



CLOUD ADOPTION METHODOLOGY

Abstract

Reduced Operational Expenditure is the prime factor that drives cloud adoption by any organization, whereas other significant benefits offered by cloud adoption include (but not limited to), high availability/ ease to implement disaster recovery, ability to scale it faster as opposed to long hardware procurement cycle on-premise, significantly lower recovery point objective (RPO) and recovery time objective (RTO), enhanced monitoring mechanisms that can be setup within fraction of seconds, and greater inherent security offered by cloud service providers etc.

This white paper provides methodology that can be adopted by any organization, if/ when cloud adoption is planned. Specific sub-sections can be leveraged in case an organization is venturing into those areas and pre-requisite steps are already completed.

Cloud Adoption Approach

Cloud Adoption approach that encompasses various stages within the journey to cloud transformation is depicted under Figure [Figure 2]. Cloud migration assessment stage would not be applicable in cases where an organization plans to perform cloud implementations for new workloads alone, as opposed to movement of existing workloads from On-premises data centers. Barring Cloud migration assessment stage, all other stages

covered below are typically applicable to any organization when they plan to move complete or part of the on-premises data center to cloud.

The reference architecture of cloud adoption methodology covered under Figure [Figure 1], highlights key constructs that are required to be defined before full-fledged cloud adoption is initiated

