

# An Overview of the AWS Cloud Adoption Framework

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## Abstract

In 2006, Amazon Web Services (AWS) began offering IT infrastructure services to businesses in the form of web services—now commonly known as cloud computing. One of the key benefits of cloud computing is the opportunity to replace up-front capital infrastructure expenses with low variable costs that scale with your business. With the cloud, businesses no longer need to plan for and procure servers and other IT infrastructure weeks or months in advance. Instead, they can instantly spin up hundreds or thousands of servers in minutes and deliver results faster. Today, AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers hundreds of thousands of businesses in 190 countries around the world. A white paper that introduces AWS, *Overview of Amazon Web Services*, is available at <http://d0.awsstatic.com/whitepapers/aws-overview.pdf>.

In order to benefit fully from adopting the AWS cloud platform staff will need to acquire new skills and the organization will need to implement some new business processes, or modify existing ones, that focus on making work practices much more efficient and agile.

We have created guidance to support successful adoption of the AWS cloud platform in organizations of different types and sizes in a structured body of knowledge, the AWS Cloud Adoption Framework (CAF). The CAF will enable organizations to maximize the positive impact and value that can be gained by adopting AWS. The CAF is based on our experience gained in assisting many organizations to successfully adopt the AWS platform. Additionally, the CAF references industry-wide best practices and frameworks and methodologies such as COBIT, TOGAF and ITIL, and shows how they can support cloud adoption.

## Introduction

Cloud-based computing introduces a radical shift in how technology is obtained and used and managed, as well as how organizations budget and pay for technology services. The key advantages of cloud computing are described in the *Overview of Amazon Web Services* white paper referenced earlier.

Without cloud-based computing, a new project typically requires a project team to initiate the procurement process to obtain the computing hardware they will need for their solution. When the computing hardware arrives, the infrastructure team prepares it and makes it available to the project team. The hardware will typically be configured for different environments needed by the solution, e.g., development, testing, quality assurance and production.

With cloud computing, when AWS services are introduced, a project team utilizes their AWS account, the virtual network is configured in the cloud, and computing environments are launched in a matter of minutes and ready for use by the project team. The environments can be reconfigured easily, scaled up or down automatically to meet usage patterns and optimize spending, or shut down temporarily or permanently. The billing for AWS services becomes an operational expense rather than a capital expense.

In order to get the full benefit of adopting the AWS cloud platform, changes need to be discussed and considered across the entire organization, and not just within the IT division.

The CAF provides guidance that supports all of the different parts of the organization to adapt existing practices, or introduce new practices, for cloud computing. At the highest level, the CAF organizes its guidance into a number of different areas of focus, termed Perspectives. Figure 1 shows the seven Perspectives of the CAF:

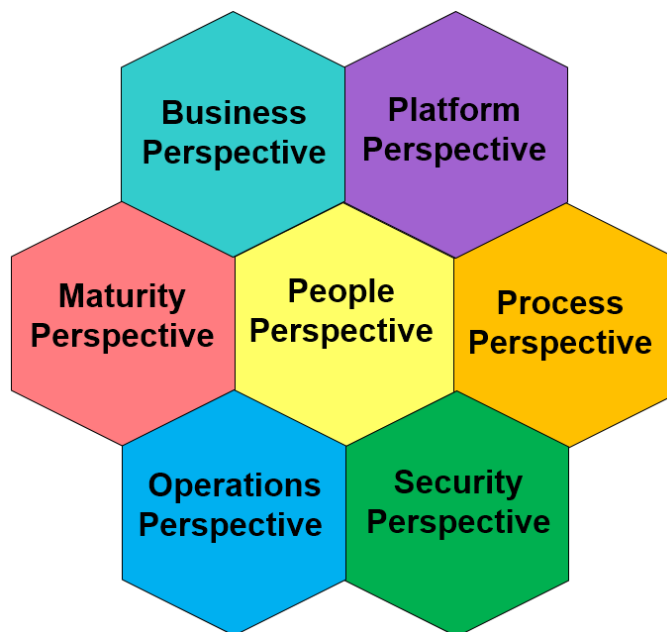


Figure 1: The AWS CAF Perspectives

A CAF *Perspective* represents an area of focus relevant to implementing cloud-based IT systems in organizations. For instance, when a cloud solution is to be implemented, the

People Perspective provides guidance on setting up or enhancing organizational structures and providing the necessary training to the people who implement and operate the cloud environment as well as the cloud-based solutions.

Each CAF Perspective is made up of Components and Activities. A *Component* is a sub-area of a Perspective that represents a specific aspect that needs attention. An *Activity* provides more prescriptive guidance for creating actionable plans that the organization uses to move to the cloud and to operate cloud-based solutions on an ongoing basis.

For example, *Organizational Structure* is one Component of the People Perspective and creating a DevOps team structure may be an Activity within that Component.

