

Analyzing the Role and Skills of the Cloud Architect

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The cloud architect is now a mandatory and critical role within IT organizations. Technical professionals focused on cloud computing must understand the responsibilities and requirements of the role and must develop the necessary skill sets for long-term success.

Key Findings

- The adoption of cloud computing is multidimensional and must be run like a multiyear program, not a fixed-duration project. As a result, the complexity of cloud adoption requires at least one accountable cloud architect to lead the organization through the transformation that a cloud program warrants.
- The most successful organizations in terms of cloud adoption appoint or hire a cloud architect by assigning a formal title and granting principal responsibility to the cloud architect.
- The cloud architect has three main responsibilities: leading cultural change for cloud adoption, developing and coordinating cloud architecture, and developing a cloud strategy and coordinating the adoption process.
- The cloud architect should have a variety of technical and nontechnical skills, but above all, the cloud architect must be a great collaborator in order to empower and connect with a variety of other architecture roles in your organization.

Recommendations

Technical professionals focused on cloud computing:

- Act now to find or become your organization's cloud architect. Promote internally with roles such as enterprise architects or architects from infrastructure and operations (I&O) or applications. Hire externally by clearly defining the position using the research in this report.
- Document or develop your technical and nontechnical skills. Important technical skills include application architecture and system integration architecture. Relevant nontechnical skills include communication and collaboration.

- Surround yourself with great relationships and colleagues that will complement your architectural skills deficiencies, especially in the key cloud domains such application development, I&O, security, integration, data, analytics, legal, finance and procurement. Cloud adoption requires a great virtual team.

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Analysis

Cloud computing is no longer a matter of "if"; it's a matter of "how." IT organizations have progressed past the cloud definitional phases of adoption but currently face major obstacles when it comes to building, deploying, consuming, managing, securing and integrating cloud services.

The adoption of cloud computing is multidimensional and must be run like a multiyear program, not a fixed-duration project. As a result, the complexity of cloud adoption requires at least one accountable architectural leader to lead the organization through the transformation that cloud computing warrants. This is the task of a role that many IT organizations are now finding to be mandatory — the cloud architect.

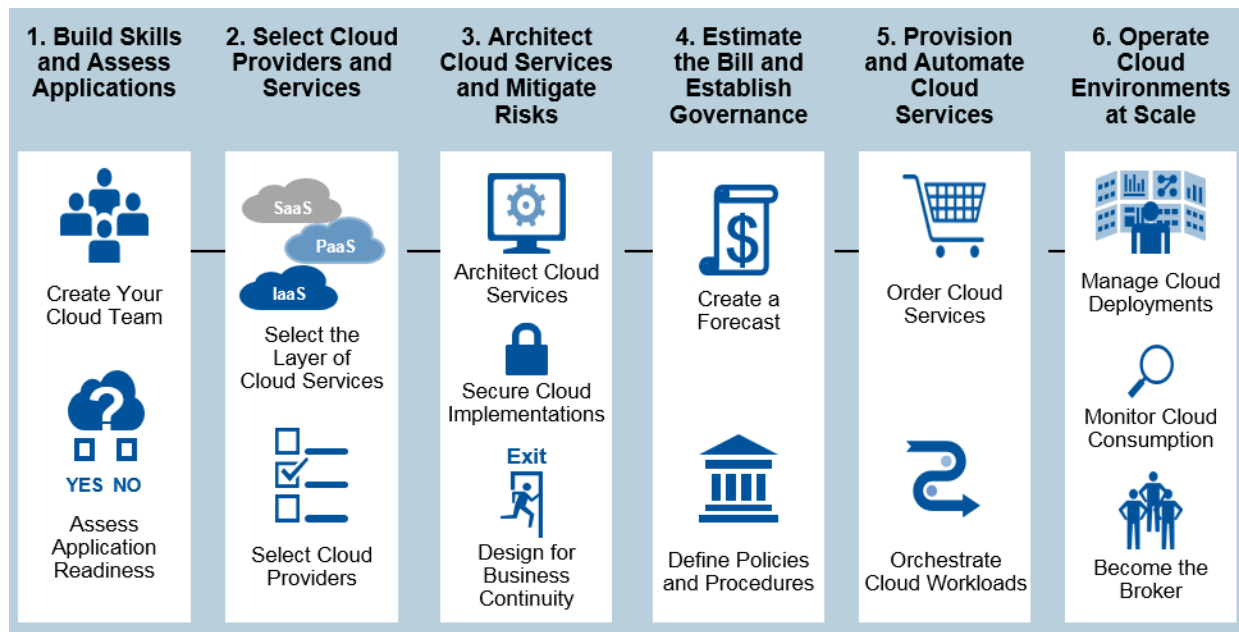
Some organizations can clearly point to their cloud architect, but many have yet to formally name this individual or have piled the cloud responsibilities onto an already overburdened technical architect. Other organizations are leaving the responsibilities of the cloud architect to an ad hoc group of individuals and, as a result, they are making limited progress in their cloud adoption. Organizations that are most successful assign formality to cloud architecture responsibilities to ensure a single, accountable architect is in charge. After the cloud architect is in place, Gartner provides assistance with "The Cloud Architect's Guide to Implementing Public Cloud Services."

If you or your organization is in the midst of sensing the need for a cloud architect or actively forming the cloud architect role, the following research will assist you with your planning and implementation by addressing the following key questions:

- What is a cloud architect?
- Why do we need a cloud architect?
- What does a cloud architect do?
- How does the cloud architect relate to other architecture roles?
- Where do we place the cloud architect in the organization, and whom do they work with?
- Where do we find a cloud architect?
- What technical and nontechnical skills does a cloud architect need?
- How can IT professionals obtain necessary skills for cloud architecture?

Cloud adoption requires a strong architectural leader that will take executive vision and oversee the entire cloud adoption process as described in "Solution Path for Developing a Public Cloud Adoption Strategy" (also see Figure 1).

Figure 1. How Do We Develop a Public Cloud Strategy?



Source: Gartner (December 2016)

At times, the cloud architect will also have to document the organization's cloud strategy if this has not already been completed by an executive sponsor or predecessor. Gartner offers assistance in "Designing a Cloud Strategy Document."

Consider the areas impacted by cloud computing: application development, IT operations, legal, finance, procurement, security, compliance, privacy, identity management, data integration, mobility, customer experience, business development, and so on. These impacts are not trivial, and reliable, scalable solutions do not stem from ad hoc, simple projects. Therefore, it is time to find or become your organization's cloud architect.

What Is a Cloud Architect?

