CORESTACK®

White Paper

CR360: A Single System of Intelligence for All Your Cloud Resources

Toward a governance model that transforms cloud chaos into cloud confidence

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When it comes to modern-day technology infrastructure, all roads digital lead to and from the cloud. And by any measure you care to examine, cloud usage continues to increase at a rapid pace. According to Gartner, spending on public cloud services grew almost 19% worldwide in 2022, and it's forecast to grow at an even faster rate in 2023, reaching $591.8 billion.[1] Longer-term growth looks even stronger, with IDC forecasting that global cloud spend will reach $1.3 trillion by 2025.[2] It would seem the digital transformation has only just begun – and is accelerating rapidly.

As the use of cloud computing expands, organizations are increasingly recognizing the importance of robust cloud governance. But in order to achieve model cloud governance in today's complex, hybrid, and multi-cloud environments, you need a cloud governance model – one that can take you from cloud chaos to cloud confidence. For cloud workloads running on the CoreStack NextGen Cloud Governance platform, the heart of this governance model is CR360 (Cloud Resource 360). It is the single system of intelligence for all your cloud resources.

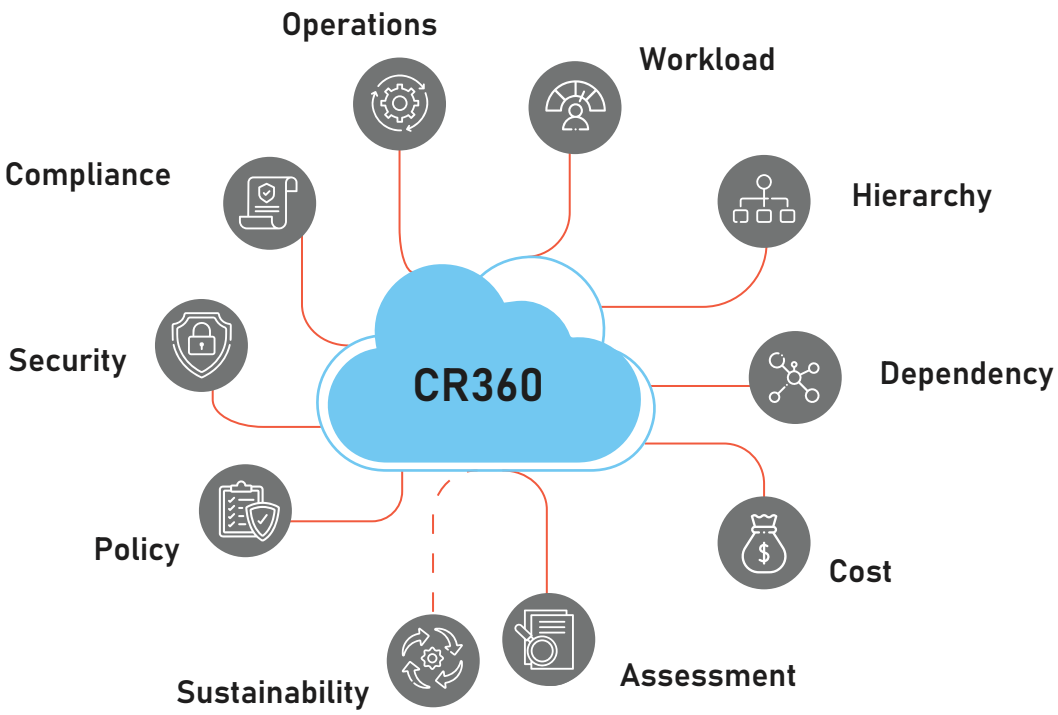
CR360 has the power to transform cloud governance for enterprises of all sizes and across all industries. As the single system of intelligence for all cloud resources, it provides new levels of visibility and understanding without requiring multiple tools or cumbersome integrations. And it is designed to adapt quickly as cloud technology evolves and as cloud providers introduce new functionality. CR360 essentially future-proofs your cloud governance platform, whether you run AWS, Azure, GCP, OCI, or some combination of hyperscalers.

This white paper provides an in-depth exploration of CR360, including what it is, how it works, how enterprises benefit from it across operations, security and compliance, cost, access, and resources, and the crucial role it plays in achieving model cloud governance.

What is CR360?

At CoreStack, we believe that the cloud is the center of gravity for all things digital, and that the cloud resource itself is the kernel. We also believe that having a holistic view into that cloud resource is critical to achieving effective and efficient cloud governance. CR360 provides that view, serving as a single system of intelligence for all cloud resources. With CR360, you get a 360-degree view of each cloud resource – a complete perspective that includes anything and everything associated with a given cloud resource. This approach delivers a unified experience with the potential for numerous beneficial outcomes and insights.

What does that mean for CoreStack's customers? It means that a single platform powered by CR360 supports multiple disparate capabilities, including FinOps, SecOps, CloudOps, and Well-Architected Assessments, all at the same time simply by leveraging different aspects of the same data from each cloud resource. We are also able to associate the cloud resource with relevant workloads, dependencies, projects, and more, giving customers a complete view of each cloud resource by applying multiple lenses to the data.