A brief description of each CAF Perspective is provided here, with more detailed descriptions being provided later in the paper:

- **Business Perspective** – represents the areas that you focus on to ensure that technology services are utilized in an optimum way to deliver maximum value.
- **Platform Perspective** – represents the areas that you focus on to ensure solutions are architected and designed in an optimum way to achieve the expected levels of functionality and quality while balancing the cost of building and operating the solution.
- **Maturity Perspective** – represents the areas that you focus on to ensure that an accurate initial assessment of the current state is carried out and the desired target state is defined, and a viable roadmap is created to move the organization forward.
- **People Perspective** – represents the areas that you focus on to ensure the organizational structures and competencies exist to successfully implement, operate and manage an AWS cloud-based environment.
- **Process Perspective** – represents the areas that you focus on to ensure the business processes are in place to plan, implement, and operate a cloud-based IT environment.
- **Operations Perspective** – represents the areas that you focus on to ensure the AWS environment can be efficiently operated to meet or exceed the service levels that have been agreed upon, with effective use of automation to minimize manual effort.
- **Security Perspective** – represents the areas that you focus on to adopt a comprehensive approach to implementing security within the AWS environment and software solutions that it supports.

Organizations can use the CAF's Perspectives, Components and Activities like building blocks to develop a plan and a roadmap to move from their current IT environment to an environment based on AWS cloud services, or to implement a new cloud-based IT

environment. An organization’s leaders can then use the plan and roadmap to provide guidance to their teams on changes they need to make to successfully adopt the AWS platform.

The CAF is not a prescriptive methodology with a sequential process. You review each Perspective and the associated Components and select those that are important to your organization’s journey to the AWS cloud platform.

The companion to the CAF is the AWS Cloud Adoption Methodology (CAM), which provides more prescriptive guidance. Figure 2 shows the relationship between the CAF, the CAM and packaged accelerators that represent initiatives based on business objectives.

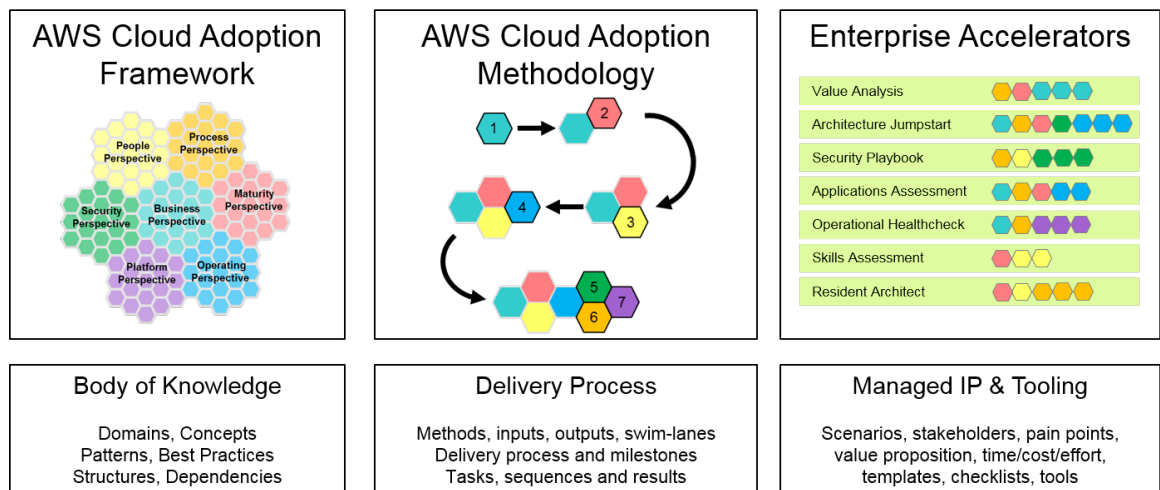


Figure 2: The relationship between CAF, CAM and Accelerators

The CAM provides guidance on methods, inputs, outputs, swim-lanes, tasks and sequencing. Accelerators provide work packages that can be delivered as service offering by the AWS Professional Services group.

## Mapping the Journey to the Cloud

Your organization’s cloud adoption journey will be unique. Understanding your current state, your target state, and the transition required to achieve the target state will determine the goals that you set and the path that you take. For instance, Figure 3 *Mapping the Journey to the Cloud*, shows you that if you operate a traditional IT

environment with an on-premises data center, and you are concerned with reducing cost and complexity, you will have a different journey to the cloud than if you are focused on driving growth or diversifying your business.