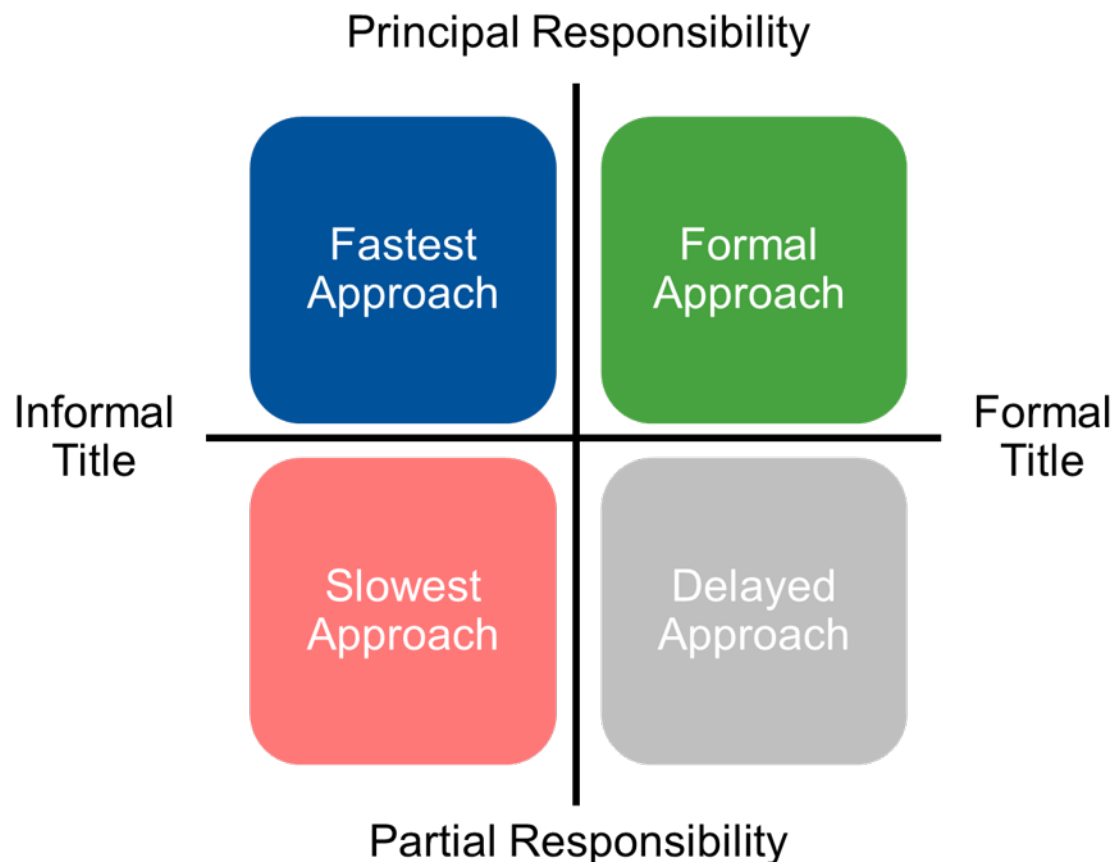
The cloud architect is responsible for the entirety of cloud computing initiatives within an organization and for directing the architectural aspects of a cloud brokering team across all aspects of IT and the business. A detailed list of responsibilities is found in the What Does a Cloud Architect Do? section.

It is also important to note that Gartner observes permutations of the cloud architect role, most notably *cloud evangelist*, *cloud strategist* or *cloud administrator*. Names are just names, but each of these permutations is far too limiting for the scope of responsibilities the cloud architect must

perform. A cloud architect must evangelize, strategize and delegate. But he/she must also primarily architect, design, facilitate, lead and direct cloud initiatives on multiple fronts.

Gartner observes four approaches to fulfilling a cloud architect role within an organization (see Figure 2).

Figure 2. Approaches to Filling the Cloud Architect Role



Source: Gartner (December 2016)

1. **Formal title, principal responsibility:** A formal organizational job title, description or job posting. HR must be very involved in this scenario, and the role must be defined just like a CIO or CTO title. In this case, an executive sponsor is very well defined in a *formal approach*. This is the clearest path to cloud success.
2. **Informal title, principal responsibility:** A dedicated role or function within the IT organization placed on a single individual. The role is often not defined in terms of the HR organization. In other words, HR often sees this role as any other senior IT role (e.g., "architect," "consultant" or "analyst"). However, within IT, this is a very formal job function with very clear responsibilities and clear executive sponsorship. Success can be had in this approach, and is often the *fastest approach* due to minimal HR change.

3. **Informal title, partial responsibility:** A senior-level architect with additional responsibility for cloud oversight and leadership. Organizations taking this approach accomplish little progress with cloud adoption, and executive sponsorship is often unclear. Therefore, this is the *slowest approach* to cloud success.
4. **Formal title, partial responsibility:** This approach often puts a "figurehead" individual in place, but the lack of authority means the architect is not empowered to make the decisions necessary. This is a *delayed approach* that often requires changing the approach before significant cloud adoption progress will occur.

If your organization desires to seek out the most qualified cloud architect individuals in the market, approach No. 1 will likely be necessary. It may even be necessary in this situation to define a very attractive job title, such as "chief cloud officer" or "chief cloud architect" to attract professionals with the right skills and leadership attributes. If HR will not name new roles like the "cloud architect," then approach No. 2 is likely the sweet spot for your organization. Approach No. 2 still places a high degree of accountability and responsibility on the cloud architect, but minimizes organizational red tape and bureaucracy by not requiring HR to spend a lot of time defining a public position and investigating market positioning. Approach No. 3 should be avoided or reserved for only the most resource-constrained organizations. A common problem that Gartner observes with approach No. 3 is that, because "cloud" is only an additional responsibility for the individual, other duties and tasks often take precedence over cloud architecture, and the entire cloud program suffers as a result. Finally, Gartner does not recommend approach No. 4 because it requires a significant amount of HR work but unfortunately provides none of the responsibility and power that the role truly warrants.

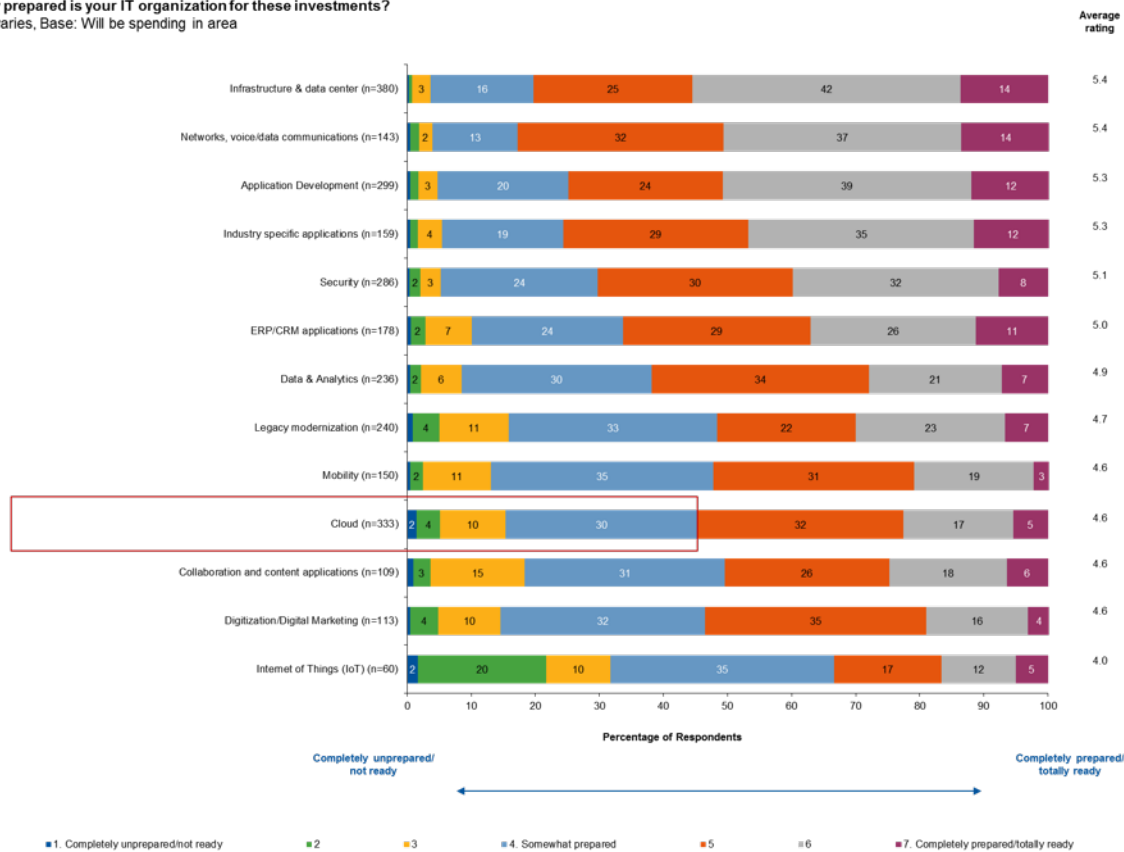
Why Do We Need a Cloud Architect?