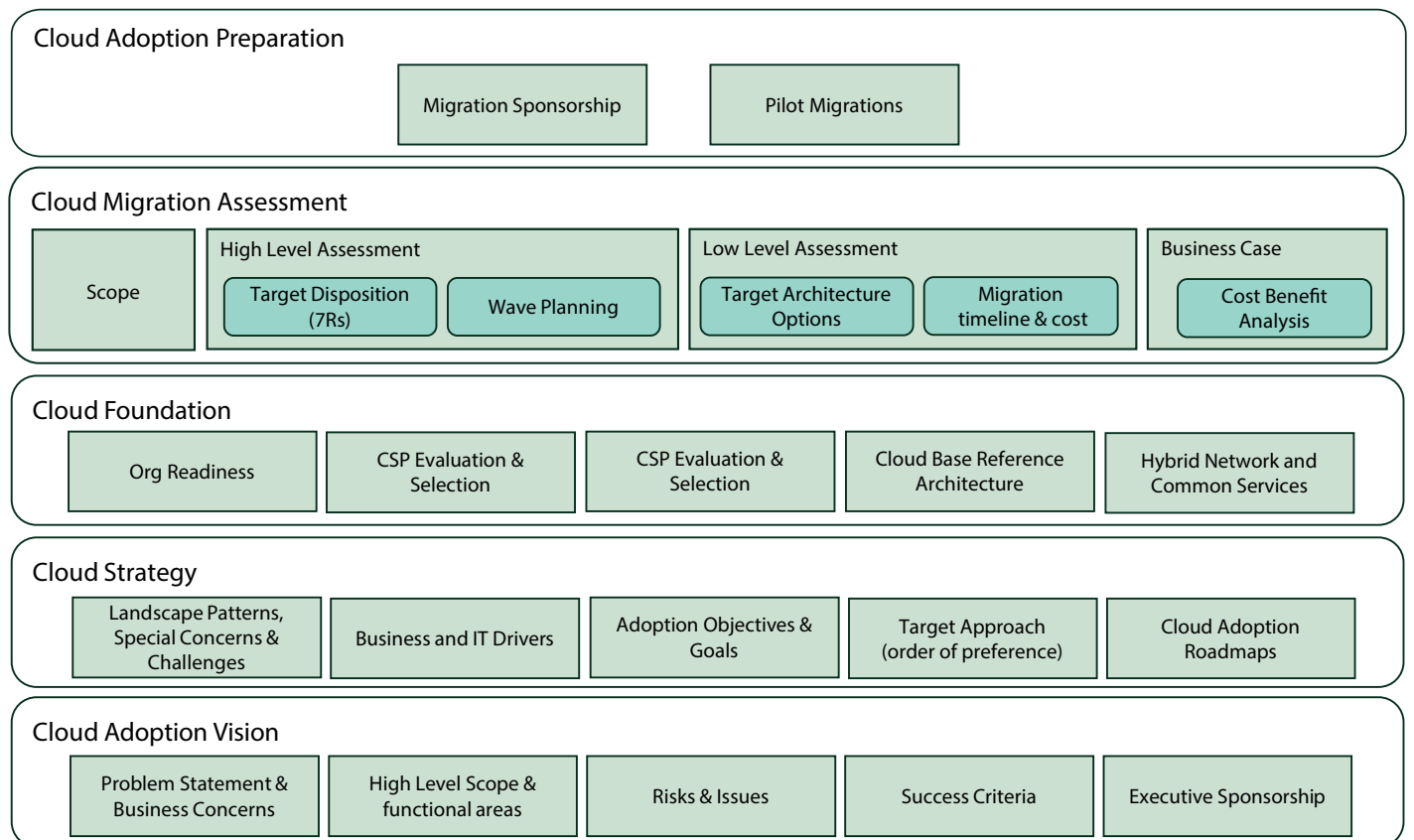


Figure 1. Cloud Adoption Methodology Reference Architecture



Cloud Adoption being strategic initiative, it starts with definition of vision and strategy but the success of cloud an initiative solely depends on traction from executive sponsors and all key stakeholders from operational units, including business organization, technology departments covering Cyber security, Networks, IT (Information Technology) etc. Hence Cloud education workshops play the significant role in ensuring that all vital stakeholders are aboard with an alignment towards cloud foundation concepts. Depending on selected cloud service providers (CSPs), educational sessions may also be tailored to target those CSPs once the core cloud team is formed.

Subsequently, cloud migration assessment (in case of on-premises workloads movement to cloud) or cloud implementation stages for new workloads adhere to cloud strategy derived from cloud vision and signed off by executive sponsors of an organization.

Cloud migrations assessment stage targets the whole IT landscape of an organization or subset of it, to extrapolate it to arrive at business case. The business case demonstrates the cost benefit analysis, that is the pre-requisite to perform big bang on-premises workload migration to cloud. But, to reduce the risk factor associated with big bang migrations, it is advised to carry out pilot migrations consisting of micro-subset of applications covering majority of operational units, complexity levels, technologies, and types of applications. The outcome of such pilot migration sub-stage results in discovery of challenges that would be faced during typical migration of any business system and serves as a benchmark to speed up the cloud adoption.

Figure [Figure 2] illustrates typical stages that are recommended to be executed by any organization, irrespective of the domain of an industry. But due modifications should be made in the covered approach based on organizational maturity and other related factors, as applicable.

Cloud Adoption Vision

Typically, EA defines the Cloud adoption vision covering problem statement, high level scope of an initiative, charter, business concerns that will be addressed by the scope, areas that will be impacted by the scope, its respective stakeholders, risks/ issues pertaining to an initiative and a success criterion. Defined cloud adoption vision is then reviewed and approved by executive sponsors such that an initiative can leverage it as an agreement document to be followed during subsequent phases.



Cloud Strategy Definition

To arrive at the cloud strategy, organization current landscape is studied to understand its patterns, on-going challenges, special concerns (such as compliance or security aspects) that can prohibit cloud adoption, and high-level approach/ a way forward for such concerns. Cloud adoption goals are then defined for the landscape that is categorized based on business capabilities/ units, on-premises technology, or type of business system, business

and IT drivers and challenges are captured. High level strategy specific to an organization is captured to address those challenges and to cover target cloud deployment approach in the order of its preference. Subsequently objectives to be met by the strategy are defined, along with a five-to-seven-year roadmap in terms of various activities to be carried out for each of the target cloud deployment approach to eventually conclude the cloud adoption.