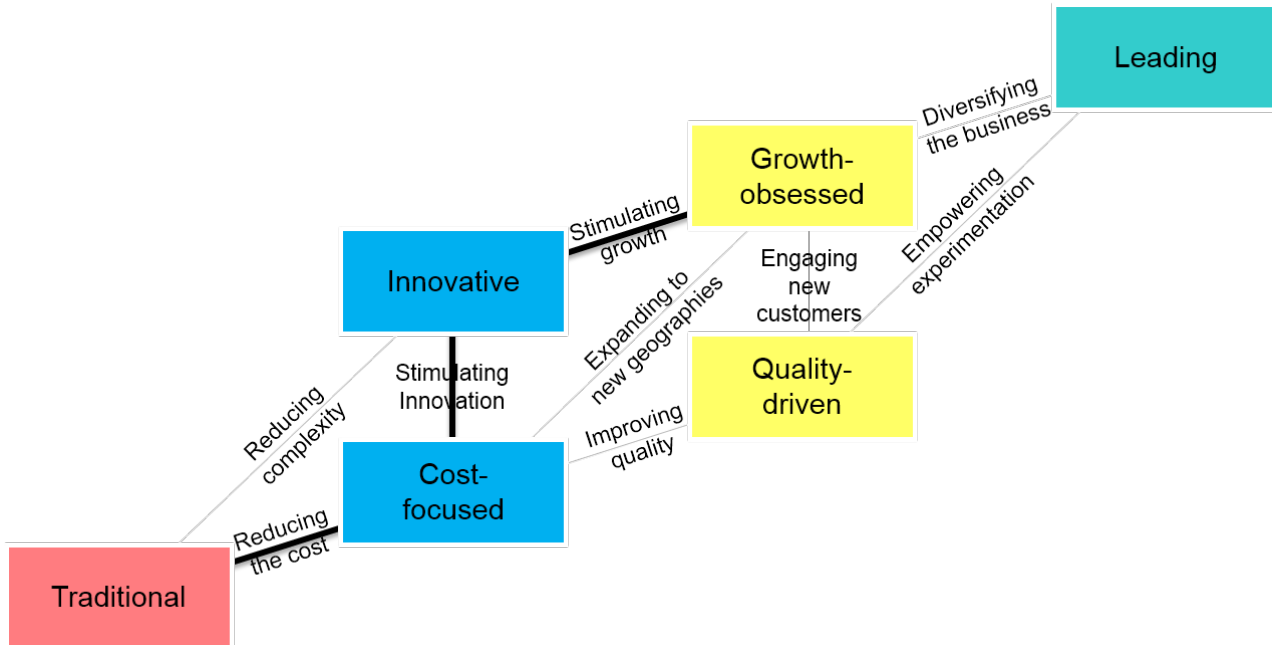


Figure 3: Mapping the Journey to the Cloud

You can use the CAF to validate your understanding of the goals for your business and create a technology strategy that helps to achieve those goals. This ensures that the business groups and IT groups align their initiatives and jointly pursue programs and projects that provide the highest overall value to the organization.

During the journey, you may find that organizational competencies need to evolve, existing processes modified or new ones introduced, and development and operations teams become more closely integrated.

In a transition to the cloud, different groups will be responsible for the process in their area of the organization. Figure 4 *Perspectives and the IT Lifecycle* shows a process that includes some form of portfolio, program and project planning (the value-based planning cycle), delivery of a technical capability into operations (the iterative development cycle), and a process to manage and maintain the solutions (the automated operations cycle).

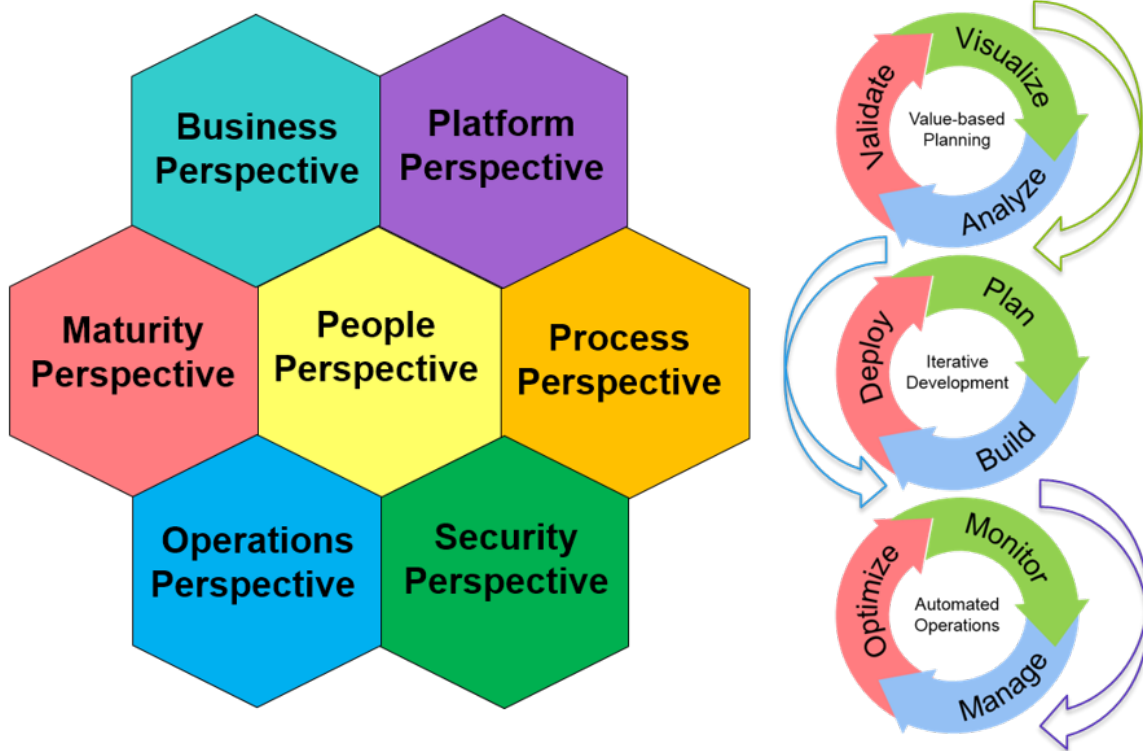


Figure 4: CAF Perspectives and the IT Lifecycle

As you go through these cycles in the overall IT lifecycle, you should consider the different CAF Perspectives and how they can help the organization to bridge communication gaps and ensure that the strategies and plans across the organization are complete and aligned.