Cloud computing is likely already being leveraged by your organization in some fashion, but the technical architects may not feel ready for the adoption that is occurring.

According to a survey of 949 IT professionals,¹ 46% of organizations feel "somewhat" prepared (or worse) for cloud computing.

Figure 3. Preparedness for Tech Investments

How prepared is your IT organization for these investments?
n = varies, Base: Will be spending in area



Source: Gartner (December 2016)

Therefore, you cannot delay placing accountability of cloud architecture leadership on an individual that will help your organization be more prepared for cloud computing adoption. The current lack of preparedness stems from organizations beginning their cloud adoption through ad hoc processes that inevitably lead to issues, frustrations, duplicate work cycles, general inefficiencies or inappropriate use that puts the company at risk. Almost every organization that has experienced ad hoc cloud adoption tells Gartner it agrees that the first step to remedy the issues from ad hoc adoption is to place an architect in charge of the cloud program.

Cloud computing shows no signs of slowing down. IT spending on public cloud services is growing more than five times faster than growth in IT spending across all categories. In aggregate, Gartner predicts a compound annual growth rate (CAGR) of 16.5% for all public cloud service segments, with the individual segment of cloud infrastructure as a service (IaaS) leading the way at 32% through 2020.² Therefore, Gartner expects that the complexities of cloud adoption — namely, interdependencies, integrations, provider management, data dispersion and impacts to traditional IT departments — will continue to challenge organizations from successfully adopting cloud computing. When an IT initiative shows indications of being challenging, but displays no signs of

slowing down, it is time to allocate people to the initiative. Finally, time is of the essence; it is often much easier to architect for complex IT initiatives in the early days rather than down the line, when many existing or in-flight projects already exist.

What Does a Cloud Architect Do?

The responsibilities of the cloud architect will be very fluid day to day and over time and will vary from organization to organization. As the cloud computing market matures and your organization improves its cloud adoption, the cloud architect will also need to evolve to support the tasks and projects in front of him or her.

However, three main responsibilities currently sit on the shoulders of the cloud architect.

1. Lead cultural change for cloud adoption
2. Develop and coordinate cloud architecture
3. Develop a cloud strategy and coordinate adoption

Lead Cultural Change for Cloud Adoption

Successful organizations develop a "cloud-first" strategy.

A cloud-first strategy is a philosophical mindset within the organization that cloud services are the primary, prioritized and promoted approach to all new IT projects.

Cloud services will be the primary option for an IT deployment unless cloud is proven to not be viable. Cloud services will be prioritized above all other IT deployment options. And cloud services will be actively promoted within the entire organization to ensure that the organization properly architects business solutions for cloud.

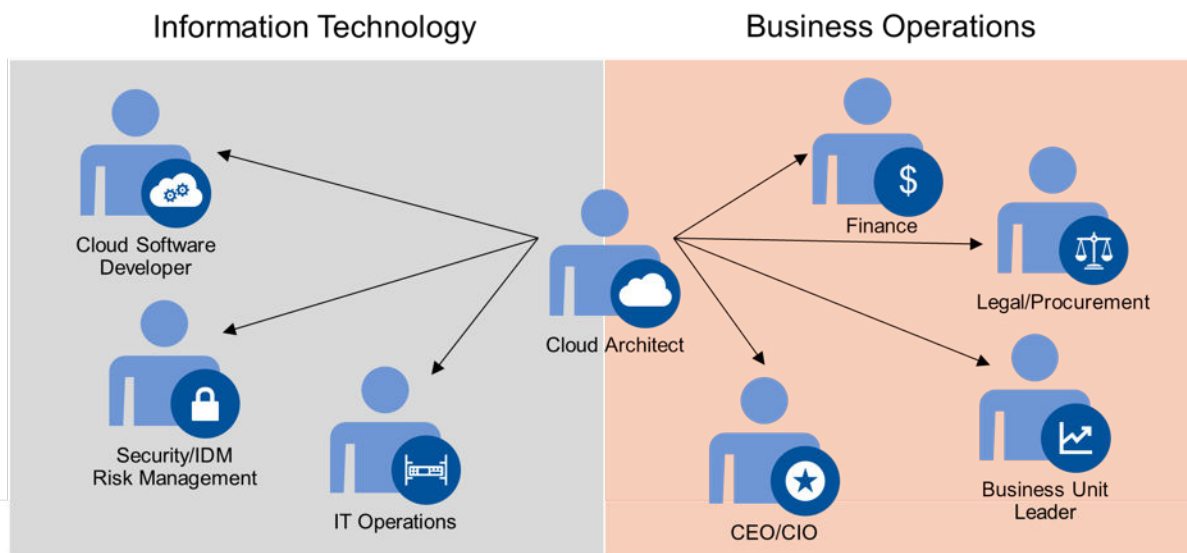
However, the famous management consultant, Peter Drucker, once said, "Culture eats strategy for breakfast." What he likely meant by this is that no matter how sound a strategy may be, if the culture of the organization does not buy into it, the organization will accomplish nothing. Many organizations have developed cloud strategies but have experienced minimal adoption or benefit from cloud services because the culture has not adapted to cloud being fundamental to everything the organization does. The cloud architect must inspire a new culture and resist the urge to execute "business as usual." The cloud architect must push the organization through thought leadership to incorporate cloud computing correctly and most effectively. So how does the cloud architect lead this cultural change?

According to Lloyd Taylor, the VP of Cloud Infrastructure at Autodesk, "You can't directly change culture. But you can change behavior, and behavior becomes culture."³ The cloud architect cannot forcefully change IT or business culture within your organization. But, the cloud architect can influence the change in behavior toward the adoption and consumption of cloud services, and this

changed behavior will lead to a culture of embracing cloud services as the primary, prioritized and promoted approach. For example, the cloud architect can influence new usage patterns by developers to instrument their consumption of cloud services only when necessary rather than keeping services running 24/7. Similarly, the cloud architect can influence colleagues in procurement to deal with cloud contracts in different ways than more traditional hardware or software contracts.

Figure 4 is an illustrative example of some key relationships the cloud architect must have in order to influence new behaviors in each of the respective areas.

Figure 4. The Cloud Architect Must Influence Behavior



Source: Gartner (December 2016)

Develop and Coordinate Cloud Architecture

Job No. 2 for the cloud architect is to develop and coordinate cloud architecture across a variety of disparate areas within the organization. These areas include (but are not limited to):

- Application development
- Application portfolio and life cycle management
- Data management, analytics and protection
- Enterprise management
- External IT hosting
- Governance
- Identity and access management (IAM)

- Infrastructure
- Integration
- Network
- Security, privacy and compliance
- User experience

The preceding list is daunting, and the relevant architectural changes do not take care of themselves automatically. A bright, focused cloud architect must closely coordinate the architecture changes to all of these areas. This does not mean that the cloud architect dictates or implements all such changes, but he or she must build relationships with the functional architects in each area to influence each toward the changes necessary. For more research on the changes necessary to many of the items in the list, refer to "The Cloud Architect's Guide to Implementing Public Cloud Services."