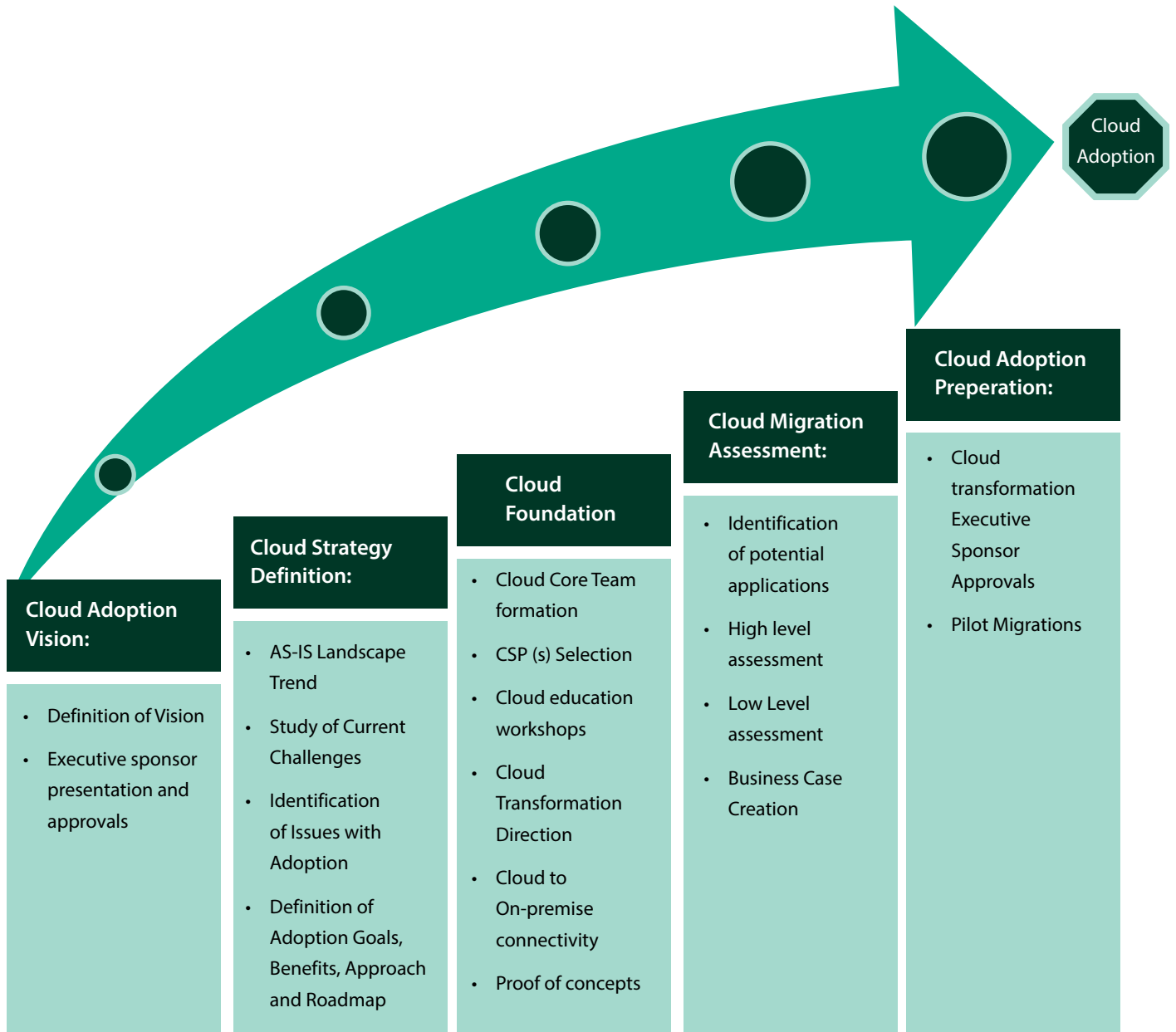


Figure 2. Cloud Adoption Approach

Cloud Foundation

Building cloud foundation is comprised of various (but not limited to) sub-stages as follows:

- **Core team formation**

Success of cloud foundation depends on representation of key stakeholders from all department who have a say in architecture, IT operations, network, security, storage etc. as well as personnel (s) from any key vendors who partner for the delivery within an organization. While there is no specific guideline on the number of folks who should form a core team, it starts as a small team to have focused

- **CSP (cloud service providers) (s) selection**

Every organization selects one preferred cloud service provider that:

- o Is cost effective. Organizations have enterprise agreements/ pre-existing contracts with certain CSPs who offer on premise technologies and hence partnering with them to leverage their public cloud may result in a cost-effective option. Additionally, the cost of amending contracts of existing on-premises IT infrastructure, applications support to repurpose it for support post cloud migration based on skill set availability, is also considered. Furthermore, the ability to re-purpose existing on-premises software licenses in cloud or extend on premise infrastructure management tools to cloud, are other crucial factors that are taken into consideration.
- o Supports major technologies present on premises, such as Azure being obvious choice if an organization is a Microsoft shop.
- o Meets their major set of Architectural requirements (availability, reliability, industry specific compliance, security etc.)
Etc.

But often organizations select the second or third choice of CSPs based on additional capabilities required but are deemed insufficient as offered by its preferred cloud service provider.

- **Cloud Transformation Direction**

Cloud Transformation direction includes prime functional specifications and architecture decisions that can be utilized by subsequent stages of the adoption as covered under Figure [Figure 3]:

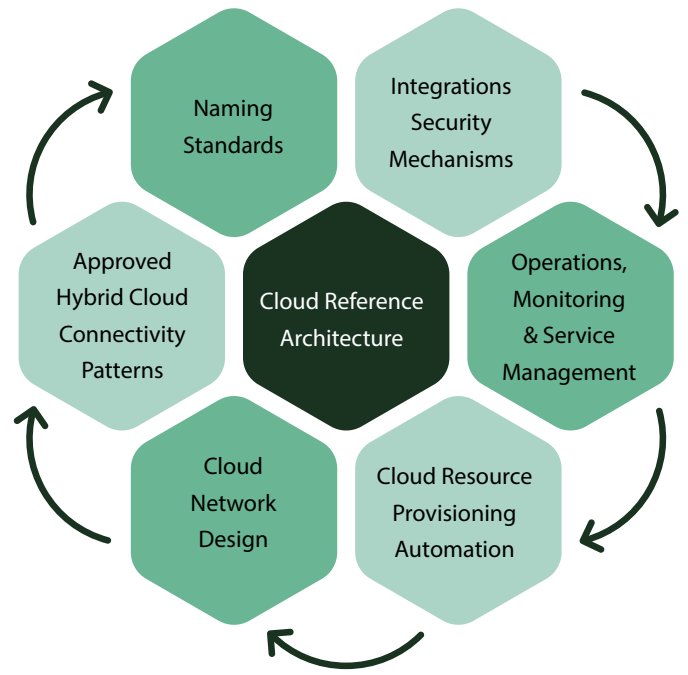


Figure 3. Cloud Transformation Direction

This phase defines Cloud EA standards, reference architecture and guidelines that are necessary before any workload is migrated or set up in the cloud. Naming standards are defined for all cloud resources, cyber approved communication mechanisms between cloud and on-premises trust levels are advised, security guidelines for all the traffic existing on-premises data center and entering cloud network are well-defined, segregation of cloud network is designed for enhanced security, operations and service management aspects are revisited and guidelines for enhanced productivity through automated resource provisioning is setup.

- **Cloud to on premise connectivity**

Organizations tend to setup cloud to on premise data center connectivity in two phased manners, that includes first the bare minimum or most cost-effective setup e.g., in case Azure is the preferred CSP, its Site-to-Site VPN followed by Express Route (along with increased bandwidth), when production workloads are planned to be setup on cloud. Additionally, any common services to be leveraged by workloads are also set up in cloud.