No doubt you are familiar with the “single system of record” on which CR360 is based. It has been leveraged by several companies to provide a holistic view of a single resource across different products. The principle is that the single system of record provides views into different aspects, whether it’s cost, compliance, security, policy, operations, assessments, etc., without having to build different databases or integrate siloed tools. A “single system of record” is a data rationalization, consolidation, and architecture approach, and if companies do not build their platform from the ground up with this approach in mind, it is very hard to catch up later.

CR360 takes this concept to the needed next level of digital complexity, elevating the technology to a “single system of intelligence.” That’s because CR360 has the capacity not just to provide holistic views of data but also, as mentioned before, to enable beneficial outcomes and insights. That’s because we can now apply the benefits of the single system to the relationship between cloud resources as well – and to all the interdependencies between every facet of a cloud resource. It’s not just a view of a single resource but of multiple resources that are connected to each other across multiple workloads and multiple cloud platforms, creating even greater intelligence. That’s the power behind CoreStack’s NextGen Cloud Governance platform.

How does CR360 work?

When a customer cloud account is onboarded to CoreStack, we set about discovering all the cloud resources that belong to the account and bringing that information into the database. In this step, we are building the inventory of all cloud resources. Once we have the inventory, we then get the detailed properties of each cloud resource from the hyperscalers, and we build the associated relationships between them. We also get the corresponding billing data for the cloud accounts.

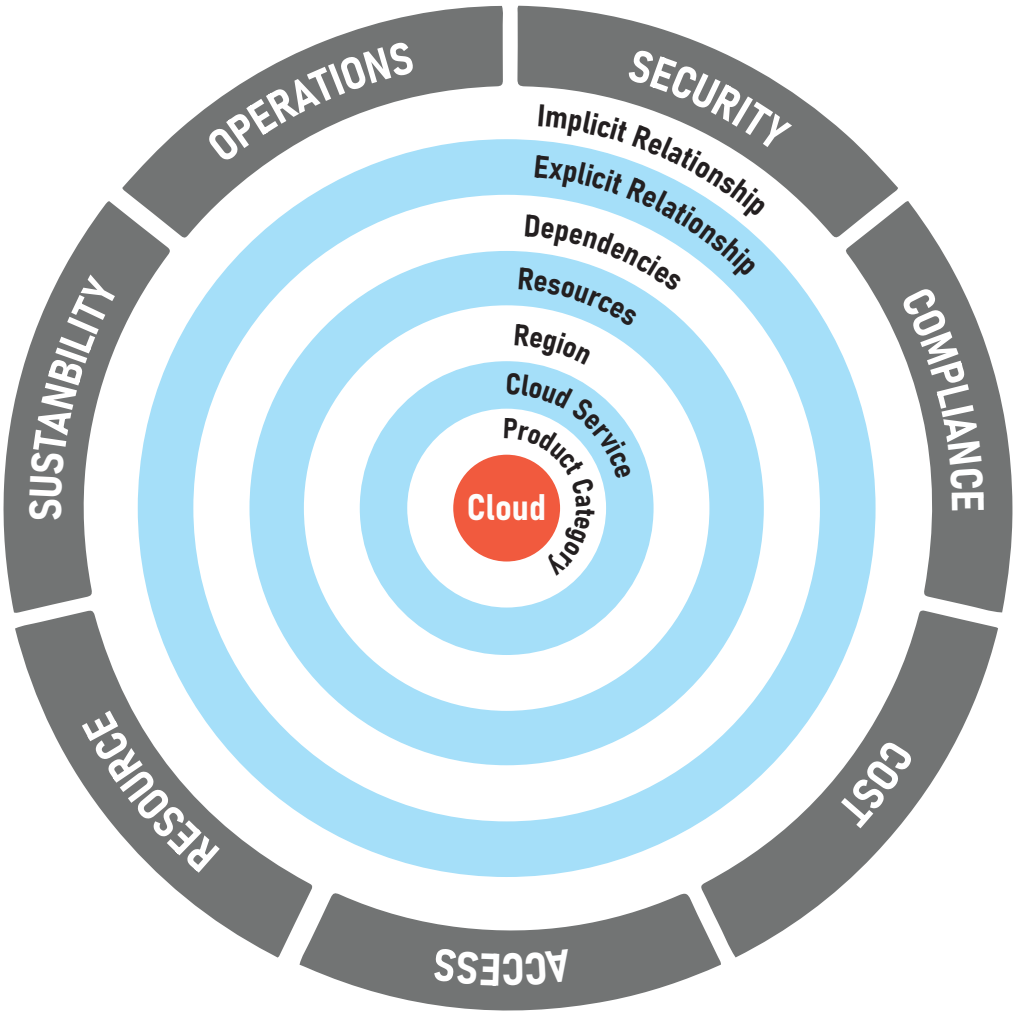
Cloud resources have hierarchies and characteristics, and, for each hierarchy, multiple dimensions, dependencies, and implicit and explicit relationships with other cloud resources. These cloud resources also allow actions that are measured or influenced by cloud-native services or third-party tools. Hyperscalers provide details about each resource through discrete APIs. At this point, we apply CR360 to build a 360-degree view of each of those resources.