Develop a Cloud Strategy and Coordinate Adoption

A cloud-first strategy does not mean "cloud-always." The cloud architect will therefore be responsible for clearly articulating to the organization those scenarios wherein cloud services may not fit. The way in which the cloud architect will do this is by creating a cloud adoption process to coordinate and align adoption. Gartner offers a starting point in Figure 1.

A brief description of each phase of the process includes:

1. **Build skills and assess applications:** Create a cloud broker team to assist with the work the cloud architect must oversee. Architect the processes by which IT and business staff choose cloud computing as the deployment model of choice per application, including the rationale behind determining which applications should use cloud computing and which ones should not. This effort is often delivered in a decision logic process that evolves over time.
2. **Select cloud providers and services:** Construct the criteria for cloud provider evaluation, comparison and selection, and collaborate with procurement divisions for assessing vendor/provider viability and risk. The cloud architect must work hard to ensure that the procurement processes for cloud work more quickly than traditional procurement practices — otherwise, cloud adoption will be slowed. Finally, the cloud architect must determine and convey strategic provider investments to the rest of the organization.
3. **Architect cloud services and mitigate risks:** Architect enterprise guidance that conveys best practices and common pitfalls for cloud system design, infrastructure integrations, application development practices and application runtime principles. Identify a comprehensive set of risks posed by cloud computing services and a risk-mitigation-mapping matrix for coping with and overcoming such risks. Furthermore, this effort will be closely tied with information classification efforts and is evolutionary in nature, as an organization gains or loses comfort with cloud projects. This effort must closely collaborate with IT security and risk departments and should include a framework that details a cloud exit strategy per provider or per application.

4. **Estimate the bill and establish governance:** Coordinate with finance teams to determine the most appropriate financial models for each cloud service that is procured. For each service, develop a structure to estimate the recurring financial bill so that cloud financial sprawl does not disrupt the organization. Establish governance that will allow cloud services to be consumed in agile fashion to meet immediate business needs yet balance against reckless or unconstrained adoption, which leads to overrunning a proposed budget.
5. **Provision and automate cloud services:** Develop a methodology for ordering and provisioning repetitive cloud services either through internal tools/processes or by leveraging external provider's tools/processes. Automate those cloud tasks that can be instrumented and conducted programmatically so that human delays and mistakes do not impact the speed and agility of cloud benefits.
6. **Operate cloud environments at scale:** Design the comprehensive set of enterprise management processes, tools, integrations and procedures to ensure running cloud systems "in control." This effort must also include professionally managing cloud providers, applications, infrastructure and systems. The effort should closely align with IT operations management (ITOM) offices within the organization.

The details of each phase of this cloud adoption process can be found in "Solution Path for Developing a Public Cloud Strategy."

How Does the Cloud Architect Relate to Other Architecture Roles?

The cloud architect is very closely related to other architecture roles, namely, enterprise architects and senior IT architects. In fact, in many examples, the cloud architect reports to, or is part of, the enterprise architecture (EA) team. However, whereas the EA team is responsible for a variety of functions, the cloud architect is laser-focused on the strategic and transformational architecture efforts that cloud introduces. Over time, the cloud architect will be vital to ensuring that "cloud" permeates everything that the IT organization does and may even dictate the need for more than one cloud architect. Table 1 highlights some core EA responsibilities that the cloud architect is not directly responsible for; however, the overlap depicts areas where the cloud architect does get involved.

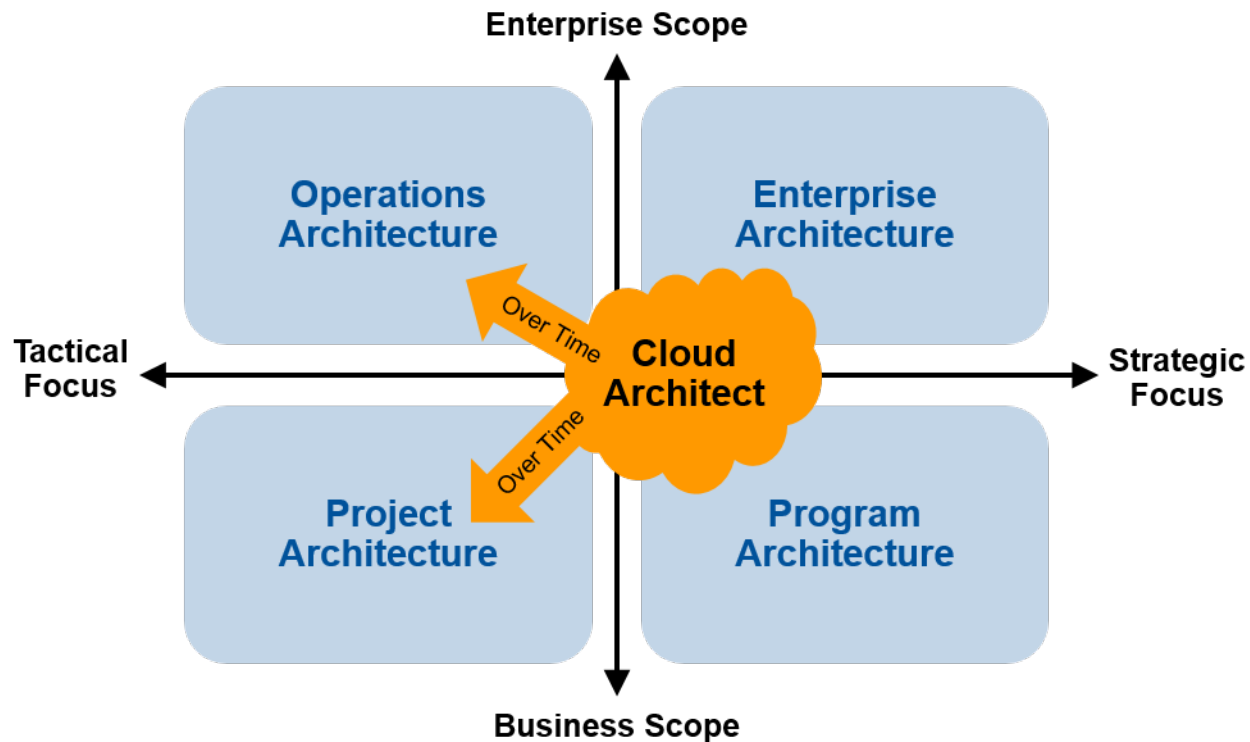
Table 1. Enterprise Architect and Cloud Architect Relationships

Enterprise Architect's Responsibility	Cloud Architect's Overlap
Overseeing corporatewide EA program and brand	Ensuring cloud initiatives do not damage or disrupt the EA program Recommending EA program tweaks to account for cloud offerings
Developing corporatewide EA policies	Adhering to corporatewide EA policies in context of cloud initiatives and influencing corporatewide policy adjustments or creation as cloud dictates evolution
Governing traditional or legacy application and infrastructure architecture	Driving cloud-native architecture principles Leading application life cycle management initiatives — refactoring or replacing legacy applications with cloud applications
Collaborating with vendor management and procurement	Collaborating with procurement to modify traditional vendor management toward cloud provider management
Enforcing IT and business unit alignment	Similar — with a specific context of cloud End-user and IT alignment for shadow IT cloud issues (e.g., file synchronization and share)
Governing integration architecture, solutions architecture, functional architecture and applications architecture	Similar — with a specific context of cloud

Source: Gartner (December 2016)

Furthermore, Figure 5 depicts the current positioning of the cloud architect in relation to four common architecture domains. Cloud architecture begins primarily with an EA and program architecture focus, but as cloud architecture matures at your organization, the cloud architect must account for and influence both operations and project architecture.

