to cloud and obtain the necessary validations for the cloud-hosted application.

4. **Integrate:** In this step, the migration team makes the external connections for the application by cooperating with contracted service providers and with application users. The migration team also makes connections or service calls to the application. Then the application is tested to demonstrate its functionality and operability.
5. **Validate:** In this step, a set of predefined tests are run for each application before being released. The team evaluates release management, verify rollout and rollback plans, and evaluates performance baselines. Business acceptance is completed by conducting parallel testing on pre-migrated and migrated applications.
6. **Cutover:** Finally, in this stage, the cutover plan that was agreed upon by the migration team and application owners will be executed to replace the old application with the new application. User acceptance testing is conducted to support a successful cutover. If the migration is not successful, the team should use the outlined rollback procedure in the cutover plan.

Related Documents

The documents listed below (with their appendices) are related to this guide and can be reviewed through Communication and Information Technology Regulatory Authority's (CITRA's) official website: (www.citra.gov.kw)

1. Cloud Computing Regulatory Framework
2. Cloud First Policy
3. Data Classification Policy
4. ICT Terms and Definitions