Think of a cloud resource has having two views: an inside out view, and an outside in view. The inside out view provides characteristics, implicit relationships, explicit relationships, direct dependencies, indirect dependencies, and actions. The outside in view can be categorized across five essential areas:

- **Operations** posture of a resource such as activities, monitoring, backups, patching, and anomalies
- **Security and Compliance** posture of a resource such as threats, vulnerabilities, architectural drift, policy violations, and control violations of regulatory standards or industry standards
- **Cost** posture of a resource such as unit rate, billing type, daily cost, monthly cost, budgets, optimization recommendations, reservations, and anomalies
- **Access** posture of a resource such as its utilization, visibility, violations, and\ recommendations
- **Resource** posture such as its implicit relationship, explicit relationship, dependencies,

Sustainability will soon be added as the sixth item on this list.

The **outside in** view is achieved through OSCAR cloud governance model listed above, and the **inside out** view is achieved via Cloud Resource Modeling (CRM).



Here's how we describe the different parts of the **inside out** view:

- **Cloud**: This layer maintains the details of the service providers such as Amazon, Azure, Oracle Cloud, Google Cloud, etc., along with the account structure they offer, the APIs, the authentication model, automation, and orchestration offerings.

- **Product Category**: Services offered by the hyperscalers are grouped under product categories. For example, AWS product categories include Compute, Containers, Network, Storage, Analytics, and Database.

- **Cloud Service**: A cloud service is a product, application, or infrastructure available on the internet. Cloud services are typically classified as IaaS, PaaS, and SaaS. For example, the cloud services in AWS include EC2, S3, RDS, ECS, and Redshift.

- **Region**: Hyperscalers offer their cloud services from multiple geographies to meet compliance, data sovereignty, and latency requirements. Each geography may have one or more regions and availability zones designed to help achieve reliability for business-critical workloads. Such discrete demarcations define disaster recovery and data residency boundaries across one or more regions. Maintaining multiple regions ensures that customers are supported across the globe. For example, cloud regions in AWS include US-East and US-West, and cloud availability zones include US-East-1a and US-East-1b.

- **Resources**: Cloud resources in AWS include EC2-Instance, Security Group, Keypair, and Image.

- **Dependencies**: There are certain prerequisites for provisioning a resource, and ependencies outline these prerequisites. For example, VPC, Keypair, Security Group, and Image are prerequisites for provisioning an instance in AWS.

Relationships between cloud resources are either explicit, which are defined at the hyperscaler, or implicit, which are derived.

- **Explicit relationship**: A cloud resource may have one or more explicit relationships with other resources. Dependent resources are always a part of explicit relationships. Sometimes the explicit relationship may be beyond the dependencies, and they may be one dimension or more than one dimension away. Put differently, relation to a relation is also a relation. Here are examples of explicit relationships for an instance in AWS:

    - Volumes is not a dependent but an explicit relation

    - VPC is a dependency, and Internet Gateway is a relation to VPC and thus related to an instance

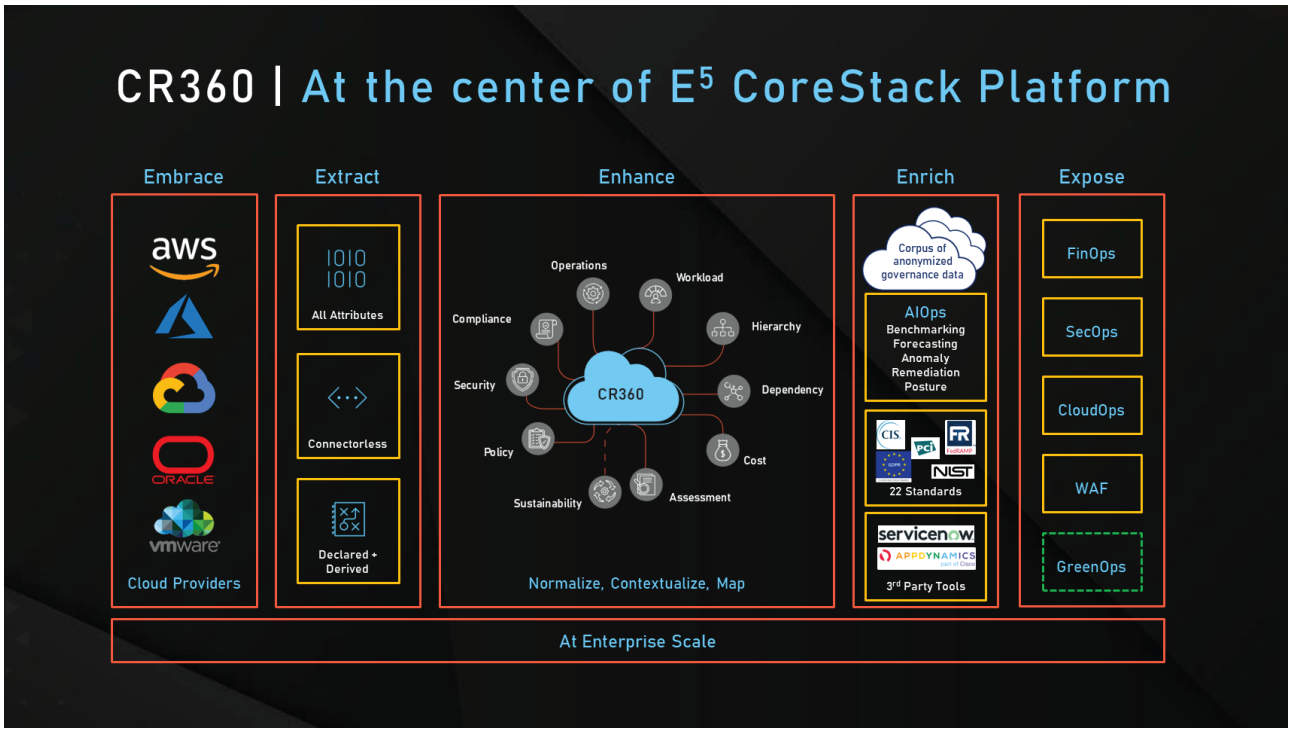
    - Load Balancer for a VM is not a dependent but a relation to an instance