Figure 5. Cloud Architect's Relationship to Architecture



Source: Gartner (December 2016)

Where Do We Place the Cloud Architect in the Organization, and Whom Do They Work With?

The answer to this question varies dramatically based on organizational structure and variability in organization charts. Gartner advises that the cloud architect reside in the central IT organization and report to the senior leader of I&O, applications or EA. The specific positioning of the role will depend on whether your organization leans toward a more infrastructure, application development or general-purpose architecture focus for cloud adoption. Regardless of your organizational design, the cloud architect has six key relationships:

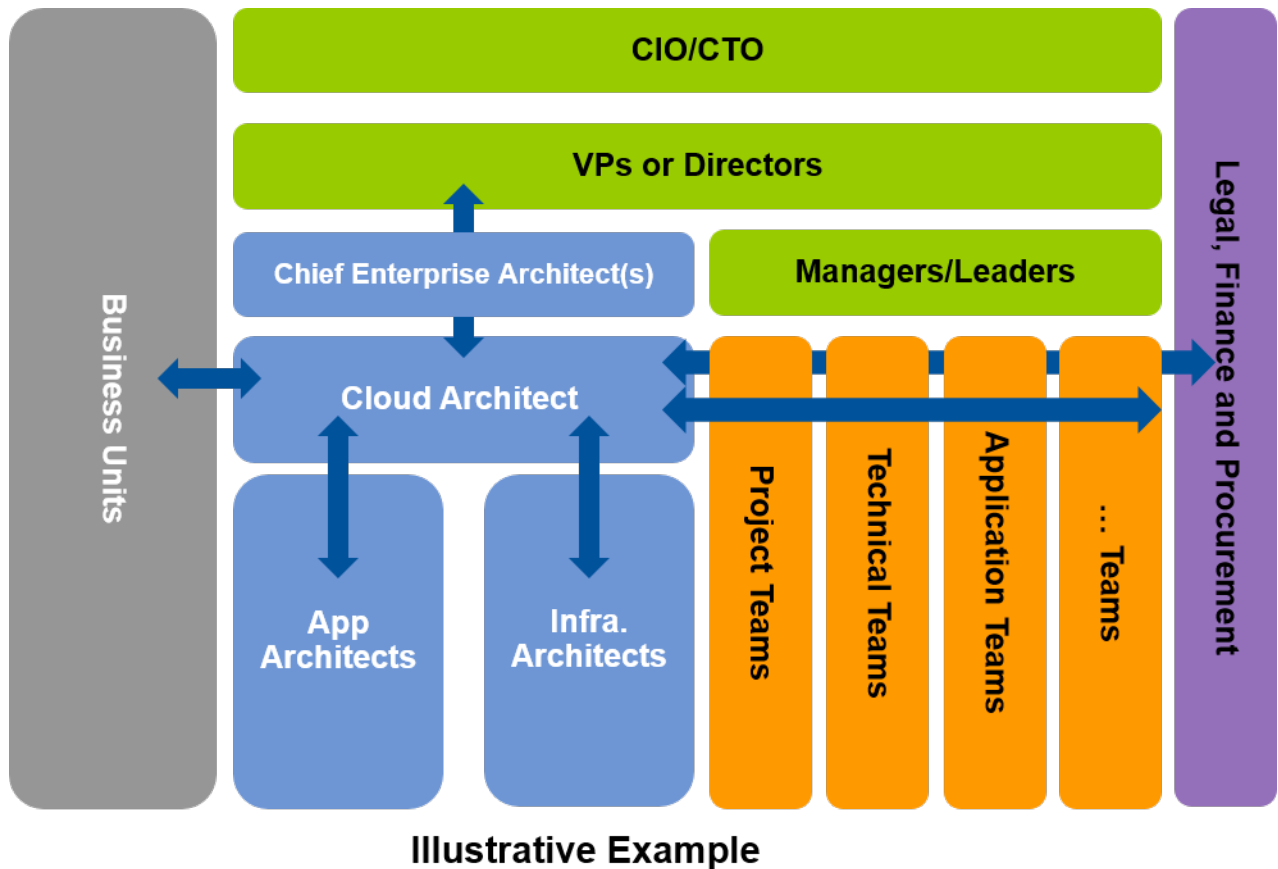
- Advisory-level access to senior-level IT leaders (e.g., director/VP/CIO), either directly or through the EA team
- Direct and collaborative access to senior EA teams
- Direct and collaborative access to domain architecture teams (e.g., application or infrastructure architecture)
- Collaborative access to technical (solution, domain and service) architects and teams (e.g., infrastructure, application, security, data, identity, governance, procurement and finance)

- Collaborative access to central function architects and teams (e.g., legal, finance and procurement)
- Collaborative access to business unit representatives to discern business requirements for business solutions

Figure 6 portrays an illustrative example of where a cloud architect might reside in the logical construct of a complex organization. The cloud architect sits in the middle of many people and teams. He or she must have access to senior-level IT leaders, either directly or through a chief enterprise architect. Because of the many impacts to a variety of infrastructure and application aspects of IT, the cloud architect must also have deep integration with the team of architects responsible for central IT departments (e.g., network, security and application development). Cloud adoption tends to come in on a project-by-project basis. Accordingly, the cloud architect must have access to a variety of project teams to learn from them as well as to impress upon them standards, best practices, and proper governances and use. Finally, business units will benefit highly in an agile cloud world through interacting with a central cloud architect or team rather than a revolving door of other architects and project individuals. If your organization already has an effective "front door" of IT to the business units, it will be more effective to leverage that existing business relationship rather than to introduce another avenue.

Figure 6 is not meant to serve as a definitive organization chart model, but rather an example that organizations can use to fit the positioning of the cloud architect into their specific models. No indicator of success dictates to whom the cloud architect should report, but successful organizations ensure that the cloud architect reports to a person of influence, such as a chief enterprise architect, a senior IT leader or a manager of architecture.

Figure 6. Cloud Architect Organization Positioning — Illustrative Example



Source: Gartner (December 2016)

Where Do We Find a Cloud Architect?

Organizations have two main choices for finding or hiring a cloud architect — internally or externally. Gartner highly prefers finding a cloud architect from within the current organization. It is much more difficult to acquire knowledge about the company and industry than it is to acquire some of the important technical skills.