The AWS CAF is not a process that you use in a specific order and does not require you use every Component to gain value. Rather, you review and prioritize the areas described in each of the seven Perspectives to determine which are important to your organization. Once you determine which Components are important to your organization you can create a roadmap to help with successful cloud adoption.



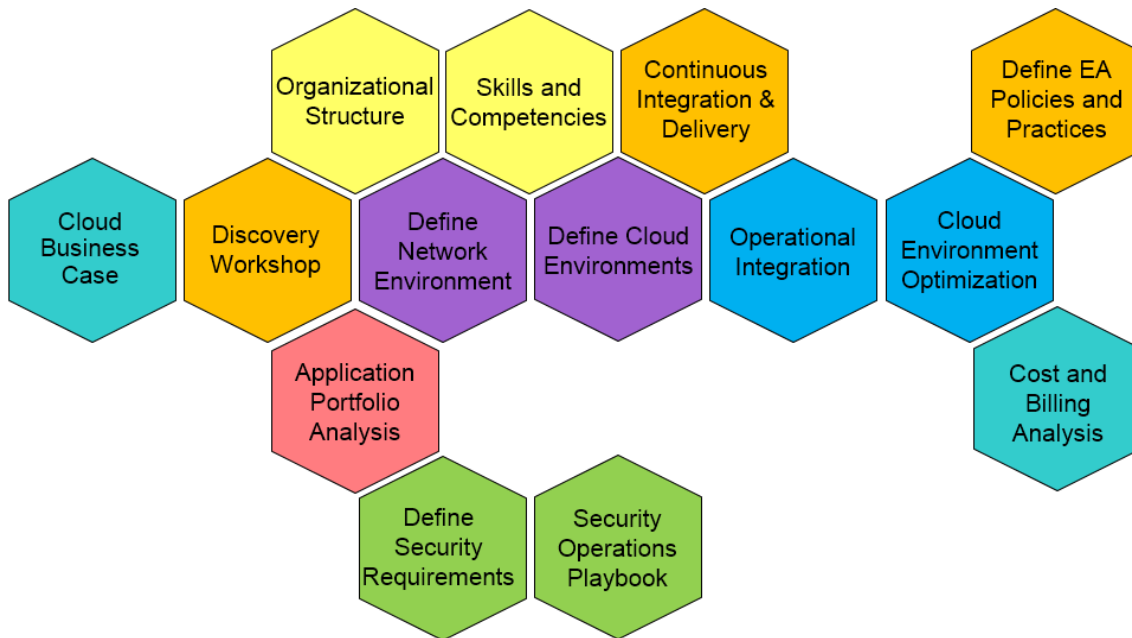


Figure 5: Sample Roadmap for Cloud Adoption

Figure 5 *Sample Roadmap for Cloud Adoption*, shows an example of the activities (read from left to right) carried out by a cloud adoption leadership team. The leadership team first reviews the seven Perspectives of the CAF and create a plan of action that spans a variety of Perspectives and involves multiple teams. The adoption journey shown here starts with a cloud business case preparation, and then moves to a discovery workshop being conducted to understand the opportunity and level of effort and resources required.

After the information has been gathered and strategies and plans defined, the leadership team is able to work on different aspects of the adoption effort. For example, they can focus on portfolio planning, design of the technology environment, and changes needed to the current organizational structures. The leadership team would meet regularly to provide updates to each other and determine (or adjust) priorities based on what is learned.

After the team leaders complete their efforts, they can create a plan to integrate the cloud environment and cloud solutions into the overall operating environment. The plan would address how the cloud environment and cloud solutions will be implemented, maintained, monitored and optimized. A member of the core leadership team would work with finance and procurement teams on integration with financial and procurement processes while another team member would focus on updating organizational policies and practices.

## CAF Perspectives Additional Detail

Each of the seven Perspectives that make up the CAF is described in more detail in following sections, beginning on the next page.

## Business Perspective: Obtaining Value from the AWS Cloud

The Business Perspective within the CAF identifies areas that IT leaders should focus on to ensure the delivery of innovative high-value-add products and services that can transform conventional ways of doing business.

When you have a thorough understanding of the Components and Activities of the Business Perspective you create a business-case using financial and strategic analysis techniques. For each proposed initiative you should combine this information using Activities of the Benefits Management Component, such as total cost of ownership (TCO) and cost-benefit analysis (CBA). Then you can use the Portfolio Governance Component to help you to prioritize initiatives in your portfolio and create an IT strategy, which would include the cloud adoption strategy. Risk Management and Cost Management practices ensure that the organization focuses attention on these important areas during cloud adoption.