- **Implicit relationship**: An implicit relationship from one cloud resource to another is derived via the network data flow between the resources rather than through regular hyperscaler APIs. Here are examples of implicit relationship for an instance in AWS:
    - Application server communicating to a database server
    - Application server reading data from S3
    - Application server reading data from SQS or sending notification through SNS

CR360 gives us a holistic 360-degree view of all cloud resources from the perspective of cost, compliance, security, policy, operations, assessments, and so on, both from outside in and inside out. As a result, we can provide different capabilities such as FinOps, SecOps, CloudOps, and Well-Architected Assessments using one platform. And if a change is made within a cloud resource, that change is reflected across the entire portfolio of capabilities immediately.

When we combine the information we get from the discovered cloud resources with billing data to create CR360, it is much more powerful than leveraging billing data alone. However, CR360 is **not limited to data from hyperscalers**. Any piece of data that is associated with a cloud resource can be captured, whether it comes from a hyperscaler or a connected third-party tool. CR360 has the ability to poll data from tools such as monitoring and vulnerability, making it even richer and more beneficial. Regardless of the source, we can analyze and present that information in a single unified dashboard that provides recommendations, remediations, and deep insights to our customers.

Enriching the Cloud Resource



Additionally, the data corpus that is created from all the anonymized cloud resources can be used to train AI models and generate recommendations for forecasting, right-sizing, predictions, and insights. The data can also be used for benchmarking how a customer in a particular industry in a particular region is leveraging cloud and comparing to others, and can provide insights that facilitate the digital transformation journey and lead to better results.

How does CR360 future-proof the cloud?

As the single system of intelligence for all cloud resources, CR360 allows CoreStack to continuously and quickly adapt the platform, delivering new and enhanced cloud governance capabilities as technology evolves and as each of the hyperscalers change and add new capabilities to their respective cloud services. For example, AWS, Azure, and GCP did not support Well-Architected Assessments even two years ago. One by one, however, they've started to implement them and expand what it means to say "Well-Architected," and CoreStack has been able to integrate these new capabilities by leveraging the existing cloud resource. For CoreStack, Well-Architected Assessment is yet another facet of the same cloud resource.

Another excellent example is sustainability, or what some people call GreenOps. A cloud resource may not provide data on the "greenness" of that resource today, but as hyperscalers make those capabilities available, CR360 will be able to leverage that data immediately, providing answers to questions like, "How green is this cloud resource? Is it powered by renewable energy? And how much more **sustainable** is the workload now that I am using green cloud resources?" While other providers will spend months playing catch-up on this front, CR360 enables quick alignment with hyperscaler developments. In fact, with CR360, CoreStack can easily extend cloud governance into every facet of the cloud as the need arises or as technology permits.