Promote Internally

Gartner observes successful cloud architects can come from a variety of different backgrounds and former roles. In the majority of successful scenarios, the cloud architect has come from the IT department or from an IT background and is an individual who has strong competency and high interest. Your cloud architect may come from one of the following roles, although this is not an exhaustive list. The technical and nontechnical skills section lays out what to look for in an individual:

- **EA:** As already conveyed many times in this research, the cloud architect is a new form of an enterprise architect with expansive impacts across a variety of areas. Cloud architects often come from the EA team because these individuals typically already have broad coverage experience and wisdom in architecting complex initiatives. Organizations should ensure that this individual is not simply an architectural theorist, but also offers real hands-on program leadership.
- **I&O (virtualization):** Although cloud computing is not virtualization 2.0, many similarities do exist, and many cloud architects have served former lives as virtualization or infrastructure architects. Another reason why this approach is popular is because many cloud programs begin with simple IaaS projects, and virtualization architects are best-positioned to understand the technical nuances of a "virtualizationlike" environment. Organizations should consider whether such an individual has the broad knowledge and collaborative nature to take on the enormity that will be a cloud architect's responsibility.
- **Application development architecture:** Many will argue that cloud computing provides a platform to perform next-generation application development. This statement is true, and the cloud architect needs a strong foundation in application development architecture. However, cloud computing also has a variety of impacts outside of pure application development. Organizations should carry the same caution as they would with a purely I&O-focused individual and discern whether an application development architect has the ability to lead in areas outside of application development.
- **Integration architecture (network, identity, services and data):** If application development is the heart of cloud computing, integration is the blood. Many common issues and struggles in adopting cloud computing come from the complexity of integrating networks, identities, services and data. Therefore, architects well-versed in complex systems and application integrations can be very well-positioned for the cloud architect role. These individuals, by their nature of connecting multiple things, are often already armed with the skills of collaborating across departments.
- **Business liaison:** Many organizations got their start in cloud adoption because business units pushed the envelope, and they often pushed it through by leveraging their dedicated business liaison in IT. These liaisons are often technical "front door" people to lines of business to capture business solution requirements and to feed those into IT for development and execution. Because cloud computing ultimately serves to deliver better business value out of IT, the right business liaison individual may be a good fit for the cloud architect role. A key aspect to review is whether this individual still has the technical strengths and leadership to lead the cloud program, or whether this individual has turned into an order taker with the business.
- **Business unit:** Although it is rare, the cloud architect will occasionally emerge from an extremely technically savvy individual in a business unit. These people tend to know the business requirements better than IT. However, this individual may not know enough about how IT operates or be microfocused on only the business unit from which he or she came.

Hire Externally

If your organization does not have a qualified internal candidate to promote to the cloud architect position, then you may be forced to look externally. The process of hiring an external candidate is as follows:

1. **Clearly define the position:** Cloud computing is a broad domain. The organization must clearly define what the role of the cloud architect will be in your organization. For example, is your organization holistically focused on outsourcing business applications to SaaS, or is your organization more focused on transforming infrastructure and software development agility by leveraging IaaS and platform as a service (PaaS)? Does your organization lean more toward consuming public cloud services or building private cloud services? Building a clear definition is task No. 1.
2. **Post the job opening and collect resumes:** Partner with your HR organization to post the position on a variety of job boards, especially those related to IT. As you collect resumes, pay particular attention to candidates that:
 - Have experience running cloud programs that align with your job definition
 - Possess specific cloud provider or platform experience as it relates with the organization's preference
 - Demonstrate leadership and collaboration experience
 - Hold specific cloud provider or platform certifications
 - Understand your industry or possess industry experience
3. **Interview and select a candidate:** Most HR organizations have a preferred interview style, and Gartner recommends following your organization preference but pivoting where possible to ask specific cloud program questions. Table 2 suggests interview categories and provides sample questions.

Table 2. Sample Interview Categories and Questions

Interview Category	Sample Question
Cultural Fit	How have you achieved cloud business or transformation objectives when faced with resistance from your colleagues?
Attitude	Tell me a time about a past situation with cloud transformation where you were convinced by others that you were wrong, or where others helped you reach a new level of insight. How did you handle this situation?
Communication	Tell me about a time when you had to approach technical topics and then translate that material into language useful to business executives who may not have a technology background.
Industry Knowledge	What do you think is the most pressing concern facing our industry right now and how do you think a cloud program can help address that?
Critical Thinking	What do you think is the biggest risk facing the three largest public cloud providers, and what can we do to insulate us from that risk?
Professionalism	Give me an example where you have made changes in the existing process (due to cloud disruption) yet were able to keep customer or employee experience in mind.
Subject Matter Expertise	Explain to me how to create a continuously available web application architecture using Amazon Web Services or Microsoft Azure.
Thought Leadership	Can you tell me the most important cloud trend happening in the market today and why it is relevant to our organization or the cloud program that we have underway?
Analytical Thought Process	Can you tell me about any past critical situation in which you had to make an immediate decision? Give an example of a situation in which you had to make a decision when you didn't have all facts available. What process do you follow for making decisions for these different circumstances, and were you satisfied with the results?
Curiosity	How do you see the cloud market changing over the next two to three years, and what do you think that means for us as an organization? How do you keep up on the fast-changing pace occurring in the cloud industry?

Source: Gartner (December 2016)

What Technical and Nontechnical Skills Does a Cloud Architect Need?

Due to the broad applicability of cloud computing on an organization, it is extremely unlikely that any individual will possess all the necessary skills that a cloud architect role demands. However, the cloud architect should possess as many of the skills described in Tables 3 and 4 as possible. Where the cloud architect lacks a specific skill, he or she should have the ability to collaborate or engage those in the organization who are resident experts. For example, if the cloud architect does not have a skill or strength in IT service management (ITSM), that individual needs to build a strong relationship with an ITSM expert and collaborate closely to drive cloud ITSM objectives to completion. Therefore, in many ways, collaboration, partnership and the ability to work well with

others is a highly coveted and prioritized skill that the cloud architect will need. Table 3 begins by describing the technical skills advantageous for the cloud architect to possess.

Table 3. Technical Skills: Cloud Architect

Skill	Description
Application Architecture	This involves the layout of an application's deployment and design. This generally includes partitioned application logic and deployment to application server engines. Application architecture is less about specific tools or languages, and more about standardized middleware options, communications protocols, data gateways and platform infrastructures. Cloud computing delivers many advancements in application architecture options, and those with current strengths in application architecture are set up for success.
Automation and Orchestration	Automation often involves streamlining a single task through a repeatable and uninterrupted process. Orchestration often involves automating the execution of a complex process with a variety of variables. Therefore, orchestration may direct several automated tasks in a specific order to deliver a complex outcome. Cloud computing aims to simplify many automation and orchestration tasks, but the cloud architect and cloud team must have foundational knowledge of both to leverage each for their full value in cloud services. This often involves having strong knowledge of scripting, programming or application programming interface (API) interaction.
Governance	This involves the processes that ensure the effective and efficient use of cloud computing in enabling an organization to achieve its goals. Cloud architects must understand governance in the grand scheme of the company and convey governance principles to cloud computing in terms of appropriate use and placement policies.
I&O	This involves the infrastructure-focused people and management processes associated with ITSM (i.e., compute, storage and networking). I&O places a keen focus on running foundational services in a controlled manner. Cloud computing has a large impact on the operational aspects that traditionally fall under the I&O realm.
Integration Architecture	This involves the processes and architecture for integrating disparate services. Integration architecture often has specific impacts on data integration, identity integration, infrastructure integration (network), services integration and provider integration. As cloud services proliferate in your organization, integration architecture is crucial for maintaining proper communication of business processes across boundaries.
ITSM/ITOM	This involves all the processes needed to manage the provisioning, capacity, performance and availability of the operational and service environments. Many times, this is implemented through a framework, such as ITIL.
Outsourcing/ External Hosting	Cloud computing is a form of outsourcing — it just so happens to emphasize self-service in the process of outsourcing infrastructure, platforms or software services. It is important for the cloud architect to have experience with IT sourcing decisions, especially those that reside outside of the company's premises.
Security	This involves technical security configurations that solidify the protection of company assets. As company assets move into external and self-service cloud environments, knowledge and experience with security policies, firewalls, encryption, and security information and event management systems will allow a cloud architect to understand and adopt cloud security services much more adequately.