- **Proof of Concepts**

Industry specific compliance applications/ data related proof of concept are identified and executed to prove its feasibility for cloud migration. Additionally, sample applications may get hosted in cloud to validate connectivity and common services setup.

Cloud Migration Assessment

Once the cloud foundation is setup, organizations start planning for readiness to migrate its workloads to cloud. Every organization has a diverse landscape of applications hence not every application may qualify for migration or the path for migration may vary based on its current state, technology, and future requirements. To arrive at the target state of landscape, cloud migration assessment is carried out. It is comprised of various sub-stages as follows:

- **Identification for potential applications**

Every organization has an application landscape maintained in CMDB (configuration management) system. Filtering obvious candidates that may not materialize into valid ones to be considered for cloud migration assessment is suggested. While every organization may have additional criteria, some of the core criteria for filtering are covered as follows:

- o Applications that are planned to be decommissioned
- o Applications that are a part of major transformation program (s), that would change their future state
- o Applications that are planned to be replaced soon etc.

Once such criteria are applied to the landscape, remaining applications are considered for cloud migration assessment. In certain cases when an organization does not want to perform full-blown assessment for the whole landscape, subset of applications covering mix of portfolios, technologies etc. is considered for carrying out cloud migration assessment.

- **High level assessment**

High level assessment consists of various activities including:

- **Discovery:**

Aspects required to assess cloud suitability include Application, database, infrastructural details, business needs in terms of future growth, time to market, on-going projects etc. are collated:

- **Application**

Application details cover its business importance, frequency of changes happening, complexity, size, SLA (Service Level Agreement) requirements, usage pattern, technology details, regulatory compliance details, predictable/ unpredictable bursts, interface details, security details, DR (Disaster Recovery) requirements etc.

- **Database**

Database details include type and version of the database, tenancy details (single or multi-tenant), size, input/ output operations requirements, disaster recovery and availability, monitoring, and backup mechanisms etc.

- **Infrastructure**

Infrastructure details for each environment of an application are collated. It includes type of infrastructure, its hardware and software details and future refresh dates, usage, associated storage, disaster recovery and availability mechanisms etc.

- **Cloud Suitability Assessment:**

Once application discovery details are collected, cloud suitability is decided based on migration and integration ease, maturity, elasticity, optimal utilization etc. and if deemed suitable, the target deployment model is arrived at based on its performance and availability, security, compliance requirements and business criticality. An outcome of high-level assessment includes readiness towards target hosting model (infrastructure as a service, platform as a service or software as a service and its suggested migration disposition.

Cloud disposition options include:

- **Re-host:** It is a lift and shift approach to move on-premises application to cloud infrastructure AS-IS when application OS and software stack is supported on cloud, without any upgrade required. This approach primarily leverages tools like Azure site recovery to perform the migration.
- **Remediate:** It includes upgrade of OS, programming languages, databases etc. to the cloud supported versions to perform the migration. E.g., Windows 2003 to windows 2019, .NET 3.5 to .NET 6 etc.
- **Re-platform:** It targets application to move to another platform technology for its OS, database, or middleware components to move it to cloud. E.g., AIX to Linux, SQL to Oracle etc.
- **Re-factor:** It includes making significant code changes to make use of cloud-based services to the part of the application. E.g., Implementing DevOps, containerization of an application, implementing API (Application Programming Interfaces) management etc.
- **Re-architect:** It includes complete re-architecture of an application to leverage cloud native services or cloud supported PaaS/ SaaS (Software as a Service) services. E.g., VB6 application re-architected to deploy in PaaS hosting model with React/ Microservices based architecture.
- **Retain:** It targets applications to remain on-premises, that may include applications that are soon to be decommissioned, having replacement in-progress, or having compliance classification that prohibits its migration etc.
- **Retire:** It aims at decommissioning an application if it is identified as not in use/ not required.

- **Migration wave planning:**

Migration wave planning aims at wave/ cluster planning for the migration that targets mix of complexity and technology for each business portfolio or domain. Each wave can have one or more clusters of applications based on interfaces/ dependencies and shared infrastructure.