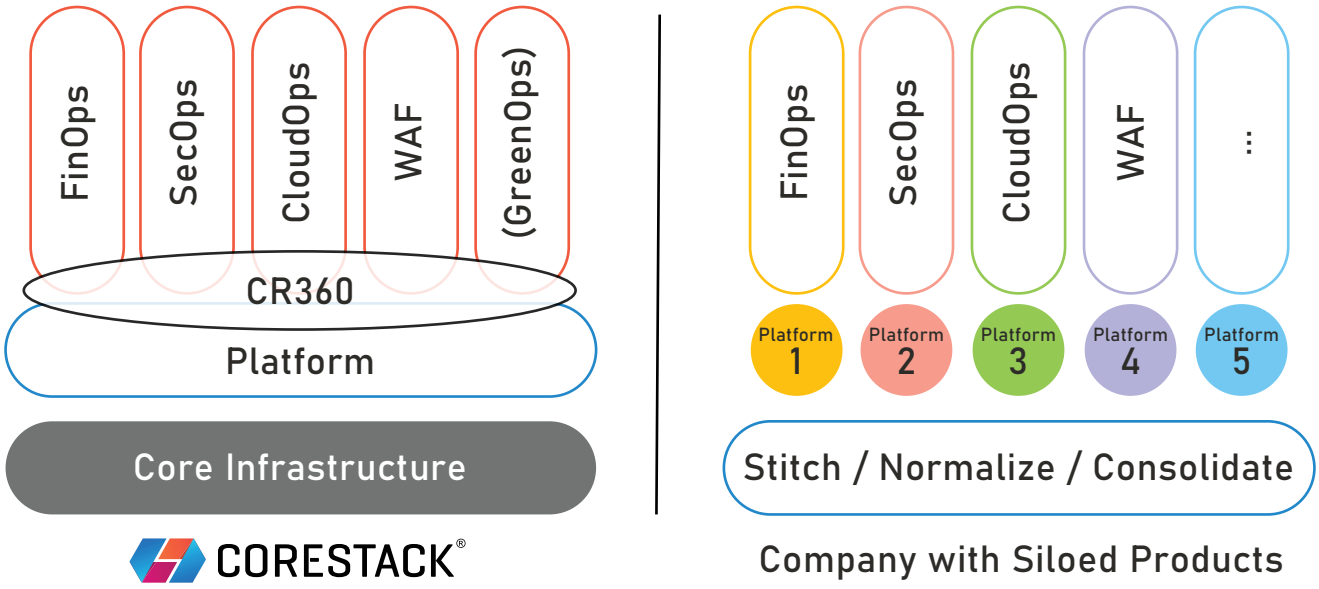
CoreStack has yet another advantage when it comes to future-proofing. With today's enterprises rapidly embracing multiple cloud services, including IaaS, SaaS, and PaaS, as well as multiple operational tools such as monitoring, logging, security, configuration management, etc., there is an increasing need for efficient orchestration across these multiple services and tools. Many organizations adopt cloud-native declarative domain-specific languages (DSLs) for provisioning and orchestration, but this approach has several limitations. Namely, cloud-native DSLs typically don't support discrete actions on cloud resources, don't support the orchestration of on-premise infrastructure or third-party tools, and only support the orchestration of services and resources native to the platform.

CoreStack has overcome these limitations by developing a patented system and method for interoperable DSL that enables orchestration of multiple cloud platforms and services providers. This **"connectorless"** approach means that, as hyperscalers add more capabilities to their cloud offering and offer support for more standards, the CoreStack platform can quickly integrate those capabilities, bypassing the typical time-intensive development cycles that other vendor tools require.

How do the alternatives to CR360 fall short?

Consider the typical enterprise SaaS provider who offers FinOps, SecOps, CloudOps, or Well-Architected Assessment – or any product to deliver cloud governance capabilities across a single cloud or multi-cloud. They can provide only cost, or security, or operations, or assessments for each of those products. There is by default no holistic 360-degree view of all the cloud resources, which creates the potential for chaos.

To provide a 360-degree view of every cloud resource would require the providers to routinely synchronize and stitch together data from different systems, normalize that data, and try to consolidate it seamlessly in a single pane of glass. It's a process that is tedious and time-consuming, and because of the way each system captures cloud resource information, it's also error-prone and extremely limited in value. What's more, as each of those siloed systems evolves, the synchronizing and stitching together, normalizing, and consolidating of data must be done continuously. If a change happens on one product or system and not the others, the process must be done all over again.



An enterprise SaaS provider that focuses on FinOps or SecOps may offer deeper capabilities in that particular area, but today's enterprises would need four, five, six, seven, or eight such tools to provide all the cloud governance capabilities they require. And when these tools operate in isolation, the impact is sub-optimal and the value of the cloud is dramatically reduced. A solution that provides integrated capabilities at the platform level via a single system of intelligence provides orders of magnitude more efficiency and more value. With CR360, CoreStack eliminates the need for integration of multiple functional siloed tools. In fact, it can replace a smorgasbord of tools and integrations with a single platform.