Source: Gartner (December 2016)

Although cloud architects must have a variety of technical skills, one could argue that the nontechnical skills are even more vital due to the cross-functional demands that cloud computing places on the organization. The nontechnical skills are described in Table 4.

Table 4. Nontechnical Skills: Cloud Architect

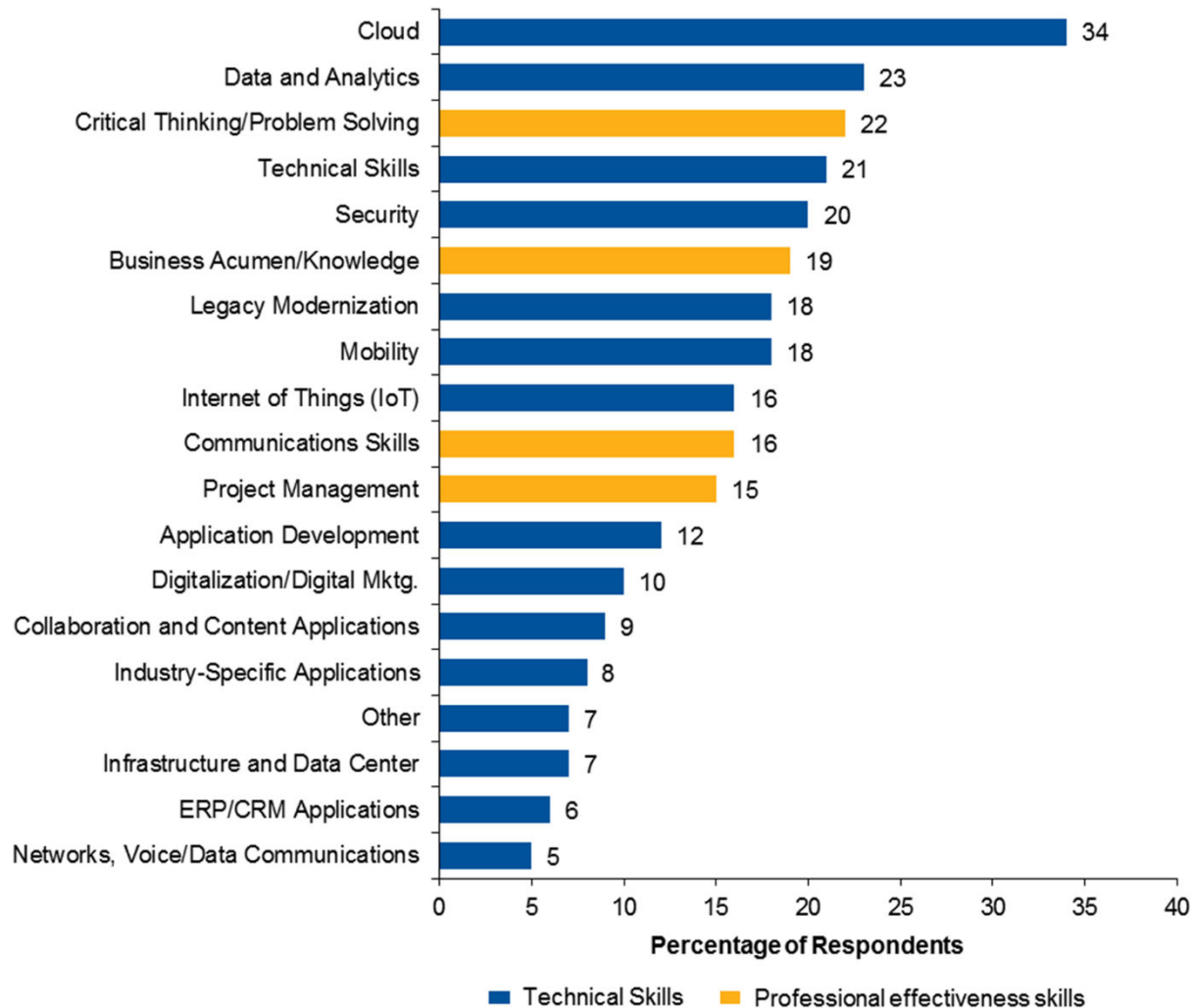
Skill	Description
Communication and Collaboration	Above all, the cloud architect must be a strong communicator and collaborator. No single individual is likely to possess all the necessary technical and nontechnical skills. Therefore, when a skill is lacking, the cloud architect must find a person with said skill and collaborate at a very high level to accomplish important tasks for the cloud program.
Company and Vertical Experience	Cloud computing often delivers business value through characteristics such as self-service, agility, elasticity or scalability. The cloud architect will often need to convey this value in business language that is specific to the individual company or market sector (e.g., healthcare or financial services). Therefore, the most ideal cloud architect will understand your company, your business or your market intimately.
Delegation	The cloud program will have many moving pieces, and you do not want the cloud architect to try to be a superhero. Rather, the cloud architect should see value in building a network of specialized colleagues and delegating assignments and tasks to best achieve an outcome.
Finance/Legal	Cloud computing has a significant financial impact on total cost of ownership (TCO) or ROI assessments. In many cases, cloud computing will aim to save the company money, but at times, it may cost more or be applied through recurring (and never-ending) operational expenses. Therefore, there is an impact to budgeting, forecasting and controlling financial expenditures. Negotiating cloud agreements is a challenging exercise for many organizations. The most successful organizations with cloud adoptions have partnered the cloud architect with general counsel to find a happy medium of technical controls and legal controls to bind into an agreement. Although the cloud architect need not be a finance or legal expert, he or she should understand the basics of IT budgeting and IT contracts and should be able to work with general counsel. If you have no history or experience with IT contracts, ask your procurement team for copies of some of your contracts so that you can understand important clauses like indemnification, notification and limitation of liability.
Procurement/ Vendor Management	Each cloud service that the organization consumes must be procured either through contract agreement or end-user licensing agreements (i.e., self-service click-through agreements). This places a burden on the procurement division that the cloud architect must work with. Traditional, lengthy procurement exercises must be streamlined, and the cloud architect is instrumental in making this happen to ensure cloud procurement is not delayed by old software procurement red tape.
Program Leadership	Cloud computing adoption will look like a very complex IT and business program; it should be treated as such. Therefore, existing knowledge and experience of leading a complex program is a benefit for the cloud architect.
Thought Leadership and Change Agency	Cloud computing requires thought leadership. It also requires the cloud architect to be a catalyst for change. Lifting and shifting the technology, processes and systems that have been used for years into the cloud will not derive the business value that cloud is built to deliver. Therefore, the cloud architect must resist the urge to execute "business as usual" and push the organization through thought leadership to incorporate cloud computing correctly and most effectively.

Source: Gartner (December 2016)

How Can IT Professionals Obtain Necessary Skills for Cloud Architecture?

A recent IT professional survey¹ (Figure 7) found that cloud computing represents the biggest skills gap in organizations today.