Based on enterprise architecture approved standards, on premise platforms and target cloud service provider, various accelerators can be used during data discovery, assessment, and wave planning exercises.

Indicative accelerators/ tools (but not limited to), that help during assessment include:

- Microsoft assessment and planning toolkit (MAP) & Azure Migrate: MAP is beneficial for discovery of infrastructure, application, or devices by scanning a network and can provide preliminary report of OS compatibility of desktops/ servers, whereas Azure migration accelerates migration including assessment, and sizing of target platform and helps perform migration for servers, databases, and web apps. AWS (Amazon Web Services) Migration Acceleration Program (MAP) and the AWS Migration Hub are similar tools from Amazon for AWS migration.
- WLM Solution suite from Infosys: An accelerator that recommends target hosting option based on data collated for an application during application discovery phase, in the format that the tool requires.
- Google Migrate for Compute Engine and the Google Storage Transfer Service: These tools enable migration to VM instances and data transfer to cloud storage bucket, respectively.
- CAST: CAST analyzes application portfolio health, disposes application into one of the five R's, it identifies application dependencies, components not compatible with cloud, or cloud services that an application can leverage, open-source usage and remediation required, technology obsolesce, data sensitivity involved, and provides recommendations etc.

- **Low level assessment**

Low level assessment aims at detailed assessment to arrive at:

- o Potential target architectural options for migration of an applications to cloud
- o Migration Timeline
- o Migration Cost for an application

It starts with understanding of on-premises application overview, architecture, deployment details etc. and then

venture into defining cloud suitability assessment score card that includes identification of criteria that will be assessed, suitability decision in the scale of least compatible to most compatible for cloud migration based on an application state along with potential approaches to bridge the gaps identified.

Migration Assessment score card or a checklist includes various parameters (but not limited to):

- o Application lifecycle stage
- o Architectural maturity
- o Usage trend
- o Software technology stack
- o Special hardware requirements
- o Reporting, caching, and session management
- o Database technology, type, and size
- o Usage of local/ external storage
- o Requirements for OS level rights/ windows events/ registry updates
- o Network latency, protocol, bandwidth requirements
- o Integration/ Communication requirements
- o Security requirements
- o Availability, DR, and business continuity requirements
- o Regulatory/ compliance requirements
- o Data sensitivity, retention, backup and restore policies
- o Support SLA etc.

An application is then looked at its alignment to all target hosting models (SaaS, PaaS, or IaaS) and then its suitability is recommended for each tier of an application. Based on an outcome of suitability assessment, each target architecture option is provided with an approach to migrate each tier of an application, along with target infrastructure configurations and communication setup necessary.

- **Business case creation**

Business case creation includes cost-benefit analysis of application migration to realize potential savings. Various cost factors that make capital expenses (server hardware refresh, software/ application refresh) and operational expenses (application maintenance cost, labor, power, space etc.) are calculated for on premise applications, then capital expenses (associated with application migration, setup of its required services) and operational expenses (cloud services cost and labor) are calculated for recommended target architecture to arrive at net savings.

Cloud Adoption Preparation

After cloud migration business case creation, executives sponsor approvals are necessary for the budget that needs to be spent for migration of all suitable landscape applications. Once the migration business case is approved, pilot migrations are planned before a big bang migration exercise using factory pattern is executed. Intent of the pilot migration is to uncover any risks, learnings etc. for the group of applications that is a mix of complexities, technologies, and target hosting models etc. Additionally pilot migrations also help leverage common services setup within cloud, identify additional services necessary and implements other cloud foundation technology setup in place. Once pilot migrations are successful, full-fledged cloud migration adoption is kick-started as a multi-year program to meet goals defined in cloud strategy.

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References

1. What is Cloud Migration | Microsoft Azure
2. Enterprise Architecture Vision Template | Info-Tech Research Group (infotech.com)
3. 7 of the Most Important Criteria for Selecting a CSP | Charles Phillips

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