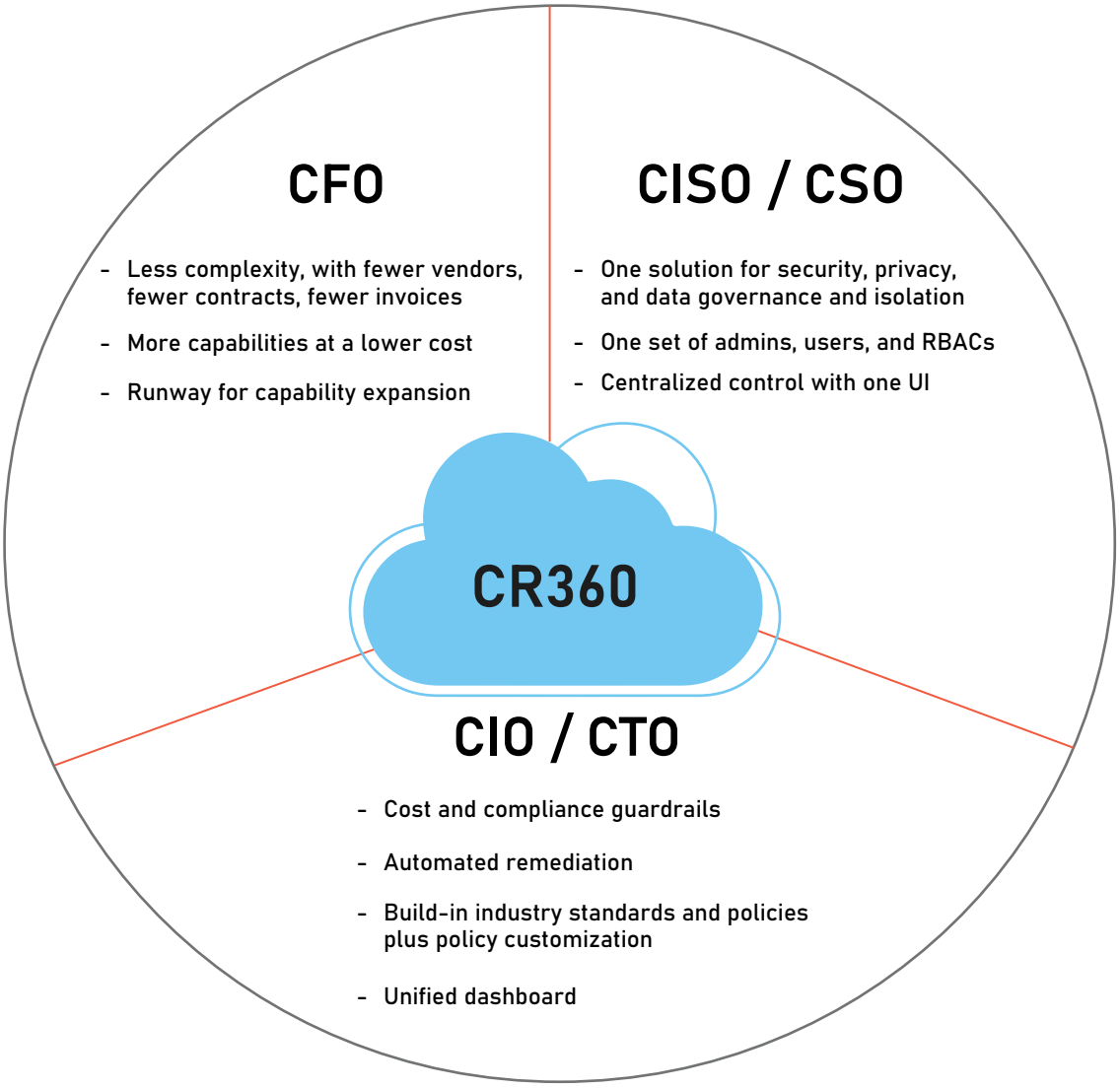
What are the benefits of CR360?

The beauty of CR360 is that all cloud resources under management are fully integrated and all data is normalized, contextualized with both implicit and explicit relationships, and properly indexed. As a result, customers on the CoreStack platform realize numerous benefits:

- By providing a holistic perspective of every interconnected facet of a cloud resource, CR360 allows you to optimize cloud usage within the context of cloud resource interdependencies across FinOps, SecOps, and CloudOps.
- CR360 brings together data from multiple hyperscalers for true multi-cloud governance for AWS, Azure, GCP, and OCI. The single system of intelligence is fed by – and operates across – all hyperscalers, consolidating all cloud data in a single pane of glass.
- CR360 is not limited to a single cloud resource. It also reflects relationships between cloud resources, such as hierarchy, dependencies, etc.
- CR360 data is not limited to that provided by hyperscalers. It can be further enriched with data from third-party tools.
- CR360 allows the platform to continuously adapt and evolve to accommodate whatever cloud technology and hyperscaler enhancements come next.

With a 360-degree view across all cloud accounts along with valuable business context, CR360 also offers substantial benefits to leadership across the organization.

CR360: Benefits to Leadership

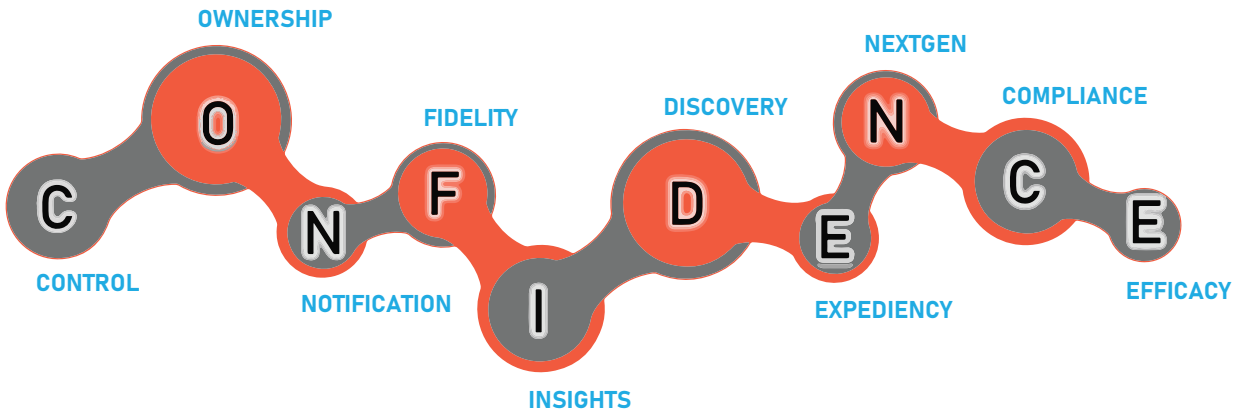


Why is CR360 important now?