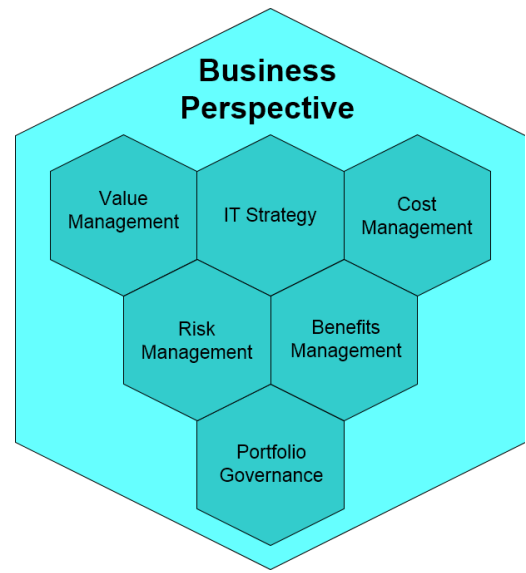


Figure 6: Business Perspective

The following is a brief explanation of each Component of the Business Perspective:

- **Value Management** – This covers the financial aspects of IT, including budgeting, cost management, prioritization of IT spending, and a system of allocating costs to the business. You create a partnership between business and IT stakeholders to enable the optimum use of IT investments.
- **IT Strategy** – This is derived from and aligned with the strategy of the overall business for the short, medium, and long term. You can create a strategy for cloud computing as either part of the overall IT strategy or as a standalone effort. Whichever approach you take, the strategy serves as the roadmap for successfully adopting cloud computing.
- **Cost Management** – This covers consideration of all costs associated with delivering IT capability. Examples include staffing costs, facilities costs, and supplier costs.
- **Risk Management** – The level of risk that the organization is willing or able to accept and manage should be understood, documented, and communicated at an organization-wide level. You capture and manage the risk to the organization from the use of IT in a manner that is aligned with overall risk management. This

minimizes the potential for compliance failures, so it should be in place for all IT-related risks.

- **Benefits Management** – The organization must optimize the value from the investments made in IT. This requires accurate business cases that provide the total cost of ownership (TCO) of IT solutions and cost–benefit analysis (CBA), where both financial and strategic benefits are documented. You measure and monitor the actual benefits delivered to determine whether the expected value is achieved.
- **Portfolio Governance** – Determines practices for the governance of IT in partnership with the rest of the organization. Requires clear roles, responsibilities, and authority to achieve the objectives that have been defined within the IT Strategy. You integrate the practices for IT governance with the practices for overall governance of the organization. This ensures that there is compliance with legal and regulatory requirements.

## Platform Perspective: Architecting and Designing for the Cloud

IT architects and designers use a variety of architectural dimensions and models to understand the nature of IT systems and their relationships. You can use the Components of the Platform Perspective to describe the structure and design of a cloud-based IT system, or a hybrid IT system that spans both cloud and non-cloud environments.

With the information derived from the Platform Perspective, you can accurately describe the architecture of the target state environment in multiple levels of detail. You can also benefit from principles and patterns in implementing new solutions on the cloud, or migrating existing non-cloud solutions to the cloud.

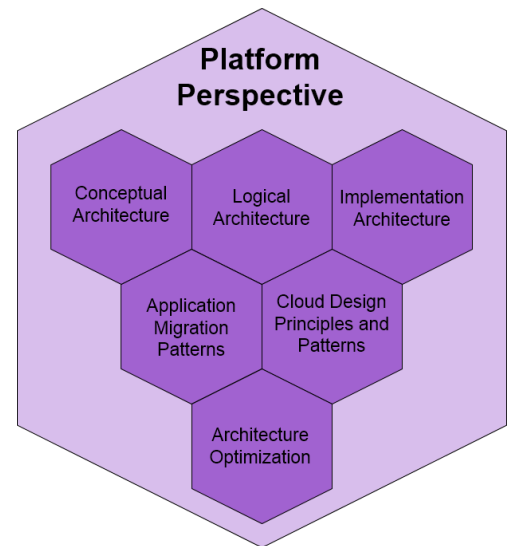


Figure 7: Platform Perspective

The following is a brief explanation of each Component of the Platform Perspective:

- **Conceptual Architecture** – There are various views of the overall architecture that can be classified as conceptual, logical and physical or implementation views. Conceptual views are the most abstract and described in terms that are familiar to non-IT users of an IT system. The conceptual architecture is used to define the business context of an IT system with business models. You balance short-, medium-, and long-term business goals and concerns for IT initiatives.
- **Logical Architecture** – Logical views describe the building blocks of the IT system and their relationships without getting into the technical details of how the functionality is implemented. The logical architecture contains application and data models that relate to the business models to meet business goals and requirements.
- **Implementation Architecture** – This describes the physical views within the IT system and the specific implementation components and their relationships. The Implementation Architecture also defines how the system's building blocks will be implemented by software or hardware elements.
- **Application Migration Patterns** – Proven approaches and best practices for migrating applications of different types to the cloud are available as migration patterns. Cloud migration patterns support the cloud delivery team to successfully migrate existing IT systems to the cloud by building upon experiences from the past.
- **Cloud Design Principles and Patterns** – Software design principles and patterns should be documented and adhered to during solution development as this will

improve quality and productivity and reduce risk. You create principles that all delivery teams follow when designing and building solutions. Patterns are proven approaches to solving problems.

- **Architecture Optimization** – Periodic reviews of architectural descriptions and implementations should be carried out to support continuous optimization of the cloud environment and cloud solutions. The cloud encourages iterative development and evolution based on feedback on the effectiveness of the functionality delivered to users.

## Maturity Perspective: Assessment of Cloud Maturity and Readiness

The IT operating environment in an organization might contain a mix of older and newer solutions developed at different times. Use the Maturity Perspective to determine the level of maturity of the organization's IT environment and its readiness to move to the cloud. You also define the roadmap for how technology solutions should move to the cloud and the sequence in which this should be done. The focus of this Perspective is on progressive implementation of cloud-based IT capabilities in line with organizational maturity and goals.