Figure 7. Top Skills Gaps Identified by IT Professionals



Source: Gartner (December 2016)

Obtaining the necessary skills to perform any job role must always begin with a gap analysis and action plan for incrementally adding the necessary skills to your individual arsenal. Gartner advocates that individuals that desire to be cloud architects someday must build out an individual development plan (IDP) with their managers. This requires documenting current skill sets, performing a skills gap analysis and creating an action plan for skill addition. Table 5 displays an illustrative example of an IDP. Individuals should fill out at least one row for each of the technical and nontechnical skills mentioned in Tables 3 and 4. This exercise not only communicates to

leaders within the organization how applicable your current skill sets are to be a cloud architect, but also will highlight to you, individually, where you need to focus and grow over time to move toward this career aspiration. Finally, the breadth of the IDP will indicate that there is not a "silver bullet" that will add all skill sets, nor any individual that will possess every single skill set. Therefore, the colleague relationships column is very important in this exercise.

Table 5. Individual Development Plan for the Cloud Architect: Illustrative Example

Skill Set	Current Experience	Current Gaps	Colleague Relationships
Integration Architecture	Network: Extensive experience establishing WAN and Multiprotocol Label Switching (MPLS) connections to branch and corporate sites. Identity: Partnered with IAM team to establish single sign-on (SSO) identity federation between corporation and external CRM provider.	Service-oriented architecture: I do not have experience with our service bus, but will look to engage and learn from that team during the coming quarter.	Data: Strong working relationship with data management and integration team. I have successfully engaged the data team to establish real-time data integrations to our HR service provider.
Legal	I have worked with external and general counsel to successfully come to terms and conditions on the following software and hardware agreements: <ul style="list-style-type: none"> Vendor A Vendor B Vendor C 	I do not have any formal legal background and often do not understand the basis of the legal terms and conditions until our counsel puts them in terms of plain English. Furthermore, I need to grow in translating legal terms into IT security and compliance policy applicability.	I sit on the IT compliance council and am engaged with a variety of risk discussion, some of which are related to legal. As a result, I have a large network of compliance, security, risk and legal colleagues to tap into when questions arise.

Source: Gartner (December 2016)

During the creation of the IDP, Gartner recommends some specific actions that individual contributors can focus on immediately that will result in a variety of necessary skill sets:

- **Get engaged in cloud projects immediately:** Odds are that your organization has many cloud projects in flight right now. Formally ask to be added to the project team, or get yourself engaged in some aspect of the cloud project. Gaining experience in a variety of cloud deployments and working with a variety of cloud providers will increase your awareness and knowledge of the intricacies of cloud computing and will organically add to your wisdom and skill sets.
- **Research cloud markets and use cases:** The internet is your friend. There is no shortage of available information online that describes what cloud computing is, why it matters, who the vendors are, how to get started, how to build solutions, how to mitigate risks and how to manage cloud professionally. Allocate time every day to peruse research documents, news articles, blogs, Twitter and any other source you can find. Saturate yourself with knowledge while being careful to not be overly attracted to any single vendor or provider who might have a biased approach.

- **Attend external training:** Cloud knowledge is quickly evolving. A variety of university-level courses, training classes and technology conferences can contribute to your knowledge on the subject. Ensure your training is not overly biased to any single vendor or provider and that it has a relevant focus for the size of your organization.
- **Prioritize integration, application architecture, security and collaboration:** The cloud architect should have a variety of skill sets. However, if you are missing several skills, you should prioritize integration, application architecture, security and collaboration. These skills tend to be more impactful and more differentiating than many of the other skill sets. They are also harder to find. Entrench yourself in these areas by collaborating with colleagues who are experts and getting involved in projects that highlight these skill sets. Build a network of colleagues who will help you grow.
- **Familiarize yourself with virtualization (servers, networks, storage and containers):** Although not a requirement, most cloud services are founded upon some form of virtualization. If you do not have foundational knowledge of server, network or storage virtualization, find a way to get that knowledge sooner, rather than later. Containers (e.g., Docker) are also exploding in popularity and form a strong base for cloud deployments. Because containers are still early in maturity, getting a jump-start on this market could differentiate you from colleagues.
- **Strengthen your ability to script and communicate with APIs:** True cloud services will always be wrapped with an API, and the best use of cloud services includes a high degree of automation and orchestration. Therefore, gaining a solid understanding of what APIs are, knowing how to communicate with them and being able to script and interact with cloud APIs are all extremely important. If these tasks are daunting for you, find an application developer who knows APIs well, and set up collaboration time to work together and learn together.
- **Spend your personal time in the cloud:** Cloud computing does not require huge amounts of money or complex lab setups. Most individuals can get started with cloud services from their homes, across the internet and for small amounts of money. Highly motivated people will spend their personal time during the night or on weekends interacting with public cloud services and following freely published lab assignments. The more you use and test cloud services, the better equipped you will be to assess and lead cloud services' impact on your organization.
- **Be your own advocate:** Communicate with your leadership about skills you lack, and detail specific tactics and strategies for collecting those missing skills. Ensure that you clearly communicate how much you desire to be a cloud architect and why you think you are the right individual, regardless of whether you have the current skill sets or not.

Recommendations

The following recommendations are intended for technology professionals who see a need for a cloud architect within their organization or desire to be a cloud architect for their organization:

- **Champion the definition and creation of a cloud architect in your organization:** Your first task is to champion or advocate that the cloud architect role be created — because your

organization needs it! You will then need to nominate or suggest the individuals capable of the role, and work with leadership or HR to bring the process of formally creating the position.

- **Explore where the cloud architect role fits:** After championing the creation of the role, the technology professional should investigate where the role fits best within the organization and advocate the proper positioning to senior leadership.

If you see the cloud architect role as the next step in your IT career:

- **Perform a gap analysis on your current skills:** If you desire to be a cloud architect, you must take control of your career and perform a skills gap analysis to discern how close or far you are from being the ideal candidate for your company.
- **Build your own individual development plan to collect missing skills:** After the gap analysis is complete, work with your supervisor to develop a multimonth or multiyear plan to collect the skills that a cloud architect requires. You should never surprise your leadership with this newfound interest. Be patient. Partner with colleagues. Learn from others.
- **Advocate to leadership your suitability for cloud architecture:** When the time is right, market yourself to be the cloud architect. Create a campaign. Lobby with leadership. Display your passion. If you are placed in the role, execute, execute, execute.

Conclusion

Cloud computing is not a matter of "if"; it's a matter of "how." Adopting cloud services is similar to a complex IT program that has no clear end in sight. Initiatives like cloud require strong leadership, not just at an executive level, but also at an architecture level. The cloud architect is paramount to the eventual success of your cloud adoption. Organizations should not delay placing the right individual into this crucial IT role. If you are qualified to be your organization's cloud architect, follow our advice in this research and act now.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"2017 Planning Guide for Cloud Computing"

"Solution Path for Developing a Public Cloud Strategy"

"The Cloud Architect's Guide to Implementing Public Cloud Services"

"Hybrid Architectures for Cloud Computing"

"Building an IT Business Case for Public Cloud IaaS or PaaS"

"A Three-Part Approach to Jump-Start Your Cloud Strategy"

"Cloud Computing Primer for 2016"

Evidence

¹ "Top Skills for IT's Future: Cloud, Analytics, Mobility and Security"

² "Forecast: Public Cloud Services, Worldwide, 2014-2020, 2Q16 Update"

³ "[DevOps Culture \(Part 1\)](#)," IT Revolution Press.

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