CR360 is important now partly because of what's currently at stake for today's organizations and partly because of what's in store. Every enterprise, whether small, medium, or large, is on a digital transformation journey of some kind, and every one of them is trying to leverage the cloud in the most efficient, secure, compliant, and cost-effective way possible. Further, they also want to make sure that their workloads in the cloud are "Well-Architected."

Very often, that journey involves migrating multiple workloads to the cloud, and finding ways to better utilize the cloud resources that are available in the marketplace. Most medium and large enterprise customers use not just one but multiple cloud providers, making migration and management even more complicated.

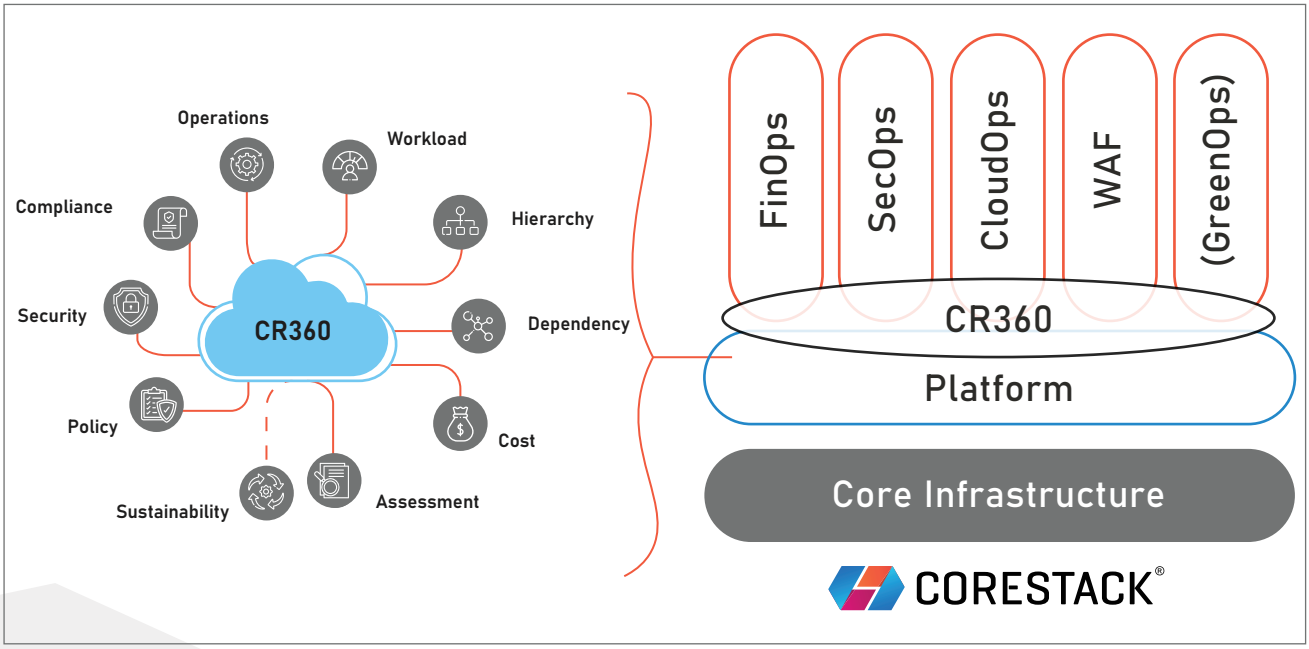
Wherever they are in digital transformation, CoreStack customers can use the holistic view that CR360 provides to approach the journey with confidence:



CR360 is also important because of what's to come. We know cloud governance for sustainability (GreenOps), edge computing, and containers is on the horizon, and that CR360 is perfectly positioned to accommodate the enhanced capabilities hyperscalers have in store. But what else is in development? What's coming that we haven't even thought of yet? And will your cloud governance platform be capable of supporting it when the time comes?

What are the key capabilities of CR360?

To get a full perspective of CR360, let's look at ten powerful capabilities CR360 enables.



1 Cost

With CR360, you can proactively monitor cloud systems against customized cost guardrails, allowing you to spot drift in cloud spending in real-time, trigger notifications and auto-remediation, and prevent cost overruns without requiring human intervention. You can identify and act on cost optimization opportunities such as right-sizing, matching resources to workloads, identifying and remediating idle and orphaned cloud resources, customizing configurations, and managing markups and discounts. Granular cost reporting and tools can help foster a culture of financial accountability.

2 Security

CR360 allows you to govern security operations proactively and autonomously, building a strong defense against security threats. You can get unified visibility into security threats, attacks, and vulnerability data, identifying threats and assessing vulnerabilities continuously against security governance guardrails.