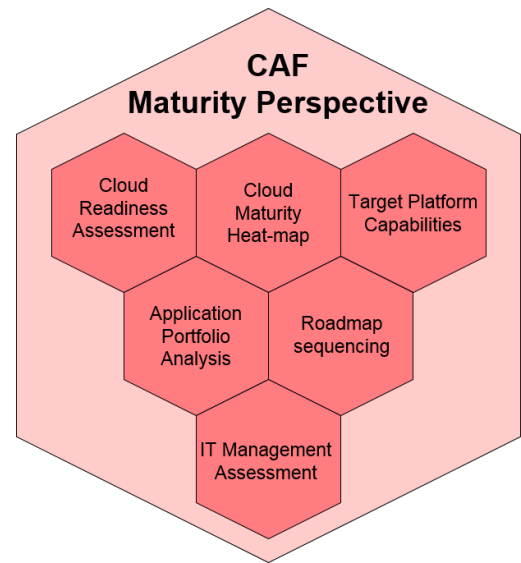


Figure 8: Maturity Perspective

The following is a brief explanation of each component of the Maturity Perspective:

- **Cloud Readiness Assessment** – Do this assessment to obtain information and determine the readiness of the organization to move to the cloud, focusing on technology infrastructure, software applications and data. You should also capture information on the existing governance, risk management and compliance processes to determine how much change is needed across the organization.
- **Cloud Maturity Heat-map** – The maturity heat map consolidates the information gathered in the Maturity Perspective and provides a summary of the analysis and recommendations. You determine the high-level prioritization of cloud adoption initiatives and their cost and organizational impact.
- **Target Platform Capabilities** – Here you define the capabilities of the target cloud platform, and how it should be implemented in stages in line with the current readiness and the strategic goals. Organizations having existing IT capabilities will need to determine how their platform will evolve for cloud adoption, and whether existing technology systems and services will be leveraged in a hybrid environment or replaced.
- **Application Portfolio Analysis** – Here you first capture information on the portfolio of applications that are used by the organization. You then use this information to assess each application against pre-defined factors business value, functional fit, conformance to principles and standards, quality, risk, etc. After this, you can decide what should be done for each application in the cloud adoption journey.
- **Roadmap Sequencing** – Here you define the ordering of all the required initiatives, and any dependencies between them, to achieve the goals of cloud adoption. This information is used to create the roadmap for cloud adoption.

- **IT Management Assessment** – Existing IT management structures, practices and processes may need to change for cloud adoption. Here you capture the relevant information on IT management and determine what changes will be required for cloud adoption.



## People Perspective: Staffing of Cloud IT Teams

The People Perspective covers organizational staff capability and change management functions that are required for efficient cloud adoption. Activities include definition of organizational structures and roles, competencies required, identification of competency gaps, training, staffing and organizational changes required to build an agile IT organization that is capable of effective cloud adoption.

The People Perspective supports the development of an organization-wide change management strategy for successful cloud adoption.

The following is a brief explanation of each component of the People Perspective:

- **Organizational Structures** – An organizational model that is optimized for cloud adoption should be established for the delivery and operation of cloud-based solutions. The IT organization might need to extend or modify its structure in order to adopt cloud computing and the changes must be carefully managed in partnership with the rest of the business.
- **Roles and Job Descriptions** – IT roles that are required to support the adoption of cloud computing should be clearly defined as part of the staffing framework. Each role should have a job description that specifies the qualifications, knowledge and experience that is required to carry out the role effectively.
- **Skills and Competencies** – Use to define the skills and competencies that are required by both internal and external staff to achieve the goals of cloud adoption. Discuss career planning and development of competencies with staff.
- **Training and Readiness** – Use to identify gaps between the required skills and competencies and what is presently available in the organization. For existing staff, provide access to training courses of different types (both classroom-based and online courses). Encourage staff to obtain certification on cloud competencies to validate their knowledge.
- **Manage staffing** – Evaluate the IT staffing (internal and external) that is needed for cloud adoption to ensure that the enterprise has sufficient expertise to support business goals, and periodically revisit. Where needed, set up partnerships to gain access to the required expertise in a timely manner.



Figure 9: People Perspective

- **Organizational Change Management** – The people-related aspects of organizational change need to be managed by providing communication and support; for example, how to adjust to new business processes and new IT solutions.

## Process Perspective: IT Lifecycle for the Cloud

In the CAF we define a process as a set of interrelated actions and activities that are performed to achieve a specified set of results, outcomes or services.

The Process Perspective covers activities across the complete IT lifecycle for cloud adoption. The focus is on managing IT initiatives as a portfolio to optimize investments, delivering services that meet quality objectives and carrying out work in well-defined programs and projects. For cloud-based software development, agile and iterative lifecycles are used to deliver functionality incrementally and catch and fix defects early. CI/CD practices are used to automate building, testing and deploying software. Operational processes can be automated to improve resilience of the solutions and reduce manual effort.