3 Compliance

With CR360, you can get an accurate and unified view of your entire multi-cloud inventory and compliance status, enabling you to achieve continuous cloud compliance against evolving industry and regulatory standards. Assess your infrastructure against industry standards such as ISO, FedRAMP, NIST, HIPAA, PCI-DSS, CIS, AWS Well-Architected Framework, and many more, and also build your own customized standards in CoreStack.

4 Policy

With built-in support for more than 2,000 policies across 22 standards – and the ability to create even more through customization – CR360 makes it easy to assess, remediate (where the hyperscaler allows), and ensure compliance with policies across multiple cloud platforms, whether for operations, cost, security, or compliance.

5 Operations

With rules-based automation, third-party integrations, continuous monitoring, and single-pane-of-glass visibility, CR360 powers smarter operations across cloud platforms, increasing efficiency, productivity, reliability, and flexibility across activities such as monitoring, backups, patching, and remediation.

6 Assessment

Powered by CR360, CoreStack's Well-Architected Assessment helps enterprises adopt cloud best practices, manage risk, and maintain reliable, secure, resilient, cost-efficient, performant, and sustainable cloud infrastructures. Well-Architected Assessment is an evolving discipline, and as this discipline matures across hyperscalers, CoreStack will be alongside taking advantage of those evolutions and applying them across other disciplines, whether cost, compliance, security, or operations. Further, CoreStack enables customers to create their own custom assessment frameworks, alongside the ones provided by hyper-scalers, and to fine-tune the assessments that suit their enterprise.

7 Workload

A workload in CoreStack is a group of related cloud resources, and it's created for the purpose of aiding in governance and yielding insights about their performance. When you create a workload, CoreStack discovers all the resources available in your cloud account and allows you to filter and select which resources you want to associate with particular workloads. You can also apply assessments from a specific Well-Architected Framework to a workload.

8 Hierarchy

Let's say two cloud resources are associated with each other in a relationship where one cloud resource uses a second cloud resource for a project. CR360 can connect those two resources, understand the primary and secondary relationship between them, and understand how they are hierarchically connected. CR360 is not just about seeing different facets of a single cloud resource, but seeing multiple facets of each cloud resource and how they relate together and across projects.

9 Dependency

By capturing relationships such as parent-child dependencies, we can determine how many cloud resources belong to a particular project, how much the resources for a particular project cost, and, if you take a cloud resource away, precisely how the project will be impacted. Dependencies let us optimize within that context, even if the cloud resource or project spans multiple cloud accounts.

10 Sustainability

The IT sector accounts for about 3.6% of global electricity consumption, and, according to recent research, the sector's carbon footprint could be reduced by over 80 percent if all electricity consumed came from renewable energy sources.[3] By addressing sustainability as a component of cloud governance, organizations will have more visibility into and control over the impact their cloud services have on the environment.

NextGen Solutions from CoreStack

CoreStack's mission has always been to help enterprises leverage best-of-breed cloud providers with the least friction possible. Built on CR360, the CoreStack NextGen Cloud Governance platform allows enterprises to embrace, enhance, and extend native cloud capabilities while providing reporting, recommendation, and auto-remediation in a unified dashboard across the most complex and multi-cloud environments. Armed with powerful FinOps, SecOps, CloudOps, and cloud assessment capabilities, enterprises can more quickly and easily capitalize on the opportunities that matter.

CoreStack was built from the ground-up as an enterprise SaaS product to provide comprehensive multi-cloud governance. It's not something that can be achieved by cobbling together multiple technologies – it must be done purposefully and deliberately. This approach not only reduces cloud costs, improves compliance, and enhances security, it also enables better control of multi-cloud environments and minimizes chaos.

CR360 provides the backbone of the CoreStack portfolio, which includes two sets of NextGen solutions:

- **CoreStack Assessments:** A powerful assessment solution that streamlines and scales the cloud assessment process, allowing partners to run assessments against multiple cloud-native frameworks as well as custom frameworks.
- **CoreStack Governance:** A set of modules that leverage AI to provide continuous and autonomous governance for FinOps, SecOps, and CloudOps across multi-cloud – all in a single platform with a unified dashboard.

No matter your level of cloud maturity, CoreStack can help you Cloud with Confidence. With CR360, CoreStack dramatically improves visibility into cloud resources and enables enterprises to make better, more informed decisions. Our NextGen Cloud Governance portfolio can transform any organization from a reactive posture to a proactive one, enabling predictable increases in top-line revenues and bottom-line efficiencies while fully realizing the competitive advantage of the cloud's variable-cost model. To get started or to learn more, visit www.corestack.io or reach out to us at contact@corestack.io.

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CoreStack is an AI-powered NextGen Cloud Governance platform that enables enterprises to embrace cloud with confidence, rapidly achieving continuous and autonomous cloud governance at scale. CoreStack helps 750+ global enterprises govern more than $2B in annual cloud consumption. The company is a Microsoft Azure (Legacy) Gold Partner, Amazon AWS Technology Partner with Cloud Operations Competency, Oracle Cloud Build Partner, and Google Cloud Build Partner.