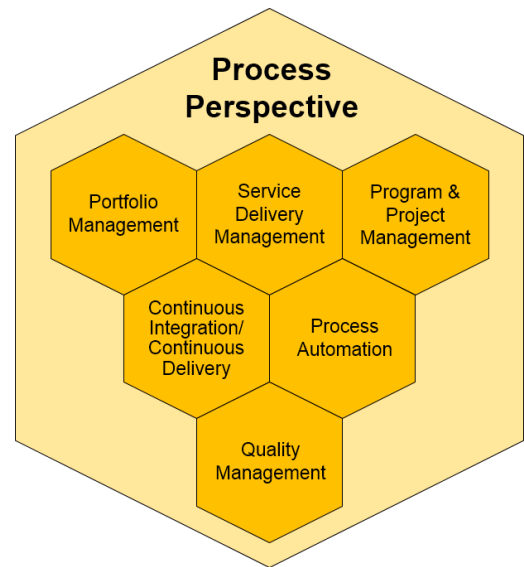


Figure 10: Process Perspective

The following is a brief explanation of each Component of the Process Perspective:

- **Portfolio Management** – IT products and services are managed as a portfolio of assets by the business. You use this to create an inventory of existing assets and prioritize new products and services.
- **Service Delivery Management** – Organizes and executes activities required to deliver IT products and services. Standard operating procedures should be in place to provide consistency. You use this area to enforce service-level agreement (SLA) and operational-level agreement (OLA) standards.
- **Program and Project Management** – Programs (i.e., groups of related projects) and individual projects selected for cloud adoption from the investment portfolio must be managed in a systematic and well-coordinated manner. You define suitable metrics to capture and communicate the effectiveness of lifecycle processes and activities.
- **Continuous Integration and Continuous Delivery (CI/CD)** – As part of a focus on agility, businesses are increasingly adopting iterative lifecycles that deliver functionality incrementally. You leverage CI and CD practices and tools to automate the software delivery lifecycle through automated builds and testing.
- **Process Automation** – Repeated service delivery management processes should be automated to improve efficiency and accuracy and reduce cost. IT infrastructure definitions should be captured in industry-standard notation and stored in

configuration management tools, just like code. You use these definitions to automatically re-create the IT infrastructure when needed.

- **Quality Management** – The quality expectations and standards of the business should cover IT processes and procedures. Once quality standards, practices and procedures are defined, you set a goal of focusing on quality at all stages of the lifecycle.

## Operations Perspective: Efficient IT Operations on the Cloud

Every organization has an operations group that defines how day-to-day, quarter-to-quarter, and year-to-year business will be conducted. IT operations must align with and support the operations of the business. Operations Perspective Components describe the focus areas that are used to enable, run, use, operate, and recover IT workloads to the level that is agreed upon with business stakeholders.

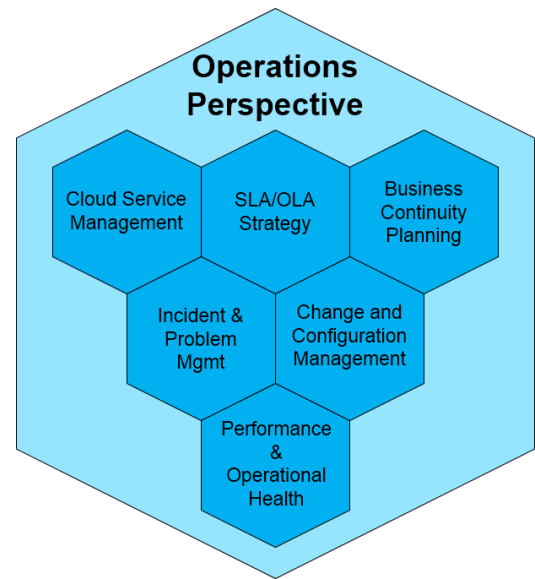


Figure 11: Operations Perspective

The Operations Perspective provides assessments to determine current operating procedures and identification of process changes and training that will be needed to allow successful cloud adoption.

The following is a brief explanation of each Component of the Operations Perspective:

- **Cloud Service Management** – Service management on the cloud should be automated and proactive, with actions taken automatically in response to potential issues. Repetitive manual tasks should be minimized to allow people to focus on value-add work. The AWS cloud platform provides comprehensive automation capabilities which can save cost and time and improve service quality.
- **SLA/OLA Strategy** – Defines the service-level agreement (SLA) and operational-level agreement (OLA) standards for the delivery of IT services. The SLA would be approved by the customers or users of IT services. Based on the SLA and OLA you would formulate policies to ensure that the levels were met by monitoring and reviewing the metrics.
- **Business Continuity Planning** – The organization should ensure that it can continue to operate if it is affected by a disaster. Disaster Recovery plans and processes must be in place to allow IT to recover from a disaster and support business operations. Operations management on the cloud focuses on proactive, end-to-end and automated management. The Information Technology Infrastructure Library (ITIL) provides valuable guidance on IT Service Management (ITSM) which can be applied to the cloud environment.
- **Incident & Problem Management** – The goal is to resolve incidents and problems and restore normal service operation as quickly as possible and minimize the impact on business operations. The root cause is identified and the defect fixed. The root

cause should be removed from the environment to prevent a recurrence. ITIL provides guidance here also.

- **Change and Configuration Management** - The AWS cloud platform provides capabilities for easily managing and monitoring the environment. You can obtain a resource inventory, configuration history and configuration change notifications. You can monitor a variety of metrics, collect log files and set alarms. You can have system-wide visibility into resource utilization, application performance and operational health. ITIL provides guidance here also.
- **Performance and Operational Health** – Organizations need to monitor cloud assets to ensure that a desired level of performance is being reached. The AWS platform provides a monitoring service for AWS cloud resources and the applications you run on AWS. The Amazon CloudWatch service monitors metrics and log files and can trigger alarms. In addition to AWS resources it can monitor custom metrics generated by your applications and log files from your applications.

## Security Perspective: Achieving Risk, Security and Compliance Goals

Every company is concerned with protecting information and assets as they grow the business. They also want to ensure they are operating within the legal boundaries and standards set by and on the behalf of governmental agencies and industry associations.

The Security Perspective gives organizations a structured approach to make good decisions based on risk assessments as they migrate to the AWS platform. Use of the components of the Security Perspective encourages a comprehensive approach to security control selection, workload compliance validation, and security operations that capitalizes on agility, TCO, and security innovation. The following is a brief explanation of each component of the Security Perspective:

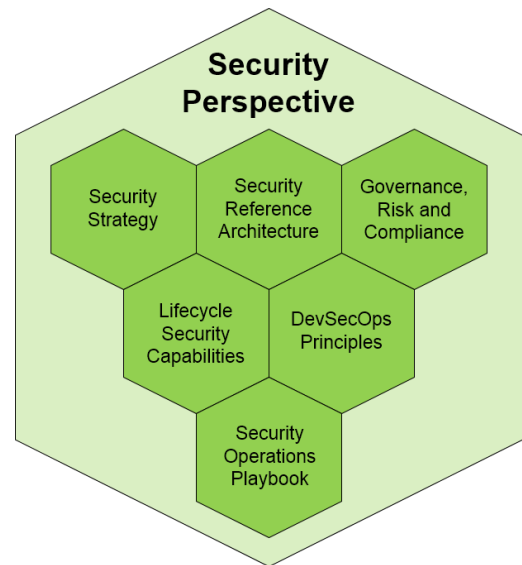


Figure 12: Security Perspective

- **Security Strategy** – The business should define and document its strategy for IT security as it makes the journey to the cloud. You create a strategy that articulates the security principles necessary for the organization to evolve and operate safely at peak efficiency. The strategy should also provide a set of catalytic actions and metrics to guide the implementation roadmap.
- **Security Reference Architecture** – Use reference architectures and solution patterns that incorporate security comprehensively. You publish these as code in addition to graphics and descriptive documentation. The results should be offered in a composable fashion so that security is embedded within the infrastructure as code philosophy.
- **Governance, Risk, and Compliance (GRC)** - GRC is a set of functions within the framework that are mutually reinforcing. When one benefits, they all benefit. Governance provides for the ability to manage authority and accountability across the cloud environment through a shared responsibility model. The shared responsibility model starts with the relationship between the cloud service provider and the customer's corporate entity of record, which can then be extended to include lines of business, the partner ecosystem, and occasionally customers. Risk management provides for the ability to make good decisions based on an understanding of the risks throughout the design, build, and run lifecycle. Leveraging familiar risk management strategies (risk registry, mapping, mitigation, and active management of residuals applied to the cloud transformation) will enable the business. Compliance provides for alignment with internal policy as well as third-

party assurance frameworks in the design and deployment of workloads. You can be confident in your deployed security and compliance posture through your compliance validation activities.

- **Lifecycle Security Capabilities** - Provides a goal-level taxonomy of desired security capabilities that facilitates control selection and operational decisions. You set foundational lifecycle security capabilities to include the ability to anticipate threats & vulnerabilities, deter attackers, detect malicious activities, respond to incidents, and recover to a known good state.
- **DevSecOps Principles** – Automation, deployment, and configuration management capabilities offered by the cloud provide an opportunity for security teams to create a business-friendly environment where guardrails are favored over gate-laden processes. You incorporate principles and practices into agile development methodologies to yield repeatable, auditable security as code. DevSecOps incorporates not only the security organization deploying solutions in the same fashion as the rest of IT but also includes innovative security solutions embedded in the DevOps process safeguarding continuous integration/continuous deployment pipelines and the resultant artifacts.
- **Security Operations Playbook** – Security operations should be automated and documented, and staff should be trained to execute well under pressure. You create a clear link from strategy to tactics by providing discrete code artifacts, task-oriented instructions, and indicators of success and failure resolutions for critical security and compliance operations. Security operations playbooks provide the necessary tactics, techniques, and procedures to uplift security operations to the cloud. You should review these procedures regularly to maintain compliance and improve as necessary.



# Conclusion

AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers hundreds of thousands of businesses in 190 countries around the world. The AWS Cloud Adoption Framework (CAF) is a guide to help with adopting AWS cloud-based services. The shift to cloud based services requires changes to business processes where cloud resources will be used as well as adapting people skills to support cloud-based solutions.

In order to benefit fully from adopting the AWS cloud platform staff will need to acquire new skills and the organization will need to implement some new business processes, or modify existing ones, that focus on making work practices much more efficient and agile.

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The companion to the CAF is the AWS Cloud Adoption Methodology (CAM), which provides more prescriptive guidance. Figure 2 shows the relationship between the CAF, the CAM and packaged accelerators that represent initiatives based on business objectives.

# Acknowledgements

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